



SERVO DRIVES & MOTORS

MELSERVO-C



Cost Effective Micro-Servo

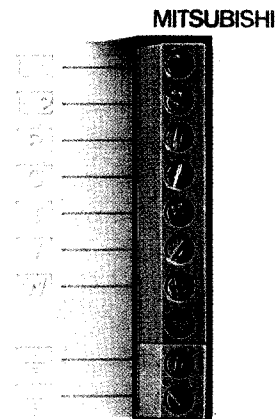
Small, easy-to-use, high-performance. An extraordinarily compact, intelligent servo.

The MELSERVO-C brushless servo, in a handy super-compact size, is the culmination of Mitsubishi servo technology.

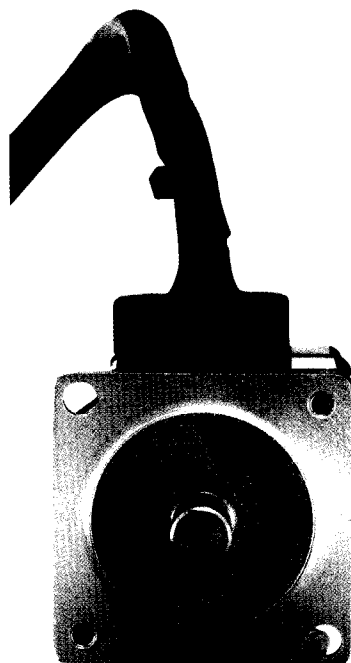
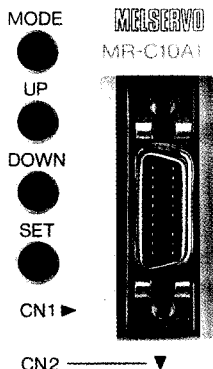
The servo-amplifier achieves high performance in an unprecedented compact body only 40 millimeters wide and 130 millimeters tall. Small but powerful, comes equipped with a serial encoder. Packed with high-level features, including real-time auto-tuning and model adaptive control.

This servo can substitute for microstep and 5 phase stepping motors, and it can be easily used even by first-time users.

A "new age" servo for use in a broad range of fresh applications, including semiconductor manufacturing devices, printing machines, and electronic component assembly.

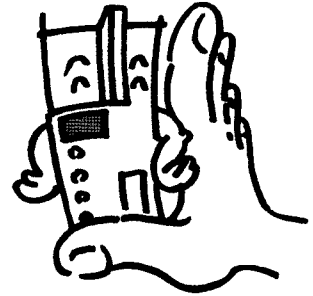


Actual size



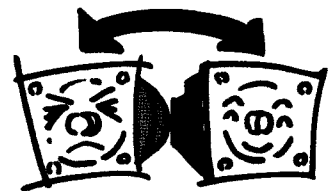
Handy super-compact size

A super-compact size of only 40 millimeters by 130 millimeters achieved through the incorporation of a high-performance custom micro-controller, a newly developed power module, and an optimal thermal design made possible with computer-aided engineering techniques.



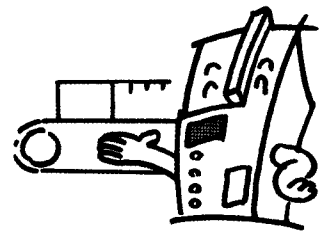
Stepping motor replacement

With stable torque characteristics and quiet, smooth operation, this servo can be used in place of stepping motors.



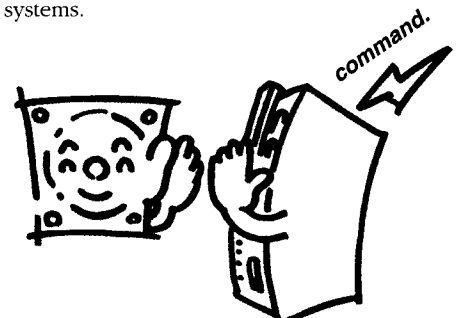
Real-time auto-tuning

Makes automatic gain adjustments even when the load's moment of inertia changes.



Model adaptive control

Operating in quick response to ideal models, it offers highly responsive and stable operation, unaffected by machine systems.



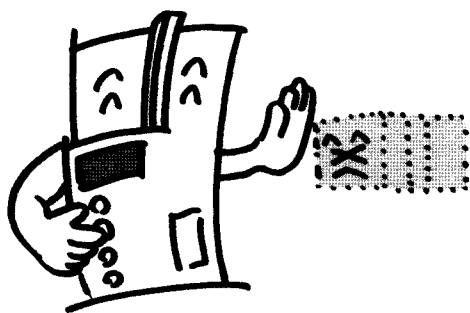
Easy setup

This servo can be setup easily using the front panel's push buttons and seven segment LEDs.



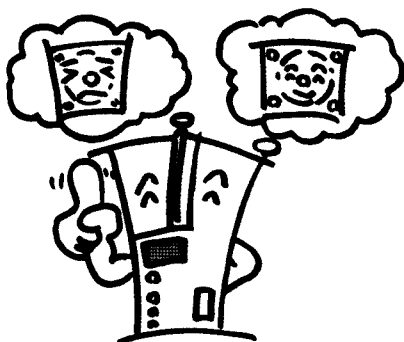
Simple test operation

Amplifier tests can be performed at the push of a button, even without a motion controller.



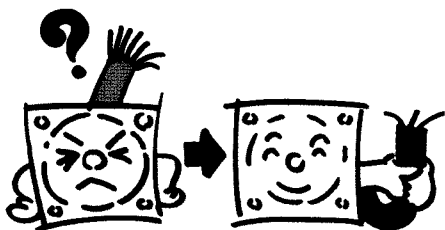
Automatic servomotor recognition

Once the encoder cable has been connected, the servo-amplifier can determine, as soon as its power is turned on, which motor is connected to it.



Serial encoder

Because the encoder signal is transmitted by serial communications, few signal wires are needed and wiring is simplified.



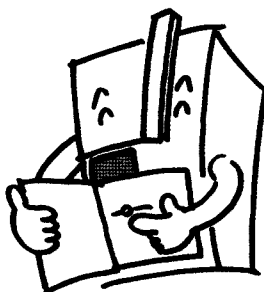
5/24V power supply interface

Either a 5V or 24V power supply can be selected for the I/O interface.



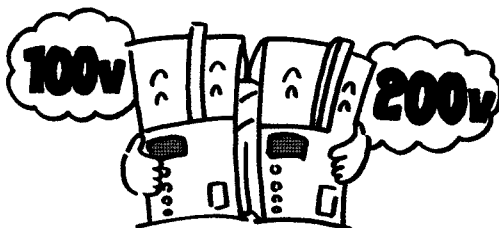
Software masking feature for control signals

Various I/O can be masked in software reducing wiring. This feature is especially convenient when there are limited I/O points.



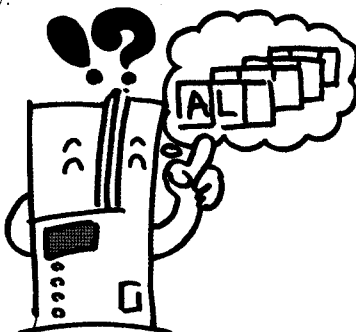
100/200V single-phase input power supply

Select either a single phase 100V or 200V amplifier.



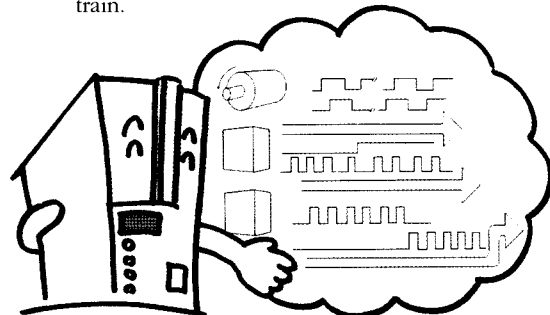
Alarm history

Even after the power has been turned off, this servo remembers the last three [OR four: THE LAST ONE AND THE THREE PREVIOUS] alarms, making it possible to find the cause and solve the problem quickly.



Command pulse train configuration

This servo can handle three command pulse configurations: encoder signals, pulse, and direction; and CW/CCW pulse train.



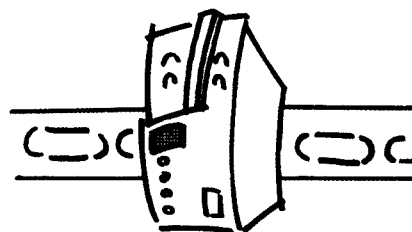
Setup software

Attaching the RS-232C communications option allows you to perform a whole range of functions with the setup software, from entering all parameters to saving them and measuring data with the software's graphing tools.



DIN rail attachment

This servo-amplifier can be attached to a DIN rail by attaching the DIN rail hardware to the servo-amplifier. (Available soon)



Torque limits

Damage to mechanics, products and machines is prevented by limiting maximum torque.

Motors with failsafe electromagnetic brakes

Motors with a failsafe electromagnetic brake have been designed for use with this servo. Users can choose the motor that best suits the machine being used.

Move Up to the Next Level Now

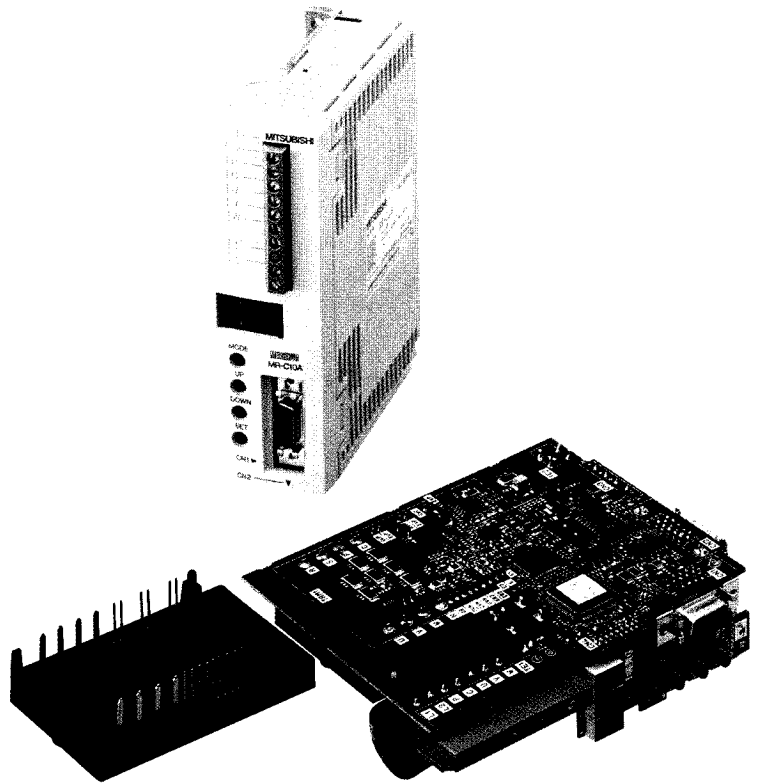
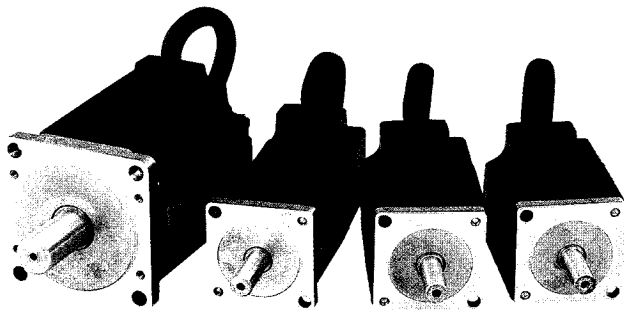
Handy Super-compact Size

■ Servo-amplifier

- A super-compact size of only 40 millimeters by 130 millimeters was achieved through the incorporation of a newly developed power module and an optimal thermal design made possible with computer-aided engineering techniques.
- Mitsubishi servo control technology including model adaptive control and real-time auto-tuning is achieved with a micro-controller, resulting in the maximum performance with the fewest number of parts.

