BS Controller for AC SERVO PRESS Instruction Manual

Introduction

Thank you very much for purchasing our Servo press.

This manual describes the hardware scheme, installation procedures, connections, running, operations, communication, status display and daily inspections.

Make sure to thoroughly understand the contents and use the product properly.

Request

We have taken all possible measures to ensure the contents of this instruction manual, however, please contact us if you have any questions or find any errors.

* To secure safety and quality, never fail to refer to this manual.

Table of contents

1. For safe use

1.1. Regarding symbols

Symbols are used to provide warnings in this instruction manual and for indication for proper product use and to prevent danger to the user or other people and damage to property from occurring. Understand the indication meanings before reading this manual.

1.2. Observe the following for safety

 DANGER	**This symbol assumes the possibility that accidental death or serious injury may occur immediately to the user, if the symbol is neglected and the product is incorrectly handled.**
The power source is as high as 200V. Look out for electric shock.	

 WARNING	**This symbol assumes that there is a potential for personal death or injury if this expression is ignored and this product is mishandled.**
In a case where the product is used in an application in which an accident resulting in death or injury or a serious expansion of damage is predictable, take safety measures such as installing a fail-safe device.	
Do not use around combustible gas. If disregarded, it may lead to an explosion.	
In a case of handling cables and connectors, etc., cut off the power temporarily without fail. If disregarded, it may lead to an electric shock.	
Do not remove the cover, disassemble, repair or modify the product. If disregarded, it may lead to an electric shock.	
Make sure to connect the protection conductor terminal to ground. Electric shock might be caused.	
Do not touch the power supply terminal in this equipment within five seconds after the power is turned off. It could cause the electric shock.	
Do not forcibly twist, pull or scratch the power cord or cord of the AC plug.	

CAUTION	**This symbol assumes that there is a potential for personal death or injury if this expression is ignored and this product is mishandled.**
Please use this product under the environment of overvoltage category II specified in IEC 60664-1.	
Please use this product under the environment of Pollution Degree II specified in IEC 60664-1.	
For the operation, stop, and emergency stop shall be done in the final machinery into which this equipment is incorporated.	
This product will surely be in a servo off state, when it is in an alarm state. However, battery alarm is excepted.	
Set up the emergency stop and interlock circuit with the external circuit. This allows to prevent expansion of damage.	
Use the input voltage, frequency and output voltage, and current within the standard. If disregarded, it may lead to an accident or electric shock.	
Do not use the product at over the specified ambient temperature. If disregarded, it may lead to fire or electric shock.	
Use in an environment without condensation due to water or moisture. If disregarded, it may lead to an electric shock.	
When output cannot be obtained, or any other abnormality is found during operation, stop use immediately. It may lead to electric shock. Contact the distributor where you purchased the product or our company's sales office without fail.	

1.3. Caution on attachment and use.

WARNING	**This symbol assumes that there is a potential for personal death or injury if this expression is ignored and this product is mishandled.**
Installation, connection, driving and operation, check and failure diagnosis shall be done by a qualified technician.	
Do not move, install, connect and check this equipment while the power is on. Please make sure the power is turned off for conducting these works.	
For installation requirements of this equipment, protection against electric shock is class Ⅰ, and equipment mobility is a stationery equipment for indoor installation. Please make sure this equipment is grounded when installed. (PE should be marked at the protective earthing terminal.)	
This equipment shall be stored in a dustproof and drip-proof controlled box. (IP54 class) If the performance of dustproof and drip-proof is not strong enough, dielectric strength shall be decreased, and the potential of dielectric breakdown shall be increased.	
The cross-sectional area of the protective bonding conductor shall be the same size as the input power wire for this equipment.	
Do not tighten the Servo press control cable excessively with binding band. Malfunction might be caused.	
The electric shock protection from the power supply terminal block of this equipment to final machinery shall be provided in the final machinery.	
For 24 VDC power supply, use SELV power supply which comply with IEC standard.	
A breaker that comply with IEC Standard shall be installed in the final machinery into which this equipment is incorporated,for the short-circuit protection of this equipment.	
The methods of the ground fault protection of this equipment are as follows: a) For the TT grounded system: Use an earth leakage breaker (Type A or B shall be used) b) For the TN grounded system: Use an over current breaker generally. (The fault loop	

impedance in the final equipment shall satisfy the overcurrent characteristics of the breaker so that the breaker shall be interrupted within 0.4s or less when earth fault is occurred.)

 CAUTION	**This symbol assumes that there is a potential for personal death or injury if this expression is ignored and this product is mishandled.**
When attaching the CPS body, allow a space of 25 mm or more for the right and left directions and 80 mm or more for up and down directions for cooling.	
Do not apply more load on the Servo press tool than allowed. The life might be considerably shortened.	
For connection to the protective earthing terminal, one wire should be provided for each terminal.	
The insulation's color of the protective earthing conductor shall be green-and-yellow.	
Design the sequencer circuit under consideration of safety measure such as emergency stop.	

1.4. Make sure to observe for sequencer circuit

Safety measure

 WARNING	**This symbol assumes that there is a potential for personal death or injury if this expression is ignored and this product is mishandled.**
Insert or pull off the connector only after turning off the power. Otherwise, controller might fail.	
Improper understanding of stroke might cause serious accident. Please understand the Section 8 in this manual to handle.	

1.5. EMC directive

The EMC directive applies not to the servo units alone but to servo-incorporated machines and equipment.

This requires the EMC filters to be used with the servo-incorporated machines and equipment to comply with the EMC directive.

Please ask a concrete solution to our office.

1.6. Others

This equipment is classified into the partly completed equipment according to Machinery Directive (2006/42/EC). Therefore, after this equipment is incorporated into the final machinery, conformity with Machinery Directive (2006/42/EC) shall be needed in the final machinery.

CE marking based on Machinery Directive is not done to the partly completed machinery. Therefore, for the case that circulates by the partly completed machinery until this equipment is incorporater into the final machinery in Europe. It is necessary for the declaration of incorporation and the manual of this equipment to be appended to this equipment

1.7. The relation with the Mitsubishi Electric servo system

BS controller works as a higher rank controller of Mitsubishi Electric servo system MR-J3A.

Please refer to the manual of the Mitsubishi Electric issue about the details of a MR-J3A system.

2. Before use

2.1. Characteristics of Servo press

The Servo press provides new production controls, press methods and other actions by programmable operations, controls and monitoring of the load and stroke amount. The characteristics are given below.

2.1.1. Possible to record program execution result

Up to 2700 pieces of data of press results can be recorded inside the BS Controller.

By using communications software, infinite data can be recorded.

2.1.2. Programmable action possible

Among factors such as speed, load stroke, time and communications with external I/O, the programmable factor is what primarily concerns the customer.

(Refer to the BS Configurator Instruction Manual)

2.1.3. Display of load and stroke during program execution and Graph display

By using special communications software, the values of load and stroke can be monitored. The electric current can also be monitored by selecting the details screen. A graph can be displayed after actions and detailed information can be obtained.

2.2. The suiting tool

Big-sized servo press controller BS-M3A works as a higher rank controller of Mitsubishi Electric servo amplifier MR-J3A. The combination of servo amplifier and a motor is decided according to the adaptation load of a tool.

Tool type	Adaptation load (kN)	Servo amplifier	Motor
BS100 series	100	MR-J3-500A	HC-RP503(B)K
BS200 series	200	MR-J3-700A	HF-SP702(B)K

2.3. Accompanying items

- BS-M3A-1B main body
- A set of plug for CN34 (EMERGENCY)

  Maker：Phoenix contact　Model：MC1.5/2-STF-3.81
- A set of plug for CN10 (DC power supply)

Maker：Phoenix contact　Model：MC1.5/3-STF-3.81

- Backup battery(CR2032WK13)
- Operating manual(CD-R)
- MR−J3A

2.4. About the model name and the version

The characters which follow the basic model name are explained. At BS-M3A-1B-zz, zz expresses Anybus option.

2.4.1. Anybus option

Code	説明
None	No Anybus option,PIO
CC	CC-Link
DV	DeviceNet
PF	Profibus DP
EI	EtherNet/IP
PN	PROFINET I/O

3. Specifications

3.1. Specifications of BS-M3A-1B

Items		Contents
Outline		Refer to outline diagram on the Appendix（Section 4）
Environment	Temperature	0～50℃
	Humidity	85% or less (No condensation)
	Altitude	Altitude 1000 m or lower
	Installing location	Harmful places with corrosive gas, cutting oil, metal powder, oil etc., are not allowed.
Power for control		DC24V±10%
Power consumption [W]		6 *1
Installing procedures		Installing on back panel
Vibration proof		0.5G（10～50Hz）
Shock proof		5G
Serial communications RS-485		115.2kbps occupied by MR-J3A
Serial communications RS-232C		19.2～76.8kbps dedicated protocol
Ethernet		UDP/IP Fixed IP address
Load cell accuracy		±1.5%@Tool rating (in a state without an overhang load)
Load sensor resolution		12Bit
Input signals		Start,Reset,P-No. Select,User in etc. Capacity of photo coupler 24V, 4.8mA, Filter time constant 50ms
Output signals		Ready,Run,Judge,Alarm,User out etc. Capacity of photo coupler 24V、30mA
Status indicator		LEDs(Charge,Status,Code,OK,NG,DC Power,Ethernet)
Cable length		Maximum 30 m
Executing program		31 points
Executing result storing function		For 2700 times

*1 It is only BS-M3A-1B. MR-J3A is not included.

3. 2. Specifications fo brake

A tool can be equipped with the brake for position maintenance as an option. The brake is released by electric current at DC24V after 0.2 second from turning on it. Control of a brake is not performed by BS controller. Please control by PLC side.

Tool type	Power consumption	Maintenance force [kN]
BS100	24V/7W	2.5
BS200	24V/19.4W	23.4

3.3. Common specification of MR-J3A

Specification common to MR-J3-500A and MR-J3-700A is indicated. *1

Power supply	Voltage/frequency	3-phase 200 to 230VAC, 50/60Hz
	Permissible voltage fluctuation	AC170～253V
	Permissible frequency fluctuation	Within 5%
Control circuit power supply	Voltage, frequency	1-phase 200 to 230VAC, 50/60Hz
	Permissible voltage fluctuation	AC170～253V
	Permissible frequency fluctuation	Within 5%
	Input	45W
	Inrush current	30A (Attenuated to approx. 0A in 3ms)
Interface power supply	Voltage, frequency	DC24V±10%
	Power supply capacity	300mA
Control System		Sine-wave PWM control, current control system
Dynamic brake		Built-in
Protective functions		Over current shut-off, regenerative over voltage shut-off, overload shut-off (electronic thermal relay), servo motor overheat protection, encoder error protection, regenerative error protection, under voltage, instantaneous power failure protection, over speed protection, excessive error protection

*1 It is posting from the data of Mitsubishi Electric. Please refer to the **MR-J3- A** SERVO AMPLIFIER INSTRUCTION MANUAL for details.

3.4. Specification peculiar to the tool type

3.4.1. BS100 series

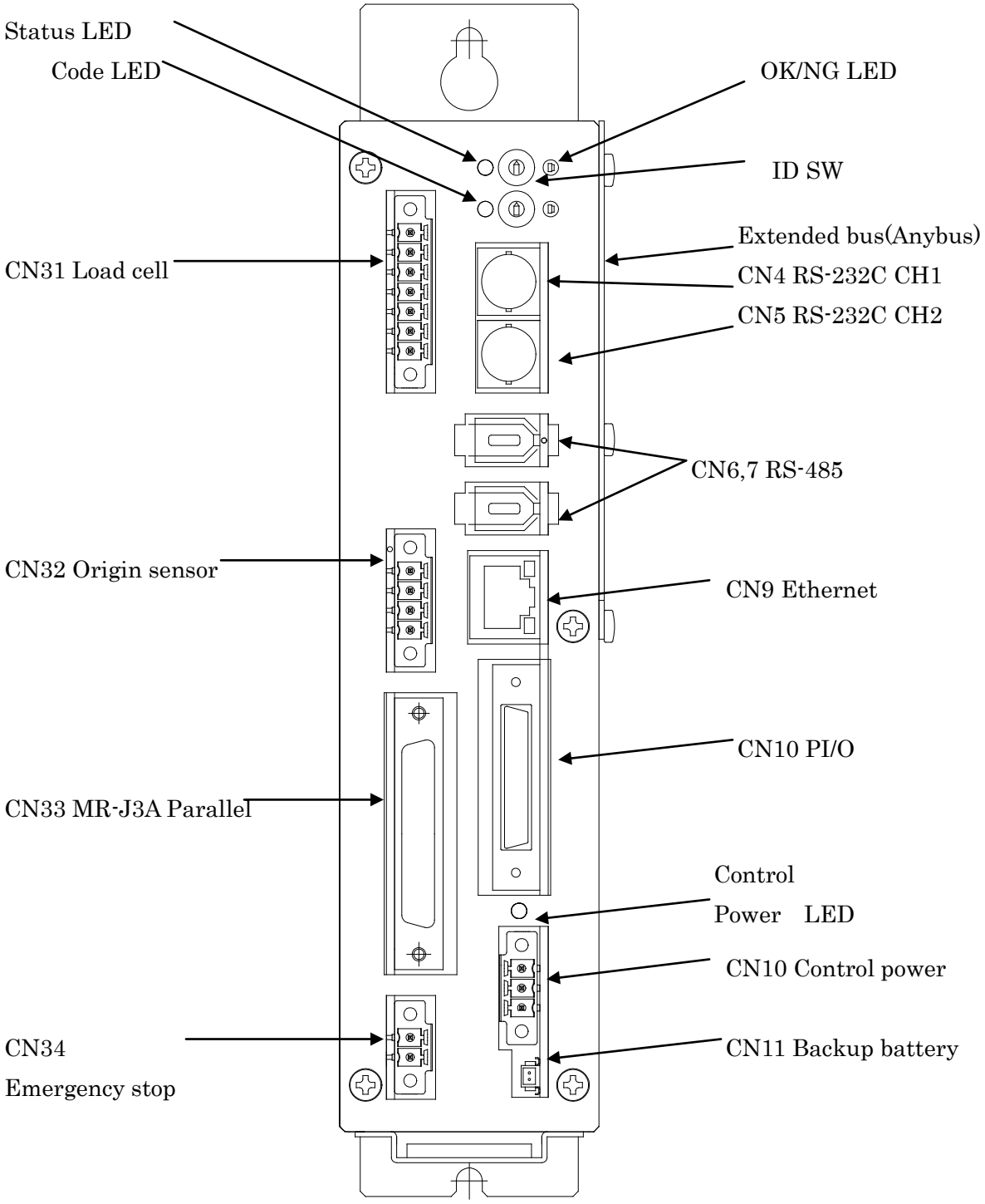
Servo motor		HC-RP503(B)K
Servo amplifier		MR-J3-500A
Power supply capacity		7.5kVA
Servo amplifier-generated heat[W]	At rated torque	195W
	With servo off	25W
Area required for heat dissipation		3.9m²
Power supply Inrush Currents (A0-p)		44A (Attenuated to approx. 20A in 20ms)

