INSTRUCTION MANUAL

YC-1000L

YAESU MUSEN CO , LTD.

TOKYO JAPAN.

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LOGGING DATA PROCESSOR

YC-1000L

The YC-1000L is a high performance test instrument for engineering or service laboratories. A precision 0.02 ppm frequency counter, digital voltmeter, and quartz clock are controlled by a 4 bit Central Processing Unit, allowing measurement of frequency stability versus time, supply voltage, and temperature. Printout on paper tape provides convenient recording of the measurement results for future reference. Thus, the YC-1000L is a single-unit test station for testing of oscillator stability.

We recommend that you read this manual in its entirety, so as to become better acquainted with the YC-1000L Logging Data Processor.

SPECIFICATIONS

1. FREQUENCY COUNTER

Frequency range: A) 10 Hz to 60 MHz
B) 50 Hz to 600 MHz

Sensitivity: A) 10mV rms
B) 20mV rms
(Refer to Chart 1)

Input voltage: A) 10mV to 20V rms (HIGH)
10mV to 2V rms (LOW)
B) 20mV to 2V rms

Input impedance: A) HIGH: 1 Mohm/20 pF
LOW: 50 ohms/20 pF
B) 50 ohms/25 pF

Gate time: 10mS, 100mS, 1S

Accuracy: ±1 count ±0.02 ppm

Display: 8 digits
(kHz readout)

Display time:

GATE	DISPLAY
10mS	100mS
100mS	200mS
1S	2S

Internal frequency standard:
1 MHz

Stability (After 24 hour warm-up period)
Aging rate: 0.02×10^{-6} per day or better
Temperature: $\pm 0.05 \times 10^{-6}$ or better over the range −10°C to +60°C

2. PERIOD MEASUREMENT (T=1/F)

Period range: 0.1S – 0.1μS

Input voltage: A) 10mV – 20V rms (HIGH)
10mV – 2V rms (LOW)

3. PULSE COUNTER

Pulse range: 0 – 99999999

Input level: TTL

4. AC/DC VOLTMETER

Voltage range: 9.99V
99.9V
999V

Frequency range: 10Hz to 1 kHz (AC range)

Input impedance: 10 Mohms

Accuracy: ±1 count ±1% (0 – 40°C)

Response time: 1 second

Display time: 2 seconds

Display: 3 digits

5. THERMOMETER

Range: −29.9°C – +99.9°C
(with supplied probe)

Accuracy: ±1 count ±2%

Response time: 1 second

Display time: 2 seconds

Probe response time:
240 seconds

6. CLOCK

Display: Time 1: 24 hour, 6 digits
(with alarm function)
Time 2: 24 hour, 6 digits

7. TIMER

Display: 24 hour, 6 digits
00. 00. 00 – 23. 59. 59

8. PRINTER

Writing system: 5 x 7 Dot Matrix Thermal Printer

Letters per line: 20

Printing speed: 2 lines per second

9. GENERAL SPECIFICATIONS

Operating temperature:
0 – 40°C

Power requirements:
AC 100/110/117/200/220 or 234V 50/60 Hz

Power consumption:
STBY: 35VA
ON: 38VA

Dimensions: 312(W) x 82(H) x 310(D) mm

Weight: approximately 6.5 Kg

SEMICONDUCTOR COMPLEMENT

IC

78C10	1
78L05	1
F3403	2
MC1416	3
MC5156	1
MC10116	1
MC14001B	3
MC14011B	1
MC14013B	2
MC14015B	1
MC14023B	1
MC14027B	2
MC14042B	6
MC14050B	3
MC14066B	2
MC14068B	2
MC14069B	2
MC14519B	1
MC14557B	1
MM74C90	1
MSL912R	2
MSM5592	1
RC4151NB	1
SN7407N	2
SN74LS00N	1
SN74LS10N	1
SN74LS112N	1
SN74LS157N	1
SN74LS196N	1
SN74S00N	1
SN74S10N	1
SN74S20N	1
SN74S196N	1
SP8630	1
TA7179P	1
TC5032P	1
TL082C	1
μPA56C	1
μPC157A	1
μPC616A	1
μPC14312	1
μPC14315	1
μPD546C-23	1
μPD546C-28	1
μPD549C	1

FET

2SK19GR	1

TRANSISTOR

2SB705R	2
2SC943	1
2SC2026	2
2SC2120Y	6
2SD389P	1
2SD794Q	1
MPS3640	1
MPS-A13	4

DIODE

1SS16 (Schottky Barrier)	2
1SS55 (Si)	1
1S953 (Si)	2
1S1555 (Si)	41
S1RBA10 (Si)	2
S5VB10 (Si)	1
TDA1053 (PIN)	1
SR105D (LED)	20
SG205D (LED)	1

DISPLAY TUBE

LD8217/FIP8A11	1

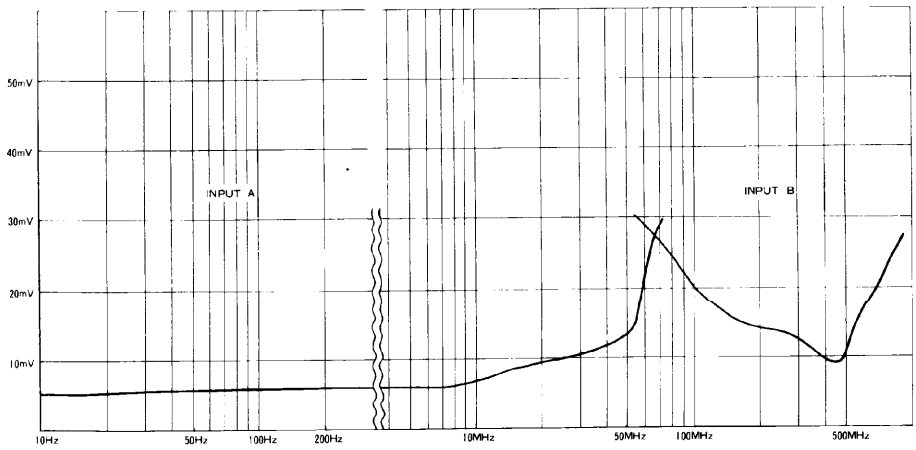
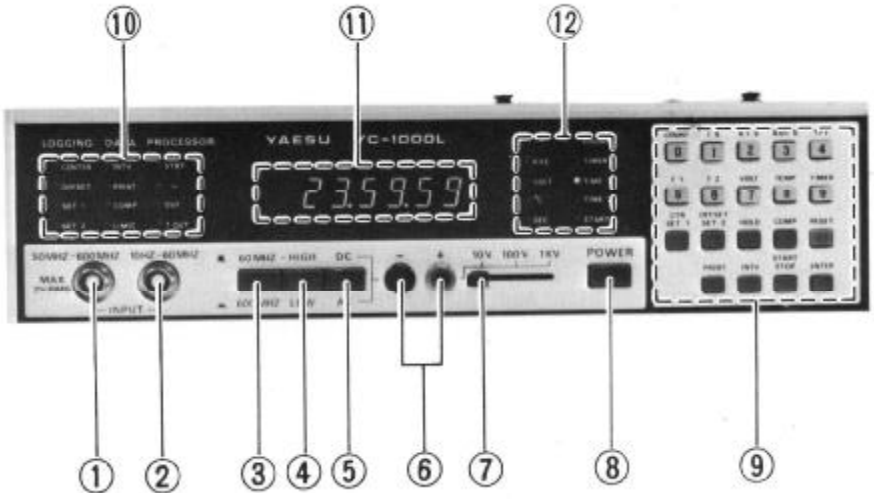


Chart 1 Characteristic of Frequency Response

FRONT PANEL CONTROLS AND SWITCHES



(1) (2) INPUT JACKS

Jack (1) accepts a 50 ohm input at 50–600 MHz, with maximum input level 2 volts rms (typical level 20 mV rms). Jack (2) accepts either a high impedance (1 megaohm) or low impedance (50 ohm) input at 10 Hz – 60 MHz. The maximum permissible levels are 20 volts rms in the high impedance position (10 mV typical operating level), and 2 volts rms in the low impedance position (10 mV typical). Impedance switching, performed by the HIGH-LOW switch described below, is accomplished only in the 10 Hz – 60 MHz range.

(3) FREQUENCY RANGE SELECTION SWITCH

Push this switch for selection of the 50 MHz – 600 MHz range of the frequency counter. When this switch is not pushed, the 10 Hz – 60 MHz range, is selected.

(4) INPUT IMPEDANCE SELECTION SWITCH

When using the 10 Hz – 60 MHz frequency range, push this switch for selection of the low impedance (50 ohm) range. When the switch is not pushed, the high impedance (1 megaohm) range will be selected automatically.

(5) INPUT VOLTAGE AC/DC SWITCH

When using the voltmeter for measurements, this switch should be pushed for AC inputs. When DC voltages are being measured, do not push this switch.

(6) VOLTMETER INPUT TERMINALS

When DC voltages are being measured, be certain to connect the POSITIVE (+) to the RED (+) terminal, and connect the NEGATIVE (–) side to the BLACK (–) terminal.

(7) VOLTMETER RANGE SELECTION SWITCH

This lever should be positioned according to the desired voltmeter measuring range. In the 10V position, display of voltages between 0.01 volts and 9.99 volts will occur. In the 100V position, the display will indicate between 0.1 volt and 99.9 volts. In the 1KV position, the indication will be 1 volt to 999 volts.

(8) POWER SWITCH

This is the main power ON/OFF switch for the YC-1000L. When the switch is turned ON, the digital display will become active. When the switch is turned off, and the AC power cord is still plugged into the wall outlet, the STBY (STAND-BY) LED will be illuminated, indicating that the digital clock is still in operation. Remove the power plug from the wall outlet when not using the YC-1000L for an extended period of time.

(9) KEYBOARD

The keyboard is used for numerical value input as well as control function programming. The first ten keys described below can represent either the numerical values (zero through nine) or the control function indicated.

COUNT (0): This key provides counting of the number of pulses which have passed during the test period.

1 S (1): This key selects the frequency counter, 1 second gate time.

0.1 S (2): This key selects the frequency counter, 0.1 second gate time.

0.01 S (3): This key selects the frequency counter, 0.01 second gate time.

1/F (4): Push this key for measurement of the period.

T1 (5): This key selects the main clock.

T2 (6): This key selects the secondary clock.

VOLT (7): This key selects voltmeter operation.

TEMP (8): This key selects the thermometer.

TIMER (9): This key selects the stopwatch timer.

CTR/SET 1: When measuring the deviation of a test value from an arbitrary (target) value, push the CTR (CENTER) key to program the target value of voltage, temperature, or frequency. When programming the timer, use this key to program the TIME 1 (ON) time.

OFFSET/ SET 2 : Use the OFFSET key for programming an "acceptable" tolerance value (e.g. ±0.5 volts) relative to a target value programmed through the CTR key. The SET 2 key is used to program the TIME 2 (OFF) value for the timer.

HOLD : This button is used to hold the digital clock at a particular time (when calibrating to a standard, etc.)

RESET : This key is used for zero setting numeric values on the display, as well as error correction while programming.

PRINT : This key activates the printer.

INTV : Press this button when programming the desired interval between printouts of test results.

START/ STOP : This is the starting and stopping key for the YC-1000L printer/ counter. This key is also used to program a temperature below zero degrees Centigrade for use on the thermometer comparator mode.

ENTER : Push this key for entering of numerical values.

(10) MODE INDICATORS

These LEDs light up according to the operating mode in use.

Indicator	Operating Mode
KHZ	Frequency Counter
VOLT	Voltmeter
°C	Thermometer
SEC	Period (T = 1/F)
COUNT	Pulse Counter
TIMER	Timer
TIME 1	Primary clock
TIME 2	Secondary clock
START	Printer in operation

(11) DISPLAY

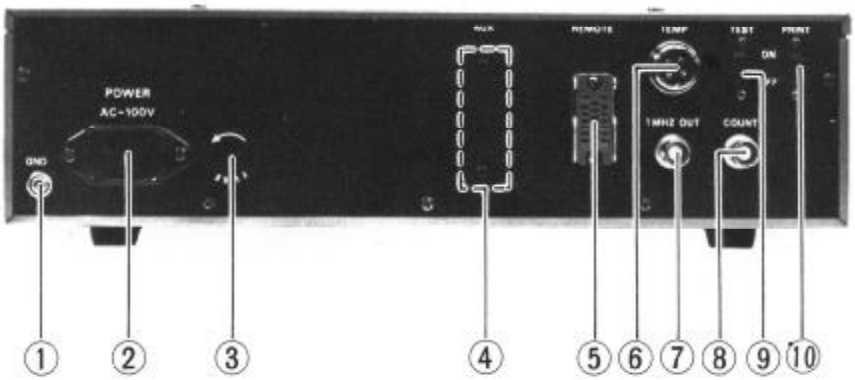
An easy-to-read eight digit fluorescent tube provides display of the measurement data.

(12) MODE INDICATORS

These LEDs light up to indicate the processor condition.

Indicator	Operating Mode/Condition
CENTER	Comparator Target Value
OFFSET	Comparator Tolerance Value
SET 1	SET 1 Time Achieved (TIME 1 Clock Only)
SET 2	SET 2 Time Achieved (TIME 1 Clock Only)
INTV	Interval
PRINT	Printer Operation
COMP	Comparator
LIMIT	Comparator Tolerance Exceeded
STBY	Power Off, Power Cord Plugged In
—	Negative Value
OVF	Overflow
OUT	Time Out

REAR APRON CONNECTIONS

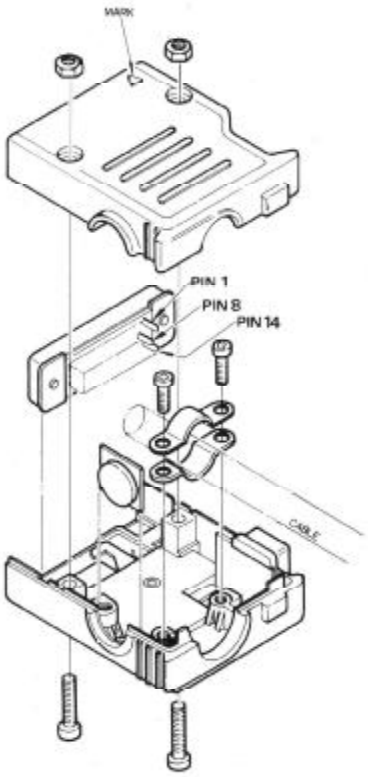


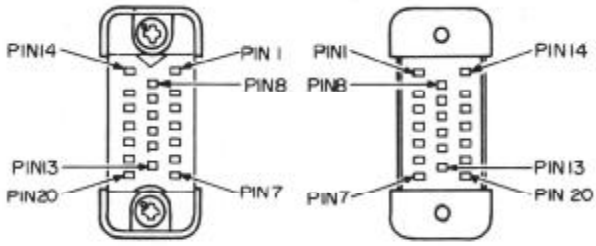
(1) GND

For best performance and safety, connect a good earth ground to this point, using a heavy, braided cable less than ten feet (3.3 meters) long for connection to the bench ground buss.

