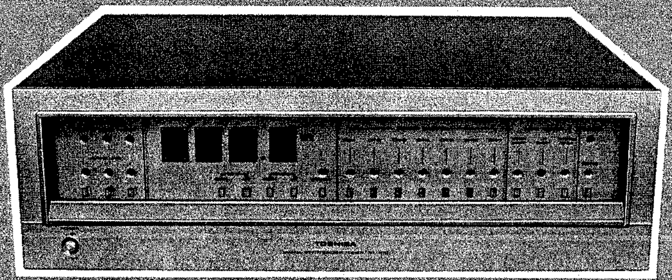
SERVICE DATA
FILE NO. 170-020

TOSHIBA

FM DIGITAL SYNTHESIZER TUNER

ST-910



SPECIFICATIONS

CIRCUIT SYSTEM

PLL frequency synthesizer system using the quartz crystal oscillator.
High performance Front-End using 6-channel varicap diodes.
Stereo demodulation circuit using the PLL ICs.

SEMICONDUCTORS

Transistor:	32
FET:	9
Diode:	100
IC:	linear 11 digital 85
LED:	24

TUNER SECTION

Frequency Range:	87.5~107.9MHz
Usable Sensitivity (IHF):	1.8 μV
Distortion Factor:	MONO 0.15 % (400 Hz, 100 %) STEREO 0.2 % (400 Hz, 100 %)
S/N Ratio:	75 dB
Frequency Response:	20 Hz~15 kHz, ±0.5 dB
Selectivity (IHF):	85 dB
Image Rejection Ratio:	100 dB
IF Rejection Ratio:	100 dB
Capture Ratio:	1.5 dB
Spurious Ratio:	100 dB
AM Suppression Ratio:	65 dB
FM Stereo Separation:	40 dB (1 kHz)
Rated Power Output:	FIXED 650 mV (400 Hz, 100 %) VARIABLE 0~2.0 V (400 Hz, 100 %)
Output Impedance:	1 kΩ (at the maximum power input)
Antenna Input:	300 Ω BALANCE 75 Ω UNBALANCE
Muting:	20 dB, 40 dB, 60 dB

POWER SOURCE AND OTHERS

Power Source:	AC100/120/220/240 V 50/60 Hz
Power Consumption:	30 W
Dimensions:	450 mm (W) × 135 mm (H) × 340 mm (D) (17 23/32" × 5 5/16" × 13 13/32")
Weight:	8 kg (17 lbs)

ACCESSORIES

FM feeder antenna, FM coaxial connector, connecting cords, silicon cloth, felt pad, Owner's manual.

TABLE OF CONTENTS

 ST-910

1. OPERATING CONTROLS

1-1. FRONT VIEW

③ SIGNAL LEVEL indicators

These indicators are used to indicate the signal level as follows;

No Indicator is put on	under 20 dB
One Indicator is put on	beyond 20 dB
Two Indicators are put on	beyond 40 dB
Three Indicators are put on	beyond 60 dB

④ Frequency displays

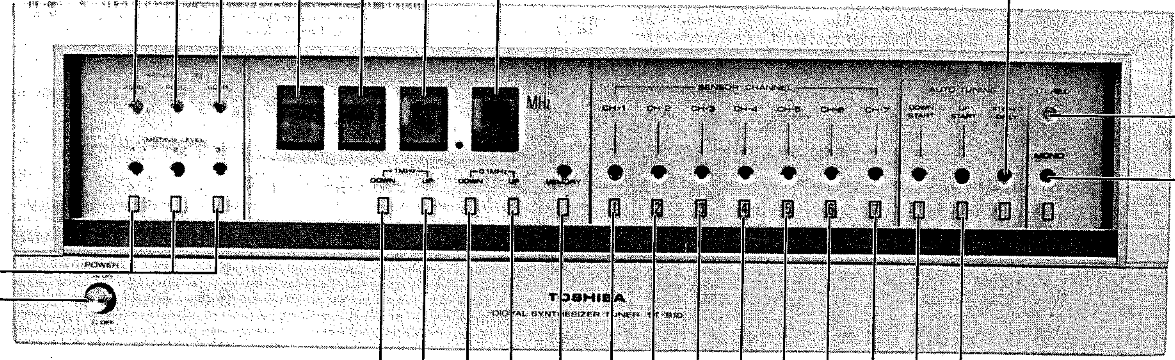
The frequency you chosed is shown by digital number. Display figures are 100 MHz, 10 MHz, 1 MHz, 0.1 MHz.

⑨ STEREO ONLY STOP switch

This switch has the stop operation only at the stereo broadcasts. Its operation can be released by operating the compulsive monoural switch as explained at 10.

⑩ Compulsive MONOURAL switch

This switch has the operation of changing stereo source to manoural compulsively. You can use this switch when you want to record the stereo broadcast having much noise to listen.



② MUTING LEVEL switches

You can use it when changing the sensitivity of the automatic tuning operation. There are three levels. By touching the switch, you can select the following levels.

MUTING LEVEL 1	beyond 20 dB
MUTING LEVEL 2	beyond 40 dB
MUTING LEVEL 3	beyond 60 dB

When the radio waves have not enough level to reach the muting level, the automatic tuning operation should not be operated. The same situation is occured when choosing the Manual or Preset tuning operation. When touching the switch of MUTING LEVEL 1 and the green indicator lamp is turned off, the muting operation is not operated. The Manual or Preset tuning operation is chosed at that situation, the noise will be heared outside the broadcast frequency. When Power Switch is turned on, the switch of Muting Level 1 is necessarily turned on. It has the function of ON/OFF operation and Muting operation can be released by using this switch.

⑪ STEREO indicator

The STEREO indicator lamp is turned on when received broadcast is stereo source. But when the compulsive monoural switch is operated, this lamp is not turned on. The compulsive monoural switch can be released by touching the switch once more. This switching operation is necessarily released when Power Switch is turned off.

① Power switch

Push the button, Power Supply is put on. Push it once more, it is put off.

⑤ Manual TUNING switches

By touching this switch (UP or DOWN), you can change the receiving frequency with a 1 MHz or 0.1 MHz interval.
Each step is sent by each touching.

⑦ MEMORY switches

This switch plays a role of the memorizing the received frequency by IC memory device. When touching this switch, the green indicator lamp is turned on and the device is under the memorization operation during about 3 seconds. You must touch one switch in SENSOR CHANNEL CH-1 ~ CH-7, while the green indicator lamp is turned on and lighted brightly and put off. At the same time, the green indicator lamp of the SENSOR CHANNEL related to the switch you touch is lighted up. When you want to call the memorized and presetted frequency, you only touch the switch, you will be able to receive it easily. If you don't touch it during about 3 seconds, the memorization operation will be released. All corresponding pilot lamps go off when Power Switch is turned off, it means the received frequencies you chose are transfered to the CHO as the reserved broadcasting stations.

⑧ AUTO TUNING switches

By touching this switch, the frequency is increased (UP switch) or decreased (DOWN switch) and its operation is stopped when it accordes one of the broadcast frequencies. If it reaches the maximum (107.9 MHz) or minimum (87.5 MHz) value, its operation is reversed. When you want to choose the automatic tuning operation, pay attention to the things as follows;

a. If receiving signal level does not reach beyond the input level, the tuning operation cannot be stopped.
b. As explained at 9, you can use this switch only for stereo broadcasts.

Corresponding pilot lamp is lighted during operation and goes off when scanning operation is stopped.

1-2. REAR VIEW

⑬ MPX OUT terminal

When FM broadcasts by 4 channel will be started, you can enjoy the 4 channel broadcasts by using the adapter.

⑭ OUTPUT terminals

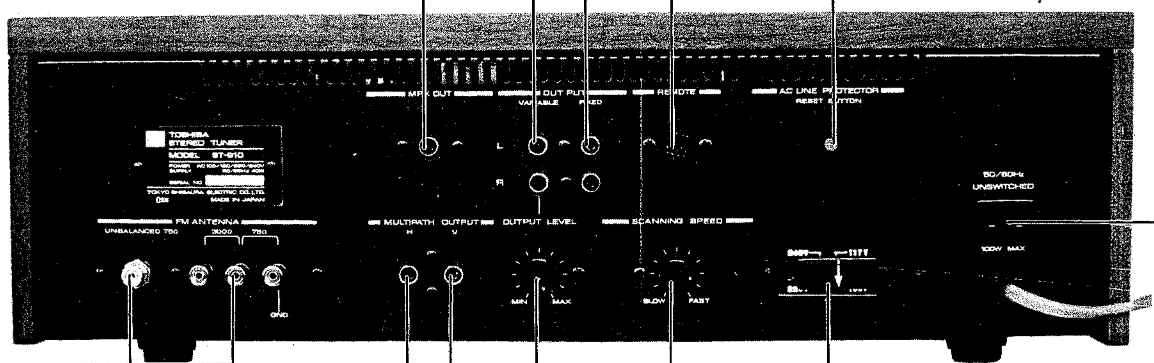
There are two terminals as follows;

FIXED ...... connected to LINE IN terminals of the Tape Deck and so on.

VARIABLE .. connected to the terminals of Amplifire using attached code. It should be connected the L and R compatible to each set.

⑫ FM antenna terminals

This set has two terminals for 75 Ω coaxial cable and for 300 Ω feeder cable. Both cable can be used, but you must avoid connecting two cables at the same time.

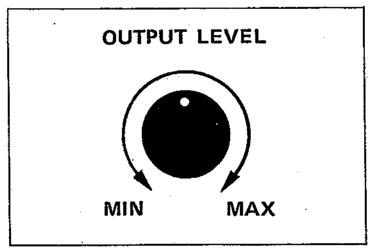


⑯ MULTIPASS OUTPUT terminals

They are used to find the most suitable location of the antenna by using the oscilloscope as explained at another page.

⑰ OUTPUT LEVEL control knob

This knob is used to adjust the output level of VARIABLE output terminal. Right turning of the increases output level.
Left turning decreases it and full turning of it indicates zero output level.



⑮ Remote control terminal

You can enjoy controlling this set remotely by using remote control unit offered by TOSHIBA.

⑲ AC LINE PROTECTOR RESET BUTTON

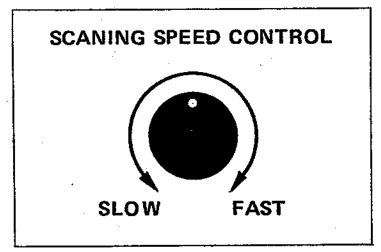
This button is used to cut an electric current from the Power Supply when an electric current to the circuit is overflowed. At the same time, the red button is breaked out from Rear panel.
When it is operated by unknown origin, contact your serviceman.
After tracing it and repairing it, the red button is pushed. Power Supply will be put on.

⑳ AC Spare Receptacle

This Receptacle supply AC 100/120/220/240 V independent of Power Supply switch of this set. Please enjoy this Receptacle to use for Power Supply of another set, Tape Deck, Record Player and so on. But the Power consumption of these sets should be limited under 100 W.

⑱ SCANNING SPPED control knob

This knob is used to vary the speed of the automatic tuning operation. Right turning fully of the knob indicates maximum speed, 2~3 times/sec at a 0.1 MHz unit. Left turning fully of the knob indicates minimum speed, 20~30 times/sec at a 0.1 MHz unit.

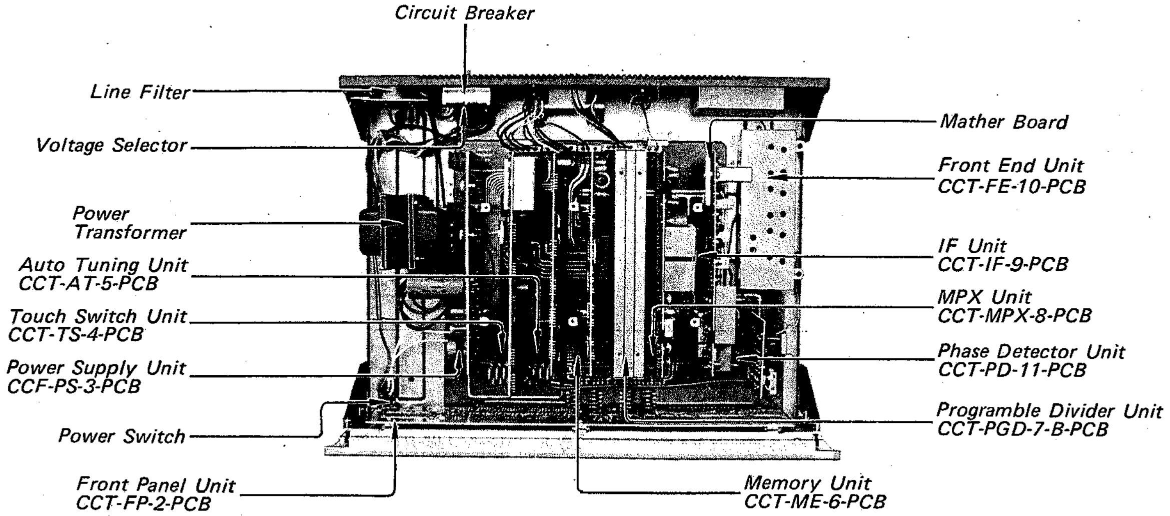


㉑ Power Supply voltage selector

We adjust your set's selector for your local power line voltage.
Available power supply voltages are as follows;
100 V/120 V/220 V/240 V.
However, we adjusted your ST-910 selector for your local power line voltage. In case you want to use your ST-910 in the different voltage area, please contact your local dealer.

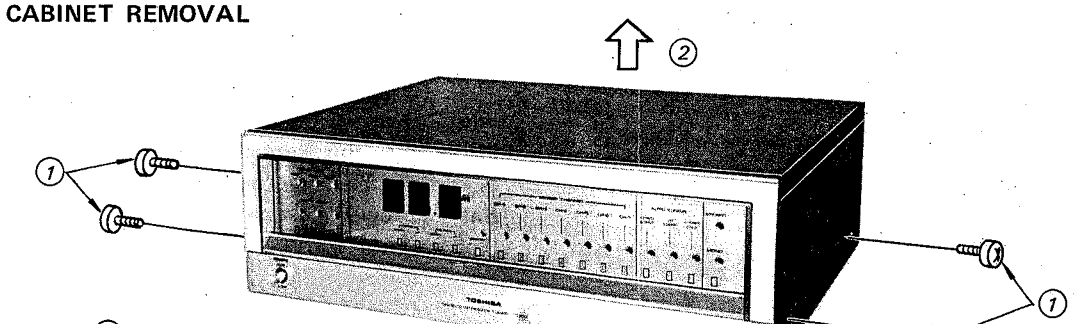
2. PARTS LOCATION

2-1. CHASSIS TOP VIEW



3. DISASSEMBLY INSTRUCTION

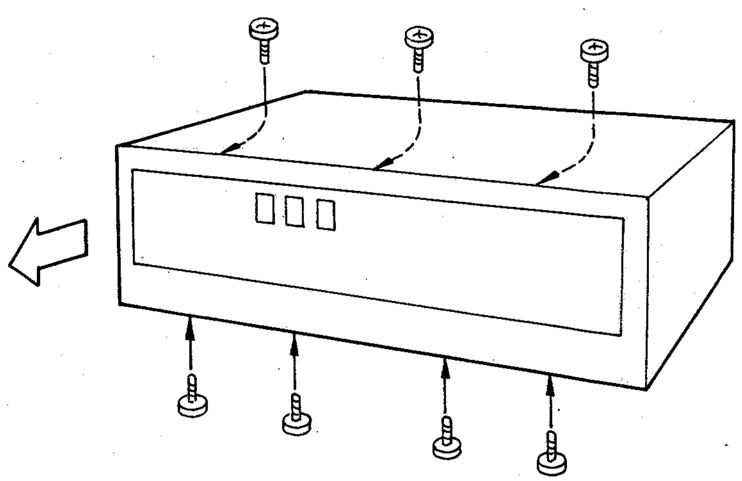
3-1. CABINET REMOVAL



① *Remove the four screws.*

② *Pull out the cabinet.*

3-2. FRONT PANEL REMOVAL

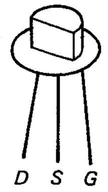


① *Remove the cabinet.*

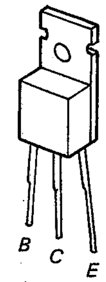
② *Removal the seven screws.*

③ *Pull out the panel.*

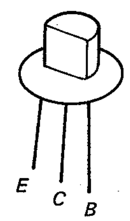
4. SEMICONDUCTOR BASE DIAGRAM



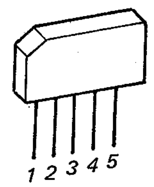
2SK19



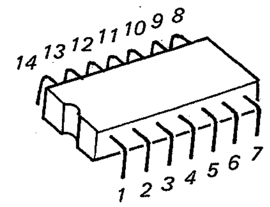
2SD235



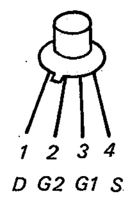
2SC732
2SC734
2SA495
2SA493
2SC785



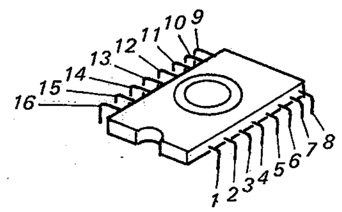
TA7060P



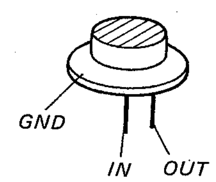
TC7400P	TD3404AP
TC7404P	TD3410AP
TC7420P	TD3473AP
TD3493AP	TD1060P
TC7476P	TD1072P
TD1062P	TD3442AP
TD1065P	TD3502AP
TD3400AP	



