MAINTENANCE MANUAL

FOR
TMX-8712 HANDSET
19B801596P1

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SPECIFICATIONS

POWER SUPPLY	
Nominal	13.8 VDC
Range	10.5 VDC to 16 VDC No failure or lack of functions within this range
CURRENT DRAIN	Less than 5 milliamperes
OPERATING TEMPERATURE RANGE	
Nominal	25°C
Operating Range	-30°C to +60°C
VCC VOLTAGE	At 25°C, 5.0VDC to 5.4 VDC typical
CLOCK FREQUENCY	28.800 KHz +0.1 Hz at 25° C 28.800 KHz +10 PPM at -20°C to +50°C
WATCH DOG FREQUENCY	2 to 4 Hz at 25°C

DESCRIPTION

The General Electric TMX-8712 Handset, shown in Figure 1, consists of a telephone numeric keypad with special function keys, a liquid crystal display and two circuit boards; Interface Board (A1) containing the handset microphone, microphone pre-amplifier, sidetone mixer and amplifier, earpiece driver and handset earpiece; Logic Board (A2) containing the keypad switches, a microprocessor, receive and transmit buffers and a clock generator.

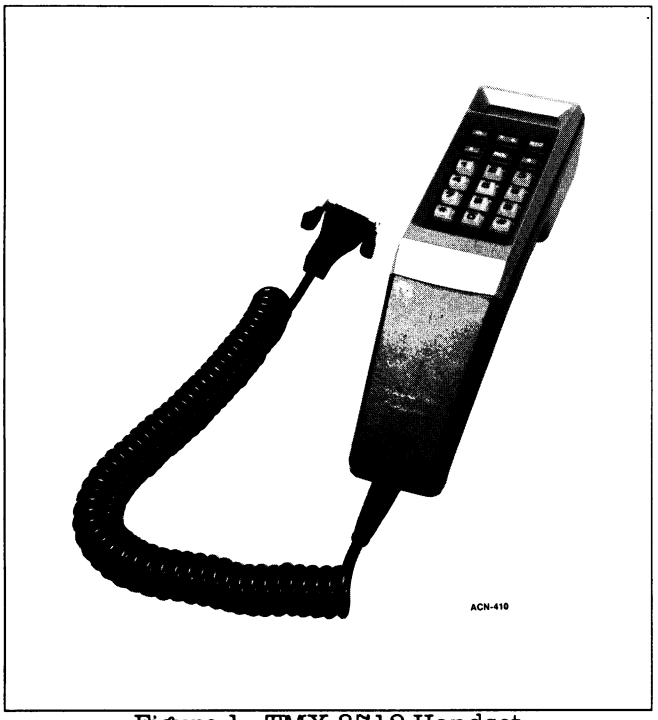


Figure 1 - TMX-8712 Handset

INTERFACE BOARD A1

Audio from the electret microphone (B101) is amplified by U101A and passed to the transmit audio path of the radio. A portion of this is connected to the sidetone mixer and amplifier U101B through divider resistors R127, R128 and R104. Audio from the receiver is amplified by U101B and along with the sidetone, is passed to the earpiece driver transistors Q101 and 102. The output of the driver is connected to the earpiece B102.

LOGIC BOARD

The 4-bit microprocessor (U3) scans the keypad and provides output control to the display driver. The microprocessor also provides control of the display backlighting. When a key is closed on the keypad, an ASCII code is generated by the microprocessor and sent to the radio logic circuits over a 2-wire asynchronous serial bus. The logic unit in the radio interprets the code and returns an appropriate response to the microprocessor which in turn, completes the command.

Backlighting of the display and keypad is provided by five LED's (H1-H5). Control for the backlighting is provided by a pulsed signal from the microprocessor to the LED driver transistor Q5. The duty cycle, determined by the microprocessor, establishes the intensity of the backlighting. Pressing the E (END/FUNCTION) key followed by the VOLUME "up" or "down" key adjusts the backlighting intensity (when connected to the radio).