(2) POWER

Connect the AC power cord to this point. Be certain that the voltage specification for your unit matches your local line voltage. NEVER CONNECT DC POWER TO THIS SOCKET.





PIN 1	FEED	PRINTER UNIT	(J1001, PIN 6)
2	N.C		
3	N.C		
4	S/S OUT	LOGIC UNIT	(J103, PIN 4)
5	TIME OUT	〃	(J110, PIN 7)
6	LIMIT OUT	〃	(J110, PIN 6)
7	+5V	〃	(J108, PIN 5)
8	THIO	PRINTER UNIT	
9	MOTOR	〃	
10	I1	LOGIC UNIT	(J104, PIN 2)
11	H3	〃	(J104, PIN 3)
12	H2	〃	(J104, PIN 5)
13	+10V	〃	(J108, PIN 8)
14	H1	〃	(J104, PIN 6)
15	H0	〃	(J104, PIN 9)
16	C0	〃	(J104, PIN 1)
17	C1	〃	(J104, PIN 7)
18	C2	〃	(J104, PIN 8)
19	C3	〃	(J104, PIN 4)
20	GND	〃	(J108, PIN 9)

Figure 1 Remote Terminal Connections

(3) FUSE

For all AC voltages, use an 0.5 ampere fuse. When replacing fuses, be absolutely certain to use a fuse of the proper rating.

(4) AUX

This is an uncommitted chassis cutout for field updates the user may want to incorporate. As shipped from the factory, the YC-1000L has a cover over this opening.

(5) REMOTE TERMINAL

This terminal provides access to internal switching voltages and logic gates for remote control of peripheral equipment. See Figure 1 for a complete listing. Among the connections provided are:

TIME OUT — When the TIME OUT state is reached (between the SET 1 and SET 2 times on the primary clock), 10 volts DC will appear at this point.

LIMIT — When using the comparator function, 10 volts DC will appear at this terminal when the specified tolerance limit has been exceeded.

STOP/START — When STOP or START commands are made, 10 volts DC will appear at this point.

Also available are +5 volt (100mA) and +10 volt (50mA) unswitched connections, along with a ground connection.

(6) TEMP

This is a four pin jack for connection of the thermal sensor.

(7) 1 MHz OUT

Output from the 1 MHz clock oscillator may be obtained here.

(8) COUNT

This is a BNC type jack for connection to the probe for the pulse counter. Input of TTL level signals may be made here.

(9) TEST SWITCH

This switch activates a complete test run of all YC-1000L functions, with printout on the paper tape. See the "Operation" section for details.

(10) PRINT

This switch applies voltage to activate the printer circuitry.

ACCESSORIES

Test Cable for frequency measurement
Red and Black Test Lead for voltage measurement
Thermal sensor probe
AC Power Cable
Spare Fuse (0.5A)
Tape Roll for printer
BNC Connector

INSTALLATION

The YC-1000L is designed for operation in many areas of the world, using a multi-tap transformer providing operation from 100/110/117/200/220/234 volts AC, 50/60 Hz. Therefore, before plugging the YC-1000L into the wall outlet, check to see that the voltage specification on the rear of the instrument matches your local line voltage. If not, please refer to the power transformer wiring diagram below.

When replacing fuses, be absolutely certain to use only a fuse rated at 0.5 amperes. A fuse is a protective device whose function must not be defeated by installation of an improper fuse.

CAUTION

SERIOUS DAMAGE CAN RESULT IF IMPROPER VOLTAGES ARE APPLIED TO THIS INSTRUMENT. OUR WARRANTY DOES NOT COVER DAMAGE CAUSED BY IMPROPER SUPPLY VOLTAGES, OR USE OF AN IMPROPER FUSE.

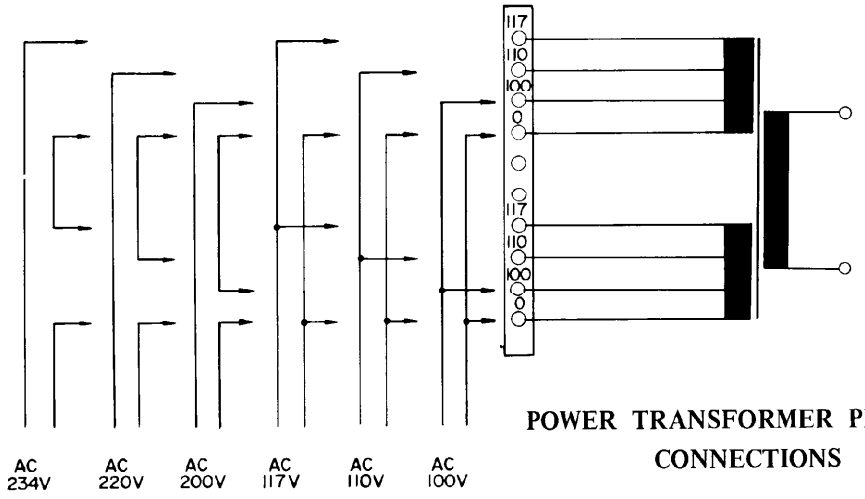
If excessively high or low voltages are applied to the YC-1000L, the digital display will read "E" when the power switch is turned on. If this condition is observed, turn the YC-1000L OFF immediately, and check your line voltage and power transformer primary connections.

OPERATING NOTE

Although unlikely, it is possible for the CPU to come up in a random condition when the unit is turned on. Should a random display be observed on the digital readout when the unit is first switched on, please turn the YC-1000L off, unplug the power cord from the wall outlet, and plug it in again. The POWER ON RESET feature will then initialize the CPU properly.

Always have the POWER switch OFF when plugging or unplugging the power cord into the wall outlet.

For best performance and safety, always connect a good earth ground to the rear panel GND terminal, using a heavy, braided cable for the connection to the bench ground buss. Use the shortest ground lead possible.



POWER TRANSFORMER PRIMARY CONNECTIONS

GENERAL CARE AND MAINTENANCE

The YC-1000L is a ruggedly built test instrument. However, please avoid severe physical shocks or blows to the cabinet, as damage can occur. The exterior of the unit may be wiped with a damp cloth whenever desired.

COUNTER ACCURACY

When measuring frequency with a frequency counter, there are two types of potential errors which are inherent in design, and cannot be avoided. A discussion of these error types follows.

(1) Clock master oscillator error

This error can occur when the frequency of the clock oscillator changes because of temperature variation or aging of the crystal. For example, if the crystal frequency increases by 1%, the gate time will be reduced by 1%, resulting in a −1% error in the displayed frequency from the actual value.

In the YC-1000L, a crystal oven is used to provide high stability in the oscillator crystal. The resulting accuracy is 0.000002%, which represents a maximum error of 1 Hz at 50 MHz.

(2) Input gate roundoff error

This second error is present in any frequency counter, and it is called a one count error. This error results when the gate opens just before a pulse or just after a pulse, causing an error of +1 count.

Referring to Figure 2, note that the counter will count 15 pulses if the measurement is made as in (A), but only 14 pulses is the measurement is as in (B). This error will occur only on the last digit.

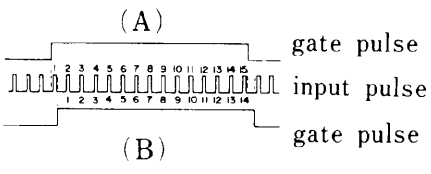


Figure 2

Do not confuse this error with errors caused by instability in the input signal. In an example shown in Figure 3, if a distorted signal crosses the threshold level twice in a positive half cycle, the counter will display two times the actual frequency. (Note: Modulation on the input signal, can cause misleading results. Increasing the input level slightly will cure this problem.)

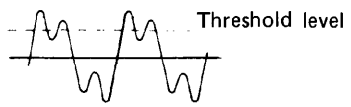


Figure 3

WARM-UP INSTRUCTIONS

Once the power cable is connected to the wall outlet, the POWER switch may be either on or off for warm-up to take place. After a warm-up of one hour, full specified accuracy will be maintained.

OPERATING NOTES

(1) No frequency counter is immune from counting errors when the input signal-to-noise ratio is very poor. Accordingly, when measuring extremely noisy circuits, some error may be observed, unless steps are taken to improve the signal-to-noise ratio.

(2) Do not exceed the rated rms values for input signals applied to the counter. Do not exceed 20 volts when using the high impedance range of the 10 Hz – 60 MHz scale on the counter, and do not exceed 2 volts rms in the low impedance case. Do not exceed 2 volts rms when using the 50 – 600 MHz range at any time.

(3) When measuring unknown voltages of possibly high value, start testing with the voltmeter scale in the 1 KV position. The range may then be changed, as necessary, once an approximate voltage determination is made.

(4) The thermal sensor probe packed with the YC-1000L is recommended for use with this instrument. We cannot guarantee the accuracy of other probes with this unit. Measurement of temperatures up to 100 degrees centigrade is provided, but do not exceed ten minutes of measurement at that temperature.

OPERATION

Once the power cord is plugged in, the STBY LED will become illuminated. We recommend a minimum of 30 minutes' warm-up prior to commencing measurement, in order to allow the frequency counter crystal oven to stabilize the master oscillator crystal.

When the POWER switch is turned on, the microprocessor will automatically be set to the TIME 1 (primary clock) mode, and the digital display will indicate the time that has elapsed since the power cable was plugged in.

ERROR CORRECTION

When establishing measurement parameters from the keyboard, occasionally input errors will be made by the operator. In this case, the letter "E" will appear on the display, indicating that an error has been made. To correct this situation, press the RESET key, and re-enter the data.

FREQUENCY MEASUREMENT

Three gate times are available for frequency measurement, depending on the degree of accuracy required. Two frequency measuring ranges are also provided, and selection should be made on the basis of the range most closely corresponding to the frequency to be measured. When the counter is in use, the KHZ LED will be illuminated.

Example 1

To measure a 12,345.678 kHz signal, connect the counter probe cable to the INPUT A terminal (10 Hz – 60 MHz), and select the HIGH or LOW impedance position, as appropriate, on the input impedance switch. Depending on the gate time selected on the keyboard (push the 1S, 0.1S, or 0.01S key), the display will indicate as follows:

1S GATE TIME	1 2 3 4 5. 6 7 8
0.1S GATE TIME	1 2 3 4 5. 6 7
0.01S GATE TIME	1 2 3 4 5. 6

Example 2

To measure a 123,456.78 kHz signal, connect the counter probe cable to the INPUT B terminal (50 MHz – 600 MHz). Depending on the gate time selected, the display will indicate as follows:

1S GATE TIME	1 2 3 4 5 6. 7 8
0.1S GATE TIME	1 2 3 4 5 6. 7
0.01S GATE TIME	1 2 3 4 5 6.

CLOCK OPERATION

A 24 hour clock is provided within the YC-1000L, with interface to the microcomputer circuits allowing timing during measurement runs. Before proceeding with explanations of typical uses of the clocks, we will discuss the initial setting procedure.

On the keyboard, T1 corresponds to the primary (TIME 1) clock in the YC-1000L. The clock will display until 23:59:59, then will proceed to 00:00:00 at the start of a new day. When the YC-1000L is initially plugged in and turned on, the TIME 1 mode will be selected automatically, and the displayed time will correspond to the time that has elapsed since the power cord was plugged into the wall outlet.

When setting the clock, the hour data can be any digit, just as you would write it normally. In other words, to set 1:23:45, you would push the 1, 2, 3, 4, and 5 keys in that order. However, for minutes and seconds, you must push keys to enter any zeroes in the time. For example, to enter 23:05:08, one would push the 2, 3, 0, 5, 0, and 8 keys **not** 2, 3, 5, 8; the latter would be displayed as 00:23:58.

Time Setting Example

(1) With the POWER switch ON, press the T1 key. The digital display will indicate the time that has elapsed since the unit was plugged in.

(2) Push the HOLD key to stop the clock.

(3) Push the RESET key to set the clock to zero for re-programming.

(4) Use the keyboard to enter the desired time. It usually is best, when trying to set the present time, to set the display for a short time (one minute or so) ahead of the correct time, in order to allow a precise countdown to the exact second, in accordance with a time standard. Examples of the correct keyboard entry procedure are shown below.

For 09:30:

9	00.00.09
3	00.00.93
0	00.09.30
0	00.93.00
0	09.30.00

For 22:05:30

2	00.00.02
2	00.00.22
0	00.02.20
5	00.22.05
3	02.20.53
0	22.05.30

(5) Once the desired time has been programmed, press the ENTER key at the precise instant that you want the clock to start. This will allow proper calibration of the clock against a time standard. So long as the power cord is not disconnected, this time programming will remain in the clock.

TIME OUT MODE

When using the T1 clock, the SET 1 and SET 2 times may be used to control peripheral equipment, using the rear apron REMOTE jack. The TIME OUT pin (pin 5 of the REMOTE jack) provides +10 V when the clock is between the SET 1 and SET 2 times. When the clock reaches the SET 2 time again, the +10 V will disappear until the SET 1 time.

To set the SET 1 and SET 2 times, proceed as follows:

(1) Press the SET 1 (or SET 2) key, then the RESET key, to zero the display. Be sure that you are using the TIME 1 clock.

(2) Use the keyboard to program the desired starting (SET 1) and stopping (SET 2) times for the timer. The entry procedure is the same as that for the T1 clock.

(3) When the ENTER key is pressed, the SET 1 or SET 2 LED will become illuminated, depending on the time slot being set.

SECONDARY CLOCK (Time 2)

The TIME 2 (T2) clock can be used as a second time standard. You may use it for storage of Coordinated Universal Time (UTC), or for timing of length of time on a job, for example. The programming procedure is identical to that for the T1 clock, except that the operator must press the T2 key initially.

STOP WATCH TIMER

A stop watch timer is available on the YC-1000L. Programming is done as follows:

(1) Press the TIMER key to activate the timer. The display will indicate "0".

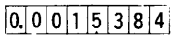
(2) Press the START/STOP key to start the stopwatch.

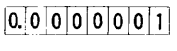
(3) Press the START/STOP key to stop the stopwatch. If the time goes beyond 23 hours, 59 minutes, and 59 seconds, the OVF LED will light up, and the count will again begin at zero.

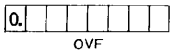
PERIOD MEASUREMENT (T = 1/F)

By pressing the 1/F key, display of the period will be performed. Use only the 10 Hz – 60 MHz range, and set the input impedance switch to HIGH. The SEC LED will become illuminated. The displays for frequencies of 10 Hz, 650 Hz, 10 MHz, and greater than 10 MHz are shown below.

