



**MITSUBISHI
ELECTRIC**

for a greener tomorrow



Changes for the Better

TYPE-B MOTOR CONTROL CENTER



Tough & Stylish

Unleashing the power of the seamless integration of functionality and durability at the cutting edge of technological development

Type-B Motor Control Center

The Type-B Motor Control Center is the newest addition to Mitsubishi Electric's distinguished line-up of motor control products. Developed by a company long recognized as a pioneer in the field of motor-switching devices, the product is the result of state-of-the-art technology comprehensively engineered from the user's perspective. The Type-B Electronic Multi-function Motor Controller, on the other hand, is characterized by a heightened capacity to withstand various site-related conditions. Tough and stylish, it comes fully equipped with useful functions enhanced by an attractively designed, high-visibility display for an expanded range of applications.

Easy Maintenance

- Capacitors and LCDs easily replaced
- Grips easily maintained thanks to the use of long-lasting grease



Secure

- Equipped with the latest security mechanisms



Expanded User Support

- Provides 3-mode restart function after instantaneous voltage drops
- Provides running time/count-based alarms
- Permits setting of target current
- Ample test functions



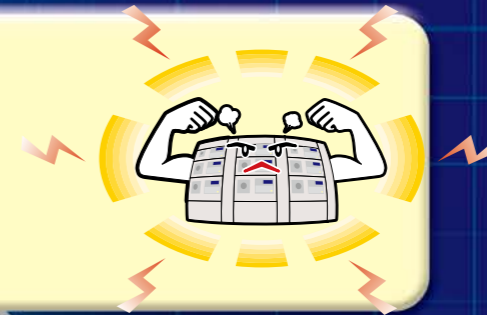
Space Saving

- Employs unit height of 150mm as standard



Tough

- Durable motor controller, highly resistant to a wide range of external factors



Stylish

- Motor controller features:
- Visually appealing design
- MCCB operating handles and LED lamps for easy viewing of operating status
- Attractive high-visibility LCDs



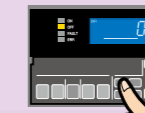
Type-B Motor Control Center



Type-B Electronic Multi-function Motor Controller (EMC-B)

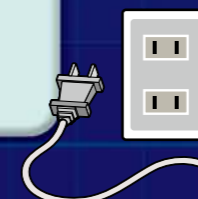
Easy Operation

- Simple to use
- Quick learning process



Energy-saving

- Features LCD "Normally OFF" mode
- Measures electrical energy
- Features 0-1mA DC current output
- Uses a low-capacity regulating transformer



Tough & Stylish

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**Added resistance to the effects of temperature, corrosive gas, radio noise and static electricity
EMC-B Tough Motor Controller (Tough-Con)**

Vibration/Impact-resistant

Remains problem-free even after the Control Center contactor has switched ON/OFF a million times.

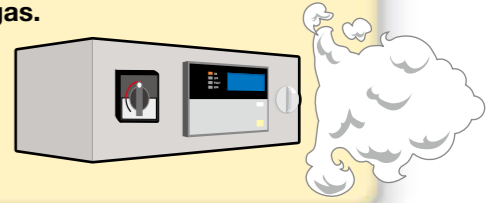


Corrosive Gas

Can be used in an environment subjected up to 50ppb of H₂S gas (ISA S71.04 G3 ^{†2}). ^{†3}

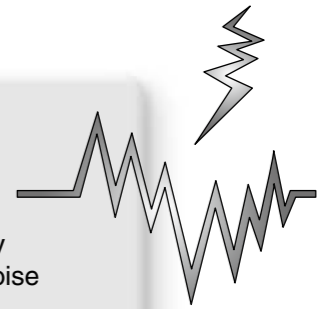
• Protected by a special high-performance coating for keeping out corrosive gas.

- Housed in a semi-hermetic casing.
- Fitted with gold-plated switches and connectors.



Surge/Noise

Prevents malfunctions caused by propagation/radiation of surge/noise and noise from the power supply. Withstands an impulse noise level of 5kV.



Radio Noise

Highly resistant to interference from cellular phones and transceivers.

Cellular phones : may be used even at close proximity to the controller ^{†4}

Transceivers : may be used at a distance of 40cm or more (154MHz, 5W; 460MHz, 5W; 900MHz, 5W)



Dust

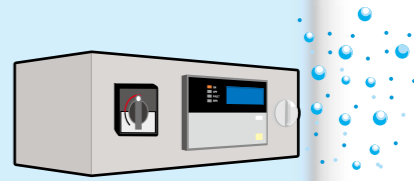
Keeps out dust thanks to its hermetic construction and specially coated board elements (to IP53 ^{†1} when mounted on the Control Center). (The Control Center has a semi-hermetic construction and may be optionally protected against dust to IP43 ^{†1} max.)



Water

Hermetic construction guards against intrusion of water (to IP53 ^{†1} when mounted to the Control Center).

(The Control Center has a semi-hermetic construction and may be optionally waterproofed to a maximum of IP43 ^{†1}.)



Static Charge

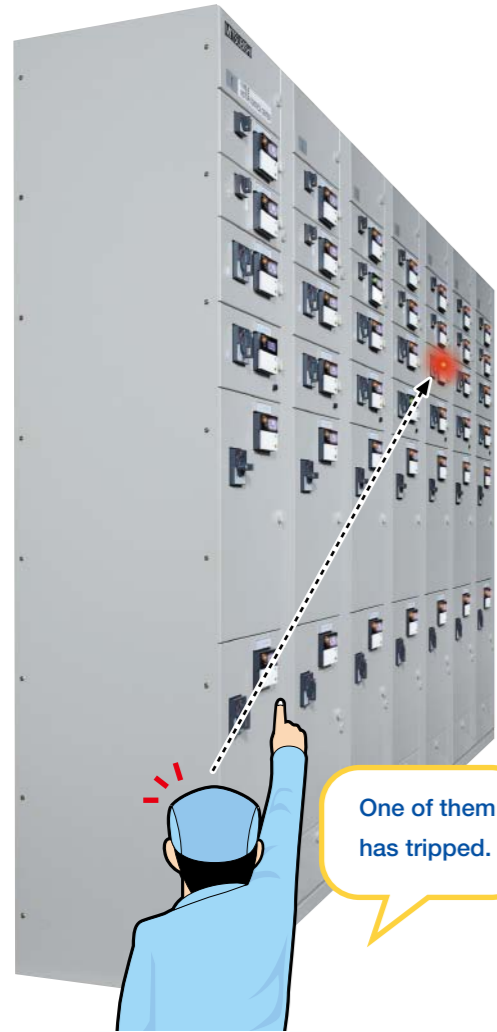
Withstands the effects of static electricity at the highest level in its class (15kV). (Complies with international standard IEC61004-2 Class 4 requirements [static discharge immunity testing].)



^{†1}: Index of protective level against dust and liquids.
^{†2}: ISA (Instrument Society of America) S71.04 (environmental conditions for process measurement and control systems) G3 (level of severity indicating an environment subject to a strong likelihood of corrosion).
^{†3}: Here, the term "corrosive gas" refers to H₂S alone (50% RH or less).
 The concurrent presence of another gas can accelerate corrosion and thus shorten the expected service life.
 If the presence of a non-H₂S gas on its own is expected, contact us during the planning stage.
 If operation in an environment subjected to corrosive gas is expected (up to 50ppb), contact us for considerations pertaining to devices other than the EMC.
^{†4}: According to the results of our studies of phones from multiple Japanese manufacturers (2010).

Stylish (practical, attractively designed indicators)

1. The MCCB operating handles and LED lamps help make the current status of individual panels easily recognizable, all at one glance.



One of them has tripped.

The clearly visible MCCB operating handles and LED lamps make it easy to detect the operating states of rows of panels at a glance. They've made our routine checks especially easy.

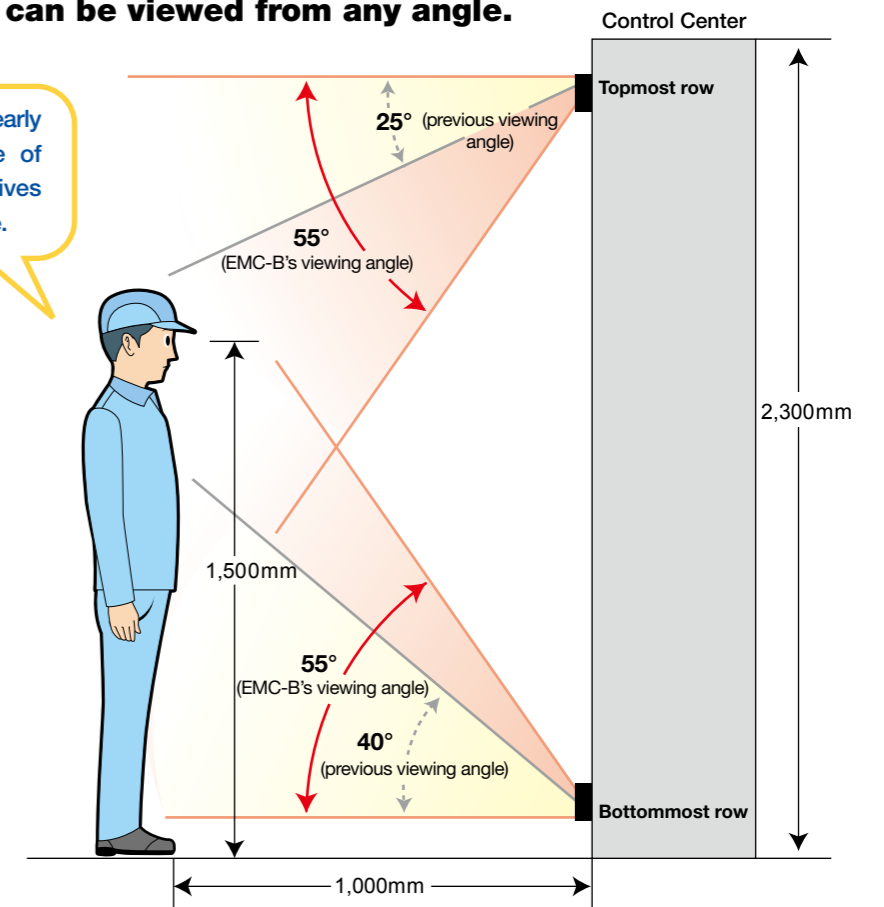


Visually appealing design



2. The high-visibility LCD can be viewed from any angle.

The images on the LCD are clearly visible across a wide range of angles—even from perspectives well above or below the device.



The newly-added bar graphs now display information on operating current graphically. The text is bright and extremely legible and turns orange to alert us as soon as a motor trips. There's no need for stepladders or bending down when checking the displays.



When OFF When ON



The MCCB operating handle is fitted to a plate with a high-contrast 2-segment design, making the current operating state easy to identify even when viewed at an angle.

LED Lamp (front and side views)

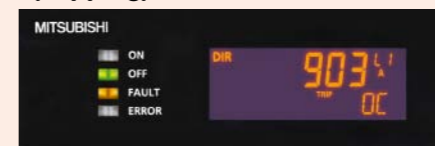


The LED used to indicate operating states is twice as bright as before. In addition, the LED portion protruding from the lamp body enables checking from both the front and sides.

(Normal)



(Tripping)



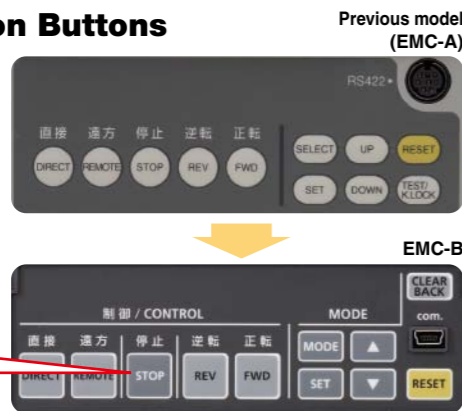
The main display is a LCD specially designed to provide wide viewing angles, making inspections of topmost/bottommost units significantly easier than with previous models. The positive display (i.e., white text against a blue background) turns orange when a motor trips. Compared to displays on previous models, the new display is significantly more advanced in terms of visibility and legibility from wider viewing angles.

Easy Operation

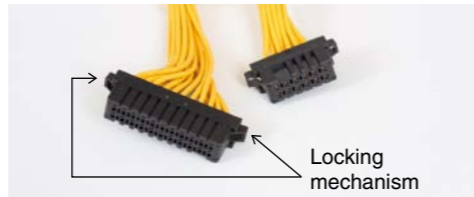
Operation Panel - The ultimate in operation ease

1. EMC-B Operation Buttons

The arrangement and design of the operation buttons have been fully reconfigured to improve ease of operation. The darker shade of the STOP button makes it easier to spot.

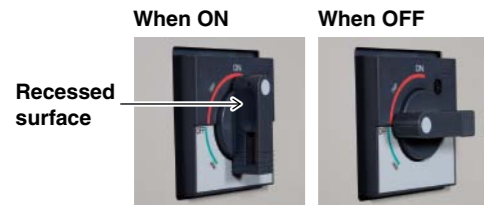


2. Connector with a Locking Mechanism



The connectors have a locking mechanism on both ends, enhancing connection reliability. In addition, reduced spring pressure and use of metal plating makes connection/disconnection easier than with previous models.

3. MCCB Operating Handle



The recessed handle surface provides a better grip for easier operation. The location of the indentations has been determined based on ergonomic considerations.

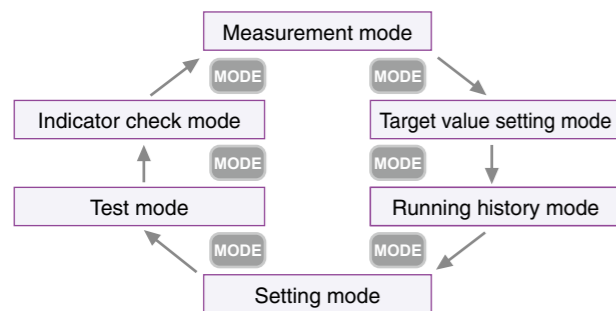
4. Block Connector for Control Circuit Terminal



The connector is easy to hold and can be connected/disconnected, making execution of work smooth. Its transparency facilitates confirmation of wiring conditions and connection/disconnection to the connector mount.

Easy-to-Learn Button Operation

1. Mode Sequence of the EMC-B



Shifting through modes is as easy as pressing the MODE button.

2. Additional Button (DISP)



One press of the DISP (display) button turns on the LCD without needing to open the cover. ^[†1]

†1: Only valid in LCD Normally OFF mode (see page 15).

3. Simplified EMC Settings

<Setup mode screen>



Settings are performed in setup mode. Switch to setup mode and use the ▲ and ▼ buttons to move to the item to be set.

1. Item setting guidance

⇒ Codes are displayed corresponding to the item to be set. In the example on the left, BL is displayed, which stands for backlight control.

2. Item serial number

⇒ Each item that can be set has a corresponding number. To represent the hundreds column, an "a" is displayed at the top right of the number. In the example on the left, the display indicates the number "180".

3. Setting contents

⇒ When the target item is displayed, the setting can be changed. The targeted item setting will flash and can be changed using the ▲ and ▼ buttons. When the desired value is reached, press the "SET" button.

Space-saving

Improved Packaging Efficiency Saves Space

E Series Unit (fitted with EMC-B)

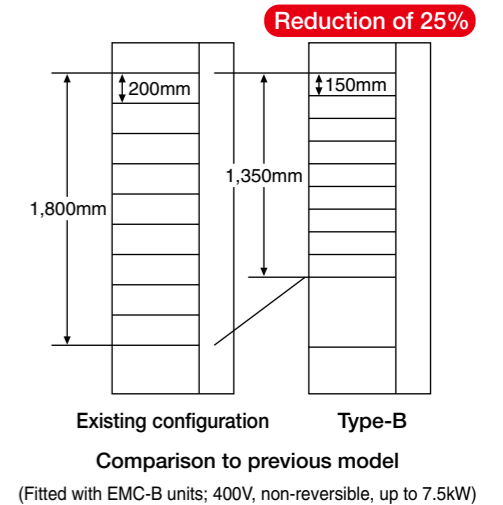
1. 150mm-high Unit Added to Line-up



150mm unit

150mm unit (with door opened)

The addition of a 150mm unit to the line-up further increases space efficiency permitting the use of as many as 24 units (400V, non-reversible, up to 7.5kW).



Existing configuration

Type-B

Comparison to previous model

(Fitted with EMC-B units; 400V, non-reversible, up to 7.5kW)

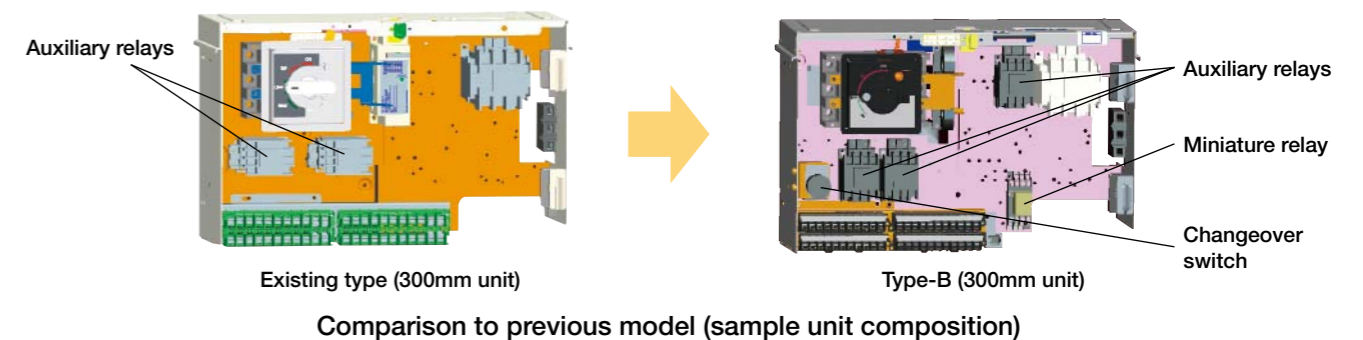
2. Higher Packaging Efficiency in 200mm/300mm-high Units

Maximum Number of Relays Accommodated

Unit height (mm) (400V system)	Power (kW)	Auxiliary relay (SR type)		Miniature-size relay (MY type)	
		Previous model	Type-B	Previous model	Type-B
200	~ 15kW	0 ^{†1}	1 ^{†1}	1 ^{†2}	2 ^{†2}
	~ 37kW	0 ^{†1}	0 ^{†1}	1 ^{†2}	1 ^{†2}
300	~ 15kW	2 ^{†2}	4 ^{†2}	5 ^{†3}	7 ^{†3}
	~ 37kW	2 ^{†2}	3 ^{†2}	5 ^{†3}	5 ^{†3}

†1: Permits the use of an additional CP-type circuit protector or AR22-type changeover switch.
†2: Permits the use of a CP-type circuit protector or AR22-type changeover switch.
†3: Permits the use of a CP-type circuit protector.

The internal components have been reduced in size and laid in a different arrangement for better use of the space inside the unit. The use of miniature-size relays has also helped increase the efficiency in accommodating control devices.



Existing type (300mm unit)

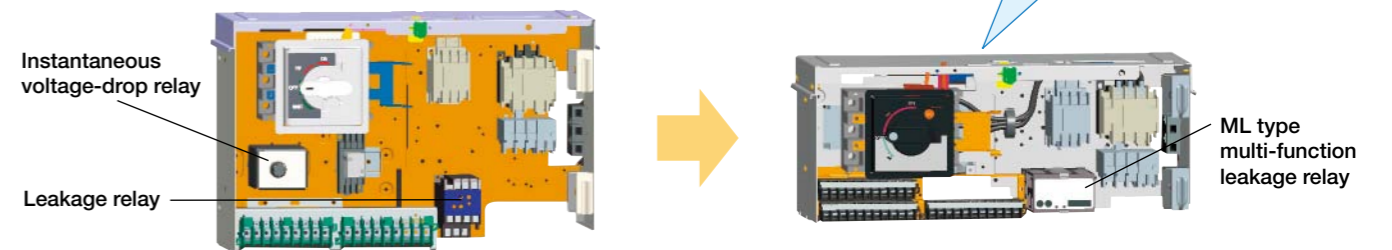
Type-B (300mm unit)

Comparison to previous model (sample unit composition)

B Series Unit (not fitted with EMC-B)

B Series Units Also Made More Compact

The functions of both the leakage relay and instantaneous voltage-drop relay have been combined in a single relay in the form of the ML-type multi-function leakage relay. Nearly identical in size to the existing leakage relay, the new relay has a reduced height now permitting installation in a 200mm unit while the existing type requires a 300mm unit.



