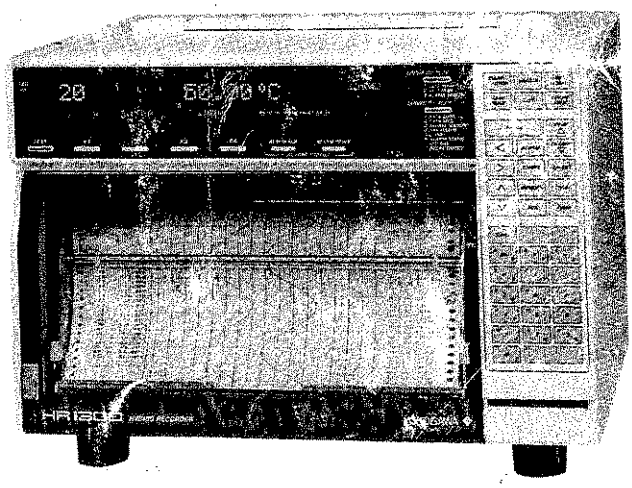
Instruction Manual

HR 1300

Model 3750
Portable
Hybrid Recorder

IM 3750 - 01E



YOKOGAWA
Yokogawa Electric Corporation

IM 3750 - 01E
4th Edition

YOK HR1300 22
YOK HR2300 31

READ ME FIRST

CAUTION

Damage to the recorder may result if power is applied without removing the clamp plate. Make absolutely sure that you have removed the clamp plate from the carriage section before you turn on the power.

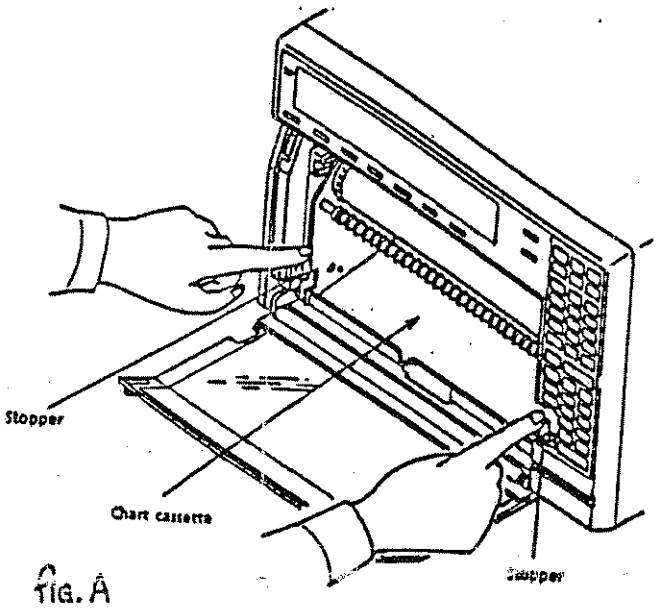


fig. A

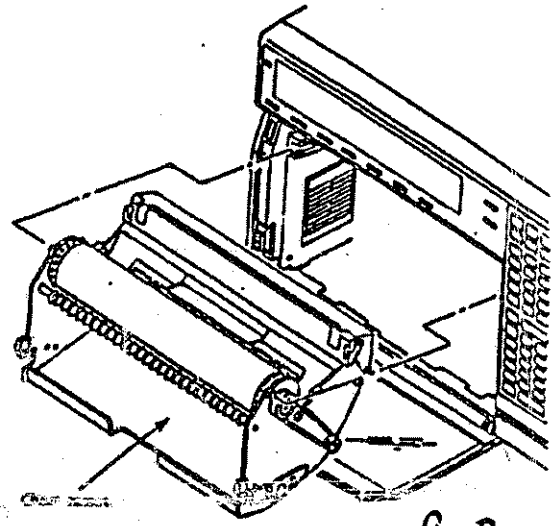


fig. B

(1) Opening the door exposes the "stopper" latches on each side at the bottom of the chart cassette (see Figure A).

(2) When the two stopper latches are pressed down, the chart cassette will swing out toward you.

(3) Lift the chart cassette gently and pull it towards you to separate it from the main unit (see Figure B).

(4) A screw that fastens the clamp plate is at the top left inside the internal assembly (Figure C).

(5) As shown in Figure C , loosening the locking screw by turning it in the direction of the arrow and pushing the clamp plate down and away from the carriage will enable the carriage to move freely.

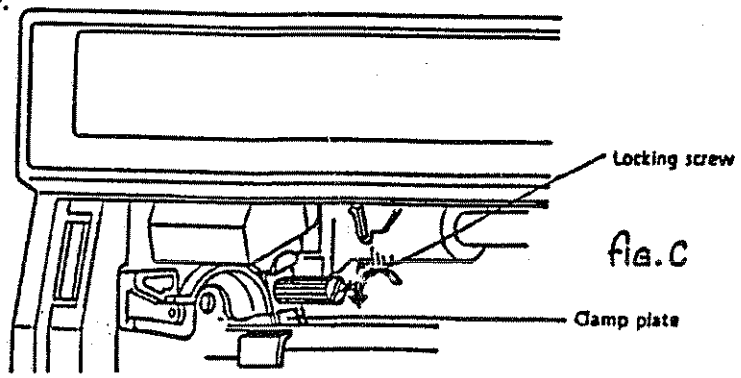


fig. C

BEFORE RETURNING UNIT:

Loosen the locking screw, Raise the clamp plate into position to lock the carriage assembly and tighten the locking screw.

IF THE UNIT IS RETURNED WITHOUT THE CARRIAGE LOCKED INTO PLACE, THE CUSTOMER WILL BE LIABLE FOR DAMAGES TO THE UNIT.

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How to use this Instruction Manual

This Instruction Manual describes the standard functions and operation procedures of Model 3750, HR1300 recorder. For operation methods of other options, see other instruction manuals listed below.

Product name	Model	Instruction Manual No.
GP-IB interface	/GP-IB	IM 3750-50E
RS232C interface	/RS232C	IM 3750-50E
Calculation function	/MATH	IM 3750-60E
User's linearization and Remote RJC	/ULN	IM 3750-70E
DC power souce	/DC	IM 3750-70E
AC input (AC voltage 1 point, AC current 1 point)	/AC2	IM 3750-70E
AC input (AC voltage 3 points, AC current 3 points)	/AC6	IM 3750-70E

FD No. 10030-N

CONTENTS

1. INSTRUMENT INSPECTION

1

Although this instrument has been thoroughly inspected at the factory before shipment, you should check the following points when it is delivered to you.

1.1 Accessories and External Visual Check

The HR1300 is supplied with those accessory items shown in Figure 1.2 and Table 1.1. Please verify that none are missing. You should also check the instrument exterior to ensure that there has been no damage (see Figure 1.1).

If any accessories are missing, or there are any problems such as external damage, please contact your agent.

<HR1300 / 3750>

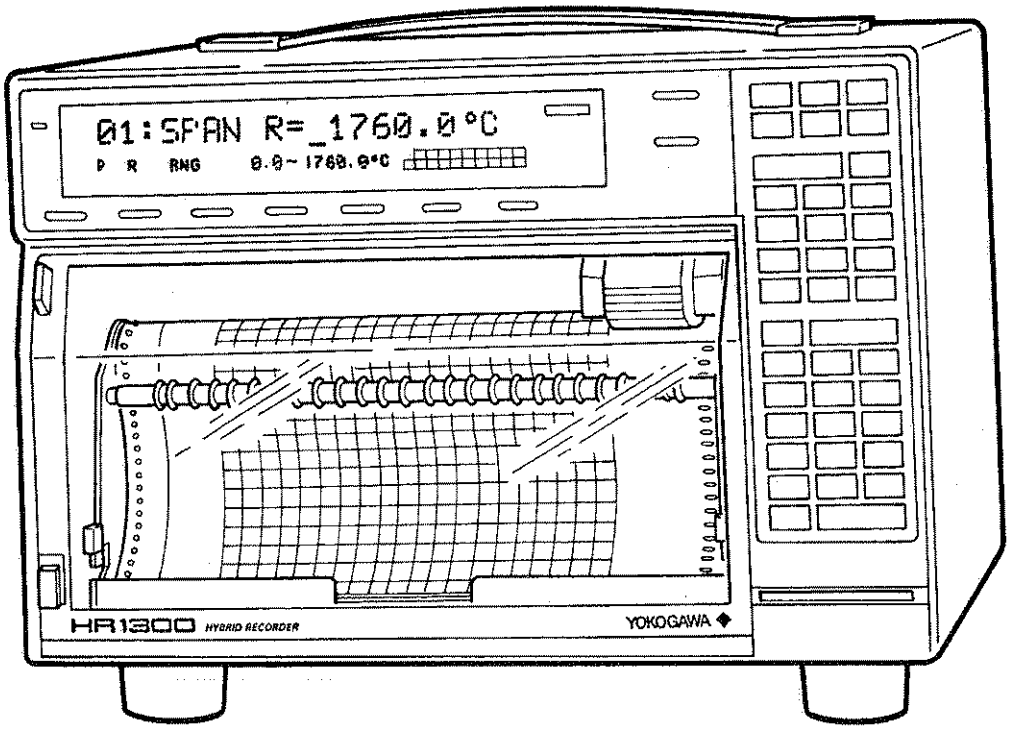


Figure 1.1 External Appearance Drawing

(1) Accessories for the HR1300

1

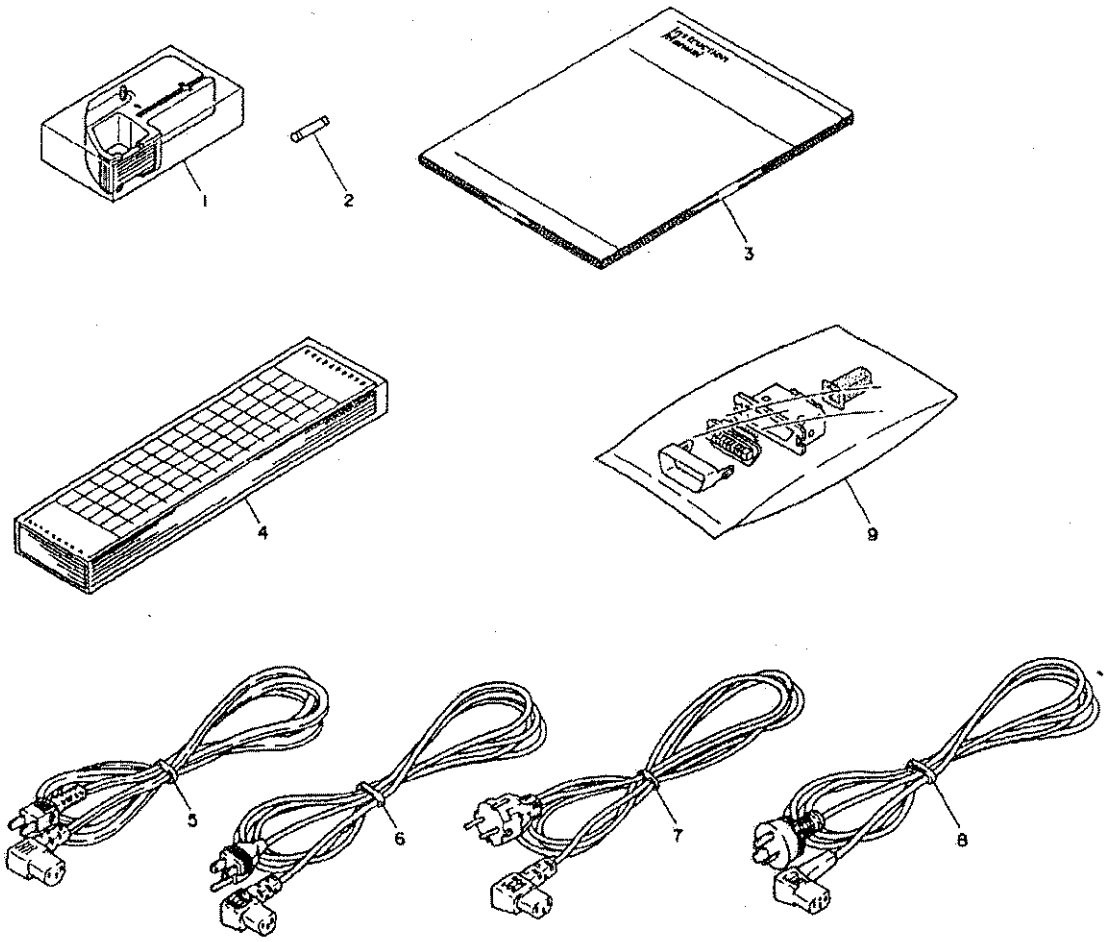


Figure 1.2 HR1300 Accessories

Table 1.1 HR1300 Accessory Table

Number	Name	Part No.	Quantity	Remarks	
1	Ribbon cassette	B9627AZ	1		
2	Fuse	A9197KF	1	1.25 A time-lag type (in fuse holder)	
3	Instruction manual	—	1	IM 3750 - 01E	
4	Chart paper	B9855AY	1		
5	Power cord	A9009WD	1	Rated voltage 125V, standards other than below	Select
6	Power cord	A9008WD	1	UL standard, rated voltage 125V	
7	Power cord	A9011WD	1	VDE standard, rated voltage 250V	
8	Power cord	A9026WD	1	SAA standard, rated voltage 240V	
9	Connector	A9026KC	1	36 - pin connector	

1.2 Model Number and Specification Verification

1.2.1 Model Number Verification

As shown in Figure 1.3, the Model Number and other information about the HR1300 Hybrid Recorder are inscribed on a name plate on the left side of the case.

Verify that the instrument received conforms exactly to the order specifications.

Please indicate the model number and serial number in any communications with us.

Opening the door and removing the chart cassette will enable you to check the name plate. See Section 1.3, "Preparations Prior to Use", for the chart cassette removal procedure.

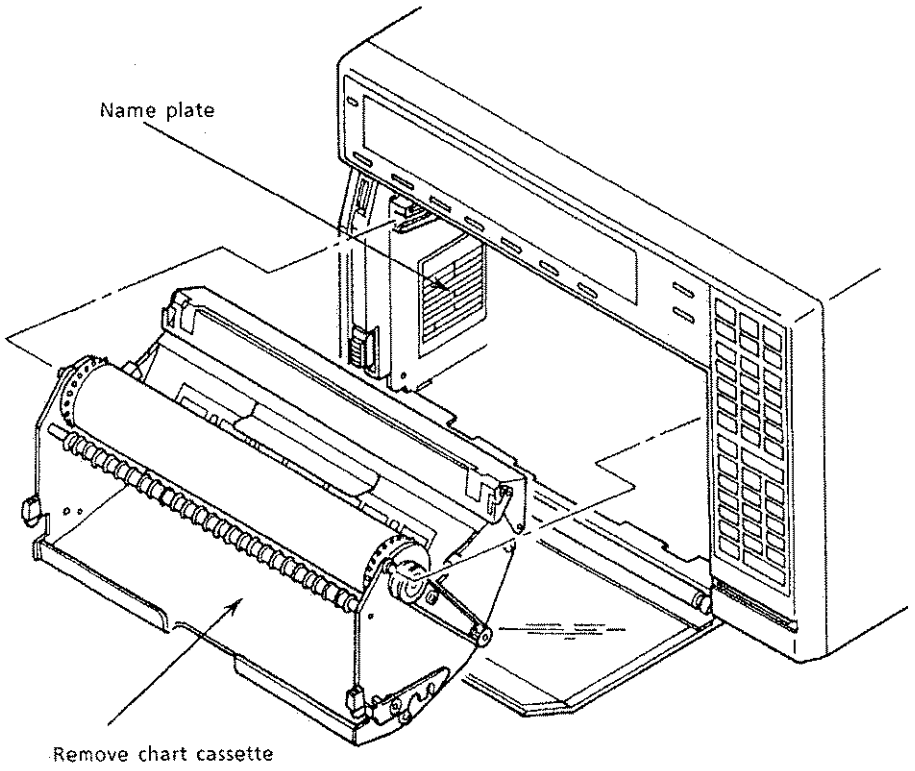


Figure 1.3 Model Number Verification

Model and Suffix Codes

Mode	Suffix Codes		Optional Code	Description
HR1300	3750	12	.....	10 points/2 sec (high-breakdown-voltage solid-state relay)
		22	.....	20 points/2 sec (high-breakdown-voltage solid-state relay)
Power requirements			-0	90 to 250V AC
Frequency			1	50 Hz
			2	60 Hz
Optional features			/ □	Should be specified at the time of order

Optional Features

Option Code	Description	
/ GP-IB	GP-IB interface	Not mixed
/ RS232C	RS-232C interface	
/ MATH	Mathematical functions	
/ REM	Remote control	
/ AK-02	Alarms (internal, 2 points)	
/ SIT	Screw input terminal block	
/ DF	°F display	
/ DC	DC power source	
/ AC2	AC input (2 points)	Not mixed
/ AC6	AC input (6 points)	
/ ULN	User's linearization	

Optional Accessories

Code	Name	
3789 03	IC Memory card, 64K bytes	
3789 04	IC Memory card, 256K bytes	
3789 05	IC Memory card, 512K bytes	
3798 11	Rack mounting kit for HR1300 (JIS)	
3798 13	Rack mounting kit for HR1300 (ANSI)	
3798 01	Clamped input terminal block (10 points)	
3798 02	Screw input terminal block (10 points)	
4389 20	Shunt resistor (For clamped input terminal block)	250Ω ±0.1%
4389 21		100Ω ±0.1%
4389 22		10Ω ±0.1%
4159 20	Shunt resistor (For screw input terminal block)	250Ω ±0.1%
4159 21		100Ω ±0.1%
4159 22		10Ω ±0.1%

Spares

Part No.	Name	Unit for Sales
B9627AZ	ten-color ink ribbon	1
B9855AY	Z-fold chart (20m), 10mm div. on time axis	6

1.3 Preparations Prior to Use

Remove the soft cover from the recorder, take the recorder out of its packing, and remove the clamp plate which holds the carriage section during shipment to prevent damage.

CAUTION

Damage to the recorder may result if power is applied without removing the clamp plate. Make absolutely sure that you have removed the clamp plate from the carriage section before you turn on the power.

(1) Opening the door exposes the "stopper" latches on each side at the bottom of the chart cassette (see Figure 1.4).
(2) When the two stopper latches are pressed down, the chart cassette will swing out toward you.

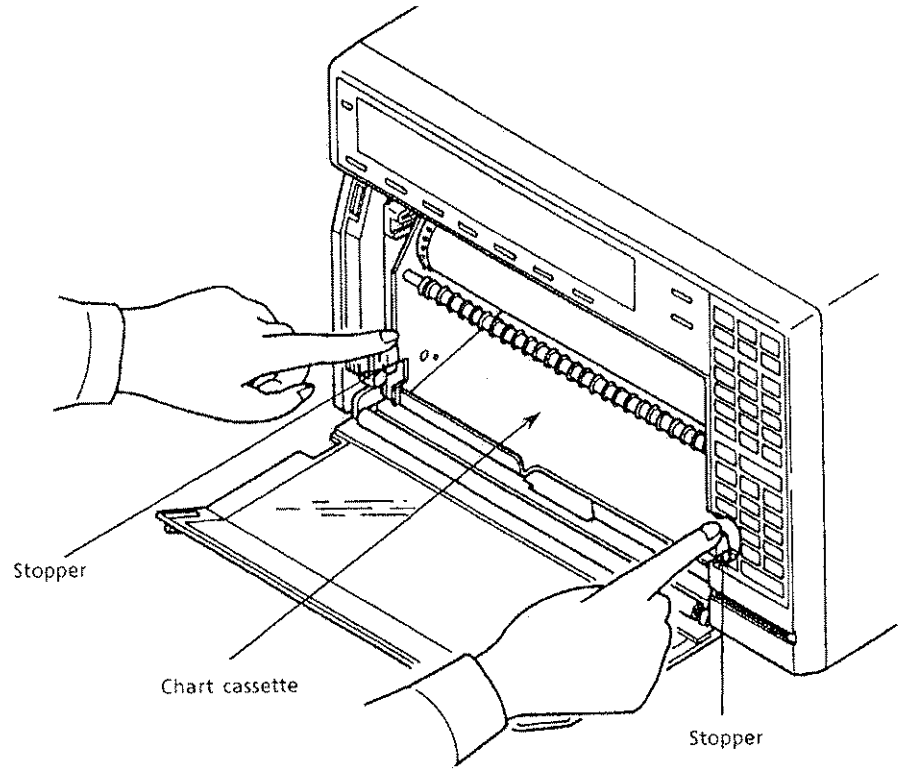


Figure 1.4

(3) Lift the chart cassette gently and pull it towards you to separate it from the main unit (see Figure 1.6).

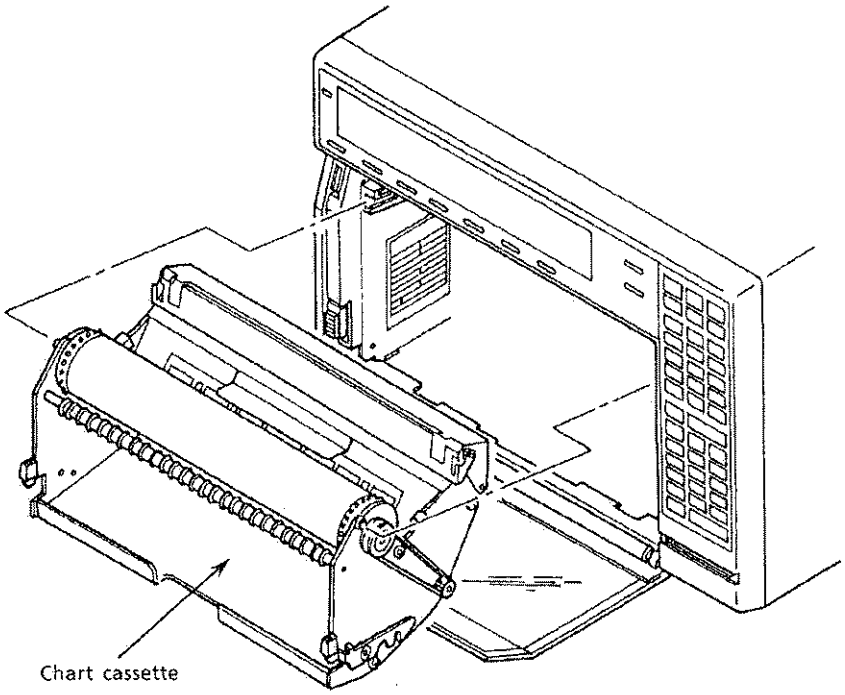


Figure 1.5

(4) A screw that fastens the clamp plate is at the top left inside the internal assembly (Figure 1.6).

(5) As shown in Figure 1.6, loosening the locking screw by turning it in the direction of the arrow and pushing the clamp plate down and away from the carriage will enable the carriage to move freely.

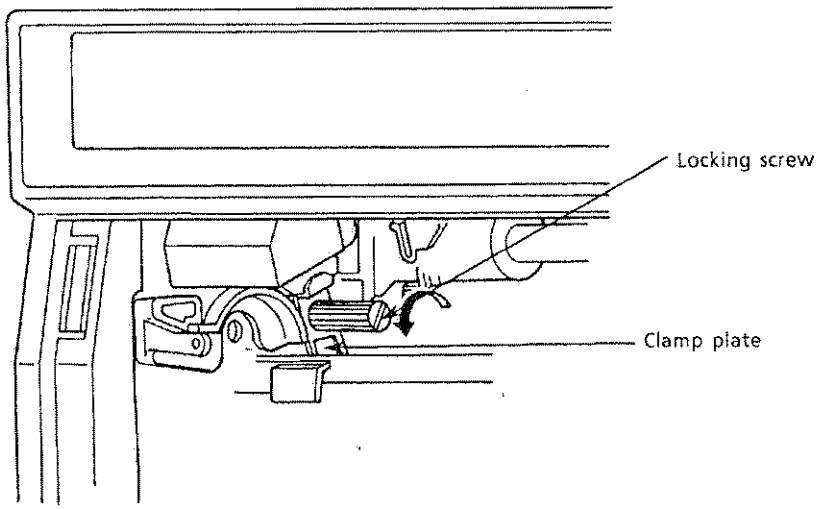


Figure 1.6

(6) Keeping the clamp plate in the lowered position, retighten the locking screw to secure the clamp plate.

1.4 Self-Test

Before final installation in a rack, it is necessary to check whether there has been any damage to major components of the recorder due to shipping. A self-test program is provided in the recorder to test the major components for this purpose. Turning on the power initiates these tests automatically.

Determine from the results of these tests whether there has been any damage to major components.

<Self-Test Procedure>

(1) First verify that the recorder power switch is turned OFF, then connect the power cord to the rear panel power connector as shown in Figure 1.7, and connect the power cord plug to a power outlet.

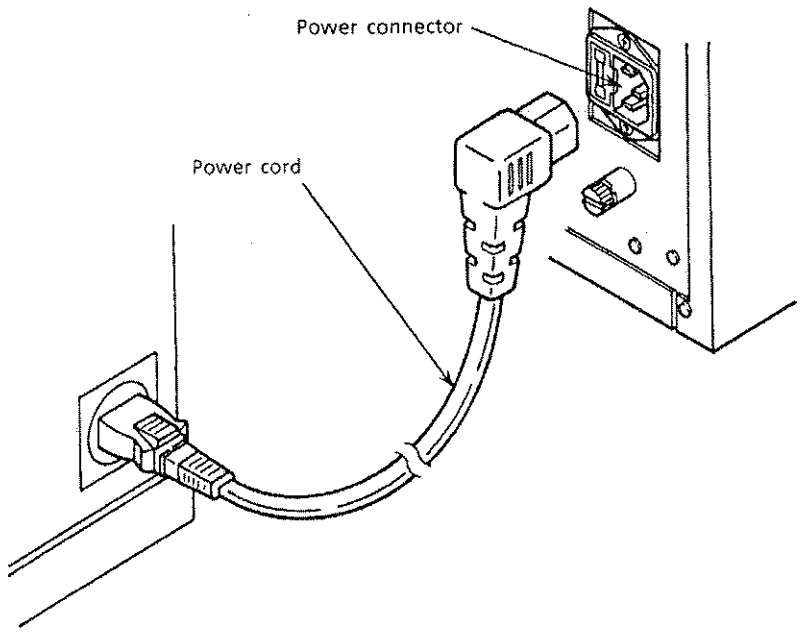


Figure 1.7

(2) Turn on the power switch (see Figure 1.8).

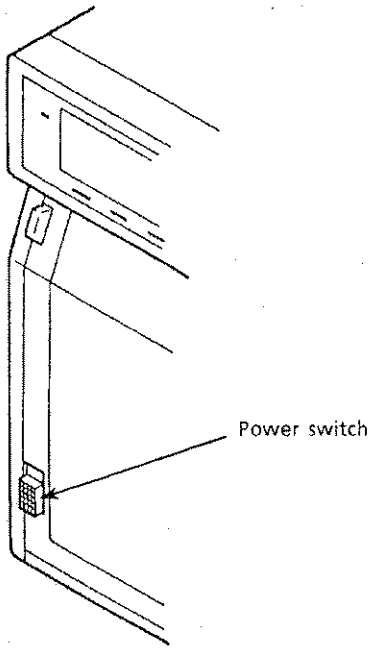
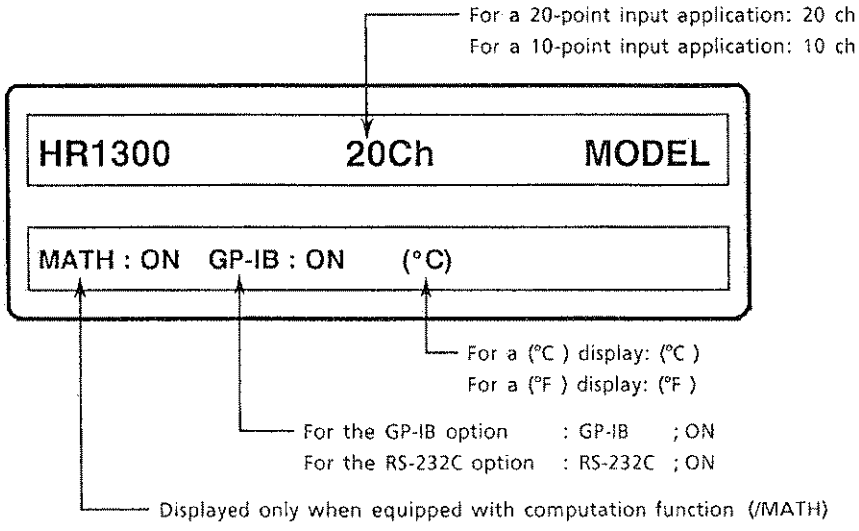


Figure 1.8

(3) A display will appear as shown here to indicate that self-test is in progress. Although a FAIL indication will appear at first, it does not indicate a malfunction.



(4) Self-Test Results

1) If Normal–

The print carriage will move to the home position on the left side (as seen from the front). If the carriage is already in the home position when power is turned ON, it will first move a few mm to the right and then return to the home position. While this is occurring, the display will indicate a DATA AUTO status.

2) If Not Normal–

If the test finds a problem, it will stop and display one of the following error messages:

- ROM error ..... "ROM ERROR"
- RAM error ..... "RAM ERROR"
- A/D calibration value error .... "A/D ILLEGAL ADJUST" or "A/D SUM ERROR"
- Printer card error ..... "PRINTER FAIL"
- General-purpose communications card error
  ..... "COMM CARD ERROR"
- General-purpose communications disconnected
  ..... "COMM CARD REMOVED"

CAUTION

If an error message is displayed, the recorder will not operate properly. Immediately turn off the power and contact your agent or our nearest service facility.

When contacting your agent or our service department, please give the model number, serial number, and the error message displayed, as this will help reduce the time required for the service person to repair the unit.

(5) Cautions about Noise

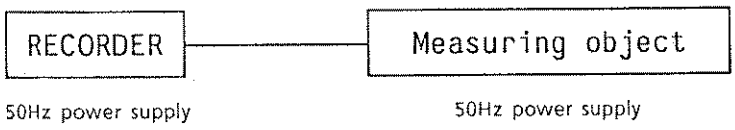
Hybrid recorder has 3 modes.

- 50Hz (20m sec integeration)
- 60Hz (16.7m sec integration)
- 100m sec integration

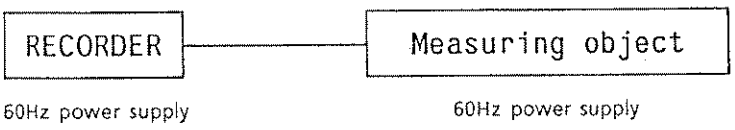
Set by Dip switches. See page P3-3.

Exampples of each is shown below.

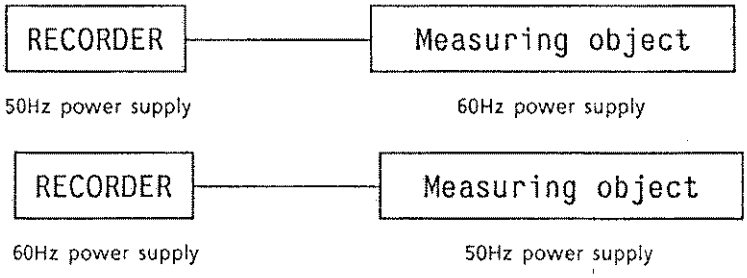
① The case of 50Hz (20m sec integration)



② The case of 60Hz (16.7m sec integration)



③ The case of 100m sec integration



For applications of mixed frequency (i.e. 50Hz and 60Hz), measurement can be done using 100msec integration time.
100msec integration mode has the following restrictions concerning scan interval.

The Fastest SCAN Interval

50Hz or 60Hz	100m sec integration
2 sec	6 sec

④ Grounding the recorder and measuring objct can greatly decrease common mode noise.

2. GENERAL

2.1 Product Outline

The HR1300 is a state-of-the-art advanced-function microprocessor-based hybrid recorder developed to bring together new features requested by our users, while retaining those qualities of earlier Yokogawa models which have proven YOKOGAWA to be the pioneer in hybrid recorders. This instrument has a large number of functions which merits its appellation as a third-generation hybrid recorder.

- **High-speed Scanning** : 20 points/2 seconds (high-breakdown-voltage solid-state relays)
- **High-speed Recording** : 50 points/2 seconds
  Gives an analog recording of 30 computed data points in addition to 20 measurement data points
- **10-color Recording** : Programmable 10-color recording
- **Simple Interactive Operation System with Large Multi-Element Display**
- **IC Memory Card** : Permits saving and recalling of measured data, computed data, and parameter settings.
- **Variety of Computational Functions (Optional) Including Arithmetic and Statistical Computations**
- **Variety of Alarms (including /AK-02)**
- **Computer-friendly (with GP-IB, RS-232C options)**
- **AC input (option)**
- **DC power (option)**

These capabilities make it the last word in hybrid recorders.

We hope that you will find this recorder useful as a multi-purpose instrument for efficiently performing data acquisition, recording, monitoring and control in process industries, research and development, or test and inspection departments.

2.2 Features

- **High-speed Scanning** : 20 points/2 seconds
- **High-speed Recording** : 50 points/2 seconds

2

Through improvements to the raster scan system and the wire dot printer proven on earlier models, the recorder can scan up to 20 data points in two seconds and, including computed data, can record up to 50 points in two seconds. This substantially improves the simultaneity of the data and enables more dependable data analysis.

- **10-color Recording**
  Addition of four new colors—orange, yellow-green, dark blue, magenta—to the existing purple, red, green, blue, brown and black makes for even easier-to-read analog recordings.

- **Small Size and Lightweight**

- **Easy Operation with Interactive Format**
  Setting is simplified through an interactive format, and the ribbon and chart can be replaced in a quick "3-touch" procedure.
  Input terminal blocks can be removed when connecting wiring, enabling connections to be made securely in an accessible position.

- **IC Memory Cards**
  IC memory cards with up to a 512K-byte capacity can be used, enabling storage and retrieval of measurement data, computed data, and parameter settings. Events such as alarms, chart end, and external contacts can be used to trigger acquisition of data in IC memory, so there is no loss of data.

- **Abundant Computing Functions (optional)**
  The following computing functions are provided for a significantly enhanced efficiency in data analysis; four-function arithmetic, square root, absolute value, common logarithm, exponential, maximum and minimum value, average, total, maximum minus minimum, standard deviation, and deviation.

- **Rich Variety of Input**
  DC voltage, thermocouple, resistance temperature detector, or contact input can be freely selected for each individual input. DC current is also available with a shunt resistor.

- **Many Recording Variations**
  Analog record, analog/digital record, and logging record are available as recording formats, so that the format can be matched to the application objectives. Moreover, you can record with a wealth of variations by using functions such as zone recording, partial compression, titles, scaling, and tag number printing.

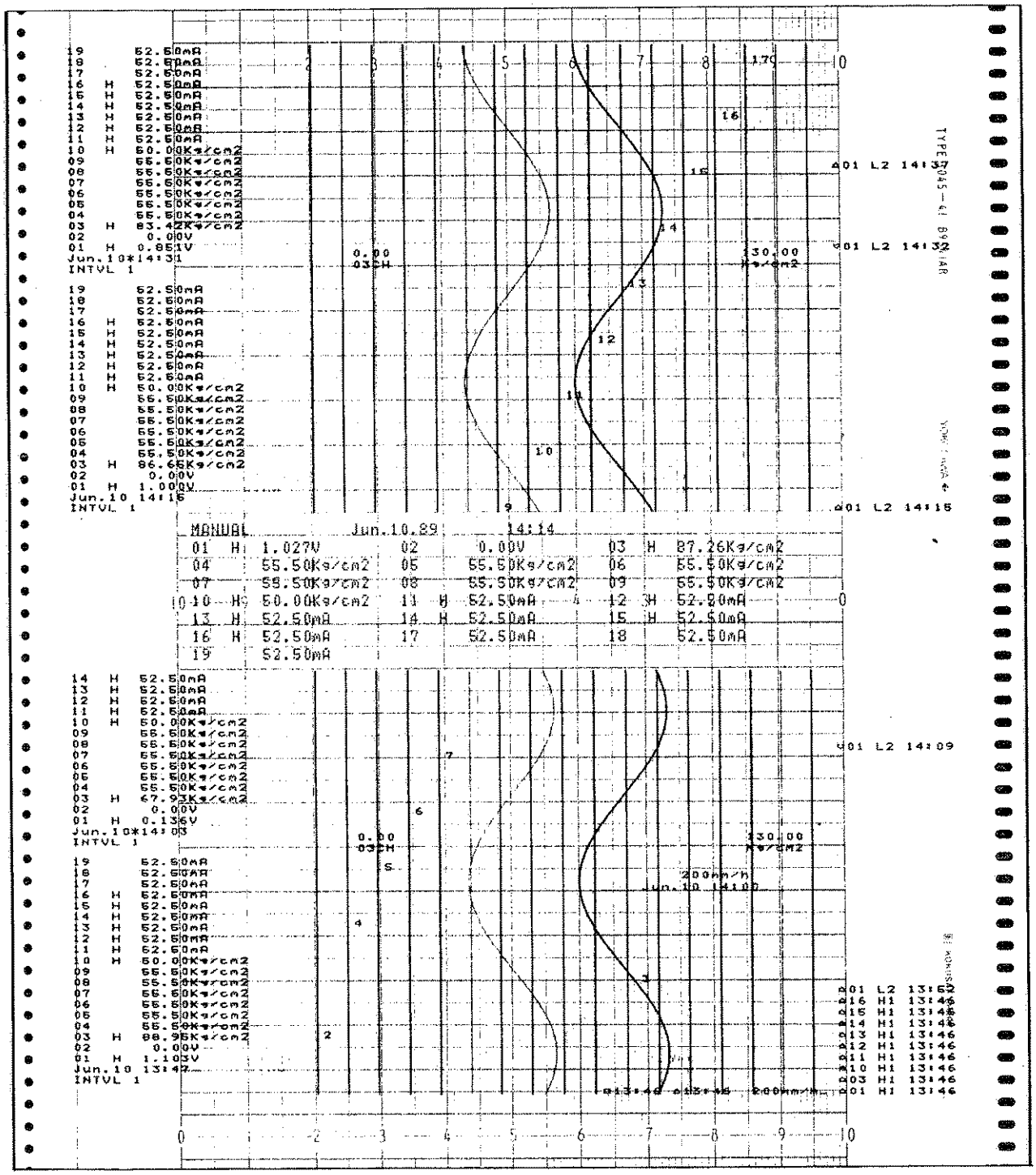
- **Full Complement of Alarm Functions**
  The recorder provides an abundance of alarm functions such as upper and lower limit alarms, the difference (ΔT) between upper and lower limit alarms, and rate-of-change alarms, and allows you to freely combine them to set up to six levels per channel. These display their power across a broad range of applications such as process and production line control.

- **Large, Easy-to-read Multi-Element Display**

- **Free Scaling Function and Difference (ΔT) Computation Function**

- **Options and Accessories**
  Options include remote control, an internal alarm output unit (2 points), GP-IB interface, RS-232C interface, IC memory card, DC power source, AC input and user's linearization.

2.3 Recording Examples



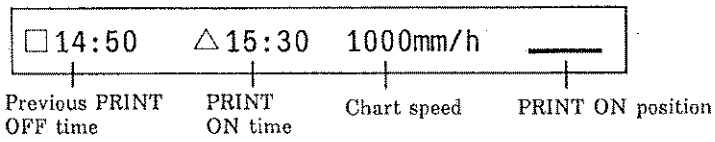
Overflow Mark (*) ..... Printed out when printout data is missing.

- Alarm printout ..... Δ01 H1 * 12 : 00 This indicates that succeeding alarm data are missing.
- Measured data printout ... For example, Jun. * 13 : 00 is printed when all blocks are missing.

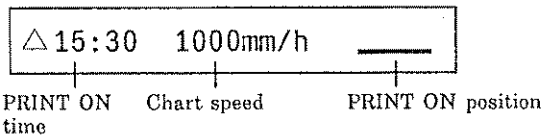
(PRINT ON)

When START/STOP is pressed, the words PRINT ON will be printed in the upper-right hand corner of the chart.

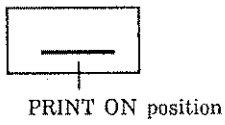
1. **Normal PRINT ON**



2. **"PRINT ON" will print out immediately after turning ON the power.**



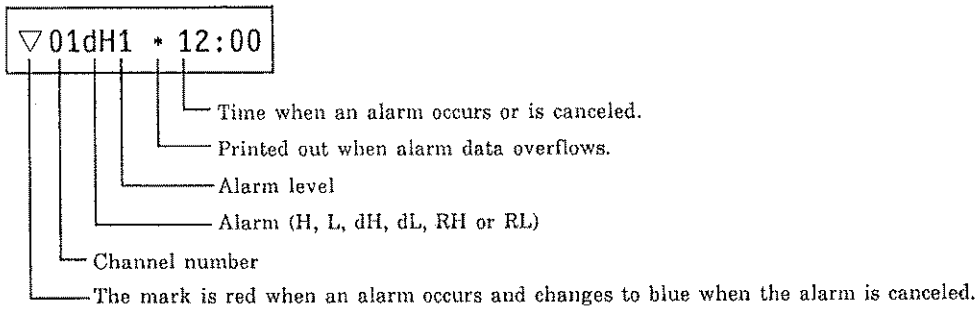
3. **"PRINT ON" will print out when chart speed (mm / h) × trend recording interval (sec.) is more than 3000:**



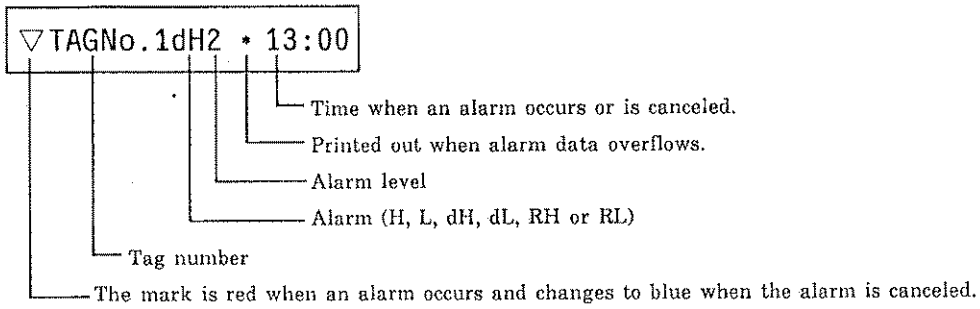
(Alarm printout)

When an alarm occurs or is canceled, the alarm contents are printed out in the upper-right hand corner of the chart.

1. **Alarm printout in CH print mode:**



2. **Alarm printout in TAG print mode:**



※ To change TAG mode to CH mode or vice versa, set SET UP mode first.

3. **When chart speed (mm/h) × trend recording interval (sec.) is more than 3000:**
   alarm printout is not executed.

Note: * Alarm data overflow

* If "*" (alarm data overflow) is printed, some alarm messages are missing (not printed). Alarm occurrence and canceling (up to 50 data) can be stored in memory and printed in sequence; however, if alarms occur and are canceled many times, alarm printout (output from memory) speed is slower than alarm occurrence and canceling (input to memory), and so memory overflows. Therefore, some overflow alarm data will be neither stored nor printed.

(Time printout)

1. **Single mode**

Time intervals are selected according to the chart speed and printed.

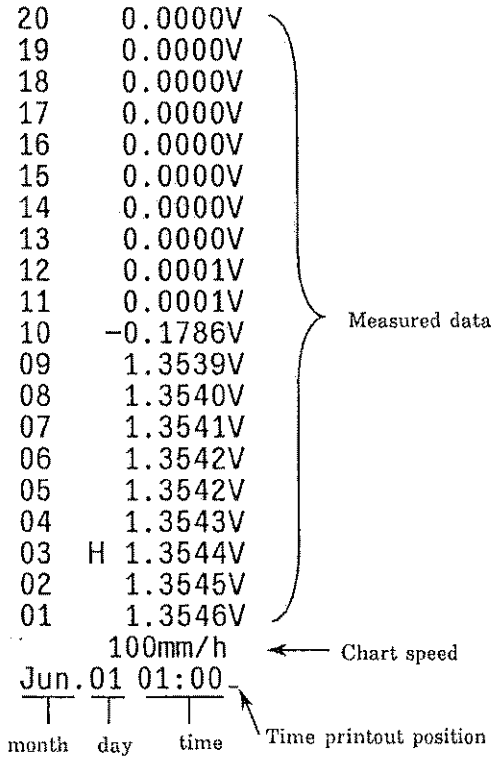


Chart Speed	Measured Data Recording Intervals	
	1-row	2-row
10 to 24mm/h	12 hours	6 hours
25 to 49 mm/h	4 hours	2 hours
50 to 99 mm/h	2 hours	1 hour
100 to 500 mm/h	1 hour	30 minutes

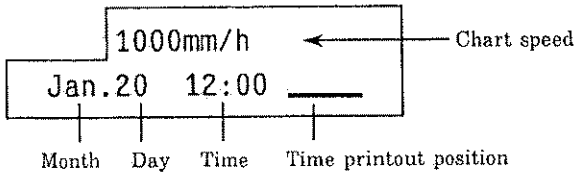
For chart speeds other than the above, the measured data recording intervals are not printed. If chart speed (mm/H) × trend recording interval (sec.) is more than 3000, the measured data recording intervals are not printed either.

2. MULTIPLE mode

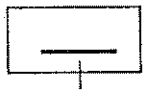
The time is printed in the upper-right hand corner of the chart depending on the chart speed.

Chart Speed (mm/h)	Time-printout Intervals
100 to 1500	Every hour
50 to 99	Every two hours
25 to 49	Every four hours
10 to 24	Every twelve hours
up to 9	No printout

2.1 Time printout when chart speed (mm/h) × trend recording interval (sec.) is less than or equal to 3000:



2.2 Time printout when chart speed (mm/h) × trend recording interval (sec.) is more than 3000:



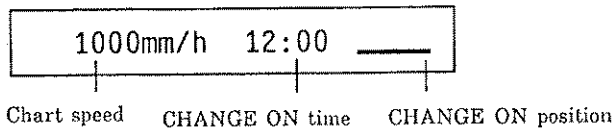
(CHANGE ON printout)

If the chart speed is changed, a new chart speed is displayed in the upper-right hand corner of the chart.

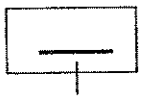
It is not possible to record the comment.

IF PRINT ON MODE is set, CHANGE ON printout is not performed.

1. **When chart speed (mm/h) × trend recording interval (sec.) is less than or equal to 3000, CHANGE ON is printed.**



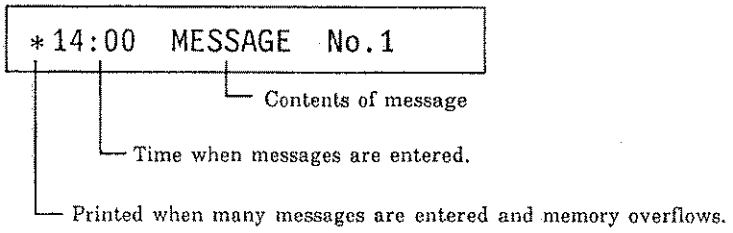
2. **CHANGE ON printout when chart speed (mm/h) × trend recording interval (sec.) is more than 3000:**



(Message printout)

Entered messages are printed. The message printout position changes with TAG / CH and the line numbers in the logging mode.

1. **Message printout when chart speed (mm / h) × trend recording interval (sec.) is less than or equal to 3000:**



2. **Message printout when chart speed (mm / h) × trend recording interval (sec.) is more than or equal to 3000:**
   No messages are printed.

Note : Message overflow
Up to 12 message data can be stored in memory. If message printout requests continue, message printout speed (output from memory) will be slower than message printout requests (input to memory), thereby overflowing the memory. So, overflow printout data are neither stored nor printed.

3. COMPONENT NAMES AND FUNCTIONS

3.1 Component Names and Functions

3

HR1300

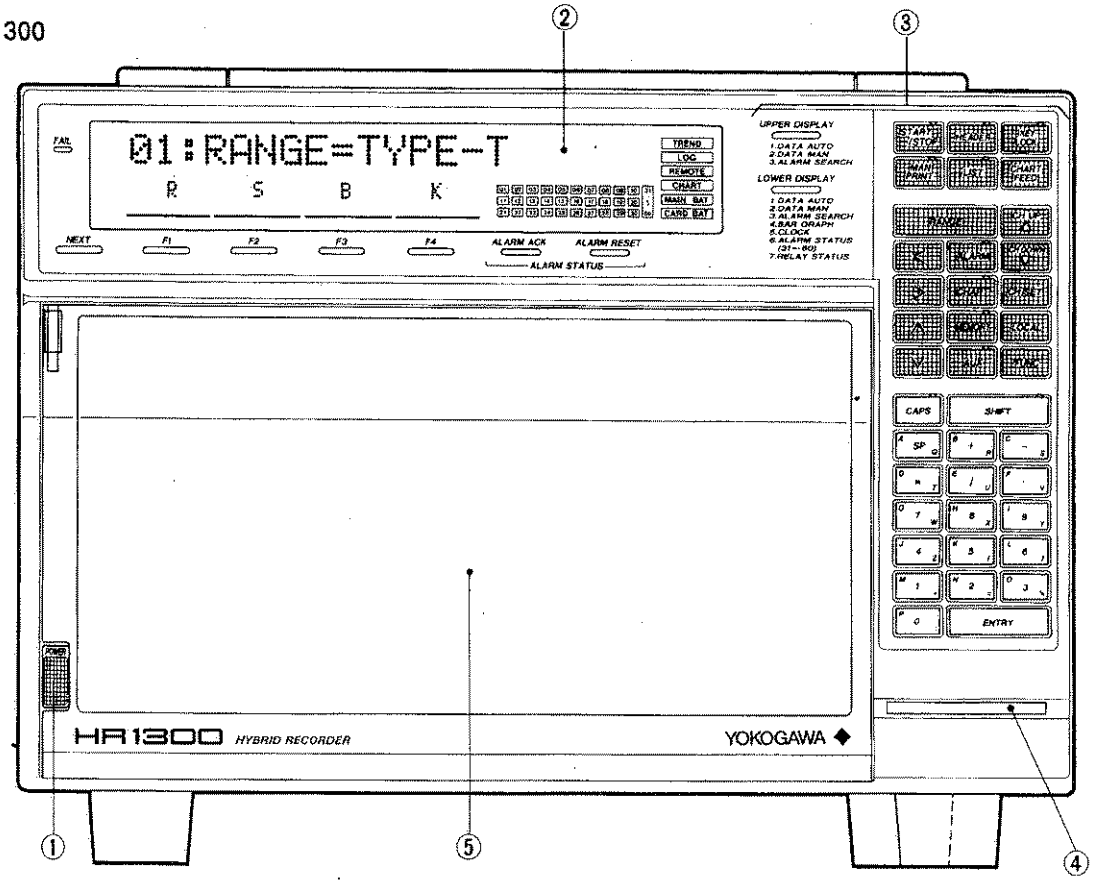


Figure 3.1 HR1300 Component Names

① **Power Switch**
Turns on and off power supplied to the recorder.

② **Display Panel**

③ **Setting Panel**
See Section 6.4 for operating instructions.

④ **IC Memory Card Drive**
IC memory cards are inserted into this drive port for use.

⑤ **Chart and Chart Cassette**
The recorder uses a Z-fold chart, 20 m (66 feet) in length, with an effective analog trend recording width of 150 mm (10 inches nominally). The chart is stored inside a chart cassette.

3.2 Recorder Main Unit DIP Switches

The DIP switches are located on the rear of the recorder (see Figure 3.2). The DIP switch functions are as follows:

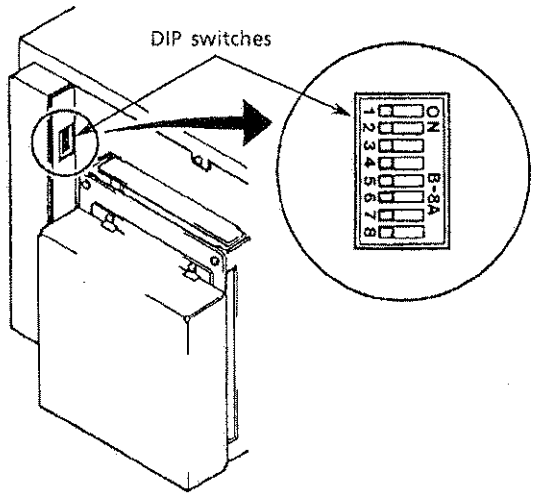


Figure 3.2 DIP Switch Setting

			(Upon shipment)
No. 1	:	ON to enable SET UP parameter changes.	OFF
No. 2	:	ON to select 100 msec integration (for both 50 and 60Hz operation). When ON, minimum measurement interval becomes 6 seconds. Set to OFF if noise is a problem. Please see P1-11.	OFF
No. 3	:	50/60Hz selection When ON : 20 msec integration (50Hz) When OFF: 16.7 msec integration (60Hz)	As specified
No. 4	:	ON to enable writing to IC memory card. OFF to disable writing to IC memory card. (Reading is always enabled.)	ON
No. 5	:	Always OFF	OFF
No. 6	:		OFF
No. 7	:		OFF
No. 8	:	ON to enable A/D calibration, etc. This switch OFF is for use at time of shipment and during adjustment by service personnel. Use by the customer will cause incorrect operation. Please leave these switches OFF at all times.	OFF

Make changes in the DIP switch with the power OFF.

4. INSTALLATION

4.1 Installation Site

The recorder installation site should be chosen so as to meet the following conditions as much as possible :

(1) Minimal mechanical vibration.

(2) Minimal presence of corrosive gases.

(3) Near room temperature (23°C) with minimal temperature fluctuations.

(4) Not directly exposed to high heat radiation.

(5) Minimal electromagnetic field influence.

(6) Humidity neither too high nor too low ;
keeping it constant at 55% is ideal.

4.2 Mounting (Rack Mount)

(1) HR1300 Rack Mounting

1) The optional rack adapter (3798 11 or 3798 13) should be used for rack mounting. When mounting the recorder on a rack, attach blind patches on top and bottom of the recorder.
2) Before mounting the recorder in a rack, protect the internal assembly by returning the clamp plate removed in Section 1.3 back to its original position, thus locking the carriage in place.
3) Figure 4.1 shows the external dimensions and rack mounting dimensions for the HR1300.

Dimensions

Unit : mm
(inch)

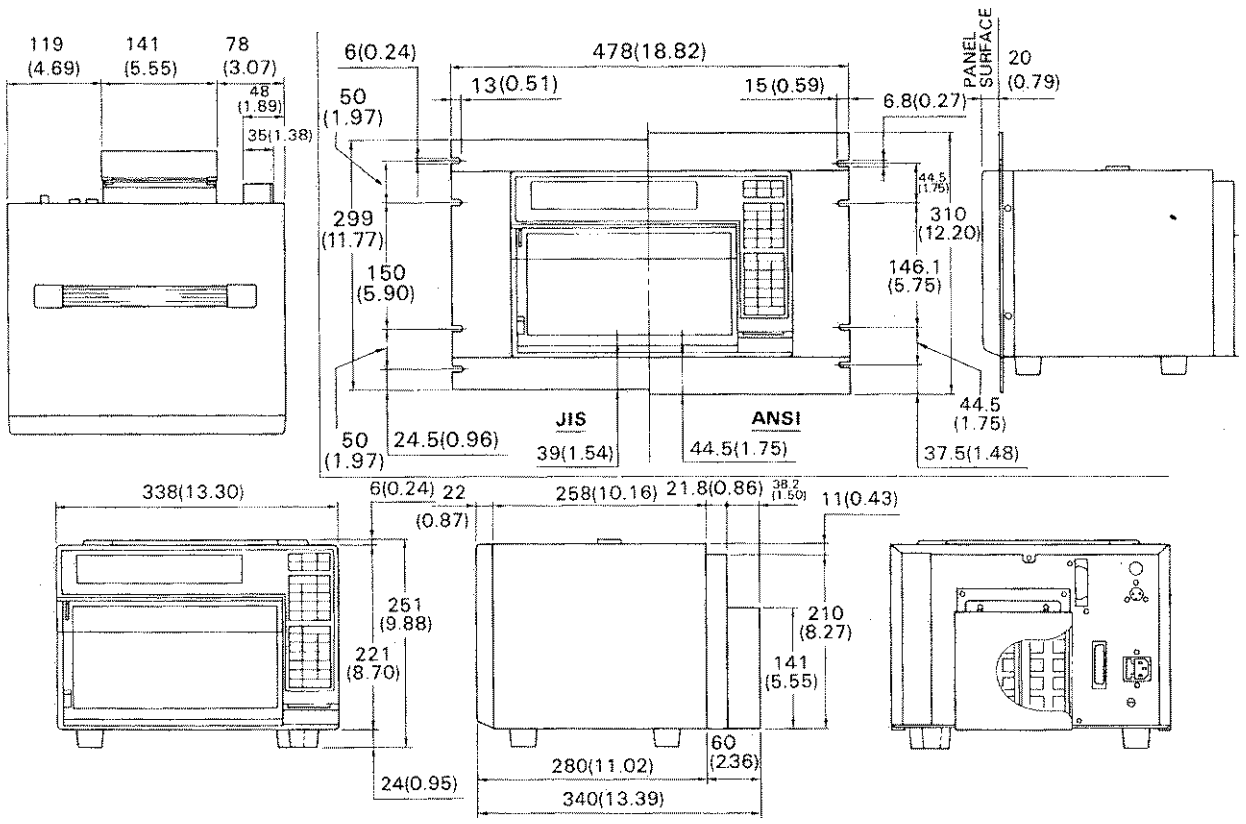


Figure 4.1 HR1300 External Dimensions and Rack Mounting

4) When you have finished the rack mounting, take off the clamp plate from the carriage as described in Section 1.3 (P1 - 6).

5. CONNECTIONS

5.1 Wiring

5.1.1 Power Wiring

For AC Power

Turn off the recorder power switch and connect the power cord supplied with the recorder to the recorder power connector on the rear panel as shown in Figure 5.3. For safety, connect the ground terminal to a ground of Class 3 or better.

5.1.2 Input Wiring

(1) For the best thermocouple input wiring, it is recommended that the thermocouple element conductors be directly connected to the recorder input terminal..
However, for wiring over a considerable distance between the recorder and measuring point, a thermocouple extender wire is generally used.

(2) Connections to the recorder input terminals should be made as follows:

1) For a clamped input terminal model:
strip about 6mm (1/4inch) of insulation from the end of the wire, insert it into the input terminal, and tighten the screw (Figure 5.1).

2) For a screw input terminal model:
available by specifying the /SIT option : use insulated sleeve crimp-on terminals (for 4mm screws) such as those shown in Figure 5.2.1 for leadwire terminations (Figure 5.2.2).

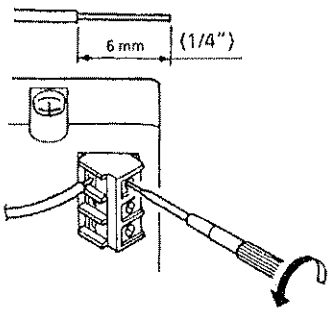


Figure 5.1 Clamped Input Terminal Type)

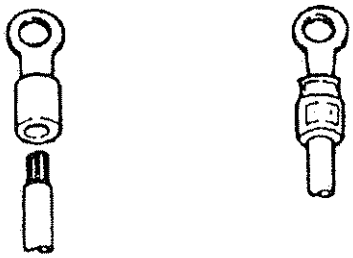


Figure 5.2.1

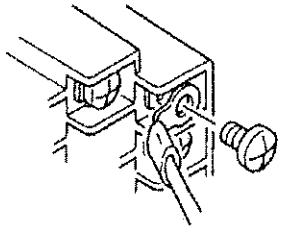


Figure 5.2.2 Screw Input terminal Type)

(3) Adhere to the following requisites so as to prevent noise produced in the measurement circuit:
   1) Keep wiring to the recorder input terminals separate from the power and ground circuits.
   2) Use of a shielded cable for wiring to the recorder input terminals is effective against noise due to electrostatic induction. Connect the shield to the recorder ground terminal.
   3) To reduce noise due to electromagnetic induction, it is comparatively effective to use wires twisted at a constant pitch for wiring to the recorder input terminals.

CAUTION

1. The maximum permissible input voltage at the input terminals is 60V DC peak, with a maximum permissible common-mode voltage of 250V AC. Take care not to apply excessive voltages. Also, exercise caution so that over-voltages are not applied due to static electricity or other causes when wiring is being connected.
2. After connecting the wiring, be sure to replace the terminal cover, both for safety and to obtain the rated measurement accuracy. Be particularly careful in the case of thermocouple input, as operation without the cover may cause measurement errors or fluctuations.

5.2 Terminal Arrangement

Recorder Rear Panel

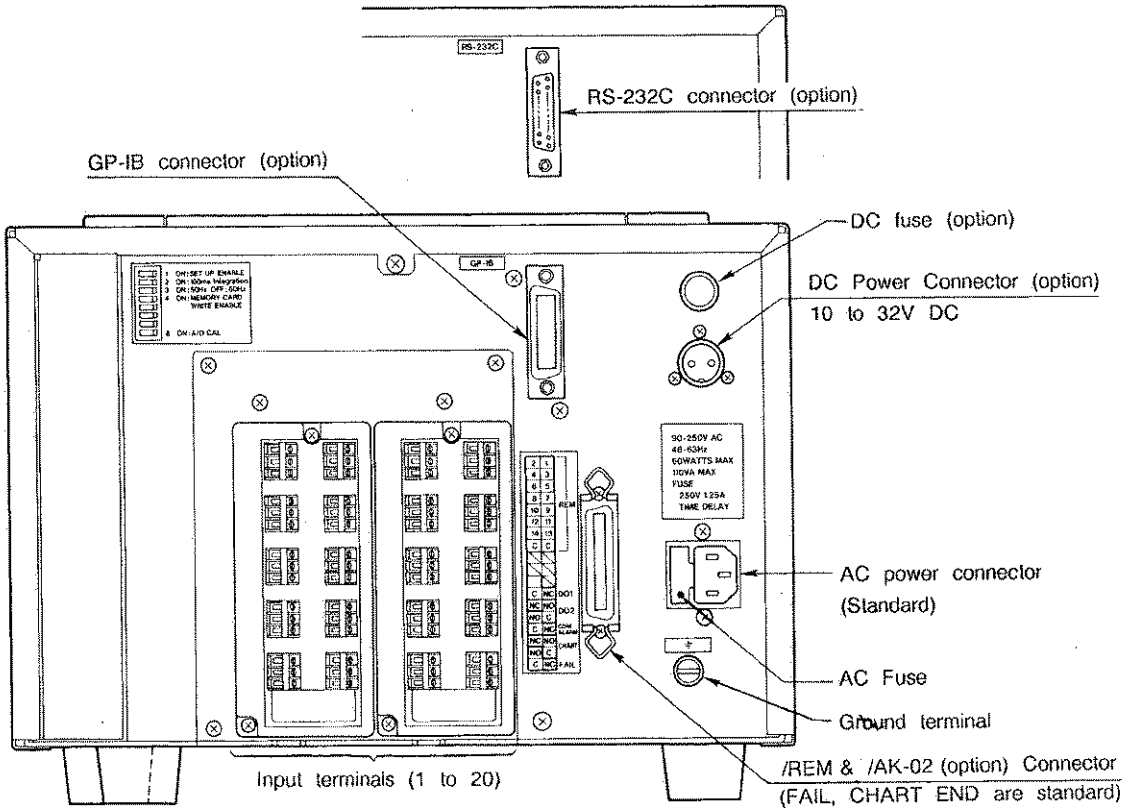


Figure 5.3 Terminal Arrangement (Clamped Input Terminal Model)

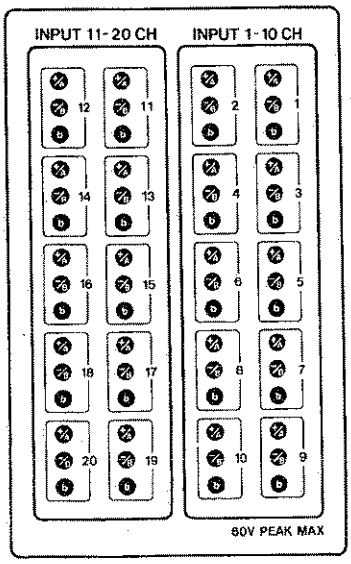


Figure 5.4 Clamped Input Terminal Arrangement

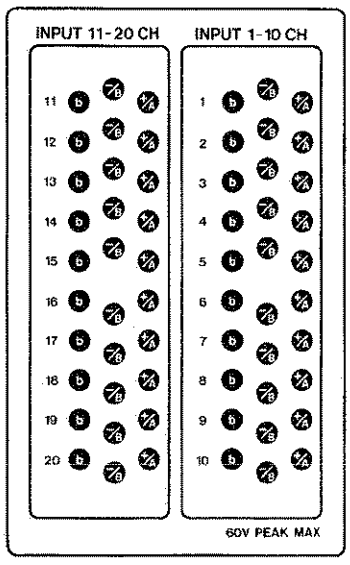


Figure 5.5 Screw Input Terminal Arrangement

5.3 Wiring to Input Terminals

Connect the leadwires to the recorder input terminals as shown in Figures 5.6 and 5.7.

Clamped Input Terminal Model

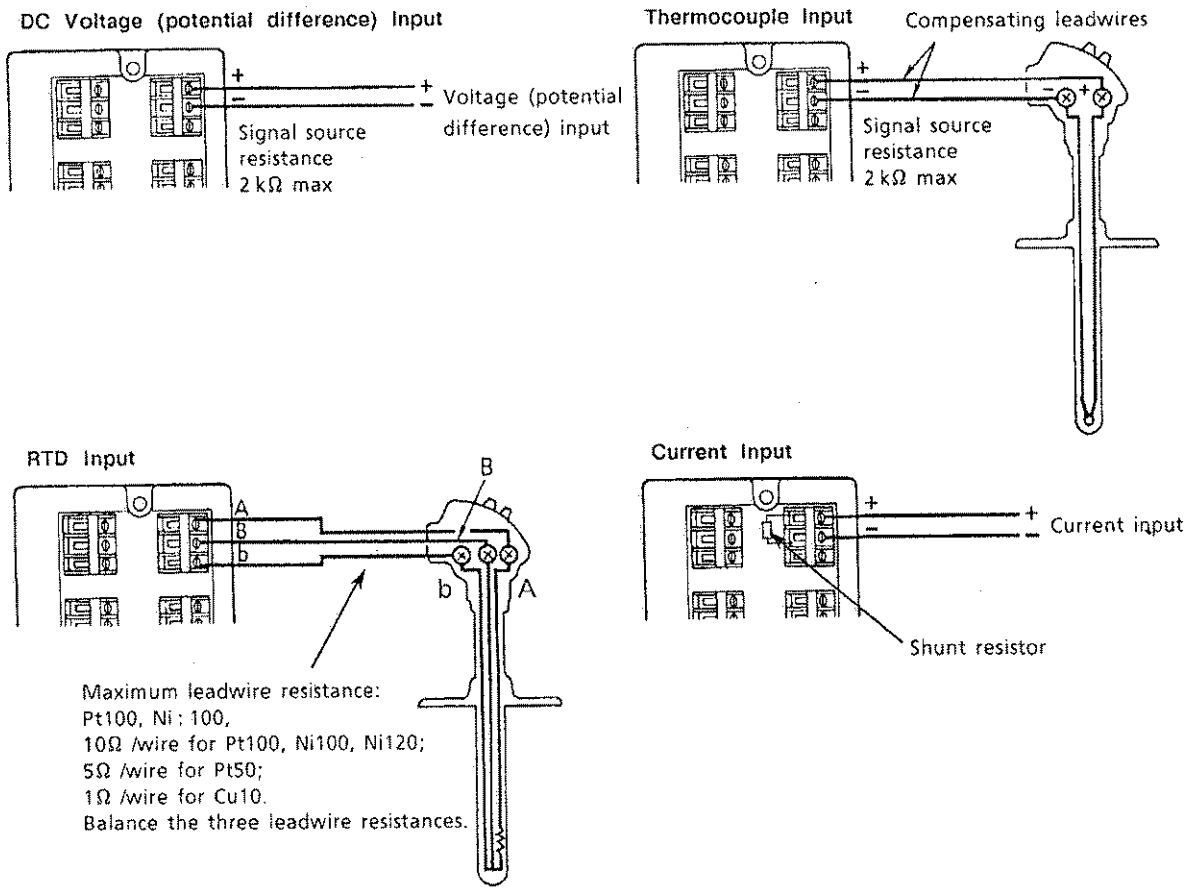


Figure 5.6

Screw Input Terminal Model

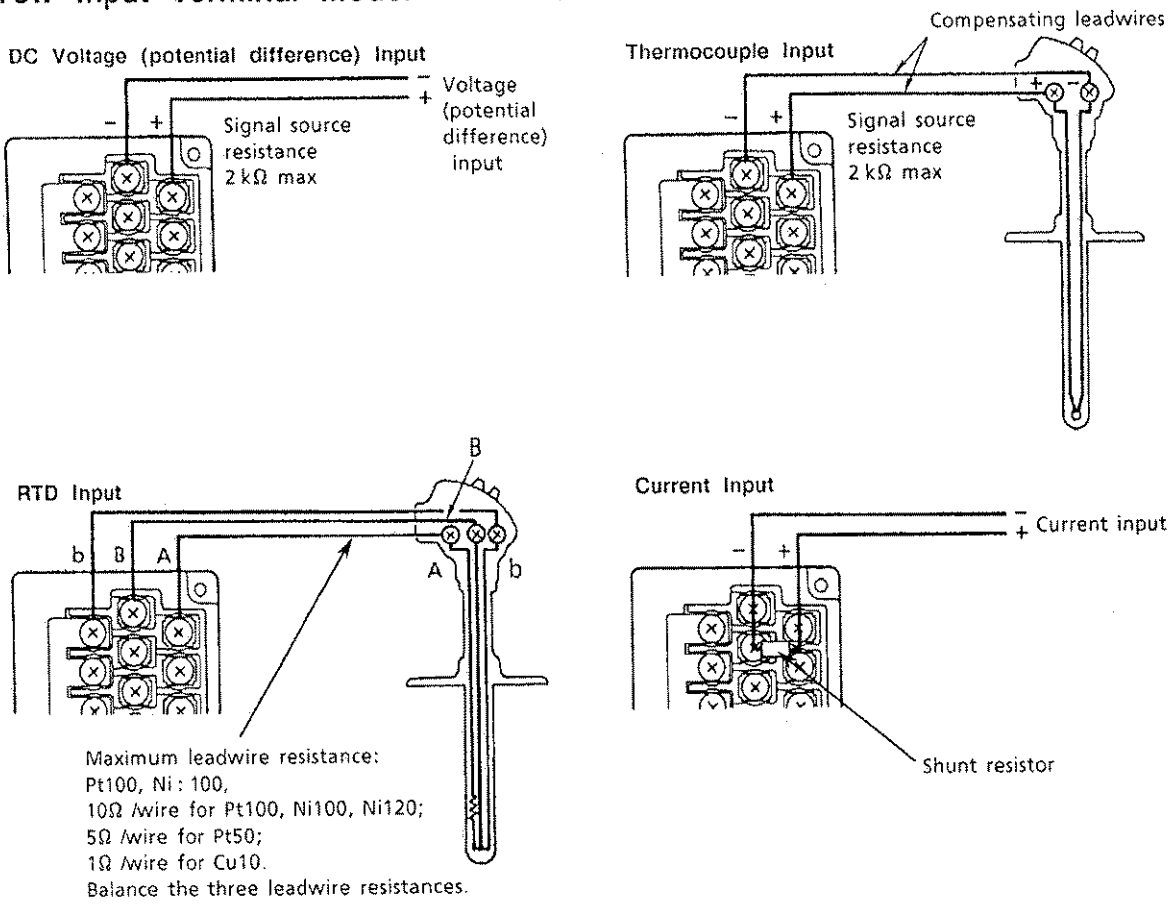


Figure 5.7

6. OPERATION

6.1 Chart and Ribbon Installation

6.1.1 Chart Installation and Replacement

(1) Chart Installation

The chart can be installed or replaced with power either OFF or ON.

1) To ensure a proper chart-feed, riffle and fan the chart on both ends (see Figure 6.1.1).
2) Open the front door and remove the chart cassette from the recorder (see Figures 1.4 and 1.5 on pages 1 - 5, 1 - 6).
3) Remove the chart pressure roller. A spring mechanism is built into the left end of the roller. Push the roller to the left and remove it (see Figure 6.1.2).

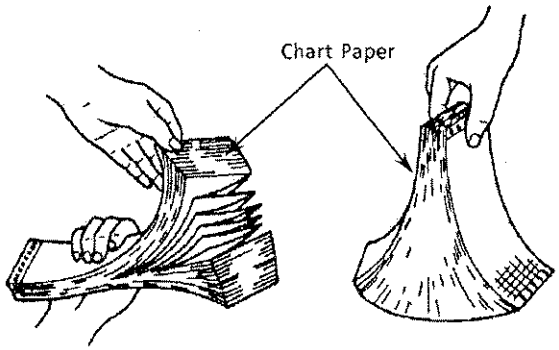


Figure 6.1.1

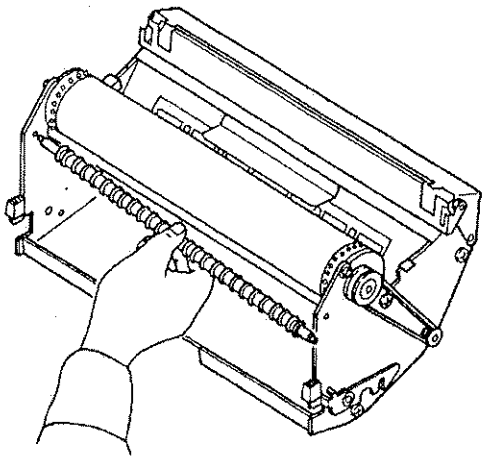


Figure 6.1.2

4) Lift the knobs on the left and right sides of the chart pressure plate at the rear of the chart cassette, and slide the plate back (see Figure 6.1.3).
5) Place the chart in the storage compartment with the round drive holes of the paper on the left and the chart-cut end pointing toward you (see Figure 6.1.4).

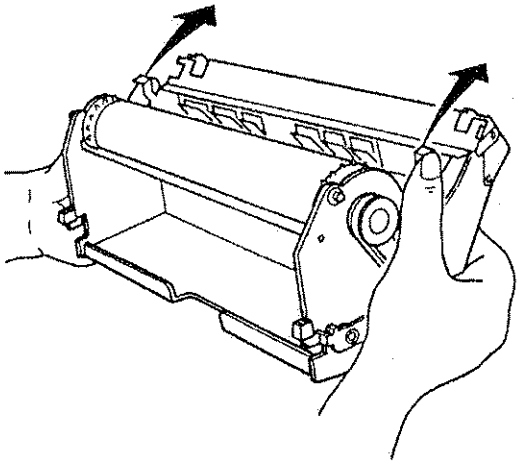


Figure 6.1.3

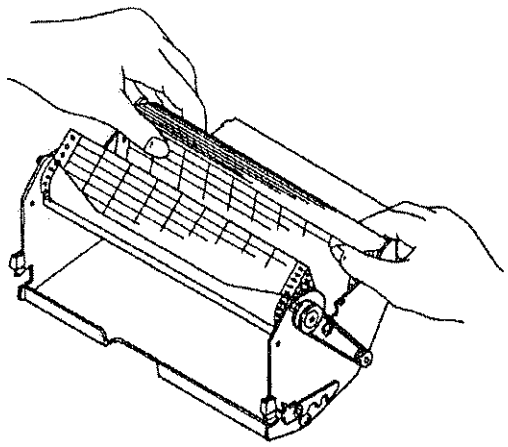


Figure 6.1.4

6) To engage the chart drive holes with the sprockets correctly, install the chart paper so that the mark "-" [Ⓐ in Figure 6.1.5] appearing every 5 cm meets a groove [Ⓑ in Figure 6.1.5].
7) Return the chart roller and chart pressure plate to their original positions, following ① through ③ in Figure 6.1.6. Engage the projections ③, indicated by the arrow (see Figure 6.1.6) with the holes on the left and right sideplates on the chart cassette.

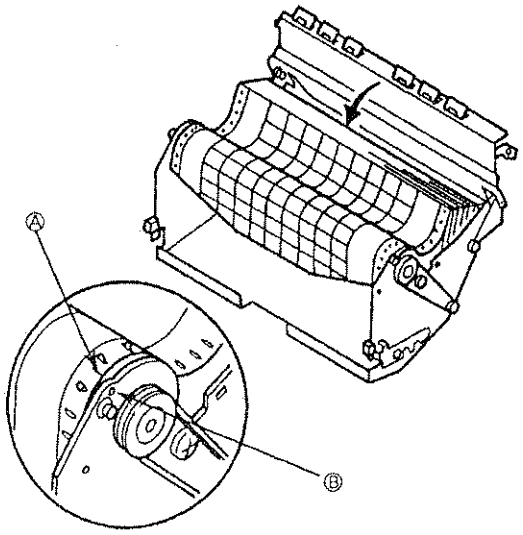


Figure 6.1.5

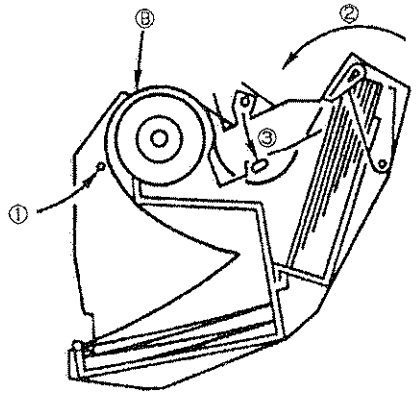


Figure 6.1.6

8) Engage the projections on the chart cassette with the support mechanism on the recorder chassis, and insert the cassette into the support mechanism completely (see Figures 6.1.7 ① and 6.1.8 ①).
9) Swing and push the chart cassette into the recorder chassis until it locks with a click (see Figures 6.1.7 ② and 6.1.8 ②).
10) With the power turned on, press the FEED button on the front left side of the recorder to feed out at least three folds of chart paper to the receiver, and verify that the chart is feeding properly. Note that you should also press the FEED button to verify operation after manual feeding of a blank chart.
    If the chart is not feeding properly, repeat the procedure starting from step 2).
11) When the chart end is near, the message, "RENEW CHART", printed in scarlet will appear in the chart margins to notify you that it is time to ready a new chart.
12) The CHART indicator on the front left side of the recorder will light when the chart reaches its end. Replace it with a new chart according to the above procedure steps 1) through 10).

