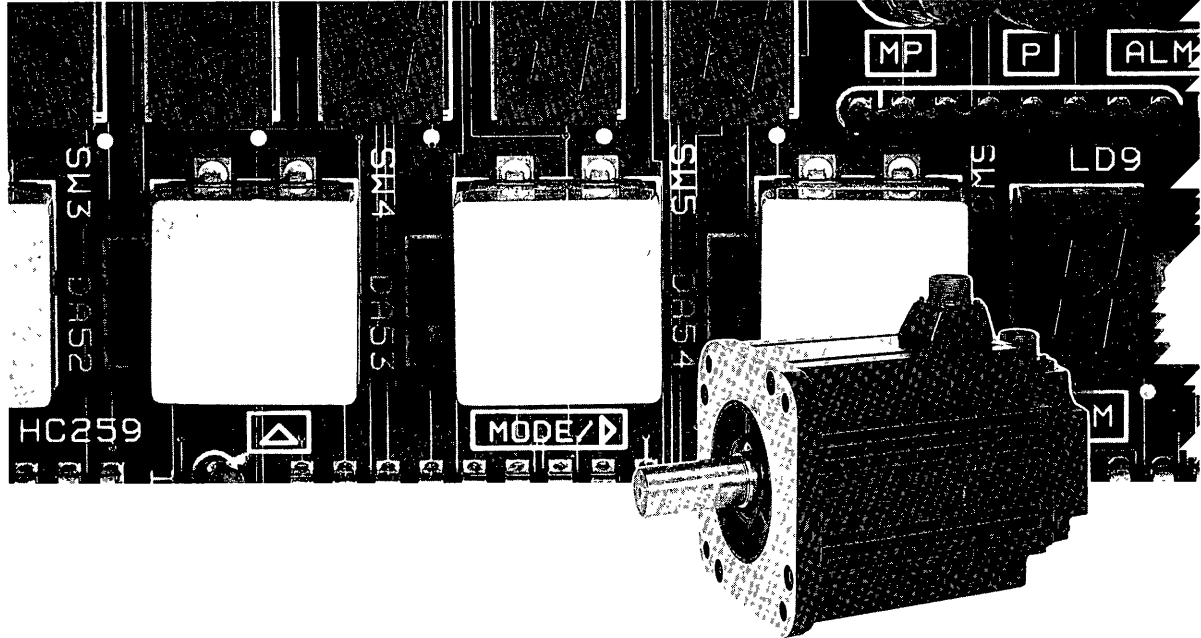


AC SERVO DRIVES HR SERIES DESCRIPTIVE MANUAL

FOR MULTI-FUNCTIONS/POSITIONING CONTROL

SERVOMOTOR M,F,G SERIES

SERVOPACK CACR-HR-□□UB (BASE-MOUNTED TYPE)



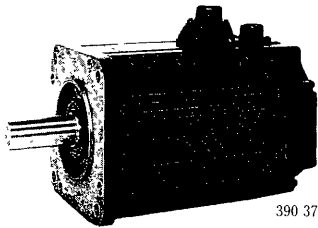
YASKAWA



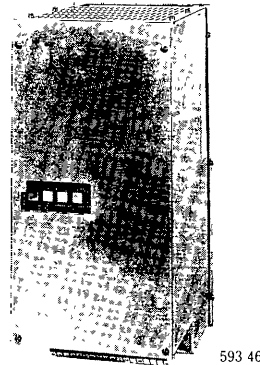
Yaskawa AC Servos have been developed for the most advanced FA and FMS. The extensive servo manufacturing technology accumulated through half a century of servo drive applications has created this series.

AC Servopack CACR-HR is a general-purpose multi-function position controller which applies YASKAWA's long-term positioning control technologies to software.

In addition to realization of high-accuracy and quick response control even under adverse conditions, easy and flexible operation is available with excellent maintainability due to various display functions and protective functions.



AC SERVOMOTOR



SERVOPACK
(Base-mounted Type)

CAUTION

Never conduct voltage resistance or megger tester.

| | | |
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1 OUTLINE

Servopack type CACR-HR [] [] UB is single axis position controller and servo amplifier for AC servomotor.

Input method of positioning data (speed, position) can be selected from Table 1.1 by setting parameters. Each input method has four operation modes described in Table 1.2. All servo constants are set by parameters. Therefore, adjustment can be performed properly without dispersion.

This manual describes functions and use of Servopack type CACR-HR [] [] UB and to realize its full performance. Read this manual to customize the use of this drive and improve performance for the machines.

Table 1.1 Input Method

| Input Method | Description |
|---|---|
| Serial Communication Input | Positioning data are input by serial commands. Commands can be sent to 16 Servopacks with one master controller by connecting with multi-drop method. |
| Station No. Input | Indexing positioning is performed. Numbers provided to indexing points (station numbers) are input as position data. Speed data are selected from four types of speed set in the Servopack by parameters, by speed selection signals. Both "one-way rotation" and "short-cut rotation" are possible. <ul style="list-style-type: none"> • Range of station numbers <ul style="list-style-type: none"> Binary coded decimal (BCD): 0 to 999 Binary: 0 to 4095 |
| Digital Switch(DG-SW) (Thumbwheel Switch) Input | Positioning data are input by contacts from digital switches, relays or sequencers. <ul style="list-style-type: none"> • Range of positioning data <ul style="list-style-type: none"> Speed: Up to 6 digits Position: Sign + up to 8 digits <p>Note: According to strobe signal, HR drive reads DG-SW input data in time divisions of 2 digits. Therefore, YASKAWA's exclusive digital switch is recommended. When another digital switch or relay is used, use "contact input unit". When data are directly input from the PLC, it is necessary to set scan time of HR drive (24 to 2000 ms, variable) to match sequencer's scan time.</p> |
| Command Table Input | Positioning data are selected from the command table set in the Servopack by using the positioning data selection signals. Positioning data are selected in the form of position and speed as a pair : Up to 64 patterns can be selected. |

Table 1.2 Operation Modes

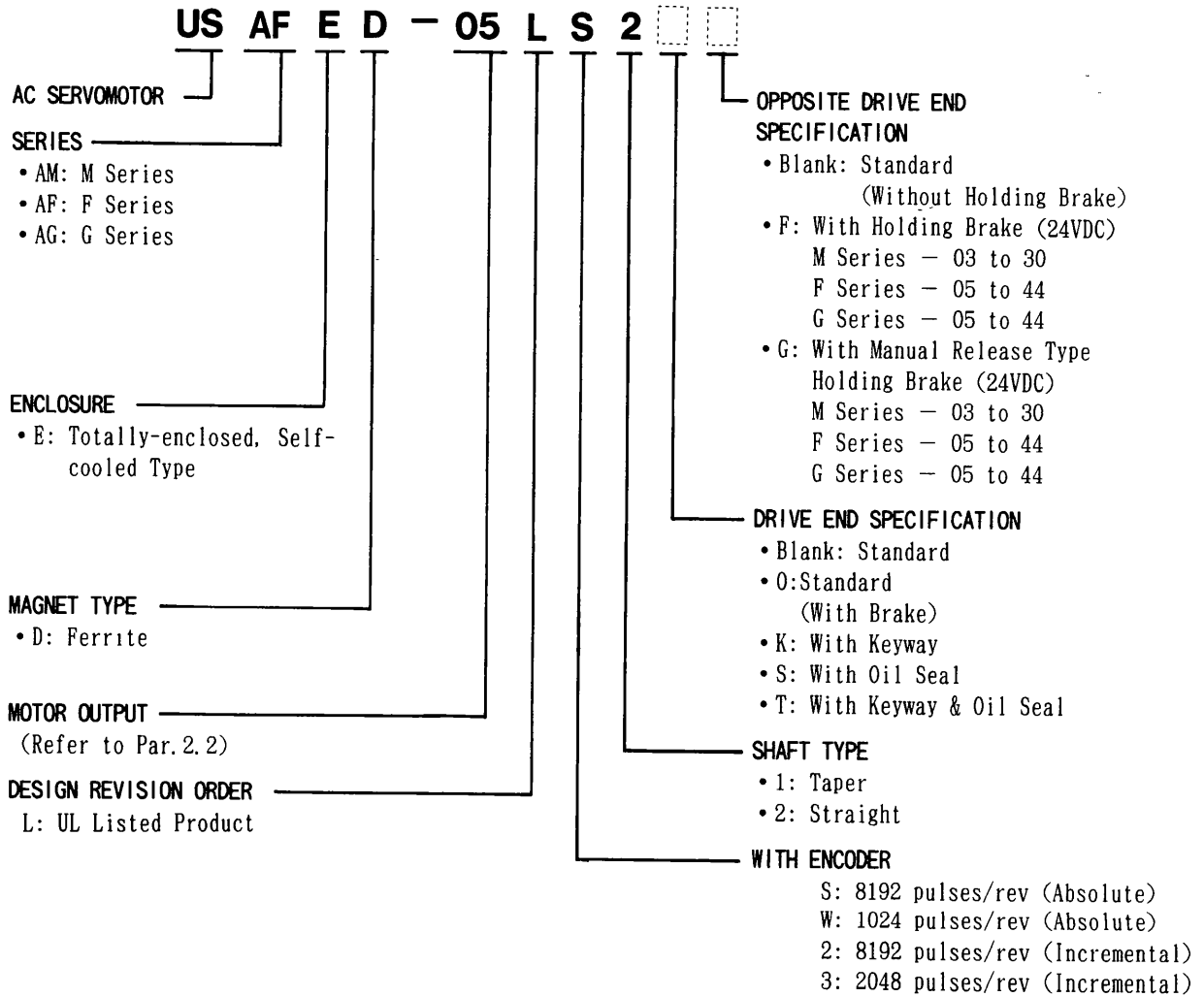
| Operation Mode | Contents |
|---------------------------------|---|
| Automatic Mode | After positioning data are input, positioning is performed based on the data by turning ON start signal. |
| Manual Mode | While manual operation signal is turned ON, operation is performed at constant speed. |
| Pulse Mode | <p>Positioning is performed by pulse train command given by an external pulse generator.</p> <ul style="list-style-type: none"> • Pulse method: Line driver/line receiver method • Pulse form: 90° phase difference 2-phase pulse train (up to 1.6 Mpps) Sign + pulse train (up to 400 kpps) CW + CCW pulse train (up to 400 kpps) • Pulse multiplication: ×1, ×10, ×100 |
| Zero-point Return (Homing) Mode | <p>Used for zero-point return (homing) when incremental encoder is used. Two types of methods can be selected.</p> <p>(1) Decel limit switch and encoder Cϕ-pulse signal are used. (2) Only stop limit switch is used.</p> |

2 TYPE DESIGNATION AND CONFIGURATION

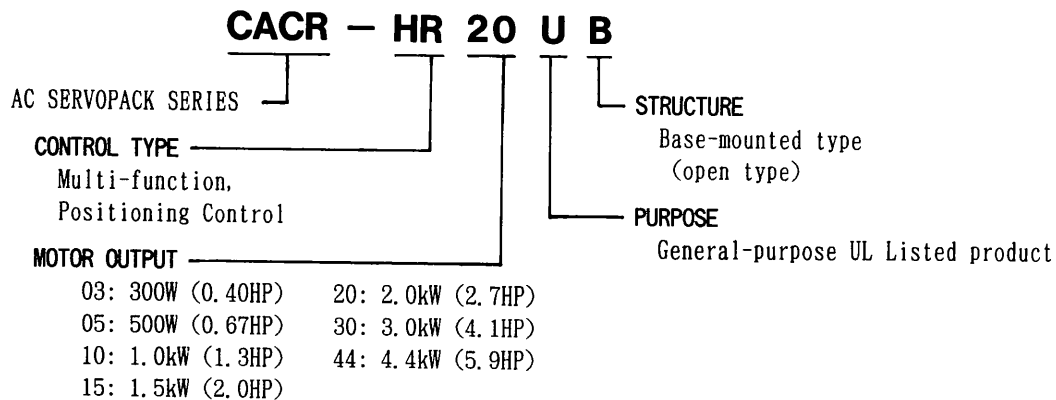


2.1 TYPE DESIGNATION

(1) SERVOMOTOR



(2) SERVOPACK



2.2 COMBINATION OF AC SERVOPACK AND SERVOMOTOR

Table 2.1 Combination of AC SERVOPACK and SERVOMOTOR

| Configuration, Main Circuit Voltage | | | Base-mounted Type, 3-phase 200VA | | | | | | | | |
|---|---|--|--|-----------------------------|-----------------------------|----------------------|----------------------|----------------|------------|--------------|--------------------------|
| Type CACR-HR | | | 03UB | 05UB | 10UB | 15UB | 20UB | 30UB | 44UB | | |
| M Series | Applicable Servomotor | Type USAMED- | 03L [] 1 | — | 06L [] 1 | 09L [] 2 | 12L [] 2 | 20L [] 2 | 30L [] 2 | 44L [] 2 | |
| | | Output | kW HP | 0.3 0.4 | — | 0.6 0.8 | 0.9 1.2 | 1.2 1.6 | 2.0 2.7 | 3.0 4.1 | 4.4 5.9 |
| | | Speed | r/min | Rating 1000/ Max 2000 | — | Rating 1000/Max 2000 | | | | | Rating 1000/ Max 1500 |
| | Continuous Output Current | | Arms | 3.0 | — | 5.8 | 7.6 | 11.7 | 18.8 | 26.0 | 33.0 |
| | Max Output Current | | Arms | 7.3 | — | 13.9 | 16.6 | 28.0 | 42.0 | 56.5 | 70.0 |
| | Allowable Load Inertia $J_L (=GD^2/4)$ | | kg·cm ² lb·in·S ² ×10 ⁻³ | 67.5 60 | — | 121.5 107.5 | 183.5 162.5 | 290 256 | 550 486 | 715 633.5 | 1200 1063 |
| | F Series | Applicable Servomotor | Type USAFED- | — | 05L [] 1 | — | 09L [] 1 | 13L [] 2 | 20L [] 2 | 30L [] 2 | 44L [] 2 |
| Output | | | kW HP | — | 0.45 0.6 | — | 0.85 1.1 | 1.3 1.7 | 1.8 2.4 | 2.9 3.9 | 4.4 5.9 |
| Speed | | | r/min | — | Rating 1500/ Max 2500 | — | Rating 1500/Max 2500 | | | | |
| Continuous Output Current | | Arms | — | 3.8 | — | 6.2 | 9.7 | 15.0 | 20.0 | 30.0 | |
| Max Output Current | | Arms | — | 11.0 | — | 17.0 | 27.6 | 42.0 | 56.5 | 77.0 | |
| Allowable Load Inertia $J_L (=GD^2/4)$ | | kg·cm ² lb·in·S ² ×10 ⁻³ | — | 67.5 60 | — | 121.5 107.5 | 183.5 162.5 | 290 256 | 550 486 | 715 633.5 | |
| G Series | | Applicable Servomotor | Type USAGED- | — | 05L [] 1 | — | 09L [] 1 | 13L [] 2 | 20L [] 2 | 30L [] 2 | 44L [] 2 |
| | Output | | kW HP | — | 0.45 0.6 | — | 0.85 1.2 | 1.3 1.8 | 1.8 2.4 | 2.9 3.9 | 4.4 5.9 |
| | Speed | | r/min | — | Rating 1500/ Max 3000 | — | Rating 1500/Max 3000 | | | | |
| | Continuous Output Current | | Arms | — | 3.8 | — | 7.6 | 11.7 | 19.0 | 26.0 | 33.0 |
| | Max Output Current | | Arms | — | 11.0 | — | 17.0 | 28.0 | 42.0 | 56.5 | 70.0 |
| | Allowable Load Inertia $J_L (=GD^2/4)$ | | kg·cm ² lb·in·S ² ×10 ⁻³ | — | 67.5 60 | — | 121.5 107.5 | 183.5 162.5 | 290 256 | 550 486 | 715 633.5 |

Note: Combination of SERVOMOTOR and encoder is as shown below:

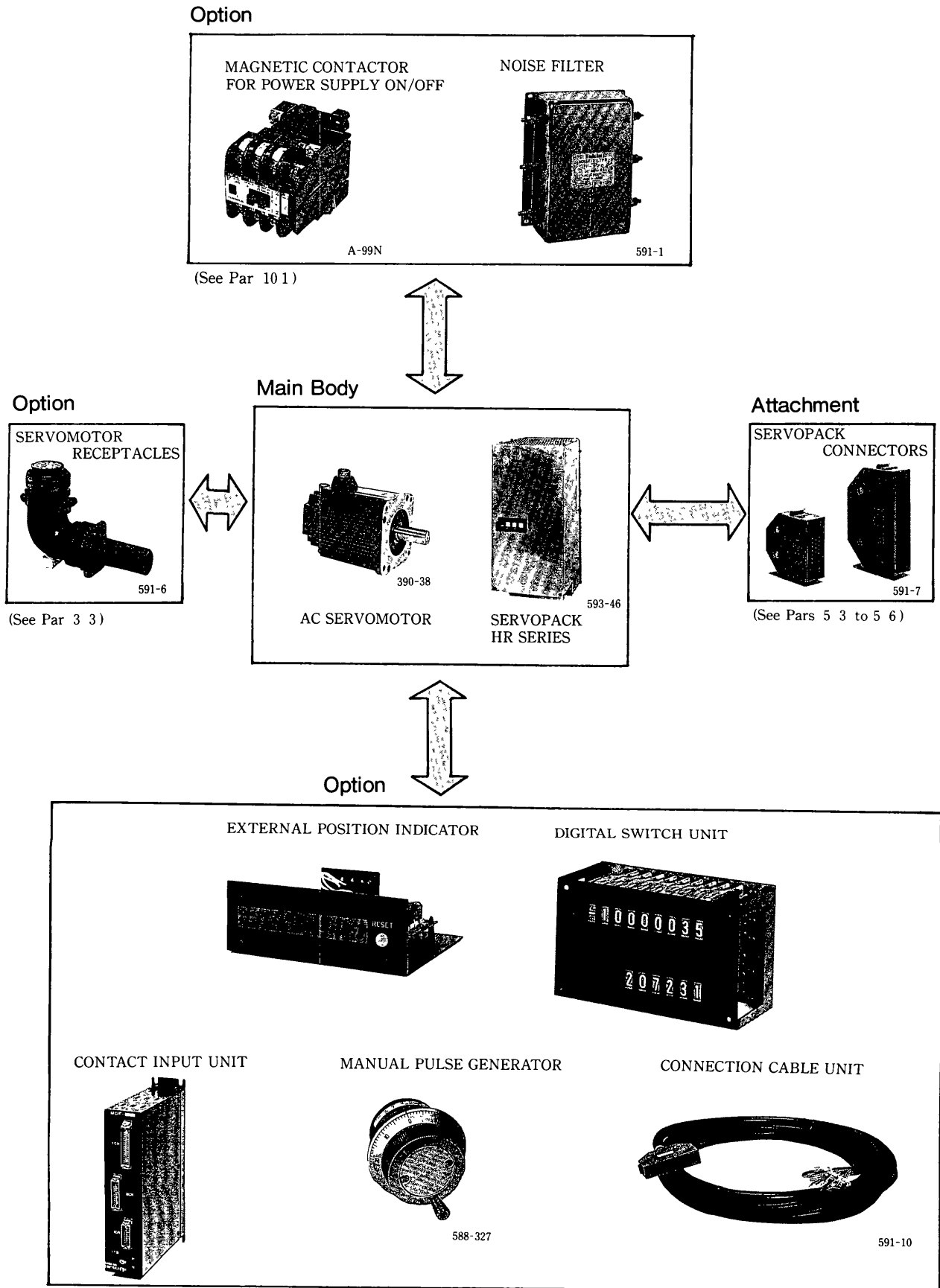
Table 2.2 Combination of Servomotor and Encoder

| No. of Pulses | Incremental Encoder | | Absolute Encoder | |
|---------------|---------------------|------|------------------|------|
| | 2048 | 8192 | 1024 | 8192 |
| M Series | ○ | ◎ | ○ | ◎ |
| F Series | ○ | ◎ | ○ | ◎ |
| G Series | ○ | ◎ | ○ | ◎ |

◎ Standard

○ Semi-standard

2.3 CONFIGURATION WITH PERIPHERAL DEVICES



(See YASKAWA Controls Co, Ltd Catalog HSE-CO-16)

3

RATINGS AND SPECIFICATIONS OF AC SERVOMOTOR

3.1 RATINGS AND SPECIFICATIONS

3.1.1 M Series

(1) Ratings

Time Rating: Continuous

Insulation: Class F

Isolation Voltage: 1500 VAC, one minute

Insulation Resistance: 500 VDC, 10MΩ or more

Enclosure: Totally-enclosed, self-cooled;
equivalent to IP65 exclusive shaft
opening

Ambient Temperature: 0 to + 40°C

Ambient Humidity: 20% to 80%
(non-condensing)

Vibration: 15μm or below

Finish in Munsell Notation: N1.5

Excitation: Permanent magnet

Mounting: Flange mounted

Drive Method: Direct drive

(2) Combination with encoder

• Standard

USAMED -[] LS [] : With absolute encoder (8192 pulses/rev)

USAMED -[] L2 [] : With incremental encoder (8192 pulses/rev)

• Semi-Standard

USAMED -[] LW [] : With absolute encoder (1024 pulses/rev)

USAMED -[] L3 [] : With incremental encoder (2048 pulses/rev)

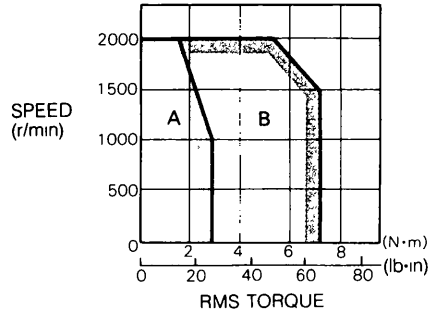
Table 3.1 Ratings and Specifications of M Series AC SERVOMOTORS

| Item | Motor Type USAMED- | Motor Type USAMED- | | | | | | |
|--|--|--------------------|----------------|----------------|---------------|---------------|----------------|----------------|
| | | 03L | 06L | 09L | 12L | 20L | 30L | 44L |
| Rated Output* | kW (HP) | 0.3 (0.4) | 0.6 (0.8) | 0.9 (1.2) | 1.2 (1.6) | 2.0 (2.7) | 3.0 (4.0) | 4.4 (5.9) |
| Rated Torque* | N·m (lb·in) | 2.84 (25) | 5.69 (50) | 8.63 (76) | 11.5 (102) | 19.1 (170) | 28.4 (253) | 41.9 (373) |
| Continuous Max Torque* | N·m (lb·in) | 2.94 (26) | 5.88 (52) | 8.82 (78) | 11.8 (105) | 21.6 (192) | 32.3 (287) | 46.1 (409) |
| Instantaneous Peak Torque* | N·m (lb·in) | 7.17 (64) | 14.1 (125) | 19.3 (172) | 28.0 (249) | 44.0 (391) | 63.7 (566) | 91.1 (810) |
| Rated Current* | A | 3.0 | 5.8 | 7.6 | 11.7 | 18.8 | 26 | 33 |
| Rated Speed* | r/min | 1000 | | | | | | |
| Instantaneous Max Speed* | r/min | 2000 | | | | | | 1500 |
| Torque Constant | N·m/A (lb·in/A) | 1.01 (9.0) | 1.04 (9.2) | 1.21 (10.7) | 1.02 (9.0) | 1.07 (9.5) | 1.16 (10.3) | 1.33 (11.8) |
| Moment of Motor Inertia $J_m (=GD_w^2/4)$ | Kg·m ² × 10 ⁻⁴ (lb·in·S ² × 10 ⁻³) | 13.5 (12.0) | 24.3 (21.5) | 36.7 (32.5) | 58 (51.5) | 110 (97.2) | 143 (127) | 245 (213) |
| Power Rate* | kW/s | 6.0 | 13.3 | 20.3 | 22.7 | 33.2 | 57.0 | 74.0 |
| Inertia Time Constant | ms | 12.8 | 6.3 | 4.4 | 6.0 | 5.2 | 3.5 | 3.6 |
| Inductive Time Constant | ms | 2.7 | 5.1 | 6.5 | 10.4 | 12.9 | 15.3 | 16.2 |

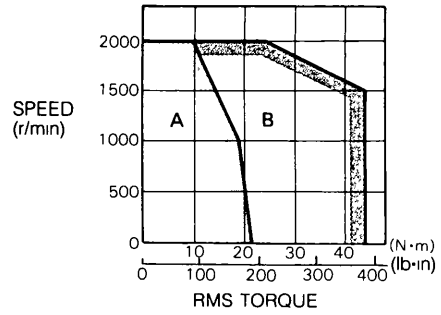
* Typical value at armature winding temperature of 20°C, in combination with Servopack

(3) Torque-Speed Characteristics

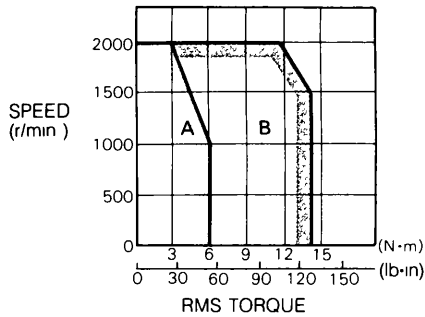
• TYPE USAMED-03L



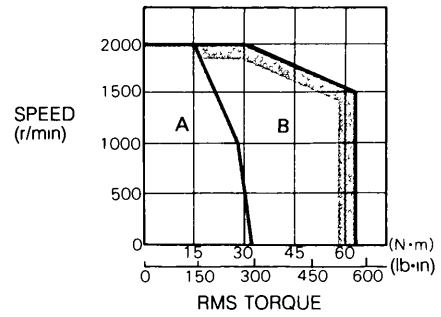
• TYPE USAMED-20L



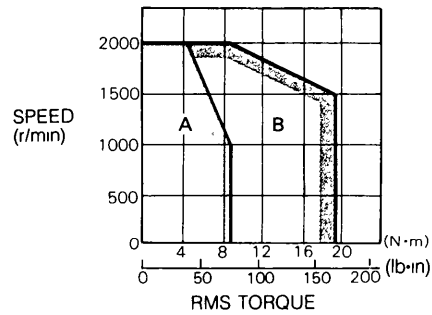
• TYPE USAMED-06L



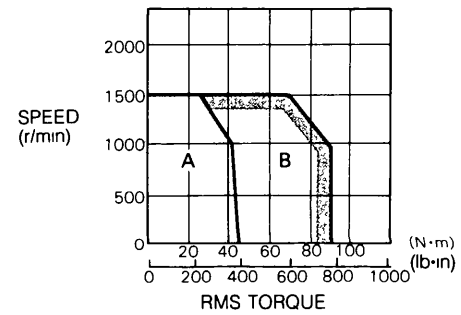
• TYPE USAMED-30L



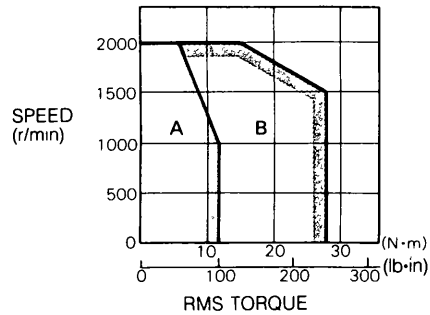
• TYPE USAMED-09L



• TYPE USAMED-44L



• TYPE USAMED-12L



A CONTINUOUS DUTY ZONE
 B INTERMITTENT DUTY ZONE
 POWER SUPPLY 200 V
 Typical at 20°C (Armature Winding Temp)

3.1.2 F Series

(1) Ratings

Time Rating: Continuous

Insulation: Class F

Isolation Voltage: 1500 VAC, one minute

Insulation Resistance: 500 VDC, 10MΩ or more

Enclosure: Totally-enclosed, self-cooled
Equivalent to IP-65 exclusive
shaft opening

Ambient Temperature: 0 to + 40°C

Ambient Humidity: 20% to 80%
(non-condensing)

Vibration: 15μm or below

Finish in Munsell Notation: N1.5

Excitation: Permanent magnet

Mounting: Flange mounted

Drive Method: Direct drive

(2) Combination with encoder

• Standard

USAFED- [] LS [] : With absolute encoder (8192 pulses/rev)

USAFED- [] L2 [] : With incremental encoder (8192 pulses/rev)

• Semi-Standard

USAFED- [] LW [] : With absolute encoder (1024 pulses/rev)

USAFED- [] L3 [] : With incremental encoder (2048 pulses/rev)

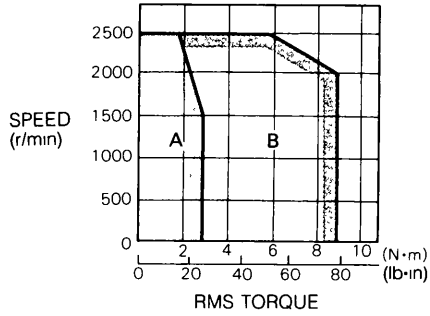
Table 3.2 Ratings and Specifications of F Series AC SERVOMOTORS

| Item | Motor Type USAFED- | 05L | 09L | 13L | 20L | 30L | 44L |
|---|--|----------------|----------------|----------------|---------------|---------------|----------------|
| | | Rated Output* | kW (HP) | 0.45 (0.6) | 0.85 (1.1) | 1.3 (1.7) | 1.8 (2.4) |
| Rated Torque* | N·m (lb·in) | 2.84 (25) | 5.39 (48) | 8.34 (74.0) | 11.5 (102) | 18.6 (165) | 28.4 (253) |
| Continuous Max. Torque* | N·m (lb·in) | 2.94 (26) | 5.88 (52) | 8.83 (78) | 11.8 (102) | 22.6 (200) | 37.3 (330) |
| Instantaneous Peak Torque* | N·m (lb·in) | 8.92 (79) | 15.2 (135) | 24.7 (219) | 34.0 (302) | 54.1 (479) | 76.2 (675) |
| Rated Current* | A | 3.8 | 6.2 | 9.7 | 15 | 20 | 30 |
| Rated Speed* | r/min | 1500 | | | | | |
| Instantaneous Max. Speed* | r/min | 2500 | | | | | |
| Torque Constant | N·m/A (lb·in/A) | 0.8 (7.1) | 0.92 (8.2) | 0.92 (8.2) | 0.82 (7.3) | 0.98 (8.7) | 1.02 (9.06) |
| Moment of Motor Inertia J _M (=GD ² /4) | Kg·m ² × 10 ⁻⁴ (lb·in·S ² × 10 ⁻³) | 13.5 (12.0) | 24.3 (21.6) | 36.7 (32.6) | 58 (51.5) | 110 (97.7) | 143 (127) |
| Power Rate* | kW/s | 6.0 | 12 | 18.9 | 22.7 | 31.5 | 57 |
| Inertia Time Constant | ms | 10.9 | 6.0 | 4.4 | 5.9 | 5.2 | 3.7 |
| Inductive Time Constant | ms | 3.2 | 5.2 | 6.1 | 10.4 | 13 | 15.2 |

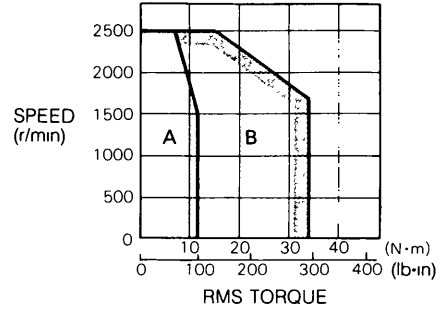
* Typical value at armature winding temperature of 20°C. in combination with Servopack.

(3) Torque-Speed Characteristics

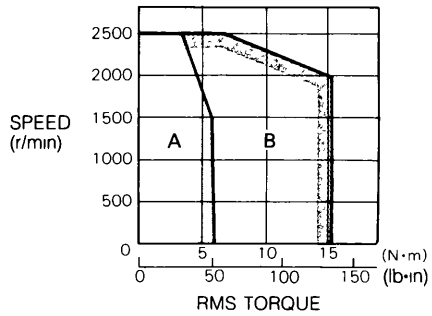
• TYPE USAFED-05L



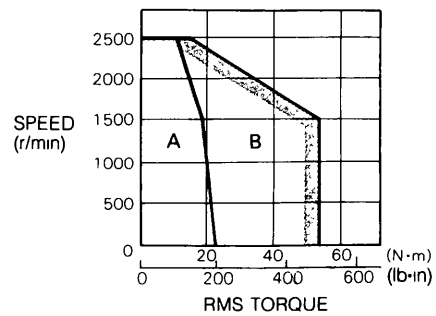
• TYPE USAFED-20L



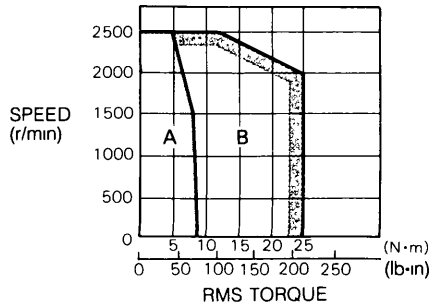
• TYPE USAFED-09L



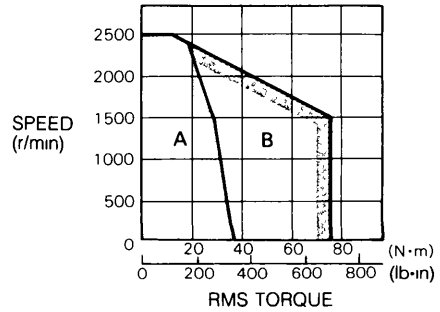
• TYPE USAFED-30L



• TYPE USAFED-13L



• TYPE USAFED-44L



A CONTINUOUS DUTY ZONE
 B INTERMITTENT DUTY ZONE
 POWER SUPPLY 200 V
 Typical at 20°C (Armature Winding Temp)

3.1.3 G Series

(1) Ratings

Time Rating: Continuous

Insulation: Class F

Isolation Voltage: 1500 VAC, one minute

Insulation Resistance: 500 VDC, 10MΩ or more

Enclosure: Totally-enclosed, self-cooled
Equivalent to IP-65 exclusive
shaft opening

Ambient Temperature: 0 to + 40°C

Ambient Humidity: 20% to 80%
(non-condensing)

Vibration: 15μm or below

Finish in Munsell Notation: N1.5

Excitation: Permanent magnet

Mounting: Flange mounted

Drive Method: Direct drive

(2) Combination with encoder

• Standard

USAGED- [] LS [] : With absolute encoder (8192 pulses/rev)

USAGED- [] L2 [] : With incremental encoder (8192 pulses/rev)

• Semi-Standard

USAGED- [] LW [] : With absolute encoder (1024 pulses/rev)

USAGED- [] L3 [] : With incremental encoder (2048 pulses/rev)

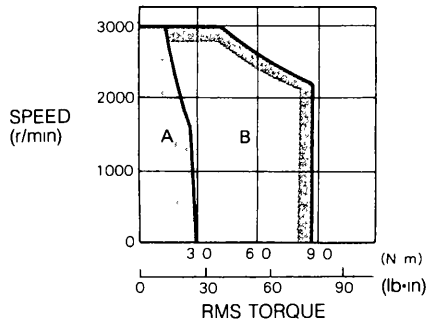
Table 3.3 Ratings and Specifications of G Series AC SERVOMOTORS

| Item | Motor Type USAGED- | 05L | 09L | 13L | 20L | 30L | 44L |
|--|---|----------------|----------------|----------------|---------------|---------------|---------------|
| | | Rated Output* | kW (HP) | 0.45 (0.6) | 0.85 (1.1) | 1.3 (1.7) | 1.8 (2.4) |
| Rated Torque* | N·m (lb·in) | 2.84 (25) | 5.39 (48) | 8.34 (74.0) | 11.5 (102) | 18.6 (165) | 28.4 (253) |
| Continuous Max. Torque* | N·m (lb·in) | 2.94 (26) | 5.88 (52) | 8.83 (78) | 11.8 (102) | 22.6 (200) | 37.3 (330) |
| Instantaneous Peak Torque* | N·m (lb·in) | 8.92 (79) | 13.3 (118) | 23.3 (207) | 28.0 (249) | 45.1 (401) | 66.2 (589) |
| Rated Current* | A | 3.8 | 7.6 | 11.7 | 19.0 | 26.0 | 33.0 |
| Rated Speed* | r/min | 1500 | | | | | |
| Max. Speed* | r/min | 3000 | | | | | |
| Torque Constant | N·m/A (lb·in/A) | 0.80 (7.1) | 0.80 (7.1) | 0.83 (7.4) | 0.67 (5.9) | 0.80 (7.1) | 0.95 (8.4) |
| Moment of Motor Inertia $J_M (=GD_M^2/4)$ | $kg \cdot m^2 \times 10^{-4}$ (lb·in·s ² × 10 ⁻³) | 13.5 (12.0) | 24.3 (21.6) | 36.7 (32.6) | 58 (51.5) | 110 (97.7) | 143 (127) |
| Power Rate* | kW/s | 6.0 | 12.0 | 18.9 | 22.7 | 36.5 | 57.0 |
| Inertia Time Constant | ms | 10.9 | 6.1 | 4.3 | 5.8 | 5.2 | 3.4 |
| Inductive Time Constant | ms | 3.2 | 5.2 | 6.7 | 10.6 | 13.2 | 15.9 |

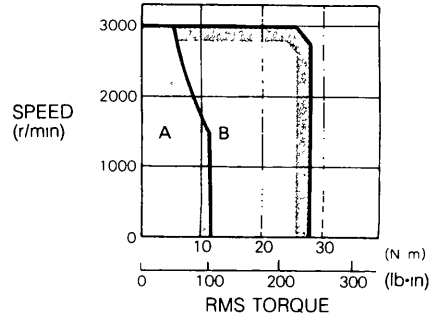
* Typical value at armature winding temperature of 20°C. in combination with Servopack.

(3) Torque-Speed Characteristics

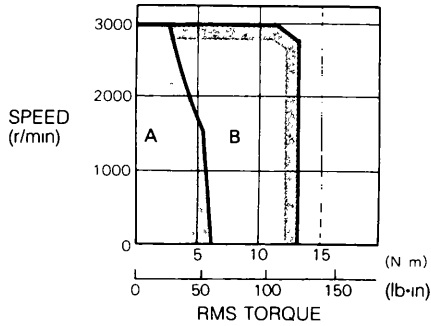
• TYPE USAGED-05L



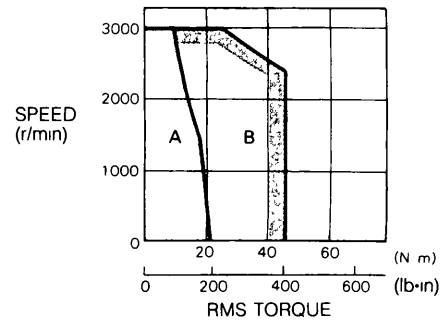
• TYPE USAGED-20L



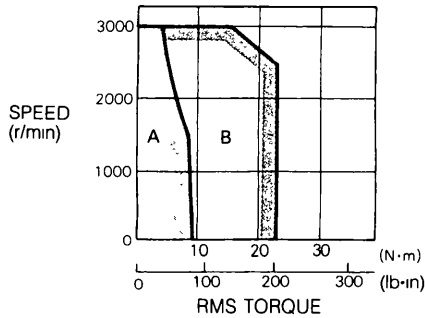
• TYPE USAGED-09L



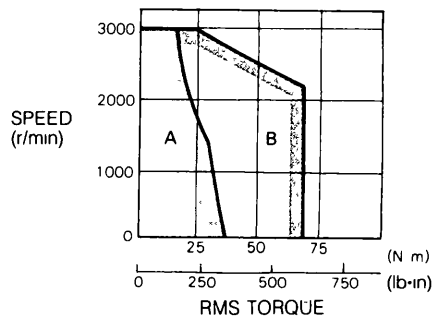
• TYPE USAGED-30L



• TYPE USAGED-13L



• TYPE USAGED-44L



A CONTINUOUS DUTY ZONE
 B. INTERMITTENT DUTY ZONE
 POWER SUPPLY 200 V
 Typical at 20°C (Armature Winding Temp)

3.2 MECHANICAL CHARACTERISTICS

3.2.1 Mechanical Strength

AC servomotors can carry up to the momentary maximum torque of each motor at output shaft.

3.2.2 Allowable Radial Load and Thrust Load

Table 3.4 shows allowable loads according to AC servomotor types.

