MITSUBISHI
TRANSISTORIZED AC SERVO
MELSERVO-H

INSTRUCTION MANUAL

EXTENSION DIO OPTION CARD
MR-H-D01

Thank you for choosing the option card for Mitsubishi MELSERVO-H AC Servo. This instruction manual gives information on the MR-H-D01 option card used to extend the digital I/O of the MR-H series servo amplifier.

When this option card is used with the battery option, the built-in memory of the option card can hold data before alarm occurs if the power is switched off.

This option card can be used with the servo amplifier having the software version of C1 and later.

Use the diagnostic mode of the MR-PRU to check the software version. (See Chapter 3 of the servo amplifier specification/instruction manual.)
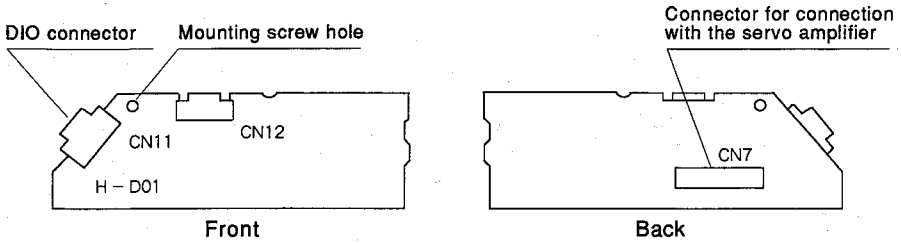
CONTENTS

1. HANDLING

1-1. Standard Specifications

Item		Specifications
Functions		Extension digital I/O, extension data memory
Digital input		24 points, photocoupler isolated, 24 VDC, 5 mA
Digital output		16 points, open collector, 24 VDC, max. 50 mA
Pulse train input	Mode	Any of forward/reverse rotation pulse train, 2-phase pulse train and signed pulse train
	Frequency	Differential 400 kpps, open collector 200 kpps
Extension memory: contents and capacity		Data before alarm : 256 data × 2 channels (selected by parameter setting)
		Monitored data : 1 data × 16 types

1-2. Structure

DIO connector   Mounting screw hole

Connector for connection
with the servo amplifier

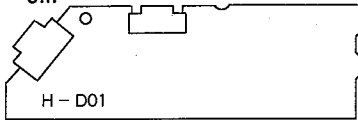CN11   CN12

H - D01

CN7

Front   Back

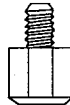# 1-3. Installation to the Servo Amplifier

After unpacking, check that the following set is complete and that the printed circuit board is intact. Then install the option card to the servo amplifier in the following procedure.
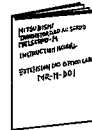
Before installing the option card to the servo amplifier, make sure that the power is off.

H - D01

1 x MR-H-D01 option card   1 x spacer screw   1 x instruction manual
                                                            (this manual)

Installation Procedure

MR-H10A
⌇
MR-H100A
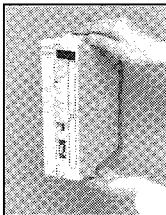
| Put your fingers on the top and bottom catches. | Unfold upper, down and pull out. | Peplase the printed circuit board mounting screw to spacer screw. | Fit the option card snugly and fix it with the printed circuit board mounting screw. |
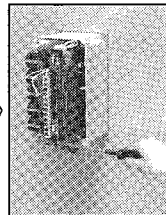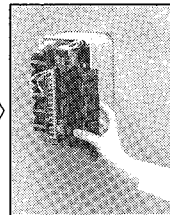
MR-H200A
⌇
MR-H350A
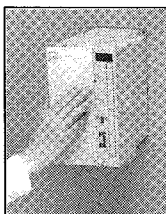
| Open the terminal cover. | Disconnect the brake cables. | Put your fingers on the top, bottom, left and right catches. | Unfold upper, down and pull out. |
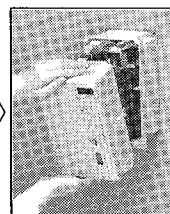
Fold the connector protection cover at the bottom (inclined area) of the cover removed and reinstall the cover.