10 Hz 

650 Hz 

10 MHz 

OVER 10 MHz 

The OVF (Overflow) display in the final example indicates that the period was less than 0.0000001 second (0.1 μS). This is the measurement limit of the YC 1000L, and measurement of the period cannot be accomplished above 10 MHz, as can be seen.

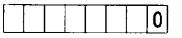
PULSE COUNTER

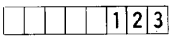
A running count of the number of pulses that pass within an arbitrary period of time can be displayed. The YC-1000L can handle any TTL level pulses that are typically found in electronic equipment today.

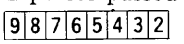
Press the COUNT key, and connect the counter probe to the rear apron COUNT jack. Now press the START/STOP key to start and stop the counting period. When a count is finished, press the RESET key to return the display to 0.

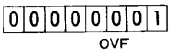
In the first example, 123 pulses passed through the gate during the measurement period.
In the second example, 98,765,432 pulses passed through the gate.
If more than 100,000,000 pulses pass through the gate, an overflow condition will occur, and the OVF LED will light up. The last digit may have some indication, but this will not be accurate.

Example

When the COUNT key is pressed


123 pulses passed


98765432 pulses passed


Overflow


DIGITAL VOLTMETER

Pressing the VOLT key activates the digital voltmeter. AC and DC voltages from 0 to 999 volts may be measured. Set the voltmeter range switch to the range most closely corresponding to the maximum voltage expected, and set the AC/DC switch to the appropriate position.

The acceptable voltage spreads within each range are:

10V range	0.00 –	9.99	volts	AC/DC
100V range	0.0 –	99.9	volts	AC/DC
1000V range	0 –	999	volts	AC/DC

When measuring DC voltages, be certain to connect the red lead to the positive terminal, and the black lead to the negative terminal. Then be certain to use the leads in that polarity.

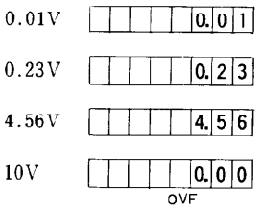
When a voltage is measured that exceeds the range selected, the OVF LED will become illuminated. In this case, remove the test probe immediately and select a more appropriate range. If an OVF display is obtained in the 1000 volt range, the voltage is beyond the range of the YC-1000L.

CAUTION

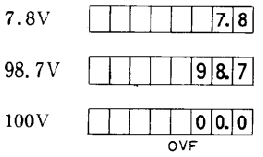
IT IS POSSIBLE TO DAMAGE THIS INSTRUMENT BY PROLONGED OPERATION IN AN OVERFLOW CONDITION. AS WELL, IT IS POSSIBLE TO DAMAGE THE UNIT BY APPLYING EXCESSIVELY HIGH VOLTAGES (IN EXCESS OF 1000 VOLTS).

Typical display indications for a number of test voltages are shown below. Note that, when a negative voltage is detected, the "–" LED will become illuminated.

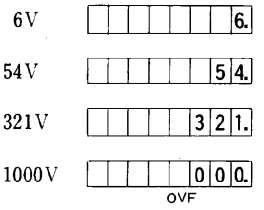
10V RANGE



100V RANGE



1000V RANGE

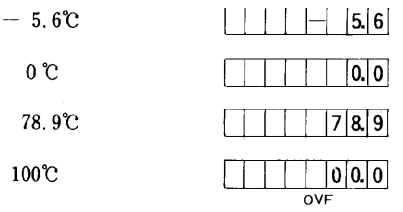


DIGITAL THERMOMETER

Connect the accessory thermal probe cable assembly to the rear apron TEMP connector to activate the digital thermometer. Three digits will be displayed, indicating the temperature present at the tip of the thermal sensor. The permissible measurement range is −29.9°C to +99.9°C. Temperatures below −29.9°C will cause a random display to occur, and temperatures greater than 100°C will cause the OVF LED to become illuminated; the digital display will also go to zero.

When taking a temperature measurement, wait at least four minutes for the probe to assume the temperature of its environment. Minor changes will then be displayed accurately, but major temperature changes will cause some erratic readings until the probe can assume the new temperature. In typical oscillator measurements, very large excursions in the ambient temperature seldom occur within the space of four minutes, so this phenomenon should present no inconvenience or difficulty to the user.

Typical display indications are shown below.



COMPARATOR FUNCTION

The YC-1000L will allow comparison of a test value with a target or specification value, and will display the amount of variance from the target value. An accpetable tolerance limit from the target value may also be programmed, to determine compliance with specifications. Should out-of-specification conditions be detected, the LIMIT LED will become illuminated, and the LIMIT OUT terminal (pin 6 of the REMOTE connector) will have 10 volts DC applied to it for as long as the out-of-spec. condition exists.

The comparator function may be used for measurement of frequency, period, voltage, temperature, and pulse counting.

The number of places available for measurement are as follows:

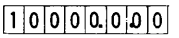
Mode	**Places available** (digits)
Frequency counter	
1 second gate time	8
0.1 second gate time	7
0.01 second gate time	6
Period	8
Voltage(negative voltages not permitted)	3
Temperature (negative temperatures OK if START/STOP key is pressed)	3

Example 1

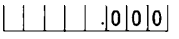
Let us say that an oscillator is being tested. The specified value of the output is 10,000.00 kHz (10 MHz) ±10 Hz. Let us use a gate time of one second for best precision. Proceed as follows to determine compliance of a unit under test to specifications:

(1) Press the 1S key to set the desired gate time. The 1 second gate time ensures that roundoff error will not affect test results adversely. Press the CTR key because you will first be programming the target (CTR) value.

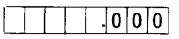
(2) To program 10,000.00 kHz as the center value, press 1,0,0,0,0,0,0,0 on the keyboard.



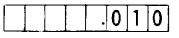
(3) Press the ENTER key to enter the center frequency.



(4) Now press the OFFSET key to set the allowable tolerance. The display will initially show .000 in the window.

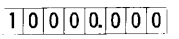


(5) Because ±10 Hz is the specified tolerance, press 1,0, and ENTER.



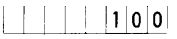
(6) Press the COMP key to activate the comparator function. The frequency counter probe may now be connected to the unit under test.

(7) If no signal is applied to the counter probe, the display will indicate as shown to the right, and the "–" and LIMIT LEDs will be illuminated.

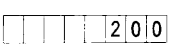


(8) If a signal precisely on the desired value (10 MHz) is applied to the counter probe, the display will indicate "0" to show 0 kHz variance from the specified value.

(9) If a 9999.900 kHz signal is applied to the counter, the display will indicate 100 and "–" LED will be illuminated, as shown, which means that the unit under test is 100 Hz away from the target value. The LIMIT LED will also be illuminated, because the unit is outside of the ±10 Hz specified tolerance.



(10) If a signal at 10000.200 kHz is applied to the counter, the display will indicate 200, thus indicating 200 Hz variance from the target value. Because this is outside the allowable tolerance, the LIMIT LED will light up.



Example 2

To determine offset from desired values when measuring period, the programming procedure is identical. The only difference is that the entry of the target value and tolerance must be made carefully, because the value is less than one second. Therefore, if the specified period is 0.012345 seconds, press the 0,0,1,2,3,4,5 and ENTER keys. The programming procedure is summarized below:

(1) Press the 1/F key to set the YC-1000L up for period testing.

(2) Press the CTR key for programming the center value. Enter the desired value as described above. Be sure to press the ENTER key.

(3) Press the OFFSET key, and enter the desired tolerance. Remember to press ENTER.

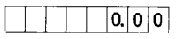
(4) Press the COMP key, and connect the counter probe to the circuit under test to begin measurement. The variation from the desired value will be displayed.

Example 3

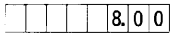
Let us say that measurement of a very stable voltage line for an oscillator circuit is desired. The comparator function will handle this with ease. The specification is +8 volts ±0.5 volts DC.

(1) Set the voltmeter selection range to 0 – 9.99 volts, and the AC/DC selector switch to DC. Connect the voltmeter test leads to the front panel terminals.

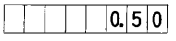
(2) Press the VOLT key to activate the voltmeter.



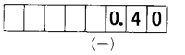
(3) Press the CTR key to program the target value. Press 8,0,0, and ENTER to enter the specified number: 8 volts.



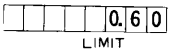
(4) Press the OFFSET key to program the tolerance. Press 5,0, and ENTER to establish this value.



(5) Press COMP, and connect the voltmeter probes to the circuit under test, being certain to observe proper polarity. For an input voltage of 7.6 volts, the readout will show 0.40 volts, the variation from the target value. The "–" LED will be illuminated indicating that the variation is below the target value.

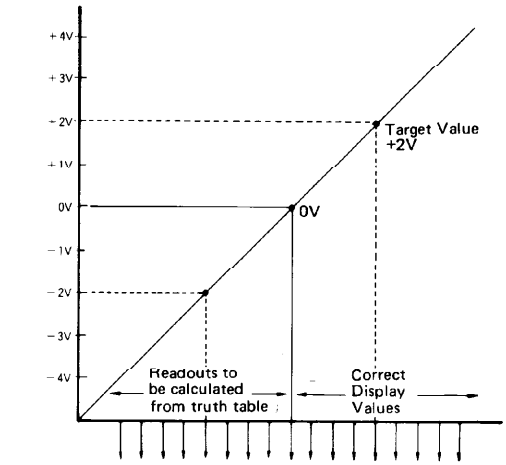


(6) If 8.6 volts are applied to the probes, the readout will display 0.60 volts, and the LIMIT LED will light up, indicating that the observed voltage is out of specification. The LIMIT OUT terminal on the REMOTE connector will have +10 volts applied to it.



(7) When using the comparator function, it is not possible to test negative target values.

Note: If the measuring voltage goes below 0 volts, the display values must be compensated according to the truth table. The truth table shown below illustrates a target value of +2 volts.



Display Value	–2	–1.5	–1	–0.5	–0	–0.5	–1	–1.5	–2	–1.5	–1	–0.5	0	+0.5	+1	+1.5	+2	– ···		
plus Correction Value	–4	–4	–4	–4	–4	–3	–2	–1	0	0	0	0	0	0	0	0	0	0 ···		
equals Actual Value	–6	–5.5	–5	–4.5	–4	–3.5	–3	–2.5	–2	–1.5	–1	–0.5	0	+0.5	+1	+1.5	+2	+ ···		

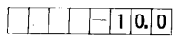
Truth Table

Example 4

The comparator feature will also work well for testing ambient temperatures. Let us say that we are testing a chamber with a target temperature of −10.0°C ±1.0°C. Proceed as follows:

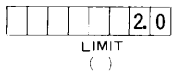
(1) Press the TEMP and CTR keys to set the YC-1000L for programming of the target temperature.

(2) Press 1,0,0, and START/STOP to set the target temperature of −10.0°C. If the target were +10.0°C, you should not push the START/STOP key, which makes the temperature value negative. Press the ENTER key.

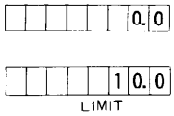


(3) Press the OFFSET key, then 1,0, and ENTER. This sets the tolerance at ±1.0°C.

(4) Push the COMP key, and use the thermal probe to begin testing. Should the temperature be −12°C, the display will indicate 2.0, and the LIMIT and "−" LEDs will be illuminated, indicating out-of-spec. conditions, with the variance being on the LOW side of the target. Ten volts will appear at the LIMIT OUT terminal at the REMOTE connector.



If the temperature is −10°C, the display will indicate zero, and if the temperature is 0°C, the display will indicate 10.0, with the limit condition being shown at the LIMIT LED and LIMIT OUT terminal of the REMOTE connector.



PRINTER OPERATION

The printer provides a log of test measurements for record keeping purposes. The printer will log data from the frequency counter, period and pulse counter, the voltmeter, the clocks, and the thermometer (a maximum of four functions may be included on any run). The interval between tests may be set to any point between 1 minute and 99 minutes, and the microprocessor will then automatically command the YC-1000L test circuitry to measure the circuit and print out the results. As the order in which keys are pushed is important, please follow the example below in order to understand the proper programming procedure.

Example 1

Let us say that you wish to evaluate the frequency stability of an oscillator circuit. Parameters of interest are the output frequency, the time of the test, the input voltage, and the temperature in the oscillator enclosure. Proceed as follows:

(1) Press the PRINT key, and be sure that the rear apron PRINT switch is on.

(2) Press the T1, 1S, VOLT, and TEMP keys to program logging of the time, frequency counter (1 second gate time), the voltmeter, and the thermometer. The display will indicate 5178 to correspond to the numeric values for the above keys. Now press the ENTER key. Be certain that all the necessary probes are properly connected to the unit under test.

(3) Press the INTV key to set the desired interval. Let us test the circuit every 10 minutes. Press 1 and 0, then ENTER.

(4) Now press the START/STOP key twice. The YC-1000L will test the circuit every ten minutes, and log the data on the paper tape. A typical readout for a test at 11:15:45 local time, at 14,180.000 kHz, supply voltage 12.5 volts, and temperature 26.5 degrees is shown.

(5) Press the START/STOP key again to stop the test run.

Example 2

To print the target value prior to the measurement, proceed as follows.

(1) Program the mode and logging time as detailed in the example 1. Next, press the START/STOP key ONCE.

(2) Press the CTR key and program the target value. Press the ENTER key to activate the printer.

(3) Press the PRINT key to select the desired mode.

(4) Press the START/STOP key to begin measurements.

* The target value printing mode can only be programmed for frequency, period, voltage, and temperature. All target value modes are selected via the PRINT key.

REPLACEMENT OF PAPER TAPE

The YC-1000L printer uses a 20 letter per line, 5 x 7 dot matrix for character generation. The paper tape used is Jujo Thermal TP50CMA*. Replacement of the tape roll is simple to accomplish.