Instantaneous voltage-drop relay

Leakage relay

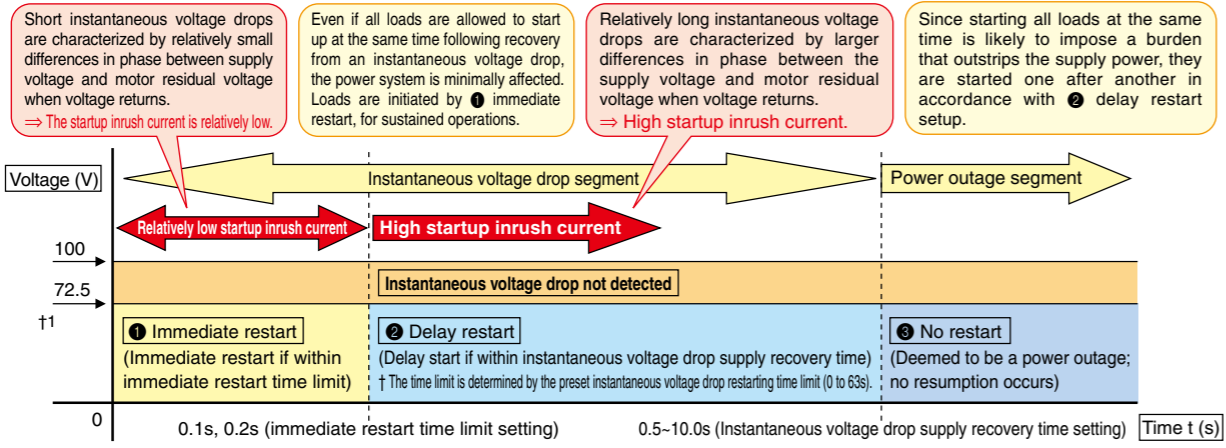
Existing type (in 300mm unit)

Type-B (in 200mm unit)

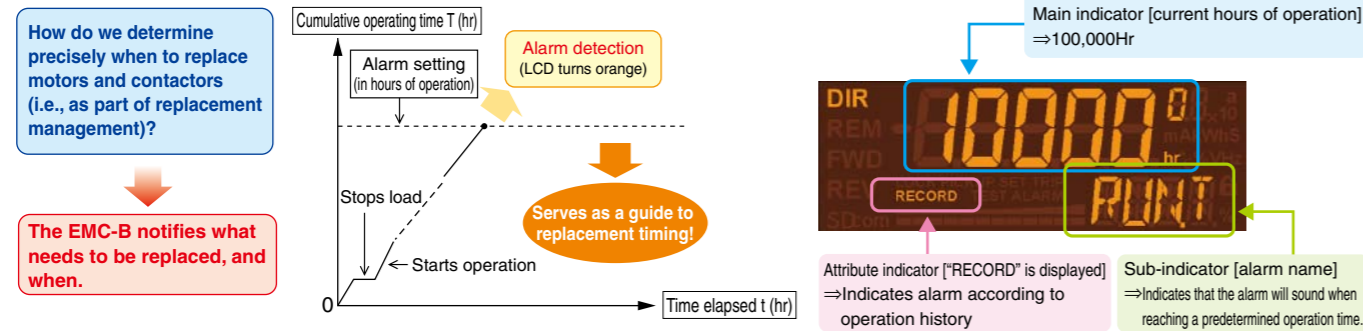
Comparison to previous model (sample unit composition)

Expanded Maintenance Support

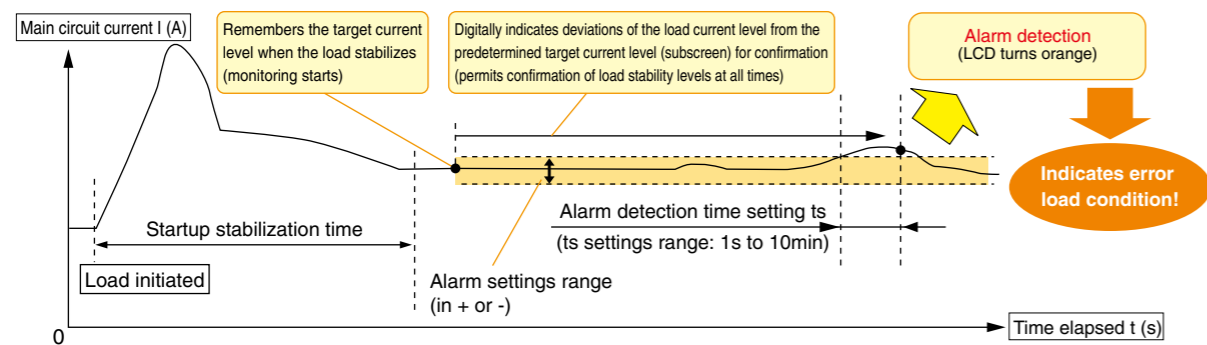
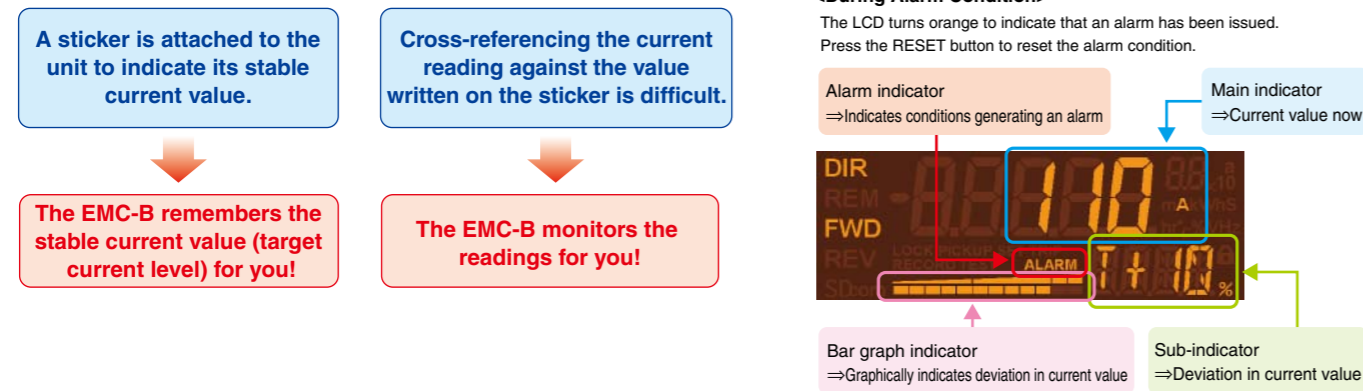
1. 3-mode Restart Function after Instantaneous Voltage Drop



2. Running Time/Count-based Alarms



3. Target Current Setup



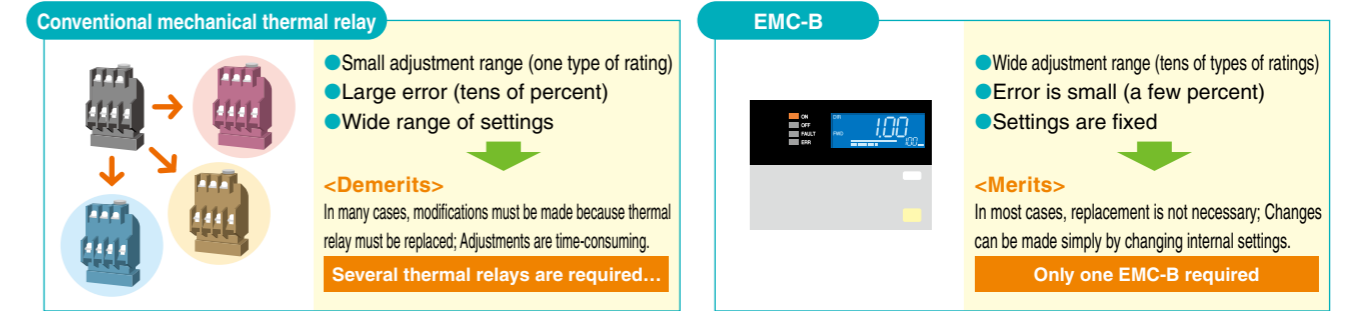
Plant Startup Support

Plant startup time has recently become much shorter. From installation to operation, hardly any time is required in most cases.

With this in mind, the EMC-B is equipped with support features including functions to test the transmission system and simulate system error or failures.

1. Electronic Thermal Relay Enables Simple Post-delivery Adjustment

The EMC-B can function as an electronic thermal relay. As the adjustment range is large and the error is small, there is no need for replacement.



2. Ample Test Functions^{†1}

1. Abnormal CPU operation mode

I need to conduct tests that simulate system error and transmission tests during abnormal CPU operation.

The EMC-B can simulate system error!

In the abnormal CPU operation test mode, actual internal signals when the system is not operating properly (internal failure signal: M250) can be simulated simply by pushing a button. At the same time, when the CPU is operating abnormally transmission data is sent automatically, which means that generation of the transmission signals sent in the case of an actual system error can be simulated (with CDL transmission specifications).

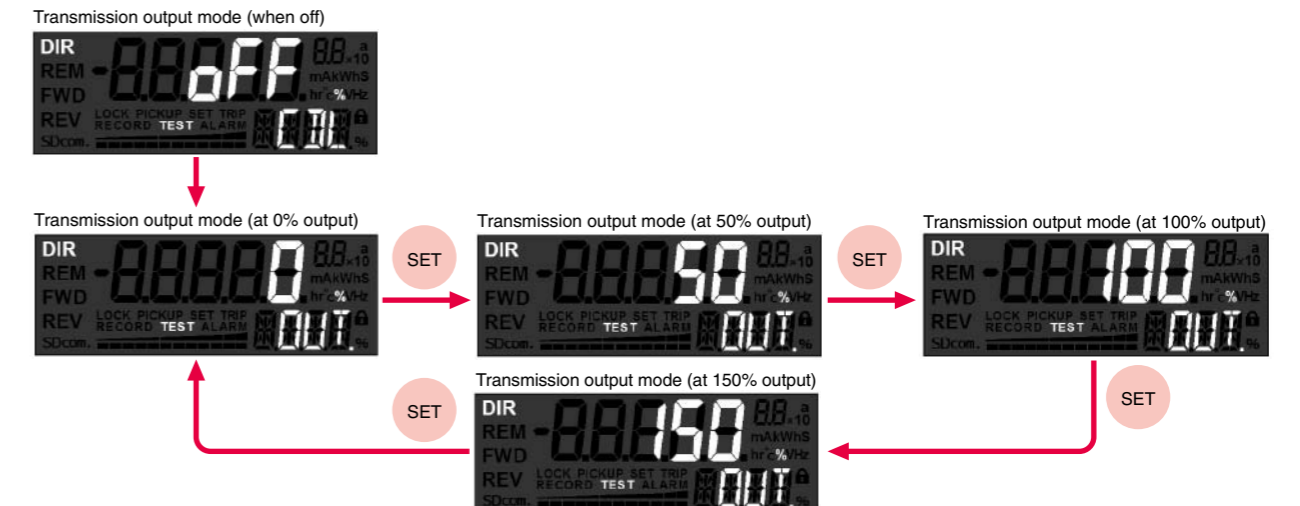


2. Transmission output mode

I want to conduct a main circuit current output test for transmission.

Using EMC-B, the level can be changed and output enabled without having to perform actual input!

In transmission output test mode, it's possible to simulate the output of main circuit current transmission data. The output level can be varied between 0→50→100→150→0% and so on. For "[06] Current setting," 100% of the setting value is output (the displays below are for CDL transmission specifications).



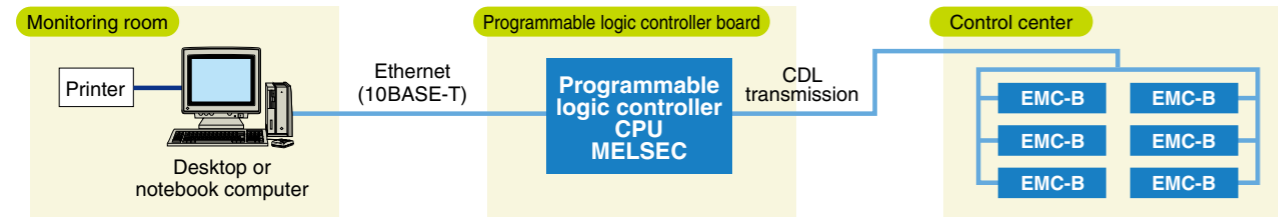
†1: Other possible tests not listed here include the overcurrent/ground fault trip test and external current output test.

†2: When "SET" is pushed, in the case of abnormal CPU operation, transmission notification is sent (for CDL transmission).

CDL MASTER Maintenance Support/Operation Status Monitoring System (optional)

This system provides efficient maintenance support and monitoring of control center status by making it possible to view EMC data on a personal computer.^{†1}

Sample system configuration



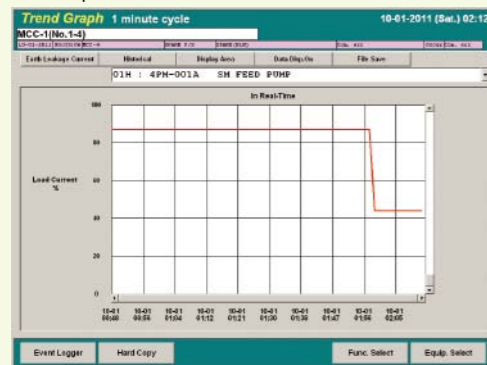
- Data such as present load conditions and measurement values are displayed on the screen for simple monitoring of load operation status.
- Efficient maintenance is possible using operation log data.
- The monitoring system has a simple structure; for example, monitoring of device settings can be performed via simple data entry.
- Easy to change settings such as load name or unit position.
- EMC characteristics are tested once for all points.
- EMC registration data, status, measurement values, operation log, settings, failure log and other items can be saved as text or CSV files.

<Unit Status List>

Tag No.	Load Name	Status	FL Status	Ld Cur	%
MP-001A	MP-001A	Stop	07-00	0.00 A	0.00
MP-001B	MP-001B	Stop	07-00	0.00 A	0.00
MP-001C	MP-001C	Stop	07-00	0.00 A	0.00
MP-001D	MP-001D	Stop	07-00	0.00 A	0.00
MP-001E	MP-001E	Stop	07-00	0.00 A	0.00
MP-001F	MP-001F	Stop	07-00	0.00 A	0.00
MP-001G	MP-001G	Stop	07-00	0.00 A	0.00
MP-001H	MP-001H	Stop	07-00	0.00 A	0.00
MP-001I	MP-001I	Stop	07-00	0.00 A	0.00
MP-001J	MP-001J	Stop	07-00	0.00 A	0.00
MP-001K	MP-001K	Stop	07-00	0.00 A	0.00
MP-001L	MP-001L	Stop	07-00	0.00 A	0.00
MP-001M	MP-001M	Stop	07-00	0.00 A	0.00
MP-001N	MP-001N	Stop	07-00	0.00 A	0.00
MP-001O	MP-001O	Stop	07-00	0.00 A	0.00
MP-001P	MP-001P	Stop	07-00	0.00 A	0.00
MP-001Q	MP-001Q	Stop	07-00	0.00 A	0.00
MP-001R	MP-001R	Stop	07-00	0.00 A	0.00
MP-001S	MP-001S	Stop	07-00	0.00 A	0.00
MP-001T	MP-001T	Stop	07-00	0.00 A	0.00
MP-001U	MP-001U	Stop	07-00	0.00 A	0.00
MP-001V	MP-001V	Stop	07-00	0.00 A	0.00
MP-001W	MP-001W	Stop	07-00	0.00 A	0.00
MP-001X	MP-001X	Stop	07-00	0.00 A	0.00
MP-001Y	MP-001Y	Stop	07-00	0.00 A	0.00
MP-001Z	MP-001Z	Stop	07-00	0.00 A	0.00

<Unit Arrangement>

<Trend Graph>



<Event Logger>

Alarm Stop	Main Config	Event History	Time Start
MP-001A	MP-001A	MP-001A	08-02-2011 13:37
MP-001B	MP-001B	MP-001B	08-02-2011 13:37
MP-001C	MP-001C	MP-001C	08-02-2011 13:37
MP-001D	MP-001D	MP-001D	08-02-2011 13:37
MP-001E	MP-001E	MP-001E	08-02-2011 13:37
MP-001F	MP-001F	MP-001F	08-02-2011 13:37
MP-001G	MP-001G	MP-001G	08-02-2011 13:37
MP-001H	MP-001H	MP-001H	08-02-2011 13:37
MP-001I	MP-001I	MP-001I	08-02-2011 13:37
MP-001J	MP-001J	MP-001J	08-02-2011 13:37
MP-001K	MP-001K	MP-001K	08-02-2011 13:37
MP-001L	MP-001L	MP-001L	08-02-2011 13:37
MP-001M	MP-001M	MP-001M	08-02-2011 13:37
MP-001N	MP-001N	MP-001N	08-02-2011 13:37
MP-001O	MP-001O	MP-001O	08-02-2011 13:37
MP-001P	MP-001P	MP-001P	08-02-2011 13:37
MP-001Q	MP-001Q	MP-001Q	08-02-2011 13:37
MP-001R	MP-001R	MP-001R	08-02-2011 13:37
MP-001S	MP-001S	MP-001S	08-02-2011 13:37
MP-001T	MP-001T	MP-001T	08-02-2011 13:37
MP-001U	MP-001U	MP-001U	08-02-2011 13:37
MP-001V	MP-001V	MP-001V	08-02-2011 13:37
MP-001W	MP-001W	MP-001W	08-02-2011 13:37
MP-001X	MP-001X	MP-001X	08-02-2011 13:37
MP-001Y	MP-001Y	MP-001Y	08-02-2011 13:37
MP-001Z	MP-001Z	MP-001Z	08-02-2011 13:37

<Daily Report>

Tag No.	Ld Cur	Lk Cur	Energy	...
MP-001A	0.00	0.00	0.00	...
MP-001B	0.00	0.00	0.00	...
MP-001C	0.00	0.00	0.00	...
MP-001D	0.00	0.00	0.00	...
MP-001E	0.00	0.00	0.00	...
MP-001F	0.00	0.00	0.00	...
MP-001G	0.00	0.00	0.00	...
MP-001H	0.00	0.00	0.00	...
MP-001I	0.00	0.00	0.00	...
MP-001J	0.00	0.00	0.00	...
MP-001K	0.00	0.00	0.00	...
MP-001L	0.00	0.00	0.00	...
MP-001M	0.00	0.00	0.00	...
MP-001N	0.00	0.00	0.00	...
MP-001O	0.00	0.00	0.00	...
MP-001P	0.00	0.00	0.00	...
MP-001Q	0.00	0.00	0.00	...
MP-001R	0.00	0.00	0.00	...
MP-001S	0.00	0.00	0.00	...
MP-001T	0.00	0.00	0.00	...
MP-001U	0.00	0.00	0.00	...
MP-001V	0.00	0.00	0.00	...
MP-001W	0.00	0.00	0.00	...
MP-001X	0.00	0.00	0.00	...
MP-001Y	0.00	0.00	0.00	...
MP-001Z	0.00	0.00	0.00	...

<Unit Entry>

Unit No.	Equipment	Ref.	Location
MP-001A	MP-001A	MP-001A	08-02-2011 13:38
MP-001B	MP-001B	MP-001B	08-02-2011 13:38
MP-001C	MP-001C	MP-001C	08-02-2011 13:38
MP-001D	MP-001D	MP-001D	08-02-2011 13:38
MP-001E	MP-001E	MP-001E	08-02-2011 13:38
MP-001F	MP-001F	MP-001F	08-02-2011 13:38
MP-001G	MP-001G	MP-001G	08-02-2011 13:38
MP-001H	MP-001H	MP-001H	08-02-2011 13:38
MP-001I	MP-001I	MP-001I	08-02-2011 13:38
MP-001J	MP-001J	MP-001J	08-02-2011 13:38
MP-001K	MP-001K	MP-001K	08-02-2011 13:38
MP-001L	MP-001L	MP-001L	08-02-2011 13:38
MP-001M	MP-001M	MP-001M	08-02-2011 13:38
MP-001N	MP-001N	MP-001N	08-02-2011 13:38
MP-001O	MP-001O	MP-001O	08-02-2011 13:38
MP-001P	MP-001P	MP-001P	08-02-2011 13:38
MP-001Q	MP-001Q	MP-001Q	08-02-2011 13:38
MP-001R	MP-001R	MP-001R	08-02-2011 13:38
MP-001S	MP-001S	MP-001S	08-02-2011 13:38
MP-001T	MP-001T	MP-001T	08-02-2011 13:38
MP-001U	MP-001U	MP-001U	08-02-2011 13:38
MP-001V	MP-001V	MP-001V	08-02-2011 13:38
MP-001W	MP-001W	MP-001W	08-02-2011 13:38
MP-001X	MP-001X	MP-001X	08-02-2011 13:38
MP-001Y	MP-001Y	MP-001Y	08-02-2011 13:38
MP-001Z	MP-001Z	MP-001Z	08-02-2011 13:38

EMCSET Plant Startup/Maintenance Support Software (Computer Version) (Optional)

This software makes it easy to efficiently read/write internal sequence data and edit setting data/display operation logs of the EMC using a computer.