The eight-digit liquid crystal display (H1) is driven by the multiplexed output of the microprocessor. Due to the board operating temperature range requirement for the LCD, the driving signal must be temperature compensated to maintain good contrast and operating speed. This compensation is provided by temperature compensating regulator U102 and diodes D103 - D109.

TEST SPECIFICATIONS

MICROPHONE

1. Sensitivity: An input level of 97 dB SPL will produce an output of 35 mV rms ±5 dB. (dB SPL = 20 Log10 (Pn/Po) where Pn is the RMS sound pressure in Pascals and Po = 2 x 10^{-5} Pascal)

2. Distortion: For an input signal of < 1% distortion, the output distortion will not exceed 3% from 300 Hz to 3000 Hz.

RECEIVER

1. Offhook Sensitivity: A 1 KHz, 3 V rms input signal will produce an output level of 94 ± 3 dB SPL, as measured at the artificial ear (approximately 26 mV rms across the DH52 speaker).

2. Distortion: For an input signal of 3 V rms with less than 1% distortion, the output distortion is less than 5% as measured at the artificial ear, from 300 to 3000 Hz.

3. Ear protection: An audio limiter is provided to ensure that the maximum acoustic output does not exceed 120 dB.

SIDETONE LEVEL

The acoustic-to-acoustic sidetone response shall be such that a 1000 Hz, 97 dB SPL transmit-audio input signal shall produce 85 ±4 dB SPL at the artificial ear.

ON/OFF

Power is applied to the handset when the radio is turned on.

HOOK CONDITION

The hook condition is created by a hanger containing a magnet to actuate a reed switch.. The hook condition must operate as follows:

1. OFF Hook: 0.2V maximum, 0.6 mA sink minimum.

2. ON Hook: (Properly mounted on the hanger): Open collector (high impedance)

SERIAL DATA

The serial data format is a pseudo RS-232 format. Specifically, it is an asynchronous serial bus operating between Vcc and 0 Volts.

Baud rate:	300 + 5%
Bit Pattern:	1 start, 2 stop, 8 data (no parity check)
Format:	0 to Vcc inverted (Vcc is the "No Data" condition)
Vcc:	4.5 to 6.0 VDC
Keypad Data:	High - Open collector Low - 0.2 VDC, 1 mA sink
Display Data:	High - open collector drive <50μA current drain Low - 0.8V maximum

SERVICE NOTES

To test the handset by itself, loop the output to the input by connecting P1-1 to P1-6 on a test connector. Apply nominal +13 Volts to P1-3 and ground to P1-8. Connect the handset cord connector to the test connector. To turn ON the audio and backlighting portions of the handset, press the RCL (RECALL) button and while holding it pressed, push the "*" button. The audio and backlighting portion of the handset will turn on. This step must be completed before performing any other test.

Operation of the handset will now cause changes in the display according to the following:

1. Numerical keys, pressed individually, will display the number entered. If more than eight digits are entered, the digits will disappear to the left in the order they were entered.

2. When the control keys (BLUE) are pressed individually, either a character will be displayed or there will be no reaction from the display.

SINGLE KEY ENTRIES

Key	Display
CNCL/MON	No Reaction
VOL ▼	h
VOL ▲	-
STO	r
E	No Reaction
RCL	No Reaction
S	=
*	=
#	Space
1	'
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9
0	0

EXTRA FUNCTIONS

To execute the following commands, hold the first key down while pressing the second key.

1. To clear the display at any time, press "E" first and simultaneously press "VOL".

2. Commands used to display specific functions:

Display Functions:

	To Display		To Clear	
	1st Key	2ndKey	1stKey	2ndKey
In Use	CNCL/MON	8	CNCL/MON	9
Roam	CNCL/MON	STO	CNCL/MON	8
Horn	CNCL/MON	*	CNCL/MON	#

3. Commands used to backlight the keys and the display:

Function	First Key	Second Key
Increment the Backlight	CNCL/MON	3
Decrement the Backlight	CNCL/MON	4

The backlight has eight levels of intensity; therefore, it can be incremented eight times and decremented eight times. The second key can be pressed more than eight times but will stay at its highest level when incrementing and will stay off while decrementing.

