

# FT-690RII

## TECHNICAL SUPPLEMENT

This manual is intended to serve as a supplement to the FT-690RII Operating Manual. Detailed information regarding functions, specifications, options and operation has been provided in the Operating Manual, and is not reprinted herein. Therefore, this supplement is not intended to serve as an independent reference, but to be used in conjunction with the information provided in the Operating Manual.

Because of the compactness and complexity of the double-sided glass-epoxy circuit boards used in the FT-690RII, four layout diagrams are provided for each board. Each side of the board is identified by the type of the majority of components installed on that side. In most cases one side has only chip components, and the other has either a mixture of both chip and lead components (trimmers, coils, electrolytic capacitors, packaged ICs, etc.), or lead components only. The two "obverse" views depict the board as it is seen when viewed directly with the eye, while the two "reverse" views depict the unseen side of the board as it would appear if one were to peer through the board from the other side without seeing the components and tracks on the near side.

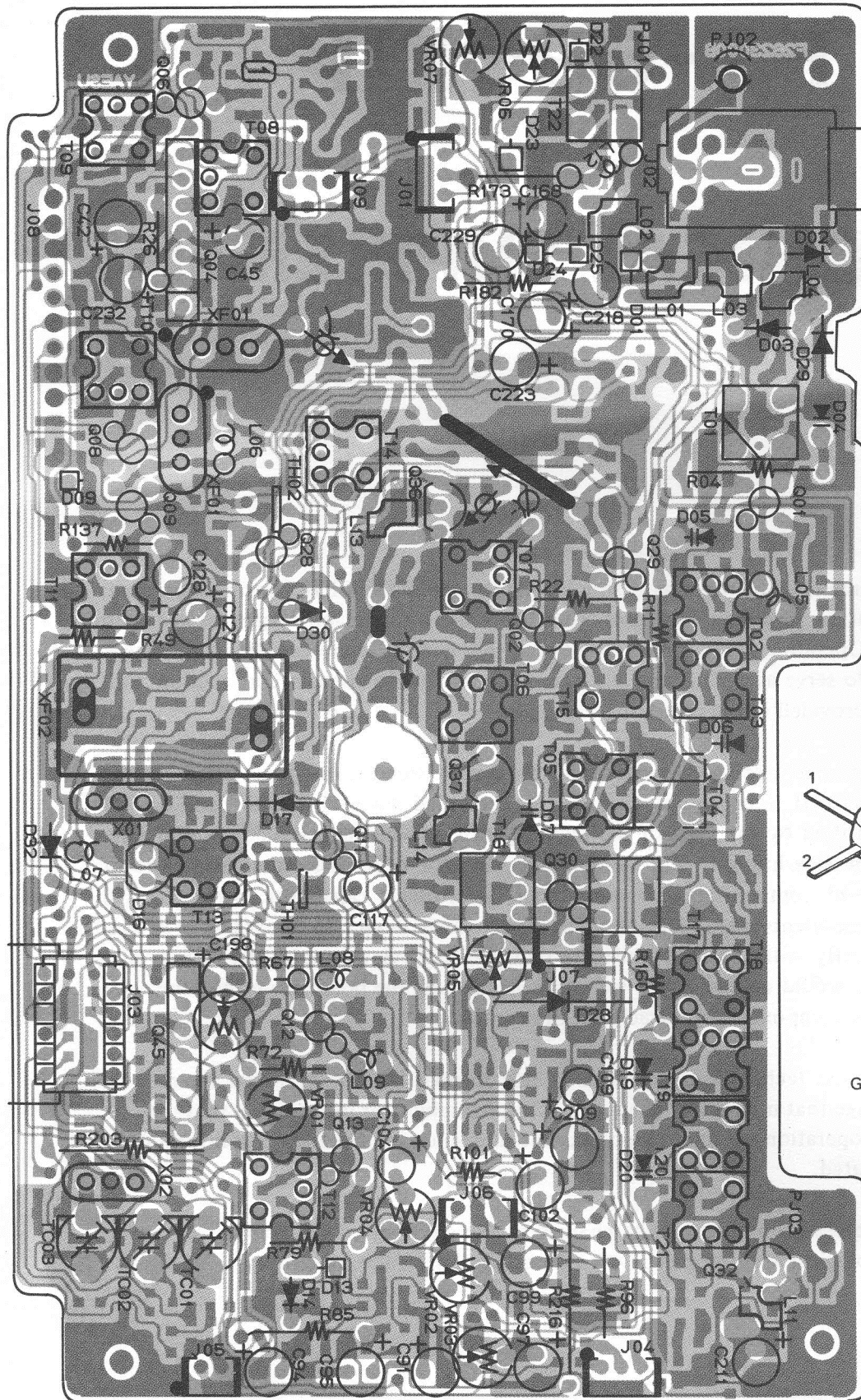
While we believe the technical information in this manual is correct, Yaesu assumes no liability for damage that may occur as a result of typographical or other errors that may be present. Your cooperation in pointing out any inconsistencies in the technical information would be appreciated.

Yaesu Musen reserves the right to make changes in the circuitry of this transceiver, in the interest of technological improvement, without notification of the owners.

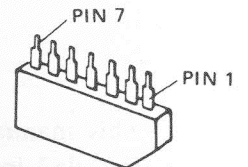


**YAESU MUSEN CO., LTD.**  
**C.P.O. BOX 1500**  
**TOKYO, JAPAN**

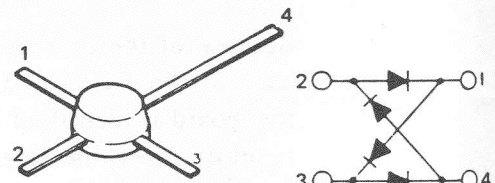
# MAIN UNIT



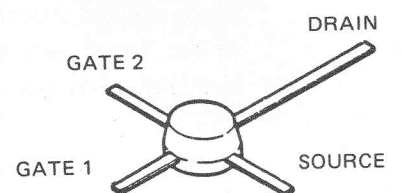
(obverse view of "chip-only" side)



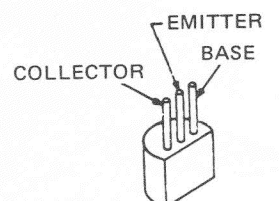
$\mu$ PC577H (Q3004)  
 $\mu$ PC1037H (Q3045)



ND487C1-3R (Q3030)

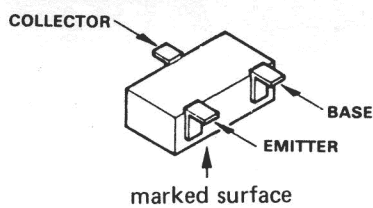
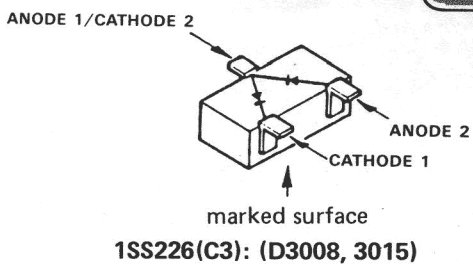
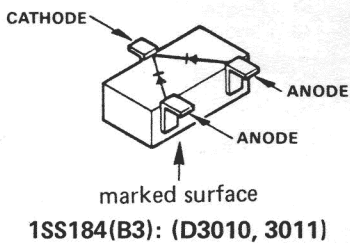
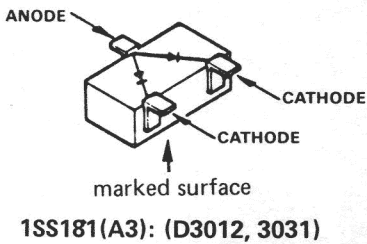
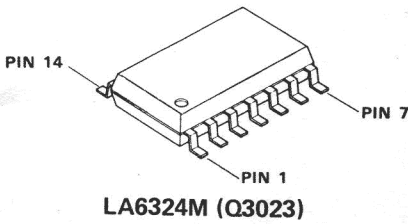
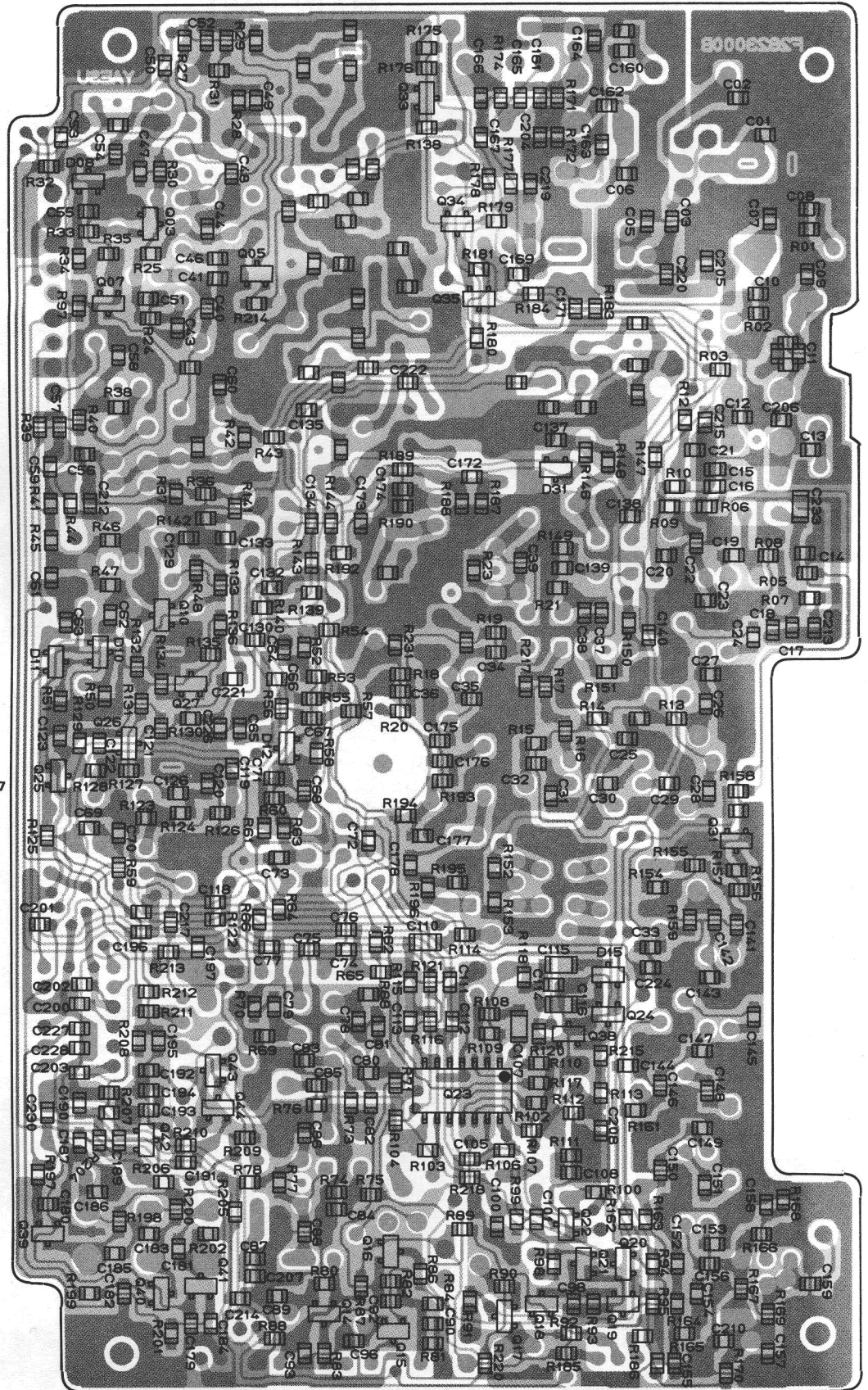


3SK74L (Q3002)  
 3SK122L (Q3001, 3006  
 3008, 3009  
 3011-3013  
 3028, 3029)



2SC2026 (Q3032, 3037)

# MAIN UNIT



(reverse view of "chip-only" side)

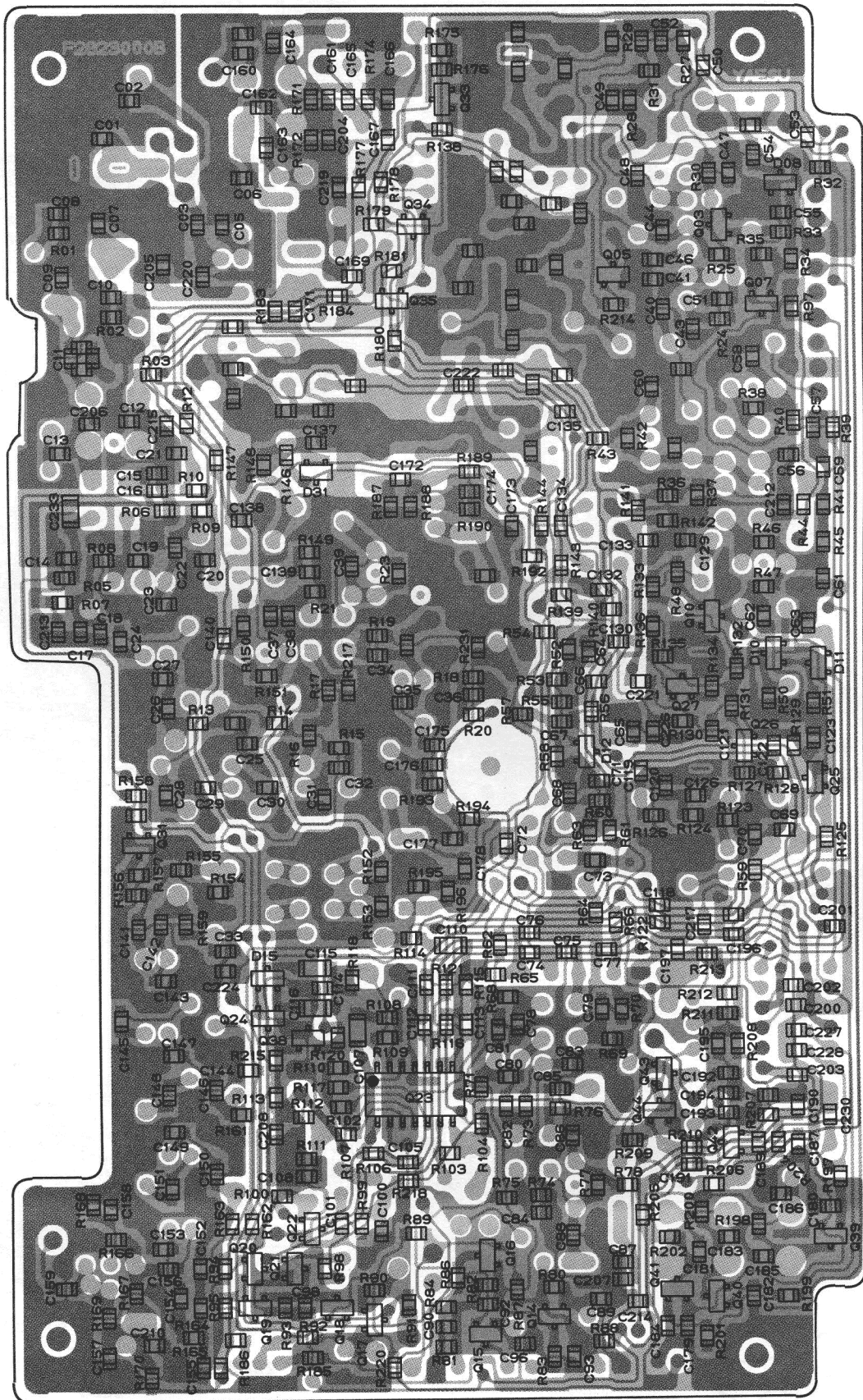
**2SA812F(M6):** (Q3015, 3017, 3018, 3034, 3038)

**2SC1623F(L6):** (Q3003, 3005, 3007, 3010, 3014, 3016, 3019-3022, 3024, 3025, 3027, 3033, 3035, 3039-3044)

**2SC2620B(QB):** (Q3026)

**2SC3052F(LF):** (Q3031)

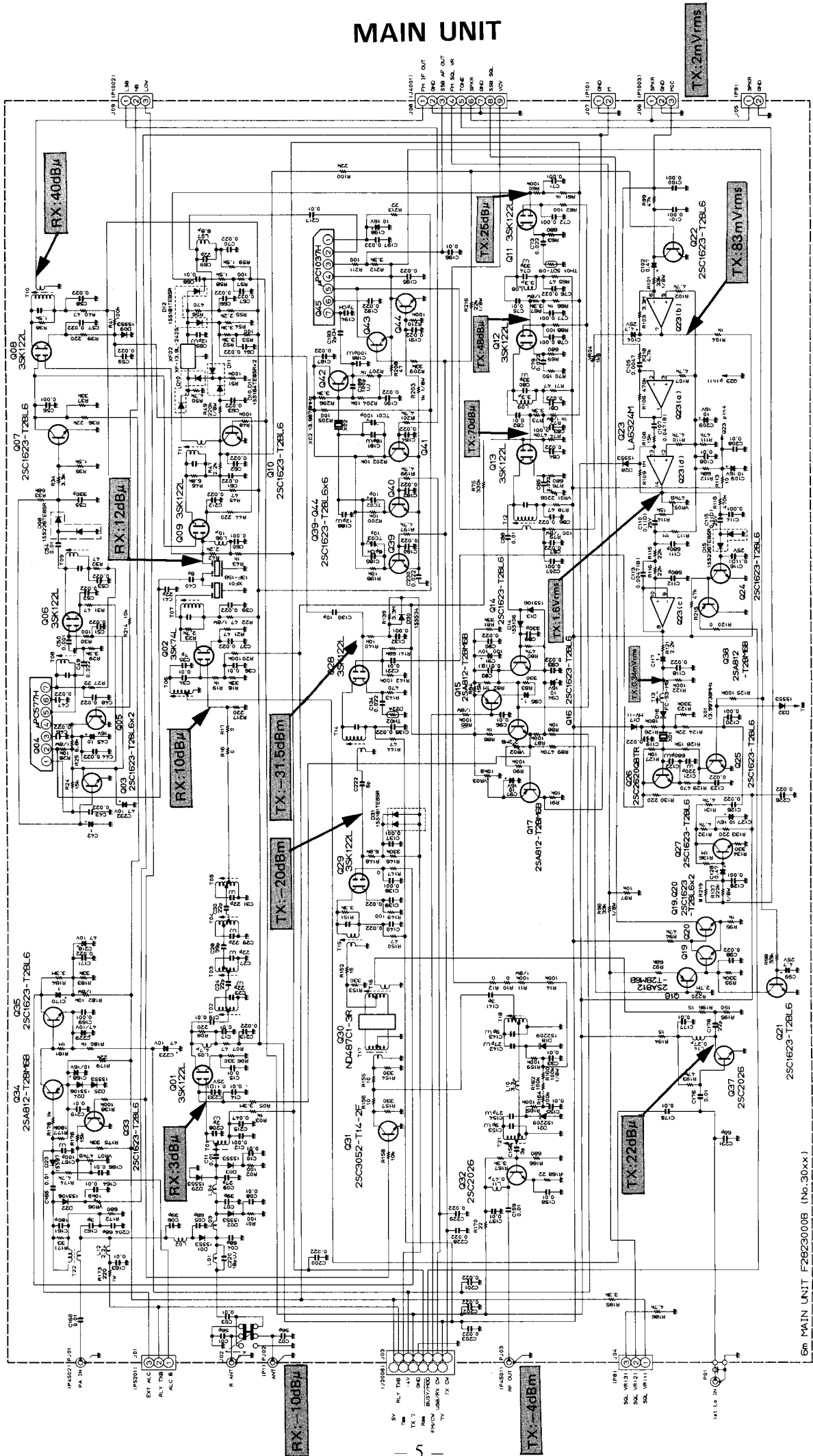
# MAIN UNIT



(obverse view of "chip-only" side)



# MAIN UNIT



RESISTOR VALUES ARE IN OHMS UNLESS OTHERWISE NOTED.  
CAPACITOR VALUES ARE IN P.F. UNLESS OTHERWISE NOTED.