Supports plant startup work

Simply connect the EMC to a computer at the time of plant startup to easily check EMC functions (e.g., control, protection).

Simple data editing

Simple to read/write data such as settings and operation logs without the need for the onsite operator to perform complicated operations.

Computer-based centralized management

Data can be managed centrally using a computer. In addition, it's possible to read/write onsite EMC data and display it on the monitor.

Simple to change EMC internal sequence circuits

Standard sequence data is provided separately (operations manual included).

EMCSET (computer version)

† It's recommended that this software be purchased pre-installed as a set with a computer specified by Mitsubishi Electric. The software can be supplied separately, but the user will be required to personally check operations after installation. The operations guarantee only applies when used with a computer specified by Mitsubishi Electric.

Advantages Demonstrated in Four Situations

Situation 1: Quickly test operations at time of plant startup

The number of motor operations and failures can be checked easily. It took less time to test operations when installing equipment for production line A.

Situation 2: Easily complete settings using data-editing software

Setting the EMC for expanding conveyor belt of production line B was easy. All that was required was carrying over the data for existing EMC settings.

Situation 3: Carry-over sequence circuits too...

It's now easier to put all the EMCs under the same sequence circuit at the time of plant startup too.

Situation 4: Integrate EMC status displays

When starting up production line C, all of the measurements could be checked on a single screen without having to use the control panel of the EMC main unit. The data log function is also very convenient for maintenance.

Easy Maintenance

Replacement of Parts

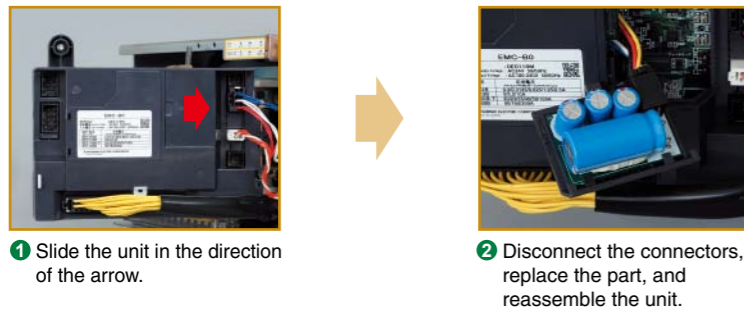
When a replacement part^{†1} reaches the end of its life, it can now be replaced by the user without detaching the EMC unit (i.e., without disconnecting all connectors).^{†2} The EMC-B allows replacement of the aluminum electrolytic capacitor PCB^{†3} and display PCB (i.e., LCD, LED).

†1: Aluminum electrolytic capacitor, LCD, LED.
 †2: Replacement parts are sold separately. Contact us to place your orders.
 †3: A long service life aluminum electrolytic capacitor rated at 125°C and 5,000hr is adopted

1. Replacing the Aluminum Electrolytic Capacitor PCB

When the aluminum electrolytic capacitor reaches the end of its life...^{†1} the power supply may fail, preventing normal startup.

†1: We designate replacement time of the aluminum electrolyte capacitor as 10 years.



2. Replacing the Display PCB (LCD, LED)

When the LCD reaches the end of its life...^{†2} the text may become too light, certain segments may not illuminate, or the visibility may deteriorate altogether.

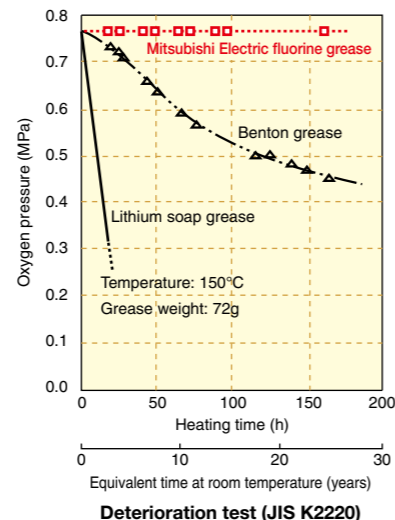
†2: The liquid crystal display (LCD) is likely to require replacement after 10 years or so of use.



CAUTION Capacitors tend to deteriorate over time while in storage. Contact us if capacitors kept in reserve need to be replaced. Be sure to take every precaution to protect against static electricity to avoid physical and subsequent functional damage to the product.

Use of Long-lasting Grease in the Power-supply Grip

Mitsubishi Electric's original fluorine grease is used at contact points for energizing the power-supply grip. The oil content of the grease tends to resist evaporation, and the grease is characterized by its resistance to oxidation, sometimes retaining its initial state for 30 years or more, as verified by testing. Unlike conventional grease, which tends to cake and necessitates a great deal of labor for removal and reapplication, the new grease remains highly lubricative, and its use significantly reduces the maintenance workload. (In practice, contamination by foreign matter/dust still requires routine maintenance.)



In general, the oxygen pressure tends to drop as grease bonds with oxygen and deterioration progresses as a result. Mitsubishi Electric fluorine grease is characterized by its resistance to oxidation and deterioration.

Adding/Changing Specifications

I want to change the EMC-B specifications.^{†1}

†1: Here, "specifications" refers to the hardware-based items shown below.

It's no longer necessary to replace the EMC main unit. Specifications can be changed simply by making additions/changes to the options board.^{†2}

†2: Changes are not possible for some product versions. Please check with a Mitsubishi Electric representative.

1. Procedure for Checking Specifications

The present specifications and specifications after making changes can be easily checked in test mode.

<EMC-B hardware-based specifications list>

- 1 Main indicator: 1st digit
Transmission data
(0: None, 1: CDL, 2: CC-Link, 3: Modbus[®]-RTU)
- 2 Main indicator: 2nd digit
Input/Output data
(0: None, 1: 5-point input + 10-point output, 2: 7-point input + 8-point output)
- 3 Main indicator: 3rd digit
External current output data (T/D: Transducer)
(0: None, 2: 0-1mA + 4-20mA)
- 4 Main indicator: 4th digit
Auxiliary power supply data (0: None, 1: Yes)
- 5 Main indicator: 5th digit
Micro-leakage current measurement data (0: None, 1: Yes)
- 6 Sub-indicator: 1st digit
Low-sensitivity ground overcurrent specification (0: None, 1: Yes)
- 7 Sub-indicator: 2nd digit
System error contact output function (0: None, 1: Yes)

H/W: Indicates that specifications are based on hardware.

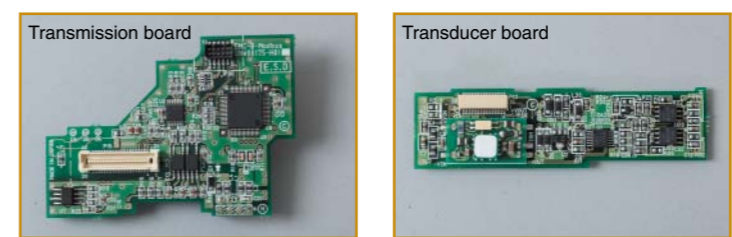
In the example above, the values indicate: CDL transmission (1), 5-point input (2), no external current output (3), auxiliary power supply (4), micro-leakage current measurement specification (5), no low-sensitivity ground overcurrent specification (6) and no system error contact output function (7).

2. Adding Transmission Options Board

The standard specification for transmission is CDL, but by adding a CC-Link or Modbus[®]-RTU transmission board, it's possible to change to CC-Link or Modbus[®]-RTU specifications (see pages 27 and 28 for details).

3. Adding Transducer Options Board

The external current output function is an option for standard specifications, but if a transducer board is added, the external current output function can be provided.



Note Please contact a Mitsubishi Electric representative for details.

Energy saving

Energy-savings

LCD Normally Off Mode

The EMC-B LCD can be set to normally on or normally off. EMC-B consumes 7% less power than our previous model (i.e., EMC-A), and use of the Normally Off mode enables even further reductions in power consumption (e.g., 10% less power consumed than in Normally On mode at high brightness), while also having the effect of extending the service life of the LCD.

Settings can be used to prioritize saving energy or visibility.

LCD mode	Backlight on/off status			Power consumption ratio ^{†1}
	Key operation	Normal (2min after key operated)	Key operation again	
LCD Normally Off mode	High brightness	Off	High brightness	90%
LCD Normally On mode (low brightness)	High brightness	Low brightness	High brightness	95%
LCD Normally On mode (high brightness)	High brightness	High brightness	High brightness	100%

†1: Calculations are based on treating Normally On mode (high brightness) as 100% consumption.

LCD Normally Off mode

In this mode, the LCD is normally off, prioritizing energy savings. The LCD turns on (high brightness) during key operation and turns off two minutes after key operation stops.

Please note that use of the Normally On mode shortens the service life of the LCD. Therefore, we recommend operation in Normally Off mode.

LCD Normally On mode

In this mode, the LCD is always on, prioritizing visibility. The low-brightness mode can be used for energy-saving operation but the service life will be shorter compared to use in Normally Off mode. In high-brightness mode, the LCD remains on with high brightness regardless of the amount of time elapsed. In low-brightness mode, the LCD switches to high brightness when key operation begins, and returns to low brightness two minutes after key operation stops.



Power/Electrical Energy

The EMC-B comes with a simplified power/electrical energy measurement function as standard, providing measurements of power and electrical energy according to a preset input voltage/power factor. Measurement of power/electrical energy is provided to improve energy-savings.

0-1mA DC Current Output

The existing main circuit current (running current) may be output in the form of a 0-1mA DC current (optional). After doing so, there is no longer any need to add CT for an external meter, and the output current may be reduced from 1 (or 5) A to 1mA, further contributing to various energy-saving schemes.

Small-capacity Control Transformer

In addition to the existing 75-VA and 150-VA control transformers, a 50-VA small-capacity control transformer has been added to the line-up to accommodate wide-ranging energy-saving schemes.

Security

Secure

The EMC-B now makes it possible to deploy a soft padlock (security function^{†2}) designed to lock data electronically via special software.

Previously, the cover had to be equipped with a physical padlock to ensure data protection.



†2: The security function requires a special security key (EMC-B-SKEY, available separately).

Type-B Motor Control Center Product Specifications

- Applied standard IEC60439-1
IEC61439-1, -2
- Other applicable standards JEM1195
- Degree of protection IEC60529
according to IP20 to IP52 (indoor type)
IP33 to IP54 (outdoor type)
- Internal separation up to Form 4b
- Rated insulation voltage 690VAC
- Frequency 50/60Hz
- Rated current up to AC 3,500A
- Rated short-circuit withstand current up to 75kA, 1.0sec.
- Maximum load capacity 2,000A (MCCB)
300kW (440V; motor starter)
- Maximum load capacity of withdrawable unit 150kW, 380-440V
75kW, 200-220V
400A (MCCB)
- Maximum load capacity of 55kW, 440V/220V common
inverter
- Seismic performance 0.4G (standard intensity; JEM-TR 144)



Casing Construction

Full Casing Line-up to Suit Individual Needs

In addition to the basic type, the line-up includes thin and low-profile casings as well, enabling selection according to implementation needs. (For external dimensions, see P35.)

Basic Casing

The compact, double-front construction (panel height: 2,300mm; panel width: 600mm; panel depth: 550mm) of the basic casing raises accommodation efficiency, and thanks to the narrow panel width, the casing uses less space in the machine room as well.

Thin Casing

The thin casing features single-front construction (panel depth: 400mm). The back consists of a panel structure permitting installation next to a wall, making this type a good choice when a space-saving arrangement is desired in a location that does not allow for maintenance space behind the casing. † The back panel must be at least 50mm away from the wall to avoid condensation.

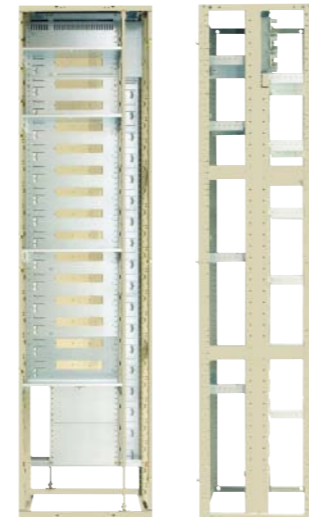
Low-profile Casing

Designed to be otherwise identical to the basic and thin casings, the low-profile casing has a panel height of 1,900mm. It offers a ready solution to the problem of installations in machine rooms with low ceilings or in other locations where structural obstacles such as pipes are located above the panel.

Safety-oriented Compartment Construction

- A metal partition is positioned between units and between the busbar compartment and the units, to eliminate as much unused space as practicably possible. (Compliant with IEC Standard Form 4a.)

- The unit compartment and the wiring duct compartment are separated to enable safe and easy wiring work.



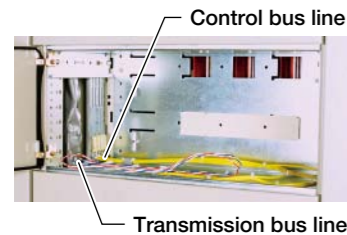
Front Side
Casing (basic type)

Simple Planning

- The unit arrangement may be freely planned and modified in increments of 100mm.
- Depending on the particular application, select freely among the basic, thin and low-profile casings. (The thin casing is only available with single-front construction.)

Easy Installation

- The casing may be shipped in separate units to any location.
- The horizontal busbar may be configured in the upward or downward direction in a vertical arrangement.
- The use of a control/transmission bus line permits full B wiring.



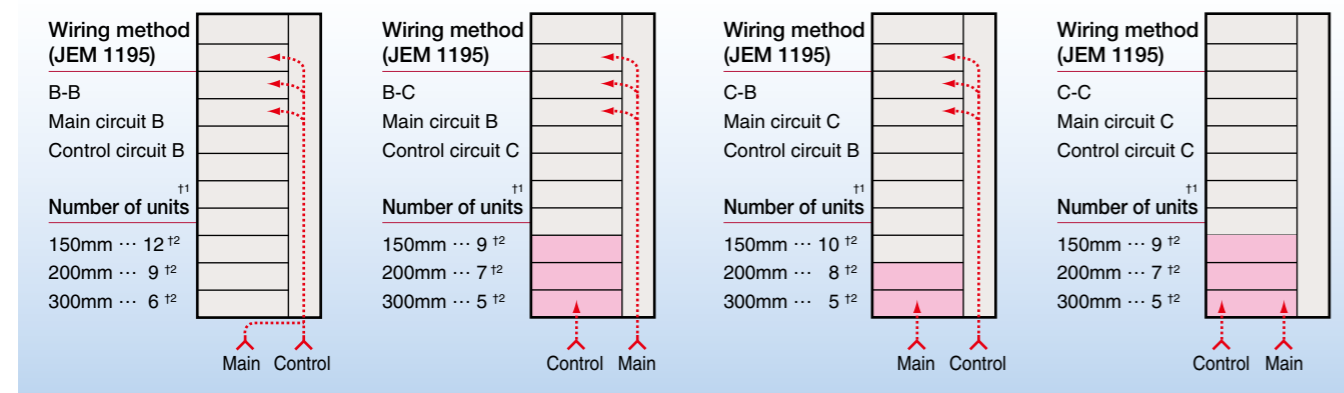
Improved Heat Transfer Characteristics

- Ventilation holes are installed on the lower faceplate and duct door, increasing internal ventilation efficiency and enhancing the heat transfer characteristics of the storage unit.



Exterior view

Wiring Method and Number of Units in a Stack



†1: Indicates the maximum number of units in a stack of panels 2,300mm high.
†2: May vary depending on the number of terminal mounts and size.

B wiring: The external cable is connected to the units so that more units may be arranged in a stack.

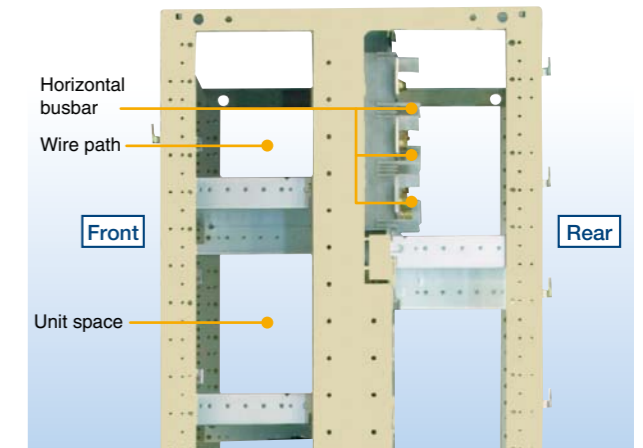
C wiring: The external cable is connected to the terminal mount space at the panel bottom so that cabling work is easy.

(The cable from the units to the terminal mount at the panel bottom is to be connected at the Mitsubishi Electric factory.)

Busbar

Horizontal Busbar (copper, tin-plated)

Rated busbar current	Busbar compartment space	
	3-phase, 3-line	3-phase, 4-line
600A	300mm	500mm
800A		
1,000A		
1,200A		
1,600A	400mm	500mm
2,000A		
2,500A	400mm (front/rear)	500mm (front/rear)
3,000A		
3,500A		



Horizontal busbar (side view)

- The horizontal busbar is arranged vertically at the top-rear so that the load cable can be drawn either upward or downward.

- The space at the top-front can be used as a wire path when control wiring is laid from panel to panel for common circuit interlock or other such mechanisms.

- As a rule, the size of the neutral phase of the 3-phase, 4-line horizontal busbar is 1/2 the size of the other phases.



Horizontal busbar (rear view)

Vertical Busbar (copper, tin-plated Z-shaped busbar)

Rated busbar current: 700A, 900A (optional)

- The Z-shaped vertical busbar is a Mitsubishi Electric original, and possesses a short-circuit withstand strength that is approximately three times higher than that of flat-type busbars.

- The vertical busbar is shielded by means of a steel plate on both the front and rear sides. The angular openings found at intervals of 100mm are for the unit grips; while unused holes are fitted with an insulating plate. Holes used may be fitted with a shutter that opens and closes in conjunction with the insertion/removal of the grips (optional).

- The vertical busbar support is made of an insulation material with enhanced resistance to the detrimental elements of the environment.

- Insulated busbars are optionally available.

Horizontal busbar: insulation tube

Vertical busbar: resin-molded case



Z-shaped vertical busbar

Unit

Thin, Large-capacity Grips Support Up to 400A Rating

The newly-designed grip enables compact, large-capacity configurations. The thin grips pave the way for multi-tiered configurations and increase the maximum ratings from 300 to 400A. Together, these improvements allow the addition/removal of large-scale grip connection power feeder units without disconnecting power from the busbar.

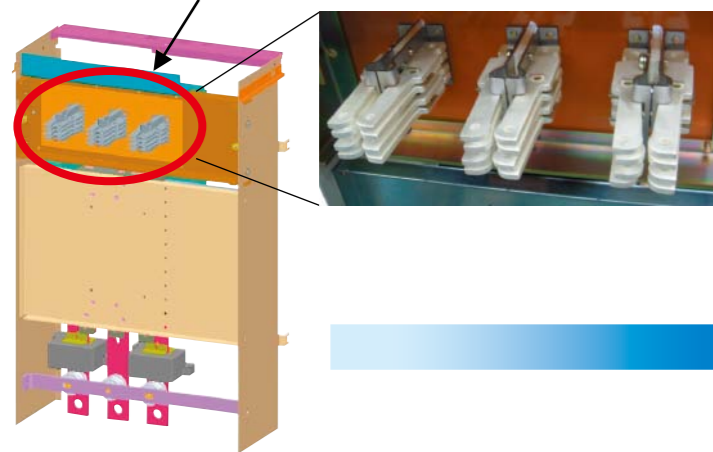
Grip rating	Unit type	Grip construction	
		Previous	Type-B
To 300A	Motor starter: to 150kW (at 400V) Power feeder (MCCB): to 225AF	Standard grip Does not require disconnection of power from the busbar at time of unit addition/removal	New type grip Higher maximum rating thanks to compact, yet large-capacity design (300 → 400A)
To 400A	Large-scale power feeder (MCCB): to 400AF	Large-capacity grip (designed exclusively for large-scale power feeder units) Requires disconnection of power from the busbar at time of unit addition/removal	Does not require disconnection of power from the busbar at the time of unit addition/removal
Over 400A	Large-scale power feeder and incoming	Bolt connection Requires disconnection of power from the busbar at time of unit addition/removal	Bolt connection Requires disconnection of power from the busbar at time of unit addition/removal

Standard and large-capacity grips were incompatible in previous models, requiring the disconnection of power from the busbar and sometimes even panel modifications when adding/removing large-scale power feeder units (fitted with large-capacity grips).