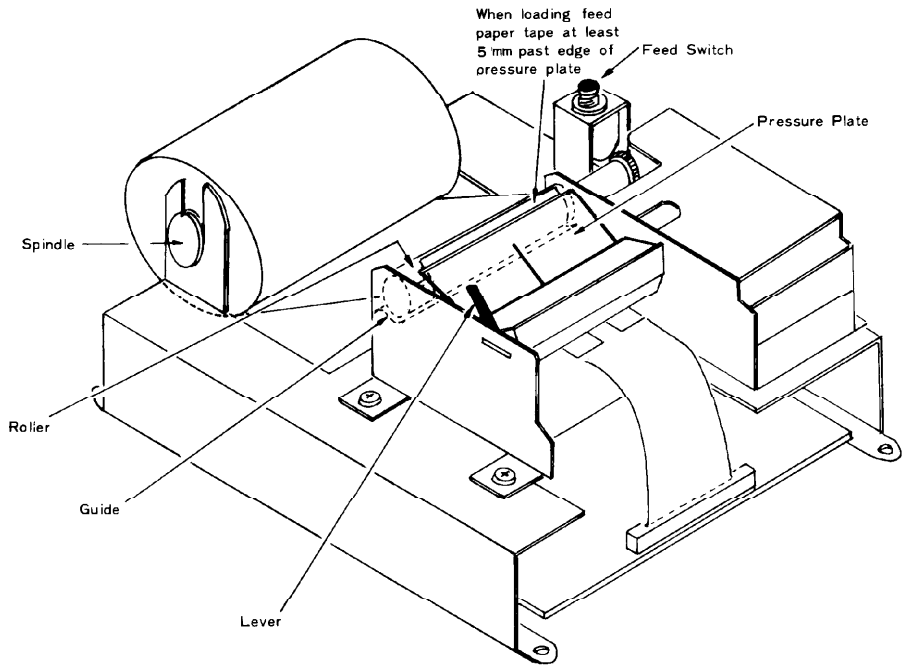
(1) Remove the printer cover by pulling upward on the two black latches on the top cover of the YC-1000L.

(2) Remove the paper tape roll shaft from its holder.

(3) Place a new roll onto the spindle and feed the paper tape through the guides until it projects slightly beyond the holder, as shown below.

(4) Carefully replace the printer cover, and press the feed switch on the printer cover to feed the paper tape through the slit in the cover. Secure the black latches on the top of the cover. Installation is now complete.

*NOTE: The paper tape is 60mm (W) x 25m (L) and is equivalent to the paper used in the Olivetti Divisimma 33/37PD printer.



Printer Unit

NOTES ON PAPER TAPE STORAGE

(1) Store the paper tape used in the YC-1000L at temperatures below 30°C and at humidity of less than 60%, in order to avoid discoloration.

(2) Avoid direct exposure to sunlight for prolonged periods of time.

(3) Do not use cellophane tape on the paper tape, because the glue used in the cellophane tape may discolor the paper tape.

(4) Typical paper tape shelf life is in excess of five years.

SYSTEM TEST PROCEDURE

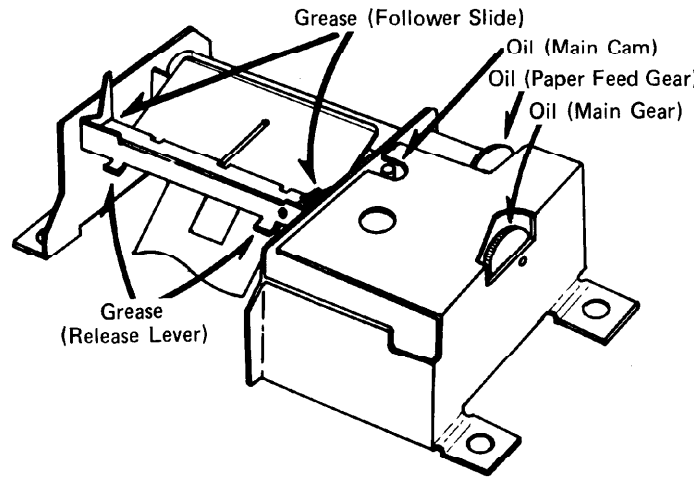
A system test switch is provided, allowing the operator to confirm proper microprocessor and printer operation.

Set the rear panel TEST switch to ON. The printer will then generate a test run of all YC-1000L systems, producing the display shown. Once a test run is complete, set the TEST switch to off, and commence normal operation.

Function Symbols	Display
F	11, 111. 111 kHz
F	222, 222. 22 kHz
F	3333, 333. 3 kHz
1 / F	4, 4444444 SEC
T 1	5555, 55. 55
T 2	6666, 66. 66
D C	77777777. V
TEMP	8888888. 8 °C
D C	99999999. V
TEMP	-------. - °C
CETR	

PRINTER LUBRICATION

The printer should be well lubricated to provide a many years of reliable operation. Apply oil or grease sparingly to the areas shown below.



CIRCUIT DESCRIPTION

A full description of every logic state in the YC-1000L is well beyond the scope of this manual. In order to help you understand the YC-1000L better, we are presenting a simplified explanation of the basic functions of the various units involved in the circuit. Please refer to the block diagram and schematics for details.

PRE-SCALER UNIT

The signal from input "A" (10 Hz – 60 MHz) is buffered by Q_{501} **(2SK19GR)** and fed through capacitors C_{502} and C_{505} to Q_{502} **(MC10116)**, a 3 stage ECL broad-band amplifier. The output is then converted to TTL by Q_{503} **(MPS3640)**.

The signal from input "B" (50 MHz – 600 MHz) is fed to D_{507} **(TDA1053)**, a pin diode module, and amplified by Q_{506} **(MC5156)**. The amplified signal is fed to pre-scaler Q_{507} **(SP8630)** where the signal is divided by ten. The divided output is then fed to Q_{508} **(2SC2026)** and Q_{509} **(2SC2026)** where the output is converted to TTL for operation with the LOGIC UNIT.

A portion of the output from Q_{506} is rectified by D_{505}, D_{506} **(1SS16)** and amplified by Q_{504} **(μPC157A)** and Q_{505} **(2SC943)**. The amplified DC signal is fed to D_{507} as an AGC voltage, and D_{507} controls the attenuation.

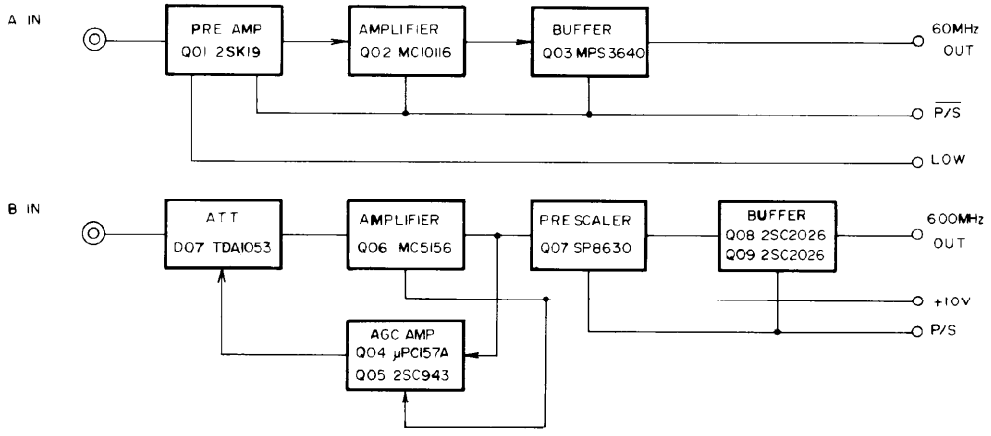
V/F CONVERTER UNIT (PB-2035A)

The function of the V/F Converter Unit is to convert voltage to frequency. It is only active during temperature and voltage measurements.

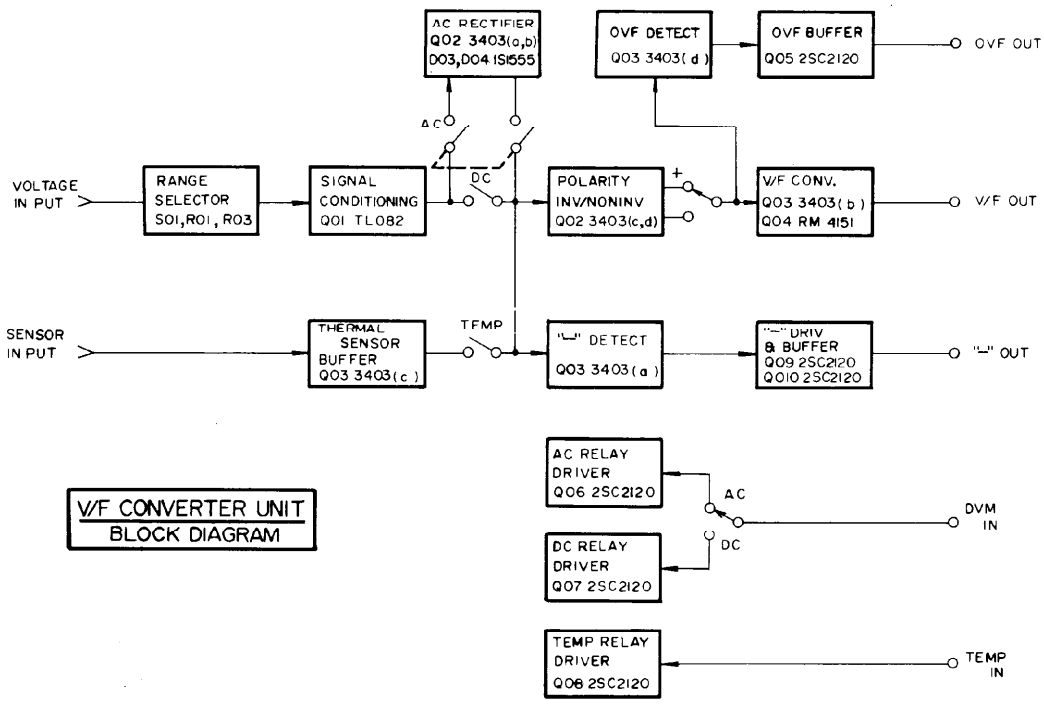
DC inputs are fed to a voltage divider consisting of R_{401}, R_{402}, and R_{403}. This output is then fed to voltage follower Q_{401} (TL082) and buffered by operational amplifiers Q_{402}(c,d). The polarity is controlled by RL_{404}.

All DC voltages pass through RL_{402} to operational amplifiers Q_{403}(a). If the voltage from the input terminals is negative, the output from Q_{403}(a) will indicate positive. The output from Q_{403}(a) is then fed to R_{436}, R_{437} and to the base of Q_{409} which activates RL_{404}. However, if the output from Q_{403}(a) is positive, RL_{404} will remain open. The output from RL_{404} is then fed to V/F converter Q_{403}(b) and Q_{404} (RM4151NB).

AC inputs are fed to a voltage divider consisting of R_{401}, R_{402}, and R_{403}. The buffered output from pin 1 of Q_{401} is fed through RL_{401} to a rectifier circuit which consists of operational amplifier Q_{402}(b) and two diodes D_{403}, D_{405}. The rectified output is converted to an RMS voltage by Q_{402}(a). This output is then fed to the final stage of Q_{402} where it is processed by the above mentioned DC circuit.



PRE-SCALER UNIT
BLOCK DIAGRAM



V/F CONVERTER UNIT
BLOCK DIAGRAM

Temperature inputs from the thermal sensor are buffered by Q_{403} and fed to the V/F converter circuit. Q_{406}, Q_{407}, and Q_{408} are relay drivers for controlling the three measuring modes. If the voltage passing through Q_{402}(c, d) is greater than the measuring capacity of Q_{403}(b), the overflow from Q_{403}(b) is fed to Q_{403}(d) producing an overflow indicator signal which is fed through lamp driver Q_{435} **(MPSA13)** on the Logic Unit PB-2032 to the OVF LED D_{210}.

LOGIC UNIT

The logic unit consists of the following circuits:

(1) Input gate
(2) Counter
(3) Time base
(4) CPU
(5) Display control
(6) Gate controller
(7) LED driver
(8) Decimal point control

(1) INPUT GATE

As shown below, the following inputs are fed to four separate circuits:

1. 60 MHz gate inputs are fed to Q_{101}(a) **(SN74S10N)**;
2. 600 MHz gate inputs are fed to Q_{101}(c) **(SN74S10N)**;
3. Voltage/temperature inputs are fed to Q_{103}(b) **(SN74S00N)**; and
4. Pulse counter inputs are fed to Q_{103}(d) **(SN74S10N)**;

Each output from the above circuits will fed one of the four gates of Q_{102}(a). The output from Q_{102}(a) is then fed to Q_{103}(c). The input to Q_{103} (c) is controlled by the time base signal, and the output from Q_{103}(c) is fed to counter Q_{104}.

(2) COUNTER

The counter unit consists of an 8 digit decade counter. The first 2 digit counters are Q_{104} **(SN76S196)** and Q_{105} **(SN74LS196N)** which count

the number of pulses passing through the gate. The remaining 6 digits are counted by decade counter Q_{107} **(TC5032)**. The BCD code output from Q_{107} is fed to 4-bit A PORT, Q_{118} which stores the binary information between the counter unit and indicator unit.

(3) TIME BASE

The 1 MHz time base signal is fed to a 6-stage decade divider Q_{113} **(MSM5592)**, and the 0.01 S, 0.1 S, and 1 S trigger signals may be found at pins 11, 10, and 9.

(4) CPU

The Central Processing Unit (CPU) Q_{118} **(μPD546C-23)** is a 4-bit parallel 1 chip microprocessor consisting of ALU, ROM, RAM, and I/O ports.

At the CPU, comparative sampling, data storage, and ALU calculations are performed creating LIMIT OUT and TIME OUT command signals for the various modes.

The timing-pulse to set/reset the counter and display are fed to ports F0 and F6. Port F2 of the CPU provides dynamic drive for the 6 digit counter Q_{107}.

(5) DISPLAY CONTROL

The display control IC Q_{119} **(μPD549C)** converts 4-bit data signals and 1-bit control signals which are delivered from the E PORT of CPU into 8 digit signals to drive the display.

(6) GATE CONTROLLER

The 7-bit output from the CPU is fed to the function latch circuit Q_{123}, Q_{124}, and Q_{128} **(MC14042B)** to create a control signal for the various gate circuits. Interfacing is accomplished through Q_{112}, Q_{116}, and Q_{117} **(MC14050B)**. Q_{102} **(SN74S20N)** is a gate selector for controlling the operating mode.

(7) LED DRIVER

The 4-bit output from the E PORT is fed to LED driver Q_{125} **(μPA56C)** and the 5-bit outputs from the H PORT and I_1 PORT are fed to LED driver Q_{122} **(MC1416)** to indicate the mode of operation. Q_{133} works as a driver for the KHz LED, and the other indicators are driven by Q_{134}, Q_{135}, etc.

(8) DECIMAL POINT CONTROL

The decimal location is controlled by Q_{126} and Q_{127} **(MC14011B)** for each mode of operation. Q_{114} and Q_{120} **(MC14066B)** control the gate switching for the DVM and Q_{121} **(MC14519B)** is the switching circuit for the pre-scaler. The decimal is illuminated by driver Q_{130}(a).

CLOCK OSCILLATOR

The clock oscillator circuit is composed of a 1 MHz crystal oscillator TC0-8D2 which feeds the logic circuit and supplies the count for the self check. The 15.5 VDC supply is regulated by Q_{901} **(μPC14312)** to 12 VDC which is used to power the oscillator.