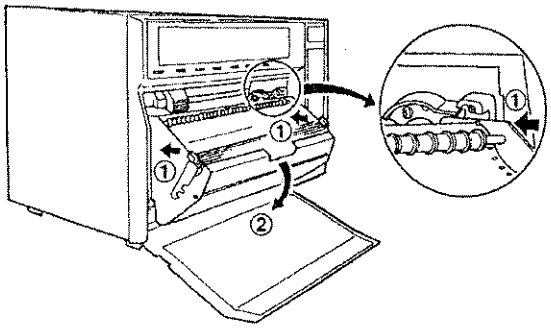


Figure 6.1.7

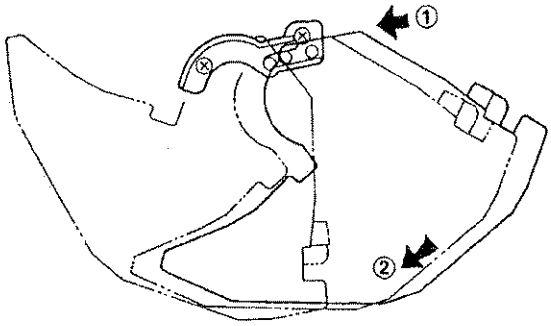


Figure 6.1.8

(2) Chart Replacement

1) When "CHART" appears on the display, prepare a new chart for replacement.
2) Press the START/STOP key to stop the recording (scanning will continue).
3) Put in a new chart following the "(1) Chart Installation" procedure.

CAUTION

Please use only genuine Yokogawa chart paper, B9855AY.
Using charts other than those specified may cause problems.

6.1.2 Ribbon Cassette Installation and Replacement

(1) Ribbon Cassette Installation

Note 1: Before using the recorder for the first time, make sure that the shipping stop (clamp plate) has been released (See Figure 1.6).

Note 2: Do not allow the printing mechanism to operate without a cassette ribbon installed. Operation without a ribbon may damage the platen and / or tear the chart.

1) Open the front door and remove the chart cassette (Figure 6.1.9).
For chart cassette removal, see pages 1-5 and 1-6.

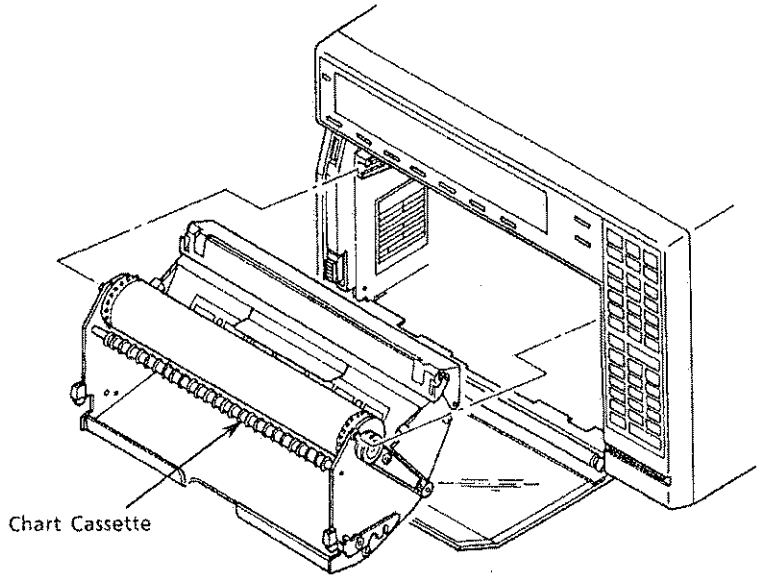


Figure 6.1.9

2) Pressing the red lever on the carriage (Figure 6.1.10) will move the ribbon cassette holder to the right (See Figure 6.1.11).

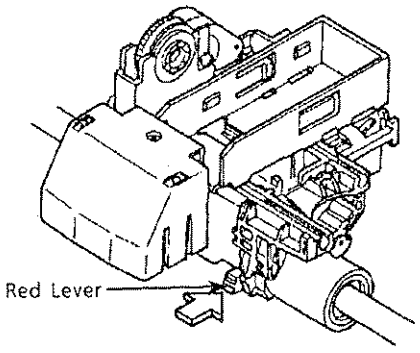


Figure 6.1.10 Carriage

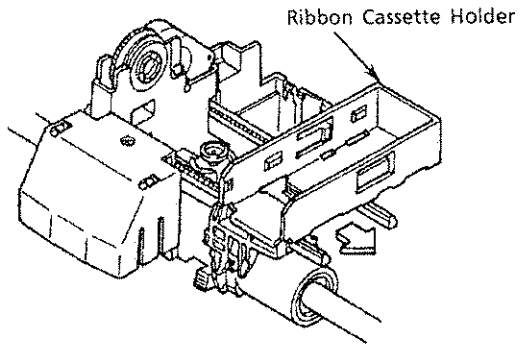


Figure 6.1.11

3) Tilt the ribbon cassette holder in the direction of the arrow (Figure 6.1.9).
4) Rotate the shaft on the ribbon cassette counterclockwise to take up any slack in the ribbon (Figure 6.1.13).

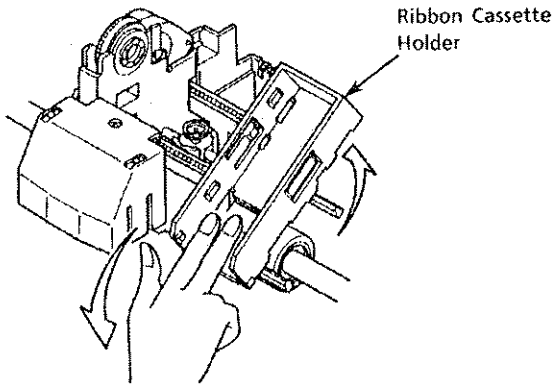


Figure 6.1.12

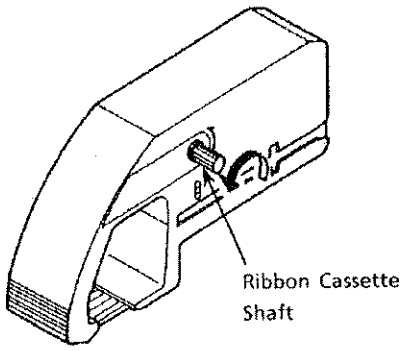


Figure 6.1.13 Ribbon Cassette

5) Insert the ribbon cassette into the holder (Figure 6.1.14), and return it to a horizontal position (Figure 6.1.15).
6) Raise the ribbon cassette front and return to level (Figure 6.1.15).

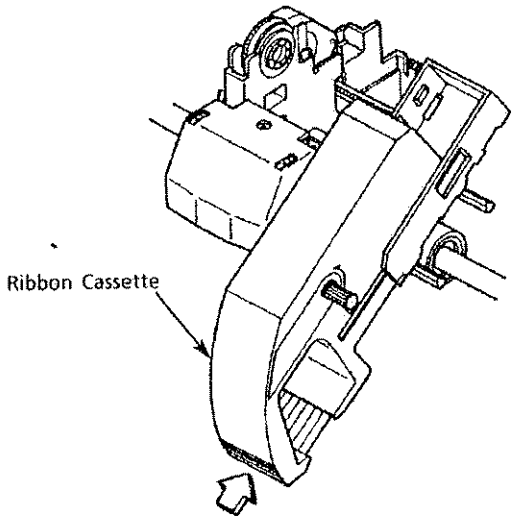


Figure 6.1.14

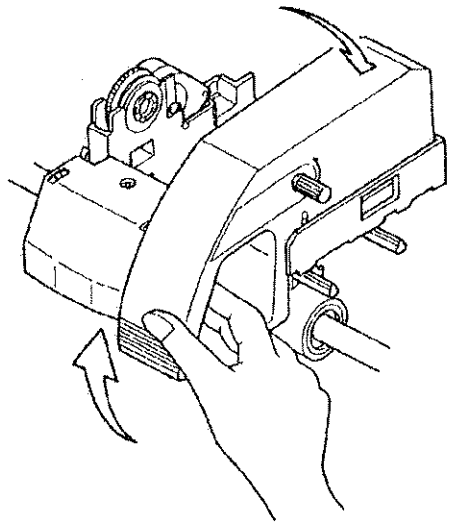


Figure 6.1.15

7) Push the ribbon cassette to the left until it reades the stopper (Figure 6.1.16).
Confirm that the 3 white lines on the head cover are completely hidden from view when viewed from the front.
If the white lines can be seen, the ribbon cassette is not installed properly. Push the ribbon cassette to the left once more (Figure 6.1.17, 6.1.18).

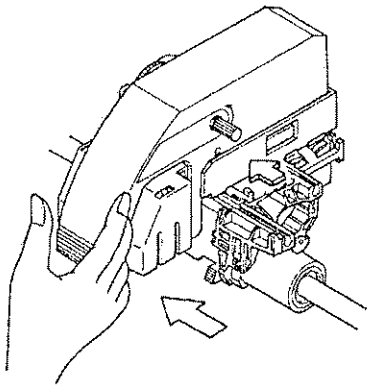


Figure 6.1.16

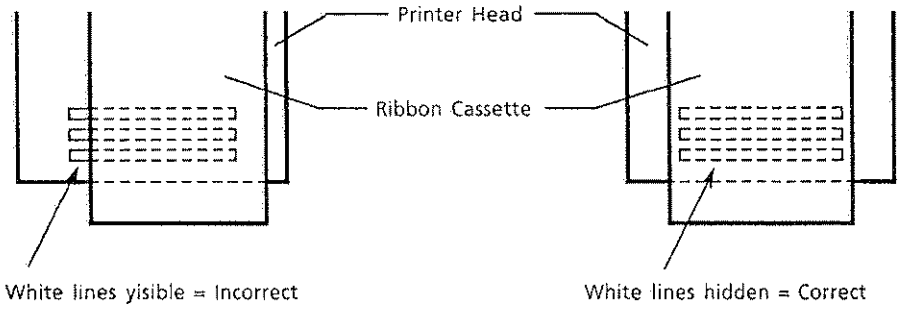


Figure 6.1.17

Figure 6.1.18

8) Turn the ribbon cassette knob counterclockwise to tighten the ribbon (Figure 6.1.13).
9) Return the chart cassette to the recorder. This completes ribbon cassette installation.
Push FEED KEY once after ribbon cassette installation. Not pushing FEED KEY, chart start will be later than setting.

> Make sure that the ribbon cassette is securely fastened to the carriage, and that the ribbon is properly postioned on the print head.
>
> If you use same ribbon cassette for long time, the ribbon will be waved. It cause no printout by gap between ribbon and printer head. Exchange the ribbon at this case.

(2) Ribbon Cassette Replacement

1) When replacing the ribbon cassette, first press the START/ STOP key to stop the printer function.
2) Install the new ribbon cassette in the carriage according to the foregoing "(1) Ribbon Cassette Installation" procedure.

6.2 Description of Initial Settings

Initial Settings

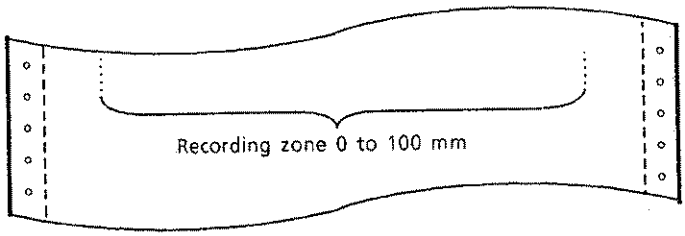
- Measurement Range ..... 2V range (All channels)
  Measurement span −2.0000V to +2.0000V
  Scaling OFF
- Measurement Interval ..... 1scan / 2 seconds
- Recording Format ..... Trend record (Analog + digital)
- Trend Interval ..... AUTO mode (Recording interval determined by chart speed.)
- Logging Interval ..... SINGLE mode (Recording interval : 1 hour)
- Recording Zone ..... 0 to 150 mm
- Chart Speed ..... 100 mm / H
- Display ..... UPPER DISPLAY : Data auto-display
  LOWER DISPLAY : Data auto-display
- Alarms ..... All levels OFF on all channels
- TAG, MESSAGE, HEADER . All channels and all items set to spaces

6.3 Simple Example of Entering Data

6.3.1 Example of Changing Setting to Thermocouple (TC)

This section explains the procedure for changing the following setting parameters, assuming that the recorder is in the initial condition described in Section 6.2.

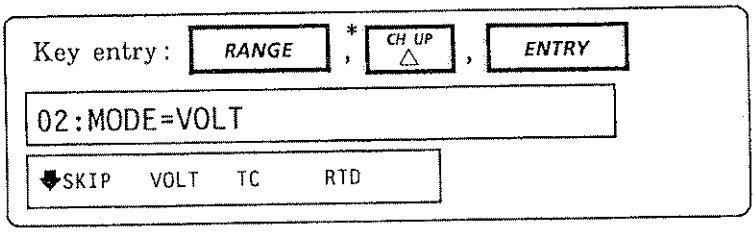
Channel : Channel 2
Range : Thermocouple type T
Temperature range −200.0 °C to 400.0 °C
Alarms : High-limit alarm set at 100 °C
Recording : Analog recording range (recording zone) set at 0 to 100 mm



6.3 [Range] [Channel]

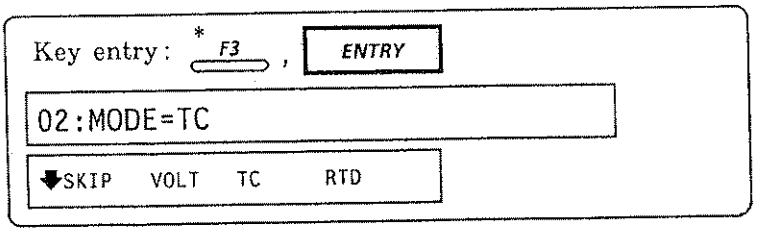
[Key Entry, Panel Display] The panel displayed when * key is pressed. [Description]

Key entry: RANGE, *, CH UP △, ENTRY



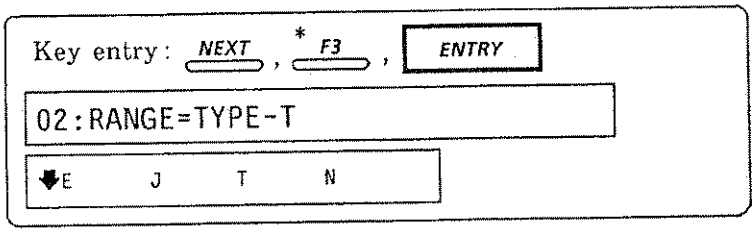
- Go into range setting mode and select Channel 2.

Key entry: *, F3, ENTRY



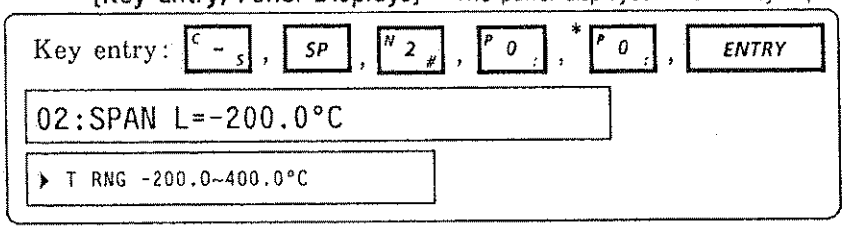
- The TC (thermocouple) setting screen appears.

Key entry: NEXT, *, F3, ENTRY

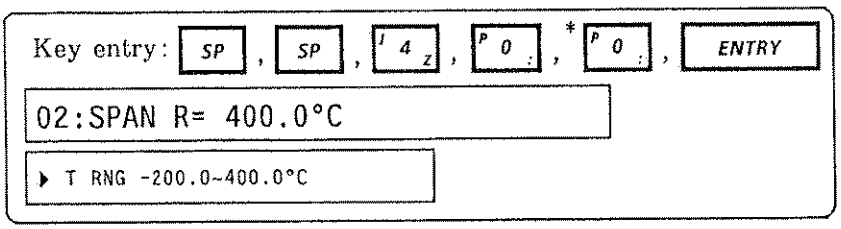


- Select type T.

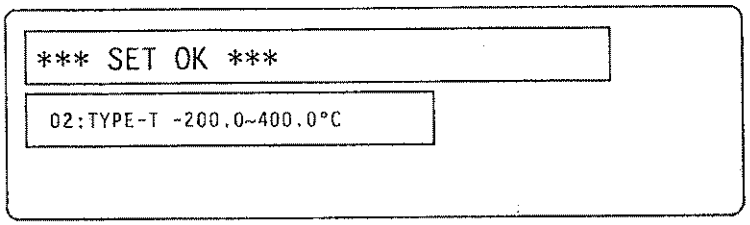
[Key Entry, Panel Displays] The panel displayed when * key is pressed. [Description]



- Left input span value of −200.0 °C.



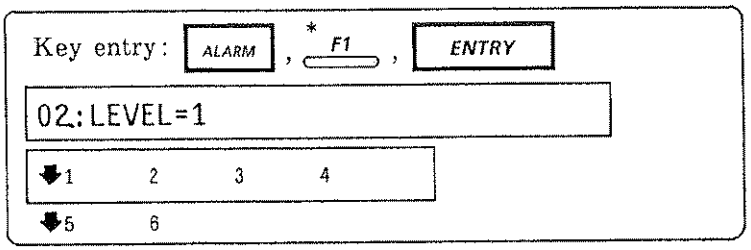
- Right input span value of 400.0 °C.



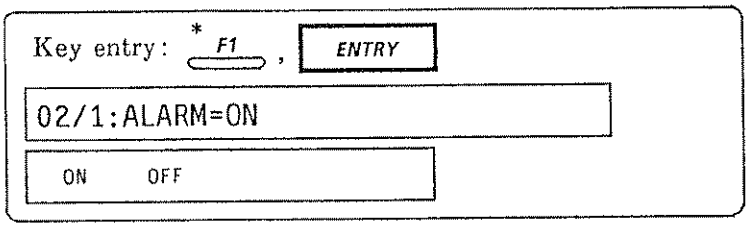
- Range setting complete.

6.3

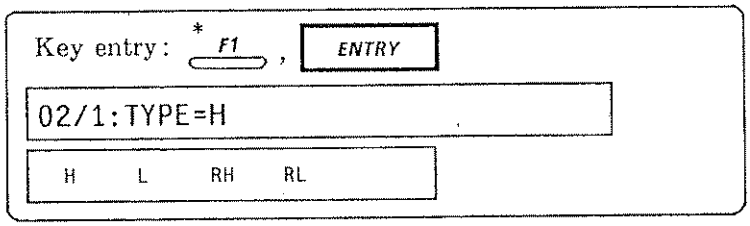
[Alarm] The panel displayed when * key is pressed.



- Set alarm.
  Although up to six levels can be set for each channel, here we will select only one.

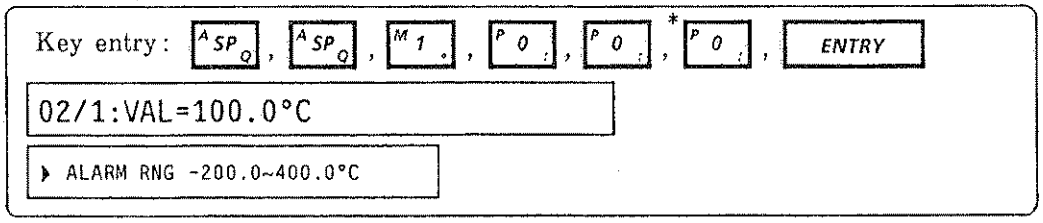


- Turn ON the Level 1 alarm of Channel 2.

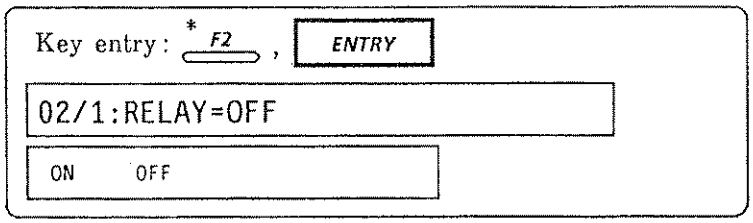


- Select upper-limit alarm (H).

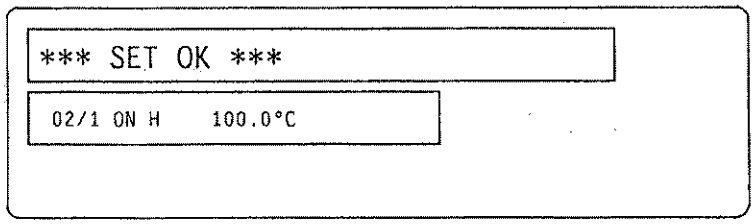
[Key Entry, Panel Displays] The panel displayed when * key is pressed. [Description]



- Set upper-limit alarm value to 100.0 °C.

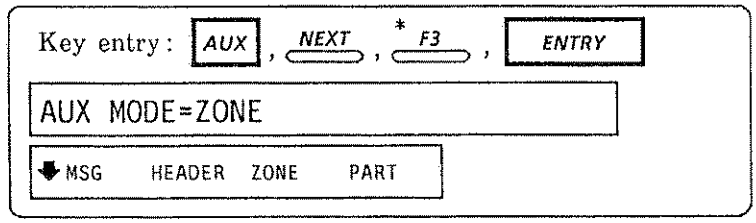


- If you will not use a relay output, set this to OFF.

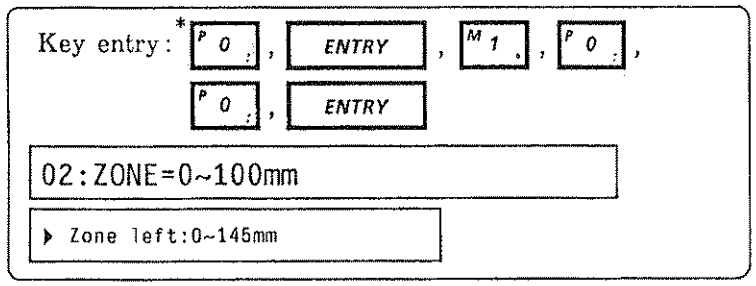


- Alarm setting is complete.

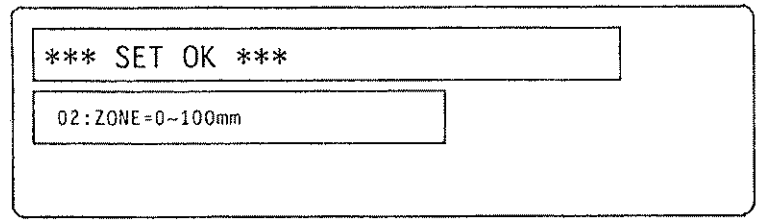
[Recording Zone] The panel displayed when * key is pressed.



- Set recording zone.



- Set the recording zone (left) to 0 and recording zone (right) to 100 mm.
- Left zone ranges 0 to 145 mm.
- Right zone ranges 5 to 150 mm.



- Recording zone settings are complete.

6.3.2 Error Code Summary Table

	Error Number	Error Description
Settings	001	Main recorder-related errors other than those below
	002	Value entered exceeds allowable setting range.
	003	Time setting error
	004	Attempted to enter a channel which cannot be selected.
Recording	010	Command error in GP-IB communication
	011	Attempted to record setting list when out of chart.
	020	Attempted to repeat setting list recording while setting list recording already in progress.
Range	040	Current DELTA channel larger than reference channel
	041	DELTA target channel set up for SKIP
	042	DELTA target channel set up for DI
	043	DELTA target channel set up for SCALE
	045	Left SPAN value same as right value
	046	Left SCALE value same as right value
Alarm	060	Attempted to set alarm on channel with range setting for SKIP.
	061	Attempted to set alarm on channel setting for DI.
	062	Non-existent relay number entered.
AUX	082	SET-UP RECORD PARTIAL setting is OFF (partial compression).
	083	Channel set to PARTIAL has range set to SKIP (partial compression).
	084	Channel set to PARTIAL has range set to DI (partial compression).
	086	Left zone value is same as right value.

	Error Number	Error Description
AUX	087	Left zone value is larger than right value.
	088	Band between left and right zone values is less than 5 mm.
	090	Computation options 31 through 60 non-existent.
	091	Syntax error in CONST (constant) entry.
	092	Setting exceeds allowable CONST (constant) range.
	094	Attempted to set more than 11 channels to interpolation ON.
	096	Attempted to set system ON alarm mode to other than NONE when set up CONTL boundary is EXT.
IC Memory Card	120	Card error • IC card not plugged in. • Not properly formatted.
	121	Card capacity error • Insufficient capacity to create file.
	122	File name error • File name is all spaces. • File name includes space (s). • File name includes *, ?, +, /, :, or comma. • File name begins with AUX, COM, PRN, NUL, or CLOCK.
	123	Sampling / playback execution error • Sampling designation entered while sampling in progress. • Designation entry repeated during data playback.
	124	Directory error • Directory full – cannot register new file.
	125	Creating device type error • Attempted playback of file created on non-HR device. (Data file, setting file).
	126	Write-protect violation error (Hybrid recorder itself) • HR setting for write prohibition by SET UP mode

	Error Number	Error Description
IC Memory Card	127	Write-protect violation error (IC Memory Card) • The file is write-protected.
	128	Trigger source error • All trigger sources were disabled during trigger mode SET UP.
	129	Playback start-point error • Playback start-point exceeded actual number of data samples.
	130	Channel number error • No target channels for data sampling. • Too many data playback channels.
	131	Data count error • Number of data points is 0 or greater than 32,000.
	132	File format error • Wrong file format
	133	No file name
	134	Setting file error
	139	Other IC card related error
Computation	140	Undefined code error
	141	Number of parentheses doesn't match
	142	Specified function for which multiple instances are not allowed.
	143	Context error Example: 01*+02
	144	Invalid computation expression channel number or GROUP input error Example : 31=32+33 31=G1+34 (if G1=31 or 33)
	145	Statistical function input error
Communications	160	Communications-related error

Description of Basic Function, Operation, Setting

6.4 Panel Operation Description

6.4.1 Names and Functions of Individual Keys

(1) [Recording-Related Keys]

HR1300

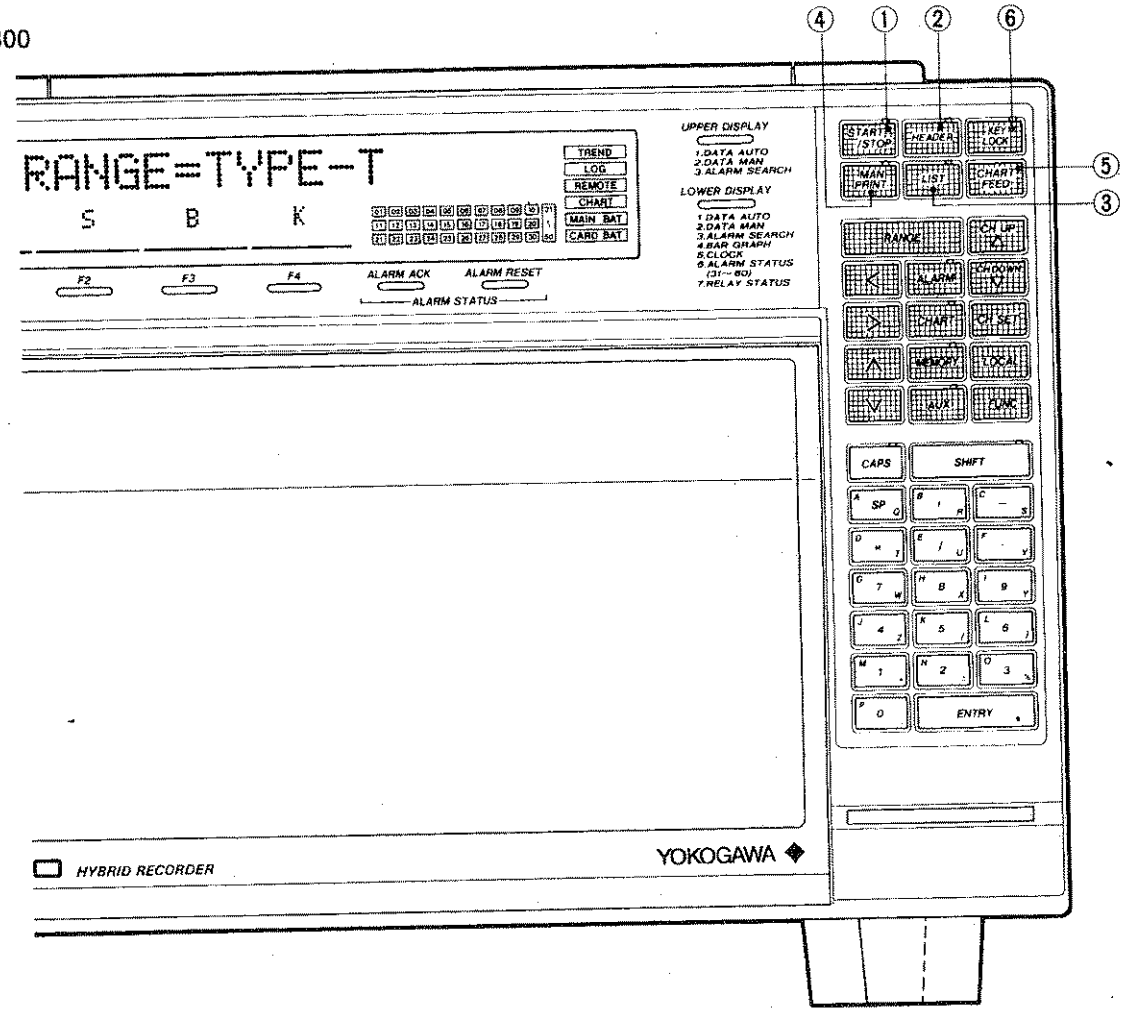


Figure 6.4.1 HR1300 Recording-Related Key Names

CAUTION

Do not press the keys with a screwdriver, a mechanical pencil, the end of a nail or any other sharp object. Otherwise, they may be damaged.

① **Recording START/STOP Key**

Each press of this key alternately starts (LED lit) or stops (LED OFF) recording.

- The initial setting conditions for recording are as follows:

  Recording format : TREND
  Recording interval mode : AUTO
  Chart speed : 100 mm/h

- See the following manual sections for setting change procedures:

  To change recording format ..... [AUX] SYSTEM (Section 6.10.2)
  To change recording interval ..... [AUX] SYSTEM (Section 6.10.2)
  To change chart speed ..... [CHART] (Section 6.9)
  To change recorder operating mode .... [AUX] SYSTEM (Section 6.10.2)
  Print-on alarm
  Change-on alarm
  To change recording color ..... SET-UP mode COLOR (Section 6.11.9)
  To change scanning interval ..... SET-UP mode INTVL (Section 6.11.2)

② **HEADER Key**

Lights LED and prints header information onto chart.
(Not set at time of shipment. See Section 6.10.6.)

③ **LIST Key**

Lights LED and prints out setting list for RANGE and ALARM, etc.

(※ If you wish to start a SET-UP mode list printout, press the [FUNC] key, and select "SL-ON".)

④ **MAN PRINT Key**

Gives a logging record of a single scan of data.
(LED lights and analog recording stops.)
When the writing of the single scan of data is complete, the LED turns OFF, the MAN PRINT function is automatically cancelled, and the instrument returns to the recording previously in progress.

⑤ **CHART FEED Key**

Pressing this key causes the chart to feed as long as it is depressed.

⑥ **KEY LOCK Key**

Pressing this key lights the LED and locks all keys on the panel.
You can enable or disable key locking individually for PRINT, MAN-PRINT, LIST, CHART FEED and certain other keys. (See Section 6.11.4).

6.4

(2) [Display-Related Keys]

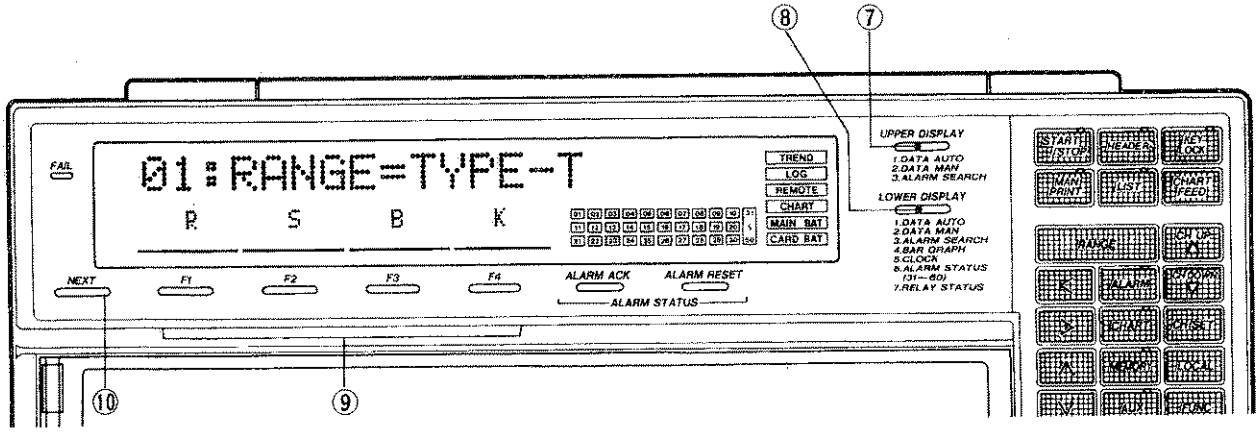


Figure 6.4.2 Display-Related Key Names

⑦ UPPER DISPLAY Changes

(Display Example)

```
01  d  H  0.00 mV
02 d dH -123.00mV ▲AUTO
```

← Pressing the UPPER DISPLAY key, displays the upper line of the display.

1. DATA AUTO Display (▲ AUTO)
   Displays data for each channel in succession, for two seconds per channel.
2. DATA MAN Display (▲ MAN)
   Displays data for one specified channel.
   Channel is selected using the CH UP △, CH DOWN ▽ or CH-SET keys.
3. ALARM SEARCH Display (▲ ALM)
   Displays channels for which alarms are present, for two seconds per channel.

⑧ LOWER DISPLAY Change

(Display Example)

```
01  d  H  0.00 mV
02 d dH -123.00mV ◀AUTO
```

← Pressing the LOWER DISPLAY key displays the lower line of the display.

1. DATA AUTO Display (◀AUTO)
   Displays data for each channel in succession, for two seconds per channel.
2. DATA MAN Display (◀MAN)
   Displays data for one specified channel.
   Channel is selected using the CH UP △, CH DOWN ▽ or CH-SET keys.
3. ALARM SEARCH Display (◀ALM)
   Displays data for channels for which alarms are present, for two seconds per channel.

4. BAR GRAPH Display (◀BAR)

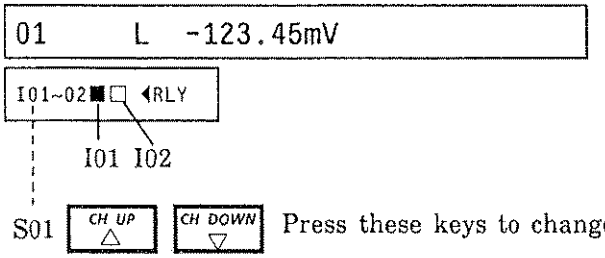
   Displays a bar graph of the data for the channel being displayed on the upper line.

5. CLOCK Display (◀CLK)

   Displays date and time of day.

   - See Section 6.10.1 for time-changing procedure.

6. RELAY STATUS Display (◀RLY)

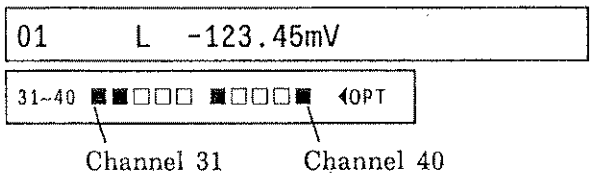


   This mode allows you to monitor the output states of the internal alarm relays (I01 and I02).

   - The figure above shows a display of the statuses of relays I01 and I02.
   - The light boxes □ indicate output OFF, and the dark boxes ■ output ON.
   - To change the displayed group, use the CH UP △ and CH DOWN ▽ keys.

7. ALARM STATUS Display (◀OPT)

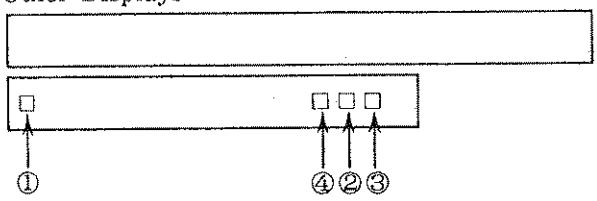
   Note : In systems not having channels 31 through 60 this can be skipped.



   This mode is used to monitor alarms occurring in optional channels 31 through 60.

- The above figure shows a display of the ALARM statuses of channels 31 through 40.
- The light boxes □ indicate no alarm, and the dark boxes ■ that an alarm is present. If ALARM ACK ON has been selected in the SET-UP settings, the indicator will flash when an alarm is present. Pressing the ALARM ACK key stops the flashing and causes the indicator to show the current alarm status.
- In the case of display for channels 41 through 50 the display will read 41 instead of 31, and for channels 51 through 60 will read 51 instead of 31.
- To switch between the 31 group and the 41 or 51 group, use the CH UP △ and CH DOWN ▽ keys.

8. Other Displays



① ▼ : There is a "next" screen for call up by using the NEXT function key.

① ▷ : Information

② C : CHANGE-ON ALARM

② P : PRINT-ON ALARM

③ M : Memory card in operation

③ T : Memory card awaiting trigger

④ △ : Upper display

④ ◁ : Lower display

⑨ **Function Keys (F1 through F4)**
When selection items are displayed above the keys F1 through F4 during setting, they can be selected using those keys.

⑩ NEXT Key (NEXT)
When the mark is visible to the left of the function indicators on the display, this indicates that there are still more function key selections available. Press the NEXT key when you wish to see these selections. Continuing to press it will return you to the setting selections from which you started.

(3) [Alarm Display and Alarm Output Relay Related Keys]

When any of the alarms set on the individual channels occur (see Section 6.8, "Alarm Setting"), the corresponding LED for that channel 1 through 20 on the front panel will begin flashing (ALM ACK must be set to ON in the SET-UP mode CONTROL selections).

When the MATH option is installed, the "31 through 60" indicator will also flash if alarms occur.

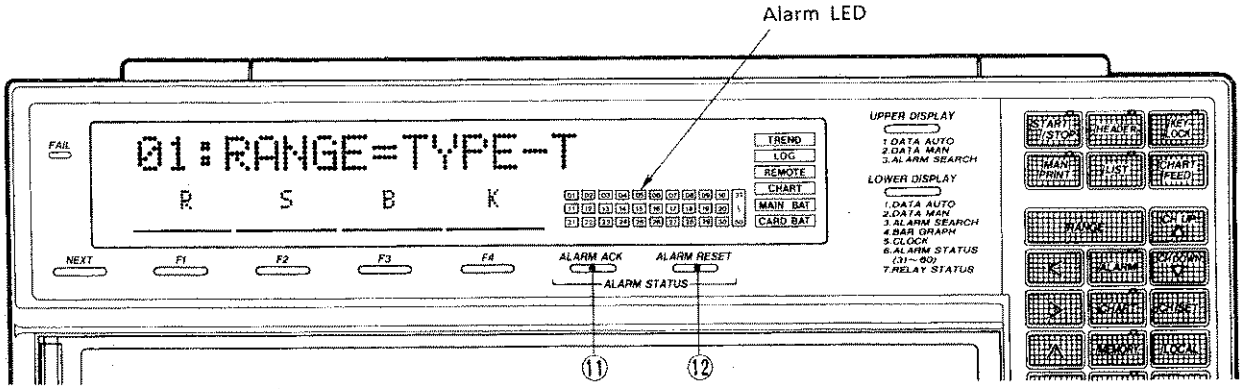


Figure 6.4.3 Alarm Display and Alarm Output Relay Related Key Names

⑪ ALARM ACK Key

This key stops the flashing of the alarm status indicator for the channel in alarm, and causes it to show the current alarm status (lit if in alarm, OFF if recovered from alarm). If a new alarm occurs in some channel after this key is pressed, that channel's alarm status indicator will begin to flash.

NOTE

1. This mode of operation is in effect only if ALM ACK = ON was selected in SET-UP mode.
2. The common output relay, too, will turn OFF (internal alarm output relay [when installed as option].

⑫ ALARM RESET Key

When alarms have occurred and relays are generating outputs from the internal alarm output relay unit (optional), pressing this key will reset all the relay outputs to the OFF condition. This capability is enabled when RELAY HOLD or ALM ACK = ON has been selected in the setting CONTROL mode.

(Display Description)

The display shows the status of the alarms (see Section 6.8, "Alarm Setup") set for each of the individual channels 1 through 20. For computation channels (channels 31 through 60) the 31 to 60 indicator displays the status.

If ALM ACK has been set to ON in SET-UP:

The alarm indicator begins flashing when an alarm occurs. (The alarm flashing will be maintained even if the channel recovers from alarm.)

If ALM ACK has been set to OFF in SET-UP:

The alarm indicator turns ON when the alarm occurs and turns OFF when the channel recovers from alarm.

(4) [Entry Setting Related Keys]

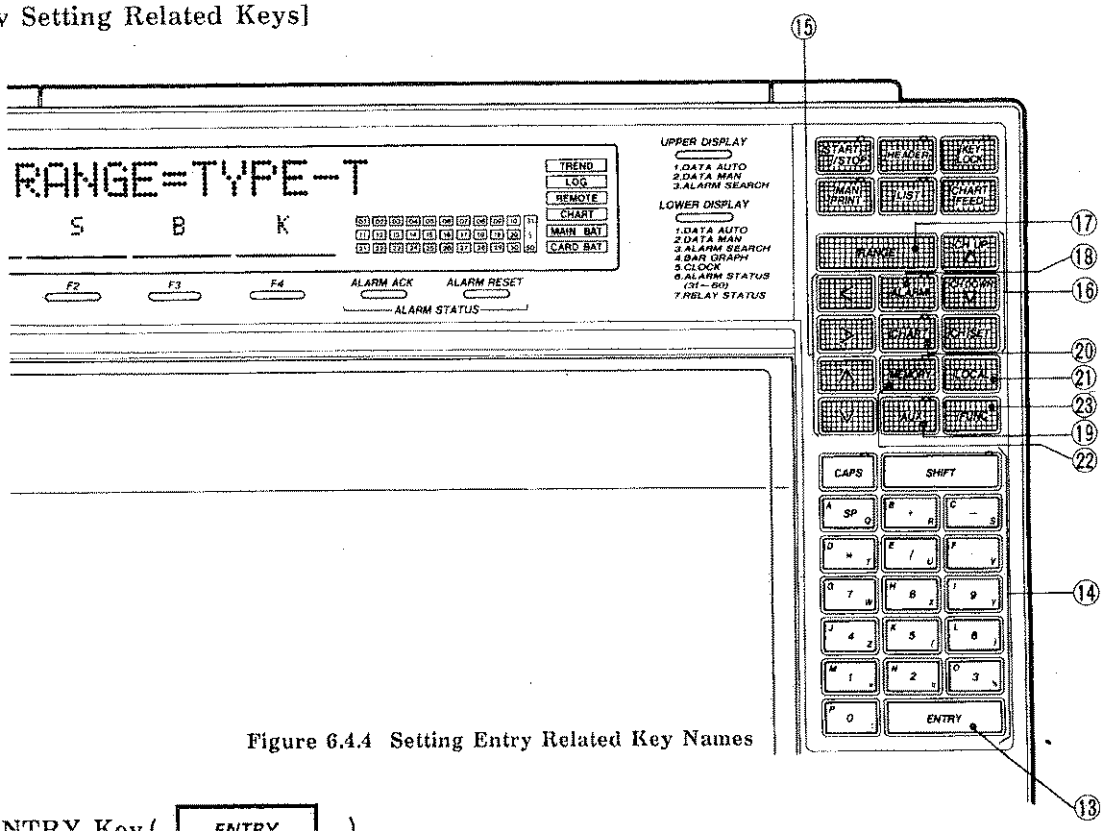


Figure 6.4.4 Setting Entry Related Key Names

⑬ **ENTRY Key (** ENTRY **)**

Pressing this key after completing a setting puts the displayed setting(s) into effect.

⑭ **Numerical Keys (Including** SHIFT **and** CAPS **Keys)**

These keys are used to input numerals and letters during setting.
The character input is displayed at the cursor position.

(1) CAPS Key

Pressing this key once turns ON the LED, pressing it again turns the LED OFF. Capital letters are entered in upper case when the LED is ON, and small letters are entered in lower case when the LED is OFF.

(2) SHIFT Key

Pressing this key once turns ON the upper left LED, pressing it a second time turns ON the upper right LED, and pressing it a third time turns the LEDs OFF. These three modes enable input as follows:

- When both LEDs are OFF, numerals — Example: G 7 W key inputs "7"
- When left LED is ON, letters at upper left — Example: G 7 W key inputs "G"
- When right LED is ON, letters at lower right — Example: G 7 W key inputs "W"

⑮ [<], [>], [∧], [∨] Keys (Cursor Movement, Screen Forward / Back Shift)

- [<] [>] : These keys move the cursor indicating the input position left and right.
  (Example) −0002 V
  ↑ Cursor
- [∧] [∨] : These keys are used to return the input screen back by one or to advance it forward.

⑯ Channel Change Keys ([CH UP △], [CH DOWN ▽], [CH-SET] Keys)

[CH UP △] : Key used to change the selected channel number (in the direction of higher numbers)

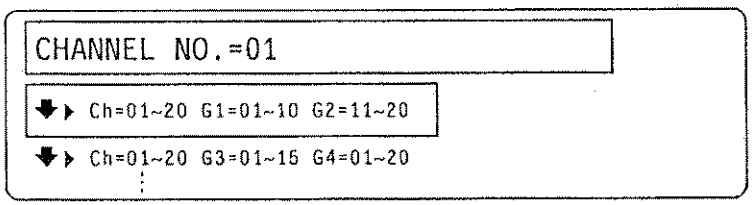
[CH DOWN ▽] : Key used to change the selected channel number (in the direction of lower numbers)

The sequencing of channels is as follows:

Standard : CH1 to CH20, G1 (Group 1) to G6 (Group 6)
(Groups not selectable will cause an error.)

With MATH option : CH1 to CH20, CH31 to CH60, G1 to G6
See Section 6.11.6, "Group Setting", concerning group (G1 through G6) selection, and the separate user manual for the MATH option concerning CH31 through CH60.

[CH-SET] : This key is used to change the selected channel to one specified by numerical entry.



- Entering 01 through 20 selects the specified channel.
- Entering G1 through G6 selects the individual group.

⑰ RANGE Setting Key ([RANGE] Key)

Used to set the measurement range. (See Section 6.7, "Range Setting".)

⑱ ALARM Setting Key ([ALARM] Key)

Used to set alarms. (See Section 6.8, "Alarm Setting".)

⑲ AUX Function Setting Key ([AUX] Key)

Used to change settings of parameters peculiar to hybrid recorders. (See Section 6.10, "Settings Under AUX").

(CLOCK, Format (TREND / LOGGING),
Operating Mode (Print-On-Alarm, Change-On-Alarm),
Recording Interval Mode (AUTO / FIX))

⑳ **CHART SPEED Setting Key (** CHART **Key)**

Used to set chart speed.

㉑ **LOCAL Key (** LOCAL **Key)**

Used to set communications to LOCAL mode during GP-IB communications.

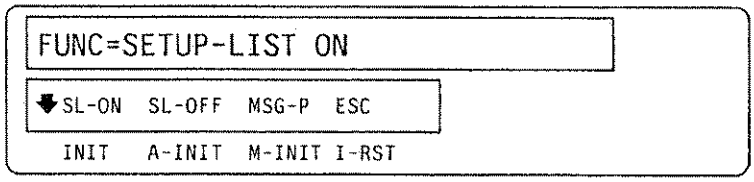
(Linked to REMOTE indicator. Turns off REMOTE indicator.)

㉒ **MEMORY Key**

Used for setting when IC memory cards are in use. (See Section 7. "IC Memory Card".)

㉓ **FUNC Key**

This key calls up the following screen:



① SL-ON : Initiates a list printout of the SET UP information.
② SL-OFF : Stops the SET-UP LIST printout.
③ MSG-P : Initiates printout of messages.
(MESSAGE PANEL setting information in AUX mode.)
④ INIT : Initializes the internal settings.
⑤ A-INIT : Clears alarm printout memory.
⑥ M-INIT : Clears message printout memory.
⑦ I-RST : Intervals are reset in multiple mode.
(Invalid in single mode)
⑧ ESC : Return to display mode.

6.4.2 Other Displays

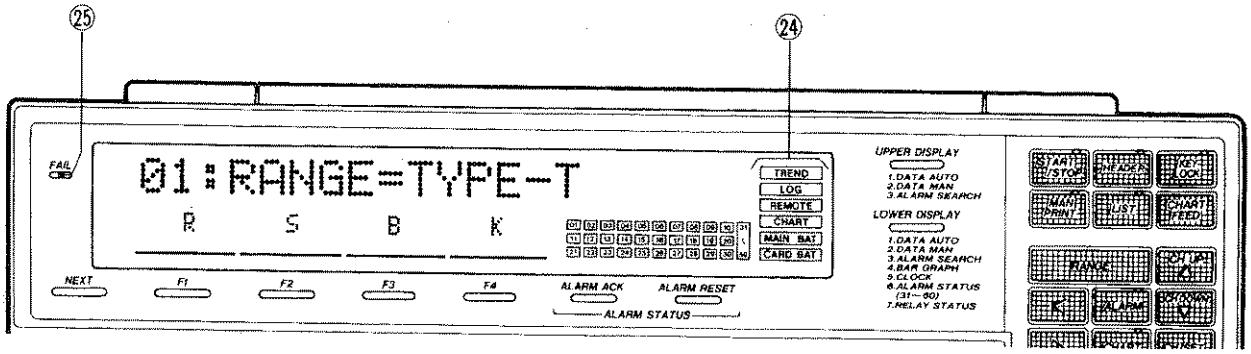


Figure 6.4.5 Miscellaneous Indicator Names

㉔ TREND, LOG, REMOTE, CHART, MAIN BAT and CARD BAT

TREND : Lights up when digital + analog trend recording is in progress.

LOG : Lights up when digital-only recording is in progress.

REMOTE : Lights up when recorder is in REMOTE status (communication-enabled status) with GP-IB communications.

CHART : Lights up when incipient chart end is detected. When this indicator lights up, recording is halted after more 10mm of chart advance, and the recorder goes into a measurement-display-only mode.

(Note : If an IC Memory Card is used, it is possible to set it so that data acquisition to the card begins simultaneously with chart end.)

MAIN BAT : Lights up when setting status backup battery voltage drops. For a standard model, battery life is about 10 years. A service person should be called to replace the battery.

CARD BAT : Lights up when the IC Memory Card internal backup battery voltage drops. See Section 7.1.3 for the battery installation and replacement procedure.

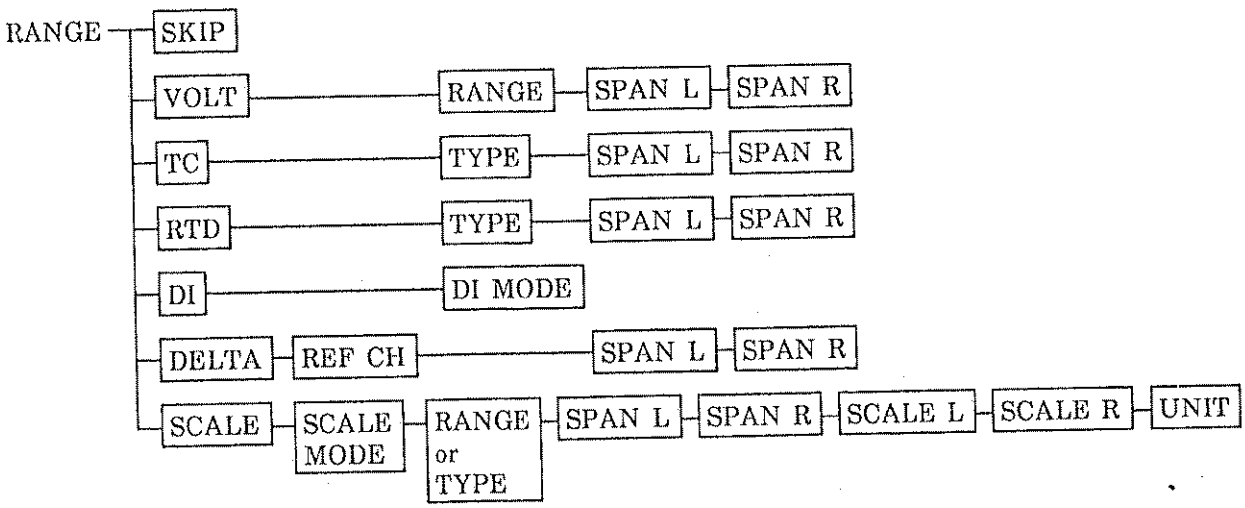
㉕ FAIL

Lights up when a malfunction occurs inside the recorder. If this indicator lights up, turn power OFF and contact your agent or service shop.

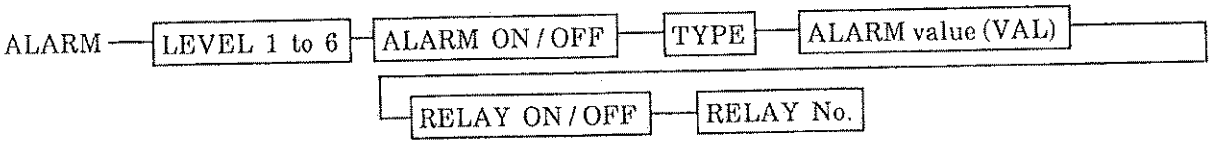
6.5 Setting Flowchart

6.5.1 Setting Flow

RANGE

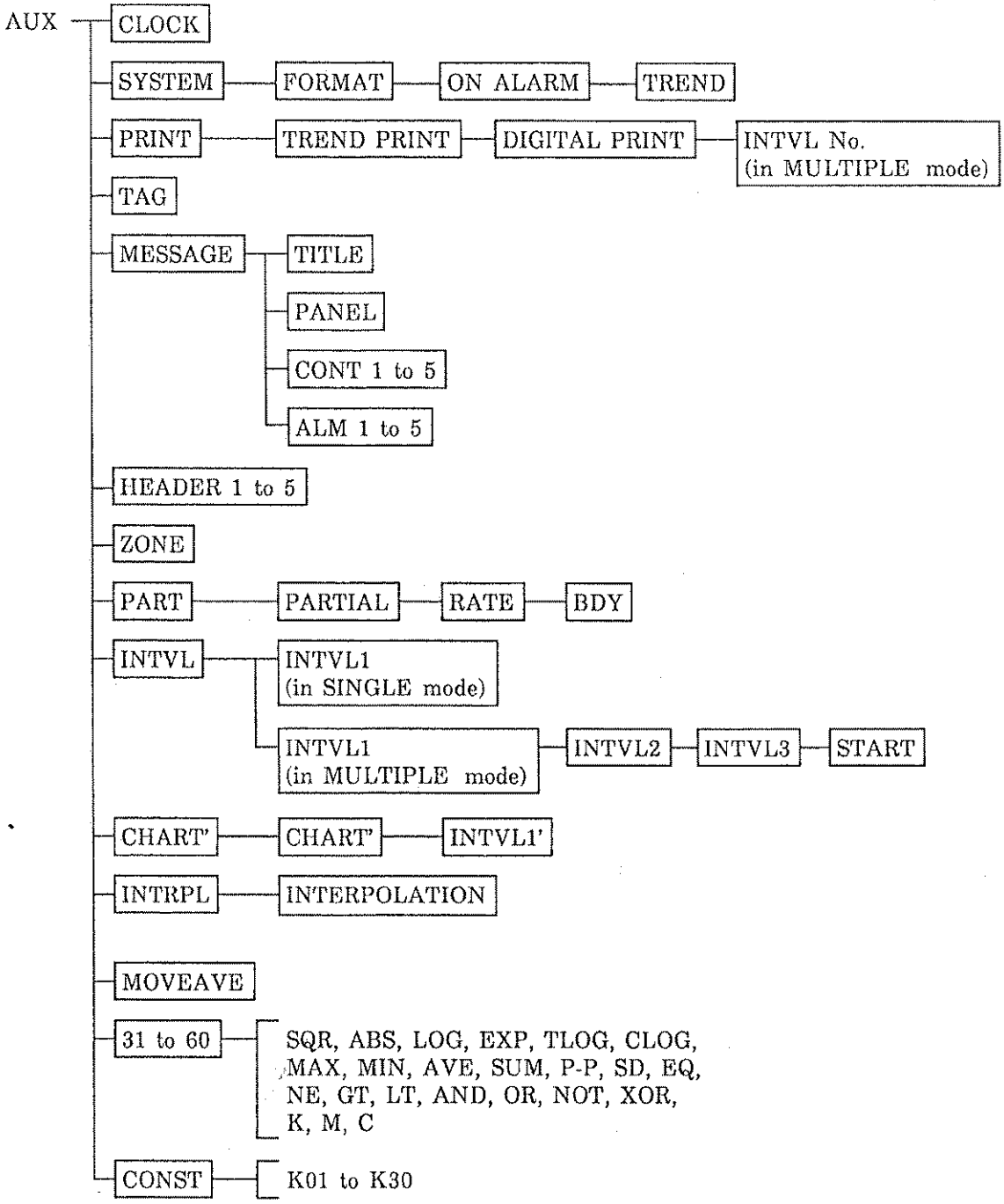


ALARM



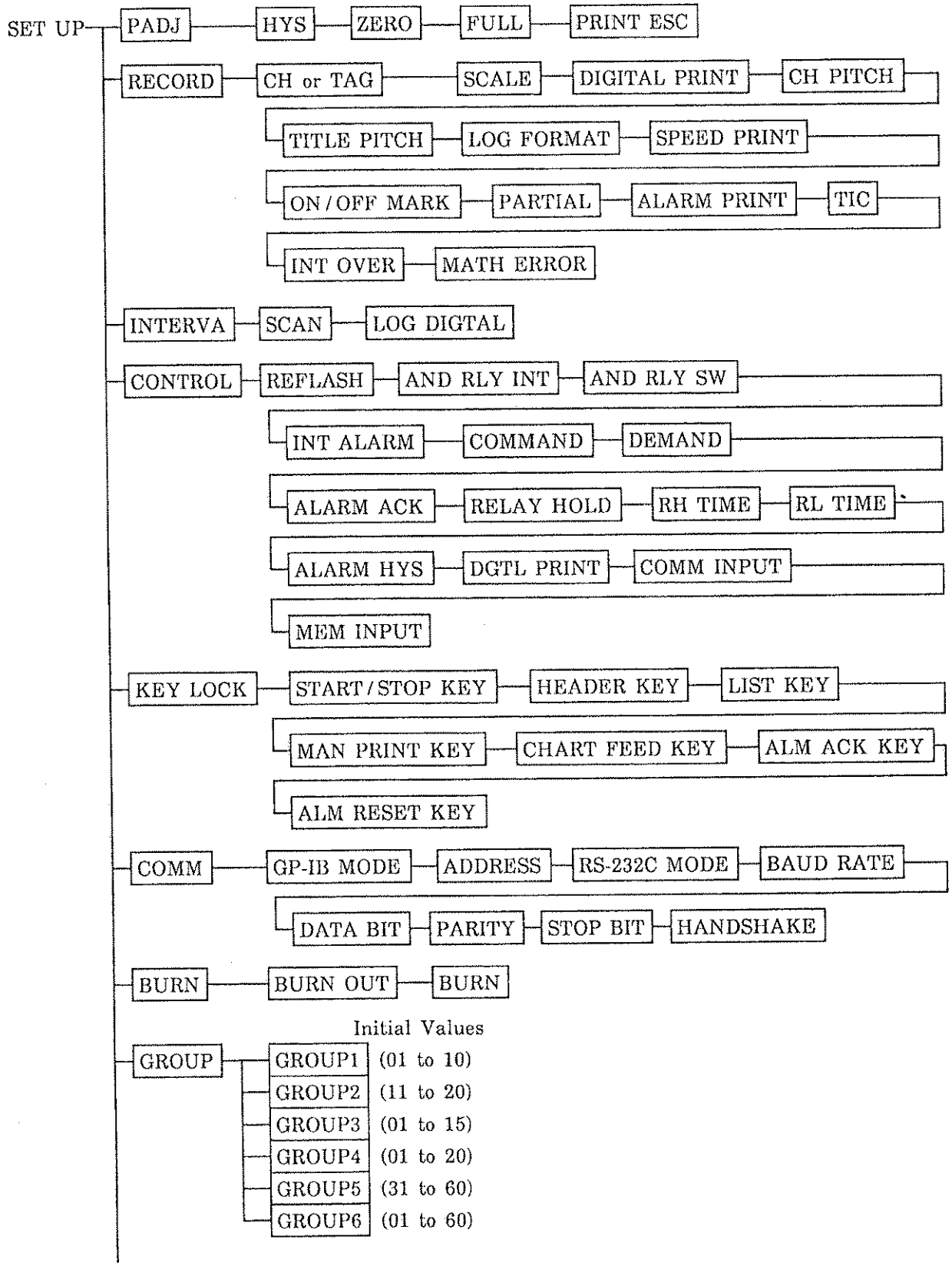
CHART

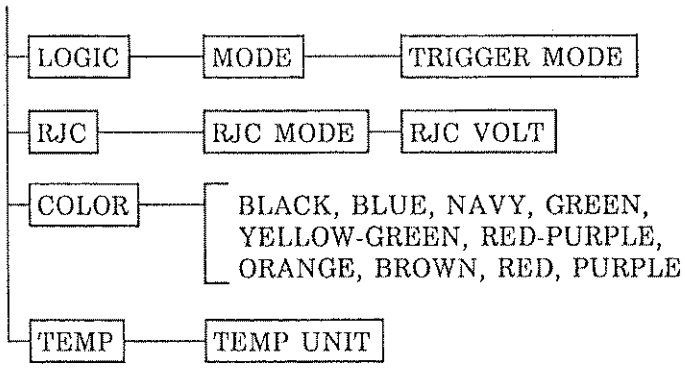
AUX


AUX
CLOCK
SYSTEM
FORMAT
ON ALARM
TREND
PRINT
TREND PRINT
DIGITAL PRINT
INTVL No.
(in MULTIPLE mode)
TAG
MESSAGE
TITLE
PANEL
CONT 1 to 5
ALM 1 to 5
HEADER 1 to 5
ZONE
PART
PARTIAL
RATE
BDY
INTVL
INTVL1
(in SINGLE mode)
INTVL1
(in MULTIPLE mode)
INTVL2
INTVL3
START
CHART'
CHART'
INTVL1'
INTRPL
INTERPOLATION
MOVEAVE
31 to 60
SQR, ABS, LOG, EXP, TLOG, CLOG,
MAX, MIN, AVE, SUM, P-P, SD, EQ,
NE, GT, LT, AND, OR, NOT, XOR,
K, M, C
CONST
K01 to K30

6.5

SET UP


SET UP
PADJ
HYS
ZERO
FULL
PRINT ESC
RECORD
CH or TAG
SCALE
DIGITAL PRINT
CH PITCH
TITLE PITCH
LOG FORMAT
SPEED PRINT
ON / OFF MARK
PARTIAL
ALARM PRINT
TIC
INT OVER
MATH ERROR
INTERVA
SCAN
LOG DIGTAL
CONTROL
REFLASH
AND RLY INT
AND RLY SW
INT ALARM
COMMAND
DEMAND
ALARM ACK
RELAY HOLD
RH TIME
RL TIME
ALARM HYS
DGTL PRINT
COMM INPUT
MEM INPUT
KEY LOCK
START / STOP KEY
HEADER KEY
LIST KEY
MAN PRINT KEY
CHART FEED KEY
ALM ACK KEY
ALM RESET KEY
COMM
GP-IB MODE
ADDRESS
RS-232C MODE
BAUD RATE
DATA BIT
PARITY
STOP BIT
HANDSHAKE
BURN
BURN OUT
BURN
Initial Values
GROUP
GROUP1 (01 to 10)
GROUP2 (11 to 20)
GROUP3 (01 to 15)
GROUP4 (01 to 20)
GROUP5 (31 to 60)
GROUP6 (01 to 60)


LOGIC
MODE
TRIGGER MODE
RJC
RJC MODE
RJC VOLT
COLOR
BLACK, BLUE, NAVY, GREEN,
YELLOW-GREEN, RED-PURPLE,
ORANGE, BROWN, RED, PURPLE
TEMP
TEMP UNIT

6.5.2 Setting Information Summary (RANGE, ALARM and AUX Keys) 1/2

Setting Parameter			Function Keys F1	F2	F3	F4	NEXT	Menu Content	Remarks
RANGE (CHANNEL, GROUP)	MODE		SKIP	VOLT	TC	RTD	○	Normal measurements, skip, difference calculation	DELTA : difference calculation SCALE: used for scaling values
			DI	DELTA	SCALE				
	VOLT (MODE)		20mV	60mV	200mV	2V	○	DC voltage input	
			6V	20V	50V				
	TC (MODE)		R	S	B	K	○	Thermocouple input	
			E	J	T	N	○		
			W	L (J)	U (U)	KpAuFe			
	RTD (MODE)		PT1	PT2	PT3	PT4	○	RTD input Pt1 : Pt100, 1mA JPt. Cu1 : Cu10, GE Pt2 : Pt100, 2mA JPt. Cu2 : Cu10, L&N Pt3 : Pt50, 2mA JPt. Cu3 : Cu10, WEED Pt4 : Pt100, 1mA Cu4 : Cu10, BAILEY Pt5 : Pt100, 2mA Pt6 : Pt100, 1mA, High sensitivity (JPt) Ni1 : Ni100, 1mA SAMA Pt7 : Pt100, 2mA, High sensitivity (JPt) Ni2 : Ni100, 1mA DIN Pt8 : Pt100, 1mA, High sensitivity Ni3 : Ni120, 1mA Pt9 : Pt100, 2mA, High sensitivity	
			PT5	NI1	NI2	NI3	○		
			CU1	CU2	CU3	CU4	○		
			PT6	PT7	PT8	PT9	○		
			J263						
	DI (MODE)		DI1	DI2				DI1 : voltage input DI2 : contact input	
	DELTA							Set differential computation	
	MODE (SCALE)		VOLT	TC	RTD				
ALARM (CHANNEL, GROUP)	LEVEL		1	2	3	4	○	Number of alarms per channel	
			5	6					
	ALARM		ON	OFF				Alarm ON / OFF	The following designation is made only at alarm ON.
	TYPE		H	L	RH	RL		Alarm type	
			(dH)	(dL)					
	VAL							Alarm value	
	RELAY		ON	OFF				Relay output ON / OFF	The following relay No. designation is made only at relay output ON.
	RELAY No.							Relay No.	
AUX	AUX MODE		CLOCK	SYSTEM	PRINT	TAG	○		
			MSG	HEADER	ZONE	PART	○		
			INTVL	CHART'	INTPL	MOVAVE	○		
			31 to 60	CONST					
	SYSTEM	FORMAT	TREND	LOG				Determines recording format.	
		ON ALARM	NONE	PRINT	CHANGE			Print-on-alarm Change-on-alarm	
		TREND	FIX	AUTO				Switch to trend recording mode	
	PRINT	TREND PRINT	ON	OFF				Trend recording ON / OFF	
		DIGITAL PRINT	ON	OFF				Digital recording ON / OFF	
		INTVL No.	1	2	3			Interval No. when in multiple mode	
	TAG	TAG						Tag input	
	MESSAGE		TITLE	PANEL	CONT-1	CONT-2	○	Message input	
			CONT-3	CONT-4	CONT-5	ALM-1	○		
			ALM-2	ALM-3	ALM-4	ALM-5			

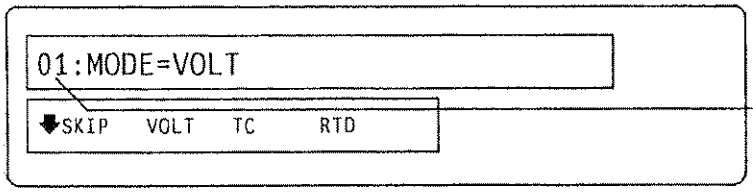
Setting Information Summary (RANGE, ALARM and AUX Keys) 2/2

Setting Parameter			Function Keys F1	F2	F3	F4	NEXT	Menu Content	Remarks
AUX	HEADER	HEADER LINE	1 to 5				○	Specify header lines	
		LINE						Header input	
	ZONE							Zone recording width entry L:0 to 145, R:5 to 150	
	PART	PARTIAL	ON	OFF				Partial compression recording selection	
		RATE						Compression rate entry	
		BDY						Boundary point entry	
	INTVL	INTVL1 to 3						Logging interval setup	INTVL2, 3 are set only when logging mode is MULTIPLE.
		START TIME	ON	OFF				Start time setup	
	CHART'	CHART SP'						Chart speed for change-on-alarm	
		INTVL'						Logging interval for change-on-alarm	
	INTRPL		ON	OFF				Analog recording interpolation function ON/OFF selection	
	MOVEAVE	MOVE AVERAGE	ON	OFF				Moving average function ON/OFF selection	
	31 TO 60							Computation channel (31 through 60) selection	
								(Memory, digital input, analog recording)	
	CONST							Entry of constants used in computations	

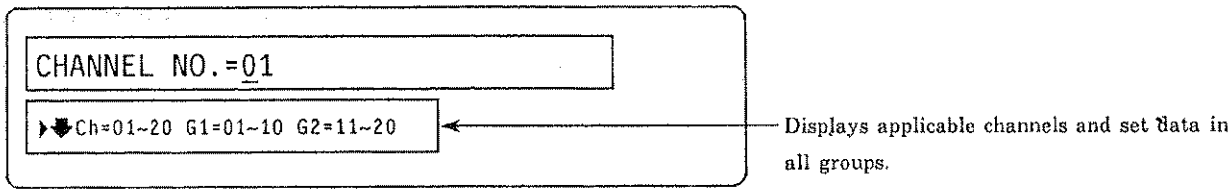
6.6 Channel Number Specification (Group Specification)

When making range or alarm settings during measurement, channel numbers can be specified using the CH UP △ and CH DOWN ▽ keys. Invalid channel No. and groups are ignored.

Range Setting Screen



Alternatively, if you wish to move from channel 1 to channel 20, pressing the CH-SET key and entering "20" on the screen below,

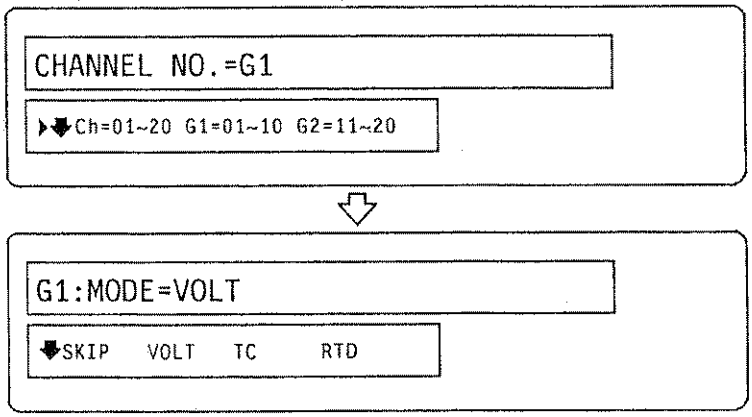


will call up the range setting screen for channel 20.

6.6

<Group Specification>

If you wish to use Group 1 to make entries for channels 1 through 10 together, input "G1".



※ To change the channels making up G1, use SET UP to change the channel numbers included in the group.

The following are limited to make group settings:

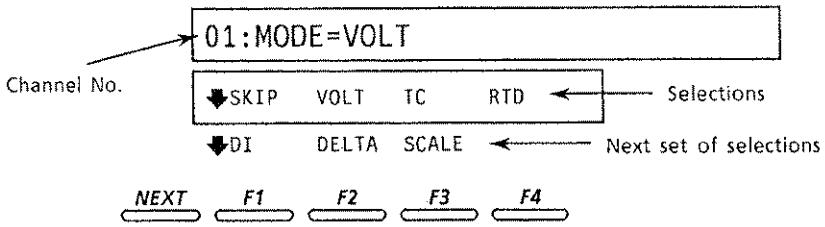
- Channels 01 to 20, and 31 to 60 must be set individually as a group.
- In RANGE and MOV－AVE modes, groups including channels 31 through 60 are invalid.
- For setting channels 31 to 60, groups that include channels 01 to 20 are invalid.
- For alarm settings, different modes and ranges in a group are invalid.
- For partial range settings, different modes, ranges and span in a group are invalid.
- Interpolations cannot be set into a group.

6.7 Range Setting

Range setting selects the measurement input type and sets the recording range.

SKIP	:	Deletes the specified channel from the set of those measured.
VOLT	:	Measures voltage (DC).
TC	:	Measures temperature using thermocouple (TC).
RTD	:	Measures temperature using resistance temperature detector (RTD).
DI	:	Accepts contact input (to record operation).
DELTA	:	Performs difference computation.
SCALE	:	Performs scaling on DC, TC or RTD measurement and append units.

- Pressing the RANGE key displays the first setting screen.



The selections are explained sequentially below.

- Set the range information for all channels.
- You can also set multiple channels at one time by using the group function. (See Section 6.11.6.)
- When the recording span, scaling value, and engineering units are being set, use numerical and alphabetical keys.

Example 1. To set the "left" span at 125.00 as a scaling value:
Press the keys: M 1 . | N 2 # | K 5 (| F - V | P 0 : | P 0 ;

Example 2. To set the engineering units in kg/m^2:
Press the keys: SHIFT | K 5 (| SHIFT | G 7 W | E I U | SHIFT | M 1 . | N 2 #

* To change from upper-case alphabetical characters to lower-case characters—and vice versa—press the CAPS key.

- CAPS lamp lights up ···· upper-case characters
- CAPS lamp turns off ····· lower-case characters

6.7

Input Range Tables

1. DC Voltage Input

Input Category	Selected Range	Input Type	Measurement Range	Recording Units	Remarks
DC Voltage	20 mV	20 mV	– 20.000 to 20.000 mV	mV	
	60 mV	60 mV	– 60.00 to 60.00 mV	mV	
	200mV	200mV	– 200.00 to 200.00 mV	mV	
	2 V	2 V	– 2.0000 to 2.0000 V	V	
	6 V	6 V	– 6.000 to 6.000 V	V	
	20 V	20 V	– 20.000 to 20.000 V	V	
	50 V	50 V	– 50.00 to 50.00 V	V	

2. Thermocouple / RTD / Contact Inputs

Input Category	Selected Range	Input Type	Measurement Range		Remarks
			°C	°F	
Thermocouple	R	Type R	0.0 to 1760.0 °C	32 to 3200 °F	
	S	Type S	0.0 to 1760.0 °C	32 to 3200 °F	
	B	Type B	0.0 to 1820.0 °C	32 to 3308 °F	
	K	Type K	−200.0 to 1370.0 °C	−328 to 2498 °F	Old CA
	E	Type E	−200.0 to 800.0 °C	−328.0 to 1472.0 °F	Old CRC
	J	Type J	−200.0 to 1100.0 °C	−328.0 to 2012.0 °F	Old IC
	T	Type T	−200.0 to 400.0 °C	−328.0 to 752.0 °F	Old CC
	N	Type N	0.0 to 1300.0 °C	32 to 2372 °F	NBS
	W	Type W	0.0 to 2315.0 °C	32 to 4199 °F	OMEGA
	L	Type L (Fe-CuNi)	−200.0 to 900.0 °C	−328.0 to 1652.0 °F	DIN 43710
	U	Type U (Cu-CuNi)	−200.0 to 400.0 °C	−328.0 to 752.0 °F	DIN 43710
	KpAuFe	Kp VS Au7Fe	0.0 to 300.0 K	0.0 to 300.0 K	
RTD	PT 1	JPt 100Ω	−200.0 to 550.0 °C	−328.0 to 1022.0 °F	Measurement current 1 mA
	PT 2	JPt 100Ω	−200.0 to 250.0 °C	−328.0 to 482.0 °F	2 mA
	PT 3	JPt 50Ω	−200.0 to 550.0 °C	−328.0 to 1022.0 °F	2 mA
	PT 4	Pt 100Ω	−200.0 to 600.0 °C	−328.0 to 1112.0 °F	1 mA
	PT 5	Pt 100Ω	−200.0 to 250.0 °C	−328.0 to 482.0 °F	2 mA
RTD (SAMA)	NI 1	Ni 100Ω	−200.0 to 250.0 °C	−328.0 to 482.0 °F	Measurement current 1 mA
RTD (DIN)	NI 2	Ni 100Ω	−60.0 to 180.0 °C	−76 to 356.0 °F	1 mA
RTD (McGRAW EDISON COMPANY)	NI 3	Ni 120Ω	−70.0 to 200.0 °C	−94.0 to 392.0 °F	Measurement current 1 mA
RTD (High Sensitivity)	PT 6	JPt 100Ω	−140.00 to 150.00°C	−220.0 to 302.0 °F	1 mA High sensitivity
	PT 7	JPt 100Ω	−70.00 to 70.00°C	−94.0 to 158.0 °F	2 mA High sensitivity
	PT 8	Pt 100Ω	−140.00 to 150.00°C	−220.0 to 302.0 °F	1 mA High sensitivity
	PT 9	Pt 100Ω	−70.00 to 70.00°C	−94.0 to 158.0 °F	2 mA High sensitivity
RTD	J263	J263*B	0.0 to 300.0 K	0.0 to 300.0 K	
RTD* (Cu10, for sensors of particular makers)	CU 1	Cu 10Ω	−200.0 to 300.0 °C	−328.0 to 572.0 °F	For GE
	CU 2	Cu 10Ω	−200.0 to 300.0 °C	−328.0 to 572.0 °F	For L & N
	CU 3	Cu 10Ω	−200.0 to 300.0 °C	−328.0 to 572.0 °F	For WEED
	CU 4	Cu 10Ω	−200.0 to 300.0 °C	−328.0 to 572.0 °F	For BAILEY
Contact	DI 1	Voltage input	less than 2.4V = OFF, 2.6V or greater = ON		
	DI 2	Contact input	Contact ON / OFF		

* Ranges of guaranteed accuracy for Cu10 inputs :
  CU 1 (Cu10, GE) : −84.4 to 170.0 °C, −119.9 to 338.0 °F
  CU 2 (Cu10, L&N) : −75.0 to 150.0 °C, −103.0 to 302.0 °F
  CU 3 (Cu10, WEED) : −200.0 to 250.0 °C, −328.0 to 482.0 °F
  CU 4 (Cu10, BAILEY): −200.0 to 250.0 °C, −328.0 to 482.0 °F

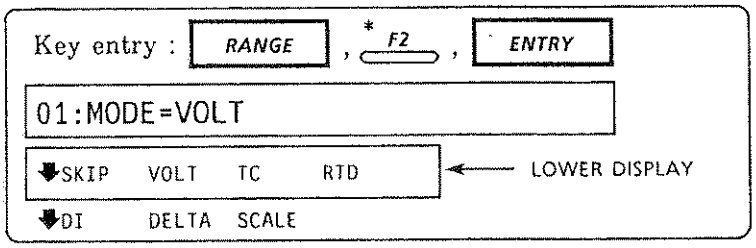
R, S, B, K, E, J, T:
ANSI, IEC 584, DIN IEC 584
JIS C 1602-1981
L: Fe-CuNi, DIN 43710
U: Cu-CuNi, DIN 43710
N: Nicrosil-Nisil
IEC 584, DIN IEC 584
W: W·5%Re-W·26%Re
Hoskins Mfg Co.