Table 3.4 Allowable Radial Load and Thrust Load

• M Series

| Motor Type USAMED- | Allowable Radial Load* N(1b) | Allowable Thrust Load N(1b) |
|-----------------------|------------------------------------|-----------------------------------|
| 03L □ 1 | 490(110) | 98(22) † |
| 06L □ 1 | | |
| 09L □ 2 | 686(154) | 343(77) |
| 12L □ 2 | 1470(330) | 490(110) |
| 20L □ 2 | | |
| 30L □ 2 | | |
| 44L □ 2 | 1764(397) | 588(132) |

• F Series

| Motor Type USAFED- | Allowable Radial Load* N(1b) | Allowable Thrust Load N(1b) |
|-----------------------|------------------------------------|-----------------------------------|
| 05L □ 1 | 490(110) | 98(22) † |
| 09L □ 1 | | |
| 13L □ 2 | 686(154) | 343(77) |
| 20L □ 2 | 1470(331) | 490(110) |
| 30L □ 2 | | |
| 44L □ 2 | | |

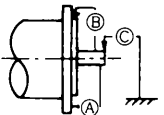
• G Series

| Motor Type USAGED- | Allowable Radial Load* N(1b) | Allowable Thrust Load N(1b) |
|-----------------------|------------------------------------|-----------------------------------|
| 05L □ 1 | 490(110) | 98(22) † |
| 09L □ 1 | | |
| 13L □ 2 | 686(154) | 343(77) |
| 20L □ 2 | 1470(331) | 490(110) |
| 30L □ 2 | | |
| 44L □ 2 | | |

* Maximum values of the load applying to the shaft extension.
 † Do not apply the exceeding load because motor can not be rotated.

3.2.3 Mechanical Specifications

Table 3.5 Mechanical Specifications in mm

| Accuracy(T. I. R.) ^{*1} | | Reference Diagram |
|--|------------------------------|---|
| Flange surface perpendicular to shaft [Ⓐ] | 0.04 |  |
| Flange diameter concentric to shaft [Ⓑ] | 0.04 | |
| Shaft run out [Ⓒ] | 0.02 (0.04) ^{*2} | |

*1 T. I. R. (Total Indicator Reading)

*2 Accuracy for motor type USAMED-44L 1:2

3.2.4 Rotating Direction

AC Servomotor rotates CCW viewed from the load side when connection shown in Par.3.3.1 is performed and forward command is given to Servopack with parameter 14, b0 setting = 0 (Fig. 3.11).

3.2.5 Impact Resistance

When mounted horizontally and exposed to vertical shock impulses, the motor can withstand up to two incidents with shock acceleration of 98m/s^2 (10G) (Fig. 3.12).

Note

A precision detector is mounted on the opposite drive end of AC servomotor. Care should be taken to protect the shaft from impacts that could damage the detector.

3.2.6 Vibration Resistance

When mounted horizontally, the motor can withstand vibration (vertical, lateral, axial) of 24.5m/s^2 (2.5G) (Fig. 3.13).

3.2.7 Vibration Class

Vibration of the motor running at rated speed is $15\mu\text{m}$ or below (Fig. 3.14).

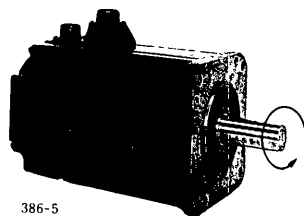


Fig. 3.11 Forward Rotation Direction

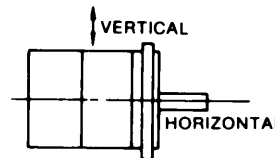


Fig. 3.12 Impact Resistance

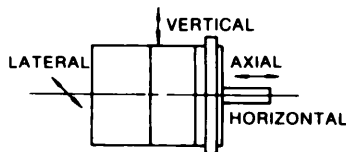


Fig. 3.13 Vibration Resistance

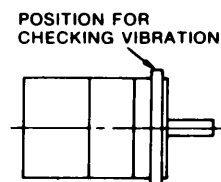


Fig. 3.14 Vibration Checking

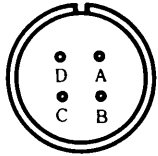
3.3 RECEPTACLES

3.3.1 Connector Specifications

(1) Without brake (M, F, G series)

(a) Motor receptacle

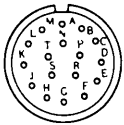
- M, F, G series



| | |
|---|--------------|
| A | Phase U |
| B | Phase V |
| C | Phase W |
| D | Frame Ground |

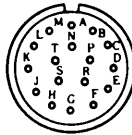
(b) Detector receptacle

- Incremental encoder



| | | | |
|---|------------------|---|---|
| A | Channel A output | K | — |
| B | Channel A output | L | — |
| C | Channel B output | M | — |
| D | Channel B output | N | — |
| E | Channel C output | P | — |
| F | Channel C output | R | — |
| G | 0V | S | — |
| H | +5VDC | T | — |
| J | Frame Ground | - | — |

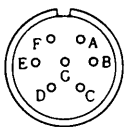
- Absolute encoder



| | | | |
|---|------------------|---|---------------|
| A | Channel A output | J | Frame Ground |
| B | Channel A output | K | — |
| C | Channel B output | L | — |
| D | Channel B output | M | — |
| E | Channel Z output | N | — |
| F | Channel Z output | P | — |
| G | 0V | R | Reset |
| H | +5VDC | S | 0V(battery) |
| - | — | T | 3.6V(battery) |

(2) With brake

- M, F, G series



| | | | |
|---|--------------|---|----------------|
| A | Phase U | E | Brake terminal |
| B | Phase V | F | Brake terminal |
| C | Phase W | G | — |
| D | Frame Ground | - | — |

NOTE

3.3.2 List of Standard Combination

Table 3.6 M Series: Characteristics of AC SERVOMOTOR, Detector, and Holding Brake (Option) for Standard Combination

| AC SERVOMOTOR Type USAMED- | AC SERVOMOTOR | | | | Detector | | | |
|-------------------------------|-------------------|-------------------|-------------------|----------------|--------------------|-------------------|-------------------|----------------|
| | Receptacle | L-type Plug | Straight Plug | Cable Clamp | Receptacle | L-type Plug | Straight Plug | Cable Clamp |
| 03L ☐ 1 | MS3102A 18-10P | MS3108B 18-10S | MS3106B 18-10S | MS3057 -10A | 97F3102E 20-29P | MS3108B 20-29S | MS3106B 20-29S | MS3057 -12A |
| 06L ☐ 1 | | | | | | | | |
| 09L ☐ 2 | | | | | | | | |
| 12L ☐ 2 | MS3102A 22-22P | MS3108B 22-22S | MS3106B 22-22S | MS3057 -12A | | | | |
| 20L ☐ 2 | | | | | | | | |
| 30L ☐ 2 | | | | | | | | |
| 44L ☐ 2 | MS3102A 32-17P | MS3108B 32-17S | MS3106B 32-17S | MS3057 -20A | | | | |

Table 3.7 F Series: Characteristics of AC SERVOMOTOR, Detector, and Holding Brake (Option) for Standard Combination

| AC SERVOMOTOR Type USAFED- | AC SERVOMOTOR | | | | Detector | | | |
|-------------------------------|-------------------|-------------------|-------------------|----------------|--------------------|-------------------|-------------------|----------------|
| | Receptacle | L-type Plug | Straight Plug | Cable Clamp | Receptacle | L-type Plug | Straight Plug | Cable Clamp |
| 05L ☐ 1 | MS3102A 18-10P | MS3108B 18-10S | MS3106B 18-10S | MS3057 -10A | 97F3102E 20-29P | MS3108B 20-29S | MS3106B 20-29S | MS3057 -12A |
| 09L ☐ 1 | | | | | | | | |
| 13L ☐ 2 | | | | | | | | |
| 20L ☐ 2 | MS3102A 22-22P | MS3108B 22-22S | MS3106B 22-22S | MS3057 -12A | | | | |
| 30L ☐ 2 | | | | | | | | |
| 44L ☐ 2 | | | | | | | | |

Table 3.8 G Series: Characteristics of AC SERVOMOTOR, Detector, and Holding Brake (Option) for Standard Combination

| AC SERVOMOTOR Type USAGED- | AC SERVOMOTOR | | | | Detector | | | |
|-------------------------------|-------------------|-------------------|-------------------|----------------|--------------------|-------------------|-------------------|----------------|
| | Receptacle | L-type Plug | Straight Plug | Cable Clamp | Receptacle | L-type Plug | Straight Plug | Cable Clamp |
| 05L ☐ 1 | MS3102A 18-10P | MS3108B 18-10S | MS3106B 18-10S | MS3057 -10A | 97F3102E 20-29P | MS3108B 20-29S | MS3106B 20-29S | MS3057 -12A |
| 09L ☐ 1 | | | | | | | | |
| 13L ☐ 2 | | | | | | | | |
| 20L ☐ 2 | MS3102A 22-22P | MS3108B 22-22S | MS3106B 22-22S | MS3057 -12A | | | | |
| 30L ☐ 2 | | | | | | | | |
| 44L ☐ 2 | | | | | | | | |



| Holding Brake | | | | |
|---------------|-------------------|-------------------|-------------------|----------------|
| | Receptacle | L-type Plug | Straight Plug | Cable Clamp |
| | MS3102A 20-15P | MS3108B 20-15S | MS3106B 20-15S | MS3057 -12A |
| | MS3102A 24-10P | MS3108B 24-10S | MS3106B 24-10S | MS3057 -16A |
| | — | — | — | — |

Note: These connectors
are made by
DAI-ICHI DENSHI
KOGYO Co., Ltd.

| Holding Brake | | | | |
|---------------|-------------------|-------------------|-------------------|----------------|
| | Receptacle | L-type Plug | Straight Plug | Cable Clamp |
| | MS3102A 20-15P | MS3108B 20-15S | MS3106B 20-15S | MS3057 -12A |
| | MS3102A 24-10P | MS3108B 24-10S | MS3106B 24-10S | MS3057 -16A |

Note: These connectors
are made by
DAI-ICHI DENSHI
KOGYO Co., Ltd.

| Holding Brake | | | | |
|---------------|-------------------|-------------------|-------------------|----------------|
| | Receptacle | L-type Plug | Straight Plug | Cable Clamp |
| | MS3102A 20-15P | MS3108B 20-15S | MS3106B 20-15S | MS3057 -12A |
| | MS3102A 24-10P | MS3108B 24-10S | MS3106B 24-10S | MS3057 -16A |

- Notes:
1. For connection parts(plugs, clamps, etc) contact your Yaskawa representative. For connecting method, there are two types: soldering(MS type)and caulking(JA type).
 2. These connectors are made by DAI-ICHI DENSHI KOGYO Co. Ltd.

4

RATINGS AND SPECIFICATIONS OF AC SERVOPACK

4.1 RATINGS AND SPECIFICATIONS

Table 4.1 AC SERVOPACK Ratings and Specifications

| SERVOPACK Type | | | CACR-HR | 03UB | 05UB | 10UB | 15UB | 20UB | 30UB | 44UB |
|--|-------------------------------------|--|---|---|------------|-----------|-----------|-----------|-----------|-----------|
| Max. Applicable Motor Capacity kW (HP) | | | | 0.3 (0.40) | 0.5 (0.67) | 1.0 (1.3) | 1.5 (2.0) | 2.0 (2.7) | 3.0 (4.1) | 4.4 (5.9) |
| Basic Specifications | Input Power Supply | Main | No of Phases | 3-phase AC | | | | | | |
| | | | Voltage | 200 to 230V +10 to -15% 50/60Hz | | | | | | |
| | | | Control | Single-phase 200 to 230VAC +10 to -15% 50/60Hz | | | | | | |
| | Control Method | | | Full-wave rectifying, transistorized PWM control, sine-wave drives | | | | | | |
| | Feedback | | | Absolute encoder (8192 or 1024 pulses/rev), incremental encoder (8192, 2500, or 2048 pulses/rev) | | | | | | |
| | Environmental Conditions | Ambient Temp | | 0 to +55°C | | | | | | |
| Storage Temp | | -20 to +85°C | | | | | | | | |
| Ambient/Storage Humidity | | 90% or less (non-condensing) | | | | | | | | |
| Vibration-/Shock Resistance | | 4.9m/s ² (0.5G)/19.6m/s ² (2G) | | | | | | | | |
| Configuration, Dimensions in mm (in) | | | | Base-mounted 185W × 450H × 270D (7.28W × 17.72H × 10.63D) | | | | | | |
| Positioning Control Specifications | Station No. Command Method | Operation Spec | | Constant point positioning by station No command (contact data) | | | | | | |
| | | Command Input | | Position command BCD (up to 3-digit 000 to 999) or BIN (up to 12-bit 0 to 4095) | | | | | | |
| | | System | | Both absolute and incremental commands available | | | | | | |
| | DG-SW Command Method | Operation Spec | | Positioning by DG-SW command data | | | | | | |
| | | Command Input | | Position command Sign + up to 8 digits (-99999999 to +99999999) Speed command Up to 6 digits (000000 to 240000), to be less than motor max speed | | | | | | |
| | | System | | Both absolute and incremental commands available | | | | | | |
| | Serial Communication Command Method | Operation Spec | | Positioning by serial communication | | | | | | |
| | | Command Input | | RS422, asynchronous, communication speed 9.6/4.8/2.4/1.2 kBaud | | | | | | |
| | | System | | Both absolute and incremental commands available | | | | | | |
| | Command Table Method | Operation Spec | | Positioning by position No and speed No command (contact data) | | | | | | |
| | | Command Input | | Position command Sign + up to 8 digits (-99999999 to +99999999) Speed command Up to 6 digits (000000 to 240000), to be less than motor max speed Position/speed No command BIN (up to 6 bits 1 to 64) | | | | | | |
| | | System | | Only absolute value command available | | | | | | |
| | Others | Operation Spec. | | Positioning by pulse train (line PG or pulse train input) | | | | | | |
| | | Command Input | | Position command Number of pulses — A + B or UP + DN or P + SIGN Speed command Up to 400 kpps (A + B : 1.6 Mpps) | | | | | | |
| | | System | | Only incremental command available | | | | | | |
| Common Built-in Function | Dynamic Brake (DB) | | | Operated at main power OFF, servo alarm, servo OFF | | | | | | |
| | Holding Brake Interface | | | Output signal for turning brake power supply ON/OFF (brake timing is set by parameter) | | | | | | |
| | Regeneration | | | Built-in (regenerating resistor included) | | | | | | |
| | Overtravel Protection | | | By soft limit and hard LS internal command stop at operation | | | | | | |
| | External Current Limit | | | Current limit value switching by contact input Current limit value. Common in FWD/REV, FWD only, REV only (parameter setting) | | | | | | |
| | Protective Functions | | | OV, OC, OL, OS, FAN, PG, UV, CPU, ABS, POS, O-PH, RWD, PG, HARD, OF, PRM, OH (See Table 4.2) | | | | | | |
| | Display | | | Main circuit power supply green LED, control power supply green LED, alarm red LED Alarm contents code output in 7-segment, fault contents display in data display section | | | | | | |
| | Monitor | | | Serial communication (position, speed, torque, etc.) Speed output in analog value | | | | | | |
| | Positioning Control Function | | | Linear accel/decel, exponential accel/decel, A/B function, pulse multiplication, soft OT, backlash compensation, COIN NEAR, motor-line PG switching (incremental operation), etc. | | | | | | |
| Control Interface I/O | Input | | Serial 1 port and digital 24V system × 20 (Max) | | | | | | | |
| | Output | | Serial 1 port and digital 24V system × 18 (Max), 5V system 2 circuits (PG output) | | | | | | | |
| Gain and Parameter Settings | | | | Serial communication (RS422, asynchronous, communication speed 9.6/4.8/2.4/1.2 kBaud) or selection by AC SERVOPACK switch | | | | | | |
| Absolute Encoder Battery | | | | Provided on SERVOPACK board | | | | | | |
| Applicable Inertia J _L | | | | 5 times or less of rotor inertia J _m (motor GD ²) for M, F or G series | | | | | | |

• Servopack Type CACR-HR15UB to -44UB

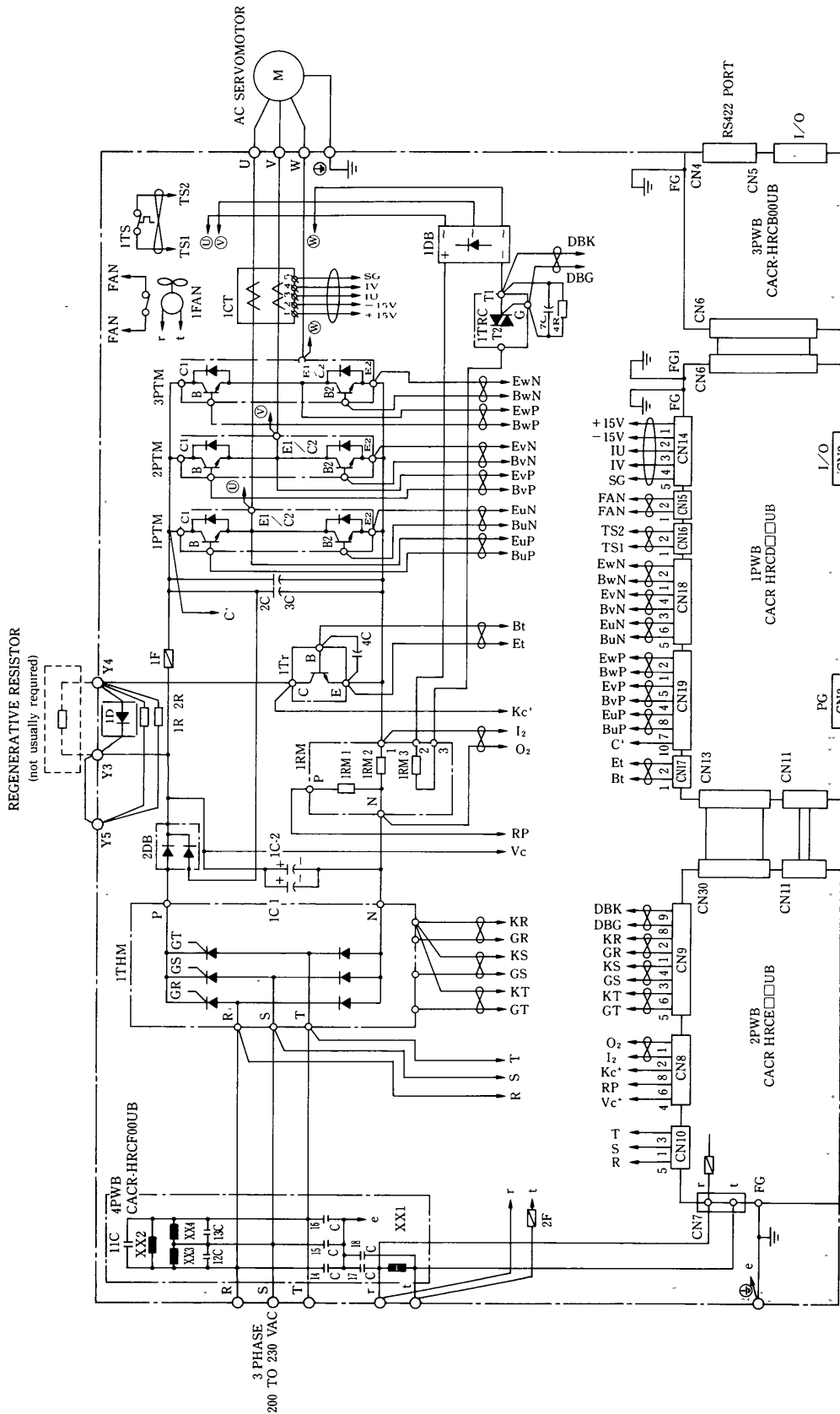


Fig. 4.2 Internal Block Diagram of Servopack Type CACR-HR15UB to-44UB

4.3 PROTECTIVE CIRCUIT

Servopack provides functions to protect the Servopack and motor from malfunctions.

(1) Dynamic brake function

Servopack incorporates a dynamic brake for emergency stop. This brake operates when:

- Alarm (fault detection) occurs.
- Servo ON command is turned OFF.
- Main power supply is turned OFF.

(2) Fault detecting functions

Table 4.2 Fault Detecting Functions

| Fault | Detection |
|------------------------------|--|
| Overcurrent (OC) | Overcurrent flow in the main circuit (at 1.2 times or more of inst. max. current) |
| FAN STOP (FAN) | FAN stop. |
| Regeneration Trouble (RG) | Regenerative circuit not activated in Servopack. |
| Overvoltage (OV) | Excessively high DC voltage in the main circuit (approx 420V.) |
| Overspeed (OS) | Excessively large speed feedback detected. |
| Under Voltage (UV) | Low DC voltage in the main circuit after power ON. (150V or less.) |
| Overload (OL) | Overload condition of motor and Servopack. |
| Heatsink Overheat (OH) | Overheat of heatsink (approx. 90°C min.) |
| PG Disconnection (PG) | Encoder signal disconnection. |
| Overflow Deviation (OF) | Excessive following error. |
| Open Phase (O-PH) | Any one phase open in three-phase power input. |
| Overrun Prevention (RWY) | Wrong wiring of motor circuit or PG signal line. |
| CPU Error (CPU) | Errors related to CPU. |
| Hardware Error (HARD) | |
| Absolute Control Error (ABS) | Errors related to absolute encoder. |
| Position Error (POS) | |
| Parameter Error (PRM) | Data set value error of parameter. |
| Battery Voltage Low | Battery voltage drop or battery disconnection. |

(3) Overload Detection (OL) Level

Overload detection level is set as shown in Fig. 4.4 when motor rated current = 100%. (When allowable current applying time at motor locking is at the maximum, operating time at higher rotating speed is shorter for the same overload.)

NOTE

Overload detection level is determined with hot start conditions of ambient temperature 55° C. The set value cannot be changed.

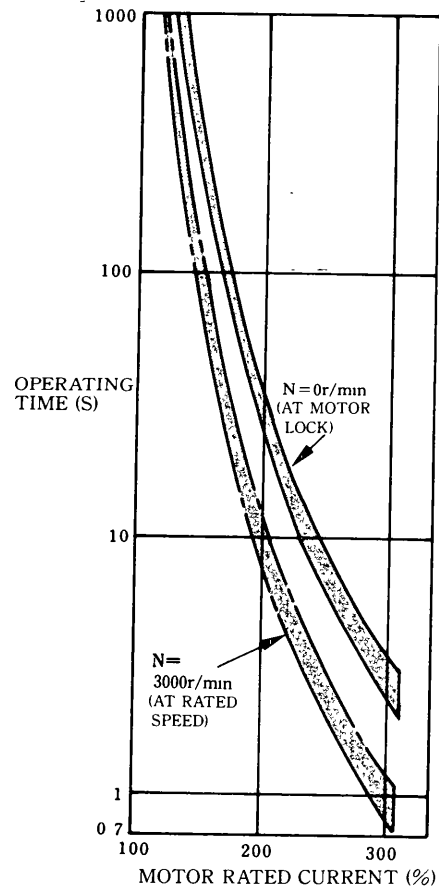


Fig. 4.4 Overload Characteristics

(4) Servo alarm output [ALM]

If any fault detection circuits in Table 4.2 functions, the power drive circuit in the Servopack is turned OFF, 7-segment LEDs indicate the operation status and a servo alarm signal is output.

(5) Protective circuit operation

An alarm signal indicates some fault. Check the cause and fix the problem, and restart the operation. Before checking the cause, turn OFF the main power supply to avoid danger. Apply the sequence so that the alarm signal turns OFF only the main circuit (Ⓡ, Ⓢ, Ⓣ), as shown in Figs.5.17 and 5.18. This allows rapid reaction in the event of a malfunction.

If the power to the control circuit (Ⓡ, Ⓣ) is simultaneously turned OFF, this also turns OFF the LED in the Servopack indicating the cause of the alarm signal.

(6) Resetting servo alarm

To reset the servo alarm, turn on alarm reset signal $\overline{\text{RST}}$ (or serial communication command ARES).

If ? is ON (e.g., Servopack is over loaded), it takes a few minutes to reset the alarm condition.

4.4 PRECAUTIONS FOR APPLICATION

4.4.1 Overhanging Load

The motor is rotated by the load; Additional regenerative resistor may be required against this rotation and achieve continuous running.

Example: Vertical axis without counterweight

Since Servopack has the regenerative brake capability of short time (corresponding to the motor stopping time), for application to a minus load, contact your Yaskawa representative.

4.4.2 Load Inertia (J_L)

The allowable load inertia J_L converted to the motor shaft must be within five times (M, F, G series) the inertia of the applicable AC servomotor. If the allowable inertia is exceeded, an overvoltage alarm may be given during deceleration. If this occurs, take the following actions:

- Reduce the current limit.
- Slow down the deceleration curve.
- Decrease the maximum speed.

For details, contact your Yaskawa representative.

4.4.3 Allowable Cyclic Operating Frequency

Start/Stop cyclic operating frequency is limited separately by Servopack and Servomotor. It is necessary to satisfy both conditions.

(1) Allowable cyclic operating frequency limited by Servopack

Servopack limitation is due to Servopack built-in regenerative resistor generating power. Allowable frequency differs depending on combined motor types, capacities, load inertia J_L , accel/decel current and motor speed.

For the following cases, contact your Yaskawa representative.

- When start/stop cyclic operating frequency up to rated speed exceeds 60 times/min at load inertia $J_L = 0$.
- When start/stop cyclic operating frequency up to rated speed exceeds $\frac{60}{m+1}$ times/min at load inertia $J_L = \text{motor inertia } J_M \times m$ times.

(2) Allowable cyclic operating frequency limited by Servomotor

When AC Servomotor rms torque in an operation cycle is within the continuous duty zone of motor performance (Par. 3.1), the operation can be repeated in the operation cycle.

4.4.4 High Voltage Line

If the supply voltage is 400/440 V, the voltage must be dropped from 400/440V to 200V by using a power transformer. Table 5.12 shows the transformer selection.

Connection should be made so that the power is supplied and cut at the primary side of the transformer.

4.5 POWER LOSS

The power loss of Servopack is shown in Table 4.2.

Table 4.2 Power Loss at Rated Output

| SERVOPACK Type CACR- | Output Current A | Power Loss | | | |
|-------------------------|------------------------|----------------------|---------------------------------|-------------------------|------------|
| | | Main Circuit W | Regenerative Resistor * W | Control Circuit W | Total W |
| HR03UB | 3.0 | 20 | 10 | 60 | 90 |
| HR05UB | 4.2 | 40 | 10 | | 110 |
| HR10UB | 7.6 | 70 | 20 | | 150 |
| HR15UB | 11.7 | 80 | 20 | | 160 |
| HR20UB | 18.8 | 100 | 40 | | 200 |
| HR30UB | 26.0 | 160 | 80 | | 300 |
| HR44UB | 33.0 | 210 | 100 | | 370 |

* Power loss in regenerative resistors occurs at motor deceleration. The maximum allowable value of average power loss is shown. When a motor operates in a duty cycle exceeding this value, a regenerative resistor must be provided.

5 CONNECTION

5.1 TYPICAL CONNECTION

5.1.1 Basic Connection

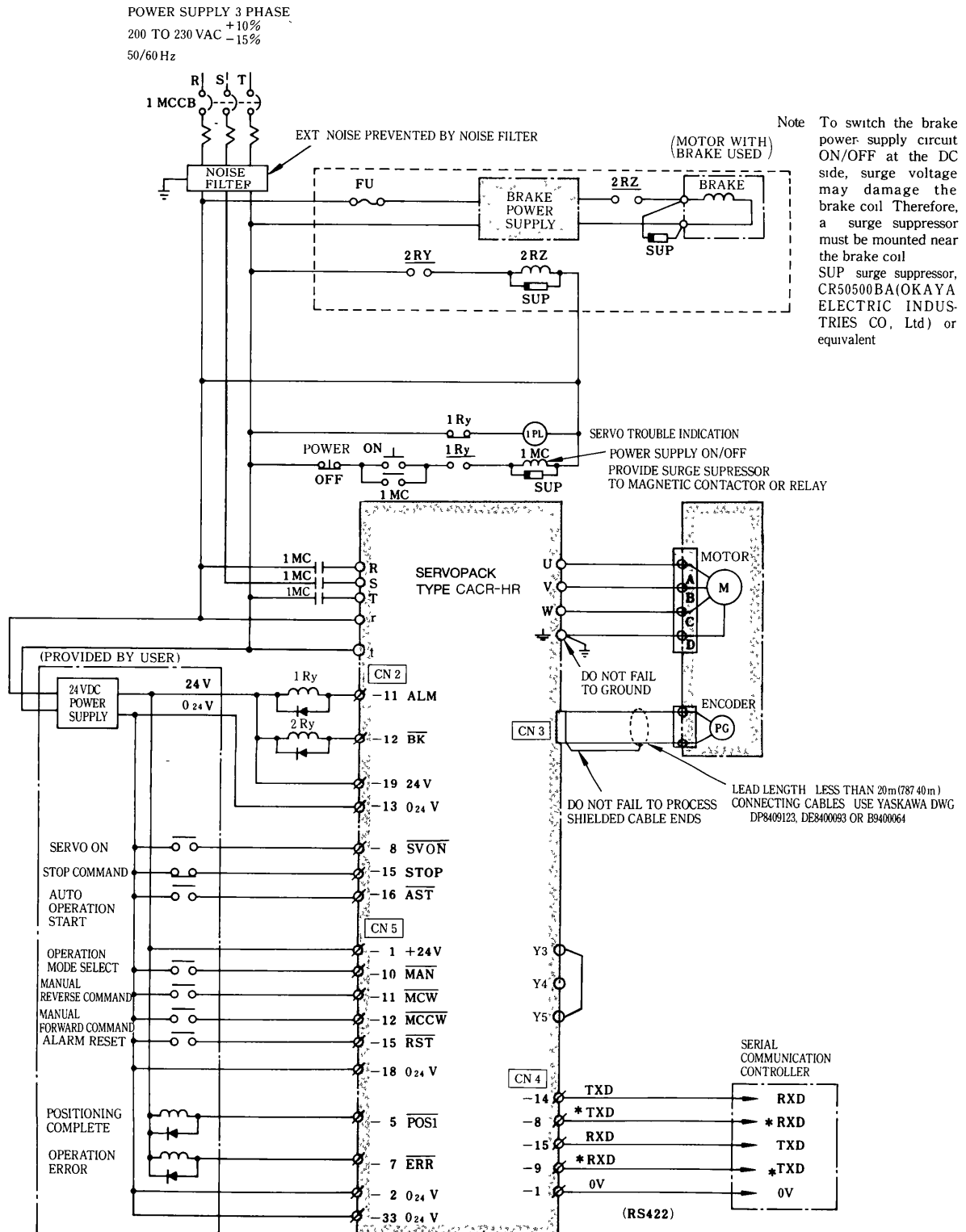
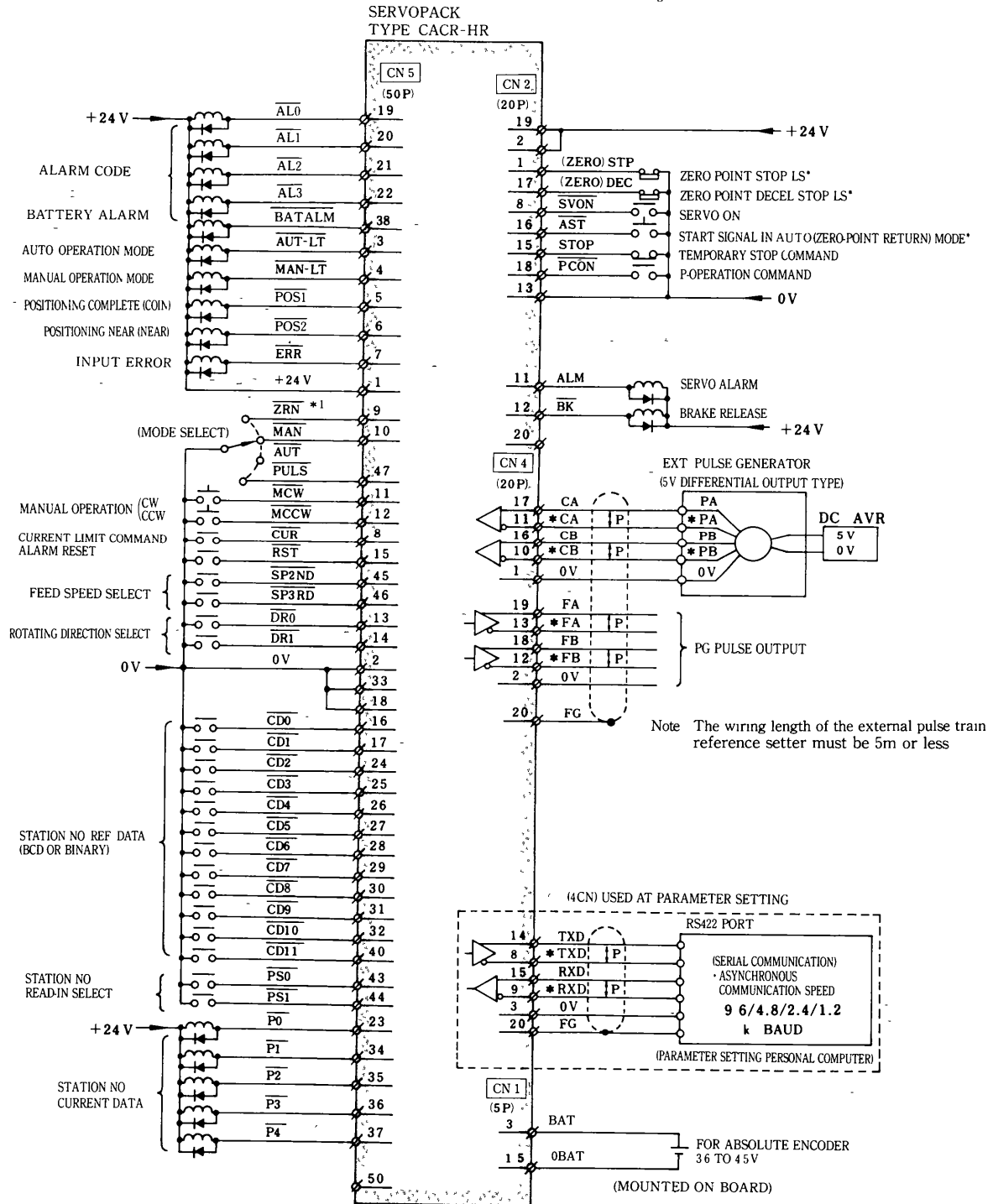


Fig. 5.1 Basic Connection

5.1.2 Typical Connection at Positioning by Station No.

Note For power supply and motor connection, refer to Fig 5.1

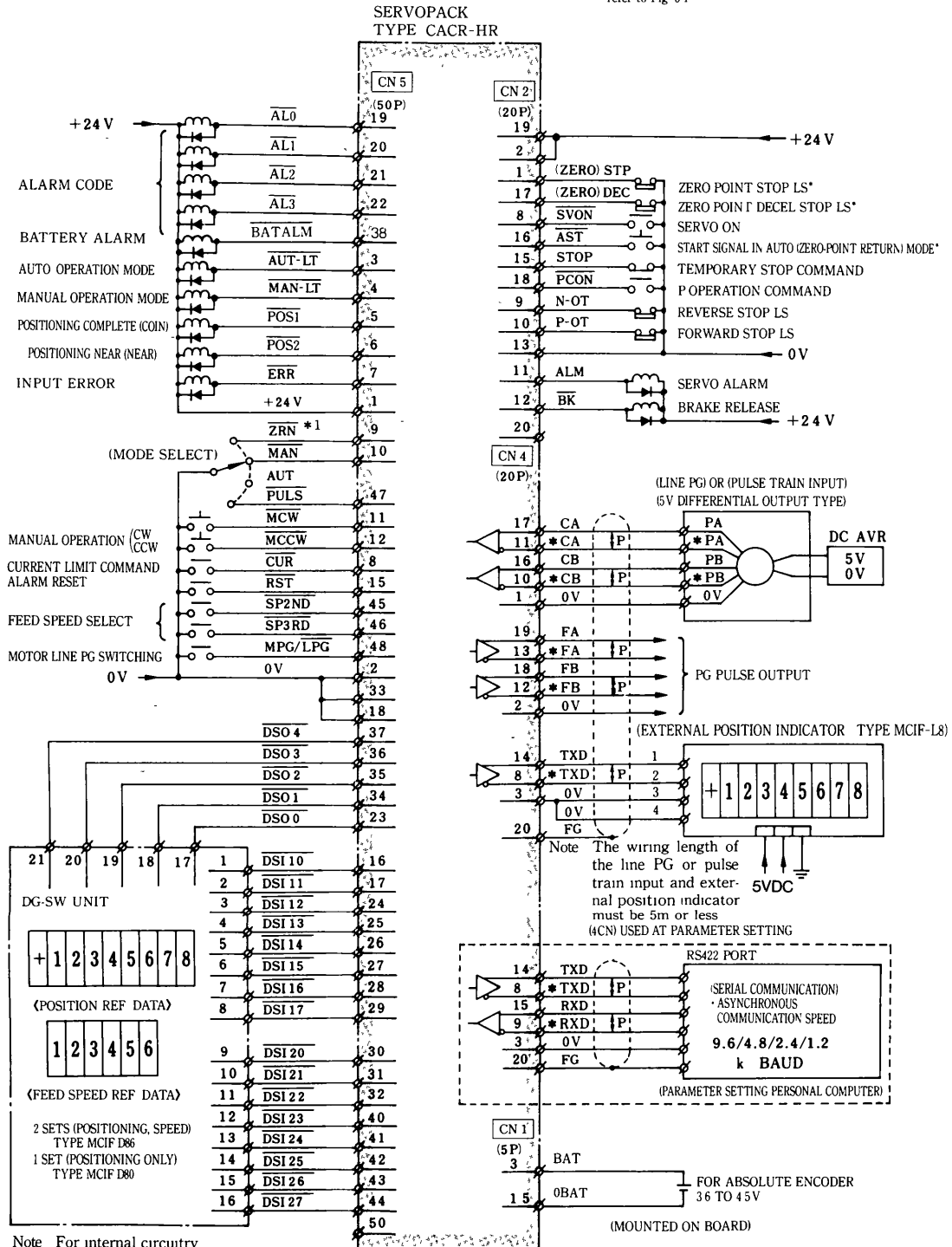


*1 Signals related to zero-point return are needed when incremental encoder is used LS Limit Switch

Fig. 5.2 Typical Connection at Positioning by Station No.

5.1.3 Typical Connection at Positioning by DG-SW Data

Note For power supply and motor connection, refer to Fig. 5.1



Note For internal circuitry refer to Fig. 5.4. Additionally, the wiring length of the DG-SW unit must be 5m or less.

