INSTRUCTION MANUAL

Model : DataBlue 6000®

50MS/s Digital Storage Oscilloscope

Wilke Techno Logy

NOTICE

DML : Digital Storage Oscilloscope (DSO)
+Digital Multimeter (DMM)
+Logic Analyzer (LGA)

DM : Digital Storage Oscilloscope (DSO)
+Digital Multimeter (DMM)

DSO : Digital Storage Oscilloscope (DSO)

Protek - 3850

Contents

1. General

This light and compact-sized product, with its large LCD screen, can be used as a Digital Storage Oscilloscope (50 MS/Sec, 8 BIT), a Logic Analyzer (50 MS/Sec, 16 CHANNEL), and a Digital Multimeter with 4000 COUNT indicators (Hz, Cap function included); three instruments are combined into one for higher efficiency and convenience. Accordingly, this product can be used for FIELD SERVICE, PERSONAL USE at research lab, ANALOG and LOGIC ANALYSIS in many fields.

2. Features

2.1 DSO (DIGITAL STORAGE OSCILLOSCOPE) function

(1) 50MS/sec, 8 BIT resolution, and 2048 WORD/CH and 2CH
(2) Input waveform setting AUTO range function
(3) DMM Measurement Indication Function by the cursor
(other than time difference, voltage difference, and frequency)
(4) Waveform, SET-UP DATA, and time can be stored onto the memory
(5) Low-speed signal measurement by ROLL MODE
PRE TRIGGER POINT function
Over lapping Indication function (2CH)
OR/AND TRIGGER function
Compressed/scroll function

2.2 LGA (LOGIC ANALYZER) function

(1) 50MS/sec, 2048 WORD/CH, 16CH
(2) Input waveform setting AUTO RANCE function
(3) 16CH simultaneous TIMING indication
STATE indication of HEX, BIN, DEC, OCT, ASCII
(4) 1, 0, X DATA TRIG and OR, AND TRIG function of 16CH
(5) ANALOG and X-Y indication
(6) CURSOR Measurement Indication, ROLL MODE, PRE TRIG POINT,
OVERLAPPING, COMPRESSED/SCROLL function

2.3 DMM (Digital Multimeter) function

(1) 4000 COUNT DMM of BAR-GRAPH indication function.
(2) 6 DMM basic function, CONDUCTIVITY BUZZER, CAPACITANCE measurement, FREQUENCY measurement by RECIPROCAL method.
(3) DSO/LGA and DMM are electrically insulated. They can be indicated at the same time even if they are measured separately.
(4) Relative value measurement, MIN/MAX value measurement, hold function, AUTO RANGE function, DATA LOGGER function.
(5) Data measured and time can be stored on the 16 memories.

2.4 Others

(1) Three type of power sources
(BAT, external DC, and AC adapter)
(2) Large and easy-to-read LCD
(3) Easy-to-read operation keys
(4) Printer output and RS-232C Interface are possible (option)

3. Specifications

3.1 DSO Part

⊙ Vertical part

○ Mode	:	CH1, CH2, DUAL, ADD, SUB, XY
○ Sensitivity	:	5mV/DIV~20V/DIV I, 2, 5 STEP 12 steps
○ Accuracy	:	± 3% ± 1 DOT
○ Resolution	:	8 bit(the first seven bits are used for indication)
○ Frequency characteristics	:	For 5mV ~ 2V/DIV DC : DC ~ 10MHz AC : 10Hz ~ 10MHz
○ Maximum sampling frequency	:	50MS/sec (DUAL 25MS/sec)
○ Rectangular wave characteristics :		For 5mV ~ 2V/DIV OVERSHOOT : 10% ± 1 DOT SAG (for 1KHz) : 5% ± 1 DOT Other distortion : 10% ± 1 DOT
○ Input conjunction	:	AC, DC, GND
○ Input RC	:	1MΩ ± 3%, 25pF ± 5pF
○ Input voltage-proof	:	± 200V (DC + AC PEAK)

⊙ Horizontal part

○ Record length	:	2048 WORD/CH
○ The length of display screen	:	140 WORD/CH (compressed 1400 WORD/CH)
○ Sweep method	:	AUTO, NORM, SINGLE
○ Sweep time	:	Normal mode : 2S/DIV ~0. 1 μs/DIV 1-2-5 STEP 23 steps Compressed mode : 20S/DIV ~1μ S/DIV 1-2-5 STEP 23 steps Roll mode : 20S/DIV ~1S/DIV (compressed) 2S/DIV ~0.1S/DIV (normal) 1-2-5 STEP 5 steps

External clock : DC ~ 20MHz
(Input resistance, Voltage-proof, LEVEL is the same as the external input)

- ○ Jitter : ± 1 Sample time
- ○ PRE, MID, POST trigger : Location of waveform 25%, 50%, 75%
- ○ Reference Memory : 2048 WORD × 4 waveform (RF1 ~ RF4)
  140 WORD × 12 waveform (RF5 ~ RFF)
- ○ SET-UP Memory : 16 PCS

⊙ Synchronization

- ○ Signal : CH1, CH2, OR, AND, EXT
- ○ Connecting method : DC
- ○ Polarity : +, - (↑, ↓)
- ○ Synchronization sensitivity : CH1, CH2 : DC ~ 10MHz 0.5DIV
  EXT : DC ~ 10MHz
  1) 500mVp-p at the center of THRESHOLD (DML only)
  2)TTL level (DM/DSO)

⊙ Others

- ○ EXT input resistance, voltage-proof, Level :
  100㏀ ±3%, ±40V PEAK, TTL LEVEL
- ○ When using Logic probe : (DML only)
  1MΩ ± 50%, ± 40V PEAK, TTL, CMOS, VAR LEVEL
- ○ Cursor voltage difference, Time difference, Frequency :
  Accuracy voltage difference : Reading value ± 3% ± 1dot
  Others : Reading value ± 1 sample time ± 1dot
- ○ DMM display : nine functions (electrically insulated)
- ○ Calendar, time : year, month, day, hour, minute : ± 3min/month (normal temperature)
- ○ Window display : It indicates the trigger point and indication location
- ○ Display part : LCD (128 × 160 DOT)
- ○ Signal output : (For probe phase adjustment)
  Waveform : rectangular waveform
  Frequency : 1KHz ±30%
  Output voltage : 500mV ±30%
- ○ AUTO RANGE function : Vertical, Horizontal axis range, Trigger level
- ○ Other functions : Overlapping function, Waveform comparison function, Printer output function, Scroll function, Timing and State display function at LGA

○ About SEC/DIV and sampling frequency

Normal mode	Compressed mode	Sampling frequency	
SEC/DIV	SEC/DIV	Hz	
2 s	20 s	10	
1 s	10 s	20	
0.5 s	5 s	40	
0.2 s	2 s	100	
0.1 s	1 s	200	
50 ms	0.5 s	400	
20 ms	0.2 s	1 k	
10 ms	0.1 s	2 k	
5 ms	50 ms	4 k	
2 ms	20 ms	10 k	
1 ms	10 ms	20 k	
0.5 ms	5 ms	40 k	
0.2 ms	2 ms	100 k	
0.1 ms	1 ms	200 k	
50 μs	0.5 ms	400 k	
20 μs	0.2 ms	1 M	
10 μs	0.1 ms	2 M	
5 μs	50 μs	4 M	
2 μs	20 μs	10 M	
1 μs	10 μs	20 M	
0.5 μs	5 μs	40 M	* 20 M
0.2 μs	2 μs	50 M	* 25 M
0.1 μs	1 μs	50 M	* 25 M

* In case V. MODE is other than ch1, ch2 (chL, chH)

3. 2 Logic Analyzer Part

○ Data input	16CH
○ External trigger input	1CH
○ External clock input	1CH
○ External qualifier input	1CH
○ Number of data channels	16CH
○ Max sampling frequency	50MS/sec (8 CH)
○ Record length	2048WORD/CH
○ Input R. C	1MΩ ± 5%, about 10PF

○ THRESHOLD voltage	TTL : about +1.4V CMOS : about + 2.4V VAR : -2.5 ~ 7.5V variable
○ Maximum input voltage proof	± 40V (DC + AC PEAK)
○ Swing voltage	500mVp-p when THRESHOLD is used as center
○ Minimum pulse width	20nSEC/Ons
○ Sweep method	AUTO, NORM, SINGLE
○ Sampling time	internal 20nS ~ 100mS 1-2-5 STEP external DC ~ 20MHz (minimum pulse 20nSEC)
○ Sweep time	Normal Mode — Same as DSO Compressed mode — Same as DSO Roll Mode — Same as DSO
○ Vertical mode	CHL : CHO~CH7, DATA input of 8CH CHH : CH8~CHF, DATA input of 8CH DUAL : CHO~CHF, DATA input of 16CH AND : AND DATA input of CHO~CH7, CH8~CHF OR : OR DATA input of CHO~CH7, CH8~CHF
○ Trigger	
25%, 50%, and 75% of total waveform (PRE, MID, POST TRIG)	
○ Data trigger	Combinatien of 0, 1, X for 16CH
○ Trigger Mode	CHL : DATA TRIGGER of CH0~CH7 CHH : DATA TRIGGER of CH8~CHF AND : AND TRIGGER of CH8~CHF and CH0~CH7 OR : OR TRIGGER of CH8~CHF and CH0~CH7 EXT : EXTERNAL TRIGGER
○ Polarity	↑, ↓
○ Jitter	±1 Sample time
○ Reference Memory	2048 WORD × 8CH 4(common part with DSO) 140 × 8CH 12(common part with DSO)
○ Setup Memory	16PCS (common part with DSO)
○ Timing display	16CH are displayed at the same time
○ Cursor display	The number of sample between cursors, Time difference, Frequency
○ DMM	nine functions (electrical insulation)
○ State display	HEX, BIN, OCT, DEC, ASCII display
○ Calendar clock	Same as DSO
○ Window display	Same as DSO

- ○ Auto range — (Optimal setting for time axis range)
- ○ Other functions — Overlapping function, comparison function, Anlong function at DSO, XYdisplay function, Print output function, and scroll function

3.3 DMM Part

⊙ Measuring function

- ○ DC, AC voltage measurement
- ○ DC, AC current measurement
- ○ Resistance measurement
- ○ Conductivity check
- ○ Diode test
- ○ Capacitance measurement
- ○ Frequency measurement (Reciprocal method)

○ Max display	4000 (frequency 9999)	
○ Bargraph	800 Segment	1 segment 15 count
○ Polarity display	only "-" is lit	
○ Measuring cycle	two times/sec	
○ Supplementary function	Relative measured value Max/Min measured value Hold function Conductivity buzzer output, Over warning	
○ Reference Memory	16 PCS	
○ Data Logger	Cycle : 2S, 5S, 10S, 15S, 30S, 60S, 120S Number of data : 1~999~(printer output)	
○ Temperature coefficient	Accuracy x 0.1/under ° C(0~18° C, 28~40° C)	
○ Voltage-proof between cases	500V (DC+AC PEAK)	
○ Voltage-proof between DSO/LGA	500V (DC+AC PEAK)	

○ Rate (23° C ± 5° C under 80% RH. avoid dew and humidity)

◆ DCV (DC voltage) Accuracy : ± (% leading value + numerical value of min row)

(at 23° C ± 5° C)

Range	Resolution	Measuring accuracy	Input impedance	Max input voltage
400 mV	0.1 mV	0.3 + 1	> 100 MΩ	1000VDC or 750V ACrms
4000 mV	1 mV		about 11MΩ	
40 V	10 mV		about 10MΩ	
400 V	100 mV			
1000 V	1 V	0.3 + 3		

◆ ACV (AC voltage) Accuracy : ± (% leading value + numrical value of min row)

Range	Resolution	Measuring accuracy	Input impedance	Max input voltage
400 mV	0.1 mV	40-100Hz 0.1 + 2	> 100 MΩ <50PF	1000VDC or 750V ACrms
4000 mV	1 mV	40-500Hz	about 11MΩ <50PF	
40V	10 mV		about 10MΩ	
400 V	100 mV	1.2 + 5		
1000 V	1 V			

Calibration : Inspection on average wave value, sinewave actual value calibration.
400mV is only for manual.

Input method : AC connection method

◆ DCA DC current

Range	Resolution	Mesuring accuracy	Max voltage drop	Max input current
40 mA	10 μA	1.0 + 2	< 0.4V	0.4 ADC
400 mA	100 μA	2.0 + 2	< 2.5V	

Over current protection : 400mA Range : Fuse protection (0.5A/250V)

◆ ACA (AC current) 40Hz~500Hz Accuracy : ± (%leading value + numerical value of min row)

Range	Resolution	Mesuring accuracy	Max voltage drop	Max input current
40 mA	10 μA	2.0 + 5	< 0.4V	0.4 A, ACrms
400 mA	100 μA		< 2.5V	

Over current protection : 40, 400mA Range : fuse protection (0.5A/250V)
Calibration : Inspection on average wave value, sinewave actual value calibration

◆ Ω Resistance

Range	Resolution	Mesuring accuracy	Mas measuring current	Open voltage	Input protection
400 Ω	100 mΩ	0.7 + 2	1mA	about 0.4V	Max 250VDC or ACrms
4 KΩ	1 Ω	0.7 + 1	100 μA		
40 KΩ	10 Ω		10 μA		
400 KΩ	100 Ω		1 μA		
4 MΩ	1 KΩ		100 μA		
40 MΩ	10 KΩ	2.0 + 1	100 μA		

◆ ·))) Conductivity Check

Range	Resolution	Check resistance	Max measuring current	Open voltage	Input protection
400 Ω	100 mΩ	Less than about 40 Ω	less than 1mA	0.4V	250Vrms

Buzzer responding speed : less than 50mS

◆ ⊣◀⊢ Diode Test Accuracy : ± (leading value + numerical value of min row)

Range	Resolution	Mesuring accuracy	Measuring current	Open voltage	Input protection
4 V	1 mV	1.0 + 2	about 1 mA	< 3V	250Vrms

◆ ⊣⊢ Capacitance range

Range	Resolution	Mesuring accuracy	Responding speed	Charge voltage measured	Input protection
4 nF	1 PF	5 ± 2dgt	1S	about 1V	250VDC or ACrms
40 nF	10 PF	5 ± 1dgt			
400 nF	100 PF				
4 μ F	1 nF				
40μ F	10 nF				

note) Check 4nF, 40nF range after 0 calibration with Δ Rel

◆ Hz (frequency) range (Reciprocal method)

Range	Resolution	Responding time	Others
100 Hz	10 mHz	1 S	Measured accuracy ± (0.1% ± 10dgt) Input impedance about 10 MΩ Max input voltage 500 VDC or ACrms
1000 Hz	100 MHz		
10 kHz	1 Hz		
100 kHz	10 Hz	0.1 S	

Over indication : above 100kHz

◆ Input sensitivity (AC RMS)

Above 1kHz 50mV(rms)

3.4 Power source part

○ Main battery	6 (AA TYPE)
○ Battery for DMM	2(AAA TYPE)
○ Battery life span	Main battery About 5 hours (at normal temprature and in AUTO MODE - alkali battery) About 200 hours for DMM (at normal temperature and at DCV Mode - alkali battery)
○ Battery for data preservation and clock	Lithium Battery
○ Battery life span	About 20,000 hours (normal temperature)
○ External power source	DC 7.5V~9V (300mA)
○ Option	Its own printer AC adapter Ni-Cd battery
○ Operation environment	
Operating temperature	5° C ~ 35° C
Operating humidity	20% ~ 80% RH
Storing temperature	-20° C ~ 60° C
○ Weight	About 1.1Kg (without battery)

○ Size About 50mm (H) ×235mm (W) × 153mm (D)

4. Function and operation of each part

4.1 Main body

(1) Power switch
This is the switch that turns on/off the power.

(2) DC input
Power input port of AC ADAPTER.
Turn off the power switch in case of connecting.

(3) Contrast
This is the switch used to adjust the contrast of the display.
Adjust the display for easy readability.

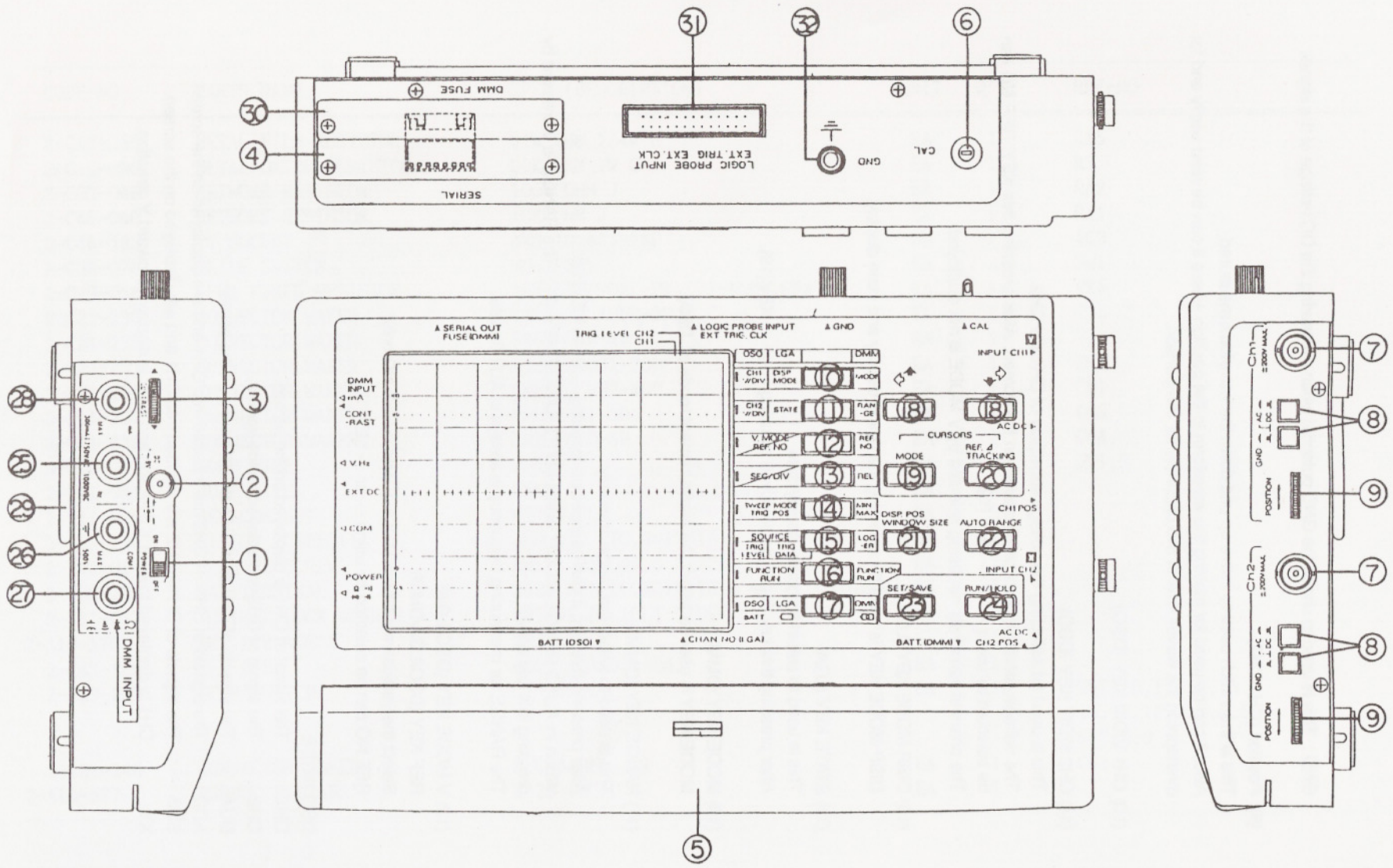
(4) Connector cover (option)
Be sure to connect them after disconnecting over when RS 232C and PRINTER (option) are connected.