2. I/O SPECIFICATIONS

2-1. Connector Pinouts

CN11
Type: PCR-S50FS (Honda Tsushin Kogyo)

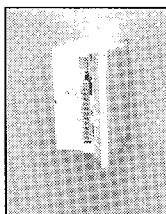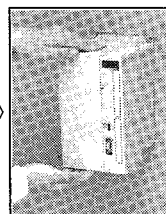| Pin	Signal	Pin	Signal	Pin	Signal
25		50			
24	DO13	49	SD		
23		48	DO12		DO15
22	DO11	47	DO14		
21		46			SG
20	VDD	45	DI17		
19		44	VIND		DI16
18	DI19	43	DI15		
17		42	DI18		DI14
16	SG	41	DI13		
15		40	SG		DI12
14	DI5	39	SG		
13		38	DI4		DI11
12	DI3	37	DI10		
11		36	DI2		DI9
10	DI1	35	DI8		
9		34	DI0		DI7
8	DO5	33	DI6		
7		32	DO4		DO10
6	DO3	31	DO9		
5		30	DO2		DO8
4	DO1	29	DI23		
3		28	DO0		DO7
2	DI21	27	DI22		
1		26	DI20		DO6
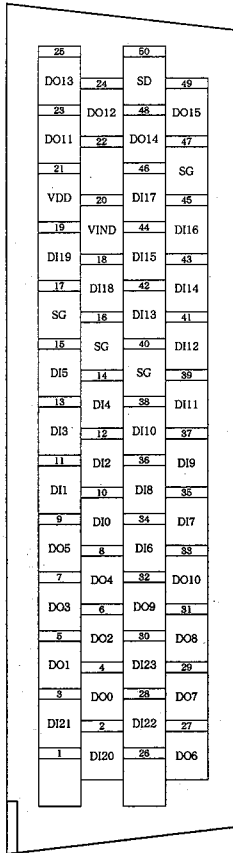
CN12
Type: PCR-S20FS (Honda Tsushin Kogyo)

Pin	Signal	Pin	Signal
10		20	
9		19	OP24	SD
8	OP5	18	SG
7		17	P5	P24
6	P5	16	
5		15	NP1D
4	PP1D	14	PTR
3		13	NPD
2	NPRD	12	PPRD
1		11	LG	PPD
	NTR		LG
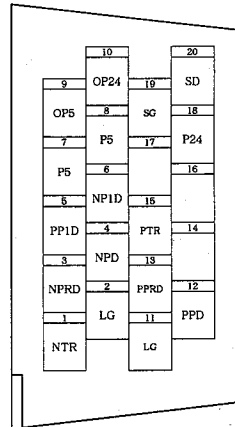
* The following wiring connectors are required:
For CN11: PCR-LS50LA +PCR-S50FS or Mitsubishi's MR-HCN1 option
For CN12: PCR-LS20LA1 +PCR-S20FS or Mitsubishi's MR-HCNS option

2-2. Electrical Specifications of the I/O Signals

CN11

| Signal	Code	Connector Pin No.	Function/Application	I/O Classification
Power output	VDD	21	Approx. 24 VDC is output. The sum of the CN1, CN11 and CN12 values is 200 mA max.	—
Power input	VIND	20	Connect VDD or the external power supply.	—
Shield	SD	50	Connect one end of the shielded cable.	—
24V common	SG	16, 17, 40, 47	Common terminal for the 24 V power supply. Each pin is connected internally.	—
Digital input bit 0	DI00	10	Bit 0 of digital input	DI-1
Digital input bit 1	DI01	11	Bit 1 of digital input	DI-1
Digital input bit 2	DI02	12	Bit 2 of digital input	DI-1
Digital input bit 3	DI03	13	Bit 3 of digital input	DI-1
Digital input bit 4	DI04	14	Bit 4 of digital input	DI-1
Digital input bit 5	DI05	15	Bit 5 of digital input	DI-1
Digital input bit 6	DI06	34	Bit 6 of digital input	DI-1
Digital input bit 7	DI07	35	Bit 7 of digital input	DI-1
Digital input bit 8	DI08	36	Bit 8 of digital input	DI-1
Digital input bit 9	DI09	37	Bit 9 of digital input	DI-1
Digital input bit 10	DI10	38	Bit 10 of digital input	DI-1
Digital input bit 11	DI11	39	Bit 11 of digital input	DI-1
Digital input bit 12	DI12	41	Bit 12 of digital input	DI-1
Digital input bit 13	DI13	42	Bit 13 of digital input	DI-1
Digital input bit 14	DI14	43	Bit 14 of digital input	DI-1
Digital input bit 15	DI15	44	Bit 15 of digital input	DI-1
Digital input bit 16	DI16	45	Bit 16 of digital input	DI-1
Digital input bit 17	DI17	46	Bit 17 of digital input	DI-1
Digital input bit 18	DI18	18	Bit 18 of digital input	DI-1
Digital input bit 19	DI19	19	Bit 19 of digital input	DI-1
Digital input bit 20	DI20	2	Bit 20 of digital input	DI-1
Digital input bit 21	DI21	3	Bit 21 of digital input	DI-1
Digital input bit 22	DI22	28	Bit 22 of digital input, strobe signal	DI-1
Digital input bit 23	DI23	30	Bit 23 of digital input	DI-1
Digital output bit 0	DO00	4	Bit 0 of digital output, alarm code output bit 0	DO-1
Digital output bit 1	DO01	5	Bit 1 of digital output, alarm code output bit 1	DO-1
Digital output bit 2	DO02	6	Bit 2 of digital output, alarm code output bit 2	DO-1
Digital output bit 3	DO03	7	Bit 3 of digital output, alarm code output bit 3	DO-1
Digital output bit 4	DO04	8	Bit 4 of digital output	DO-1
Digital output bit 5	DO05	9	Bit 5 of digital output	DO-1
Digital output bit 6	DO06	27	Bit 6 of digital output	DO-1
Digital output bit 7	DO07	29	Bit 7 of digital output	DO-1
Digital output bit 8	DO08	31	Bit 8 of digital output	DO-1
Digital output bit 9	DO09	32	Bit 9 of digital output	DO-1
Digital output bit 10	DO10	33	Bit 10 of digital output	DO-1
Digital output bit 11	DO11	23	Bit 11 of digital output	DO-1
Digital output bit 12	DO12	24	Bit 12 of digital output	DO-1
Digital output bit 13	DO13	25	Bit 13 of digital output	DO-1
Digital output bit 14	DO14	48	Bit 14 of digital output	DO-1
Digital output bit 15	DO15	49	Bit 15 of digital output	DO-1

