
Service Manual

Model 436101/436102/436103/436104/436106
μR10000

Important Notice to the User

- This manual contains information for servicing YOKOGAWA's μ R10000. Check the serial number to confirm that this is the correct service manual for the instrument to be serviced. Do not use the wrong manual.
- Before any maintenance and servicing, read all safety precautions carefully.
- Only properly trained personnel may carry out the maintenance and servicing described in this service manual.
- Do not disassemble the instrument or its parts, unless otherwise clearly permitted by this service manual.
- Do not replace any part or assembly, unless otherwise clearly permitted by this service manual.
- In principle, Yokogawa Electric Corporation (YOKOGAWA) does not 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, reliability, or user safety hazards.
- 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 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 troubleshooting 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 microprocessors, large scale CMOS gate arrays, and surface-mount components to provide state-of-the-art performance and functions.
 - Repair of components can only be performed by specially trained and qualified maintenance personnel with special highly accurate tools, including costly ones.
 - 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 downtime.
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Introduction

This manual contains information for servicing YOKOGAWA's μ R10000.

Note

This is the first edition of the manual, dated March 2005.

WARNING

This service manual is to be used by properly trained personnel only. To avoid personal injury, do not perform any servicing unless you are qualified to do so. Refer to the safety precautions prior to performing any servicing. Even if servicing is carried out according to this service manual, or by qualified personnel, YOKOGAWA assumes no responsibility for any result occurring from that servicing.

Safety Standards and EMC Standards

This recorder conforms to IEC safety class I (provided with terminal for protective grounding), Installation Category II, Measurement Category II (CAT II), and EN61326-1 (EMC standard), class A (use in a commercial, industrial, or business environment). This recorder is designed for indoor use.

Precautions Related to the Protection, Safety, and Alteration of the Product

- The following safety symbols are used on the product and in this manual.
 -  "Handle with care." To avoid injury and damage to the instrument, the operator must refer to the explanation in the manual.
 -  Protective ground terminal
 -  AC
 -  "High temperature." To avoid injury caused by hot surface, do not touch locations where this symbol appears.
- For the protection and safe use of the product and the system controlled by it, be sure to follow the instructions and precautions on safety that are stated in this manual whenever you handle the product. Take special note that if you handle the product in a manner that violate these instructions, the protection functionality of the product may be damaged or impaired. In such cases, YOKOGAWA does not guarantee the quality, performance, function, and safety of the product.
- When installing protection and/or safety circuits such as lightning protection devices and equipment for the product and control system or designing or installing separate protection and/or safety circuits for fool-proof design and fail-safe design of the processes and lines that use the product and the control system, the user should implement these using additional devices and equipment.
- If you are replacing parts or consumable items of the product, make sure to use parts specified by YOKOGAWA.
- This product is not designed or manufactured to be used in critical applications that directly affect or threaten human lives. Such applications include nuclear power equipment, devices using radioactivity, railway facilities, aviation equipment, air navigation facilities, aviation facilities, and medical equipment. If so used, it is the user's responsibility to include in the system additional equipment and devices that ensure personnel safety.
- Do not modify this product.

WARNING

- **Power Supply**
Ensure that the source voltage matches the voltage of the power supply before turning ON the power.
- **Protective Grounding**
Make sure to connect the protective grounding to prevent electric shock before turning ON the power.
- **Necessity of Protective Grounding**
Never cut off the internal or external protective earth wire or disconnect the wiring of the protective earth terminal. Doing so invalidates the protective functions of the instrument and poses a potential shock hazard.
- **Defect of Protective Grounding**
Do not operate the instrument if the protective earth or fuse might be defective. Make sure to check them before operation.
- **Do Not Operate in an Explosive Atmosphere**
Do not operate the instrument in the presence of flammable liquids or vapors. Operation in such environments constitutes a safety hazard.
- **Do Not Remove Covers**
The cover should be removed by YOKOGAWA's qualified personnel only. Opening the cover is dangerous, because some areas inside the instrument have high voltages.
- **External Connection**
Connect the protective grounding before connecting to the item under measurement or to an external control unit.
- **Damage to the Protective Structure**
Operating the recorder in a manner not described in this manual may damage its protective structure.

Exemption from Responsibility

- YOKOGAWA makes no warranties regarding the product except those stated in the WARRANTY that is provided separately.
- YOKOGAWA assumes no liability to any party for any loss or damage, direct or indirect, caused by the user or any unpredictable defect of the product.

Conventions Used in This Manual

WARNING

Calls attention to actions or conditions that could cause serious or fatal injury to the user, and precautions that can be taken to prevent such occurrences.

CAUTION

Calls attentions to actions or conditions that could cause light injury to the user or damage to the instrument or user's data, and precautions that can be taken to prevent such occurrences.

Overview of This Manual

This manual is meant to be used by qualified personnel only. Make sure to read the safety precautions at the beginning of this manual as well as the warnings and cautions contained in the chapters relevant to any servicing you may be carrying out.

This manual contains the following chapters.

Chapter 1 Principles of Operation

Describes the principles of operation of the recorder.

Chapter 2 Troubleshooting

Lists problems that can occur and gives corrective actions.

Chapter 3 Tests

Gives procedures for testing the performance of the instrument.

Chapter 4 Adjustments

Explains how to adjust the instrument.

Chapter 5 Schematic Diagram

Provides a system configuration diagram.

Chapter 6 Customer Maintenance Parts List

Contains exploded views and a list of replaceable parts.

Chapter 7 Replacing Parts

Provides procedures for replacing components of the recorder.

Specifications are not included in this manual. For specifications, refer to the *μR10000 Recorder User's Manual* (IM 04P01B01-01E).

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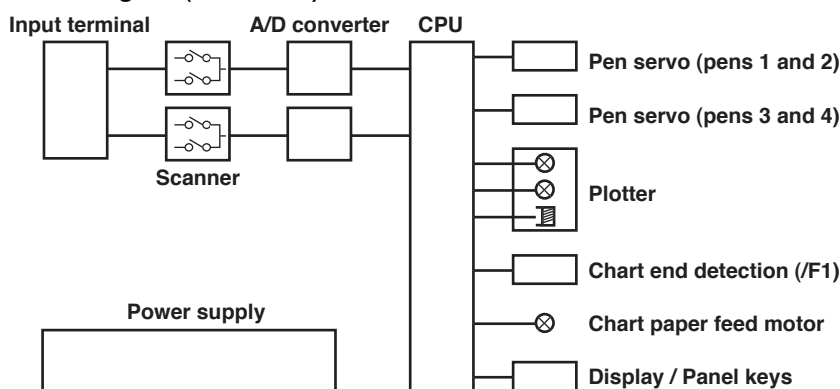
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1.1 Principles of Operation

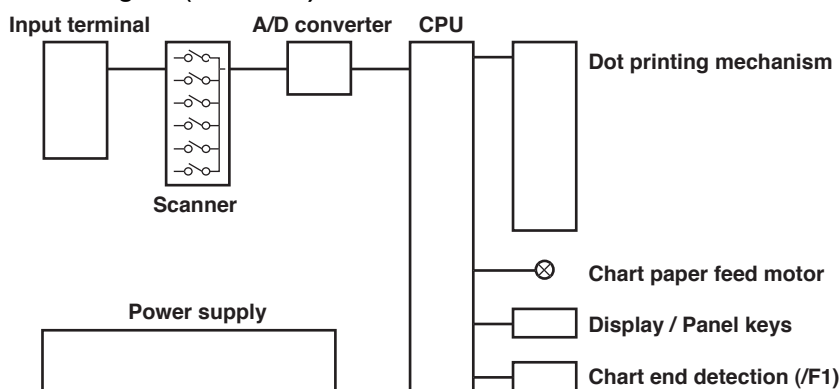
Block Diagram

The following explains the principles of operation of the μ R10000.

Block Diagram (Pen Model)



Block Diagram (Dot Model)



Input Terminal

For connecting the measurement input signal wires. The terminals can be used for DC voltage, thermocouple, resistance temperature measurement, and contact input.

- The reference junction compensation circuit for thermocouples is built in.
- Proven transistor method used for measuring the temperature of the terminals.
- Metal core construction used in the internal printed circuit boards to equalize temperature.
- Input terminals removable.

Scanner

Switches the measured input signal (channel). The input signal switching section uses highly reliable solid state relays (SSR).

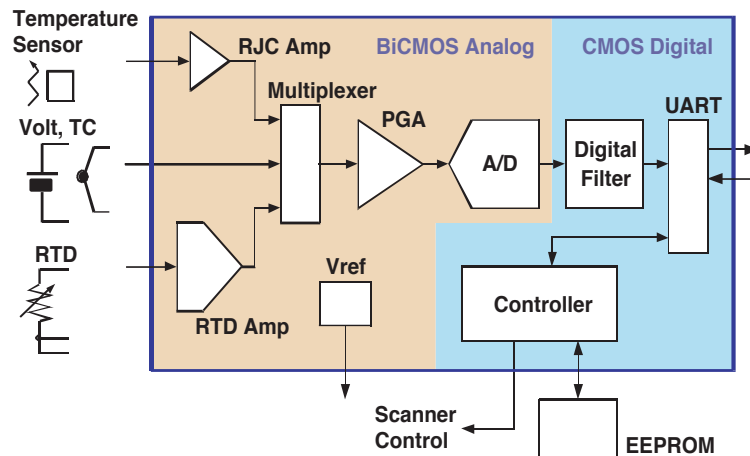
The pen models use two A/D converter, one is for channels 1 and 2, the other for channels 3 and 4.

On the dot model, all channels are driven by one A/D converter.

A/D Converter

ASIC

Uses a proprietary one-chip ASIC. The ASIC is a combination analog/digital IC that contains popular CMOS processes. The table below shows its configuration.



- **Controller**
Controls switching of the input signal by the scanner, and switching of the A/D converter attenuator and RTD/TC mode.
- **PGA (programmable gain amplifier)**
Programmable amplifier with a gain of 1 to 100 times.
- **A/D**
Converts analog signals to digital signals. Uses a pulse width modulation-based integrating A/D converter that suppresses the effects of noise on the input signal. The dot model converts six channels of data per second.
- **UART (Universal Asynchronous Receiver-Transmitter)**
Performs serial communications with the CPU via a photocoupler.

EEPROM

Stores data modified by the A/D converter.

Pen Servo (Pen Model)

Balances the pen in the recording position.

- Uses a compact, lightweight motor with a photoencoder.
- The motor is attached to the pen carriage, and moves with the pen.
- The revolution of the motor is controlled by PWM signals from the CPU.

Plotter (Pen Model)

The pen model includes an XY plotter for printing. The plotter consists of an X-axis motor positioned in the plotter assembly, the Y-axis motor installed in the carriage, and a solenoid for moving the pen up and down.

Printing Mechanism (Dot Model)

Uses a field-proven six-color wire dot printing system. Also, follows a raster scan method* that helps maintain the life-span of the drive train wire. It consists of a driver board, carriage motor, ribbon shift motor, and other components.

- * The printing carriage moves in alternation from left to right and right to left every recording interval, and prints measured values. When the printing carriage moves from left to right, measured values are printed in the appropriate order starting on the left. When the printing carriage moves from right to left, measured values are printed in the appropriate order starting on the right.

Display / Panel Keys

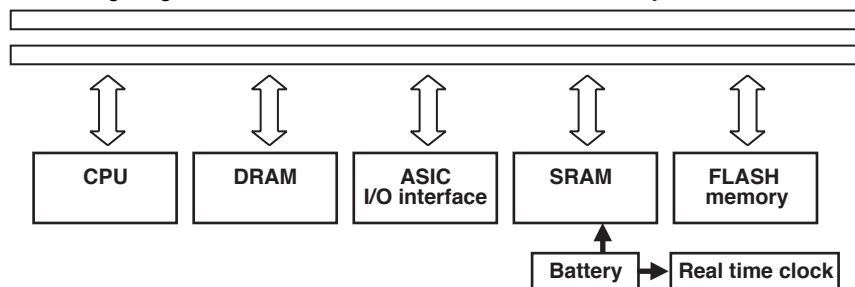
- Offers a variety of display types, with a fluorescent character display tube (VFD) of 101 dots (horizontal) x 16 dots (vertical).
- Seven keys are available for operation and settings.
- White LEDs are installed for illuminating the z-fold chart paper. The LED can be replaced.

Power Supply

A universal type power supply unit supplying a voltage of 100 V to 240 VAC at a frequency of 50/60 Hz. The fuse is built in and cannot be replaced.

CPU

The following diagram shows the structure of the CPU Assembly.



- **FLASH memory**

The following are saved on the Flash ROM.

- Programs
- Ribbon shift adjustment data (dot model)
- Pen servo adjustment data (pen model)
- The mac address and related data
- System configuration data

- **SRAM**

The following are saved on the SRAM.

Data deleted in the RAM Clear process (backed up by battery)

- Zero/Span position
- Hysteresis adjustment data (dot model)
- Data deleted in the RAM Clear process
- User settings (input range, etc.)

- **Battery**

A lithium battery. Backs up the SRAM and real time clock.

- **ASIC**

Contains interface functions for the motor and actuator, A/D converter, display, panel key, and other items. Controls the pen servo mechanism.

- **CPU and DRAM**

Firmware is installed from flash memory to the DRAM. The CPU operates according to the program in the DRAM.

2.1 Failure Analysis and Repair Procedures

This section describes failure analysis and repair procedures.

Failure Analysis Procedures

- 1 Determine the type of problem.
- 2 Check for possible user error. Check the connections and the settings of equipment to determine whether there was a handling mistake.
- 3 Execute the self diagnostic test by turning the power ON, and identify any problem items.
- 4 Analyze the cause of the problem according to the troubleshooting flow chart.

WARNING

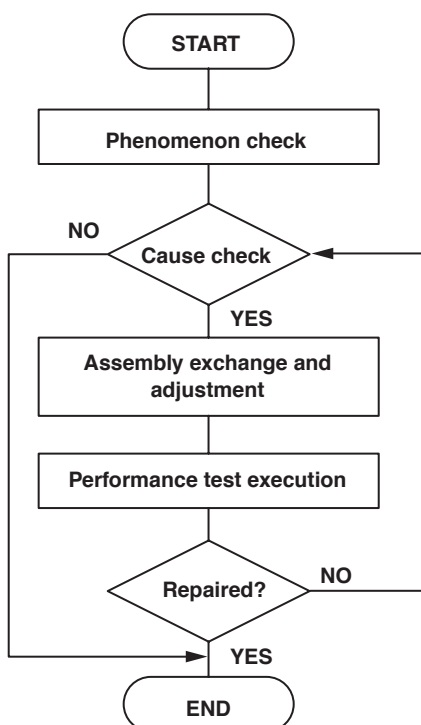
Do not touch the circuit or parts with live voltage because the power unit contains a high-voltage electrical circuit. The power unit is furnished with a dedicated cover to prevent electric shock. Do not remove this cover. Never touch any part not subject to adjustment.

CAUTION

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

Flow Chart

This flow chart consists of general service operations when a fault occurs. This chart is not always suitable for every kind of fault. However, it is recommended to perform operations according to the flow chart.



2.2 Failures and Corrective Actions

The table below describes the most common types of failures and their corrective actions.

No.	Phenomenon	Action			Description	Refer to chapter 6	
		Check	Adjust	Replace		Page	Item
1	No power	✓			Condition of power supply connection	-	-
					Power supply voltage	-	-
				✓	Peripheral wiring of the CPU Assembly	6-4, 14	12
					Popwer Assembly	6-6, 16	8
					CPU Assembly	6-4, 14	12
2	Fail display (option /F1)			✓	Other Assemblies (power supply part short)	-	-
					CPU Assembly	6-4, 14	12
3	Date/time is initialized	✓		✓	Voltage and connection of Battery Assembly		
					CPU Assembly	6-4, 14	12
					Battery Assembly	6-4, 14	14
4	Problem with key operation	✓			Key lock function	-	-
					FPC connection between Display Assembly and Pen/Dot Joint PCB	6-4, 14	1, 6
				✓	Display Assembly	6-4, 14	1
					CPU Assembly	6-4, 14	14
5	Problem with display	✓		✓	FPC connection between Display Assembly and Pen/Dot Joint PCB	6-4, 14	1, 6
					Display Assembly	6-4, 14	1
					CPU BAssembly	6-4, 14	14
6	(Pen Model) Pen recording quality poor	✓		✓	Pen axis load, condition of shaft, abnormal noises, etc.	-	-
					Adjust the recording position.	-	-
					Pen Servo Assembly	6-5	22
7	(Pen Model) Pen does not move Error message (Error: 963)-> PEN1 Error message (Error: 964)-> PEN2 Error message (Error: 965)-> PEN3 Error message (Error: 966)-> PEN4	✓			Check whether the recorder has started, as well as the pen axis load, abnormal noises, etc.	-	-
					FPC connection between Pen Servo Assembly and Pen Driver PCB	6-5 6-4	22 7
					FPC connection between Pen Driver PCB and Pen Joint PCB	6-4 6-4	7 6
				✓	Pen Servo Assembly	6-5	22
					Pen Driver PCB	6-4	7
					Pen Joint PCB	6-4	6
8	(Dot Model) Printer does not function. Printer error message (Error: 961)	✓			FPC connection between Dot Driver PCB and Dot Joint PCB	6-14 6-14	7 6
					Wiring to the Motor Assembly	6-15	23
				✓	Dot Driver PCB	6-14	7
					Dot Joint PCB	6-14	6
					Motor Assembly	6-15	23
9	(Dot Model) Printer carriage moves, but the home position (zero position) is not detected. Printer error message (Error: 961)	✓			FPC connection between Dot Driver PCB and Dot Joint PCB	6-14 6-14	7 6
					Printer carriage load, noises, etc.	-	-
				✓	Home position sensor	6-15	14
					Dot Driver PCB	6-14	7
					Dot Joint PCB	6-14	6
					Motor Assembly	6-15	23

No.	Phenomenon	Action			Description	Refer to chapter 6	
		Check	Adjust	Replace		Page	Item
10	(Dot Model) Printer carriage does not move.	✓		✓	Whether the recorder has started, carriage load, abnormal noises, etc.	-	-
					Motor Assembly (Carriage motor)	6-15	23
					Dot Driver PCB	6-14	7
11	(Dot Model) Ribbon error message (Error: 960I)	✓		✓	Load check		
					Whether the gears mesh correctly.		
					FPC connection between Dot Driver PCB and Dot Joint PCB	6-14	7
						6-14	6
12	(Dot Model) Ribbon does not feed.	✓		✓	Motor Assembly (Ribbon shift motor)	6-15	10
					Is ribbon cassette installed correctly?		
					Do the gears mesh correctly?		
					Connection between Dot Driver PCB and Dot Joint PCB	6-14	7
13	(Dot Model) Printed colors bleed.	✓		✓		6-14	6
						6-15	10
14	(Dot Model) Trend recording not normal.	✓		✓	Motor Assembly (Ribbon feed motor)		
15	(Dot Model) Print quality poor	✓		✓	Adjust the ink ribbon	-	-
16	(Dot Model) Does not print.	✓		✓	Adjust the recording position	-	-
					Adjusting the hysteresis	-	-
					Does the ribbon feed?	-	-
					Does the Carriage Assembly wire dot head operate?	-	-
17	Chart paper does not feed.	✓		✓	Carriage Assembly	6-15	14
					Dot Driver PCB	6-14	7
					Is the chart installed correctly?	-	-
					Do the gears mesh correctly?		
18	Internal illumination dim.	✓		✓	Motor Assembly (Chart feed)	6-15	10
					Pen/Dot Joint PCB	6-14	7
19	Internal illumination does not turn ON.	✓		✓	Internal illumination brightness	-	-
					LED Assembly	6-4, 14	2
20	The measured value is not correct	✓		✓	LED Assembly	6-4, 14	2
					Display Assembly	6-4, 14	1
21	Measured values fluctuate.	✓		✓	Input section wiring	-	-
22	Voltage measurement is good, but temperature measurement is not correct.	✓		✓	Noise effects		
					Is the Integral Time setting of the A/D converter correct?	-	-
					Noise effects		
23	Voltage measurement is good, but temperature measurement is not correct.	✓		✓	Scanner PCB	6-6, 16	14,15
					Is the Reference Junction Compensation setting correct? Is the terminal cover installed?	-	-
					Input Terminal Assembly (RJC Board)	6-7, 17	5
24		✓		✓	A/D Board PCB	6-6, 16	13

3.1 Acceptance Test

This section describes the procedure to perform the acceptance test.

1. Read the preface to the user's manual, "Checking the Contents of the Package" and verify that you have all of the contents.
2. Make sure to understand the operating procedures as described in the user's manual.
3. Check each function using the user's manual.
4. Read and implement section 3.2, "Self Diagnostic Test."
5. Read and implement section 3.3, "Performance Test."

3.2 Self Diagnostic Test

The recorder is provided with complete self diagnostic functions to enhance reliability in measurement and serviceability.

When you turn ON the power, the recorder will automatically execute the following types of diagnoses alternately and display the results. After these tests are completed, the recorder is ready for use.

1. Main program (Flash ROM) test
2. Main RAM write/read test
3. A/D and A/D EEPROM test
4. Memory acquisition test (write test from Flash)
5. Mechanical system test
6. Ethernet module test

The table below shows the results of the self diagnostic tests when a problem is detected.

Error display	Possible Cause
B3 secondary copy error.	Problem with CPU Assembly
B4 Flash Device error.	
B5 Flash SUM error.	
B6 Flash Data error.	
902 RAM failure.	Problem around the A/D Board PCB or EEPROM
910 A/D error.	
951 EEPROM write error.	
921 A/D calibration value error.	Problem with the A/D Board PCB or wrong adjustment data value for the A/D Board PCB.
922 A/D calibration is in the wrong order.	
930 Memory acquisition failure.	Problem with CPU Assembly
940 The ethernet module is down.	Problem with the COMM PCB or CPU Assembly
950 A/D number error.	Problem with the A/D Board PCB (installation of the A/D Board PCB out of spec)
960 Ribbon error.	(Dot model) Problem with the ribbon shift mechanism or Dot10 CPU Assembly
961 Printer error.	(Dot model) Abnormal movement of the printing carriage or problem with the Dot10 CPU Assembly
962 Plotter error.	(Pen model) Problem with Pen CPU Assembly
963 Pen 1 error.	(Pen model) Abnormal movement of the Pen Servo Assembly or problem with the Pen CPU Assembly
964 Pen 2 error.	
965 Pen 3 error.	
966 Pen 4 error.	

3.3 Performance Tests

Read the warning and cautions below before beginning tests.

WARNING

- Circuit patterns of the printed circuit board are exposed. Be careful when handling so that hands or fingers are not injured by the protruding pins.

CAUTION

- Circuit patterns of the printed circuit board are exposed. If other metallic materials touch these patterns, electrical shorting will occur, causing the circuit to be damaged or burnt.
- It is sometimes necessary to turn the recorder upside down for adjustment. Do not drop the instrument, or allow it to fall over.

Test Environment

Item	Conditions
Ambient temperature	23 ± 5°C
Relative humidity	55 ± 20%
Atmospheric pressure	86 kPa-106 kPa
Power supply voltage	Nominal voltage ±1%
Power supply frequency	Nominal frequency ±1%
Power supply waveform	Distortion factor of 5% or less
DC power supply ripple	Content ratio of 0.1% or less
Vibration	A value having negligible effects on the instrument
Position	Within ±3% of the specified position
Interference*	A value that does not affect the measured results
Electrical field	A value that does not affect the measured results
Magnetic field	A value that does not affect the measured results
Atmospheric pollutants	Levels of corrosive gasses, vapors, salts, and dust that do not affect the measured results.
Other external effects**	A value that does not affect the measured results

* *Interference* refers to common mode noise, series mode noise, power supply noise, and other phenomena in the signal line.

** Other external effects include luminance, draft, ultrasonic waves, and radiation.

Test Instruments

Instrument	Specifications
DC voltage generator	Accuracy: ±0.01% of setting or better
DMM	Accuracy: ±0.01% of rdg or better
Variable resistors	Accuracy: 0.01% + 2 mΩ or better
Insulation tester	500 VDC
Withstand voltage tester	1 to 1.5 kVAC
Glass scale	105 mm or more

Key Operations on the Recorder

The recorder has the following modes. The following is an explanation of how to enter and exit each mode.

- **Operation Mode**

The mode in which the instrument is operated. The instrument enters this mode when the power is turned ON.

- **Setting Mode**

This mode is for entering the input range, alarms, and other settings.

- Hold down the **MENU** key for three seconds or longer while in operation mode to enter this mode.
- To return to operation mode, hold down the **MENU** key for three seconds again.
- In this mode, the functions of the keys are those printed above the keys in characters and symbols.



- **Basic Setting Mode**

This mode is for setting up the thermocouple burnout function, action of alarm output relays, and other of the recorder's basic specifications.

- To enter this basic setting mode, hold down the **DISP** key and the **FUNC** key for three seconds or longer while in setting mode. In this mode, the functions of the keys are those printed above the keys in characters and symbols.
- To exit basic setting mode, display **Basic = End** then press the **CH UP** key. Choose **Store** or **Abort** in the **End =** screen, and press the **CH UP** key. If you choose Store, the settings are applied and the instrument returns to operation mode. If you choose Abort, the settings are canceled and the instrument returns to operation mode.

Note

For operating procedures in setting mode and basic setting mode, see the μ R10000 Recorder User's Manual (IM04P01B01-01E).

