

CONTENTS

TOP COVER REMOVAL	2
EXPLODED VIEW	3
MAIN UNIT	4
Parts Layout	4
Circuit Diagram	5
FILTER UNIT	7
Parts Layout	7
Circuit Diagram	7
NB UNIT	7
Parts Layout	7
Circuit Diagram	7
LOCAL UNIT	8
Parts Layout	8
Circuit Diagram	9
100W PA UNIT	10
Parts Layout	10
Circuit Diagram	10
LPF UNIT	11
Parts Layout	11
Circuit Diagram	11
DISPLAY UNIT	12
Parts Layout	12
Circuit Diagram	13
CONNECTION DIAGRAM	14
LEVEL DIAGRAM	15
Transmit	15
Receive	16
SIGNAL PATH	17
SSB MODE	17
CW MODE	18
AM MODE	19
FM MODE	20
ALIGNMENT	21
I. Local Unit	23
II. Main Unit - Receiver	24
III. Main Unit - Transmitter	26
IV. Noise Blanker Unit	27
V. 100W PA Unit (Idling Current)	27
VI. LPF Unit (CM Coupler Balance)	28
VII. Main Unit (AFP - Automatic Final Protection)	28
PARTS LIST	29



This manual is intended to serve as a supplement to the FT-747GX Operating Manual. Detailed information regarding functions, installation, interconnections 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.

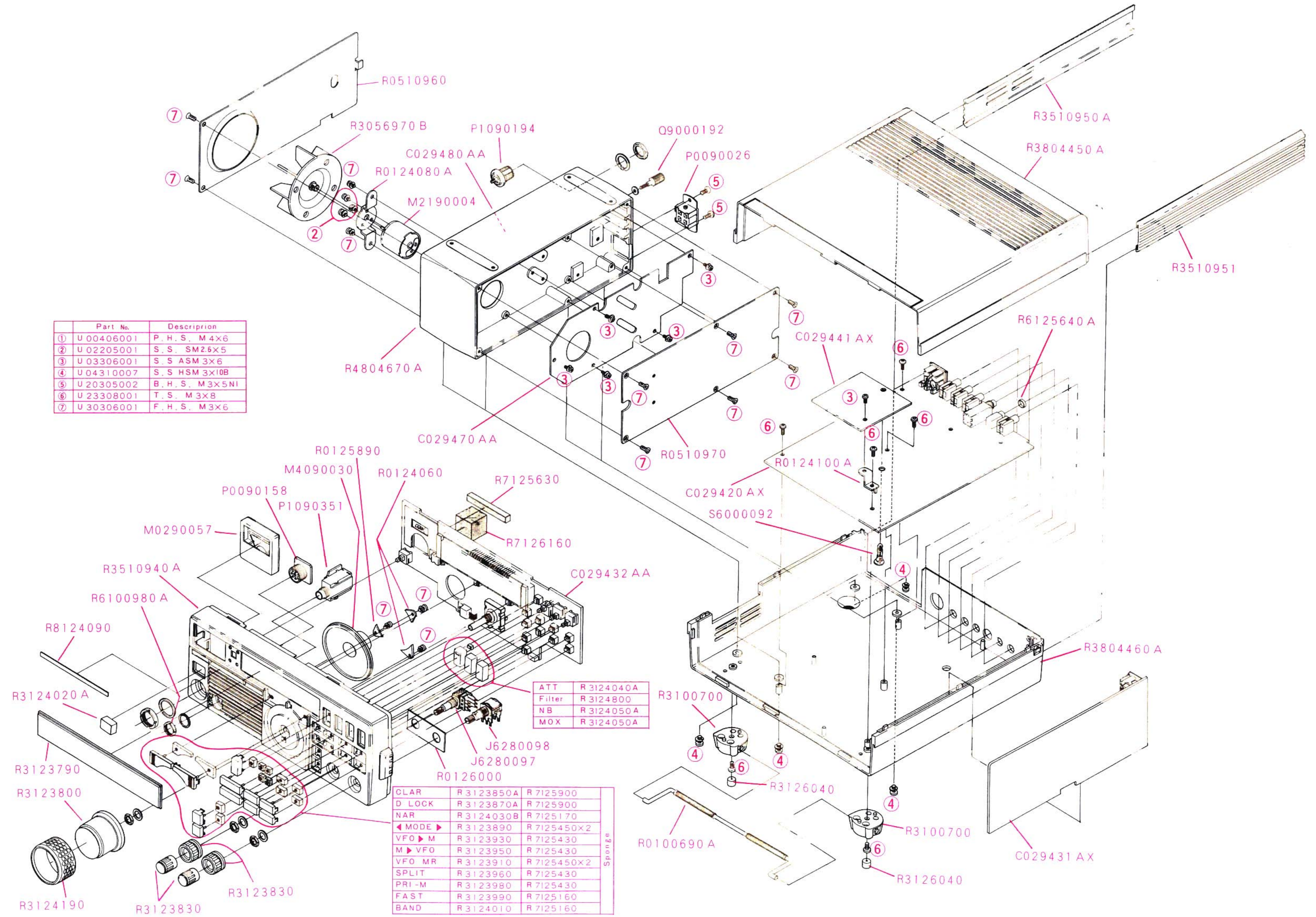
Because there are nearly two hundred and fifty semiconductor devices in the FT-747GX, circuit description information is provided in the form of numerous block diagrams. We hope that this manner of providing functional information proves to be more convenient for the owner and technician than would a lengthy verbal description. Those readers unfamiliar with the basic types of analog and digital circuits that serve as the building blocks of the FT-747GX are encouraged to study instructional material, such as that provided in handbooks on amateur radio and digital circuit design, before attempting to understand the design of the FT-747GX. Each block in the block diagrams represents one such basic circuit. General information on integrated circuits and their applications is available in the data provided by the IC manufacturers. Specific circuit details are provided in the schematic diagrams in this manual.

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 obligation to notify owners or to modify any sets produced prior to the modification.

ach side to

away from
both hands
Figure 2.
(1) which
a clip at
horizontally,
match the
holding the
position, and
out 2 cen-
clips clear

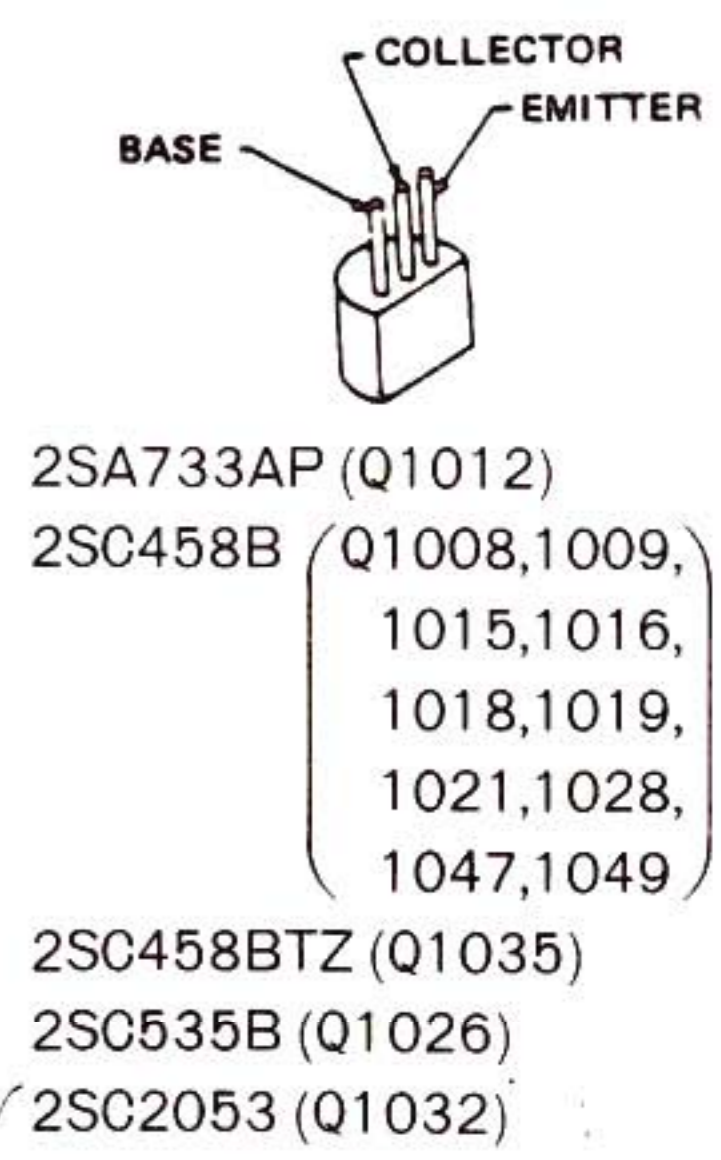
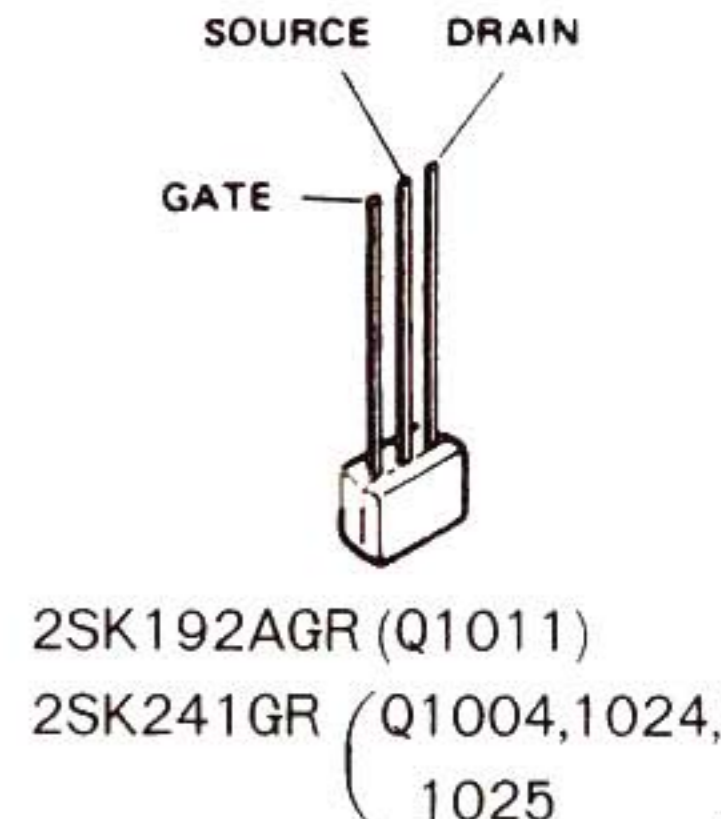
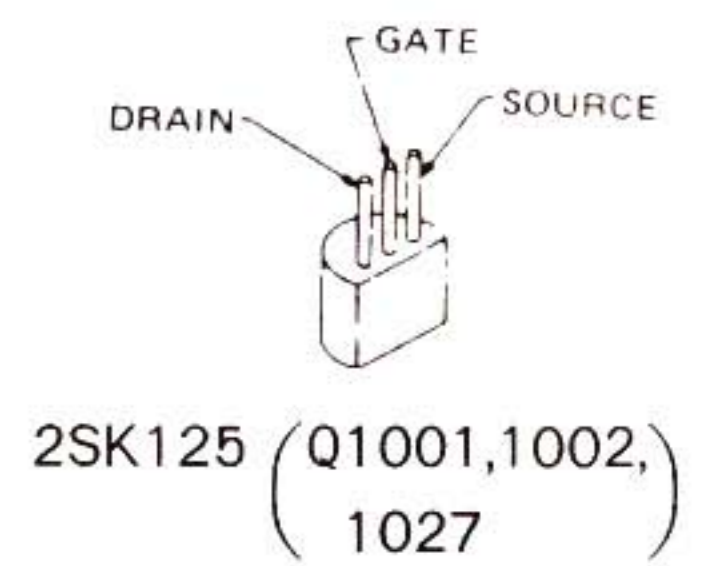
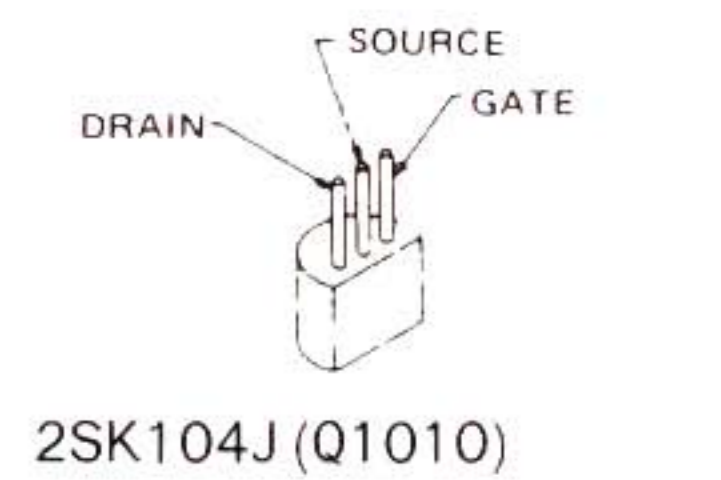
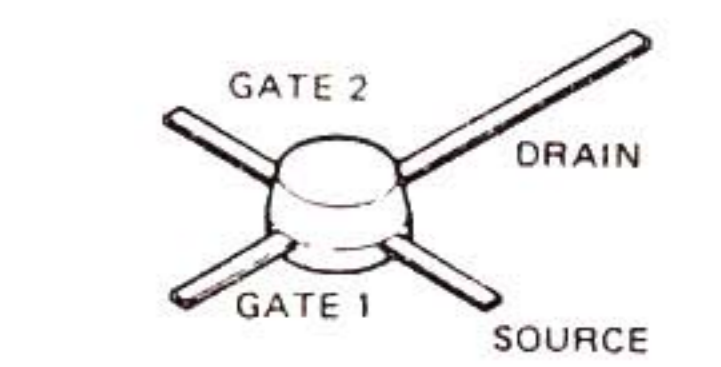
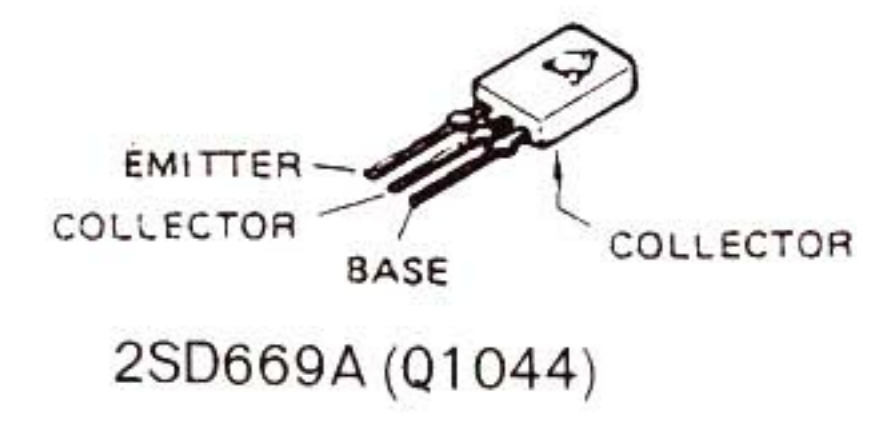
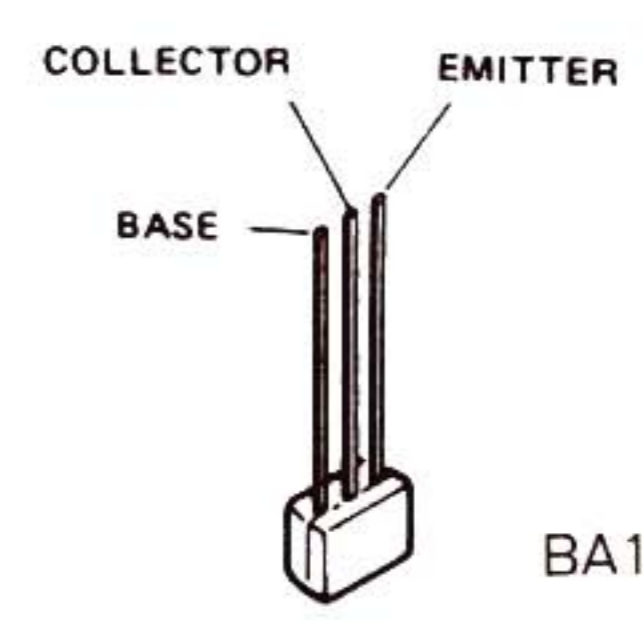
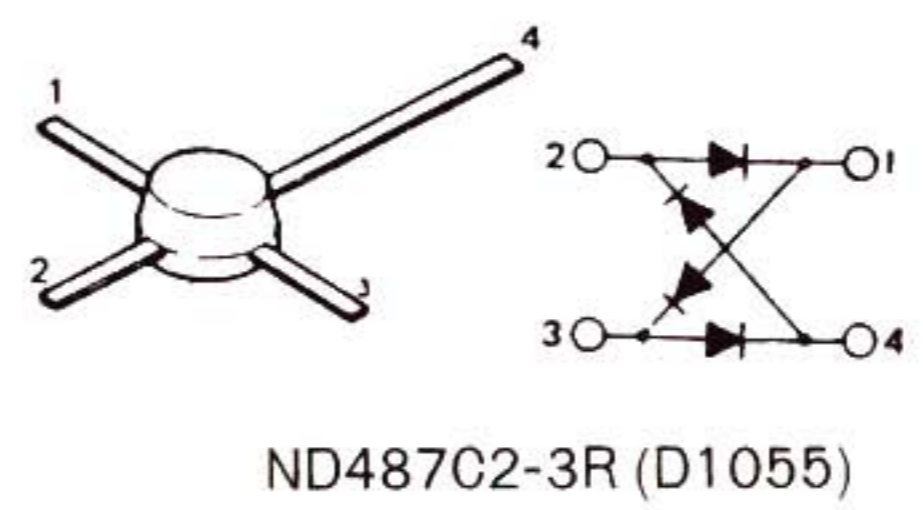
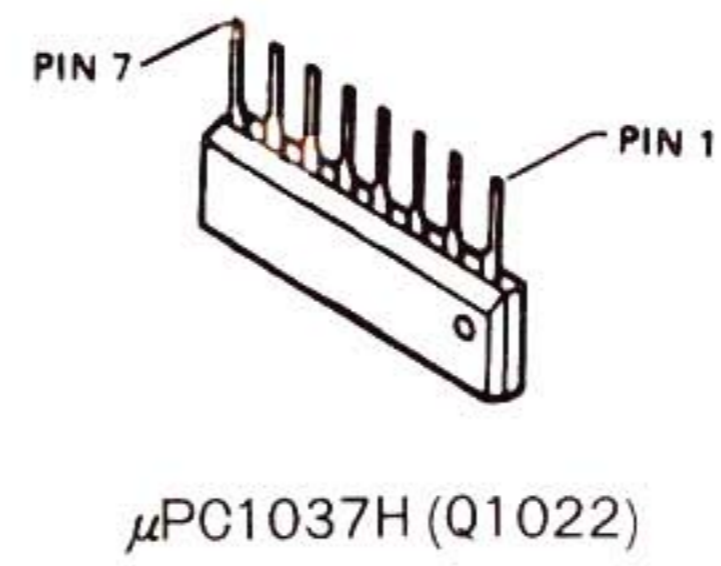
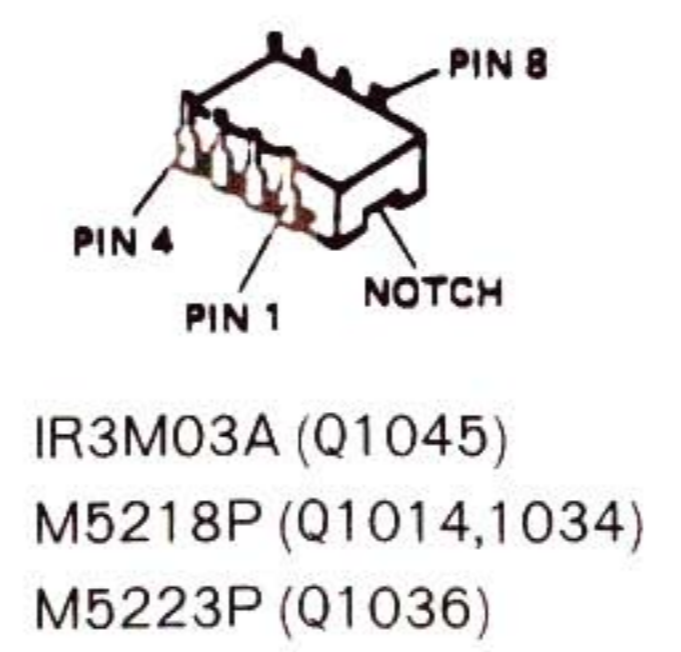
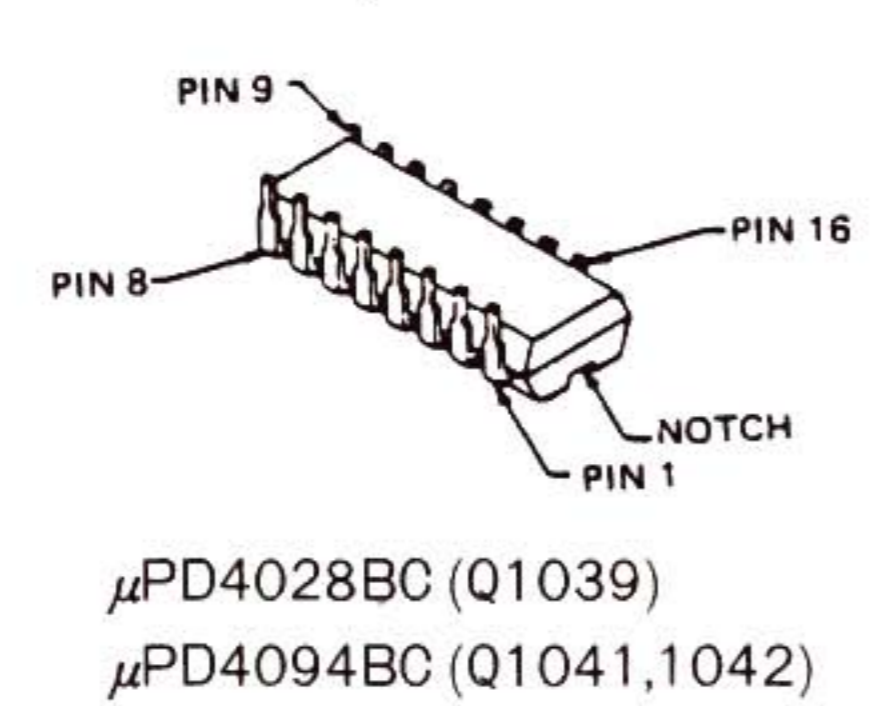
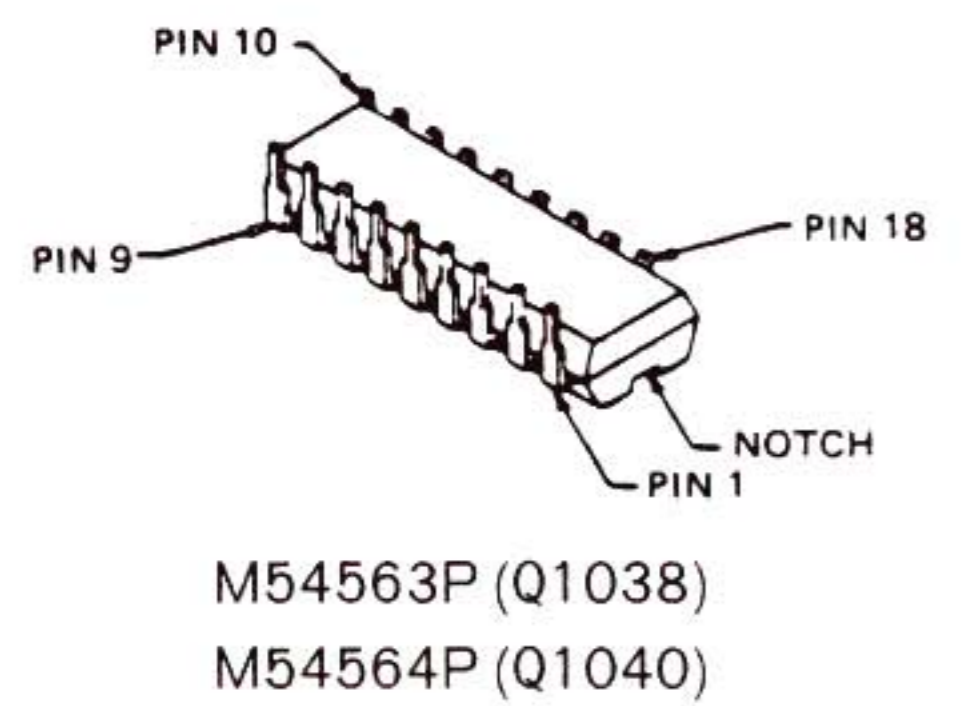
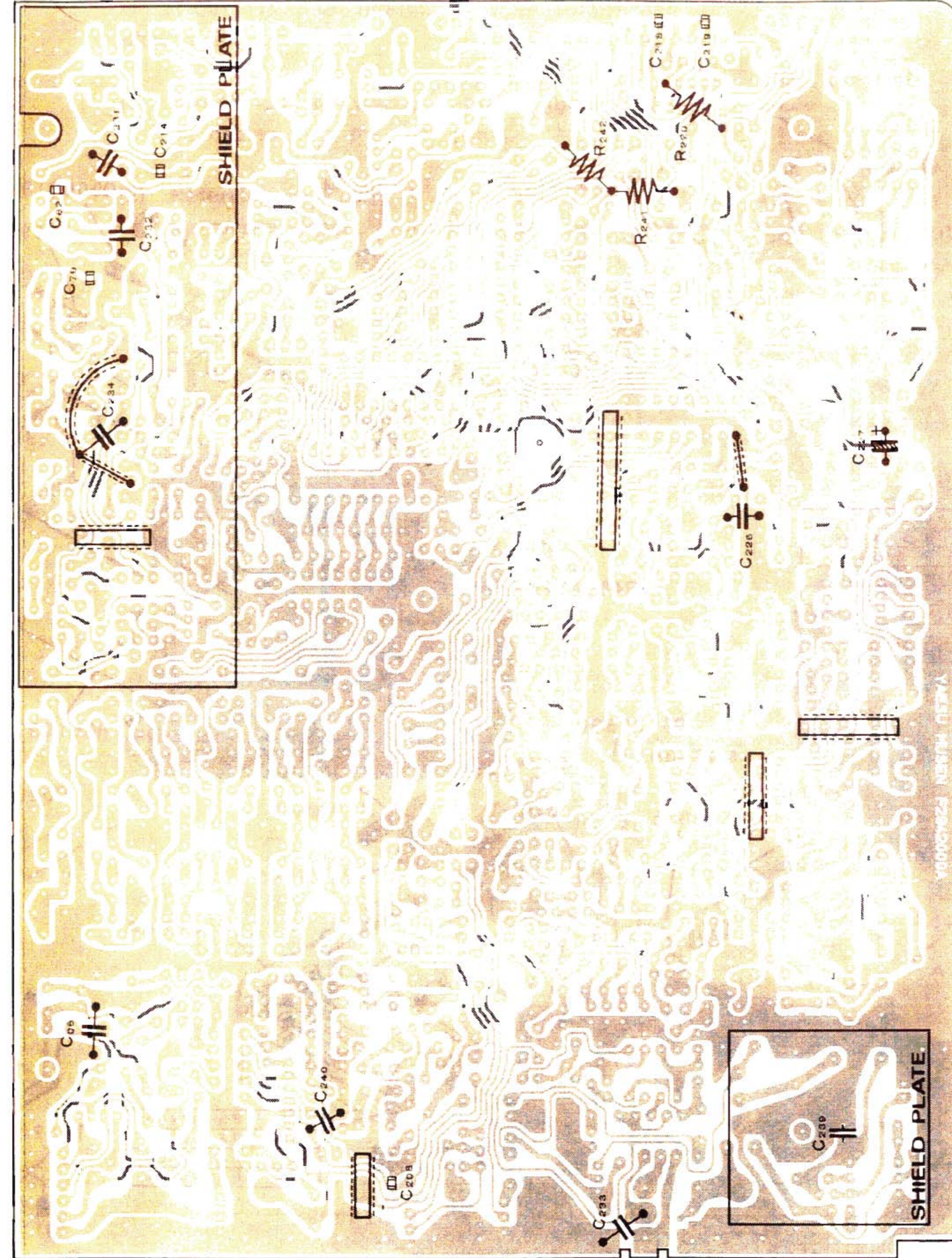
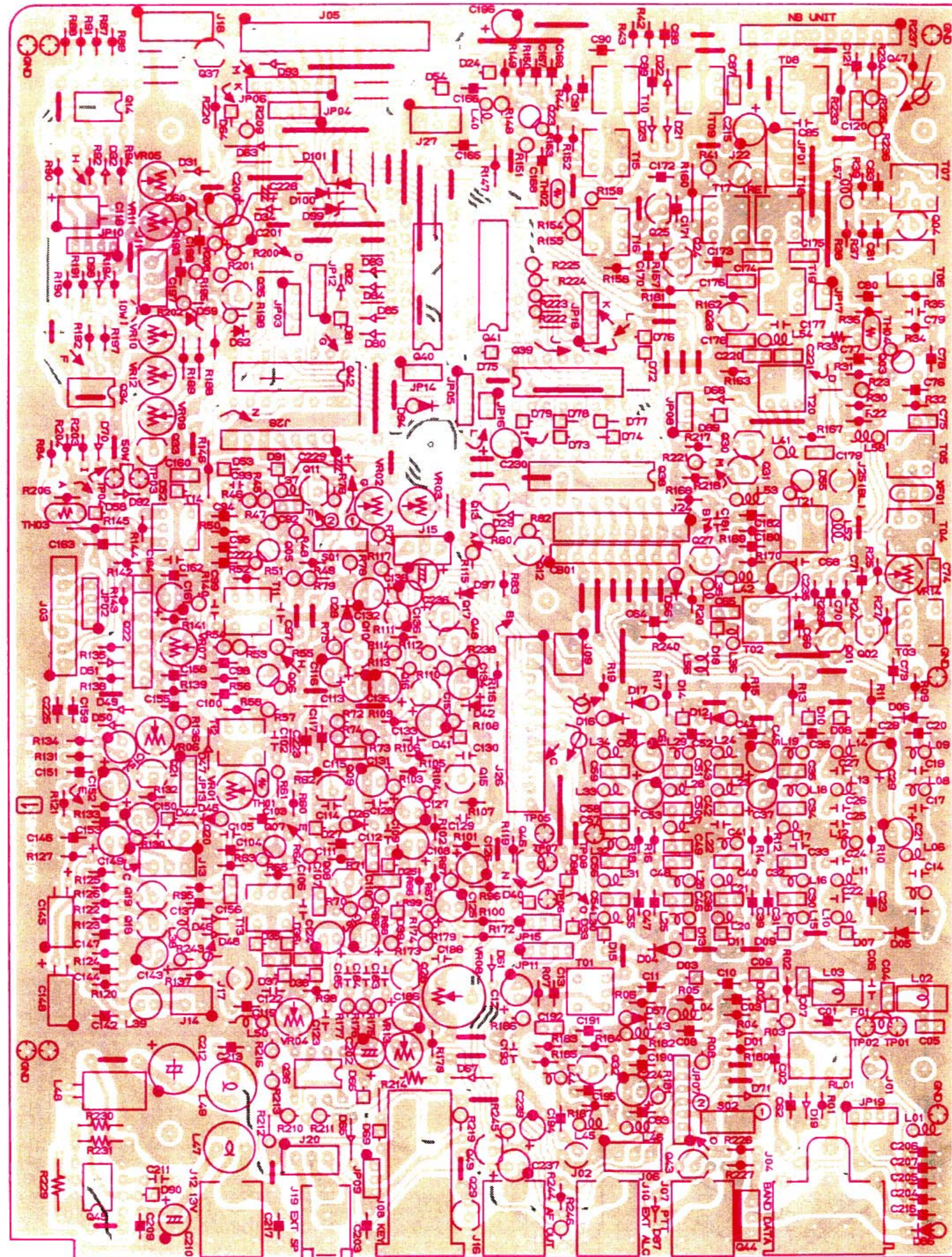