4. Commands used to turn on the audio and backlighting portions of the handset:

To turn ON the audio and backlighting portions of the handset, press the RCL (RECALL) button and while holding it pressed, push the "*" button. The audio and backlighting portion will turn on. This step must be completed before performing any other tests.

To turn OFF the audio and backlighting portions of the handset, press the RCL (RECALL) button. (NOTE: Pressing the RCL (RECALL) and "#" buttons at the same time will have the same effect). The audio and backlighting portion of the handset will shut off.

ADJUSTMENTS

The contrast ratio on the LCD display may be adjusted by using the following procedure:

1. Press Key "1".
2. Slowly turn R25 counterclockwise until a "1" is displayed as the rightmost digit on the display. Ignore any other digits at this time.
3. Continue to turn R25 in the same direction until the five normally off segments around the "1" begin to glimmer. Then, turn R25 clockwise 1/8 turn (45°).
4. If the five normally off segments do not glimmer for any setting of R25, set R25 to its full counterclockwise position.

GE Mobile Communications

General Electric Company
Lynchburg, Virginia 24502

Printed in U.S.A.

HANDSET

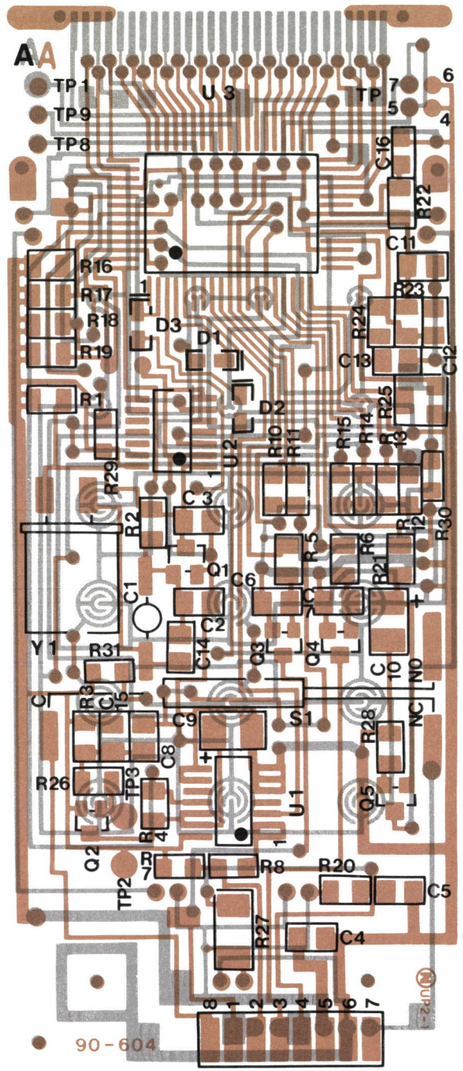
PARTS LIST

TMX-8712 HANDSET
19B801596P1
ISSUE 1

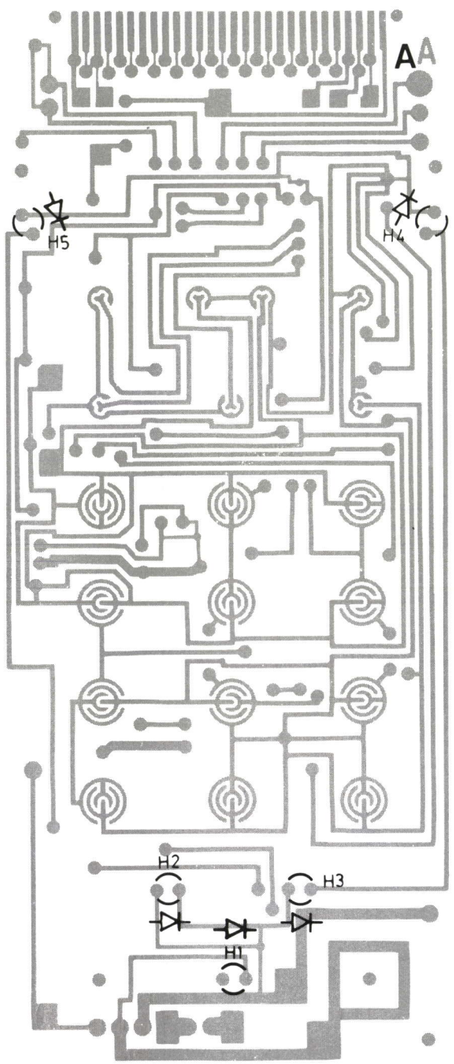
SYMBOL	GE PART NO.	DESCRIPTION
		NOTE: When ordering replacement parts all part numbers should be preceded by: "A29/".
		LOGIC BOARD BP0302934
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1	CV1305000A	Variable: 30 pF.
C2	CR2224110A	Ceramic: 220 pF + or - 10%, 50 VDCW, NPO.
C3	CR2104110A	Ceramic: 100 pF + or - 10%, 50 VDCW, NPO.
C4	CR3104410A	Ceramic: 0.001 uF + or - 10%, 50 VDCW, Z5U.
C5	CR4684410A	Ceramic: 0.068 uF + or - 10%, 50 VDCW, Z5U.
C7	CR3104410A	Ceramic: 0.001 uF + or - 10%, 50 VDCW, Z5U.
C8	CR4104300A	Ceramic: 0.01 uF + or - 10%, 25 VDCW, X7R.
C9	CU6225670A	Tantalum: 2.2 uF + or - 20%, 16 VDCW.
C10	CU6225670A	Tantalum: 2.2 uF + or - 20%, 16 VDCW.
C11	CR4684410A	Ceramic: 0.068 uF + or - 10%, 50 VDCW, Z5U.
C12	CR4684410A	Ceramic: 0.068 uF + or - 10%, 50 VDCW, Z5U.
C13	CR4684410A	Ceramic: 0.068 uF + or - 10%, 50 VDCW, Z5U.
C14	CR1103100A	Ceramic: 10 pF + or - 5%, 50 VDCW, NPO.
