MAINTENANCE MANUAL
RADIO FRONT ASSEMBLY
19D902177G17
CONVENTIONAL
19D902177G18
CONVENTIONAL/DTMF

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ILLUSTRATIONS

Ericsson GE Mobile Communications Inc.
Mountain View Road•Lynchburg, Virginia 24502

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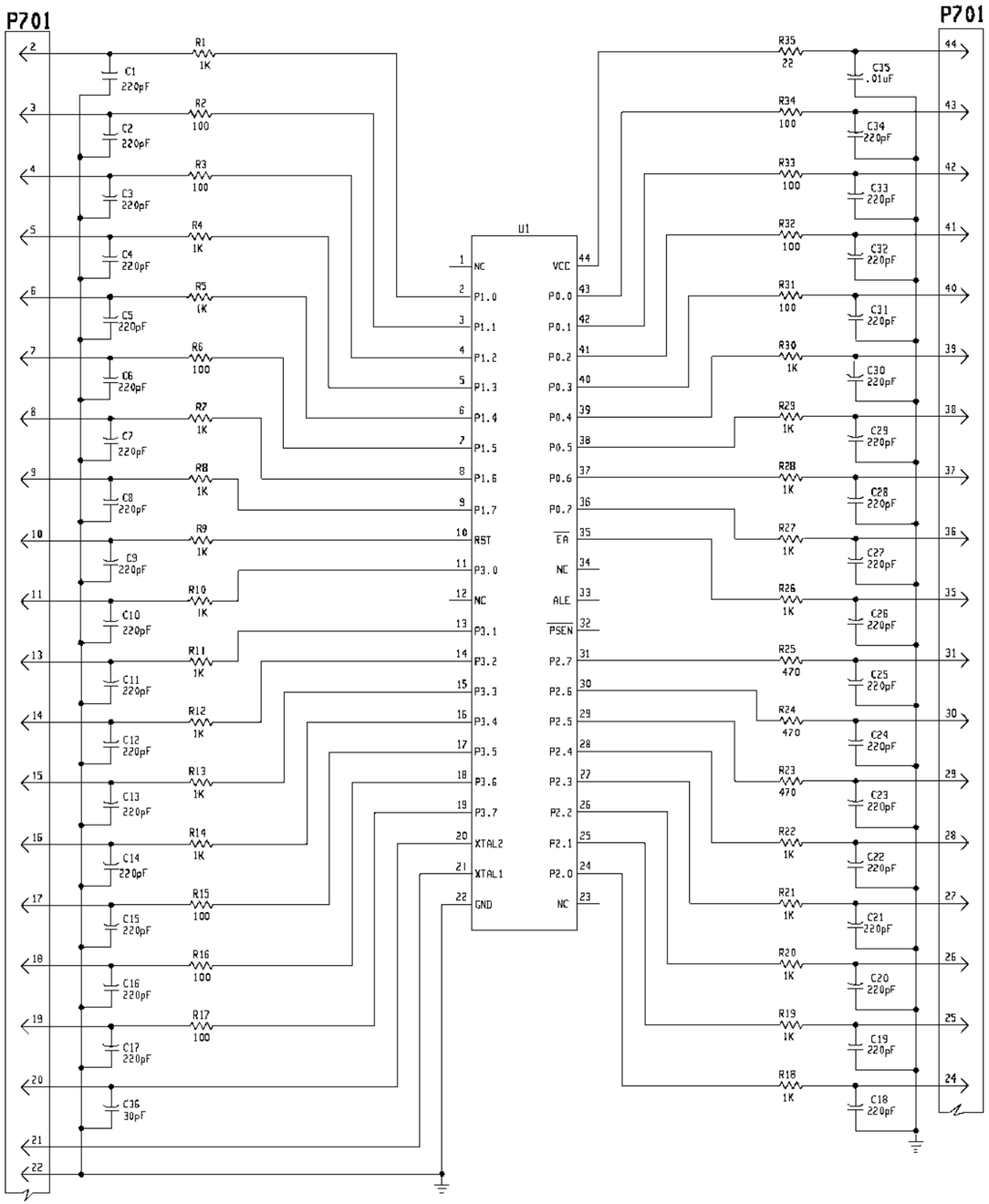


ALL RESISTORS ARE 0.1 WATT UNLESS OTHERWISE SPECIFIED AND RESISTORS VALUES ARE IN OHMS UNLESS FOLLOWED BY MULTIPLIER K OR M.
CAPACITOR VALUES IN F UNLESS FOLLOWED BY MULTIPLIER U,N, OR P
INDUCTANCE VALUES IN H UNLESS FOLLOWED BY MULTIPLIER M OR U.

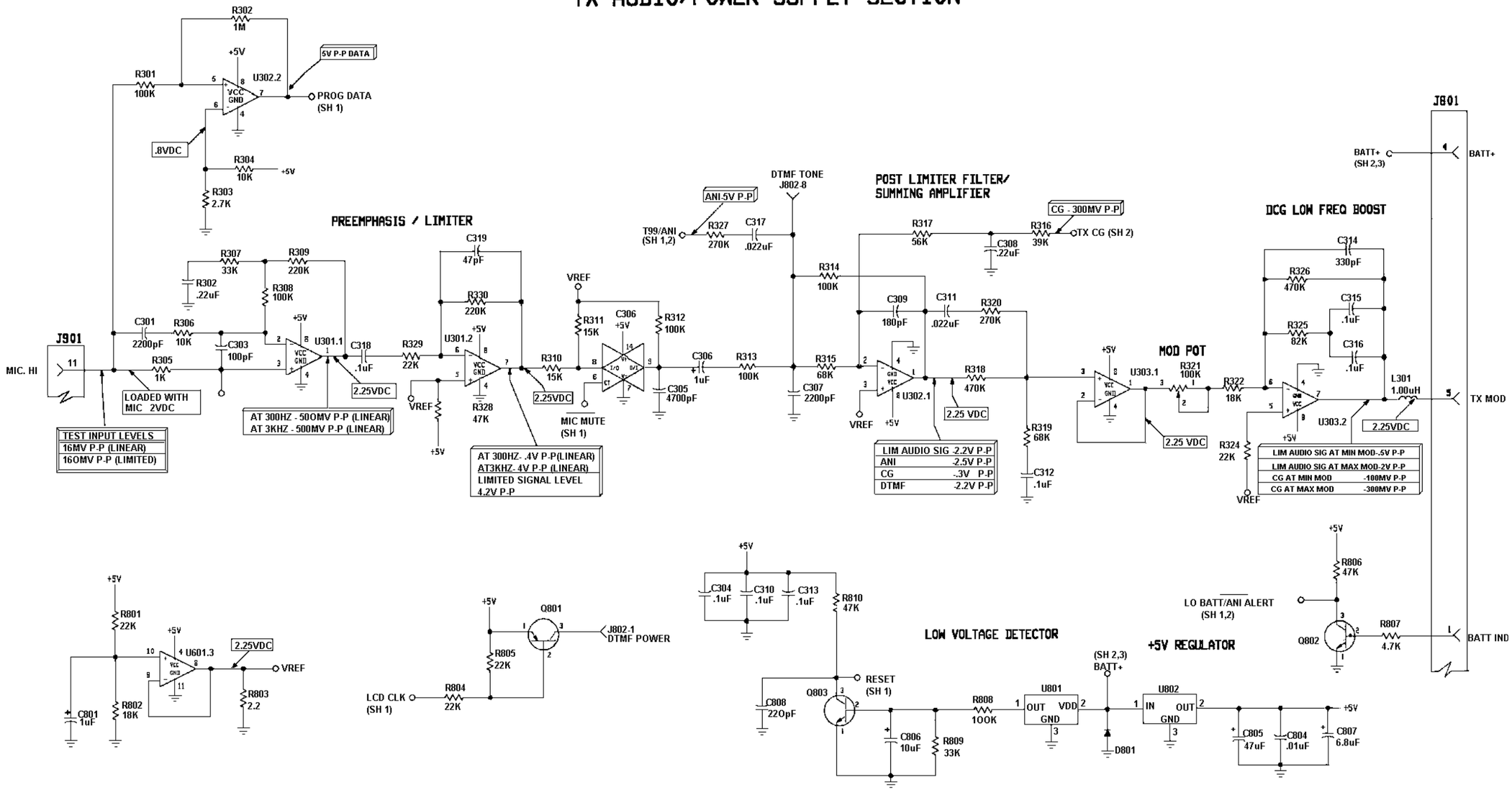
THIS SCHEMATIC DIAGRAM APPLIES TO	
MODEL NO.	REV LETTER
19C851678G1	C
19C851678G2	C
19C851678G3	B
19C851678G4	B

SPUR FILTER BOARD

19C851678G4

(19D902215, Rev. 8)

TX AUDIO/POWER SUPPLY SECTION



ALL RESISTORS ARE 0.1 WATT UNLESS OTHERWISE SPECIFIED AND RESISTORS VALUES ARE IN OHMS UNLESS FOLLOWED BY MULTIPLIER K OR M.
CAPACITOR VALUES IN F UNLESS FOLLOWED BY MULTIPLIER U, N OR P
INDUCTANCE VALUES IN H UNLESS FOLLOWED BY MULTIPLIER M OR U.

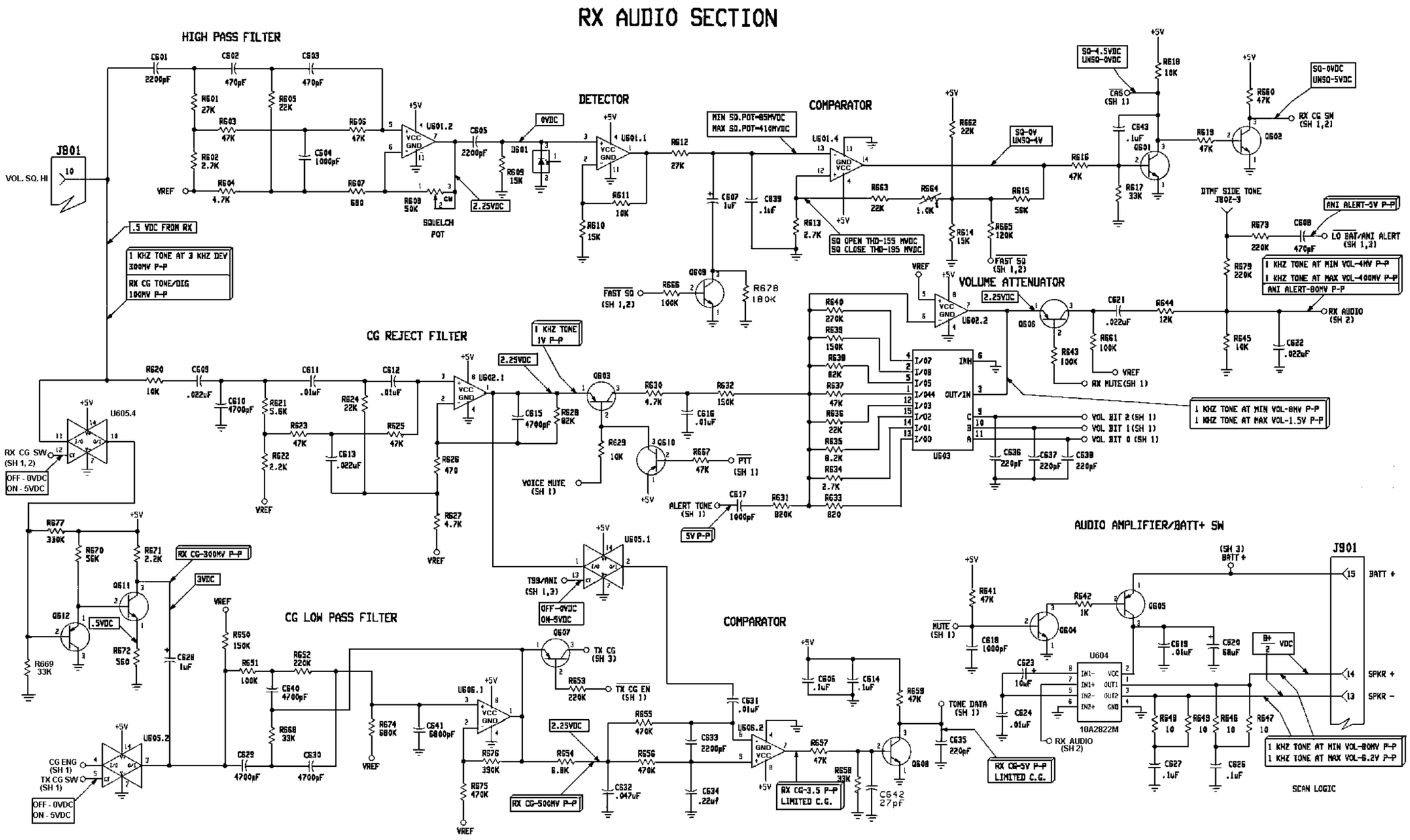
THIS SCHEMATIC DIAGRAM APPLIES TO	
MODEL NO.	REV LETTER
PL19D902631G1	C

COMPONENT	GROUP 1	GROUP 2
R328	-	47K
C643	-	.1uF
R739	-	4.7K
U804	REMOVED	ADDED

AUDIO/LOGIC BOARD

19D902631G2

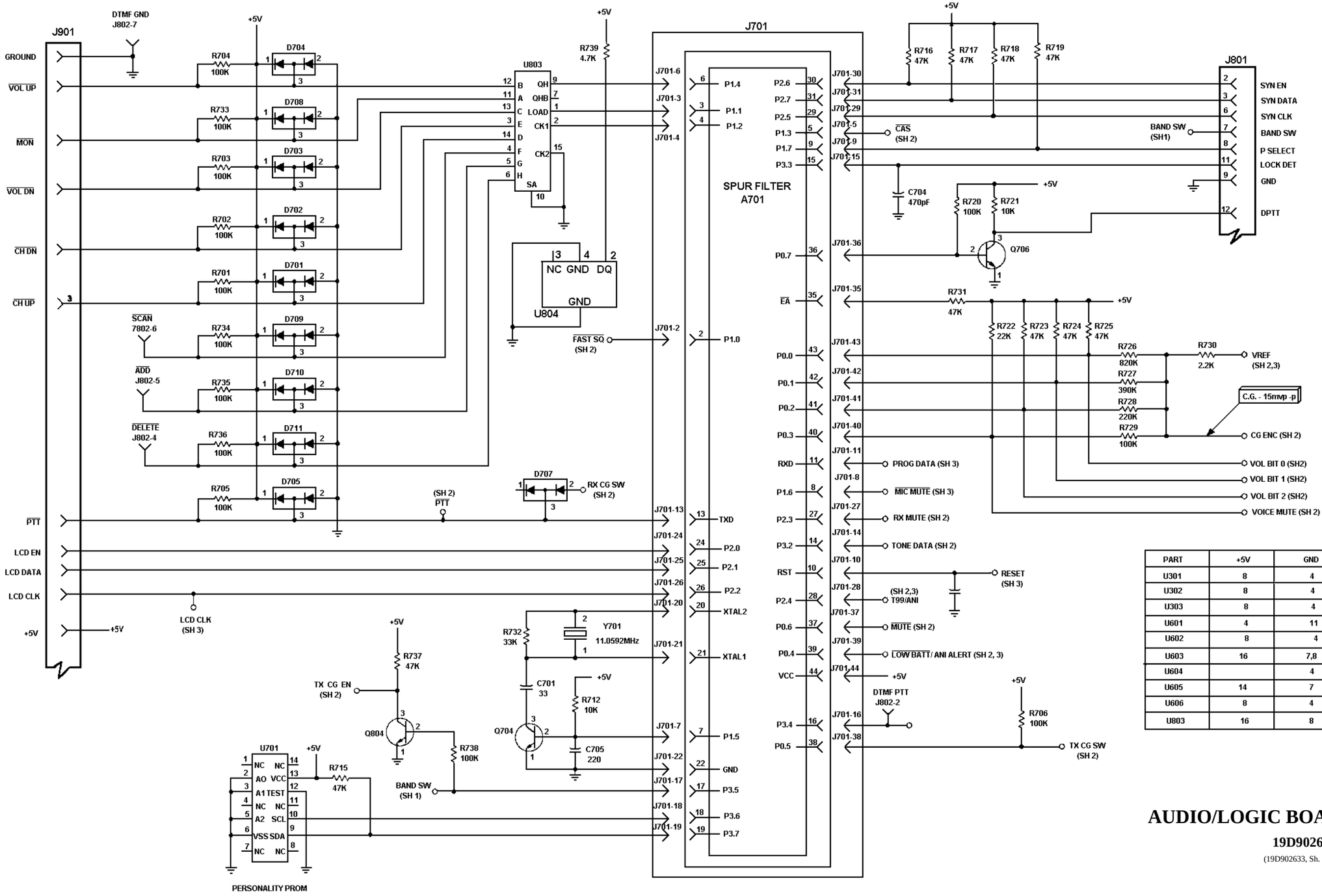
(19D902633, Sh. 3, Rev. 4)