*1 Signals related to zero-point return are needed when incremental encoder is used

Fig. 5.3 Typical Connection at Positioning by DG-SW Data

5.1.3 Typical Connection at Positioning by DG-SW Data (Cont'd)

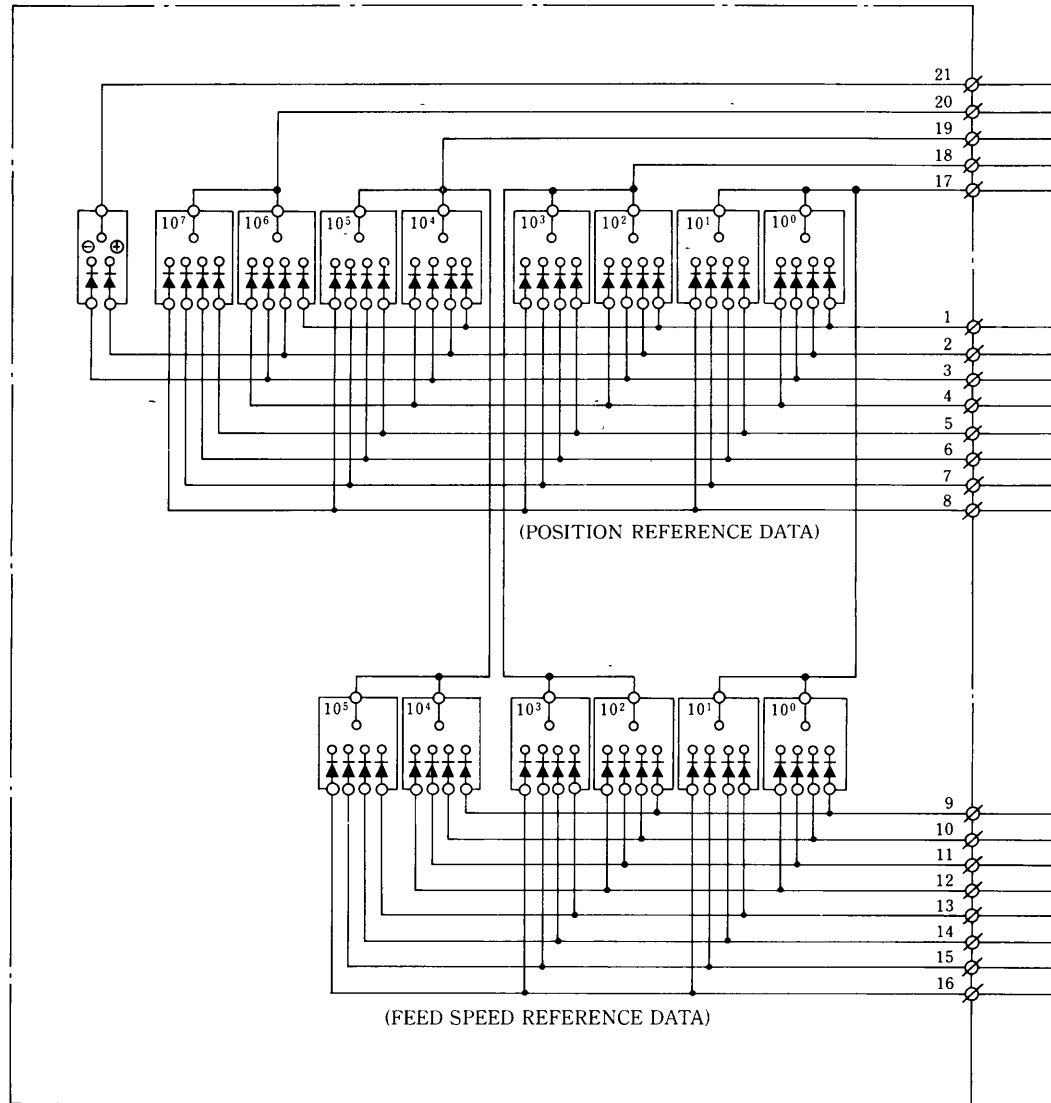
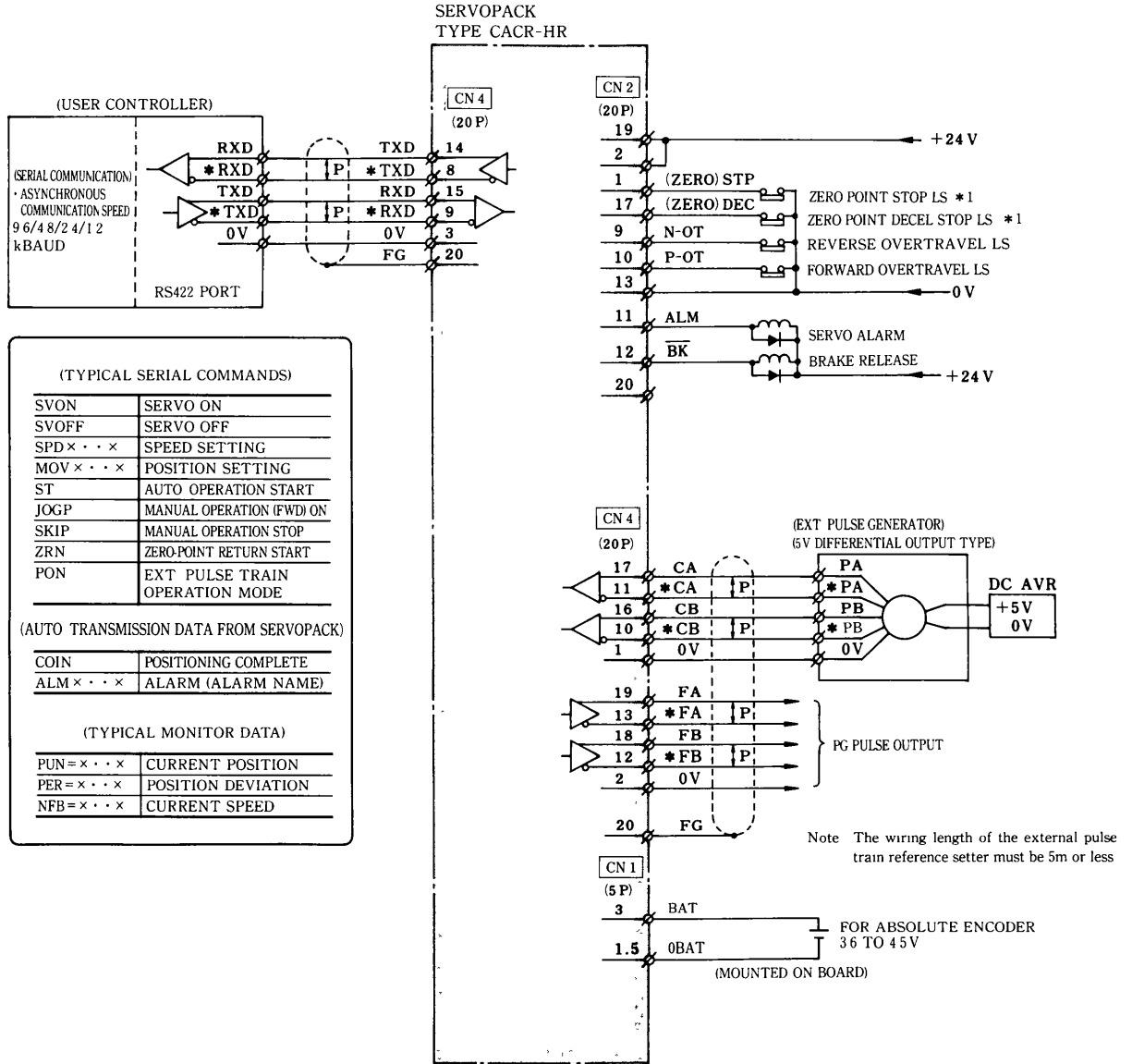


Fig 5 4 Details in DG-SW Unit

5.1.4 Typical Connection at Positioning by Serial Communication

Note For power supply and motor connection, refer to Fig 5.1

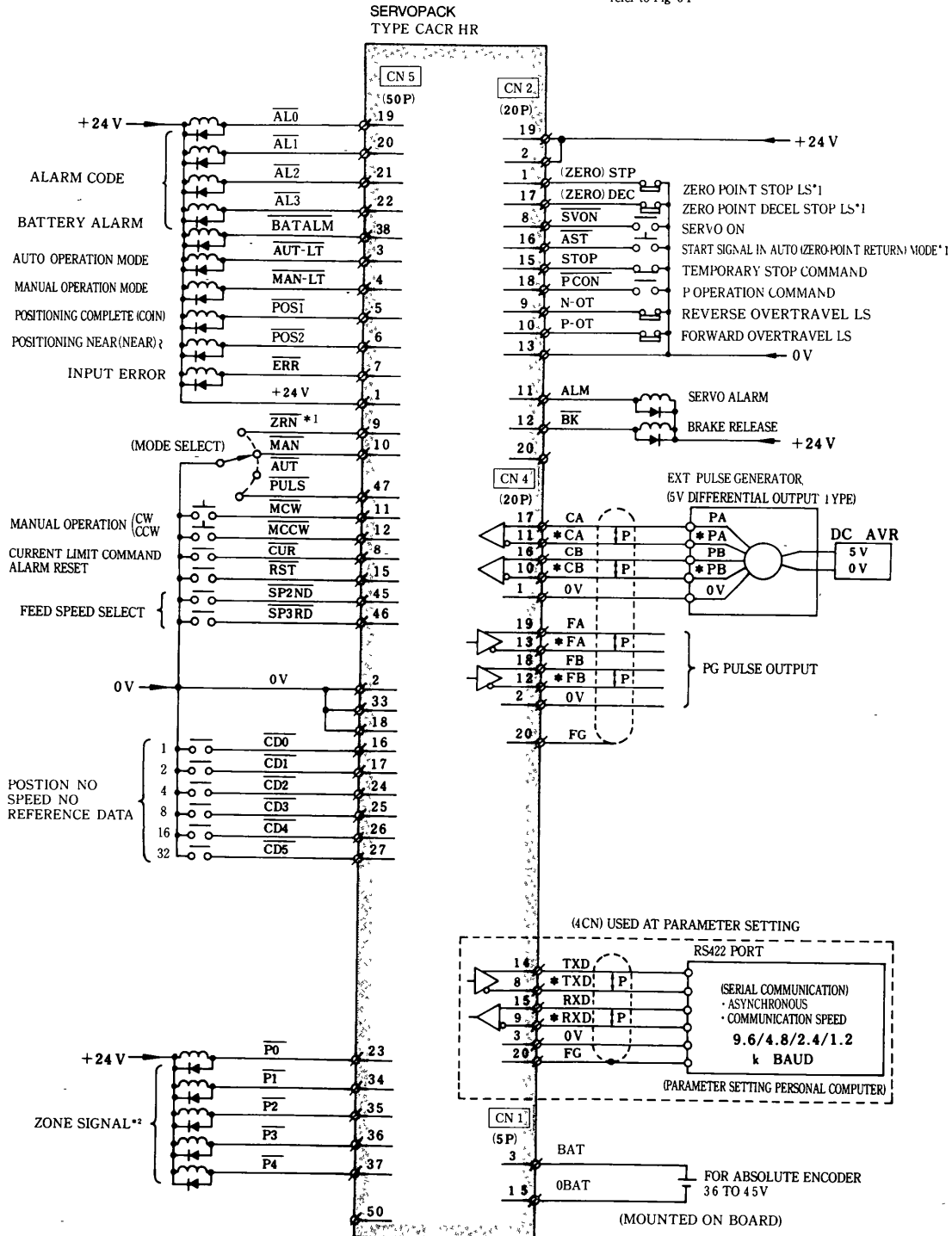


*1 Signal related zero-point return are needed when incremental encoder is used

Fig. 5.5 Typical Connection at Positioning by Serial Communication Input

5.1.5 Typical Connection at Positioning by Command Table

Note For power supply and motor connection, refer to Fig. 5.1



*1 Signals related to zero-point return (homing) are needed when incremental encoder is used
LS Limit Switch

*2 Set PRM20b5=1, PRM65b0=1 when zone signals are used

Fig. 5.6 Typical Connection at Positioning by Command Table

5.2 MAIN CIRCUIT TERMINAL NAMES AND OUTLINE

Table 5.1 Main Circuit Terminal Names and Outline

| Symbol | Name | Outline |
|----------|---|---|
| Ⓡ Ⓢ Ⓣ | Main circuit power supply input terminal | 3-phase 200 to 230VAC +10% -15% , 50/60Hz |
| Ⓤ Ⓥ Ⓦ | Motor connection terminal | Ⓤ and motor terminal A; Ⓥ and motor terminal B; Ⓦ and motor terminal C connected |
| Ⓡ Ⓣ | Control power supply input terminal | Single-phase 200 to 230VAC +10% -15% , 50/60Hz |
| Ⓧ | Grounding terminal | Connected with motor terminal D to ground. |
| ⓎⓅ ⓎⓆ ⓎⓇ | Regenerative resistor connecting terminal | ⓎⓅ ⓎⓆ : External regenerative resistor connecting terminal (Normally, no connection is necessary) ⓎⓅ ⓎⓇ : Shorted when external regenerative resistor is not used. |

5.3 CONNECTOR TERMINAL (CN2) FOR I/O SIGNALS

5.3.1 Applicable Receptacle Specifications

Table 5.2 Applicable Receptacle Specifications

| Specifications of Connector Used in SERVOPACK | Applicable Receptacle Type | | | |
|---|----------------------------|---------------|---------|-------------------------|
| | Soldered Type | Caulking Type | Case | Maker |
| MR-20RFA Right angle 20P | MR-20M* | MRP-20M01 | MR-20L* | HONDA Tsushin Co., Ltd. |

* Standard attachment of Servopack

5.3.2 Connector CN2 Layout and Connection

Table 5.3 shows the terminal layout of connector CN2 and Fig. 5.7 shows the wiring diagram for CN2.

Table 5.3 -Connector CN2 Layout

| | | | | | | |
|--|------------------------------|-------------------------|---------------------------------------|--------------------------------------|--------------------------------------|----------------------------------|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| STP | +24V | — | — | — | (BAT+) | (BAT-) |
| (At Zero-Point Return) Zero-Point Stop LS Input | STP 24V | — | — | — | (Battery Input for Absolute Encoder) | |
| | 8 | 9 | 10 | 11 | 12 | 13 |
| | $\overline{\text{SVON}}$ | N-OT | P-OT | ALM | $\overline{\text{BK}}$ | OV |
| | Overtravel LS Input | | | | | |
| Servo ON Input | Reverse Side | | Forward Side | Servo Alarm Output | Brake Release Command Output | OV for ALM BK Signal |
| 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| — | STOP | $\overline{\text{AST}}$ | DEC | $\overline{\text{PCON}}$ | 24V | FG |
| — | Temporary Stop Command Input | Start Command Input | (At Zero-Point Return) Decel LS Input | Proportional Operation Command Input | 24V for Input Signal | Frame Ground (Shielding Process) |

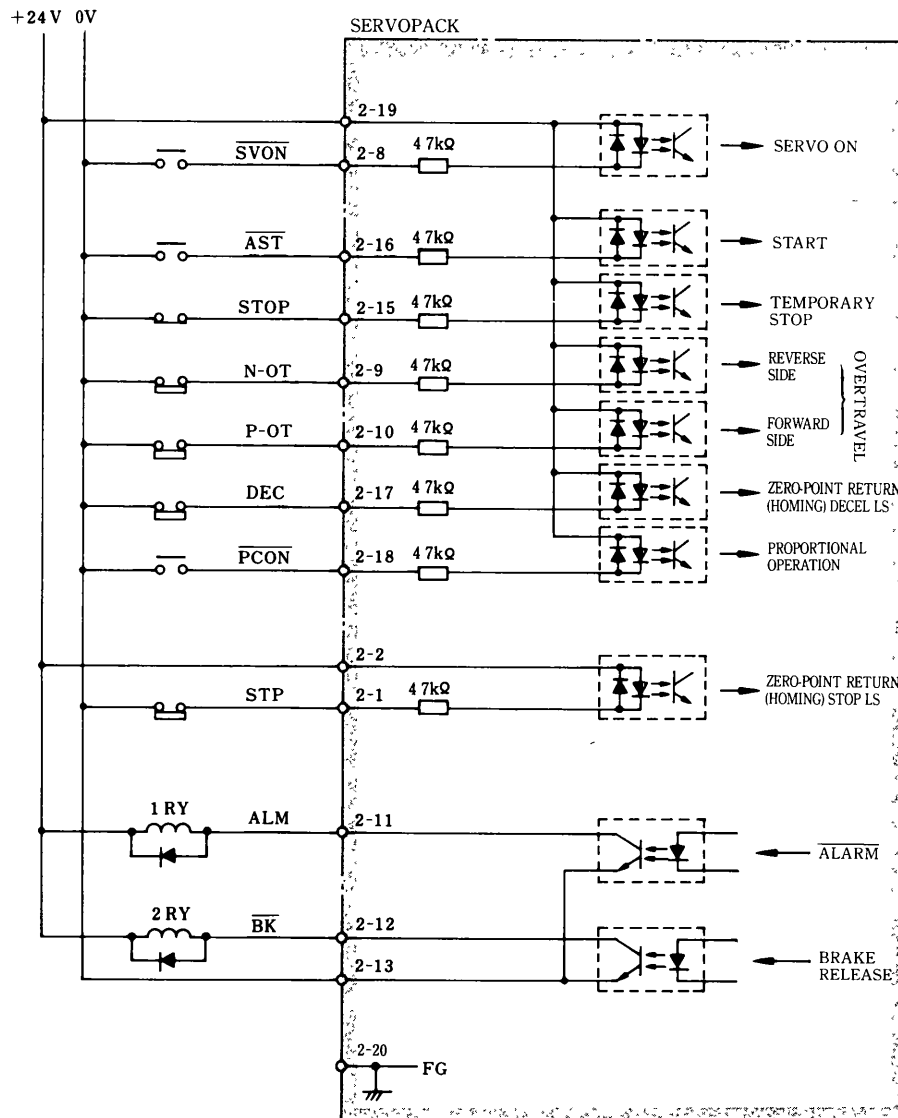

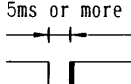
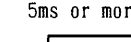
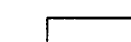
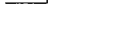



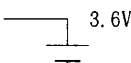


Fig. 5.7 Wiring Diagram for CN2

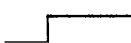
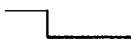
5.3.3 Description and Usage of I/O Signals of Connector CN2

(1) Input Signals

L level when contact closed, H level when opened.

| Signal Name | Pin No. | Name | Effective Logic | Function |
|--------------------------|---------|------------------------------------|--|---|
| $\overline{\text{SVON}}$ | 8 | Servo ON |  | Base block on main circuit transistors is released. Motor becomes in current conduction, when this signal is ON |
| $\overline{\text{AST}}$ | 16 | Operation start | <p>5ms or more</p>  <p>Starts by rising edge.</p> | Operation start signal in automatic operation mode or zero-point return mode |
| STOP | 15 | Temporary stop reference | <p>5ms or more</p>  | Operation stop command in automatic operation mode or zero-point return (homing) mode. When this signal is OFF, operation stops at specified accel/decel speed (parameter setting). |
| N-OT | 9 | Forward side overtravel LS |  | Connects overtravel limit switch signal according to forward or reverse side |
| P-OT | 10 | Reverse side overtravel LS |  | This signal is turned on at normal operation and off when limit switch is active |
| DEC | 17 | Zero-point return(homing) decel LS |  | Used in zero-point return (homing) mode I (refer to Par.6.2.3 (1) d). After 2-step deceleration by DEC signal and phase-C pulse signal, zero-point return is performed. |
| STP | 1 | Zero-point return(homing) stop LS |  | Used in zero-point return (homing) mode II (refer to Par.6.2.3 (1) d) After deceleration by STP signal, zero-point return is performed. |
| $\overline{\text{PCON}}$ | 18 | Proportional operation command |  | Speed loop control mode is switched from PI (proportional-integer) to P (proportional) operation. |
| (BAT+) | 6 | Absolute encoder battery input |  | Not used normally. (Battery provided on the board) |
| (BAT-) | 7 | | | |

(2) Output Signals

| Signal Name | Pin No. | Name | Effective Logic | Function |
|------------------------|---------|----------------------|---|--|
| ALM | 11 | Servo alarm |  | Output transistor is turned off when an alarm occurs (Normally ON) |
| $\overline{\text{BK}}$ | 12 | Brake release signal |  | Output transistor is turned on by brake control circuit when servo ON status |

5.4 CONNECTOR TERMINAL (CN3) FOR ENCODER

5.4.1 Applicable Receptacle and Cable Specifications

Table 5.4 Applicable Receptacle and Cable Specifications

| Specifications of Connector Used in SERVOPACK | Applicable Receptacle Type | | | | Connecting Cable Specifications |
|---|----------------------------|---------------|---------|-------------------------------|--|
| | Soldered Type | Caulking Type | Case | Maker | |
| MR-20RFA Right angle 20P | MR-20F* | MRP-20F01 | MR-20L* | HONDA Tsushin Co., Ltd. | DP8409123, B9400064 or DE8400093 |

* Standard attachment of Servopack

Note: For connecting cables, YASKAWA supply the cables with the following specifications. However, they are not attached to Servopack or motor. They can be purchased at prepared length on request. (Table 5.5)

Table 5.5 Applicable Cable Specifications

| Applicable Encoder | Absolute Encoder | Incremental Encoder | Absolute Encoder, Incremental Encoder | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|--|-------------------------|---------------------------------------|----------------|-------|----------------|--------------|----------------|-----------------|----------------|---------------------|----------------|-------------------|----------------|---------------------|----------------|---------------------|----------------|-----------------|--|----------------|-----|----------------|-------|----------------|--------------|----------------|-----------------|----------------|---------------------|----------------|-----------------------------|----------------|---------------------|--|---|------------|---|--------------|---|-------------|---|-----------|---|--------------|---|------------|---|--------------|---|-------------|---|-----------|----|
| Connecting Method | Soldered type | Soldered type | Caulking type | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Cable Specification | YASKAWA DWG No DP8409123 | YASKAWA DWG No B9400064 | YASKAWA DWG No. DE8400093 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Maker | Fujikura Cable Co | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Finished Dimension | φ 8.0mm | φ 7.5mm | φ 10.0mm | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| (Recommended Receptacle Type) | (For soldered type) | (For soldered type) | (For caulking type) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Internal Configuration and Lead Colors (DP8409123 and B9400064 are standard) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | <table border="1"> <tr><td>A₁</td><td>Red</td></tr> <tr><td>A₂</td><td>Black</td></tr> <tr><td>A₃</td><td>Green-yellow</td></tr> <tr><td>B₁</td><td>Blue-white-blue</td></tr> <tr><td>B₂</td><td>Yellow-white-yellow</td></tr> <tr><td>B₃</td><td>Green-white-green</td></tr> <tr><td>B₄</td><td>Orange-white-orange</td></tr> <tr><td>B₅</td><td>Purple-white-purple</td></tr> <tr><td>B₆</td><td>Grey-white-grey</td></tr> </table> | A ₁ | Red | A ₂ | Black | A ₃ | Green-yellow | B ₁ | Blue-white-blue | B ₂ | Yellow-white-yellow | B ₃ | Green-white-green | B ₄ | Orange-white-orange | B ₅ | Purple-white-purple | B ₆ | Grey-white-grey | <table border="1"> <tr><td>A₁</td><td>Red</td></tr> <tr><td>A₂</td><td>Black</td></tr> <tr><td>A₃</td><td>Green/yellow</td></tr> <tr><td>F₁</td><td>Blue-white/blue</td></tr> <tr><td>F₂</td><td>Yellow-white/yellow</td></tr> <tr><td>F₃</td><td>Pale green-white/pale green</td></tr> <tr><td>F₄</td><td>Orange-white/orange</td></tr> </table> | A ₁ | Red | A ₂ | Black | A ₃ | Green/yellow | F ₁ | Blue-white/blue | F ₂ | Yellow-white/yellow | F ₃ | Pale green-white/pale green | F ₄ | Orange-white/orange | <table border="1"> <tr><td>1</td><td>Blue-white</td></tr> <tr><td>2</td><td>Yellow-white</td></tr> <tr><td>3</td><td>Green-white</td></tr> <tr><td>4</td><td>Red-white</td></tr> <tr><td>5</td><td>Purple-white</td></tr> <tr><td>6</td><td>Blue-brown</td></tr> <tr><td>7</td><td>Yellow-brown</td></tr> <tr><td>8</td><td>Green-brown</td></tr> <tr><td>9</td><td>Red-brown</td></tr> <tr><td>10</td><td>Purple-brown</td></tr> </table> | 1 | Blue-white | 2 | Yellow-white | 3 | Green-white | 4 | Red-white | 5 | Purple-white | 6 | Blue-brown | 7 | Yellow-brown | 8 | Green-brown | 9 | Red-brown | 10 |
| A ₁ | Red | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| A ₂ | Black | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| A ₃ | Green-yellow | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| B ₁ | Blue-white-blue | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| B ₂ | Yellow-white-yellow | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| B ₃ | Green-white-green | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| B ₄ | Orange-white-orange | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| B ₅ | Purple-white-purple | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| B ₆ | Grey-white-grey | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| A ₁ | Red | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| A ₂ | Black | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| A ₃ | Green/yellow | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| F ₁ | Blue-white/blue | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| F ₂ | Yellow-white/yellow | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| F ₃ | Pale green-white/pale green | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| F ₄ | Orange-white/orange | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | Blue-white | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | Yellow-white | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | Green-white | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | Red-white | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | Purple-white | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6 | Blue-brown | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7 | Yellow-brown | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 8 | Green-brown | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 9 | Red-brown | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 10 | Purple-brown | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| YASKAWA Specifications | Standard length 5m, 10m, 20m Terminal ends are not provided (without connectors) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

NOTES

- When applicable cable is used, allowable wiring distance between Servopack and motor (PG) is up to 20m.
- When wiring distance between Servopack and motor (PG) exceeds 20m, cable which can be used for up to 50m (YASKAWA DWG No. DP8409179) is available. Contact your YASKAWA representative

5.4.2 Connector CN3 Layout and Connection

The terminal layout for the Servopack connector (CN3) is shown in Table 5.6, the connection with absolute encoder in Figs. 5.8 and 5.9 and the connection with incremental encoder in Figs. 5.10 and 5.11.

Table 5.6 Connector CN3 Layout

| | | | | | | |
|------|------|------|------|------|-------|----|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| PGOV | PGOV | PGOV | PG5V | PG5V | PG5V | — |
| 8 | 9 | 10 | 11 | 12 | 13 | |
| — | — | — | — | BAT† | BAT0† | |
| 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| PC | *PC | PA | *PA | PB | *PB | FG |

† Required only when absolute encoder is used.

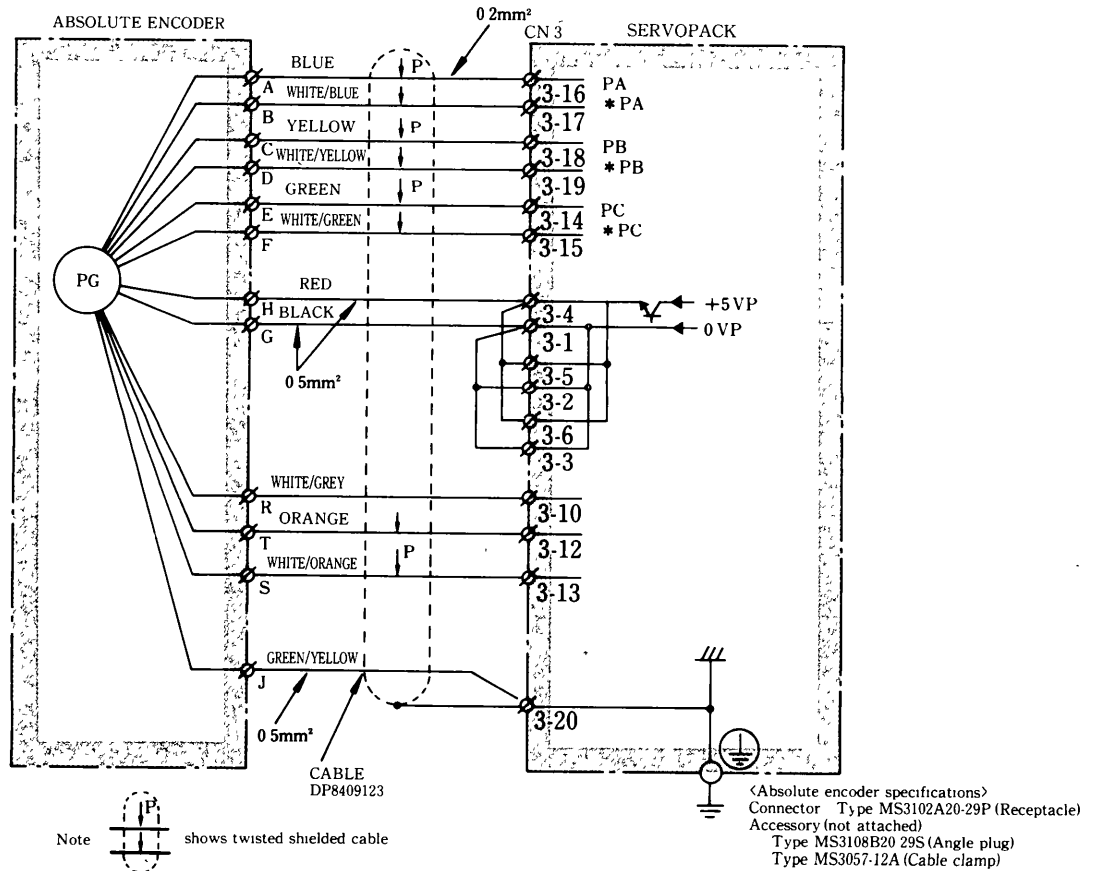


Fig. 5.8 Connection between CN3 and Absolute Encoder
(When soldered type cable DP8409123 is used)

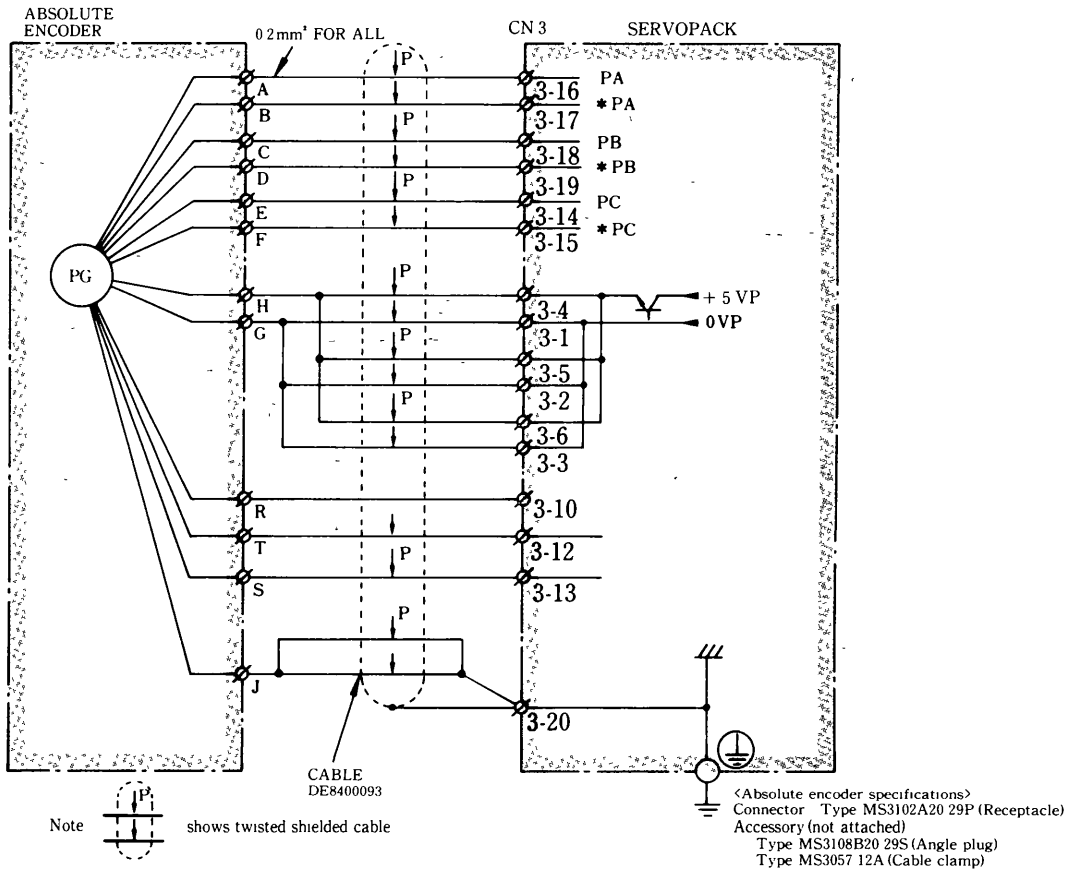


Fig. 5.9 Connection between CN3 and Absolute Encoder
(When caulking type cable DE8400093 is used)

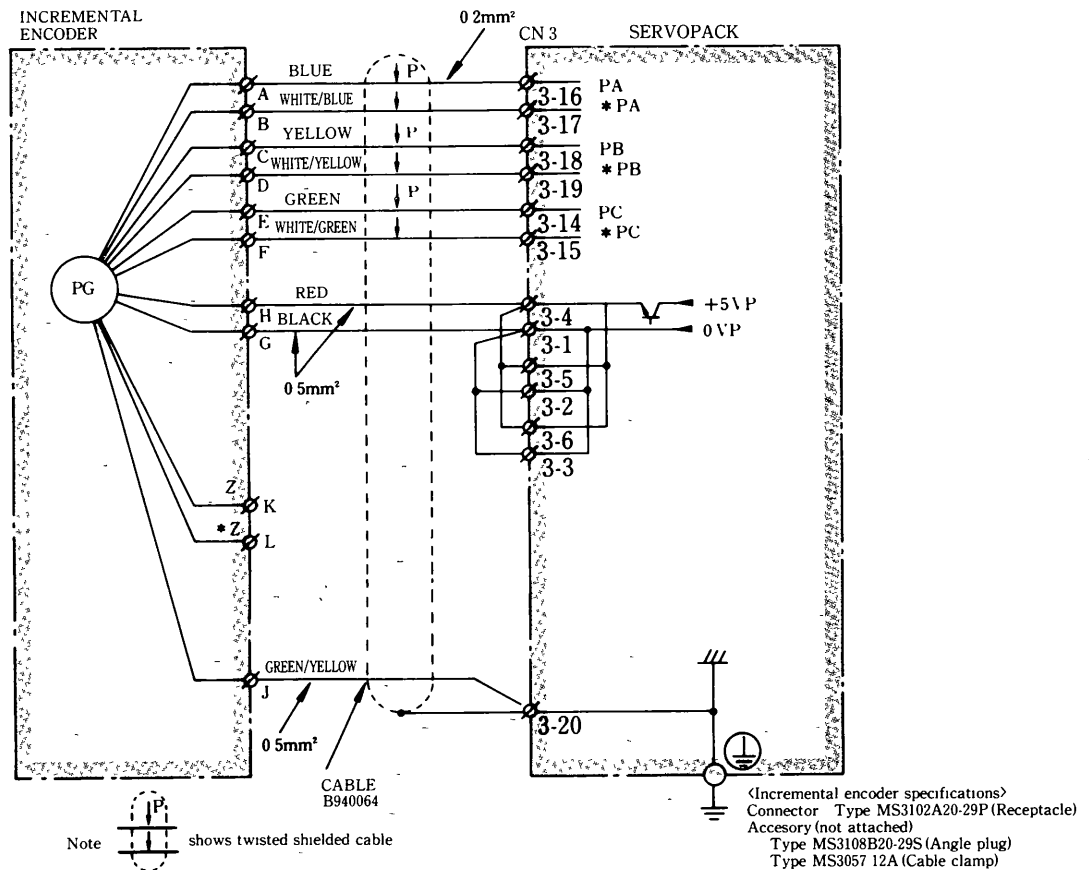


Fig. 5.10 Connection between CN3 and Incremental Encoder
(When soldered type cable B940064 is used)

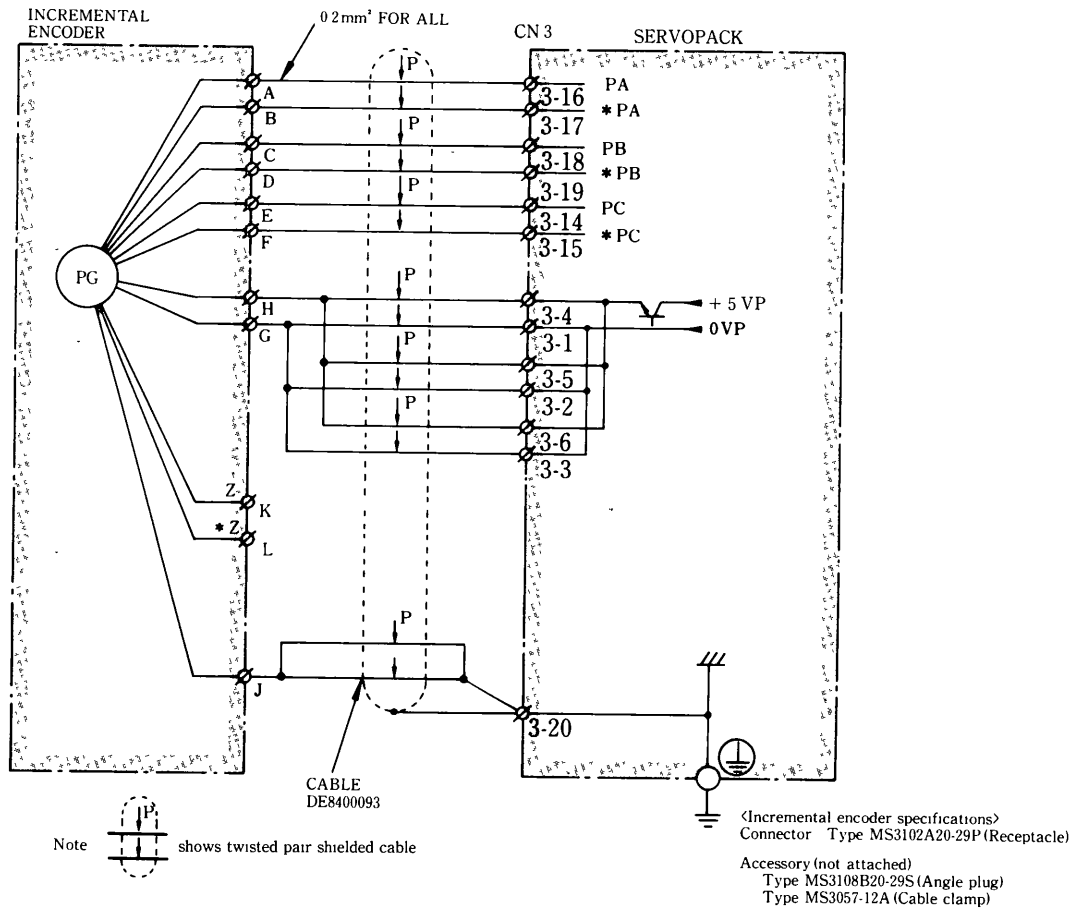


Fig 5.11 Connection between CN3 and Incremental Encoder
(When caulking type cable DE8400093 is used)

5.5 CONNECTOR TERMINAL (CN4) FOR I/O SIGNALS

5.5.1 Applicable Receptacle

Table 5.7 Applicable Receptacle

| Specifications of Connector Used in SERVOPACK | Applicable Receptacle Type | | | |
|---|----------------------------|---------------|---------|-------------------------|
| | Soldered Type | Caulking Type | Case | Maker |
| MR-2ORMA Right angle 20P | MR-20F* | MRP-20F01 | MR-20L* | HONDA Tsushin Co., Ltd. |

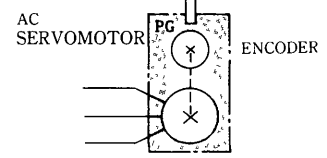
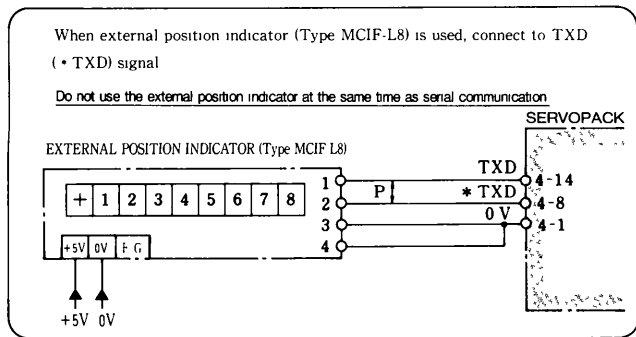
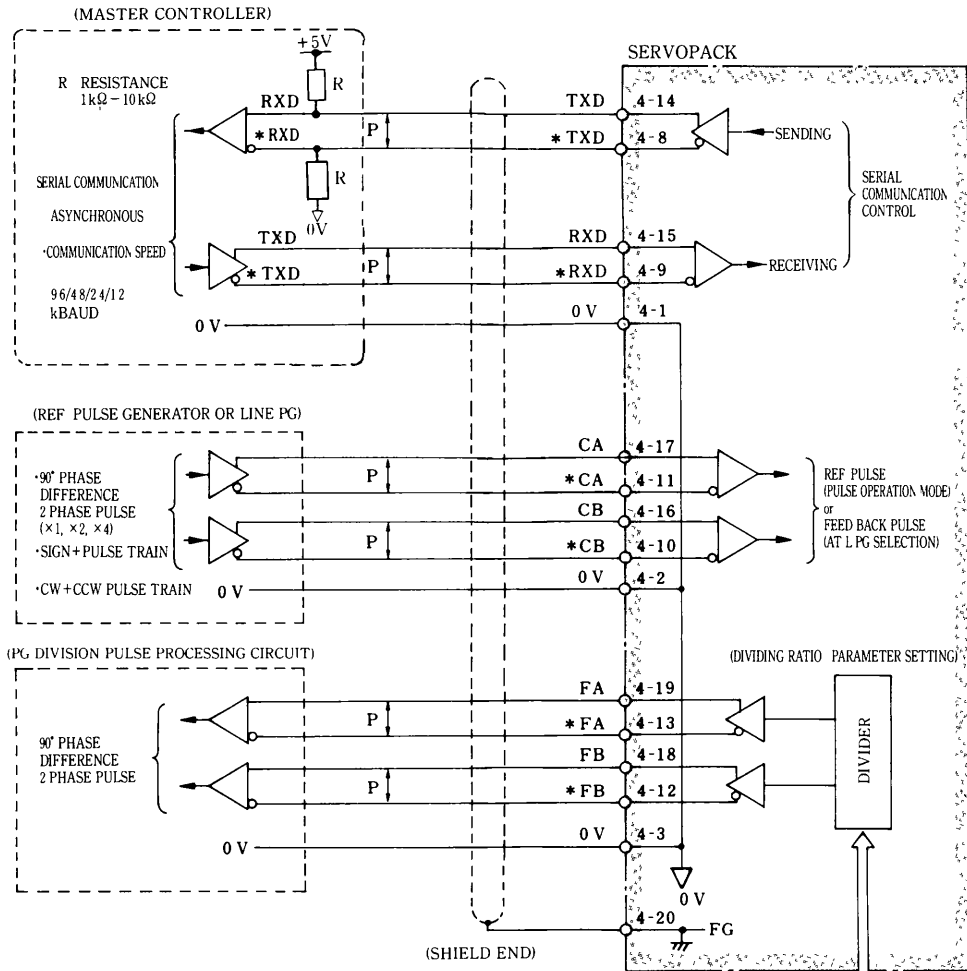
* Standard attachment of Servopack

5.5.2 Connector CN4 Layout and Connection

Table 5.8 shows the terminal layout of connector CN4 and Fig.5.12 shows the wiring diagram for CN4.