C15	CR4104300A	Ceramic: 0.01 uF + or - 10%, 25 VDCW, X7R.
C16	CR4684410A	Ceramic: 0.068 uF + or - 10%, 50 VDCW, Z5U.
		- - - - - - - - - - DIODES - - - - - - - - - -
D1 thru D3	SD0301567A	Silicon: BAS19 SMD.
	SD0303011A	Silicon: 1SS220/1 SMD.
		- - - - - - - - - - LEDS - - - - - - - - - -
H1 and H2	SE0301564A	LED, Green: 3mm, clear, long lead.
H4 and H5	SE0301564A	LED, Green: 3mm, clear, long lead.
		- - - - - - - - - TRANSISTORS - - - - - - - - -
Q1	ST0301597A	NPN, 2SC2712Y.
Q2	ST0301598A	PNP, 2SA1162Y.
Q4 and Q5	ST0301597A	NPN, 2SC2712Y.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1	RR3223200A	Surface Mount: 2.2K ohms + or - 5%, 1/8 W, 1206.
R2	RR5273200A	Surface Mount: 270K ohms + or - 5%, 1/8 W, 1206.
R3	RR4103200A	Surface Mount: 10K ohms + or - 5%, 1/8 W, 1206.
R4	RR5333200A	Surface Mount: 330K ohms + or - 5%, 1/8 W, 1206.
R6 thru R8	RR4103200A	Surface Mount: 10K ohms + or - 5%, 1/8 W, 1206.
R10 thru R19	RR4103200A	Surface Mount: 10K ohms + or - 5%, 1/8 W, 1206.
R21	RR3393200A	Surface Mount: 3.9K ohms + or - 5%, 1/8 W, 1206.
R22 thru R24	RR4103200A	Surface Mount: 10K ohms + or - 5%, 1/8 W, 1206.
R25	RW5100000A	Variable: 100K ohms, SMD TYPE 1-TURN.
R26	RR2473200A	Surface Mount: 470 ohms + or - 5%, 1/8 W, 1206.
R28	RR1223200A	Surface Mount: 22 ohms + or - 5%, 1/8 W, 1206.
R29 and R30	RR4103200A	Surface Mount: 10K ohms + or - 5%, 1/8 W, 1206.
R31	RR5103200A	Surface Mount: 100K ohms + or - 5%, 1/8 W, 1206.
		- - - - - - - - - - SWITCHES - - - - - - - - - -
S1	VR0301572A	Reed Switch: sim to OKI Type ORT233.
		- - - - - - - - - INTEGRATED CIRCUITS - - - - - - -
U1	UC0301568A	IC-CMOS, 4093 SOIC PKGD.
U2	UC0301569A	IC-CMOS, 4024 SOIC PKGD.
U3	UC0301570A	4-BIT Microprocessor, uPD7502.
		- - - - - - - - - - CRYSTALS - - - - - - - - - -
	SR0301571A	3.6864 MHZ XTAL HC49U-A.
		- - - - - - - - - - MISCELLANEOUS - - - - - - - - - -
	XX0301944A	LCD Glass 8 DIGIT.
	ES0301579A	Insulation Tube (0.1050 METER).
	ET0301870A	Double Side Tape (3/8 WIDTH).
	NC0301945A	Zebra Connector (37 x 6.5 x 1MM).
		AUDIO BOARD (PCB Interface) BP03029355
		- - - - - - - - - - MICROPHONES - - - - - - - - - -
B101	XX0301589A	Condenser MIC, EM60.
B102 *	XX0301947A	Speaker, DH52. (Note R106)
	XX0303235A	Speaker, KDR920. (Note R106).
