

# **FT-23R**

## **TECHNICAL SUPPLEMENT**



**YAESU MUSEN CO., LTD.**

C.P.O. BOX 1500, TOKYO, JAPAN

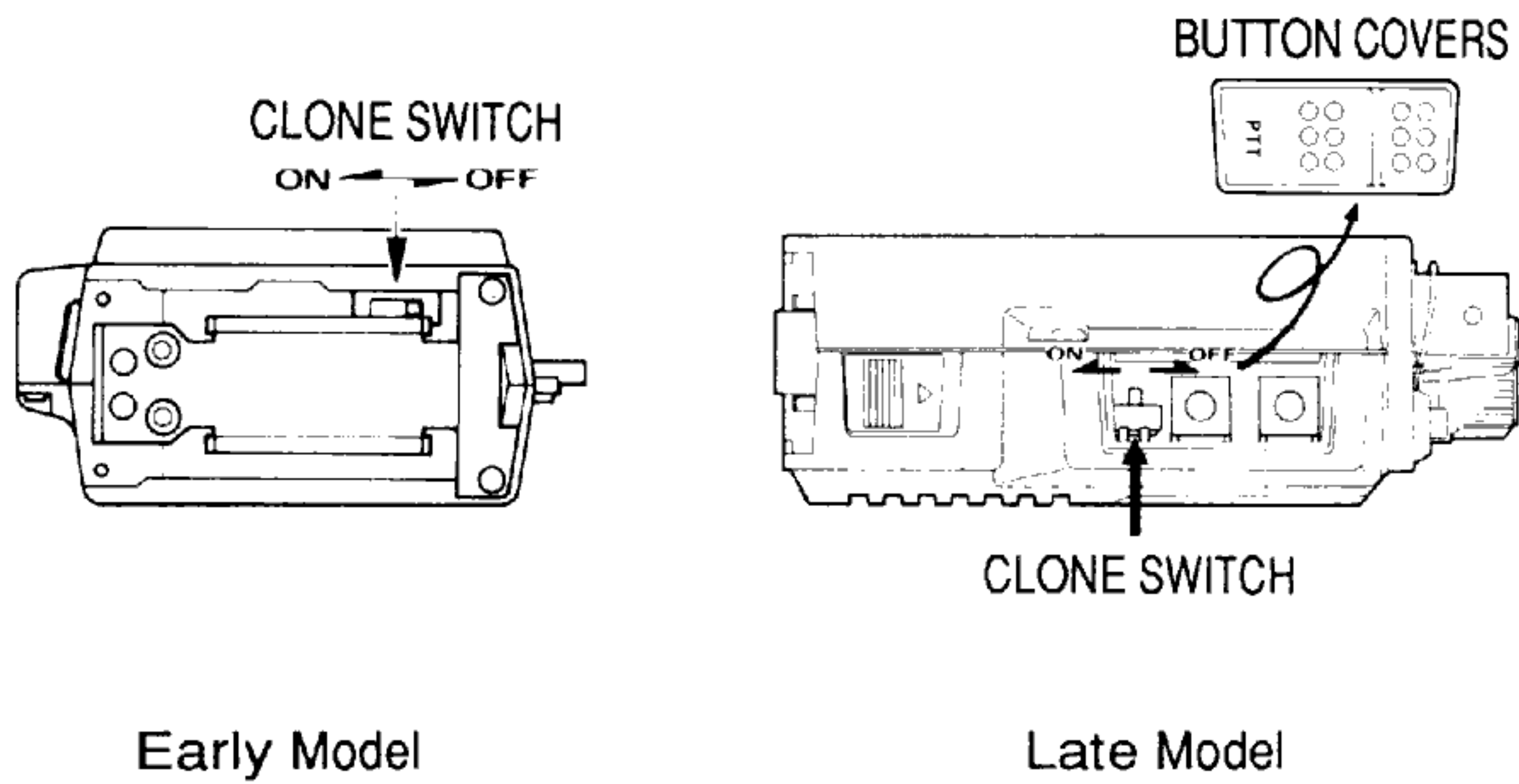
**YAESU U.S.A.**

17210 Edwards Rd., Cerritos, California 90701, U.S.A.

**YAESU EUROPE B.V.**

Snipweg 3. 1118AA Schiphol, The Netherlands

Early and late models can be distinguished by the location of the clone switch, as shown below.

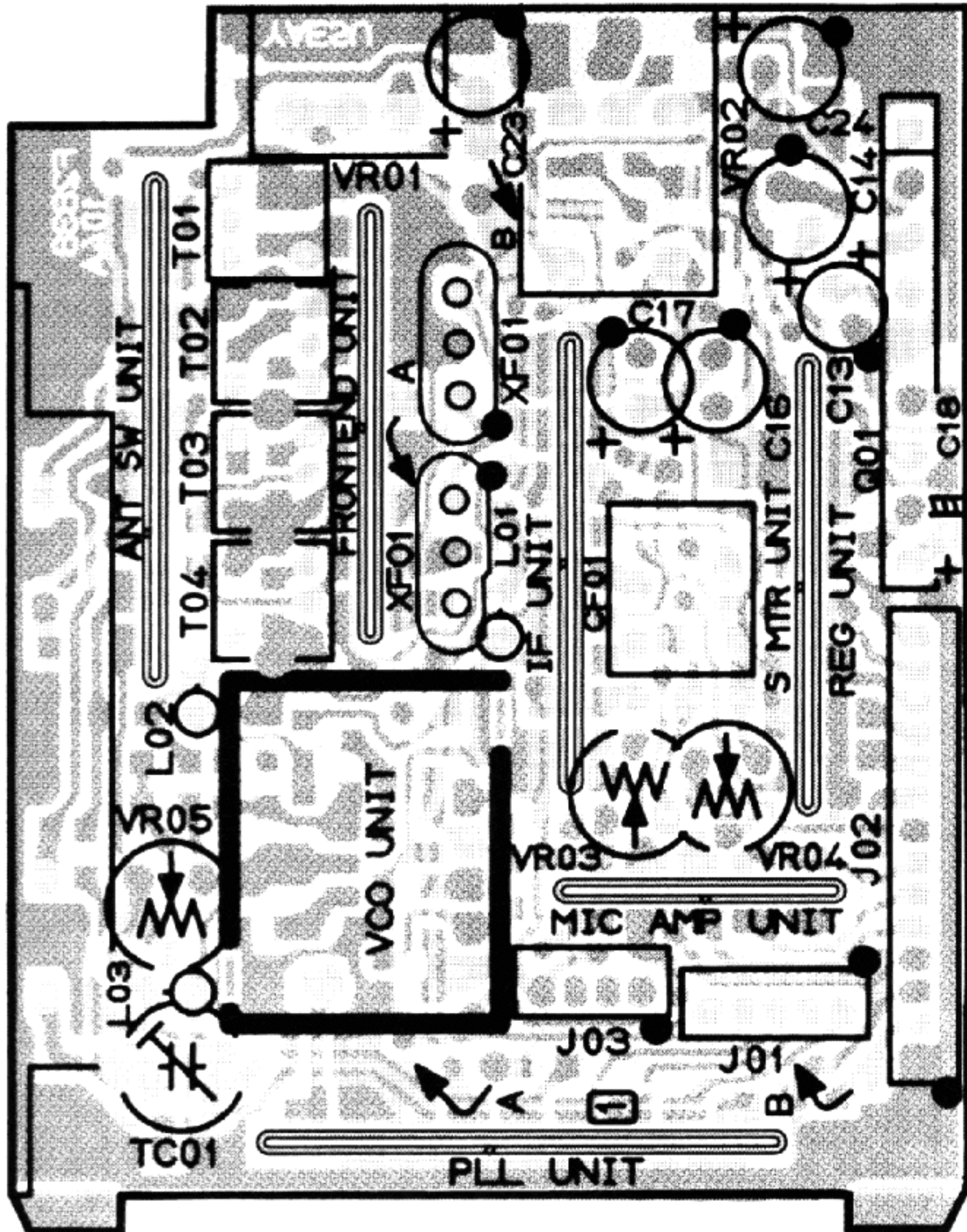


# Early Model FT-23R

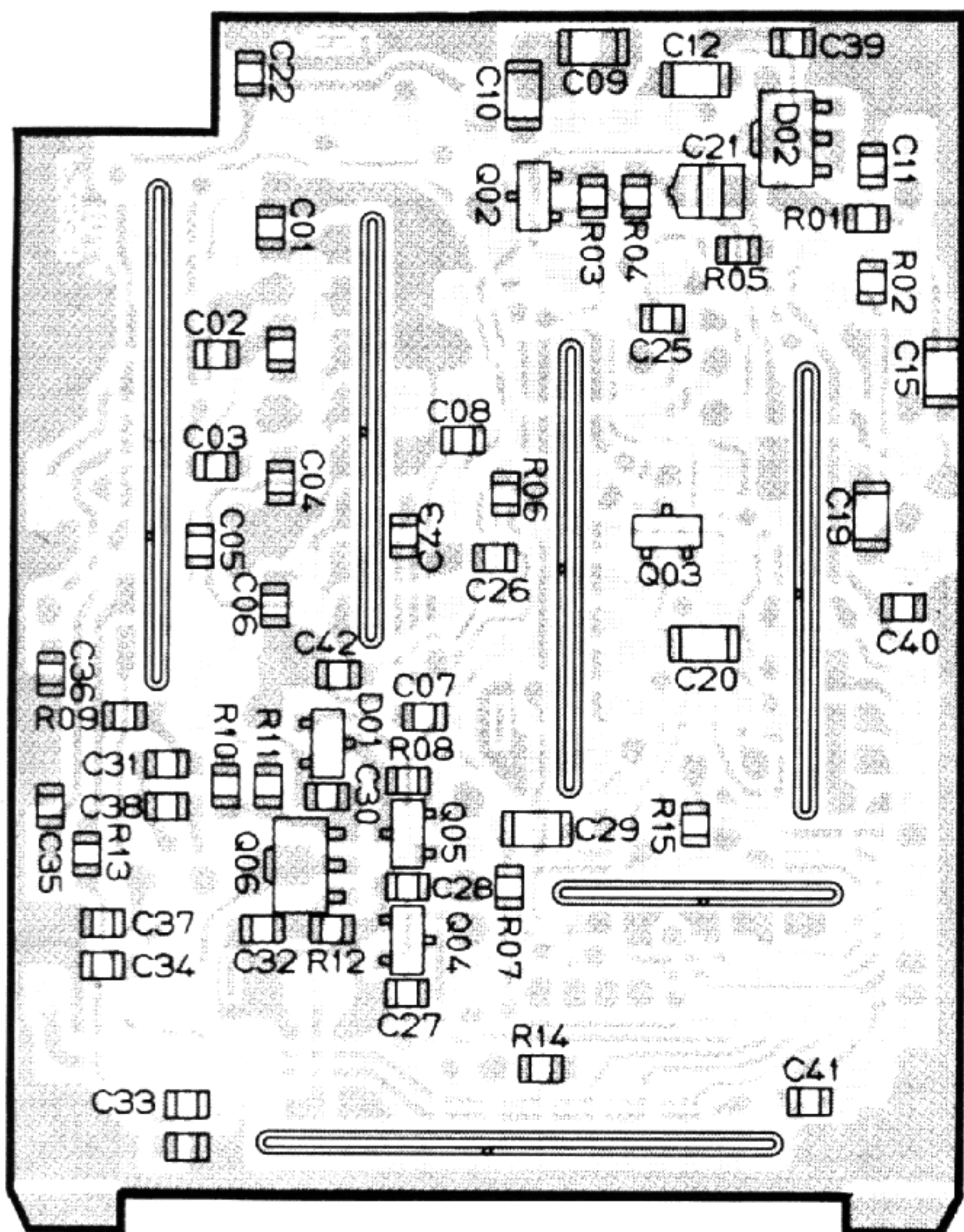
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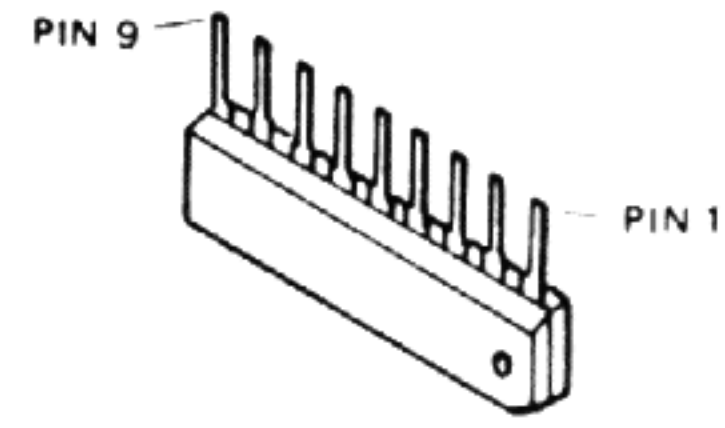
# MOTHER BOARD



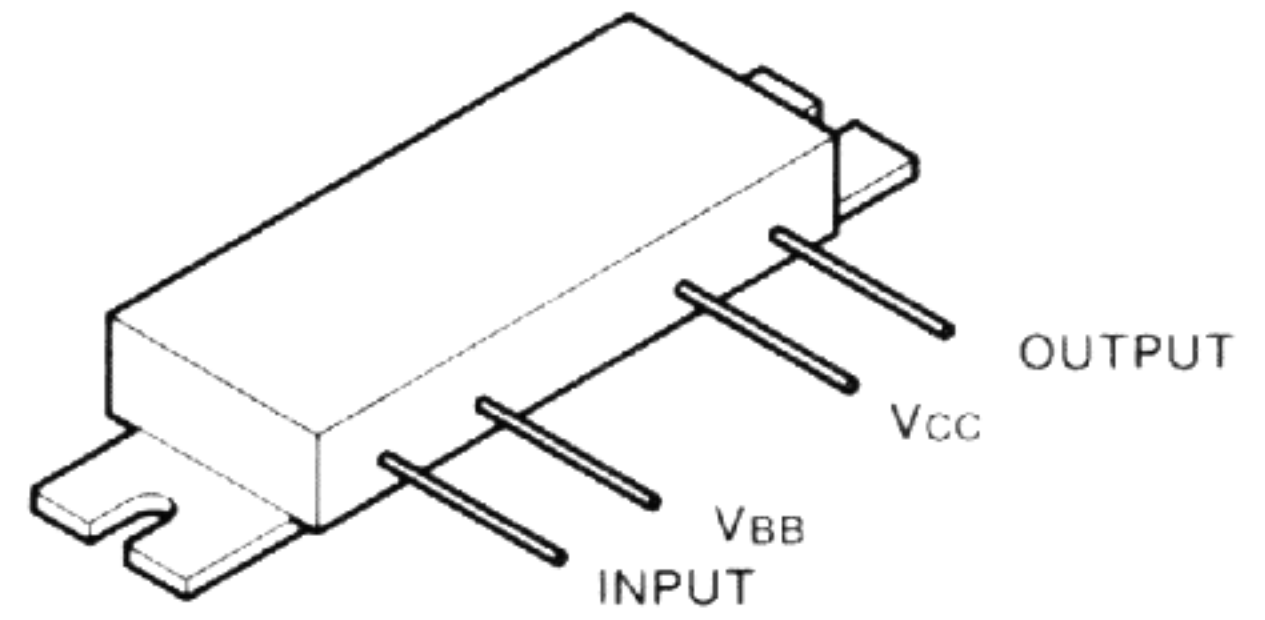
(obverse view of "component" side)



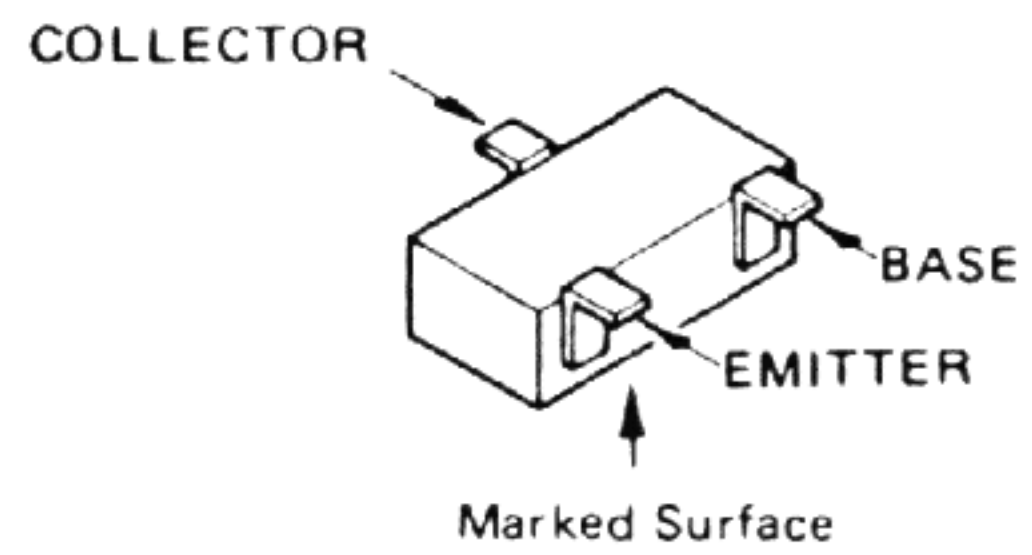
(reverse view of "chip-only" side)



LA4145 (Q101)



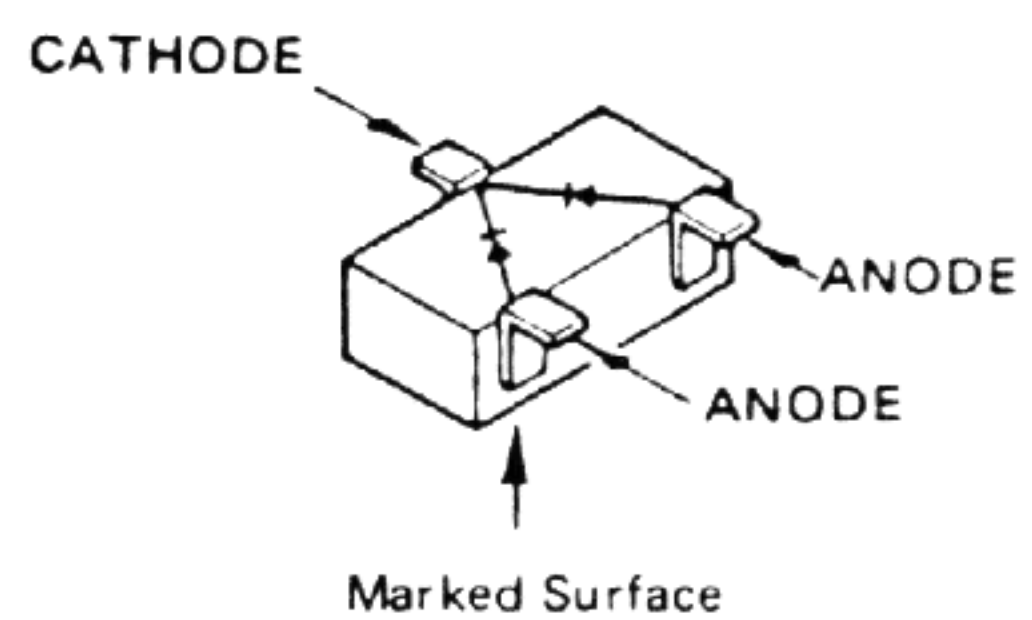
M57796MA (Q107)



- 2SA1162GR (SG) : (Q102)
- 2SC2712GR (LG) : (Q103)
- 2SC3356 (R22) : (Q105)
- FA1A4M (L33) : (Q104)

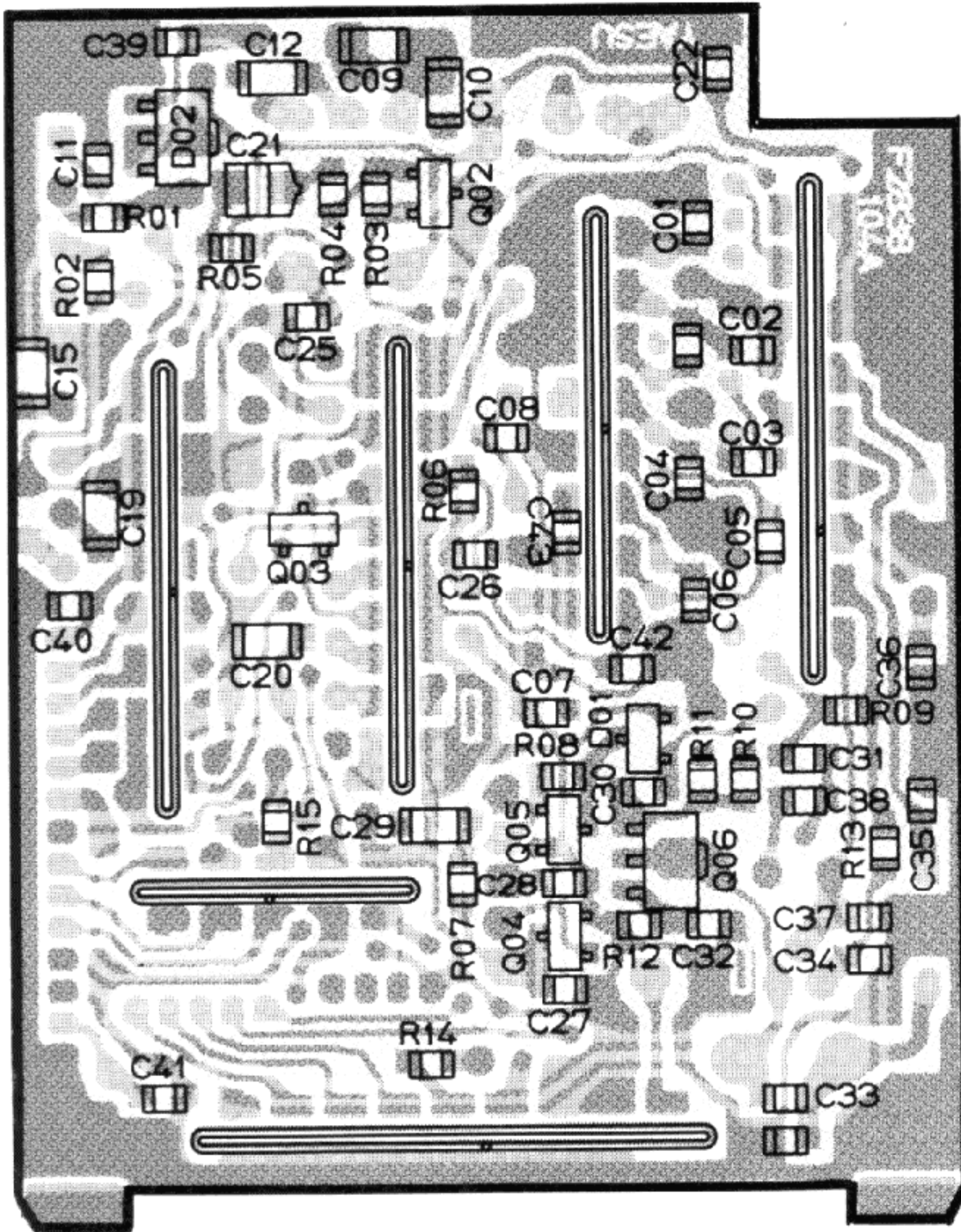


2SC2954 (Q106)

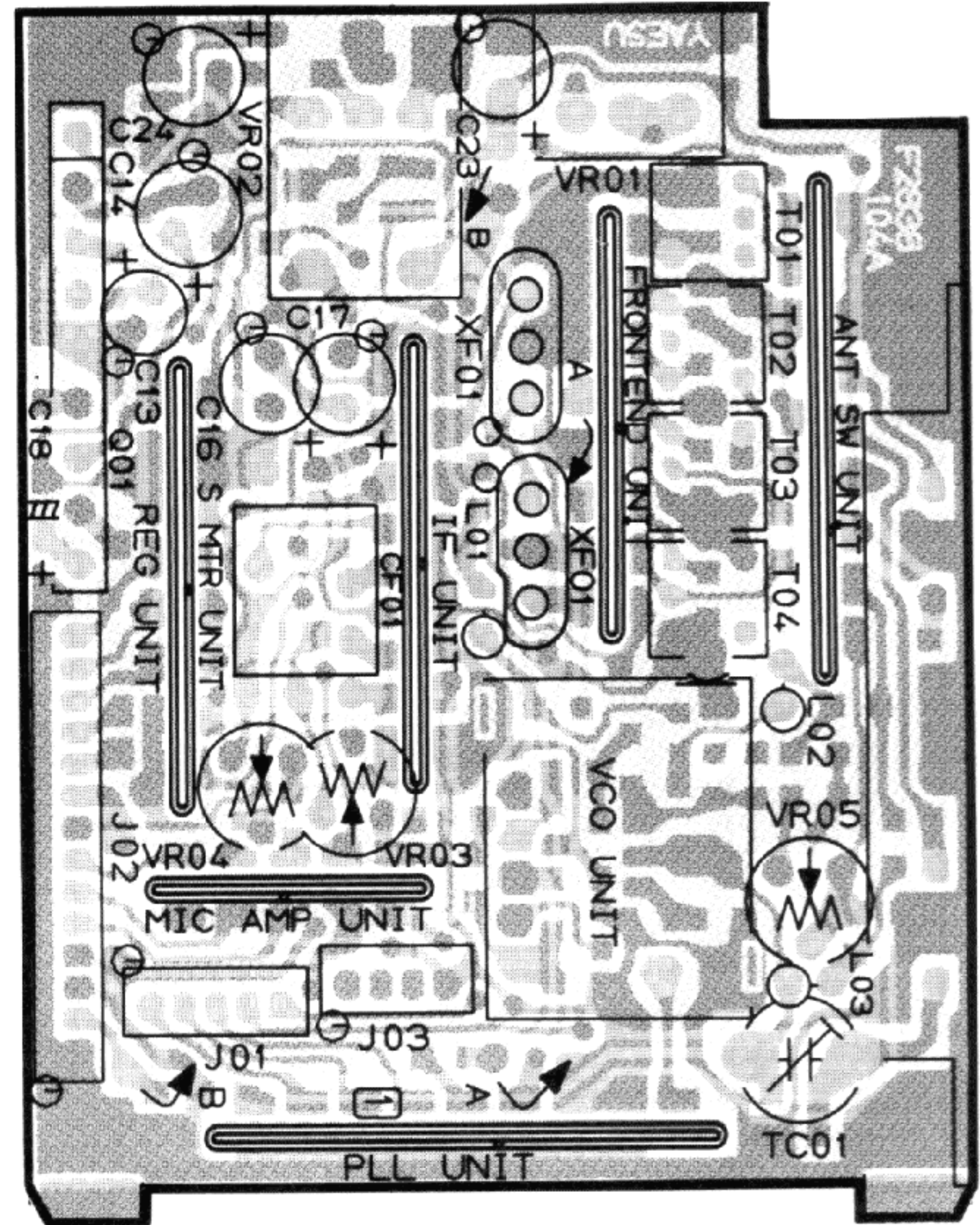


1SS184 (B3) : (D101)

# MOTHER BOARD



(obverse view of "chip-only" side)



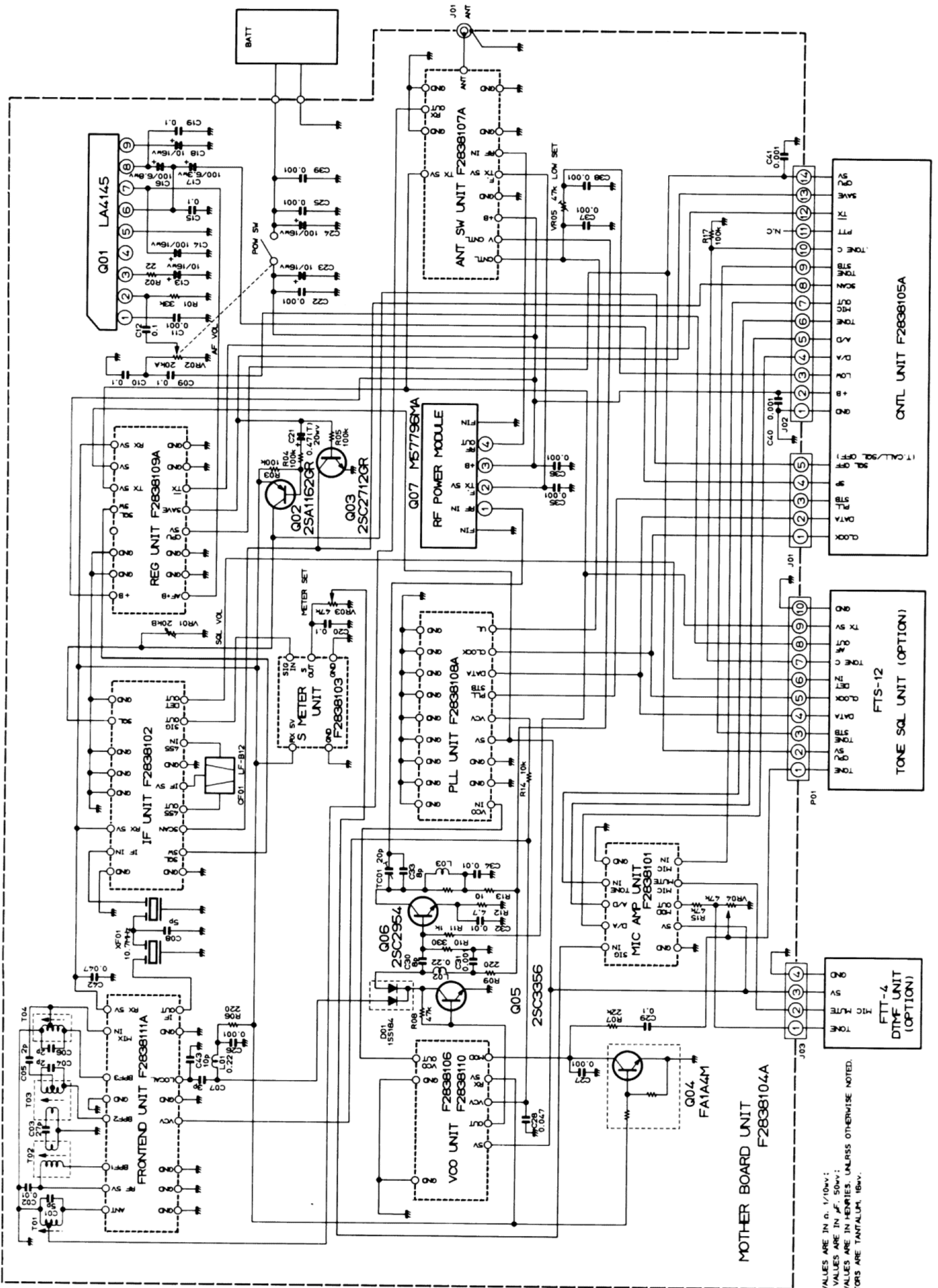
(reverse view of "component" side)

## CHIP SEMICONDUCTOR CROSS-REFERENCE

PART LOCATION NO.	ORIGINAL	REPLACEMENT		
	NOMENCLATURE (MARKING) AND PART NUMBER	NOMENCLATURE (MARKING) AND PART NUMBER		
Q102,605,606,607,1002,1012	2SA1162GR(SG) G3111620G	2SA812F/G(M6/M7) G3108120F/G	2SA1052C/D(MC/MD) G3110520C/D	2SA1179F/G(M6/M7) G3111790F/G
Q103,602,603,608,801,802,902,903,904,1003,1004,1005,1006,1010	2SC2712GR/BL(LG/LL) G3327120G/B	2SC1623F/G(L6/L7) G3316230F/G	2SC2462C/D(LC/LD) G3324620D/D	2SC2812F/G(L6/L7) G3328120F/G
Q701	M5224FP G1090726	LA6324M G1090559		
D1001,1002	1SS181(A3) G2070001	MC2836(A4) G2070024	DCA015TA(A4) G2070014	
D603,1007,1008	1SS184(B3) G2070009	MC2838(A6) G2070018	DCB015TA(A6) G20700021	

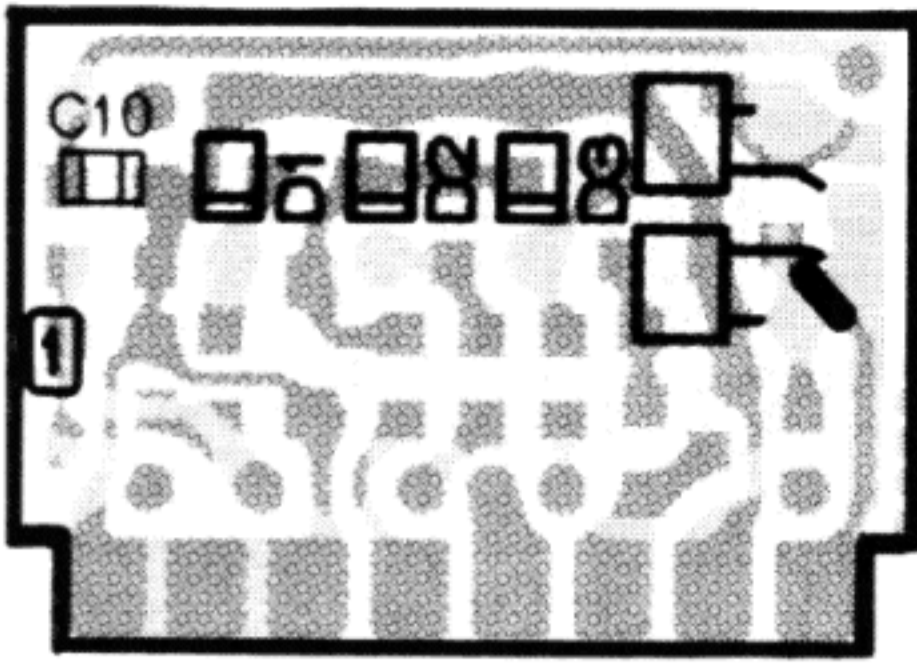
\* Semiconductors not listed above may be replaced only with original types.

# MOTHER BOARD

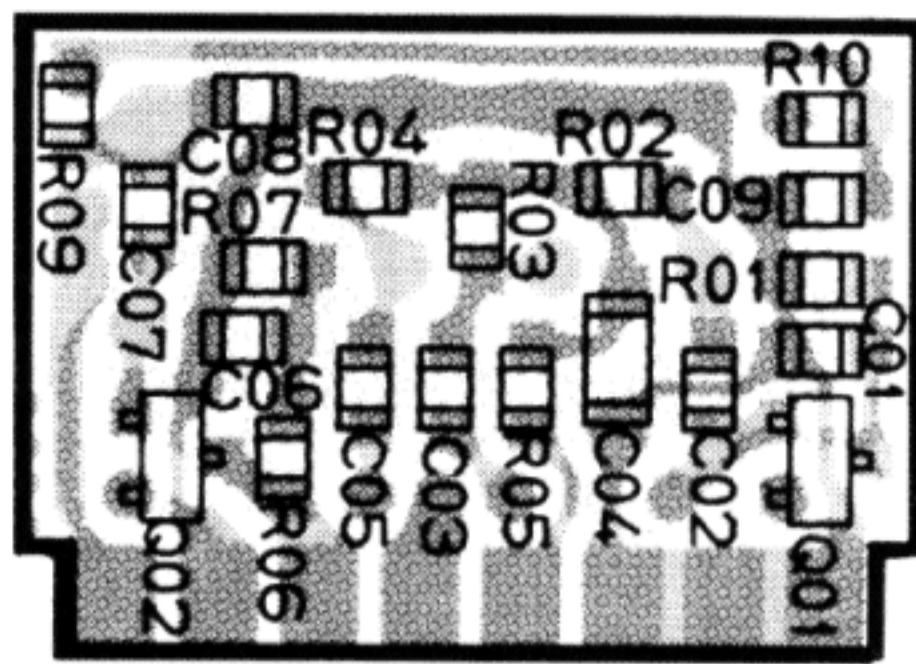


RESISTOR VALUES ARE IN  $\Omega$ , 1/10 $\Omega$ ,  
 CAPACITOR VALUES ARE IN  $\mu$ F, 50 $\mu$ V;  
 INDUCTOR VALUES ARE IN HENRIES, UNLESS OTHERWISE NOTED.  
 (T) CAPACITORS ARE TANTALUM, 16 $\mu$ V.

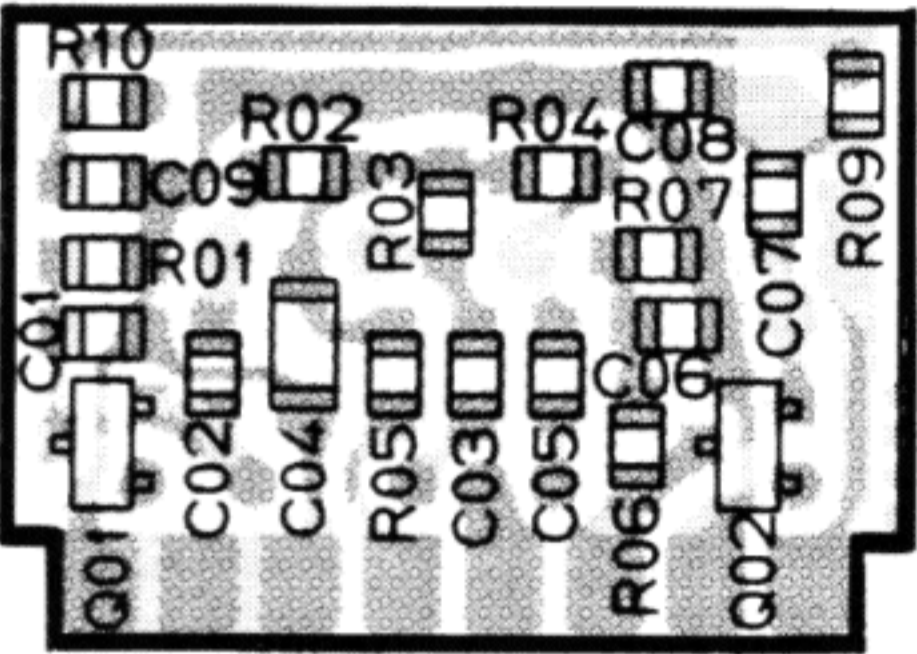
# FRONTEND UNIT



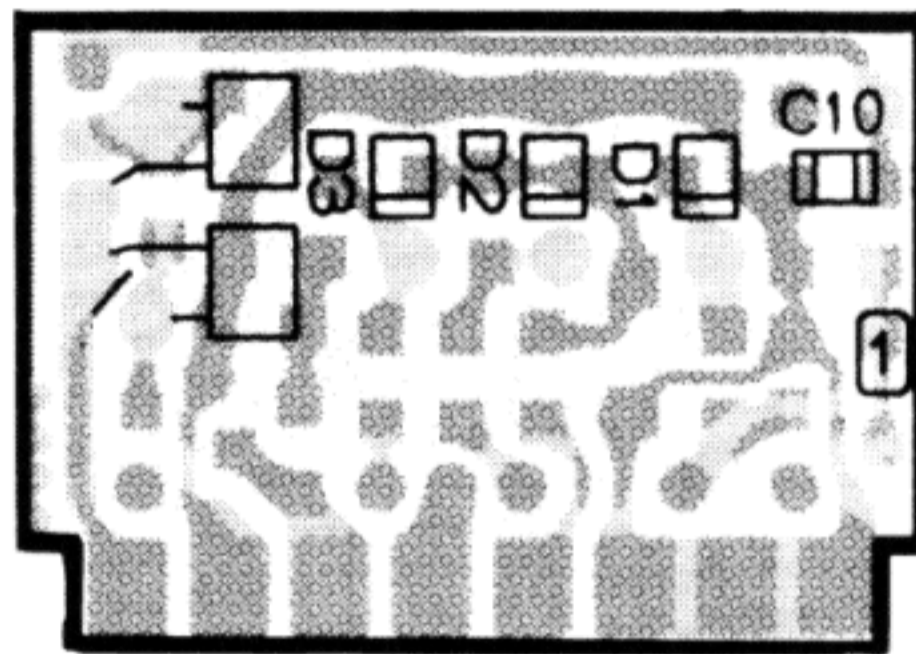
(obverse view of "diode" side)



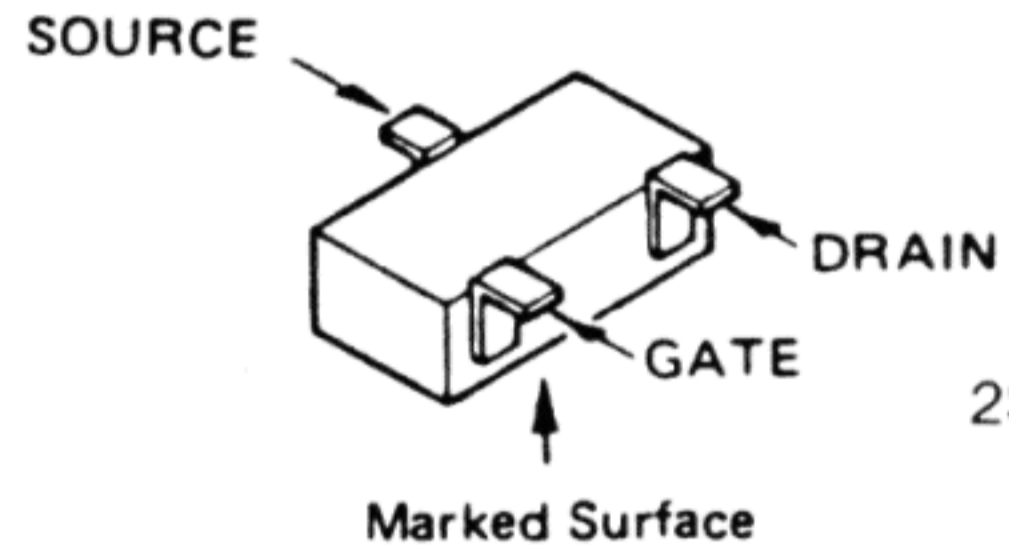
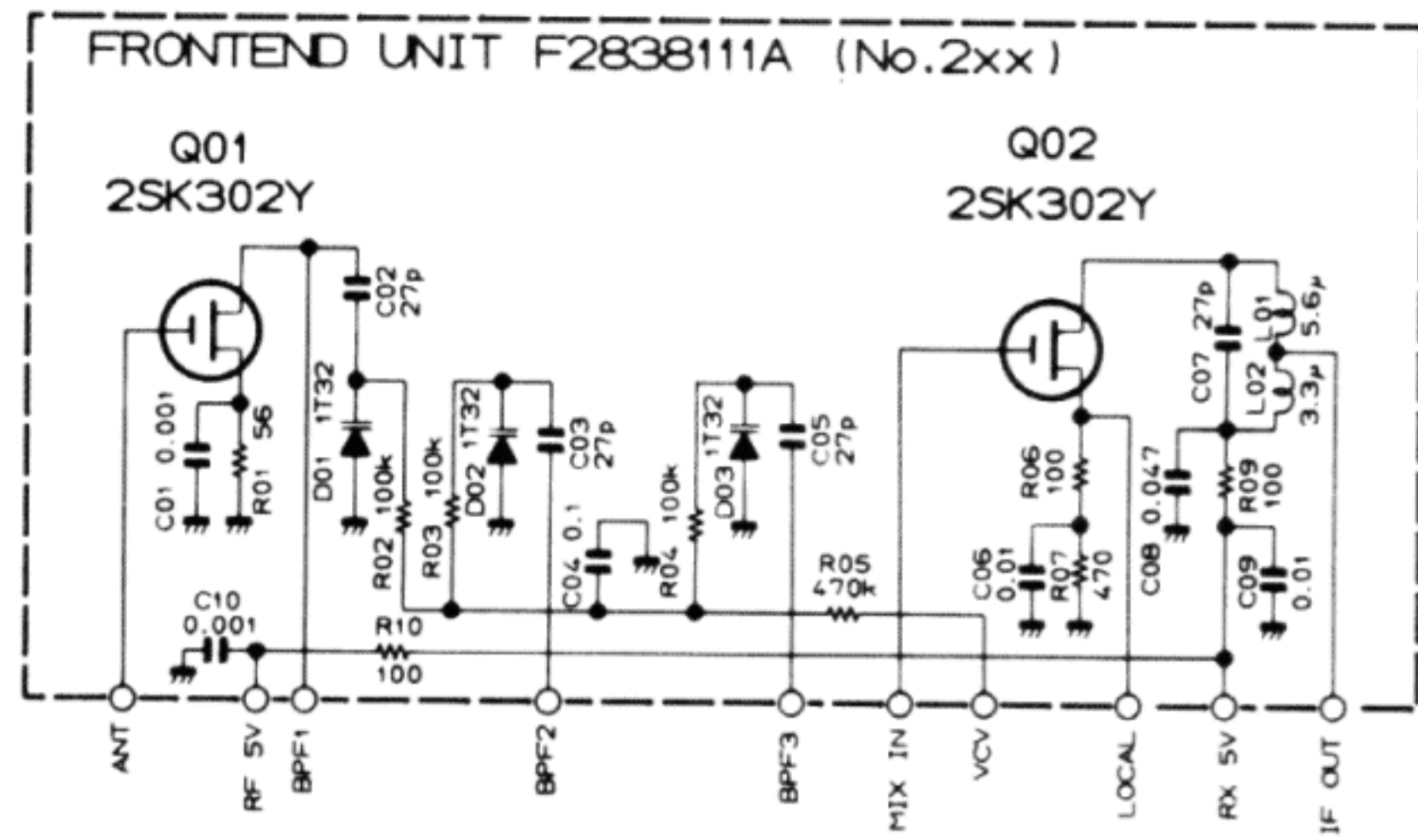
(obverse view of "FET" side)



(reverse view of "FET" side)

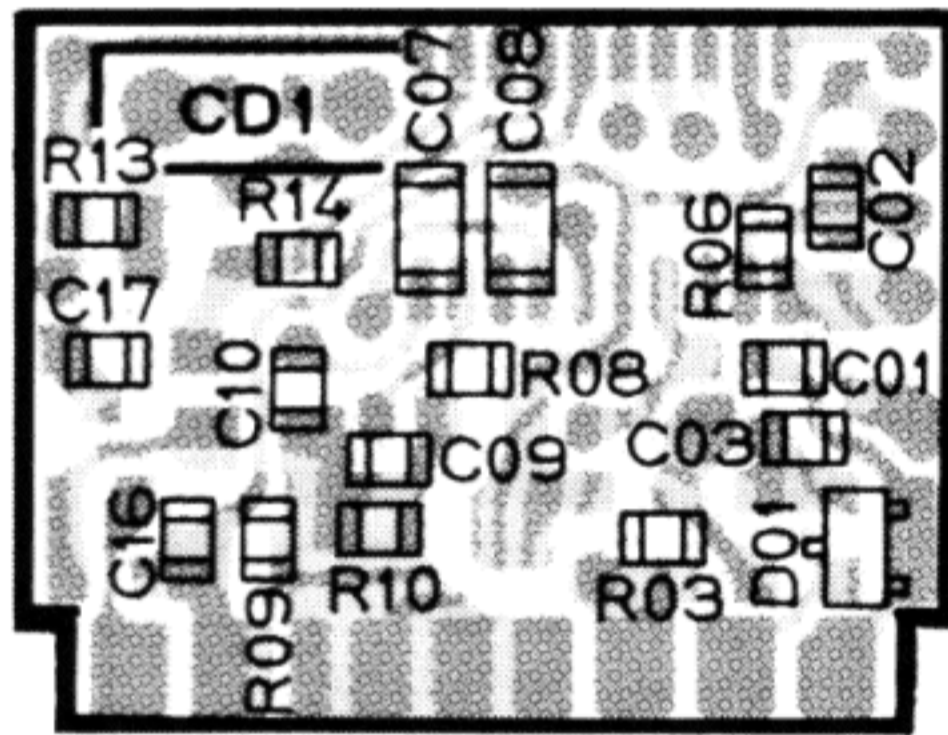


(reverse view of "diode" side)

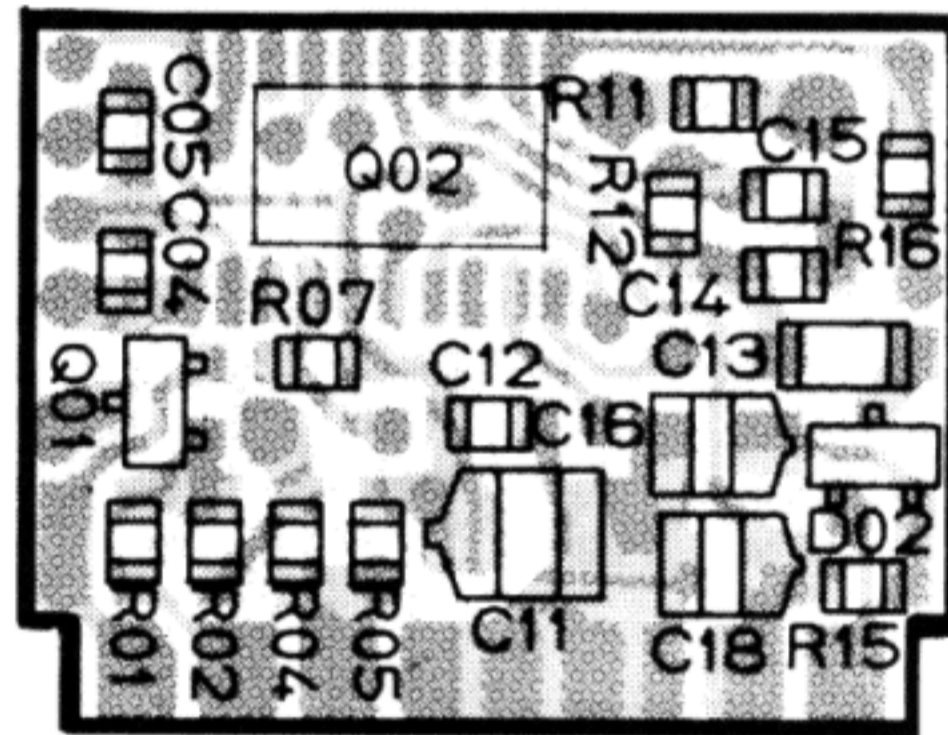


2SK302Y (TY)  
(Q201,202)

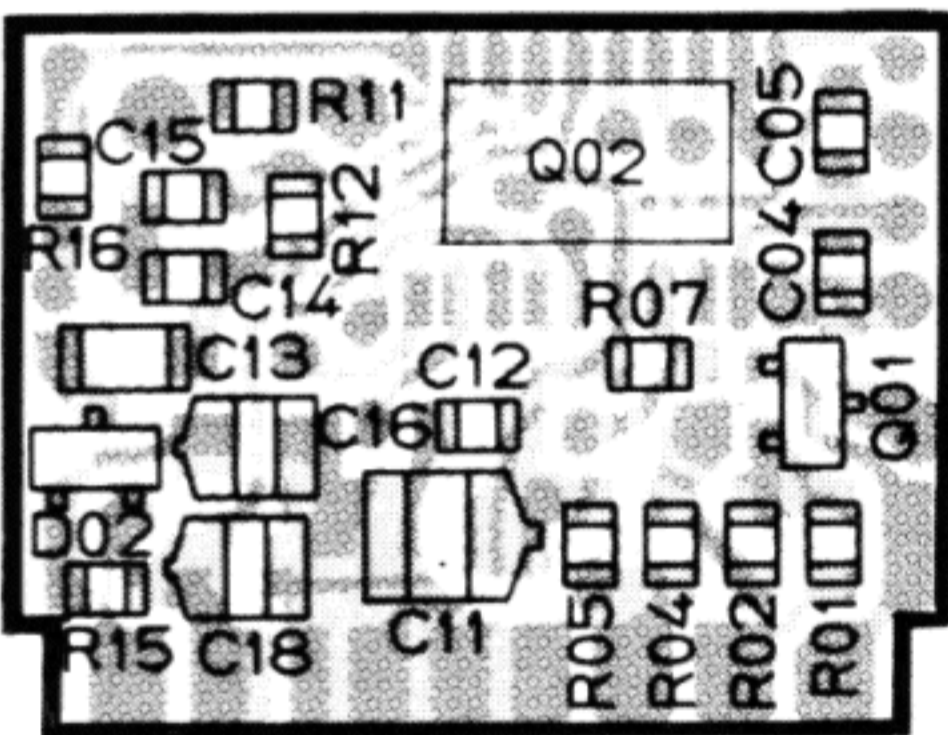
# IF UNIT



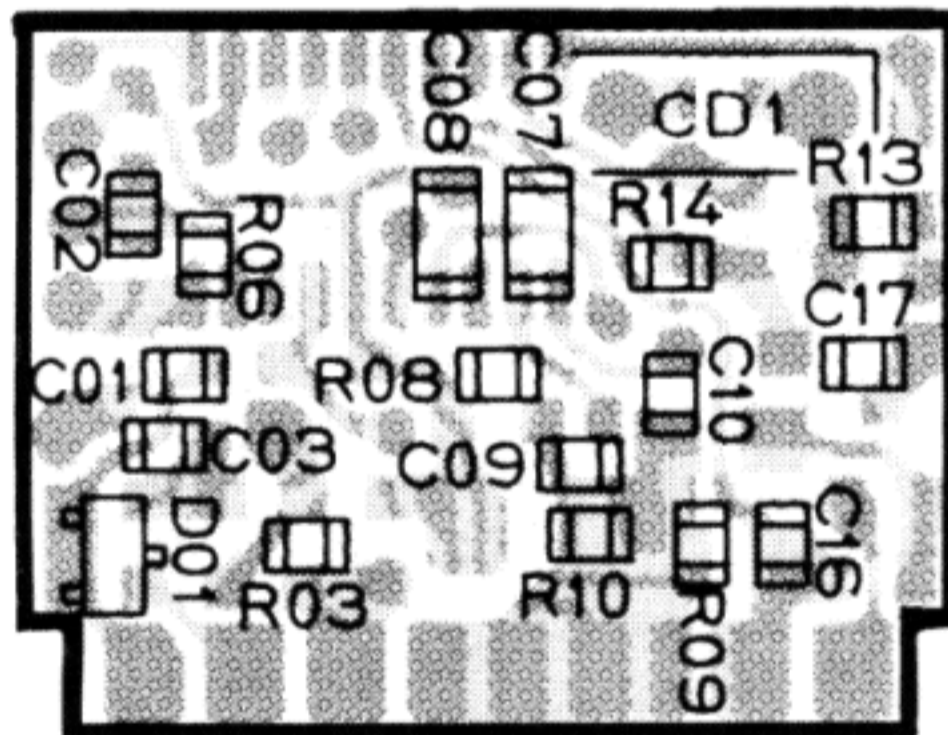
(obverse view of "mixed-component" side)