Comparison to Previous Models (large-scale grip connection power feeder units)

Large-capacity Grip

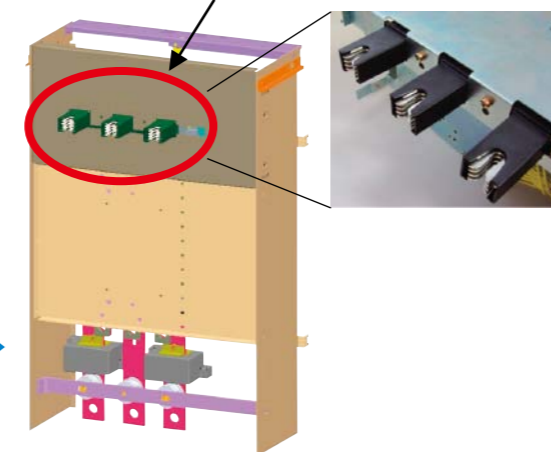
(exclusively designed for large-scale power feeder units)



Previous unit (rear view)

New Grip

(with increased capacity to a maximum rating of 400A)



Type-B unit (rear view)

New Grip

(rated at 400A)



Improved Usability and Ease of Maintenance

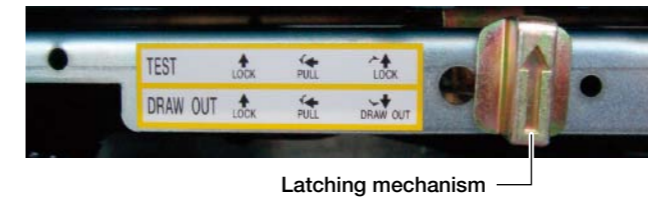
The one-touch lever used to attach/detach the unit has been reassessed and improved to make tasks significantly easier.

Additional Environmental Considerations

- The main circuit cable incorporates halogen-free wires.
- Plastic parts are identified by material names to facilitate recycling.

CAUTION The phase sequence of a load side terminal fitted to the rear unit of a double-front configuration is reversed. Refer to the cautionary plate attached to the unit door.

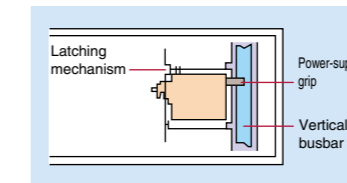
Unit latching mechanism



Latching mechanism

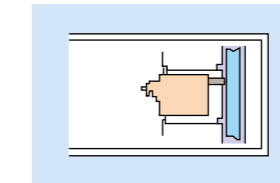
Run position

Connecting the power-supply grip to the vertical busbar locks the latching mechanism. If the mechanism fails to lock, the unit is not correctly inserted.



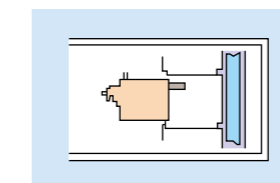
Test position

Turn the latching mechanism 90 degrees to the left. The arrow should point to the left. When you remove the unit under these conditions, the unit is held in place automatically. Now, lock the latching mechanism once again. The grip is released from the busbar, and the circuit in the unit is disconnected from the busbar.



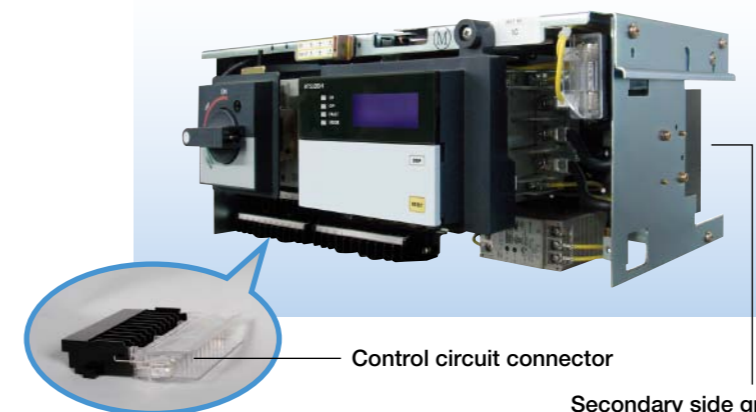
Drawing position

Turn the latching mechanism 180 degrees from the locked position. The arrow will point downward. Pull to remove the unit from the unit housing.



Automatic connection unit (optional)

The secondary side of the unit also uses grips. It's simple to detach the unit only by removing the control circuit connector.



Control circuit connector

Secondary side grip

Door and relevant components

- The MCCB operating handle, display, and operating and setting functions of the EMC-B are located on the surface of the door.
- The system uses a card-type holder, allowing easy switching of usage nameplates.
- In addition to a door interlock, the MCCB operating handle is equipped with another interlock that prevents the MCCB from turning ON while the door is open. Yet another interlock controls unit insertion/removal. A lock pin ^{†1} or a padlock ^{†2} can be attached to the MCCB operating handle at either the ON or OFF position. Up to three padlocks can be attached.

^{†1}: One lock pin is provided for an array. More lock pins can be added as optional components.
^{†2}: Optional



Unit door



Lock pin



Padlock (optional)

EMC-B Specifications

<Names and Functions of Parts>

1 Enlarged View of the LCD

A few characters appearing on the display on their own are assigned different meanings. For the sake of convenience, they are identified as follows:

Character	Location on LCD	Notation used herein
a, A	Upper right	a
	Middle right	A
%	Middle right	% UP
	Bottom right	% DOWN

2 LED Indicating Lamps¹²

ON	red (ON)	Run
OFF	green (ON)	Stop
ON	red (flashing)	Transmission error during run
OFF	green (flashing)	Transmission error during stop
FAULT	orange (flashing)	Fault tripped status
ERROR	red (ON)	System error inside the main unit

¹²: The above are sample indications, modifiable using a ladder program.
¹³: It's possible to change ON to green and OFF to red.

3 Operation Buttons¹⁴

DIR	(direct)	Direct operation (SW1)
REM	(remote)	Remote operation (SW2)
STOP	(stop)	Stop (SW3)
REV	(reverse rotation)	Reverse rotation (SW4)
FWD	(normal rotation)	Normal rotation (SW5)

¹⁴: Switches 1-5 can be enabled/disabled.
 The layout of the operating switches can be changed.

4 Indication Selection/Settings Button

MODE	: Switches through various modes.
SET	: Stores setting in memory. Retains target current value. Starts/stops counting of zone alarms.
▲, ▼	: Increases/Decreases indicated values.
CLEAR/BACK	: Clears running history values.
RESET	: Resets after fault tripping. Resets indication of running time/count alarms.

5 [com.] Connector

- Used to connect a PC using a special cable for communication.
- Used to mount a security key to set up security parameters.

6 Operation Button Cover

The following operations are possible when the operation button cover is closed:

DISP	: With the cover closed, the CLEAR/BACK button serves as the DISP button. One press of the button turns on the LCD.
RESET	: With the cover closed, the RESET button here provides the same function as the indication selection/settings RESET button (4 above).

7 Ratings Plate (Operator's Guide)

1 LCD

DIR	(ON)	: Direct operation
REM	(ON)	: Remote operation
FWD	(ON)	: Normal rotation
REV	(ON)	: Reverse rotation
SD	(ON)	: CDL transmission indication (ON during transmission)
com.	(ON)	: Indicated during communication with PC

RECORD (ON) : Running history mode
 : Flashing for running time/count alarms

SET (ON) : Setting mode
 TEST (ON) : TEST mode
 LOCK (ON) : Operation button lock state

1 (ON) : Security function ON

TRIP (flashing) : Fault tripping¹¹
 PICKUP (flashing) : Pickup indication¹¹
 ALARM (flashing) : Alarm indication¹¹

¹¹: Flashes in response to a specific fault, pickup, or alarm.

Segment/Bar Graph Indication (alphanumeric/bar graph indication)

Indicator A (7 SEG)	: Measurements (main circuit current, leakage current, power level), settings, error
Indicator B (7 SEG)	: Main circuit current phase indication, history indication (7-digit indication max. by [Indicator A+B]), setup screen serial number
Indicator C (14/16 SEG)	: Measurements (relative value of main circuit current, deviation range), setup screen guidance, fault cause
Indicator D	: Measurements (relative value of main circuit current, deviation range, relative value of leakage current) in bar graph

a (ON) : In setting mode, indicates settings No. 100 through 199 when ON; indicates settings No. 0 through 99 when OFF

A (ON) : Indicates unit of main circuit current ([A]), unit of leakage current ([mA])

% UP (ON) : Indicates unit for numerical input in percentage (%) in setting mode (setting value appearing in [Indicator A])

% DOWN (ON) : Indicates unit for relative value and deviation range appearing in [Indicator C]

<Functions>

Function	Description
Applicable load	Low-voltage 3-phase (including inverter load)
Specifications	Standard (low-voltage (L), high-voltage (H), high-resistance grounding (G)), micro-leakage current measurement (M), low-sensitivity ground overcurrent (LL), 1-phase, 3-wire (S)
Protection	Overcurrent (600/800% saturation), instantaneous overcurrent, undercurrent, leakage current (ground fault), unbalance (other than inverter load)
Measurement	Main circuit current (up to 1,270% of motor rated value), leakage current (up to 1,400mA), trip current (same as main circuit current/leakage current), power (0 to 9,999kW), electrical energy (0 to 9,999,999kWh) [abbreviated power level/electrical energy]
Indicators	LED: Run, stop, fault, transmission error, system error LCD: Remote, direct, normal rotation, reverse rotation, trip (trip current, trip cause), alarm, settings (settings guidance + settings No.), running history, system error code
Sequence	Remote/direct operation switching, fault alarm output, contact output at system error, fault reset, programmable sequence
Control	Normal rotation, reverse rotation, stop
Analog input	MCT current sensor (main circuit current), ZCT zero-phase transformer (leakage current)
Digital input	5 points (1 for normal rotation, 1 for reverse rotation [for general use if in non-reversible sequence], 3 for general use) (7 points for 7-point input specifications)
Analog output (optional)	External current output (0-1mA DC 1-ch, triple/quintuple extension scale), external current output (4-20mA DC 1-ch, with zero/span adjustment function)
Digital output	10 points (1a 1b x 1 point for tripping/alarm, 1b x 1 point for stop, 1a x 1 point for normal rotation, 1a x 1 point for reverse rotation [for general use if in non-reversible sequence], 6 points for general use (1a x 3 points, 1b x 2 points, 1c x 1 point) (8 points at time of 7-point input specifications)
Instantaneous voltage drop restart	3-mode instantaneous voltage drop restart (with instantaneous voltage drop immediate restart function)
Alarm	Alarms for individual items under protection, running time/count alarm, target current alarm
Running history	Running time (0 to 327,670hr), number of normal rotations (0 to 9,999,999), number of reverse rotations (0 to 9,999,999), number of faults (0 to 255)
Settings	Varies depending on specifications (see below)
Transmission (optional)	CDL transmission interface, CC-Link transmission interface, Modbus [®] -RTU transmission interface
Fail-safe	Load condition setup for unit failure (load condition trip/lock)
Test	Automatic inspection of protective characteristics, overcurrent/leakage current forced trip test, 0-1mA DC/4-20mA DC forced output test, CDL transmission forced output test, system error contact output test, CPU error operation test
Self-diagnosis	Error code indication in response to system error
Security	Key lock function, security function
Energy-saving	LCD control selection (2-step brightness settings)

<Names and Functions of Parts>

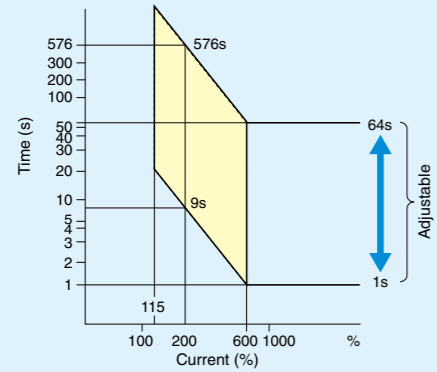
Setting name	Setting range	Setting name	Setting range	Setting name	Setting range
[01] Key lock selection	OFF/ON	[52] Unbalanced trip output selection	OFF/ON	<During Modbus [®] -RTU transmission (30a-36a)>	
[02] Specifications	Low-voltage (L)/High-voltage (H)/High-resistance grounding (G)/Micro-leakage current measurement (M)/Low-sensitivity ground overcurrent (LL); 1-phase, 3-wire (S)	[60] Leakage sensitivity current	Low-voltage: 30 - 1000mA High-voltage: 100 - 800mA	[30a] Modbus [®] transmission function	OFF/ON
[03] Phase selection	Single-phase 2-lines/3-phase 3-lines	[61] Leakage operating time	Low-voltage: 0.1, 0.3, 0.8s High-voltage: 0.1, 0.2, 0.3, 0.8s	[31a] Modbus [®] transmission station number	1 - 247dec
[04] MCT rating	Low-voltage: 21 types; high-voltage: 16 types	[62] Leakage trip output selection	OFF/ON	[32a] Modbus [®] transmission speed	2.4k, 4.8k, 9.6k, 19.2k, 38.4k, 57.6k, 115.2k
[05] MCT phase and order	Positive/negative	[63] Leakage trip OFF fault indication retention selection	OFF/ON	[33a] Modbus [®] parity setting	Non, odd, even
[06] Current setting value	40 - 110%	[64] Leakage interlock	OFF/ON	[34a] Modbus [®] stop-bit setting	1.2
[07] ZCT selection (with LL specifications)	ZCT1, ZCT2	[65] Leakage pre-alarm operating value	30 - 70%	[35a] Modbus [®] master station non-response detection time	OFF/1 - 300s
[08] Power-supply frequency	50/60Hz	[66] Leakage 2-stage warning	OFF/ON	[36a] Modbus [®] output selection in case of transmission error	Hdd, clr
[09] Average time for main circuit current measurement	OFF, 1 - 30s	[67] Leakage alarm level 1 (with M specifications)	OFF, 0.2-50.0mA	[50a] Triple/quintuple extension scale	3, 5
[10] Power operating selection	OFF / ON	[68] Leakage alarm level 2 (with M specifications)	OFF, 0.2-50.0mA	[51a] CT primary rating current value	37 types
[11] Voltage rating	Low-voltage: 14 types, high-voltage: 2 types	[20a] Instantaneous voltage drop supply recovery time	0.5 - 10s	[52a] External current output for site meter (DC 0-1 mA) ¹¹	OFF/ON
[12] Voltage setting	Low-voltage: 84 - 484V High-voltage: 2,600 - 9,000V	[21a] Instantaneous voltage drop immediate restart time limit	0.1, 0.2s	[54a] External current output for site meter (DC 4-20 mA) ¹¹	OFF/ON
[13] Power factor	0 - 100%	[22a] Instantaneous voltage drop restarting time limit	0 - 127s	[56a] Phase selection for transmission current output (with S specifications)	1, 0, 2
[20] Overcurrent operating level	100 - 120%	<During CDL transmission (30a-37a)>		[60a] Running time alarm	10 - 300,000hr
[21] Overcurrent operating time	1 - 64s	[30a] CDL transmission function	OFF/ON	[61a] Running count alarm	10 - 900,000times
[22] Overcurrent thermal memory	Cold/Hot	[31a] CDL transmission address	00 - 40 hex	[70a] Target count value display function selection ¹²	OFF/ON
[23] Overcurrent trip output selection	OFF/ON	[32a] CDL transmission mode	1 - 7	[71a] Bar graph display function selection ¹²	OFF/ON
[24] Overcurrent starting interlock time	0 - 120s	[33a] CDL transmission simultaneous same information group number	0 - 7	[72a] Zone alarm setting value [upper side] ¹²	5 - 90%
[25] Overcurrent pre-alarm operating value	50 - 115%	[35a] CDL transmission master station no response detection time	7 - 160s	[73a] Zone alarm setting value [lower side] ¹²	5 - 90%
[26] Overcurrent operating time characteristic	600/800%	[36a] CDL sending interval at startup	0.1 - 2.0s	[74a] Zone alarm at starting delay time ¹²	1 - 160s
[30] Instantaneous overcurrent operating level	50 - 900%	[37a] CDL sending period at startup	1 - 127s	[75a] Zone alarm detection time ¹²	1 - 600s
[31] Instantaneous overcurrent operating time	0.1 - 9s	<During CC-Link transmission (30a-36a)>		[76a] Zone alarm count time ¹²	60 - 600s, 0.5 - 24hr
[32] Instantaneous overcurrent trip output selection	OFF/ON	[30a] CC-Link transmission function	OFF/ON	[77a] Zone alarm retention selection ¹²	OFF/ON
[40] Undercurrent operating level	30 - 100%	[31a] CC-Link transmission station number	0 - 64dec	[80a] Backlight control for LCD	Continuously ON (low/high brightness), ON only during operation
[41] Undercurrent operating time	1 - 9s	[32a] CC-Link baud rate	156k, 625k, 2.5M, 5M, 10M	[81a] Security setting	OFF/ON
[42] Undercurrent trip output selection	OFF/ON	[33a] CC-Link version	1, 2-2, 2-4, 2-8	[82a] Security level setting	OFF/ON
[50] Unbalanced operating level (excluding S specifications)	5 - 180%	[34a] Master station non-response delay time	OFF, 0 - 300s	¹¹ : Does not appear on models with no external current output function. ¹² : Does not apply to S specifications.	
[51] Unbalanced operating time (excluding S specifications)	1 - 9s	[35a] Output selection in case of transmission error	0.1		
		[36a] Output selection in case programmable controller CPU is stopped	0.1		

<General Specifications>

Item	Specifications	Item	Specifications
Control power supply	Power supply voltage	Control power supply	Power OFF → ON: approx. 10A, 3ms
	Permissible power supply voltage regulation	EMC-B unit	Approx. 400g
	Rated power supply frequency	EMC-B unit + auxiliary power supply + external current output	Approx. 180g
	Permissible power supply frequency regulation	MCT-002B (010B, 100B)	Approx. 350g
Environmental conditions	Ambient temperature for service	MCT-300B	Approx. 180g
	Ambient humidity for service	ZCT-100B	Approx. 1,340g
	Ambient temperature for storage	BT-05S	
	Ambient humidity for storage		
Consumption VA	Control power supply	Standards followed	JEM 1195-2000 JEM 1357-1995 JEM 1356-1994 JIS C 4601-1993
		Standards followed as necessary	Motor Control Center Static protective relay for electric motor Dynamic and electronic protective relays for electric motor Ground fault relay for high-voltage power reception

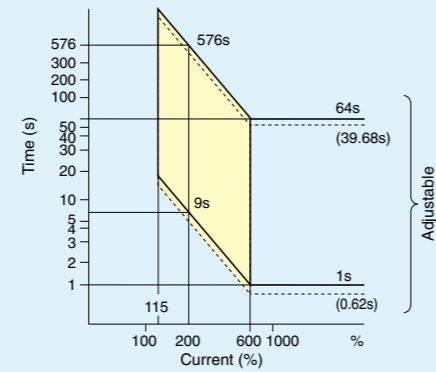
<Protective Characteristics>

Overcurrent Operating Characteristics



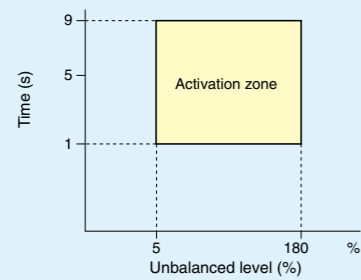
The graph depicts time-based overcurrent operating characteristics with settings at 600%. These characteristics also apply at 800%.

Hot-start Characteristics

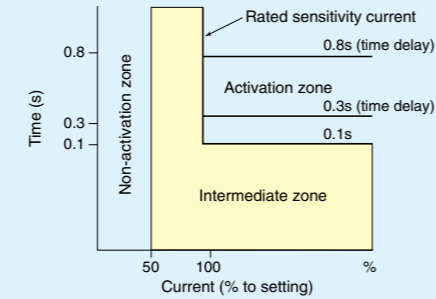


The graph depicts time-based overcurrent operating characteristics with settings at 600%. These characteristics also apply at 800%.