B102 **	XX0302575A	Speaker, DTR-154P. (Note R106).
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C22	CA3104310A	Disc: 1000 pF + or - 10%, 50 VDCW, X7R.
C23	CE6105757A	Electrolytic: 1 uF + or - 20%, 50 VDCW, RADIAL.
C101	CE7105717A	Electrolytic: 10 uF + or - 20%, 25 VDCW, RADIAL.
C102	CE8105670A	Electrolytic: 100 uF + or - 20%, 16 VDCW, RADIAL.
C103	CE6335757A	Electrolytic: 3.3 uF + or - 20%, 50 VDCW, RADIAL.
C105	CE7105717A	Electrolytic: 10 uF + or - 20%, 25 VDCW, RADIAL.
C107	CE5105757A	Electrolytic: 0.1 uF + or - 20%, 50 VDCW, RADIAL.
C108 and C109	CA3104310A	Disc: 1000 pF + or - 10%, 50 VDCW, X7R.
C110	CE8105711A	Electrolytic: 100 uF + or - 20%, 25 VDCW, RADIAL.
C111 and C112	CA3104310A	Disc: 1000 pF + or - 10%, 50 VDCW, X7R.
C113	CE6105757A	Electrolytic: 1 uF + or - 20%, 50 VDCW, RADIAL.
C114	CE6335757A	Electrolytic: 3.3 uF + or - 20%, 50 VDCW, RADIAL.
C115	CE7225677A	Electrolytic: 22 uF + or - 20%, 16 VDCW, RADIAL.
C116	CA2474210A	Disc: 470 pF + or - 10%, 50 VDCW, Y5P.
C117	CL4103750A	Polyester: 0.01 uF + or - 5%, 50 VDCW,.
C118	CA3104310A	Disc: 1000 pF + or - 10%, 50 VDCW, X7R.
C120	CE8105711A	Electrolytic: 100 uF + or - 20%, 25 VDCW, RADIAL.
		- - - - - - - - - - DIODES - - - - - - - - - -
D101 thru D112	SD0300382A	Silicon, 1N4148.
		- - - - - - - - JACKS AND RECEPTACLES - - - - - - -
J1	WX0302993A	10-WAY Jumper.
J4	NC0301596A	2-WAY Connector.
		- - - - - - - - - TRANSISTORS - - - - - - - - -
Q101	ST0300177A	NPN, 2SD467.
Q102	ST0300178A	PNP, 2SB561.
Q103 and Q104	ST0300177A	NPN, 2SD467.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R101	RF1473200A	Carbon film: 47 ohms + or - 5%, 1/8 W.
R102	RF4153200A	Carbon film: 15K ohms + or - 5%, 1/8 W.
R103	RF4223200A	Carbon film: 22K ohms + or - 5%, 1/8 W.
R104	RX0302693A	Metal film: 22K ohms + or - 1%, 1/8 W.
	RX0302929A	Metal film: 22K ohms + or - 1%, 1/6 W.
R105	RF3473200A	Carbon film: 4.7K ohms + or - 5%, 1/8 W.
R106 *	RX0302695A	Metal film: 100K ohms + or - 1%, 1/8 W.
	RX0302931A	Metal film: 100K ohms + or - 1%, 1/6 W.
R106 **	RX0303270A	Metal film: 180K ohms + or - 1%, 1/8 W.
	RX0303271A	Metal film: 180K ohms + or - 1%, 1/6 W.
R107 and R108	RF3103200A	Carbon film: 1K ohms + or - 5%, 1/8 W.
R109	RX0302694A	Metal film: 68K ohms + or - 1%, 1/8 W.
	RX0302930A	Metal film: 68K ohms + or - 1%, 1/6 W.