Table 5.8 Connector CN4 Layout

| | | | | | | |
|---|-----------------------------------|---|--------------------------|---|---------------------------|----------------------------------|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 0V | 0V | 0V | — | (+5V) | — | — |
| 0V for (Serial communication) (Pulse train command) (PG division output) signal | | | — | +5V output (Pull-up resistor connection) | — | — |
| 8 | 9 | 10 | 11 | 12 | 13 | |
| *TXD | *RXD | *CB | *CA | *FB | *FA | |
| For serial communication (RS 422) | | Line receiver negative side input for pulse train command | | PG division output line driver negative side output | | |
| Line driver negative side output | Line receiver negative side input | $\overline{B\phi}$ Input | $\overline{A\phi}$ Input | $\overline{B\phi}$ Output | $\overline{A\phi}$ Output | |
| 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| TXD | RXD | CB | CA | FB | FA | FG |
| For serial communication (RS 422) | | Line receiver positive side input for pulse train command | | PG division output line driver positive side output | | Frame Ground (Shielding process) |
| Line driver positive side output | Line receiver positive side input | $B\phi$ Input | $A\phi$ Input | $B\phi$ Output | $A\phi$ Output | |



Note The wiring length of the external pulse generator, line PG or external position indicator must be 5m or less

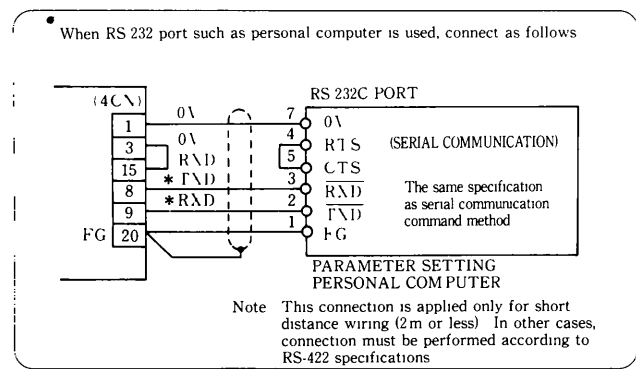


Fig. 5.12 Wiring Diagram for CN4

5.5.3 Description and Usage of I/O Signals of Connector CN4

| Signal Name | Pin No. | Name | Circuit Configuration | Function |
|-------------|---------|---------------------------|--------------------------|--|
| TXD | 14 | Data transmit signal | Positive side output | Data transmit signal from Servopack by serial communication with RS422 specifications. When external position indicator (MCIF-L8) is used, current position data are sent. When data are not sent, signal line becomes high impedance. |
| *TXD | 8 | | Negative side output | |
| RXD | 15 | Data receiving signal | Positive side input | Data receiving signal from master controller (personal computer, etc.) by serial communication with RS422 specifications. |
| *RXD | 9 | | Negative side input | |
| OV | 1 | OV for signal | | TXD(*TXD), RXD(*RXD), OV for signal |
| CA | 17 | Pulse train input signal | A ϕ | <ol style="list-style-type: none"> Reference pulse is input for positioning in external pulse train operation mode. (For pulse forms, refer to Par. 8.2 "PARAMETER 19".) When line PG (refer to Par. 6.2.5 (5)), feedback pulse is input. |
| *CA | 11 | | $\overline{A\phi}$ | |
| CB | 16 | | B ϕ | |
| *CB | 10 | | $\overline{B\phi}$ | |
| OV | 2 | OV for signal | | CA(*CA), CB(*CB), OV for signal |
| FA | 19 | PG division output signal | A ϕ | PG (encoder) division output can be obtained. Dividing ratio is set by parameters. Refer to Par. 8.2 "Parameter 64" Note: Even if motor rotating direction setting (b0 of parameter 14) is changed to 1 (rotating direction is reversed), phase relation between phases A and B is not changed. |
| *FA | 13 | | $\overline{A\phi}$ | |
| FB | 18 | | B ϕ | |
| *FB | 12 | | $\overline{B\phi}$ | |
| OV | 3 | OV for signal | | OV for signal FA(*FA), FB(*FB) |

Note Serial data sending signal
When data are not sent, signal line becomes high impedance. Therefore, mount pull-up and pull-down resistors on the host controller data receiving section.

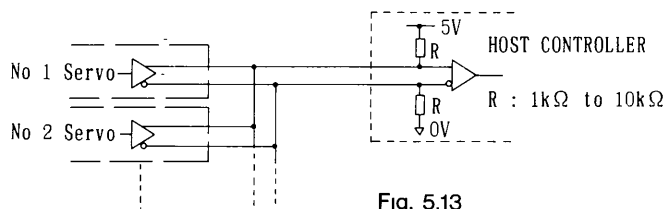


Fig. 5.13

When CACR-HR [] UB is used on one axis and shorting pins [TM-1] and [TM-2] are at 2-3 side, no resistor at the host controller side is needed since pull-up and pull-down resistors are connected at Servopack side.
For multi-axis configuration, switch [TM-1] and [TM-2] to 1-2 side and connect pull-up and pull-down resistors in the host controller side

5.6 CONNECTOR TERMINAL (CN5) FOR I/O SIGNALS

5.6.1 Applicable Receptacle Specifications

Table 5.9 Applicable Receptacle Specifications

| Specifications of Connector Used in SERVOPACK | Applicable Receptacle Type | | | |
|---|----------------------------|---------------|---------|-------------------------|
| | Soldered Type | Caulking Type | Case | Maker |
| MR-5ORMA Right angle 50P | MR-50F* | MRP-50F01 | MR-50L* | HONDA Tsushin Co., Ltd. |

* Standard attachment of Servopack

5.6.2 Connector CN5 Layout and Connection

The layout for the Servopack connector (CN5) differs partially depending on position reference method (set by parameter 15). Table 5.10 shows "Station No. Command Method", Table 5.11 shows "DG-SW Command" and Table 5.12 shows "Command Table Method".

"Common I/O signal" described in Par. 5.6.3(1) can be used for serial command method.

Figs. 5.14, 5.15 and 5.16 show the wiring diagram for CN5.



• Wiring Diagram for CN5 (Station No. Command Method)

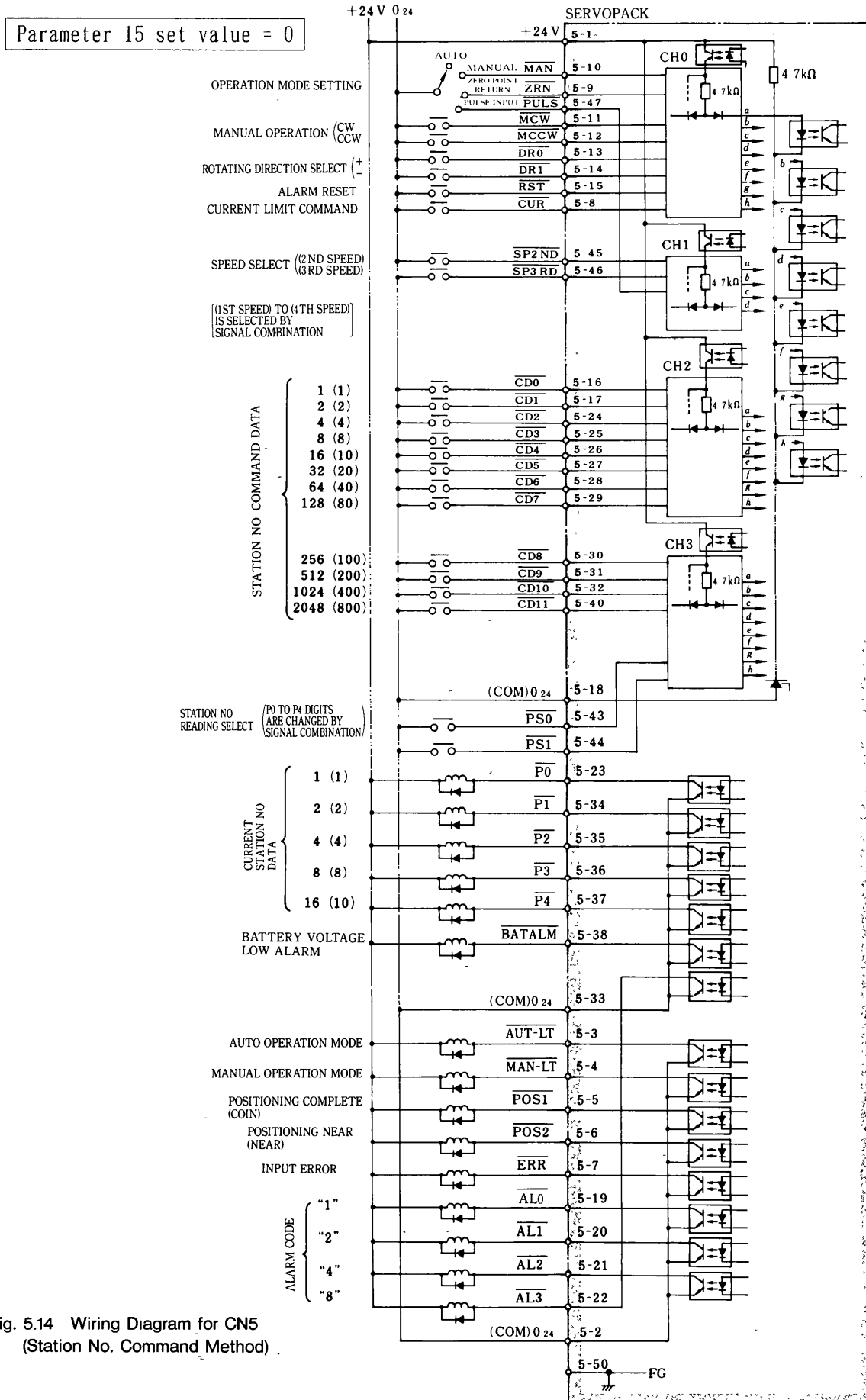


Fig. 5.14 Wiring Diagram for CN5 (Station No. Command Method)

• Wiring Diagram for CN5 (DG-SW Command Method)

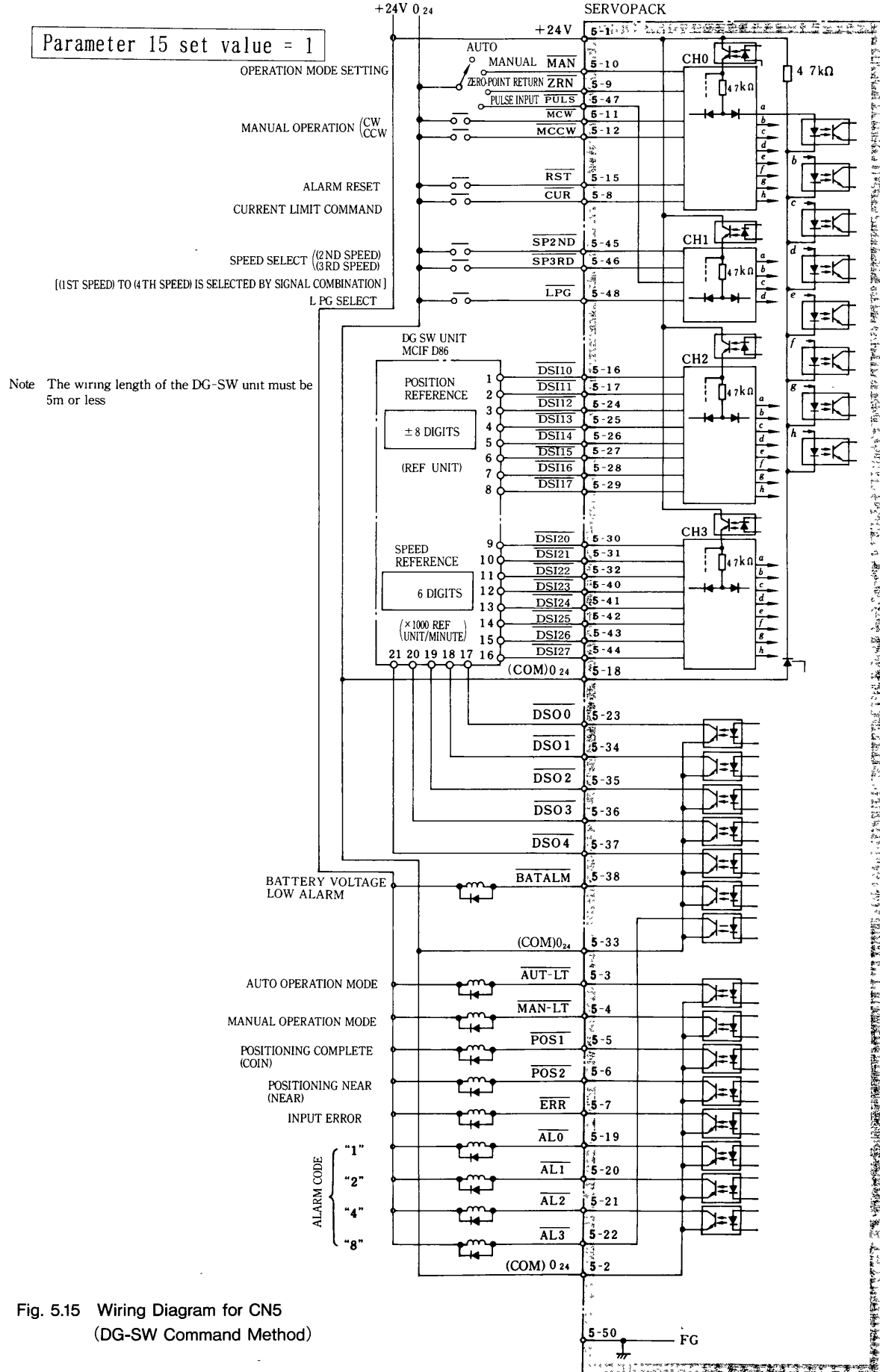


Fig. 5.15 Wiring Diagram for CN5 (DG-SW Command Method)

• Wiring Diagram for CN5 (Command Table Method)

Parameter 15 set value = 4

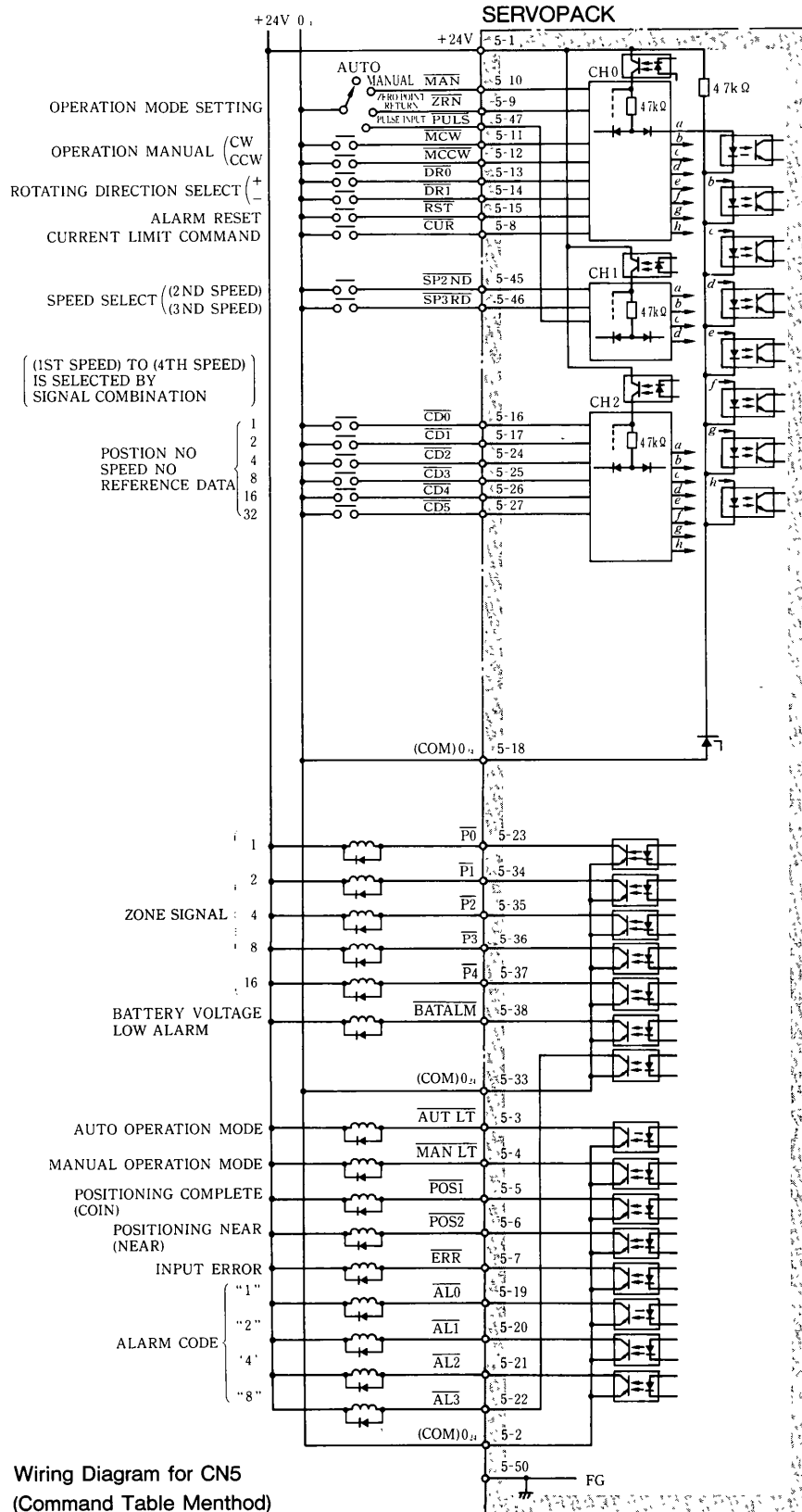


Fig. 5.16 Wiring Diagram for CN5 (Command Table Method)

5.6.3 Description and Usage of I/O Signals of Connector CN5





(1) Common I/O signals: Can be used regardless of position reference method (set by parameter 15), including serial command method.

• Output Signals



| Signal Name | Pin No. | Name | Effective logic | Function | | | | | | | | | | |
|---------------------|------------------|--|------------------|---|-------------|---|------------------|------------------|------------------|--------|---|---|---|---|
| $\overline{AL0}$ | 19 | Servo Alarm Code Output* (1, 2, 4, 8) | | Outputs the contents in binary when an alarm occurs (ALM signal = H level) or an error occurs (\overline{ERR} signal = L level). (Refer to Par. 6.4.2 (9).) | | | | | | | | | | |
| $\overline{AL1}$ | 20 | | | | | | | | | | | | | |
| $\overline{AL2}$ | 21 | | | | | | | | | | | | | |
| $\overline{AL3}$ | 22 | | | | | | | | | | | | | |
| | | <table border="1"> <thead> <tr> <th>Signal Name</th> <th>$\overline{AL0}$</th> <th>$\overline{AL1}$</th> <th>$\overline{AL2}$</th> <th>$\overline{AL3}$</th> </tr> </thead> <tbody> <tr> <td>Binary</td> <td>1</td> <td>2</td> <td>4</td> <td>8</td> </tr> </tbody> </table> | | | Signal Name | $\overline{AL0}$ | $\overline{AL1}$ | $\overline{AL2}$ | $\overline{AL3}$ | Binary | 1 | 2 | 4 | 8 |
| Signal Name | $\overline{AL0}$ | $\overline{AL1}$ | $\overline{AL2}$ | $\overline{AL3}$ | | | | | | | | | | |
| Binary | 1 | 2 | 4 | 8 | | | | | | | | | | |
| \overline{ERR} | 7 | Error Output | | Outputs if contact reference data error or malfunction during motor applied with current. Does not operate when \overline{ERR} signal is operating (L level). | | | | | | | | | | |
| $\overline{POS1}$ | 5 | Positioning Complete Output (COIN) | | Outputs with current position - aimed position \leq parameter 6 set value. (Refer to Par.8.2, "Parameter 6".) | | | | | | | | | | |
| $\overline{POS2}$ | 6 | Positioning Near Output (NEAR) | | Outputs with current position - aimed position \leq parameter 45 set value. (Refer to Par.8.2, "Parameter 45".) | | | | | | | | | | |
| $\overline{AUT-LT}$ | 3 | Operation Mode | | Outputs when "auto operation mode" is set during servo ON Status. | | | | | | | | | | |
| $\overline{MAN-LT}$ | 4 | Display Output | | | Manual | Outputs when "manual operation mode" is set during servo ON Status. | | | | | | | | |
| \overline{BATALM} | 38 | Battery Voltage Low Alarm | | Detects and outputs when battery voltage provided on the panel is low (only at power supply turned ON). | | | | | | | | | | |

* In the station No. command method (parameter 15 set value = 0), by setting parameter 20 b6=1 and parameter 66 b4=1, current data (station No.) output signals (P5 to P8) are enabled.

• Input Signals

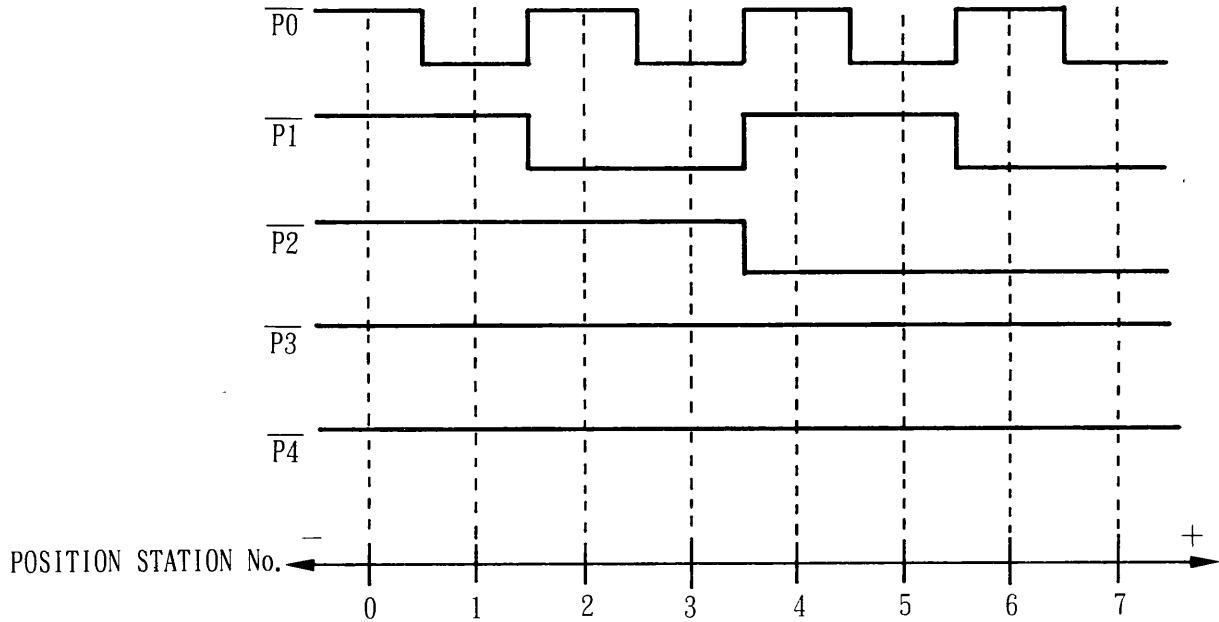
| Signal Name | Pin No. | Name | | Effective Logic | Function | | | |
|---------------------------|---------|------------------------------|----------------------------|---|--|---------------------------|----------------------------|---------------------------------|
| $\overline{\text{ZRN}}$ | 9 | Operation Mode Setting Input | Zero-Point Return (Homing) | Operation mode is determined by combination of three types of signals H or L level setting described on the left. | $\overline{\text{ZRN}}$ | $\overline{\text{MAN}}$ | $\overline{\text{PULS}}$ | Operation Mode |
| $\overline{\text{MAN}}$ | 10 | | Auto/Manual | | H | H | H | Auto |
| $\overline{\text{PULS}}$ | 47 | | Pulse Operation | | H | L | H | Manual |
| | | | | | L | H | H | Zero-point return (homing) |
| | | | | | H | H | L | Pulse |
| $\overline{\text{MCW}}$ | 11 | Manual Operation Command | Motor Reverse Direction |  | Signal becomes effective in manual operation mode setting. Operation can be performed only while this signal is turned ON. | | | Motor reverse direction command |
| $\overline{\text{MCCW}}$ | 12 | | Motor Forward Direction | | | | | Motor forward direction command |
| $\overline{\text{RST}}$ | 15 | Alarm Reset | |  | Resets alarm status. Check the alarm contents before turning on this signal. | | | |
| $\overline{\text{SP2ND}}$ | 45 | Speed Select Signal | 2nd Speed | Selects parameter setting (1st speed) to (4th speed) reference speed. | $\overline{\text{SP2ND}}$ | $\overline{\text{SP3RD}}$ | Auto/Manual Operation Mode | Pulse Operation Mode |
| $\overline{\text{SP3RD}}$ | 46 | | 3rd Speed | | | | Parameter No. (Contents) | Input pulse multiplication |
| | | | | | H | H | 4 (1st speed) | × 1 |
| | | | | | L | H | 31 (2nd speed) | × 10 |
| | | | | | H | L | 32 (3rd speed) | × 100 |
| | | | | | L | L | 33 (4th speed) | × 1 |
| $\overline{\text{CUR}}$ | 8 | Current Limit Command | |  | Motor current is limited with current value set by parameter by turning ON this signal. | | | |
| $\overline{\text{LPG}}$ | 48 | Line PG Select Input | |  | Signal used for line PG. Feedback system is switched to line PG by turning ON this signal. | | | |

(2) Reference data signal for Station No. reference method
 (Parameter 15 Set Value = 0)

| Signal Name | Pin No. | Name | Effective Logic | Function | | | | | | | | |
|-------------------|---------|-----------------------------------|-----------------|---|--|------------------|--------------------------------|----------|--------------------------------|----------|--------|----------|
| \overline{DRO} | 13 | Rotating Direction Select Input | + | Rotating direction is set by signal combination. | \overline{DRO} | \overline{DRI} | Absolute Mode | | Incremental Mode | | | |
| | | | | | H | H | Short-cut direction | | (Error) | | | |
| | | | | | L | H | Station No. increase direction | | Station No. increase direction | | | |
| | | | | | H | L | Station No. decrease direction | | Station No. decrease direction | | | |
| \overline{DRI} | 14 | | - | | L | L | (Error) | | (Error) | | | |
| | | | | | Absolute/incremental modes are set by parameter 14 b3. | | | | | | | |
| | | | | | | | | | | | | |
| $\overline{CD0}$ | 16 | Station No. Reference Data | |  | | | 1 | | | 1 | | |
| $\overline{CD1}$ | 17 | | | | | | 2 | | | 2 | | |
| $\overline{CD2}$ | 24 | | | | | | 4 | | | 4 | | |
| $\overline{CD3}$ | 25 | | | | | | 8 | | | 8 | | |
| $\overline{CD4}$ | 26 | | | | | | 10 | | | 16 | | |
| $\overline{CD5}$ | 27 | | | | | | 20 | | | 32 | | |
| $\overline{CD6}$ | 28 | | | | | | 40 | | | 64 | | |
| $\overline{CD7}$ | 29 | | | | | | 80 | | | 128 | | |
| $\overline{CD8}$ | 30 | | | | | | 100 | | | 256 | | |
| $\overline{CD9}$ | 31 | | | | | | 200 | | | 512 | | |
| $\overline{CD10}$ | 32 | | | | | | 400 | | | 1024 | | |
| $\overline{CD11}$ | 40 | | | 800 | | | 2048 | | | | | |
| $\overline{PS0}$ | 43 | Station No. Read-out Select Input | | Reads out current station No. data output ($\overline{P0}$ to $\overline{P4}$) by signal combination. | | | H | L | | H | L | |
| $\overline{PS1}$ | 44 | | | | | | H | H | | L | L | |
| $\overline{P0}$ | 23 | Current Station No. Data Output | |  | (BCD) | (BINARY) | (BCD) | (BINARY) | (BCD) | (BINARY) | (BCD) | (BINARY) |
| $\overline{P1}$ | 34 | | | | 1 | 1 | 1 | 1 | 10 | 16 | 100 | 256 |
| $\overline{P2}$ | 35 | | | | 2 | 2 | 2 | 2 | 20 | 32 | 200 | 512 |
| $\overline{P3}$ | 36 | | | | 4 | 4 | 4 | 4 | 40 | 64 | 400 | 1024 |
| $\overline{P4}$ | 37 | | | | 8 | 8 | 8 | 8 | 80 | 128 | 800 | 2048 |
| | | | | | 10 | 16 | Parity | | Parity | | Parity | |

- Notes: 1. Parity outputs so that number of low level of $\overline{P0}$ to $\overline{P4}$ becomes odd number.
 2. Current station No. data output is a coded output as in the following example.

when : $\overline{PS0} = H$, $\overline{PS1} = H$, parameter 14 b4 = 0



3. If motor stops at a position between two stations, the nearer station No. is output.
 4. During motor rotation, current station No. data output is unstable.

(3) Reference data signal for DG-SW reference method
 (Parameter 15 Set Value = 1)

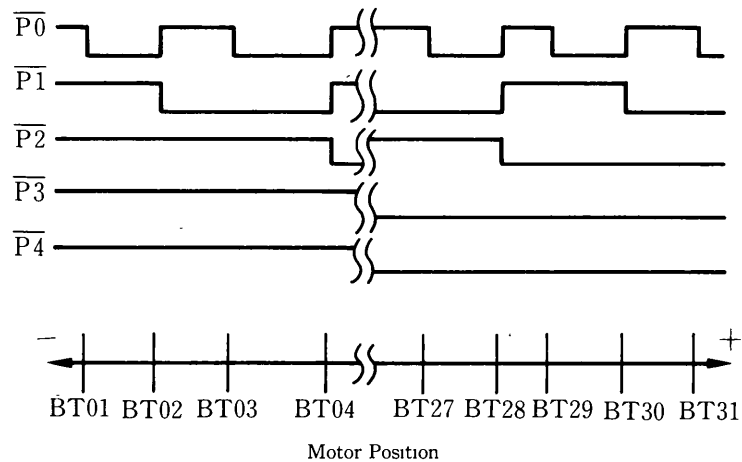
| Signal Name | Pin No. | Name | Effective Logic | Function | | | | | | |
|--------------------|---------|--------------------------|---|----------|--------|--------|--------|--------|--|---|
| $\overline{DSI10}$ | 16 | Position Ref. Data Input | | 1 | | | | | BCD Selected by data strobe output described below is input by 2 digits. | |
| $\overline{DSI11}$ | 17 | | | 2 | 10^0 | 10^2 | 10^4 | 10^6 | | + |
| $\overline{DSI12}$ | 24 | | | 4 | digit | digit | digit | digit | | - |
| $\overline{DSI13}$ | 25 | | | 8 | | | | | | |
| $\overline{DSI14}$ | 26 | | | 1 | | | | | | |
| $\overline{DSI15}$ | 27 | | | 2 | 10^1 | 10^3 | 10^5 | 10^7 | | |
| $\overline{DSI16}$ | 28 | | | 4 | digit | digit | digit | digit | | |
| $\overline{DSI17}$ | 29 | | | 8 | | | | | | |
| $\overline{DSI20}$ | 30 | Speed Ref. Data Input | | 1 | | | | | | |
| $\overline{DSI21}$ | 31 | | | 2 | 10^0 | 10^2 | 10^4 | | | |
| $\overline{DSI22}$ | 32 | | | 4 | digit | digit | digit | | | |
| $\overline{DSI23}$ | 40 | | | 8 | | | | | | |
| $\overline{DSI24}$ | 41 | | | 1 | | | | | | |
| $\overline{DSI25}$ | 42 | | | 2 | 10^1 | 10^3 | 10^5 | | | |
| $\overline{DSI26}$ | 43 | | | 4 | digit | digit | digit | | | |
| $\overline{DSI27}$ | 44 | | | 8 | | | | | | |
| $\overline{DS00}$ | 23 | Data Strobe Output | Read-in time for one digit can be set by parameter 77. (Normally, it is set to 24ms.) 24ms to 2000ms | | | | | | Data strobe is output in order by any pulse width. It takes 5 times of pulse width to read-in all digits. | |
| $\overline{DS01}$ | 34 | | | | | | | | | |
| $\overline{DS02}$ | 35 | | | | | | | | | |
| $\overline{DS03}$ | 36 | | | | | | | | | |
| $\overline{DS04}$ | 37 | | | | | | | | | |

- (4) Reference data signal for command table method .
 (Parameter 15 set Value = 4)

| Signal Name | P1n No. | Name | Effective Logic | Function |
|------------------|---------|---|-----------------|--|
| $\overline{CD0}$ | 16 | Position No., Speed No., Reference Data Input | | 1 Specifies position No. and speed No. in $\overline{CD0}$ to $\overline{CD5}$ codes. |
| $\overline{CD1}$ | 17 | | | 2 Specifies 64 when all $\overline{CD0}$ to $\overline{CD5}$ codes are OFF(H). |
| $\overline{CD2}$ | 24 | | | 4 Set parameter 14 b4=0 since $\overline{CD0}$ to $\overline{CD5}$ are effective only in binary setting. |
| $\overline{CD3}$ | 25 | | | 8 |
| $\overline{CD4}$ | 26 | | | 16 |
| $\overline{CD5}$ | 27 | | | 32 |
| $\overline{P0}$ | 23 | Zone Signal Output | | 1 Output only when parameter 20 b5=1 and parameter 65 b0=1 are set. |
| $\overline{P1}$ | 34 | | | 2 |
| $\overline{P2}$ | 35 | | | 4 |
| $\overline{P3}$ | 36 | | | 8 |
| $\overline{P4}$ | 37 | | | 16 |

Notes

1. Zone signals are coded output as shown below. (It is safe to read in the data during stop because of coded output.)



2. Boundary positions of BT1 to BT31 are set by serial command. Positions must be arranged in the order as shown above.
3. It takes 40ms maximum from boundary position passing to zone signal change.
4. Even if the number of boundary positions to be set is less than 31, keep the order from BT1 to BT31. (Set so as to be BT_n value \leq BT_{n+1} value.)

For power supply to turn OFF in sequence, both power supplies are turned OFF simultaneously (including momentary power loss) (Fig.5.17) or the main circuit power supply is turned OFF before the control power supply (Fig.5.18).

(Precautions for Figs. 5.17 and 5.18)

- Main circuit power supply must be turned OFF by SERVO ALARM signal.

(If the control supply is also turned OFF, LED which indicates the servo alarms also goes out.)

- In power supply ON-OFF sequence in Fig.5.17, it takes approx. 1 second at maximum to establish a normal signal in the control circuit (1Ry is turned on).

Note : Because of initializing the Servopack, SERVO ALARM signal is output for approx. 1 second at maximum (typical 200 to 300ms) when the control power supply is turned ON.

Therefore, hold POWER ON signal for more than 1 second.

However, in the sequence in Fig.5.18, it is not necessary since the control power supply is always turned ON.

- Since Servopack is of capacitor input type, large charging current (charging time is 0.5 second) is applied when the main circuit power supply is turned ON. Therefore, frequent switching of power supply will result in deterioration of the main circuit elements which may cause unexpected trouble.

(Motor operation start/stop must be performed by turning operation signal ON-OFF. Do not use the power supply ON-OFF.)

- Turn ON or OFF Servopack power supply in SERVO OFF state to prevent trouble at transition.



5.7.2 Power Supply Line Protection

Circuit breakers (MCCB) or fuses must be used to protect the power-supply lines to the SERVOPACK. Select the breakers or fuses based on the number of SERVOPACKs and their ratings. (Refer to Table 5.13)

Do not use fast-blow fuses because the in-rush current will destroy them.

Table 5.13 Power Supply Capacity and MCCB or Fuse Capacity

| Servopack Type CACR- | Power Supply *1 Capacity per Servopack (kVA) | Power Supply *2 Capacity per MCCB or Fuse (A) |
|-------------------------|--|---|
| HR03UB | 0.65 | 5 |
| HR05UB | 1.1 | 5 |
| HR10UB | 2.1 | 8 |
| HR15UB | 3.1 | 10 |
| HR20UB | 4.1 | 12 |
| HR30UB | 6.0 | 18 |
| HR44UB | 8.0 | 24 |

*1 : Values at rated load

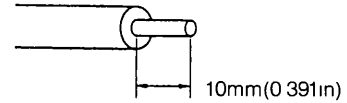
*2 : Breaking characteristic (25°C) : 200% 2s or more, 700% 0.01s or more

Note : Use a high-speed type of earth leakage circuit breaker. (Time-delay type is not adjustable.)

5.8 WIRE SIZES

The wire sizes and types are shown in Table 5.13.