■ Servomotor

- Improved heat dissipation of the motor and a super-compact design were achieved with a molding process that uses newly developed high-thermal conductivity resin. (Frame diameter on 100-watt and below units is 40 millimeters square.)
- This compact design offers maximum torque of 400% (100-watt and below units) through enhanced coil density made possible through original Mitsubishi technology.



Stepping Motor Replacement

■ No more cogging or stalling

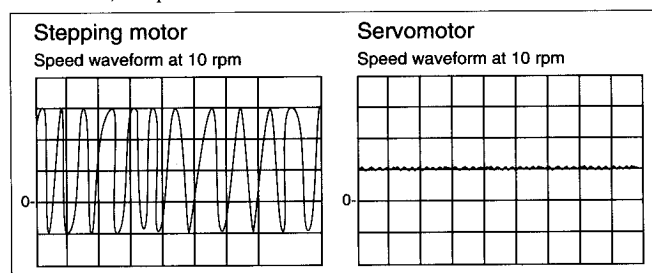
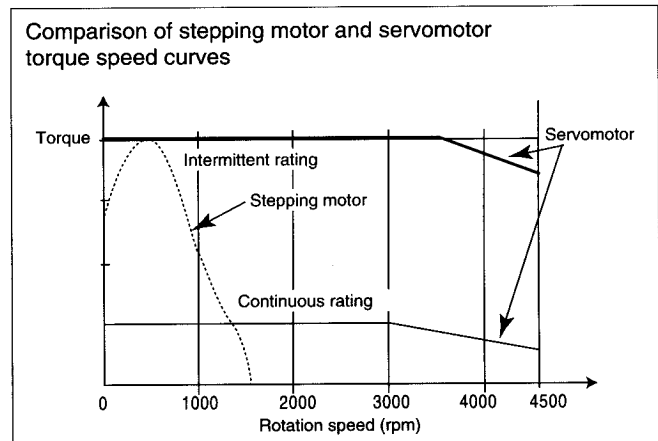
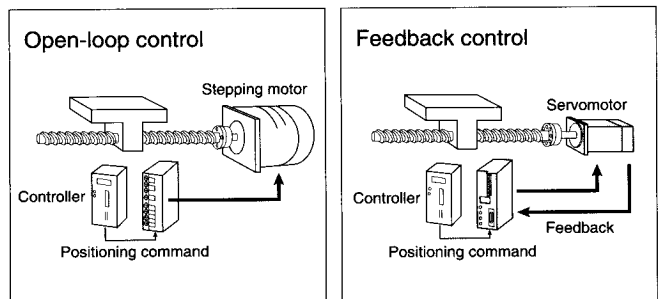
Because control is performed using integral feedback to verify the servomotor's position, this unit can start smoothly, without losing step. This is often a problem with stepping motors responding to sudden load fluctuations and sudden acceleration/deceleration.

■ Stable torque characteristics

Reduced machine cycle time and greater production speeds are achieved thanks to stable torque characteristics, from low to high speeds (maximum rotation speed 4,500 rpm).

■ Smooth operation

Operation is smooth at low speeds and during acceleration/deceleration because feedback control is performed with a 4,000 pulse/rev encoder.



Easy Operation

■ Real-time auto-tuning

Merely selecting the response setting that fits the machine being used eliminates the need for servo gain adjustments. This is because the real-time auto-tuning function automatically adjusts the gain to fit the machine. And Mitsubishi's unique control technology model adaptive control makes possible a highly responsive and stable system.

■ Automatic recognition of motor model

The servo-amplifier automatically recognizes the drive motor with the motor ID information (motor model name, etc.) built into the encoder. This eliminates the need to set parameters, thereby removing setting errors as well.

■ Easy operation

- Test operation, monitoring, and parameter setting can all be performed easily using just four keys.
- The monitoring function allows you to display the status of nine parameters, including motor rotation speed, feedback pulse, command pulse, effective load factor, and peak load factor.
- The servo can remember the conditions that existed during the last three [OR four: THE LAST ONE AND THE THREE PREVIOUS] alarms.

Satisfies overseas industrial standards

■ Satisfies EN, UL, and cUL standards

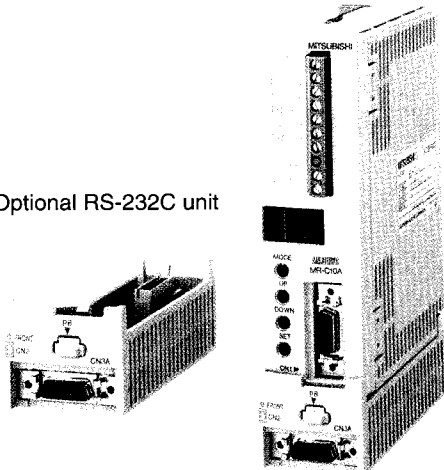
- An EMC filter (optional) is available for meeting EN-standard EMC directives. The MR-CC(-UE) servo-amps and HC-PQ(-EC) servomotors meet low-voltage directives (LVD).
- The MR-CC(-UE) servo-amps and HC-PQ(-UL) servomotors also meet UL and cUL standards.

Personal Computer Interface

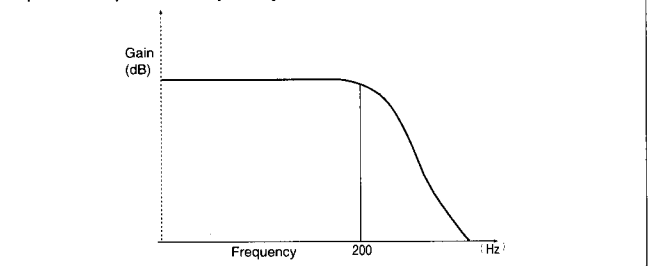
■ Communication with a PC is made possible

- This servo can be connected to a PC using the optional RS-232C unit.
- Setup software can be used to display various monitoring details and to enter and save all parameters. And with its graphing functions, it is possible to display servomotor speed, torque waveform, and digital I/O status. This makes it possible to check operating conditions.

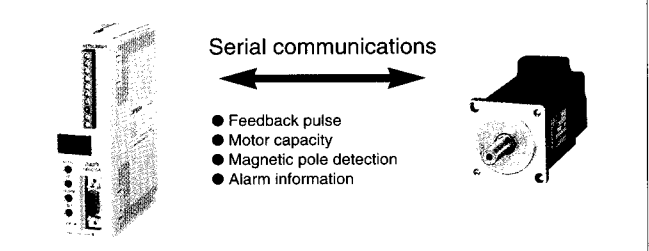
Optional RS-232C unit



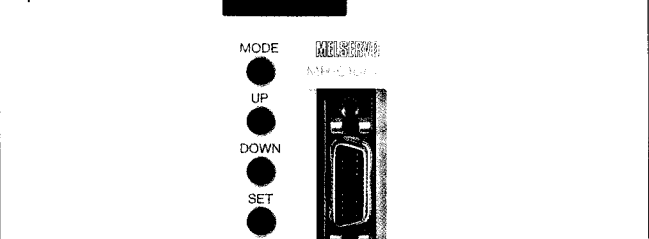
Speed response frequency characteristics



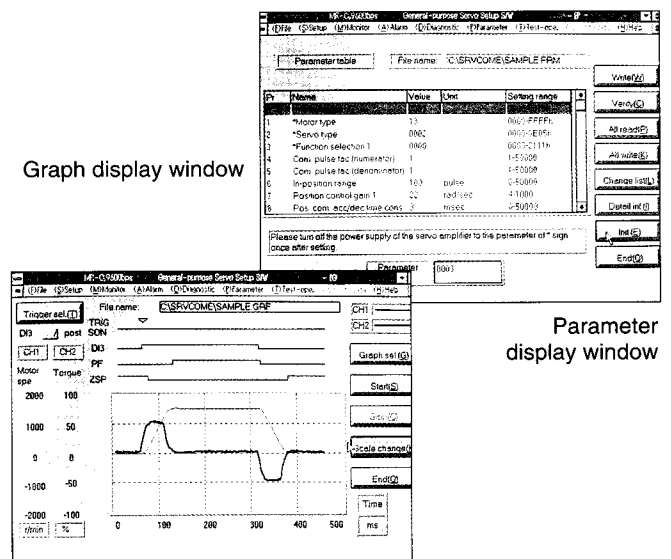
Encoder serial communications



Display panel and operation buttons



Graph display window



Parameter display window

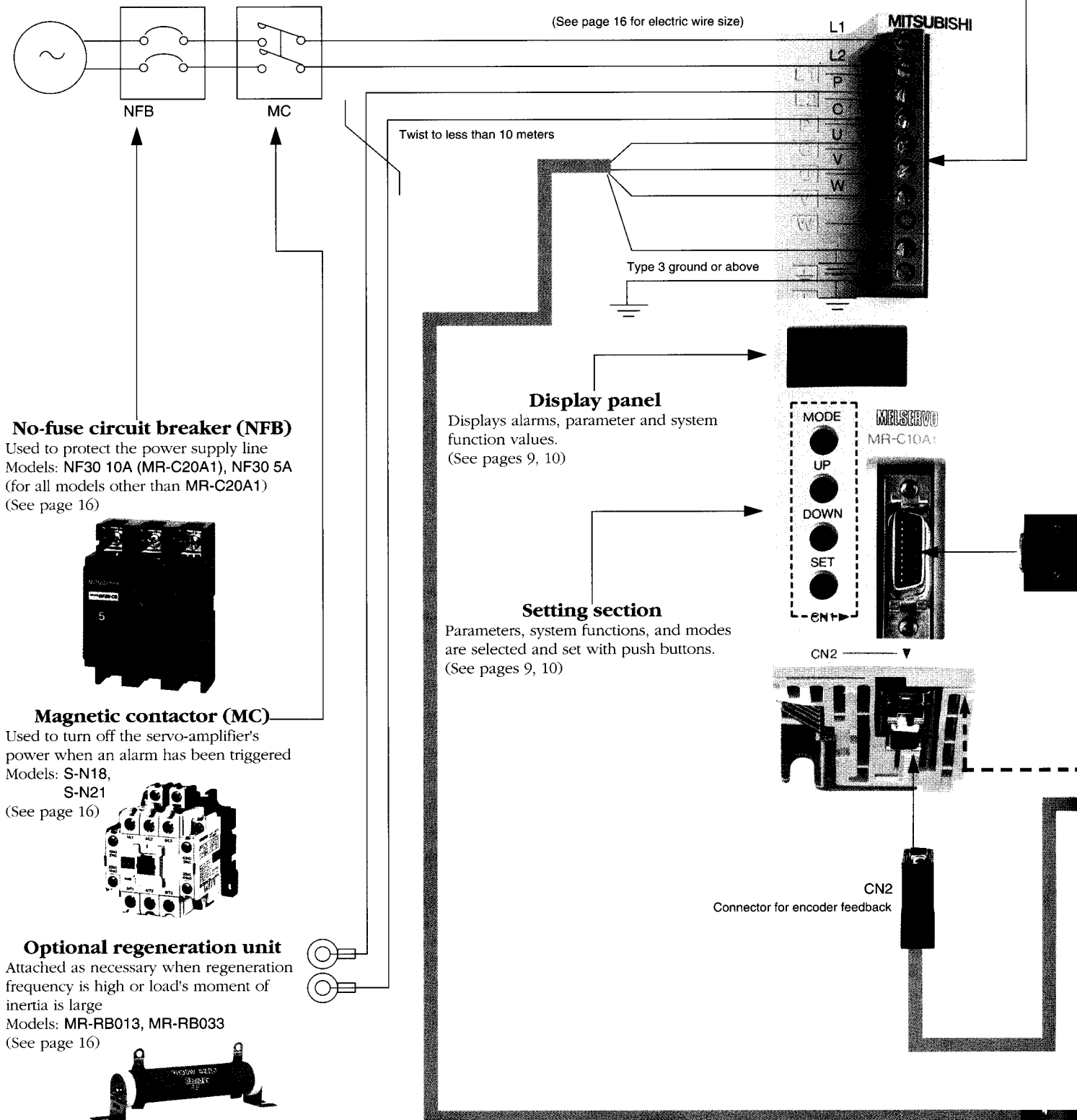
Connections with Peripheral Equipment

Connections between the MR-C and peripheral equipment.