CN12

Signal	Code	Connector Pin No.	Function/Application	I/O Classification
Power output	P24	18	Approx. 24 VDC is output. The sum of the CN1, CN11 and CN12 values is 200 mA max.	—
P24 common	SG	19	Common for the P24 power supply	—
P5 common	LG	2, 11	Common for the P5 power supply	—
Power output	P5	7, 8	Approx. 5 VDC is output. Permissible current 60 mA max.	—
Differential input	PPD	12	Positive input for differential forward rotation pulse	DI-2
Differential input	PPRD	13	Negative input for differential forward rotation pulse	DI-2
Differential input	NPD	4	Positive input for differential reverse rotation pulse	DI-2
Differential input	NPRD	3	Negative input for differential reverse rotation pulse	DI-2
OC input	PP1D	5	Input for open collector forward rotation pulse	DI-2
OC input	NP1D	6	Input for open collector reverse rotation pulse	DI-2
OC common	OP5	9	Connect P5 or the external power supply.	—
OC common	OP24	10	Connect P24 or the external power supply.	—
Terminal resistor	NTR	1	Connect NPD at the final stage.	—
Terminal resistor	PTR	15	Connect PPD at the final stage.	—
Shield	SD	20	Connect one end of the shielded cable.	—

Interface Specifications

Connect external devices in accordance with the signal interface (see the I/O Classification in the table) diagrams detailed below.

(1) Digital input interface DI-1

Provide a signal using a miniature relay or open collector transistor.

Servo amplifier

P24
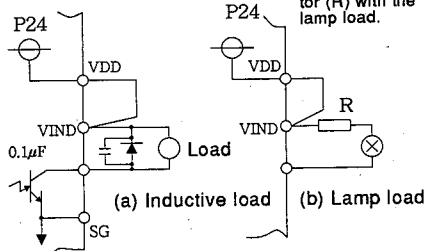
VDD

VIND

R

Approx. 5 mA

4.7k Ω

SW

TR

SG
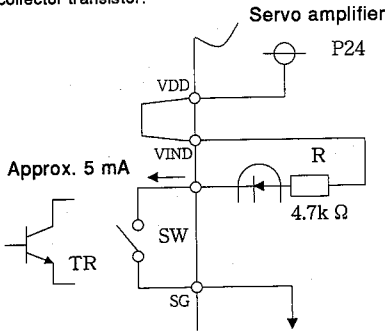
(2) Digital output interface DO-1

A lamp, relay or photocoupler can be driven.

