Service Manual

MV1000/MV2000

MVAdvanced™

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YOKOGAWA
Yokogawa Electric Corporation

SM MV1000-01E
1st Edition

Important Notice to the User

- This manual contains information for servicing YOKOGAWA's MV1000 and MV2000. 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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Revisions

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Introduction

This manual contains information for servicing YOKOGAWA's MV1000 and MV2000.

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

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

Safety Precautions

The general safety precautions described here must be observed during all phases of operation. If the MV is used in a manner not described in this manual, the protection provided by the MV may be impaired. Yokogawa Electric Corporation assumes no liability for the customer's failure to comply with these requirements.

WARNING

- **Use the Correct Power Supply**
  Ensure that the source voltage matches the voltage of the power supply before turning ON the power. In the case of a desktop type, ensure that it is within the maximum rated voltage range of the provided power cord before connecting the power cord.
- **Use the Correct Power Cord and Plug**
  To prevent electric shock or fire, be sure to use the power cord supplied by YOKOGAWA. The main power plug must be plugged into an outlet with a protective ground terminal. Do not disable this protection by using an extension cord without protective earth grounding.
- **Connect the Protective Grounding Terminal**
  Make sure to connect the protective grounding to prevent electric shock before turning ON the power.
  The power cord that comes with the desktop type is a three-prong type power cord. Connect the power cord to a properly grounded three-prong outlet.
- **Do Not Impair the Protective Grounding**
  Never cut off the internal or external protective grounding wire or disconnect the wiring of the protective grounding terminal. Doing so invalidates the protective functions of the instrument and poses a potential shock hazard.
- **Do Not Operate with Defective Protective Grounding**
  Do not operate the instrument if the protective grounding might be defective. Also, 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 an environment constitutes a safety hazard.
  Prolonged use in a highly dense corrosive gas (H_2S, SOx, etc.) will cause a malfunction.
- **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.
- **Ground the Instrument before Making External Connections**
  Connect the protective grounding before connecting to the item under measurement or control unit.
- **Damage to the Protection**
  Operating the instrument in a manner not described in this manual may damage the instrument's protection.

Safety Symbols Used on Equipment and in 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


Functional ground terminal (do not use this terminal as a protective ground terminal.)


Alternating current


Direct current

ON (power)


OFF (power)

Conventoins Used in 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 instrument.

Chapter 2 **Troubleshooting**
Lists problems that can occur and gives corrective actions.

Chapter 3 **Testing**
Gives procedures for testing the characteristics 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**
Describes how to replace parts.

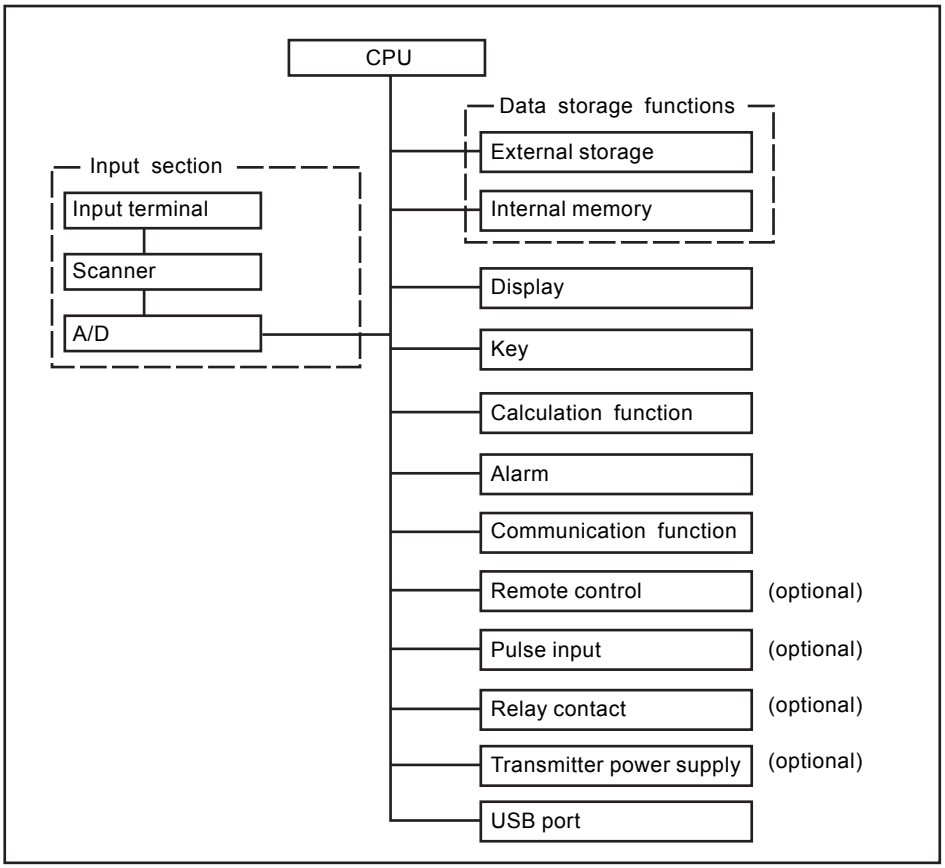
Specifications are not included in this manual. For specifications, refer to the MV1000/MV2000 User's Manual (IM MV1000-01E).

Contents

1.1 Principles of Operation

The following explains the principles of operation of the MV.

Block Diagram



Input Terminal Section

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 for measuring the temperature of the terminals.
- Metal core construction used in the internal printed circuit boards to equalize temperature.
- Input terminals removable.

Scanner Section

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

A/D Conversion Section

Converts analog signals to digital signals. It is a PWM (pulse width modulation) type converter. A/D converter calibration data is stored in an EEPROM.

For the correspondence between input channels and A/D converters, see “Measurement Accuracy” on page 3-6.

Saving Data

The capacity of the internal memory is either 80 MB (standard memory) or 200 MB (expansion memory).
The CF card can be used as an external memory medium.

Display/Keys

The MV uses an LCD display. You can control the MV with key operations.

Calculation

You can calculate the difference between two measurement inputs, perform linear scaling, square roots, calibration correction, and other computations.

Alarms

Alarm functions include upper limit alarm and lower limit alarm.

Other Functions

Serial/Ethernet Communication

The MV can communicate with other instruments via the Ethernet, RS-232, or RS-422/485 interface (with the serial communication option).

Remote Control/Pulse Input

Record start and other operations can be controlled using external signals (with the optional remote control function).
Counts the number of pulses for each measruement (with the pulse input option).

Relay Output

The MV can output alarms or FAIL/Status (optional).

Transmitter Power Supply Output

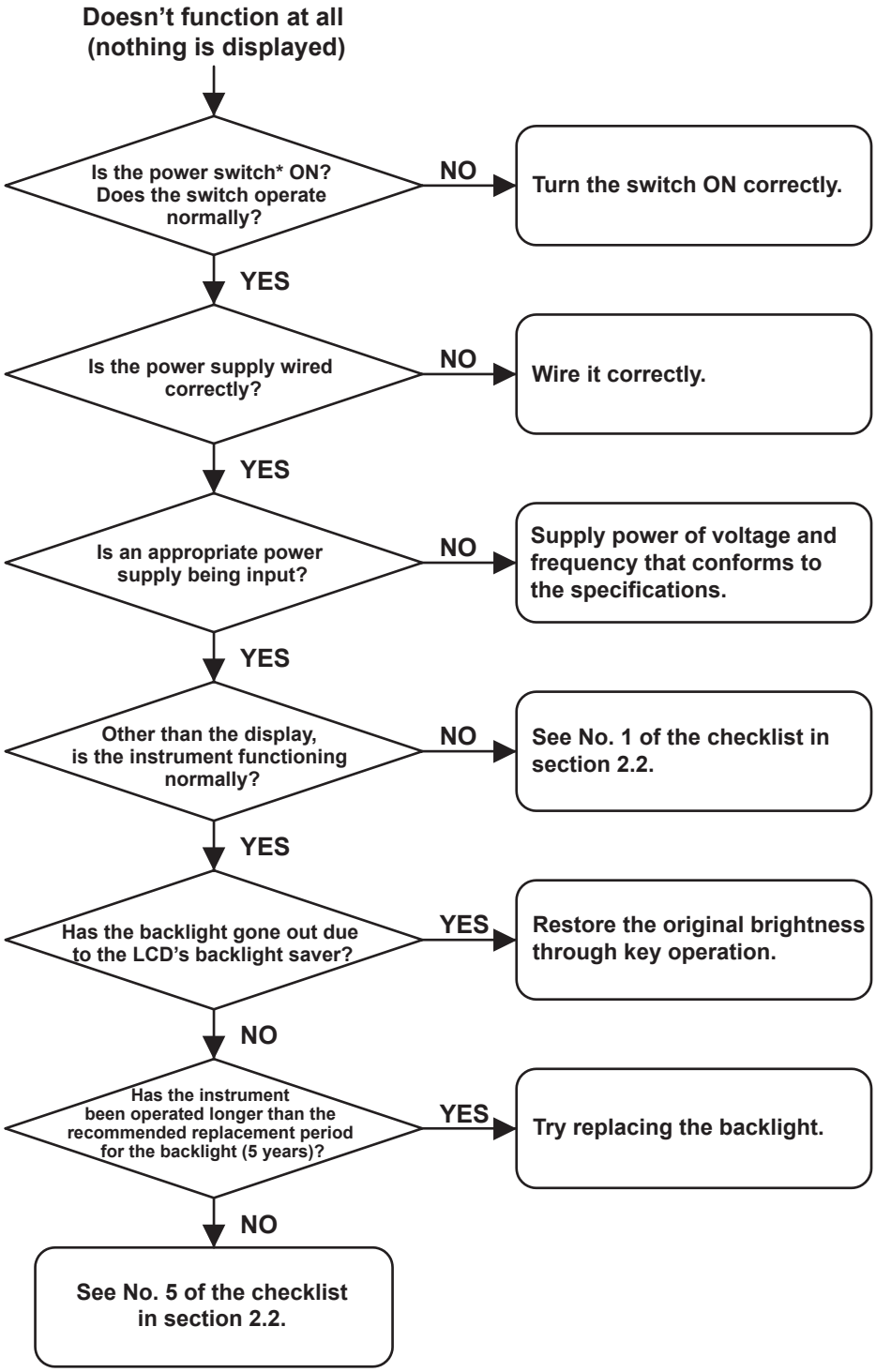
The MV can output 24 VDC for use as a power supply for transmitters (optional).

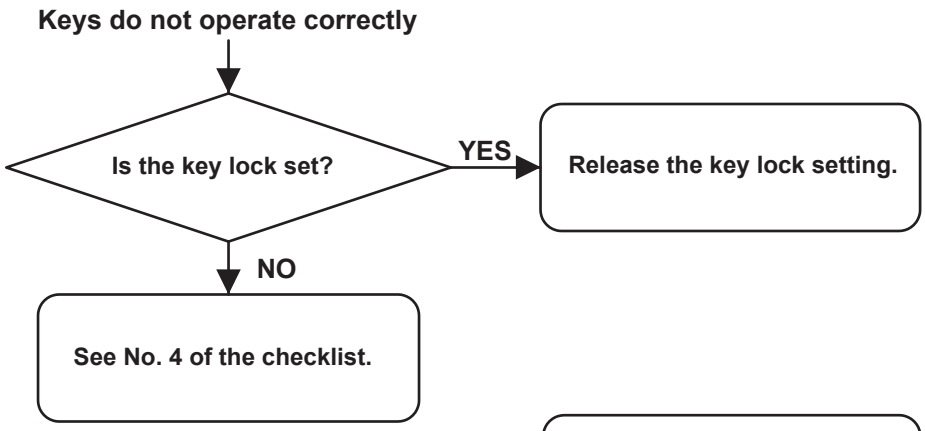
USB Port

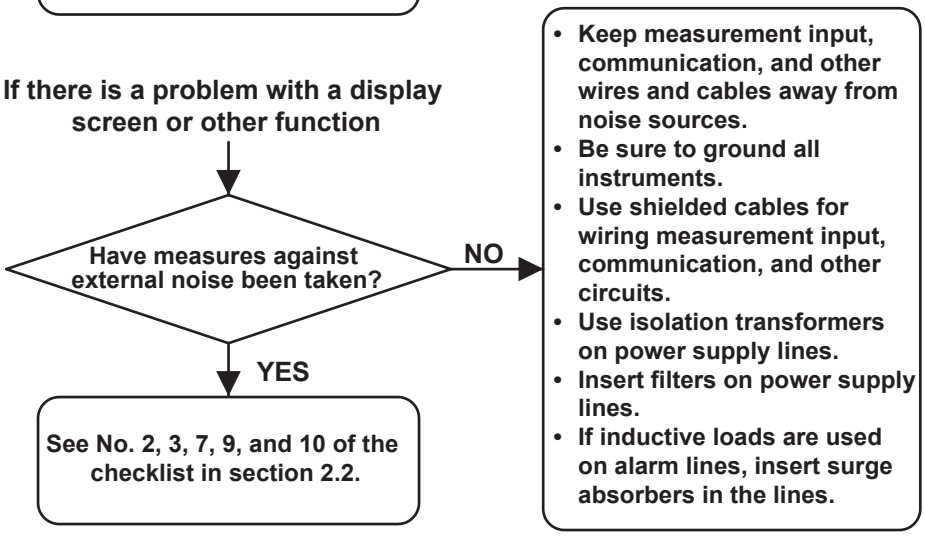
Allows connection with USB keyboard and USB flash memory devices.

2.1 Failure Analysis Flow Chart

When a failure occurs, refer to the flow chart below for corrective actions.