Required connectors and options have been listed to allow users to set up their systems and use immediately after purchase.

Power supply
Single-phase 100V or 200V power supply
(power supply and voltage vary depending on the series)

MR-C servo-amplifier
MR-C ☐ A or MR-C ☐ A1



Terminal block

The power supply, optional regeneration unit, and motor's U, V, W ground wires are connected to the terminal block. Use a regular flat head screwdriver to connect the power supply to the terminal block. (See page 15)

Junction terminal block

Signals can be easily wired to the optional terminal block and optional CN1 cable.

Optional RS232-C unit

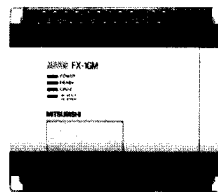
Mounting this optional unit on the underside of the servo-amplifier makes RS-232C communications possible. Turn the power off when mounting or removing this unit.

CN1

Control signal connector
(See pages 15)

Upper controller

This servo can be connected to a Mitsubishi motion controller or any pulse output controller.



FX-20GM
(E-20GM)

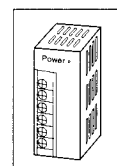
FX-1PG



AD75 P1-P3,
A1SD75 P1-P3

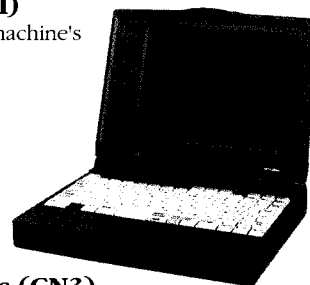
External 24V or 5V power supply

Connects to an external power supply. (24 or 5 volts, 0.2 amperes or greater)



Control signal (for operation panel)

Connects to the PLC I/O or the machine's operation panel.



RS-232C communications (CN3)

Connects the unit to user's personal computer, making possible monitoring, batch parameter entry and storage, graph display, and test operation. Dedicated cables and setup software are available also. Cables: For IBM compatibles: MR-CPCATCBL3M (See page 17)

Setup software: MRZJW3-SETUP41E and above (See page 18)



Encoder cable

This cable connects the servomotor encoder to the servo-amplifier. Extended-life cables with a long bending life are also available. This cable comes in standard lengths of 5 and 10 meters.

Models: MR-JCCBL□M (standard model)
MR-JCCBL□M-H (extended-life model)

(See page 17)

Servomotor cable

The motor's power cable and the encoder cable are extended 0.3 meter.

Encoder

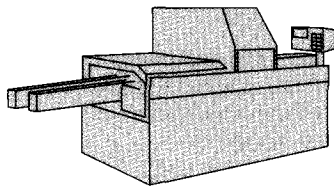
Detects position, speed, and magnetic pole position.

HC-PQ servomotor
(See page 17 for electromagnetic brake)

Applications

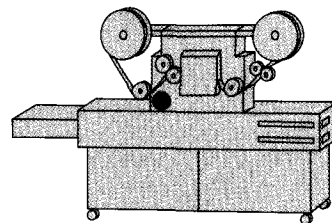
Semiconductor manufacturing devices

The MR-C can be used to replace stepping motors in LCD and wafer conveyance devices.



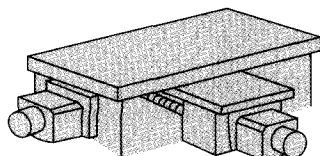
Printing machines

Well suited for use in positioning for registration presses and label printing.



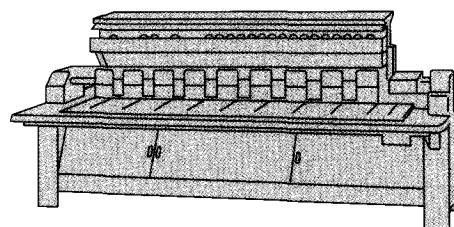
Electronic component assembly

Can be used with small loaders and unloaders and simple X-Y positioning tables.



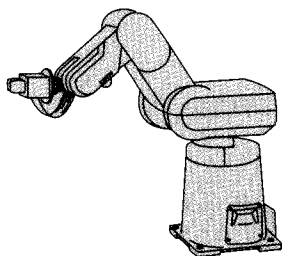
Textile machines

Well suited for use in positioning with knitting, embroidering, and laundry machines.



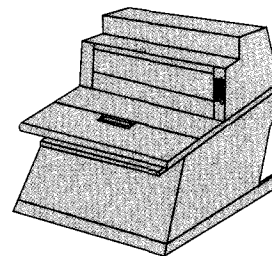
Robots

Suited for use at the tips of small and ultra-compact robots.



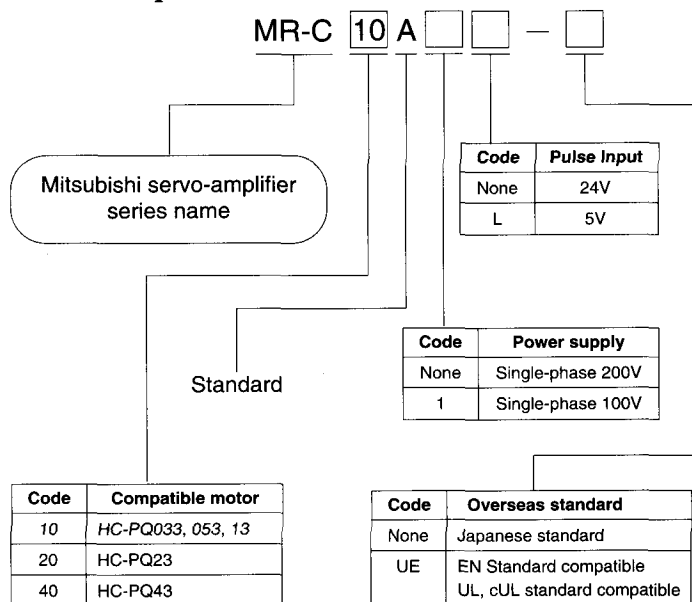
Other applications

The MR-C can be used to replace microstepping and 5 phase step motors in office, medical and experimental machinery.