Table 5.13 Wire Size



| Circuit | Model CACR-HR | Terminal Symbol | Torque † Values N•m | 75°C Copper Wire Range | | Wire Type |
|----------|-------------------------|----------------------|---------------------------|---------------------------|-----------------|--|
| | | | | AWG | mm ² | |
| On-line | 03UB | R, S, T (Y3, Y4, Y5) | 1.2 | 14-10 | 2-5.5 | Power Cable: 600V vinyl sheathed lead or equivalent |
| | | U, V, W | 1.2 | 14-10 | 2-5.5 | |
| | | r, t | 1.2 | 14-10 | 2-5.5 | |
| | | ⊕ | 1.2 | 12-10 | 3.5-5.5 | |
| | 05UB | R, S, T (Y3, Y4, Y5) | 1.2 | 14-10 | 2-5.5 | |
| | | U, V, W | 1.2 | 14-10 | 2-5.5 | |
| | | r, t | 1.2 | 14-10 | 2-5.5 | |
| | | ⊕ | 1.2 | 12-10 | 3.5-5.5 | |
| | 10UB | R, S, T (Y3, Y4, Y5) | 1.2 | 14-10 | 2-5.5 | |
| | | U, V, W | 1.2 | 14-10 | 2-5.5 | |
| | | r, t | 1.2 | 14-10 | 2-5.5 | |
| | | ⊕ | 1.2 | 12-10 | 3.5-5.5 | |
| | 15UB | R, S, T (Y3, Y4, Y5) | 1.2 | 14-10 | 2-5.5 | |
| | | U, V, W | 1.2 | 14-10 | 2-5.5 | |
| | | r, t | 1.2 | 14-10 | 2-5.5 | |
| | | ⊕ | 1.2 | 12-10 | 3.5-5.5 | |
| | 20UB | R, S, T (Y3, Y4, Y5) | 1.2 | 14-10 | 2-5.5 | |
| | | U, V, W | 1.2 | 10 | 5.5 | |
| | | r, t | 1.2 | 14-10 | 2-5.5 | |
| | | ⊕ | 1.2 | 12-10 | 3.5-5.5 | |
| | 30UB | R, S, T (Y3, Y4, Y5) | 1.2 | 12-10 | 3.5-5.5 | |
| | | U, V, W | 1.2 | 10 | 5.5 | |
| | | r, t | 1.2 | 14-10 | 2-5.5 | |
| | | ⊕ | 1.2 | 10 | 5.5 | |
| | 44UB | R, S, T (Y3, Y4, Y5) | 1.2 | 8 | 8 | |
| | | U, V, W | 1.2 | 8 | 8 | |
| | | r, t | 1.2 | 14-10 | 2-5.5 | |
| | | ⊕ | 1.2 | 10 | 5.5 | |
| Off-line | Common to All models | | | | | *Wire with Class 1 Wiring |

* Twisted pair cable or twisted pair totally shielded cable
Core cable 0.2mm or more, plated soft steel twisted cable
Finished dimensions : CN2 16DIA or less
CN3 11DIA or less

† 1.80 N•m max

IMPORTANT

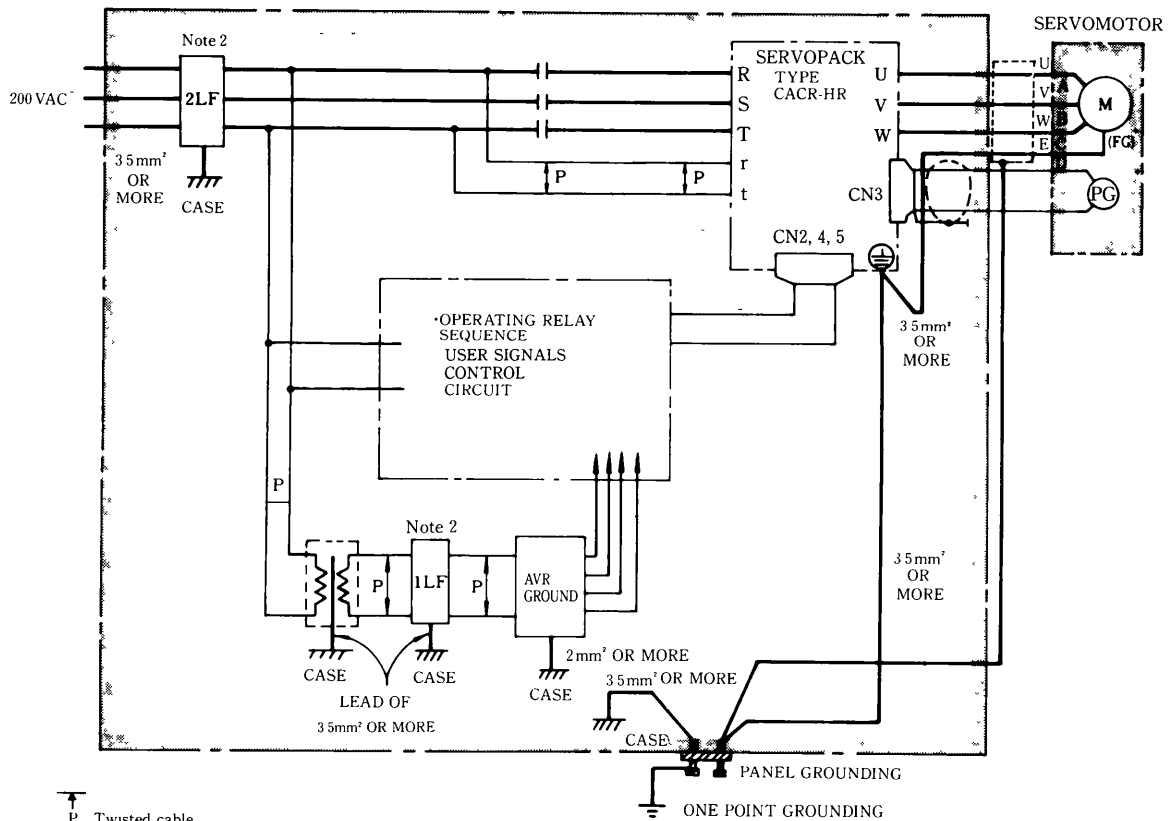
Lead size should be determined considering voltage drop of leads.

5.9 NOISE CONTROL

Servopack uses power transistors in the main circuit. When these transistors are switched, the effect of di/dt or dv/dt (switching noise) may sometimes occur depending on the wiring or grounding method.

The Servopack incorporates CPU. This requires wiring and treatment to prevent noise interference. The recommended wiring and grounding for reducing switching noise are shown in Fig. 5.19

(1) Grounding method



Twisted cable

Notes

- 1 Use wires of 3.5mm² or more for grounding to the case (preferably flat-woven copper wire)
- 2 Connect line filters observing the precautions as shown in (2) Noise filter installation

Fig. 5.19 Grounding Method

- Motor frame grounding

When the motor is at the machine side and grounded through the frame, Cf dv/dt current flows from the PWM power through the stray capacity of the motor. To prevent this effect of current, motor ground terminal ⑩ (motor frame) should be connected to terminal ① of Servopack.

(Terminal ② of Servopack should be directly grounded.)

- Metallic Conduit Grounding

When motor wiring is in a metallic conduit, ground the conduit and the terminal box. Perform the following grounding procedures at one point.



(2) Noise filter installation

When noise filters are installed to prevent noise from the power line, the block type must be used. The recommended noise filter is shown in Table 5.17. The power supply to peripherals also needs noise filters.

Note

If the noise filter connection is wrong, the effect decreases greatly. Observing the precautions, carefully connect them as shown in Figs. 5.20 to 5.23.

Table 5.17 Recommended Noise Filter

| SERVOPACK Type CACR- | Applicable Noise Filter | Recommended Noise Filter | |
|-------------------------|--|--------------------------|----------------------------------|
| | | Type | Specifications |
| HR03UB HR05UB | (CORRECT)  | LF-305 | Three-phase 200VAC class, 5A |
| HR10UB HR15UB | | LF-315 | Three-phase 200VAC class, 15A |
| HR20UB | (WRONG)  | LF-320 | Three-phase 200VAC class, 20A |
| HR30UB | | LF-330 | Three-phase 200VAC class, 30A |
| HR44UB | | LF-340 | Three-phase 200VAC class, 40A |

Note: Noise filter made by Tokin Corp.



5.9 NOISE CONTROL (Cont'd)

- (a) Separate the input leads from the output. Do not bundle or run them in the same duct.
- (b) Do not bundle the ground lead with the filter output line or other signal lines or run them in the same duct.

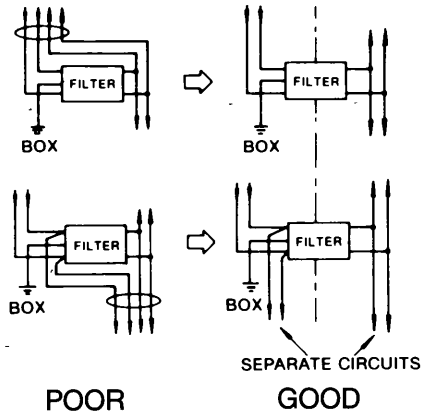


Fig. 5.20

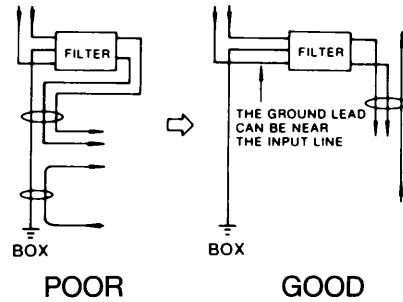


Fig. 5.21

- (c) Connect the ground lead singly to the box or the ground panel.

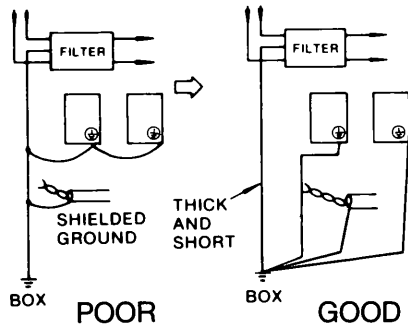


Fig. 5.22

- (d) The filter on the control panel is required to ground to the equipment ground terminal.

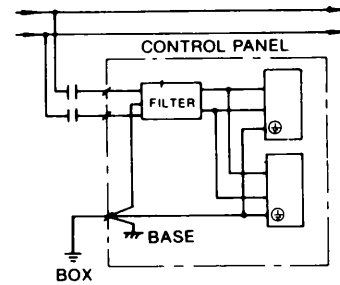


Fig. 5.23

(3) Serial communication line noise preventive action

When personal computers, etc. are used as master controllers, insert troidal core (ESD-RB series by Tokin Corp. or equivalent) in the input section as a noise preventive action.

Take some noise preventive action (such as insertion of a line filter) in the power supply lines.

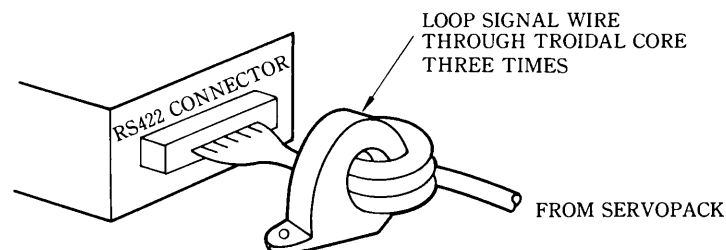


Fig. 5.24

6.1 OPERATION AND FUNCTIONS OF CN2 INPUT SIGNAL

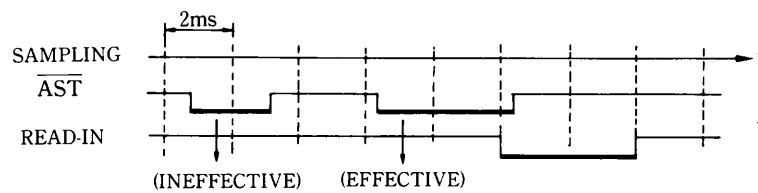
6.1.1 Signal Timing

- \overline{SVON} , \overline{AST} , STOP, N-OT, P-OG, DEC, \overline{PCON}

These signals are sampled every 2ms and read-in whenever the same levels are continued more than two times. (2 to 4ms filter)

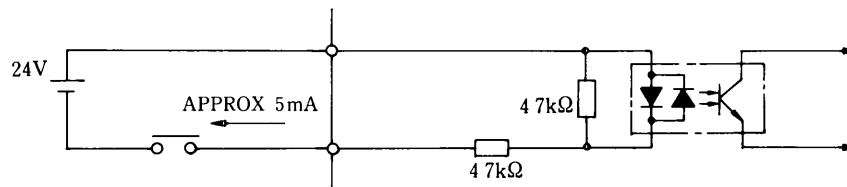
It is necessary to hold more than 5ms to be effective.

Example of AST Signal



- Since STP signal has a small filter, the above example is not applied.

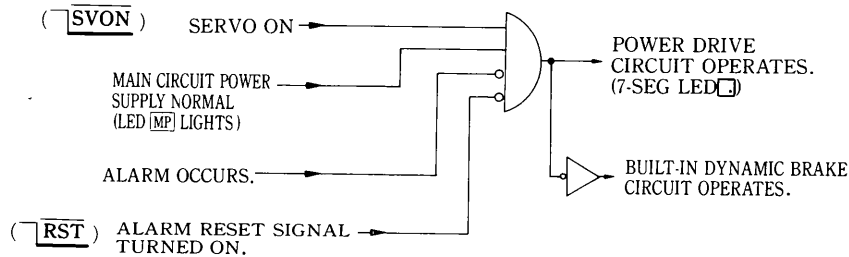
6.1.2 Input Circuit (Refer to Fig. 5.7 for Connection.)



6.1.3 Signal Operation and Functions

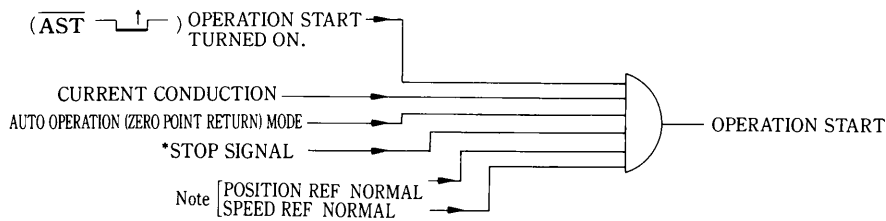
(1) Servo ON $\overline{\text{SVON}}$

By turning ON this signal, Servopack main circuit power drive circuit operates according to the following conditions and the motor is applied with current.



(2) Operation start $\overline{\text{AST}}$

- ① Operation start signal in automatic operation mode or zero-point return (homing) mode. 5ms or more pulse width required.
- ② $\overline{\text{AST}}$ signal becomes effective when the following conditions are satisfied and operation is started by signal rising edge.



Notes:

- Position reference not normal: when reference data exceed software overtravel value (refer to Par.8.3 "Parameters 40, 41").
- Speed reference not normal : when data exceed speed limit value (refer to Par.8.3 "Parameter 46").

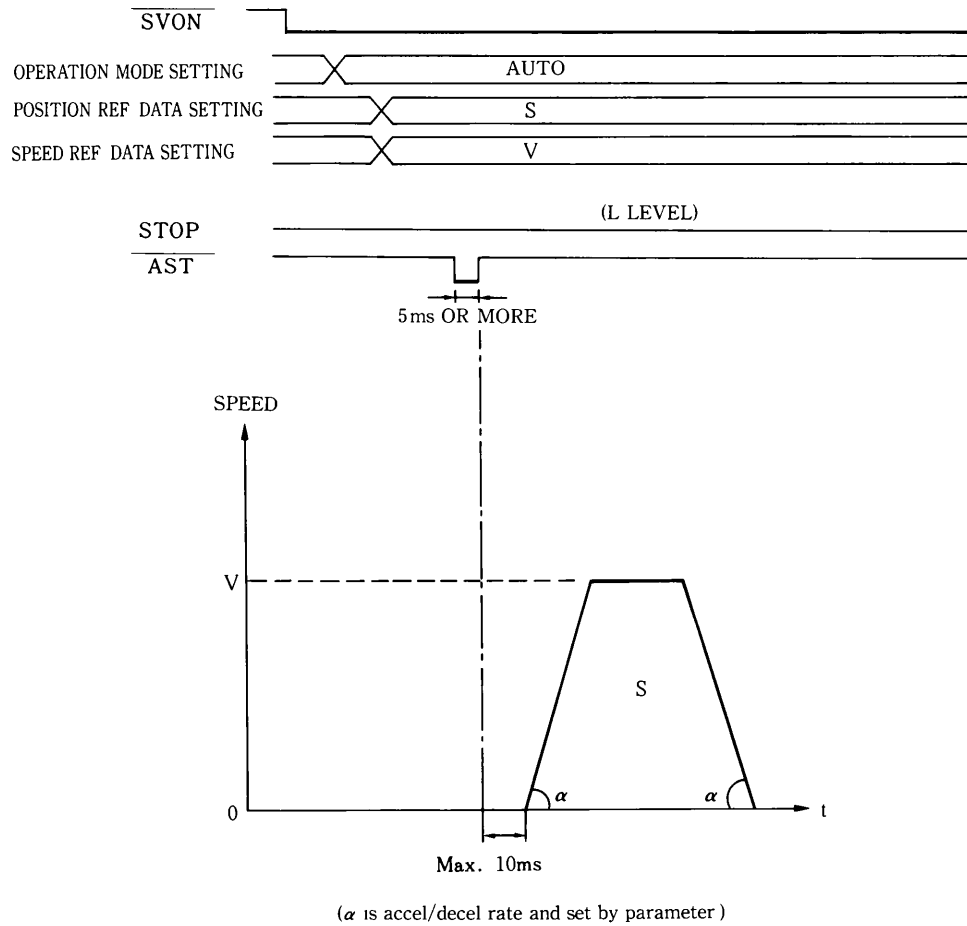
* The STOP signal is active when contact is open.

In the above cases, an error occurs by turning $\overline{\text{AST}}$ signal ON and operation does not start. Instead, ERR signal (refer to Par.6.3.2 (3)) is output.

③ When $\overline{\text{AST}}$ signal is not accepted (disregarded):

- Motor is moving.
- Motor is not under current conduction.
- Automatic operation mode or zero-point return (homing) mode is not selected.

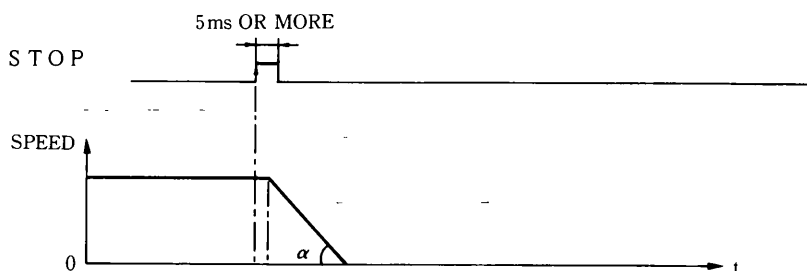
④ Timing chart



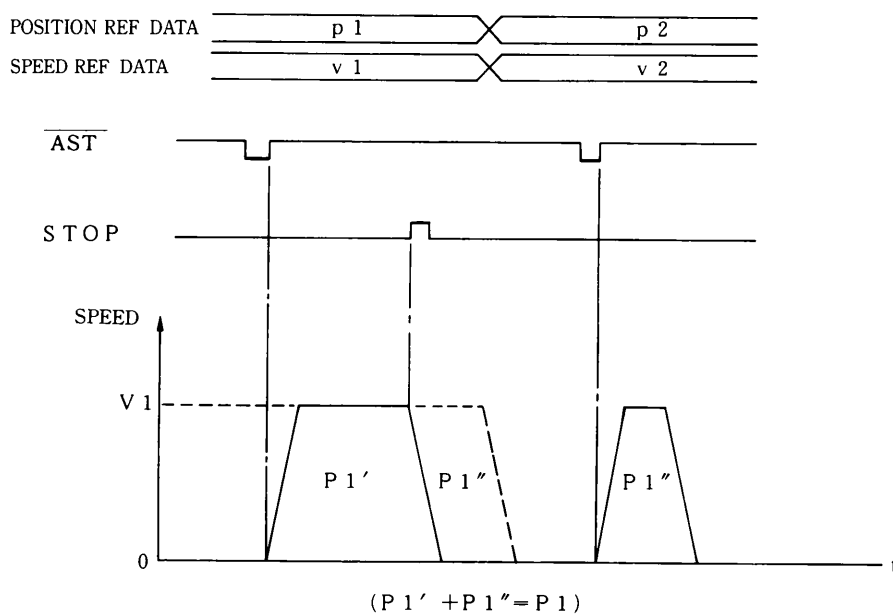
6.1.3 Signal Operation and Functions (Cont'd)

(3) Temporary stop [STOP]

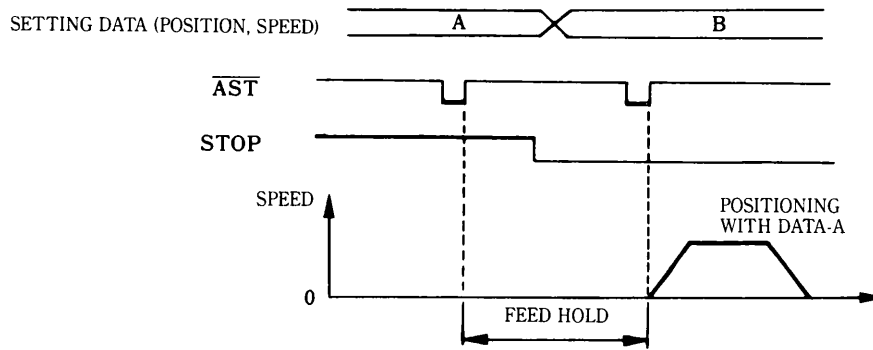
- ① Temporary stop reference in automatic operation mode or zero-point return (homing) mode. 5ms more than pulse width is required.
- ② If STOP signal is turned on during operation, it is detected by the signal rising edge and deceleration to a stop is performed at parameter set speed.



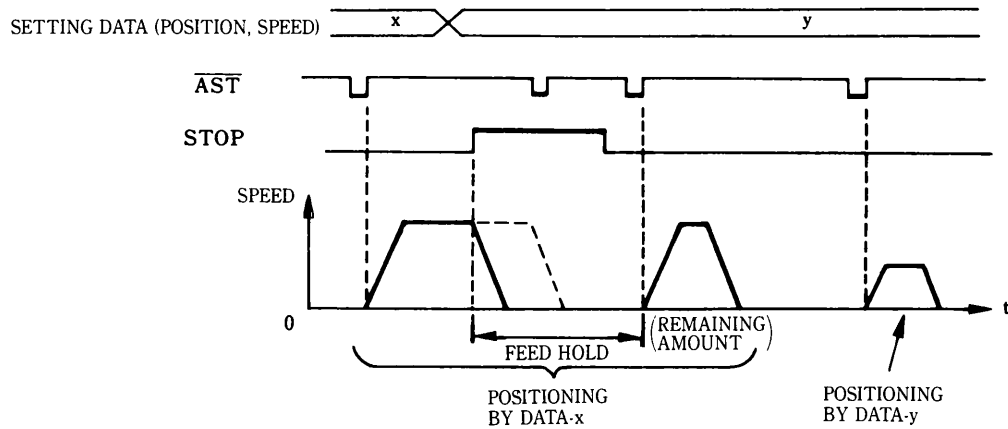
- ③ STOP signal contains feed hold function. That is, when position reference data are not discharged completely and operation stops after STOP signal is turned on, if \overline{AST} signal is turned on, aimed position and feeding speed will be processed with the former data. (Remaining positioning)



④ Feed hold functions when $\overline{\text{AST}}$ signal is turned ON with STOP signal turned ON.



⑤ Typical operation with STOP signal



⑥ Feed hold release

- After $\overline{\text{AST}}$ signal is turned ON when STOP signal is OFF.
- Operation mode is switched.
- Baseblocking (current is not applied to motor.)

⑦ When STOP signal input remains open, stop status continues. Therefore, when STOP signal is not used, set parameter 19 b1 = 1.

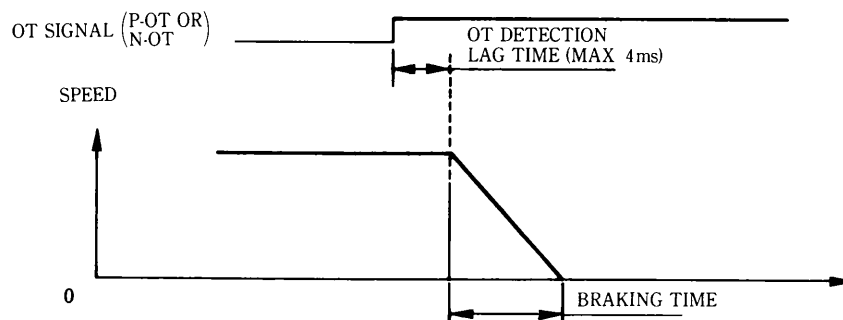
6.1.3 Signal Operation and Functions (Cont'd)

(4) Overtravel LS (P-OT, N-OT)

- ① When P or N-OT signal operates, speed reference in the moving direction is forced to be 0. (Motor stops at maximum deceleration rate during operation.)
- ② Relation between reference direction, motor rotating direction and P-OT or N-OT signal.

| Parameter 14b0 | Reference Direction (Ref Data Polarity) | Motor Rotating Direction | Effective OT Signal |
|---------------------------|---|--------------------------|---------------------|
| 0 (Standard) | + | Forward(CCW) | P-OT |
| | - | Reverse(CW) | N-OT |
| 1 (Reverse Connection) | + | Reverse(CW) | P-OT |
| | - | Forward(CCW) | N-OT |

- ③ When P-OT and N-OT signal are not used, set parameter 19 b0 = 1.
- ④ After P-OT or N-OT signal is detected, there is a 4ms lag time at maximum until braking is actually applied. Additionally, there is a braking time until stop. When LS is set, these points must be considered.



(5) LS related to zero-point return (homing) [DEC, STP]

Refer to the zero-point return (homing) mode described in Par. 6. 2. 3 (1)(d).

(6) Proportional operation reference [PCON]

Speed loop control mode is changed from PI operation to P operation by turning ON this signal, and servo rigidity is reduced.

6.2 OPERATION AND FUNCTIONS OF CN5 INPUT SIGNAL

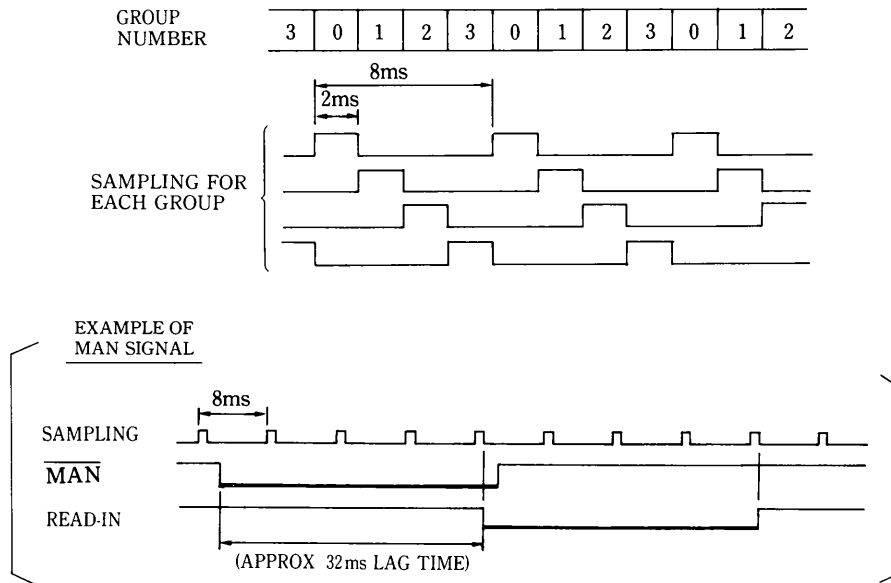
6.2.1 Signal Timing

Input signals are divided into four groups (CH0 to CH3: refer to Figs. 5.14, 5.15 and 5.16).

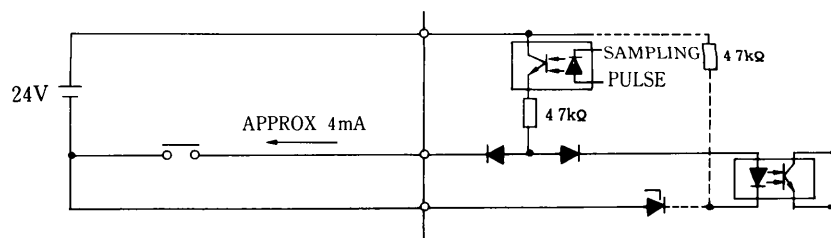
Each group is sampled every 8ms with 2ms width pulse.

When the same level continues three times or more, each signal is read-in (24 to 32ms filter).

Signal must be hold more than 30ms to be effective.



6.2.2 Input Circuit (Refer to Figs. 5.14, 5.15 and 5.16 for Typical Connection.)



6.2.3 Signal Operation and Functions

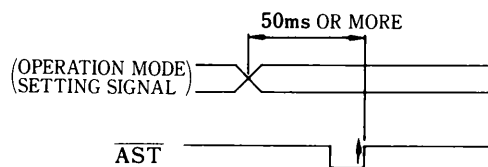
(1) Operation mode setting ($\overline{\text{MAN}}$, $\overline{\text{ZRN}}$, $\overline{\text{PULS}}$)

Automatic, manual, external pulse train or zero-point return (homing) operation mode is selected by operation mode signal setting, as shown below:

| Operation Mode | Operation Mode Setting Signal | | | Description |
|---------------------------|-------------------------------|--------------------------|-------------------------|---|
| | $\overline{\text{MAN}}$ | $\overline{\text{PULS}}$ | $\overline{\text{ZRN}}$ | |
| Automatic | H | H | H | Sets position data and performs positioning by turning on $\overline{\text{AST}}$ signal. |
| Manual | L | H | H | Performs constant speed operation by manual signal ($\overline{\text{MCW}}$, $\overline{\text{MCCW}}$). |
| External pulse train | H | L | H | Performs positioning by pulse train reference. |
| Zero-point return(homing) | H | H | L | Zero-point return method is selected by parameter setting. |
| — | H | L | L | Setting status described on the left is considered as an error and ERR signal is output. Operation cannot be performed. |
| | L | H | L | |
| | L | L | H | |
| | L | L | L | |

Notes:

1. If operation mode is switched during motor rotating, the motor will stop. (In this case, there is no feed hold)
2. 50ms or more is needed for timing with $\overline{\text{AST}}$ signal.

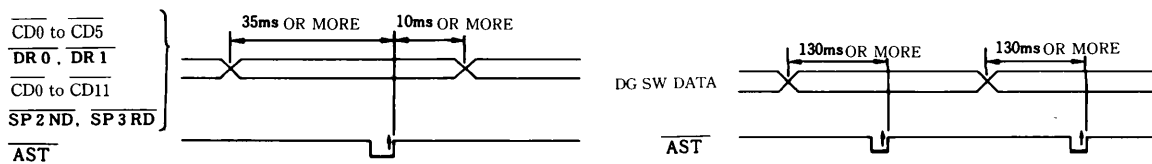


(a) Automatic operation mode

| Position Reference Method | Parameter 15 Set Value | Position Data | Reference Direction | Operation |
|------------------------------|------------------------|--|---|---|
| Station No. Reference Method | 0 | Station No. Reference contact data $\overline{CD0}$ to $\overline{CD11}$. | By rotating direction selection signal $\overline{DR0}$ or $\overline{DR1}$. | By turning ON the \overline{AST} signal, the axis is positioned at station No. set at constant data. (Absolute or incremental reference) |
| DG-SW Reference Method | 1 | DG-SW Reference data value $\overline{DSI10}$ to $\overline{DSI17}$ $\overline{DS00}$ to $\overline{DS04}$ | DG-SW reference data polarity (+/-) | By turning ON the \overline{AST} signal, the axis is moved to the position set by DG-SW reference data. (Absolute or incremental reference) |
| Command Table Method | 4 | Position No., speed No. selecting signals $\overline{CD0}$ to $\overline{CD5}$ | | By turning ON the \overline{AST} signal, positioning is performed at the position specified by position No. selection signals. |

Notes:

- There are four speed setting methods by parameter setting.
 - ① (1st speed) to (4th speed) by selected $\overline{SP2ND}$ and $\overline{SP3RD}$ (speed setting signal)
 - ② DG-SW
 - ③ serial command
 - ④ speed table
- Timing with \overline{AST} signal



Since DG-SW data are strobed for five times by 2 digits, it takes more than 120ms* for complete input of all digits. Refer to Par. 5.6.3 (3).

* For parameter 65 setting "b2 = 0".

6.2.3 Signal Operation and Functions (Cont'd)

(b) Manual operation mode

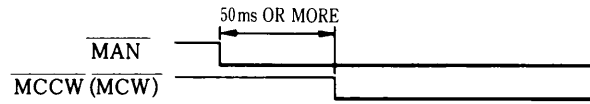
Constant start operation is performed only when manual operation signal ($\overline{\text{MCW}}$ or $\overline{\text{MCCW}}$) is turned ON. Operation method is set on parameter 15.

(Position reference method: Station No., DG-SW or command table)

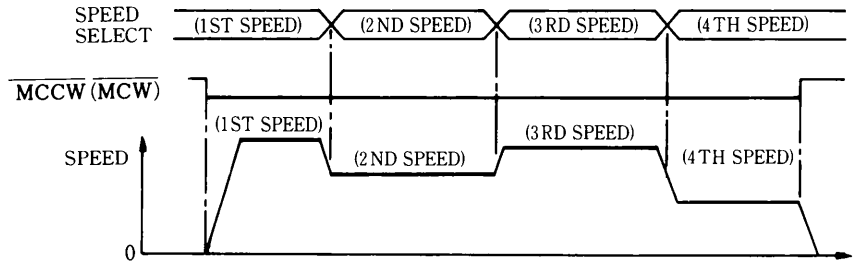
| Items | Contents |
|--|--|
| Accel/Decel speed speed | <p>Graph showing SPEED vs time t. The speed starts at 0, increases linearly with slope α during the 'OPERATION SIGNAL ON' period, reaches a constant speed, and then decreases linearly with slope α after the signal turns off. Text: SPEED THREE TYPES OF SETTING METHODS AVAILABLE, α ACCELERATION RATE (PARAMETER SETTING).</p> |
| Conditions | <p>Logic diagram for MOTOR FORWARD RUNNING and MOTOR REVERSE RUNNING. Inputs include MOTOR CURRENT CONDUCTION (SERVO ON), MANUAL OPERATION MODE, $\overline{\text{MCCW}}$ ON, and $\overline{\text{MCW}}$ ON. The forward running signal is the AND of Motor Current Conduction, Manual Operation Mode, and $\overline{\text{MCCW}}$ ON. The reverse running signal is the AND of Motor Current Conduction, Manual Operation Mode, and $\overline{\text{MCW}}$ ON.</p> |
| Station No. Ref. Method (Parameter 15) = 0 Operation | <p>Performs positioning at the nearest station in the operating direction after operation signal is turned OFF.</p> <p>Graph showing SPEED vs POSITION. The speed starts at 0, increases linearly, reaches a constant speed, and then decreases linearly to 0 at position No 2. A dashed line indicates a stopping target point at No 1. Text: (STOPPING TARGET POINT) IS INDICATED BY NO 2, (STATION NO) No 1, No 2.</p> <p>Due to accel/decel rate, the second, nearest station may be selected.</p> |
| DG-SW Ref. Method (Parameter 15) = 1 | <p>Stops at a deceleration rate set to parameter after operation signal is turned OFF.</p> |
| Command Table Method (Parameter 15) = 4 | |

Notes:

1. Timing with operation setting signal



2. When speed select signal ($\overline{\text{SP2ND}}$, $\overline{\text{SP3RD}}$) is used and speed is changed during operation, corresponding parameter speed is set.



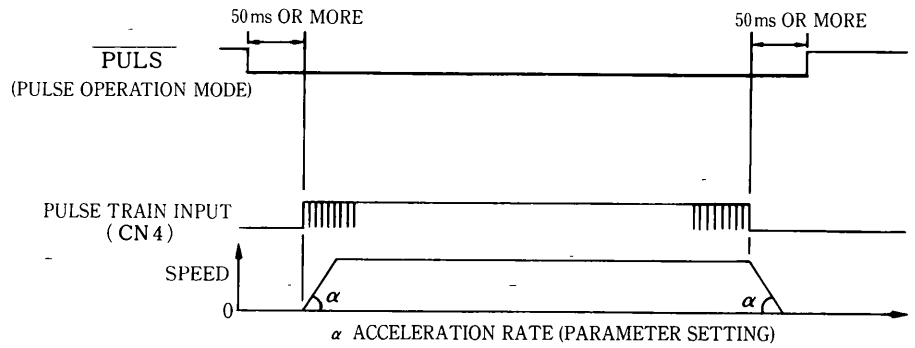
3. In DG-SW speed reference, speed varies if the setting is changed while $\overline{\text{MCW (MCCW)}}$ is turned ON since setting data are read-in every 120 ms *.
However, do not change DG-SW setting during operation, incorrect data may be read-in.
* Parameter 65 b2 = 0



6.2.3 Signal Operation and Functions (Cont'd)

(c) Pulse train operation mode

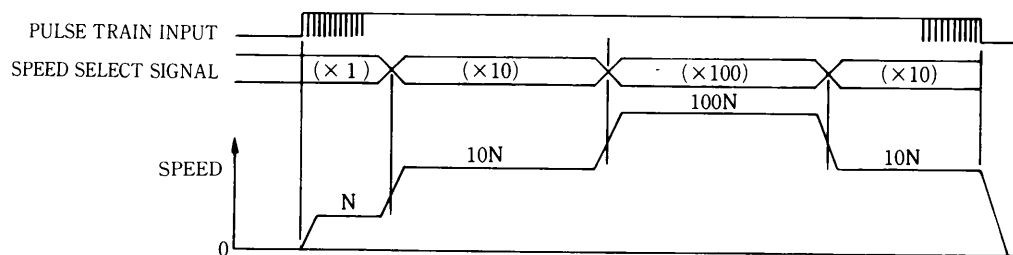
In this mode, positioning by external reference pulse train is performed.



Notes:

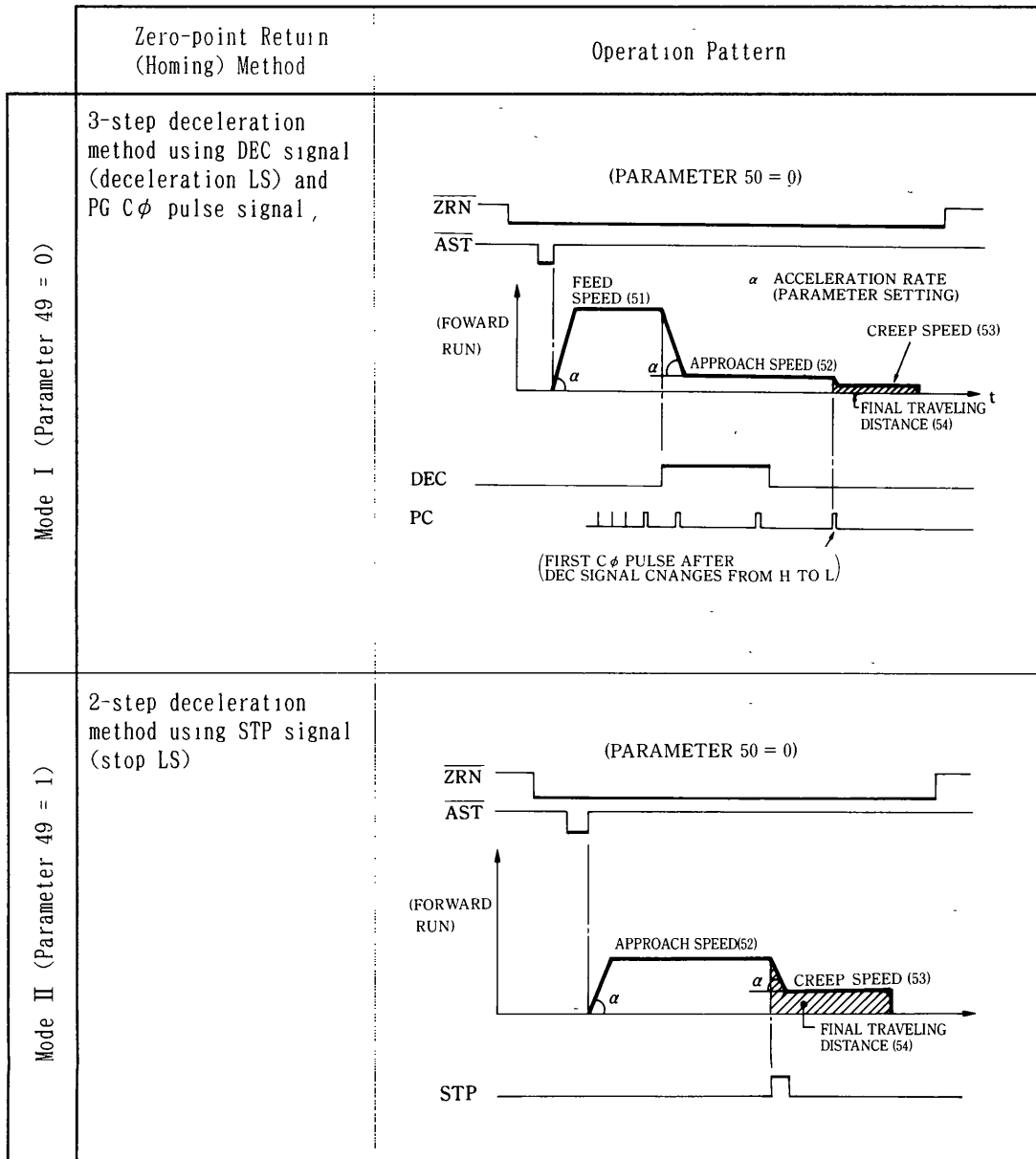
1. One-pulse input moves one reference unit.
2. Frequency \rightarrow reference speed $\{f \text{ (pps)} \rightarrow f \times 60 \text{ (reference unit) / min.}\}$
 Number of pulses \rightarrow Positioning value $\{P \text{ (pulse)} \rightarrow P \text{ (reference unit)}\}$
3. For pulse train signal form to be input to CN4, refer to Par.8.2 "Parameter 19 b3".
4. Speed select signals ($\overline{\text{SP2ND}}$, $\overline{\text{SP3RD}}$) at pulse operation mode determines input pulse multiplier.

| $\overline{\text{SP2ND}}$ | $\overline{\text{SP3RD}}$ | Pulse Multiplier |
|---------------------------|---------------------------|------------------|
| H | H | $\times 1$ |
| L | H | $\times 10$ |
| H | L | $\times 100$ |
| L | L | $\times 1$ |



(d) Zero-point return (homing) mode (positioning using LS)

When zero-point return mode is used, set parameter 18 b4 = 1.