(5) Battery case cover
Press the lock part and pull the cover.
Insert the batteries properly (be sure to check the polarity of battery).
Both alkali and mangan batteries can be used.
The left space is for the main batteries (3×6) and the right space is for DMM batteries (2×4).

(6) CAL signal output port
This is used for adjusting the phase of the probe.
If the square wave measured by connecting the end point of probe to the output port is slanted and distorted, adjust the trimmer of the probe.

(7) CH1 and CH2 input port
This is the BNC port used for inputting the measured signal of DSO.
When inputting the signal, the same axis cable or probe can be used.
Connect the GND of the probe to the GND of the signal source.
If the attenuation ratio of the probe is 1/10, the voltage of the screen is ten times higher than the leading value.

(8) DC, AC, GND Switch
This is the switch used to select the connection method of input signal.
AC : Input signal can be AC connection. DC components can be removed.
DC : Input signal can be DC connection. The measurement including DC components can be possible.


DMM FUSE
SERIAL
LOGIC PROBE INPUT
EXT.TRIG EXT.CLK
GND
CAL
SERIAL OUT
FUSE(DMM)
TRIG LEVEL CH2
CH1
LOGIC PROBE INPUT
EXT TRIG. CLK
GND
CAL
DMM INPUT
4mA
CONT
-RAST
Ω V Hz
EXT DC
COM
POWER
DSO
LCA
DMM
INPUT CH1
INPUT CH2
CURSORS
MODE
REF. Δ TRACKING
DISP POS
WINDOW SIZE
AUTO RANGE
SET/SAVE
RUN/HOLD
CH1 POS
CH2 POS
BATT (DSO)
CHAN NO (LCA)
BATT (DMM)
Ch1
Ch2
GND
POSITION
DMM INPUT

GND : This is used to check the GND potential when measuring the DC voltage of the signal.

(9) Position (CH1/CH2)

This is the switch used to move up and down the waveform measured.
Also, it can be used for moving the waveform to the position where it can be read easily and for overlapping the waveforms of two channels for comparison.

(10) CH1 V/DIV KEY (DSO)

(11) CH2 V/DIV KEY (DSO)

This is used for selecting the voltage sensitivity of CH1and CH2.
The voltage sensitivity can be displayed on the screen. After pressing this KEY, REF NO can be selected by using ← or → KEY (18).
The channel sensitivity not being selected by V MODE is not displayed.

(10) DISP MODE KEY (LGA)

DISP MODE KEY is used for selecting the timing display and state display.

(11) STATE KEY (LGA)

This is used to select the state display data.
After pressing this key, It can be selecyed by using ← or → KEY(18).

(10) MODE KEY (DMM)

MODE KEY is used to select the measurement mode of DMM.

(11) RANGE KEY (DMM)

This is used to select the range manually.
After pressing this key, it can be selected by using ← or → KEY(18).
When in AUTO RANGE MODE, press AUTO RANGE KEY (22). The RANGE is increased by pressing this key again.
The RANGE for measuring frequency is always in AUTO state.

(12) V MODE KEY (DSO/LGA)

REF KEY (DSO/LGA/DMM)
Select the vertical movement MODE (DMM is REF NO only).
REF NO can be selected by using ← or → KEY(18).

○ DSO MODE

CH1 : The signal of CH1 is displayed on the screen.
CH2 : The signal of CH2 is displayed on the screen.
DUAL : The signals of CH1 and CH2 are displayed on the screen.
ADD : The signals of CH1 + CH2 are inputted into CH1 and are displayed on the screen.
SUB : The signals of CH1 - CH2 are inputted into CH1 and are displayed on the screen.
XY : CH1 is displayed toward X direction and CH2 is displayed toward Y direction.

○ LGA MODE

CHL : The 8 signals of CH0~CH7 are displayed on the screen.
CHH : The 8 signals of CH8~CHF are displayed on the screen.
DUAL : The 16 signals of CH0~CHF are displayed on the screen.
AND : AND signals of CH0~CH7 and CH8~CHF are inputted into CH0~CH7 and are displayed.
OR : OR signals of CH0~CH7 and CH8~CHF are inputted into CH0~CH7 and are displayed.

The display of REFERENCE MEMORY and REF number can be selected by using ← → KEY(18).
It can be saved in the selected display number by using the SAVE KEY(23).
SET-UP DATA can be saved at the same time.
When V. mode is in CH2(chH) MODE, it is saved in the REF MEMORY selected by CH2 (ch H). When in DSO MODE that V. MODE is dual or XY and RF1 selects RF2, RF1 and RF2 are displayed at the same time if dual is selected. If XY is selected, RF1 is displayed at X and RF2 at Y. At the same time, if RF3 and RF4 are selected, RF3 and RF4 are displayed at the same time when dual mode is selected. If XY is selected, RF3 is displayed at X and RF4 at Y.
In case of LGA of CHH MODE, the data of REF number is displayed at chL. For other cases, it is displayed at chH. When in DUAL MODE, the overwriting is possible at chH.

(13) SEC/DIV KEY (DSO, LGA)

This is used to select the sweeping time.
After pressing this key, It can be selected by using ← or → KEY(18).
In case of compressed mode, the sweeping time increases 10 times.
Also, external EXT, CK ↑ , ↓ can be selected.

Roll mode : In the following range, the waveform is automatically changed and displayed.
20 S~1S/DIV (compressed mode)
2S~0.1S/DIV(normal mode)

DOT enlargement mode : In the following range, the waveform is enlarged automatically.
0.2 μ S, 0.1 μ S/DIV (normal mode)
0.2 μ S, 1 μ S/DIV (compressed mode)
In this case, the horizontal resolution deteriorates.

(13) Δ REL (DMM)

If this is pressed once, the printer turns into the Relative measuring mode.
In this mode, the difference between previously indicated value and the reference value is displayed.
REL is cleared according to the selection of AUTO RANGE (22) and MODE (10).
Accurate measurement is possible depending on the use of "0" OFF SET while measuring low resistance and low capacitance.

Over display can be operated at absolute value.

(14) SWEEP MODE, TRIG, POS KEY (DSO, LGA)

This key is used to select the sweeping method.
Sweep method can be selected according to → key after pressing this key.
Trigger option is selected by using ← key after pressing this key.

RUN KEY - Sweeping can be started and stopped according to(24).

AUTO	:	Sweep is done according to the trigger signal. If the trigger signal does not exist, FREE-RUN beam is displayed. (Trigger is ignored in ROLL MODE)
NORM	:	Sweep is done only when there is a trigger signal. It does not change when there is no trigger signal. (In Roll Mode, it is free- run until it is tr iggered)
SIGN	:	Sweep is done once according to RUN KEY (24). Others are same as in NORM MODE.

TRIG POSITION

POST : The position of entire waveform (25%) becomes the trigger position.
(▼_____)
MID : The position of entire waveform (50%) becomes the trigger position.
(____▼____)
PRE : The position of entire waveform (75%) becomes the trigger position.
(_____▼)

(14) MIN/MAX HOLD KEY (DMM)

Whenever it is pressed once, the printer is set up as follows and operated.

↱ MIN VALUE HOLD DISPLAY → MAX VALUE HOLD DISPLAY → HOLD CANCELLATION ┐

According to the MIN/MAX HOLD DISPLAY for the measurement value, changing measurement value can be accurately measured.

(15) LOGGER KEY (DMM)

This is used for the DATA LOGGER of DMM.
DATA LOGGER CYCLE is selected according to the pressing.
It can be selected by using ←, → KEY(18)
Next, by turning the function key (16) into LG MODE, output the data in that cycle to the output of the printer.(1~999~up to ∞)
If it is turned into LG MODE without connecting the printer, it changes into stop state until the printer outputs. You should be careful.

(15) SOURCE, SLOPE KEY (DSO, LGA),
TRIG LEVEL, TRIG DATA SET KEY
This is used to select the trigger source and the polarity of sweep.
After pressing this key, TRIG LEVEL, TRIG DATA can be set up by ←, → KEY (18).

In case of DSO

CH1 : CH1 input signal becomes the synchronization signal and TRIG LEVEL is set up with KEY (18).

CH2 : CH2 input signal becomes the synchronization signal and TRIG LEVEL is set up with KEY (18).

AND : When input signal CH1 and CH2 is valid, AND WAVEFORM becomes the synchronization signal and The TRIG LEVEL of CH1, CH2 can be selected by kEY (18).

OR : When input signal CH1 or CH2 is valid, OR WAVEFORM becomes the synchronization signal and The TRIG LEVEL can be selected by KEY (18).

EXT : External signal becomes the synchronization signal.

○ TRIG LEVEL is increased with ← KEY and it is decreased with → KEY.

○ Polarity is synchronized by selecting ↑ (+) (synchronization signal rises) and ↓ (−) (synchronization signal drops)

In case of LGA

CHL : Input signals of CH0~CH7 become the synchronization signal and The TRIG DATA of CH0~CH7 is set up by (18).

CHH : Input signals of CH8~CHF become the synchronization signal and The TRIG DATA of CH8~CHF is set up by (18).

AND : When input signals of CHL and CHH are valid, AND waveform becomes the synchronization signal and The TRIG DATA of CH0~CHF is set up by (18).

OR : When input signals of CHL or CHH are valid, OR waveform becorms the synchronization signal and The TRIG DATA of CH0~CHF is set up by (18).

EXT : External signal becomes the synchronization signal.

○ TRIG DATA selects REF CH with ← KEY (18) and sets up DATA with → KEY (18)

○ Polarity is synchronized by selecting valid rise of TRIG DATA ↑ (1) and drop ↓ (0).

(16) Function Key

This key is used to select the PRINTER OUTPUT and OVERLAPPING function, DATA LOGGER function, MEMORY FILE DISPLAY function, and other functions such as time setting. After pressing this key , they can be selected with ← → KEY (18).
Printer output, memory file function, and time setting are executed by using SET/SAVE KEY (23).

PL : It turns into the overlapping mode while operating in DSO/LGA MODE.

RF : While in DSO/LGA MODE, RF1~RFF, and in DMM MODE, 16 MEMORY FILES up to M1~MF and SAVE TIME are displayed by using KEY (23).

PR : The copy of the screen is output through the printer by using SET/SAVE key (23).

TM : This is the MODE that sets up the CALENDAR and time.

SM : While in DSO/LGA MODE, SET-UP DATA selected up to RF1~RFF can be loaded

by using SET/SAVE KEY (23).

(17) DSO/LGA/DMM KEY

Three basic MODE of Digital storage oscilloscope(DSO), Logic Analyzer (LGA), and Digital Multimeter (DMM) can be selected by using these keys.

(18) ↑ ←, ↓ → KEY

Three keys are used for selecting each measuring function, time setting, cursor, waveform display position movement, and data setting.

It is used after setting up according to various function keys.

(19) CURSORS MODE KEY (DSO/LGA)

By using this key, the cursor measurement function can be selecyed.

After pressing this key, the cursor is moved by using the CURSOR tracking key -(20) and ← or → KEY (18).

- ⊿ V1 : The voltage differense of CH1 between two points according to the cursor can be measured. (DSO)
- ⊿ V2 : The voltage difference of CH2 between two points according to the cursor can be measured. (DSO)
- ⊿ T : Time difference between two points according to the cursor can be measured.
- ⊿ 1/T : Frequency between two points according to the cursor can be measured.
- ⊿ CR : The number of samples between two points according to the cursor can be measured.
- DMM : DMM that has been set up in DMM MODE can be measured and the measurement value can be displayed.

  While displaying the cursor, CALENDAR and TIME are displayed.

(20) CURSORS REF, △, TRACKING KEY (DSO/LGA)

Movable cursor is selected by using this key.

After pressing this key, the cursor is moved by ←, → Key (18)

CURSOR DISPLAY can move only the thick dotted line. When two dotted lines are the thick dotted line all, They can be moved in the fixed state.

(21) DSP. POS, WINDOW SIZE KEY

The screen display position can be moved and the screen mode (compressed or normal) can be determined by using this key.

After pressing this key, The screen display position on memory can be moved by ←, → key (18).

At this time, the trigger point and display position is displayed on the screen.

(22) AUTO RANGE KEY

Sweep time is automatically selected for the input signal by pressing this key.

While in DSO MODE, The vertical sensitivity and trigger level is automatically converted.

The responding frequency of input signal is valid for synchronization in the range 50Hz~10MHz and 50Hz~20MHz for LGA.
If possible, place the position handle(9) of CH1 and CH2 in the center while in DSO.
In case of waiting for input signal, Auto Set Up! is displayed.
Measurement condition is set up automatically as belows.

SWEEP MODE : AUTO
SOURCE : CH1 or CH2 LGA is CHL or CHH
RUN/STOP : RUN
Display mode : Normal MODE

While in DMM, the RANGE becomes AUTO by pressing this key.
Conductivity buzzer and diode test mode can not be run in AUTO MODE.
Frequency measurement range is in AUTO normally.

(23) SET/SAVE KEY
The execution and time of MODE can be set up by using the function key (16) is set up.
Also, it is used to save REFERENCE MEMORY and to load SET UP DATA.

(24) RUN/HOLD KEY
By using this key, the sampling of signal can be run and held.
The waveform displayed does not move when in HOLD state.

(25) V. Hz Input Terminal (DMM)
This is the input terminal (+ side) used to measure the voltage and frequency.

(26) COM Input terminal (DMM)
This is the input terminal (GN side) of TOTAL DMM MEASUREMENT MODE.

(27) Ω ··· Input Terminal
This is the terminal (+side) for measuring the resitance, conductivity buzzer,diode test, and capacitance.

(28) mA Input Terminal
This is the input terminal (+ side) for measuring the current.

(29) STAND
Use the stand for easy readability.

(30) Fuze Cover (used to protect the instrument when measuring the current)
Detach this cover when replacing 500mA fuse.

(31) Logic-Probe, EXT TRIG, EXT CK input connector
Logic probe, External synchronization signal, and Input of external clock are connected.

(32) GND Terminal

This is used for GND connection.

4-2 Logic Probe

1. VAR, CMOS, TTL Switch

   This is the switch used to select the THRESHOLD LEVEL (VAR ADJ, CMOS LEVEL and TTL LEVEL).

2. Check Terminal

   This is the terminal that checks THRESHOLD voltage with VAR ADJ.

   The voltage between GND of LOGIC PROBE and CHECK terminal is measured in DCV MODE of DMM. The measured value becomes THRESHOLD voltage.

3. VAR ADJ

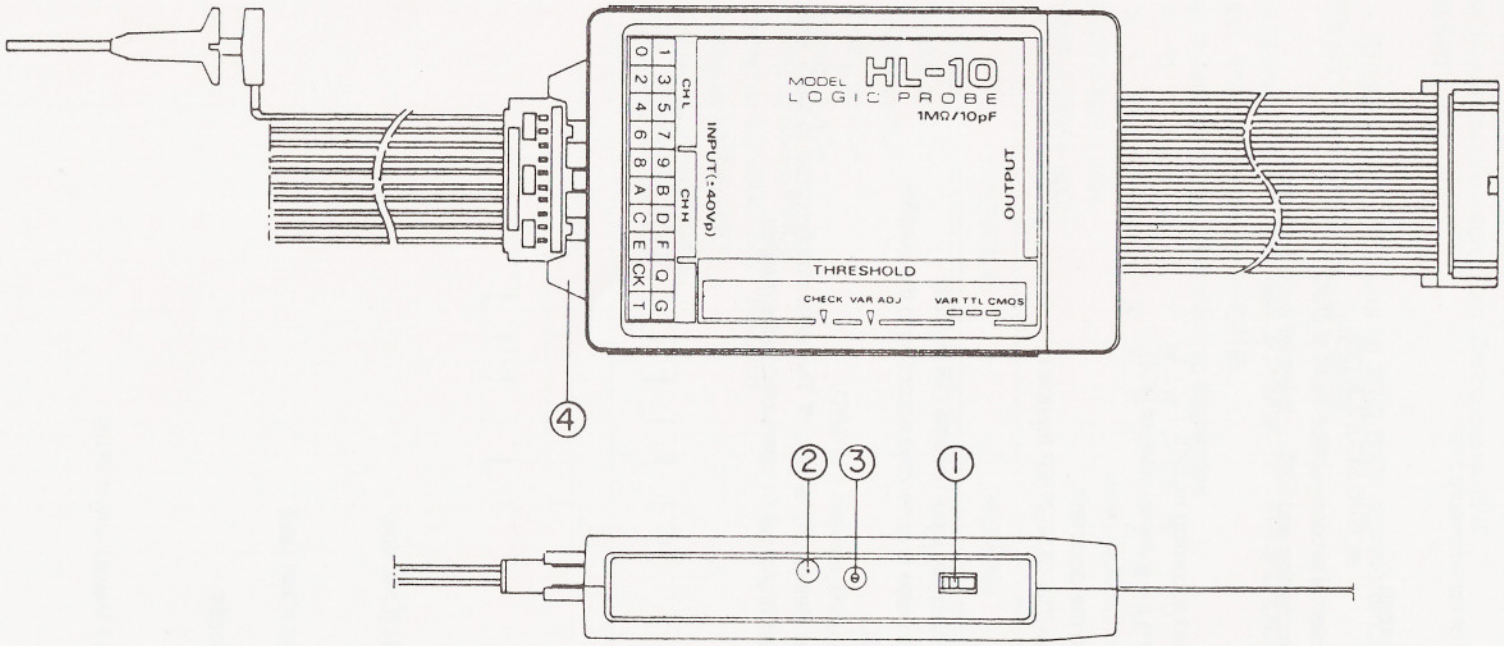
   When setting up THRESHOLD LEVEL (1) into VAR, the THRESHOLD voltage is adjusted.

4. Probe Input

   Input 16CH DATA, The external CLOCK and TRIGGER, and QUALIFIER signal.

   Probe Input Contents

Q	:	Qualifier Input		G	:	GND	
CK	:	External CLOCK input		T	:	External sychronization input	
F	:	chF	chH side	7	:	ch7	chL side
E	:	chE		6	:	ch6	
D	:	chD		5	:	ch5	
C	:	chC		4	:	ch4	
B	:	chB		3	:	ch3	
A	:	chA		2	:	ch2	
9	:	ch9		1	:	ch1	
8	:	ch8		0	:	ch0	



[Logic probe Diagram]

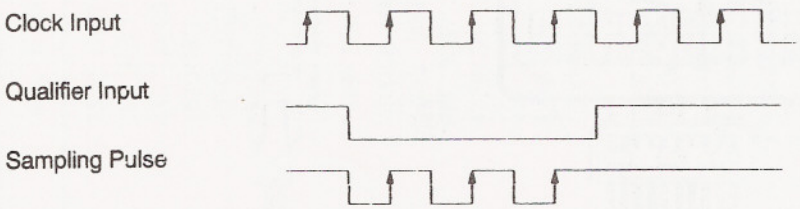
Probe Input Description

○ GND
Connect this to the GND of non-measured item.

