

Thank you for purchasing this M-System product. This manual primarily describes precautions required in installing and wiring the power supply. Before operating the product, read this manual thoroughly to acquire sufficient knowledge of the product to use it safely and correctly. Keep this manual close at hand and use for reference during operation.

When using MDC6-12024A-M2, read the "MDC6 Operation Manual" together without fail.

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0967521-8D (Side A)

**Key to Warning Symbols**

**CAUTION** Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury or in property damage.

**Warning Symbols**

CAUTION	
Minor electric shock may occasionally occur. Do not disassemble the Product or touch the interior of the Product.	
Minor burns may occasionally occur. Do not touch the Product while power is being supplied or immediately after power is turned OFF.	
Minor fires may occasionally occur. Tighten terminal screws to a torque of 9.6 in-lb (1.08 N·m) so that they do not become loose.	
Minor electric shock may occasionally occur during operation. Install the terminal cover.	
The Product may occasionally be damaged. Do not allow any clippings or cuttings to enter the Product during installation work.	

**Suitability for Use**

M-System shall not be responsible for conformity with any standards, codes, or regulations that apply to the combination of the products in the customer's application or use of the product.

Take all necessary steps to determine the suitability of the product for the systems, machines, and equipment with which it will be used.

Know and observe all prohibitions of use applicable to this product. NEVER USE THE PRODUCTS FOR AN APPLICATION INVOLVING SERIOUS RISK TO LIFE OR PROPERTY WITHOUT ENSURING THAT THE SYSTEM AS A WHOLE HAS BEEN DESIGNED TO ADDRESS THE RISKS, AND THAT THE M-SYSTEM PRODUCT IS PROPERLY RATED AND INSTALLED FOR THE INTENDED USE WITHIN THE OVERALL EQUIPMENT OR SYSTEM.

**EN Precautions for Safe Use**

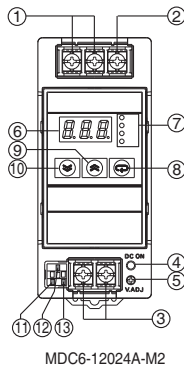
- (1) Installing/Storage Environment
- Store the product with ambient temperature -25 to +65°C (-13 to +149°F), and relative humidity 25 to 90%.
  - To maintain the function of the Maintenance forecast monitor function during storage over an extended period of time, satisfy the following conditions.
    - Store the product with temperature -25 to +30°C (-13 to +86°F) and humidity 25 to 70% if the storage period exceeds three months.
  - The internal parts may occasionally deteriorate and be broken due to adverse heat radiation depending on the mounting status. The maintenance forecast monitor function may not work correctly. Do not use the product in any way other than the standard mounting direction.
  - Use the product where the relative humidity is 25 to 85%.
  - Avoid places where the product is subjected to direct sunlight.
  - Avoid places where the product is subjected to penetration of liquid, foreign substance, or corrosive gas.
  - Avoid places subject to shock or vibration.
    - A device such as a contact breaker may be a vibration source. Set the Power Supply as far as possible from possible sources of shock or vibration.
  - If the Power Supply is used in an area with excessive electronic noise, be sure to separate the Power Supply as far as possible from the noise sources.
  - The internal parts may occasionally deteriorate and be broken due to adverse heat radiation. Do not loosen the screw on the side face of the main body.
  - Arrangement/Wiring
    - The light electric shock may possibly be caused. Connect the ground completely.
    - The light ignition may possibly be caused. Ensure that input and output terminals are wired correctly.
    - Use the following material to the wire to be applied to the product for preventing from the occurrence of the smoking or ignition caused by the abnormal load.
 