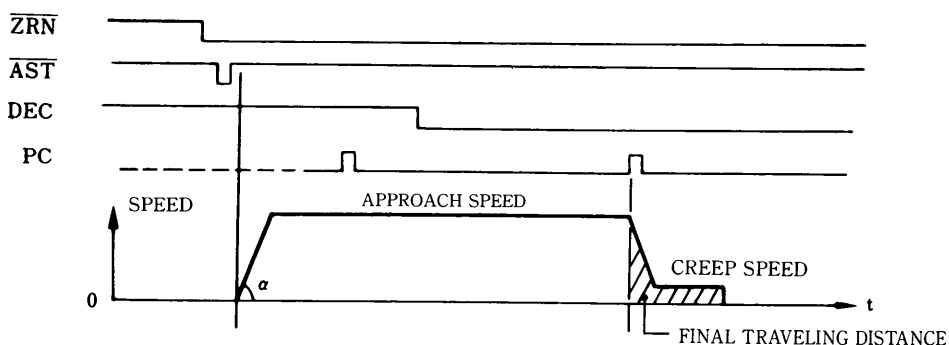


6.2.3 Signal Operation and Functions (Cont'd)

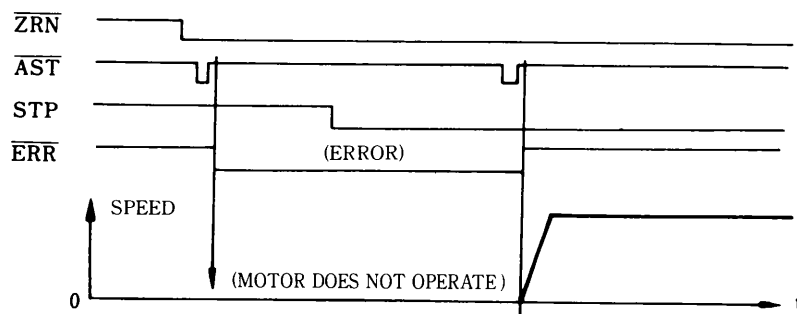
Note 1: Related parameters: Parameters described below become effective when parameter 18 b4 = 1, ineffective when b4 = 0.

| Parameter No. | Name | Setting Range | Unit |
|---------------|--|--|-----------------------------|
| 50 | Zero-speed return (homing) direction | 0: FWD, 1: REV direction | |
| 51 | Zero-speed return feed speed | 0 to 240000 | ×1000 • reference unit/min. |
| 52 | Zero-point return approach speed | 0 to 240000 | |
| 53 | Zero-point return creep speed | 0 to 240000 | |
| 54 | Zero-point return final traveling distance | FWD: 0 to +99999999 REV: -99999999 to 0 | Reference unit |

Note 2: When DEC signal is at H level in mode I and \overline{AST} signal is activated, operation is started at approach speed (parameter 52) from the beginning, regardless of zero-point return feed speed (parameter 51)



Note 3: When STP signal is at H level in mode II and \overline{AST} signal is activated, an error occurs (\overline{ERR} signal is output.)



(2) Speed selection ($\overline{\text{SP2ND}}$, $\overline{\text{SP3RD}}$)

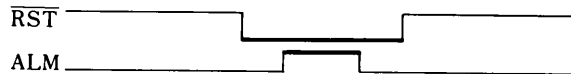
- In automatic or manual operation mode, reference speed can be selected from (1st speed) to (4th speed) by combination of speed selection signals and speed reference selection (Refer to Par. 8.2 "Parameter 18 b2, b3").

| Speed Select Signal | | Parameter | | |
|---------------------------|---------------------------|-----------|----------------|---|
| $\overline{\text{SP2ND}}$ | $\overline{\text{SP3RD}}$ | No. | Name | Setting Range/Unit |
| H | H | 4 | 1st feed speed | 1 to 240000 ($\times 1000 \cdot$ reference unit/min.) |
| L | H | 31 | 2nd feed speed | |
| H | L | 32 | 3rd feed speed | |
| L | L | 33 | 4th feed speed | |

- In pulse operation mode, $\overline{\text{SP2ND}}$ and $\overline{\text{SP3RD}}$ are used to select input pulse multiplier. (Refer to 6.2.3(1) (c) Note 4.)

(3) Alarm reset ($\overline{\text{RST}}$)

- Signal to reset servo alarm status. This becomes effective with pulse width of 30ms or more.
- Refer to Par. 6.1.3 (3) for the operation of $\overline{\text{RST}}$ signal.
- If $\overline{\text{RST}}$ signal is activated at normal operation (not in servo alarm status), alarm output signal ALM becomes H.



6.2.3 Signal Operation and Functions (Cont'd)

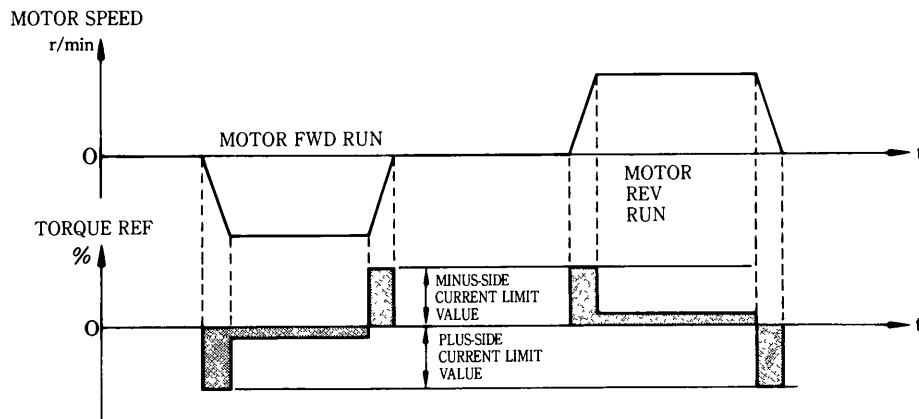
(4) Current limit command \overline{CUR}

- By setting parameter 17 b0 = 1, plus or minus side current limit value set by parameter becomes effective when \overline{CUR} signal is turned ON.
- Relation between current limit parameter and \overline{CUR} signal is shown in the table below:

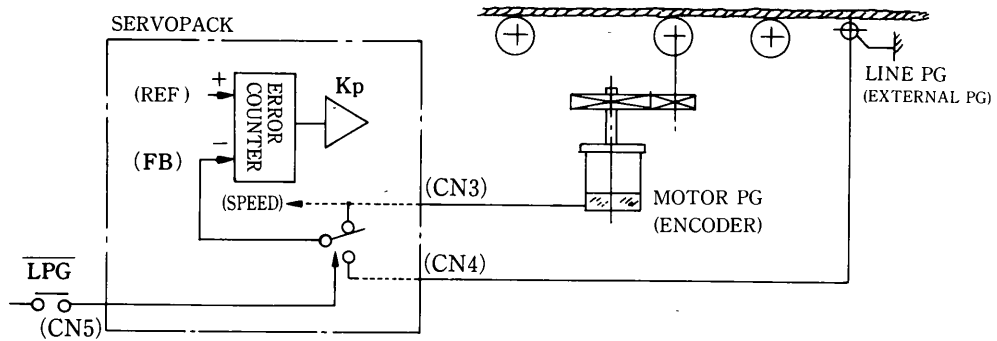
| Parameter | | Parameter 17 bo = 1 | | | |
|-------------------------------------|-----|-----------------------|-----------------------------|-----------------------------|---|
| Name | No. | bo = 0 | \overline{CUR} signal = H | \overline{CUR} signal = L | |
| | | (Current Limit Value) | (Plus limit value) | (Minus limit value) | |
| (Motor special current limit value) | (7) | ○ | ○ | ○ | ○ |
| Current limit value | 34 | × | ○ | ○ | ○ |
| Plus limit value | 35 | × | × | ○ | × |
| Minus limit value | 36 | × | × | × | ○ |

Notes:

1. Parameters with ○ are effective. When more than one parameter has ○, the smaller set value becomes effective.
2. Parameter 34 "current limit value" is effective for both plus and minus.
3. Limit value of parameters 35 and 36 are explained below:



(5) Line PG (External PG) switching ($\overline{\text{LPG}}$)



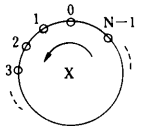
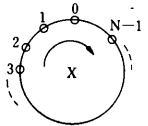
- When $\overline{\text{LPG}}$ signal is turned ON, position feedback signal is switched from motor PG to line PG and position fully closed loop by line PG is formed.
- Line PG output pulse corresponds to reference data one-by-one. That is, one pulse from line PG is read-in as one reference unit move.
- When line PG is used, zero-point return (homing) cannot be performed. Entering zero-point return mode causes an error.



(6) Input signal used in station No. reference method

(a) Rotating direction selection ($\overline{\text{DR0}}$, $\overline{\text{DR1}}$)

By combining $\overline{\text{DR0}}$ and $\overline{\text{DR1}}$ signals, the rotating direction at the motor shaft (viewed from the load side) in automatic operation mode is selected as shown below:

| Parameter 14-b3 | Signal | $\overline{\text{DR0}}$ | H | L | H | L |
|-----------------|------------------|---------------------------------|--|---|---------------------------------|---|
| | | $\overline{\text{DR1}}$ | H | H | L | L |
| 0 | Absolute mode | Short-cut direction | Station No. increasing direction (Example) | Station No. decreasing direction (Example) | (This setting causes an error.) | |
| 1 | Incremental mode | (This setting causes an error.) |  |  | | |

6.2.3 Signal Operation and Functions (Cont'd)

(b) Station No. reference data ($\overline{CD0}$ to $\overline{CD11}$)

Contact data input signal to specify the positioning station No.

By parameter (14 b4) setting, BCD or binary code is selected.

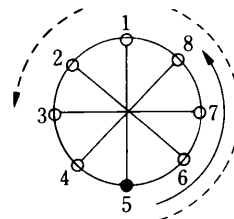
- Absolute mode: Move to data ($\overline{CD0}$ to $\overline{CD11}$) station No. position. (Parameter 14 b4 = 0)
- Incremental mode: Data ($\overline{CD0}$ to $\overline{CD11}$) indicates station No. to move to. (Parameter 14 b4 = 1)

(Example)

When data ($\overline{CD0}$ to $\overline{CD11}$) value is "3" with current station No. ⑤, ($\overline{DR0} = L$, $\overline{DR1} = H$) is input after start command is turned ON.

<Absolute mode> : Move to station No. ③ position. (----->)

<Incremental mode> : Move to station No. ⑧ position. (————>)



- Station No. reference data codes

| Parameter 14-b4 | Data Code | $\overline{CD0}$ | $\overline{CD1}$ | $\overline{CD2}$ | $\overline{CD3}$ | $\overline{CD4}$ | $\overline{CD5}$ | $\overline{CD6}$ | $\overline{CD7}$ | $\overline{CD8}$ | $\overline{CD9}$ | $\overline{CD10}$ | $\overline{CD11}$ |
|-----------------|--------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|-------------------|-------------------|
| 1 | BCD (0 to 999) | 1 | 2 | 4 | 8 | 10 | 20 | 40 | 80 | 100 | 200 | 400 | 800 |
| 0 | Binary (0 to 4095) | 1 | 2 | 4 | 8 | 16 | 32 | 64 | 128 | 256 | 512 | 1024 | 2048 |

(c) Station No. read-out selection ($\overline{PS0}$, $\overline{PS1}$)

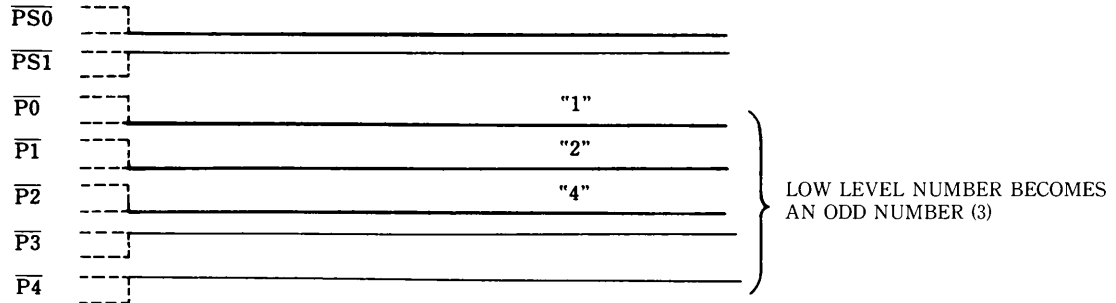
Current station No. value is read-out by current data (station No.) output signal ($\overline{P0}$ to $\overline{P4}$) $\overline{P0}$ to $\overline{P4}$ have only 5 bits. Therefore, by selecting $\overline{PS0}$ and $\overline{PS1}$, data must be read-out successively.

Output signals ($\overline{P0}$ to $\overline{P4}$) change the codes as shown in the table below by combining $\overline{PS0}$ or $\overline{PS1}$ H and L.

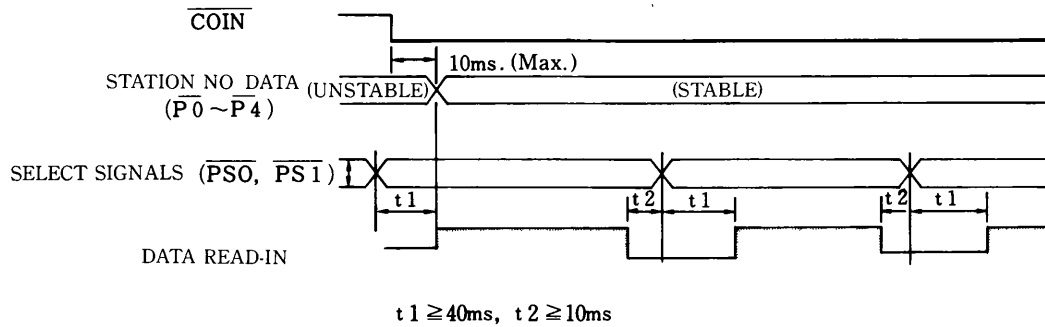
| Input Signal \ Output Signal | | $\overline{PS0}$ | H | L | H | L |
|------------------------------------|-----------------|------------------|------------|------------|------------|---|
| | | $\overline{PS1}$ | H | H | L | L |
| BCD setting parameter 14 b4 = 1 | $\overline{P0}$ | 1 | 1 | 10 | 100 | |
| | $\overline{P1}$ | 2 | 2 | 20 | 200 | |
| | $\overline{P2}$ | 4 | 4 | 40 | 400 | |
| | $\overline{P3}$ | 8 | 8 | 80 | 800 | |
| | $\overline{P4}$ | 10 | Odd parity | Odd parity | Odd parity | |
| Binary parameter 14 b4 = 0 | $\overline{P0}$ | 1 | 1 | 16 | 256 | |
| | $\overline{P1}$ | 2 | 2 | 32 | 512 | |
| | $\overline{P2}$ | 4 | 4 | 64 | 1024 | |
| | $\overline{P3}$ | 8 | 8 | 128 | 2048 | |
| | $\overline{P4}$ | 16 | Odd parity | Odd parity | Odd parity | |

Notes:

1. In a case other than $\overline{PS0} = \overline{PS1} = H$, $\overline{P4}$ becomes parity bit.
 For example, in BCD setting, when $\overline{PS0} = L$ and $\overline{PS1} = H$, and ($\overline{P0}$ to $\overline{P3}$) is 7, data are output as $\overline{P4} = H$ so that the figure below becomes an odd number (3) completely at low level with $\overline{P0} = L$, $\overline{P1} = L$, $\overline{P2} = L$ and $\overline{P3} = H$.

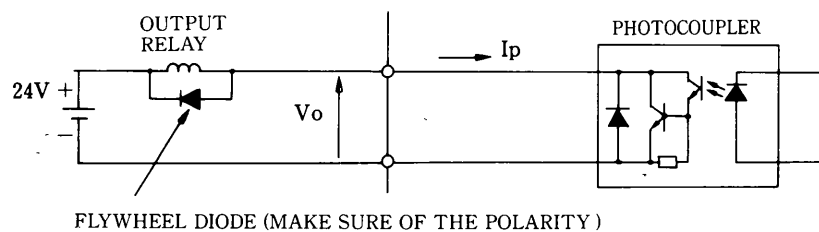


2. Timing with which current value data (station No.) is read-out several times must be as follows.



6.3 OPERATION AND FUNCTIONS OF CN2/CN5 OUTPUT SIGNAL

6.3.1 Output Circuit (Refer to Figs. 5.7, 5.14 and 5.15.)

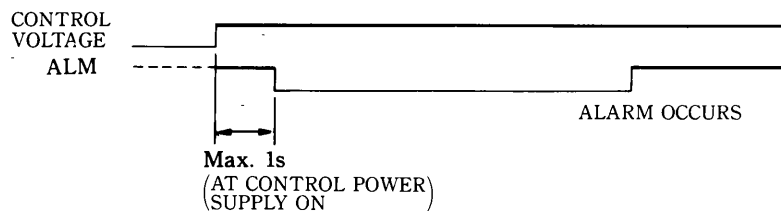


- Applied voltage: $V_o \leq 30V$
- Applied current: $I_p \leq 50mA$
- Flywheel diode: Use diode having repetitive peak reverse voltage 5 times more than the voltage.

6.3.2 Signal Operation and Functions

(1) Alarm (ALM)

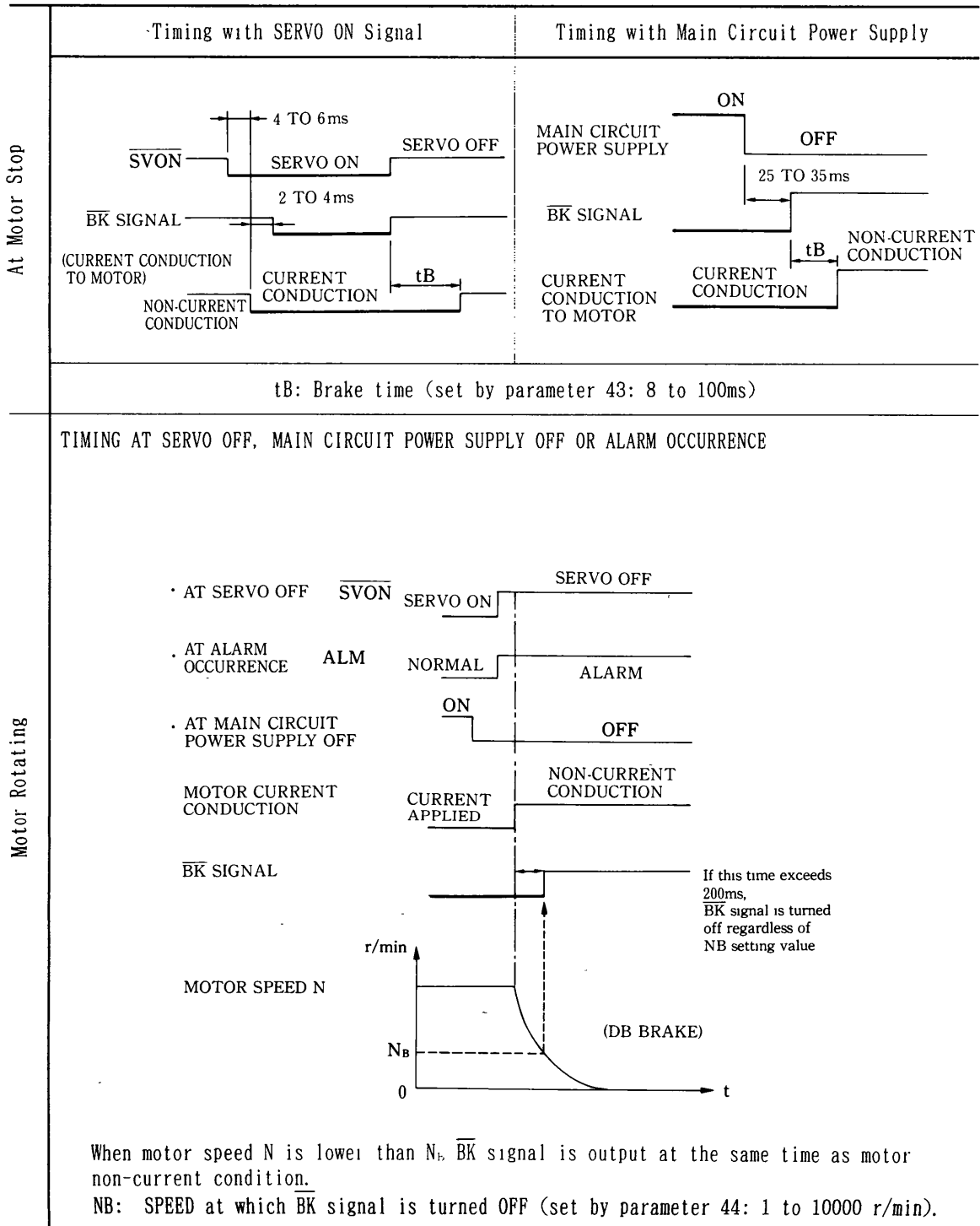
- When fault detection function (see Table 4.1) operates, the power drive circuit in the Servopack is turned OFF and alarm signal is output. Then the alarm contents are displayed to a 7-segment LED.
- Alarm signal timing



(2) Brake release signal \overline{BK}

Brake release signal \overline{BK} is an output signal to interlock the timing between current conduction or motor speed and brake release.

By setting parameter '19 b2 = 1, the brake release signal becomes effective. In this case, interlocking constant set by parameter 43 or 44 becomes effective.



6.3.2 Signal Operation and Functions (Cont'd)

(3) Reference Error ($\overline{\text{ERR}}$)

Outputs when reference data by contact signal is incorrect or operation is abnormal under motor current conduction. At this time, the motor cannot be driven.

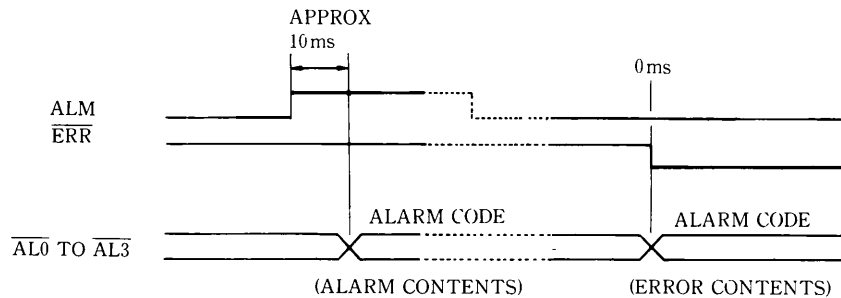
| Error Contents | | | $\overline{\text{ERR}}$ Output Timing | |
|-----------------------|---|--|---|--|
| Reference Error | At station No. Reference | Commands A to F at BCD setting | <p>$\overline{\text{ERR}}$ is released by correcting reference or switching operation mode once.</p> | |
| | | Commands station 0 at setting "station No. 0 not provided" in absolute reference mode. | | |
| | At DG-SW reference | Commands position data exceeding software over-travel set value. | | |
| | | Commands data exceeding speed limit value. | | |
| Operation Error, etc. | At station No. Reference | Operation mode improper setting (refer to Par. 6.2.3 (1).) | <p>$\overline{\text{ERR}}$ signal is output in the conditions as described on the left. Recovery from error immediately releases $\overline{\text{ERR}}$.</p> | <p>$\overline{\text{ERR}}$ is not output at baseblock.</p> <p>At baseblock, $\overline{\text{ERR}}$ is output only when:</p> <ul style="list-style-type: none"> • out of software overtravel range • external overtravel is detected |
| | | At DG-SW Reference | | |
| | $\overline{\text{LPG}}$ signal is turned on in pulse operation mode. | | | |
| | Software over-travel is applied during operation in pulse or manual operation mode. | | | |
| | External over-travel (P-OT, N-OT) is applied. | | | |

(4) Alarm code ($\overline{AL0}$ to $\overline{AL3}$)

- When an alarm occurs (ALM signal = H) or an error occurs (\overline{ERR} signal = L), the contents are output in 4-bit code.

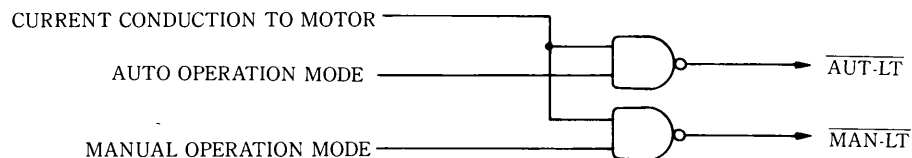
For details of alarm or error contents and corresponding alarm code signals, refer to (9) "Servopack status output signal".

- Output timing




(5) Operation mode display ($\overline{AUT-LT}$, $\overline{MAN-LT}$)

Output conditions of each signal are as follows:



(6) Battery voltage low-level detection (\overline{BATALM})

If Servopack built-in battery (nominal voltage 3.6V) voltage become less than 3.3V (detected range 3.0 to 3.3V), it is detected when the control power supply is turned ON and \overline{BATALM} signal is output. At this time, a 7-SEG LED blinks .

(7) Positioning complete, positioning near (\overline{COIN} (\overline{NEAR}))

\overline{COIN} (\overline{NEAR}) signal is output with the conditions according to positioning complete (near) width set by parameter and operation mode.

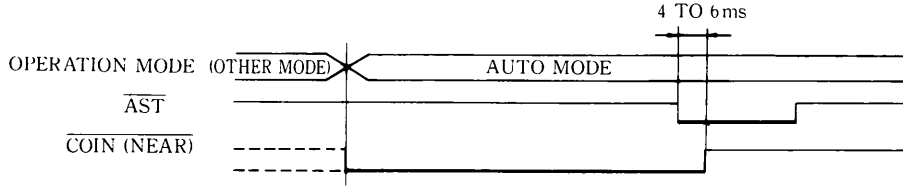
| Output Signal | Parameter (Refer to Par. 8.2.) | | | |
|-------------------|--------------------------------|---------------|---------------|----------------|
| | Name | Parameter No. | Setting Range | Unit |
| \overline{COIN} | Positioning complete width | 6 | 1 to 250 | Reference unit |
| \overline{NEAR} | Positioning near width | 45 | 0 to 3000 | |

\overline{COIN} (\overline{NEAR}) signal is always output during baseblock.

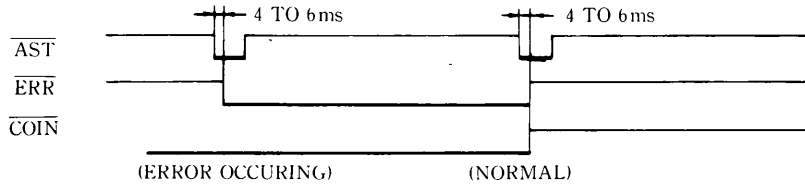
6.3.2 Signal Operation and Functions (Cont'd)

(a) Output specifications in automatic operation mode

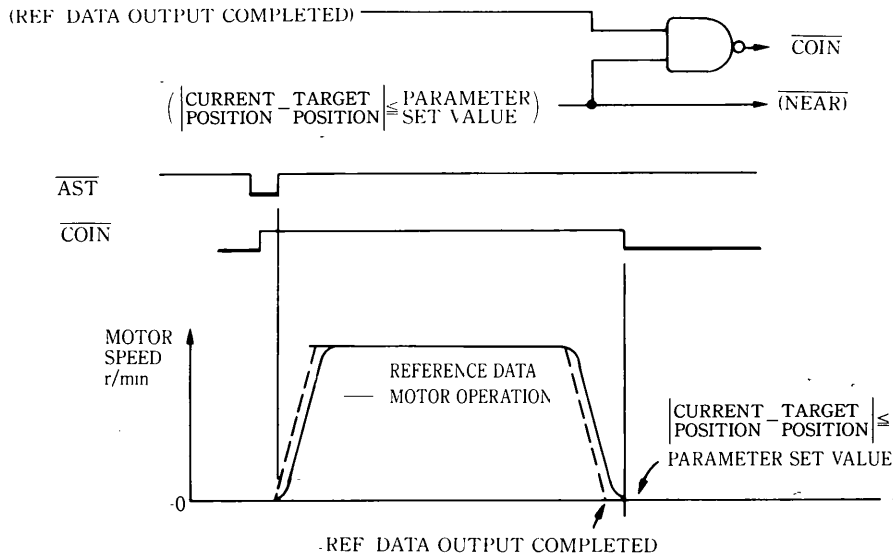
① At mode switching and relation with \overline{AST} signal



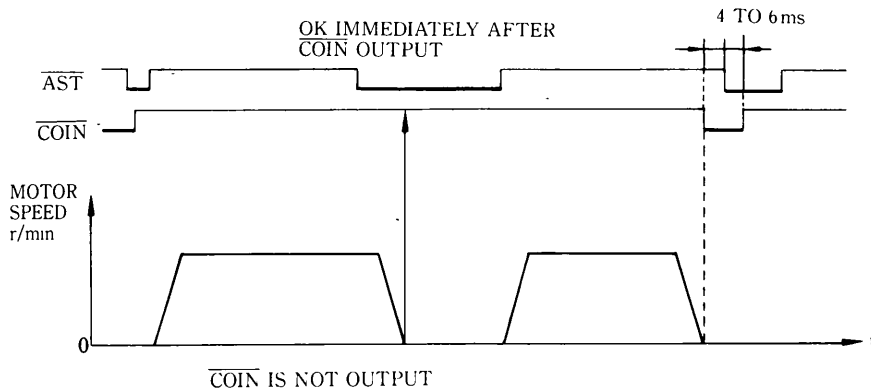
② \overline{COIN} signal becomes as shown below if and error occurs when \overline{AST} signal is turned ON.



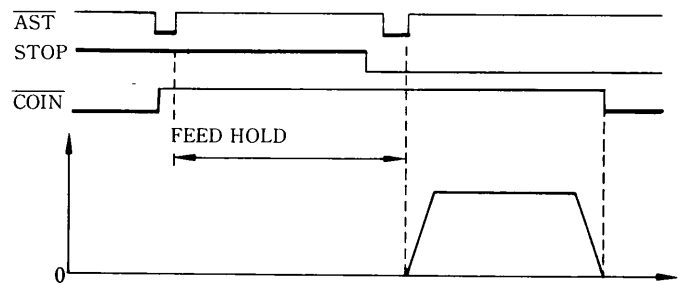
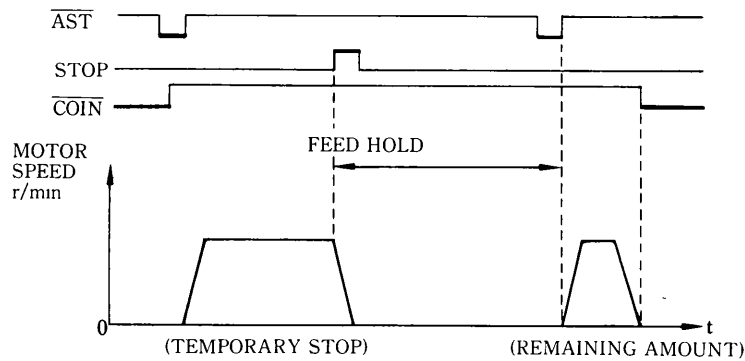
③ Conditions where \overline{COIN} (\overline{NEAR}) signal is output during automatic operation



④ When \overline{AST} signal is turned ON during automatic operation

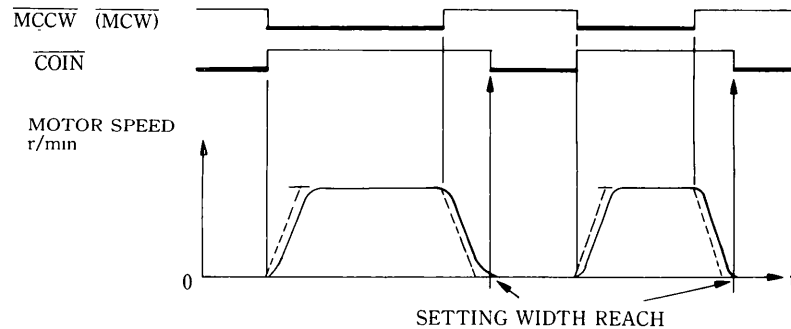


⑤ $\overline{\text{COIN}}$ signal is not output in feed hold status.



(b) Output specifications in manual operation mode

In manual operation mode, $\overline{\text{COIN}}$ is output during stop. When operation signal ($\overline{\text{MCW}}$, $\overline{\text{MCCW}}$) is turned ON, $\overline{\text{COIN}}$ becomes high.



(8) Station No. Output ($\overline{\text{P0}}$ to $\overline{\text{P4}}$)

(a) Station No. reference method (parameter 15 set value = 0)

- Positioning station No. is indicated in BCD or binary code(5 bits).
(BCD/binary setting depends on parameter 14 b4.)

- By combining H and L levels of read-out input signal ($\overline{\text{PS0}}$, $\overline{\text{PS1}}$), the code contents of $\overline{\text{P0}}$ to $\overline{\text{P4}}$ changes. Refer to Par. 6. 2. 3 (6) (c).

(b) Command table method (parameter 15 set value = 4)

- By setting parameter 20 b5 = 1 and parameter 65 b0 = 1, $\overline{\text{P0}}$ to $\overline{\text{P4}}$ become zone signals.

6.3.2 Signal Operation and Functions (Cont'd)

(9) Servopack status output signals

| SERVOPACK Status | | | | Status Output Signal | | | | | | |
|------------------|-----------|----------------------------|----------------|----------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|---|
| 7SEG. LED | Contents | | | ALM | $\overline{\text{ERR}}$ | Alarm Code | | | | |
| | | | | | | $\overline{\text{AL3}}$ | $\overline{\text{AL2}}$ | $\overline{\text{AL1}}$ | $\overline{\text{AL0}}$ | |
| Status | • | Motor current Conduction | Ref. Operation | Normal | 0 | 1 | 1 | 1 | 1 | 1 |
| | | | | Mode Error | 0 | 0 | 0 | 1 | 0 | 1 |
| | | | | Position Error | 0 | 0 | 0 | 1 | 0 | 0 |
| | | | | Speed Error | 0 | 0 | 0 | 0 | 1 | 1 |
| | - | Base-blocking | | | 0 | 1 | 1 | 1 | 1 | 1 |
| | P | P-Side Overtravel | | | 0 | 0 | 1 | 1 | 0 | 1 |
| | | P-Side Software Overtravel | | | 0 | 0 | 1 | 0 | 1 | 1 |
| | N | N-Side Overtravel | | | 0 | 0 | 1 | 1 | 0 | 0 |
| | | N-Side Software Overtravel | | | 0 | 0 | 1 | 0 | 1 | 0 |
| | d | Battery Voltage Low | | | - | - | - | - | - | - |
| Alarm | B | Abso Error | | | 1 | 1 | 0 | 1 | 1 | 1 |
| | ! | Overcurrent | | | 1 | 1 | 1 | 1 | 1 | 0 |
| | 2 | FAN stop | | | 1 | 1 | 1 | 1 | 0 | 1 |
| | 3 | Regenerative Error | | | 1 | 1 | 1 | 1 | 0 | 0 |
| | 4 | Overvoltage | | | 1 | 1 | 1 | 0 | 1 | 1 |
| | 5 | Overspeed | | | 1 | 1 | 1 | 0 | 1 | 0 |
| | 6 | Undervoltage | | | 1 | 1 | 1 | 0 | 0 | 1 |
| | 7 | Overload | | | 1 | 1 | 1 | 0 | 0 | 0 |
| | 8 | Position Error | | | 1 | 1 | 0 | 1 | 1 | 1 |
| | R | Heat Sink Overheat | | | 1 | 1 | 0 | 1 | 0 | 1 |
| | E | PG Disconnection | | | 1 | 1 | 0 | 0 | 1 | 1 |
| | F | Open Phase | | | 1 | 1 | 0 | 0 | 0 | 0 |
| | H | Hardware Error | | | 1 | 1 | 1 | 1 | 1 | 1 |
| | J | Overflow | | | 1 | 1 | 1 | 1 | 0 | 0 |
| | L | Overrun | | | 1 | 1 | 0 | 0 | 1 | 1 |
| | Y | Parameter Error | | | 1 | 1 | 0 | 0 | 0 | 1 |
| | CPU Error | | | 1 | 1 | 1 | 1 | 1 | 1 | |

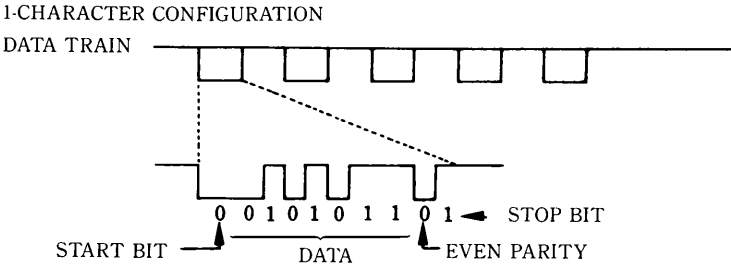
Notes:

- At battery voltage low-level detection, LED indicator \boxed{d} blinks.
- At CPU error, LED indicator is uncertain.
- Status output signal
0: Relay ON, 1: Relay OFF, -: Not defined

7 SERIAL COMMUNICATION

7.1 SPECIFICATIONS

| Items | Specifications |
|----------------------------|---|
| Standard in complying with | RS422 |
| Communication method | Asynchronous (ASYNC) |
| Baud rate | 9600, 4800, 2400, 1200, Baud, selected at initial setting (9600 Baud prior to shipping) |
| Start bit | 1 bit |
| Data | 7 bits |
| Parity | 1 bit even |
| Stop bit | 1 bit |
| Start/stop | XON/XOFF control |



7.2 CONTROL CONFIGURATION

| | 1-axis Control | Multi-axis Control |
|-----------------|--|--|
| Outline | <p>HOST CONTROLLER</p> <p>CN4</p> <p>SERVOPACK</p> <p>MOTOR (M)</p> | <p>HOST CONTROLLER</p> <p>CN4</p> <p>#1 SERVOPACK</p> <p>MOTOR (M)</p> <p>#2 SERVOPACK</p> <p>MOTOR (M)</p> <p>(UP TO 16 AXES AVAILABLE)</p> |
| Initial Setting | <ul style="list-style-type: none"> • Baud rate (not required for 9600 Baud) | <ul style="list-style-type: none"> • Address (For how to use axis address, refer to Par. 7.3.2.) • Baud rate |

Note: For initial setting method, refer to Par. 11.2.1 (1).

7.3 COMMAND TRANSMISSION (MASTER CONTROLLER → SERVOPACK)

7.3.1 Transmission Method

| | One-axis Control | Multi-axis Control |
|---------|---|--|
| Command | <div style="border: 1px solid black; padding: 2px; display: inline-block;">COMMAND CHAR- ACTER LINE</div> <div style="border: 1px solid black; padding: 2px; display: inline-block; margin-left: 20px;">CR</div> | <ul style="list-style-type: none"> • When axis is specified: <div style="border: 1px solid black; padding: 2px; display: inline-block; margin-right: 10px;">AXIS NO.</div> <div style="border: 1px solid black; padding: 2px; display: inline-block; margin-right: 10px;">COMMAND CHAR- ACTER LINE</div> <div style="border: 1px solid black; padding: 2px; display: inline-block;">CR</div> • When all axes are specified: <div style="border: 1px solid black; padding: 2px; display: inline-block; margin-right: 10px;">COMMAND CHAR- ACTER LINE</div> <div style="border: 1px solid black; padding: 2px; display: inline-block;">CR</div> <p>(Command becomes effective for all axes.)</p> |
| Example | <ul style="list-style-type: none"> • SVON <div style="border: 1px solid black; padding: 2px; display: inline-block;">CR</div> • SPD12345 <div style="border: 1px solid black; padding: 2px; display: inline-block;">CR</div> • MOV1234 <div style="border: 1px solid black; padding: 2px; display: inline-block;">CR</div> • ST <div style="border: 1px solid black; padding: 2px; display: inline-block;">CR</div> | <ul style="list-style-type: none"> • 1SVON <div style="border: 1px solid black; padding: 2px; display: inline-block;">CR</div> • 2SVON <div style="border: 1px solid black; padding: 2px; display: inline-block;">CR</div> • 1SPD123 <div style="border: 1px solid black; padding: 2px; display: inline-block;">CR</div> • 2SPD456 <div style="border: 1px solid black; padding: 2px; display: inline-block;">CR</div> • 1MOV123 <div style="border: 1px solid black; padding: 2px; display: inline-block;">CR</div> • 2MOV456 <div style="border: 1px solid black; padding: 2px; display: inline-block;">CR</div> • ST <div style="border: 1px solid black; padding: 2px; display: inline-block;">CR</div> |

7.3.2 How to Use Axis Address

(1) How to set axis address and axis designation

| Control Configuration | Axis Address Setting | | Axis Designation Method | | | | |
|--|----------------------|---------|-------------------------|--------------|---------------|---------------|---------------|
| | 10-digit | 1-digit | Not designated | Axis No. = m | Axis No. = om | Axis No. = no | Axis No. = nm |
| One-axis control | Not required | 0 | Possible | Not used | Not used | Not used | Not used |
| Multi-axis control; 2 to 9 axes group designation not provided | Not required | M | Possible | Possible | Not used | Not used | Not used |
| Multi-axis control; 2 to 9 axes group designation provided | N | M | Possible | Prohibited | Possible | Possible | Possible |
| Multi-axis control; 10 to 16 axes | N | M | Possible | Prohibited | Possible | Possible | Possible |

Note: M, N, m or n is a number from 1 to 9.