○ External synchronization input
It can be used by EXT ↑, ↓ at TRIG SOURCE (15).
It can be also used for external synchronization input of DSO.
EXT is the rise synchronization and EXT is the fall synchronization.

○ External Clock Input
SEC/DIV (13) can be used according to EXT ↑, ↓.
It can be used for inputting the external clock of DSO.
EXT ↑ is sampled when the clock rises.
EXT ↓ is sampled when the clock falls.
The CLOCK is valid when The QUALIFIER Input is L.

○ Qualifier Input
External clock input and Qualifier input become OR logically.
Necessary external clock pluse is generated according to the qualifier.
It can be used during DSO.
When the qualifier is not used, connect it to GND.
For example, when Clip Select Signal is L, If The data synchronized to clock signal is needed to be sampled, Clip Select Signal will be connected to the qualifier.



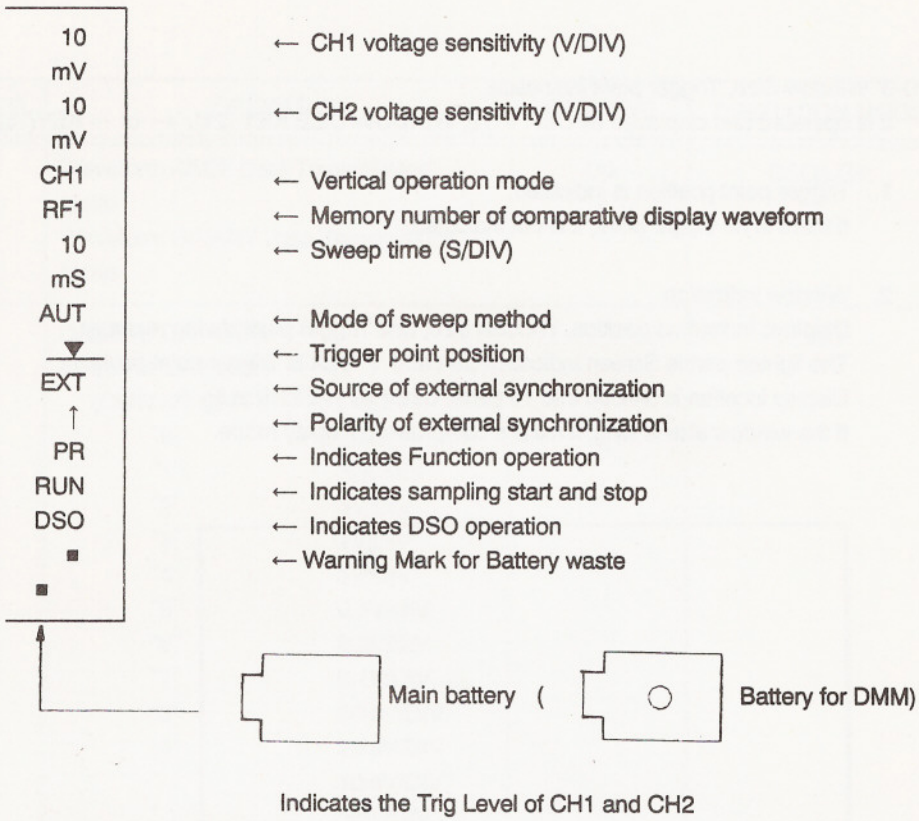
○ CH0 ~ CH7
This is Data input of 8CH (CHL side)

○ CH8 ~ CHF
This is Data input of 8CH (CHH side)

4-3. LCD Display Contents

(1) DSO Mode

(1)-1 Display Contents of Measurement Menu



Indicates the Trig Level of CH1 and CH2

(1)-2 Cursor measurement indication, DMM indication, Calendar, Time indication(DSO/LGA)

It is operated and displayed by CURSOR MODE KEY (19), REF KEY(20), ← or → KEY (18).

① Cursor mode is indicated

△ V1, △ V2, △ 1/T, △ T, △ CR, DMM

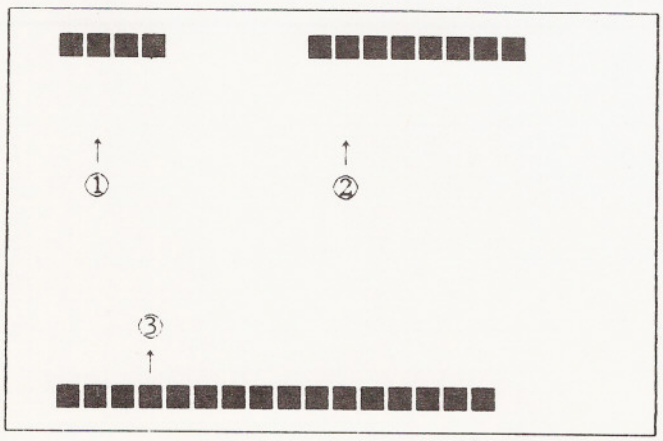
② Cursor measurement value

Measured value is displayed with two cursors.

In DMM Mode, DMM measured value is displayed.

③ Calendar, Time indication

Year, month, day, hour, and minute are displayed in turn.

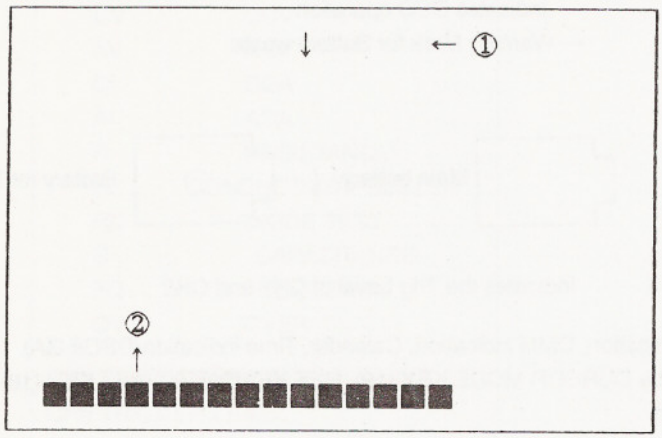


(1)-3 Window Size, Trigger point indication

It is operated and displayed by DSP. POS, WINDOW SIZE KEY (21), ← or → KEY(18).

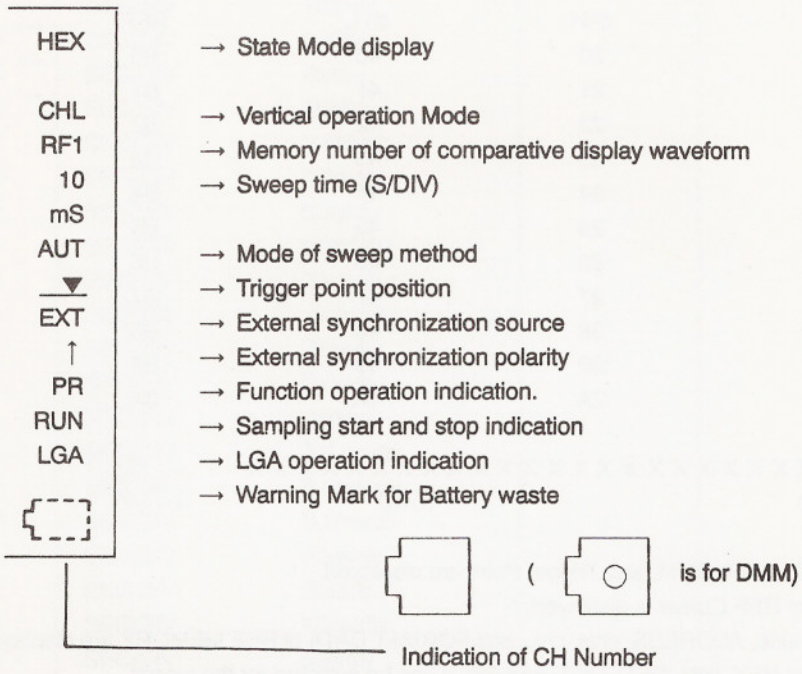
1. Trigger point position is indicated.
   If there is no trigger point, it is not indicated.

2. Window indication
   Displays Indication position, Window size, and Trigger point during memory.
   The lighted part is Screen indication part and ▼ part is Trigger point position.
   Display location is divided into 16 parts, Use it as you look at it.
   If the window size is long, it means compressed display mode.



(2) LGA Mode

(2)-1 Display contents of measurement Menu



(2)-2 REF CURSOR ADDRESS display

CURSOR XXXX WORD

Cursor address (0000~2047 word) is displayed.

In state display, the top part becomes the address.

(2)-3 Trigger Data display

TG XXXXXXXXXXXXXXXX

CH FEDCBA9876543210

The most left side is MSB (chF) of 16CH

The most right side becomes the trigger data of LSB(ch0) of 16CH.

Any one of 0, 1, X can be used as data.

(2)-4 State display contents of LGA

△ T	+ 5.00 mS			← ①
Cursor	1023	WORD		← ②
ADDR.	chH	ch L	RFF	← ③
1023 :	20	40	B0	← ④
1024T	21	41	B1	← ⑤
1025 :	22	42	B2	
1026 :	23	43	B3	
1027 :	24	44	B4	
1028 :	25	45	B5	
1029 :	26	46	B6	
1030 :	27	47	B7	
1031 :	28	48	B8	
1032 :	29	49	B9	
1033 :	2A	4A	BA	

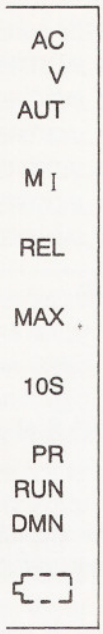
TG XXXXXXXXXXXXXXXXXXXXXXXXXX ← ⑥
91-10-10 10-10 ← ⑦

① △T, △1/T, △CR, DMM, and Trigger Point are displayed.
② Address of REF Cursor is displayed.
③ From left side, ADDRESS, chH, chL, and FORMAT DATA of REF MEMORY are displayed. Any one of HEX, BIN, DEC, OCT, and ASCII can be selected for the format.
④ 14 rows from the address of REF CURSOR are displayed.
⑤ For address of trigger pointer, T is displayed next to the address.
⑥ Trigger data is displayed.
⑦ Window Indication and Time are displayed.

- Cursor address can be moved with DSP POS KEY (21) and ←, → KEY (18).
- In case of Timing Indication, The cursor of thick dotted line is REFERENCE Cursor.
- When Normal Mode and Compressed Mode are changed, REF CURSOR ADDRESS is changed because of the fixed cursor position on the Timing Indication Screen.

(3) DMM MODE

Measurement Menu display



← Measurement Mode

← Auto or manual range

← Memory number of comparative display waveform

← Relative value measured

← Min/max value measured

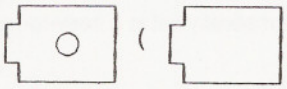
← Data logger cycle

← Function operation

← Measurement hold and start

← DMM operation

← Warning Mark for Battery waste



is for main battery)

(4) Other display

OVER : Indicates in case that a large input signal is entered while the Range is fixed.

_____ : Polarity indication, lighting at Minus.

V.mV : Voltage measurement. Unit during Diode Test.

mA : Unit when measuring the current.

Ω . kΩ . MΩ : Resistance measurement. unit when measuring the conductivity buzzer.

nF.μ F : Unit when measuring capacitance.

KHz : Unit when measuring the frequency.

M1~MF : Indicate the comparative memory contents.

BAR - GRAPH : Indicate 800 segment when 1 segment is indicated in 5 count.

Calendar, Time : Year, month, day, hour, and minute are displayed in turn.

5. Basic Operation

5-1. In case of DSO

(1) Turn the power switch on. Adjust the contrast knob for easy readability.
It turns into DSO MODE by using DSO/LGA/DMM MODE Key (17).

(2) AC/DC/GND SW (8) of CH1 is set to GND. It is turned into CH1 Mode by using V Mode Key (12).

(3) It turns into Auto Mode by using Sweep Mode Key (14).

(4) It turns into CH1 ↑ Mode with Source Key (15).
It turns into 10 mS/DIV with SEC/DIV Key (13).

(5) It turns into RUN by using RUN/HOLD Key (24).

(6) Beam should be placed in the middle with the position knob of CH1 (9).

(7) AC/DC/GND SW (8) should be place in DC or AC.

(8) Signal measured is inputted by connecting the probe to CH1 input (7) (CAL signal (6) is O.K., too.). It becomes easy-to-read at CH1 V/DIV Key (1).

(9) The TRIG Level is adjusted to the position where trigger is taking place according to Source Key (15), ← → Key (18). Set it up so that it can be easily readable cycle with SEC/DIV Key(13).

(10) The waveform can be automatically set in a easy-to-read state according to Auto Range Key(22).

5-2. Logic-Analyzer Setting Up

(1) In Power Off state, connect the Logic-Probe to the main body.
Turn the Power S.W (1) on.
Turn DSO/LGA/DMM Mode Key (17) to LGA Mode.

(2) Turn V Mode (12) to CHL for 8CH and DUAL for 16CH.

(3) Turn the Sweep Mode Key (14) to Auto Mode.

(4) Turn the Source Key (15) to CHL ↑ Mode.
Turn SEC/DIV Key (12) to 10mS/DIV.

(5) Turn Run/Hold Key (24) to Run.

(6) Set up the Level SW of Probe acording to input level of Probe. (TTL LEVEL)

(7) Connect GND of Probe to GND of non-measured item and CH to be measured to non-measured terminal.
(Do not use for Probe EXT, Trig, CLK of DSO)

(8) Set up the Trig Data by using the Source Key (15), ← → (18) for safety triggering. Set it up again at SEC/DIV Key (13) for easily readable cycle.

(9) The cycle can be automatically set up by using the Auto Range Key (22).

(10) State display is carried out by using DISP Mode Key (10).
Data display is selected by using the State Key.
The address of cursor can be moved by using DISP POS KEY (21), ← → KEY (18).

5-3. In Case of DMM

DSO/LGA/DMM Key (17) is turned to DMM Mode.
Connect the test-lead to the input terminal. The voltage and frequency are measured by connecting the red LEAD to "V" terminal and the black LEAD to "COM" terminal.

(1) Voltage Measurement
According to AC or DC voltage, ACV or DCV can be converted by using the Mode Key (10).
Set up the Range by using the Range Key (11). And connect the Test-Lead to the circuit.
Black Test Lead is connected to GND side of the circuit and Red one is connected to non-measured point (for both AC and DC).
Read when the display is stable.

* Be careful because Over Input Display for 1000V Range does not work.
* High Voltage Measurement : When it is Low Frequency at the position of ACV Auto Range, please select Manual Range in case of the close state of Full Count.

(2) Current Measurement
According to AC or DC current, ACmA or DCmA can be converted by the Mode Key (10).
Set the range by using the range key (11).
To measure the current, connect the Red Lead to mA terminal and black Lead to the COM terminal.
Lastly, serially connect the Test-Lead to measuring circuit.

* Be careful because if the current goes over 500mA, the protection fuse blows out.

(3) Resistance Measurement and Conductivity Check
Select the resistance measurement Ω or conductivity check ·)))) by using the Mode Key (10). Connect the Red Test Lead to Ω terminal and black Test Lead to COM terminal. Measure the resisrance after connecting the Test Lead to the non-measured resistance and the display is stabilized.
In case of conductivity check, the buzzer rings if non-measured resisrance goes below about 40 Ω. The resistance value at that time is displayed.

* In resistance range, "O" OFF-SET is executed according to REL KEY (13).
For OFF-SET, short the Test-Lead and press REL Key (13).

(4) Diode Measurement and Capacitance Measurment
Diode —|◀— and Capacitance ⊣ (— are selected for measurement by using Mode Key (10).

Red Test Lead is connected to Ω terminal and Black One to COM terminal.
Diode (forward directed voltage) is measured by connecting Red Test Lead to Anode and Black One to Cathode.
Capacitance is measured by connecting the test lead to non-measured part.
Read it after the value to be read is stabilized.
The condenser with polarity is measured by connecting the red lead to + side and black to — side.

* In low capacitance range, "O" OFF-SET for the internal capacity is carried out by REL KEY (13). For OFF-SET, open the test lead and press REL Key (13)

(5) Frequency Measurement
Select the frequency measurement (Hz) by using Mode Key (10).
Red Test Lead is connected to V terminal and Black Lead to COM terminal. To measure the frequency, Black Test Lead is connected to GND of measuring point and Red One to non-measured point.
Read the value to be measured after it stabilizes.

6. Other Operation

6-1. Compressed Display and Normal Display

(1) The display can be checked and selected by using DSP. POS/WINDOW SIZE Key (21).

(2) In compressed mode, waveform or data that the time axis is compressed in 1/10 is displayed. In normal mode, They are displayed with the compensated DOT.
(they are not compensated during the sampling in roll mode of DSO)
The whole or the part can be observed by this mode in detail.

(3) Screen display position can be moved for observation by using ← , → Key (18)

6-2. DOT Enlargement Mode

(1) In case that Sweep time is the same as the next, DOT Enlargement Mode is carried out and 1 Sampling is enlarged to several dots.

Normal display mode	:	4 DOT/Sample at 0.1μ S/DIV 2 DOT/Sample at 0.2μ S/DIV (When V. Mode (12) is other than CH1, CH2 (CHL, CHH), X2 times DOT/Sample)
Compressed display Mode	:	1 DOT/Sample at 1μ S/DIV 1 DOT/Sample at 2μ S/DIV

Horizontal resolution deteriorates when in normal display Mode.

6-3. Cursor Measurement

(1) Voltage Measurement (DSO)

It turns into △ V1 or △ V2 Mode by using the Cursor Mode Key (19).

Move two cursors to the position to be measured by using REF. △ Key (20) and ←, → Key (18). (Dotted cursor can be moved)

The measured voltage difference is displayed on the upper side of the screen.

By placing one cursor to GND position, the voltage can be measured in absolute value.

By converting two CURSORs into the dotted line cursor, It becomes TRACKING MODE and can be moved as two line interval is fixed.

When 1:10 Probe is used, the measured value must be multiplied by 10.

(2) Time Measurement

It turns into △ T Mode by using the Cursor Mode Key (19).

Move two cursors to the position to be measured by using REF. △ Key (20) and ←, → Key (18).

The measured time difference is displayed on the upper part of the screen.

(3) Frequency Measurement

It turns into △ 1/T Mode by using the Cursor Mode Key (19).

Move two cursors to the point where one cycle of waveform to be measured is located.

The value of the frequency is displayed on the upper part of the screen.

(4) Measuring the number of samples

During the external CLOCK MODE (15) and △ V1, △ V2 Mode (19) at LGA MODE, △ CR which is the number of samples between two points can be displayed.