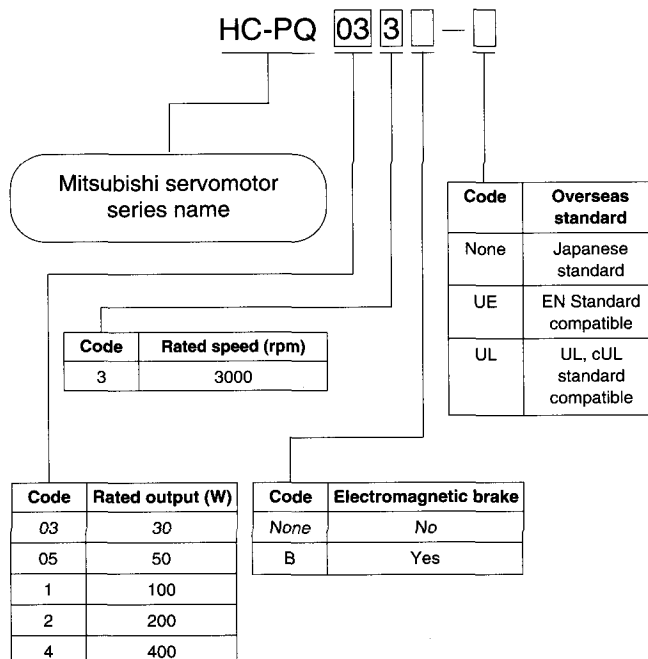


Model configuration

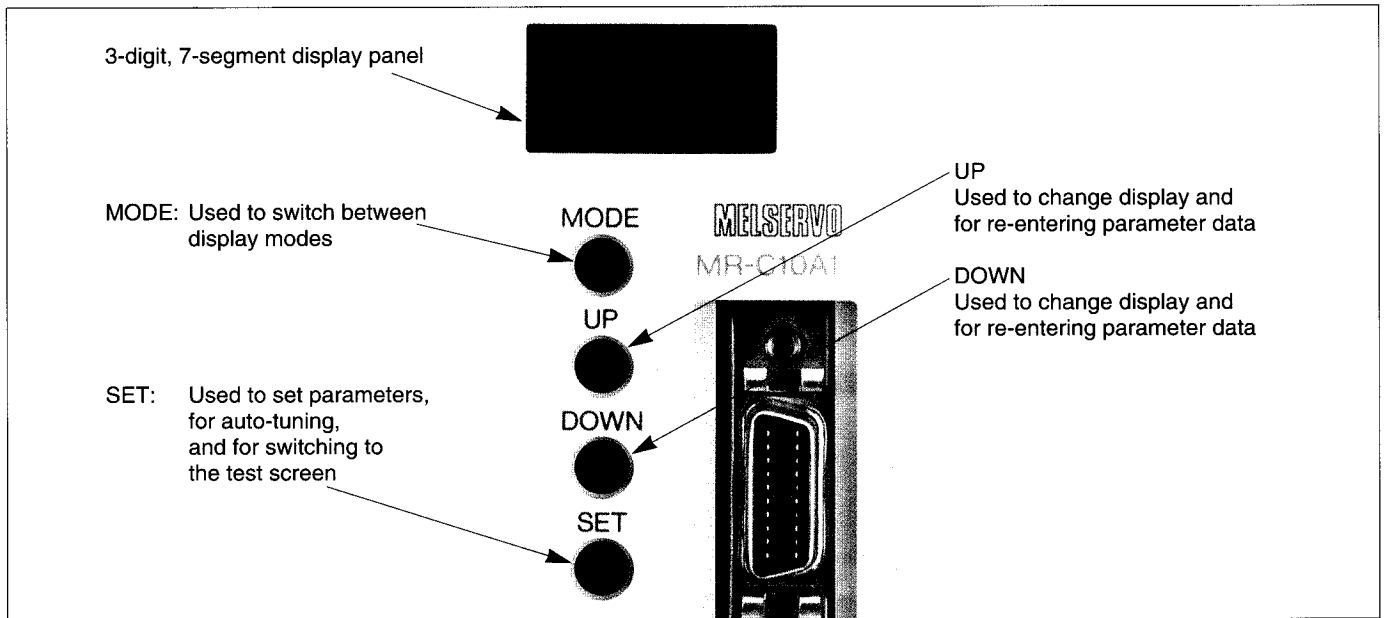
■ Servo-amplifier



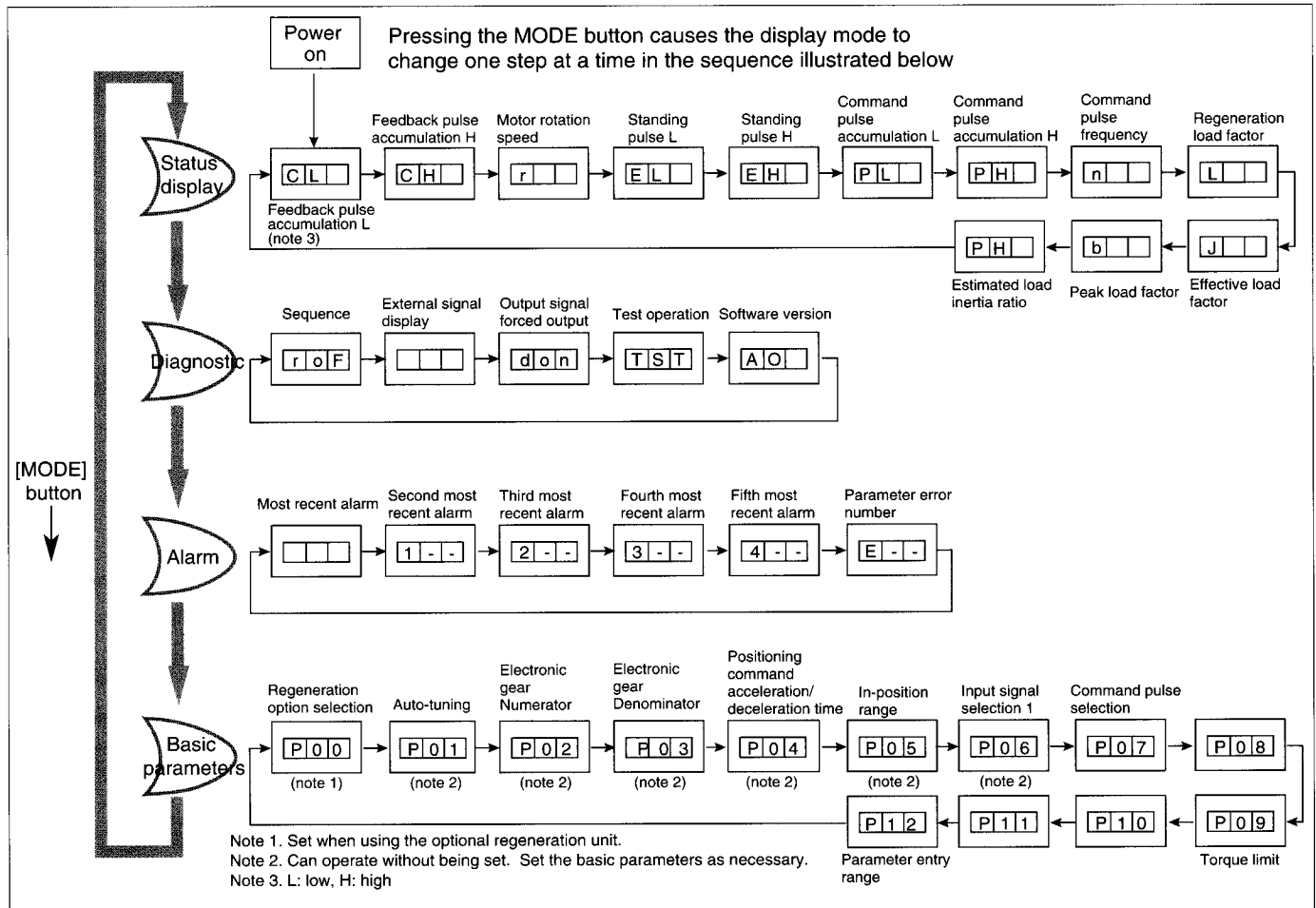
■ Servo motor



Even this small unit comes with a display panel and setting section



Explanation of 7-segment display device

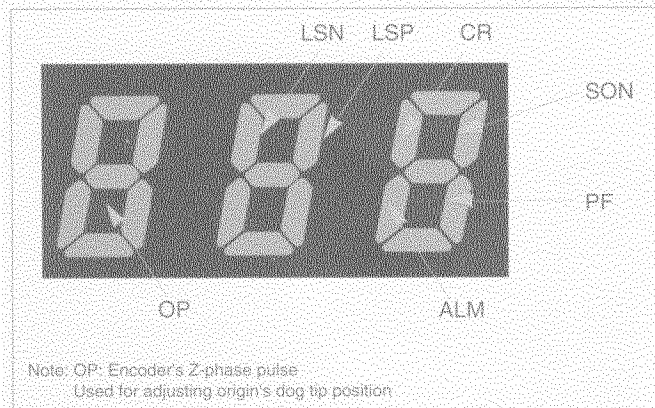


Enhanced Functions Make Setup Easy

User-friendly, from turning on through connection checks and parameter setting

External signal display

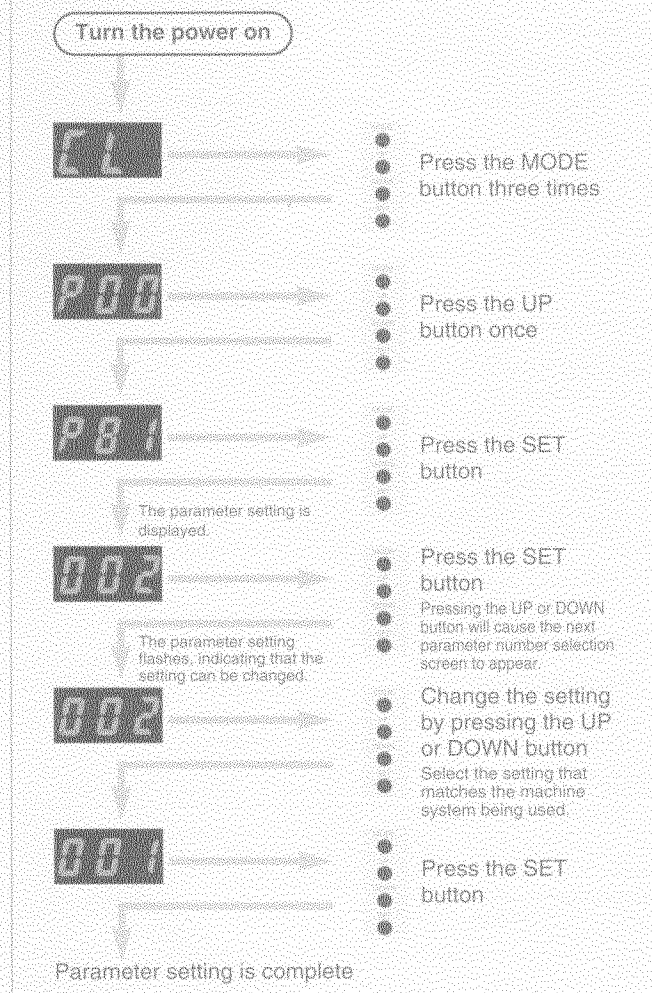
External input/output signals' on/off status is displayed in segments. The upper portion of each segment indicates the input signal, while the lower portion indicates the output signal.



Setting parameters

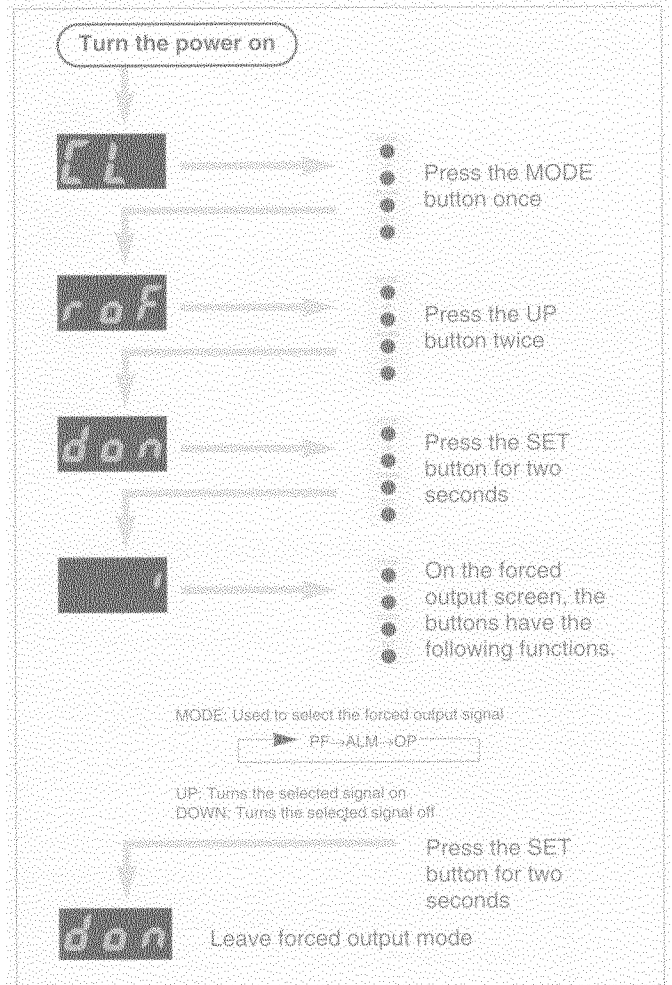
Basic parameters are set as illustrated below.

Example: Selecting the auto-tuning response setting



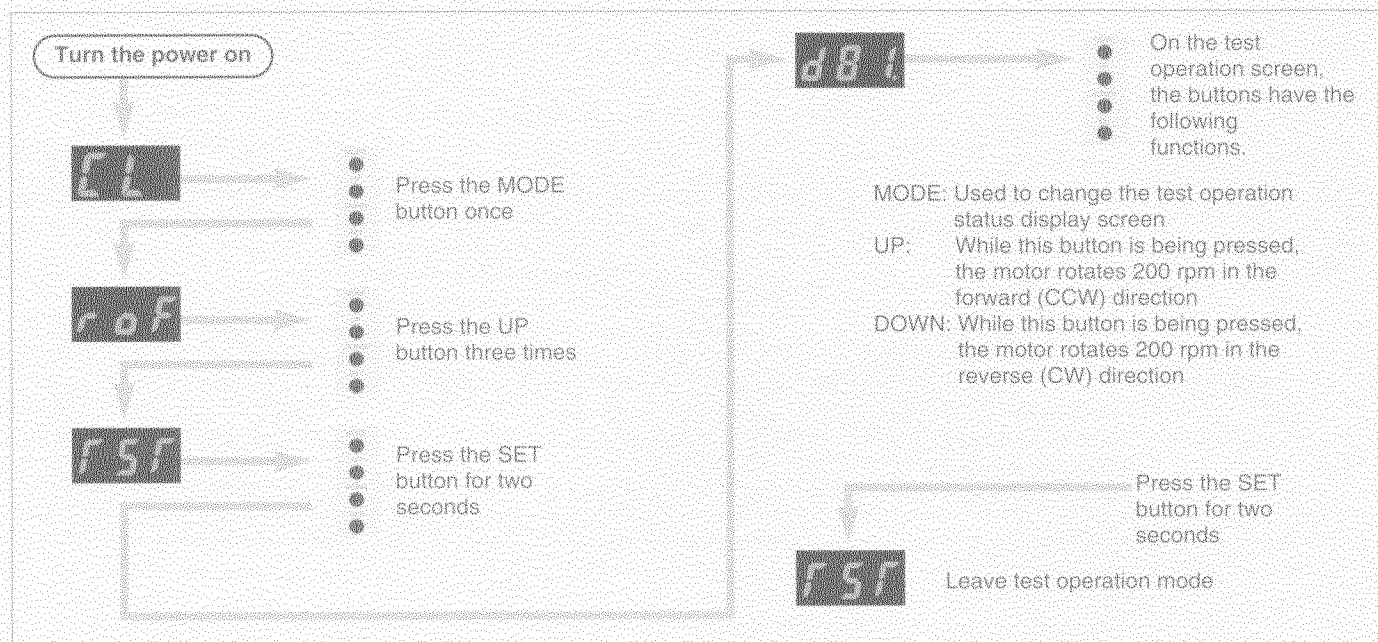
Forced outputs

Forcing external output signals such as alarm and position complete signals to be turned on and off makes it easy to perform external wiring and sequence checks.



Test operation

The operation of the servomotor and servo-amplifier can be checked before wiring the control signals.



Basic parameters

The basic parameters are listed below. Basic operation can be set with just ten parameters.

For parameters marked with an asterisk, turn the power off after performing the setting; turn the power back on to complete the setting.