- **Test/Adjustment Mode**

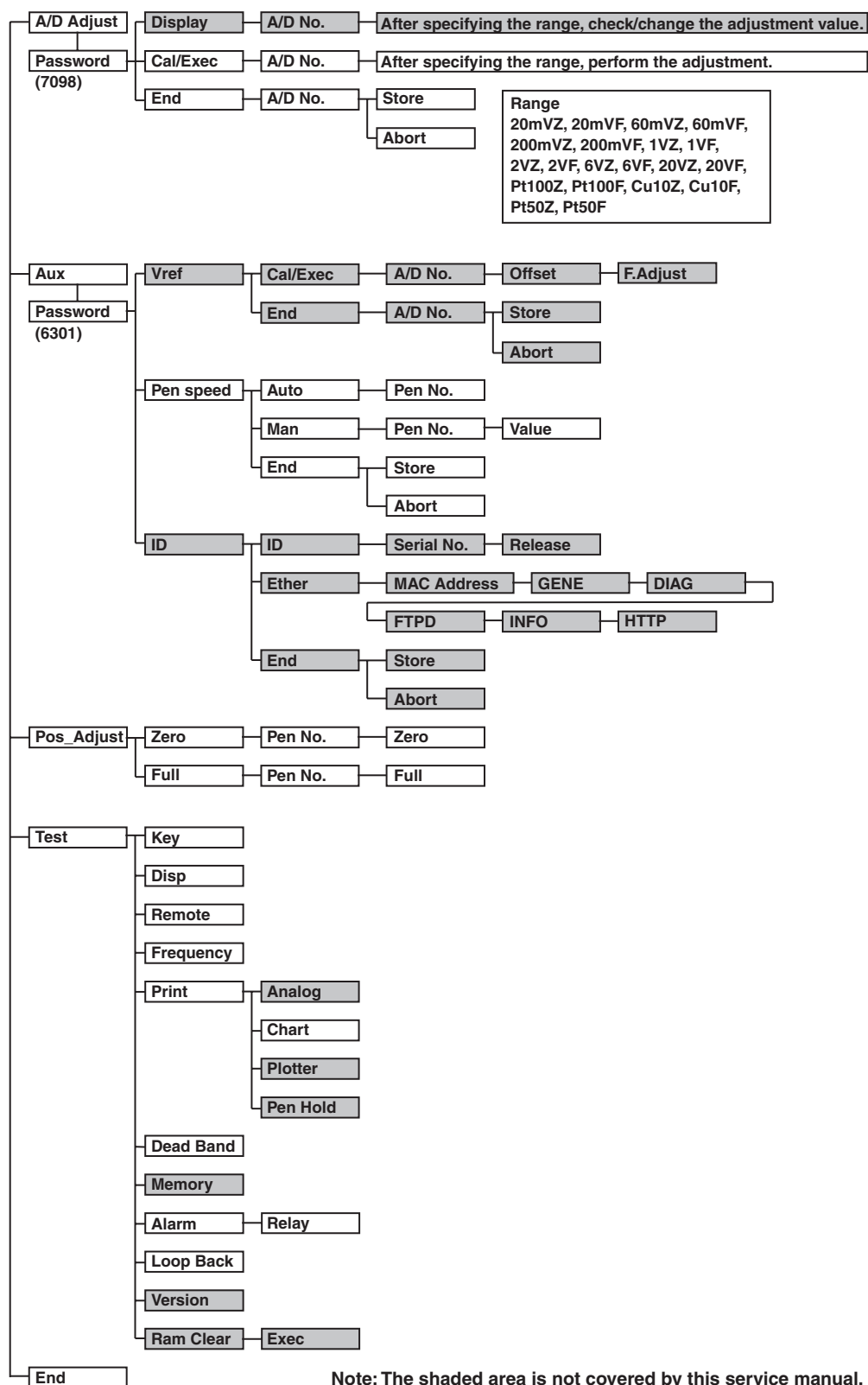
The mode in which the instrument is adjusted and tested.

- Enter this mode by pressing the **MENU** and **CH UP** keys while turning ON the power. The Test/Adjustment Mode menu is displayed. In this mode, the functions of the keys are those printed above the keys in characters and symbols.
- To return to operation mode, display **Menu = End** then press the **CH UP** key.
- The following shows the structure of Test/Adjustment Mode. The shaded area is not covered by this service manual.

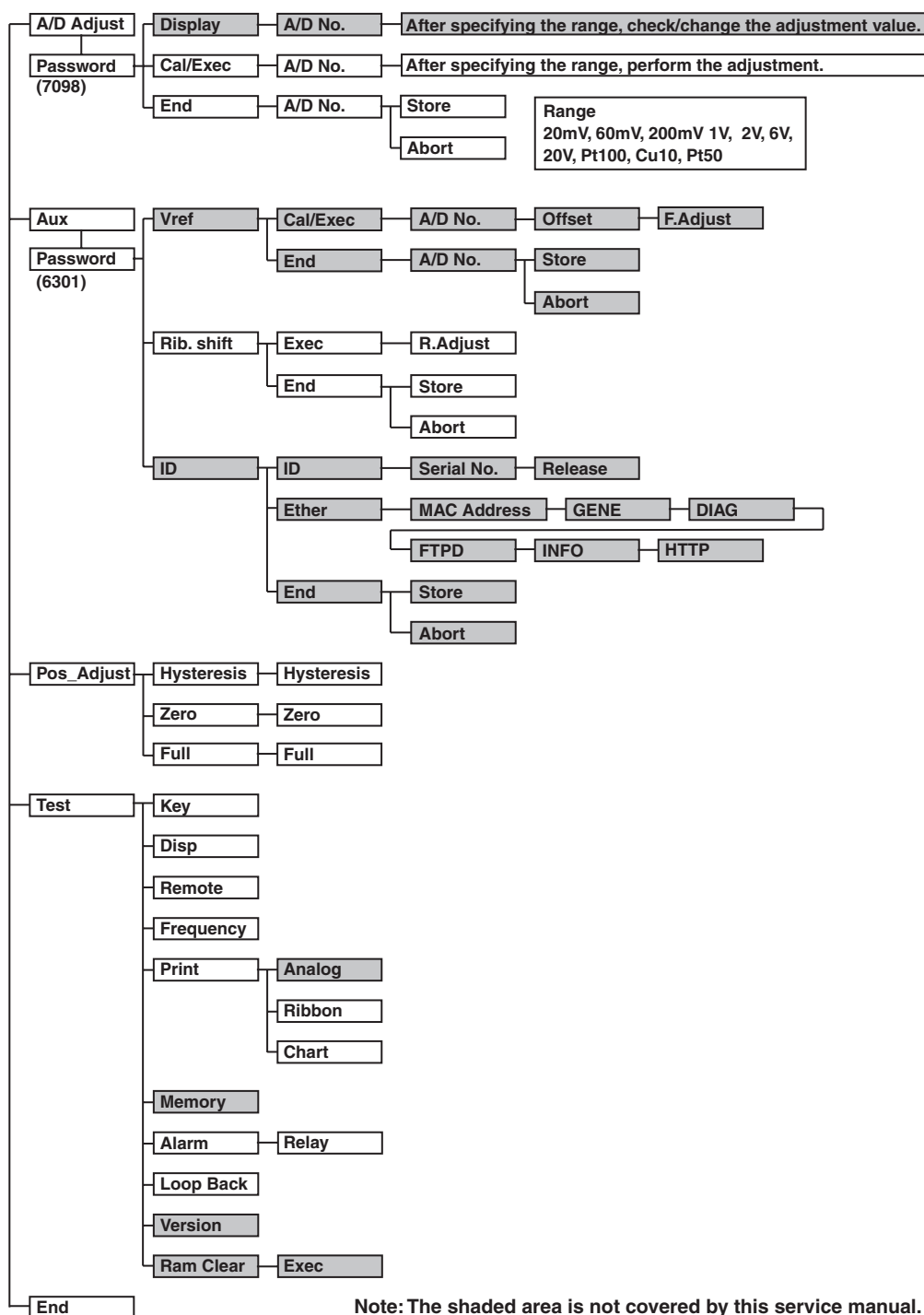
CAUTION

Do not enter settings in Test/Adjustment Mode that are not specified by this manual. Changing the settings can result in incorrect operation of the instrument.

The Test/Adjustment Mode Menu (Pen Model)



The Test/Adjustment Mode Menu (Dot Model)



Tests

The following is a list of the tests of the μ R10000.

- Insulation Resistance
- Protective Grounding
- Withstand Voltage
- Measurement Accuracy
- Channel-to-Channel Error
- Burnout Detection
- Reference Junction Compensation Accuracy
- Display
- Key
- Power Supply Frequency Detection
- Battery Backup
- Recording Accuracy
- Z-Fold Chart Paper Feed Accuracy
- Dead Band (Pen Model)
- Pen Offset (Pen Model)
- Ink Bleed (Dot Model)
- Overscale Amount
- Relay Contact Output
- Remote Control Input
- Loop Back Test
- Z-Fold Chart End Detection
- Other Functions in Test Mode

3.4 Test Procedures

Insulation Resistance

● Procedures

Perform a measurement with an insulation tester and check whether the results meet the criteria. Perform the measurement with the power switch turned ON.

Criteria

Terminals Measured	Criteria	Condition
Between the power and earth terminals	100 M Ω or more	Short the L and N terminals.
Between the input and earth terminals	100 M Ω or more	Short all input terminals.
Between input terminals	100 M Ω or more	Short the odd and even channels of the +/A, -/B, and b* terminals, and measure between odd and even channels.
Between the relay contact output terminals and earth terminals	100 M Ω or more	With the /A1, /A2, /A3, or /F1 option. Short all relay contact output terminals.
Between remote control input C terminal and earth terminals	100 M Ω or more	With the /R1 option.
Between the RS-422A/485 SG terminals and earth terminals	100 M Ω or more	With the /C3 option.
Between the Ethernet terminal and earth terminals.	100 M Ω or more	With the /C7 option. Short all input/output terminals

* With the dot model without the /N2 option, exclude the b terminal. The b terminals are connected to all channels.

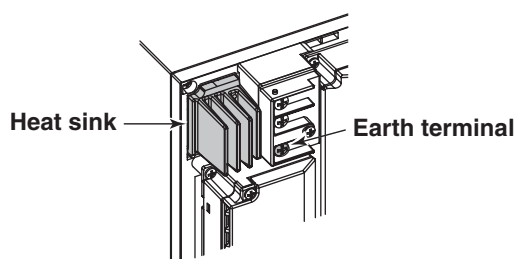
Protective Grounding

● Procedures

Perform a resistance measurement with a DMM (Digital Multi Meter), and check whether the results meet the criterion.

Criterion

Measured Location	Criterion
Between earth terminal and power supply heat sink	0.2 Ω or less



Withstand Voltage

● Procedures

Perform the test with a withstanding voltage tester, and check whether the results meet the criteria. Perform the measurement with the power switch turned ON.

Test Duration

The test duration is one minute.

Criteria

Tested Terminals	Applied Voltage	Max Allowable Leak Current	Condition
Between the power and earth terminals	1.5 kVAC	5 mA	Short the L and N terminals.
Between the input and earth terminals	1.0 kVAC	1 mA	Short all input terminals.
Between input terminals	1.0 kVAC	1 mA	Short the odd and even channels of the +/A, -/B, and b* terminals, and measure between odd and even channels.
Between the relay contact output terminals and earth terminals	1.5 kVAC	1 mA	With the /A1, /A2, /A3, or /F1 option. Short all relay contact output terminals.
Between remote control input C terminal and earth terminals	500 VDC	0.1 mA	With the /R1 option.

* With the dot model without the /N2 option, exclude the b terminal. The b terminals are connected to all channels.

Measurement Accuracy

● Overview

Tests the measuring accuracy of the recorder. The measurement accuracy test is performed in one of the following ways.

- One representative channel* for each A/D converter is tested, and the channel-to-channel error between the representative channel and other channels is tested (see next item).
 - * The pen model uses one A/D converter (A/D 1) for both channels 1 and 2, and another (A/D 2) for both channels 3 and 4. Choose channel 1 or 2 to test A/D 1, and channel 3 or 4 to test A/D 2.
The dot model uses a single A/D converter for channels 1 through 6. Choose any one of channels 1 through 6 to test the A/D converter.
- The measuring accuracy of all channels is tested separately.

● Test Instruments

Instrument	Specifications
DC voltage generator	Accuracy: $\pm 0.01\%$ of setting or better
DMM	Accuracy: $\pm 0.01\%$ of rdg or better
Variable resistors	Accuracy: $0.01\% + 2 \text{ m}\Omega$ or better

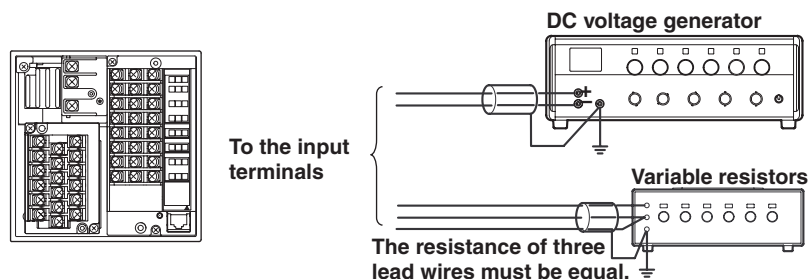
● Recorder Settings

Set the input range of the channels under test to the test range.

3.4 Test Procedures

● Procedures

Warm up the instrument for thirty minutes before performing the test. Set the ranges on the recorder, and input the values determined for each range. Check whether the displayed measured values meet the criteria.



Criteria

Range	Input Range	Allowed by Test	Accuracy Specification	Remarks
20mV	+20 mV	±3 digits	±(0.1% of rdgs.+2digits)	
	0 mV	±1 digits		
	-20 mV	±3 digits		
60mV	+60 mV	±6 digits		
	0 mV	±1 digits		
	-60 mV	±6 digits		
200mV	+200 mV	±3 digits		
	0 mV	±1 digits		
	-200 mV	±3 digits		
2V	+2 V	±3 digits		
	+1 V	±2 digits		
	0 V	±1 digits		
	-1 V	±2 digits		
	-2	±3 digits		
6V	+6 V	±6 digits	±(0.1% of rdgs+3 digits)	
	0 V	±1 digits		
	-6 V	±6 digits		
20V	+20 V	±3 digits		
	0 V	±1 digits		
	-20 V	±3 digits		
50V	+50 V	±5 digits		
	0 V	±2 digits		
	-50 V	±5 digits		
Pt100	-200°C: 18.52Ω	±0.4°C	±(0.15% of rdgs+0.3°C)	
	0°C: 100Ω	±0.2°C		
	600°C: 313.71Ω	±0.9°C		
TC-T	0 mV	±0.2°C		EXT RJC mode
TC-K	0 mV	±0.3°C		EXT RJC mode
Cu10 (GE)	-200°C: 1.326Ω	±1.4°C	±(0.4% of rdgs+1.0°C)	Performed when the /N1 option is specified.
	0°C: 9.036Ω	±0.8°C		
	300°C: 20.601Ω	±1.7°C		
Pt50	-200°C: 8.57Ω	±0.8°C	±(0.3% of rdgs+0.6°C)	Performed when the /N1 option is specified.
	0°C: 50Ω	±0.4°C		
	600°C: 158.64Ω	±0.9°C		

Channel-to-Channel Error

● Procedures

Pen Model

Assign inputs as shown in the table below in parallel to channels 1 and 2, and check whether the measured values on both channels meets the criteria. Perform the same test using channels 3 and 4.

Criteria

Range	Input	Criteria
20 mV	Short +/A and –/B	0.00 ± 0.01 mV
Pt100	103.9 Ω	$10 \pm 0.2^{\circ}\text{C}$, between channel dispersion within 0.2°C

Dot Model

Assign inputs as shown in the above table in parallel to channels 1 through 6, and check whether the measured values on all channels meets the test criteria.

- * The b terminal of the resistance temperature detector input is connected internally. However, when option /N2 is specified, the b terminal is isolated at each channel.

Burnout Detection

● Procedures

The test is performed on a representative channel* from each A/D converter. Set up the burnout detection function on the recorder in advance.

- * On a four-pen model for example, perform the test on channel 1 and channel 3. On a dot model, check an arbitrary channel.

Check the action in the following cases.

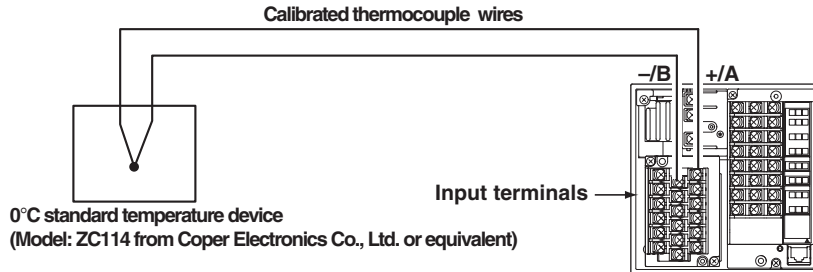
- Connect 2 k Ω between the channel's +/A terminal and –/B terminal. Set that channel's thermocouple type to K and check that a value close to room temperature is displayed.
- Connect 82 k Ω and 0.1 μF in parallel between the channel's +/A terminal and –/B terminals. Set that channel's thermocouple type to K and check that the displayed value is "B. out."

Reference Junction Compensation Accuracy

● Procedures

Set all channels to thermocouple type T. Measure 0°C on one of the channels and check that the display is within the criteria below.

Criterion: $\pm 0.5^{\circ}\text{C}$



- Use a calibrated thermocouple, and wires of 0.5 diameter or less without a terminal chip. Also, pay attention to the measurement accuracy.
- Monitor the 0°C standardized temperature bath at all times, and confirm that it is within $0^{\circ}\text{C} \pm 0.01^{\circ}\text{C}$.
- When using a 0°C standard temperature device, the tip of the thermocouple floats 10 mm off the bottom.
- Perform the test in a stable environment. If drafts are present and may influence the results, position the equipment to avoid them.
- After connecting the thermocouple, allow a warm-up time of 30 minutes or more before beginning measurement.
- Always use terminal covers.
- When measuring, filters may be applied.

Display

● Procedures

1. Turn ON the power switch while pressing the **MENU** and **CH UP** keys. **Menu = A/D Adjust** is displayed.
2. Select **Menu = Test**, and press the **↵** key.
3. Choose **Test = Disp** and press the **↵** key.
The test pattern is displayed. Each time you press the DISP key the display pattern changes. For each pattern, check that there are no missing parts, abnormalities, or other defects. Press the **ESC/?** key to return to the Test = Disp screen.

* Select using the **▽△** key. You can hold down the **SHIFT** key while pressing **▽△** key to reverse the key's action.

● Displayed Pattern

- All pixels lit: status display also lit
- All pixels not lit
- Horizontal stripes: 2 pixels each lit/not lit
- Vertical stripes: 2 pixels each lit/not lit

Keys

● Procedures

1. Turn ON the power switch while pressing the **MENU** and **CH UP** keys. **Menu = A/D Adjust** is displayed.
2. Select **Menu = Test**, and press the **↵** key.
3. Choose **Test = Key** and press the **↵** key.
Confirm that the appropriate box turns On or OFF when each key is pressed.
The box of the display corresponds to the order of the keys.
Press the **ESC/?** key twice to return to the Test = Key screen.

☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
 Enter 2 ESC, Out.

* Select using the **▽△** key. You can hold down the **SHIFT** key while pressing **▽△** key to reverse the key's action.

Power Supply Frequency Detection

● Procedures

1. Turn ON the power switch while pressing the **MENU** and **CH UP** keys. **Menu = A/D Adjust** is displayed.
2. Select **Menu = Test**, and press the **↵** key.
3. Choose **Test = Frequency** and press the **↵** key.
The detected power supply frequency is displayed. Confirm that it matches the actual power supply frequency.

Frequency
 50.0Hz

* Select using the **▽△** key. You can hold down the **SHIFT** key while pressing **▽△** key to reverse the key's action.

Battery Backup

● Procedures

1. Set the date and time on the recorder. Also, set an arbitrary channel to the 20 mV range.
2. Turn OFF the power switch.
3. Turn ON the power after approximately one minute, then check that the set date, time, and range are not initialized.

Recording Accuracy

● Overview

Set the channels to the 2 V range and confirm that the recording accuracy is within the criteria.

Pen Model

Check the accuracy of all pens. Use standard pens (or equivalent).

* A “standard pen” is one whose tip does not fluctuate more than ± 0.1 mm.

Dot Model

Check an arbitrary channel.

● Recorder Settings

Set the input to the 2 V range, and -2.000 V to 2.000 V.

● Procedures

Input values equivalent to 0, 25, 50, 75, and 100%, and record.

Measure the recorded results using a Glass scale (or equivalent), then confirm that the results meet the criteria below.

Criteria

Input	Criteria
-2 V	0 ± 0.3 mm
-1 V	25 ± 0.3 mm
0 V	50 ± 0.3 mm
1 V	75 ± 0.3 mm
2 V	100 ± 0.3 mm

Note

These criteria do not include the measurement accuracy. When taking the measurement accuracy into account, the criteria are measurement accuracy ± 0.3 mm.

Z-Fold Chart Paper Feed Accuracy

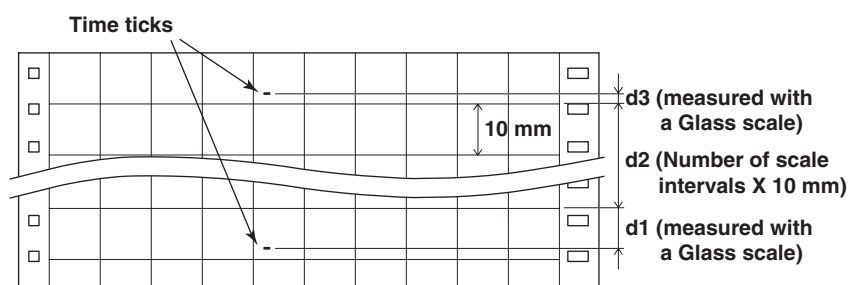
● Procedures

1. Turn ON the power switch while pressing the **MENU** and **CH UP** keys. **Menu = A/D Adjust** is displayed.
2. Select **Menu = Test**, and press the $\leftarrow$ key.
3. Choose **Test = Print** and press the $\leftarrow$ key.
4. Select **Menu = Chart**, and press the $\leftarrow$ key.

The recorder starts feeding paper, then stops after approximately 500 mm.

Time ticks are printed between the start and stop of paper feeding. Check that the space between the two time ticks (d1 + d2 + d3 in the figure below) satisfies the criterion below. Measure using a Glass scale (or equivalent).

Criterion: 500 ± 0.4 mm



* Select using the $\nabla\Delta$ key. You can hold down the **SHIFT** key while pressing $\nabla\Delta$ key to reverse the key's action.

Dead Band (Pen Model)

● Procedures

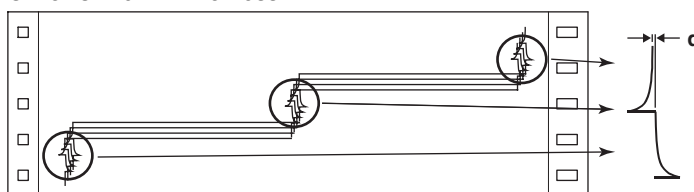
Check the accuracy of all pens. Use standard pens (or equivalent).

* A "standard pen" is one whose tip does not fluctuate more than ± 0.1 mm.

1. Turn ON the power switch while pressing the **MENU** and **CH UP** keys. **Menu = A/D Adjust** is displayed.
2. Select **Menu = Test**, and press the **↵** key.
3. Choose **Test = Dead Band** and press the **↵** key.

The dead band measurement pattern is automatically recorded near 0%, 50%, and 100%. Measure the following portions of the recorded results using a Glass scale (or equivalent), then confirm that the results meet the criteria.

Criterion: 0.2 mm or less



* Select using the **▽△** key. You can hold down the **SHIFT** key while pressing **▽△** key to reverse the key's action.

Pen Offset (Pen Model)

● Procedures

Check all pens. Use standard pens (or equivalent).

* A "standard pen" is one whose tip does not fluctuate more than ± 0.1 mm.

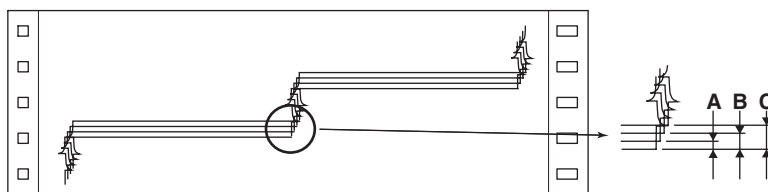
1. Turn ON the power switch while pressing the **MENU** and **CH UP** keys. **Menu = A/D Adjust** is displayed.
2. Select **Menu = Test**, and press the **↵** key.
3. Choose **Test = Dead Band** and press the **↵** key.

The dead band measurement pattern is automatically recorded near 0%, 50%, and 100%.

Measure the following portions of the recorded results using a Glass scale (or equivalent), then confirm that the results meet the criteria.

Criteria

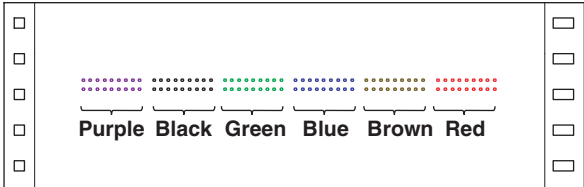
Item	Criteria
A	2.2 ± 1 mm
B	4.4 ± 1 mm
C	6.6 ± 1 mm



* Select using the **▽△** key. You can hold down the **SHIFT** key while pressing **▽△** key to reverse the key's action.

Ink Bleed (Dot Model)

- **Procedures**
 1. Turn ON the power switch while pressing the **MENU** and **CH UP** keys. **Menu = A/D Adjust** is displayed.
 2. Select **Menu = Test**, and press the **↵** key.
 3. Choose **Test = Print** and press the **↵** key.
 4. Select **Menu = Ribbon**, and press the **↵** key.
Printing of six color test patterns begins. Confirm that the printed colors did not bleed.



* Select using the **▽△** key. You can hold down the **SHIFT** key while pressing **▽△** key to reverse the key's action.