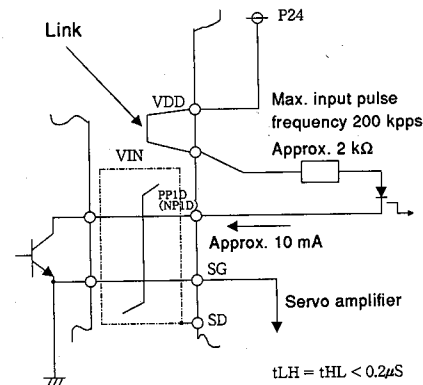Permissible current: 50 mA max.
Inrush current: 100 mA max.

Note: Use an absorber (D, C) with the inductive load and an inrush current suppressing resistor (R) with the lamp load.
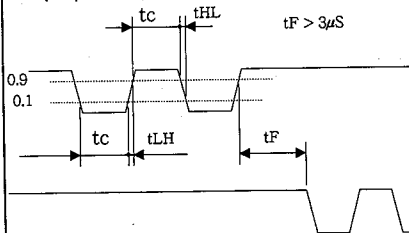
P24

VDD

VIND

0.1μF

Load

SG

(a) Inductive load

P24

VDD

VIND

R

(b) Lamp load

(3) Pulse train input interface DI-2

1) Open collector system

• Interface example

Link

P24

VDD

Max. input pulse frequency 200 kpps

Approx. 2 kΩ

VIN

PP1D
(NP1D)

Approx. 10 mA

SG

Servo amplifier

SD

$tLH = tHL < 0.2\mu S$

• Input pulse conditions

$tc > 4.5\mu S$

$tF > 3\mu S$

tc   tHL

0.9
0.1

tc   tLH   tF

2) Differential line driver system

• Interface example

+5V

Equivalent to Am26LS32

PPD
(NPD)

PTR
(NTR)

PPRD
(NPRD)

Servo amplifier

Equivalent to Am26LS31

SD

High: 4.2 to 5 V
Low: 0 to 0.8 V

Max. input pulse frequency 400 kpps

$tLH = tHL < 0.1\mu S$

$tc > 1\mu S$

$tF > 3\mu S$

• Input pulse conditions

tc   tHL

0.9
0.1

tc   tLH   tF
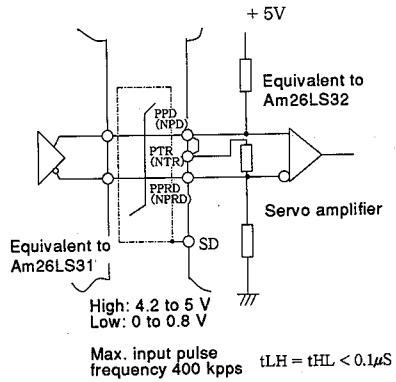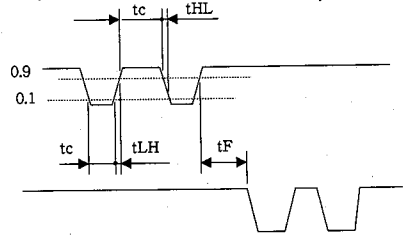
3. FUNCTIONS

3-1. Digital Speed Command

This function is used for speed control. A 12-bit binary speed command is given instead of the analog speed command to enable a wide range of speed control from high speed to ultra-low speed without the influence of noise, etc. Use DI00 to 11 to provide the speed command in 12-bit binary (1 to 4095).

• I/O relationship

When DI00 to 11 are all on, the motor speed is the value set in parameter 35.
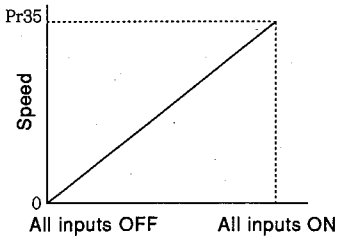
• Analog-digital selection

The speed command can be switched between analog and digital with this option card fitted and parameter 70 set to $\boxed{\times}\boxed{\times}\boxed{0}\boxed{1}$.
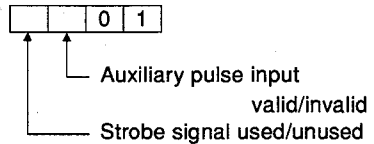
DI12 OFF: digital speed command
DI12 ON : analog speed command

• Parameter

This function valid when set parameter 70 as shown below.
(For more information, see the section of PARAMETERS.)