3.4.2. BS200 series

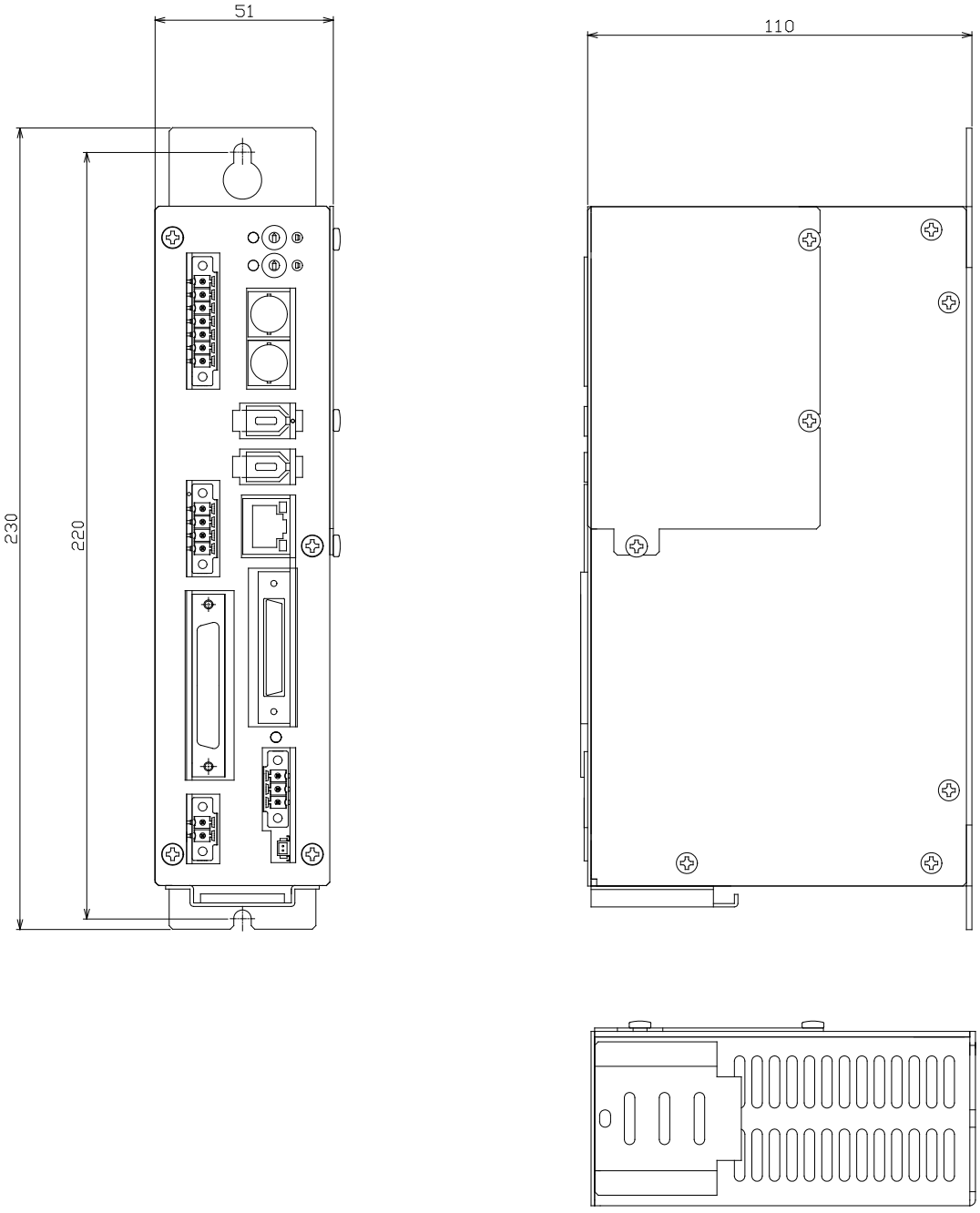
Servo motor		HF-SP702(B)K
Servo amplifier		MR-J3-700A
Power supply capacity		10.0kVA
Servo amplifier-generated heat[W]	At rated torque	300W
	With servo off	25W
Area required for heat dissipation		6.0m^2
Power supply Inrush Currents (A0-p)		88A (Attenuated to approx. 20A in 20ms)

4. Construction

4.1. Name of each part of the controller



4.2. Outline



4.3. Connection figure (include options)

4.3.1. BS100

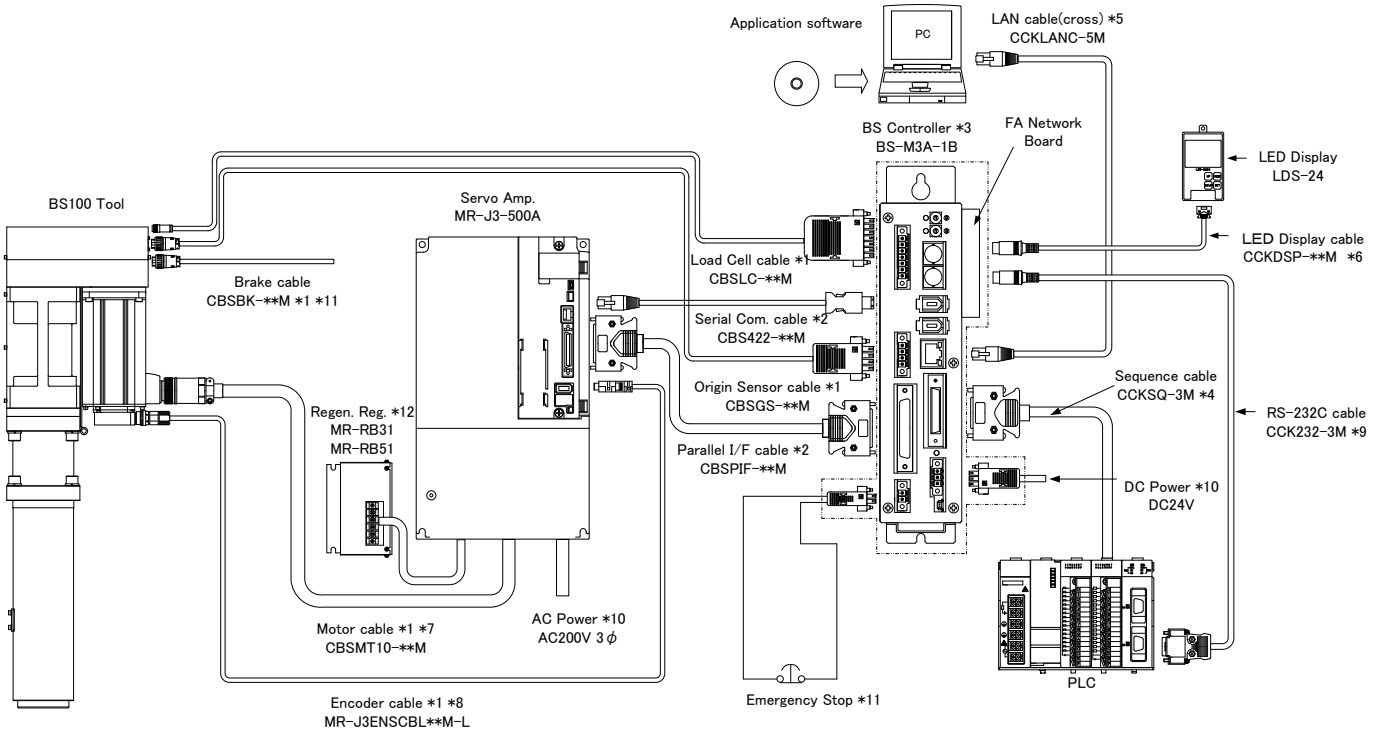


Fig.4-3-1 BS100 Series

*1 The length of a cable is selectable from 5,10 and 20m. The junction cable is not prepared.

*2 The length of a cable is selectable from 0.5 and 1m.

*3 The connectors in a dashed line are included to the controller set.

*4 This is unnecessary when using a FA Network Board.

*5 The type of LAN cable may not be crossing when using a HUB.

*6 The length of a LED Display cable is selectable from 5 and 10m.

*7 The model name of movable cable is CBSMT10R-**M.

*8 The model name of movable cable is MR-J3ENSCBL**M-H.

*9 Detail of the model name is different for each PLC type.

*10 A customer prepares cables.

*11 A customer controls this line.

*12 A external regeneration resister is an option.

4.3.2. BS200

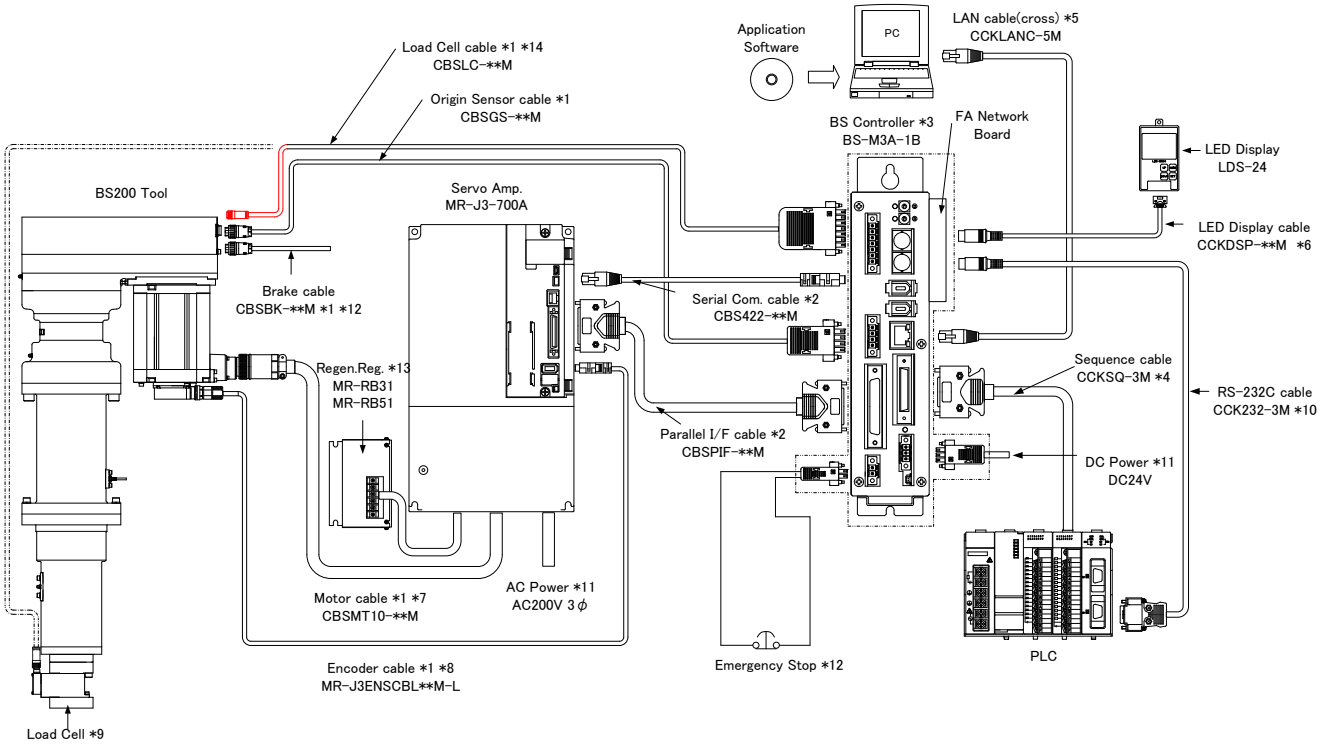


Fig.4-3-2 BS200 Series

*1 The length of a cable is selectable from 5,10 and 20m. The junction cable is not prepared.

*2 The length of a cable is selectable from 0.5 and 1m.

*3 The connectors in a dashed line are included to the controller set.

*4 This is unnecessary when using a FA Network Board.

*5 The type of LAN cable may not be crossing when using a HUB.

*6 The length of a LED Display cable is selectable from 5 and 10m.

*7 The model name of movable cable is CBSMT20R-**M.

*8 The model name of movable cable is MR-J3ENSCBL**M-H.

*9 The load cell is an option.

*10 Detail of the model name is different for each PLC type.

*11 A customer prepares cables.

*12 A customer controls this line.

*13 A external regeneration resister is an option.

*14 A model without a load cell needs a load cell cable to recognize a tool type.

5. Installation

5.1. Procedures for installing to control panel

5.1.1. Designing conditions for control box

Please be advised that the control box meets the general safety specifications.
Take the following into consideration.

1. The control box to house the BS should be a dustproof and drip-proof structure.
2. Temperature in the control box should be from 0 to 50° C.
   Heat generating amount of the BS depends on the operating status of the Servo press. Install a fan, heat exchanger and heat radiation fin according to the heat generating amount in the control panel.
3. Make sure to apply sealing to the cable outlet and window portion.
4. Consider mounting of the BS so that maintenance such as inspection and removal is easily carried out.

5.1.2. Cautions when installing BS

When installing the main body of the BS, secure space of more than 25 mm (for cooling) on both sides and more than 80 mm (for removal) above and under the main body. Moreover, space 100mm or more is required for a front side because of connectors.

5.1.3. The interval with MR-J3A

Please make BS controller and MR-J3A adjoin. A connection cable should give 50cm or less as a standard.

5.1.4. Noise Filter of MR-J3A

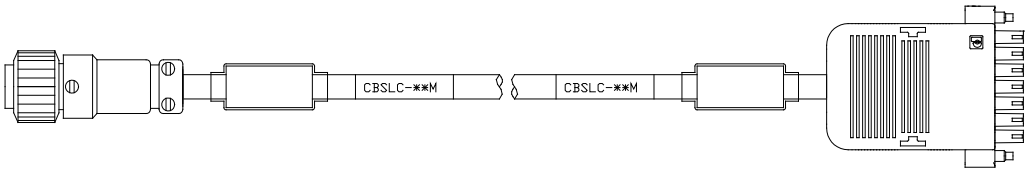
Please be sure to insert a line noise filter in AC power supply of MR-J3A.