Overscale Amount

- **Overview**
 - Pen Model**
Check the accuracy of all pens. Use standard pens (or equivalent).
* A "standard pen" is one whose tip does not fluctuate more than ± 0.1 mm.
 - Dot Model**
Check an arbitrary channel.
- **Recorder Settings**
Set the input to the 2 V range, and -2.000 V to 2.000 V.
- **Procedures**
Input each value and record. Confirm that the recording position meets the criterion below.
Criteria

Input Value	Criteria
-2.3 V	That it was 0.3 mm or more on the left side relative to the Zero recording position
2.3 V	That it was 0.3 mm or more on the right side relative to the Full recording position

Relay Contact Output

- **Overview**
This test performed when the /A1, /A2, /A3, or /F1 option is specified. It is performed for all relay contact outputs.
- **Procedures**
 1. Turn ON the power switch while pressing the **MENU** and **CH UP** keys. **Menu = A/D Adjust** is displayed.
 2. Select **Menu = Test**, and press the **↵** key.
 3. Choose **Test = Alarm** and press the **↵** key.
The relay number selection screen (Relay=IO1) appears.
 4. Select a relay number and check the relay action according to the table below.

* Select using the **▽△** key. You can hold down the **SHIFT** key while pressing **▽△** key to reverse the key's action.

When the /F1 Option is Not Installed

Relay	Relay No.
I01-I06	I01-I06

When the /F1 Option Is Installed

Relay	Relay No.
I01-I04	I01-I04
Chart Paper End Output Relay	I05
FAIL Output Relay	FAIL

Output Relays Other Than the FAIL Output Relay

Select the relay number to test and confirm that it is open between the NO and C relay output terminals. Press the $\leftarrow$ key. The relay is energized. Check that it is closed between relay output terminals NO and C.

FAIL Output Relay

Select FAIL in the relay number selection screen and confirm it is closed between relay output terminals NO and C. Press the $\leftarrow$ key. The relay is deenergized approximately four seconds thereafter. Confirm that it is open between relay output terminals NO and C.

You cannot operate the recorder after execution of FAIL output relay test. Turn OFF the recorder, then turn it back ON again.

Remote Control Input● **Overview**

This test is performed when the /R1 option is specified. It is performed for all remote control input terminals.

● **Procedures**

1. Turn ON the power switch while pressing the **MENU** and **CH UP** keys. **Menu = A/D Adjust** is displayed.
2. Select **Menu = Test**, and press the $\leftarrow$ key.
3. Choose **Test = Remote** and press the $\leftarrow$ key.
4. Connect the remote control input terminal under test to the C terminal and press the $\leftarrow$ key.

The remote control input terminal condition confirmation screen appears.

Confirm that the display of the corresponding remote control input terminal is 1.

Remote Status 00000

5. Press the **ESC/?** key to return to the **Test = Remote** screen.
Repeat the above steps 4 and 5 for all input terminals.

* Select using the $\nabla\Delta$ key. You can hold down the **SHIFT** key while pressing $\nabla\Delta$ key to reverse the key's action.

Loop Back Test (Ethernet Communication Interface, /C7)

● Procedures

This test performed when the /C7 option is specified.

1. Connect the recorder to the network.
2. Turn ON the power switch while pressing the **MENU** and **CH UP** keys. **Menu = A/D Adjust** is displayed.
3. Confirm that the indicator on the left of the Ethernet port on the recorder illuminates.
4. Choose **Menu = Test**, and press the **↵** key.
3. Choose **Test = Loop Back** and press the **↵** key.
Confirm that **OK** is displayed. If **ERROR** is displayed, check the connection to the network.

* Select using the **▽△** key. You can hold down the **SHIFT** key while pressing **▽△** key to reverse the key's action.

Z-Fold Chart Paper End Detection

● Procedures

This test performed when the /F1 option is specified. Confirm the status below.

Status	Criterion
Chart paper present	The CHART END indicator is out
No chart paper present	The CHART END indicator illuminates

Other Functions in Test Mode

In addition to the tests described up to now, you can perform the following tests in test mode. They are not described in detail in this manual.

Menu	Description
Test > Print > Analog	Tests the analog recorder recording quality.
Test > Print > Plotter	Tests the plotter pen recording quality (pen model).
Test > Print > Pen Hold	Aligns the pens to the position when the recorder is shipped (pen model).
Test > Memory	Performs a test of the SRAM. .
Test > Version	Displays the firmware version.
Test > Ram Clear	Initializes the setup data.

4.1 Foreword

This chapter describes adjustments of the A/D converters, recording position, pen speed (pen model), and ink ribbon (dot model).

Environment

See section 3.3, “Test Environment.”

Operations on the Main Unit

See section 3.3, “Key Operations on the Recorder.”

Preparation

All adjustments are to be made after warming up the recorder for at least thirty minutes.

4.2 Adjustments to the Pen Model

Adjusting the A/D Converters

● Overview

Enter the value determined for each range, perform measurement, then write the adjusted values to the AD converter.

● Instruments Used

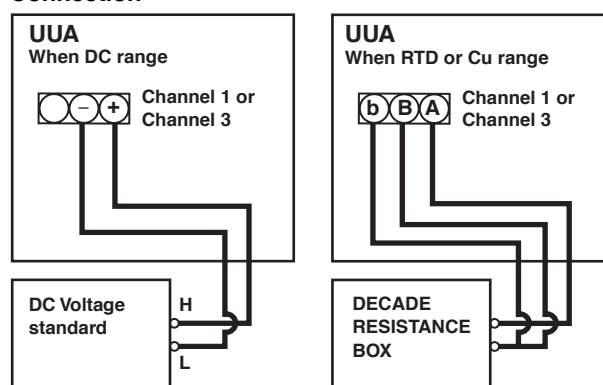
Instrument	Specifications
DC voltage generator	Accuracy: $\pm 0.005\%$ of setting + 1 μV or better
Resistors	10 Ω , 50 Ω , 100 Ω , 150 Ω , 300 Ω , Accuracy: 0.01% or better

● Channel

Adjustment of channels 1 and 2 is performed using channel 1, and adjustment of channels 3 and 4 is performed using channel 3.

● Procedure

Connection



UUA: Unit Under Adjustment

Input Value

Input Type	Range	Zero	Full	Description
DC voltage	20 mV	0 mV	20 mV	-
	60 mV	0 mV	60 mV	-
	200 mV	0 mV	200 mV	-
	1 V	0 mV	1 V	-
	2 V	0 mV	2 V	-
	6 V	0 mV	6 V	-
	20 V	0 mV	20 V	-
RTD	50 V	No adjustment needed		-
	Pt100	100 Ω	300 Ω	-
	Cu10	10 Ω	50 Ω	With the /N1 option.
	Pt50	50 Ω	150 Ω	With the /N3 option.

● Procedure

The following explains the procedure when working with channel 1.

1. Press the **MENU** and **CH UP** keys while turning ON the power. **Menu = A/D Adjust** is displayed.

2. With **Menu = A/D Adjust** is displayed, press the $\leftarrow$ key.

Menu=A/D Adjust

3. Input the password (see page 3-5).

Password=

4. Select **Mode = Cal/Exec**, then press the $\leftarrow$ key.

Mode=Cal/Exec

5. Select **A/D No. = 1**, then press the $\leftarrow$ key.

* For channel 3, select A/D No. = 2.

A/D No.=1

6. Select **Range = 20 mVZ**.

Range=20mVZ

7. Enter the zero value for the 20 mV range, then press the $\leftarrow$ key.
After measurement, the adjusted value is displayed.

Range=20mVZ
Zero:-200

8. Press the $\leftarrow$ key.
You are returned to the **A/D No. =** screen.

9. Leave the A/D No. unchanged, then press the $\leftarrow$ key.

A/D No.=1

10. Select **Range = 20 mVF**, then press the $\leftarrow$ key.

Range=20mVF

11. Enter the Full value for the 20 m range on channel 1, then press the $\leftarrow$ key.
After measurement, the adjusted value is displayed.

Range=20mVF
Full:32768

12. Repeat steps 5 to 11 to adjust the following ranges: 60 mV, 200 mV, 1 V, 2 V, 6 V, 20 V, Pt100, Cu10 (with the /N1 option).

Saving Adjusted Values

13. When all adjustments are finished, select **Mode = End**, then press the $\leftarrow$ key.

Mode=End

14. Select **A/D No. = 1**, then press the $\leftarrow$ key.

* You can select an A/D No. of 1, 2, or 1+2. The adjusted value is saved on the AD converter of the selected number.

A/D No.=1

* Select using the $\nabla\Delta$ key. To enter numerical values, move the cursor to the entry point using the $\triangleleft\triangleright$ key. Select the value using the $\nabla\Delta$ key. You can hold down the **SHIFT** key while pressing $\nabla\Delta$ key or $\triangleleft\triangleright$ key to reverse the key's action.

4.2 Adjustments to the Pen Model

- With **End = Store** displayed, press the $\leftarrow$ key.
The adjusted value is saved to the A/D converter.

End=Store

Concluding Adjustments

- Select **Menu = End**, then press the $\leftarrow$ key. You are returned to the operation mode.

Menu=End

Adjusting the Pen Speed

● Overview

This is an adjustment to make the speed of the pen as it moves from left to right almost the same as when it moves from right to left. The recorder adjusts automatically. The adjustment is performed when the pen servo assembly is replaced.

● Procedure

- Press the **MENU** and **CH UP** keys while turning ON the power. **Menu = A/D Adjust** is displayed.
- Select **Menu = Aux**, then press the $\leftarrow$ key.
Menu=Aux
- Enter the password (see page 3-5), then press the $\leftarrow$ key.
Password=
- Select **Sub = Pen speed**, then press the $\leftarrow$ key.
Sub=Pen speed
- Select **Pen speed = Auto**, then press the $\leftarrow$ key.
Pen speed=Auto
- Select the pen to adjust, then press the $\leftarrow$ key.
The recorder performs the adjustment automatically and displays the results.

Pen No.=1

Value=9
38:37:1

Understanding the Results

• Value = 9

The number showing the adjustment result. It is an integer from 0 to 20.

• 39:38:1

39: The time count required to move from 25% to 75%.

38: The time count required to move from 75% to 25%.

1: The difference between the two time counts above.

Criteria

Time count: Less than or equal to 50

Difference between the two time counts: Less than or equal to 10% value of the time count whichever smaller

- Press the $\leftarrow$ key, then perform steps 5 and 6 on the installed pen.

* Select using the $\nabla\Delta$ key. To enter numerical values, move the cursor to the entry point using the $\triangleleft\triangleright$ key. Select the value using the $\nabla\Delta$ key. You can hold down the **SHIFT** key while pressing $\nabla\Delta$ key or $\triangleleft\triangleright$ key to reverse the key's action.

8. When all pen adjustments are finished, select **Mode = End**, then press the $\leftarrow$ key.

Mode=End

9. With **End = Store** displayed, press the $\leftarrow$ key. The adjusted value is saved.

End=Store

Concluding Adjustments

10. Select **Menu = End**, then press the $\leftarrow$ key. You are returned to the operation mode.

Menu=End

Note

If **Error** is displayed in the adjustment results screen, this most likely indicates that the pen cannot move normally through the full scale. Check the operation of the pen, then perform the adjustment again.

Adjusting the Pen Position

● Overview

This is an adjustment of the pen position to make the recording position 0 to 100 mm. Each pen is adjusted individually. The adjustment is performed when the recording accuracy is outside the criterion, or when internal components have been replaced.

Conditions

- Use a standard pen (or equivalent).
 - * A "standard pen" is one whose tip does not fluctuate more than ± 0.1 mm.
- The adjustment matches the Zero position to the 0% position of the z-fold chart paper.
- It also aligns the Full position from the 0% of the z-fold chart paper to the 100 mm position.
- For measurement, use a Glass scale (or equivalent).

● Criterion

Adjustment criterion: within ± 0.1 mm

● Procedure

1. Install the pen into the pen arm.
2. Press the **MENU** and **CH UP** keys while turning ON the power. **Menu = A/D Adjust** is displayed.
3. Select **Menu = Pos Adjust**, then press the $\leftarrow$ key. The Zero/Full selection screen appears.

Menu=Pos Adjust

* Select using the $\nabla\Delta$ key. To enter numerical values, move the cursor to the entry point using the $\triangleleft\triangleright$ key. Select the value using the $\nabla\Delta$ key. You can hold down the **SHIFT** key while pressing $\nabla\Delta$ key or $\triangleleft\triangleright$ key to reverse the key's action.

4.2 Adjustments to the Pen Model

Adjusting the Zero Position

4. Select **P_Adj = Zero**, then press the $\leftarrow$ key.

P_Adj=Zero

5. Select the number of the pen to adjust, then press the $\leftarrow$ key.
The adjustment value input screen is displayed.

Pen No.=1
1-4

6. Adjust the numerical value so that the pen recorder position overlaps the 0% position of the z-fold chart paper.

Zero=42
0/70

7. When the adjustment is complete, press the $\leftarrow$ key.
You are returned to the Zero/Full selection screen.

Repeat steps 4 to 7 to adjust all pens.

Adjusting the Full Position

8. Select **P_Adj = Full**, then press the $\leftarrow$ key.

P_Adj=Full

9. Select the number of the pen to adjust, then press the $\leftarrow$ key.

Pen No.=1
1-4

10. Adjust the numerical value so that the pen recorder position is in alignment from the 0% position of the z-fold chart paper to the 100 mm position.

Full=2
-45/15 (B:3026)

11. When the adjustment is complete, press the $\leftarrow$ key.
You are returned to the Zero/Full selection screen.

Repeat steps 8 to 11 to adjust all pens.

12. When all pen adjustments are finished, select **Mode = End**, then press the $\leftarrow$ key.

Mode=End

13. With **End = Store** displayed, press the $\leftarrow$ key.
The adjusted value is saved.

End=Store

Concluding Adjustments

14. Select **Menu = End**, then press the $\leftarrow$ key. You are returned to the operation mode.

Menu=End

* Select using the $\nabla\Delta$ key. To enter numerical values, move the cursor to the entry point using the $\triangleleft\triangleright$ key. Select the value using the $\nabla\Delta$ key. You can hold down the **SHIFT** key while pressing $\nabla\Delta$ key or $\triangleleft\triangleright$ key to reverse the key's action.

4.3 Adjustments to the Dot Model

Adjusting the A/D Converters

● Overview

Enter the value determined for each range, perform measurement, then write the adjusted values to the A/D converter.

● Instruments Used

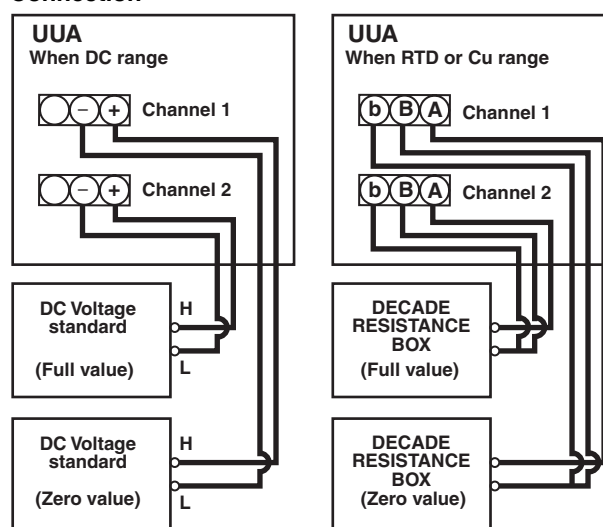
Instrument	Specifications
DC voltage generator	Accuracy: $\pm 0.005\%$ of setting + 1 μV or better
Resistors	10 Ω , 50 Ω , 100 Ω , 150 Ω , 300 Ω , Accuracy: 0.01% or better

● Channel

Enter the Zero value for channel 1 and the Full value for channel 2, and perform the adjustment.

● Procedure

Connection



UUA: Unit Under Adjustment

Input Value

Same as the pen model. See page 4-2.

4.3 Adjustments to the Dot Model

● Procedure

1. Press the **MENU** and **CH UP** keys while turning ON the power. **Menu = A/D Adjust** is displayed.

Menu=A/D Adjust
2. With **Menu = A/D Adjust** is displayed, press the $\leftarrow$ key.
3. Input the password (see page 3-6).

Password=
4. Select **Mode = Cal/Exec**, then press the $\leftarrow$ key.

Mode=Cal/Exec
5. Select **A/D No. = 1**, then press the $\leftarrow$ key.

A/D No.=1
6. Select **Range = 20 mV**.

Range=20mV
7. Enter the zero value for the 20 mV range on channel 1 and the Full value on channel 2, then press the $\leftarrow$ key.
After measurement, the adjusted value is displayed.

Range=20mV
Z: -585 F: 32769
8. Press the $\leftarrow$ key.
You are returned to the A/D No. = screen.
9. Repeat steps 5 to 8 to adjust the following ranges: 60 mV, 200 mV, 1 V, 2 V, 6 V, 20 V, Pt100, Cu10 (with the /N1 option).

Saving Adjusted Values

10. When all adjustments are finished, select **Mode = End**, then press the $\leftarrow$ key.

Mode=End
11. Select **A/D No. = 1**, then press the $\leftarrow$ key.

A/D No.=1
12. With **End = Store** displayed, press the $\leftarrow$ key.
The adjusted value is saved to the A/D converter.

End=Store

Concluding Adjustments

13. Select **Menu = End**, then press the $\leftarrow$ key. You are returned to the operation mode.

Menu=End

* Select using the $\nabla\Delta$ key. To enter numerical values, move the cursor to the entry point using the $\leftarrow$ key. Select the value using the $\nabla\Delta$ key. You can hold down the **SHIFT** key while pressing $\nabla\Delta$ key or $\leftarrow$ key to reverse the key's action.

Adjusting the Ink Ribbon

● Overview

This is an adjustment of the position of the ink ribbon. The adjustment is performed when colors of the dots bleed into one another.

● Procedure

1. Press the **MENU** and **CH UP** keys while turning ON the power. **Menu = A/D Adjust** is displayed.

2. Select **Menu = Aux**, then press the $\leftarrow$ key.

Menu=Aux

3. Enter the password (see page 3-6), then press the $\leftarrow$ key.

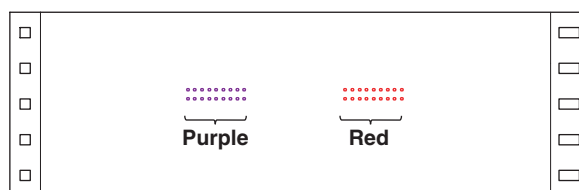
Password=

4. Select **Sub = Rib. shift**, then press the $\leftarrow$ key.

Sub=Rib. shift

5. Select **Rib. shift = Exec**, then press the $\leftarrow$ key.
The ribbon shift adjustment pattern starts printing, and the adjustment value entry screen appears.

Rib. shift=Exec



6. Adjust the numerical value so that the concentration of purple and red is almost the same.

R.Adjust=17

7. After finding the right adjustment value, press the $\leftarrow$ key.

Saving Adjusted Values

8. When all adjustments are finished, select **Mode = End**, then press the $\leftarrow$ key.

Mode=End

9. With **End = Store** displayed, press the $\leftarrow$ key.
The adjusted value is saved.

End=Store

Concluding Adjustments

10. Select **Menu = End**, then press the $\leftarrow$ key. You are returned to the operation mode.

Menu=End

* Select using the $\nabla\Delta$ key. To enter numerical values, move the cursor to the entry point using the $\triangleleft\triangleright$ key. Select the value using the $\nabla\Delta$ key. You can hold down the **SHIFT** key while pressing $\nabla\Delta$ key or $\triangleleft\triangleright$ key to reverse the key's action.

Adjusting the Printer Position

● Overview

This is an adjustment of the printer position to make the recording position 0 to 100 mm. The adjustment is performed when the recording accuracy is outside the criterion, or when internal components have been replaced.

● Conditions

- The adjustment matches the Zero position to the 0% position of the z-fold chart paper.
- It also aligns the Full position from the 0% of the z-fold chart paper to the 100 mm position.
- For measurement, use a Glass scale (or equivalent).

● Criterion

Adjustment criterion: ± 0.1 mm

● Procedure

1. Press the **MENU** and **CH UP** keys while turning ON the power. **Menu = A/D Adjust** is displayed.
2. Select **Menu = Pos Adjust**, then press the $\leftarrow$ key. The Hysteresis/Zero/Full selection screen appears.

Menu=Pos_Adjust

Adjusting the Hysteresis

3. Select **P_Adj = Hysteresis**, then press the $\leftarrow$ key. The hysteresis adjustment pattern starts printing, and the adjustment value entry screen appears.

P_Adj=Hysteresis

4. Adjust the numerical value so that the recorded result is as close to a straight line as possible.

Hysteresis=-2
-7/7

5. When the adjustment is complete, press the $\leftarrow$ key. You are returned to the Hysteresis/Zero/Full selection screen.

Adjusting the Zero Position

6. Select **P_Adj = Zero**, then press the $\leftarrow$ key. The adjustment value input screen is displayed.

P_Adj=Zero

7. Adjust the numerical value so that the pen recorder position overlaps the 0% position of the z-fold chart paper.

Zero=7
0/15

8. When the adjustment is complete, press the $\leftarrow$ key. You are returned to the Hysteresis/Zero/Full selection screen.

* Select using the $\nabla\Delta$ key. To enter numerical values, move the cursor to the entry point using the $\triangleleft\triangleright$ key. Select the value using the $\nabla\Delta$ key. You can hold down the **SHIFT** key while pressing $\nabla\Delta$ key or $\triangleleft\triangleright$ key to reverse the key's action.

Adjusting the Full Position

9. Select **P_Adj = Full**, then press the $\leftarrow$ key.
The adjustment value input screen is displayed.

P_Adj=Full

10. Adjust the numerical value so that the pen recorder position is in alignment from the 0% position of the z-fold chart paper to the 100 mm position.

Full=4
-30/30 (B:1000)

11. When the adjustment is complete, press the $\leftarrow$ key.
You are returned to the Hysteresis/Zero/Full selection screen.

Saving Adjusted Values

10. When all adjustments are finished, select **Mode = End**, then press the $\leftarrow$ key.

Mode=End

11. With **End = Store** displayed, press the $\leftarrow$ key.
The adjusted value is saved.

End=Store

Concluding Adjustments

12. Select **Menu = End**, then press the $\leftarrow$ key. You are returned to the normal operating mode.

Menu=End

* Select using the $\nabla\Delta$ key. To enter numerical values, move the cursor to the entry point using the $\triangleleft\triangleright$ key. Select the value using the $\nabla\Delta$ key. You can hold down the **SHIFT** key while pressing $\nabla\Delta$ key or $\triangleleft\triangleright$ key to reverse the key's action.

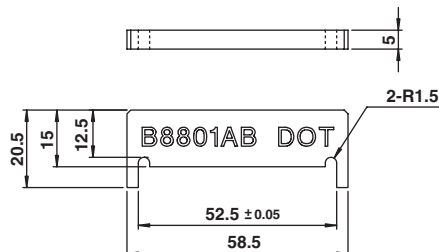
Adjusting the Belt Tension of the Printing Carriage

● Overview

This is an adjustment of the belt tension of the printing carriage. The adjustment is performed when printer component is replaced.