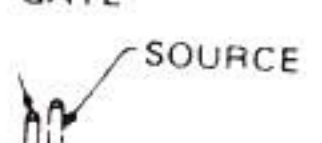

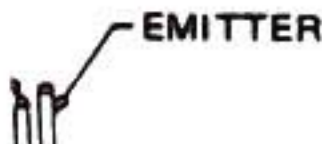

Part No.	Description
① U 00406001	P. H. S. M4X6
② U 02205001	S. S. SM2.6X5
③ U 03306001	S. S. ASM 3X6
④ U 04310007	S. S. HSM 3X10B
⑤ U 20305002	B. H. S. M3X5NI
⑥ U 23308001	T. S. M 3X8
⑦ U 30306001	F. H. S. M3X6

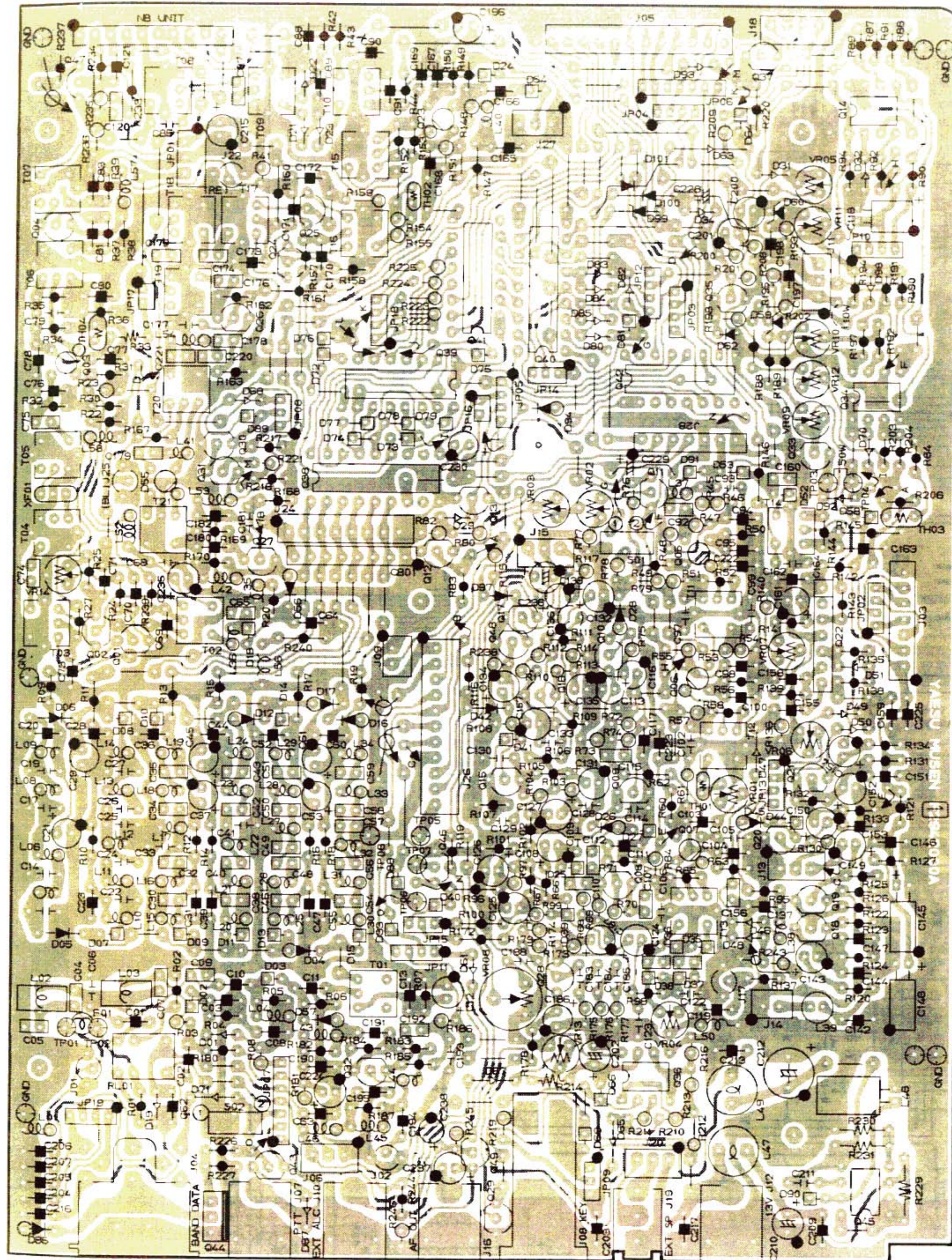
ATT	R 3124040A
Filter	R 3124800
NB	R 3124050A
MOX	R 3124050A

CLAR	R 3123850A	R 7125900
D LOCK	R 3123870A	R 7125900
NAR	R 3124030B	R 7125170
◀ MODE ▶	R 3123890	R 7125450X2
VFO ▶ M	R 3123930	R 7125430
M ▶ VFO	R 3123950	R 7125430
VFO MR	R 3123910	R 7125450X2
SPLIT	R 3123960	R 7125430
PRI-M	R 3123980	R 7125430
FAST	R 3123990	R 7125160
BAND	R 3124010	R 7125160

PARTS LAYOUT



-  DRAIN
-  SOURCE
- 003,
005~1007,
023
-  SOURCE GATE
- 010)
-  GATE SOURCE
- 001,1002,
027
-  DRAIN
- Q1011)
- Q1004,1024,
1025
-  COLLECTOR EMITTER
- 1012)
- 1008,1009,
1015,1016,
1018,1019,
1021,1028,
1047,1049
- Q1035)
- Q1026)
- Q1032)
-  COLLECTOR
- Q1044)



Component side (reverse)

MAIN UNIT VOLTAGE CHART
(DC VOLT)

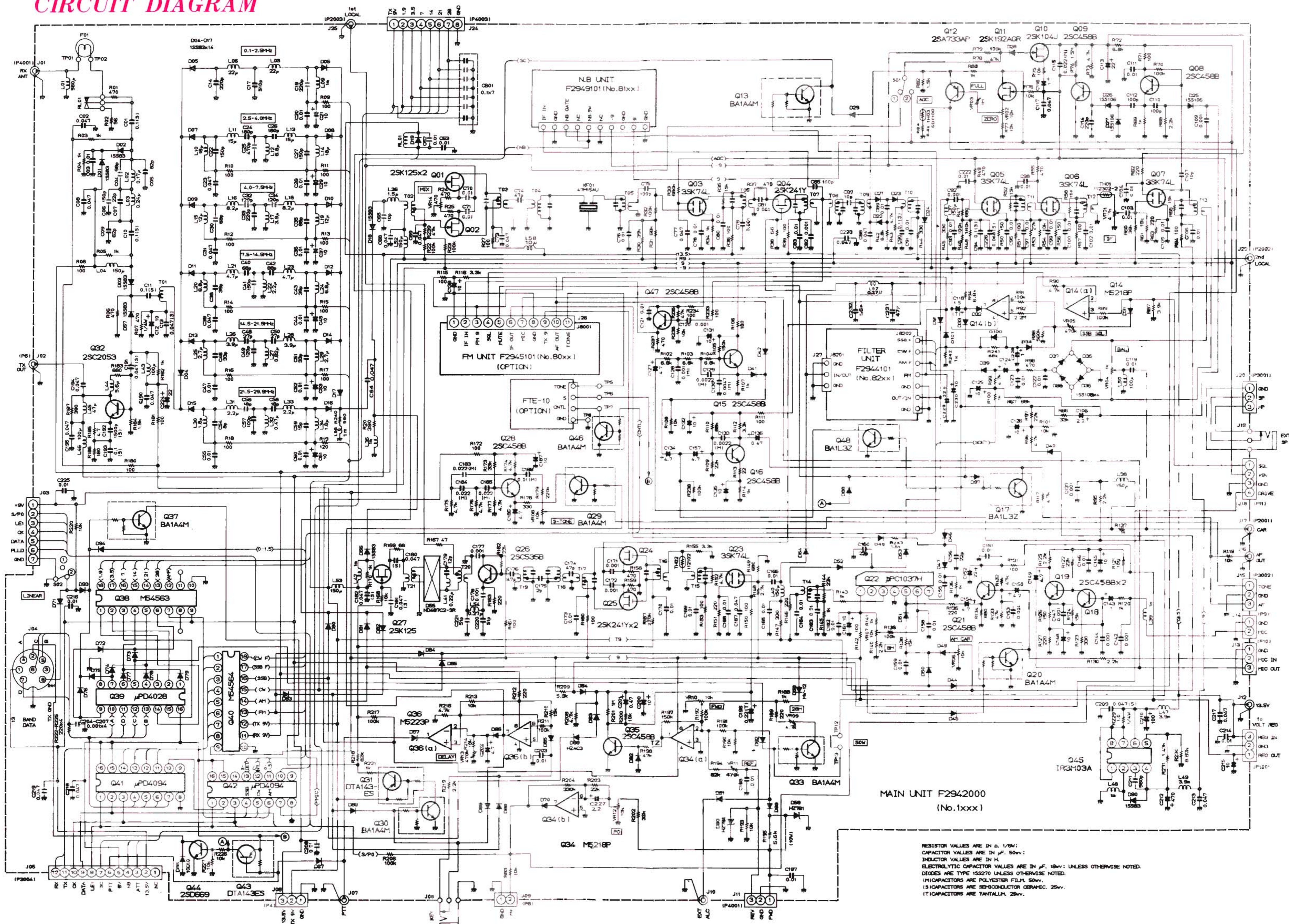
	E (S)	C (D)	B (G ₁)	(G ₂)	REMARKS
Q1001	25/-0.1	127/134	-07/-5.1		RX/TX
Q1002	25/-0.1	127/134	-07/-5.1		RX/TX
Q1003	2.0/0	132/134	1.5/4.1	3.2/3.2	RX/TX
Q1004	0.6	13.4	0		
Q1005	1.7/0	7.8/8.8	1.7/4.0	3.4/3.4	RX/TX
Q1006	2.2	7.4	2.4	3.4	
Q1007	1.9	8.0	1.8	3.6	
Q1008	4.8	8.3	5.5		
Q1009	0	3.4	0.1		
Q1010	3.6	3.6	0		
Q1011	6.2	8.8	3.4		
Q1012	5.3/0.7	0/0	4.7/4.6		RX/TX
Q1013	0/0	5.0/0.1	0/4.3		RX/TX
Q1015	4.2	8.4	4.8		
Q1016	1.3	4.4	2.0		
Q1017	0/0	0/0	0.1/3.7		RX/TX
Q1018	0.1	1.4	0.7		
Q1019	0.8	4.2	1.4		
Q1020	0/0	0/0	7.0/0		RX/TX
Q1021	3.0	8.4	3.6		
Q1023	1.9	0	1.8	3.2	
Q1024	0/0.6	8.9/8.6	-3.9/0.1		RX/TX
Q1025	0/0.6	8.9/8.6	-3.9/0.1		RX/TX
Q1026	3.0	7.5	3.8		
Q1027	0/1.6	-4.0/0.1	0/6.9		RX/TX
Q1028	0.6(0.3/0.6)	7.7(7.7/3.7)	1.0(1.0/0.9)		RX CW/TX CW KEY UP/DWN
Q1029	0(0/0)	0.6(0.6/0)	0(0/1.0)		RX CW/TX CW KEY UP/DWN
Q1030	0(0/0)	0(7.5/0)	0(0/10.5)		RX CW/TX CW KEY UP/DWN
Q1031	0(7.5/7.5)	0(-0.5/7.5)	0(7.5/0)		RX CW/TX CW KEY UP/DWN
Q1032	8.1	13.2	8.8		
Q1033	0	6.9	0		
Q1035	0	3.1	-0.5		
Q1037	0/0	0.5/7.4	4.0/0		0.5-1.5, 14.5-18.5 / other 21.5-25.0MHz
Q1043	5.5/5.0	0/5.0	5.0/0.6		RX/TX
Q1044	0/0	0.6/0	0/0.6		RX/TX
Q1046	0/0	0.4/0	0/4.8		RX/TX (MODE FM SPLIT ON)
Q1047	0.8	8.7	1.5		
Q1048	0/0	0/0	0.1/3.7		RX/TX

MAIN UNIT IC VOLTAGE CHART

(DC VOLT)

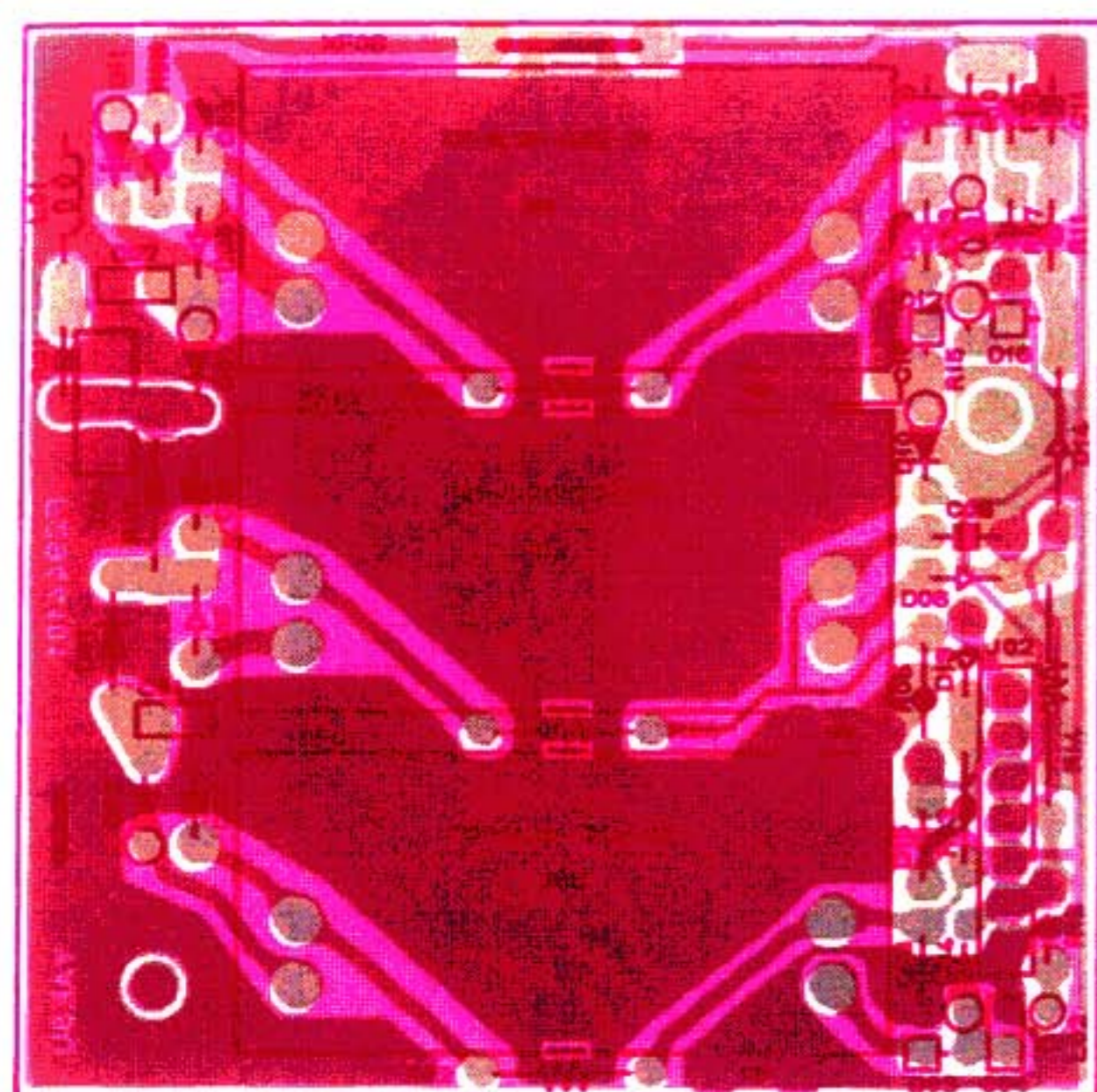
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	REMARKS		
Q1014	8.4/2.5	8.4/2.5	8.8/2.5	-9.0/9.0	3.1/2.7	7.0/1.8	-7.6/8.4	8.9/8.9												SQL VR CCW/CW	
Q1022	7.0	—	5.4	0	3.1	3.1	3.1														
Q1034	-5.2	0	0	-9.0	0	0	-7.7	8.9													
Q1036	12.0/0.7	0/10.2	4.2/3.9	0/0	4.2/3.9	12.9/2.1	0/10.8	13.1/12.3												KEY UP/DWN (MODE CW VHT 1.3 MIN)	
Q1038	0	0	0	4.1	0.2	0.2	0	0.1	13.4	0	0.2	13.0	0	0	12.0	0	0	0	0	MODE AM, 14MHz	
Q1039	0	0	0	0	0	4.7	0	0	0	5.0	0	5.0	0	0	0	5.0				MODE AM, 14MHz	
Q1040	0/0	4.8/4.8	0/0	0/0	0/0	0/0	0/4.4	4.5/0	8.9/8.9	0/0	7.6/-1.3	0/7.5	0/0	0/0	0/0	7.7/7.7	7.9/7.9	0/0		MODE USB, RX/TX	
Q1041	0	4.6	0	5.0	0	5.0	0	0	0	0	0	0	0	4.8	5.0	5.0				14MHz	
Q1042	0	0	0	4.8	0	0	0	0	0	0	0	0	0	4.9	5.0	5.0	5.0				MODE USB, 14MHz
Q1045	13.5	0.1	-8.2	-9.0	-7.8	13.5	13.5	13.5													

CIRCUIT DIAGRAM

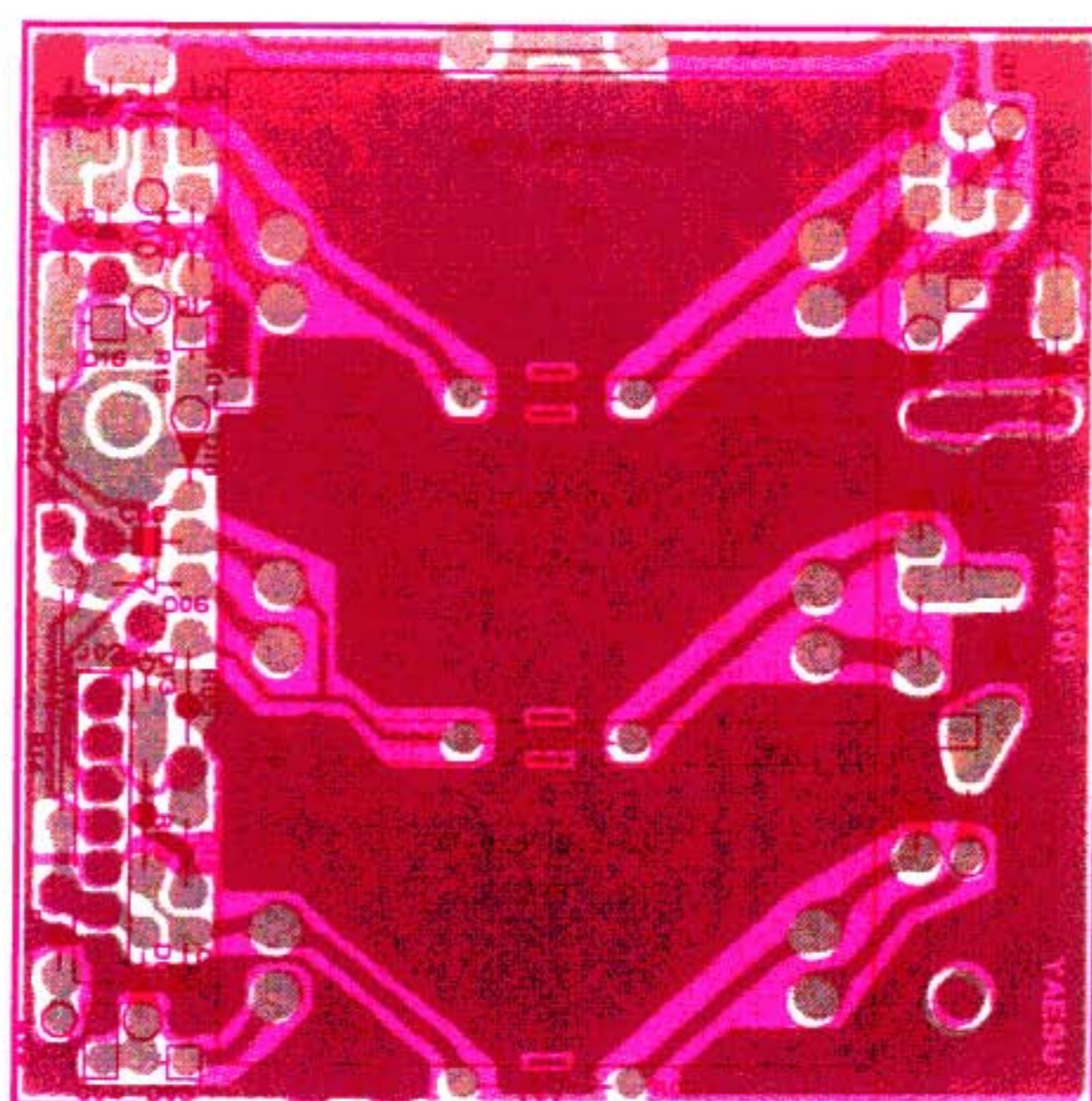


RESISTOR VALUES ARE IN Ω , $k\Omega$, $M\Omega$.
 CAPACITOR VALUES ARE IN μF , $50V$.
 INDUCTOR VALUES ARE IN μH .
 ELECTROLYTIC CAPACITOR VALUES ARE IN μF , $150V$, UNLESS OTHERWISE NOTED.
 DIODES ARE TYPE 1N5270 UNLESS OTHERWISE NOTED.
 (M) CAPACITORS ARE POLYESTER FILM, $50V$.
 (S) CAPACITORS ARE SEMICONDUCTOR CERAMIC, $25V$.
 (T) CAPACITORS ARE TANTALUM, $25V$.