KP vs Au7Fe: NBS Vol.76A
Pt100: JIS C 1604-1989, JIS C 1606-1989
IEC 751, DIN IEC 751
Jpt100: JIS C 1604-1989, JIS C 1606-1989
Pt50: JIS C 1604-1981, JIS C 1606-1984
Ni100: SAMA, DIN 43760
Ni120: McGRAW E-DISON
J263 * B (PT-Co 0.5 no 1%): YOKOGAWA

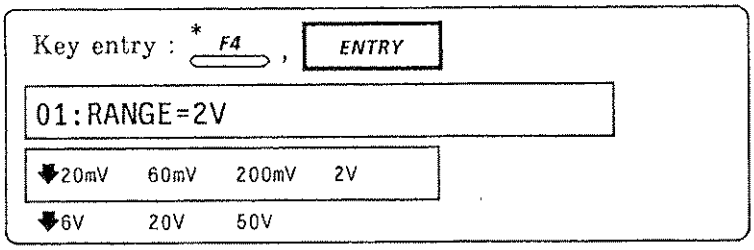
6.7.1 Voltage (VOLT) Measurement Setting

The following describes range setting when the measured signal is a DC voltage.

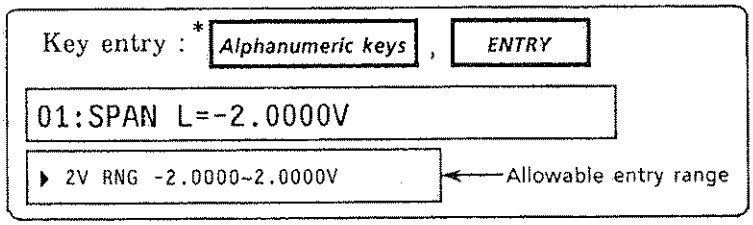
[Key Entry, Panel Displays] The panel displayed when * key is pressed. [Description]



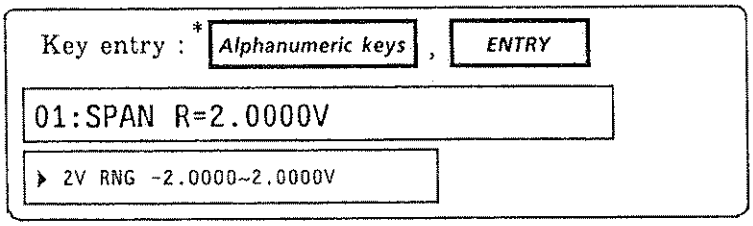
- Setting DC voltage (DC VOLT) input.
- Select from the LOWER DISPLAY using the function key.



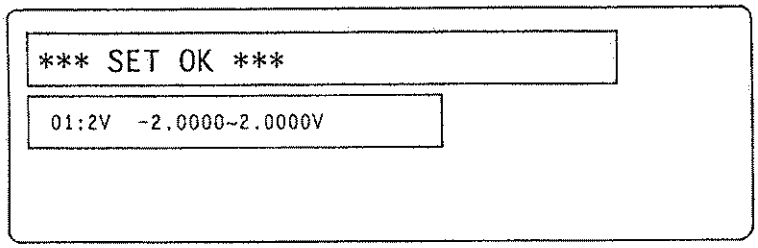
- Press ENTRY to accept the selection and advance to the next screen.
- Choose from among the voltage input range selections.



- Input the recording span left value.
- Input the value via the numeric key by referring to the allowable input range on the LOWER DISPLAY.
- The decimal point is automatically set depending on the range code.



- Input the recording span right value.

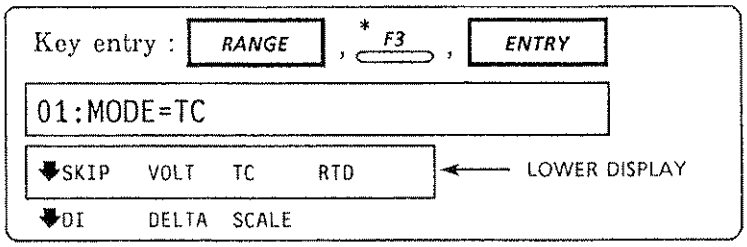


- The "SET OK" message is displayed to show that the settings have been accepted internally.
- The LOWER DISPLAY shows the information entered.
- Pressing ENTRY again will return you to the starting screen.
- To proceed to the next channel, press CH UP △ to change the channel number.
- To return to the data display mode, press the UPPER DISPLAY key.

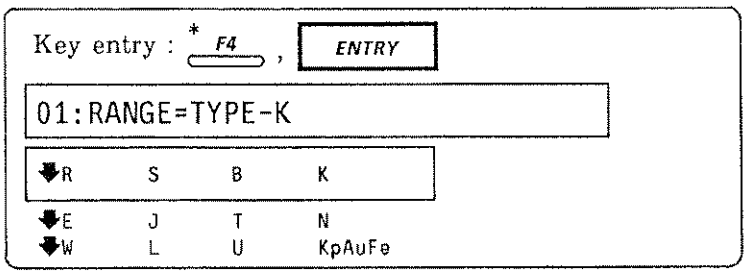
6.7.2 Thermocouple (TC) Measurement Setting

The following describes range setting when the measurement sensor is a thermocouple.

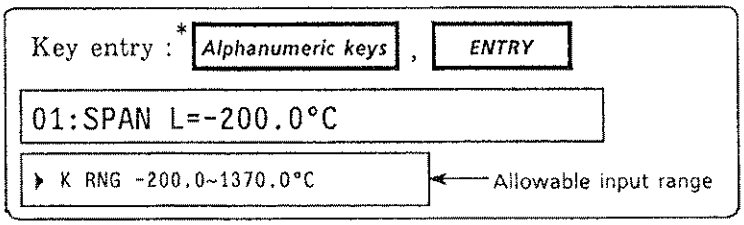
[Key Entry, Panel Displays] The panel displayed when * key is pressed. [Description]



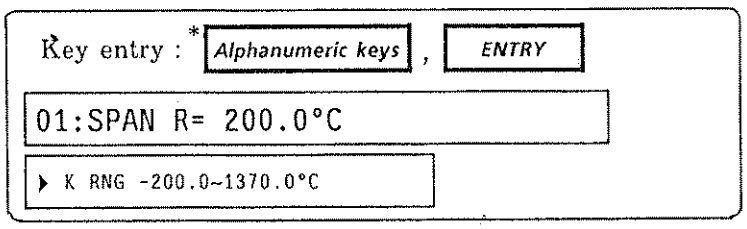
- Set a thermocouple (TC) input.
- Select from the LOWER DISPLAY using the function key.



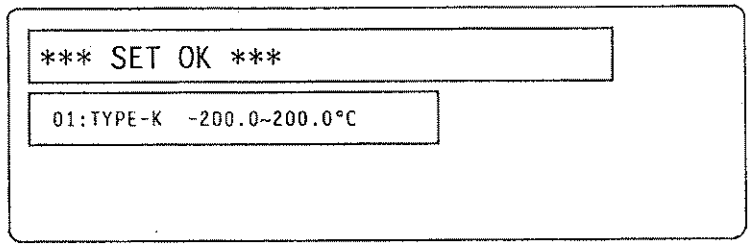
- Press ENTRY to accept the selection and advance to the next screen.
- Select the thermocouple type.



- Input the recording span left value.
- Input the value via the numeric key by referring to the allowable input range on the LOWER DISPLAY
- The decimal point is automatically set depending on the range code.



- Input the recording span right value.

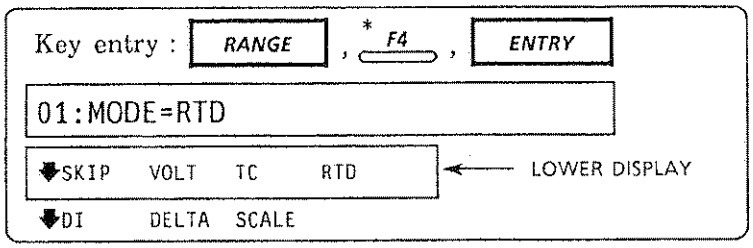


- The "SET OK" message is displayed to show that the settings have been accepted internally.
- The LOWER DISPLAY shows the information entered.
- Pressing ENTRY again will return you to the starting screen.
- To proceed to the next channel, press CH UP △ to change the channel number.
- To return to the data display mode, press the UPPER DISPLAY key.

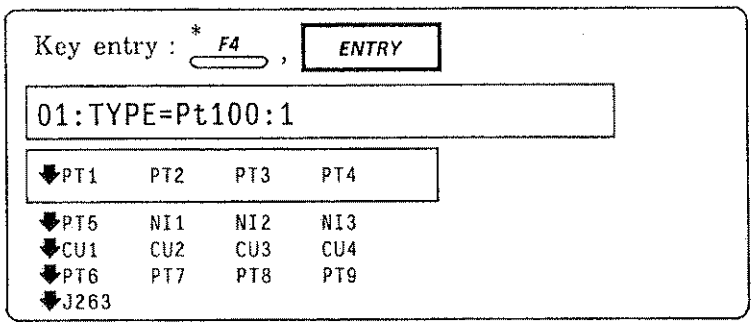
6.7.3 Resistance Temperature Detector (RTD) Measurement Setting

The following describes range setting when the measurement sensor is a resistance temperature detector (RTD).

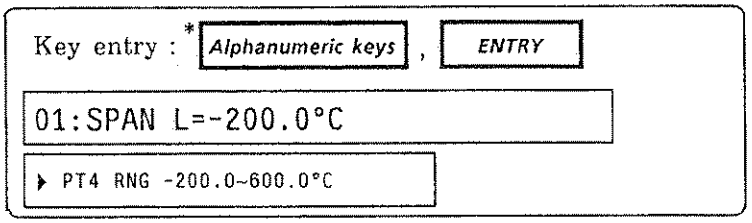
[Key Entry, Panel Displays] The panel displayed when * key is pressed. **[Description]**



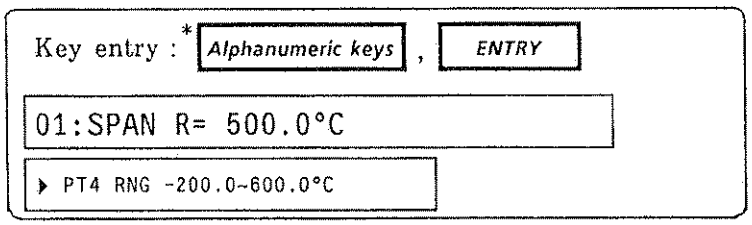
- Set a resistance temperature detector (RTD) input.
- Select from the LOWER DISPLAY using the function key.



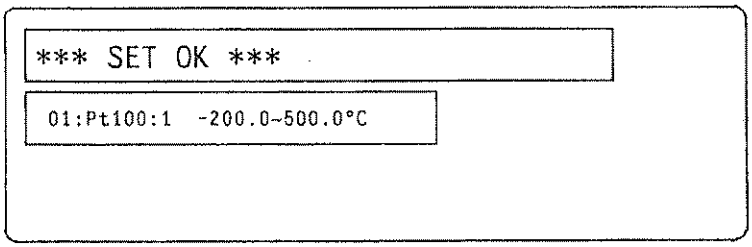
- Press ENTRY to accept the selection and advance to the next screen.
- Select the RTD input type.



- Input the recording span left value.
- Input the value via the numeric key by referring to the allowable input range on the LOWER DISPLAY.
- The decimal point is automatically set depending on the range code.



- Input the recording span right value.



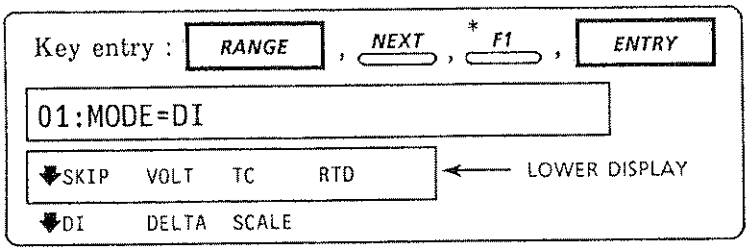
- The "SET OK" message is displayed to show that the settings have been accepted internally.
- The LOWER DISPLAY shows the information entered.
- Pressing ENTRY again will return you to the starting screen.
- To proceed to the next channel, press CH UP △ to change the channel number.
- To return to the data display mode, press the UPPER DISPLAY key.

(RTD Type Description)

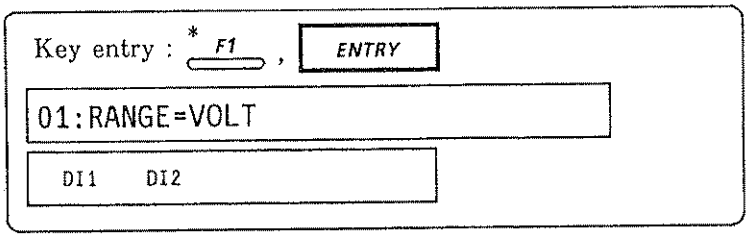
LOWER DISPLAY	UPPER DISPLAY	
PT1	JPt100 : 1	
PT2	JPt100 : 2	
PT3	Pt50 : 2	
PT4	Pt100 : 1	
PT5	Pt100 : 2	
NI1	Ni100 : 1-SAMA	
NI2	Ni100 : 1-DIN	
NI3	Ni120 : 1	
CU1	Cu10 : GE	
CU2	Cu10 : L&N	
CU3	Cu10 : WEED	
CU4	Cu10 : BAILEY	
PT6	JPt100 : 1-H	High-sensitivity
PT7	JPt100 : 2-H	
PT8	Pt100 : 1-H	
PT9	Pt100 : 2-H	
J263	J263*B	

6.7.4 Setting for Recording Operations Using Contact Input (DI)

[Key Entry, Panel Displays] The panel displayed when * key is pressed. [Description]



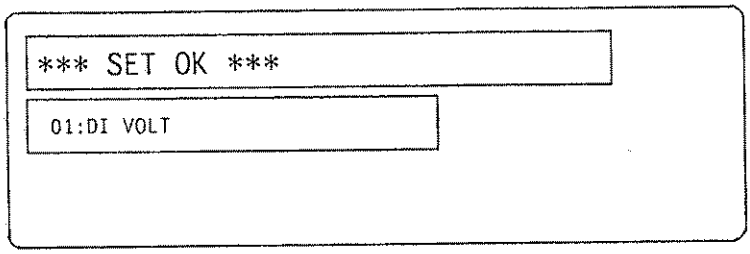
- Set to record equipment operations using contact inputs (DI).
- Select from the LOWER DISPLAY using the function key.



- Determine the contact input type.

DI1 : (VOLT) Records ON / OFF status of a voltage input.
(0 to 2.4V is OFF, 2.4V and higher is ON)

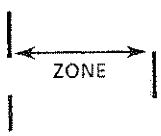
DI2 : (CONTACT) Records ON / OFF status of a mechanical contact.



- The "SET OK" message is displayed to show that the settings have been accepted internally.
- The LOWER DISPLAY shows the information entered.
- Pressing ENTRY again will return you to the starting screen.
- To proceed to the next channel, press CH UP △ to change the channel number.
- To return to the data display mode, press the UPPER DISPLAY key.

The selections made up to this point will result in a recording trace traversing from 0 to 150 mm between the contact OFF and ON states. You should follow the instructions in Section 6.10.7 "Zone Recording Setting" to set a zone for the ON / OFF record.

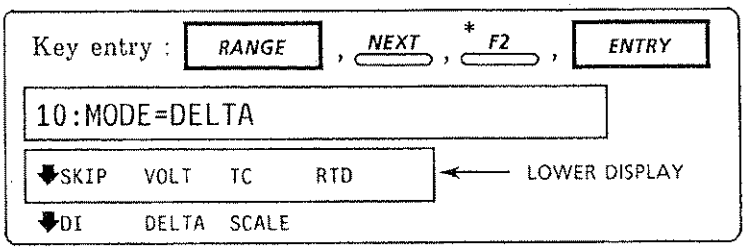
Example : OFF ON



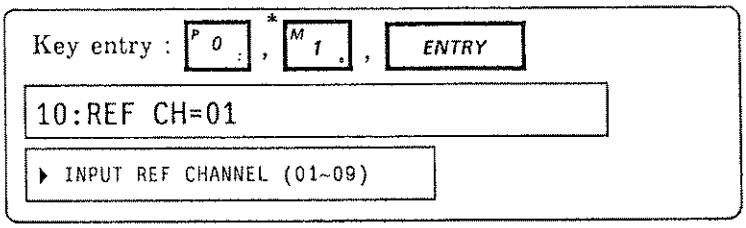
6.7.5 Difference Computation Setting

The following describes the range setting used to obtain the difference between the measured-values of two channels.

[Key Entry, Panel Displays] The panel displayed when * key is pressed. [Description]

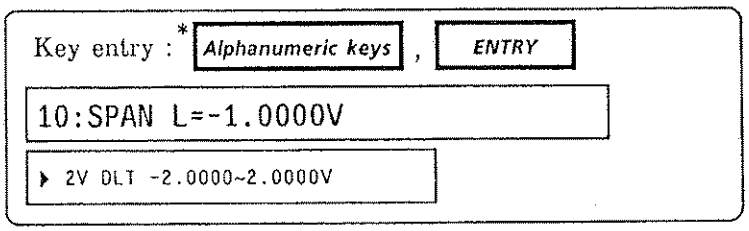


- Set a difference computation (DELTA) input.
- Select from the LOWER DISPLAY using the function key.

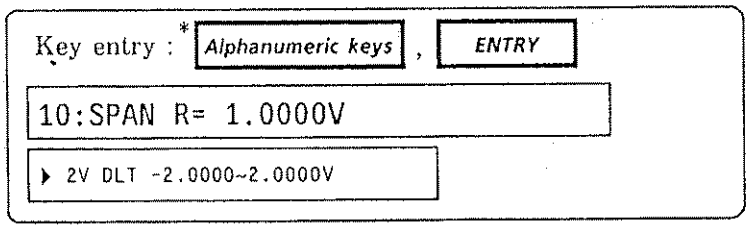


- Input the reference channel for the difference computation.

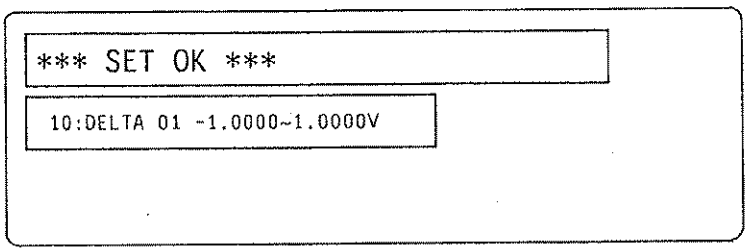
  Note : The channel number of the reference channel must be lower than that of the channel being setting.



- Input the recording span left value.
- The range will be automatically set to the same range as the reference channel.
- Input the value via the numeric key by referring to the allowable input range on the LOWER DISPLAY.



- Input the recording span right value.



- The "SET OK" message is displayed to show that the settings have been accepted internally.
- The LOWER DISPLAY shows the information entered.
- Pressing ENTRY again will return you to the starting screen.
- To proceed to the next channel, press CH UP △ to change the channel number.
- To return to the data display mode, press the UPPER DISPLAY key.

<Allowable Range Settings and Maximum Span Values for Difference Computation Mode>

(1) Thermocouple (TC)

	°C	°F		°C	°F
	Range	Range		Range	Range
R	−1760.0 to 1760.0	−3168 to 3168	T	−600.0 to 600.0	−1080.0 to 1080.0
S	−1760.0 to 1760.0	−3168 to 3168	N	−1300.0 to 1300.0	−2340 to 2340
B	−1820.0 to 1820.0	−3276 to 3276	W	−2315.0 to 2315.0	−4167 to 4167
K	−1570.0 to 1570.0	−2826 to 2826	L	−1100.0 to 1100.0	−1980.0 to 1980.0
E	−1000.0 to 1000.0	−1800.0 to 1800.0	U	−600.0 to 600.0	−1080.0 to 1080.0
J	−1300.0 to 1300.0	−2340.0 to 2340.0	Kp vs Au7Fe	−300.0K to 300.0K	−300.0K to 300.0K

(2) Resistance Temperature Detector (RTD)

	°C	°F		°C	°F
	Range	Range		Range	Range
Pt100 : 1 JPt100 : 1	−750.0 to 750.0	−1350.0 to 1350.0	Cu10 : GE	−500.0 to 500.0	−900.0 to 900.0
Pt100 : 2 JPt100 : 2	−450.0 to 450.0	−810.0 to 810.0	Cu10 : L & N	−500.0 to 500.0	−900.0 to 900.0
Pt50 : 2	−750.0 to 750.0	−1350.0 to 1350.0	Cu10 : WEED	−500.0 to 500.0	−900.0 to 900.0
Pt100 : 1	−800.0 to 800.0	−1440.0 to 1440.0	Cu10 : BAILEY	−500.0 to 500.0	−900.0 to 900.0
Pt100 : 2	−450.0 to 450.0	−810.0 to 810.0	Pt100 : 1 (JPt) High sensitivity	−290.00 to 290.00	−522.0 to 522.0
Ni 100 : 1 DIN	−240.0 to 240.0	−432.0 to 432.0	Pt100 : 2 (JPt) High sensitivity	−140.00 to 140.00	−252.0 to 252.0
Ni 100 : 1 SAMA	−450.0 to 450.0	−810.0 to 810.0	Pt100 : 1 High sensitivity	−290.00 to 290.00	−522.0 to 522.0
Ni 120 : 1	−270.0 to 270.0	−486.0 to 486.0	Pt100 : 2 High sensitivity	−140.00 to 140.00	−252.0 to 252.0
J263*B	−300.0K to 300.0K	−300.0K to 300.0K			

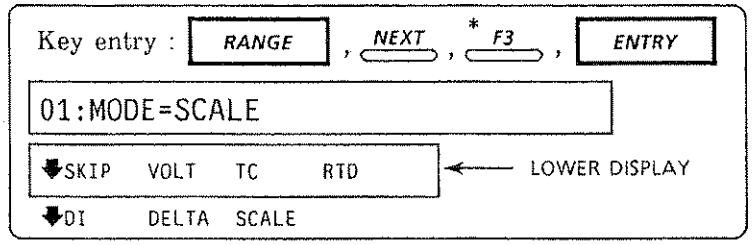
(3) DC Voltage

Range	Range
20 mV	−20.000 to 20.000
60 mV	−60.00 to 60.00
200 mV	−200.00 to 200.00
2 V	−2.0000 to 2.0000
6 V	−6.000 to 6.000
20 V	−20.000 to 20.000
50 V	−50.00 to 50.00

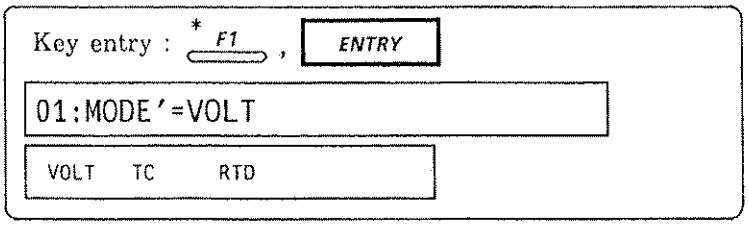
6.7.6 Scaling Setting (with Unit Assignment Capability)

The following describes the range setting used for scaling measured data.

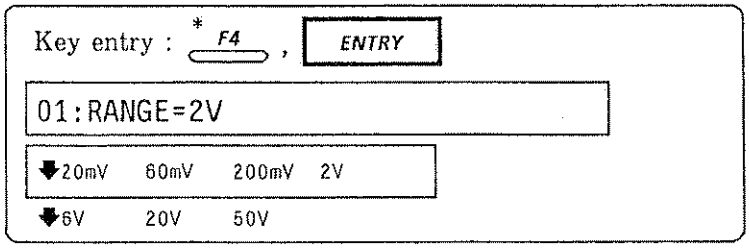
[Key Entry, Panel Displays] The panel displayed when * key is pressed. [Description]



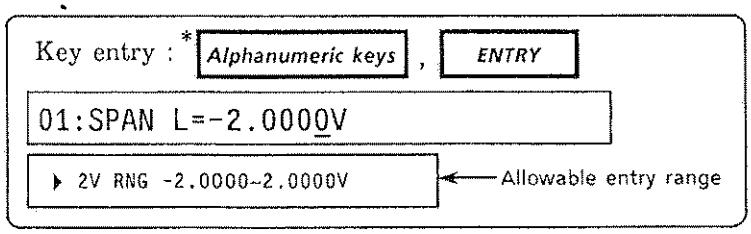
- Setting for scaling.
- Select from the LOWER DISPLAY using the function key.



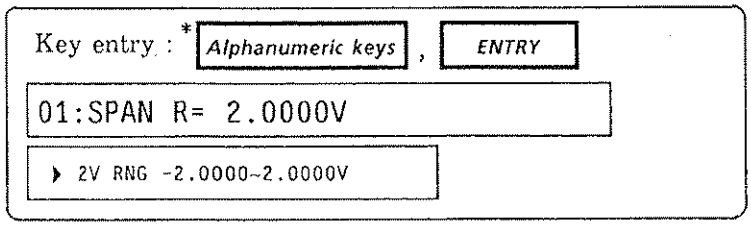
- Specify whether the input type to be scaled is voltage (VOLT), thermocouple (TC), or resistance temperature detector (RTD).
  This example shows scaling for a voltage input.



- Use a 2V voltage range.

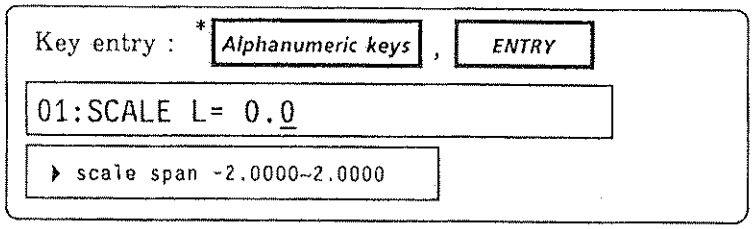


- Input the recording span left value.
- Input the value via the numeric key in referring to the allowable input range on the LOWER DISPLAY.
- The decimal point is automatically set depending on the range code.

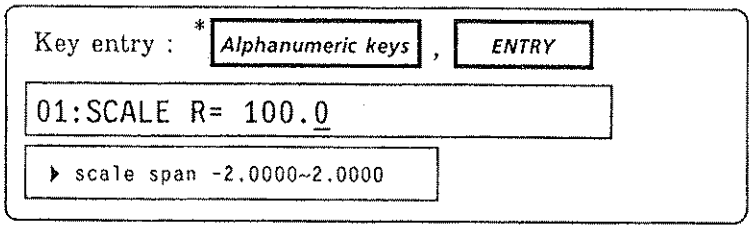


- Input the recording span right value.

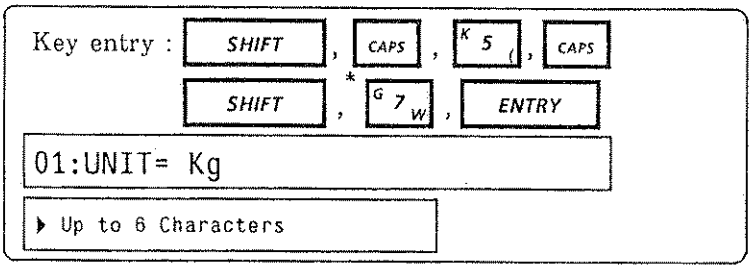
[Key Entry, Panel Displays] The panel displayed when * key is pressed. [Description]



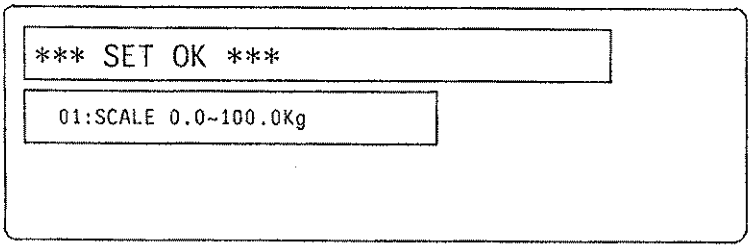
- Input the scale value corresponding to the span left value entered two screens before. Include the decimal point position in the input.
  (In this example, −2.0000V will be scaled to "0.0". The allowable input range is −20000 to +20000.)



- Input the scale value corresponding to the span right value entered two screens before.
  (In this example, +2.0000V will be scaled to "100.0".)
- The decimal point for span right is automatically set to the same position as that for span left.



- Append units to the scaled value. Up to six characters can be input.

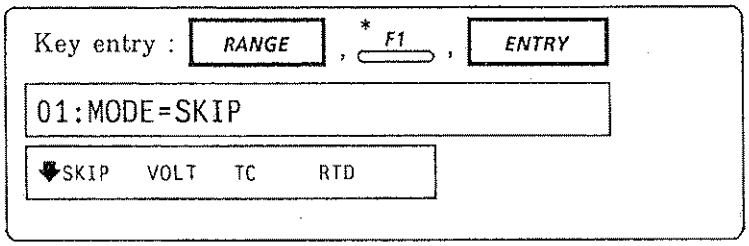


- The "SET OK" message is displayed to show that the settings have been accepted internally.
- The LOWER DISPLAY shows the information entered.
- Pressing ENTRY again will return you to the starting screen.
- To proceed to the next channel, press CH UP △ to change the channel number.
- To return to the data display mode, press the UPPER DISPLAY key.

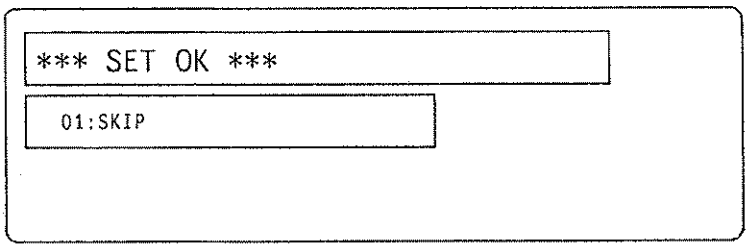
6.7.7 Skip Setting

The recorder can be setting so as not to perform data measurement, recording and display for unused channels.

[Key Entry, Panel Displays] The panel displayed when * key is pressed. [Description]



- Set to skip No.1 channel.



- The "SET OK" message is displayed to show that the settings have been accepted internally.
- The LOWER DISPLAY shows the information entered.
- Pressing ENTRY again will return you to the starting screen.
- To proceed to the next channel, press CH UP △ to change the channel number.
- To return to the data display mode, press the UPPER DISPLAY key.

CAUTIONS

1. Alarms are automatically turned OFF on the affected channel when the following types of changes are performed. Exercise care when making these changes.
   (1) When measurement mode (SKIP, VOLT, TC ....) is changed.
   (2) When measurement range is changed.
   (3) When any of the following are changed, if scaling is ON.
   - Decimal point position for linear scaling
   - Measurement mode (VOLT, TC, RTD) or range
   - Scaling LEFT
   - Scaling RIGHT
   - Span LEFT
   - Span RIGHT

   (4) Difference alarms (dH, dL) only are turned OFF in the case of DELTA (channel-to-channel difference) when the reference channel is changed or the reference channel measurement mode or range is changed.

2. Partial compression / expansion is automatically turned OFF on the affected channel when the following types of changes are performed. Exercise care when making these changes.
   (1) When measurement mode (SKIP, VOLT, TC ....) is changed.
   (2) In the case of DELTA (channel-to-channel difference), when the reference channel is changed
   (3) When measurement range is changed.
   (4) When any of the following are changed, if scaling is on.
   - Decimal point position for linear scaling.
   - Measurement mode (VOLT, TC, RTD) or range
   - Scaling LEFT
   - Scaling RIGHT
   - Span LEFT
   - Span RIGHT

   (5) When the recording span is changed.

3. When, in the case of DELTA (difference computation), the reference channel measurement mode (SKIP, VOLT, TC ....) or the measurement range is changed, the channel which was performing the difference computation will be released from difference computation mode and its span values will be set to the range maximum (right) and minimum (left).

   Examples :

	Measurement Mode	Range	SPAN L	SPAN R
01ch	TC	Type-T	−100.0	300.0
		Reference Channel	SPAN L	SPAN R
02ch	DELTA	01ch	−100.0	100.0

   Assume that the setup is as above, and that channel 01 is changed as follows.

	Measurement Mode	Range	SPAN L	SPAN R
※ 01ch	VOLT	2V	−2.0000	2.0000

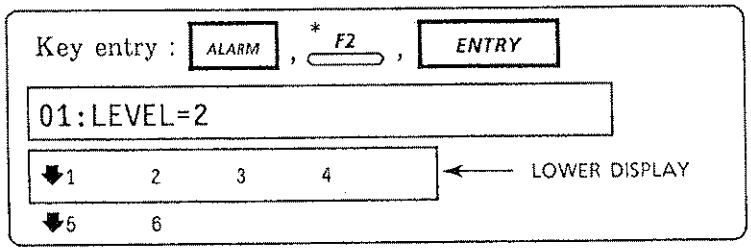
   This cancels difference computation on channel 02, which becomes as follows.

	Measurement Mode	Range	SPAN L	SPAN R
※ 02ch	TC	Type-T	−200.0	400.0

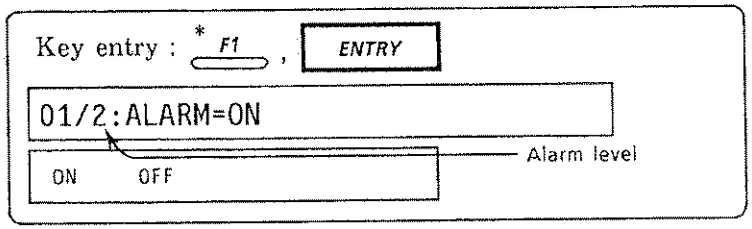
6.8 Alarm Setting

- Alarms can be set on the measured data of any channel.
- The available alarm types are high and low limit (H, L), rate-of-change limits on increasing and decreasing signals (RH, RL), and high and low difference limits.
- Relay output numbers can also be assigned for alarm output relays (optional).
- Up to six alarms can be set per channel.
- Pressing the ALARM key displays the starting screen.
- Any alarm setpoint can be set with the numerical and alphabetical keys if it is within a settable range.

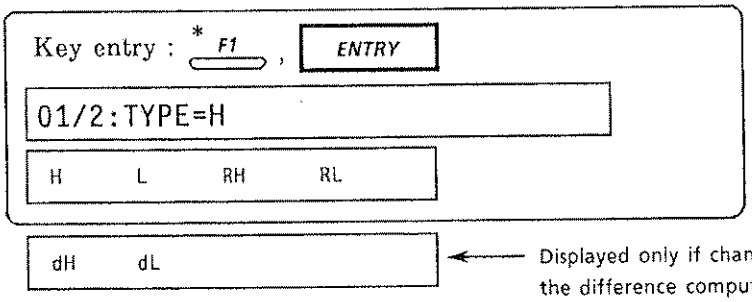
[Key Entry, Panel Displays] The panel displayed when * key is pressed. [Description]



- Set the first alarm ON of channel No.1.
- Select the alarm level to be set from among those (1 to 6) listed in the LOWER DISPLAY.



- Turn ON the alarm for level 2 ON of channel No.1.



- Select a high limit (H) alarm for level 2 of channel No.1.

6.8

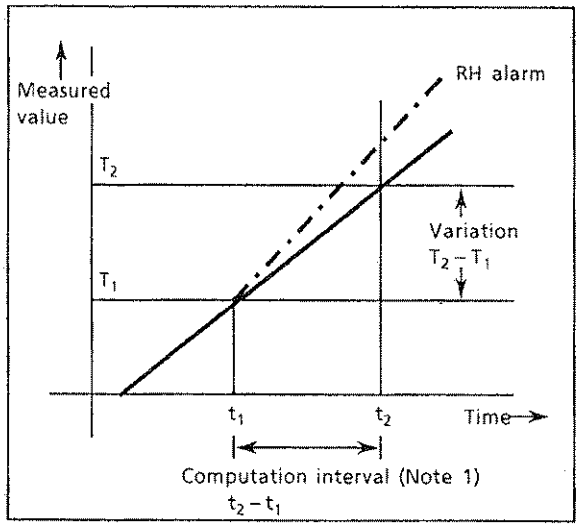
<Alarm Types>

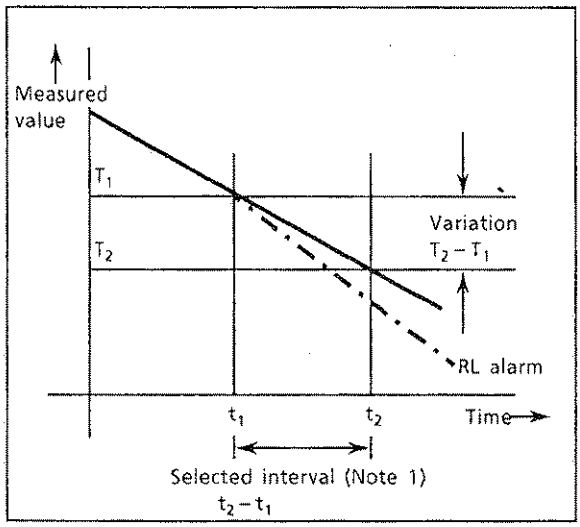
H ..... **High Limit Alarm**
Alarm is generated when the measured value is higher than the alarm setting.

L ..... **Low Limit Alarm**
Alarm is generated when the measured value is lower than the alarm setting.

RH ..... **Rate-of-change Limit on Increase**
Alarm is generated when the measured value variation in the ascending direction during the selected interval is greater than the alarm setting.

RL ..... **Rate-of-change Limit on Decrease**
Alarm is generated when the measured value variation in the descending direction during the selected interval is greater than the alarm setting (treating both as signed values).





6.8

Note 1 : The selected interval is determined by the computation interval selected during rate-of-change alarm setup, Section 6.11.3 (8). (1 to 15 measurement scan intervals, initial value = 1 scan)

Note 2 : When any of the following conditions occurs, the measurement of variation for the ascending and descending rate-of-change alarms begins again from that instant.

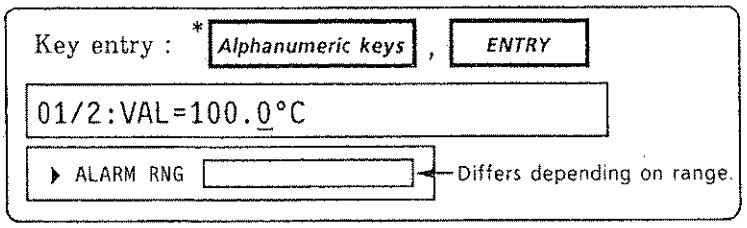
(1) Power is turned ON.
(2) Measurement mode (VOLT, TC, RTD ...) is changed.
(3) Measurement range is changed.
(4) If scaling is ON, and any of the following are changed:
- Span LEFT
- Span RIGHT
- Scaling LEFT
- Scaling RIGHT
- Decimal point position for linear scaling

(5) Alarm turned ON or OFF in setup.
(6) There are no more rate-of-change alarms.

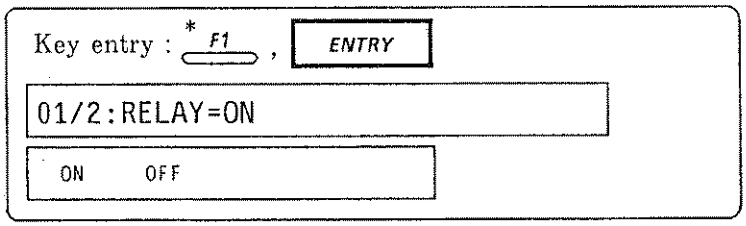
dH ..... **Difference High-limit Alarm**
Alarm is generated when the difference between the measured values of two channels is greater than the alarm setting.

dL ..... **Difference Low-limit Alarm**
Alarm is generated when the difference between the measured values of two channels is less than the alarm setting (treating both as signed values).

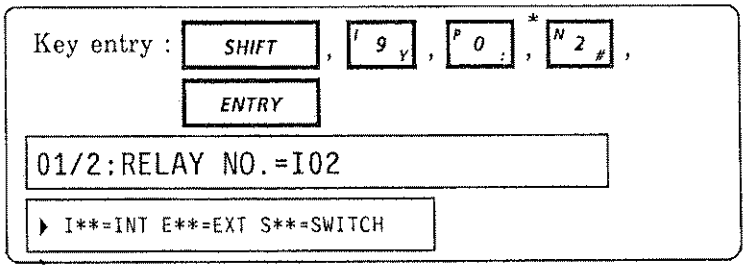
[Key Entry, Panel Displays] The panel displayed when * key is pressed. [Description]



- Input the alarm setting. An alarm will be generated when the measurement data reaches this value.

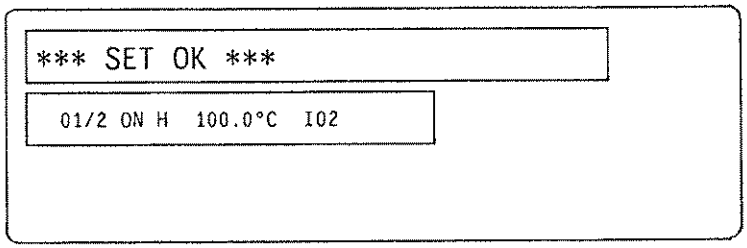


- Select whether or not to provide a relay output using the alarm output relays (option).



- Specify the number of the relay to use for output. Here we set internal output relay I02 as the output.

I01 through I02 .... Internal alarm output relays
S01 through S10 ... Internal (software) switches



- The "SET OK" message is displayed to show that the settings have been accepted internally.
- The LOWER DISPLAY shows the information entered.
- Pressing ENTRY again will return you to the starting screen.
- To proceed to the next channel, press CH UP △ to change the channel number.
- To return to the data display mode, press the UPPER DISPLAY key.

CAUTIONS

1. Alarm hysteresis can be set by the procedure in Section 6.11.3 (9).
2. Alarms cannot be set on DI or SKIP input measurements.
3. Alarms are automatically turned OFF on the affected channel when the following types of changes are performed. Exercise care when making these changes.
   (1) When measurement mode (SKIP, VOLT, TC ....) is changed.
   (2) When measurement range is changed.
   (3) When any of the following are changed, if scaling is ON.
   - Measurement mode (VOLT, TC, RTD) or range
   - Span LEFT
   - Span RIGHT
   - Scaling LEFT
   - Scaling RIGHT
   - Decimal point position for linear scaling

   (4) Difference alarms (dH, dL) only are turned OFF in the case of DELTA (channel-to-channel difference) when the reference channel is changed or the reference channel measurement mode or range is changed.
   (5) Output relays can be used as OR or AND gates by assigning multiple alarms to a single relay.
   Example :

CH No.	Level No.	Mode	Alarm setting value	Relay No.
02	5	H	100.0°C	I02
05	3	H	110.0°C	I02

   I02 will turn on when an alarm is generated on either of channel 02 level 5 or channel 05 level 3 (when set for OR output).
   The selection between OR and AND is done in setting mode as described in Section 6.11.3 (2), "Internal Alarm Relay Output AND/OR Selection".

6.9 Chart Speed Setting

- Chart speed setting selects the rate at which the chart is fed.
- Pressing the [CHART] key calls up the starting display.

[Key Entry, Panel Displays] The panel displayed when * key is pressed. [Description]

Key entry : [CHART] , [ASP Q] , [M 1] , [P 0] , [P 0]

CHART SP= 100mm/H

▸ Chart Speed: 1~1500mm/H ← LOWER DISPLAY

- Set the chart speed.

The allowable setting range is 1 to 1500 mm / hour.

Key entry : [ENTRY]

*** SET OK ***

CHART SPEED= 100mm/H

- The "SET OK" message is displayed to show that the settings have been accepted internally.
- The LOWER DISPLAY shows the chart speed entered.
- Pressing [ENTRY] again will return you to the starting display.
- To return to the data display mode, press the [UPPER DISPLAY] key.

CAUTIONS

Selection of the chart speed that will go into effect when an alarm occurs for change-on-alarm, or when the remote control contact is ON, is performed using "CHART" " in the [AUX] setting (Section 6.10.10).

There are two modes for analog recording interval : AUTO and FIX.

AUTO ..... Analog recording interval is automatically determined based on chart speed.

FIX ..... Interval is same as measurement interval.

AUTO / FIX selection is done using "SYSTEM" in [AUX] setting.

For details on this, see Section 6.10.2 (3), "Trend Recording Mode Selection".

6.9

- Relationship between chart speed and printing (when combining analog and digital recording)

(For recording of 30-point / 6-sec.)

Chart Speed	CH No. Tag No.	Date / Time Chart Speed Measured Value	Alarm Scale Value Messages (Titles)
1 to 9 mm / h	Recordable	Not recordable	Recordable
10 to 500mm / h	Recordable	Recordable	Recordable
501 to 1500mm / h	Not recordable	Not recordable	Not recordable

- Relationship between chart speed and digital recording interval (when interval is in SINGLE mode in analog and digital recording.)

Chart Speed	Spacing Between Digital Measured Value Recordings	
	1 Row	2 Rows
10 to 24mm / h	12-hr	6-hr
25 to 49mm / h	4-hr	2-hr
50 to 99mm / h	2-hr	1-hr
100 to 500mm / h	1-hr	30-min

6.10 Settings Under AUX

These are parameters which are normally left set at their initialization values, but for which capability for modification during measurement has been provided based on user requests.

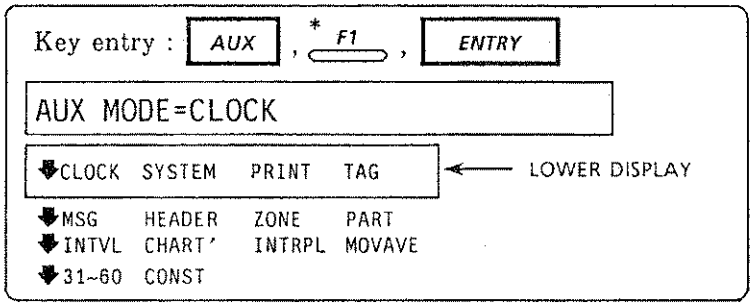
These parameters divide broadly into the following. Initial values are given in parentheses ( ).

6.10.1	CLOCK	Clock time-of-day adjustment
6.10.2	SYSTEM	Recording format (TREND)
		Recording mode selection (NONE)
		Trend recording mode (AUTO)
6.10.3	PRINT FORMAT	Recording ON / OFF (ON)
		Logging interval specification (1 hour)
6.10.4	TAG	Tag settings (all spaces)
6.10.5	MESSAGE	Message settings, including TITLE (all spaces)
6.10.6	HEADER	Header setting (all spaces)
6.10.7	ZONE	Zone recording setting (0 to 150 mm)
6.10.8	PARTIAL	Partial compression / expansion (OFF)
6.10.9	INTVL	Logging interval setting
6.10.10	CHART'	Chart speed and logging interval settings to be used when change-on-alarm or remote control is in effect.
6.10.11	INTERPOLATION	Interpolation setting (OFF)
6.10.12	MOVE AVE	Moving average (OFF)

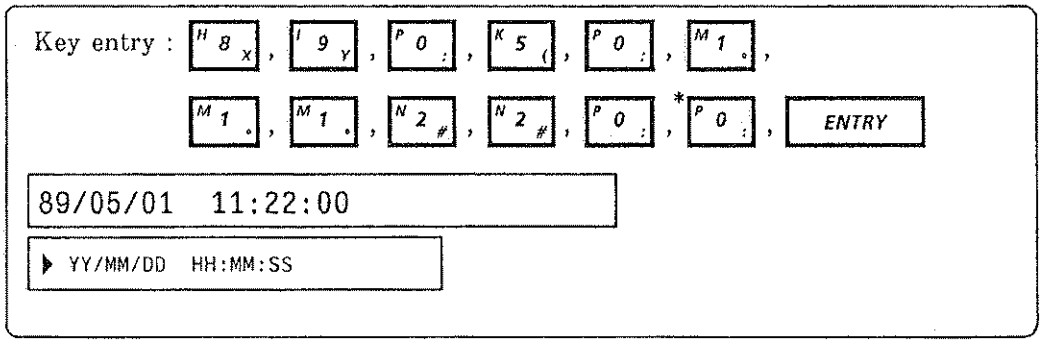
6.10.1 CLOCK Setting

Press the AUX key to call up the starting display.

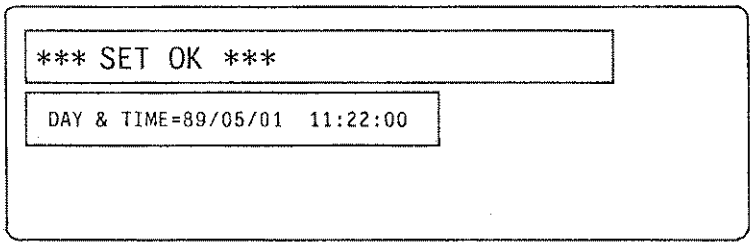
[Key Entry, Panel Displays] The panel displayed when * key is pressed. [Description]



- Set the time-of-day maintained by the recorder's internal clock.
- Select CLOCK from among the selections on the LOWER DISPLAY.



- Advance to the next display with the ENTRY key and enter the year, month, day, hour, minute and second in that order.



- The "SET OK" message is displayed to show that the settings have been accepted internally.
- The LOWER DISPLAY shows the information entered.
- Pressing ENTRY again will return you to the starting display of this mode.
- Press the AUX key to select setting for a different mode. To return to the data display mode, press the UPPER DISPLAY key.

6.10

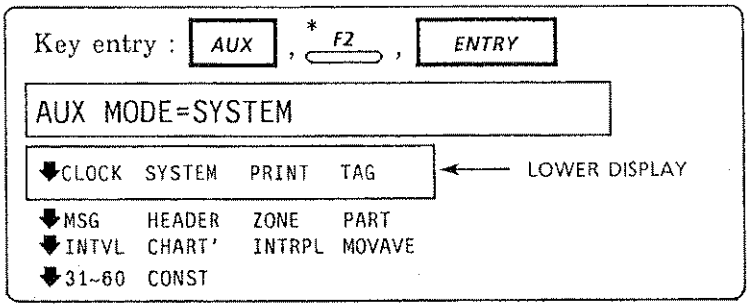
6.10.2 SYSTEM Setting

For all channels, set the following:

- the recording format (in trend mode or logging mode)
- the recording mode (normal recording, change-on alarm, or print-on alarm)
- the trend mode (AUTO or FIX)

Press the AUX key to call up the starting display.

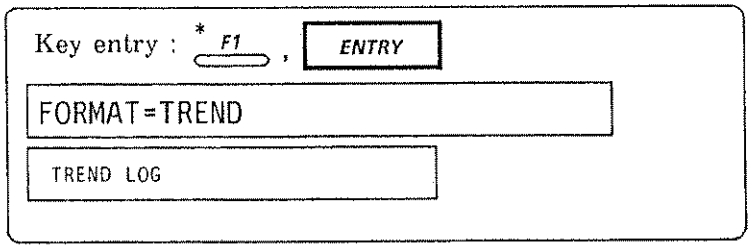
[Key Entry, Panel Displays] The panel displayed when * key is pressed. [Description]



- Set the recording system.
- Select SYSTEM from the selections on the LOWER DISPLAY.

(1) FORMAT Selection

Select whether to put recording into TREND (analog + digital) mode or into LOGGING (digital only) mode.

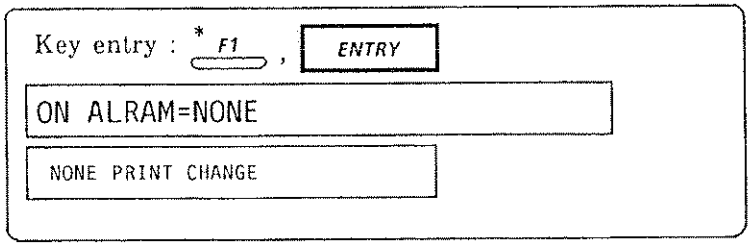


- Select either TREND or LOGGING for recording format. (initial value = TREND)

(2) Recording Mode Selection

Selects either normal mode (NONE), CHANGE ON ALARM mode, or PRINT ON ALARM mode.

- NONE ..... Recording is started by pressing the START/STOP key once, and stopped by pressing it again.
- CHANGE ON ALARM ... A mode in which generation of an alarm causes chart speed and logging interval to change from their normal values to a speed and interval set up in advance for use when alarms occur. (see Section 6.10.10.)
  When data is entered, the mark C is displayed.
- PRINT ON ALARM ..... A mode in which recording starts when an alarm is generated.
  When data is entered, the mark P displayed.



- Select normal recording mode. (initial setting = NONE)

Note: When the SET UP CNTRL demand is "EXT", if other than "NONE" is specified, an error occurs.

(3) Trend Recording Mode Selection

Determines whether trend recording mode is AUTO or FIX.

- When mode is AUTO ..... Recording interval is determined automatically based on chart speed.

  1. Trend recording interval is determined by :

     $$\text{Measurement interval} \times N \leqq 720 \times \frac{1}{\text{Chart Speed (mm/h)}}$$

     (N = 1, 2, 3 ... integer)

     Example : Measurement interval = 2 seconds

     Chart Speed = 100 mm/h

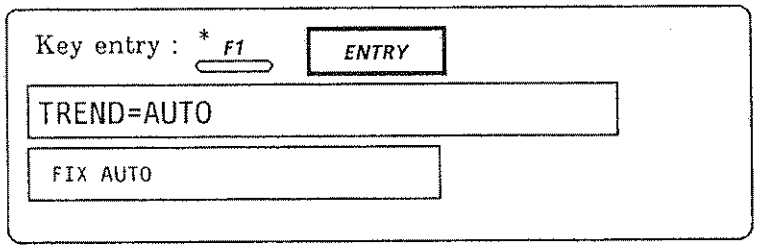
     $$\frac{720}{100 \text{ mm/h}} = 7.2 \text{ seconds}$$

     From the above, the trend recording interval becomes 6.

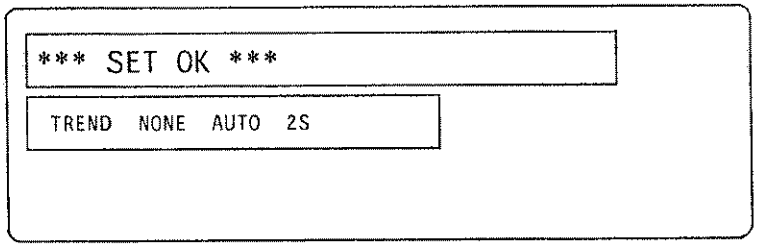
  2. If the above computation yields a result smaller than the measurement interval, the trend recording interval becomes the same as the measurement interval.

- When mode is FIX ..... Trend recording is performed at same interval as the scan interval set in SET UP mode. See Section 6.11.2 (1) "SCAN INTERVAL Selection".

[Key Entry, Panel Displays] The panel displayed when * key is pressed. [Description]



- Set trend recording mode to AUTO.



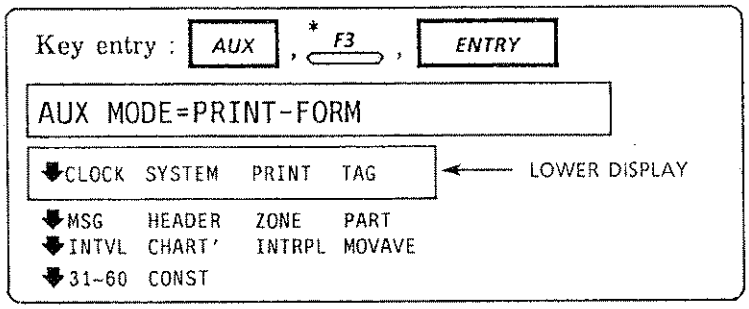
- The "SET OK" message is displayed to show that the settings have been accepted internally.
- The LOWER DISPLAY shows the information entered.
- Pressing ENTRY again will return you to the starting display of this mode.
- Press the AUX key to select setting for a different mode. To return to the data display mode, press the UPPER DISPLAY key.

6.10.3 PRINT FORMAT Setting (Individual Channel Recording ON/OFF)

This mode allows setting of three selections:

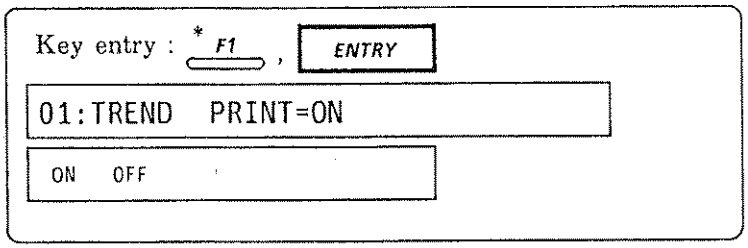
- Whether to give an analog record.
- Whether to give a logging record.
- Which of the logging interval settings to use (when "MULTIPLE" is in effect).

[Key Entry, Panel Displays] The panel displayed when * key is pressed. **[Description]**



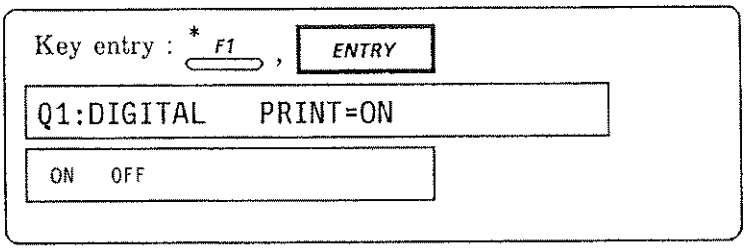
- Perform recording related setting.
- Select PRINT from LOWER DISPLAY selections.

(1) TREND Recording ON/OFF Specification



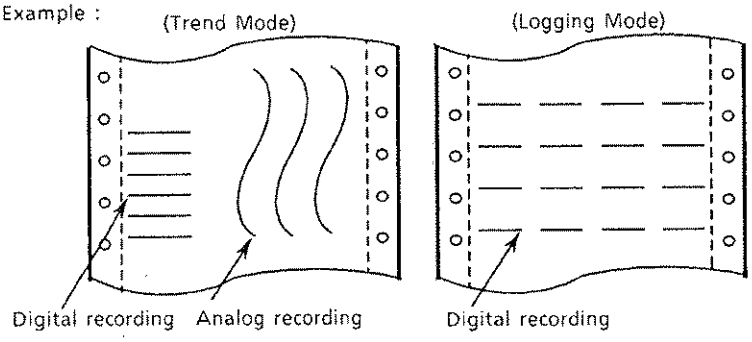
- Select for one channel whether or not to perform analog recording of the measurement data.
- The initial values are set to give an analog record for all channels from 1 through 20.

(2) DIGITAL Recording ON/OFF Specification



- Select for one channel whether or not to perform digital recording of measurement data.

Example :

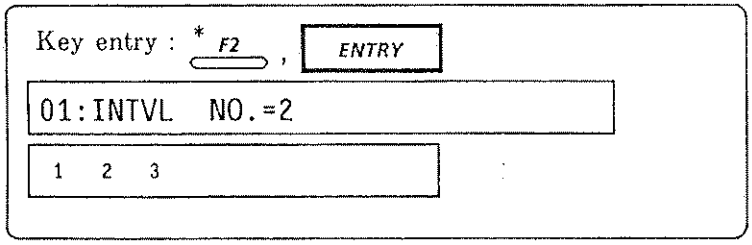


- The initial values are set to give a digital record for all channels from 1 through 20.

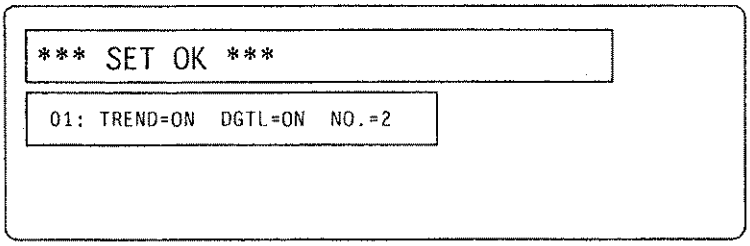
Note : If the logging interval has been set to SINGLE with INTERVAL in SET UP mode (Section 6.11.2), the Logging Interval 1 setting in Section 6.10.9 is automatically selected. (initial value is 1 hour.) Since it is necessary to select from among the three intervals set in Section 6.10.9 only when MULTIPLE is in effect, the procedure following need be done only in that case.

(3) LOGGING INTERVAL Specification

[Key Entry, Panel Displays] The panel displayed when * key is pressed. [Description]



- Select the interval for digital recording of data for one channel. The actual times for the three intervals (when MULTIPLE is in effect) are determined by the procedure in Section 6.10.9 "LOGGING INTERVAL Setting".

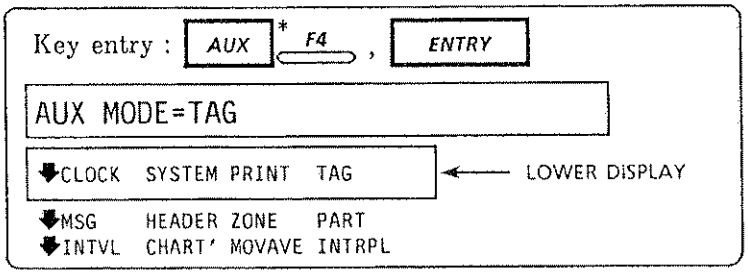


- The "SET OK" message is displayed to show that the settings have been accepted internally.
- The LOWER DISPLAY shows the information entered. Pressing ENTRY again will return you to the starting display of this mode.
- To proceed to the next channel, press CH UP △ key.
- Press the AUX key to select setting for a different mode.
- To return to the data display mode, press the UPPER DISPLAY key.

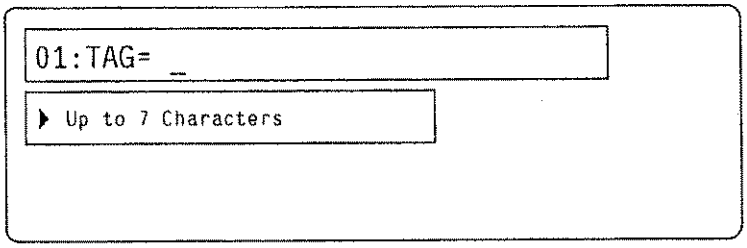
6.10.4 TAG Settings

Comments (tags) can be set to be recorded instead of channel numbers. This mode sets the TAG definitions.

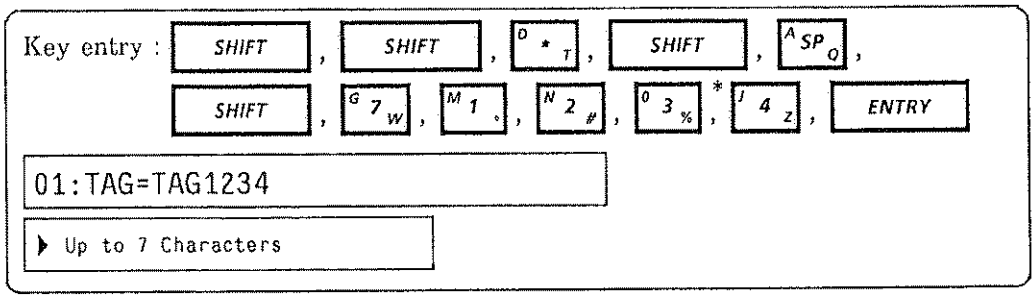
[Key Entry, Panel Displays] The panel displayed when * key is pressed. [Description]



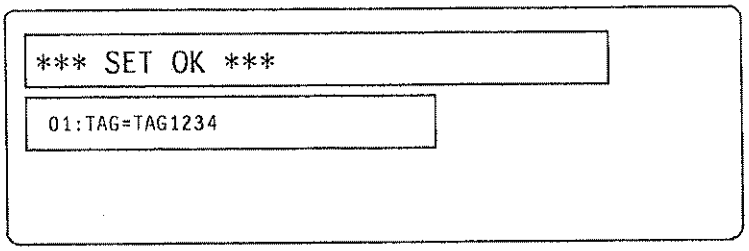
- This procedure sets the tag definitions.
- Select TAG from the LOWER DISPLAY.



- When the ENTRY key is pressed, the display advances to a tag entry display and the cursor appears. Up to seven characters can be entry.



- Entry the tag name.



- The "SET OK" message is displayed to show that the settings have been accepted internally.
  The LOWER DISPLAY shows the information entered.
  Pressing ENTRY again will return you to the starting display of this mode.
- To proceed to the next channel, press CH UP △ key.
- Press the ENTRY key to select setting for a different mode.
- To return to the data display mode, press the UPPER DISPLAY key.

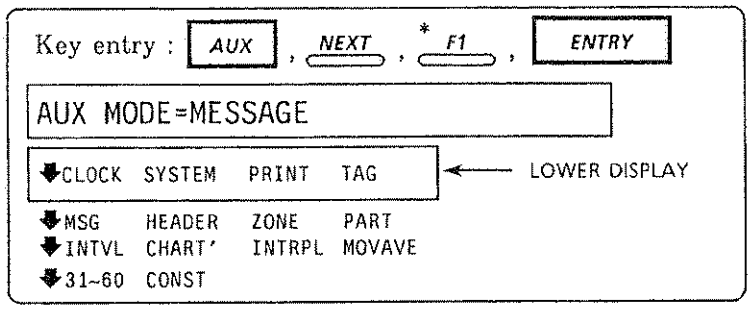
Note : The selection as to whether to record the channel number or the tag name is made in the SET UP mode. (see Section 6.11.1 (1).)

6.10.5 MESSAGE Setting

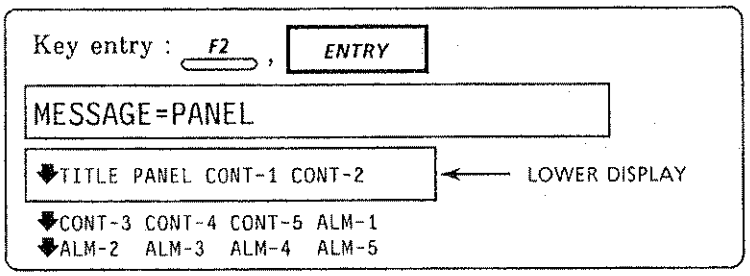
Messages can be set to print out:

- As a title of 32 characters maximum.
- Functions (16 characters) using panel keys (in FUNC KEY CALL).
- Remote controls (5 types, up to 16 characters) from the rear panel.
- Alarm messages (5 types, up to 16 characters).

[Key Entry, Panel Displays] The panel displayed when * key is pressed. **[Description]**

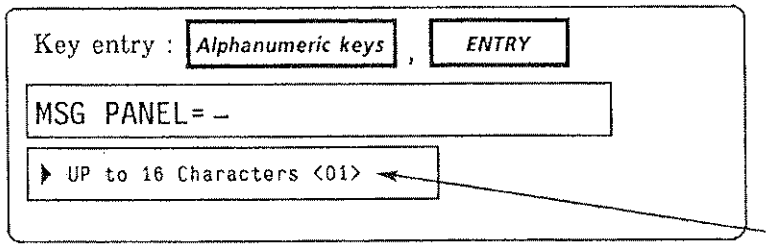


- This procedure sets the message definitions.
- Select MESS from the LOWER DISPLAY line.

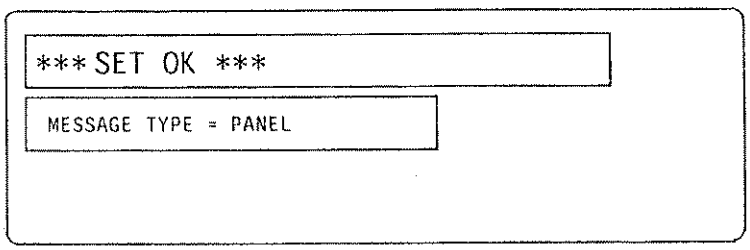


- Here we enter the messages whose recording will be commanded from the front panel keys.

TITLE :	Message for title printing	CONT-5 :	Remote control message 5
PANEL :	Messages commanded from front panel key using FUNC KEY CALL command	ALM-1 :	Alarm condition 1 dependent message 1
		ALM-2 :	Alarm condition 2 dependent message 2
CONT-1 :	Remote control message 1	ALM-3 :	Alarm condition 3 dependent message 3
CONT-2 :	Remote control message 2	ALM-4 :	Alarm condition 4 dependent message 4
CONT-3 :	Remote control message 3	ALM-5 :	Alarm condition 5 dependent message 5
CONT-4 :	Remote control message 4		



- Enter the message definition. (Example at left is for message whose printing is commanded from panel.)



- Setting finished.

The conditions controlling alarm message printing are set using "LOGIC" in SET UP mode. The printing conditions for ALM-1 are set using MSG-1. Similarly, MSG-2 through MSG-5 correspond to ALM-2 through ALM-5.

The following can be set as alarm conditions :

OFF	No message printout
ALL	Print the message when an alarm goes ON in any channel.
SELECT-RELAY ID	Print the message when the internal switch or relay specified by RELAY ID goes from the OFF to the ON state.

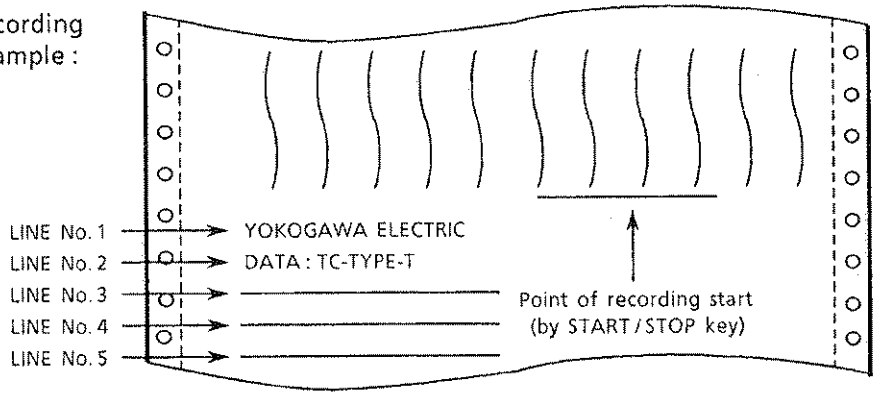
CAUTIONS

1. Title printout is in effect for trend recording only.
   Panel key, remote control and alarm dependent messages are printed out with time of day (hour:minute) plus 16 characters.
2. Remote-control message printout employs edge detection (contact OFF-to-ON transition). Since detection is performed with a one-second cycle period, the contact must remain ON for at least one second.
3. Messages (title, panel key, remote control, alarm control) print only when PRINT START is in effect.
   When PRINT STOP is selected, generation of a message printing request (except title) results in the message data being retained internally; the retained message data is then printed out the next time PRINT START is selected.
4. Message printout data is stored into a memory with capacity for 12 messages, and printed out in sequence. However, if numerous message requests occur in a short interval there may be times when the memory capacity is exceeded because the rate of message printout (output from memory) is slower than that the message printout request rate (input to memory).
   When this occurs, the printout data corresponding to the later messages will not go into memory, and as a result those messages will not be printed.

6.10.6 HEADER Setting

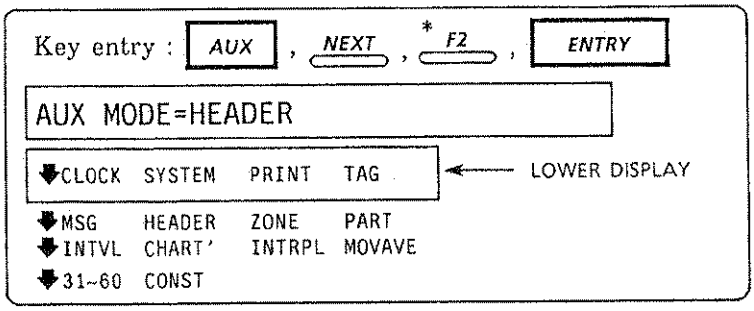
The header can be used to print out comments concerning the recording prior to recording start. Up to 5 lines of 60 characters each can be printed.

Recording example :

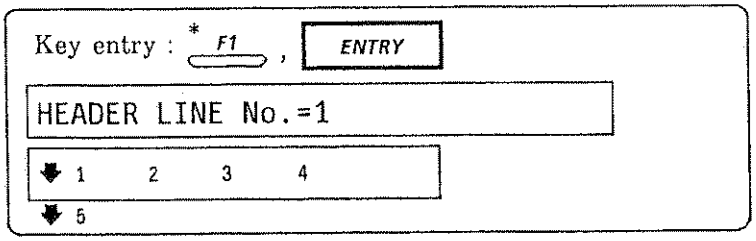


- Pressing the HEADER key on the front panel records the text defined by the entries below (five lines in all, No.1 through No. 5).

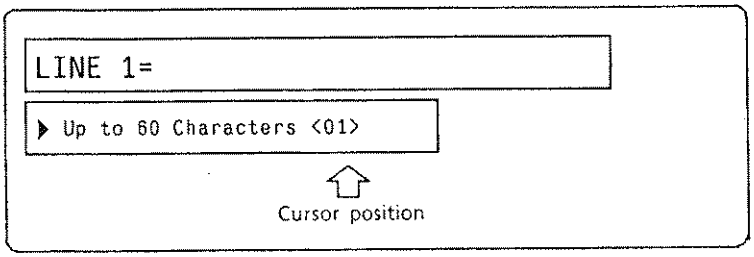
[Key Entry, Panel Displays] The panel displayed when * key is pressed. **[Description]**



- This procedure sets the header definition.
- Select HEADER from the selections on the LOWER DISPLAY line using the function keys.

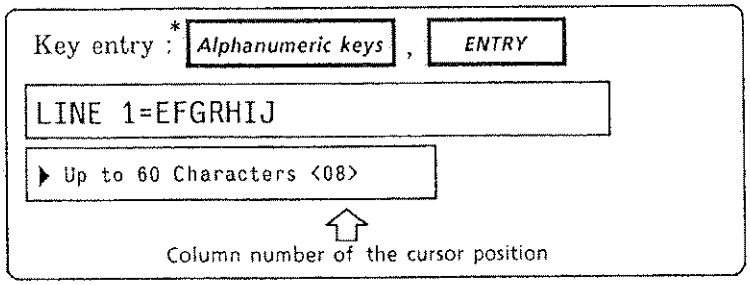


- Select the number of the line to be entered.
  "1" selects Line 1, "5" selects Line 5.



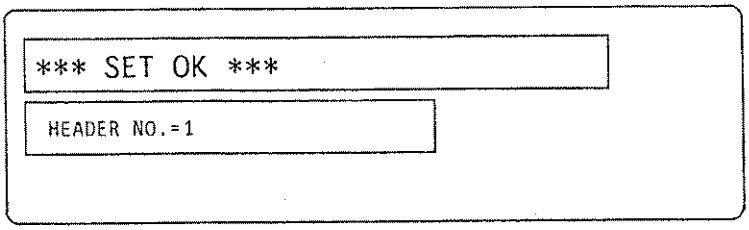
- The display for text entry will appear.

[Key Entry, Panel Displays] The panel displayed when * key is pressed. [Description]



- Enter text.
- The cursor position of the current input point is shown at the right of the LOWER DISPLAY.

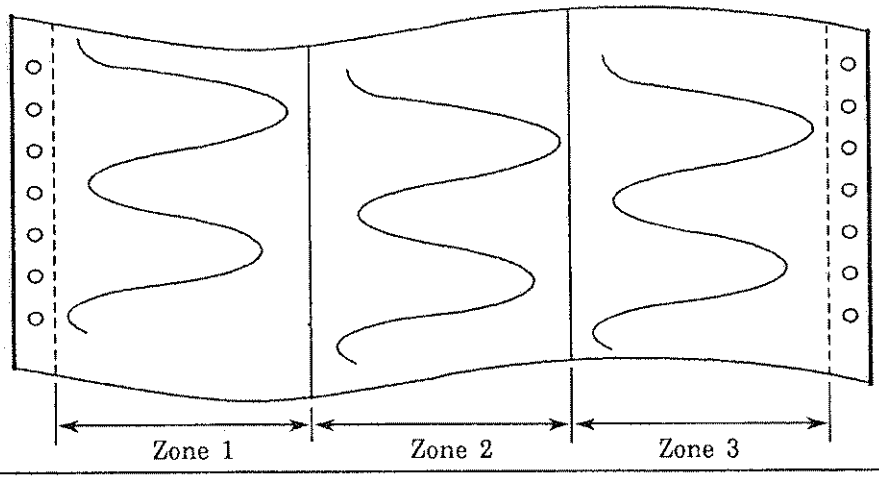
This can be followed by definition entries for several more header lines.



- The "SET OK" message is displayed to show that the settings have been accepted internally.
- The LOWER DISPLAY shows the information entered. Pressing ENTRY again will return you to the starting display of this mode.
- Press the AUX key to select setup for a different mode.
- To return to the data display mode, press the UPPER DISPLAY key.

6.10.7 ZONE Recording Setting (Recording width Setting)

"Zone recording" means :



Zone recording makes it possible to prevent the recording traces of different channels from overlapping each other, through the definition of different recording bands (zones) for individual channels on the chart paper.

[Key Entry, Panel Displays] The panel displayed when * key is pressed. **[Description]**

Key entry : AUX , NEXT , * F3 , ENTRY

```
AUX MODE=ZONE
▼CLOCK  SYSTEM   PRINT  TAG
▼MSG    HEADER   ZONE   PART
▼INTVL  CHART'   INTRPL MOVAVE
▼31~60  CONST
```

← LOWER DISPLAY

- This procedure sets a recording zone.
- Select ZONE from the LOWER DISPLAY line.

Key entry : > , K 5 (, * P 0 : , ENTRY

```
01:ZONE=50~150mm
▶ Zone Left=0~145mm
```

Channel No.

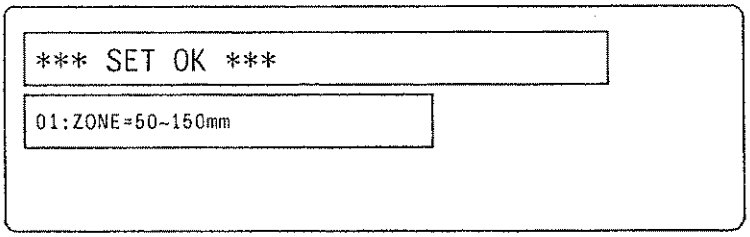
- Input recording zone settings for channel 01.
- This fixes the left boundary during analog recording. This position corresponds to the span-left value set in the range setting step.
- The LOWER DISPLAY line shows the allowable input range.

Key entry : M 1 . , K 5 (, * P 0 : , ENTRY

```
01:ZONE=50~150mm
▶ Zone Right=5~150mm
```

- This fixes the right boundary during analog recording. This position corresponds to the span-right value set in the range setting step. (See Section 6.7.)

[Key Entry, Panel Displays] The panel displayed when * key is pressed. [Description]



* The recording zone for channel 01 has been set to the band between 50 and 150 mm.

- The "SET OK" message is displayed to show that the settings have been accepted internally.
- The LOWER DISPLAY shows the information entered. Pressing ENTRY again will return you to the starting screen of this mode.
- To proceed to the next channel, press CH UP △ key.
- Press the AUX key to select setup for a different mode.
- To return to the data display mode, press the UPPER DISPLAY key.