6. Installing lines

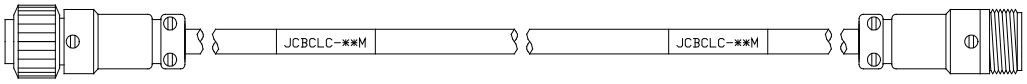
6.1. Load cell i/f(CN31)

It is used for the communication with strain gauge amplifier. The signal level is an equivalent for RS-422. There is no necessity for connection in the system without a load cell.

Cable type：CBSLC-**M(Basic Cable)



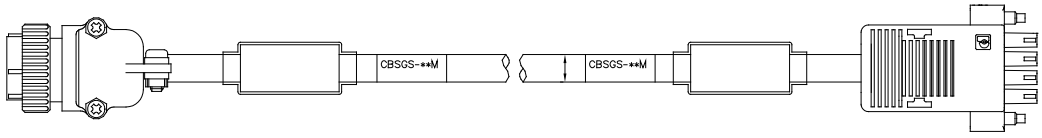
Cable type：JCBSLC-**M(Joint Cable)



6.2. Origin sensor i/f(CN32)

An origin sensor is connected. Although, as for this system, absolute encoder specification is also prepared, all tools are equipped with the origin sensor for the initial position setup.

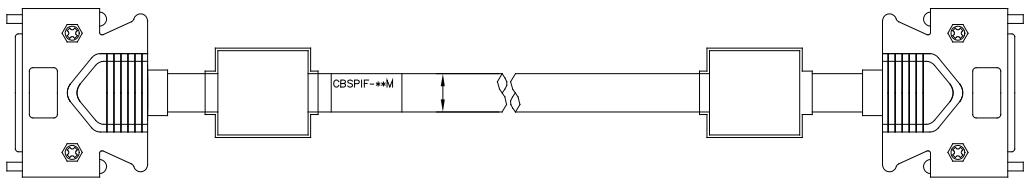
Cable type：CBSGS-**M



6.3. MR-J3A parallel i/f(CN33)

It connects with CN1 of MR-J3A. The position detection pulse of a motor and the position instruction pulse to MR-J3A are contained. In order to avoid the influence of a noise, short wiring is recommended as much as possible.

Cable type：CBSPIF-**M



6.4. Emergency stop(CN34)

An emergency stop SW is connected. The logic is normally closed. If it is made opened, an emergency stop will be output to MR-J3A.

6.5. RS-232C(CN4)

It is a general-purpose serial communication port. Since DC24V power supply is assigned, it is dangerous if it connects except an exclusive cable here. A setup of a protocol and a baud rate is performed from CPS SP Configurator.

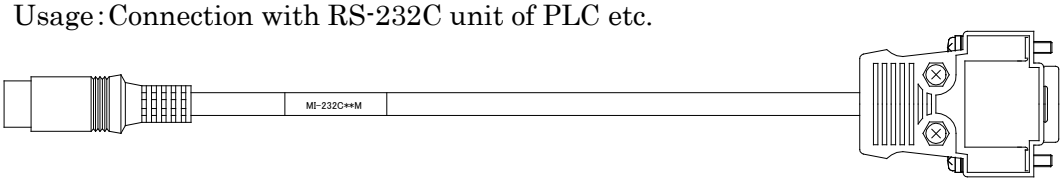
Controller side connector typr：HR12-10R-8SDL（HIROSE）

Pin number	Signal name	Contents
1	Rxd	
2	Txd	
3	RTS	
4	CTS	
5	S-GND	Signal GND
6		
7	P-GND	Power GND
8	24V	Power

Cable type：CCK232-**M(General)

：CCK232M-**M(Only for Mitsubishi Electric PLCs)

Usage：Connection with RS-232C unit of PLC etc.



6.6. RS-232C(CN5)

It is a general-purpose serial communication port. Since DC24V power supply is assigned, it is dangerous if it connects except an exclusive cable here. A setup of a protocol and a baud rate is performed from CPS SP Configurator.

Controller side connector type：HR12-10R-8SDL（HIROSE）

Pin number	Signal name	Contents
1	Rxd	
2	Txd	
3		
4		
5	S-GND	Signal GND
6		
7	P-GND	Power GND
8	24V	Power

6.7. RS-485(CN6,7)

It connects with CN3 of MR-J3A. Although two connectors are prepared for cascade connection, it cannot be used by 1:1. Please connect either of CNs 6

and 7.

The potential difference of GND for signals is permissible to 7V. When communication is not stabilized, please turn on GND for signals of the pin numbers 5 and 6 . If the metal cover of a right-hand side is removed toward BS controller and 3 and 4 of the dip switch SW4 on the substrate are turned on (above), GND for signals will become effective.

Cable type:

Controller side connector type:53462(Molex)

Pin number	Signal name	Contents
1	RD＋	
2	RD-	
3	TD+	
4	TD-	
5	S-GND	Signal GND
6	S-GND	Signal GND

Cable type:CBS422-**M

6.8. Ethernet(CN8)

It connects with a personal computer and exclusive application BS Configurator performs a setup of BS controller etc. The protocol is UDP/IP. They are 10 / 100M automatic change. It is necessary to make LAN setup of a personal computer into a fixed IP address.

The example of a setting IP address 192:168:1:1

Subnet mask 255:255:0:0

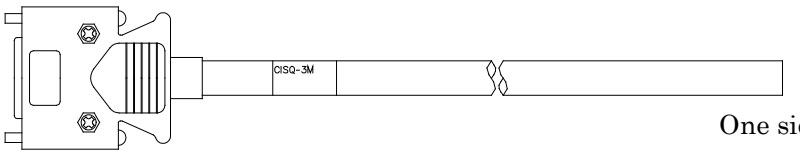
Please use a cross cable, when you connect a personal computer and CPS controller directly. Please use a straight cable, when you connect via a HUB.

6.9. Parallel I/O (CN9)

It connects with a sequencer etc. and BS is controlled.

Cable type:CCKSQ-**M

(Refer to the wiring diagram for CPS<=>PLC connection.)



One side is cut.

Connector:54306-3611(MOLEX)

6.9.1. Bit assignment

Input

Bit number	Signal name	Contents
0	STOP	Program execution is interrupted, then a scram is carried out. After performing speed zero for 0.2 seconds, it will be in a servo off state.
1	RESET	Alarm release and judgment output reset.
2	ORIGIN	Origin is started. Original position information disappears by start of origin.
3	START	Program execution is started.
4	USER_SEL	User output selection.
5	JOG_SPD1/U_IN0	Bit 0 of JOG speed specification binaries/user input 0, are superposed. When JOG_ENA is ON, JOG speed is specified in four stages with the input bit 6. When JOG_ENA is off, it becomes the user input 0.
6	JOG_SPD2/U_IN1	Bit 1 of JOG speed specification binaries/user input 1, are superposed.
7	JOG_ENA	JOG operation is permitted. Moreover, the output bit 3 is changed to BAT.ALARM.
8	PNO1/JOG+	The bit 0 of the binary value which specifies an execution program number/+ Direction JOG are superposed. When JOG_ENA is ON, JOG operation is carried out in the direction of +.
9	PNO2/JOG-	The bit 1 of the binary value which specifies an execution program number/- Direction JOG are superposed. When JOG_ENA is ON, JOG operation is carried out in the direction of -.
10	PNO4	The bit 2 of the binary value which specifies an execution program number.
11	PNO8	The bit 3 of the binary value which specifies an execution program number.
12	PNO16	The bit 4 of the binary value which specifies an execution program number.
13	SERVO_ON	Servo-on is directed to MR-J3A. In operation by PI/O, unless it is in a servo-on state, a system does not operate at all.*1
14	U_IN2	User input 2.
15	U_IN3	User input 3.

*1 On the tool operation screen and a program execution screen of BS Configurator, SERVO_ON signal are ignored.

Output

Bit number	Signal name	Contents
0	ALARM(N.C)	Alarm. It is normaly closing. It turns off in the state of alarm.
1	ALM_MR(N.C)	The alarm state of MR-J3A is shown. It is normal y closing.
2	READY	The completion of operation preparation.
3	IN_ORIGIN/BAT.ALARM	In origin mode/Battery alarm are superposed. BAT.ALARM is chosen when JOG_ENA is ON.
4	RUN	It turns on during program execution.
5	OK	O.K. judging output. The output timing of O.K./NG is a time of executing jdg command in a program.
6	NG	NG judging output.
7	IN_JOG/AREA1	Under JOG operation/Area signal1 are superposed. IN_JOG is chosen when JOG_ENA is ON.
8	P_ANS1/U_OUT0	The response of the bit 0 of binary value which specifies an execution program number/User output 0 are superposed. User outputs are chosen when USER_SEL is ON. It is the same to the bit 12.
9	P_ANS2/U_OUT1	The response of the bit 0 of binary value which specifies an execution program number/User output 1 are superposed.
10	P_ANS4/U_OUT2	The response of the bit 1 of binary value which specifies an execution program number/User output 2 are superposed.
11	P_ANS8/U_OUT3	The response of the bit 2 of binary value which specifies an execution program number/User output 3 are superposed.
12	P_ANS16/U_OUT4	The response of the bit 3 of binary value which specifies an execution program number/User output 4 are superposed.
13	U_OUT5	User output 5.
14	U_OUT6	User output 6.
15	USER_SEL_ANS	The response of USER_SEL.
16	BAT.ALARM	It is an output only for battery alarms. *1
17	ORIGIN_END	It turns on, when origin is completed. It turns off, when origin is required. *1
18	PJ_WAIT	When using a post judgment, it turns on in the state of waiting a judgement from a PC.
19	AREA2	Area signal 2.
20	AREA3	Area signal 3.
21	AREA4	Area signal 4.
22-31	RESERVED	

* Above bit16 can be used only when Anybus option is chosen. It is that PI/O (CN9)

suits from bit0 to bit15.

BS controller of version 1.02.23 or more is needed to use bit16 to bit18.

BS controller of version 1.02.31 or more is needed to use bit19 to bit21.

6.9.2. PIO connector pin assignment

A pin number, the wiring color of PIO cable, and a signal name are shown.

The shield line of a cable is connected to the connector shell by the side of a controller.

Connector (MOLEX : 54306-3611)

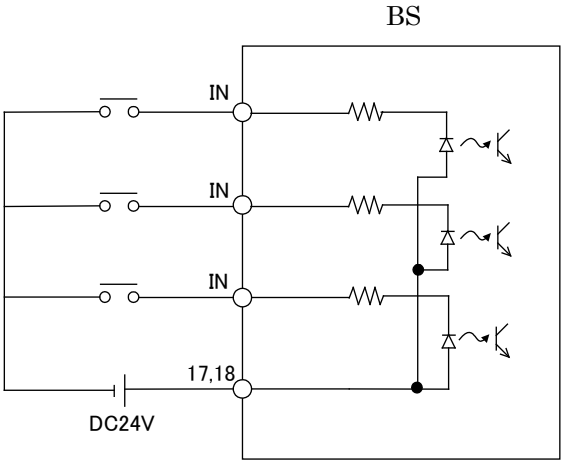
Connector shell (MOLEX : 54331-0361)

Cable (SUN LIGHTSX 0.2×18P)

PIN No.	Bit	Color	Signal name	PIN No.	Bit	Color	Signal name
1	I0	Gn	STOP	19	O0	LB/W	ALARM
2	I1	Br	RESET	20	O1	R/Bk	ALARM_MR
3	I2	Bl	ORIGIN	21	O2	Gn/Bk	READY
4	I3	Gy	START	22	O3	Br/Bk	IN_ORIGIN/BAT.ALARM
5	I4	Or	USER_SEL	23	O4	Bl/Bk	RUN
6	I5	Pr	JOG_SPD1/U_IN0	24	O5	Gy/Bk	OK
7	I6	Pn	JOG_SPD2/U_IN1	25	O6	Or/Bk	NG
8	I7	LB	JOG_ENA	26	O7	Pn/Bk	IN_JOG/AREA
9	I8	W	PNO1/JOG+	27	O8	LB/Bk	P_ANS1/U_OUT0
10	I9	Gn/W	PNO2/JOG-	28	O9	W/Bk	P_ANS2/U_OUT1
11	I10	Bw/W	PNO4	29	O10	Gn/R	P_ANS4/U_OUT2
12	I11	Bl/W	PNO8	30	O11	Br/R	P_ANS8/U_OUT3
13	I12	Gy/W	PNO16/U_IN4	31	O12	Bl/R	P_ANS16/U_OUT4
14	I13	Or/W	SERVO_ON	32	O13	Gy/R	U_OUT5
15	I14	Pr/W	U_IN2	33	O14	Or/R	U_OUT6
16	I15	Pn/W	U_IN3	34	O15	Pn/R	USER_SEL_ANS
17		R	+24V	35		Bk	0V
18		R/W	+24V	36		Bk/W	0V

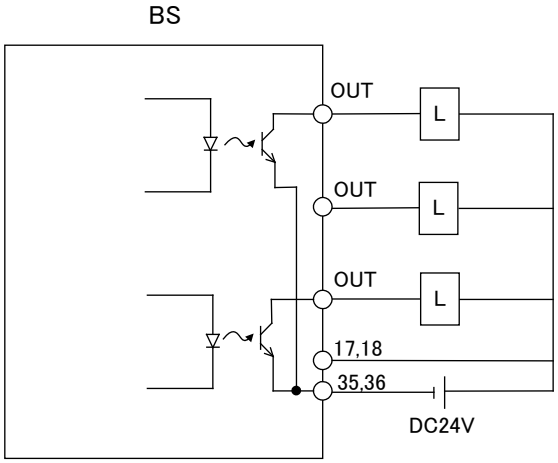
6.9.3. Wiring by the side of input

Common voltage is DC24V and serves as a photo-coupler input. (Current is about 5mA / 1 circuit.)



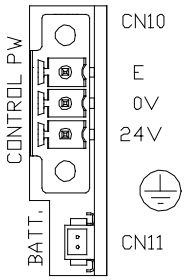
6.9.4. Wiring by the side of output

Open collector output (30mA / 1 circuit)



6.10. Control power supply (CN10)

Control power supply 24V are connected.



6.11. Backup battery (CN11)

The exclusive battery for SRAM backup is connected. Please connect a backup battery in the state of control power supply ON. Although the life of a battery is about five years, it changes a lot according to a use state and environment. If battery voltage is less than 2.1V, BAT.ALARM (parallel output 3) turns on. Even in such a case, inside information is held unless a control power supply is turned off.

Please attach for a red lead to upside.

6.12. Anybus

If the metal cover of the right side is removed toward CPS controller, the

connector for Anybus will appear. If it equips with Anybus card which HMS offers, control equivalent to PI/O will be attained by networks, such as CC-Link.