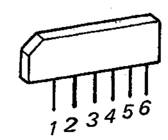
3SK22



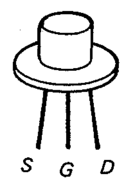
TC5000C



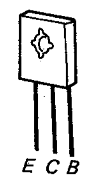
TA7086M



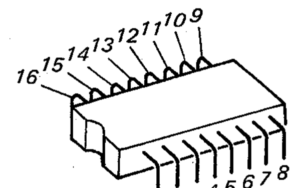
TA7066P



2SK30A-0

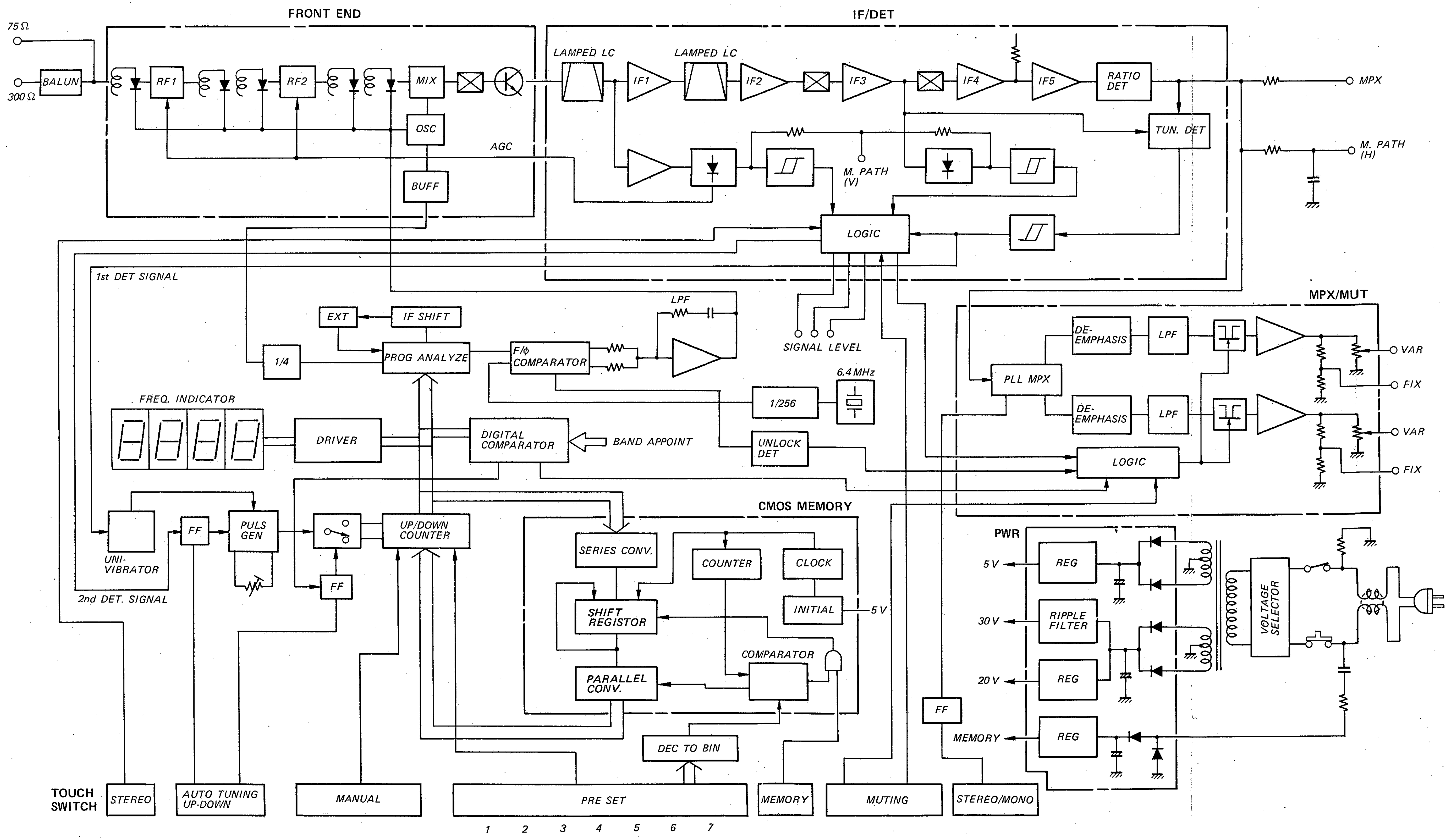


2SA496



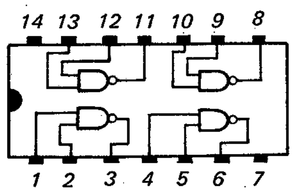
TD3475AP
TD34192AP
TD3447AP

5. BLOCK DIAGRAM

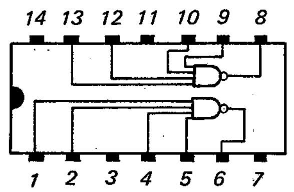


6. INSIDE CONNECTION OF IC and TRUTH TABLE

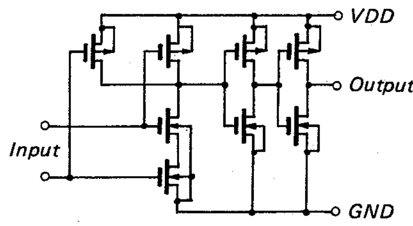
TC7400P



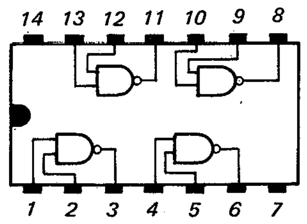
TC7420P



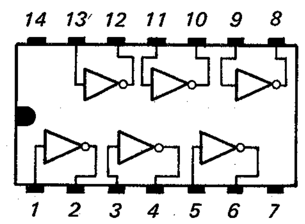
Basic Circuit (For 2 Inputs) TC7400P, TC7420P



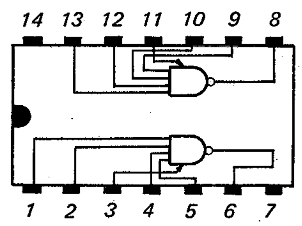
TD1065P



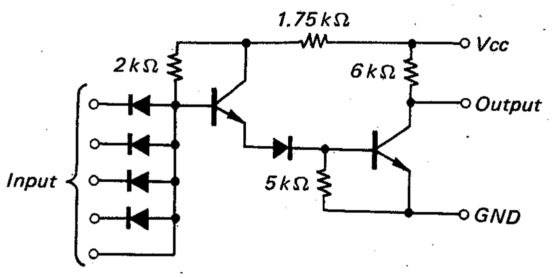
TD1072P



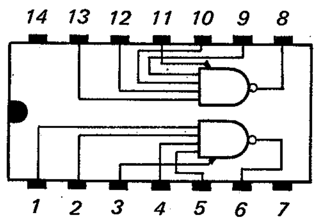
TD1060P



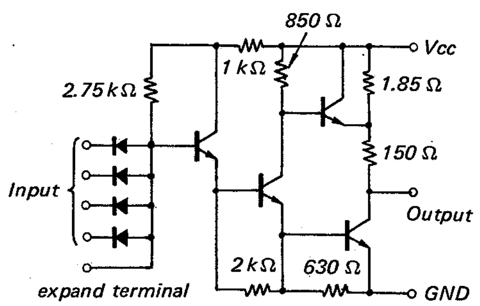
Basic Circuit TD1060P TD1065P TD1072P



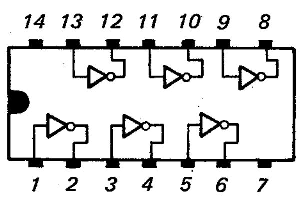
TD1062P



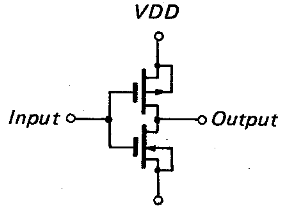
Basic Circuit TD1062P



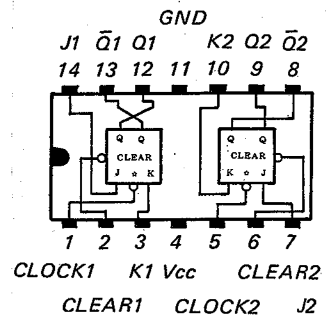
TC7404P



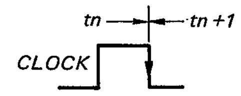
TC7404P Basic Circuit



TD3473AP



☆ mark indicates CLOCK

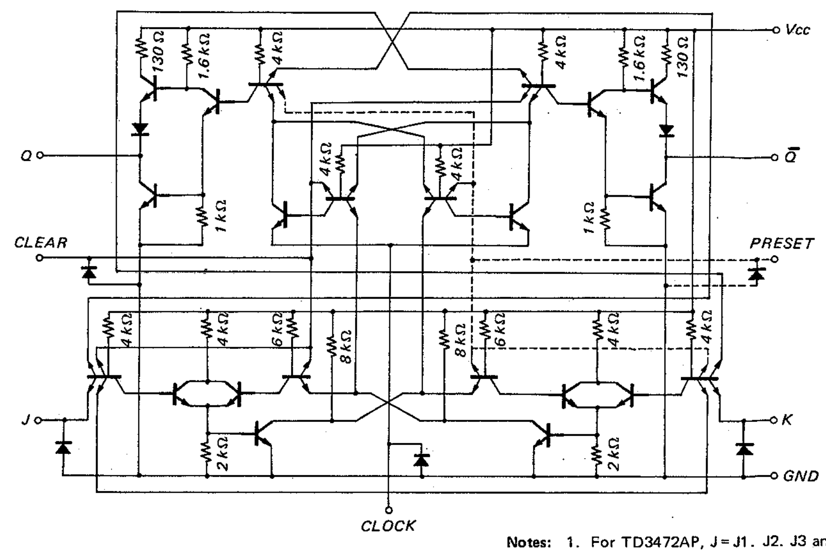


tn	:	Bit time before clock pulse
tn+1	:	Bit time after clock pulse
J	:	J1, J2, J3
K	:	K1, K2, K3
NC	:	No internal connection

TRUTH TABLE (for every Flip Flop)

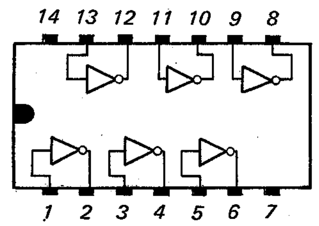
tn		tn+1
J	K	Q
0	0	Qn
0	1	0
1	0	1
1	1	Q̄n

BASIC CIRCUIT (for every Flip Flop) TD3473AP

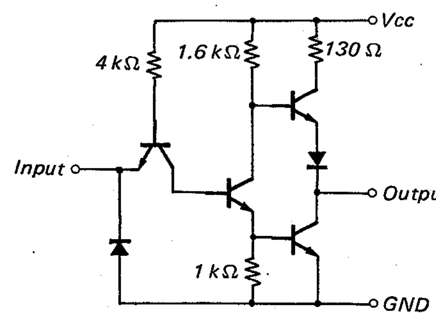


Notes: 1. For TD3472AP, J=J1. J2. J3 and k=k1. K2. K3
2. Dot lines are connections only for TD3472AP

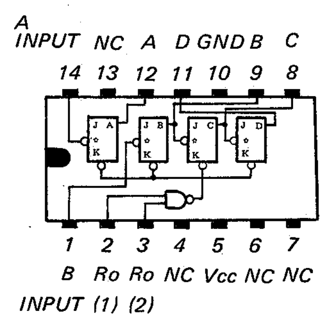
TD3404AP



Basic Circuit TD3404AP



TD3493AP



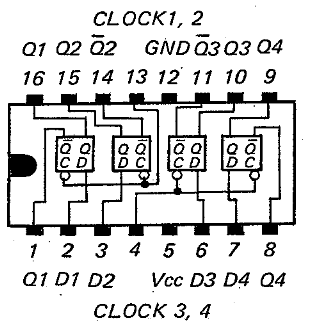
☆ mark indicates CLOCK

Notes:
1. In RIPPLE COUNT mode OUTPUT A shall be connected to OUTPUT B.
2. Every output is reset to 0 when both Ro(1) and Ro(2) are 1.

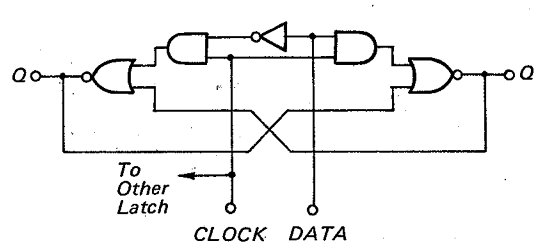
TRUTH TABLE

RIPPLE COUNT MODE				
COUNT	OUTPUT			
	A	B	C	D
0	0	0	0	0
1	1	0	0	0
2	0	1	0	0
3	1	1	0	0
4	0	0	1	0
5	1	0	1	0
6	0	1	1	0
7	1	1	1	0
8	0	0	0	1
9	1	0	0	1
10	0	1	0	1
11	1	1	0	1
12	0	0	1	1
13	1	0	1	1
14	0	1	1	1
15	1	1	1	1

TD3475AP



LOGIC DIAGRAM (for every LATCH)



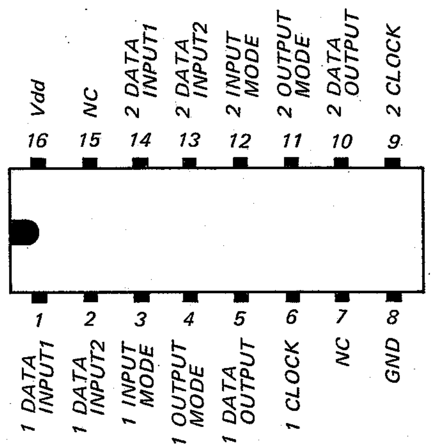
TRUTH TABLE

tn	tn+1	
D	Q	Q̄
1	1	0
0	0	1

tn : Bit time before clock pulse
tn+1 : Bit time after clock pulse

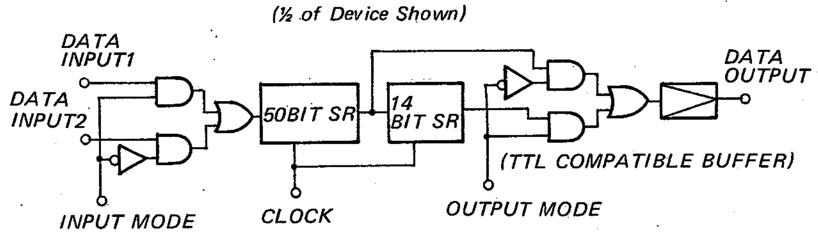
This truth table shows the output when clock pulse changes from 0 to 1. When clock pulse is 1, Q changes according to D. After clock pulse reverses to 0, Q holds state of D before the reversion.