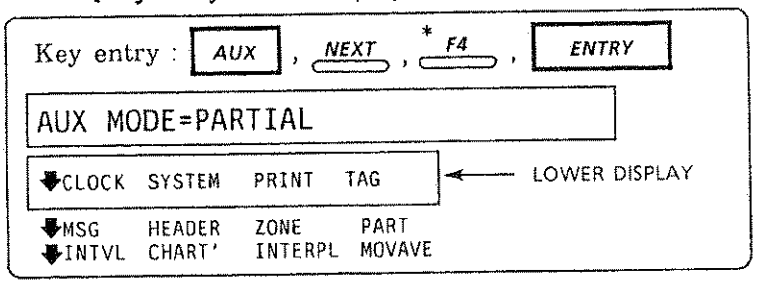
CAUTIONS

- Allowable input ranges : $0 \leqq$ zone left $\leqq 145$
  $5 \leqq$ zone right $\leqq 150$
- The zone left setting must be less than the zone right setting.
- Minimum zone width is 5 mm.

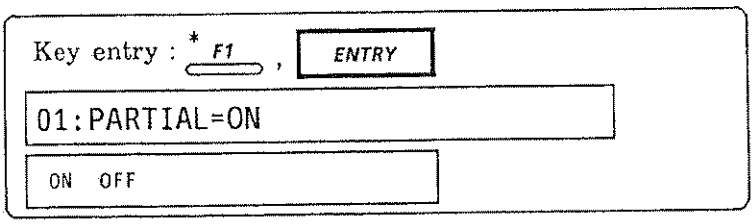
6.10.8 PARTIAL Compression Recording Setting

The partial compression feature makes it possible to compress part of the recording range for differentiated recording of those parts that require detailed examination and parts that do not.

[Key Entry, Panel Displays] The panel displayed when * key is pressed. **[Description]**



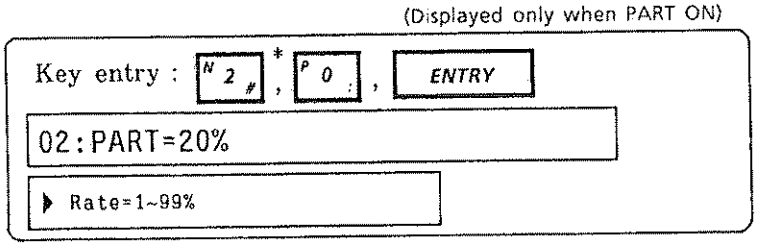
- This procedure sets partial compression recording.
- Select PART from the selections on the LOWER DISPLAY line.



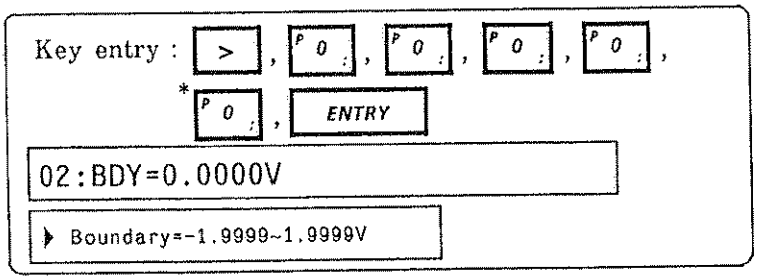
- Turn ON partial compression.

Note : When partial compression is being performed, an ON / OFF designation is required in SET UP mode (RECORD). (See Section 6.11.1 (9))

(Displayed only when PART ON)



- Specify as a percentage that part of the zone full-span width to be compressed.

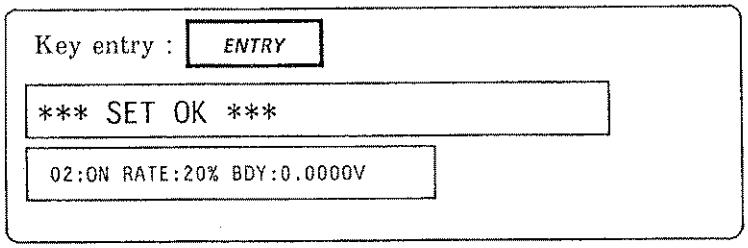


- Set the boundary value for partial compression (must be within the channel span range, and within the scaling range also if scaling is ON.)

Note : Input is not possible if the displayed channel is set for SKIP or DI.

- The LOWER DISPLAY shows the allowable range of input (screen shown is for 2V range).

[Key Entry, Panel Displays]



[Description]

- The "SET OK" message is displayed to show that the settings have been accepted internally.
- The LOWER DISPLAY shows the information entered. Pressing ENTRY again will return you to the starting screen of this mode.
- To proceed to the next channel, press CH UP △ key.
- Press the AUX key to select setting for a different mode.
- To return to the data display mode, press the UPPER DISPLAY key.

(Normal Recording Example)

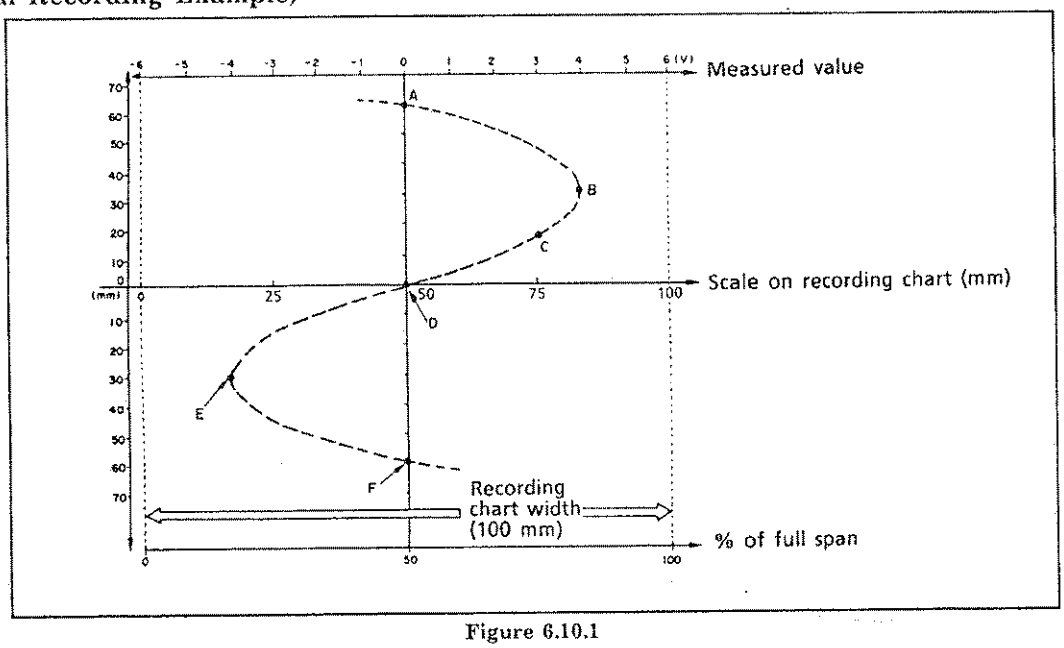


Figure 6.10.1

(Partial Recording Example)

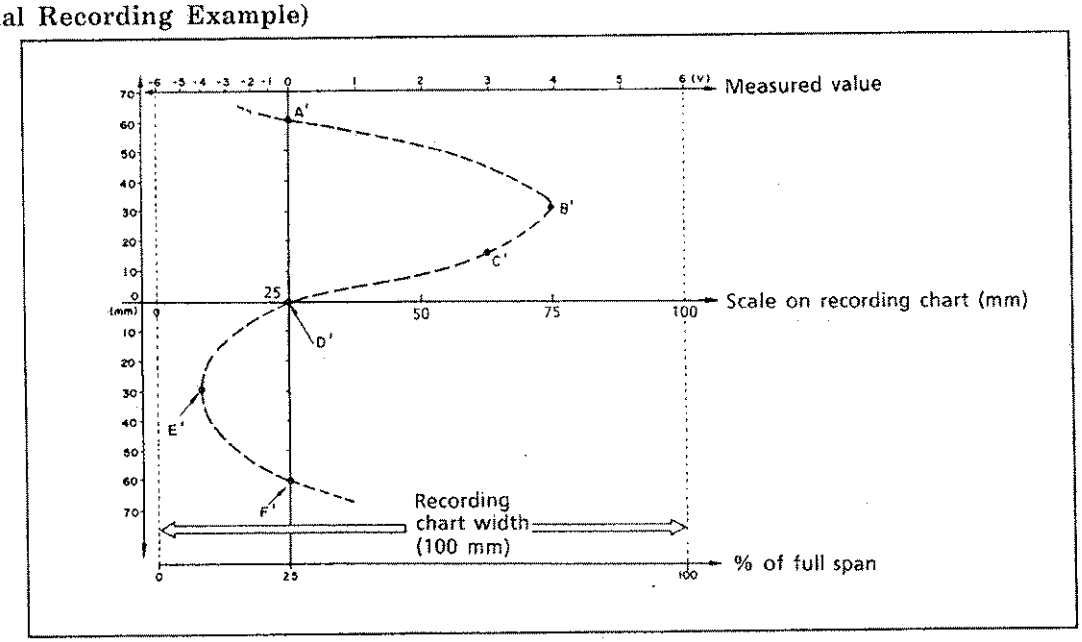


Figure 6.10.2

(Explanation of Partial Recording)

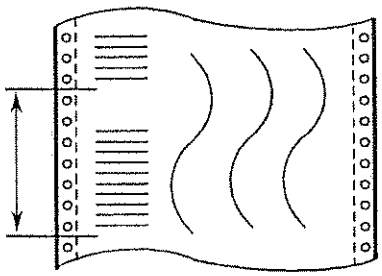
- Figure 6.10.1 shows normal recording with a 100mm span. Here the 0V point is positioned 50 mm (50% of span) from the chart paper left margin.
  (The 100mm has been set for the full span of the measured value (−6 to +6V).)
- Figure 6.10.2 shows partial compression recording with a 100 mm span. In this case the 0V point is positioned 25mm (25% of span) from the chart paper left margin.
  (The 100mm has been set for the full span of the measured value (−6 to +6V).)

As can be seen from the figure, the partial compression boundary value serves as a boundary, and on the recording chart the size of the band allocated to the left side (here, the negative side) is equal to the recording span (100mm in this example) multiplied by the partial compression recording band factor (%), and the size of the band allocated to the right side (here, the positive side) is the recording span multiplied by 100 minus the partial compression recording band factor. Thus the scales differ on the left and right sides of the partial compression boundary value.

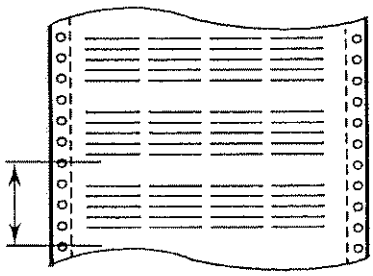
6.10.9 LOGGING INTERVAL Setting (Including Start Time)

- The logging interval is the time interval between digital recording operations.

(In Trend Recording Mode)



(In Digital Recording Mode)



The logging interval is the time interval that digital values are recorded as shown on the above charts.

- Up to three logging intervals can be set (when MULTIPLE is in effect). You can also determine individually which of those logging intervals to use for each channel. (See Section 6.10.3 (3), "LOGGING INTERVAL Specification").
- The relationships in the table below obtain depending on whether logging interval mode is SINGLE or MULTIPLE, and whether recording format is TREND or LOGGING modes.

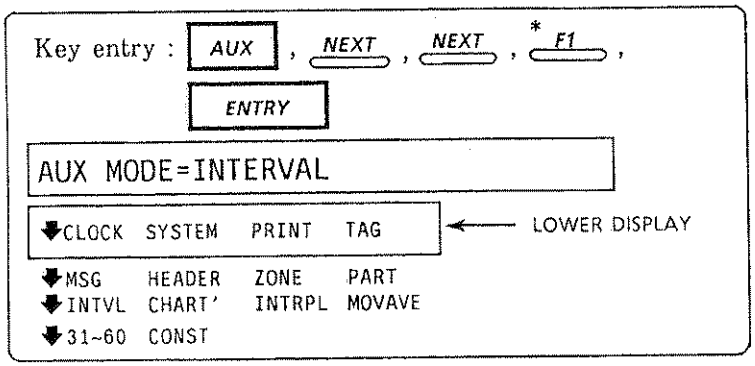
	SINGLE	MULTIPLE
TREND	Logging interval automatically decided by the relationship between chart speed and digital recording. *1	Select one of logging intervals 1 through 3 for each individual channel.
LOGGING	All channels recorded at times set for one certain interval (Interval 1).	Select one of logging intervals 1 through 3 for each individual channel.

*1: Use SET UP mode to transfer between SINGLE and MULTIPLE for logging intervals.

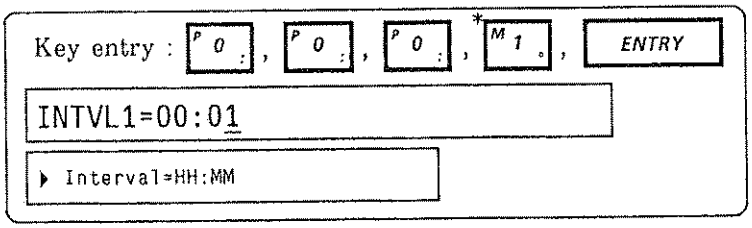
*2: When this is automatically determined, the relationships between them are as shown in the table below.

Chart Speed	Digital Measured Value Recording Interval	
	1 Row	2 Rows
10 to 24 mm/h	12 hr	6 hr
25 to 49 mm/h	4 hr	2 hr
50 to 99 mm/h	2 hr	1 hr
100 to 1500 mm/h	1 hr	30 min

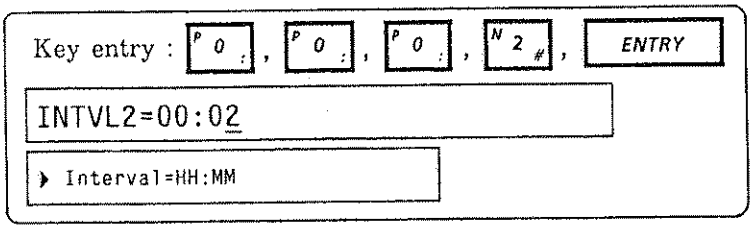
[Key Entry, Panel Displays] The panel displayed when * key is pressed. [Description]

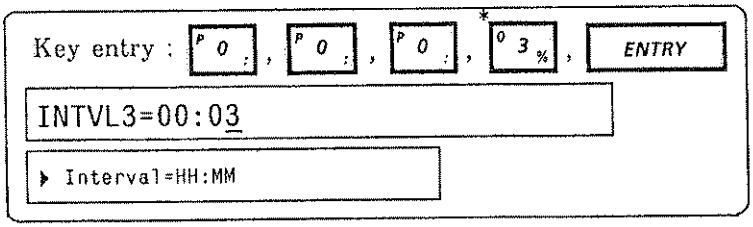


- This procedure sets the logging interval (s).
- Select INTVL from the LOWER DISPLAY line.

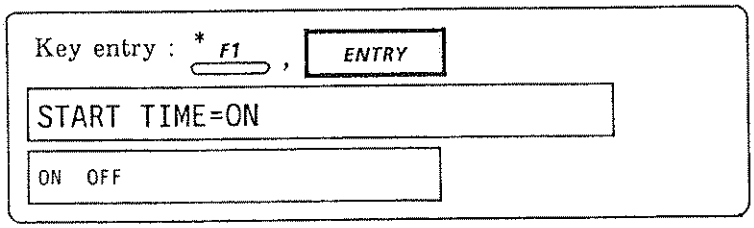


- Input the logging interval. Values up to 24 hr can be input. (initial setting = 1 hour.)
- If the recording mode is SINGLE, then interval setting is finished at this point and the value set for Interval 1 will become the interval for all channels.
- Intervals 2 and 3 can be set only if the recording mode is MULTIPLE.



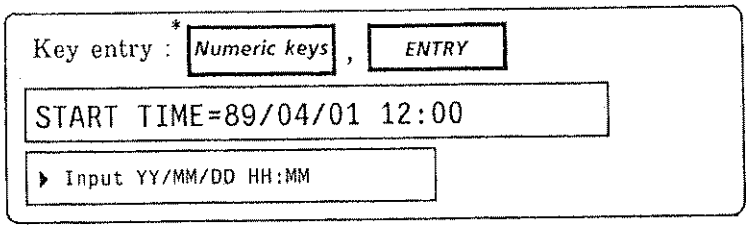


- Set interval 3 (3 minutes).

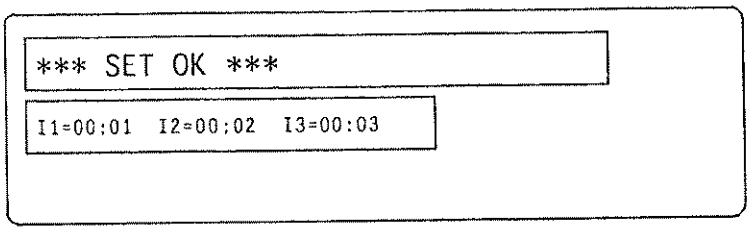


- Set the "Start On" time. (Recording will start at the time of day set.)
- When the start time is OFF, setting entry is no longer necessary.

[Key Entry, Panel Displays] The panel displayed when * key is pressed. [Description]



- Input the year, month, day, hour and minute at which to start.

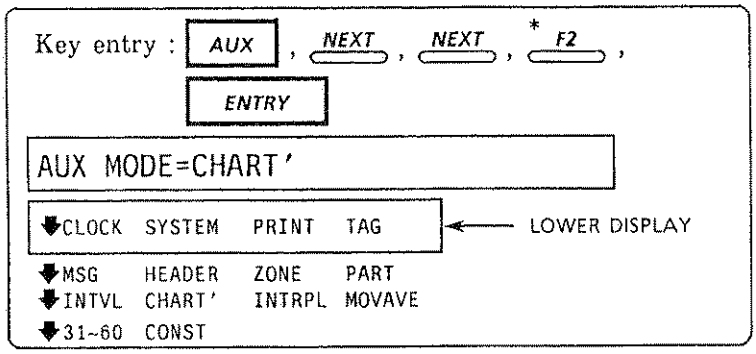


- The "SET OK" message is displayed to show that the settings have been accepted internally.
- The LOWER DISPLAY shows the information entered. Pressing ENTRY again will return you to the starting display of this mode.
- Press the AUX key to select setting for a different mode.
- To return to the data display mode, press the UPPER DISPLAY key.

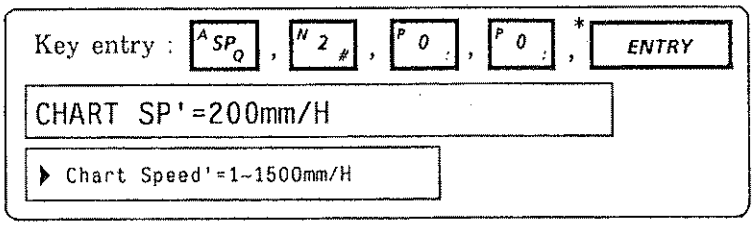
6.10.10 Setting of Chart Speed and Logging Interval Used When Change-On-Alarm or Remote Control in Effect

- The /REM option function is used for remote control.
- In change-on-alarm mode it is possible to change the chart speed and logging interval when an alarm occurs.
  This procedure sets the chart speed and logging interval in effect after the change.

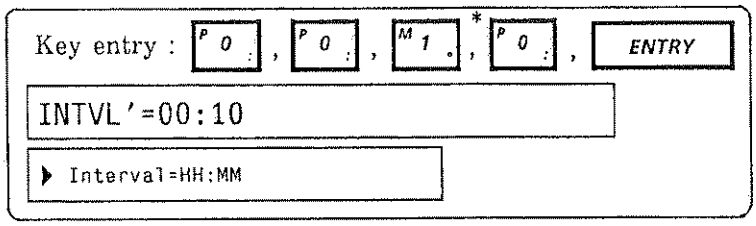
[Key Entry, Panel Displays] The panel displayed when * key is pressed. [Description]



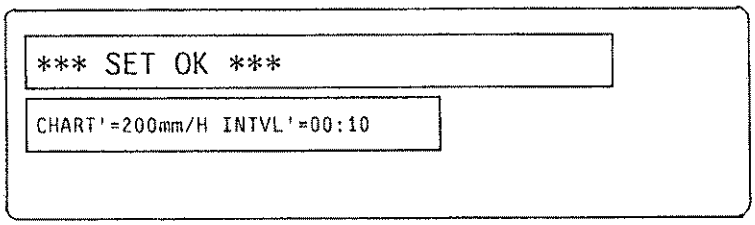
- This procedure sets the post-change chart speed and logging interval.



- Input the post-change chart speed.



- Input the post-change logging interval value (10 minutes).



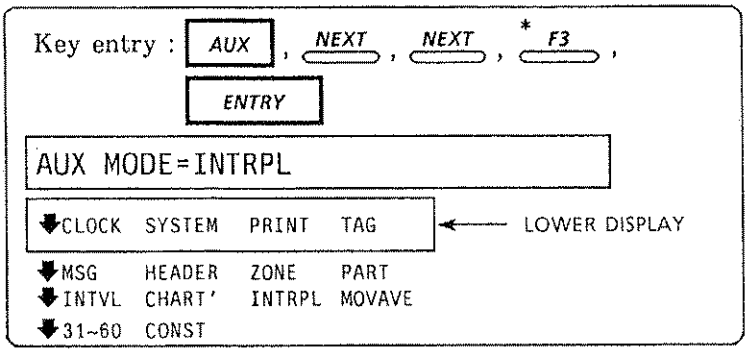
- The "SET OK" message is displayed to show that the settings have been accepted internally.
- The LOWER DISPLAY shows the information entered. Pressing ENTRY again will return you to the starting display of this mode.
- Press the AUX key to select setting for a different mode.
- To return to the data display mode, press the UPPER DISPLAY key.

* : This function is used to enable recording data with more detail or logging data in greater quantity for a certain time period following occurrence of an alarm.

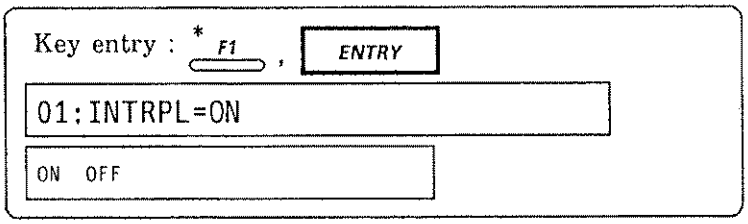
6.10.11 Interpolation Setting

When performing analog recording of data, the interpolation function enables data points to be linked by lateral line segments so as to show the continuity of the data.

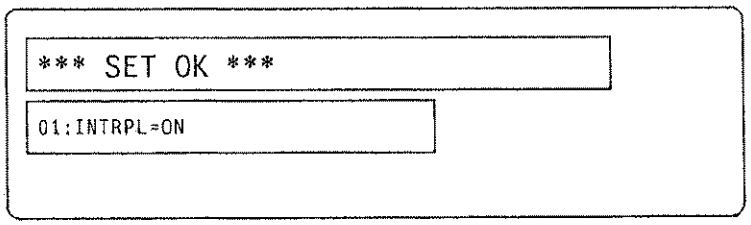
[Key Entry, Panel Displays] The panel displayed when * key is pressed. **[Description]**



- This procedure sets interpolation.
- Select INTRPL from the LOWER DISPLAY line.



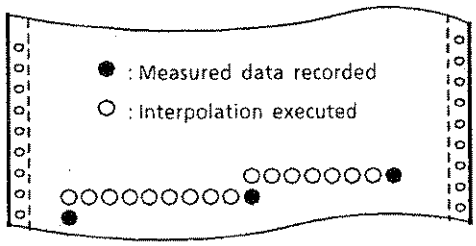
- Select whether or not to perform interpolation (initial setting = OFF).



- The "SET OK" message is displayed to show that the settings have been accepted internally.
- The LOWER DISPLAY shows the information entered. Pressing ENTRY again will return you to the starting display of this mode.
- Press the AUX key to select setting for a different mode.
- To return to the data display mode, press the UPPER DISPLAY key.

* The maximum number of channels for which INTRPL can be selected is 10. Interpolation is performed only when the trend recording interval (see Section 6.10.2 (3)) is 6 seconds or greater.

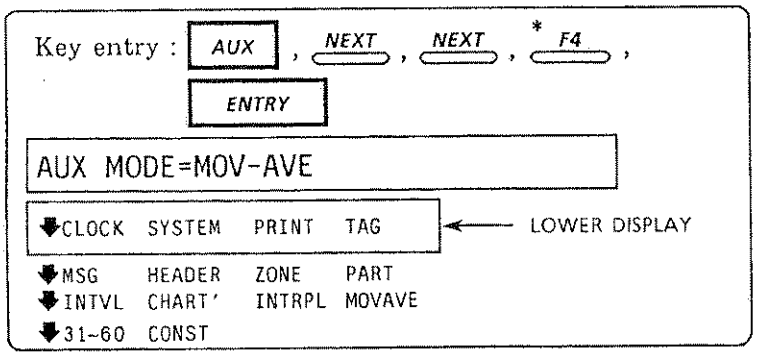
<Recording Example>



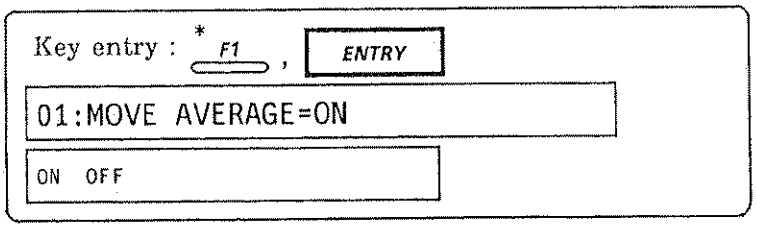
6.10.12 Moving Average Setting

Select whether or not to perform a moving average on the measured data.

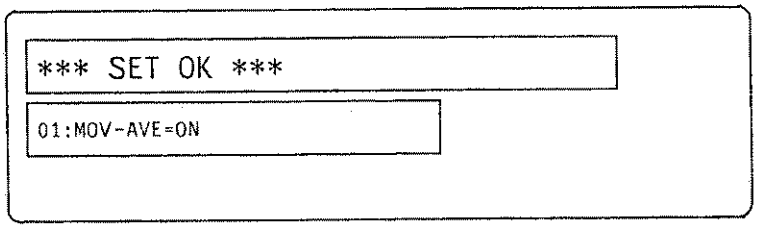
[Key Entry, Panel Displays] The panel displayed when * key is pressed. [Description]



- This procedure performs moving average setting.



- Select whether or not to perform moving average on channel 1 (initial setting = OFF).



(Specifications)

Moving average is performed over 8 scans of data.

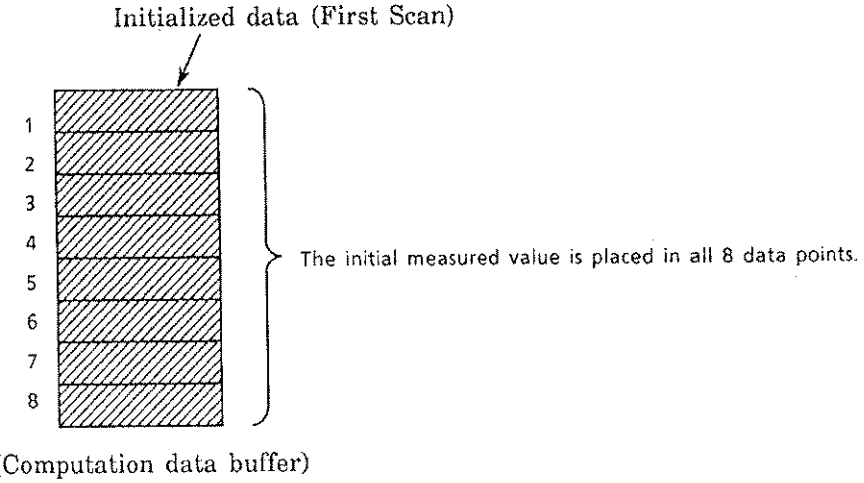
※ For each channel, the 8 oldest scans of data are deleted, the updated data are stored in the buffer memory, and then, 8 new scans of data are computed and recorded.

(Reason for Use)

If there is jitter in the measured signal, it can be suppressed in the final measurement result by computing a moving average.

Notes :

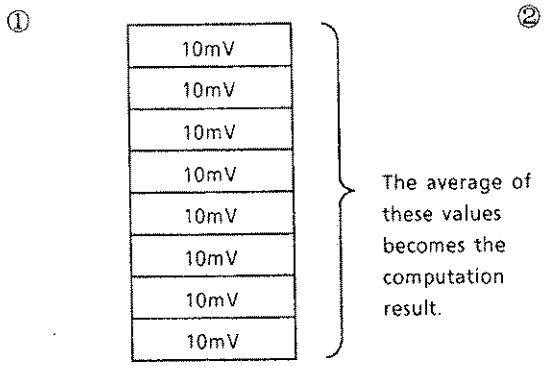
1. If the input goes over-range in the plus or minus direction, the data for that scan is replaced by +OVER = 32382 (7E7EH) or −OVER = −32383 (8181H) in the moving average computation.
2. Processing at measurement start :



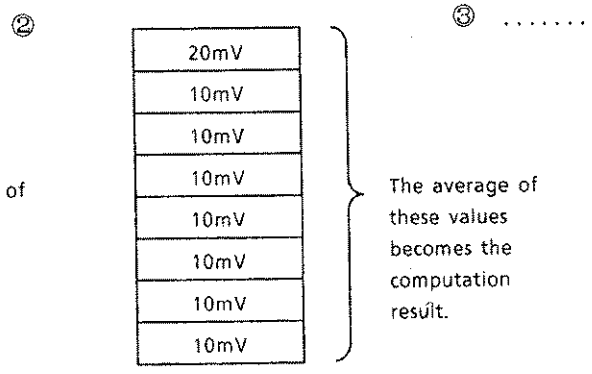
(Computation data buffer)

Example :

When measurement result on first scan is 10 mV :



Measurement result on second scan = 20 mV :



6.11 Changing SET UP (Basic Pre-Use Recorder Specifications)

Although the SET UP parameters normally do not require change, you may need to refer to this section when adding options or modifying functions to fit an application.

These parameters cannot be changed during operation and measuring

(Entering SET UP Mode)

1. Set DIP switch No. 1 in the back of the recorder to ON.

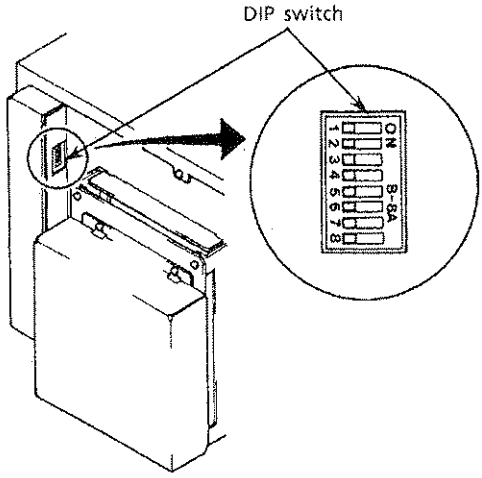
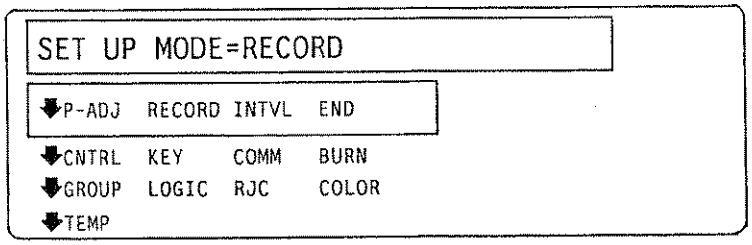


Figure 6.11.1

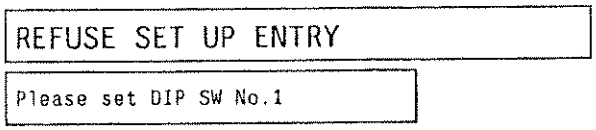
2. Hold the *UPPER DISPLAY* key on the operation panel depressed and turn power ON. Display below appears.



6.11

CAUTION

- Continue with each setting procedure until the "*** SET ***" indication appears.
- If DIP switch No. 1 is OFF, the recorder will display the message below and HOLD until the DIP switch is set to ON.



SET UP Summary

RECORD (Recording Related SET UP) - - - Section 6.11.1

Parameter	Description	Setting Range	
		Setting Items	Initial Setting
TAG/CH	Selects whether tag name or channel number will be displayed/recorded on panel and recording chart.	TAG CH	CH
SCALE	Selects spacing of divisions on scale recorded on chart.	A (0, 100%) B (Every 20%) C (0, 50, 100%) OFF	A
DIGITAL PRINT	Specifies number of digits for left-end digital values during trend recording.	1 (digit) 2 (digit)	1 (digit)
CH PITCH	Selects channel number recording spacing during trend recording.	12.5 (mm) 5.0 (mm)	12.5 (mm)
TITLE PITCH	Selects spacing between each TITLE recording during trend recording.	1500 (mm) 600 (mm)	1500 (mm)
LOG FORMT	Selects whether to print logging recordings vertically or horizontally on chart.	HORI (Horizontal) VERT (Vertical)	HORI
SPEED PRINT	Selects whether or not to record speed information when chart speed changes.	ON OFF	ON
ON/OFF MARK	Selects whether or not to record recording start time on chart.	ON OFF	ON
PARTIAL	Selects whether or not to perform partial compression recording.	ON OFF	OFF
ALARM PRINT	Selects whether or not to print occurrence and release of alarms.	ON OFF	ON
TIC	Selects whether or not to print TIC (scale recording position).	ON OFF	OFF
INTEG OVER	Select whether to hold or reset integrator values to 0 on count up. (When using computation option).	RESET HOLD	RESET
MATH ERROR	Selects whether to set computation result to "+OVER" or "−OVER" value when error occurs in computation (option).	−OVER +OVER	+OVER

INTERVAL (Interval Related SET UP)

Parameter	Description	Setting Range	
		Setting Items	Initial Setting
SCAN	Decides the interval between scans.	2, 3, 4, 5, 6, 10, 12, 15, 20, 30, 60	2 (second)
LOG INTVL	Logging interval setup	SINGLE MULTI	SINGLE

ALARM, Communication, IC Memory Card and Remote Control Related SET UP (CONTROL)

Parameter	Description	Setting Range	
		Setting Items	Initial Setting
REFLASH	Selects whether or not to set realarm on repeat of failure.	ON OFF	OFF
AND RLY INT	Selects whether to use AND or OR on relay output (internal relays).	NONE I01, I02	NONE
AND RLY SWT	Selects whether to use AND or OR on internal switch (internal switches).	NONE S01 to S10	NONE
INT ALM	Selects whether to energize or de-energize internal alarm output relays.	ENERG DE-EN	ENERG
COMMAND	Selects either internal (alarm) or external (remote control option) command type for recording start/stop control.	TRIG LEVEL	TRIG
DEMAND	Selects whether to perform CHANGE ON and PRINT ON on alarm or on remote controls from external source.	INT EXT	INT
ALARM ACK	Selects whether to enable or disable front panel ALARM ACK key.	ON OFF	OFF
RELAY HOLD	Selects hold or non-hold operation for alarm output relays.	ON OFF	OFF
RH TIME	Selects interval time to be used when an ascending rate-of-change alarm is set.	1 (SCAN) to 15 (SCAN)	1 (SCAN)
RL TIME	Selects interval time to be used when an descending rate-of-change alarm is set.	1 (SCAN) to 15 (SCAN)	1 (SCAN)
ALARM HYS	Sets alarm hysteresis in %.	0.0% to 1.0%	0.5%
DGTL PRINT	Selects whether to perform digital print commands according to internal settings (INT) or remote control (EXT).	EXT INT	INT
COMM INPUT	Selects whether or not to use channels 31 through 60 for digital communications output.	ON OFF	OFF
MEM INPUT	Selects whether or not to use channels 31 through 60 for memory playback.	ON OFF	OFF

BURN OUT Related SET UP (BURN)

Parameter	Description	Setting Range	
		Setting Items	Initial Setting
BURN OUT	Selects whether to force measurement result to "+OVER" or "−OVER" on burnout.	UP DOWN	UP
BURN	Selects whether or not to perform burnout processing in recorder.	ON OFF	ON

GROUP SET UP

Parameter	Description	Setting Range	
		Setting Items	Initial Setting
G1 to G6	Specifies which channels are to be assigned to which groups.	1 to 20 31 to 60	G1=01 to 10 G2=11 to 20 G3=01 to 15 G4=01 to 20 G5=31 to 60 G6=01 to 60

LOGICAL SET UP

Parameter	Description	Setting Range	
		Setting Items	Initial Setting
LOGICAL	Sets operating conditions for PRINT ON ALARM and CHANGE ON ALARM, etc.	START STOP MAN PRINT DIGITAL CHNG SPEED MSG 1 to 5	———
TRIGGER MODE	Displays Relay ID only during SELECT.	OFF ALL SELECT	OFF All for START STOP CHNG SPEED
RELAY ID	Set Relay ID.	I01, I02 S01 to S10	———

KEY LOCKOUT SET UP

Parameter	Description	Setting Range	
		Setting Items	Initial Setting
START STOP KEY	Selects whether or not key is enabled during KEY LOCK.	LOCK FREE	LOCK
HEADER KEY		LOCK FREE	LOCK
LIST KEY		LOCK FREE	LOCK
MAN PRINT KEY		LOCK FREE	LOCK
CHART FEED KEY		LOCK FREE	LOCK
ALM ACK KEY		LOCK FREE	LOCK
ALM RESET KEY		LOCK FREE	LOCK

RJC SET UP

Parameter	Description	Setting Range	
		Setting Items	Initial Setting
RJC MODE	Selects whether to use internal settings or external settings for reference junction compensation values.	INT (internal setting) EXT (external setting)	INT (internal setting)
RJC VOLT	Sets reference junction compensation value. (Displayed only for EXT)	Numeric value input	

Recording Color SET UP (COLOR)

Parameter	Description	Setting Range	
		Setting Items	Initial Setting
COLOR	Specifies the recording color for each channel.	PURPLE RED GREEN BLUE BROWN BLACK NAVY YEL - GREEN RED - PURPLE ORANGE	Distributed over all channels.

Temperature Display °C/°F SET UP

Parameter	Description	Setting Range	
		Setting Items	Initial Setting
TEMP UNIT	Switches between °C and °F temperature display.	°C °F	Set at installation.

Printer Adjustment SET UP

Parameter	Description	Setting Range	
		Setting Items	Initial Setting
HYS	Printer recording vertical direction adjustment	−100 to 100	1
ZERO	Printer left side specification	0 to 4000	_____
FULL	Printer right side specification	0 to 4000	_____
PRINT ESC		YES NO	_____

6.11.1 Recording Related SET UP (RECORD)

Set DIP switch No. 1 in the back of the recorder to ON, and while holding the UPPER DISPLAY key pressed, turn ON the recorder power.

On entering SET UP mode, the display will first show the screen below.

[Key Entry, Panel Displays] The panel displayed when * key is pressed. [Description]

Key entry : * F2 , ENTRY

```
SET UP MODE=RECORD
▼P-ADJ  RECORD INTVL  END
▼CNTRL  KEY    COMM   BURN
▼GROUP  LOGIC  RJC    COLOR
▼TEMP
```

- This procedure sets recording related SET UP parameters.
- Select RECORD from the selections on the LOWER DISPLAY line.

(1) Channel Printing, Tag Printing Selections

Key entry : * F2 , ENTRY

```
CH OR TAG=CHANNEL
TAG   CH
```

- Select whether to use channel numbers or the specified tag names for display and printing.
(initial setting = CH)

(2) Scale Printing Selection

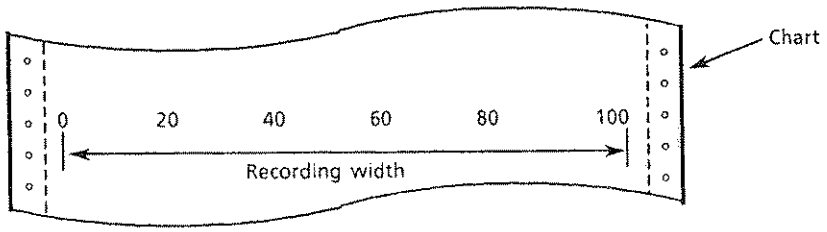
Key entry : * F2 , ENTRY

```
SCALE=EVERY 20
A     B     C     OFF
```

- Select spacing for scale printing.
(initial setting = A)

A ..... Prints 0% and 100%.
B ..... Prints every 20%.
C ..... Prints three positions : 0%, 50%, and 100%
OFF ..... Does not print scale.

(Example for B)



* : Specifications differ depending on whether partial compression is ON or OFF.

(When partial compression is OFF)

- Every 20% ..... Setting is permitted only when recording width is 150mm ; when 149mm or less, 0 or 100% printing results. If 49 mm or less, printing is not performed, and printing steps to the next channel.
- 0, 50, 100% ..... Setting is permitted only when the recording width is 100mm or greater; when 99mm or less, 0 or 100% printing results. If 49mm or less, printing is not performed, and printing steps to the next channel.
- 0, 100% ..... Setting is permitted only when the recording width is 50mm or greater; if 49mm or less, printing is not performed, and printing steps to the next channel.

(When partial compression is ON)

- When recording width is 100mm or greater, printing is performed at three locations : left end, line segment, and right end.
- When recording width is 50 to 90mm, printing is performed at two locations : left end and right end.
- When recording width is 49mm or less, printing is not performed, and steps to the next channel.

(3) Selection of Number of DIGITAL Recording Columns for TREND Recording

[Key Entry, Panel Displays] The panel displayed when * key is pressed. [Description]

Key entry : * F1 , ENTRY

DIGITAL PRINT=1-CLMN

1-CLMN 2-CLMN 3-CLMN 4-CLMN

- Set the number of columns for digital recording. (initial setting = CLMN1)

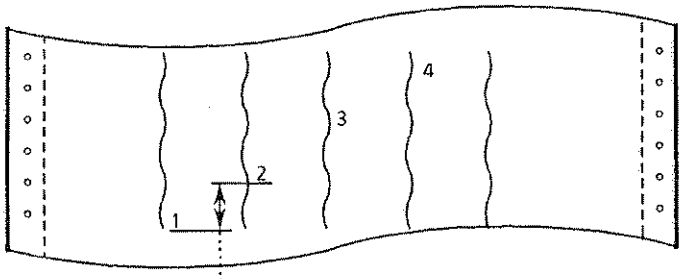
(4) CHANNEL No. Printing Pitch Selection

Key entry : * F2 , ENTRY

CH PITCH=12.5mm

5.0mm 12.5mm

- Set the spacing between channel number printout pitch in trend recording. (initial setting = 12.5mm)



Channel number printing pitch

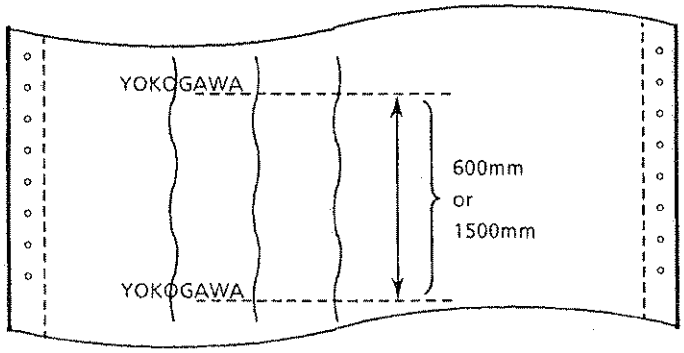
(5) TITLE Printing Spacing Selection

Key entry : * F2 , ENTRY

TITLE PITCH=1500mm

600mm 1500mm

- Set the spacing between printouts of the message set up in Section 6.10.5 (TITLE). (initial setting = 1500mm)



(6) Vertical/Horizontal Recording Direction Selection for LOGGING Recording

[Key Entry, Panel Displays] The panel displayed when * key is pressed. [Description]

Key entry : F2 , ENTRY

LOG FORMAT=HORIZON

VERTI HORI

- HORI ..... Horizontal direction
- VERTI .... Vertical direction

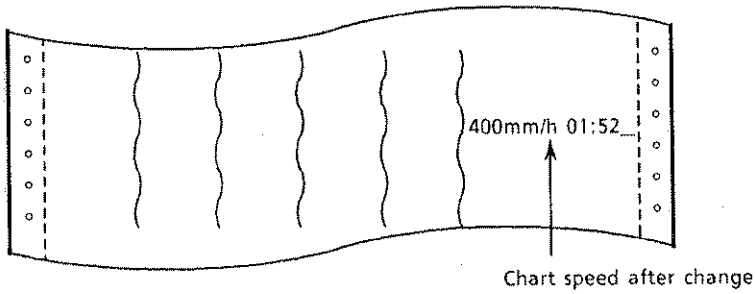
- Select whether recording will be done in horizontal direction or vertical direction during logging recording. (initial setting = HORI)

(7) Speed Printout on CHART SPEED Change

Key entry : F2 , ENTRY

SPEED PRINT=OFF

ON OFF



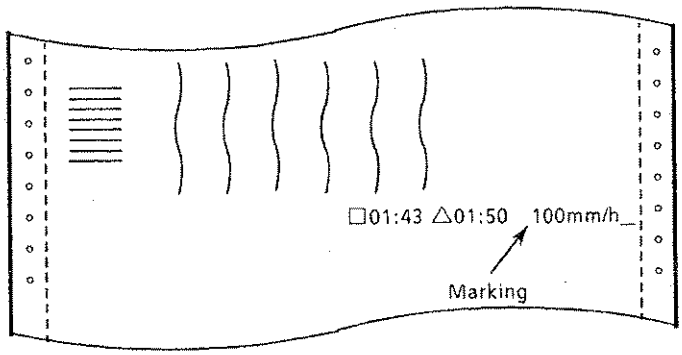
- Select whether or not to print speed on chart when chart speed is changed. (initial setting = ON)

(8) Marking Recording Selection

Key entry : F2 , ENTRY

ON/OFF MARK=OFF

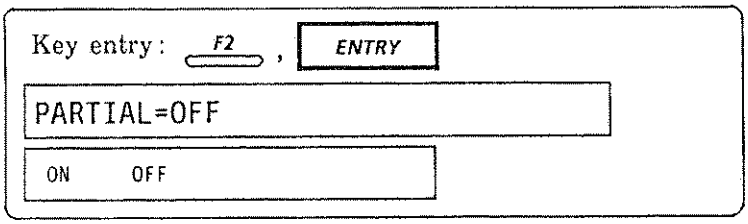
ON OFF



- Select whether to print time-stamp marking on chart when recording starts.
- Effective only in trend mode. (initial setting = ON)

(9) Partial Compression Recording Selection

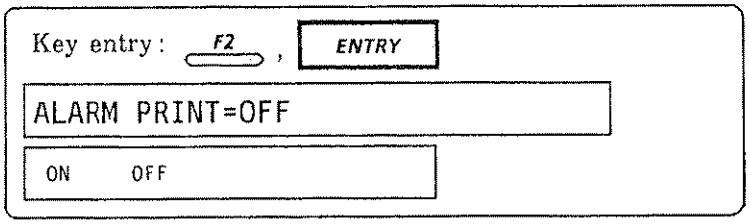
[Key Entry, Panel Displays] The panel displayed when * key is pressed. [Description]



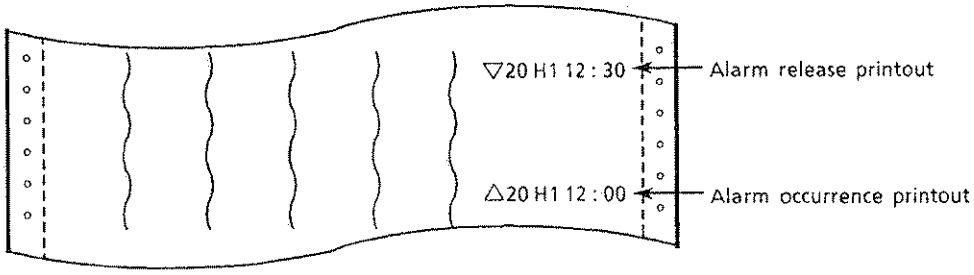
- Select whether or not to perform partial compression. (initial setting = OFF)

※ The areas to be subjected to partial compression are set up by the procedure described in Section 6.10.8.

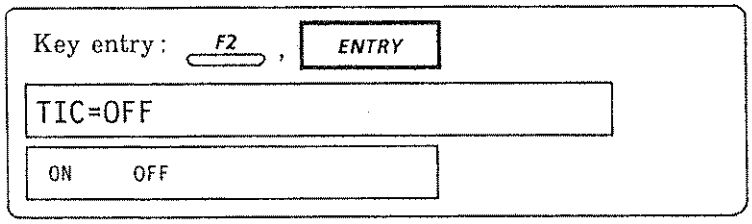
(10) ALARM PRINT ON/OFF Selection



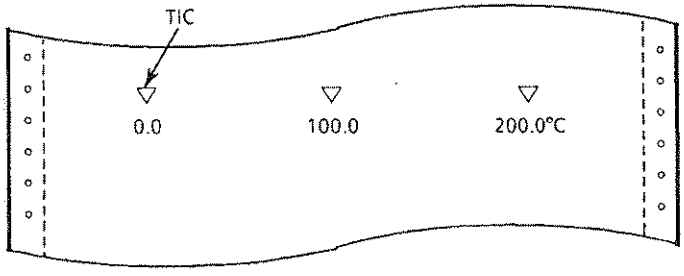
- Select whether to perform printout on alarm occurrence and release. (initial setting = ON)



(11) TIC (SCALE Printout Position) PRINT ON/OFF

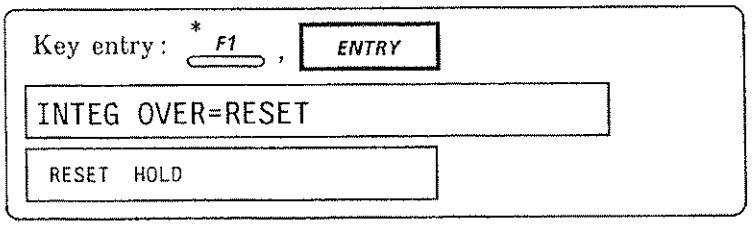


- Select whether to print tic marks to indicate exact positions of scale values printed on chart. (initial setting = OFF)



(12) Handling When Internal Computation Reaches Maximum Value

[Key Entry, Panel Displays] The panel displayed when * key is pressed.

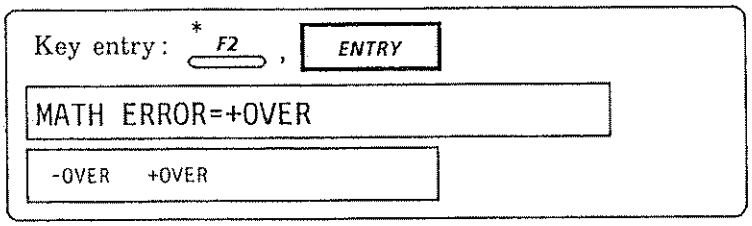


※ Computation range is ±30,000.

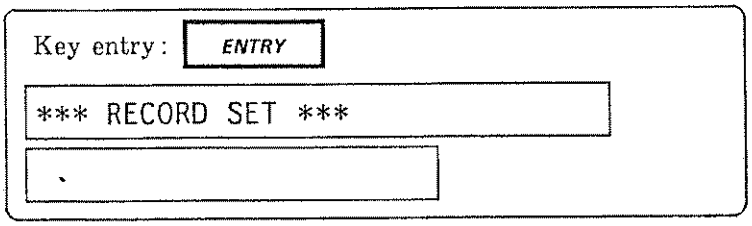
[Description]

- Select whether to be reset or held to ZERO when counting-up occurs during computation summing up (TLOG SUM). (initial setting = RESET)

(13) Selection of Printout for Computation (MATH Option) Error



- Select whether to set computation result to "+OVER" or to "−OVER" when error occurs in internal computation (31 and up). (initial setting = +OVER)



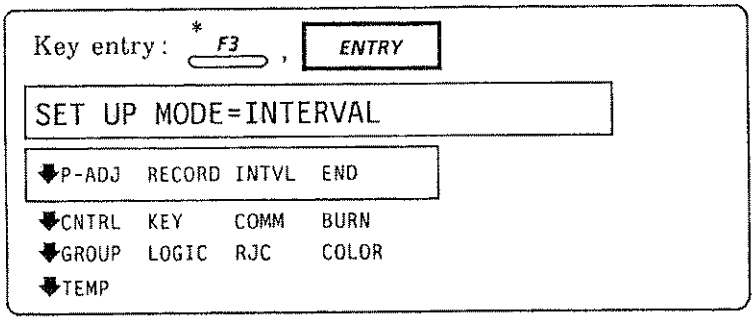
- SET UP completes.

6.11.2 INTERVAL Related SET UP (INTVL)

Set DIP switch No. 1 in the back of the recorder to ON and, while holding the UPPER DISPLAY key pressed, turn ON the recorder power.

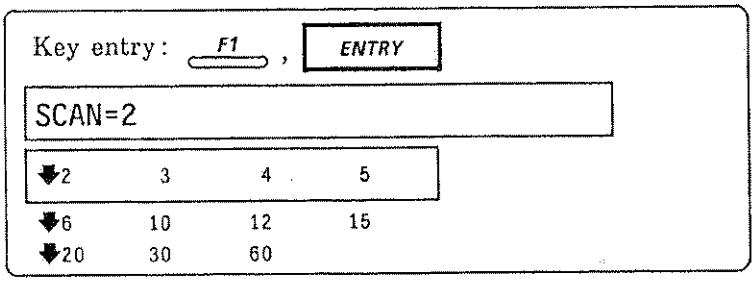
On entering SET UP mode, the display will first show the screen below.

[Key Entry, Panel Displays] The panel displayed when * key is pressed. [Description]



- This procedure sets interval related SET UP parameters.
- Select INTVL from the selections on the LOWER DISPLAY line.

(1) SCAN INTERVAL Selection (2 to 60 Seconds)



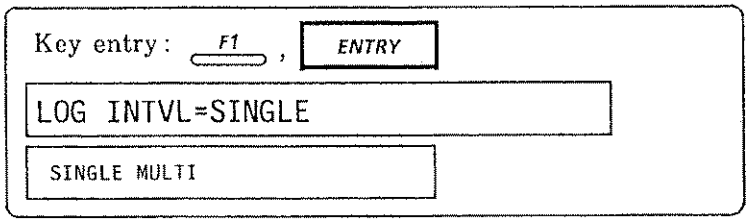
- Select the interval between scans. (initial setting = 2 sec)

※ In the case that FIX mode was selected in the trend recording mode selection (Section 6.10.2(3)), the scanning interval selected here determines how many seconds the trend recording interval will be.

※ In the case that 100ms has been selected as the A/D integration time (see Section 3.2, "Recorder Main Unit DIP Switches"), select from 6 to 60 seconds.

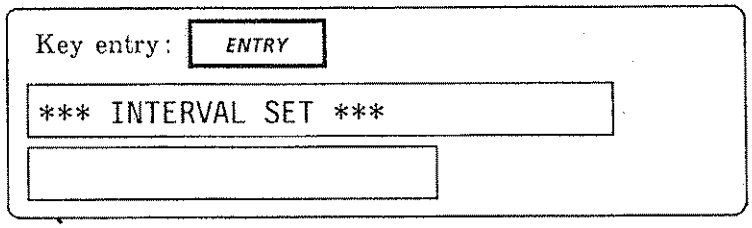
(2) Logging Interval Mode Selection

[Key Entry, Panel Displays] The panel displayed when * key is pressed. [Description]



- This procedure selects the logging interval mode. (initial setting = SINGLE)

- SINGLE ... (During Trend Recording)
  Measured value digital recording interval is determined automatically according to chart speed and number of lines of digital recording.
  (During Logging Recording)
  There is a single logging recording interval (which can be set at from 1 minute to 24 hours) which applies to all channels.
- MULTI .... (During Trend Recording)
  Measured value digital recording can be done with any of three intervals (which can be set at from 1 minute to 24 hours individually).
  (During Logging Recording)
  Logging recording can be done with any of three intervals.



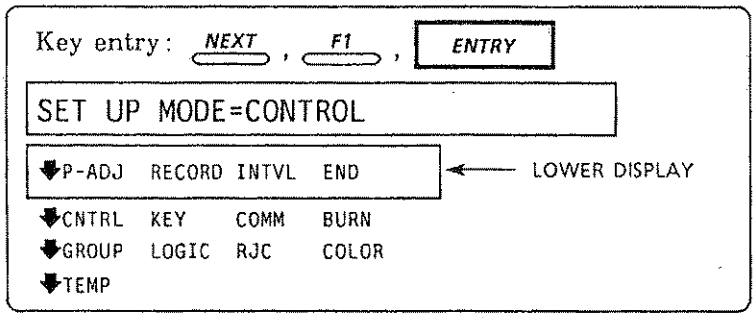
- Setting completes.

6.11.3 Alarm, Communications, IC Memory Card and Remote Control Related SET UP (CONTROL)

Set DIP switch No. 1 in the back of the recorder to ON and, while holding the UPPER DISPLAY key pressed, turn ON the recorder power.

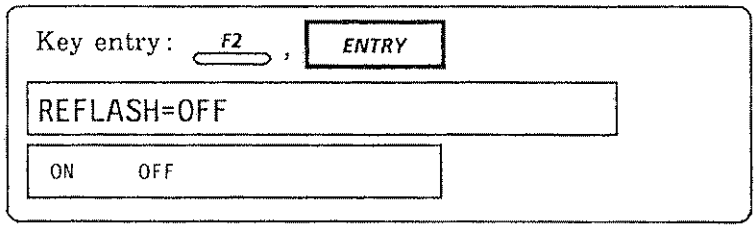
On entering SET UP mode, the display will first show the screen below.

[Key Entry, Panel Displays] The panel displayed when * key is pressed. **[Description]**



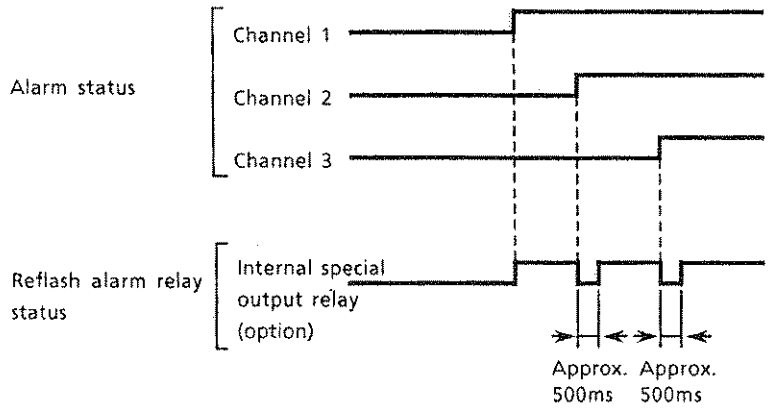
- This procedure sets alarm, communication input, IC memory card, and remote control related SET UP parameters.
- Select CONTROL from the selections on the LOWER DISPLAY line.

(1) Selection for Reflash on New Alarms



- Selects whether or not to provide "reflash" on internal special output relays (option).
  ON : Reflash alarm mode
  OFF : No reflash alarm mode

※ "Reflash" is a function used to indicate repeating alarm occurrences among a group of alarms sharing a special output relay.



(2) ALARM Relay Output AND/OR Selection

[Key Entry, Panel Displays] The panel displayed when * key is pressed.

Key entry : F3 , ENTRY

AND RLY INT=I01~I02

▼NONE I01 I01~02

[Description]

- Select the internal relays which will output with a logical AND function. (initial setting = NONE, meaning all OR output)

Key entry : F3 , ENTRY

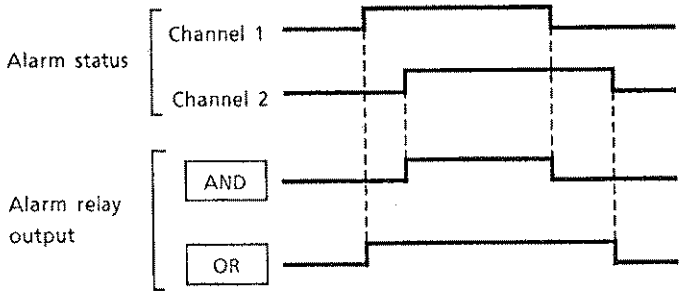
AND RLY SW=S01~S02

▼NONE S01 S01~02 S01~03

▼S01~04 S01~05 S01~06 S01~07

▼S01~08 S01~09 S01~10

- Select the internal switches which will output with a logical AND function. (initial setting = NONE, meaning all OR output)



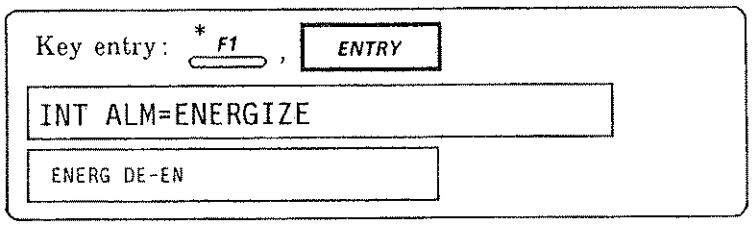
CAUTION

Precautions to observe when specifying AND output for an alarm relay.

- The logical AND function does not affect alarm printing. As with any other alarm, printing is performed individually for each alarm occurrence.
- Since both the internal alarm output relays and the internal switches are divided midway into AND group and OR group, it is not possible to freely intermix AND and OR output relays.

(3) Internal ALARM Relay Output Energize / De-Energize Selection

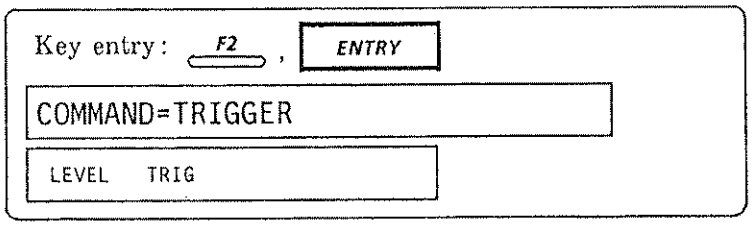
[Key Entry, Panel Displays] The panel displayed when * key is pressed.



[Description]

- Select whether internal alarm relays energize or de-energize on alarm.
  ENERG ... Energizing type
  DE-EN ... De-energizing type
  (initial setting = ENERG)

(4) Recording Start / Stop Control and Internal (Alarm) or External (Remote Control Option) Command Format (Trigger or Level) Selection



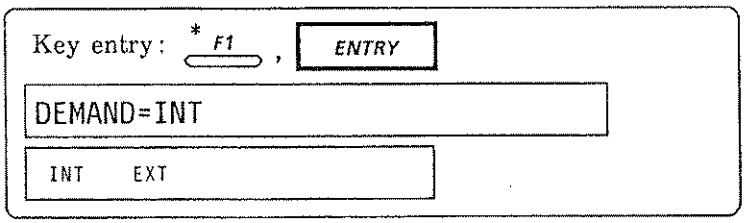
- Select whether to use trigger or level format for recording control by internal (alarm) or external (remote control option) sources.
  (initial setting = TRIG)

Trigger (TRIG) .. Recording started by internal (alarm) or external (remote control) requests, but stopped by START/STOP key.

Level (LEVEL) .. Recording start and stop both performed according to internal (alarm) or external (remote control) requests.

(5) Selection of Whether to Perform Change On (Chart Speed Interval Change) and/or Print ON (Recording ON/OFF) with External Remote Control or with Alarms

[Key Entry, Panel Displays] The panel displayed when * key is pressed. [Description]

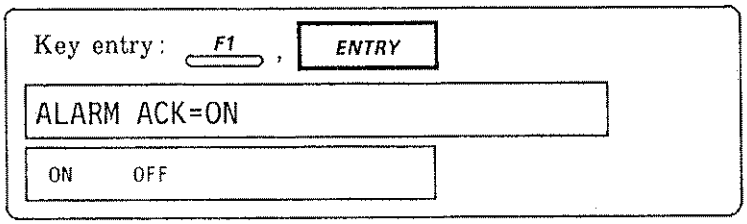


- Select whether to perform change on (chart speed and logging interval change) and/or print on (recording start/stop) based on external remote control (contact input) or based on internal commands (alarms).
  (initial setting = INT)

{ INT ..... Internal command (alarm)
{ EXT ..... Remote control (option) based command

※ When EXT is selected, "Print ON and Change ON" can no longer be selected at "ON ALARM" in the AUX SYSTEM mode.

(6) Front Panel ALARM ACK Key Enable/Disable Selection



- Select whether to enable or disable acknowledge operations on front panel alarm indications and alarm output relays via the ALARM ACK key.
  (initial setting = OFF)

ON ..... When an alarm occurs, the alarm indicator begins flashing (flashing continues even if the alarm recovers).
Pressing the ALARM ACK key causes the indicators to show the current alarm status. (Alarm in progress ... ON, alarm recovered OFF)

OFF .... When an alarm occurs, the alarm indicator turns ON. When the alarm recovers, the indicator turns OFF. The ALARM ACK key is disabled and has no effect on operation.

(7) ALARM Relay Output Hold / Non-Hold Selection

[Key Entry, Panel Displays] The panel displayed when * key is pressed.

Key entry : * F1 , ENTRY

RELAY HOLD=ON

ON OFF

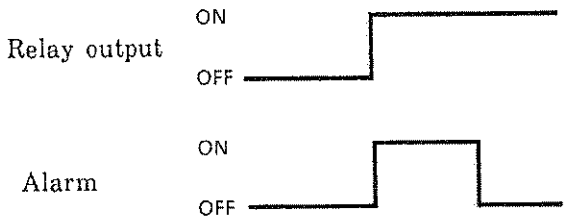
[Description]

- Select whether or not to hold alarm output relays on until reset.
  (initial setting = OFF)

(When ON)

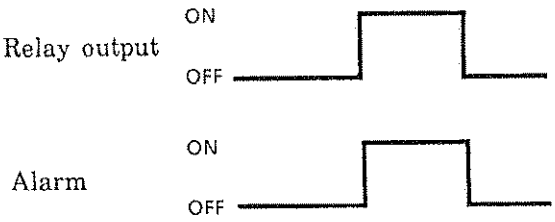
Once turned ON, output relay remains ON even if alarm turns OFF.

(Relays are turned OFF by pressing front panel ALARM RESET key.)



(When OFF)

Output relay turns ON and OFF together with alarm.



(8) Scan Interval Selection for Rate of Change (RH, RL) Settings

[Key Entry, Panel Displays] The panel displayed when * key is pressed. [Description]

Key entry: * F1 , ENTRY

RH TIME=1

▼1	2	3	4
▼5	6	7	8
▼9	10	11	12
▼13	14	15	

- Select interval setting for rate-of-change limit alarm on increase.
- The numbers on the LOWER DISPLAY line are the numbers of scans. (initial setting = 1)

Key entry: * F1 , ENTRY

RL TIME=1

▼1	2	3	4
▼5	6	7	8
▼9	10	11	12
▼13	14	15	

- Select interval setting for rate-of-change limit alarm on decrease. (initial setting = 1)

(9) ALARM Hysteresis Selection (For High (H) and Low (L) Limit Alarms)

Key entry: * F1 , ENTRY

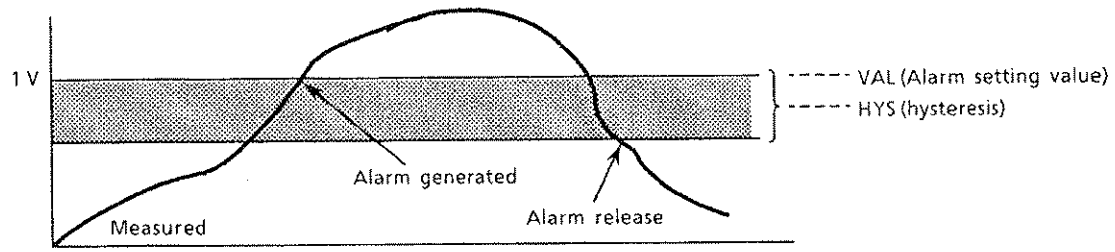
ALARM HYS=0.0%

▼0.0	0.1	0.2	0.3
▼0.4	0.5	0.6	0.7
▼0.8	0.9	1.0	

- Determine to what percentage of recording span to set the alarm hysteresis.

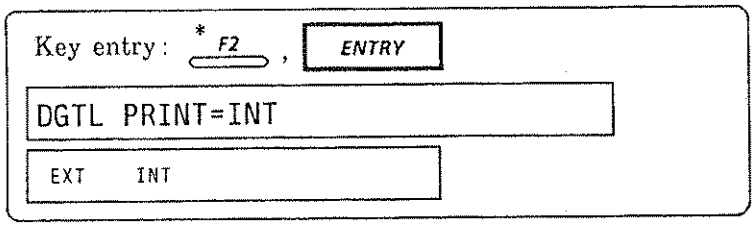
Note: Hysteresis for rate-of-change alarms (RH, RL) and difference alarms (dH, dL) is fixed at 0% regardless of this hysteresis setting. (initial setting = 0.5%)

<Alarm Hysteresis Operation> (high limit alarm)
The alarm hysteresis is the difference between the levels of alarm generation and release.



(10) Digital Recording Control Selection

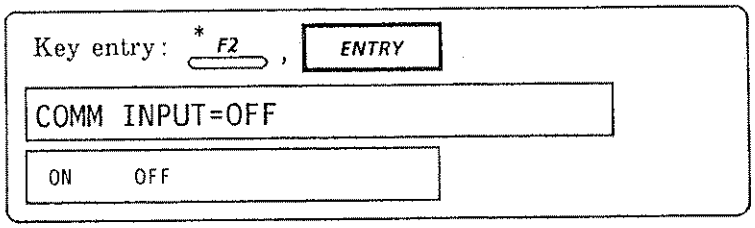
[Key Entry, Panel Displays] The panel displayed when * key is pressed.



[Description]

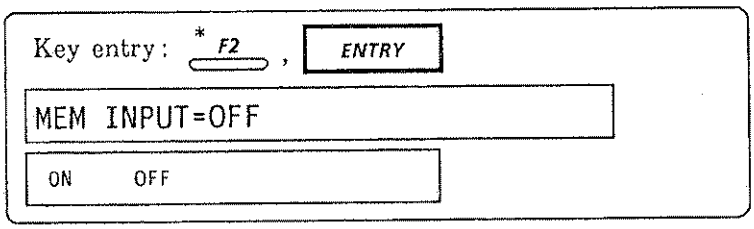
- Select whether to execute the digital print command at the pre-set interval (INT) or under remote control via a contact input and output (EXT).
  Effective in trend mode only.
  (initial setting = INT)

(11) Communications Input (31 to 60) ON / OFF

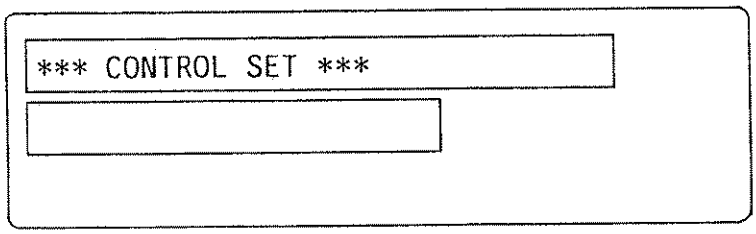


- Select whether or not to perform communications input using channels 31 through 60.
  (initial setting = OFF)

(12) IC Memory Card Input (31 to 60) ON / OFF



- Selects whether or not to perform IC memory card input using channels 31 through 60.
  (initial setting = OFF)



- SET UP is completed.

6.11.4 Key Lockout SET UP

This SET UP mode enables you to specify which keys will be operative ("free") even when the KEY LOCK is on.

Set DIP switch No. 1 in the back of the recorder to ON and, while holding the UPPER DISPLAY key pressed, turn ON the recorder power.

[Key Entry, Panel Displays] The panel displayed when * key is pressed. **[Description]**

Key entry: NEXT , * F2 , ENTRY

```
SET UP MODE=KEY-LOCK
▼P-ADJ  RECORD INTVL  END
▼CNTRL  KEY    COMM   BURN
▼GROUP  LOGIC  RJC    COLOR
▼TEMP
```

- The initial SET UP mode display appears.

Key entry: * F2 , ENTRY

```
START STOP KEY=LOCK
FREE  LOCK
```

- Select whether the START/STOP key will be locked or free when the key lock is on. (Initial setting = LOCK)

Key entry: * F2 , ENTRY

```
HEADER KEY=LOCK
FREE  LOCK
```

- Select whether the HEADER key will be locked or free when the key lock is on. (Initial setting = LOCK)

Key entry: * F2 , ENTRY

```
LIST KEY=LOCK
FREE  LOCK
```

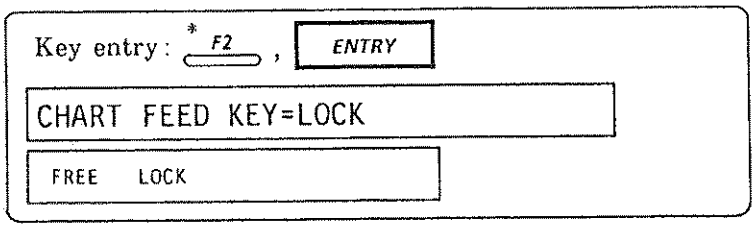
- Select whether the LIST key will be locked or free when the key lock is on. (Initial setting = LOCK)

Key entry: * F2 , ENTRY

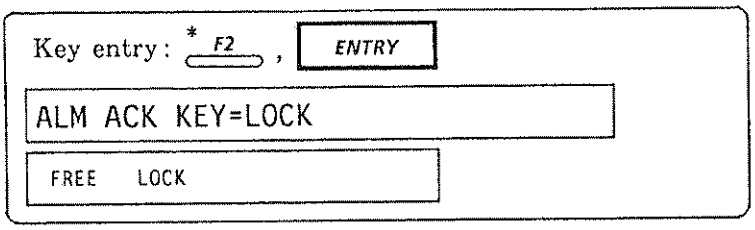
```
MAN PRINT KEY=LOCK
FREE  LOCK
```

- Select whether the MAN PRINT key will be locked or free when the key lock is on. (Initial setting = LOCK)

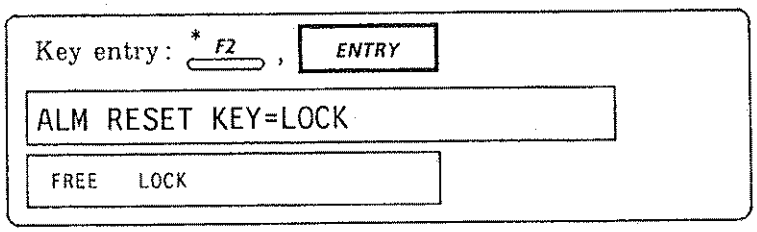
[Key Entry, Panel Displays] The panel displayed when * key is pressed. [Description]



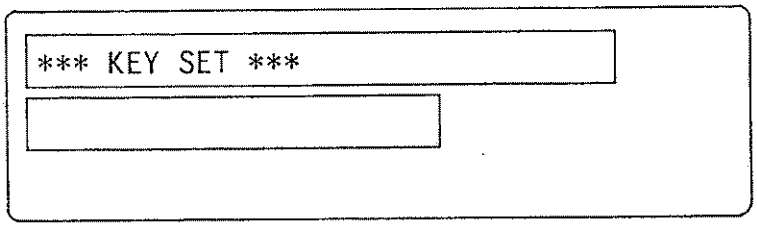
- Select whether the CHART FEED key will be locked or free when the key lock is on. (Initial setting = LOCK)



- Select whether the ALARM ACK key will be locked or free when the key lock is on. (Initial setting = LOCK)



- Select whether the ALARM RESET key will be locked or free when the key lock is on. (Initial setting = LOCK)

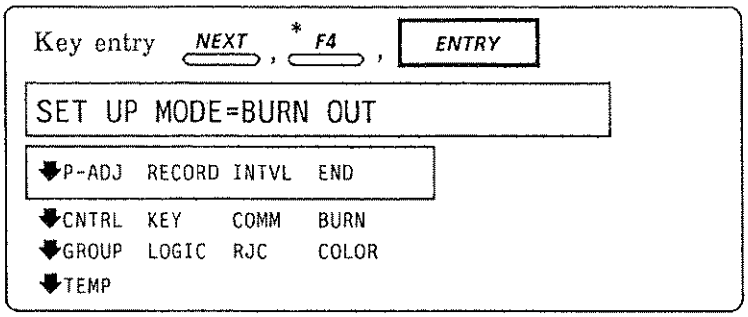


- Pressing ENTRY, F4 (END), ENTRY takes the recorder out of SET UP mode and shows the same display as when power is turned ON. (measuring mode)

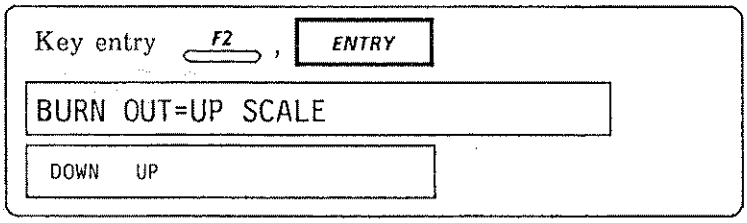
6.11.5 Burnout Related SET UP (BURN)

Set DIP switch No. 1 in the back of the recorder to ON and, while holding the UPPER DISPLAY key pressed, turn ON the recorder power.

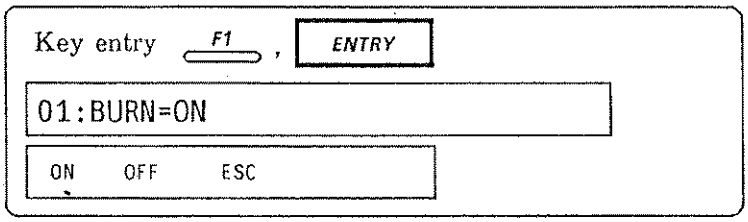
[Key Entry, Panel Displays] The panel displayed when * key is pressed. [Description]



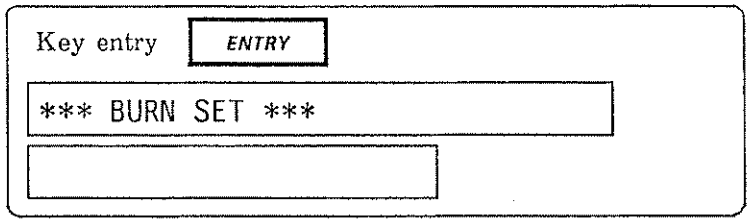
- The initial SET UP mode screen appears.



- Select whether to set the measurement result to "+OVER" or to "−OVER" when a burnout occurs.



- Select whether or not to perform burnout processing for TC (thermocouple) inputs.