6.13. Brake

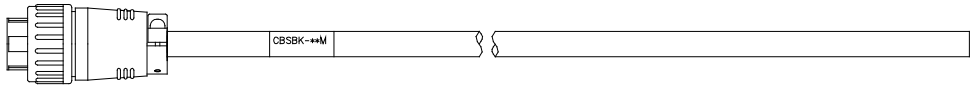
Although a tool with a brake can be chosen as an option, brake control is not performed by BS controller. Please control a brake by the user system side. A brake will be released if current is passed between a No. 1 pin and a No. 2 pin. The brake is completely released in 0.2 seconds after turning on the current. Please do not move the ram until the brake is released.

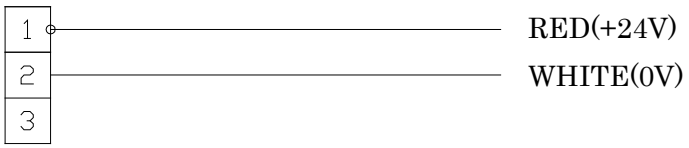
An option brake is an object for position maintenance to the last, and is not applicable to dynamic braking.

If a jig weight added to the ram exceeds several percent of the tool maximum thrust, the ram may fall naturally. In such a case, please use the brake for position keeping.

MR-J3A builds in the dynamic brake. A sudden stop is possible if an emergency stop (CN34) is opened.

Cable type：CBSBK−**M





6.14. Motor cable

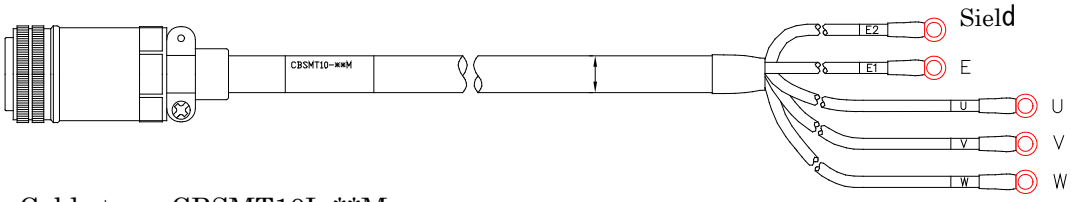
Please fully perform measure against a noise about the motor cable of MR-J3A.

Noise filters, such as a ferrite core, need to be attached.

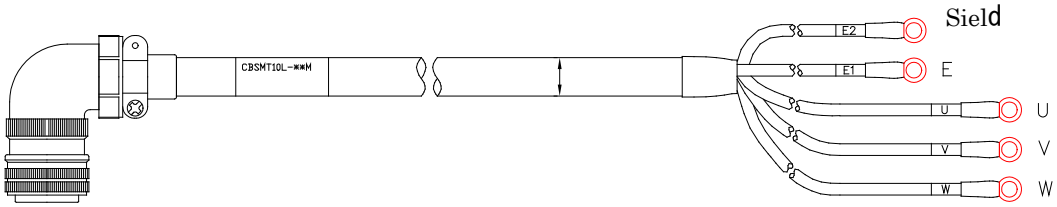
The cables for BS100 series

Cable type：CBSMT10-**M

Cable type：CBSMT10R-**M （Cable for movable）



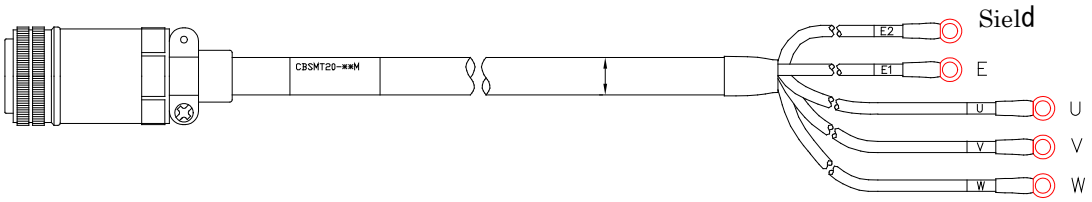
Cable type：CBSMT10L-**M



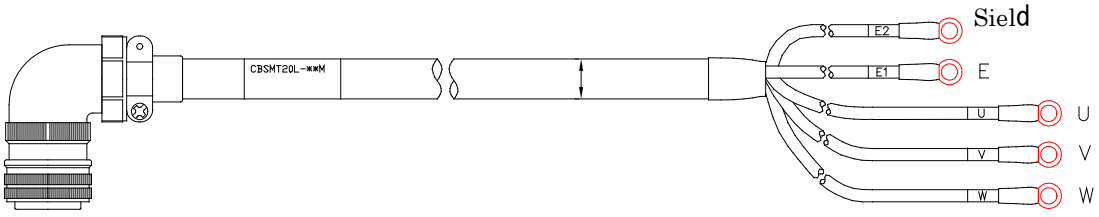
The cables for BS200 series

Cable type：CBSMT20-**M

Cable type：CBSMT20R-**M （Cable for movable）



Cable type：CBSMT20L-**M



6.15. Encoder Cable

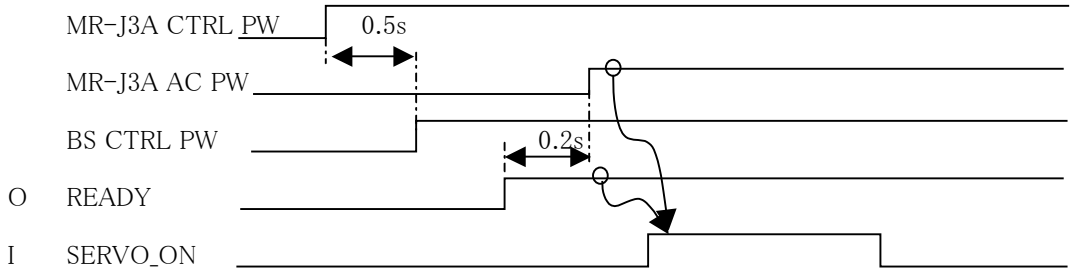
Cable type：MR-J3ENSCBL**M-L

Cable type：MR-J3ENSCBL**M-H (Cable for movable)

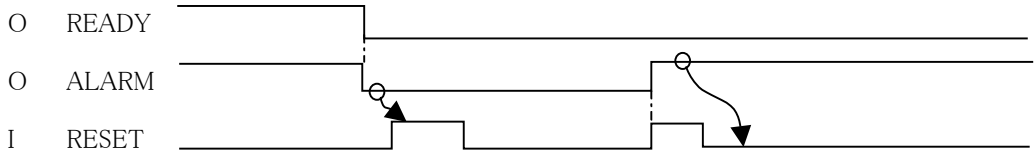
7. Timing Chart

The timing chart of fundamental operation is shown.

7.1. Power supply injection

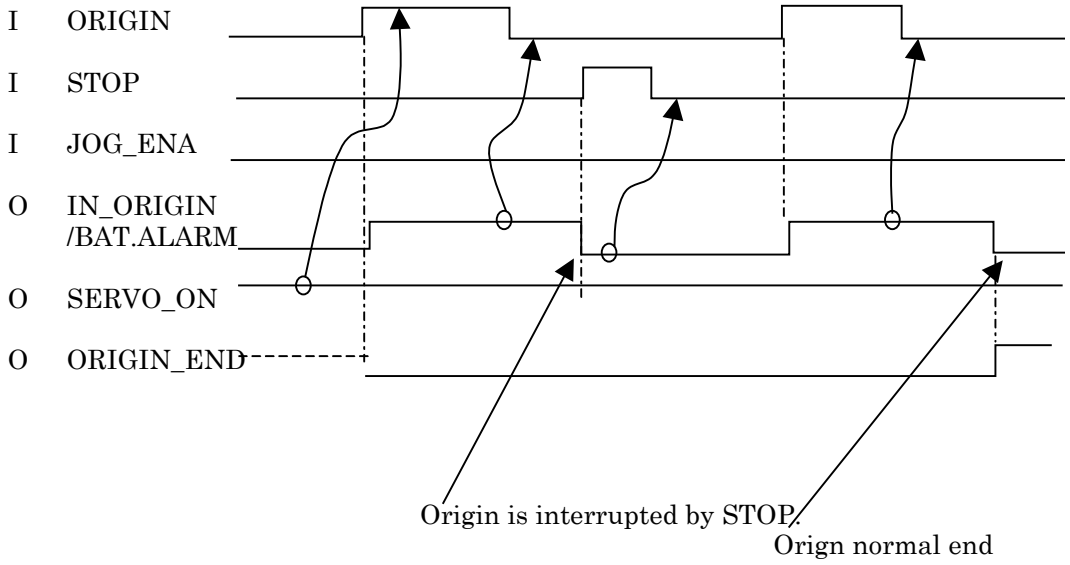


7.2. Alarm reset

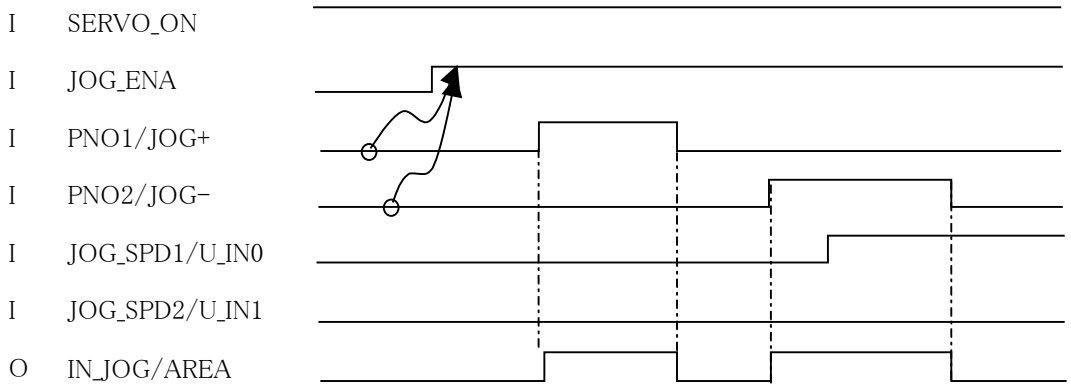


Alarm may not be canceled unless it outputs RESET twice.

7.3. Origin

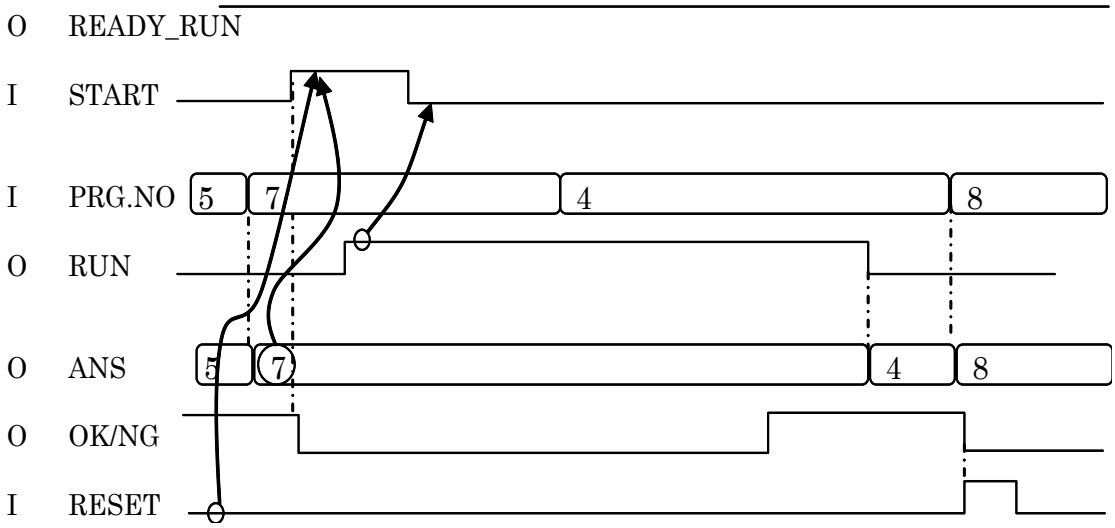


7.4. JOG

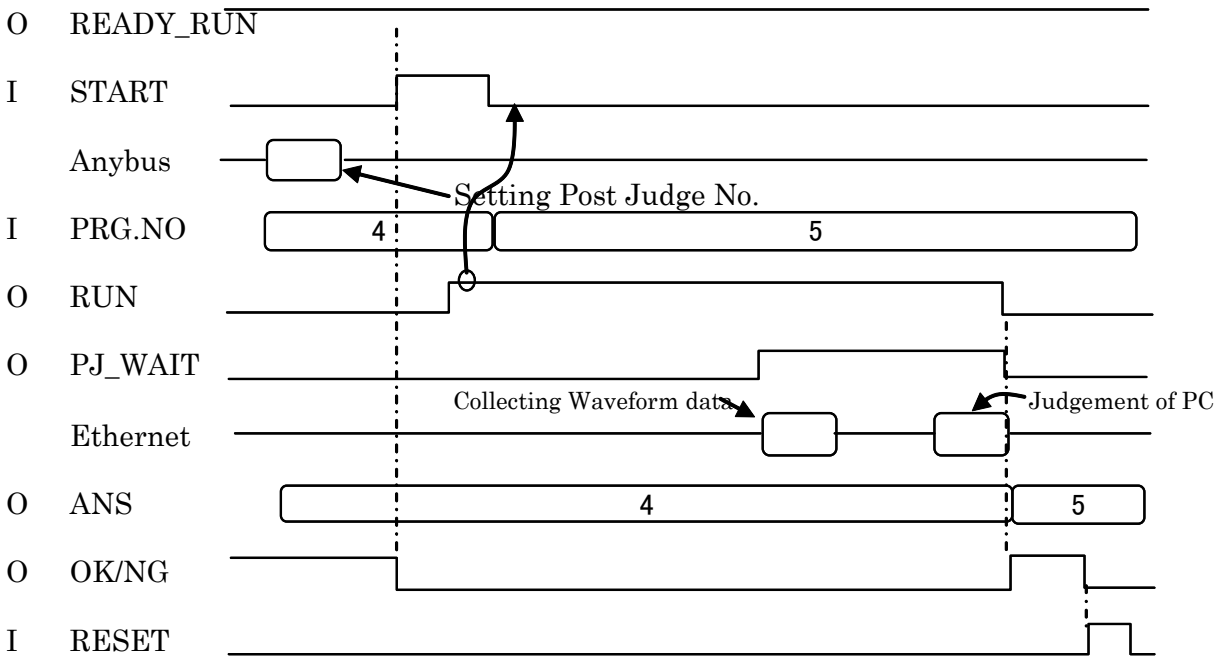


When you turns on JOG_ENA, it is required for PNO1/JOG+, and PNO2/JOG- to be in the state of off. It will become alarm if JOG_ENA is turned ON when either of those signals is ON.