5m MAIN UNIT F282300B (No. 30-xx)

## MAIN UNIT VOLTAGE CHART (DC VOLT)

### ◎CONNECTORS

PIN No.	1	2	3	4	5	6	7	8	9	10	11	12	REMARKS
J3001	2.7	3.8	2.2	—	—	—	—	—	—	—	—	—	
J3003	0	6.8	0	4.9	1.8	0.8	0	0	-4.0	-4.0	-3.9	4.9	
J3004	3.9	3.9	1.3	—	—	—	—	—	—	—	—	—	
J3005	0.2	0	—	—	—	—	—	—	—	—	—	—	
J3006	0.2	0	0	—	—	—	—	—	—	—	—	—	
J3007	0	0	—	—	—	—	—	—	—	—	—	—	
J3008	0	0	4.7	1.9	0.1	0.2	0	4.9	5.2	—	—	—	
J3009	4.4	4.8	0	—	—	—	—	—	—	—	—	—	

### ◎TRANSISTORS & FETS

	E (S)	C (D)	B (G1)	(G2)	REMARKS		E (S)	C (D)	B (G1)	(G2)	REMARKS
Q3001	1.1/0	6.6/6.8	2.0	0.8/-3.9	RX/TX	Q3024	0	6.8	0	—	
Q3002	0.3	6.6	1.2	0		Q3025	0	0/0.1	0.6/0.7	—	RX/TX
Q3003	0	6.2/0.4	0	—	NB OFF/ON	Q3026	0/2.8	0/7.3	0/3.5	—	RX/TX
Q3005	0	6.2/0.1	0/0.7	—	NB OFF/ON	Q3027	0/0.2	0/6.0	0/0.7	—	RX/TX
Q3006	6.2/0.4	6.7/6.6	6.2/1.2	0.3	NB OFF/ON	Q3028	0/1.0	6.8/6.5	3.0	-4.0/0.8	RX/TX
Q3007	0	3.0	0	—		Q3029	0/0.8	6.8/6.3	2.9	-4.0/0.8	RX/TX
Q3008	1.2/0.6	6.7/6.8	3.0	0.8/-3.9	RX/TX	Q3031	0	0	0	—	
Q3009	1.2/0.6	6.5	3.0	0.8/-3.9	RX/TX	Q3032	0/0.3	0/7.3	0/1.1	—	RX/TX
Q3010	0	4.5/0	0/0.6	—	RX/TX	Q3033	0	1.9	0	—	
Q3011	1.2/0	6.7/6.8	2.9	0.8/-3.9	RX/TX	Q3034	0.8	-3.6	1.0	—	
Q3012	1.2/0	6.7/6.8	2.9	0.8/-3.9	RX/TX	Q3035	-4.0	2.9	-3.6	—	
Q3013	1.2/0	6.7/6.8	3.3	0.8/-3.9	RX/TX	Q3037	0	0/7.4	0/0.8	—	RX/TX
Q3014	-3.3	2.9	-3.3	—		Q3038	1.9	0	6.8	—	
Q3015	4.9	1.8	4.9	—		Q3039	0/1.6	6.7/4.4	0	—	FM/SSB
Q3016	2.6	4.9	2.9	—		Q3040	0/1.6	6.7/1.6	0/2.2	—	FM/SSB
Q3017	0	3.1	2.5	—		Q3041	0/1.6	6.7/4.4	0	—	FM/SSB
Q3018	0	3.1	2.5	—		Q3042	6.0/3.2	6.7/4.4	6.5/3.3	—	FM/SSB
Q3019	0.1	0.8	0	—		Q3043	6.0/0.1	6.0/0	0/2.8	—	FM/SSB
Q3020	0.1	0.1	0.8	—		Q3044	0	6.0/0.1	0/0.8	—	FM/SSB
Q3021	0	0	0.6	—						—	
Q3022	0	0	0.6/0	—	RX/TX					—	

### ◎ICs

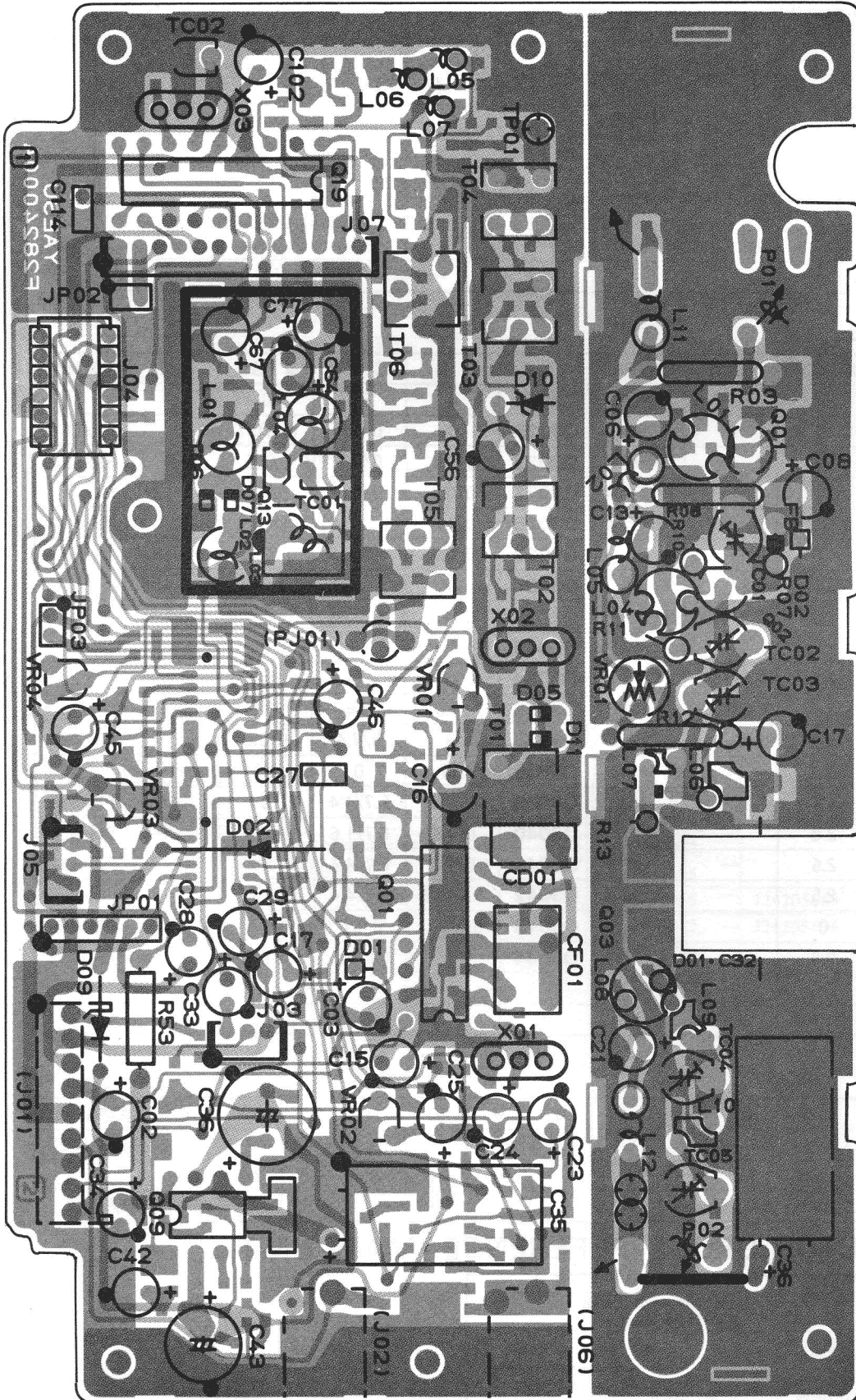
PIN No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	REMARKS
Q3004	6.2/5.2	6.2/1.1	6.2/1.3	6.2/0.1	6.8/6.2	6.2/1.9	6.8/6.2	—	—	—	—	—	—	—	NB OFF/ON
Q3023	2.7	2.7	2.7	6.7	2.7	2.7	2.7	2.8	2.8	2.3	0	2.8	2.8	2.8	
Q3045	6.8/6.4	6.8/5.5	6.1/4.9	6.0/0.1	6.0/2.8	6.0/2.9	6.0/2.9	—	—	—	—	—	—	—	FM/SSB

## CHIP SEMICONDUCTOR CROSS-REFERENCE (MAIN UNIT)

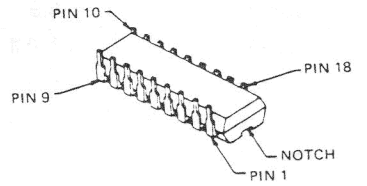
PART LOCATION No.	ORIGINAL	REPLACEMENT		
	NOMENCLATURE (MARKING) AND PART NUMBER	NOMENCLATURE (MARKING) AND PART NUMBER		
Q3017, 3034	2SA812F (M6) G3108120F	2SA1179F (M6) G3111790F		
Q3015, 3018, 3038	2SA812F/G(M6/M7) G3108120F/G	2SA1162GR (SG) G3111620G	2SA1179F/G(M6/M7) G3111790F/G	
Q3014, 3016, 3035, 3042	2SC1623F(L6) G3316230F	2SC2712GR (LG) G3327120G	2SC2812F (L6) G3328120G	
Q3003, 3005, 3007, 3010, 3019, 3020, 3021, 3022, 3024, 3025, 3027, 3033, 3039, 3040, 3041, 3043, 3044	2SC1623F/G(L6/L7) G3316230F/G	2SC2462C/D(LC/LD) G3324620C/D	2SC2712GR/BL(LG/LL) G3327120G/B	2SC2812F/G(L6/L7) G3328120F/G
Q3031	2SC3052F (LF) G3330520F	2SC3052E (LE) G3330520E		
D3012, 3031	ISS181 (A3) G2070001	DCA015TA (A4) G2070014	MC2836 (A4) G2070024	
D3010, 3011	ISS184 (B3) G2070009	DCB015TA (A6) G2070012	MC2838 (A6) G2070018	
D3008, 3015	ISS226 (C3) G2070003	ISS123 (C3) G2070020		

\*Semiconductors not listed above may be replaced only with original types.

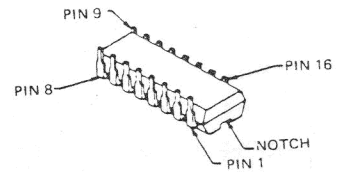
# PLL/PA UNIT



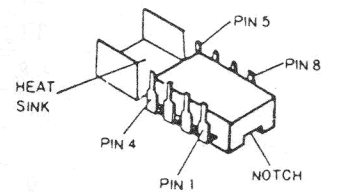
(obverse view of "component" side)



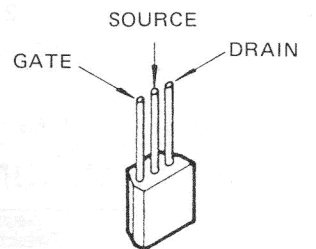
MC145145P1 (Q4019)



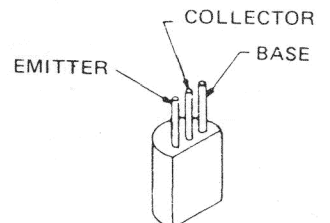
MC3357P (Q4001)



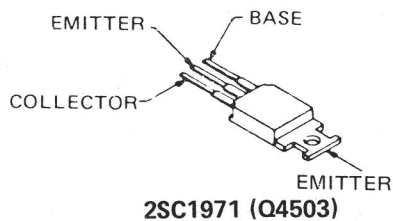
μPC575C2 (Q4009)



2SK192A-GR (Q4013)

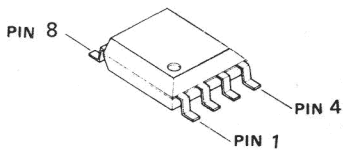
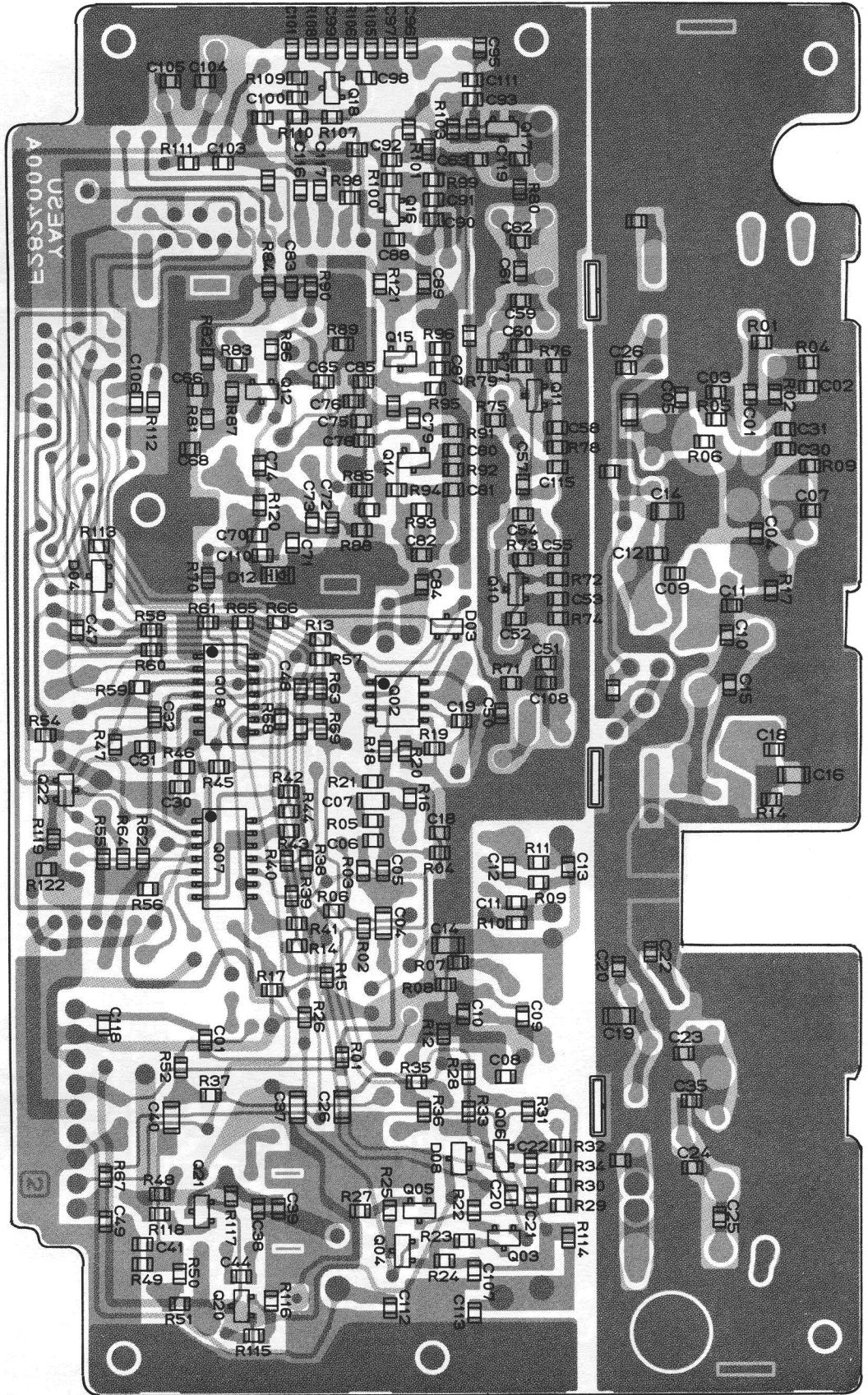


2SC2053 (Q4502)

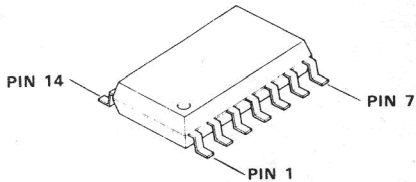


2SC1971 (Q4503)

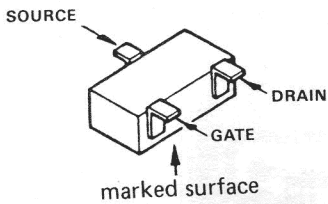
# PLL/PA UNIT



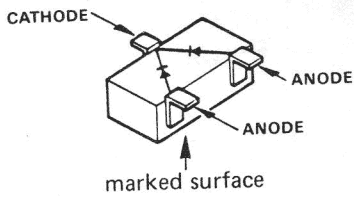
LA6358M (Q4002)



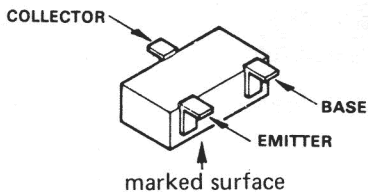
LA6324M (Q4008)  
LC4022BM (Q4007)



2SK302Y(TY): (Q4014, 4015)



1SS184(B3): (D4003, 4004, 4008)



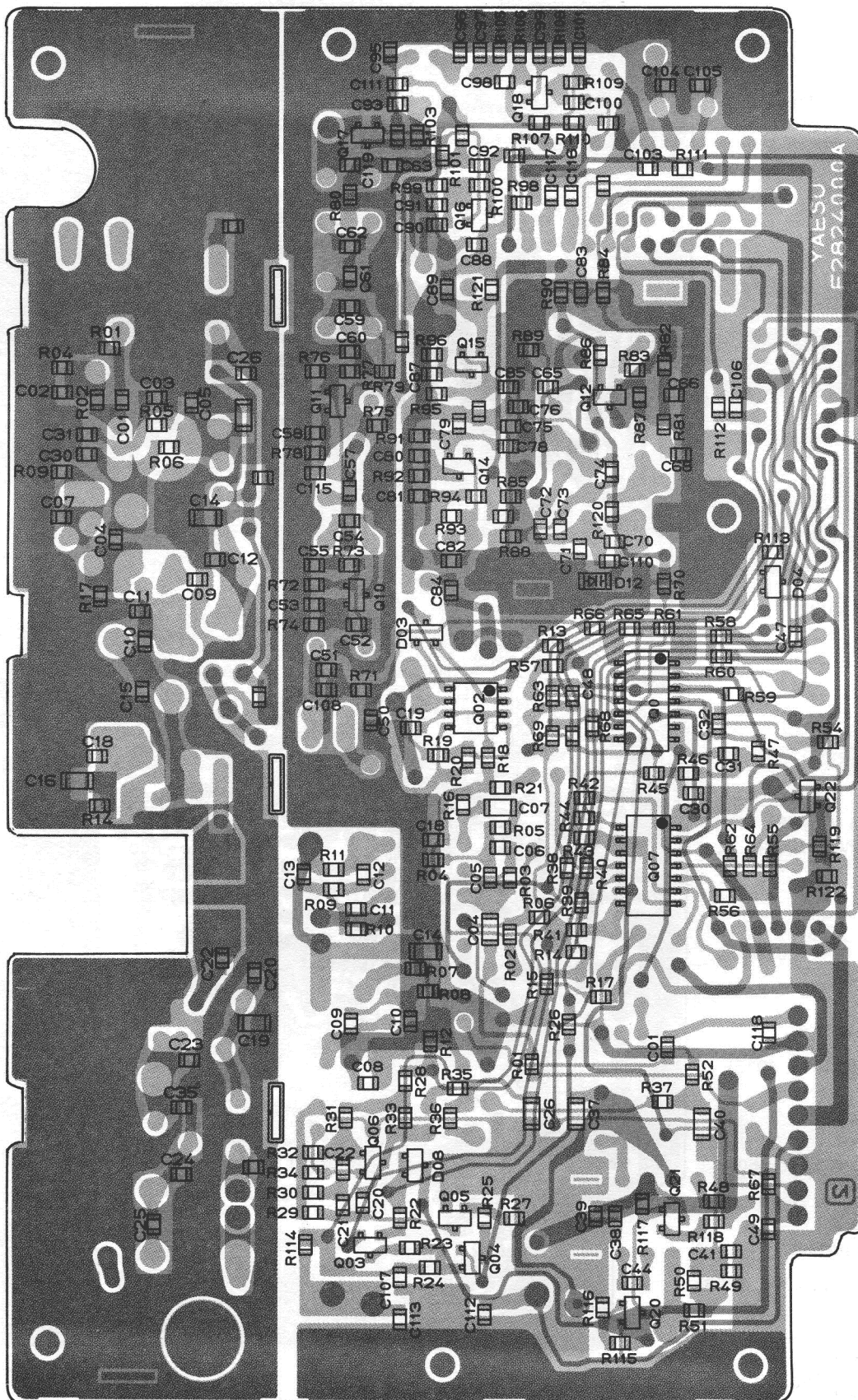
2SA812F(M6): (Q4003, 4004, 4012)

2SC1623F(L6): (Q4005, 4006, 4017, 4020-4022)

2SC2620B(QB): (Q4010, 4011, 4016, 4018)

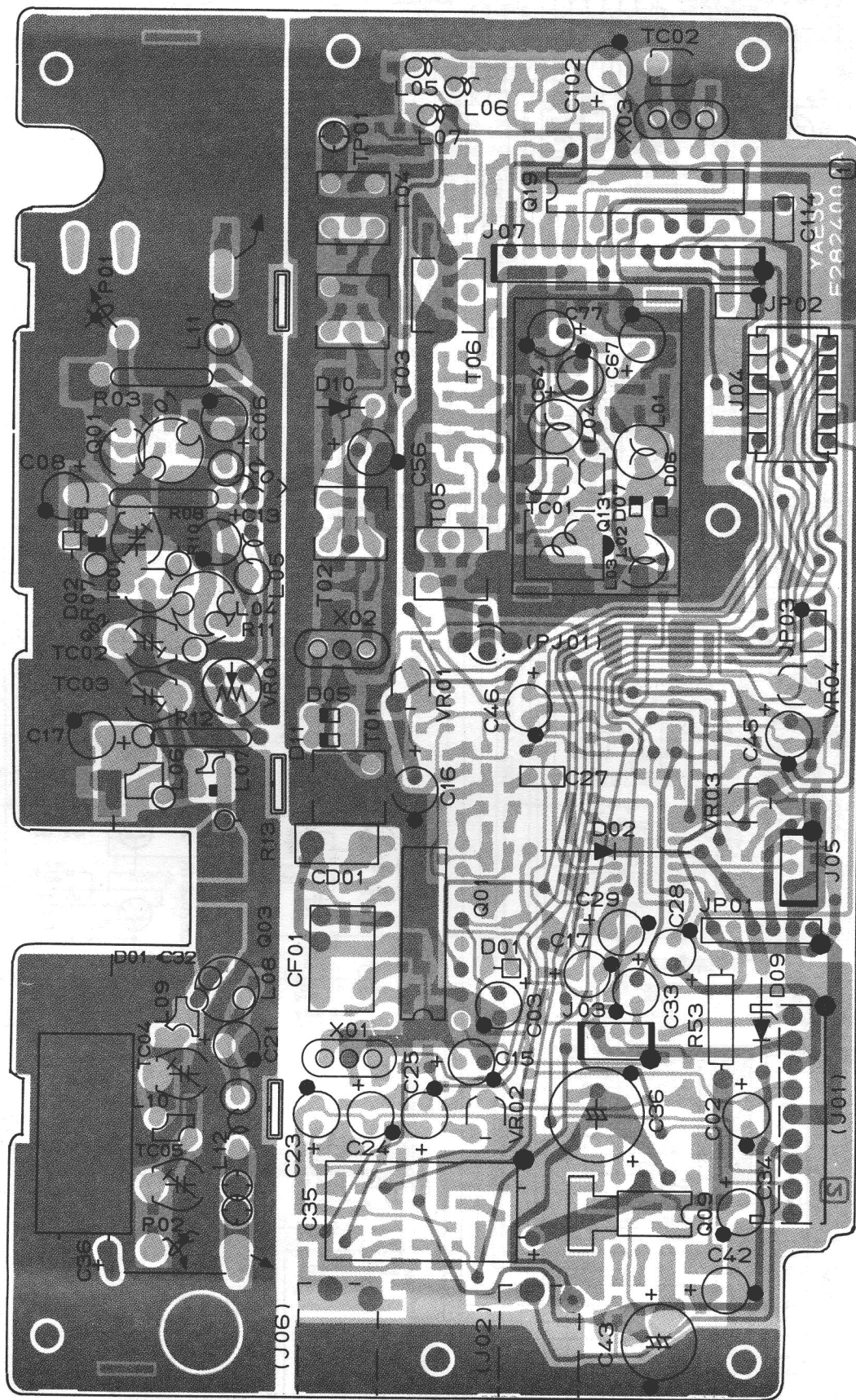
(reverse view of "chip-only" side)