Unbalance Characteristics

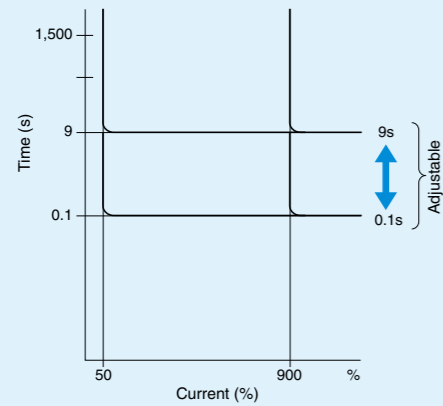


Ground Fault Operating Characteristics

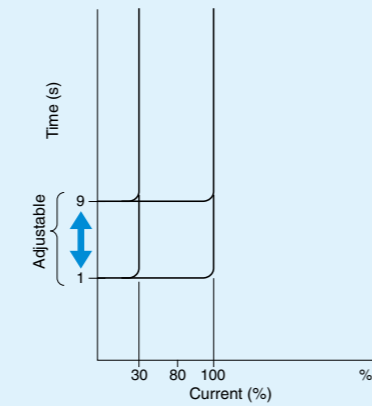


The above graph corresponds to low-voltage specifications. Characteristics are different for high-voltage/high-resistance earth specifications.

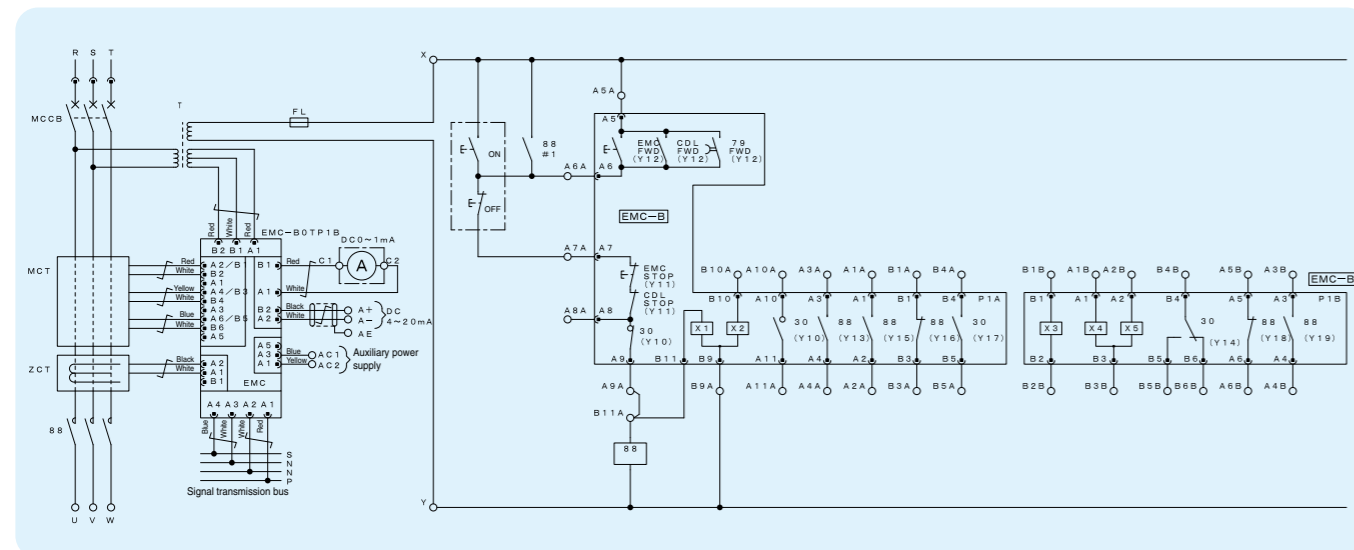
Overcurrent Instantaneous Characteristics



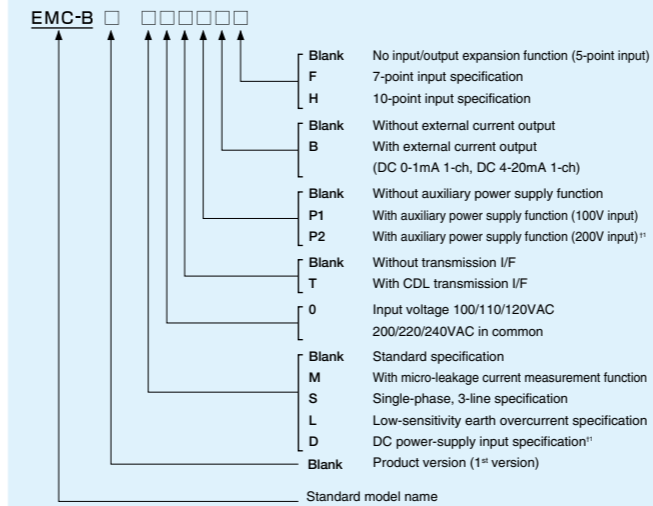
Undercurrent Characteristics



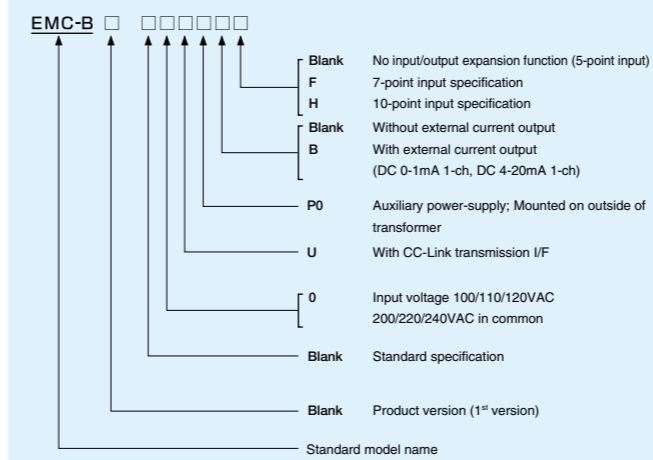
<Sample Wiring> Standard EMC-B for a non-reversible sequence (CDL transmission, 5-point input)



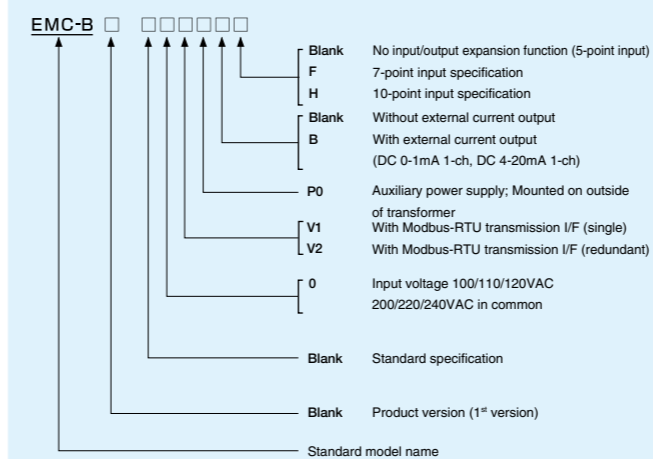
<Product Configuration>



EMC-B CC-Link transmission specifications¹² (optional)

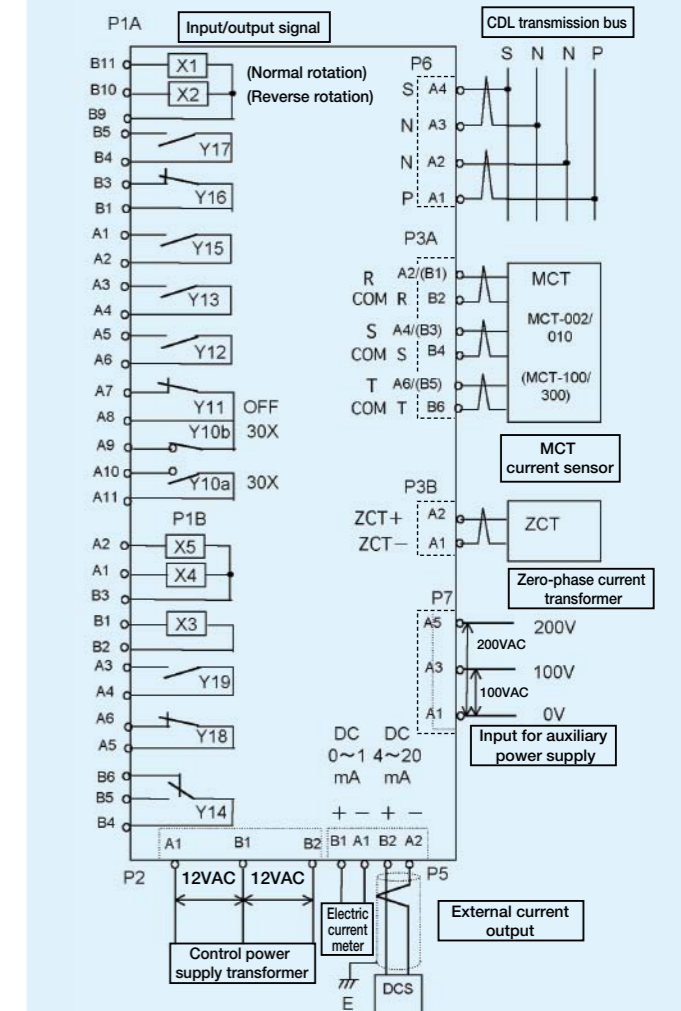


EMC-B Modbus®-RTU transmission specifications¹² (optional) [see page 27]



¹¹: For DC power-supply input specifications, the input voltage is DC and there is no auxiliary power-supply function.
¹²: Please confirm the delivery schedule separately.

<Internal Circuit Diagram>



<Associated Equipment>

The following equipment must be connected when using the EMC-B.

Special Transformer	BT-05, BT-07, BT-15
Special Current Sensor (MCT)	MCT-002B, MCT-010B, MCT-100B, MCT-300B
Special Zero-phase Current Transformer (ZCT)	ZCT-35B, ZCT-100B, ZCT-100BZ, ZCT-300B



CDL Transmission System

What is a CDL Transmission System?

Control center data link systems (CDLs) were developed to establish a control/information network connecting various devices and equipment in a power distribution system. They are primarily used as part of a configuration for monitoring power distribution systems managed from control centers. Connecting devices and equipment with a flexible, branching digital network reduces wiring costs, facilitates distributive control/collective supervision/maintenance, and results in reliable systems.

Item	Specifications							
Physical conditions	Transmission medium	Electricity Twisted pair cable KV/KHV/CPEE 0.75 to 2.0mm ² (AWG 14 to 18)						
		Light Silica glass GI50/125 optical fiber						
	Transmission distance	By electricity 2,000m (depending on cable size and number of terminals) ^{†1}						
		By light Silica glass GI optical fiber 2,000m ^{†1}						
	Topology	Bus type (loop connection also possible)						
Electrical conditions	Connected terminals	64 terminals max. (depending on type)						
	Transmission line	4 in total, i.e., P (power): 1; N (GND): 2; S (signal): 1						
	Transmission speed	9.6kbps (bit/s)						
Logic	Signal/Type	Time-division multiplex digital transmission ^{†2} , Baseband ^{†3} , Current bus ^{†4}						
	Bus connection	By photocoupler						
	Transmission power supply	24VDC (signal line: 12VDC)						
Self-diagnosis	Control	CSMA/NBA ^{†5}						
	Synchronization	Asynchronous (8-bit data, 1-bit parity)						
	Basic frame construction	<table border="1"> <tr> <td>SA</td> <td>DA</td> <td>CW</td> <td>BC</td> <td>DATA</td> <td>FCC</td> </tr> </table> <p>SA: Self address (1 byte) BC: DATA byte size (1 byte) DA: Destination address (1 byte) DATA: Transmission data CW: Control code (1 byte) FCC: Frame check code (1 byte)</p>	SA	DA	CW	BC	DATA	FCC
	SA	DA	CW	BC	DATA	FCC		
Error detection	Combined parity/FCC							
Self-diagnosis	Bus low-level detection/separation	The duration for which the level of the signal line (S) remains low is monitored. If it remains low for more than a specific period (200 to 500ms), an error condition is assumed, resulting in cutting off the terminal signal line in question from the CDL transmission bus.						
	Double-address detection	The use of the same address by different slave terminals results in a double-address error.						

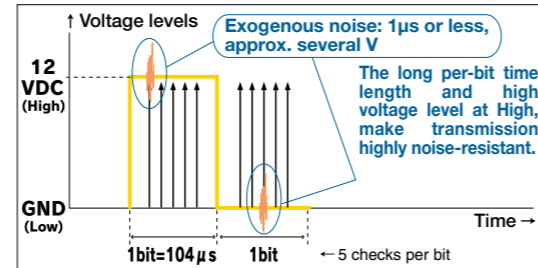
†1 May be increased to 10km max. using repeaters.
 †2 Refers to a transmission system in which a single transmission channel is used by multiple terminals through a time-share scheme.
 †3 Refers to a transmission system in which digital signals are sent to a transmission channel without modulation.
 †4 Refers to a transmission system using electric current.
 †5 Refers to a transmission system often used in field networks intended primarily to connect field equipment and sequencers or to connect controllers to other controllers. Individual terminals and nodes (master terminals) monitor the common bus, initiating transmission when it becomes available. (Transmission collisions are circumvented by applying a set of rules that grant varying precedence to individual nodes.) Since any of the nodes is likely to be using the bus at any given time, the system is highly efficient. The abbreviation stands for Carrier Sense Multiple Access with Non-destructive Bitwise Arbitration.

[High Reliability (noise resistance)]

1. CDL Transmission and Noise Resistance

In CDL transmission, the level of the signal line at High is 12VDC. This is sufficiently high relative to noise waveforms (approximately several V). At transmission speeds of 9.6kbps, the per-bit time length (104μs) is also sufficient for noise waveforms (several μs or less). These factors make the line highly resistant to external noise. Combined with the signal level check (bit checks) executed as often as five times per bit, they make CDL a remarkably reliable transmission system.

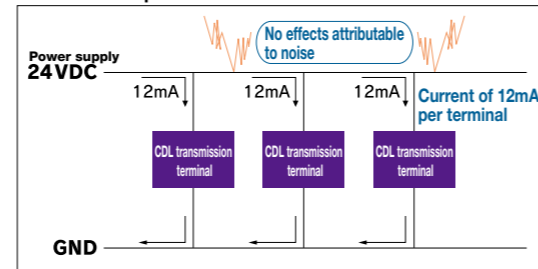
▼ Noise Resistance Characteristics of CDL Transmission



2. Current Loop Scheme

CDL transmission applies a current loop scheme whereby signals are sent using changes in electric current. As a transmission system that takes advantage of an appreciable amount of current (i.e., 12mA per terminal), it is relatively unaffected by transmission cable resistance and offers high S/N ratios and high noise resistance.

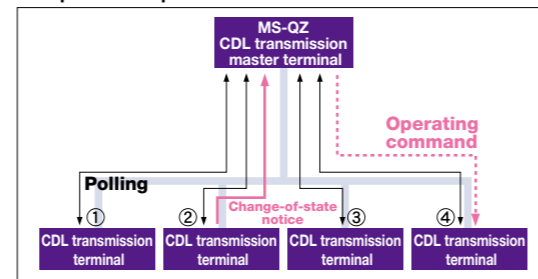
▼ Current Loop Scheme



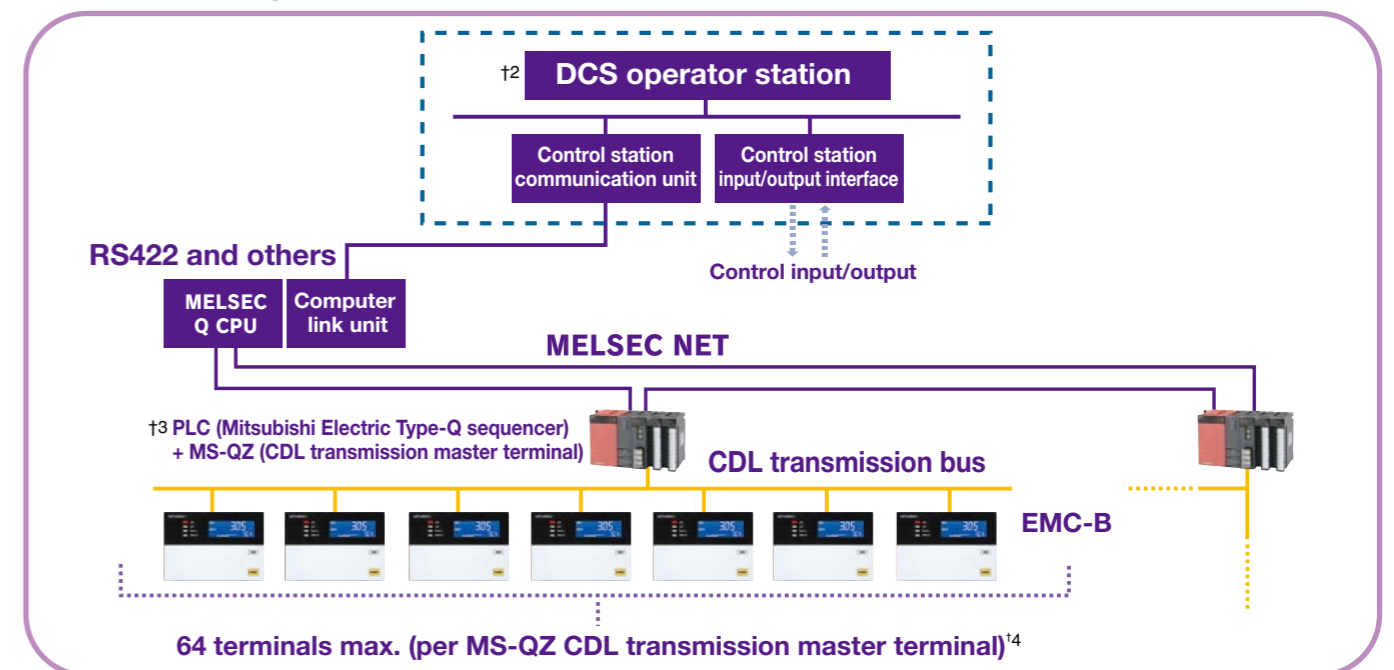
[Improved Response]

In CDL transmissions, slave terminals normally respond in sequence (①→②→③→④) to polling (periodical queries) from the master terminal based on assigned addresses. In this method, it takes 12.8s for the master terminal to call on a specific slave terminal (polling) regardless of the number of connected terminals. (In the diagram to the right, each of the terminals ① through ④ are called once every 12.8s.) Thanks to a CSMA/NBA system^{†5}, a change in the state of a slave terminal (e.g., in its output contact or presence of a fault) is immediately reported before polling by the master terminal occurs. Likewise, data initiating a command for operations written to the master terminal will be executed immediately on the slave terminal in question. Signal transmission (change-of-state notice, operating commands) between master and slave terminals occurs based on the priority specific to a CDL transmission.

▼ Improved Response



Sample Configuration for a CDL Transmission System



†2: Distributed Control System.
 †3: Programmable Logic Controller.
 †4: For the maximum number of MS-QZs that can be accommodated by a PLC, see the catalog for the "Network System CDL for Mitsubishi Electric Power Distribution Systems" (Japanese only) (JNEE-SL-0123). If adding a local station to the system, please be certain to turn off the transmission power-supply first. Devices may be damaged due to factors such as cabling errors or short-circuiting between the pins.

[CDL transmission-based functions]

Transmission function	CDL support
Status monitoring	○
Current monitoring	○
Operation log monitoring	○
Error monitoring	○
Polling transmission ^{†5}	○
Control command	○
Automatic inspection command	○
Clear operation log command	○
Status change notification	○
Setting change notification	○
Read settings	○
Write settings ^{†6}	×
Loopback test ^{†7}	×
Broadcast transmission	○

†5: Standard function for CDL transmission.
 †6: For CDL transmission, it is not possible to write settings.
 †7: Only Modbus[®]-RTU transmission is supported.

Calculating Transmission Distance

A CDL transmission system uses electric current to transmit signals. Feasible transmission distances depend on transmission line impedance and the number of connected terminals. The specific transmission type affects the propagation time of the entire transmission system. This makes it important to determine transmission distances in ways that satisfy both of the following requirements:

- (1) The transmission system is divided into independent systems (nodes) separated by relays (RPG) or optical converters (OEG) with the maximum length of each node assigned the value in Table 1.
- (2) The overall transmission system consists of nodes. The maximum distance between the two terminals that are farthest apart is the figure given in Table 2.