7.5. Program execution



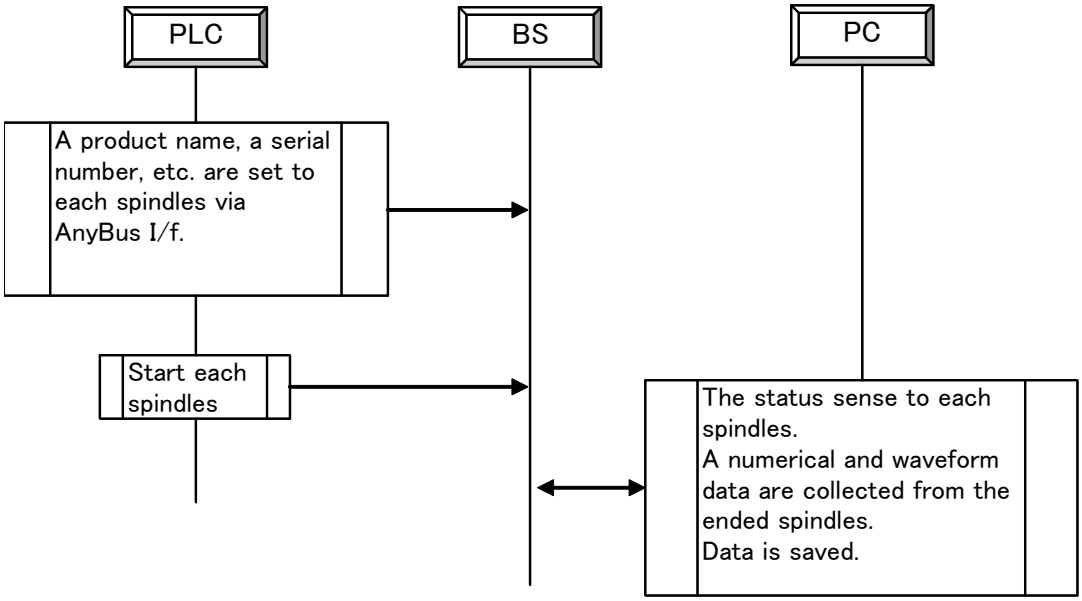
7.6. Program execution using Post Judge



"Post Judge" is the function to take in waveform data to PC, to perform a special analysis in PC, and to return judgment to BS controller. This function can perform judgment processing which cannot be realized only by the real-time operation within BS controller. Please refer to a BS_Configurator handling description for details.

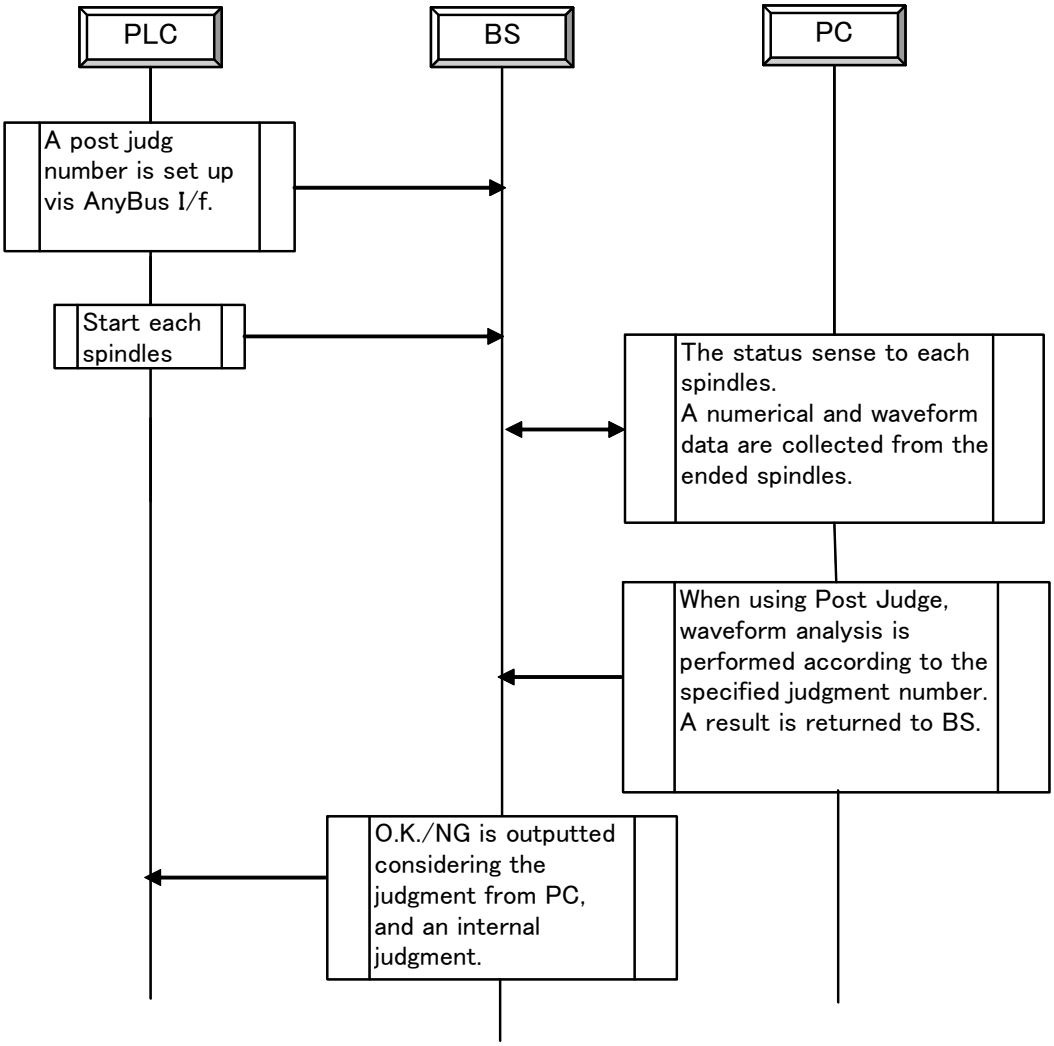
7.7. Writing of a product name and a serial number

The flow chart in the case of recording a product name, a serial number, etc. to numerical data using Anybus i/f is shown



7.8. Post Judge

"Post Judge" is the function to take in waveform data to PC, to perform special analysis in PC, and to return a judgment to BS controller. This function can perform judgment processing which cannot be realized only by the real-time operation within BS controller. Please refer to a BS_Configurator handling description for details.



8. Concept of stroke

When using the Servo press, an incorrect setting of stroke will cause a serious accident.Please be sure to understand concept of stroke well before using the servo press. then design user programs, sequence, and system after that.

8.1. Semi closed loop

The stroke value of a servo press is calculated from the encoder pulse of a motor, and may not show the exact position of the ram always.

The right stroke value cannot be outputted before an origin return.

In proportion to load, a tool is distorted slightly. It is about 0.3mm at the maximum load

When the mechanism of a timing belt or others breaks down, the actual position and stroke value of the ram are-less correlating.

When the position of the ram has serious influence for operation of a system , we recommend you to form the sensor which detects the position of the ram uniquely.

8.2. Direction

The direction where ram is extended is the direction of +.

8.3. System home position

It is used when adjusting offset of the whole system. It is set as a controller using BS Configurator. When tools are exchanged, adjustment of an attachment position can be easily performed by change of a system home position.

8.4. User home position

It is the offset which can be arbitrarily set up in a user program. It specifies using a home position table. It is set up on the basis of a system home position. The stroke value of 32 pieces is prepared for the home position table. The contents of a home position table can be changed by BS Configurator.

The stroke value treated in a user program starts from a user home position.

8.5. System stroke limit

It is the maximum stroke value set to the tool table.*1 A setup can be arbitrarily changed in the range exceeding it. The stroke value starts from an origin sensor.

8.6. User stroke limit

It is the stroke limit which can be described in a user program. The stroke

value starts from a user home position.

8.7. If the stroke limit is exceeded

If one of stroke limits is exceeded, a controller turns off READY and will be in a servo off state. Please input RESET, in order to restore. If ON of READY is checked, please move ram into a stroke limit by manual operation.

8.8. A motion of the ram at the time of servo off

At the moment of servo-off, a ram may shift from various factors slightly. The amount of shift is 1mm or less. In order to prevent the shift, please stop servo-off or use the brake for position keeping.

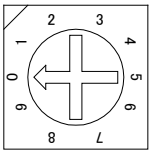
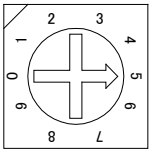
*1 A tool table is the file various setting value about a tool is indicated to be. It exists under the installation folder of BS Configurator. If a tool type is chosen on a tool selection screen, the contents of a tool table will be displayed.

9. Connection with Personal Computer

In order to set up BS controller, exclusive application BS Configurator is started, and it is necessary to connect with a personal computer. The procedure is explained.

9.1. Spindle number setup

BS controller is connectable with the same communication system to 31 sets. In this case, in order to discriminate each controller, it is necessary to set up a spindle number.

The spindle number setting method	
BS front IDx10  IDx1 	In the left figure, the spindle number is set as 5. ID x 10 is 10 digits. ID x 1 is 1 digit. Please set up a spindle number in one communication system not to overlap. Duplication of a spindle number causes a communication error. Please set up the number between 01-31.In the other setup, it becomes an error.

When a spindle number is changed, a spindle new number becomes effective after a re-injection of a power supply.

9.2. IP address setup of BS controller

The IP address of BS controller is set up like this 192:168: (master number +14) : (spindle number).

A master number is set up by the SW1 bits 0-3 on CPU board. A master number adds 1 to the binary value of 4 bits of SW1 low ranks. SW1 is visible if the cover of an expansion bus is removed. A front panel side is a low rank bit. The master number is set as 1 at the time of shipment. The controller of a different master number is not connectable with one communication system. The default gateway is 192.168.1.1.

9.3. IP address setup of a personal computer

In order to communicate with BS controller, it is necessary to set a fixed IP address for a personal computer in the communication method of Ethernet. Since the setting methods of a fixed IP address differ for every OS, refer to

other data for them.

An example of a setting of an IP address

IP address	192.168.1.1(The default gateway of BS)
Subnet mask	255.255.0.0

Since it is not connectable with the Internet environment in almost all cases, the personal computer set as the fixed IP address should be careful.

9.4. LAN cable

Please use a cross cable, when you link a BS controller and a personal computer directly. Please use a straight cable, when you go via a hub.

9.5. Communicative check

If connection is completed, BS Configurator will be started and communication will be checked. In the following explanation, the spindle number shall be set as No. 1.

9.5.1. Setup of operational authoority

Operation authority can be set to BS Configurator. All operations are attained by setting it as "All ". If setup-operation authority is chosen with a pull down menu, an operation authority screen (Fig. 9-1) will be displayed. The radio button of “All” is turned ON, a password is inputted, and O.K. button is clicked. The initial value of a password is "2".

Fig.9-1 Operational authority screen

9.5.2. Setup of receive filter

If a setup-data collection-receiving filter is chosen with a pull down menu, a receiving filter screen will be displayed. Please set up, as shown in Fig. 9-3.

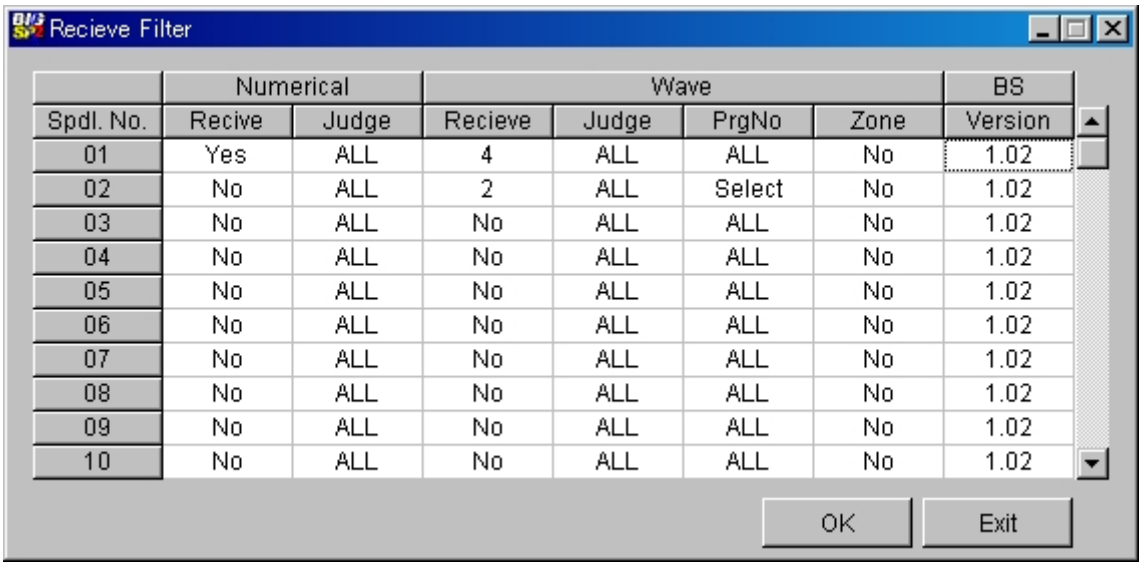


Fig.9-3 Receive filter screen

9.5.3. Collection setup

At the pull down menu, check is put into setup-data collection-collection. (refer to Fig. 9-4.)

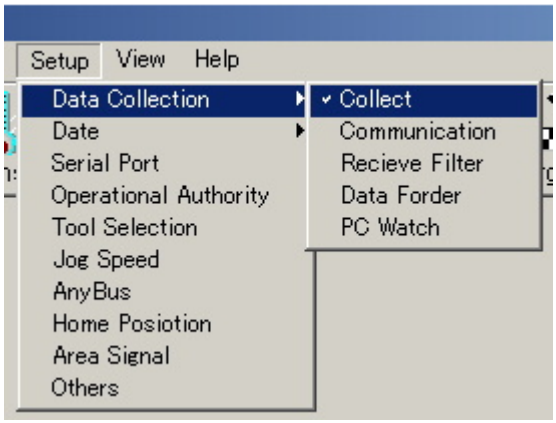


Fig.9-4 Collection setup

9.5.4. Check of status

If the status bar of the screen lower part is displayed as shown in Fig. 9-5, communication is performed normally. Although various alarms are displayed when no setup for BS controller is performed, there is no problem. As shown in

Fig. 9-6, when status is displayed, communication is not performed normally. Please improve a setup from the beginning of Chapter 9.