- Pressing ENTRY , F3 (ESC), ENTRY , F4 (END), ENTRY takes the recorder out of SET UP mode and shows the same display as when power is turned ON. (measuring mode)

6.11.6 Group SET UP

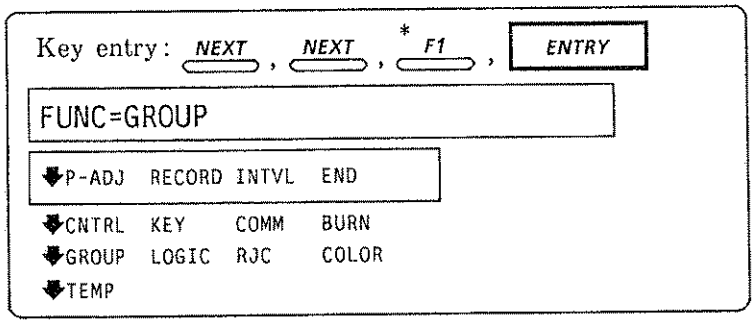
This SET UP changes the channels included in the individual groups.

☆ In the initial setup, the channels are assigned to the individual groups as shown below.

G1=01 to 10	G4=01 to 20
G2=11 to 20	G5=31 to 60
G3=01 to 15	G6=01 to 60
	(21 to 30 omitted)

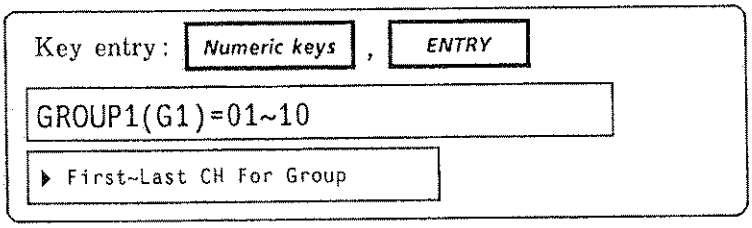
Set DIP switch No. 1 in the back of the recorder to ON and, while holding the UPPER DISPLAY key pressed, turn ON the recorder power.

[Key Entry, Panel Displays] The panel displayed when * key is pressed.



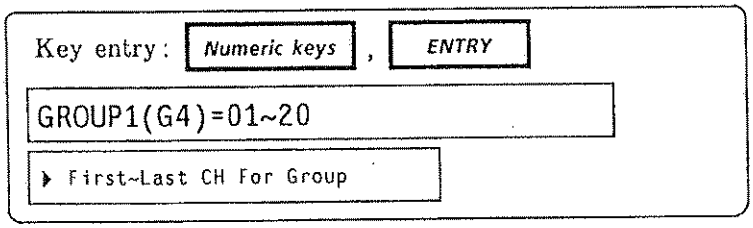
[Description]

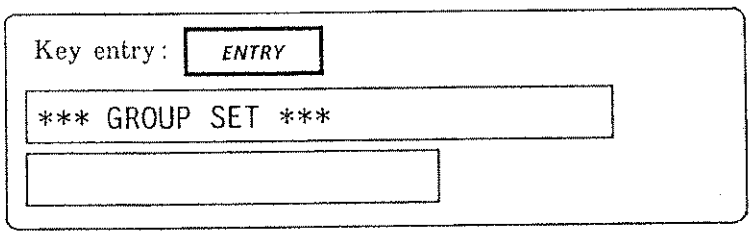
- Perform a group setting.



- Specify the channels to be assigned to Group 1.
- Following this, the remaining groups to Group 6 can be set in the same manner.

※ First channel No. must be less than the last channel No.





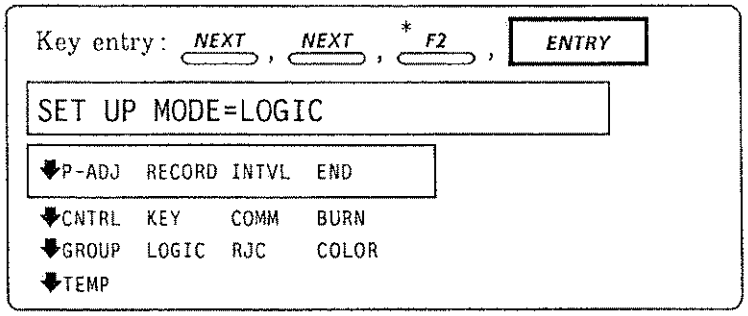
- Group SET UP is completed.
- Pressing ENTRY once more returns the display to the first display pressing F4 (END) and then ENTRY takes the recorder out of SET UP mode.

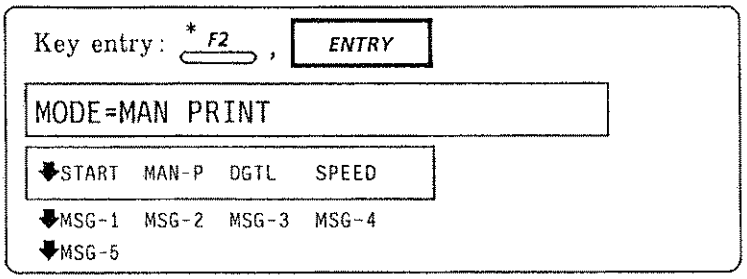
6.11.7 Logic SET UP
(Set mainframe operation during print-on / change alarm activation)

This SET UP selects the actuating conditions for print-on-alarm and change-on-alarm. It also turns ON and OFF manual print and message print on alarm occurrence, and selects the conditions which will actuate them.

Set DIP switch No. 1 in the back of the recorder to ON and, while holding the UPPER DISPLAY key depressed, turn ON the recorder power.

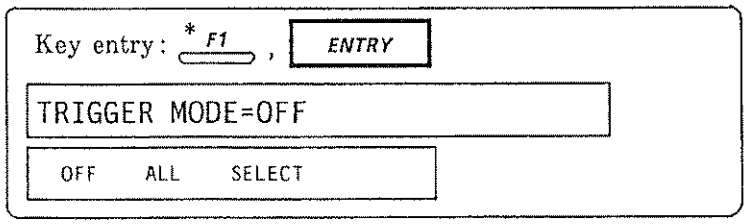
[Key Entry, Panel Displays] The panel displayed when * key is pressed. [Description]





- Select the actuating conditions for print-on-alarm and change-on-alarm, and turns ON and OFF manual print and message print on alarm occurrence and selects the conditions which will actuate them.

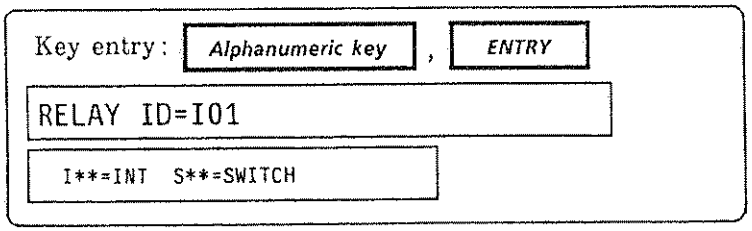
- START STOP .. Selects condition for print-on-alarm.
  MAN PRINT ... Turns manual print start ON / OFF and selects condition.
  DIGITAL ..... Turns digital recording start ON / OFF and select condition.
  SPEED ..... Selects condition for change-on-alarm.
  MSG ..... Turns message print start ON / OFF and selects condition.



- Relay ID screen is displayed only when trigger mode is set to SELECT.
- There is no "OFF" on the START STOP or SPEED.

OFF ..... Does not start operation even if alarm occurs.
ALL ..... Starts operation when even one alarm occurs.
SELECT ..... Starts operation when relay specified by RELAY ID goes from OFF to ON.

[Key Entry, Panel Displays] The panel displayed when * key is pressed.

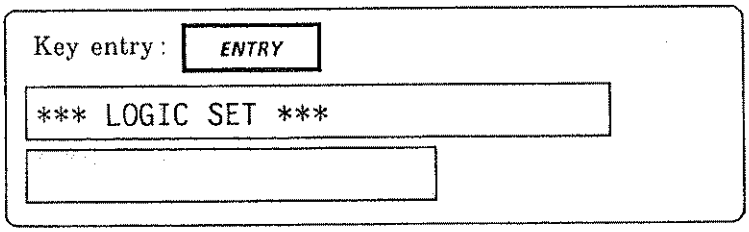


I** ..... Internal alarm
S** ..... Internal switch

· Trigger mode cannot be set to OFF for PRINT or SPEED. Choose either ALL or SELECT

[Description]

- Specify relay number when SELECT chosen.



- Logic SET UP is completed. Pressing ENTRY , F4 (END), ENTRY takes the recorder out of SET UP mode and shows the same display as when power is turned ON.

CAUTION

(1) DIGITAL ····· Effective only when digital recording control selection (Section 6.11.3 (10) in SET UP mode) is "EXT" in trend mode.

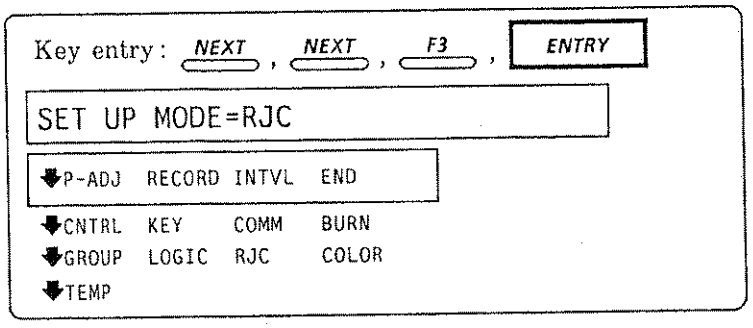
(2) The MSG-1 selection becomes the print start condition selection for "ALM-1" in the message setup of Section 6.10.5. Similarly, MSG-2 through MSG-5 become the condition selections for ALM-2 through ALM-5, respectively.

6.11.8 RJC SET UP

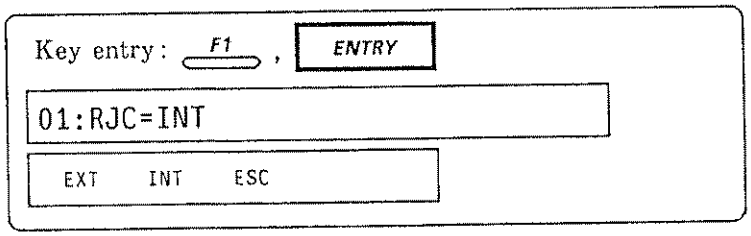
This SET UP selects whether to use internal or external reference junction compensation values.

Set DIP switch No. 1 in the back of the recorder to ON and, while holding the UPPER DISPLAY key pressed, turn ON the recorder power.

[Key Entry, Panel Displays] The panel displayed when * key is pressed. **[Description]**



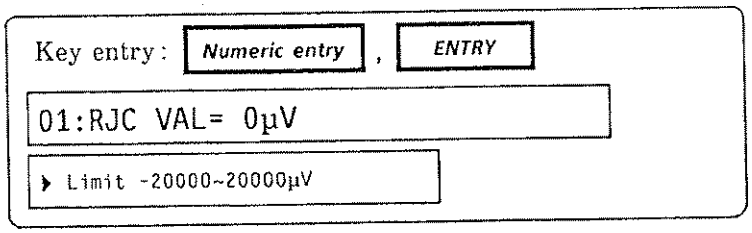
- Select reference junction compensation related setup.



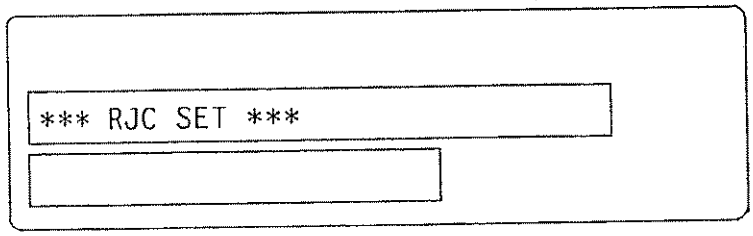
- Determine whether to perform reference junction compensation based on internal data or an external setting.

INT ..... Uses recorder internal reference junction compensation circuit.
EXT ..... Inputs voltage value to use as reference junction compensation value.

(Input only when EXT is selected.)



- Input voltage to use for reference junction. (Must be within range −20000 μV to +20000 μV.)



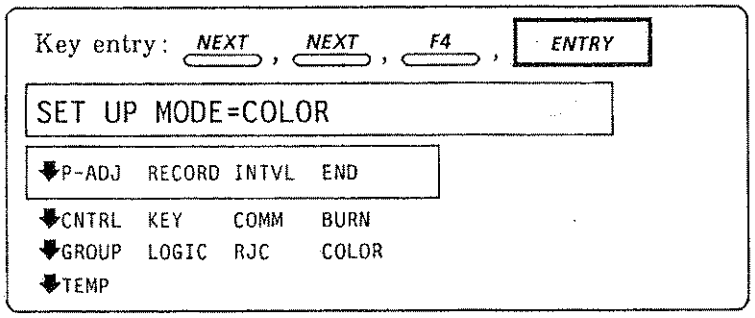
- RJC setup is completed.
- Pressing ENTRY once more returns the display to the first display; pressing F4 (END) and then ENTRY returns the recorder to normal mode.

6.11.9 Recording Color SET UP (COLOR)

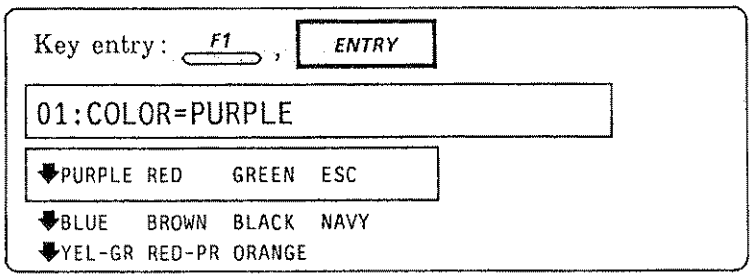
The colors to be used for trend recording can be set individually for each channel.

Set DIP switch No. 1 in the back of the recorder to ON and, while holding the UPPER DISPLAY key pressed, turn ON the recorder power.

[Key Entry, Panel Displays] The panel displayed when * key is pressed. **[Description]**

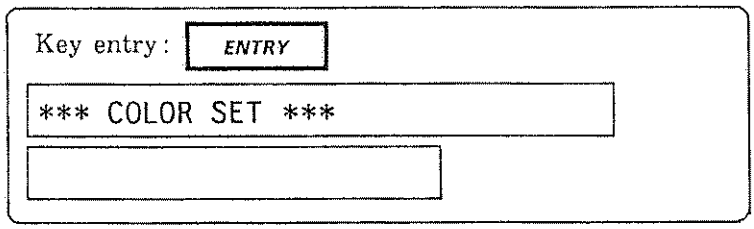


- Select colors.



- Specify color for channel No.1. To specify colors for other channels, change the channel number with CH UP △ and CH DOWN ▽ .

Note: The initial settings are, in order from channel 1, purple, red, green, blue, brown, black, navy, blue yellow-green, red-purple, and orange.



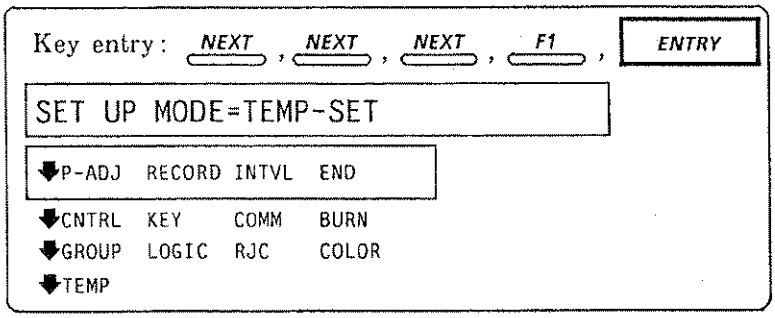
- Press ENTRY key again, then press F4 key (ESC), ENTRY key , F4 key (END), and ENTRY key to release from SET UP mode.

6.11.10 °C/°F Temperature Display SET UP

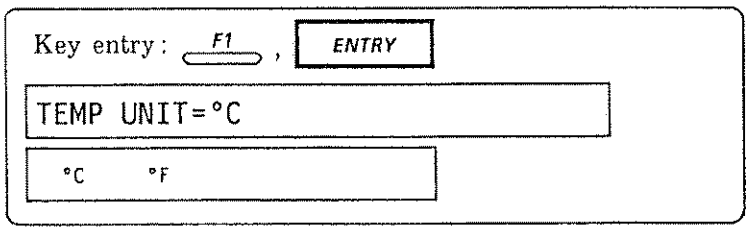
Set DIP switch No. 1 in the back of the recorder to ON and, while holding the UPPER DISPLAY key pressed, turn ON the recorder power.

On entering the SET UP mode, the display unit will first show the screen below.

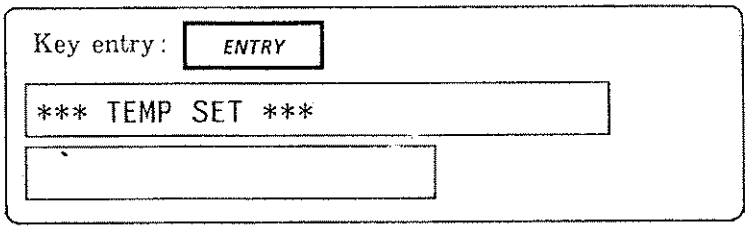
[Key Entry, Panel Displays] The panel displayed when * key is pressed. **[Description]**



- Selects either °C or °F for temperature display.



- Select the temperature unit.



- Setting is complete.
- Pressing ENTRY again, and then F4 and ENTRY takes the recorder out of the SET UP mode.

Note: The following settings are initialized whenever temperature display is changed.

- All parameter settings except those of SET UP mode
- Groups within SET UP and RJC voltage values for RJC EXTERNAL

6.12 Function Call (FUNC) SET UP

Pressing the FUNC key on the front panel gives the display shown below, and starts the operation described in the following.

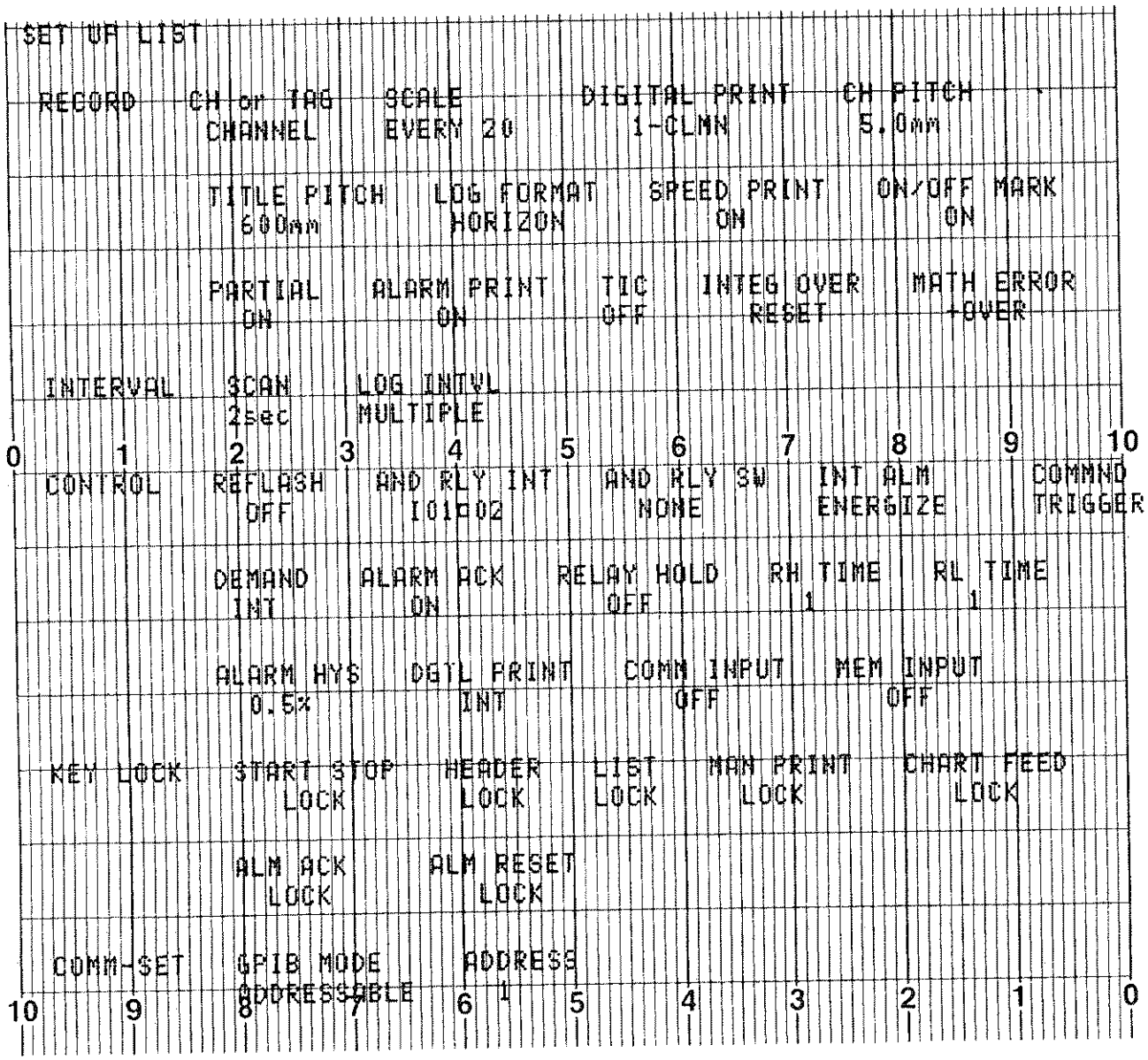
[Key Entry, Panel Displays] The panel displayed when * key is pressed. **[Description]**

Key entry : FUNC

```
FUNC=SET UP-LIST ON
▼SL-ON  SL-OFF MSG-P  ESC
▼INIT   A-INIT M-INIT I-RST
```

(1) SL-ON ..... Prints out a list of the details set up in the SET UP mode.
(2) SL-OFF ..... Stops printout of a list of the details in the SET UP mode.

<Set Up Mode List Printout Example :>



6.12

(3) MSG-P ..... Prints out message (PANEL).
(4) INIT ..... Initializes all the details already set up.
(5) A-INIT ..... Clears alarm printing memory.
(6) M-INIT ..... Clears message printing memory.
(7) I-RST ..... Clears interval information.

All of these are set by the function keys F1 through F4, and executed by the ENTRY key.

6.12

7. IC MEMORY CARD

7.1 Outline

7.1.1 Background

In order to use the memory functions described in this section, you must use a YOKOGAWA IC Memory Card. Please procure a YOKOGAWA IC Memory Card.

The memory functions discussed here comprise functions to store measured data, parameter setting values, communication input data, and computed data (when /MATH option installed).
By using the parameter setting value memory function to save range and setting information to an IC memory card, you can re-use a set of previously employed measurement conditions whenever needed just by inserting that card into the recorder.

The data memory function can be used to start data acquisition on alarm occurrences, chart end, external contact inputs, or memory setting completion.

The data stored in memory can of course be recorded on the chart when necessary, and also be output via communications.

A write protect switch (No. 4) is provided to prohibit the writing to the IC memory card. (See Section 3.2 "Recorder Main Unit DIP Switches".)

7.1.2 Specifications

Functions	:	Setting value and data memory
Format	:	IC memory card
Memory capacity	:	64K bytes, or 256K bytes or 512K bytes
Sampling modes	:	Free mode ; Start via manual Trigger mode ; Start via trigger conditions
Sampling rate	:	Scan interval selected for recorder, plus 1/2/5/10 minutes
Data length	:	0.5K, 1K, 2K, 4K, 8K, 16K, 32K data samples per channel, selection common to all channels
Data capacity	:	2 bytes per data
Sampled channels	:	Individually specified for each channel.

Trigger conditions

1. Data write

   Alarm detection : Select relay No. or switch No. of alarm trigger in data write mode. When the alarm occurs, the triggering condition is satisfied when the specified relay or switch goes from OFF to ON.

   Chart end detection : Triggering condition satisfied when chart end is detected.

   External contact input : Triggering condition satisfied when contact input turns ON, if recorder has optional remote (/REM) function.

2. Data Read

   Alarm detection : Select relay No. or switch No. of alarm trigger in data read mode. When the alarm occurs, the triggering condition is satisfied when the specified relay or switch goes from OFF to ON.

   External contact input : Triggering condition satisfied when contact input turns ON, if recorder has optional remote (/REM) function.

   * Monitoring for external contact input triggering detection is performed once each second. Therefore, the ON time of the external contact input must be at least one second. Alarm and chart end detection is done at each measurement interval.

Pre-trigger	:	Can be set from 0 to 100% in 10% increments.
Memory data	:	Parameter setting values Measured data (including computed data) Communications input data (when /GP-IB, /RS-232C in use)
Output	:	Chart recording; Data output rate output time interval Communications output (when /GP-IB, /RS-232C in use); ASCII and binary output
Battery backup	:	Lithium battery (life approximately 5 years) ...for 64K bytes (life approximately 3 years) ...for 256K bytes (life approximately 10 months)...for 512K bytes

7

7.1.3 Battery Installation / Replacement

This section describes how to install or replace the IC memory card memory data protection battery.

A battery should always be installed when using the card.

(1) Hold the IC memory card with its part number label side on top.
(2) Catch the side of the battery holder with your fingernail and pull out to remove the holder (Figure 7.1).
(3) Insert new batteries B9586JU (for 3789 03, 64K bytes), B9586JV (for 3789 04 and 3789 05, 256K bytes, 512K bytes) into the holder.
(4) Insert the battery holder into the IC memory card.
Thus, the new battery has been loaded. Also, the battery can be replaced in accordance with the following.
(5) If CARD BAT is displayed when the memory card is in use, replace the battery.
(6) Keep the power turned ON and the IC memory card installed in the recorder when replacing the battery. If the power is turned OFF or the card is remoned from the recorder when the battery is being replaced, all information in the card will be lost, so exercise care.
(7) Catch the battery holder on the right side of the IC memory card with your fingernail and pull out the battery holder.
(8) Replace with a new battery, and re-insert the battery holder into the IC memory card.
The above completes the replacement.

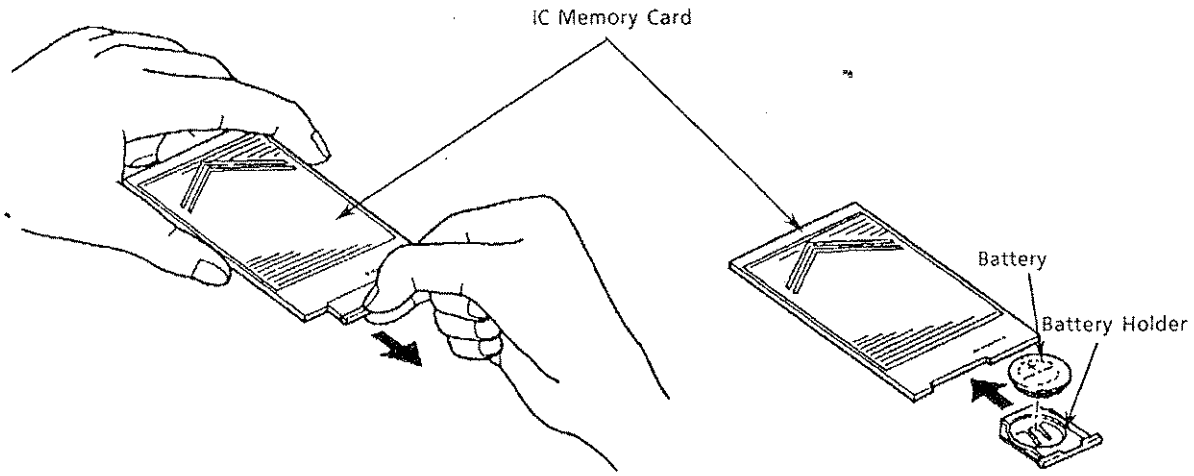
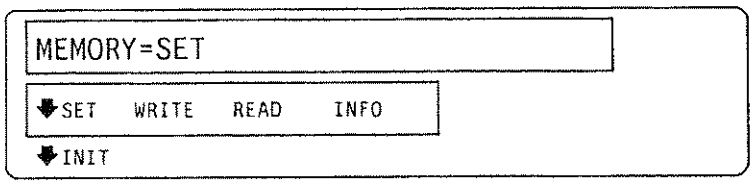


Figure 7.1

7.1.4 Introduction to the Setting Screen

Pressing the front panel MEMORY key displays the setting screen.

[Key Entry, Panel Displays]

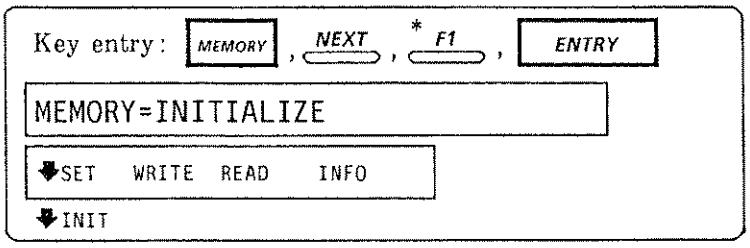


Menu Name	Function
SET	Used to load and save panel setting values.
WRITE	Used to set conditions for measured data write (sampling) and execute write operations.
READ	Used to set conditions for output of measured data (sampled data) and execute recording operations.
INFO	Used to display VOLUME NAME and usable memory capacity in memory card.
INIT	Used to initialize memory cards.

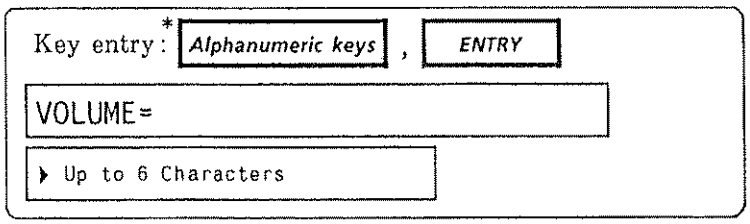
7.1.5 Initialization

An IC memory card must always be initialized before it is used for the first time. A volume name of up to six characters identifying the user name or experiment can be entered when the IC memory card is initialized.

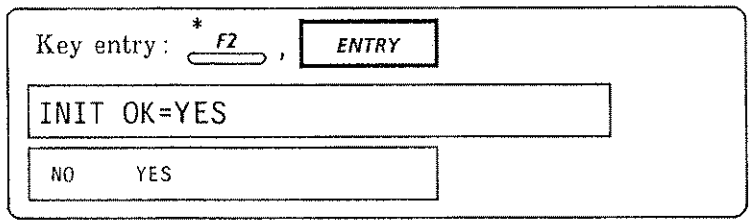
[Key Entry, Panel Displays] The panel displayed when * key is pressed. [Description]



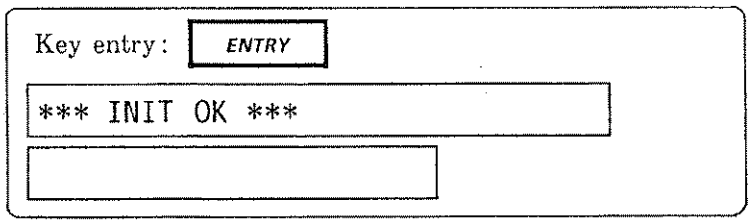
- IC memory card initialization screen.



- Enter the volume name. (Up to six characters)



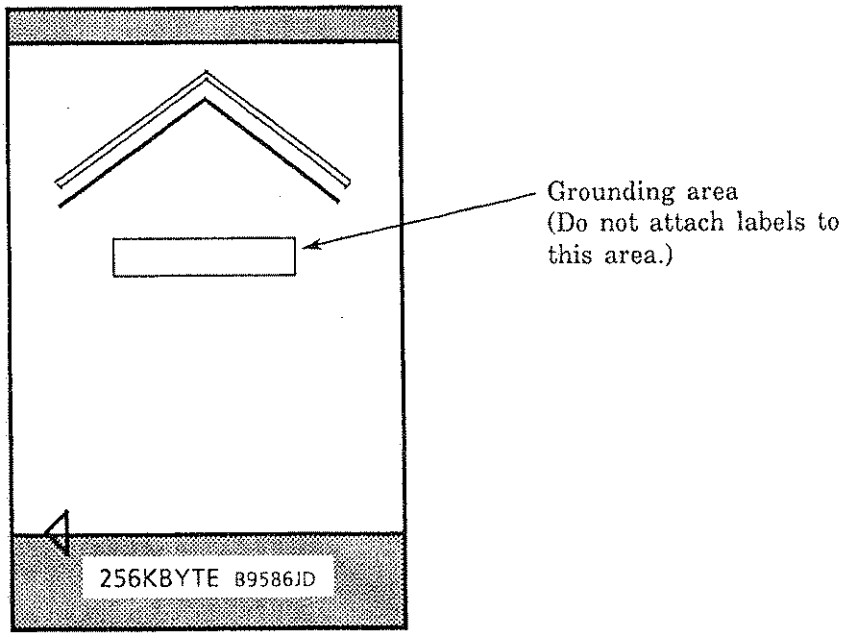
- If it is OK to initialize this card, verify that the IC memory card is properly inserted in the drive and press the ENTRY key.



CAUTION

Although adhesive labels are provided on which to write IC memory card volume and file information, these should never be placed over the grounding surface in the middle of the card rear surface.

Placing a label over this area will defeat its static electricity protection effect and may cause loss of the data stored in the card.



7.1.6 Background Information to Know Before Setting

(1) An IC memory card can store panel setting value files in as well as measured data files. The maximum number of files which can be stored is 48 files, including both measured data and panel setting value files. One of these 48 files is used as a volume information file.

(2) About File Capacity

Of the IC memory card capacity, 3.5K bytes is dedicated to file management. Thus in the case of the type having a nominal 256K byte usable area, the maximum capacity is 252.5K bytes (508.5K bytes for a 512K byte type). Panel setup values consume 20K bytes / file. Subsection (3) shows how to compute measured data file sizes.

(3) Measured data file size estimates are obtained as follows.

([Sampled data length]×2)×[No. of sampled channels]+256+64×No. of sampled channels

([Sampled data length]×2): No. of bytes

256+64×No. of sampled channels: File header information data length

* Sampled data length : Data length specified by sample length.
* No. of sampled channels : Number of channels which have been set to ON and for which RANGE has not been set to SKIP.

Example 1: File size for 500 points, 50 channels:

$(2 \times 500 \times 50 + 256 + 64 \times 50)/1024 = 52.2$

About 52K bytes will be used (1K bytes=1024 bytes).

Example 2: File size for 32000 points, 4 channels:

$(2 \times 32000 \times 4 + 256 + 64 \times 4)/1024 = 250.5$

About 250K bytes will be used. (1K bytes = 1024 bytes)

(4) The total number of files in an IC memory card cannot exceed 48.

Example:

Three panel setting files
Four sampled data files

The IC memory card in which these files are registered will contain 3+4+1=8 files

1: Volume information file

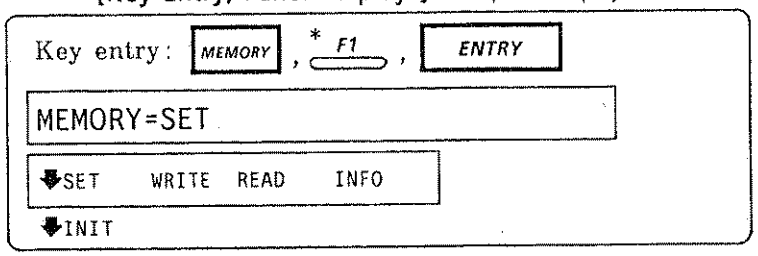
7.1.7 Storing Setting Information (SET)

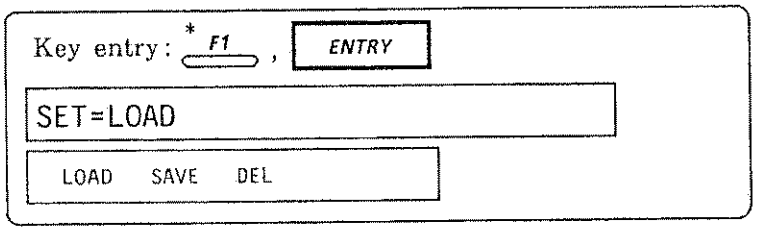
Function Combining setting information files of ranges and other such parameters with measured data files, up to 48 files can be stored.

Selections
(1) LOAD : Loads setting information from IC memory card into recorder.
(2) SAVE : Saves setting information from recorder to IC memory card.
(3) DEL : Deletes an unwanted file.

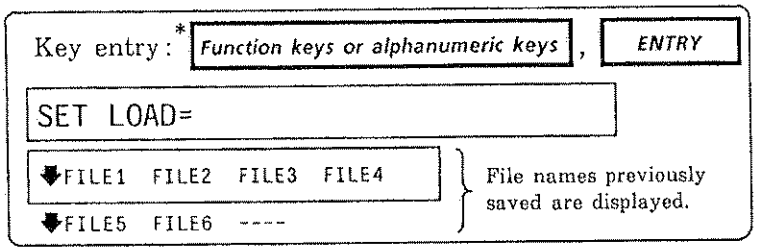
[LOAD Example]

[Key Entry, Panel Displays] The panel displayed when * key is pressed. [Description]

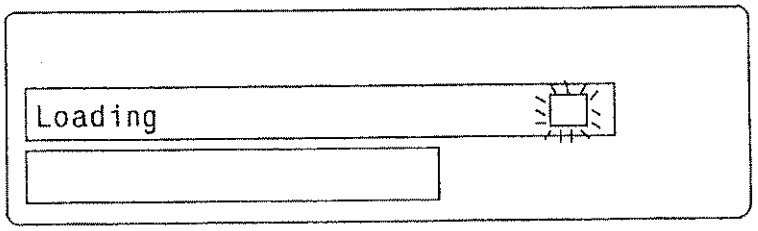




- Load setting information in IC memory card.



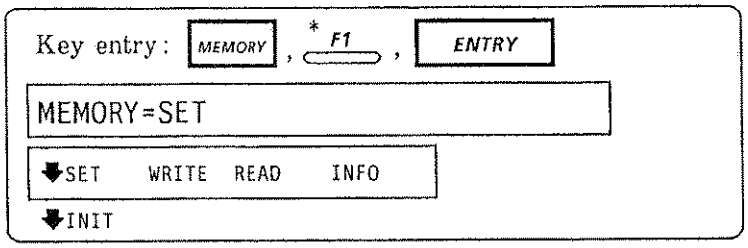
- Input file name of file to be loaded.
- Files previously saved can be selected using the function.
- The file name can also be input using the numeric keys.

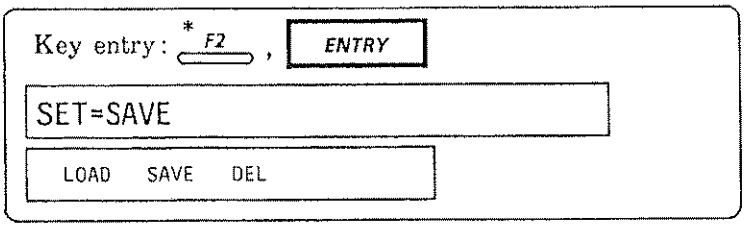


- Loading begins.
- GP-IB and RS-232C communications cannot be used while loading is in progress.
- When loading ends, the screen returns to data display mode.

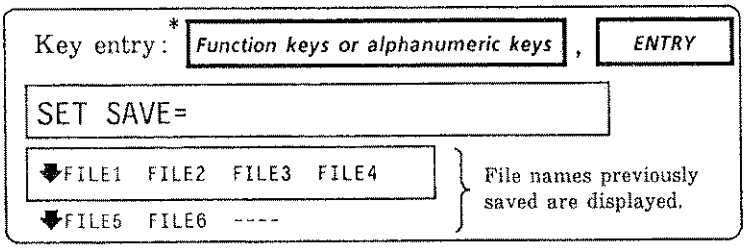
[SAVE Example]

[Key Entry, Panel Displays] The panel displayed when * key is pressed. [Description]

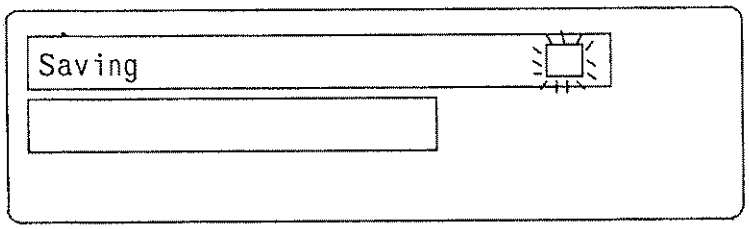




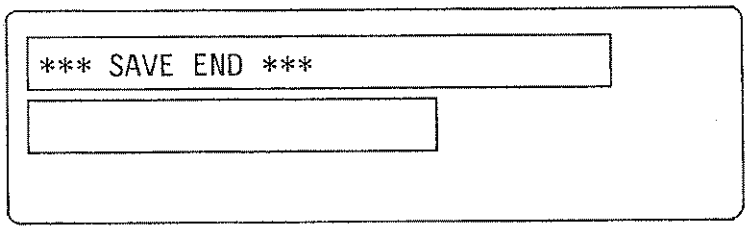
- Save setting information to IC memory card.



- Input file name of file to be saved.
- If a previously saved file is to be re-used, it can be selected using the function keys. The file name can also be input using the numeric keys.



- Saving begins.
- An error message will be displayed at this time if the number of files exceeds 48, or there is no IC memory card capacity.

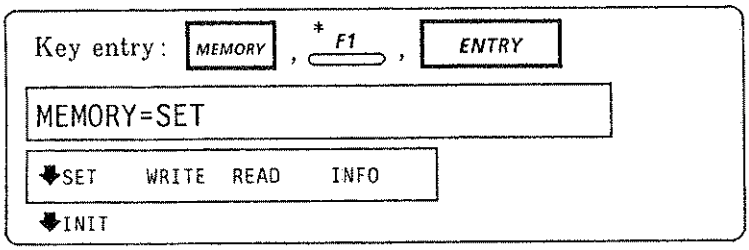


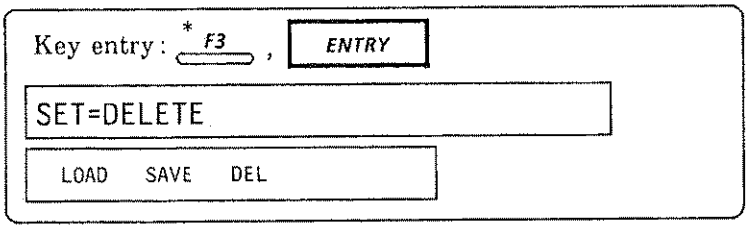
- Saving is completed.

Note: Each setting information file = 20K bytes

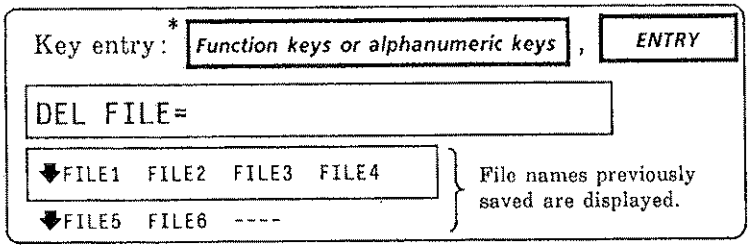
[DEL Example]

[Key Entry, Panel Displays] The panel displayed when * key is pressed. **[Description]**

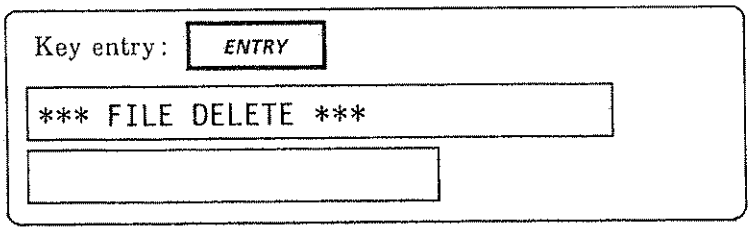




- Delete unwanted file from among the setting information files on the IC memory card.



- Use the function keys to select the setting information file to be deleted. The file name can also be input using the numeric keys.



- The deletion is completed.

7.1.8 Measured Data Storage
(1) Data Write (WRITE)

Function — Write data to IC memory card.

[Key Entry, Panel Displays] The panel displayed when * key is pressed. [Description]

Key entry: MEMORY, * F2, ENTRY

```
MEMORY=DATA-WRITE
▼SET   WRITE  READ   INFO
▼INIT
```

- Select write.

Key entry: * F1, ENTRY

```
WRITE=TRIGGER
▼TRIG  DIRECT  STOP  CH-SET
▼DEL
```

- Select method to use for write.

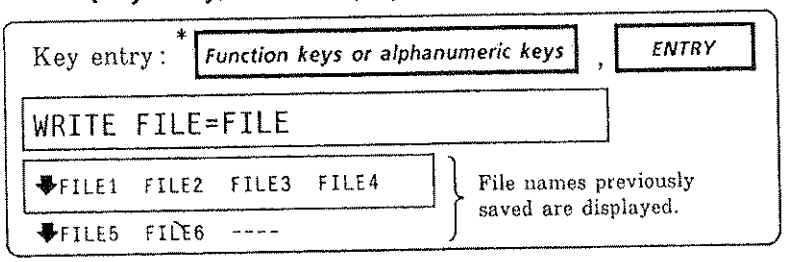
- TRIG ..... { • Alarm occurrence • Chart end • Remote control contact input (/REM option) } Begins acquiring measured data to IC memory using any of the above as a trigger.
- DIRECT ..... Begins acquiring data to IC memory card as soon as settings completed.
- STOP ..... Used when you wish to abort writing of data to IC memory card while the write is in progress.
- CH-SET ..... Specifies only required channels among those whose measured data is being acquired to the IC memory card.
- DEL ..... Deletes measured data file already present on IC memory card.

In the setting procedures that follow, the information to be entered differs for each menu selection.

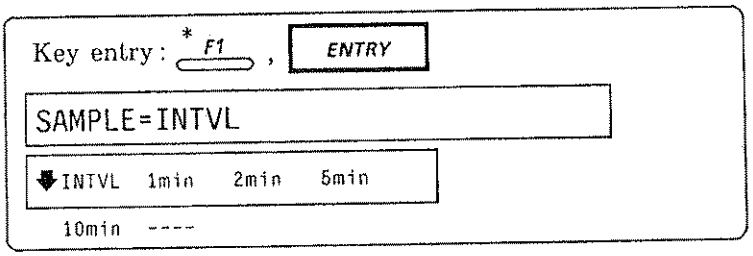
[When TRIG is Selected]

Acquisition of measured data to the IC memory card can be started using an alarm occurrence chart end, or remote control contact input as a trigger.

[Key Entry, Panel Displays] The panel displayed when * key is pressed. [Description]

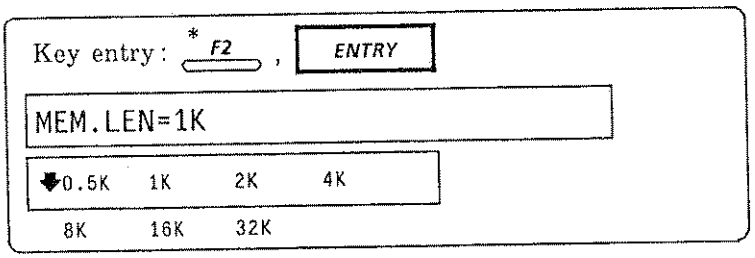


- Input the file name.

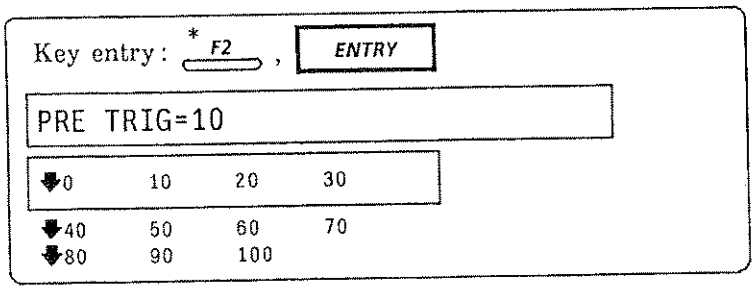


- Decide the interval with which data will be sampled to the IC memory card.

INTVL ... Causes data to be sampled at the scan interval.

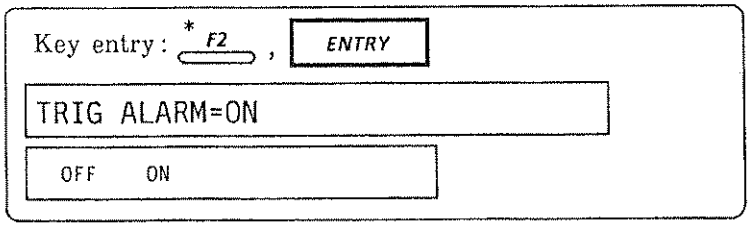


- Acquire 1K (1000) data samples. This sampling designation applies to all channels which have been specified as ON using CH-SET and have not been set for SKIP in RANGE setting.



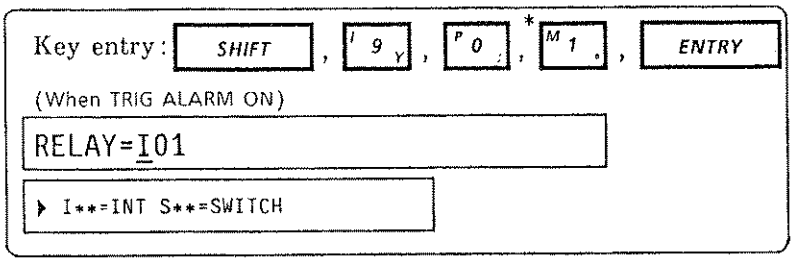
- Set a pre-trigger. Enables you to specify what percentage of the total data acquired in the IC memory card will consist of pre-trigger data.

[Key Entry, Panel Displays] The panel displayed when * key is pressed.

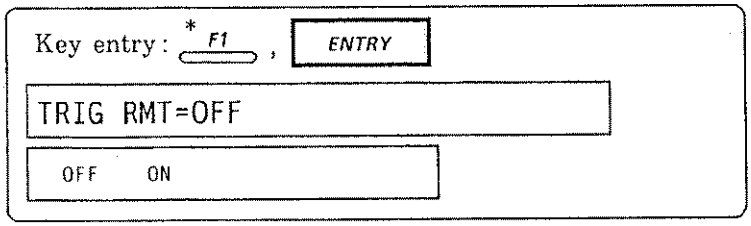


[Description]

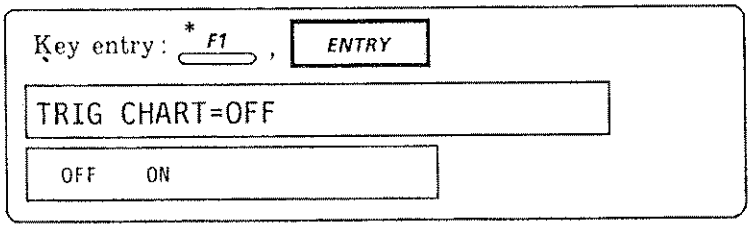
- Select whether or not to use an alarm occurrence as a trigger to start sampling of data to the IC memory card.



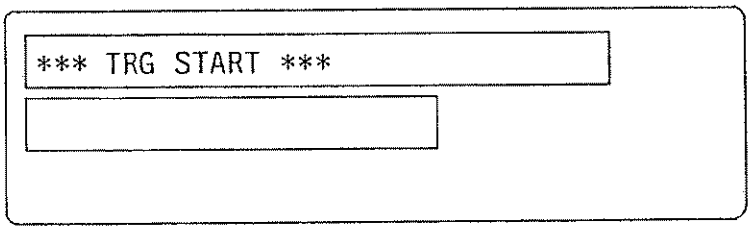
- If ON was selected above, input the relay number of the alarm output which will become the trigger.
  - I** .... Internal alarm output relay
  - S** .... Internal switch



- Select whether or not to use a remote control (option) contact input as the trigger to start sampling of data to the IC memory card.



- Select whether or not to use a chart end as a trigger to start sampling of data to the IC memory card.

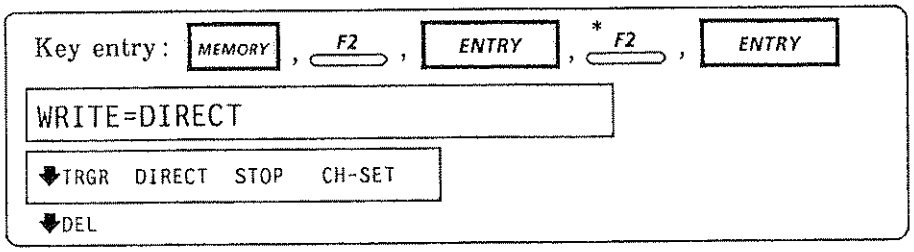


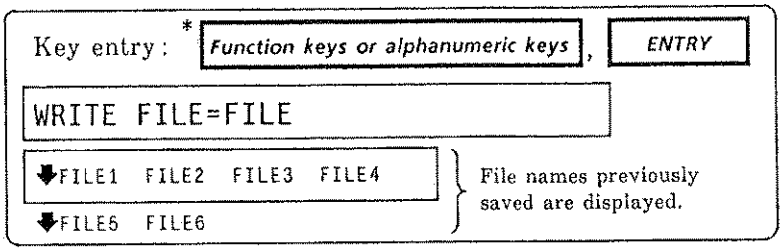
- Setting is completed and recorder begins waiting for the triggers.
- Pressing ENTRY once more returns the recorder to the initial screen.

[DIRECT]

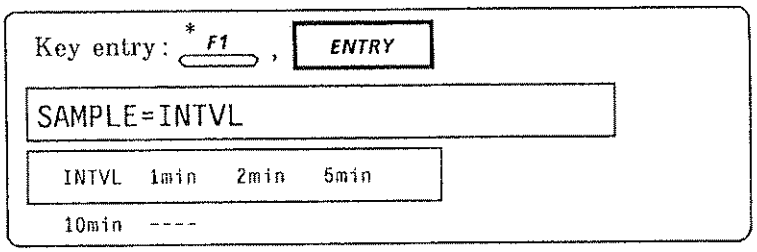
Measured data acquisition to the IC memory card begins as soon as setting is completed.

[Key Entry, Panel Displays] The panel displayed when * key is pressed. [Description]



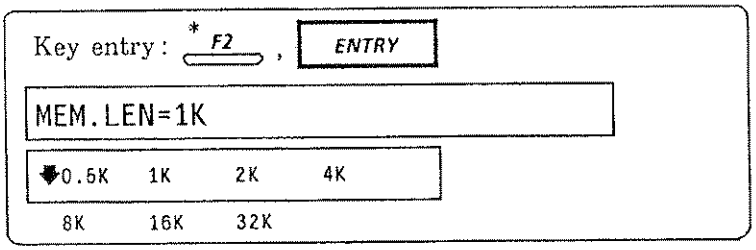


- Input the file name.

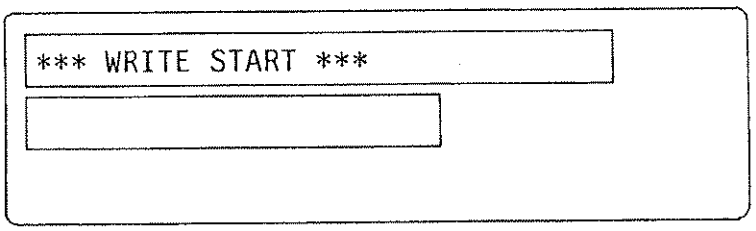


INTVL ····· Causes data to be sampled at the scan interval.

- Decide the interval with which data will be sampled to the IC memory card. This sampling specification applies to all channels which have been specified as ON using CH-SET and have not been set for SKIP in RANGE setting.



- Acquire 1K (1000) data samples.



- Sampling to the IC memory card begins as soon as the setting is completed.

[When CH SET is Selected]

CH SET is used to select only those required channels from among the measured data for acquisition to the IC memory card.

[Key Entry, Panel Displays] The panel displayed when * key is pressed. [Description]

Key entry : MEMORY , F2 , ENTRY , * F4 , ENTRY

```
WRITE=CH-SET
▼TRGR  DIRECT  STOP   CH-SET
▼DEL
```

Key entry : * F1 , ENTRY

```
01:MEMORY=ON
  ON    OFF   ESC
```

- Select this channel for acquisition of measured data to the IC memory card.

- The initial value is ON for all channels.
- Use the CH UP △ , CH DOWN ▽ and CH-SET keys to change the channel No. for selection.

Key entry : ENTRY

```
*** SET OK ***
```

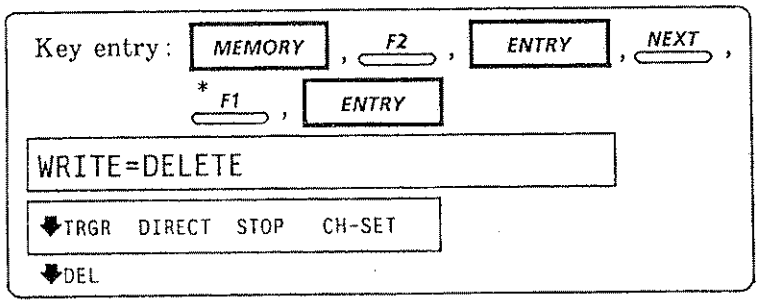
- Pressing the ENTRY key once more returns the recorder to the CH-SET starting screen.
- Press ESC (F3) and ENTRY key to end.

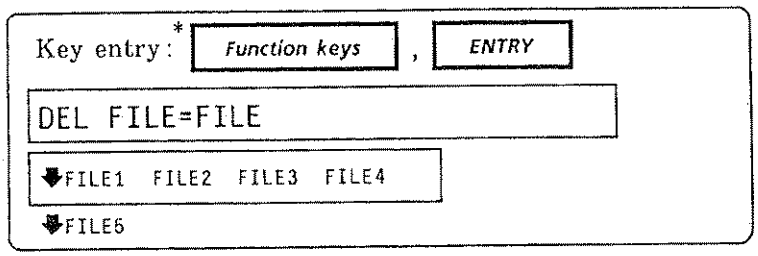
[When DEL is Selected]

Deletes a file already present on the IC memory card.

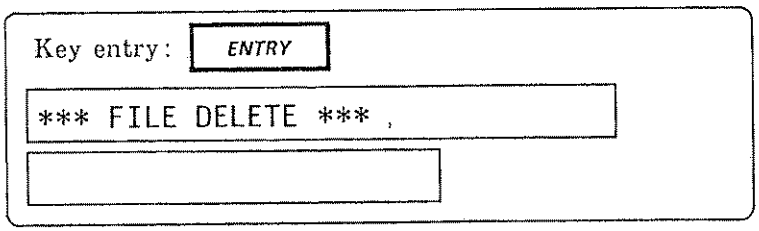
[Key Entry, Panel Displays] The panel displayed when * key is pressed.

[Description]





- Select the name of the file to be deleted from the IC memory card.



- The file has been deleted.

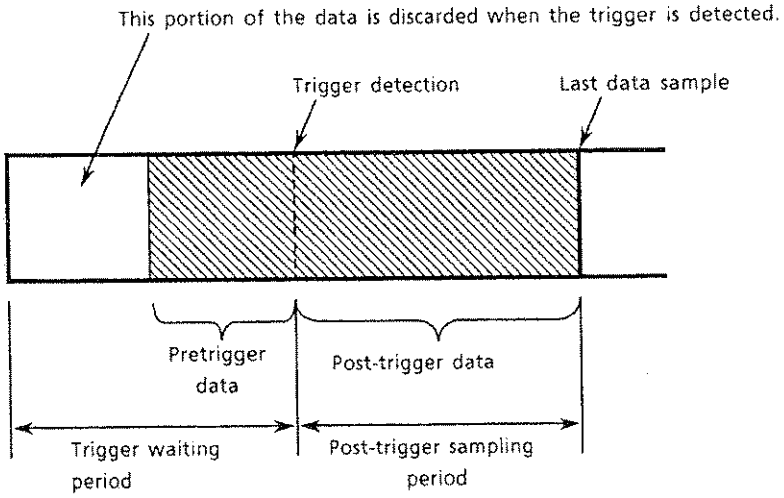
[About Triggering Conditions]

① Pretrigger

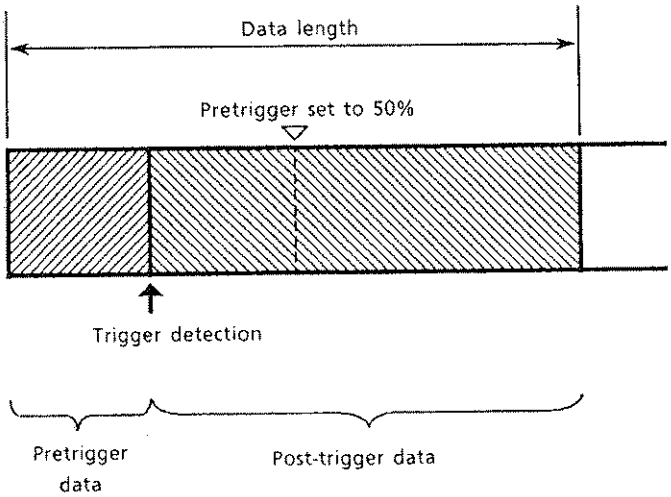
Pretriggering is used with sampling in the trigger mode.

Setting pretrigger to 0% effectively disables pretrigger, so that only data measured after the trigger is retained.

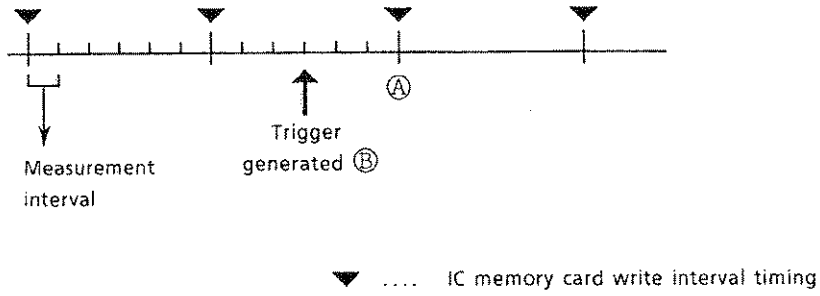
When pretrigger is set to a value other than 0% and the triggering condition is detected, data acquired prior to the trigger is retained in an amount determined by the specified pretrigger fraction, data acquired earlier is discarded, and data sampling continues uninterrupted following the trigger.



- If the trigger is detected before enough data has been acquired to fill the pretrigger size allocation, the pretrigger data area becomes the data acquired since the start of sampling, and the post-trigger data becomes the data acquired from trigger detection until the specified data length is reached.



- Trigger detection when measurement interval and sample interval differ:

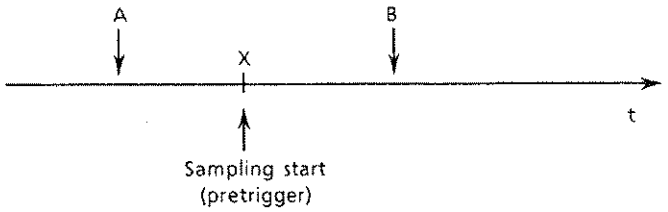


When the IC memory card write interval and measurement interval differ (see figure above), and the trigger occurs in the interval between IC memory card write times (Ⓑ in figure above), the data written to the IC memory card as the apparent trigger point data is that measured at next IC memory card write time (Ⓐ in figure above).

② **Internal alarm trigger**

The occurrence of an alarm condition can be used as the trigger for IC memory card operation.

When this is done, the trigger is applied at the leading edge of the alarm event. If an alarm is already present when sampling is begun and the trigger wait state is entered, it will not act as a trigger.

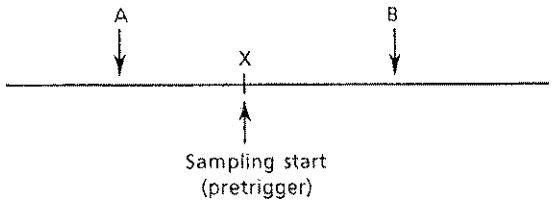


- If the alarm occurs at time A and the IC memory card operation and trigger wait are started at time X, triggering will not take place.
  However, if the alarm occurs again at time B, then B will become the triggering point.
- If the IC memory card operation and trigger wait are started at time X, and the alarm occurs at time B, then B will become the triggering point.

③ **External Contact (Contact Input via Remote Control /REM)**

Triggering occurs when the external contact goes from OFF to ON (edge detection), starting IC memory card data writes.

Triggering will not occur if the contact is already ON when the recorder enters the trigger wait state.

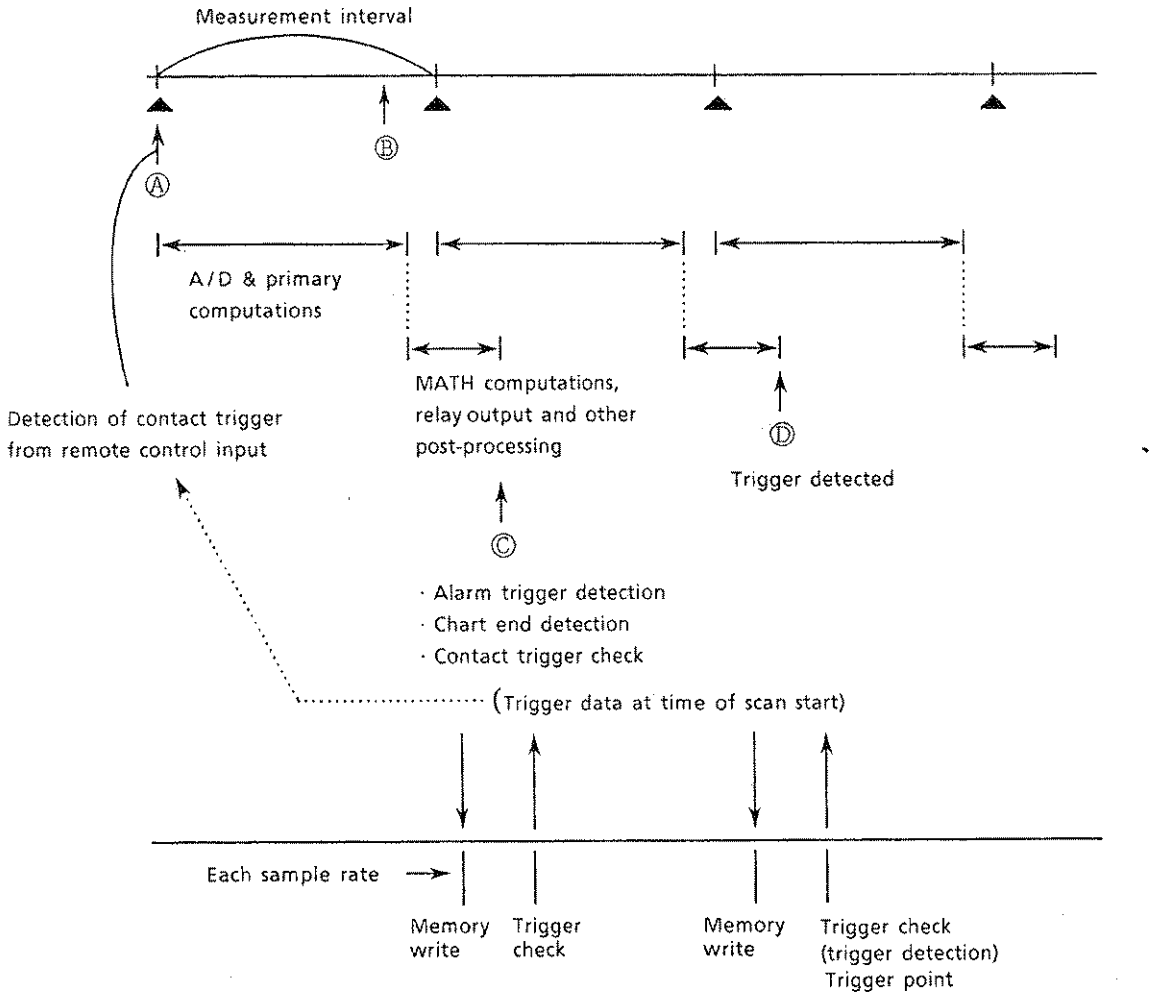


- If the external contact turns ON at time A, and the IC memory card operation and trigger wait are started at time X, triggering will not take place. However, if the contact makes an OFF to ON transition again at time B, then B will become the triggering point.
- If the IC memory card operation and trigger wait are started at time X, and the contact off to on transition occurs at time B, then B will become the triggering point.

[Trigger Detection Timing]

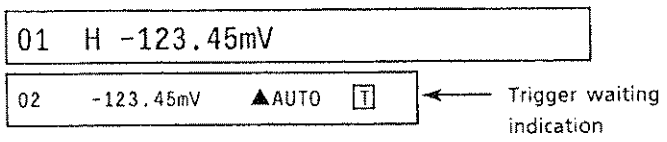
Actual trigger detection is performed with the timing indicated by point Ⓒ in the figure below. Since for contact detection the recorder retains the contact status at Ⓐ, this means that even if the contact goes from off to on at point Ⓑ this will not result in triggering at point Ⓒ. Triggering will result in the next interval at Ⓓ.

In the case of alarms or chart end, triggering will result at Ⓒ even if they occur at Ⓑ.

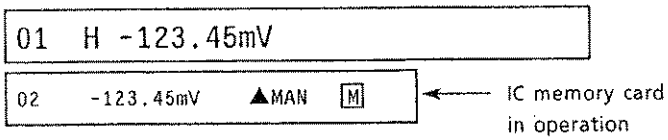


[Recorder Displays]

Trigger waiting state



IC memory card in operation



- When different operating states are in force for READ and WRITE, then the indications for memory operation in-progress, trigger wait, and stopped are displayed in sequence.

Example:

If WRITE is in progress with READ waiting for trigger, the [M] symbol is displayed.

CAUTION

Do not remove the IC memory card while data write is in progress.

If the IC memory card is removed while a data write operation is in progress, data sampling will halt (the timing of the halt may be delayed up to one sample time interval). The file whose write was in progress will remain as is on the IC memory card.

In this case the following will be true for write-in-progress file:

(1) Since the formal file close procedure will not have been performed, the data cannot be read back. Therefore this file will not be shown in the list of existing files for recording and playback (loading), but will remain as a file on the IC memory card.

(2) The file which has become unusable due to the write process interruption will be displayed together with the general data files by the DEL selection of the MEMORY setting WRITE menu, and so should be deleted.

(2) Data Read (READ)

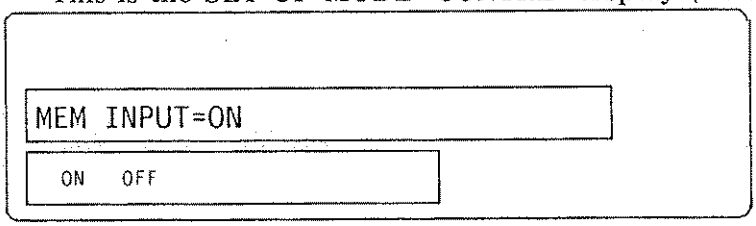
[Specifying Channels at Time of Data Read]

The data written to the IC memory card can be played back using the computation channels 31 through 60.

Note:

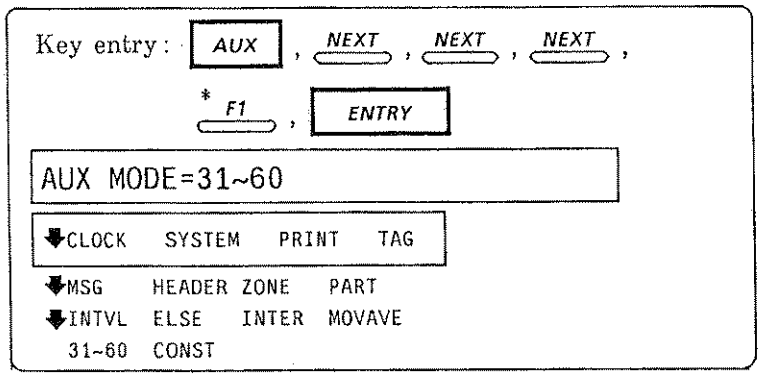
- To play back data on a recorder, 31 to 60 channels should be set same range (SPAN) as measuring channels when they were written.
- To play back data on a recorder not equipped with the /MATH computation option, you must set to ON the MEM INPUT parameter under "CONTRL" in the SET UP mode.

This is the SET UP MODE "CONTRL" display. (Refer to Section 6.11.3)



- During WRITE, channels set to OFF will be processed as though set for SKIP.
- Refer to the MATH option instruction manual for recorders equipped with the MATH option.
- In addition to the above setting, the setting described below must be done using the AUX key.

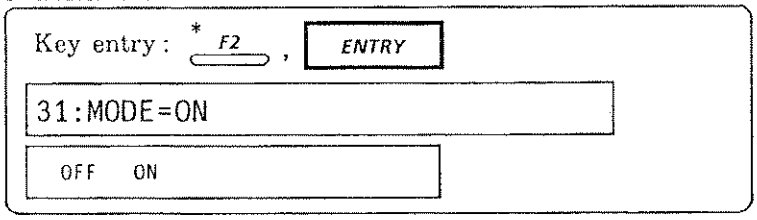
[Key Entry, Panel Displays] The panel displayed when * key is pressed.



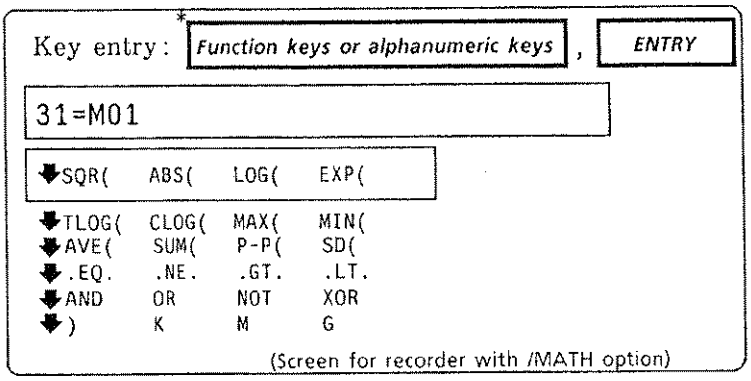
[Description]

- Channels 31 through 60 are set for use by memory.

Setting up to play back on channel 31 data written to the IC memory card from channel 01.

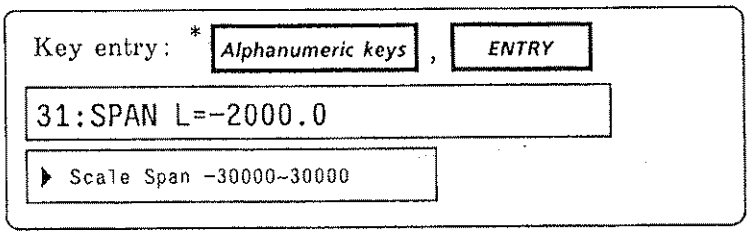


[Key Entry, Panel Displays] The panel displayed when * key is pressed.

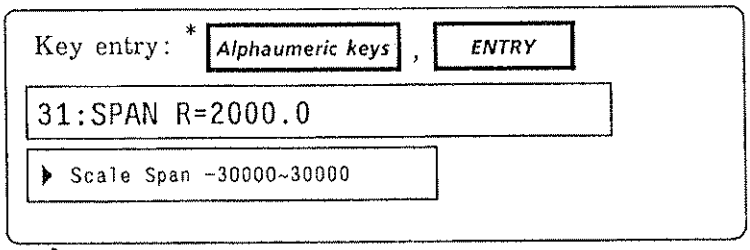


[Description]

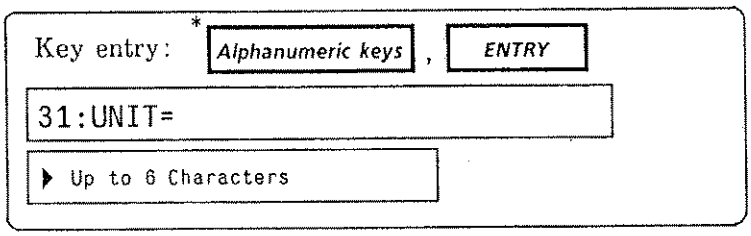
- Assign channel 31 to channel 1 data written to IC memory card.



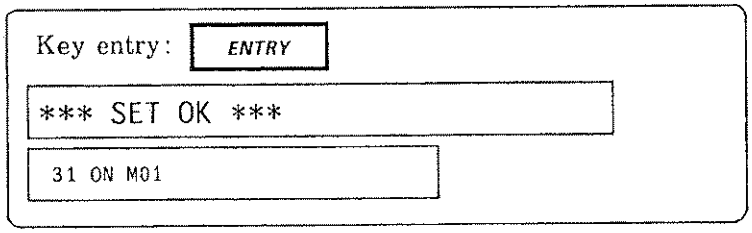
- Input recording span left value.



- Input recording span right value. A decimal-point position is the same position as for the left span.



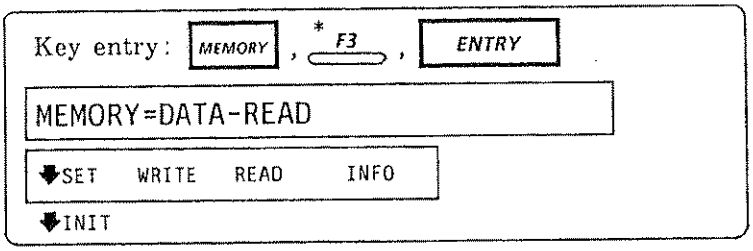
- Input unit (up to 6 characters).



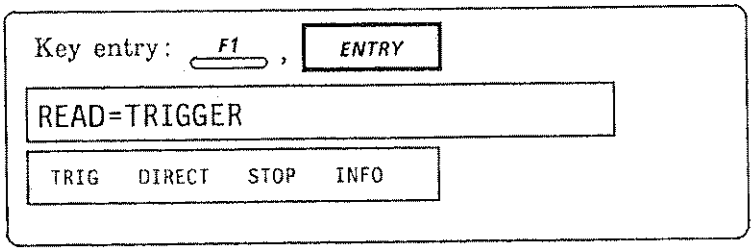
- Setting is complete. Repeat the procedure in the same manner for channels 32 through 60.

This procedure reads back data previously written into an IC memory card (computed data written to the card can also be read back).

[Key Entry, Panel Displays] The panel displayed when * key is pressed. [Description]



- Select read.



- Specify procedure to use for reading.

Readback from the IC memory card can be triggered by:

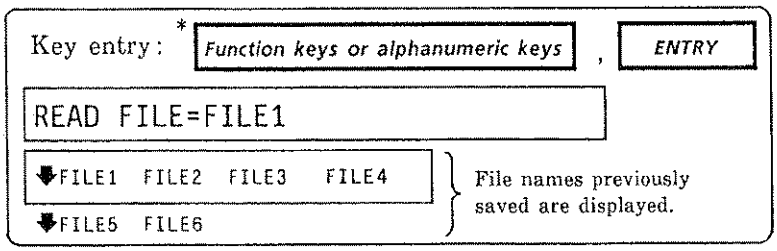
- TRIG ..... • Alarm detection
  • Remote control (/REM option) contact input
- DIRECT .... Begins reading data from IC memory card as soon as setting is complete.
- STOP ..... Used to abort an IC memory card data read operation in progress.
- INFO ..... Obtains display of information on data to be read back from the IC memory card.