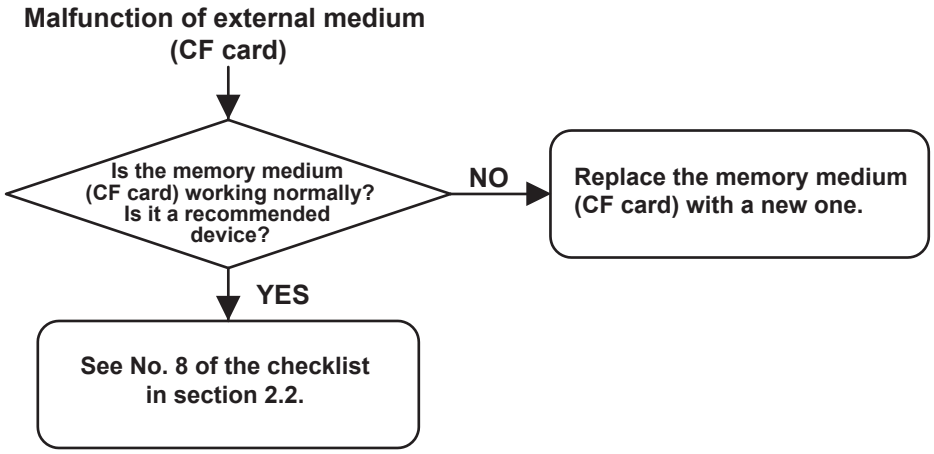


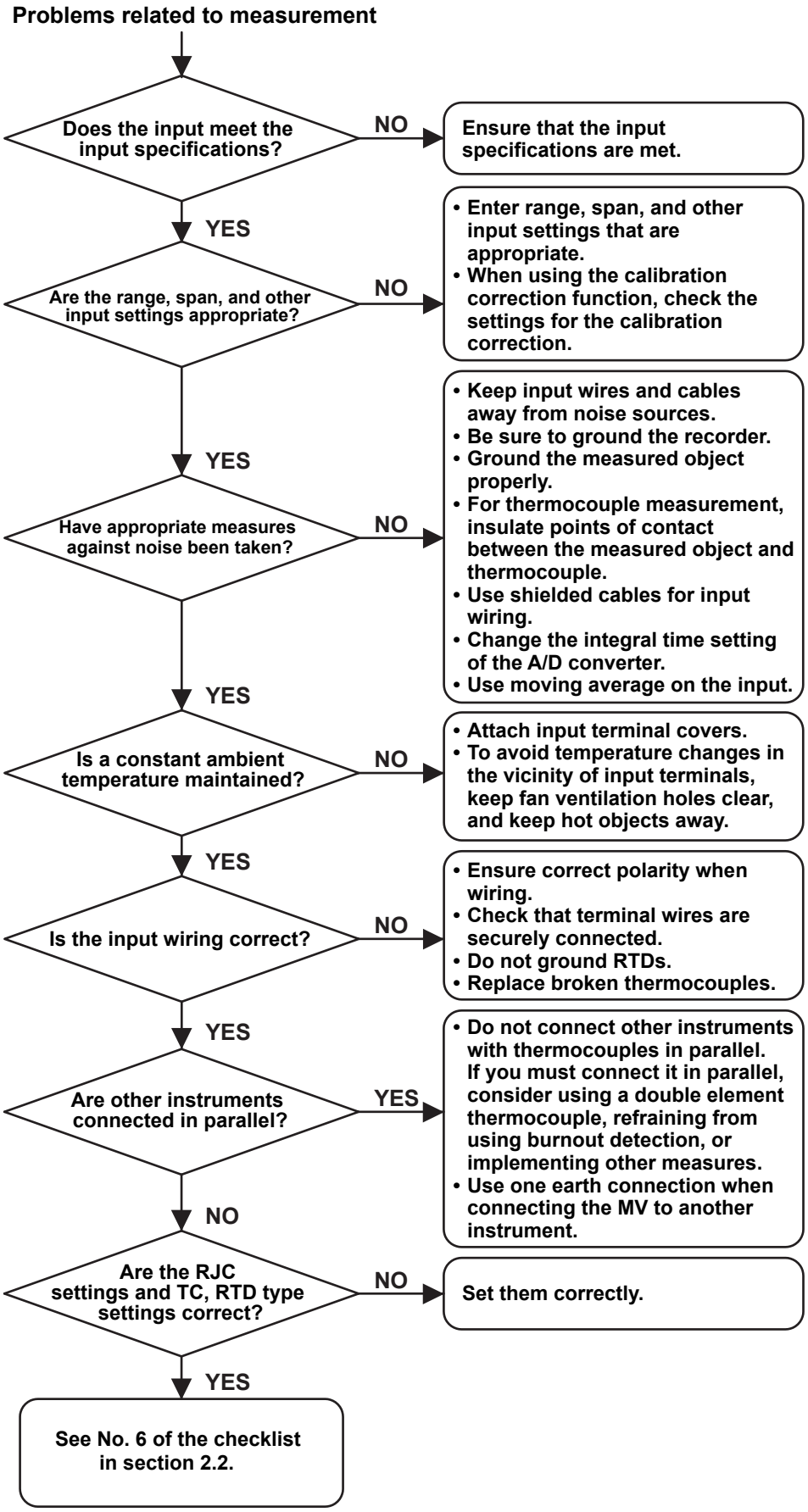




Note

If menu items required for screen menus or function menus are not displayed, check menu customization settings.




Problems related to measurement
Does the input meet the input specifications?
NO
Ensure that the input specifications are met.
YES
Are the range, span, and other input settings appropriate?
NO
• Enter range, span, and other input settings that are appropriate.
• When using the calibration correction function, check the settings for the calibration correction.
YES
Have appropriate measures against noise been taken?
NO
• Keep input wires and cables away from noise sources.
• Be sure to ground the recorder.
• Ground the measured object properly.
• For thermocouple measurement, insulate points of contact between the measured object and thermocouple.
• Use shielded cables for input wiring.
• Change the integral time setting of the A/D converter.
• Use moving average on the input.
YES
Is a constant ambient temperature maintained?
NO
• Attach input terminal covers.
• To avoid temperature changes in the vicinity of input terminals, keep fan ventilation holes clear, and keep hot objects away.
YES
Is the input wiring correct?
NO
• Ensure correct polarity when wiring.
• Check that terminal wires are securely connected.
• Do not ground RTDs.
• Replace broken thermocouples.
YES
Are other instruments connected in parallel?
YES
• Do not connect other instruments with thermocouples in parallel. If you must connect it in parallel, consider using a double element thermocouple, refraining from using burnout detection, or implementing other measures.
• Use one earth connection when connecting the MV to another instrument.
NO
Are the RJC settings and TC, RTD type settings correct?
NO
Set them correctly.
YES
See No. 6 of the checklist in section 2.2.

2.2 Troubleshooting Checklist

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 *1		Part Name	MV1000		MV2000	
							Page	Item	Page	Item
1	The instrument doesn't start even though the power is ON	✓			Power supply cable connection/wiring	-	-	-	-	-
				✓	MAIN POWER BOARD ASSEMBLY 12V POWER BOARD ASSEMBLY	Power Assembly	6-3	2	6-12	2
				✓	MAIN BOARD ASSEMBLY	Main PBA	6-3	4	6-12	11
				✓	SUB BOARD ASSEMBLY	Sub PCB Assembly	6-3	5	6-12	13
2	FAIL state			✓	MAIN BOARD ASSEMBLY	Main PBA	6-3	4	6-12	11
				✓	SUB BOARD ASSEMBLY	Sub PCB Assembly	6-3	5	6-12	13
				✓	OPTION TERMINAL ASSEMBLY	Option Terminal Assembly	6-5	12	6-14	12, 13
3	Abnormal functioning of memory (backup)	✓			Battery connection	Battery Assembly	6-3	6	6-12	12
		✓			Battery voltage (must be +3.0 V or more)	-	-	-	-	-
				✓	MAIN BOARD ASSEMBLY	Main PBA	6-3	4	6-12	11
				✓	SUB BOARD ASSEMBLY	Sub PCB Assembly	6-3	5	6-12	13
4	Key operation abnormality	✓		✓	Check the FFCs*3 for key wiring (whether pulled out or damaged)	-	-	-	-	-
				✓	SW BOARD ASSEMBLY	Bezel Assembly	6-2	1	6-10	1
				✓	CONNECTION BOARD ASSEMBLY	Bezel Assembly	6-2	1	6-10	1
				✓	MAIN BOARD ASSEMBLY	Main PBA	6-3	4	6-12	11
5	LCD display not normal	✓		✓	Check the FFCs*3 for key wiring (whether pulled out or damaged)	-	-	-	-	-
				✓	MAIN BOARD ASSEMBLY	Main PBA	6-3	4	6-12	11
				✓	SUB BOARD ASSEMBLY	Sub PCB Assembly	6-3	5	6-12	13
				✓	CONNECTION BOARD ASSEMBLY	Bezel Assembly	6-2	1	6-10	1
				✓	Back Light Unit of LCD ASSEMBLY	Bezel Assembly	6-2	1	6-10	1
				✓	LCD ASSEMBLY	Bezel Assembly	6-2	1	6-10	1
6	Large measurement error Temperature measurement abnormal	✓			Keep input wires away from noise sources (through distance and shielding, etc.)	-	-	-	-	-
		✓			Check that the input terminals are not disconnected from the instrument	-	-	-	-	-
		✓			Check that the input terminal cover is not loose	-	-	-	-	-
		✓			Check that the RJC (INT/EXT) setting is correct	-	-	-	-	-
			✓	✓	AD SCANNER BOARD ASSEMBLY	AD-STD/ISO	6-3	7, 8	6-12	24, 25 26, 27
7	Fluctuation in measured values	✓			Does the integral time setting of the A/D converter match the power supply frequency?	-	-	-	-	-
		✓			Keep input wires away from noise sources (through distance and shielding, etc.)	-	-	-	-	-

No.	Phenomenon	Action			Description	Refer to Chapter 6				
		Check	Adjust	Replace *1		Part Name	MV1000		MV2000	
							Page	Item	Page	Item
8	External media functioning abnormally	✓			Is the memory medium (CF card) working normally?	-	-	-	-	-
		✓		✓	Check the FFC*3 for the MEDIA PBA*2 (whether pulled out or damaged)	-	-	-	-	-
				✓	MEDIA BOARD ASSEMBLY	-	6-2	-	6-10	-
				✓	SUB BOARD ASSEMBLY	Sub PCB Assembly	6-3	5	6-12	13
				✓	MAIN BOARD ASSEMBLY	Main PBA	6-3	4	6-12	11
9	Abnormal communication	✓			Check communication settings	-	-	-	-	-
		✓			Check communication wiring/cables (whether pulled out or damaged)	-	-	-	-	-
				✓	POW TERM & COMM BOARD ASSEMBLY	I-PWR Terminal 24V-Power Terminal Power Terminal	6-4	8	6-14	3
				✓	MAIN BOARD ASSEMBLY	Main PBA	6-3	4	6-12	11
10	USB operation abnormal	✓			Are connected USB devices (USB memory and USB keyboard) operating normally?	-	-	-	-	-
		✓		✓	Check the FFC*3 for the MEDIA PBA*2 (whether pulled out or damaged)	-	-	-	-	-
				✓	MEDIA BOARD ASSEMBLY (front panel)	Media CF PBA	6-2	-	6-10	-
				✓	POW TERM & COMM BOARD ASSEMBLY (rear panel)	I-PWR Terminal 24V-Power Terminal Power Terminal	6-4	8	6-14	3
				✓	SUB BOARD ASSEMBLY	Sub PCB Assembly	6-3	5	6-12	13
				✓	MAIN BOARD ASSEMBLY	Main PBA	6-3	4	6-12	11

*1: The table shows only the specific parts that must be replaced. When actually carrying out replacement, the entire assembly that contains a part may have to be replaced.

*2: Printed Board Assembly

*3: Flexible Flat Cable

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 MV is provided with complete self diagnostic functions to enhance reliability in measurement and serviceability.
When you turn ON the power, the MV 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. Ethernet module test

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

Display upon Error		Likely Cause	Refer to Chapter 6				
			Part Name	MV1000		MV2000	
				Page	Item	Page	Item
901 902	ROM failure. RAM failure.	Connection between MAIN BOARD ASSEMBLY and SUB BOARD ASSEMBLY	–	–	–	–	–
		Replace the SUB BOARD ASSEMBLY or MAIN BOARD ASSEMBLY	Sub PCB Assembly	6-3	5	6-12	13
			Main PBA	6-4	12	6-12	11
910 921	A/D memory failure for all input channels. A/D calibration value error.	Connection between AD SCANNER BOARD ASSEMBLY and MAIN BOARD ASSEMBLY	–	–	–	–	–
		Replace the AD SCANNER BOARD ASSEMBLY or MAIN BOARD ASSEMBLY	AD-STD/ISO	6-3	7, 8	6-12	24, 25, 26, 27
			Main PBA	6-4	12	6-12	11
930	Memory acquisition failure.	Connection between MAIN BOARD ASSEMBLY and SUB BOARD ASSEMBLY	–	–	–	–	–
		Replace the SUB BOARD ASSEMBLY or MAIN BOARD ASSEMBLY	Sub PCB Assembly	6-3	5	6-12	13
			Main PBA	6-4	12	6-12	11
		Replace the internal CF card	–	6-2	–	6-10	–
940	The Ethernet module is down.	Check communication settings	–	–	–	–	–
		Connection between POW TERM & COMM BOARD ASSEMBLY and MAIN BOARD ASSEMBLY	–	–	–	–	–
		Check the communication cables and LINK LED illumination	–	–	–	–	–
		Replace the MAIN BOARD ASSEMBLY or POW TERM & COMM BOARD ASSEMBLY	Main PBA	6-4	12	6-12	11
			I-PWR Terminal 24V-Power Terminal Power Terminal	6-4	8	6-14	3

3.3 Performance Test

Read the warning and cautions below before beginning tests.

Test Environment

Item	Conditions	
Ambient temperature	23 ±5°C	
Relative humidity	20 to 80% RH	
Atmospheric pressure	86 kPa-106 kPa	
Power supply voltage	AC power supply (Power supply suffix code:-1)	90 to 132 VAC, 180 to 264 VAC
	12 VDC power supply (Power supply suffix code:-2)	10.0 to 28.8 VDC
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*1	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*2	A value that does not affect the measured results	

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

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

Test Instruments

Instrument	Specifications
DC voltage generator	Accuracy: ±0.005% of setting + 1 μV
DMM	Accuracy: ±0.005% of rdg + 1 μV
Variable resistors	Accuracy: 0.01% + 2 mΩ or better
Insulation tester	500 VDC
Withstand voltage tester	500 to 2300 VAC, 1000 VDC
Function generator	Accuracy: ±20ppm of setting for 100 Hz
0°C standard temperature device	Accuracy: ±0.05°C
Thermocouple (Type T)	Calibrated

Instrument Operation

For operating procedures in setting mode and basic setting mode, see the following manuals.

- MV1000 First Step Guide (IM MV1000-02E)
- MV2000 First Step Guide (IM MV2000-02E)
- MV1000/MV2000 User's Manual (IM MV1000-01E)

Tests

The following tests are explained.

- Insulation Resistance
- Protective Grounding
- Withstand Voltage
- Measurement Accuracy
- Reference Junction Compensation Accuracy
- Battery Backup
- Pulse Input Function (Option)

3.4 Test Procedures

Insulation Resistance

- **Test Procedures**

  Perform a measurement with an insulation resistance meter and check whether the results satisfy the reference values. Perform the measurement with the power switch turned ON.

Reference Value

Terminals Measured	Reference Value	Condition
Between the power and protective ground terminal	100 MΩ or more	Short the L (+) and N (–) terminals.
Between the input and protective ground terminal	100 MΩ or more	Short all input terminals.
Between the Ethernet and protective ground terminal	100 MΩ or more	Short all pins of the Ethernet terminal.
Between RS-422-A/485 SG and RS-422-A/485 FG terminals	100 MΩ or more	With the /C3 option.

Protective Grounding

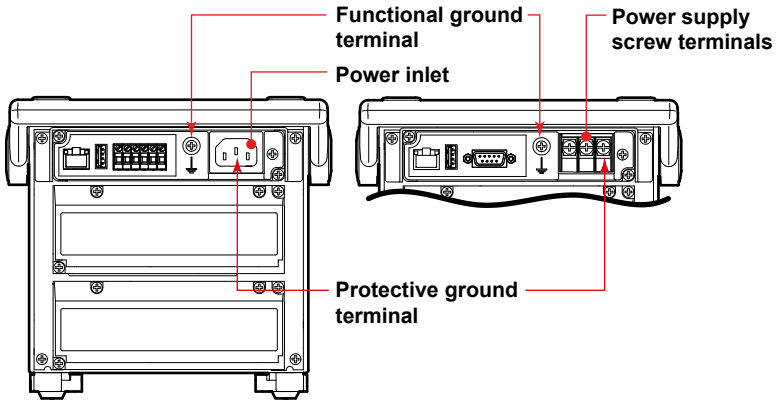
- **Test Procedures**

  Perform a resistance measurement with a DMM (digital multimeter), and check whether the results satisfy the reference values.