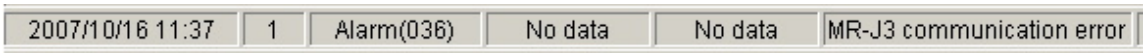


Fig.9-5 Status bar Alarm state

Fig.9-6 Status bar Communication error state

9.6. Starting of two Configurators

It is also possible to install two BS Configurators in one PC, and to start simultaneously. Starting of the 2nd Configurator displays the message "the port cannot be used." It is because the 1st Configurator has already used the port number 5008 (default value). Then, at the 2nd Configurator, it is set up so that the port number except 5008 may be used. In the menu of the 2nd Configurator,Setup-Data collection-Communication is chosen, and the communication setting screen is opened.

Please choose 5009 at the list-box of All Port No. button, and click O.K. button. Please re-start the 2nd Configurator. Two Configurators can be used if the message about a port is not displayed. If two Configurators are used, data can be displayed by the station.

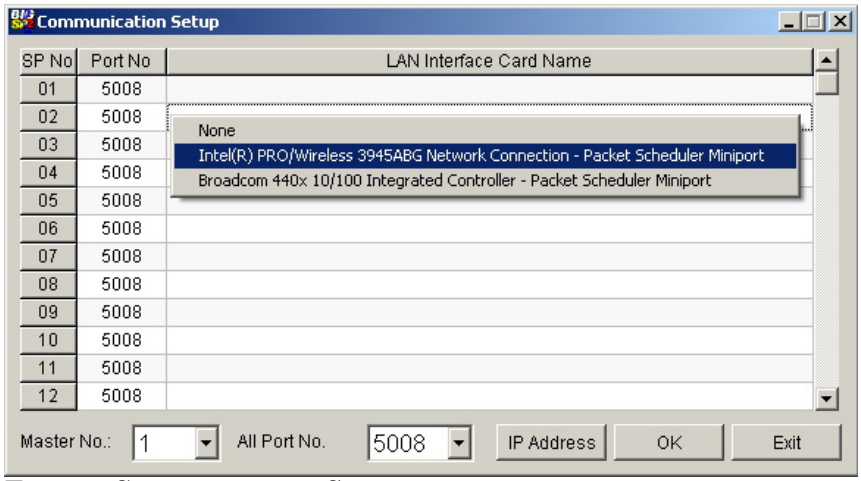


Fig. 9-5 Communication Setup screen

9.7. Use of two or more network interface cards

If LAN Interface Card Name in the Communication Setup screen of Fig. 9-5 is used, the communication route between a PC and controllers can be specified. Mixture of a network is avoidable if this function is used when using two or more network interface cards. Moreover, if two Configurators are started and data collection is performed by the separated network interface card, the time of data collection can be shortened.

As shown in Fig. 9-5, the network interface card names are displayed in a floating window by right click of the lower part of LAN Interface Card Name.

A setup will become effective, if LAN Interface Card Name of you wish is chosen and O.K. button is clicked.

9.8. Arbitrary IP address setup

Arbitrary IP addresses can be set up now to the controller of a version 1.02.26 or later. On Fig. 9-5 Communication Setup screen if IP Address button is clicked, Fig.9-6 IP Address Setup screen will open. The IP address of Configurator and the IP address of a controller can be arbitrarily set up on this screen. Address 4 is decided by the spindle number. A spindle number is set up with the rotary SWs of the front upper part of a controller. The setting range of a spindle number is from 1 to 31.

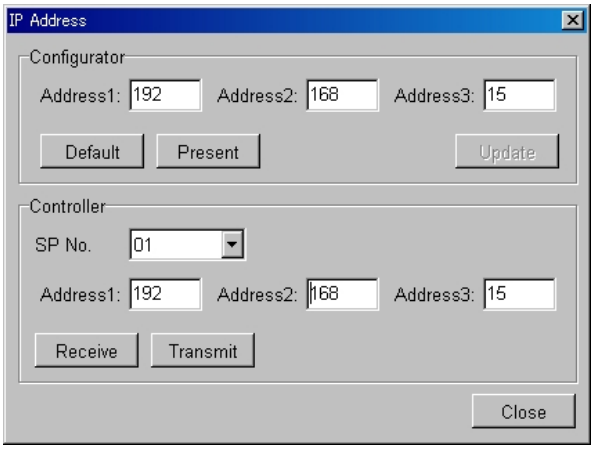


Fig.9-6 IP Address Setup screen

9.8.1. Notes

Communication is impossible unless Configurator and a controller are the same IP addresses. Moreover, it is necessary to also change the IP address of the network interface card used with a personal computer. Please setup addresses 1 and 2 with the same addresses of a controller.

A setup of a controller becomes effective after a re-injection of a power supply.

9.8.2. The communication method with an IP address unknown controller

Please use a default fixed IP address to the controller with an unknown setup of an IP address. When a spindle number is set as 71 to 99 with the rotary SW of the upper part in front of a controller, the IP address of the controller is as follows.

192.168.15.(spindle number - 70)

A new IP address becomes effective by re-injection of a power supply.

10. Starting

10.1. Starting procedure of BS controller

The outline procedure in the case of actually using BS controller is shown below. The item which needs details is indicated after [2].

10.1.1. Attachment to equipment

BS controller,MR-J3A and a tool are fixed to equipment.

10.1.2. Wiring

Please wire with reference to a wiring diagram.

10.1.3. Control power supply injection

Only a control power supply is switched on. Please refer Section7 Timing Chart 7-1 Power supply injection.

10.1.4. Attachment of a backup battery

The backup battery for holding the contents of a setting is attached.

10.1.5. Parameter setup of MR-J3A

The parameter of MR-J3A is set up. (It is required work only when MR-J3A is purchased alone.)

10.1.6. Parameter setup of BS

Tool type selection, a setup of a stroke limit, etc. are performed from exclusive PC application BS Configurator.

10.1.7. Re-starting of a power supply

After a setup of a parameter, a power supply is turned off at once and only a control power supply is switched on again. If alarm has not occurred, AC power supply is also switched on. When alarm has occurred, please remove a cause with reference to troubleshooting.

10.1.8. Check of a brake

When a mechanical brake is chosen as an option, it checks that a brake is taken off in the state of operation.

10.1.9. Check of an emergency stop

Please perform emergency stop operation and check that an emergency stop operates.

10.1.10. Origin

Large restriction is applied to speed and output load when origin has not been completed.

10.1.11. Build a program.

Build a program which suited the purpose using BS Configurator, and transmit to BS controller.

10.1.12. Execution of a program

If you run a program and there is an inconvenient portion, please add correction and raise the completeness of a program.

10.2. Parameter setup of MR-J3A

When purchased in lump sum with a tool, the parameter of MR-J3A is already set up.

Caution 1 About PA05 and PA15, those are setups for SP200 series. It is set to 8192 in SP100 series. As for the parameter by which a setup is changed into BS systems, * mark is attached to the Change required item.

Caution 2 About PA02, it is a setup of standard regeneration resistance. When equipping with regeneration resistance of an option, a setup needs to be changed.

Caution 3 About PA03, it is a setup of an incremental system. When you use it by the absolute encoder system, please set it as 2.

Parameter A

No.	Symbol	Name	Setting	Unit	Range	Change required
PA01	*STY	Control mode	0000		0000-0235h	*
PA02	*REG	Regenerative option	0000		0000-000Ah	*
PA03	*ABS	Absolute position detection system	0000		0000-0004h	*
PA04	*AOP01	Function selection A-1	0000		0000-0011h	
PA05	*FBP	Number of command input pulses per revolution	16384		0/1000-50000	*
PA06	CMX	Electronic gear numerator (Command pulse multiplying factor numerator)	1		1-1048576	*
PA07	CDV	Electronic gear denominator (Command pulse multiplying factor denominator)	1		1-1048576	*
PA08	ATU	Auto tuning	0001		0000-0003h	
PA09	RSP	Auto tuning response	12		1-32	
PA10	INP	In-position range	100	pulse	0-10000	
PA11	TLP	Forward torque limit	100.0	%	0.0-100.0	
PA12	TLN	Reverse torque limit	100.0	%	0.0-100.0	
PA13	*PLSS	Command pulse input from	0010		0000-0712h	
PA14	*POL	Rotation direction selection	0		0-1	*
PA15	*ENR	Encoder output pulses	16384	pulse/rev	1-100000	*
PA16		For manufacturer setting	0000		0000-FFFFh	
PA17	*MSR	For manufacturer setting	0000		0000-FFFFh	
PA18	*MTY	For manufacturer setting	0000		0000-FFFFh	
PA19	*BLK	Parameter write inhibit	000C		0000-FFFFh	*

Parameter B

No.	Symbol	Name	Setting	Unit	Range	Change required
PB01	FILT	Adaptive tuning mode (Adaptive filter)	0000		0000-0002h	
PB02	VRFT	Vibration suppression control filter tuning mode (Advanced vibration suppression control)	0000		0000-0002h	
PB03	PST	Position command acceleration/deceleration time constant (Position smoothing)	10	ms	0-20000	*
PB04	FFC	Feed forward gain	0	%	0-100	
PB05	FFCF	For manufacturer setting	500	rad/s	10-4500	
PB06	GD2	Ratio of load inertia moment to servo motor inertia moment	0.8	times	0.0-300.0	
PB07	PG1	Model loop gain	38	rad/s	1-2000	
PB08	PG2	Position loop gain	58	rad/s	1-1000	
PB09	VG2	Speed loop gain	327	rad/s	20-50000	
PB10	VIC	Speed integral compensation	21.5	ms	0.1-1000.0	
PB11	VDC	Speed differential compensation	980		0-1000	
PB12	OVA	For manufacturer setting	0	%	0-100	
PB13	NH1	Machine resonance suppression filter 1	4500	Hz	100-4500	
PB14	NHQ1	Notch form selection 1	0000		0000-0330h	
PB15	NH2	Machine resonance suppression filter 2	4500	Hz	100-4500	
PB16	NHQ2	Notch form selection 2	0000		000-0331h	
PB17	NHF	Automatic setting parameter	000E		0000-031Fh	
PB18	LPF	Low-pass filter	3141	rad/s	100-18000	
PB19	VRF1	Vibration suppression control vibration frequency setting	100.0	Hz	0.1-100.0	
PB20	VRF2	Vibration suppression control resonance frequency setting	100.0	Hz	0.1-100.0	
PB21	VRF3	For manufacturer setting	0.00		0.00-1.00	
PB22	VRF4	For manufacturer setting	0.00		0.00-1.00	
PB23	VFBF	Low-pass filter selection	0000		0000-0011h	
PB24	*MVS	Slight vibration suppression control selection	0000		0000-0021h	
PB25	*BOP1	Function selection B-1	0000		0000-1F12h	
PB26	*CDP	Gain changing selection	0000		0000-0014h	
PB27	CDL	Gain changing condition	10		0-9999	
PB28	CDT	Gain changing time constant	1	ms	0-100	
PB29	GD2B	Gain changing ratio of load inertia moment to servo motor inertia moment	7.0	倍	0.0-300.0	
PB30	PG2B	Gain changing position loop gain	37	rad/s	1-2000	
PB31	VG2B	Gain changing speed loop gain	823	rad/s	20-50000	
PB32	VICB	Gain changing speed integral compensation	33.7	ms	0.1-5000.0	

PB33	VRF1B	Gain changing vibration suppression control vibration frequency setting	100.0	Hz	0.1-100.0	
PB34	VRF2B	Gain changing vibration suppression control resonance frequency setting	100.0	Hz	0.1-100.0	
PB35	VRF3B	For manufacturer setting	0.00		0.00-1.00	
PB36	VRF4B	For manufacturer setting	0.00		0.00-1.00	
PB37	VP1	For manufacturer setting	100	pulse	0-32767	
PB38	TGW1	For manufacturer setting	0.0		0.0-20.0	
PB39	TGW2	For manufacturer setting	0.0		0.0-20.0	
PB40	TGW3	For manufacturer setting	0.0		0.0-20.0	
PB41	VRFF1	For manufacturer setting	1125	Hz	1-1125	
PB42	VRFF2	For manufacturer setting	1125	Hz	1-1125	
PB43	VRFQ	For manufacturer setting	0004		0000-0304h	
PB44		For manufacturer setting	0000		0000-FFFFh	
PB45		For manufacturer setting	0000		0000-FFFFh	

Parameter C

No.	Symbol	Name	Setting	Unit	Range	Change required
PC01	STA	Acceleration time constant	0	ms	0-50000	
PC02	STB	Deceleration time constant	0	ms	0-50000	
PC03	STC	S-pattern acceleration/deceleration time constant	0	ms	0-1000	
PC04	TQC	Torque command time constant	500	ms	0-20000	
PC05	SC1	Internal speed command 1	100	r/min	0-50000	
PC06	SC2	Internal speed command 2	500	r/min	0-50000	
PC07	SC3	Internal speed command 3	1000	r/min	0-50000	
PC08	SC4	Internal speed command 4	200	r/min	0-50000	
PC09	SC5	Internal speed command 5	300	r/min	0-50000	
PC10	SC6	Internal speed command 6	500	r/min	0-50000	
PC11	SC7	Internal speed command 7	800	r/min	0-50000	
PC12	VCM	Analog speed command maximum speed	0	r/min	0-50000	
PC13	TLC	Analog torque command maximum output	100.0	%	0.0-1000.0	
PC14	MOD1	Analog monitor output 1	0000		0000-041Fh	
PC15	MOD2	Analog monitor output 2	0001		0000-041Fh	
PC16	MBR	Electromagnetic brake sequence output	100	ms	0-1000	
PC17	ZSP	Zero speed	50	r/min	0-10000	
PC18	*BPS	Alarm history clear	0000		0000-0001h	
PC19	*ENRS	Encoder output pulses selection	0000		0000-0021h	
PC20	*SND	Station number setting	0	station	0-31	
PC21	*SOP	Communication function selection	0040		0000-0150h	*
PC22	*COP1	Function selection C-1	0000		0000-1111h	
PC23	*COP2	Function selection C-2	0000		0000-1511h	
PC24	*COP3	Function selection C-3	0000		0000-0061h	