In the setting procedures that follow, the information to be entered differs for each menu selection.

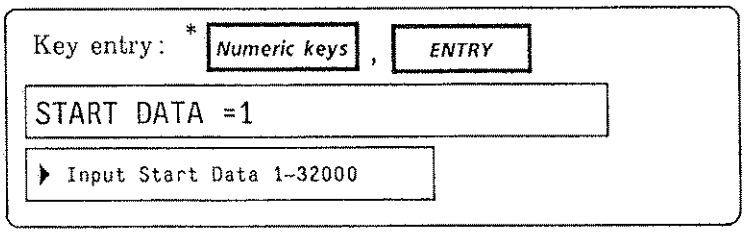
[When TRIG is Selected]

Data can be readback from the IC memory card using an alarm occurrence or remote control contact input as a trigger.

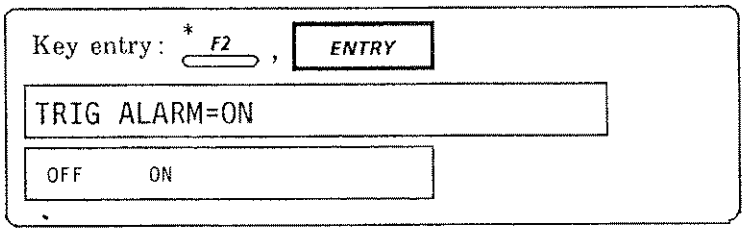
[Key Entry, Panel Displays] The panel displayed when * key is pressed. [Description]



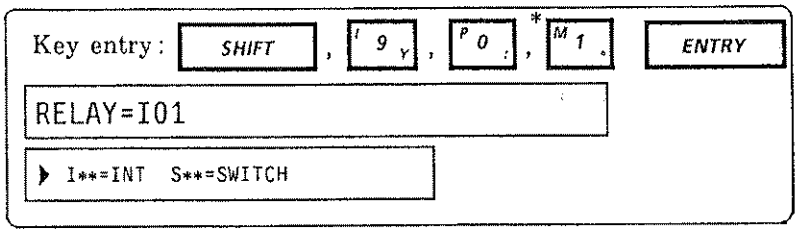
- Input name of the file to be read.



- Specify the number of the data sample from which to begin reading.

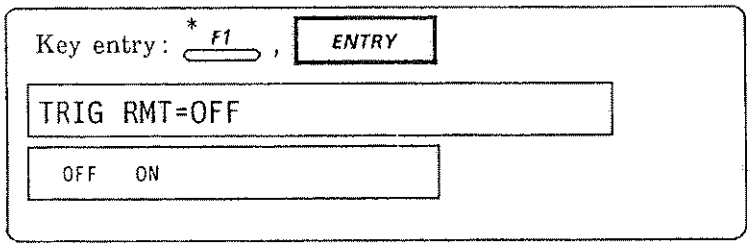


- Select whether or not to use the occurrence of an alarm as the trigger for readback of data from the IC memory card.



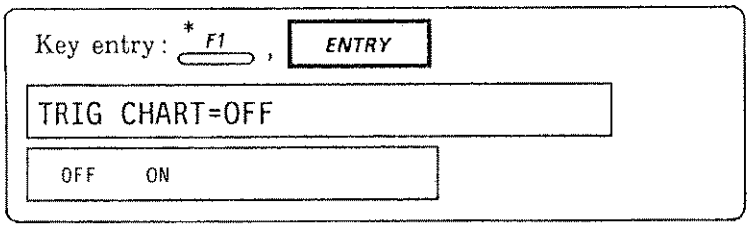
- If ON was selected above, input the relay number of the alarm output which will become the trigger.
  - I** .... Internal alarm output relay
  - S** .... Internal switch

[Key Entry, Panel Displays] The panel displayed when * key is pressed.

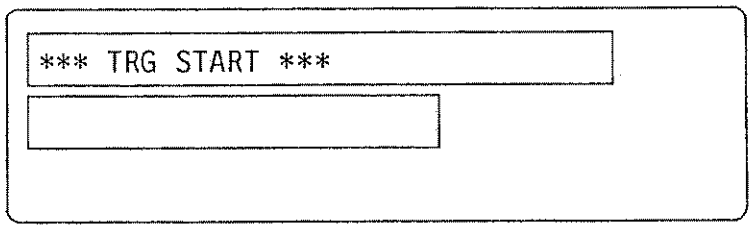


[Description]

- Select whether or not to use a remote control (option) contact input as the trigger for readback of data from the IC memory card.



- Select whether or not to use a chart end as a trigger to start sampling of data to the IC memory card.



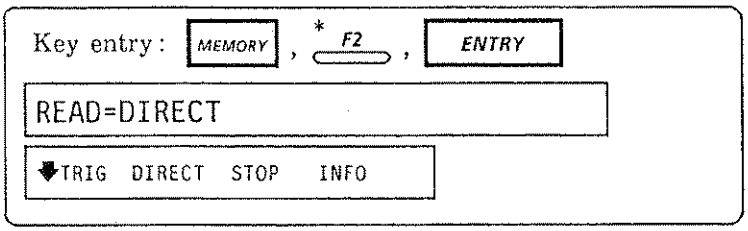
- Setting is completed and recorder begins waiting for the triggers.
- Pressing ENTRY once more returns the recorder to the initial screen.

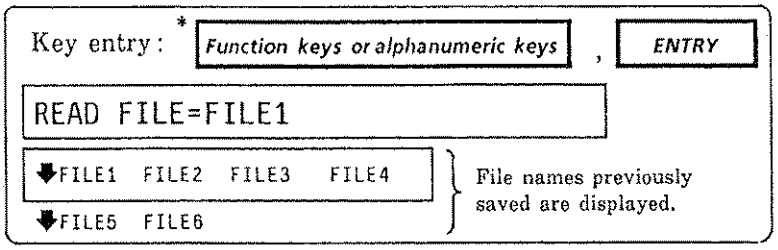
* In the TRIGGER mode, making all trigger OFF results in ERROR.

[DIRECT]

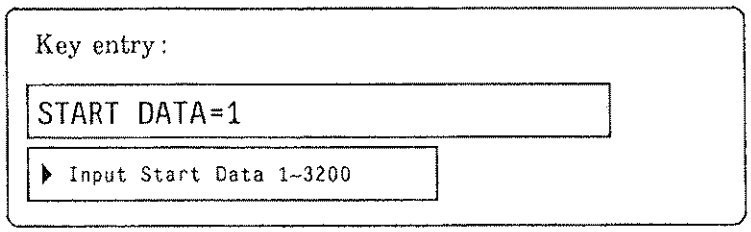
Readback of the data from the IC memory card begins as soon as setting is completed.

[Key Entry, Panel Displays] The panel displayed when * key is pressed. [Description]

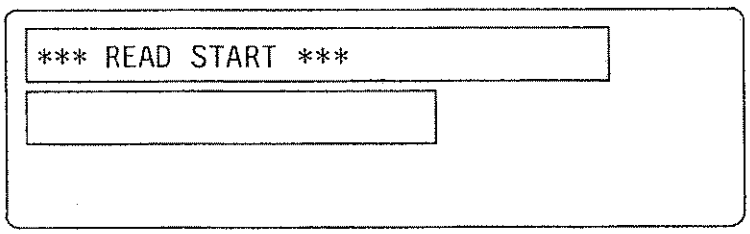




- Input the name of the file to be read.



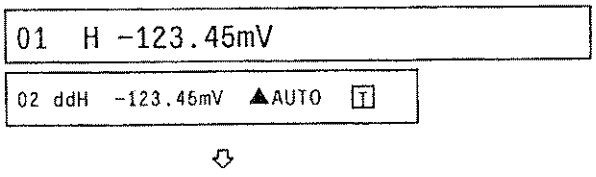
- Specify the number of the data sample from which to begin reading.



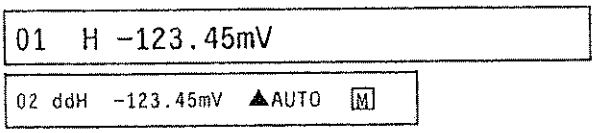
- Setting is complete, and readback of data from the IC memory card begins.

[Display During Readback]

Display while awaiting trigger.



Display while read in progress.



[Display at END of Readback]

After all data has been read, or if the recorder is waiting for a trigger or not performing a read, the data for M□□ channels is assigned the "SKIP" value.

If a SKIP value is used for computation on a computation channel (from 31 through 60), a computation error will result in yielding a value of "+OVER" or "−OVER" (selected when setting MATH ERROR processing in SET UP mode).

CAUTION

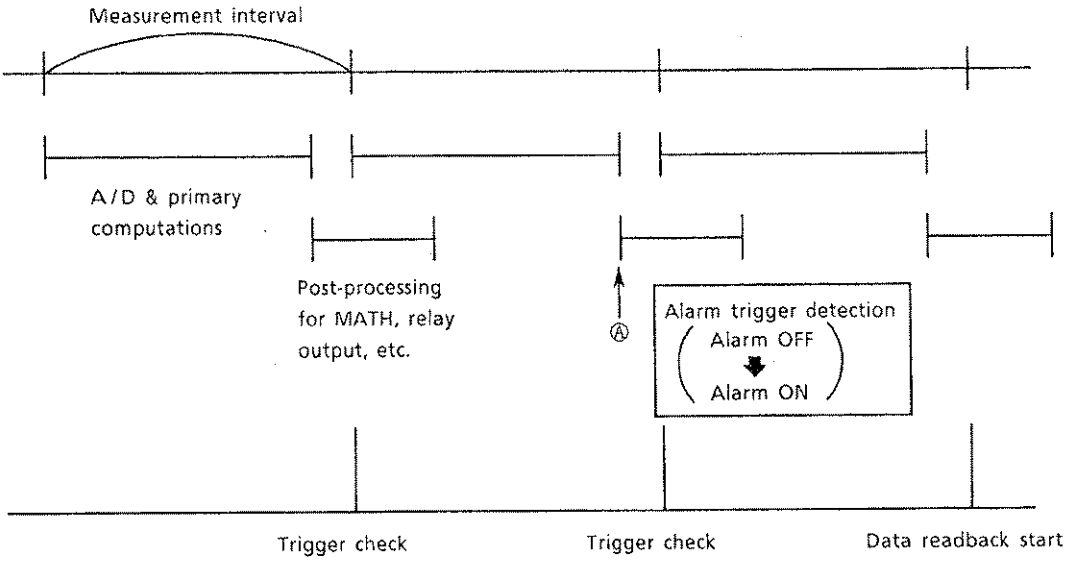
- Do not turn OFF the recorder power (including power failures, etc.) while a trigger wait, data read or data write operation is in progress.
  Even if power recovers, the trigger wait, data write and data read operations will abort.
- Data readback is done once each measurement interval.

① **Alarm Trigger**

An alarm condition can be used as a trigger. When this is done, the recorder triggers and begins reading data on the leading edge of the alarm event.

If an alarm is already present when the recorder enters the trigger wait state, it will not act as a trigger.

- **Alarm**

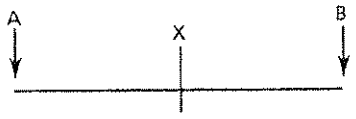


In the case of alarm triggering, data readback begins from the next measurement interval following the one that detects it (alarm occurs at point Ⓐ).

② **External Contact (Via Remote Control /REM Option) Trigger**

Triggering occurs when the external contact goes from OFF to ON (edge detection), starting data readback.

Triggering will not occur if the contact is already ON when the recorder enters the trigger wait state.

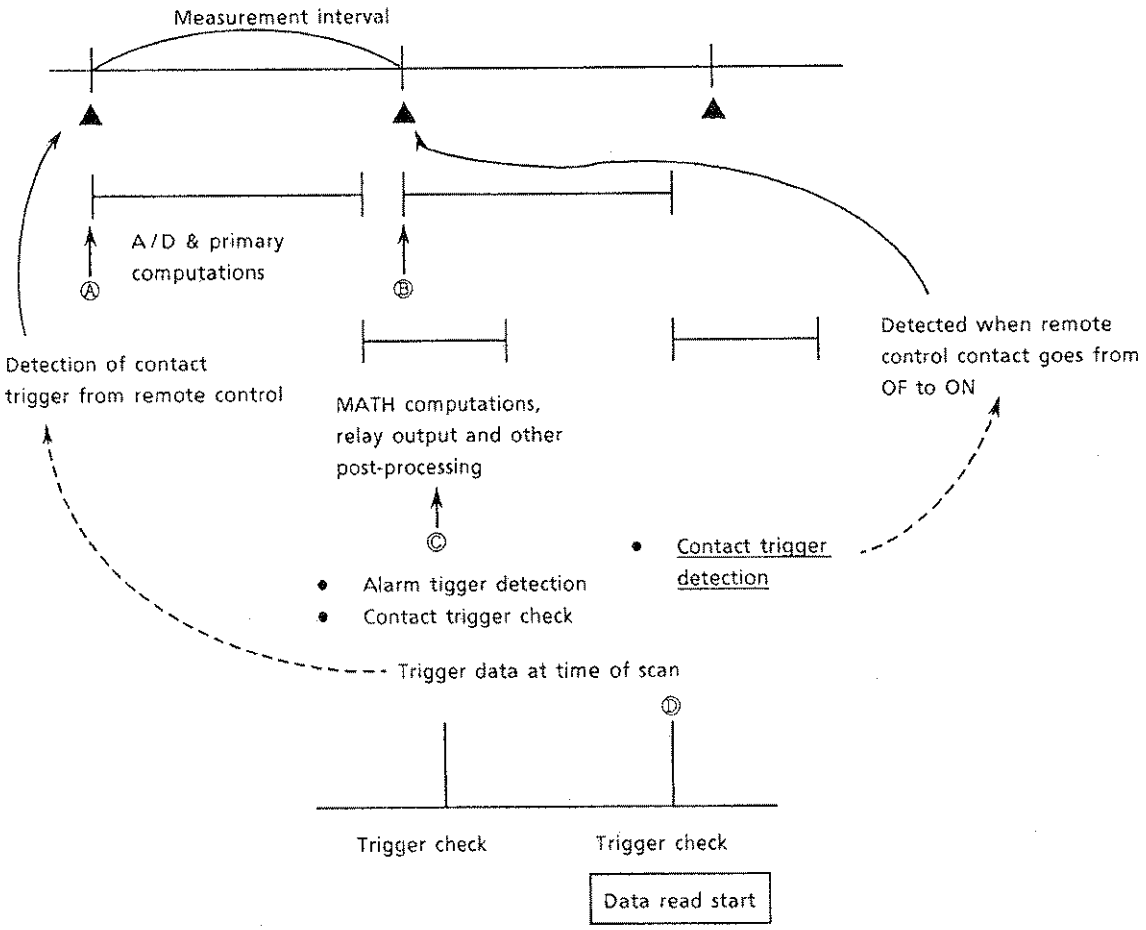


- If the external contact turns ON at time A, and the data read operation is initiated at time X, triggering will not take place. However, if the contact makes an OFF to ON transition again at time B, then readback will begin.
- If the data read operation is initiated at time X, and the contact OFF to ON transition occurs at time B, then readback will begin from point B.

③ Trigger Detection Timing

Actual trigger detection is performed with the timing indicated by point Ⓒ in the figure below. Since for contact detection the recorder retains the contact status at Ⓐ, this means that even if the contact goes from off to on at point Ⓑ this will not result in triggering at point Ⓒ. Triggering will result in the next interval at Ⓓ.

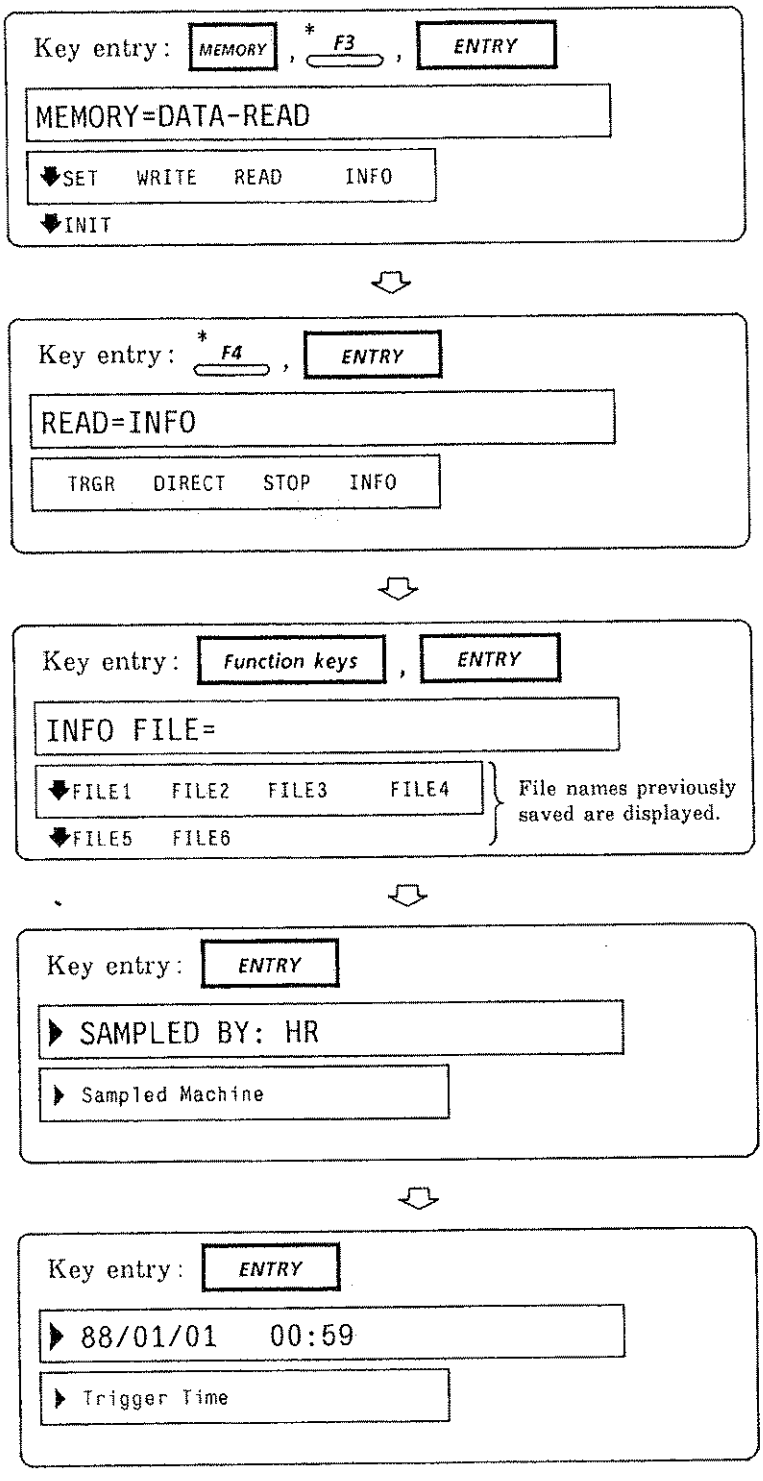
In the case of alarms or chart end, triggering will result at Ⓒ even if they occur at Ⓑ.



(3) Checking Setting and Measurement Information (INFO)

Used to display information about what kind of data is stored on an IC memory card.

[Key Entry, Panel Displays] The panel displayed when * key is pressed. [Description]

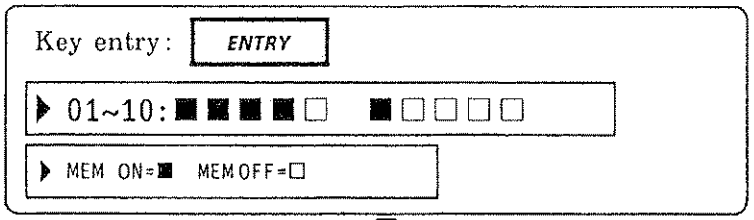


- Select read.
- Select information read.
- Use the function keys to select the file for which you want information.
- Since the IC memory card may be used with other YOKOGAWA products (LR, DMM etc.), this display shows that the data about to be read is data from this device.
- Display date and time that the data was written to the IC memory card.
  (For data from other products which does not contain data and time information, the display shows "00/00/00 00:00")

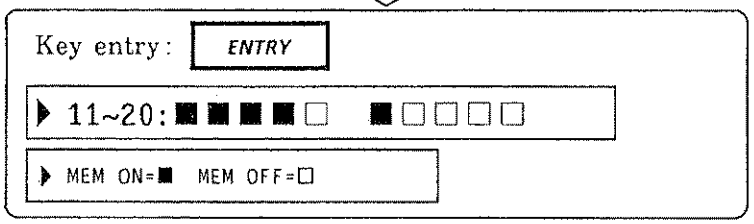
The following shows for which channels data was written to the IC memory card.

Channel written = ■
Channel not written = □

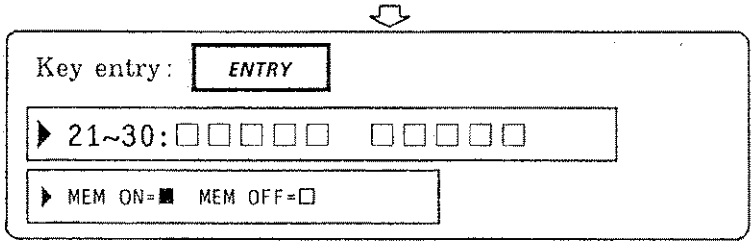
[Key Entry, Panel Displays] The panel displayed when * key is pressed. **[Description]**



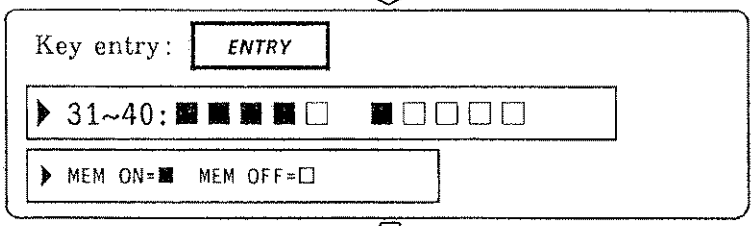
- Channels 1 through 10



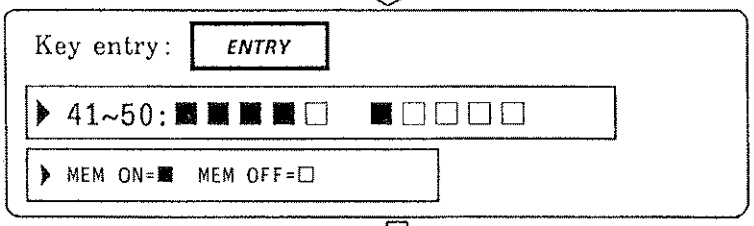
- Channels 11 through 20



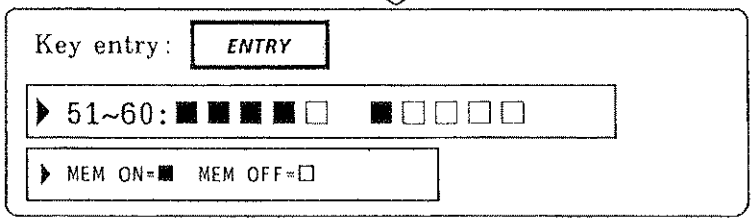
- Channels 21 through 30 (everything □)



- Channels 31 through 40

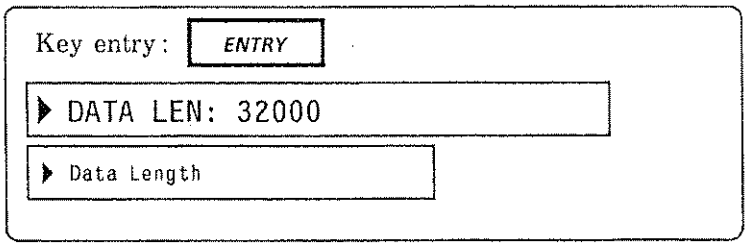


- Channels 41 through 50



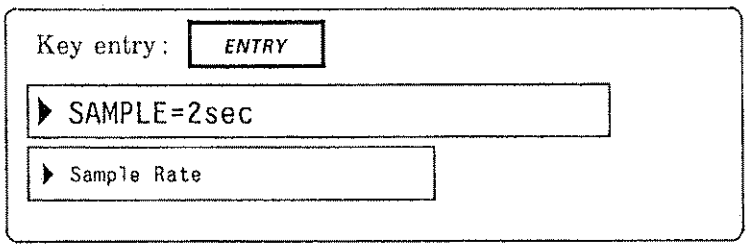
- Channels 51 through 60

[Key Entry, Panel Displays] The panel displayed when * key is pressed.

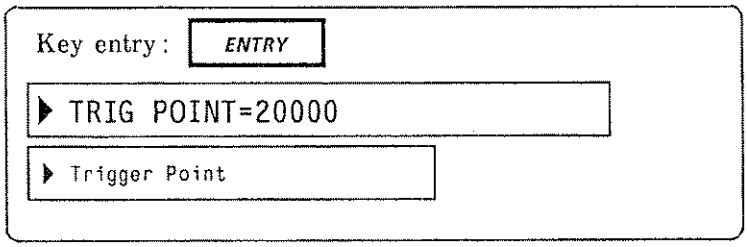


[Description]

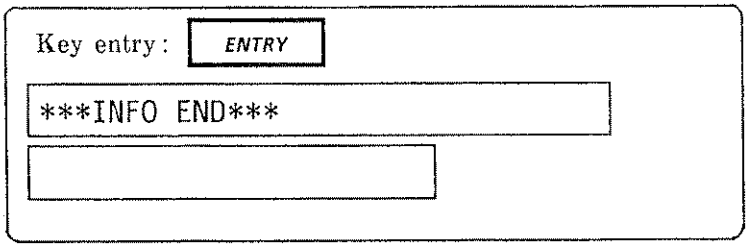
- Display number of data samples



- Display interval at which data sampling was performed.



- Displays number of data sample at which trigger occurred.
  (Display will read "1" if pretrigger = 0% or sampling is done in DIRECT mode.)

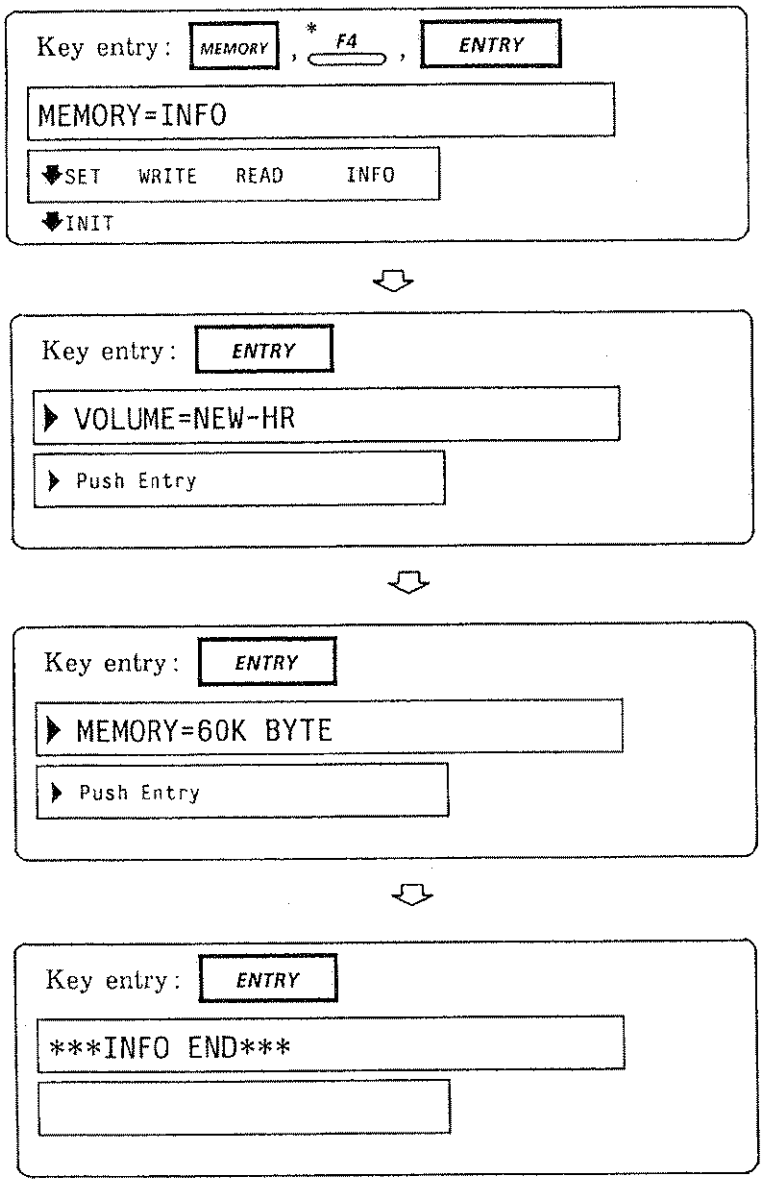


- Information display completed.

(4) Displaying Capacity Remaining on IC Memory Card

Displays the capacity remaining on the IC memory card.

[Key Entry, Panel Displays] The panel displayed when * key is pressed.

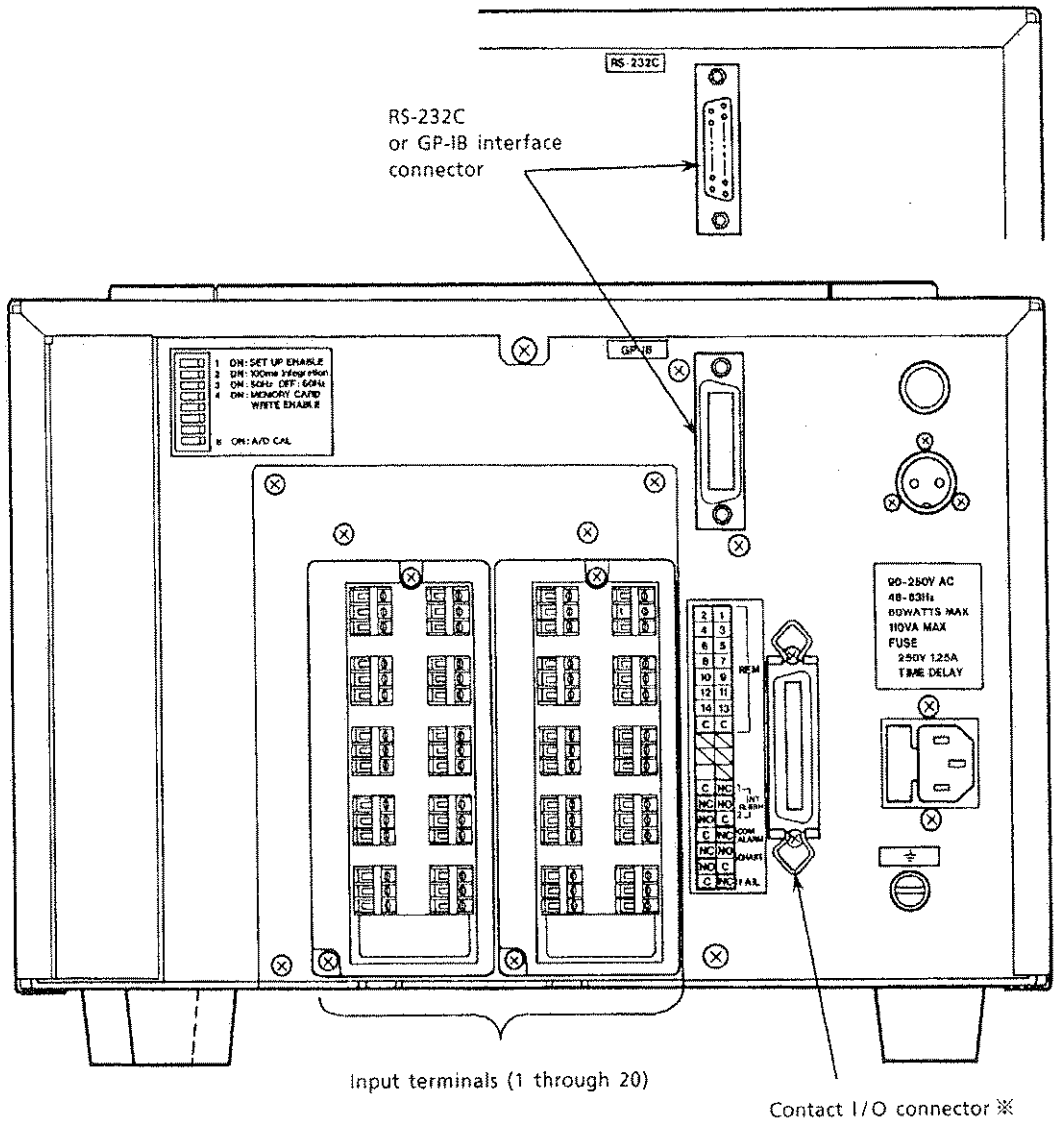


[Description]

- Select IC memory card information (INFO).
- Display IC memory card volume name.
- Display IC memory card memory remaining.

8. CONTACT OUTPUTS AND INPUTS

HR2300 Rear Panel Option Arrangement



※ Note : Contact I/O connector signals

(Connector for recorder fail, chart end, common alarm output, internal alarm output relay (AK-02), and remote control terminals (/REM))

Figure 8.1 Rear Panel Option Arrangement

8

8.1 Remote Control Function (Option /REM) Specifications

This option enables the recorder functions to be controlled externally by contact inputs.

Controlled Functions :
1. Message print command (1 to 5 messages)
2. Recording start/stop
3. Chart speed and logging interval changes
4. Manual print command
5. Digital print command (for use during trend mode)
6. IC memory card data write and read commands

Input Signals : Dry contact or open-collector (TTL or transistor)

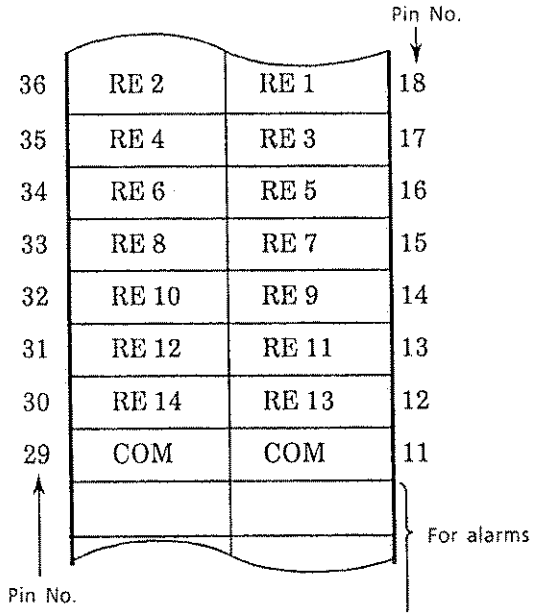
Input Conditions : ON voltage (0.5V maximum) (30mA DC)
Leakage current in OFF state (0.25mA maximum)
Signal duration (one second minimum)

Input Type : Photocoupler isolation (one side common)
Internal isolated power source (5V ± 5%)

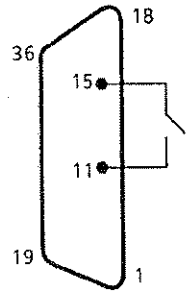
Dielectric Strength : Between input and ground terminals
1000 V (50 or 60 Hz) for one minute

Power Consumption : Included in the standard value for the recorder.

Wire and use the accessory connector.



RE 1 : Chart speed, logging interval change
RE 2 : Recording start/stop
RE 3 : Digital print (in trend mode)
RE 4 : Manual print
RE 5 : IC memory card read
RE 6 : IC memory card write
RE 7 : Message print 1
RE 8 : Message print 2
RE 9 : Message print 3
RE 10 : Message print 4
RE 11 : Message print 5
COM : Common



Note : To print Message 1, connect wires to pins 15 and 11 (or 29).

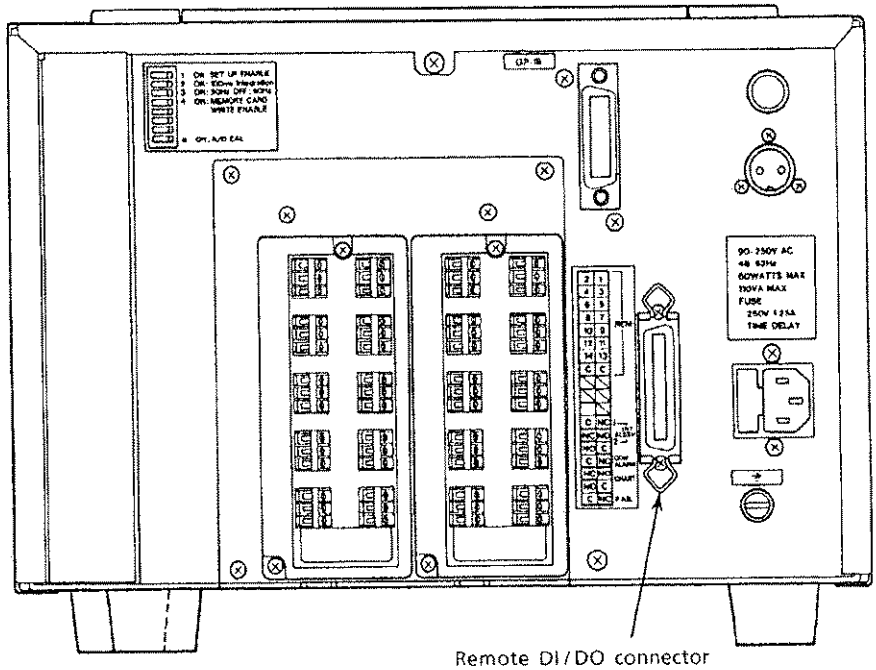


Figure 8.2 Remote Connector

8.2 Internal Alarm Output Relays (Option /AK-02)

(Refault Realarm Output Relay)

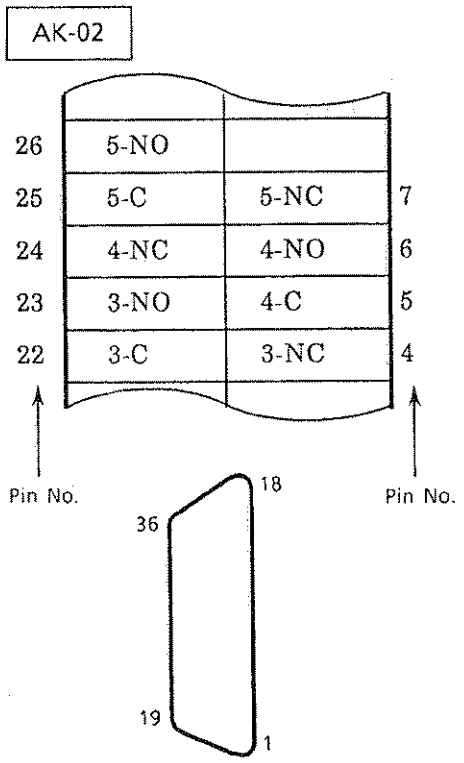
Number of Output Contacts: 2 points

Output Type : Relay transfer contact + single-point common
Energize / de-energize operation can be switched (set in energized when panel mount shipment)

Output Capacity : 24V DC, 0.5A ····· Life 300,000 cycles
(resistive load with arc suppressor)

Dielectric Strength : 1000V (50 or 60Hz) for one minute between output and ground terminals

Power Consumption: Included in recorder standard specification.



Wiring required to accessory connector.

5 ..... I01
4 ..... I02
3 ..... Common alarm output relay

Two of the internal alarm output relay points output via pins number 6 and 7, and 23 through 26 of the left-hand remote control connector as seen from the rear. The common alarm output relay uses pins 4, 5 and 22.

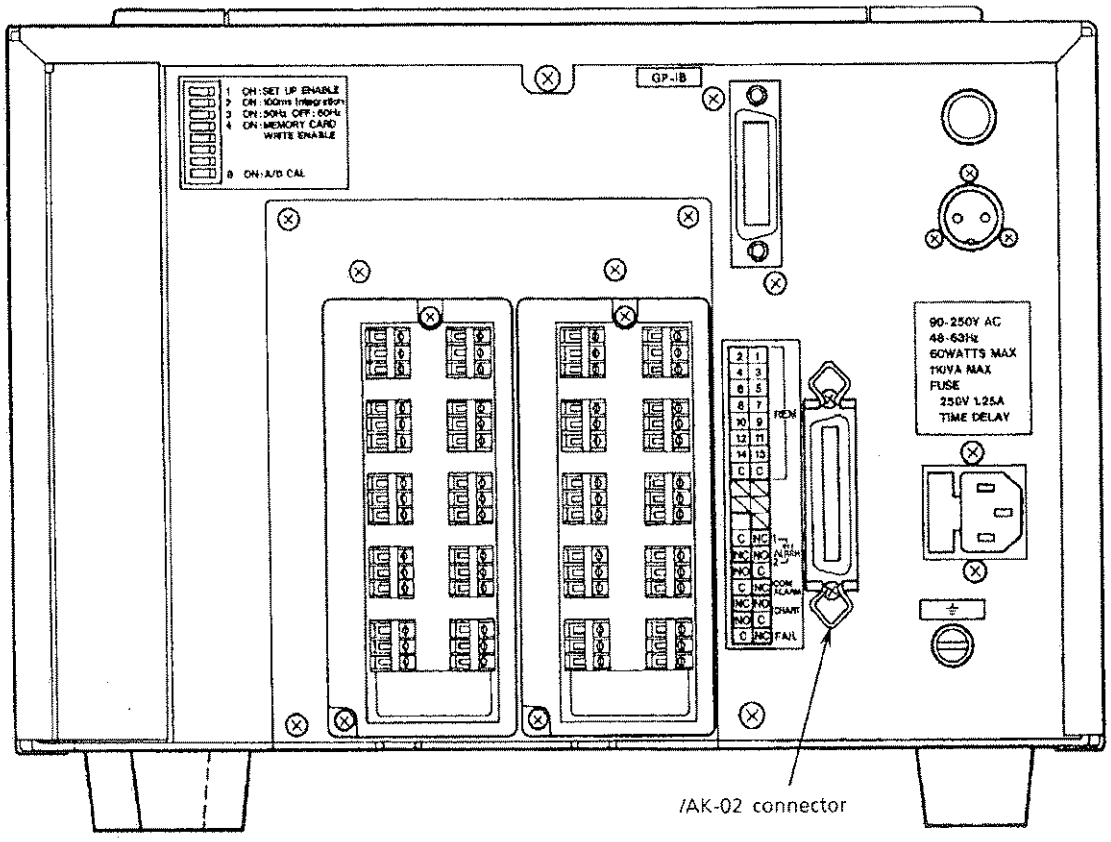
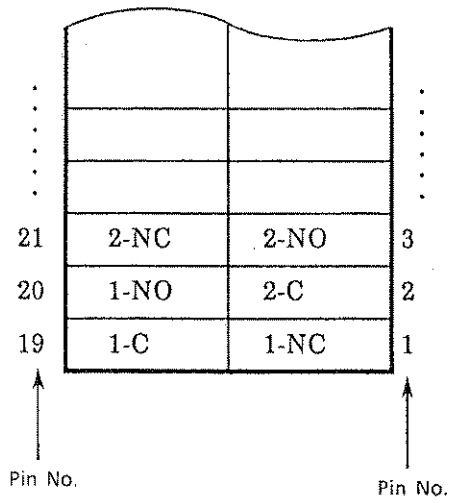


Figure 8.3 Internal Alarm Output Relay (/AK-02) Connector

8.3 Standard Contact Output Function

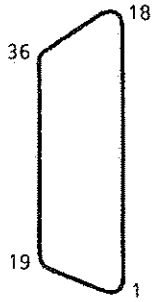
The HR1300 is equipped as standard with functions for contact output of "Recorder Fail" and "Chart End". The type and capacity of the output contacts is the same as for the alarm contacts (there is no switching between energized and de-energized operation).



The same connector as for the remote control and AK-02 is used. The connector wiring is as follows.

1 ..... Recorder FAIL output (de-energize on alarm).

2 ..... Chart end output (energize on alarm).



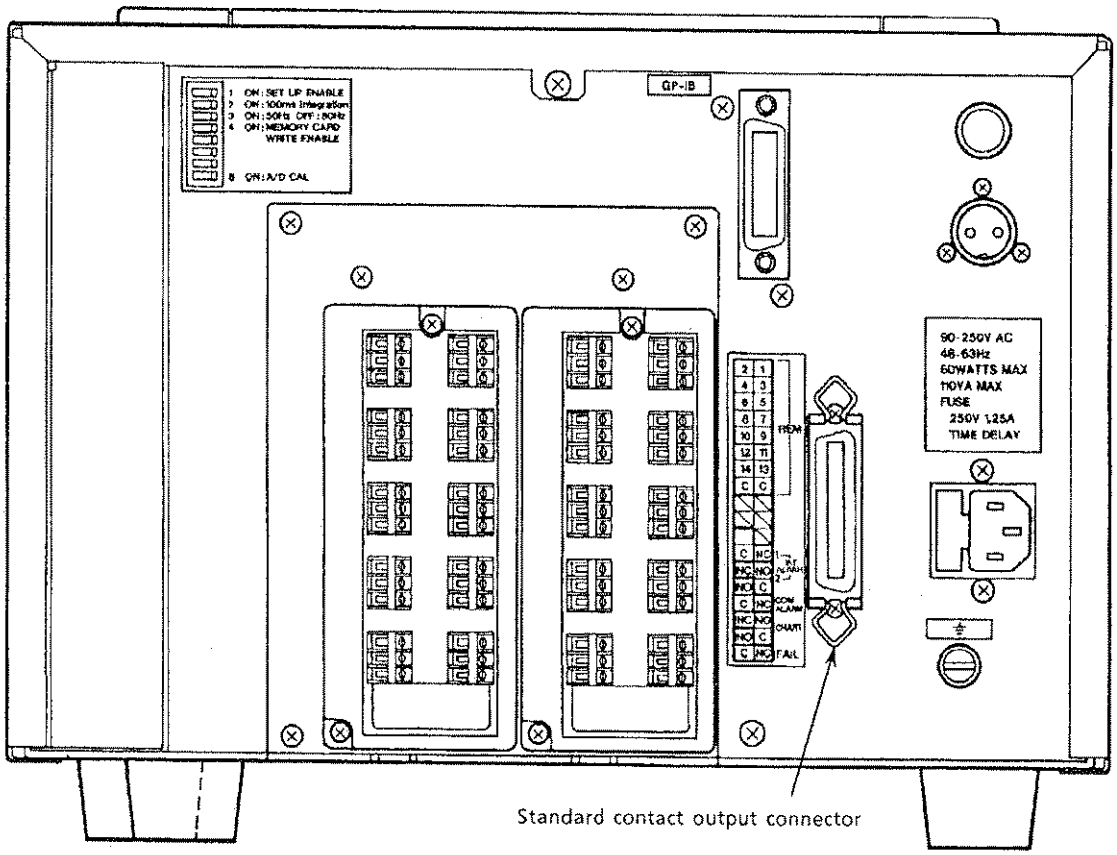


Figure 8.4 Standard Contact Output Connector

9. MAINTENANCE (FUSE REPLACEMENT)

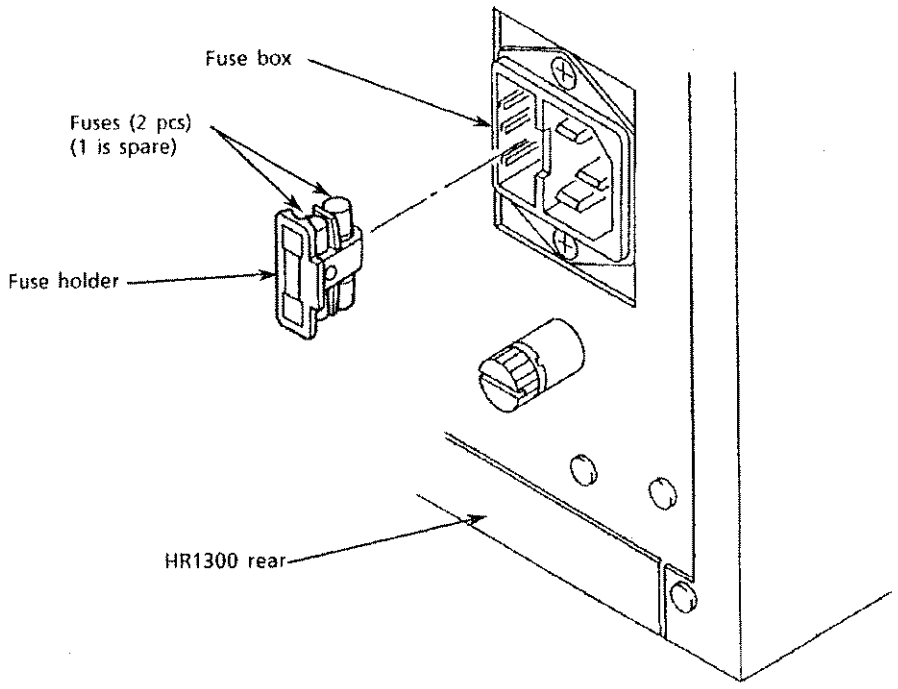


Figure 9.1 Fuse Replacement

We recommend that you replace the fuses every two years for preventive maintenance.

(1) Turn OFF the power switch.

(2) Open the fuse box at the side of the rear panel power connector and replace the fuses. The fuses used are 1.25A time-lag types. (Part number: A9197KF)

10. ACCESSORY, MODEL NAMES AND PART NUMBERS

Accessories available for the HR1300 include the IC memory cards, external alarm output relays, push-in input terminal blocks, screw input terminal blocks, DC current input shunt resistors, and rack mounting adapter.

3789 03	IC Memory Card, 64K bytes (for setting, measured and computed data)
3789 04	IC Memory Card, 256K bytes (for setting, measured and computed data)
3789 05	IC Memory Card, 512K bytes (for setting, measured and computed data)
3798 11	3750 Rack Mounting Adapter (JIS)
3798 13	3750 Rack Mounting Adapter (ANSI)
3798 01	Clamped Input Terminal Blocks
3798 02	Screw Input Terminal Blocks
4389 20	250Ω ± 0.1% Shunt Resistor for Clamped Input Terminal Blocks
4389 21	100Ω ± 0.1% Shunt Resistor for Clamped Input Terminal Blocks
4389 22	10Ω ± 0.1% Shunt Resistor for Clamped Input Terminal Blocks
4159 20	250Ω ± 0.1% Shunt Resistor for Screw Input Terminal Blocks
4159 21	100Ω ± 0.1% Shunt Resistor for Screw Input Terminal Blocks
4159 22	10Ω ± 0.1% Shunt Resistor for Screw Input Terminal Blocks

B9627AZ	10-color Ribbon
B9855AY	Z-Fold Recording Chart (20m) 10mm Style

11. RECORDER SPECIFICATIONS

MEASUREMENTS

Number of Inputs: Up to 10 or 20 points.

Input Types, Range, Accuracy and Resolution:

Input Type	Range	Measurement (Digital display & printout)		Recording (Analog trend)	
		Accuracy	Resolution	Accuracy	Resolution
DC V	20 mV	± (0.05% of rdg + 5 digits)	1μV	±0.2% of span (not including measurement accuracy)	± 0.04% of span
	60 mV	± (0.05% of rdg + 2 digits)	10μV		
	200 mV	± (0.05% of rdg + 2 digits)	10μV		
	2 V	± (0.05% of rdg + 2 digits)	100μV		
	6 V	± (0.05% of rdg + 2 digits)	1mV		
	20 V	± (0.05% of rdg + 2 digits)	1mV		
	50 V	± (0.05% of rdg + 2 digits)	10mV		
TC	R S	± (0.05% of rdg + 1°C) R, S: 0 to 100°C ±3.7°C 100 to 300°C ±1.5°C	0.1°C		
	B	B: 400 to 600°C ± 2°C			
	K	± (0.05% of rdg + 0.7°C) −200 to −100°C ± (0.05% of rdg + 1°C)	0.1°C		
	E J T	± (0.05% of rdg + 0.5°C) J, L: −200 to −100°C ± (0.05% of rdg + 0.7°C)			
	*1 L *1 U				
	Kp vs Au7Fe	± (0.05% of rdg + 0.7K)	0.1K		
	*2 N	± (0.1% of rdg + 0.7°C)	0.1°C		
	*2 W	± (0.1% of rdg + 1°C)			
RTD	Pt100 (1mA, 2mA) JPt100 (1mA, 2mA) Pt50 (2mA)	± (0.05% of rdg + 0.3°C)	0.1°C		
	Pt50 (2mA)	± (0.05% of rdg + 0.3°C)			
	*3 Ni 100 (1mA) *4 Ni 120 (1mA)	± (0.05% of rdg + 0.3°C)	0.1°C		
	J263*B	± (0.05% of rdg + 0.3K)	0.1K		
	Cu10Ω GE, L&N, WEED, BAILEY	±(0.2% of rdg + 0.7°C)	0.1°C		
	High-sensitivity model Pt100 (1 mA) Pt100 (2 mA) JPt100 (1 mA) JPt100 (2 mA)	±(0.05% of rdg + 0.3°C)	0.01°C		
Contact Status	Input signal : contact status or DC V				

*1 :
L ; Fe-CuNi
U ; Cu-CuNi
*2 :
N ; Nicrosil-Nisil
W ; W·5%Re − W 26%Re
*3 : SAMA / DIN
*4 : McGRAW EDISON
*5 :
Pt50 ; JIS C1604-1981
JIS C1606-1986
Pt100 ; JIS 1604-1989
JIS 1606-1989
DIN IEC751,
IEC751
JPt100 ; JIS C1604-1989
JIS C1606-1989

Reference Junction Compensation Error: ±1°C (R, S, B, W), ±0.5°C (K, J, E, T, N, L, U, Kp vs Au7Fe).

Scan Cycle Time: 2 to 60s selectable (2, 3, 4, 5, 6, 10, 12, 15, 20, 30, 60s).

Scanning Rate: Max. 20 points / 2 seconds.

A-D Integration Time: 20mS (50Hz), 16.7 mS (60Hz), and 100mS (50 / 60Hz) are selectable via an internal switch.

Input Impedance: More than 10MΩ on 2V or lower ranges and TC, approx. 1MΩ on 6V or higher ranges.

Input Bias Current: Less than 10nA.

TC Burnout Protection: 2kΩ or less (normal), 100kΩ or more (open), current approx. 6μA, detection pulse width approx. 2mS (ON or OFF selectable for each channel).

Temperature Spread on Terminals: Within 0.3°C among input terminals when temperature is balanced.

Allowable Source Resistance: Less than 1kΩ (DC V & TC).

Temperature Coefficient:
Zero drift ... 0.01% of range / °C,
Full Span ... 0.01% of range / °C.

Maximum Allowable Input Voltage: 60V DC.

Maximum Common Mode Voltage: 250V AC rms.

Common Mode Rejection: More than 120dB (50 or 60Hz ±0.1%).

Normal Mode Rejection: More than 40dB (50 or 60 Hz ±0.1%).

PRINTOUT

Printing Technique: Raster scan using a wire-dot printer and a 10-color ribbon.

Effective Recording Span: 150mm (analog data).

Chart: Z-fold chart (230mm×20m) with calibrated width of 150mm.

Recording Colors: Analog data (TREND mode) ... 10 colors (purple, red, green, blue, brown, black, navy blue, yellowish green, purplish red, orange), color can be specified for every channel, digital data (TREND mode) ... channel number, measured data, date & time, chart speed (black), alarm (ON mark ; red, OFF mark ; blue), LOG & LIST modes ... all data (purple).

Recording Accuracy: Measurement accuracy +(±0.2% of effective recording span).

Printout Format: Analog trend / analog trend + digital / logging.

The following recording is available in the trend mode, zone recording ... recording width and recording position (0 and 100% positions) settable in 1mm steps, partially expanded-scale printout ... can be specified for every point (one break point).

Recording can also be turned ON / OFF in every channel for the following items (panel setting), analog recording, digital printing, interpolation and moving average recording.

Recording common to all channels for the following items (panel setting) can be turned ON / OFF ; alarm printing, scale value printing, scale value tick, and vertical or horizontal printing selectable in the logging mode.

Chart Speeds: 1 to 1,500mm / h.

Change of Chart Speed: Chart speed or logging interval is changed by remote control signals (optional) or alarm occurrence.

Print Cycle Time (Interval):

Analog recording interval in the trend mode:

FIX mode ... recording for interval is same as measuring interval.

AUTO mode ... recording interval is determined in accordance with the chart speed.

Digital recording interval in the trend mode:

MULTIPLE mode ... selectable for each channel from any of three values (1min to 24h).

SINGLE mode ... chart speed and the number of recording lines automatically determine digital interval.

Interval in the logging mode :

MULTIPLE mode ... chosen and recorded from one of three types of interval for every channel (1min to 24h).

SINGLE mode ... recorded at a determined interval.

Chart Drive: Pulse motor drive.

Chart Speed Accuracy: ±0.1% (for recordings longer than 1m).

Start Time: Programmable for measurement (scan) and printing start time or T LOG interval.

Printout Mode:

1. NORMAL:
   Printing starts when START / STOP switch turned ON and stops when switch is turned OFF.
2. PRINT ON ALARM (Either one of the following is settable):
   TRIGGER mode ... Printing starts at set alarm ON*1, and stops at START/STOP switch OFF (set on shipment at the factory).
   LEVEL mode ... Printing starts at set alarm ON*1, and stops at alarm OFF.
3. CHART SP / INTVL CHANGE ON ALARM:
   Chart speed/interval changes at set alarm ON*1, and restored at alarm OFF.

*1: All of the OR alarms or the set alarm.

Engineering Unit Printout: Engineering unit (up to 6 alphanumerics) can be defined and printed out.

Tag Number Printout: Tag number can be printed out in place of channel number (up to 7 alphanumerics).

Alarm Printout: Channel number, alarm type, and the time of alarm ON/OFF are printed.

Scale Markings Printout: Scale values (0/100%, 0/50/100%, or 20% steps) can be printed out.

Program List Printout: Contents of entire setting memory can be listed on the chart.

Manual Printout: Time and measured data for all channels can be printed out for a single line by a push of MANUAL PRINT key, input signal or alarm. *

Message Printing: Printing contents ... message (max. 16 characters) and day and time, external contact ... 5 types of messages can be printed out, input signal ... volt-free contact, signal duration of 2 or more, alarm ... 5 types of message (max. 16 characters) can be printed out. Time interval message (max. 16 characters), panel key message (max. 32 characters) is printed out.

Header Printing: Header information of 60 characters × 5 lines is printed by depressing panel key.

Relation of Chart Speed and Printing

Chart Speed (mm/h)	CH No./ TAG No.	Date, Hr., Chart-Speed, Measured value	Alarm, Scale Value, Message (title)
1 to 9	○	×	○
10 to 500	○	○	○
501 to 1500	×	×	×

Printing Intervals of Digital Data (Analog recording & digital printout)

Chart Speed (mm/h)	Printing Intervals of Digital Data	
	1 line	2 lines
10 to 24	12 h	6 h
25 to 49	4 h	2 h
50 to 99	2 h	1 h
100 to 500	1 h	30 min

(Interval = Auto)

DISPLAY AND CONTROLS

Type of Display: Vacuum fluoresecnt large-scaled display (5×7 dot matrix, blue), 2 lines (upper display ... 20 characters, larger size, lower display ... 28 characters, smaller size).

Data Display: Measured data (channel number or TAG, alarm status, measured value, engineering unit), bargraph, clock, alarm status, relay status, programming data, chart end, battery status, and recording format (TREND/LOGGING).

Control Section: Recording keys ... recording start/stop key, control keys for messages and manual printing. Setting keys ... keys for range and alarm setting (function keys, numerical keys) and display changing keys, key lock function ... any keys can be locked/unlocked except for those related to DISPLAY.

Number of Group Programmings: Up to 6 groups, programmable for range, alarm, printing format, tag number and MATH channel (C LOG).

CALCULATION (STANDARD)

Scaling:
Range ... DC V / TC / RTD
Input range ... each range within the measuring range
Scaling range ... −20000 to +20000
Deicmal point ... freely settable.

Difference Calculation (ΔT): Between any channels (within the same range).

Moving Average: For every 8 scans (ON / OFF is selectable for every channel).

MEMORY CARD

Memory Data: Setting data, measured data, communication input data and programmed parameter can be stored on a memory card (optional).

Sample Mode and Rate (Common Setting to All Channels):
In writing: Free mode ... sampling start by manual, sampling interval ... measurement interval or 1 / 2 / 5 / 10min., Trigger mode ... sampling start by trigger condition, sampling interval ... measurement interval or 1 / 2 / 5 / 10min.
In reading: Free mode, Trigger mode ... synchronized with measurement interval.

Memory Capacity: 512, 256 or 64K bytes.

Data Length (Common Setting to All Channels): 500 / 1,000 / 2,000 / 4,000 / 8,000 / 16,000 / 32,000 data / ch, data length ... 2 bytes / data.

Trigger Conditions: In Writing ... chart end detection alarm or external contact input (optional), In Reading ... alarm, external contact.

Pre-Trigger: 0 to 100%, in 10% steps.

Output: Outpus for communication and recording are possible.

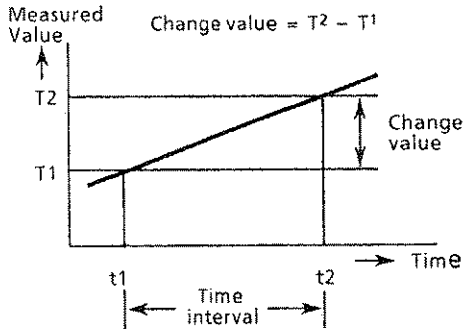
Battery Backup: Lithium battery, battery life ... about 3 years (256K bytes), about 5 years (64K bytes), about 10 months (512K bytes).

ALARMS

Number of Alarm Set Levels: Up to 6 levels / channel.

Alarm Types: High (H), low (L), high-rate of change (RH), low-rate of change (RL), delta high (ΔH), and delta low (ΔL).

Alarm Programming: All alarms are programmable via front-panel keys. * high-rate of change (time interval) : Measurement cycle × (1 to 15).



Display: The flashing display can be obtained for 20 point alarm status (ch. 1 to 20) + one common point for computing channels (ch. 31 to 60).

Recording:
Trend mode: CH. No., alarm types, and ON / OFF times in the right margin.
Logging mode: CH. No. and alarm types at the head of measured data.

Alarm Outputs (Optional):
2 points (internal).
AND or OR output as well as REFLASH output can be specified. REFLASH alarm output (500ms) using internal alarm relay contact.

Alarm Acknowledgement: Pressing the ALARM ACK key stops the alarm display flashing and resets the dedicated common relay output.

Alarm Reset: Hold type relay output by pressing the ALARM RESET key.

CONSTRUCTION

Dimensions: Approx. 338 (W) × 221 (H) × 341.5 (D) mm, (12-3/4" × 8-11/16" × 13-3/8").
(clamped input terminal)
Approx. 338 (W) × 221 (H) × 360 (D) mm, (12-3/4" × 8-11/16" × 14-1/4").
(screw input terminal)

Weight: Approx. 9.7kg (21.4 lbs).

POWER REQUIREMENTS

Power Supply: 90 to 250V AC (wide voltage range power supply), 50 and 60Hz (must be specified).

Power Consumption: Approx. 80VA.

NORMAL OPERATING CONDITIONS

Ambient Temperature and Humidity Range:
5 to 40°C (41 to 104°F), 20 to 80% R.H.

Input Source Resistance:
Less than 2kΩ (DC V & TC inputs),
less than 10Ω/wire (Pt100Ω),
less than 5Ω/wire (Pt50Ω),
less than 1Ω/wire (Cu10Ω).

GENERAL SPECIFICATIONS

Insulation Resistance: More than 20MΩ at 500V DC between terminals and case.

Dielectric Strength: Between power terminals and ground; 1500V AC (50/60Hz) for one minute.
Between contact output terminals and ground; 1000V AC (50/60Hz) for one minute.
Between measurement terminals and ground; 1000V AC (50/60Hz) for one minute.
Between measurement terminals ; 1000V AC (50/60Hz) for one minute.

Battery-Backup Memory: Lithium battery, maintains all setting and measured data for about 10 years (23°C±3°C, st'd model).

FAIL Alarm: FAIL lamp lights up when the recorder is in fail condition (FAIL output signal changes to non-inductive).

Chart End Detection: When the chart reaches near its end, "CHART" appears on the display. When recording is automatically stopped, the recorder goes into the monitoring status, and the CHART END output relay is energized (transfer contact).

Clock: With calendar function.

Key Lock Selector: Effective only for specified keys.

Input Terminals: Clamped input terminal block (standard); screw input terminal block (/SIT) (optional). The input terminal block can be removed from the mainframe for easier wiring.

OPTIONAL FEATURES

GP-IB Interface (/GP-IB):
Conforms to IEEE St'd 488-1978. Talker Functions: measured value I/O (ASCII and binary, input is ASCII only), Set point I/O Listener Functions: Setting and controlling available other than for the following: Power ON/OFF, Key lock ON, CHART FEED, SET UP contents, and setting some of the memory functions.

RS-232C Interface (/RS232C):
Conforms to EIA RS-232C.
Mode: Measured value I/O (ASCII and binary, input is ASCII only), set point I/O (ASCII), memory data I/O (ASCII and binary), Setting and controlling available other than for the following: POWER ON/OFF, Key lock ON/OFF, CHART FEED, SET-UP contents, and setting some of the memory functions.

Computation (/MATH):
Types: +, −, ×, ÷, SQR (square root), ABS (absolute, value), LOG (common logarithm), EXP (exponential), Maximum, Minimum, Averages, Totals, Max. −Min., Standard deviation, Logic (AND, OR, NOT, XOR).
C LOG ... Computational processing in a group measured at the same time (total, max., min., average, standard deviation, and max−min).
T LOG ... Time series computational processing (max. 24 hours) for a channel (total, max., min., average, and max−min).
Number of channels ... Up to 30 channels, Trend and digital (logging) recording available, analog input of digital input through communications interfaces (/GP-IB or /RS232C) available.

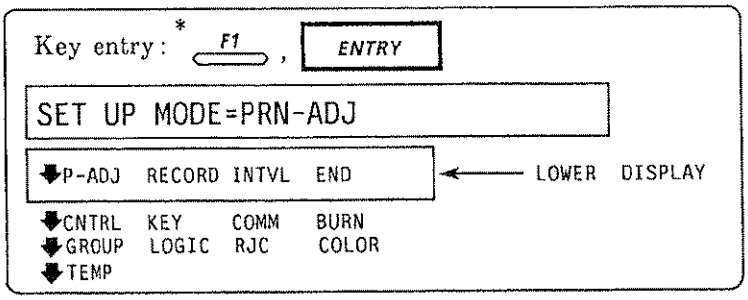
Remote Control (/REM):
Through the contact input, start/stop, chart speed/interval change, manual printout, message recording (5 types), digital recording in the trend mode, writing on the memory card, and loading trigger available.
Input signal: TTL-level, open collector, and contact status.

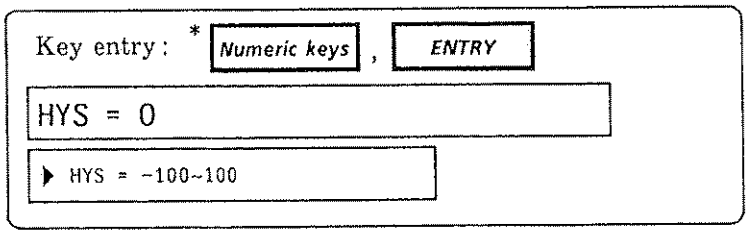
Internal Alarm Output (/AK-□□):
2 points (internal alarm), contact rating: 24V DC 0.5A

12. PRINTOUT ADJUSTMENT

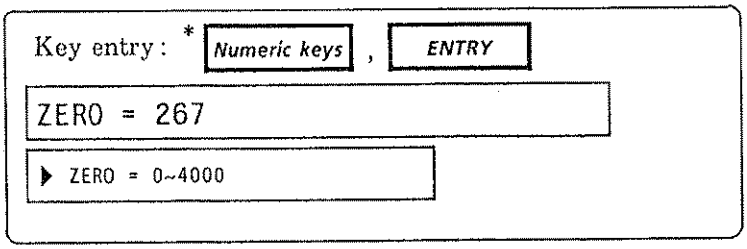
Set the DIP switch at the rear of the chart cassette to No. 1. Hold it down *UPPER DISPLAY* and turn ON the power. The SET UP mode is set and the initial panel lifts up.

[Key Entry, Panel Displays] The panel displayed when * key is pressed. **[Description]**





- When ENTRY key is pressed, the printer begins printing out data.
- Change the numeric value to print out data on one vertical line (set at the factory before shipment).



- Can set a minimum printout position.

※ Use numeric keys for data entry.

※ If the too much value is set, It's not good for carrige.

[Key Entry, Panel Displays] The panel displayed when * key is pressed. [Description]

Key entry: * *numeric keys* , *ENTRY*

FULL = 1485

▶ FULL = 0~4000

- Can set a minimum printout position.

※ Use numeric keys for data entry.

Key entry: *F1* , *ENTRY*

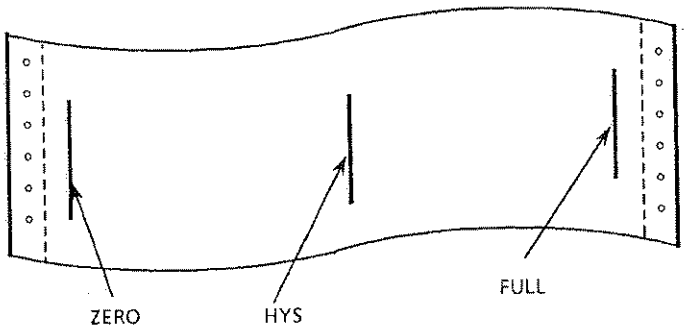
PRINT ESC = YES

YES NO

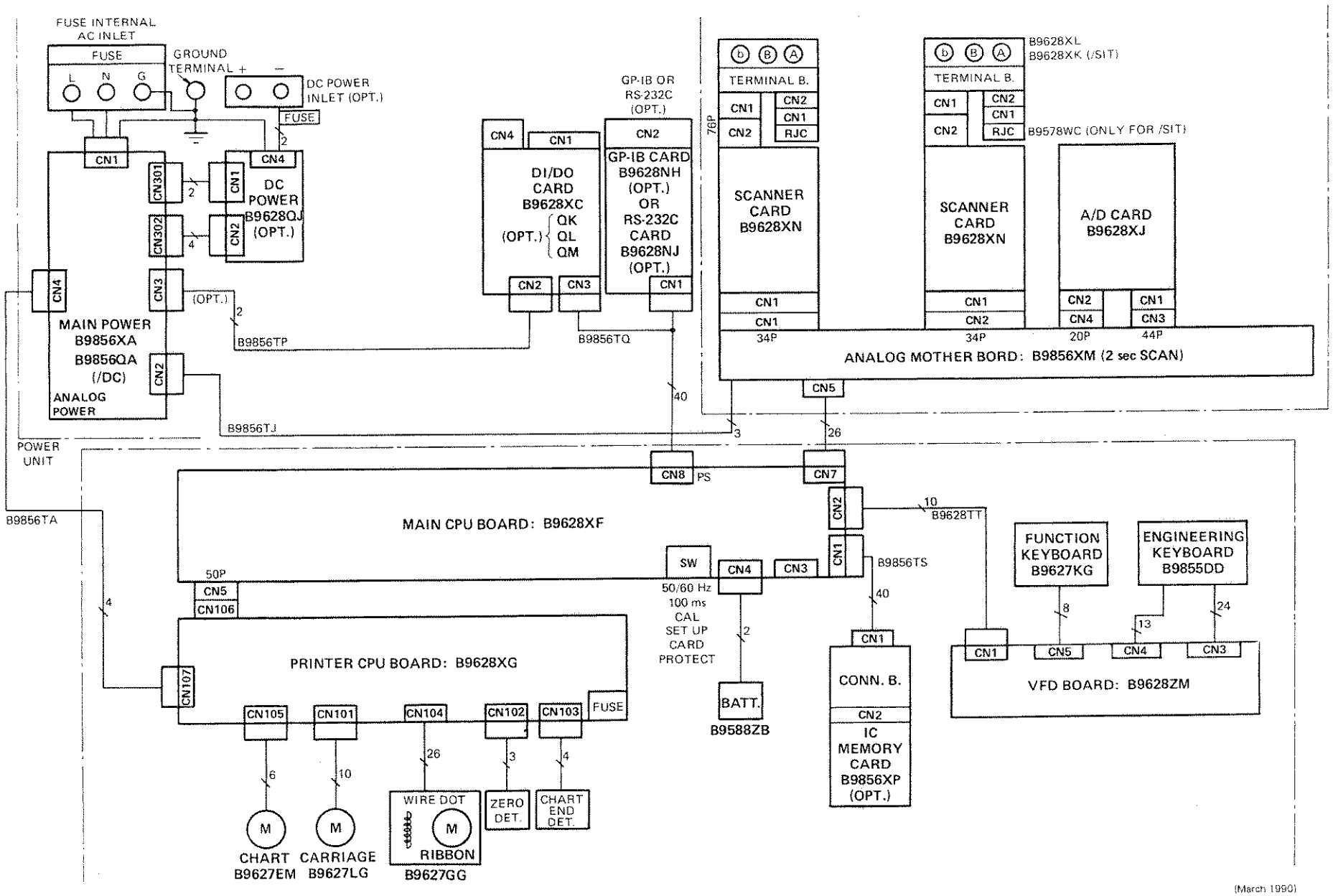
- Press *F1* and *ENTRY* keys concurrently to cancel the printout correction mode.

*** PRINT SET ***

- Press *ENTRY* key again to return to SET UP mode.

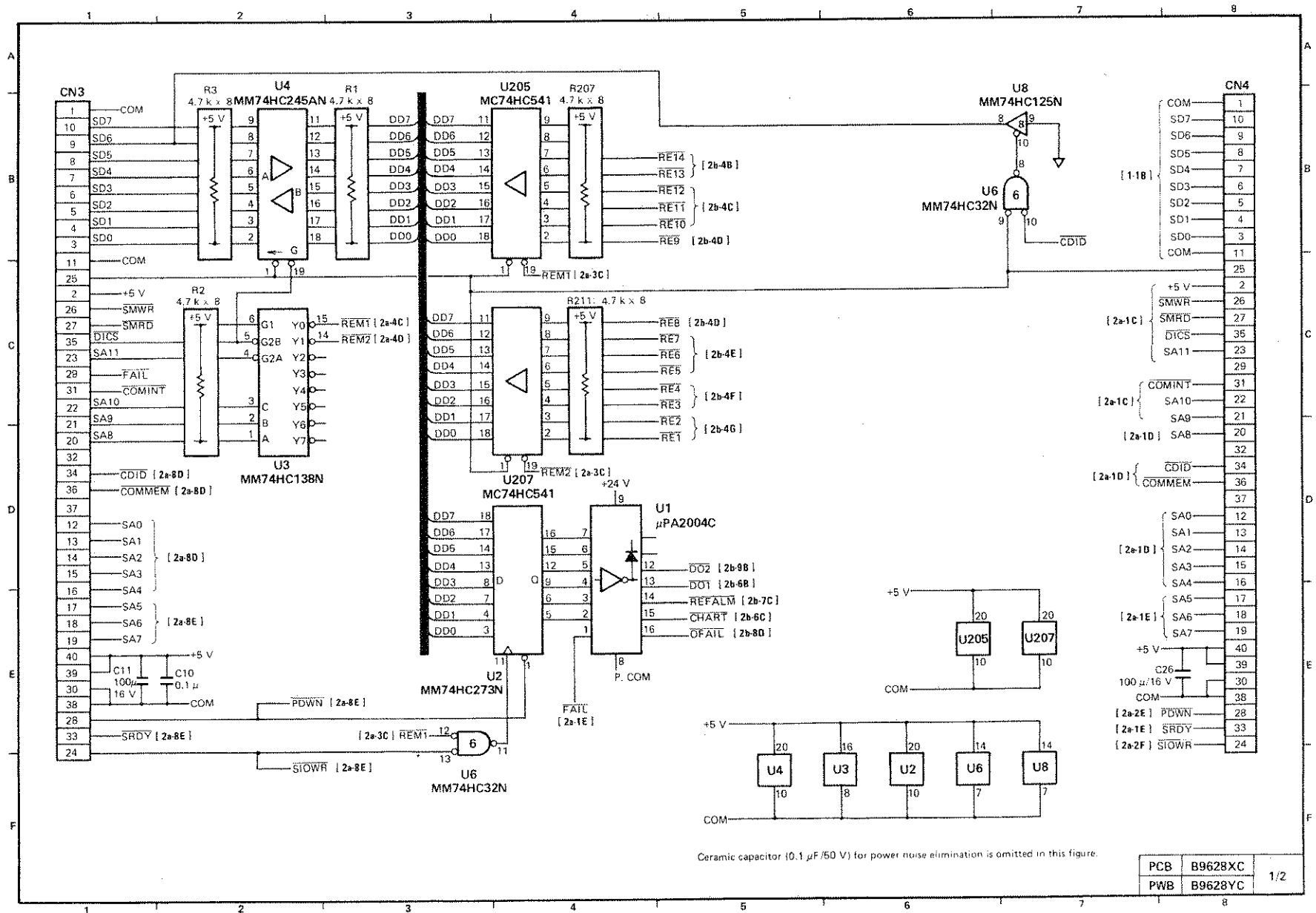


13. SCHEMATIC DIAGRAMS AND PARTS LIST.



(March 1990)

Figure 13-1. Model 3750 (HR1300) Hybrid Recorder Overall Wiring.



Ceramic capacitor (0.1 μF/50 V) for power noise elimination is omitted in this figure.

PCB	B9628XC	1/2
PWB	B9628YC	

(March 1990)

Figure 13-2a. DI/DO Card Ass'y: B9628XC/QK/QL/QM Schematic Diagram (1/2).