Recommended Wire Type:

Terminal	Recommended Wire Type
Input	AWG14 to 20 (Cross section 0.517 to 2.081mm <sup>2</sup> )
Output	AWG14 to 18 (Cross section 0.823 to 2.081mm <sup>2</sup> )
Alarm output terminal	AWG18 to 26 (Cross section 0.261 to 0.823mm <sup>2</sup> ) (wires to be stripped: 9 to 10mm)
Ground terminal	AWG14 or more (2.081mm <sup>2</sup> or more)

- EN Nomenclature**
- Power input terminal (L) (N) (Fig. 1)  
(The fuse is located on the (L) side.)
  - Protective Earth terminal (PE) (⊕)
  - DC output terminal (-), (+V)
  - Output indicator (DC ON: green)
  - Output voltage adjuster (V. ADJ)
  - Main display unit
  - Operation display unit
  - Mode key
  - Up key
  - Down key
  - Alarm output terminal: Undervoltage alarm output terminals (DC LOW)
  - Alarm output terminal: Maintenance forecast monitor terminal (Yrs)
  - Common terminal for alarm output

Fig. 1 Nomenclature



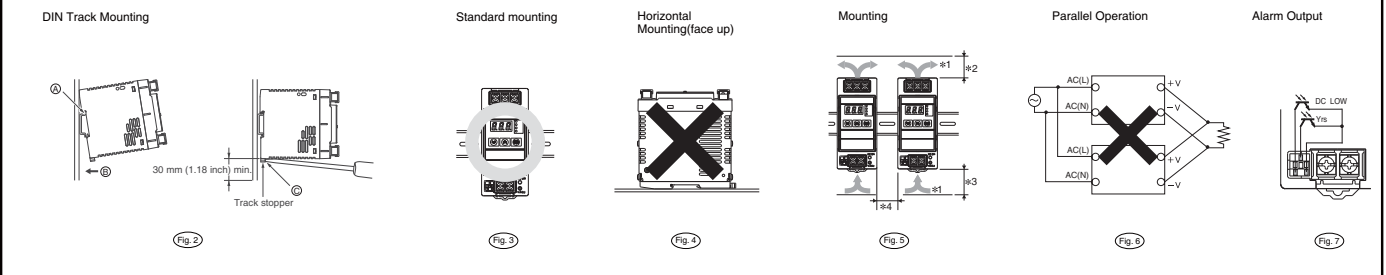
MDC6-12024A-M2

**EN Safety standards**

- DC output terminals (3) are galvanically isolated from the Power input terminals (1).
- Overvoltage category III.
- This equipment is for protection class 1.
- Climatic class: 3K3  
-According to EN50178 (=VDE0160).  
Overvoltage category II: According to UL60950-1 and EN60950-1.  
CSA Level 3  
Surrounding Air Temperature according to UL508 Listing: 40°C(104°F)  
Use in pollution degree2 environment.