(2) Axis designation function (M, N, m or n is a number from 1 to 9.)

(a) One-axis control

| Axis Designation | Axis with Effective Command | Use of Command to Require Response | Response for Command (ERR [] , OK*) |
|------------------|-----------------------------|------------------------------------|--------------------------------------|
| Not provided | — | Possible | Provided |

* Response OK to command is given only when parameter 72 b4=1 is set.

(b) Multi-axis (2 to 9 axes) control without group designation

| Axis Designation | Axis with Effective Command | Use of Command to Require Response | Response for Command (ERR [] , OK*) |
|------------------|-----------------------------|------------------------------------|--------------------------------------|
| Not provided | All axes | Not possible | Not Provided |
| Axis No. = m | Axis with axis address m | Possible | Provided |

* Response OK to command is given only when parameter 72 b4=1 is set.

- (c) Multi-axis (2 to 9 axes) control with group designation and multi-axis control for 10 axes or more (up to 16 axes)

| Axis Designation | Axis with Effective Command | Use of Command to Require Response | Response for Command (BRR [] , OK*) |
|------------------|-----------------------------------|------------------------------------|--------------------------------------|
| Not provided | All axes | Not possible | Not provided |
| Axis No. = om | Axes with M = m (group) | Not possible | Not provided |
| Axis No. = no | Axes with N = n (group) | Not possible | Not provided |
| Axis No. = nm | Axes with N = n and M = m (group) | Possible | provided |

* Response OK to command is given only when parameter 72 b4 = 1 is set.

(3) Precautions on multi-axis control

If no axis is designated on serial command, a command is effective for all axes. Do not forget to designate axis number when one axis operation is required. (Pay attention especially to RES or ST command.)

7.4 TRANSMISSION DATA (SERVOPACK → HOST CONTROLLER)

(1) Data

DATA CHARACTER LINE CR LF

(2) Example

• ALM _ _ . RUN _ _ CR LF

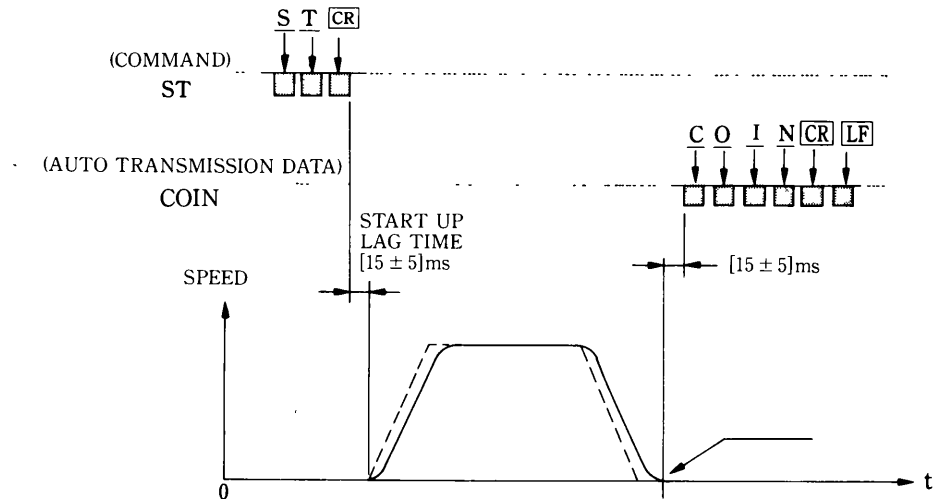
• PUN = +1 2 3 4 5 6 7 8 CR

• COIN CR LF

Monitor data

.....Automatic transmission data
(One-axis control only)

7.5 SERIAL COMMUNICATION AND TYPICAL SERVOPACK RESPONSE



7.6 SERIAL COMMUNICATION CONTROL CODE

| Control Code | Contents |
|--------------|--|
| Ctrl-S | Stops transmission. (X-OFF) |
| Ctrl-Q | Restart transmission. (X-ON) |
| Ctrl-C | Monitor data transmission from Servopack is canceled. (For restart, send monitor command to Servopack again.) |
| Ctrl-E | Switches echo-back "provided/not provided" from Servopack for command. (At initialization, echo-back is set to "not provided.") |

Example

① (INITIAL)
 ① (COMMAND) MON1
 ② (MONITOR DATA) PUN = +123
 ③ Ctrl-E
 ④ (COMMAND) MON3
 ⑤ (ECHO BACK) MON3
 ⑥ (MONITOR DATA) NFB = 0
 ⑦ Ctrl-E
 ⑧ (COMMAND) MON4
 ⑨ (MONITOR DATA) NREF = 0

Note: Echo-back functions only for one-axis control.
Echo-back is not provided for multi-axis control.

7.7 AUTOMATIC TRANSMISSION DATA FROM SERVOPACK

- Monitor data are sent automatically from Servopack only in one-axis control. (Transmission is completed at one time.)

| Transmission Conditions | | Data Display |
|---------------------------|---|---|
| At Positioning Completion | | COIN |
| At Positioning Near | | NEAR |
| At Alarm Occurrence | | ALM <u>n.</u> <u>nnnn</u> ↑ ↑ Alarm Alarm code abbreviation |
| At Parity Error | | ERR PE |
| At Command Error | Command Error (Undefined command is sent.) | ERR SN |
| | No. (pp) Error (ALMp, MONp, PRMpp, etc.) | ERR PN |
| | Data (n.....n) Error (Exceeding specified digits) | ERR OV |

- In multi-axis control, ERR SN(PN, OV) data are automatically sent only when axis designation command (1MON1, 2MON1, etc.) error occurs. (Automatic transmission is not performed.)

• Communication Error Cause

× : No error occurs

○ : Only ERR OV occurs at excessive number of digits.

| | Command | ERR PN | ERR OV | ERR SN |
|--------------|-----------------------|--------------------|--|---------------------------------------|
| Operation | SVON | × | × | $\overline{\text{RST}}$ ON, OL status |
| | SVOFF | × | × | |
| | ARES | × | × | |
| | ZEROSSET (±) nnnnnnnn | × | ○ | |
| | RES | × | × | |
| Move command | POS (±) nnnnnnnn | × | software overtravel exceeded | * |
| | POSI (±) nnnnnnnn | × | software overtravel exceeded | * |
| | JOG (±) nnnnnn | × | speed limit exceeded | * |
| | MOV (±) nnnnnnnn | × | ○ | |
| | MOVI (±) nnnnnnnn | × | ○ | |
| | SPD nnnnnn | × | speed limit exceeded | |
| | ST | × | × | * |
| | JOGP | × | speed limit exceeded | * |
| | JOJN | × | speed limit exceeded | * |
| | ZRN | × | speed limit exceeded | * |
| | PCON | × | × | |
| | PCOFF | × | × | |
| | SKIP | × | × | |
| | HOLD | × | × | |
| | PON | × | × | Motor not under current conduction |
| | POFF | × | × | Not in pulse mode |
| | SET (±) nnnnnnnn | × | ○ | |
| Parameter | PRM | × | × | |
| | PRMpp | Other than 0 to 99 | × | |
| | PRMpp= (±) nnnnnnnn | Other than 0 to 99 | Exceeding number of bytes determined per parameter No. | |
| Monitor | MU=n | × | Other than 1 or 2 | |
| | MONp | Other than 1 to 6 | × | |
| | INp | Other than 1 to 8 | × | |
| | OUTp | Other than 1 to 3 | × | |
| | ALM (p) | Other than 0 to 9 | × | |

* Refer to the next page.

Cause of ERR SN marked with *

| Move Command \ Cause | Motor is not under current conduction | Currently moving | Command exceeds software overtravel | OT condition in the commanded direction | STOP signal is turned OFF (STOP is active). | Speed limit is exceeded. |
|----------------------|---------------------------------------|------------------|-------------------------------------|---|---|--------------------------|
| POS | ○ | ○ | × | ○ | × | ○ |
| POSI | ○ | ○ | × | ○ | × | ○ |
| JOG | ○ | ○ | ○ | ○ | × | × |
| ST | ○ | ○ | ○ | ○ | ○ | ○ |
| JOGP | ○ | ○ | ○ | ○ | × | × |
| JOGN | ○ | ○ | ○ | ○ | × | × |
| ZRN * | ○ | ○ | ○ | ○ | ○ | × |

○ : An error occurs.

× : An error does not occur.

* ERR SN is displayed when ZRN is commanded and STOP signal is activated in the zero-point return (homing) mode II (PRM49=1).

7.8 SERIAL COMMAND

7.8.1 Serial Command List

| | Command | Contents |
|---------------------|--|--|
| Operation | SVON | Performs current conduction to motor |
| | SVOFF | Stops current conduction to motor |
| | ARES | Resets alarm |
| | ZEROSSET (±) nnnnnnnn | Re-writes machine zero-point so that current position will be (±) nnnnnnnn |
| | RES | Performs the same operation as control power supply OFF/ON |
| Moving Command | POS (±) nnnnnnnn | Performs positioning at linear accel/decel speed in (±) nnnnnnnn (Absolute value) |
| | POSI (±) nnnnnnnn | Performs positioning at linear accel/decel speed in (±) nnnnnnnn (Incremental value) |
| | JOG (±) nnnnnn | Performs constant speed operation at (±) nnnnnnn speed |
| | MOV (±) nnnnnnnn | Sets position reference (Absolute value) |
| | MOVI (±) nnnnnnnn | Sets position reference (Incremental value) |
| | SPD nnnnnn | Sets speed reference. |
| | ST | Starts automatic operation |
| | JOGP | Starts manual operation plus direction |
| | JOGN | Starts manual operation minus direction |
| | ZRN | Starts zero-point return (homing) |
| | PCON | Performs P (proportional) operation in speed loop |
| | PCOFF | Releases P operation of speed loop. |
| | SKIP | Decelerates and stops |
| | HOLD | Feed hold (remaining amount is held.) |
| | PON | Enters pulse operation mode. |
| | POFF | Clears pulse operation mode |
| | Parameter | SET (±) nnnnnnnn |
| PRM | | Sends all parameters (Unused parameters are not sent) |
| PRMpp | | Sends parameters with pp (parameter number). |
| Monitor | PRMpp= (±) nnnnnnnn | Re-writes parameters with pp (parameter number) to (±) nnnnnnnn. |
| | MU=n | Selects monitor signal n=1: torque reference, n=2: speed reference |
| | MONp | Sends monitor data. |
| | INp | Sends input signal status. |
| | OUTp | Sends output signal status |
| Command Table Setup | ALM (p) | Sends alarm code. p not provided: current alarm, p = 1 to 9: alarm which occurred p times before |
| | PT/VT/BT | Sends all command table positions/speeds/boundary positions. |
| | PTpp/VTpp/BTpp | Sends position/speed/boundary position number pp |
| | PTpp= (±) nnnnnnnn VTpp= (±) nnnnnnnn BTpp= (±) nnnnnnnn | Re-writes position /speed/boundary position number pp. |

7.8.2 Command Functions

(1) Parameter operation commands

Monitor or re-write parameter contents.

(Since parameters are stored in E²PROM, the contents are not erased even if the control power supply is turned OFF.)

For details, refer to Par. 8.1 "PARAMETER LIST".

| Command | Function/Contents |
|---|--|
| PRM | <p>All parameters are sent from Sevopack by this command. (Unused parameters are not sent.) Used for parameter contents check.</p> <p>(Example)</p> <pre> COMMAND [] → [PRM1 = ××……× PRM2 = ××……× PRM49= ××……× ] (Sent from Sevopack.) </pre> |
| PRMpp (pp: parameter number) | <p>Contents of parameters with pp are sent from Sevopack. Used for specified parameter contents check.</p> <p>(Example)</p> <pre> COMMAND [PRM30] → PRM30 = ××……× (Sent from Sevopack.) </pre> |
| $\text{PRMpp} = \pm \underbrace{\text{n}\cdots\text{n}}_{\substack{\text{within} \\ \text{8 digits}}} \\ \left. \begin{array}{l} \text{pp: parameter} \\ \text{number,} \\ \text{n: 0 to 9} \end{array} \right\}$ | <p>Re-writes parameter with parameter No. pp to ($\pm\text{n}\cdots\text{n}$). You can omit the +.</p> <p>For off-line parameters (refer to the note below), execute command [RES] after this command.</p> <p>Unless [RES] command is executed, the parameter contents will not be re-written.</p> <p>(Example)</p> <pre> COMMAND [] • [PRM10 = 123 PRM12 = -456 PRM20 = 789 [RES] ← For off-line parameters, execute [RES] command without fail. </pre> |

(Cont'd)

(Cont'd)

| Command | Function/Contents |
|--|---|
| TRMpp = ± n...n <div style="margin-left: 100px;">} within 8 digits</div> (pp : Parameter No.) n : 0 to 9 | <p>For applications where the online parameter (refer to the note below) is re-written frequently during operation, use this command instead of PRMpp = ± n.....n .</p> <p>Functions are the same. (Number of write-in times is limited on E² PROM physical characteristic).</p> <p>Contents set by this command are returned to the contents set by PRMpp = ± n.....n command at the beginning by turning ON/OFF the control power supply or executing RES command.</p> |

Note: Examples of Parameter Contents Renewal Command

| Online Parameter* ¹ | Offline Parameter* ² | |
|--------------------------------------|--|---|
| PRM1 = 50 PRM2 = 100 PRM5 = 30 | PRM17 = 11111 PRM18 = 10100 PRM19 = 11111 RES | <p>*1 Online parameter: Parameter is renewed only by parameter write-in command.</p> <p>*2 Offline parameter: Parameter is renewed after RES command is sent after command.</p> |

(2) Basic operation command

| Command | Function/Contents | | | | | | |
|---|---|------|-------|---|---|---------------------------|---------------------------|
| RES | Provides initial reset ; the same conditions as when control power supply is switched from OFF to ON, or to the Servopack control section. | | | | | | |
| ARES | When Servopack detects an alarm, the alarm is reset by this command. The same operation as alarm reset signal RST. | | | | | | |
| ZEROSSET ± n...n 8 digits (+ can be omitted.) | <p>[± n.....n] is a position with reference of machine zero point (home position). (Unit: reference unit)</p> <ul style="list-style-type: none"> • ZEROSSET ± n.....n • RES <p>By execution of the above commands, current position is set to [± n...n] .</p> <p>Note: Current position is a value indicated by monitor data <PUN = ± × × × > (refer to (4) "Monitor Command").</p> | | | | | | |
| SVON SVOFF | <p>Servopack main circuit power drive circuit operates by SVON command and the motor becomes in current conduction.</p> <p>The current conduction to motor is released by SVOFF command.</p> <p>(These two commands perform the same operation as SERVO ON signal SVON.</p> <div style="text-align: center; margin-top: 10px;"> <table style="margin: auto; border-collapse: collapse;"> <tr> <td style="border: 1px solid black; padding: 5px; margin: 0 20px;">SVON</td> <td style="border: 1px solid black; padding: 5px; margin: 0 20px;">SVOFF</td> </tr> <tr> <td style="text-align: center;">▼</td> <td style="text-align: center;">▼</td> </tr> <tr> <td style="text-align: center;">NON CURRENT CONDUCTION</td> <td style="text-align: center;">NON CURRENT CONDUCTION</td> </tr> </table> <p>MOTOR STATUS CONDUCTION CURRENT CONDUCTION CONDUCTION</p> </div> | SVON | SVOFF | ▼ | ▼ | NON CURRENT CONDUCTION | NON CURRENT CONDUCTION |
| SVON | SVOFF | | | | | | |
| ▼ | ▼ | | | | | | |
| NON CURRENT CONDUCTION | NON CURRENT CONDUCTION | | | | | | |

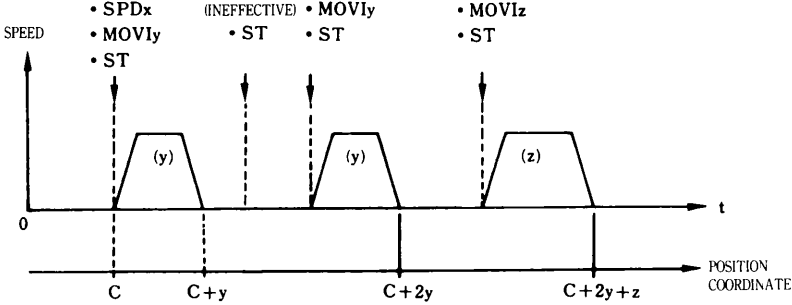
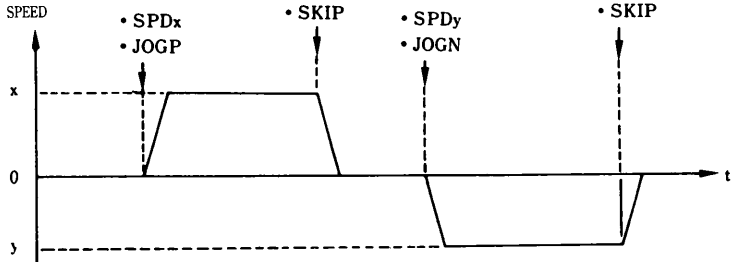
7.8.2 Command Functions (Cont'd)

(3) Move command

| Command | Function/Contents | | | | | | | | | | |
|---|--|-------------------------|--|-------------------------|-----|-----------|-------|---|----------------|---|-------------------|
| SPD $n\cdots n$ Max. 6-digit | <p>Setting command for speed reference. ($nn\cdots n$) unit is [$\times 1000$ reference unit/min]. Speed reference value is the set value of parameter 4 when the power supply is turned ON or RES command is executed.</p> <div style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <p style="text-align: center;">Example</p> <p>Reference unit = 0.01mm: When 15m/min; $\frac{15000\text{mm}/\text{min}}{0.01\text{mm}} = 1500000$ reference units/min. $= 1500$ [$\times 1000$ reference units/min]</p> <p>\therefore SPD 1500</p> </div> | | | | | | | | | | |
| MOV $\pm n\cdots n$ Max. 8-digit (+ can be omitted) | <p>Setting command for position reference. ($\pm n\cdots n$) unit is [reference unit].</p> <p>($+ n\cdots n$) : Motor FWD run, ($- n\cdots n$) : Motor REV run Position reference value becomes 0 when the power supply is turned ON and RES command is executed. Operation differs depending on parameter 14 b3 [position reference mode] setting.</p> <table border="1" style="margin: 10px auto;"> <thead> <tr> <th colspan="2">Parameter</th> <th rowspan="2">Position Reference Mode</th> </tr> <tr> <th>No.</th> <th>Set Value</th> </tr> </thead> <tbody> <tr> <td rowspan="2">14 b3</td> <td>0</td> <td>Absolute value</td> </tr> <tr> <td>1</td> <td>Incremental value</td> </tr> </tbody> </table> <div style="display: flex; justify-content: space-around;"> <div style="width: 45%;"> <p style="text-align: center;">Absolute Mode</p> <p style="text-align: center;">(Data are in absolute value.)</p> </div> <div style="width: 45%;"> <p style="text-align: center;">Incremental Mode</p> <p style="text-align: center;">(Data are in incremental value.)</p> </div> </div> <p style="text-align: center;">POSITION COORDINATE</p> | Parameter | | Position Reference Mode | No. | Set Value | 14 b3 | 0 | Absolute value | 1 | Incremental value |
| Parameter | | Position Reference Mode | | | | | | | | | |
| No. | Set Value | | | | | | | | | | |
| 14 b3 | 0 | Absolute value | | | | | | | | | |
| | 1 | Incremental value | | | | | | | | | |

(Cont'd)

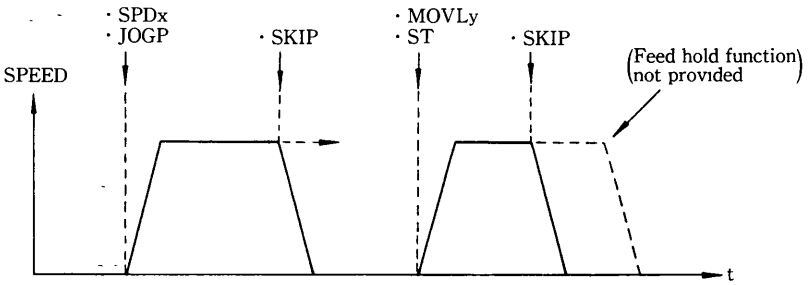
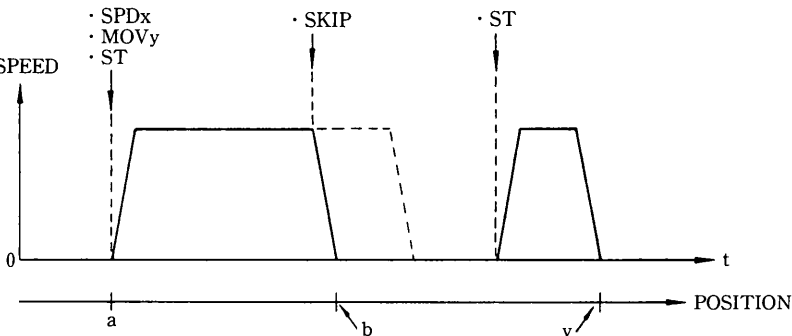
(Cont'd)

| Command | Function/Contents |
|---|---|
| <p>MOVI ± n.....n Max. 8-digit (+ can be omitted)</p> | <p>Position reference setting command which is effective when position reference mode is absolute mode (14 b3 = 0). Data are in <u>incremental value</u>.</p>  <p>Note: Do not use this command for incremental mode (parameter 14 b3 = 1). Does not operate normally.</p> |
| <p>ST</p> | <p>Command to start automatic operation after speed or position data setting command. ST command is disregarded during positioning.</p> <p>(Example)</p> <p>① <input type="text" value="SPD n...n"/> Speed data setting <input type="text" value="MOV ± n...n"/> Position data setting <input type="text" value="ST"/> Automatic operation start</p> <p>② <input type="text" value="MOV ± n...n"/> } Operates at speed which was <input type="text" value="ST"/> } set before.</p> <p>③ <input type="text" value="RES"/> } In this case, returns to zero point (home <input type="text" value="ST"/> } position) at speed set in parameter 4.</p> <p>Notes:</p> <ol style="list-style-type: none"> When <input type="text" value="ST"/> command is sent for special axis operation check after parameter change for special axis <u>in case of multi-axis configuration, be sure to designate the axis.</u> If <input type="text" value="ST"/> command is sent without axis designation after <input type="text" value="RES"/> command is sent to all axes or the control power supply is turned OFF and then ON, all axes will operate as described in (Example) ③. If STOP signal input (CN2-15) remains open, <input type="text" value="ERR SN"/> (command error) occurs even if <input type="text" value="ST"/> command is sent at move command execution. When STOP signal is not used, set parameter 19 b1=1. |
| <p>JOGP JOGN</p> | <p>Manual jog operation start command. The speed is set by command <input type="text" value="SPD"/> : <input type="text" value="JOGP"/> : Motor FWD run , <input type="text" value="JOGN"/> : Motor REV run. <input type="text" value="SKIP"/> command is used for stop.</p>  |

(Cont'd)

7.8.2 Command Functions (Cont'd)

(Cont'd)

| Command | Function/Contents |
|---------|--|
| SKIP | <p>Command to stop operation after deceleration set by a parameter.</p> <p>(Example 1)</p>  <p>(Example 2)</p> <p>When <input type="text" value="SKIP"/> command is input during positioning by <input type="text" value="MOV"/> command in absolute mode, the remaining positioning is executed only by <input type="text" value="ST"/> command after stopping.</p>  |

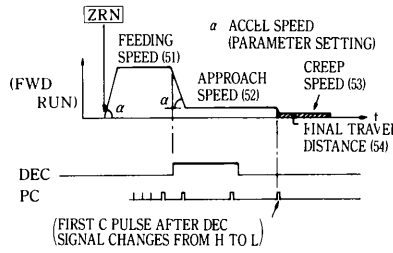
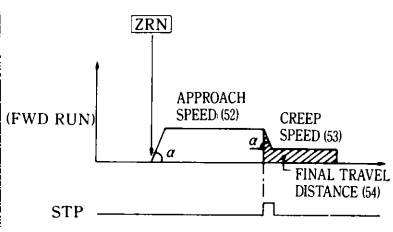
(Cont'd)

(Cont'd)

| Command | Function/Contents |
|---------|-------------------|
|---------|-------------------|

ZRN

Command to start zero-point return (homing) operation as shown below:

| | Zero-point Return Method | Operation Pattern |
|-----------------------------|--|--|
| Mode I (Parameter 49=0) | 3-step deceleration method using DEC signal (decel LS), C ϕ pulse signal (in Servopack) | (PARAMETER 50 = 0)  <p>The diagram for Mode I shows a speed profile starting with a ZRN signal. The speed increases to a Feeding Speed (G1) with deceleration α, then to an Approach Speed (G2) with deceleration α, and finally to a Creep Speed (G3). The final travel distance is G4. Signals shown include DEC (deceleration signal) and PC (Cϕ pulse signal), with a note that the first C pulse after DEC changes from H to L.</p> |
| Mode II (Parameter 49=1) | 2-step deceleration method using STP signal (decel LS) | (PARAMETER 50 = 0)  <p>The diagram for Mode II shows a speed profile starting with a ZRN signal. The speed increases to an Approach Speed (G2) with deceleration α, and then to a Creep Speed (G3). The final travel distance is G4. The STP signal is shown as a pulse at the end of the approach phase.</p> |

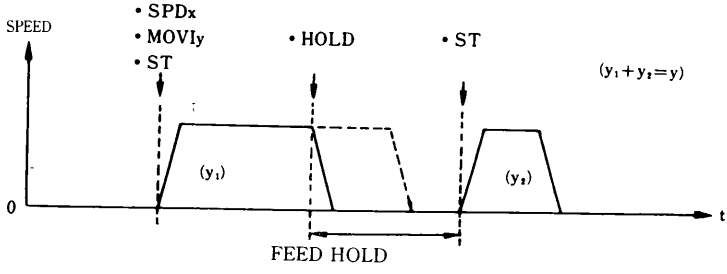
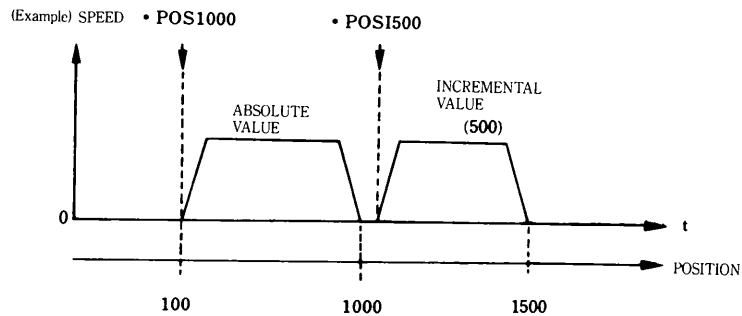
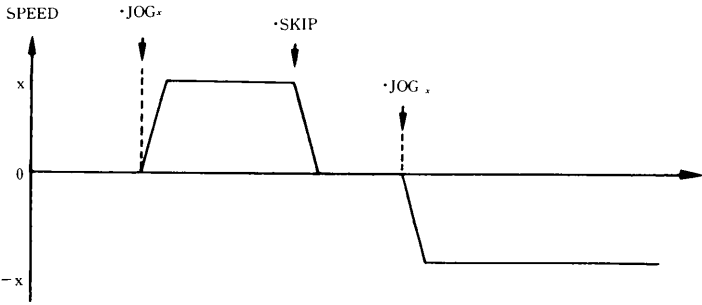
Note 1: Related parameters

Parameters shown below are effective when parameter 18 b4 = 1.
Does not operate when b4 = 0.

| Parameter No. | Name | Unit |
|---------------|--|--------------------------------------|
| 50 | Zero-point return direction | 0: FWD direction 1: REV direction |
| 51 | Zero-point return feeding speed | 0 to 240000 |
| 52 | Zero-point return approach speed | 0 to 240000 |
| 53 | Zero-point return creep speed | 0 to 240000 |
| 54 | Zero-point return final traveling distance | FWD:0 to +99999999 |
| | | REV:0 to -99999999 |
| | | Reference unit |

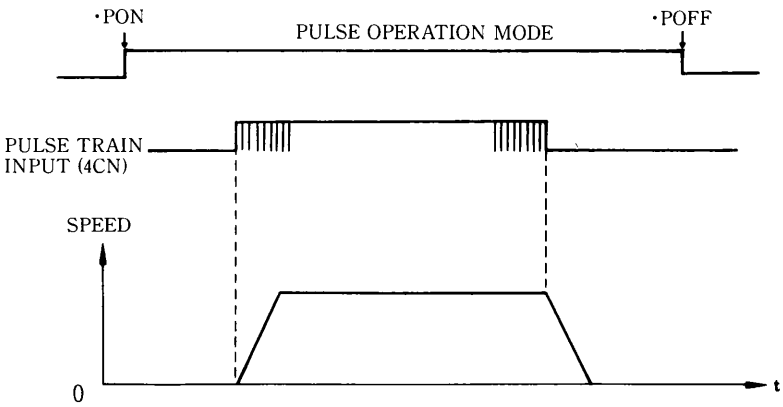
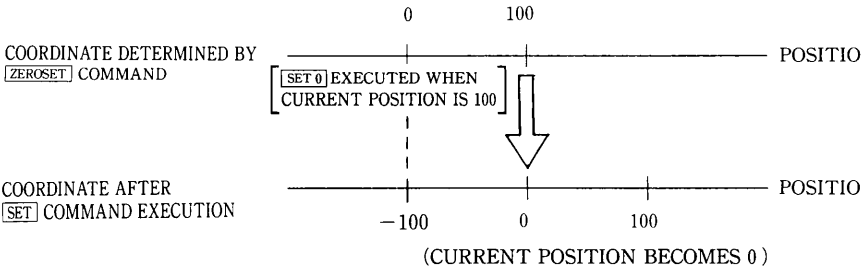
(Cont'd)

(3) Move command (Cont'd)

| Command | Function/Contents |
|--|---|
| <p>HOLD</p> | <p>(1) When this command is sent during positioning by [ST] command, operation stops at a specified deceleration speed. However, the remaining amount is held. (Feed hold function)</p>  <p>(2) When [HOLD] command is sent during manual operation ([JOGP], [JOGN], [JOG ±n.....n] command) or during operation by [POS], [POSI] command, the same operation is performed as [SKIP] command.</p> |
| <p>POS (±) n...n Max. 8-digit</p> <p>POSI (±) n...n Max. 8-digit</p> | <p>Command to perform positioning by linear accel/decel. Data (±) n...n moves to position [(±) n...n] in absolute value for POS; moves by distance [(±) n...n] in incremental value for POS1. [Speed is a set value of parameter (4).]</p>  <p>(Example) SPEED • POS1000 • POSI500</p> |
| <p>JOG (±) n...n Max. 6-digit</p> | <p>Command to perform manual jog operation at speed [(±) n...n]</p>  |

(Cont'd)

(Cont'd)

| Command | Function/Contents |
|--------------------------------|--|
| PON POFF | <p>Command to turn ON/OFF pulse operation mode (positioning operation by external pulse train command). [PON] enters pulse operation mode and [POFF] releases it.</p>  |
| PCON PCOFF | <p>Command to change Servopack speed loop control mode from PI (proportion - integer) operation to P (proportion) operation. [PCON] enters P operation and [PCOFF] returns to PI operation.</p> |
| SET (±) n····n Max. 8-digit | <p>Command to re-write the current position to [(±) n····n]. After execution of this command, a new coordinate becomes effective.</p> <p>(Example)</p>  <p>Note: Coordinate which has been changed by [SET] command is returned to the former by [RES] command or turning ON/OFF the control power supply.</p> |

(Cont'd)

(3) Move command (Cont'd)

| Command | Function/Contents |
|--|---|
| PT | <p>All position tables are sent from the Servopack by this command. (Example)</p> <p>Command PT → $\left\{ \begin{array}{l} \text{PT01} = \pm n \dots n \\ \text{PT02} = \pm n \dots n \\ \dots \dots \dots \\ \text{PT64} = \pm n \dots n \end{array} \right.$</p> <p style="text-align: right;">(Sent from Servopack)</p> |
| PTpp (pp: Position No. pp=1 to 64) | <p>Position No. pp reference position is sent from the Servopack. (Example)</p> <p>Command PT25 → PT25 = +00050000</p> <p style="text-align: right;">(Sent from Servopack)</p> |
| <p>PTpp = $\pm n \dots n$ (Max. 8 digits)</p> <p>$\left\{ \begin{array}{l} \text{pp} : \text{Position No.} \\ \pm n \dots : \text{Reference} \\ \text{position} \\ \text{pp} = 1 \text{ to } 64 \end{array} \right.$</p> | <p>A command to change position No. pp reference position to ($\pm n \dots n$). + can be omitted. Becomes effective by execution of RES command or ON/OFF of control power supply. (Example)</p> <p>Command \bullet PT25=50050 \bullet RES</p> <p>\bullet Reference position ($\pm n \dots n$) unit is [reference unit]. Note: Data cannot be changed frequently because of characteristics of E²PROM.</p> |
| VT | <p>All speed tables are sent from Servopack by this command. (Example)</p> <p>Command VT → $\left\{ \begin{array}{l} \text{VT01} = n \dots n \\ \text{VT02} = n \dots n \\ \dots \dots \dots \\ \text{VT64} = n \dots n \end{array} \right.$</p> <p style="text-align: right;">(Sent from Servopack)</p> |
| VTpp (pp: Speed No. pp=1 to 64) | <p>Speed No. pp reference speed is sent from the Servopack. (Example)</p> <p>Command VT25 → VT25 = 001200</p> <p style="text-align: right;">(Sent from Servopack)</p> |
| <p>VTpp = n...n (Max. 6 digits)</p> <p>$\left\{ \begin{array}{l} \text{pp} : \text{Speed No.} \\ n \dots : \text{Reference} \\ \text{speed} \\ \text{pp} = 1 \text{ to } 64 \end{array} \right.$</p> | <p>A command to change speed No. pp reference speed to (n...n). Becomes effective by execution of RES command or ON/OFF of control power supply. (Example)</p> <p>Command \bullet VT25=1250 \bullet RES</p> <p>\bullet Reference speed (n...n) unit is [$\times 1000$ reference unit/minute].</p> <div style="border: 1px solid black; padding: 10px; margin: 10px 0;"> <p style="text-align: center;">Example</p> <p>When reference unit = 0.01mm and at 15m/min;</p> $\frac{15000\text{mm/min.}}{0.01\text{mm}} = 1500000 \text{ reference unit/min.}$ $= 1500 [\times 1000 \text{ reference unit/min.}]$ <p>Therefore, VT25 = 1500 is obtained.</p> </div> <p>Note: Data cannot be changed frequently because of characteristics of E²PROM.</p> |

(Cont'd)

(Cont' d)

| Command | Function/Contents |
|---|---|
| BT | All boundary tables for zone signals are sent from the Servopack by this command. (Example) Command BT $\left\{ \begin{array}{l} BT01 = \pm n \dots n \\ BT02 = \pm n \dots n \\ \dots \dots \dots \\ BT31 = \pm n \dots n \end{array} \right.$ (Sent from Servopack) |
| BTpp (pp: Boundary No. pp=1 to 31) | Boundary No. pp boundary position is sent from the Servopack. (Example) Command BT25 \rightarrow BT25 = +00050000 (Sent from Servopack) |
| BTpp = $\pm n \dots n$ (Max. 8 digits) $\left. \begin{array}{l} pp : \text{Boundary No.} \\ \pm n \dots : \text{Boundary} \\ \text{position} \\ pp = 1 \text{ to } 31 \end{array} \right\}$ | A command to change boundary No. pp boundary position to ($\pm n \dots n$). + can be omitted. Becomes effective by execution of RES command or ON/OFF of control power supply. (Example) Command <ul style="list-style-type: none">• BT25=50050• RES <ul style="list-style-type: none">• Boundary position unit is [reference unit] .• For boundary position, write in the data so as to be $BT01 \leq BT02 \leq BT03 \leq \dots \leq BT31$ <div style="border: 1px solid black; padding: 10px; margin: 10px 0;"><p style="text-align: center;">Example</p><p style="text-align: center;">When only BT01 to BT10 are used, set as follows:</p><p style="text-align: center;">BT11 = + 99999999</p><p style="text-align: center;">⋮</p><p style="text-align: center;">BT31 = + 99999999</p></div> <p>Note: Data cannot be changed frequently because of characteristics of E²PROM.</p> |

(4) Monitor commands

By executing monitor commands, monitor data are sent continuously and repeatedly from the Servopack* (excluding ALM and ALMp commands). Data are indicated by CHARACTER STRING CR without LF. By sending some characters to the Servopack, monitor data transmission is stopped after sending LF.

* When parameter 72 b5 = 1 is set, data are sent from the Servopack only one time.

(a) MON commands

| Command | Data Sent from SERVOPACK | | (Unit) Others | | | | | | | | | | | | | | | | | | | | | | | |
|---|-----------------------------|--|--------------------------------|--|--|--------|---------|------|--------------|--------|---|-----------------|-----|---|------|----------------------|-------------------------|---|----------|---|------|------------------------|---------------------------|---|----------|---|
| | Name | Display | | | | | | | | | | | | | | | | | | | | | | | | |
| MON1 | Current Position | PUN = ± n...n 8 digits | (Reference unit) | | | | | | | | | | | | | | | | | | | | | | | |
| MON2 | Position following error | PER = ± n...n 8 digits | ×4 multiplier of encoder pulse | | | | | | | | | | | | | | | | | | | | | | | |
| MON3 | Current speed (motor speed) | NFB = ± n...n 5 digits | (r/min) | | | | | | | | | | | | | | | | | | | | | | | |
| MON4 | Reference speed | NREF = ± n...n 6 digits | (×1000) reference unit/min | | | | | | | | | | | | | | | | | | | | | | | |
| MON5 | Torque reference | TREF = ± n n n 3 digits | (%) | | | | | | | | | | | | | | | | | | | | | | | |
| MON6 | SERVOPACK status | STS = $\begin{matrix} n & n & n \\ \swarrow & \uparrow & \searrow \\ (PRDY) & (SLIM) & (TLIM) \end{matrix}$ | | | | | | | | | | | | | | | | | | | | | | | | |
| <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th colspan="2"></th> <th>Status</th> <th>n Value</th> </tr> </thead> <tbody> <tr> <td rowspan="2">PRDY</td> <td>Main circuit</td> <td>Normal</td> <td>1</td> </tr> <tr> <td>DC power supply</td> <td>Low</td> <td>0</td> </tr> <tr> <td rowspan="2">SLIM</td> <td rowspan="2">Speed limit function</td> <td>Speed limiting (active)</td> <td>1</td> </tr> <tr> <td>Inactive</td> <td>0</td> </tr> <tr> <td rowspan="2">TLIM</td> <td rowspan="2">Current limit function</td> <td>Current limiting (active)</td> <td>1</td> </tr> <tr> <td>Inactive</td> <td>0</td> </tr> </tbody> </table> | | | | | | Status | n Value | PRDY | Main circuit | Normal | 1 | DC power supply | Low | 0 | SLIM | Speed limit function | Speed limiting (active) | 1 | Inactive | 0 | TLIM | Current limit function | Current limiting (active) | 1 | Inactive | 0 |
| | | Status | n Value | | | | | | | | | | | | | | | | | | | | | | | |
| PRDY | Main circuit | Normal | 1 | | | | | | | | | | | | | | | | | | | | | | | |
| | DC power supply | Low | 0 | | | | | | | | | | | | | | | | | | | | | | | |
| SLIM | Speed limit function | Speed limiting (active) | 1 | | | | | | | | | | | | | | | | | | | | | | | |
| | | Inactive | 0 | | | | | | | | | | | | | | | | | | | | | | | |
| TLIM | Current limit function | Current limiting (active) | 1 | | | | | | | | | | | | | | | | | | | | | | | |
| | | Inactive | 0 | | | | | | | | | | | | | | | | | | | | | | | |

(b) Input signal status

| Command | Data Sent from SERVOPACK | | Remarks | |
|---------|--------------------------|---|------------------------------------|----------------------|
| | Contents | Display | | |
| IN1 | Connector CN2 input | INp = n ₇ n ₆ n ₅ n ₄ n ₃ n ₂ n ₁ n ₀ (p corresponds to command number.) n ₀ to n ₇ is " 0 " or " 1 " | Refer to the Note described below: | |
| IN2 | Connector CN5 input | | | |
| IN3 | | | | |
| IN4 | | | | |
| IN5 | | | | |
| IN6 | Input pulse signal | | | |
| IN7 | DG-SW setting | Position reference | DS1 = ±nnnnnnnn | Data are in decimal. |
| IN8 | | Speed reference | DS2 = ±nnnnnnnn | |

Note: $INp = n_7 n_6 n_5 n_4 n_3 n_2 n_1 n_0$

Monitor data indicate input signal status.