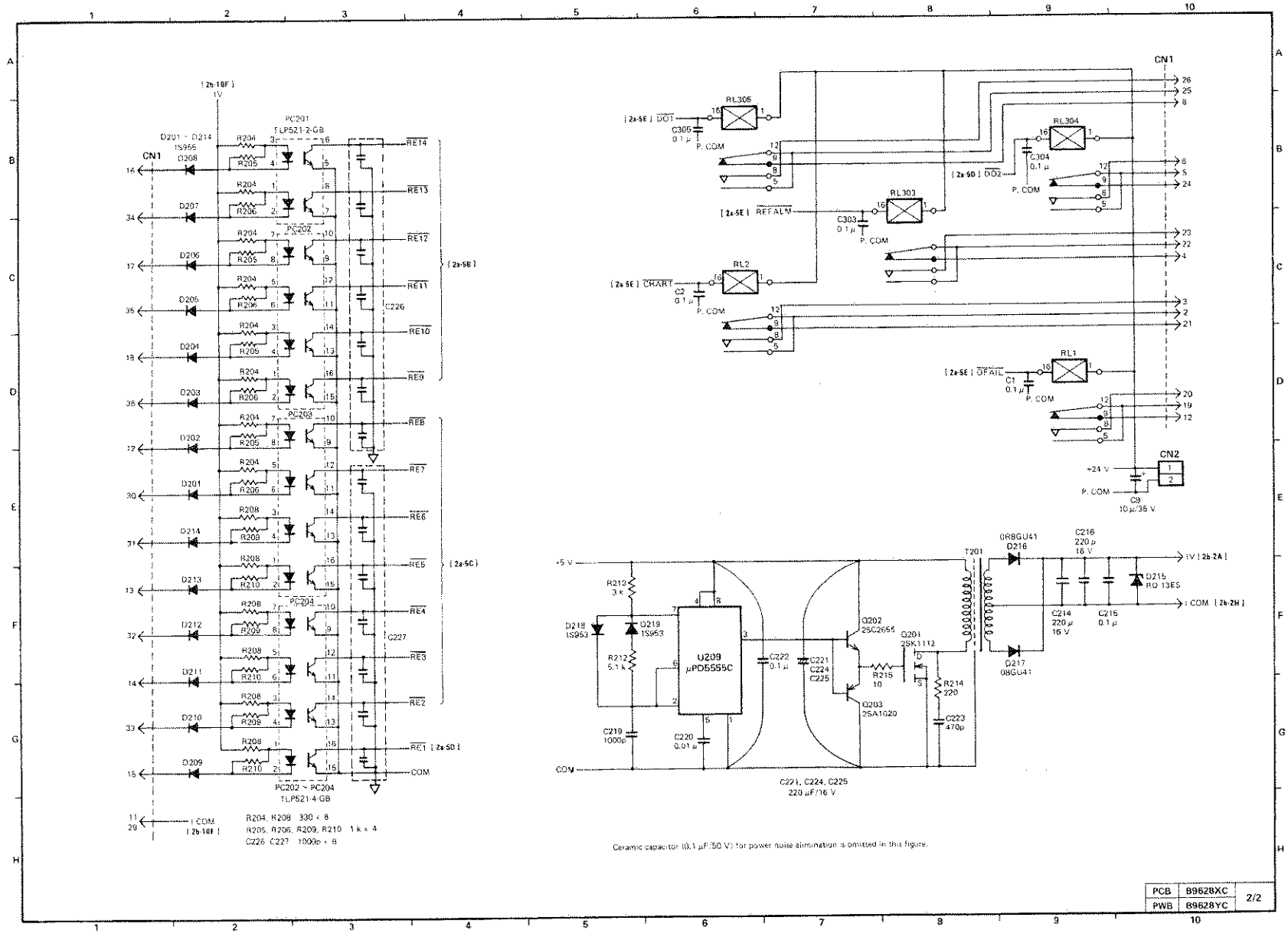


Figure 13-2b. D1/DO Card Ass'y: B9628XC/QK/QL/QM Schematic Diagram (2/2).

(March 1990)

13-2. DI/DO Card Ass'y: B9628XC/QK/QL/QM.

(March 1990)

Item	Part No.	Q'ty				Part Name and Description					Remarks
R1~R3	A9070RL	3	3	3	3	Res: module	4.7kΩ	±5%	1/8 W	RKC1/8 B8 4.7 kΩ J	8 elements
R201~R203		0	0	0	0						not assigned
R204	A9108RL	0	1	0	1	Res: module	330Ω	±5%	1/8 W	RKC1/8 B8 330Ω J	8 elements
R205, R206	A9111RL	0	2	0	2	Res: module	1kΩ	±5%	¼W	RKC¼B4 S 1kΩ J	4 elements
R207	A9070RL	0	1	0	1	Res: module	4.7kΩ	±5%	1/8 W	RKC1/8 B8 4.7 kΩ J	8 elements
R208	A9108RL	0	1	0	1	Res: module	330Ω	±5%	1/8 W	RKC1/8 B8 330Ω J	8 elements
R209, R210	A9111RL	0	2	0	2	Res: module	1kΩ	±5%	¼W	RKC¼B4 S 1kΩ J	4 elements
R211	A9070RL	0	1	0	1	Res: module	4.7kΩ	±5%	1/8 W	RKC1/8 B8 4.7kΩ J	8 elements
R212	A9066RG	0	1	0	1	Res: met film	5.1kΩ	±1%	¼W	LF¼ 5.1kΩ F	
R213	A9060RG	0	1	0	1	Res: met film	3kΩ	±1%	¼W	LF¼ 3kΩ F	
R214	A9033RG	0	1	0	1	Res: met film	220Ω	±1%	¼W	LF¼ 220Ω F	
R215	A9001RG	0	1	0	1	Res: met film	10Ω	±1%	¼W	LF¼ 10Ω F	
C1, C2	A9114CC	2	2	2	2	Cap: cer	0.1μF		50V	FK26Y5V 1H104Z	
C3~C5		0	0	0	0						not assigned
C6~C8	A9114CC	3	3	3	3	Cap: cer	0.1μF		50V	FK26Y5V 1H104Z	
C9	A9440CA	1	1	1	1	Cap: Al elect	10μF	±20%	35V	ECEA1VU100	
C10	A9114CC	1	1	1	1	Cap: cer	0.1μF		50V	FK26Y5V 1H104Z	
C11	A9415CA	1	1	1	1	Cap: Al elect	100μF	±20%	16V	KME16VB100	
C12, C13	A9114CC	2	2	2	2	Cap: cer	0.1μF		50V	FK26Y5V 1H104Z	
C14~C16		0	0	0	0						not assigned
C17, C18	A9114CC	2	2	2	2	Cap: cer	0.1μF		50V	FK26Y5V 1H104Z	
C19, C20		0	0	0	0						not assigned
C21~C25		0	0	0	0						not assigned
C26	A9415CA	1	1	1	1	Cap: Al elect	100μF	±20%	16V	KME16VB100	
C214	A9416CA	0	1	0	1	Cap: Al elect	220μF	±20%	16V	KME16VB220 (M)	
C215	A9114CC	0	1	0	1	Cap: cer	0.1μF		50V	FK26Y5V 1H104Z	
C216	A9416CA	0	1	0	1	Cap: Al elect	220μF	±20%	16V	KME16VB220 (M)	
C217, C218		0	0	0	0						not assigned
C219	A9244CY	0	1	0	1	Cap: film	1000pF	±10%	50V	MFL5002-102K	
C220	A9260CY	0	1	0	1	Cap: film	0.01μF	±10%	50V	MFL5002-103K	
C221	A9416CA	0	1	0	1	Cap: Al elect	220μF	±20%	16V	KME16VB220 (M)	
C222	A9114CC	0	1	0	1	Cap: cer	0.1μF		50V	FK26Y5V 1H104Z	
C223	A9169CC	0	1	0	1	Cap: cer	470pF	±5%	50V	CC45SL1H471JYA	
C224, C225	A9416CA	0	2	0	2	Cap: Al elect	220μF	±20%	16V	KME16VB220 (M)	
C226, C227	A9008CL	0	2	0	2	Cap: module	1000pF	±20%	50V	EXF-P4102ZFW	8 elements
C301, C302		0	0	0	0						not assigned
C303~C305	A9114CC	0	0	3	3	Cap: fxd cer	0.1μF		50V	FK26Y5V 1H104Z	
D201~D210	A9250HD	0	10	0	10	Diode				1S955	

Ass'y Part No.	B9628XC	B9628QK	B9628QL	B9628QM
	B9628XC : ST'D			
	B9628QK : /REM			
	B9628QL : /AK-02			
	B9628QM : /REM/AK-02			

13-2. DI/DO Card Ass'y: B9628XC/QK/QL/QM. (Continued)

Item	Part No.	Q'ty				Part Name and Description		Remarks
D211~D214	A9250HD	0	4	0	4	Diode	1S955	
D215	A9455HD	0	1	0	1	Diode: Zener	RD13E-S	
D216, D217	A9477HD	0	2	0	2	Diode	0R8GU41	
D218, D219	A9248HD	0	2	0	2	Diode	1S953	
Q201	A9526HQ	0	1	0	1	Transistor: FET	2SK1112	
Q202	S9655HC	0	1	0	1	Transistor: NPN	2SC2655	
Q203	S9020HA	0	1	0	1	Transistor: PNP	2SA1020	
U1	A9096HL	1	1	1	1	IC	μPA2004C	
U2	A9081LN	1	1	1	1	IC	MM74HC273N	
U3	A9026LN	1	1	1	1	IC	MM74HC138N	
U4	A9025LN	1	1	1	1	IC	MM74HC245AN	
U5		0	0	0	0			not assigned
U6	A9011LN	1	1	1	1	IC	MM74HC32N	
U7		0	0	0	0			not assigned
U8	A9023LN	1	1	1	1	IC	MM74HC125N	
U201~U204		0	0	0	0			not assigned
U205	A9087LN	0	1	0	1	IC	MC74HC541	
U206		0	0	0	0			not assigned
U207	A9087LN	0	1	0	1	IC	MC74HC541	
U208		0	0	0	0			not assigned
U209	A9266LA	0	1	0	1	IC	μPD5555C	
PC201	A9107HL	0	1	0	1	Photo coupler	TLP521-2-GB	
PC202~PC204	A9121HL	0	3	0	3	Photo coupler	TLP521-4-GB	
RL1, RL2	A9268MR	2	2	2	2	Relay	DSP1-24V	
RL301, RL302		0	0	0	0			not assigned
RL303~RL305	A9268MR	0	0	3	3	Relay	DSP1-24V	
CN1	A9637KC	1	1	1	1	Connector	57LE-40360-7700-D12	
CN2	A9537KP	1	1	1	1	Connector	1L-G-2P-S3L2-E	
CN3, CN4	A9114KP	2	2	2	2	Connector	PS-40PA-D4LT1-PN1-K	
T201		0	1	0	1	Transformer		
	B9627ZZ	1	1	1	1	Bracket		
	B9628YC	1	1	1	1	Printed Wiring Board		

Ass'y Part No.	B9628XC	B9628QK	B9628QL	B9628QM
	B9628XC : ST'D			
	B9628QK : /REM			
	B9628QL : /AK-02			
	B9628QM : /REM/AK-02			

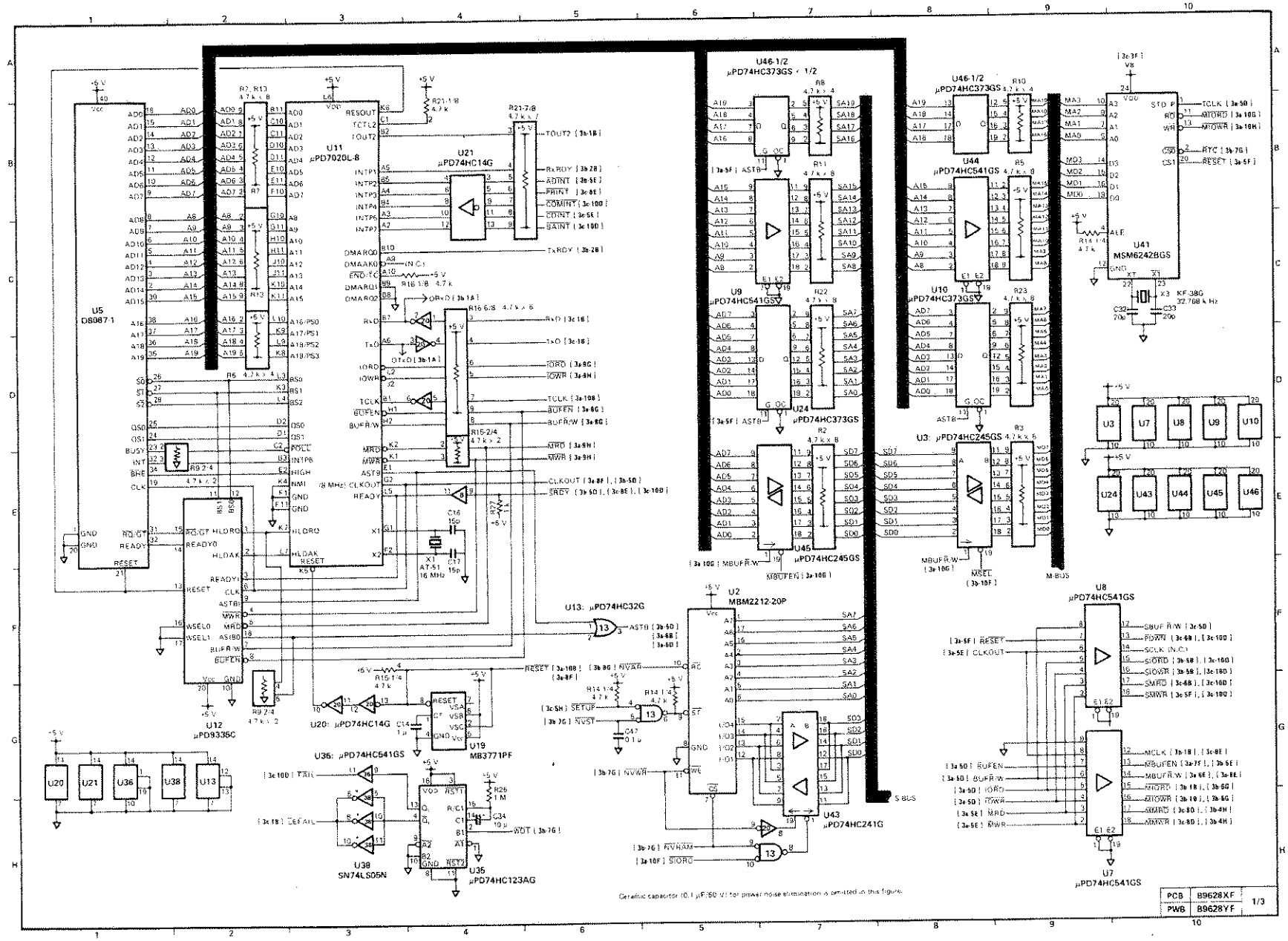


Figure 13-3a. Main CPU Board Ass'y: B9628XF Schematic Diagram (1/3).

(March 1990)

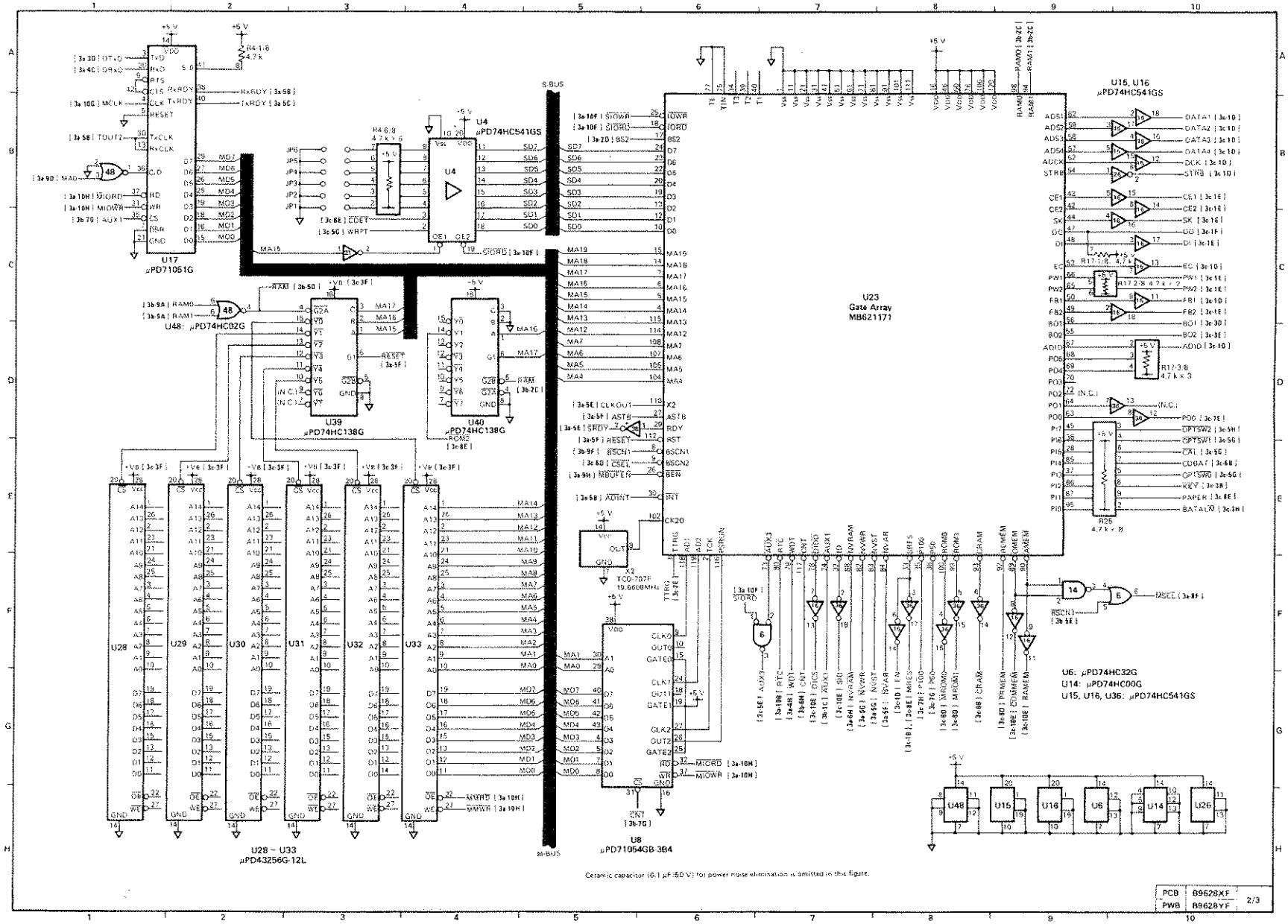


Figure 13-3b. Main CPU Board Ass'y: B9628XF Schematic Diagram (2/3)

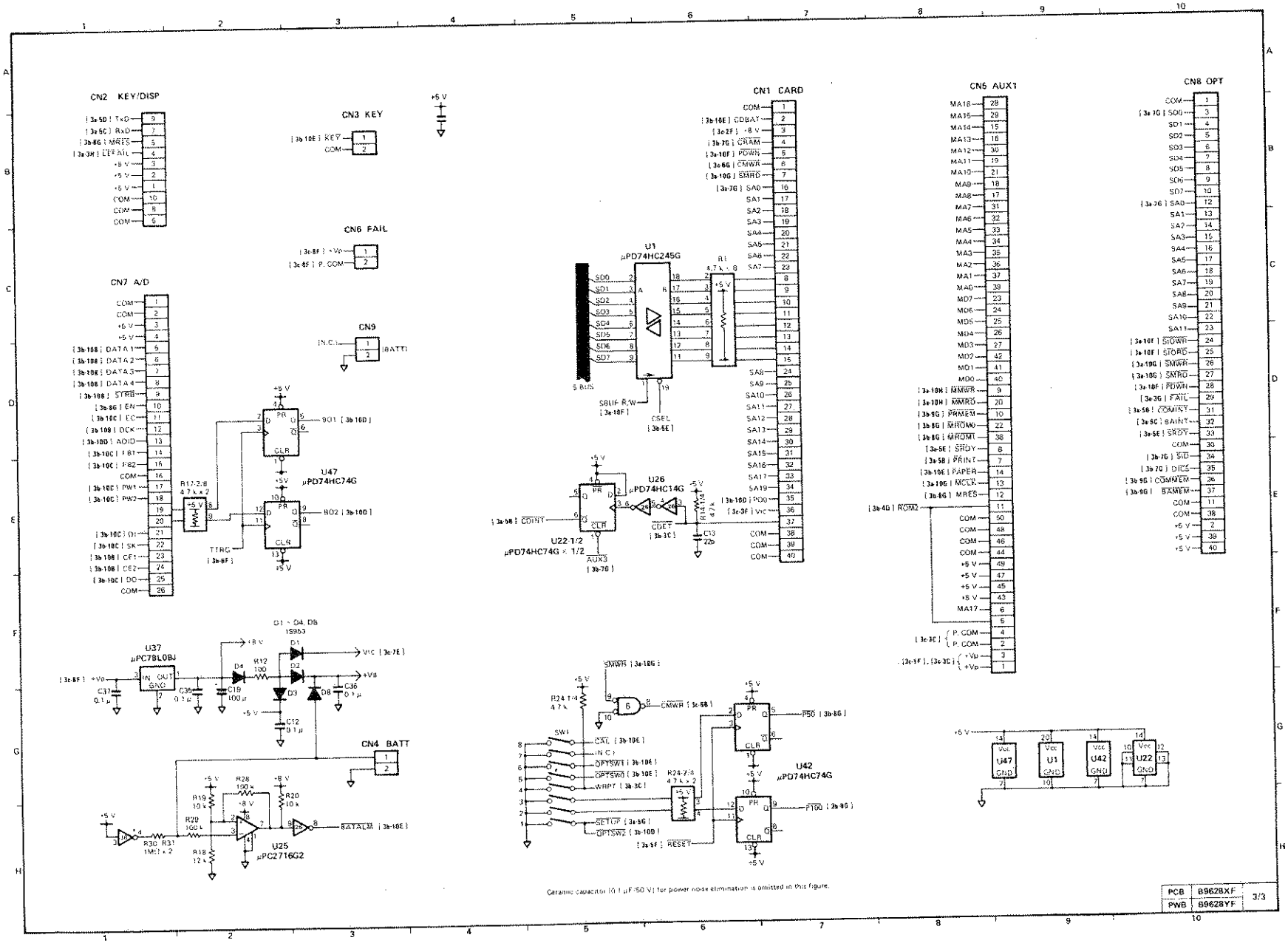


Figure 13-3c. Main CPU Board Ass'y: B9628XF Schematic Diagram (3/3).

(March 1990)

13.3. Main CPU Board Ass'y: B9628XF/LA/LB/LC.

(March 1990)

Item	Part No.	Q'ty				Part Name and Description					Remarks
R1~R5	A9070RL	5	5	5	5	Res: module	4.7kΩ	±5%	1/8 W	MRGC09X 4.7kΩJ	8 elements
R6	A9043RL	1	1	1	1	Res: module	4.7kΩ	±5%	1/8 W	MRGC05X 4.7kΩJ	4 elements
R7	A9070RL	1	1	1	1	Res: module	4.7kΩ	±5%	1/8 W	MRGC09X 4.7kΩJ	8 elements
R8~R10	A9043RL	3	3	3	3	Res: module	4.7kΩ	±5%	1/8 W	MRGC05X 4.7kΩJ	4 elements
R11	A9070RL	1	1	1	1	Res: module	4.7kΩ	±5%	1/8 W	MRGC09X 4.7kΩJ	8 elements
R12	B9691XA	1	1	1	1	Res	100Ω		0.1W		
R13	A9070RL	1	1	1	1	Res: module	4.7kΩ	±5%	1/8 W	MRGC09X 4.7kΩJ	8 elements
R14, R15	A9043RL	2	2	2	2	Res: module	4.7kΩ	±5%	1/8 W	MRGC05X 4.7kΩJ	4 elements
R16, R17	A9070RL	2	2	2	2	Res: module	4.7kΩ	±5%	1/8 W	MRGC09X 4.7kΩJ	8 elements
R18	A9076RG	1	1	1	1	Res: met film	12kΩ	±1%	¼W	LF¼ 12kΩF	
R19	A9073RG	1	1	1	1	Res: met film	10kΩ	±1%	¼W	LF¼ 10kΩF	
R20	B9591XK	1	1	1	1	Res	10kΩ		0.1W		
R21~R23	A9070RL	3	3	3	3	Res: module	4.7kΩ	±5%	1/8 W	MRGC09X 4.7kΩJ	8 elements
R24	A9043RL	1	1	1	1	Res: module	4.7kΩ	±5%	1/8 W	MRGC05X 4.7kΩJ	4 elements
R25	A9070RL	1	1	1	1	Res: module	4.7kΩ	±5%	1/8 W	MRGC09X 4.7kΩJ	8 elements
R26	B9591XR	1	1	1	1	Res	1MΩ		0.1W		
R27	B9591XD	1	1	1	1	Res	1kΩ		0.1W		
R28, R29	B9591XP	2	2	2	2	Res	100kΩ		0.1W		
R30	B9591XR	1	1	1	1	Res	1MΩ		0.1W		
R31	B9591XR	1	1	1	1	Res	1MΩ		0.1W		
C1~C10	A9146CC	10	10	10	10	Cap: cera	0.1μF		50V	C3216JF1H104Z	
C11, C12	A9146CC	2	2	2	2	Cap: cera	0.1μF		50V	C3216JF1H104Z	
C13	A9017CN	1	1	1	1	Cap: mica	22pF	±10%	100V	DM05C 220K1	
C14	A9371CY	1	1	1	1	Cap: film	1μF	±10%	50V	553M5002 105K	
C15	A9146CC	1	1	1	1	Cap: cera	0.1μF		50V	C3216JF1H104Z	
C16, C17	A9015CN	2	2	2	2	Cap: mica	15pF	±10%	100V	DM05C 150K1	
C18	A9146CC	1	1	1	1	Cap: cera	0.1μF		50V	C3216JF1H104Z	
C19	A9415CA	1	1	1	1	Cap: Al elect	100μF		16V	KME16VB100	
C20	A9146CC	1	1	1	1	Cap: cera	0.1μF		50V	C3216JF1H104Z	
C21~C23	A9146CC	3	3	3	3	Cap: cera	0.1μF		50V	C3216JF1H104Z	
C24		0	0	0	0						not assigned
C25~C30	A9146CC	6	6	6	6	Cap: cera	0.1μF		50V	C3216JF1H104Z	
C31		0	0	0	0						not assigned
C32, C33	A9017CN	2	2	2	2	Cap: mica	22pF	±10%	100V	DM05C 220K1	
C34	A9029CT	1	1	1	1	Cap: Ta elect	10μF	±20%	16V	204M1602-106M4	
C35~C40	A9146CC	6	6	6	6	Cap: cera	0.1μF		50V	C3216JF1H104Z	
C41~C50	A9146CC	10	10	10	10	Cap: cera	0.1μF		50V	C3216JF1H104Z	
C51~C60	A9146CC	10	10	10	10	Cap: cera	0.1μF		50V	C3216JF1H104Z	

Ass'y Part No.	B9628XF	B9628LA	B9628LB	B9628LC
B9628XF : ST'D				
B9628LA : with /MATH		●		●
B9628LB : with /RPT			●	●
B9628LC : with /MATH, /RPT				●

13.3. Main CPU Board Ass'y: B9628XF/LA/LB/LC. (Continued)

Item	Part No.	Q'ty				Part Name and Description		Remarks
D1~D4	A9248HD	4	4	4	4	Diode	1S953	
D5~D7		0	0	0	0			not assigned
D8	A9248HD	1	1	1	1	Diode	1S953	
U1	A9120LN	1	1	1	1	IC: Digital	μPD74HC245GS	
U2	A9062LD	1	1	1	1	IC: NV RAM	MBM2212-20P	
U3	A9120LN	1	1	1	1	IC: Digital	μPD74HC245GS	
U4	A6053LM	1	1	1	1	IC: Digital	μPD74HC541GS	
U5	A9075LC	0	1	0	1	IC: MATCH	D8087-1	
U6	A9103LN	1	1	1	1	IC: Digital	μPD74HC32G	
U7~U9	A6053LM	3	3	3	3	IC: Digital	μPD74HC541GS	
U10	A9126LN	1	1	1	1	IC: Digital	μPD74HC373GS	
U11	A9086LC	1	1	1	1	IC: CPU	μPD70208L-8	
U12	B9586JX	0	1	0	1	IC: Digital	μPD9335C	
U13	A9103LN	1	1	1	1	IC: Digital	μPD74HC32G	
U14	A9092LN	1	1	1	1	IC: Digital	μPD74HC00G	
U15, U16	A6053LM	2	2	2	2	IC: Digital	μPD74HC541GS	
U17		0	0	0	0			not assigned
U18	A9066LC	1	1	1	1	IC: Digital	μPD71054GB-3B4	
U19	A9608LB	1	1	1	1	IC: Digital	MB3771PF	
U20	A9098LN	1	1	1	1	IC: Digital	μPD74HC14G	
U21	A9098LN	1	1	1	1	IC: Digital	μPD74HC14G	
U22	A9105LN	1	1	1	1	IC: Digital	μPD74HC74G	
U23	B9628ZA	1	1	1	1	IC: Gate Array	MB621171	
U24	A9126LN	1	1	1	1	IC: Digital	μPD74HC373GS	
U25	A6003LC	1	1	1	1	IC: Analog	μPC271G2	
U26	A9098LN	1	1	1	1	IC: Digital	μPD74HC14G	
U27		0	0	0	0			not assigned
U28	A6004LQ	0	0	1	1	IC: RAM	μPD43256G-12L	
U29, U30	A6004LQ	2	2	2	2	IC: RAM	μPD43256G-12L	
U31, U32	A6004LQ	2	2	2	2	IC: RAM	μPD43256G-12L	
U33	A6004LQ	0	0	1	1	IC: RAM	μPD43256G-12L	
U34		0	0	0	0			not assigned
U35	A9107LN	1	1	1	1	IC: Digital	μPD74HC123G	
U36	A6053LM	1	1	1	1	IC: Digital	μPD74HC541GS	
U37	A9263LA	1	1	1	1	IC: Analog	μPC78L08J	
U38	A9147LB	1	1	1	1	IC: Digital	SN74LS05N	
U39, U40	A9109LN	2	2	2	2	IC: Digital	μPD74HC138G	
U41	B9581ZC	1	1	1	1	IC: Clock	MSM6242BGS	
U42	A9105LN	1	1	1	1	IC: Digital	μPD74HC74G	
U43	A9118LN	1	1	1	1	IC: Digital	μPD74HC241GS	
U44	A6053LM	1	1	1	1	IC: Digital	μPD74HC541GS	
U45	A9120LN	1	1	1	1	IC: Digital	μPD74HC245GS	

Ass'y Part No.	B9628XF	B9628LA	B9628LB	B9628LC
B9628XF : ST'D				
B9628LA : with /MATH		●		●
B9628LB : with /RPT			●	●
B9628LC : with /MATH, /RPT				●

13.3. Main CPU Board Ass'y: B9628XF/LA/LB/LC. (Continued)

Item	Part No.	Q'ty				Part Name and Description		Remarks
U46	A9126LN	1	1	1	1	IC: Digital	μPD74HC373GS	
U47	A9105LN	1	1	1	1	IC: Digital	μPD74HC74G	
U48	A9093LN	1	1	1	1	IC: Digital	μPD74HC02G	
SW1	A9095SS	1	1	1	1	Switch: DIP	B-8A-T	
X1	A9144EX	1	1	1	1	Oscillator	AT-51	16 MHz
X2	A9122EX	1	1	1	1	Oscillator	TCO-707F	19.6608 MHz
X3	B9591YJ	1	1	1	1	Oscillator	KF-38G	32.768 kHz
CN1	A9619KP	1	1	1	1	Connector	PS-40PE-D4T1-B1	
CN2	A9616KP	1	1	1	1	Connector	PS-10PE-D4T1-B1	
CN3	A9476KP	1	1	1	1	Connector	IL-G-2P-S3T2-E	
CN4	B9589ZW	1	1	1	1	Connector	IL-2P-S3EN2	
CN5	A9907KP	1	1	1	1	Connector	HIF6A-50PA-1.27DSA	
CN6	A9476KP	1	1	1	1	Connector	IL-G-2P-S3T2-E	
CN7	B9628KE	1	1	1	1	Connector	PS-26PE-D4T1-B1	
CN8	A9619KP	1	1	1	1	Connector	PS-40PE-D4T1-B1	
CN9	B9589ZW	1	1	1	1	Connector	IL-2P-S3EN2	
	A9831KP	1	1	1	1	IC Socket	QILE68P-410T	for U11
	B9628YF	1	1	1	1	Printed Wiring Board		

Ass'y Part No.	B9628XF	B9628LA	B9628LB	B9628LC
B9628XF : ST'D B9628LA : with /MATH B9628LB : with /RPT B9628LC : with /MATH, /RPT				

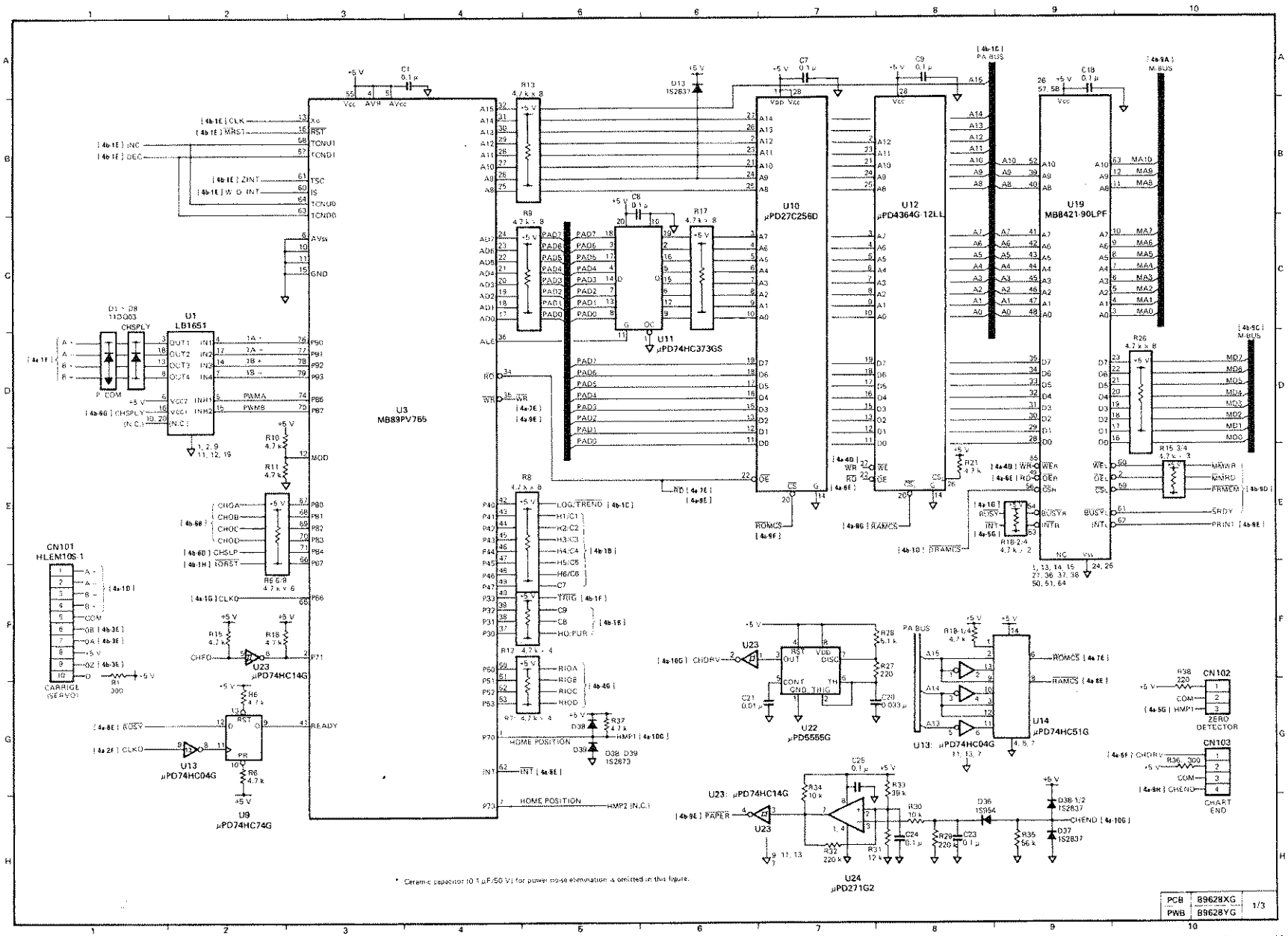


Figure 13-4a. Printer CPU Board Ass'y: B9628XG Schematic Diagram (1/3).

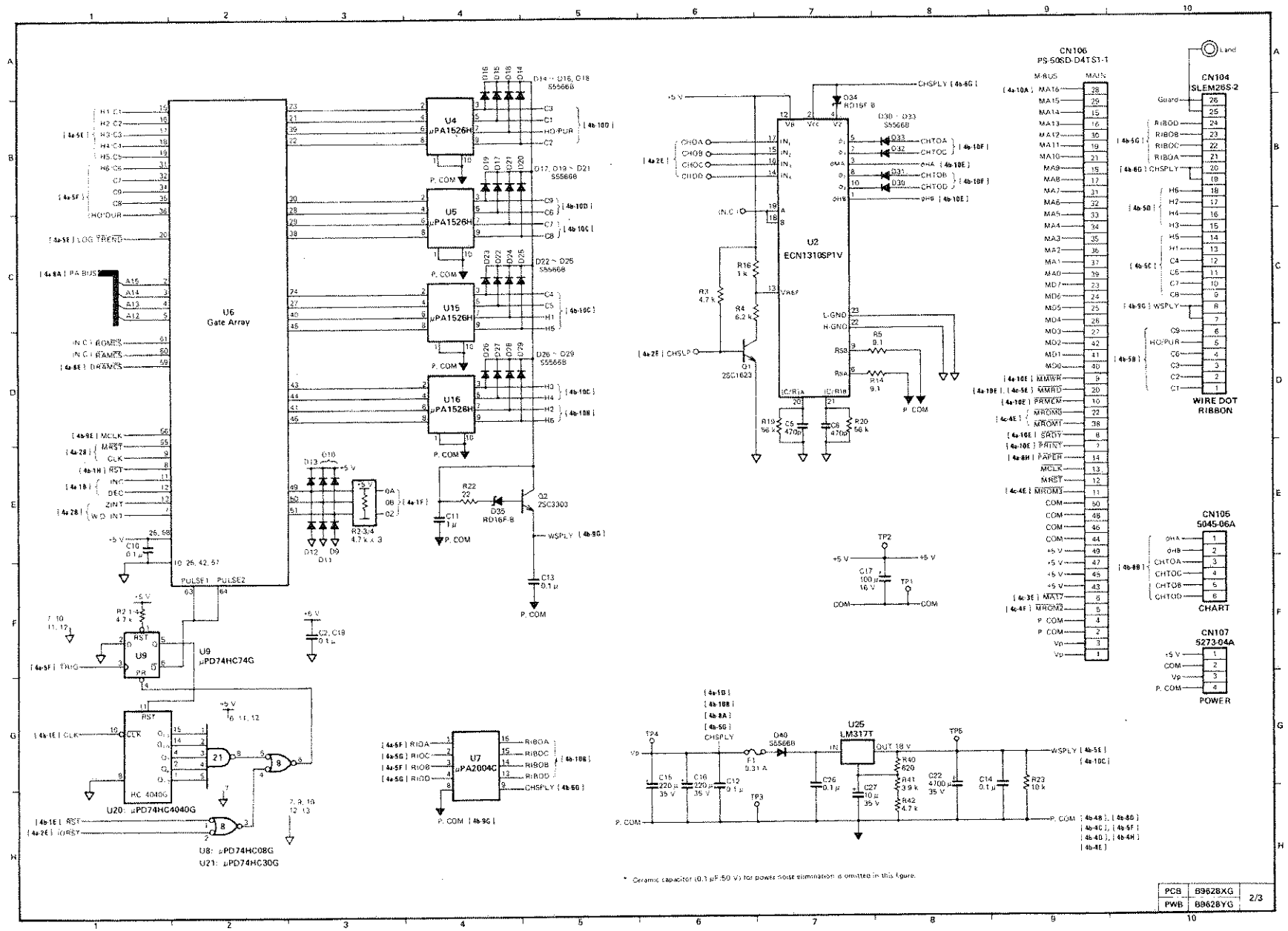


Figure 13-4b. Printer CPU Board Ass'y: B9628XG Schematic Diagram (2/3).

(March 1990)

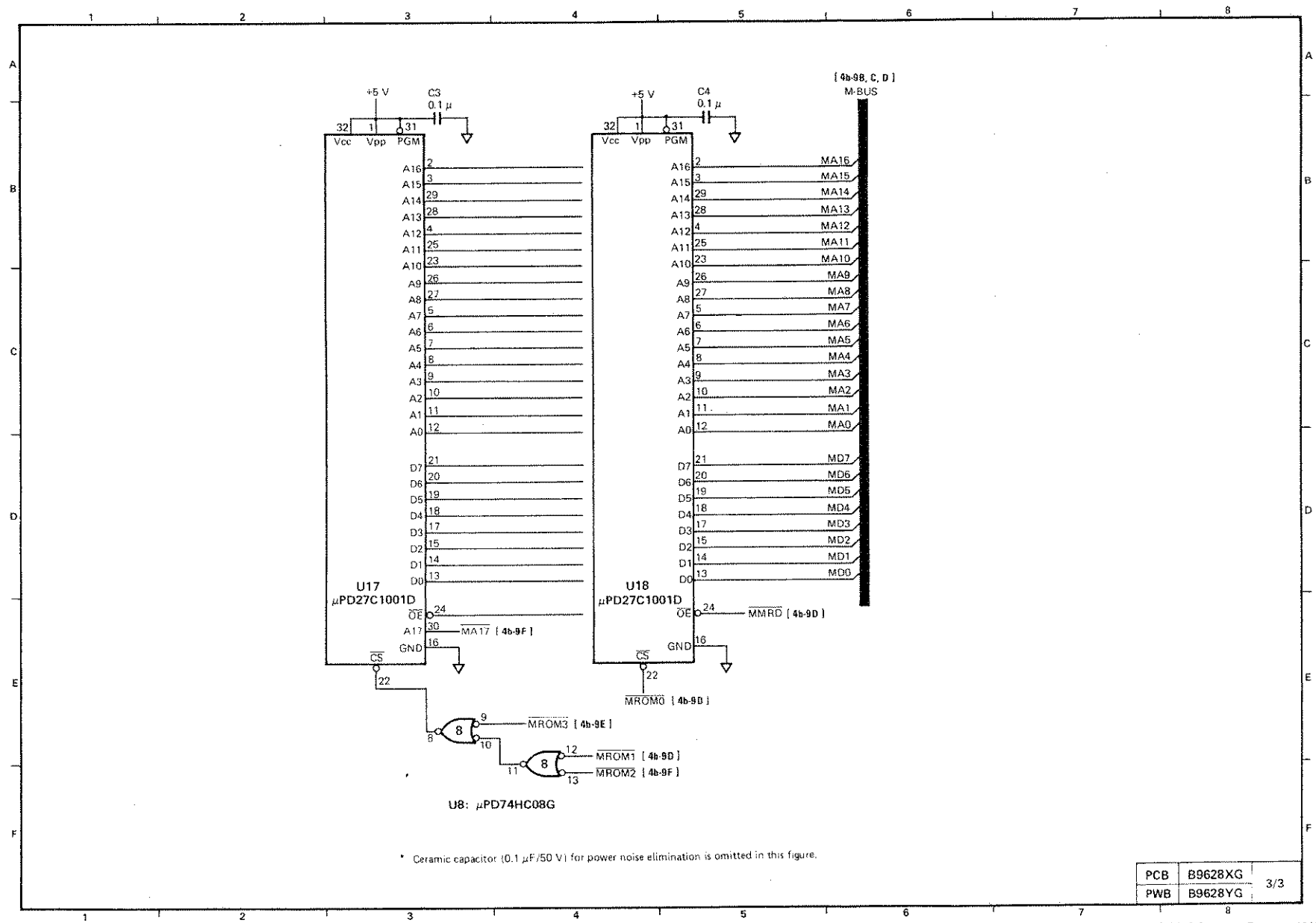


Figure 13-4c. Printer CPU Board Ass'y: B9628XG Schematic Diagram (3/3).

13.4. Printer CPU Board Ass'y: B9628XG.

(March 1990)

Item	Part No.	Q'ty	Part Name and Description				Remarks
R1	B9591XC	1	Res: met film	300Ω			
R2	A9043RL	1	Res: module	4.7kΩ	±5%	1/8W RKC1/8B4 4.7kΩJ	4 elements
R3	B9591XH	1	Res: met film	4.7kΩ			
R4	A9206RG	1	Res: met film	6.2kΩ	±5%	1/8W ERJ-8GCYJ622	
R5	A9123RJ	1	Res: met oxide film	9.1Ω	±5%	1W ERX1SJ9R1	
R6	A9070RL	1	Res: module	4.7kΩ	±5%	1/8W RKC1/8B8 4.7kΩJ	8 elements
R7		0					not assigned
R8, R9	A9070RL	2	Res: module	4.7kΩ	±5%	1/8W RKC1/8B8 4.7kΩJ	8 elements
R10	B9591XH	1	Res: met film	4.7kΩ			
R11		0					not assigned
R12	A9043RL	1	Res: module	4.7kΩ	±5%	1/8W RKC1/8B4 4.7kΩJ	4 elements
R13	A9070RL	1	Res: module	4.7kΩ	±5%	1/8W RKC1/8B8 4.7kΩJ	8 elements
R14	A9123RJ	1	Res: met oxide film	9.1Ω	±5%	1W ERX1SJ9R1	
R15	A9043RL	1	Res: module	4.7kΩ	±5%	1/8W RKC1/8B4 4.7kΩJ	4 elements
R16	B9591XD	1	Res: met film	1kΩ			
R17	A9070RL	1	Res: module	4.7kΩ	±5%	1/8W RKC1/8B8 4.7kΩJ	8 elements
R18	A9043RL	1	Res: module	4.7kΩ	±5%	1/8W RKC1/8B4 4.7kΩJ	4 elements
R19, R20	A9229RG	2	Res: met film	56kΩ	±5%	1/8W ERJ-8GCYJ563	
R21	B9591XH	1	Res: met film	4.7kΩ			
R22	A9147RG	1	Res: met film	22Ω	±5%	1/8W ERJ-8GCYJ220	
R23	B9591XK	1	Res: met film	10kΩ			
R24, R25		0					not assigned
R26	A9070RL	1	Res: module	4.7kΩ	±5%	1/8W RKC1/8B8 4.7kΩJ	8 elements
R27	A9171RG	1	Res: met film	220Ω	±5%	1/8W ERJ-8GCYJ221	
R28	A9204RG	1	Res: met film	5.1kΩ	±5%	1/8W ERJ-8GCYJ512	
R29	B9591XQ	1	Res: met film	220kΩ			
R30	B9591XK	1	Res: met film	10kΩ			
R31	B9591XM	1	Res: met film	12kΩ			
R32	B9591XQ	1	Res: met film	220kΩ			
R33	A9225RG	1	Res: met film	39kΩ	±5%	1/8W ERJ-8GCYJ393	
R34	B9591XK	1	Res: met film	10kΩ			
R35	A9229RG	1	Res: met film	56kΩ	±5%	1/8W ERJ-8GCYJ563	
R36	B9591XC	1	Res: met film	300Ω			
R37	B9591XH	1	Res: met film	4.7kΩ			
R38	A9171RG	1	Res: met film	220Ω	±5%	1/8W ERJ-8GCYJ221	
R39		0					not assigned
R40	A9044RG	1	Res: met film	620Ω	±1%	¼W LF¼ 620ΩF	
R41	A9063RG	1	Res: met film	3.9kΩ	±1%	¼W LF¼ 3.9kΩF	
R42	A9065RG	1	Res: met film	4.7kΩ	±1%	¼W LF¼ 4.7kΩF	
C1~C4	A9146CC	4	Cap: cera	0.1μF		50V C3216JF1H104Z	
C5, C6	A6027CC	2	Cap: cera	470pF			
C7~C10	A9146CC	4	Cap: cera	0.1μF		50V C3216JF1H104Z	
C11	A9371CY	1	Cap: film	1μF	±10%	50V 553M5002-105K	
C12~C14	A9146CC	3	Cap: cera	0.1μF		50V C3216JF1H104Z	
C15, C16	A9531CA	2	Cap: Al elect	220μF		35V KME35VB220 (M)	
C17	A9415CA	1	Cap: Al elect	100μF		16V KME16VB100	
C18, C19	A9146CC	2	Cap: cera	0.1μF		50V C3216JF1H104Z	
C20	A9253CY	1	Cap: film	0.033μF	±10%	50V 501N5002-333K	

13.4. Printer CPU Board Ass'y: B9628XG. (Continued)

Item	Part No.	Q'ty	Part Name and Description				Remarks
C21	A9250CY	1	Cap: film	0.01μF	±10%	50V 501N5002-103K	
C22	A9532CA	1	Cap: Al elect	4700μF		35V FTK35VTSN4700 (M)	
C23~C26	A9146CC	4	Cap: cera	0.1μF		50V C3216JF1H104Z	
C27	A9440CA	1	Cap: Al elect	10μF		35V SME35VB10	
D1~D8	A9392HD	8	Diode: SBD			11DQ03	
D9, D10	A9149HL	2	Diode			1S2873	
D11, D12	A9149HL	2	Diode			1S2873	
D13		0					not assigned
D14~D20	A9396HD	7	Diode			S5566B	
D21~D30	A9396HD	10	Diode			S5566B	
D31~D33	A9396HD	3	Diode			S5566B	
D34, D35	A9187HD	2	Diode: zener			RD16F-B	
D36	A9249HD	1	Diode			1S954	
D37~D39	A9149HL	3	Diode			1S2873	
D40	A9396HD	1	Diode			S5566B	
Q1	A9479HQ	1	Transistor: NPN			2SC1623-L5, L6, L7	
Q2	A9480HQ	1	Transistor: NPN			2SC3303	
U1	B9586JL	1	IC			LB1651	
U2	A9322LA	1	IC			ECN1310SP1V	
U3	B9628JB	1	IC			M889765A118	
U4, U5	A9155HL	2	IC			μPA1526H	
U6	B9628ZB	1	IC: Gate Array				
U7	A9096HL	1	IC			μPA2004C	
U8	A9095LN	1	IC			μPD74HC08G	
U9	A9105LN	1	IC			μPD74HC74G	
U10		0					not assigned
U11	A9126LN	1	IC			μPD74HC373GS	
U12	B9591ZB	1	IC			μPD4364G-12/15LL	
U13	A9094LN	1	IC			μPD74HC04G	
U14	A9104LN	1	IC			μPD74HC51G	
U15, U16	A9155HL	2	IC			μPA1526H	
U17, U18		0					not assigned
U19	A6003LQ	1	IC			MB8421-90LPF	
U20	A6123LM	1	IC			μPD74HC4040G	
U21	A9102LN	1	IC			μPD74HC30G	
U22	A6000LE	1	IC			μPD5555G	
U23	A9098LN	1	IC			μPD74HC14G	
U24	A6003LC	1	IC			μPC271G2	
U25	A9236LA	1	IC			LM317T	
CN101	A9641KP	1	Connector			HLEM-10S-1	
CN102	B9573VW	1	Connector			IL-G-3P-S3T2-E	
CN103	A9477KP	1	Connector			IL-G-4P-S3T2-E	
CN104	A9910KP	1	Connector			SLEM26S-2	
CN105	A9303KP	1	Connector			5045-06A	

13.4. Printer CPU Board Ass'y: B9628XG. (Continued)

Item	Part No.	Q'ty	Part Name and Description		Remarks
CN106	A9906KP	1	Connector	HIF6A-50DA-1.27DSA	
CN107	A9355KP	1	Connector	5273-04A	
F1	B9566ZN	1	Fuse Socket		
	B9573TZ	1	Fuse	K193727/500 mA	
	A9177KH	1	Heat Sink	Type SB-7	
	A9030YC	1	Test Pin		
	A9919KP	2	IC Socket	DICF-32CS-E	for U17, U18
	Y9305LB	1	Screw: M3 X 5		
	Y9305LE	1	Screw: M3 X 5		black
	B9628YG	1	Printed Wiring Board		

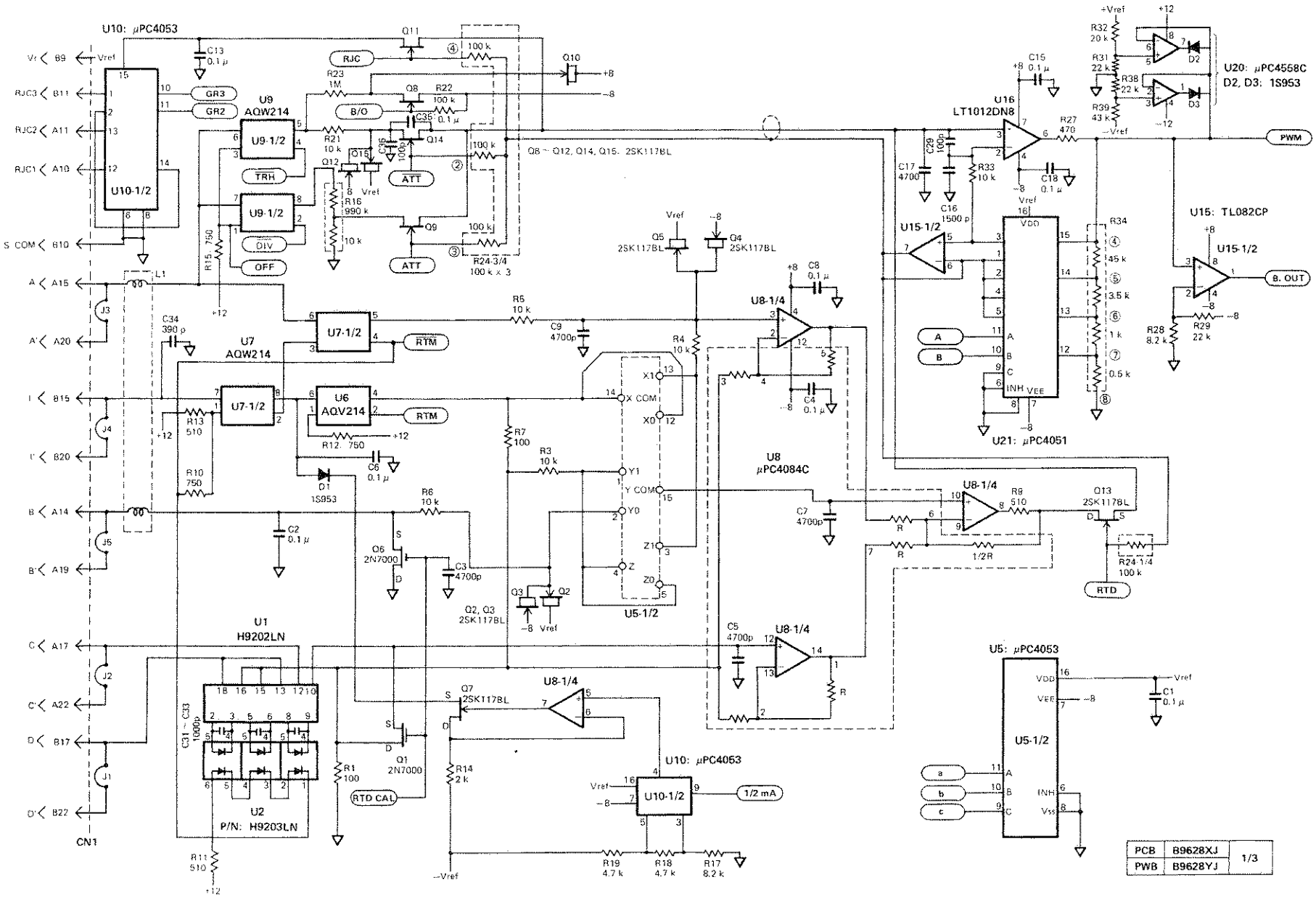
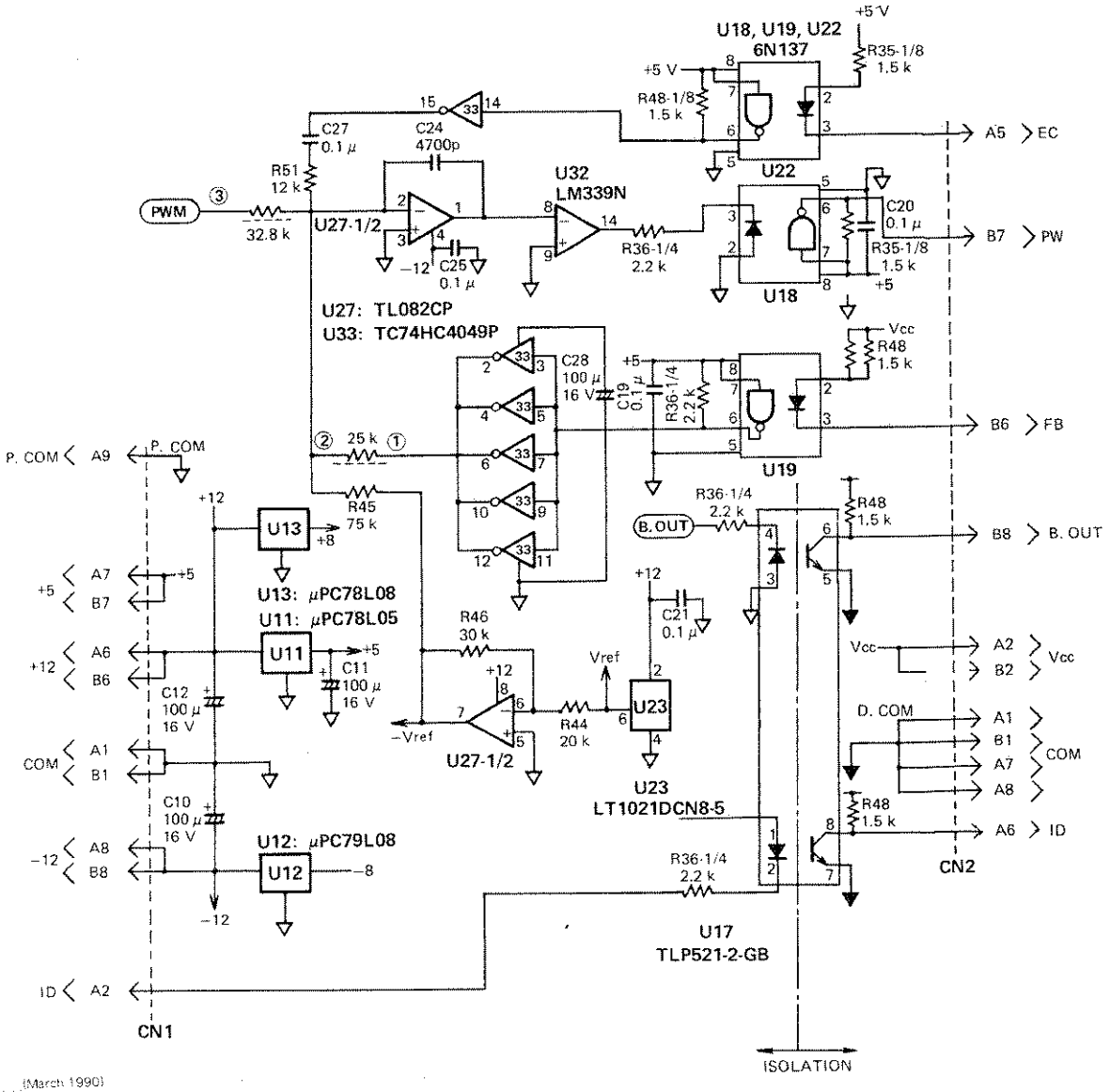


Figure 13-5a. A/D Card Ass'y: B9628XJ Schematic Diagram (1/3).

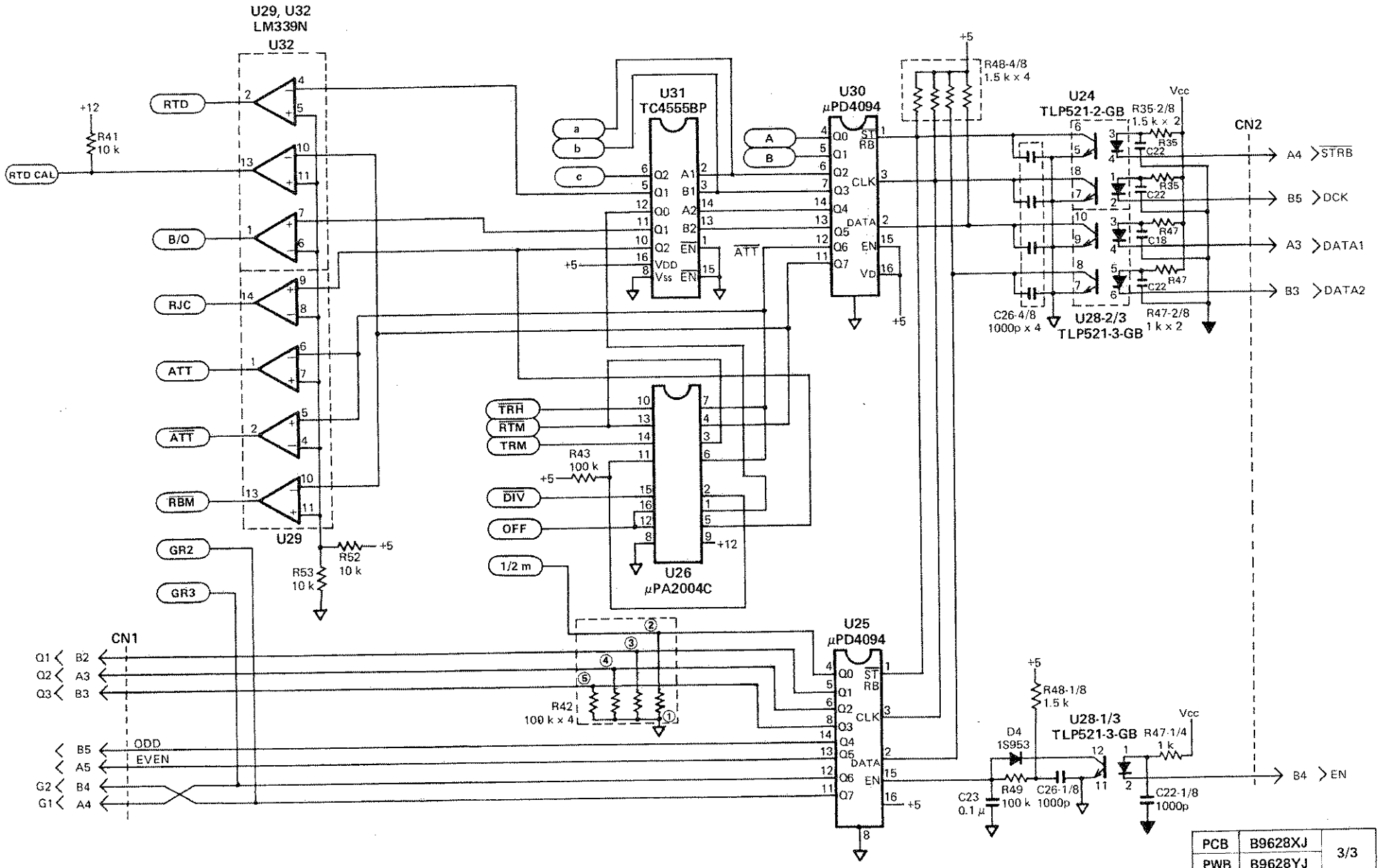
(March 1990)



PCB	B9628XJ	2/3
PWB	B9628YJ	

(March 1990)

Figure 13-5b. A/D Card Ass'y: B9628XJ Schematic Diagram (2/3).



PCB	B9628XJ	3/3
PWB	B9628YJ	

(March 1990)

Figure 13-5c. A/D Card Ass'y: B9628XJ Schematic Diagram (3/3).

13.5. A/D Card Ass'y: B9628XJ.

(March 1990)

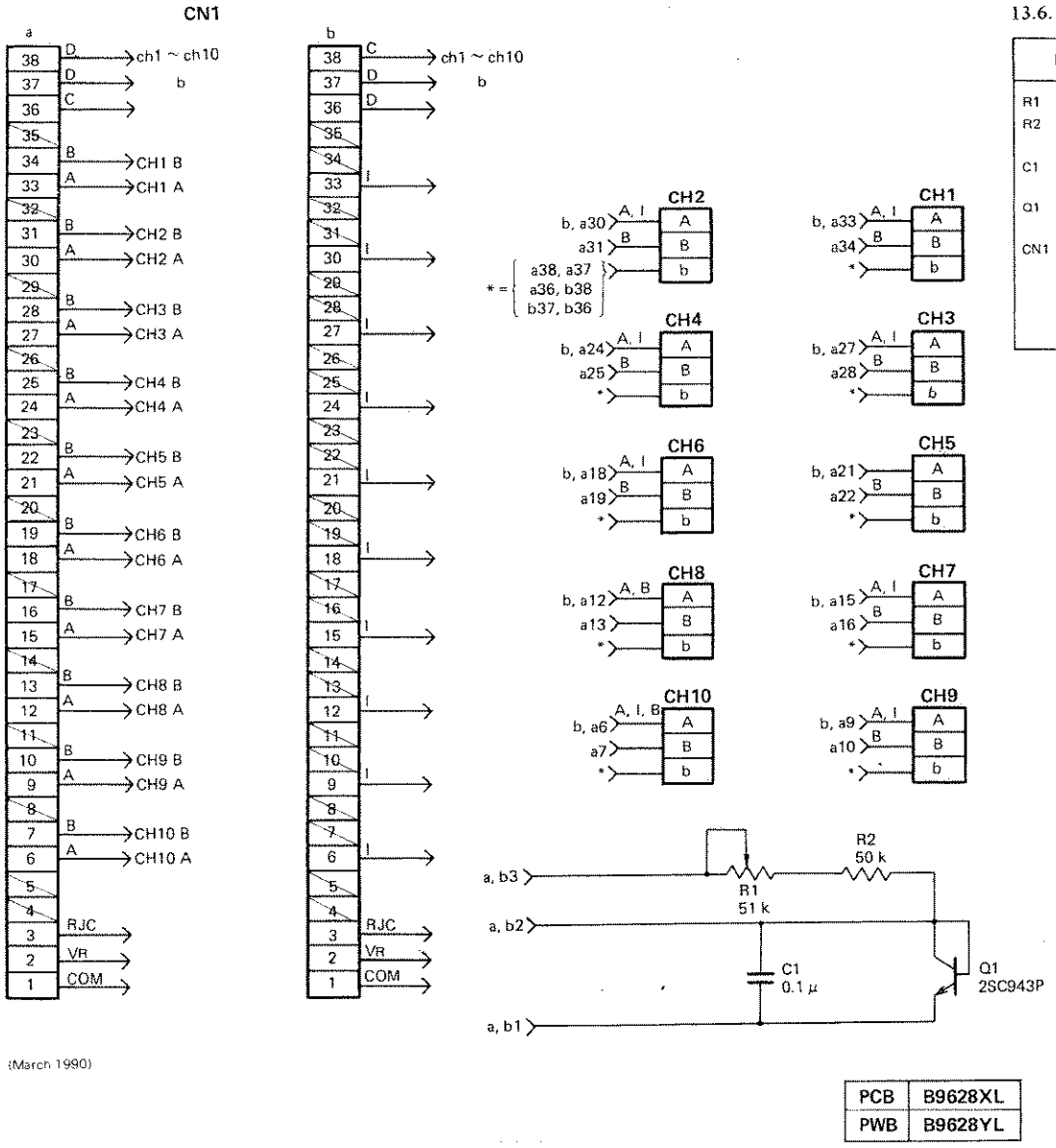
Item	Part No.	Q'ty	Part Name and Description	Remarks
R1	A9359RQ	1	Res: met film 100Ω ±0.5% 1/8 W JF1/8 100ΩD T11	
R2		0		not assigned
R3~R6	A9073RG	4	Res: met film 10kΩ ±1% ¼W LF¼ 10kΩF	
R7	A9359RQ	1	Res: met film 100Ω ±0.5% 1/8 W JF1/8 100ΩD T11	
R8	B9628ZR	1	Res: module MRP1714	
R9	A9042RG	1	Res: met film 510Ω ±1% ¼W LF¼ 510ΩF	
R10	A9046RG	1	Res: met film 750Ω ±1% ¼W LF¼ 750ΩF	
R11	A9042RG	1	Res: met film 510Ω ±1% ¼W LF¼ 510ΩF	
R12	A9046RG	1	Res: met film 750Ω ±1% ¼W LF¼ 750ΩF	
R13	A9042RG	1	Res: met film 510Ω ±1% ¼W LF¼ 510ΩF	
R14	A9056RG	1	Res: met film 2kΩ ±1% ¼W LF¼ 2kΩF	
R15	A9046RG	1	Res: met film 750Ω ±1% ¼W LF¼ 750ΩF	
R16	A9191RL	1	Res: module MRP1583	
R17	A9071RG	1	Res: met film 8.2kΩ ±1% ¼W LF¼ 8.2kΩF	
R18, R19	A9065RG	2	Res: met film 4.7kΩ ±1% ¼W LF¼ 4.7kΩF	
R20		0		not assigned
R21	A9535RK	1	Res: met film 10kΩ ±1% ERO-S2CHF10kΩ	
R22	A9097RG	1	Res: met film 100kΩ ±1% ¼W LF¼ 100kΩF	
R23	A9121RG	1	Res: met film 1MΩ ±1% ¼W LF¼ 1MΩF	
R24, R25	A9102RL	2	Res: module 100kΩ ±5% 1/8 W RKC1/8 B4 100kΩJ	4 elements
R26	A9081RG	1	Res: met film 22kΩ ±1% ¼W LF¼ 22kΩF	
R27	A9042RG	1	Res: met film 510Ω ±1% ¼W LF¼ 510ΩF	
R28	A9071RG	1	Res: met film 8.2kΩ ±1% ¼W LF¼ 8.2kΩF	
R29	A9081RG	1	Res: met film 22kΩ ±1% ¼W LF¼ 22kΩF	
R30		0		not assigned
R31	A9081RG	1	Res: met film 22kΩ ±1% ¼W LF¼ 22kΩF	
R32	A9080RG	1	Res: met film 20kΩ ±1% ¼W LF¼ 20kΩF	
R33	A9073RG	1	Res: met film 10kΩ ±1% ¼W LF¼ 10kΩF	
R34		0		not assigned
R35	A9124RL	1	Res: module 1.5kΩ ±5% 1/8 W MRGC09 X 1.5kΩ	8 elements
R36	A9181RL	1	Res: module 2.2kΩ ±5% ¼W RKC¼B4S 2.2kΩJ	4 elements
R37	A9185RL	1	Res: module MRP1548	
R38	A9081RG	1	Res: met film 22kΩ ±1% ¼W LF¼ 22kΩF	
R39	A9088RG	1	Res: met film 43kΩ ±1% ¼W LF¼ 43kΩF	
R40		0		not assigned
R41	A9073RG	1	Res: met film 10kΩ ±1% ¼W LF¼ 10kΩF	
R42	A9102RL	1	Res: module 100kΩ ±5% 1/8 W RKC1/8 B4 100kΩJ	4 elements
R43	A9073RG	1	Res: met film 10kΩ ±1% ¼W LF¼ 10kΩF	
R44	A9080RG	1	Res: met film 20kΩ ±1% ¼W LF¼ 20kΩF	
R45	A9094RG	1	Res: met film 75kΩ ±1% ¼W LF¼ 75kΩF	
R46	A9084RG	1	Res: met film 30kΩ ±1% ¼W LF¼ 30kΩF	
R47	A9101RL	1	Res: module 1kΩ ±5% 1/8 W RKC1/8 B4 1kΩJ	4 elements
R48	A9124RL	1	Res: module 1.5kΩ ±5% 1/8 W MRGC09 X 1.5kΩ	8 elements
R49	A9097RG	1	Res: met film 100kΩ ±1% ¼W LF¼ 100kΩF	
R50		0		not assigned
R51	A9075RG	1	Res: met film 12kΩ ±1% ¼W LF¼ 12kΩF	
R52, R53	A9073RG	2	Res: met film 10kΩ ±1% ¼W LF¼ 10kΩF	

13.5. A/D Card Ass'y: B9628XJ. (Continued)

Item	Part No.	Q'ty	Part Name and Description	Remarks
C1, C2	A9114CC	2	Cap: cer 0.1μF 50V FK26Y5V1H104Z	
C3	A9248CY	1	Cap: film 4700pF ±10% 50V MFL5002-472K	
C4	A9114CC	1	Cap: cer 0.1μF 50V FK26Y5V1H104Z	
C5	A9248CY	1	Cap: film 4700pF ±10% 50V MFL5002-472K	
C6	A9114CC	1	Cap: cer 0.1μF 50V FK26Y5V1H104Z	
C7	A9248CY	1	Cap: film 4700pF ±10% 50V MFL5002-472K	
C8	A9114CC	1	Cap: cer 0.1μF 50V FK26Y5V1H104Z	
C9	A9248CY	1	Cap: film 4700pF ±10% 50V MFL5002-472K	
C10	A9415CA	1	Cap: Al elect 100μF 16V KME16VB100	
C11, C12	A9415CA	2	Cap: Al elect 100μF 16V KME16VB100	
C13~C15	A9114CC	3	Cap: cer 0.1μF 50V FK26Y5V1H104Z	
C16	A9245CY	1	Cap: film 1500pF ±10% 50V MFL5002-152K	
C17	A9248CY	1	Cap: film 4700pF ±10% 50V MFL5002-472K	
C18~C20	A9114CC	3	Cap: cer 0.1μF 50V FK26Y5V1H104Z	
C21	A9114CC	1	Cap: cer 0.1μF 50V FK26Y5V1H104Z	
C22	A9008CL	1	Cap: module 1000pF EXF-P8102W	8 elements
C23	A9114CC	1	Cap: cer 0.1μF 50V FK26Y5V1H104Z	
C24	A9248CY	1	Cap: film 4700pF ±10% 50V MFL5002-472K	
C25	A9114CC	1	Cap: cer 0.1μF 50V FK26Y5V1H104Z	
C26	A9008CL	1	Cap: module 1000pF EXF-P8102ZW	8 elements
C27	A9114CC	1	Cap: cer 0.1μF 50V FK26Y5V1H104Z	
C28	A9415CA	1	Cap: Al elect 100μF 16V KME16VB100	
C29	A9025CN	1	Cap: mica 100pF ±10% 100V DM05C 101K1	
C30	A9114CC	1	Cap: cer 0.1μF 50V FK26Y5V1H104Z	
C31~C33	A9244CY	3	Cap: film 1000pF ±10% 50V MFL5002-102K	
C34	A9033CN	1	Cap: mica 390pF ±10% 100V DM05C-391K1	
C35	A9114CC	1	Cap: cer 0.1μF 50V FK26Y5V1H104Z	
C36	A9244CY	1	Cap: film 1000pF ±10% 50V MFL5002-102K	
L1	A9059ML	1	Inductor 8mH 0.2A SU9H-02080	
J1~J5	A9005RY	5	Short bar C-25Z	0Ω resistor
D1~D4	A9248HD	4	Diode 1S953	
Q1	A9489HQ	1	MOS FET 2N7000	
Q2~Q5	B9586JS	4	J FET 2SK117BL	
Q6	A9489HQ	1	MOS FET 2N7000	
Q7~Q10	B9586JS	4	J FET 2SK117BL	(Lead Forming)
Q11~Q15	B9586JS	5	J FET 2SK117BL	(Lead Forming)
U1	H9202LN	1	IC	FET switch
U2	H9203LN	1	IC	Photo isolator
U3, U4		0		not assigned
U5	A9062LM	1	IC μPC4053	
U6	A9179HL	1	IC AQV214	
U7	A9180HL	1	IC AQW214	
U8	A9227LA	1	IC μPC4084C	
U9	A9180HL	1	IC AQW214	
U10	A9062LM	1	IC μPC4053	

13.5. A/D Card Ass'y: B9628XJ. (Continued)

Item	Part No.	Q'ty	Part Name and Description		Remarks
U11	A9205LA	1	IC	μPC78L05	
U12	A9293LA	1	IC	μPC79L08	
U13	A9263LA	1	IC	μPC78L08	
U14	A9058LD	1	IC	S2444P	NV RAM
U15	A9139LA	1	IC	TL082CP	
U16	A9334LA	1	IC	LT1012DN8	
U17	A9107HL	1	IC	TLP521-2	
U18, U19	A9086HL	2	IC	6N137	
U20	A9082LA	1	IC	μPC4558C	
U21	A9060LM	1	IC	μPC4051	
U22	A9086HL	1	IC	6N137	
U23	A9323LA	1	IC	LT1021DCN8-5	
U24	A9107HL	1	IC	TLP521-2	
U25	B9566ZL	1	IC	μPD4094	
U26	A9096HL	1	IC	μPA2004C	
U27	A9139LA	1	IC	TL082CP	
U28	A9108HL	1	IC	TLP521-3	
U29	A9019LA	1	IC	LM339N	
U30	B9566ZL	1	IC	μPD4094	
U31	A9148LM	1	IC	TC4555P	
U32	A9019LA	1	IC	LM339N	
U33	A9089LN	1	IC	TC74HC4049P	
CN1	B9628ZD	1	Connector	PCN12A-44P-2.54DS	
CN2	A9808KP	1	Connector	PCN12A-20P-2.54DS	
	B9628YJ	1	Printed Wiring Board		



(March 1990)

PCB	B9628XL
PWB	B9628YL

Figure 13-6. Terminal Board Ass'y: B9628XL Schematic Diagram.