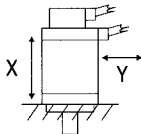
Parameter number	Name	Abbreviation	Description	Factory setting	Setting range
*00	Regeneration option selection	REG	Used to select the regeneration option	000	000~002h
01	Auto-tuning	ATU	Used to select the auto-tuning response setting	002	001~215h
02	Electronic gearing numerator	CMX	Used to set the command pulse input multiplier	1	1~999
03	Electronic gearing denominator	CDV	Used to set the command pulse input divisor	1	1~999
04	Positioning command acceleration/deceleration time	PST	Used to set the positioning command acceleration/deceleration time	5 (ms)	0~999
05	In-position range	INP	Used to set the range for the lag pulse, which triggers the in-position output	100 (pulse)	0~999
*06	Input signal selection 1	IP1	Used to select the input signal's function	000	000~111h
*07	Command pulse selection	OP1	Used to select the command pulse waveform	010	000~312h
*08	Spare			0	
*09	Torque limit	TLL	Used to set the torque limits	100 (%)	0~100
10	Spare			0	
11	Spare			0	
12	Parameter write disable	BLK	Used to select the parameter reference range and write range	000	000~FFFh

Specifications, Characteristics, Safety Features

Standard specifications

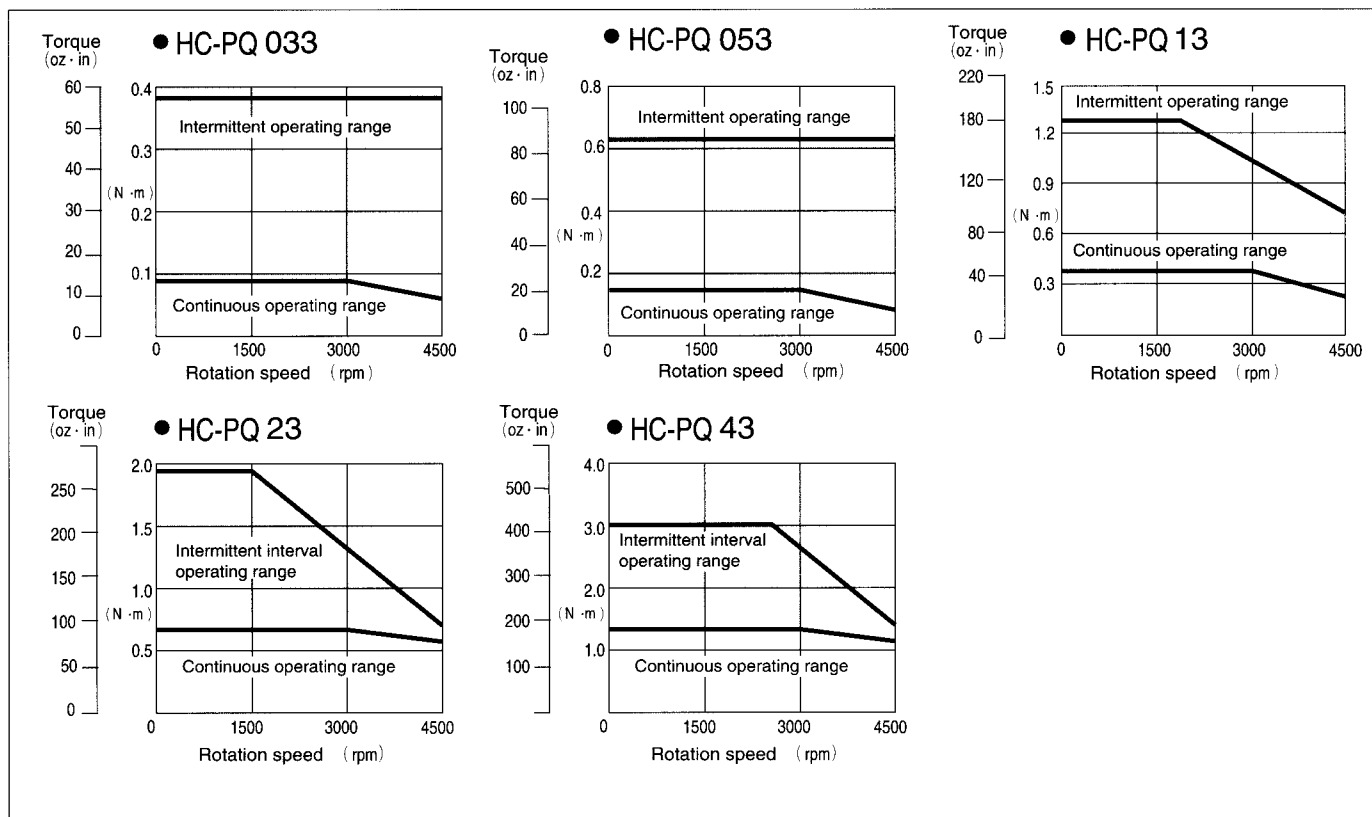
Specification		Model	Servomotor model	HC-PQ033(B)	HC-PQ053(B)	HC-PQ13(B)	HC-PQ23(B)	HC-PQ43(B)	HC-PQ033(B)	HC-PQ053(B)	HC-PQ13(B)	HC-PQ23(B)
		Servo-amplifier model	MR-C10A			MR-C20A	MR-C40A	MR-C10A1			MR-C20A1	
Servomotor (note 1)	Continuous characteristics	Rated output (W)	30	50	100	200	400	30	50	100	200	
		Rated torque (N·m (oz·in))	0.095 (13.45)	0.16 (22.66)	0.32 (45.32)	0.64 (90.63)	1.3 (184)	0.095 (13.45)	0.16 (22.66)	0.32 (45.32)	0.64 (90.63)	
	Maximum torque (N·m (oz·in))		0.38 (53.8)	0.64 (90.63)	1.28 (181)	1.92 (271.9)	2.99 (423)	0.38 (53.8)	0.64 (90.63)	1.28 (181)	1.92 (271.9)	
	Rated rotation speed (rpm)		3000									
	Maximum rotation speed (rpm)		4500									
	Permissible instantaneous rotation speed (rpm)		5400					5175		5400		
	Power rate at continuous rated torque (kW/s)		6.45	13.47	34.13	46.02	116.55	6.45	13.47	34.13	46.02	
	Moment of inertia J (kg·cm ² (oz·in ²)) (note 7)		0.014 (0.077)	0.019 (0.104)	0.03 (0.164)	0.088 (0.487)	0.143 (0.782)	0.014 (0.077)	0.019 (0.104)	0.03 (0.164)	0.089 (0.487)	
	Speed/position detector		Encoder (resolution: 4,000 P/rev)									
	Accessories		Encoder, serial									
Structure		Totally enclosed, self-cooling (protection degree: IP44)										
Environment	Ambient temperature/humidity		0-40°C (avoid freezing), storage: -15-70°C/80% RH or below (avoid condensation), storage: 90% RH or below									
	Atmosphere		Indoor (avoid exposure to direct sunlight); no corrosive gas, inflammable gas, oil mist, or dust									
	Elevation/vibration (note 6)		1,000 meters or less above sea level / X:19.6 m/S ² (2G), Y:19.6 m/S ² (2G)									
Weight (kg) (lb)		0.32 (0.71)	0.37 (0.82)	0.50 (1.1)	0.96 (2.1)	1.45 (3.17)	0.32 (0.71)	0.37 (0.82)	0.50 (1.1)	0.96 (2.1)		
Servo-amplifier (note 2)	Power supply (note 3)	Voltage/Frequency	Single-phase AC 200~230V 50/60 Hz					Single-phase AC 100~115V 50/60 Hz				
		Permissible voltage fluctuation	Single-phase AC170~253V					Single-phase AC85~126V				
		Permissible frequency fluctuation	±5% or less									
		Power facility capacity (kVA)	0.1	0.2	0.3	0.5	0.9	0.1	0.2	0.3	0.5	
	Control system		Sinusoidal PWM control/current control system									
	Control mode		Pulse train input position control									
	Control logic		Model adaptive control									
	Auto-tuning		Real-time auto-tuning									
	Rated output current (A)		0.85	0.85	0.85	1.5	2.8	0.85	0.85	0.85	1.5	
	Maximum output current (A)		5.0	5.0	5.0	6.0	6.44	5.0	5.0	5.0	6.0	
	Regeneration brake frequency (times/min) (note 4)	No options	△	△	(note 4-1)	(note 4-2)	(note 4-3)	△	△	(note 4-1)	(note 4-2)	
		MR-RB013 (10W)	△	△	4,660	1,400	800	△	△	4,660	1,400	
		MR-RB033 (30W)	△	△	△	4,300	2,400	△	△	△	4,300	
	Recommended load's moment of inertia ratio		30 times the servomotor's moment of inertia or less (note 5)									
	Safety features		Excess current, regeneration error (electronic thermal), excess voltage, motor-amp combination error, encoder error, insufficient voltage/sudden power outage, excess speed, large error									
	Position control specifications	Maximum input pulse frequency	Max.200kpps									
		Positioning feedback pulse	4,000 pulse/revolution									
		Command pulse multiple	Electronic gear A/B multiple : A, B: 1-199 1/50<A/B<20									
		Positioning complete width setting	0-999 pulses									
		Excess error	±50k pulses									
Power supply		External DC 24V or DC 5V power supply										
PC communication functions	Necessary options	Optional RS-232C unit (MR-C-T01), optional dedicated cable, and PC setup software required										
	Functions	Status display, diagnostic display, alarm display, parameter setting, operation waveform monitoring										
Structure		Open										
Environment	Ambient temperature/humidity		0-50°C (avoid freezing), storage: -20-65°C/90% RH or below (avoid condensation), storage: 90% RH or below									
	Atmosphere		Inside control panel; no corrosive gas, inflammable gas, oil mist, or dust									
	Elevation/vibration (note 6)		1,000 meters or less above sea level / 5.9 m/S ² or below, (0.6G) or below									
Weight (kg) (lb)		0.6 (1.323)	0.6 (1.323)	0.6 (1.323)	0.6 (1.323)	1.0 (2.205)	0.6 (1.323)	0.6 (1.323)	0.6 (1.323)	0.6 (1.323)		

- Notes 1. Inquire about use in special conditions, e.g. where oil and water are present in the machine site.
2. Output and rated rotation speed cannot be guaranteed when the power supply's voltage falls. The currents indicated are the amplifier's rated and maximum current.
3. The power facility capacity varies depending on the power supply's impedance.
4. The figures for regeneration brake frequency indicate the permissible frequency when the motor alone decelerates to a stop from the rated rotation speed. The triangle marks in the table indicate that there are no limits on regeneration if the effective torque is less than the rated torque. When load is applied, regeneration frequency is 1/(m+1) of the figures in the table (m = load's moment of inertia/motor's moment of inertia). When the rated rotation speed is exceeded, the permissible number of times is in inverse proportion to the square of operating speed divided by rated speed. When the operation rotation speed is frequently changing, or when a continuous regeneration condition exists, such as during up/down feed, the regeneration heat during operation must be assessed and measures taken to ensure that it does not exceed the permissible range.
4-1. When the load's moment of inertia is 30 times or less, there are no limits on regeneration brake frequency if the effective torque is less than the rated torque.
4-2. When the load's moment of inertia is 10 times or less, there are no limits on regeneration brake frequency if the effective torque is less than the rated torque.
4-3. When the load's moment of inertia is 1 time or less, there are no limits on regeneration brake frequency if the effective torque is less than the rated torque.
5. Contact Mitsubishi if the load's moment of inertia ratio exceeds the figure in the table.
6. The direction of vibration is as shown in this diagram.



7. The moment of inertia of a motor with a built-in electromagnetic brake is noted in the diagram of external dimensions.