AUDIO/LOGIC BOARD

19D902631G2

(19D902633, Sh. 2, Rev. 2)

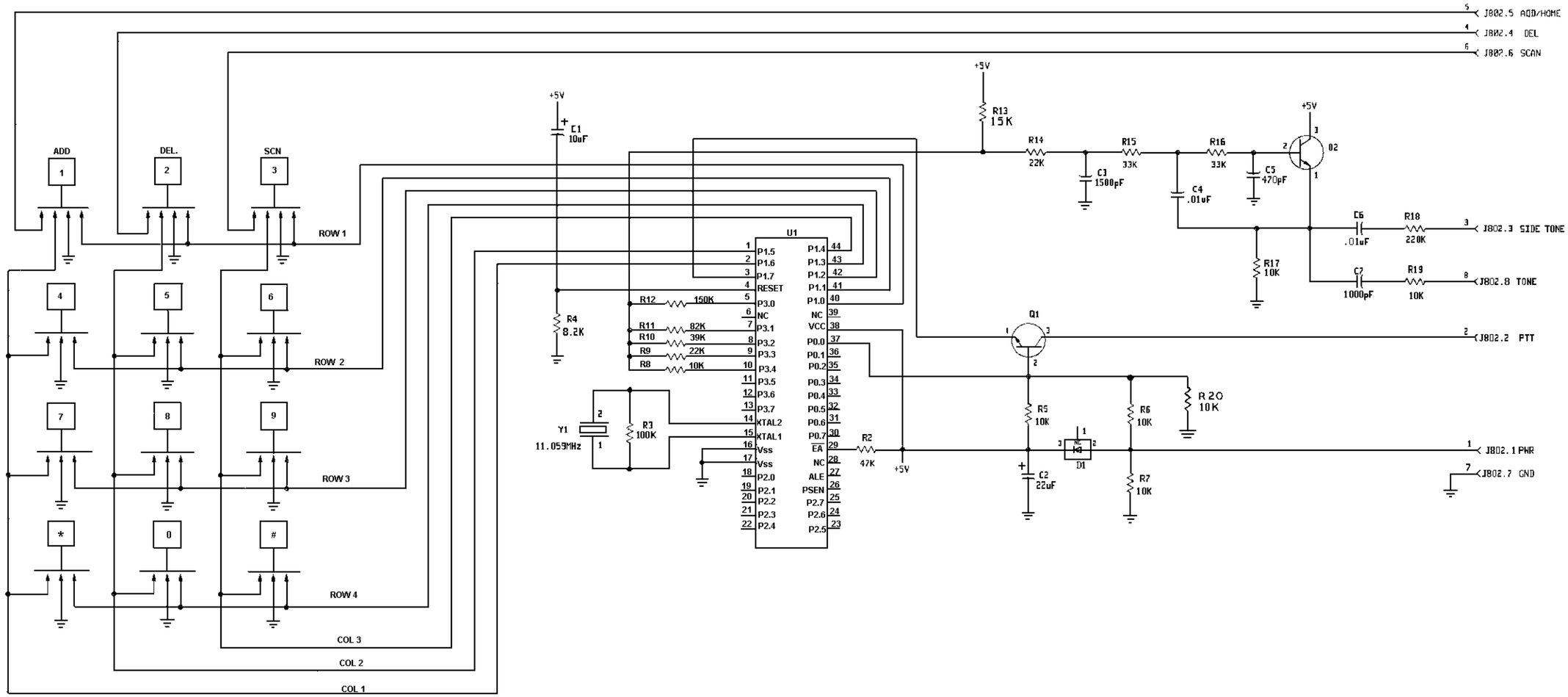


PART	+5V	GND
U301	8	4
U302	8	4
U303	8	4
U601	4	11
U602	8	4
U603	16	7,8
U604		4
U605	14	7
U606	8	4
U803	16	8

AUDIO/LOGIC BOARD

19D902631G2

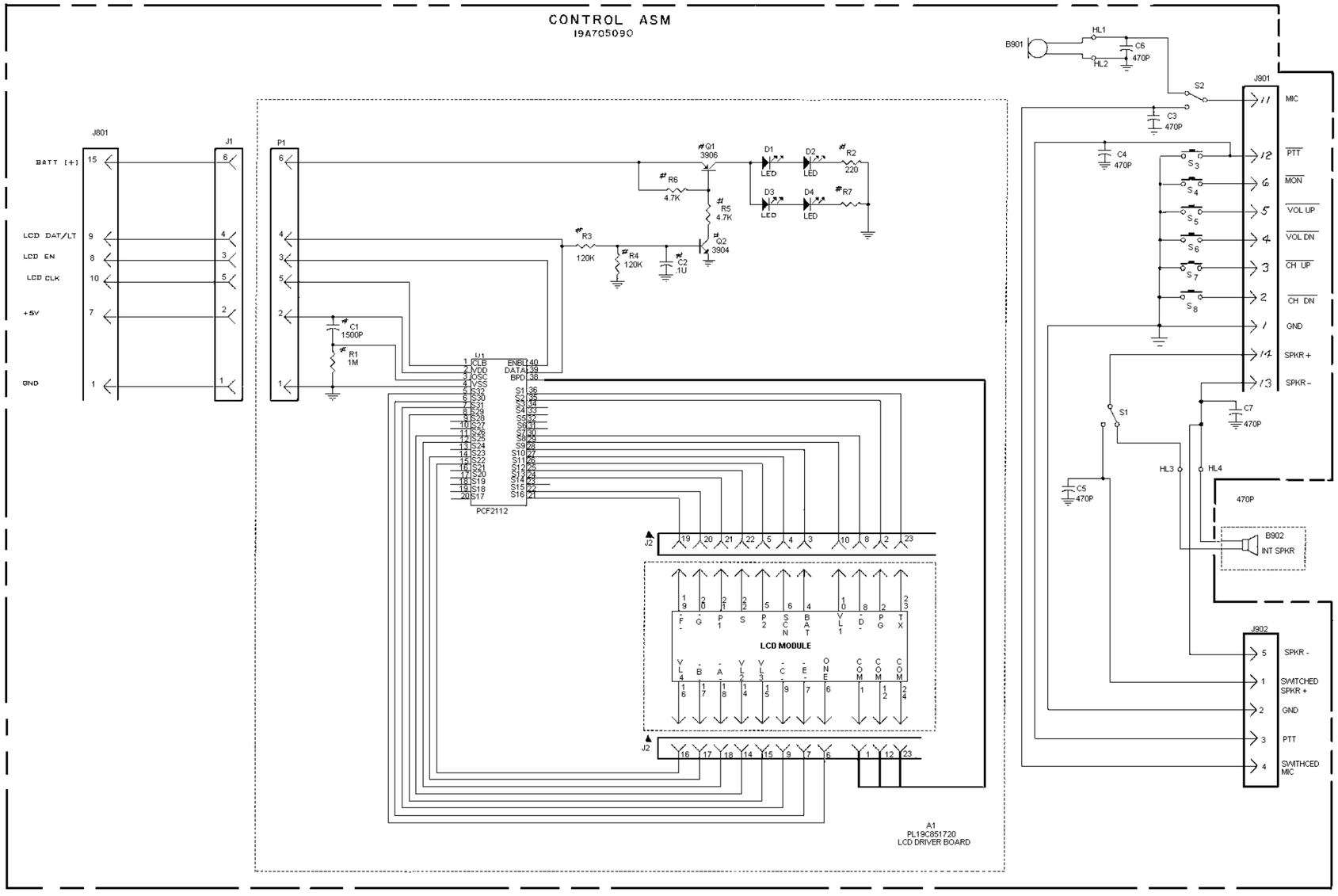
(19D902633, Sh. 1, Rev. 1)



SCAN/DTMF BOARD

19C851992G1

(19D902999, Sh. 1, Rev. 2)

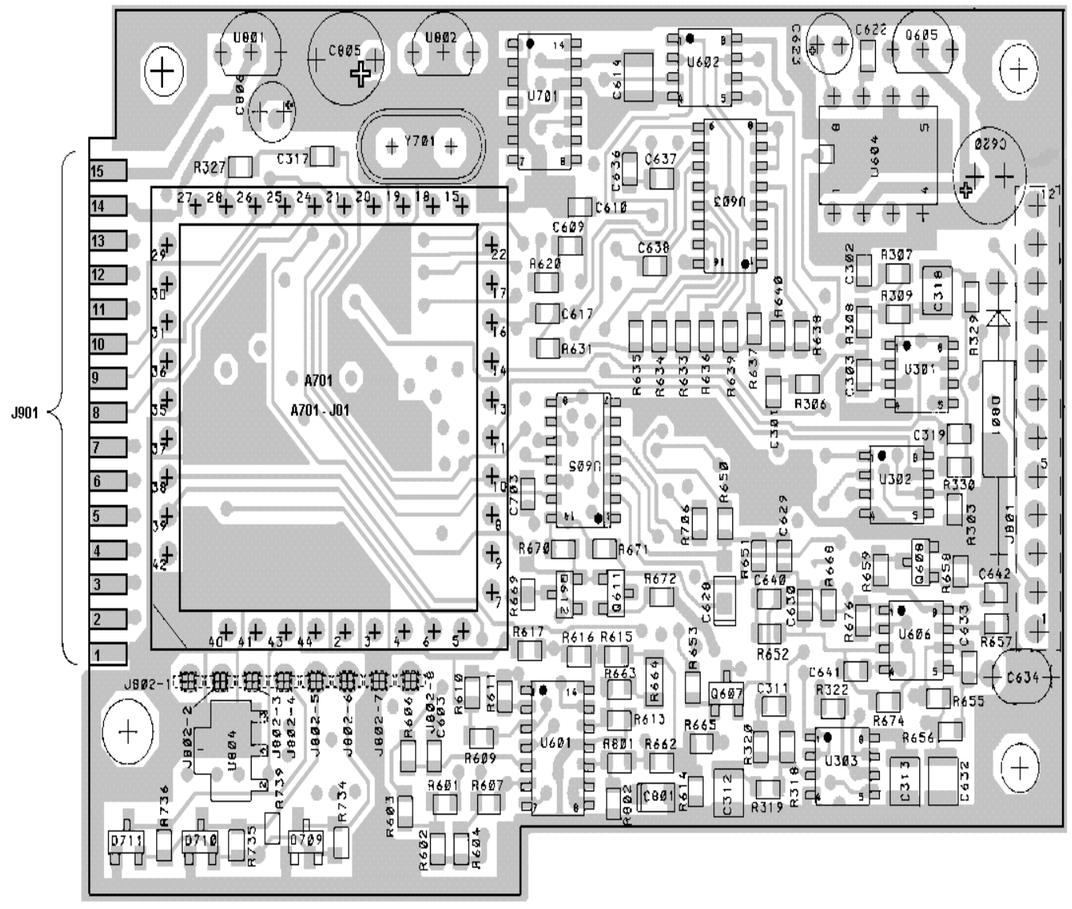


FRONT CAP ASSEMBLY

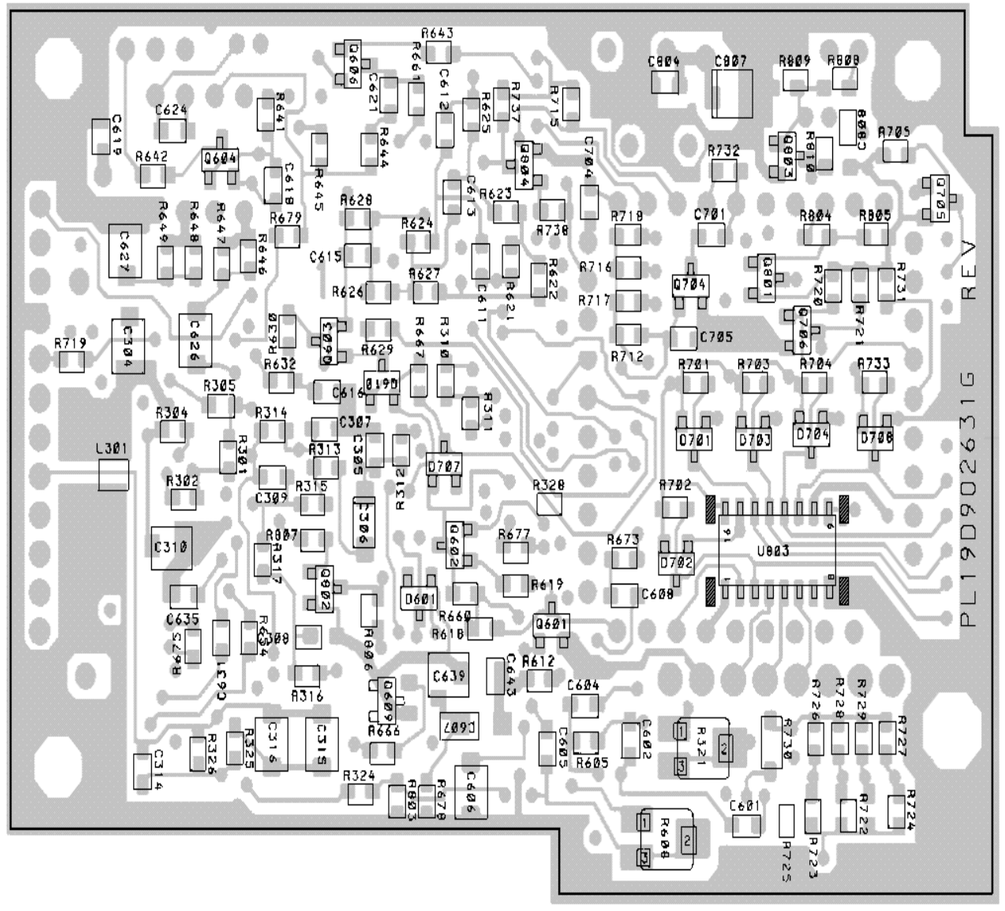
19D902180G10 & G11

(19D902216, SH. 2, REV. 3)

COMPONENT SIDE

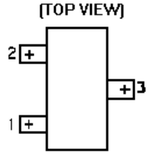


SOLDER SIDE



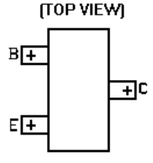
LEAD IDENTIFICATION FOR
D601 & D701-D711
(SOT) DIODES

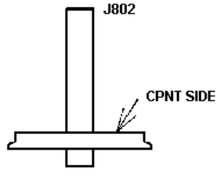
(TOP VIEW)



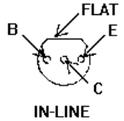
LEAD IDENTIFICATION FOR
Q601-Q612, Q704, Q706, Q801 - Q804
(SOT) TRANSISTORS

(TOP VIEW)





LEAD IDENTIFICATION
FOR Q605

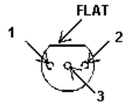


IN-LINE

TOP VIEW

NOTE: CASE SHAPE IS DETERMINING FACTOR FOR LEAD IDENTIFICATION.

LEAD IDENTIFICATION
FOR U802

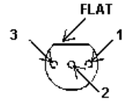


IN-LINE

TOP VIEW

NOTE: CASE SHAPE IS DETERMINING FACTOR FOR LEAD IDENTIFICATION.

LEAD IDENTIFICATION
FOR U801



IN-LINE

TOP VIEW

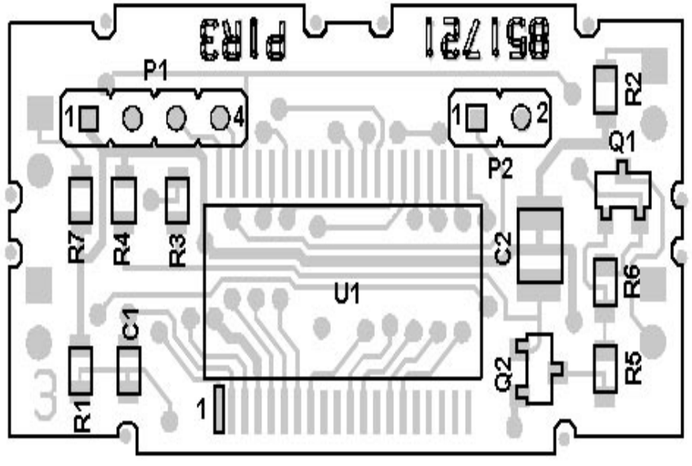
NOTE: CASE SHAPE IS DETERMINING FACTOR FOR LEAD IDENTIFICATION.

