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**Service  
Manual**

**Model 3750  
Hybrid Recorder HR1300**

SM 3750 - 01E

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**YOKOGAWA**   
Yokogawa Electric Corporation

Model 3750  
Hybrid Recorder HR1300

SM 3750 - 01E

SM 3750 - 01E  
2nd Edition



## IMPORTANT NOTICE TO THE USER

YOKOGAWA ELECTRIC CORPORATION (YOKOGAWA) does not in principle supply parts other than those listed in the Customer Maintenance Parts List in this Service Manual (mainly modules and assemblies). Therefore if an assembly fails, the user should replace the whole assembly and NOT components within the assembly (see NOTE). If the user attempts to repair the instrument by replacing individual components within the assembly, YOKOGAWA assumes no responsibility for any consequences, such as defects in instrument accuracy, functionality, or reliability, or user safety hazards. This Service Manual is to be used primarily by authorized maintenance personnel. For service and maintenance of the CRT display, contact the nearest YOKOGAWA Sales and Service Office. Addresses may be found on the back cover of this manual.

YOKOGAWA does not offer more detailed maintenance and service information than that contained in this Service Manual.

All reasonable efforts have been made to assure the accuracy of the content of this Service Manual. However, there may still be errors such as clerical errors or omissions. YOKOGAWA assumes no responsibility of any kind concerning the accuracy or contents of this Service Manual, nor for the consequences of any errors.

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NOTE: YOKOGAWA design policy with regard to maintenance and serviceability

YOKOGAWA instruments have been designed in a way that the replacement of electronic parts can be done on an assembly (module) basis by the user. YOKOGAWA instruments have also been designed in a way that trouble-shooting and replacement of any faulty assembly can be done easily and quickly. Therefore, YOKOGAWA strongly recommends replacing the entire assembly over replacing parts or components within the assembly. The reasons are as follows:

- The instruments use high-performance micro-processors, large scale CMOS gate arrays and surface-mount components to provide state-of-art performance and functions.
- Repair of components can only be performed by specially trained and qualified maintenance personnel with special tools. In addition, repair of components requires various special parts and components, including costly ones. It also requires facilities where highly-accurate and expensive maintenance equipment and special tools are provided.
- When taking the service life and cost of the instruments into consideration, the replacement of assemblies offers the user the possibility to use YOKOGAWA instruments more effectively and economically with a minimum in down-time.

## SAFETY PRECAUTIONS

The following general safety precautions must be observed during all phases of operation, service, and repair of this instrument. Failure to comply with these precautions or with specific WARNINGS given elsewhere in this manual violates safety standards of design, manufacture, and intended use of the instrument. The YOKOGAWA Electric Corporation assumes no liability for the customer's failure to comply with these requirements.

General Definitions of Safety Symbols used on Equipment and in Manuals.



Explanation: To avoid injury, death of personnel or damage to the instrument, the operator must refer to an explanation in the instruction manual.



High Voltage Terminal: Indicates dangerous voltage (terminals fed from the interior by voltage exceeding 1000 volts must be so marked). Never touch!



Protective grounding terminal: To protect against electrical shock in case of a fault. This symbol indicates that the terminal must be connected to ground prior to operation of equipment.



Laser radiation: This calls attention to a procedure, practice, condition or the like, which—if not correctly performed or adhered to—could result in loss of Eyesight or Injury to Eyes of personnel.

(CLASS 3A)

Do not stare into beam or VIEW directly with optical Instruments.

(CLASS 3B)

Avoid exposure to beam.

**WARNING**

A WARNING sign denotes a hazards. It calls attention to a procedure, practice, condition or the like, which, if not correctly performed or adhered to, could result in injury or death or personnel.

**CAUTION**

A CAUTION sign denotes a hazard. It calls attention to a procedure, practice, condition or the like, which, if not correctly performed or adhered to, could result in damage to or destruction of part or all of the product.

**WARNINGS****Power supply**

Ensure the source voltage matches the voltage of the power supply before turning ON the power.

**Power cord and plug**

To prevent an electric shock or fire, be sure to use the power supply cord specified in the instruction manual.

**Protective grounding**

Make sure to connect the protective grounding to prevent an electric shock before turning on the power.

**Necessity of protective grounding**

Never cut off the internal or external protective grounding wire or disconnect the wiring of protective grounding terminal. Doing so poses a potential shock hazard.

**Fuse**

To prevent a fire, make sure to use the fuse with specified standard (current, voltages, type). Before replacing the fuse, turn off the power and unplug the power cord. Do not use a different fuse or short-circuit the fuse holder.

**Do not operate in an explosive atmosphere**

Do not operate the instrument in the presence of flammable liquids or vapors. Operation of any electrical instrument in such an environment constitutes a safety hazard.

**External connection**

To ground securely, insert the main power plug before connecting to measurement or control unit.



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# 1. GENERAL INFORMATION

## 1.1 Introduction

This manual describes servicing information concerning the YOKOGAWA Hybrid Recorder, Model HR1300. This chapter contains information on how to use this manual and gives information that must be known before servicing the HR1300.

## 1.2 Manual Configuration

This manual is composed of eleven chapters.

- (Chapter 1) General Information  
Usage, Specifications, Safety consideration, and required equipment for servicing.
- (Chapter 2) Incoming Inspection  
The method of Incoming inspection.
- (Chapter 3) Self-Diagnostic Functions  
The procedure for self-diagnosis and its interpretation.
- (Chapter 4) Performance Test  
Basic specifications of HR1300, performance tests required to check performance, and the testing method.
- (Chapter 5) Disassembly and Re-assembly  
The procedure for disassembly and re-assembly.
- (Chapter 6) Adjustment  
Items that can be adjusted by the user.
- (Chapter 7) Replaceable parts  
How to read Customer Maintenance Parts List (CMPL) and the way to order parts.
- (Chapter 8) Principles of Operation  
Principles and Configuration of HR1300.
- (Chapter 9) Trouble-shooting  
Procedures for Trouble-shooting and information on how to order a repair.
- (Chapter 10) Schematic Diagram  
The system configuration diagram.
- (Chapter 11) Customer Maintenance Parts List  
Exploded views, associated parts list used for disassembly, assembly and adjustments.

## 1.3 Specifications

Refer to Instruction Manual IM 3750-01E Chapter 11 for specifications.

## 1.4 Safety Consideration

Make sure to read the safety precautions at the beginning of this manual thoroughly.  
Also read warnings and cautions contained in each chapter carefully.

## 1.5 Equipment Required for Servicing

Equipment required for servicing is shown in Table 1.1. The equipment required is also described at the beginning of each chapter.

Table 1.1 Equipment Required for Servicing

Equipment	Critical Specification	Recommended	Use*
DC Voltage Generator	DCV Accuracy: $\pm 50$ ppm	YOKOGAWA 2552	P
Dial variable Resistor	Accuracy: $\pm 10$ ppm	YOKOGAWA 2793-01	P
Grass scale	At least 255mm		P
Chart	With scale	YOKOGAWA B9627RY	P
Standard temperature generator	Generation temperature: $\pm 0.01^\circ\text{C}$	KOMATSU ZEROCON (Japan)	P
Thermocouple	At most 0.3mm in diameter	TYPE T	P
Standard Resistor 100 $\Omega$	Accuracy: $\pm 0.01\%$	YOKOGAWA 2792	P
Philips screwdriver	M2, M2.6, M3, M4		P, A
Wrenches	mm size		A
Hexagonal wrench	Facing width 1.5mm		A
Tension gauge	About 500g max		A
White locking enamel			A
Spacer jig	Manufactured by YOKOGAWA	Parts No. B9627HZ	A

\* P=Performance Test, A=Adjustment

## 2. INCOMING INSPECTION

### 2.1 Introduction

This chapter describes the procedure to perform the incoming inspection.

### 2.2 Incoming Inspection Procedure

- (1) Read Chapter 1 "1.1 Accessories and External Visual Check" of the Instruction Manual and confirm that the Hybrid Recorder is complete with accessories.
- (2) Make sure to understand the operating procedure as described in the Instruction Manual. (3) Check each function using the Instruction Manual.
- (4) Read and implement Chapter 3 "Self-Diagnosis Functions".
- (5) Read and implement Chapter 4 "Performance Test".



## 3. SELF-DIAGNOSIS FUNCTIONS

### 3.1 Introduction

HR1300 is provided with complete self-diagnosis functions to enhance reliability in measurement and serviceability.

### 3.2 Self-Diagnosis Functions

When the power is turned ON, HR1300 automatically executes the following five types of diagnosis alternately and displays the results.

After these functions are completed, the instrument is in operating condition.

- (1) System ROM TEST
- (2) RAM TEST
- (3) A/D calibration value TEST
- (4) Printer card TEST
- (5) Communication Interface TEST

Table 3.1 shows the diagnosed contents and results of Self-Diagnosis.

Table 3.1 Contents of Power-Up Self-Diagnosis

No	Diagnostic Items and Contents	Display at Start	Display at Normal Completion	Display in case of Failure	Action After Failure Detection	Execution Time
1	ROM TEST Checks sum value of ROM calibration data.	HR1300 XXch MODEL	—	ROM ERROR	Operation will Stop	Approx. 10 sec
2	RAM TEST After writing a fixed pattern to the System RAM, CPU reads it to collate with the fixed pattern.			RAM ERROR		
3	A/D calibration value TEST * Collate calibration data and the specified value. * Checks sum value of EEPROM calibration data			A/D ILLEGAL ADJUST or A/D SUM ERROR		
4	Printer card TEST After sending a operation command to the Printer card, CPU checks the answer back signal			PRINTER FAIL		
5	Communication Interface TEST CPU checks the answer back signal from the Communication card			COMM CARD ERROR and COMM CARD REMOVED		

## 4. PERFORMANCE TEST

### 4.1 Introduction

The objective of the performance test is to verify the operation of the instrument's performance against published specifications.

### 4.2 Testing Conditions

Please test the instrument under the following conditions.

- Ambient Temperature :  $23 \pm 2^{\circ}\text{C}$
- Humidity :  $55 \pm 10\% \text{R.H.}$
- Power supply voltage : 90 to 250V
- Power supply frequency: 50 or 60Hz  $\pm 1\%$

### 4.3 Preparation

The following preparatory steps should be made before starting the performance test.

- (1) Turn ON the power supply, and check that the self diagnostic functions indicate PASS (see Chapter 3)
- (2) Allow at least a warm up time of 60 minutes.

### 4.4 Performance Test

The following pages explain the performance test listed below. The specifications, tolerance, required equipment, connections, and test procedure are sequentially described for each test.

The following tests can be performed:  
(the tests need not be performed in any specific order.)

- (1) Measurement Accuracy Test
- (2) Recording Accuracy Test
- (3) Chart Speed Accuracy Test
- (4) Reference Junction Compensation Accuracy Test



## 4.4.1 Measurement Accuracy Test

## Specification

DC voltage : 0.05% of rdg + 2 digits  
                   0.05% of rdg + 5 digits (20mV Range only)  
 RTD (Pt100) : 0.05% of rdg + 0.3°C (PT4 Range)

## Tolerance

Range	Applied Input	Tolerance	
20mV	+20.000mV 0.000mV	19.985mV -0.005mV	to to 20.015mV 0.005mV
60mV	+60.00mV 0.00mV	59.95mV -0.02mV	to to 60.05mV 0.02mV
200mV	+200.00mV 0.00mV	199.88mV -0.02mV	to to 200.12mV 0.02mV
2V	+2.0000V 0.0000V	1.9988V -0.0002V	to to 2.0012V 0.0002V
6V	+6.000V 0.000V	5.995V -0.002V	to to 6.005V 0.002V
20V	+20.000V 0.000V	19.988V -0.002V	to to 20.012V 0.002V
50V	+50.00V 0.00V	49.95V -0.02V	to to 50.05V 0.02V
PT4 (RTD:Pt100)	18.49Ω (-200°C) 100.00Ω (0°C) 280.90Ω (500°C)	-199.6°C -0.3°C 499.4°C	to to to -200.4°C 0.3°C 500.6°C

## NOTE

For measurement accuracy, the error of a connected apparatus is not included in the Tolerance.