# PLL/PA UNIT



(obverse view of "chip-only" side)

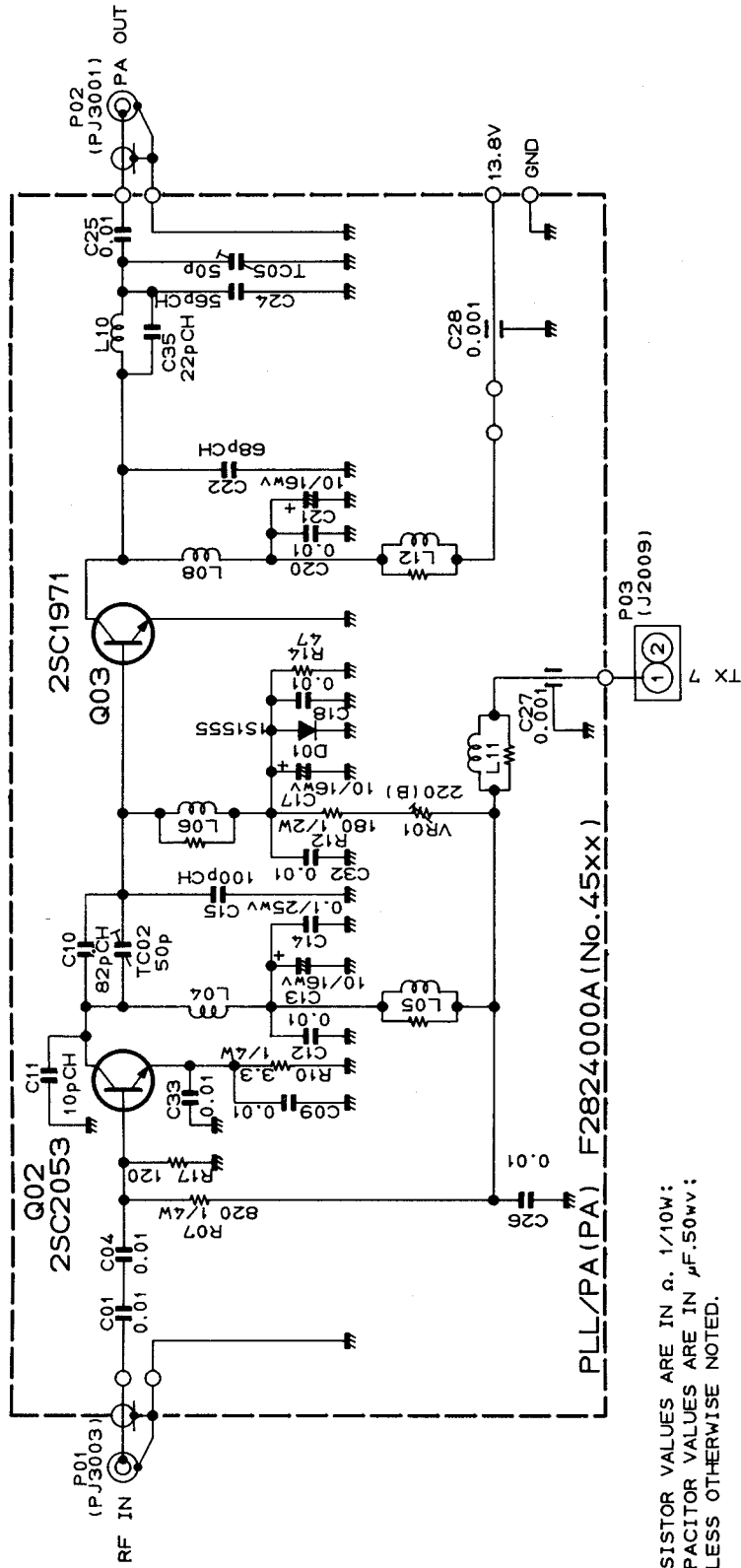
# PLL/PA UNIT



(reverse view of "component" side)



# PLL/PA UNIT



RESISTOR VALUES ARE IN  $\Omega$ , 1/10W;  
CAPACITOR VALUES ARE IN  $\mu$ F, 50V;  
UNLESS OTHERWISE NOTED.

## PLL/PA UNIT VOLTAGE CHART (DC VOLT)

### ◎CONNECTORS

PIN No.	1	2	3	4	5	6	7	8	9	10	11	12	13	REMARKS
	J4001	0	0	6.2	1.9	-0.2/0.2	0.2/0	0	0.1	1.2	---	---	---	
	0	0	4.8	1.9	-0.2/0.2	0.2/0	0	0.1	1.2	---	---	---	---	LSB, USB RX/TX
J4003	0	0	0	---	---	---	---	---	---	---	---	---	---	
J4005	0	0-4.9	4.9	---	---	---	---	---	---	---	---	---	---	CLAR CW~CCW
J4007	0	0	0	0	0.4	4.7	4.5	0	4.5	0	0	0	0	

	13.8V	TX	5V	GND	U.L	CENT	MUTE	7V	-4V	FM	FM	CW	REMARKS
J4004	13.8	4.5/0	4.9	0	4.8	0	4.9	6.8	-3.9	4.5/0	0.1	0	FM RX/TX
	13.8	4.5/0	4.9	0	4.8	0	4.9/0	6.8	-3.9	0	4.8	4.5	CW RX/TX
	13.8	4.5/0	4.9	0	4.8	0	4.9/0	6.8	-3.9	0	4.8	0	USB, LSB RX/TX

### ◎TRANSISTORS

	E	C	B	REMARKS		E	C	B	REMARKS
Q4003	4.9	4.9	4.3		Q4014	0.2	6.6	0	
Q4004	2.8/0.1(4.7)	2.8/-0.1(4.7)	2.2/0(4.1)	CW RX/TX (FM, USB, LSB)	Q4015	0.5	6.7	0	
Q4005	0	0	0.6		Q4016	0.9	6.7	1.5	
Q4006	0.9	3.8	1.5		Q4017	0.3	6.1	0.9	
Q4010	1.2	6.6	1.9		Q4018	0.1	0.9	0.7	
Q4011	1.3	6.7	2.0		Q4020	0(0)	0.1/13.6(0.1)	0.64/0(0.64)	FM, USB, LSB RX/TX (CW)
Q4012	0	0	2.8		Q4021	1.7/13.0(13.0)	13.6(13.6)	0.1/13.6(0.1)	FM, USB, LSB RX/TX (CW)
Q4013	1.1	6.3	0						

### ◎ICs

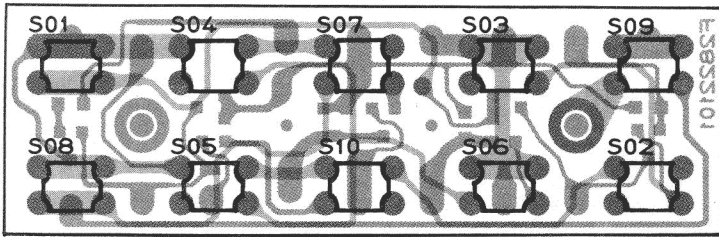
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	REMARKS
C4001	6.5/6.4	6.2/6.0	6.4/6.3	6.6/6.4	1.1	1.1	1.1	6.6/6.4	2.8/2.7	1.9	2.0	0.7/0.3	0/5.9	4.5/0	0	2.0	---	---	FM RX/TX
	6.5/6.4	6.2/6.0	6.4/6.3	6.6/6.4	1.1	1.1	1.1	6.6/6.4	3.1/2.8	1.9	2.0	0.7/0.3	0/5.9	0	0	2.0	---	---	CW RX/TX
	6.5/6.4	6.2/6.0	6.4/6.3	6.6/6.4	1.1	1.1	1.1	6.6/6.4	3.1/3.2	1.9	2.0	0.7/0.3	0/5.9	0	0	2.0	---	---	USB RX/TX
	6.5/6.4	6.2/6.0	6.4/6.3	6.6/6.4	1.1	1.1	1.1	6.6/6.4	2.3/2.2	1.9	2.0	0.7/0.3	0/5.9	0	0	2.0	---	---	LSB RX/TX
Q4002	5.4	1.8	2.8/3.3	0	1.4	2.8	0	6.5	---	---	---	---	---	---	---	---	---	---	FM RX/TX
	5.4	1.8	3.0/2.9	0	1.4	3.0/2.9	0	6.5	---	---	---	---	---	---	---	---	---	---	CW RX/TX
	5.4	1.8	3.0/3.1	0	1.4	3.0/3.1	0	6.5	---	---	---	---	---	---	---	---	---	---	USB RX/TX
	5.4	1.8	2.3	0	1.4	2.3	0	6.5	---	---	---	---	---	---	---	---	---	---	LSB
Q4007	2.5	2.5	2.5	2.4	4.5	4.9	0	2.5	2.5	2.5	2.5	4.5	0.1/4.9	4.9	---	---	---	---	FM/CW, USB, LSB
Q4008	1.4	0.4	0.4	6.7	0.1	1.3	1.1	2.5	2.5	2.3	-3.8	0	0	0	---	---	---	---	FM, CW
	1.5	0.4	0.4	6.7	0.1	1.3	1.1	2.5	2.5	2.3	-3.8	0	0	0	---	---	---	---	USB
	2.0	0.4	0.4	6.7	0.1	1.3	1.1	2.5	2.5	2.3	-3.8	0	0	0	---	---	---	---	LSB
Q4009	1.7/1.8	1.3.5	1.2.8/ 1.3.5	7.2/0.3	5.9/0.6	13.6	0.2/0	1.7/4.8	---	---	---	---	---	---	---	---	---	---	FM, USB, LSB RX, CW /FM, USB, LSB TX
Q4019	0	0	2.3	0	4.8	2.1	2.3	4.5	0	4.5	0	1.4	4.8	4.8	4.8	1.6	0	0	FM, CW
	0	4.5	2.3	0	4.8	2.1	2.3	4.5	0	4.5	0	1.4	4.8	4.8	4.8	1.6	0	0	USB
	0	0	2.3	0	4.8	2.1	2.3	4.5	0	4.5	0	1.4	4.8	4.8	4.8	4.5	0	0	LSB

## CHIP SEMICONDUCTOR CROSS-REFERENCE (PLL/PA UNIT)

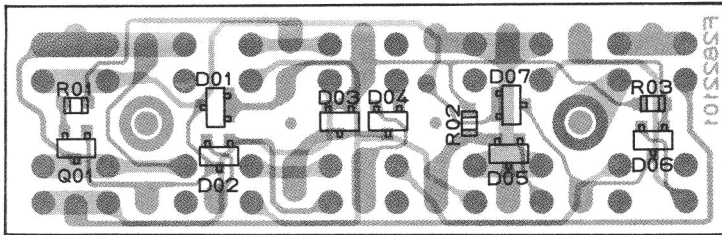
PART LOCATION No.	ORIGINAL NOMENCLATURE (MARKING) AND PART NUMBER	REPLACEMENT NOMENCLATURE (MARKING) AND PART NUMBER	
	Q4012	2SA812F (M6) G3108120F	2SA1179F (M6) G3111790F
Q4003, 4004	2SA812F/G(M6/M7) G3108120F/G	2SA1162GR (SG) G3111620G	2SA1179F/G(M6/M7) G3111790F/G
Q4017	2SC1623F (L6) G3316230F	2SC2712GR (LG) G3327120G	2SC2812F (L6) G3328120F
Q4005, 4006, 4020, 4021, 4022	2SC1623F/G(L6/L7) G3316230F/G	2SC2462C/D(LC/LD) G3324620C/D	2SC2712GR/BL(LG/LL) G3327120G/B
Q4007	LC4066BM G1090772	μPD4066BG G1090602	
D4003, 4004, 4008	ISS184 (B3) G2070009	DCB015TA (A6) G2070012	MC2838 (A6) G2070018

\*Semiconductors not listed above may be replaced only with original types.

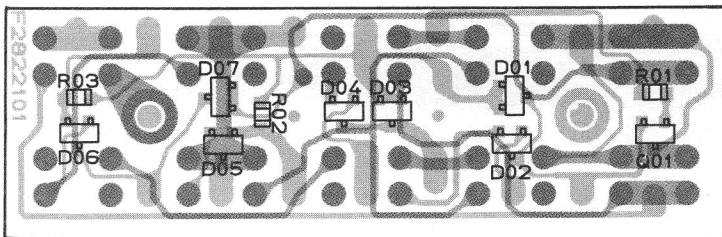
# SW UNIT



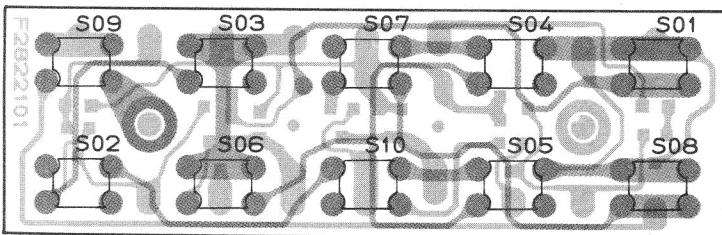
(obverse view of "component" side)



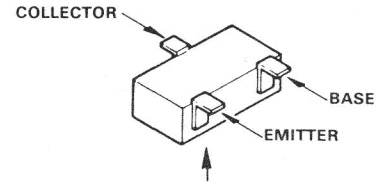
(reverse view of "chip-only" side)



(obverse view of "chip-only" side)

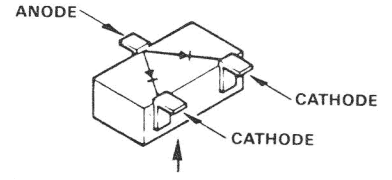


(reverse view of "component" side)



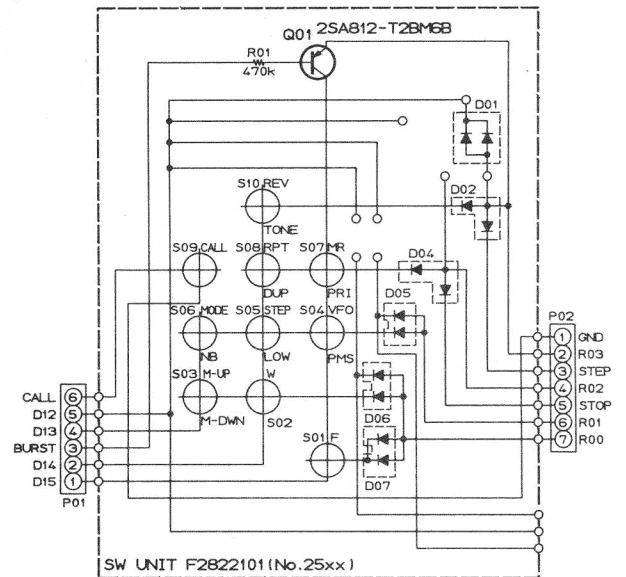
marked surface

2SA812F(M6): (Q2501)



marked surface

1SS181(A3): (D2501~2507)



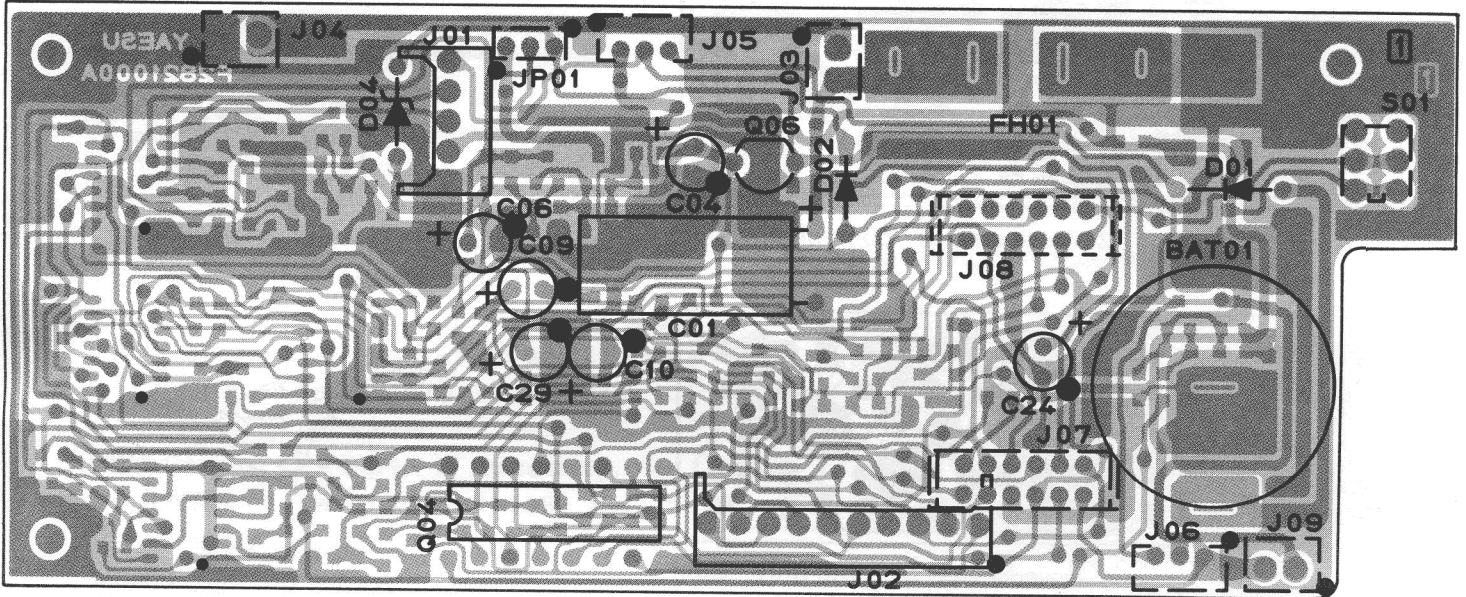
RESISTOR VALUES ARE IN  $\Omega$ /10w:  
DIODES ARE TYPE 1SS181:  
UNLESS OTHERWISE NOTED.

## CHIP SEMICONDUCTOR CROSS-REFERENCE (SW UNIT)

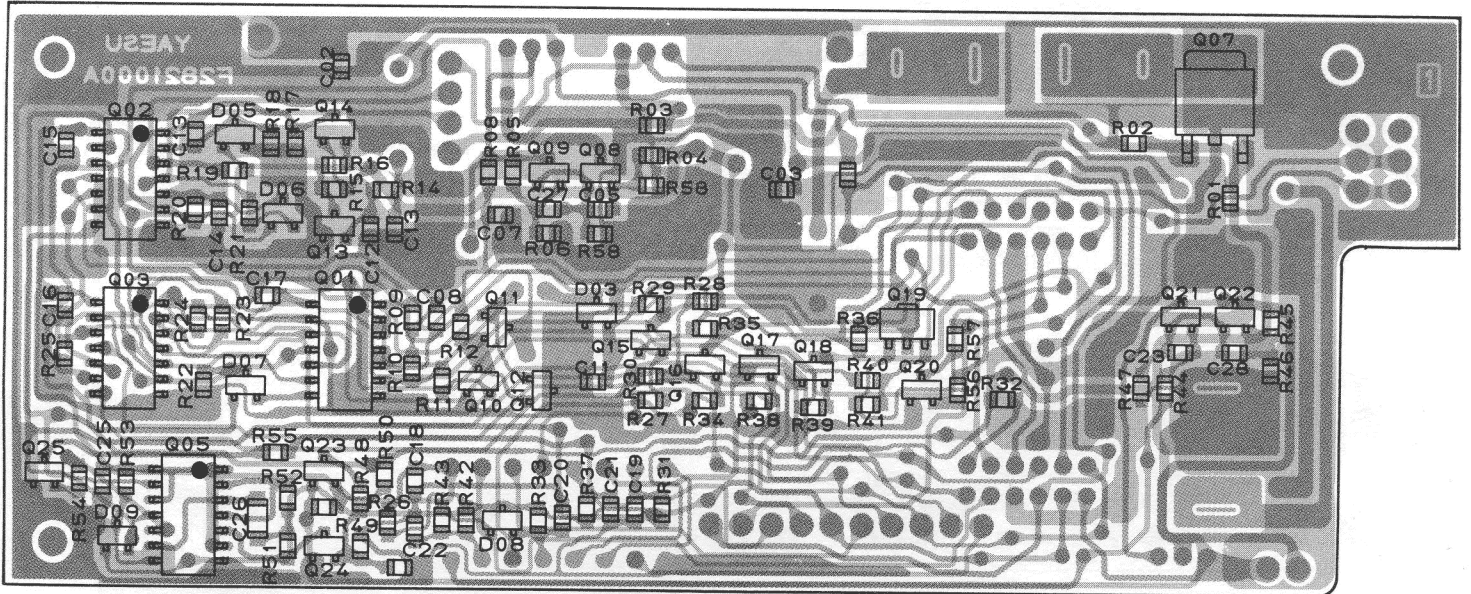
PART LOCATION No.	ORIGINAL	REPLACEMENT	
	NOMENCLATURE (MARKING) AND PART NUMBER	NOMENCLATURE (MARKING) AND PART NUMBER	NOMENCLATURE (MARKING) AND PART NUMBER
Q2501	2SA812F/G (M6/M7) G3108120F/G	2SA1162GR (SG) G3111620G	2SA1179F/G (M6/M7) G3111790F/G
D2501, 2502, 2503, 2504, 2505, 2506, 2507	ISS181 (A3) G2070001	DCA015TA (A4) G2070014	MC2836 (A4) G20700024

\*Semiconductors not listed above may be replaced only with original types.