(5) DMM Measuring display

It turns into DMM MODE by using the Cursor Mode Key (19). The measured value is displayed in DMM Mode.

6-4. PRE, POST, MID TRIGGER

Before and behind of the trigger point are observed in detail by this function.

In Post Trigger Mode, 25% position of total area becomes the trigger point and position after the trigger point can be easily observed. In Pre Trigger Mode, 75% of total area becomes the trigger point and position before the trigger point can be easily observed.

In case that Post trigger and Pre trigger mode are used at the same time. More than total capacity can be observed (1.5 times).

6-5. Reference Memory

Up to 16PCS of DSO, LGA observation waveform and Set-up data as well as up to 16PCS measured data of DMM can be memorized.

(1) Waveform of Reference Memory or Measured Data of DMM are displayed by selecting

REF NO KEY(12).

(2) Press the SET/SAVE Key (23) to save the Measured Data of DMM, Set-Up Data, and the Observed Waveform onto the Reference Memory selected.

(3) Reference memory is saved until it is resaved and can be compared by using REF NO KEY (12).

(4) By pressing the SET/SAVE KEY (23) in SM MODE of Function Key (16), REF NO SET-UP DATA selected can be loaded and set up.

(5) By pressing the SET/SAVE KEY (23) in RF Mode of Function Key (16), Time saved in the 16 memories is displayed (in DSO/LGA Mode - RF1~RFF, in DMM Mode - M1~MF).
To stop display, press the function key (16) and turn it into the blank mode.

6-6. Calendar, Time Setting

It can be set up and changed according to the following order.

1. Select the TIME MODE by using the Function key (16).
2. Press the SET/SAVE Key (23) once to display the calendar, time, and ↓ on the bottom of the screen.
3. Year, Month, Day, hour, and Minute are displayed in turn. Change the numerical value with ← Key (18). Use the → Key (18) to change the position ↓.
4. Setting up is completed by pressing the SET/SAVE KEY (23) once again.
5. Lastly, Turn to Blank Mode with Function Key (16).

Display Contents

↓

' 00-00-00 00:00

Changed example

↓

' 90-12-24 23:59

(Dec.24, 1990 23 O' clock 59 minutes)

6-7. Battery Replacement

If the mark that indicates weak battery is lit, replace the batteries with new ones.

is for main battery (3X6)


is for DMM battery (4X2).

(If the batteries are completely dead, it is not lit.)

1. Press the Lock part and pull out the cover.
2. Be sure to place the polarity of batteries properly.
3. Put on the cover in opposite order.

6-8. Initialization

It can be initialized by performing the following operations.

1. Turn off the power SW (1).
2. Turn on the power switch (1) as you press the SW of CH1 V/DIV (10).
3. Turn on the power SW (1) as you press the SW (10) of CH1 V/DIV and ← Key (18) to initialize it and set up the sample waveform at CH1 and CH2.

CH1 : Rectangular wave CH2 : Triangular wave

6-9. Printer Output, DMM Data Logger Output

Data Logger Of DMM and Copying the contents on the screen can be carried out by the option printer and RS-232C Interface.

1. Connect RS-232C Interface to the connector 4 (option) before connecting it to the printer.
2. Turn on the power SW (1) when Baudrate of the RS-232C Interface and the Printer matches.
3. Currently displayed contents can be copied by pressing the SET/SAVE Key (23) after changing it into the Printer (PR) Mode by using the Function Key (16).
4. Copying can be stopped by using the Function key (16).
   After the completion, change it into blank mode.
5. Data logger output of DMM can be carried out by setting the cycle with the LOGGER KEY (15) and turning to LOGGER MODE with the FUNCTION KEY (16).

7. Cautions While Handling

(1) Do not use this product in an area with high temperature, low temperature, and high humidity.
(2) Do not give signals that exceeds the capacity of the product.
(3) Do not drop the product. Be careful not to give the strong impact.
(4) Use approved AC-adapter only.
(5) When the mark indicating weak battery is lit, replace the batteries immediately.

is for Main Batteries


is for DMM.

(6) If the data is not properly saved or the internal clock is inaccurate, Internal Lithium Battery may be weak. Replace it immediately.
(7) LCD response time may vary according to the surrounding temperature.
(8) Use water and detergent mixed together to clean the product.
(9) The life span of the battery varies according to the type, temperature, and measuring condition.
(10) Input impedance is especially high in 400m Range of DCV and ACV of DMM.
The value displayed may fluctuate when input is open and the external noise is loud. This does not mean that the product is defective.

8. Calibration Method

8-1. DMM calibration (in case of manual)

1. Turn DCV mode into 400mV Range.
Input 390.0mV to COM.V terminal and calibrate VR12 so that the display can be 390. 0mV

2. Next, for 40V range, input 39.00 into COM. V terminal. Then, calibrate VR14 so that the display can be 39.00V.

3. Next, for 4V range, input 3.900V into COM. V terminal. Then, calibrate VR15 so that the display can be 3.900V.

4. Turn ACV mode into 4V Range.
Input Sinewave of 100Hz, 3.900VRMS into COM. V terminal.
Calibrate VR13 so that the display becomes 3.900V.
Calibrate VR13 so that other range exist within allowed range.

5. Input 10MΩ into COM, R terminal in 40MΩ range of Resistance Mode.
Calibrate VR16 so that the display can be 10.00MΩ.
Calibrate VR16 so that other range can exist within a allowed range.

6. Turn C Mode into 400.0nF Range.
Connect 0.33μF to COM. R terminal. Calibrate VR11 so that the diaplay can be 330.0nF.
For 40.00nF and 4.000nF range, start from 0 by using △ REL Key.

8-2. DSO Calibration

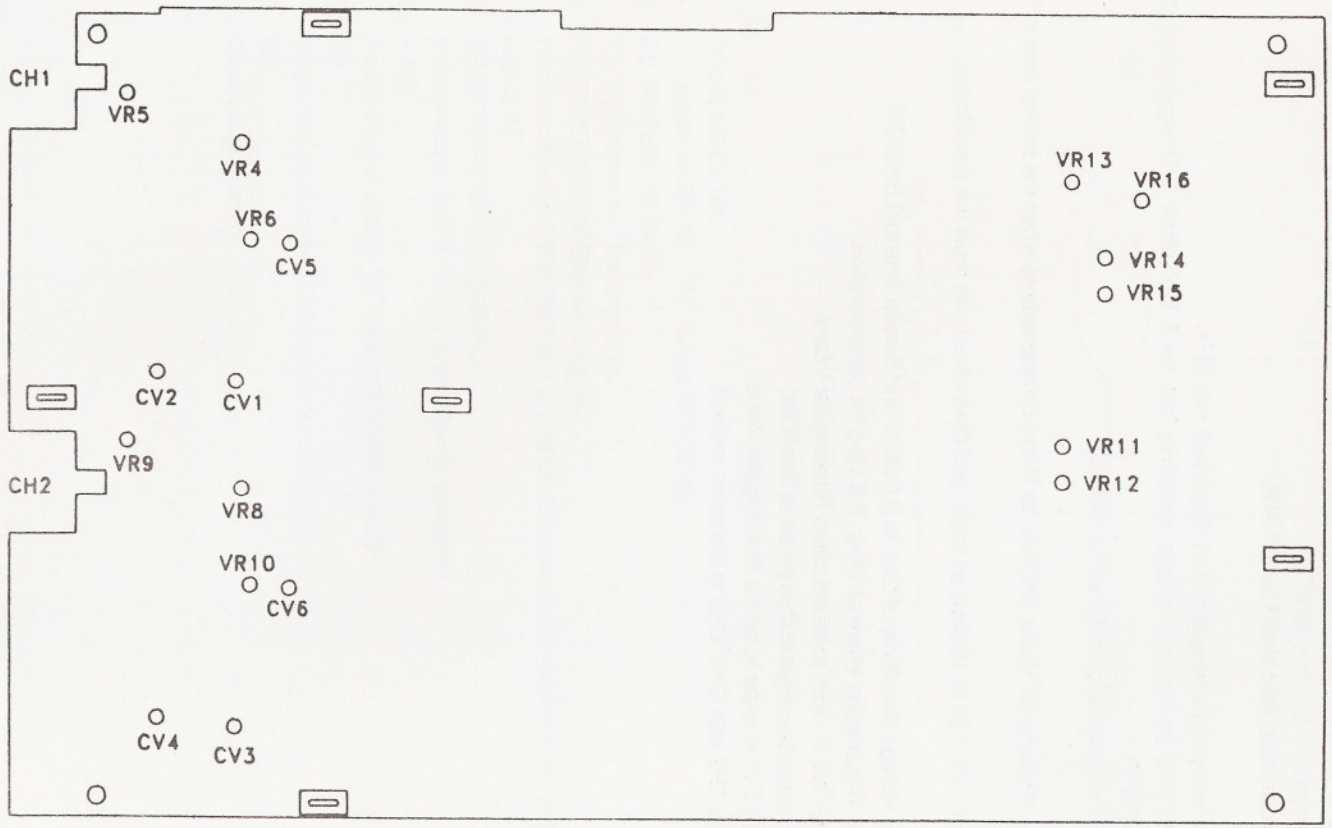
1. Change the Input-combine S.W of CH1, CH2 to GND and turn Position to the center.
   Change V MODE to Dual and to Run state by using 1mS/DIV.
   Calibrate VR6 so that the beam does not move when the voltage sensitivity of CH1 changes to 50mV, 0.1V, 1.2V/DIV. Calibrate VR4 so that the beam can not be moved when they change (5mV, 10mV, 20mV).
   Also, CH2 is calibrated by VR10 and VR4.

2. Input the corrected retangular wave (25mVp-p) into CH1.
   Calibrate VR5 so that the voltage sensitivity can be 5 DIV when CH1 input combine is in DC (5mV/DIV).
   Calibrate VR2 with VR9 in the same method.

3. Input the Rectangular Wave (100KHz for Wave compensation) when the sweep time is 1 μ S/DIV.
   Calibrate CV5 (3dB at 10MHz) so that F and Over-shoot can meet the specification.

4. Turn the Voltage Sensitivity of CH1 to 0.5V/DIV and Sweep time to 0.5mS/DIV.
   Input the Rectangular Wave of 1KHz, 2.5 Vp-p for compensation.
   Calibrate CV2 in order to be the clean Rectangular Wave.
   Use the capacity-compensated probe at 5mV/DIV.
   Calibrate CV1 in order to be the Rectangular Wave.
   Calibrate CH2 with CH4, CH3 in the same method.

8-3. Adjustment point



9. RS-232C

9-1. General introduction

When this RS-232C interface connected with PRINTER (option),
It is possible to hard copy.
Also, this interface is used for controlling function of reading and writing of waveform from an external controller.

9-2. Specification

Synchronization ——→ Asynchronization (ASYNC).
Stop bit ——→ 2 Stop bit.
Parity ——→ Nothing.
Charactor length ——→ 8 Bit.
Communication speed ——→ One selection of 75,150,300,600,1200,2400, 4800, 9600 BPS.

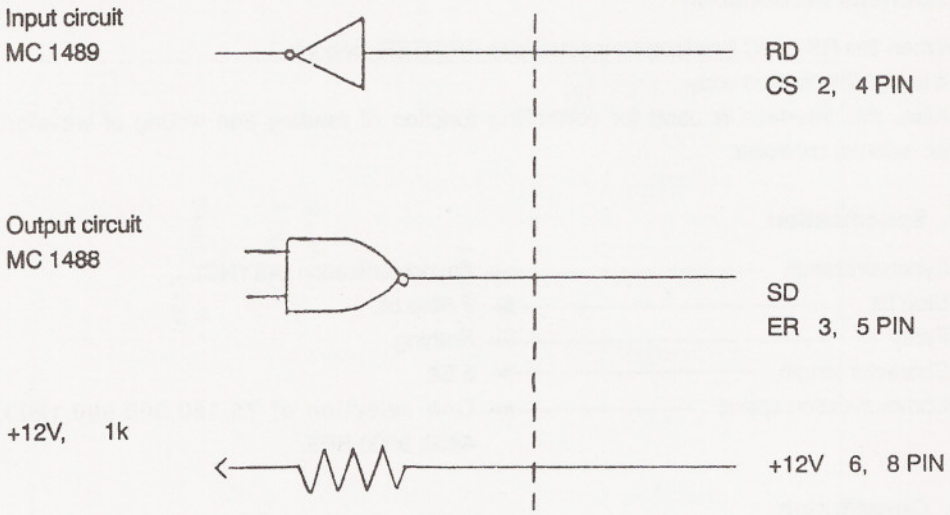
9-3. Constitution

It is possible for this interface to be connected with the following instruments.
(1) The computer equipped with RS-232C.
(2) Printer of option.
(3) Signal line and pin number.

CONNECTOR NUMBER	SIGNAL LINE	DIRECTION OF SIGNAL (3850 → EXTERNAL EQUIPMENT)	MEANING
1	FG		FRAME GROUND
2	RD	←	RECEIVING DATA
3	SD	→	SEND DATA
4	CS	←	SEND POSSIBLE SIGNAL
5	RS	→	SEND REQUIREMENT SIGNAL
6	+12V	→	
7	SG		SIGNAL GROUND
8	+12V	→	

9-4. Circuit Diagram and Signal line

(1) Input and Output Circuit



(2) Signal Line

A) SD (SEND DATA)
"L" output MARK (1) "H" output SPACE (0).

B) RD (RECEIVING DATA)
The logic same as "Transmit data".

C) RS (SEND REQUIREMENT SIGNAL)
This indicates that 3850 DSO is in a position to transmit and receive in the range of output "H".

D) CS (SEND POSSIBLE SIGNAL)
If transmission data is "H", it is possible to transmit.

E) +12V
If output signal data is "H", external device is active.

F) FG
Grounding on chassis of DSO 3850 for protection.

G) SG
Common grounding.

9-5. Connection with PRINTER

(1) When connect with "PRINTER"
You should set the switch at the same connection with communication speed, length of character and stop bit between DSO 3850 and PRINTER.

(2) Signal Line and Pin No.

DSO 3850		Direction	PRINTER		MEANING
Pin No.	SIGN		Pin No.	SIGN	
1	FG		2	GND	Frame Ground
2	RD	←	1	SD	Send Data
3	SD	→	3	RD	Receiving Data
4	CS	←	5	CS	Send Possible Signal
5					
6					
7	SG		4	GND	

(3) To make it start, please set the function key to Printer Mode(PR) and push the SET/SAVE key. Also, to make it stop, please push the SET/SAVE key again. When stopping copy or completing it, place the function key to the "Blank" Mode.

9-6. Connection with COMPUTER

(1) The normal connection with COMPUTER is stated in the following table.
The attention must be paid to the fact that the connection method might be different according to kinds of computer.
Also, please set the same communication speed, length of character, stop bit, parity and delimit.

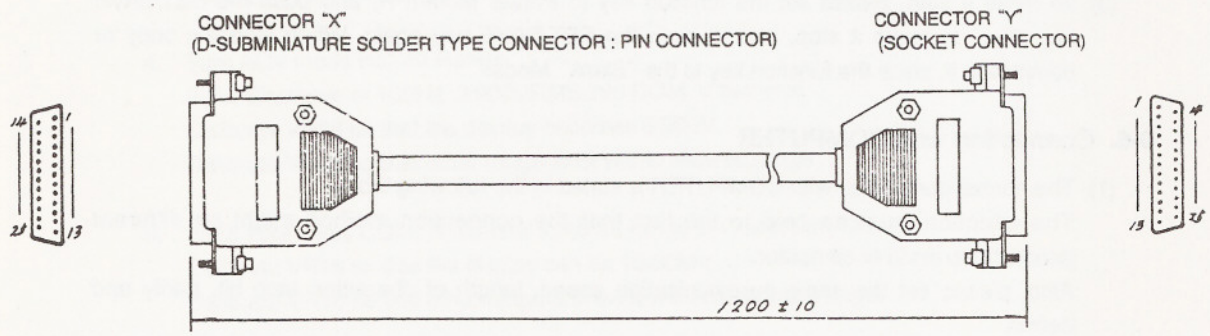
(2) Signal Line and Pin No.

DSO 3850		Direction	COMPUTER		MEANING
Pin No.	SIGN		Pin No.	SIGN	
1	FG		1	FG	Frame Ground
2	RD	←	2	SD	Send Data
3	SD	→	3	RD	Receiving Data
4	CS	←	4	RS	Send Requirement Signal
5	RS	→	5	CS	Send Possible Signal
6	+12V	→	6	DSR	
7	SG		7	SG	Signal Ground
8	+12V	→	8	DCD	

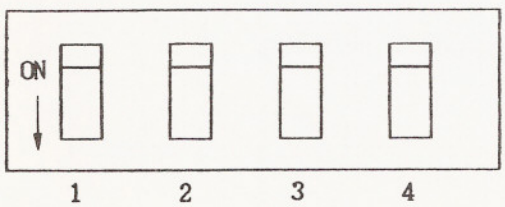
(3) INTERFACE

A) Transmitting data to computer
After checking "CS LINE" on ACTIVE "H", take a action for transmitting.

B) Receiving data from computer
In case that data receiving is possible, set RS LINE on ACTIVE "H".



(4) Setting up "SWITCH"



The setting up "SWITCH" of unit is made as the following form and it has to be taken while the electricity power is turned off.

A) SWITCH 2~4 : Setting up the COMMUNICATION SPEED

< 2 >	< 3 >	< 4 >	SPEED
ON	ON	ON	9600 BPS
ON	ON	OFF	4800 BPS
ON	OFF	ON	2400 BPS
ON	OFF	OFF	1200 BPS
OFF	ON	ON	600 BPS
OFF	ON	OFF	300 BPS
OFF	OFF	ON	150 BPS
OFF	OFF	OFF	75 BPS

(2) Switch 1 : Setting up the LOCAL/REMOTE
ON : REMOTE mode, put on when make the remote-control by COMPUTER.
OFF : LOCAL mode, put off when make an output to PRINTER.

9-7. Remote Command

(1) Function
A) Reading and writing the data of waveform.
B) Control panel for selection mode.
C) Selection Remote/Local of panel.

(2) Operation
You can operate REMOTE mode by setting on Switch 1 of RS-232C unit according to power on.

(3) Command

HEADER	DELIMIT

* HEADER : ASCII Code of two letters.
* DELIMIT : CR + CF in the begining.
It is possible to make CR according to command.

(4) Error Output
In case of FRAMING error or COMMAND error of RS-232C, the indication of function position "ER" is diaplayed.

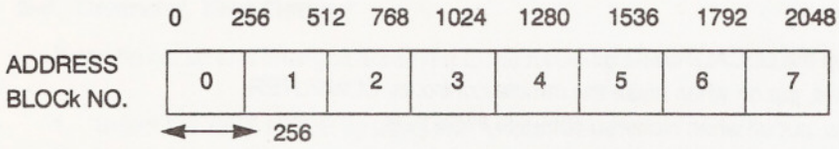
(5) Format and Block of a waveform data

A) It is possible for waveform data to be used by ASCII code or binary code in acordance with "U0" or "U1" command.
(ASCII code at begining).