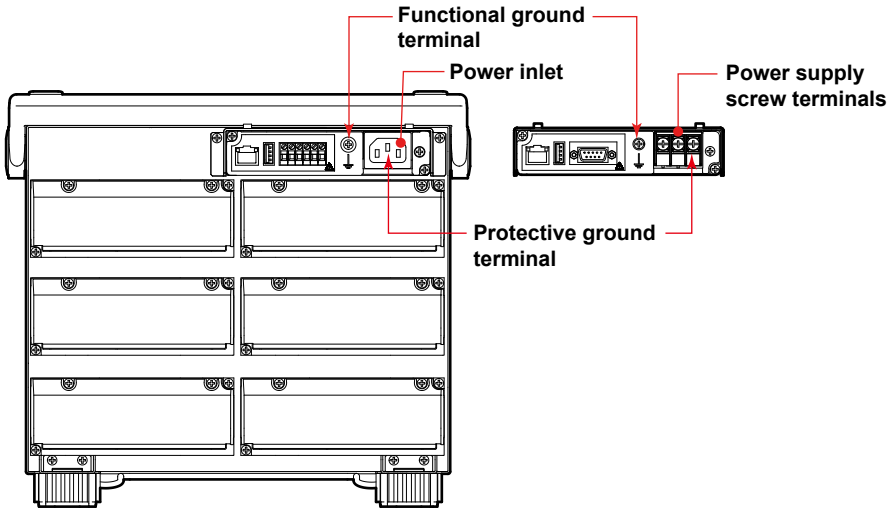
Reference Value

Measured Location	Reference Value
Between the protective ground terminal and functional ground terminal	0.2 Ω or less

MV1000



MV2000



Withstand Voltage

- **Test Procedures**

  Perform the test with a withstanding voltage tester, and check whether the results satisfy the reference values. Perform the measurement with the power switch turned ON.

Test time: 1 minute

Tested Terminals	Applied Voltage	Maximum Allowable Leakage Current	Condition
Between the power and protective ground terminals	2.3 kVAC	10 mA	For models with 100-240 VAC power supply. Short the L and N terminals.
	0.5 KVAC	10 mA	For models with 12 VDC power supply. Short the + and – terminals.
Between the input and protective ground terminals	1.5 kVAC	2 mA	Short all input terminals.
Between input terminals	1.0 kVAC	1 mA	Short the odd and even channels of the A/+, B/- terminals*, and measure between odd and even channels.
Between relay contact output and protective ground terminals	1.6 kVAC	2 mA	With the /A1, /A2, /A3, /A4, or /F1 option. Short all relay contact output terminals.
Between the remote control input and protective ground terminals	1.0 kVDC	2 mA	With the /R1 option. Short all remote control input terminals.
Between pulse input and protective ground terminals	1.0 kVDC	2 mA	With the /PM1 option. Short all pulse input terminals.
Between 24 V transmitter power supply output and protective ground terminals	500 VAC	10 mA	With the /TPS2 or /TPS4 option. Short all 24 V transmitter power supply output terminals.

* The b terminals on the following models are independent on all channels. Short the odd and even channels of the A/+, B/-, and b terminals, and measure between odd and even channels.

- MV1004, MV1008, MV2008
- With the /N1 or /N2 option.

Measurement Accuracy

● Overview

The measurement accuracy is tested using two different* integral times.

* But only one integral time is used when using the MV2000 with the /MC1 option.

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 page).
  * Choose any channel number for each A/D from those listed in the A/D converter configuration table.
  Ex.: With the MV1004, set channels 1 and 3 as representative channels.
- The measuring accuracy of all channels is tested separately.

● A/D Converter Configuration

Models	Measurement Interval	Number of Channels	No. of A/Ds	Channel Number by A/D
MV1004	125 ms	4CH	2	1-2, 3-4
MV1006	1 s	6CH	1	1-6
MV1008	125 ms	8CH	4	1-2, 3-4, 5-6, 7-8
MV1012	1 s	12CH	1	1-12
MV1024	1 s	24CH	2	1-12, 13-24
MV2008	125 ms	8CH	4	1-2, 3-4, 5-6, 7-8
MV2010	1 s	10CH	1	1-10
MV2020	1 s	20CH	2	1-10, 11-20
MV2030	1 s	30CH	3	1-10, 11-20, 21-30
MV2040	1 s	40CH	4	1-10, 11-20, 21-30, 31-40
MV2048	1 s	48CH	4	1-12, 13-24, 25-36, 37-48

● Test Instruments

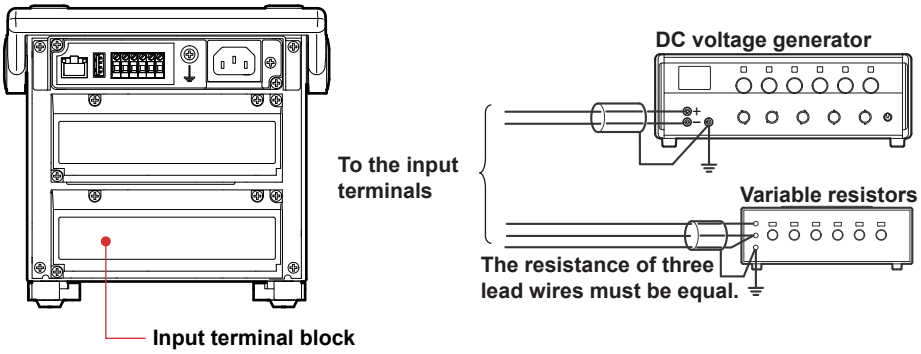
Instrument	Specifications
DC voltage generator	Accuracy: ±0.005% of setting + 1 µV
DMM	Accuracy: ±0.005% of rdg + 1 µV
Variable resistors	Accuracy: 0.01% + 2 mΩ or better

● Setup

Set the input range of the channels under test, and the test range.

● Test Procedures

Warm up the instrument for thirty minutes before performing the test.
Enter the input value determined for each range. Check whether the displayed measured values satisfy the reference values.



Reference Value (Integral Time: 20 ms (50 Hz)/16.7 ms (60 Hz))

Range	Input Value	Range Allowed by Test	Accuracy Specification	Note
20 mV	+20.000 mV	±18 digits	(0.05% of rdg + 12 digits)	
	0.000 mV	±10 digits		
	–20.000 mV	±18 digits		
60 mV	+60.00 mV	±5 digits	(0.05% of rdg + 3 digits)	
	0.00 mV	±2 digits		
	–60.00 mV	±5 digits		
200 mV	+200.00 mV	±10 digits	(0.05% of rdg + 3 digits)	
	0.00 mV	±2 digits		
	–200.00 mV	±10 digits		
2 V	+2.0000 V	±18 digits	(0.05% of rdg + 12 digits)	
	0.0000 V	±10 digits		
	–2.0000 V	±18 digits		
6 V	+6.000 V	±5 digits	(0.05% of rdg + 3 digits)	
	0.000 V	±2 digits		
	–6.000 V	±5 digits		
20 V	+20.000 V	±10 digits	(0.05% of rdg + 3 digits)	
	0.000 V	±2 digits		
	–20.000 V	±10 digits		
50 V	+50.00 V	±4 digits	(0.05% of rdg + 3 digits)	
	0.00 V	±2 digits		
	–50.00 V	±4 digits		
Pt100	–200°C: 18.52 Ω	±0.4°C	(0.15% of rdg + 0.3°C)	
	0°C: 100.00 Ω	±0.2°C		
	600°C: 313.71 Ω	±0.9°C		
TC-T	0°C: 0.000 mV	±0.4°C	(0.15% of rdg + 0.5°C)	EXT RJC mode
TC-K	0°C: 0.000 mV	±0.5°C	(0.15% of rdg + 0.7°C)	EXT RJC mode
Cu10 (GE)	–200°C: 1.326 Ω	±1.4°C	(0.4% of rdg + 1.0°C)	Performed when the /N1 option is specified.
	0°C: 9.036 Ω	±0.8°C		
	300°C: 20.601 Ω	±1.7°C		
Pt50	–200°C: 8.57 Ω	±0.8°C	(0.3% of rdg + 0.6°C)	Performed when the /N3 option is specified.
	0°C: 50.00 Ω	±0.4°C		
	550°C: 150.40 Ω	±1.8°C		

Reference Value (Integral Time: 1.67 ms (600 Hz))

Range	Input Value	Range Allowed by Test	Accuracy Specification
2 V	+2.0000 V	±57 digits	(0.1% of rdg + 40 digits)
	0.0000 V	±32 digits	
	–2.0000 V	±57 digits	

* Not tested for the MV2000 with the /MC1 option.

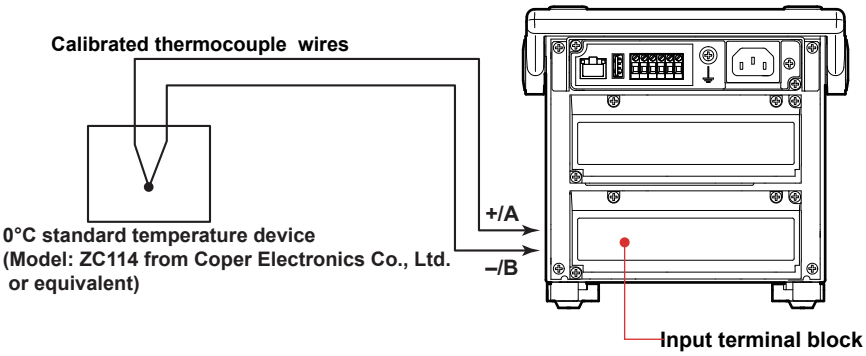
Reference Junction Compensation Accuracy

- **Test Procedures**

  Measure 0°C on all channels, and check that the display is within the reference values below.

  Set all channels to thermocouple type T.

  Reference value: ±0.5°C



  - Use a calibrated thermocouple, and wires of 0.5 diameter or less without terminal tips. Also, be sure to take the level of thermocouple error into consideration during testing.
  - Monitor the 0°C standard temperature device at all times, and confirm that it is within 0°C ±0.05°C.
  - When using a 0°C standard temperature device, ensure that the tip of the thermocouple floats about 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 begging measurement.
  - Always use terminal covers.
  - If the quality is found to be sufficiently stable, perform a test on one representative channel for each AD converter*.

    * Choose any channel number for each A/D from those listed in the “A/D Converter Configuration” in section 3.4, “Measurement Accuracy.”
    Ex.: With the MV1004, set channels 1 and 3 as representative channels.

Battery Backup

- **Test Procedures**

  1. Set the date and time. 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.

Pulse Input Function

- **Overview**
  This test performed when the /PM1 option is specified. Enter calculation settings, input a pulse signal, and perform the test.

- **Test Instruments**

Instrument	Specifications
Function generator	Accuracy: ±20ppm of setting for 100 Hz

- **Setup**
  1. Press the **MENU key**, then choose **Math channel** > **Calculation expression (Expression)**.
  2. Enter the following expressions. Press the **ESC key** to return to the setting menu.
     - 101CH: Q06 (span: 0-100)
     - 102CH: Q07 (span: 0-100)
     - 103CH: Q08 (span: 0-100)
  3. Select **Group set**, then set **CH set** to 101-103.
  4. Press the **ESC key** twice to return to operation mode.

- **Test Procedures**
  Input a pulse signal of 100 Hz and 0-5 V to input pulse terminals 6, 7, and 8, then perform the test.

  Reference value: 100 ±1

4.1 Before Making Adjustments

This chapter explains how to perform adjustments to the MV1000/MV2000.

Environment

See section 3.3, “Test Environment.”

Instrument Operation

For operating procedures in setting mode and basic setting mode, see the following manuals.

- MV1000 First Step Guide (IM MV1000-02E)
- MV2000 First Step Guide (IM MV2000-02E)
- MV1000/MV2000 User’s Manual (IM MV1000-01E)

Note

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

4.2 Adjusting the A/D Converters

● Overview

The number of included A/D converters differs depending on the instrument model. For all of the A/D converters, input a predetermined value for each range and take measurements, then save the calibration values.

● Instruments Used

Instrument	Specifications
DC voltage generator	Accuracy: ±0.005% of setting + 1 μV or better
Variable resistors	Accuracy: 0.01% + 2 mΩ or better

● Calibration

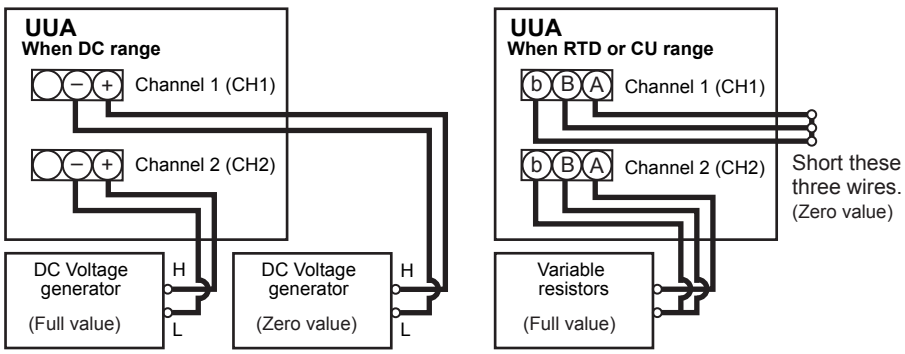
Calibrated Channels

Model	A/D No. 1		A/D No. 2		A/D No. 3		A/D No. 4	
	Zero	Full	Zero	Full	Zero	Full	Zero	Full
MV1004	CH1	CH2	CH3	CH4	-	-	-	-
MV1006	CH1	CH2	-	-	-	-	-	-
MV1008	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8
MV1012	CH1	CH2	-	-	-	-	-	-
MV1024	CH1	CH2	CH13	CH14	-	-	-	-
MV2008	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8
MV2010	CH1	CH2	-	-	-	-	-	-
MV2020	CH1	CH2	CH11	CH12	-	-	-	-
MV2030	CH1	CH2	CH11	CH12	CH21	CH22	-	-
MV2040	CH1	CH2	CH11	CH12	CH21	CH22	CH31	CH32
MV2048	CH1	CH2	CH13	CH14	CH25	CH26	CH37	CH38

Input Value

Input Type	Range	Zero	Full	Remarks
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	
	50 V	No adjustment needed		
RTD	Pt100	0 Ω	300 Ω	
	Cu10	0 Ω	200 Ω	With the /N1 or /N3 option.

Connection



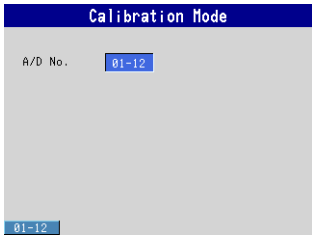
UUA: Unit Under Adjustment

Calibration Procedure

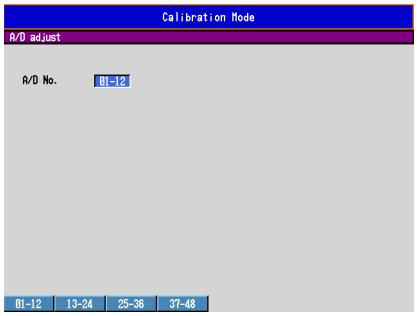
1. Press the **UP arrow key** while turning ON the power.
The instrument starts up in **Calibration Mode**, and the **A/D No.** are displayed.