TC5000C

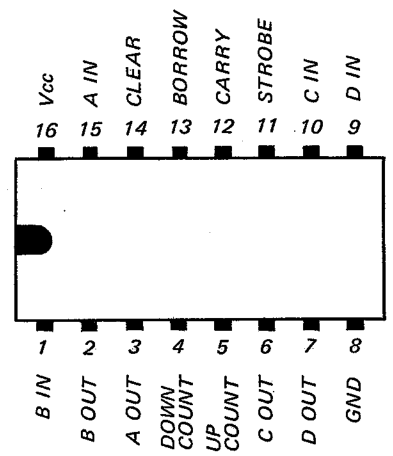


LOGIC DIAGRAM

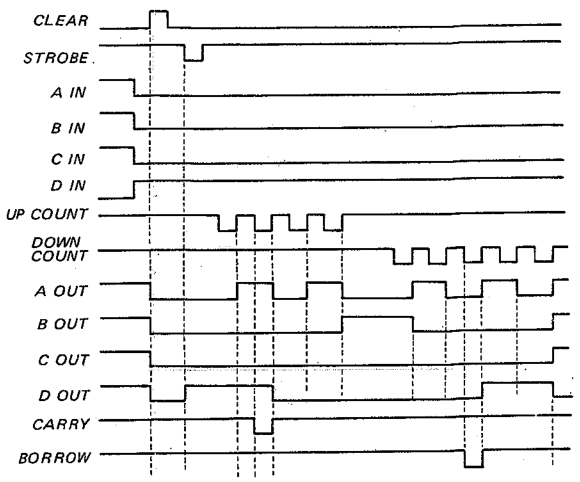
(½ of Device Shown)



TD34192AP



TIMING CHART

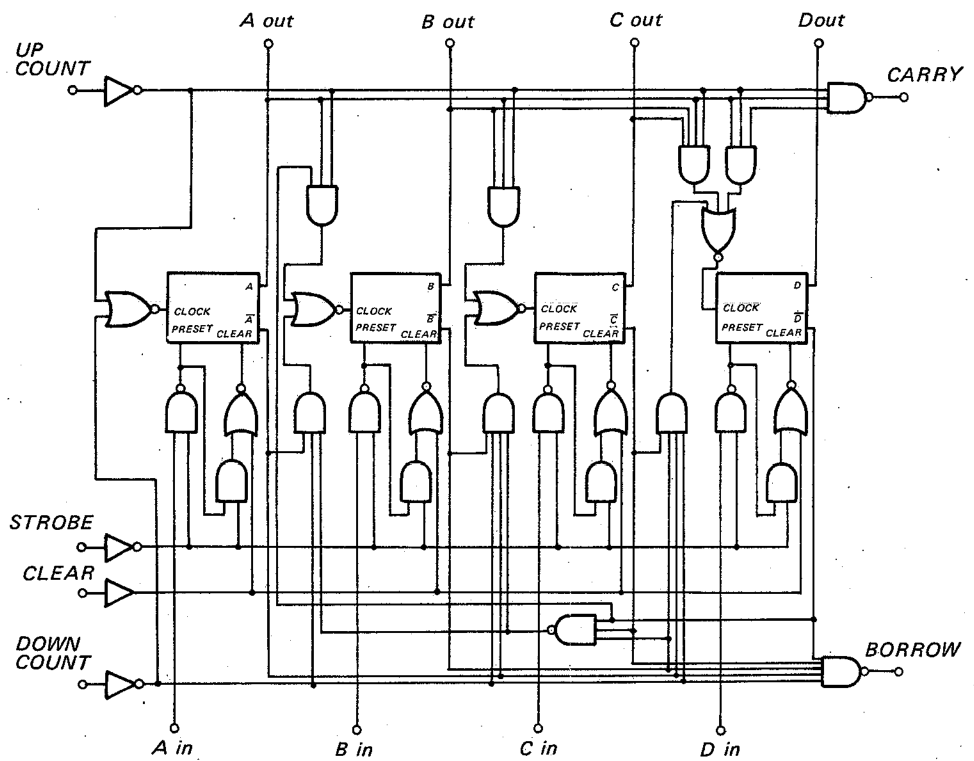


TRUTH TABLE TD34192AP

INPUT tn								OUTPUT tn+1					
COUNT -UP PULSE	COUNT -DOWN PULSE	STROBE	CLEAR	INPUT				OUTPUT				BORROW	CARRY
				A	B	C	D	A	B	C	D		
※	※	0	0	A_{IN}	B_{IN}	C_{IN}	D_{IN}	A_{IN}	B_{IN}	C_{IN}	D_{IN}	Note 1	Note 1
※	※	0	0	1	0	0	1	1	0	0	1	Note 1	Note 1
※	※	※	1	※	※	※	※	0	0	0	0	Note 1	Note 1
1	1	1	0	※	※	※	※	1	0	0	0	1	1
2	1	1	0	※	※	※	※	0	1	0	0	1	1
3	1	1	0	※	※	※	※	1	1	0	0	1	1
4	1	1	0	※	※	※	※	0	0	1	0	1	1
5	1	1	0	※	※	※	※	1	0	1	0	1	1
6	1	1	0	※	※	※	※	0	1	1	0	1	1
7	1	1	0	※	※	※	※	1	1	1	0	1	1
8	1	1	0	※	※	※	※	0	0	0	1	1	1
9	1	1	0	※	※	※	※	1	0	0	1	1	0
0	1	1	0	※	※	※	※	0	0	0	0	1	1
1	1	1	0	※	※	※	※	1	0	0	0	1	1
↕	↕	↕	↕	↕	↕	↕	↕	↕	↕	↕	↕	↕	↕
8	1	1	0	※	※	※	※	0	0	0	1	1	1
9	1	1	0	※	※	※	※	1	0	0	1	1	1
1	8	1	0	※	※	※	※	0	0	0	1	1	1
1	7	1	0	※	※	※	※	1	1	1	0	1	1
1	6	1	0	※	※	※	※	0	1	1	0	1	1
↕	↕	↕	↕	↕	↕	↕	↕	↕	↕	↕	↕	↕	↕
1	1	1	0	※	※	※	※	1	0	0	0	1	1
1	0	1	0	※	※	※	※	0	0	0	0	0	1
1	9	1	0	※	※	※	※	1	0	0	1	1	1

Notes: 1. BORROW output and CARRY output depend on A, B, C, and D output DOWN COUNT and UP COUNT inputs.
2. ※: 0 or 1
3. tn: Bit time before CLOCK input changes from 0 to 1.
4. tn+1: Bit time after CLOCK input changes from 0 to 1.

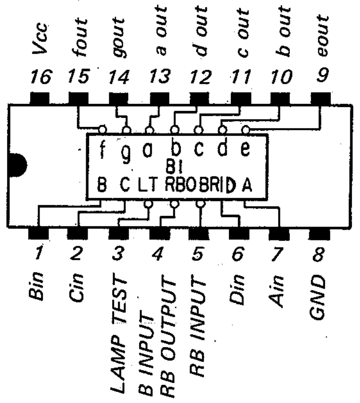
LOGIC DIAGRAM TD-34192AP



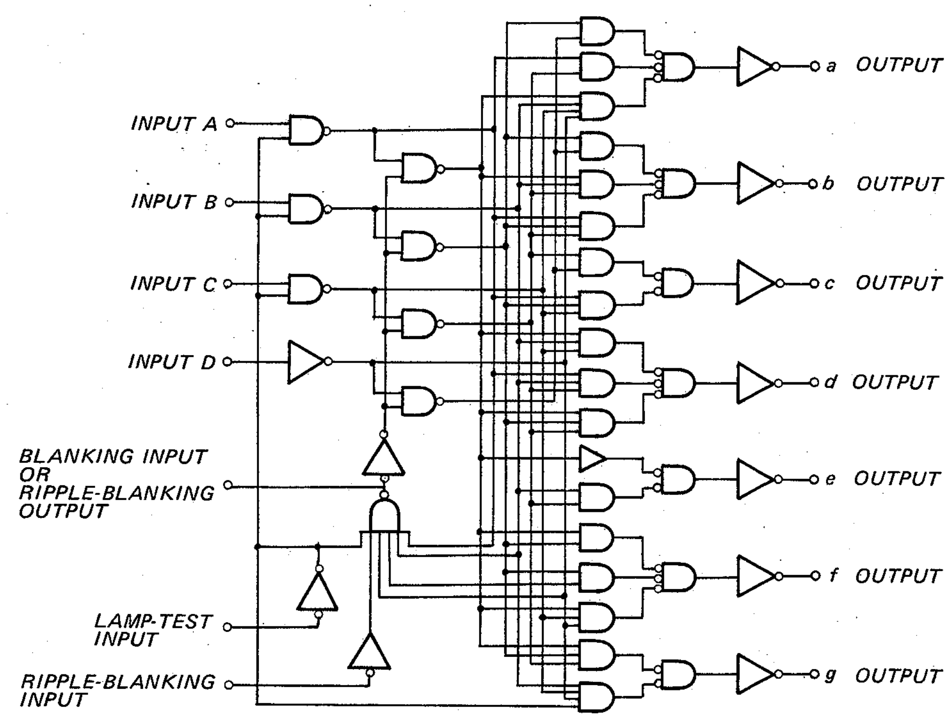
Explanations for operation:

1. UP-COUNT operation
   ABCD outputs (Aout, Bout, Cout and Dout) depend on the rise-up of counting pulse which is fed to UP-COUNT input when DOWN-COUNT input is 1, CLEAR input is 0 and STROBE input is 1. UP-COUNT input pulse of negative polarity appears on CARRY output terminal when BCD outputs change from 9 (Aout=1, Bout=0, Cout=0, Dout=1) to 0 (Aout=0, Bout=0,
2. DOWN-COUNT operation
   ABCD outputs depend on the rise-up of counting pulse which is fed to DOWN-COUNT input when UP-COUNT input is 1, CLEAR input is 0 and STROBE input is 1.
   DOWN-COUNT input pulse of negative polarity appears on BORROW output terminal when BCD outputs change from 0 to 9.
3. PRESET operation
   When STROBE input is reset to 0 under the condition that CLEAR input is 0, Ain, Bin, Cin and Din inputs are transfered to Aout, Bout, Cout and Dout respectively and put in memory. When STROBE input is set to 1, PRESET inputs of Ain, Bin, Cin and Din are shut out. This operation with COUNT operation enables counting from any state.
4. RESET operation
   When CLEAR input is set to 1, Aout, Bout, Cout and Dout are reset to 0.

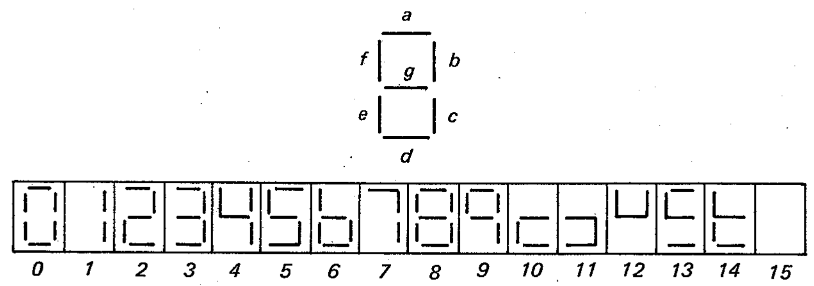
TD3447AP



LOGIC DIAGRAM TD3447AP



Number indication form



 ST-910

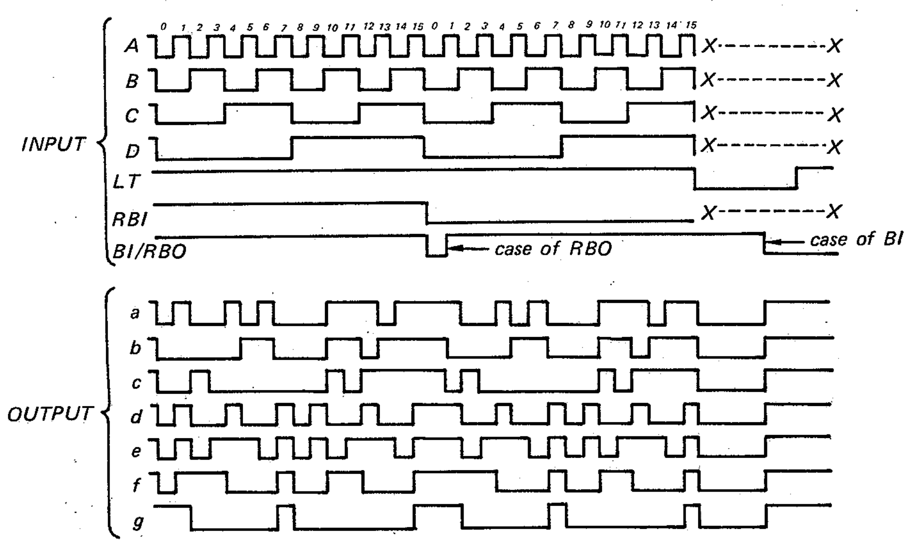
TRUTH TABLE TD-3447AP

FUNCTION	INPUT						OUTPUT								NOTE
	LT	RBI	D	C	B	A	BI/RBO	a	b	c	d	e	f	g	
0	1	1	0	0	0	0	1	0	0	0	0	0	0	1	1
1	1	x	0	0	0	1	1	1	0	0	1	1	1	1	1
2	1	x	0	0	1	0	1	0	0	1	0	0	1	0	
3	1	x	0	0	1	1	1	0	0	0	0	1	1	0	
4	1	x	0	1	0	0	1	1	0	0	1	1	0	0	
5	1	x	0	1	0	1	1	0	1	0	0	1	0	0	
6	1	x	0	1	1	0	1	1	1	0	0	0	0	0	
7	1	x	0	1	1	1	1	0	0	0	1	1	1	1	
8	1	x	1	0	0	0	1	0	0	0	0	0	0	0	
9	1	x	1	0	0	1	1	0	0	0	1	1	0	0	
10	1	x	1	0	1	0	1	1	1	1	0	0	1	0	
11	1	x	1	0	1	1	1	1	1	0	0	1	1	0	
12	1	x	1	1	0	0	1	1	0	1	1	1	0	0	
13	1	x	1	1	0	1	1	0	1	1	0	1	0	0	
14	1	x	1	1	1	0	1	1	1	1	0	0	0	0	
15	1	x	1	1	1	1	1	1	1	1	1	1	1	1	
BI	x	x	x	x	x	x	0	1	1	1	1	1	1	1	2
RBI	1	0	0	0	0	0	0	1	1	1	1	1	1	1	3
LT	0	x	x	x	x	x	1	0	0	0	0	0	0	0	4

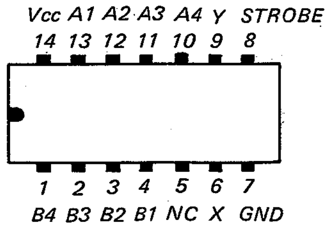
Notes:

1. Wired OR is available for BI/RBO (BI; BLANKING INPUT, RBO; RIPPLE-BLANKING OUTPUT). To drive seven-segment indication tube, this terminal shall be kept open or shall be 1.
   To make indication of 0 in decimal number, RBI input shall be open or shall be 1.
   Both 1 or 0 are acceptable for mark X in this truth table.
2. When BI input is 0, every segment output is set to 1 no matter what the other inputs are.
3. When RIPPLE-BLANKING INPUT (RBI) adn data inputs A, B, C and D are 0, every segment output is set to 1 and RBO output
4. When BI/RBO input is 1 and LAMP-TEST INPUT (LT) is 0, every segment output is reset to 0.