* In case of ASCII code :
  Value + Delimit Value + Delimit · · · Value + Delimit.
  Value is "000" ~ "255".

* In case of Binary code :
  Value Value Value · · · Value.
  Value is "0" ~ "11111111" (8 bit)
  Delimit is invalidety.

B) It is possible to read the part of waveform (2k word : 2048 data) by deviding the unit of block as following form.



<Example> In case of transmission of the data from 256 to 1024,
Address command "A1", Address and command "B3".

(6) Input and Output of data
Input of Data (Computer → DSO 3850)

A) Input of Command
<Example> WO DELIMIT

B) Input of Data
<Example> In case of ASCII
000 DELIMIT, 128 DELIMIT, · · · , 100 DELIMIT

C) Input of next command

Output of Data (Reading)

A) Input of Command
<Example> In case of ASCII
RO DELIMIT

B) Output of Data
<Example> In case of ASCII
000 DELIMIT, 128 DELIMIT, · · · , 100 DELIMIT

C) Input of next command

(7) Service Request
It is possible to output from SRQ On according to Command.
"0" + DELIMIT is output when "Trig stop" is at single mode.

(8) Be careful because every command may not operate according to the each mode DSO, LGA and DMM.

9-8. COMMAND

HEADER	OPERATION	BEGINING	OPERATION MODE
A0 A7	Transmission START of waveform Data Setting up ADDRESS BLOCK <Ex>A1 : Transmission from Data 512	A0	DSO/LGA
B0 B7	Transmission END of waveform Data Setting up ADDRESS BLOCK <Ex>B3 : Transmission to Data 1023	B0	DSO/LGA
CO	Setting up BEGINING Same operation as POWER ON	C0	ALL
D0 D1	DELIMIT + LF DELIMIT CR	D0	ALL
E0 E1	SRQ OFF SRQ ON	E0	DSO/LGA
F0 F1 F2	DSO MODE LGA MODE DMM MODE	F0	ALL

HEADER	OPERATION	BEGINING	OPERATION MODE
G0 G1 G2	TRIGGER POINT 25% TRIGGER POINT 50% TRIGGER POINT 75%	G1	DSO/LGA
H0 H1 H2 H3 H4 H5 H6 H7 H8 H9	TRIGGER SOURCE CH 1 ↑ TRIGGER SOURCE CH 1 ↓ TRIGGER SOURCE CH 2 ↑ TRIGGER SOURCE CH 2 ↓ TRIGGER SOURCE OR ↑ TRIGGER SOURCE OR ↓ TRIGGER SOURCE AND ↑ TRIGGER SOURCE AND ↓ TRIGGER SOURCE EXT ↑ TRIGGER SOURCE EXT ↓		
I0 I1	REMOTE MODE PANEL SW NOT INPUT REMOTE PANEL SW NOTHING INPUT	I0	ALL
J0 J1 J2 J3 J4 J5 J6 J7 J8 J9 J : J ; J< J= J> J?	REL MOMERY SELECTION NO REL MOMERY SELECTION REF 1 REL MOMERY SELECTION REF 2 REL MOMERY SELECTION REF 3 REL MOMERY SELECTION REF 4 REL MOMERY SELECTION REF 5 REL MOMERY SELECTION REF 6 REL MOMERY SELECTION REF 7 REL MOMERY SELECTION REF 8 REL MOMERY SELECTION REF 9 REL MOMERY SELECTION REF A REL MOMERY SELECTION REF B REL MOMERY SELECTION REF C REL MOMERY SELECTION REF D REL MOMERY SELECTION REF E REL MOMERY SELECTION REF F	J0	ALL

HEADER	OPERATION	BEGINING	OPERATION MODE
K0	Setting VERTICAL MODE CH 1	K0	DSO/LGA
K1	VERTICAL MODE CH 1		
K2	VERTICAL MODE CH 2		
K3	VERTICAL MODE DUAL		
K4	VERTICAL MODE ADD		LGA AND
K5	VERTICAL MODE SUB		LGA OR
K6	VERTICAL MODE XY		LGA NOTHING
L0	CH1 V/DIV 50V/div	L0	DSO
L1	CH1 V/DIV 10V/div		
L2	CH1 V/DIV 5V/div		
L3	CH1 V/DIV 2V/div		
L4	CH1 V/DIV 1V/div		
L5	CH1 V/DIV 0.5V.div		
L6	CH1 V/DIV 0.2V/div		
L7	CH1 V/DIV 0.1V/div		
L8	CH1 V/DIV 50mV/div		
L9	CH1 V/DIV 20mV/div		
L :	CH1 V/DIV 10mV/div		
L ;	CH1 V/DIV 5mV/div		
M0	REL MEMORY SAVE by J COMMAND SELECTION		ALL
N0	SWEEP MODE AUTO	N0	DSO/LGA
N1	SWEEP MODE NORM		
N2	SWEEP MODE SINGLE		

HEADER	OPERATION	BEGINING	OPERATION MODE
O0 O1 O2 O3 O4 O5 O6 O7 O8 O9 O : O ;	CH2 V/DIV 20V/div CH2 V/DIV 10V/div CH2 V/DIV 5V/div CH2 V/DIV 2V/div CH2 V/DIV 1V/div CH2 V/DIV 0.5V/div CH2 V/DIV 0.2V/div CH2 V/DIV 0.1V/div CH2 V/DIV 50mV/div CH2 V/DIV 20mV/div CH2 V/DIV 10mV/div CH2 V/DIV 5mV/div	O0	DSO
P0 P1	RUN OPERATION STOP OPERATION	P1	ALL
Q0	AUTO RANGE OPERATION		ALL
R0	Reading of CH2 waveform Data (ADD, SUB waveform)		DSO/LGA
R1	Reading of CH2 waveform Data (ADD, SUB waveform)		
R2 R3 R4 R5	Reading of REF1 waveform Data (ADD, SUB waveform) Reading of REF2 waveform Data (ADD, SUB waveform) Reading of REF3 waveform Data (ADD, SUB waveform) Reading of REF4 waveform Data (ADD, SUB waveform)		

HEADER	OPERATION		BEGINING	OPERATION MODE
S0	SEC/DIV	20s/div	S=	DSO/LGA
S1	SEC/DIV	10s/div		
S2	SEC/DIV	5s/div		
S3	SEC/DIV	2s/div		
S4	SEC/DIV	1s/div		
S5	SEC/DIV	0.5s/div		
S6	SEC/DIV	0.2s/div		
S7	SEC/DIV	0.1s/div		
S8	SEC/DIV	50ms/div		
S9	SEC/DIV	20ms/div		
S :	SEC/DIV	10ms/div		
S ;	SEC/DIV	5ms/div		
S<	SEC/DIV	2ms/div		
S=	SEC/DIV	1ms/div		
S>	SEC/DIV	0.5ms/div		
S?	SEC/DIV	0.2ms/div		
S@	SEC/DIV	0.1ms/div		
SA	SEC/DIV	50us/div		
SB	SEC/DIV	20us/div		
SC	SEC/DIV	10us/div		
SD	SEC/DIV	5us/div		
SE	SEC/DIV	2us/div		
SF	SEC/DIV	1us/div		
SG	SEC/DIV	0.5us/div		
SH	SEC/DIV	0.2us/div		
SI	SEC/DIV	0.1us/div		
SJ	EXT CK ↑			
SK	EXT CK ↓			

HEADER	OPERATION		BEGINING	OPERATION MODE
TO	Output of sec/div			DSO/LGA
	Output Data	SEC/DIV		
	"0"	20s/div		
	"1"	10s/div		
	"2"	5s/div		
	"3"	2s/div		
	"4"	1s/div		
	"5"	0.5s/div		
	"6"	0.2s/div		
	"7"	0.1s/div		
	"8"	50ms/div		
	"9"	20ms/div		
	":"	10ms/div		
	";"	5ms/div		
	"<"	2ms/div		
	"="	1ms/div		
	">"	0.5ms/div		
	"?"	0.2ms/div		
	"@"	0.1ms/div		
	"A"	50us/div		
	"B"	20us/div		
	"C"	10us/div		
	"D"	5us/div		
	"E"	2us/div		
	"F"	1us/div		
	"G"	0.5us/div		
	"H"	0.2us/div		
	"I"	0.1us/div		
	"J"	EXT ↑		
	"K"	EXT ↓		

HEADER	OPERATION	BEGINING	OPERATION MODE
U0	Waveform ASCII Data Transmission Mode	U0	DSO/LGA
U1	Waveform BINARY Data Transmission Mode		
V0	Output of CH1 V/DIV		DSO
V1	Output of CH2 V/DIV (OUTPUT DATA) (V/DIV) "0" 20V/DIV "1" 10V/DIV "2" 5V/DIV "3" 2V/DIV "4" 1V/DIV "5" 0.5V/DIV "6" 0.2V/DIV "7" 0.1V/DIV "8" 50mV/DIV "9" 20mV/DIV " : " 10mV/DIV " ; " 5mV/DIV		
V2	MODE OUTPUT OF DMM (OUTPUT DATA) (MODE) "0" DCV "1" ACV "2" DCA "3" ACA "4" RESISTANCE "5" COUNDUCTIVITY BUZZER "6" DIODE TEST "7" CAPACITANCE "8" FREQUENCY		

HEADER	OPERATION	BEGINING	OPERATION MODE
V3	DMM DATA OUTPUT OUTPUT DATA -XX.XX mV DV DELIMIT └─①─┘ └─②┘ └─③┘ ① POLARITY + 4COLUMNS + ASCII DATA OF DECIMAL POINT 6 COLUMS ② ASCII DATA OF 3 COLUMNS ③ ASCII DATA OF MEASUREMENT MODE OR OVER(OV) 2 COLUMNS DATA MODE DV DCV AV ACV DI DCA AI ACA R RESISTANCE RL CONDUCTIVITY BUZZER RD DIODE TEST C CAPACITANCE FQ FREQUENCY OV OVER		DMM
V4 V5	CH1 TRIGGER LEVEL CH2 TRIGGER LEVEL OUTPUT DATA 00~FF BINARY DATA DATA 1 BYTE		DSO DSO
W0 W1 W2 W3 W4 W5	Writing OF CH1 Waveform DATA Writing OF CH2 Waveform DATA Writing OF REF1 Waveform DATA Writing OF REF2 Waveform DATA Writing OF REF3 Waveform DATA Writing OF REF4 Waveform DATA		DSO/LGA
X0 X1	LOCK OFF of Remote Mode LOCK of Remote Mode	X0	ALL
Y0 Y1 Y2	TRIG LEVEL SET UP of CH1, CH2 TRIG DATA SET UP of LGA for CH 0 ~ CH F TRIG "X" DATA SETUP of LGA for CH0 ~ CH F		DSO LGA LGA

* After Y0 + DELIMIT, TRIG LEVEL sets up CH1 TRIG LEVEL 00 ~ FF(1 BYTE) + CH2 TRIG LEVEL 00 ~ FF(1 BYTE).
  It becomes 00(-) ~80(GND) ~ FF(+) level.
  (Example) In case that the level of CH1, CH2 becomes GND.
  Yφ + DELIMIT + 80H + 80H

* After Y1 + DELIMIT, TRIG DATA sets up TRIG DATA (00~FF) of CH0(LSB) ~ CH7(MSB) + TRIG DATA (00 ~ FF) of CH8(LSB) ~ CHF(MSB).

* After Y2 + DELIMIT, TRIG X DATA sets up X DATA (00 ~ FF) of CH0(LSB) ~ CH7(MSB) + X DATA (00 ~ FF) of CH8(LSB) ~ CHF(MSB).
  (Example) In case of setting up the following trigger data.

CH	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
DATA	0	X	1	X	1	1	0	0	X	X	0	0	X	X	1	0

  Y1 + DELIMIT + 02H + 2CH
  Y2 + DELIMIT + CCH + 50CH

HEADER	OPERATION	BEGINING	OPERATION MODE
Z0	Setting up DCV	Z0	DMM
Z1	Setting up ACV		
Z2	Setting up DCA		
Z3	Setting up ACA		
Z4	Setting up RESISTANCE		
Z5	Setting up CONDUCTIVITY BUZZER		
Z6	Setting up DIODE TEST		
Z7	Setting up CAPACITANCE		
Z8	Setting up FREQUENCY		

10.Servicing

10.1 Part List

CODE-NO	PARTS NAME	SPEC (DESCRIPTION)	UNIT	Q'TY	REF-NO
2-A10-581	LCD DISPLAY ASS'Y	3820 (HC)		1	
2-T43-040	LCD	TLX 1013	EA	1	
2-C42-155	CONNECTOR WAFER	AXL 220801-20P	EA	1	
2-T07-211	SCALE PLATE	3820(HC) (PC T0.5*165*96.5 C310282)	EA	1	
2-A10-630	ACQ PCB ASS'Y	3850 (HC)		1	
2-C32-075	BUZZER	PKM13EPP-4002	EA	1	BZ1
2-C28-023	CERAMIC CAPACITOR	100PF 50V J	EA	2	C19,20
2-C28-008	CERAMIC CAPACITOR	10PF 50V D	EA	4	C18,8,92,93
2-C28-010	CERAMIC CAPACITOR	15PF 50V J	EA	2	C15,5
2-C28-046	CERAMIC CAPACITOR	2200PF 500V K	EA	2	C13,3
2-C28-127	CERAMIC CAPACITOR	220PF 500V K	EA	2	C12,2
2-C28-185	CERAMIC CAPACITOR	3PF 500V J	EA	1	C89
2-C28-019	CERAMIC CAPACITOR	47PF 50V J	EA	4	C16,22,23,6
2-C28-005	CERAMIC CAPACITOR	5PF 50V C	EA	2	C17,7
2-C28-022	CERAMIC CAPACITOR	82PF 50V J	EA	1	C10
2-C30-063	ELECTROLYTIC CAPACITOR	100UF 6.3V M	EA	10	C24,25,26,27,28 29,30,31,32,33
2-C30-064	ELECTROLYTIC CAPACITOR	10UF 16V M	EA	2	C94,96
2-C33-241	ELECTROLYTIC CAPACITOR	2.2UF 50V M	EA	1	C95
2-C34-166	FILM CAPACITOR	0.01UF 50V J	EA	1	C84
2-C34-165	FILM CAPACITOR	0.033UF 50V J	EA	2	C87,88
2-C34-173	FILM CAPACITOR	0.1UF 50V K	EA	4	C21,83,85,86
2-C34-168	FILM CAPACITOR	27000PF 50V F	EA	1	C90
2-C34-167	FILM CAPACITOR	2700PF 50V K	EA	1	C91
2-C30-061	METALIZED FILM CAPACITOR	0.022UF 400V K	EA	2	C1,11
2-C34-157	SEMI CONDUCTOR CERAMIC CAP	0.01UF 25V M	EA	5	C100,101,102,103 99

CODE-NO	PARTS NAME	SPEC (DESCRIPTION)	UNIT	Q'TY	REF-NO
2-C34-108	SEMI CONDUCTOR CERAMIC CAP	0.1UF 25V M	EA	43	C40,41,42,43,44,45,46 47,48,49,50,51,52,53 54,55,56,57,58,59,60 61,62,63,64,65,66,67 68,69,70,71,72,73,74 75,76,77,78,79,80,82,98
2-C34-170	SEMI CONDUCTOR CERAMIC CAP	1000PF 25V K	EA	2	C14,4
2-C28-186	TF CAPACITOR	0.1UF 50V Z	EA	1	C97
2-C31-021	TRIMMER CAPACITOR	10P S/R	EA	2	CV5,6
2-C31-027	TRIMMER CAPACITOR	20P	EA	2	CV1,3
2-C31-025	TRIMMER CAPACITOR	6P	EA	2	CV2,4
2-C27-113	CONNECTOR	AXL 226211	EA	1	CN2
2-C32-072	CRYSTAL	25MHZ (DS-49U4H25MHZ+-50PPM)	EA	1	X1
2-C32-071	CRYSTAL	4MHZ (DS-MAT4MHZ+-30PPM)	EA	1	X2
2-C02-122	DIODE	1B 4B42	EA	1	D10
2-C03-096	DIODE	1S 1544 A	EA	4	D1,2,5,6
2-C03-026	DIODE	1S 1588	EA	2	D3,7
2-C03-011	DIODE	1SS 86	EA	2	D4,8
2-C42-975	DSA	DSA-152 MA	EA	1	Z1
2-C03-151	FET	2SK 389	EA	2	Q1,2
2-C42-974	FUSE	0.5A 250V (50*20)	EA	1	FU1
2-C42-006	IC	AX-1011P	EA	3	IC14,15,19
2-C04-130	IC	AX-1021G	EA	2	IC20,21
2-C04-129	IC	CXD 1175AM	EA	2	IC10,11
2-C46-003	IC	CXK 5814P-35L	EA	2	IC12,13
2-C04-131	IC	EL 2020CN	EA	2	IC1,7
2-C04-101	IC	LM 385 Z-2.5	EA	1	IC5

CODE-NO	PARTS NAME	SPEC (DESCRIPTION)	UNIT	Q'TY	REF-NO
2-C04-102	IC	LM 6364 N	EA	2	IC3,9
2-C04-132	IC	HC3850DM	EA	1	IC23
2-C04-123	IC	TC 74AC 00F	EA	1	IC16
2-C04-122	IC	TC 74AC 08F	EA	1	IC22
2-C04-124	IC	TC 74AC 74F	EA	2	IC17,18
2-C04-126	IC	TC 74HC 164AF	EA	1	IC24
2-C04-125	IC	TC 74HC 374AF	EA	2	IC25,26
2-C46-043	IC	TC 74HC 4052AF	EA	1	IC4
2-C04-127	IC	TC 74HC 4053AF	EA	1	IC27
2-C04-098	IC	TC 74HC 4053AF	EA	2	IC2,8
2-C04-094	IC	UPC 834 C	EA	1	IC6
2-C32-073	INDUCTOR	100UH K	EA	4	L10,11,12,9
2-C32-059	INDUCTOR	47UH	EA	7	L1,2,3,4,5,6,7
2-C32-074	INDUCTOR	BL01RN1-A62	EA	1	L8
2-C42-969	DEALY LINE	JD 5020G	EA	2	DL1
2-C43-203	ACQ PCB	3850 (01-080-03)	EA	1	
2-C03-155	REALY	ATF-219	EA	2	RL1,2
2-C03-153	HYBRID RESISTOR	AX 1016	EA	1	HA1
2-C03-154	HYBRID RESISTOR	AX 1022	EA	1	HA2
2-C20-319	METAL FILM RESISTOR	1.5K OHM 1/8W D	EA	2	R15,45
2-C20-157	METAL FILM RESISTOR	1.5K OHM 1/8W F	EA	2	R16,46
2-C20-328	METAL FILM RESISTOR	10 OHM 1/8W F	EA	2	R17,47
2-C17-016	METAL FILM RESISTOR	10.1K OHM 1/4W D	EA	2	R35,5
2-C15-005	METAL FILM RESISTOR	100 OHM 1/8W F	EA	8	R10,20,39,40,50 74,9,92
2-C20-336	METAL FILM RESISTOR	100K OHM 1/8W F	EA	6	R29,30,31,32,72,80
2-C20-323	METAL FILM RESISTOR	10K OHM 1/8W D	EA	1	R24