## Required Equipments

Equipment	Q'ty	Critical Specification	Recommended
DC Voltage Generator	1	DCV accuracy : ±50ppm	YOKOGAWA 2552
Dial variable resistor	1	Accuracy : ±10ppm	YOKOGAWA 2793-01

Connection

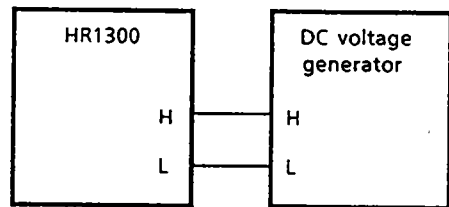


Fig A

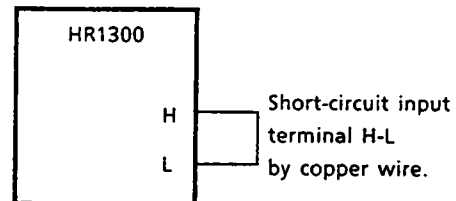


Fig B

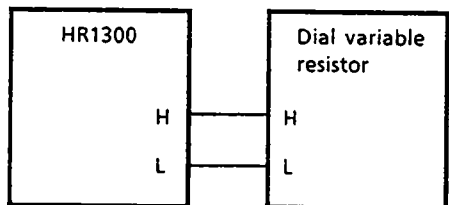


Fig C

Procedure

- (1) Connect the equipment as shown in Fig A.
- (2) Turn ON the power of the HR1300 and the DC Voltage Generator.
- (3) Set Range of HR1300 and output of DC voltage generator (Applied Input) as shown in the table of Tolerance (20mV to 50V Range, except Applied Input 0mV and 0V).
- (4) Turn ON the DC Voltage Generator output and check that the measured value of HR1300 lies within the Tolerance.
- (5) Turn OFF the power of the HR1300 and the DC Voltage Generator.
- (6) Change the connection to the one shown in Fig B using standard copper wire.
- (7) Turn ON the power of the HR1300.
- (8) Set Range of HR1300 as shown in the table of Tolerance (20mV to 50V Range, only Applied Input 0mV and 0V).
- (9) Check that the measured value of HR1300 lies within the Tolerance.
- (10) Turn OFF the power of the HR1300.
- (11) Change the connection to the one shown in Fig C.
- (12) Turn ON the power of the HR1300.
- (13) Set Range of HR1300 and resistance of Dial variable resistor as shown in the table of Tolerance (PT4 Range).
- (14) Check that the measured value of HR1300 lies within the Tolerance.
- (15) Turn OFF the power of the HR1300.

## 4.4.2 Recording Accuracy Test

## Specification

Measurement accuracy + ( $\pm 0.2\%$  of effective recording span)

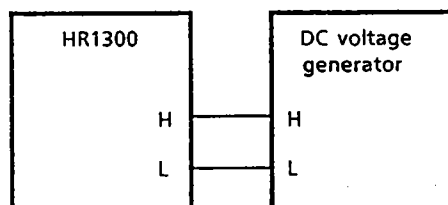
## Tolerance

Measured Value	Pen Movement Width	Tolerance	
-2.0000V	0mm	-0.3	to 0.3mm
-1.0000V	37.5mm	37.2	to 37.8mm
0.0000V	75.0mm	74.7	to 75.3mm
1.0000V	112.5mm	112.2	to 112.8mm
2.0000V	150.0mm	149.7	to 150.3mm

## Required Equipments

Equipment	Q'ty	Critical Specification	Recommended
DC Voltage Generator	1	DCV accuracy : $\pm 500$ ppm	YOKOGAWA 2554
Glass scale	1	at least 155mm	

## Connection



## Procedure

- (1) Connect the equipment as shown in Connection.
- (2) Turn ON the power of the HR1300 and the DC Voltage Generator.
- (3) Set Range of HR1300 to 2V.
- (4) Turn ON and adjust the DC Voltage Generator output so that the measured value of HR1300 becomes Measured Value in the table of Tolerance.
- (5) Check by using the glass scale that the pen movement width lies within the Tolerance.
- (6) Turn OFF the power of the HR1300 and DC Voltage Generator.

### 4.4.3 Chart Speed Accuracy Test

#### Specification

Chart feed accuracy:  $\pm 0.1\%$  (for recordings longer than 1m)

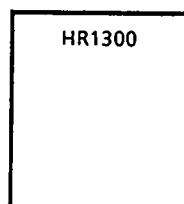
#### Tolerance

Chart feed	Tolerance
1000mm	999 to 1001mm

#### Required Equipments

Equipment	Q'ty	Critical Specification	Recomended
Chart	1	With scale	YOKOGAWA B9627RY

#### Connection



no equipment is required to connect

#### Procedure

- (1) Turn ON the power of the HR1300.
- (2) Set chart speed to 1000mm/h.
- (3) Start feeding chart by pressing START STOP key.
- (4) After one hour, stop feeding chart by pressing START STOP key.
- (5) Measure the scale on the chart and check that the feeding length lies within the Tolerance.
- (6) Turn OFF the power of the HR1300.

#### 4.4.4 Reference Junction Compensation Accuracy Test

##### Specification

Thermocouples K, J, E, T, N, L, U, KP vs Au7Fe:  $\pm 0.5^{\circ}\text{C}$   
 R, S, B, W :  $\pm 1^{\circ}\text{C}$

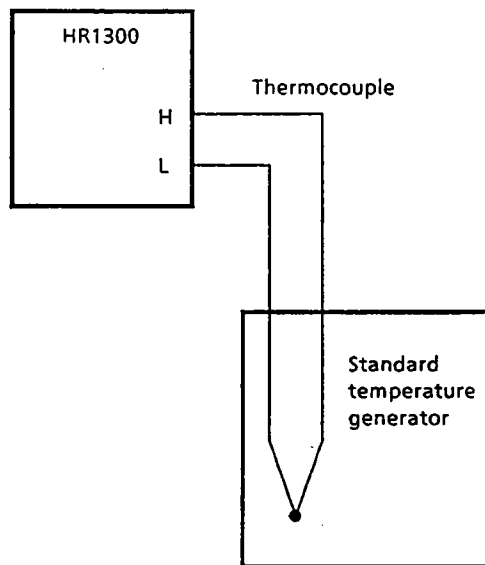
##### Tolerance

Set temperature	Thermocouple	Tolerance
0°C	K, J, E, T, N, L, U, KP vs Au7Fe	-0.5°C to 0.5°C
	R, S, B, W	-1°C to 1°C

##### Required Equipments

Equipment	Q'ty	Critical Specification	Recommended
Standard temperature generator	1	Generation temperature: $\pm 0.01^{\circ}\text{C}$	KOMATSU ZEROCON (Japan)
Thermocouple	1	at most 0.3mm in diameter	TYPE T

##### Connection



Procedure
-----------

- (1) Connect the equipment as shown in Connection.
- (2) Turn ON the power of the HR1300 and the Standard temperature generator.
- (3) Set Range of HR1300 to thermocouple which is used, and set Standard temperature generator to 0°C.
- (4) Check that the measured value lies within the Tolerance.
- (5) Turn OFF the power of the HR1300 and Standard temperature generator.

\*\*\* The following is a simple test method for your reference. \*\*\*

- (1) Short-circuit the input terminals H-L using standard copper wire.
- (2) Turn ON the power of the HR1300.
- (3) Set Range of HR1300 to thermocouple (any thermocouple is acceptable).
- (4) Check that the measured value indicates the room temperature.
- (5) Turn OFF the power of the HR1300.

1  
2



3  
4

## 5. DISASSEMBLY AND RE-ASSEMBLY

### 5.1 Introduction

This chapter describes the procedure of disassembling and assembling.

#### WARNING

Before disassembling, disconnect all power sources from the main body as follows:

- Turn OFF the power switch.
- Disconnect the power cable.
- Disconnect the I/O cable.

#### CAUTION

Note that installing or removing assemblies while power is ON may result in damaging internal circuits. Therefore always make sure to turn OFF the power.



## 5.2 Disassembling / Assembling Procedure

### 5.2.1 How to remove Top cover

- a. See CMPL page 2, and remove 9,10,11,12 (nine screws)

### 5.2.2 How to disassemble Chart Cassette Assembly

- a. See CMPL page 2, and loose 5 (two screws) and remove 3,4

### 5.2.3 How to remove and disassemble Bezel assembly

- a. Remove Ribbon Cassette first
- b. See CMPL page 4, and remove 1,3,4,5 (two screws)
- c. Remove 4,6,33,34 (four screws) and pull out Bezel assembly
- d. See CMPL page 8, and remove 13,14 (four screws)
- e. Disconnect two connectors on 11 (cables from VFD display and IC card assembly)
- f. See CMPL page 6, and remove 16,17,18 (two screws)
- g. Disconnect four cables on 11
- h. Remove 11,12,13,14,15 (four screws)
- i. Remove 6,7,8 (four screws)

### 5.2.4 How to remove Internal Mechanism

- a. See CMPL page 8, and disconnect five cables on 12 (cables from Internal Mechanism)
- b. Remove three screws which are fastening bottom plate and rear panel (rear end of bottom plate)
- c. Separate Internal Mechanism and electric parts with rear panel

### 5.2.5 How to disassemble Internal mechanism

- a. See CMPL page 4 and remove 12,13,14,15,16,17 (one screw)
- b. Remove 10,11 (two screws)
- c. Remove the belt of 22 from pulleys then remove 20,21,22,23,24,25 (three screws)
- d. Remove 18,19 (two screws)
- e. Remove 26,27 (one screw)
- f. Remove 28,29 (one screw)
- g. Remove 30,31,32 (one screw)

### 5.2.6 5.2.6 How to remove Terminal Assembly

- a. See CMPL page 10 and remove 6,8
- b. Remove 1,3,5, (two screws for each Terminal Assembly)

**5.2.7 How to remove Circuit Boards**

- a. See CMPL page 8, and remove 21,22,23,24 (one screw)
- b. Remove 7,11,12 (four screws)
- c. Remove 25,26 (four screws)
- d. Remove 1,2/3 (two screws for each board on the rear panel)
- e. Remove 4,5,6
- f. Remove 18,19 (four screws)
- g. Remove 32,33,34 (three screws)
- h. Remove 16,20 (four screws)

**5.2.8 How to remove Fuse**

- a. See CMPL page 10, and remove 11,12

**5.2.9 Re-assemble**

- a. Re-assemble should be done by reversely performing the disassembling procedure.



## 6. ADJUSTMENT

### 6.1 Introduction

This chapter explains the adjustment method which is necessary when the result of Performance Test (chapter 4) is outside the allowance or when any assembly has been replaced.

You cannot perform adjustment for parts not described in this chapter unless a dedicated tool is used.

### 6.2 Adjusting Conditions

Please test the instrument under the following conditions.

- Ambient Temperature :  $23 \pm 2^{\circ}\text{C}$
- Humidity : 45 to 75%R.H.
- Power supply voltage :  $90 \text{ to } 240\text{V} \pm 1\%$
- Power supply frequency : 50 or 60Hz  $\pm 1\%$

#### WARNING

- (1) Before disassembling, disconnect all power sources from the main body as follows:
  - Turn OFF the power switch.
  - Disconnect the power cable.
  - Disconnect the I/O cable.
- (2) When the cover is removed, do not touch voltage live parts.  
Before turning ON the power, make sure there is no short-circuit.

## 6.3 Adjustment

The following pages explain the adjustment.