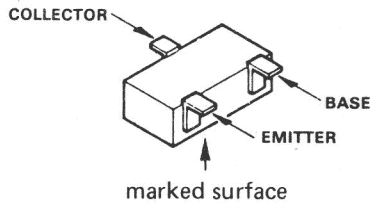
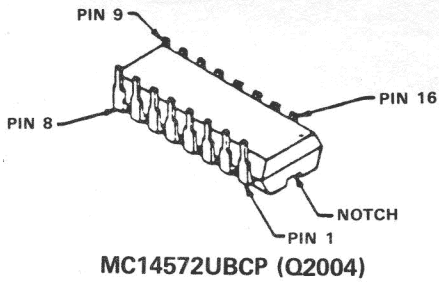
# CNTL UNIT



(obverse view of "component" side)

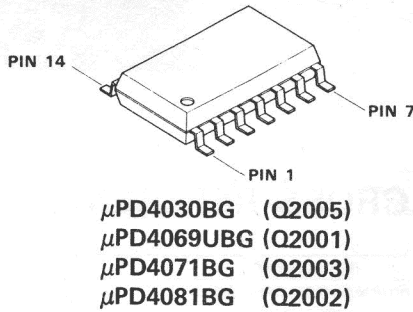


(reverse view of "chip-only" side)

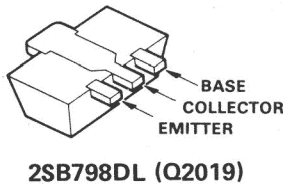


2SA812F(M6): (Q2012, 2014-2016, 2023)

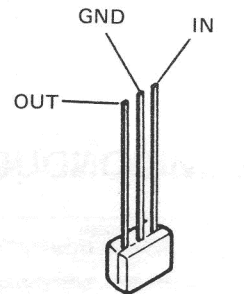
2SC1623F(L6): (Q2008-2011, 2013, 2017, 2018, 2020-2022, 2024, 2025)



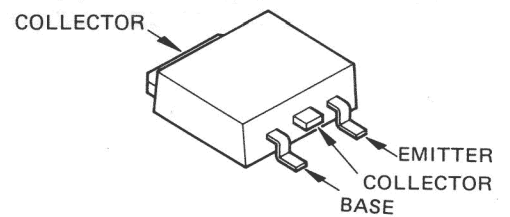
μPD4030BG (Q2005)  
μPD4069UBG (Q2001)  
μPD4071BG (Q2003)  
μPD4081BG (Q2002)



2SB798DL (Q2019)

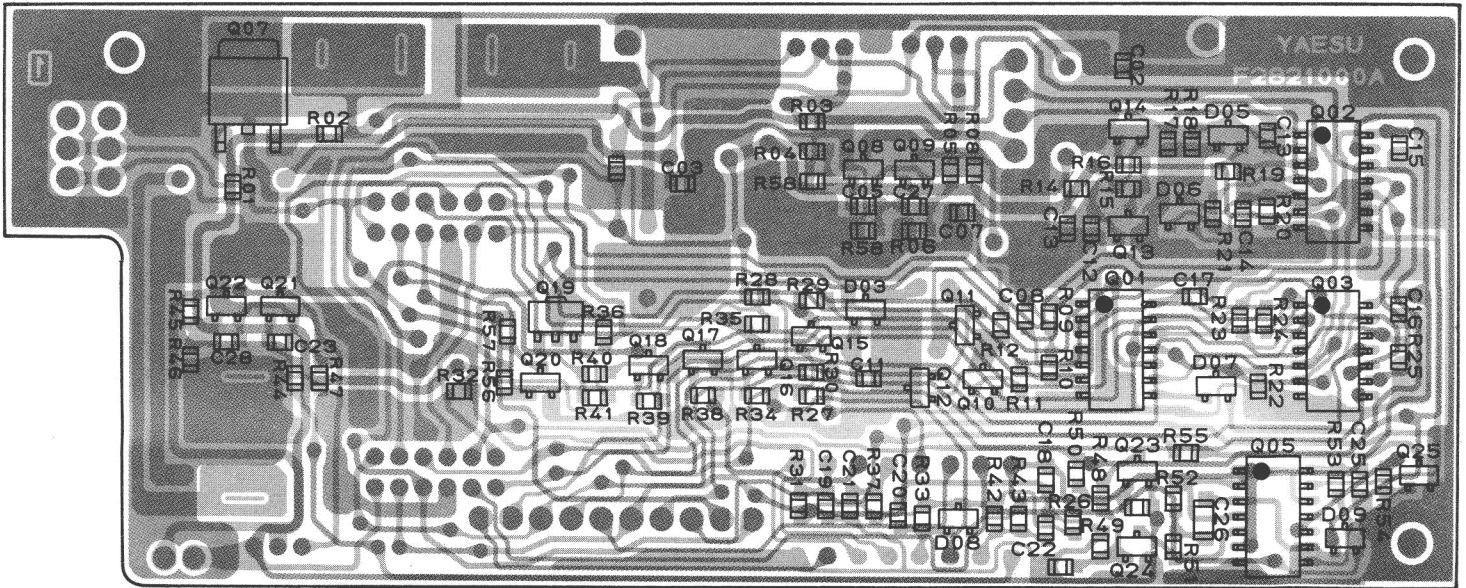


LVC550C (Q2006)

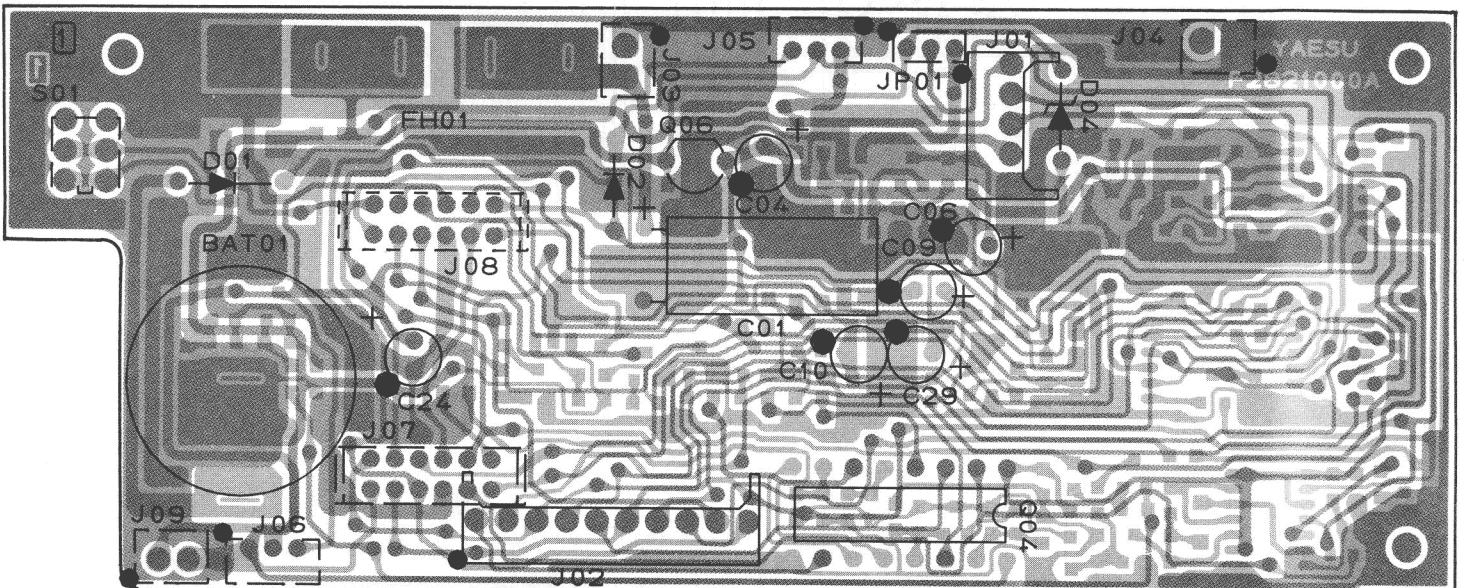


2SD1033K (Q2007)

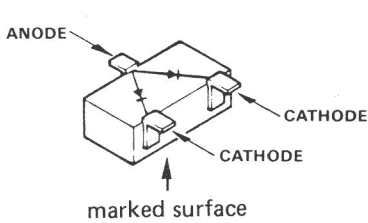
# CNTL UNIT



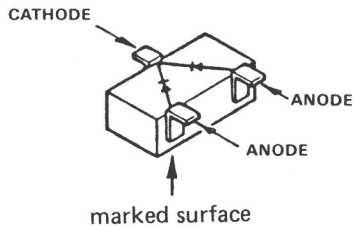
(obverse view of "chip-only" side)



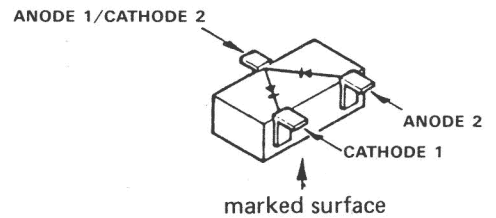
(reverse view of "component" side)



1SS181(A3): (D2009)

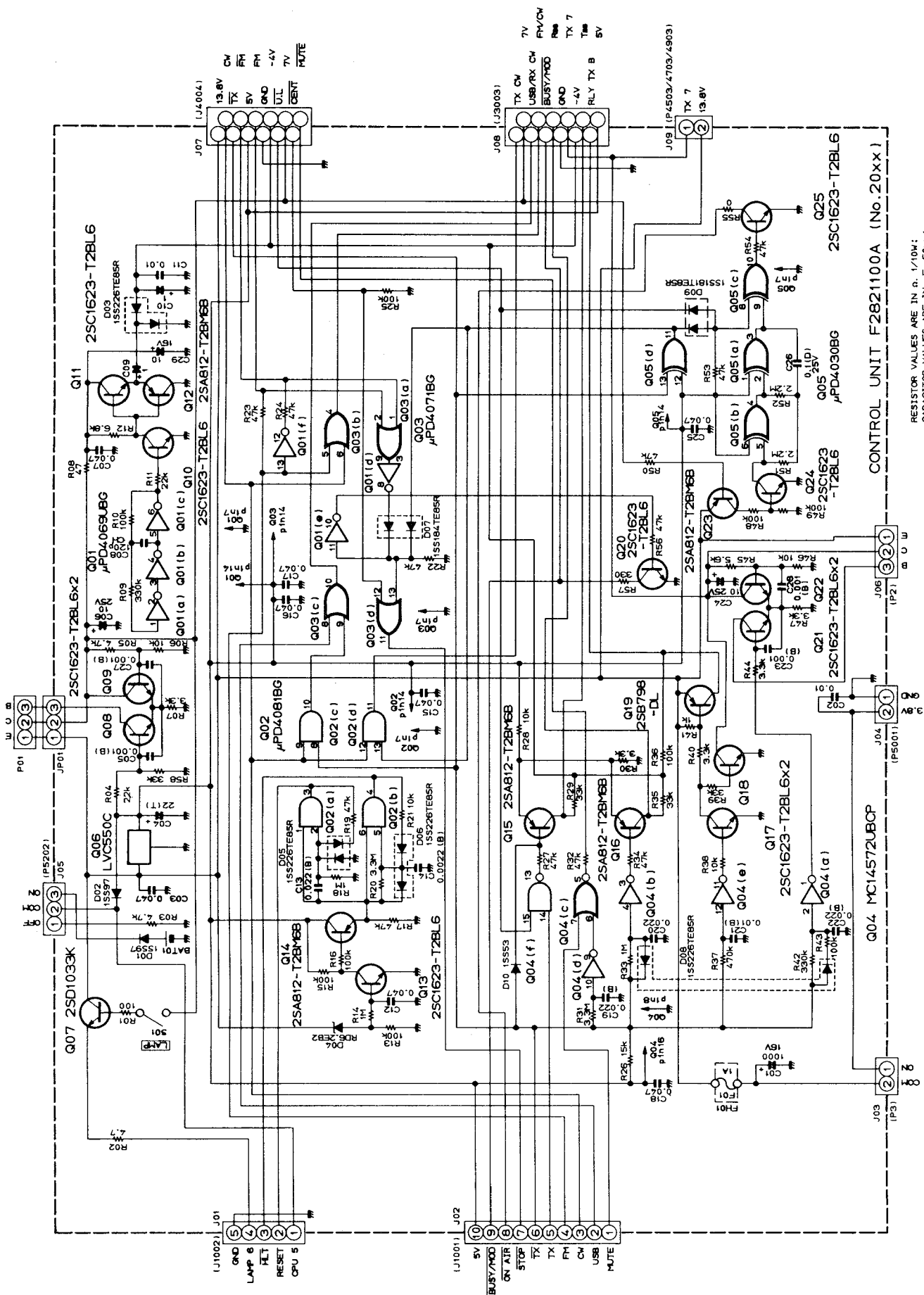


1SS184(B3): (D2007)



1SS226(C3): (D2003, 2005, 2006, 2008)

# CNTL UNIT



RESISTOR VALUES ARE IN Ω, 1/10W;  
 CAPACITOR VALUES ARE IN μF, 50V;  
 UNLESS OTHERWISE NOTED,  
 (T) CAPACITORS ARE TANTALUM, 10V.

CONTROL UNIT F2821100A (No. 20xx)

## CNTL UNIT VOLTAGE CHART (DC VOLT)

### ◎CONNECTORS

PIN No.	1	2	3	4	5	6	7	8	9	10	REMARKS
J2001	4.5	0	4.9	0/5.9	0	---	---	---	---	---	LAMP OFF/ON
J2002	0	0	0	4.5	0	4.5	0	3.2	2.3	4.9	FM RX BUSY
J2003	12	12	---	---	---	---	---	---	---	---	
J2004	0	12	---	---	---	---	---	---	---	---	
J2005	4.6/0	4.6	3.1	---	---	---	---	---	---	---	BACK UP OFF/ON
J2006	0	0	0	---	---	---	---	---	---	---	RX
J2009	0	12	---	---	---	---	---	---	---	---	RX
JP2001	12	7.9	11.5	---	---	---	---	---	---	---	

	13.8V	TX	5V	GND	U.L	CENT	MUTE	7V	-4V	FM	FM	CW	REMARKS
J2007	12	4.6	4.9	0	1.5	0	4.9	6.9	-4.5	4.5	0	0	FM RX

	TX CW	USB/RX CW	BUSY/MOD	GND	-4V	RL TXB	5V	TBB	TX7	RBB	FM/CW	7V	REMARKS
J2008	0	0	2.3	0	-4.5	-4.5	4.9	-4.5	0	0.7	4.9	6.9	FM RX

### ◎TRANSISTORS & FETS

	E (S)	C (D)	B (G)	REMARKS		E (S)	C (D)	B (G)	REMARKS
Q2007	0.7/6.3	12	0/6.9	LAMP OFF/ON	Q2017	0	11	0	RX
Q2008	4.1	11.5	4.6		Q2018	0	0	0.7	RX
Q2009	4.1	6.9	4.7		Q2019	12	-4.5	11.5	RX
Q2010	0	2.5	2.5		Q2020	0	0	0.6	RX
Q2011	2.7	6.9	2.5		Q2021	0	0	0	RX
Q2012	2.7	0	2.5		Q2022	0	0	0	RX
Q2013	0	0	0.6		Q2023	12	11.5	11	
Q2014	4.9	4.9	4.3		Q2024	0	4.5	0	
Q2015	0.8	-4.5	4.9	RX	Q2025	0	3.4	0	
Q2016	0.8	0.7	0	RX					

### ◎ICs

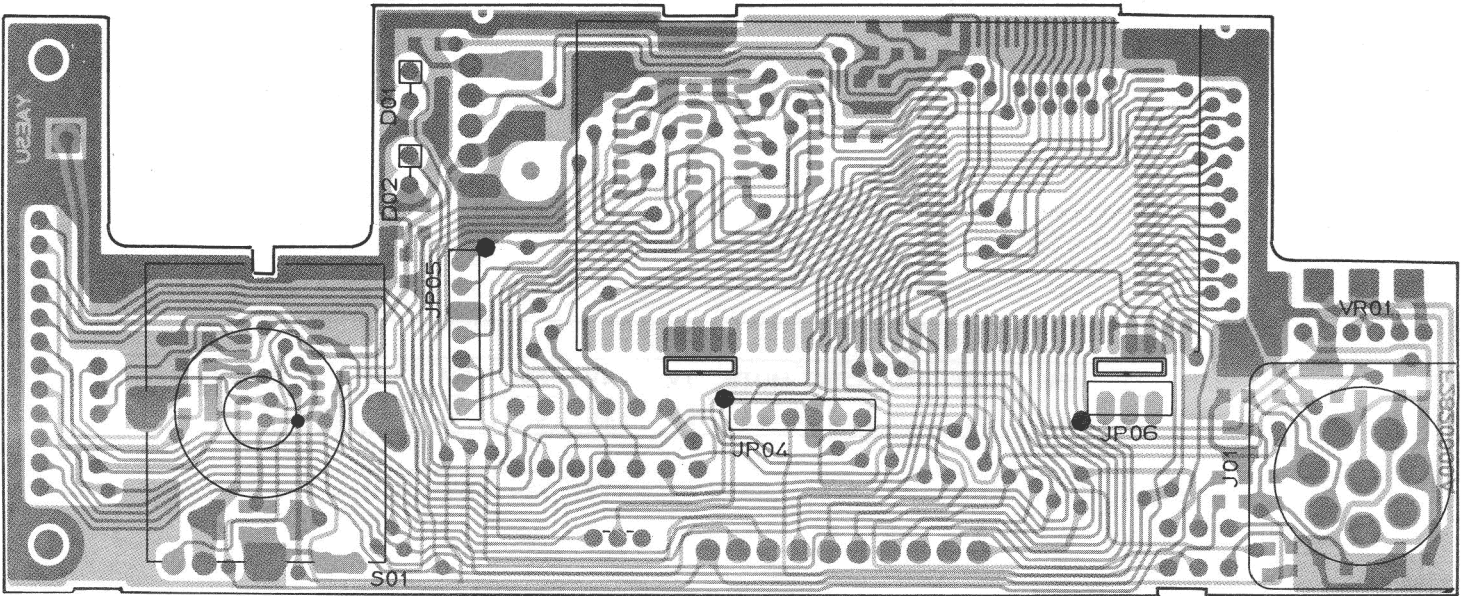
PIN No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Q2001	2.5	2.8	2.8	2.1	2.1	2.4	0	0	4.9	4.9	0	0	4.5	4.9	---	---
Q2002	4.9	0	0	4.9	4.7	4.9	0	4.5	0	0	0	0	0	4.9	---	---
Q2003	0	4.5	4.9	4.9	4.5	0	0	0	0	0	0	0	0	4.9	---	---
Q2004	0	4.4	0	4.1	4.9	0	0	0	0	3.4	0	4.3	4.9	0	1.5	4.9
Q2005	4.9	4.9	0	4.9	0	4.9	0	0.5	0	0	0	4.9	4.5	4.9	---	---
Q2006	12	0	4.9	---	---	---	---	---	---	---	---	---	---	---	---	---

## CHIP SEMICONDUCTOR CROSS-REFERENCE (CNTL UNIT)

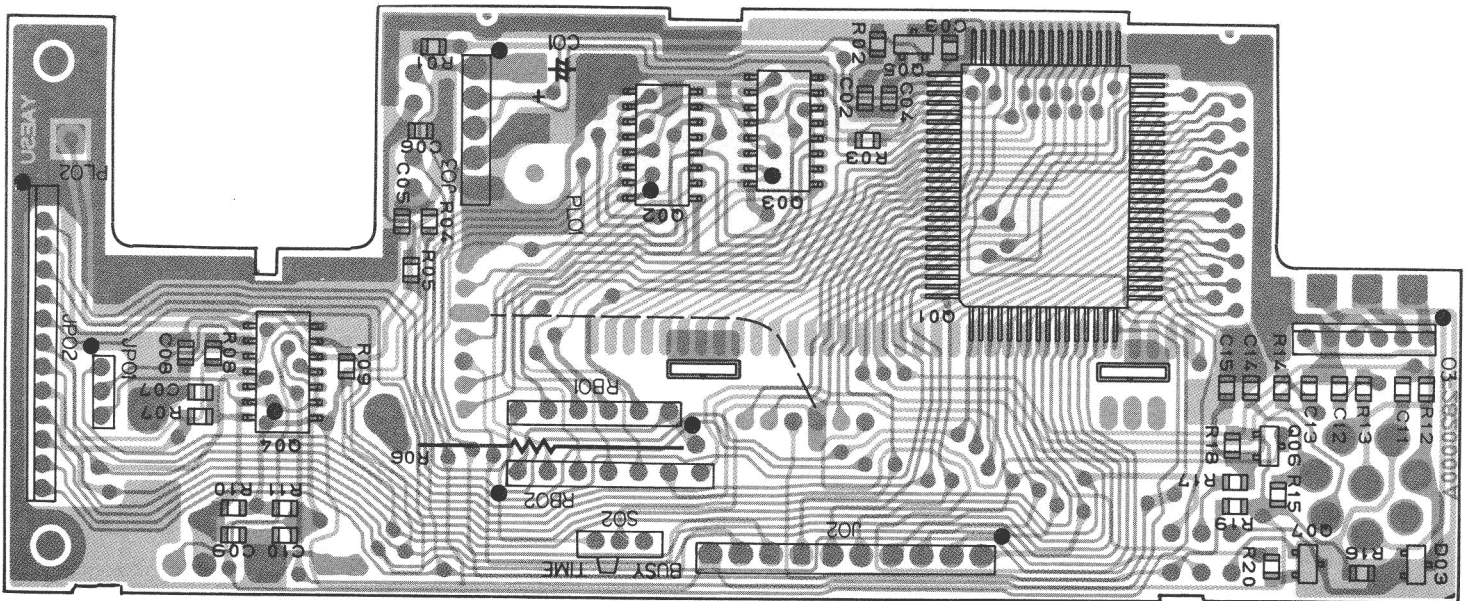
PART LOCATION No.	ORIGINAL NOMENCLATURE (MARKING) AND PART NUMBER	REPLACEMENT NOMENCLATURE (MARKING) AND PART NUMBER	
	Q2012, 2014, 2015, 2016, 2023	2SA812F/G (M6/M7) G3108120F/G	2SA1162GR (SG) G3111620G
Q2008, 2009, 2010, 2011, 2013, 2017, 2018, 2020, 2021, 2022, 2024, 2025	2SC1623F/G (L6/L7) G3316230F/G	2SC2462C/D (LC/LD) G3324620C/D	2SC2712GR/BL(LG/LL) G3327120G/B 2SC2812F/G (L6/L7) G3328120F/G
D2009	ISS181 (A3) G2070001	DCA015TA (A4) G2070014	MC2836 (A4) G2070024
D2007	ISS184 (B3) G2070009	DCB015TA (A6) G2070012	MC2838 (A6) G2070018
D2003, 2005, 2006, 2008	ISS226 (C3) G2070003	ISS123 (C3) G2070020	

\*Semiconductors not listed above may be replaced only with original types.