CODE-NO	PARTS NAME	SPEC (DESCRIPTION)	UNIT	Q'TY	REF-NO
2-C20-161	METAL FILM RESISTOR	12K OHM 1/8W F	EA	2	R23,26
2-C20-156	METAL FILM RESISTOR	1K OHM 1/8W F	EA	5	R14,21,44,51,81
2-C17-027	METAL FILM RESISTOR	1M OHM 1/4W D	EA	3	R36,6,73
2-C20-339	METAL FILM RESISTOR	1M OHM 1/8W F	EA	2	R59,83
2-C20-332	METAL FILM RESISTOR	2.2K OHM 1/8W F	EA	3	R85,86,87
2-C12-051	METAL FILM RESISTOR	22 OHM 1/4W F	EA	4	R1,2,3,33
2-C20-331	METAL FILM RESISTOR	2K OHM 1/8W F	EA	1	R25
2-C20-151	METAL FILM RESISTOR	330 OHM 1/8W F	EA	1	R90
2-C20-334	METAL FILM RESISTOR	33K OHM 1/8W F	EA	1	R82
2-C20-326	METAL FILM RESISTOR	3K OHM 1/8W D	EA	2	R22,52
2-C20-264	METAL FILM RESISTOR	3K OHM 1/8W F	EA	5	R13,18,27,43,48
2-C20-267	METAL FILM RESISTOR	4.3K OHM 1/8W F	EA	2	R19,49
2-C20-333	METAL FILM RESISTOR	4.7K OHM 1/8W F	EA	6	R12,42,60,61,62,89
2-C20-327	METAL FILM RESISTOR	47 OHM 1/8W F	EA	7	R28,38,53,54,55 8,88
2-C20-153	METAL FILM RESISTOR	470 OHM 1/8W F	EA	2	R56,57
2-T45-011	METAL FILM RESISTOR	470K OHM 1/4W F	EA	2	R37,7
2-C20-337	METAL FILM RESISTOR	470K OHM 1/8W F	EA	1	R58
2-C20-329	METAL FILM RESISTOR	510 OHM 1/8W F	EA	1	R76
2-C20-338	METAL FILM RESISTOR	680K OHM 1/8W F	EA	3	R77,78,79
2-C20-335	METAL FILM RESISTOR	75K OHM 1/8W F	EA	1	R84
2-C20-330	METAL FILM RESISTOR	866 OHM 1/8W F	EA	2	R11,41
2-C20-340	METAL FILM RESISTOR	9.76M OHM 1/2W D	EA	2	R75,91
2-C17-025	METAL FILM RESISTOR	990K OHM 1/4W D	EA	2	R34,4
2-C20-341	METAL FILM RESISTOR	1 OHM 1/3W D	EA	1	R71
2-C03-066	NETWORK RESISTOR	100K OHM J	EA	2	RA1,2
2-C03-152	NETWORK RESISTOR	1K OHM J	EA	1	RA3

CODE-NO	PARTS NAME	SPEC (DESCRIPTION)	UNIT	Q'TY	REF-NO
2-C12-138	TANTAL RESISTOR	9 OHM 1/2W C	EA	1	R70
2-C39-201	PUSH SWITCH	PS-132-A12PBS	EA	4	SW1,2,3,4
2-C30-086	PTC THERMISTOR	500 OHM	EA	1	PTC
2-C06-011	TR	2SA 1015-Y	EA	1	Q4
2-C06-073	TR	2SA 1048-GR	EA	2	Q5,9
2-C06-020	TR	2SC 1815-Y	EA	1	Q3
2-C06-048	TR	2SC 2120-Y	EA	1	Q7
2-C06-072	TR	2SC 2458-GR	EA	2	Q6,8
2-C06-074	TR	PS-2501-4	EA	1	PC1
2-C29-058	SEMI FIXED RESISTOR	10K OHM (V08L-PV-Y72-B10K)GRAY	EA	2	VR1,2
2-C29-080	SEMI FIXED RESISTOR	10K OHM (VM5CKPV10K)	EA	4	VR11,13,5,9,10
2-C29-059	SEMI FIXED RESISTOR	1K OHM (VM5CKPV1K)	EA	2	VR10,6
2-C29-060	SEMI FIXED RESISTOR	200 OHM (VM5CK-PV)	EA	2	VR4,8
2-C29-082	SEMI FIXED RESISTOR	22K OHM (VM5CKPV22K)	EA	2	VR12,15
2-C29-081	SEMI FIXED RESISTOR	500K OHM (VM5CKPV500K)	EA	2	VR14,16
2-C21-250	CONNECTOR WAFER	FFC-40BMEPI-40P	EA	1	CN1
2-T17-007	TOUCH CONTACTOR	(OP20-P001-1) BSBM	EA	2	
2-T37-086	JACK	3850(HC) (C3601BE SN/PL,C310304)	EA	4	
2-T23-168	KEY TOP KNOB	AP-37-GL (PS-132 TYPE)	EA	4	
2-T03-084	SHIELD PLATE(A)	3820(HC) (C2801P T0.5 C310276)	EA	1	
2-T07-243	SHIELD PLATE(E)	3850(HC) (C2801P T0.5 C310308)	EA	1	
2-T07-244	SHIELD PLATE(F)	3850(HC) (C2801P T0.5 C310309)	EA	1	
2-T48-135	MACHINE SCREW	FH(+) M2.0*6.0 NI/PL	EA	8	
2-A10-631	CPU PCB ASS'Y	3850 (HC)		1	

CODE-NO	PARTS NAME	SPEC (DESCRIPTION)	UNIT	Q'TY	REF-NO
2-T43-041	LITHIUM BATTERY	3V (CR2032-1HS)	EA	1	BT1
2-T42-096	BUZZER	KBS-20DB-4P-0	EA	1	BZ1
2-C28-027	CERAMIC CAPACITOR	150PF 50V J	EA	2	C11,12
2-C28-013	CERAMIC CAPACITOR	22PF 50V J	EA	2	C32,33
2-C28-017	CERAMIC CAPACITOR	33PF 50V J	EA	2	C26,27
2-C33-124	ELECTROLYTIC CAPACITOR	1000UF 16V M	EA	2	C101,102
2-C30-063	ELECTROLYTIC CAPACITOR	100UF 6.3V M	EA	4	C14,23,5,9
2-C33-078	ELECTROLYTIC CAPACITOR	1UF 50V M	EA	1	C34
2-C33-200	ELECTROLYTIC CAPACITOR	470UF 16V M	EA	2	C103,104
2-C33-126	ELECTROLYTIC CAPACITOR	470UF 6.3V M	EA	6	C15,16,21,4,7,8
2-C33-049	ELECTROLYTIC CAPACITOR	47UF 16V M	EA	1	C10
2-C30-065	FILM CAPACITOR	0.01UF 50V J	EA	1	C25
2-C34-108	SEMI CONDUCTOR CERAMIC CAP	0.1UF 25V M	EA	16	C1,13,17,18,19 20,22,24,28,29,3 30,31,35,36,6
2-C32-021	CRYSTAL	12MHZ (HC18U) (20PPM)	EA	1	X2
2-C32-022	CRYSTAL	20MHZ (HC18U) (20PPM)	EA	1	X1
2-C03-026	DIODE	1S 1588	EA	7	D2,3,4,5,6,7,8
2-C46-035	DIODE	HZ-3B-2	EA	1	ZD2
2-C46-299	DIODE	S5277B	EA	1	D1
2-C46-398	DIODE	Z 2015 U	EA	1	ZD1
2-C46-048	IC	8053 ALR	EA	1	IC13
2-C04-096	IC	8054 HN	EA	1	IC19
2-C46-001	IC	AX-1010G 156	EA	1	IC1
2-C04-138	IC	LM 2940CT-5.0	EA	1	IC16
2-C04-091	IC	MSM 62*42B	EA	1	IC12
2-C08-079	IC	TA 78DL 05 AP	EA	1	IC17

CODE-NO	PARTS NAME	SPEC (DESCRIPTION)	UNIT	Q'TY	REF-NO
2-C04-113	IC	TC 5525BPL-10L	EA	1	IC4
2-C46-431	IC	TC57256 AD-12	EA	1	IC3
2-C04-139	IC	TC 74HC 00AP	EA	1	IC7
2-C46-394	IC	TC 74HC 132AP	EA	1	IC11
2-C04-040	IC	TC 74HC 138AP	EA	2	IC18,6
2-C04-041	IC	TC 74HC 139AP	EA	1	IC5
2-C04-140	IC	TC 74HC 151AP	EA	1	IC10
2-C04-031	IC	TC 74HC 390AP	EA	1	IC9
2-C04-049	IC	TC 74HC 02AP	EA	1	IC8
2-C04-141	IC	IC 74HC 373AP	EA	1	IC2
2-C04-095	IC	TL 497 ACN	EA	2	IC14,15
2-C32-047	INDUCTOR	220UH (FL5H221K)	EA	2	L1,2
2-C32-058	INDUCTOR	47UH (SN-5 400 13PI H-8MM)	EA	1	L3
2-C43-168	CPU PCB	3820 (01-069-05A PSR INK)	EA	1	
2-C10-022	CARBON FILM RESISTOR	100 OHM 1/4W J	EA	3	R11,12,18
2-C18-051	CARBON FILM RESISTOR	1M OHM 1/4W J	EA	1	R13
2-C10-003	CARBON FILM RESISTOR	2.2 OHM 1/4W J	EA	1	R4
2-C10-013	CARBON FILM RESISTOR	22 OHM 1/4W J	EA	1	R6
2-C18-024	CARBON FILM RESISTOR	470 OHM 1/4W J	EA	1	R14
2-C13-003	METAL FILM RESISTOR	1.2K OHM 1/4W F	EA	2	R3,5
2-C13-056	METAL FILM RESISTOR	100K OHM 1/4W F	EA	1	R10
2-C18-094	METAL FILM RESISTOR	10K OHM 1/4W F	EA	1	R8
2-C19-079	METAL FILM RESISTOR	1K OHM 1/4W F	EA	1	R17
2-C13-020	METAL FILM RESISTOR	3.9K OHM 1/4W F	EA	1	R2
2-C13-058	METAL FILM RESISTOR	4.3K OHM 1/4W F	EA	1	R7
2-C13-022	METAL FILM RESISTOR	4.7K OHM 1/4W F	EA	1	R16
2-C13-057	METAL FILM RESISTOR	43K OHM 1/4W F	EA	1	R9

CODE-NO	PARTS NAME	SPEC (DESCRIPTION)	UNIT	Q'TY	REF-NO
2-C13-055	METAL FILM RESISTOR	91K OHM 1/4W F	EA	1	R15
2-C16-090	METAL OXIDE RESISTOR	20K OHM 1W G	EA	1	R1
2-C03-066	NETWORK RESISTOR	100K OHM J	EA	1	RA2
2-C46-040	NETWORK RESISTOR	10K OHM J	EA	1	RA1
2-C46-393	IC SOCKET	AXS 102813-28P	EA	1	IC3
2-C36-078	SLIDE SWITCH	SS-273 Y	EA	1	SW1
2-C29-058	SEMI FIXED RESISTOR	10K OHM(V08L-PV-Y72-B10K)GRAY	EA	1	VR1
2-C21-236	CONNECTOR WAFER	5244-08 AUPB-8P	EA	1	CN5
2-C21-235	CONNECTOR WAFER	5268-04A-4P	EA	1	CN2
2-C21-231	CONNECTOR WAFER	AXB-120001-20P	EA	1	CN6
2-C21-234	CONNECTOR WAFER	HKP 40 FD2-40P	EA	1	CN1
2-C21-237	CONNECTOR WAFER	LGP-4031-300	EA	1	CN3
2-C21-232	CONNECTOR WAFER	Z220-8FD-8P	EA	1	CN4
2-C26-079	JUMP WIRE	2.5MM	EA	2	JP1,3
2-C11-081	JUMP WIRE	25MM	EA	2	
2-T11-026	HEXAGON NUT	M3 NI/PL	EA	2	
2-C42-136	SILCON RUBBER(1)	ARH 230 (T0.3*13*18)	EA	2	
2-T48-016	MACHINE SCREW	BH(+) M3.0*6.0 NI/PL	EA	2	
2-T20-262	CAL TERMINAL	3820(HC) (C2801P T0.6 NI/PL C310296)	EA	1	
2-T11-017	TOOTHED LOCK WASHER	3PI NI/PL (OUT SIDE)	EA	2	
2-A10-576	KEY PCB ASS'Y	3820 (HC)		1	
2-C43-169	KEY PCB	3820 (01-071-04)	EA	1	
2-C39-222	PUSH SWITCH	PT-002-C1	EA	16	SW1,10,11,12,13 14,15,16,2,3,4,5 6,7,8,9
2-C21-248	CONNECTOR WAFER	FFC-8AMEPI-8P	EA	1	CN1
2-A10-577	RS232C PCB ASS'Y	3820 (HC)	EA	1	

CODE-NO	PARTS NAME	SPEC (DESCRIPTION)	UNIT	Q'TY	REF-NO
2-C30-063	ELECTROLYTIC CAPACITOR	100UF 6.3V M	EA	1	C1
2-C30-064	ELECTROLYTIC CAPACITOR	10UF 16V M	EA	4	C3,4,5,6
2-C34-108	SEMI CONDUCTOR CERAMIC	0.1UF 25V M	EA	2	C2,7
2-C21-197	P/C CONNECTOR	RDBD-25SA-LNA(4-40)(25P)	EA	1	P1
2-C21-337	IC	19.6608MHZ (DS-C-3303 19.6608MHZ)	PCS	1	IC3
2-C21-198	IC	MAX 232 CPE	EA	1	IC1
2-C43-170	RS232C PCB	3820 (01-076-04)	EA	1	
2-C11-001	CARBON FILM RESISTOR	1K OHM 1/4W J	EA	2	R1,2
2-C42-193	DIP SWITCH	WCAP 4103	EA	1	
2-C21-249	CONNECTOR WAFER	FFC-8LAMEP1-8P	EA	1	P2
2-T12-172	RS232C BRACKET(1)	3820(HC) (SECC T1.0 DARK C310284-1)	EA	1	
2-T12-173	RS232C BRACKET(2)	3820(HC) (SECC T1.2 DARK C310290)	EA	1	
2-T48-016	MACHINE SCREW	BH(+) M3.0*6.0 NI/PL	EA	2	
2-T10-015	MACHINE SCREW	BH(+) M3.0*8.0 NI/PL	EA	2	
2-T11-070	MACHINE SCREW	PH(+) M2.6*6.0 BLACK	EA	4	
2-T11-009	SPRING WASHER	3PI NI/PL	EA	2	
2-A10-633	LOGIC PROBE ASS'Y	3850 (HC)		1	
2-C42-973	EMI CABLE	FS-R26-7 26PIN 0.5M	EA	1	
2-C42-972	FLAT CABLE	B2-26-7 26PIN 0.5M	EA	1	
2-C30-063	ELECTROLYTIC CAPACITOR	100UF 6.3V M	EA	2	C1,2
2-C33-198	ELECTROLYTIC CAPACITOR	47UF 10V M	EA	1	C3
2-C34-169	SEMI CONDUCTOR CERAMIC CAP	0.047UF 25V Z	EA	4	C90,91,92,93
2-C34-108	SEMI CONDUCTOR CERAMIC CAP	0.1UF 25V M	EA	8	C10,11,4,5,6 7,8,9
2-C27-115	CONNECTOR	3094-02A	EA	1	
2-C42-971	CONNECTOR	AXM 126415	EA	1	

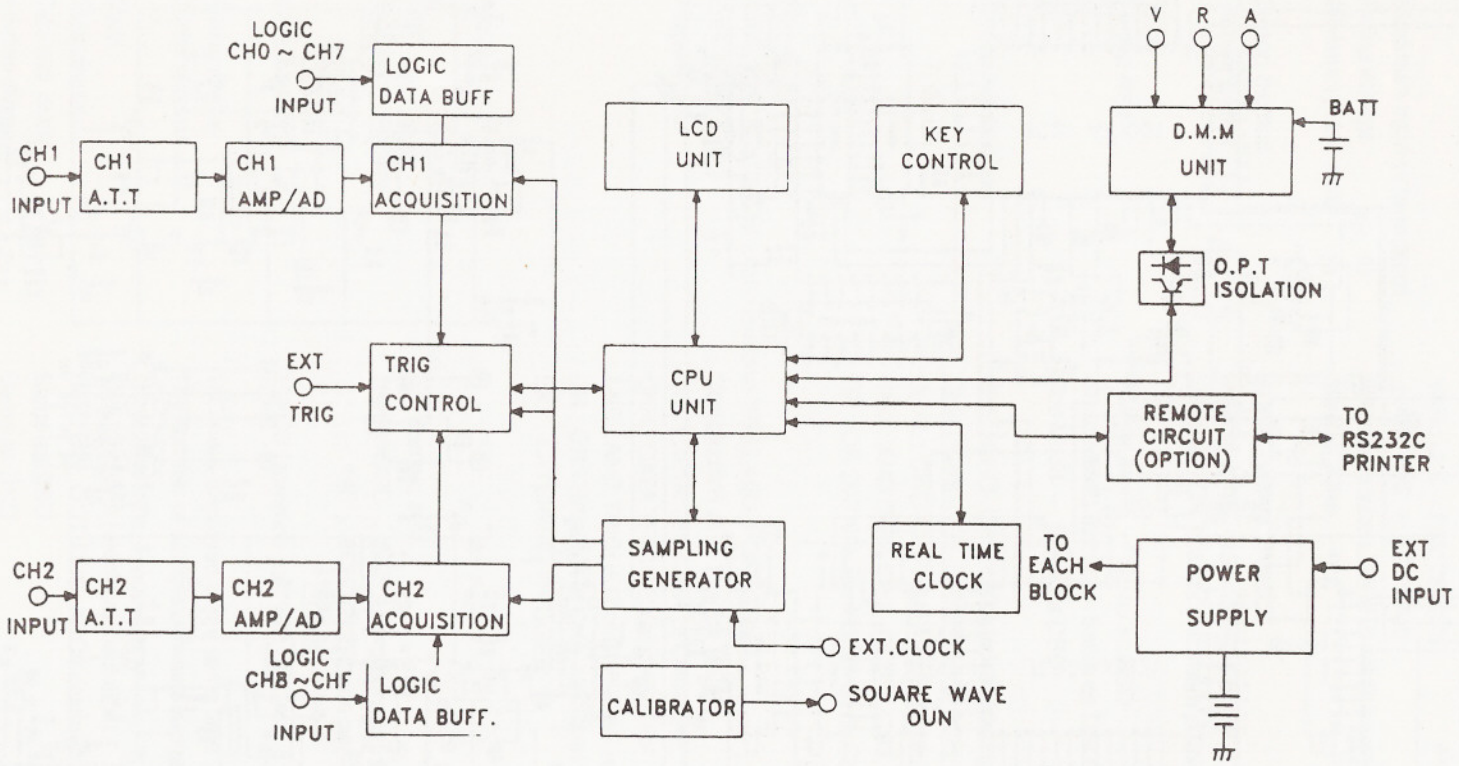
CODE-NO	PARTS NAME	SPEC (DESCRIPTION)	UNIT	Q'TY	REF-NO
2-C27-114	CONNECTOR	AXM 220211	EA	1	
2-C42-970	CONNECTOR	AXP 426218	EA	1	
2-C27-116	CONNECTOR	MFC-20HF	EA	1	
2-C04-135	IC	AX-1001	EA	5	HA1,2,3,4,5
2-C04-123	IC	TC 74HC 00F	EA	1	IC5
2-C04-133	IC	TC 74HC 32F	EA	1	IC6
2-C04-134	IC	TC 74HC 241AF	EA	1	IC1,2,3,4
2-C43-201	LOGIC PCB	3850 (01-081-04 PSR INK)	EA	1	
2-C21-339	CONNECTOR PIN	HKP-FH3	EA	2	
2-C21-338	CONNECTOR PIN	PF-085	EA	2	
2-C20-328	METAL FILM RESISTOR	10 OHM 1/8W F	EA	1	R9
2-C20-336	METAL FILM RESISTOR	100K OHM 1/8W F	EA	1	R1,2
2-C20-160	METAL FILM RESISTOR	10K OHM 1/8W F	EA	1	R5
2-C20-344	METAL FILM RESISTOR	2.7K OHM 1/8W F	EA	1	R6
2-C20-153	METAL FILM RESISTOR	470 OHM 1/8W F	EA	3	R10,3,4
2-C20-343	METAL FILM RESISTOR	47K OHM 1/8W F	EA	1	R8
2-C20-342	METAL FILM RESISTOR	51K OHM 1/8W F	EA	1	R7
2-C36-085	SWITCH	SS-310-2P3T	EA	1	
2-C35-064	POTENTION METER VR	10K OHM (POT 3102P-1-103)	EA	1	
2-T20-269	LOGIC PROBE CASE(1)	HL-10 (ABS DARK GRAY C810094)	EA	1	
2-T20-270	LOGIC PROBE CASE(2)	HL-10 (ABS DARK GRAY C810095)	EA	1	
2-T20-273	ELLIGATE CLIP	BLACK	EA	1	
2-T20-272	MINI PIN CLIP	PF-080 (BLACK)	EA	1	
2-T20-272	MINI PIN CLIP	PF-081 (STACK)	EA	1	
2-T22-261	LOGIC PROBE PLATE	HL-10 (OST HL10-001)	EA	1	
2-T48-136	TAPPING SCREW	BH(+) PI2.6*14.0 NI/PL	EA	1	
2-Z10-126	LINE ASS'Y	3850 (HC)		1	