Torque Characteristics



Safety Features

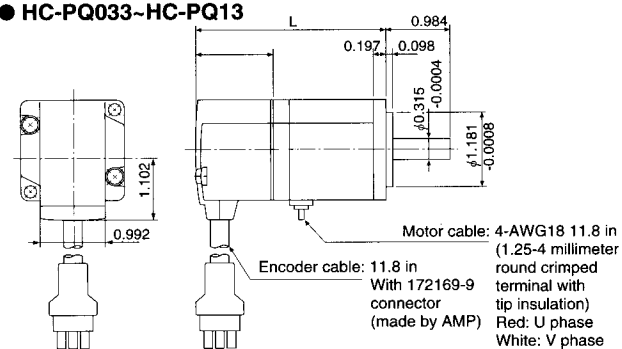
The servo-amplifier possesses the following safety features for complete protection of itself and the servomotor. When an alarm is triggered and a protection circuit is activated, the unit is protected by ceasing output, which is done by cutting off the transistor base. Details of the alarm can be confirmed by referring to the alarm history after the power is turned off. After an alarm has been triggered, and the source of the problem eliminated, turn the power off and reset the unit.

Alarm code	Safety feature name	Description
A10	Insufficient power	Is activated when the power supply's voltage falls below a certain level or when a sudden power outage of more than 15 milliseconds occurs. Is also activated when the power is turned off and then turned back on again before the display goes blank.
A12	Memory error 1	Is activated when an error is detected in the printed board's ROM or RAM.
A14	Watchdog	Is activated when an error is detected in the printed board's CPU or other components.
A15	Memory error 2	Is activated when an error is detected in the printed board's EEPROM.
A16	Motor-amp combination error	Is activated when the motor and amplifier do not match.
A17	Board error	Is activated when an error is detected in the printed board's CPU or other components.
A20	Encoder error	Is activated when an error is detected in the encoder cable or encoder.
A30	Regeneration error	Is activated when there is an excess load on the regeneration brake resistor due to excess regeneration frequency, or when an error is detected in the regeneration transistor.
A31	Excess speed	Is activated when the servomotor rotation speed is detected to be 120% or more of the maximum rotation speed.
A32	Excess current	Is activated when excess current is detected due to a grounding fault, short circuit, etc.
A33	Excess voltage	Is activated when the converter generating line voltage reaches 400 volts or above due to insufficient regeneration capacity.
A35	Command pulse frequency error	Is activated when the pulse train command's frequency exceeds 250 kpps.
A37	Parameter error	Is activated when parameters are detected to be outside the setting range through a parameter check performed when the power is turned on or the unit reset.
A50	Excess load	Is activated when current above the electronic thermal characteristics is flowing.
A52	Large error	Is activated when the deviation counter's standing pulse reaches 50K pulses or above.

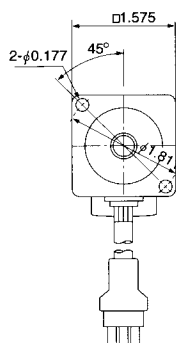
External Dimensions

Servomotor

● HC-PQ033~HC-PQ13



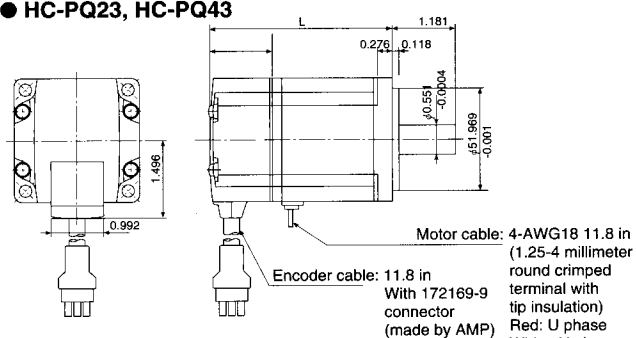
Note 1: When mounting the servomotor horizontally we recommend encoder connector is facing downwards.
Note 2: Use a friction coupling to fasten the load.



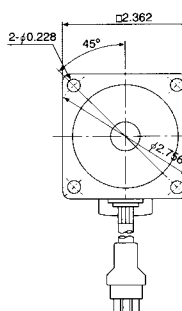
Model	Output (W)	Variable dimension L	Moment of inertia J (oz · in ²)	Weight (lb)
HC-PQ033	30	2.579	0.077	0.71
HC-PQ053	50	2.815	0.104	0.82
HC-PQ13	100	3.406	0.164	1.1

(unit: inch)

● HC-PQ23, HC-PQ43



Note 1: When mounting the servomotor horizontally we recommend encoder connector is facing downwards.
Note 2: Use a friction coupling to fasten the load.

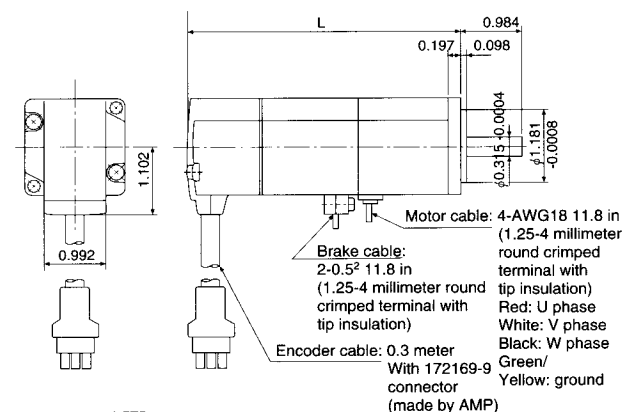


Model	Output (W)	Variable dimension L	Moment of inertia J (oz · in ²)	Weight (lb)
HC-PQ23	200	3.504	0.487	2.1
HC-PQ43	400	4.488	0.782	3.2

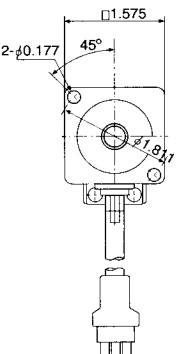
(unit: inch)

Servomotor with fail safe brake

● HC-PQ033B~HC-PQ13B



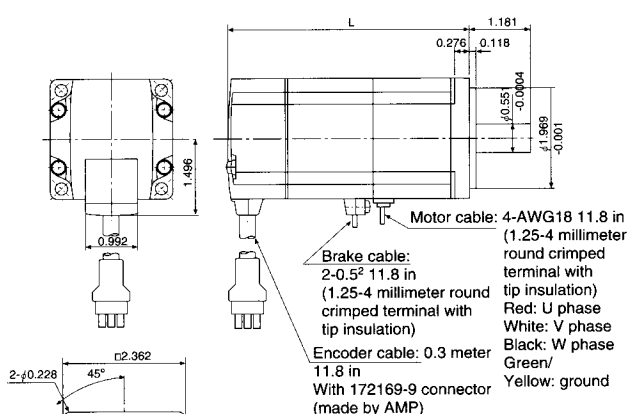
Note 1: When mounting the servomotor horizontally we recommend encoder connector is facing downwards.
Note 2: Use a compression type coupling to fasten the load.



Motor	Output (W)	L (in)	Braking static friction torque (oz · in)	Moment of inertia (oz · in ²)	Weight (lb)
HC-PQ033B	30	3.681	45.3	0.093	1.39
HC-PQ053B	50	3.917		0.12	1.52
HC-PQ13B	100	4.508		0.175	1.83

(unit: inch)

● HC-PQ23B, HC-PQ43B



Note 1: When mounting the servomotor horizontally we recommend encoder connector is facing downwards.
Note 2: Use a compression type coupling to fasten the load.

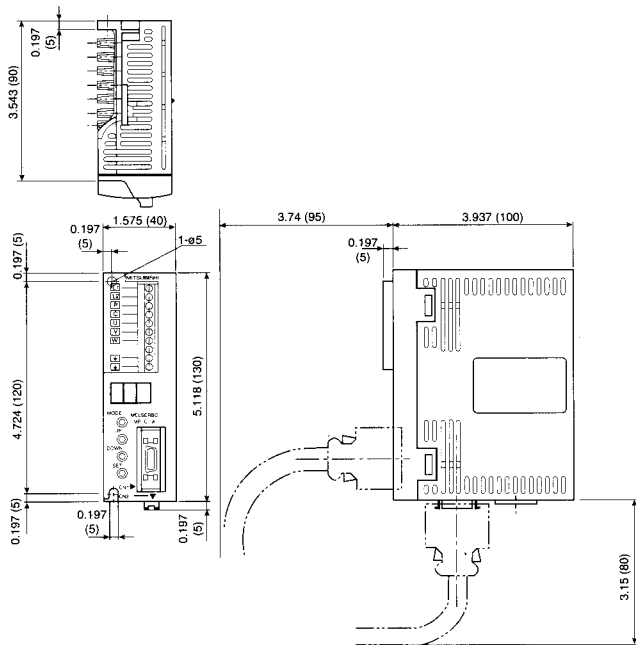
Motor	Output (W)	L (in)	Braking static friction torque (oz · in)	Moment of inertia (oz · in ²)	Weight (lb)
HC-PQ23B	200	4.764	184	0.744	3.53
HC-PQ43B	400	5.748	184	1.044	4.63

(unit: inch)

Servo-amplifier

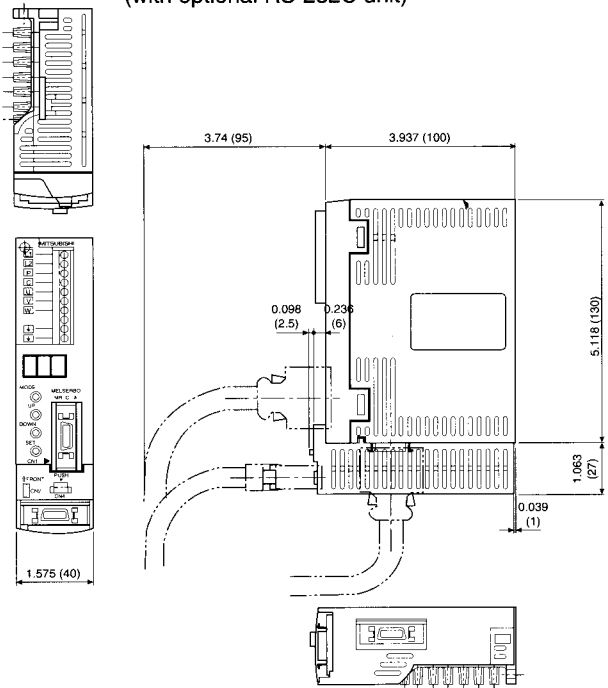
● MR-C10A, 20A, 10A1, 20A1 (without optional RS-232C unit)

in (mm)



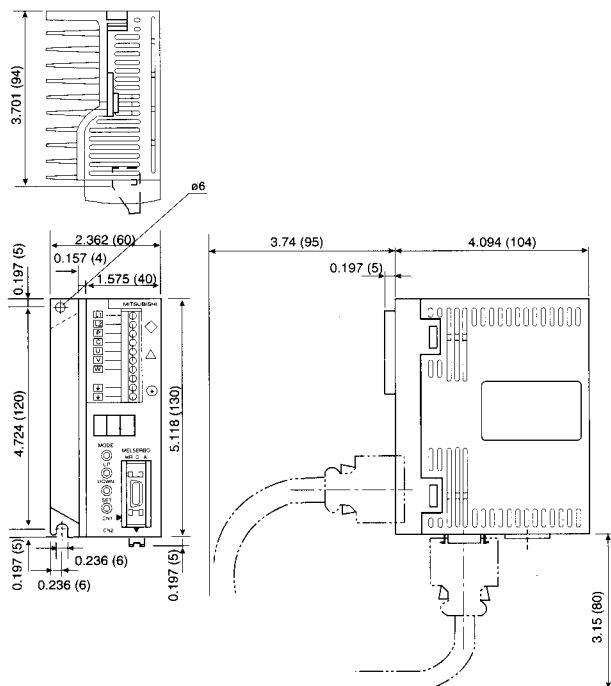
● MR-C10A, 20A, 10A1, 20A1 (with optional RS-232C unit)

in (mm)