TIMING CHART



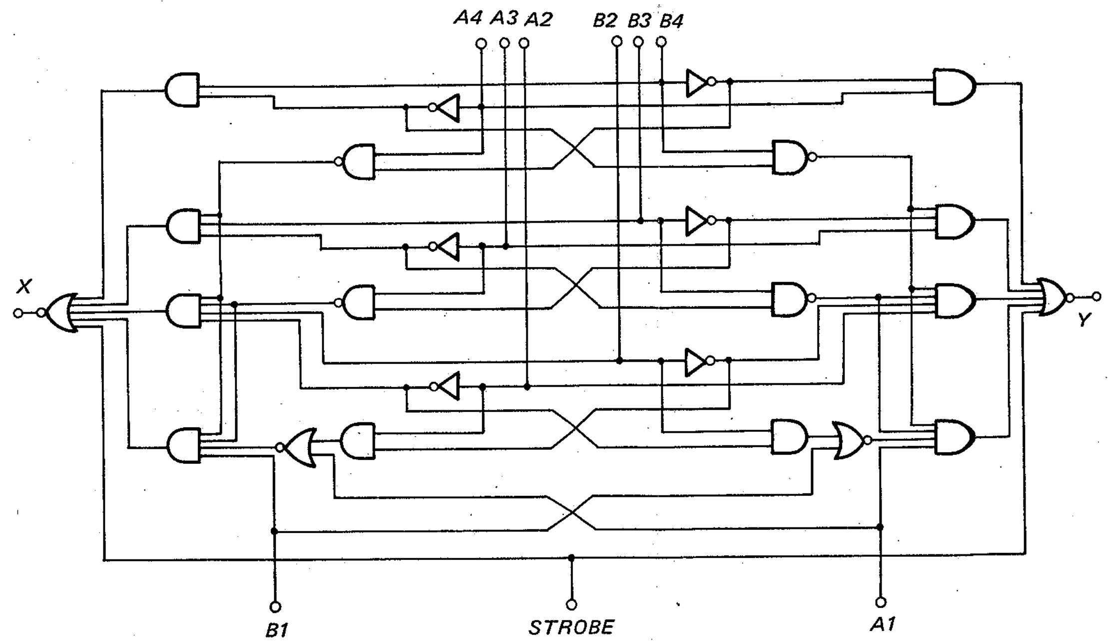
TD3502AP



TRUTH TABLE TD3502AP

INPUT				OUTPUT	
NUMERICAL VALUE A4 A3 A2 A1		NUMERICAL VALUE B4 B3 B2 B1	STROBE	X	Y
A	>	B	0	1	0
A	<	B	0	0	1
A	=	B	0	1	1
A	⋛	B	1	0	0

LOGIC DIAGRAM



 ST-910

7. PRINCIPLE OF DIGITAL CIRCUITS

Signals used in digital circuit are 0 and 1 only. Not only electronic computers but also various digital equipment such as measuring instruments and controllers work according to the combination of 0 and 1, as Morse code makes communication possible by means of only two signals of dots and dashes. Both Morse code and digital system have fixed rules using two signals or signs. The rules of digital systems to arrange combinations of 0 and 1 is called "Logic". No matter on how large a scale the digital equipment is, it is operated by the combination of only three logic circuits of OR (logical sum), AND (logical product) and NOT (negation). The reason why digital circuitry has seen highly developed is because of the introduction of integrated circuits due to the repeated use of these three simple circuits.

7-1. LOGIC

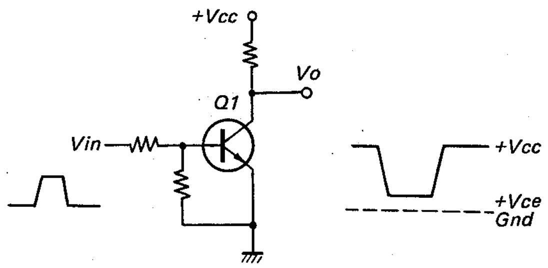
As forementioned, all information in digital circuitry is expressed by the combination of the two signs of 0 and 1. That is, digital systems must be formed by 0 and 1 only. Accordingly rules must be made what combination of 0 and 1 means what. This rule of the digital system is called "Logic", and the circuit based on the logic is called "Logical Operation Circuit" ("Logic Circuit" for short). "Logic" is not a special word for digital circuits. It comes from the science also called "Logic" which deals with the process of human thought and leads to the right conclusion. In logic, each matter (proposition) is judged true of false one by one, and right conclusion is reached. And logic has two standards of true and false is similar to digital circuits having two signs of 0 and 1. Thus the algebra of logic, which forms logic, applies to digital circuits.

The 1 and 0 are also called affirmation and negation, and symbolized A and Ā. In digital circuit, anything can be used as circuit element, if there are two definitely distinguishable states, which can be externally controlled. Thus digital element is alternative and called "Two-level Logic". The following are the practical examples of two distinguishable states:

Voltage is high or low at a point.
Current flows into or out of a point.
Transistor is on or off.
Pulse is present or absent at a cirtain time.

The two states in circuits which will be mentioned hereinafter are that voltage is high or low at a point, in most cases. The difinition which voltage will be 1 or 0 is free. It may be that high voltage is 1 and low voltage is 0, and vice versa. The important matter is to define which voltage is 1 or 0.

Taking a saturated inverter circuit as an example, as in Figure 8-1, when NPN transistor Q1 is off, its collector output voltage Vo is to the power supply voltage Vcc, and when on, the collector is saturated and the voltage $+V_{CE}$ (sat) (≈Gnd). Therefore, the two states in this circuit are +Vcc and $+V_{CE}$ (sat), and either may be defined as 1 or 0.



Positive logic	Negative logic
logic 1	logic 0
logic 0	logic 1

Fig. 7-1. Positive logic and Negative logic

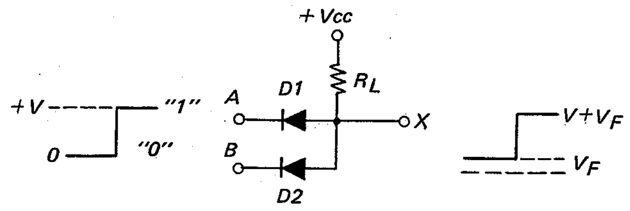
If the relatively high voltage is defined as 1, and the low voltage as 0, the logic is called "Positive Logic", and conversely if the relatively high voltage is 0, and the low Voltage is 1, it is called "Negative Logic".

Positive logic: 1 = +Vcc
0 + +VCE (sat)
Negative logic: 1 = +VCE (sat)
0 = +Vcc

To make up a digital system, the necessary logical functions are OR, AND, NOT and DELAY. But a delay circuit can be made with a flip flop circuit and a flip flop circuit can be made with the combination of the first three functions. Therefore, basic logical functions are OR, AND and NOT. The combination of these three makes every function possible.

(1) Logical product (AND)

A logical product circuit is called an AND circuit, or an AND gate. The example of an AND circuit is shown in Figure 8-2, in which voltage of 0(V) or +V(V) is applied to input and/or B. According to positive logic, 1 is +V(V) and 0 is 0(V). If 0(V) is applied to input A or B, or applied to both inputs, the connected diode D1 or D2, or both diodes will be conducting and the forward voltage drop of the diode which is almost equal to grounding potential is developed at output X. Only when +V(V) voltage is applied to both inputs, a high positive voltage +V is developed at the output.



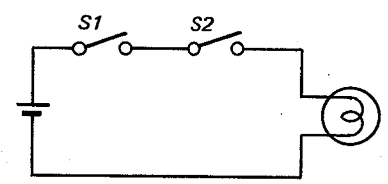
(a) Circuit

A	B	X
0	0	0
0	1	0
1	0	0
1	1	1

(b) Truth table

Fig. 7-2. AND Circuit and Truth table

The table in Figure 8-2 shows the output for the combination of inputs A and B. Such a table that shows the relation of output and combination of inputs is called a "Truth Table". As in this truth table, only when all the inputs are 1, output is 1, this is logical product. The circuit shown in Figure 8-3 is a common to study the logical product, in which switches are connected in series.



(a) Circuit

S1	S2	L
0	0	0
1	0	0
0	1	0
1	1	1

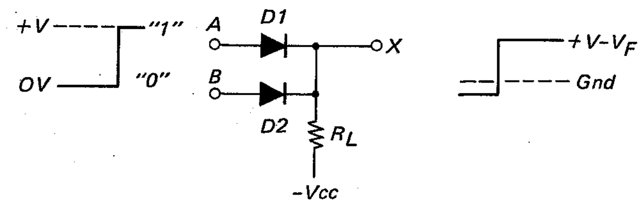
S = 1 = closed L = 1 = light-ON
S̄ = 0 = open L̄ = 0 = light-OFF

(b) Truth table

Fig. 7-3. An example of AND circuit

The inputs are switches S1 and S2. Closed switches are defined as 1, and open switches as 0. The output is the lamp, and light-ON is defined as 1, and light-OFF as 0. Then all inputs must be 1 (switches are closed) to obtain an output of 1 (lamp lights). Therefore, the circuit of Figure 8-3 can be considered as an AND circuit. Switches S1, "AND" S2 must be closed to light the lamp.

A logical sum circuit is also called an OR circuit, or OR gate. Figure 8-4 is an example of it. By positive logic, when 1 = +V is applied to either of the inputs, for example, to input A as in Figure (a), diode D1 will conduct and at output X, +V voltage which is reduced by V_F (forward drop voltage of diode) is developed.



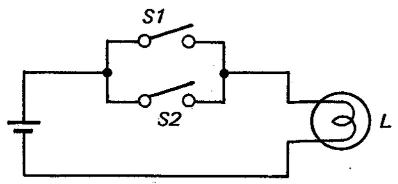
(a) Circuit

A	B	X
0	0	0
1	0	1
0	1	1
1	1	1

(b) Truth table

Fig. 7-4. OR Circuit

If, at this time, OV is applied to input B, D2 is cut off by reverse bias and B is nothing to do with the output. As in truth table of (b), if either of the inputs A and B is 1, the output is 1, this is an OR circuit. Figure 8-5 is an example of OR circuit with switches. Switches are connected in parallel and to light lamp, one switch is enough to be closed. It is not necessary to close both switches. S1 "OR" S2 must be closed to light the lamp.



(a) Circuit

S1	S2	L
0	0	0
1	0	1
0	1	1
1	1	1

S = 1 = closed L = 1 = light-ON
S̄ = 0 = open L̄ = 0 = light-OFF

(b) Truth table

Fig. 7-5. An example of OR Circuit

(3) Negation (NOT)
A negation circuit is called a NOT circuit, or inverter, in which the output is always the inverse of the input. Taking Figure 8·1 as an example, if a high voltage is applied to the input (Vin = +V), Q1 is turned on, and a low collector saturated voltage is developed at the output, and if a low voltage is applied to the input (Vin = 0), Q1 turns off and high supply voltage is developed. The truth table is as shown.

Input	Output
0	1
1	0

Fig. 7-6. Truth table of NOT

The equation is as follows:

AND $X = A \cdot B \ (= AB)$ (8·2)
OR $X = A + B$ (8·4)
NOT $X = \bar{A}$

The basic logical function is these three. But instead of them, NOR circuits and NAND circuits may be the basic circuits, which are the combinations of NOT and AND, and NOT and OR.

NAND = AND + NOT = $\overline{AB}$
NOR = OR + NOT = $\overline{A+B}$

Table 7-1. Logic symbol

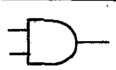
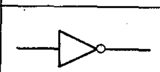
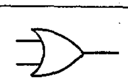
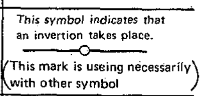
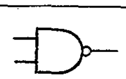
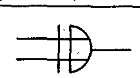
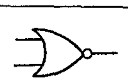
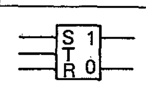
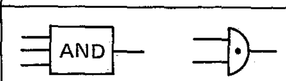
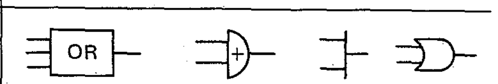
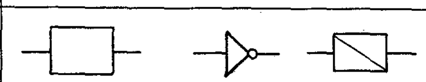
NAME	SYMBOL	NAME	SYMBOL
logic product AND		negation NOT	
logic sum OR		logic negation	
NAND		Exclusive OR	
NOR		Flip Flop	

Table 7-2. Logic symbols of all sorts

NAME	SYMBOL
logic product AND	
logic sum OR	
negation NOT	

7-2. Binary Number System

Numbers we usually use are 0, 1, 2, 3, 4, 5, 6, 7, 8 and 9, which have each different meaning. This is decimal system, whose units are powers of ten. The meaning which each of the numbers from 0 to 9 have is called significance. By means of decimal system, 1234, for example, is expressed as follows:

$1234 = 1 \times 10^3 + 2 \times 10^2 + 3 \times 10^1 + 4 \times 10^0$

The base is 10. It is said that the base of 10 originates in 10 fingers of man's hands. But 10 is not only one base to express number. If the base is 2, 1234 is expressed as follows:

The maximum power of 2 smaller than 1234 is $2^{10} = 1024$. Then, $1234 = 2^{10} + X1 \quad X1 = 210$
In the same manners,
$X1 = 2^7 \ (= 128) + X2 \quad X2 = 82$
$X2 = 2^6 \ (= 64) + X3 \quad X3 = 18$
$X3 = 2^4 \ (= 16) + X4 \quad X4 = 2$
$X4 = 2^1 \ (= 2)$
Then, $1234 = 2^{10} + 2^7 + 2^6 + 2^4 + 2^1 =$ 10011010010

Such a number system whose base is 2 is called the Binary Number System, whose units are powers of 2. Numbers of the binary number system are 1 and 0 only. This is most convenient to digital circuit in which only two states are permitted, like high voltage and low voltage. But this binary number is not familiar to us, even though it is convenient to digital system. For example, it is difficult to know intuitively how to express the above 10011010010 by means of decimal system and 1234 by means of binary number system. Accordingly, it is necessary to convert decimal number into binary number when putting numbers into a computer, and conversely to convert binary numbers into decimal number when expressing the result. Then, instead of absolute binary numbers symbolized binary numbers are used for computer programming.

One of the symbolized binary numbers is Binary Coded Decimal (BCD). As in Table 8·3 (a), absolute binary numbers are counted by multiplying 2. But by means of the binary coded decimal system, the figure of each digit in the decimal system is expressed with binary number. Only numbers from 0 to 9 are expressed by absolute binary number.

Table 7-3. Decimal and binary number

Decimal	(a) Binary coded decimal	(b) Absolute binary number
0	0000	0000
1	0001	0001
2	0010	0010
3	0011	0011
4	0100	0100
5	0101	0101
6	0110	0110
7	0111	0111
8	1000	1000
9	1001	1001
10	1010	00010000
11	1011	00010001
12	1100	00010010
13	1101	00010011
14	1110	00010100
15	1111	00010101

Taking 1234 as an example, it is expressed as follows, by binary coded decimal:

1234 = 0001 : 0010 : 0011 : 0100

Each decimal digit is expressed by a binary number. Decimal numbers have ten significances from 0 to 9. Then, to distinguish each significance with the combination of 0 and 1 of a binary number, a binary number of 4 digits is necessary. This is because 3 digits distinguish only 8 states ($2^3 = 8$). On the other hand, 4 digits distinguish 16 states ($2^4 = 16$) and six states are unnecessary. This is seemed wasteful but is convenient, because conversion can be done intuitively. A digit in the decimal system, which can be 0,1,2,3,4,5,6,7,8 and 9 is called a "Bit" in the binary system, and can be 0 and 1. Accordingly, 1 digit is expressed with 4 bits by means of binary coded decimal. And when some bits mean one thing, this is called word, bite or code.

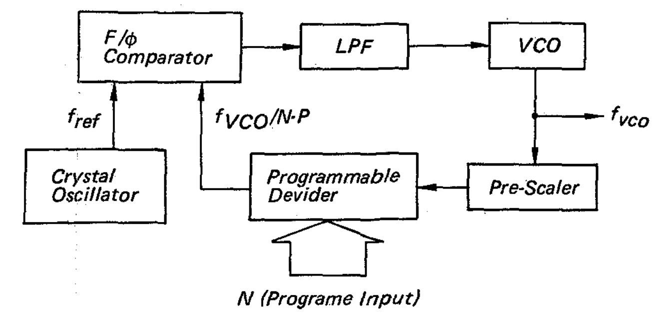


Fig. 7-7.

Fig. 7-7 is a block diagram of a typical PLL synthesizer.

An F/φ comparator compares $f_{VCO}/N \cdot P$ with f_{ref} and when they are in a phase or they have a certain phase difference, f_{VCO} is locked.