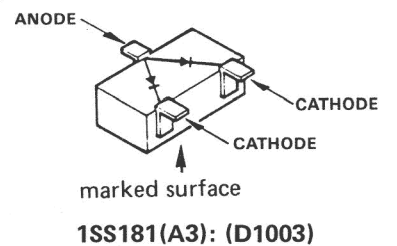
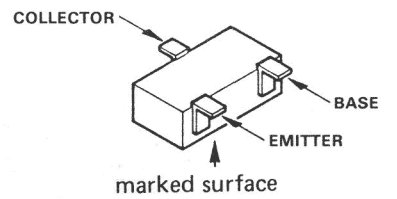
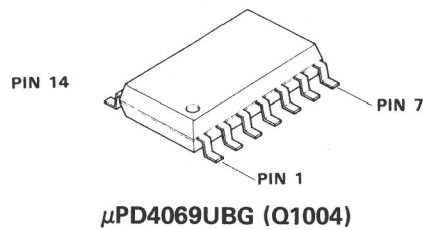
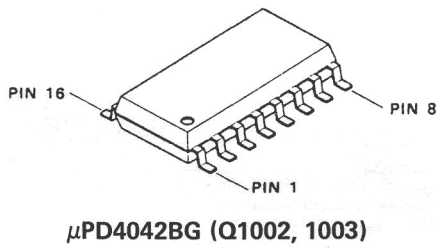
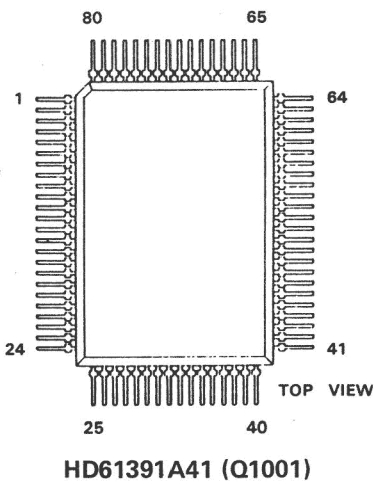
# CPU UNIT



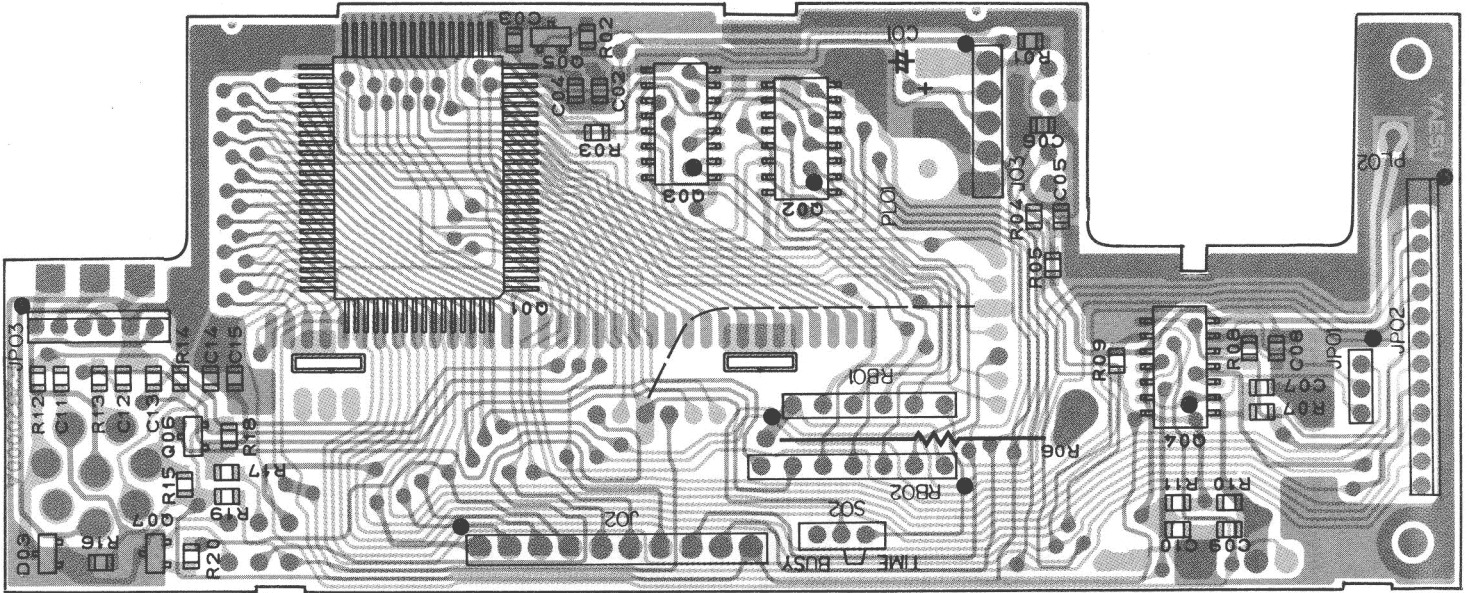
(obverse view of "LCD" side)



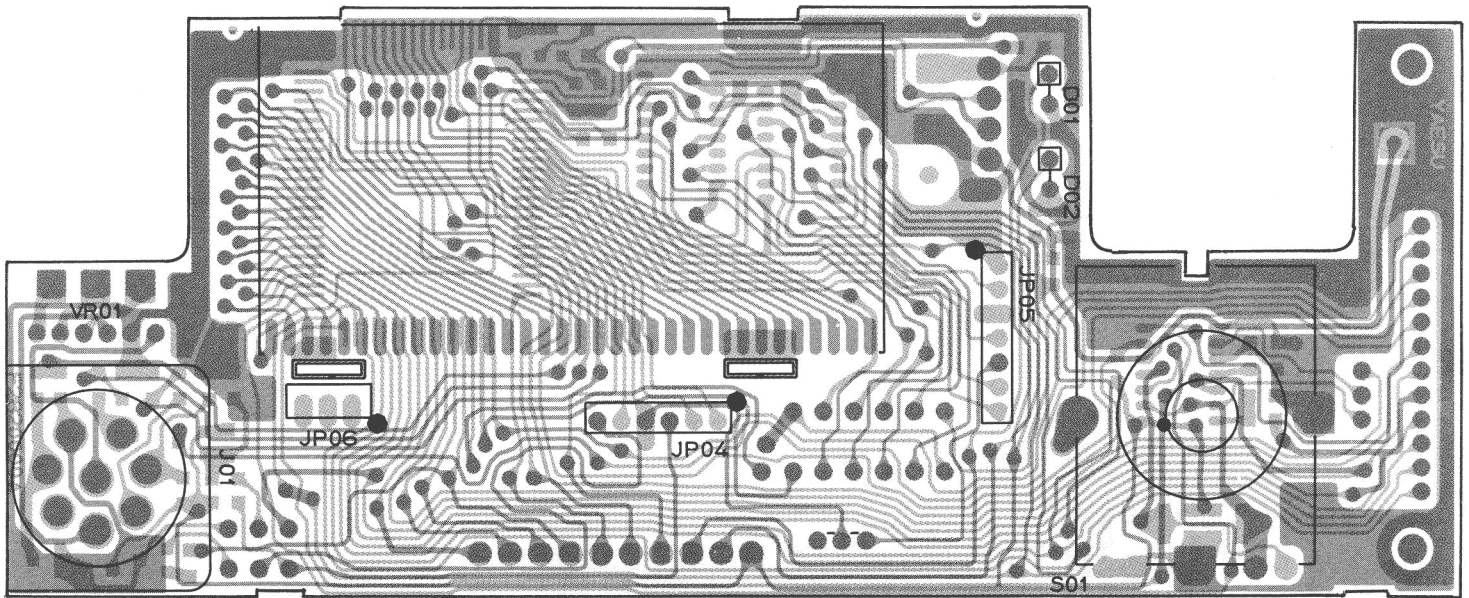
(reverse view of "IC" side)



# CPU UNIT

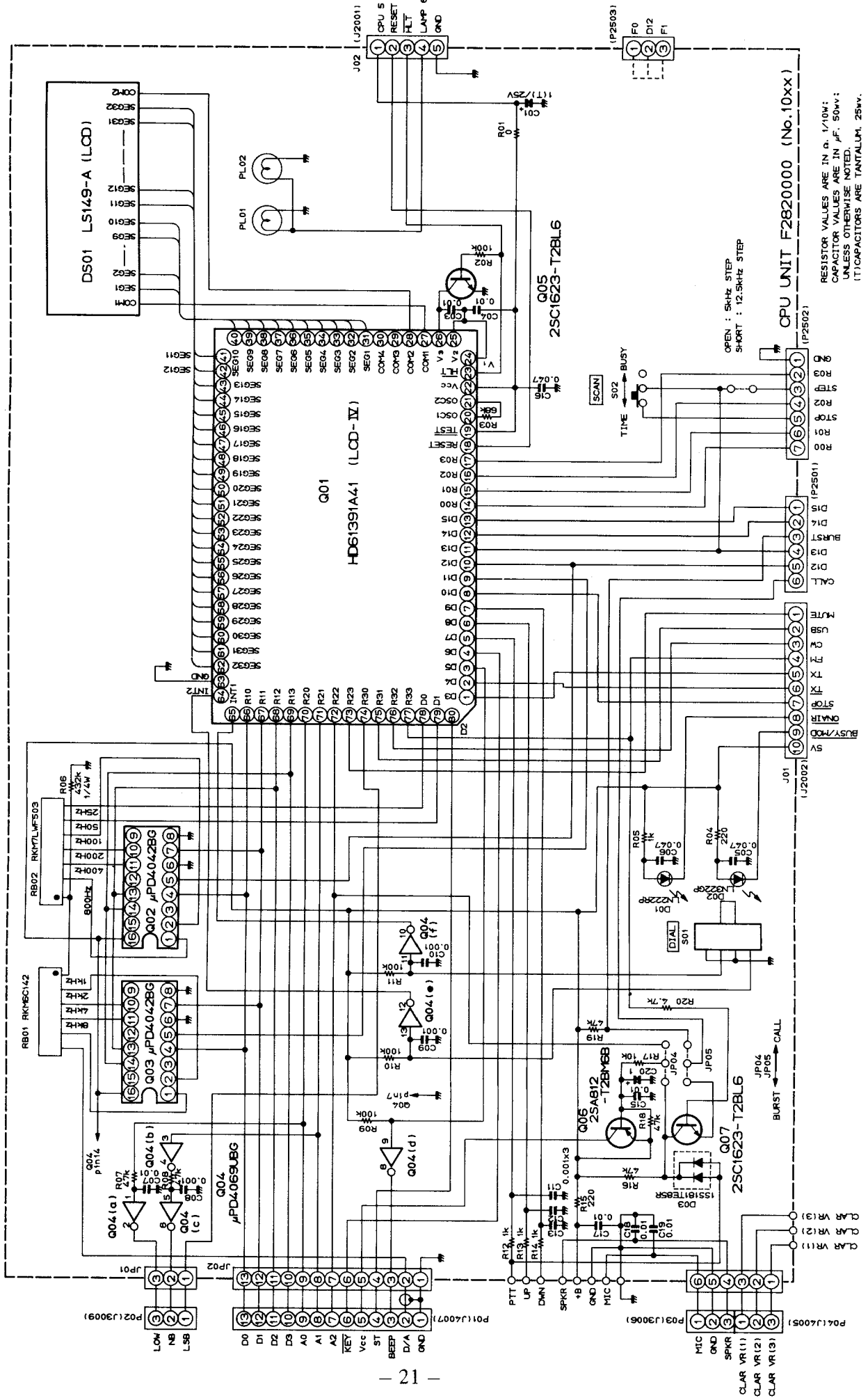


(obverse view of "IC" side)



(reverse view of "LCD" side)

# CPU UNIT



RESISTOR VALUES ARE IN Ω, 1/10W;  
 CAPACITOR VALUES ARE IN μF, 50V;  
 UNLESS OTHERWISE NOTED.  
 (†) CAPACITORS ARE TANTALUM, 25V.

## CPU UNIT VOLTAGE CHART (DC VOLT)

### ◎CONNECTORS

PIN No.	1	2	3	4	5	6	7	8	9	10	11	12	13	REMARKS
J1001	0/4.5	0	0	4.5	0/4.5	4.5/0	0/4.9	3.2/0	2.3/3.7	4.9	—	—	—	FM RX/TX
J1002	4.5	0	4.9	0/5.9	0	—	—	—	—	—	—	—	—	LAMP OFF/ON
JP1001	0	0	0	—	—	—	—	—	—	—	—	—	—	
JP1002	0	0	0	0	0(4.9)	4.5	4.5	0	4.5	0	0	0	0	(T CALL ON)

### ◎TRANSISTORS & FETS

	E (S)	C (D)	B (G)	REMARKS
Q1005	0	0	0.6	
Q1006	4.9	0	4.6	
Q1007	4.1	4.9	4.5	

### ◎ICs

PIN No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Q1002	0	0	4.9	0	4.5	0	0	0	4.9	0	0	4.9	0	0	4.9	4.9
Q1003	0	0	4.9	0	4.5	0	0	0	4.9	0	0	4.9	0	0	4.9	4.9
Q1004	4.5	0	0	4.9	4.9	0	0	0	4.9	0	4.9	0	4.9	4.9	—	—
Q1001	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
	0	4.5	4.9	4.5	4.5	4.5	4.5	0	4.5	4.5	※	0.9	0.9	4.5	4.5	4.5
	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
	4.5	0	4.5	2.2	2.2	4.5	4.9	2.2	2.2	0	2.3	2.3	2.3	2.3	2.3	2.3
	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48
	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3
	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64
	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	0
	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
0	0	0	0	0	0	4.5	0	4.5	0	0	0	0	4.5	0	0	

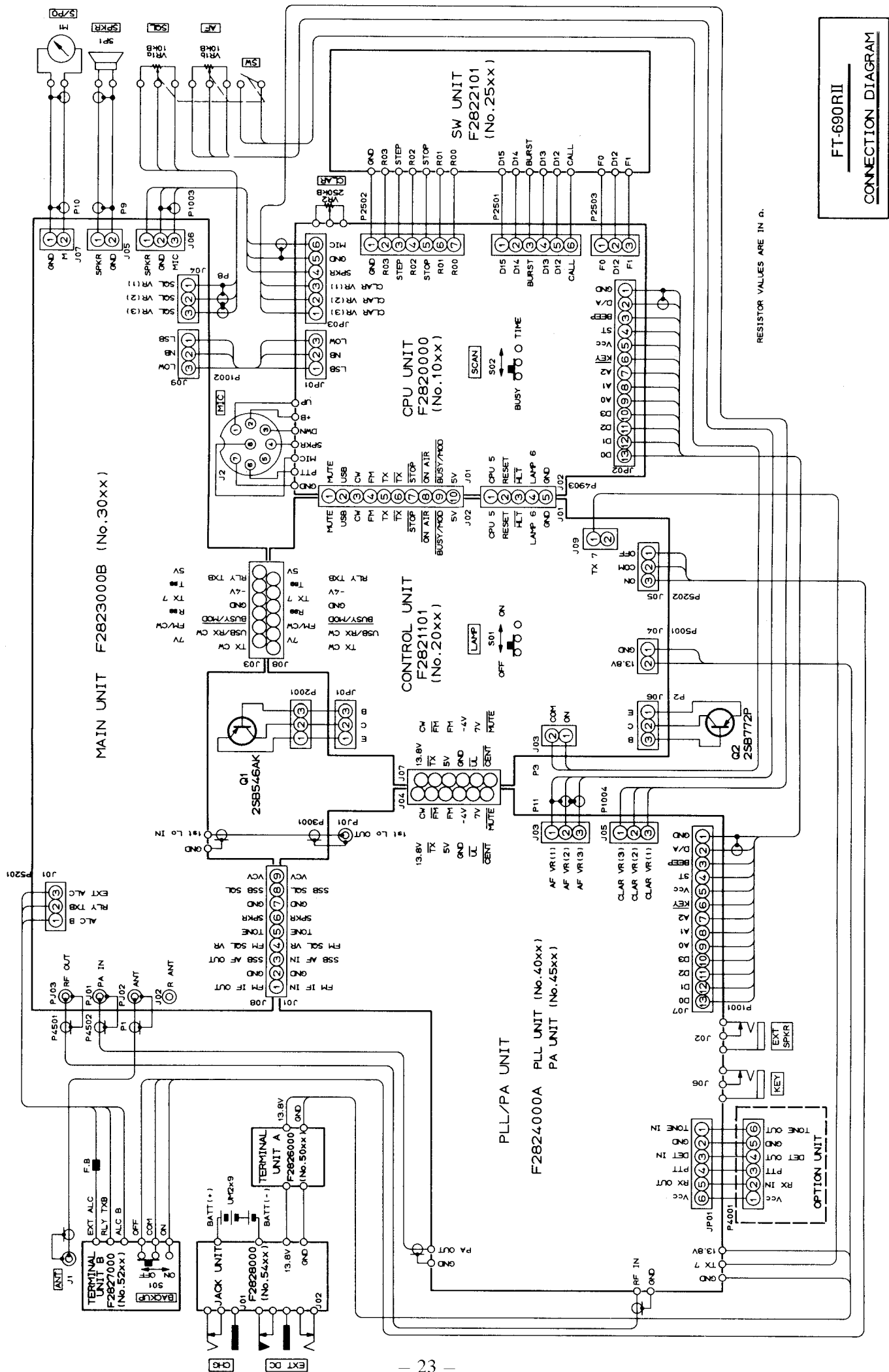
※

SCAN MODE	STEP	
	5kHz	12.5kHz
TIME	4.3	4.3
BUSY	0	4.3

## CHIP SEMICONDUCTOR CROSS-REFERENCE (CPU UNIT)

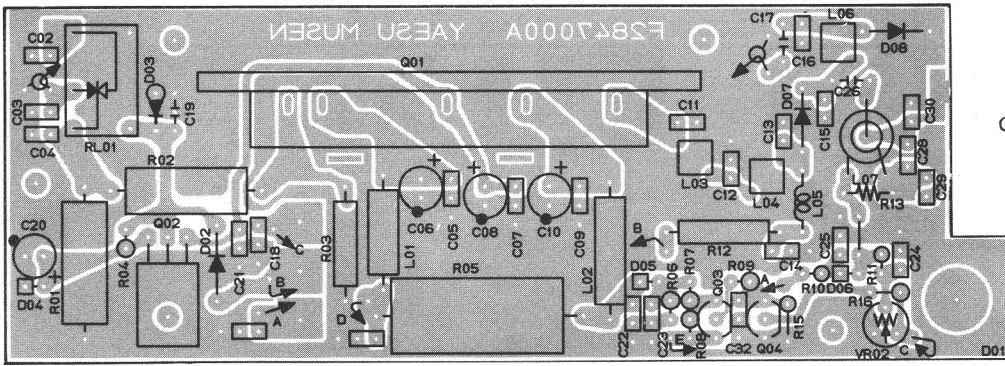
PART LOCATION No.	ORIGINAL	REPLACEMENT		
	NOMENCLATURE (MARKING) AND PART NUMBER	NOMENCLATURE (MARKING) AND PART NUMBER		
Q1006	2SA812F/G(M6/M7) G3108120F/G	2SA1162GR (SG) G3111620G	2SA1179F/G (M6/M7) G3111790F/G	
Q1005, 1007	2SC1623F/G (L6/L7) G3316230F/G	2SC2462C/D (LC/LD) G3324620C/D	2SC2712GR/BL(LG/LL) G3327120G/B	2SC2812F/G (L6/L7) G3328120F/G
D1003	ISS181 (A3) G2070001	DCA015TA (A4) G2070014	MC2836 (A4) G2070024	

\*Semiconductors not listed above may be replaced only with original types.