PC25	*COP4	For manufacturer setting	0000		0000-0111h	
PC26	*COP5	Function selection C-5	0000		0000-0111h	
PC27	*COP6	For manufacturer setting	0000		0000-1111h	
PC28	*COP7	For manufacturer setting	0000		0000-0000h	
PC29	*COP8	For manufacturer setting	0000		0000-0001h	
PC30	STA2	Acceleration time constant 2	0000	ms	0-50000	
PC31	STB2	Deceleration time constant 2	0	ms	0-50000	
PC32	CMX2	Command pulse multiplying factor numerator 2	0		1-65535	
PC33	CMX3	Command pulse multiplying factor numerator 3	1		1-65535	
PC34	CMX4	Command pulse multiplying factor numerator 4	1		1-65535	
PC35	TL2	Internal torque limit 2	1	%	0.0-100.0	
PC36	*DMD	Status display selection	100.0		0000-011Fh	
PC37	VCO	Analog speed command offset	0000	mV	-999-999	
PC38	TPO	Analog torque command offset	1	mV	-999-999	
PC39	MO1	Analog monitor 1 offset	0	mV	-999-999	
PC40	MO2	Analog monitor 2 offset	0	mV	-999-999	
PC41	MOSD1	For manufacturer setting	0	pulse	-1048576-1048576	
PC42	MOSD2	For manufacturer setting	0	pulse	-1048576-1048576	
PC43		For manufacturer setting	0000		0000-FFFFh	
PC44		For manufacturer setting	0000		0000-FFFFh	
PC45		For manufacturer setting	0000		0000-FFFFh	
PC46		For manufacturer setting	0000		0000-FFFFh	
PC47		For manufacturer setting	0000		0000-FFFFh	
PC48		For manufacturer setting	0000		0000-FFFFh	
PC49		For manufacturer setting	0000		0000-FFFFh	
PC50		For manufacturer setting	0000		0000-FFFFh	

Parameter D

No.	Symbol	Name	Setting	Unit	Range	Change required
PD01	*DIA1	Input signal automatic ON selection 1	0C00		0000-0FFFh	*
PD02	*DIA2	For manufacturer setting	0000		0000-0000h	
PD03	*DI1	Input signal device selection 1 (CN1-15)	00020202		00000000-003F3F3Fh	
PD04	*DI2	Input signal device selection 2 (CN1-16)	00212100		00000000-003F3F3Fh	
PD05	*DI3	Input signal device selection 3 (CN1-17)	00070704		00000000-003F3F3Fh	
PD06	*DI4	Input signal device selection 4 (CN1-18)	00080805		00000000-003F3F3Fh	
PD07	*DI5	Input signal device selection 5 (CN1-19)	00030303		00000000-003F3F3Fh	
PD08	*DI6	Input signal device selection 6 (CN1-41)	00202006		00000000-003F3F3Fh	

PD09	*DI7	For manufacturer setting	00000000		00000000-00000000h	
PD10	*DI8	Input signal device selection 8 (CN1-43)	00000A0A		00000000-003F3F3Fh	
PD11	*DI9	Input signal device selection 9 (CN1-44)	00000B0B		00000000-003F3F3Fh	
PD12	*DI10	Input signal device selection 10 (CN1-45)	00232323		00000000-003F3F3Fh	
PD13	*DO1	Output signal device selection 1 (CN1-22)	0004		0000-3F3Fh	
PD14	*DO2	Output signal device selection 2 (CN1-23)	000C		0000-3F3Fh	
PD15	*DO3	Output signal device selection 3 (CN1-24)	0008		0000-3F3Fh	*
PD16	*DO4	Output signal device selection 4 (CN1-25)	0007		0000-3F3Fh	
PD17	*DO5	For manufacturer setting	0003		0000-3F3Fh	
PD18	*DO6	Output signal device selection 6 (CN1-49)	0002		0003-0003h	
PD19	*DIF	Response level setting	0002		0000-3F3Fh	
PD20	*DOP1	Function selection D-1	0000		0000-0011h	
PD21	*DOP2	For manufacturer setting	0000		0000-0111h	
PD22	*DOP3	Function selection D-3	0000		0000-0211h	
PD23	*DOP4	For manufacturer setting	0000		0000-0111h	
PD24	*DOP5	Function selection D-5	0000		0000-FFFFh	
PD25		For manufacturer setting	0000		0000-FFFFh	
PD26		For manufacturer setting	0000		0000-FFFFh	
PD27		For manufacturer setting	0000		0000-FFFFh	
PD28		For manufacturer setting	0000		0000-FFFFh	
PD29		For manufacturer setting	0000		0000-FFFFh	
PD30		For manufacturer setting	0000		0000-FFFFh	

10.3. Parameter setup of BS controller

A parameter required in order to start a program is only tool type selection. Please setup a stroke limit, acceleration time, and deceleration time if needed. These can be set up from the tool selection screen of exclusive PC application BS Configurator. The tool selection screen is shown in Fig. 10-3-1.

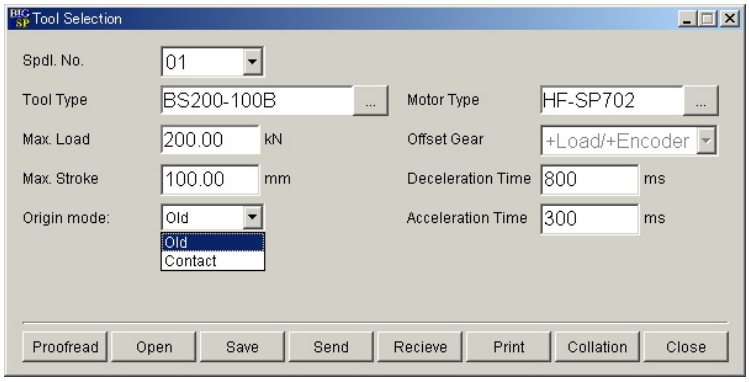


Fig. 10-3-1 Tool selection screen

Tool type setting procedure is explained.

1) Choose a spindle number.

2) Choose a suitable tool name from the pull down list of tool types.

3) A click of the display area of the maximum stroke displays a numerical input screen. The maximum stroke of a system is inputted. A positive numerical value smaller than a default numerical value can be set up. If the Max. stroke is set as longer 5-10mm than the actually used maximum stroke value, the crash by incorrect operation etc. may be able to be prevented.

4) Set up deceleration time by the same method. Deceleration time is time required for a tool to stop from top speed. Although a cycle time will be shortened if deceleration time is shortened, the rate of regeneration load rises.

5) Set up acceleration time by the same method. Acceleration time is time until a tool reaches top speed from a stop state. Although a cycle time will be shortened if acceleration time is shortened, large current flows at the time of acceleration. Since it leads to a rise of the rate of execution load, please be careful.

6) A click of a send button displays a check screen. A click of O.K. sends the contents of a display to BS controller.

7) After changing a tool type, a power supply needs to be re-supplied. Please re-switch on a control power supply after equipping with a backup battery.

10.4. Re-injection of a control power supply

The control power supply of MR-J3A is switched on first. It is displayed on the display area of MR-J3A as AL E6, and blinks. Since the power supply of BS controller is not on, this shows that MR-J3A is in an emergency stop state. If the power supply of BS controller is switched on, MR-J3A will be in a normal state. Supposing MR-J3A is in an alarm state at this time, please specify a cause from the contents of an alarm display, and remove the cause. In addition, when alarm is generated, please remove a cause with reference to troubleshooting.

10.5. Check of the brake

When a mechanical brake is chosen as an option, please check that a brake is taken off at the time of operation. Please control a brake by the sequencer which controls a system. BS system is not equipped with the control and the interlock function about a brake. Since there is a case where the system was

worked, having forgotten brake release as an example of a trouble, plentifully, please be careful enough.

Cautions 1 A serge noise generates a mechanical brake at the time of opening and closing. Since the noise control circuit is added to the brake control circuit of CPS controller, it is not necessary to prepare a serge killer etc. by the user side.

Cautions 2 The mechanical brake which is an option article is an object for position maintenance. Please do not use it for braking.

10.6. Check of emergency stop

Please check that the emergency stop input (CN33) of BS controller is released, and MR-J3A will be in the emergency stop state. As for MR-J3A, a dynamic brake operates in the state of an emergency stop.

Note A dynamic brake is not applicable to position maintenance.

10.7. Origin

In an incremental encoder system, whenever it switches on a control power supply, a origin is needed. Moreover, also in an absolute encoder system, origin is surely required at once. Execution of a program cannot be performed in the state of un-completing an origin. Moreover, in the state of un-completing an origin , even in manual operation, the speed of a tool and an output are restricted sharply. Speed is restricted to origin speed. An output is restricted to about 10% of the maximum output. Where the load exceeding it is applied, origin cannot be performed.

If origin is again started from the completion position of origin, ram will once move in the minus direction. Please design a mechanism so that rum can operate in the 10mm or more minus direction from the origin point.

10.8. Program creation

There are the following as indispensable data at the time of creating a program.

1. Contact position with a work
2. Permission Maximum Stroke
3. Permission Maximum Load

These parameters are greatly concerned with the safety of a system. Please pay careful attention and define a numerical value.

Refer to the applicable item of the operation description of BS Configurator for program language specification. We recommend you for the more unfamiliar one to use the program automatic generation function of BS

Configurator. If the numerical value is set up according to the guide screen, a program will be generated automatically.

Please send the created program to a BS controller.

10.9. Execution of a program

Although execution of a program is usually performed by PI / O operation, it is possible even if it uses the program execution function of BS Configurator. When wiring of PI/O and a control system are incomplete, it is effective as a check means of operation.

We recommend use of the numerical monitor of BS Configurator, or a waveform monitor function to debugging of a program. Please refer to the applicable item of a BS Configurator operation description about those details.

11. Troubleshooting

Alarm is generated in many cases in multiplex, and the contents of a display machine etc. are overwritten by the newest alarm. In order to know the details of alarm, we recommend you to use the alarm history function of BS Configurator. In an alarm history function, a monitor is possible for the alarm history of BS controller and MR-J3A.

11.1. The state display by LED

There are four LEDs in the front panel upper part of BS controller. Among those, two pieces are assigned to STATUS and CODE and display the internal state of CPS controller in the state of these lightings.

LED3		LED4		The state of a controller	Note
STATUS		CODE			
Color	State	Color	State		
	off		off	Power supply off	It may be, when CPU is not operating normally.
	off	Green	Blink	Servo off	It is in the state of servo off.
Green	on		off	READY	It is in the state in which program execution is possible.
Orange	on		off	Under program execution	
—	Blink	—	-	Battery alarm	Blink of STATUS is not based on a color but means battery alarm. Even when LED3 is off, it is compulsorily green and blinks.
Red	on	Green	on	Slight alarm	It is the alarm resulting from I/O operation and timing.
Red	on	Orange	on	Middle alarm	It is alarm to be set up according to CPS SP Configurator.
Red	on	Red	on	Serious alarm	It is the alarm resulting from the environment of a controller, and hardware.

11.2. Alarm code table

An alarm code cannot be known only with a controller. Please use BS Configurator or the below-mentioned option article.

Basic alarm code

Alarm code	Name	Meaning/correspondence
001	The abnormalities in RAM backup	Abnormalities were discovered by the data of the backup domain of SRAM. The domain containing abnormalities is shown by the detailed alarm code. Consumption of a backup battery or the omission of the connector of a backup battery is suspected(CN11). When a backup file exists, restoration can restore easily. (Refer BS_Configurator handling description 7-6-2 backup)
002	The abnormalities in CAL	The output is over tolerance level at the time of the calibration of a load cell. Please check calibration value by manual operation. (Refer BS Configurator handling description 4-3 proofreading) When a tool has been crashed, calibration value may be out of order. In this case, repair is required.
003	The abnormalities in ZERO	The no-load output value of a load cell is over tolerance level. Please check a load cell output by the monitor function. (Refer BS Configurator handling description 4-3 proofreading) When a tool has been crashed, no-load output value may be out of order. In this case, repair is required. Moreover, it may become abnormalities in ZERO if a program is started when load is applied to a tool. In this case, please start a program after removing the cause of load.
006	Program un-registering.	The specified user program does not exist in a controller. Please check that an appointed program number is in a controller.
007	Tool un-registering.	A tool type has not been registered. Please set a suitable tool type as a controller. Consumption of a backup battery or the omission of the connector of a backup battery is suspected(CN11). All itmes of thr setup menu in BS Configurator need to be set up. When a backup file exists, restoration can restore easily. (Refer BS Configurator handling description 7-6-2 backup)
008	Origin error	Abnormalities occurred during origin and origin was not completed. The following things can be considered as a factor which bars origin, STOP signal is inputted, Excessive load exists. Please remove these causes and perform origin operation again.
009	The abnormalities in SG amplifier	The communication with a tool is unusual. Please check the connection of an encoder cable(CN31).
010	The abnormalities	The types of the tool connected with the tool type set as

	in a tool type	the controller differ. Please set the right tool type to the controller.
011	The abnormalities in EEPROM	Abnormalities were discovered at the contents of EEPROM. Please check the numerical value of each item on the maintenance information screen of BS Configurator. Please consult with a operating window, when there is an unusual numerical value.
013	Basic parameter or gain parameter un-registering.	The parameter which accompanies a tool has not been registered. All itmes of thr setup menu in BS Configurator need to be set up. When a backup file exists, restoration can restore easily. (Refer BS Configurator handling description 7-6-2 backup)
014	The abnormalities in the contents of Program	The parameter exceeding rating is contained in the program under execution. Please check the contents of a user program. When each table is being referred to with speed, the position, and the load parameter, please check the contents of each table.
016	The abnormalities in a driver	It is the alarm about a motor driver. Please refer to a detailed alarm code.
017	AC power supply is OFF state.	AC power supply is in off state. Please check the state of power supply.
018	The abnormalities in origin	A program was started in the state of un-completing an origin.
019	The abnormalities in a data collection failure	Access for data collection was not made from PC during user program execution. The abnormalities of data collection PC and Ethernet cable are suspected. When you do not perform data collection, please set this function off.
020	Emergency stop	STOP signal of a general-purpose input operated. Please turn off STOP signal and perform reset operation.
021	Tool type mismatching error	The tool type of the performed program differs from the tool type set to the controller.
022	Power supply re-injection demand	Since the backup file was restored, a power supply needs to be re-supplied.
023	Backup area partial error	The checksum error occurred in a part of backup domain.
024	The abnormalities in JOG operation signal	When JOG_ENA is turned on, JOG+ or JOG- has already turned on.
025	It was started in AC power supply OFF.	It was going to work the controller in spite of OFF state of AC power supply.
026	Since it is JOG_ENA ON, it cannot start.	It was going to start the program in spite of the state of ON of JOG_ENA.
027	Under operation of JOG or origin	It was going to start the program during JOG operation or origin.
029	Anybus	It failed in initialization of the card which was equipped

	initialization error	to Anybus. Please check the Anybus card.
030	Tool change error	The power supply is not re-switched on after change of a tool type. A power supply is re-switched on.
031	Anybus error	Abnormalities have occurred in Anybus.
032	A collision of PC and PLC	While opening the tool proofreading screen or the tool operation screen of BS Configurator,, program start operation was made via I/O. Please close the tool proofreading screen or a tool operation screen of BS Configurator at the time of program execution.
033	The error of Anybus board kind	The kind of board equipped to Anybus is wrong. Please check the kind of Anybus set to the controller, and the kind of actual board.
034	Absolute position is lost	The encoder information of MR-J3A was lost. The following causes can be considered-consumption of the backup battery of MR-J3A,disconnection of an encoder cable. This alarm is not resettable unless the power supply of BS system is re-switched on. After a re-injection of a power supply, it needs origin operation.
035	The abnormalities in MR-J3A communication initialization	It failed in communication initialization with MR-J3A. Please check whether the power supply of MR-J3A is on. Moreover, please check a communication cable. Please check a power supply injection sequence.
036	The abnormalities in MR-J3A communication	The communication with MR-J3A is impossible. Please check whether the power supply of MR-J3A is on. Moreover, please check a communication cable. Please check a power supply injection sequence.
037	Torque restriction proofreading value is inaccurate.	The setting value of DAC for a torque restriction voltage output is over the range.
038	Alarm in MR-J3A.	Alarm is generated in MR-J3A. The contents of alarm of MR-J3A can be checked by the alarm history function of BS Configurator, or the MR-J3A alarm history function.
040	Servo-off starting error	Origin, JOG, or the program was started in the state of Servo-off. Please start after turning on SERVO_ON.
041	MR-J3 ABS setup error	Some error is in a parameter setup of MR-J3A. Encoder specification is not set as the absolute type via serial communication. Please set up the parameter of MR-J3A correctly.
042	MR-J3 ABS type read error	It failed in reading of encoder specification at initialization after a power supply injection of a controller. Please check the communication cable which connects CN3 of MR-J3A with CN6 or CN7 of BS-M3A-1B.
051	Post judgment response error	Although the post judgment was used, PC did not answer within regulation time. Please check that PC is in a data collection state. Moreover, about a setup of the response time from PC, please refer BS Configurator handling description 7-7-7 others.
053	Anybus	The communication with the master of a network

	communication error	stopped. The omission of the communication cable or the abnormalities of the master are suspected.
098	The abnormalities in a battery	Backup battery voltage fell. A battery needs to be exchanged.