● Tools Used

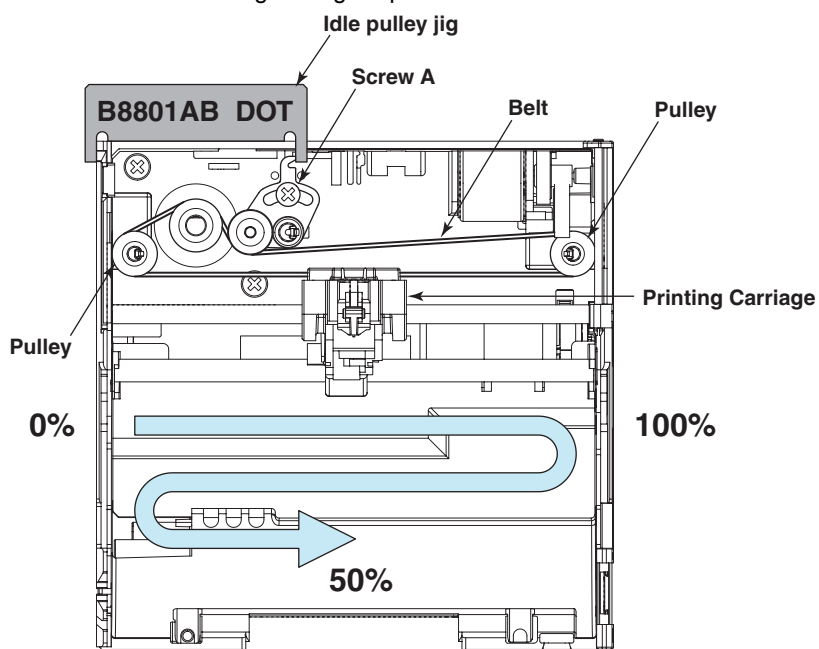
Name	Part number
Idle pulley jig	B8801AB



● Procedure

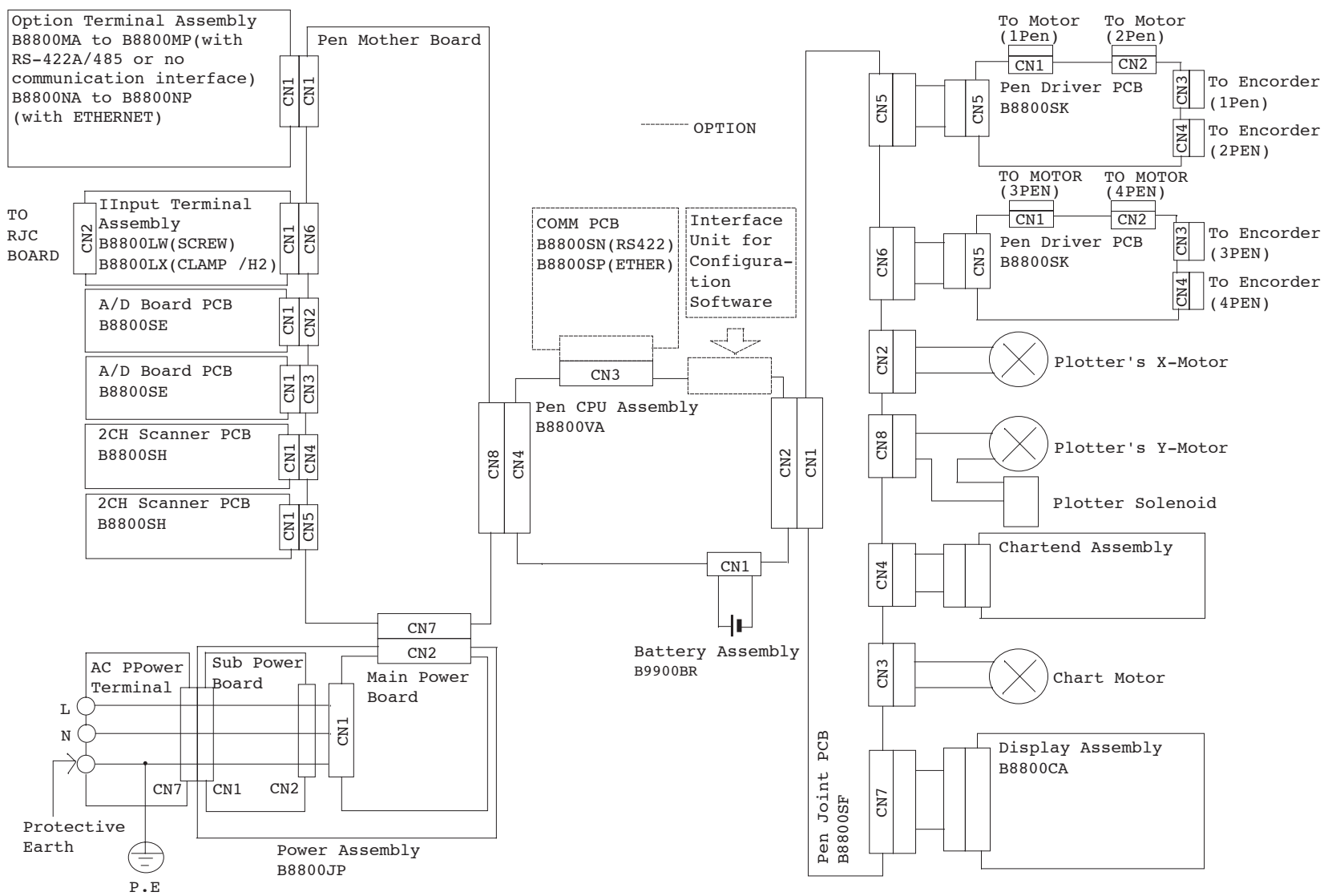
Push in the pulley until it is fixed in place by the latch.

1. Attach the printing carriage belt as shown in the figure.
After attaching the belt, wipe the back of the belt with a non woven fabric with Ethyl alcohol and to remove dirt and oils.
2. Confirm that the printing carriage moves smoothly by holding the printing carriage, then moving it from 0% up and back, then moving to around 50%.
3. Loosen screw A and set the idle pulley jig as shown in the figure.
Align the right leg of the jig with the Lever Assembly spring hook, and the left leg with the side of the internal unit.
4. Fasten screw A. The tightening torque is 0.3 to 0.35 N·m.

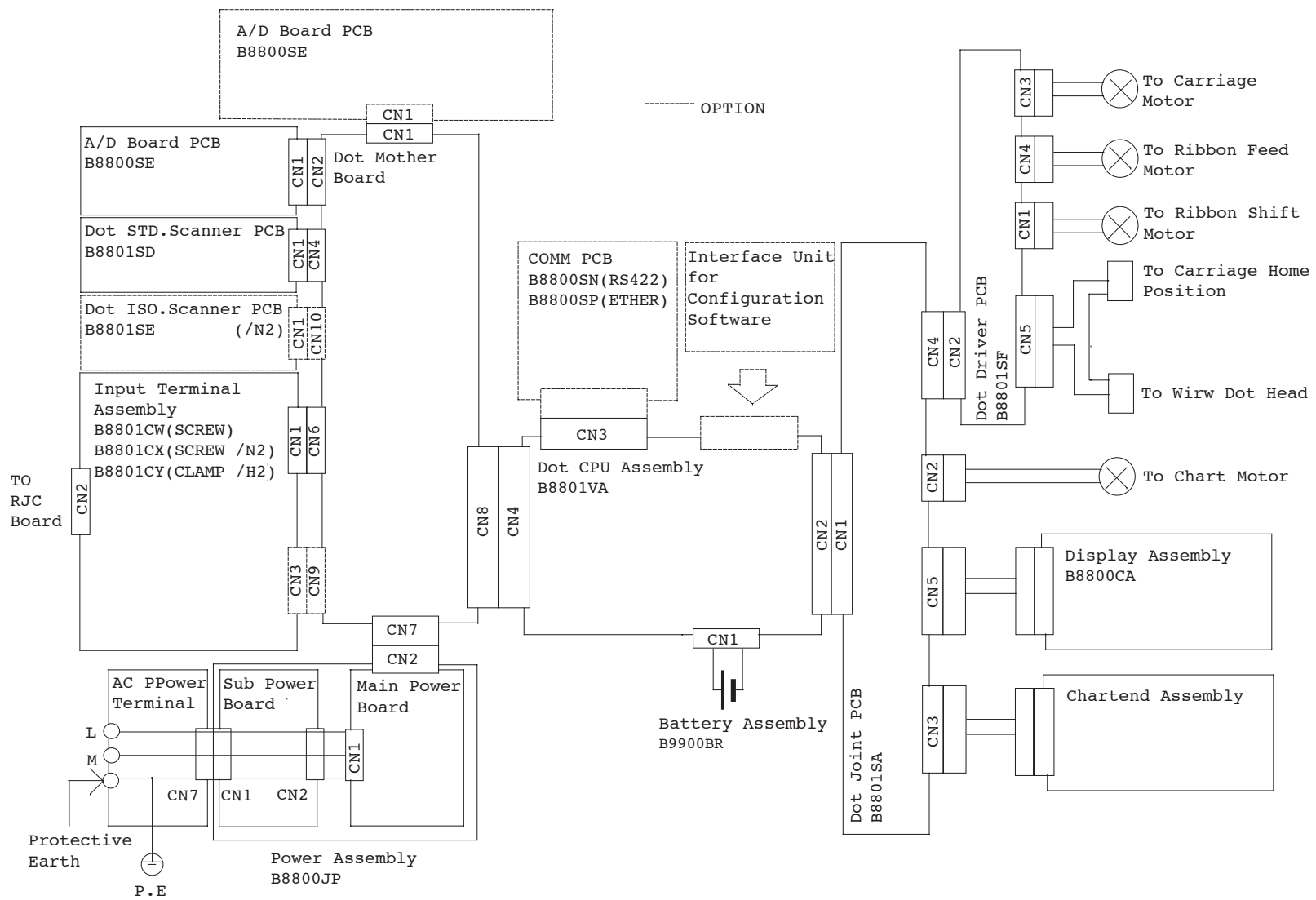


Push in the pulley until it is fixed in place by the latch.

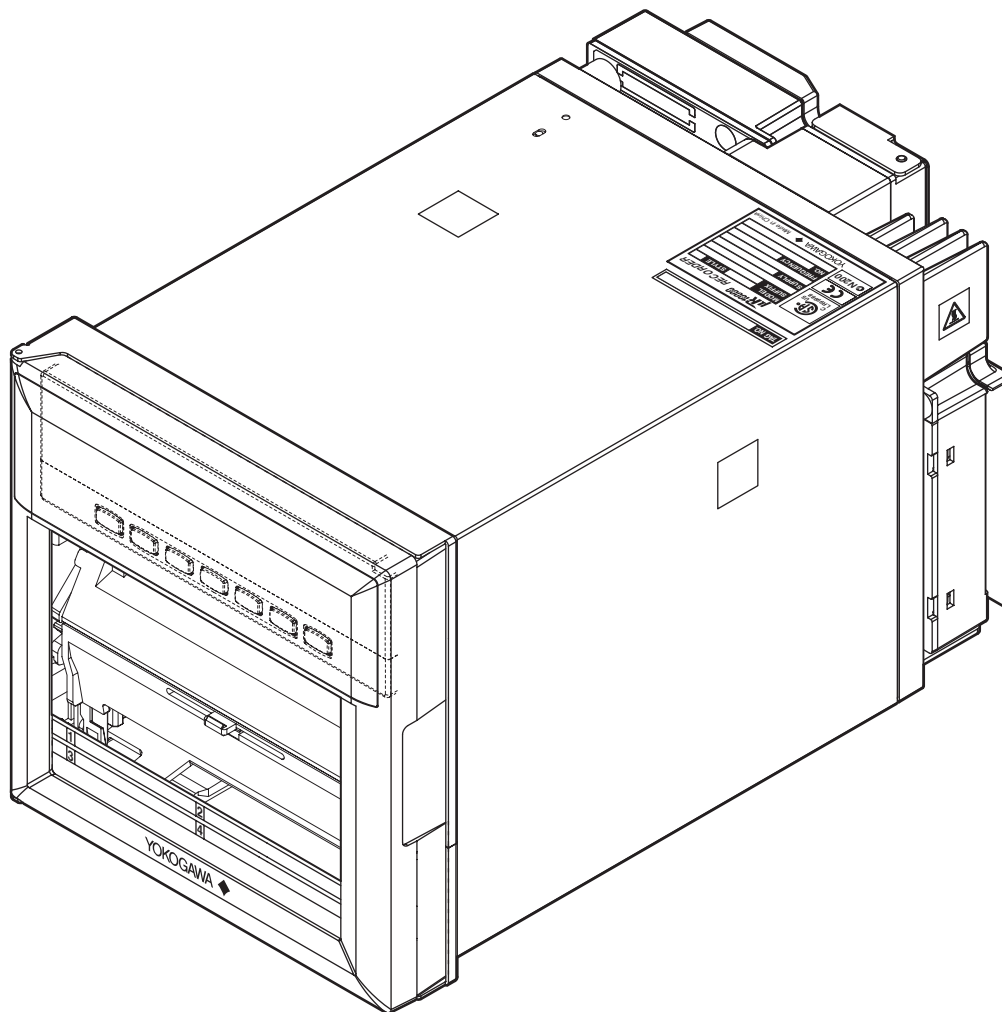
5.1 Schematic Diagram (Pen Model)



5.2 Schematic Diagram (Dot Model)



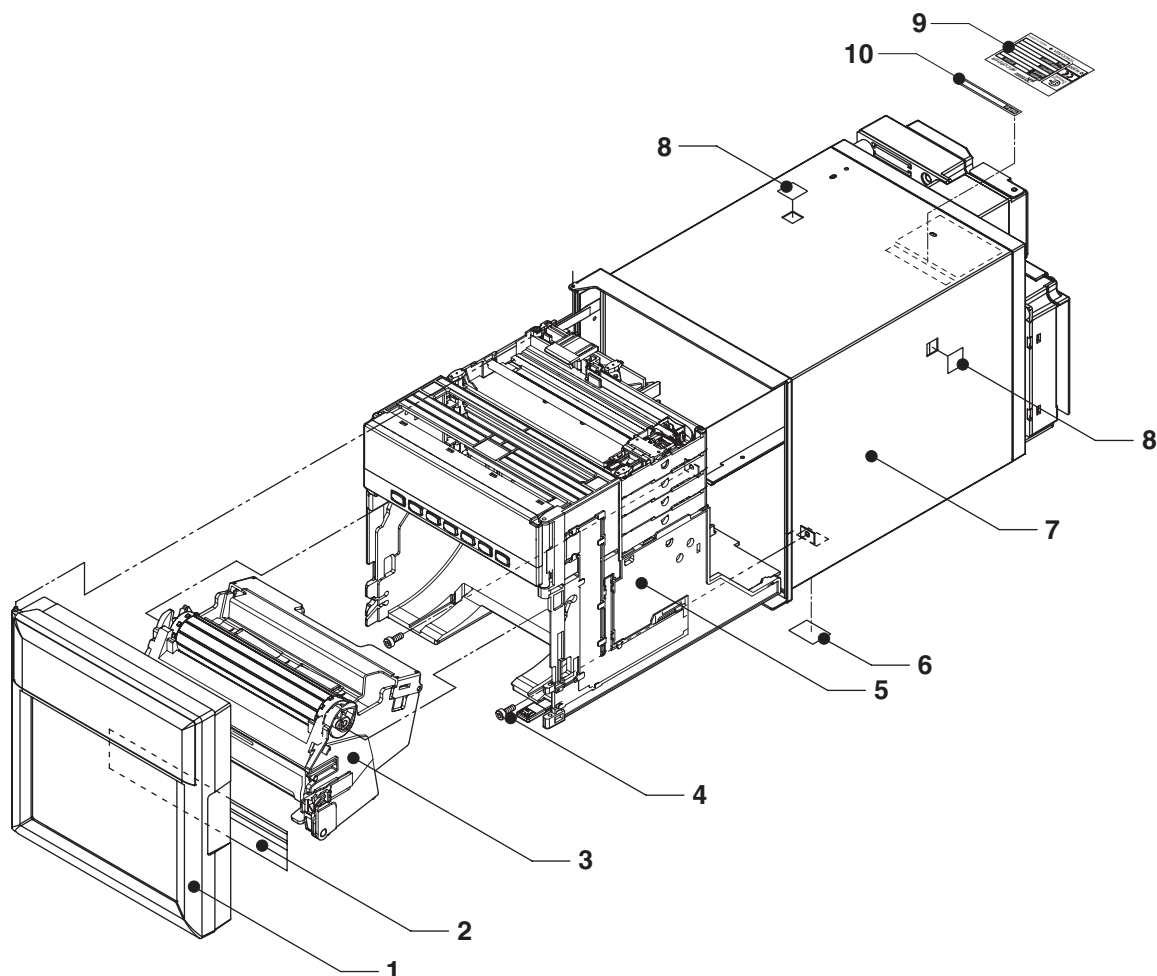
6.1 Customer Maintenance Parts List (Pen Model)



Note:

Parts marked with a © symbol are Customer Maintenance Parts (CMP).

Complete Set



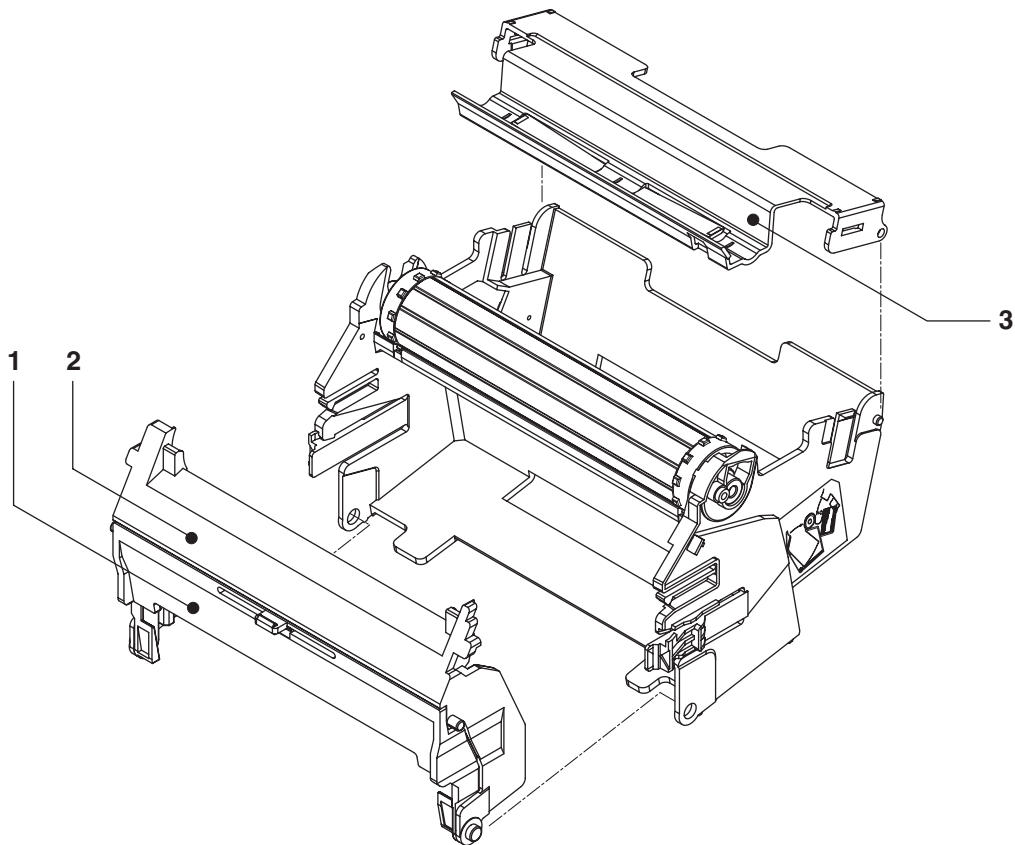
Item	Part No.	Qty	Description
1	B8800BA	1	Door Assembly (not /H3)
	B8800BB	1	Door Assembly (/H3)
⊙ 2	B9900AE	1	Name Plate *1
	B9900AF	1	Name Plate *2
	B9900AG	1	Name Plate *3
			(select)
	B9900AH	1	Name Plate *4
⊙ 3	B8800AJ	1	Chart Cassette Assembly (not /F1)
	B8800AK	1	Chart Cassette Assembly (/F1)
			(select) (see page 3)
4	Y9306ZX	2	Bolt
5	-	1	Pen Frame Assembly (see page 4)
6	B8800AB	1	Name Plate
7	-	1	Case Assembly (see page 6)
8	B9900CR	4	Name Plate
9	-	1	Name Plate
10	-	-	Name Plate (Customer Option)

Note :

- *1 Model 436101
- *2 Model 436102
- *3 Model 436103
- *4 Model 436104

⊙ (CMP)

Chart Cassette Assembly

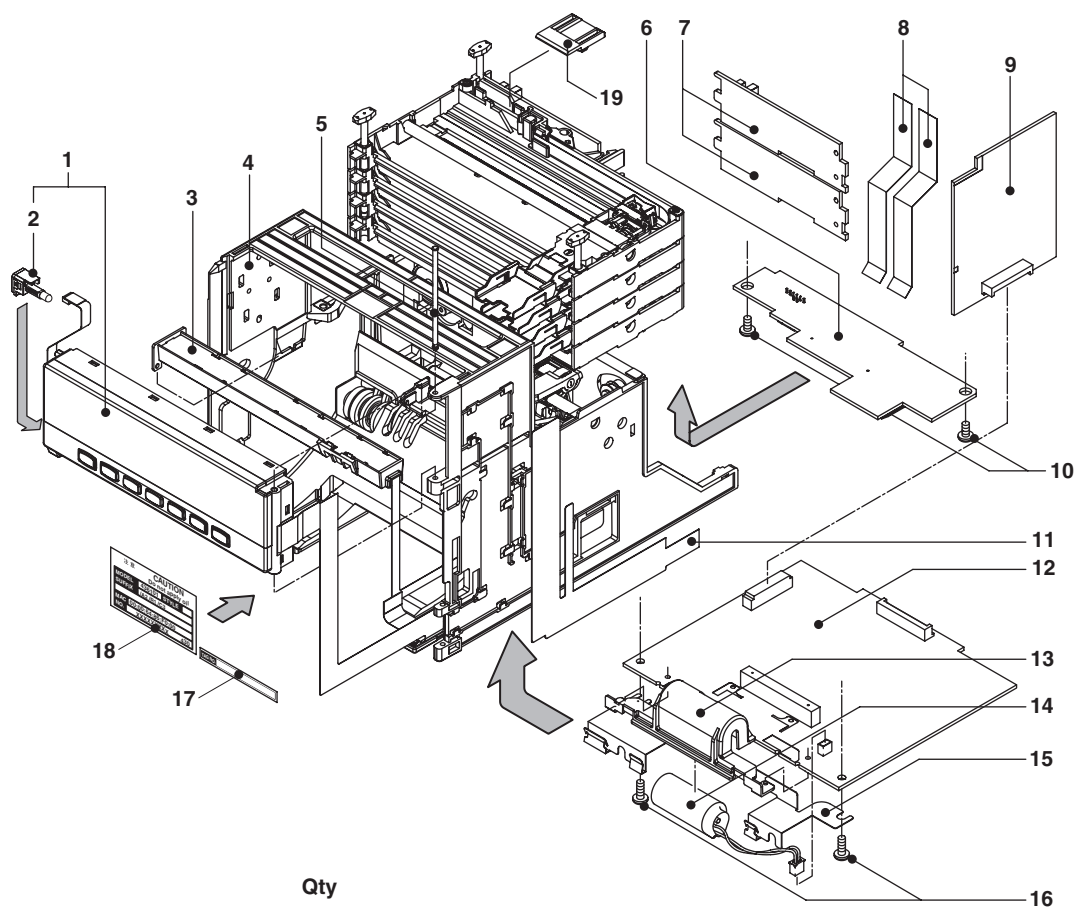


Item	Part No.	Qty	Description
○ 1	B8800EQ	1	Front Cover 1
○ 2	B8800ER	1	Front Cover 2
○ 3	B9962FD	1	Stock Cover
	B8800AL	1	Stock Cover Assembly (/F1) } (select)

Note :
○ (CMP)

6.1 Customer Maintenance Parts List (Pen Model)

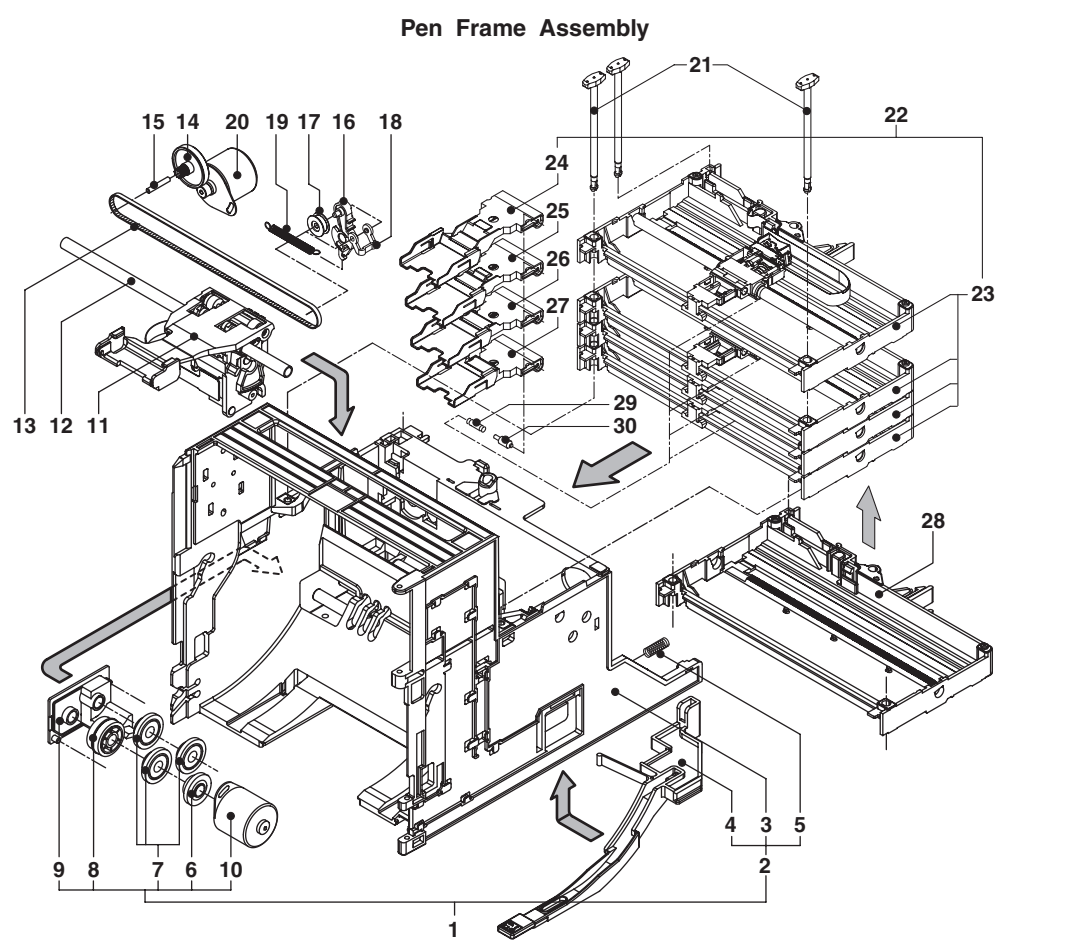
Pen Frame Assembly



Item	Part No.	Qty				Discription
		Model	436101	436102	436103	
1	B8800CA	1	1	1	1	Display Assembly
2	B8800CR	1	1	1	1	LED Assembly
3	B9962ER	1	1	1	1	Sensor Bracket (not /F1)
	B8800EA	1	1	1	1	Chartend Assembly (/F1)
4	B8800DA	1	1	1	1	Pen Frame Assembly (see page 5)
5	B8800DV	1	1	1	1	VFD Latch
6	B8800SF	1	1	1	1	Pen Joint PCB
7	B8800SK	1	1	2	2	Pen Driver PCB
8	B8800HR	1	1	2	2	Servo FPC
9	B8800SN	1	1	1	1	RS422 COM PCB (/C3)
	B8800SP	1	1	1	1	Ether COM PCB (/C7)
10	B9988DL	2	2	2	2	Screw
11	B8800DW	1	1	1	1	Disp. FPC Cover
12	B8800VA	1	1	1	1	Pen CPU Assembly
13	B9900FZ	1	1	1	1	Battery Holder
14	B9900BR	1	1	1	1	Battery Assembly
15	B8800DY	1	1	1	1	EMC Earth Bracket
16	B9988DL	2	2	2	2	Screw
17	-	-	-	-	-	Name Plate (Customer Option)
18	-	1	1	1	1	Name Plate
19	B8800FX	1	1	1	1	P Servo Dust Cover