Required equipment, connections, and procedure are sequentially described for each of the following items. (the items need not be performed in any specific order)

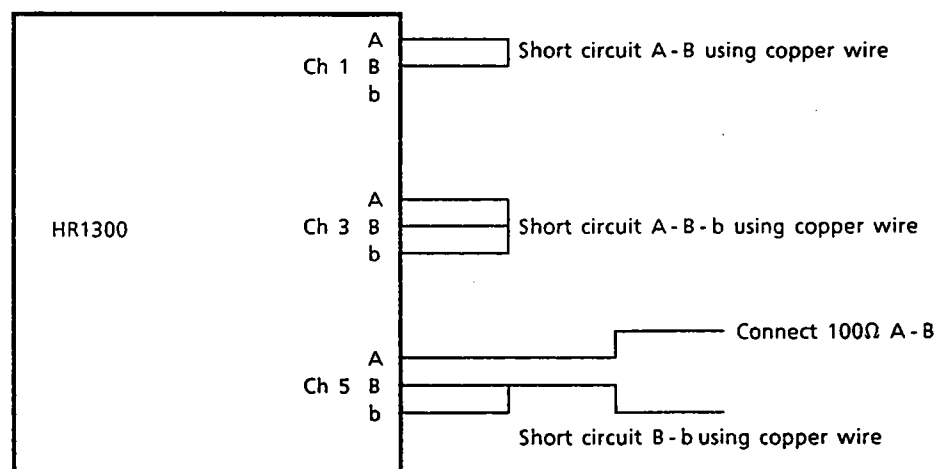
- (1) Measurement Accuracy Adjustment
- (2) Printer Mechanism Adjustment

### 6.3.1 Measurement Accuracy Adjustment

#### Required Equipment

Equipment	Q'ty	Minimum Specification	Recommended
Standard Resistor 100Ω	2	Accuracy: $\pm 0.01\%$	YOKOGAWA 2792

#### Connection



Procedure
-----------

- (1) Connect equipment according to Connection.
- (2) Allow at least a warm up time of 60 minutes.
- (3) Save setting parameters to IC card, or print "SET UP LIST".
- (4) Turn OFF the power of HR1300.  
Set switch 1,2,4,8 of the DIP switch on the rear panel to ON.
- (5) Hold the "LOWER DISPLAY" key depressed and turn ON the power.  
Hold the "LOWER DISPLAY" key until "SET UP MODE=RECORD" appears on the display.
- (6) Select "A/D" using function key and press "ENTRY" key.  
"A/D MODE=DC DISP" appears on the display.
- (7) Select "DC AVE" using function key and press "ENTRY" key.  
"20mV ZERO" appears on the display.
- (8) Press "ENTRY" key. HR1300 adjusts 0mV automatically and "A/D MODE=DC AVERAGE" appears on the display.
- (9) Press "ENTRY" key, then "AVE=20mV ZERO" appears on the display.
- (10) Select "0Ω:1-Z" using function key and press "ENTRY" key.  
HR1300 adjusts 0Ω automatically and "A/D MODE=DC AVERAGE" appears on the display.
- (11) Press "ENTRY" key, then "AVE=0Ω:1mA" appears on the display.
- (12) Select "100Ω:1" using function key and press "ENTRY" key.  
HR1300 adjusts 100Ω automatically and "A/D MODE=DC AVERAGE" appears on the display.
- (13) Press "ENTRY" key, then "AVE=100Ω:1mA" appears on the display.
- (14) Select "100:1H" using function key and press "ENTRY" key.  
HR1300 adjusts 100Ω automatically and "A/D MODE=DC AVERAGE" appears on the display.
- (15) Press "ENTRY" key, then "AVE=100Ω:1mA-H" appears on the display.
- (16) Select "0Ω:2-Z" using function key and press "ENTRY" key.  
HR1300 adjusts 0Ω automatically and "A/D MODE=DC AVERAGE" appears on the display.
- (17) Press "ENTRY" key, then "AVE=0Ω:2mA" appears on the display.
- (18) Select "100Ω:2" using function key and press "ENTRY" key.  
HR1300 adjusts 100Ω automatically and "A/D MODE=DC AVERAGE" appears on the display.
- (19) Press "ENTRY" key, then "AVE=100Ω:2mA" appears on the display.
- (20) Select "100:2-H" using function key and press "ENTRY" key.  
HR1300 adjusts 100Ω automatically and "A/D MODE=DC AVERAGE" appears on the display.
- (21) Select "WRITE" using function key and press "ENTRY" key.
- (22) "WRITE OK=NO" appears on the display. Select "YES" using function key and press "ENTRY" key. "A/D MODE=WRITE" appears on the display.
- (23) Select "ESC" using function key and press "ENTRY" key.  
"\*\*\* A/D SET \*\*\*" appears on the display.

- (24) Press "ENTRY" key, then "SET UP MODE=A/D-ADJ" appears on the display.  
Select "END" using function key and press "ENTRY" key.  
HR1300 returns to normal operation.
- (25) Perform Measurement Accuracy Test (par. 4.4.1).
- (26) Turn OFF the power of HR1300.

### 6.3.2 Printer Mechanism Adjustment

#### Required Equipment

Equipment	Q'ty	Minimum Specification	Recommended
Philips screwdriver	1	M3	
Spacer jig	1	Manufactured by YOKOGAWA	B9586MC
Tension gauge	1	About 500g max.	
Hexagonal wrench, mm	1		
White locking enamel			

#### WARNING

Before disassembling, disconnect all power sources from the main body as follows:

- Turn OFF the power switch.
- Disconnect the power cable.
- Disconnect the I/O cable

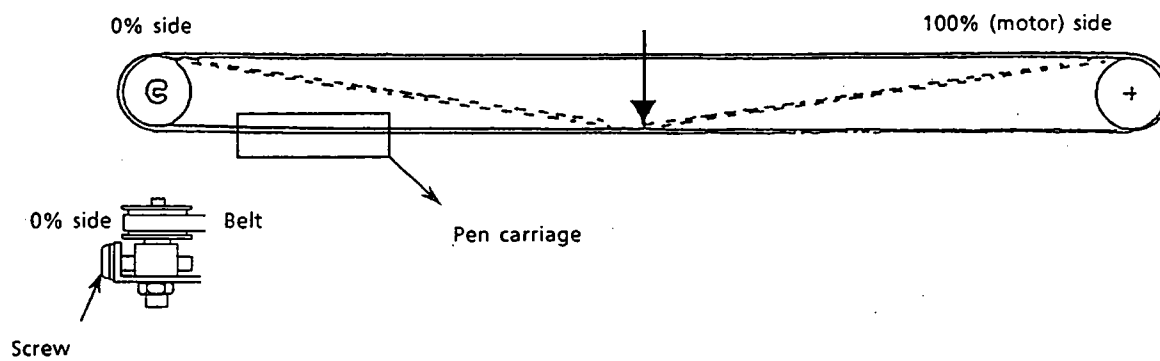
#### CAUTION

After performing this Printer Mechanism Adjustment, PRINTOUT ADJUSTMENT is needed.

Perform PRINTOUT ADJUSTMENT according to Chapter 12 of instruction manual.



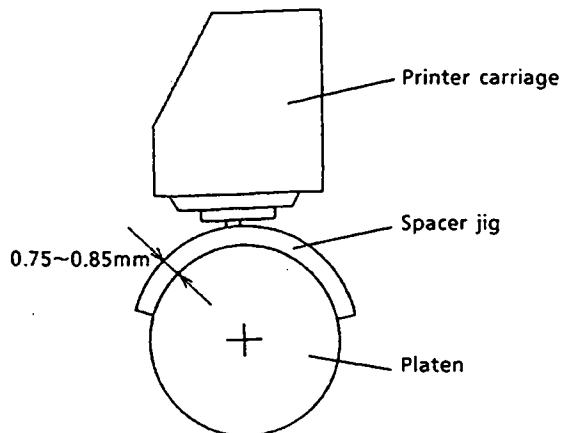
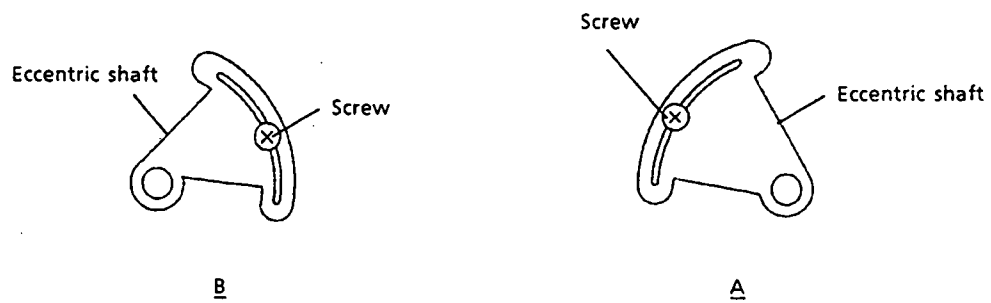
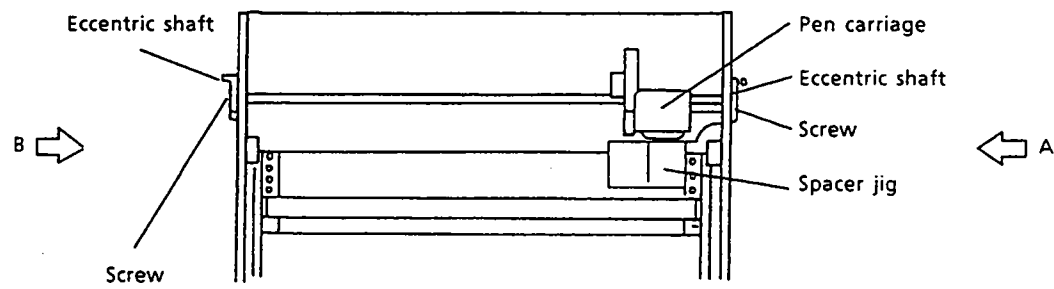
## 1. Adjustment of Pen Carriage Belt Tension

**Adjustment location****Procedure**

- (1) Pull out Internal Mechanism.
- (2) Move the pen carriage to the 0% side.
- (3) Adjust the screw which holds the pulley so that the tension used to get the belt's sides to touch (at the center between the pulleys), ranges from 220 gf to 250 gf using the tension gauge (if the tension is more than 150 gf, this adjustment is not needed).
- (4) Lock the screw with white locking enamel.

## 2. Adjustment of the Wire Stroke

## Adjustment location



- (1) Pull out Internal Mechanism.
- (2) Move the pen carriage to the 100% side.
- (3) Adjust the Eccentric shaft so that the spacer jig can be inserted between the platen and dot wire of the printer carriage.
- (4) Move the pen carriage to the 0% side and adjust the Eccentric shaft as same as (3)
- (5) Tighten the screws of the Eccentric shaft and lock the screws with white locking enamel.



## 7. REPLACEABLE PARTS

### 7.1 Introduction

This chapter describes how to read CMPL (Customers Maintenance Parts List) which should be referred to when replacing assemblies and how to order parts.

### 7.2 How to Read CMPL

When replacement of parts is necessary, we strongly recommend replacement with an assembly unit.

The YOKOGAWA's equipment is designed to enable easy maintenance on a assembly replacement base.

Parts supplied from YOKOGAWA are listed in CMPL of chapter 11 - the content also includes electrical and mechanical parts on an assembly-basis.

Smaller parts than that are not supplied.

The contents of CMPL are as follows.

- Item No.
- YOKOGAWA parts No.
- Number used
- Content description

### 7.3 How to Order Parts

When ordering parts from CMPL, inform a nearby YOKOGAWA sales/service office or agency of the YOKOGAWA parts No. and the required number.

Addresses are listed on the back of this manual.

## 7.4 Reference Value for periodic maintenance

The table below shows reference values for periodic maintenance. These values are expected to vary with setting conditions and circumstances of usage. Therefore, please use these reference values with care.

Periodic maintenance (reference value)

Part name	Part No.	Exchange cycle (year)	Remarks
Fluorescent display module	B9628SW	4	30000 hours
FUSE (1.25A time lag)	A9197KF	2	For AC power
FUSE (500mA)	B9573TZ	10	In the Printer Board assembly
MOTOR (chart)	B9627EM	5	
MOTOR (carriage)	B9627LG	5	
MOTOR (ribbon)	B9627FN	5	
BATTERY	B9588ZB	10	Lithium battery

## 7.5 Precautions for Assembly Exchange

### 7.5.1 CPU Board Assembly

- (1) Before exchanging the board, save the set up data on the IC memory card and printout set up list.
- (2) After exchanging the board, perform PRINTOUT ADJUSTMENT according to Chapter 12 of instruction manual.

### 7.5.2 A/D Card Assembly

- (1) calibration data is saved in the NV-RAM of the card. Therefore, when this card has been exchanged, there is no need for calibration.