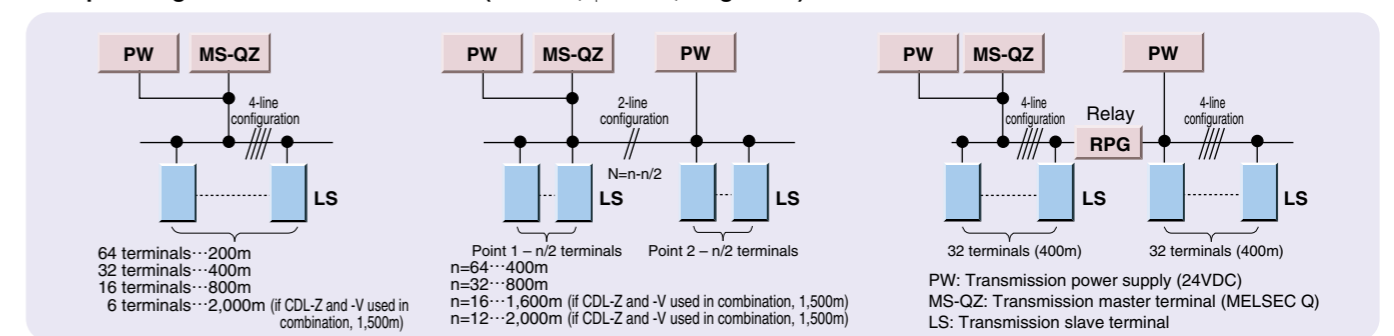
■ Table 1

Transmission line type [Single]	Maximum node length (N being 64 max.)
0.75mm ² (AWG 18, φ1.0mm)	76/N × 100m
1.25mm ² (AWG 16, φ1.3mm)	128/N × 100m
2.0mm ² (AWG 14, φ1.6mm)	200/N × 100m

■ Table 2

Conditions	Maximum transmission system length
Basic system (not using relays or optical converters)	2,000m (if CDL-Z and -V used in combination, 1,500m)
Transmission system using a repeater	4,000m (if CDL-Z and -V used in combination, 3,000m)
System with "n" repeaters (n = 1, 2, 3, 4)	2,000 × (n+1) m (1,500 × (n+1) m when using CDL-Z or CDL-V) (Max. length is 10,000m (6,000m when using CDL-Z or CDL-V))
Transmission system using an optical converter	Silica glass GI type optical fiber 2,000m

Example using 1.25mm² transmission line (AWG 16, φ1.3mm, single line)



Modbus®-RTU Transmission System

What is Modbus®-RTU^{†1} Transmission?

Modbus^{®†2} transmission is a de facto standard bus^{†3} equipped with the Modbus[®] protocol.^{†4} Modbus[®] transmission is used widely throughout industries based on the fact that the protocol has been released for public use, and also because of its simple configuration. As a multi-vendor network, Modbus[®] transmission-compliant devices are provided from manufacturers worldwide, so system configuration and expansion capabilities are excellent. Additionally, RS485 and other standards can be used as the physical layer.

^{†1} As a form of serial communication, Modbus[®] transmission has a remote terminal unit (RTU) mode and an American Standard Code for Information Interchange (ASCII) mode. In general, the RTU mode (known as Modbus[®]-RTU), which allows one byte of data to be sent without changes, is used (including for our EMC-B).

^{†2} Modbus[®] is a registered trademark of Schneider Electric SA.

^{†3} The worldwide standard transmission bus for all practical purposes irrespective of whether or not there are established standards or norms.

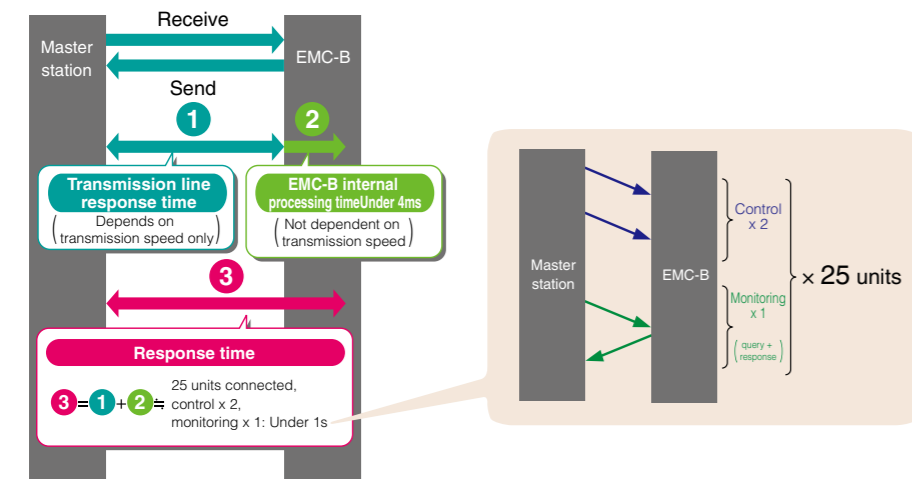
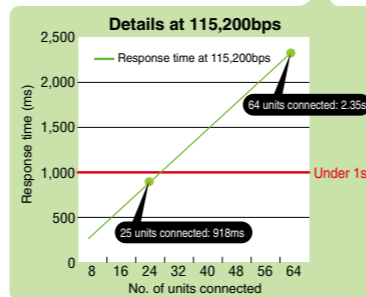
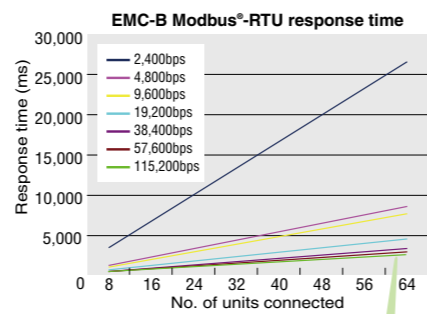
^{†4} A communications protocol developed by Modicon Inc. (AEG Schneider Automation International S.A.S.) for programmable logic controllers (PLCs).

Models with CC-Link transmission specifications are also included in the line-up. Using our high-speed field network, which also has high compatibility with MELSEC PLCs, an industry-leading maximum transmission speed of 10Mbps has been achieved.

Feature 1 Realizes Fast Response Time Under 1s (control x 2, monitoring x 1) When 25 EMC-B units are Connected

The EMC-B Modbus[®]-RTU supports transmission speeds of up to 115.2kbps

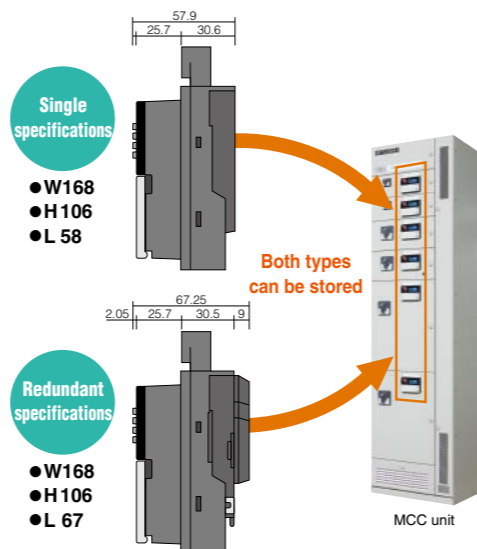
- Based on our unique technologies, the EMC-B internal processing time per unit has been reduced to less than 4ms.
- Based on the above, transmission of monitoring/control data at the maximum transmission speed setting (115.2kbps) when 25 EMC-B units are connected is under 1s, realizing smooth, stress-free responsiveness (calculations based on three communication exchanges [control x 2; monitoring x 1]).
- Even when the maximum of units (64) is connected, response time is still an impressive 2.5s (under the same conditions as those described above).



Feature 2 More Compact EMC-B Realized Even with Redundant Transmission Specifications

The EMC-B has an industry-leading compact size thanks to use of the same external dimensions (length, width) for both redundant and single transmission specifications. In addition, MCC units with a height of 150mm can be stored with an increase in the depth dimension of only approximately 10mm.

(However, storage is not possible in the case of 200mm-high units and use of the S-N80 connector only. In this case, only units with height of other than 200mm are supported.)



Example Modbus®-RTU Transmission System Configuration

Examples of single and redundant configurations are shown below for the case of the EMC-B with Modbus[®]-RTU transmission system. The EMC-B can be connected to any machinery or system that conforms to the Modbus[®]-RTU transmission protocol. For the EMC-B with redundant system configurations, various configurations can be realized in the range where redundancy is desired (see ① to ④ below). It is also possible to connect directly to a distributed control system (DCS) without going through a programmable logic controller (PLC).

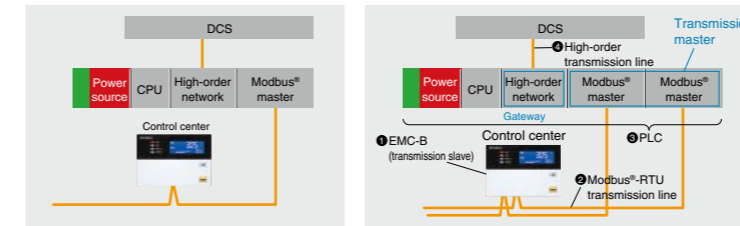


Fig. 1 In the case of single Modbus[®]-RTU

Fig. 2 In the case of redundant Modbus[®]-RTU

Range where redundancy is possible in our EMC-B
(In Fig. 2, redundancy is from EMC-B to transmission master (①+② below))

- EMC-B (transmission slave)
- Modbus[®]-RTU transmission line (between EMC-B⇄PLC)
- PLC (power source, CPU, transmission master, gateway^{†5})
- High-order transmission line (between PLC⇄DCS)

^{†5} A transmission system component that enables overall communications through mutual conversion of data differing in terms of medium or protocol.

Redundant Modbus®-RTU Transmission Control System: A Choice of Two Types to Suit Customer Operations

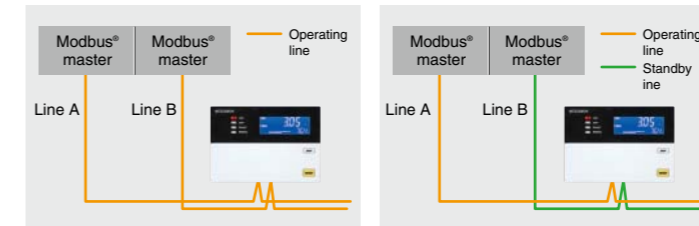


Fig. 3 Double-master system (standard)

Fig. 4 Standby master system (option)

Control system	Double-master system	Standby master system
Features	Consists of two operating lines (A and B), and the same commands (control, monitoring) are sent simultaneously for both lines. ● Useful for equipment where a power outage is not acceptable.	Control is via the operating line (line A) only. The standby line (line B) is only used to check system soundness (monitoring). ● The system that is in general use.
Merits	No need to consider the switching time regardless of which line the error occurs in.	No need to set timing for either line (operating, standby). Can be applied to single transmission routes.
Demerits	Care is needed to ensure that the difference in control timing between the two lines does not become too large to make sure that subsequently received control signals can be accepted. Cannot be applied to single transmission routes.	Need to consider switching time (dead time: dependant on system) when an error occurs in the operating line.
Applicable (recommended) systems	Systems that require 24-hour operation or where it is difficult to secure time for switching (i.e., systems where a power outage is not acceptable).	Standard systems or systems with single transmission route (e.g., systems where only the master is redundant).

Modbus® Function Code

For EMC-B, the following items are supported within the function code defined in the Modbus[®] protocol.

			Function		EMC-B support
			Code	Sub-code	
Data access	Bit Access	Physical discrete inputs	Read discrete inputs	02	○
		Internal bits or physical coils	Read coils	01	○
			Write single coil	05	○
		16-bit Access	(Internal registers or physical output registers)	Write multiple coils	15
	Read input registers			04	○
	Diagnostics		Read holding registers	03	○
			Write single register	06	○
			Diagnostics	08	Only 00 supported

† Circles (○) indicate total support; triangles (△) indicate partial support.

Advantages of EMC-B Modbus® Transmission

- Excellent responsiveness → Equal to or under 10ms, excluding transmission route (fixed regardless of transmission speed)
- Faster transmission speed than the standard Modbus[®] transmission → Set speed up to 115.2kbps
- Increased No. of connected terminals → Up to 64 units can be connected (standard: 32 units)

	Item	Specifications	
Physical conditions	Transmission medium	Three-line twist sealed cable [0.3sq], FG line [1.25sq]	
	Transmission distance	1,200m (at 19.2kbps) (changes depending on transmission speed)	
	Topology	Bus method	
	Connected terminals	Max. 64 units	
	Settable addresses	1-257 (amount for 64 units)	
	Transmission line	Five in total: DA(RX+) (transmission line), DB(RX-) (transmission line), DG(GND), FG and SLD	
	Terminal resistance	120Ω	
Electrical conditions	Physical layer	RS485 ^{†9}	
	Transmission speed	2.4k, 4.8k, 9.6k, 19.2k, 38.4k, 57.6k, 115.2bps (control center standard is 19.2k)	
	Bus connection method	Photo coupler	
Logic system	Transmission power source	Not required (supplied from EMC-B)	
	Transmission/Control system	Single master/multi-slave system, ^{†10} function code ^{†11}	
	Synchronizing method	Asynchronous (data: 8-bit, parity: 1-bit)	
	General frame configuration	AF: Address field (1 byte)	DATA: Data field (max. 253 bytes)
		FF: Function field (1 byte)	CRC: Cyclic redundancy check (error check field) (2 bytes)
	Parity bit	Non, odd, even ^{†12}	
	Stop bit	1 or 2 ^{†12}	
Error detection	Parity, CRC ^{†13}		
Other functions	Broadcast	Broadcast query ^{†14}	
	Redundancy specifications	Double-master system/Standby-master system (for both systems, consult a Mitsubishi Electric representative regarding the delivery schedule)	

^{†9} RS485 are standards relating to the level of the communications-protocol physical layer, which consists of two lines: the communications line and grounding line.

^{†10} In Modbus[®] transmission, only the master station can issue a query (start transmission). The slave stations see the query, perform the specified function and send a response message.

^{†11} In Modbus[®] transmission, a code known as the function code is prepared. This code defines the transmission function and allows support functions to be adopted or rejected for each device (the supporting function codes for the EMC-B are shown below).

^{†12} Parity-bit and stop-bit settings are correlated as follows.
① Parity bit: Odd or even → Stop bit: 1 ② Parity bit: Non → Stop bit: 2

^{†13} Cyclic redundancy check (CRC) is an error-detection technique that uses a prepared, standardized generator polynomial, and considers the data frame that transmits the CRC to be a high-degree polynomial.

^{†14} Special queries transmitted as a batch from a master station to all slave stations. The receiving slave stations execute functions as directed by the query but cannot send an answer.

Benefits of Installing a Control Center

The pumps and various machinery used in factories, water supply and sewage treatment facilities, power plants, and other industrial plants utilize numerous motors. A control center provides the switching mechanisms used to control, protect, gauge, monitor, or otherwise centrally control an array of motors by housing multiple units fitted with switches to turn motors on/off and, as a protective mechanism, uses molded-case circuit breakers (MCCBs) to safely isolate circuits in fault states upon electrical system failure.



Construction and Configuration



Unit front view



View with the EMC opened



Unit rear view

Construction

A control center consists of a cubicle and units.

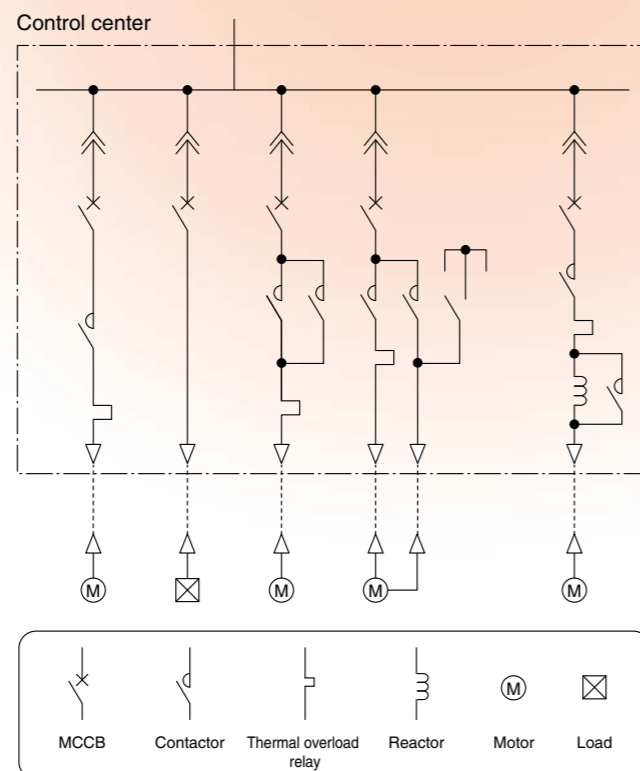
Cubicle

The cubicle houses units and allows the configuration of busbars used to supply power to the units. The units and the busbar compartments are separated by partitions.

Unit (functional component)

The drawer-type units are fitted with a short-circuit protective device, contactor, parts for auxiliary circuits (control, gauge), etc. A single unit is installed for each motor (or feeder).

A full line-up of units representing a wide range of motor capacities and startup types is available for specific applications.



Deploying a Mitsubishi Electric Control Center Results in the Following Benefits.

1 Damage Control

In the event of accidents, damage is limited to the busbar compartment, unit compartment or other compartment, minimizing incident repercussions.

2 Inspection, Settings Alteration, and Testing during Operations

There is no need to disconnect power from the busbar for inspection, settings alteration, or testing. Only the affected feeder must be stopped and its unit drawn out to perform any of the foregoing tasks, with plant operations allowed to continue throughout the work.

3 Simple Addition/Removal of Feeders

- The control center is designed on a unit-per-feeder basis, with units stacked in a column. Each additional feeder is easily installed in an available panel space, simplifying planning. The same is true of feeder removal. Units are easily removed together with associated wiring.
- A feeder can be added/removed without disconnecting power from the busbar.

4 High-density Packaging

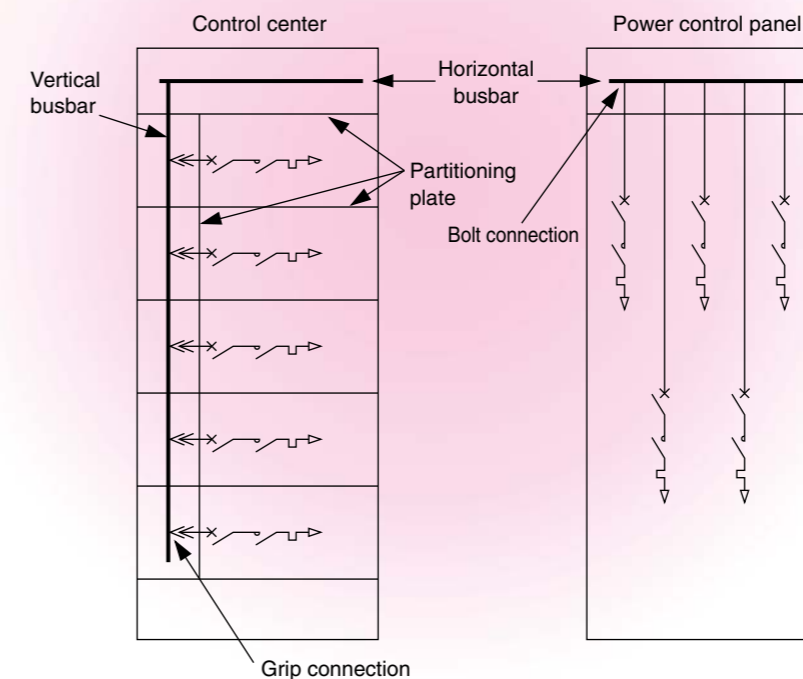
Up to 24 units may be installed as long as the motor load is rated 400V (non-reversible, 7.5kW) or less.

5 Wide Selection

Select a unit from a wide selection to suit individual motor capacity specifications—i.e., reversible, non-reversible, star-delta startup, inverter.