R110	RX0302692A	Metal film: 3.3K ohms + or - 1%, 1/8 W.
	RX0302928A	Metal film: 3.3K ohms + or - 1%, 1/6 W.
R111	RF4103200A	Carbon film: 10K ohms + or - 5%, 1/8 W.
R112	RX0301583A	Metal film: 64K ohms + or - 1%, 1/4 W.
R113	RX0301584A	Metal film: 48K ohms + or - 1%, 1/4 W.
R115 and R116	RF1103200A	Carbon film: 10 ohms + or - 5%, 1/8 W.
R117	RF4103200A	Carbon film: 10K ohms + or - 5%, 1/8 W.
R118	RF3273200A	Carbon film: 2.7K ohms + or - 5%, 1/8 W.
R119	RF3223200A	Carbon film: 2.2K ohms + or - 5%, 1/8 W.
R120 and R121	RF4223200A	Carbon film: 22K ohms + or - 5%, 1/8 W.
R122	RF1473200A	Carbon film: 47 ohms + or - 5%, 1/8 W.
R123	RF3153200A	Carbon film: 1.5K ohms + or - 5%, 1/8 W.
R125	RF2393200A	Carbon film: 390 ohms + or - 5%, 1/8 W.
R126	RF4183200A	Carbon film: 18K ohms + or - 5%, 1/8 W.
R127	RX0302696A	Metal film: 220K ohms + or - 1%, 1/8 W.
	RX0302932A	Metal film: 220K ohms + or - 1%, 1/6 W.
R128	RX0302691A	Metal film: 2.2K ohms + or - 1%, 1/8 W.
	RX0302927A	Metal film: 2.2K ohms + or - 1%, 1/6 W.
R129	RF1333300A	Carbon film: 33 ohms + or - 5%, 1/4W.
		- - - - - - - - INTEGRATED CIRCUITS - - - - - - -
U101	UL0301585A	IC-OP AMP, 1458.
U102	UL0301586A	IC-REG, LM317LZ.
		PTT BOARD BP0303095A
		- - - - - - - - - - SWITCHES - - - - - - - - - -
S1 and S2	VS0303139A	Key Switch.
		- - - - - - - - - MISCELLANEOUS - - - - - - - - -
	EF0301587A	Fiber washer. (Quantity 2 - Used with Audio Board).
	WC0303141A	Wire PVC 24AWG RED. (Used with PTT Board).
	WC0303142A	Wire PVC 24AWG BLACK. (Used with PTT Board).
	AA0300004	Tensol Adhesive.
	FW0303091	Washer, M2.
	FS0301734	Screw, M2x5.
	FM0301823	Screw, M2.5x6 TORX.
	FM0301824	Screw, M3x8 TORX.
	FM0301825	Screw, M3x10 TORX.
	KP0301943	Adhesive Tape.
	LA0300681	Serial NO Label.
	MC0300997	Support.
	MC0301826	Bushing, M2.5.
	LA0301827	Label.
	MS0300998	Support (LCD).
	MS0302532	Strike Plate.
	PP0303097	Sponge-Button.
	PP0300990	Light Pipe.
	PP0302126	Pad Switch.
	PP0302608	Besel Light Grey.
	PP0302606	Cover Dark Grey.
	PP0302607	Base.
	PP0300995	Support (MIC).
	PP0302802	Nameplate (TMX).
	PP0301030	Cover Label.
	PP0302998	Outer Ring.
	PP0302601	Cover Latch.
	PP0302016	Pad (REED SWITCH).
	PP0302999	Button.
	XA0301000	H/SET Cable Assembly.
	XA0301942	Speaker Lead Assembly.
	19D901916P1	Handset cord.