Auxiliary pulse input
valid/invalid
Strobe signal used/unused

• Strobe signal

Controls the read timing of the 12-bit binary input.
Prepare binary data and switch on the strobe signal at least 1 mS later. Keep the strobe signal on for not less than 10 mS and leave the data unchanged during this period.
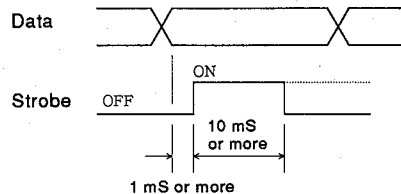
Set 3 in the strobe signal selection bit of parameter 70 to automatically monitor and read a data change independently of the external strobe signal.

For use of the internal power supply   For use of the external power supply

VDD	VDD
VIND	VIND
DI11	DI11
DI10	DI10
DI09	DI09
DI08	DI08
DI07	DI07
DI06	DI06
DI05	DI05
DI04	DI04
DI03	DI03
DI02	DI02
DI01	DI01
DI00	DI00
DI12 (Analog-digital selection)	DI12 (Analog-digital selection)
DI22 (STB)	DI22 (STB)
SG	SG

Within 10 m   Within 10 m

—7—

3-2. Electronic Gear Ratio External Setting

This function is used for position control to set the electronic gear numerator of the parameter as required in 5-digit BCD or 16-bit binary from the outside.

• I/O relationship

For binary input:
use DI00 to 15 and set 1 to 65535.

For BCD input:
use DI00 to 19 and set 1 to 65535.

• Auxiliary pulse multiplication ratio

While the electronic gear changes the main pulse multiplication ratio of CN1, the auxiliary pulse multiplication ratio can change the multiplication ratio of the auxiliary pulse train input.

This is convenient to switch between high, medium and low speeds using the same auxiliary pulse frequency input.

Input		Multiplication Ratio
DI21	DI20	
0	0	1 time
0	1	10 times
1	0	100 times
1	1	1 time

1: Input ON
0: Input OFF

• Parameter

This function valid when set parameter 70 as shown below.
(For more information, see the section of PARAMETERS.)

Binary/BCD selection
Auxiliary pulse input valid/invalid
Strobe signal used /unused

• Strobe signal

Controls the read timing of the 12-bit binary input.

Prepare binary data and switch on the strobe signal at least 1 mS later. Keep the strobe signal on for not less than 10 mS and leave the data unchanged during this period.
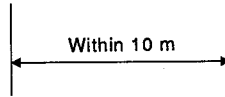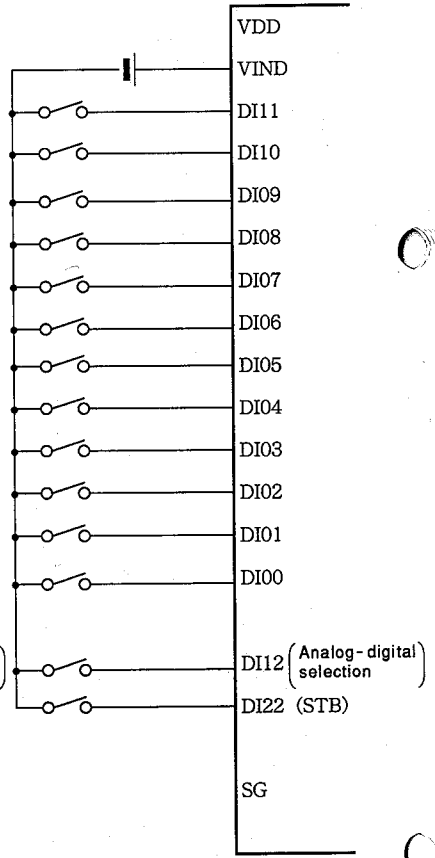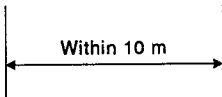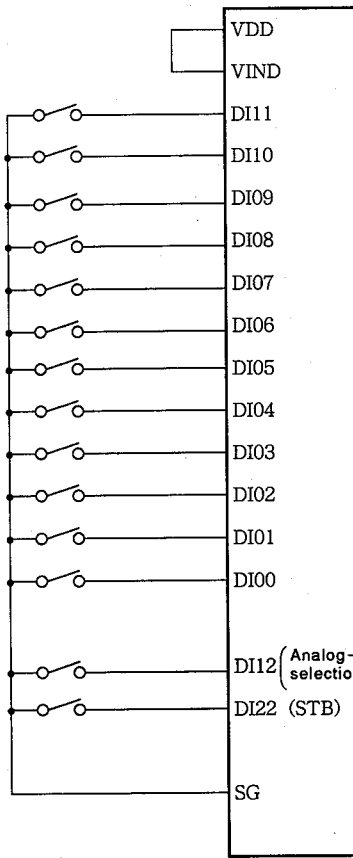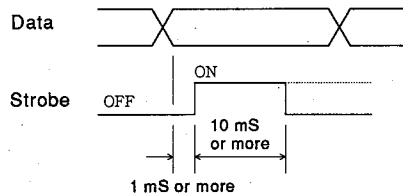

Set 3 in the strobe signal selection bit of parameter 70 to automatically monitor and read a data change independently of the external strobe signal.