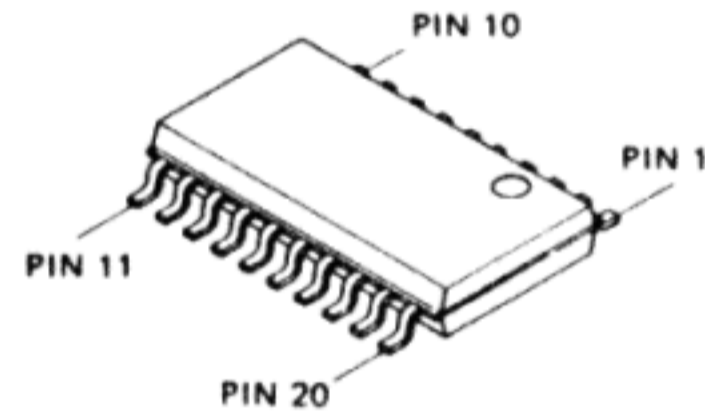
(obverse view of "chip-only" side)



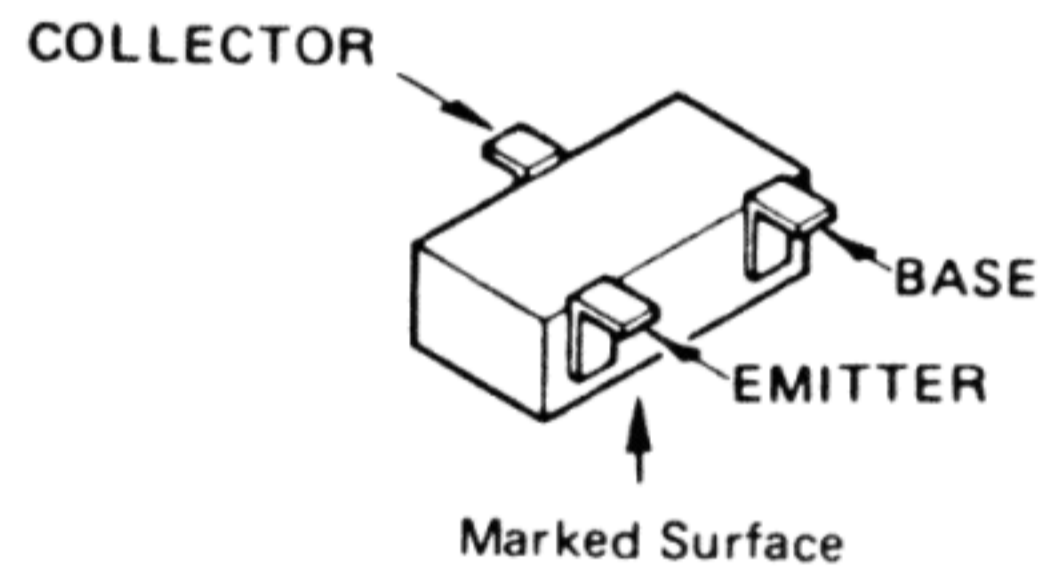
(reverse view of "chip-only" side)



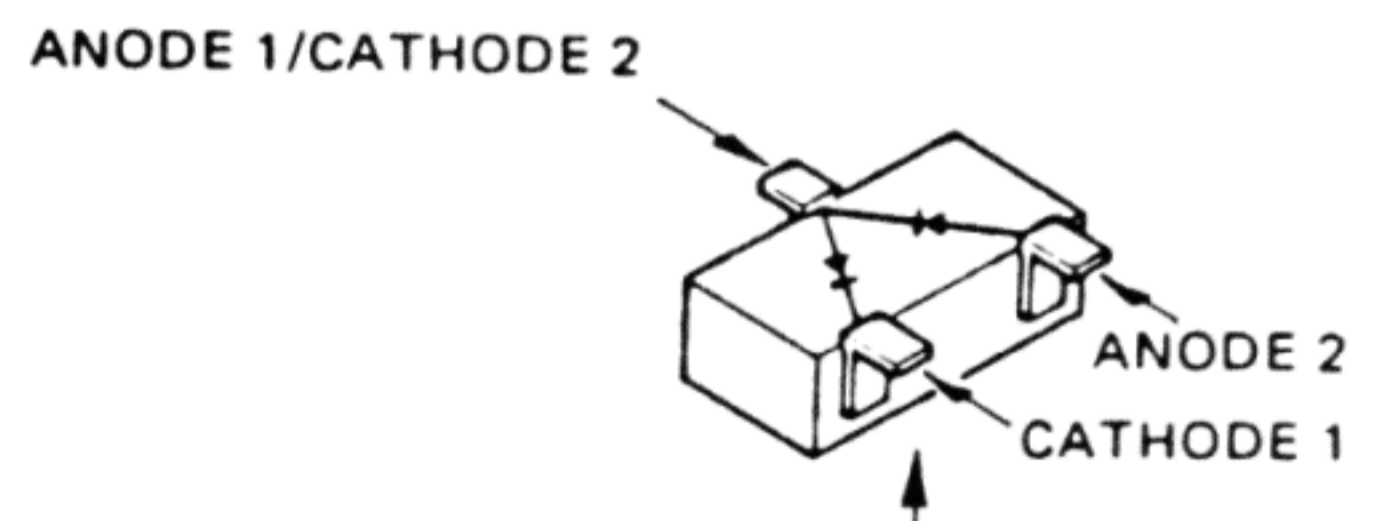
(reverse view of "mixed-component" side)



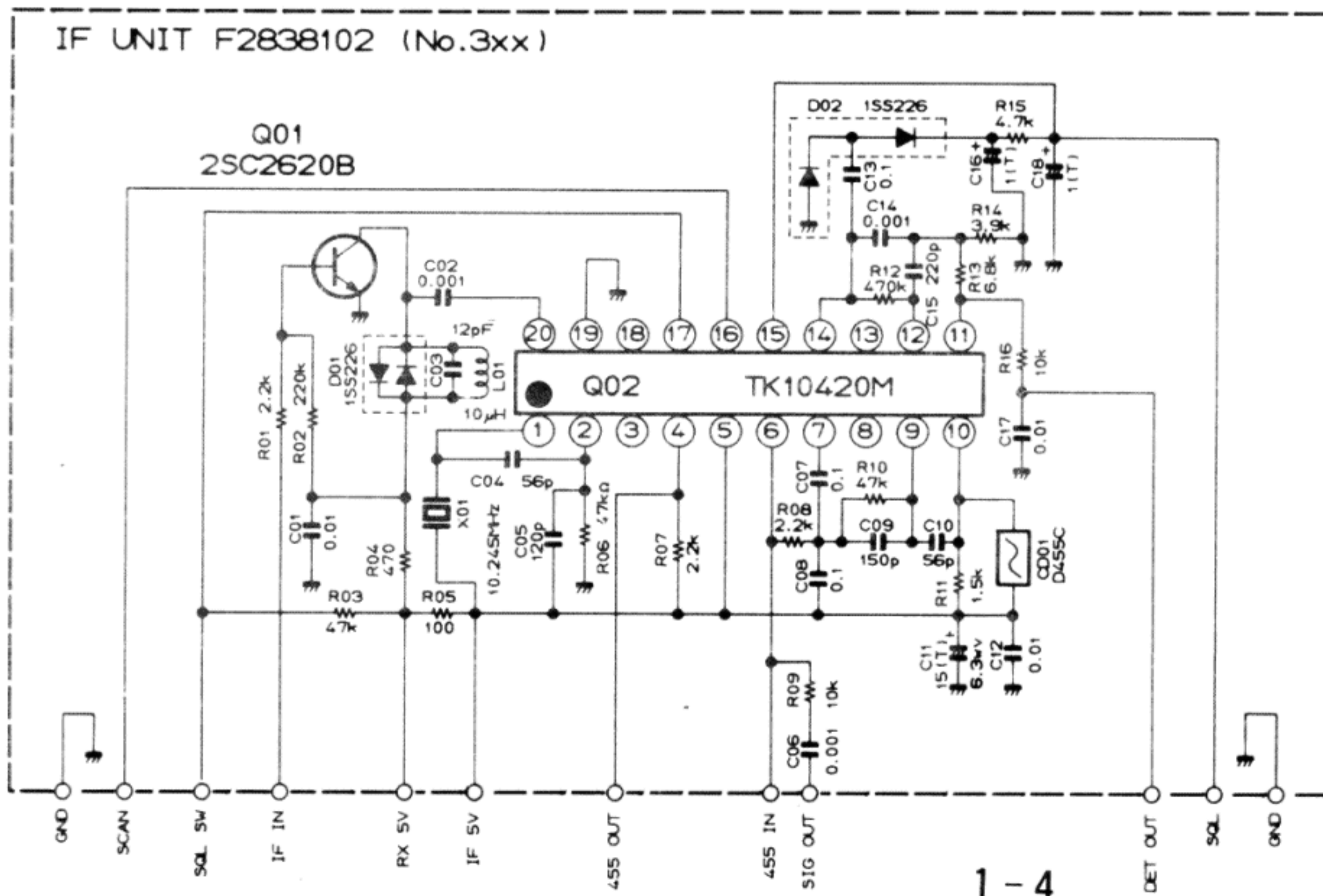
TK10420M (Q302)



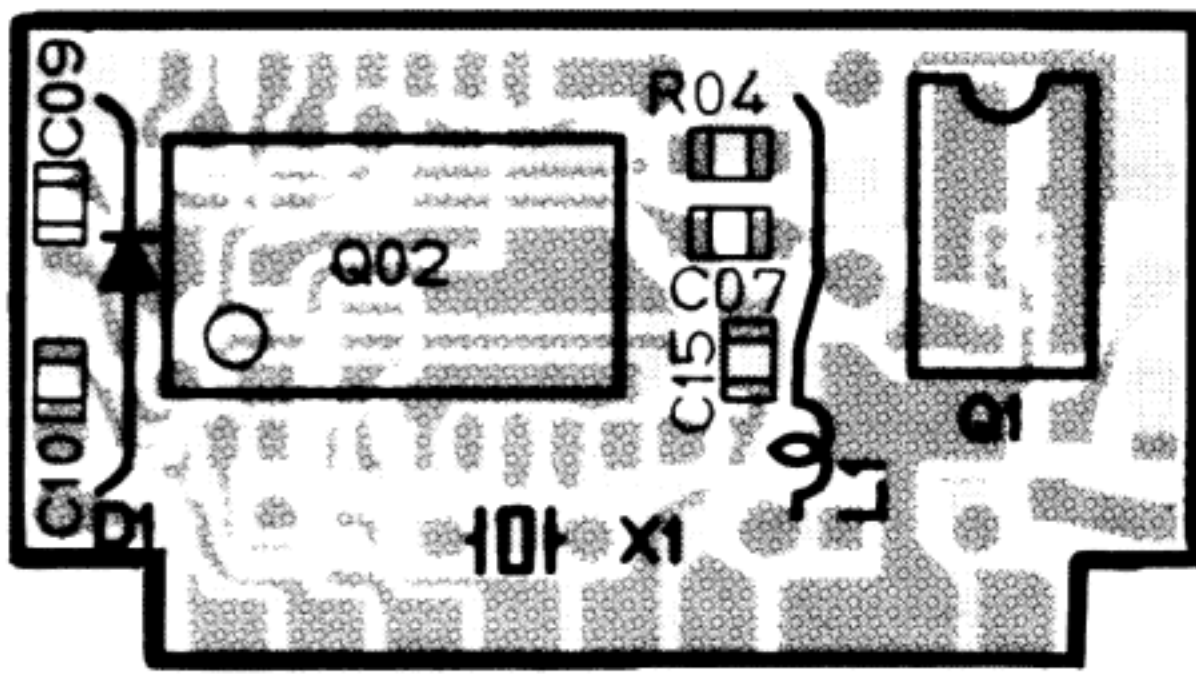
2SC2620B (QB)  
(Q301)



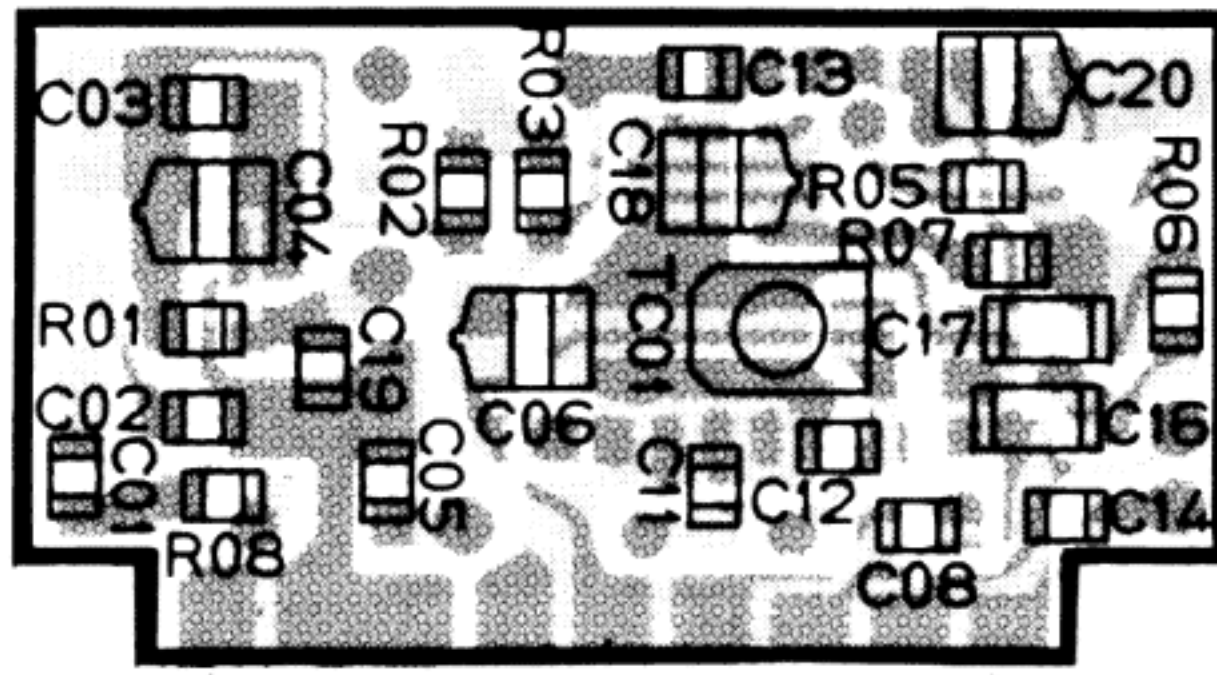
1S5226 (C3)  
(D301,302)



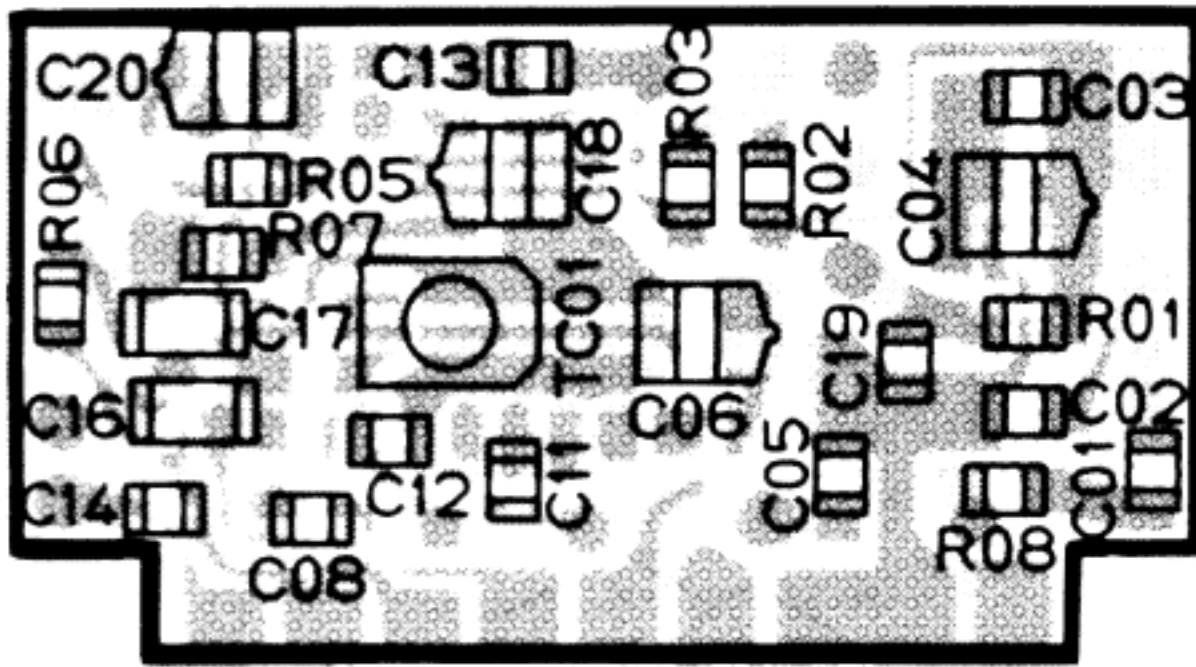
# PLL UNIT



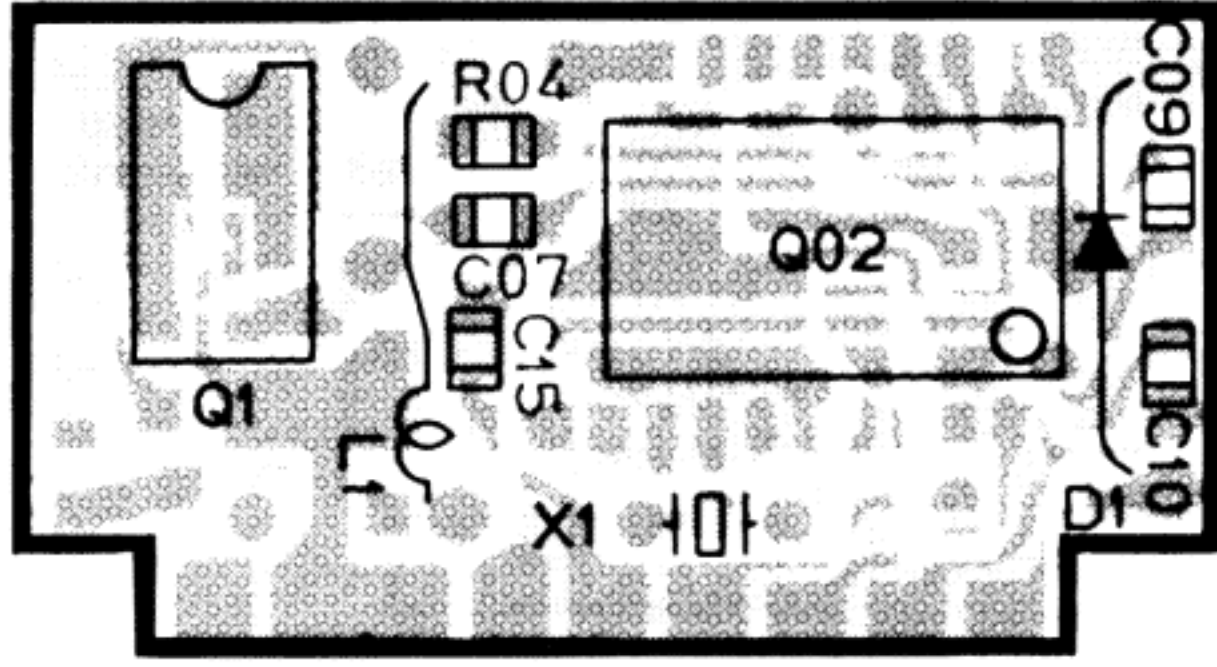
(obverse view of "mixed-component" side)



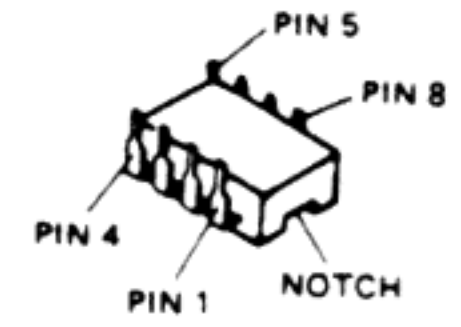
(obverse view of "chip-only" side)



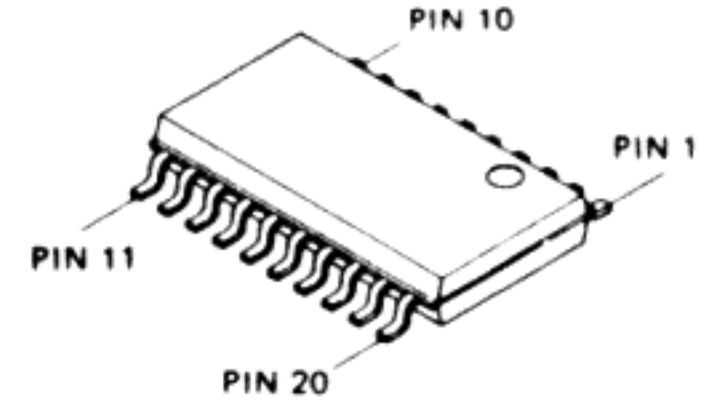
(reverse view of "chip-only" side)



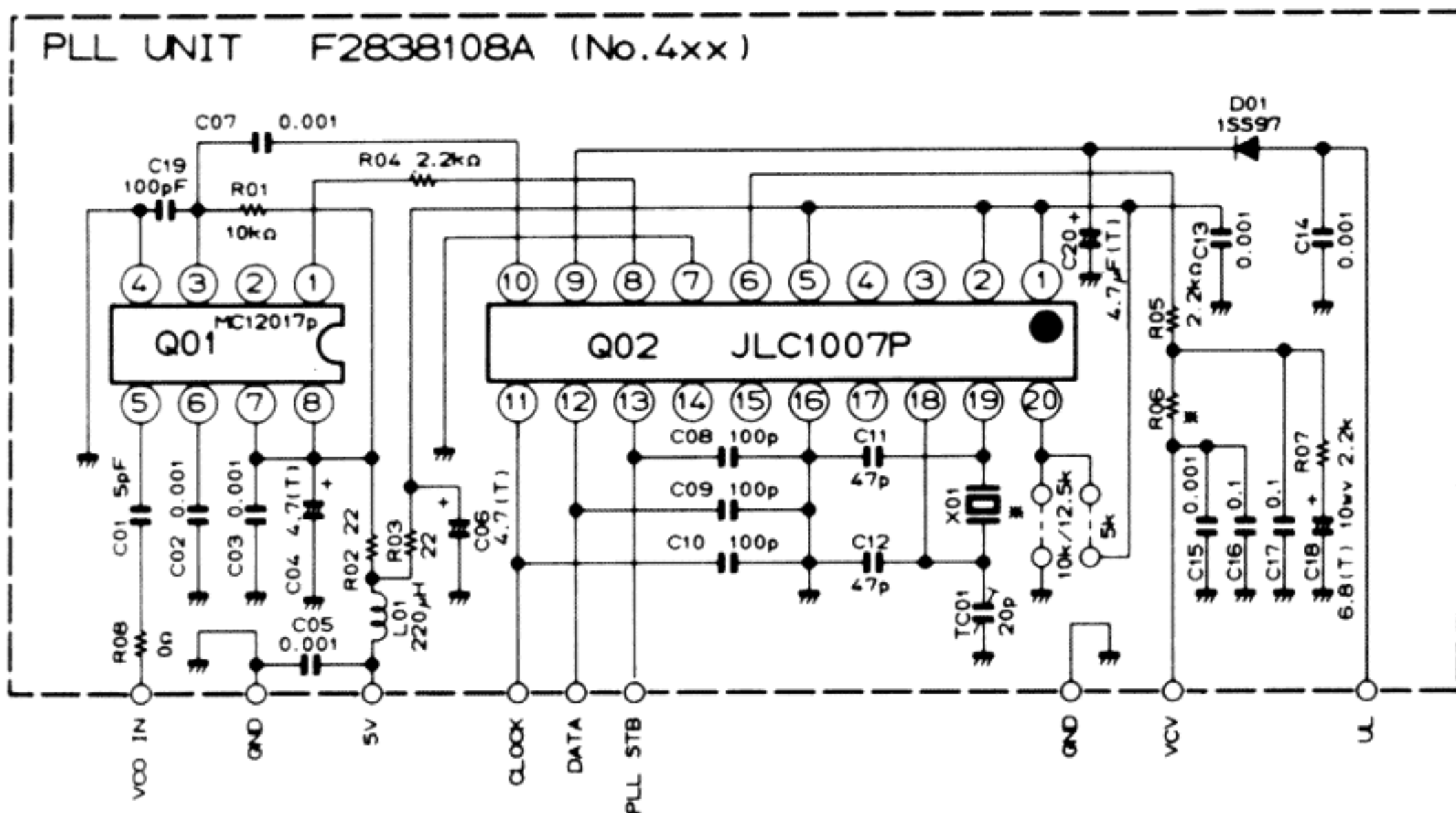
(reverse view of "mixed-component" side)



MC12017P (Q401)



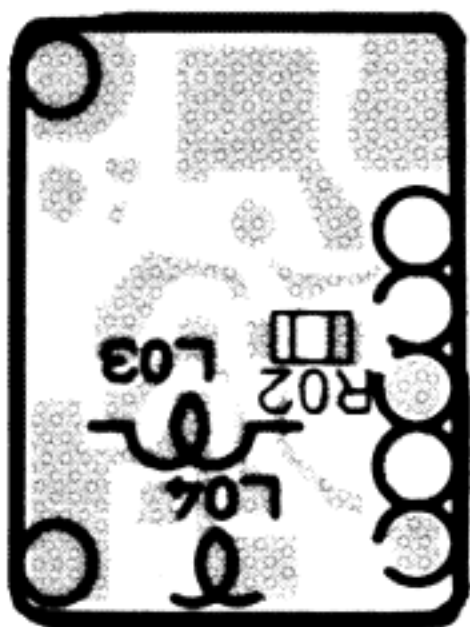
JLC1007P (Q402)



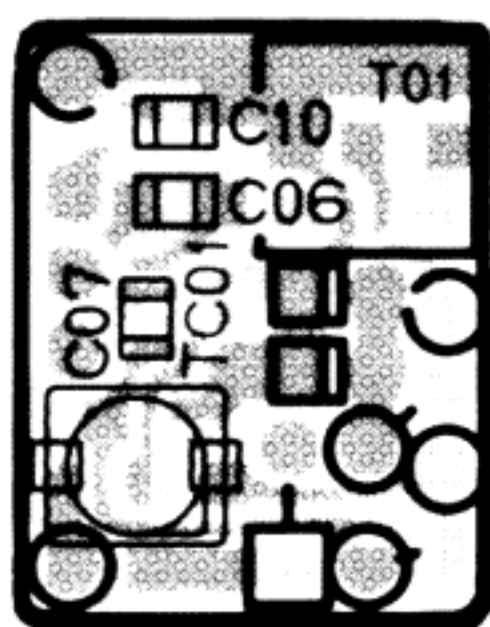
R06	15k $\Omega$ = 5kHz
	10k $\Omega$ = 10kHz STEP
	4.7k $\Omega$ = 12.5kHz STEP
X01	10.24kHz = 5kHz STEP
	12.8kHz = 12.5kHz STEP

RESISTOR VALUES ARE IN  $\Omega$ , 1/10W;  
CAPACITOR VALUES ARE IN  $\mu$ F, 50V;  
INDUCTOR VALUES ARE IN HENRIES, UNLESS OTHERWISE NOTED.  
(T)CAPACITORS ARE TANTALUM, 6.3V.

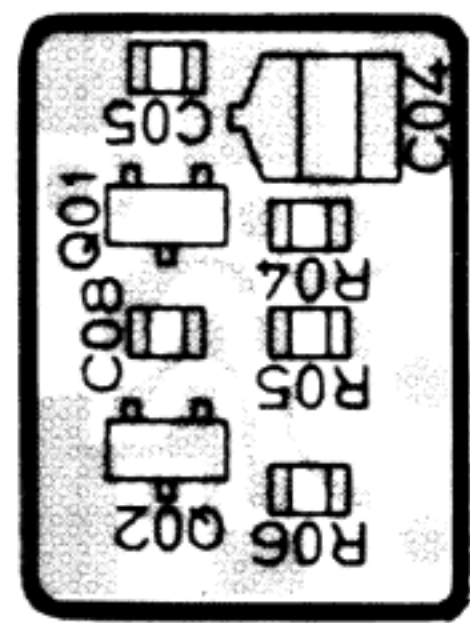
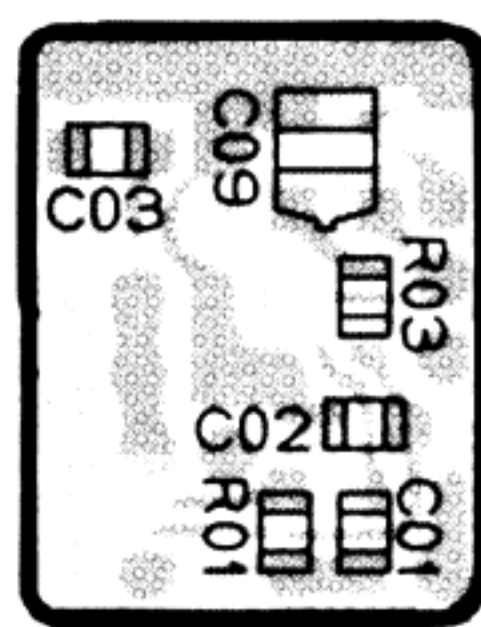
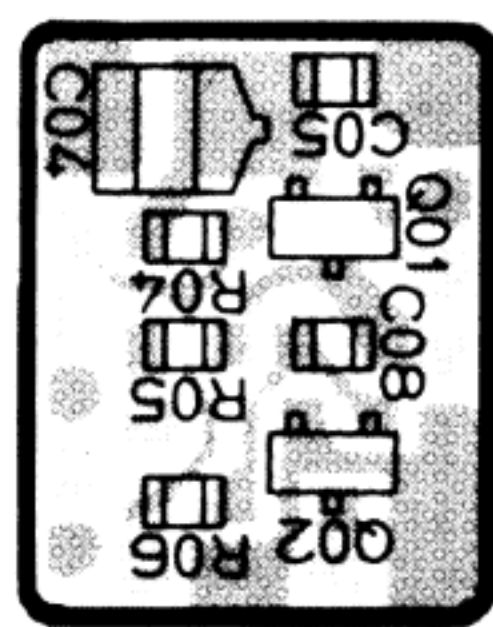
# VCO UNIT



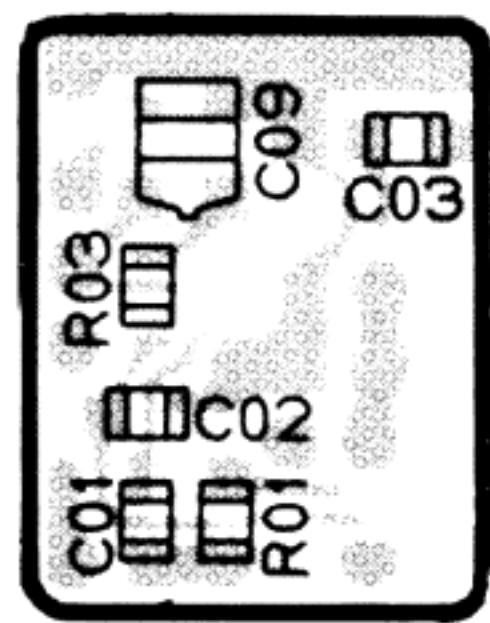
(obverse view of "mixed-component" side)



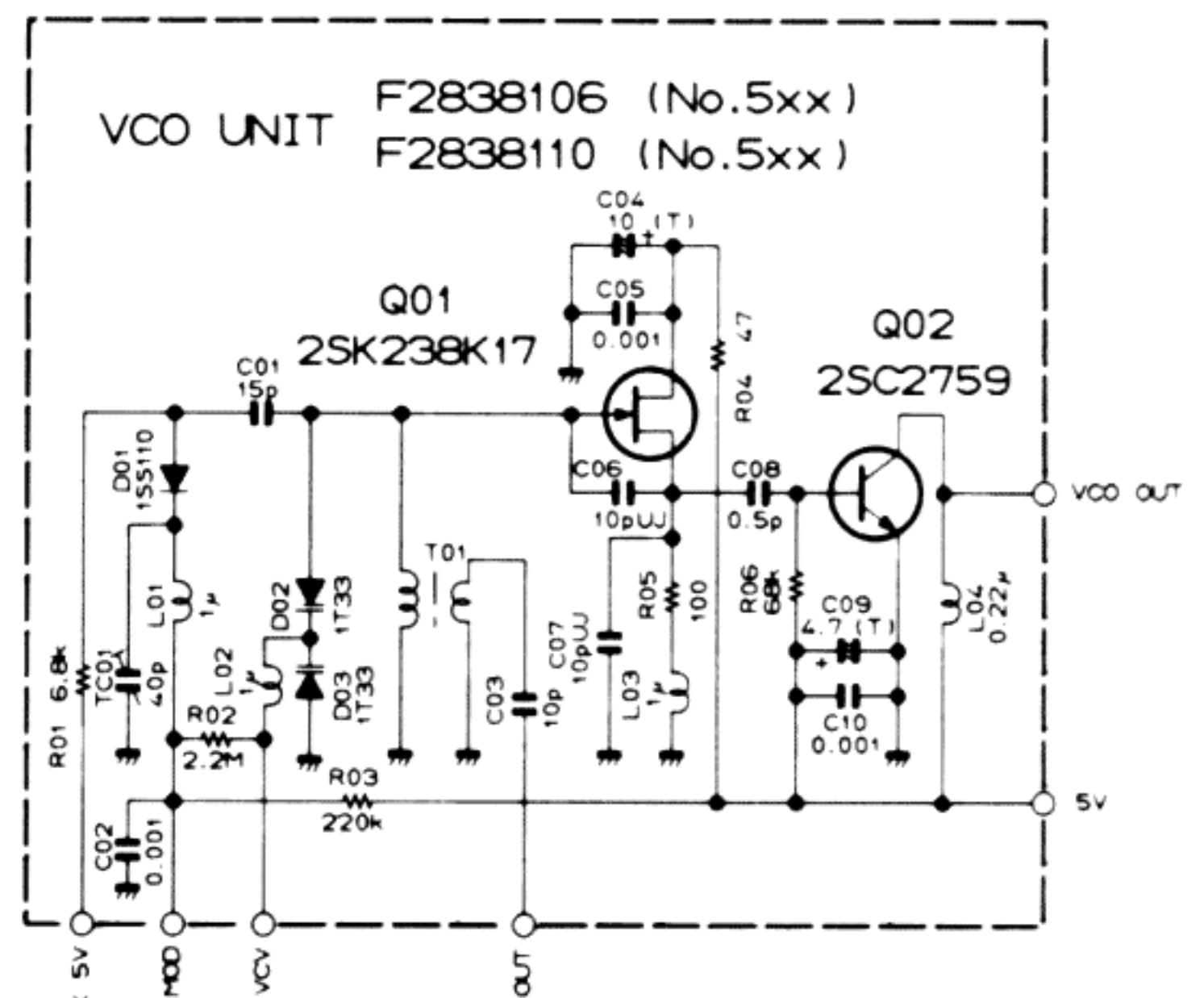
(obverse view of "chip-only" side)



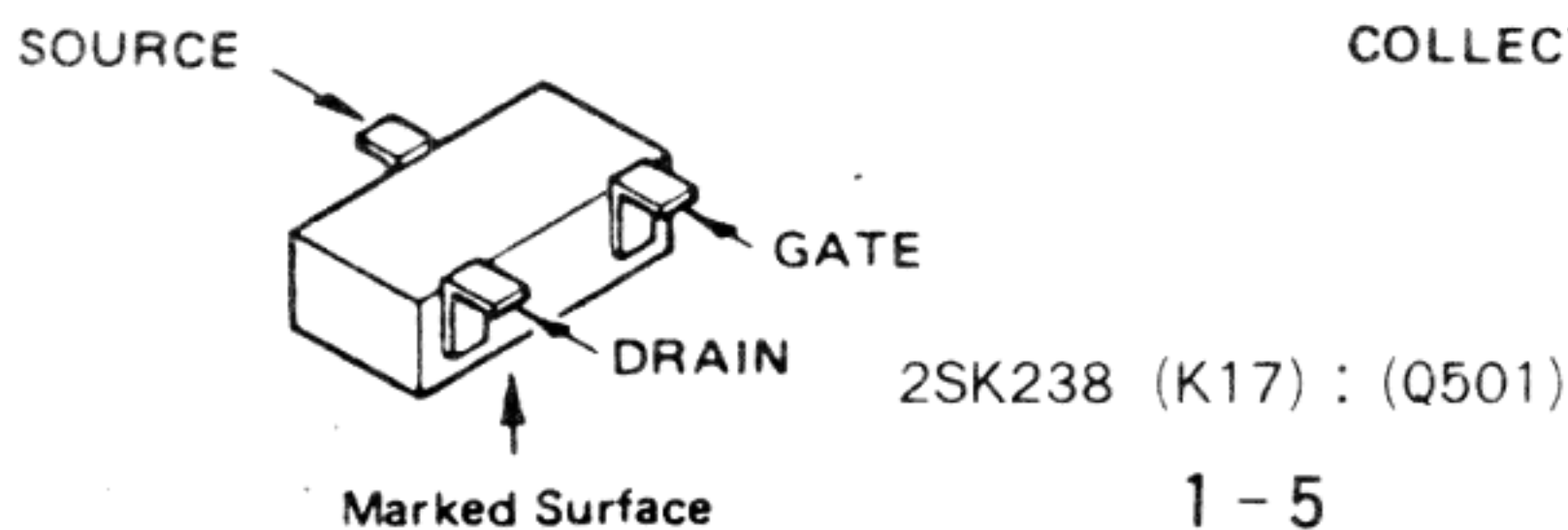
(reverse view of "chip-only" side)



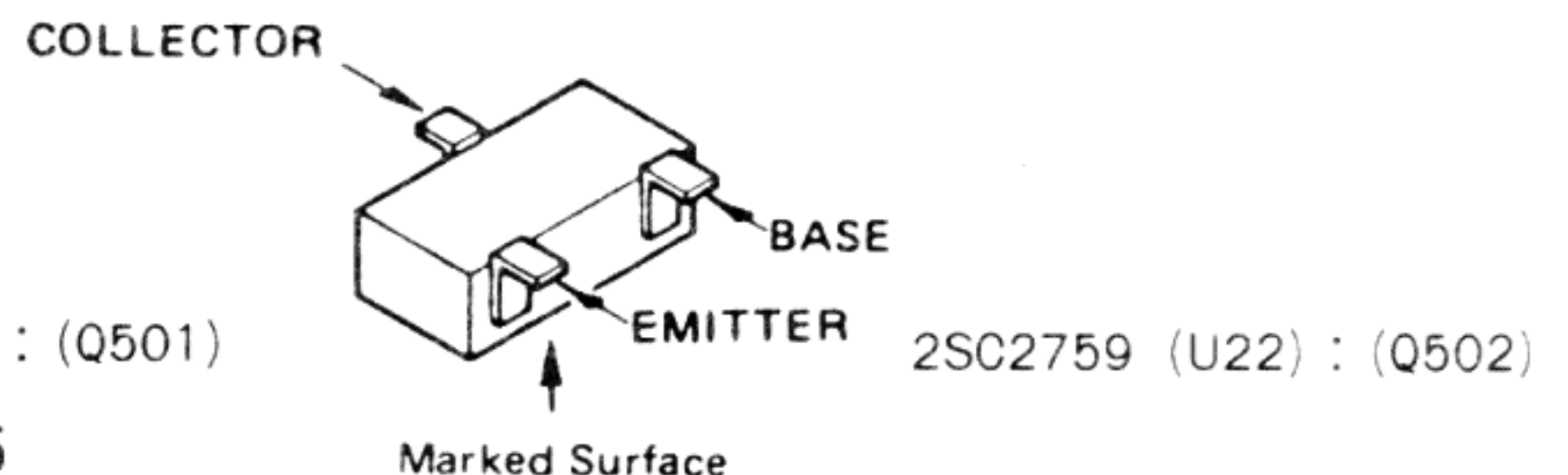
(reverse view of "mixed-component" side)



RESISTOR VALUES ARE IN  $\Omega$ , 1/10W;  
CAPACITOR VALUES ARE IN  $\mu$ F, 50V;  
UNLESS OTHERWISE NOTED.  
(T)CAPACITORS ARE TANTALUM, 6.3V.

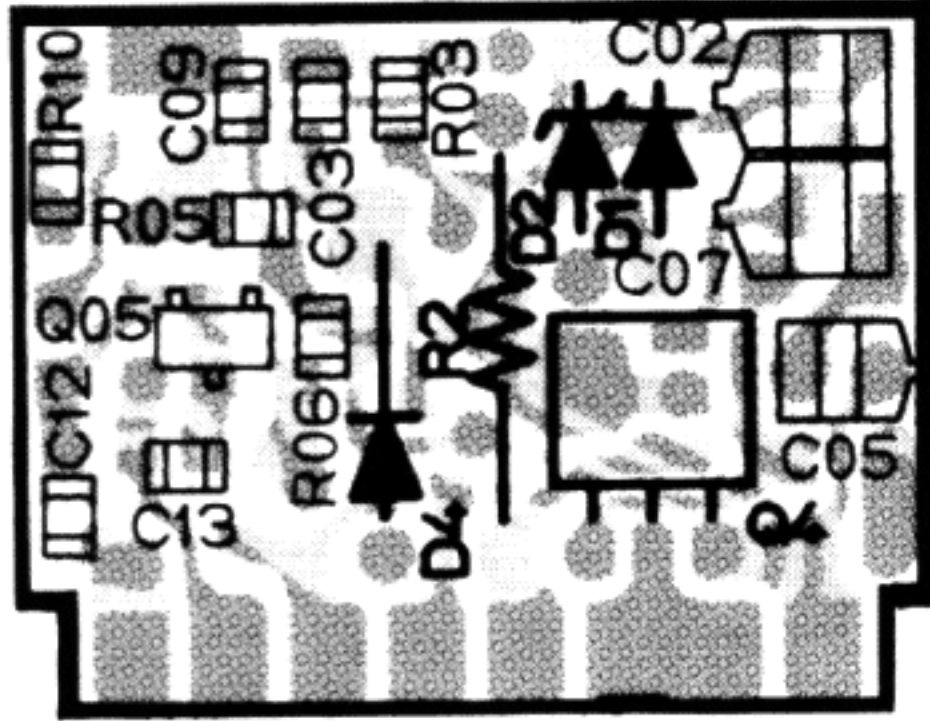


1 - 5

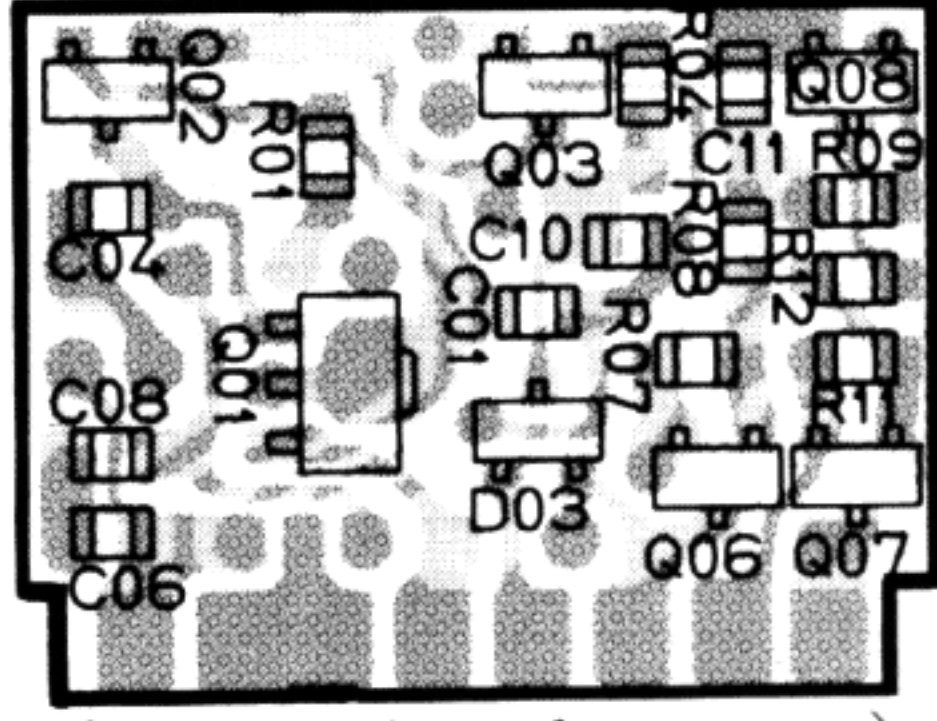




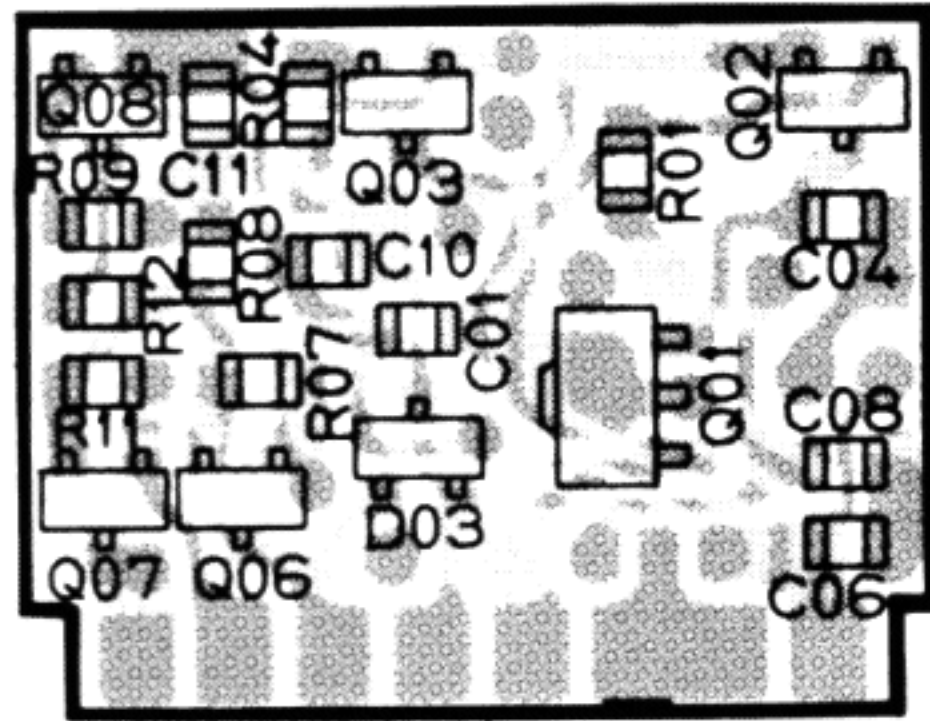
# REG UNIT



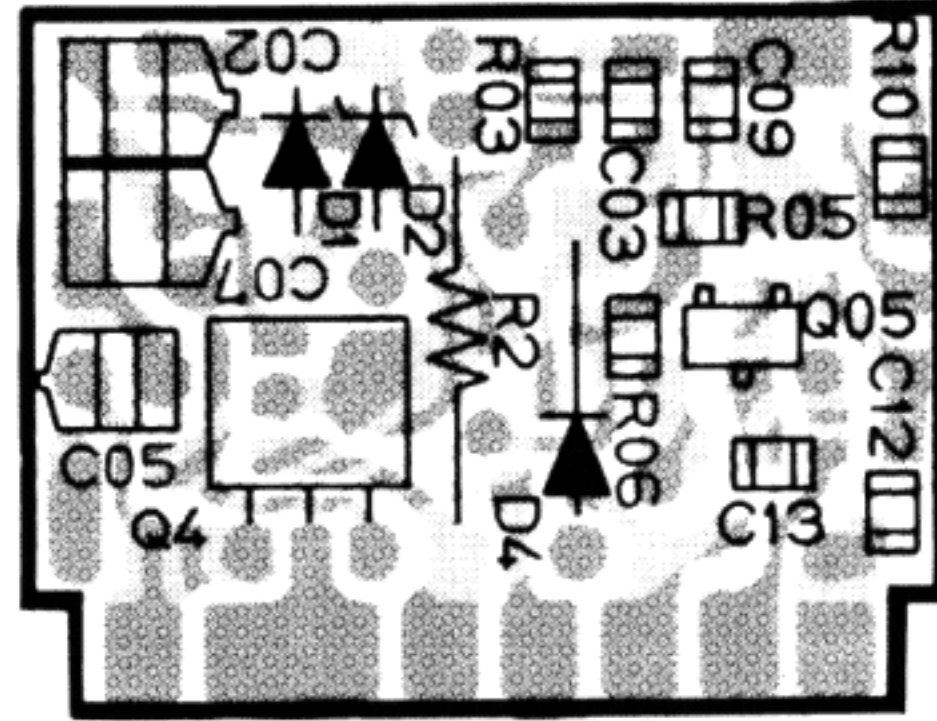
(obverse view of "mixed-component" side)