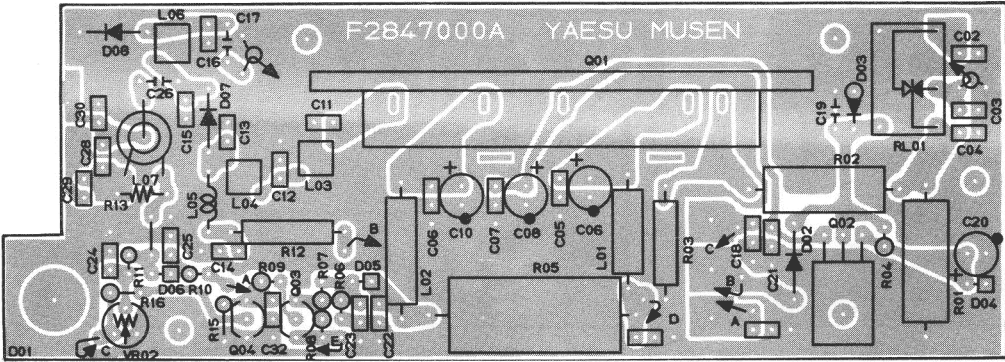


FT-690R II  
CONNECTION DIAGRAM

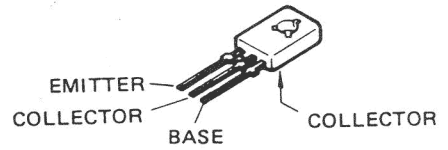
# FL-6020



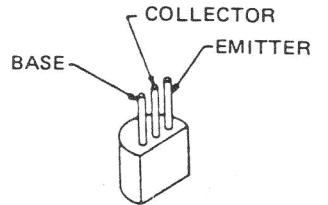
(obverse view of "component" side)



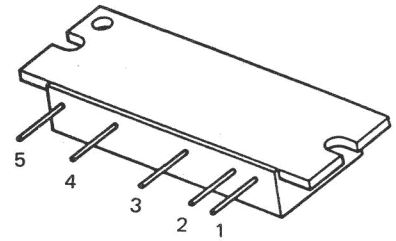
(reverse view of "component" side)



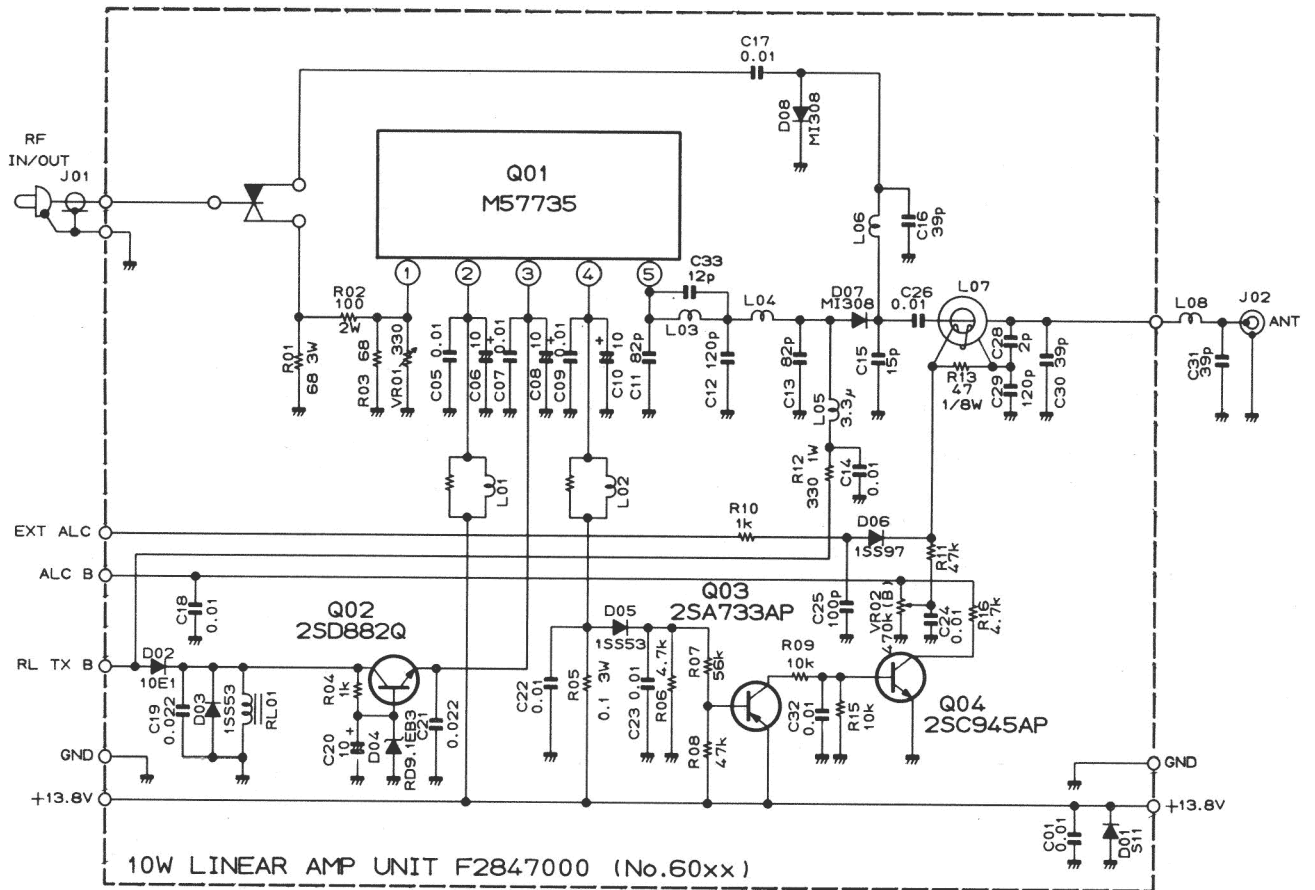
2SD882Q (Q6002)



2SA733AP (Q6003)  
2SC945AP (Q6004)

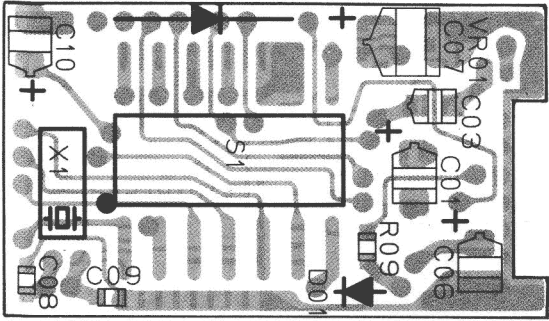


M57735 (Q6001)

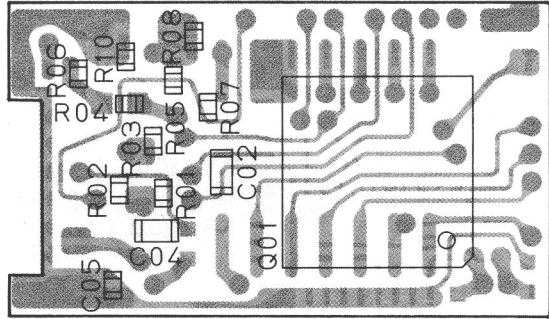


RESISTOR VALUES ARE IN  $\Omega$ , 1/4W;  
CAPACITOR VALUES ARE IN  $\mu$ F, 50V;  
INDUCTOR VALUES ARE IN HENRIES;  
UNLESS OTHERWISE NOTED.

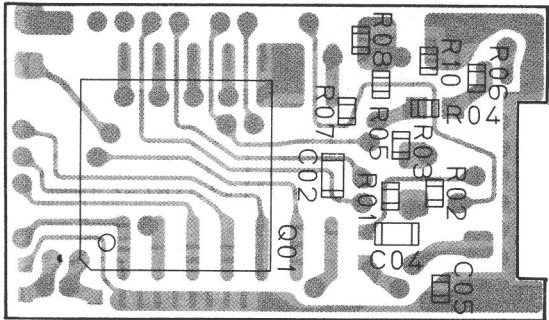
# FTS-7



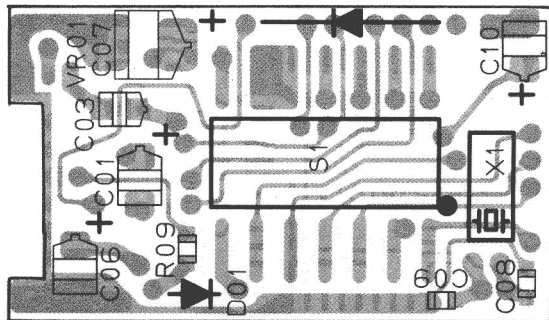
(obverse view of "switch" side)



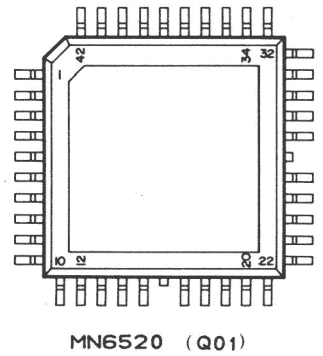
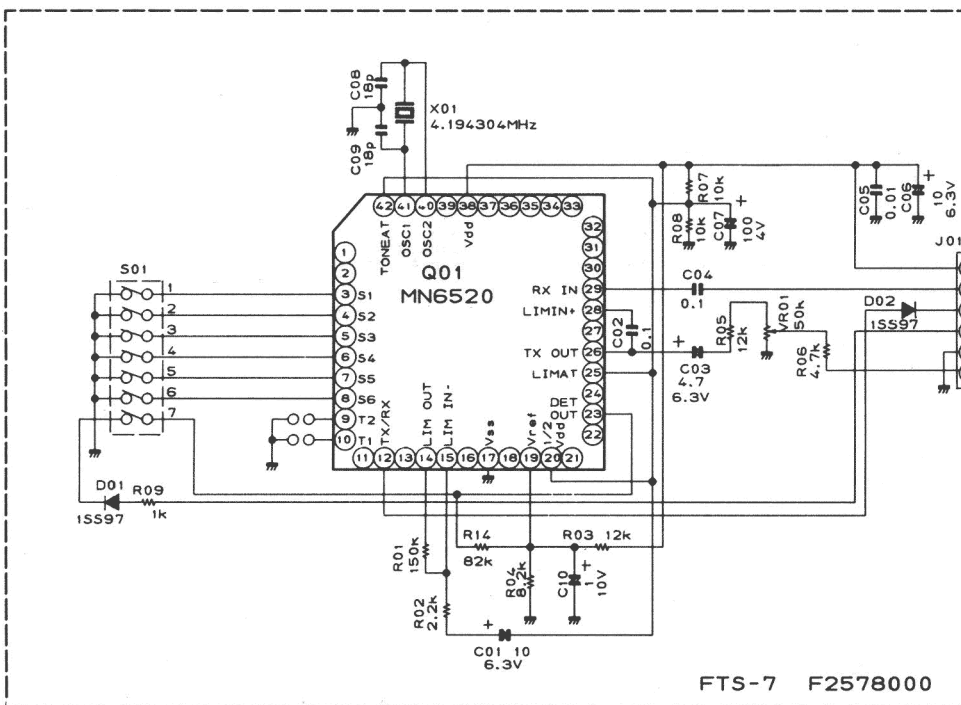
(obverse view of "IC" side)



(reverse view of "IC" side)



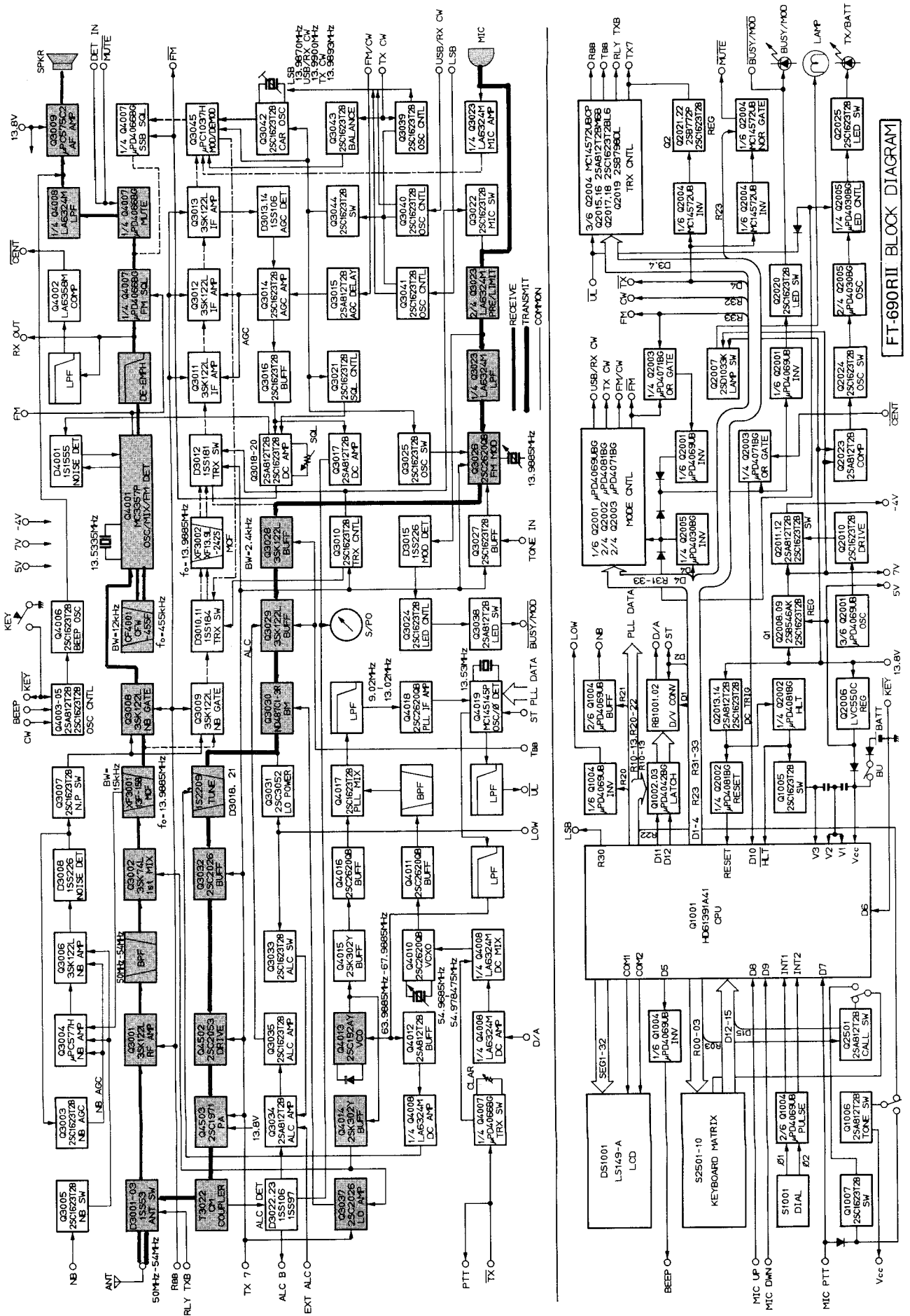
(reverse view of "switch" side)



MN6520 (Q01)

FTS-7  
CIRCUIT DIAGRAM

# SIGNAL PATHS : FM





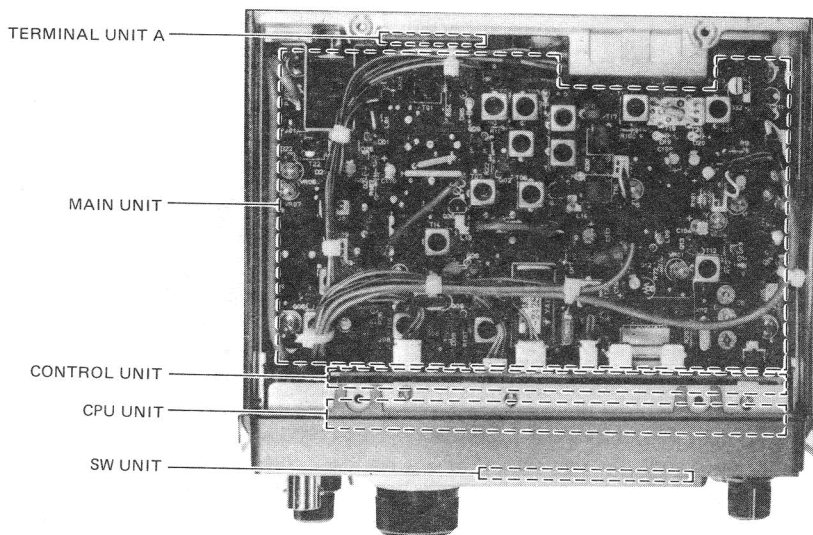


## CHIP COMPONENT INFORMATION

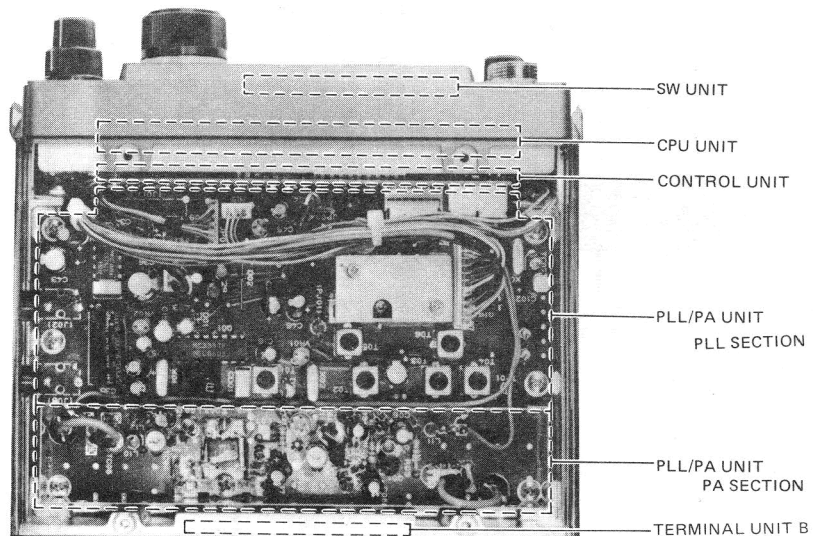
While chip components are generally more reliable and enduring than lead components, they are much more difficult to replace. The chip placement robots at the factory set the components into place on a small spot of resin adhesive before soldering, and this adhesive provides rigid mechanical support for the component independently of the solder joints. Once the resin has been cured there is no way to remove it. Therefore, to remove

a chip component, it is necessary to first remove all of the solder at each connection and then forcefully break the adhesive bond. This must be done very carefully, both to avoid overheating the board and lifting tracks when desoldering, and to avoid damaging the board or underlying tracks when breaking off the component. Removed components should never be reused, as they are bound to be unreliable after removal.

## BOARD LAYOUT



TOP VIEW



BOTTOM VIEW

## ALIGNMENT

The high reliability of the chip components in the FT-690RII minimize the possibility that repair or realignment should be needed after leaving the factory. However, if damage occurs and some parts subsequently be replaced, realignment may be required. If a sudden problem occurs during normal operation, it is likely due to component failure; realignment should not be done until after the faulty component has been replaced.

Because of the compact circuitry of this transceiver, we recommend that servicing be performed only by authorized Yaesu service technicians who are experienced with the circuitry and fully equipped for repair and alignment. Therefore, if a fault is suspected, contact the dealer from whom the transceiver was purchased for instructions regarding repair. Authorized Yaesu service technicians realign all circuits and make complete performance checks to ensure compliance with factory specifications after replacing any faulty components.

Those who do undertake any of the following alignments are cautioned to proceed at their own risk. Yaesu must reserve the right to change circuits and alignment procedures in the interest of improved performance, without notifying owners.

Under no circumstances should any alignment be attempted unless the normal function and operation of the transceiver are clearly understood, the cause of the malfunction has been clearly pinpointed and any faulty components replaced, and the need for realignment determined to be absolutely necessary.

The following test equipment (and thorough familiarity with its correct use) is necessary for complete realignment. Correction of problems caused by misalignment resulting from use of improper test equipment is not covered under the warranty policy.

In those procedures so indicated, a 50-ohm dummy load that is non-reactive up to 60 MHz must be used. Correct alignment is not possible with an antenna.

### Alignment Equipment

DC voltmeter (at least 20-kilohms/volt)  
AF Millivoltmeter  
60 MHz standard signal generator (SSG) with calibrated level and modulation (see note below)  
AF signal generator  
SINAD meter (SINADDER)  
FM linear detector (deviation meter)  
CM coupler (directional coupler)  
RF wattmeter (50W,  $\pm 5\%$  @ 60MHz)  
50-ohm non-reactive (@60 MHz) dummy load  
Frequency counter (100Hz resolution at 60MHz)  
Oscilloscope

Note: SSG levels referred to in the alignment procedure are based on  $0\text{dBu}=0.5\text{uV}$ .

### Alignment Precautions

Correct alignment requires that the ambient temperature be the same as that of the transceiver and test equipment, and that this temperature be held constant between 20 and 30 °C (68 to 86 °F). When the transceiver is brought into the shop it should be allowed at least 2 hours for thermal equalization before alignment.

Alignments must not be made unless the oscillator shields and circuit boards are firmly affixed in place. Also, the frequency counter must be thoroughly warmed up before beginning.

Supply voltage during alignment must be held constant at 12.5V DC, except where specifically indicated otherwise. Use a well regulated, adjustable power supply capable of at least 10A continuous load.

## A. PLL Unit, Part I

### 1) Reference Oscillator

Connect the frequency counter to pin 16 of Q4019 and adjust TC4002 for 13.530 MHz  $\pm$ 10 Hz. Remove the counter.

### 2) Loop Resonant Circuits

a) Connect the RF voltmeter to the junction of L4006 & C4098. Adjust T4002, T4003, T4004 and T4006 for maximum RF voltage. Remove the voltmeter.

**NOTE:** All of the remaining steps in this section (A) require that plug P3001 be removed from PJ4001 (1st Local Out), and a 50-ohm resistor (dummy load) be connected across PJ4001. P3001 will be replaced in step A. 4) d).

b) Connect the RF voltmeter across PJ4001 with the 50-ohm resistor, and adjust T4005 for maximum RF voltage. Remove the voltmeter.

### 3) D-to-A Converter

a) Connect the frequency counter across PJ4001 with the 50-ohm resistor, and adjust VR4003 for the same frequency in both transmit and receive ( $\pm$ 25 Hz).

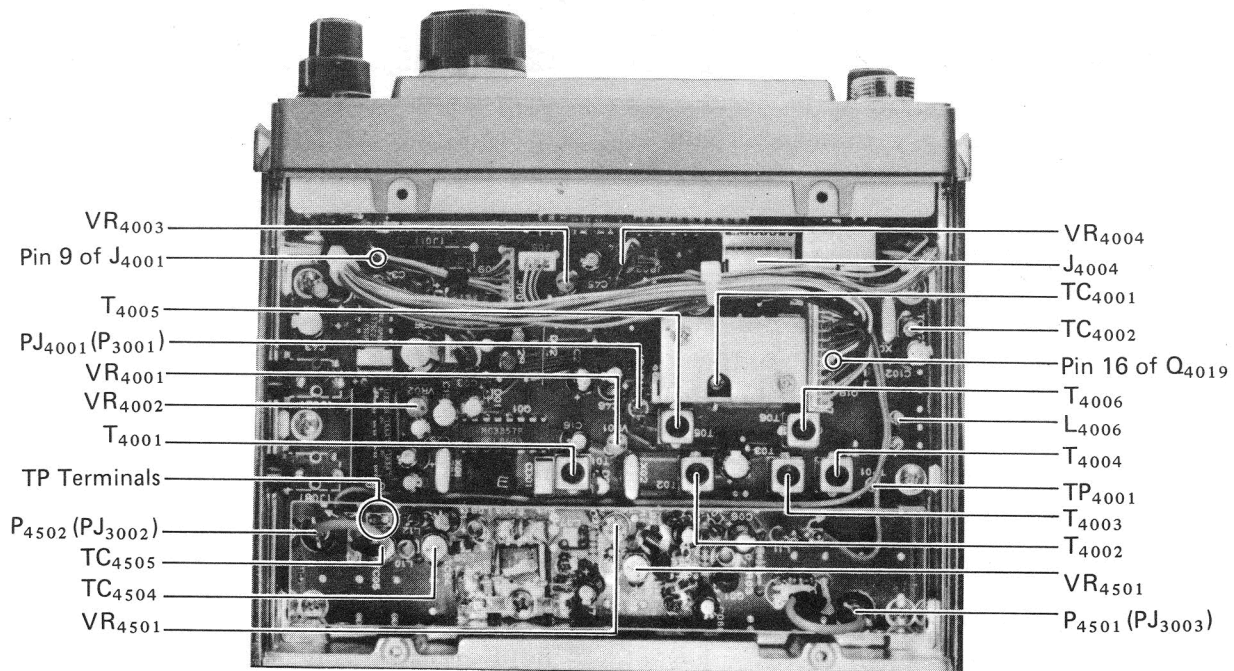
b) Adjust T4001 for 65.9885 MHz on the counter ( $\pm$ 25 Hz).

c) Set the front panel controls to USB, 51.9985 MHz.

d) Slowly adjust the tuning knob until the display just steps down to 51.9984 MHz (ie., to the highest step that shows this frequency).

e) Adjust VR4004 for 65.988475 MHz on the counter ( $\pm$ 25 Hz):

f) Remove the frequency counter.