When f_{VCO} is locked, the following relation exists:

$f_{VCO}/N \cdot P = f_{ref}$

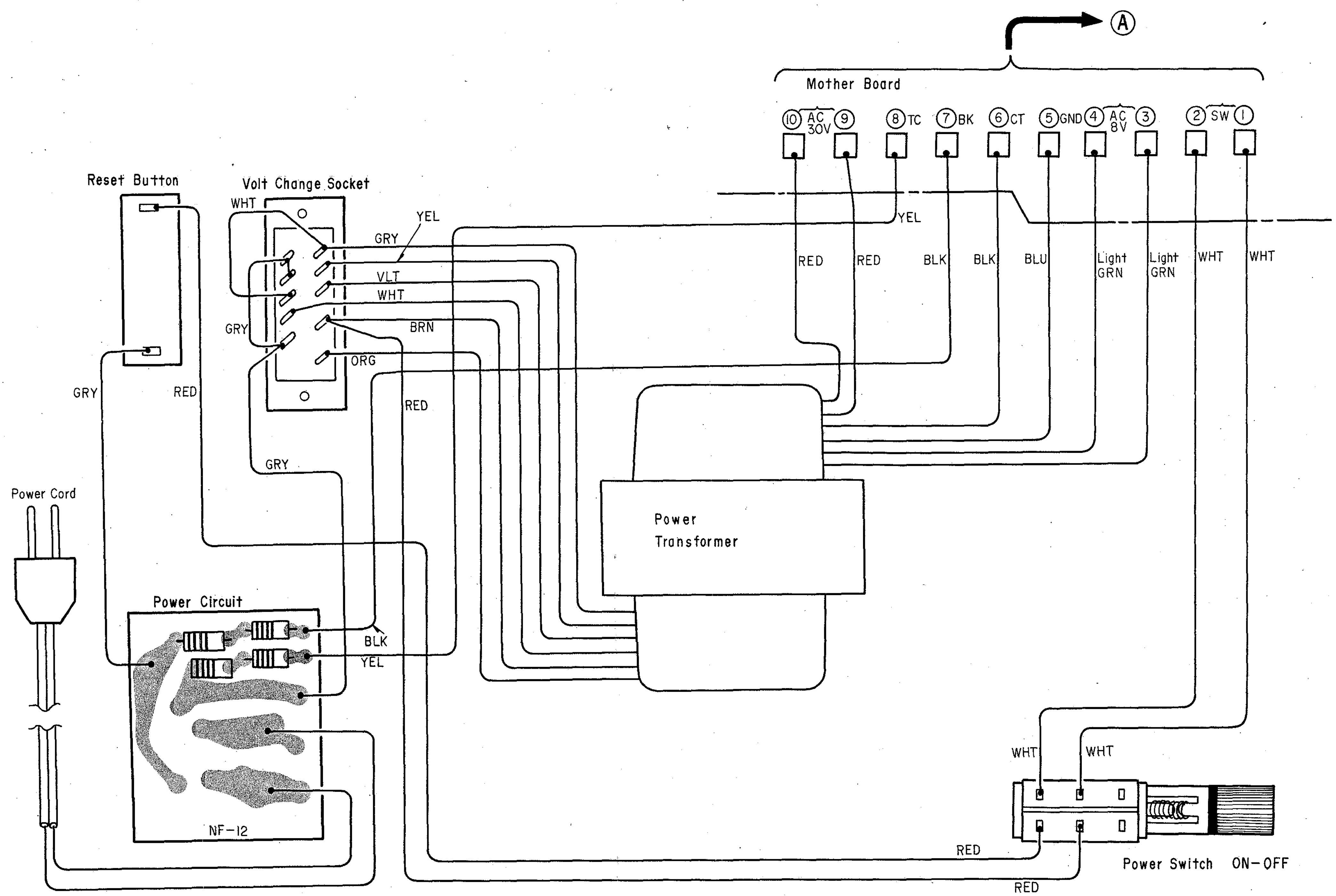
then, $f_{VCO} = N \cdot P \cdot f_{ref}$

This means that f_{VCO} can be any frequency which is a multiple of $P \cdot f_{ref}$ and can be varied with optional N.

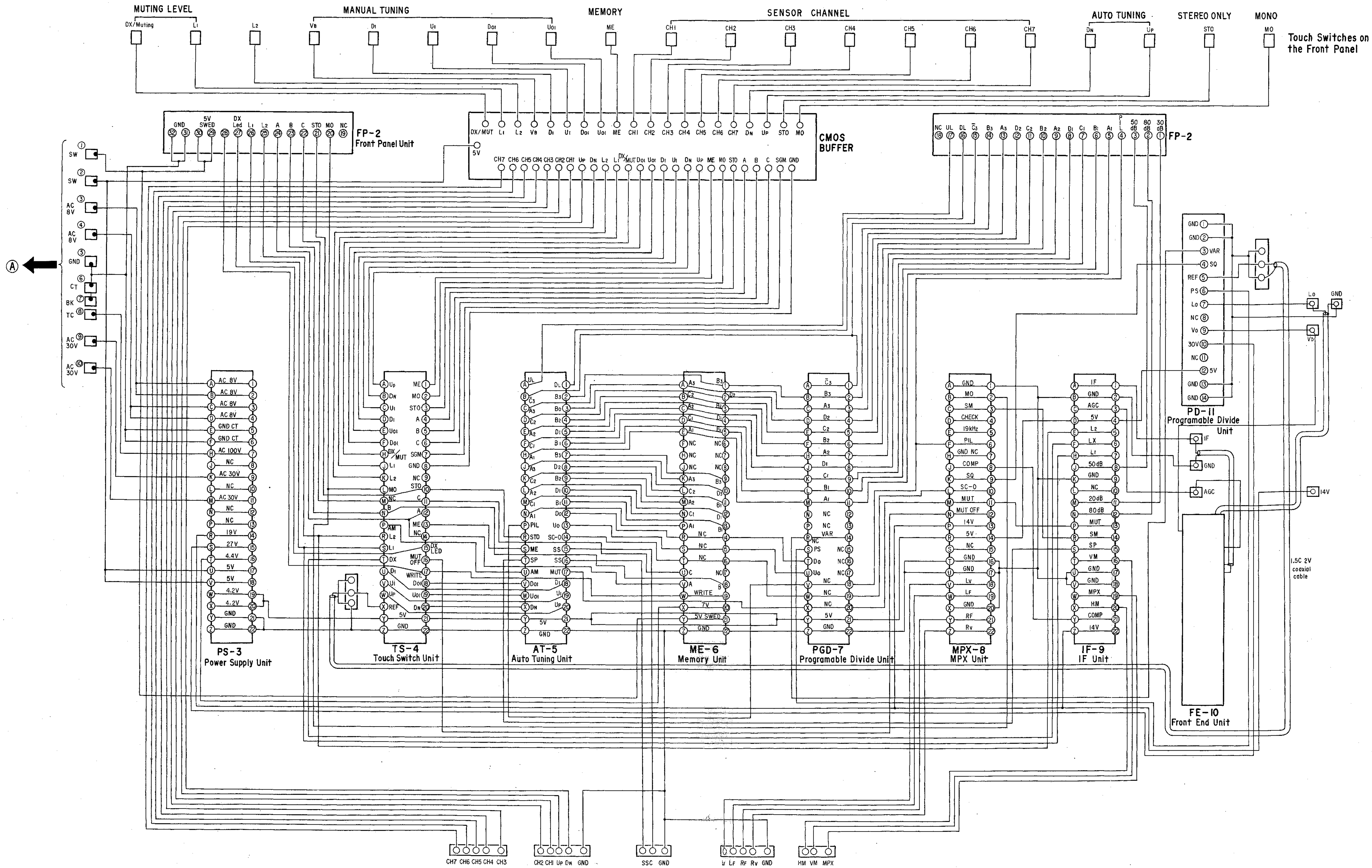
In ST-910: $f_{ref} = 25$ kHz,
$P = 4$,
$N = 982 \sim 1186$.

8. SCHEMATIC AND MOUNTING DIAGRAM

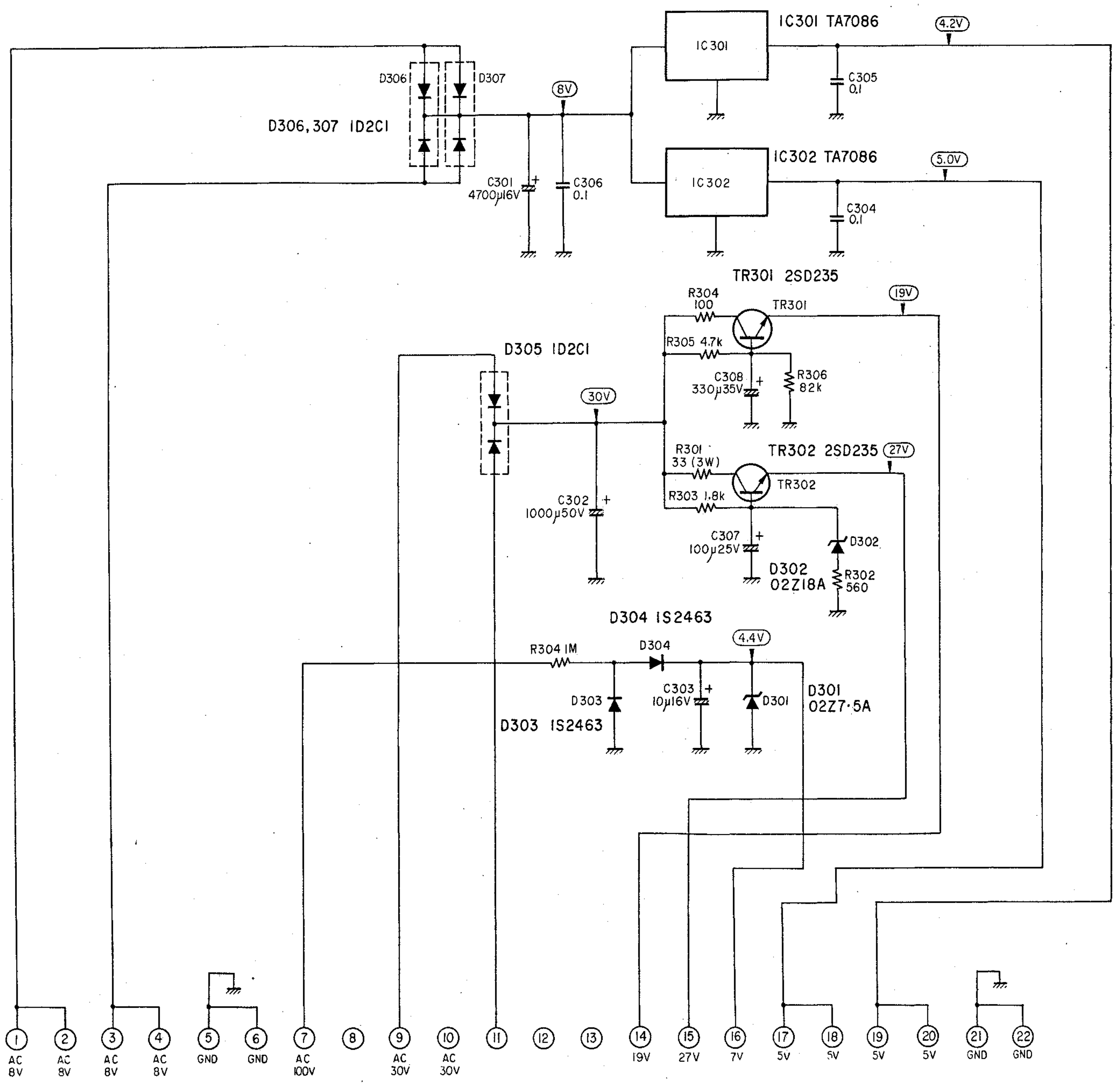
8-1. Schematic Diagram I, Wiring Diagram



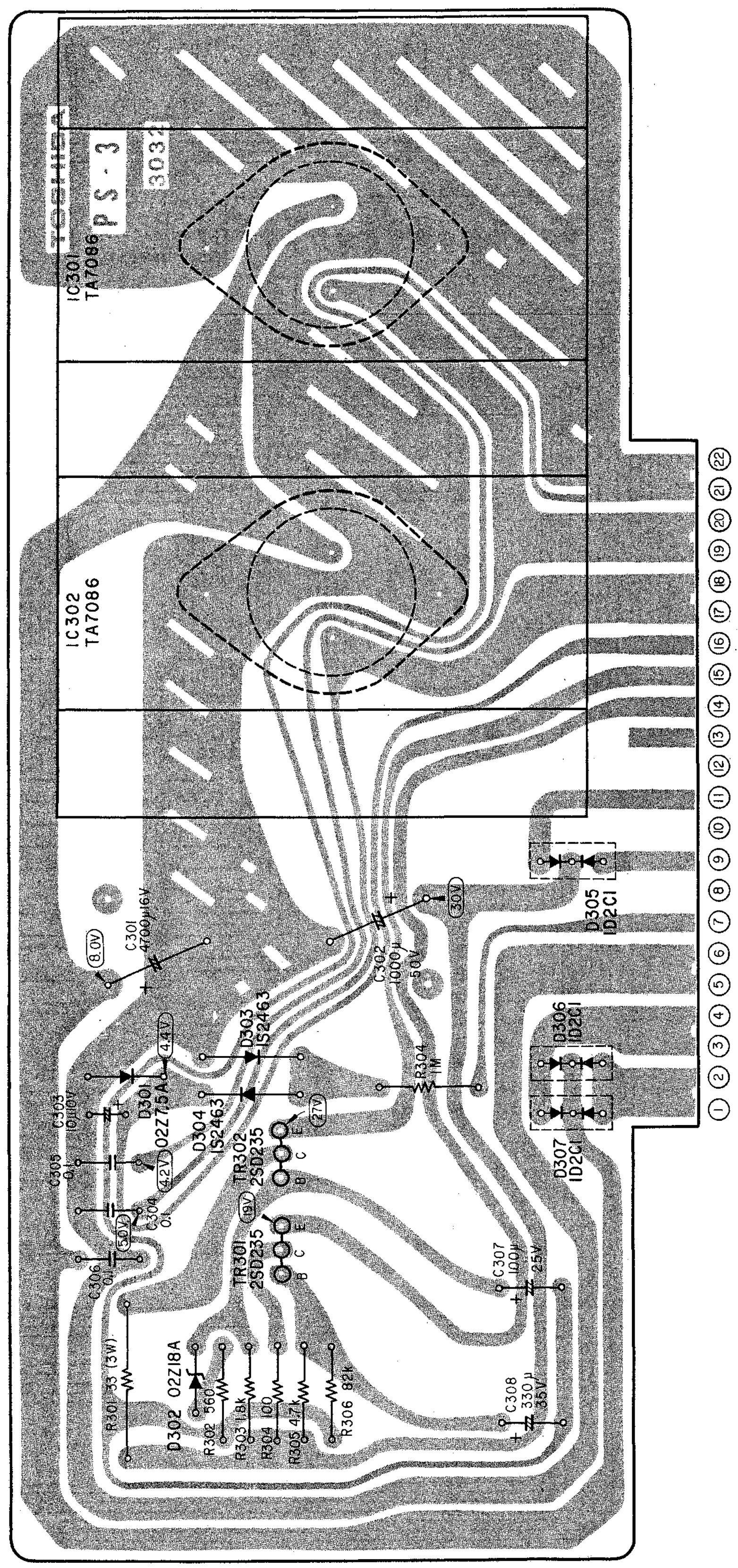
8-2. Schematic Diagram II, General



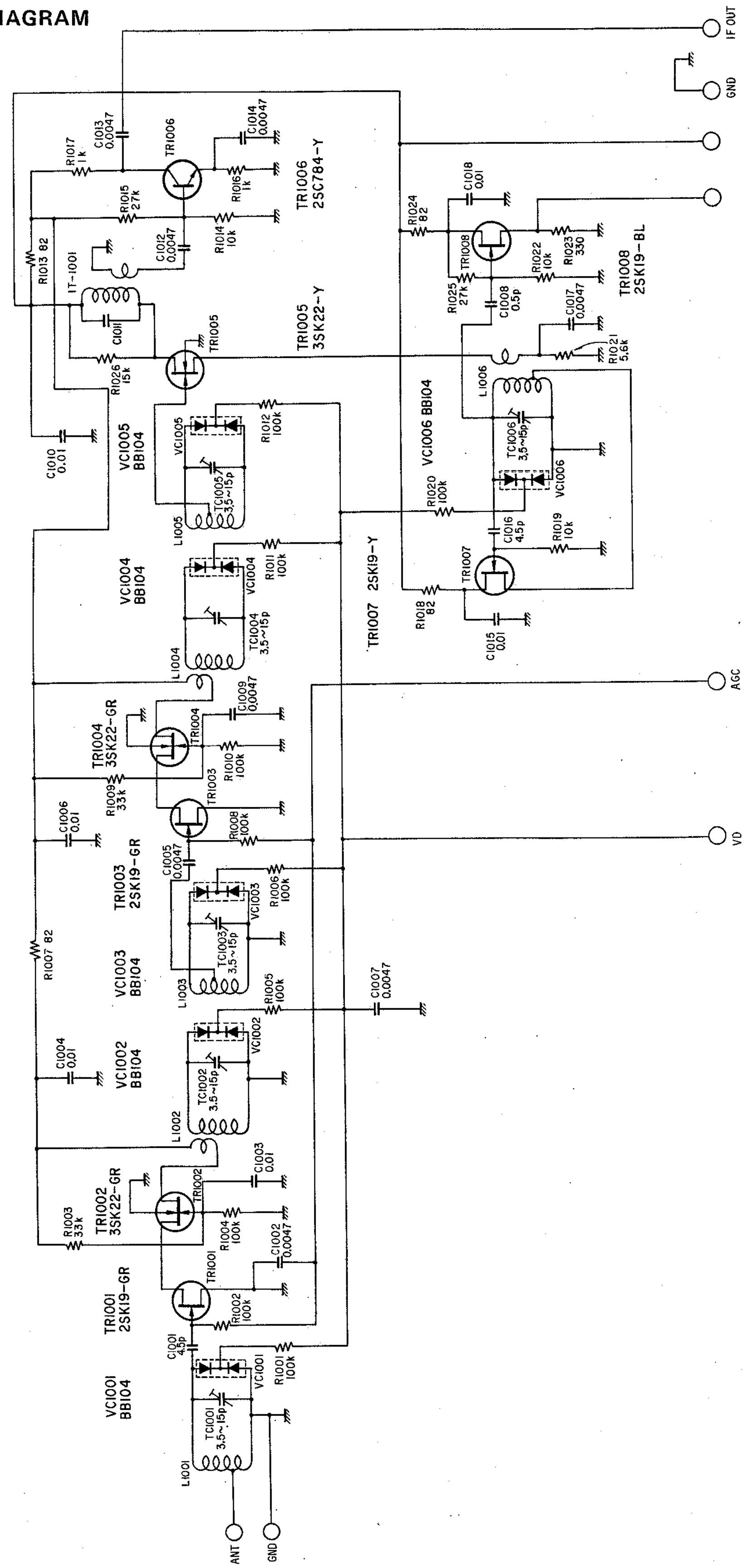
8-3. Power Supply Unit CCT-PS-3
SCHEMATIC DIAGRAM