2. Select the **A/D No.** to calibrate with a soft key, then press the **DISP/ENTER key**.

MV1000

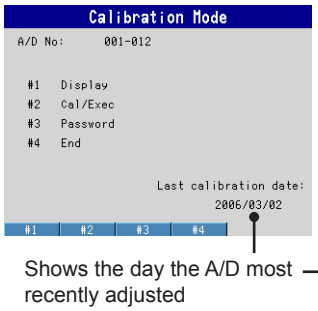


MV2000

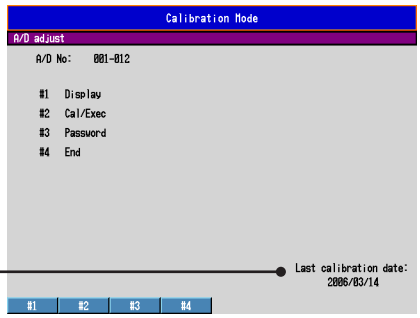


3. Press the **Cal/Exec** #2 soft key.

MV1000



MV2000



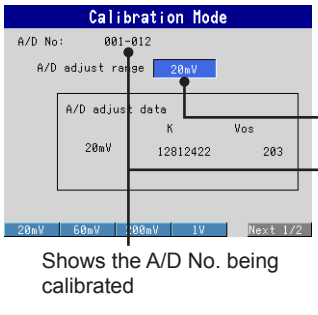
Inputting a Reference Signal

4. Input the zero value of the range to be adjusted to the zero channel of the A/D No., and the full value to the Full channel. See the calibration channels and input values on the previous page.
Ex.: To adjust the 20 mV range of A/D No. 1, input 0 mV to CH1, and 20 mV to CH2.

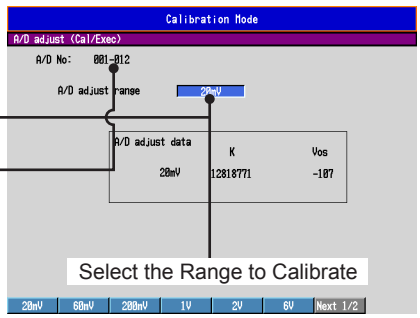
Executing the Adjustment

5. Select the soft key of the range to adjust, then press the **DISP/ENTER key**.

MV1000



MV2000



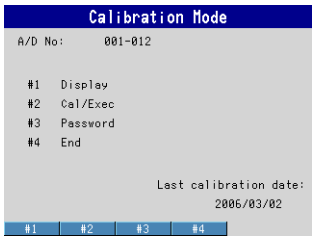
A message is displayed, and adjustment executes automatically.

```
M550
The A/D calibration is being
executed...
```

6. Repeat steps ***4*** and ***5*** to adjust all ranges.
When finished, press the **ESC key**.

7. Press the **End** #4 soft key.

MV1000

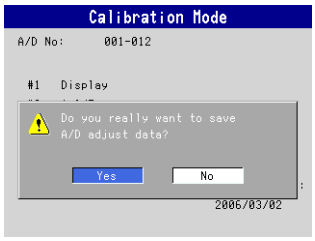


MV2000

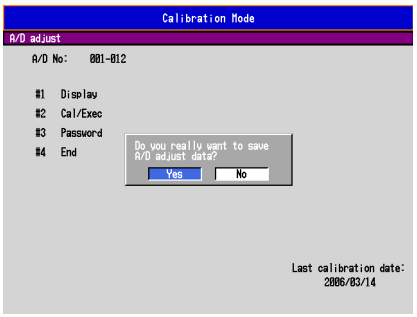
Saving Adjusted Values

8. Use the **left** or **right arrow key** to choose **Yes** (save calibration values) or **No** (do not save), then press the **DISP/ENTER key**.

MV1000



MV2000



9. Repeat steps ***2*** – ***8*** to adjust all **A/D No.**
When finished, press the **ESC key**.

Concluding Adjustments

10. Turn OFF the power switch.

5.1 Schematic Diagram (MV1000)

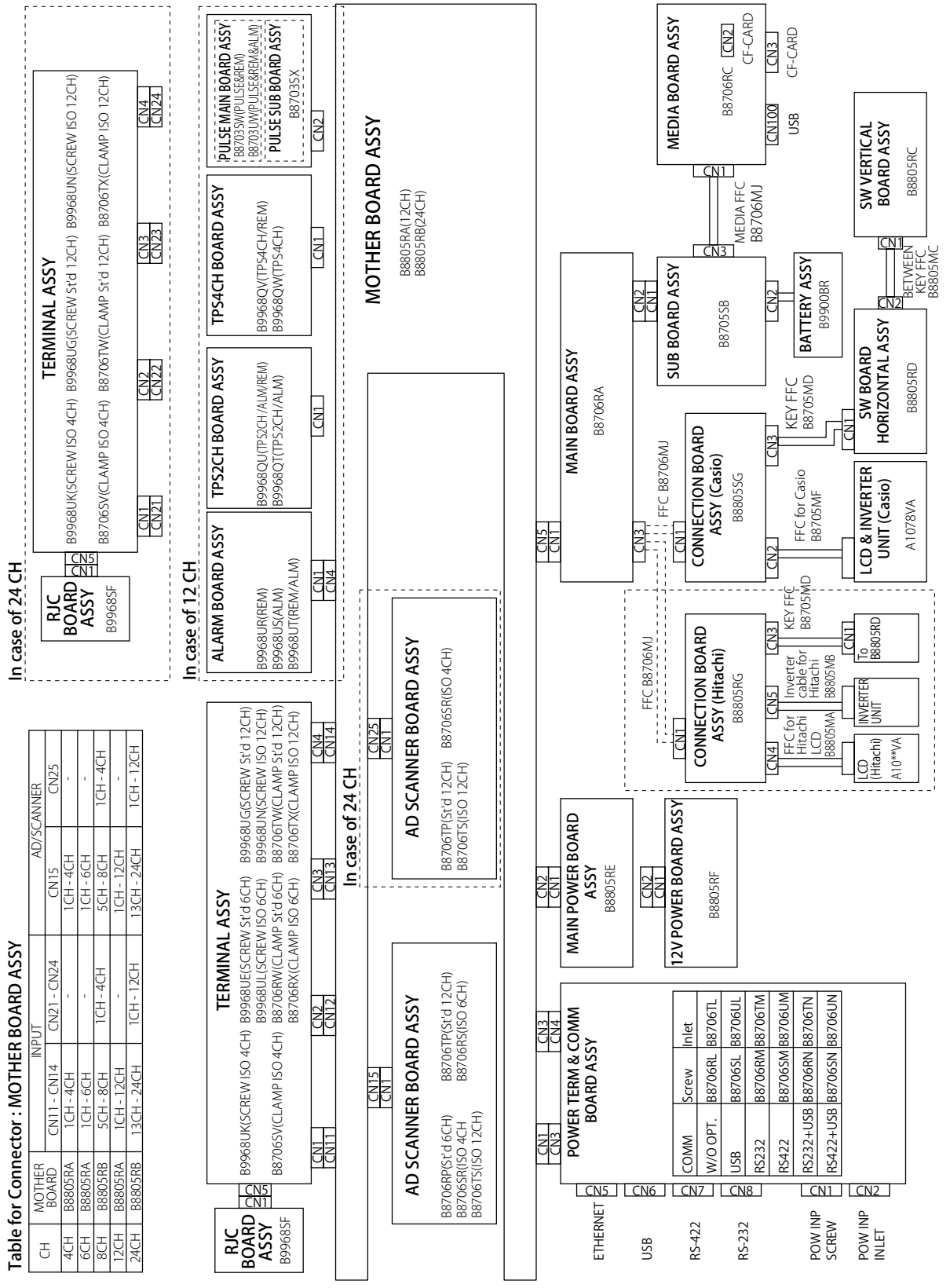
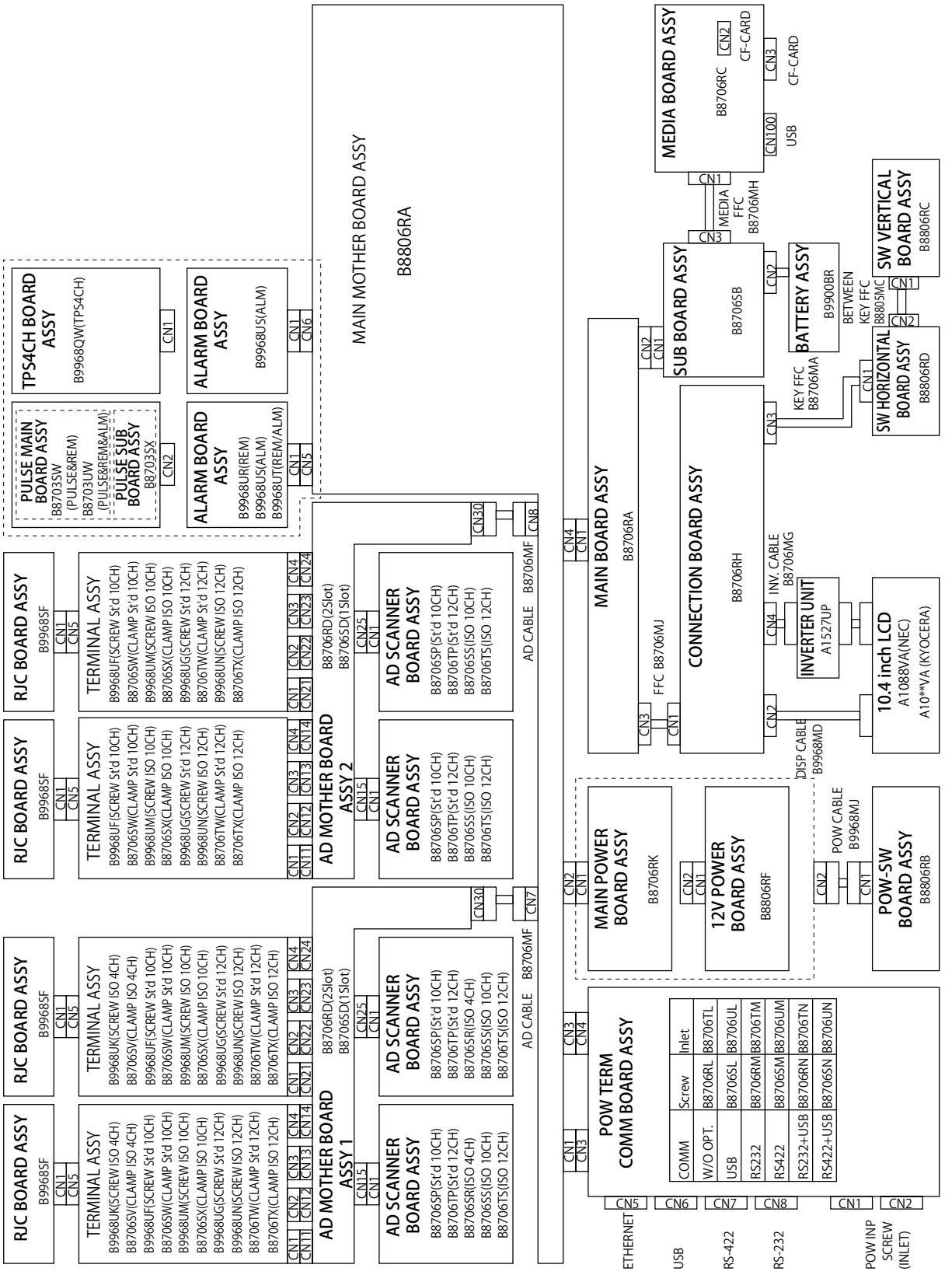


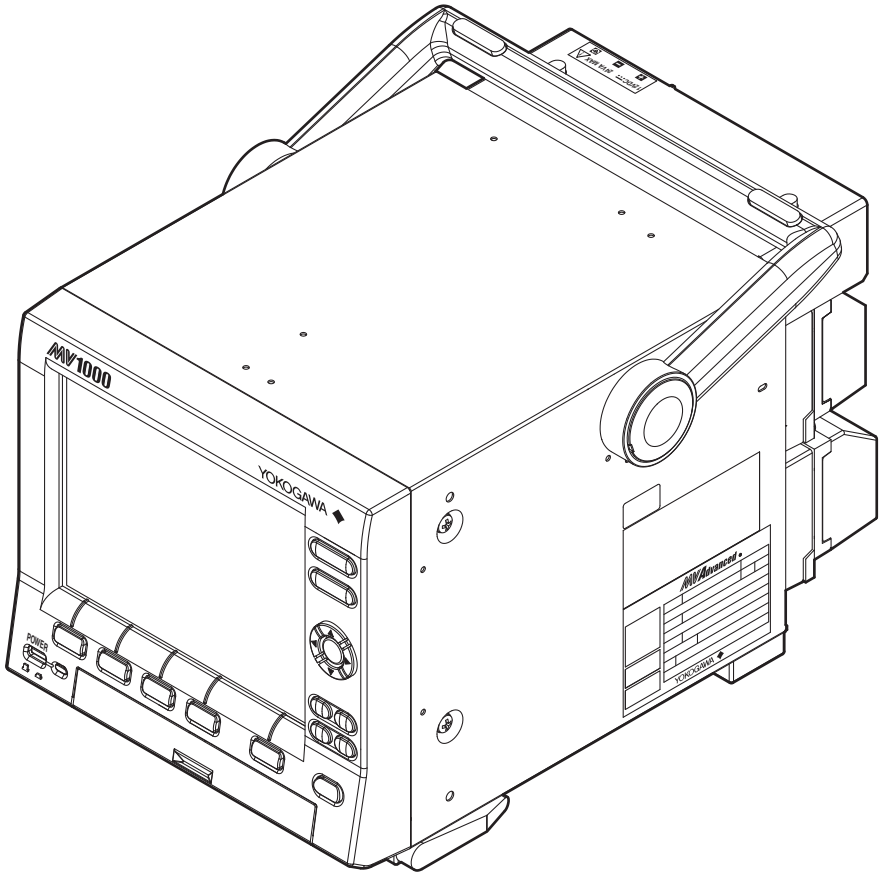
Table for Connector : MOTHER BOARD ASSY

CH	MOTHER BOARD	INPUT		AD/SCANNER	
		CN11 - CN14	CN21 - CN24	CN15	CN25
4CH	B8805RA	1CH - 4CH	-	1CH - 4CH	-
6CH	B8805RA	1CH - 6CH	-	1CH - 6CH	-
8CH	B8805RB	5CH - 8CH	1CH - 4CH	5CH - 8CH	1CH - 4CH
12CH	B8805RA	1CH - 12CH	-	1CH - 12CH	-
24CH	B8805RB	13CH - 24CH	1CH - 12CH	13CH - 24CH	1CH - 12CH

5.2 Schematic Diagram (MV2000)



6.1 Customer Maintenance Parts List (MV1000)



Note:

- **Parts marked with a ◎symbol are Customer Maintenance Parts (CMP).**
- **The contents of this CMPL are subject to change without prior notice as a result of continuing improvements to the instrument's performance and functions.**