PLL/PA UNIT ALIGNMENT POINTS

- 4) PLL VCV (Varactor Control Voltage)
  - a) Select the FM mode and tune to the high band edge (54.000 MHz).
  - b) Connect the DC voltmeter to pin 9 of J4001, and adjust TC4001 for  $4.4 \pm 0.1V$ .
  - c) Tune the transceiver to the low band edge (50 MHz) and confirm  $1.1 \pm 0.2V$ .
  - d) Remove the voltmeter and 50-ohm resistor and replace P3001 in PJ4001.

- b) Set the transceiver to USB, and tune for peak on the signal. Then reduce the injection level just below the S-meter (agc) threshold.
- c) Connect the AF voltmeter to the EXT SP jack, and adjust T3001 and T3006 for maximum AF (adjust the VOL control as necessary to keep meter readings near mid-range).
- d) Tune the RF signal generator and transceiver to 50 MHz and adjust T3002-T3005 for maximum AF.
- e) Tune the RF signal generator and transceiver to 54 MHz and check that the AF voltage is the same as at 50 MHz in the previous step  $\pm 2dB$ .
- f) Now tune the RF signal generator back to 52 MHz, injection level to -10dBu, and adjust T3007, T3011 and T3012 for maximum AF. Then remove the voltmeter.

## B. Main Unit, Receiver

**NOTE:** Remove plug P4701 from PJ3003 (RF Out) on the Main Unit for all of the steps in this section (B).

### 1) CW/FM Carrier Oscillator

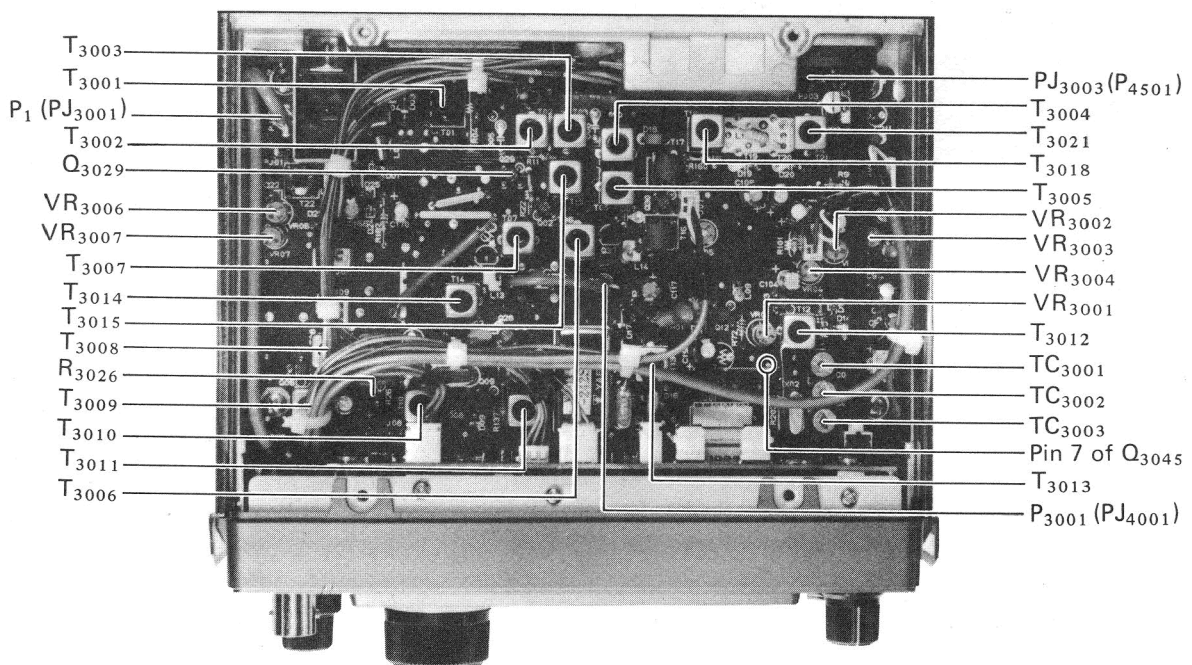
- a) Touch the frequency counter probe to gate 1 of Q3029 for the following adjustments.
- b) Set the mode to CW, short the KEY jack to transmit, and adjust TC3003 for  $13.9893 \text{ MHz} \pm 10 \text{ Hz}$ .
- c) Now select the FM mode, close the PTT line and adjust T3013 for  $13.9885 \text{ MHz} \pm 10 \text{ Hz}$ . Remove the counter.

### 2) RF & IF Transformers

- a) Connect the RF signal generator, tuned to 52 MHz, to the ANT jack.

### 3) S-Meter Calibration

- a) In USB mode, with -10dBu injection, adjust VR3003 for S-5 indication on the S-meter.
- b) Adjust VR3001 just to the point where the S-meter reading begins to rise above S-5.
- c) Increase injection to -4dBu and readjust VR3003 for S-1 deflection.
- d) Increase injection to +16dBu and adjust VR3002 for S-9 deflection.

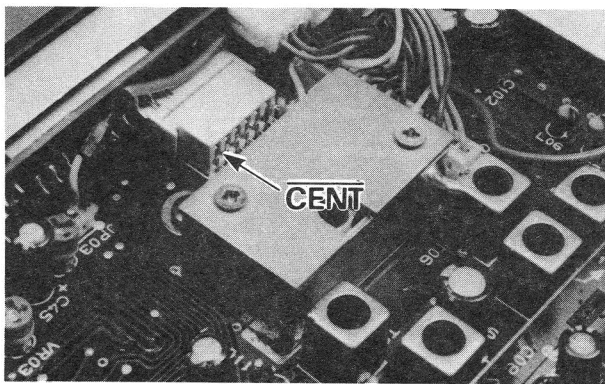


**MAIN UNIT ALIGNMENT POINTS**

## C. PLL Unit, Part II

The RF signal generator must be connected to the ANT jack for all steps.

- 1) D-to-A Converter Linearity
  - a) Tune the signal generator to 52 MHz, and set for 0dBu injection.
  - b) Set the front panel controls to USB, 25 Hz steps, 51.9985 MHz.
  - c) Slowly adjust the tuning knob back and forth around 51.9985 and 51.9984 MHz while listening to the beat of the injected carrier.
  - d) Adjust VR4004, if necessary, for smooth transition between the 25 Hz tuning steps.
- 2) FM Discriminator Center Detection
  - a) Select the FM mode, and tune the transceiver to 52 MHz.
  - b) Connect the DC voltmeter (10V range) to the CENT pin of J4004.
  - c) Tune the signal generator 1.5 kHz below the transceiver display frequency.



- d) Turn VR4001 fully clockwise, and then counterclockwise just over the threshold where voltage on the meter drops to zero.
- e) Referring to Figure 1, raise the signal generator frequency gradually to confirm that the voltage rises to 5V within 1.5 to 4.0 kHz above the display frequency.
- f) Disconnect all test equipment.

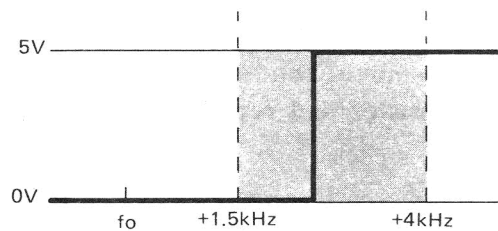


Figure 1

## D. Main Unit, Transmitter

**NOTE:** Remove plug P4501 from PJ3003 (RF Out) on the Main Unit for all of the steps in this section (D).

- 1) Tx IF Transformers
  - a) Set the transceiver to USB mode, and tune to 52 MHz.
  - b) Connect a 50-ohm resistor across PJ3003, and connect the RF voltmeter across the resistor.
  - c) Connect the AF generator to pin 8 (center pin) of the MIC jack, and inject 1 mV @ 1.5 kHz.
  - d) Close the PTT line (short pins 6 and 7 of the MIC jack), and adjust T3014, T3015, T3018 and T3021 for maximum deflection on the RF voltmeter.
- 2) SSB Carrier Frequency

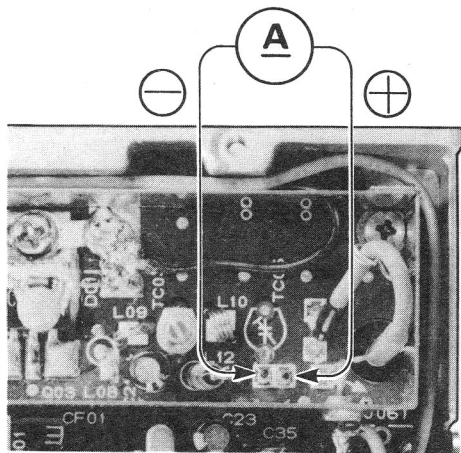
Perform these steps only after aligning the Tx IF Transformers. Setup is the same.

  - a) Retune the AF generator to 300 Hz and note the the deflection on the voltmeter.
  - b) Now retune the AF generator to 2700 Hz and compare the voltmeter deflection with that at 300 Hz. If the voltage is different adjust TC3002, while switching the AF generator between 300 and 2700 Hz.
  - c) Select the LSB mode and repeat a) and b), adjusting TC3001 if necessary.
  - d) Remove the test equipment, but do not replace P4501 in PJ3003 if you will be proceeding to the next section.

## E. PA Unit

### 1) Idling Current

- a) Reduce the supply voltage to 8V DC.
- b) Connect the dummy load to the ANT jack.
- c) Temporarily remove the jumper between the terminal posts near L4512, and connect the milliammeter across these posts.
- d) Close the PTT line and adjust VR4501 for  $45 \pm 5$  mA on the milliammeter.
- e) Remove the meter and replace the jumper between the posts.



### 2) Interstage Matching Trimmers

- a) Connect plug P4501 (if removed earlier) to PJ3003.
- b) Connect the wattmeter and dummy load to the ANT jack.
- c) Select the FM mode, and set the transceiver to 52 MHz.
- d) Close the PTT line and adjust trimmers TC4502 and TC4505 for maximum RF output.

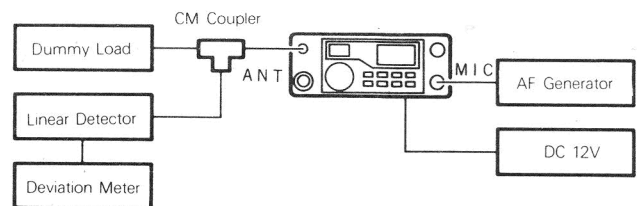
## F. Miscellaneous Transmitter Adjustments

### 1) ALC and PO Meter Calibration

- a) With the wattmeter and dummy load connected to the ANT jack, and the transceiver set to 52 MHz and select the FM mode.
- b) Connect the AF generator to pin 8 (center pin) of the MIC jack, and inject 2 mV @ 1.5 kHz.
- c) Close the PTT line (short pins 6 and 7 of the MIC jack), and adjust VR3004 on the Main Unit for 2.8W output on the wattmeter.
- d) Increase the AF level to 6 mV and adjust VR3007 for 2.8W on the wattmeter.
- e) Adjust VR3006 so that the meter on the transceiver deflects to the center of the green zone.

### 2) FM IDC (Deviation Control)

- a) Connect the linear detector/deviation meter with the dummy load to the ANT jack.



**PARTS LIST**

MAIN CHASSIS			TERMINAL UNIT B		
Symbol No.	Part No.	Description	Symbol No.	Part No.	Description
Q1	G3205461K	2SB546AK		F2827000	Printed Circuit Board
Q2	G3207720P	2SB772P		C028270AA	PCB with Components
<b>POTENTIOMETERS</b>			<b>SWITCH</b>		
VR1	J62800092	K12B61006 10KB/10KA AF, SQL	S5201	N6090061	SSJ-012M
VR2	J60800127	K121N0G0F 250KB CLAR			
<b>CONNECTORS</b>			<b>CONNECTORS</b>		
J1	P1090541	BNC-RM ANT	P5201	T9205394A	
J2	P0090384	FM214-8SSPY MIC	P5202	T9205395	
<b>METER</b>			<b>FERRITE BEADS</b>		
M1	M0290023	T-22		L9190001	4A R13X3X1
<b>SPEAKER</b>			<b>CPU UNIT</b>		
SP1	M4090067	TL-57A	Symbol No.	Part No.	Description
	R3803451	PANEL		F2820000	Printed Circuit Board
	R7115680	WINDOW		C028200AM	PCB with Components Models A1, B, F
	R3115710	KNOB (FUNCTION)			
	R3115711	" RPT			
	R3115712	" VFO			
	R3115713	" STEP			
	R3115714	" MR	Q1001	G1090734	HD61391A41(LCD-1V)
	R3115715	" REV	Q1002, 1003	G1090735	μPD4042BG
	R3115716	" UP	Q1004	G1090584	μPD4069UBG
	R3115717	" MODE			
	R3115718	" CALL			
	R3115719	" M			
	R3507740	" MAIN DIAL	Q1005	G3316237F	2SC1623T2BL6
	R3115910	" VOL	Q1006	G3108127F	2SA812T2BM6B
	R3115920	" SQL			
	R3115930	" CLAR			
	R0507650	TOP CASE			
	R0507660	BOTTOM CASE			
	R0507670A	SIDE PLATE L	D1001	G2090070	LN222RP LED(RED)
	R0507680A	SIDE PLATE R	D1002	G2090071	LN322GP " (GREEN)
			D1003	G2070001	1SS181TE85R SI
<b>TERMINAL UNIT A</b>			<b>RESISTORS</b>		
Symbol No.	Part No.	Description	R1001, 1021	J24205000	RMC 1/10T 000J 1/10W 0Ω
	F2826000	Printed Circuit Board	R1004, 1015	J24205221	" " 221J " 220Ω
	C028260AA	PCB with Components	R1005, 1012, 1013, 1014	J24205102	" " 102J " 1kΩ
			R1017	J24205103	" " 103J " 10kΩ
			R1007, 1008, 1016, 1018, 1019	J24205473	" " 473J " 47kΩ
			R1003	J24205683	" " 683J " 68kΩ
P5001 (w/wire)	T9205398 R0115750	BOARD SPRING	R1002, 1009-1011	J24205104	" " 104J " 100kΩ
<b>CONNECTOR</b>					

R1006	J21249001	Metallic Film 1/4W 432k $\Omega$	Q2006	G1090736	LVC550C
<b>BLOCK RESISTORS</b>			<b>TRANSISTORS</b>		
RB1001	J40900055	RKM6C142	Q2007	G3410330K	2SD1030K
RB1002	J40900056	RKM7LWF503	Q2008–2011, 2013, 2017, 2018, 2020–2022, 2024, 2025	G3316237F	2SC1623T2BL6
<b>CAPACITORS</b>			Q2012, 2014– 2016, 2023	G3108127F	2SA812T2BM6B
C1008–1013	K22170805	Chip Ceramic 50WV B 0.001 $\mu$ F (C2012B1H102MFA)	Q2019	G3207987	2SB798-T2DL
C1007	K22170817	" " " " 0.01 $\mu$ F (C2012B1H103MFA)	<b>DIODES</b>		
C1003, 1004,	K22171004	" " " F 0.01 $\mu$ F (C2012F1H103MFA)	D2001, 2002	G2090118	1SS97 Schottky
C1017–1019	K13179008	Ceramic Disc " " 0.01 $\mu$ F (DD106F103Z50)	D2003, 2005, 2006, 2008	G2070003	1SS226TE85R Si
C1005, 1006	K22171008	Chip Ceramic " " 0.047 $\mu$ F (C2012F1H473MFA)	D2004	G2090246	RD6.2EB2 Zener
C1016	K13179009	Ceramic Disc " " 0.047 $\mu$ F (DD110F473Z50)	D2007	G2070009	1SS184TE85R Si
C1001	K70167105	Tantalum 25WV 1 $\mu$ F (DN1V010M1S)	D2009	G2070001	1SS181TE85R "
C1020	K40179001	Electrolytic 50WV 1 $\mu$ F (RC2-50V010M)	D2010	G2090027	1SS53 "
			<b>RESISTORS</b>		
<b>SWITCHES</b>			R2055	J24205000	RMC 1/10T 000J 1/10W 0 $\Omega$
S1001	Q9000361	SRGFVV	R2002	J24205479	" " 4R7J " 4.7 $\Omega$
S1002	N6090061	SSJ-012M	R2008	J24205470	" " 470J " 47 $\Omega$
			R2001	J24205101	" " 101J " 100 $\Omega$
			R2057	J24205331	" " 331J " 330 $\Omega$
			R2041	J24205102	" " 102J " 1k $\Omega$
<b>CONNECTORS</b>			R2004	J24205222	" " 222J " 2.2k $\Omega$
J1001	P0090099	3022-10A	R2007, 2030, 2040, 2044, 2047	J24205332	" " 332J " 3.3k $\Omega$
J1002	P0090113	3022-05A	R2003, 2005	J24205472	" " 472J " 4.7k $\Omega$
			R2045	J24205562	" " 562J " 5.6k $\Omega$
<b>LAMPS</b>			R2012	J24205682	" " 682J " 6.8k $\Omega$
PL1001, 1002	Q1000061	HRS-3060A 8V 50mA	R2006, 2021, 2028, 2038, 2046	J24205103	" " 103J " 10k $\Omega$
			R2026	J24205153	" " 153J " 15k $\Omega$
<b>LIQUID CRYSTAL DISPLAY</b>			R2011	J24205223	" " 223J " 22k $\Omega$
DS1001	G6090053	LS149-A	R2029, 2035, 2039, 2058	J24205333	" " 333J " 33k $\Omega$
			R2017, 2019, 2022–2024, 2027, 2032, 2034, 2050, 2053, 2054, 2056	J24205473	" " 473J " 47k $\Omega$
<b>CONTROL UNIT</b>					
Symbol No.	Part No.	Description			
	F2821000A	Printed Circuit Board			
	C028210AB	PCB with Components			
			R2010, 2013, 2015, 2016, 2025, 2036, 2043, 2048, 2049	J24205104	" " 104J " 100k $\Omega$
<b>ICs</b>			R2009, 2042	J24205334	" " 334J " 330k $\Omega$
Q2001	G1090584	$\mu$ PD4069UBG	R2037	J24205474	" " 474J " 470k $\Omega$
Q2002	G1090679	$\mu$ PD4081BG			
Q2003	G1090675	$\mu$ PD4071BG			
Q2004	G1090037	MC14572UBCP			
Q2005	G1090714	$\mu$ PD4030BG			

			SW UNIT		
			Symbol No.	Part No.	Description
R2014, 2018, 2033	J24205105	RMC 1/10T 105J 1/10W 1MΩ			
R2051, 2052	J24205225	" " " " 225J " 2.2MΩ		F2822101	Printed Circuit Board
R2020, 2031	J24205335	" " " " 335J " 3.3MΩ		C028221AM	PCB with Components
<b>CAPACITORS</b>			<b>TRANSISTOR</b>		
C2008	K22170237	Chip Ceramic 50WV CH 120pF (C2012CH1H121JFA)	Q2501	G3108127F	2SA812T2BM6
C2005, 2023, 2027, 2028	K22170805	" " " " B 0.001μF (C2012B1H102MFA)	<b>DIODES</b>		
C2014	K22170809	" " " " " 0.0022μF (C2012B1H222MFA)	D2501, 2502, 2504-2507	G2070001	1SS181TE85R
C2021	K22170817	" " " " " 0.01μF (C2012B1H103MFA)	<b>RESISTOR</b>		
C2002, 2011	K22171004	" " " " F 0.01μF (C2012F1H103ZFA)	R2501	J24205474	RMC 1/10T 474J 1/10W 470kΩ
C2013, 2019, 2020, 2022	K22170821	" " " " B 0.022μF (CM21W5R223M50VAT)	<b>SWITCHES</b>		
C2003, 2007, 2012, 2015-2018, 2025	K22171008	" " " " F 0.047μF (C2012F1H473ZFA)	S2501-2510	N5090029	JPM1990-0101
C2026	K22141904	" " " " D 0.1μF (C3216D1E104MFA)	<b>CONNECTORS</b>		
C2004	K70107226	Tantalum 10WV 22μF (DN1A220M1S)	P2502 (w/wire)	T9205393A	
C2009	K40179001	Electrolytic 50WV 1μF (RC2-50V010M)	<b>MAIN UNIT</b>		
C2010, 2029	K40129012	" " " " 16WV 10μF (RC2-16V100M)	<b>Symbol No.</b>		
C2006, 2024	K40149012	" " " " 25WV 10μF (RC2-25V100M)	<b>Part No.</b>		
C2001	K40129046	" " " " 16WV 1000μF (RE2-16V102M)	<b>Description</b>		
<b>FUSE CLIP</b>				F2823000B	Printed Circuit Board
FH2001	P2000024	UF-0033#01		C028230AM	PCB with Components Model A1
				C028230AN	" " " " Model A2
				C028230AP	" " " " Model B
				C028230AQ	" " " " Model F
			<b>ICs</b>		
<b>FUSE</b>			Q3004	G1090072	μPC577H
F2001	Q0000020	MF-51 1A	Q3023	G1090559	LA6324M
			Q3045	G1090101	μPC1037H
<b>CONNECTORS</b>			<b>FETs</b>		
J2001	P1090304	3024-05CH	Q3001, 3006, 3008, 3009, 3011-3013, 3028, 3029	G4801220L	3SK122L
J2002	P1090126	3024-10CH	Q3002	G4800740L	3SK74L
J2003, 2004, 2009	P0090524	5483-02A	<b>TRANSISTORS</b>		
J2005, 2006	P0090486	PI22A03M	Q3003, 3005, 3007, 3010, 3014, 3016, 3019-3022, 3024, 3025, 3027, 3033,	G3316237F	2SC1623-T2BL6
J2007, 2008	P0090595	5418-12A			
<b>SWITCH</b>					
S2001	N4090094	SPH222A			
<b>BATTERY</b>					
BAT2001	Q9000106	CR2055-WT2			