DISPLAY UNIT

The 7-segment display unit DS_{201} **(LD8217)** consists of $D_{201} - D_{210}$, $D_{212} - D_{221}$ **(SR105D)** and D_{211} **(SG205D)**.

KEYBOARD UNIT

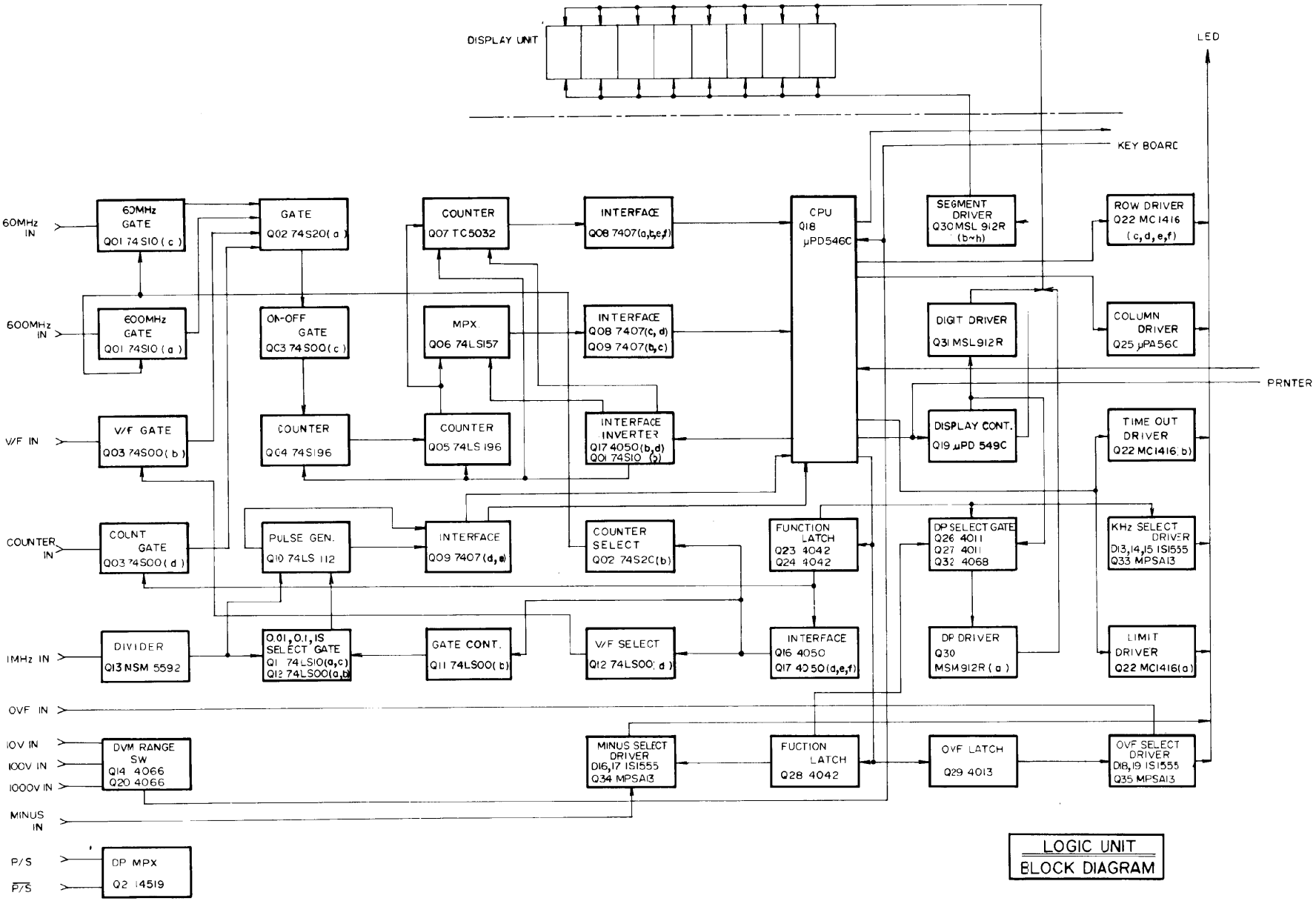
The keyboard uses 19 momentary contact key switches and 5 diodes to form a matrix. All modes are controlled through the keyboard and fed directly to the C PORT and H PORT of the CPU.

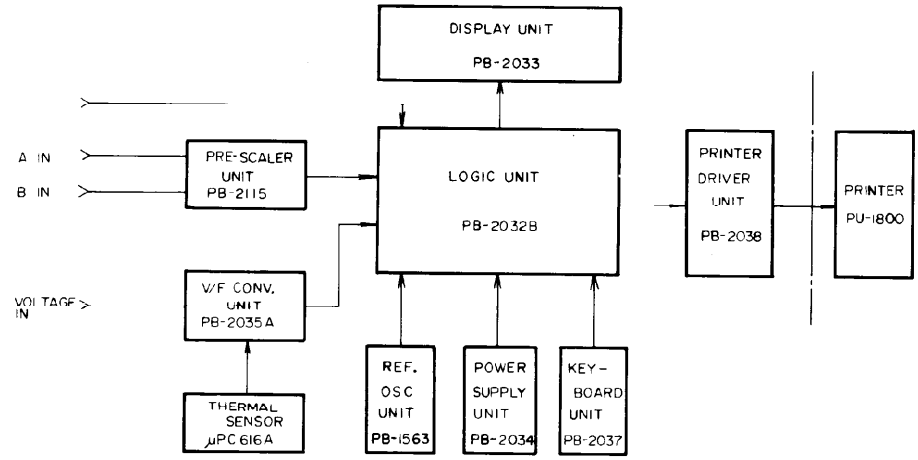
POWER SUPPLY

The power supply is designed to operate from 100/110/117/200/220/234 Volts AC 50/60 Hz.

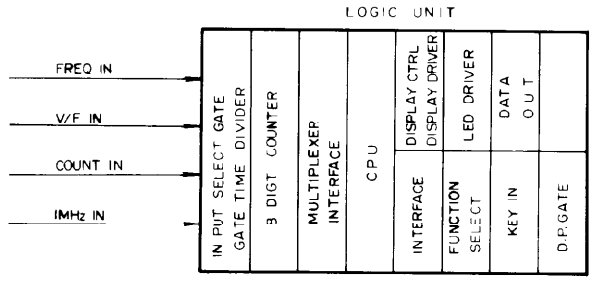
The secondary of the transformer supplies several voltages to the circuit. The two 18V taps are rectified by a full-wave bridge D_{301} **(S1RBA)** and stabilized by Q_{301} **(TA7179P)** for a ± 15V output. Taps for 7.5V and 15.5V are rectified by D_{302} **(S5VB)** and regulated by Q_{302} **(78C10)**, Q_1 **(2SB705)**, Q_{303} **(78L05)** Q_{02} **(2SB705)** providing +10V and +5V.

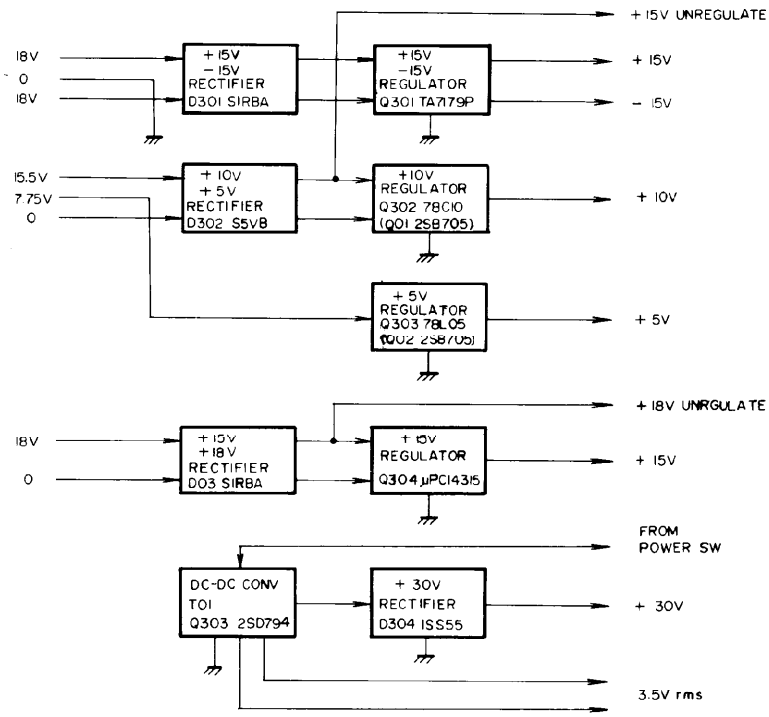
The DC-DC converter unit consists of T_{301}, Q_{305} **(2SD794)** and supplies two voltages to the digital display. D_{304} **(1SS55)** rectifies 30V for the segments and 3.5V for the filaments.


DISPLAY UNIT
LED
KEY BOARD
60MHz IN
60MHz GATE Q01 74S10 (c)
GATE Q02 74S20 (a)
COUNTER Q07 TC5032
INTERFACE Q08 7407(a,b,e,f)
CPU Q18 μPD546C
SEGMENT DRIVER Q30 MSL 912R (b~h)
ROW DRIVER Q22 MC1416 (c, d, e, f)
600MHz IN
600MHz GATE Q01 74S10 (a)
ON-OFF GATE QC3 74S00 (c)
MPX Q06 74LS157
INTERFACE Q08 7407(c, d) Q09 7407(b,c)
DIGIT DRIVER Q31 MSL912R
COLUMN DRIVER Q25 μPA56C
PRNTER
V/F IN
V/F GATE Q03 74S00 (b)
COUNTER Q04 74S196
COUNTER Q05 74LS 196
INTERFACE INVERTER Q17 4050(b,d) Q01 74S10 (b)
DISPLAY CONT. Q19 μPD 549C
TIME OUT DRIVER Q22 MC1416 b)
COUNTER IN
COUNT GATE Q03 74S00 (d)
PULSE GEN. Q10 74LS 112
INTERFACE Q09 7407 (d, e)
COUNTER SELECT Q02 74S20 (b)
FUNCTION LATCH Q23 4042 Q24 4042
DP SELECT GATE Q26 4011 Q27 4011 Q32 4068
KHz SELECT DRIVER D13,14,15 IS1555 Q33 MPSA13
1MHz IN
DIVIDER Q13 NSM 5592
0.01, 0.1, 1S SELECT GATE Q1 74LS10(a,c) Q12 74LS00(a,b)
GATE CONT. Q11 74LS00(b)
V/F SELECT Q12 74LS00(d)
INTERFACE Q16 4050 Q17 4050 (d,e,f)
DP DRIVER Q30 MSM912R (a)
LIMIT DRIVER Q22 MC1416(a)
OVF IN
10V IN
100V IN
1000V IN
DVM RANGE SW Q14 4066 Q20 4066
MINUS SELECT DRIVER D16,17 IS1555 Q34 MPSA13
FUCTION LATCH Q28 4042
OVF LATCH Q29 4013
OVF SELECT DRIVER D18,19 IS1555 Q35 MPSA13
MINUS IN
P/S
P/S
DP MPX Q2 14519
LOGIC UNIT
BLOCK DIAGRAM