For binary input   For BCD input

To be disconnected when the
external power supply is used.

For binary input:

Terminal
VDD
VIND
DI15
DI14
DI13
DI12
DI11
DI10
DI09
DI08
DI07
DI06
DI05
DI04
DI03
DI02
DI01
DI00
DI22 (STB)
DI20
DI21
SG

DI20, DI21: External auxiliary pulse multiplication ratio

Need not be connected when the external power supply is used.

Within 10 m

For BCD input:

Terminal
VDD
VIND
DI19
DI18
DI17
DI16
DI15
DI14
DI13
DI12
DI11
DI10
DI09
DI08
DI07
DI06
DI05
DI04
DI03
DI02
DI01
DI00
DI22 (STB)
DI20
DI21
SG

DI20, DI21: External auxiliary pulse multiplication ratio

Need not be connected when the external power supply is used.

Within 10 m
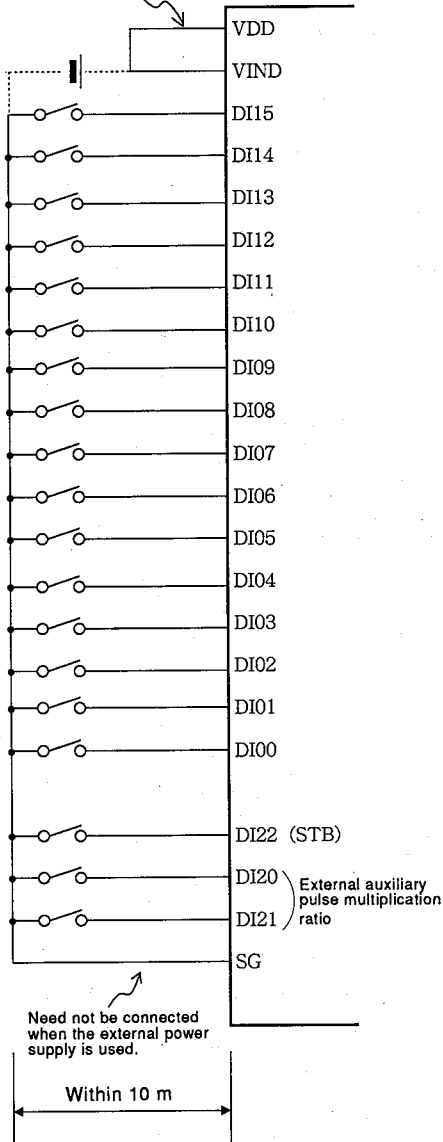
3-3. Auxiliary Pulse Train Input

This function is used for position control. The auxiliary pulse train is added to or subtracted from the pulse train entered through CN1 and is used for fine adjustment during synchronous operation or with a manual pulse generator or the like.
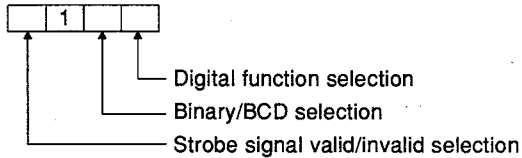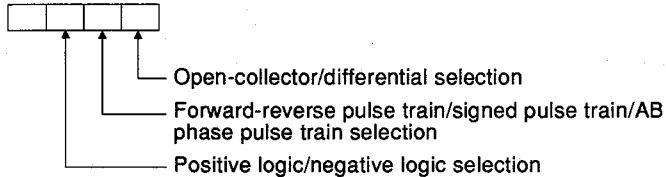
• Parameters

To select this function, set 1 in the corresponding bit of parameter 70 and set the input pulse form in parameter 72.
(For details, see the section of PARAMETERS.)