## 8. PRINCIPLE OF OPERATION

### 8.1 System Configuration

Figure 8.1 shows the overall block diagram of the HR1300 2second scan model. It is composed of analog, main controller, recorder, man-machine, and communication sections.

The analog section is composed of detachable terminal blocks, 10 point/unit (TB1,TB2), scanners of similarly 10 point/unit (SC1,SC2), as well as a pre-amplifier (PA1) and A-D converter (AD-1). The circuits of the scanners and the pre-amplifier are structured in such a way that they can cope with universal inputs (DC voltage, Thermo-couple, Resistance Temperature Detector, and contact signal for operation recording).

The input signals are A-D converted by A-D1 through PA1. The A-D converted signals are sent to the main controller through the photo coupler.

The main controller is composed around  $\mu P1$ , the multi-functional 16-bit microprocessor and the GA1, the gate array for A-D control, and calculates the input signals and processes the overall control and management.

The recorder section is composed around  $\mu P2$ , an 8-bit ASIC 1 chip microprocessor and the GA2, a gate array for optical encoder interface, and controls the carriage drive, the wire-dot printer drive, recorder chart feed and so on. The information is transmitted between the main controller and the recorder by means of DM1, the dual port memory.

The man-machine section is composed of  $\mu P3$ , an 8-bit ASIC 1 chip microprocessor, VFD, the fluorescent display tube, KB, the panel keyboard etc. and executes the VFD display control and the key input processing. The information is transmitted between the main controller and the man-machine section by means of the serial communication function integrated in  $\mu P1$  and  $\mu P3$ .

The communication section is composed around  $\mu P4$ , an 8-bit ASIC 1 chip microprocessor, and controls external communication. The information between the main controller and the communication section is executed through DM2, dual port memory.

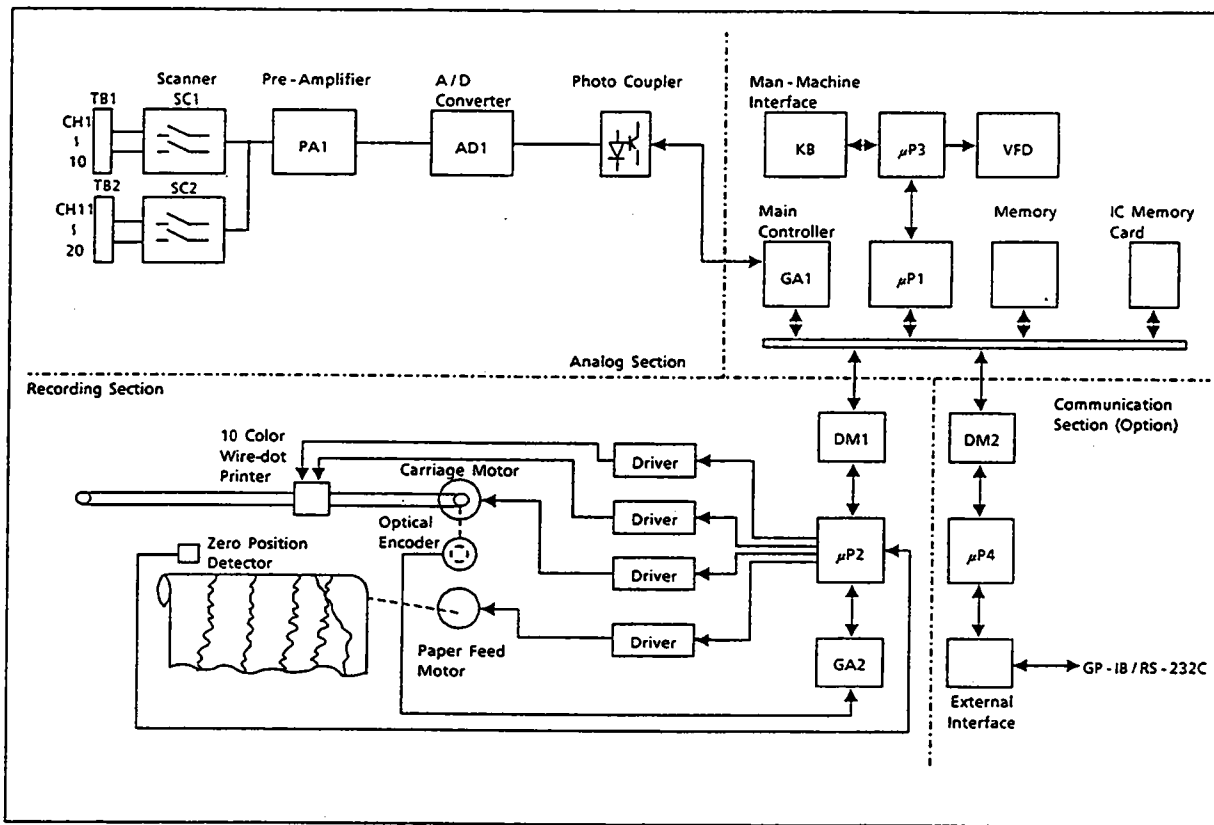


Figure 8.1 System Block Diagram

## 9. TROUBLE-SHOOTING

### 9.1 Introduction

This chapter explains the causes of problems and how to determine faulty assemblies as a result of self diagnosis and trouble-shooting flow.

### 9.2 Procedure

- (1) Recognizing the trouble.  
First of all, make sure what kind of trouble it is.
- (2) Check if it is a handling mistake or not.  
Check the connections and the settings of equipments to determine if it is a handling mistake.
- (3) Execute self diagnosis.  
Execute self diagnosis (refer to chapter 3) when power ON and find the problem items.
- (4) Analyze the cause of the problem according to the trouble-shooting flow chart (section 9.3).

#### WARNING

In default of the following instructions, injury or danger of life may result.

- (1) Do not touch the circuit and voltage live parts because the power unit contains the high-voltage electrical circuit.
- (2) Power unit is furnished with a dedicated cover to prevent electric shock. Do not remove this cover.
- (3) Never touch any part not subject to adjustment.

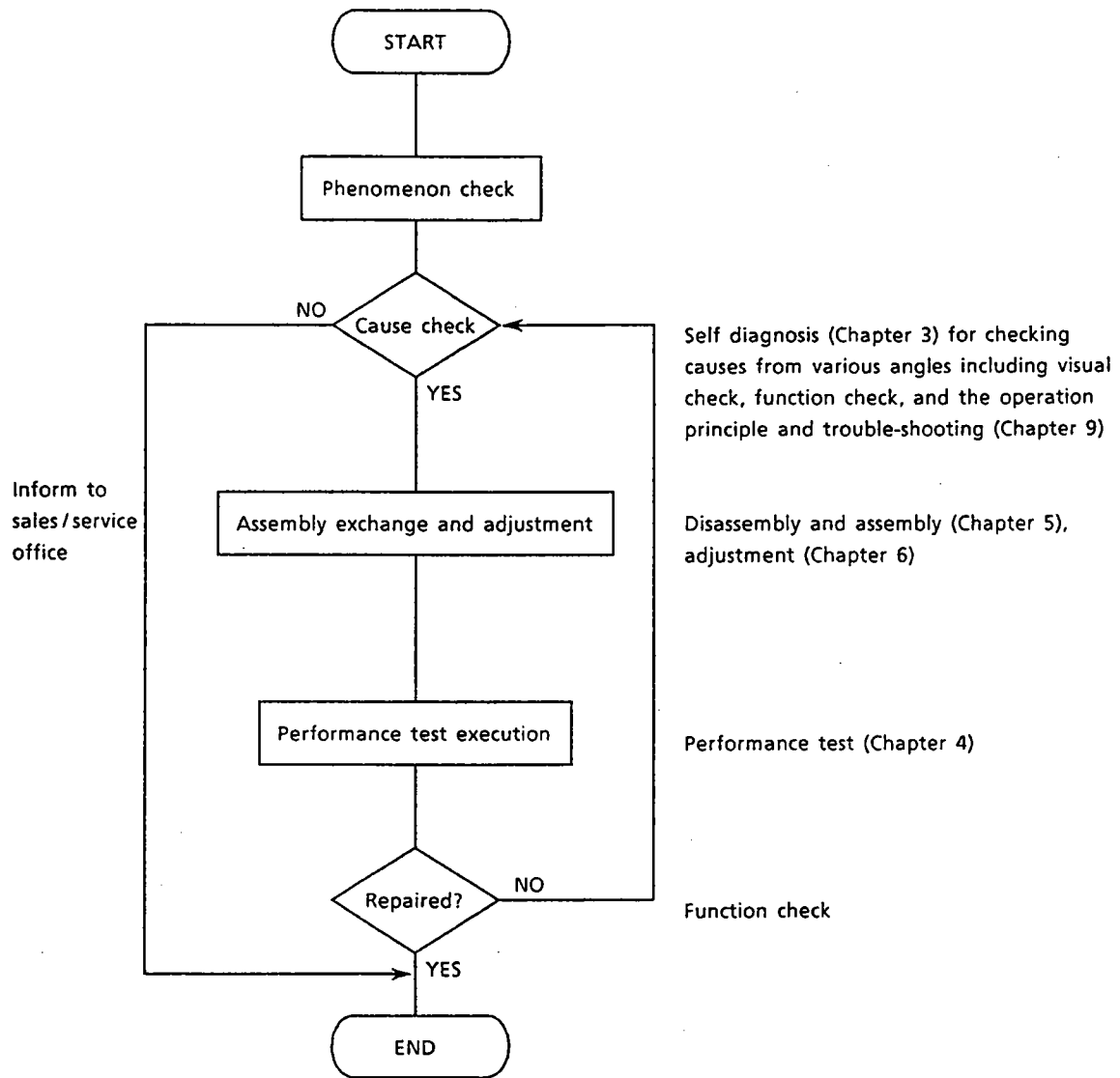
#### CAUTION

Make sure to connect input terminal (voltage or current) correctly.  
The internal circuit may be damaged when wrongly connected.



### 9.3 Flow Chart

This flowchart consists of general service operations when a fault occurs. The chart is not always suitable for various faults. However, it is recommended to perform operations according to the flowchart.



## 9.4 Trouble-Shooting

Item	Trouble	Operation item			Check Item
		Check	Adjust- ment	Ex- change	
1	The power is not turned ON	<input type="radio"/> <input type="radio"/>		<input type="radio"/> <input type="radio"/> <input type="radio"/>	The power cable is disconnected. The fuse (in the AC socket) is burnout. MAIN POWER BOARD Ass'y MAIN CPU BOARD Ass'y
2	FAIL state			<input type="radio"/> <input type="radio"/>	MAIN CPU BOARD Ass'y PRINTER BOARD Ass'y
3	SELF TEST error (ROM ERROR)			<input type="radio"/> <input type="radio"/>	MAIN CPU BOARD Ass'y PRINTER BOARD Ass'y
4	SELF TEST error (RAM ERROR)			<input type="radio"/>	MAIN CPU BOARD Ass'y
5	SELF TEST error (A/D ILLEGAL) (A/D SUM ERROR)			<input type="radio"/>	A/D CARD Ass'y
6	SELF TEST error (PRINTER ERROR)			<input type="radio"/>	PRINTER BOARD Ass'y
7	SELF TEST error (COMM CARD ERROR) (COMM CARD REMOVED)			<input type="radio"/>	GP-IB CARD Ass'y or RS232C CARD Ass'y
8	The memory can not be backed up	<input type="radio"/> <input type="radio"/>		<input type="radio"/>	The battery connector is disconnected? Battery voltage is low (less than +2.5v) MAIN CPU BOARD Ass'y
9	The keyboard operation is not normal	<input type="radio"/>		<input type="radio"/> <input type="radio"/> <input type="radio"/>	The KEYBOARD cable is disconnected. KEYBOARD Ass'y MAIN CPU BOARD Ass'y VFD BOARD Ass'y
10	Display is not normal			<input type="radio"/> <input type="radio"/>	MAIN CPU BOARD Ass'y VFD BOARD Ass'y
11	The measured value is incorrect	<input type="radio"/> <input type="radio"/>		<input type="radio"/> <input type="radio"/>	The input is disconnected. Noise A/D CARD Ass'y MAIN CPU BOARD Ass'y