**EN Precautions for Correct Use**

<p><b>■ Mounting</b></p> <p><b>■ DIN Track Mounting</b></p> <p>To mount the power supply on a DIN track, hook portion (A) of the power supply onto the track and press the power supply in direction (B). To dismount the power supply, pull down portion (C) with a flat-blade screwdriver and pull out the power supply.</p> <p><b>■ Mounting Direction</b></p> <table border="1"> <tr> <td>Standard Mounting (Fig. 3)</td> <td>Valid</td> </tr> <tr> <td>Horizontal Mounting (Fig. 4)</td> <td>Invalid</td> </tr> <tr> <td>Others Mounting</td> <td>Invalid</td> </tr> </table> <p><b>■ Mounting Space</b></p> <p>Install the power supply so that the air flow circulates around the power supply, as the power supply is designed to radiate heat by means of natural air flow.</p> <ul style="list-style-type: none"> <li>* 1 Direction of air circulation</li> <li>* 2 75 mm (2.95 inch) or more</li> <li>* 3 75 mm (2.95 inch) or more</li> <li>* 4 20 mm (0.79 inch) or more</li> </ul> <p><b>■ Rated Power Input Voltage</b></p> <p>100 to 240 VAC Universal input</p> <p><b>■ Parallel Operation</b></p> <p>The product is not designed for parallel operation.</p> <p><b>■ Output Voltage Adjustment</b></p> <p>Default Setting: Set at the rated voltage Adjustable Range: Adjustable with "V.ADJ" (5) on the front surface of the product from -10% to +15% of the rated output voltage. Turning clockwise increases the output voltage, and turning counterclockwise decreases the output voltage.</p> <p>Notes:</p> <ol style="list-style-type: none"> <li>If the output voltage is adjusted to less than 20V (factory setting), the undervoltage alarm function may be activated.</li> <li>Do not exceed the rated output capacity and current after adjusting the output voltage.</li> </ol> <p><b>■ Dielectric Strength Test</b></p> <p>Rated dielectric strength: 3000VAC between &lt;input terminals (1) together &gt; and &lt;output terminals (3), (11), (12) together &gt; for 1 minute. When testing, set the cutoff current for the withstand voltage test device to 20mA. Notes: 1. Sudden switching of 3000VAC may possibly cause a voltage surge, damaging the power supply. Increase/decrease test voltage gradually. 2. Be sure to short-circuit all the output terminals and the Alarm output terminals of the power supply to protect the power supply from damage.</p>	Standard Mounting (Fig. 3)	Valid	Horizontal Mounting (Fig. 4)	Invalid	Others Mounting	Invalid	<p><b>■ Insulation Resistance Test</b></p> <p>When testing the insulation resistance of the power supply, use a DC ohmmeter at 500VDC. Note: Be sure to short-circuit all the output terminals and the Alarm output terminals of the power supply to protect the power supply from damage.</p> <p><b>■ Overload Protection</b></p> <p>The load and the power supply are automatically protected from overcurrent damage by this function. Overload protection is activated if the output current rises above 105% of the rated current. When the output current returns within the rated range, overload protection is automatically cleared. Notes: 1. If the power supply has been short-circuited or supplied with an overcurrent longer than 20 seconds, the internal parts of the power supply may occasionally be deteriorated or damaged. 2. The internal parts may possibly be deteriorated or damaged. Do not use the product for applications where the load causes frequent inrush current and overload.</p> <p><b>■ Overvoltage Protection</b></p> <p>This power supply automatically protects itself and the load from overvoltage. Overvoltage protection is activated if the output voltage rises above approx. 130% of the rated output voltage. To reset the power supply, leave the power supply off for more than 3 minutes and then turn it on again. Note: Be sure to clear the cause of the overvoltage, before turning on the power supply.</p> <p><b>■ Alarm Output</b></p> <p>Transistor Output/Sink type (NPN type) DC30V max., 50mA max. Residual voltage upon power-on: 2V or smaller. Leakage current upon shutoff: 0.1mA or smaller. Note: For the undervoltage alarm function, and maintenance forecast monitor function, refer to the "MDC6 Operation Manual".</p> <p><b>■ In Case there is No Output Voltage</b></p> <p>The possible cause for no output voltage may be the presence of an overload or overvoltage condition, or may be due to the functioning of an latching protective device. The latching protection may operate if a large amount of surge voltage such as a lightning surge occurs while turning on the power supply. In case there is no output voltage, please check the following points before contacting us: Check the Overload Protected Status: • Check whether the load is in overload status or is short-circuited. Remove wires to load when checking. • Attempt to clear the overvoltage or latching protection function: Turn the power supply off once, and leave it off for at least 3 minutes. Then turn it on again to see if this clears the condition.</p>	<p><b>■ Conformance to EU Directives</b></p> <p>Refer to Specification Sheets and this instruction manual for details on the operating condition for EMC-compliance. Warning: This is a class A product. In a residential, commercial or light industrial environment it may cause radio interference. This product is not intended to be installed in a residential environment; in a commercial and light industrial environment with connection to the public mains supply, the user may be required to take adequate measures to reduce interference.</p>
Standard Mounting (Fig. 3)	Valid							
Horizontal Mounting (Fig. 4)	Invalid							
Others Mounting	Invalid							
<p><b>Contact address</b></p> <p>M-System Co., Ltd. 5-2-55, Minamitsumori, Nishinari-ku, Osaka 557-0063 JAPAN Phone: +81-6-6659-8201 Fax: +81-6-6659-8510 E-mail: info@m-system.co.jp</p>								



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0969710-6B (Side A)

■ What is "Maintenance Forecast Monitor Function" ?