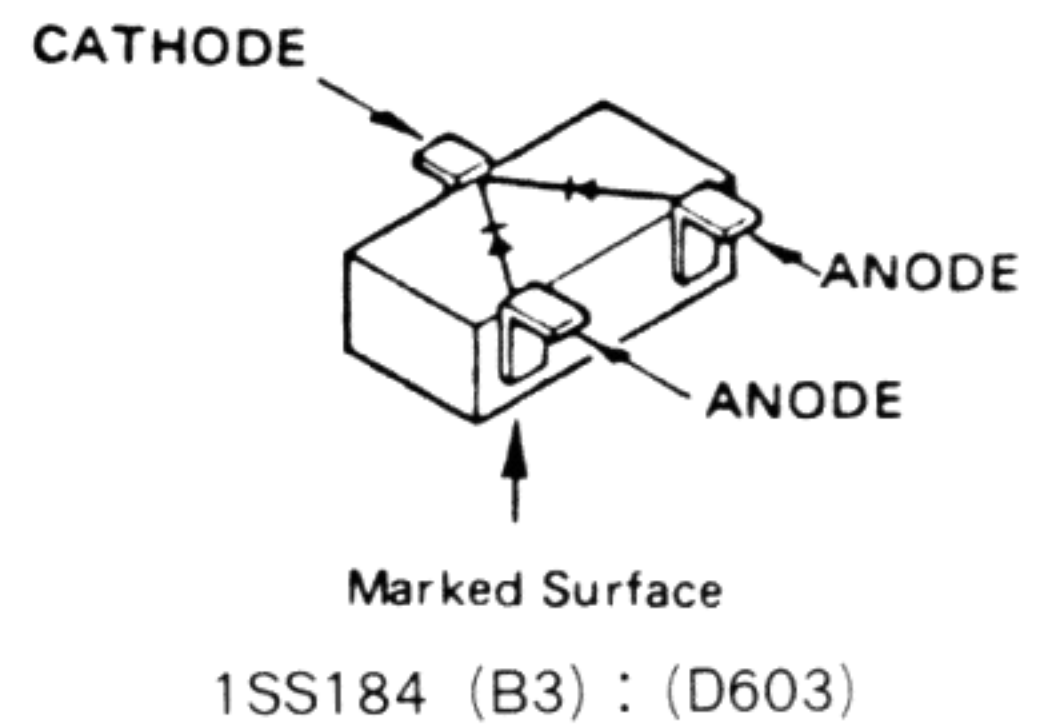
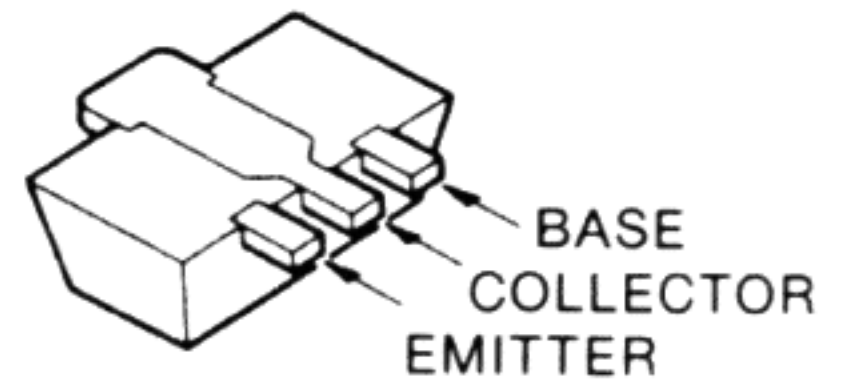
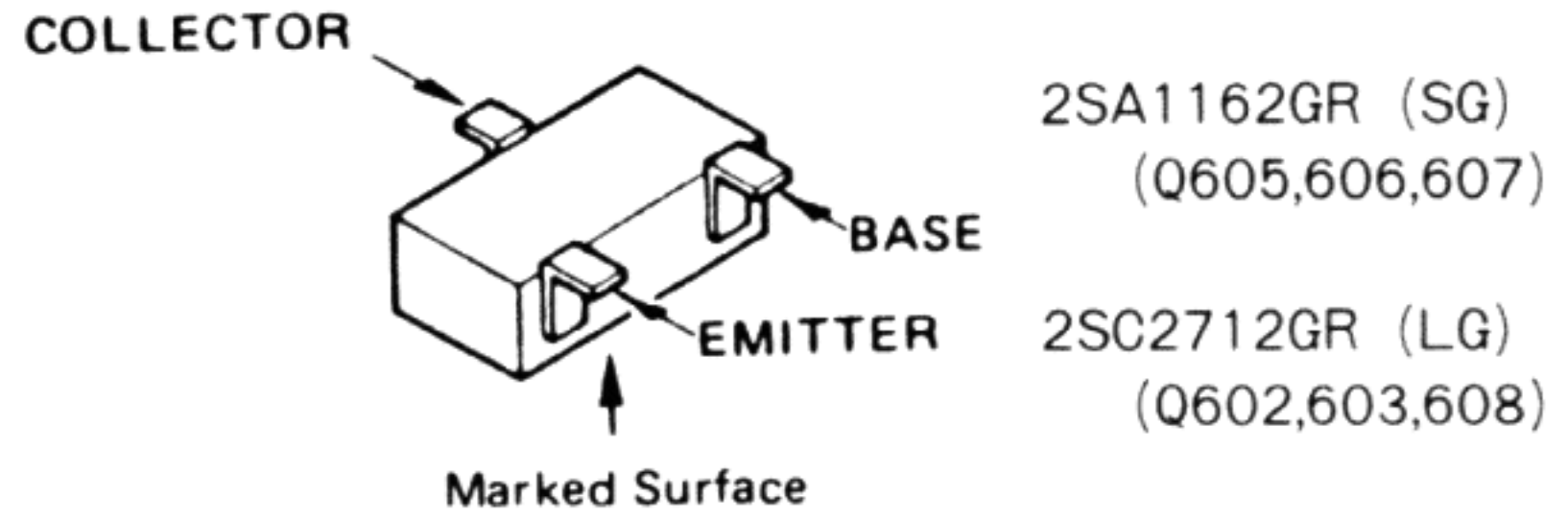
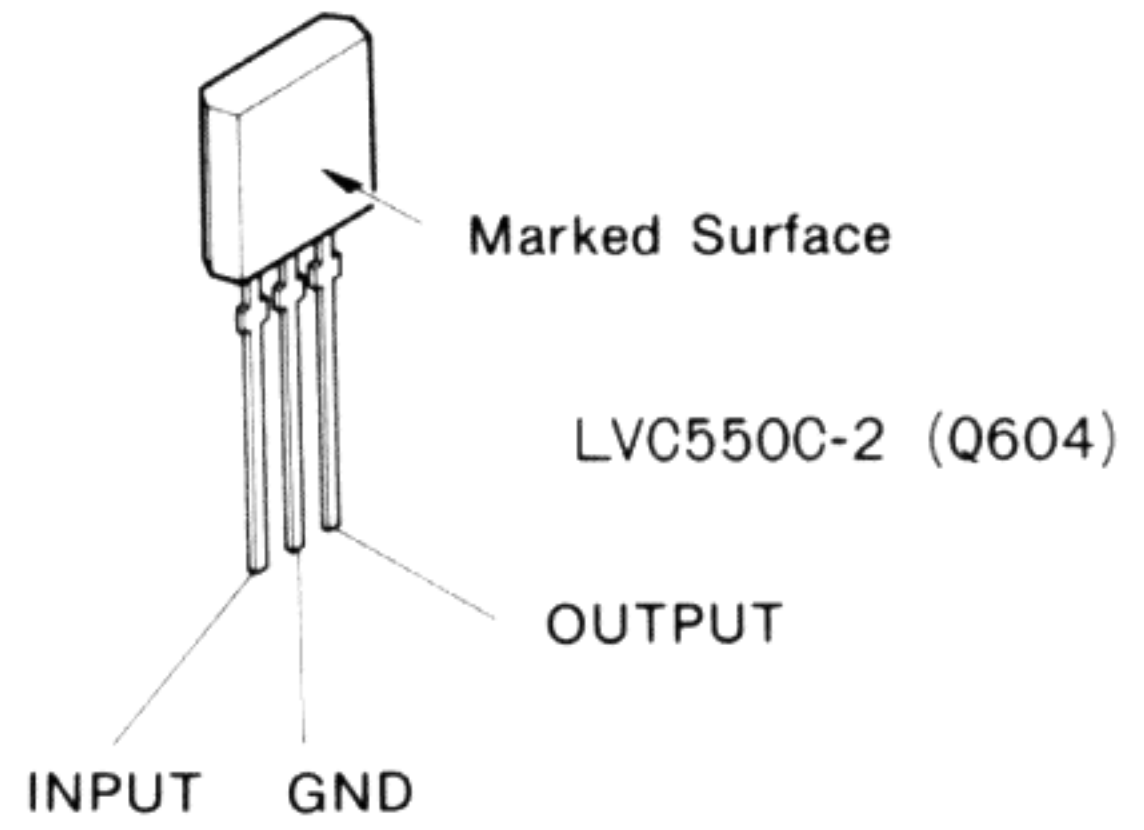
(obverse view of "chip-only" side)



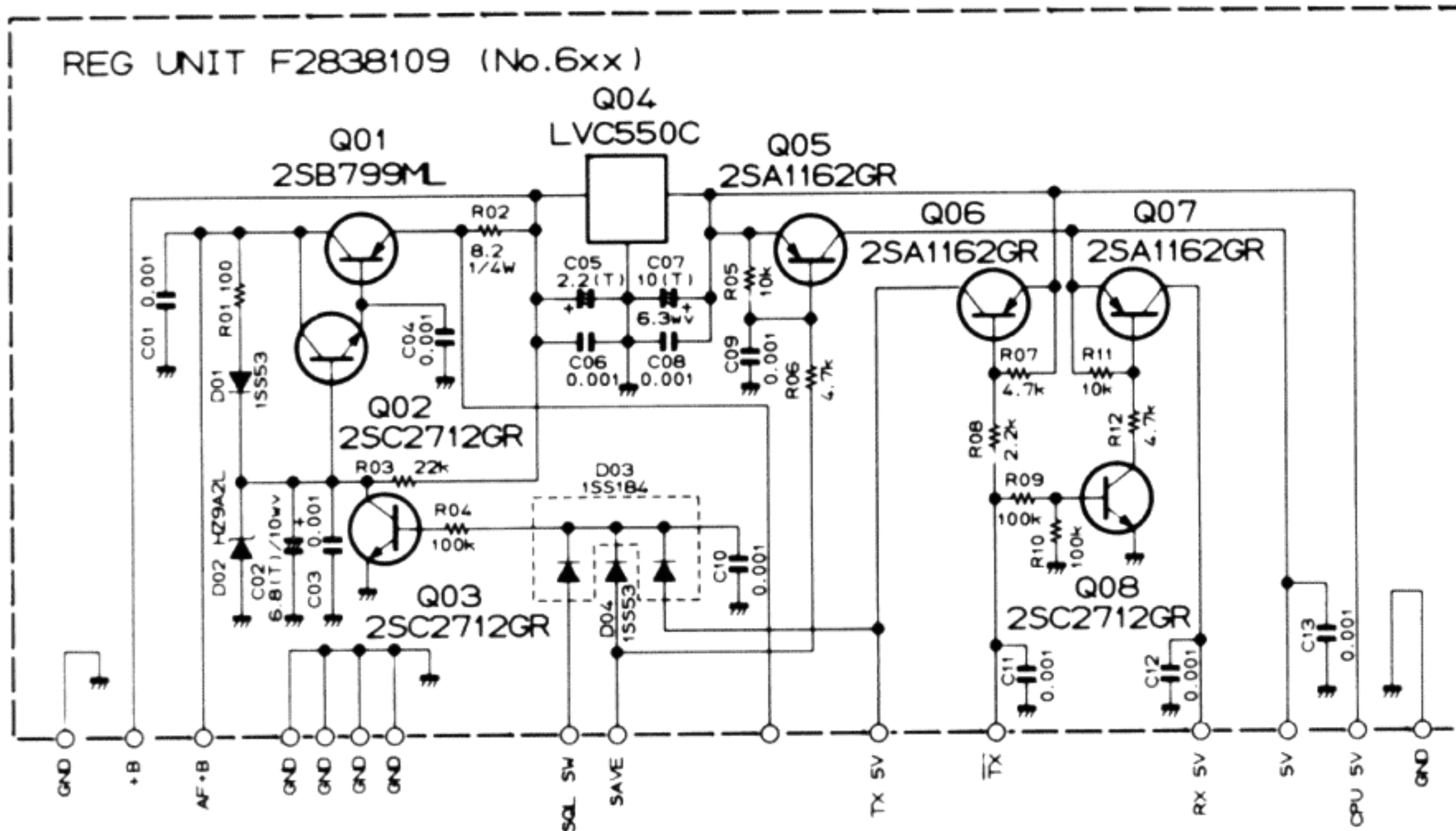
(reverse view of "chip-only" side)



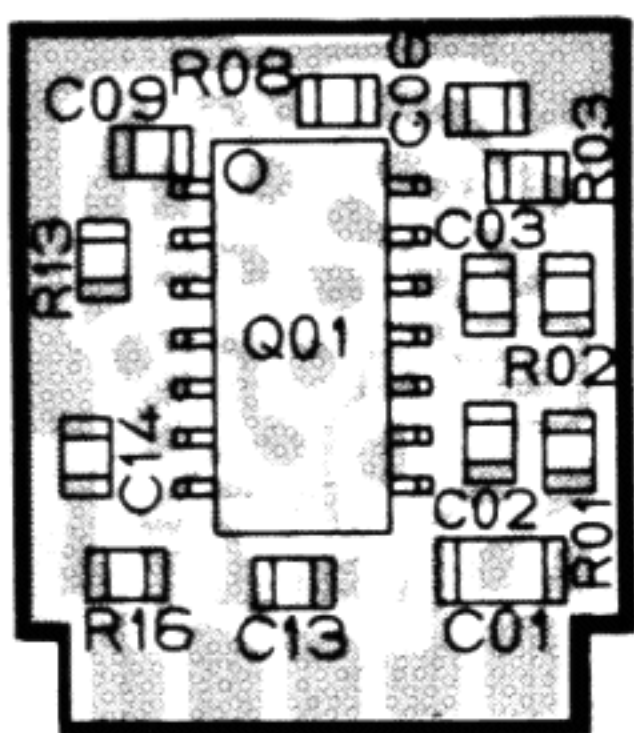
(reverse view of "mixed-component" side)



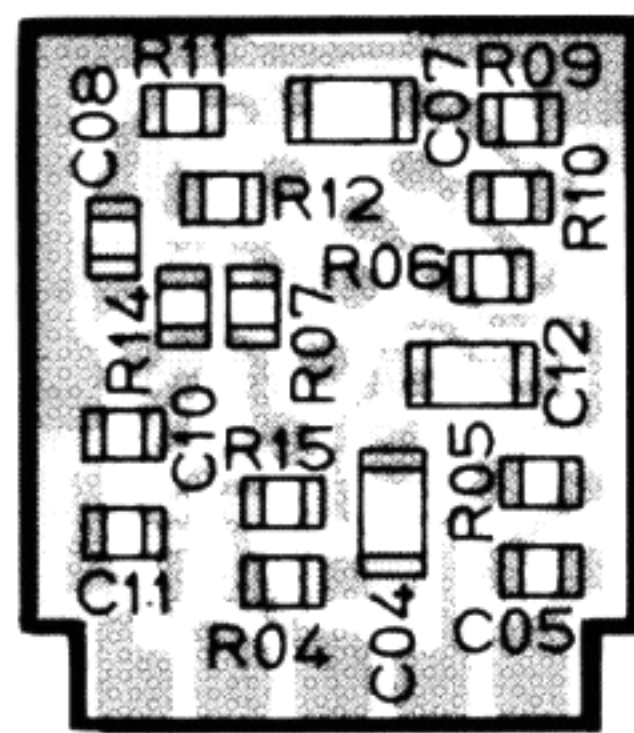
RESISTOR VALUES ARE IN  $\Omega$ , 1/10W;  
CAPACITOR VALUES ARE IN  $\mu$ F, 50V;  
UNLESS OTHERWISE NOTED.  
(T) CAPACITORS ARE TANTALUM, 16V.



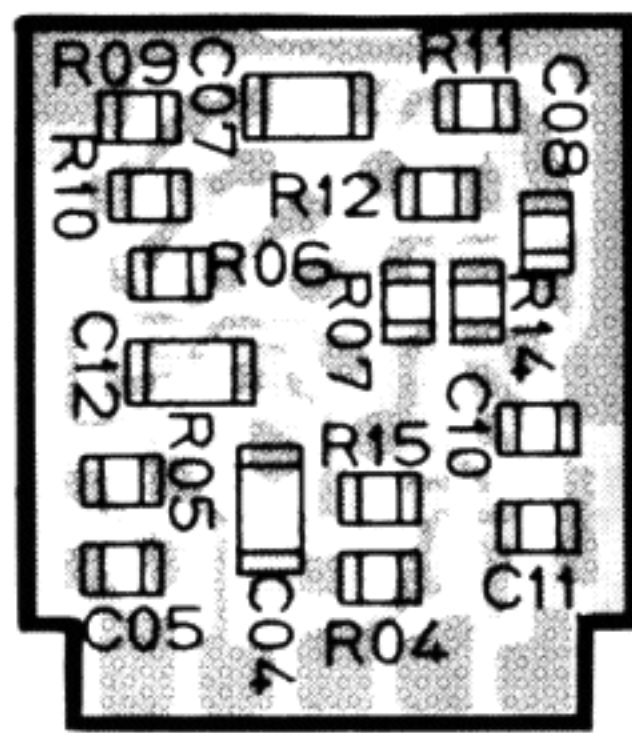
# MIC AMP UNIT



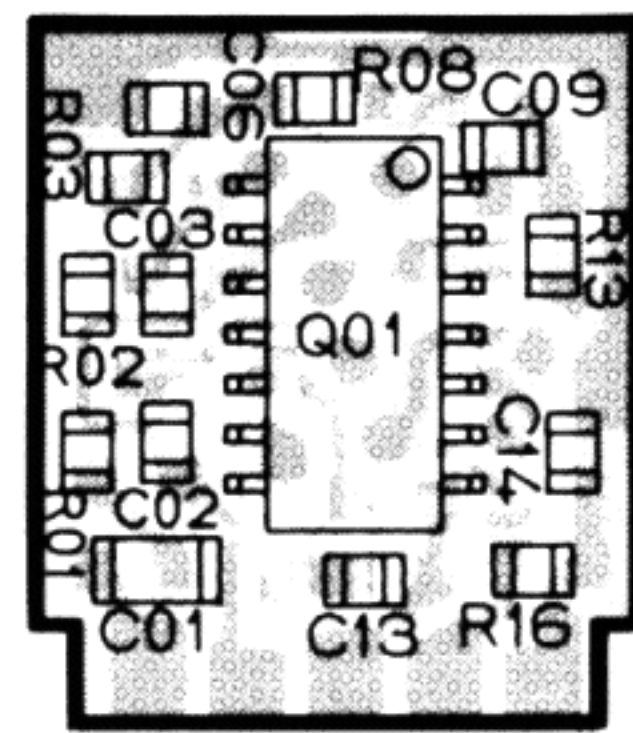
(obverse view of "IC" side)



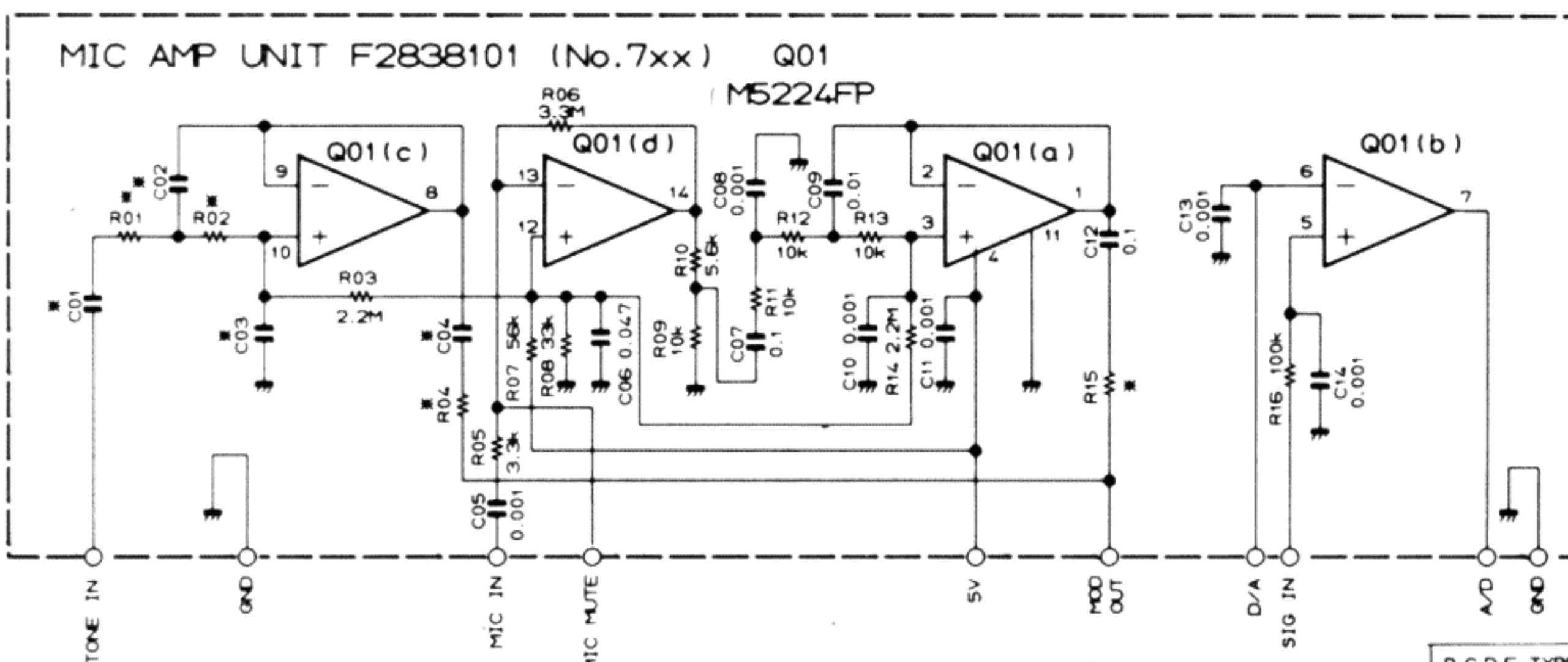
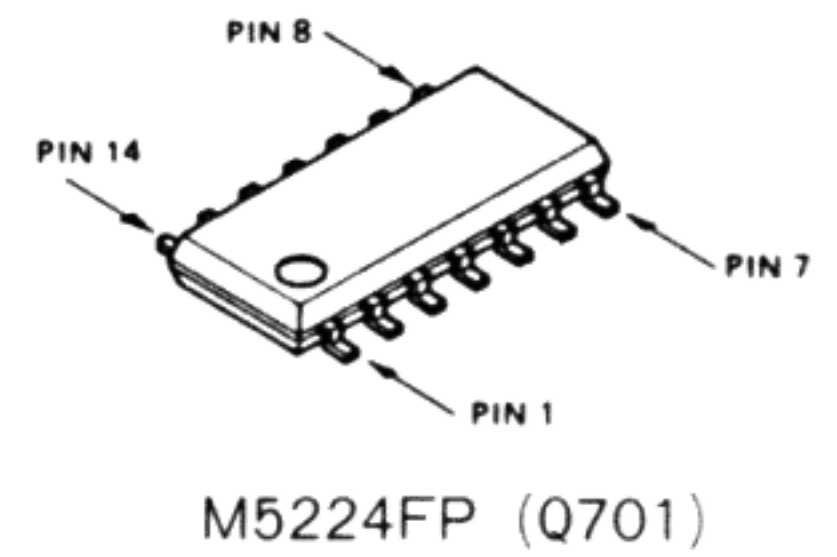
(reverse view of "C-R" side)



(obverse view of "C-R" side)

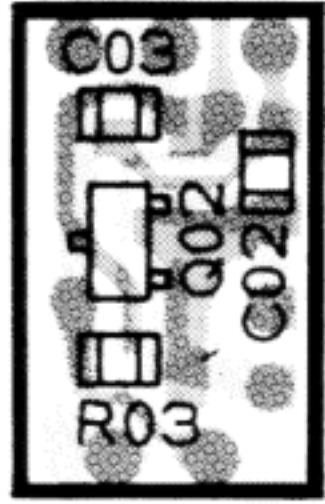


(reverse view of "IC" side)

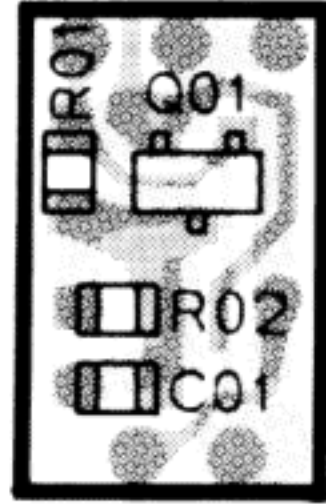


	C01	C02	C03	C04	R01	R02	R04	R15
B.C.D.E TYPE	0.1	0.01	0.0022	0.1	10k	10k	22k	22k
A.F TYPE	—	—	0.01	—	—	—	—	22k

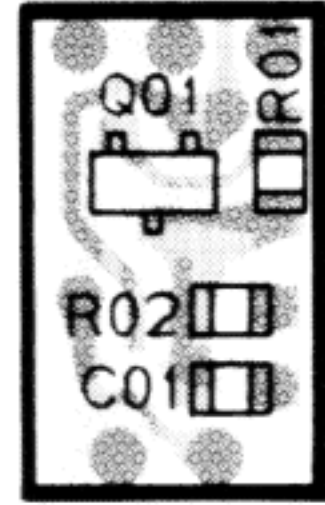
## S METER UNIT



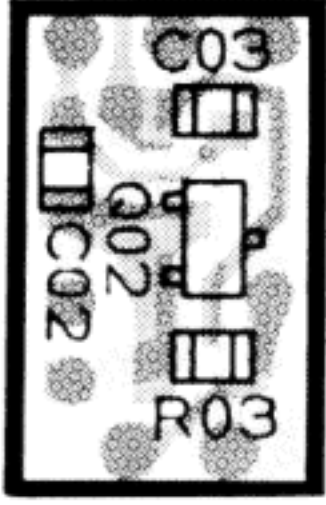
(obverse view of "top" side)



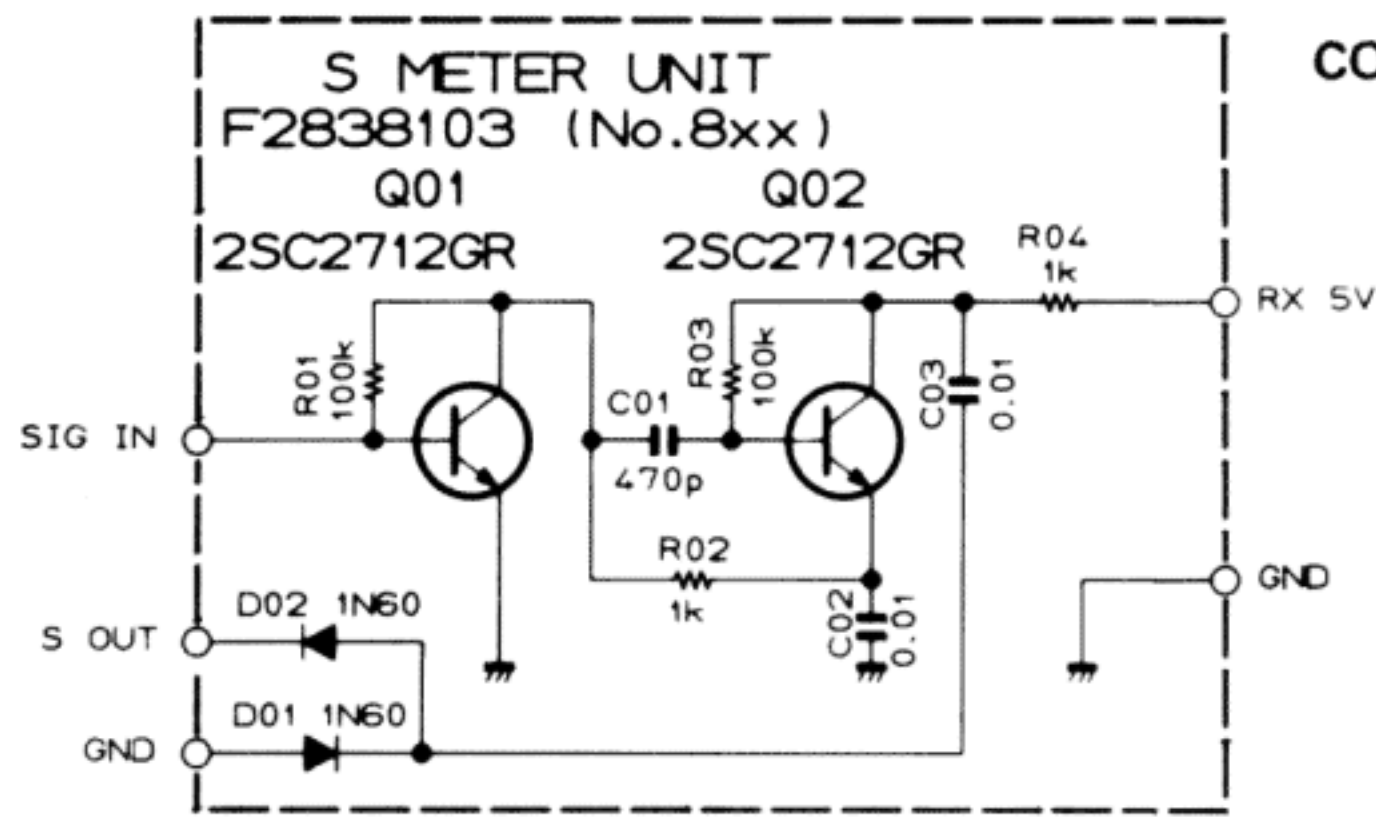
(obverse view of "bottom" side)



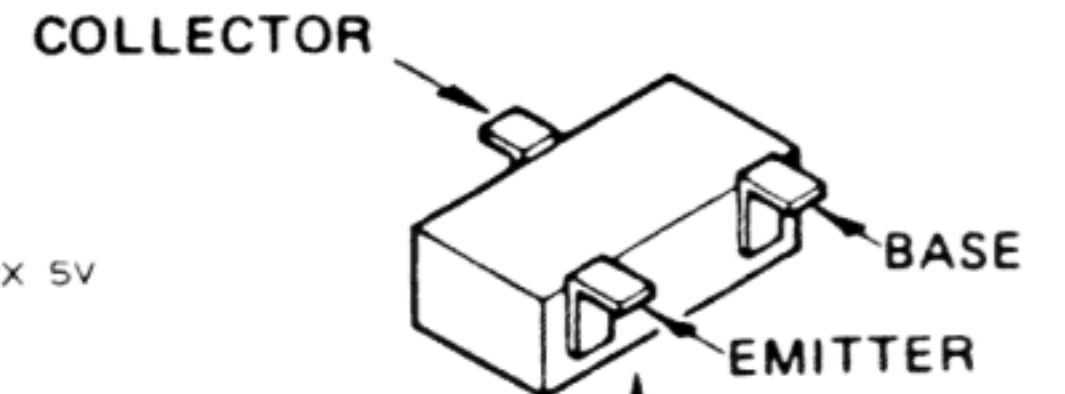
(reverse view of "bottom" side)



(reverse view of "top" side)

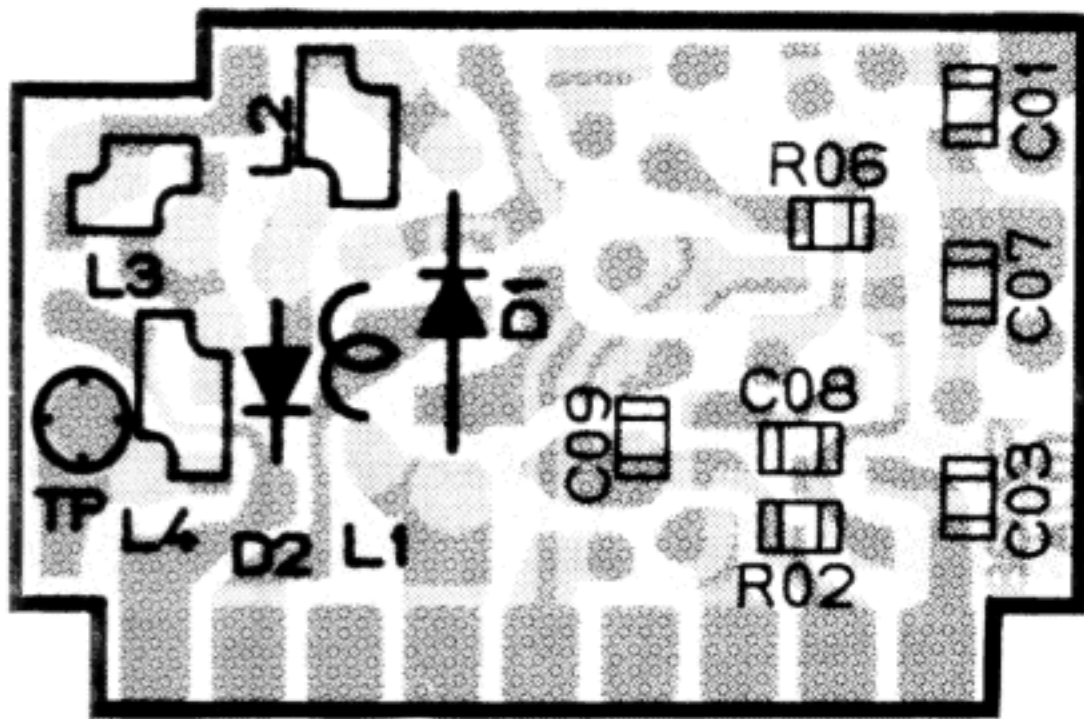


RESISTOR VALUES ARE IN  $\Omega$ , 1/10W;  
CAPACITOR VALUES ARE IN  $\mu$ F, 50V;  
UNLESS OTHERWISE NOTED.

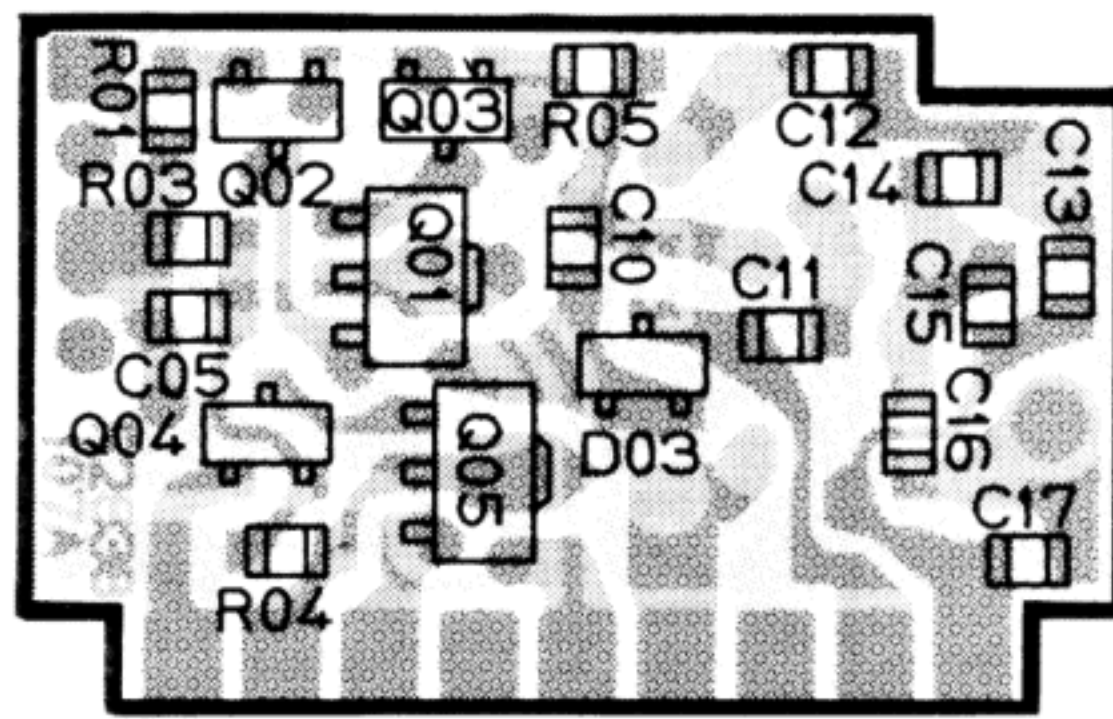


Marked Surface  
2SC2712GR (LG)  
(Q801,802)

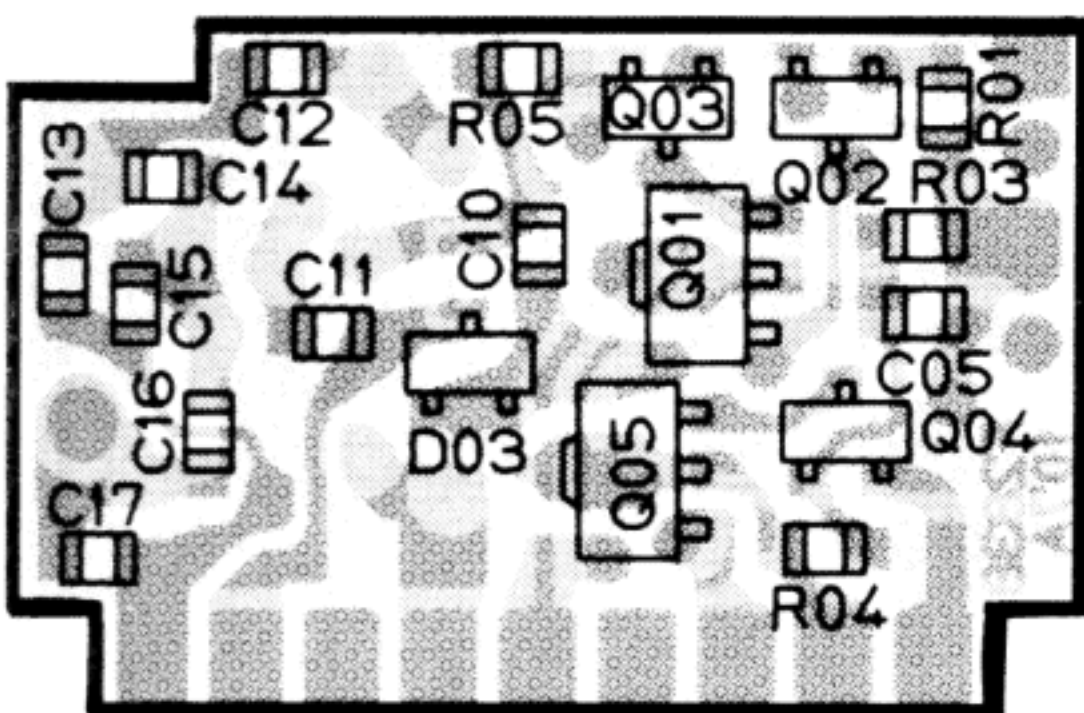
## ANT SW UNIT



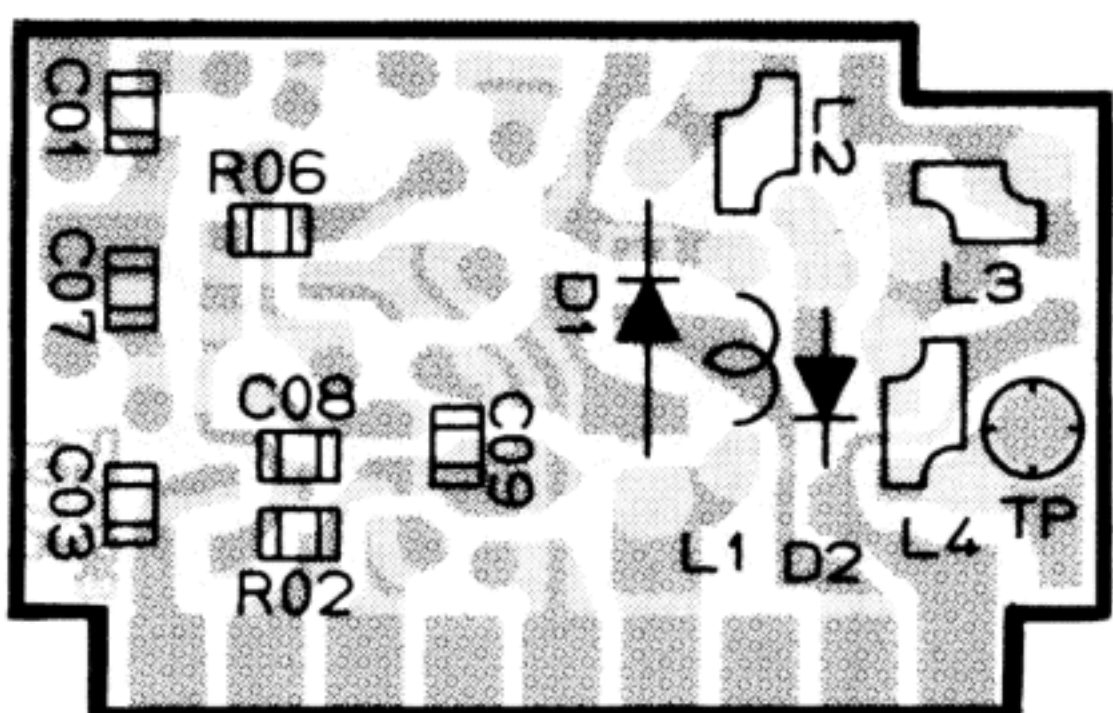
(obverse view of "mixed-component" side)



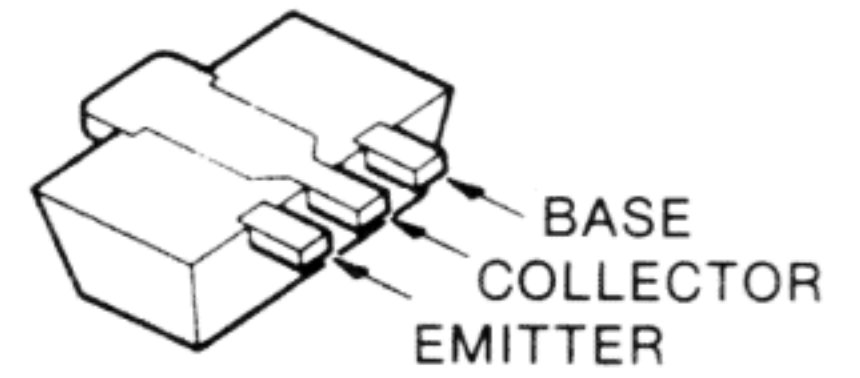
(obverse view of "chip-only" side)



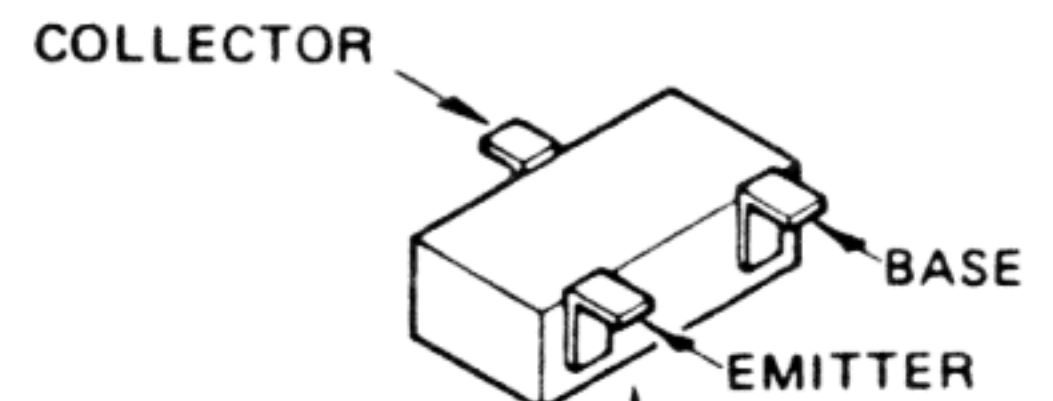
(reverse view of "chip-only" side)



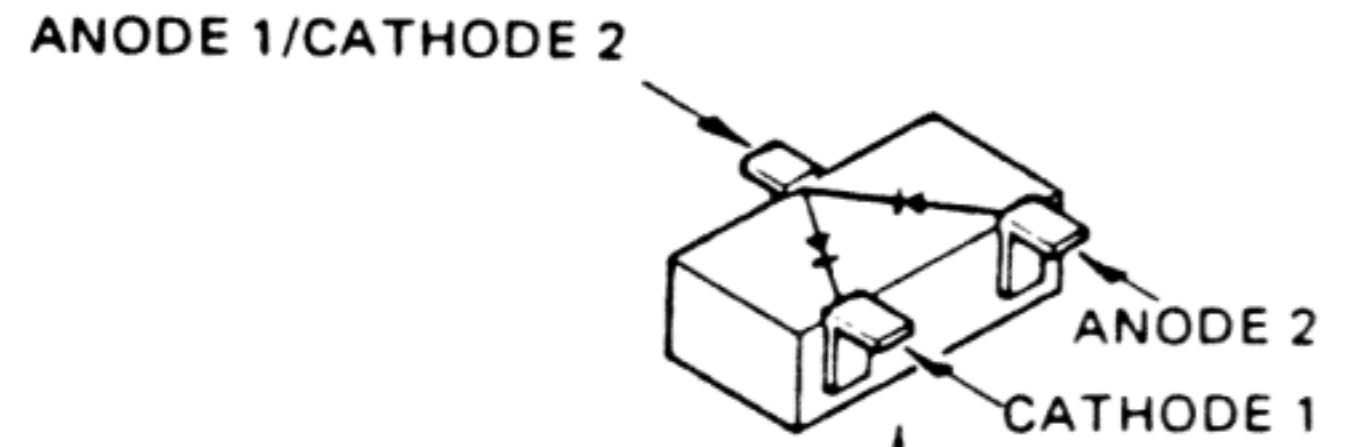
(reverse view of "mixed-component" side)



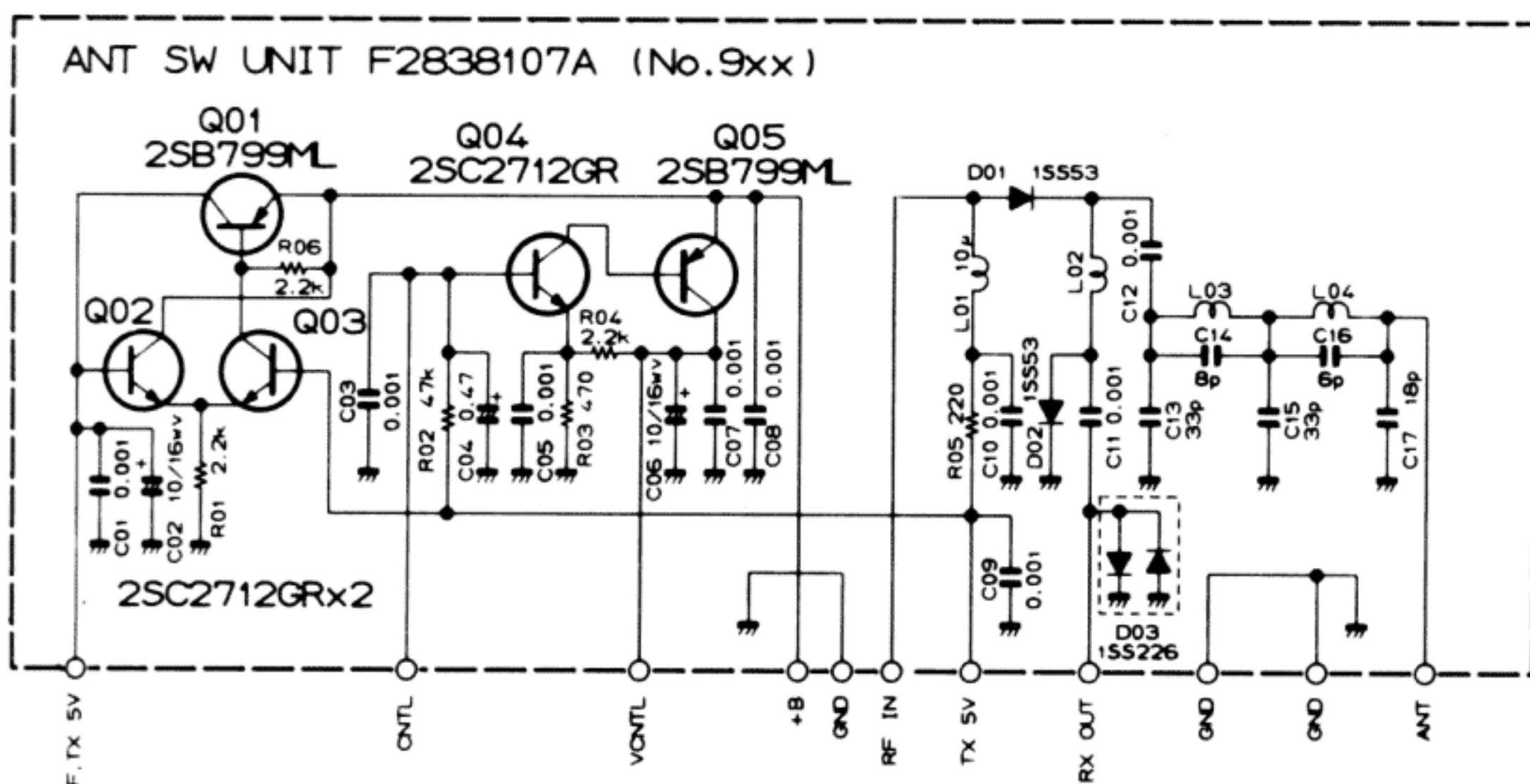
2SB799 (Q901,905)



Marked Surface  
2SC2712GR (LG)  
(Q902,903,904)

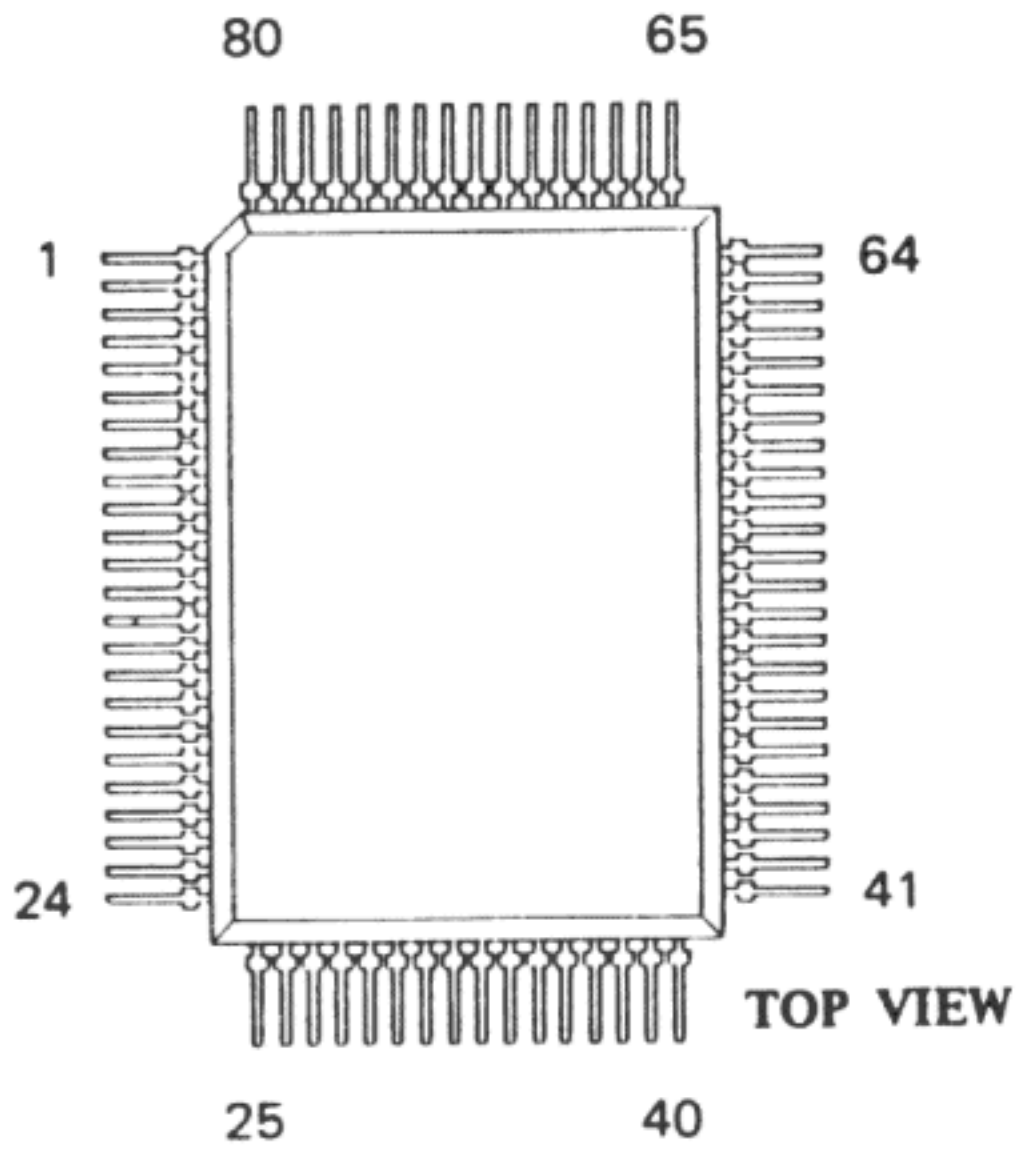


Marked Surface  
1SS226 (C3) : (D903)

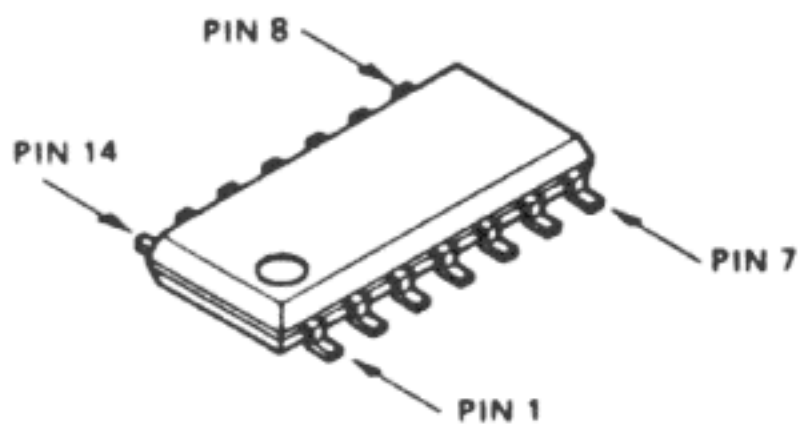


RESISTOR VALUES ARE IN  $\Omega$ , 1/10W;  
CAPACITOR VALUES ARE IN  $\mu$ F, 50V;  
INDUCTOR VALUES ARE IN HENRIES, UNLESS OTHERWISE NOTED.