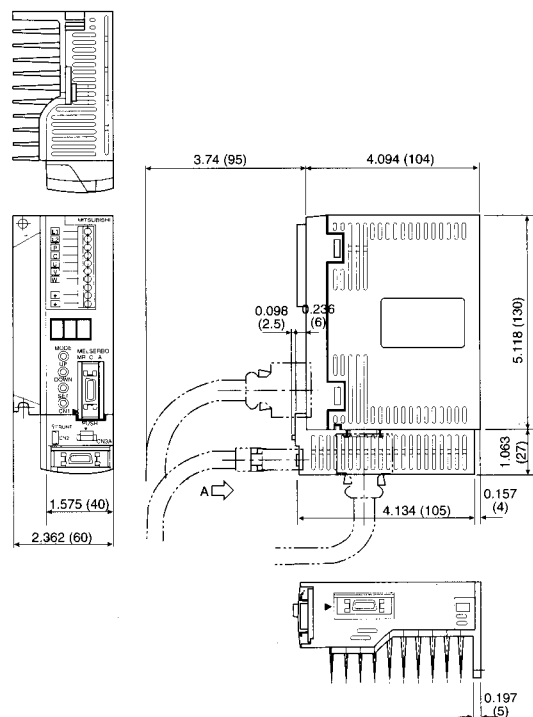
● MR-C40A (without optional RS-232C unit)

in (mm)



● MR-C40A (with optional RS-232C unit)

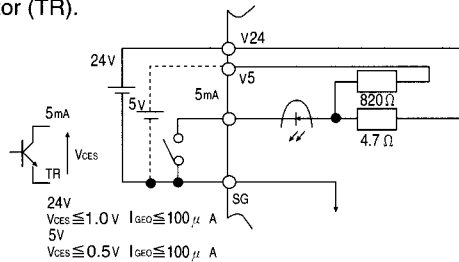
in (mm)



Interface signals

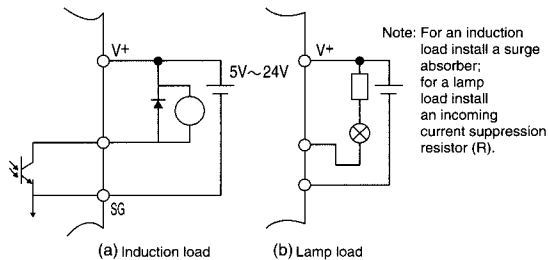
Digital input interface (DI-1)

Supply signal with a miniature relay or an open collector transistor (TR). ✓



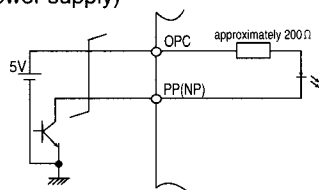
Digital output interface (DO-1)

Can drive a lamp, relay, or photocoupler.

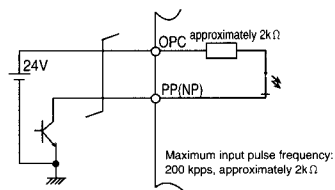


Pulse train input interface (DI-2)

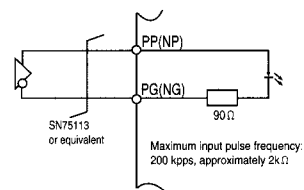
- Open collector method
MR-C ☐ L
(with 5V power supply)



MR-C ☐
(with 24V power supply)




● Differential line driver method
MR-C ☐ L, MR-C ☐



Explanation of Terminals

Terminal Block

Signal	Abbreviation	Terminal block	Description of function/application
Main circuit power supply	L1,L2	TE1	With the single-phase 100V series, connect to an AC 100-115V 50/60 Hz power supply; with the single-phase 200V series, connect to an AC 200-230V 50/60 Hz power supply.
Motor output	U,V,W		Connect to the U, V, and W terminals of the motor's power supply. If the motor and amplifier's phases are switched, they will not operate properly. Connecting to a commercial power supply will cause the amplifier to break down.
Regeneration brake resistor	P,C		Connect an optional regeneration unit (MR-RB013 or MR-RB033) between P and C when required.
Ground			Connect to the motor's ground terminal and a ground (type 3 ground or above).

Connector CN1

Signal	Abbreviation	Terminal number	Description of function/application	
Servo on	SON	17	To enable amplifier to switch-on, input terminal. Short circuiting between SON and SG causes power to flow to the base circuit. Disconnecting these terminals causes power to the base to be cut-off and the servomotor to enter a free running condition.	DI-1
Forward over-travel limit	LSP	15	Forward/reverse-over-travel signal input terminal. *Opening the connection between LSP and SG makes the unit unable to operate in a CCW direction, but able to operate in a CW direction. To operate in a CCW direction, short circuit between LSP and SG with a limit switch.	
Reverse over-travel limit	LSN	14		
Clear	CR	13	Clear signal input terminal. The position control counter is cleared with the edge of the short-circuit between CR and SG. Users can also select continuous clear during short circuits with parameter 6.	
Alarm	ALM	2	Alarm signal output terminal. When the power is turned-on, the protective circuit is activated, and if the base is cut off, the ALM-SG connection cannot be made. If everything is normal when the power is turned on, the connection is made.	
Positioning complete	PF	3	Positioning-complete signal input terminal. When the standing pulse is smaller than the in-position range parameter setting, the connection between PF and SG is made.	DO-1
Z-phase pulse	OP	4	Encoder signal input terminal. One pulse is output for each motor rotation. Minimum pulse width is approximately 800 μs. Set the clip speed to 100 rpm or less when using this pulse for return to origin.	
Forward (CCW) pulse train	PP	9	Forward/reverse-pulse-train signal input terminal. With an open collector method: Connect the + side of the 24V(MR- □), 5V(MR- □) power supply to the OPC open collector power terminal, and input the respective pulse trains to PP-SG and NP-SG. With a differential receiver method: Open the connection between the OPC open collector power terminal and SG, and input the respective pulse trains to PP-PG and NP-NG.	DI-2
		PG		
Reverse (CW) pulse train	NP	7		
	NG	8		
Open collector power supply	OPC	19	Open collector power supply input terminal. With an open collector method, connect this terminal to the + side of a 25V power supply (MR-C □ L), or 24V power supply (MR-C □) when inputting a pulse train. (Permissible deviation: ±10%)	
Interface power supply	V24	20	Supplies interface power to the digital input section. Connect the + side of the power supply to V24 when using 24V power supply (permissible deviation: ±10%) and V5 when using a 5V power supply (permissible deviation: ±10%)	
	V5	16		
Digital output power supply	V+	1	Connect the power supply that drives the digital output section between V+ and SG. A connection will be made internally to the output transistor protective diode.	
Interface power supply common	SG	5 12	COMMON terminal of the digital power supply (24V or 5V).	
Shield	SD	11	Connect to one end of the shield wire.	

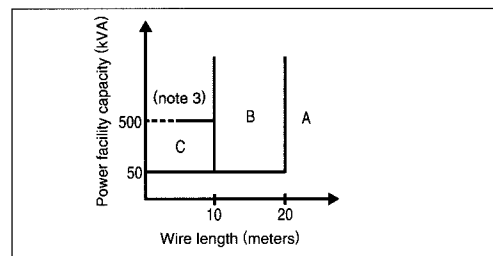
*Note: The LSP and LSN signals are automatically set to ON internally(at the time of shipping, so wiring is not required).
The signal can be activated from the parameters.

Selection of peripheral equipment

■ Electric wires, no-fuse circuit breakers, magnetic contactors

Servo-amplifier	No-fuse circuit breaker	Magnetic contactor (note 2)			Electric wire size (mm ²)		
		A	B	C	L1,L2 $\frac{\text{---}}{\text{---}}$	U,V,W $\frac{\text{---}}{\text{---}}$	P,C
MR-C10A MR-C20A MR-C10A1	5A NF-30	S-N18	S-N21	S-N21	3-core AWG 18 (0.75mm ²)	4-core AWG 18 (0.75mm ²)	2-core AWG 18 (0.75mm ²)
MR-C20A1 MR-C40A	10A NF-30	S-N18	S-N21	S-N21	3-core AWG 18 (0.75mm ²)	4-core AWG 18 (0.75mm ²)	2-core AWG 18 (0.75mm ²)

- Notes
1. Use tough rubber-sheathed cable for the electric wires. The standard length of the electric wires in the table is 30 meters.
 2. Select a magnetic contactor based on the relationship between the wire length and the power supply capacity (see diagram at right).
 3. Refer to technical reference materials when connecting directly beneath a large capacity transformer (500 kVA or greater, wire length of 10 meters or less).



■ Surge suppressors

Attach surge suppressors to the servo-amplifier and signal cable's AC relays, AC valves, and AC power supply brake. Attach diodes to the DC relays and DC valves.

Sample configuration

Surge suppressor: 972A-2003 504 11 (rated 200V, made by Matsuo Denki)
Diode: A diode rated four or more times greater than the relay's drive voltage/current, and two or more times greater than the current.

■ Data line filter

Attaching a data line filter to the pulse output cable or motor PLG cable of the pulse train command unit (AD75, etc.) is effective in preventing noise penetration.

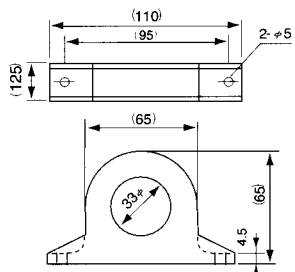
Sample configuration

Data line filter: ESD-SR-25 (made by Tokin),
ZCAT3035-1330 (made by TDK)

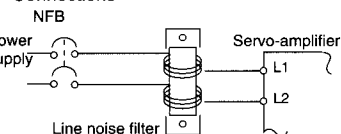
■ Line noise filter FR-BSF01

Effective in suppressing radio noise emitted from the servo-amplifier's power supply side or output side and high-frequency current leakage (zero-phase current). Especially effective in the 0.5 MHz to 5 MHz band. The greater the number of coils, the more effective this filter is.

External dimensions



Connections

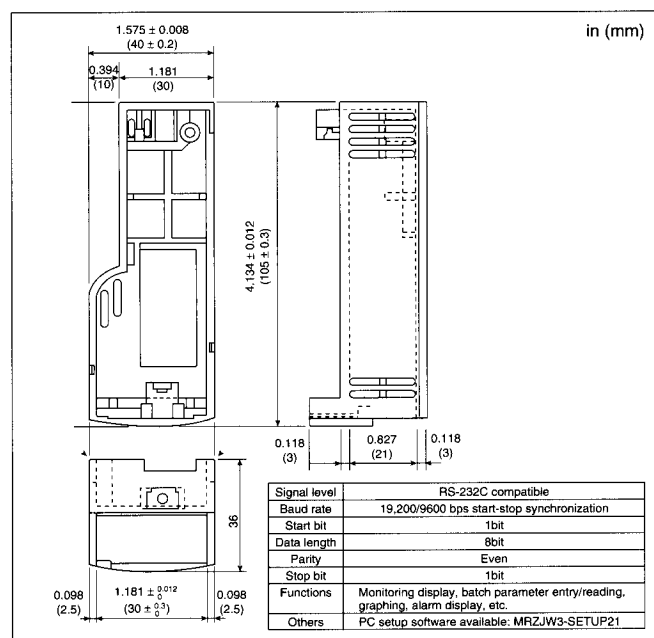


The servo-amplifier's input-side cable is wound three or more times in the same direction jointly for each phase.
When winding the output-side cable, do not wind more than three times.