FILTER UNIT PARTS LAYOUT

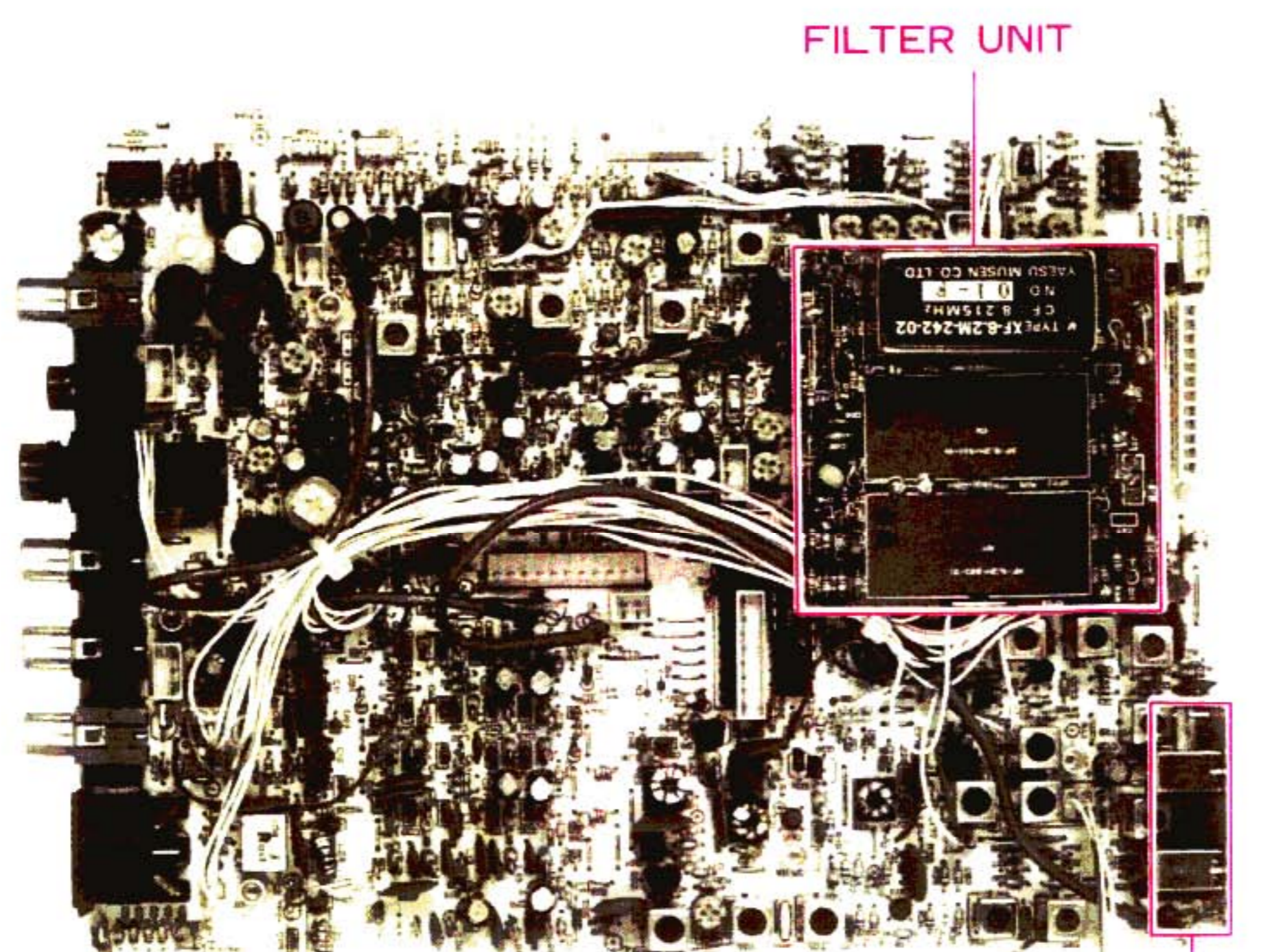
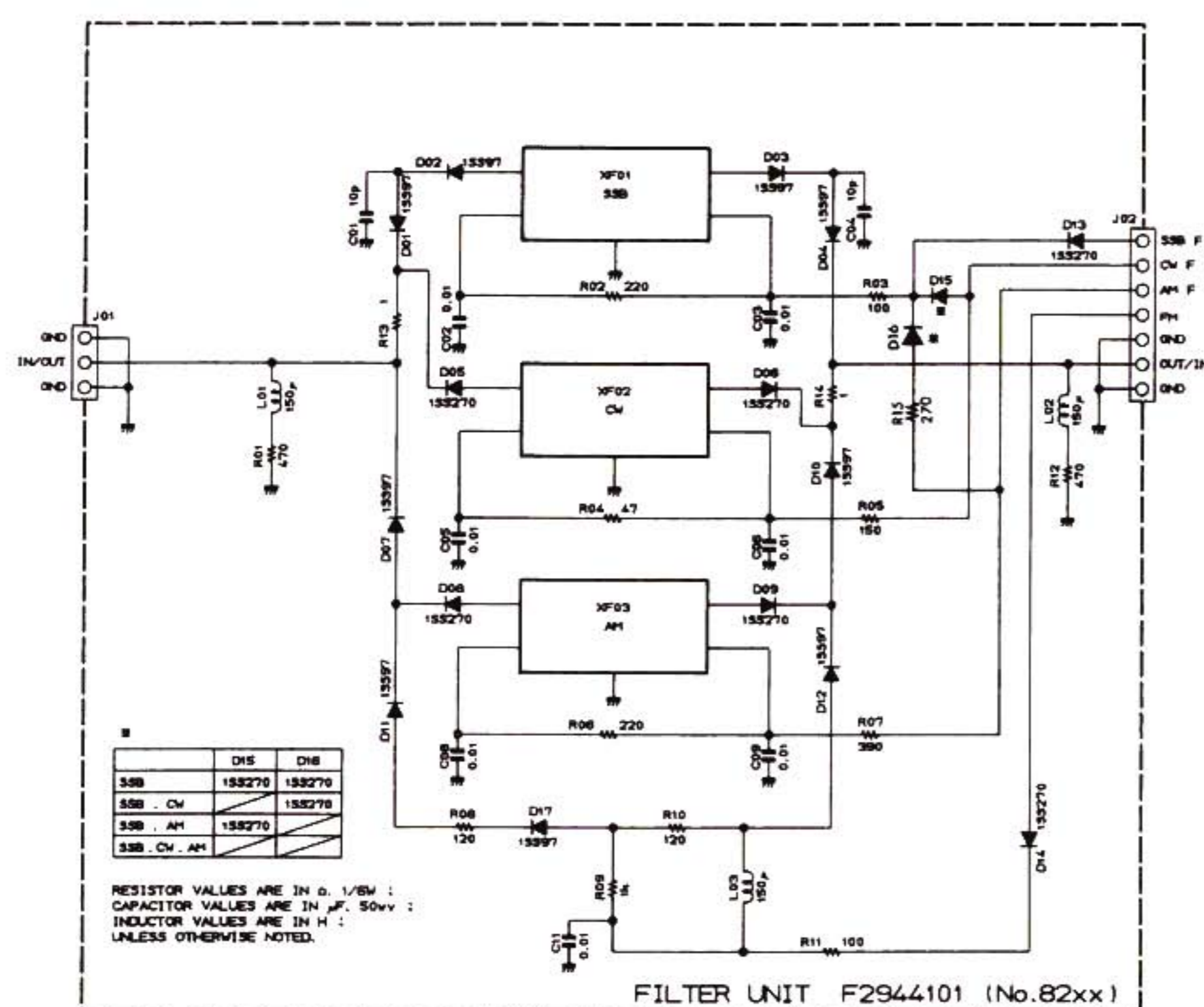


Component side (obverse)



Component side (reverse)

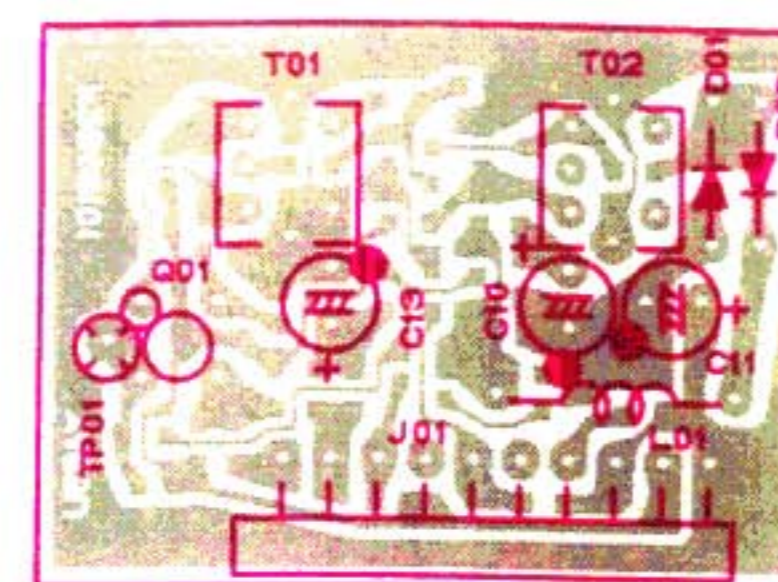
FILTER UNIT CIRCUIT DIAGRAM



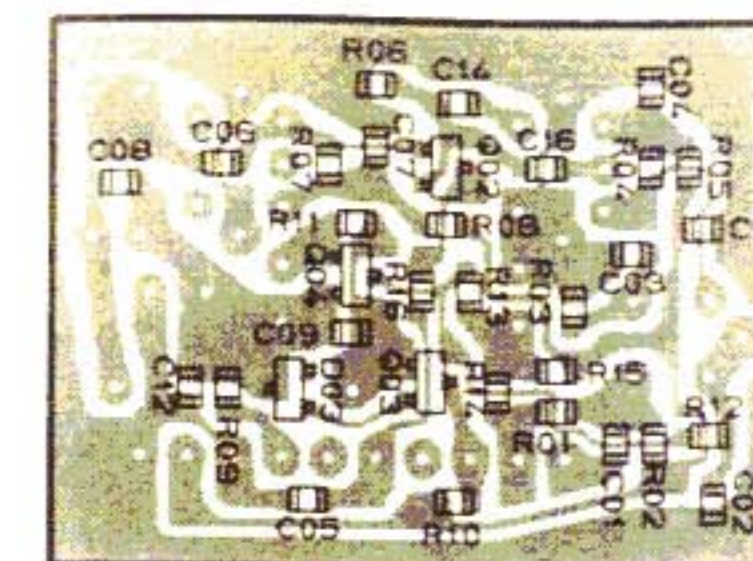
FILTER UNIT

NB UNIT

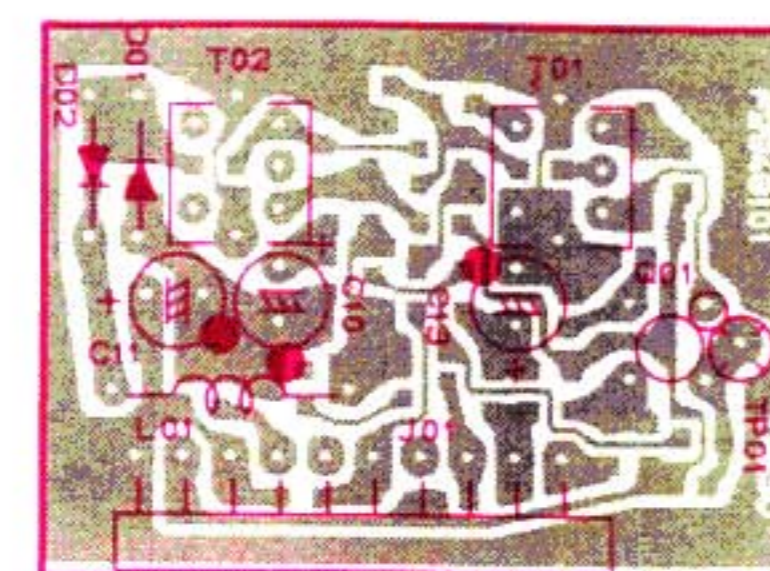
NB UNIT PARTS LAYOUT



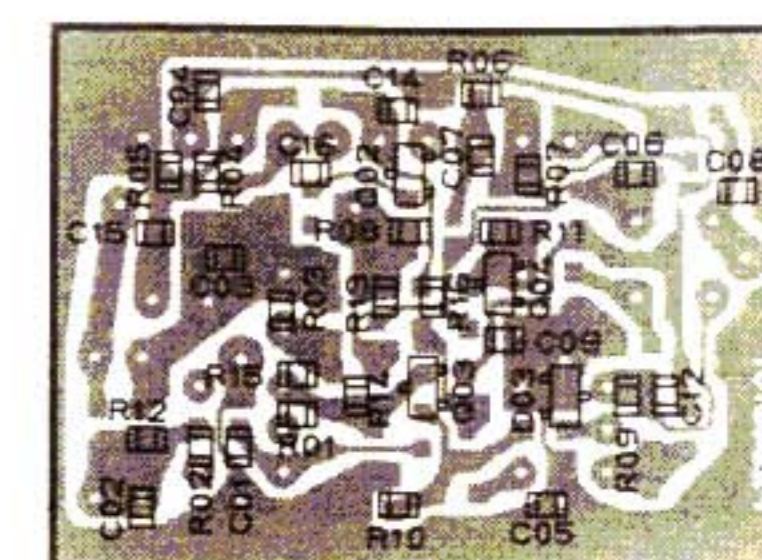
Component side (obverse)



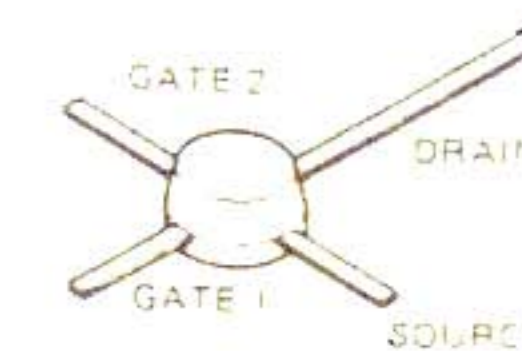
Solder side (obverse)



Component side (reverse)



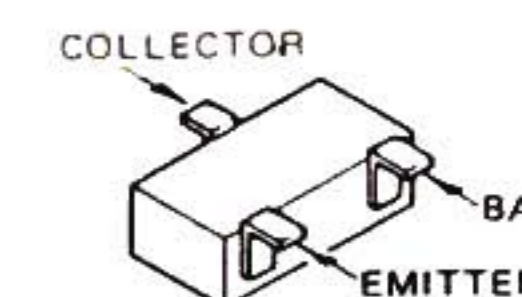
Solder side (reverse)



3SK74L
(Q8101)

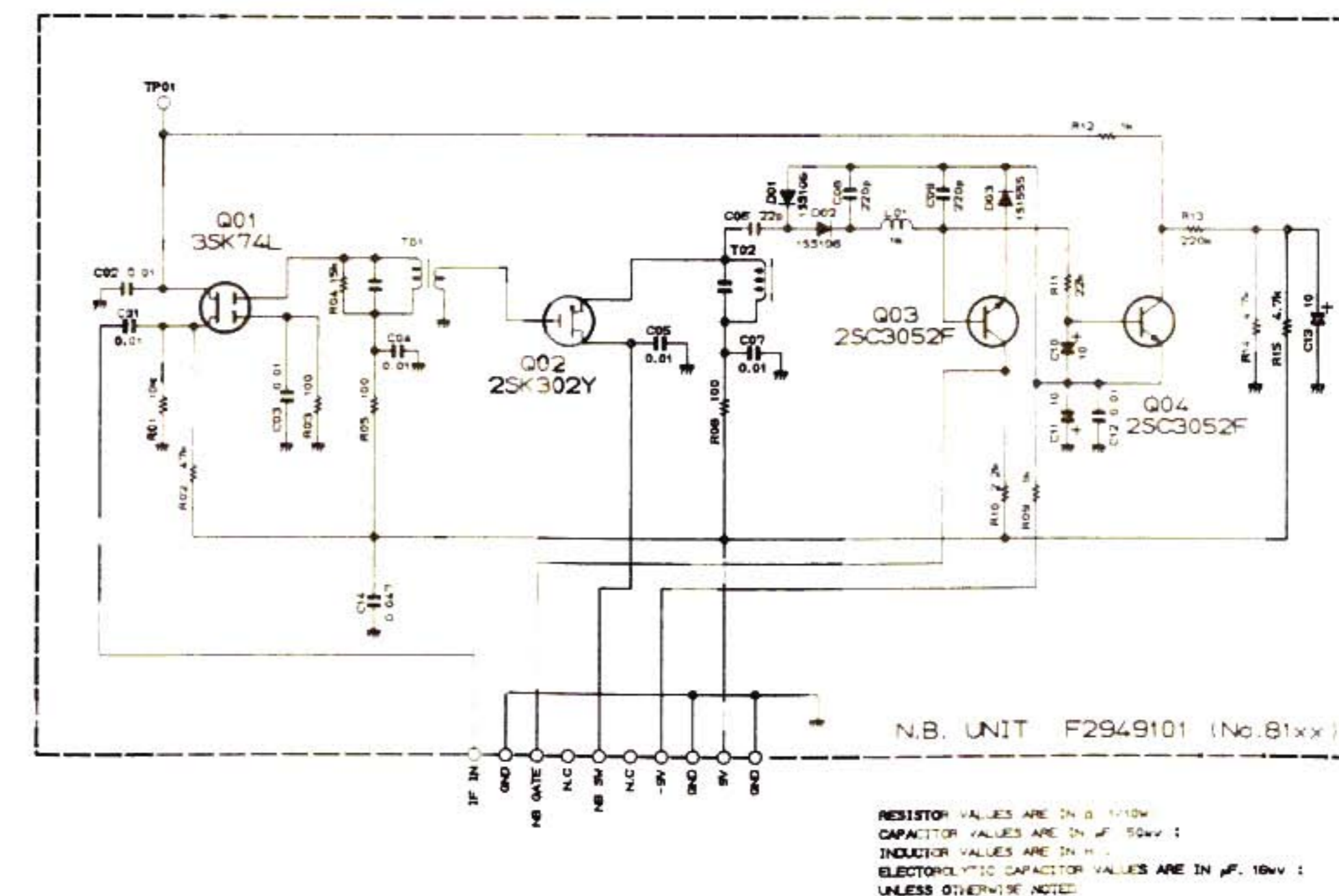


Marked Surface
2SK302Y
(Q8102)



Marked Surface
2SC3052F
(Q8103,8104)

NB UNIT CIRCUIT DIAGRAM

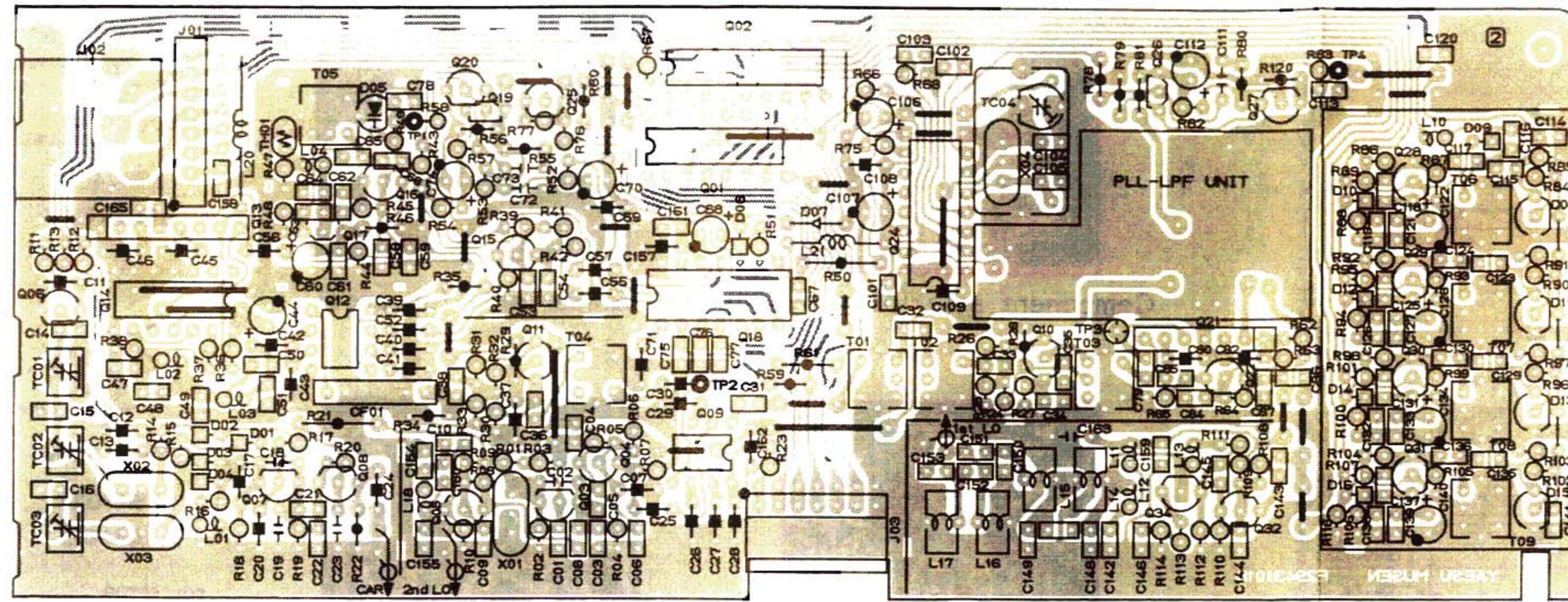


NB UNIT VOLTAGE CHART

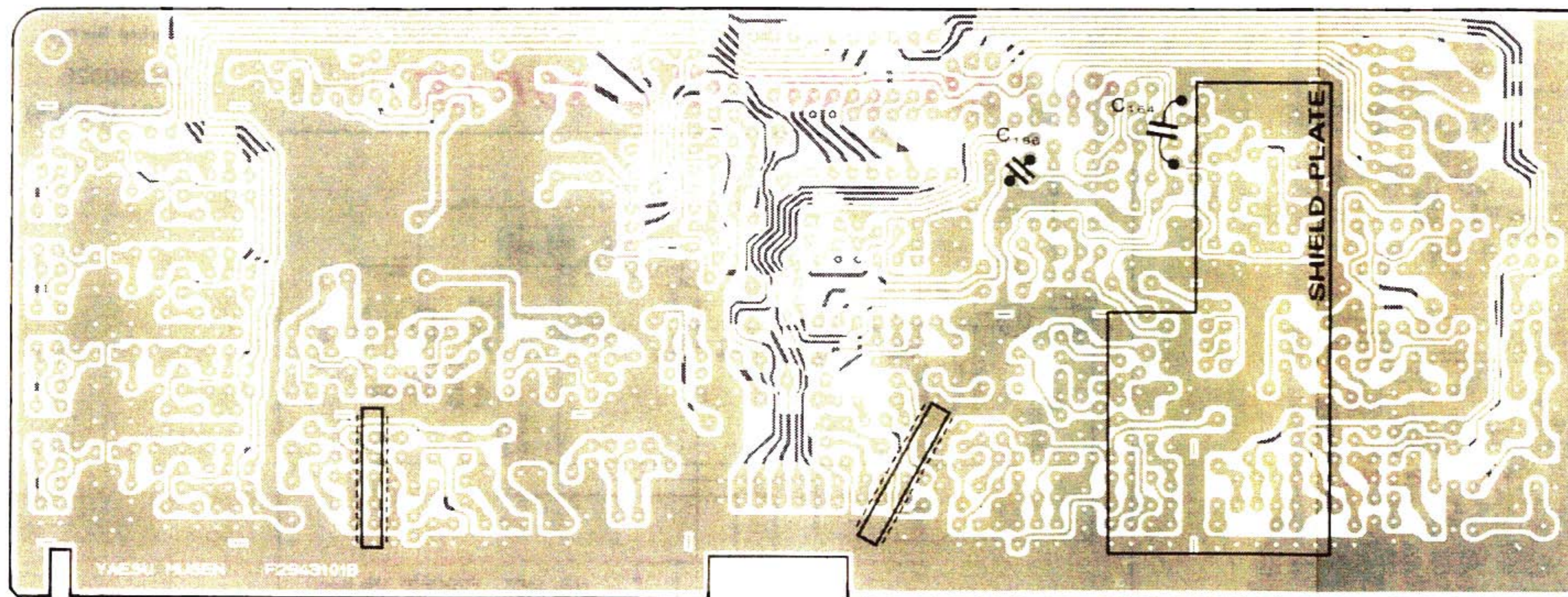
(DC VOLT)

	E (S)	C (D)	B (G ₁)	(G ₂)	REMARKS
Q8101	7.4	1.5	1.5	4.3	
Q8102	1.7/0	8.9/8.2	0/0		NB OFF/ON
Q8103	-8.8	6.4	-8.9		
Q8104	-9.1	4.3	-9.0		

PARTS LAYOUT



Component side (obverse)



Solder side (obverse)

LOCAL UNIT IC VOLTAGE CHART

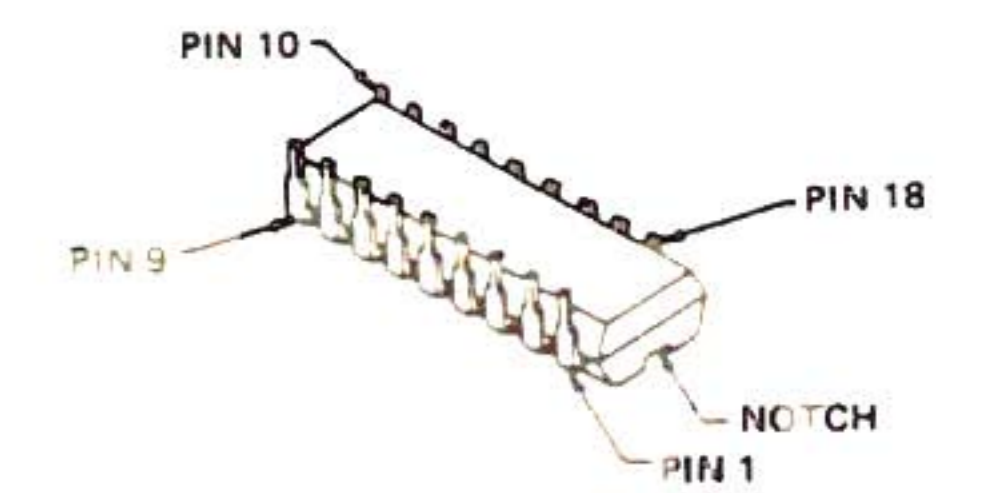
(DC VOLT)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	REMARKS
Q2001	-	-	-	0	4.8	0	0	0	0	0	0	4.8	0	0	5.0	5.0			14MHz
Q2002	0	0	4.8	0	0	4.8	0	0	8.8	0	0	0	7.6	0	0	7.6	-0.4	0	14MHz, MODE USB
Q2009	6.4	3.8	2.7	0	2.7	3.8	3.8	7.8											14MHz, MODE USB
Q2012	6.4	3.8	2.7	0	2.7	3.8	3.8	7.7											14MHz, MODE USB
Q2013	0	0	4.9	2.6	2.6	0	4.9	2.5											14MHz, MODE USB
Q2014	0	4.9	0	0	0	0	0	0	2.5	0	2.5	2.5	2.3	4.9					14MHz, MODE USB
Q2018	-2.4	-	-	-	2.1	2.2	0.5	0	-	-	2.4	5.0	4.2	0					14MHz, MODE USB
Q2021	5.9	5.2	4.8	0	2.6	2.6	2.6												14MHz, MODE USB
Q2024	-2.4	-	-	-	2.2	1.9	0.5	0	-	-	0.5	4.8	2.0	0					14MHz, MODE USB