Pr.70

```
┌──┬──┬──┬──┐
│  │ 1│  │  │
└──┴──┴──┴──┘
```
└── Digital function selection
└── Binary/BCD selection
└── Strobe signal valid/invalid selection

Pr.72

```
┌──┬──┬──┬──┐
│  │  │  │  │
└──┴──┴──┴──┘
```
└── Open-collector/differential selection
└── Forward-reverse pulse train/signed pulse train/AB phase pulse train selection
└── Positive logic/negative logic selection

The electronic gear can be set to the auxiliary pulse train input, independently of the main pulse train input.
For more information, see parameters 73 and 74.
The multiplication ratio can be changed from the outside using the contacts. (For details, see pages 8 and 9.)

• Wiring

Open collector type

P5 or P24
OP5 or OP24
PP1D
NP1D
LG or SG
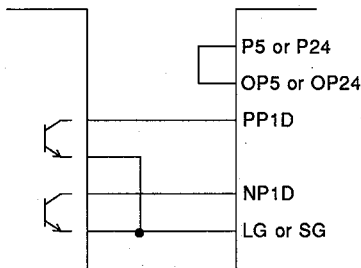
Differential type

PPD
PPRD
NPD
NPRD

For 5V-based input, connect P5 and OP5 and use LG as a common.
For 24V-based input, connect P24 and OP24 and use SG as a common.

3-4. Alarm Code Output

The corresponding alarm can be provided to the open collector output in 4-bit code.

• Wiring

To be disconnected when the external power supply is used.

VDD
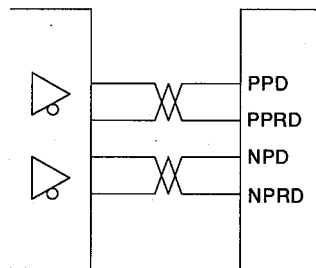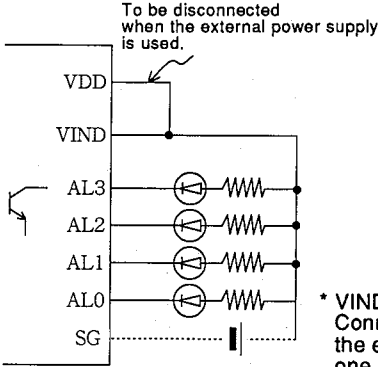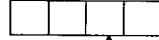VIND
AL3
AL2
AL1
AL0
SG

• Parameter

This function valid when set parameter 71 as shown below. (For details, see the section of Parameters.)
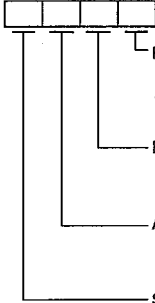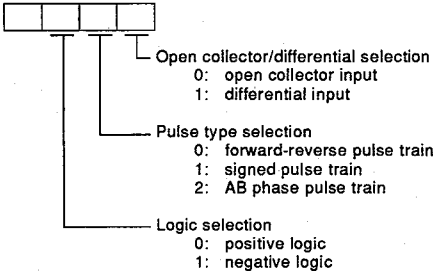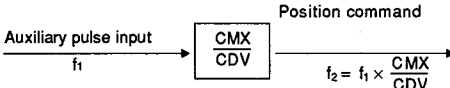
Alarm code output valid/invalid selection

* VIND is common to DI and DO. Connection cannot be made to use the external power supply with only one side.

Alarm Definition (Protective function)	Alarm Display	Bit Outputs				Decimal Value
		AL3	AL2	AL1	AL0	
Memory alarm 1	AL12	0	0	0	0	0
Clock alarm	AL13	0	0	0	0	0
Watch dog	AL14	0	0	0	0	0
Memory alarm 2	AL15	0	0	0	0	0
Board alarm	AL17	0	0	0	0	0
Memory alarm 3	AL19	0	0	0	0	0
Regeneration alarm	AL30	0	0	0	1	1
Undervoltage	AL10	0	0	1	0	2
Main circuit device overheat	AL45	0	0	1	1	3
Motor overheat	AL46	0	0	1	1	3
Overload 1	AL50	0	0	1	1	3
Overload 2	AL51	0	0	1	1	3
Overcurrent	AL32	0	1	0	0	4
Overspeed	AL31	0	1	0	1	5
Error excessive	AL52	0	1	0	1	5
Detector alarm 1	AL16	0	1	1	0	6
Detector alarm 2	AL20	0	1	1	0	6
Feedback alarm	AL42	0	1	1	0	6
Parameter alarm	AL37	1	0	0	0	8
Overvoltage	AL33	1	0	0	1	9
Motor miswiring	AL44	1	0	1	1	11
Ground fault	AL24	1	1	0	0	12
Command pulse frequency alarm	AL35	1	1	0	1	13
Auxiliary pulse frequency alarm	AL73	1	1	0	1	13
Absolute position disappear	AL25	1	1	1	0	14
Add-on memory alarm 1 (Add-on RAM check)	AL74	1	1	1	1	15
Add-on memory alarm 2 (Add-on EP-ROM check)	AL75	1	1	1	1	15
RS-232C alarm	AL8E	0	0	0	0	0