AUDIO/LOGIC BOARD

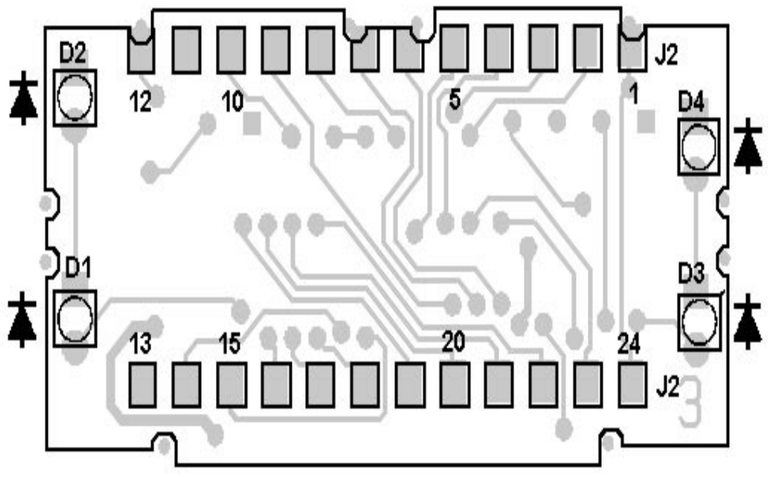
19D902631G2

(19D902631, Rev. 2)
(19D902632, Layer 1, Rev. 1)
(19D902632, Layer 4, Rev. 1)

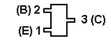
COMPONENT SIDE



SOLDER SIDE



LEAD IDENTIFICATION FOR
Q1, & Q2
(SOT) TRANSISTORS
(TOP VIEW)

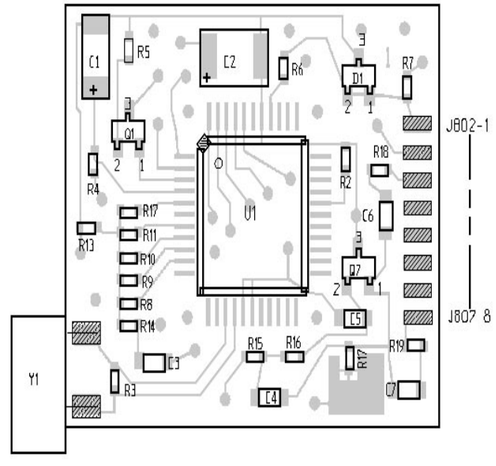


LCD BOARD

19C851720G1

(19C851720, Sh. 1, Rev. 3)
(19C851721, Component Side, Rev. 3)
(19C851721, Solder Side, Rev. 3)

COMPONENT SIDE

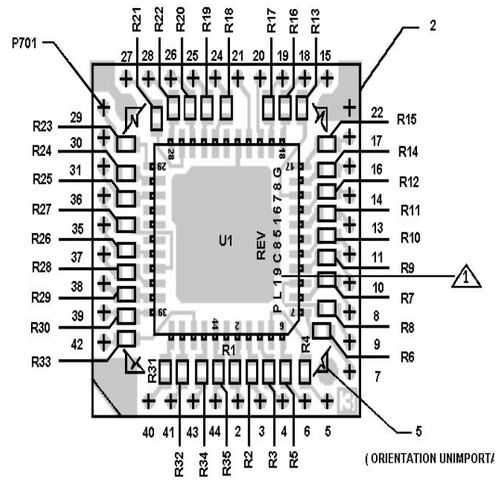


SCAN/DTMF BOARD

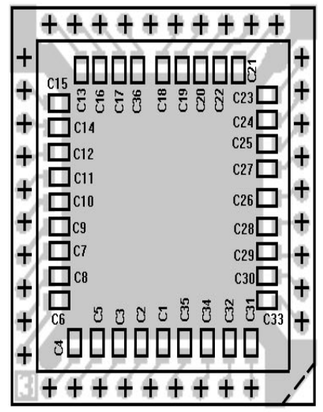
19C851992G1

(19C851992, Sh. 1, Rev. 1)
(19C851991, Layer 1, Rev. 1)

COMPONENT SIDE



SOLDER SIDE



SPUR FILTER BOARD

19C851678G4

(19C851678, Rev. 1)
(19C851679, Comp. Side, Rev. 3)
(19C851679, Solder Side, Rev. 3)

SYMBOL	PART NO.	DESCRIPTION
R806	19B801251P473	Metal film: 47K ohms ±5%, 1/10 w.
R807	19B801251P472	Metal film: 4.7K ohms ±5%, 1/10 w.
R808	19B801251P104	Metal film: 100K ohms ±5%, 1/10 w.
R809	19B801251P333	Metal film: 33K ohms ±5%, 1/10 w.
R810	19B801251P473	Metal film: 47K ohms ±5%, 1/10 w.
		- - - - - - -INTEGRATED CIRCUITS - - - - -
U301	19A705450P2	Dual Operational Amplifier, sim to MC34072.
U302 and U303	19A702293P3	Linear: Dual Op Amp; sim to LM358D.
U601	19A702293P1	Linear: Quad Op Amp; sim to LM324D.
U602	19A702293P3	Linear: Dual Op Amp; sim to LM358D.
U603	19A702705P3	Digital: 8-Channel Analog Multiplexer; sim to 4051BM.
U604	19A705452P1	Linear: Audio Amplifier; sim to TDA 2822M.
U605	19A702705P4	Digital: Quad Analog Switch/Multiplexer; sim to 4066BM.
U606	19A702293P3	Linear: Dual Op Amp; sim to LM358D.
U701	19A704724P205	EEPROM: CMOS, sim to Seiko S8054ALO.
U801	19A705454P1	Voltage Detector, sim to Seiko S 8054ALO.
U802	19A702536P1	Linear positive voltage regulator; sim to LM2931AZ-
U803	19A703987P322	8-bit shift register.
U804	RYT1186063/1	Digital: 48-Bit Serial Number ROM.
		- - - - - - - - - - CRYSTALS - - - - - - - - -
Y701	19A702511G26	Quartz: 11.0592 MHz.
		- - - - - - - - MISCELLANEOUS - - - - - - -
	19A702364P310	Machine screw, TORX Drive: No. M3-0.5 x 10.
	19B801570P2	Connector holder.
	19A705662P1	Connector, Elastomeric.
		FRONT CAP ASSEMBLY (CONVENTIONAL) 19D902180G10 (CONVENTIONAL/DTMF) 19D902180G11
A3		
		- - - - - - - - - - MODULE - - - - - - - - - -
B902	19A149673P1	Round: Water Proof, 24 ohms, 1/2 w.; sim to Line Electric Co. VS-50W24.
		- - - - - - - - MISCELLANEOUS - - - - - - - -
	19A702364P1305	Machine screw.
	19C851997P1	Gasket, Speaker.
	19C851636P2	Switch pad.
	19A705777P1	Nameplate.
		FRONT COVER ASSEMBLY (CONVENTIONAL) 19D902072G17
	19A116318P4	Foil, Magnetic shielding: 1.5 inches long
	19A705664P1	Gasket
	344A4654P1	Gasket
	19B801566P8	Shield
		FRONT COVER ASSEMBLY (CONVENTIONAL) 19D902072G18
	19D902072P4	Keypad, DTMF
	19D902072P13	Cable, SCAN/DTMF
	19A116318P4	Foil, Magnetic shielding: 1.5 inches long.
	19A705664P1	Gasket.
	19A705651P1	Loudspeaker, permanent magnet.
	19A702364P304	Machine screw.
	19A705861P1	Diaphragm.
	19C851992G1	Board, SCAN/DTMF.
		LCD ASSEMBLY 19A705090G6
		- - - - - - - - - - - - LEDS - - - - - - - - - -
H1	19C851660P2	Display crystal.

SYMBOL	PART NO.	DESCRIPTION
		- - - - - - - - MISCELLANEOUS - - - - - - - -
	19A703685P3	LCD connector.
	19B801569P1	Diffuser.
	19C851719P2	Lens.
		CONTROL ASSEMBLY 19A705090G10
		- - - - - - - - - - CAPACITORS - - - - - - - - -
C3 thru C7	19A702052P3	Ceramic: 470 pF ±10%, 50 VDCW.
		- - - - - - - - - - JACKS - - - - - - - - - -
J1	19A115834P1	Contact, electrical: sim to AMP 2-330808-8.
		- - - - - - - - - - METERS - - - - - - - - - -
M1	19A701301P3	Cartridge: Electret.
		- - - - - - - - - - SWITCHES - - - - - - - - -
S1	19A705712P1	Subminiature switch.
S2	19A705712P2	Subminiature switch.
		- - - - - - - - MISCELLANEOUS - - - - - - - -
29	19A705733P4	Contact frame, circuitized.
32	19B801571P2	Dome switch.
36	19C851722P1	Auxiliary boot jack.
		CONVENTIONAL/DTMF BOARD 19C851992G1
		- - - - - - - - - - CAPACITORS - - - - - - - -
C1	19A705205P206	Tantalum: 10.0 µF ±20%, 16 VDCW.
C2	19A705205P223	Tantalum: 22 µF, 6 VDCW; sim to Sprague 293D.
C3	19A702052P6	Ceramic: 1500 pF ±10%, 50 VDCW.
C4	19A702052P14	Ceramic: 0.01 µF ±10%, 50 VDCW.
C5	19A702052P3	Ceramic: 470 pF ±10%, 50 VDCW.
C6	19A702052P14	Ceramic: 0.01 µF ±10%, 50 VDCW.
C7	19A702052P5	Ceramic: 1000 pF ±10%, 50 VDCW.
		- - - - - - - - - - DIODES - - - - - - - - - -
D1	19A702526P2	Silicon: Schottky Barrier; sim to BAT 17.
		- - - - - - - - - - JACKS - - - - - - - - - -
J802		Part of printed wire board.
		- - - - - - - - - - TRANSISTORS - - - - - - - -
Q1	19A134739P2	Silicon, NPN.
Q2 and Q3	19A700076P2	Silicon, NPN: sim to MMBT3904, low profile.
Q4	19A700059P2	Silicon, PNP: sim to MMBT3906, low profile.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R2	19A149818P473	Metal film: 47K ohms ±5%, 1/16 w.
R3	19A149818P104	Metal film: 100K ohms ±5%, 1/16 w.
R4	19A149818P822	Metal film: 8.2K ohms ±5%, 1/16 w.
R5 thru R8	19A149818P103	Metal film: 10K ohms ±5%, 1/16 w.
R9	19A149818P223	Metal film: 22K ohms ±5%, 1/16 w.
R10	19A149818P393	Metal film: 39K ohms ±5%, 1/16 w.
R11	19A149818P823	Metal film: 82K ohms ±5%, 1/16 w.
R12	19A149818P154	Metal film: 150K ohms ±5%, 1/16 w.
R13	19A149818P153	Metal film: 15K ohms ±5%, 1/16 w.
R14	19A149818P223	Metal film: 22K ohms ±5%, 1/16 w.
R15 and R16	19A149818P333	Metal film: 33K ohms ±5%, 1/16 w.
R17	19A149818P103	Metal film: 10K ohms ±5%, 1/16 w.
R18	19A149818P224	Metal film: 220K ohms ±5%, 1/16 w.
R19	19A149818P103	Metal film: 10K ohms ±5%, 1/16 w.
R20	19A149818P392	Metal film: 3.9K ohms ±5%, 1/16 w.
R21	19A149818P103	Metal film: 10K ohms ±5%, 1/16 w.
R22	19A149818P273	Metal film: 27K ohms ±5%, 1/16 w.
R23	19A149818P562	Metal film: 5.6K ohms ±5%, 1/16 w.

SYMBOL	PART NO.	DESCRIPTION
		- - - - - - INTEGRATED CIRCUITS - - - - -
U1	19A704345P30	Integrated circuit, Digital CHMOS: 8-bit micro procssor.
		- - - - - - - - - - CRYSTALS - - - - - - - - -
Y1	19A702511G26	Quartz: 11.0592 MHz.
		LCD DRIVER BOARD 19C851720G1
		- - - - - - - - - - CAPACITORS - - - - - - - - -
C1	19A702052P6	Ceramic: 1500 pF ±10%, 50 VDCW.
C2	19A702052P26	Ceramic: 0.1 µF ±10%, 50 VDCW
		- - - - - - - - - - DIODES - - - - - - - - - -
D1 thru D4	19A705713P1	LED, Subminiature.
		- - - - - - - - - - JACKS - - - - - - - - - -
J2		Part of printed wire board.
		- - - - - - - - - - PLUGS - - - - - - - - - -
P1	19B801235P13	Electrical contact.
P2	19B801235P3	Electrical contact.
		- - - - - - - - - TRANSISTORS - - - - - - - -
Q1	19A700059P2	Silicon, PNP: sim to MMBT3906, low profile.
Q2	19A700076P2	Silicon, NPN: sim to MMBT3904, low profile.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1	19B801251P105	Metal film: 1M ohms ±5%, 1/10 w.
R2	19B801251P221	Metal film: 220 ohms ±5%, 1/10 w.
R3 and R4	19B801251P124	Metal film: 120K ohms ±5%, 1/10 w.
R5 and R6	19B801251P472	Metal film: 4.7K ohms ±5%, 1/10 w.
R7	19B801251P221	Metal film: 220 ohms ±5%, 1/10 w.
		- - - - - - INTEGRATED CIRCUITS - - - - -
U1	19A705714P1	LCD driver chip.
		- - - - - - - - MISCELLANEOUS - - - - - - - -
4	19C851720G7	LCD driver.

PRODUCTION CHANGES

Changes in the equipment to improve performance or to simplify circuits are identified by a "Revision Letter" which is stamped after the model number of the unit. The revision stamped on the unit includes all previous revisions. Refer to the Parts List for the descriptions of parts affected by these revisions.

REV. A - SPUR FILTER BOARD 19C851678G4

To correct response to serial number U1 was 349A9595G1.

REV. B - SPUR FILTER BOARD 19C851678G4

To correct DCG inversion on UHF band in talkaround and correct incorrect channel number in display when scanning P1 channel. U1 was 349A9595G2.