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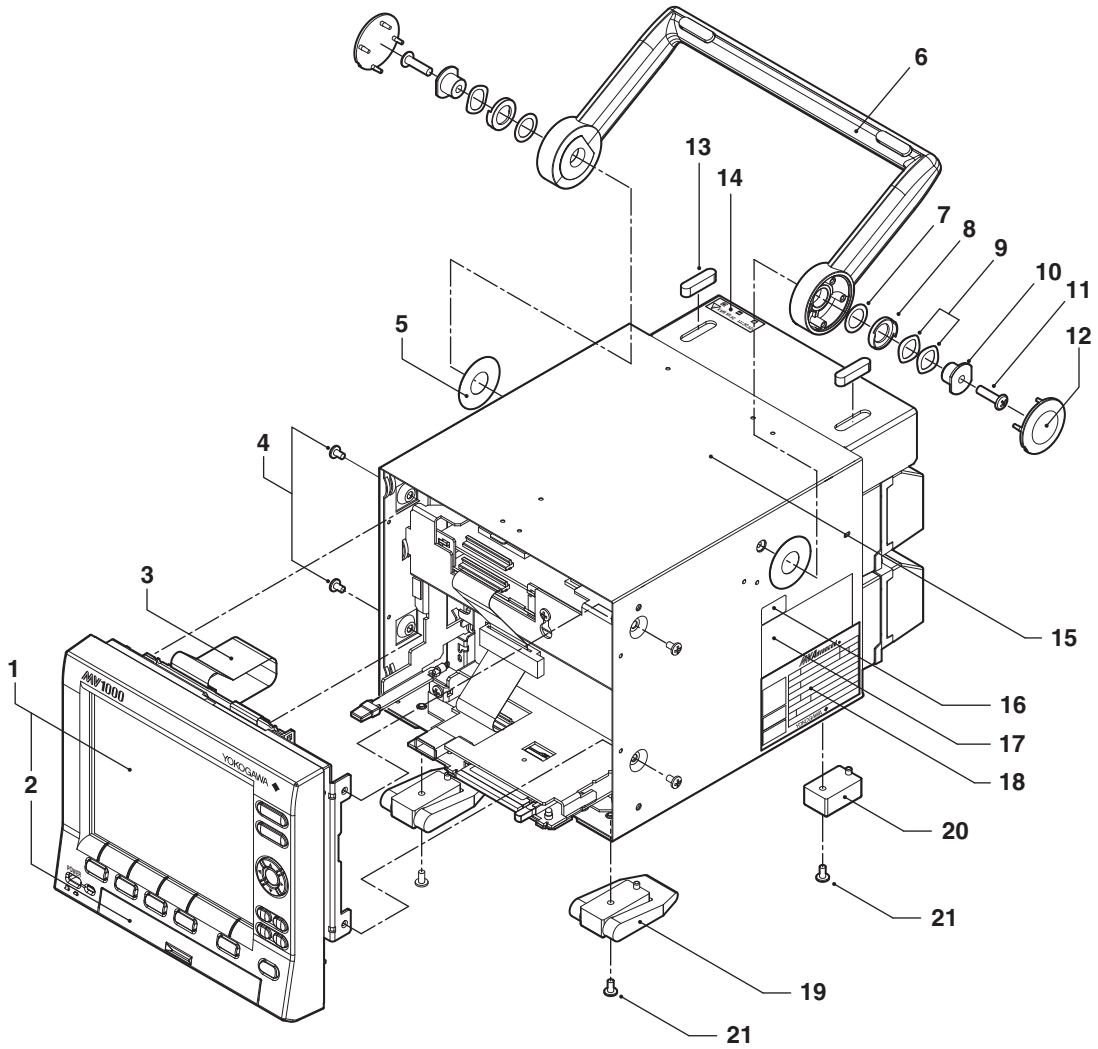
CMPL MV1000-01E

2 **Complite Set**



	Item	Part No.	Qty	Description
	1	B8805BA	1	Bezel Assembly
◎	2	B8805BG	1	Cover
	3	B8706MJ	1	FFC (0.5MM-120MM)
	4	Y9305LB	4	Screw
	5	B8805FH	2	Sheet
	6	B8805FA	1	Handle Assembly
	7	B8805FJ	2	Washer
	8	B8805FM	2	Spacer
	9	B8805FL	3	Wave Washer
	10	B8805BZ	2	Stud
	11	B8805FK	2	Screw
	12	B8805FC	2	Cap
	13	B8805FE	2	Damper
	14	B8805AC	1	Name Plate (*1) } (select)
		B8805AG	1	Name Plate (*2) }
	15	–	1	Body Assembly (see page 3)
	16	B8800AY	1	Name Plate
	17	–	1	Name Plate
	18	–	1	Name Plate
	19	B9961BR	2	F.Foot
	20	B9961BS	2	R.Foot
	21	Y9306LS	4	Screw

Note: *1 100VAC,240VAC
*2 12VDC,24VDC
◎ (CMP)

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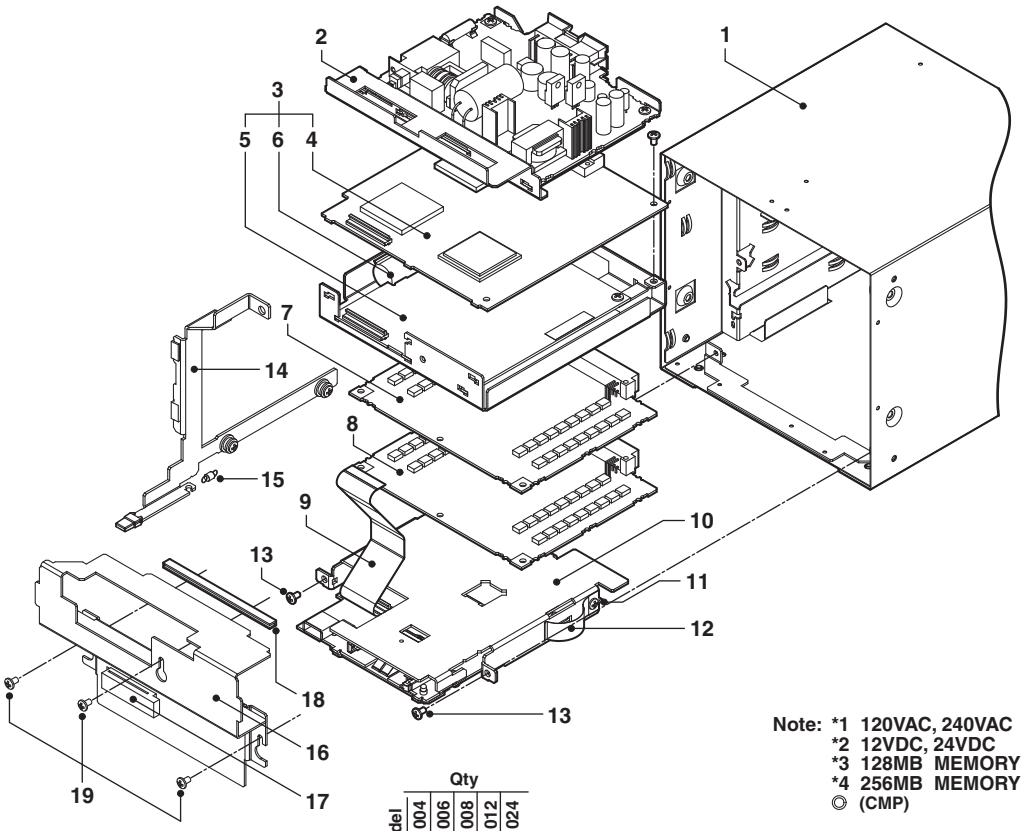
Body Assembly 3



Note: *1 120VAC, 240VAC
*2 12VDC, 24VDC
*3 128MB MEMORY
*4 256MB MEMORY
◎ (CMP)

Item	Part No.	Model / Qty MV1004	MV1006	MV1008	MV1012	MV1024	Description
1	B8805CA	1	1	1	1	1	Case Assembly
2	B8805DA	1	1	1	1	1	Power Assembly (*1) } (select)
	B8805EA	1	1	1	1	1	Power Assembly (*2) }
3	B8805DD	1	1	1	1	1	Main Assembly
4	B8706RA	1	1	1	1	1	Main PBA
5	B8805PB	1	1	1	1	1	SUB PCB Assembly
6	B9900BR	1	1	1	1	1	Battery Assembly
7	B8706SR	–	–	1	–	–	AD-ISO. 4CH }
	B8706TP	–	–	–	–	1	AD-STD. 12CH (not /N1,/N2) } (select)
	B8706TS	–	–	–	–	1	AD-ISO. 12CH (or /N1,/N2) }
8	B8706SR	1	–	1	–	–	AD-ISO. 4CH }
	B8706RP	–	1	–	–	–	AD-STD. 6CH (not /N1,/N2) }
	B8706RS	–	1	–	–	–	AD-ISO. 6CH (or /N1,/N2) } (select)
	B8706TP	–	–	–	1	1	AD-STD. 12CH (not /N1,/N2) }
	B8706TS	–	–	–	1	1	AD-ISO. 12CH (or /N1,/N2) }
9	B8706MJ	1	1	1	1	1	FFC (0.5MM-120mm)
10	B8805DF	1	1	1	1	1	CF Assembly (*3) } (select)
	B8805EF	1	1	1	1	1	CF Assembly (*4) }
11	Y9305LB	1	1	1	1	1	Screw
12	B9240DK	1	1	1	1	1	Spring
13	Y9305LB	2	2	2	2	2	Screw
14	B8805CN	1	1	1	1	1	SW Lever Assembly
15	B9900FH	1	1	1	1	1	Spring
16	B8805CM	1	1	1	1	1	PCB Bracket
17	B9573PZ	1	1	1	1	1	Clamp
18	A9088KY	1	1	1	1	1	Clamp
19	Y9305LB	3	3	3	3	3	Screw

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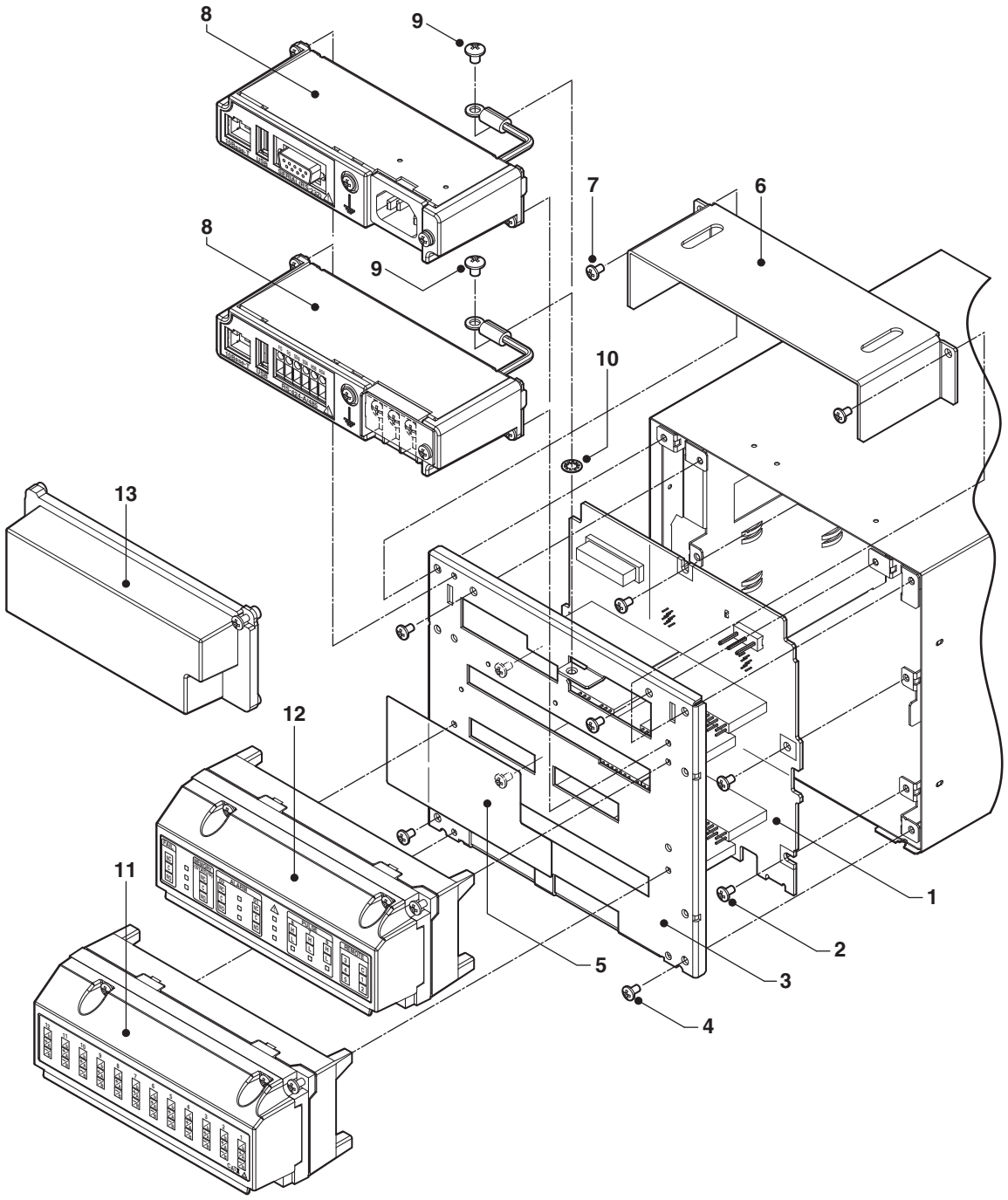
4 **Rear Assembly (1/3)**



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Rear Assembly (2/3) 5

	Item	Part No.	Qty Model MV1004	MV1006	MV1008	MV1012	MV1024	Description
	1	B8805RA	1	1	–	1	–	12CH Mother PBA } (select)
		B8805RB	–	–	1	–	1	24CH Mother PBA } (select)
	2	Y9305LB	5	5	5	5	5	Screw
	3	B8805CL	1	1	1	1	1	Rear Panel
	4	Y9305LB	4	4	4	4	4	Screw
◎	5	B8805AD	1	1	–	1	–	Name Plate
	6	B8805CR	1	1	1	1	1	PW TERM Cover
	7	Y9305LB	2	2	2	2	2	Screw
	8	B8706ER	1	1	1	1	1	I-PWR Terminal (*1) (not /C2,/C3) } (select)
		B8706ES	1	1	1	1	1	I-PWR Terminal (*1) (/C2) (not /C3) } (select)
		B8706ET	1	1	1	1	1	I-PWR Terminal (*1) (/C3) (not /C2) } (select)
		B8706JA	1	1	1	1	1	24V-Power Terminal (*2) (not /C2,/C3) } (select)
		B8706JB	1	1	1	1	1	24V-Power Terminal (*2) (/C2) (not /C3) } (select)
		B8706JC	1	1	1	1	1	24V-Power Terminal (*2) (/C3) (not /C2) } (select)
	9	Y9405LB	1	1	1	1	1	Screw
	10	Y9401WL	1	1	1	1	1	Washer
◎	11	–			1			Terminal Assembly-1 (select) } (reference in an appended chart.)
◎	12	–			1			Terminal Assembly-2 (select) } (reference in an appended chart.)
◎	13	B9968DN			1			CONN Cover Assembly (select) } (reference in an appended chart.)