Detailed alarm code

It is a detailed alarm code in the case of the abnormalities in a driver

Alarm code	Name	Meaning/correspondence
102	FPGA error.	They are the abnormalities of a logic IC. Repair is required.
103	Updating timing violation of a basic parameter.	A tool type setup was performed during servo-on. Please do not perform a tool type setup during program execution.
104	Origin isn't finished.	Positioning operation was performed for orogin not to be performed. Please perform origin.
200	The abnormalities in a motor type	Abnormalities were discovered by the contents of a motor table. Please refer to the details of a motor table.
202	Outside of the range-rated current.	Abnormalities were discovered by the contents of a motor table. Please refer to the details of a motor table.
203	Rated current is outside of the range.	Abnormalities were discovered by the contents of a motor table. Please refer to the details of a motor table.
204	Outside of the range-max speed.	Abnormalities were discovered by the contents of a motor table. Please refer to the details of a motor table.
207	Outside of the range-max rated current.	Abnormalities were discovered by the contents of a motor table. Please refer to the details of a motor table.
211	Outside of the range-encorder direction.	Abnormalities were discovered by the contents of a tool table. Please refer to the details of a tool table.
212	Outside of the range-origin direction.	Abnormalities were discovered by the contents of a tool table. Please refer to the details of a tool table.
213	Outside of the range-encorder resolution.	Abnormalities were discovered by the contents of a tool table. Please refer to the details of a tool table.
214	Outside of the range-origin speed.	Abnormalities were discovered by the contents of a tool table. Please refer to the details of a tool table.
215	Outside of the range-creep speed.	Abnormalities were discovered by the contents of a tool table. Please refer to the details of a tool table.
216	Outside of the range-origin sensor logic.	Abnormalities were discovered by the contents of a tool table. Please refer to the details of a tool table.
217	Outside of the	Abnormalities were discovered by the contents of a

	range-load cell type.	tool table. Please refer to the details of a tool table.
218	Outside of the range-current limit.	Abnormalities were discovered by the contents of a tool table. Please refer to the details of a tool table.
308	Outside of the range-stop speed ratio.	Abnormalities were discovered by the contents of a tool table. Please refer to the details of a tool table.
309	Outside of the range-deceleration.	Abnormalities were discovered by the contents of a tool table. Please refer to the details of a tool table.
310	Outside of the range-deceleration ratio.	Abnormalities were discovered by the contents of a tool table. Please refer to the details of a tool table.
400	Outside of the range-control mode.	They are the abnormalities of a control mode parameter. Incorrect operation of a microcomputer is suspected. Repair is required, if, so that it may occur frequently.
401	Over limit-target stroke.	Since there was a possibility of the stroke limit having been exceeded or exceeding, it went into the stop mode.
402	Over limit-target speed.	The speed target value exceeding the limit was set up.
404	Inconsistency of pulus limits.	- side of stroke restriction value was set up more greatly than + side.
410	Outside of the range-stroke mode.	The parameter in the positioning mode is unusual. Incorrect operation of a microcomputer is suspected. Repair is required, if, so that it may occur frequently.
411	Outside of the range-acceleration time.	The setting value of acceleration time is over the range. Please improve a setup of a tool table or check a tool setup.
530	Z phase ditected wrong timing.	The encoder incorrect-counted. Incorrect operation by the abnormalities in an encoder cable and the noise can be considered. Please add filters, such as a ferrite core, to a noise generation source.
532	ABZ of encoder alarm.	Disconnection detection of an encoder cable operated. Please check the plug of a connector.
536	Z-phase lost	Z phase of the encoder was not detected more than a fixed term. The failure relevant to an encoder cable or an encoder is suspected.
540	Limit over-stroke.	The stroke limit was exceeded. Please move by manual operation after reset at within the limits.
550	Limit over-current in origin mode.	Current restriction value was exceeded at the time of origin. In such a case, the big load at the time of origin should set the concerned part of a tool table as proper value.
551	Limit over-stroke in origin mode.	The stroke range currently assumed by origin sequence was exceeded. The abnormalities of an originsensor is suspected.
552	Limit over-load in origin mode	Load restrictions worked before origin finished. Please check whether there is any nothing that bars a motion of ram.
553	Load cell recieve	The communication state with load cell amplifier is not good.

	error	The measure against a noise is required. It is, when the load sensor connector has fallen out.
1001-1031	The abnormalities in a program	Abnormalities were detected in the program number (detailed alarm code -1000).
1101-1131	The abnormalities in Judge Table	Abnormalities were detected in Judge Table number (detailed alarm code -1100).
1201-1231	The abnormalities in Zone Table	Abnormalities were detected in Zone Table number (detailed alarm code -1200).
1301	The abnormalities in Position Table	Abnormalities were detected in Position Table.
1302	The abnormalities in Load Table	Abnormalities were detected in Load Table.
1303	The abnormalities in Speed Table	Abnormalities were detected in Speed Table.
1304	The abnormalities in Home Position Table	Abnormalities were detected in Home Position Table.
1400	The abnormalities in Tool Table	Abnormalities were detected in Home Tool Table.
1601	The abnormalities in Numerical data	Abnormalities were detected in the pointer of Numerical data.
1602	The abnormalities in Numerical data	Abnormalities were detected in Numerical data.
1603	The abnormalities in Waveform data	Abnormalities were detected in the pointer of Normal Waveform data.
1604	The abnormalities in Waveform data	Abnormalities were detected in Normal Waveform data.
1605	The abnormalities in Waveform data	Abnormalities were detected in the pointer of NG Waveform data.
1606	The abnormalities in Waveform data	Abnormalities were detected in NG Waveform data.
1701	The abnormalities in Alarm history	Abnormalities were detected in the pointer of Alarm history.
1702	The abnormalities in Alarm history	Abnormalities were detected in Alarm history.
1801	The abnormalities in Backup time	Abnormalities were detected in Backup time.
1802	The abnormalities in Total running times	Abnormalities were detected in Total running times.
1803	The abnormalities in Total running distance	Abnormalities were detected in Total running distance.
1901-1904	The abnormalities in Others	Abnormalities were detected in Others.
1905	The abnormalities in JOG speed	Abnormalities were detected in JOG speed
1906	The abnormalities in Load/Stroke output interval	Abnormalities were detected in Load/Stroke output interval.

1907	The abnormalities in Others	Abnormalities were detected in Others.
1908	The abnormalities in Load Rate Parameters	Abnormalities were detected in Load Rate Parameters.
2001-2010	The abnormalities in Unused area	Abnormalities were detected in Unused area.

12. Regeneration

The regeneration electric power which occurs by rapid slowdown is changed into heat by regeneration resistance. In BS Configurator, a monitor is possible for the rate of regeneration load. If the rate of regeneration load exceeds 85%, it will become the alarm of the abnormalities in regeneration (caution). There are two methods in avoiding the abnormalities in regeneration. The first is the method of lowering regeneration frequency.、The second is the method of using more nearly mass regeneration resistance.

Caution Although it is the warning of fault regeneration as MR-J3A when the rate of regeneration load exceeds 85%, by BS controller, warning is also treated as alarm.

12.1. Lowering regeneration frequency

Although there are a method of lengthening slowdown time, and a method of taking long operation pause time in order to lower regeneration frequency ,in all a cycle time becomes long.

12.2. Regeneration option

The larger regeneration option is prepared by Mitsubishi Electric than the regeneration resistance built-in MR-J3A. Refer to the technical data of MR-J3A for the details of a regeneration option.

When it corresponds to the regeneration of high frequency by the regeneration option, it is necessary to consider the temperature rise in a control board. I ask measure, such as attaching a cooling device so that the temperature in a control box may not exceed 50 degrees C, of you.

13. Absolute encoder system

MR-J3A corresponds to the absolute encoder system. Therefore, BS system can also be equivalent to the absolute encoder system.

13.1. Setup

13.1.1. Setup to BS controller

In the tool type of absolute encoder system, "A" is attached to the end of tool type form.

13.1.2. Setup to MR-J3A

PA03 is set as 0002 by parameter setup. In the 1st power supply injection after performing this setup, the alarm of AL.25-" absolute position disappearance" will be generated at MR-J3A. The release method of the alarm is mentioned later.

13.1.3. Wearing of a backup battery

Please equip CN4 of MR-J3A with the backup battery of exclusive use.

13.2. The alarm release method

The alarm of AL.25 "absolute position disappearance" will occur in MR-J3A by a power supply injection of the first time after absolute encoder system setup, consumption of a backup battery and disconnection of an encoder cable. AL.25 will be canceled if the power supply of MR-J3A is re-switched on after removing some causes of alarm.

Important If wiring connection of the BS system is made normally and the power supply of BS controller is switched on when AL.25 occur, BS controller will be in the state where origin is not completed. In this case, execution of a program etc. cannot be performed unless origin operation is completed. When AL.25 occurs, please perform origin operation after re-switching on a power supply.

14. Load-Sensor-less System

The load-sensor-less tool is also prepared in this system. The special feature is shown in a comparison table.

Item	load-sensor-less	with load sensor
Load value	It computes from motor current.	Load cell value
Accuracy	±15%@Tool rating	±2%@Tool rating
Renewal cycle of load value	1ms	1ms
At the time of crash	It has no problem to the amount of -proof of a tool and a system.	A load cell carries out plastic modification in about 150% of its rating.
Disconnection	No	It is detected by ZERO and CAL alarm.
Price	Only the part without a load cell is cheaper.	Only the part of a load cell is more expensive.

Since there are the above special features, please choose the system according to the use.

15. Tool Type Discernment

Information, such as a tool type name and load cell proofreading value, is written in BS tool. It will become alarm if the tool name different from the tool linked to BS controller is set up.

About connection of BS controller and MR-J3A, there is no function to recognize the capacity of MR-J3A in BS controller. Therefore, incorrect connection is not detected. In multi-spindles composition, I ask sufficient consideration for connection of BS controller, MR-J3A, and a motor of you.

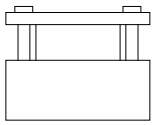
16. Stole

A stole can be carried out with arbitrary load value by executing a load restriction command on a program. Load accuracy is a 15%@FS grade. In the case of a stole, droop pulses occurs at a maximum of 2 rotations on a motor. If the procedure of canceling load restrictions is mistaken, ram will operate abruptly, and there is a risk of causing breakage of a work and a system. Please cancel load restrictions after solving droop pulses.

17. Others

17.1. The options of the servo press

The options of the servo press are shown below.

 BS Configurator	BS Configurator It is exclusive application software which operates on Windows of IBM compatible machine. Setup of a controller, a maintenance, and editing a user program, data collection, etc. can be performed.
	LED DISPLAY This is two steps of 6 figure display machines by 7 segment LED. It connects with RS-232C port of a controller. Monitors, such as a numerical result, can be done.
	Electromagnetic brake It is effective when preventing the slide of the ram at the time of servo off. A brake is not controlled by BS controller.

18. Article of Consumption

18.1. Battery

18.1.1. The detection method

The visual check of the abnormalities in a battery can be carried out by blink of LED3 STATUS in the front panel upper part of a controller.

Moreover, since a battery unusual signal is outputted also from a general-purpose output, it is detectable also by PLC.

18.1.2. The exchange method

Although the life of a backup battery is about five years, it varies greatly according to a state of operation and environment of operation. If the abnormalities in a battery occur, please exchange a backup battery quickly. Battery exchange is carried out in the state of power supply ON. If batteries are exchanged in the state of power supply off, a backup circuit will not operate normally but consumption of a battery will progress remarkably.

18.1.3. Management

Exchange date of a backup battery is memorized in a controller by BS Configurator, and a monitor of it is possible. Moreover, calculation of the net backup time is count. Please use it for management of a backup battery.

18.1.4. Clock setup

This controller is equipped with the clock function. In the case of battery exchange, we recommend you to setup of a date and time.

18.2. Parts having service lives of MR-J3A

Please refer to the collection of servo amplifier technical data of MR-J3A for details.

Part name	Life guideline
Smoothing capacitor	10 years
Relay	Number of power-on and number of emergency stop times : 100,000 times
Cooling fan	10,000 to 30,000hours (2 to 3 years)
Absolute position battery	Approx. 10,000 hours (battery life with power off)

19. Maintenance of Tool

About a tool, we recommend you implementation of a periodical maintenance. By BS controller, the number of times of operation and the total information on the mileage of a ball screw are managed. A monitor is possible for these information by the maintenance information function of BS Configurator. A near maintenance cycle can be obtained from these information and the load situation of a program. Please ask for details the window in your duty.

An overhaul must be carried out at our company and any overhaul carried out by another company falls outside our guaranteed coverage.

If you have any questions on the Servo press, please contact us.

20. Cautions on abandonment

Devices into which electronic equipment is mounted must not be discarded as domestic waste. Please obey the local laws or regulations effective at present for electrical and electronic equipment waste.

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Revision history	