# CNTL UNIT

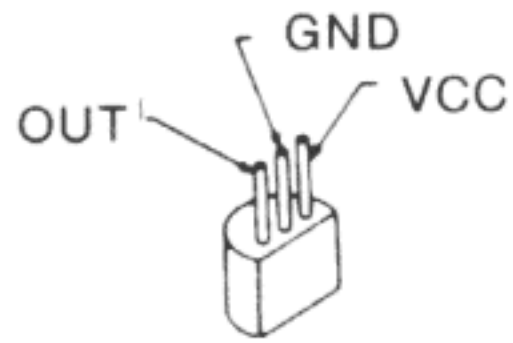


HD613901A51 (Q1001)

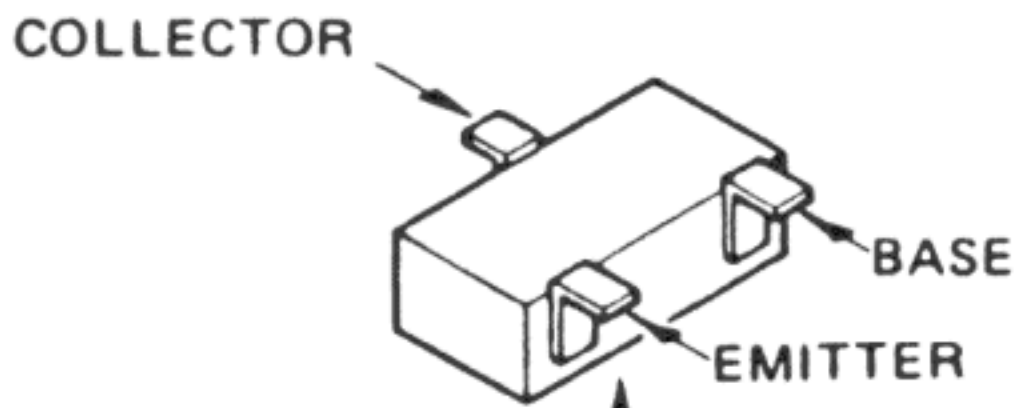


μPD4066BG (Q1008)

μPD4001BG (Q1009)



PST523G (Q1007)

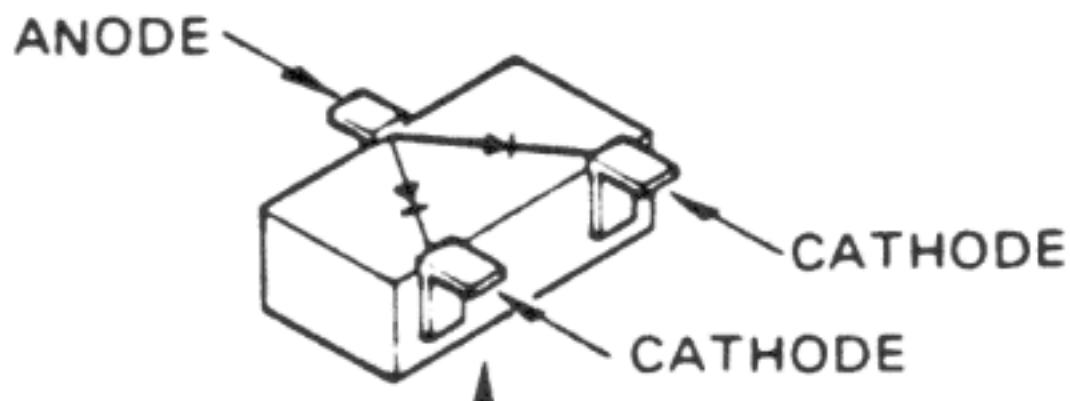


Marked Surface

2SA11.62GR (SG) : (Q1002,1012)

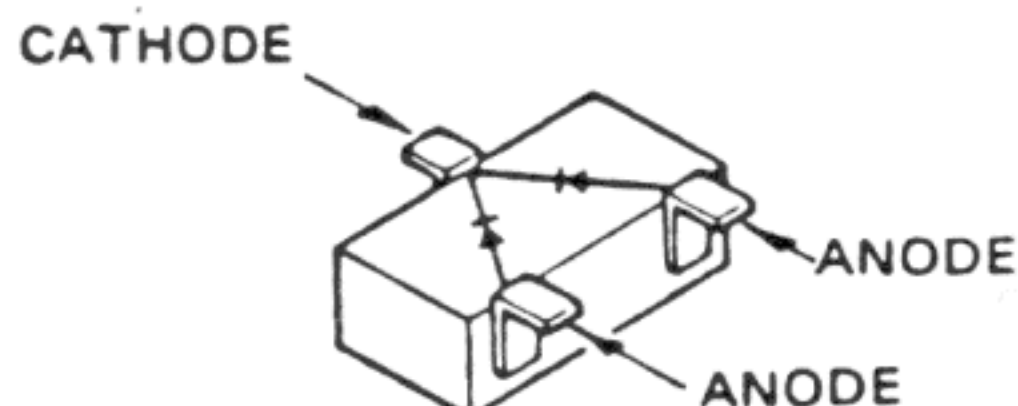
2SC2712GR (LG) : (Q1003,1004  
1005,1006  
1010)

FA1A4M (L33) : (Q1011,1013)



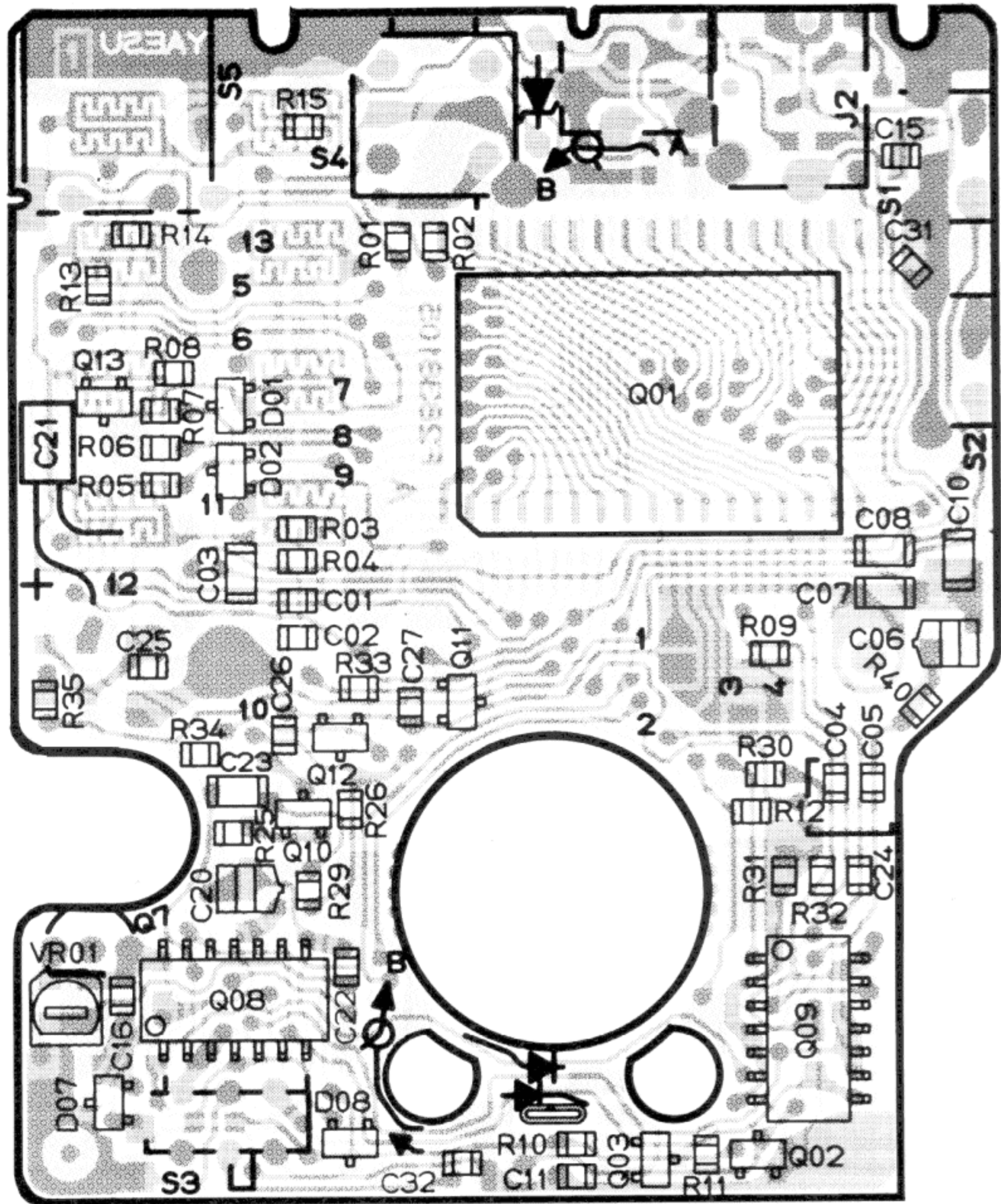
Marked Surface

1SS181 (A3) :  
(D1001,1002,1008)

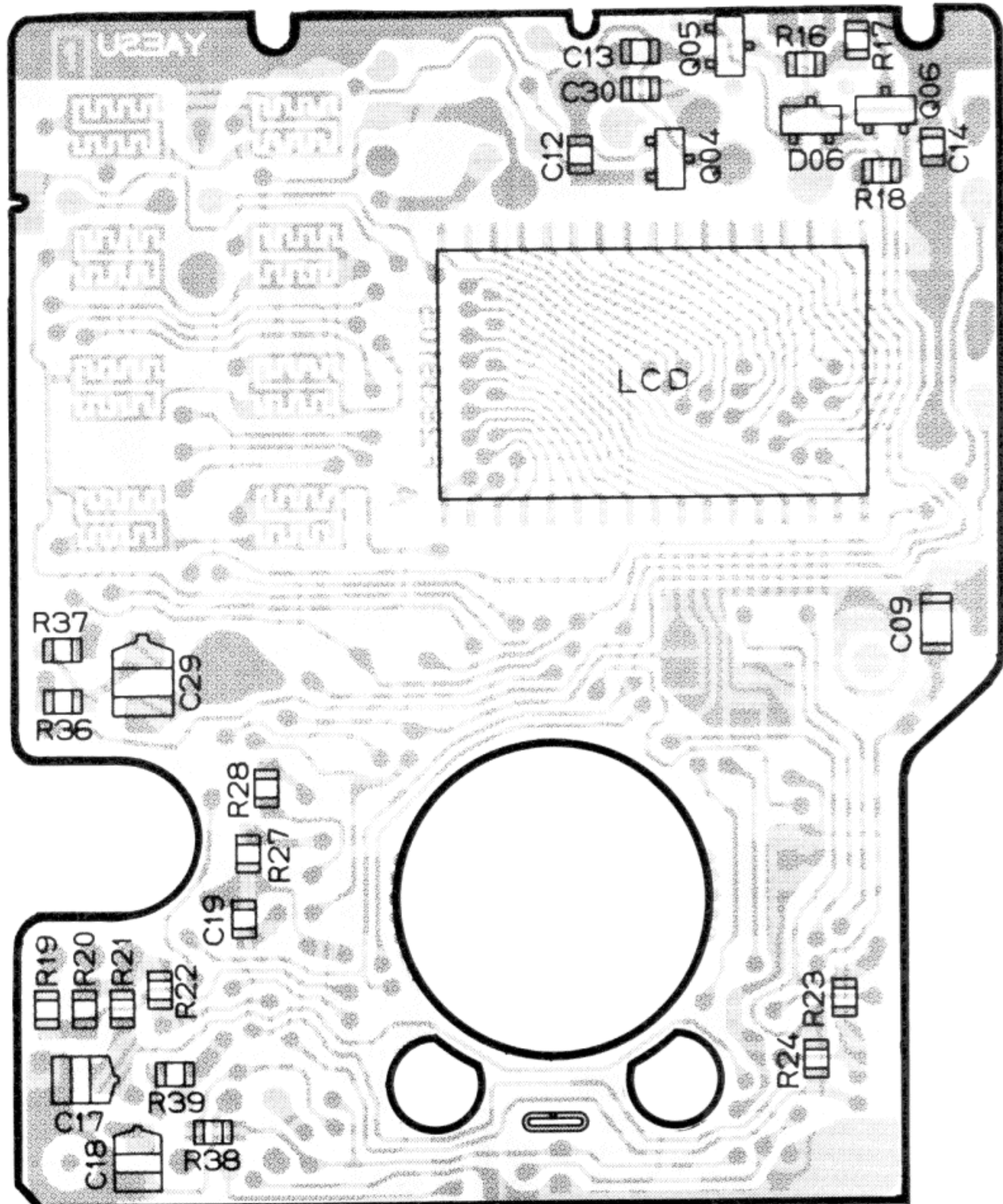


Marked Surface

1SS184 (B3) : (D1007)  
SLM-23VMW (D1006)  
(LED)

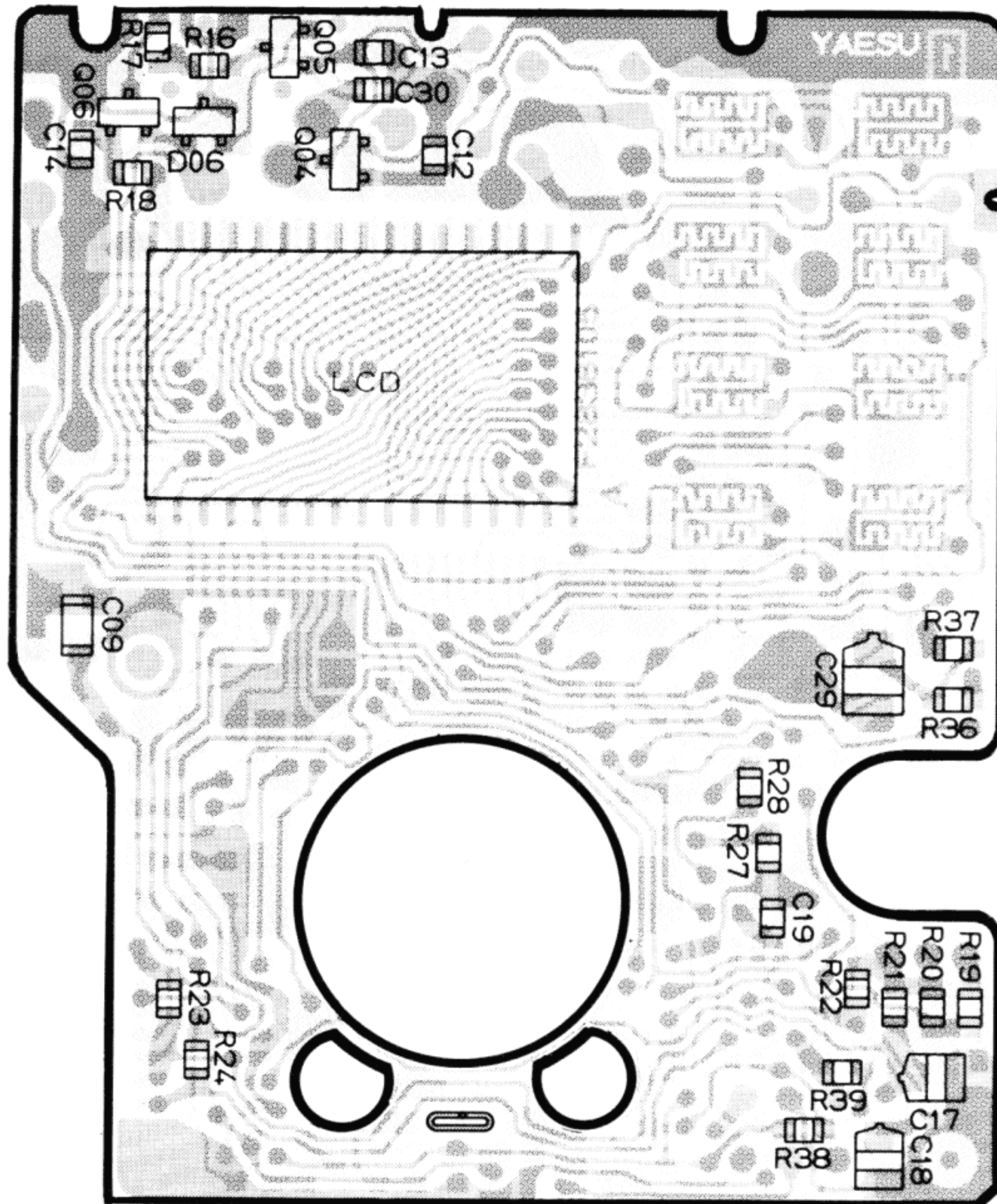


(obverse view of "microprocessor" side)

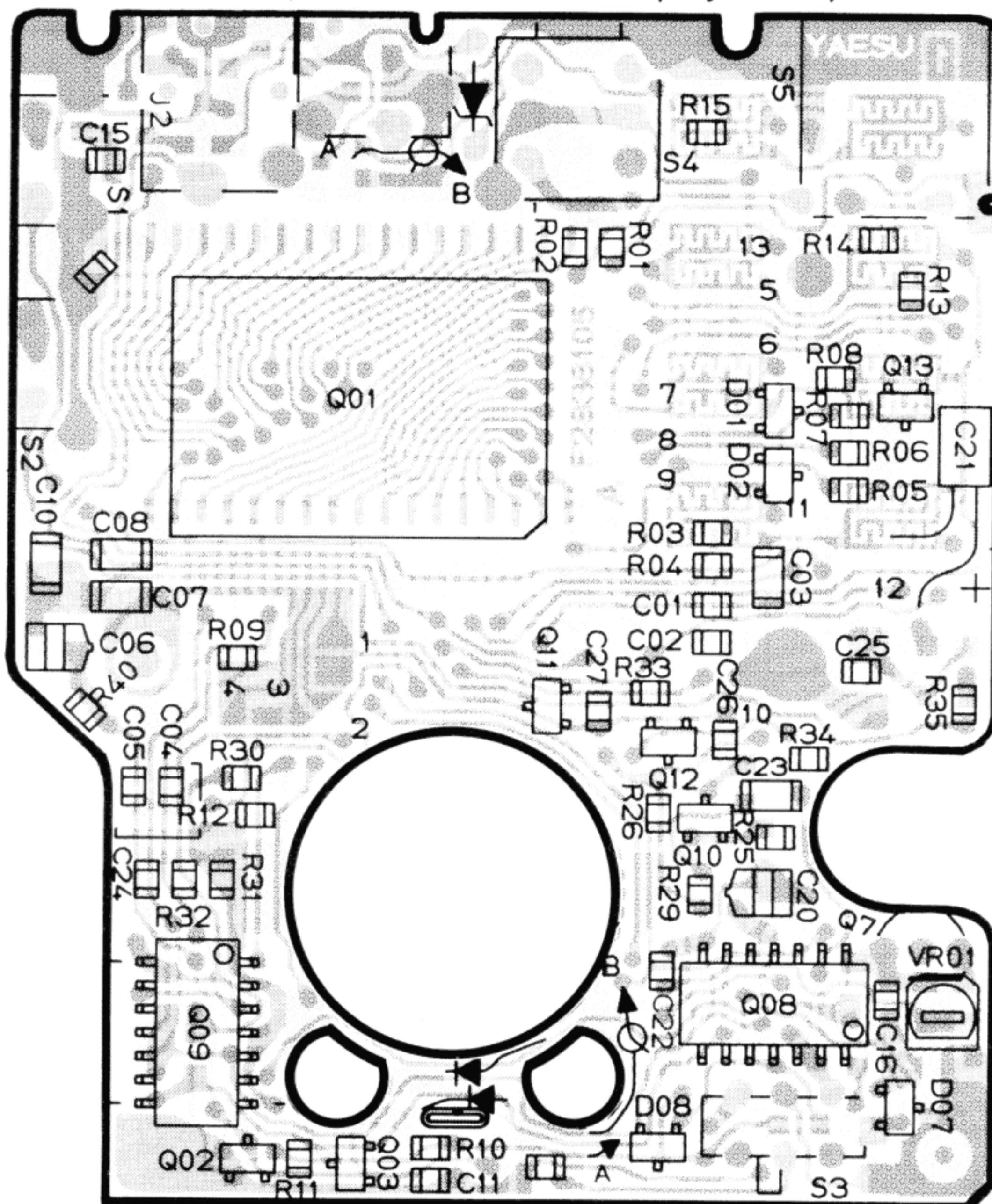


1-8 (reverse view of "display" side)

# CNTL UNIT

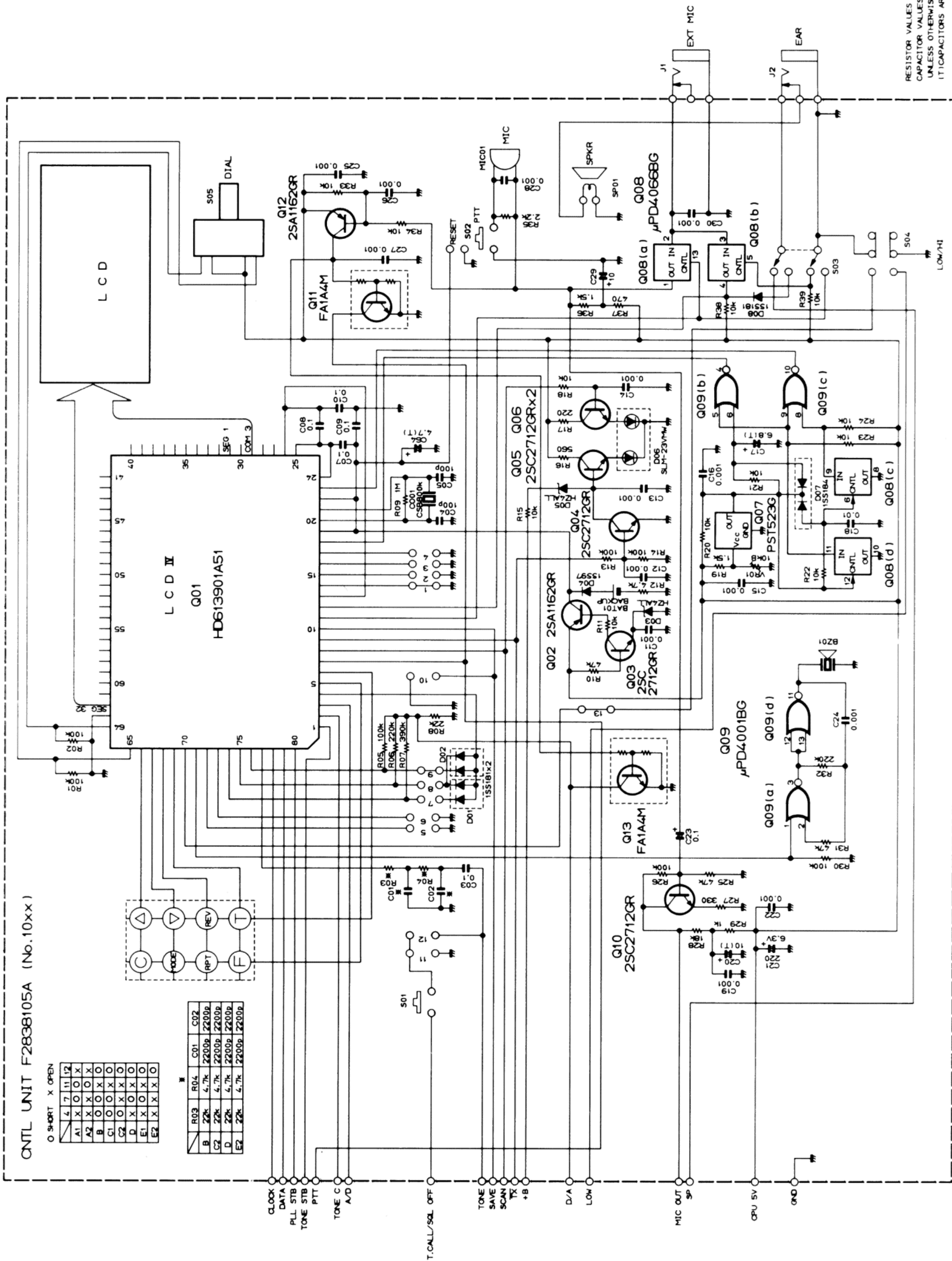


(obverse view of "display" side)



(reverse view of "microprocessor" side)

# CNTL UNIT



CNTL UNIT F2838105A (No.10xx)

O SHORT X OPEN

A1	X	O	O	X
A2	X	X	O	X
B	O	O	X	O
C1	O	O	X	O
C2	O	X	X	O
D	X	O	X	O
E1	X	O	X	O
E2	X	X	X	O

R03	R04	C01	C02
B	22k	4.7k	2200p
C2	22k	4.7k	2200p
D	22k	4.7k	2200p
E2	22k	4.7k	2200p

RESISTOR VALUES ARE IN Ω, 1/10Ω;  
CAPACITOR VALUES ARE IN μF, 50μV;  
UNLESS OTHERWISE NOTED.  
†) CAPACITORS ARE TANTALUM, 16V.

## ALIGNMENT

The FT-23R has been carefully aligned by highly skilled technicians at the factory, and is designed so that no further alignment should ever be required. However, in the unlikely event of a component failure, re-alignment may be necessary. All component replacement and service should be performed only by an authorized Yaesu representative, or the warranty policy may be voided.

The following test equipment is required for alignment:

RF Signal Generator:  
calibrated output level at 150 MHz

Deviation Meter (linear detector)

Oscilloscope

AF Millivoltmeter

SINAD Meter

Inline Wattmeter: 150 MHz

Regulated DC Power Supply:  
adjustable from 4 to 17V, 2A

50-ohm Non-reactive Dummy Load: 10W at 150 MHz

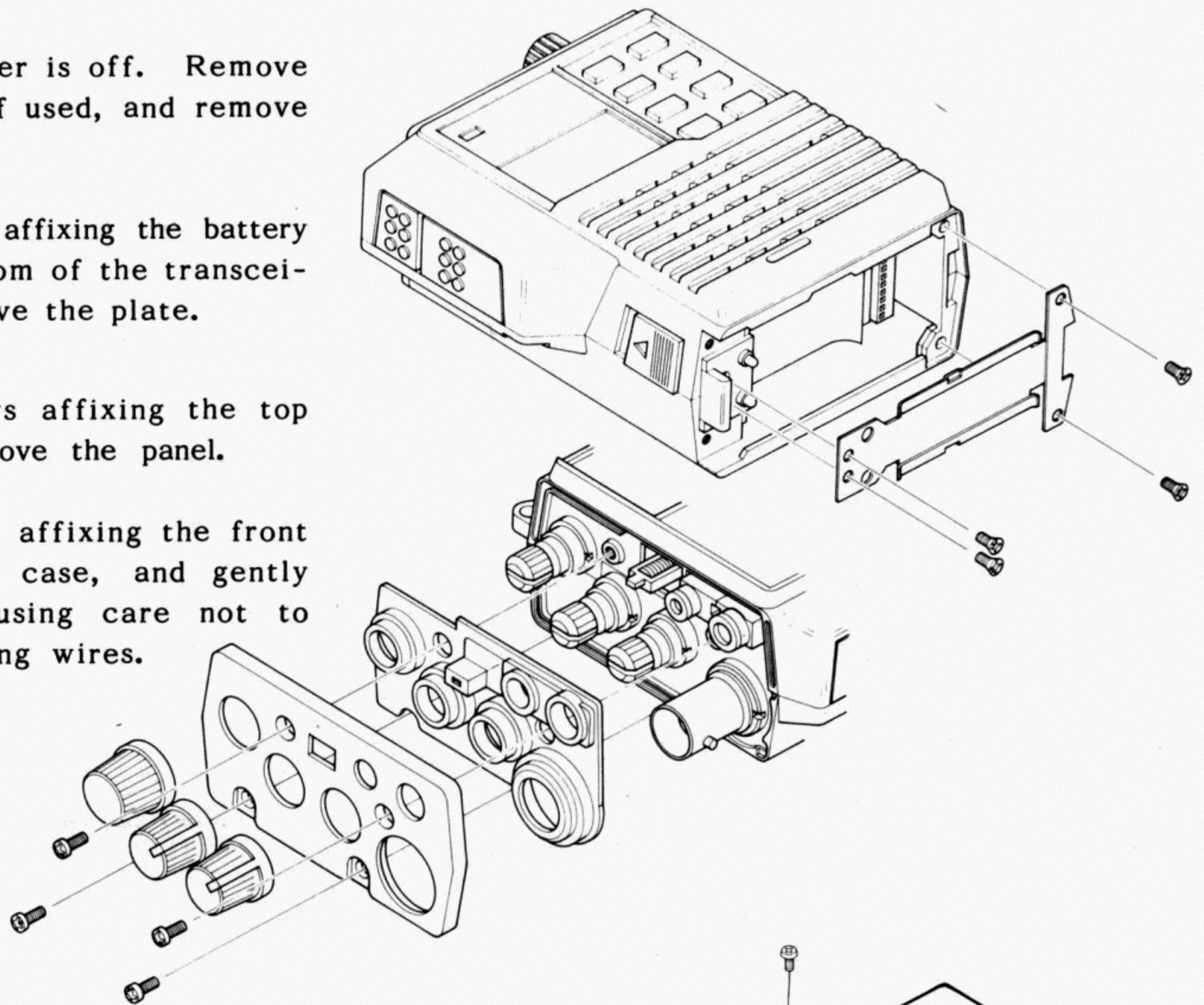
Frequency Counter: 0.2ppm accuracy at 150 MHz

AF Signal Generator

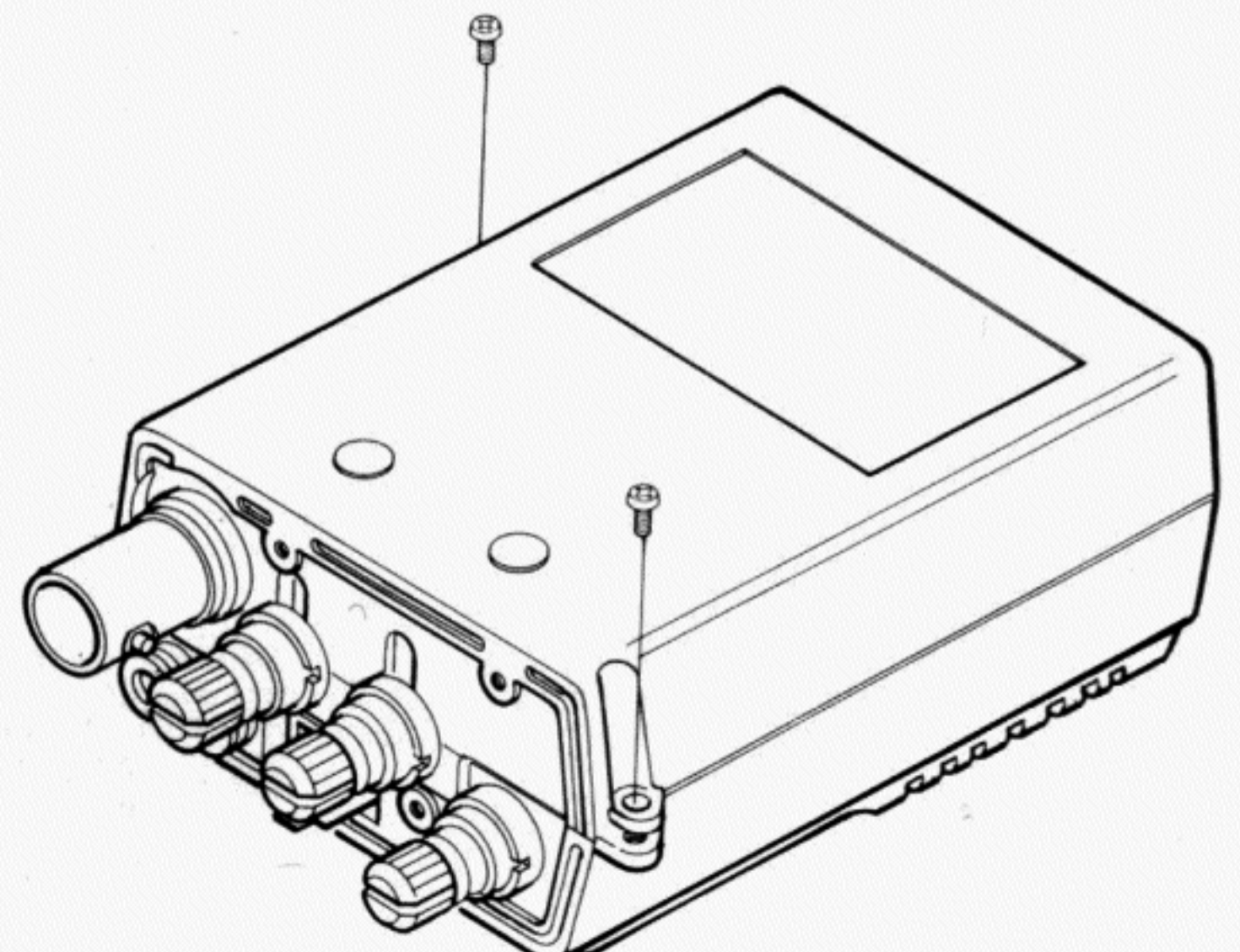
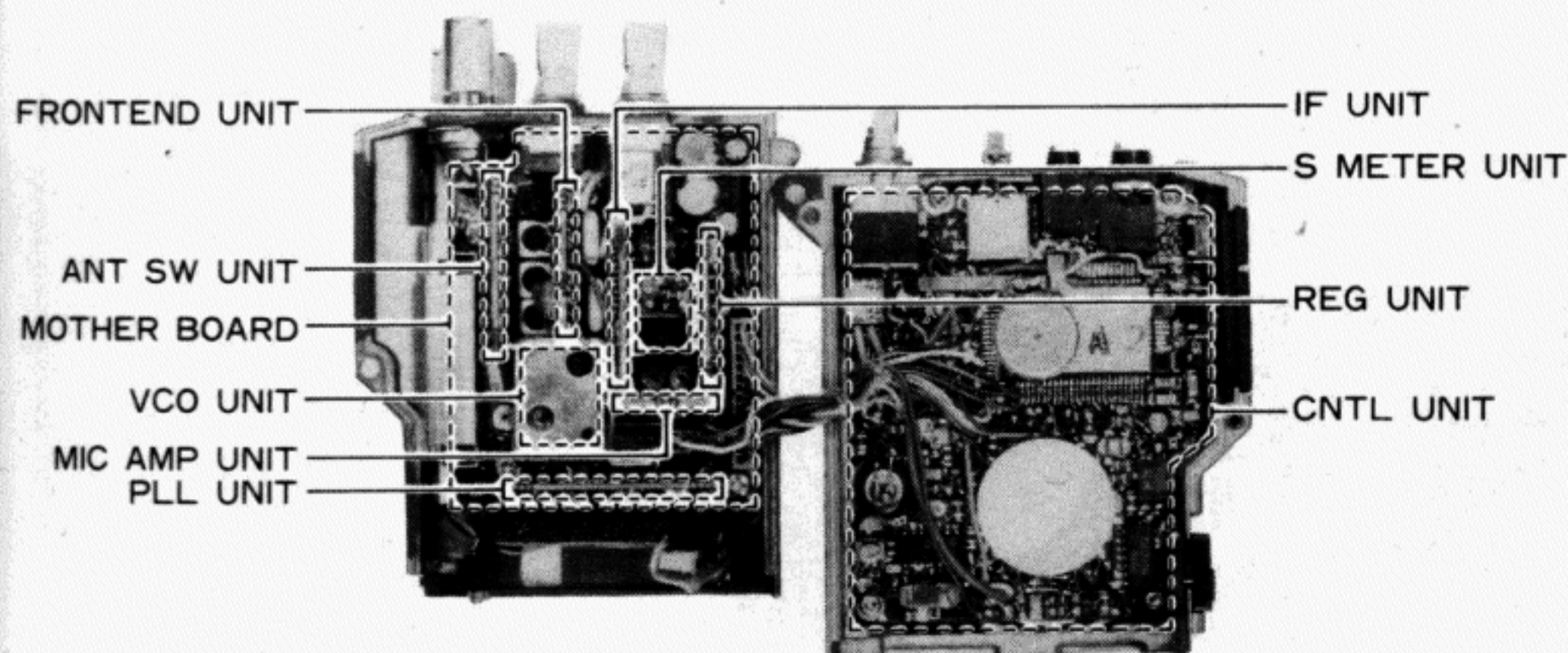
DC Voltmeter: high impedance

## CASE DISASSEMBLY

1. Make sure the transceiver is off. Remove the hard or soft case, if used, and remove the battery pack.
2. Remove the four screws affixing the battery spring plate on the bottom of the transceiver, and carefully remove the plate.
3. Remove the four screws affixing the top panel, and carefully remove the panel.
4. Remove the two screws affixing the front and rear halves of the case, and gently separate the halves, using care not to stress the interconnecting wires.



## BOARD LAYOUT



## I. PLL & TRANSMITTER

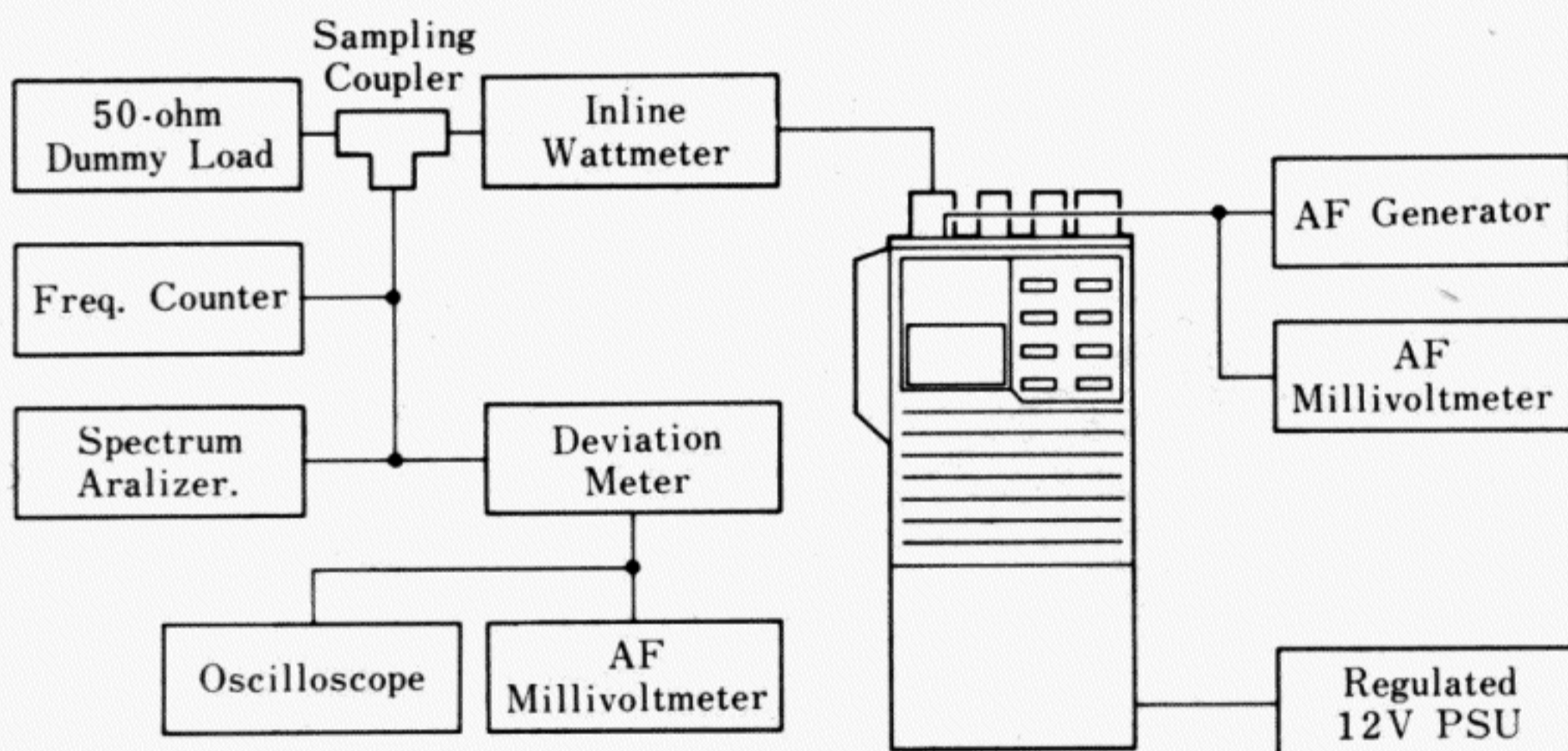
Set up the test equipment as shown in the diagram below for transmitter alignment. Adjust the supply voltage to 12.0V for all steps except Transmitter Output Power alignment (B).

### A. PLL VCV (Varactor Control Voltage)

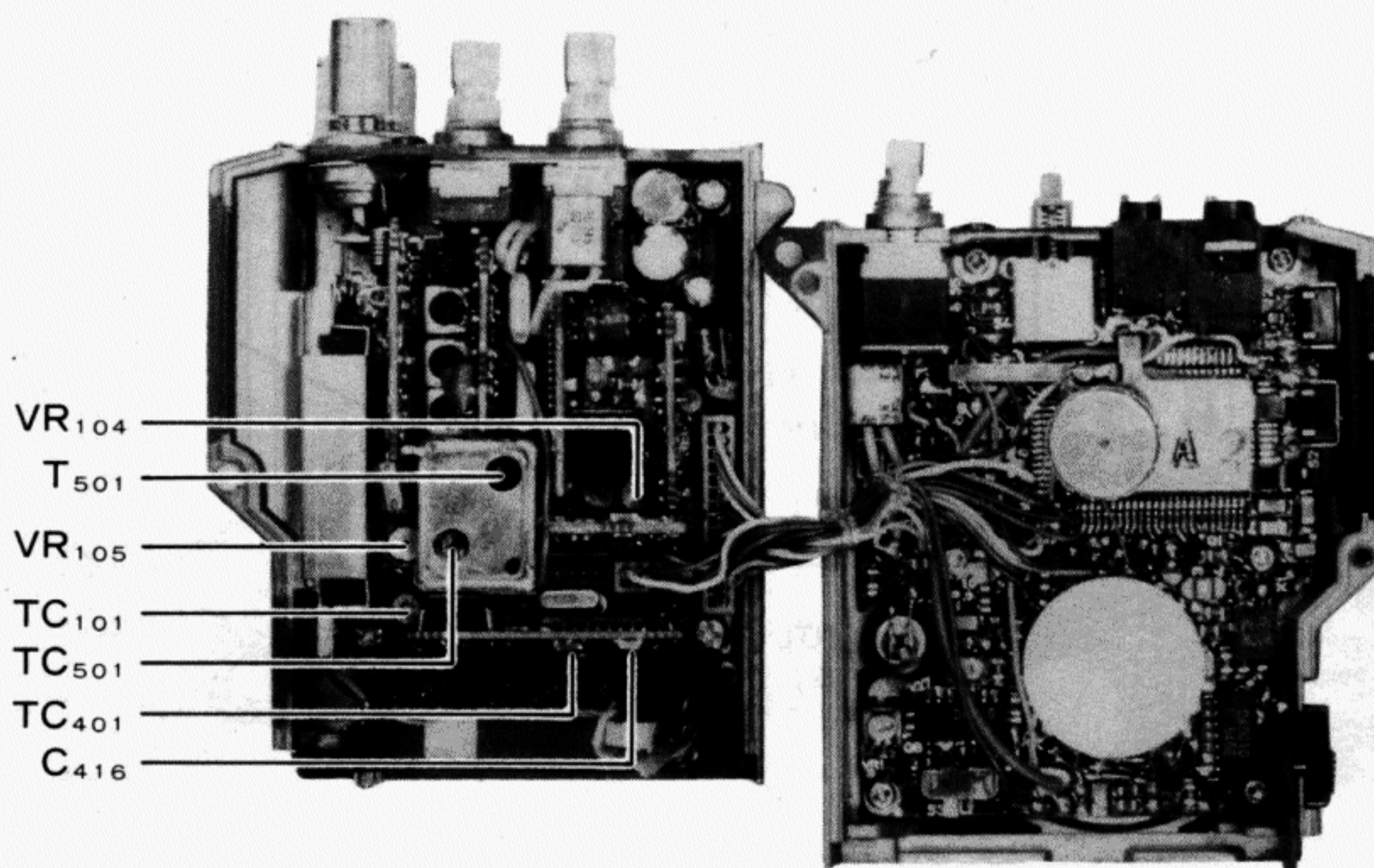
- (1) Connect the DC voltmeter between C416 on the PLL Unit and chassis ground.
- (2) While transmitting on 144,000 MHz adjust transformer T501 on the VCO Unit for  $1.35 \pm 0.05$  VDC.
- (3) While receiving on 144.000 MHz adjust trimmer TC501 on the VCO Unit for  $1.1 \pm 0.05$  VDC.
- (4) Retune the transceiver and confirm the high-end VCV for the transceiver version being aligned, as follows:

Version	Frequency	Tx VCV	Rx VCV
A, C, E	148.000	<1.8V	<1.6V
B, D	146.000	<1.7V	<1.5V

### PLL & TRANSMITTER ALIGNMENT SETUP



### PLL & TRANSMITTER ALIGNMENT POINTS



### B. Transmitter Output Power

- (1) Tune the transceiver to band center (145 or 146 MHz), and set the LOW switch to the undepressed position.
- (2) Increase the supply voltage to 12.5V.
- (3) Adjust TC101 on the Mother Board for peak output power on the wattmeter (at least 5W with less than 1.5A supply current).
- (4) Press the LOW switch on the top panel, and adjust VR105 on the Mother Board for 0.5 watts output.
- (5) Return the supply voltage to 12.0V.

### C. PLL Reference Frequency

With the transceiver tuned to band center (145 or 146 MHz), adjust TC401 on the PLL Unit, if necessary, so that the display frequency matches the frequency counter when transmitting.

### D. Modulation Level

- (1) With the transceiver tuned to band center (145 or 146 MHz), adjust the AF generator for 25mV output at 1 kHz to the MIC jack.
- (2) Adjust VR104 on the Mother Board for  $\pm 4.5$  kHz deviation on the deviation meter.

## II. RECEIVER

Set up the test equipment as shown above for receiver alignment.

### A. Sensitivity

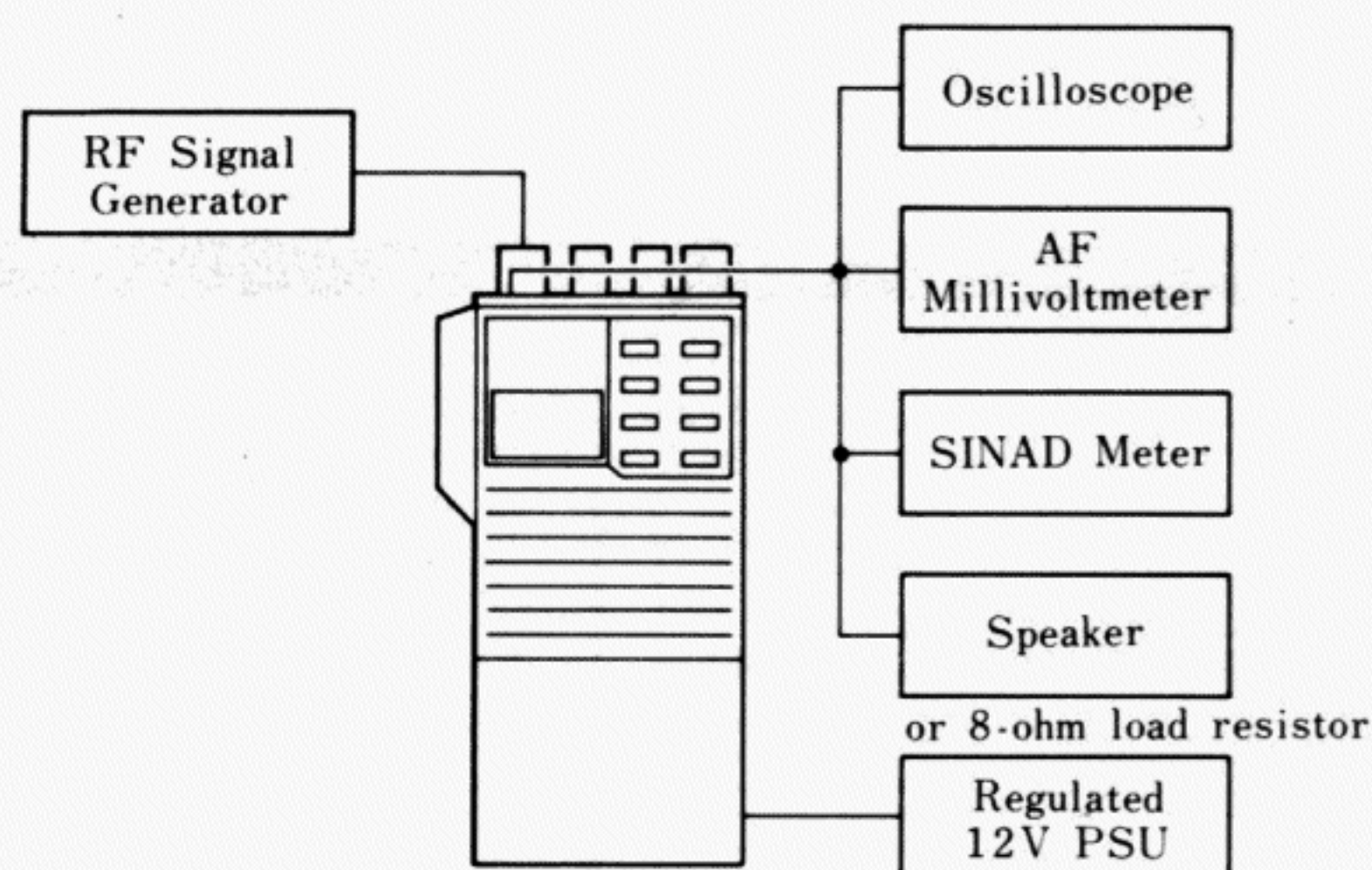
- (1) With the transceiver and RF signal generator both tuned to band center (145 or 146 MHz), set the generator for  $\pm 3.5$  kHz deviation of 1 kHz tone modulation, and set the output level for 40 dBu at the antenna jack.
- (2) Preset VR103 on the Mother Board fully clockwise.
- (3) Adjust T101 through T104 on the Mother Board for maximum S-meter indication, reducing the generator level if more than four bargraph segments turn on.

After step (3), generator level should be 0.2  $\mu$ V or less for 12dB SINAD. Perform the following adjustment next.

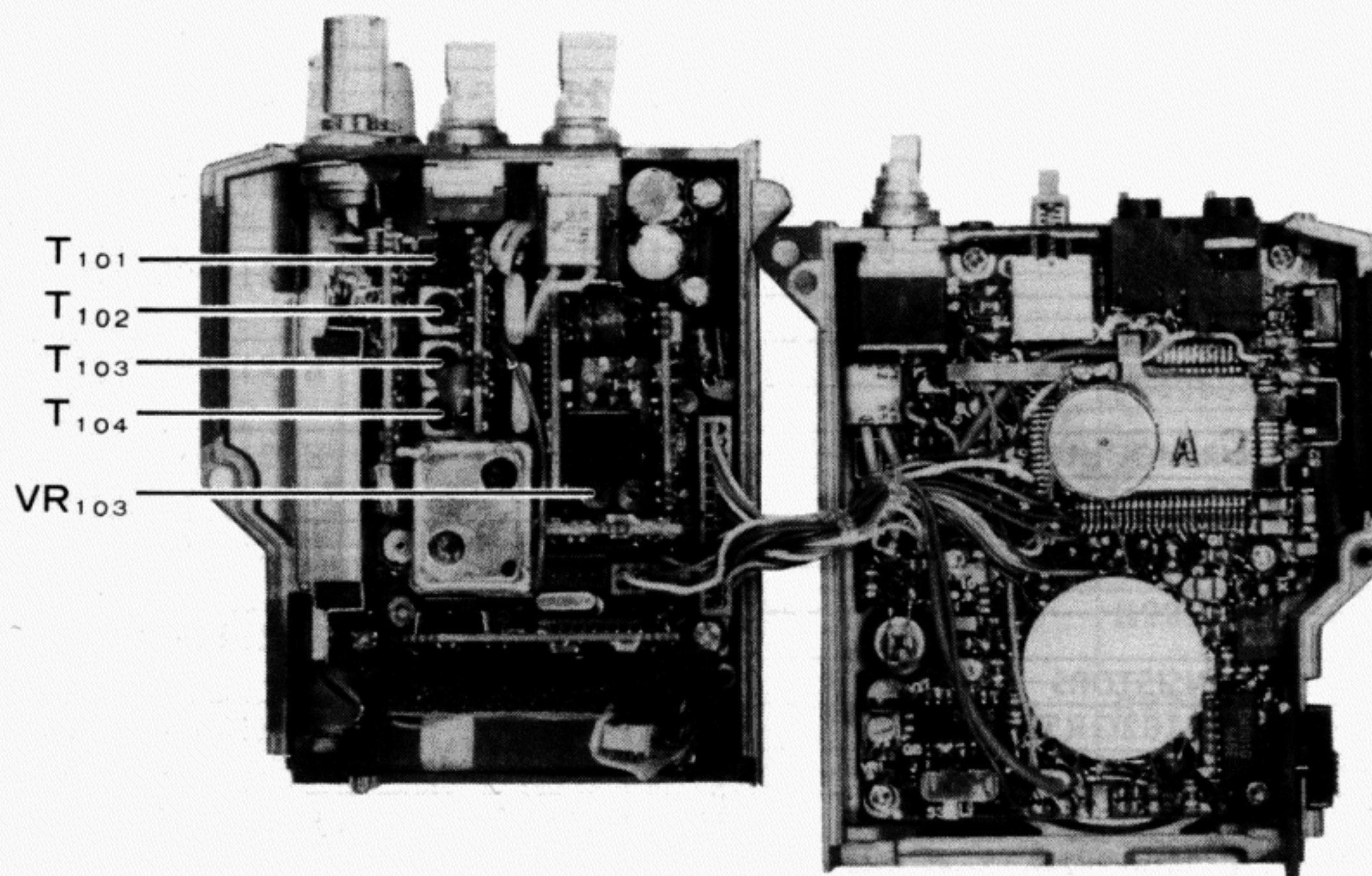
### B. S-meter Sensitivity

- (1) With the transceiver and RF signal generator set up as in step (1) of the above Sensitivity adjustment procedure, set the signal generator for 20 dBu output.
- (2) Adjust VR103 on the Mother Board so that all bargraph segments are just turned on.
- (3) Reduce the generator output so that only two bargraph segments are on, and confirm that the generator output level is now 5 dBu or less.