The power supply unit is equipped with electrolytic capacitors. The electrolyte inside the electrolytic capacitor penetrates the sealing rubber and evaporates as time passes since it is manufactured (※1), which causes deterioration of characteristics such as decreasing the capacitance (※2), etc. Due to this deterioration of the characteristics of the electrolytic capacitor, the power supply unit decreases its performance as time passes. The maintenance forecast monitor function shows an approximate period left for maintenance of the power supply unit due to deterioration of electrolytic capacitors. When the period left for maintenance that the power supply forecasts reaches the set value, an alarm is indicated and an output signal is triggered. Use this function to know the approximate replacement timing of the power supply unit.

Note:

THE MAINTENANCE FORECAST MONITOR FUNCTION INDICATES AN APPROXIMATE PERIOD LEFT FOR MAINTENANCE, BASED ON DETERIORATION OF THE ELECTROLYTIC CAPACITOR. IT DOES NOT PREDICT FAILURES CAUSED BY OTHER REASONS.

■ Principle of operation

The deterioration speed of the electrolytic capacitor varies considerably according to the ambient temperature. (Generally the speed follows "Rule of Two for every 10°C"; for every 10°C increase in temperature the rate of degradation doubles according to Arrhenius's equation.) The MDC6-12024A-M2 monitors the temperature inside the power supply, and calculates the amount of deterioration according to the running hours and inside temperature. Judging by this amount of deterioration, the power supply will give the alarm indication and output when the period left for maintenance reaches the set value.

Notes:

1. Due to degradation of internal electronic parts, replace the power supply at least once every 15 years even if indication and output of maintenance forecast monitor are not issued.
2. The maintenance forecast is accelerated or decelerated according to operating conditions. Periodically check indication.
3. The output may turn ON and OFF alternately according to the acceleration or deceleration of Maintenance forecast.
4. The accuracy of Maintenance forecast monitor may become worse in the application having frequent ON/OFF for AC power.

■ Indication and Output

When the product is purchased, "FUL" (※3) will be indicated. As electrolytic capacitors deteriorate, indication changes to "HLF" (※4). After the remaining time to maintenance is reduced to two years, indication automatically changes to a value (※5), which decreases from "1.5" to "1.0" to "0.5" to "0.0" (year) as the running hours increase. If the maintenance forecast monitor setting is set to a value larger than two years, value indication automatically begins after the remaining time to maintenance is reduced to the set years. If the remaining time becomes smaller than setting L (which can be set arbitrarily between 0 and 5.0 years), an alarm (RD!) and the remaining time are indicated alternately. And an output is given to an external device from a transistor (⑫ Yrs) to notify of the replacement timing, together with indication. (The output is turned off after the replacement timing is reached; with no continuity across ⑫ and ⑬.)

In the case that the remaining time is reduced to smaller than 0.5 year and an alarm is issued.

Notes:

1. The remaining time to maintenance is based on continuous operation, not including the time when the power supply is turned off, and so may take longer to reach than the actual time indicated.
2. Until the power supply has been turned for about one month in total, indication is fixed at "FUL" to estimate the extent of deterioration, while the output remains turned on (with continuity across ⑫ and ⑬).