FRONT CAP ASSEMBLY

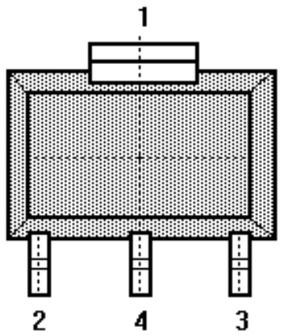
(CONVENTIONAL)
19D902177G17

(CONVENTIONAL/DTMF)
19D902177G18

SYMBOL	PART NO.	DESCRIPTION
A2	19D902631G2	AUDIO/LOGIC BOARD
A701	19C851678G4	SPUR FILTER BOARD
		- - - - - - - - - - CAPACITORS - - - - - - -
C1 thru C34	19A702061P69	Ceramic: 220 pF ±5%, 50 VDCW, temp coef 0±30 PPM/°C.
C35	19A702052P14	Ceramic: 0.01 µF ±10%, 50 VDCW.
C36	19A702061P35	Ceramic: 30 pF ±5%, 50 VDCW, temp coef 0±30 PPM.
		- - - - - - - - - - - PLUGS - - - - - - - - - - -
P701	19B801573P1	Connector.
		- - - - - - - - - - RESISTORS - - - - - - - - -
R1	19B801251P102	Metal film: 1K ohms ±5%, 1/10 w.
R2 and R3	19B801251P101	Metal film: 100 ohms ±5%, 1/10 w.
R4 and R5	19B801251P102	Metal film: 1K ohms ±5%, 1/10 w.
R6	19B801251P101	Metal film: 100 ohms ±5%, 1/10 w.
R7 thru R14	19B801251P102	Metal film: 1K ohms ±5%, 1/10 w.
R15 thru R17	19B801251P101	Metal film: 100 ohms ±5%, 1/10 w.
R18 thru R22	19B801251P102	Metal film: 1K ohms ±5%, 1/10 w.
R23 thru R25	19B801251P471	Metal film: 470 ohms ±5%, 1/10 w.
R26 thru R30	19B801251P102	Metal film: 1K ohms ±5%, 1/10 w.
R31 thru R34	19B801251P101	Metal film: 100 ohms ±5%, 1/10 w.
R35	19B801251P220	Metal film: 22 ohms ±5%, 1/10 w.
		- - - - - INTEGRATED CIRCUITS - - - -
U1	349A9595G3	Microcomputer: 8-bit, CHMOS; 8XC524.
		- - - - - - - - - - CAPACITORS - - - - - - -
C301	19A702052P7	Ceramic: 2200 pF ±10%, 50 VDCW.
C302	19A702052P30	Ceramic: 0.022 µF ±10%, 50 VDCW.
C303	19A702061P61	Ceramic: 100 pF ±5%, 50 VDCW, temp coef 0±30 PPM.
C304	19A702052P26	Ceramic: 0.1 µF ±10%, 50 VDCW
C305	19A702052P10	Ceramic: 4700 pF ±10%, 50 VDCW.
C306	19A705205P2	Tantalum: 1 µF, 16 VDCW; sim to Sprague 293D.
C307	19A702052P107	Ceramic: 2200 pF ±5%, 50 VDCW.
C308	19A702052P30	Ceramic: 0.022 µF ±10%, 50 VDCW.
C309	19A702061P67	Ceramic: 180 pF ±5%, 50 VDCW, temp coef 0±30 PPM.
C310	19A702052P26	Ceramic: 0.1 µF ±10%, 50 VDCW
C311	19A702052P30	Ceramic: 0.022 µF ±10%, 50 VDCW.
C312 and C313	19A702052P26	Ceramic: 0.1 µF ±10%, 50 VDCW
C314	19A702061P73	Ceramic: 330 pF ±5%, 50 VDCW, temp coef 0±30 PPM/°C.
C315 and C316	19A702052P26	Ceramic: 0.1 µF ±10%, 50 VDCW
C317	19A702052P30	Ceramic: 0.022 µF ±10%, 50 VDCW.
C318	19A702052P26	Ceramic: 0.1 µF ±10%, 50 VDCW
C319	19A702061P45	Ceramic: 47 pF ±5%, 50 VDCW, temp coef 0±30 PPM.
C601	19A702052P107	Ceramic: 2200 pF ±5%, 50 VDCW.
C602	19A702061P77	Ceramic: 470 pF ±5%, 50 VDCW, temp coef 0±30 PPM.
C603	19A702061P77	Ceramic: 470 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM.
C604	19A702052P105	Ceramic: 1000 pF ±5%, 50 VDCW.
C605	19A702052P7	Ceramic: 2200 pF ±10%, 50 VDCW.
C606	19A702052P26	Ceramic: 0.1 µF ±10%, 50 VDCW
C607	19A705205P2	Tantalum: 1 µF, 16 VDCW; sim to Sprague 293D.
C608	19A702061P77	Ceramic: 470 pF ±5%, 50 VDCW, temp coef 0±30 PPM.
C609	19A702052P30	Ceramic: 0.022 µF ±10%, 50 VDCW.
C610	19A702052P10	Ceramic: 4700 pF ±10%, 50 VDCW.
C611 and C612	19A702052P114	Ceramic: 0.01 µF ±5%, 50 VDCW.
C613	19A702052P30	Ceramic: 0.022 µF ±10%, 50 VDCW.
C614	19A702052P26	Ceramic: 0.1 µF ±10%, 50 VDCW
C615	19A702052P10	Ceramic: 4700 pF ±10%, 50 VDCW.
C616	19A702052P14	Ceramic: 0.01 µF ±10%, 50 VDCW.
C617	19A702052P5	Ceramic: 1000 pF ±10%, 50 VDCW.
C618	19A702052P5	Ceramic: 1000 pF ±10%, 50 VDCW.
C619	19A702052P14	Ceramic: 0.01 µF ±10%, 50 VDCW.
C620	19A704879P14	Electrolytic: 68 µF ±20%, 10 VDCW.
C621	19A702052P30	Ceramic: 0.022 µF ±10%, 50 VDCW.
C622	19A702052P30	Ceramic: 0.022 µF ±10%, 50 VDCW.
C623	19A704879P5	Electrolytic: 10 µF ±20%, 16 VDCW.
C624	19A702052P14	Ceramic: 0.01 µF ±10%, 50 VDCW.
C626 and C627	19A702052P26	Ceramic: 0.1 µF ±10%, 50 VDCW
C628	19A705205P2	Tantalum: 1 µF, 16 VDCW; sim to Sprague 293D.
C629 and C630	19A702052P10	Ceramic: 4700 pF ±10%, 50 VDCW.
C631	19A702052P14	Ceramic: 0.01 µF ±10%, 50 VDCW.
C632	19A702052P22	Ceramic: 0.047 µF ±10%, 50 VDCW.
C633	19A702052P7	Ceramic: 2200 pF ±10%, 50 VDCW.
C634	19A143565P12	Ceramic: 220000 pF ±10%. 50 VDCW; sim to KEMET C323C224K5R5CA.
C635	19A702061P69	Ceramic: 220 pF ±5%, 50 VDCW, temp coef 0±30 PPM/°C.
C636 thru C638	19A702061P69	Ceramic: 220 pF ±5%, 50 VDCW, temp coef 0±30 PPM/°C.
C639	19A702052P26	Ceramic: 0.1 µF ±10%, 50 VDCW
C640	19A702052P10	Ceramic: 4700 pF ±10%, 50 VDCW.
C641	19A702052P12	Ceramic: 6800 pF ±10%, 50 VDCW.
C642	19A702236P36	Ceramic: 27 pF ±5%, 50 VDCW, temp coef 0±30 PPM/°C.
C643	19A702052P134	Ceramic: 0.1 µF ±5%, 25 VDCW.
C701	19A702061P37	Ceramic: 33 pF ±5%, 50 VDCW, temp coef 0±30 PPM/°C.
C703	19A702061P77	Ceramic: 470 pF ±5%, 50 VDCW, temp coef 0±30 PPM.
C704	19A702061P77	Ceramic: 470 pF ±5%, 50 VDCW, temp coef 0±30 PPM.
C705	19A702061P69	Ceramic: 220 pF ±5%, 50 VDCW, temp coef 0±30 PPM/°C.
C801	19A705205P2	Tantalum: 1 µF, 16 VDCW; sim to Sprague 293D.
C804	19A702052P14	Ceramic: 0.01 µF ±10%, 50 VDCW.
C805	19A701534P9	Tantalum: 47 µF ±20%, 6.3 VDCW.
C806	19A704879P5	Electrolytic: 10 µF ±20%, 16 VDCW.
C807	19A705205P14	Tantalum: 6.8 µF, 6 VDCW; sim to Sprague 293D.
C808	19A702061P69	Ceramic: 220 pF ±5%, 50 VDCW, temp coef 0±30 PPM/°C.
		- - - - - - - - - - DIODES - - - - - - - - - -
D601	19A705377P3	Silicon, Hot Carrier: sim to HSMS-2920.
D701 thru D705	19A700053P2	Silicon: 2 Diodes in Series; sim to BAV99.
D707 and D708	19A700053P2	Silicon: 2 Diodes in Series; sim to BAV99.
D709 thru D711	19A700053P2	Silicon: 2 Diodes in Series; sim to BAV99.
D801	19A116585P1	Silicon, fast recovery, 600 mA, 50 PIV.
		- - - - - - - - - - JACKS - - - - - - - - - -
J701		Part of printed wire board 19d902631P1.
J801	19A705482P1	Printed wire, 2-part; sim to SAMTEC SSW-112-01-SS.
J802	19B209648P1	Contact, electrical.
J901		Part of printed wire board.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L301	344A3289P17	Fixed coil; 1 µH +5%. Sim to TDK NL252018T-1ROJ.
Q601 and Q602	19A700076P2	Silicon, NPN: sim to MMBT3904, low profile.
Q603	19A700059P2	Silicon, PNP: sim to MMBT3906, low profile.
Q604	19A700076P2	Silicon, NPN: sim to MMBT3904, low profile.
Q605	19A700026P2	Silicon, PNP: sim to BC369.
Q606	19A700059P2	Silicon, PNP: sim to MMBT3906, low profile.
Q607	19A700059P2	Silicon, PNP: sim to MMBT3906, low profile.
Q608	19A700076P2	Silicon, NPN: sim to MMBT3904, low profile.
Q609	19A700076P2	Silicon, NPN: sim to MMBT3904, low profile.
Q610	19A700059P2	Silicon, PNP: sim to MMBT3906, low profile.
Q611	19A700076P2	Silicon, NPN: sim to MMBT3904, low profile.
Q612	19A700059P2	Silicon, PNP: sim to MMBT3906, low profile.
Q704	19A700076P2	Silicon, NPN: sim to MMBT3904, low profile.
Q706	19A700076P2	Silicon, NPN: sim to MMBT3904, low profile.
Q801	19A700059P2	Silicon, PNP: sim to MMBT3906, low profile.
Q802 thru Q804	19A700076P2	Silicon, NPN: sim to MMBT3904, low profile.
		- - - - - - - - - - TRANSISTORS - - - - - - - -
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R301	19B801251P104	Metal film: 100K ohms ±5%, 1/10 w.
R302	19B801251P105	Metal film: 1M ohms ±5%, 1/10 w.
R303	19B801251P272	Metal film: 2.7K ohms ±5%, 1/10 w.
R304	19B801251P103	Metal film: 10K ohms ±5%, 1/10 w.
R305	19B801251P102	Metal film: 1K ohms ±5%, 1/10 w.
R306	19B801251P103	Metal film: 10K ohms ±5%, 1/10 w.
R307	19B801251P333	Metal film: 33K ohms ±5%, 1/10 w.
R308	19B801251P104	Metal film: 100K ohms ±5%, 1/10 w.
R309	19B801251P224	Metal film: 220K ohms ±5%, 1/10 w.
R310 and R311	19B801251P153	Metal film: 15K ohms ±5%, 1/10 w.
R312 thru R314	19B801251P104	Metal film: 100K ohms ±5%, 1/10 w.
R315	19B801251P683	Metal film: 68K ohms ±5%, 1/10 w.
R316	19B801251P393	Metal film: 39K ohms ±5%, 1/10 w.
R317	19B801251P563	Metal film: 56K ohms ±5%, 1/10 w.
R318	19B801251P474	Metal film: 470K ohms ±5%, 1/10 w.
R319	19B801251P683	Metal film: 68K ohms ±5%, 1/10 w.
R320	19B801251P274	Metal film: 270K ohms ±5%, 1/10 w.
R321	19A705496P7	Variable, surface mount: 100K ohms ±25%, 1/10 w.
R322	19B801251P183	Metal film: 18K ohms ±5%, 1/10 w.
R324	19B801251P223	Metal film: 22K ohms ±5%, 1/10 w.
R325	19B801251P823	Metal film: 82K ohms ±5%, 1/10 w.
R326	19B801251P474	Metal film: 470K ohms ±5%, 1/10 w.
R327	19B801251P274	Metal film: 270K ohms ±5%, 1/10 w.
R328	19B801251P473	Metal film: 47K ohms ±5%, 1/10 w.
R329	19B801251P223	Metal film: 22K ohms ±5%, 1/10 w.
R330	19B801251P224	Metal film: 220K ohms ±5%, 1/10 w.
R601	19B801251P273	Metal film: 27K ohms ±5%, 1/10 w.
R602	19B801251P272	Metal film: 2.7K ohms ±5%, 1/10 w.
R603	19B801251P473	Metal film: 47K ohms ±5%, 1/10 w.
R604	19B801251P472	Metal film: 4.7K ohms ±5%, 1/10 w.
R605	19B801251P223	Metal film: 22K ohms ±5%, 1/10 w.
R606	19B801251P473	Metal film: 47K ohms ±5%, 1/10 w.
R607	19B801251P681	Metal film: 680 ohms ±5%, 1/10 w.
R608	19A705496P6	Resistor, variable surface mount: 50K ohms ±25%, adjustment range 15% to 85%; sim to MURATA Type RGV4E.
R609 and R610	19B801251P153	Metal film: 15K ohms ±5%, 1/10 w.
R611	19B801251P103	Metal film: 10K ohms ±5%, 1/10 w.
R612	19B801251P273	Metal film: 27K ohms ±5%, 1/10 w.
R613	19B801251P272	Metal film: 2.7K ohms ±5%, 1/10 w.
R614	19B801251P153	Metal film: 15K ohms ±5%, 1/10 w.
R615	19B801251P563	Metal film: 56K ohms ±5%, 1/10 w.
R616	19B801251P473	Metal film: 47K ohms ±5%, 1/10 w.
R617	19B801251P333	Metal film: 33K ohms ±5%, 1/10 w.
R618	19B801251P103	Metal film: 10K ohms ±5%, 1/10 w.
R619	19B801251P473	Metal film: 47K ohms ±5%, 1/10 w.
R620	19B801251P103	Metal film: 10K ohms ±5%, 1/10 w.
R621	19B801251P562	Metal film: 5.6K ohms ±5%, 1/10 w.
R622	19B801251P222	Metal film: 2.2K ohms ±5%, 1/10 w.
R623	19B801251P473	Metal film: 47K ohms ±5%, 1/10 w.
R624	19B801251P223	Metal film: 22K ohms ±5%, 1/10 w.
R625	19B801251P473	Metal film: 47K ohms ±5%, 1/10 w.
R626	19B801251P471	Metal film: 470 ohms ±5%, 1/10 w.
R627	19B801251P472	Metal film: 4.7K ohms ±5%, 1/10 w.
R628	19B801251P823	Metal film: 82K ohms ±5%, 1/10 w.
R629	19B801251P103	Metal film: 10K ohms ±5%, 1/10 w.
R630	19B801251P472	Metal film: 4.7K ohms ±5%, 1/10 w.
R631	19B801251P824	Metal film: 820K ohms ±5%, 1/10 w.
R632	19B801251P154	Metal film: 150K ohms ±5%, 1/10 w.
R633	19B801251P821	Metal film: 820 ohms ±5%, 1/10 w.
R634	19B801251P272	Metal film: 2.7K ohms ±5%, 1/10 w.
R635	19B801251P822	Metal film: 8.2K ohms ±5%, 1/10 w.
R636	19B801251P223	Metal film: 22K ohms ±5%, 1/10 w.
R637	19B801251P473	Metal film: 47K ohms ±5%, 1/10 w.
R638	19B801251P823	Metal film: 82K ohms ±5%, 1/10 w.
R639	19B801251P154	Metal film: 150K ohms ±5%, 1/10 w.
R640	19B801251P274	Metal film: 270K ohms ±5%, 1/10 w.
R641	19B801251P473	Metal film: 47K ohms ±5%, 1/10 w.
R642	19B801251P102	Metal film: 1K ohms ±5%, 1/10 w.
R643	19B801251P104	Metal film: 100K ohms ±5%, 1/10 w.
R644	19B801251P123	Metal film: 12K ohms ±5%, 1/10 w.
R645	19B801251P103	Metal film: 10K ohms ±5%, 1/10 w.
R646 thru R649	19B801251P100	Metal film: 10 ohms ±5%, 1/10 w.
R650	19B801251P154	Metal film: 150K ohms ±5%, 1/10 w.
R651	19B801251P104	Metal film: 100K ohms ±5%, 1/10 w.
R652 and R653	19B801251P224	Metal film: 220K ohms ±5%, 1/10 w.
R654	19B801251P682	Metal film: 6.8K ohms ±5%, 1/10 w.
R655 and R656	19B801251P474	Metal film: 470K ohms ±5%, 1/10 w.
R657	19B801251P473	Metal film: 47K ohms ±5%, 1/10 w.
R658	19B801251P333	Metal film: 33K ohms ±5%, 1/10 w.
R659	19B801251P473	Metal film: 47K ohms ±5%, 1/10 w.
R660	19B801251P473	Metal film: 47K ohms ±5%, 1/10 w.
R661	19B801251P104	Metal film: 100K ohms ±5%, 1/10 w.
R662 and R663	19B801251P223	Metal film: 22K ohms ±5%, 1/10 w.
R664	19A705813P1	Thermistor: sim to AL03006-624-73-G100.
R665	19B801251P124	Metal film: 120K ohms ±5%, 1/10 w.
R666	19B801251P104	Metal film: 100K ohms ±5%, 1/10 w.
R667	19B801251P473	Metal film: 47K ohms ±5%, 1/10 w.
R668 and R669	19B801251P333	Metal film: 33K ohms ±5%, 1/10 w.
R670	19B801251P563	Metal film: 56K ohms ±5%, 1/10 w.
R671	19B801251P222	Metal film: 2.2K ohms ±5%, 1/10 w.
R672	19B801251P561	Metal film: 560 ohms ±5%, 1/10 w.
R673	19B801251P224	Metal film: 220K ohms ±5%, 1/10 w.
R674	19B801251P684	Metal film: 680K ohms ±5%, 1/10 w.
R675	19B801251P474	Metal film: 470K ohms ±5%, 1/10 w.
R676	19B801251P394	Metal film: 390K ohms ±5%, 1/10 w.
R677	19B801251P334	Metal film: 330K ohms ±5%, 1/10 w.
R678	19B801251P104	Metal film: 100K ohms ±5%, 1/10 w.
R679	19B801251P224	Metal film: 220K ohms ±5%, 1/10 w.
R701 thru R704	19B801251P104	Metal film: 100K ohms ±5%, 1/10 w.
R705	19B801251P103	Metal film: 10K ohms ±5%, 1/10 w.
R706	19B801251P104	Metal film: 100K ohms ±5%, 1/10 w.
R712	19B801251P103	Metal film: 10K ohms ±5%, 1/10 w.
R715 thru R719	19B801251P473	Metal film: 47K ohms ±5%, 1/10 w.
R720	19B801251P104	Metal film: 100K ohms ±5%, 1/10 w.
R721	19B801251P103	Metal film: 10K ohms ±5%, 1/10 w.
R722	19B801251P223	Metal film: 22K ohms ±5%, 1/10 w.
R723 thru R725	19B801251P473	Metal film: 47K ohms ±5%, 1/10 w.
R726	19B801251P824	Metal film: 820K ohms ±5%, 1/10 w.
R727	19B801251P394	Metal film: 390K ohms ±5%, 1/10 w.
R728	19B801251P224	Metal film: 220K ohms ±5%, 1/10 w.
R729	19B801251P104	Metal film: 100K ohms ±5%, 1/10 w.
R730	19A702931P234	Metal film: 2210 ohms ±1%, 200 VDCW, 1/8 w.
R731	19B801251P473	Metal film: 47K ohms ±5%, 1/10 w.
R732	19B801251P333	Metal film: 33K ohms ±5%, 1/10 w.
R733	19B801251P104	Metal film: 100K ohms ±5%, 1/10 w.
R734 thru R736	19B801251P104	Metal film: 100K ohms ±5%, 1/10 w.
R737	19B801251P473	Metal film: 47K ohms ±5%, 1/10 w.
R738	19B801251P104	Metal film: 100K ohms ±5%, 1/10 w.
R739	19B801251P472	Metal film: 4.7K ohms ±5%, 1/10 w.
R801	19B801251P223	Metal film: 22K ohms ±5%, 1/10 w.
R802	19B801251P183	Metal film: 18K ohms ±5%, 1/10 w.
R803	19B801251P222	Metal film: 2.2K ohms ±5%, 1/10 w.
R804 and R805	19B801251P223	Metal film: 22K ohms ±5%, 1/10 w.