Note :

◎ (CMP)



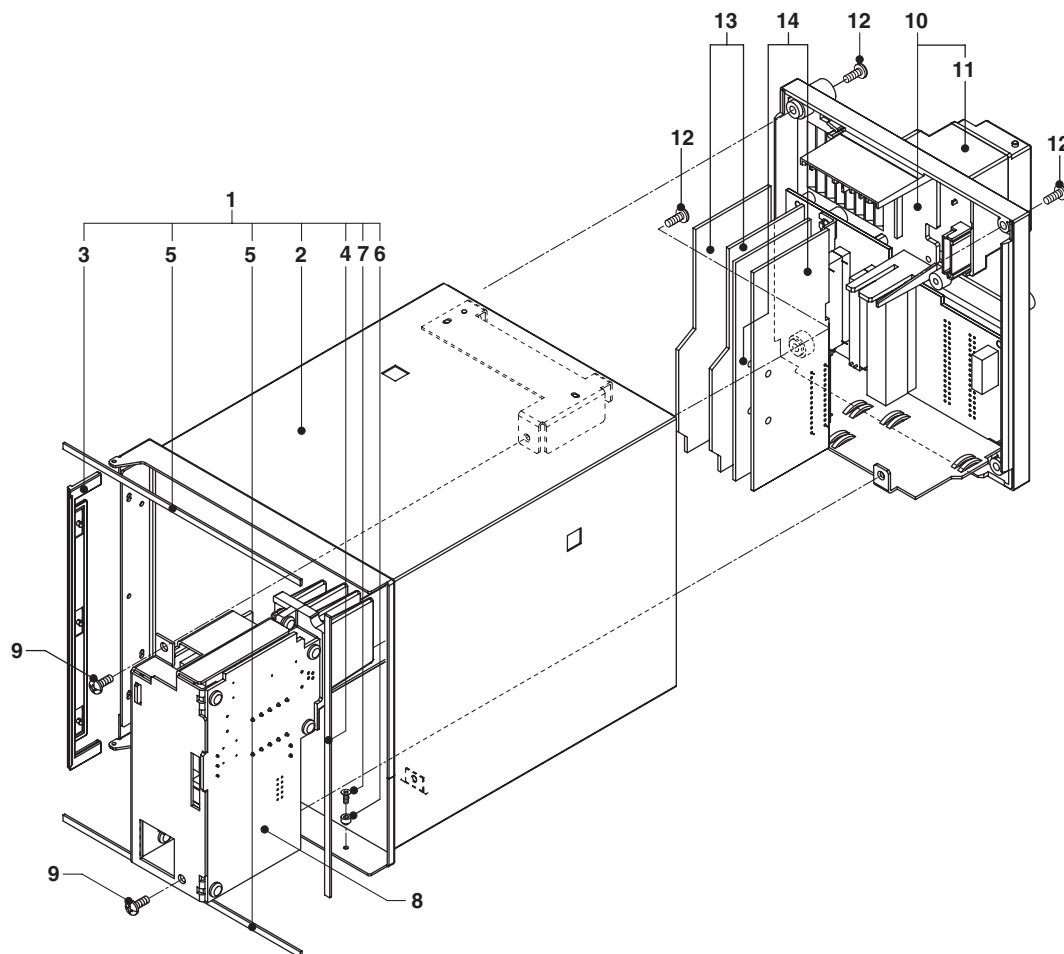
Item	Part No.	Qty				Description
		Model	436101	436102	436103	
1	B8800DB	1	1	1	1	Frame Assembly
2	B8800DC	1	1	1	1	Frame Sub Assembly
3	B8800DD	1	1	1	1	Pen Frame
4	B8800DE	1	1	1	1	Switch Lever
5	B9962EN	1	1	1	1	Spring
6	B9962EE	1	1	1	1	Gear A
7	B9962EF	3	3	3	3	Gear B
8	B9962EG	1	1	1	1	Gear C
9	B9962EH	1	1	1	1	Gear Cover
10	B9962EJ	1	1	1	1	Motor Assembly
11	B8800DJ	1	1	1	1	Carriage Assembly
12	B8800DX	1	1	1	1	Main Shaft
13	B9900RA	1	1	1	1	Belt 105164X2
14	B8800DP	1	1	1	1	Pulley Gear
15	B8800DQ	1	1	1	1	Pulley Pipe
16	B8800DR	1	1	1	1	Idler Lever
17	B9900RP	1	1	1	1	Pulley Bearing
18	B8800DS	1	1	1	1	Pulley Clip
19	B9900RM	1	1	1	1	Spring
20	B8800DT	1	1	1	1	X Motor Assembly

Item	Part No.	Qty				Description
		Model	436101	436102	436103	
21	B8800HQ	3	3	3	3	Base Latch
22	B8800FA	1	1	1	1	1 Pen Servo Assembly
	B8800FB	-	1	1	1	2 Pen Servo Assembly
	B8800FC	-	-	1	1	3 Pen Servo Assembly
	B8800FD	-	-	-	1	4 Pen Servo Assembly
23	B8800FG	1	2	3	4	Pen Servo Assembly
24	B8800HA	1	1	1	1	1 Pen Arm Assembly
25	B8800HB	-	1	1	1	2 Pen Arm Assembly
26	B8800HC	-	-	1	1	3 Pen Arm Assembly
27	B8800HD	-	-	-	1	4 Pen Arm Assembly
28	B8800FJ	3	2	1	-	Pen Servo Spacer
29	B9900LQ	1	2	3	4	Spring
30	B9900LP	1	2	3	4	Pin

Note:
⊙ (CMP)

6.1 Customer Maintenance Parts List (Pen Model)

Case and Back Panel Assembly

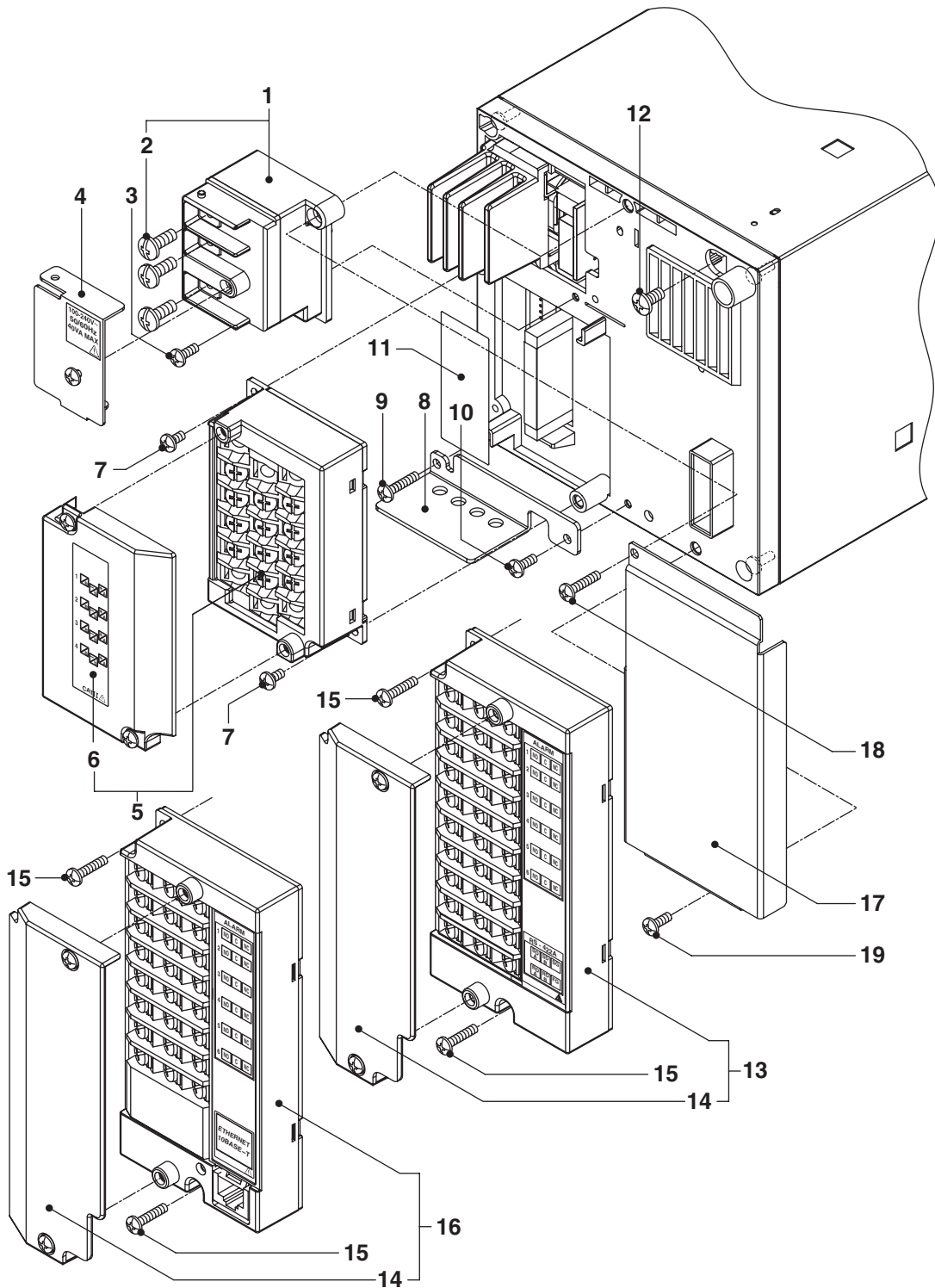


Item	Part No.	Qty				Discription
		Model	436101	436102	436103	
1	B8800BP	1	1	1	1	Case Assembly
2	B8800BQ	1	1	1	1	Case Assembly
3	B8800BV	1	1	1	1	Case Gasket
4	B9900CB	1	1	1	1	Gasket
5	B9900CF	2	2	2	2	Gasket
6	B9900CD	1	1	1	1	Pin
7	Y9203EB	1	1	1	1	Screw
8	B8800JP	1	1	1	1	Power Assembly
9	Y9305LB	2	2	2	2	Screw
10	B8800JA	1	1	1	1	Back Panel Assembly
11	—	1	1	1	1	Terminal Assembly (see Page 7)
12	Y9308LB	3	3	3	3	Screw
13	B8800SE	1	1	2	2	A/D Board PCB
14	B8800SH	1	1	2	2	2CH Scanner PCB

Note:

⊙ (CMP)

Terminal Assembly (1/3)



6.1 Customer Maintenance Parts List (Pen Model)

Terminal Assembly (2/3)

Item	Part No.	Qty	Description
1	B8800JJ	1	Terminal Assembly
2	E9655FX	3	Screw
3	B9988DL	1	Screw
4	B8800AP	1	Cover Assembly
5	B8800LW	1	Input Terminal Assembly (not *1)
			(select)
	B8800LX	1	Input Terminal Assembly (*1)
6	B8800AM	1	Input Cover Assembly (not *1)
	B8800AN	1	Input Cover Assembly (*1)
			(select)
7	Y9306LS	2	Screw
8	B9900EH	1	Bracket
9	Y9314LB	1	Screw
10	B9988DL	1	Screw
11	—	1	Name Plate
12	Y9406LK	1	Screw
13	B8800MA	1	Option Terminal Assembly (*2)
	B8800MB	1	Option Terminal Assembly (*3)
	B8800MC	1	Option Terminal Assembly (*4)
	B8800MD	1	Option Terminal Assembly (*5)
	B8800ME	1	Option Terminal Assembly (*6)
	B8800MF	1	Option Terminal Assembly (*7)
	B8800MG	1	Option Terminal Assembly (*8)
	B8800MH	1	Option Terminal Assembly (*9)
	B8800MJ	1	Option Terminal Assembly (*10)
	B8800MK	1	Option Terminal Assembly (*11)
	B8800ML	1	Option Terminal Assembly (*12)
			(select)
	B8800MM	1	Option Terminal Assembly (*13)
	B8800MN	1	Option Terminal Assembly (*14)
	B8800MP	1	Option Terminal Assembly (*15)
14	B8800KG	1	Option Cover Assembly
15	Y9318LB	2	Screw

Note: see page 9

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Terminal Assembly (3/3)

Item	Part No.	Qty	Description
16	B8800NA	1	Option Terminal Assembly (*16)
	B8800NB	1	Option Terminal Assembly (*17)
	B8800NC	1	Option Terminal Assembly (*18)
	B8800ND	1	Option Terminal Assembly (*19)
	B8800NE	1	Option Terminal Assembly (*20)
	B8800NF	1	Option Terminal Assembly (*21)
	B8800NG	1	Option Terminal Assembly (*22)
	B8800NH	1	Option Terminal Assembly (*23)
	B8800NJ	1	Option Terminal Assembly (*24)
	B8800NK	1	Option Terminal Assembly (*25)
	B8800NL	1	Option Terminal Assembly (*26)
	B8800NM	1	Option Terminal Assembly (*27)
	B8800NN	1	Option Terminal Assembly (*28)
	B8800NP	1	Option Terminal Assembly (*29)
17	B8800JZ	1	Bracket
18	Y9318LB	1	Screw
19	Y9308LB	1	Screw

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6

Customer Maintenance Parts List

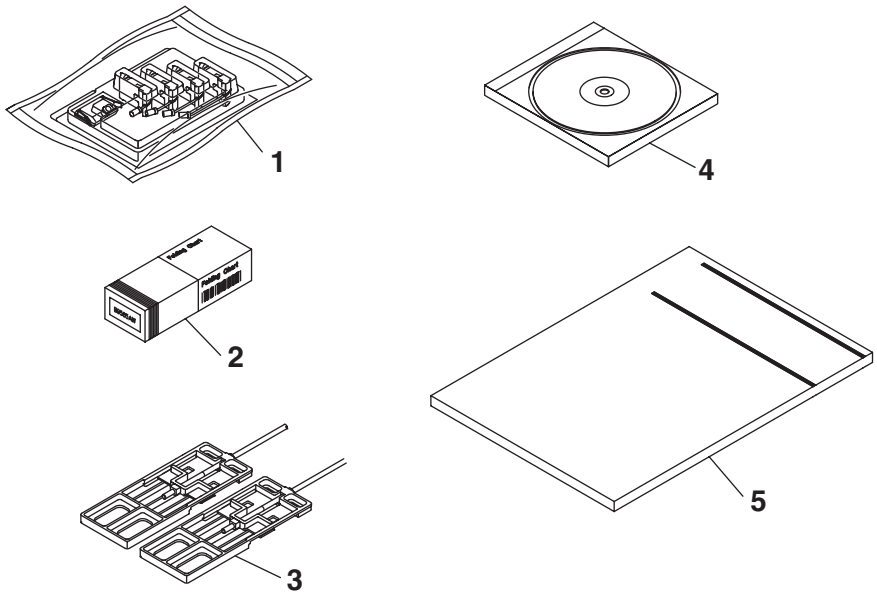
Note

Note

Model Code	Suffix Code (options)							
436101 436102 436103 436104							/H2	*1
	/A1			/C3				*2
	/A2			/C3				*3
	/A3			/C3				*4
				/C3				*5
		/F1		/C3				*6
	/A1	/F1		/C3				*7
	/A2	/F1		/C3				*8
	/A1		/R1	/C3				*9
	/A2		/R1	/C3				*10
	/A3		/R1	/C3				*11
			/R1	/C3				*12
		/F1	/R1	/C3				*13
	/A1	/F1	/R1	/C3				*14
	/A2	/F1	/R1	/C3				*15
	/A1				/C7			*16
	/A2				/C7			*17
	/A3				/C7			*18
					/C7			*19
		/F1			/C7			*20
	/A1	/F1			/C7			*21
	/A2	/F1			/C7			*22
	/A1		/R1		/C7			*23
	/A2		/R1		/C7			*24
	/A3		/R1		/C7			*25
			/R1		/C7			*26
		/F1	/R1		/C7			*27
	/A1	/F1	/R1		/C7			*28
	/A2	/F1	/R1		/C7			*29

6.1 Customer Maintenance Parts List (Pen Model)

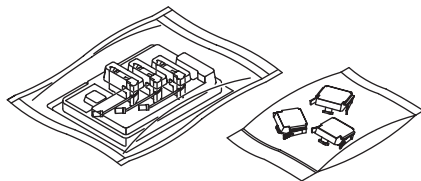
Standard Accessories



Item	Part No.	Qty				Discription
		Model	436101	436102	436103	
1	—	1	1	1	1	Pen Assembly (1st pen and plotter pen)
	—					Pen Assembly (1st, 2nd pens and plotter pen)
	—					Pen Assembly (1st, 2nd, 3rd pens and plotter pen)
	—					Pen Assembly (1st, 2nd, 3rd, 4th pens and plotter pen)
2	B9565AW	1	1	1	1	Chart *2
3	B9900BX	2	2	2	2	Bracket Assembly
4	B8800LZ	1	1	1	1	CD-ROM for Manuals
5	—	1	1	1	1	Manuals

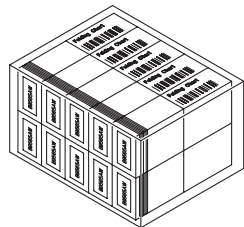
SPARES

⊙ (CMP)



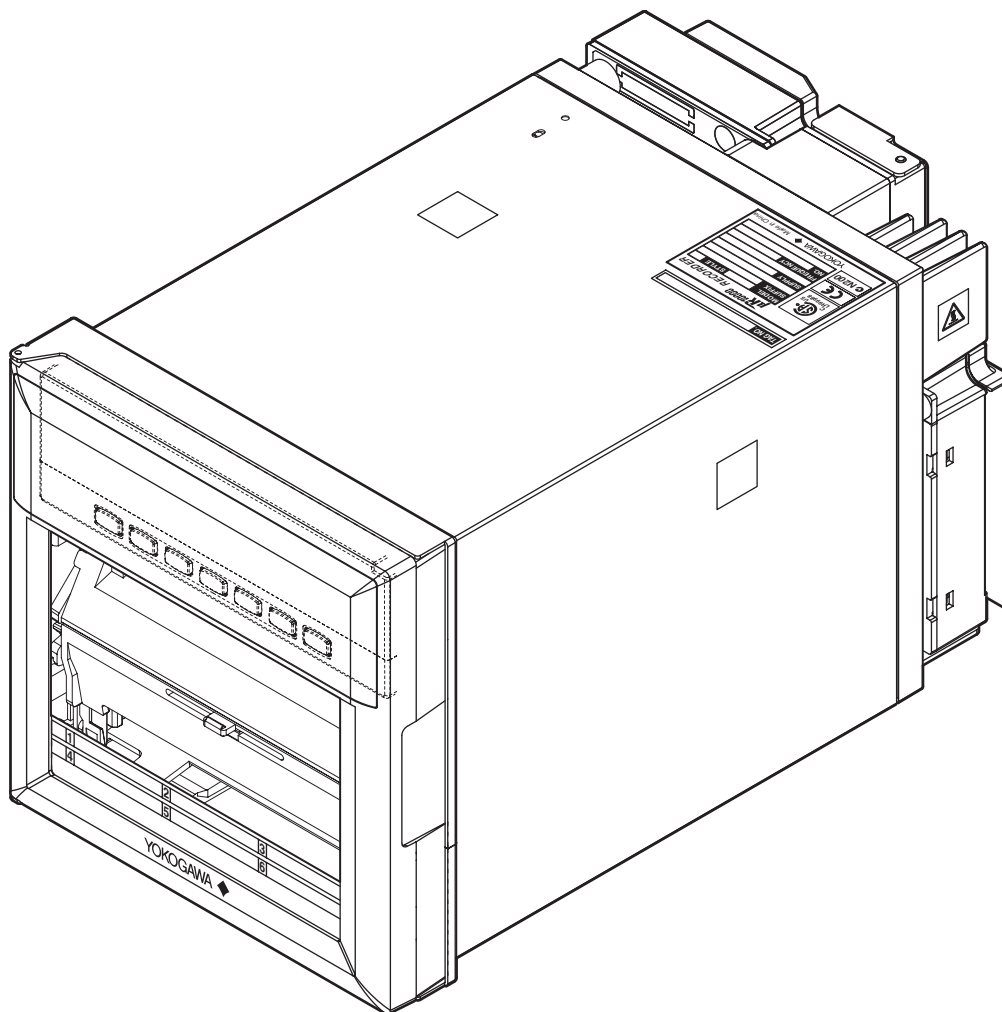
Note *1 Pen package is supplied in packs of 3 pcs
One pack is the minimum order quantity.

Part No.	Description
B9902AM	1st Pen (red)
B9902AN	2nd Pen (green)
B9902AP	3rd Pen (blue)
B9902AQ	4th Pen (violet)
B9902AR	Plotter Pen (purple)



*2 Part number: B9565AW
Minimum order quantity 10 units
(1 chart /unit)

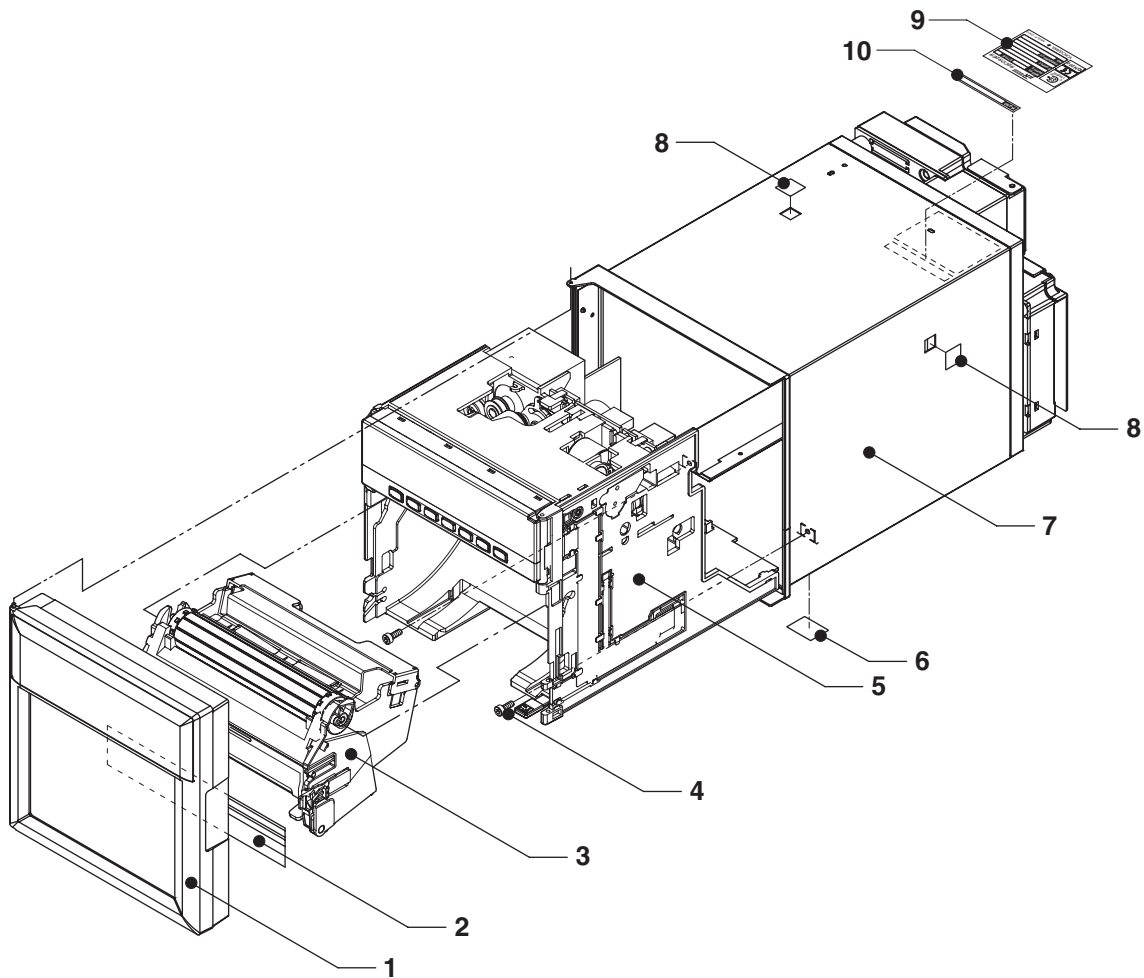
6.2 Customer Maintenance Parts List (Dot Model)



Note:

Parts marked with a ©symbol are Customer Maintenance Parts (CMP).