MAIN UNIT
BLOCK DIAGRAM



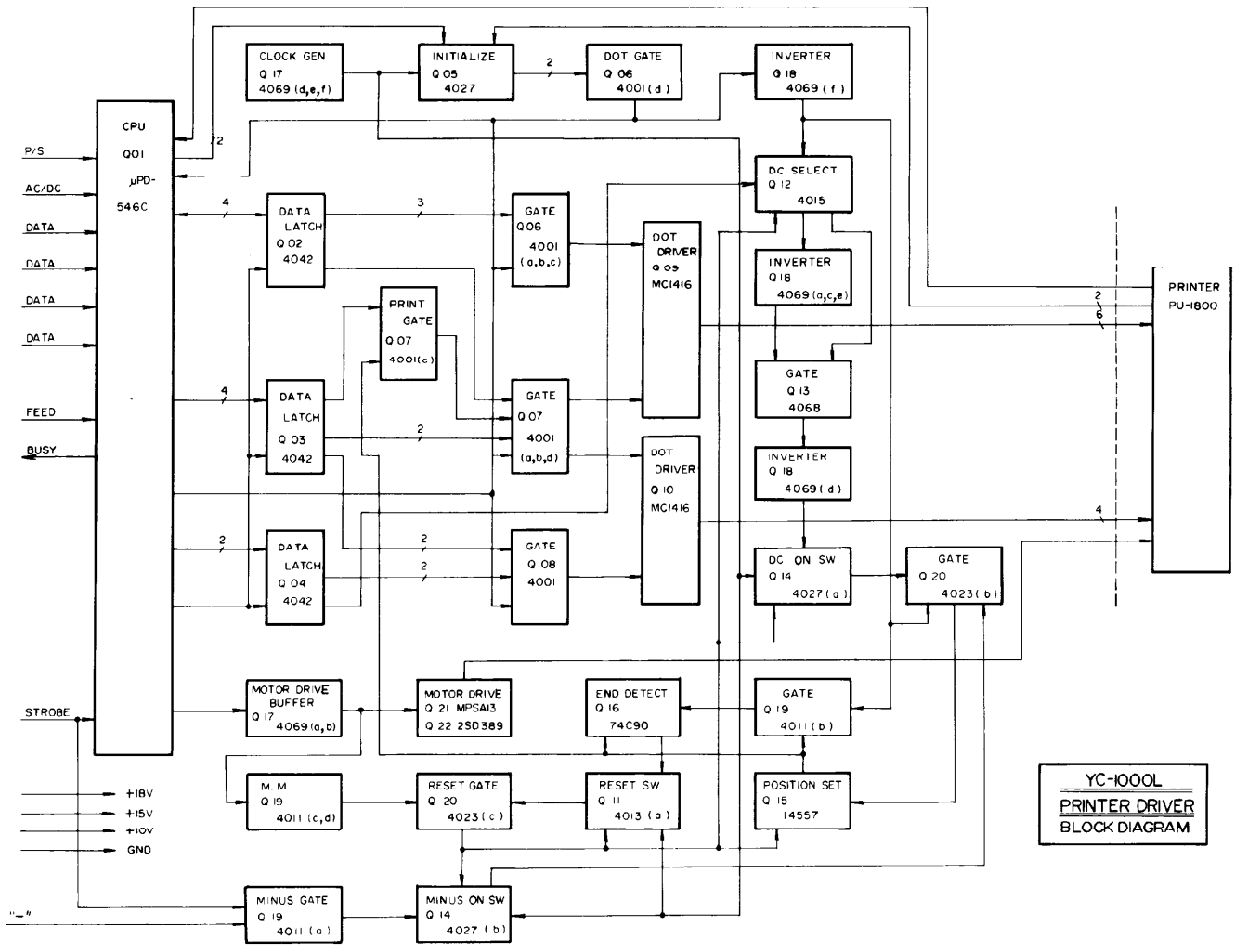


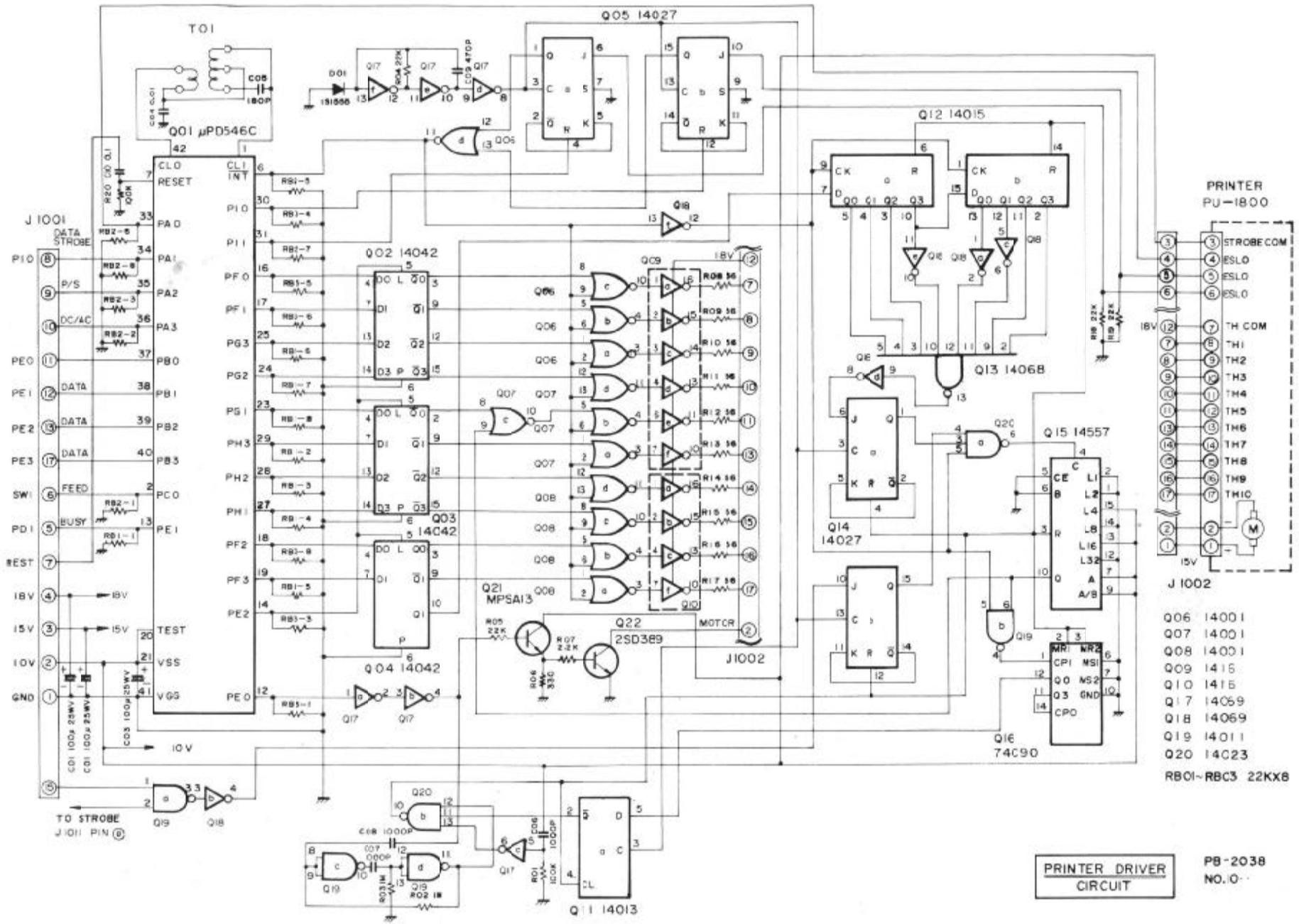
POWER SUPPLY UNIT
BLOCK DIAGRAM

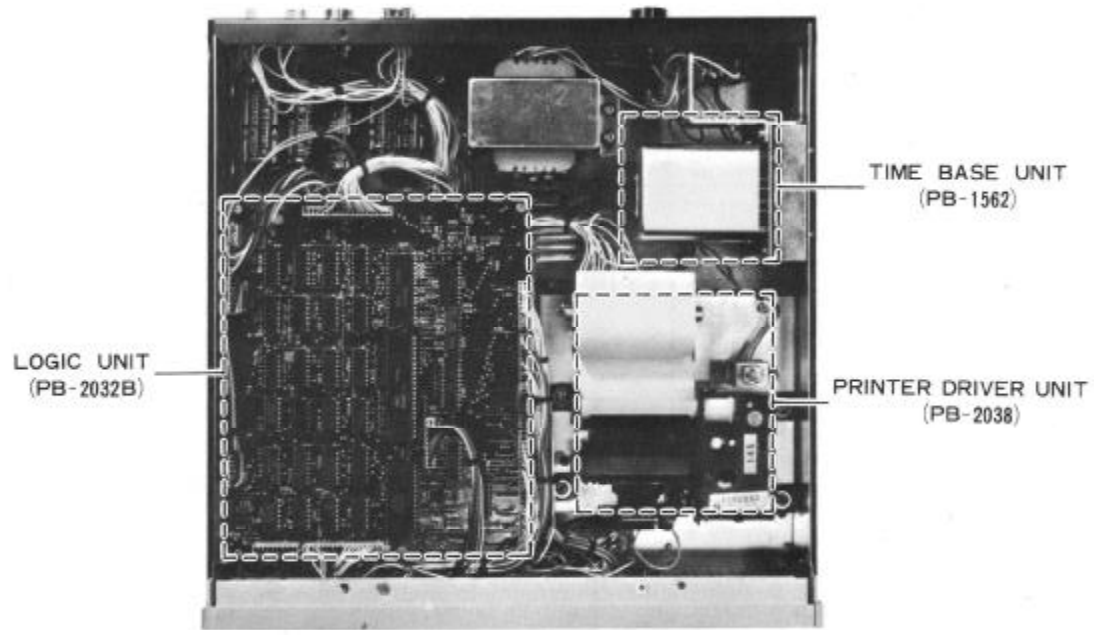
PRINTER DRIVER UNIT

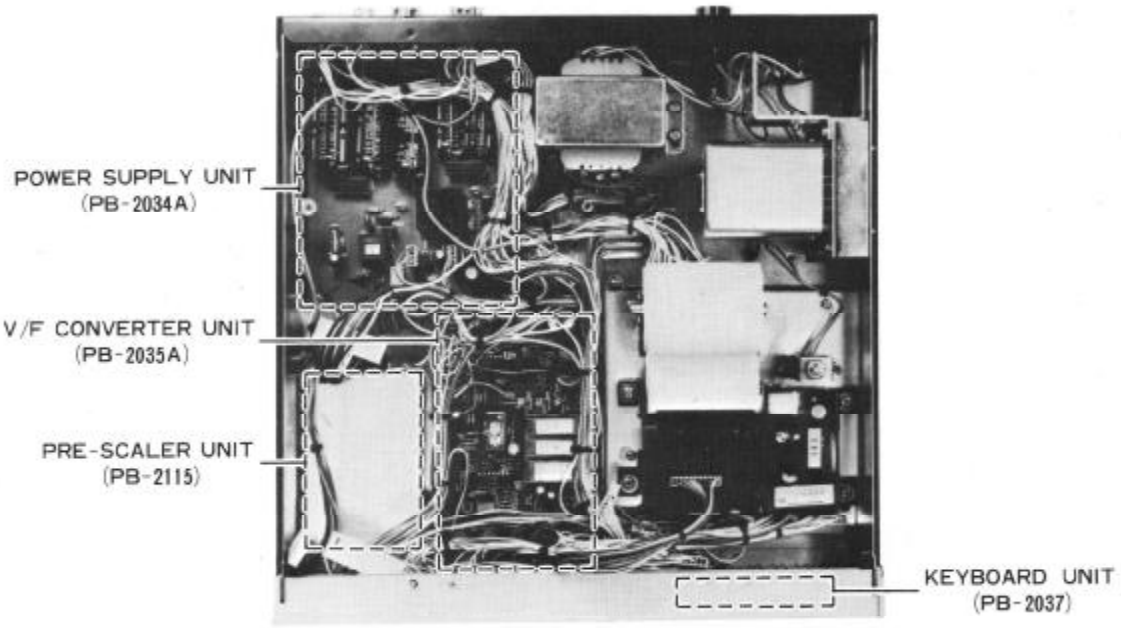
The printer driver unit consists of the CPU, motor driver, and head driver.

At the CPU, 4-bit data signals and 1 strobe signals from the Logic Circuit are processed to energize the thermal head through the head driver.




T01
Q01 μPD546C
Q05 14027
Q12 14015
Q13 14068
Q14 14027
Q15 14557
Q16 74090
Q02 14042
Q03 14042
Q04 14042
Q21 MPSA13
Q22 2SD389
Q11 14013
J1001
J1002
TO STROBE J1011 PIN ⑧
PRINTER PU-1800
STROBE COM
ESLO
ESLO
ESLO
TH COM
TH1
TH2
TH3
TH4
TH5
TH6
TH7
TH8
TH9
TH10
Q06 14001
Q07 14001
Q08 14001
Q09 1415
Q10 1415
Q17 14069
Q18 14069
Q19 14011
Q20 14023
RB01~RB03 22KX8
PRINTER DRIVER CIRCUIT
PB-2038
NO.0


TIME BASE UNIT
(PB-1562)
LOGIC UNIT
(PB-2032B)
PRINTER DRIVER UNIT
(PB-2038)


POWER SUPPLY UNIT
(PB-2034A)
V/F CONVERTER UNIT
(PB-2035A)
PRE-SCALER UNIT
(PB-2115)
KEYBOARD UNIT
(PB-2037)

PARTS LIST

MAIN CHASSIS

Symbol Number	Parts Number	Description
		TRANSISTOR
Q1, 2	G3207050R	2SB705R
		RESISTOR
R1	J01245562	Carbon film ¼W TJ 5.6KΩ
		POWER TRANSFORMER
PT1	L3030076	
		SWITCH
S1	N0190062	J22-123
S2	N4090028	1F-0001AC2061VD
S3, 4	N6090013	SS-F-22-08
		RECEPTACLE
J1	P0090094	NC174 6A 250V
J2, 3	P1090050	UG-625 B/U
J4	P1090189	MJ-015 (RED)
J5	P1090190	MJ-015 (BLACK)
J6	P0090011	FM-144S
J7	P1090149	S1620A-STA
J8	Q9000078	T-10
		MULTI JACK
MJ1	P4090008	3305-010-011
		MINI CONNECTOR
P1 (with wire)	T9202570B	5047-05
P2 (with wire)	T9202630B	5047-17
P3 (with wire)	T9202650	5047-03
P4 (with wire)	T9202660	5047-03
P1, 2	P1090072	5047-05
P3	P1090084	5047-17
P4	P1090074	5047-03
		FUSE
F1	Q0000002	1A, 250V
		FUSE HOLDER
FH1	P2000015	SN2052

LOGIC UNIT

Symbol Number	Parts Number	Description
PB-2032B	F0002032B	Printed circuit board
	C0020320	P.C. Board with components

		IC & TRANSISTOR	
Q122	G1090094	IC	MC1416
Q126, 127	G1090068	"	MC14011B
Q129	G1090067	"	MC14013B
Q123, 124, 128	G1090051	"	MC14042B
Q115, 116, 117	G1090166	"	MC14050
Q114, 120	G1090257	"	MC14066B
Q132	G1090261	"	MC14068B
Q121	G1090050	"	MC14519B
Q130, 131	G1090260	"	MSL912R
Q113	G1090112	"	MSM5592
Q125	G1090240	"	μPA 56C
Q118	G1090258	"	μPD546C-23
Q119	G1090259	"	μPD549C
Q108, 109	G1090119	"	SN7407N
Q103	G1090169	"	SN74S00N
Q101	G1090254	"	SN74S10N
Q102	G1090255	"	SN74S20N
Q104	G1090256	"	SN74S196N
Q112	G1090253	"	SN74LS00N
Q111	G1090194	"	SN74LS10N
Q110	G1090121	"	SN74LS112N
Q106	G1090181	"	SN74LS157N
Q105	G1090033	"	SN74LS196N
Q107	G1090098	"	TC5032
Q133, 134, 135	G3090005	Tr	MPSA13
		IC SOCKET	
QS101	P3090037		42 Pin DIL
		DIODE	
D101 – 121	G2015550	Silicon	1S1555
		RESISTOR	
R101,102, 124 – 127	J01215221	Carbon film ⅛W TJ 220Ω	
R103, 111, 112 142, 143, 154	J01215222	" " " TJ 2.2KΩ	
R109, 110	J01215103	" " " TJ 10KΩ	
R145 – 147	J01215153	" " " TJ 15KΩ	
R104 – 106 113 – 123 128 – 141 148 – 153 155, 156	J01215223	" " " TJ 22KΩ	
R107, 108	J01215104	" " " TJ 100KΩ	
R144	J10276331	Carbon composition ½W 330Ω	
		BLOCK RESISTOR	
RB101	J40900013	EXB-P-88-223 ⅛Wx8 4.7KΩ	
RB102 – 105	J40900015	EXB-P-88-473 ⅛Wx8 22KΩ	
		CAPACITOR	
C103	K02179023	Ceramic	50WV CH 180pF
C104	K13170103	"	" 0.01μF
C105	K50177102	Mylar	" 1000pF
C101, 102	K54200003	"	100WV 0.15μF

C106, 107	K40120476	Electrolytic 16WV 47μF	Q305	G3407940Q	Tr 2SD794Q
		TRANSFORMER			**DIODE**
T101	L0190002	M312 162N	D304	G2090132	Silicon 1SS55
			D301, 303	G2090127	" S1RBA10
			D302	G2090022	" S5VB10
		MINI CONNECTOR			
J103	P0090042	5048-05A			
J110	P0090054	5048-07A			**RESISTOR**
J101	P0090037	5048-08A	R301, 302	J01245399	Carbon film ¼W TJ 3.9Ω
J104, 107	P0090072	5048-09A	R305	J10246569	" composition ¼W GK 5.6Ω
J105	P0090039	5048-13A	R303, 304	J10246330	" " " GK 33Ω
J102	P0090055	5048-16A	R306	J10246222	" " " GK 2.2KΩ
J108, 109	P0090056	5048-17A	R309	J01245512	" film " TJ 5.1KΩ
J106	P0090057	5048-18A	R307	J10246103	" composition " GK 10KΩ
			R310	J01245473	" film " TJ 47KΩ
			R311	J01245563	" " " TJ 56KΩ
			R308	J01245104	" " " TJ 100KΩ