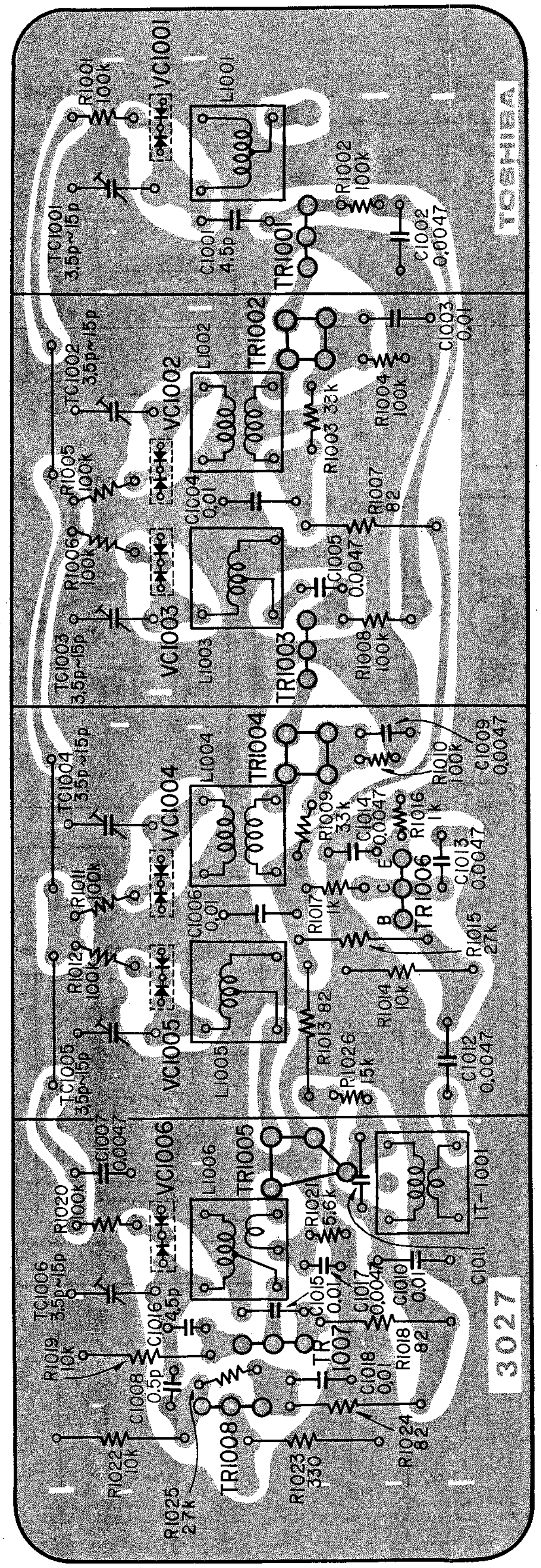
Power Supply Unit
BOTTOM VIEW



8-4. Front End Unit CCT-FE-10
SCHEMATIC DIAGRAM

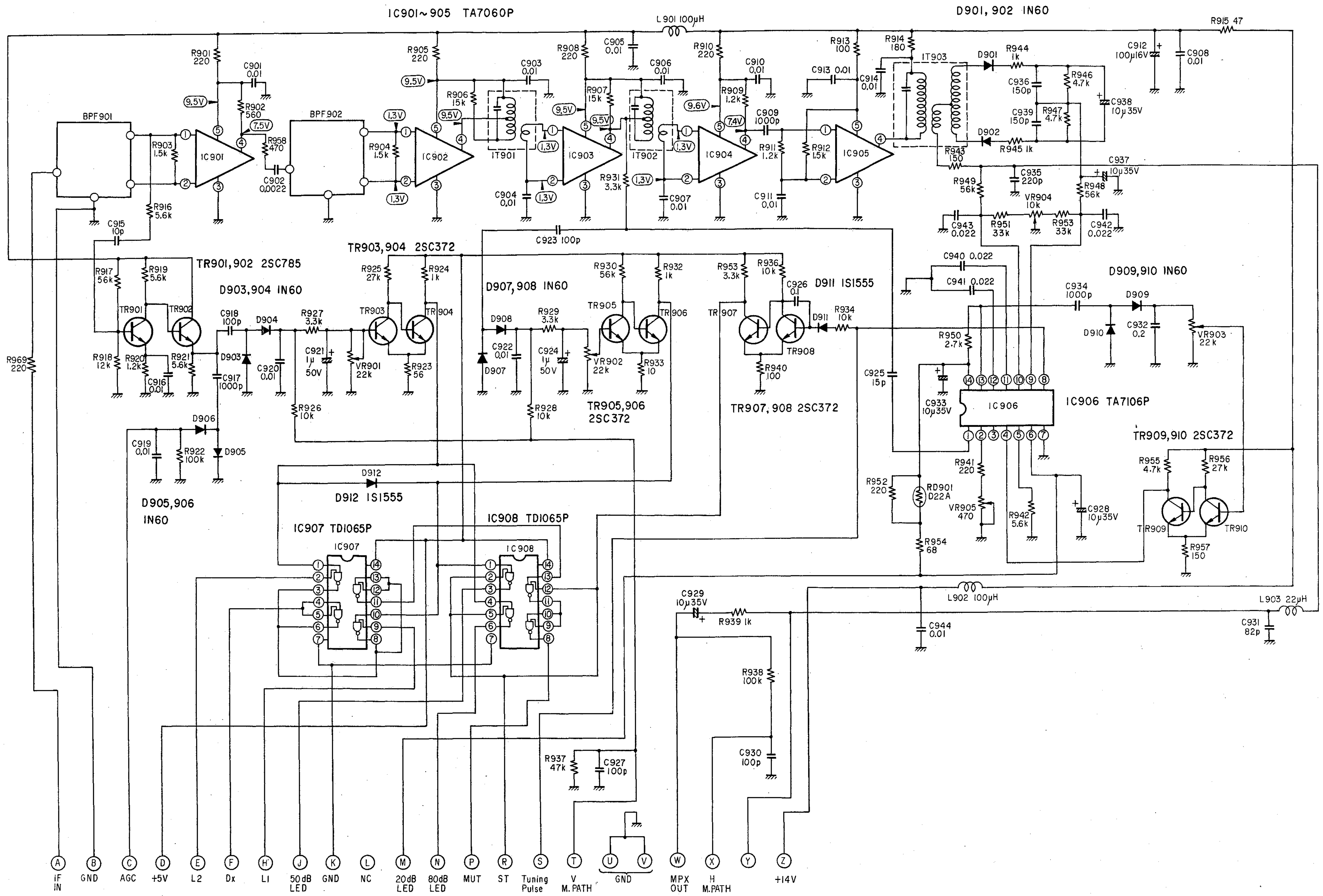


BOTTOM VIEW

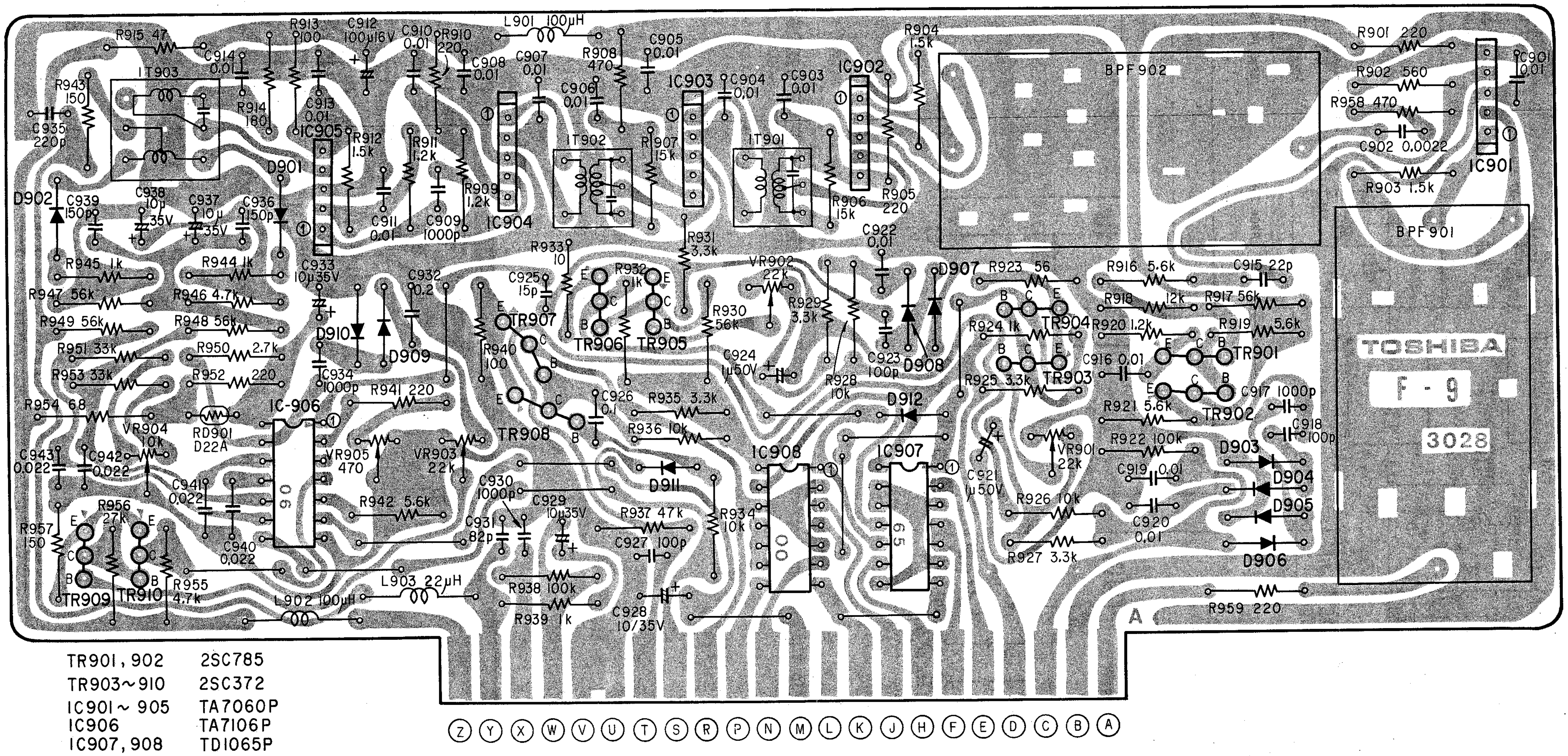


TR1001, 1003	2SK19-GR
TR1002, 1004	3SK22-GR
TR1005	3SK22-Y
TR1006	2SC784-Y
TR1007	2SK19-Y
TR1008	2SK19-BL
VC1001~1006	BB104