Complete Set

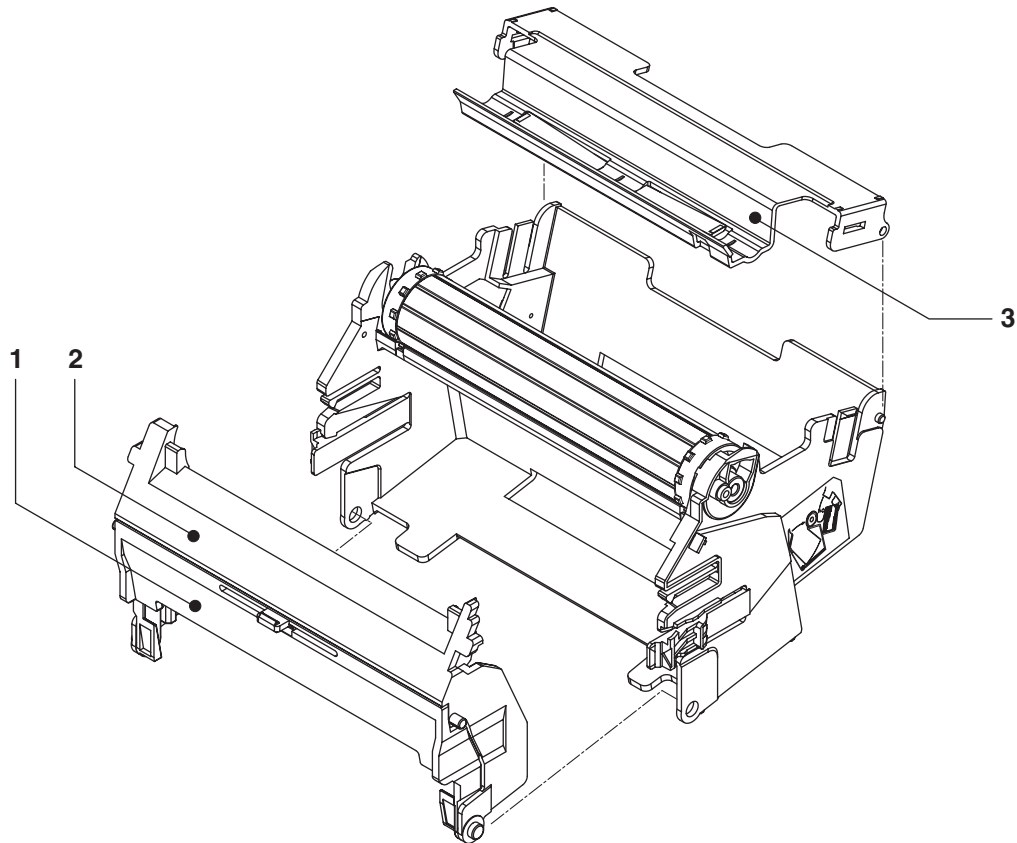


Item	Part No.	Qty	Description
1	B8800BA	1	Door Assembly (not /H3) } (select)
	B8800BB	1	Door Assembly (/H3) }
⊙ 2	B9901AE	1	Name Plate
⊙ 3	B8800AJ	1	Chart Cassette Assembly (not /F1) } (select) (see page 3)
	B8800AK	1	Chart Cassette Assembly (/F1) }
4	Y9306ZX	2	Bolt
5	—	1	Dot Frame Assembly (see page 4)
6	B8800AB	1	Name Plate
7	—	1	Case Assembly (see page 6)
8	B9900CR	4	Name Plate
9	—	1	Name Plate
10	—	—	Name Plate (Customer Option)

Note :

⊙ (CMP)

Chart Cassette Assembly

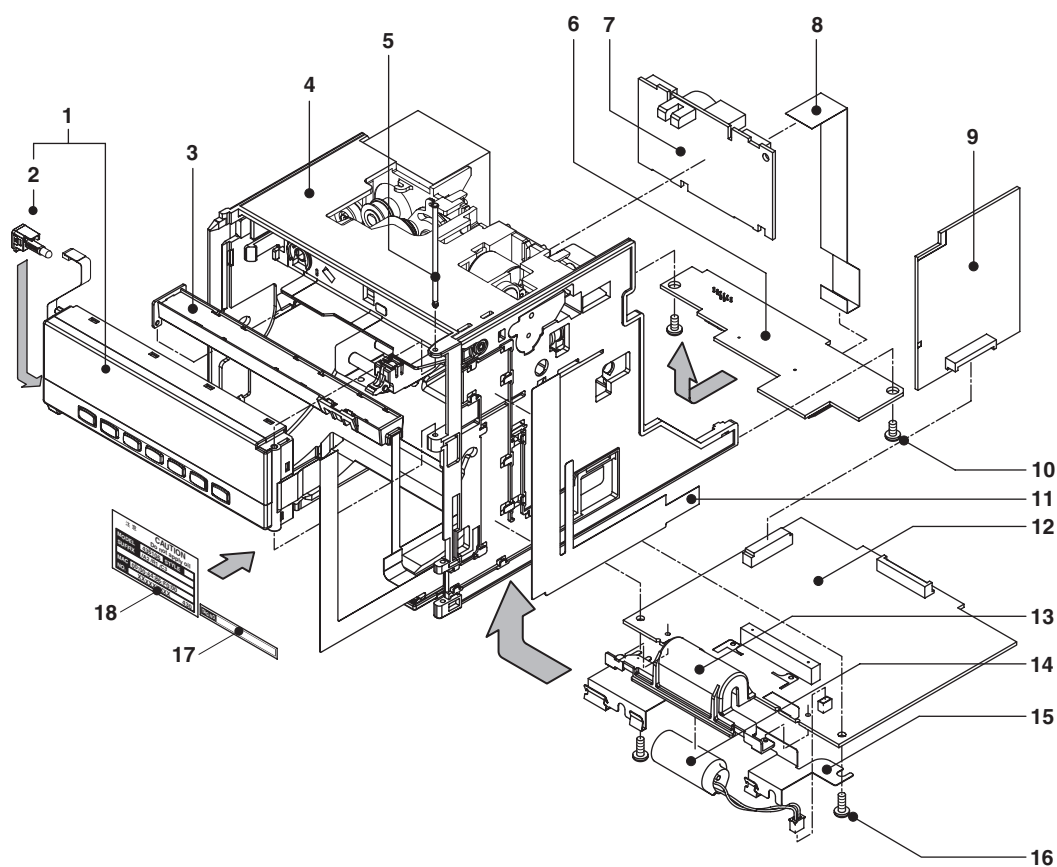


Item	Part No.	Qty	Description
⊙ 1	B8800EQ	1	Front Cover 1
⊙ 2	B8800ER	1	Front Cover 2
⊙ 3	B9962FD	1	Stock Cover
	B8800AL	1	Stock Cover Assembly (/F1) } (select)

Note :

⊙ (CMP)

Dot Frame Assembly

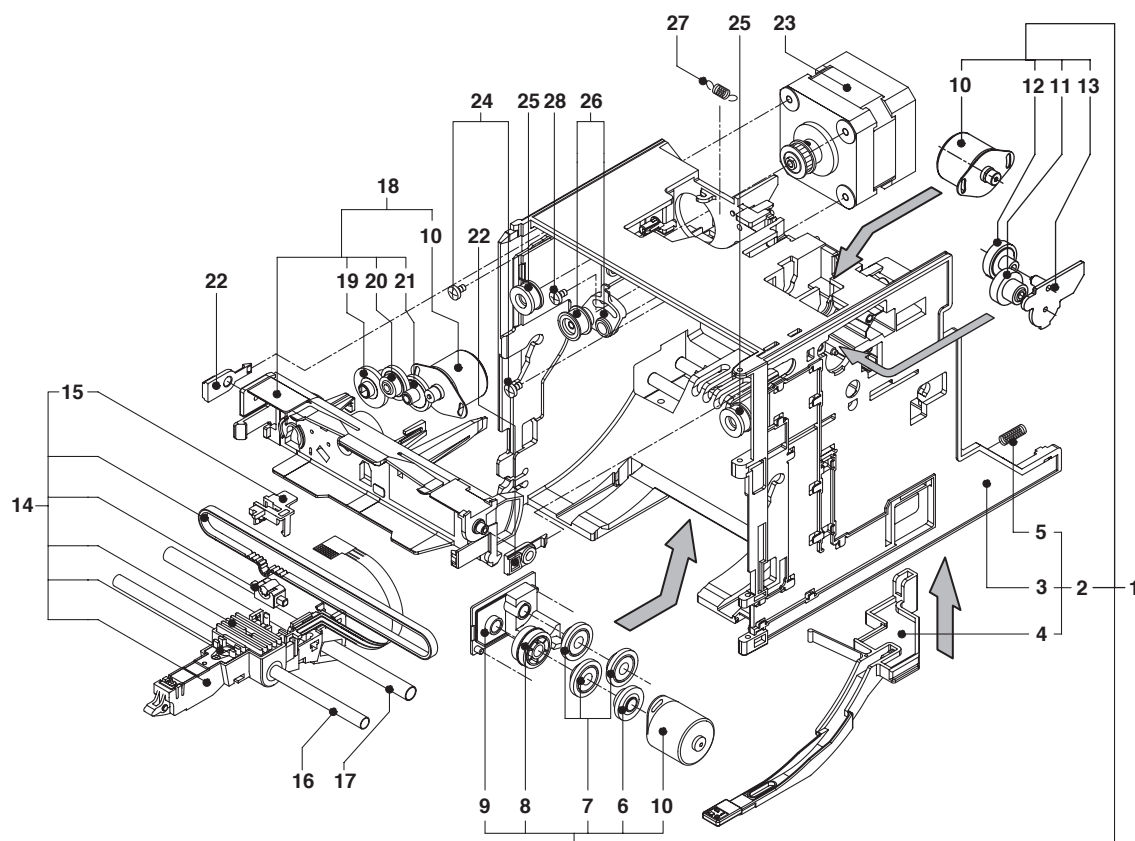


Item	Part No.	Qty	Discription
1	B8800CA	1	Display Assembly
2	B8800CR	1	LED Assembly
3	B9962ER	1	Sensor Bracket (not /F1) } (select)
	B8800EA	1	Chartend Assembly (/F1) }
4	B8801AE	1	Dot Printer Assembly (see page 5)
5	B8800DV	1	VFD Latch
6	B8801SA	1	Dot Joint PCB
7	B8801SF	1	Dot Driver PCB
8	B8801BY	1	Driver FPC
9	B8800SN	1	RS422 COM PCB (/C3) } (select)
	B8800SP	1	Ether COM PCB (/C7) }
10	B9988DL	2	Screw
11	B8800DW	1	Disp. FPC Cover
12	B8801VA	1	Dot10 CPU Assembly
13	B9900FZ	1	Battery Holder
14	B9900BR	1	Battery Assembly
15	B8800DY	1	EMC Earth Bracket
16	B9988DL	2	Screw
17	-	-	Name Plate (Customer Option)
18	-	1	Name Plate

Note :

○ (CMP)

Dot Printer Assembly

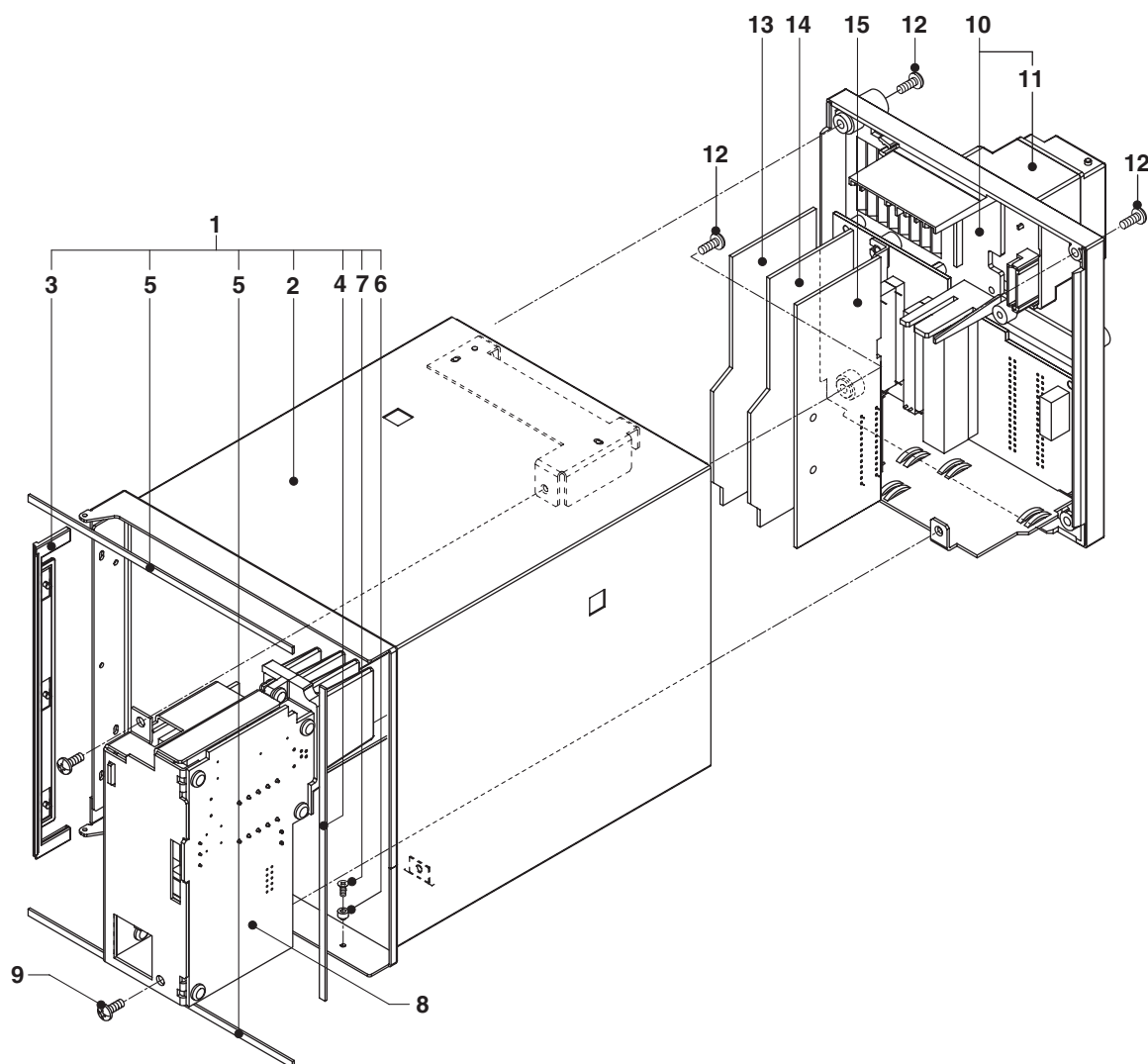


Item	Part No.	Qty	Description	Item	Part No.	Qty	Description
1	B8801BB	1	Frame Assembly	16	B9963CP	1	M-Pipe
2	B8801BC	1	Frame Sub Assembly	17	B8800DX	1	Main Shaft
3	B8801BD	1	Dot Frame	18	B9901PG	1	Ribbon Holder Assembly
4	B8800DE	1	Switch Lever	19	B9901HL	1	Gear
5	B9962EN	1	Spring	20	B9901HM	1	Gear
6	B9962EE	1	Gear A	21	B9901HN	1	Gear
7	B9962EF	3	Gear B	22	B9963DA	2	Holder Bushing
8	B9962EG	1	Gear C	23	B9963CF	1	Motor Assembly
9	B9962EH	1	Gear Cover	24	Y9306LS	2	Screw
10	B9962EJ	3	Motor Assembly	25	B9963CJ	2	Pulley Assembly
11	B8801BW	1	Swing Gear A	26	B9901EK	1	Lever Assembly
12	B8801BX	1	Swing Gear B	27	B9901EN	1	Spring
13	B9963EL	1	Swing Gear Cover	28	B9988DL	1	Screw
14	B9963CL	1	Carriage Assembly				
	-	1	Printer Head Assembly				
	-	1	Sub Carriage Assembly				
	-	1	Belt				
	-	1	Block				
	-	1	Screw				
15	B9963DF	1	Sensor Clamper				

Note:

© (CMP)

Case and Back Panel Assembly



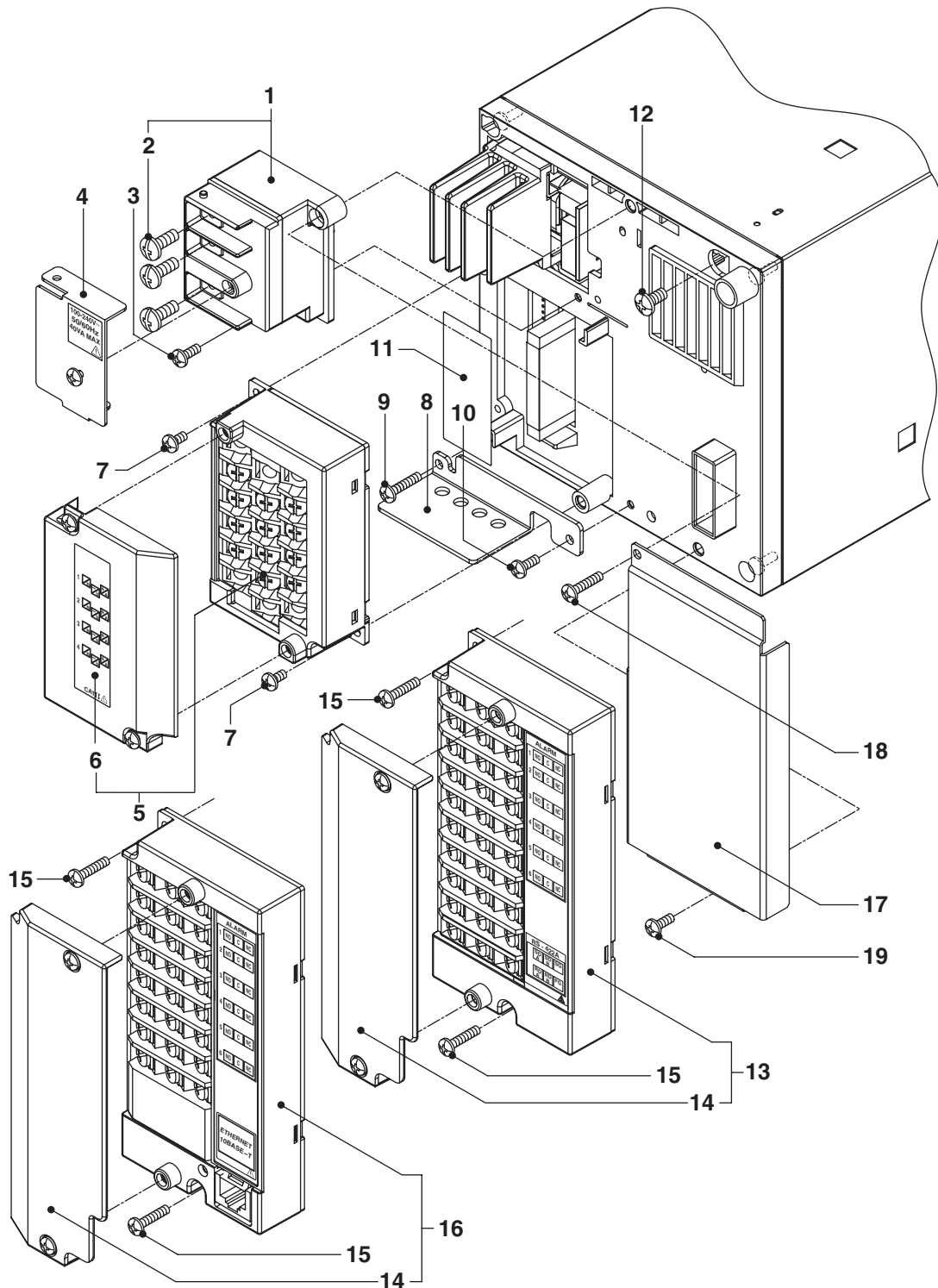
Item	Part No.	Qty	Discription
1	B8800BP	1	Case Assembly
2	B8800BQ	1	Case Assembly
3	B8800BV	1	Case Gasket
4	B9900CB	1	Gasket
5	B9900CF	2	Gasket
6	B9900CD	1	Pin
7	Y9203EB	1	Screw
8	B8800JP	1	Power Assembly
9	Y9305LB	2	Screw
10	B8801CA	1	Back Panel Assembly (not /N2)
	B8801CB	1	Back Panel Assembly (/N2)
11	-	1	Terminal Assembly (see Page 7)
12	Y9308LB	3	Screw
13	B8800SE	1	A/D Board PCB
14	B8801SD	1	DOT STD. Scanner PCB
15	B8801SE	1	DOT ISO. Scanner PCB (/N2)

(select)

Note:

⊙ (CMP)

Terminal Assembly (1/3)



6.2 Customer Maintenance Parts List (Dot Model)

Terminal Assembly (2/3)

Item	Part No.	Qty	Description
1	B8800JJ	1	Terminal Assembly
2	E9655FX	3	Screw
3	B9988DL	1	Screw
4	B8800AP	1	Cover Assembly
5	B8801CW	1	Input Terminal Assembly (not *1, *2)
	B8801CX	1	Input Terminal Assembly (*1)
	B8801CY	1	Input Terminal Assembly (*2)
6	B9901JC	1	Cover Assembly (not *1,*2)
	B9901JD	1	Cover Assembly (*1)
	B9901JP	1	Cover Assembly (*2)
7	Y9306LS	2	Screw
8	B9900EH	1	Bracket
10	Y9314LB	1	Screw
10	B9988DL	1	Screw
11	B9900BS	1	Name Plate
12	Y9406LK	1	Screw
13	B8800MA	1	Option Terminal Assembly (*3)
	B8800MB	1	Option Terminal Assembly (*4)
	B8800MC	1	Option Terminal Assembly (*5)
	B8800MD	1	Option Terminal Assembly (*6)
	B8800ME	1	Option Terminal Assembly (*7)
	B8800MF	1	Option Terminal Assembly (*8)
	B8800MG	1	Option Terminal Assembly (*9)
	B8800MH	1	Option Terminal Assembly (*10)
	B8800MJ	1	Option Terminal Assembly (*11)
	B8800MK	1	Option Terminal Assembly (*12)
	B8800ML	1	Option Terminal Assembly (*13)
	B8800MM	1	Option Terminal Assembly (*14)
	B8800MN	1	Option Terminal Assembly (*15)
	B8800MP	1	Option Terminal Assembly (*16)
14	B8800KG	1	Option Cover Assembly
15	Y9318LB	2	Screw

(select)

(select)

(select)

Note: see page 9

© (CMP)

Terminal Assembly (3/3)

Item	Part No.	Qty	Description
16	B8800NA	1	Option Terminal Assembly (*17)
	B8800NB	1	Option Terminal Assembly (*18)
	B8800NC	1	Option Terminal Assembly (*19)
	B8800ND	1	Option Terminal Assembly (*20)
	B8800NE	1	Option Terminal Assembly (*21)
	B8800NF	1	Option Terminal Assembly (*22)
	B8800NG	1	Option Terminal Assembly (*23)
	B8800NH	1	Option Terminal Assembly (*24)
	B8800NJ	1	Option Terminal Assembly (*25)
	B8800NK	1	Option Terminal Assembly (*26)
	B8800NL	1	Option Terminal Assembly (*27)
	B8800NM	1	Option Terminal Assembly (*28)
	B8800NN	1	Option Terminal Assembly (*29)
	B8800NP	1	Option Terminal Assembly (*30)
17	B8800JZ	1	Bracket
18	Y9318LB	1	Screw
19	Y9308LB	1	Screw

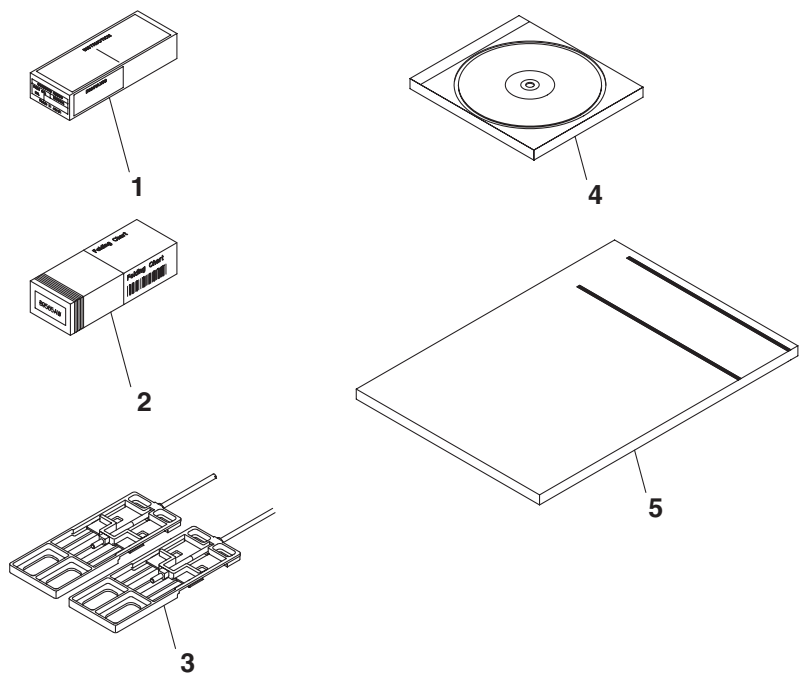
(select)

© (CMP)

Note

Model Code	Suffix Code (options)						
436106 □ □ □ □						/N2	*1
						/H2	*2
	/A1			/C3			*3
	/A2			/C3			*4
	/A3			/C3			*5
				/C3			*6
		/F1		/C3			*7
	/A1	/F1		/C3			*8
	/A2	/F1		/C3			*9
	/A1		/R1	/C3			*10
	/A2		/R1	/C3			*11
	/A3		/R1	/C3			*12
			/R1	/C3			*13
		/F1	/R1	/C3			*14
	/A1	/F1	/R1	/C3			*15
	/A2	/F1	/R1	/C3			*16
	/A1			/C7			*17
	/A2			/C7			*18
	/A3			/C7			*19
				/C7			*20
		/F1		/C7			*21
	/A1	/F1		/C7			*22
	/A2	/F1		/C7			*23
	/A1		/R1	/C7			*24
	/A2		/R1	/C7			*25
	/A3		/R1	/C7			*26
			/R1	/C7			*27
		/F1	/R1	/C7			*28
	/A1	/F1	/R1	/C7			*29
	/A2	/F1	/R1	/C7			*30

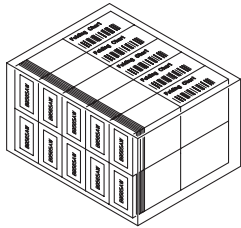
Standard Accessories



Item	Part No.	Qty	Description
1	B9901AX	1	Ribbon Cassette
2	B9565AW	1	Chart *1
3	B9900BX	2	Bracket Assembly
4	B8800LZ	1	CD-ROM for Manuals
5	-	1	Manuals

SPARES

(CMP)



Note *1 Part number: B9565AW
Minimum order quantity 10 units
(1 chart /unit)

7.1 Introduction

Notes When Replacing Parts

- Replacement of parts can only be performed by properly trained personnel.
- This section describes disassembly of the instrument. Refer to the disassembly procedures when reassembling.
- If parts other than the chart paper, pens, ribbon cassette, and internal light LED are replaced, the instrument is no longer warranted by YOKOGAWA.