### RECEIVER ALIGNMENT SETUP



### RECEIVER ALIGNMENT POINTS





# PARTS LIST

MAIN CHASSIS					
Symbol No.	Part No.	Name & Description			
		<b>CONNECTOR</b>			
J01	P1090541	BNC-RM ANT			<b>CERAMIC FILTER</b>
			CF101	H3900280	LF-B12
		<b>MISCELLANEOUS</b>			
	R3116390	DIAL Knob			<b>RESISTORS</b>
	R3116620	VOL,SQL Knobs	R112	J24205479	RMC 1/10T4R7J 1/10W 4.7Ω
	R3508300	PTT Button Cover	R113	J24205100	" " 100J " 10Ω
	R3508310	UNLOCK Lever	R102	J24205220	" " 220J " 22Ω
	R0117370	Coil Spring	R106,109	J24205221	" " 221J " 220Ω
	R0507950B	Battery Spring Plate	R110	J24205331	" " 331J " 330Ω
	R3503650A	Top Panel Gasket	R111	J24205102	" " 102J " 1kΩ
	R3507960	Jack Seal Gasket	R114	J24205103	" " 103J " 10kΩ
			R107,118A,F	J24205223	" " 223J " 22kΩ
			R116	J00215223	Carbon film 1/8W 22kΩ
			R101	J24205333	RMC 1/10T333J 1/10W33kΩ
			R108,115	J24205473	" " 473J " 47kΩ
			R103-105,117	J24205104	" " 104J " 100kΩ
MOTHER BOARD					
Symbol No.	Part No.	Name & Description			
	F2838104A	Printed Circuit Board			
	C028384AA	PCB with Components			<b>POTENTIOMETERS</b>
			VR101	J60800128	K091K0004-20KB 20kΩ B
			VR102	J60800129	K0911100D-20KA 20kΩ A
			VR103-105	J51776473	RH0411CS4J 47kΩ B
					<b>CAPACITORS</b>
			C104-106	K22170203	Chip Ceramic 50WV 2pF CH (C2012CH1H020CFA)
			C107	K22170204	" " " 3pF " (C2012CH1H030CFA)
			C101,108	K22170206	" " " 5pF " (C2012CH1H050CFA)
			C130,133	K22170209	" " " 8pF " (C2012CH1H080DFA)
			C143	K22170211	" " " 10pF " (C2012CH1H100DFA)
		<b>IC</b>			
Q101	G1090558	LA4145	C103	K22170221	" " " 27pF " (C2012CH1H270JFA)
			C111,122,125-127 131,135-141	K22170805	" " " 0.001μF B (C2012B1H102MFA)
		<b>PWR-MODULE</b>			
Q107	G1090732	M57796MA	C102,132,134	K22170817	" " " 0.01μF " (C2012B1H103MFA)
			C128,142	K22171008	" " " 0.047μF F (C2012F1H473ZFA)
			C109,110,112,115 119,120,129	K22141904	" " " 25WV 0.1μF D (C3216D1E104MFA)
		<b>TRANSISTORS</b>			
Q102	G3111627G	2SA1162GRTE85R	C121	K78130001	Tantalum 20WV 0.47μF (F951D474MRAAF1Q2)
Q103	G3327127G	2SC2712GRTE85R			
Q104	G3070001	FA1A4M	C113,118,123	K40129052	Electrolytic 16WV 10μF (RC3-16V100M)
Q105	G3333567	2SC3356-T2B			
Q106	G3329547	2SC2954-T2B	C114,124	K40129038	" " 16WV 100μF (RC2-16V101M)
			C116,117	K40089020	" " 6.3WV 100μF (RC3-6V101M)
		<b>DIODE</b>			
D101	G2070009	1SS184TE85R Si			
					<b>TRIMMER CAPACITOR</b>
			TC101	K91000149	VCT31E161A 20pF
		<b>CRYSTAL FILTER</b>			
XF101	H1102114	10M15BM 10.7MHz			



C311	K78080004	Chip Tantalum 6.3W 15 $\mu$ F (F950J156MVCAF1Q2)	TC401	K91000154	TRIMMER CAPACITOR ECR-KN020E11X 20pF
		INDUCTOR			INDUCTORS
L301	L1190344	LAL02KR100K 10 $\mu$ H	L401	L1190311	LAL02NA221K 220 $\mu$ H
<b>PLL UNIT</b>					
Symbol No.	Part No.	Name & Description	<b>VCO UNIT</b>		
	F2838108A	Printed Circuit Board	Symbol No.	Part No.	Name & Description
	C028388AA	PCB with Components Model A1,A2,D,E2 5kHz steps		F2838106	Printed Circuit Board VCO-LC
	C028388AB	" " " Model F 10kHz steps		F2838110	" " "
	C028388AC	" " " Model B,C2 12.5kHz steps		C028386AF	VCO-OSC PCB with Components
		ICs	Q501	G3802387S	FET 2SK238-K17
Q401	G1090725	MC12017P			
Q402	G1090582	JLC1007P			
					TRANSISTOR
			Q502	G3327597C	2SC2759-T2B U23
		DIODE			
D401	G2090118	1SS97 Schottky			
					DIODES
			D501	G2090297	1SS110 Si
		CRYSTAL	D502,503	G2090271	1T33 Varactor
X401**	H0102771	UM-1 10.240MHz			
X401■	H0102772	UM-1 12.800MHz			
					RESISTORS
			R504	J24205470	RMC 1/10T 470J 1/10W 47 $\Omega$
		RESISTORS	R505	J24205101	" " 101J " 100 $\Omega$
R408	J24205000	RMC 1/10T 000J 1/10W 0 $\Omega$	R501	J24205682	" " 682J " 6.8k $\Omega$
R402,403	J24205220	" " 220J " 22 $\Omega$	R506	J24205683	" " 683J " 68k $\Omega$
R404,405,407	J24205222	" " 222J " 2.2k $\Omega$	R503	J24205224	" " 224J " 220k $\Omega$
R406■	J24205472	" " 472J " 4.7k $\Omega$	R502	J24205225	" " 225J " 2.2M $\Omega$
R401,406*	J24205103	" " 103J " 10k $\Omega$			
R406°	J24205153	" " 153J " 15k $\Omega$			
					CAPACITORS
			C508	K22170201	Chip Ceramic 50WV 0.5pF CH (C2012CH1HOR5CFA)
C401	K22170206	Chip Ceramic 50WV 5pF CH (C2012CH1H050CFA)	C503	K22170211	" " " 10pF " (C2012CH1H100DFA)
C411,412	K22170227	" " " 47pF " (C2012CH1H470JFA)	C506,507	K22170311	" " " " UJ (C2012UJ1H100DFA)
C408-410,419	K22170235	" " " 100pF " (C2012CH1H101JFA)	C501	K22170215	" " " 15pF CH (C2012CH1H150JFA)
C402,403,405,407 413-415	K22170805	" " " 0.001 $\mu$ F B (C2012B1H102MFA)	C502,505,510	K22170805	" " " 0.001 $\mu$ F B (C2012B1H102MFA)
C416,417	K22141904	" " 25WV 0.1 $\mu$ F D (C3216D1E104MFA)	C509	K78080002	Chip Tantalum 6.3WV 4.7 $\mu$ F (F950J475MSAAF1Q2)
C404,406,420	K78080002	Chip Tantalum 6.3WV 4.7 $\mu$ F (F950J475MSAAF1Q2)	C504	K78080003	" " " 10 $\mu$ F (F950J106MTAAF1Q2)
C418	K78100003	" " 10WV 6.8 $\mu$ F (F951A685MTAAF1Q2)			

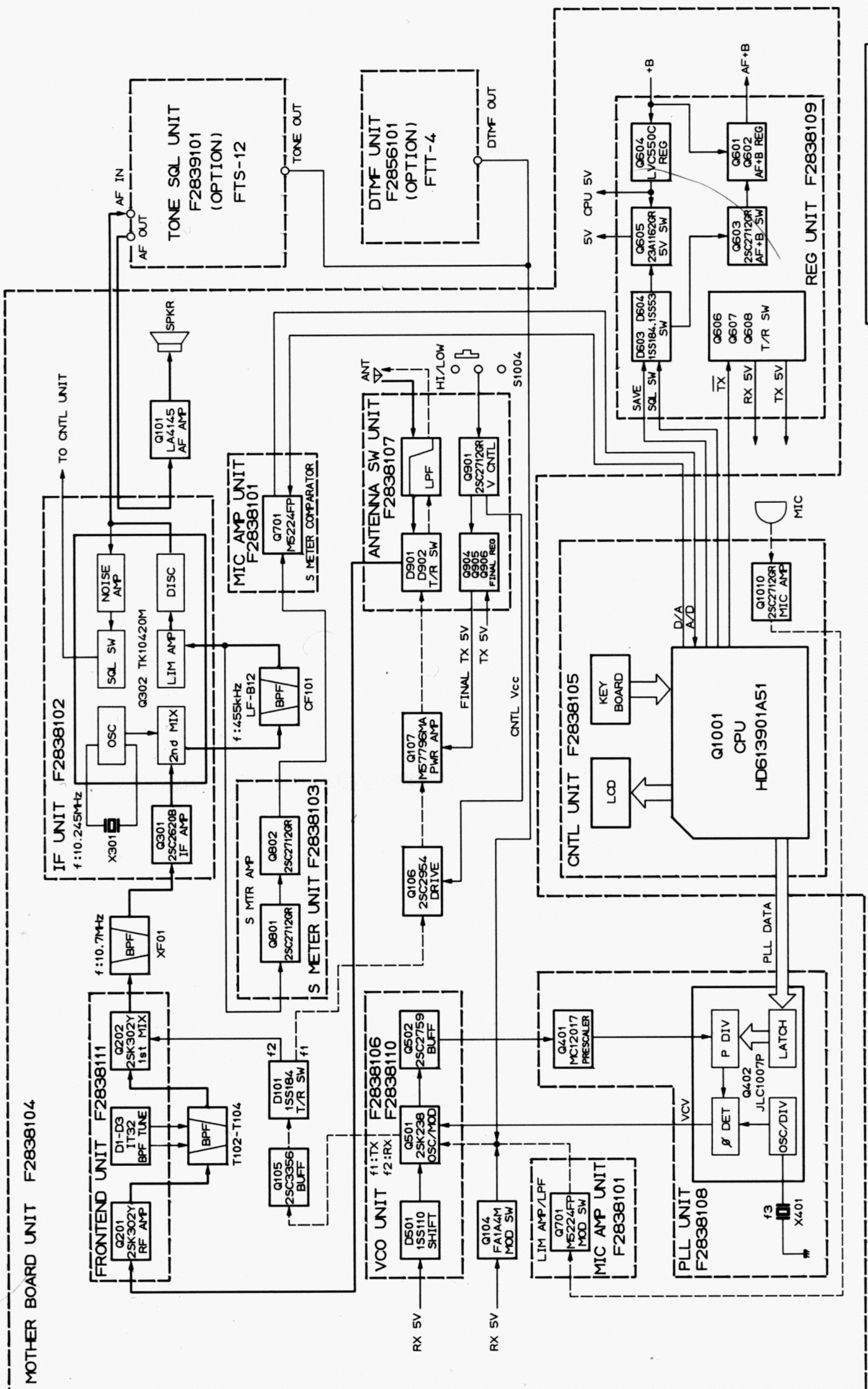
- Model A1,A2,D,E2
- Model B,C2

TRIMMER CAPACITOR			C602	K78100003	Chip Tantalum 10WV 6.8μF (F951A685MTAAF1Q2)
TC501	K91000152	ECR-JA040G12X	C607	K78080003	" " 6.3WV 10μF (F950J106MTAAF1Q2)
INDUCTORS					
L501-503	L1190283	LAL02NA1R0M 1μH			
L504	L1190342	LAL02KRR22M 0.22μH			
MIC AMP UNIT			Symbol No.	Part No.	Name & Description
TRANSFORMER				F2838101	Printed Circuit Board
T501	L0021684A	R12-E991X 150MHz		C028381AA	PCB with Components Model A1,A2,F
				C028381AB	" " " Model B,C2,D,E2
TEST POINTS					
TP	Q5000082	IPS-1091-01			
					IC
	R0116640	SHIELD CASE	Q701	G1090726	M5224FP
	R0117100	SHIELD TOP			
RESISTORS					
REG UNIT			R705	J24205332	RMC 1/10T332J1/10W3.3kΩ
Symbol No.	Part No.	Name & Description	R710	J24205562	" " 562J " 5.6kΩ
	F2838109A	Printed Circuit Board	R701*,702*,709 711-713	J24205103	" " 103J " 10kΩ
	C028389AA	PCB with Components	R704*,715	J24205223	" " 223J " 22kΩ
			R708	J24205333	" " 333J " 33kΩ
			R707	J24205563	" " 563J " 56kΩ
		IC	R716	J24205104	" " 104J " 100kΩ
Q604	G1090736	LVC550C-2	R703,714	J24205225	" " 225J " 2.2MΩ
			R706	J24205335	" " 335J " 3.3MΩ
TRANSISTORS					
Q601	G3207997L	2SB799ML			CAPACITORS
Q602,603,608	G3327127G	2SC2712GRTE85R	C705,708,710,711 713,714	K22170805	Chip Ceramic 50WV 0.001μF B (C2012B1H102MFA)
Q605-607	G3111627G	2SA1162GRTE85R	C703*	K22170809	" " " 0.0022μF " (C2012B1H220MFA)
			C702*,703*,709	K22170817	" " " 0.01μF B (C2012B1H103MFA)
DIODES			C706	K22171008	" " " 0.047μF " (C2012B1H473ZFA)
D601,604	G2090027	1SS53 Si	C701*,704*,707 712	K22141904	" " " 0.1μF D (C3216D1E104MFA)
D602	G2090183	HZ9A2L Zener			
D603	G2070009	1SS184TE85R Si			
RESISTORS					
R602	J01245829	Carbon film 1/4W 8.2Ω TJ			
R601	J24205101	RMC 1/10T101J 1/10W 100Ω			
R608	J24205222	" " 222J " 2.2kΩ	S METER UNIT		
R606,607,612	J24205472	" " 472J " 4.7kΩ	Symbol No.	Part No.	Name & Description
R605,611	J24205103	" " 103J " 10kΩ		F2838103	Printed Circuit Board
R603	J24205223	" " 223J " 22kΩ		C028383AA	PCB with Components
R604,609,610	J24205104	" " 104J " 100kΩ			
CAPACITORS			Q801,802	G3327127G	2SC2712GRTE85R
C601,603,604 606,608-613	K22170805	Chip Ceramic 50WV 0.001μF B (2012B1H102MFA)			
C605	K78120002	Chip Tantalum 16WV 2.2μF (F951C225MSAAF1Q2)			

- Model A1,A2,F
- \* Model B,C2,D,E2

		DIODES			INDUCTORS
D801,802	G2090029	1N60 Ge	L901	L1190344	LAL02KR100K 10μH
			L902, L904	L0021683	
			L903	L0021682	
		RESISTORS			
R802	J24205102	RMC 1/10T102J 1kΩ			
R804	J01245102	Carbon film 1/4W 1kΩ			TERMINAL POSTS
R801,803	J24205104	RMC 1/10T104J 100kΩ	TP901	Q5000016	TP-E/MS-60124
		CAPACITORS			
C801	K22170801	Chip Ceramic 50WV 470pF B (C2012B1H471MFA)	CNTL UNIT		
C802,803	K22170817	" " " 0.01μF " (C2012B1H103MFA)	Symbol No.	Part No.	Name & Description
				F2838105A	Printed Circuit Board
				C028385AA	PCB with Components Model F
				C028385AB	" " " Model A1, A2
				C028385AC	" " " Model B, C2, D, E2 w/o BAT1001
ANT SW UNIT					
Symbol No.	Part No.	Name & Description			
	F2838107A	Printed Circuit Board			
	C028387AA	PCB with Components			
		ICs			
			Q1001	G1090741	HD613901A51
			Q1007	G1090752	PST523G
Q901,905	G3207997L	2SB799ML	Q1008	G1090602	μPD4066BG
Q902-904	G3327127G	2SC2712GRTE85R	Q1009	G1090601	μPD4001BG
		DIODES			TRANSISTORS
D901,902	G2090027	1SS53 Si	Q1002,1012	G3111627G	2SA1162GRTE85R
D903	G2070007	1SS226TE85R "	Q1003-1006,1010	G3327127G	2SC2712GRTE85R
			Q1011,1013	G3070001	FA1A4M
		RESISTORS			
R905	J24205221	RMC 1/10T221J 1/10W 220Ω			DIODES
R903	J24205471	" " 471J " 470Ω	D1001,1002,1008	G2070001	1SS181TE85R Si
R901,904,906	J24205222	" " 222J " 2.2kΩ	D1003,1005	G2090334	HZ4ALL Zener
R902	J24205473	" " 473J " 47kΩ	D1004	G2090118	1SS97 Schottky
			D1006	G2070028	SLM-23VMW T-97 LED
			D1007	G2070009	1SS184TE85R Si
		CAPACITORS			
C916	K22170207	Chip Ceramic 50WV 6pF CH (C2012CH1H060DFA)			LIQUID CRYSTAL DISPLAY
C914	K22170209	" " " 8pF " (C2012CH1H080DFA)	DS1001	G6090060	LR-541C
C917	K22170217	" " " 18pF " (C2012CH1H180JFA)			
C913,915	K22170223	" " " 33pF " (C2012CH1H330JFA)			CERAMIC RESONATOR
C901,903,905 907-912	K22170805	" " " 0.001μF B (C2012B1H102MFA)	X1001	H7900270	CSB800K
C904	K40179033	Electrolytic " 0.47μF (RC3-50VR47M)			
C902,906	K40129052	" 16WV 10μF (RC3-16V100M)			





**FT-23R**  
**BLOCK DIAGRAM**

RECEIVE  
TRANSMIT  
COMMON/CNTL

A1..A2..D1..E1..E2	B..C1..C2
f3	10.240MHz 12.8MHz

A1..C1..G1	A2..C2..E2	B..D
f1	144-148MHz	140-160MHz 144-148MHz
f2	133.3-137.3MHz	129.3-149.3MHz 133.3-135.3MHz

MOTHER BOARD UNIT F2838104

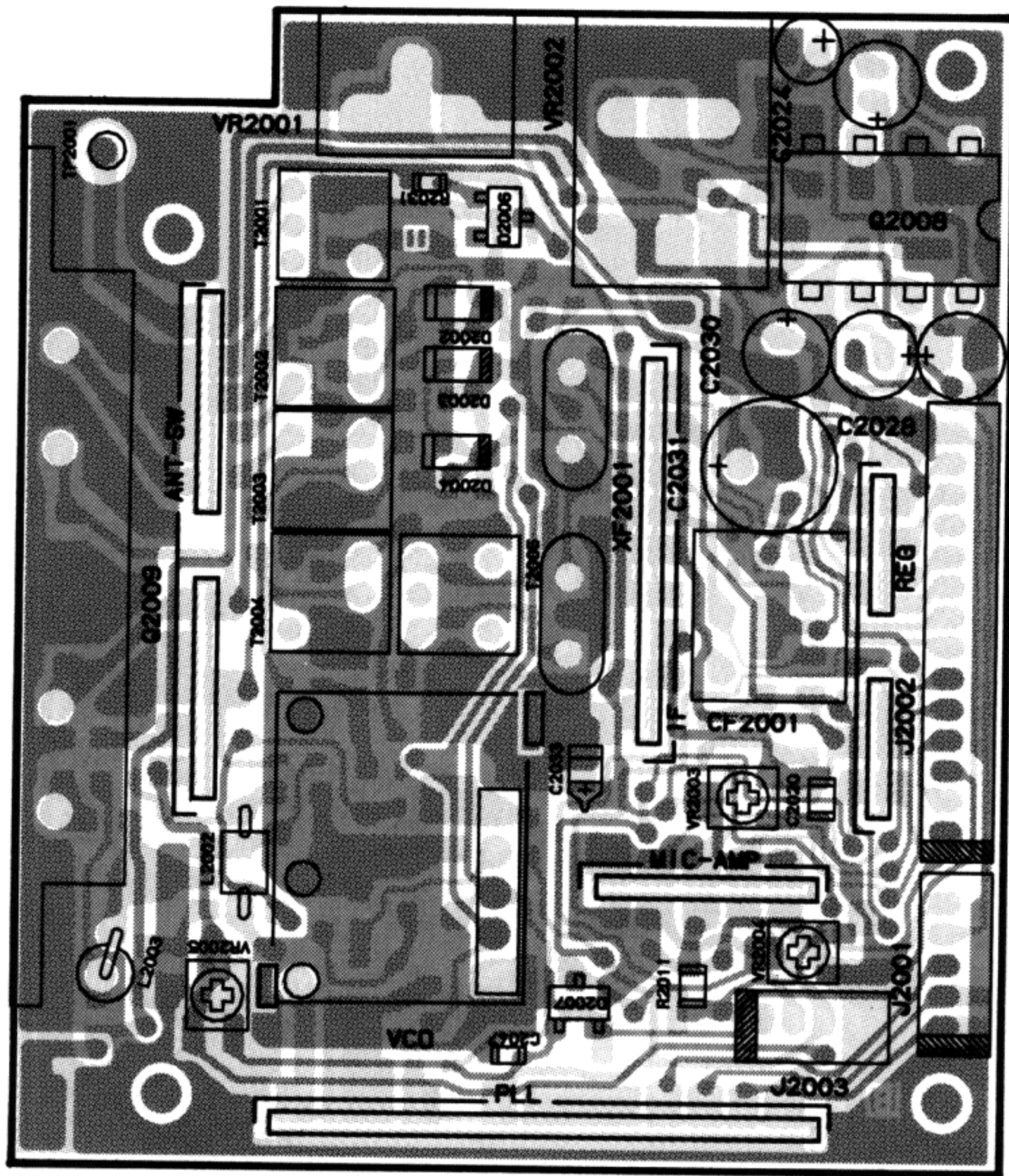
# Late Model FT-23R

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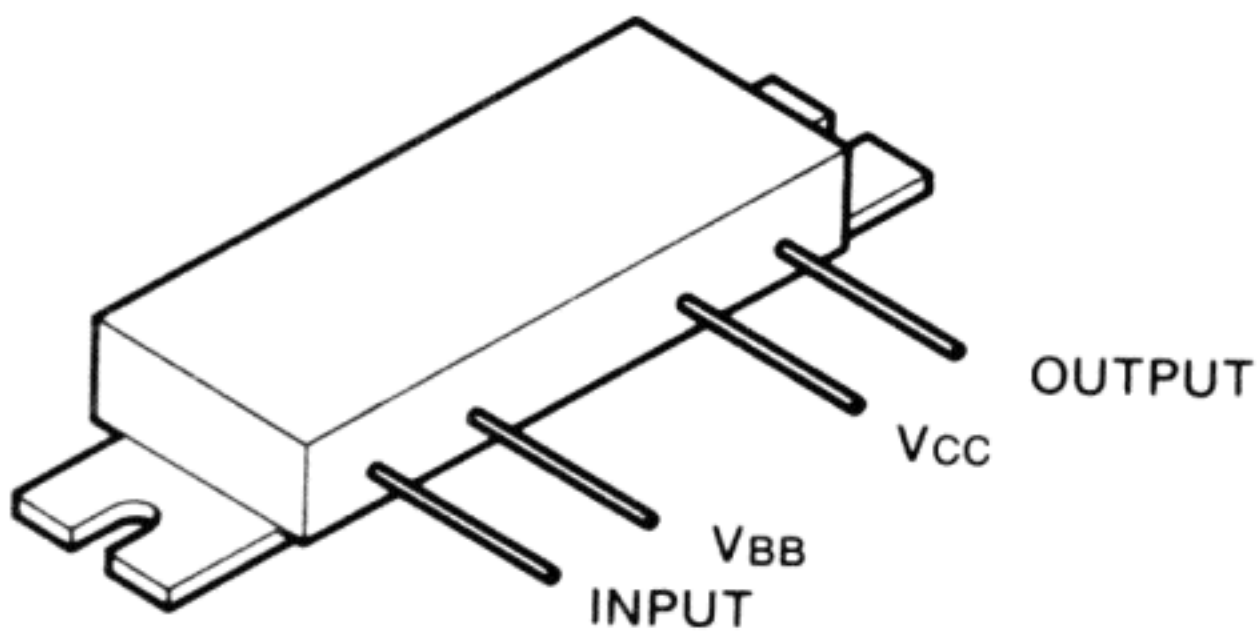
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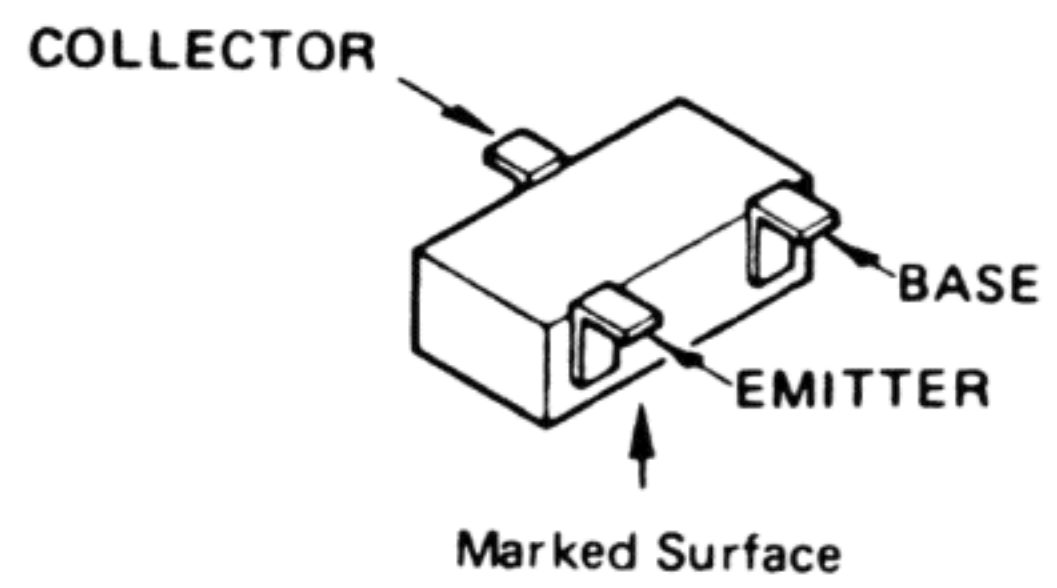
# MOTHER BOARD



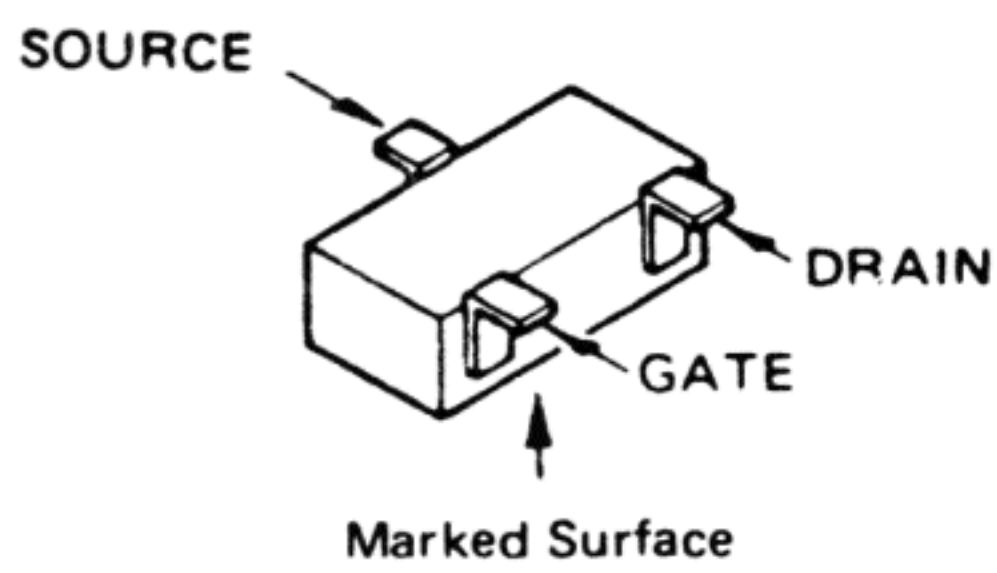
(obverse view of "mixed-component" side)



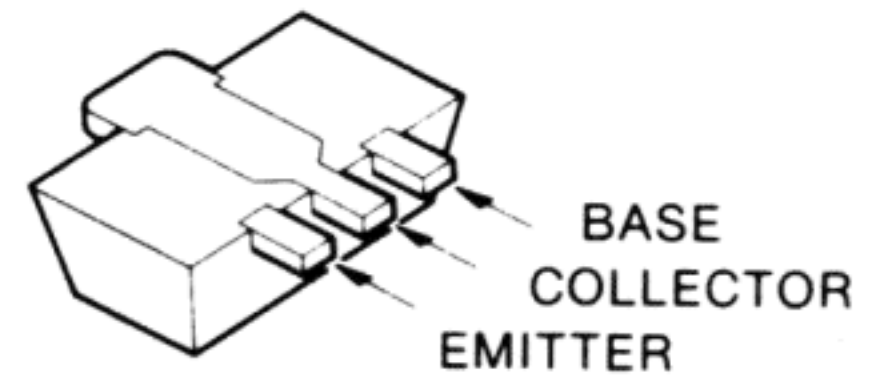
M57796MA (Q2009)



- 2SC3120 (HB) : (Q2002)
- 2SC3356 (R22) : (Q2003)
- FA1A4M (L33) : (Q2005)
- 2SC2712GR (LG) : (Q2007)
- 2SA1162GR (SG) : (Q2010)

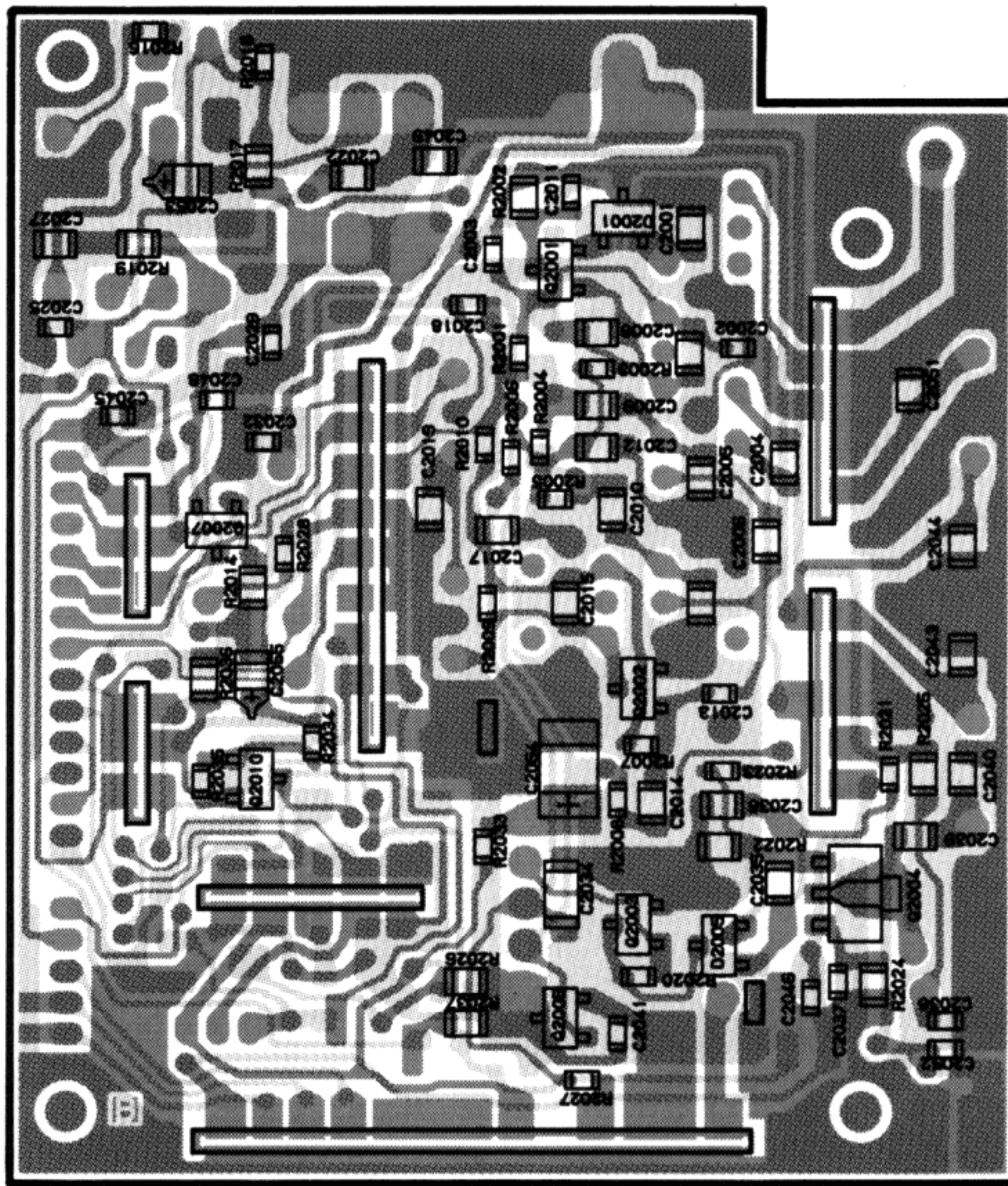


2SK302Y (TY) : (Q2001)

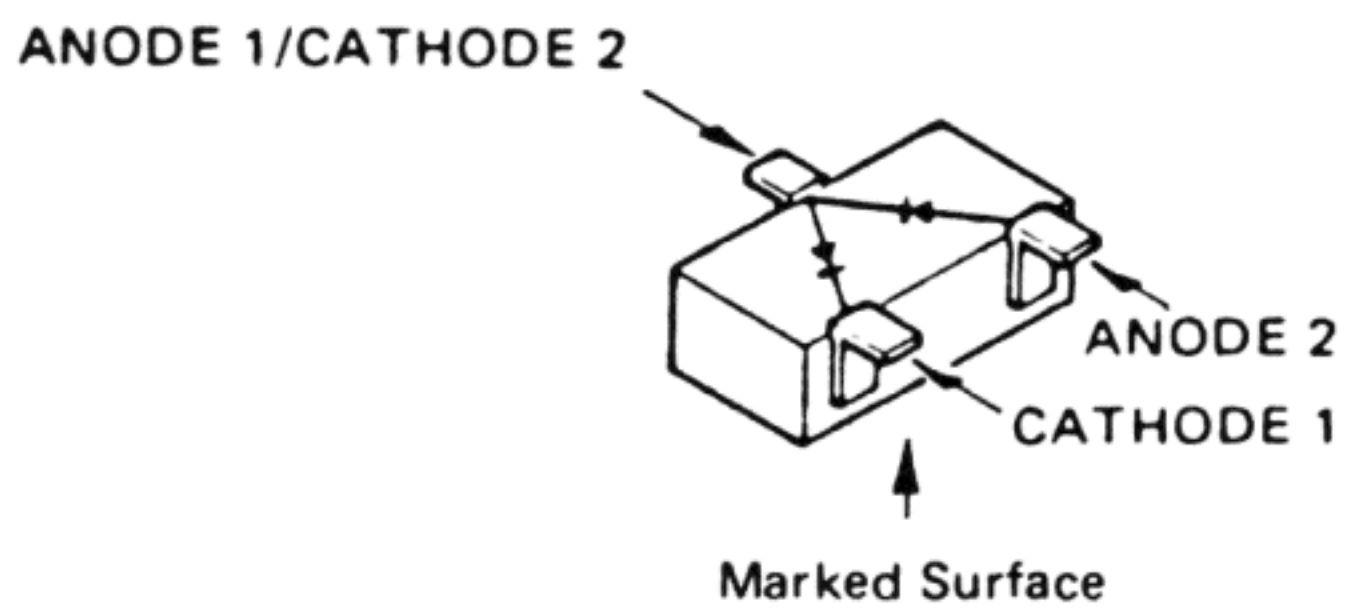


2SC2954 (QK) : (2004)

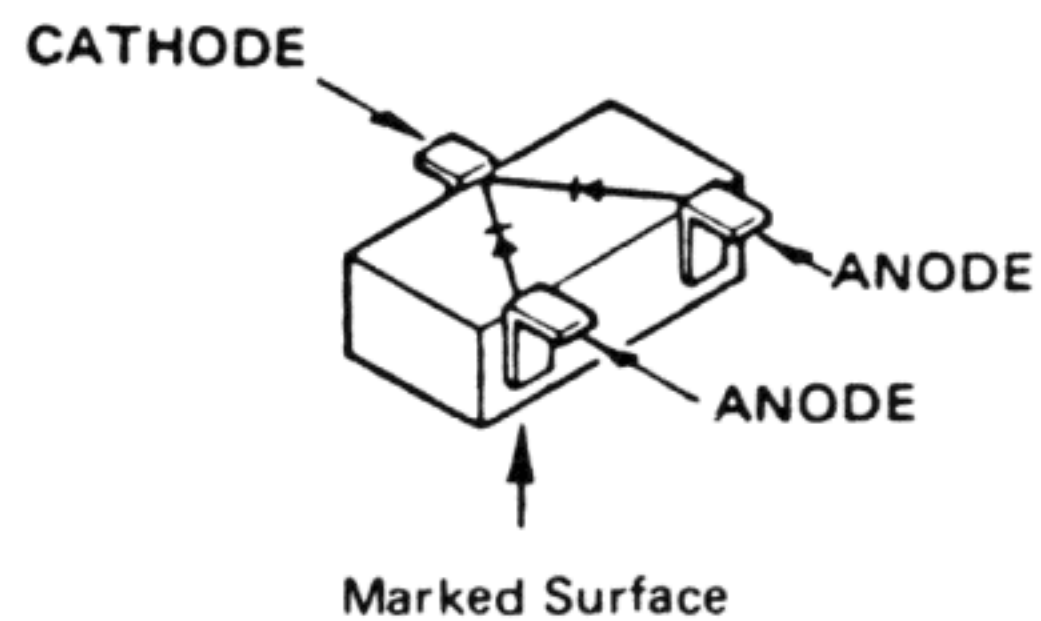
# MOTHER BOARD



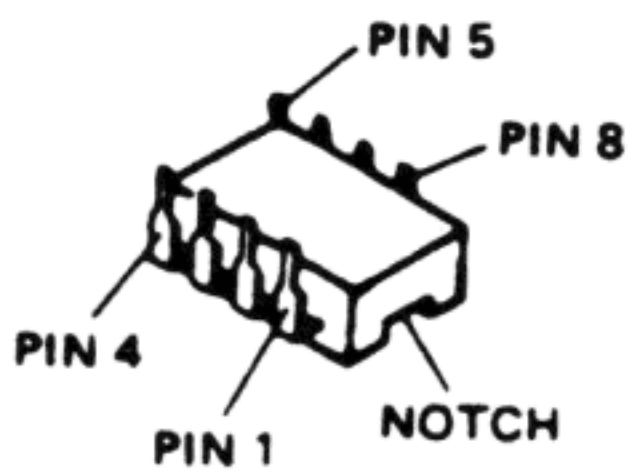
(obverse view of "chip-only" side)



1SS226 (C3) : (D2001, D2007)

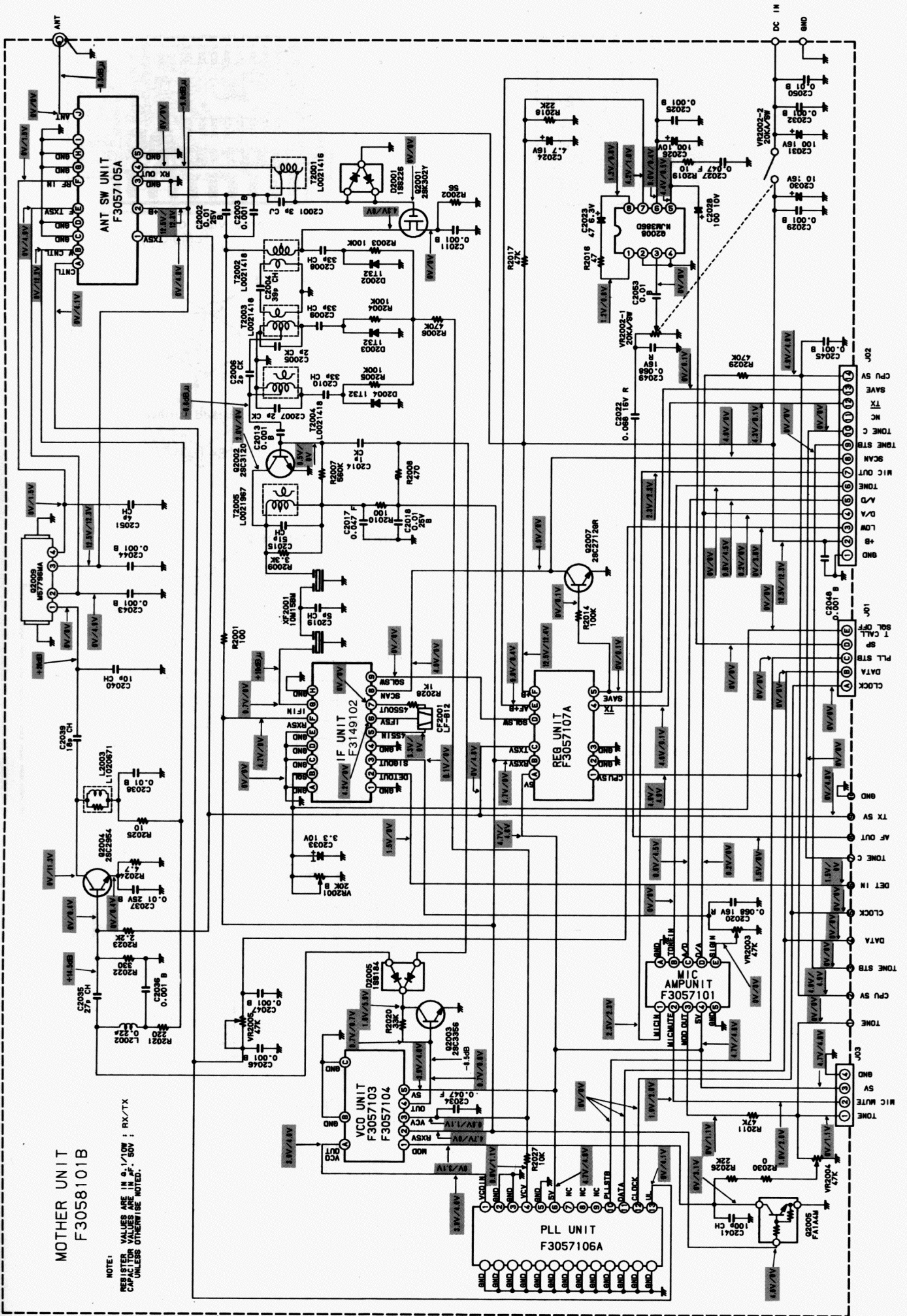


1SS184 (B3) : (D2005)

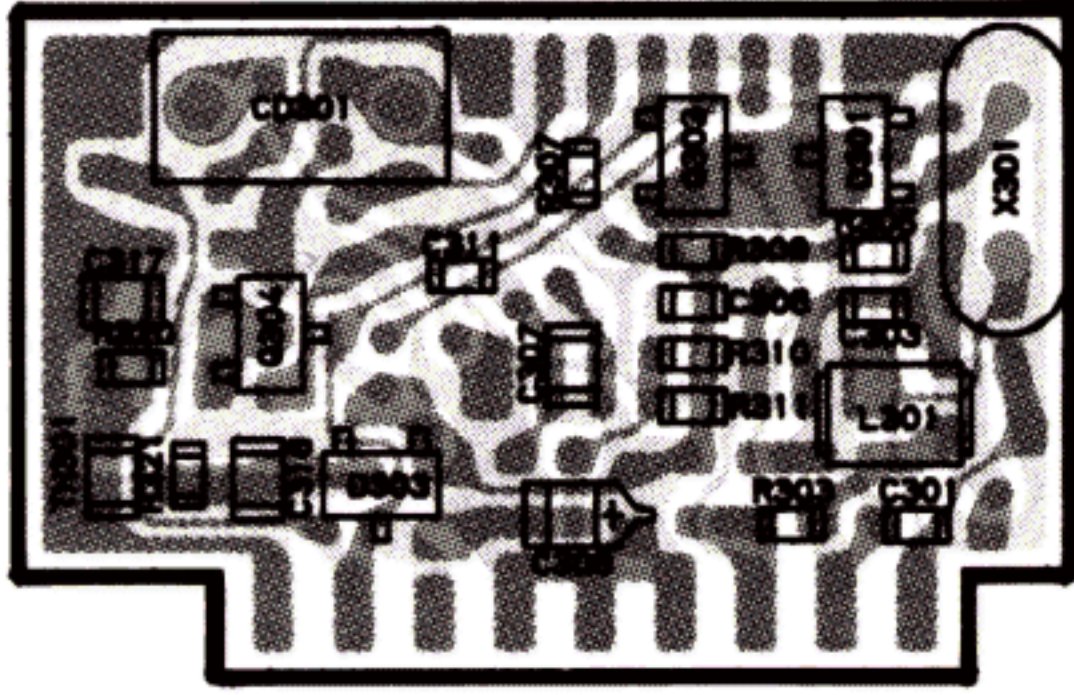


NJM386D (Q2008)

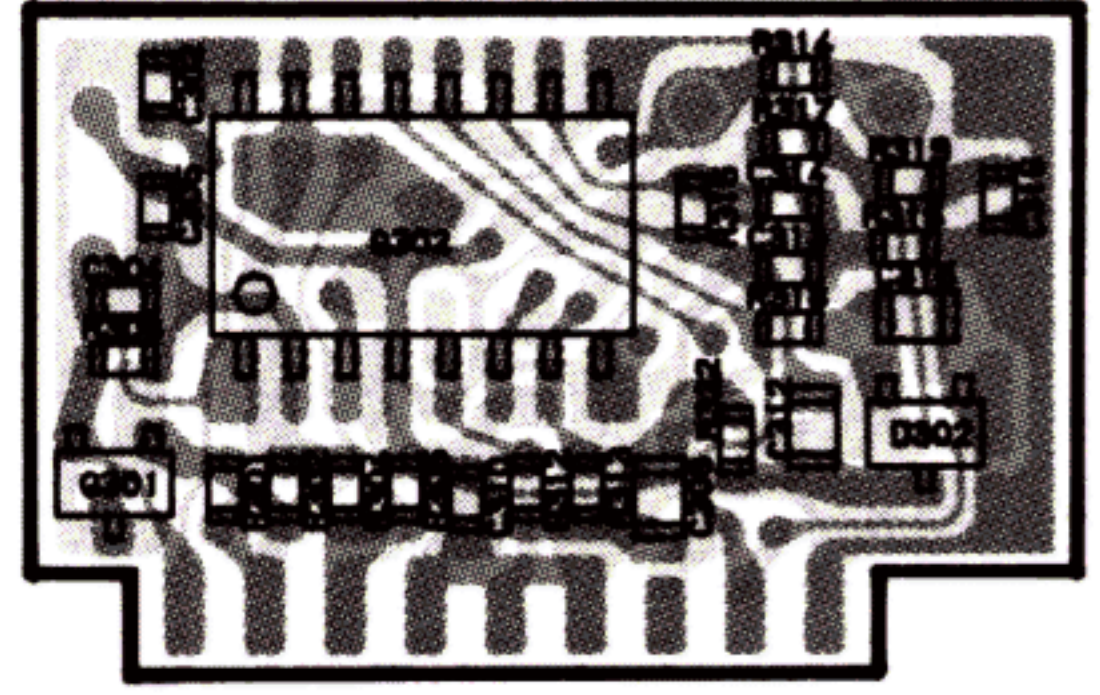
# MOTHER BOARD



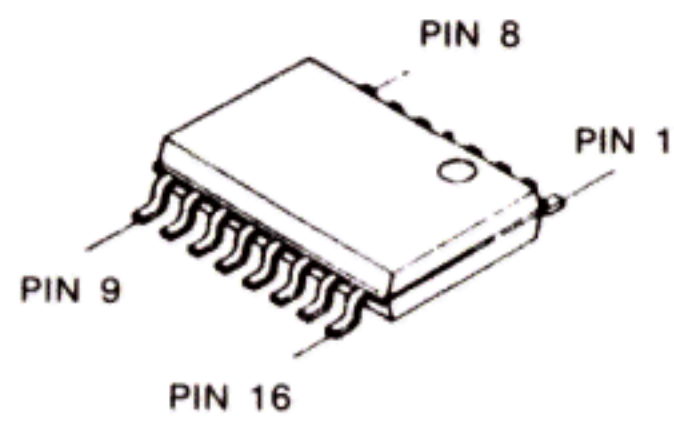
# IF UNIT



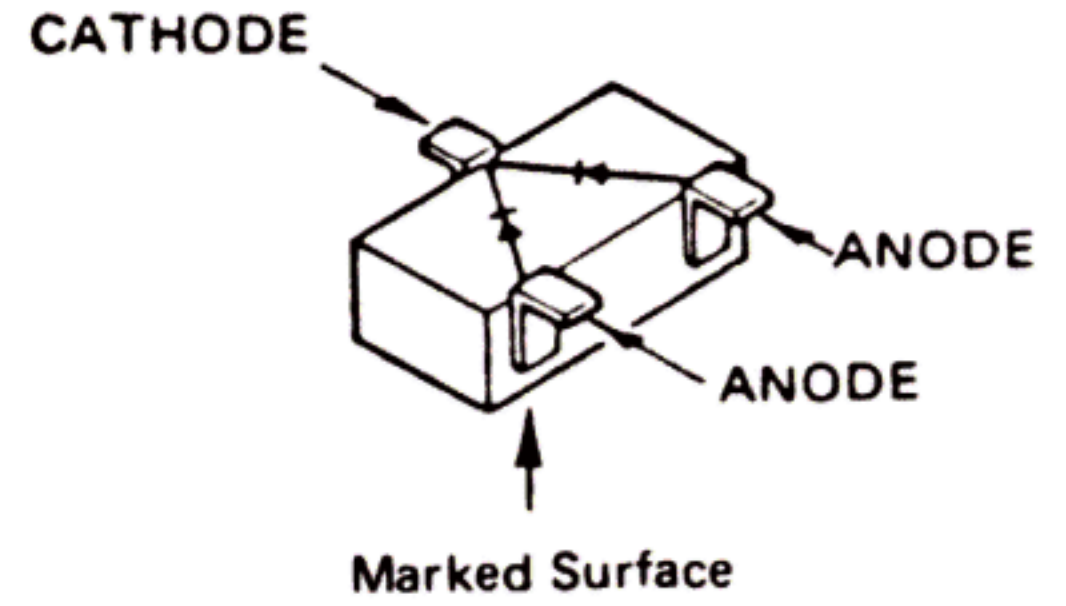
(obverse view of "mixed-component" side)



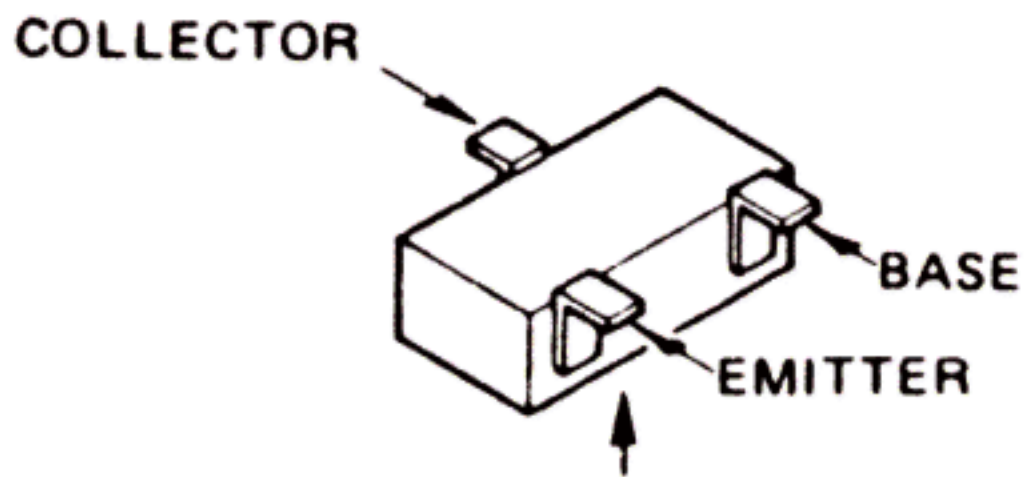
(obverse view of "chip-only" side)



MC3372ML (Q302)



1SS184 (B3) : (D303)



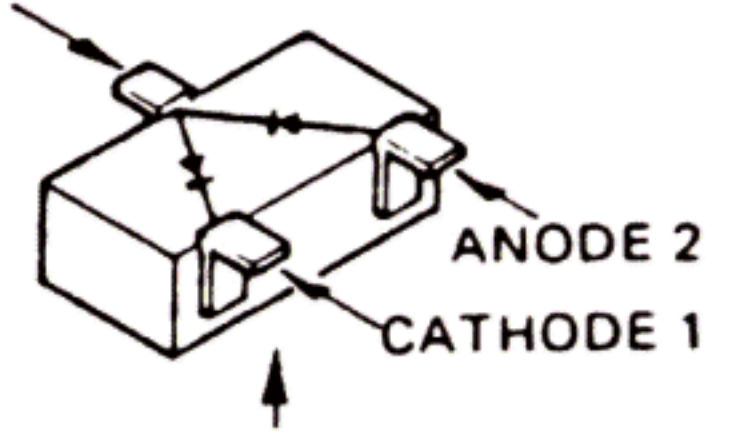
Marked Surface

2SC2620B (QB)  
(Q301)

2SC2712GR (LG)  
(Q304)