8-5. IF Unit CCT-IF-9
SCHEMATIC DIAGRAM



BOTTOM VIEW

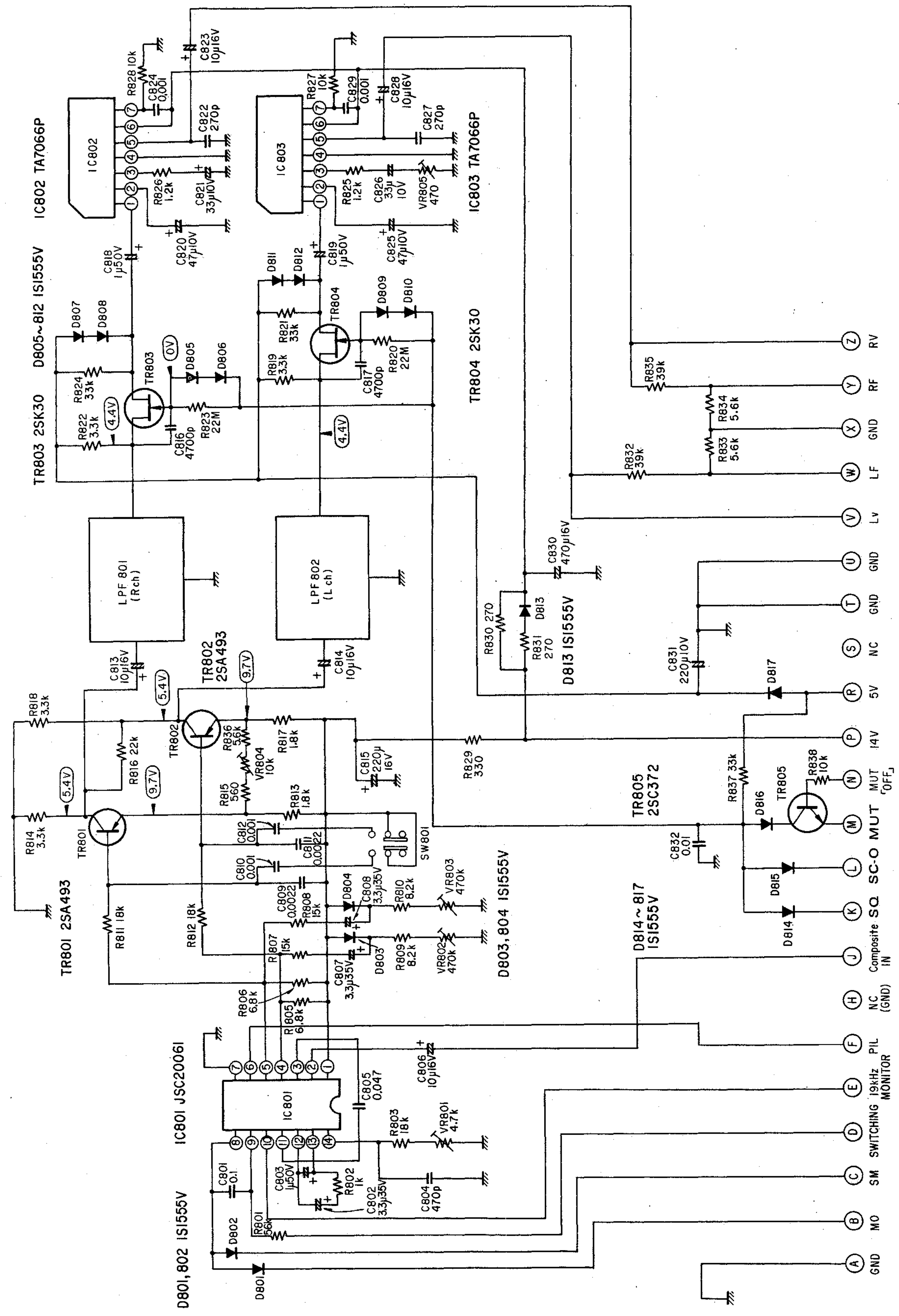


TR901, 902	2SC785
TR903~910	2SC372
IC901~905	TA7060P
IC906	TA7106P
IC907, 908	TD1065P
D901~910	IN60
D911, 912	IS1555

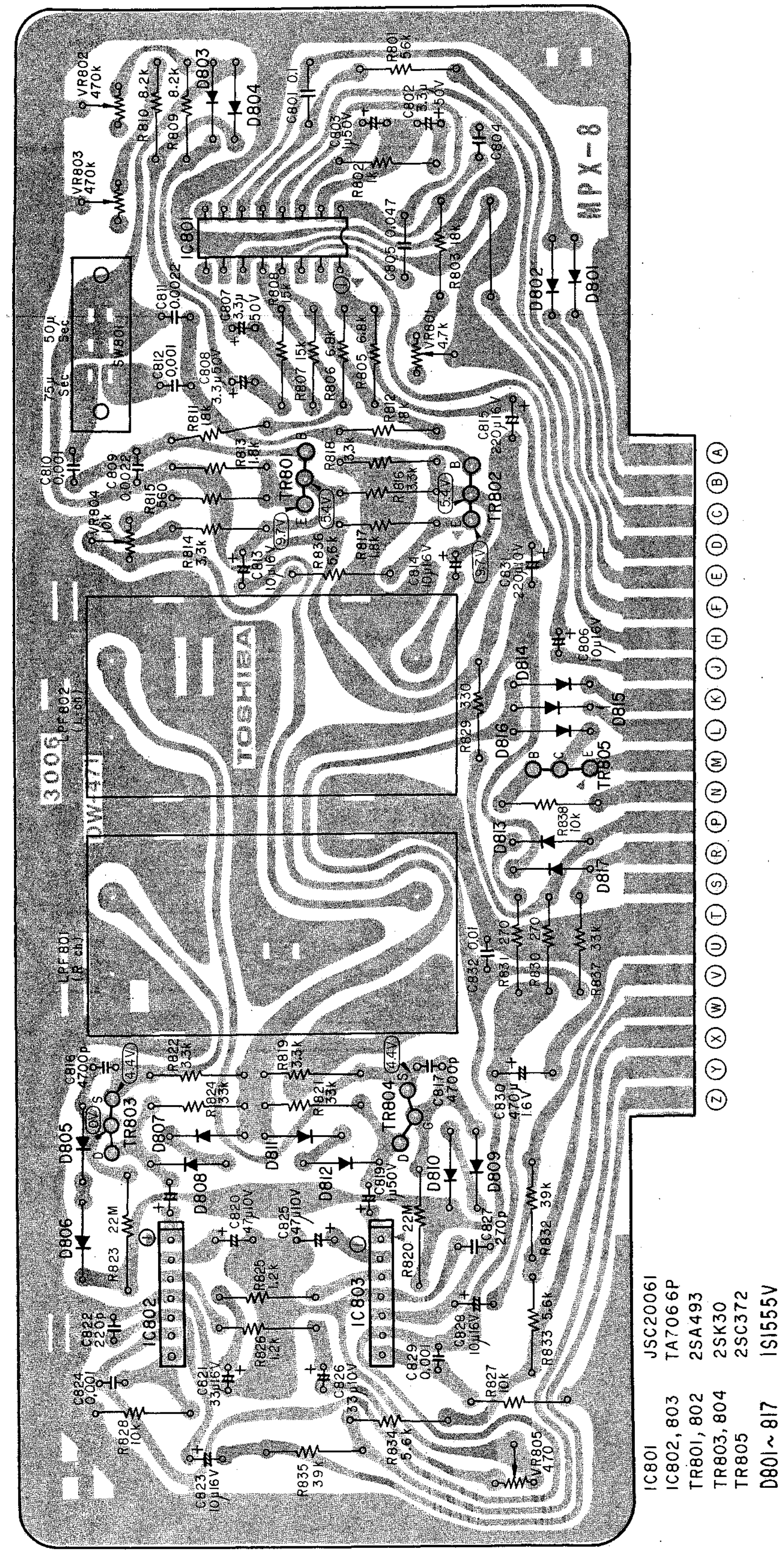
VOLTAGE CHART

	1	2	3	4	5
IC901			GND	7.5 V	9.5 V
IC902	1.3 V	1.3 V	GND	9.5 V	9.5 V
IC903	1.3 V	1.3 V	GND	9.5 V	9.5 V
IC904	1.3 V	1.3 V	GND	7.4 V	9.6 V

8-6. Multiplex Unit CCT-MPX-8
SCHEMATIC DIAGRAM



BOTTOM VIEW



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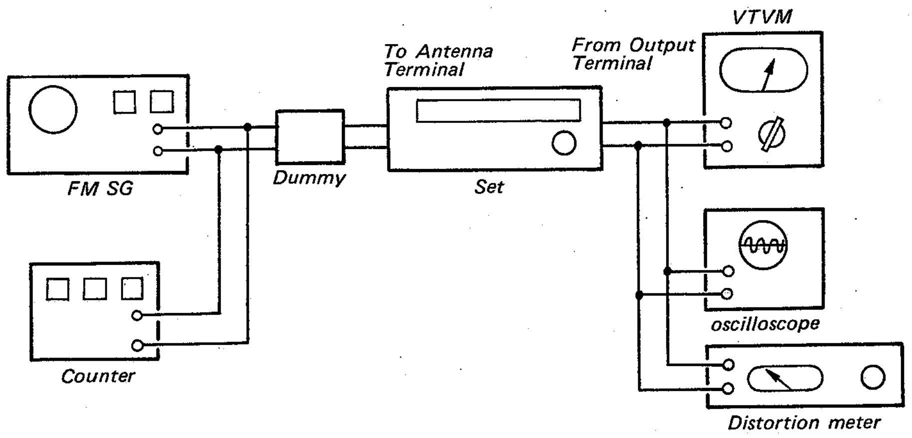
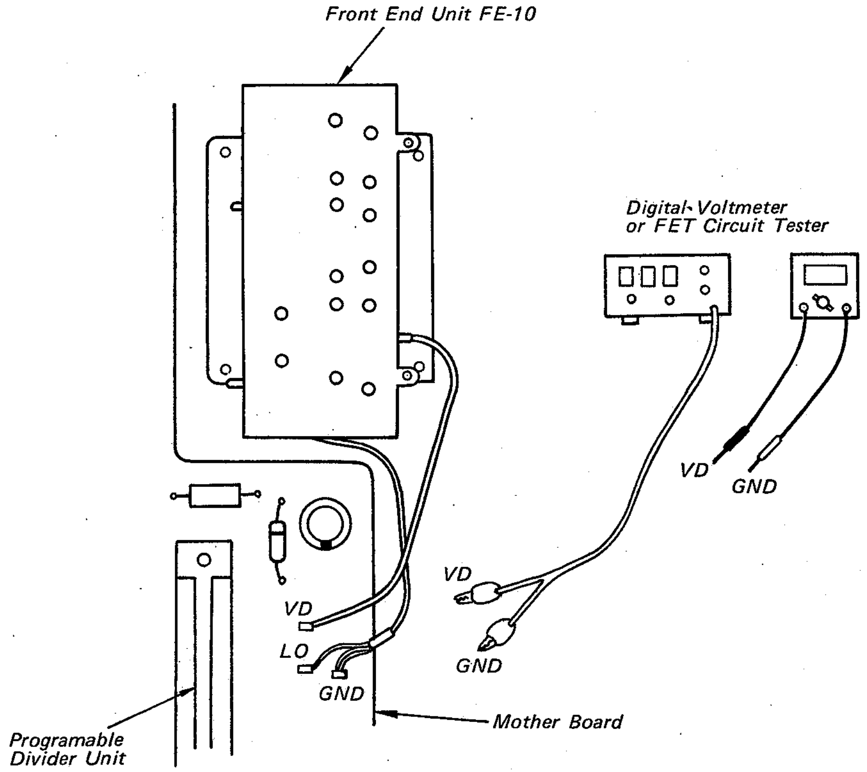
9. CIRCUIT ADJUSTMENTS

9-1. RF ADJUSTMENTS

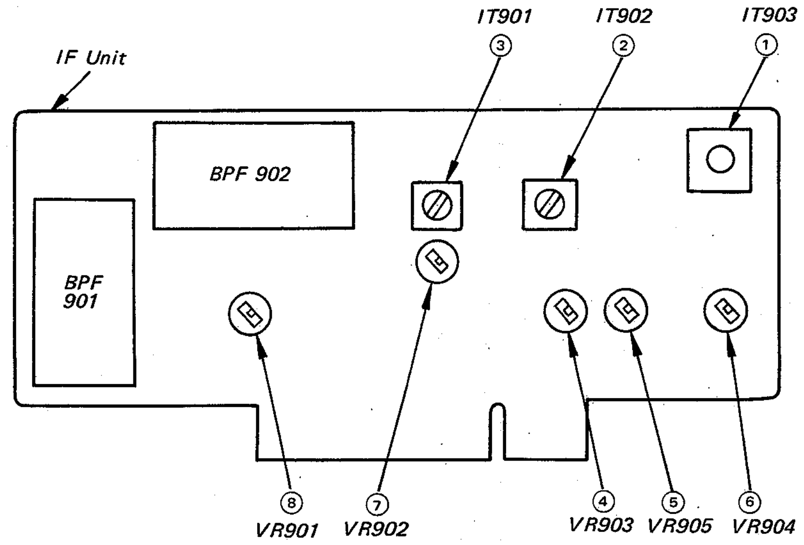




1. Adjust Vd (Voltage across Varicap) to 4.0 V at 87.5 MHz and to 25.0 V at 107.9 MHz with L1006 and TC1006. Repeat two or three times for precise adjustment.
2. Check the frequency calibration at 98.0 MHz.

   Notes:
   - o FM signal generator shall be switched on 30 minutes before use.
   - o Calibrate the signal generator for 1 kHz accuracy at 98.000 MHz (106 dB, with no modulation) with a 250 MHz frequency counter.
   - o After the signal generator calibration, turn off the frequency counter to prevent interference.
3. Adjust oscillator coil and trimmer for maximum sensitivity at 88 MHz and 107.8 MHz, respectively. Repeat several times to minimize tracking error.

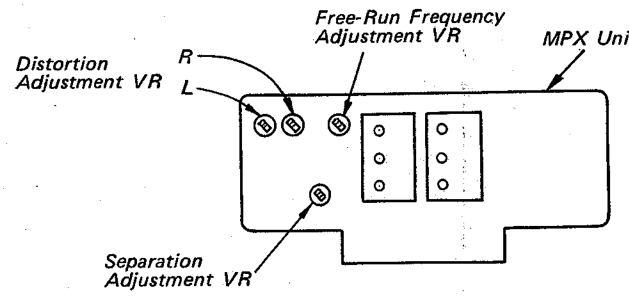
9-2. Distortion and Separation Adjustment



1. Feed frequency-counter-calibrated 98.000 MHz signal from a signal generator and tune the receiver to it.
2. Minimize MPX OUT distortion with discriminator transformer①. (monaural)
   Specification: 0.15 % maximum
   Conditions: Carrier; 98.000 MHz, 60 dB
   Modulation; 75 kHz deviation at 1 kHz

   Notes:
   - o Since this discriminator adjustment causes pulse position change, re-adjust VR⑥ so that SIGNAL LEVEL indicator on the front panel lights.
   - o Use external modulation.
3. Minimize L– and R–channel distortion with distortion adjustment VRs. (stereo)
   Specification: 0.2 % maximum

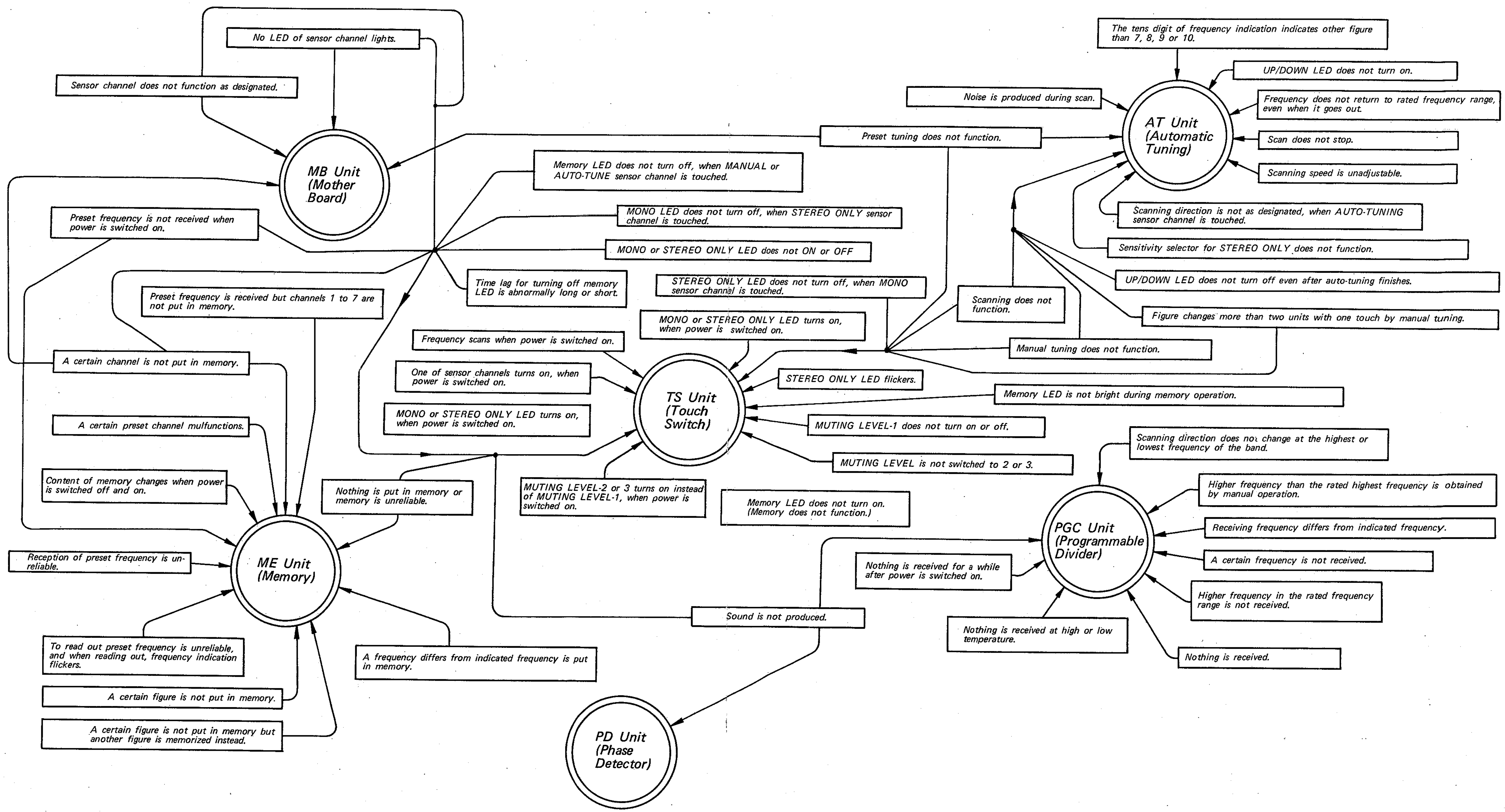
   Notes:
   - o Use external stereo modulator.
   - o Make sure that monaural distortion is less than 0.15 % when MONO SW is depressed.



4. Adjust separation adjustment VR for maximum separation by switching stereo modulator for L– or R–channel modulation.
5. Remove IF unit and check the pulse width.
6. Adjust LED lighting level with VRs④,⑦ and ⑧ on IF unit, as follows.