13.6. Terminal Board Ass'y: B9628XL.

(March 1990)

Item	Part No.	Q'ty	Part Name and Description	Remarks
R1	A9090RG	1	Res: met flm 51kΩ ±1% ¼W LF¼ 51kΩF	
R2	A9269RV	1	Res: valiable 50kΩ GF-06P 50kΩ	
C1	A9114CC	1	Cap: cera 0.1μF 50V KF26Y5V1H104Z	
Q1	G9197HQ	1	Transistor: NPN 2SC943P	
CN1	B9628ZJ	1	Connector PCN12-76S-2.54DSA (42)	
	A9110KW	10	Terminal S430-3P	
	B9628YL	1	Printed Wiring Board	

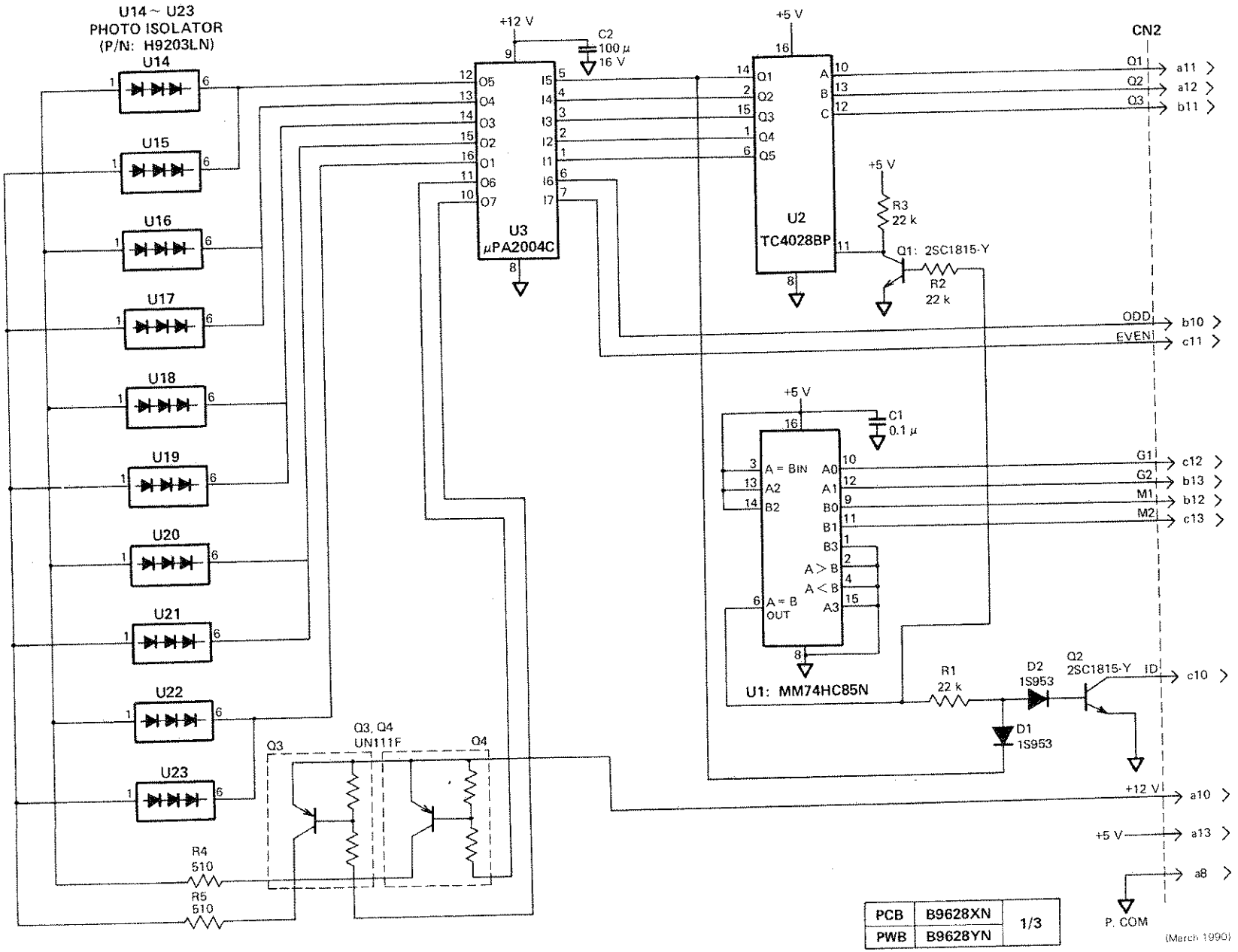
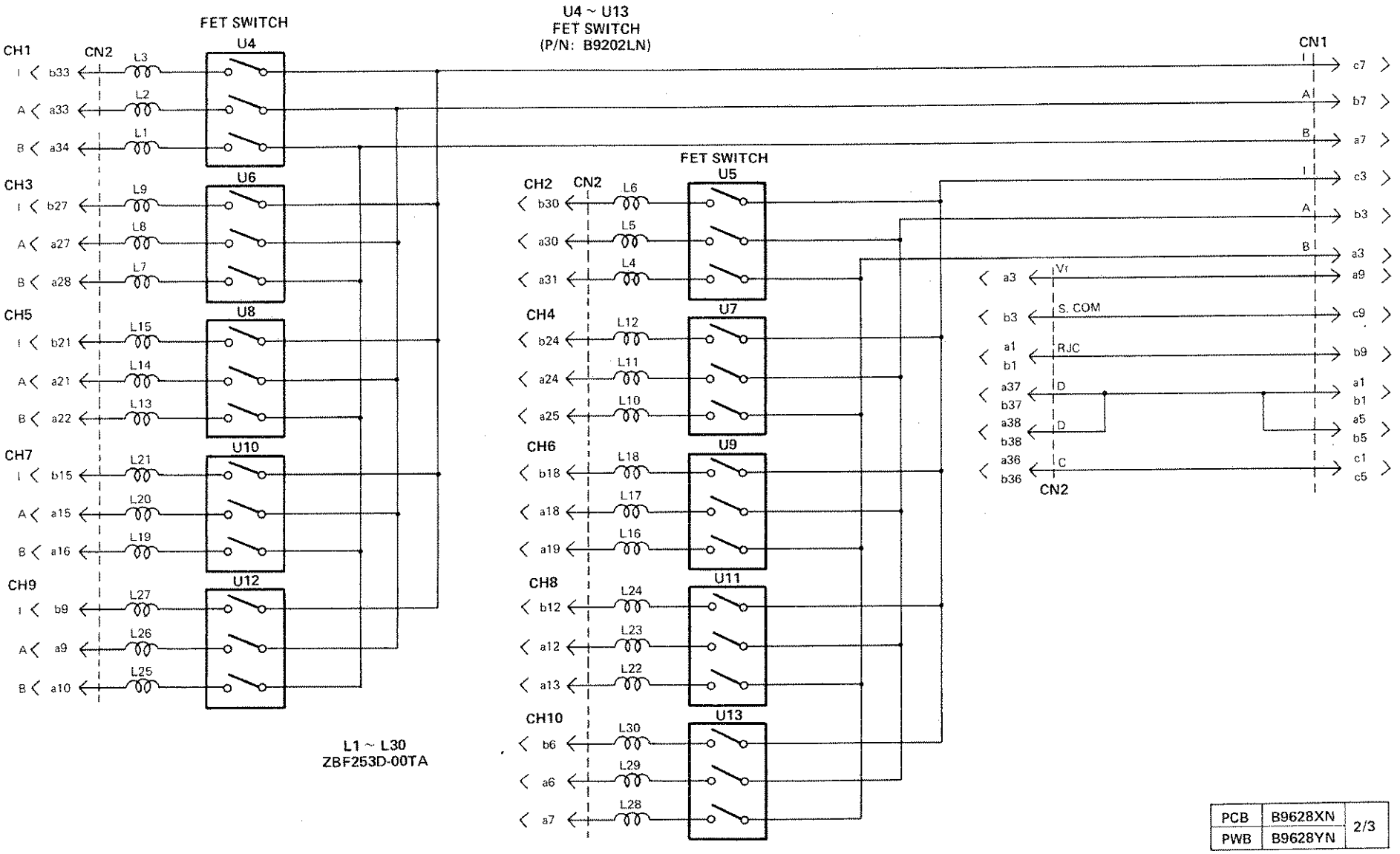


Figure 13-7a. SSR Scanner Card Ass'y: B9628XN Schematic Diagram (1/3).



PCB	B9628XN	2/3
PWB	B9628YN	

Figure 13-7b. SSR Scanner Card Ass'y: B9628XN Schematic Diagram (2/3).

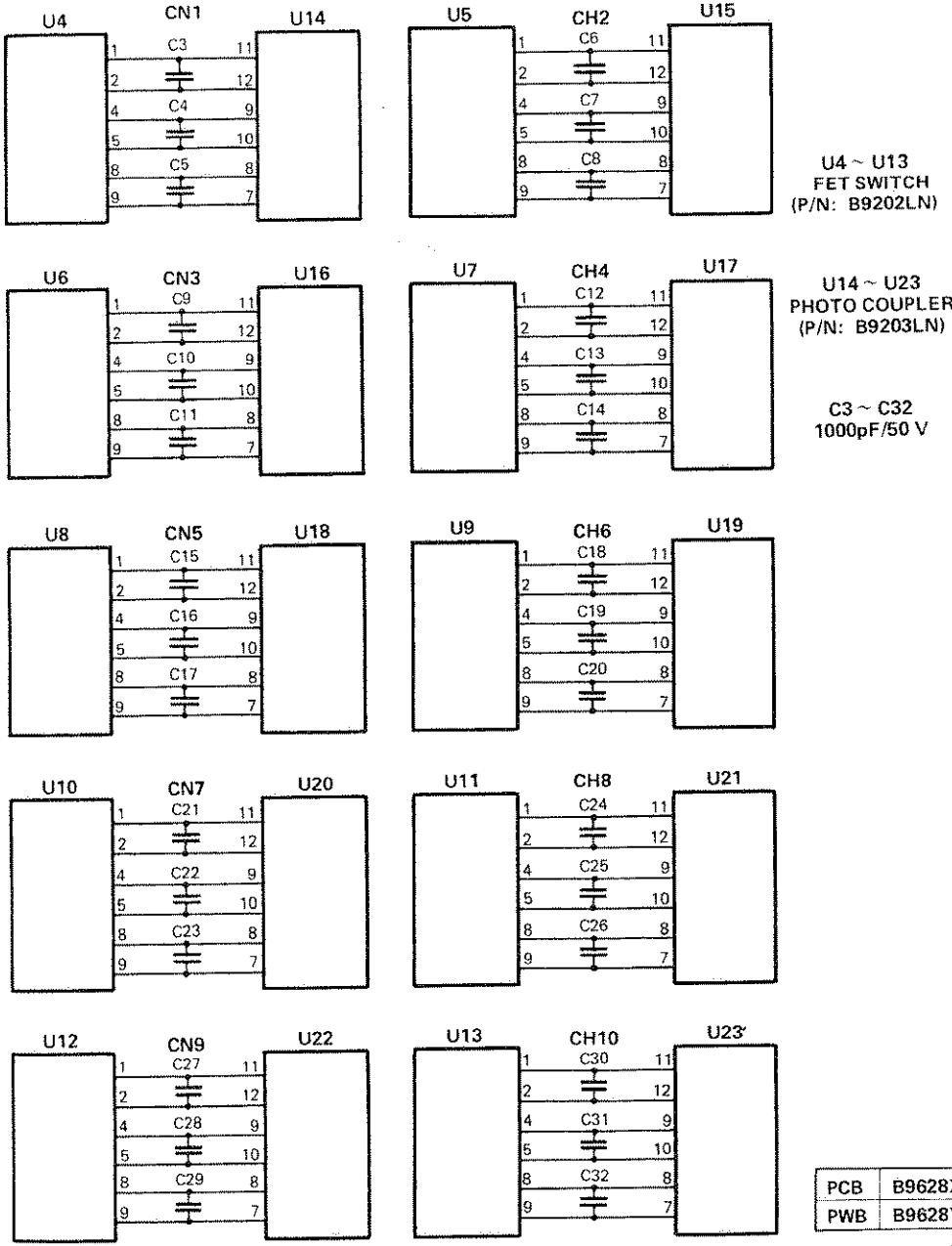


Figure 13-7c. SSR Scanner Card Ass'y: B9628XN Schematic Diagram (3/3).

13.7. SSR Scanner Card Ass'y: B9628XN.

(March 1990)

Item	Part No.	Q'ty	Part Name and Description	Remarks
R1~R3	A9081RG	3	Res: met film 22kΩ ±1% ¼W LF¼ 22kΩF	
R4, R5	A9042RG	2	Res: met film 510Ω ±1% ¼W LF¼ 510ΩF	
C1	A9114CC	1	Cap: cer 0.1μF 50V FK26Y5V1H104Z	
C2	A9415CA	1	Cap: Al elect 100μF 16V KME16VB100	
C3~C32	A9244CY	30	Cap: film 1000pF ±10% 50V 501N5002-102K	
L1~L30	A9106MC	30	Ferrite bead ZBF253D-00TA	
D1, D2	A9248HD	2	Diode 1S953	
Q1, Q2	A9340HQ	2	Transistor: NPN 2SC1815-Y	
Q3, Q4	A9156HL	2	Transistor UN111F	
U1	A9017LN	1	IC MM74HC85N	
U2	A9019LM	1	IC TC4028BP	
U3	A9096HL	1	IC μPA2004C	
U4~U13	H9202LN	10	FET Switch	
U14~U23	H9203LN	10	Photo Isolator	
CN1	B9628ZF	1	Connector PCN10A-48P-2.54DS (42)	
CN2	B9628ZH	1	Connector PCN12A-76P-2.54DS (42)	
	B9628YN	1	Printed Wiring Board	

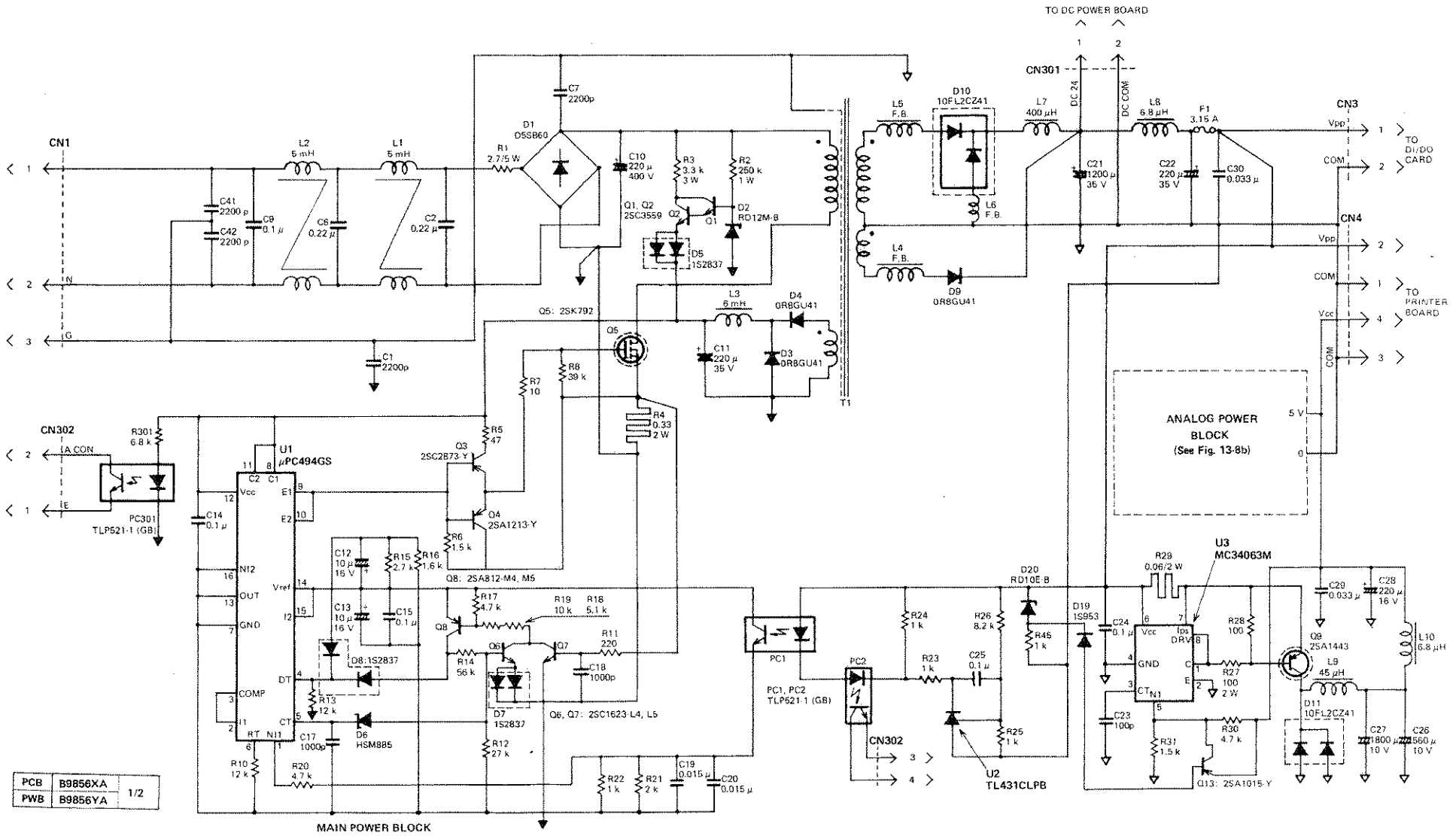
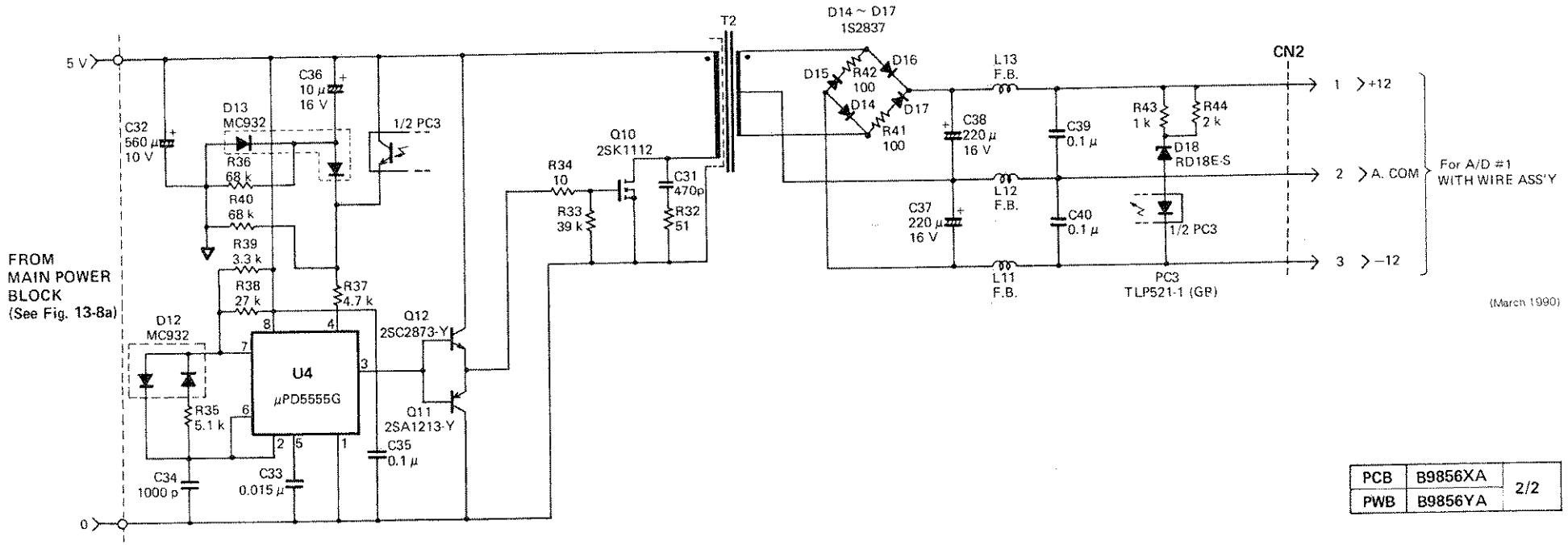


Figure 13-8a. Main Power Board Ass'y: B9856XA/QA Schematic Diagram (1/2).



PCB	B9856XA	2/2
PWB	B9856YA	

Figure 13-8b. Main Power Board Ass'y: B9856XA/QA Schematic Diagram (2/2).

13-8. Main Power Board Ass'y: B9856XA/QA.

(March 1990)

Item	Part No.	Q'ty		Part Name and Description				Remarks
R1	A9515RA	1	1	Res: ww	2.7Ω	±10%	5W RGG5 2.7ΩK	
R2	A9402RK	1	1	Res: met film	250kΩ	±1%	1W CM1 250kΩF	
R3	S9963RN	1	1	Res: M.O.F.	3.3kΩ	±5%	3W RSS3 3.3kΩJ	
R4	A9010RY	1	1	Res: plate	0.33Ω	±10%	2W BPR28F 0.33ΩK	
R5	A9017RG	1	1	Res: met film	47Ω	±1%	¼W LF¼ 470F	
R6	A9053RG	1	1	Res: met film	1.5kΩ	±1%	¼W LF¼ 152F	
R7	A9001RG	1	1	Res: met film	10Ω	±1%	¼W LF¼ 100F	
R8	A6205RS	1	1	Res: met film	39kΩ	±5%	1/8W ERJ-8GCYJ393V	
R9		0	0					not assigned
R10	A9075RG	1	1	Res: met film	12kΩ	±1%	¼W LF¼ 123F	
R11	A6151RS	1	1	Res: met film	220Ω	±5%	1/8W ERJ-8GCYJ221V	
R12	A6201RS	1	1	Res: met film	27kΩ	±5%	1/8W ERJ-8GCYJ273V	
R13	A6193RS	1	1	Res: met film	12kΩ	±5%	1/8W ERJ-8GCYJ123V	
R14	A6209RS	1	1	Res: met film	56kΩ	±5%	1/8W ERJ-8GCYJ563V	
R15	A6177RS	1	1	Res: met film	2.7kΩ	±5%	1/8W ERJ-8GCYJ272V	
R16	A6172RS	1	1	Res: met film	1.6kΩ	±5%	1/8W ERJ-8GCYJ162V	
R17	A6183RS	1	1	Res: met film	4.7kΩ	±5%	1/8W ERJ-8GCYJ472V	
R18	A6184RS	1	1	Res: met film	5.1kΩ	±5%	1/8W ERJ-8GCYJ512V	
R19	A6191RS	1	1	Res: met film	10kΩ	±5%	1/8W ERJ-8GCYJ103V	
R20	A6183RS	1	1	Res: met film	4.7kΩ	±5%	1/8W ERJ-8GCYJ472V	
R21	A6174RS	1	1	Res: met film	2kΩ	±5%	1/8W ERJ-8GCYJ202V	
R22~R24	A6167RS	3	3	Res: met film	1kΩ	±5%	1/8W ERJ-8GCYJ102V	
R25	A9049RG	1	1	Res: met film	1kΩ	±1%	¼W LF¼ 102F	
R26	A9071RG	1	1	Res: met film	8.2kΩ	±1%	¼W LF¼ 822F	
R27	A9104RJ	1	1	Res: M.O.F.	100Ω	±5%	2W RSM2FB 100ΩJ	
R28	A6143RS	1	1	Res: met film	100Ω	±5%	1/8W ERJ-8GCYJ101V	
R29	A9009RY	1	1	Res: plate	0.06Ω	±10%	2W BPR28 0.06ΩK	
R30	A9065RG	1	1	Res: met film	4.7kΩ	±1%	½W LF½ 472F	
R31	A9053RG	1	1	Res: met film	1.5kΩ	±1%	¼W LF¼ 152F	
R32	A9018RG	1	1	Res: met film	51Ω	±1%	¼W LF¼ 510F	
R33	A6205RS	1	1	Res: met film	39kΩ	±5%	1/8W ERJ-8GCYJ393V	
R34	A9001RG	1	1	Res: met film	10Ω	±1%	¼W LF¼ 100F	
R35	A9066RG	1	1	Res: met film	5.1kΩ	±1%	¼W LF¼ 512F	
R36	A9093RG	1	1	Res: met film	68kΩ	±1%	¼W LF¼ 683F	
R37	A6183RS	1	1	Res: met film	4.7kΩ	±5%	1/8W ERJ-8GCYJ472V	
R38	A6201RS	1	1	Res: met film	27kΩ	±5%	1/8W ERJ-8GCYJ273V	
R39	A9061RG	1	1	Res: met film	3.3kΩ	±1%	¼W LF¼ 332F	
R40	A9093RG	1	1	Res: met film	68kΩ	±1%	¼W LF¼ 683F	
R41, R42	A6143RS	2	2	Res: met film	100Ω	±5%	1/8W ERJ-8GCYJ101V	
R43	A6167RS	1	1	Res: met film	1kΩ	±5%	1/8W ERJ-8GCYJ102V	
R44	A6174RS	1	1	Res: met film	2kΩ	±5%	1/8W ERJ-8GCYJ202V	
R45	A9049RG	0	1	Res: met film	1kΩ	±1%	¼W LF¼ 102F	

Ass'y Part No.	B9856XA	B9856QA
	B9856XA: ST'D	
	B9856QA: /DC (OPTION)	

13-8. Main Power Board Ass'y: B9856XA/QA. (Continued)

Item	Part No.	Q'ty		Part Name and Description				Remarks
R301	A6187RS	0	1	Res: met film	6.8kΩ	±5%	1/8W ERJ-8GCYJ682V	
C1	B9586MP	1	1	Cap: cer	2200pF	±20%	400V DE7100F222MVA1-KC	
C2	S9407VC	1	1	Cap: film	0.22μF	±20%	250V XE224	
C3, C4		0	0					not assigned
C5		0	0					not assigned
C6	S9407VC	1	1	Cap: film	0.22μF	±20%	250V XE224	
C7	B9586MP	1	1	Cap: cer	2200pF	±20%	400V DE7100F222MVA1-KC	
C8		0	0					not assigned
C9	S9406VC	1	1	Cap: film	0.1μF	±20%	250V XE104	
C10	A9533CA	1	1	Cap: Al elect	220μF	±20%	400V KMH400VNSN220 (M)	
C11	A9531CA	1	1	Cap: Al elect	220μF	±20%	35V KME35VB220 (M)	
C12, C13	A9411CA	2	2	Cap: Al elect	10μF	±20%	16V KMA16VB10	
C14, C15	A6012CC	2	2	Cap: cer	0.1μ		50V ECU-□-1H-104-ZFM	
C16		0	0					not assigned
C17	A9244CY	1	1	Cap: film	1000pF	±10%	50V ECQ-B1H102K	
C18	A6013CC	1	1	Cap: cer	1000pF		50V ECU-□-1H-102-ZFM	
C19, C20	B9591WD	2	2	Cap: cer	0.015μF		50V ECU-□-1H-153-ZFM	
C21	S9451CA	1	1	Cap: Al elect	1200μF	±20%	35V SXE35VB1200	
C22	A9531CA	1	1	Cap: Al elect	220μF	±20%	35V KME35VB220 (M)	
C23	A9168CC	1	1	Cap: cer	100pF	±5%	50V CC45CH1H101JYA	
C24	A6012CC	1	1	Cap: cer	0.1μF		50V ECU-□-1H-104-ZFM	
C25	A9366CY	1	1	Cap: film	0.1μF	±10%	63V 553M6302 104K	
C26	A9530CA	1	1	Cap: Al elect	60μF	±20%	10V SXF10VB560 (M)	
C27	A9535CA	1	1	Cap: Al elect	1800μF	±20%	10V SXF10VB1800	
C28	A9416CA	1	1	Cap: Al elect	220μF	±20%	16V KME16VB220 (M)	
C29, C30	A9253CY	1	1	Cap: film	0.033μF	±10%	50V 501N5002-333K	
C31	A9169CC	1	1	Cap: cer	470pF	±5%	50V CC45SL1H471JYA	
C32	A9530CA	1	1	Cap: Al elect	560μF	±20%	10V SXF10VB560	
C33	B9591WD	1	1	Cap: cer	0.015μF		50V ECU-□-1H-153-ZFM	
C34	A9244CY	1	1	Cap: film	1000pF	±10%	50V ECQ-B1H102K	
C35	A6012CC	1	1	Cap: cer	0.1μF		50V ECQ-□-1H-104-ZFM	
C36	A9411CA	1	1	Cap: Al elect	10μF	±20%	16V KMA16VB10	
C37, C38	A9416CA	2	2	Cap: Al elect	220μF	±20%	16V KME16VB220 (M)	
C39, C40	A6012CC	2	2	Cap: cer	0.1μF		50V ECU-□-1H-104-ZMF	
C41, C42	B9586MP	2	2	Cap: cer	2200pF	±20%	400V DE7100F222MVA1-KC	
L1, L2	B9586MN	2	2	Coil: filter	5mH		SC02-500	
L3	A9056ML	1	1	Coil: choke	6mH		SBC-31	
L4~L6	A9106MC	3	3	Ferrite bead			ZBF-253D-00	
L7	A9055ML	1	1	Coil: choke	400μH		HP-034SZ	
L8	B9628ZU	1	1	Coil	6.8μH		SBC4-6R8-452	
L9	A9058ML	1	1	Coil: choke	45μH		HP-052Z	
L10	B9628ZU	1	1	Coil	6.8μH		SBC4-6R8-452	

Ass'y Part No.	B9856XA	B9856QA
	B9856XA: ST'D	
	B9856QA: /DC (OPTION)	

13-8. Main Power Board Ass'y: B9856XA/QA. (Continued)

Item	Part No.	Q'ty		Part Name and Description		Remarks
L11~L13	B9591YF	3	3	Ferrite bead	ZBF-503D-00	
T1	B9628ZW	1	1	Transformer		
T2	B9628ZZ	1	1	Transformer		
D1	S9124HR	1	1	Diode: bridge	D6SB60	
D2	A6016HE	1	1	Diode: zener	RD12M-B	
D3, D4	A9477HD	2	2	Diode: H.E.D.	0R8GU41	
D5	A6000HD	1	1	Diode	1S2837	
D6	A6008HD	1	1	Diode: S.B.D.	HSM88S	
D7, D8	A6000HD	2	2	Diode	1S2837	
D9	A9477HD	1	1	Diode: H.E.D.	0R8GU41	
D10	A9178HL	1	1	Diode: stack	10FL2CZ41	
D11	A9178HL	1	1	Diode: stack	10FL2CZ41	
D12, D13	A9182HL	2	2	Diode: stack	MC932	
D14~D17	A6000HD	4	4	Diode	1S2837	
D18	A9312HD	1	1	Diode: zener	RD18E-B	
D19	A9248HD	0	1	Diode	1S953	
D20	A9306HD	0	1	Diode: zener	RD10E-B	
Q1, Q2	A9527HQ	2	2	Transistor: NPN	2SC3559	
Q3	A6027HQ	1	1	Transistor: NPN	2SC2873-Y	
Q4	A6028HQ	1	1	Transistor: PNP	2SA1213-Y	
Q5	A9540HQ	1	1	Transistor: FET	2SK792	
Q6, Q7	A6003HQ	2	2	Transistor: NPN	2SC1623-L4, L5	
Q8	A6002HQ	1	1	Transistor: PNP	2SA812-M4, M5	
Q9	A9481HQ	1	1	Transistor: PNP	2SA1443	
Q10	A9526HQ	1	1	Transistor: FET	2SK1112	
Q11	A6028HQ	1	1	Transistor: PNP	2SA1213-Y	
Q12	A6027HQ	1	1	Transistor: NPN	2SC2873-Y	
Q13	A9338HQ	0	1	Transistor: PNP	2SA1015-Y	
PC1~PC3	A9106HL	3	3	Photo coupler	TLP521-1 (GB)	
PC301	A9106HL	0	1	Photo coupler	TLP521-1 (GB)	
U1	A6000LR	1	1	IC: Switching Regulator	μPC494GS	
U2	A9169LA	1	1	IC: Shunt Regulator	TL431CLPB	
U3	A6001LR	1	1	IC: Switching Regulator	MC34063M	
U4	A6000LE	1	1	IC: Timer	μPD5556G	
CN1	L9063JA	1	1	Connector	5096-03C	
CN2	B9573VW	1	1	Connector	IL-G-3P-S3T2-E	
CN3	A9476KP	1	1	Connector	IL-G-2P-S3T2-E	
CN4	A9355KP	1	1	Connector	5273-04A	

		Ass'y Part No. B9856XA	B9856QA	
				B9856XA: ST'D B9856QA: /DC (OPTION)

13-8. Main Power Board Ass'y: B9856XA/QA. (Continued)

Item	Part No.	Q'ty		Part Name and Description		Remarks
CN301	A9287KP	0	1	Connector	5273-02A	
CN302	B9628TY	0	1	Wiring ass'y		
F1	B9566ZN	1	1	Fuse Holder	19560	
	B9627ZS	1	1	Bracket		
	B9627NF	1	1	Bracket		
	B9627ZT	1	1	Bracket		
	B9855PE	1	0	Heat Sink		
	Y9305LE	4	4	Screw: M3 X 5		bind, black
	Y9306LB	7	7	Screw: M3 X 6		bind
	Y9310LB	1	1	Screw: M3 X 10		bind
	A9200KH	2	2	Tube	53 25L	
	B9586JJ	1	1	Fuse	TR5-TK19372-3.15A	
	B9628YS	1	1	Spacer		
	B9856YA	1	1	Printed Wiring Board		

		Ass'y Part No. B9856XA	B9856QA	
				B9856XA: ST'D B9856QA: /DC (OPTION)

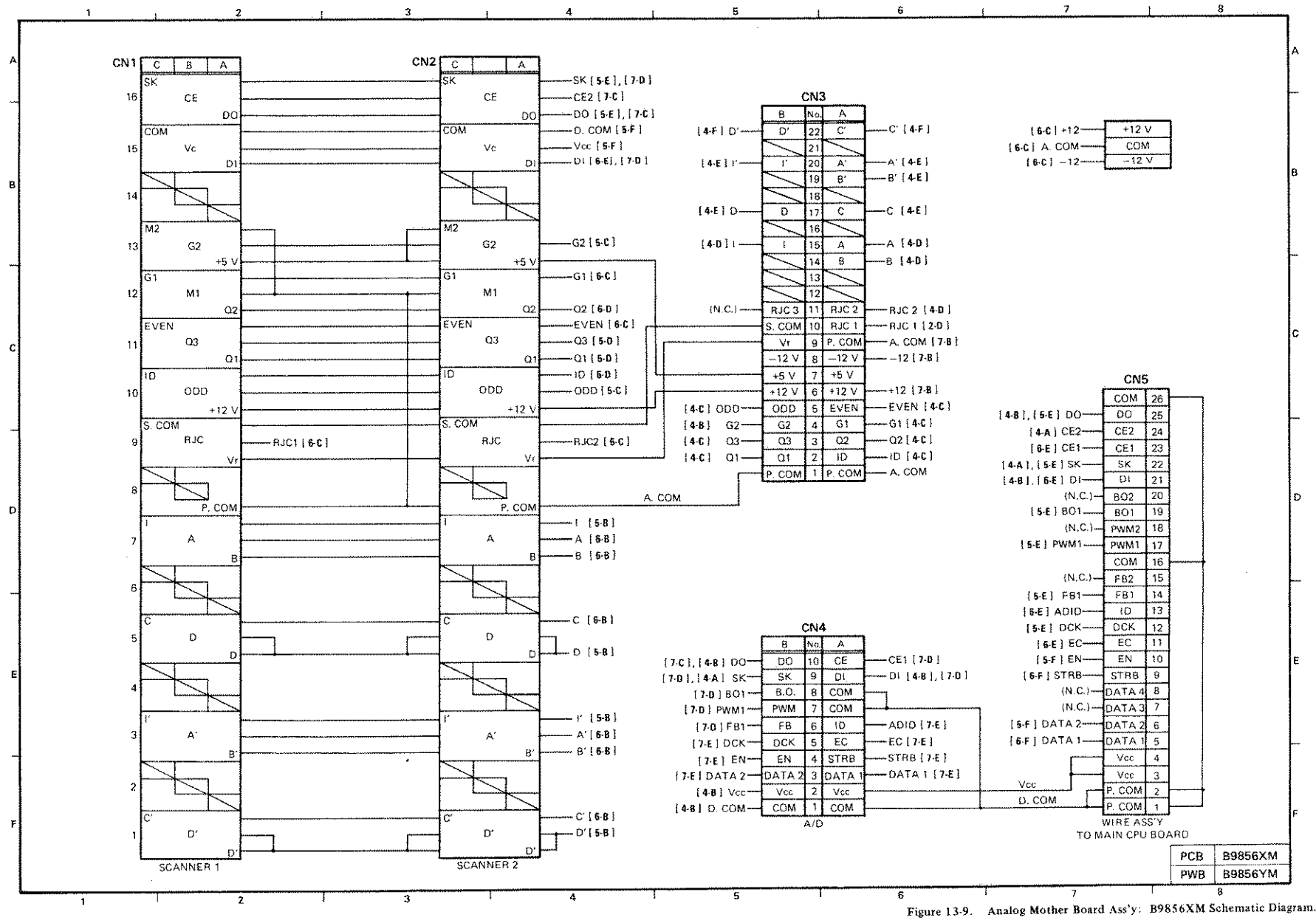
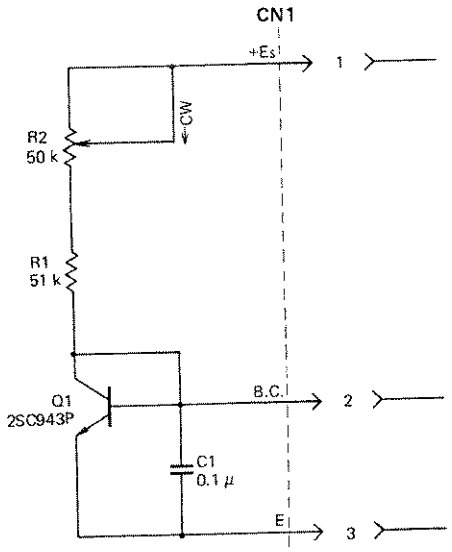


Figure 13-9. Analog Mother Board Ass'y: B9856XM Schematic Diagram.

13.9. Analog Mother Board Ass'y: B9856XM.

(March 1990)

Item	Part No.	Q'ty	Part Name and Description		Remarks
CN1, CN2	B9628ZG	2	Connector	PCN10-48S-2.54DSA (42)	
CN3	B9628ZE	1	Connector	PCN12-44S-2.54DSA (42)	
CN4	A9812KP	1	Connector	PCN12-20S-2.54DSA (11)	
CN5	B9856TN	1	Wire Ass'y		
	B9856TJ	1	Wire Ass'y		
	B9856YM	1	Printed Wiring Board		



(March 1990)

PCB	B9578WC
PWB	B9578YC

Figure 13-10. RJC Board Ass'y: B9578WC Schematic Diagram.

13.10. RJC Board Ass'y: B9578WC.

(March 1990)

Item	Part No.	Q'ty	Part Name and Description					Remarks
R1	A9090RG	1	Res: met flm	51kΩ	±1%	¼W	LF¼ 51kΩF	
R2	A9269RV	1	Res: var	50kΩ	±20%	¼W	RJ6P 50kΩ	
C1	A9114CC	1	Cap: cer	0.1μF		50V	FK26Y5V1H104Z	
Q1	G9197HQ	1	Transistor: NPN				2SC943P	
CN1	A9748KP	1	Connector				5513-03APB	
	B9578YC	1	Printed Wiring Board.					

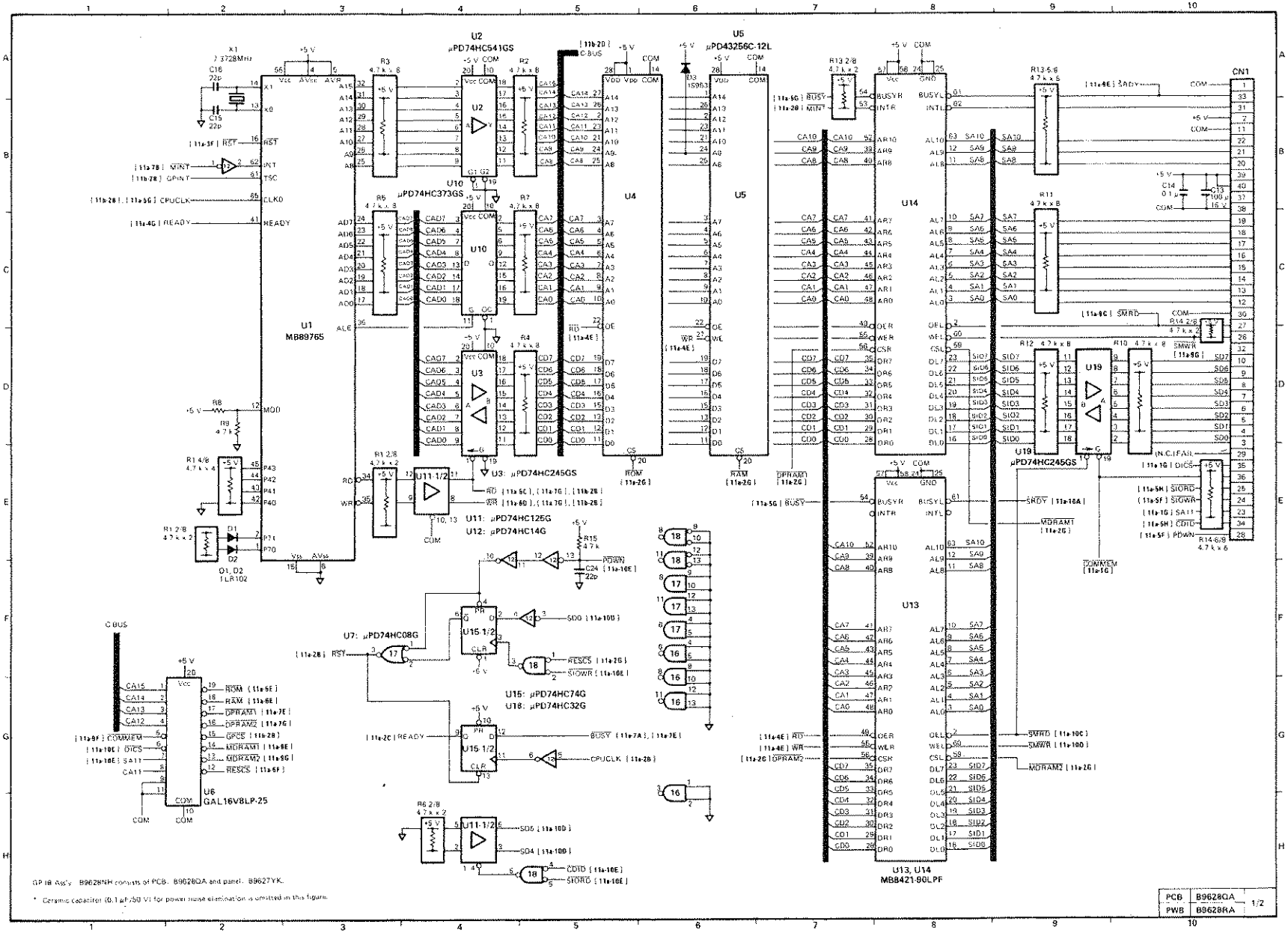
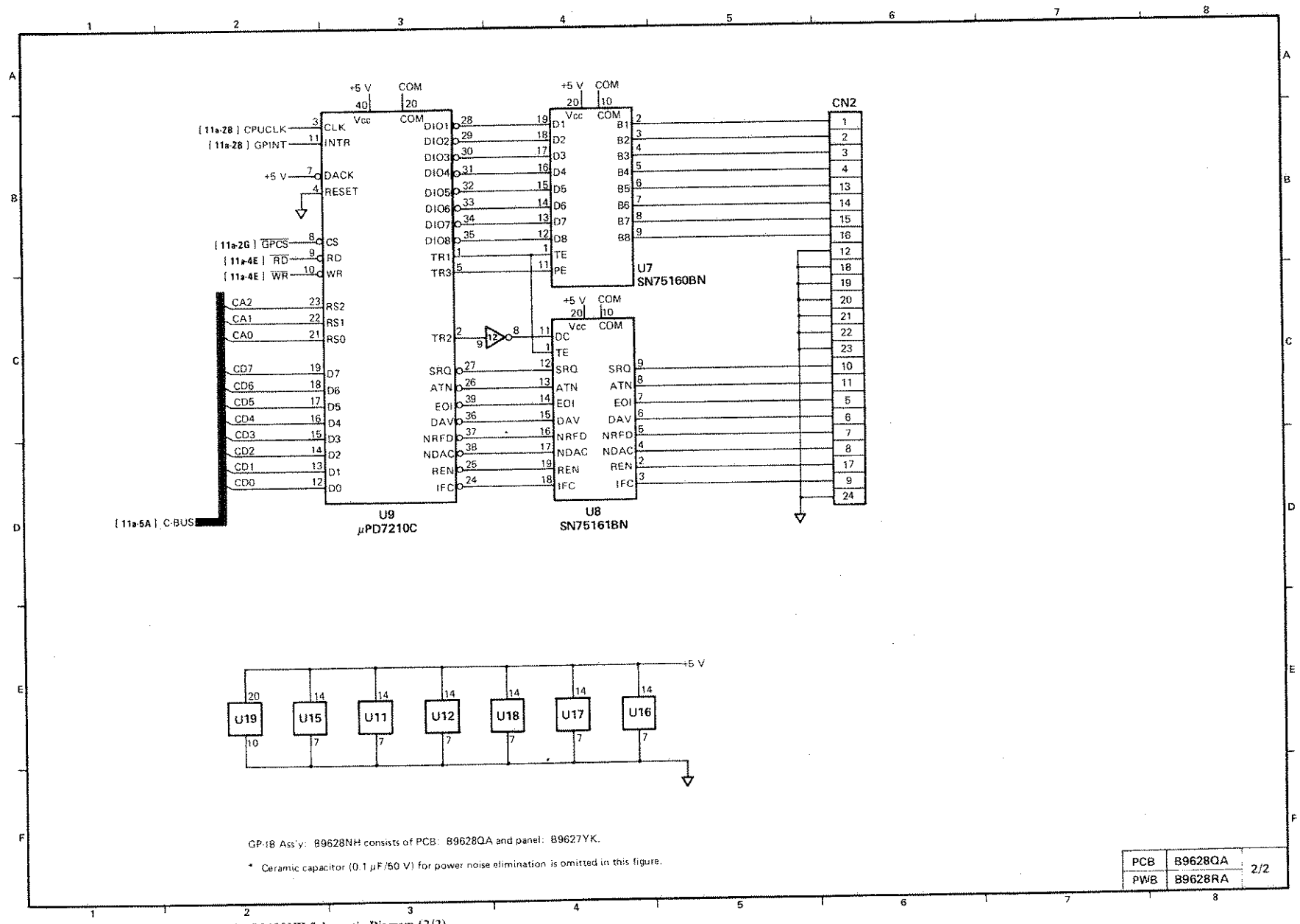


Figure 13-11a. GP-IB Card Ass'y (Option): B9628NH Schematic Diagram (1/2).



GP-IB Ass'y: B9628NH consists of PCB: B9628QA and panel: B9627YK.

* Ceramic capacitor (0.1 μF/50 V) for power noise elimination is omitted in this figure.

PCB	B9628QA	2/2
PWB	B9628RA	

(March 1990)

Figure 13-11b. GP-IB Card Ass'y (Option): B9628NH Schematic Diagram (2/2).

13.11. GP-IB Ass'y: B9628NH.

(March 1990)

Item	Part No.	Q'ty	Part Name and Description	Remarks
	B9628QA	1	GP-IB Card Ass'y	see below
	B9627YK	1	Panel	

GP-IB Card Ass'y: B9628QA.

(March 1990)

Item	Part No.	Q'ty	Part Name and Description	Remarks
R1~R5	A9070RL	5	Res: module 4.7kΩ ±5% 1/8W RKC1/8B8 4.7kΩJ	8 elements
R6	A9043RL	1	Res: module 4.7kΩ ±5% 1/8W RKC1/8B4 4.7kΩJ	4 elements
R7	A9070RL	1	Res: module 4.7kΩ ±5% 1/8W RKC1/8B8 4.7kΩJ	8 elements
R8		0		not assigned
R9	A9065RG	1	Res: met film 4.7kΩ ±1% ¼W LF¼ 4.7kΩF	
R10	A9070RL	1	Res: module 4.7kΩ ±5% 1/8W RKC1/8B8 4.7kΩJ	8 elements
R11~R14	A9070RL	4	Res: module 4.7kΩ ±5% 1/8W RKC1/8B8 4.7kΩJ	8 elements
R15	A9065RG	1	Res: met film 4.7kΩ ±1% ¼W LF¼ 4.7kΩF	
C1~C10	A9114CC	10	Cap: cer 0.1μF 50V FK26Y5V1H104Z	
C11, C12	A9114CC	2	Cap: cer 0.1μF 50V FK26Y5V1H104Z	
C13	A9430CA	1	Cap: Al elect 100μF 16V ECEA1CU101	
C14	A9114CC	1	Cap: cer 0.1μF 50V FK26Y5V1H104Z	
C15, C16	A9017CN	2	Cap: mica 22pF ±10% 100V DM05C 220K1	
C17		0		not assigned
C18~C20	A9114CC	3	Cap: cer 0.1μF 50V FK26Y5V1H104Z	
C21~C23		0		not assigned
C24	A9017CN	1	Cap: mica 22pF ±10% 100V DM05C 220K1	
D1, D2		0		not assigned
D3	A9248HD	1	Diode 1S953	
U1	B9586HC	1	IC MB89765	
U2	A6053LM	1	IC μPD74HC541G	
U3	A9120LN	1	IC μPD74HC245G	
U4		0		not assigned
U5	A9063LD	1	IC μPD43256C-12L	
U6	B9628ZC	1	IC GAL16V8LP-25	
U7	A9573LB	1	IC SN75160BN	
U8	A9572LB	1	IC SN75161BN	
U9	A9031LC	1	IC μPD7210C	
U10	A9126LN	1	IC μPD74HC373G	
U11	A9140LN	1	IC μPD74HC125G	
U12	A9098LN	1	IC μPD74HC14G	
U13, U14	A6003LQ	2	IC MB8421-90LPF	
U15	A9105LN	1	IC μPD74HC74G	
U16	A9092LN	1	IC μPD74HC00G	
U17	A9095LN	1	IC μPD74HC08G	
U18	A9103LN	1	IC μPD74HC32G	
U19	A9120LN	1	IC μPD74HC245G	

GP-IB Card Ass'y: B9628QA. (Continued)

Item	Part No.	Q'ty	Part Name and Description	Remarks
X1	A9145EX	1	Vibrator AT-51, 7.3728 MHz	
CN1	A9114KP	1	Connector PS-40PA-D4LT1-PN1-K	
CN2	A9514KC	1	Connector 57LE20240-77CRD35G	
	A9918KP	1	IC Socket DICF-28CS-E	for U4
	Y9308LE	2	Screw: M3 × 8	
	B9628RA	1	Printed Wiring Board	

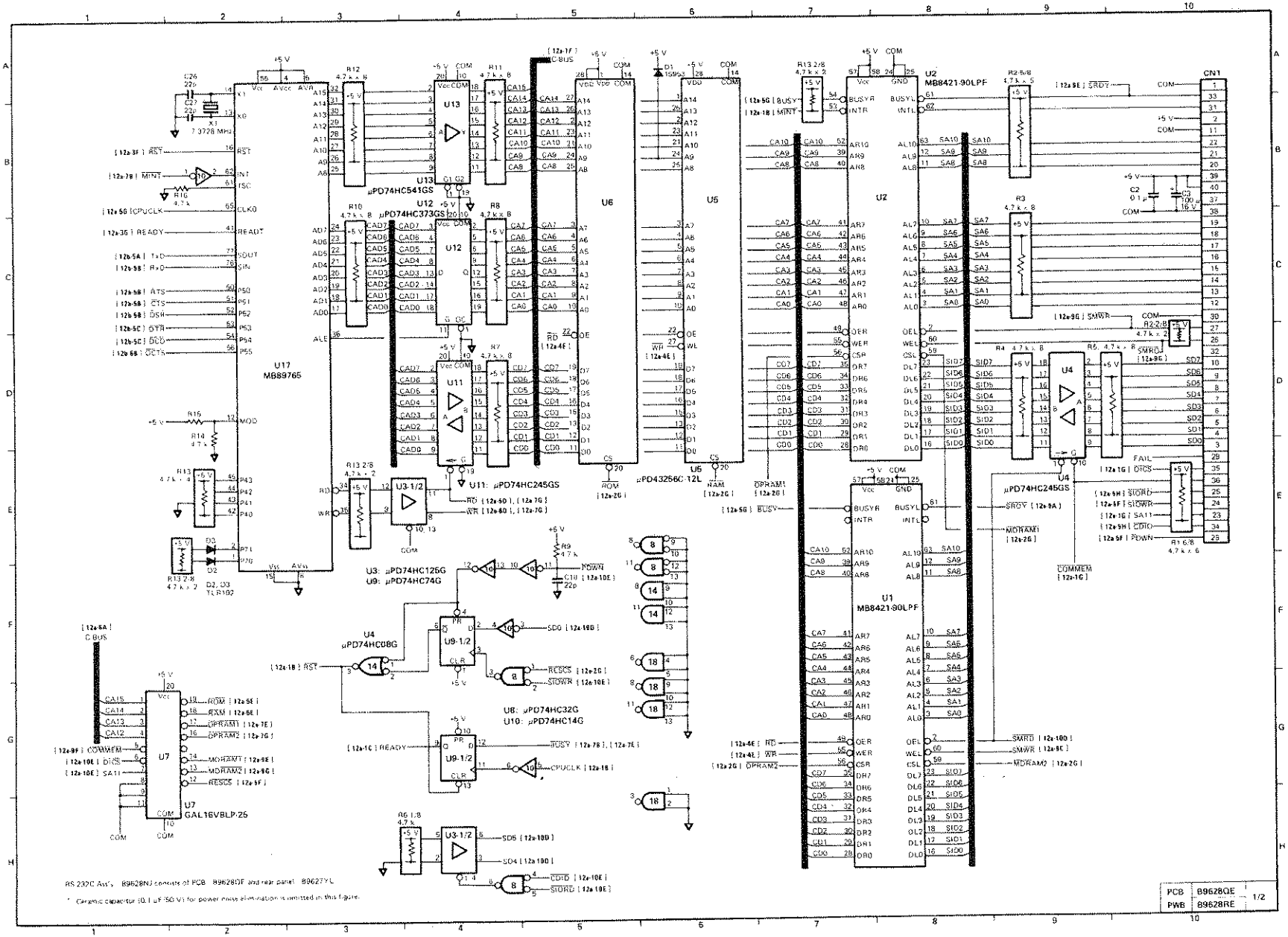
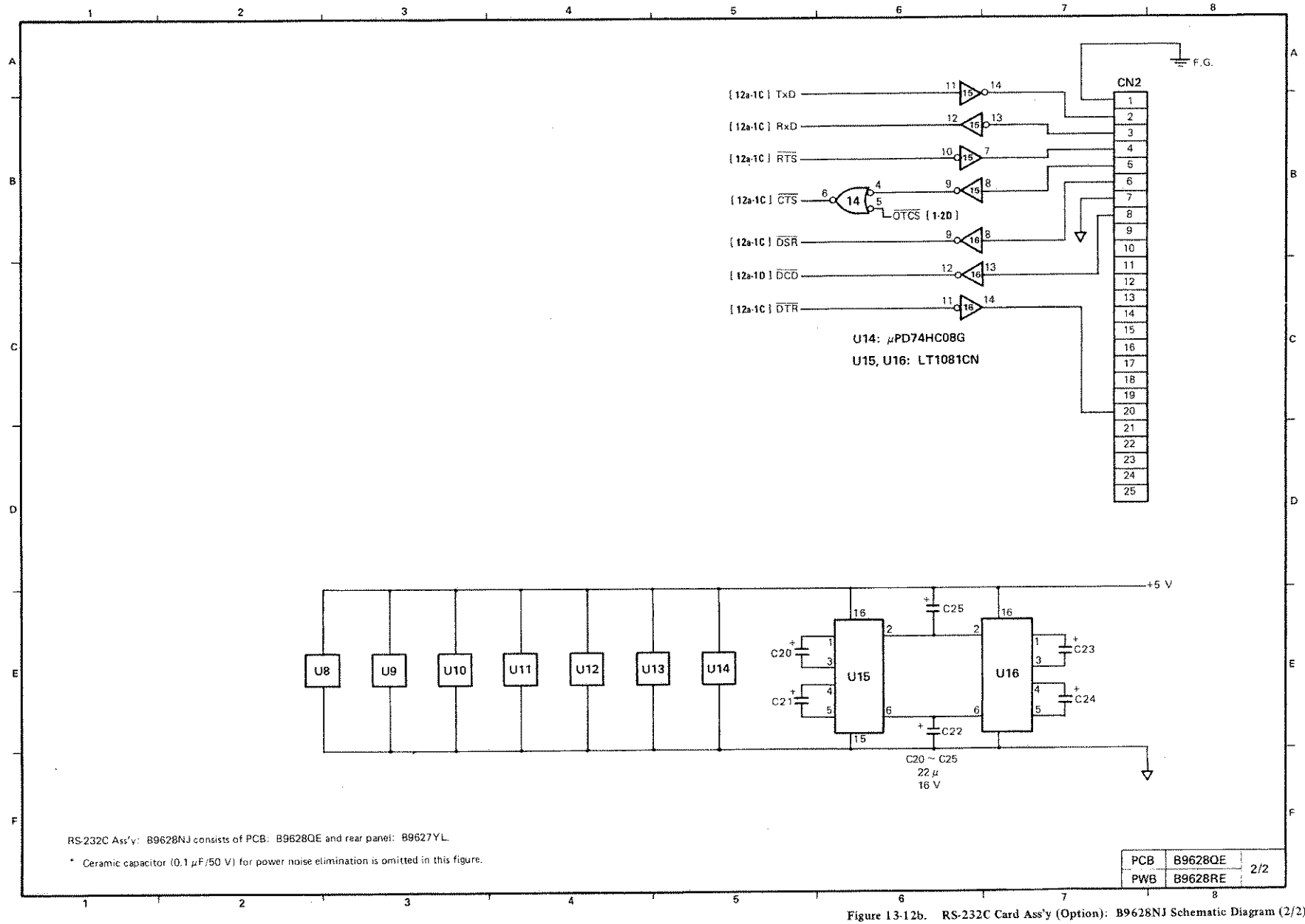


Figure 13-12a. RS-232C Card Ass'y (Option): B9628NJ Schematic Diagram (1/2).

(March 1990)



(March 1990)

Figure 13-12b. RS-232C Card Ass'y (Option): B9628NJ Schematic Diagram (2/2).

13.12. RS-232C Ass'y: B9628NJ.

(March 1990)

Item	Part No.	Q'ty	Part Name and Description	Remarks
	B9628QE	1	RS-232C Card Ass'y	see below
	B9627YL	1	Panel	

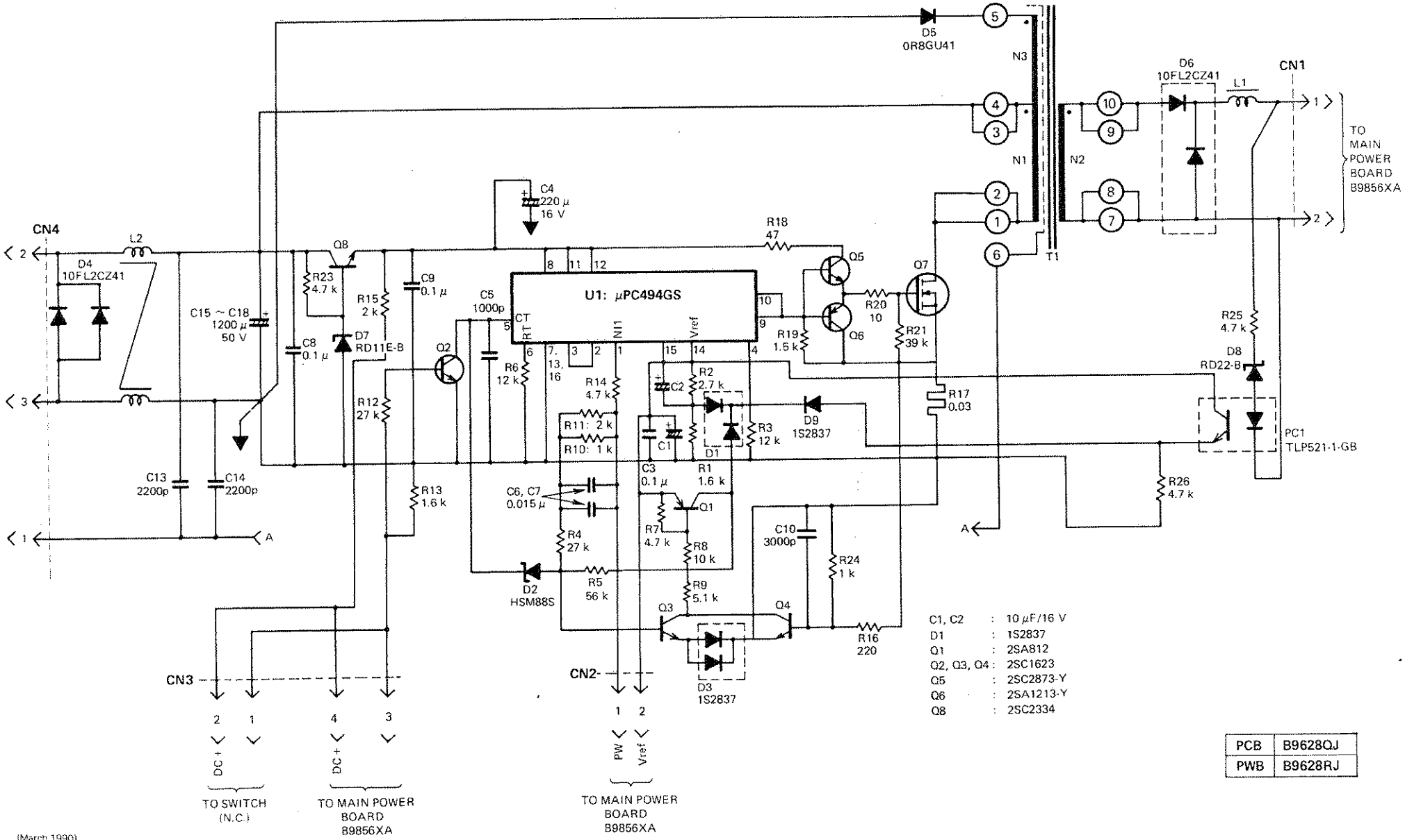
RS-232C Card Ass'y: B9628QE.

(March 1990)

Item	Part No.	Q'ty	Part Name and Description	Remarks
R1~R5	A9070RL	5	Res: module 4.7kΩ ±5% 1/8W RKC1/8B8 4.7kΩJ	8 elements
R6	A9043RL	1	Res: module 4.7kΩ ±5% 1/8W RKC1/8B4 4.7kΩJ	4 elements
R7, R8	A9070RL	2	Res: module 4.7kΩ ±5% 1/8W RKC1/8B8 4.7kΩJ	8 elements
R9	A9065RG	1	Res: met flm 4.7kΩ ±1% ¼W LF¼ 4.7kΩF	
R10	A9070RL	1	Res: module 4.7kΩ ±5% 1/8W RKC1/8B8 4.7kΩJ	8 elements
R11~R13	A9070RL	3	Res: module 4.7kΩ ±5% 1/8W RKC1/8B8 4.7kΩJ	8 elements
R14	A9065RG	1	Res: met flm 4.7kΩ ±1% ¼W LF¼ 4.7kΩF	
R15		0		not assigned
R16	A9065RG	1	Res: met flm 4.7kΩ ±1% ¼W LF¼ 4.7kΩF	
C1, C2	A9114CC	2	Cap: cer 0.1μF 50V FK26Y5V1H104Z	
C3	A9430CA	1	Cap: Al elect 100μF 16V ECEA1CU101	
C4~C9	A9114CC	6	Cap: cer 0.1μF 50V FK26Y5V1H104Z	
C10	A9017CN	1	Cap: mica 22pF ±10% 100V DM05C 220K1	
C11~C19	A9114CC	9	Cap: cer 0.1μF 50V FK26Y5V1H104Z	
C20	A9412CA	1	Cap: Al elect 22μF 16V KMA16VB22	
C21~C25	A9412CA	5	Cap: Al elect 22μF 16V KMA16VB22	
C26, C27	A9017CN	2	Cap: mica 22pF ±10% 100V DM05C 220K1	
C28	A9114CC	1	Cap: cer 0.1μF 50V FK26Y5V1H104Z	
D1	A9248HD	1	Diode 1S953	
U1, U2	A6003LQ	2	IC MB8421-80LPF	
U3	A9140LN	1	IC μPD74HC125G	
U4	A9120LN	1	IC μPD74HC245G	
U5	A9063LD	1	IC μPD43256C-12L	
U6		0		not assigned
U7	B9628ZC	1	IC GAL16V8LP-25	
U8	A9103LN	1	IC μPD74HC32G	
U9	A9105LN	1	IC μPD74HC74G	
U10	A9098LN	1	IC μPD74HC14G	
U11	A9120LN	1	IC μPD74HC245GS	
U12	A9126LN	1	IC μPD74HC373GS	
U13	A6053LM	1	IC μPD74HC541GS	
U14	A9095LN	1	IC μPD74HC08G	
U15, U16	A9619LB	2	IC LT1081CN	
U17	B9586HC	1	IC MB89765	

RS-232C Card Ass'y: B9628QE. (Continued)

Item	Part No.	Q'ty	Part Name and Description	Remarks
X1	A9145EX	1	Vibrator AT-51, 7.3728 MHz	
CN1	A9114KP	1	Connector PS-40PA-D4LT1-PN1-K	
CN2	A9627KC	1	Connector DBLC-J25SAF-10L6	
	A9918KP	1	IC Socket DICF-28CS-E	for U6
	Y9308LE	2	Screw: M3 × 8	
	B9628RE	1	Printed Wiring Board	



C1, C2 : 10 μF/16 V
D1 : 1S2837
Q1 : 2SA812
Q2, Q3, Q4 : 2SC1623
Q5 : 2SC2873-Y
Q6 : 2SA1213-Y
Q8 : 2SC2334

PCB	B9628QJ
PWB	B9628RJ

(March 1990)

Figure 13-13. DC Power Board Ass'y (Option): B9628QJ Schematic Diagram.

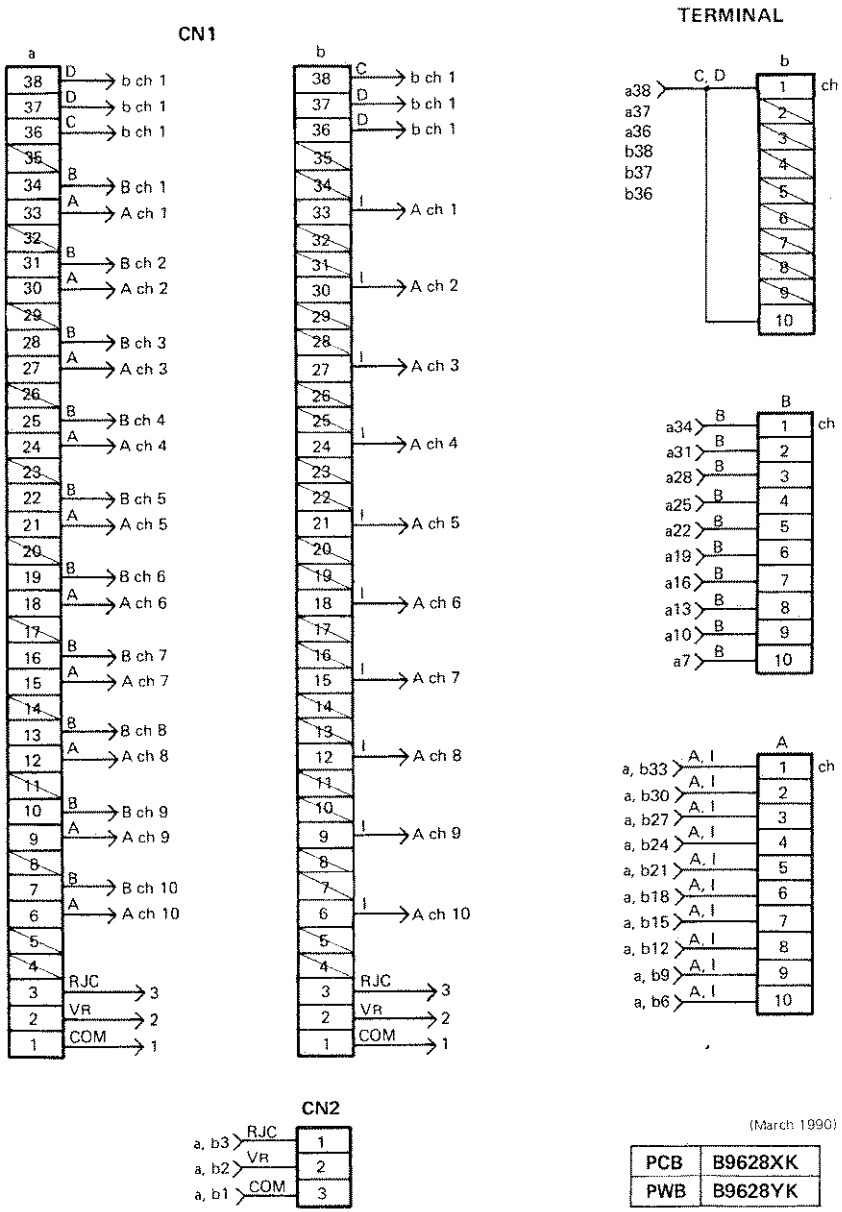
13.13. DC Power Board Ass'y: B9628QJ.

(March 1990)

Item	Part No.	Q'ty	Part Name and Description				Remarks
R1	A6172RS	1	Res: met film	1.6kΩ	±5%	1/8 W ERJ-8GCYJ 162	
R2	A6177RS	1	Res: met film	2.7kΩ	±5%	1/8 W ERJ-8GCYJ 272	
R3	A6193RS	1	Res: met film	12kΩ	±5%	1/8 W ERJ-8GCYJ 123	
R4	A6201RS	1	Res: met film	27kΩ	±5%	1/8 W ERJ-8GCYJ 273	
R5	A6209RS	1	Res: met film	56kΩ	±5%	1/8 W ERJ-8GCYJ 563	
R6	A9075RG	1	Res: met film	12kΩ	±1%	¼W LF¼ 12kΩF	
R7	A6183RS	1	Res: met film	4.7kΩ	±5%	1/8 W ERJ-8GCYJ 472	
R8	A6191RS	1	Res: met film	10kΩ	±5%	1/8 W ERJ-8GCYJ 103	
R9	A6184RS	1	Res: met film	5.1kΩ	±5%	1/8 W ERJ-8GCYJ 512	
R10	A6167RS	1	Res: met film	1kΩ	±5%	1/8 W ERJ-8GCYJ 102	
R11	A6174RS	1	Res: met film	2kΩ	±5%	1/8 W ERJ-8GCYJ 202	
R12	A6201RS	1	Res: met film	27kΩ	±5%	1/8 W ERJ-8GCYJ 273	
R13	A6172RS	1	Res: met film	1.6kΩ	±5%	1/8 W ERJ-8GCYJ 162	
R14	A6183RS	1	Res: met film	4.7kΩ	±5%	1/8 W ERJ-8GCYJ 472	
R15	A6174RS	1	Res: met film	2kΩ	±5%	1/8 W ERJ-8GCYJ 202	
R16	A6151RS	1	Res: met film	220Ω	±5%	1/8 W ERJ-8GCYJ 221	
R17	A9011RY	1	Res: plate	0.03Ω	±10%	2W BPR28 0.03Ω K	
R18	A9017RG	1	Res: met film	47Ω	±1%	¼W LF¼ 47ΩF	
R19	A9053RG	1	Res: met film	1.5kΩ	±1%	¼W LF¼ 1.5kΩF	
R20	A9001RG	1	Res: met film	10Ω	±1%	¼W LF¼ 10ΩF	
R21	A9605RS	1	Res: met film	39kΩ	±5%	1/8 W ERJ-8GCYJ 393	
R22		0					not assigned
R23	A9065RG	1	Res: met film	4.7kΩ	±1%	¼W LF¼ 4.7kΩF	
R24	A9167RS	1	Res: met film	1kΩ	±5%	1/8 W ERJ-8GCYJ 102	
R25	A9065RG	1	Res: met film	4.7kΩ	±1%	¼W LF¼ 4.7kΩF	
R26	A6183RS	1	Res: met film	4.7kΩ	±5%	1/8 W ERJ-8GCYJ 472	
C1, C2	A9411CA	2	Cap: Al elect	10μF		16V KMA16VB10	
C3	A6012CC	1	Cap: cera	0.1μF		50V ECU-□-1H-104-ZFM	
C4	A9416CA	1	Cap: Al elect	220μF		16V KME16VB220 (M)	
C5	A9244CY	1	Cap: film	1000pF	±10%	50V ECQ-B1H102K	
C6, C7	B9591WD	2	Cap: cera	0.015μF		50V ECU-□-1H-153-ZFM	
C8, C9	A6012CC	2	Cap: cera	0.1μF		50V ECU-□-1H-104-ZFM	
C10	G9066CC	1	Cap: cera	3300pF		50V RPE122CH332J50	
C11, C12		0					not assigned
C13, C14	B9586MP	2	Cap: cera	2200pF		50V KC222M	
C15~C18	A9547CA	4	Cap: Al elect	1200μF		50V SXE50VB1200	
L1	A9055ML	1	Choke coil			HP-034SZ	
L2	B9586KM	1	Coil			SC10-100	
D1	A6000HD	1	Diode			1S2837	2 elements
D2	A6008HD	1	Diode: S.B.D.			HSM88S	
D3	A6000HD	1	Diode			1S2837	2 elements
D4	A9178HL	1	Diode: Stack			10FL2CZ41	
D5	A9477HD	1	Diode: H.E.D.			0R8GU41	
D6	A9178HL	1	Diode: Stack			10FL2CZ41	
D7	A9307HD	1	Diode: Zener			RD11E-B	
D8	A9314HD	1	Diode: Zener			RD22E-B	
D9	A9006HD	1	Diode			1S2837	2 elements

13.13. DC Power Board Ass'y: B9628QJ. (Continued)

Item	Part No.	Q'ty	Part Name and Description		Remarks
Q1	A6002HQ	1	Transistor: PNP	2SA812	
Q2~Q4	A6003HQ	3	Transistor: NPN	2SC1623	
Q5	A6027HQ	1	Transistor: NPN	2SC2873-Y	
Q6	A6028HQ	1	Transistor: PNP	2SA1213-Y	
Q7	A9531HQ	1	Power FET	2SK850	
Q8	A9399HQ	1	Transistor: NPN	2SC2334	
U1	A6000LR	1	IC: Switching Regulator	μPC494GS	
PC1	A9106HL	1	Photo Coupler	TLP521-1-GB	
T1	B9628ZX	1	Transformer		
CN1	A9287KP	1	Connector	5273-02A	
CN2	A9477KP	1	Connector	IL-G-4P-S3T2-E	
CN3	A9476KP	1	Connector	IL-G-2P-S3T2-E	
CN4	A9248KP	1	Connector	5289-3A	
	B9627ZW	1	Heat Sink		
	Y9305LE	2	Screw: M3 X 5		
	Y9308LB	2	Screw: M3 X 8		
	G9622AG		Adhesive		
	A9275XK		Adhesive		
	A9202KH	1	Sheet	BFG30 D-3	
	B9628RJ	1	Printed Wiring Board		



(March 1990)

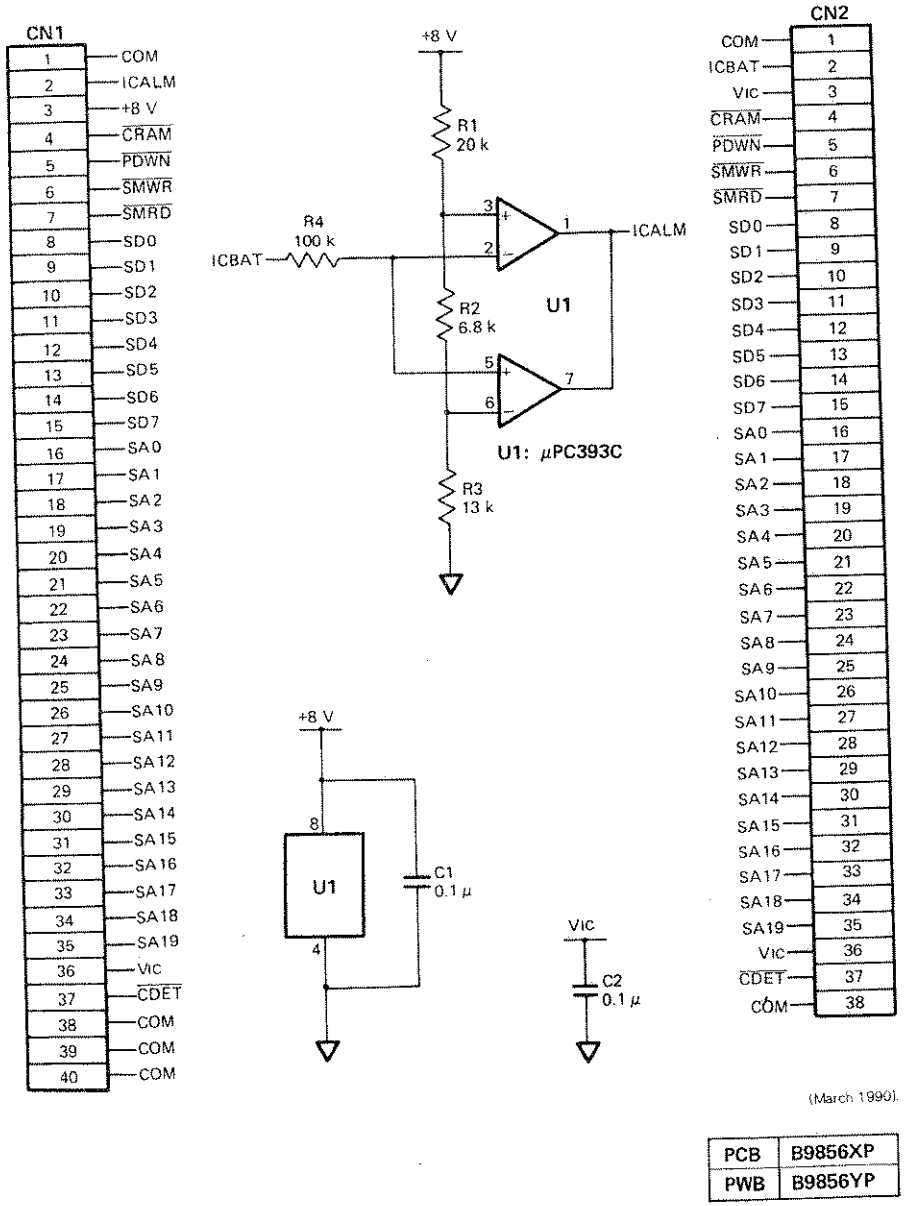
PCB	B9628XK
PWB	B9628YK

Figure 13-14. Terminal Board Ass'y (for/SIT, Option): B9628XK Schematic Diagram.

13.14. Terminal Board Ass'y: B9628XK.

(March 1990)

Item	Part No.	Q'ty	Part Name and Description	Remarks
CN1	B9628ZJ	1	Connector PCN12-76S-2.54DSA (42)	
CN2	A8747KP	1	Connector 5512-03A	
	B9628YK	1	Printed Wiring Board	



(March 1990)

PCB	B9856XP
PWB	B9856YP

Figure 13-15. IC-Memory Card Board Ass'y (Option): B9856XP Schematic Diagram.

13.15. IC-Memory Card Board Ass'y: B9856XP.

(March 1990)

Item	Part No.	Q'ty	Part Name and Description				Remarks
R1	A9080RG	1	Res: met film	20kΩ	±1%	¼W	LF¼ 20kΩF	
R2	A9069RG	1	Res: met film	6.8kΩ	±1%	¼W	LF¼ 6.8kΩF	
R3	A9076RG	1	Res: met film	13kΩ	±1%	¼W	LF¼ 13kΩF	
R4	A9097RG	1	Res: met film	100kΩ	±1%	¼W	LF¼ 100kΩF	
C1, C2	A9114CC	2	Cap: cera	0.1μF		50V	FK26Y5V1H104Z	
U1	A9225LA	1	IC: Analog				μPC393C	
CN1	B9856TS	1	Wire Ass'y					
CN2	A9823KP	1	Connector				BD1R	
	B9856YP	1	Printed Wiring Board					