Note: *1 120VAC, 240VAC
*2 12VDC, 24VDC
(CMP)

Terminal Assembly-1

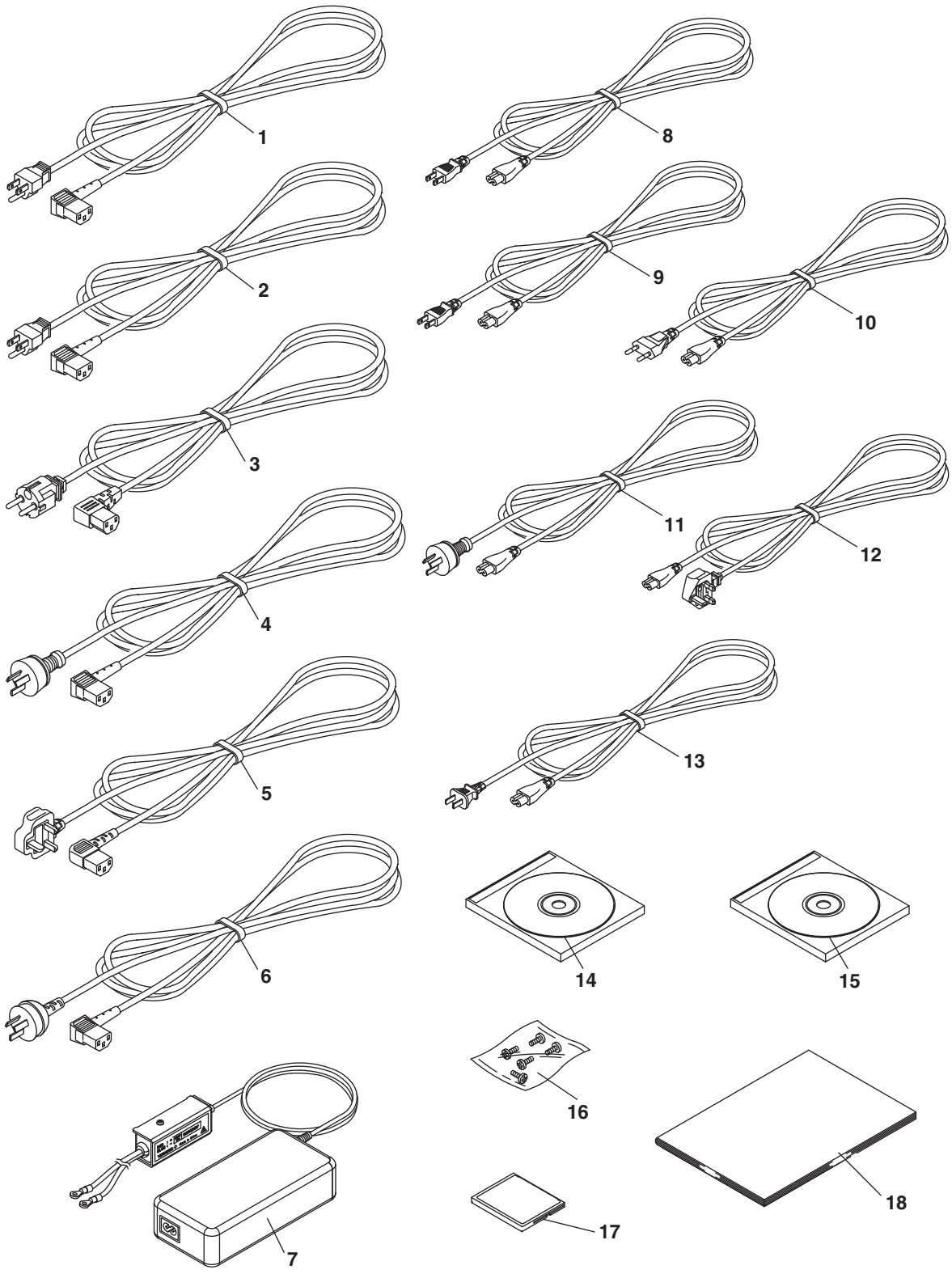
MODEL CODE	MS CODE	MS CODE (OPTION)		PART No.
	INP TERMINAL	OR	NOT	
MV1004	–1	——	——	B8706JP
	–2	——	——	B9968LJ
MV1006	–1	——	/N1, /N2	B8706HR
		/N1, /N2	——	B8706JQ
	–2	——	/N1, /N2	B9968LD
		/N1, /N2	——	B9968LM
MV1008	–1	——	——	B8706JR
	–2	——	——	B9968LK
MV1012	–1	——	/N1, /N2	B8706HW
		/N1, /N2	——	B8706JW
	–2	——	/N1, /N2	B9968LH
		/N1, /N2	——	B9968LR
MV1024	–1	——	/N1, /N2	B8706HX
		/N1, /N2	——	B8706JX
	–2	——	/N1, /N2	B8706HM
		/N1, /N2	——	B8706JJ

6 Rear Assembly (3/3)

Terminal Assembly-2

MODEL CODE	MS CODE	MS CODE (OPTION)			PART No.
	INP TERMINAL	AND	OR	NOT	
MV1004 or MV1006 or MV1012	———	/A1	——	/F1, /PM1, /R1, /TPS2	B9968KA
		/A2	——	/F1, /PM1, /R1	B9968KC
		/A3	——	/R1	B9968KE
		/A1, /R1	——	/F1, /PM1, /TPS2	B9968KB
		/A2, /R1	——	/F1, /PM1	B9968KD
		/A3, /R1	——	——	B9968KJ
		/R1	——	/A1, /A2, /A3, /F1, /PM1, /TPS2	B9968KK
		/A1, /F1	——	/PM1, /R1	B9968KL
		/A2, /F1	——	/PM1, /R1	B9968KN
		/F1	——	/A1, /A2, /PM1, /R1, /TPS2	B9968KQ
		/A1, /F1, /R1	——	——	B9968KM
		/A2, /F1, /R1	——	——	B9968KP
		/F1, /R1	——	/A1, /A2, /PM1	B9968KR
		/A1, /TPS2	——	/PM1, /R1	B9968KT
		/A1, /R1, /TPS2	——	/PM1	B9968KU
		/R1, /TPS2	——	/A1, /PM1	B9968KY
		/TPS2	——	/A1, /PM1, /R1	B9968KX
		/A1, /PM1	——	/F1	B8703FA
		/A2, /PM1	——	/F1	B8703FB
		/A1, /F1, /PM1	——	——	B8703FC
		/PM1	——	/A1, /A2, /F1	B8703FD
		F1, /PM1	——	/A1	B8703FE
		——	——	/A1, /A2, /A3, /F1, /PM1, /R1, /TPS2	B9968DN
MV1008	–1	——	——	——	B8706JP
	–2	——	——	——	B9968LJ
MV1024	–1	——	——	/N1, /N2	B8706HW
		——	/N1, /N2	——	B8706JW
	–2	——	——	/N1, /N2	B9968LH
		——	/N1, /N2	——	B9968LR

Standard Accessories (1/2) 7



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8 Standard Accessories (2/2)

	Item	Part No.	Qty	Description	
◎	1	A1073WD	1	Power Cord Set (*1, *3)	(select)
◎	2	A1074WD	1	Power Cord Set (*1, *4)	
◎	3	A1009WD	1	Power Cord Set (*1, *5)	
◎	4	A1024WD	1	Power Cord Set (*1, *6)	
◎	5	A1054WD	1	Power Cord Set (*1, *7)	
◎	6	A1064WD	1	Power Cord Set (*1, *8)	
◎	7	B8805GV	1	AC Adapter Assembly (*2) (select)	
◎	8	B9988YE	1	AC-Cord (*2, *3)	(select)
◎	9	B9988YA	1	AC-Cord (*2, *4)	
◎	10	B9988YB	1	AC-Cord (*2, *5)	
◎	11	B9988YC	1	AC-Cord (*2, *6)	
◎	12	A1069WD	1	AC-Cord (*2, *7)	
◎	13	B9988YJ	1	AC-Cord (*2, *8)	
◎	14	B9991AD	1	DXA120 CD Assembly	
◎	15	B8806ZZ	1	CD for Manuals	
◎	16	E9655FX	5	Screw (ETO Screw)	
◎	17	B8706NQ	1	CF-Card 128MB	
◎	18	–	1	Manuals	

Note : *1 100VAC, 240VAC
*2 12VDC, 24VDC
*3 MV1□□□-□-□-/□M
*4 MV1□□□-□-□-/□D
*5 MV1□□□-□-□-/□F
*6 MV1□□□-□-□-/□R
*7 MV1□□□-□-□-/□Q
*8 MV1□□□-□-□-/□H
◎ CMP Parts

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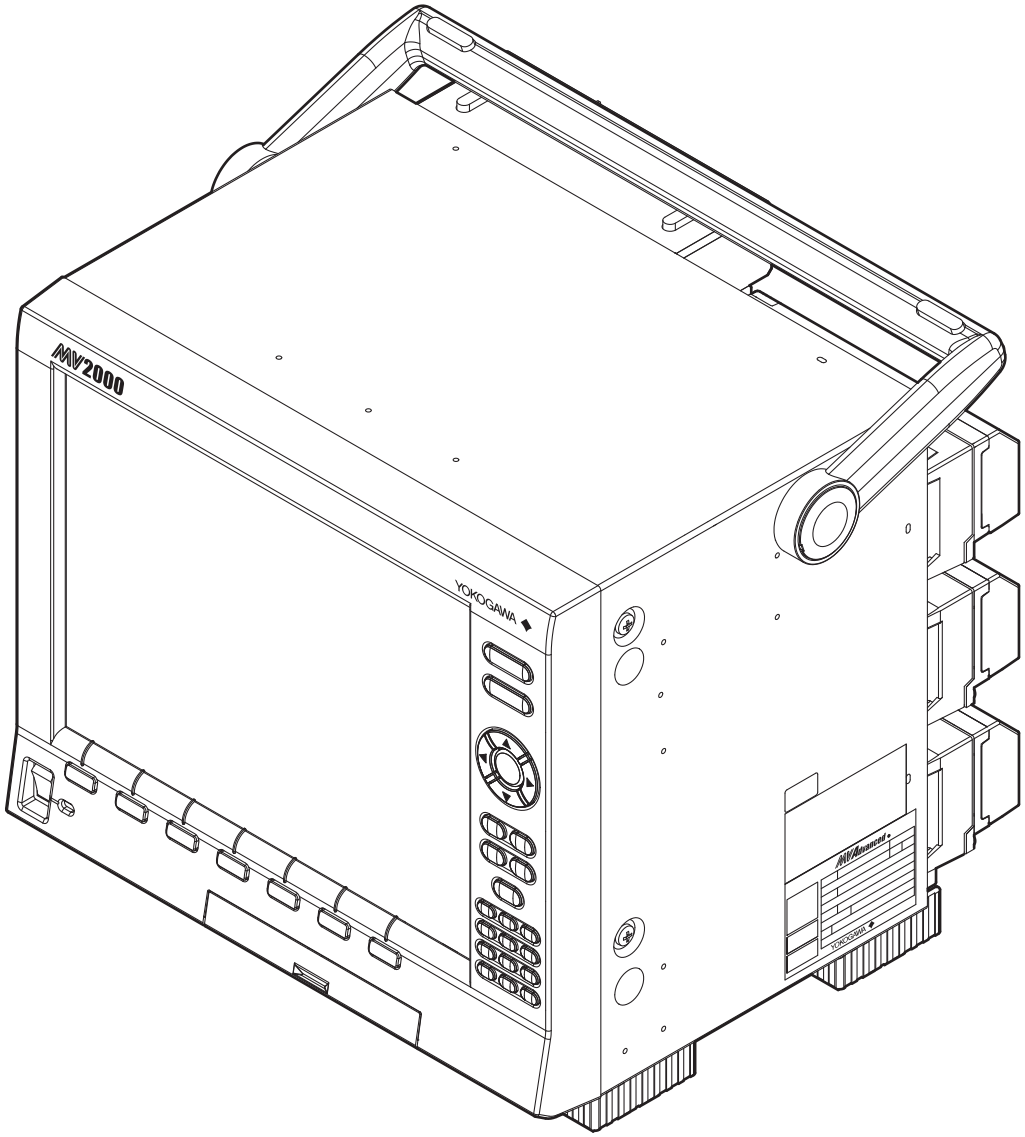
6.2 Customer Maintenance Parts List (MV2000)



Note:
- **Parts marked with a ◎symbol are Customer Maintenance Parts (CMP).**
- **The contents of this CMPL are subject to change without prior notice as a result of continuing improvements to the instrument's performance and functions.**

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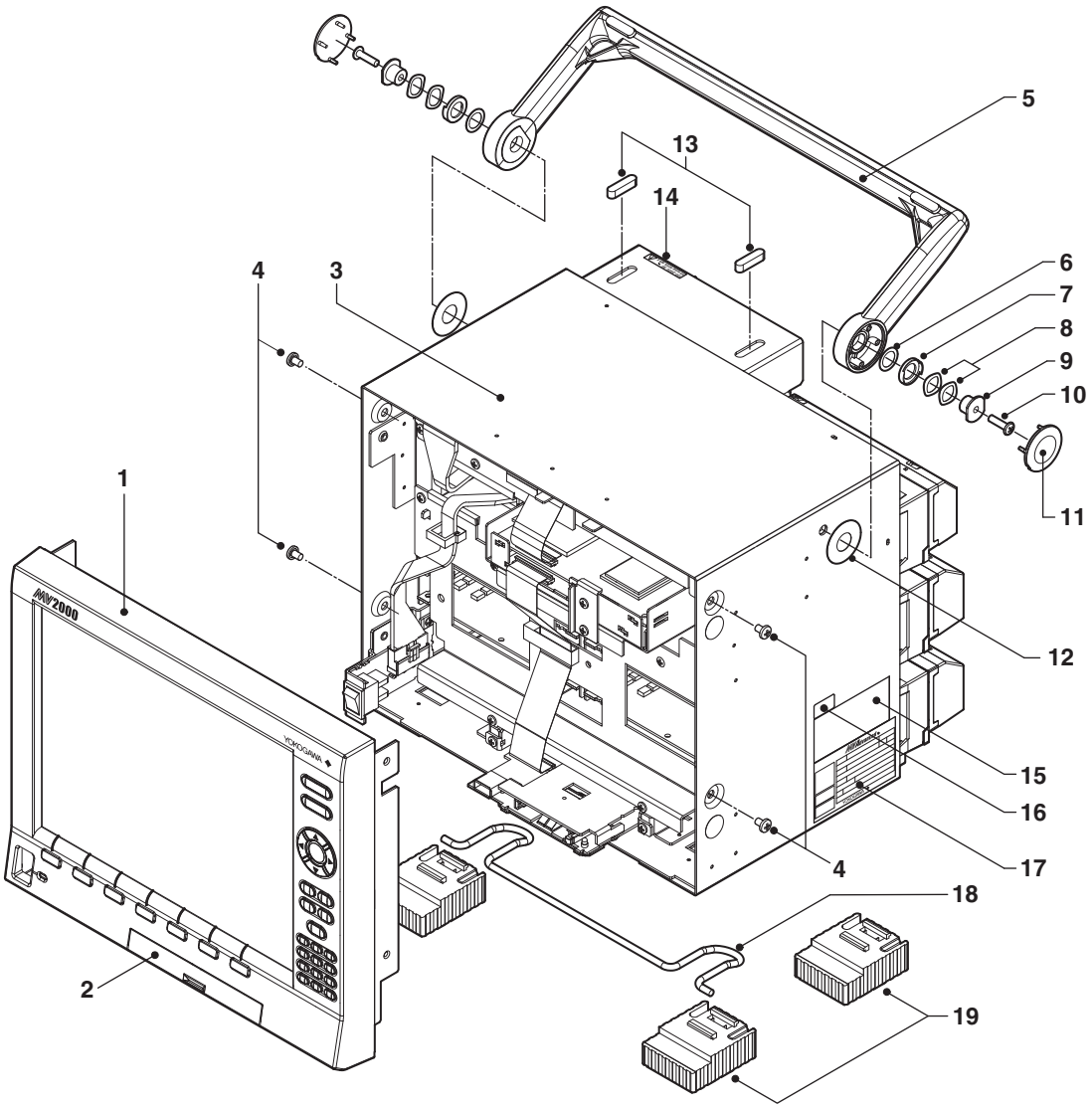
Yokogawa Electric Corporation