Reliability
Security

Economic
efficiency



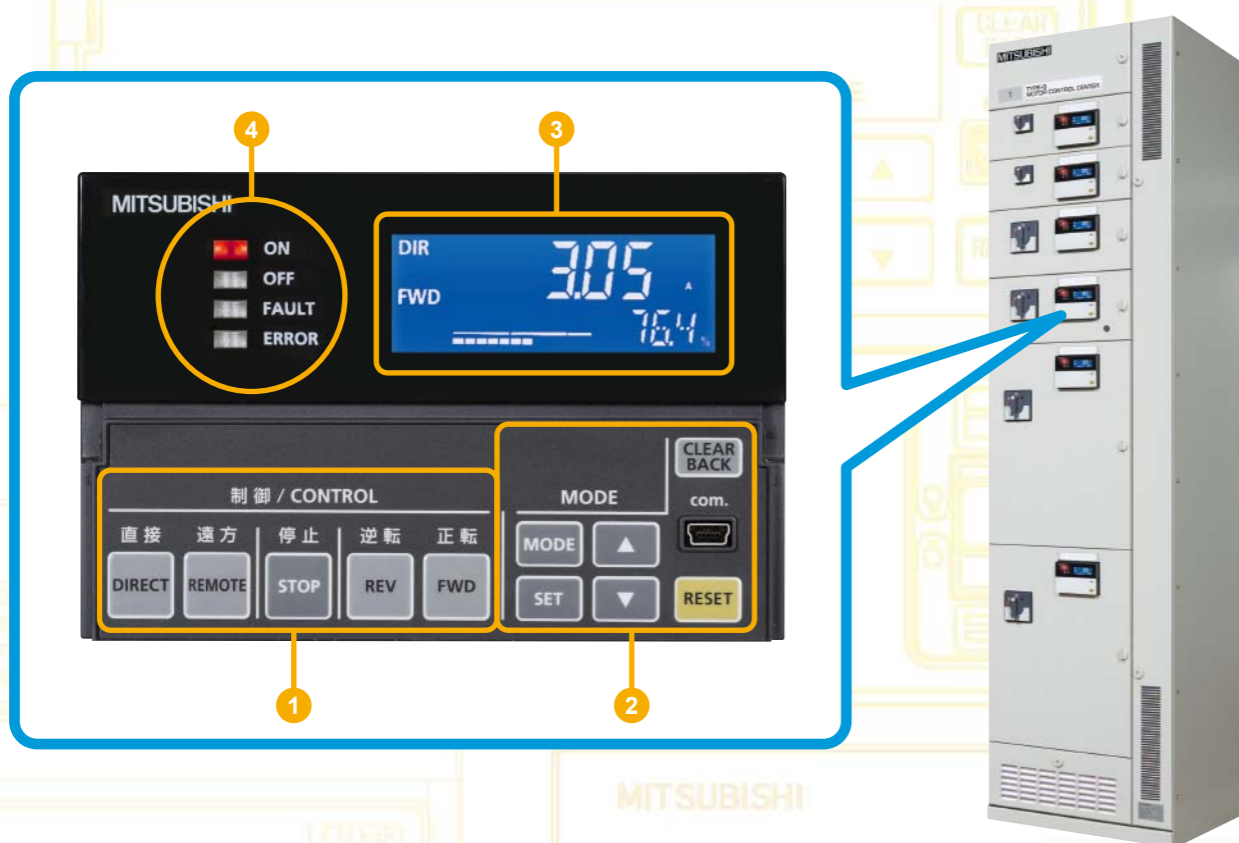
- For power control panel:
- The panel is not internally partitioned. Accidents in a feeder often affect other feeders—for example, by exposing them to arc gas.
 - Inspection, settings alterations, or testing for a single feeder requires the power to be disconnected from other feeders.
 - Each feeder addition must be preceded by an examination of the equipment arrangement and wiring routes to ascertain the space available.
 - Wiring from individual feeders is often bundled, so removal of a feeder tends to leave behind unnecessary wiring.
 - Adding/removing a feeder requires that power be disconnected from the busbar.

Benefits of Installing an EMC

EMC stands for Electronic multi-function Motor Controller^{†1}. As the name suggests, EMCs provide various electronic functions used to control motor arrays.

In 1985, Mitsubishi Electric began marketing electronic motor controllers in the EMC Series of products. The series has grown steadily, leading to the EMC-Z, and then to the EMC-A, all the while adding pioneering functions to meet the needs of changing times.

†1: Controller exclusively designed for Mitsubishi Electric control centers.



1 Control Buttons

The EMC provides a way to directly control a single motor. Pressing the buttons will cause the motor to operate normally, in reverse, or stop. Setting the EMC to REMOTE enables external control.

2 Display Selection/Settings Buttons

These buttons are used to switch between LCD modes and to change settings. Pressing the RESET button resets the controller in the event of fault-triggered tripping.

3 LCD

The display provides a wide range of information, including readings for the main circuit current, leakage current, and other parameters.

4 LED Lamps

These lamps indicate the state of the motor (e.g., in operation, at rest, tripped).

Using EMCs will provide the following benefits to your facilities.

1 Extensive Motor Protective Mechanisms

EMCs meet a wide range of needs for motor protection.

There is no need to provide separate relays to protect motors against overcurrent (OC), unbalance (UB), leakage current (ground fault, GF), instantaneous overcurrent (OCI), or undercurrent (UC) or power shortage. The wide selection and range of settings eliminates the need to consider equipment replacement when planning or changing configurations. The controllers can also be used in combination with harmonic circuits (inverter loads).

2 Various Indicators/Readings

The state of the motor is indicated by LED lamps (e.g., operational, at rest, fault, error (including system error)).

The EMC provides current meter, leakage current meter, and voltage meter functions, eliminating the need for separate meters and reducing cost and space requirements.

The readings are indicated on a LCD.

The standard power status/electrical energy meters are simplified. (The meters require advance settings of rated voltage, voltage used, and power factor.)

A current output function can also be incorporated (optional; 0-1mA DC, 4-20mA DC).

3 Programmable Sequence

Using a MELSEC programmable controller and equivalent ladder software, it's possible to freely program the internal ladder program. Installing the ladder program internally reduces internal wiring in the unit, allowing cost to be reduced. Ladder programs can be changed using the software (max. steps: 350). There are five input points (forward × 1, reverse × 1 and general-use × 3), and 10 output points (trip/alarm: 1a1b × 1, stop: 1b × 1, forward: 1a × 1, reverse: 1a × 1, general-use × 6 [1a × 3, 1b × 2, 1c × 1]), which can be applied to various circuits. As optional items, seven input points (eight output points), and 10 input points (five output points) are also available. In addition, an instantaneous voltage drop restart function is included, enabling continuous operation.

4 Compact Design

Designed to be compact, it fits in a unit only 150mm in height. This increases the number of units that can be housed while reducing the number of panels.

5 Multiplexing Compliant

A range of communication options are provided for CDL/CC-Link Modbus®-RTU^{†2} transmission. In the case of CDL transmission, when the CDL MASTER maintenance support system is connected, a dedicated maintenance monitoring system can be set-up, decreasing the workload of daily maintenance tasks. Structuring transmission to include the distributed control system enables constant monitoring of operation and control.

†2: Please confirm the delivery schedule, including that for standard products, separately.

6 Preventing Accidents

The EMC constantly monitors the system for load/leakage currents and retains histories of various operations to help predict and prevent accidents by indicating the hours of motor operation/number of contactor activations (open/close), and the nature and number of motor tripping events based on causative factors.

Other preventive functions include self-diagnostics, auxiliary power supply (optional), and various fail-safe mechanisms.

7 Simple Panel Planning and Alteration

Compact dimensions make unit size less of a consideration, simplifying panel planning.

Its compatibility for a wide range of applications make it possible to address changes with great flexibility, from planning to delivery.

8 Simplified Post-delivery Modification/Customization

Before EMCs were used in control centers, when currents reached unexpected levels due to motor capacity, there were many cases in which modifications such as the replacement of thermal relays or the addition of a reactor were carried out. However, since the introduction of EMCs, the adjustment range is large and most problems can be resolved by changing internal settings. In contrast to the adjustment scales of thermal relays, which are imprecise and produce large error, accurate settings are possible using EMCs. EMCs are also convenient for adjustment because of the many functions incorporated, such as functions to automatically inspect the protective properties, test overcurrent/leakage current and test system error and transmission data output (see page 10 for more information regarding test output functions). The reduced time required for making adjustments also increases efficient use of time.

Related Products

TYPE LIM-B Inverter Panelboard

Up to 12 inverters can be stored in each cabinet.

Installed side-by-side with the control center, this realizes more efficient, centralized monitoring.

Features

- The Type-B motor control center has the same casing depth and busbar structure, enabling side-by-side busbar connection.
- The unit structure is suitable for additions, changes and maintenance.
- The structure realizes efficient heat transfer using the central ventilation pipe space.
- Data linking is possible using the EMC-B.
- Up to 30kW, 2-panel storage is possible. For single-panel storage, equipment of up to 280kW can be added.
- When Mitsubishi Electric FREQROL-A700 Series inverters are equipped with the CDL transmission interface option (H-A7CDL), use as a CDL transmission terminal is possible, and a CDL transmission system can be established.

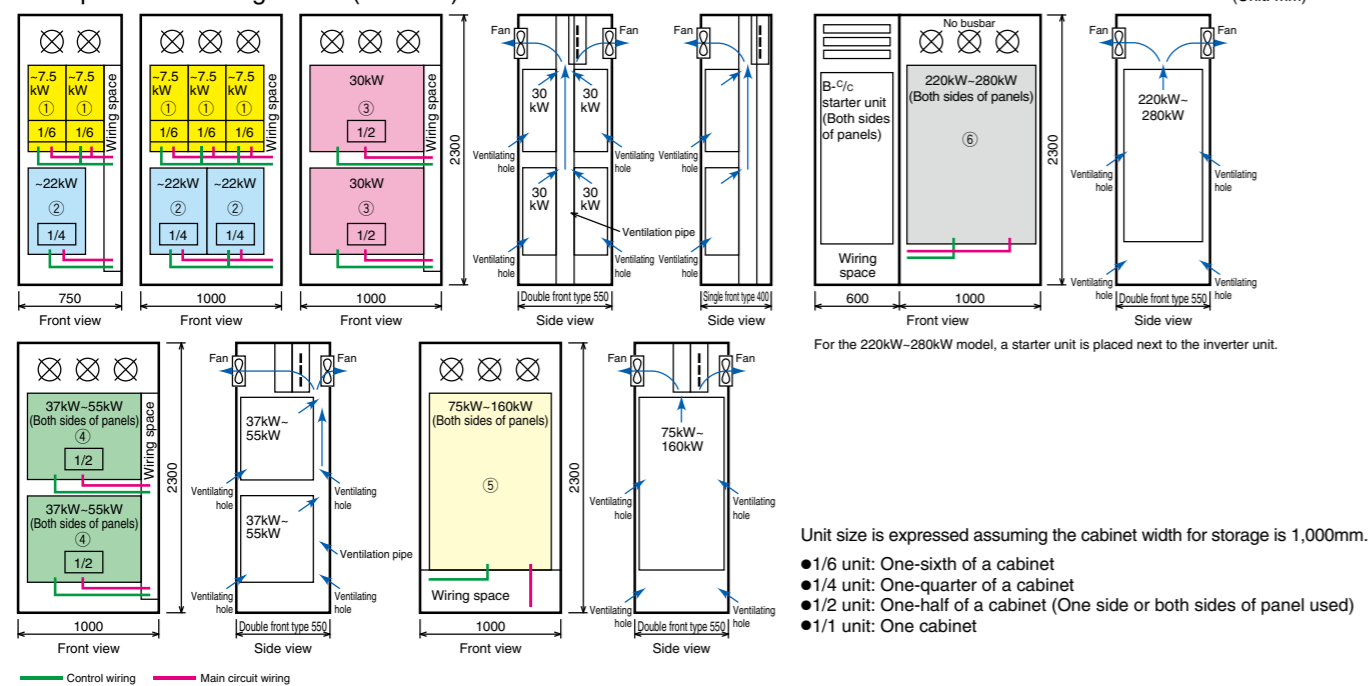


Unit size (with Mitsubishi Electric FR-A700 Series inverter mounted)

E Series (using EMC)					
400V			200V		
Inverter capacity	Unit size	Unit No.	Inverter capacity	Unit size	Unit No.
~3.7kW	1/6 unit	①	~3.7kW	1/6 unit	①
5.5kW	1/6 unit	①	5.5kW	1/4 unit	②
7.5kW	1/6 unit	①	7.5kW	1/4 unit	②
11kW	1/4 unit	②	11kW	1/4 unit	②
15kW	1/4 unit	②	15kW	1/4 unit	②
18.5kW	1/4 unit	②	18.5kW	1/2 unit	③
22kW	1/4 unit	②	22kW	1/2 unit	③
30kW	1/2 unit	③	30kW	1/2 unit	③
37kW	1/2 unit (Both sides of panel used)	④	37kW	1/2 unit	④
45kW	1/2 unit (Both sides of panel used)	④	45kW	1/1 unit (Both sides of panel used)	⑤
55kW	1/2 unit (Both sides of panel used)	④	55kW	1/1 unit (Both sides of panel used)	⑤
75kW~160kW	1/1 unit (Both sides of panel used)	⑤	75kW~90kW	1/1 unit (Both sides of panel used)	⑤
220kW~280kW	1/1 unit (Both sides of panel used)	⑥			

† The unit sizes for non-standard sequences such as the B Series (using thermal relays) and inverters of other manufacturers may vary. For details, please consult a Mitsubishi Electric representative.

Example of unit configuration (At 400V)



TYPE CNF-B Distribution Panelboard

Accommodating as many as 36 MCCBs in a Compact Configuration

Realizing More Effective Central Monitoring from the User's Point of View through Contiguous Arrangement with the Motor Control Center

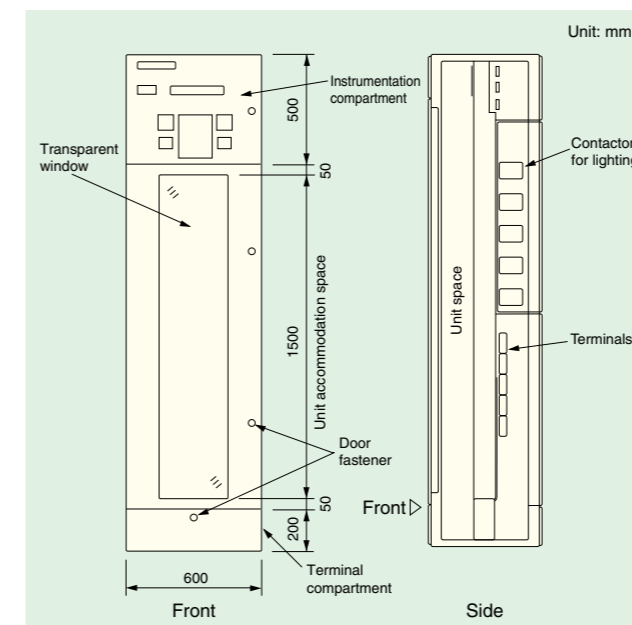
Features

- Constructed with the same casing depth and configured using the same busbar scheme as the Type-B Motor Control Center, this model permits contiguous installation and direct connection of busbars of both panels.
- With its B wiring (standard), connection to external devices is easy through the front of the panel.
- Accommodates units within a height of 1,800mm, housing up to 18 units of 100 AF/3P MCCB units (18 units x 2 = 36 in total).^{†1}
- In the case of 50AF/2P MCCB, however, up to 24 units may be installed (24 x 2 = 48 in total).^{†1}
- Features double-door construction (inside door, outside door). The inside door (i.e., unit front) is fitted with a protective cover that leaves only the MCCB operating handles exposed.
- The transparent safety cover fitted to the MCCB power-supply side ensures safe execution of maintenance/inspection work even when the inside door is left open.
- The unit comes in two types: grip and fixed.

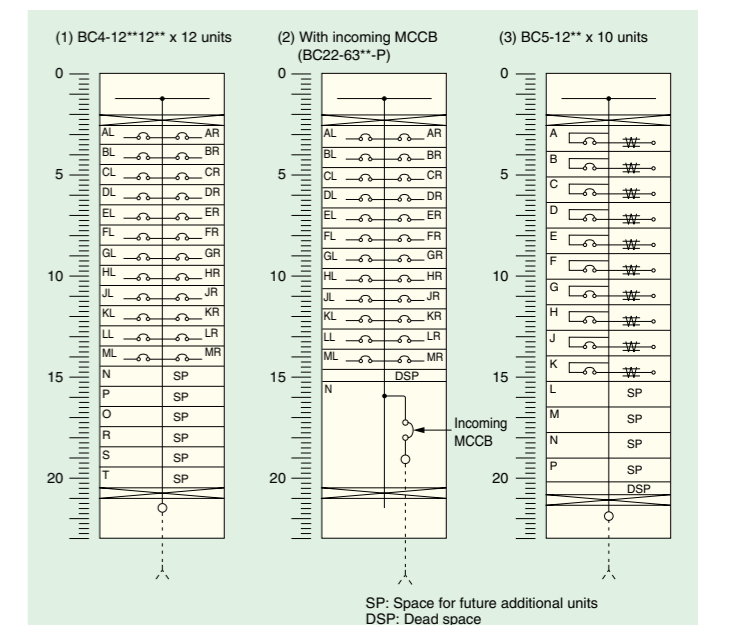


†1: Load stacking must be planned such that the total load will remain within the vertical busbar capacity (vertical busbar: 700A standard, 900A optional).

Panel Configuration Sample



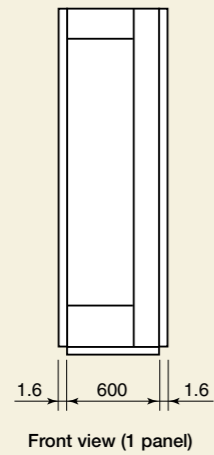
Example unit configuration



External Dimensions

Basic Casing

Unit: mm

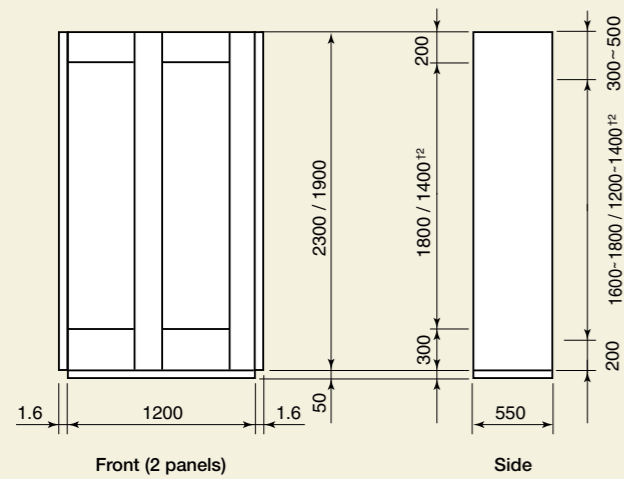


<Maintenance Space>

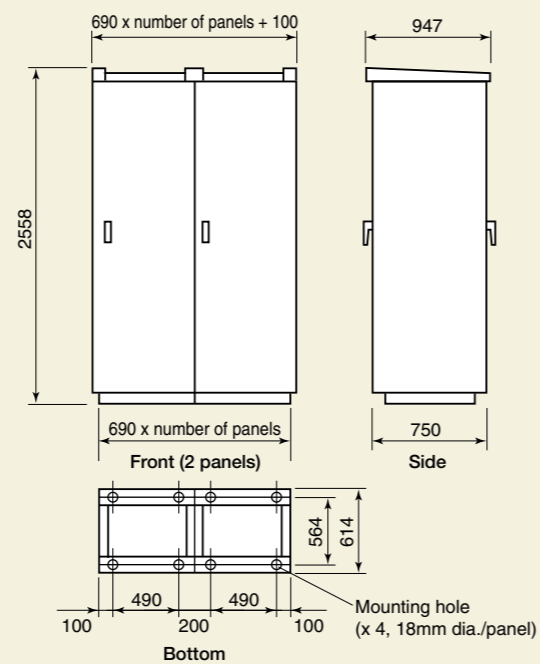
	Side	Front	Rear
Indoor casing	600	1200	1200
Outdoor casing	800	1200	1200
Thin casing	600	1200	50 ^{†1}

†1: To prevent condensation.