WARNING

Remove all wires and cables from the recorder and turn OFF the power switch before attempting any disassembly or assembly. Certain parts of the recorder carry high voltages.

CAUTION

- The internal circuitry is vulnerable to damage from static electricity. Take appropriate measures to ensure that static electricity does not flow to the internal circuits.
- Plastic molded framing with latches are used to secure components. Applying excessive force to latches can cause them to break.

Testing after Replacement of Parts

When replacing the parts other than the chart paper, pens, ribbon cassette, and internal light LED, be sure to check them by performing the insulation resistance test, withstand voltage test, and protective grounding function (see chapter 3).

Screw Driver and Tightening Torque

Screw Driver

The recorder generally uses M3 + screws except for securing the internal unit in which case M3 hex screws are used. Use the appropriate screw driver for each type of screw.

Screw Tightening Torque

- **Printed circuit boards (excluding the Mother Board Assembly)**
The screw tightening torque is 0.35 to 0.45 N·m.
- **Input Terminal Assembly, Option Terminal Assembly, Mother Board Assembly**
The screw tightening torque is 0.55 to 0.6 N·m.
- **Other**
If a different torque is specified in a particular instruction, use that torque instead.

7.2 Replacable Parts

The recommended replacement periods for wearable parts (ones with limited lifespans) is given in the table below. The replacement periods are based on standard operating conditions. The actual replacement period should be determined depending on the actual operating conditions.

Pen Model

Item	Replacement Period	Part Name	Part No.	Note	Quantity Used
Z-fold chart paper	33 days	Chart	B9565AW	When used at 20 mm/h	1
Felt pen	2 km	Pen Assembly	B9902AM B9902AN B9902AP B9902AQ	Red Green Blue Violet At a pen speed of 10 cm/s	1 each
Plotter pen	100,000 characters	Pen Assembly	B9902AR	When printing continuously	1
Display	5 years*	Display Assembly	B8800CA	For pens 1 to 4	1
Chart paper feed motor	5 years	Motor Assembly	B9962EJ		1
Plotter carriage	5 years	Carriage Assembly	B8800DJ		1
Plotter motor	5 years	X Motor Assembly	B8800DT	For the X-axis	1
Lever bearing	5 years	Bearing	B9900RP	For the plotter	1
Pen servo	5 years	Pen Servo Assembly	B8800FG	Shared by all pens (excludes the pen arm ASSY)	1 to 4
Internal light LED	2 years*	LED Assembly	B8800CR		1

* The half life of the brightness at the factory default brightness setting.

Dot Model

Item	Replacement Period	Part Name	Part No.	Note	Quantity Used
Z-fold chart paper	33 days	Chart	B9565AW	When used at 20 mm/h	1
Ribbon cassette	3 months	Ribbon Cassette	B9901AX		1
Display	5 years*	Display Assembly	B8800CA		1
Chart paper feed motor	5 years	Motor Assembly	B9962EJ		1
Lever	3 years	Lever Assembly	B9901EK	For the carriage	1
Pulley	3 years	Pulley Assembly	B9963CJ	For the carriage	2
Carriage motor	5 years	Motor Assembly	B9963CF		1
Carriage	5 years	Carriage Assembly	B9963CL		1
Ribbon shift motor	5 years	Motor Assembly	B9962EJ		1
Ribbon shift gear	5 years	Swing Gear A Swing Gear B	B8801BX B8801BW		1 each
Ribbon feed motor	5 years	MOTOR Assembly	B9962EJ		1
Ribbon feed gear	5 years	Gear	B9901HL B9901HM B9901HN		1 each
Internal light LED	2 years*	LED Assembly	B8800CR		1

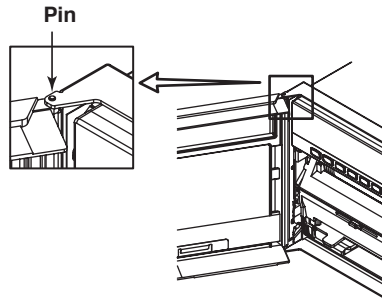
* The half life of the brightness at the factory default brightness setting.

For information on replacing the parts in the shaded area, see the *μR10000 Recorder user's manual* (IM 04P01B01-01E).

7.3 Disassembly

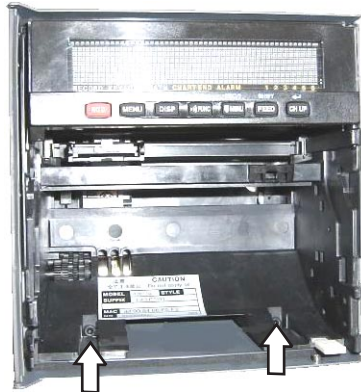
Door Assembly [Item 1 on pages 6-2 and 6-12]

Remove the door by depressing the hinge pin.

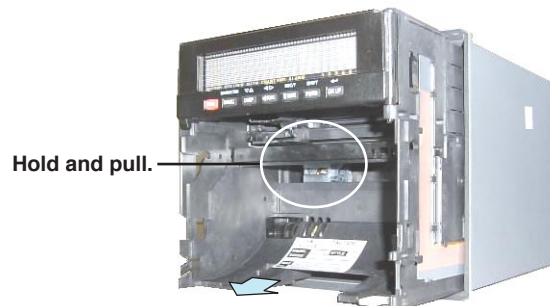


Internal Unit - Frame Assembly [Item 5 on pages 6-2 and 6-12]

1. Remove the Chart Cassette Assembly.
2. Remove the two screws from the lower part of the internal unit.
Tool used: 3 mm hex wrench (70 mm or longer)

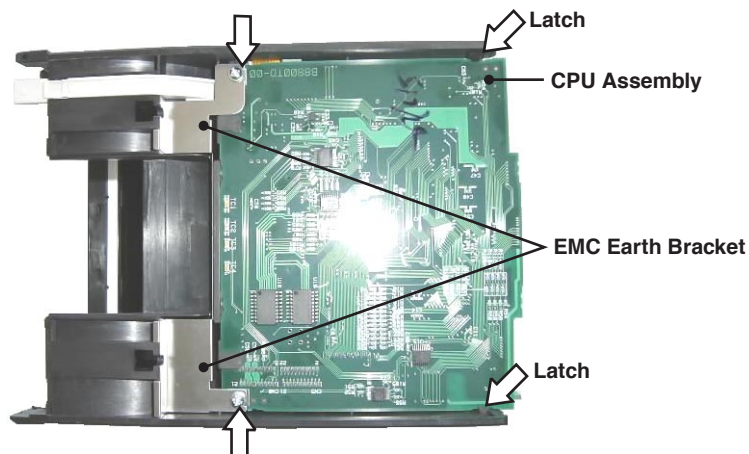


3. Hold the internal unit at its center, and pull it out toward you.

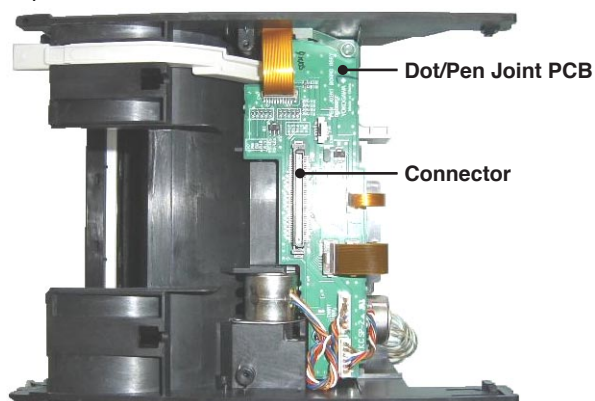


CPU Assembly, Battery Assembly [Item 14 on pages 6-4 and 6-14]

1. Remove the internal unit.
2. Remove the two screws securing the CPU Assembly.

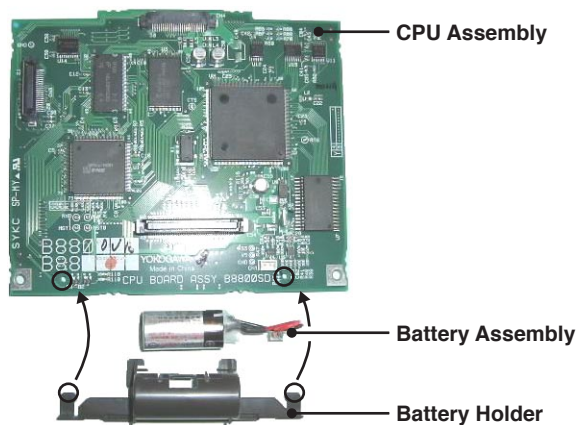


3. Remove the EMC Earth Brackets.
4. The CPU Assembly is connected to the connector on the Joint PCB at the bottom. Release the latches, then pull the CPU Assembly straight up to separate it from the Joint PCB.



Removing the Battery Assembly

5. Pull the projection on the battery holder through the hole in the CPU Assembly, and remove the Battery Assembly cable from the CPU Assembly.



Note

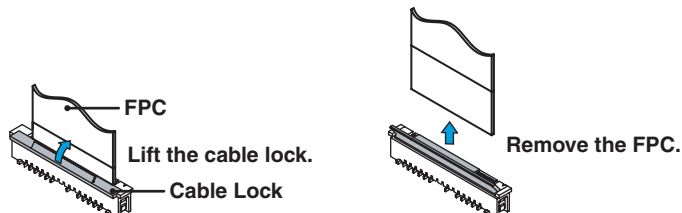
If you will save the CPU Assembly, remove the Battery Assembly connector from the CPU Assembly to prevent shorting the battery.

Joint PCB [Item 6 on pages 6-4 and 6-14]

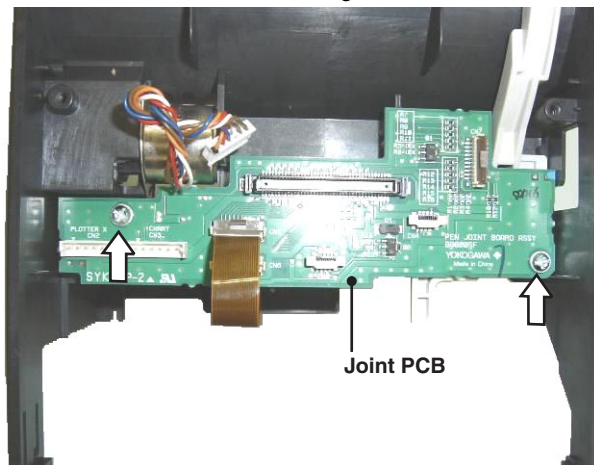
1. Remove the internal unit.
2. Remove the CPU Assembly.
3. Remove the cable and the FPC (Flexible Printed Circuit) connected to the Joint PCB.

Removing the FPC

Release the cable lock of the connector and remove the FPC. When reassembling, be sure to lock the FPC after reattaching it.



4. Remove the two screws securing the Joint PCB.

**Connecting the Joint PCB Connector**• **Pen Model****Connector Connects to**

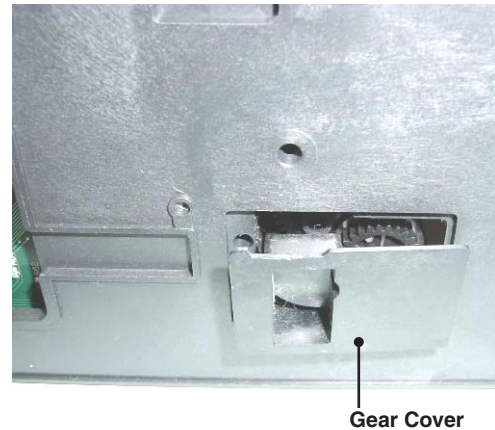
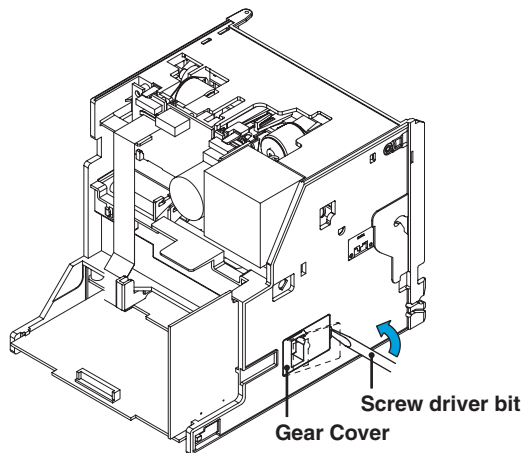
CN1	Pen CPU Assembly
CN2	X Motor Assembly (Plotter X motor)
CN3	Motor Assembly (Chart paper feed motor)
CN4	Chartend Assembly (/F1 option)
CN5	Pen Driver PCB
CN6	Pen Driver PCB
CN7	Display Assembly
CN8	Carriage Assembly (Plotter carriage)

• **Dot Model****Connector Connects to**

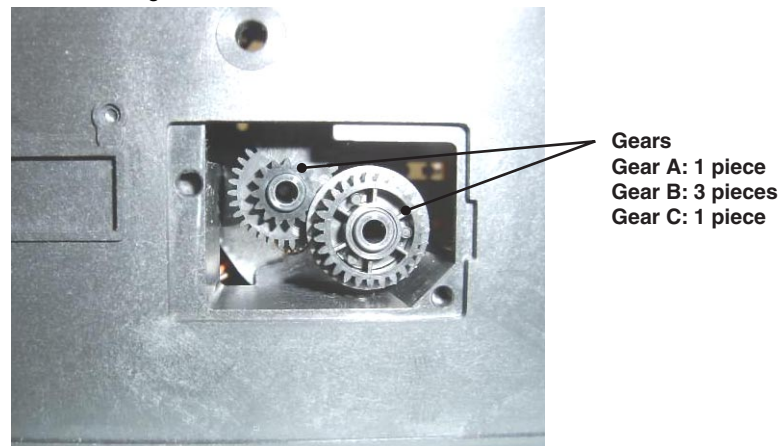
CN1	Dot10 CPU Assembly
CN2	Motor Assembly (Chart paper feed motor)
CN3	Chartend Assembly (/F1 option)
CN4	Dot Driver PCB
CN5	Display Assembly

Chart Paper Feed Motor - Motor Assembly (B9962EJ) [Item 10 on pages 6-5 and 6-15]

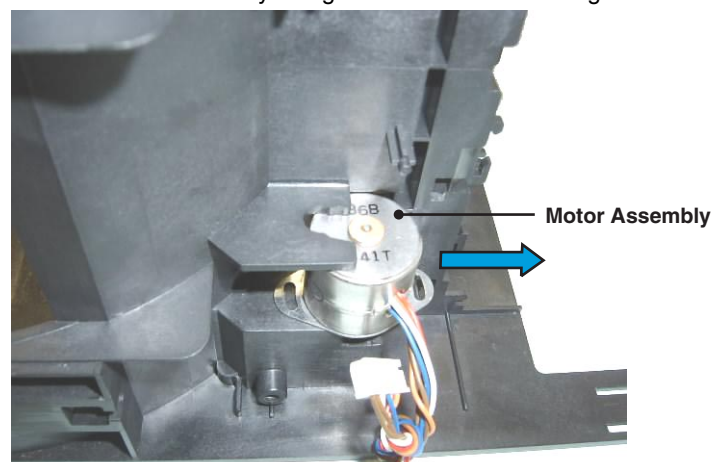
1. Remove the internal unit.
2. Remove the Gear Cover. Light pressure is used to place the Gear Cover.



3. Remove the gears.

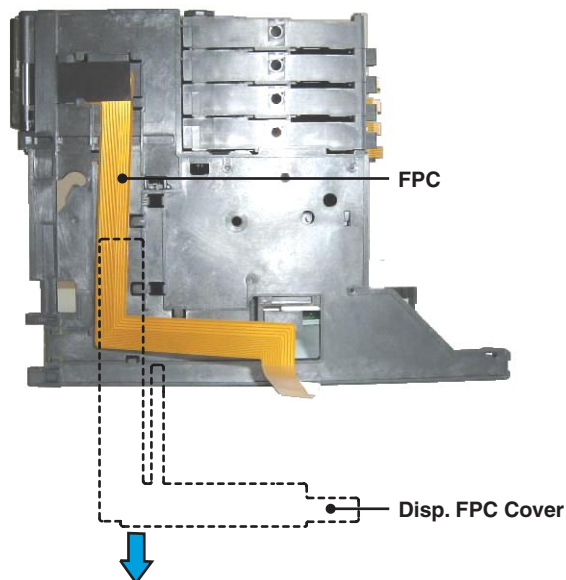


4. Remove the Motor Assembly cable from the connector on the Joint PCB.
5. Remove the Joint PCB.
6. Pull the Motor Assembly straight out as shown in the figure.

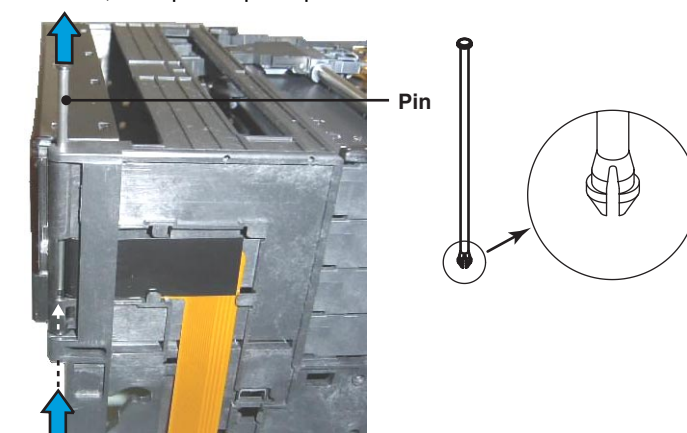


Display Assembly [Item 1 on pages 6-4 and 6-14]

1. Remove the internal unit.
2. Remove the CPU Assembly.
3. Remove the FPC cable from the Display Assembly connected to the Joint PCB.
4. Remove the semitransparent Disp. FPC Cover.



5. Push up on the hinge pin of the Display Assembly, then pull the pin out. The tip of the pin forms latch. To remove the pin, squeeze the tip using a pair of tweezers, then push up the pin.



Push

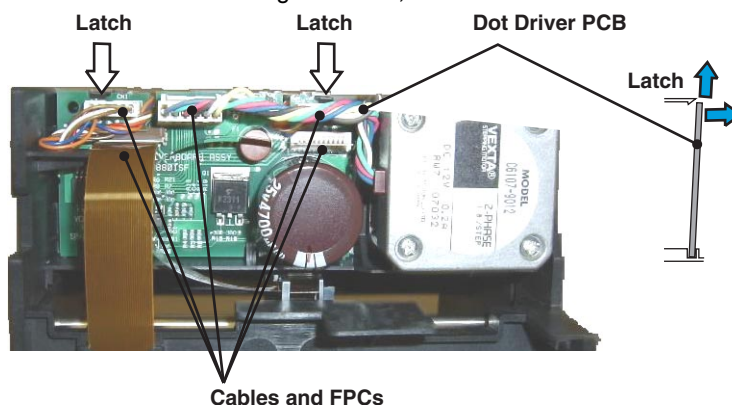
6. Remove the Display Assembly.



● Dot Model

Dot Driver PCB [Item 7 on page 6-14]

1. Remove the internal unit.
2. Remove all cables and FPCs connected to the Dot Driver PCB.
3. Release the latch securing the board, then remove the Dot Driver PCB.



Connecting the Connector of the Dot Driver PCB

Connector	Connects to
CN1	Motor Assembly (Ribbon shift motor)
CN2	Dot Joint PCB
CN3	Motor Assembly (Carriage motor)
CN4	Motor Assembly (Ribbon feed motor)
CN5	Carriage Assembly

● Dot Model

Ribbon Holder Assembly [Item 18 on page 6-15]

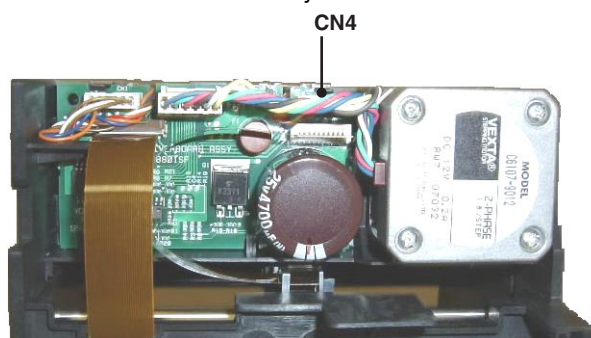
Ribbon Feed Motor - Motor Assembly (B9962EJ) [Item 10 on page 6-15]

Swing Gear A and B [Items 11 and 12 on page 6-15]

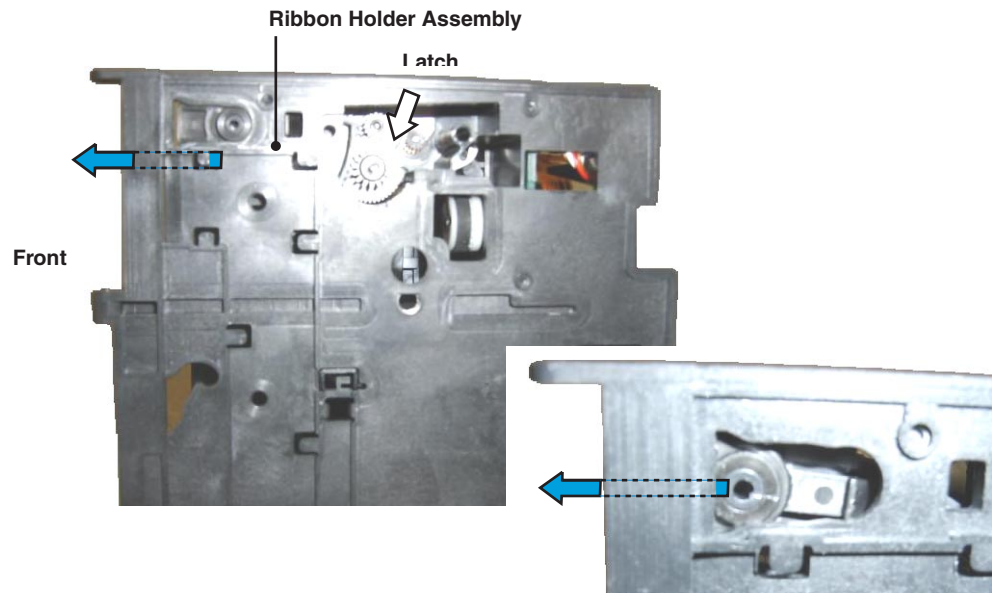
Ribbon Shift Motor - Motor Assembly (B9962EJ) [Item 10 on page 6-15]

Ribbon Holder Assembly

1. Remove the internal unit.
2. Remove the Motor Assembly cable connected to CN4 on the Dot Driver PCB.

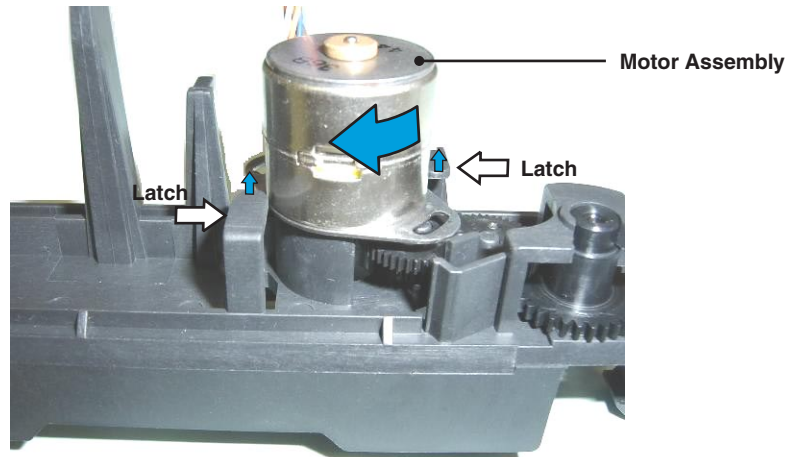


3. Release the left and right latches simultaneously, then pull the Ribbon Holder Assembly toward you to remove.



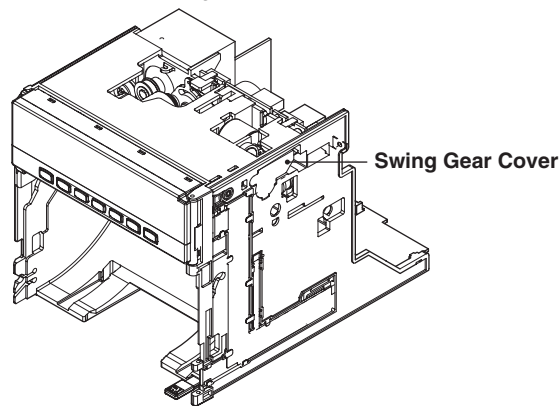
Ribbon Feed Motor - Motor Assembly (B9962EJ)

4. While releasing the tab on the latch securing the Motor Assembly on the Ribbon Holder Assembly, turn the Motor Assembly in the arrowed direction. The Motor Assembly is removed.