48-BIT SERIAL NUMBER ROM U804

344A4050P101



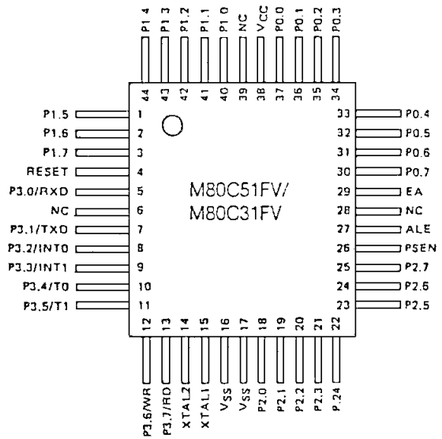
TOP VIEW

PIN NAMES
Pin 1 Ground
Pin 2 Data (DQ)
Pin 3 No Connect
Pin 4 Ground

MICROPROCESSOR U1 (80C51)

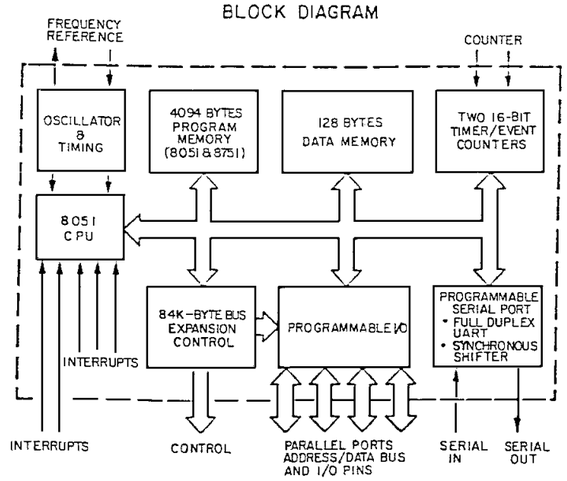
19A704345P30

CHMOS 8-BIT MICROCOMPUTER
19A704345P20,21,30



PIN IDENTIFICATION

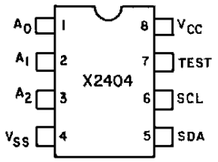
BLOCK DIAGRAM



EEPROM U701

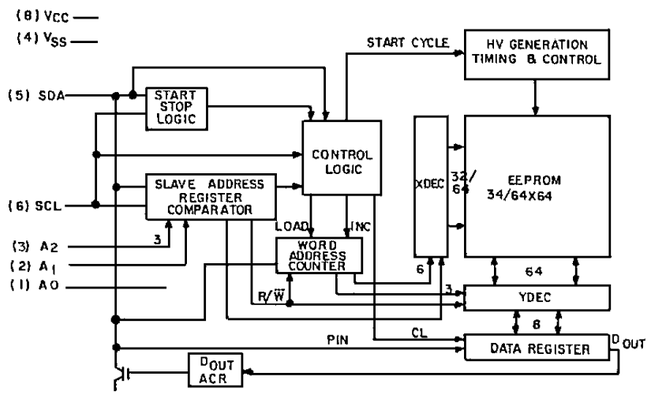
19A704724P1

PIN CONFIGURATION



1 A_0 → TO V_{SS}
2 AND 3 A AND A ADDRESS INPUTS
4 V_{SS}
5 SDA SERIAL DATA — I^2C BUS
6 SCL SERIAL CLOCK — I^2C BUS
7 TEST INPUT — TO V_{SS}
8 V_{CC}

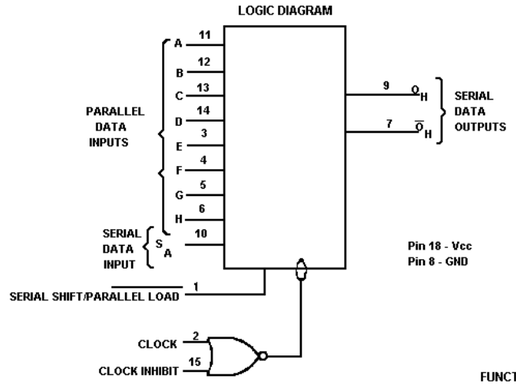
FUNCTION DIAGRAM



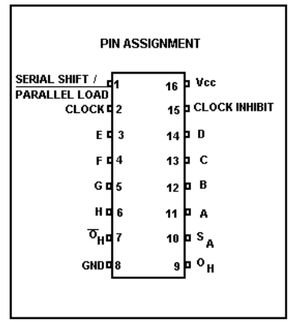
SHIFT REGISTER U803

19A703987P322

LOGIC DIAGRAM



PIN ASSIGNMENT

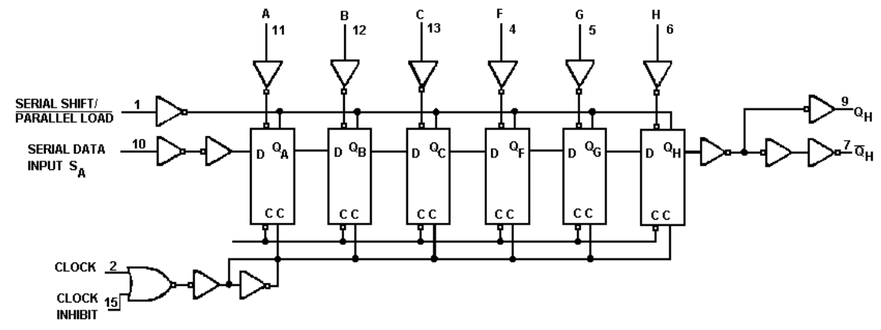


FUNCTION TABLE

INPUTS					INTERNAL STAGES		OUTPUT	
SERIAL SHIFT/ PARALLEL LOAD	CLOCK	CLOCK INHIBIT	S_A	A -- H	Q_A	Q_B	Q_H	OPERATION
L	X	X	X	a...h	a	b	h	ASYNCHRONOUS PARALLEL LOAD
H	↑	L	L	X	L	Q_{An}	Q_{Gn}	SERIAL SHIFT VIA CLOCK
H	↑	L	H	X	H	Q_{An}	Q_{Gn}	
H	L	↑	L	X	L	Q_{An}	Q_{Gn}	SERIAL SHIFT VIA CLOCK INHIBIT
H	L	↑	H	X	H	Q_{An}	Q_{Gn}	
H	X	H	X	X	NO CHANGE			INHIBITED CLOCK
H	H	X	X	X				
H	L	L	X	X	NO CHANGE			NO CLOCK

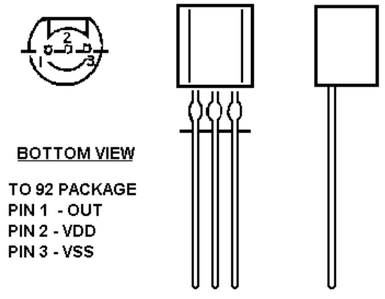
X = DON'T CARE
Q_{An}-Q_{Gn} = DATA SHIFTED FROM PRECEDING STAGE

EXPANDED LOGIC DIAGRAM



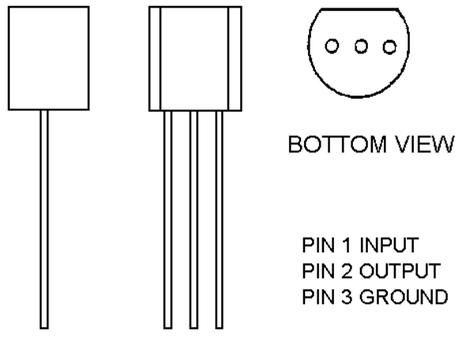
VOLTAGE DETECTOR

19A705454P1



VOLTAGE REGULATOR U802

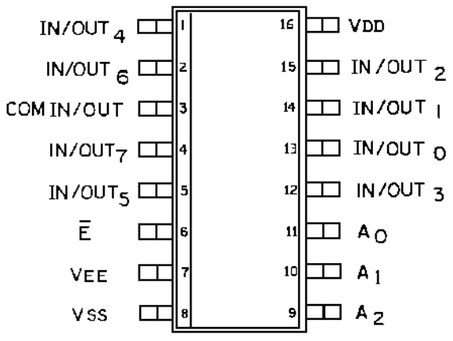
19A702536P1



BILATERAL SWITCH U603

19A702705P3

PIN CONFIGURATION

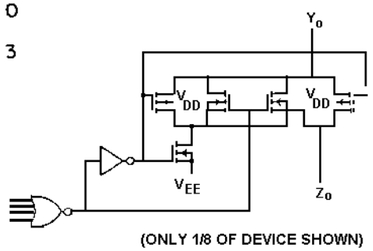


LOGIC DIAGRAM

FUNCTION TABLE

INPUTS				CHANNEL ON
E	A_2	A_1	A_0	
L	L	L	L	Y0-Z
L	L	L	H	Y1-Z
L	L	H	L	Y2-Z
L	L	H	H	Y3-Z
L	H	L	L	Y4-Z
L	H	L	H	Y5-Z
L	H	H	L	Y6-Z
L	H	H	H	Y7-Z
H	X	X	X	NONE

H= HIGH STATE (THE MORE POSITIVE VOLTAGE)
L= LOW STATE (THE LESS POSITIVE VOLTAGE)
X= STATE IS IMMATERIAL

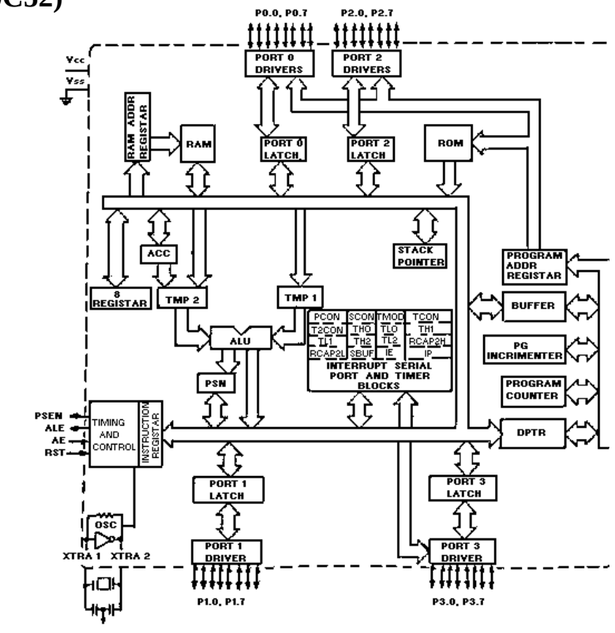


(ONLY 1/8 OF DEVICE SHOWN)

MICROPROCESSOR U1 (80C52)

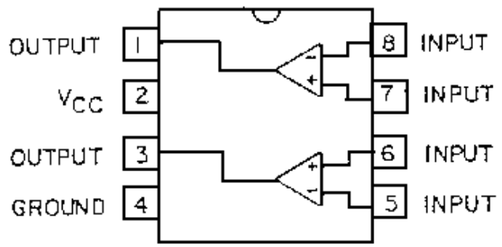
19A705557P4

FUNCTION DIAGRAM



AUDIO AMPLIFIER U604

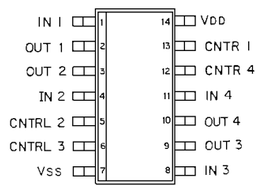
19A705452P1



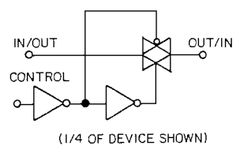
BILATERAL SWITCH U605

19A702705P1

PIN CONFIGURATION

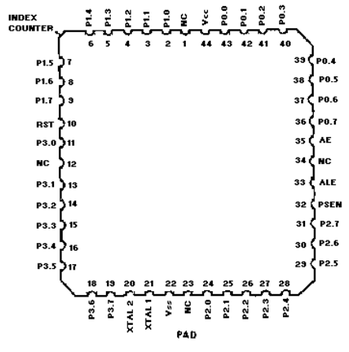


LOGIC DIAGRAM



(1/4 OF DEVICE SHOWN)

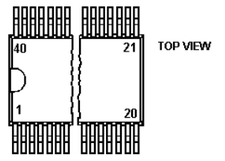
CONTROL	SWITCH
0	OFF
1	ON



VSS	CIRCUIT GROUND POTENTIAL
VCC	+5V POWER SUPPLY
PORT 0	8—BIT OC BI-DIRECTIONAL I/O PORT.
PORT 1	8—BIT QUASI-BIDIRECTIONAL I/O PORT.
PORT 2	8—BIT QUASI-BIDIRECTIONAL I/O PORT.
PORT 3	8—BIT QUASI-BIDIRECTIONAL I/O PORT.
3.0	RXD — SERIAL PORT RECEIVER DATA.
3.1	TXD — SERIAL PORT TRANSMITTER DATA.
3.2	INT0 — INTERRUPT 0 INPUT.
3.3	INT1 — INTERRUPT 1 INPUT.
3.5	T1 — COUNTER 1 INPUT.
3.6	WR — WRITE CONTROL.
3.7	RD — READ CONTROL.
RST	RESET.
ALE	ADDRESS LATCH ENABLE.
PSEN	PROGRAM STORE ENABLE OUTPUT.
EA	INTERNAL/EXTERNAL INSTRUCTION FETCH.
XTAL1	INPUT TO OSCILLATOR AMPLIFIER.
XTAL2	OUTPUT FROM OSCILLATOR AMPLIFIER.

LCD DRIVER U1

19A705714P1



PINNING
SUPPLY

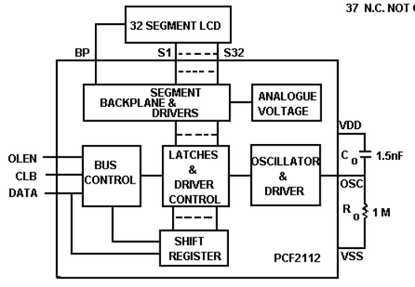
2 VDD POSITIVE SUPPLY
4 VSS NEGATIVE SUPPLY

INPUTS

3 OSC OSCILLATOR INPUT
39 DATA DATA LINE
40 DLEN DATA LINE ENABLE
1 CLB CLOCK BURST
} CBUS

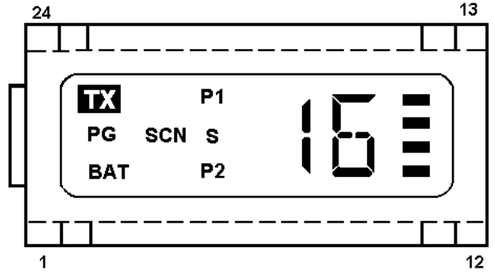
OUTPUTS

38 BP BACK PLANE DRIVER (COMMON OF LCD)
5 TO 36 LCD DRIVER OUTPUTS (S32 TO S1)
37 N.C. NOT CONNECTED



LCD

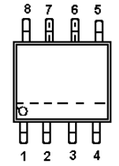
19C851660P2

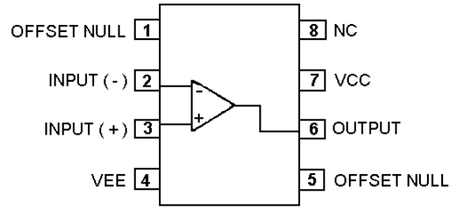


PIN OUT			
1	COM	13	NC
2	PG	14	BAR 2
3	BAT	15	BAR 3
4	SCN	16	BAR 4
5	P2	17	1B
6	ONE	18	1A
7	1E	19	1F
8	1D	20	1G
9	1C	21	P1
10	BAR 1	22	S
11	NC	23	TX
12	COM	24	COM