CODE-NO	PARTS NAME	SPEC (DESCRIPTION)	UNIT	Q'TY	REF-NO
2-T01-001	BNC CONNECTOR	UG-625/U	EA	3	
2-C20-148	METAL FILM RESISTOR	22 OHM 1/8W F	EA	1	R90,91,92
2-C22-059	CONNECTOR LEAD WIRE	3820-01	EA	1	
2-C22-058	LEAD WIRE	3820-02	EA	3	
2-T03-085	CABINET	3820(HC) (ABS DARK GRAY C810085-2)	PCS	1	
2-T36-117	CHASSIS	3820(HC) (SECC T0.8 DRAY GRAY C310271)	EA	1	
2-T20-268	BATTERY COVER	3850(HC) (ABS DARK GRAY SPRAY C810086-1)	EA	1	
2-T05-083	WINDOW	3820(HC) (ACRYL T2.0*117.8*94.8 C810089)	EA	1	
2-T54-263	POLY FOOT	3820(HC) (POLYESTER BLACK C810088)	EA	4	
2-T54-262	RUBBER FOOT	3820(HC) (RUBBER BLACK T2.0 C310294)	EA	4	
2-T22-258	SIDE FRAME(L)	3850(HC) (SECC T0.8 DRAK GRAY C310307)	EA	1	
2-T22-220	SIDE FRAME(R)	3820(HC) (SECC T0.8 DRAK GRAY C310273)	EA	1	
2-T18-042	JACK GUIDE(1)	3820(HC) (P.P DARK GRAY C810096)	EA	3	
2-T18-043	JACK GUIDE(2)	3820(HC) (P.P RED C810096)	EA	1	
2-T03-086	BATTERY HOLDER	PI 15*140 (PVC TUBE)	EA	2	
2-T47-069	CABINET INSERT	3820(HC) (C3601BE PI5*8 C310293)	EA	1	
2-T21-084	KEY SWITCH KNOB(1)	3820(HC) (ABS BLACK C810087-1-1)	EA	1	
2-T21-085	KEY SWITCH KNOB(2)	3820(HC) (ABS CITY WHITE C810087-2-1)	EA	4	
2-T11-027	HEXAGON NUT	M4 NI/PL	EA	1	
2-T54-271	PACKING	3820(HC) (RUBBER BLACK C810090)	EA	1	
2-T22-259	REAR PANEL	3850(HC) (SECC T0.8 DARK GRAY C310305)	EA	1	
2-T35-091	COVER PLATE	3850(HC) (SECC T0.8 DARK GRAY C310306)	EA	1	
2-T07-241	TOP PLATE	3850(HC) (OST3850-001)	EA	1	
2-T23-189	PCB GRIP	5506 (C310074-2,BSBM 5*6)	EA	4	
2-T29-090	PCB GRIP(1)	3820(HC) (C3601BE 5*12 C310291)	EA	2	
2-T29-091	PCB GRIP(2)	3820(HC) (C3601BE 5*11 C310292)	EA	8	
2-T48-016	MACHINR SCREW	BH(+) M3.0*6.0 NI/PL	EA	8	

CODE-NO	PARTS NAME	SPEC (DESCRIPTION)	UNIT	Q'TY	REF-NO
2-T10-136	MACHINR SCREW	FH(+) M2.6*8.0 NI/PL	EA	4	
2-T11-070	MACHINR SCREW	PH(+) M2.6*6.0 BLACK	EA	1	
2-T11-068	MACHINR SCREW	PH(+) M3.0*4.0 BLACK	EA	4	
2-T22-222	INSULATION SHEET(1)	3820(HC) (PE T0.3 C310285)	EA	1	
2-T22-223	INSULATION SHEET(2)	3820(HC) (PE T0.3 C310286)	EA	1	
2-T22-260	INSULATION SHEET(3)	3850(HC) (PE T0.3 C310311)	EA	2	
2-T20-261	SPRING	3820(HC) (SUS304 PI0.6 C310295)	EA	4	
2-T44-069	STAND	3820(HC) (PWR PI3.0 BLACK C310278)	EA	1	
2-T20-258	BATTERY TERMINAL(A)	3820(HC) (C5210 T0.3 NI/PL C310287-1)	PCS	2	
2-T20-259	BATTERY TERMINAL(B)	3820(HC) (C5210 T0.3 NI/PL C310288)	EA	2	
2-T20-260	BATTERY TERMINAL(C)	3820(HC) (C5210 T0.3 NI/PL C310289-1)	PCS	2	
2-T01-031	GROUND TERMINAL	OS615(HC) (RSBM NI/PL)	EA	1	
2-T10-097	TOOTHED LOCK WASHER	4PI (NI) (OUT SIDE)	EA	1	
2-Z50-118	OPTION ASS'Y	36820 (HC)		1	
2-T54-276	AC ADAPTOR	6V 750MA (PRINTER)	EA	1	
2-C42-231	PRINTER CABLE	3820	EA	1	
2-C40-061	PRINTER	3820 (BM-80 DS)	EA	1	
2-T52-140	PRINT PAPER	3820 PRINT PAPER (BM-80DS)	EA	1	
2-Z50-122	PACKING ASS'Y	3850 (HC)		1	
2-T54-277	AC ADAPTOR	8V 350MA (KNU-409)(MAIN)	EA	1	
2-T53-035	BATTERY	1.5V (AA,UM3 TYPE)	EA	6	
2-T53-192	BATTERY	1.5V (AAA,UM4 TYPE)	EA	2	
2-T14-019	COXIAL CABLE	BNC-TO-CLIP 100CM(RG58)	EA	1	
2-T47-040	TEST CORD	RED & BLACK(ADM305)	EA	1	
2-T05-074	TEST CORD	OP27 (100MHZ)	EA	2	
2-T14-148	INDIVIDUAL BOX	3850 (HC)	EA	1	

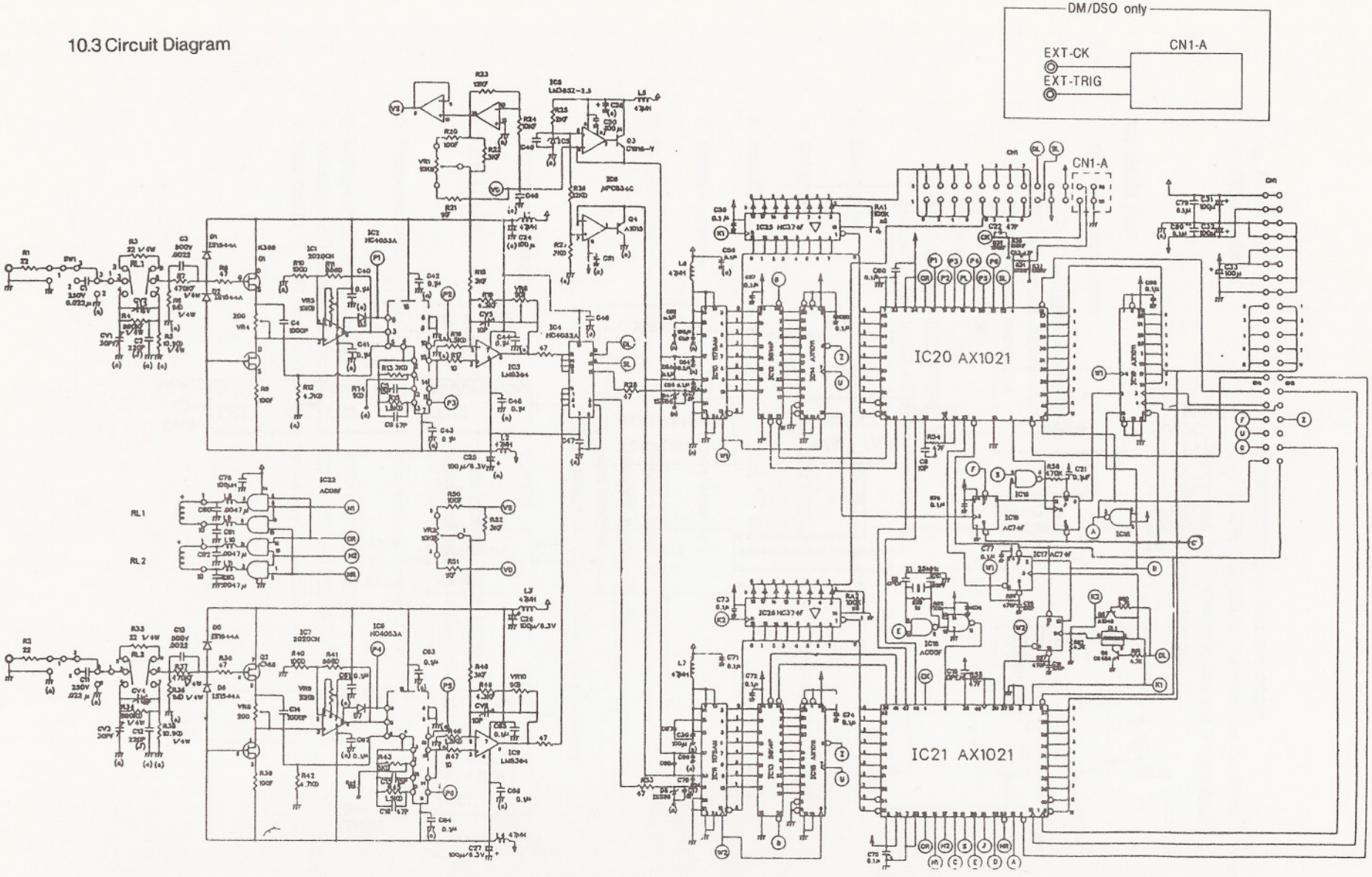
CODE-NO	PARTS NAME	SPEC (DESCRIPTION)	UNIT	Q'TY	REF-NO
2-T14-126	OUT BOX	3820 (HC)	EA	0.25	
2-T33-120	CARRING CASE	3820 (HC)	EA	1	
2-T07-242	MANUAL	3850 (HC)	EA	1	
2-T14-112	POLY BAG	T0.05*320*230 (ZIPPER)	EA	1	
2-T52-003	SILICA GEL	5/G	EA	2	