Item	Trouble	Operation item			Check Item
		Check	Adjust-ment	Ex-change	
12	The measured temperature is incorrect	<input type="radio"/> <input type="radio"/> <input type="radio"/>		<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	The input is disconnected. Noise Terminal Cover is removed. A/D CARD Ass'y MAIN CPU BOARD Ass'y RJC BOARD Ass'y SCANNER CARD Ass'y
13	The measured value fluctuates	<input type="radio"/>			Power frequency set is incorrect. (DIP switch)
14	Printer carriage does not move			<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	PRINTER BOARD Ass'y CARRIAGE MOTOR Ass'y MAIN CPU BOARD Ass'y A/D CARD Ass'y
15	Trend recording is incorrect	<input type="radio"/>	<input type="radio"/> <input type="radio"/>	<input type="radio"/> <input type="radio"/>	Printer adjust in SET UP is incorrect. Belt tension is incorrect. Chart or Ribbon cassette is not installed properly. PRINTER BOARD Ass'y MAIN CPU BOARD Ass'y
16	Ink ribbon is not fed	<input type="radio"/> <input type="radio"/>		<input type="radio"/> <input type="radio"/>	Ribbon cassette is not installed properly. RIBBON FEED MOTOR cable is disconnected. PRINTER BOARD Ass'y RIBBON FEED MOTOR Ass'y
17	Chart is not fed	<input type="radio"/> <input type="radio"/> <input type="radio"/>		<input type="radio"/> <input type="radio"/> <input type="radio"/>	Chart cassette is not installed properly Chart is not installed properly CHART FEED MOTOR cable is disconnected. PRINTER BOARD Ass'y MAIN CPU BOARD Ass'y CHART FEED MOTOR Ass'y
18	The alarm is not output	<input type="radio"/>		<input type="radio"/> <input type="radio"/> <input type="radio"/>	Setting value is incorrect MAIN CPU BOARD Ass'y DI/DO CARD Ass'y INT. ALARM Ass'y

## 9.5 How to Order a Repair

When ordering repair, clearly state the information listed below and address it to the YOKOGAWA sales/service office or agency.

- address
- Name of person in charge and telephone number
- Model code and Serial No. of instrument
- Detailed explanation of the problem



# 10. SCHEMATIC DIAGRAM

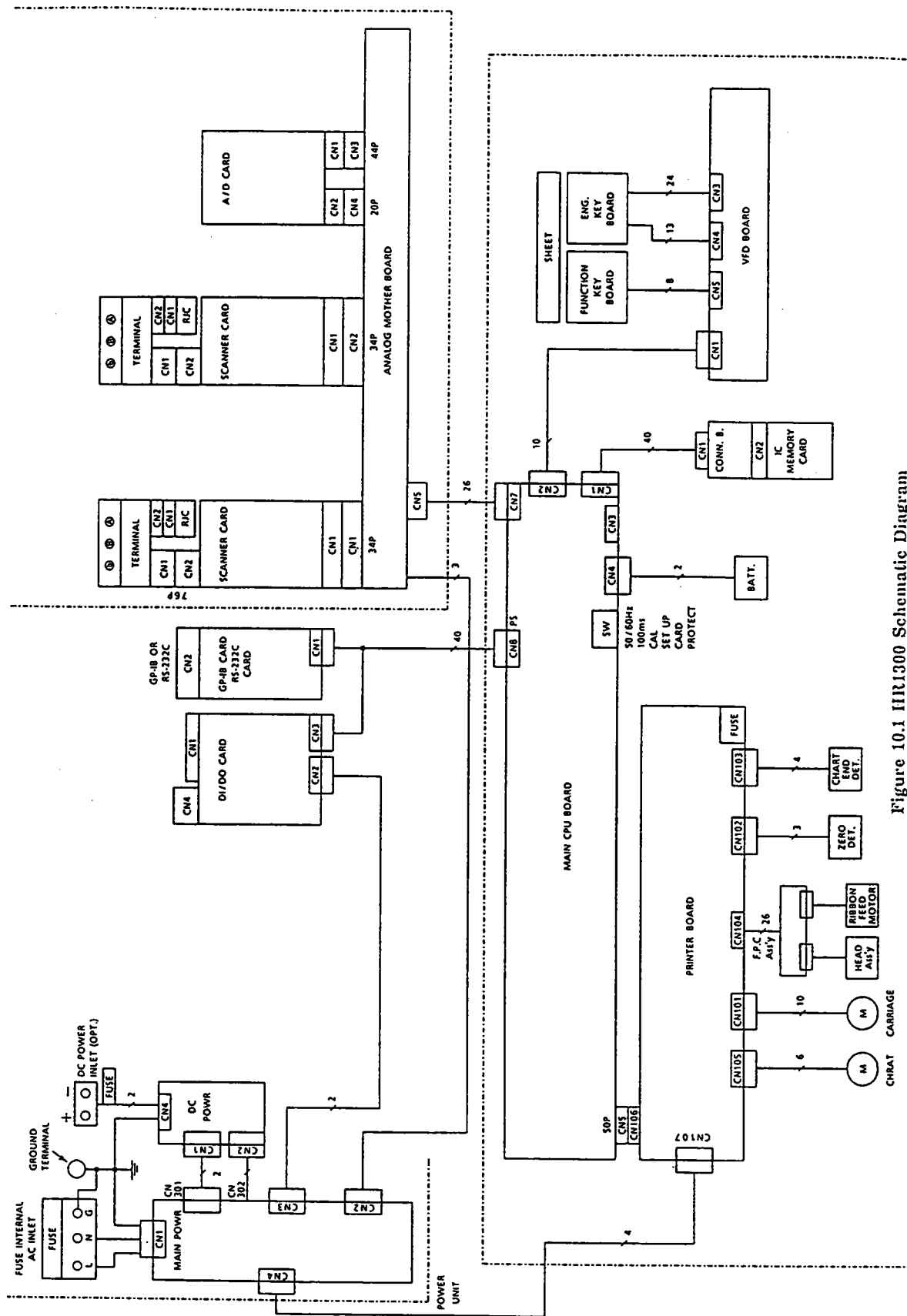


Figure 10.1 HR1300 Schematic Diagram

2  
2



2  
2

# 11. CUSTOMER MAINTENANCE PARTS LIST (CMPL)





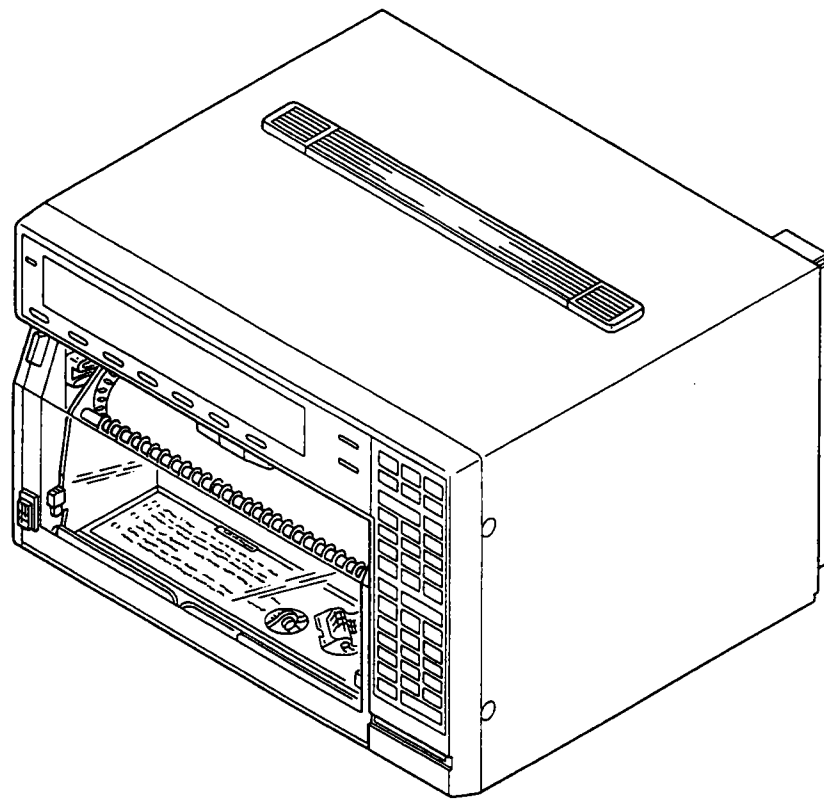
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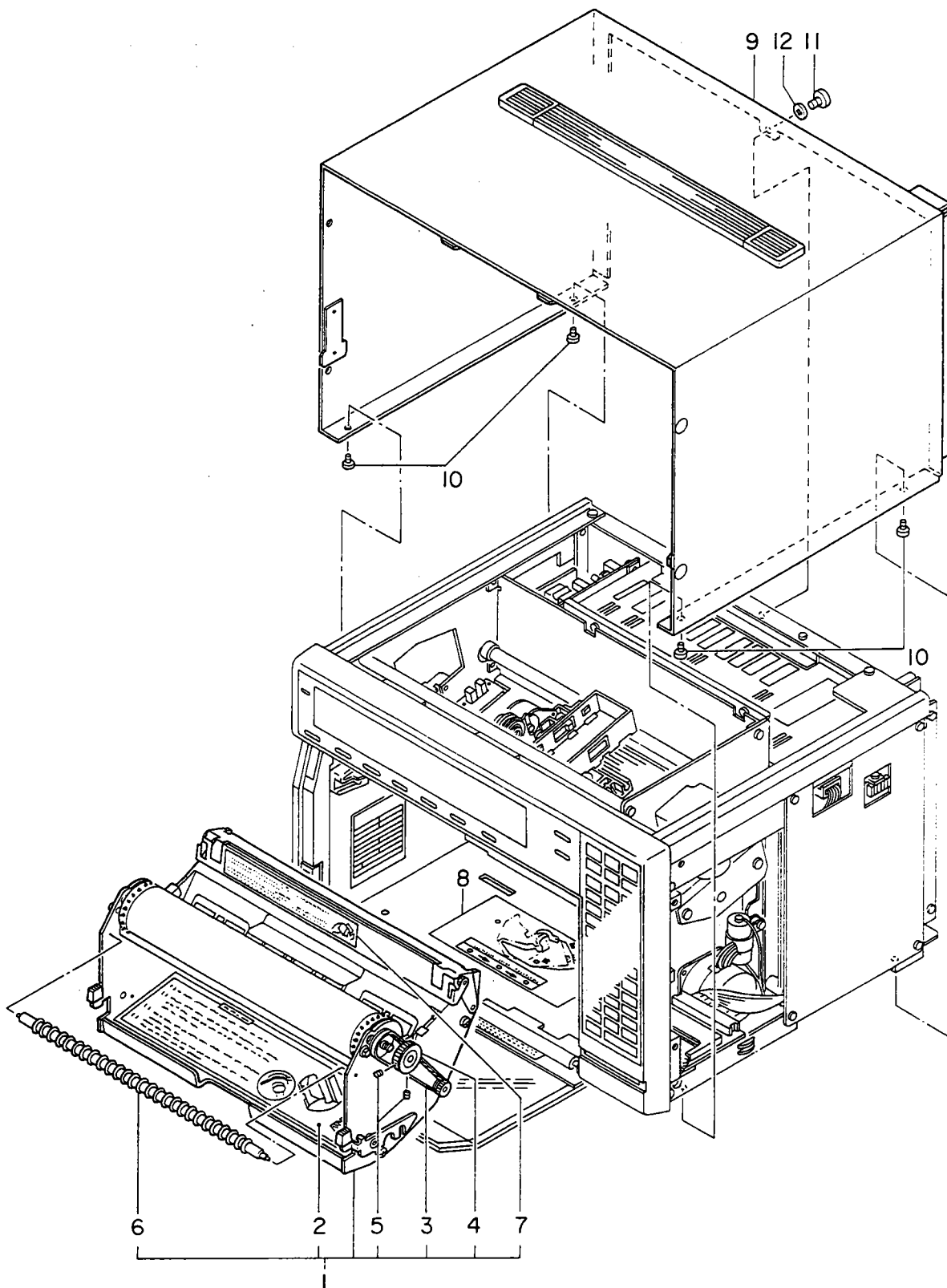
**Customer  
Maintenance  
Parts List**