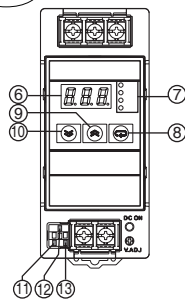
■ PERIODIC CHECK

It may takes from several years to several tens of years under general operating conditions for the power supply to give the maintenance forecast monitor alarm. During operation over an extended period of time, periodically check if the maintenance forecast monitor output (⑫ Yrs) is correctly functioning by the following procedure.

1. Select the operation mode.
2. Check that the output (⑫ Yrs) is turned on (with continuity across ⑫ and ⑬).
3. In the operation mode, press and hold the  $\approx$  (⑨) and  $\simeq$  (⑩) keys **simultaneously** for at least three seconds. The main display (⑥) changes to "RD!". An inactive output (⑫ Yrs) (no continuity across ⑫ and ⑬) in the "RD!" indication indicates the correct function.
4. Release keys to return to the regular state.

Note: DC output stays ON while the periodical check.

Fig. 1 Nomenclature



MDC6-12024A-M2

Fig. 2 Undervoltage alarm function

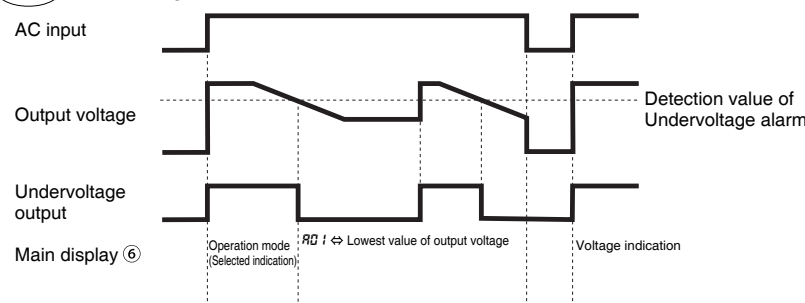
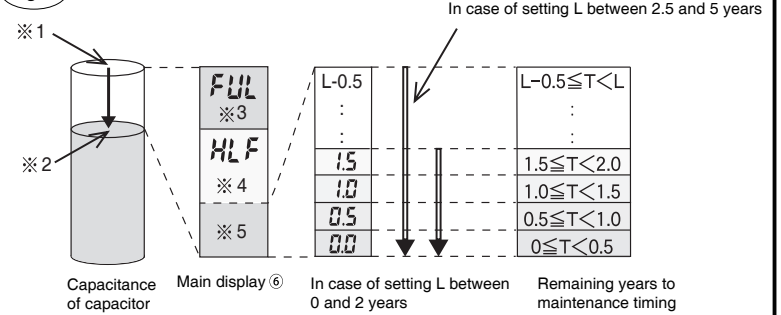


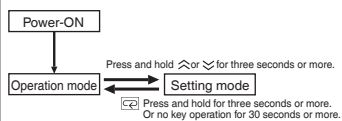
Fig. 3



■ Name and Function of Each Part

Name	Function
⑥ Main display	Indicates the measurement or set value.
⑦ Operation indicator	V Lights up when the output voltage is indicated. Blinks during setup of undervoltage alarm value.
	A Lights up during indication of output current.
	Apk Lights up during indication of peak hold current.
⑧ Mode key	Use the mode key to change the indicated parameter or reset the peak hold current value.
	Use the up key to change to the setting mode or to increase the set value.
⑨ Up key	Use the up key to change to the setting mode or to increase the set value.
⑩ Down key	Use the down key to change to the setting mode or to decrease the set value.

■ Mode Change



■ Operation Mode

Various states of the power supply unit are indicated.

	Output voltage	At operation indicator (⑦), ● indicates a lit LED. * indicates a blinking LED.
	Output current	
	Peak hold current	
	Maintenance forecast monitor	

Note: The output voltage will be displayed when the power supply is first turned on after it is received from the factory. Thereafter, the main display will be indicated in the same display when shutting down.

Fig.1

■ Setting Mode

Set various parameters of the power supply unit.