CMPL MV2000-01E

2 **Complite Set**



Item	Part No.	Qty	Description
1	B8806BA	1	Bezel Assembly (For English) } (select)
	B8806BB	1	Bezel Assembly (For Japanese) } (select)
2	B8805BG	1	Cover
3	–	1	Body Assembly (see page 3)
4	Y9406LB	4	Screw
5	B8806FA	1	Handle Assembly
6	B8805FJ	2	Washer
7	B8805FM	2	Spaser
8	B8805FL	4	Wave Washer
9	B8805BZ	2	Stud
10	B8805FK	2	Screw
11	B8805FC	2	Cap
12	B8805FH	2	Sheet
13	B8805FD	2	Damper
14	B8806AC	1	Name Plate (100VAC, 240VAC) } (select)
	B8806AG	1	Name Plate (12VDC, 24VDC) } (select)
15	–	1	Name Plate
16	B8800AY	1	Name Plate
17	–	1	Name Plate
18	B8806CW	1	Support
19	B9318JK	4	Foot Assembly

Note:
◎ (CMP)

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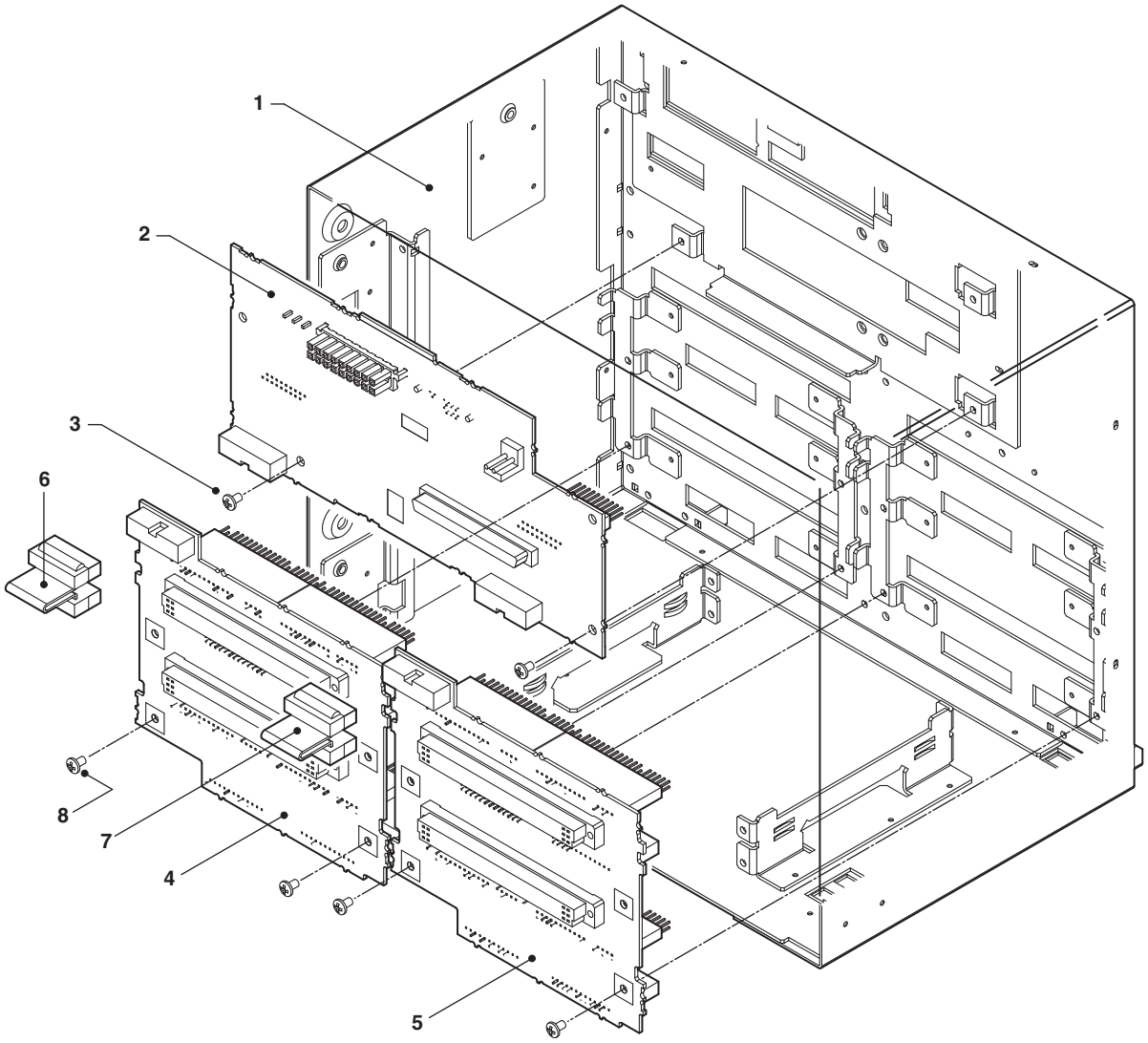
Body Assembly (1/3) 3



Item	Part No.	Model	Qty MV2008	MV2010	MV2020	MV2030	MV2040	MV2048	Description
1	B8806CA		1	1	1	1	1	1	Case Assembly
2	B8806RA		1	1	1	1	1	1	Main Mother PBA
3	Y9305LB		2	2	2	2	2	2	Screw
4	B8706SD		–	1	–	–	–	–	AD Mother 1Slot PBA } (select)
	B8706RD		1	–	1	1	1	1	AD Mother 2Slot PBA
5	B8706SD		–	–	–	1	–	–	AD Mother 1Slot PBA } (select)
	B8706RD		–	–	–	–	1	1	AD Mother 2Slot PBA
6	B8706MF		1	1	1	1	1	1	AD-Main Mother Cable
7	B8706MF		–	–	–	1	1	1	AD-Main Mother Cable
8	Y9305LB		2	2	2	4	4	4	Screw

Note:
◎ (CMP)

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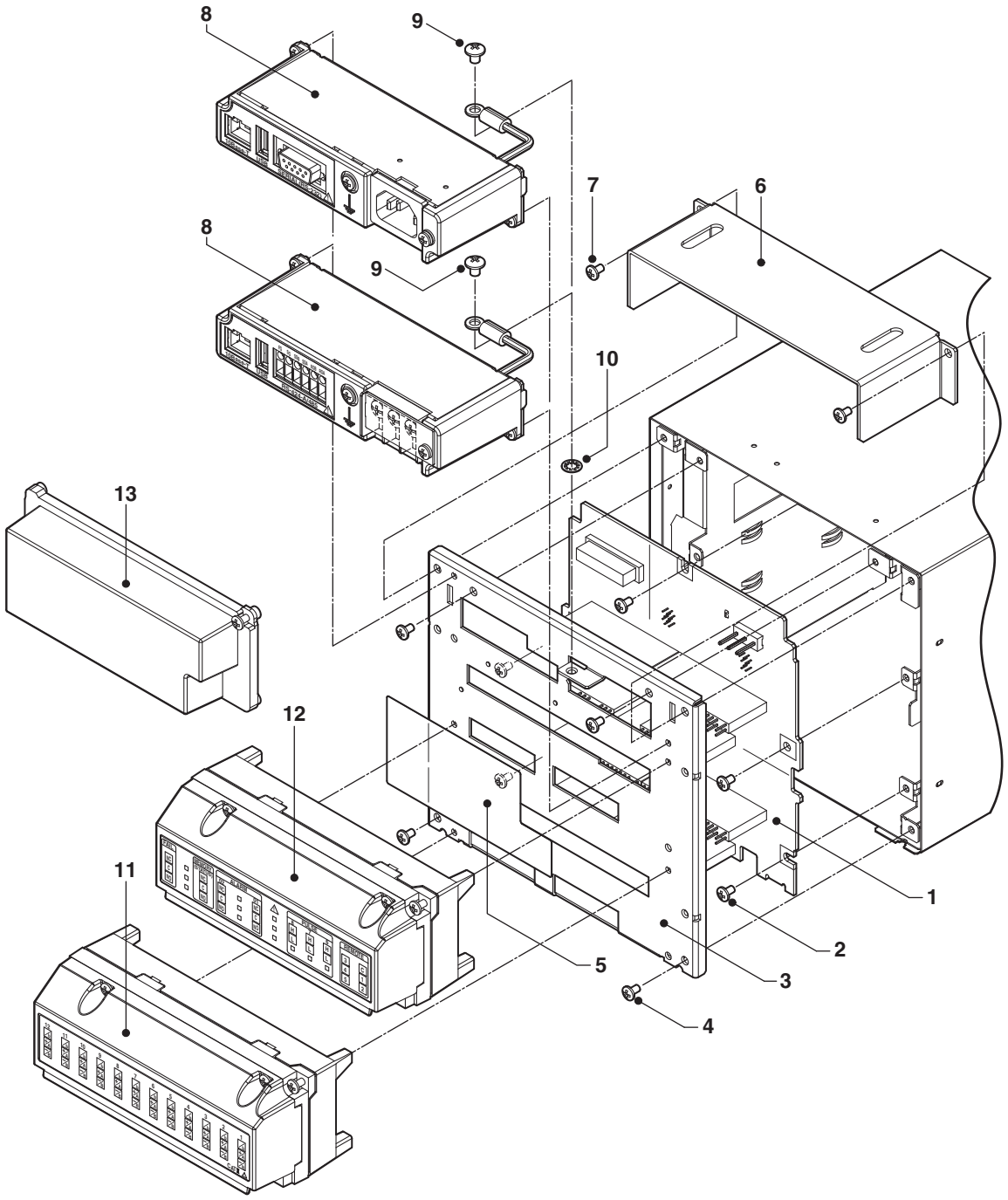
4 **Rear Assembly (1/3)**



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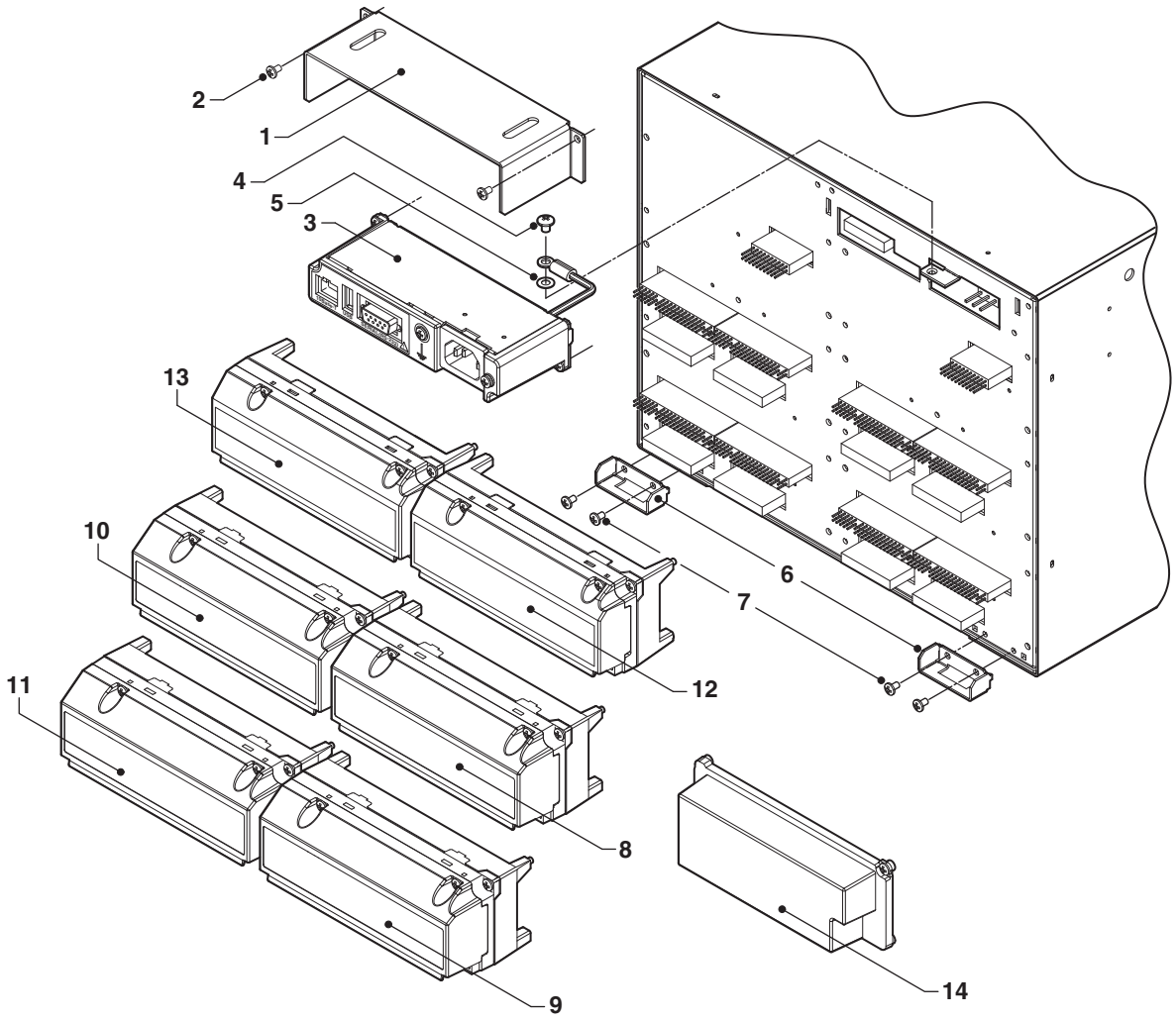
Body Assembly (3/3) 5