Q3035, 3039-3044	G3316237F	2SC1623-T2BL6		R3079	J01215101	Carbon Film 1/8W TJ	100Ω
				R3070, 3195	J24205151	RMC 1/10T 151J 1/10W	150Ω
Q3015, 3017, 3018, 3034, 3038	G3108127F	2SA812-T2BM6B		R3008, 3039, 3044, 3130, 3133, 3217	J24205221	" " 221J "	220Ω
Q3026	G3326207B	2SC2620QBTR		R3173	J20306221	Metallic Film 1W	220Ω
Q3031	G3330527F	2SC3052-T14-2F		R3006, 3083, 3134, 3153, 3154, 3157	J24205331	RMC 1/10T 331J 1/10W	330Ω
Q3032, 3037	G3320260	2SC2026		R3056, 3129, 3143	J24205471	" " 471J "	470Ω
<b>DIODES</b>							
Q3030	G2090247	ND487C1-3R	Schottky	R3063, 3069, 3076, 3166, 3172	J24205681	" " 681J "	680Ω
D3001-3003, 3009, 3025, 3028-3030, 3032	G2090027	1SS53	Si	R3003, 3019, 3043, 3061, 3066, 3086, 3095, 3104, 3178, 3180, 3207	J24205102	" " 102J "	1kΩ
D3008, 3015	G2070003	1SS226TE85R	"	R3072, 3203, 3219*	J01215102	Carbon Film 1/8W TJ	1kΩ
D3010, 3011	G2070009	1SS184TE85R	"	R3035, 3038, 3058, 3059	J24205152	RMC 1/10T 152J 1/10W	1.5kΩ
D3012, 3031	G2070001	1SS181TE85R	"	R3042, 3047, 3055, 3121	J24205222	" " 222J "	2.2kΩ
D3013, 3014, 3022, 3024	G2090244	1SS106	Schottky	R3023	J24205272	" " 272J "	2.7kΩ
D3016	G2090180	FC-53M-5	Varactor	R3029, 3034, 3052, 3054, 3073, 3151, 3167, 3185, 3206, 3212	J24205332	" " 332J "	3.3kΩ
D3017	G9090017	MV-11	Varistor	R3067	J01215332	Carbon Film 1/8W TJ	3.3kΩ
D3018, 3021	G2022090	1S2209	Varactor	R3050, 3102, 3107, 3110, 3131, 3132, 3174, 3186, 3197, 3199, 3201, 3218	J24205472	RMC 1/10T 472J 1/10W	4.7kΩ
D3023	G2090118	1SS97	Schottky	R3025, 3046, 3148	J24205682	" " 682J "	6.8kΩ
<b>CRYSTALS</b>							
X3001	H0102713A	HC-49/T 3P	13.99738MHz	R3088, 3091, 3097, 3122, 3127, 3140, 3158, 3198, 3200, 3202, 3204, 3214	J24205103	" " 103J "	10kΩ
X3002	H0102712A	HC-18/T 3P	13.9878MHz	R3026, 3182	J01215103	Carbon Film 1/8W TJ	10kΩ
<b>CRYSTAL FILTERS</b>							
XF3001	H1102109	13F-15B		R3024, 3084, 3108, 3114, 3128, 3176	J24205153	RMC 1/10T 153J 1/10W	15kΩ
XF3002	H1102110	XF-13.9L-242S		R3036, 3100, 3115, 3116, 3124, 3179	J24205223	" " 223J "	22kΩ
<b>RESISTORS</b>							
R3010, 3012, 3016, 3017, 3120, 3147	J24205000	RMC 1/10T 000J 1/10W	0Ω	R3216	J01215223	Carbon Film 1/8W TJ	22kΩ
R3113, 3155, 3156	J24205100	" " 100J "	10Ω	R3018, 3037, 3081, 3098, 3175, 3183, 3209	J24205333	RMC 1/10T 333J 1/10W	33kΩ
R3152, 3194, 3196	J24205150	" " 150J "	15Ω	R3096, 3101	J01215333	Carbon Film 1/8W TJ	33kΩ
R3027, 3168, 3170, 3213	J24205220	" " 220J "	22Ω				
R3171	J24205330	" " 330J "	33Ω				
R3007, 3021, 3031, 3032, 3040, 3045, 3065, 3071, 3078, 3144, 3150, 3208	J24205470	" " 470J "	47Ω				
R3022	J01215470	Carbon Film 1/8W TJ	47Ω				
R3001, 3002, 3030, 3053, 3057, 3062, 3068, 3149, 3205, 3211	J24205101	RMC 1/10T 101J 1/10W	100Ω				

• Model A2, B

R3080, 3094 3099, 3111, 3193, 3215	J24205473	RMC 1/10T 473J 1/10W 47kΩ	C3130	K22170211	Chip Ceramic 50WV CH 10pF (C2012CH1H100DFA)
			C3065, 3186	K22170313	" " " UJ 12pF (C2012UJ1H120JFA)
R3033, 3092, 3112, 3141	J24205683	" " 683J " 68kΩ			
			C3181, 3220	K22170317	" " " " 18pF (C2012UJ1H180JFA)
R3014, 3020, 3041, 3048, 3051, 3060, 3087, 3090, 3125, 3138, 3142, 3159, 3162, 3164, 3165, 3210	J24205104	" " 104J " 100kΩ			
			C3024, 3030, 3041, 3069, 3178	K22170219	" " " CH 22pF (C2012CH1H220JFA)
			C3023, 3027, 3029, 3031	K22170319	" " " " UJ 22pF (C2012UJ1H220JFA)
			C3009	K22170221	" " " " CH 27pF (C2012CH1H270JFA)
R3011, 3085, 3160	J01215104	Carbon Film TJ 1/8W 100kΩ	C3142, 3154	K22170321	" " " " UJ 27pF (C2012UJ1H270JFA)
R3126, 3177	J24205184	RMC 1/10T 184J 1/10W 180kΩ	C3074, 3080	K22170323	" " " " " 33pF (C2012UJ1H330JFA)
R3049, 3137	J01215224	Carbon Film TJ 1/8W 220kΩ			
R3075, 3093, 3123, 3146	J24205334	RMC 1/10T 334J 1/10W 330kΩ	C3006, 3007, 3028	K22170225	" " " " CH 39pF (C2012CH1H390JFA)
R3074, 3089, 3106, 3118	J24205474	" " 474J " 470kΩ	C3001, 3002	K22170229	" " " " " 56pF (C2012CH1H560JFA)
R3082, 3109, 3117, 3136, 3181	J24205105	" " 105J " 1MΩ	C3004, 3005, 3204, 3231	K22170231	" " " " " 68pF (C2012CH1H680JFA)
R3220	J01245275	Carbon Film 1/4W 2.7MΩ	C3167, 3189	K22170335	" " " " UJ 100pF (C2012UJ1H101JFA)
R3005, 3103, 3139, 3184	J24205335	RMC 1/10T 335J 1/10W 3.3MΩ	C3188	K06175101	Ceramic Disc " " 100pF (DD106UJ101J50)
			C3161	K22170241	Chip Ceramic " CH 180pF (C2012CH1H180JFA)
<b>POTENTIOMETERS</b>					
VR3001	J51745221	H0651A003-220B 220Ω	C3121	K22170343	" " " " UJ 220pF (C2012UJ1H221JFA)
VR3002	J51762225	H0521A127A-2.2MB 2.2MΩ	C3055, 3089	K22170247	" " " " CH 330pF (C2012CH1H331JFA)
VR3003	J51762103	H0521A113A-10KB 10kΩ			
VR3004	J51745102	H0651A007-1KB 1kΩ	C3111, 3112, 3122	K22170355	" " " " UJ 680pF (C2012UJ1H680JFA)
VR3005, 3007	J51745473	H0651A017-47KB 47kΩ			
VR3006	J51745103	H0651A013-10KB 10kΩ	C3012, 3050, 3056, 3060, 3071, 3072, 3077, 3078, 3083, 3100, 3101, 3114, 3120, 3129, 3132, 3137, 3138, 3169, 3207	K22170805	" " " " B 0.001μF (C2012B1H102MFA)
<b>THERMISTORS</b>					
TH3001	G9090022	SDT-09			
TH3002	G9090002	D22A			
<b>CAPACITORS</b>					
C3193	K22170203	Chip Ceramic 50WV CH 2pF (C2012CH1H020CFA)			
C3206	K22170303	" " " UJ 2pF (C2012UJ1H020CFA)	C3105, 3113	K22170813	" " " " " 0.0047μF (C2012B1H472MFA)
C3141, 3156, 3162	K22170204	" " " CH 3pF (C2012CH1H030CFA)	C3003, 3008, 3010, 3011, 3014, 3015, 3017, 3019, 3033, 3034, 3036, 3054, 3068, 3075	K22170817	" " " " " 0.01μF (C2012B1H103MFA)
C3185, 3222	K22170207	" " " " 6pF (C2012CH1H060DFA)			
C3035, 3194	K22170208	" " " " 7pF (C2012CH1H070DFA)			
C3040	K22170209	" " " " 8pF (C2012CH1H080DFA)			
C3143, 3153	K22170310	" " " UJ 9pF (C2012UJ1H090DFA)			

C3082, 3088, 3092, 3096, 3108, 3155, 3157-3160, 3163-3166, 3175-3177, 3196, 3208, 3217, 3219, 3221	K22170817	Chip Ceramic 50WV B 0.01 $\mu$ F (C2012B1H103MFA)	<b>TRIMMER CAPACITORS</b>					
			TC3001	K91000118	CTZ51J118 100pF			
			TC3002, 3003	K91000085	CTZ51C122 10pF			
			<b>INDUCTORS</b>					
L3001	L0020824	0.17 $\mu$ H						
L3002	L0021678							
L3003, 3004	L0021659							
C3037, 3039, 3043, 3044, 3046-3049, 3051-3053, 3057-3059, 3061-3064, 3066, 3067, 3070, 3073, 3076, 3079, 3081, 3084- 3087, 3090, 3093, 3098, 3118, 3119, 3123, 3126, 3134, 3135, 3139, 3140, 3171, 3180, 3182, 3184, 3187, 3190- 3192, 3195, 3197, 3200- 3203, 3212, 3213, 3226- 3228, 3230	K22171006	" " " F 0.022 $\mu$ F (C2012F1H223ZFA)	L3005	L1190254	L-C3A4R7KA 4.7 $\mu$ H			
			L3006	L1190258	L-C3A100KA 10 $\mu$ H			
			L3007	L1190256	L-C3A6R8KA 6.8 $\mu$ H			
			L3008, 3009, 3010	L1190252	L-C3A3R3KA 3.3 $\mu$ H			
			L3011	L1190242	L-C3AR47MA 0.47 $\mu$ H			
			L3012	L1190250	L-C3A2R2MA 2.2 $\mu$ H			
			L3014	L1190239	L-C3AR27MA 0.27 $\mu$ H			
						<b>TRANSFORMERS</b>		
			T3001	L0021663	52MHz			
			T3002-3005, 3018, 3021	L0021662	52MHz			
			T3006	L0021664	66MHz			
			T3007, 3010-3012, 3014, 3015	L0021667	13.9MHz			
			T3008, 3009	L0021666	13.9MHz			
			T3013	L0021672	13.9MHz			
T3016, 3017	L0190007	MKMA070 PB01-BR						
T3022	L0021669							
C3107	K22141808	" " 25WV B 0.047 $\mu$ F (3216B1E473MFA)	<b>CONNECTORS</b>					
			PJ3001-3003	P1090210	TMP-JV			
C3215	K22171008	" " 50WV F 0.047 $\mu$ F (C2012F1H473ZFA)	J3001, 3004, 3006, 3009	P0090486	PI22A03M			
C3110, 3115, 3116, 3233	K22141904	" " 25WV D 0.1 $\mu$ F (C3216D1E104MFA)	J3002	P1090539	JPJ-1000-01-010			
			J3003	P1090542	5410-12APB			
C3102	K40179010	Electrolytic 50WV 0.47 $\mu$ F (RE-50VR47M)	J3005, 3007	P0090485	PI22A02M			
			J3008	P0090090	3022-09A			
C3128	K40179005	" " 0.47 $\mu$ F (RC2-50VR47M)						
C3042, 3095, 3117, 3170	K40179013	" " 1 $\mu$ F (RE-50V010M)						
C3099	K40149001	" 25WV 4.7 $\mu$ F (RE-25V4R7M)						
C3104	K40149011	" " 4.7 $\mu$ F (RC2-25V4R7M)	<b>PLL/PA UNIT (PLL)</b>					
			Symbol No.	Part No.	Description			
				F2824000A	Printed Circuit Board			
				C028240AM	PCB with Components			
C3045, 3168	K40129012	" " 10 $\mu$ F (RC2-16V100M)	<b>ICs</b>					
			Q4001	G1090145	MC3357P			
C3218, 3223, 3229, 3232	K40109002	" 10WV 47 $\mu$ F (RE-10V470M)	Q4002	G1090626	LA6358M			
			Q4007	G1090772	LC4022BM			
C3091	K40109024	" " 100 $\mu$ F (RE2-10V101M)	Q4008	G1090559	LA6324M			
			Q4009	G1090073	$\mu$ PC575C2			
			Q4019	G1090550	MC145145P1			





PJ4001	P1090210	TMP-JV	C4518, 4520 4525, 4526	K22171004	Chip Ceramic 50WV F 0.01μF (C2012CH1H103ZFA)
			C4532, 4533	K13179008	Ceramic Disc " " 0.01μF (DD106F103Z50)
<b>TERMINAL POST</b>					
TP4001	Q5000036	TP-G MK1095	C4514	K22141904	Chip Ceramic 25WV D 0.1μF (C3216D1E104MFA)
			C4513, 4517, 4521	K40129004	Electrolytic 16WV 10μF (RE-16V100M)
	R0115290	Shield Case			
	R0115300	Shield Case Top			
	R0117830	Shield Plate (Rear)			
	R0118610	Spring (Ground Contact)	TC4502, 4505	K91000089	VCT51G 50pF
	R0507690A	Shield Case			
	R0118210	Shield Plate (Rear)			
<b>TRIMMER CAPACITORS</b>					
<b>INDUCTORS</b>					
			L4504	L0020340	
			L4505, 4511, 4512	L1020683	
			L4506	L0020828	
			L4508	L0020735	
			L4510	L0020725	
<b>PLL/PA UNIT (PA)</b>					
Symbol No.	Part No.	Description			
<b>TRANSISTORS</b>					
Q4502	G3320530	2SC2053			
Q4503	G3319710	2SC1971			
<b>DIODE</b>					
D4501	G2015550	1S1555			
<b>RESISTORS</b>					
R4510	J02245339	Carbon Film 1/4W SJ 3.3Ω			
R4514	J24205470	RMC 1/10T 470J 1/10W 47Ω			
R4517	J24205121	" " 121J " 120Ω			
R4512	J00275181	Carbon Film 1/2W VJ 180Ω			
R4507	J02245821	" " 1/4W SJ 820Ω			
<b>POTENTIOMETER</b>					
VR4501	J51762221	H0521A103A220 B 220Ω			
<b>CAPACITORS</b>					
C4511	K22170211	Chip Ceramic 50WV CH 10pF (C2012CH1H100DFA)			
C4535	K22170219	" " " " 22pF (C2012CH1H220JFA)			
C4524	K22170229	" " " " 56pF (C2012CH1H560JFA)			
C4522	K22170231	" " " " 68pF (C2012CH1H680JFA)			
C4510	K22170233	" " " " 82pF (C2012CH1H820JFA)			
C4515	K22170235	" " " " 100pF (C2012CH1H101JFA)			
C4527, 4528	K21170002	Feed Through " 0.001μF (ECK-Y1H102WE)			
C4501, 4504, 4509, 4512,	K22171004	Chip Ceramic " F 0.01μF (C2012CH1H103ZFA)			
<b>CONNECTORS</b>					
			P4501, 4502 (with wire)	T9316503	
			P4503 ( " )	T9205391A	
<b>ACCESSORIES</b>					
Symbol No.	Part No.	Description			
<b>PLUG</b>					
				P0090034	C-107 EXT SP
				P1090140	DP55-01-1A*
<b>ANTENNA</b>					
			Q3000048	YHA-6	
<b>MIC</b>					
				M3090052	MH-10E8 *
				M3090060	MH-10C8 * (DTMF) MH-10F8 *
				S6000094A	Shoulder Belt *
				R0071360	Microphone Hanger *
					* Optional same models

FL-6020			CAPACITORS		
<b>MAIN CHASSIS</b>			C6028	K00172020	Ceramic Disc 50WV SL 2pF (DD104SL020C50)
Symbol No.	Part No.	Description	C6033	K00175120	" " " " 12pF (DD104SL120J50)
<b>CONNECTORS</b>			C6015, 6016, 6030, 6031	K00175390	" " " " 39pF (DD104SL390J50)
J6001	P0090597A		C6011, 6013	K00175820	" " " " 82pF (DD104SL820J50)
J6002	P1090352	FM-MDR-M1 Antenna	C6025	K00175101	" " " " 100pF (DD105SL101J50)
	R4803630A	HEAT SINK	C6029	K00175121	" " " " 120pF (DD105SL121J50)
	S5000028	CATCH CLIP	C6012	K00175151	" " " " 150pF (DD106SL151J50)
<b>POWER MODULE</b>			C6001, 6005, 6007, 6009, 6014, 6017, 6018, 6022, 6023, 6024, 6026, 6032	K13179008	" " " " F 0.01μF (DD106F103Z50)
Q6001	G1090475	M57735	C6019, 6021	K13179010	" " " " 0.022μF (DD108F223Z50)
<b>POWER AMP UNIT</b>			C6006, 6008, 6010, 6020	K40179014	Electrolytic " 10μF (RE-50V100M)
Symbol No.	Part No.	Description	<b>INDUCTORS</b>		
	F2847000A	Printed Circuit Board	L6001	L1020673	
	C028470	PCB with Components w/o Q6001	L6002	L1020663	
<b>TRANSISTORS</b>			L6003, 6004	L0021674	
Q6002	G3408820Q	2SD882Q	L6005	L1190252	L-C3A3R3KA
Q6003	G3107331P	2SA733AP	L6006	L0021438	
Q6004	G3309451P	2SC945AP	L6007	L0021677	
<b>DIODES</b>			L6008	L0021675	
D6001	G2090232	S11B Si	<b>RELAY</b>		
D6002	G2090306	10E1 "	RL6001	M1190045	AG2013
D6003, 6005	G2090027	1SS53 "			
D6004	G2090197	RD9.1EB3 Zener			
D6006	G2090118	1SS97 Schottky			
D6007, 6008	G2090337	MI308 PIN			
<b>RESISTORS</b>			<b>ACCESSORIES</b>		
R6001	J22355680	Metaric Film 3W 68Ω	Symbol No.	Part No.	Description
R6002	J20336101	" " 2W 100Ω		T9015405	DC POWER CORD
R6003	J01245680	Carbon Film 1/4W TJ 68Ω	<b>SPARE FUSE</b>		
R6004, 6010	J02245102	" " " SJ 1kΩ		Q0000005	5A
R6005	J30356019	Metaric Film 3W 0.1Ω	<b>MOBILE MOUNTING BRACKET</b>		
R6005, 6016	J02245472	Carbon Film 1/4W SJ 4.7kΩ		D6000046	MMB-31
R6007	J02245563	" " " " 56kΩ			
R6008, 6011	J02245473	" " " " 47kΩ			
R6009, 6015	J02245103	" " " " 10kΩ			
R6012	J20306331	Metaric Film 1W 330Ω			
R6013	J01215470	Carbon Film 1/8W TJ 47Ω			
<b>POTENTIOMETERS</b>					
VR6001	J50747331	P6-S2X330 330ΩB			
VR6002	J51745474	H0651A023-470KB 470kΩB			

<b>FTS-7 TONE ENCODER/DECODER (D3000321)</b>		
Symbol No.	Part No.	Description
	F2578101A	Printed Circuit Board
<b>IC</b>		
Q1001	G1090577	MN6520
<b>DIODES</b>		
D1001, 1002	G2090244	Schottky Barrier 1SS106
<b>CRYSTAL</b>		
X1001	H0102571	MS-309 4.194304MHz
<b>RESISTORS</b>		
R1009, 1010	J24205102	Chip RMC 1/10T 102J 1k $\Omega$
R1002	J24205222	" " " 222J 2.2k $\Omega$
R1006	J24205472	" " " 472J 4.7k $\Omega$
R1003,1007,1008	J24205103	" " " 103J 10k $\Omega$
R1004,1005	J24205123	" " " 123J 12k $\Omega$
R1001	J24205104	" " " 104J 100k $\Omega$
<b>POTENTIOMETER</b>		
VR1001	J51750473	H0423A047-47KB 47k $\Omega$ B
<b>CAPACITOR</b>		
C1008, 1009	K22170217	Chip Ceramic 50WV 18pF CH (C2012CH1H180JFA)
C1005	K22171004	" " " 0.01 $\mu$ F F (C2012F1H103ZFPA)
C1002, 1004	K22141904	" " 25WV 0.1 $\mu$ F D (C3216D1E104MFA)
C1003	K72080002	Chip Tantalum 6.3WV 4.7 $\mu$ F (F950J475MA1)
C1001, 1006	K72080003	" " " 10 $\mu$ F (F950J106MC1)
C1007	K72060007	" " 4WV 100 $\mu$ F (F950G107MH1)
<b>SWITCH</b>		
S1001	N7090030	SGK1072
<b>CONNECTOR</b>		
J1001	P0090373	5703-06CPB



E2240900(8710-ST)