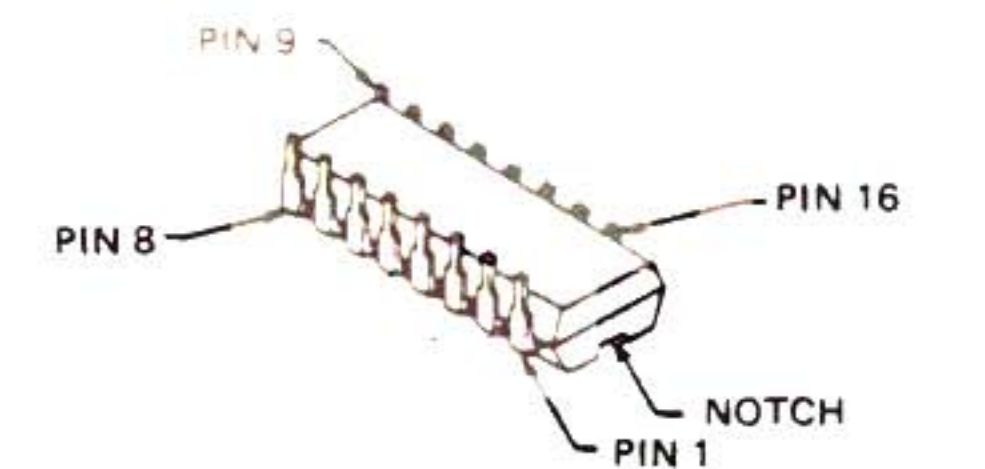
LOCAL UNIT VOLTAGE CHART

(DC VOLT)

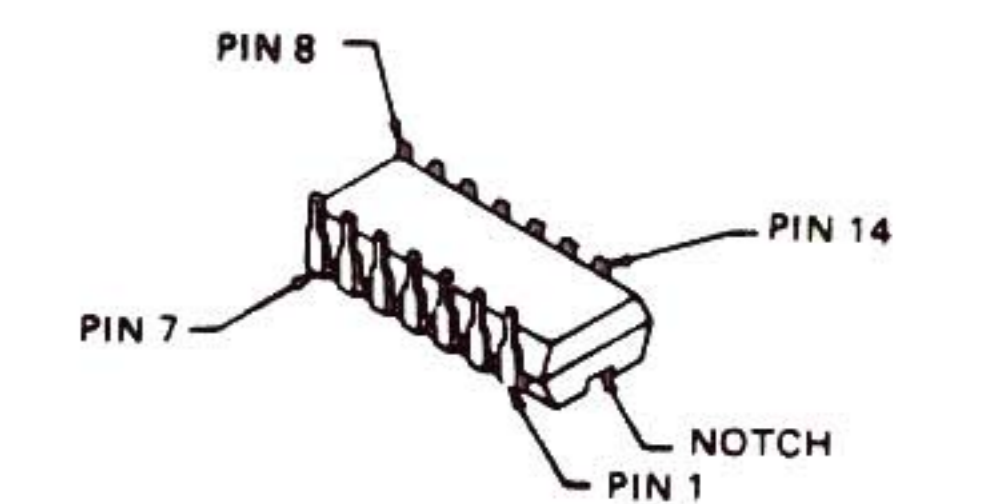
	E (S)	O (D)	B (G)	REMARKS
Q2003	3.1	8.1	3.9	
Q2004	3.5	8.1	4.2	
Q2005	1.4	8.1	2.2	
Q2006	0/0	0.7/0	0/0.7	RX/TX, MODE CW
Q2007	2.0	6.6	2.0	MODE USB
Q2008	1.7	8.0	2.4	MODE USB
Q2010	1.8	8.4	2.5	
Q2011	1.9	8.4	2.6	
Q2015	3.6	8.0	4.2	
Q2016	2.3	8.3	2.9	
Q2017	1.0	8.4	0	
Q2019	8.6	0.5	0.6	
Q2020	0	5.6	0.7	
Q2022	2.5	8.3	3.2	
Q2025	0/0	5.0/0	0/0.6	PLL LOCK/UNLOCK
Q2026	0.8	8.6	0.5	14MHz
Q2027	0.1	5.3	0.8	14MHz
Q2028	2.6	7.1	3.3	3.5MHz
Q2029	2.6	7.1	3.3	28MHz
Q2030	2.6	7.1	3.3	18MHz
Q2031	3.1	7.0	3.9	28MHz
Q2032	2.5	8.3	3.3	
Q2034	2.8	8.7	3.5	



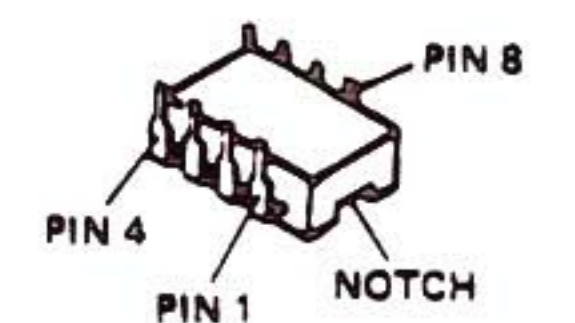
M54564P (Q2002)



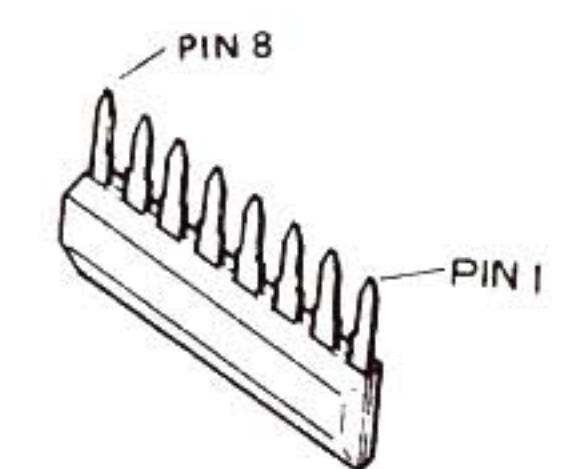
μPD4094BC (Q2001)



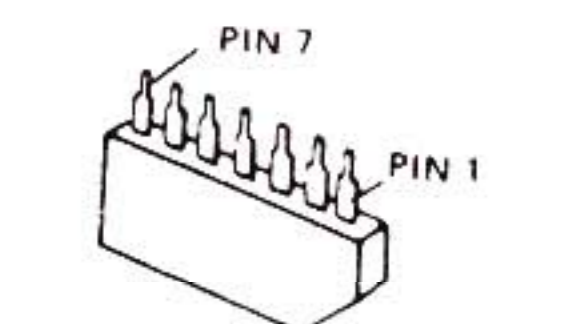
CX-7925B (Q2018,2024)
μPD4013BC (Q2014)



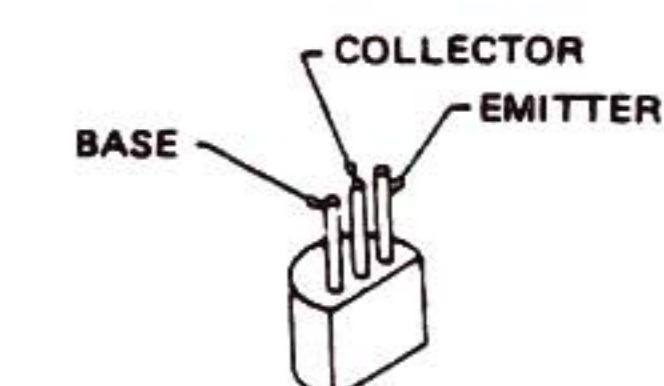
SN16913P (Q2009,2012)



M54459L (Q2013)



μPC1037H (Q2021)

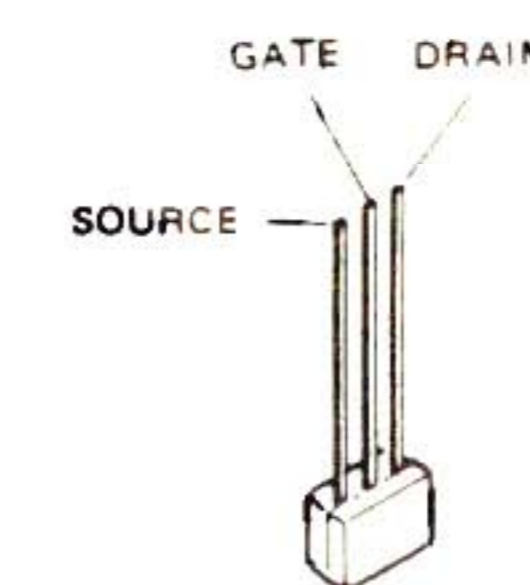


2SC458C (Q2004~2008,
2010,2011,
2015,2025)

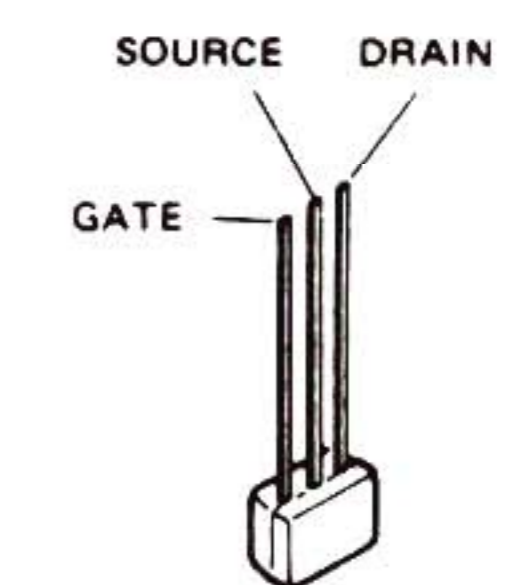
2SC535B (Q2003,2016,
2022,2028-
2032)

2SC732TMBL (Q2020,2027)

2SC2053 (Q2034)

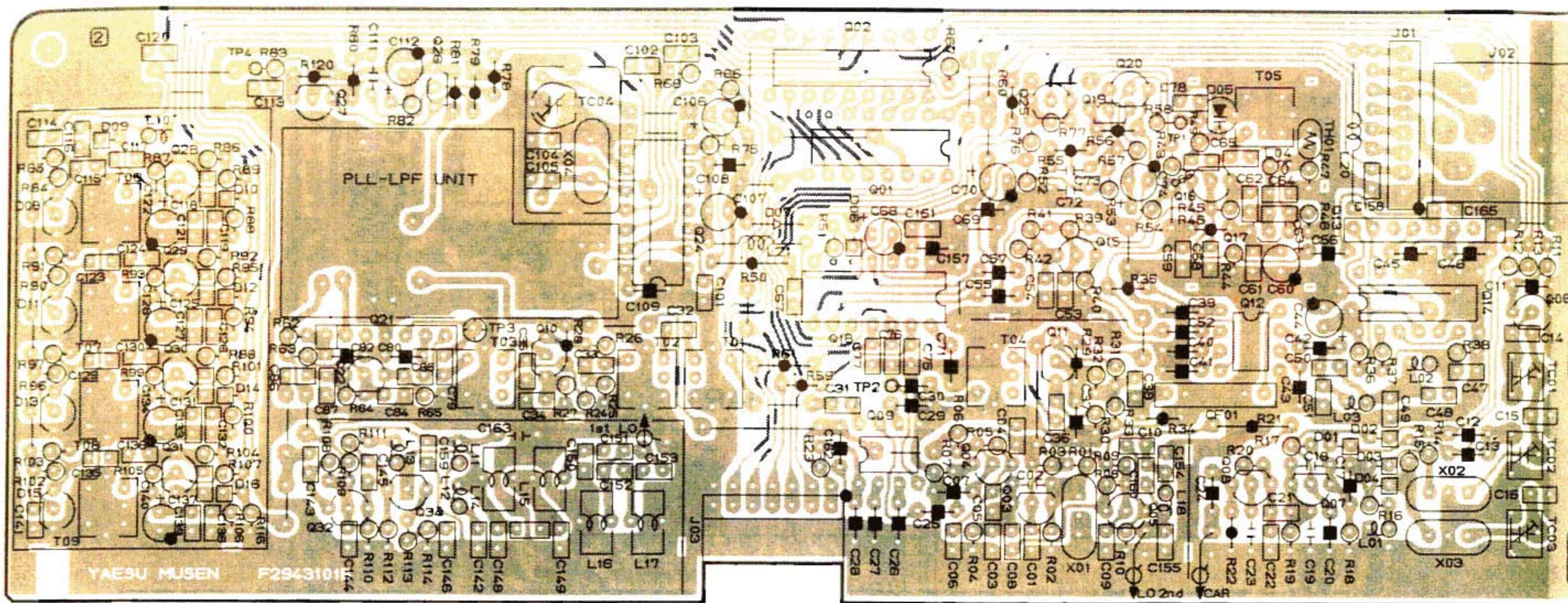


2SK184Y (Q2019,2026)

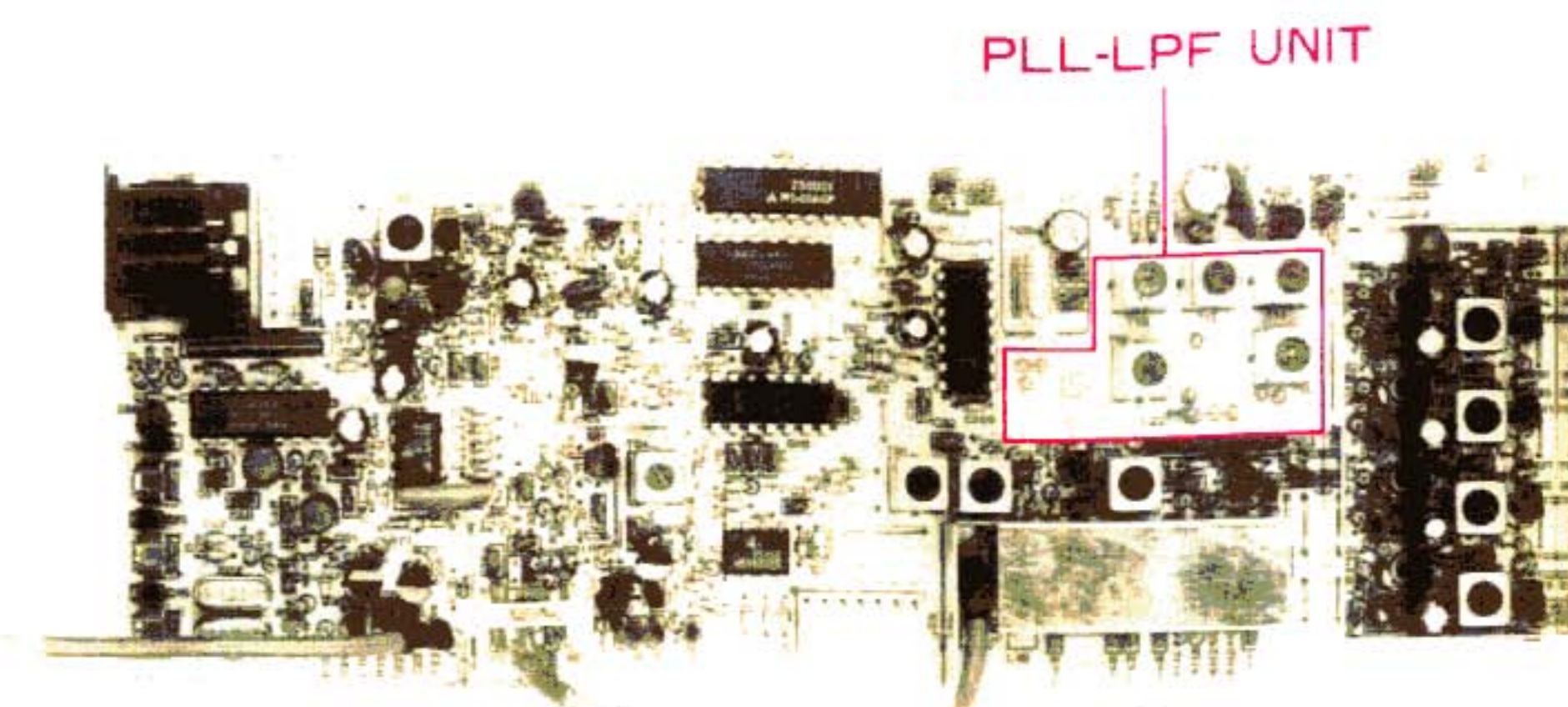


2SK192AGR (Q2017)

PIN 18
 NOTCH
 PIN 1
 (002)
 PIN 16
 NOTCH
 PIN 1
 (001)
 PIN 14
 NOTCH
 PIN 1
 (2024)
 14)
 PIN 8
 CH
 (2012)
 -PIN 1
 (13)
 IN 1
 (021)



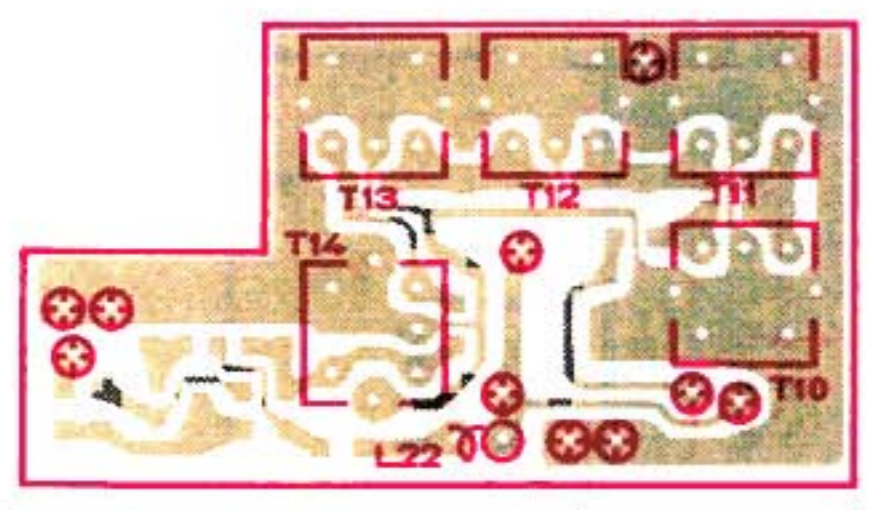
Component side (reverse)



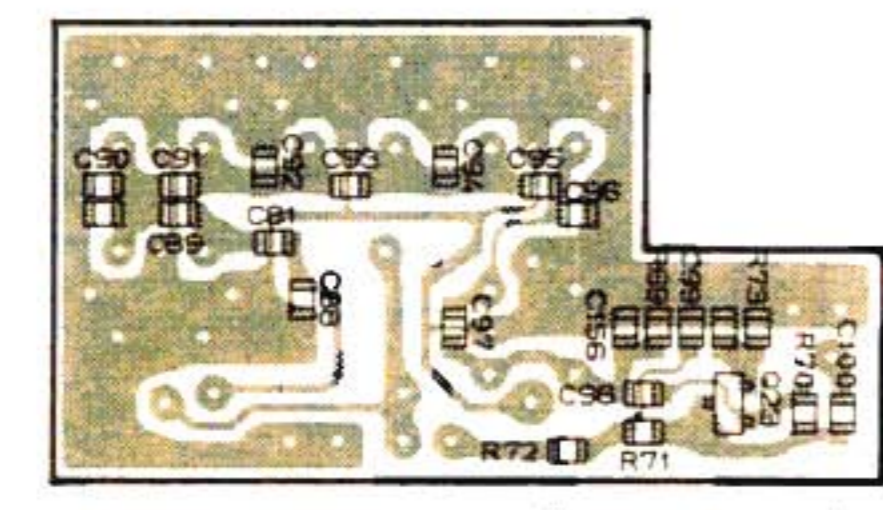
PLL-LPF UNIT

CIRCUIT DIAGRAM

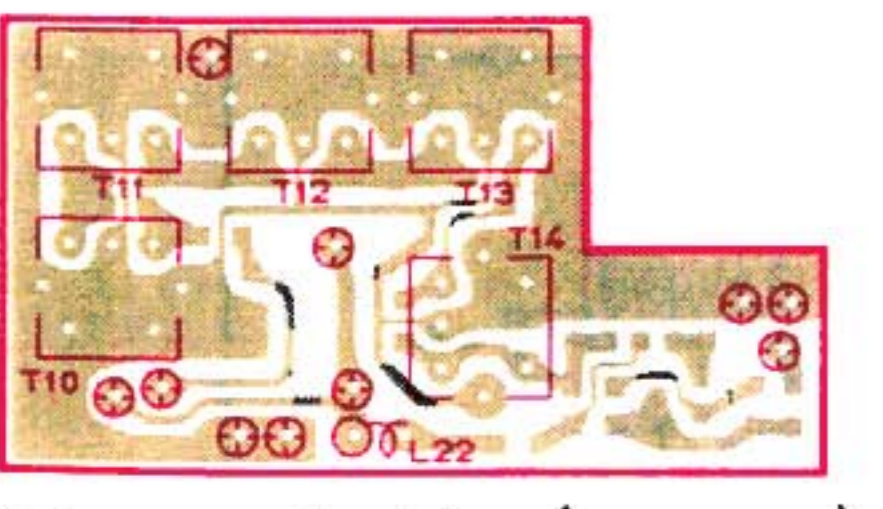
PLL-LPF UNIT PARTS LAYOUT



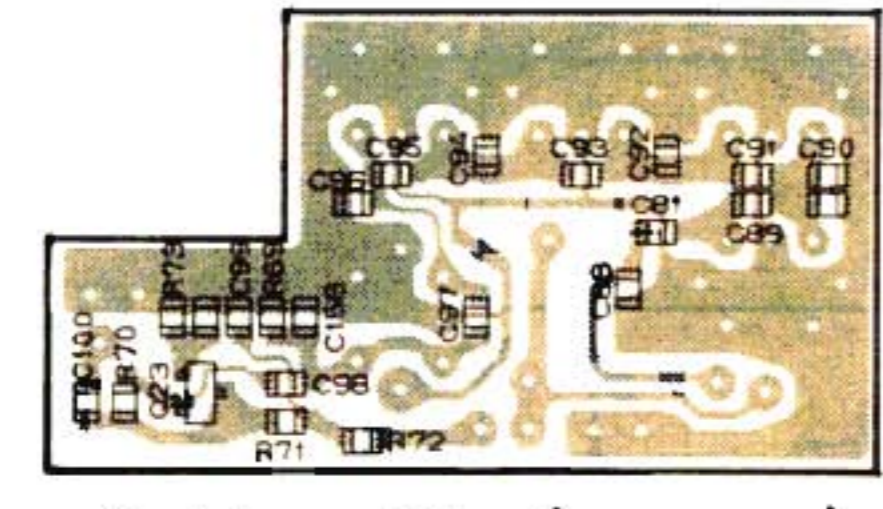
Component side (obverse)



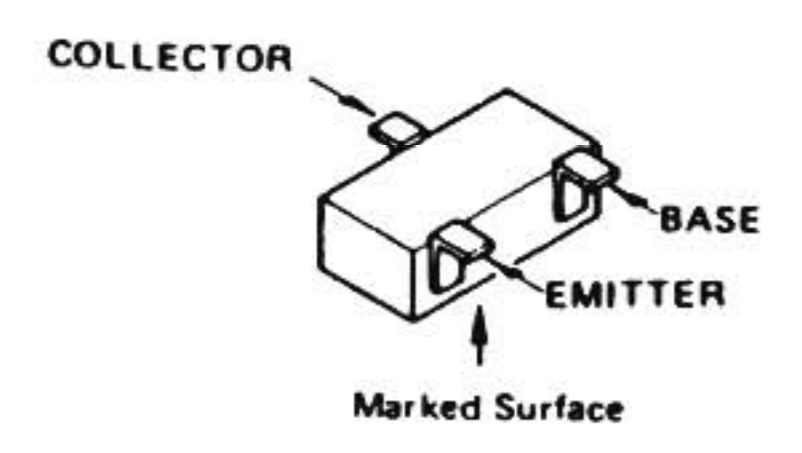
Solder side (obverse)



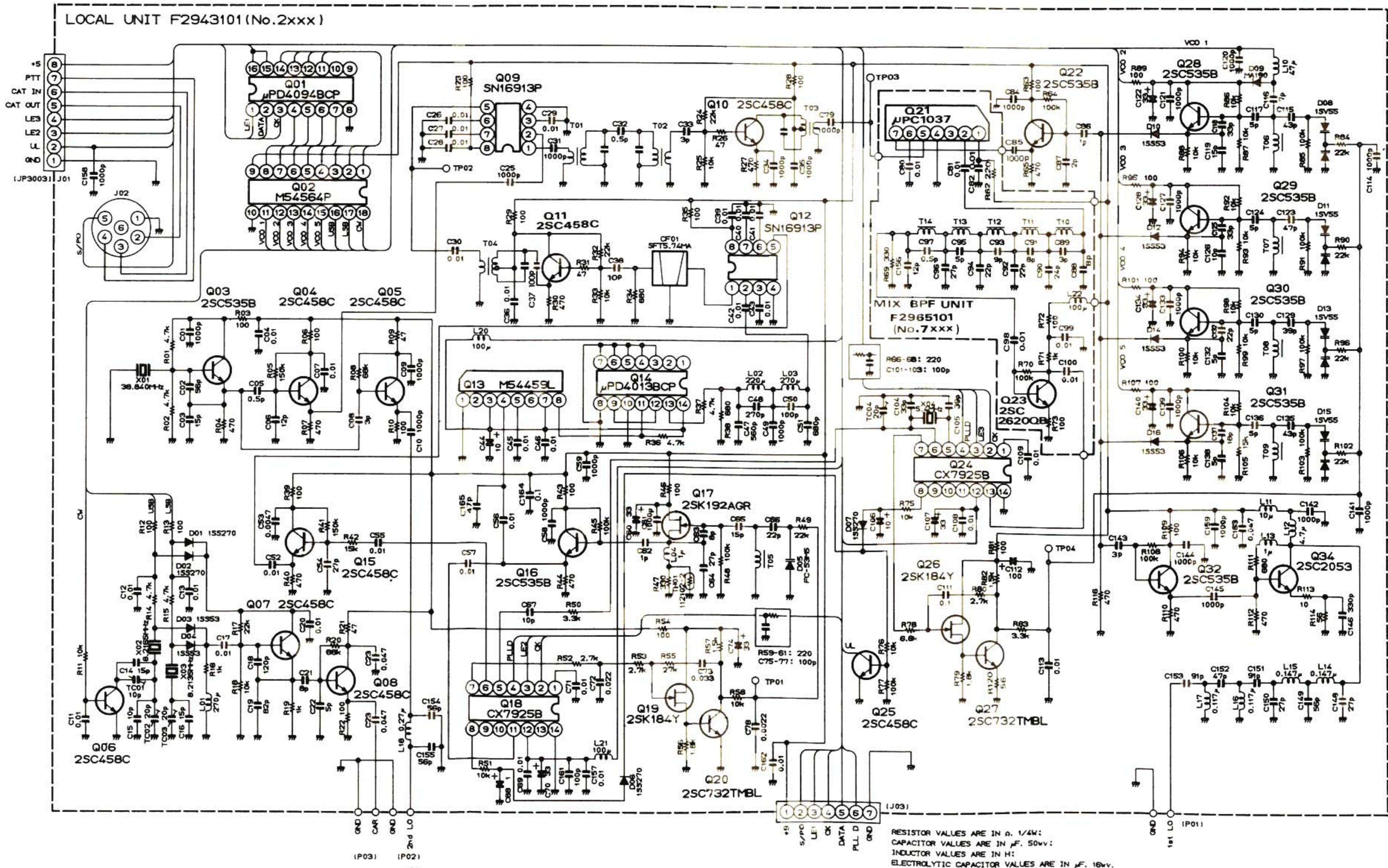
Component side (reverse)