* 1: Output transistor ON (continuity to common terminal SG)
 0: Output transistor OFF (non-continuity to common terminal SG)

4. PARAMETERS

Class	No.	Code	Name and Function	Initial Value	Incre-ments	Setting Range

Option parameter	70		Input signal selection:
			Used to select the application and mode of the input signal.
			
			└─ Function selection
			    0: not used
			    1: digital speed command
			    2: electronic gear ratio external setting
			
			── Binary/BCD selection
			    0: binary input
			    1: BCD input
			
			── Auxiliary pulse valid/invalid selection
			    0: invalid
			    1: valid
			
			── Strobe valid/invalid selection
			    0: valid
			    3: automatic
			
			Note 1. For the digital speed command, binary input is only valid and BCD cannot be selected.
			Note 2. When the auxiliary pulse is made valid, set the required values in Pr. 72.
				0000	—	0000 to 4112

	71		Output signal selection:
			Used to select the application of the output signal.
			
			Set value
			    0: not used
			    1: 4-bit alarm code is used.
				0000	—	0000 to 0001

Class	No.	Code	Name and Function	Initial Value	Increments	Setting Range

Option parameter	72		Auxiliary pulse form selection:
			Used to select the type, etc. of the auxiliary pulse input.
			
			Open collector/differential selection
			   0: open collector input
			   1: differential input
			
			Pulse type selection
			   0: forward-reverse pulse train
			   1: signed pulse train
			   2: AB phase pulse train
			
			Logic selection
			   0: positive logic
			   1: negative logic
				0000	—	0000 to 2121

	73		Auxiliary pulse input electronic gear numerator: Used to set the multiplier of the auxiliary pulse input. Position command Auxiliary pulse input f_1 → $\dfrac{CMX}{CDV}$ → $f_2 = f_1 \times \dfrac{CMX}{CDV}$ Note: Set within the range of $\dfrac{1}{50} < \dfrac{CMX}{CDV} < 50$.	1	1	1 to 32767
	74		Auxiliary pulse input electronic gear denominator: Used to set the divisor of the auxiliary pulse input.	1	1	32767

5. ALARM CODES

Amplifier LED Display	Parameter Unit Screen Display		Cause of Occurrence	Check Point	Remedy
	Current alarm (Name and definition)	Cause of alarm occurrence			
AL73	Op Ref.f.er	Op. board AUX pulse exceeded	Auxiliary pulse input frequency is too high.	Check the positioning unit.	Change the positioning unit.
AL74	Op Memo.er1	Op. board error	Option card fault.	Change the option card and examine.	Change the option card.

◯. COMMUNICATION COMMAND LIST

When the serial communication function of the MR-H is used to control the in-puts/outputs of this option, the commands of this option are extended to the com-mands given in the Communication Function Instruction Manual (IB (NA)67153).

Command	Data No.	Description
34	1E to 35	Names and ON/OFF states of the corresponding DI's DI00 to 23 correspond to data No. 1E and onward.
34	97 to A6	Names and ON/OFF states of the corresponding DO's DO00 to 15 correspond to data No. 96 and onward.
8B	86	Forced output of DO00
8B	87	Forced output of DO01
8B	88	Forced output of DO02
8B	89	Forced output of DO03
8B	8A	Forced output of DO04
8B	8B	Forced output of DO05
8B	8C	Forced output of DO06
8B	8D	Forced output of DO07
8B	8E	Forced output of DO08
8B	8F	Forced output of DO09
8B	90	Forced output of DO10
8B	91	Forced output of DO11
8B	92	Forced output of DO12
8B	93	Forced output of DO13
8B	94	Forced output of DO14
8B	95	Forced output of DO15
A0	02	Batch write to DI ports (As in command 00, each bit corresponds to each output.)
A0	03	Batch write to DO ports (As in command 01, each bit corresponds to each output.)

MITSUBISHI ELECTRIC CORPORATION

Specifications subject to change without notice.