Model 3750  
Hybrid Recorder  
(Desk Top Type)

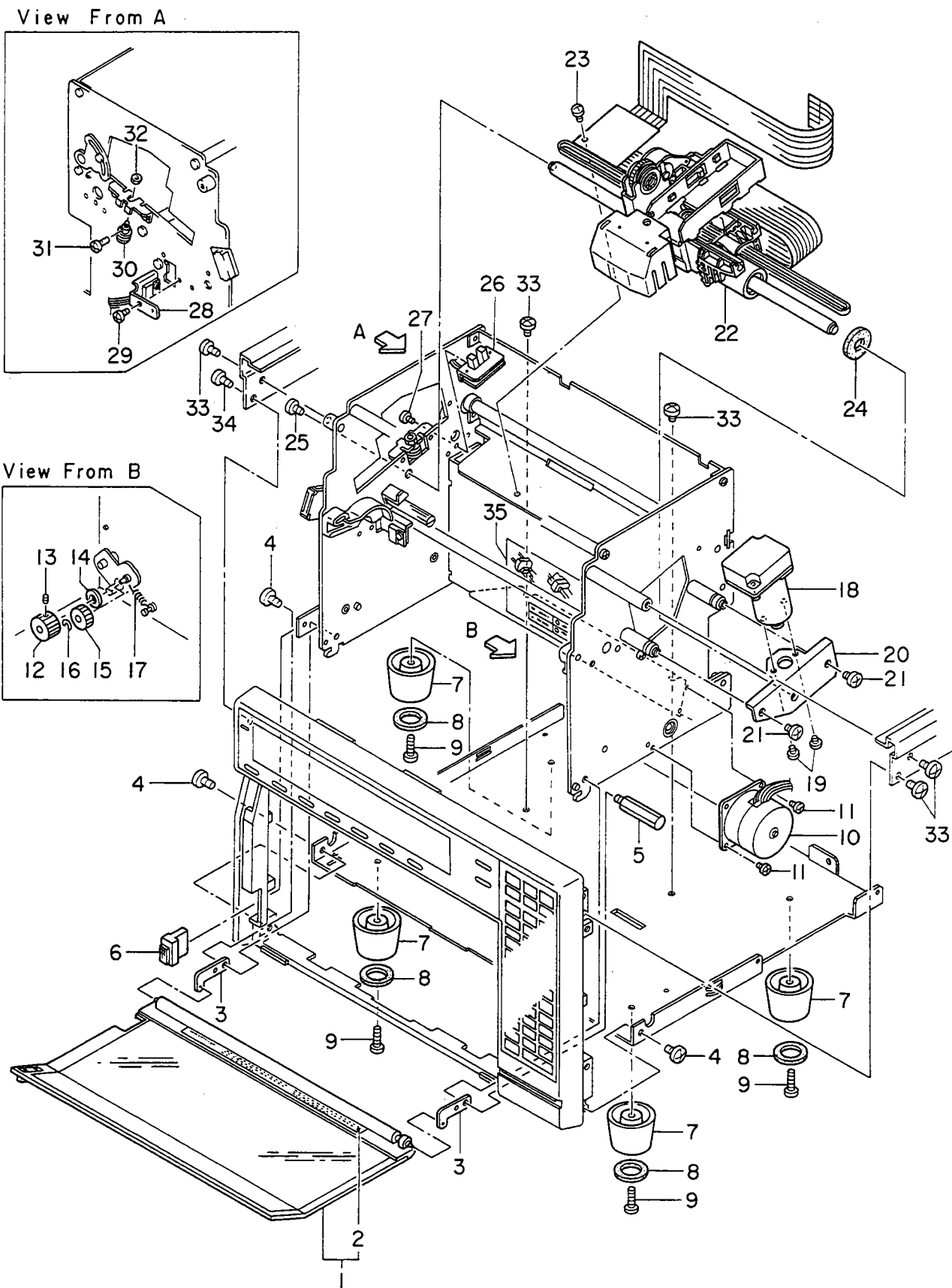
HR1300

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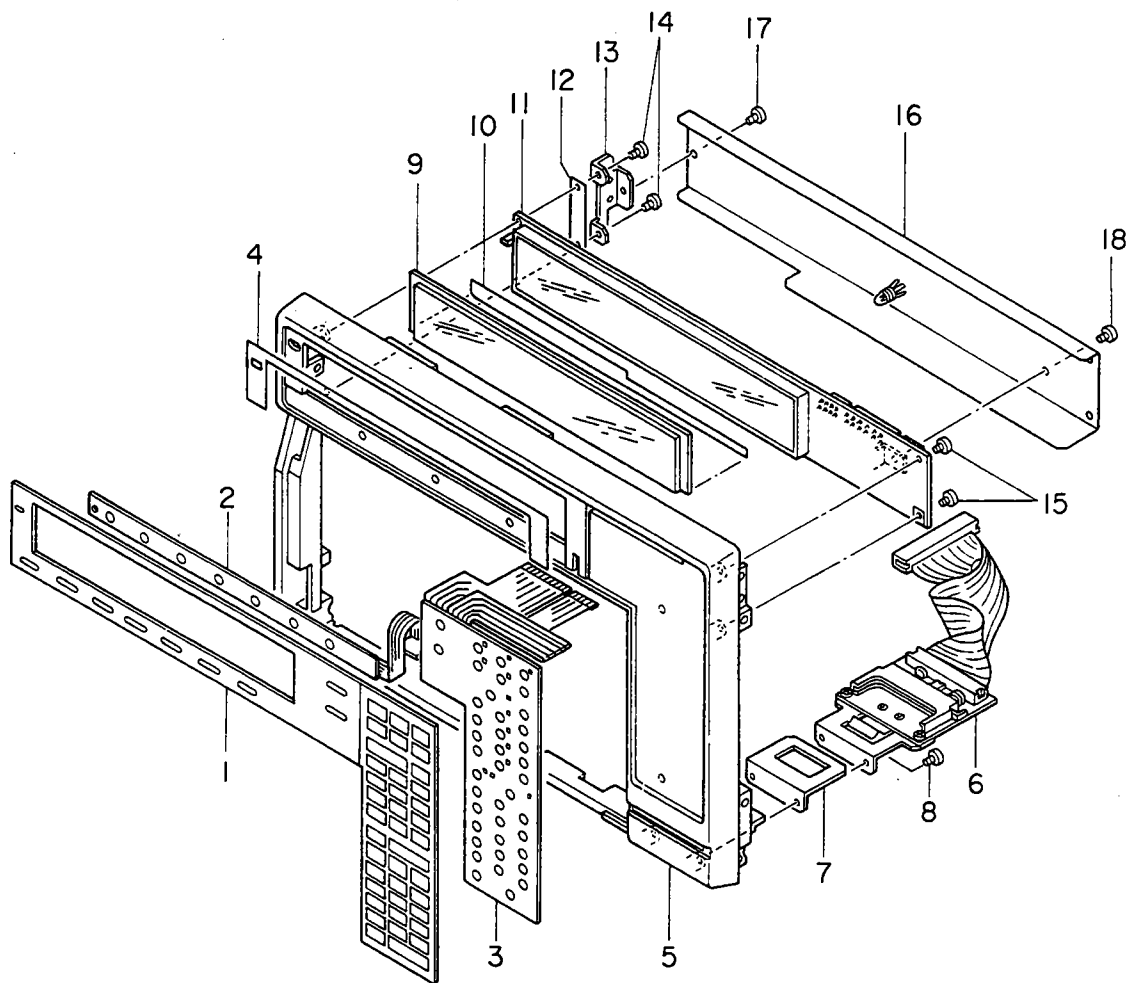




<u>Item</u>	<u>Part No.</u>	<u>Qty</u>	<u>Description</u>
1	B9855JA	1	Chat Cassette Assembly
	B9855NT	1	Chat Cassette Assembly
			(select either one)
2	B9619AL	1	Nameplate (for B9855JA: Japanese)
	B9619AN	1	Nameplate (for B9855NT: English)
3	B9619JD	1	Belt
4	-	1	Pulley
5	Y9303SJ	2	Setscrew
6	B9855KG	1	Collar Assembly
7	B9627AG	1	Nameplate
8	B9855BT	1	Nameplate
9	-	1	Case Assembly
10	Y9304LS	4	B. H. Screw M3 x 4
11	Y9405LB	1	B. H. Screw M4 x 5
12	Y9401WL	1	Washer (with toothed lockwasher)

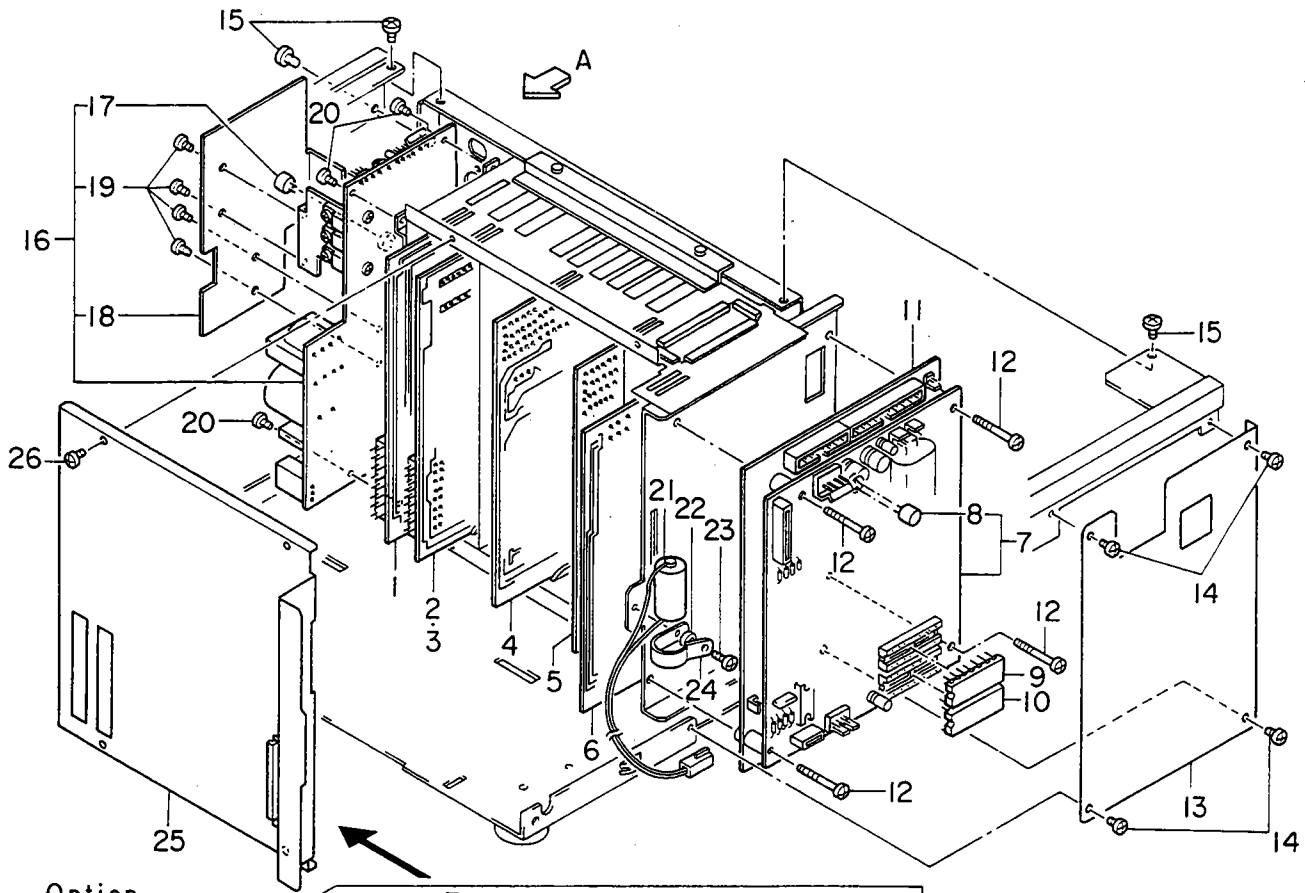


Item	Part No.	Qty	Description
1	B9855EA	1	Cover Assembly } (select either one)
	B9855EG	1	
2	B9855EE	1	Nameplate (for B9855EA: Japanese)
	B9855EF	1	Nameplate (for B9855EG: English)
3	-	2	Plate
4	Y9405LS	3	B. H. Screw M4 × 5
5	B9855DW	1	Rod
6	-	1	Knob
7	A9055ZB	4	Block
8	B9850KS	4	Bumper
9	Y9414LS	4	B. H. Screw M4 × 14
10	B9627EM	1	Motor (for chart drive)
11	Y9306TY	2	Taptight Screw M3 × 6
12	B9585HY	1	Gear
13	Y9304SJ	1	Setscrew
14	B9585PZ	1	Spacer
15	B9585HR	1	Gear
16	Y9200ET	1	E-Ring
17	A9021KN	1	Spring
18	B9627LG	1	Motor Assembly (for carriage drive)
19	B9590DS	2	Screw
20	-	1	Bracket
21	Y9405LS	2	B. H. Screw M4 × 5
22	-	1	Carriage Assembly
23	Y9304LS	1	B. H. Screw M3 × 4
24	B9627QT	1	Bumper
25	Y9405LS	1	B. H. Screw M4 × 5
26	B9855LF	1	Sensor Assembly
27	Y9304LS	1	B. H. Screw M3 × 4
28	B9855LK	1	Sensor Assembly
29	Y9304LS	1	B. H. Screw M3 × 4
30	B9627DU	1	Pulley Assembly
31	Y9312LS	1	B. H. Screw M3 × 12
32	Y9401CB	1	Nut
33	Y9405LS	5	B. H. Screw M4 × 5
34	Y9304LS	1	B. H. Screw M3 × 4
35	B9855BT	1	Name plate