Solder side (reverse)



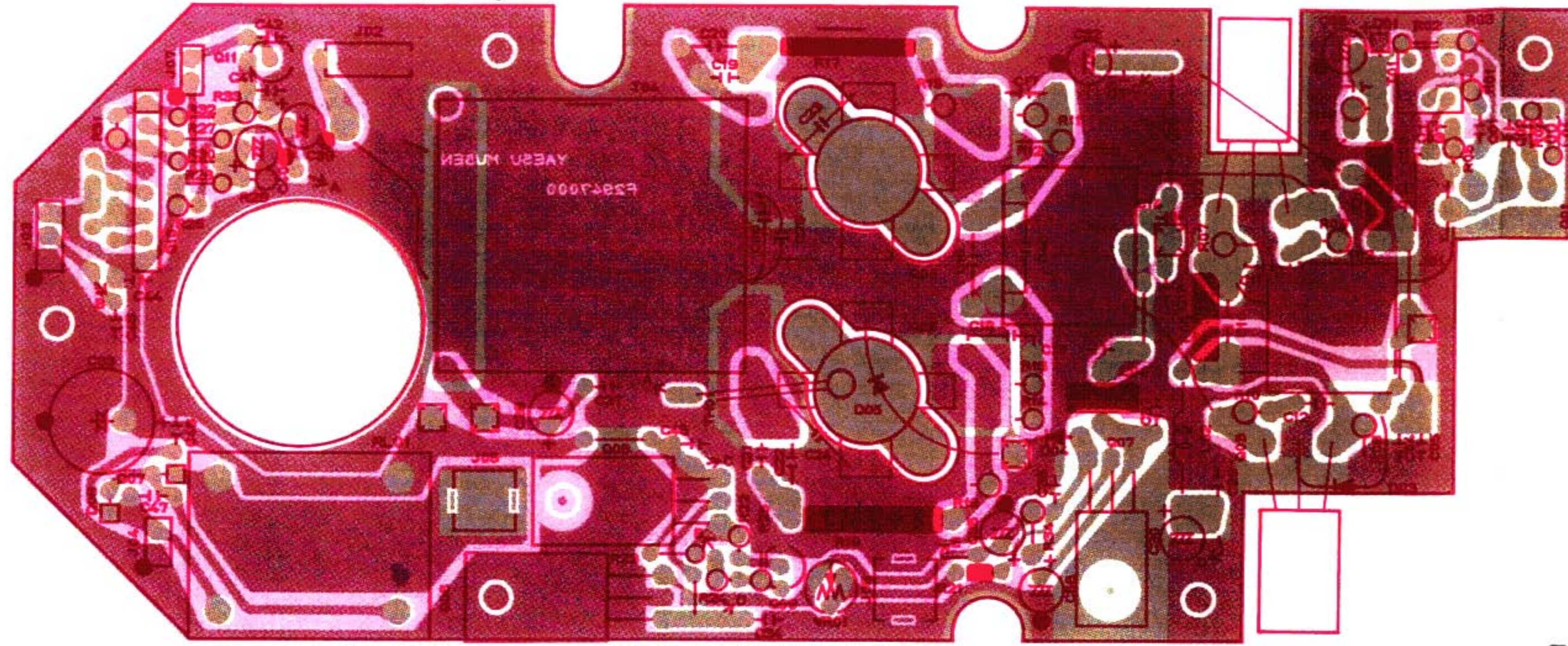
2SC2620QB (Q7023)



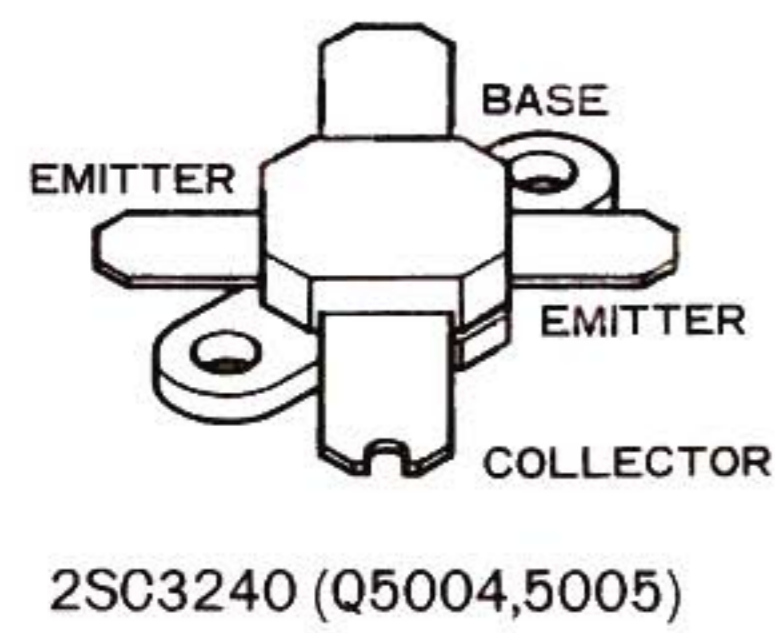
RESISTOR VALUES ARE IN Ω, 1/4W;
 CAPACITOR VALUES ARE IN pF, 50v;
 INDUCTOR VALUES ARE IN H;
 ELECTROLYTIC CAPACITOR VALUES ARE IN μF, 16v,
 UNLESS OTHERWISE NOTED.

100W PA UNIT

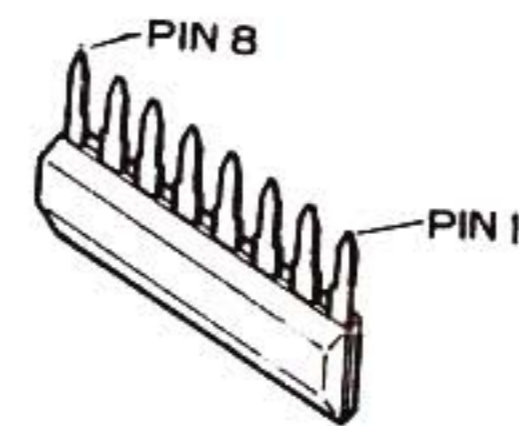
PARTS LAYOUT



Component side (obverse)



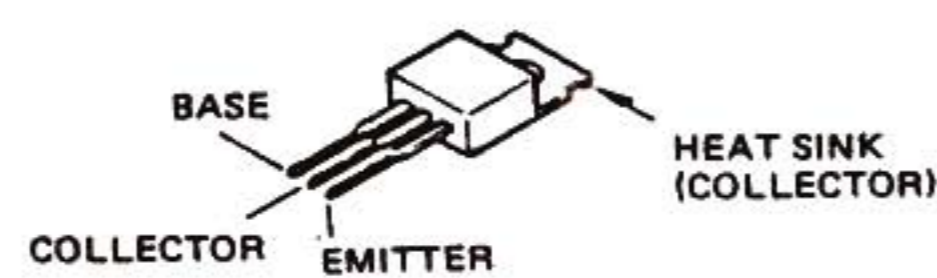
2SC3240 (Q5004,5005)



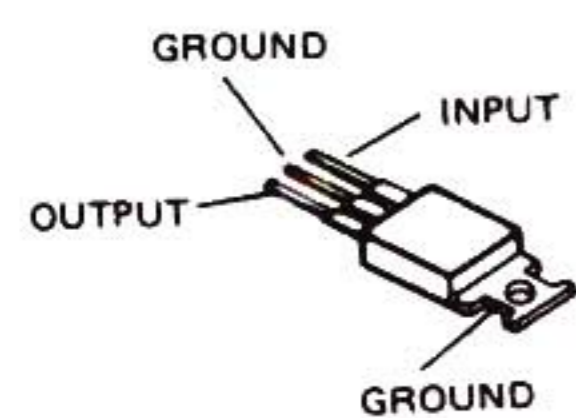
M5218L (Q5010)



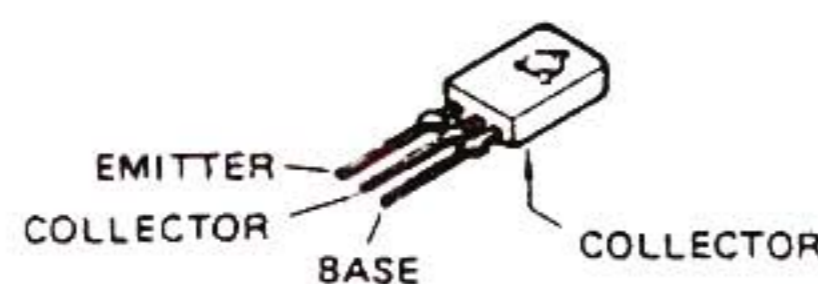
2SB824R (Q5008)
2SC2166 (Q5001)



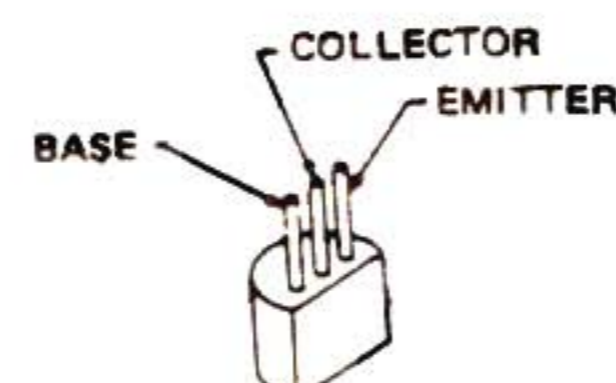
2SC3133 (Q5002,5003)



μPC7808H (Q5006)



2SD882Q (Q5007)



2SC458D (Q5009)
2SC2001 (Q5011)

PA UNIT VOLTAGE CHART

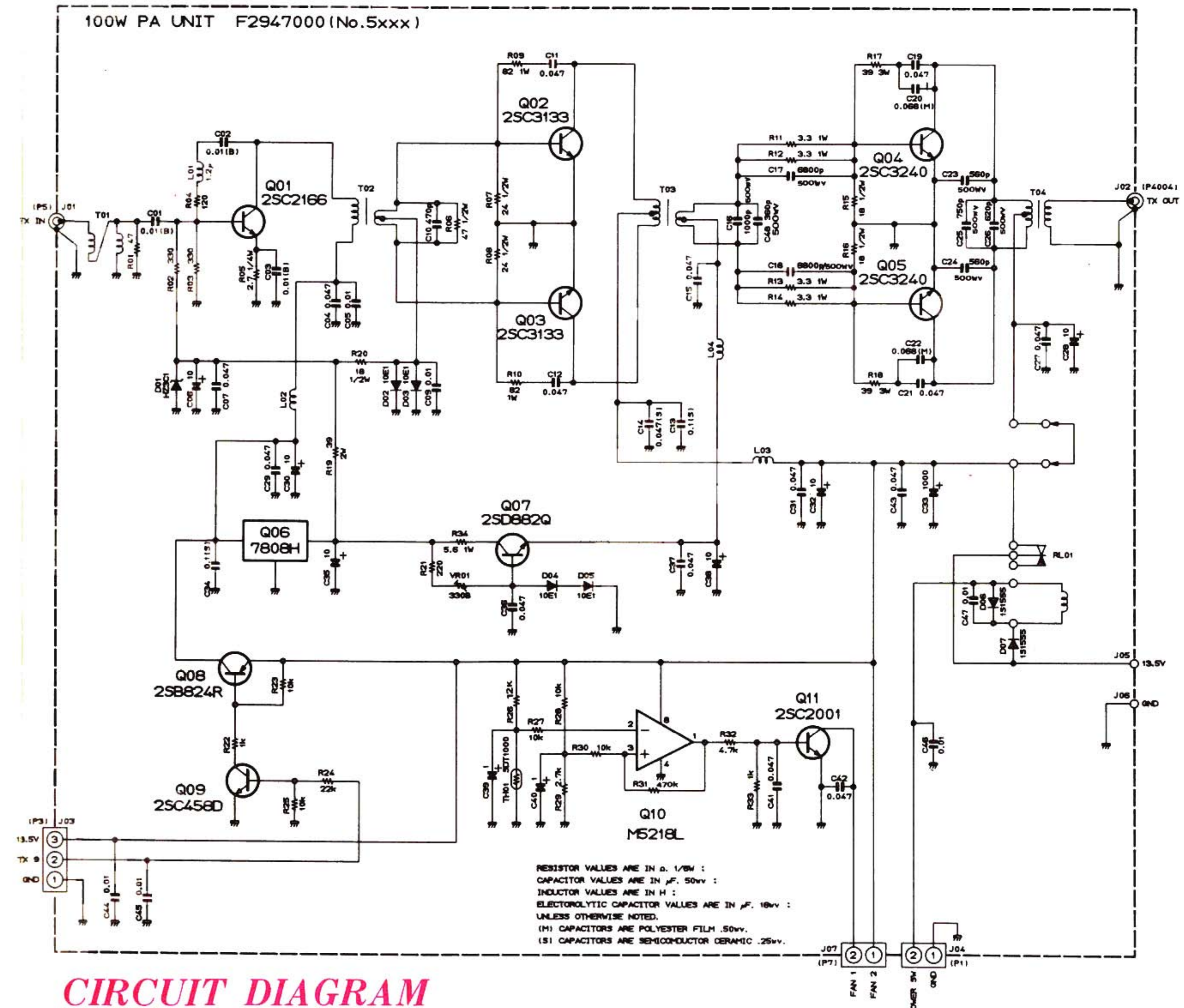
(DC VOLT)

	E	C	B	REMARKS
Q5001	0/0.4	0/13.4	0/1.2	RX/TX
Q5002	0/0	13.5/13.5	0/0.7	RX/TX
Q5003	0/0	13.5/13.5	0/0.7	RX/TX
Q5004	0/0	13.5/13.5	0/0.6	RX/TX
Q5005	0/0	13.5/13.5	0/0.6	RX/TX
Q5007	0.4/1.4	0/7.6	0/0.7	RX/TX
Q5008	13.5/13.5	0.5/13.4	13.5/12.7	RX/TX
Q5009	0/0	13.5/0.1	0/0.7	RX/TX
Q5010	0	13.5	0.2	

PA UNIT IC VOLTAGE CHART

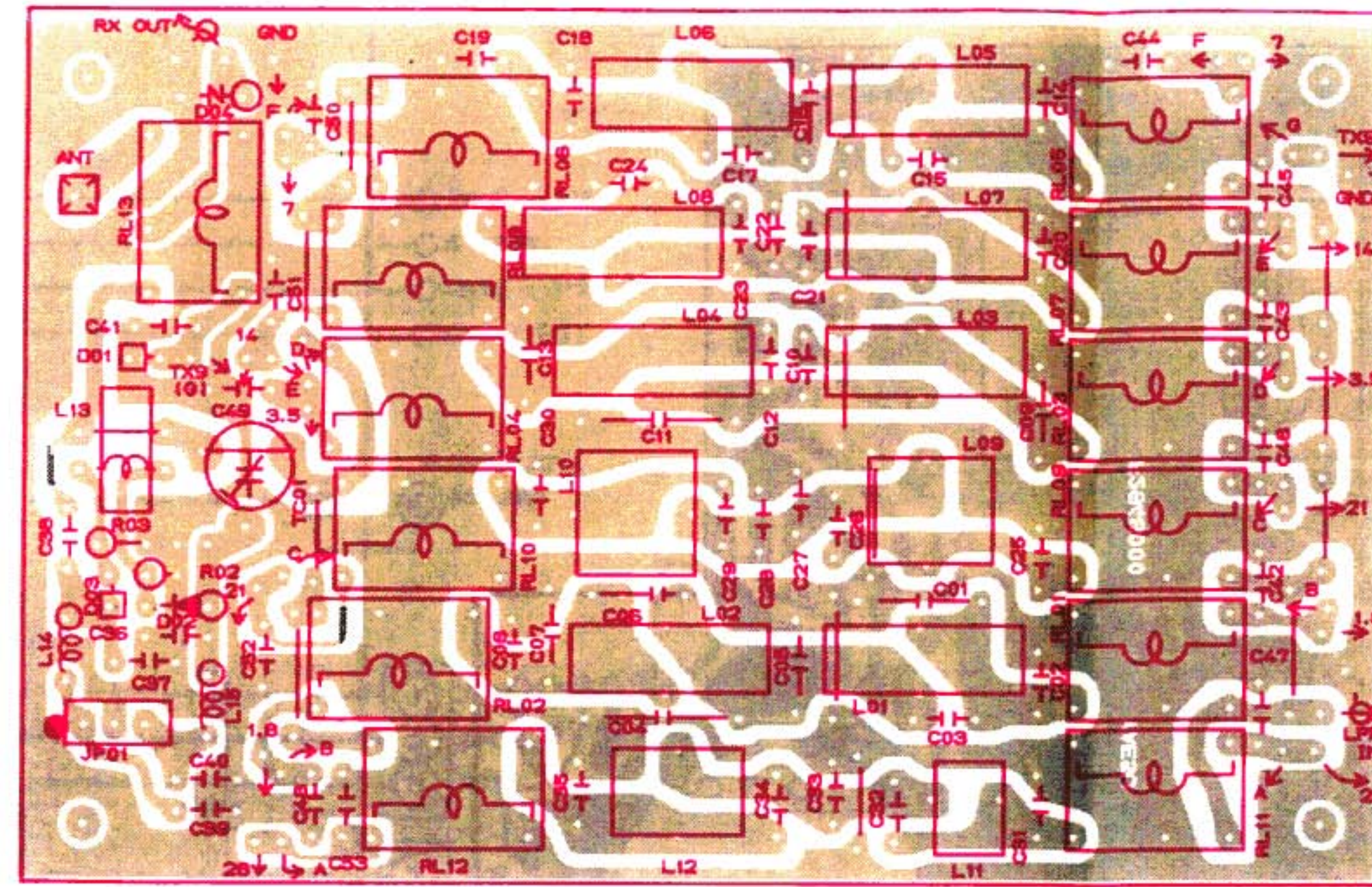
(DC VOLT)

	1 (IN)	2 (GND)	3 (OUT)	4	5	6	7	8	REMARKS
Q5006	0.4/13.4	0/0	0/8.0						RX/TX
Q5010	1.4/1.3	40-70/10-30	2.8/3.1	0/0	-	-	-	13.5/13.5	FAN OFF/ON

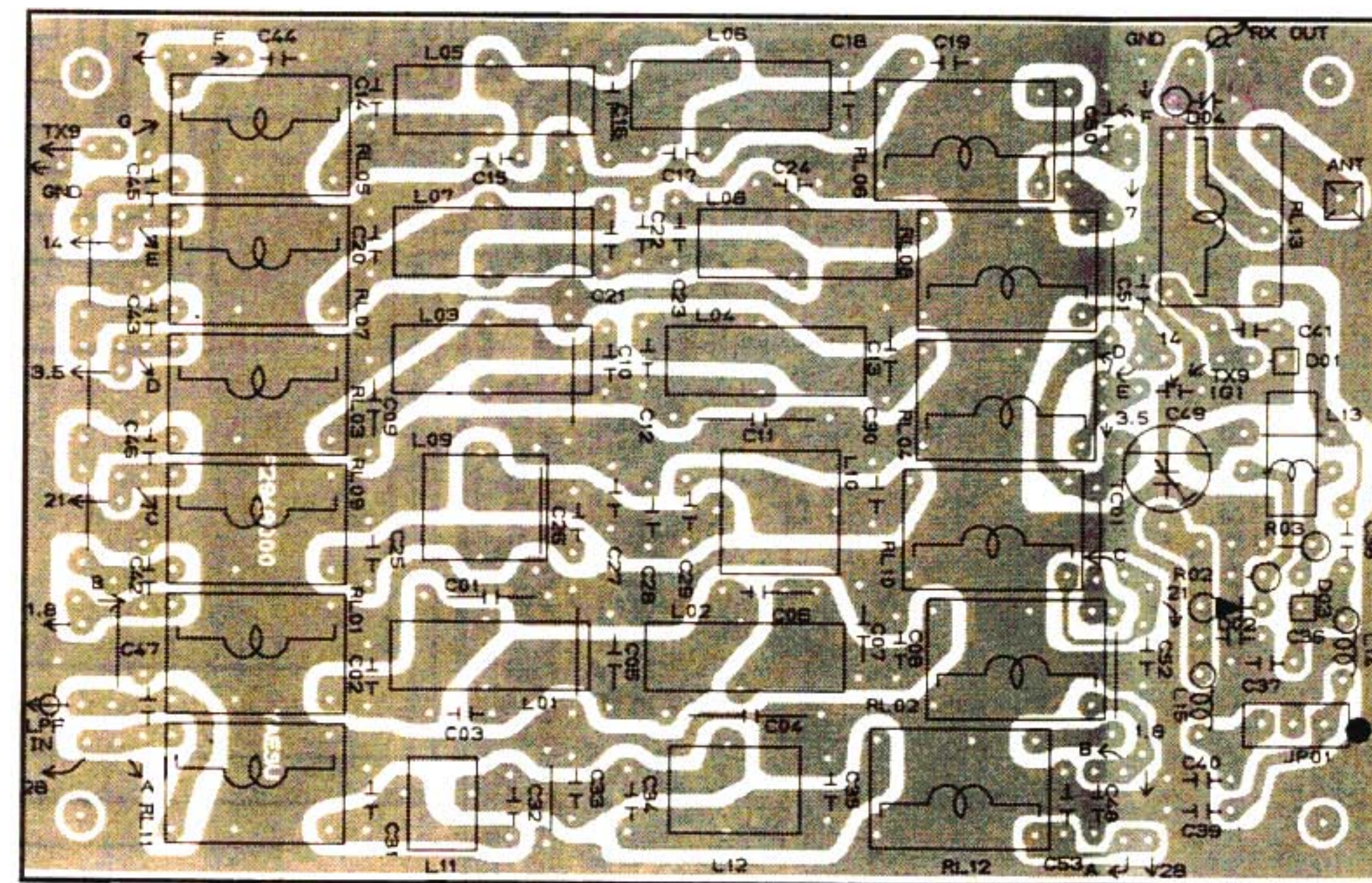


CIRCUIT DIAGRAM

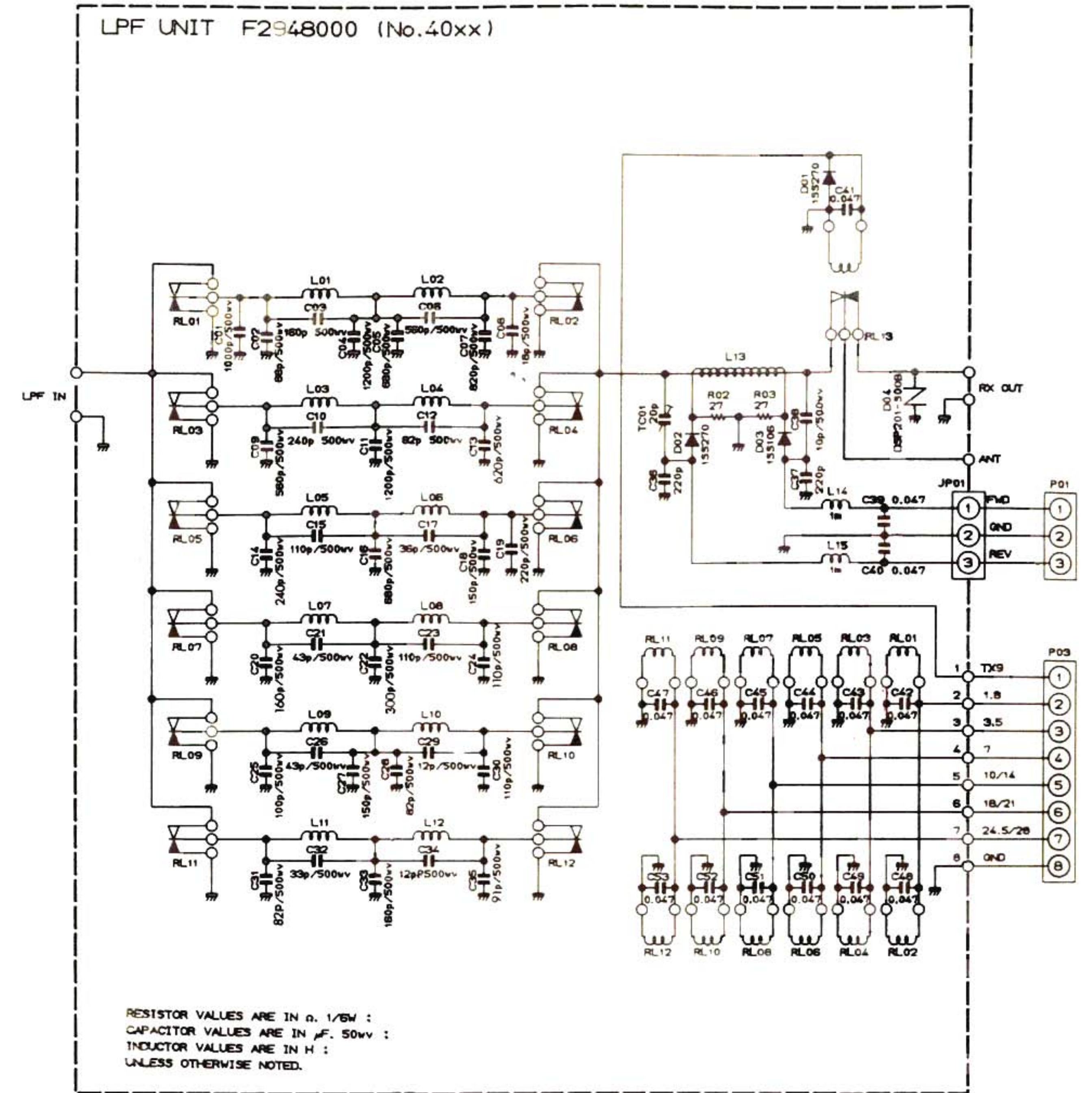
PARTS LAYOUT



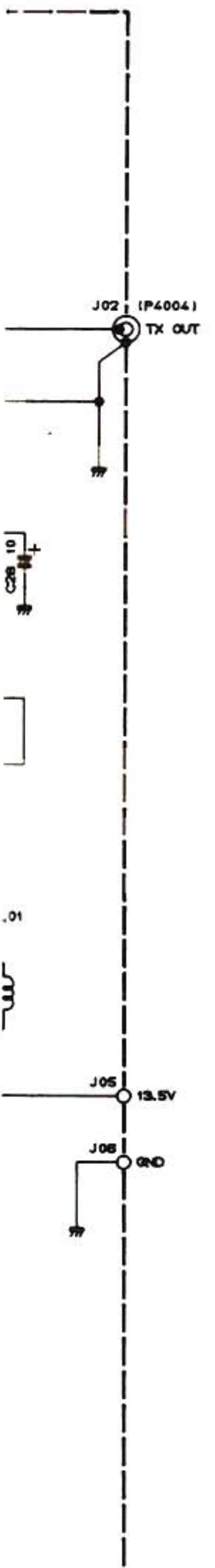
Component side (obverse)



Component side (reverse)