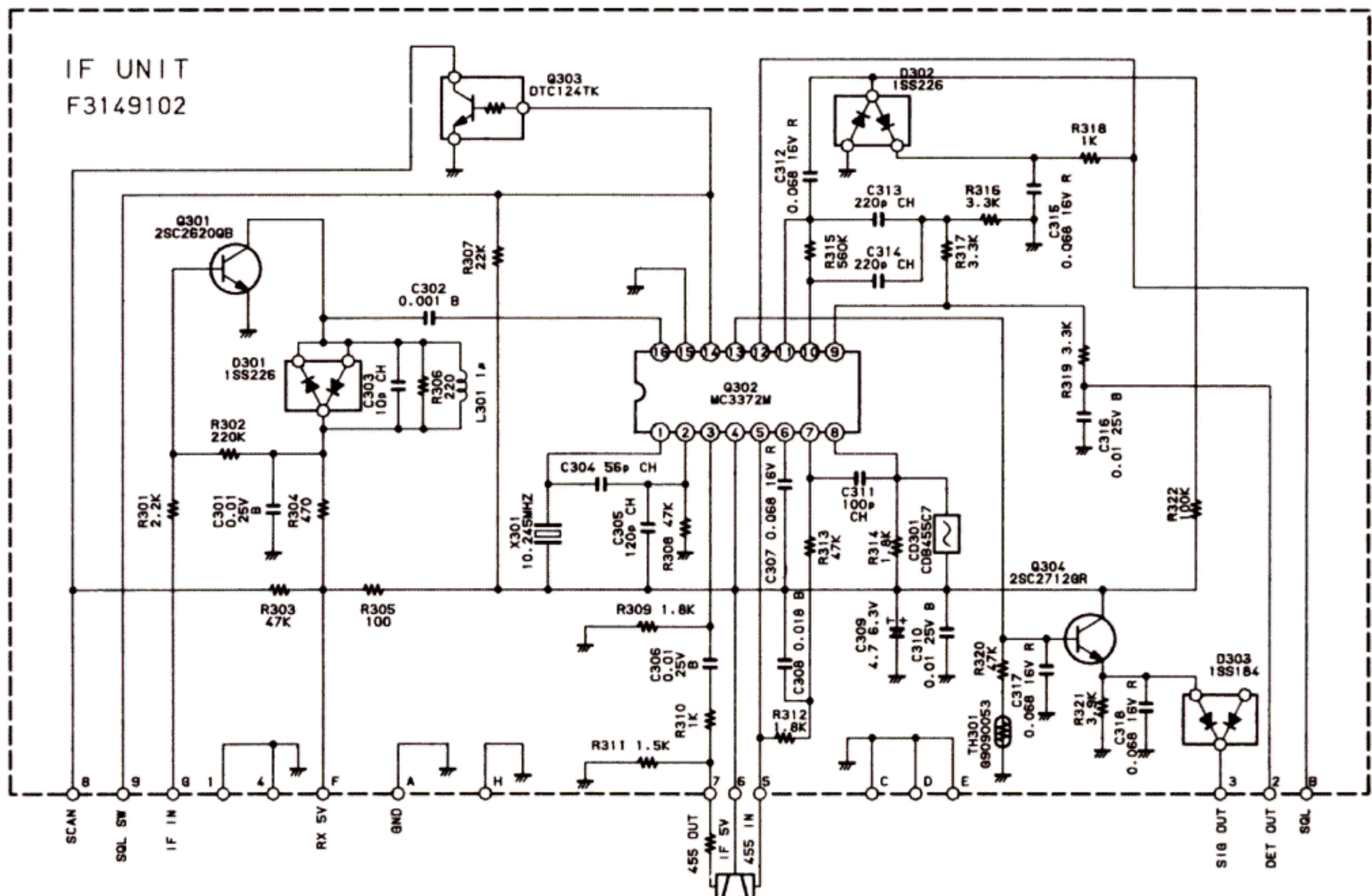
DTC124TK (O5)  
(Q303)

ANODE 1/CATHODE 2

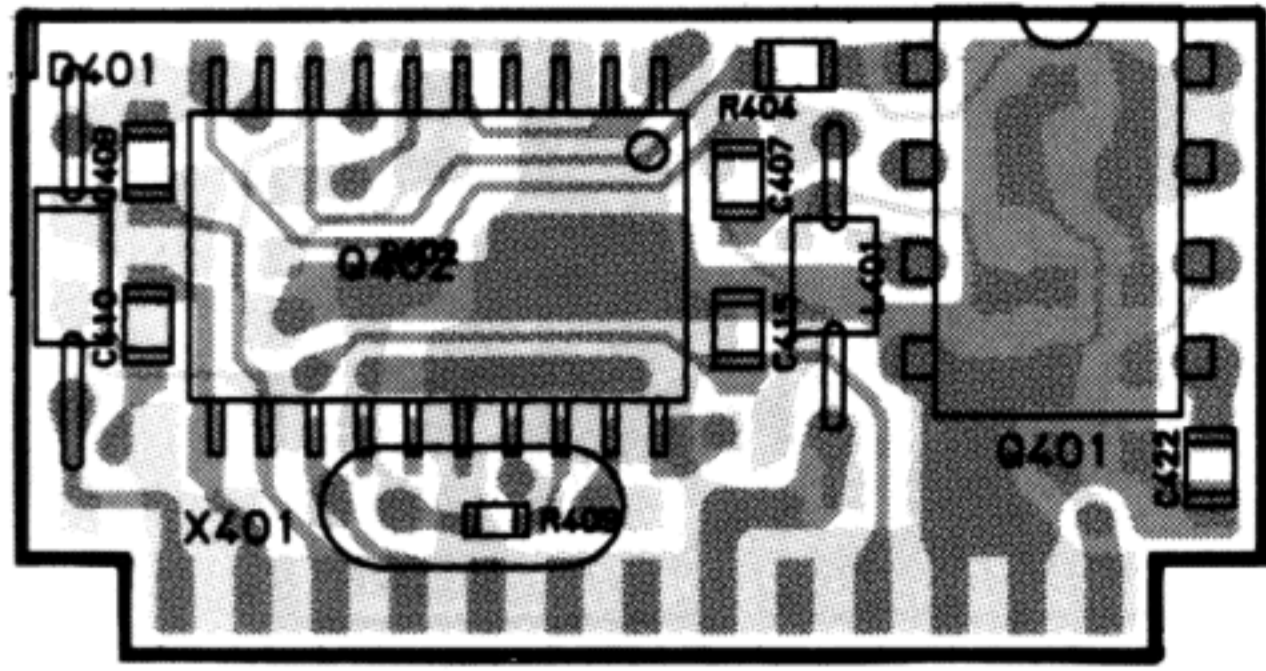


Marked Surface

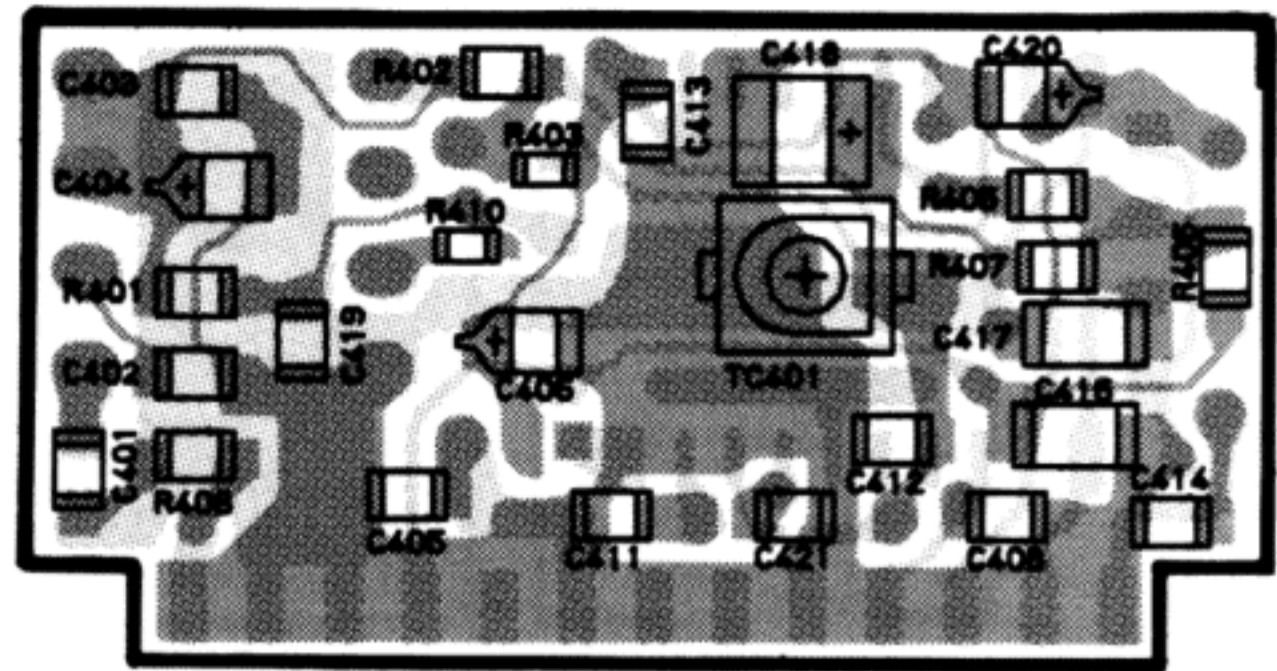
1SS226 (C3)  
(D301,302)



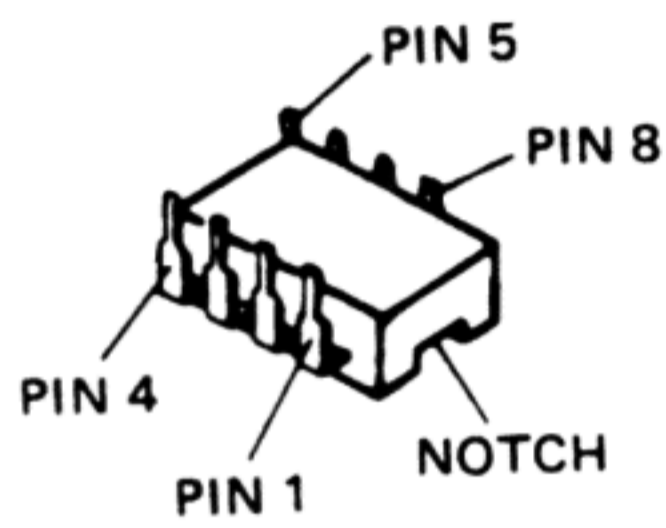
# PLL UNIT



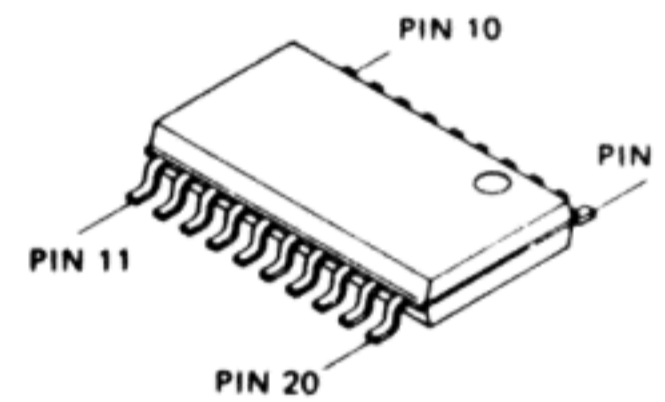
(obverse view of "mixed-component" side)



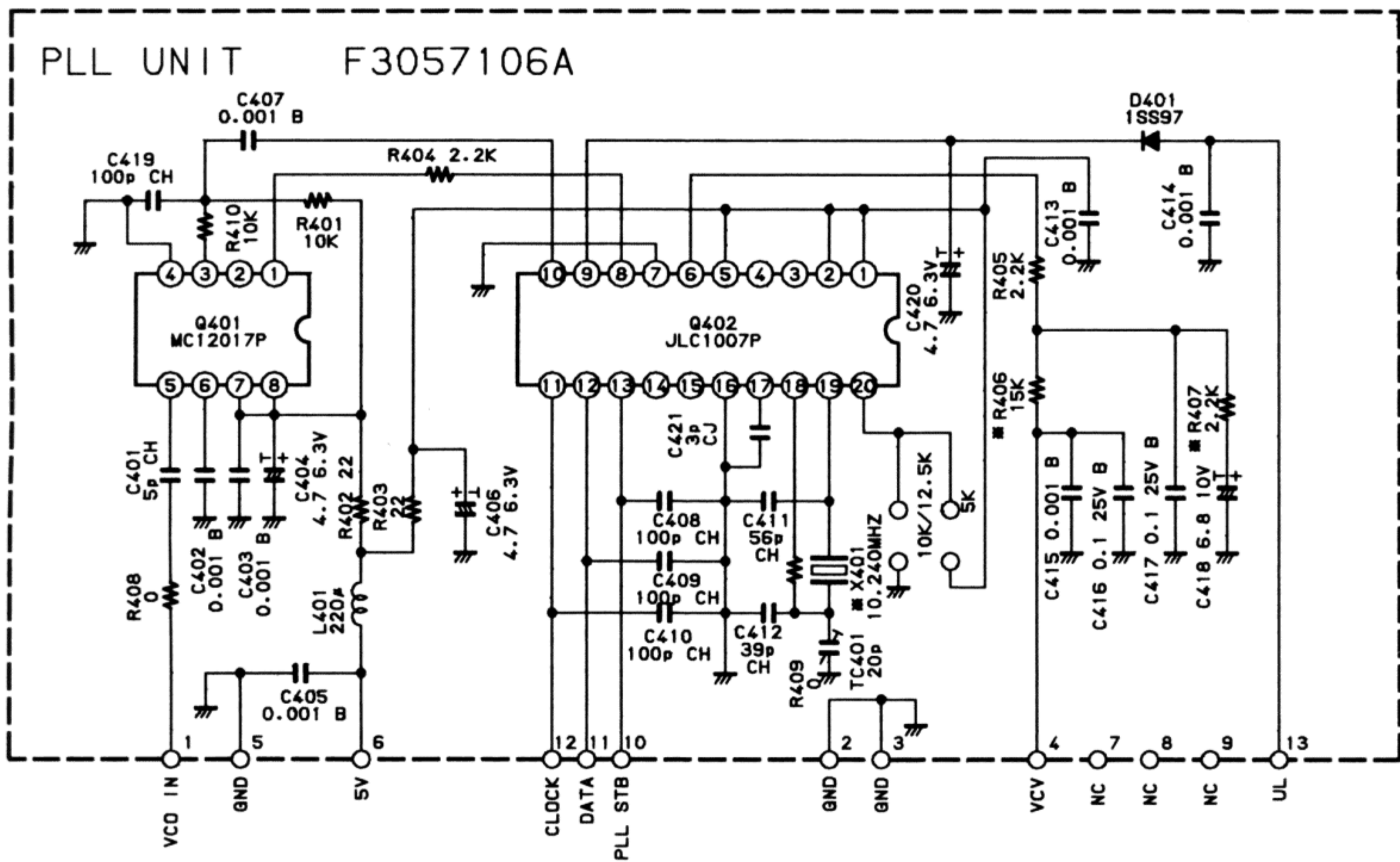
(obverse view of "chip-only" side)



MC12017P (Q401)



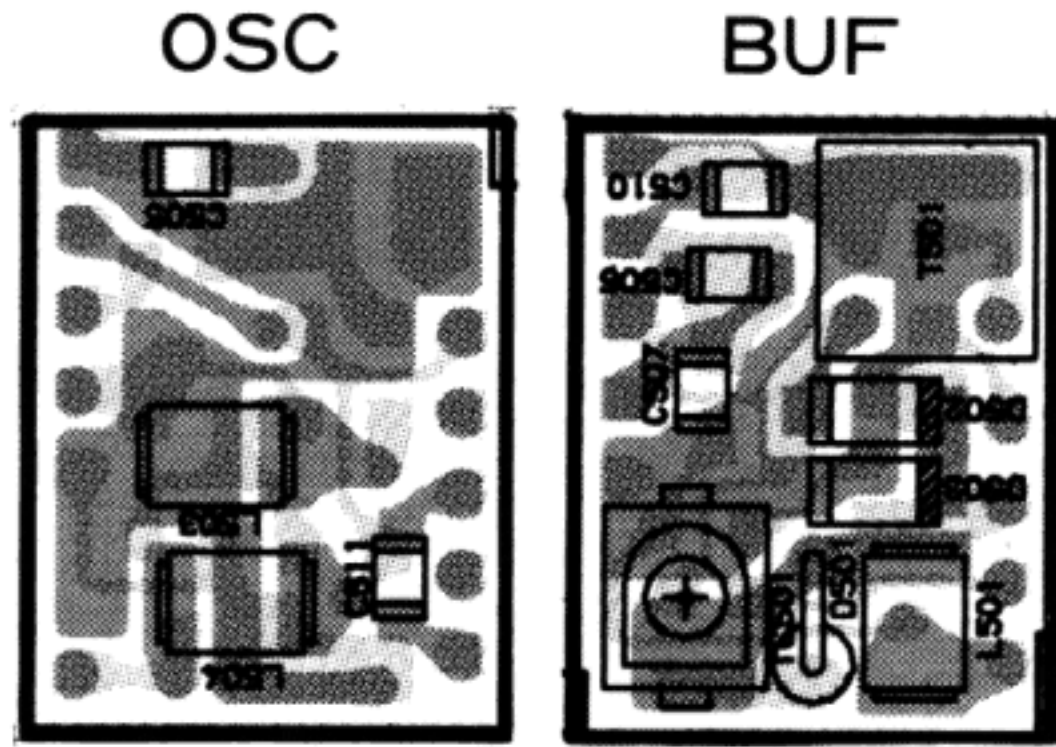
JLC1007P (Q402)



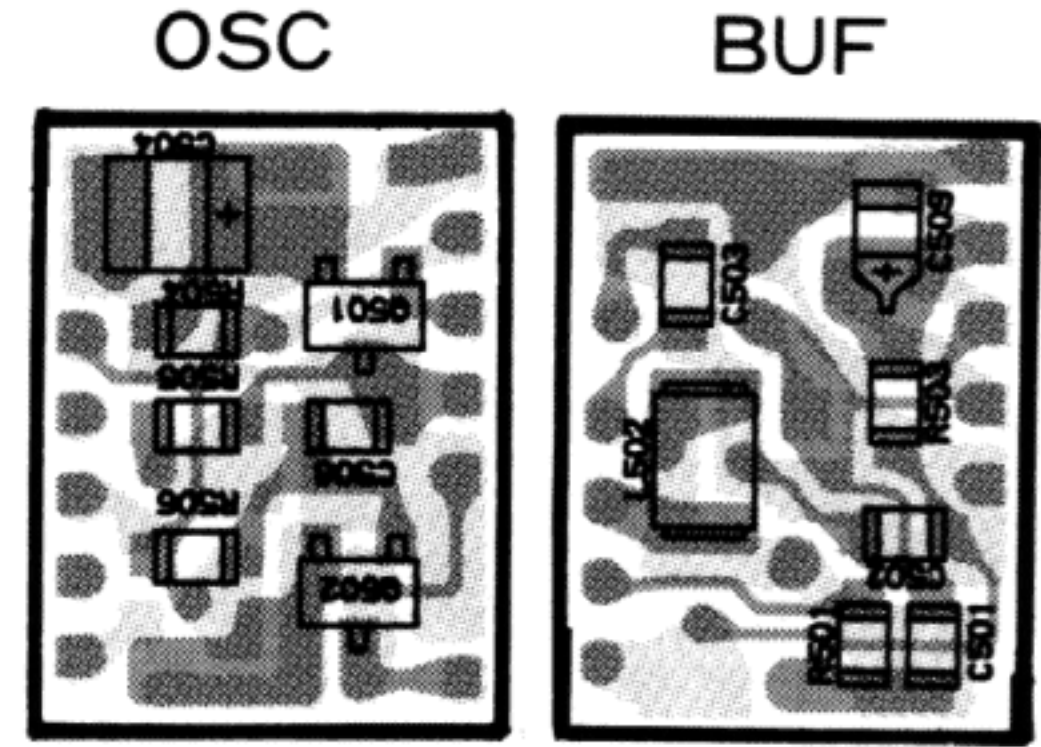
	XF401	R406	R407
A1, A2, D, E2, A3 TYPE	10.240MHZ	15K $\Omega$	1.5K $\Omega$
B, C2 TYPE	12.800MHZ	4.7K $\Omega$	1K $\Omega$

NOTE:  
 RESISTOR VALUES ARE IN  $\Omega$ , 1/10W ;  
 CAPACITOR VALUES ARE IN  $\mu$ F, 50V ;  
 (T) CAPACITOR VALUES ARE TANTALUM ;  
 INDUCTOR VALUES ARE IN H  
 UNLESS OTHERWISE NOTED.

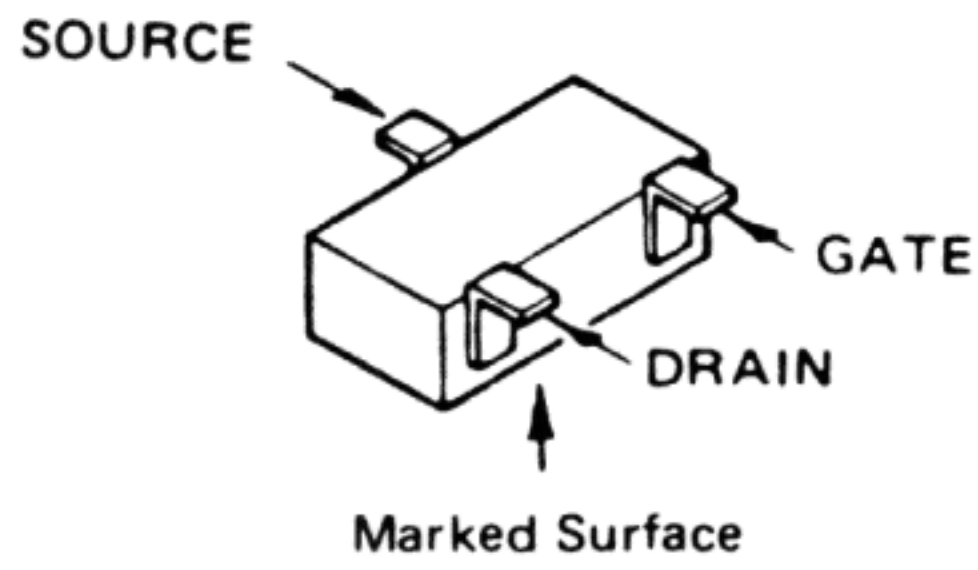
# VCO UNIT



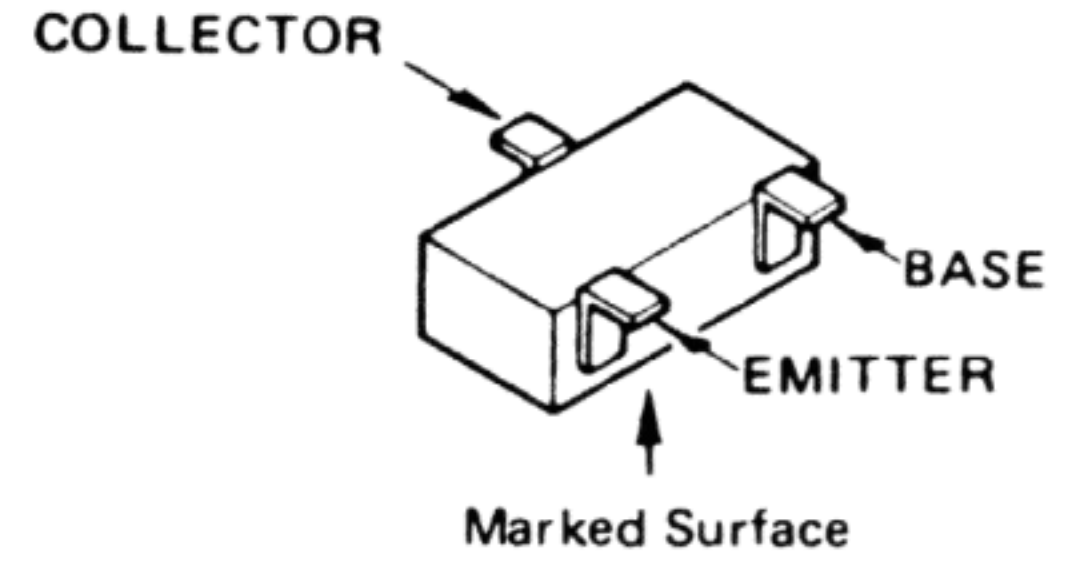
(obverse view of "top" side)



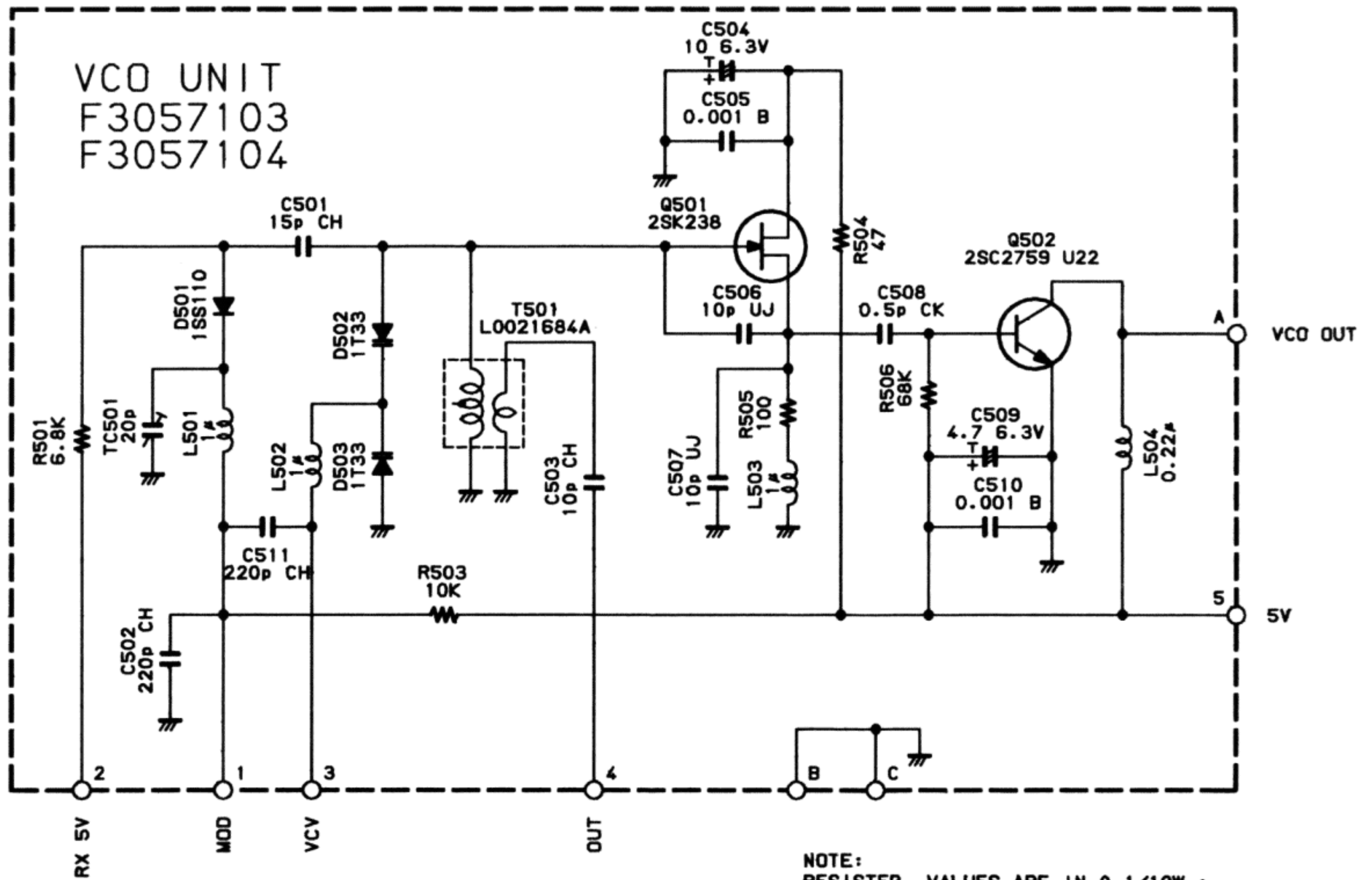
(obverse view of "bottom" side)



2SK238 (K17) : (Q501)

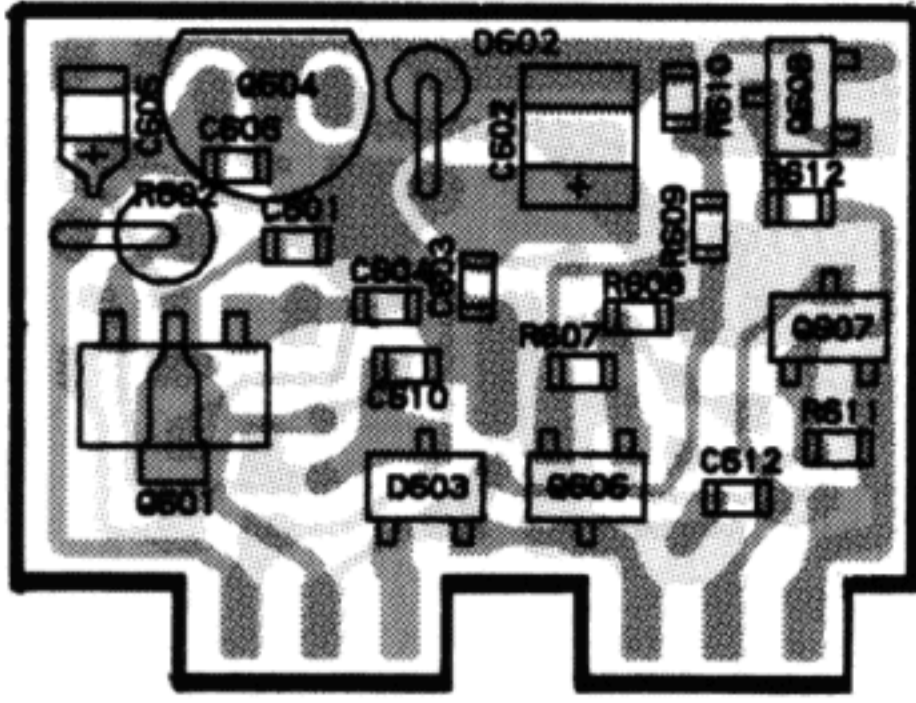


2SC2759 (U22) : (Q502)

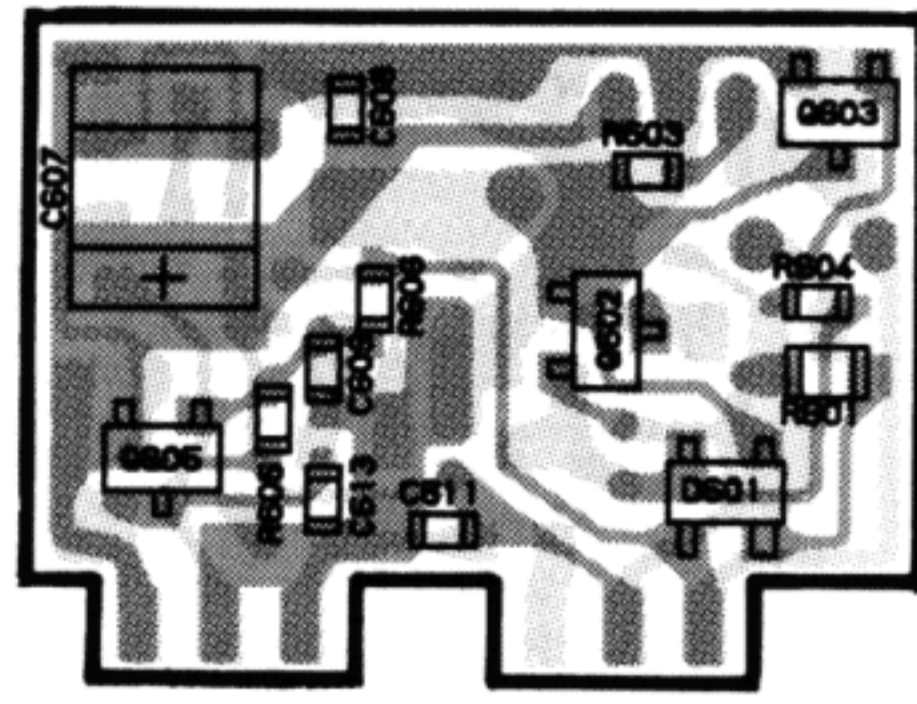


NOTE:  
 RESISTER VALUES ARE IN  $\Omega$ , 1/10W ;  
 CAPACITOR VALUES ARE IN  $\mu$ F, 50V ;  
 (T) CAPACITOR VALUES ARE TANTALUM ;  
 INDUCTOR VALUES ARE IN H  
 UNLESS OTHERWISE NOTED.

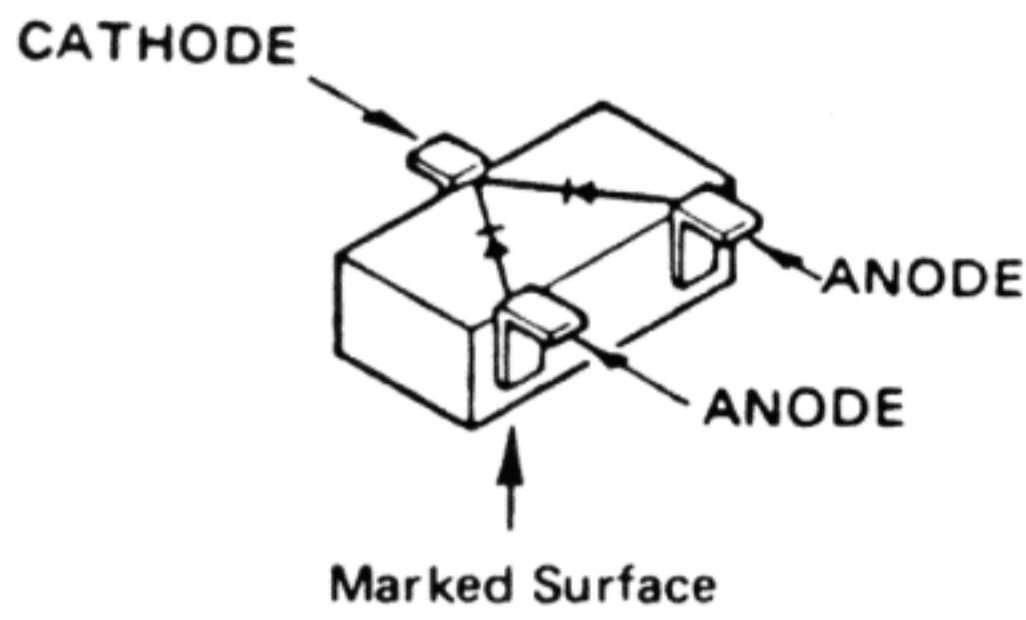
# REG UNIT



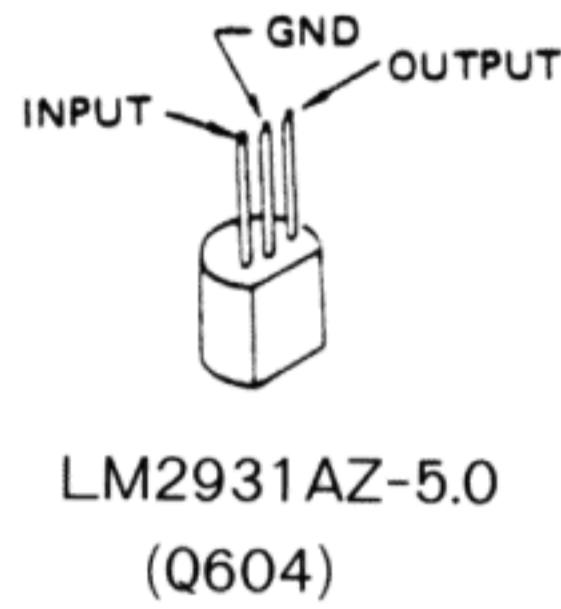
(obverse view of "top" side)



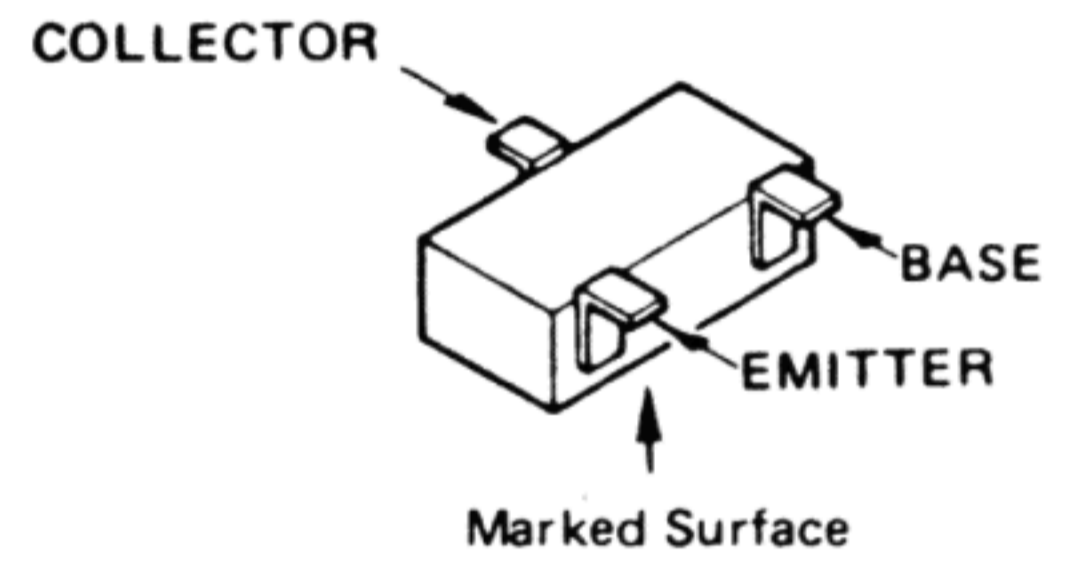
(obverse view of "bottom" side)



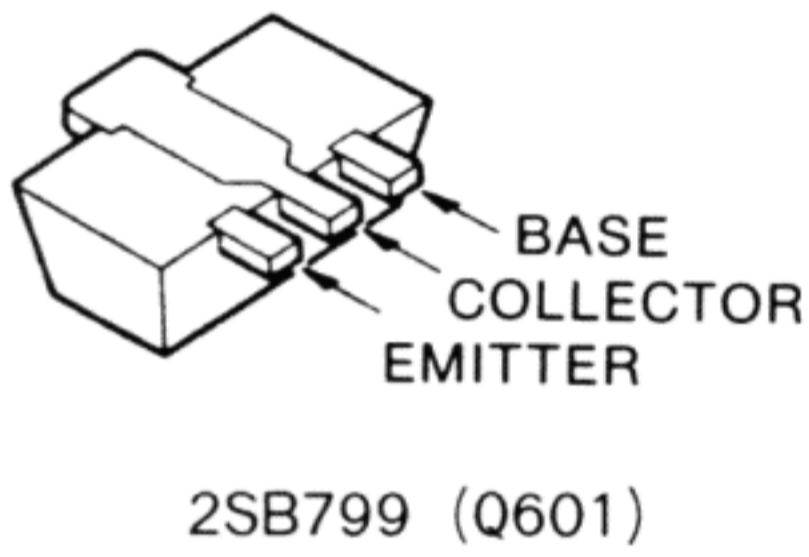
1SS184 (B3) : (D603)



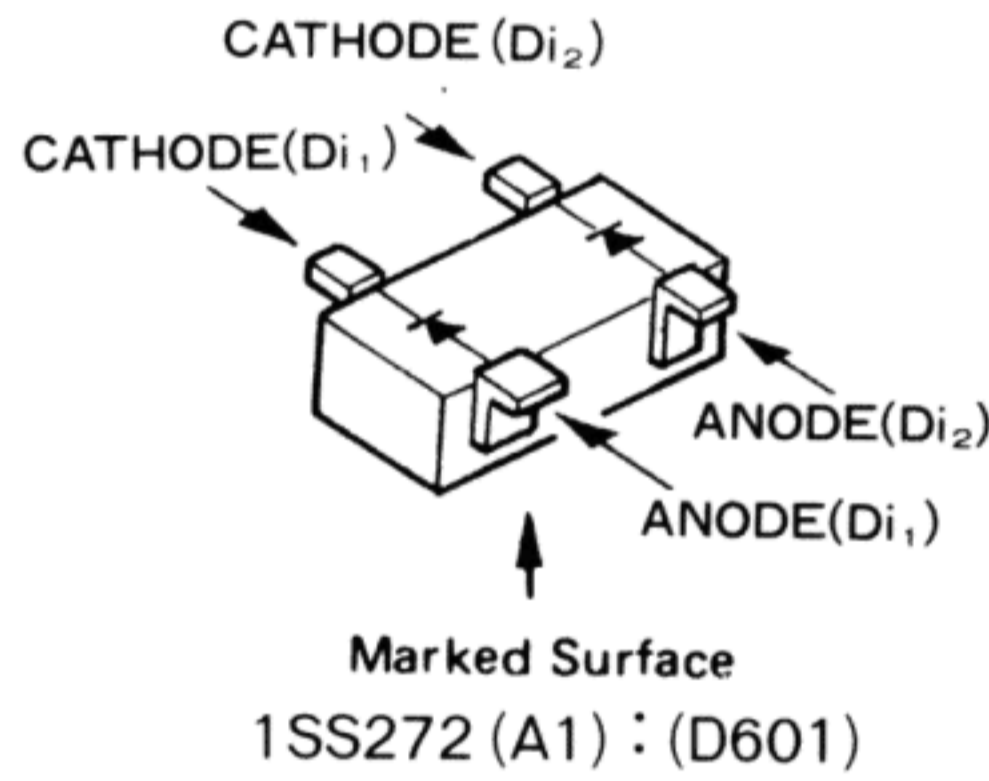
LM2931AZ-5.0 (Q604)



2SA1162GR (SG) (Q605,606,607)



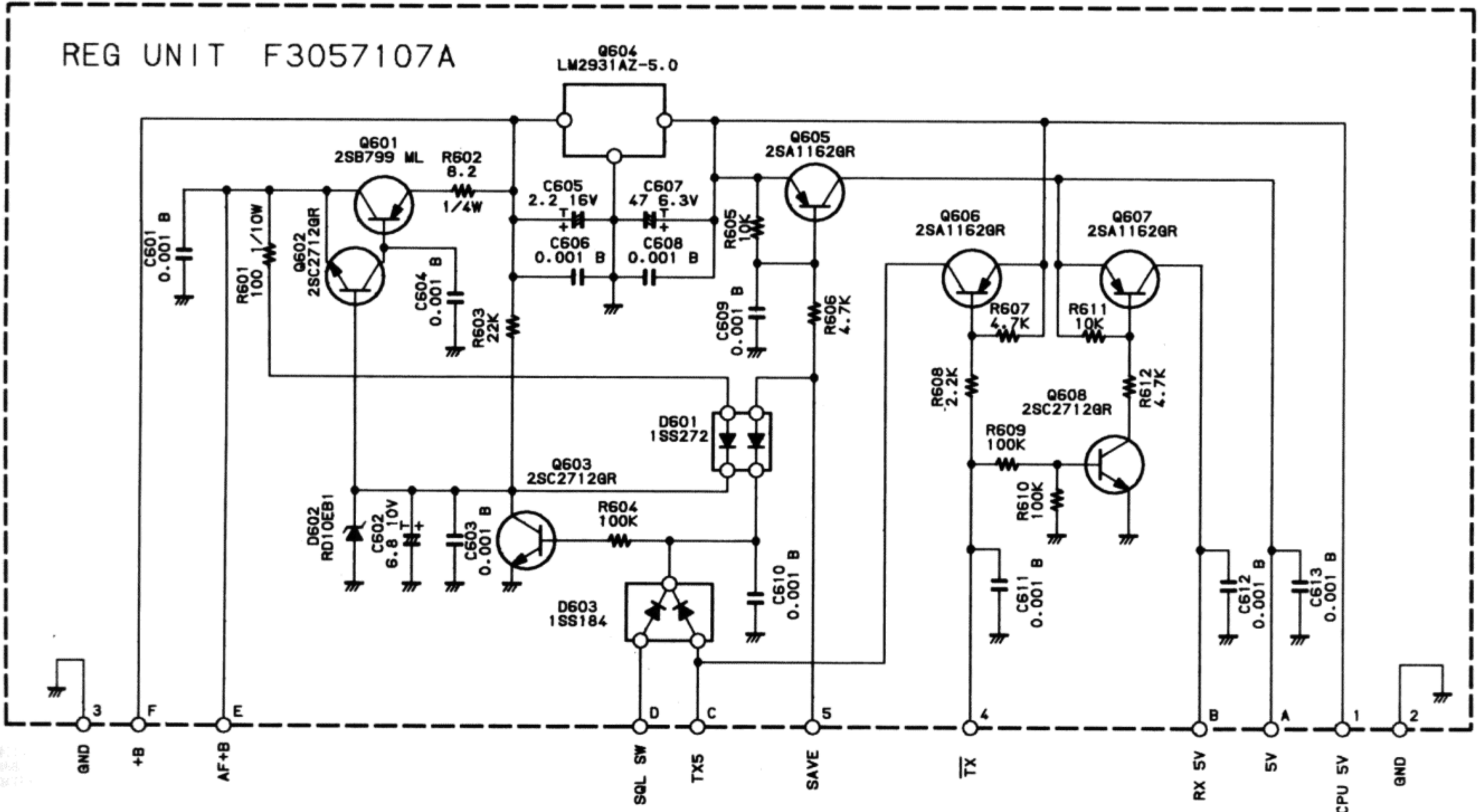
2SB799 (Q601)



1SS272 (A1) : (D601)

2SC2712GR (LG) (Q602,603,608)

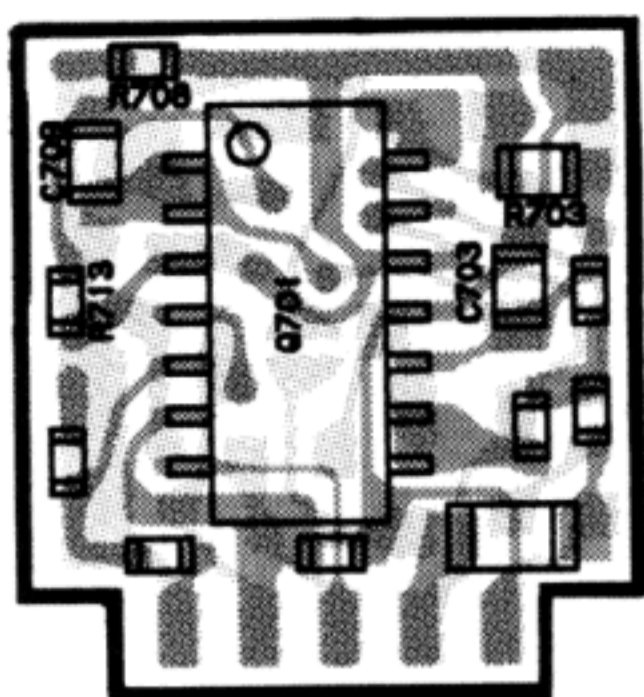
## REG UNIT F3057107A



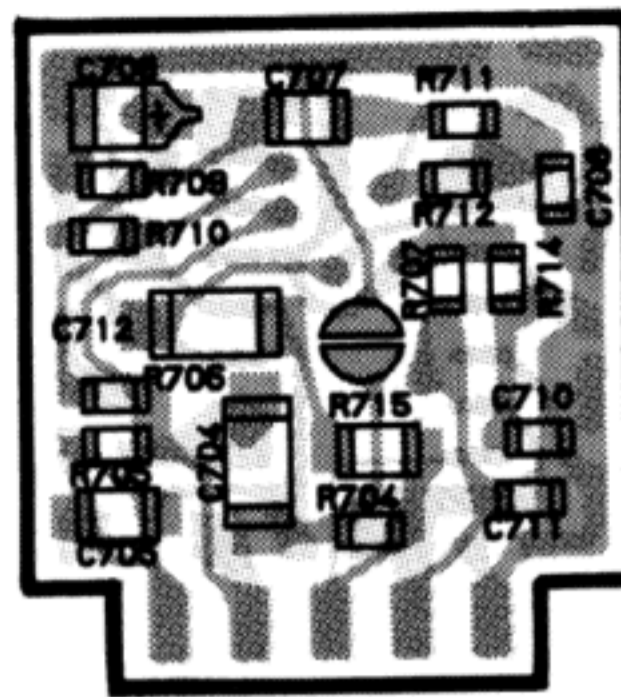
**NOTE:**

RESISTOR VALUES ARE IN Ω, 1/16W ;  
 CAPACITOR VALUES ARE IN μF, 50V ;  
 (T) CAPACITOR VALUES ARE TANTALUM ;  
 INDUCTOR VALUES ARE IN H  
 UNLESS OTHERWISE NOTED.