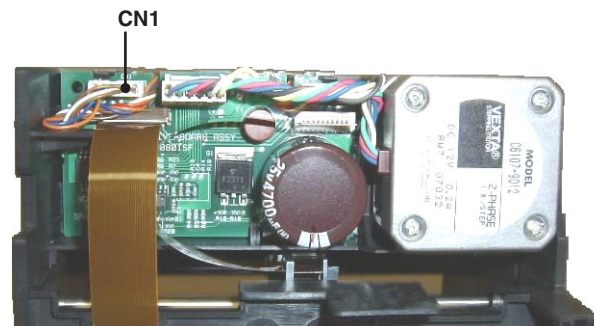
Swing Gear A and B

5. Remove the Swing Gear Cover. Light pressure is used to place the Swing Gear Cover.
6. Remove the Swing Gear A and B.

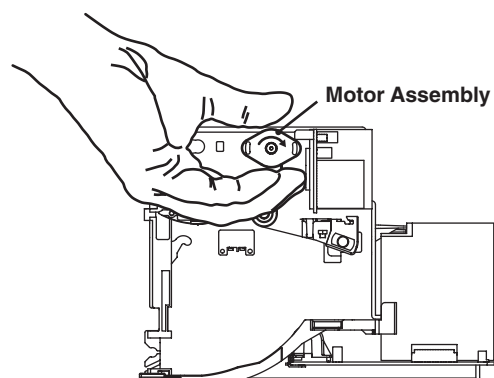
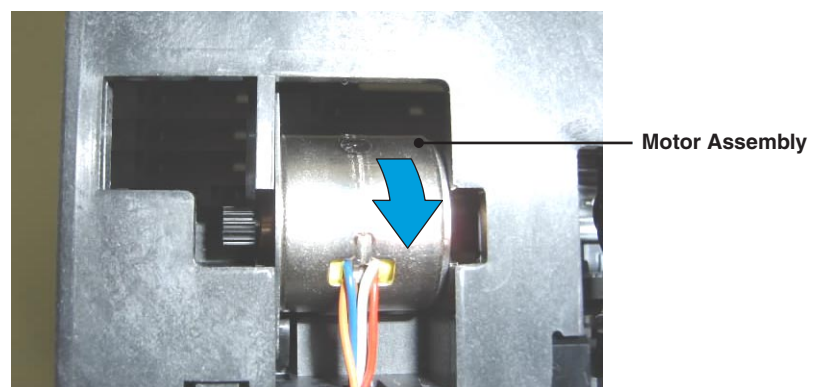


Ribbon Shift Motor - Motor Assembly (B9962EJ)

7. Remove the Motor Assembly cable from CN1 on the Dot Driver PCB.



8. Turn the Motor Assembly in the arrowed direction, release the latch, then pull to remove.



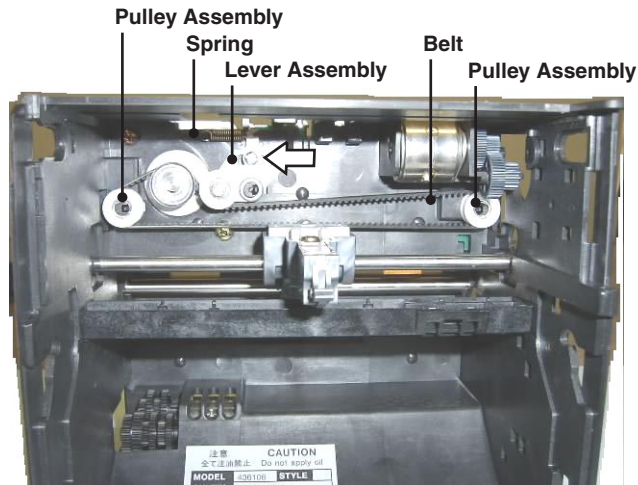
● Dot Model

Lever Assembly (B9901EK) [Item 26 on page 6-15]

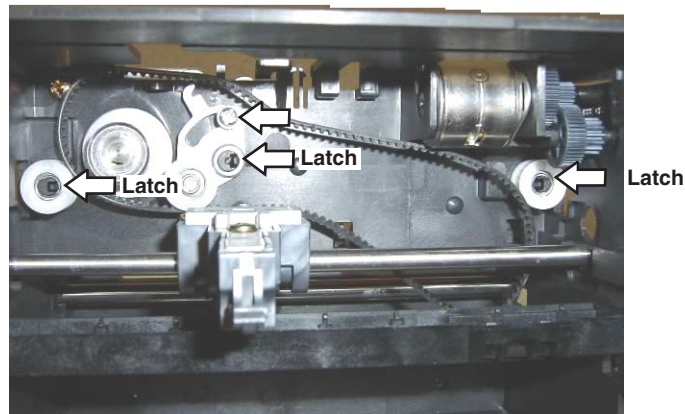
Pulley Assembly (B9963CJ) [Item 25 on page 6-15]

1. Remove the internal unit.
2. Remove the Ribbon Holder Assembly.
3. Loosen the screw* securing the Lever Assembly and remove the belt tension spring.

* The screw tightening torque is 0.3 to 0.35 N·m.



4. Remove the belt from the left and right Pulley.
5. Remove the screw securing the Lever Assembly, grasp the support latch with a pair of tweezers, then pull out the Lever Assembly toward you to remove.



6. Grasp the pulley shaft latch with a pair of tweezers, then pull out the Pulley toward you to remove.

The belt tension must be adjusted when reassembling. See section 4.3.

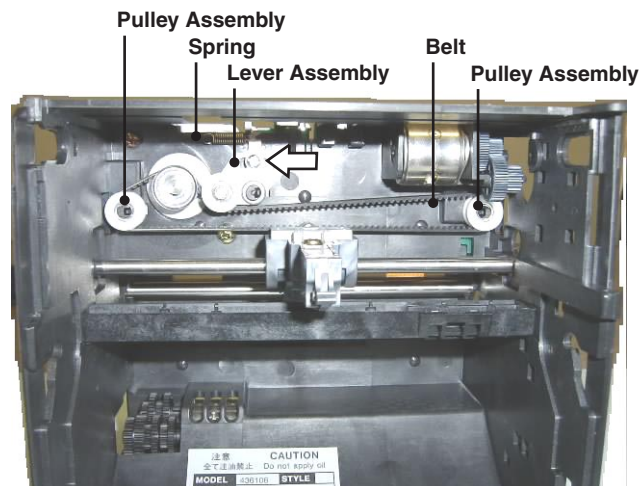
7.3 Disassembly

● Dot Model

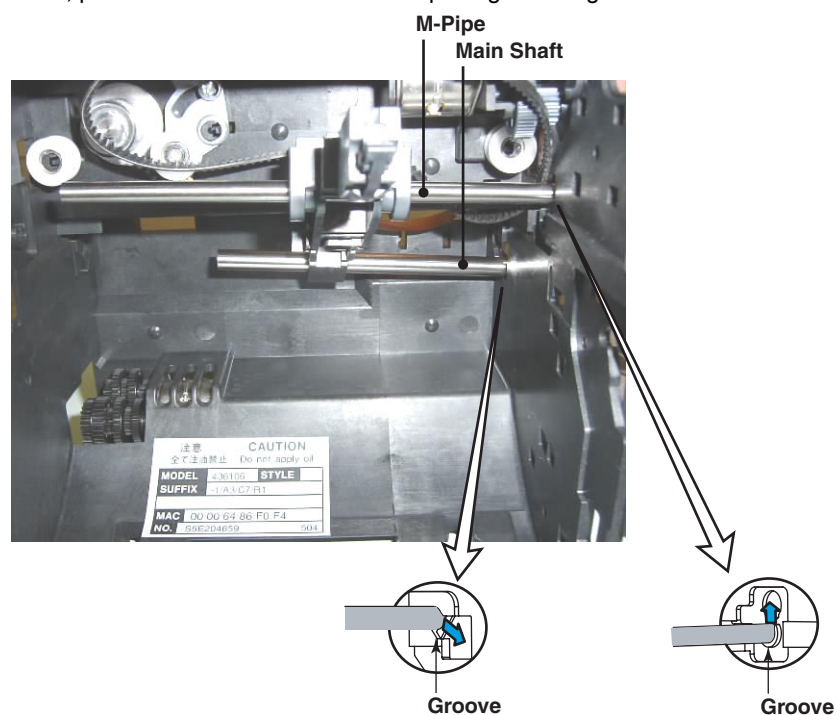
Carriage Assembly (B9963CL) [Item 14 on page 6-15]

1. Remove the internal unit.
2. Remove the Dot Driver PCB.
3. Remove the Ribbon Holder Assembly.
4. Loosen the screw* securing the Lever Assembly and remove the belt tension spring.

* The screw tightening torque is 0.3 to 0.35 N·m.



5. Pull the main shaft toward you to remove it from the shaft securing groove. Then, pull out the main shaft from the opening in the right side of the Frame.



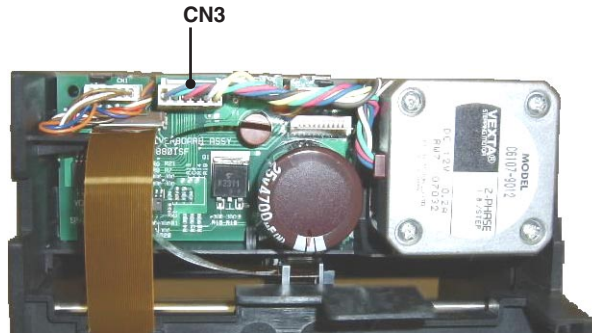
6. Hold the M-Pipe, then push it upward to remove it from the shaft securing groove. Then, pull out the M-Pipe from the opening in the right side of the Frame.

The belt tension must be adjusted when reassembling. See section 4.3.

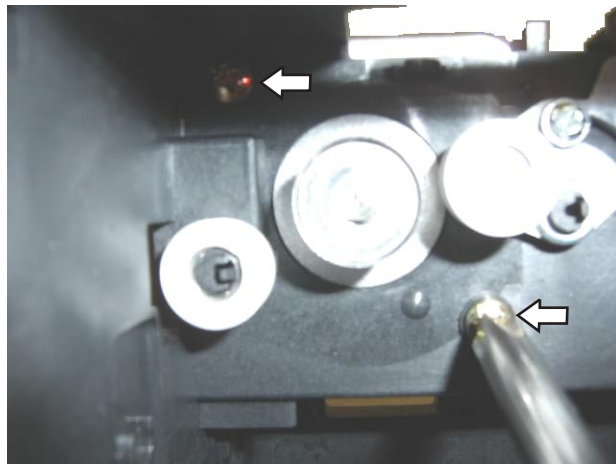
● Dot Model

Carriage Motor - Motor Assembly (B9963CF) [Item 23 on page 6-15]

1. Remove the internal unit.
2. Remove the Ribbon Holder Assembly.
3. Loosen the screw* securing the Lever Assembly and remove the belt tension spring. Then remove the Belt from the Pulley Assembly.
* The screw tightening torque is 0.3 to 0.35 N·m.
4. Remove the cable from the Motor Assembly from CN3 on the Dot Driver PCB.



5. Remove the two screws securing the Motor Assembly (0.3 to 0.35 N·m), then remove the Motor Assembly.



The belt tension must be adjusted when reassembling. See section 4.3.

● Pen Model

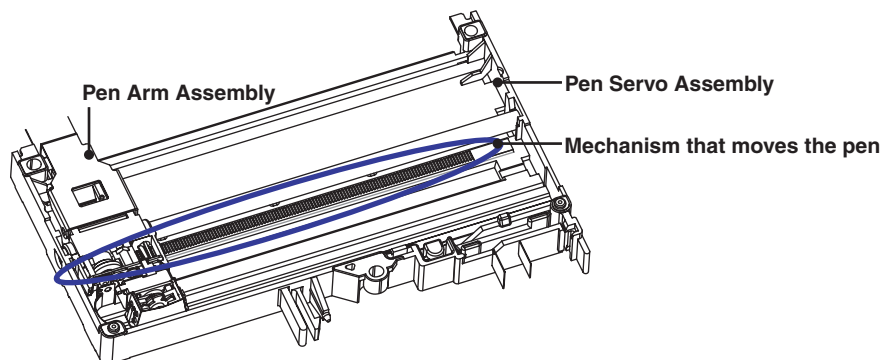
Pen Servo Assembly (B8800FG) [Item 23 on page 6-5],

Pen Driver PCB [Item 7 on page 6-4]

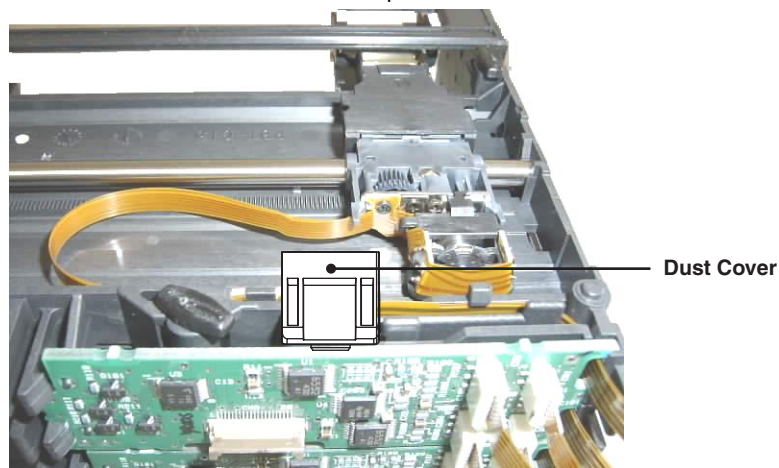
Pen Arm Assembly [Items 24 to 27 on page 6-5]

CAUTION

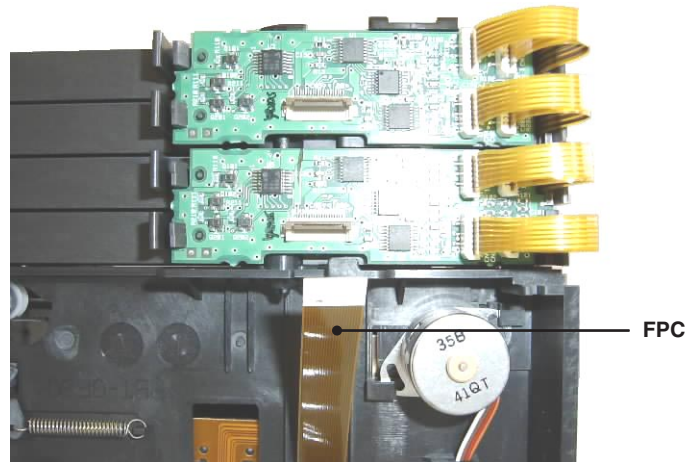
- If any foreign material adheres to the mechanism of the Pen Servo Assembly that moves the pens, malfunction can occur.
- If any foreign material adheres to the bottom of the Pen Servo Assembly, that foreign material can fall onto components during assembly and cause malfunction.
- Before assembly, visually inspect the mechanism that moves the pens and the bottom to confirm that no foreign materials have accumulated, and if necessary, use an air blower to clean the affected areas.



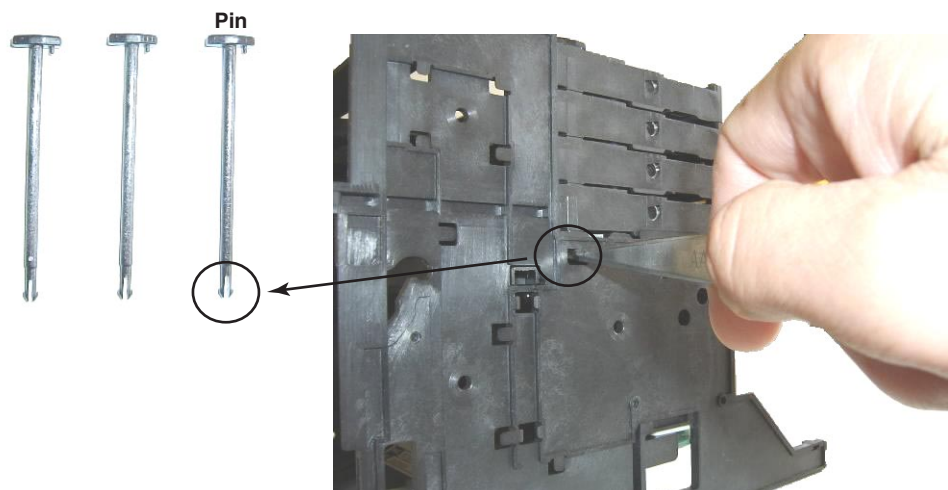
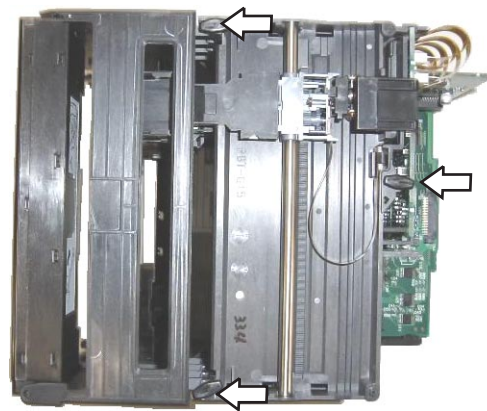
1. Remove the internal unit.
2. Remove the Dust Cover from the top of the internal unit.



3. Release the cable lock of the connector and remove the FPC from the Pen Joint PCB at the top of the Pen Driver PCB on the back panel of the internal unit.



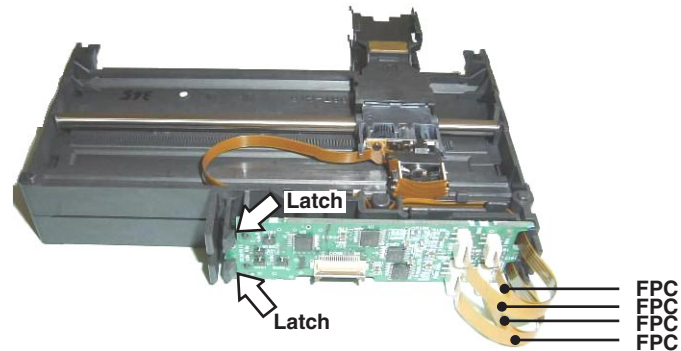
4. Remove the three pins securing the Pen Servo Assembly. The tips of the pins form latches. To remove them, squeeze the tips using a pair of tweezers, then pull out the pins.



5. Remove the two Pen Servo Assemblies and Pen Driver PCB.

7.3 Disassembly

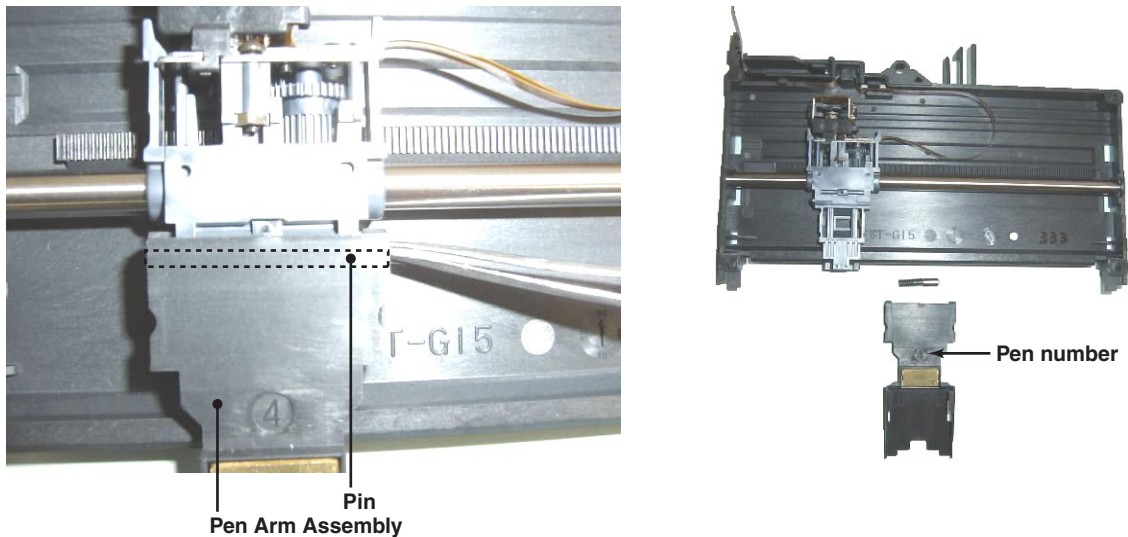
6. Remove the FPCs. Release the latches on the Pen Driver PCB, then separate the Pen Servo Assembly and Pen Driver PCB.



Note

The connector connected to the FPC from the Pen Servo Assembly on the Pen Driver PCB does not have a locking mechanism. Inserting and removing it repeatedly can result in worn or defective contacts.

6. Remove the Pin from the Pen Servo Assembly, then remove the Pen Arm Assembly.



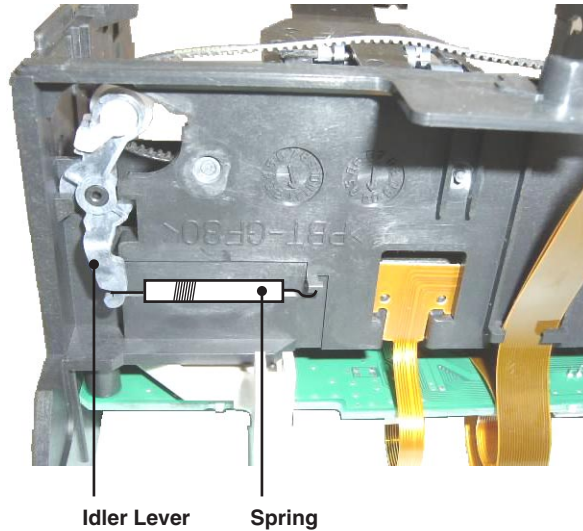
Note

The pen number is indicated on the Pen Arm Assembly. When assembling, make sure to use correct Pen Arm Assembly. Otherwise, the Pen Arm Assemblies will interfere with each other.

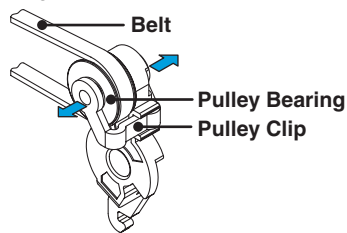
● Pen Model

Pulley Bearing (B9900RP) [Item 17 on page 6-5]

1. Remove the internal unit.
2. Remove the Pen CPU Assembly.
3. Remove all Pen Servo Assemblies.
4. Remove the Spring, then turn the Idler Lever and pull it toward you.



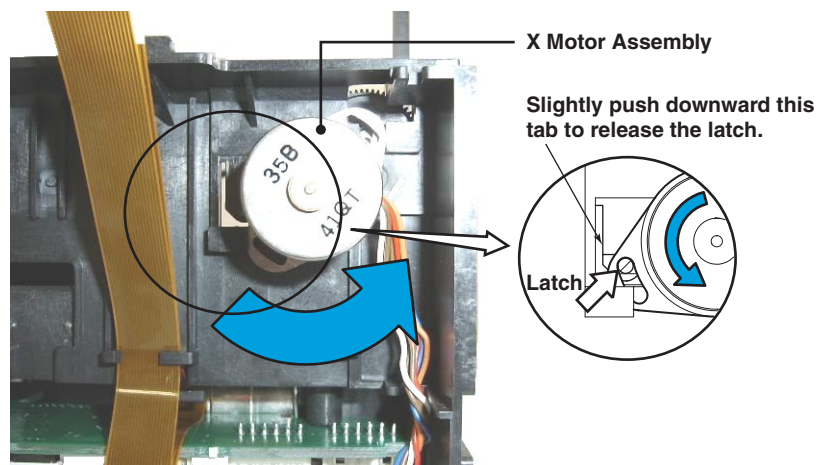
5. Slightly widen the Pulley Clip to remove the Pulley Bearing.



● Pen Model

Plotter X Motor - X Motor Assembly (B8800DT) [Item 20 on page 6-5]

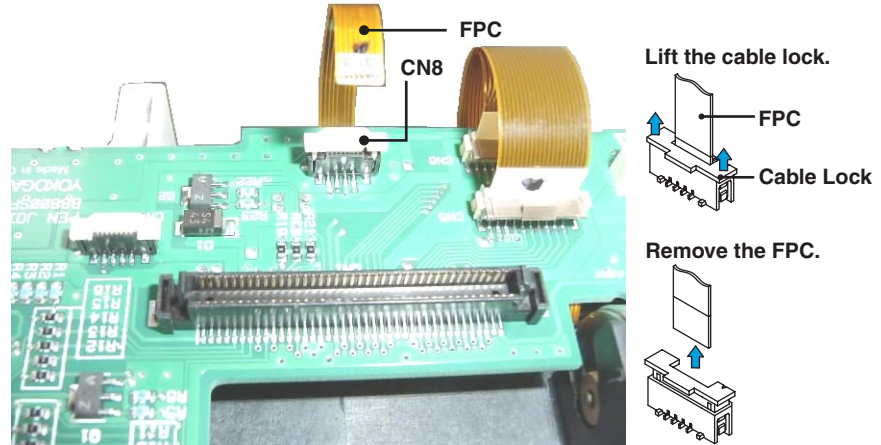
1. Remove the internal unit.
2. Remove the Pen CPU Assembly.
3. Remove all Pen Servo Assemblies.
4. Remove the Spring, then turn the Idler Lever and pull it toward you.
5. Remove the X Motor Assembly cable connected to CN2 on the Pen Joint PCB.
6. Release the latch securing the X Motor Assembly, then turn the motor in the arrowed direction to remove.



● Pen Model

Carriage Assembly (B8800DJ) [Item 11 on page 6-5]

1. Remove the internal unit.
2. Remove the Pen CPU Assembly.
3. Remove all Pen Servo Assemblies.
4. Remove the Spring, then turn the Idler Lever and pull it toward you.
5. Remove the FPC connected to CN8 on the Pen Joint PCB. Release the locking mechanism securing the FPC, then pull up the FPC.



6. Hold both ends of the Main Shaft, then pull up to remove it from the shaft securing groove. Then remove the Carriage Assembly from the Frame.