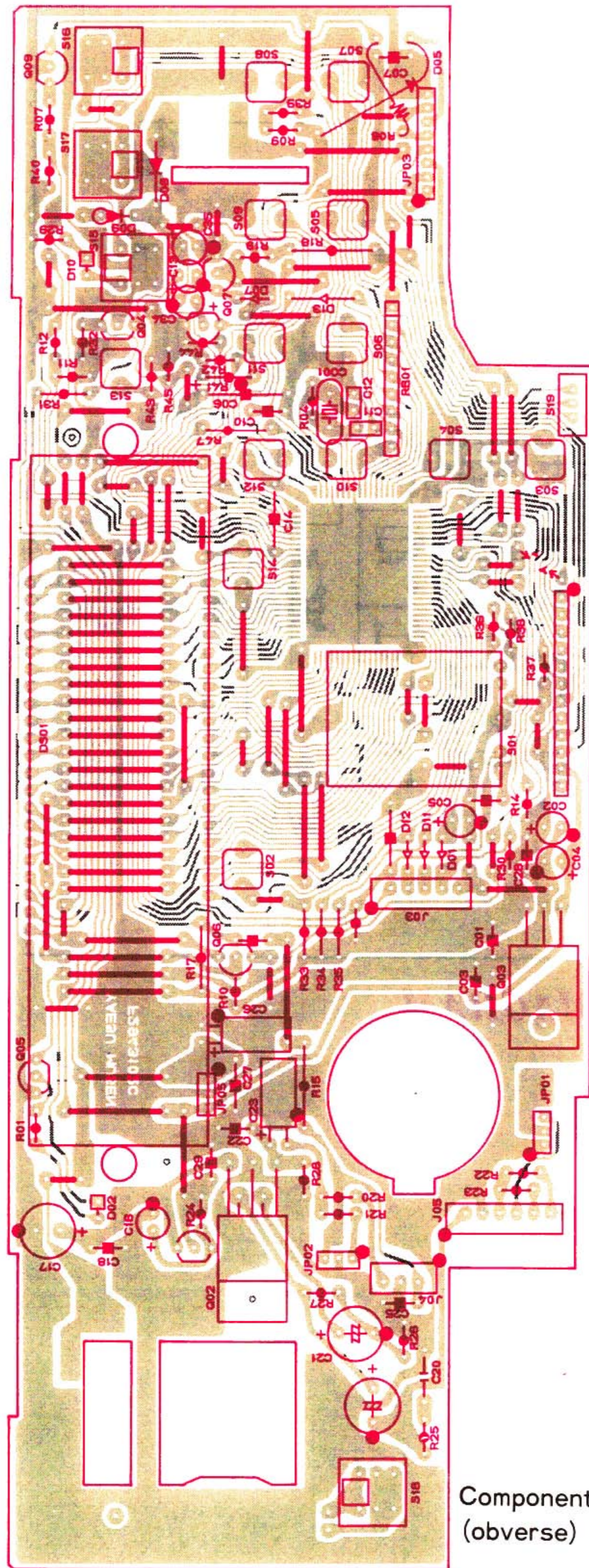


CIRCUIT DIAGRAM

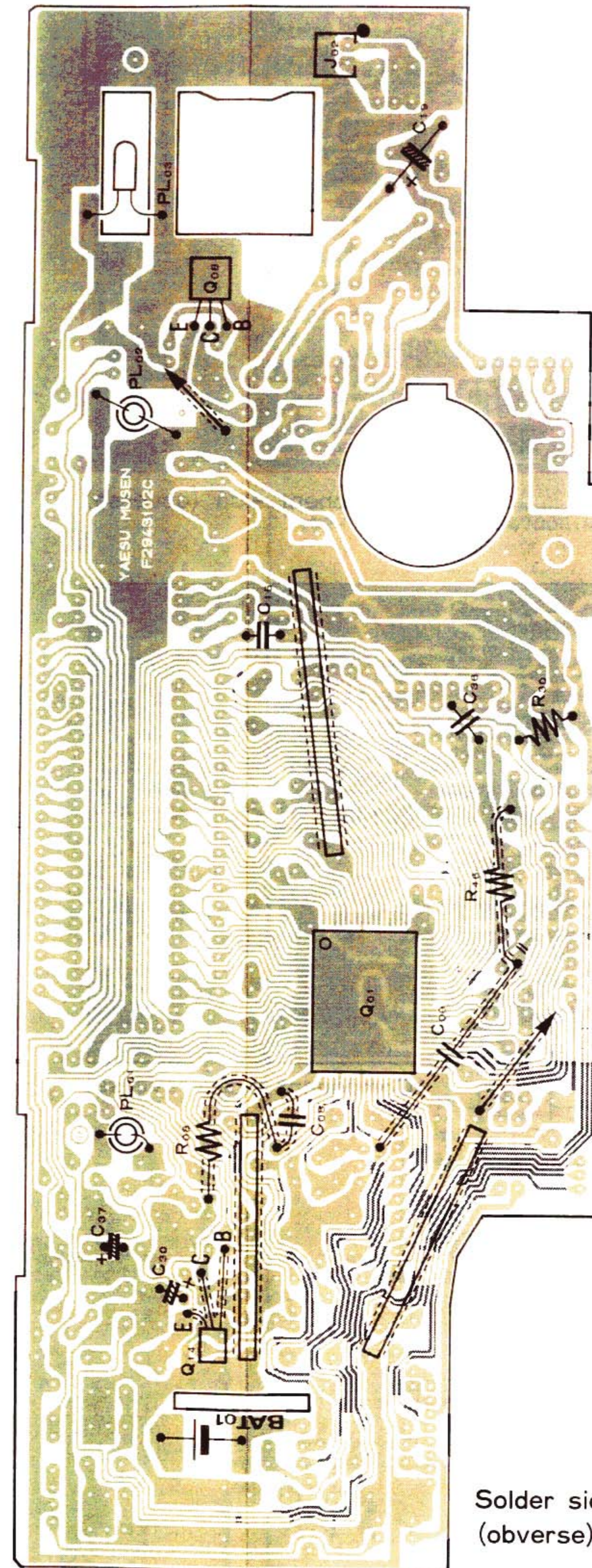


DISPLAY UNIT

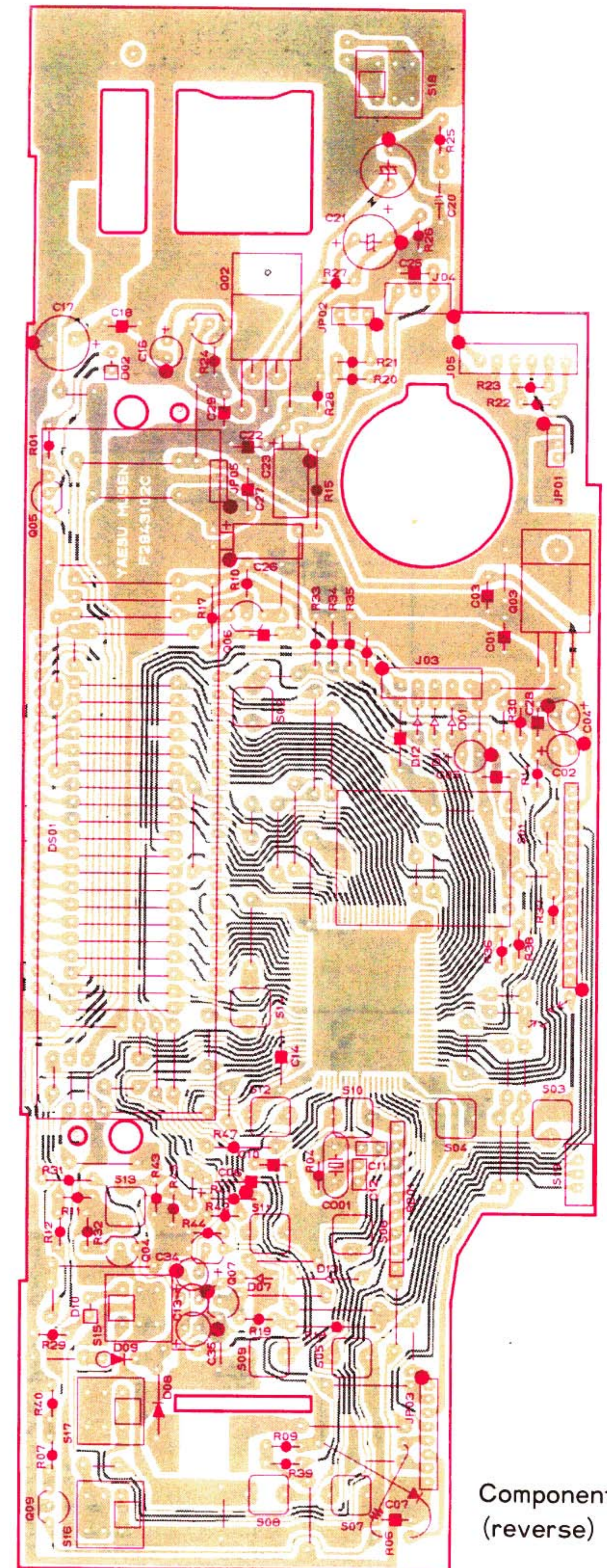
PARTS LAYOUT



Component side (obverse)

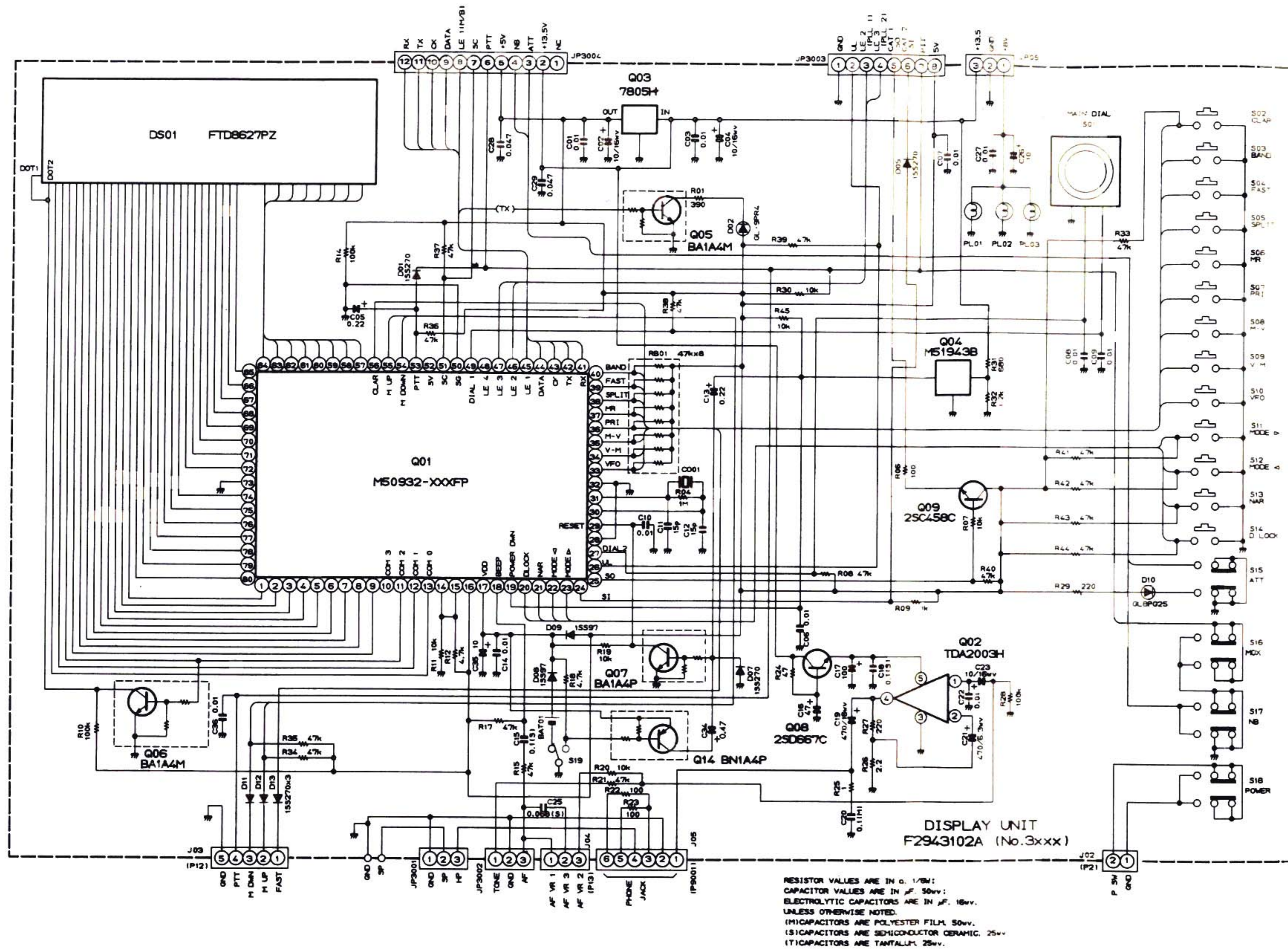


Solder side (obverse)



Component side (reverse)

CIRCUIT DIAGRAM

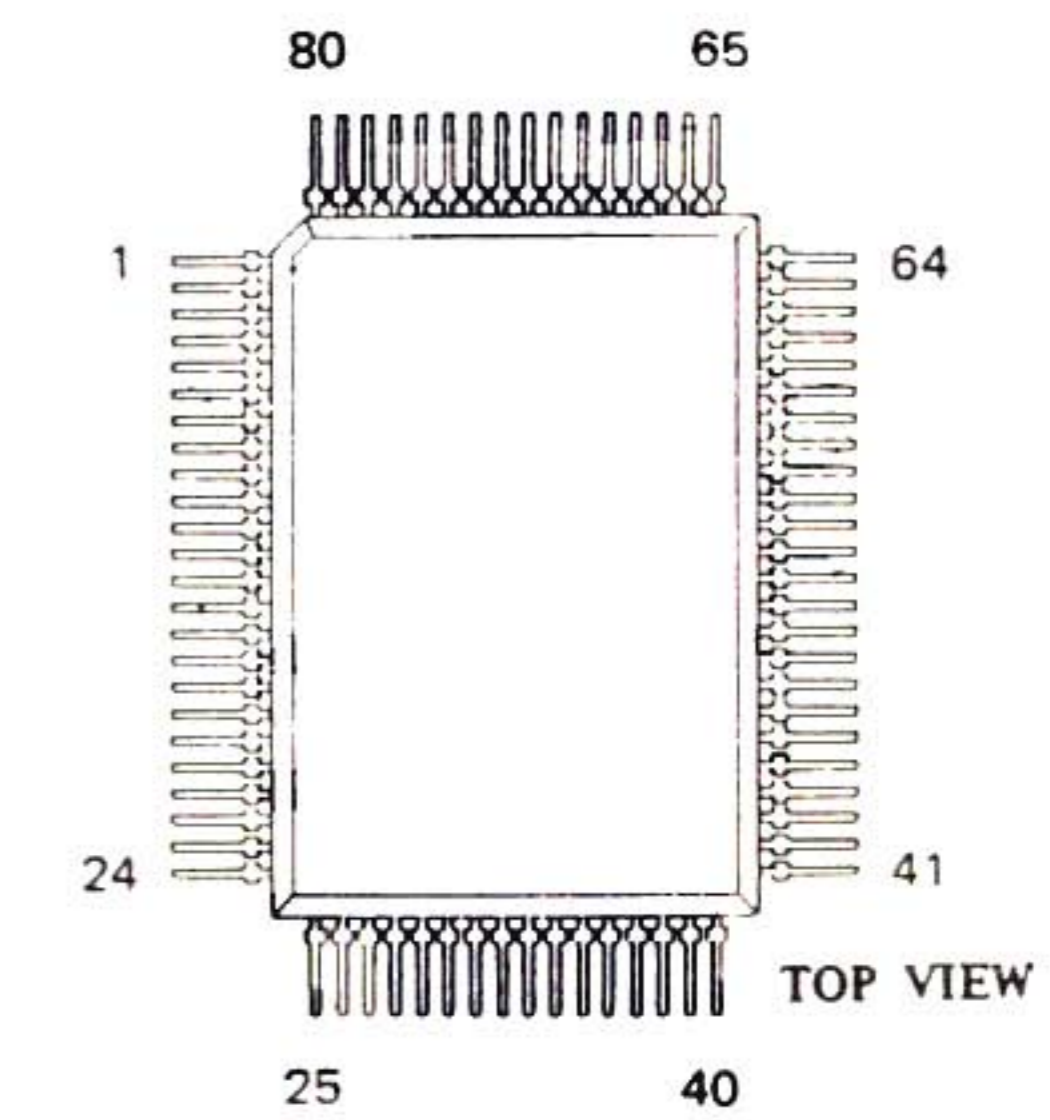


DISPLAY UNIT VOLTAGE CHART
(DC VOLT)

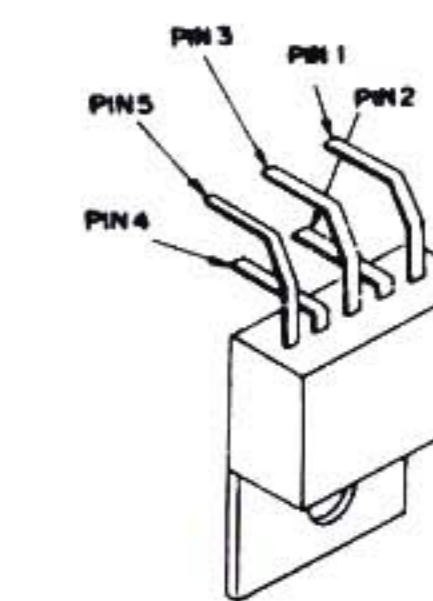
	E	C	B	REMARKS
Q3005	0/0	3.5/0	0/4.5	RX/TX
Q3006	2.7	0.8	0	
Q3007	0	4.6	0	
Q3008	12.7	13.4	13.4	
Q3009	4.2	5.0	4.6	
Q3014	4.6	0	4.0	

DISPLAY UNIT VOLTAGE CHART
(DC VOLT)

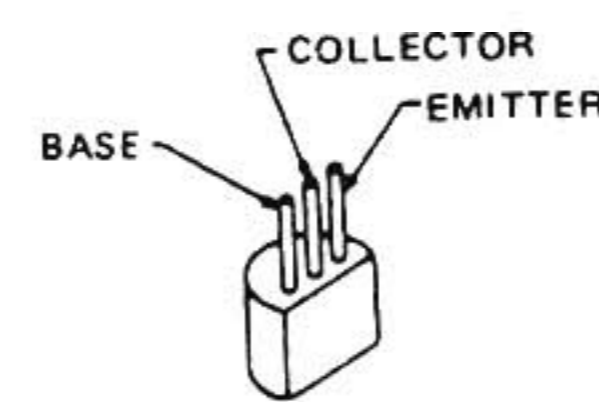
	1 (IN)	2 (GND)	3 (OUT)	4	5	REMARKS
Q3002	0.7	0.1	0	4.8	12.7	
Q3003	13.5	0	5.0			
Q3004	8.3	0	5.0			



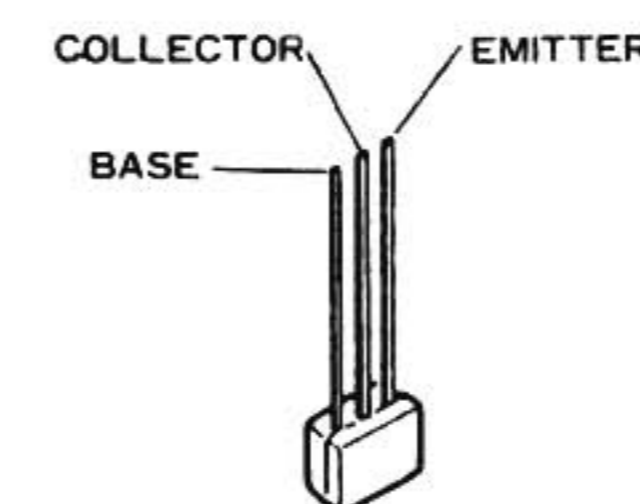
M50932-501FP (Q3001)



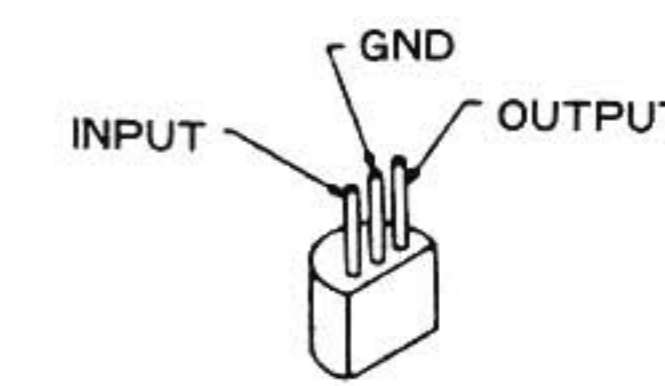
TDA2003H (Q3002)



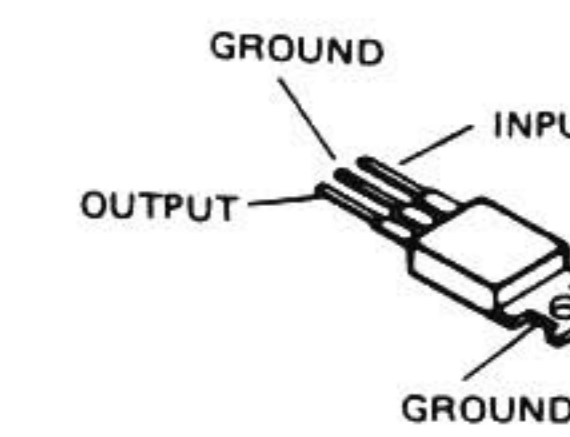
2SC458 (Q3009)
2SD667C (Q3008)



BA1A4M (Q3005,3006)
BA1A4P (Q3007)
BN1A4P (Q3014)



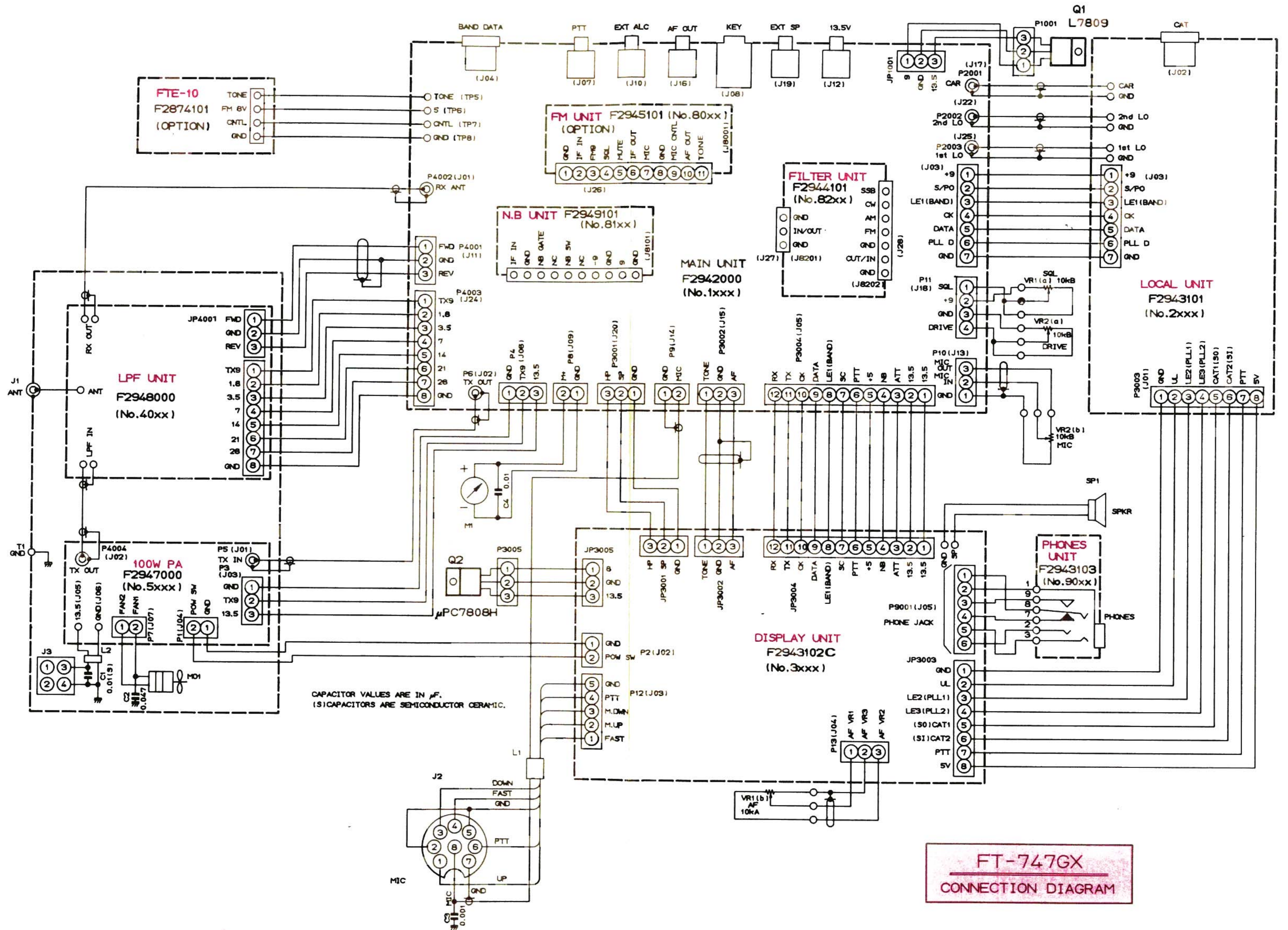
M51943BSL (Q3004)



μPC7805H (Q3003)