10.2 Block Diagram

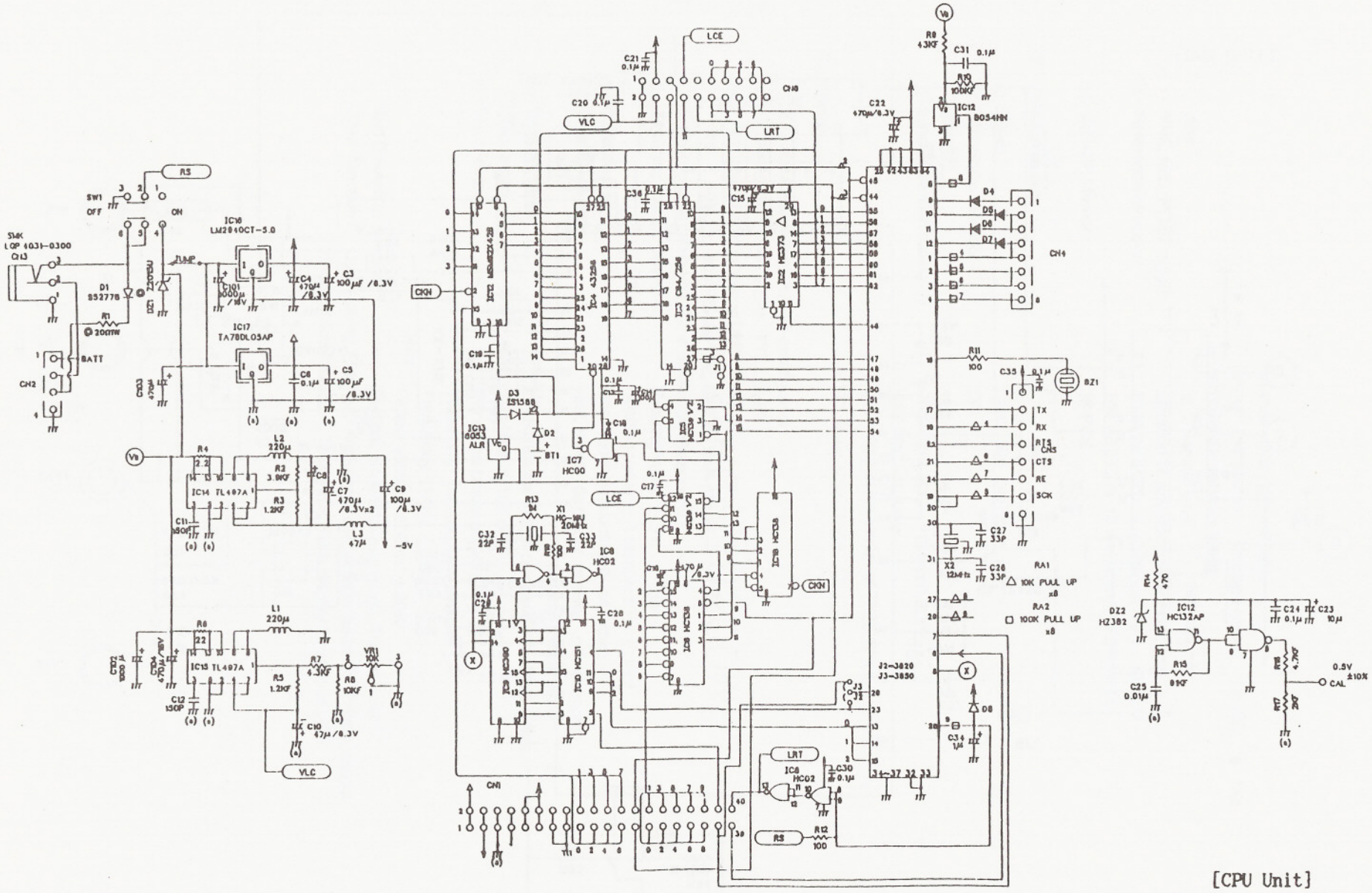


3850 BLOCK DIAGRAM

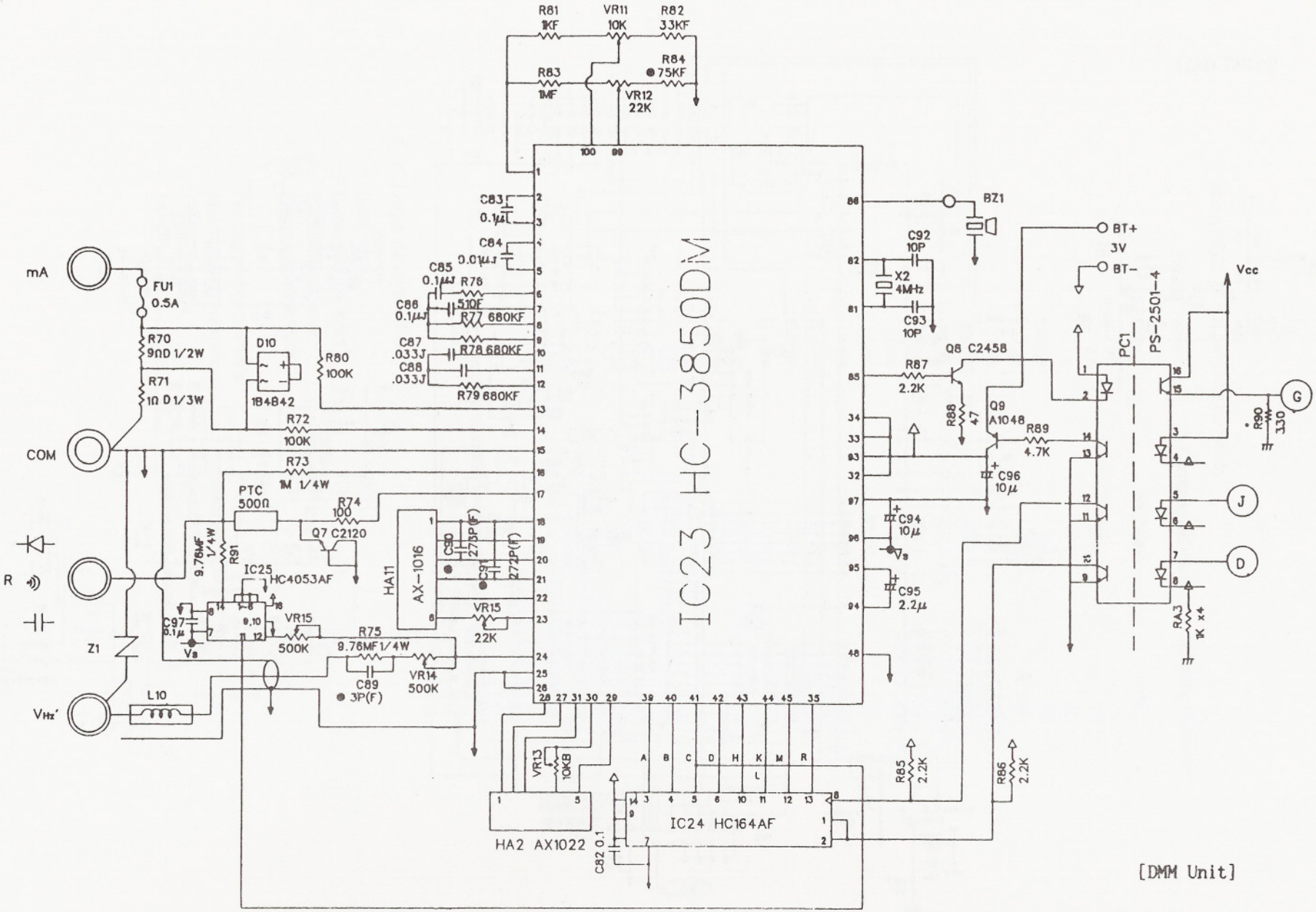
10.3 Circuit Diagram



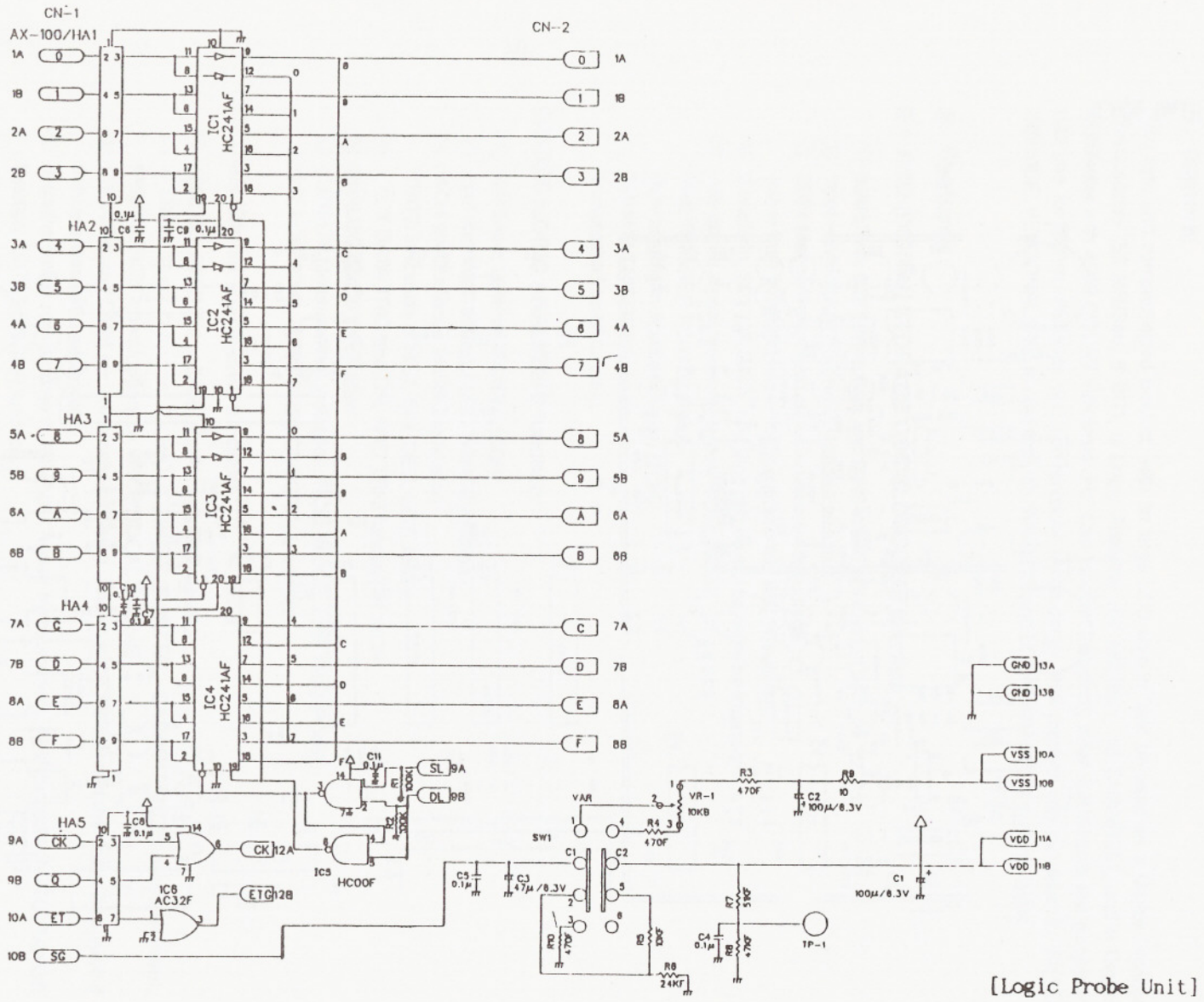
[ACQ Unit]



[CPU Unit]

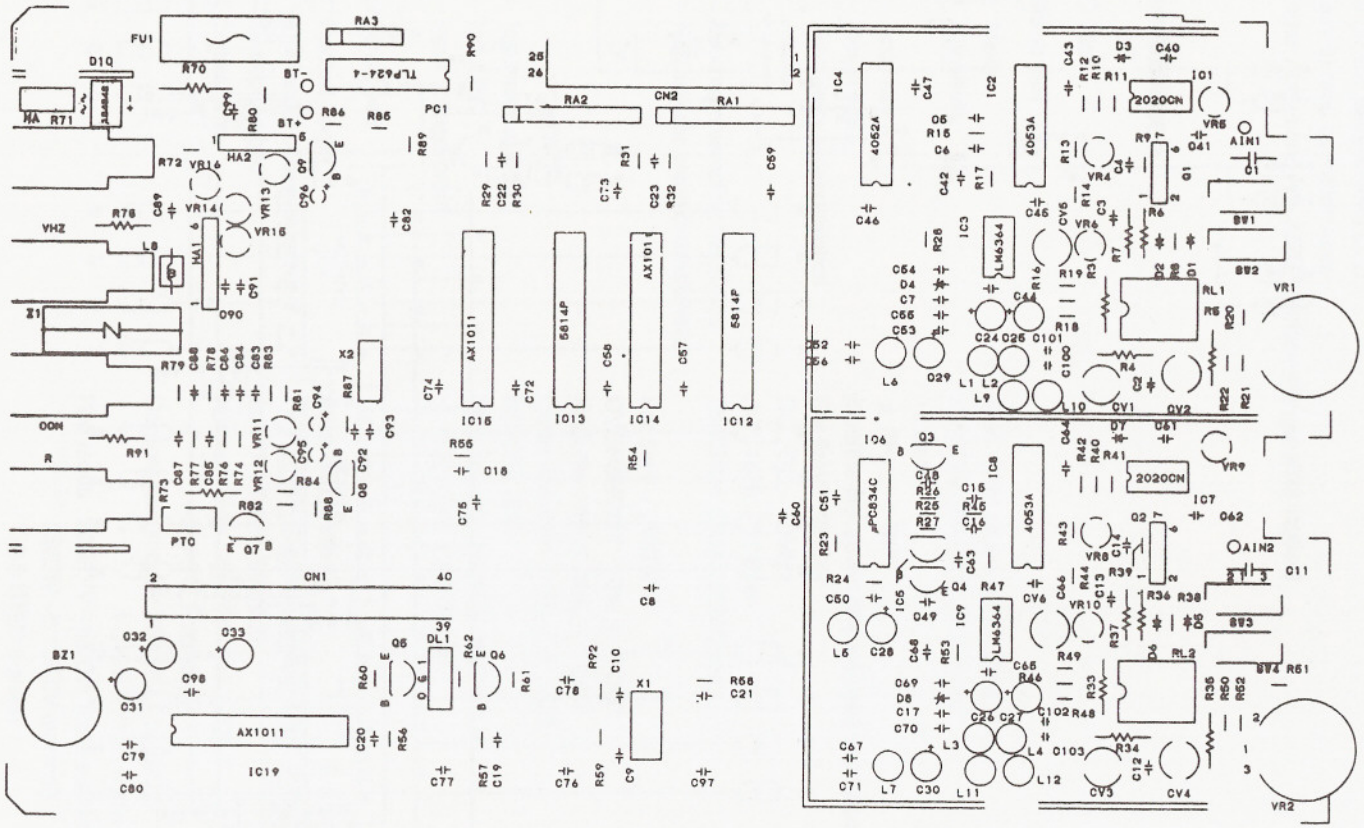

IC23 HC-3850DM
R81 1KF
VR11 10K
R82 33KF
R83 1MF
R84 75KF
VR12 22K
mA
COM
R
Z1
VHz'
FU1 0.5A
R70 9ΩD 1/2W
R71 1Ω D 1/3W
D10
1B4842
R80 100K
R72 100K
R73 1M 1/4W
PTC 500Ω
R74 100
Q7 C2120
R91 9.76MF 1/4W
IC25 HC4053AF
C97 0.1μ
VR15 500K
R75 9.76MF 1/4W
VR14 500K
C89 3P(F)
L10
C83 0.1μJ
C84 0.01μJ
C85 0.1μJ
R76 510F
C86 0.1μJ
R77 680KF
C87 .033J
R78 680KF
C88 .033J
R79 680KF
HA11 AX-1016
C90 275P(F)
C91 272P(F)
VR15 22K
BZ1
C92 10P
X2 4MHz
C93 10P
BT+ 3V
BT-
Vcc
PC1
PS-2501-4
Q8 C2458
R87 2.2K
R88 47
Q9 A1048
R89 4.7K
C96 10μ
R90 330
G
J
D
C94 10μ
C95 2.2μ
RA3 1K x4
VR13 10KB
HA2 AX1022
C82 0.1
IC24 HC164AF
R85 2.2K
R86 2.2K
A B C D H K M R L

[DMM Unit]

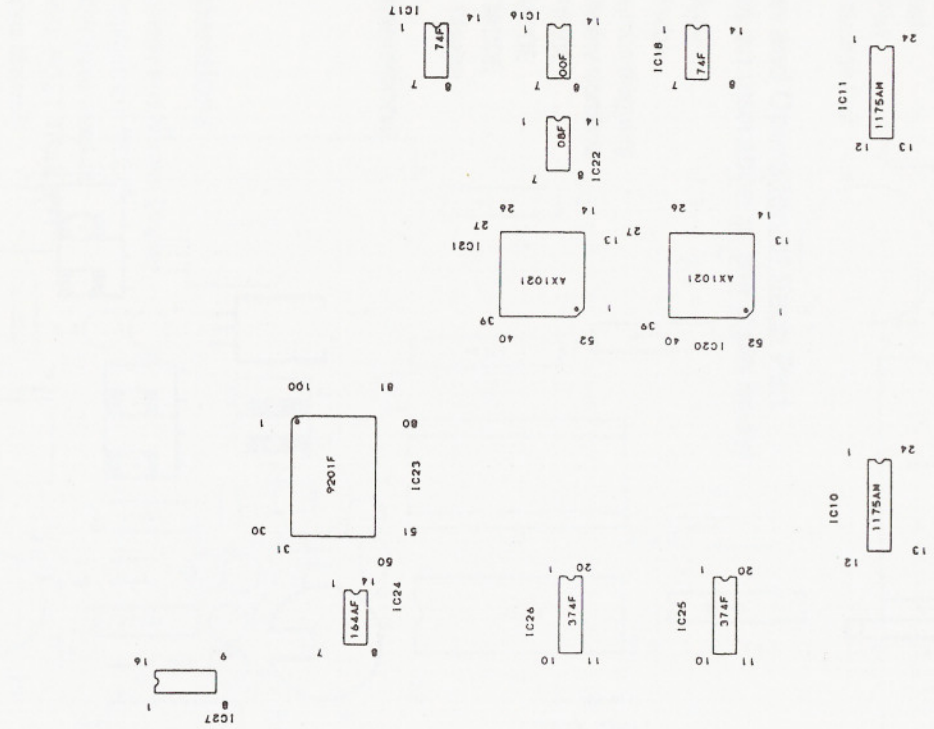


[Logic Probe Unit]

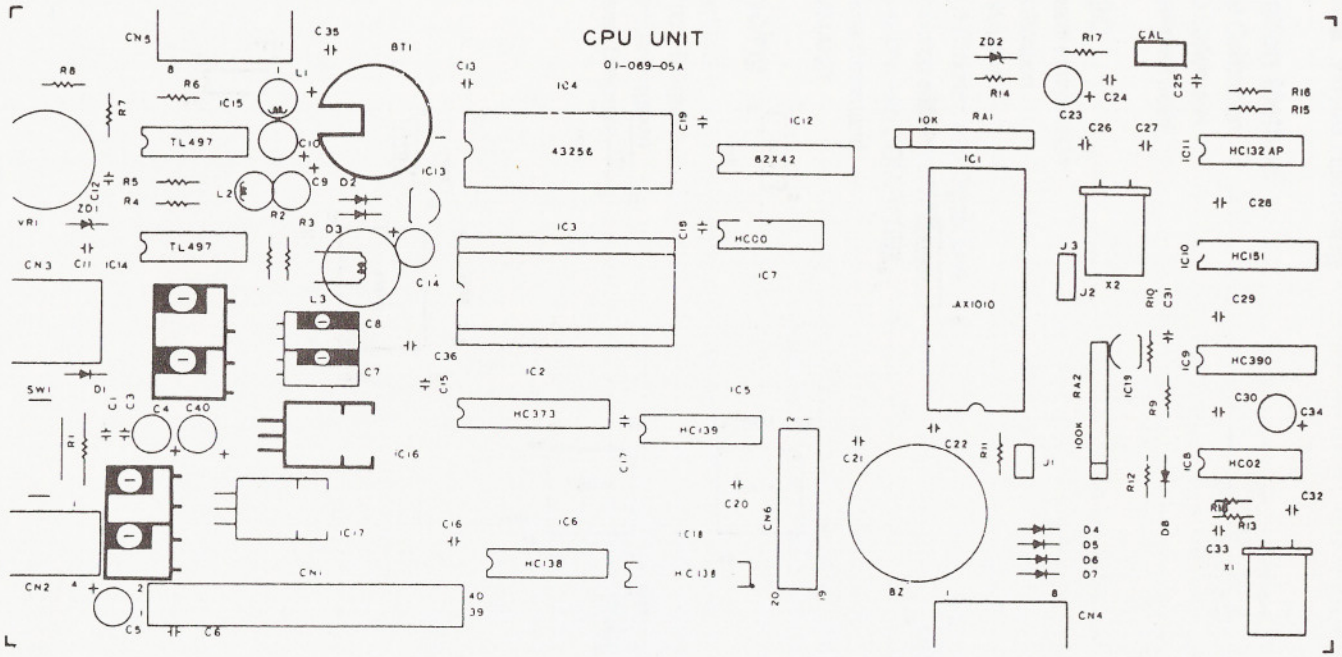
10.4 Insert Diagram



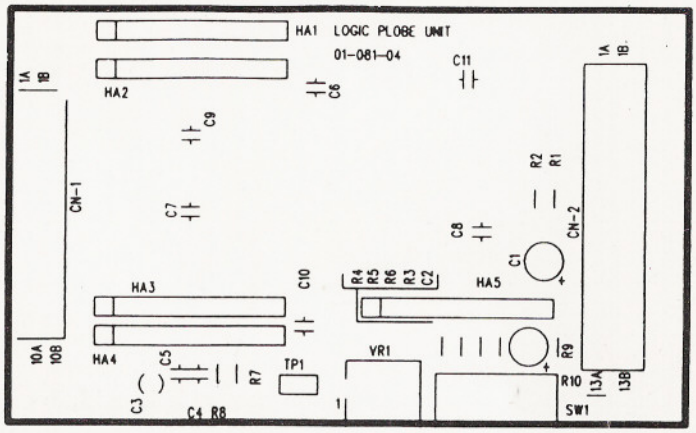
[ACQ Unit]


IC17
74F
IC16
00F
IC18
74F
IC11
1175AM
08F
IC22
IC21
AX1021
AX1021
IC20
IC23
9201F
IC10
1175AM
IC24
164AF
IC26
374F
IC25
374F
IC27

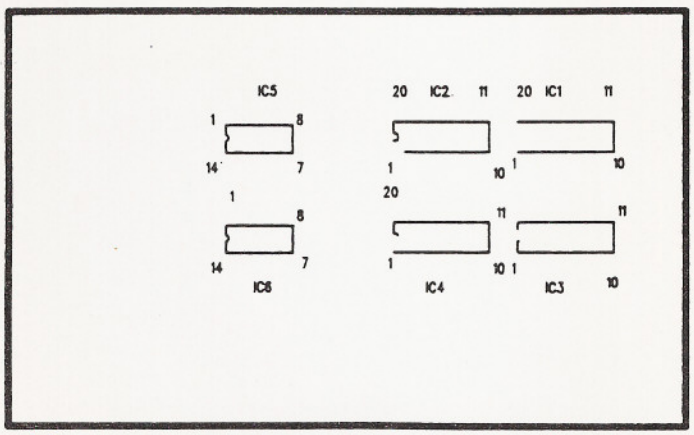
[ACQ Unit]


CPU UNIT
01-069-05A
CN5
BT1
L1
R8
R6
R7
IC15
TL497
C10
C9
D2
R5
R4
L2
R2
R3
C12
ZD1
VR1
C11
IC14
CN3
L3
C8
C7
C36
C15
SW1
D1
C1
C3
C4
C40
R1
IC16
IC17
CN2
C5
C6
CN1
40
39
IC4
43256
C19
IC12
82X42
IC3
C18
HC00
IC7
IC2
HC373
IC5
HC139
C17
C20
C16
IC6
HC138
IC18
HC138
CN6
20
19
ZD2
R14
R17
CAL
C24
C23
C25
R16
R15
10K
RA1
IC1
C26
C27
IC11
HC132AP
AX1010
J3
J2
X2
C28
RIO
C31
IC10
HC151
C29
IC9
HC390
C30
C34
RA2
100K
IC19
R9
C21
C22
R11
J1
IC8
HC02
R12
D8
R10
R13
C32
C33
X1
BZ
D4
D5
D6
D7
CN4

[CPU Unit]



[Logic Probe Unit]



[Logic Probe Unit]

Warning : Sources like small hand-held radio transceivers, fixed station radio and television transmitters, vehicle radio transmitters and cellular phones generate electromagnetic radiation that may induce voltages in the leads of a test probe. In such cases the accuracy of the oscilloscope cannot be guaranteed due to physical reasons.

Concerning the EMI, the radiated emission of several oscilloscope exceeded the limit while using the 8div vertical scale with frequencies bigger than half bandwidth.