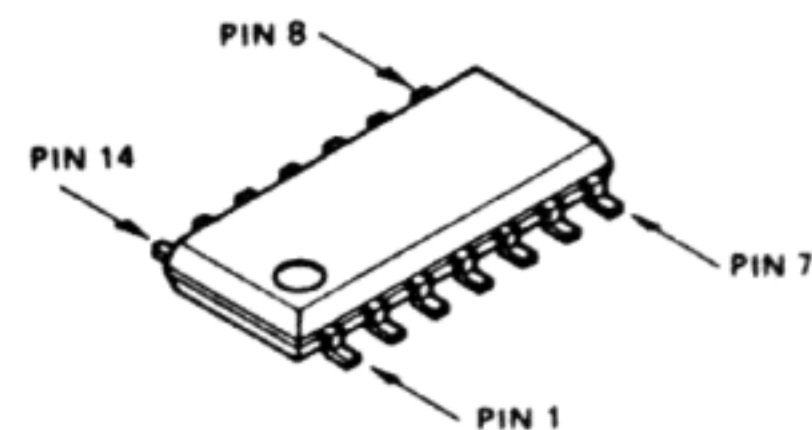
# MIC AMP UNIT



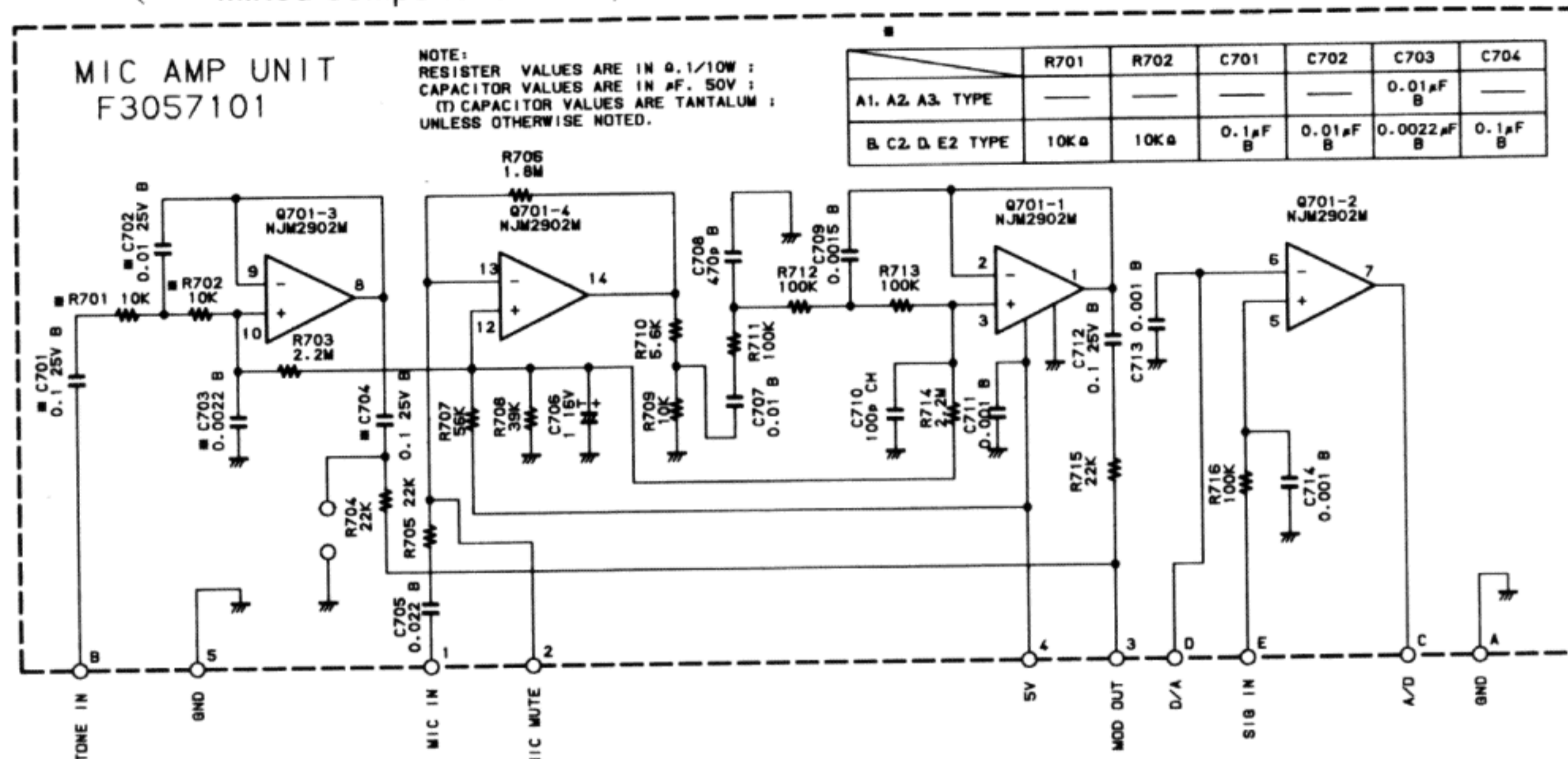
(obverse view of "mixed-component" side)



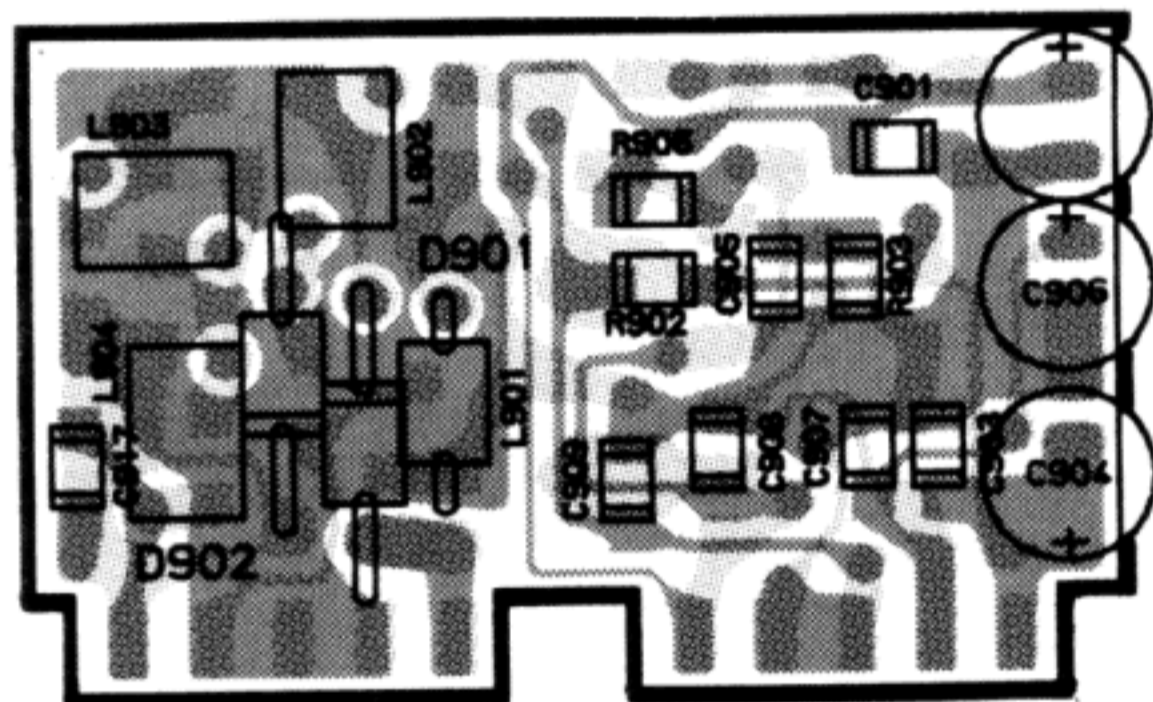
(obverse view of "chip-only" side)



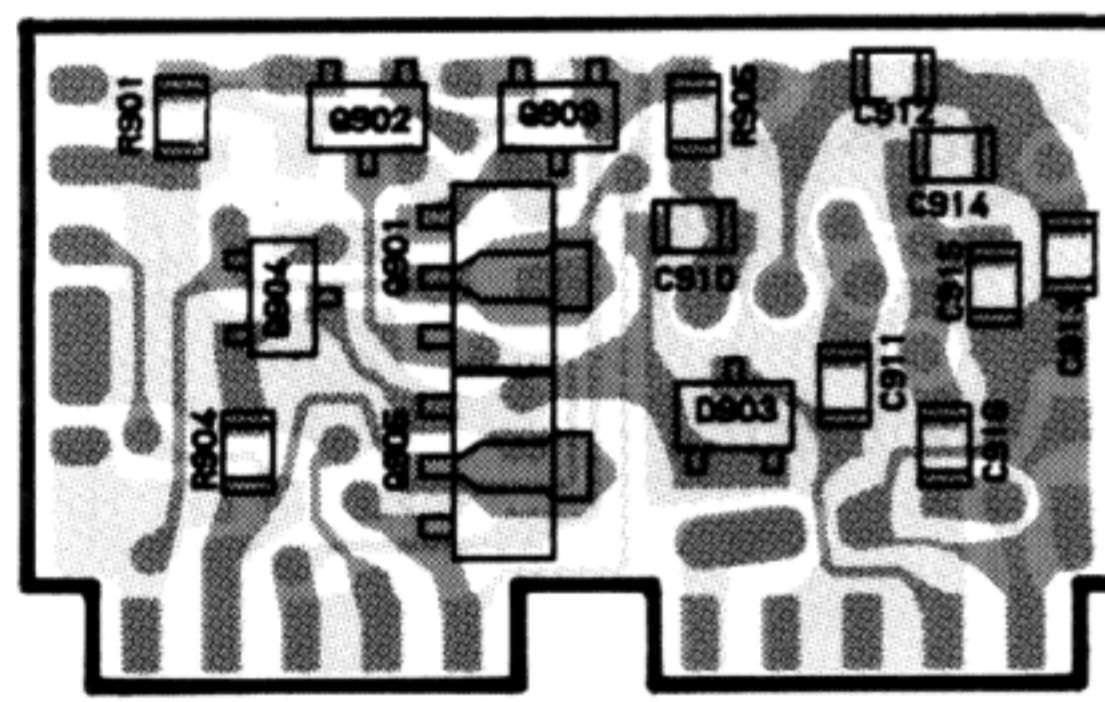
NJM2902M (Q701)



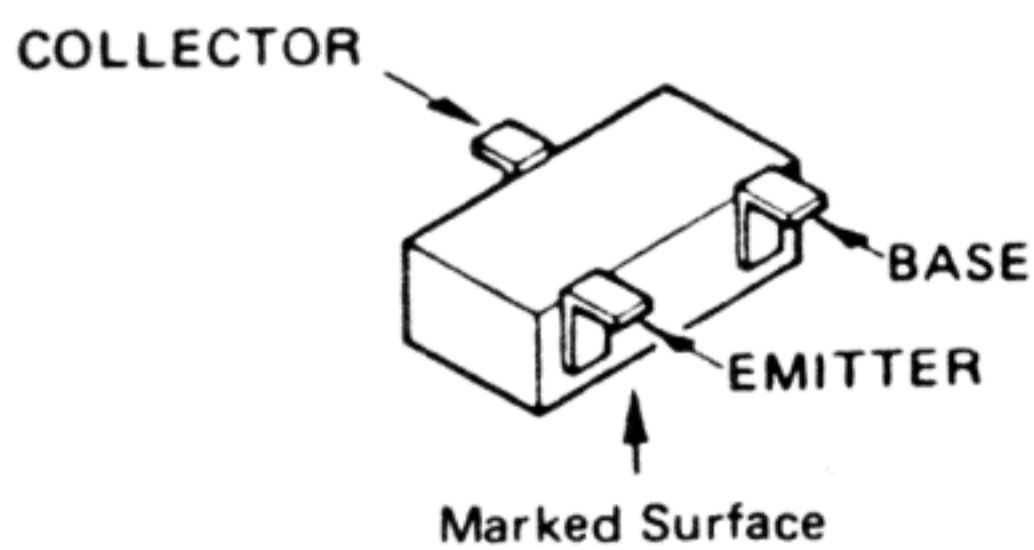
# ANT SW UNIT



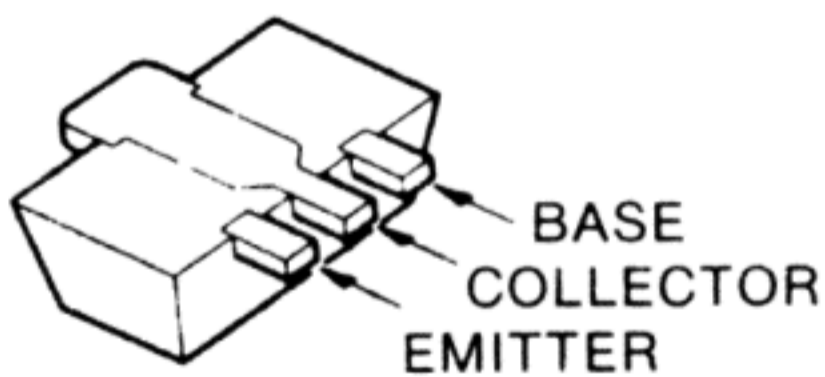
(obverse view of "mixed-component" side)



(obverse view of "chip-only" side)



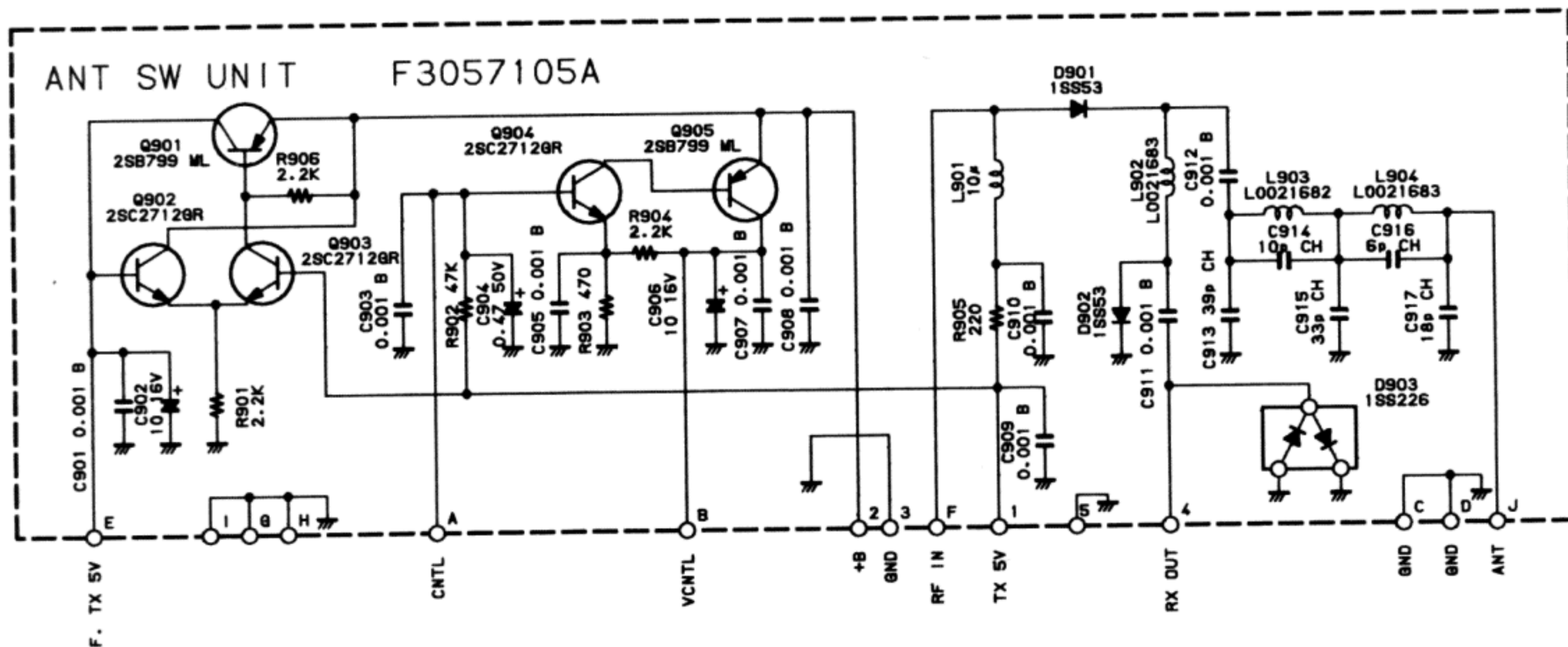
2SC2712GR (LG)  
(Q902,903,904)



2SB799 (Q901,905)

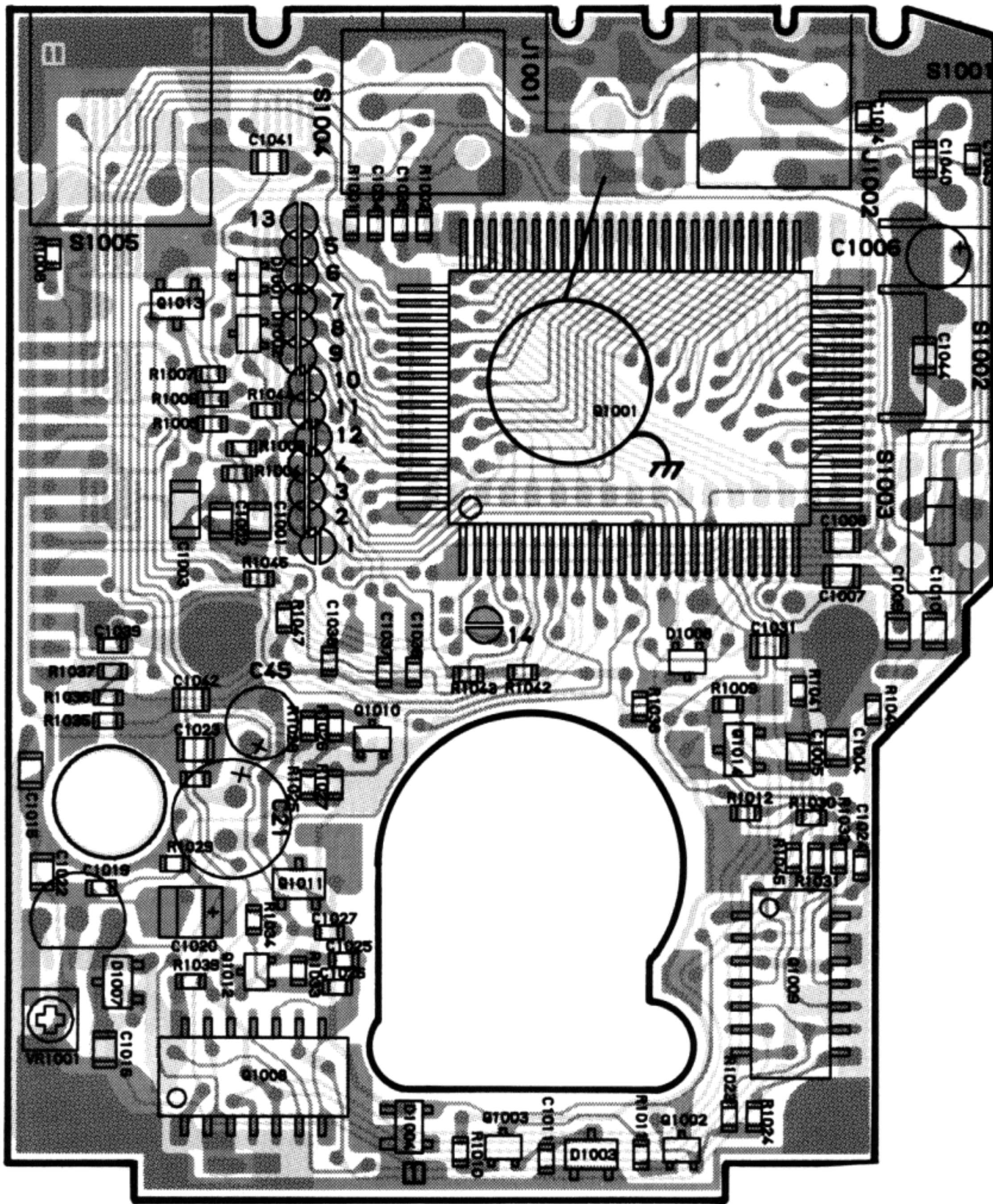


1SS226 (C3) : (D903)

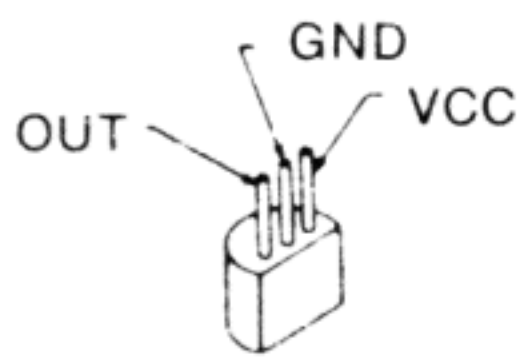




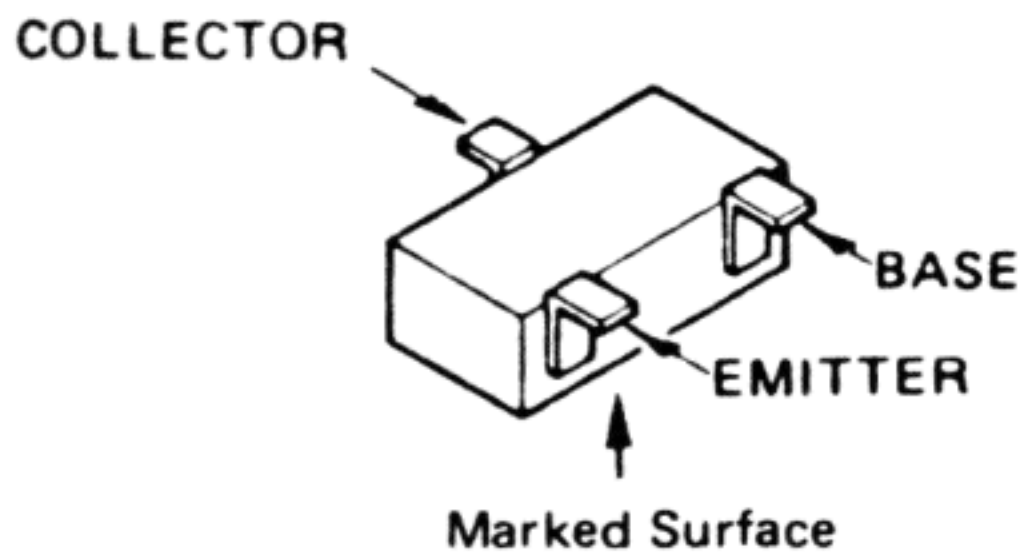
# CNTL UNIT



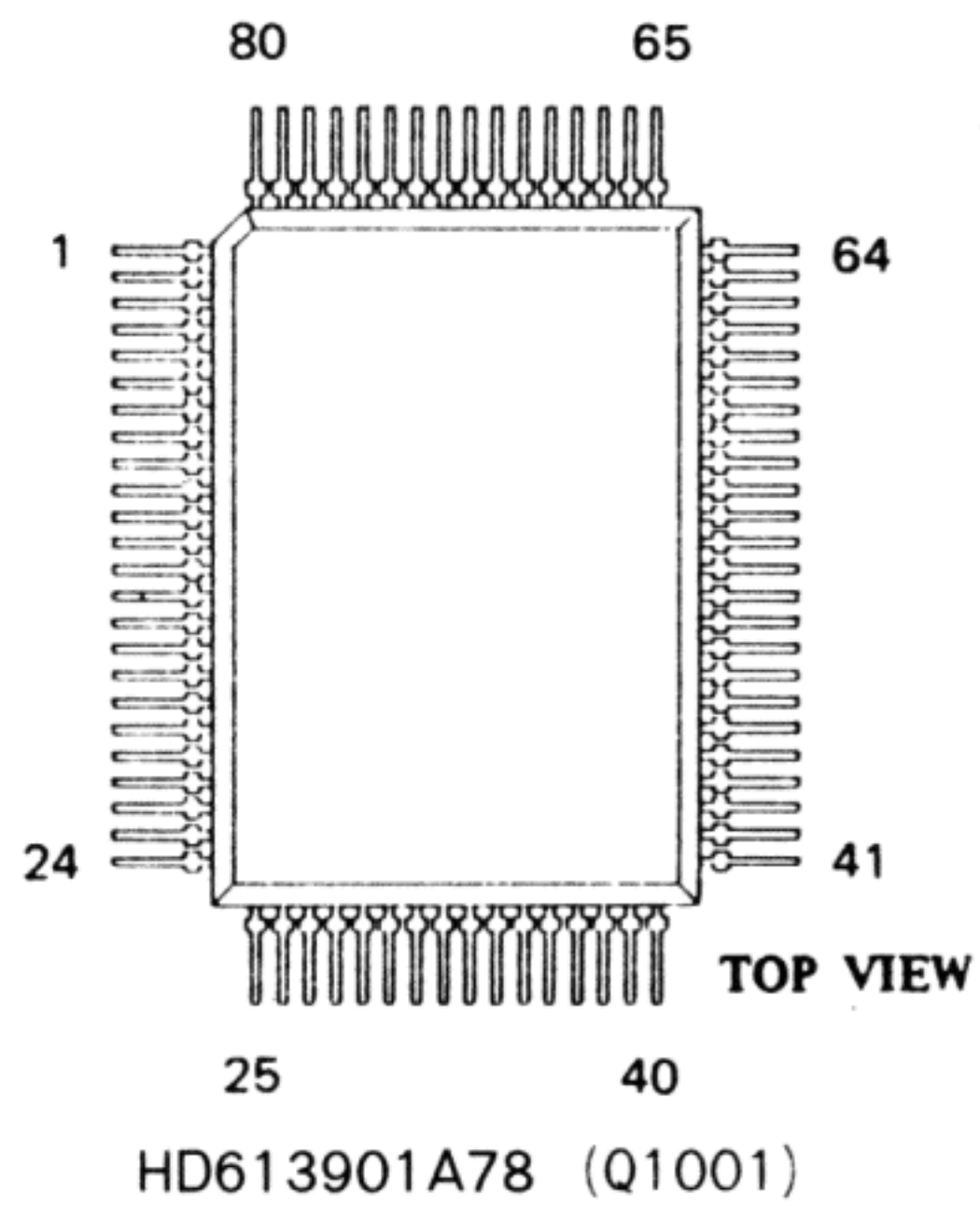
(obverse view of "mixed-component" side)



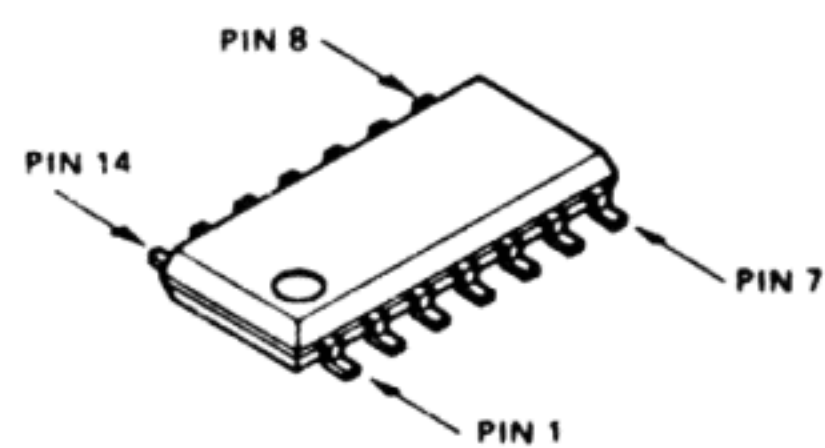
PST523G (Q1007)



- 2SA1586Y (SY) : (Q1002, Q1012)
- 2SC4116GR (LG) : (Q1003, Q1004)
- (Q1005, Q1006)
- (Q1010)
- FA1A4M (L33) : (Q1011, Q1013)
- 2SC1623 ((L6)) : (Q1014)

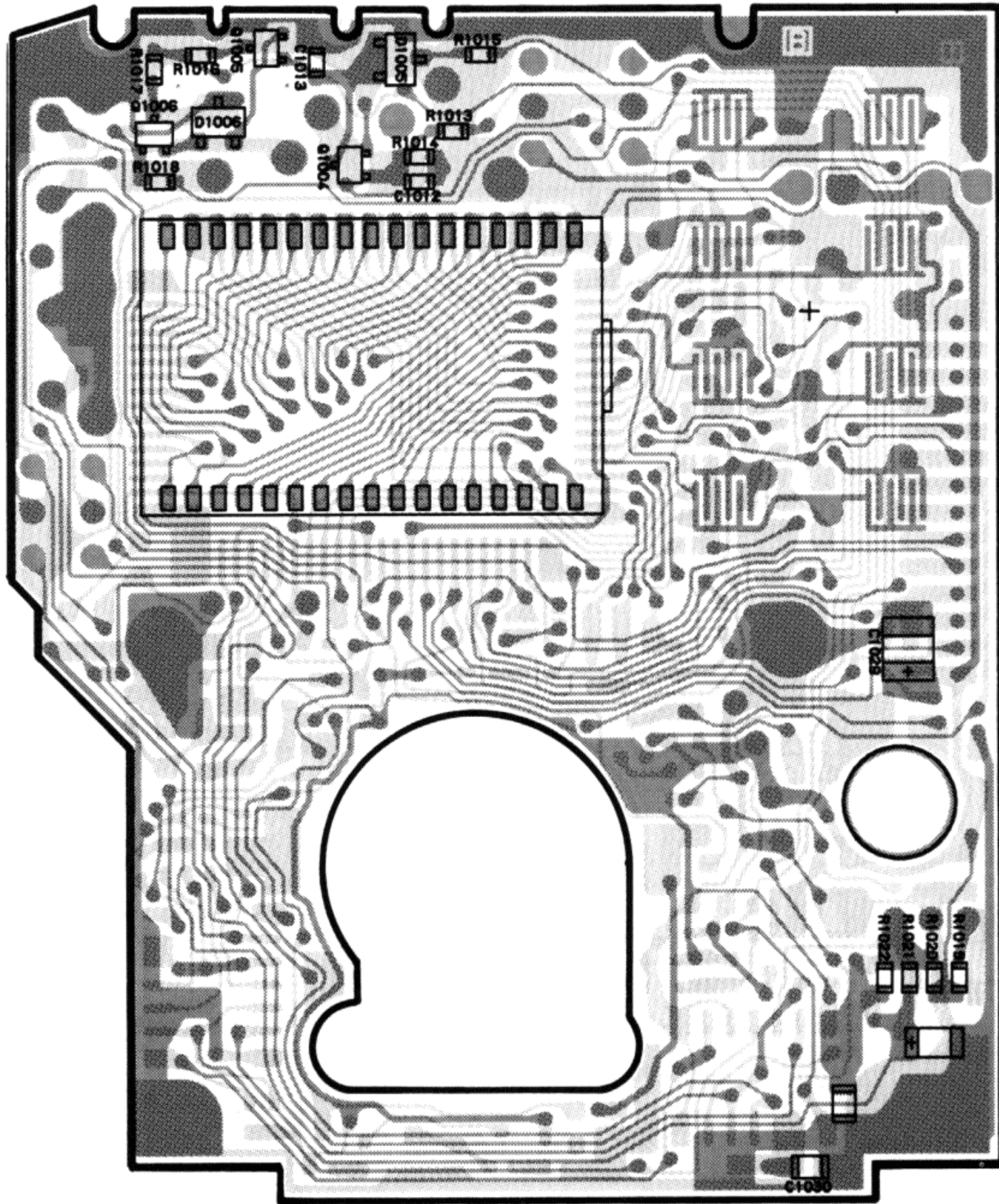


HD613901A78 (Q1001)

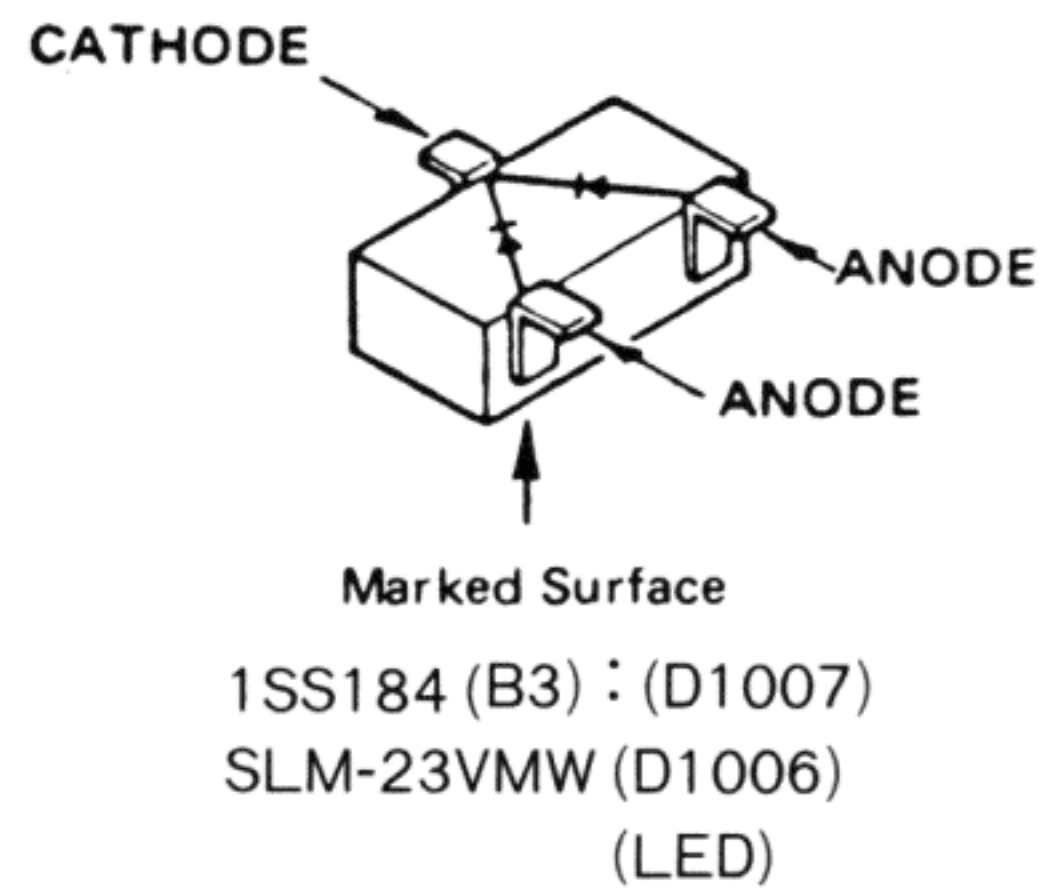
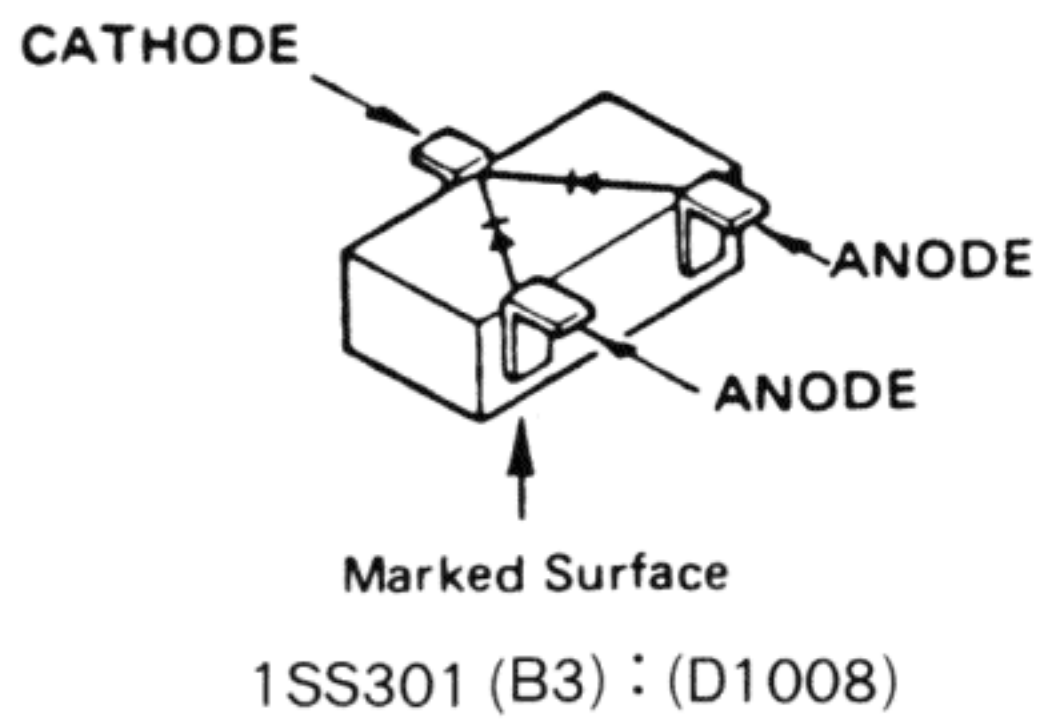
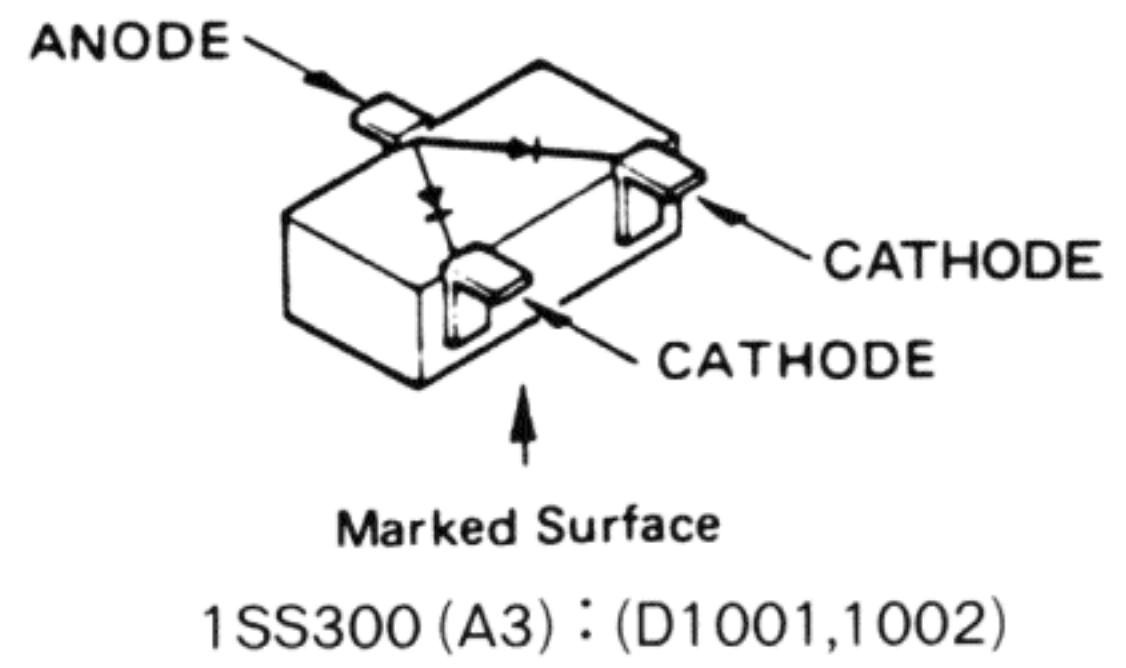
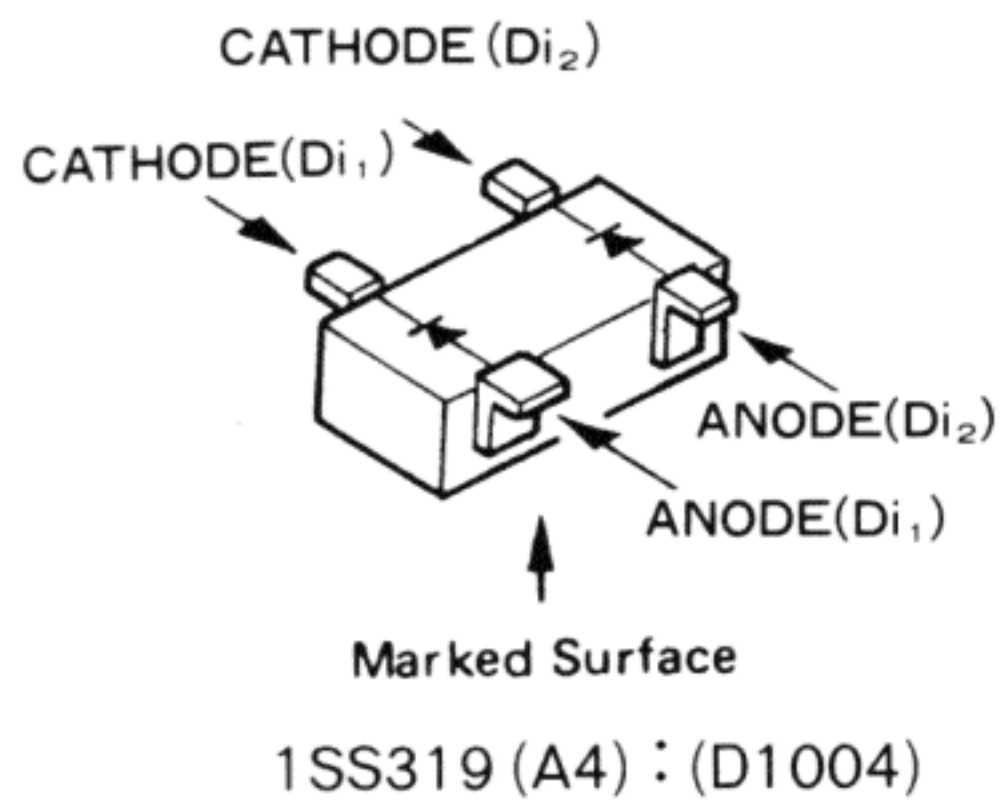


$\mu$ PD4066BG (Q1008)  
 $\mu$ PD4001BG (Q1009)

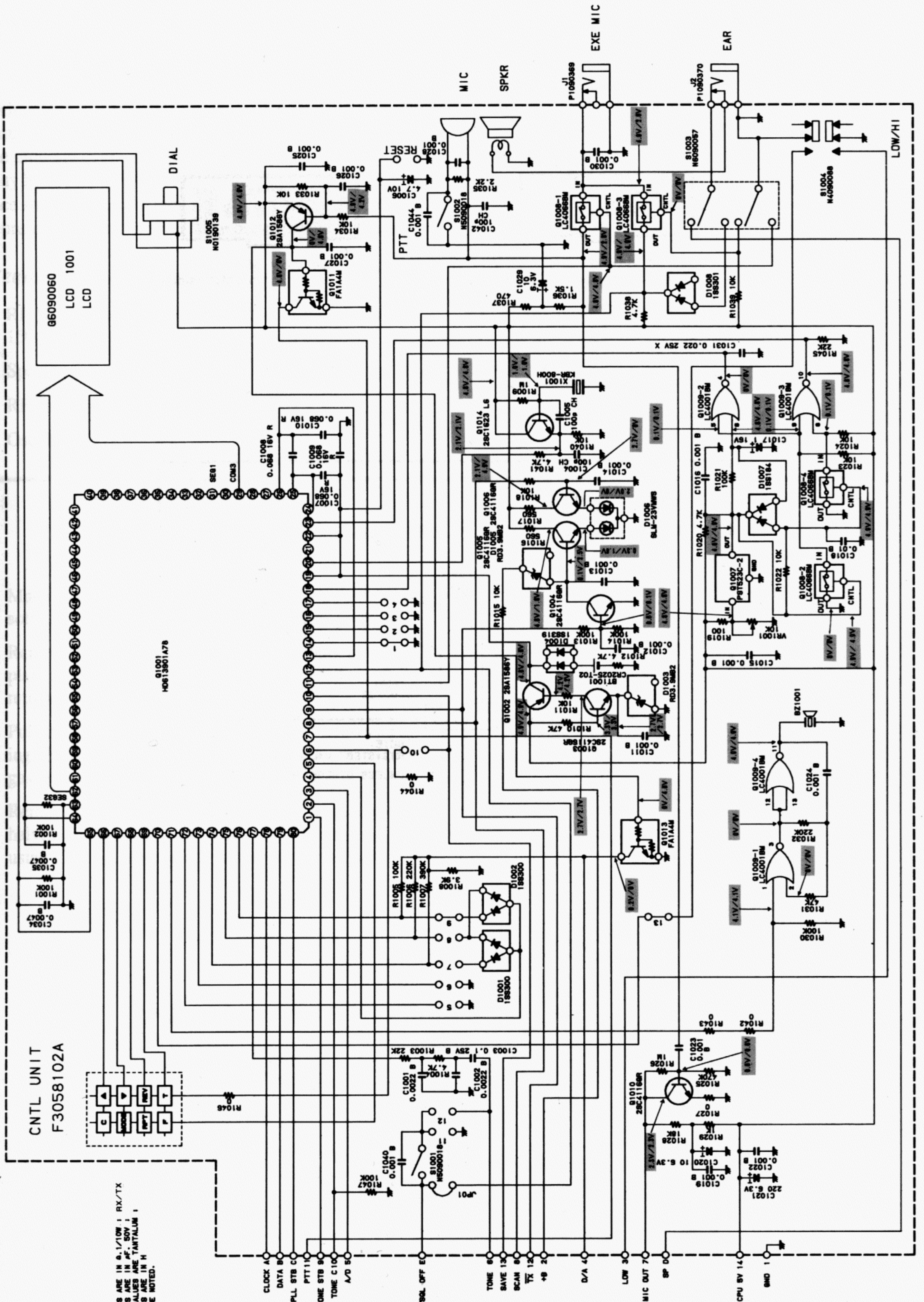
# CNTL UNIT



(obverse view of "chip-only" side)

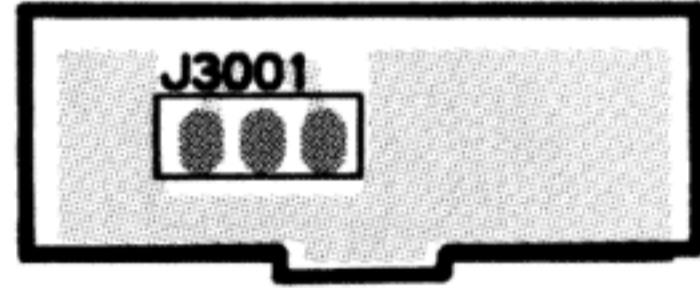


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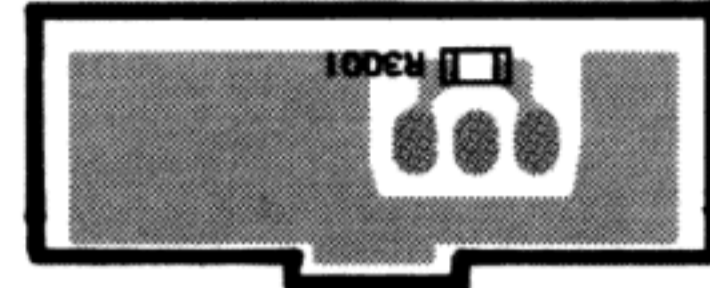


NOTE:  
RESISTOR VALUES ARE IN Ω, 1/10Ω, RX/TX  
CAPACITOR VALUES ARE IN pF, 50V  
(T) CAPACITOR VALUES ARE TANTALUM  
INDUCTOR VALUES ARE IN H  
UNLESS OTHERWISE NOTED.

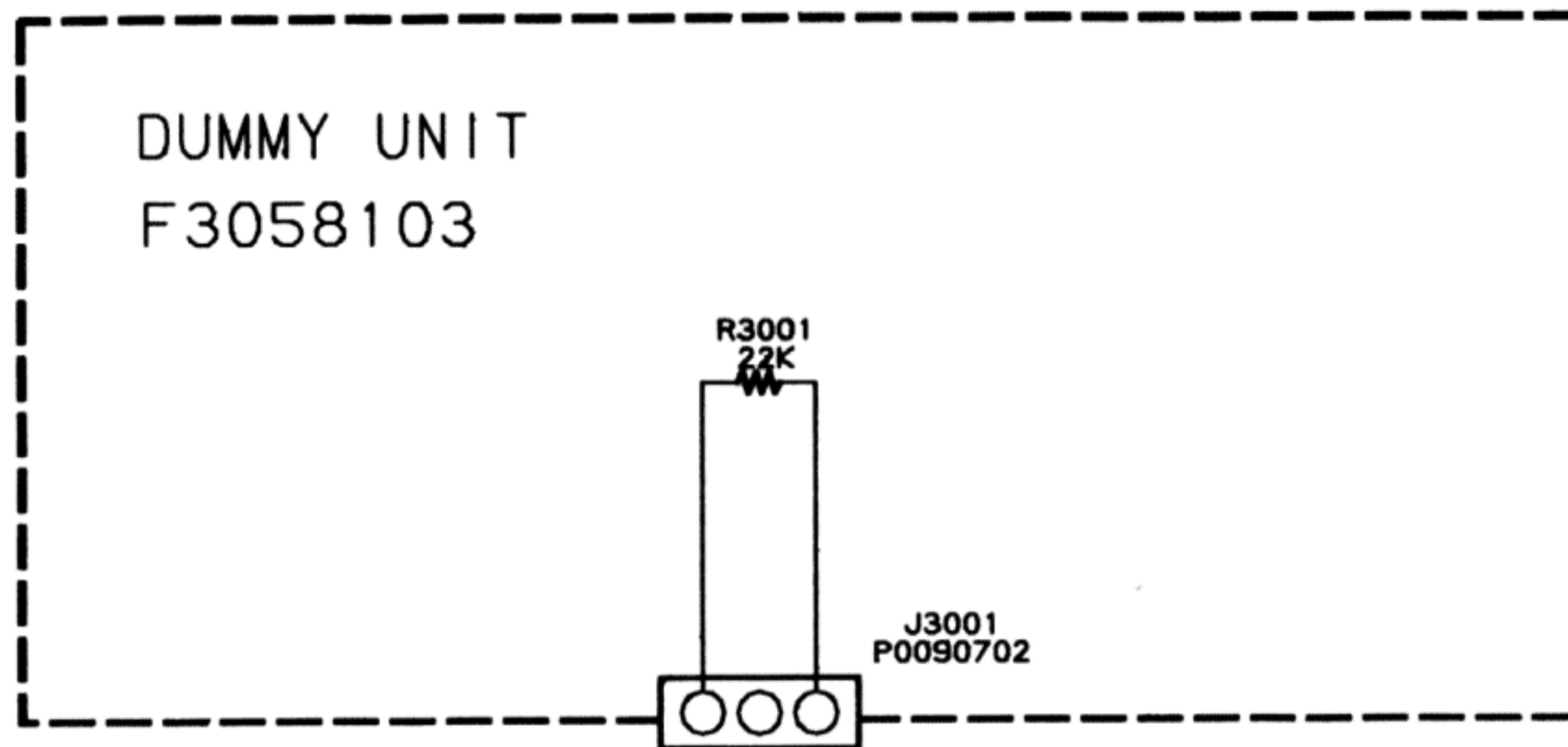
# DUMMY UNIT



(obverse view of  
"connector" side)



(obverse view of  
"chip-only" side)



NOTE:  
RESISTOR VALUES ARE IN 0.1/16W ;  
UNLESS OTHERWISE NOTED.

## ALIGNMENT

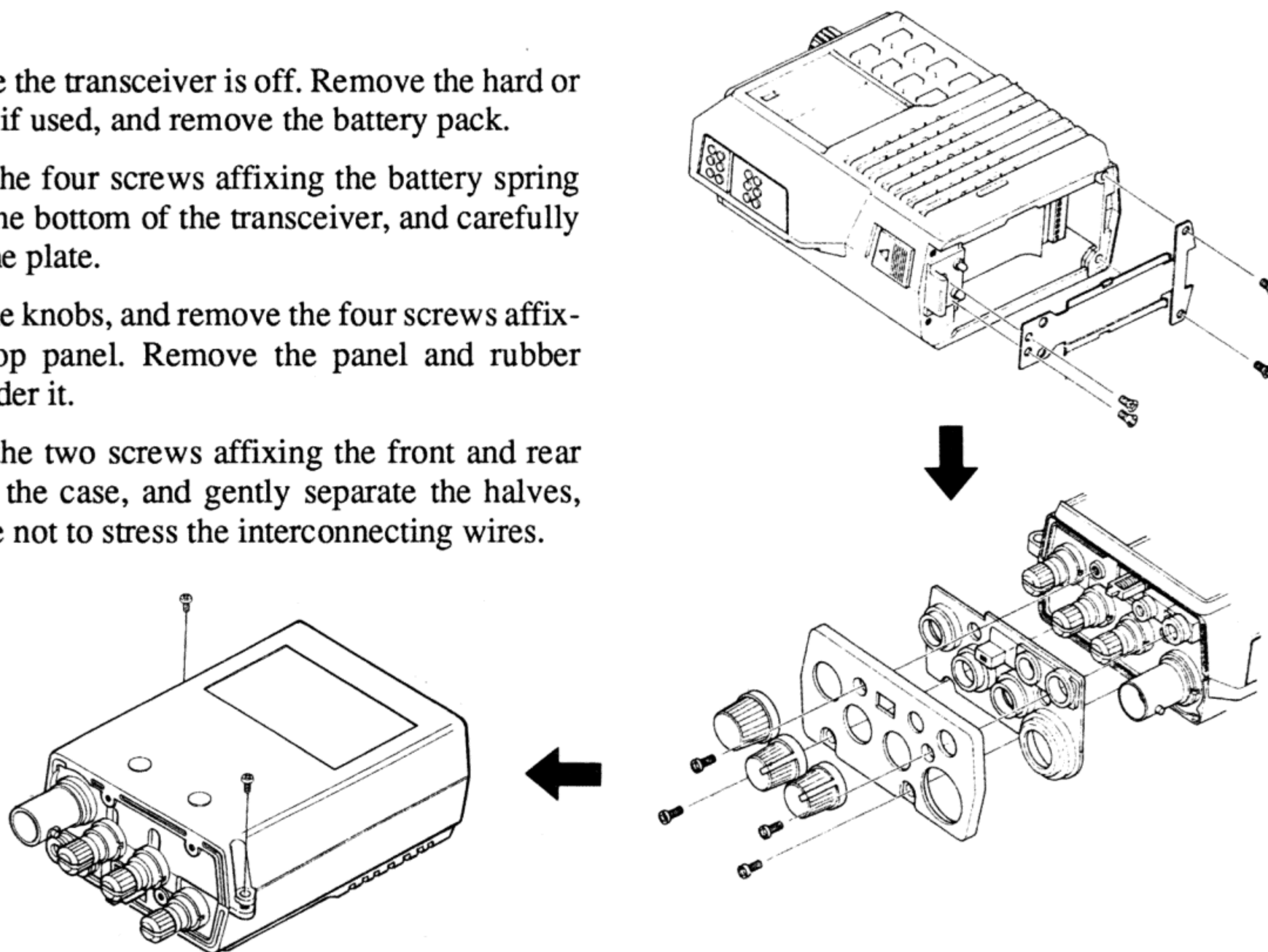
The FT-23R has been aligned by highly-skilled technicians at the factory, and is designed so that no further alignment should ever be required. However, in the unlikely event of a component failure, realignment may be necessary. All component replacement and service should be performed only by an authorized Yaesu representative, or the warranty policy may be voided.

### Required Test Equipment

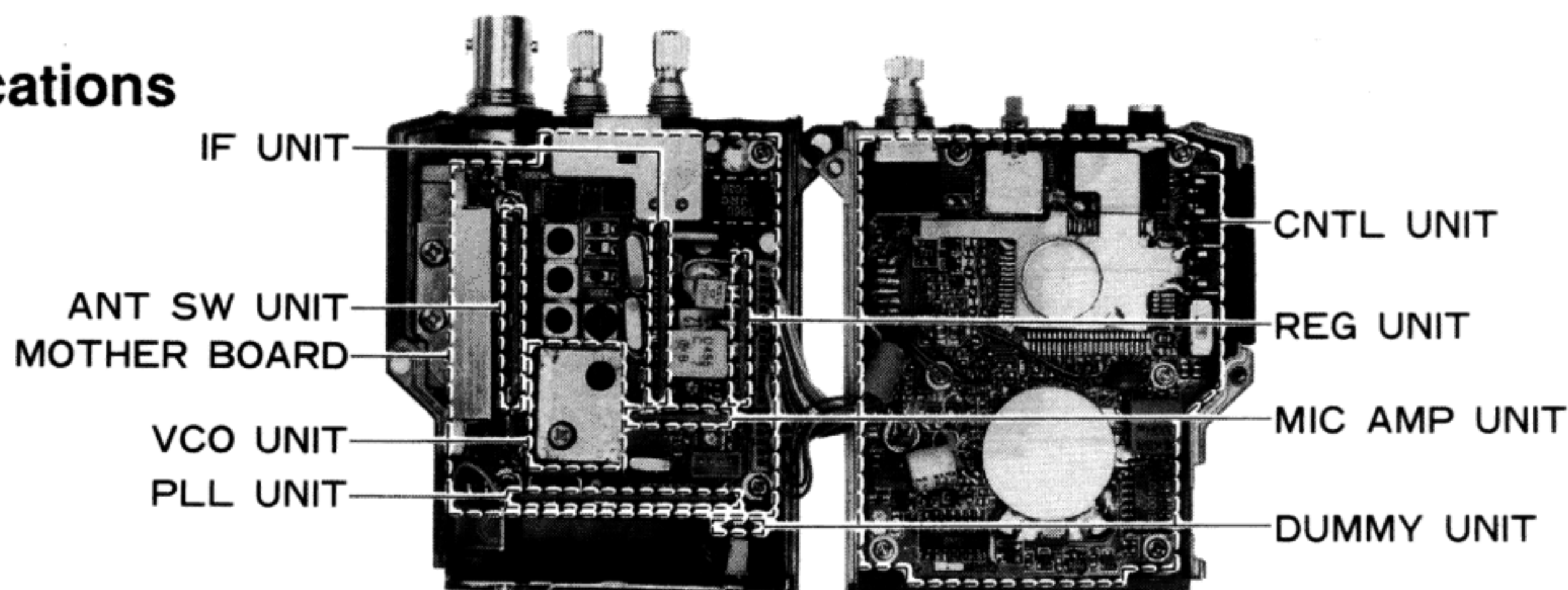
- RF Signal Generator with calibrated output level at 150 MHz
- Spectrum Analyzer
- RF Sampling Coupler
- Oscilloscope
- AF Millivoltmeter
- Deviation Meter
- SINAD Meter
- Inline Wattmeter with 5% accuracy at 150 MHz
- Regulated DC Power Supply adjustable from 10 to 15V, 2A
- 50-Ω Non-reactive Dummy Load: 10W at 150 MHz
- Frequency Counter: ±0.2ppm accuracy at 150 MHz
- AF Signal Generator
- DC Voltmeter: high impedance
- External Loudspeaker or 8-Ω load resistor.