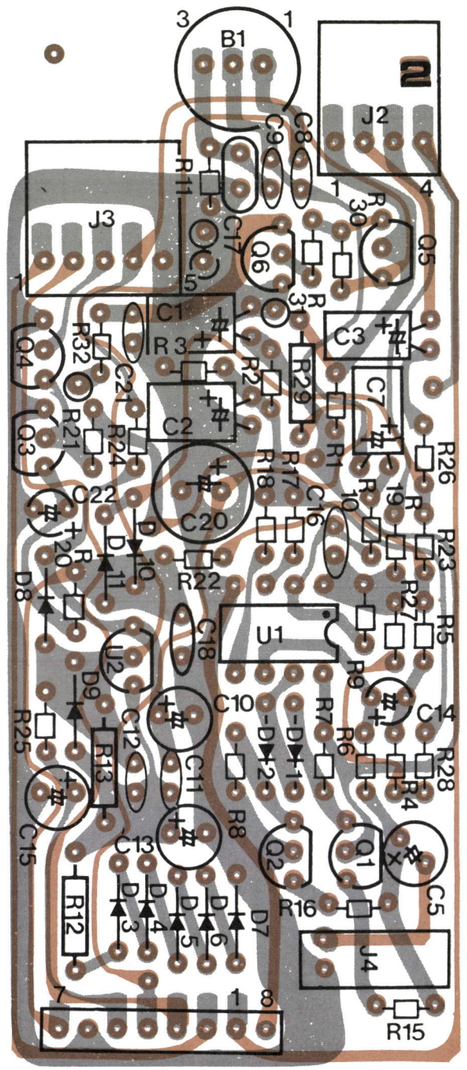
*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