DISPLAY UNIT

Symbol Number	Parts Number	Description
PB-2033	F0002033	Printed circuit board
	C0020330	P.C. Board with components
		DISPLAY
V201	G6090007	LD8217/FIP8A11
		DIODE
D201 –210 212~221	G2090130	LED SR105D
D211	G2090131	" SG205D
		MINI CONNECTOR
P204 (with wire)	T9202640B	5047-07
P203 (")	T9202610	5047-09
P201 (")	T9202590A	5047-13
P202 (")	T9202600	5047-18
P204	P1090074	5047-07
P203	P1090076	5047-09
P201	P1090080	5047-13
P202	P1090085	5047-18

POWER SUPPLY UNIT

Symbol Number	Parts Number	Description
PB-2034A	F0002034A	Printed circuit board
	C0020340	P.C. Board with components
		IC & TRANSISTOR
Q304	G1090264	IC μPC14315
Q301	G1090262	" TA7179P
Q302	G1090263	" 78C10
Q303	G1090120	" 78L05

C303 – 306, 309 310, 312, 314 316, 318, 320 322	K13170103	Ceramic disc 50WV 0.01μF
C323	K50177153	Polyester film 50WV 0.015μF
C324	K54200004	" 100WV 1μF
C325	K40120476	Electrolytic 16WV RL 47μF
C315	K41120228	" " TL 2200μF
C311	K41140338	" 25WV TL 3300μF
C301, 302	K41160477	" 35WV TL 470μF
C319	K41160228	" " TL 2200μF
C307, 308, 313 317, 321	K40170105	" 50WV RL 1μF
		POWER TRANSFORMER
PT301	L3030077	MPS-160-06
		MINI CONNECTOR
J301, 302	P0090041	5048-03A
		PLUG
P301 (with wire)	T9202620A	5047-17
P301	P1090084	5047-17

V/F UNIT

Symbol Number	Parts Number	Description
PB-2035A	F0002035A	Printed circuit board
	C0020350	P.C. Board with components
		IC & TRANSISTOR
Q402, 403	G1090266	IC F3403
Q404	G1090267	" RC4151NB

Q401	G1090265	IC	TL082C
Q405 – 410	G3321200Y	Tr	2SC2120Y
		IC SOCKET	
QS401	P3090049	308-AG37D	
		DIODE	
D401 – 416	G2015550	Silicon	1S1555
		RESISTOR	
R419	J01245470	Carbon film ¼W TJ	47Ω
R435	J01245560	" " " "	56Ω
R446	J01245101	" " " "	100Ω
R406, 407	J01245272	" " " "	2.7KΩ
R427, 440	J01245392	" " " "	3.9KΩ
R425, 441 – 443	J01245472	" " " "	4.7KΩ
R448	J01245512	" " " "	5.1KΩ
R426, 436, 437 439	J01245153	" " " "	15KΩ
R438	J01245223	" " " "	22KΩ
R420	J01245273	" " " "	27KΩ
R445	J01245563	" " " "	56KΩ
R452	J01245224	" " " "	220KΩ
R423	J20249164	Metallic film ¼W	2.2KΩ
R421, 424	J20249163	" " "	2.7KΩ
R450	J20249165	" " "	5.1KΩ
R412, 451	J20249161	" " "	6.8KΩ
R409, 447, 449	J20249158	" " "	10KΩ
R416, 418, 430 433	J20249162	" " "	47KΩ
R411	J20249160	" " "	82KΩ
R410, 413 415 417, 422, 428 429, 431, 432 434, 444	J20249159	" " "	100KΩ
R403	J20279005	" " ½W	100KΩ
R402	J20279004	" " "	900KΩ
R404	J20249157	" " "	1MΩ
R401	J20279003	" " "	9MΩ
		POTENTIOMETER	
VR401, 405	J51733103	3299W1-103	10KΩ
VR404	J51724103	PN822H-103H	10KΩ
VR403	J51724503	PN822H-503H	50KΩ
VR402	J51733204	3299W1-204	200KΩ
		CAPACITOR	
C405	K02173100	Ceramic disc 50WV CH	10pF
C401, 402, 407 410, 411	K13170103	" " "	0.01μF
C408	K50177473	Mylar "	0.047μF
C406	K70167105	Tantalum 35WV	1μF
C403, 404, 416	K40120106	Electrolytic 16WV	10μF
C414, 415	K40140476	" "	47μF
C412, 413	K40140336	" 25WV	33μF
C409	K40140476	" "	47μF

		RELAY
RL402, 403	M1190019	URH-3
RL401	M1190020	URJ-3
RL404	M1190006	FBR221D012
		SWITCH
S401	N4090026	3B-6U-15-EE
		MINI CONNECTOR
P401 (with wire)	T9202560A	5047-14
P401	P1090081	5047-14

PRE-SCALER UNIT

Symbol Number	Parts Number	Description
PB-2115	F0002115	Printed circuit board
	C0021150	P.C. Board with components
		IC FET & TRANSISTOR
Q506	G1090269	IC MC5156
Q502	G1090032	" MC10116
Q504	G1090268	" μPC157A
Q507	G1090287	" SP8630
Q501	G3800190G	FET 2SK19GR
Q505	G3309430	Tr 2SC943
Q508, 509	G3320260	" 2SC2026
Q503	G3090008	" MPS3640
		IC SOCKET
QS501	P3090039	316-AG-37D
QS502	P3090038	314-AG-37D
		DIODE
D503, 504	G2009530	Silicon 1S953
D501, 502 508 – 512	G2015550	" 1S1555
D505, 506	G2090038	Schottky barrier 1SS16
D507	G2090133	Pin TDA1053
		RESISTOR
R537	J10216220	Carbon composition 1/8W GK 22Ω
R501	J10216510	" " " " 51Ω
R517	J10216101	" " " " 100Ω
R536, 540	J10216151	" " " " 150Ω
R513	J10216221	" " " " 220Ω
R532	J10216271	" " " " 270Ω
R533	J10216331	" " " " 330Ω
R505	J10216471	" " " " 470Ω
R504, 508 – 511 514, 515	J10216511	" " " " 510Ω
R516	J10216911	" " " " 910Ω
R512, 520, 524 526, 530	J10216102	" " " " 1KΩ

R518	J10216152	Carbon composition 1/8W GK	1.5KΩ
R519	J10216182	" " " "	1.8KΩ
R506, 523	J10216222	" " " "	2.2KΩ
R507	J10216272	" " " "	2.7KΩ
R529	J10216332	" " " "	3.3KΩ
R521, 527	J10216472	" " " "	4.7KΩ
R522	J10216562	" " " "	5.6KΩ
R528, 538, 541	J10216103	" " " "	10KΩ
R534	J10216153	" " " "	15KΩ
R535	J10216223	" " " "	22KΩ
R539	J10216333	" " " "	33KΩ
R502	J10216473	" " " "	47KΩ
R525	J10216563	" " " "	56KΩ
R503, 531	J10216275	" " " "	2.7MΩ
		POTENTIOMETER	
VR503	J51724201	PN822H201H	200Ω
VR501	J51724102	PN822H102H	1KΩ
VR502	J51724103	PN822H103H	10KΩ
		CAPACITOR	
C510	K02179008	Ceramic disc 50WV CH	20pF
C539−541	K13170102	" " "	0.001μF
C502, 504, 529 530	K14179002	" " "	0.01μF
C543	K13170473	" " "	0.047μF
C509, 511−521 524, 525 535−538	K22170003	" chip "	0.001μF
C526−528, 534	K21170002	" feed thru "	0.001μF
C508	K50177104	Mylar "	0.1μF
C501	K54200002	" 100WV	0.47μF
C506, 507	K70167104	Tantalum 35WV	0.1μF
C503, 505, 522 523, 531−533 542	K70127106	" 16WV	10μF
		TRIMMER CAPACITOR	
TC501	K91000029	ECV-1ZW 20 x 53	20pF
		INDUCTOR	
L501	L1020665		
		RELAY	
RL501	M1190021	FBR211A005	
		RECEPTACLE	
J501, 502	P1090113	UG-625B/U	
		MINI CONNECTOR	
P501 (with wire)	T9202550A	5047-08	
P501	P1090075	5047-08	

KEYBOARD UNIT

Symbol Number	Parts Number	Description
PB2037	F0002037	Printed circuit board
	C0020370	P.C. Board with components
		DIODE
D601−605	G2015550	Silicon 1S1555
		KEY SWITCH
KS601−619	N5090002	AKC8S
		MINI CONNECTOR
P601(with wire)	T9202580A	5047-08
P601	P1090075	5047-08

TIME BASE UNIT

Symbol Number	Parts Number	Description
PB1563B	F0001563B	Printed circuit board
	C0015630	P.C. Board with components
		IC
Q901	G1090114	μPC14312
		CRYSTAL UNIT
X901	H9500030	TCO-8D2
		CAPACITOR
C901	K70167105	Tantalum 35WV 1μF
C902	K70127106	" 16WV 10μF

PRINTER DRIVER UNIT

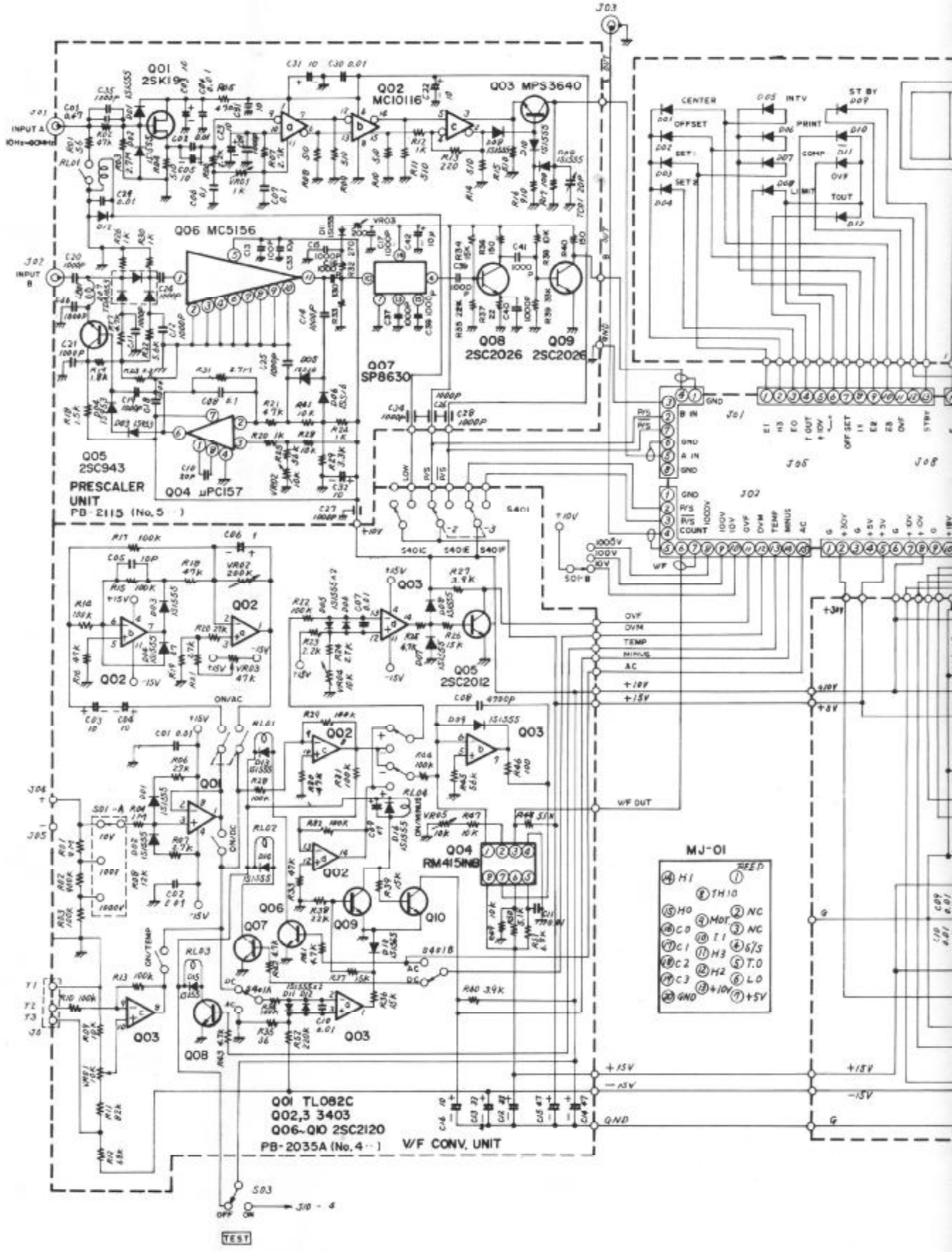
Symbol Number	Parts Number	Description
PB-2038	F0002038	Printed circuit board
	C0020380	P.C. Board with components
		IC & TRANSISTOR
Q1009, 1010	G1090094	IC MC1416
Q1006−1008	G1090027	" MC14001B
Q1019	G1090068	" MC14011B
Q1011	G1090137	" MC14013B
Q1012	G1090272	" MC14015B
Q1020	G1090026	" MC14023B
Q1005, 1014	G1090104	" MC14027B
Q1002−1004	G1090051	" MC14042B
Q1013	G1090261	" MC14068B
Q1017, 1018	G1090126	" MC14069B
Q1015	G1090273	" MC14557B