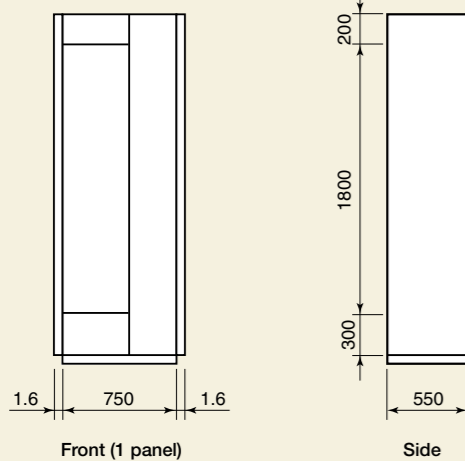
Indoor Casing



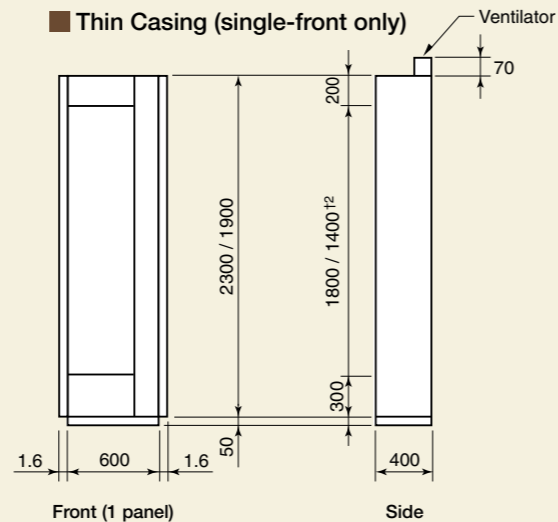
Outdoor Casing (basic type only)



Wide cabinet (for single-front only)



Thin Casing (single-front only)

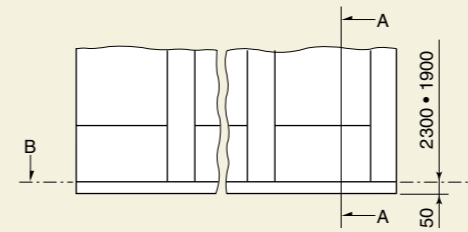


†2: Unit accommodation space.

Installation

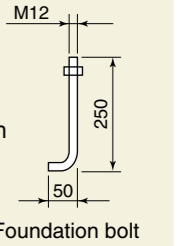
Front Bottom

Unit: mm



(Notes)

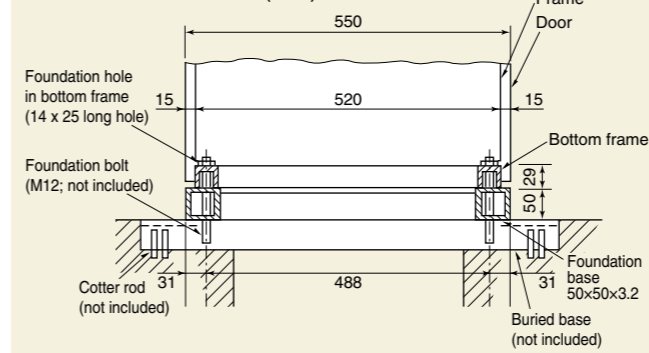
1. One foundation base unit holds a maximum of three panels; installation of four or more panels requires a combination of units.
2. A maximum of three panels can be combined on one common foundation base as a transportation unit.
3. The necessary number of foundation bolts (figure on right) can be supplied as an option.



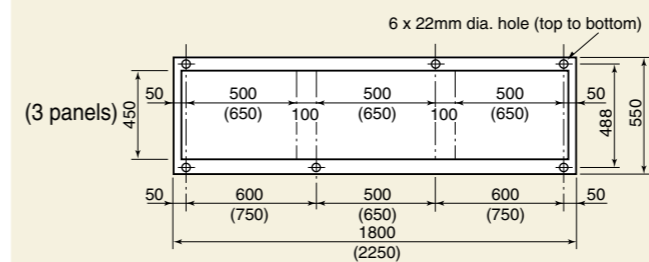
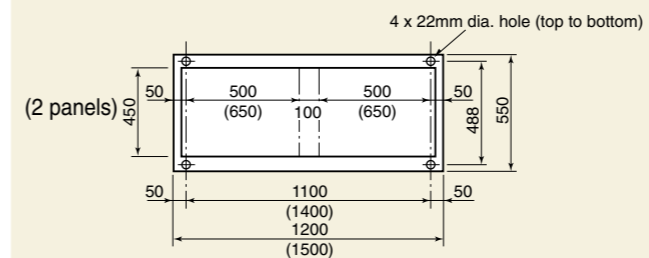
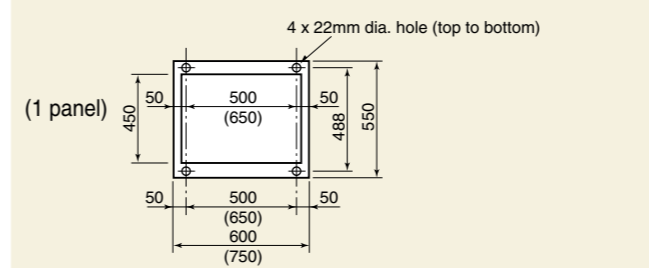
Standard/Wide cabinet

Unit: mm

Cross-sectional view (A-A)



Cross-sectional view (B-B)

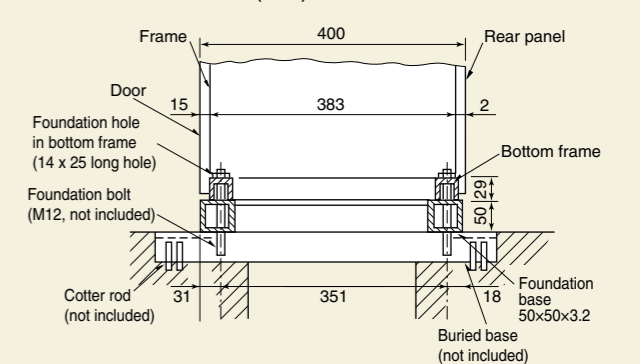


† Dimensions in parentheses are for the wide cabinet.

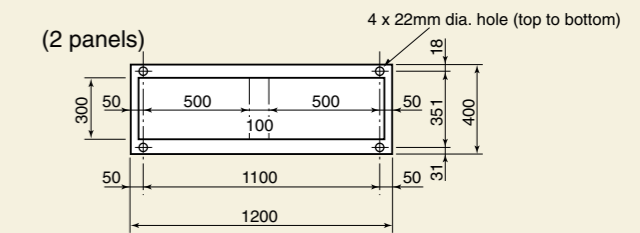
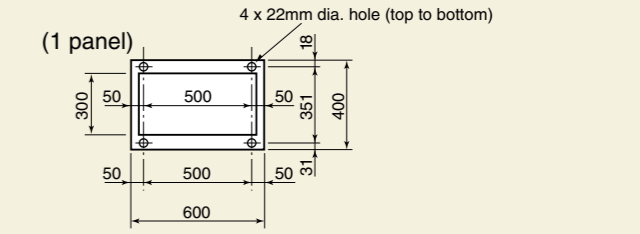
Thin Casing

Unit: mm

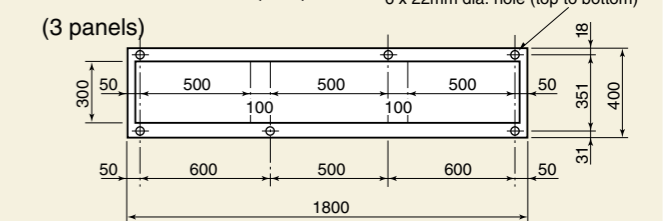
Cross-sectional view (A-A)



Cross-sectional view (B-B)



Cross-sectional view (B-B)



Specifications Sheet (for planning by customer)

Item		Standard specification	Optional specification
Applied standard		<input type="checkbox"/> IEC	<input type="checkbox"/> JEM, JIS
General conditions		Ambient temperature: -5°C ~ 40°C Relative humidity: 45 ~ 85% Elevation: 2,000m or less	<input type="checkbox"/> Seismic resistance: 1G <input type="checkbox"/> Corrosion-proof spec <input type="checkbox"/> Water-proof spec
Painting		<input type="checkbox"/> Standard (5Y7/1) Internal frame and unit case are 5Y7/1 or plating	<input type="checkbox"/> Other _____ (note on left also applies here)
		<input type="checkbox"/> Standard (melamine baking coating 30μm)	<input type="checkbox"/> Vinyl <input type="checkbox"/> Epoxy <input type="checkbox"/> Membrane thickness specified ____μm or more
Panel		<input type="checkbox"/> Indoor <input type="checkbox"/> Double-front <input type="checkbox"/> Single-front (Back: <input type="checkbox"/> Door <input type="checkbox"/> Panel)	<input type="checkbox"/> Outdoor <input type="checkbox"/> Low-profile casing <input type="checkbox"/> Thin casing (back panel) <input type="checkbox"/> With panel-to-panel partition <input type="checkbox"/> Base plate (Material: <input type="checkbox"/> Vinyl chloride <input type="checkbox"/> Steel <input type="checkbox"/> Aluminum <input type="checkbox"/> Fire-resistant board) <input type="checkbox"/> Channel base forward <input type="checkbox"/> Cable duct
		<input type="checkbox"/> IP20	<input type="checkbox"/> IP _____
		<input type="checkbox"/> Form 4a	<input type="checkbox"/> Form 4b
Busbars	Material	<input type="checkbox"/> Copper (tin plating)	<input type="checkbox"/> Copper (silver plating)
	Horizontal	<input type="checkbox"/> Standard (bare) busbar capacity ____A	<input type="checkbox"/> Insulated (with insulation tube)
	Vertical	<input type="checkbox"/> Standard (bare) busbar capacity <input type="checkbox"/> 700A <input type="checkbox"/> 900A	<input type="checkbox"/> Insulated (molded case)
	Earth	<input type="checkbox"/> Standard (earth terminal: 3 x 25 x 130mm)	<input type="checkbox"/> Horizontal earth busbar (A) <input type="checkbox"/> Vertical earth busbar (A)
	Short-circuit withstand	<input type="checkbox"/> 30kA (1s) <input type="checkbox"/> 50kA (1s)	<input type="checkbox"/> 75kA (1s)
	Neutral	<input type="checkbox"/> None	<input type="checkbox"/> Half-capacity <input type="checkbox"/> Full-capacity
Incoming power arrangement		<input type="checkbox"/> Direct to horizontal/vertical busbar Lead-in direction (<input type="checkbox"/> Top <input type="checkbox"/> Bottom) <input type="checkbox"/> Expansion of existing panel Existing equipment serial no.: _____	<input type="checkbox"/> Incoming MCCB <input type="checkbox"/> Instrument (<input type="checkbox"/> Voltmeter <input type="checkbox"/> Ammeter <input type="checkbox"/> Power meter) <input type="checkbox"/> Bus duct from top, capacity: _____ A
		<input type="checkbox"/> Terminal lug not supplied	<input type="checkbox"/> Supplied (crimp type) <input type="checkbox"/> Compression terminal (<input type="checkbox"/> Not supplied <input type="checkbox"/> Supplied)
Wiring method		<input type="checkbox"/> BB	<input type="checkbox"/> BC <input type="checkbox"/> CB <input type="checkbox"/> CC
Wiring	Material	<input type="checkbox"/> Standard (main circuit: non-halogen wire, 3.5mm ² or more, black) <input type="checkbox"/> Standard (control circuit: vinyl wire HIV, 1.25mm ² , yellow)	<input type="checkbox"/> Special _____ <input type="checkbox"/> Special _____
	Main circuit phase (color) markers	<input type="checkbox"/> Not required	<input type="checkbox"/> In vertical channel only <input type="checkbox"/> Unit interior + vertical channel
	Main circuit terminals	<input type="checkbox"/> Terminal lug not supplied	<input type="checkbox"/> Supplied (Round crimp-type lug)
Unit cable connection method	Main circuit	<input type="checkbox"/> Plug-in connection for power supply only ^{†1}	<input type="checkbox"/> Plug-in connection for power supply/load ^{†2}
	Control circuit	<input type="checkbox"/> Individual connection by single-pin connectors	<input type="checkbox"/> Connection by multi-pin connector
Unit short-circuit protective device		<input type="checkbox"/> MCCB	<input type="checkbox"/> Isolator and fuse <input type="checkbox"/> MCP
MCCB breaking current		<input type="checkbox"/> 30kA or less	<input type="checkbox"/> 50kA <input type="checkbox"/> 75kA
Short-circuit protection method		<input type="checkbox"/> Full-capacity interruption <input type="checkbox"/> Cascade interruption	<input type="checkbox"/> Selective interruption
Control circuit fuse		<input type="checkbox"/> Standard (cartridge)	<input type="checkbox"/> Bottle <input type="checkbox"/> With alarm contact <input type="checkbox"/> Circuit protector (CP)
Thermal overload relay		<input type="checkbox"/> Standard (2-element, without reset button) <input type="checkbox"/> EMC	<input type="checkbox"/> 3-element with 2E <input type="checkbox"/> With thermal release
Multi-function motor controller (EMC)		<input type="checkbox"/> Required <input type="checkbox"/> Not required	
Transmission device		<input type="checkbox"/> Not required	<input type="checkbox"/> CDL, CC-Link, Modbus®-RTU (only when EMC is selected)
Leakage current relay		<input type="checkbox"/> None <input type="checkbox"/> EMC	<input type="checkbox"/> Leakage current relay <input type="checkbox"/> ML relay ^{†3}
Space heater/Thermostat		<input type="checkbox"/> None	<input type="checkbox"/> Space heater <input type="checkbox"/> Thermostat
Nameplate		<input type="checkbox"/> Film + Acrylic	<input type="checkbox"/> Metal
Others		<input type="checkbox"/> None	<input type="checkbox"/> Witness test <input type="checkbox"/> Site investigation <input type="checkbox"/> Site commissioning test
Power system		Power supply transformer ____Φ ____W ____kVA Main circuit ____V ____Hz Control circuit ____V ____Hz	Incoming power cable size ____mm ² (<input type="checkbox"/> Crimping <input type="checkbox"/> Compression) ____ piece (s) per phase

†1: Excluding units rated 400A or above and special units.

†2: Excluding units rated 225A or above and special units.

†3: ML multi-function leakage current relay (leakage current relay + instantaneous voltage-drop relay)

Points to Note When Placing an Order

Thank you for your continued patronage of Mitsubishi Electric products. Before ordering the Mitsubishi Electric product described in this catalog (hereinafter, the Product), please carefully read the following conditions (assuming there are no requirements for special conditions relating to matters such as estimates, contracts, specifications or catalogs other than this one). When placing an order, you (the customer) agree to the stipulations stated hereinbelow.

1. Warranty Period

The free service warranty period for the Product is one (1) year from the date of delivery, provided that no separate agreement has been made between Mitsubishi Electric and the customer.

2. Scope of Warranty

If the Product is found to have a fault or defect attributable to Mitsubishi Electric during the warranty period, Mitsubishi Electric shall provide the necessary replacement parts and/or exchange/repair the faulty part at no cost to the customer. However, if it becomes necessary to dispatch a technician to the site to conduct repairs either domestically or internationally, the customer shall be liable for the expenses incurred to dispatch said technician. In addition, Mitsubishi Electric shall not be liable for work related to replacing a defective unit, onsite recalibrations or operation trials. Furthermore, defects or faults attributable to one of the causes listed in a. to g. below are not covered by the warranty; that is, defects or faults attributable to:

- Handling or use of the Product not in accordance with the directions in this catalog, the operations manual, specifications or related documents.
- A cause not resulting from use of the Product.
- Modifications or repairs other than those performed by a Mitsubishi Electric representative after the Product was purchased or delivered.
- A phenomenon that was impossible to predict using the science/technology in practice when the Product was purchased or the purchase contract was signed.
- Use of the Product after incorporating it into the customer's machinery if the fault or defect could have been avoided had the customer's machinery been equipped with functions, structure or other mechanism generally accepted as necessary by industry standards.
- Use of the Product for a purpose other than that originally intended by Mitsubishi Electric.
- Unavoidable external factors, such as fire or irregular voltage, or natural phenomena such as earthquakes, lightning, wind or water damage.

3. Exclusion of Warranty Obligations for Opportunity/Secondary Loss

Regardless of whether or not the warranty is valid, Mitsubishi Electric shall not be liable for: Any damage found not to be attributable to the Product; the loss of opportunity or profits for the customer or user caused by any fault in the Product; damage, secondary damage or accident compensation resulting from special factors regardless of whether or not such factors could be predicted by Mitsubishi Electric; damage to products of other companies; compensation for replacement work, onsite recalibrations of machinery/equipment, trial start-up operation or other work performed by the customer.

4. Range of Product Application

- Where the Product is used in combination with other products, it is the responsibility of the customer to confirm adherence to applicable standards, laws and regulations. Furthermore, confirmation of whether or not the Product is compatible with the system, devices and machinery of the customer is the responsibility of the customer. Mitsubishi Electric shall not be liable for any results of compatibility/non-compatibility of the Product with customer applications.
- The Product is designed and manufactured as a versatile product for use in general industry. Do not use the Product in applications that could potentially cause chemical contamination or electrical interference, or for special purposes that could potentially have a major impact on human life or property, such as life-support medical machinery/devices, nuclear-power machinery, power-company equipment, aerospace machinery and transportation machinery (e.g., automobiles, trains and ships). Furthermore, do not use the Product under conditions or environments that do not adhere to those described in this catalog. If the customer is considering adopting the Product for a special purpose at his/her own liability, the customer shall read and understand all Product specifications and consult Mitsubishi Electric technical personnel in advance. In the case that the Product is used for a special purpose without consulting Mitsubishi Electric in advance, Mitsubishi Electric shall not be liable for nor guarantee any of the provisions herein under any circumstances, regardless of the details.
- Mitsubishi Electric advises the customer to only use the Product in applications where a serious accident will not occur even in the event of a fault or defect in the Product. In addition, depending on the importance of the equipment, Mitsubishi Electric recommends creating a backup or redundant system external to the equipment as a safeguard against a fault or defect.
- The application examples described in this catalog are for reference purposes only; only use the Product in applications after confirming the functions and safety of the equipment/devices.
- In order to avoid unexpected damage to customers or third parties resulting from incorrect use of the Product, customers are requested to fully understand and observe all of the prohibited items and notes on use.

5. Term for Repairs (Charged) After Production is Discontinued

- Mitsubishi Electric shall accept the Product for repairs, which will be charged to the customer, up to seven (7) years after production has been discontinued. (Note that there may be times when the Product cannot be repaired due to circumstances related to manufacturing equipment or parts. Furthermore, renewal of the Product should be conducted within 15 years after the date of manufacture.)
- The Product (including spare parts) cannot be supplied after production has been discontinued.

6. Changes to Specifications

Please be aware that the specifications described in the catalog, manual or technical documents are subject to change without prior notice.

7. Scope of Services

The price of the Product does not include service costs such as the dispatch of technical personnel. Customers are requested to contact Mitsubishi Electric if such services are required.

Improving Reliability and Recommended Renewal Period

1. Improving Reliability of Safeguards

The parts equipped in protective relays have a limited service life; the rate of deterioration varies according to the application, number of years in service, usage environment and individual performance of parts. Mitsubishi Electric generally designs its products to have a recommended renewal period of 15 years. However, based on the above, there may be times when components, etc. require replacement prior to the end of the 15-year period. To avoid situations where relays do not operate properly/fail to operate as a result of unintended circumstances/conditions, depending on the importance of the equipment, the customer is advised to take countermeasures; for example, use a redundant system for safeguards, and monitor relay status using products equipped with alarm output contacts that enable constant self-monitoring.

2. Recommended Renewal Period

In general, Mitsubishi Electric recommends a scheduled renewal approximately 15 years after manufacture. This is based on the recommended renewal period described in "JEM TR-156: Guidelines for Maintenance/Inspections of Protective Relays" issued by the Japan Electrical Manufacturers' Association (in Japanese). This renewal period does not reflect the manufacturer's guaranteed values for functions and performance, but rather the period generally considered beneficial, including economically, to replace the Product with a new product considering the deterioration of machinery structural materials in a standard usage environment where standard maintenance/inspections are conducted. Unexpected malfunctions or operational failures may occur if the Product is used beyond the recommended renewal period. Furthermore, Mitsubishi Electric recommends that peripheral devices such as transformers be included in the renewal process. As described in 1. above, Mitsubishi Electric generally designs its products to have a recommended renewal period of 15 years.

Maintenance/Inspections

- For the Product to provide satisfactory performance, appropriate regular inspections and maintenance are essential. Please perform an initial inspection before turning the power on for the first time and then at least once every one to three years after that.
- Please check that all the terminal connections are securely tightened, as loose connections of conductive parts may cause abnormal heat generation.
- The LCD parts, including the LEDs used in the LCD, have a limited service life and will gradually decrease in brightness (this varies depending on the usage environment). Please replace the LCD if the lamps or LCD screen become dark or the characters become unclear (for details, please contact a Mitsubishi Electric representative).

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Safety Precautions

Please read the instruction manual
before using the device.