## Case Disassembly

- Make sure the transceiver is off. Remove the hard or soft case, if used, and remove the battery pack.
- Remove the four screws affixing the battery spring plate on the bottom of the transceiver, and carefully remove the plate.
- Pull off the knobs, and remove the four screws affixing the top panel. Remove the panel and rubber gasket under it.
- Remove the two screws affixing the front and rear halves of the case, and gently separate the halves, using care not to stress the interconnecting wires.



## Board Locations



## PLL & Transmitter

Set up the test equipment as shown below for transmitter alignment. Adjust the supply voltage to 12.0V for all steps except Transmitter Output Power.

### PLL VCV (Varactor Control Voltage)

- (1) Connect the DC voltmeter between C417 on the PLL Unit and chassis ground.
- (2) Set the transceiver to 144.00 MHz. Key the transmitter and adjust transformer T501 on the VCO Buffer Unit for  $11.5 \pm 0.05$  V DC on the voltmeter.
- (3) While receiving on 144.00 MHz, adjust trimmer TC501 on the VCO Unit for  $0.8 \pm 0.05$  V DC.
- (4) Tune the transceiver to the high band edge and confirm the correct high-end VCV for the transceiver version being aligned, in both transmit and receive, as follows:

Version	High Band Edge	Tx VCV	Rx VCV
A, C & E	148.000 MHz	< 1.6 V	< 1.3 V
B & D	146.000 MHz	< 1.5 V	< 1.2 V

### Transmitter Output Power

- (1) Tune the transceiver to band center (145 or 146 MHz), and select high power output (LOW switch not depressed).
- (2) Increase the supply voltage to 12.5 V, and then adjust VR2005 on the Mother Board for peak output power on the wattmeter (at least 5 watts with less than 1.5 A supply current).
- (3) Now press the LOW button, and adjust VR2005 (again), this time for  $0.5 \pm 0.1$  watt.

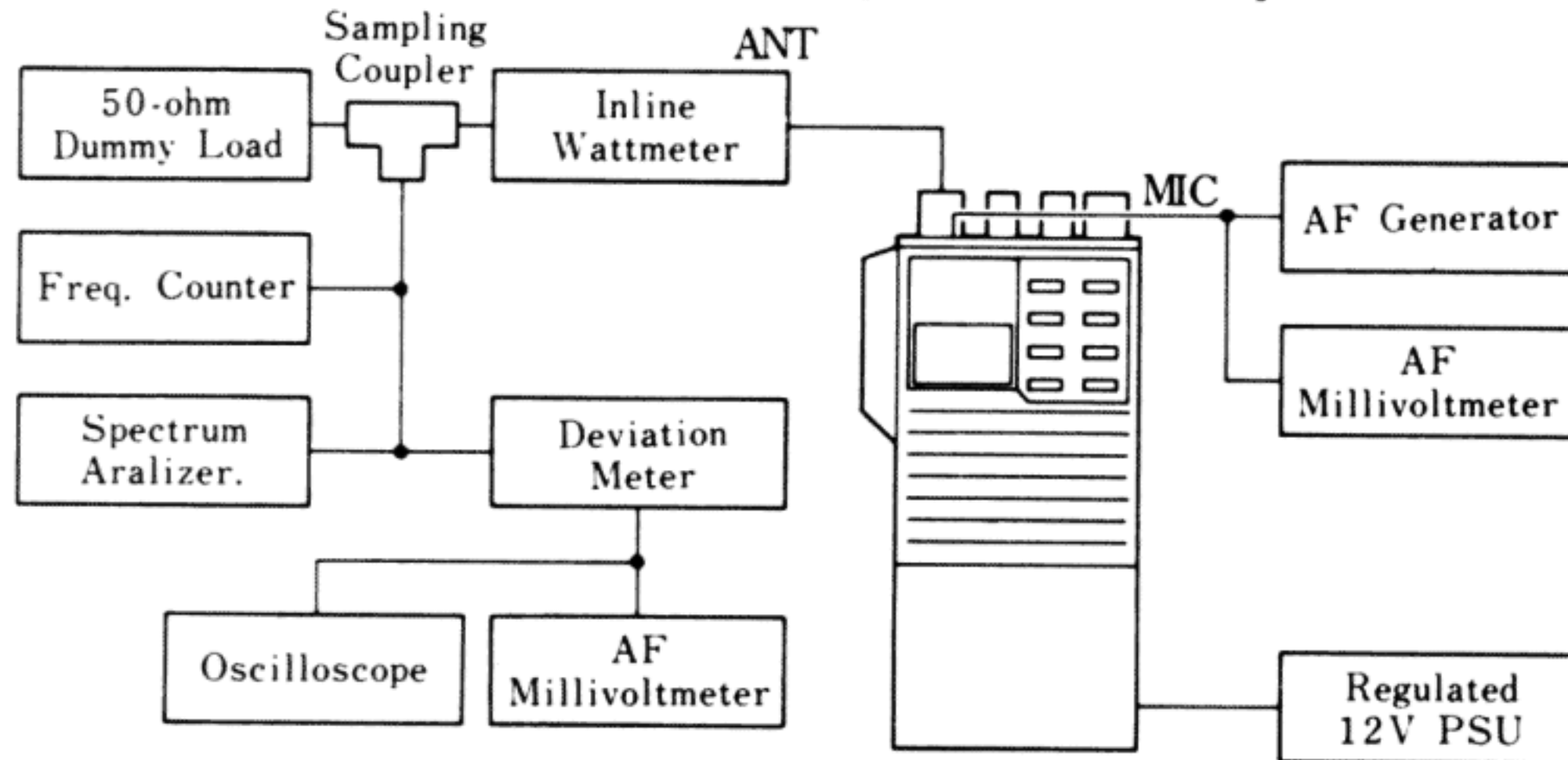
### PLL Reference Frequency

With the transceiver tuned to band center (145 or 146 MHz), adjust TC401 on the PLL Unit, if necessary, so the display frequency matches the frequency counter when transmitting.

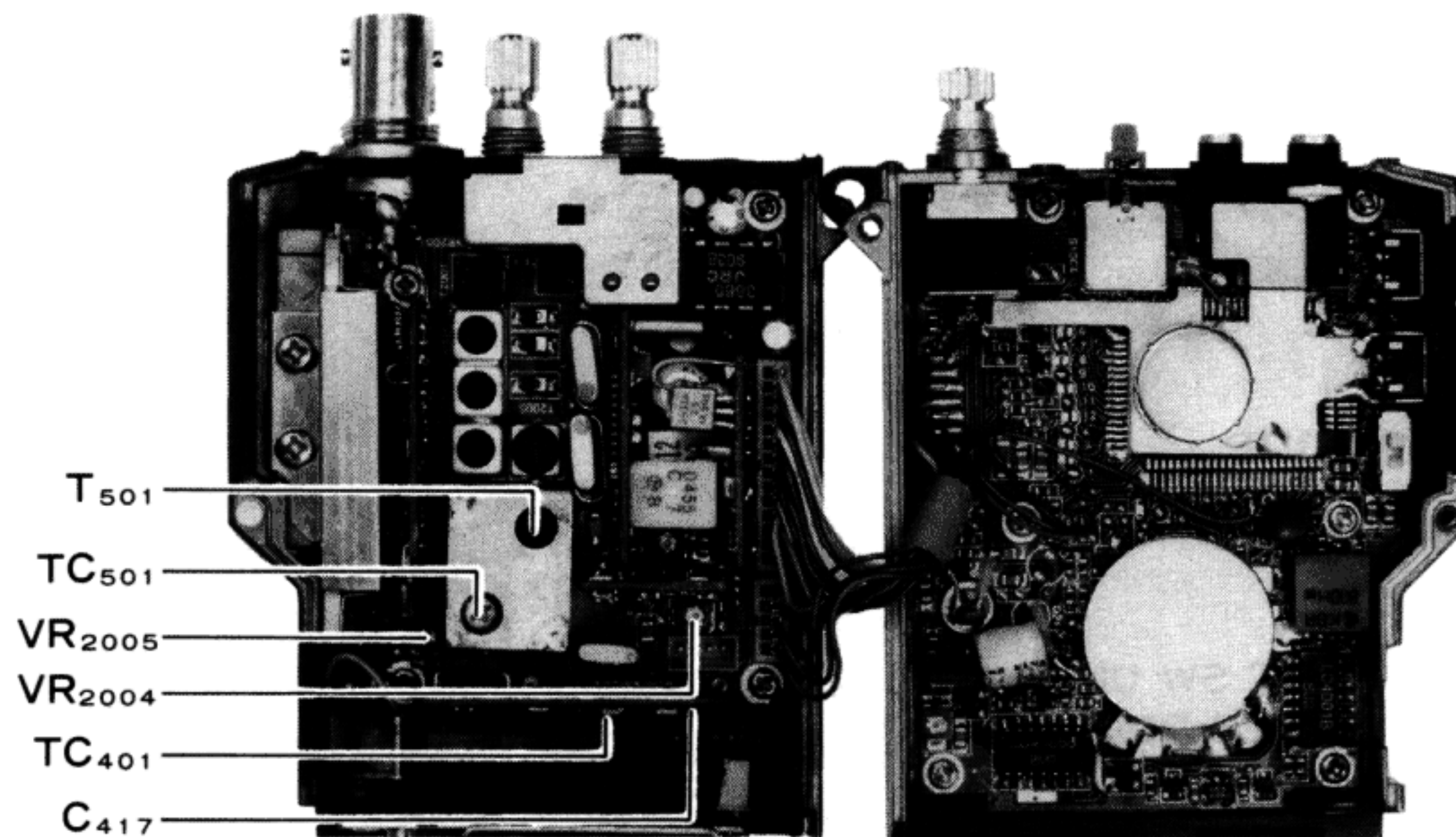
### Modulation Level

- (1) With the transceiver tuned to band center (145 or 146 MHz), adjust the AF generator for 25-mV output at 1 kHz to the MIC jack.
- (2) Adjust VR2004 on the Mother Board for  $\pm 4.8$ -kHz deviation on the deviation meter.

## PLL & Transmitter Alignment Setup



## PLL & Transmitter Alignment Points



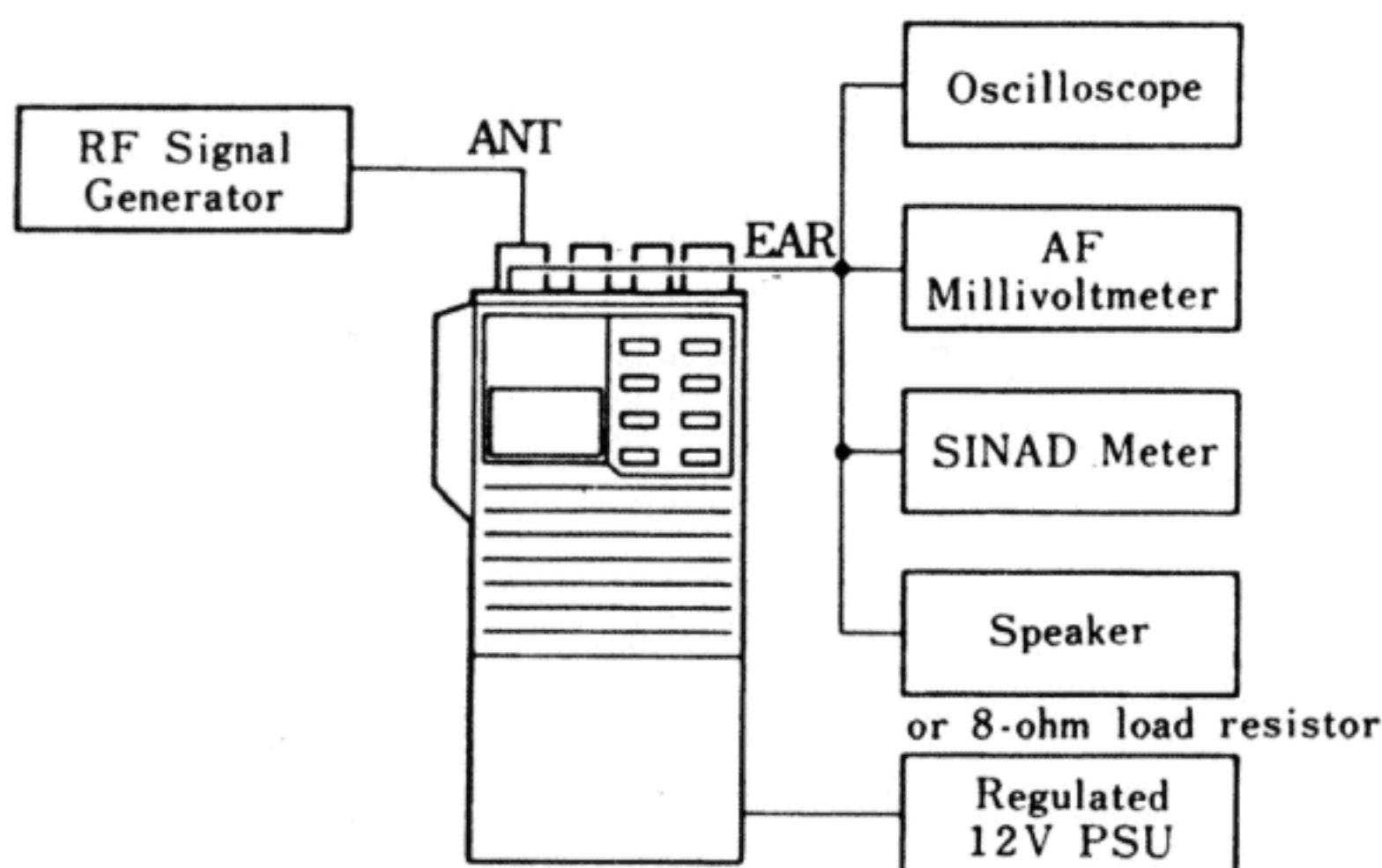
## Receiver

Set up the test equipment as shown below for receiver alignment.

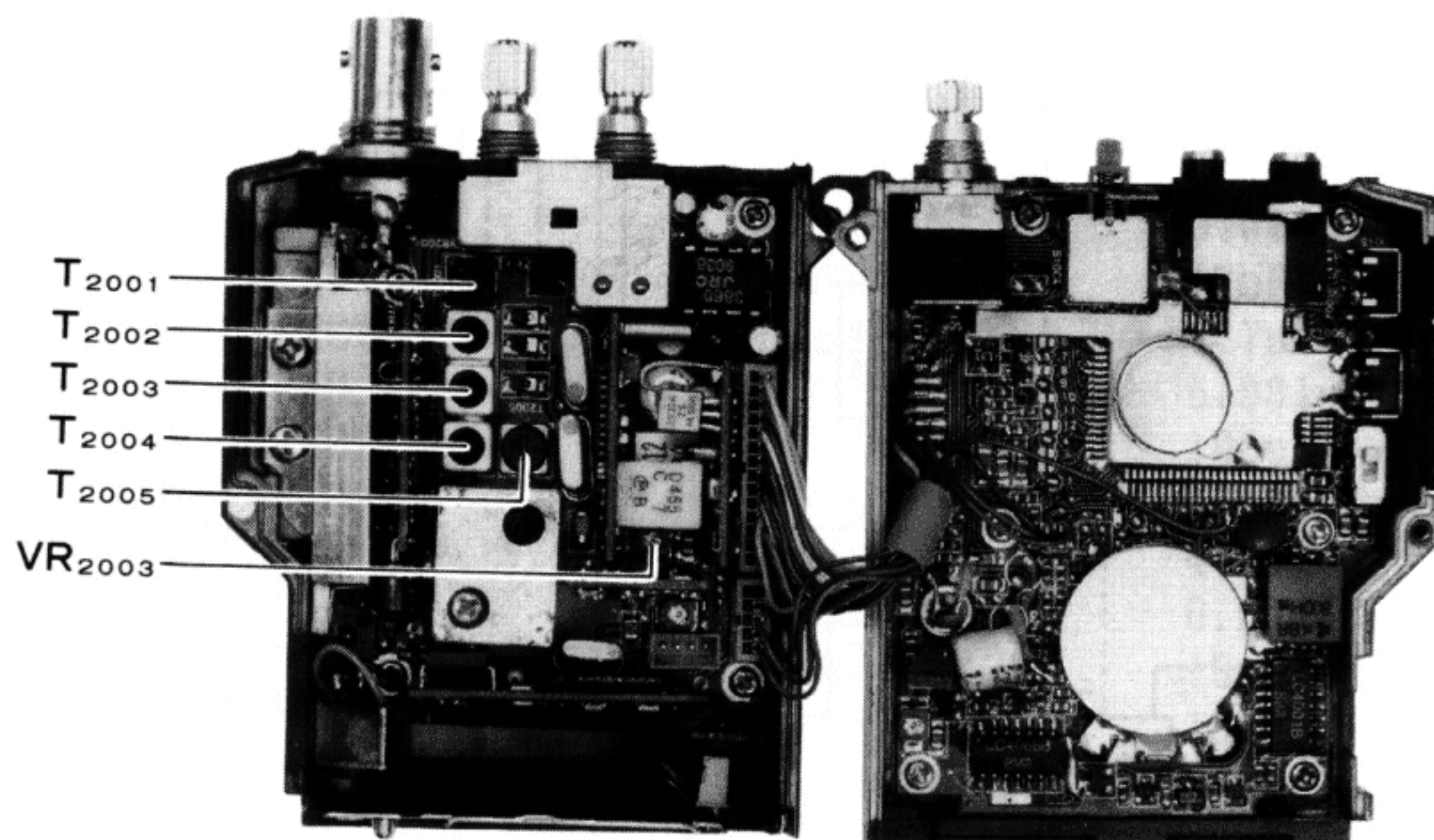
- (1) With the transceiver and the RF signal generator both tuned to band center (145 or 146 MHz), set the generator for  $\pm 3.5$  kHz deviation of 1-kHz tone modulation, and set the output level for 40 dB $\mu$  at the antenna jack.
- (2) Preset VR2003 on the Mother Board fully clockwise.

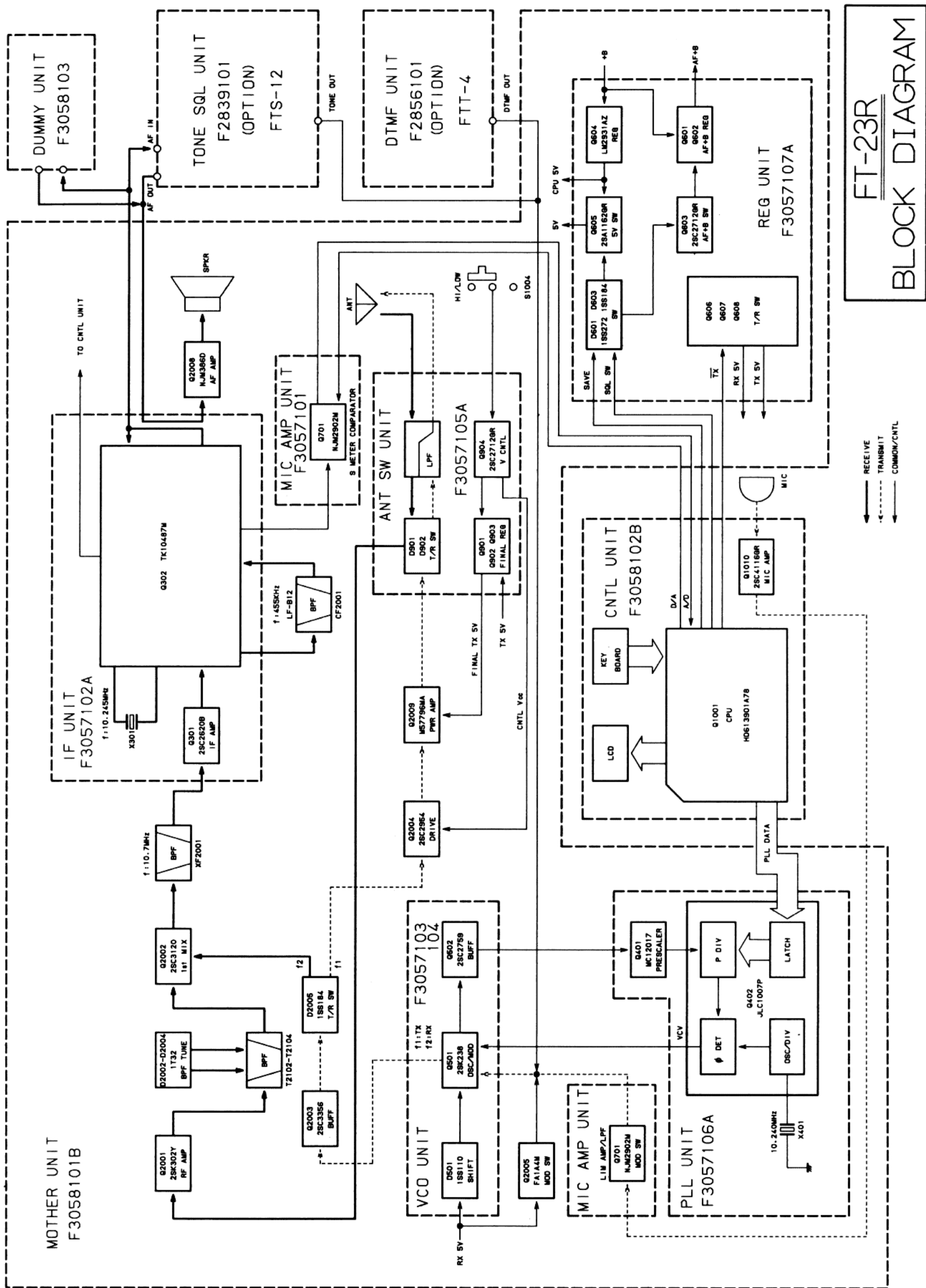
- (3) Adjust T2001 through T2005 on the Mother Board for maximum S-meter indication, reducing the generator level if more than 4 bargraph segments turn on.
- (4) After adjusting the transformers, generator level should be 0.2  $\mu$ V or less for 12dB SINAD.
- (5) Reduce the RF injection from the signal generator to 20 dB $\mu$ .
- (6) Adjust VR2003 on the Mother Board so that all bargraph segments are just turned on.
- (7) Reduce the generator output so that only 2 segments are on, and confirm that the injection level is 5 dB $\mu$  or less.

### Receiver Alignment Setup



### Receiver Alignment Points





**FT-23R**  
**BLOCK DIAGRAM**



\*\*\* IF UNIT \*\*\*

	CA0007001	P.C.B. W/COMP.				
	F3149100	P.C.B. W/D COMP.				
C 0301	K22144802	CHIP CAP.	GRM39B103M25PT	0.01uF	25V	B
C 0302	K22174809	CHIP CAP.	GRM39B102M50PT	0.001uF	50V	B
C 0303	K22174211	CHIP CAP.	GRM39CH100D50PT	10pF	50V	CH
C 0304	K22174229	CHIP CAP.	GRM39CH560J50PT	56pF	50V	CH
C 0305	K22174237	CHIP CAP.	GRM39CH121J50PT	120pF	50V	CH
C 0306	K22144802	CHIP CAP.	GRM39B103M25PT	0.01uF	25V	B
C 0307	K22120805	CHIP CAP.	GRM40R683M16PT	0.068uF	16V	R
C 0308	K22170820	CHIP CAP.	GRM40B183M50PT	0.018uF	50V	B
C 0309	K78080002	CHIP TANTALUM CAP.	F950J475MSAAF1Q2	4.7uF	6.3V	
C 0310	K22144802	CHIP CAP.	GRM39B103M25PT	0.01uF	25V	B
C 0311	K22174235	CHIP CAP.	GRM39CH101J50PT	100pF	50V	CH
C 0312	K22120805	CHIP CAP.	GRM40R683M16PT	0.068uF	16V	R
C 0313	K22174243	CHIP CAP.	GRM39CH221J50PT	220pF	50V	CH
C 0314	K22174243	CHIP CAP.	GRM39CH221J50PT	220pF	50V	CH
C 0315	K22120805	CHIP CAP.	GRM40R683M16PT	0.068uF	16V	R
C 0316	K22144802	CHIP CAP.	GRM39B103M25PT	0.01uF	25V	B
C 0317	K22120805	CHIP CAP.	GRM40R683M16PT	0.068uF	16V	R
C 0318	K22120805	CHIP CAP.	GRM40R683M16PT	0.068uF	16V	R
CD0301	H7900180	CERAMIC DISC.	CDB455C7			
D 0301	G2070003	DIODE	1SS226 TE85R			
D 0302	G2070003	DIODE	1SS226 TE85R			
D 0303	G2070009	DIODE	1SS184 TE85R			
L 0301	L1690016	COIL	32CS 380KB-1ROM=P	1uH		
Q 0301	G3326207B	TRANSISTOR	2SC2620QBTR			
Q 0302	G1091108	IC	MC3372ML			
Q 0303	G3070031	TRANSISTOR	DTC124TK T97			
Q 0304	G3327127G	TRANSISTOR	2SC2712GR TE85R			
R 0301	J24185222	CHIP RES.	RMC1/16 222JATP	2.2K	1/16W	
R 0302	J24185224	CHIP RES.	RMC1/16 224JATP	220K	1/16W	
R 0303	J24185473	CHIP RES.	RMC1/16 473JATP	47K	1/16W	
R 0304	J24185471	CHIP RES.	RMC1/16 471JATP	470	1/16W	
R 0305	J24185101	CHIP RES.	RMC1/16 101JATP	100	1/16W	
R 0306	J24185473	CHIP RES.	RMC1/16 221JATP	220	1/16W	
R 0307	J24185223	CHIP RES.	RMC1/16 223JATP	22K	1/16W	
R 0308	J24185473	CHIP RES.	RMC1/16 473JATP	47K	1/16W	
R 0309	J24185682	CHIP RES.	RMC1/16 182JATP	1.8K	1/16W	
R 0310	J24185102	CHIP RES.	RMC1/16 102JATP	1K	1/16W	
R 0311	J24185152	CHIP RES.	RMC1/16 152JATP	1.5K	1/16W	
R 0312	J24205182	CHIP RES.	RMC1/16 182JATP	1.8K	1/16W	
R 0313	J24205473	CHIP RES.	RMC1/10T 473J	47K	1/10W	
R 0314	J24185182	CHIP RES.	RMC1/16 182JATP	1.8K	1/16W	
R 0315	J24185564	CHIP RES.	RMC1/16 564JATP	560K	1/16W	
R 0316	J24185332	CHIP RES.	RMC1/16 332JATP	3.3K	1/16W	
R 0317	J24185332	CHIP RES.	RMC1/16 332JATP	3.3K	1/16W	
R 0318	J24185102	CHIP RES.	RMC1/16 102JATP	1K	1/16W	
R 0319	J24185332	CHIP RES.	RMC1/16 332JATP	3.3K	1/16W	
R 0320	J24185473	CHIP RES.	RMC1/16 473JATP	47K	1/16W	
R 0321	J24185392	CHIP RES.	RMC1/16 392JATP	3.9K	1/16W	
R 0322	J24185104	CHIP RES.	RMC1/16 104JATP	100K	1/16W	
TH0301	G9090053	THERMISTER	157-252-53006TP			
X 0301	H0102773	X'TAL	UM-1 10.245MHZ			

# PARTS LIST

## \*\*\* MOTHER BOARD UNIT \*\*\*

CS0851002 P.C.B. W/COMP./MIC AMP/IF/VCO/  
ANT SW/PLL/REG UNITS(TYP A1)  
CS0851003 P.C.B. W/COMP./MIC AMP/IF/VCO/  
ANT SW/PLL/REG UNITS(TYP A2)  
CS0851004 P.C.B. W/COMP./MIC AMP/IF/VCO/  
ANT SW/PLL/REG UNITS(TYP A3)  
CS0851005 P.C.B. W/COMP./MIC AMP/IF/VCO/  
ANT SW/PLL/REG UNITS(TYP B)  
CS0851006 P.C.B. W/COMP./MIC AMP/IF/VCO/  
ANT SW/PLL/REG UNITS(TYP C2)  
CS0851007 P.C.B. W/COMP./MIC AMP/IF/VCO/  
ANT SW/PLL/REG UNITS(TYP D)  
CS0851008 P.C.B. W/COMP./MIC AMP/IF/VCO/  
ANT SW/PLL/REG UNITS(TYP E2)  
F3058101B P.C.B. W/O COMP.

C 2001	K22170204	CHIP CAP.	GRM40CJ030C50PT	3pF	50V	CJ
C 2002	K22144802	CHIP CAP.	GRM39B103M25PT	0.01uF	25V	B
C 2003	K22174809	CHIP CAP.	GRM39B102M50PT	0.001uF	50V	B
C 2004	K22170223	CHIP CAP.	GRM40CH330J50PT	33pF	50V	CH
C 2005	K22170203	CHIP CAP.	GRM40CK020C50PT	2pF	50V	CK
C 2006	K22170203	CHIP CAP.	GRM40CK020C50PT	2pF	50V	CK
C 2008	K22170223	CHIP CAP.	GRM40CH330J50PT	33pF	50V	CH
C 2009	K22170223	CHIP CAP.	GRM40CH330J50PT	33pF	50V	CH
C 2010	K22170223	CHIP CAP.	GRM40CH330J50PT	33pF	50V	CH
C 2011	K22174809	CHIP CAP.	GRM39B102M50PT	0.001uF	50V	B
C 2012	K22120805	CHIP CAP.	GRM40R683M16PT	0.068uF	16V	R
C 2013	K22174809	CHIP CAP.	GRM39B102M50PT	0.001uF	50V	B
C 2014	K22170202	CHIP CAP.	GRM40CK010C50PT	1pF	50V	CK
C 2015	K22170229	CHIP CAP.	GRM40CH560J50PT	56pF	50V	CH
C 2017	K22170817	CHIP CAP.	GRM40B103M50PT	0.01uF	50V	B
C 2018	K22144802	CHIP CAP.	GRM39B103M25PT	0.01uF	25V	B
C 2019	K22170206	CHIP CAP.	GRM40CH050C50PT	5pF	50V	CH
C 2020	K22120805	CHIP CAP.	GRM40R683M16PT	0.068uF	16V	R
C 2022	K22120805	CHIP CAP.	GRM40R683M16PT	0.068uF	16V	R
C 2023	K40089023	AL. ELECTRO. CAP.	RC2-6V470MS	47uF	6V	
C 2024	K40129059	AL. ELECTRO. CAP.	RC3-16V4R7MS	4.7uF	16V	
C 2025	K22174809	CHIP CAP.	GRM39B102M50PT	0.001uF	50V	B
C 2026	K40109026	AL. ELECTRO. CAP.	10VB-100(M)CC	100uF	10V	
C 2027	K22120805	CHIP CAP.	GRM40R683M16PT	0.068uF	16V	R
C 2028	K70107476	TANTALUM CAP.	DN1A470MIS	47uF	10V	
C 2029	K22174809	CHIP CAP.	GRM39B102M50PT	0.001uF	50V	B
C 2030	K40129052	AL. ELECTRO. CAP.	RC3-16V100M	10uF	16V	
C 2031	K40129038	AL. ELECTRO. CAP.	RC2-16V101MS	100uF	16V	
C 2032	K22174809	CHIP CAP.	GRM39B102M50PT	0.001uF	50V	B
C 2033	K78100002	CHIP TANTALUM CAP.	F951A335MSAAF1Q2	3.3uF	6.3V	
C 2034	K22141808	CHIP CAP.	GRM42-6B473M25PT	0.047uF	50V	B
C 2035	K22170221	CHIP CAP.	GRM40CH270J50PT	27pF	50V	CH
C 2036	K22170805	CHIP CAP.	GRM40B102M50PT	0.001uF	50V	B
C 2037	K22144802	CHIP CAP.	GRM39B103M25PT	0.01uF	25V	B
C 2038	K22144802	CHIP CAP.	GRM39B103M25PT	0.01uF	25V	B
C 2039	K22170221	CHIP CAP.	GRM40CH270J50PT	27pF	50V	CH
C 2040	K22170211	CHIP CAP.	GRM40CH100D50PT	10pF	50V	CH
C 2041	K22174235	CHIP CAP.	GRM39CH101J50PT	100pF	50V	CH
C 2043	K22170805	CHIP CAP.	GRM40B102M50PT	0.001uF	50V	B
C 2044	K22170805	CHIP CAP.	GRM40B102M50PT	0.001uF	50V	B
C 2045	K22174809	CHIP CAP.	GRM39B102M50PT	0.001uF	50V	B
C 2046	K22174809	CHIP CAP.	GRM39B102M50PT	0.001uF	50V	B
C 2047	K22174809	CHIP CAP.	GRM39B102M50PT	0.001uF	50V	B

\*\*\* VCO UNIT \*\*\*

	CP1992001	P.C.B. W/COMP.				
	F3057103	P.C.B. W/O COMP.				
	F3057104	P.C.B. W/O COMP.				
C 0501	K22170215	CHIP CAP.	GRM40CH150J50PT	15pF	50V	CH
C 0502	K22170243	CHIP CAP.	GRM40CH221J50PT	220pF	50V	CH
C 0503	K22170211	CHIP CAP.	GRM40CH100D50PT	10pF	50V	CH
C 0504	K78080003	CHIP TANTALUM CAP.	F950J106MTAAF1Q2	10uF	6.3V	
C 0505	K22170805	CHIP CAP.	GRM40B102M50PT	0.001uF	50V	B
C 0506	K22170311	CHIP CAP.	GRM40UJ100D50PT	10pF	50V	UJ
C 0507	K22170311	CHIP CAP.	GRM40UJ100D50PT	10pF	50V	UJ
C 0508	K22170201	CHIP CAP.	GRM40CK0R5C50PT	0.5pF	50V	CK
C 0509	K78080002	CHIP TANTALUM CAP.	F950J475MSAAF1Q2	4.7uF	6.3V	
C 0510	K22170805	CHIP CAP.	GRM40B102M50PT	0.001uF	50V	B
C 0511	K22170243	CHIP CAP.	GRM40CH221J50PT	220pF	50V	CH
D 0501	G2090297	DIODE	1SS110			
D 0502	G2070040	DIODE	1T33-T7			
D 0503	G2070040	DIODE	1T33-T7			
L 0501	L1690016	COIL	32CS 380LB-1R0M=P	1uH		
L 0502	L1690016	COIL	32CS 380LB-1R0M=P	1uH		
L 0503	L1690016	COIL	32CS 380LB-1R0M=P	1uH		
L 0504	L1690025	COIL	32CS 380NB-R22M=P	0.22uH		
Q 0501	G3802387S	FET	2SK238-T2B K17			
Q 0502	G3327597B	TRANSISTOR	2SC2759 T2B-U22			
R 0501	J24205682	CHIP RES.	RMC1/10 682J	6.8K	1/10W	
R 0503	J24205103	CHIP RES.	RMC1/10T 103J	10K	1/10W	
R 0504	J24205470	CHIP RES.	RMC1/10 470J	47	1/10W	
R 0505	J24205101	CHIP RES.	RMC1/10T 101J	100	1/10W	
R 0506	J24205683	CHIP RES.	RMC1/10 683J	68K	1/10W	
T 0501	L0021684A	COIL	R12-E991X			
TC0501	K91000151	TRIMMER CAP.	ECR-JA020E12X	20p		
	R0130390	TERMINAL		2pcs		

\*\*\* REG UNIT \*\*\*

	CA0011001	P.C.B. W/COMP.				
	F3057107A	P.C.B. W/O COMP.				
C 0601	K22174809	CHIP CAP.	GRM39B102M50PT	0.001uF	50V	B
C 0602	K78100003	CHIP TANTALUM CAP.	F951A685MTAAF1Q2	6.8uF	6.3V	
C 0603	K22174809	CHIP CAP.	GRM39B102M50PT	0.001uF	50V	B
C 0604	K22174809	CHIP CAP.	GRM39B102M50PT	0.001uF	50V	B
C 0605	K78120002	CHIP TANTALUM CAP.	F951C225MSAAF1Q2	2.2uF	6.3V	
C 0606	K22174809	CHIP CAP.	GRM39B102M50PT	0.001uF	50V	B
C 0607	K78080013	CHIP TANTALUM CAP.	F950J476MFCAF1	47uF	6.3V	
C 0608	K22174809	CHIP CAP.	GRM39B102M50PT	0.001uF	50V	B
C 0609	K22174809	CHIP CAP.	GRM39B102M50PT	0.001uF	50V	B
C 0610	K22174809	CHIP CAP.	GRM39B102M50PT	0.001uF	50V	B
C 0611	K22174809	CHIP CAP.	GRM39B102M50PT	0.001uF	50V	B
C 0612	K22174809	CHIP CAP.	GRM39B102M50PT	0.001uF	50V	B
C 0613	K22174809	CHIP CAP.	GRM39B102M50PT	0.001uF	50V	B
D 0601	G2070048	DIODE	1SS272 TE85R			
D 0602	G2090153	DIODE	RD10EB1			
D 0603	G2070009	DIODE	1SS184 TE85R			
Q 0601	G3207997L	TRANSISTOR	2SB799-T2ML			
Q 0602	G3327127G	TRANSISTOR	2SC2712GR TE85R			
Q 0603	G3327127G	TRANSISTOR	2SC2712GR TE85R			
Q 0604	G1090785	IC	LM2931AZ-5.0			
Q 0605	G3111627G	TRANSISTOR	2SA1162GR TE85R			
Q 0606	G3111627G	TRANSISTOR	2SA1162GR TE85R			
Q 0607	G3111627G	TRANSISTOR	2SA1162GR TE85R			
Q 0608	G3327127G	TRANSISTOR	2SC2712GR TE85R			
R 0601	J24205101	CHIP RES.	RMC 1/10T 101J	100		1/10W
R 0602	J02245829	CARBON FILM RES.	RD14SJ8R2 8.2	8.2		1/4W
R 0603	J24185223	CHIP RES.	RMC1/16 223JATP	22K		1/16W
R 0604	J24185104	CHIP RES.	RMC1/16 104JATP	100K		1/16W
R 0605	J24185103	CHIP RES.	RMC1/16 103JATP	10K		1/16W
R 0606	J24185472	CHIP RES.	RMC1/16 472JATP	4.7K		1/16W
R 0607	J24185472	CHIP RES.	RMC1/16 472JATP	4.7K		1/16W
R 0608	J24185222	CHIP RES.	RMC1/16 222JATP	2.2K		1/16W
R 0609	J24185104	CHIP RES.	RMC1/16 104JATP	100K		1/16W
R 0610	J24185104	CHIP RES.	RMC1/16 104JATP	100K		1/16W
R 0611	J24185103	CHIP RES.	RMC1/16 103JATP	10K		1/16W
R 0612	J24185472	CHIP RES.	RMC1/16 472JATP	4.7K		1/16W

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\*\*\* CONTROL UNIT \*\*\*

	CS0847002	P.C.B. W/COMP.(TYP A1)					
	CS0847003	P.C.B. W/COMP.(TYP A2)					
	CS0847004	P.C.B. W/COMP.(TYP A3)					
	CS0847005	P.C.B. W/COMP.(TYP B)					
	CS0847006	P.C.B. W/COMP.(TYP C2)					
	CS0847007	P.C.B. W/COMP.(TYP D)					
	CS0847008	P.C.B. W/COMP.(TYP E2)					
	F3058102B	P.C.B. W/O COMP.					
BT1001	Q9000366	LITHIUM BATTERY	CR2025-T02				
BZ1001	M4290005	BUZZER	EFB-RE25D07				
C 1001	K22170809	CHIP CAP.	GRM40B222M50PT	0.0022uF	50V	B	TYP B
C 1001	K22170809	CHIP CAP.	GRM40B222M50PT	0.0022uF	50V	B	TYP C2
C 1001	K22170809	CHIP CAP.	GRM40B222M50PT	0.0022uF	50V	B	TYP D
C 1001	K22170809	CHIP CAP.	GRM40B222M50PT	0.0022uF	50V	B	TYP E2
C 1002	K22170809	CHIP CAP.	GRM40B222M50PT	0.0022uF	50V	B	TYP B
C 1002	K22170809	CHIP CAP.	GRM40B222M50PT	0.0022uF	50V	B	TYP C2
C 1002	K22170809	CHIP CAP.	GRM40B222M50PT	0.0022uF	50V	B	TYP D
C 1002	K22170809	CHIP CAP.	GRM40B222M50PT	0.0022uF	50V	B	TYP E2
C 1003	K22141809	CHIP CAP.	GRM42-6B104M25PT	0.1uF	25V	B	
C 1004	K22170235	CHIP CAP.	GRM40CH101J50PT	100pF	50V	CH	
C 1005	K22170235	CHIP CAP.	GRM40CH101J50PT	100pF	50V	CH	
C 1006	K70107475	TANTALUM CHIP CAP.	DN1A4R7M1S	4.7uF	10V		
C 1007	K22120805	CHIP CAP.	GRM40R683M16PT	0.068uF	16V	R	
C 1008	K22120805	CHIP CAP.	GRM40R683M16PT	0.068uF	16V	R	
C 1009	K22120805	CHIP CAP.	GRM40R683M16PT	0.068uF	16V	R	
C 1010	K22120805	CHIP CAP.	GRM40R683M16PT	0.068uF	16V	R	
C 1011	K22174809	CHIP CAP.	GRM39B102M50PT	0.001uF	50V	B	
C 1012	K22174809	CHIP CAP.	GRM39B102M50PT	0.001uF	50V	B	
C 1013	K22174809	CHIP CAP.	GRM39B102M50PT	0.001uF	50V	B	
C 1014	K22174809	CHIP CAP.	GRM39B102M50PT	0.001uF	50V	B	
C 1015	K22170805	CHIP CAP.	GRM40B102M50PT	0.001uF	50V	B	
C 1016	K22170805	CHIP CAP.	GRM40B102M50PT	0.001uF	50V	B	
C 1017	K78120009	TANTALUM CHIP CAP.	TESVA1C105M1-8R	1uF	16V		
C 1018	K22170817	CHIP CAP.	GRM40B103M50PT	0.01uF	50V	B	
C 1019	K22174809	CHIP CAP.	GRM39B102M50PT	0.001uF	50V	B	
C 1020	K78080003	TANTALUM CHIP CAP.	F950J106MTAAF1Q2	10uF	6.3V		
C 1021	K40089010	AL. ELECTRO. CAP.	RC2-6V221M	220uF	6.3V		
C 1022	K22170805	CHIP CAP.	GRM40B102M50PT	0.001uF	50V	B	
C 1023	K22170805	CHIP CAP.	GRM40B102M50PT	0.001uF	50V	B	
C 1024	K22174809	CHIP CAP.	GRM39B102M50PT	0.001uF	50V	B	
C 1025	K22174809	CHIP CAP.	GRM39B102M50PT	0.001uF	50V	B	
C 1026	K22174809	CHIP CAP.	GRM39B102M50PT	0.001uF	50V	B	
C 1027	K22174809	CHIP CAP.	GRM39B102M50PT	0.001uF	50V	B	
C 1028	K10176102	CERAMIC CAP.	DD104B102K50	0.001uF	50V	B	
C 1029	K78080003	TANTALUM CHIP CAP.	F950J106MTAAF1Q2	10uF	6.3V		
C 1030	K22170805	CHIP CAP.	GRM40B102M50PT	0.001uF	50V	B	
C 1031	K22170821	CHIP CAP.	GRM40B223M50PT	0.022uF	50V	B	
C 1034	K22174817	CHIP CAP.	GRM39B472M50PT	0.0047uF	50V	B	
C 1035	K22174817	CHIP CAP.	GRM39B472M50PT	0.0047uF	50V	B	
C 1040	K22170805	CHIP CAP.	GRM40B102M50PT	0.001uF	50V	B	
C 1042	K22170235	CHIP CAP.	GRM40CH101J50PT	100pF	50V	CH	
C 1044	K22170805	CHIP CAP.	GRM40B102M50PT	0.001uF	50V	B	
CO1001	H7900400	CERAMIC OSC.	KBR-800H				
D 1001	G2070084	DIODE	1SS300 TE85R				

R 0713	J24185104	CHIP RES.	RMC1/16	104JATP	100K	1/16W
R 0714	J24185225	CHIP RES.	RMC1/16	225JATP	2.2M	1/16W
R 0715	J24205223	CHIP RES.	RMC1/10	223J	22K	1/10W
R 0716	J24185104	CHIP RES.	RMC1/16	104JATP	100K	1/16W

R 1008	J24185103	CHIP RES.	RMC1/16 103JATP	10K	1/16W
R 1009	J24185105	CHIP RES.	RMC1/16 105JATP	1M	1/16W
R 1010	J24185473	CHIP RES.	RMC1/16 473JATP	47K	1/16W
R 1011	J24185103	CHIP RES.	RMC1/16 103JATP	10K	1/16W
R 1012	J24185472	CHIP RES.	RMC1/16 472JATP	4.7K	1/16W
R 1013	J24185104	CHIP RES.	RMC1/16 104JATP	100K	1/16W
R 1014	J24185104	CHIP RES.	RMC1/16 104JATP	100K	1/16W
R 1015	J24185103	CHIP RES.	RMC1/16 103JATP	10K	1/16W
R 1016	J24185561	CHIP RES.	RMC1/16 561JATP	560	1/16W
R 1017	J24185561	CHIP RES.	RMC1/16 561JATP	560	1/16W
R 1018	J24185103	CHIP RES.	RMC1/16 103JATP	10K	1/16W
R 1019	J24185101	CHIP RES.	RMC1/16 101JATP	100	1/16W
R 1020	J24185472	CHIP RES.	RMC1/16 472JATP	4.7K	1/16W
R 1021	J24185104	CHIP RES.	RMC1/16 104JATP	100K	1/16W
R 1022	J24185103	CHIP RES.	RMC1/16 103JATP	10K	1/16W
R 1023	J24185103	CHIP RES.	RMC1/16 103JATP	10K	1/16W
R 1024	J24185103	CHIP RES.	RMC1/16 103JATP	10K	1/16W
R 1025	J24185474	CHIP RES.	RMC1/16 474JATP	470K	1/16W
R 1026	J24185105	CHIP RES.	RMC1/16 105JATP	1M	1/16W
R 1027	J24185000	CHIP RES.	RMC1/16 000JATP	0	1/16W
R 1028	J24185183	CHIP RES.	RMC1/16 183JATP	18K	1/16W
R 1029	J24185102	CHIP RES.	RMC1/16 102JATP	1K	1/16W
R 1030	J24185104	CHIP RES.	RMC1/16 104JATP	100K	1/16W
R 1031	J24185473	CHIP RES.	RMC1/16 473JATP	47K	1/16W
R 1032	J24185224	CHIP RES.	RMC1/16 224JATP	220K	1/16W
R 1033	J24185103	CHIP RES.	RMC1/16 103JATP	10K	1/16W
R 1034	J24185103	CHIP RES.	RMC1/16 103JATP	10K	1/16W
R 1035	J24185222	CHIP RES.	RMC1/16 222JATP	2.2K	1/16W
R 1036	J24185152	CHIP RES.	RMC1/16 152JATP	1.5K	1/16W
R 1037	J24185471	CHIP RES.	RMC1/16 471JATP	470	1/16W
R 1038	J24185472	CHIP RES.	RMC1/16 472JATP	4.7K	1/16W
R 1039	J24185103	CHIP RES.	RMC1/16 103JATP	10K	1/16W
R 1040	J24185103	CHIP RES.	RMC1/16 103JATP	10K	1/16W
R 1041	J24185472	CHIP RES.	RMC1/16 472JATP	4.7K	1/16W
R 1042	J24185000	CHIP RES.	RMC1/16 000JATP	0	1/16W
R 1043	J24185000	CHIP RES.	RMC1/16 000JATP	0	1/16W
R 1044	J24185000	CHIP RES.	RMC1/16 000JATP	0	1/16W
R 1045	J24185223	CHIP RES.	RMC1/16 223JATP	22K	1/16W
R 1046	J24185000	CHIP RES.	RMC1/16 000JATP	0	1/16W
R 1047	J24185104	CHIP RES.	RMC1/16 104JATP	100K	1/16W
S 1001	N5090018	TACT SWITCH	KHH-15951		
S 1002	N5090018	TACT SWITCH	KHH-15951		
S 1003	N6090057	SLIDE SWITCH	SSSS22		
S 1004	N4090088	PUSH SWITCH	SPJ622N FI9		
S 1005	N0190139	ROTARY SWITCH	SRBM1L017B		
X 1001	H7900400	CERAMIC OSC.	KBR-800H		
	R8118690	SEAL			
	R7132740	MYLAR			
	R7132750	MYLAR			
	R0130380	SHIELD PLATE			
	R7074930	DOUBLE FACE ADHESIVE			
	R7109650	DOUBLE FACE ADHESIVE			

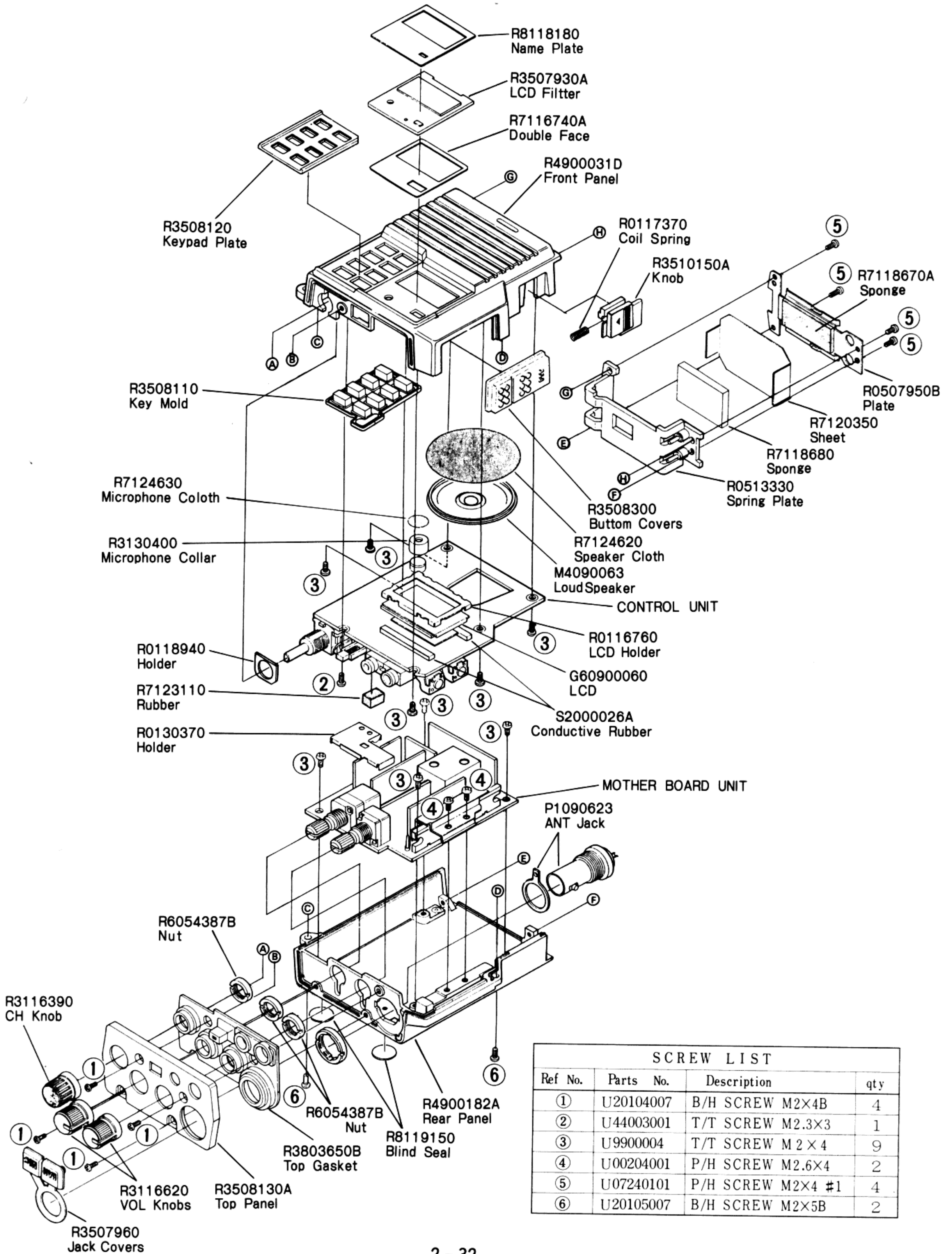


\*\*\* DUMMY UNIT \*\*\*

CS0853001 P.C.B. W/COMP.  
F3058103 P.C.B. W/O COMP.

P 3001	P0090702	CONNECTOR	9230B-1-03Z003-T	
R 3001	J24185223	CHIP RES.	RMC1/16 223JATP	22K

# EXPLODED VIEW



SCREW LIST			
Ref No.	Parts No.	Description	qty
①	U20104007	B/H SCREW M2×4B	4
②	U44003001	T/T SCREW M2.3×3	1
③	U9900004	T/T SCREW M 2 × 4	9
④	U00204001	P/H SCREW M2.6×4	2
⑤	U07240101	P/H SCREW M2×4 #1	4
⑥	U20105007	B/H SCREW M2×5B	2



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