LED	adjust	lighting level
20 dB	VR④	-12 ~ -20 dB
40 dB	VR⑦	-32 ~ -43 dB
60 dB	VR⑧	-52 ~ -63 dB

10. TROUBLE SHOOTING CHART
(Digital Circuit)



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11. PARTS LIST

SYMBOL NO.	PART NO.	DESCRIPTION
TRANSISTORS, DIODES & INTEGRATED CIRCUIT		
		(Mother Board Section)
IC101,102		I.C., TC7420P
IC103,104		I.C., TC7404P
D101-123		Diode, 1S1555V
		(Front Panel Section)
IC201		I.C., TD3442AP
IC202-204		I.C., TD3447AP
IC203-205		I.C., TD1072P
IC206		I.C., TD3400AP
TR201		Transistor, 2SA496
TR202		Transistor, 2SA495
D201, D213-217		Diode, Radiation, TLR102
D202-212, D218-220	22115248	Diode, Radiation, GL-30PG
LED201-204		Diode, Radiation, TLR306
		(Power Supply Section)
IC301,302		I.C., TA7086
TR301,302		Transistor, 2SD235
D301		Diode, 02Z7.5A
D302		Diode, 02Z18A
D303,304		Diode, 1S2463
D305-307		Diode, 1D2C1
		(Touch Switch Section)
IC401,402, 409,415,417		I.C., TD3404P
IC403,404, 410,416		I.C., TD3400P
IC405,406		I.C., TC7404P
IC407,412		I.C., TD3473AP
IC408		I.C., TD1062P
IC411		I.C., TD3410P
IC413		I.C., TC7400P
IC414		I.C., TD3475AP
IC418,419		I.C., TD3493P
D401-410		Diode, 1S1555V
D411		Diode, 1N60
TR401-403		Transistor, 2SC372
TR404		Transistor, 2SC372-0
		(Auto Tuning Section)
IC501,508		I.C., TD1065P
IC502-505, IC510,511		I.C., TD3400AP
IC506		I.C., TD3474AP
IC507		I.C., TD34192AP
IC509		I.C., TD1072P
IC512		I.C., TD3419AP
IC513		I.C., TD1060P
TR501-505		Transistor, 2SC372
D501-507		Diode, 1S1555V
D508-511		Diode, 1N60
		(Memory Section)
IC601-603		I.C., TC7476P
IC604		I.C., TC5000C
IC605,606		I.C., TC7400P
IC607,611		I.C., TD3442AP
IC608		I.C., TD3410AP
IC609		I.C., TD3502AP

SYMBOL NO.	PART NO.	DESCRIPTION
IC610,612, 613		I.C., TD3404AP
IC614,618, 619		I.C., TD3475AP
IC615-617		I.C., TD1065P
TR601-603		Transistor, 2SA495
D601-603		Diode, 1S1555
		(Programmable Divider Section)
IC701,702, IC710,711		I.C., TD3502AP
	22114015	I.C., SN74SOON
IC703-708		I.C., TD3474AP
IC712-718		I.C.,TD3400AP
IC709	22114014	I.C., SN74S74N
TR701-703		Transistor, 2SC732-GR
D701-726		Diode, 1S1555V
		(Multiplex Section)
IC801	22114376	I.C., JSC20061
IC802,703		I.C., TA7066P
TR801,802		Transistor, 2SA493
TR803,804		Transistor, 2SK30
TR805		Transistor, 2SC372
D801-817		Diode, 1S1555V
		(I.F. Section)
IC901~905		I.C., TA7106P
IC906		I.C., TD1065P
IC907, 908		I.C., TA7060P
TR901,902		Transistor, 2SC785
TR903-910		Transistor, 2SC372
D901-910		Diode, 1N60
D911		Diode, 1S1555
		(Front End Section)
TR1001,1003		Transistor, 2SK19-GR
TR1002,1004		Transistor, 3SK22-GR
TR1005		Transistor, 3SK22-Y
TR1006		Transistor, 2SC784-Y
TR1007		Transistor, 2SK19-Y
TR1008		Transistor, 2SK19-BL
VC1001-1006	22111002	Diode, BB104
		(Phase Detector)
IC1101,1103		I.C., TD3400P.
IC1102		I.C., TD3420P
IC1104		I.C., TD3410AP
IC1105	22114016	I.C., SN74S112
TR1101		Transistor, 2SC372-Y
TR1102,1103		Transistor, 2SC734
D1101-1104		Diode, 1S1555V
COILS & TRANSFORMERS		
		(Antenna Circuit Section)
	22290002	Coil, Antenna, LH-9050
		(Touch Switch Section)
L401,402	22241013	Coil, Choke, LH10-10130
		(Auto Tuning Section)
L501	22241013	Coil, Choke, LH10-10130
		(Programable Divider Section)
L701	22211178	Coil, Choke, LH-111780

SYMBOL NO.	PART NO.	DESCRIPTION
		(Front End Section)
L1001	22294255	Coil, FM, RT-8134255
L1002	22294256	Coil, FM, RT-8134256
L1003	22294257	Coil, FM, RT-8134257
L1004	22294256	Coil, FM, RT-8134256
L1005	22294257	Coil, FM, RT-8134257
L1006	22294258	Coil, FM, RT-8134258
IT1001	22265655	Transformer, IF, IT-6478
T1	22213889	Transformer, power
ELECTRICAL PARTS		
		(Mother Board Section)
E1	22167441	Jack, 22P
E2	22167442	Jack, 14P
E3	22167446	Jack, 18P
E4	22746149	Pin, Connector
		(Multiplex Section)
E5	22114376	Multiplex, JSC20061
E6	22137017	Filter, Low Pass
E7	22145938	Switch, Slide
		(IF Section)
E8	22137016	Filter, Band Pass
		(Phase Comparator Section)
E9	22146677	Switch, power
		(Panel Back Section)
E10	22148622	Circuit Breaker
E11	22163343	Jack, US Pin 4P
E12	22163361	Jack, US Pin 7P
E13	22163442	Jack, US Pin 2P
E14	22167443	Socket, 10P
E15	22167453	Connector, AC
E16	22176221	Power Cord, UL (TY)
E16	22176286	Power Cord, E2ES (TE)
E20	22167145	Volt Change Socket
		(Noise Filter Section)
E17	22137015	Noise Filter, LH-117015
		(Antenna Circuit Section)
E18	22162327	Terminal
E19	22163447	Connector, FR
CAPACITORS		
J=±5%, K=±10%, M=±20%, P=-0+100%, Z=-20+80%		
		(Antenna Circuit Section)
C001,002	22340066	Ceramic, 470PF, M
		(Mother Board Section)
C103,104,105, 106,107,108, 109,101,102	22343102	Ceramic, 0.01 mfd, M
		(Power Supply Section)
C301	22403046	Electrolytic, 8000 mfd, 16V
C302	22403039	Electrolytic, 1000 mfd, 50V
C303	22445100	Electrolytic, 10 mfd, 16V
C304,305,306	22373104	Mylar, 0.1 mfd, M
C307	22446101	Electrolytic, 100 mfd, 25V
C308	22447331	Electrolytic, 330 mfd, 35V

SYMBOL NO.	PART NO.	DESCRIPTION
		(Multiplex Section)
C801	22340002	Ceramic, 0.1 mfd, Z
C802	22448339	Electrolytic, 3.3 mfd, 50V
C803	22448109	Electrolytic, 1 mfd, 50V
C804	22382471	Polystyrene, 470PF, K
C805	22373473	Mylar, 0.047 mfd, M
C806	22445100	Electrolytic, 10 mfd, 16V
C807,808	22448339	Electrolytic, 3.3 mfd, 50V
C809	22382222	Polystyrene, 0.0022 mfd, K
C810	22382102	Polystyrene, 0.001 mfd, K
C811	22382222	Polystyrene, 0.0022 mfd, K
C812	22382102	Polystyrene, 0.001 mfd, K
C813,814	22445100	Electrolytic, 10 mfd, 16V
C815	22445221	Electrolytic, 220 mfd, 16V
C816,817	22373472	Mylar, 4700PF, M
C818,819	22440060	Electrolytic, 1 mfd, 50V
C820	22443470	Electrolytic, 47 mfd, 10V
C821	22443330	Electrolytic, 33 mfd, 10V
C822	22382221	Polystyrene, 220PF, K
C823	22445100	Electrolytic, 10 mfd, 16V
C824	22382102	Polystyrene, 0.001 mfd, K
C825	22443470	Electrolytic, 47 mfd, 10V
C826	22443330	Electrolytic, 33 mfd, 10V
C827	22382271	Polystyrene, 270PF, K
C828	22445100	Electrolytic, 10 mfd, 16V
C829	22382102	Polystyrene, 0.001 mfd, K
C830	22445471	Electrolytic, 470 mfd, 16V
C831	22445221	Electrolytic, 220 mfd, 10V
C832	22373103	Mylar, 0.01 mfd, M
		(IF Section)
C901	22342103	Ceramic, 0.01 mfd, Z
C902	22341222	Ceramic, 0.0022 mfd, P
C903,904, 905,906,907, 908	22342103	Ceramic, 0.01 mfd, Z
C909	22343101	Ceramic, 1000PF, M
C910,911	22342103	Ceramic, 0.01 mfd, Z
C912	22445101	Electrolytic, 100 mfd, 16V
C913,914	22342103	Electrolytic, 0.01 mfd, Z
C915	22361220	Ceramic, 22PF, J
C916	22342103	Ceramic, 0.01 mfd, Z
C917	22343101	Ceramic, 1000PF, M
C918	22343101	Ceramic, 100PF, M
C919,920	22342103	Ceramic, 0.01 mfd, Z
C921	22448109	Electrolytic, 1 mfd, 50V
C922	22342103	Ceramic, 0.01 mfd, Z
C923	22343101	Ceramic, 100PF, M
C924	22448109	Electrolytic, 1 mfd, 50V
C925	22361150	Ceramic, 15PF, J
C926	22342104	Ceramic, 0.1 mfd, Z
C927	22343101	Ceramic, 100PF, M
C928,929	22447100	Electrolytic, 10 mfd, 35V
C930	22343101	Ceramic, 1000PF, M
C931	22362820	Ceramic, 82PF, K
C932	22341204	Ceramic, 0.2 mfd, P
C933	22447100	Electrolytic, 10 mfd, 35V
C934	22343101	Ceramic, 1000PF, M
C935	22382221	Polystyrene, 220PF, K
C937,938	22447100	Electrolytic, 10 mfd, 35V
C939	22382151	Ceramic, 150PF, K
C940,941, 942,943	22342103	Ceramic, 0.01 mfd, Z
C944	22342103	Ceramic, 0.01 mfd, Z

SYMBOL NO.	PART NO.	DESCRIPTION
		(Front End Section)
C1001	22361459	Ceramic, 4.5PF, J
C1002	22342472	Ceramic, 0.0047 mfd, Z
C1003,1004	22342103	Ceramic, 0.01 mfd, Z
C1005	22342472	Ceramic, 0.0047 mfd, Z
C1006	22342103	Ceramic, 0.01 mfd, M
C1007	22342472	Ceramic, 0.0047 mfd, Z
C1008	22361508	Ceramic, 0.5PF, J
C1009	22342472	Ceramic, 0.0047 mfd, Z
C1010	22361103	Ceramic, 0.01 mfd, J
C1012,1013, 1014	22342472	Ceramic, 0.0047 mfd, Z
C1015	22342103	Ceramic, 0.01 mfd, Z
C1016	22361459	Ceramic, 4.5PF, J
C1017	22342472	Ceramic, 0.0047 mfd, Z
C1018	22342103	Ceramic, 0.01 mfd, Z
TC1001,1002, 1003,1004, 1005,1006	22309108	Trimmer, (3.5–15PF)
RESISTORS		
All resistors are 1/8 W, ±10%, unless otherwise noted. k=1000		
		(Antenna Circuit Section)
R001	22544155	1.5 Mohm
		(Noise Filter Section)
	22563225	2.2 Mohm
		(Jack Plate)
VR1	22625009	Variable, 1 Kohm, B, 16 DIA.
VR2	22651415	Variable, 5 Kohm, B, 16 DIA.
		(Mother Board Section)
R101,102, 103,104,105, 106,107,108, 109,110,111, 112,113,114, 115,116	2250007	22Mohm, Composition
R117	22544823	82 Kohm
R118,119,120	22500070	22Mohm, Composition
R121,122, 123,124,125, 126,127,128, 129,130,131, 132,133,134, 135,136,137, 138,139	22544105	1 Mohm
R140,141, 142,143,144, 145,146,147	22544563	56 kohm
		(Power Supply Section)
R301	22570016	33 ohm, Fixed Metal Film, 3W
R302	22544561	560 ohm
R303	22544182	1.8 Kohm
R304	22544101	100 ohm
R305	22544472	4.7 Kohm
R306	22544182	82 Kohm
R307	22544105	1 Mohm

SYMBOL NO.	PART NO.	DESCRIPTION
R801	22544563	(Multiplex Section)
R801	22544563	56 Kohm
R802	33655203	1 Kohm
R803	22544183	18 Kohm
R805,806	22544682	6.8 K ohm
R807,808	22544158	15 Kohm
R809,810	22544822	8.2 Kohm
R811,812	22544183	18 Kohm
R813	22544182	1.8 Kohm
R814	22544332	3.3 Kohm
R815	22544561	560 ohm
R816	22544223	22 Kohm
R817	22544182	1.8 Kohm
R818,819	22544332	3.3 Kohm
R820	22500070	22 Mohm, Composition
R821	22544333	33 Kohm
R822	22544332	3.3 Kohm
R823	22500070	22 Mohm, Compositon
R824	22544333	33 Kohm
R825,826	22544122	1.2 Kohm
R827,828	22544103	10 Kohm
R829	22544331	330 ohm
R830,831	22544271	270 ohm
R832	22544393	39 Kohm
R833,834	22544562	5.6 Kohm
R835	22544393	39 Kohm
R836	22544562	5.6 Kohm
R837	22544333	33 Kohm
R838	22544103	10 Kohm
VR801	22658256	4.7 Kohm, Semi-fixed Variable
VR802,803	22658282	470 Kohm, Semi-fixed Variable
VR804	22658257	10 Kohm, Semi-fixed Variable
VR805	22658307	470 ohm, Semi-fixed Variable
		(IF Section)
R901	22544221	220 ohm
R902	22544561	560 ohm
R903,904	22544152	1.5 Kohm
R905	22544221	220 ohm
R906,907	22544153	15 Kohm
R908	22544471	470 ohm
R909	22544122	1.2 Kohm
R910	22544221	220 ohm
R911	22544122	1.2 Kohm
R912	22544152	1.5 Kohm
R913	22544101	100 ohm
R914	22544181	180 ohm
R915	22544470	47 ohm
R916	22544562	5.6 Kohm
R917	22544563	56 Kohm
R918	22544123	12 Kohm
R919	22544562	5.6 Kohm
R920	22544122	1.2 Kohm
R921	22544562	5.6 Kohm
R922	22544104	100 Kohm
R923	22544560	56 ohm
R924	22544102	1 Kohm
R925	22544332	3.3 Kohm

SYMBOL NO.	PART NO.	DESCRIPTION
R926	22544103	10 Kohm
R927	22544332	3.3 Kohm
R928	22544103	10 Kohm
R929	22544332	3.3 Kohm
R930	22544563	56 Kohm
R931	22544332	3.3 Kohm
R932	22544102	1 Kohm
R933	22544100	10 ohm
R934	22544103	10 Kohm
R935	22544332	3.3 Kohm
R936	22544103	10 Kohm
R937	22544473	47 Kohm
R938	22544104	100 Kohm
R939	22544102	1 Kohm
R940	22544101	100 ohm
R941	22544221	220 ohm
R942	22544562	5.6 Kohm
R943	22544151	150 ohm
R944,945	22544102	1 Kohm
R946,947	22544472	4.7 Kohm
R947,948	22544563	56 Kohm
R950	22544272	2.7 Kohm
R951	22544333	33 Kohm
R952	22544221	220 ohm
R953	22544333	33 Kohm
R954	22544680	68 ohm
R955	22544472	4.7 Kohm
R956	22544273	27 Kohm
R957	22544151	150 ohm
VR901,902, 903	22658281	22 Kohm, Semi-fixed Variable
VR904	22658257	10 Kohm, Semi-fixed Variable
VR905	22658284	470 ohm, Semi-fixed Variable
		(Front End Section)
R1001,1002	22554104	100 Kohm
R1003	22554333	33 Kohm
R1004,1005, 1006	22554104	100 Kohm
R1007	22544820	82 ohm
R1008	22554104	100 Kohm
R1010,1011, 1012	22554104	100 Kohm

SYMBOL NO.	PART NO.	DESCRIPTION
R1013	22544820	82 ohm
R1014	22544103	10 Kohm
R1015	22544273	27 Kohm
R1016,1017	22554102	1 Kohm
R1018	22544820	82 ohm
R1019	22544103	10 Kohm
R1020	22554104	100 Kohm
R1021	22554822	8.2 Kohm
R1022	22544103	10 Kohm
R1023	22544331	330 ohm
R1024	22544820	82 ohm
R1025	22554273	27 Kohm
R1026	22554153	15 Kohm
R1038	22544820	82 ohm
CABINET PARTS		
B1	25824174	Push Button Assembly
B2	22167145	Cover, Volt Change
B3	22705021	Rivet, 30 + 35, Plastic
B4	22705022	Rivet, 30 + 55, Plastic
B5	22754256	Nut, Din
B6	22826072	Knob Assembly
B7	22841083	Panel Back
B8	25827231	Name Plate
B9	25845120	Bush, Nylon, SR3P4 (for USA Canada)
B9	25751122	Bush, Cord, (for Europe)
B10	22828031	Leg
B11	22837226	EC Glass
B12	22851083	Cabinet
B13	25761299	Cushion, P.C. Board
B14	25828222	Decoration
B15	25819358	Panel Front Assembly
B16	22841092	Panel, Display
ACCESSORIES		
	22124452	Antenna Feeder Assembly
	22167421	Connector, FP-5
	22170109	Joint Cord, TSC-2
	22952595	Owner's Manual
	22990093	Cushion Assembly
	22999160	Cleaning Cloth

12. CABINET EXPLODED VIEW