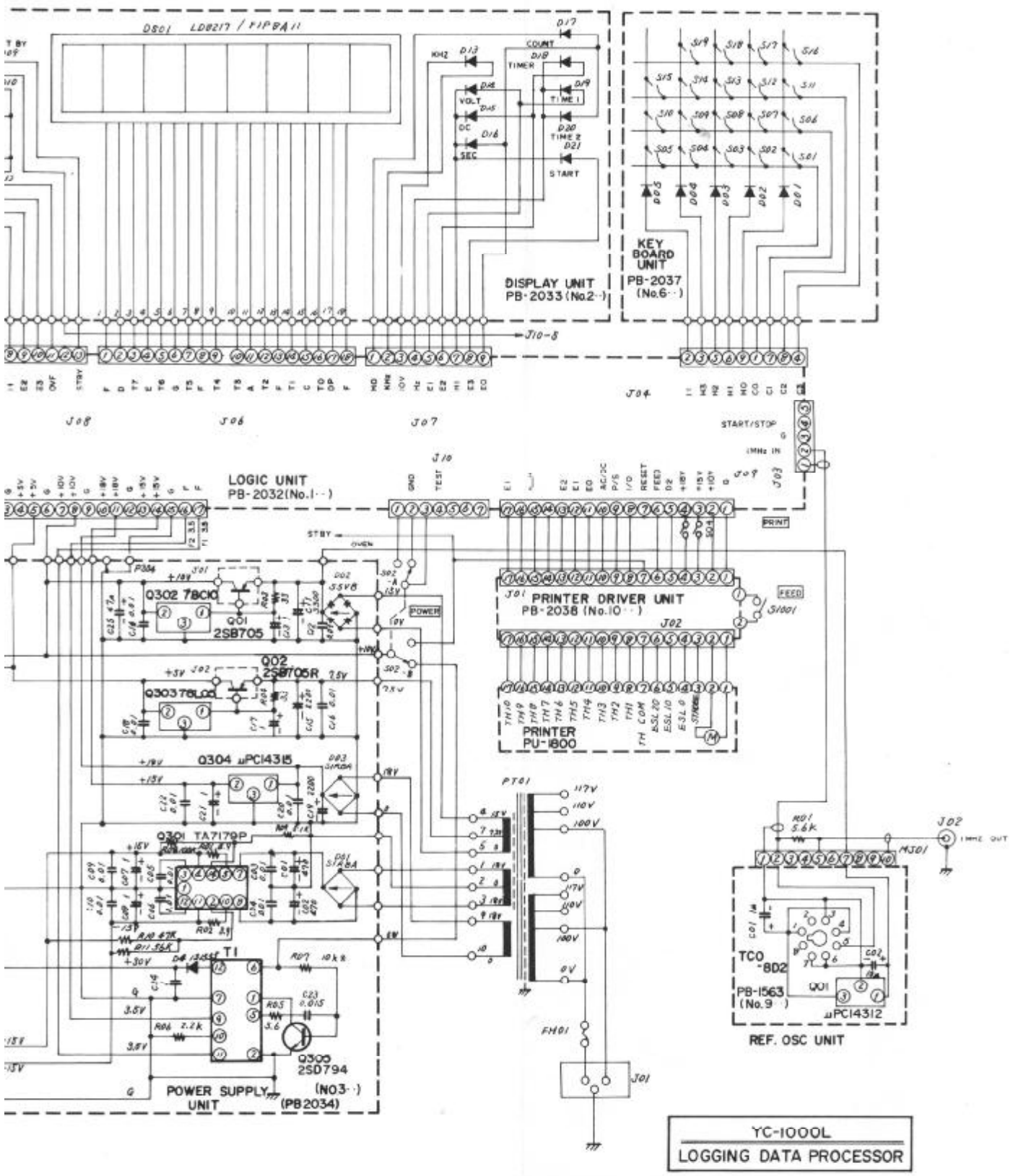
Q1001	G1090271	IC	μPD546-028
Q1016	G1090097	"	74C90
Q1022	G3403890P	Tr	2SD389P
Q1021	G3090005	"	MPS-A 13
		IC SOCKET	
QS1001	P3090037		42P DIL
		DIODE	
D1001, 1002	G2015550	Silicon	1S1555
		RESISTOR	
R1008 – 1017	J10246560	Carbon composition	¼W GK 56Ω
R1006	J01215331	" film	⅛W TJ 330Ω
R1007	J01215222	" "	" " 2.2KΩ
R1004, 1005 1018,1019,1021	J01215223	" "	" " 22KΩ
R1001, 1020	J01215104	" "	" " 100KΩ
R1002, 1003	J01215105	" "	" " 1MΩ
		BLOCK RESISTOR	
RB1001 – 1003	J40900013	EXB-P-88-223	⅛Wx8 22KΩ
		CAPACITOR	
C1005	K13170103	Ceramic disc 50WV	CH 180pF
C1004	K02179023	" " "	0.01μF
C1006, 1010	K54200003	Mylar 100WV	0.1μF
C1009	K51176471	Styrol 50WV	470pF
C1007, 1008	K51176102	" " "	1000pF
C1001 – 1003	K40140107	Electrolytic 25WV	100μF
		TRANSFORMER	
T1001	L0190002	IFT	M312-162N
		SWITCH	
S1001	N4090029		MSP103C
		MINI CONNECTOR	
J1001	P0090126	5049-17A	
J1002	P1090150	HBLB17S-1	
		PRINTER	
PR1001	Q9000075	Thermal printer PU-1800	

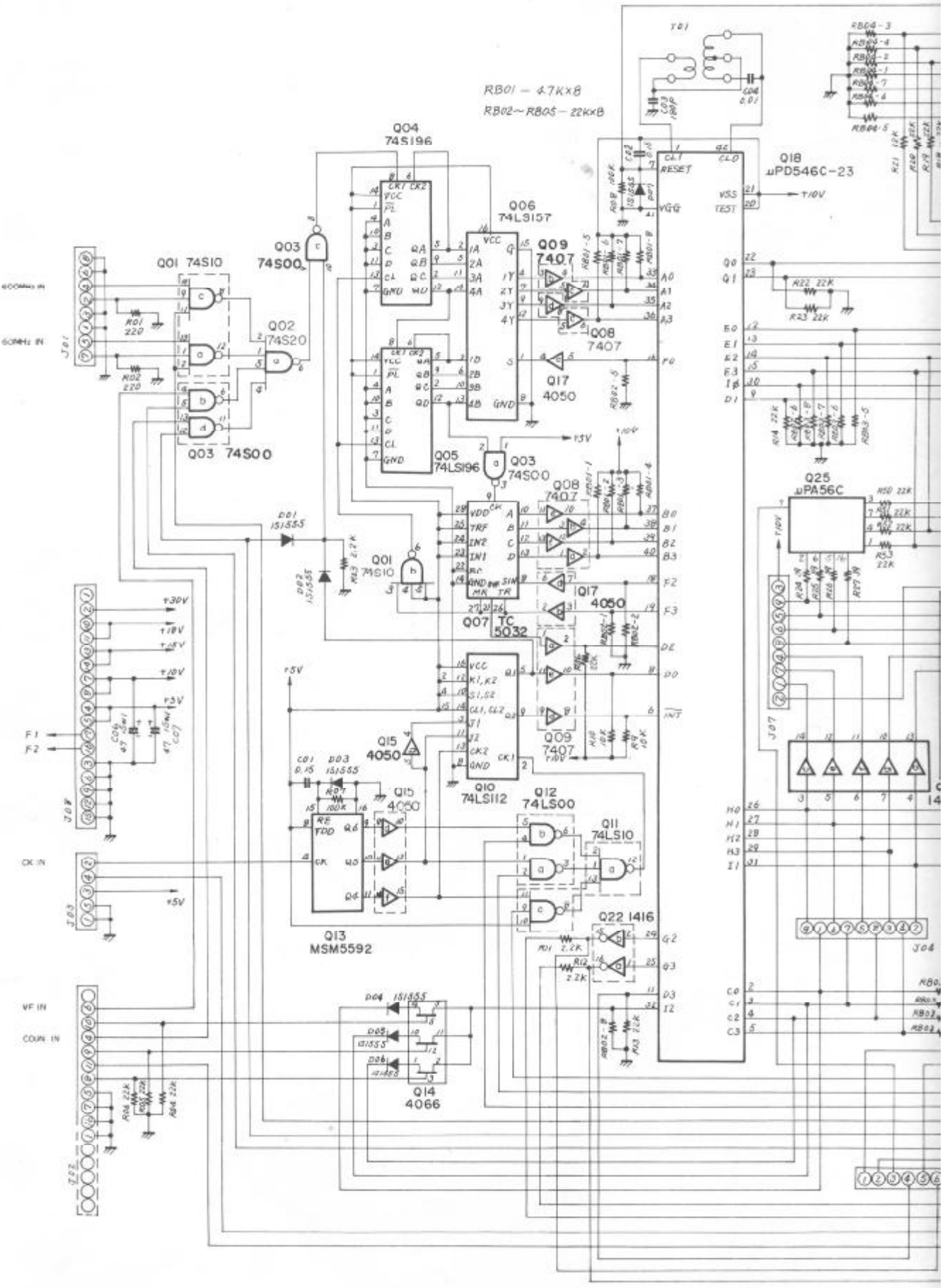
		AC POWER CORD
T9013280	2 wire, 2 prong plug	(DC-546-007)
T9013282	3 wire, 3 prong plug	(UC-904-016)
T9013284	3 wire, 2 prong EU plug	(EC-407-007)
T9013283	3 wire, 3 prong Australian plug	(SC-411-001)
Q0000002	Fuse 1A 250V	
T9100250	Coaxial cable RG-58AU, 1m BNC, Alligator clip	
O9000077	Thermal paper TP50CMA	

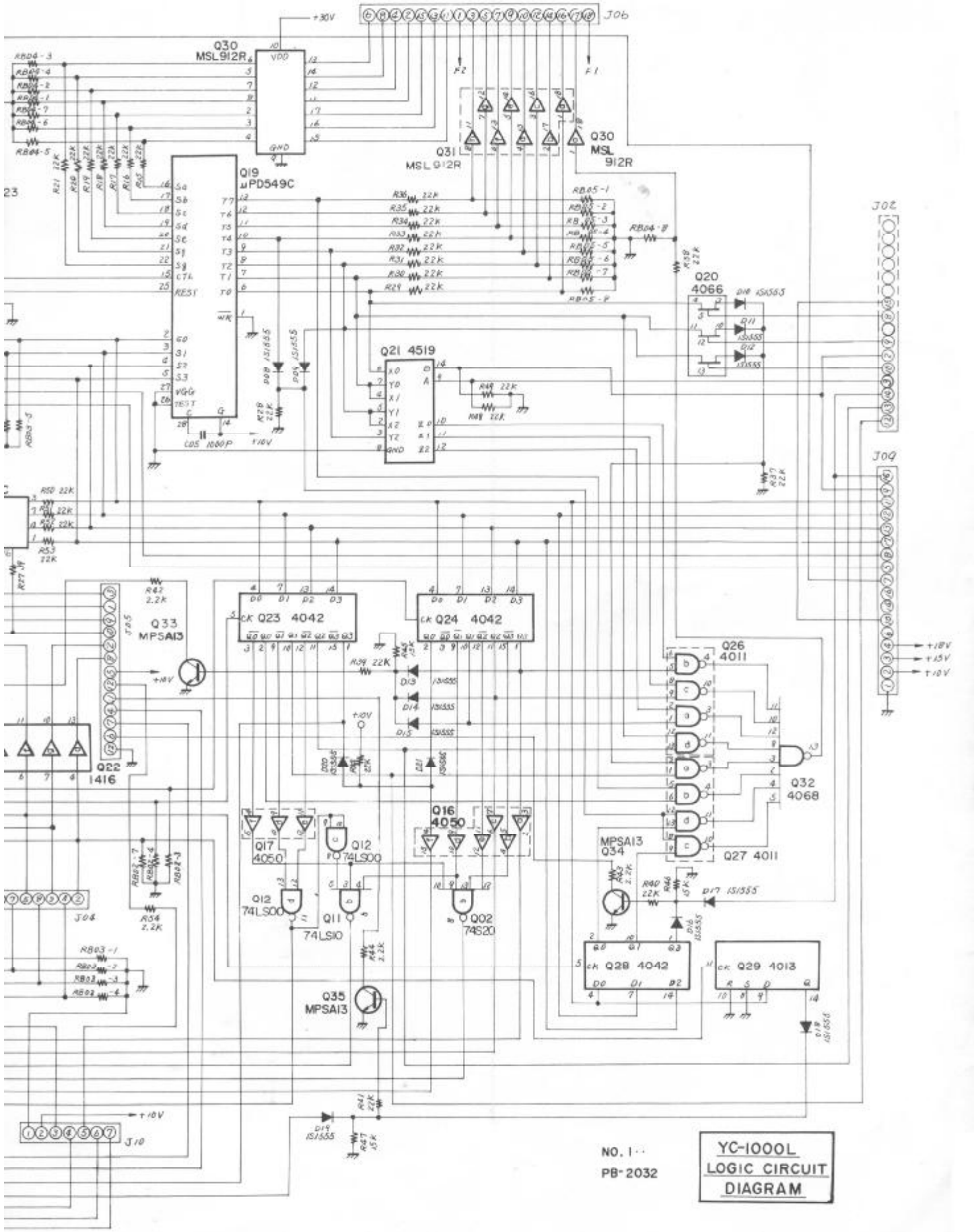
ACCESSORIES

Symbol Number	Parts Number	Description
	P0090083	BNC Plug UG-88/U
	Q9000076	Testing probe TP-2255B
	C9100770	Thermo sensor


Q01 2SK19
Q02 MC10116
Q03 MPS3640
Q06 MC5156
Q08 2SC2026
Q09 2SC2026
Q07 SP8630
Q05 2SC943
PRESCALER UNIT
PB-2115 (No.5 ···)
Q04 μPC157
Q02
Q03 2SC2012
Q04 RM415INB
MJ-01
Q01 TL082C
Q02,3 3403
Q06~Q10 2SC2120
PB-2035A (No.4 ···) V/F CONV. UNIT
INPUT A
INPUT B
CENTER
OFFSET
SET1
SET2
PRINT
COMP
OVF
LIMIT
TOUT
ST BY
INTV
GND
B IN
A IN
COUNT
OVF
OVM
TEMP
MINUS
AC
+10V
+15V
W/F OUT
ON/AC
ON/DC
ON/TEMP
TEST


DISPLAY UNIT
PB-2033 (No.2··)
KEY BOARD UNIT
PB-2037
(No.6··)
LOGIC UNIT
PB-2032(No.1··)
PRINTER DRIVER UNIT
PB-2038 (No.10··)
PRINTER
PU-1800
POWER SUPPLY UNIT (PB2034)
REF. OSC UNIT
PB-1563
(No.9··)
YC-1000L
LOGGING DATA PROCESSOR


RB01 – 4.7K×8
RB02~RB05 – 22K×8
Q04 74S196
Q06 74LS157
Q09 7407
Q08 7407
Q17 4050
Q05 74LS196
Q03 74S00
Q01 74S10
Q02 74S20
Q07 TC 5032
Q10 74LS112
Q12 74LS00
Q11 74LS10
Q15 4050
Q13 MSM5592
Q14 4066
Q18 μPD546C-23
Q25 μPA56C
Q22 1416
D01 1S1555
D02 1S1555
D03 1S1555
D04 1S1555
D05 1S1555
D06 1S1555
J01
J02
J03
J04
J07
J08
J22
F1
F2
CK IN
VF IN
COUN IN
+30V
+18V
+10V
+5V
-5V
T01


YC-1000L
LOGIC CIRCUIT
DIAGRAM
NO. 1··
PB-2032

YAESU

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