COMPONENT SIDE



SOLDER SIDE



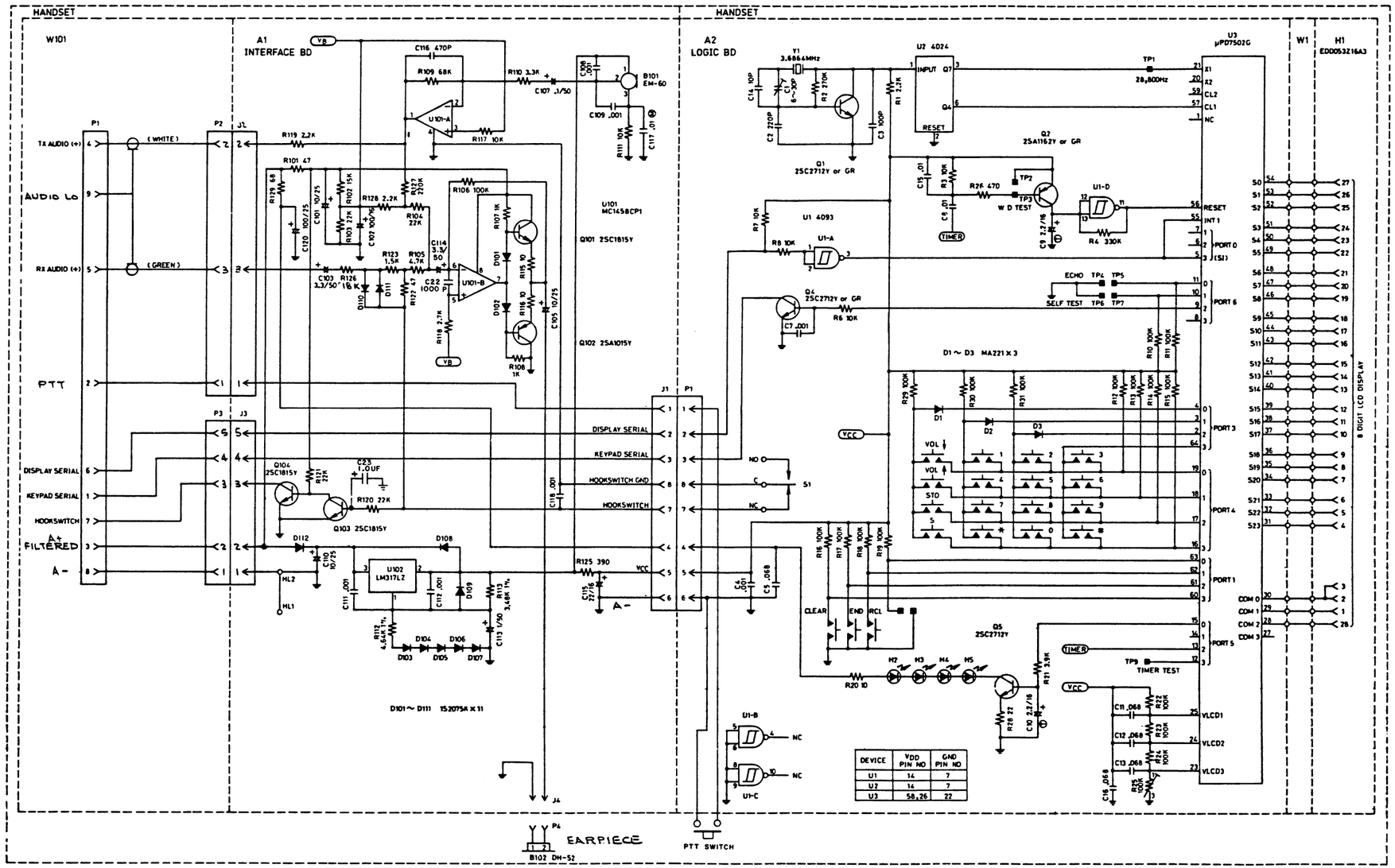


RUNS ON SOLDER SIDE
RUNS ON BOTH SIDES
RUNS ON COMPONENT SIDE

TMX-8712 HANDSET
19B801596P1

Logic Board A2
(BP0302934)

Interface Board A1
(BP0302935)



NOTES:

CHANGES REQUIRED TO CONVERT CP1000 HANDSET (19B801565) SCHEMATIC (19D901746) TO CHIEFTAIN DUPLEX HANDSET (19B801596)

1. ADD PTT SWITCH SIMILIAR TO HANDSET 19D901762.
2. W101 P1-2 FUNCTION CHANGES FROM ON/OFF TO PTT.
   REMOVE A2-Q3, C6 & R5.
3. W101 P1-3 FUNCTION CHANGES FROM CU POWER TO A+ FILTERED.
   JUMPER A1-J3-4 TO JUNCTION OF R129 & R101
   REMOVE Q105, R130, R131, Q106, C121 & R132.
4. CHANGE A1-R126 FROM 470Ω TO 18KΩ.
5. ADD 1mf CAPACITOR FROM A1-Q103 BASE TO GROUND (EMITTER OF A1-Q103).

(19D902227, Rev. 1)

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