OPERATIONAL AMPLIFIER U301

19A705450P3

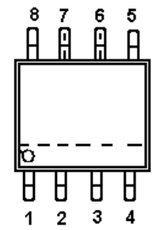


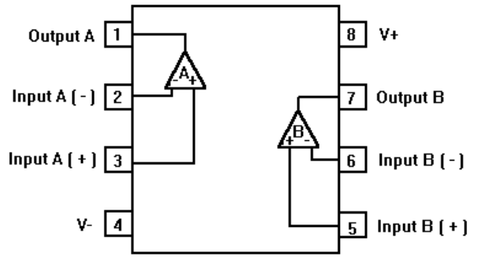


OPERATIONAL AMPLIFIER

U302/U602/U603

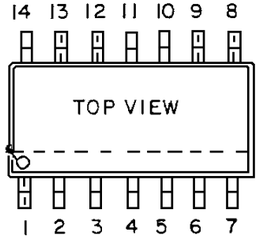
19A702293P2

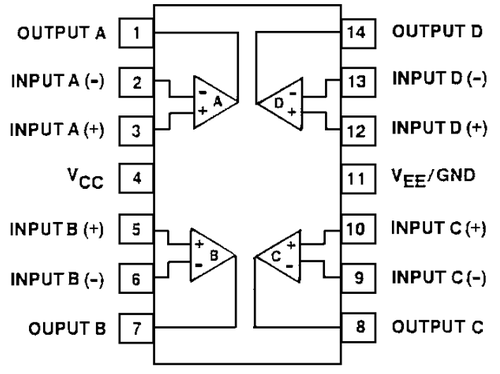




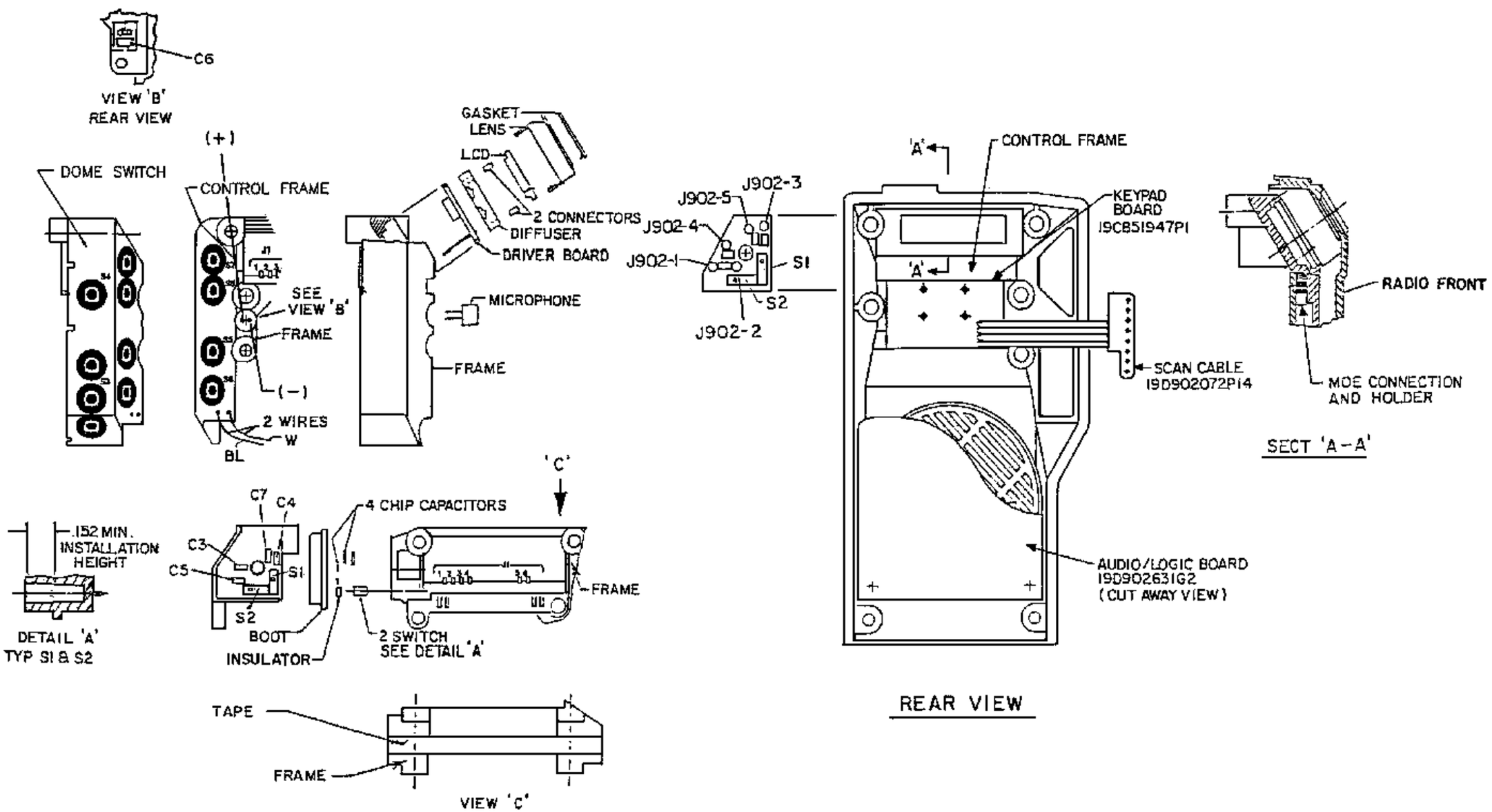
OPERATIONAL AMPLIFIER U601

19A702293P1





PIN 1 MAY BE IDENTIFIED BY INDENT OR CHAMFER



FRONT CAP ASSEMBLY

19D902180G10 & G11

(19D902180, SH. 1, REV.)