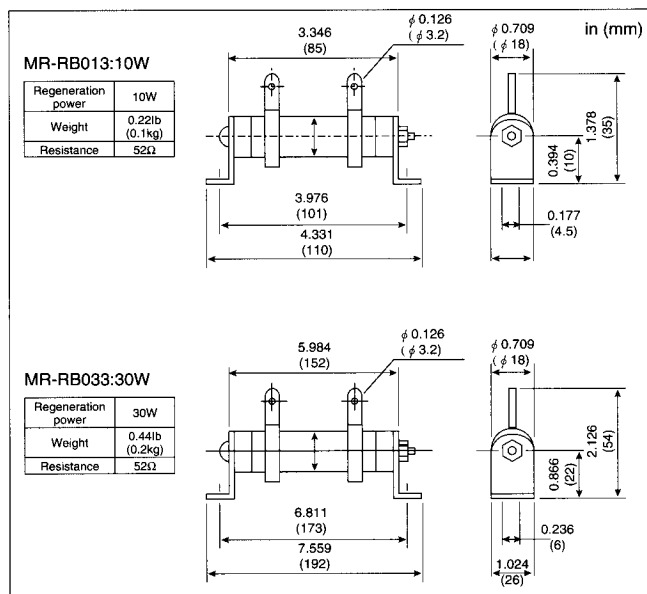
Peripheral equipment

Options

■ Optional RS-232C unit



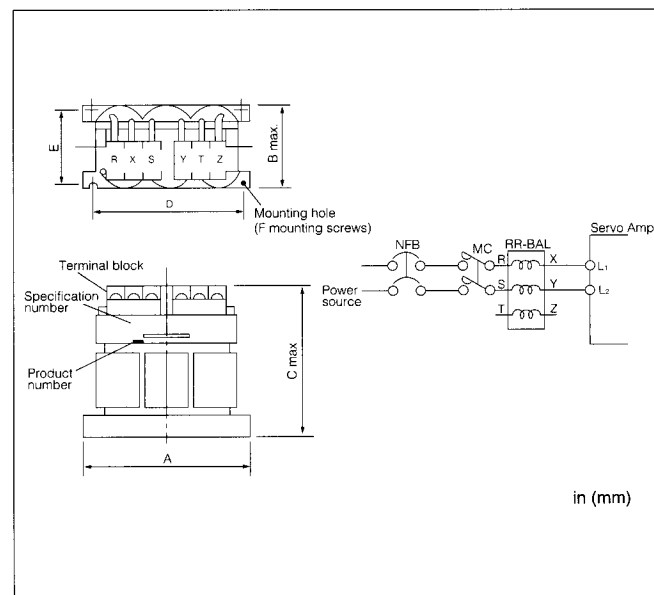
■ Optional regeneration unit



■ DIN rail attachment hardware (available soon)

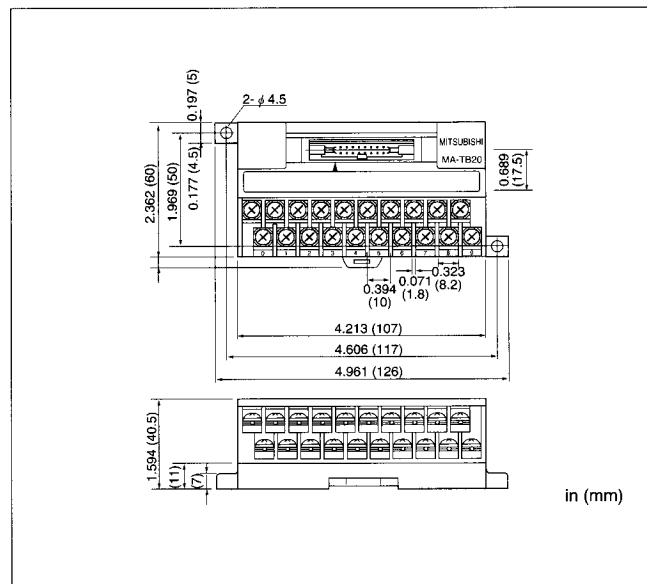
■ Power factor enhancing reactor (FR-BAL)

This power factor enhancing reactor, installed in line with harmonic suppression guidelines, makes it possible to boost a servo-amp's power factor and reduce its power capacity.



■ Junction terminal block (MR-TB20)

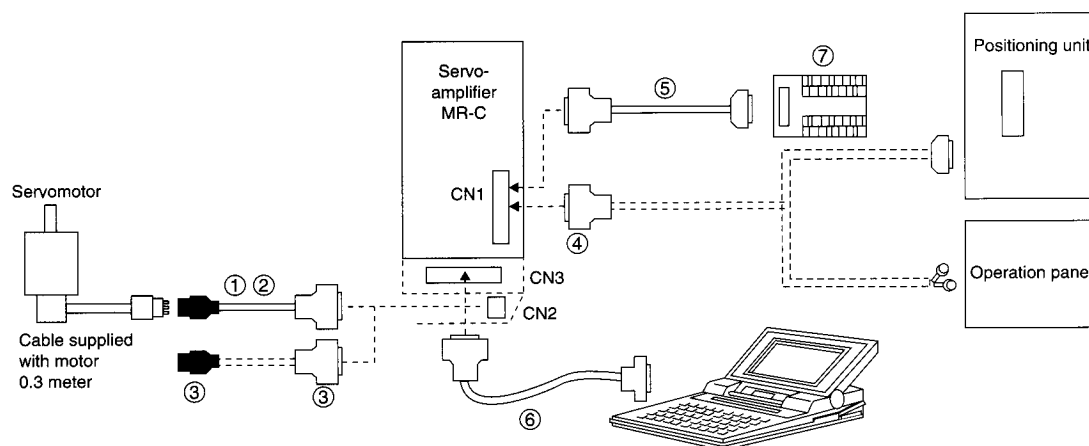
All signals can be received via this junction terminal block without connection to a CN1.



Options

Cables and Connectors

Cable and connector options are as shown in this diagram.



■ Cables and connectors

Select one for use with CN2	①	For use with HC-PQ series motors (30-200 watts)	MR-JCCBL□ M cable lengths inside box are 5 and 10 meters	Motor encoder	Junction connector (made by AMP) 1-172161-9 (connector)	Amplifier-side connector (made by 3M, or an equivalent product) 10120-3000VE (connector) 10320-52F0-008 (shell kit)
	②	Extended life cable for use with HC-PQ series motors (30-200 watts)	MR-JCCBL□ M-H cable lengths inside box are 5 and 10 meters	Motor encoder	Junction connector (made by AMP) 1-172161-9 (connector)	Amplifier-side connector (made by 3M, or an equivalent product) 10120-3000VE (connector) 10320-52F0-008 (shell kit)
	③	Encoder connector sets for use with HC-PQ series motors	MR-CCNS		Junction connector (made by AMP) 1-172161-9 (connector)	Amplifier-side connector (made by 3M, or an equivalent product) 10120-3000VE (connector) 10320-52F0-008 (shell kit)
Select one for use with CN1	④	CN1 connector	MR-CCN1			Amplifier-side connector (made by 3M, or an equivalent product) 10120-3000VE (connector) 10320-52F0-008 (shell kit)
	⑤	Junction terminal block cable. (note)	MR-CTBL05M	CN1 to terminal block cable-0.5 meter.		
For use with CN3	⑥	Serial communications cable	MR-CPCATCBL3M	Connector for optional RS-232C unit (made by 3M, or an equivalent product) 10120-3000VE (connector) 10320-52F0-008 (shell kit)		Connector to DOS/V PC GM-9LM (made by Honda Tsushin)
	⑦	Junction terminal block	MR-TB20	Use with cable above.		

Note Also available is MR-CCN1CBL3M. CN1 connector to separate wires-3meters

Electromagnetic Brake Specifications

Compatible motor		HC-PQ033B	HC-PQ053B	HC-PQ13B	HC-PQ23B	HC-PQ43B
Type		Dry, non-excitation operation				
Rated voltage		DC24V				
Static friction torque (N•m) (oz•in)		0.32 (45.3)			1.3 (184)	
Rated current (A) at 20°C		0.26			0.33	
Coil resistance (Ω) at 20°C		91			73	
Power consumption (W) at 20°C		6.3			7.9	
Weight (kg)(lbs)		0.2 (0.4)			0.4 (0.9)	
Moment of inertia J (kg•cm ²) (oz•in ²)		3x10 ⁻³ (1.6x10 ⁻²)			4x10 ⁻² (0.219)	
Permissible braking work capacity	(N•m/time) (oz•in/time)	5.6 (793)			22 (3115)	
	(N•m/Hr) (oz•in/Hr)	56 (7930)			220 (31150)	
Brake life (note) (braking capacity per brake)		20,000 times (4 N•m) (566 oz•in)			20,000 times (15 N•m) (2124 oz•in)	

Note Because the brake gap cannot be adjusted, brake life is defined as the interval until brake readjustment becomes necessary.

Setup Software

■ MRJW3-SETUP (English) software

With this software everything from setup to monitoring, diagnostics, parameter entry and recall, and test operation can be performed easily with a personal computer. To use this software the optional RS-232C unit must be attached to the servo-amplifier. Version 21 and above can be used with the MR-C series.

■ Features

(1) Windows 3.1, Windows 95 compatible

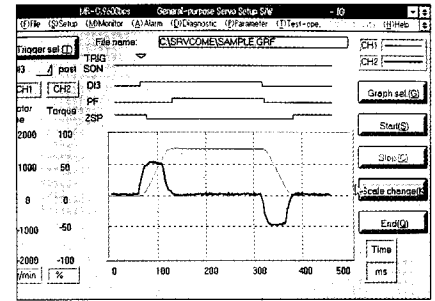
Compatible with PCs running Microsoft Windows 3.1 (see note 1), Windows 95. Setup can be performed with a PC.
 Required memory: 4MB (more recommended)
 Required hard disk space: 1MB (more recommended)
 Serial port required

(2) Wide range of monitoring functions

Equipped with graphing functions capable of displaying servomotor status through input signal triggers, such as command pulse, standing pulse, and rotation speed.

(3) PC test operation

Servomotor test operation can be performed easily with a PC.



No.	Name	Value	Unit	Setting range
1	Motor type	11		0000-FFFFh
2	Servo type	0002		0000-0E6Eh
3	Function selection 1	0000		0000-1111h
4	Com. pulse fac (numerator)	1		1-50000
5	Com. pulse fac (denominator)	1		1-50000
6	Imposition range	100	pulse	0-50000
7	Position control gain 1	22	rad/sec	4-1000
8	Pos. com. acc/decel time const.	3	ms	0-50000

■ Specifications (those inside parentheses are not available with the MR-C)

Function	Description
Monitoring	Comprehensive display, high-speed display, graphing
Alarm	Alarm display, alarm history, (alarm data display), (pre-alarm graph display)
Diagnosis	DI/DO display, (display of reasons for failure to rotate), (time setting display), (cumulative power on display), software number display, tuning data display, (ABS data display), (VC automatic offset display)
Parameters	Data setting, list display, list display of changes, detailed information display, (feed method selection [see note 2])
Test operation	JOG operation, (positioning operation), (motor-less operation), DO forced output, (programmed operation through simplified language), (one-step feed [see note 2])
(Point data [see note 2])	(Comprehensive position/speed block data display, data setting, teaching function)
File management	Data entry/saving, printing
Other functions	(Automatic operation), help display

- Notes 1. Windows is a trademark of the Microsoft Corporation
 2. Available with MR-H-AC
 3. This software may not operate properly on all personal computers.



Safety Cautions

- To ensure safe and correct use, read the "Operation Instruction Manual" in advance.
- Mitsubishi Electric general-purpose inverters are not designed or manufactured for use in machines or systems which are utilized in conditions which may be dangerous to human beings. The Mitsubishi Electric marketing service division should be contacted if studies are being conducted on the use of the products detailed here in machinery or systems for passenger transportation, medical treatment, aerospace, nuclear power, electric power, submarine relays and other specialized uses.
- These producers are manufactured under rigid quality controls. However in the interest of preventing serious accidents every possible safety measure should be adopted in the event on application on important equipment in which a failure of the inverter could be dangerous to human beings, or for which failure would result in major damage.
- Avoid load other than three-phase induction motors.