	Undervoltage alarm	* The reverse video indicates the shipment setting. 18.5 - <b>20.0</b> - 27.5(V) 0.1V intervals
	Maintenance forecast monitor	0.0 - <b>0.5</b> - 5.0(years) 0.5 year intervals

Note:

Press and hold  $\approx$  (⑨) or  $\simeq$  (⑩) for two seconds or more to increase or decrease the value rapidly.

■ Output Voltage and Current Indication Function

The output voltage and current of the power supply unit are monitored and indicated.

Note:

Operation begins after about 3 seconds since the AC power is supplied.

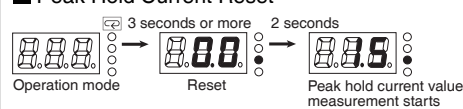
■ Peak Hold Current Indication Function

The maximum output current is memorized and indicated. The maximum output current is always updated whatever the indication mode is. The peak hold current is retained even if the AC power is turned off.

Note:

Operation begins after about 3 seconds since the AC power is supplied.

■ Peak Hold Current Reset



Note:

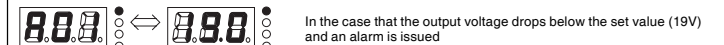
The peak hold current value is not reset in the setting made.

■ Undervoltage alarm Function (Indication)

Fig.2

When output voltage drop is detected, an alarm (RD!) and lowest output voltage value are indicated alternately. The preset value of detection voltage can be changed in the setting mode.

Further, the alarm is output from the transistor (⑪ DC LOW) to an external device. (Upon output voltage alarm: OFF; with no continuity across ⑪ and ⑬)



Notes:

1. Operation begins after about 3 seconds since the AC power is supplied.
2. The alarm is not indicated in the setting mode.
3. Press the  $\square$  (⑧) after the output voltage is restored, to reset alarm indication.
4. The undervoltage alarm function monitors the output terminal voltage of the power supply unit. To check the voltage accurately, measure the voltage at the load end.
5. Detecting function for undervoltage may be activated when AC power fails and recovers within 20 ms or more.
6. Detecting function for undervoltage may be also activated when the output current over the rated one is flown at the start.
7. When output voltage drop is detected, it automatically changes to voltage indication.

⑥ Main display	Description	Output state	Restoration method	Setting after restoration
	Noise detected in voltage or current	No change	When external noise is cleared, indication is automatically restored.	No change
	Overheated	⑫ OFF	When the overheat condition is removed, indication is automatically restored.	No change
	Undervoltage alarm set value memory error	⑪ OFF	Change over setting mode on pressing and holding $\approx$ (⑨) or $\simeq$ (⑩) for three seconds. And check the set value of the corresponding point. (The set value must return to the shipment setting. Set the each value again, if necessary.) The error message will be canceled on changing over operation mode again.	Shipment setting or value set in the setting mode again
	Memory error of alarm set value of maintenance forecast monitor	⑫ OFF	(The set value must return to the shipment setting. Set the each value again, if necessary.) The error message will be canceled on changing over operation mode again.	Shipment setting or value set in the setting mode again
	Other memory error	⑪⑫ OFF	Turn the AC input off then on again. If the product is not reset, contact the dealer.	No change

Notes:

1. External noise is probable as a cause of "- - -" and "EB\*" errors.
2. Incorrect operating conditions, ventilation error, and incorrect mounting direction are probable as a cause of "Hot" error.
3. If the "Hot" error state continues for about three hours, the maintenance forecast monitor function becomes invalid. The indication for maintenance forecast monitor remains as "Hot" even after the overheat condition is removed, and the Yrs output (⑫) remains OFF (with no continuity across ⑫ and ⑬). REPLACE THE POWER SUPPLY IF THIS CONDITION OCCURS EVEN IF THE DC OUTPUT IS CORRECT, AS INTERNAL PARTS MAY BE DETERIORATED.