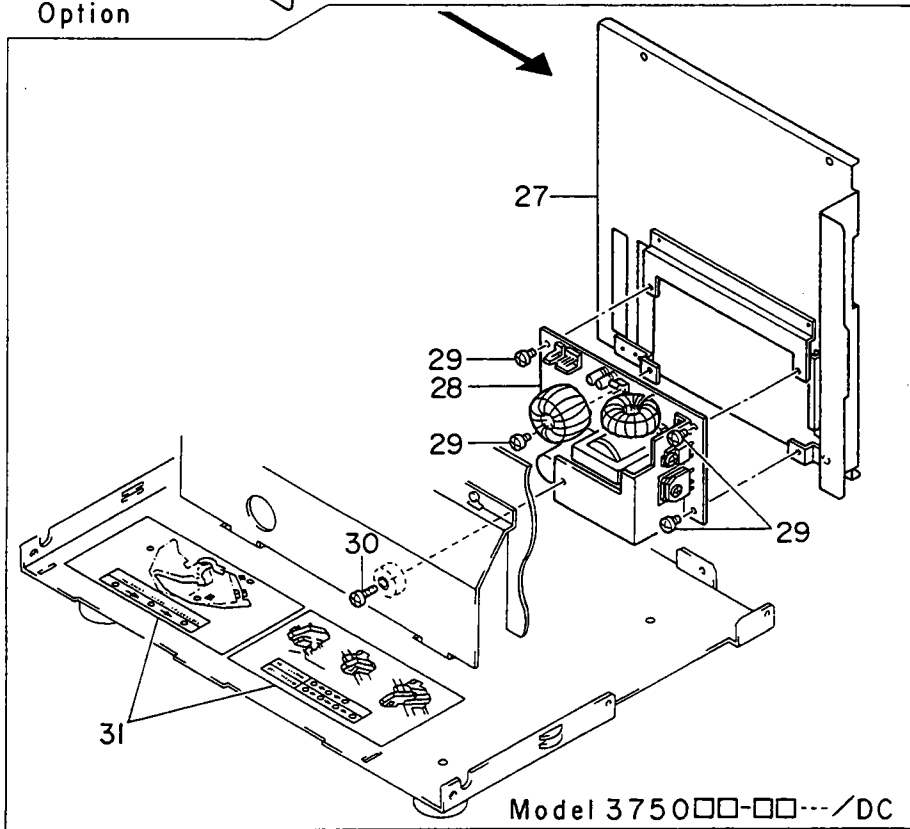


<u>Item</u>	<u>Part No.</u>	<u>Qty</u>	<u>Description</u>
1	B9855DC	1	Key Sheet
2	B9627YZ	1	Keyboard
3	B9855DD	1	Key Switch
4	B9627PD	1	Tape (length: 500 mm)
5	-	1	Bezel
6	B9855DS	1	IC Memory Card Assembly
7	-	1	Bracket
8	Y9308TY	2	Taptight Screw M3 x 8
9	B9627TE	1	Plate
10	B9855DQ	1	Plate
11	B9628SW	1	V. F. D Module Assembly
12	B9855DP	1	Insulator Sheet
13	-	1	Bracket
14	Y9308TY	2	Taptight Screw M3 x 8
15	Y9306TY	2	Taptight Screw M3 x 6
16	-	1	V. F. D Cover
17	Y9304LS	1	B. H. Screw M3 x 4
18	Y9204KS	1	B. H. Screw M2.3 x 4

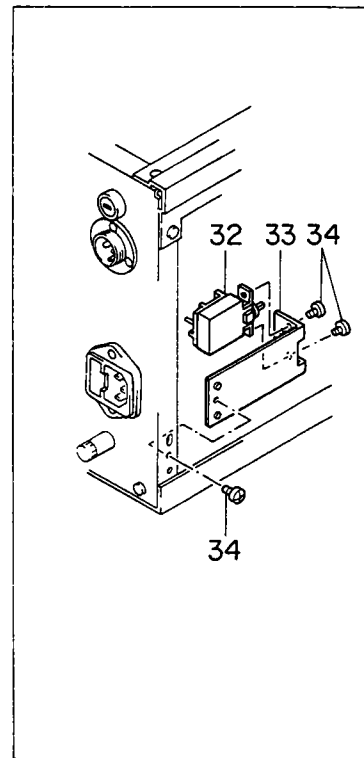




Option



View From A



Item	Part No.	Qty	Description
1	B9628XC	1	DI/DO Card Assembly
	B9628QK	1	DI/DO Card Assembly*1
	B9628QL	1	DI/DO Card Assembly*2
	B9628QM	1	DI/DO Card Assembly*3
2	B9628NH	1	GP-1B Card Assembly*4
	B9628NJ	1	RS-232C Card Assembly*5
3	B9628WL	1	ROM Assembly (U4)*4
	B9628WM	1	ROM Assembly (U6)*5
4	B9628XN	1	Scanner Card Assembly*6
5	B9628XN	1	Scanner Card Assembly*7
	B9628SX	1	/AC2 Assembly*8
	B9628SY	1	/AC6 Assembly*9
6	B9628XS	1	A/D Card Assembly
7	B9628XG	1	Printer Board Assembly
8	B9573TZ	1	Fuse (500 mA)
9	B9856WA	1	ROM Assembly
	B9856WC	1	ROM Assembly*10
10	B9856WB	1	ROM Assembly
	B9856WD	1	ROM Assembly*10
11	B9628XF	1	CPU Board Assembly*11
	B9628LA	1	CPU Board Assembly*12
12	Y9330LS	4	B. H. Screw M3 x 30
13	-	1	Bracket
14	Y9304LS	4	B. H. Screw M3 x 4
15	Y9405LS	3	B. H. Screw M4 x 5
16	B9856XA	1	Power Assembly (st'd)
	B9856QA	1	Power Assembly*13
17	B9586JJ	1	Fuse (3.15 A)
18	-	1	Heat Sink
19	Y9306LB	4	B. H. Screw M3 x 6
20	Y9304LS	4	B. H. Screw M3 x 4
21	B9588ZB	1	Battery Assembly
22	Y9902YA	1	Spacer
23	Y9310LS	1	B. H. Screw M3 x 10
24	-	1	Clamp
25	-	1	Cover
26	Y9304LS	4	B. H. Screw M3 x 4
27	-	1	Cover*13
28	B9628QJ	1	DC Power Board Assembly*13
29	Y9304LS	4	B. H. Screw M3 x 4
30	Y9310LS	1	B. H. Screw M3 x 10
31	B9855BT	1	Nameplate
32	A9235SP	1	Switch (st'd)
	A9238SP	1	Switch*13
33	-	1	Bracket
34	Y9304LS	3	B. H. Screw M3 x 4

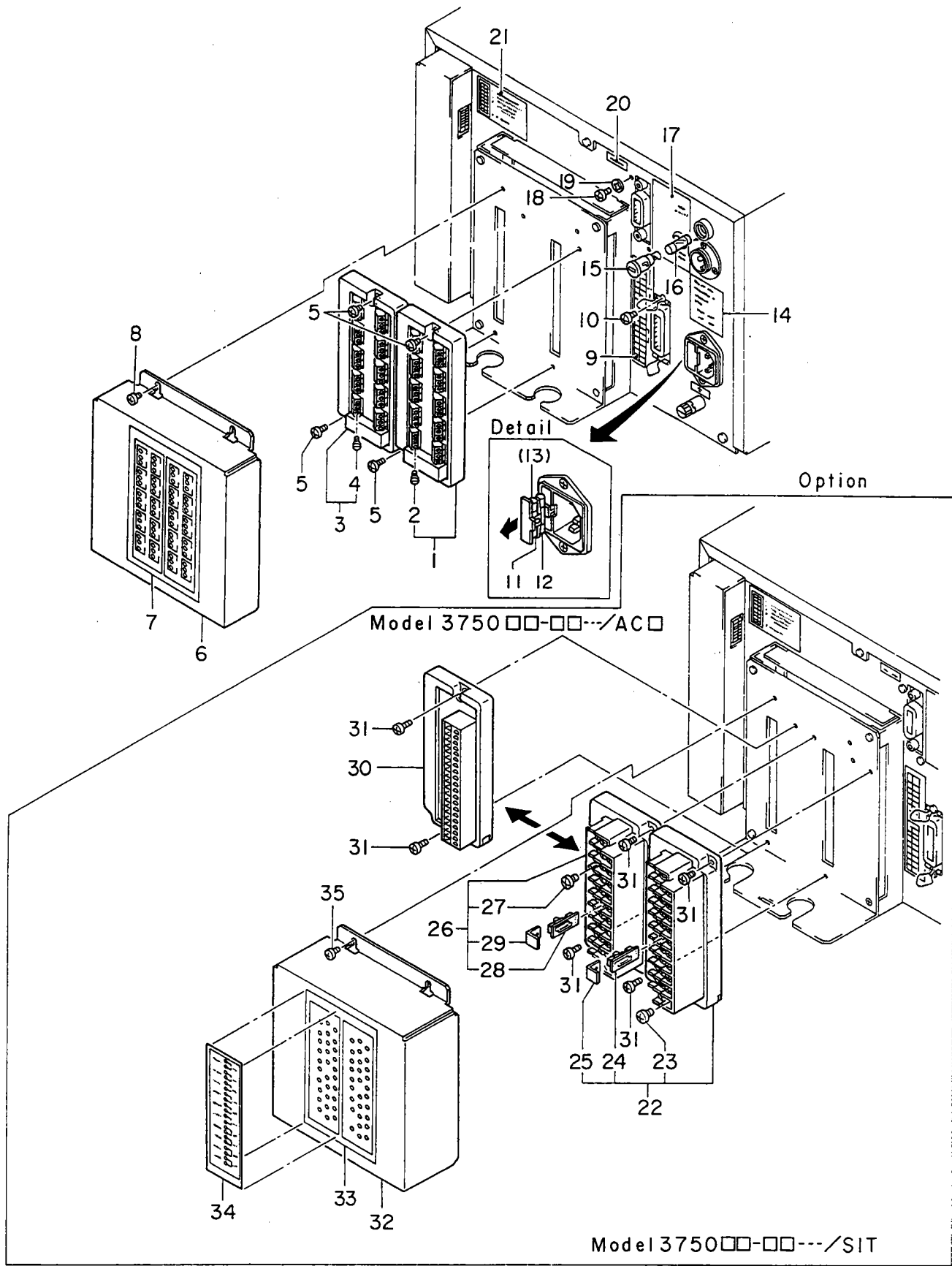
Note 1

Model	Suffix Code (options)	
3750 □□ □ □	/REM	*1
	.../AK-12	*2
	/REM.../AK-12	*3
	/GP-1B	*4
	/RS-232C	*5
	.../AC-2	*8
	.../AC-6	*9
	.../AC□.../ULN	*10
	/ULN	*11
	.../MATH.../ULN	*12
	.../DC	*13