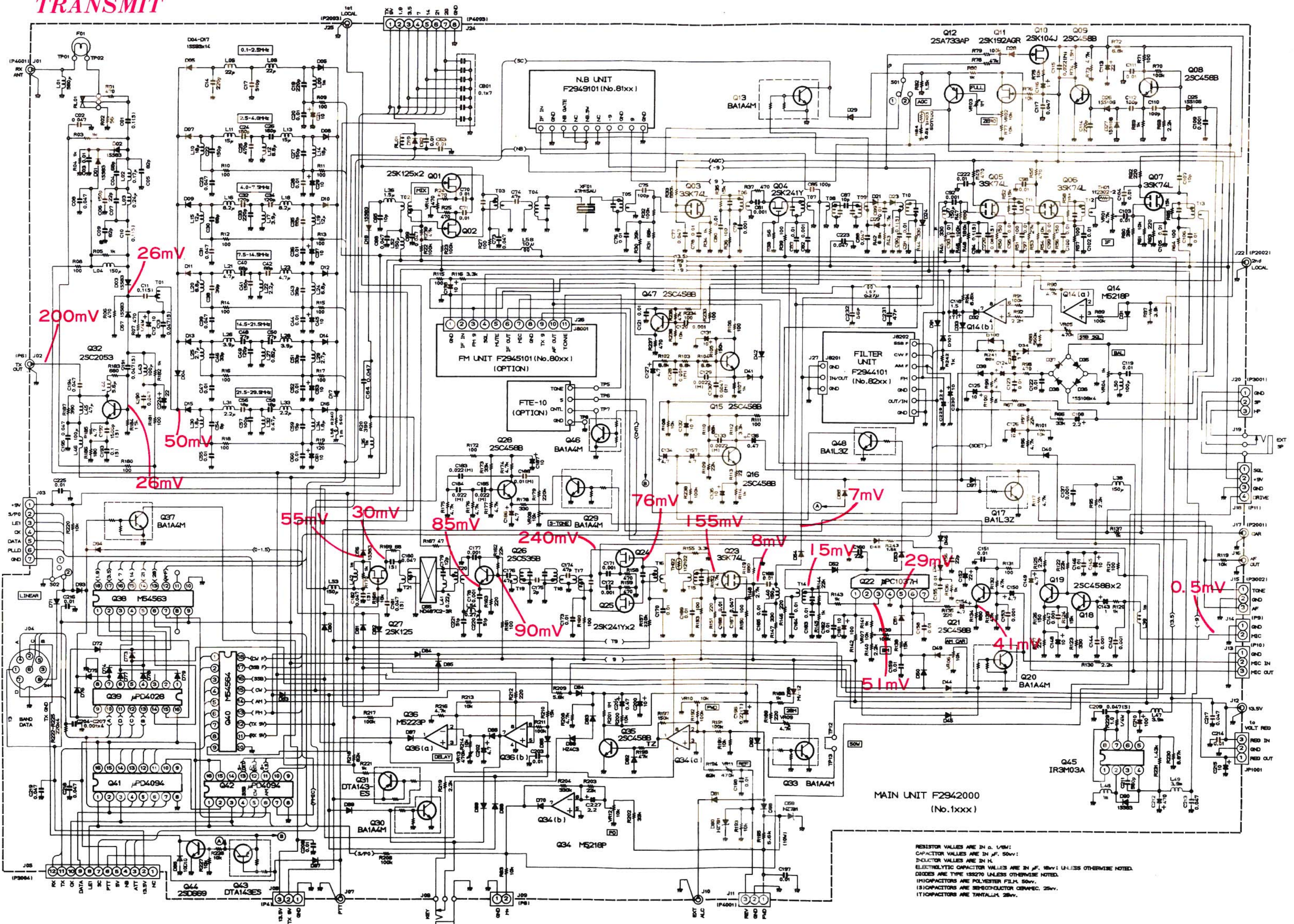
Component side
(reverse)

CONNECTION DIAGRAM



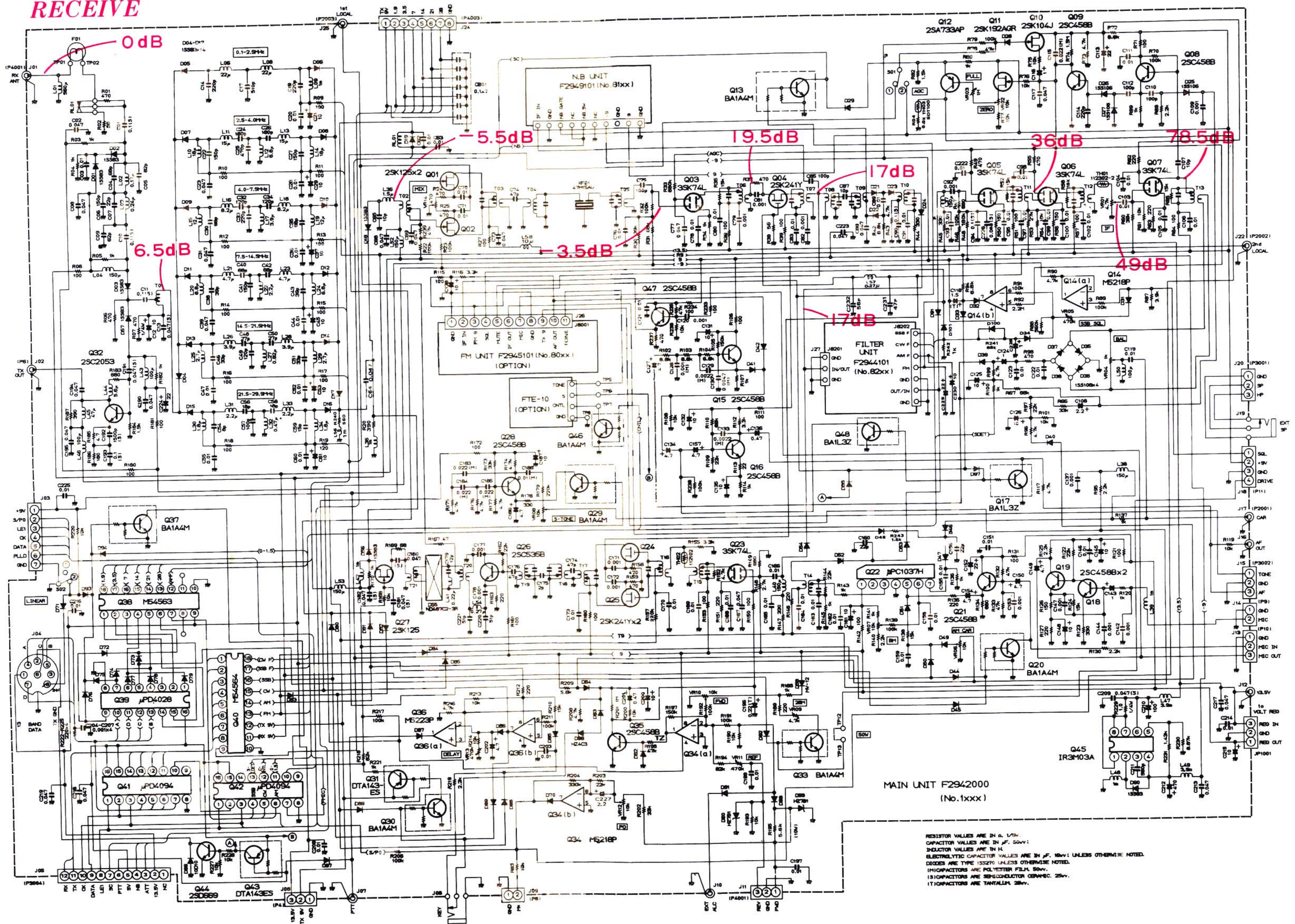
FT-747GX
CONNECTION DIAGRAM

TRANSMIT



LEVEL DIAGRAM

RECEIVE

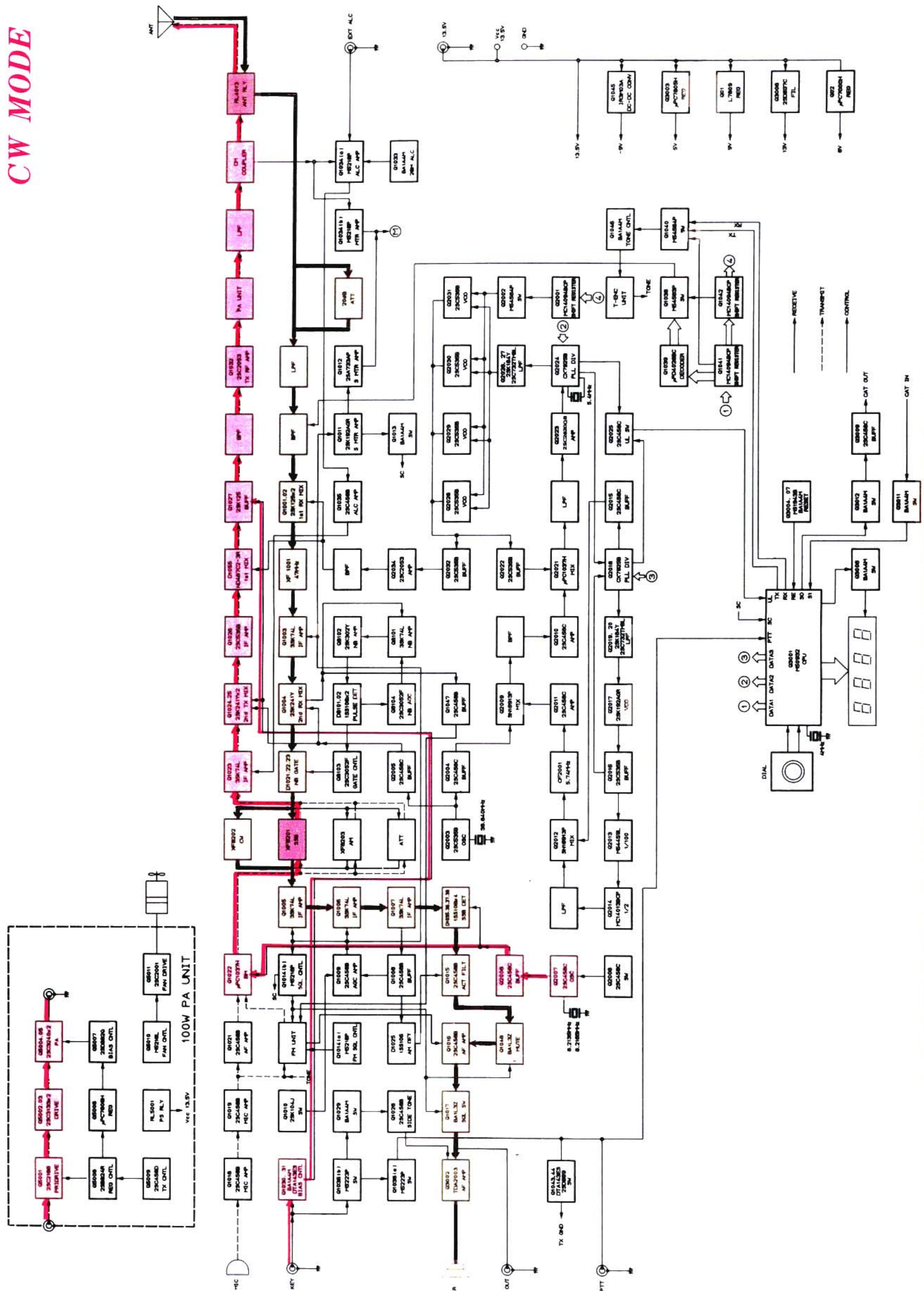


MAIN UNIT F2942000
(No. 1xxx)

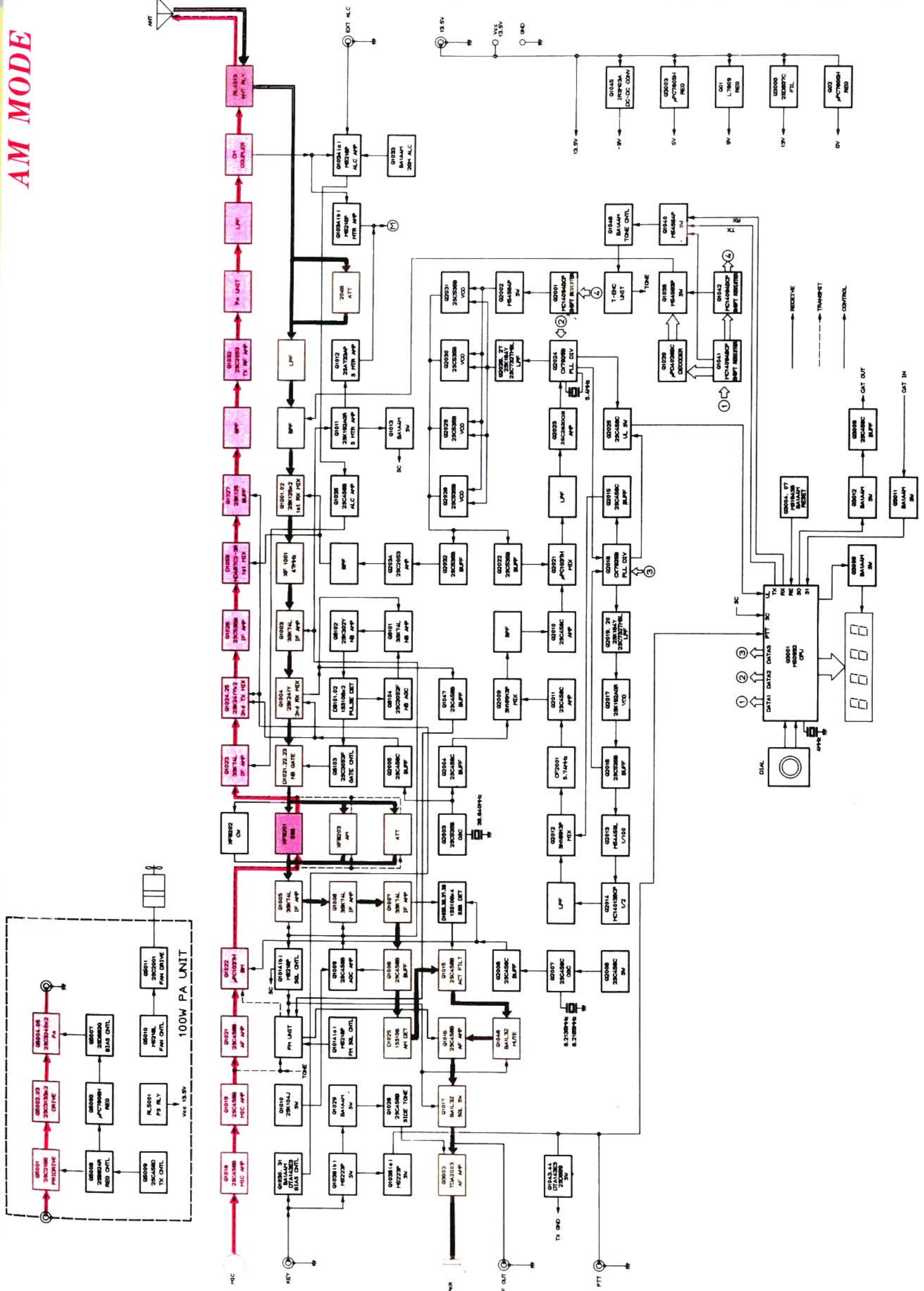
RESISTOR VALUES ARE IN Ω , $k\Omega$, $M\Omega$.
CAPACITOR VALUES ARE IN μF , $500V$.
INDUCTOR VALUES ARE IN μH .
ELECTROLYTIC CAPACITOR VALUES ARE IN μF , $100V$; UNLESS OTHERWISE NOTED.
DIODES ARE TYPE 1N4001 UNLESS OTHERWISE NOTED.
IF CAPACITORS ARE POLYESTER FILM, $50V$.
IC CAPACITORS ARE 50V/500PF CERAMIC, $25V$.
17 CAPACITORS ARE TANTALUM, $35V$.

SIGNAL PATH

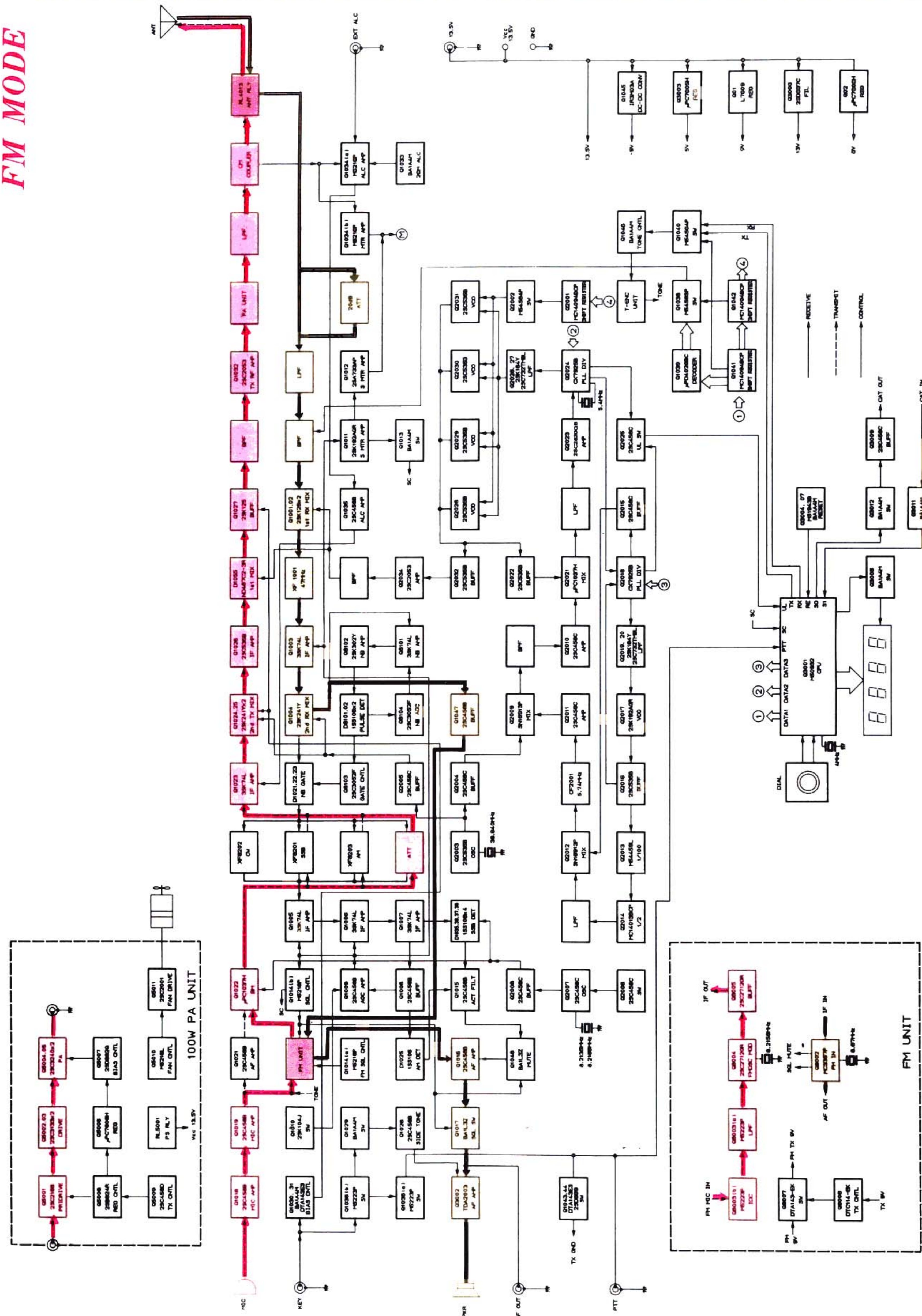
CW MODE



AM MODE



FM MODE



The FT-747GX is carefully designed to allow the knowledgeable operator to make all adjustments required for various station conditions, modes and operator preferences simply from the controls on the front panel, without opening the case of the transceiver. These adjustments are described in the FT-747GX Operating Manual.

The following procedures cover the sometimes critical and tedious adjustments that are not normally required once the transceiver has left 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.

We recommend 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 alignment are cautioned to proceed at their own risk. Problems caused by unauthorized attempts at realignment are not covered by the warranty policy. Also, Yaesu must reserve the right to change circuits and alignment procedures in the interest of improved performance, without notifying owners.

Under no circumstances should 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. While most steps do not require all equipment listed, interactions of some adjustments may require complex adjustments be performed afterwards. Do not attempt to perform only a single step unless it is clearly isolated electrically from all other steps. Rather, have all test equipment ready before beginning, and follow all of the steps in a section in the order they are presented.

A 50-ohm dummy load must be connected to the antenna jack in steps calling for transmission (pressing the MOX button). Correct alignment is not possible with an antenna.

The NAR, ATT and NB buttons should be set to OFF and the SQL control must be fully counterclockwise, unless stated otherwise.

After completing one step, read the following step to determine whether the same test equipment will be required. If not, remove the test equipment (except dummy load and wattmeter, if connected) before proceeding.

ALIGNMENT

Alignment Equipment

Frequency counter with accuracy of 0.1 ppm to 100 MHz

DC voltmeter with at least 10-Megohm input impedance

RF voltmeter with at least 5% accuracy to 100 MHz, high impedance, and ranging from 10 mV to 3 Vrms

AF millivoltmeter

DC milliammeter ranging to 500 mA

RF in-line wattmeter

Resistive dummy load, 50 ohms, 150W; three required for SWR Turndown alignment

RF signal generator covering 1-30 MHz, with calibrated output levels from 5 dBμ to 100 dBμ

AF signal generator with calibrated output levels from 1 mV to 25 mV

RF sampling coupler ("T")

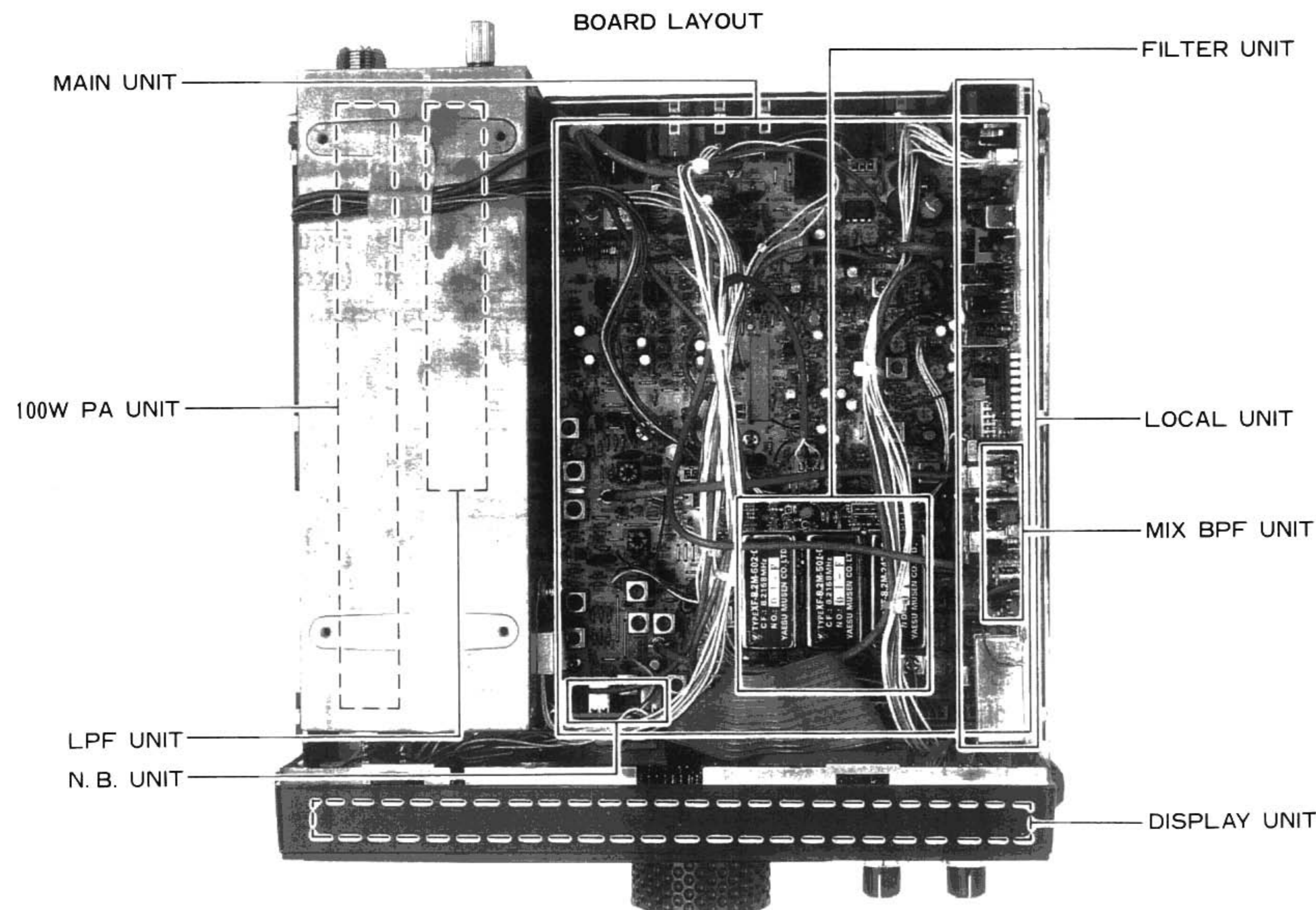
Additional Alignment Precautions

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 from hot or cold air it should be allowed some time for thermal equalization before alignment.

Alignments must only be made with oscillator shields and circuit boards firmly affixed in place. Also, the test equipment must be thoroughly warmed up before beginning.

Alignment values assume a DC supply voltage of 13.5V DC.

Note: Signal levels in dB referred to in the alignment procedure are based on 0dBu=0.5uV.



I. Local Unit

A. 2nd Local Overall Check

1. Disconnect TMP plug P2002 from J1022 on the Main Unit.
2. Connect the frequency counter to P2002 and confirm 38.8380 MHz ±400 Hz on the counter.
3. Remove the counter and connect a 50-ohm resistor and the RF voltmeter to P2002.
4. Confirm at least 230 mVrms on the voltmeter.
5. Disconnect the resistor and voltmeter, and replace P2002 in J1022.

B. PLL Subloop VCO

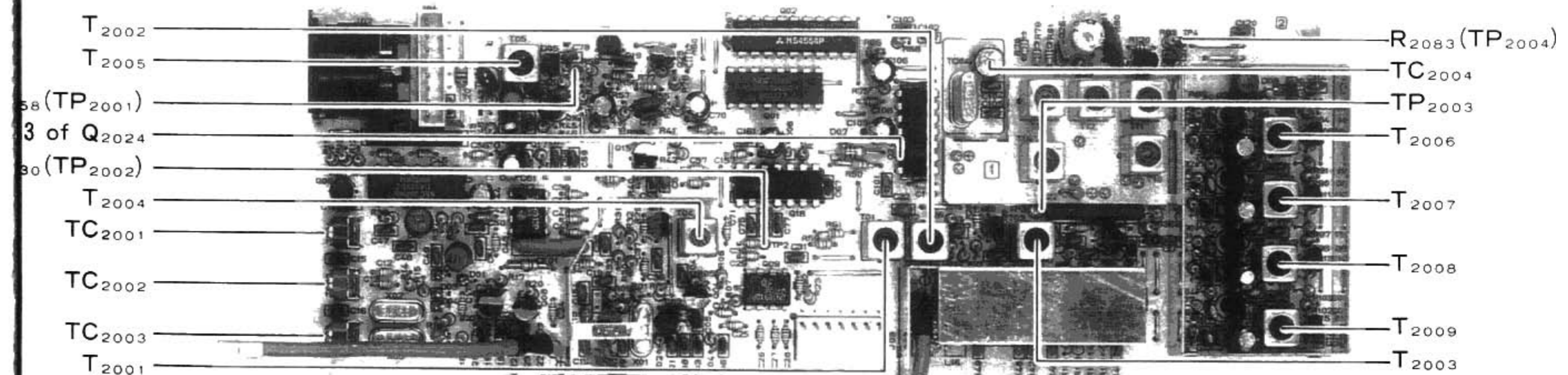
1. Connect the DC voltmeter between the exposed lead of R2058 (TP2001) and chassis ground.
2. Tune the transceiver to 7.0015 MHz, LSB mode.
3. Adjust T2005 for 2.0 ±0.1V on the meter.
4. Retune the transceiver to 7.0014 MHz and confirm at least 5.6 ±0.6V on the voltmeter.
5. Disconnect the voltmeter.