Item	Part No.	Qty Model MV2008	MV2010	MV2020	MV2030	MV2040	MV2048	Description
1	–	1	1	1	1	1	1	Body Sub Assembly (select) (see page 3)
2	B8706DA	1	1	1	1	1	1	Power Assembly (100VAC, 240VAC) } (select)
	B8806EA	1	1	1	1	1	1	Power Assembly (12VDC, 24VDC) } (select)
3	Y9305LB	2	2	2	2	2	2	Screw
4	B8806DE	1	1	1	1	1	1	Edge Guard
5	B9968MJ	1	1	1	1	1	1	POW SW Cable
6	B8806DG	1	1	1	1	1	1	Main Shelf Assembly
7	Y9305LB	2	2	2	2	2	2	Screw
8	Y9308LB	2	2	2	2	2	2	Screw
9	B8806DE	1	1	1	1	1	1	Edge Guard
10	B8806ED	1	1	1	1	1	1	Main Assembly
11	B8706RA	1	1	1	1	1	1	Main PBA
12	B9900BR	1	1	1	1	1	1	Battery Assembly
13	B8806PB	1	1	1	1	1	1	SUB PCB Assembly
14	Y9305LB	4	4	4	4	4	4	Screw
15	B8706MJ	1	1	1	1	1	1	FFC (0.5MM-120MM)
16	B8806DL	1	1	1	1	1	1	Main Stopper
17	Y9305LB	2	2	2	2	2	2	Screw
18	B8806RB	1	1	1	1	1	1	POW-SW PBA
19	Y9904KB	2	2	2	2	2	2	Screw
20	B8806CX	1	1	1	1	1	1	Sheet
21	B8806DA	1	1	1	2	2	2	AD Guide
22	B9622FW	1	1	1	1	1	1	Fastner
23	Y9305LB	3	3	3	6	6	6	Screw
24	B8706SR	1	–	–	–	–	–	AD-ISO. 4CH
	B8706SP	–	1	1	1	1	–	AD-STD. 10CH (not /N1, /N2)
	B8706SS	–	1	1	1	1	–	AD-ISO. 10CH (or /N1, /N2) } (select)
	B8706TP	–	–	–	–	–	1	AD-STD. 12CH (not /N1, /N2)
	B8706TS	–	–	–	–	–	1	AD-ISO. 12CH (or /N1, /N2)
25	B8706SR	1	–	–	–	–	–	AD-ISO. 4CH
	B8706SP	–	–	1	1	1	–	AD-STD. 10CH (not /N1, /N2)
	B8706SS	–	–	1	1	1	–	AD-ISO. 10CH (or /N1, /N2) } (select)
	B8706TP	–	–	–	–	–	1	AD-STD. 12CH (not /N1, /N2)
	B8706TS	–	–	–	–	–	1	AD-ISO. 12CH (or /N1, /N2)
26	B8706SP	–	–	–	1	1	–	AD-STD. 10CH (not /N1, /N2)
	B8706SS	–	–	–	1	1	–	AD-ISO. 10CH (or /N1, /N2) } (select)
	B8706TP	–	–	–	–	–	1	AD-STD. 12CH (not /N1, /N2)
	B8706TS	–	–	–	–	–	1	AD-ISO. 12CH (or /N1, /N2)
27	B8706SP	–	–	–	–	1	–	AD-STD. 10CH (not /N1, /N2)
	B8706SS	–	–	–	–	1	–	AD-ISO. 10CH (or /N1, /N2) } (select)
	B8706TP	–	–	–	–	–	1	AD-STD. 12CH (not /N1, /N2)
	B8706TS	–	–	–	–	–	1	AD-ISO. 12CH (or /N1, /N2)
28	B8706DC	1	1	1	1	1	1	AD Cover
29	Y9305LB	6	6	6	8	8	8	Screw
30	B9573PZ	1	1	1	1	1	1	Clamp
31	B9622FW	1	1	1	1	1	1	Fastner
32	B8806DD	1	1	1	1	1	1	Edge Guard
33	B8805DG	1	1	1	1	1	1	CF Assembly (128MB MEMORY) } (select)
	B8805EG	1	1	1	1	1	1	CF Assembly (256 MB MEMORY) } (select)
34	Y9305LB	2	2	2	2	2	2	Screw
35	B8706MH	1	1	1	1	1	1	FFC (0.5MM-170MM)

Note:
◎ (CMP)

6 Terminal Assembly (1/3)



Item	Part No.	Qty	Description
1	B8805CR	1	PW Terminal Cover
2	Y9305LB	2	Screw
3	–	1	Power Terminal (select) (see page 7)
4	Y9405LB	1	Screw
5	Y9401WL	1	Washer
6	B8806CT	2	Foot Bracket
7	Y9305LB	4	Screw
8	–	1	Input Terminal 1 } (select) (see page 7)
9	–	1	Input Terminal 2
10	–	1	Input Terminal 3
11	–	1	Input Terminal 4
12	–	1	Option Terminal 1 } (select) (see page 8)
13	–	1	Option Terminal 2
◎ 14	B9968DN	–	Conn Cover Assembly (select) (see page 7 & 8)

Note:
◎ (CMP)

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Terminal Assembly (2/3) 7

Power Terminal

MS CODE (OPTION)

			SELECT
POWER SUPPLY	AND	NOT	PART NO.
–1		/C2, /C3	B8706ER
–1	/C2	/C3	B8706ES
–1	/C3	/C2	B8706ET
–2		/C2, /C3	B8706JA
–2	/C2	/C3	B8706JB
–2	/C3	/C2	B8706JC

Input Terminal

	MS CODE (OPTION)			PART NO.			
MODEL CODE	MS CODE						
	INP TERMINAL	OR	NOT	INP 1	INP 2	INP 3	INP 4
MV2008	–1			B8706JP	B8706JR	B9968DN	B9968DN
	–2			B9968LJ	B9968LK		
MV2010	–1		/N1, /N2	B8706HS	B9968DN		
		/N1, /N2		B8706JS			
	–2		/N1, /N2	B9968LE			
		/N1, /N2		B9968LN			
MV2020	–1		/N1, /N2	B8706HS	B8706HT		
		/N1, /N2		B8706JS	B8706JT		
	–2		/N1, /N2	B9968LE	B9968LF		
		/N1, /N2		B9968LN	B9968LP		
MV2030	–1		/N1, /N2	B8706HS	B8706HT	B8706HU	B9968DN
		/N1, /N2		B8706JS	B8706JT	B8706JU	
	–2		/N1, /N2	B9968LE	B9968LF	B9968LG	
		/N1, /N2		B9968LN	B9968LP	B9968LQ	
MV2040	–1		/N1, /N2	B8706HS	B8706HT	B8706HU	B8706HV
		/N1, /N2		B8706JS	B8706JT	B8706JU	B8706JV
	–2		/N1, /N2	B9968LE	B9968LF	B9968LG	B8706HL
		/N1, /N2		B9968LN	B9968LP	B9968LQ	B8706JH
MV2048	–1		/N1, /N2	B8706HW	B8706HX	B8706HY	B8706HZ
		/N1, /N2		B8706JW	B8706JX	B8706JY	B8706JZ
	–2		/N1, /N2	B9968LH	B8706NM	B8706HN	B8706HP
		/N1, /N2		B9968LR	B8706JJ	B8706JK	B8706JL

8 Terminal Assembly (3/3)

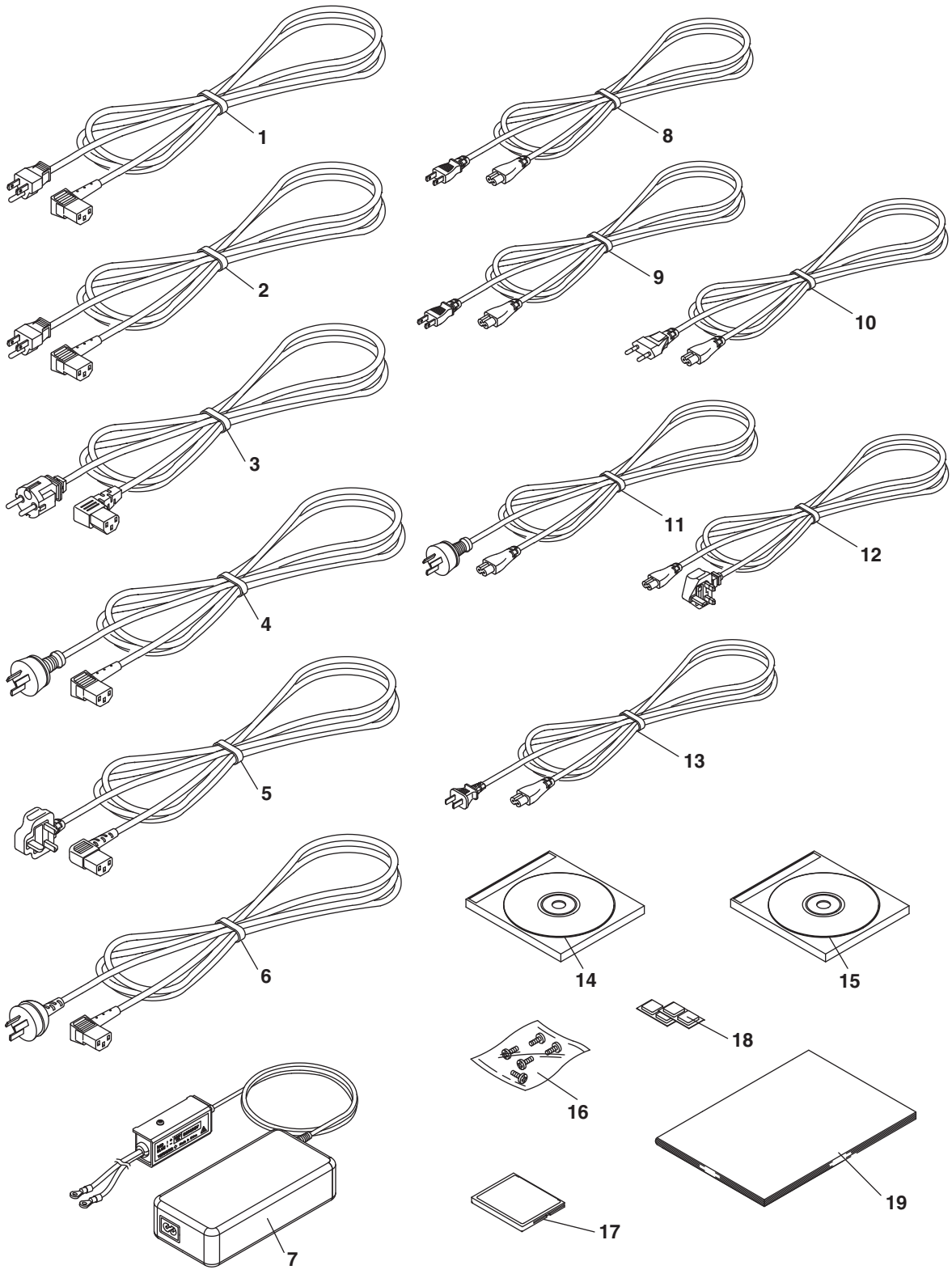
OPTION TERMINAL 1

MS CORD (OPTION)			PART NO.
AND	OR	NOT	OPT 1
/A1		/F1, /PM1, /R1	B9968KA
/A2		/F1, /PM1, /R1	B9968KC
	/A3, /A4	/F1, /PM1, /R1	B9968KE
/A1, /R1		/F1, /PM1	B9968KB
/A2, /R1		/F1, /PM1	B9968KD
/A3, /R1		/F1, /PM1	B9968KJ
/A4, /R1		/F1, /PM1	
/R1		/A1, /A2, /A3, /A4 /F1, /PM1	B9968KK
/A1, /F1		/PM1, /R1	B9968KL
/A2, /F1		/PM1, /R1	B9968KN
/A3, /F1		/PM1, /R1	B9968KQ
/F1		/A1, /A2, /A3, /A4 /PM1, /R1	
/A1, /F1, /R1		/PM1	B9968KM
/A2, /F1, /R1		/PM1	B9968KP
/A3, /F1, /R1		/PM1	B9968KR
/F1, /R1		/A1, /A2, /A3 /A4, /PM1	
/A1, /PM1		/F1	B8703FA
/A2, /PM1		/F1	B8703FB
/A1, /F1, /PM1			B8703FC
/PM1	/A3	/F1	B8703FD
/PM1		/A1, /A2, /A3, /A4, /F1	
/F1, /PM1		/A1, /A2	B8703FE
		/A1, /A2, /A3, /A4 /F1, /PM1, /R1, /TPS4	B9968DN

OPTION TERMINAL 2

MS CORD (OPTION)			PART NO.
AND	OR	NOT	OPT 2
/A3	/F1, /PM1		B9968KF
/A4			
/TPS4			B9968KW
		/A3, /A4, /F1, /PM1, /TPS4	B9968DN

Standard Accessories (1/2) 9



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10 Standard Accessories (2/2)

	Item	Part No.	Qty	Description	
◎	1	A1073WD	1	Power Cord Set (*1, *3)	(select)
◎	2	A1074WD	1	Power Cord Set (*1, *4)	
◎	3	A1009WD	1	Power Cord Set (*1, *5)	
◎	4	A1024WD	1	Power Cord Set (*1, *6)	
◎	5	A1054WD	1	Power Cord Set (*1, *7)	
◎	6	A1064WD	1	Power Cord Set (*1, *8)	
◎	7	B8805GV	1	AC Adapter Assembly (*2) (select)	
◎	8	B9988YE	1	AC-Cord (*2, *3)	(select)
◎	9	B9988YA	1	AC-Cord (*2, *4)	
◎	10	B9988YB	1	AC-Cord (*2, *5)	
◎	11	B9988YC	1	AC-Cord (*2, *6)	
◎	12	A1069WD	1	AC-Cord (*2, *7)	
◎	13	B9988YJ	1	AC-Cord (*2, *8)	
◎	14	B9991AD	1	DXA120 CD Assembly	
◎	15	B8806ZZ	1	CD for Manuals	
◎	16	E9655FX	5	Screw (ETO Screw)	
◎	17	B8706NQ	1	CF-Card 128MB	
◎	18	A9088ZM	2	Stopper	
◎	19	–	1	Manuals	

Note : *1 100VAC, 240VAC
*2 12VDC, 24VDC
*3 MV1□□□-□-□-/□M
*4 MV1□□□-□-□-/□D
*5 MV1□□□-□-□-/□F
*6 MV1□□□-□-□-/□R
*7 MV1□□□-□-□-/□Q
*8 MV1□□□-□-□-/□H
◎ CMP Parts

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7.1 Introduction

This section describes replacing parts necessary for maintenance and repair.

Replaceable Parts

When it becomes necessary to replace parts, it is recommended to replace entire assemblies rather than specific parts within assemblies.
If you plan on replacing parts yourself, please refer to the Customer Maintenance Parts List (CMPL) in chapter 6 for a list of parts supplied by Yokogawa. Parts not on this list are not available through Yokogawa. The CMPL uses the following column titles.

- Number
- Part No.
- Q'ty
- Description

If Servicing is Required

If servicing is required, contact your nearest Yokogawa dealer with the following information.

- Address
- Contact name and phone number
- Product model name, suffix code, and option codes
- Description of the problem, measured results, displayed error messages, and any other pertinent information.

7.2 Recommended Replacement Periods for Worn Parts

To preserve the reliability of the MV and to use the MV in a good condition for an extended time, it is recommended that periodic replacements be made on parts. The replacement parts may change to accommodate preventive maintenance over extended time. Be sure to check with your nearest YOKOGAWA dealer.
The following table shows the recommended replacement period for expendable parts. The replacement period shown here applies when the MV is used under standard operating conditions. For the actual replacement period, consider the actual conditions of use. Replacement of parts will be carried out by a YOKOGAWA engineer or an engineer certified by YOKOGAWA. Contact your nearest YOKOGAWA dealer when such replacement is necessary.

MV1000

Item	Replacement period	Name	Part No.	Quantity Used	Notes
LCD	5 years	Bezel Assembly	B8805BA	1	
Battery	10 years	Battery Assembly	B9900BR	1	
Aluminum electrolytic capacitor	5 years*	Power supply Assembly	–	1	
	5 years*	AD Assembly	Depends on the model		

* Replacement Period at the Upper Limit of the Normal Operating Temperature (40°C)
The replacement period varies depending on the temperature in which the instrument is operated, and the instrument's specifications. If the instrument is used in a 30°C environment, it may be operational for 10 years or more.

MV2000

Item	Replacement period	Name	Part No.	Quantity Used	Notes
LCD	5 years	Bezel Assembly	B8806BA	1	For English
			B8806BB	1	For Japanese
Battery	10 years	Battery Assembly	B9900BR	1	
Aluminum electrolytic capacitor	5 years*	Power supply Assembly	–	1	
	5 years*	AD Assembly	Depends on the model		

* Replacement Period at the Upper Limit of the Normal Operating Temperature (40°C)
The replacement period varies depending on the temperature in which the instrument is operated, and the instrument's specifications. If the instrument is used in a 30°C environment, it may be operational for 10 years or more.

Note

- The LCD should be replaced when the brightness of the LCD is reduced by half its original brightness. The brighter the display, the shorter the "half-life" of the LCD. Reductions in brightness vary depending on operating conditions, and is a subjective determination. The actual replacement period should be determined based on these considerations.
- The LCD screen may start to yellow over time. The brighter the screen, the faster such changes may progress.