Note 2

\*6: 10 points /2s  
(high breakdown voltage  
Solid state relay)

\*7: 20 points /2s  
(high breakdown voltage  
Solid state relay)



Item	Part No.	Qty	Description
1	B9627YA	1	Terminal Assembly*1
2	B9627YH	30	Screw
3	B9627YA	1	Terminal Assembly*2
4	B9627YH	30	Screw
5	Y9308LS	4	B. H. Screw M3 x 8
6	-	1	Cover
7	B9855BB	1	Nameplate
8	Y9304LS	2	B. H. Screw M3 x 4
9	B9627RN	1	Nameplate
10	Y9304LS	2	B. H. Screw M3 x 4*3
11	-	1	Fuse Holder
12	A9197KF	1	Fuse (1.25 A, timelag)
(13)	A9197KF	1	Fuse (1.25 A, timelag) (accessory)
14	B9627RM	1	Nameplate
15	A9195KF	1	Fuse Carrier
16	A9105KF	1	Fuse (10 A) } *4
17	B9855BZ	1	Nameplate
18	Y9304LS	2	B. H. Screw M3 x 4
19	Y9301WL	2	Washer (with toothed lockwasher) } *5 *6
20	B9627RR	1	Nameplate*5
	B9627RS	1	Nameplate*6
21	B9855BJ	1	Nameplate
22	B9627PA	1	Terminal Assembly
23	B9655FX	30	B. H. Screw M4 x 6 ( ± ) } *1 *7
24	B9578WC	1	R. J. C. Board Assembly
25	-	1	Cover
26	B9627PA	1	Terminal Assembly
27	E9655FX	30	B. H. Screw M4 x 6 ( ± ) } *2 *7
28	B9578WC	1	R. J. C. Board Assembly
29	-	1	Cover
30	B9627ZC	1	Terminal Assembly*2 *8
	B9627ZD	1	Terminal Assembly*2 *9
31	Y9308LS	4	B. H. Screw M3 x 8
32	-	1	Cover
33	B9855BQ	1	Nameplate*7
34	B9627ZA	1	Nameplate*2 *8 } (select either one)
	B9627ZB	1	Nameplate*2 *9
35	Y9304LS	2	B. H. Screw M3 x 4

Note 1

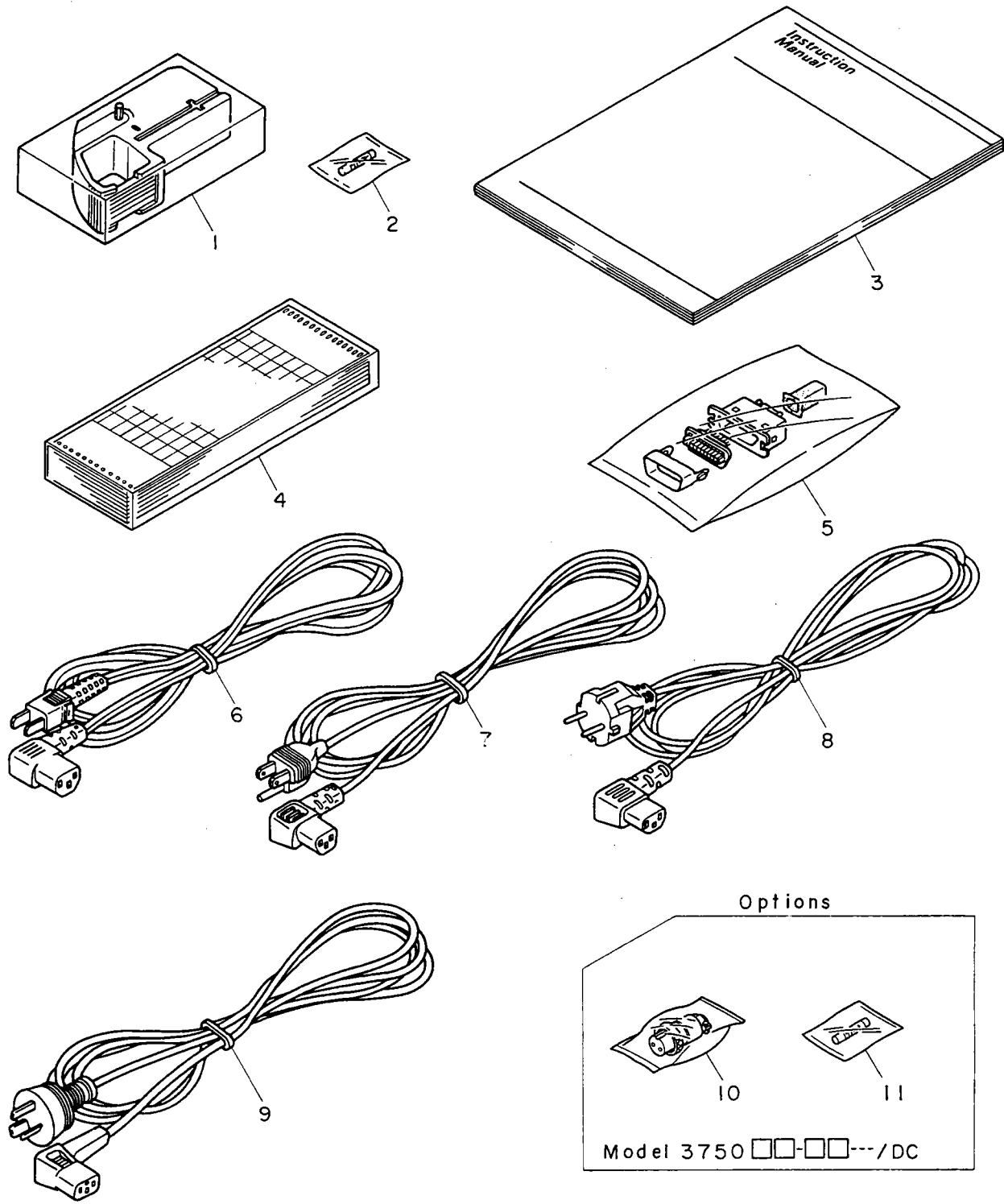
Model	Suffix Code (options)	
3750 □□ - □□	/REM .../AK-02	*3
	.../DC	*4
	/GP-IB	*5
	/RS-232C	*6
	.../SIT	*7
	.../AC2	*8
	.../AC6	*9

Note 2

\*1: 10 points /2s  
(high breakdown voltage  
solid state relay)

\*2: 20 points /2s  
(high breakdown voltage  
solid state relay)

Standard Accessories



Item	Part No.	Qty	Description
1	B9627AZ	1	Ribbon Cassette
2	B9197KF	1	Fuse (1.25 A timelag)*1
3	-	1	Instruction Manual
4	-	1	Z-Fold Chart*2
5	B9026KC	1	Connector (36-pin connector)
6	A9009WD	1	Power Supply Cord (other than below)
7	A9008WD	1	Power Supply Cord (UL standard)
8	A9011WD	1	Power Supply Cord (VDE standard)
9	A9026WD	1	Power Supply Cord (SAA standard)
10	A9614KC	1	Connector
11	A9105KF	1	Fuse (10 A)

(select)

\*2

Note

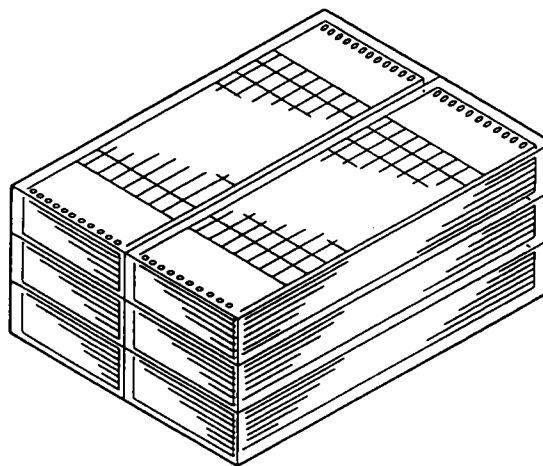
\*1: Located in the fuse holder, see pages 10 & 11 item 13

\*2: Model 3750 □□-□□.../DC (option)

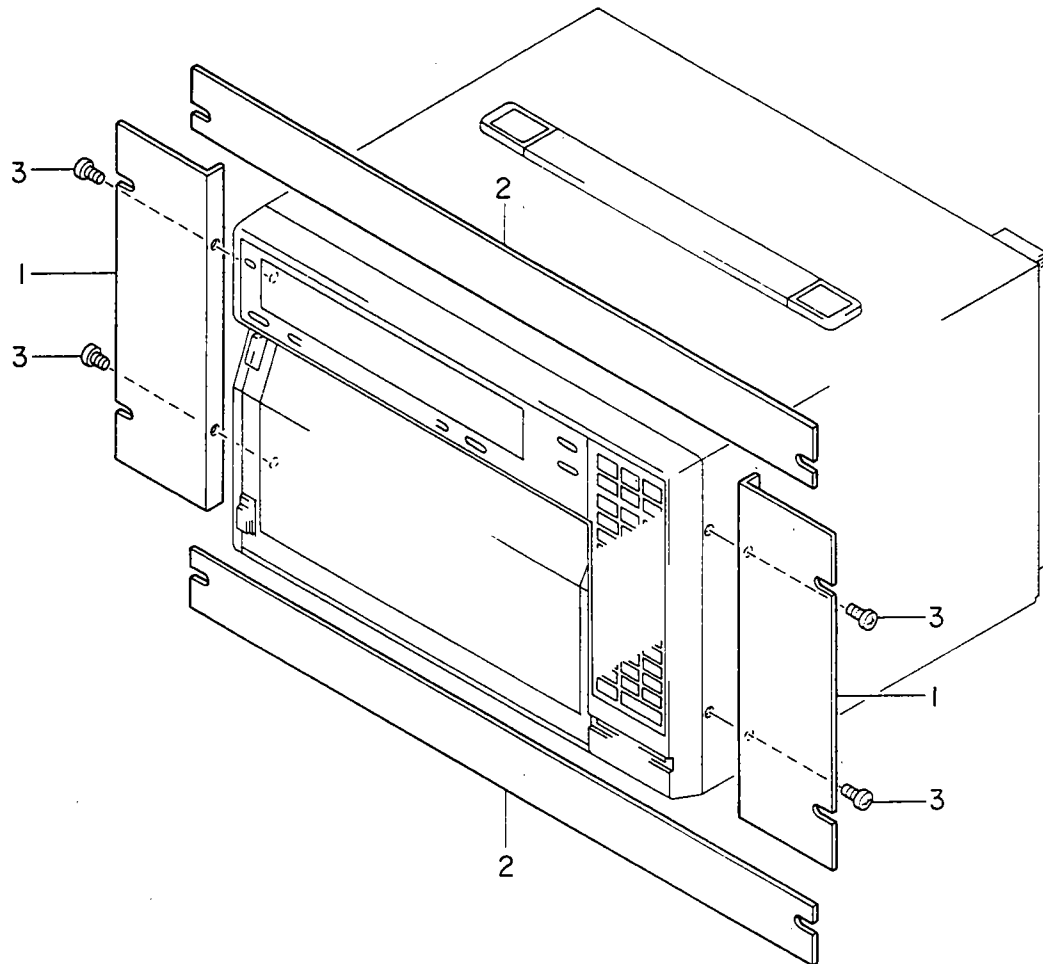
Spares

Note\*2 : Z-fold Chart is supplied in packs of 6 sheaves.  
(One pack is the minimum order quantity.)

Parts No.	Order Q'ty	Description
B9855AY	6 units (1 pc./unit)	20 m (10 mm div. on time axis)



## Rack Mounting



Code	Item	Part Name	Qty	Description
379811	1	Rack Adapter	2	JIS
	2	Plate	2	
379813	3	B. H. Screw M4 x 8	4	ANSI

# YOKOGAWA

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