C. PLL Subloop BPF

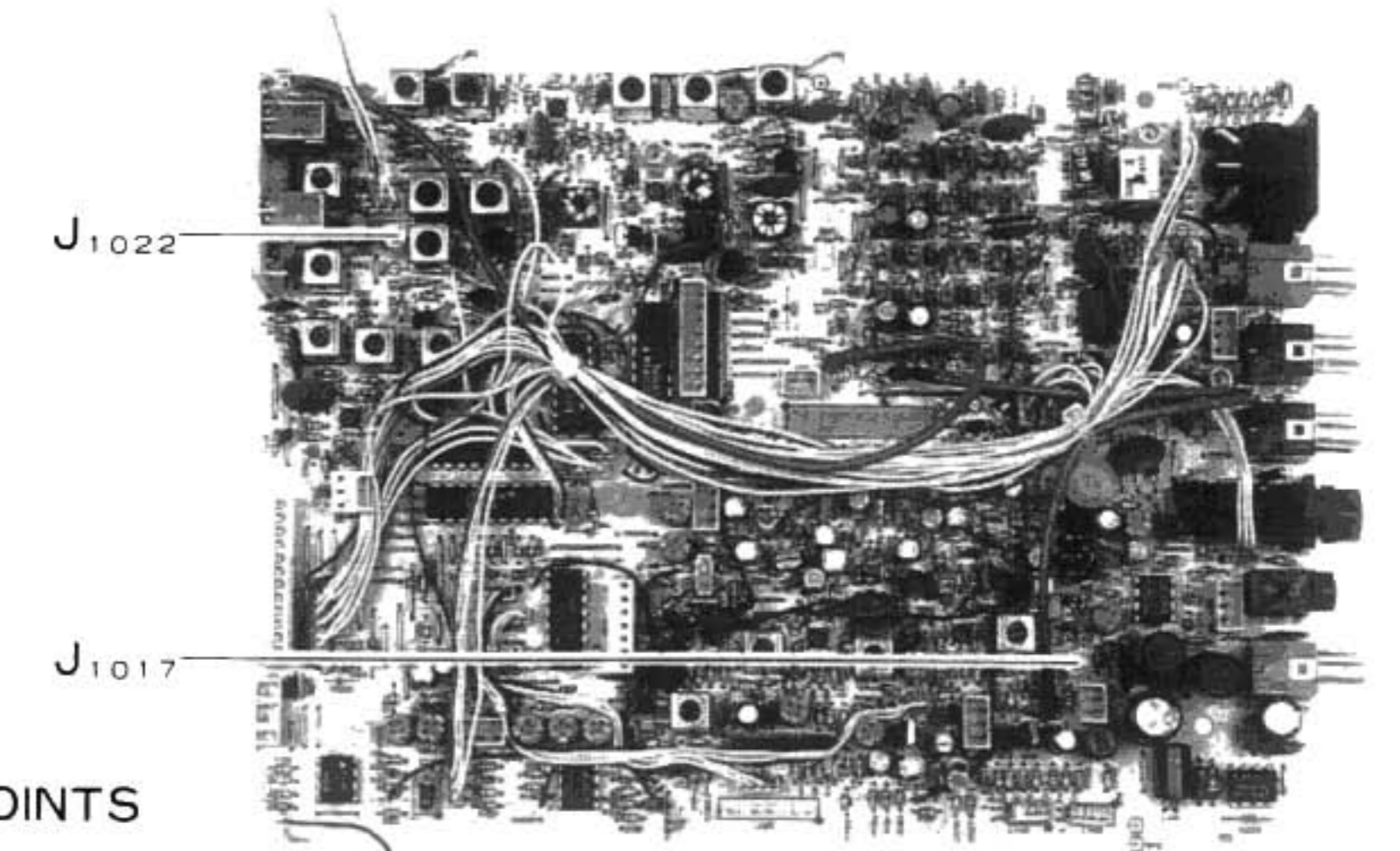
1. Connect the RF voltmeter to the exposed lead of C2030 (TP2002).
2. Tune the transceiver to 7.0265 MHz, LSB mode.
3. Adjust T2004 for peak on the voltmeter (at least 70 mVrms).
4. Move the voltmeter to TP2003, and retune the transceiver to 7.0267 MHz.
5. Adjust T2001-T2003 for peak on the voltmeter (more than 50 mVrms).
6. Disconnect the voltmeter.

D. PLL Main Loop VCO

1. Connect the DC voltmeter between the exposed lead of R2083 (TP2004) and chassis ground.
2. Referring to the following table, tune the transceiver to each adjustment frequency (MHz), adjust the corresponding transformer for 1.5 ±0.1V, retune to the corresponding check frequency and confirm the check voltage on the voltmeter.



LOCAL UNIT ALIGNMENT POINTS



MAIN UNIT ALIGNMENT POINTS

ALIGNMENT

ALIGNMENT

Adjust. Frequency	Adjust. Transformer	Check Freq.	Check Voltage
2.5000	T2006	2.4999 7.4999 0.1000	4.5-6.5V 5.0-6.5V 1.5-3.0V
7.5000	T2007	14.4999	5.0-6.5V
14.5000	T2008	21.4999	5.0-6.5V
21.5000	T2009	29.9999	5.0-6.5V

3. Connect the RF voltmeter to pin 13 of Q2024 and tune the transceiver to 29.9999 MHz. Confirm at least 90mVrms on the RF voltmeter.
4. Disconnect the voltmeters.

E. Reference Oscillator

1. Connect the frequency counter to the exposed lead of C2030 (TP2002).
2. Tune the transceiver to 7.0000 MHz, LSB mode.
3. If the TCXO option is installed, adjust the trimmer accessible through the hole in the TCXO housing, if necessary, for 5.7635 MHz \pm 3 Hz on the counter.
4. If the TCXO option is not installed, adjust TC2004, if necessary, for 5.7635 MHz \pm 10 Hz on the counter.
5. Remove the counter.

F. Carrier Point

1. Disconnect TMP plug P2001 from J1017 on the Main Unit, and connect the frequency counter to P2001.
2. With the LSB mode selected, adjust TC2003 for 8.2135 MHz \pm 10 Hz on the counter.
3. Select USB mode and adjust TC2002 for 8.2165 MHz \pm 10 Hz on the counter.
4. Select CW mode and set the DRIVE control fully counterclockwise (minimum).
5. Press the MOX button to transmit, and adjust TC2001 for 8.2158 MHz \pm 10 Hz on the counter.
6. Press the MOX button again to return to receive, remove the counter and reconnect P2001 to J1017 (unless performing the next procedure).

G. Carrier Level

1. Disconnect TMP plug P2001 from J1017 on the Main Unit, and connect a 50-ohm resistor in parallel with the RF voltmeter to P2001.
2. Confirm at least 230 mVrms on the RF voltmeter in all modes.
3. Remove the voltmeter and resistor, and reconnect P2001 to J1017.

II. Main Unit - Receiver

A. RX IF, Part I

1. Connect the RF generator to the antenna jack, and the AF voltmeter and an 8-ohm, 3W resistor across the EXT SPKR jack.
2. Tune the transceiver to 14.2000 MHz, USB mode. Set the AF gain to the 10 o'clock position.
3. Tune the RF generator for a 1.5 kHz heterodyne in the receiver, and adjust the injection level for S-7 on the S-meter.
4. Adjust T1003-T1013 for peak on the AF voltmeter, reducing the injection level, if necessary, to keep S-meter deflection near S-7.
5. Leave the test equipment connected for the next three procedures.

B. S-meter Sensitivity, Part I

1. Connect the RF voltmeter to the emitter of Q1008.
2. Tune the transceiver to 14.0000 MHz, USB mode, and adjust VR1004 for minimum on the voltmeter.
3. Adjust VR1002 so that the S-meter just begins to deflect.
4. Disconnect the voltmeter, and continue with the next procedure.

C. RX IF, Part II

1. Set the transceiver to 14.2000 MHz (USB).
2. Tune the RF generator for a 1.5 kHz heterodyne in the receiver, and adjust the injection level for S-7 on the S-meter.
3. Adjust T1003-T1013 for maximum on the S-meter, reducing the injection level, if necessary, to keep S-meter deflection near S-7.
4. Reduce the injection level to +6dBu and adjust VR1001 for S-1 indication.
5. Perform the next procedure.

D. S-Meter Sensitivity, Part II

Perform the preceding procedure, if not done already.

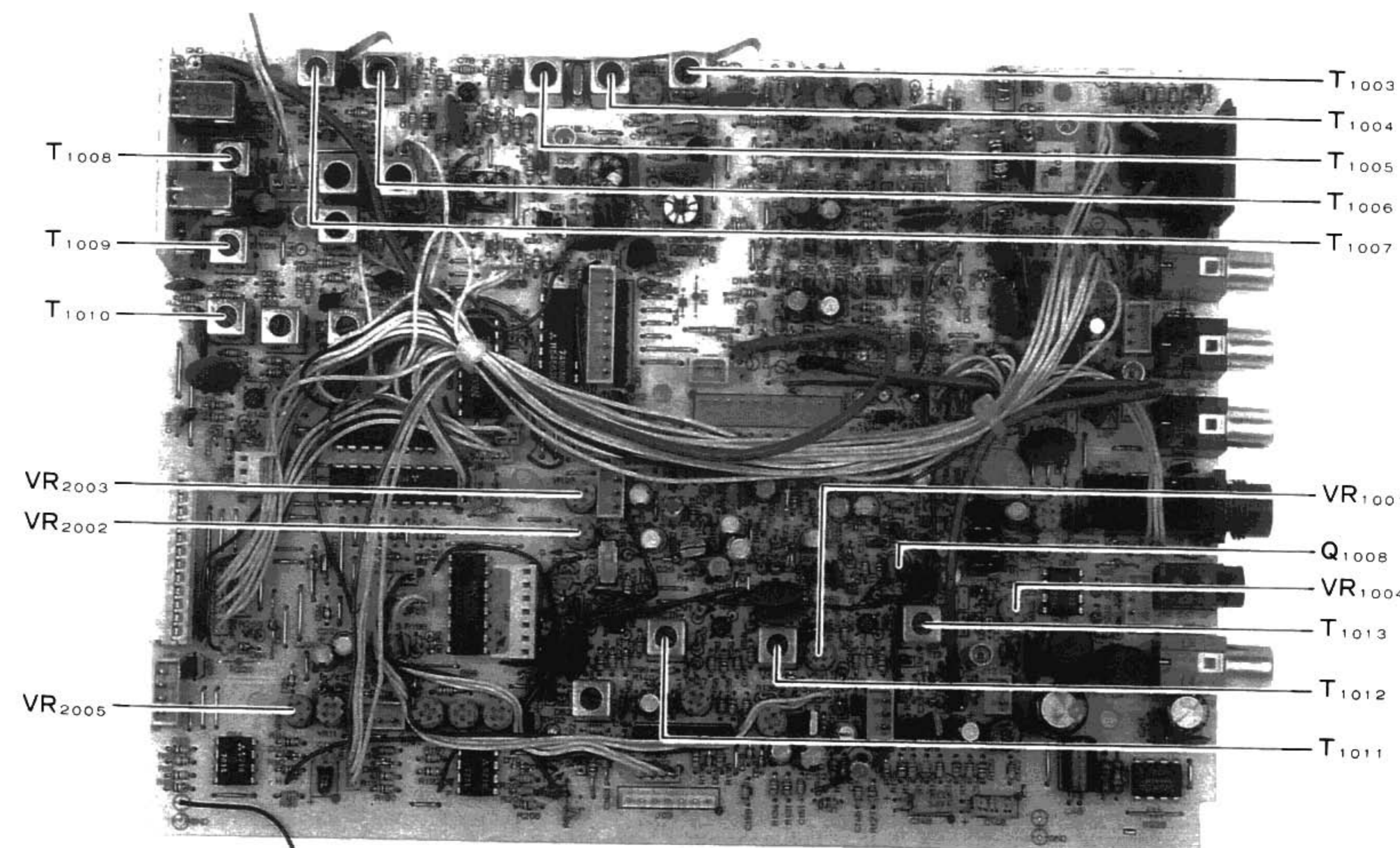
1. Set the RF injection level to +100 dBu and adjust VR1003 for S-meter deflection of 60 dB over S-9.
2. Disconnect the test equipment.

E. RX 1st Mixer

1. In LSB mode, tune to the internal heterodyne near 7.1 MHz.
2. Adjust VR1004 for best null of the heterodyne.

F. Noise Squelch

1. Tune to 14.2000 MHz, USB mode, and set the SQL control to the 10 o'clock position.
2. Adjust VR1005 so the squelch just closes when no signal is received.



MAIN UNIT ALIGNMENT POINTS
(Receiver Section)

ALIGNMENT

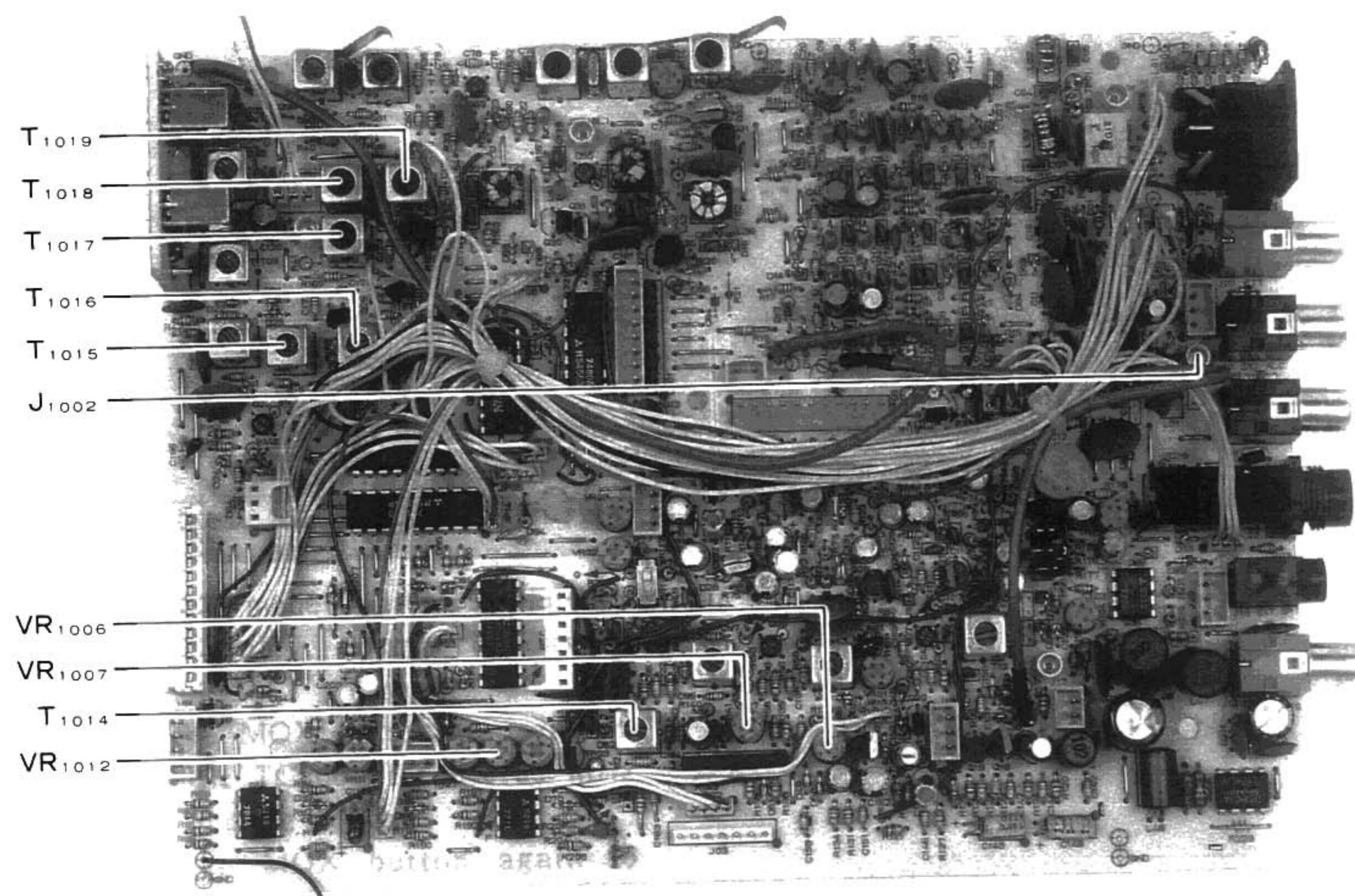
III. Main Unit, Transmitter

A. TX IF

1. Connect the dummy load and wattmeter to the antenna jack, and tune to 14.2000 MHz, CW mode.
2. Press the MOX button and set the DRIVE control for 50W output.
3. Adjust T1014-T1019 for peak on the wattmeter, reducing the DRIVE, if necessary, to keep power below 60W output.
4. Press the MOX button again to return to receive.

B. ALC & PO Meter Sensitivity

1. With the dummy load and wattmeter connected to the antenna jack, and tuned to 14.2000 MHz, CW mode, set the DRIVE control fully clockwise.
2. Press the MOX button and adjust VR1010 for 100W output, and then VR1012 for S-meter deflection to "8" on the PO scale, repeating both adjustments alternately several times.



MAIN UNIT ALIGNMENT POINTS
(Transmitter Section)

C. SSB Carrier Balance

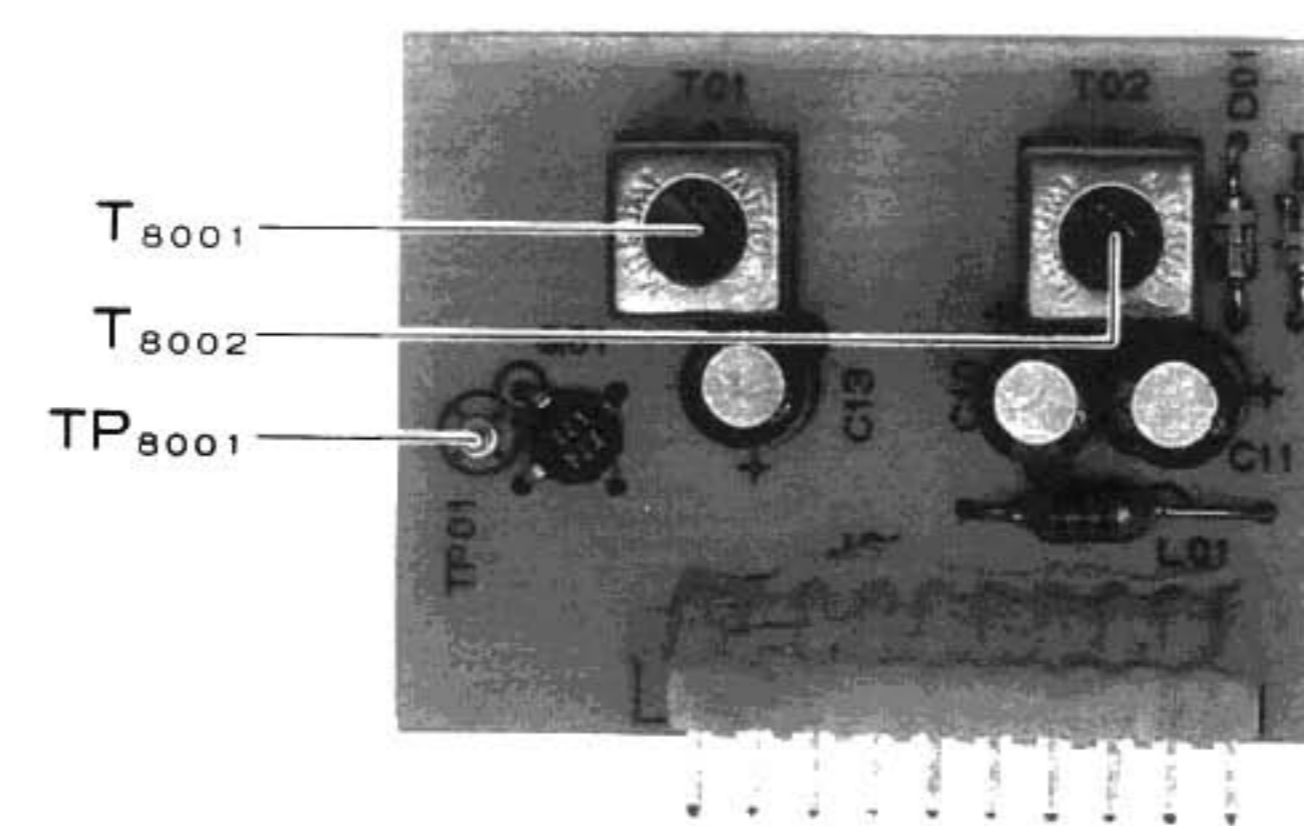
1. With the dummy load and wattmeter connected to the antenna jack, and tuned to 14.2000 MHz, CW mode, set the MIC gain fully counterclockwise.
2. Connect the RF voltmeter to J1002.
3. Press the MOX button and adjust VR1007 for minimum on the voltmeter.
4. Press the MOX button again to return to receive, and disconnect the voltmeter.

D. AM Carrier Level

1. With the dummy load and wattmeter connected to the antenna jack, and tuned to 14.2000 MHz, AM mode, set the MIC gain fully counterclockwise.
2. Preset VR1006 fully clockwise.
3. Press the MOX button and set the DRIVE control for 80W output.
4. Adjust VR1006 for 20W output.
5. Press the MOX button again to return to receive, and remove the test equipment.

IV. Noise Blanker Unit

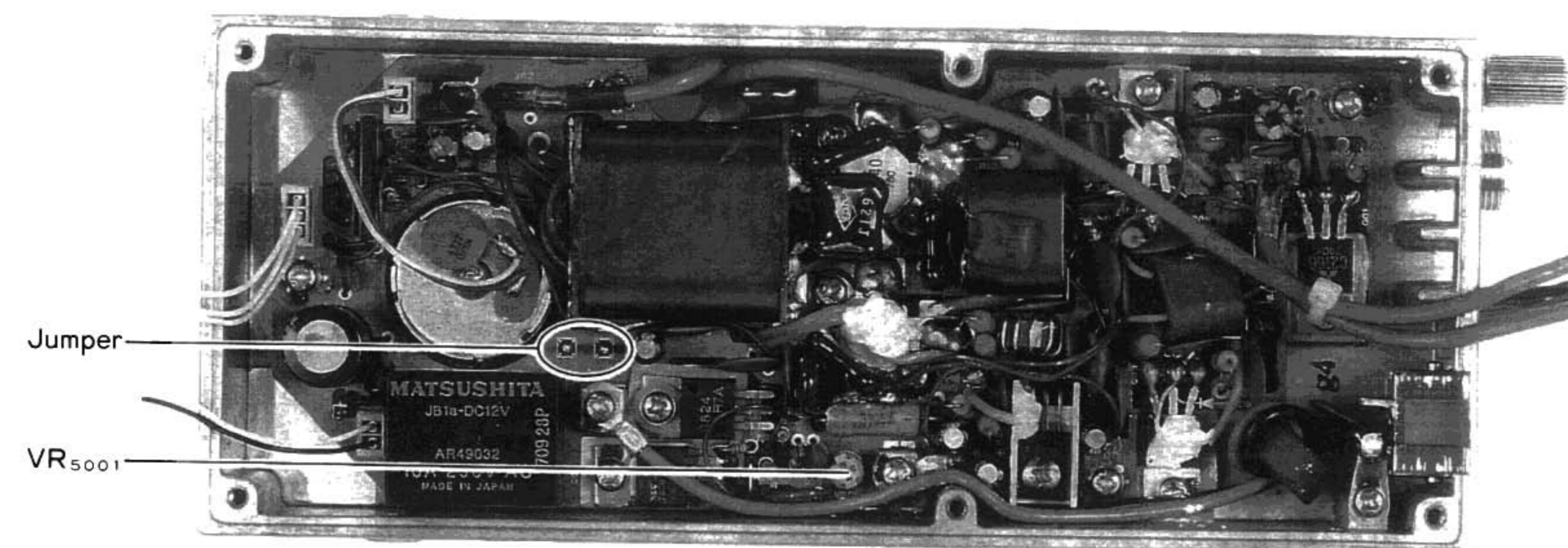
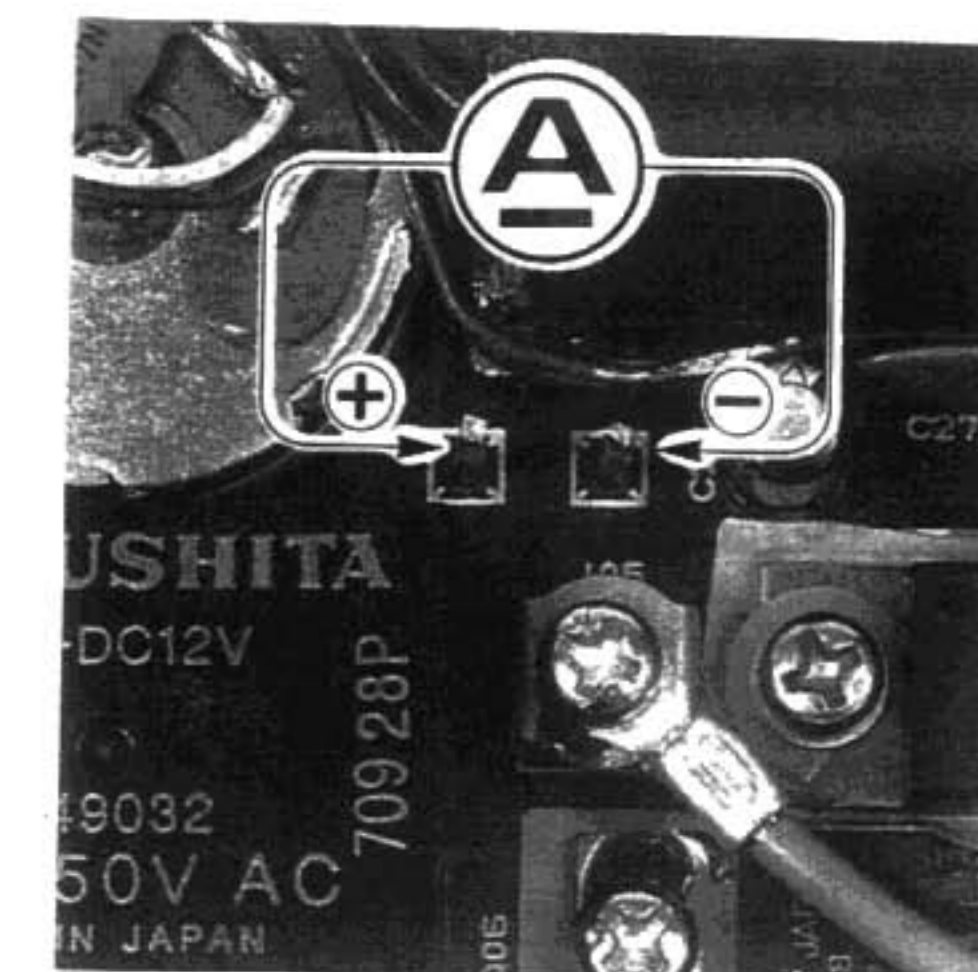
1. Connect the RF generator to the antenna jack, and the DC voltmeter between TP8001 and chassis ground.
2. Tune the transceiver and RF generator to 14.2000 MHz, and inject 40 dBu with no modulation.
3. Press the NB switch and select the USB mode.
4. Adjust T8001 and T8002 for minimum deflection on the voltmeter.
5. Disconnect the test equipment.



NB UNIT ALIGNMENT POINTS

V. 100W PA Unit (Idling Current)

1. Temporarily remove the jumper indicated below, and connect the DC milliammeter (set to 500 mA range) in its place.
2. Set the transceiver to USB mode, and set the MIC gain fully counterclockwise.
3. Press the MOX button and adjust VR5001 for 200 ±50 mA on the milliammeter.
4. Press the MOX button again to return to receive, remove the milliammeter and reinstall the jumper.



100W PA UNIT ALIGNMENT POINTS