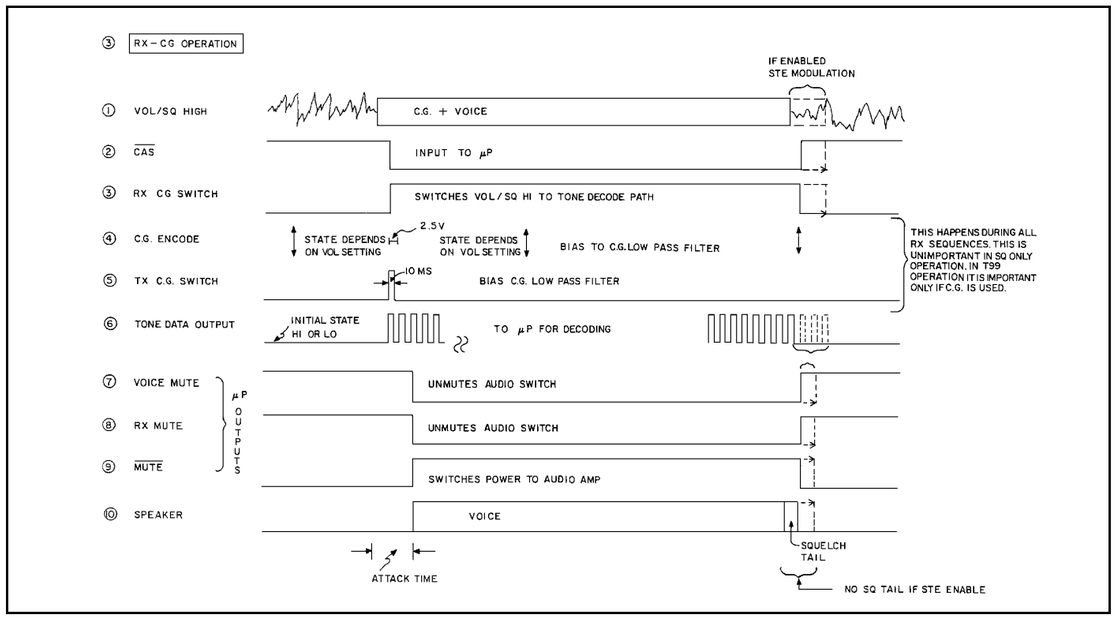


Figure 9 - RX Channel Guard Operation

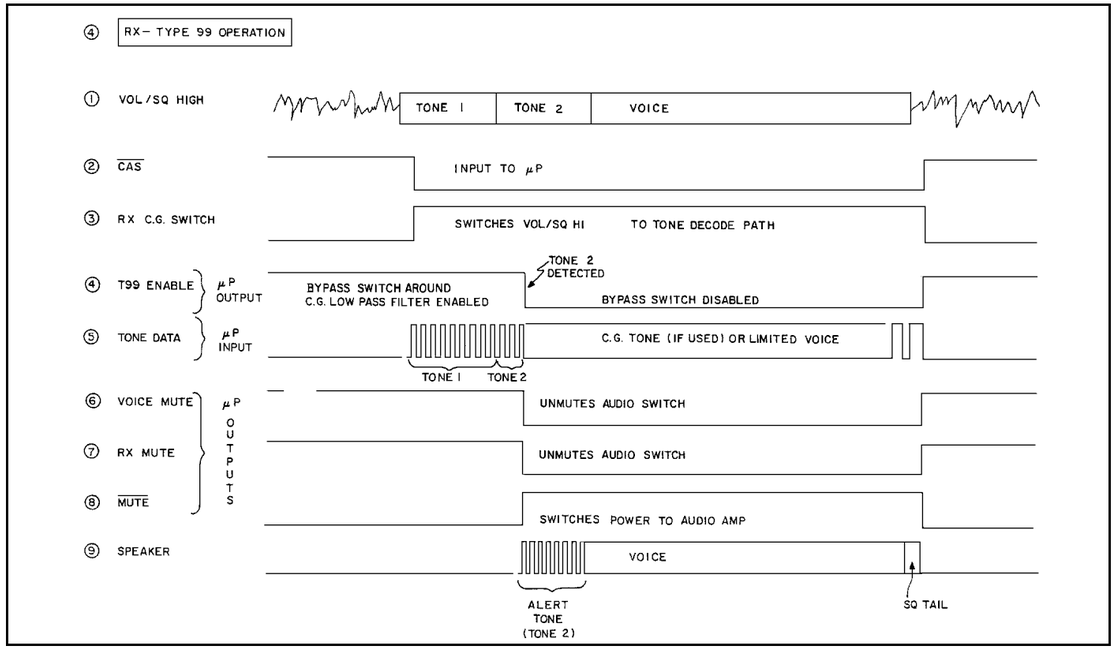


Figure 10 - RX Type 99 Operation

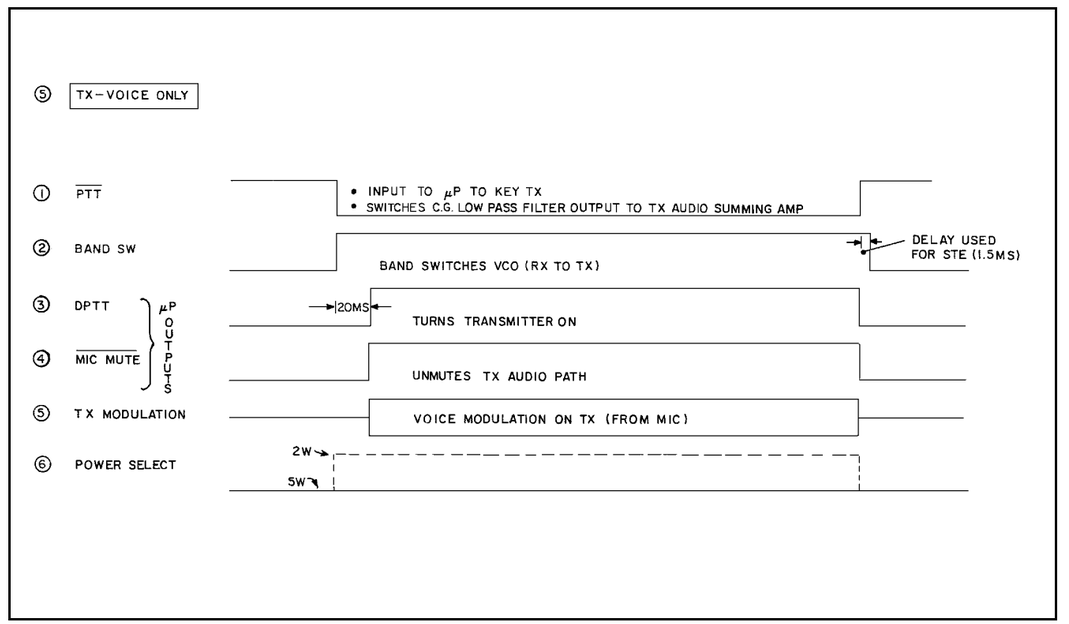


Figure 11 - TX Voice-Only Operation

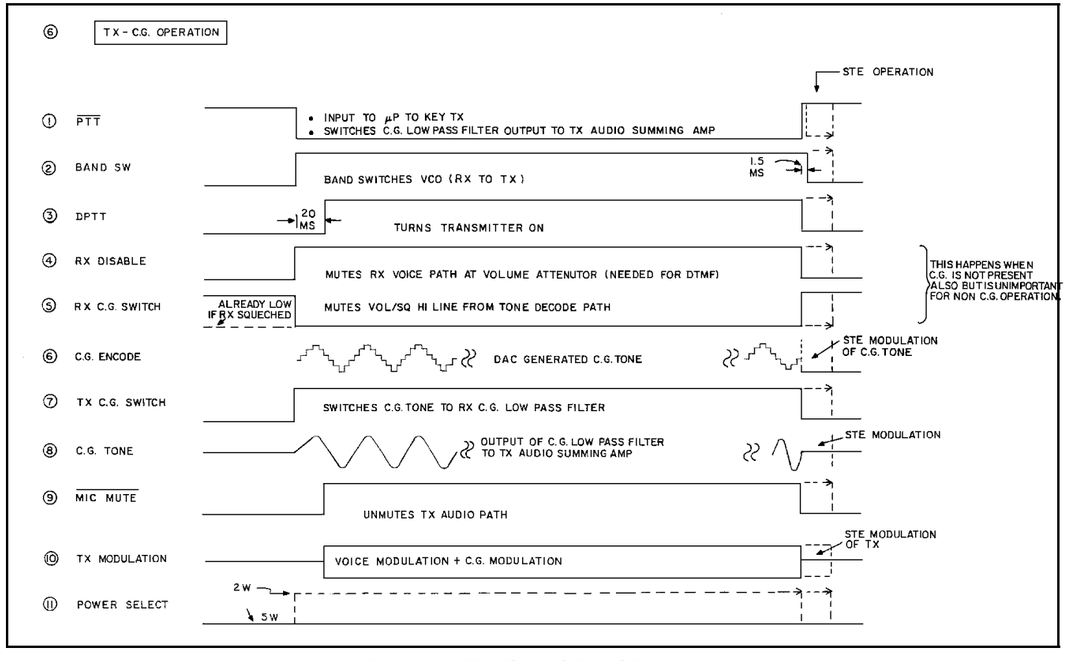


Figure 12 - TX Channel Guard Operation

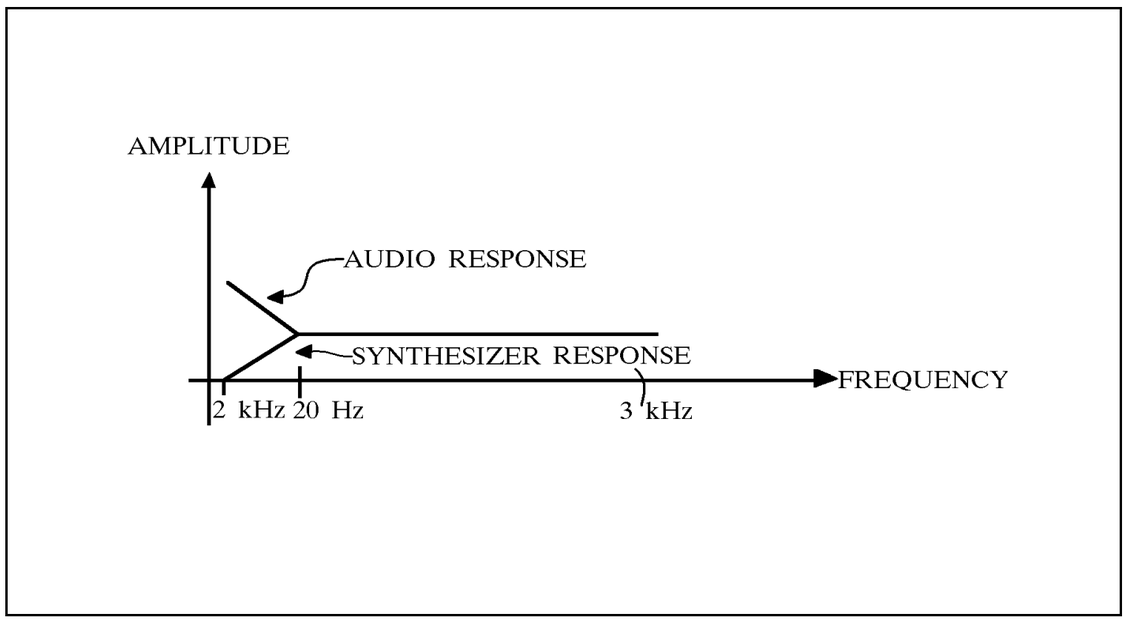


Figure 5 - Audio Response Curve

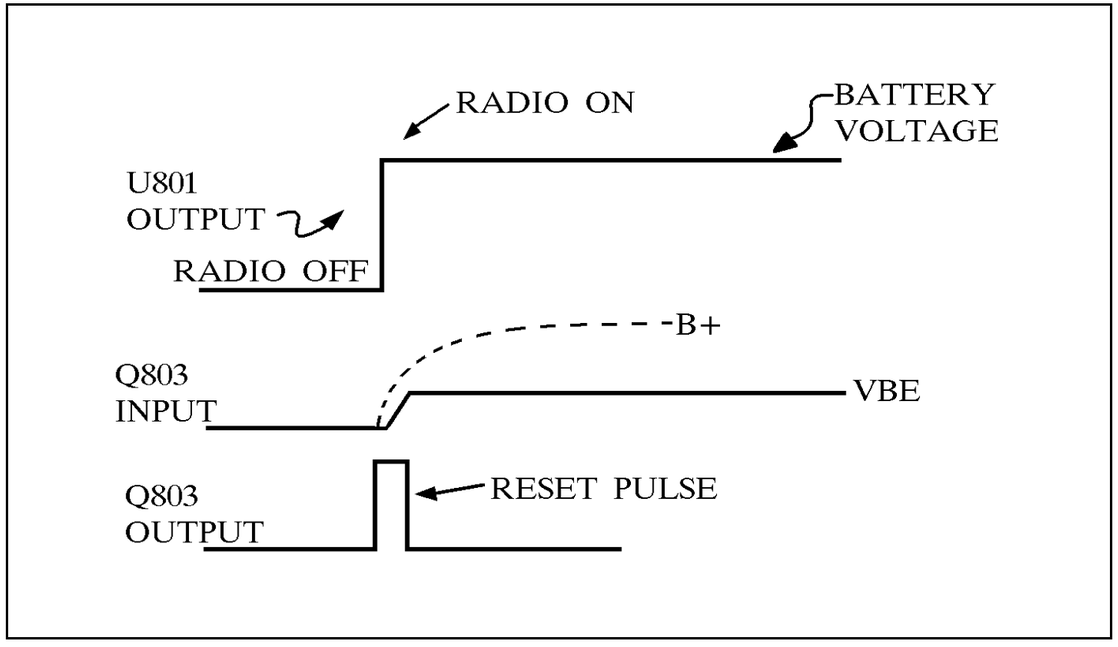


Figure 6 - Voltage Waveforms

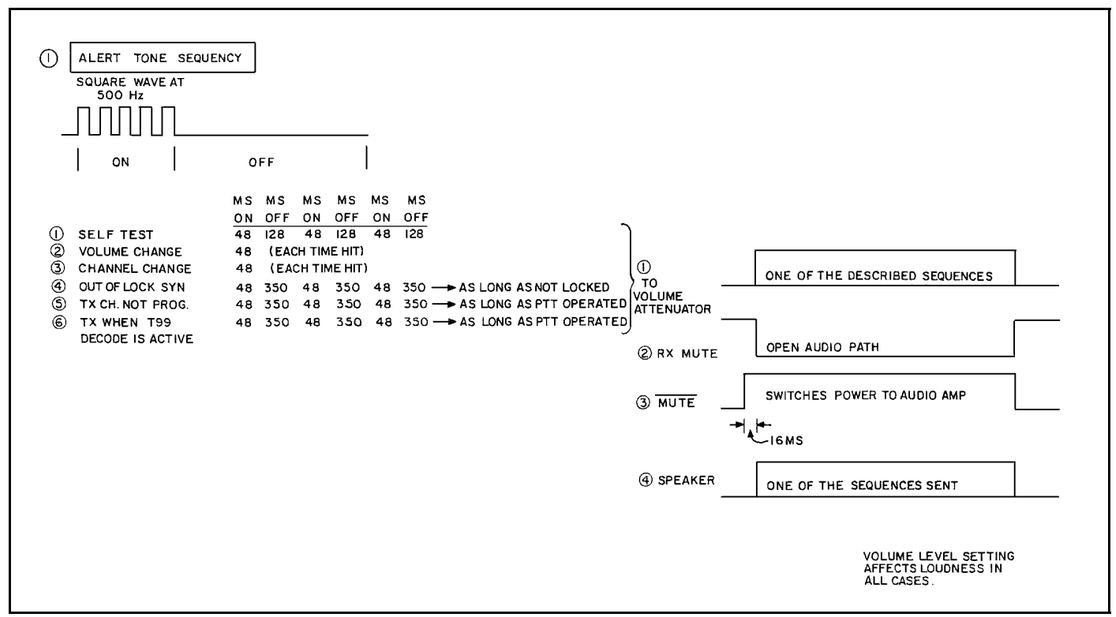


Figure 7 - Alert Tones

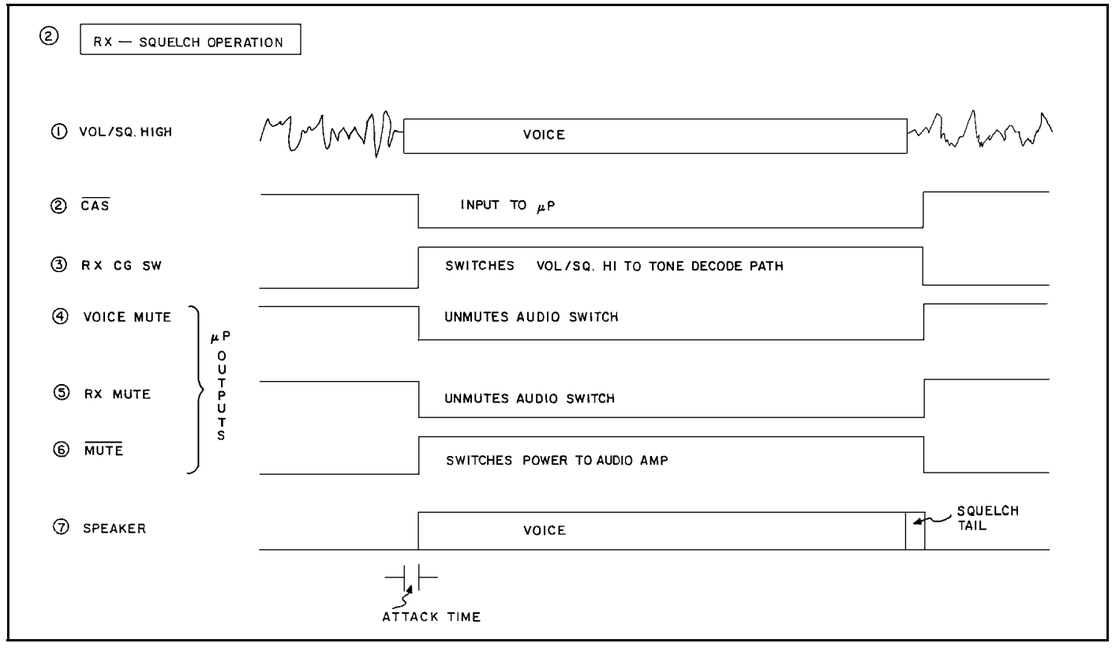


Figure 8 - RX Squelch Operation

A 6 dB/octave de-emphasis is provided by capacitor C615 and resistor R628 in the CG reject filter. Capacitor C622 and resistor R644 provide additional roll-off at higher frequencies.

Squelch Path

The squelch circuit operates on the noise components contained in the discriminator output. The signal at J801-10 is applied to a high-pass filter consisting of U601.2 and associated circuitry. The output of U601.2 is noise in a band around 6 kHz. The gain of the high-pass filter is determined by squelch potentiometer R608.

The output of U601.2 is rectified by U601.1, resistors R610 through R612, and capacitors C607 and C639. C607 is switched into operation by Q609. The Fast Squelch line, in turn, controls Q609. C607 is always switched into operation during a non-SCAN operation. During SCAN operation, C607 is switched out of the circuit for rapid squelch operation. This DC signal is then applied to comparator U601.4. If the rectified noise is more than 0.20 VDC, the CAS line is high and the microprocessor mutes the audio. Feedback resistor at U601.4 provides about 2 dB of hysteresis. Resistors R614, R662, R663, and thermistor R664 are used for temperature compensation or the threshold level.

The threshold level is temperature compensated at cold temperatures only by thermistor R664. This is necessary because of a drop in the VOL/SQ HI noise level. Thermistor R664 has a negative temperature coefficient. At 25° C and above, the thermistor has little effect on the threshold voltage level at U601B, Pin 12. At temperatures below 25° C, the resistance increases exponentially, thereby causing a drop in the threshold voltage. This voltage drop approximately tracks the voltage drop at the detected noise terminal, U601.2-13.

Limited Tone Data Path

Limited Tone Data is the 5 volts (peak-to-peak) representation of a received tone and is fed to the microprocessor where the actual tone decoding occurs. This circuit consists of an amplifier followed by a low-pass filter for voice rejection and a voltage comparator.

The low-pass filter consists of U606.1 and associated circuitry. This filter is used for both Channel Guard encoding and decoding. The filter has a breakpoint at 210 Hz. Type 99 decoding is done by bypassing the low-pass filter and going directly to comparator U606.2.

TX Audio Processing

Audio from the microphone is applied to a 6 dB/octave pre-emphasis network consisting of capacitor C301 and resistor R306 and then to amplifier U301.1. Amplifier U301.2 provides further gain and symmetrical limiting. The output of U301.2 is coupled through mic mute switch U605.3 to the post-limiter filter consisting of U302.1 and associated circuitry. Transmit Channel Guard tones are added to the microphone audio at the post-limiter filter. GE STAR ANI is also fed into post-limiter filter when programmed.

The transmit signal is applied to the low-frequency boost circuit U303.1, U303.2, and associated circuitry. The transmit deviation is set by MOD potentiometer R3211.

The low-frequency boost circuit provides an increasing output level as the input frequency decreases below 20 Hz. The shape of the response curve is shown in Figure 5. This shape is intended to be the mirror image of the synthesizer frequency response curve. The combined result of these two curves provide relatively flat modulation below 5 Hz. This is necessary for Digital Channel Guard modulation.

Regulator and Special Circuitry

A +5 volt regulator U802 supplies power to the microprocessor and all other circuitry requiring +5 volts. A voltage divider provides the input to U601.3 to generate a 2,25 volt reference for operational amplifier biasing.

Low Voltage Reset

Voltage detector U801 and transistor Q803 provide the microprocessor with the necessary reset signal during the power-up routine as well as resetting the microprocessor when the battery falls below approximately 4.75 volts (see Figure 6).

Low Battery Indicator

When the battery voltage drops to approximately 6.3 volts, the BAT IND line from the RF board is sufficiently high to turn on Transistor Q802. The output of Q802, the low battery line, drives a microprocessor port. This action turns on the BAT pixel on the LCD.

User Input

Control assembly connector J901 and SCAN connector J802 on the Audio/Logic board provide the interface between the operator and the radio. By pressing buttons on the switch panel or SCAN keypad, the operator can:

- Change volume level or channel.
- Monitor a channel.
- Key the transmitter.
- Turn SCAN on or off.
- Add or delete SCAN channels from the Scan list.
- Switch to HOME channel.

All operator commands are applied to an 8-bit shift register U803, which loads the data and control inputs into the microprocessor through J701-3, J701-4, and J701-6.

The LCD is updated to reflect the current status of the radio. The microprocessor configures the LCD through LCD EN (P2.0), LCD DAT (P2.1), and LCD CLK (P2.2).

Synthesizer Programming

After a reset, when toggling between transmit and receive, and anytime a new channel is selected, the microprocessor must reprogram the synthesizer through SYN CLK (P2.5), SYN DAT (P2.7), and SYN EN (P2.6). When locked, the LOCK DET line (J9801-11) is high.

Alert Tone

The microprocessor generates a 500 Hz alert tone (P3.4) used to signal the user of critical events. These events include synthesizer out-of-lock and activation of the volume up, volume down, and channel up buttons. The alert tone can be disabled by the programmer.

Microprocessor XTAL Frequency Pull

Port P1.5 of the microprocessor is used to switch a 33 pF capacitor (C701) into the crystal oscillator circuit. The effect of adding this capacitor is to move or pull the XTAL frequency approximately 250 ppm. This is done to keep harmonics of the microprocessor ALE line away from the receive channel frequency.

The programming at this point happens automatically when channel frequencies are initially programmed.

DTMF Encoder

The DTMF Encoder is used for encoding PCS personal radios with standard DTMF tones. The encoder consists of two parts: printed circuit board A1 and a twelve-key rubber keypad. The printed circuit board is mounted in the front cap assembly.

- The encoder performs the following functions:
- Generation of DTMF tone frequencies corresponding to digits dialed on the keypad.
- Continuous tone output as long as any digit is keyed on the keypad.
- Sidetone output to the radio speaker to permit monitoring the tones as they are transmitted.
- Uses standard tone format for high signalling reliability and equipment compatibility.

The DTMF Encoder uses standard dual tone multi-frequency format for telephone dialing. Each digit is identified by a unique combination of two tones; one corresponding to the horizontal row, and the other to the vertical column of push-button positions shown in Figure 4.

The frequencies are grouped about geometric center of the 300 to 3000 Hz voice band used in telephone and radio systems. The two tones are generated simultaneously and remain on as long as a digit on the keypad is being pressed. Row tones are in a lower frequency group than column tones. The frequencies are non-harmonic to give high immunity to false identification from beat frequencies and distortion-produced overtones.

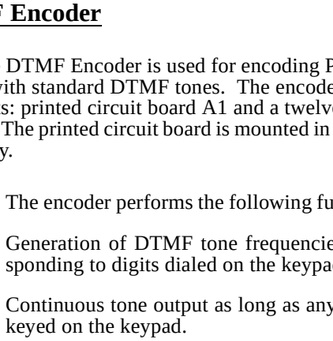


Figure 4 - Touch-Tone Keypad Frequency Format

SCAN/DTMF Board

The DTMF keypad is disabled until the PTT switch on the side of the radio is pressed and held. The PTT signal keys the microcomputer in the Audio/Logic board, Power and clock are toggled through J802.1 to the SCAN/DTMF microprocessor, enabling the oscillator. As the keypad buttons are pressed, digital signals, representing DTMF tones, are generated by ladder network resistors R8-R13. These signals pass through the R-C filter (R14-R16 and C3-C5). Side tones are connected to the receive audio section through J802.8 and are then sent to the transmitter modulator through J801.5 (on Audio/Logic board).

Liquid Crystal Display

(LCD) consists of LCD driver board A1, a diffuser, two zebra strips, the LCD, and a lens. The LCD assembly is held together by the lens. The primary function of this board is to illuminate LCD segments as controlled by the radio microprocessor on the Audio/Logic board.

Another function of this board is to provide backlighting of the LCD module. This is accomplished by using four LED devices (D1-D4). These LED's are turned on by LCD DAT/LT line and powered by a voltage switching circuit consisting of chip transistors Q1 and Q2. The diffuser, placed immediately above the LED's, evenly distributes the light. The zebra strips connect the driver board to the LCD and the entire assembly plugs into the control frame with six pins.

Microphone and Speaker

The microphone (B901) mounts directly onto the control frame (HL1 and HL2). The control assembly, when placed into the radio front assembly, is located in the correct position for receiving voice when used. The speaker, mounted i the front housing, connects to the control frame (HL3 and HL4) through two (2) wires. A protective grill cloth is placed on the front housing before the speaker is mounted to screen out foreign material.

User (Universal) Device Connector (UDC)

Part of the control frame forms UDC U901 for customer programming and for connecting external options. The speaker leads, mic high, and PTT are all brought to this connector along with ground. The mic lead and one of the speaker leads are switched to the UDC, only when micro switches S1 and S2 are operated. These switches are activated by plungers compatible PCS personal radio options. A rubber boot is placed over this connector for weather protection.

AUDIO/LOGIC BOARD

Microprocessor (80C52)

An 8-bit microprocessor (U1) is used to provide all of the control signals required by the radio. The microprocessor also generates Channel Guard tones, Digital Channel Guard words, GE STAR, ANI words, and detects Channel Guard and Type 99 tones.

The microprocessor is located on Spur Filter board (A701). The Spur Filter board includes RC filters on each port of the processor and a metal can soldered on top of the board to reduce the effect of the microprocessor-generated spurious signals.

Table 1 - Microprocessor Port Pin Identification

P0.0 (O)	Channel Guard Encode Bit 0/Volume Attenuator Bit 0	P2.0 (O)	LCD Enable
P0.1 (O)	Channel Guard Encode Bit 1/Volume Attenuator Bit 1	P2.1 (O)	LCD Data
P0.2 (O)	Channel Guard Encode Bit 2/Volume Attenuator Bit 2	P2.2 (O)	LCD Clock
P0.3 (O)	Channel Guard Encode Bit 3/Volume Attenuator Bit 3	P2.3 (O)	Receive Mute (active high)
P0.4 (I)	Low Battery Indication (active low)/ANI Alert	P2.4 (O)	T99/ANI
P0.5 (O)	Transmit Channel Guard Switch (active high)	P2.5 (O)	Synthesizer Clock
P0.6 (O)	Mute (active low)	P2.6 (O)	Synthesizer Data
P0.7 (O)	Delayed PTT (active low)	P2.7 (O)	Synthesizer Data
P1.0 (O)	Fast SQ	RXD (I)	Programmer Data
P1.1 (I)	Load (serial load)	TXD (I/O)	Programmer Data Out/PTT
P1.2 (I)	Clock (serial load)	P3.2 (I)	Tone Data
P1.3 (I)	CAS (active low)	P3.3 (I)	Lock Detect
P1.4 (I)	QH (active low) (serial load)	P3.4 (O)	Alert Tone
P1.5 (O)	XTAL Bit	P3.5 (O)	Band Switch
P1.6 (O)	Mic Mute (active low)	P3.6 (O)	E^2PROM Clock
P1.7 (O)	Power Select	P3.7 (O)	E^2PROM Data

Port Pins I=Input O=Output I/O=Bidirectional

EEPROM

The 512 x 8-bit EEPROM (U701), commonly referred to as the personality PROM, stores customer information, such as:

- Customer frequencies
- Customer tones
- Customer options

Using the EEPROM provides the convenience of programming without opening the radio.

Programming of the EEPROM is accomplished by driving the MIC HI lead, which is connected to operational amplifier circuit U302.2. With no external signal connected to MIC HI, a voltage level of 2.1 volts is at MIC HI. This causes the output of U302.2 (the program data line) to be high.

When the MIC HI is pulled low, the program data line is pulled low. If this line remains low for 20 milliseconds or longer, the microprocessor is switched into the programming mode. Once in this mode, the radio will not operate or respond to any front case button. The radio must be turned off and then back on to get the processor out of this mode.

When the microprocessor is programmed, the processor will be taken out of the programming mode by the proper character from the personal computer programmer.

RX Audio Processing

Voice Path

Received audio enters the Audio/Logic board on Pin 10 of J801. Frequencies below 300 Hz are attenuated by the Channel Guard reject filter consisting of U602.1 and associated circuitry.

The output from the CG reject filter is coupled through voice mute switch transistor Q603 to the volume attenuator circuit U602.2, and resistors R632 through R640. The feedback resistors are selected by bilateral switch Q603 and controlled by inputs volume bit 0, 1, and 2. Here the 500 Hz alert tone, generated by the microprocessor, can be added to the received audio at the alert tone input.

The volume attenuator has a range of 48 dB. The attenuator output is coupled through RX MUTE switching transistor Q606 to audio amplifier transistor U604. ANI alert is coupled to U604 input through C608 and R673. Power is supplied to the audio amplifier by transistors Q605 and Q606 and controlled by the MUTE line from the microprocessor. Amplifier U604 drives the speaker with differential outputs, which are also connected to the accessory connector through the control assembly.

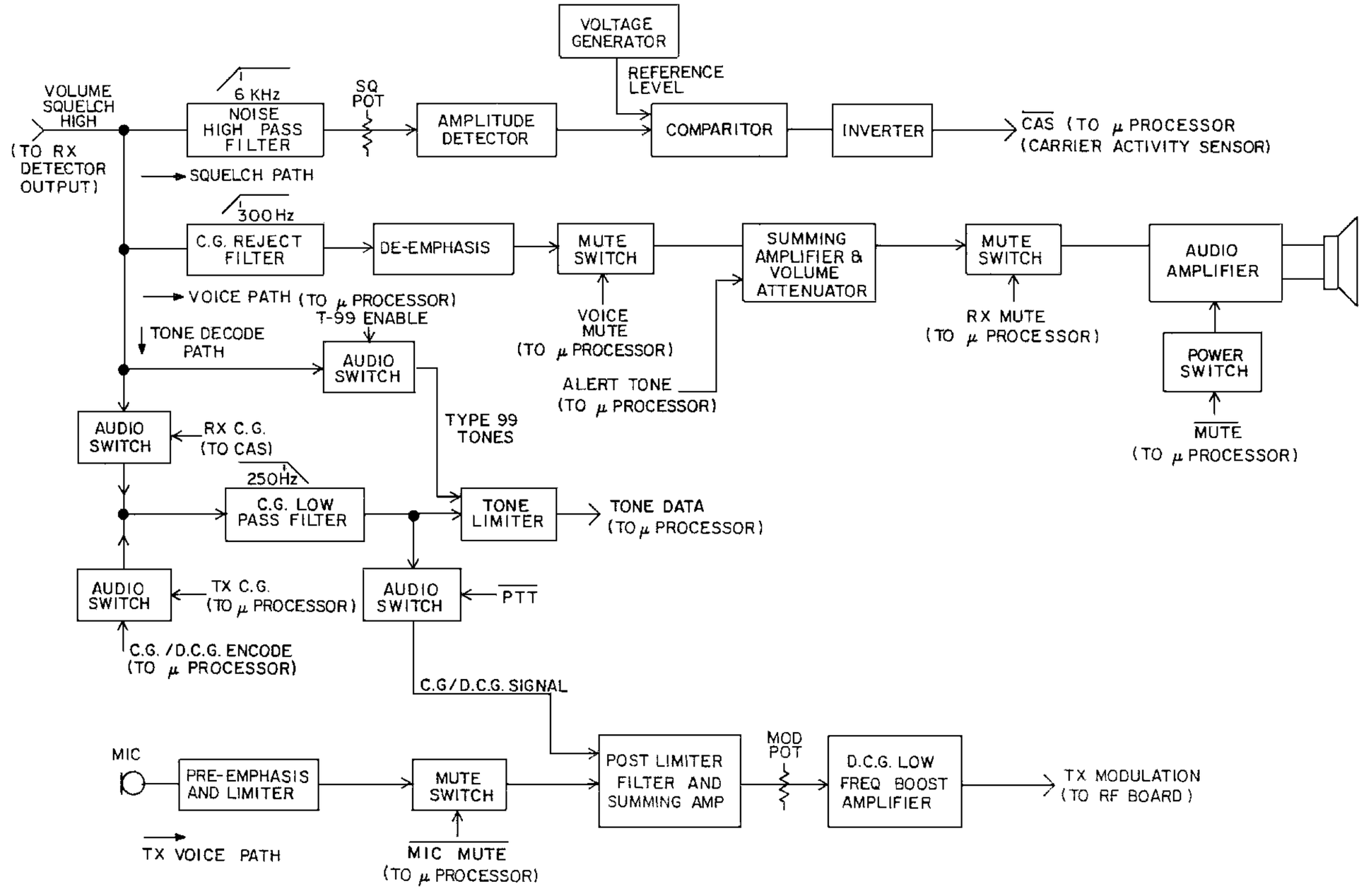


Figure 3 - Audio Paths Block Diagram

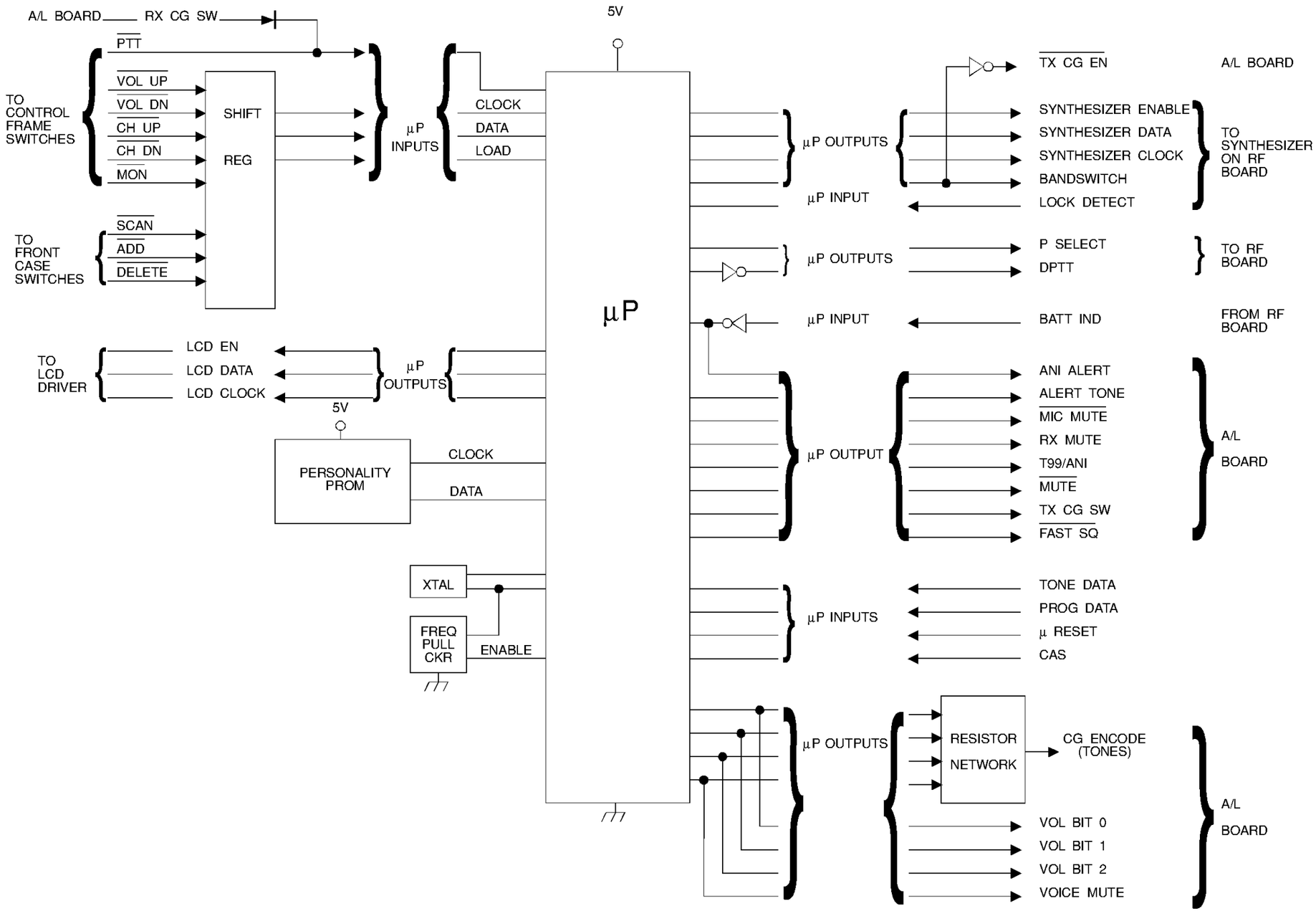


Figure 2 - Microprocessor Block Diagram

DESCRIPTION

The Radio Front Assembly (19D902177G17) for the PCS Portable Synthesized radio consists of the following components:

- Front Cap Assembly 19D902180G10
- Audio/Logic Board 19D902631G2
- Metal Over Elastomer (MOE) Connector 19A705662P1 and Holder 19B801570P2

The Radio Front Assembly (19D902177G18) for the PCS SCAN/DTMF Portable Synthesized radio consists of the following components:

- Front Cap Assembly 19D902180G11
- Audio/Logic Board 19D902631G2
- Metal Over Elastomer (MOE) Connector 19A705662P1 and Holder 19B801570P2

The front cap assembly consists of a LEXAN front housing, a control assembly, and a speaker.

The control assembly houses most operator switches/buttons, the Liquid Crystal Display (LCD), and the microphone. The Metal Over Elastomer (MOE) connector provides the interface between the printed runs on the control assembly and the printed runs on the Audio/Logic board.

The front housing contains the SCAN board (G17)or the SCAN/DTMF board that mounts the DTMF Pad (G18).

NOTE

All references to the SCAN function, equipment, and accessories apply only to the 8- and 16-channel radios.

FRONT CAP ASSEMBLY

Front cap assembly 19D902180G10 consists of a molded plastic circuit board (control frame), a Liquid Crystal Display (LCD) assembly, switches/buttons for the basic radio functions, and a Universal (User) Device Connector (UDC) all mounted in a plastic front housing.

Front cap assembly 19D902180G11 consists of a molded plastic circuit board (control frame), a Liquid Crystal Display (LCD) assembly, switches/buttons for the basic radio functions, and a Universal (User) Device Connector (UDC), all mounted in a plastic front housing. A DTMF keypad board is also mounted to the front housing. A SCAN/DTMF cable assembly connects this board to the Audio/Logic board.

The assembly diagram shows both a pictorial view of the control assembly and a view of the control assembly mounted into the radio front housing. The control frame acts like a three-dimensional printed circuit board.

The base material consists of "ULTEM" molded plastic with a two-layer printed circuit pattern on the outside perimeter of the frame. The control frame interfaces with the following:

- Control Switches/Buttons
- Liquid Crystal Display Module (LCD)
- Microphone
- Speaker
- User (Universal) Device Connector (UDC)

AUDIO/LOGIC BOARD

Audio/Logic board 19D902631G2 mounts in the Front Cap Assembly as shown in Figure 1. All Front Cap control switch operations are connected to the Audio/Logic board through MOE interface connector. The SCAN push-button board is connected by a cable to J802 on the Audio/Logic board.

A microprocessor on the Audio/Logic board interprets these commands and issues commands to the Audio/Logic circuits, the RF circuits and the LCD module on the control assembly. Microphone and speaker audio is also transferred through the MOE connector.

Refer to Figure 2 for a block diagram of the microprocessor and associated circuitry and to Figure 3 for a block diagram of the audio paths (see Table of Contents).

The Audio/Logic board consists primarily of the following:

- Microprocessor
- EEPROM
- RX Audio Processing
- TX Audio Processing
- Regulators and Special Circuits

CIRCUIT ANALYSIS

FRONT CAP ASSEMBLY

Control Switches/Buttons

The control switches/buttons include the PTT, MONitor, CHANnel UP/DOWN, and VOLume UP/DOWN controls. A "dome" switch pad adheres to the control frame with domed metal switches. When pressed, these switches make direct contact with runs on the control frame. A rubber keypad fits over the switch assembly for operator interface and weather protection.

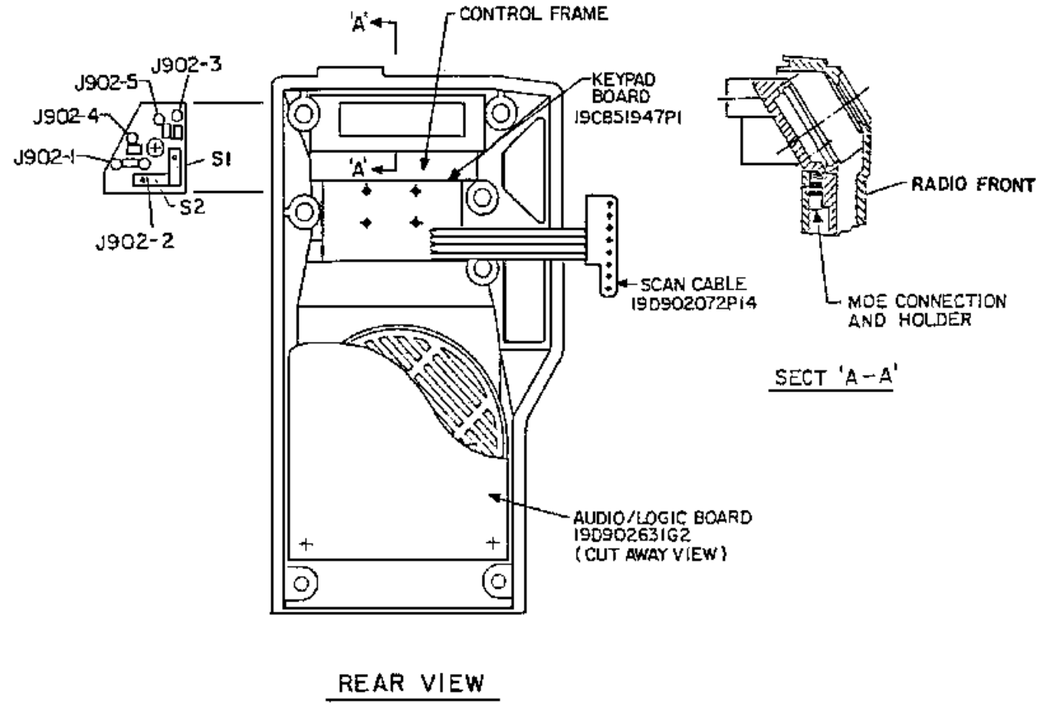


Figure 1 - Radio Front Assembly

SCAN Switches

The SCAN push-button switches consist of the ADD/HOME/EMERGENCY/BACKLIGHT, SCAN, and DELete buttons, mounted on a small printed wiring board. Pressing these switches makes contact with the runs on the board. These lines are connected to the Audio/Logic board by a cable that plugs into the Audio/Logic board.

On the Radio Front Assembly (19D902177G18) the SCAN/TALK AROUND and DELete/POWER SET buttons are part of the DTMF keypad.