- Contact <closed: 0, open: 1>
- Pulse <H level: 1, L level: 0>

The following table shows each data digit and corresponding connector pin number and signal name.

| | | n ₇ | n ₆ | n ₅ | n ₄ | n ₃ | n ₂ | n ₁ | n ₀ |
|-----|-------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
| IN1 | CN2 PIN NO. | 1 | 15 | 16 | 17 | 18 | 8 | 9 | 10 |
| | | STP | STOP | AST | DEC | PCON | SVON | N-OT | P-OT |
| IN2 | CN5 PIN NO. | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 |
| | | RST | DRI | DRO | MCCW | MCW | MAN | ZRN | CUR |
| IN3 | | 29 | 28 | 27 | 26 | 25 | 24 | 17 | 16 |
| IN4 | | 44 | 43 | 42 | 41 | 40 | 32 | 31 | 30 |
| IN5 | | | | | 49 | 48 | 47 | 46 | 45 |
| IN6 | INPUT PULSE | | | | | LPG | PULS | SP3RD | SP2ND |
| | | | | | | PG PULSE | | REF. PULSE | |
| | | | | | PA | PB | PC | CA | CB |

(4) Monitor commands (Cont'd)

(c) Output signal status

| Command | Data Sent from SERVOPACK | | Remarks |
|---------|--------------------------|--|--------------------------|
| | Contents | Display | |
| OUT1 | Connector CN2 output | OUT1 = n ₁ n ₀ | Refer to the Note below: |
| OUT2 | Connector CN5 output | OUT2 = n ₇ n ₆ n ₅ n ₄ n ₃ n ₂ n ₁ n ₀ | |
| OUT3 | | OUT3 = n ₇ n ₆ n ₅ n ₄ n ₃ n ₂ n ₁ n ₀ | |

Note: $OUT_p = n_7 n_6 n_5 n_4 n_3 n_2 n_1 n_0$

Monitor data indicate output signal status.

0 when output relay is ON, 1 when OFF.

The following table shows each data digit and corresponding connector pin number and signal name.

| | | n ₇ | n ₆ | n ₅ | n ₄ | n ₃ | n ₂ | n ₁ | n ₀ |
|------|-------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
| OUT1 | CN2 PIN NO. | | | | | | | 12 | 11 |
| | | | | | | | | BK | ALM |
| OUT2 | CN5 PIN NO. | 21 | 20 | 19 | 7 | 6 | 5 | 4 | 3 |
| | | AL2 | AL1 | AL0 | ERR | POS2 | POS1 | MAN-LT | AUT-LT |
| OUT3 | | 39 | 38 | 37 | 36 | 35 | 34 | 23 | 22 |
| | | | | DS04 | DS03 | DS02 | DS01 | DS00 | AL3 |

(4) Monitor commands (Cont'd)

(e) Servopack Status and automatic transmission data

| SERVOPACK Status | | | Automatic Transmission Data | | Note | |
|------------------|------------------|---|-----------------------------|--------------|--------|---|
| 7SEG. LED | Contents | | Alarm | Error | | |
| Status | . | Motor Current Conduc- tion Ref. Operation | Normal | — | — | |
| | | | Command | — | ERR SN | |
| | | | No. Error | — | ERR PN | |
| | | | Data Error | — | ERR OV | 1 |
| | - | Baseblocking | | — | — | |
| | P | P-Side Overtravel | | ALM P. P-OT | — | |
| | | P-Side Software Overtravel | | ALM P. P-LS | — | 1 |
| | N | N-Side Overtravel | | ALM N. N-OT | — | |
| | | N-Side Software Overtravel | | ALM N. N-LS | — | 1 |
| | d | Battery Voltage Low | | ALM D. BAT | — | 2 |
| Alarm | 0 | Abso Error | | ALM 0. ABS | — | |
| | 1 | Overcurrent | | ALM 1. OC | — | |
| | 2 | FAN stop | | ALM 2. FAN | — | |
| | 3 | Regenerative Error | | ALM 3. RG | — | |
| | 4 | Overvoltage | | ALM 4. OV | — | |
| | 5 | Overspeed | | ALM 5. OS | — | |
| | 6 | Undervoltage | | ALM 6. UV | — | |
| | 7 | Overload | | ALM 7. OL | — | |
| | 8 | Position Error | | ALM 8. POS | — | |
| | A | Heat Sink Overheat | | ALM A. OH | — | |
| | C | PG Disconnection | | ALM C. PG | — | |
| | F | Open Phase | | ALM F. O-PH | — | |
| | H | Hardware Error | | ALM H. HARD | — | |
| | J | Overflow | | ALM J. OF | — | |
| | L | Overrun | | ALM L. RWY | — | |
| | Y | Parameter Error | | ALM Y. PRMpp | — | 3 |
| | (Un- defined) | CPU Error | | | — | 4 |

Notes:

- When a position reference which is out of P or N side software overtravel range is input, a data fault error (ERR OV) occurs.
When the current position is out of P or N side software overtravel range, (ALM P.P-LS or ALM N.N-LS) occurs.
- Battery voltage low-level detection LED indicator **d** blinks.
- pp indicates a parameter number.
- In case of CPU error, LED indication is uncertain.

8 PARAMETERS

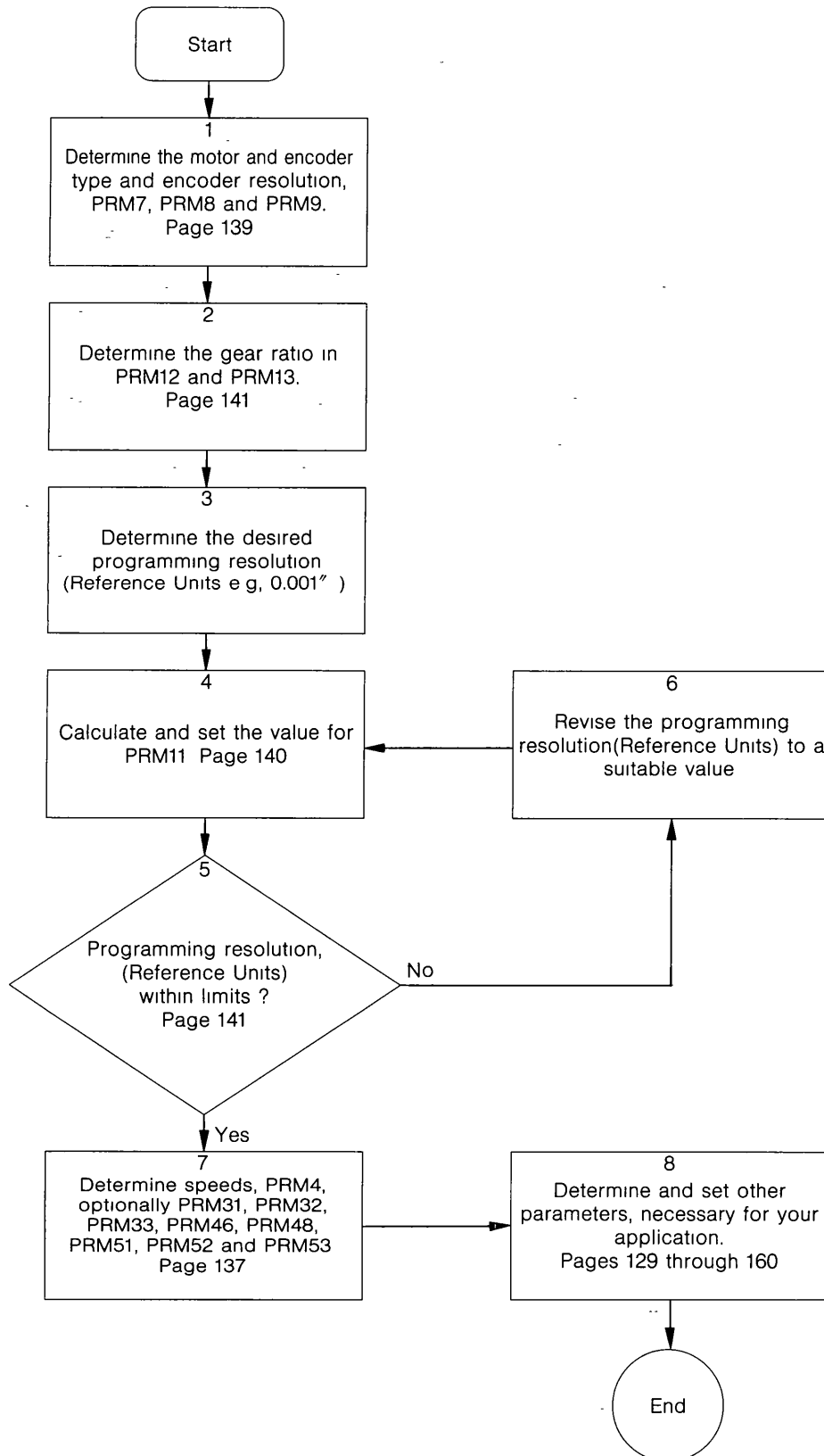
Servopack type CACR-HR sets gain, internal constants, and function selection by parameters (serial communication).

- Parameter setter: Personal computer and terminal emulator software
- Serial communication specifications: See section 7.

(Data can be set in Servopack setting and displaying section. Refer to Par.9.1.2.)



8.1 GENERAL PROCEDURE FOR DEFINING PARAMETERS



The flow chart on the previous page shows the steps necessary to determine parameters for HR-Servo applications.

◆ Step 1

Determine the motor type and motor-parameter number (PRM7) from the table on page 139. If the motor is equipped with an incremental encoder set parameter PRM9 to 1. Set this parameter to 0, in case of a motor with absolute encoder. Parameter PRM8 holds the encoder resolution. The standard absolute encoder has 8,192 lines per revolution, providing 32,768 (8,192×4) pulses per motor revolution (PRM8 = 32,768).

◆ Step 2

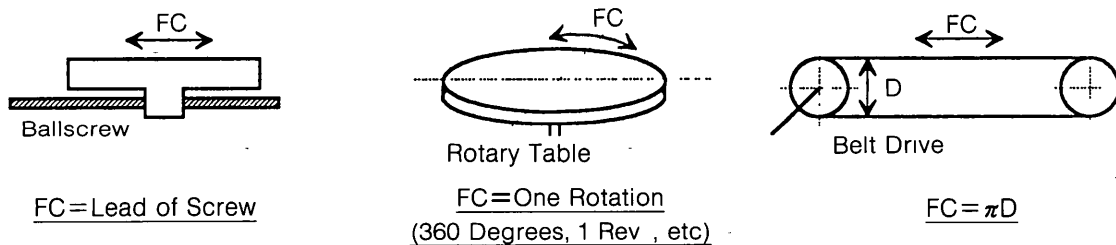
Parameters PRM12 and PRM13 define the gear ratio as a ratio of 2 integer numbers. Set parameter PRM12 to the motor speed, and set parameter PRM13 to the gearbox-output speed.

◆ Step 3

Determine the desired programming resolution, also referred to as Reference Unit. Typical values are 0.001", 0.001 mm, 0.01 degrees. This is minimum position increment that can be programmed and is different from the encoder resolution. The programming resolution is determined by parameters, the encoder resolution is determined by the number of encoder pulses and the machine configuration (gear ratio, screw pitch, etc.).

◆ Step 4

Determine the amount of linear or rotary motion for one revolution of the gearbox-output shaft (one motor revolution, in case of direct drive); also referred to as Feed Constant (FC) in this document. The illustration below shows three common application examples.



There are no restrictions for choosing the units of FC (inches, mm, degrees, furlongs, or anything else). Divide the value of FC by the programming resolution determined in step 3. Omit any remaining digits after the decimal point. The result is the value for parameter PRM11.

$$PRM11 = FC / \text{Reference Unit.}$$

◆ Step 5

There is a restriction for the HR-Servo as far as the number of encoder pulses per Reference Unit is concerned. The number of encoder pulses per Reference Unit has to be equal to or larger than 0.01 pulses, and equal to or smaller than 100 pulses. This may be quickly checked, evaluating the formula below.

$$0.01 \leq \frac{PRM8 \times PRM12}{PRM11 \times PRM13} \leq 100$$

If the calculated value is smaller than one, the programming resolution is smaller than the encoder resolution. This means that the positioning accuracy is not as good as the programming resolution (less than one encoder pulse per Reference Unit).

◆ Step 6

If the result of the calculation in step 5 is outside the limits, revise the selected programming resolution (Reference Unit) and go back to step 4.

◆ Step 7

Determine the feed speed expressed in terms of Reference Units per minute. Set parameter PRM4 to the speed in Reference Units per minute divided by 1,000.

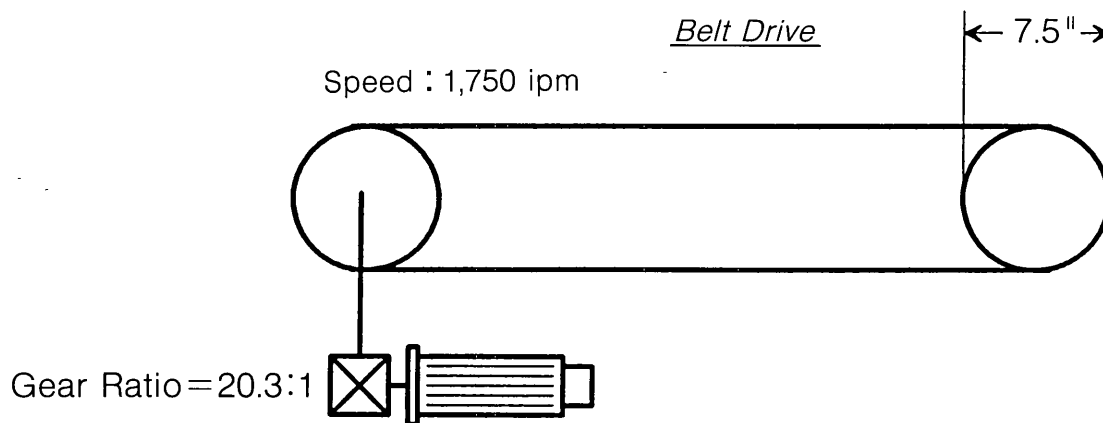
$$PRM4 = \text{Speed [Reference Unit per minute]} / 1,000$$

The other parameters related to speed, PRM31, PRM32, PRM33, PRM46, PRM48, PRM51, PRM52 and PRM53 are optional. They have to set only, if the associated optional functions are enabled. The procedure for setting the optional, speed related parameters is the same as the procedure for parameter PRM4.

◆ Step 8

Set all other parameters required for your application. Refer to pages 129 through 160 for details.

Example:



Motor part number : USAGED-13L22K (incremental encoder, 8,192 lines per rev.)

◆ Step 1

Motor and encoder parameters

- A. Motor type: PRM7=54
- B. Encoder type: PRM9=1
- C. Encoder pulses per revolution: PRM8=32,768

◆ Step 2

Parameters for the gear reduction

- A. Motor speed: PRM12=203
- B. Gearbox-output speed: PRM13=10

All parameters have to be integers (“whole numbers”). Only the ratio of parameters PRM12 and PRM13 is used for “internal” calculations.

◆ Step 3

Programming resolution (Reference Unit): 0.01” (preliminary value)

◆ Step 4

Amount of linear motion for one revolution of the gearbox-output shaft, Feed Constant (FC)

- A. $FC = \pi \times D = 3.14159 \times 7.5 \text{ inches} = 23.562 \text{ inches}$
- B. $PRM11 = FC / \text{Reference Unit} = 23.562 / 0.01 = 2356$

◆ Step 5

Programming resolution (Reference Unit) within limits?

- A. $PRM8 \times PRM12 / (PRM11 \times PRM13) = 32,768 \times 203 / (2356 \times 10) = 282$
- B. This value is outside the limits
- C. Next step is step 6

◆ Step 6

Revised programming resolution (Reference Unit): 0.001”

◆ Step 4

Amount of linear motion for one revolution of the gearbox-output shaft, Feed Constant (FC)

- A. $FC = \pi \times D = 3.14159 \times 7.5 \text{ inches} = 23.562 \text{ inches}$
- B. $PRM11 = FC / \text{Reference Unit} = 23.562 / 0.001 = 23,562$

◆ Step 5

Programming resolution (Reference Unit) within limits?

- A. $PRM8 \times PRM12 / (PRM11 \times PRM13) = 32,768 \times 203 / (23,562 \times 10) = 28$
- B. This value is within the limits
- C. Next step is step 7

◆ Step 7

Feed speed parameter value

- A. $1,750 \text{ ipm} = 1,750,000 \text{ Reference Units per minute (programming resolution} = 0.001\text{”)}$
- B. $PRM4 = \text{Speed [Reference Unit per minute]} / 1000 = 1,750,000 / 1,000 = 1,750$

◆ Step 8

Other parameters, pages 129 through 160.



◆ Results

PRM4 = 1,750
PRM7 = 54
PRM8 = 32,768
PRM9 = 1
PRM11 = 23,562
PRM12 = 203
PRM13 = 10

8.2 PARAMETER LIST

Changing Process: ON (on-line parameters), OFF (off-line parameters: effective with command <RES> or by turning the power OFF and then ON once.)

●: Typical parameters which require setting in each position reference method standard way of use

▲: Parameter to be set in each position reference method if necessary

☐: Normally not used.

| No. | Name | Range | Unit <->Related Parameter No. > | Change | | Preset at the Factory | Position Reference Method | | | |
|-----|---|--|---------------------------------------|-----------------------|-----------------------|-----------------------------|---------------------------|-------|-------------------|------------------|
| | | | | ON | OFF | | Station No. | DG-SW | Serial command | Command table |
| 1 | Position loop gain· Kp | 0 to 200 | S ⁻¹ | <input type="radio"/> | | 30 | ● | ● | ● | ● |
| 2 | Speed loop gain· Kv | 1 to 200 | | <input type="radio"/> | | 15 | ● | ● | ● | ● |
| 3 | Integral time constant : Ti | 1 to 255 | ×2(ms) | <input type="radio"/> | | 10 | ● | ● | ● | ● |
| 4 | 1st feeding speed | 1 to 240000 | (×1000) reference unit/min | <input type="radio"/> | | 60 | ● | ● | ● | ● |
| 5 | Linear accel/ decel time 1 | 8 to 60000 | ms | <input type="radio"/> | | 100 | ● | ● | ● | ● |
| 6 | Positioning complete range | 1 to 250 | Reference unit | <input type="radio"/> | | 1 | ● | ● | ● | ● |
| 7 | Motor selection | 0 to 79 | | | <input type="radio"/> | (Note) | ● | ● | ● | ● |
| 8 | Encoder pulse | 4096 to 32768 | Pulse (×4) | | <input type="radio"/> | 32768 | ● | ● | ● | ● |
| 9 | Encoder selection | 0: absolute 1: incremental | | | <input type="radio"/> | 0 | ● | ● | ● | ● |
| 10 | Absolute encoder allow- able error amount | 0 to 99999999 | Pulse | | <input type="radio"/> | 32768 | ● | ● | ● | ● |
| 11 | Reference unit/machine one rotation | 1 to 1500000 | Reference unit | | <input type="radio"/> | 32768 | ● | ● | ● | ● |
| 12 | Gear ratio setting (motor side speed) | 1 to 10000000 | Rotation | | <input type="radio"/> | 1 | ● | ● | ● | ● |
| 13 | Gear ratio setting (machine side speed) | 1 to 10000000 | Rotation | | <input type="radio"/> | 1 | ● | ● | ● | ● |
| 14 | Mode setting | 0 to 11111 | Bit (5-bit) | | | 00000 | | | | |
| | b0: Motor rotating direction (REV run connection) | 0: FWD run 1: REV run | | | | 0 | ▲ | ▲ | ▲ | ▲ |
| | b1: Finite positioning/ infinite positioning mode setting | 0: Finite positioning 1: Infinite positioning | | | | 0 | ● | ● | ● | ● |
| | b2: Linear/rotation type mode setting | 0: Linear type 1: Rotation type | | | <input type="radio"/> | 0 | ● | ● | ● | ● |
| | b3: Position reference mode | 0: Absolute 1: Incremental | | | | 0 | ● | ● | ● | ● |
| | b4: Position data code | 0: Binary 1: BCD | | | | 0 | ● | ● | | ● |
| 15 | Position reference method | 0: Station No. (contact) | <->16, 20/b2> | | | | | | | |
| | | 1: DG-SW | <->20/b1> | | <input type="radio"/> | 2 | ● | ● | ● | ● |
| | | 2: Serial command | | | | | | | | |
| | | 4: Command table | | | | | | | | |

(Cont' d)

8.2 PARAMETER LIST (Cont'd)

| No | Name | Range | Unit <→Related Parameter No > | Change | | Preset at the Factory | Position Reference Method | | | |
|---|--|-----------------------------|-------------------------------------|--------|-----|-----------------------------|---------------------------|-------|-------------------|------------------|
| | | | | ON | OFF | | Station No | DG-SW | Serial command | Command table |
| 16 | Station No | 1 to 4096 | <→20/b2> | | ○ | 1 | ● | | | |
| 17 | Function selection 1 | 0 to 11111 | Bit (5-bit) | | | 00000 | | | | |
| | b0: Current limit | 1: Set | <→34 to 36> | | | 0 | | ▲ | ▲ | |
| | b1: Feed forward | 1: Provided | <→37> | | | 0 | | ▲ | ▲ | |
| | b2: 2-step accel/decel | 1: 2-step (0: 1-step) | <→38, 39> | | ○ | 0 | ▲ | ▲ | ▲ | ▲ |
| | b3: Speed limit | 1: Set | <→46> | | | 0 | | ▲ | | |
| b4: Accel/decel type designation | 1: Set | <→68 to 71, 47, 48> | | | 0 | | ▲ | ▲ | | |
| 18 | Function selection 2 | 0 to 11111 | Bit (5-bit) | | | 00000 | | | | |
| | b0: Software overtravel (Position reference fault detection) | 1: Set | <→40, 41> | | | 0 | | ▲ | ▲ | |
| | b1: Backlash compensa- tion | 1: Provided | <→42> | | | 0 | ▲ | ▲ | ▲ | ▲ |
| | b2: Speed reference (automatic mode) | 1: Set | <→61> | | ○ | 0 | | ▲ | | ▲ |
| | b3: Speed reference (manual mode) | 1: Set | <→62> | | | 0 | | ▲ | | |
| b4: Zero point return | 1: Used | <→49 to 54> | | | 0 | | ▲ | ▲ | | |
| 19 | Function selection 3 | 0 to 11111111 | Bit (8-bit) | | | 000000 | | | | |
| | b0: OT signal | 1: Mask | <→19/b6> | | | 0 | ▲ | ▲ | ▲ | ▲ |
| | b1: STOP signal | 1: Mask | <→72/b1> | | | 0 | ▲ | ▲ | ▲ | ▲ |
| | b2: Brake release signal | 1: Used | <→43, 44> | | | 0 | ▲ | ▲ | ▲ | ▲ |
| | b3: Pulse input (reference) | 1: Used | <→63> | | | 0 | | ▲ | ▲ | |
| | b4: Pulse output (with- out FB zero point) | 1: Used | <→64> | | ○ | 0 | | ▲ | ▲ | |
| | b5: Positioning (sta- tion) near signal | 1: Used | <→45> | | | 0 | ▲ | ▲ | ▲ | ▲ |
| | b6: OT signal switching | 0: Standard 1: Inversion | | | | 0 | | ▲ | ▲ | |
| b7: Torque filter time constant change | 0: Not change 1: Change | <→90> | | | 0 | ▲ | ▲ | ▲ | ▲ | |

(Cont'd)

(Cont'd)

| No. | Name | Range | Unit <→Related Parameter No > | Change | | Preset at the Factory | Position Reference Method | | | |
|----------------|---|--------------------------------|-------------------------------------|--------|-----|-----------------------------|---------------------------|-------|-------------------|------------------|
| | | | | ON | OFF | | Station No. | DG-SW | Serial command | Command table |
| 20 | Function selection 4 | 0 to 1111111 | Bit (7-bit) | | | 0000000 | | | | |
| | b0 | 0 | | | | 0 | | | | |
| | b1: External position indicator | 1: Used 0: Not used | <→67> | | | 0 | | ● | | |
| | b2: Station No 0 | 0: Provided 1: Not provided | | | ○ | 0 | ● | | | |
| | b3: Simplified S-curve accel/decel | 1: Used 0: Not used | <→76> | | | 0 | ▲ | ▲ | ▲ | ▲ |
| | b4: Function 7 setting | 0: Not set 1: Set | <→72> | | | 0 | ▲ | ▲ | ▲ | ▲ |
| | b5: Function 5 setting | 0: Not set 1: Set | <→65> | | | 0 | ▲ | ▲ | ▲ | ▲ |
| | b6: Function 6 setting | 0: Not set 1: Set | <→66> | | | 0 | ▲ | | ▲ | |
| 21 to 30 | For future use | | | | | 0 | | | | |
| 31 | 2nd feed speed | 1 to 240000 | (×1000) · reference unit/min | | ○ | 1 | ▲ | ▲ | | |
| 32 | 3rd feed speed | 1 to 240000 | (×1000) · reference unit/min | | ○ | 1 | ▲ | ▲ | | |
| 33 | 4th feed speed | 1 to 240000 | (×1000) · reference unit/min | | ○ | 1 | ▲ | ▲ | | |
| 34 | Current limit value | 0 to 400 | % | | ○ | 400 | | ▲ | ▲ | |
| 35 | Plus side current limit value (current limiting) | 0 to 400 | % | | ○ | 400 | | ▲ | ▲ | |
| 36 | Minus side current limit value (current limiting) | 0 to 400 | % | | ○ | 400 | | ▲ | ▲ | |
| 37 | Feedforward compensation value | 0 to 200 | % | | ○ | 0 | | ▲ | ▲ | |
| 38 | Linear accel/decel time 2 | 8 to 60000 | ms | | ○ | 100 | | ▲ | ▲ | |
| 39 | Linear accel/decel accel switching speed | 0 to 240000 | (×1000) · reference unit/min | | ○ | 240000 | | ▲ | ▲ | |
| 40 | Plus side software overtravel (plus side position reference fault detection value) | ±99999999 | Reference unit | | ○ | +99999999 | | | ▲ | |
| 41 | Minus side software overtravel (minus side position reference fault detection value) | ±99999999 | Reference unit | | ○ | -99999999 | | | ▲ | |
| 42 | Backlash compensated amount | 0 to ±30000 | Pulse | | ○ | 0 | ▲ | ▲ | ▲ | ▲ |

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8.2 PARAMETER LIST (Cont'd)

| No. | Name | Range | Unit <→Related Parameter No > | Change | | Preset at the Factory | Position Reference Method | | | |
|----------------|--|--|-------------------------------------|-----------------------|-----|-----------------------------|---------------------------|-------|-------------------|------------------|
| | | | | ON | OFF | | Station No | DG-SW | Serial command | Command table |
| 43 | Braking time | 8 to 1000 | ms | <input type="radio"/> | | 8 | ▲ | ▲ | ▲ | ▲ |
| 44 | Brake ON. motor speed | 1 to 10000 | r/min | <input type="radio"/> | | 1 | ▲ | ▲ | ▲ | ▲ |
| 45 | Positioning near range (station near range) | 0 to 30000 | Reference unit | <input type="radio"/> | | 1 | ▲ | ▲ | ▲ | ▲ |
| 46 | Speed limit value | 1 to 240000 | (×1000) • reference unit/min | <input type="radio"/> | | 240000 | | ▲ | | |
| 47 | Exponential accel/decel time constant | 8 to 1000 | ms | <input type="radio"/> | | 100 | | ▲ | ▲ | |
| 48 | Exponential accel/decel bias speed | 0 to 240000 | (×1000) • reference unit/min | <input type="radio"/> | | 0 | | ▲ | ▲ | |
| 49 | Zero-point return (homing) mode | 0: DEC+C, 1:STP | | <input type="radio"/> | | 1 | | ▲ | ▲ | |
| 50 | Zero-point return direc- tion | 0: Plus direction 1: Minus direction | | <input type="radio"/> | | 0 | | ▲ | ▲ | |
| 51 | Zero-point return feed speed | 0 to 240000 | (×1000) • reference unit/min | <input type="radio"/> | | 1 | | ▲ | ▲ | |
| 52 | Zero-point return ap- proach speed | 0 to 240000 | (×1000) • reference unit/min | <input type="radio"/> | | 1 | | ▲ | ▲ | |
| 53 | Zero-point return creep speed | 0 to 240000 | (×1000) • reference unit/min | <input type="radio"/> | | 1 | | ▲ | ▲ | |
| 54 | Zero-point return final travel distance | 1 to ±99999999 | Reference unit | <input type="radio"/> | | 1 | | ▲ | ▲ | |
| 55 to 60 | For future use | | | | | 0 | | | | |
| 61 | Feed speed setting method (automatic mode) | 0: Select by parameter at contacts 1: Digital switch 2: Serial command 4: Speed table | | <input type="radio"/> | | 2 | | ▲ | | |
| 62 | Feed speed setting method (manual mode) | 0: Select by parameter at contacts 1: Digital switch 2: Serial command 4: Speed table | | <input type="radio"/> | | 2 | | ▲ | | |

(Cont'd)

(Cont'd)

| No. | Name | Range | Unit <→Related Parameter No.> | Change | | Preset at the Factory | Position Reference Method | | | |
|-----|---|--|-------------------------------------|--------|-----|-----------------------------|---------------------------|-------|-------------------|------------------|
| | | | | ON | OFF | | Station No | DC-SW | Serial command | Command table |
| 63 | Pulse signal status | 0: 90° phase difference 2-phase pulse ×4 1: 90° phase difference 2-phase pulse ×2 2: 90° phase difference 2-phase pulse ×1 3: Sign + pulse train 4: CCW pulse + CW pulse | | | | 0 | | ▲ | ▲ | |
| 64 | Output pulse dividing ratio | 2 to 64 | 1/2 | | ○ | 2 | | ▲ | | |
| 65 | Function selection 5 | 0 to 1111111 | Bit (7-bit) | | | 0000000 | | | | |
| | b0: Zone signal | 1: Used 0: Not used | | | | 0 | | | | ▲ |
| | b1: Station near signal | 1: Used 0: Not used | <→19/b5, 45> | | ○ | 0 | ▲ | | | |
| | b2: DC-SW read-in time change | 1: Change 0: Not change | <→77> | | | 0 | | ▲ | | |
| | b3: DC-SW digit number shift | 1: Used 0: Not used | <→67> | | | 0 | | ▲ | | |
| | b4: | 0 | | | | 0 | | | | |
| | b5: | 0 | | | | 0 | | | | |
| | b6: Positioning completion signal | 1: Changed 0: Not changed | | | | 0 | ▲ | ▲ | ▲ | ▲ |
| 66 | Function selection 6 | 0 to 11111111 | Bit (8-bit) | | | 00000000 | | | | |
| | b0: | 0 | | | | 0 | | | | |
| | b1: | 0 | | | | 0 | | | | |
| | b2: | 0 | | | | 0 | | | | |
| | b3: | 0 | | | | 0 | | | | |
| | b4: Extension of station No. output | 1: Used 0: Not used | | | ○ | 0 | ▲ | | | |
| | b5: | 0 | | | | 0 | | | | |
| | b6: | 0 | | | | 0 | | | | |
| | b7: Servopack response axis address | 1: Provided 0: Not provided | | | | 0 | | | | ▲ |
| 67 | Decimal point position and digit number shift | 0 to 7 | | | ○ | 0 | | ● | | |
| 68 | Accel/decel type setting (automatic mode) | 0: Linear, simplified S curve 1: Exponent | | | ○ | 0 | | ▲ | ▲ | |
| 69 | Accel/decel type setting (manual mode) | 0: Linear, simplified S curve 1: Exponent | | | ○ | 0 | | ▲ | | |
| 70 | Accel/decel type setting (pulse mode) | 0: Linear, simplified S curve 1: Exponent | | | ○ | 0 | | ▲ | ▲ | |
| 71 | Accel/decel type setting (zero-point return mode) | 0: Linear, simplified S curve 1: Exponent | | | ○ | 0 | | ▲ | ▲ | |

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8.2 PARAMETER LIST (Cont'd)

| No. | Name | Range | Unit <→Related Parameter No > | Change | | Preset at the Factory | Position Reference Method | | | |
|----------------|--|--------------------------------|-------------------------------------|--------|-----|-----------------------------|---------------------------|-------|-------------------|------------------|
| | | | | ON | OFF | | Station No. | DG-SW | Serial command | Command table |
| 72 | Function selection 7 | 0 to 111111 | Bit (6-bit) | | | 000000 | | | | |
| | b0: Overrun detection alarm check | 0: Check 1: Not check | | | | 0 | | | | |
| | b1: Remaining data after STOP signal | 0: Appear 1: Disappear | | | ○ | 0 | ▲ | ▲ | ▲ | ▲ |
| | b2: FB after positioning stop | 0: By contact 1: Motor PG | | | | 0 | ▲ | ▲ | | |
| | b3: Echo back at ini- tialization | 0: Not provided 1: Provided | | | | 0 | | ▲ | | |
| | b4: OK response for serial command | 0: No response 1: Response | | | | 0 | | ▲ | | |
| | b5: Monitor Data Transmission Specification Change | 0: Repeatedly 1: Only once | | | | 0 | | ▲ | | |
| 73 to 75 | For future use | | | | | 0 | | | | |
| 76 | Simplified S-curve accel /decel time | 0 to 124 | (+2)ms | | ○ | 0 | ▲ | ▲ | ▲ | ▲ |
| 77 | DG-SW read-in scanning time | 24 to 2000 | ms | | ○ | 24 | | ▲ | | |
| 78 to 89 | For future use | | | | | 0 | | | | |
| 90 | Torque reference filter Time constant | 0 to 100 | (×32.5)μs | | ○ | 15 | ▲ | ▲ | ▲ | ▲ |
| 91 to 99 | For future use | | | | | 0 | | | | |

Note Refer to Table 8.1 for parameter No. 7 (motor selection) preset at the factory

Servopack parameter No. 7 setting prior to shipping is as shown below. Change the set value to [motor code] suitable for motor to be used.

Table 8.1 Parameter No. 7 (Motor Selection) Setting prior to Shipping

| SERVOPACK Type | Parameter No 7 Value Set Prior to Shipping | Applicable SERVOMOTOR Type - | Motor Code |
|----------------|--|------------------------------|------------|
| HR03UB | 11 | USAMED-03L [] 1 | 1 |
| HR05UB | 12 | USAFED-05L [] 1 | 12 |
| | | USAGED-05L [] 1 | 52 |
| HR10UB | 13 | USAMED-06L [] 1 | 2 |
| | | USAMED-09L [] 2 | 3 |
| | | USAFED-09L [] 1 | 13 |
| | | USAGED-09L [] 1 | 53 |
| HR15UB | 14 | USAMED-12L [] 2 | 4 |
| | | USAFED-13L [] 2 | 14 |
| | | USAGED-13L [] 2 | 54 |
| HR20UB | 15 | USAMED-20L [] 2 | 5 |
| | | USAFED-20L [] 2 | 15 |
| | | USAGED-20L [] 2 | 55 |
| HR30UB | 16 | USAMED-30L [] 2 | 6 |
| | | USAFED-30L [] 2 | 16 |
| | | USAGED-30L [] 2 | 56 |
| HR44UB | 17 | USAMED-44L [] 2 | 7 |
| | | USAFED-44L [] 2 | 17 |
| | | USAGED-44L [] 2 | 57 |

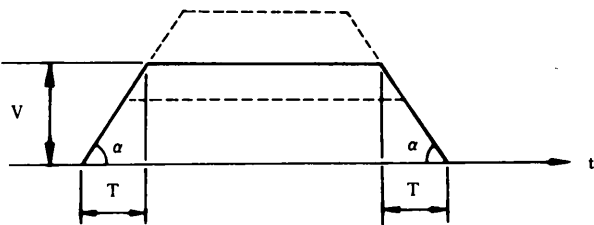


8.3 PARAMETER FUNCTION DETAILS

| No. | Name | Contents |
|---|--|--|
| 1 | Position Loop Gain (Abbreviation: Kp) | Position loop gain set value. Unit: [S ⁻¹], setting range: (0 to 200) |
| 2 | Speed Loop Gain (Abbreviation: Kv) | • Kv : Speed loop gain set value. Unit: [×2.5Hz], setting range: (1 to 200) (for equivalent inertia) |
| 3 | Integral Time Constant (Abbreviation: Ti) | • Ti: Speed loop integral time constant set value. Unit: [×2ms], setting range: (1 to 255) |
| <p>Notes:</p> <ol style="list-style-type: none"> 1. Relation between speed loop gain Kv and integral time constant Ti is defined by the following value in proportion to current reference, assuming speed deviation is εv: $Kv (\epsilon v + \int \frac{\epsilon v}{T_i} dt)$ <ol style="list-style-type: none"> 2. Speed loop gain Kv cannot obtain a high value when machine system rigidity is low. (Oscillation occurs by forcing the value to increase.) 3. Excessively small integral time constant Ti causes oscillation. Do not use it by making it extremely smaller than factory set value 10 (20ms). | | |

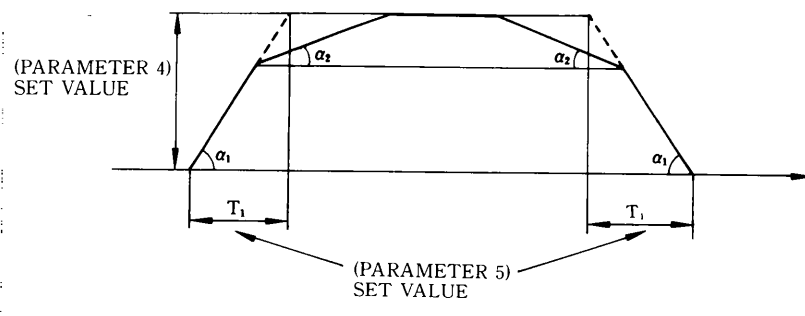
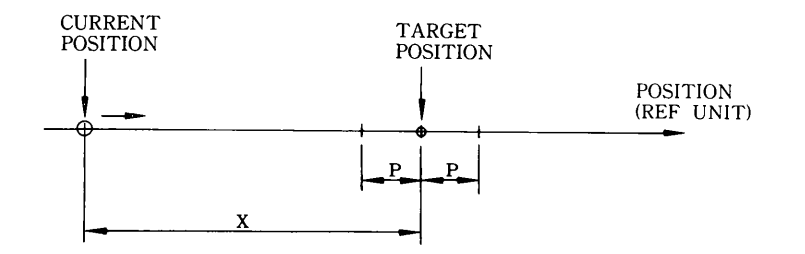
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| No. | Name | Contents | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------------|---------------------|---|---------------------------|---------------------------|--|---------------------|--|----|------|--------------------|---------------------------|---------------------------|---|---------------------|-------------|---|---|----|---------------------|------------------------------------|---|---|----|---------------------|---|---|----|---------------------|--|---|---|---------------|---|---|-----------|---|---|
| 4 | (1st) Feeding Speed | <p>Acceleration speed value set value for reference speed and linear accel/decel.</p> <p>Unit : ($\times 1000$ reference unit/min). setting range: (1 to 240000).</p> <p>(Example) For reference unit 0.01mm, feeding speed set value of 150m/min is as follows:</p> $\frac{(150 \times 10^3)}{0.01} = 15000000 \text{ reference unit/min}$ $= 15000 \times 1000 \text{ unit/min}$ $= \boxed{15000}$ <p>(1) For reference speed, this parameter set value is selected when speed select signals (CN5) both SP2ND and SP3RD are at H level.</p> <p>< Speed selected by this parameter at contact ></p> <table border="1"> <thead> <tr> <th colspan="3">Parameter</th> <th colspan="2">Speed Select Signal</th> </tr> <tr> <th>No</th> <th>Name</th> <th>Setting Range/Unit</th> <th>$\overline{\text{SP2ND}}$</th> <th>$\overline{\text{SP3RD}}$</th> </tr> </thead> <tbody> <tr> <td>4</td> <td>(1st) Feeding Speed</td> <td>1 to 240000</td> <td>H</td> <td>H</td> </tr> <tr> <td>31</td> <td>(2nd) Feeding Speed</td> <td rowspan="2">$(\times 1000$ reference unit/min)</td> <td>L</td> <td>H</td> </tr> <tr> <td>32</td> <td>(3rd) Feeding Speed</td> <td>H</td> <td>L</td> </tr> <tr> <td>33</td> <td>(4th) Feeding Speed</td> <td></td> <td>L</td> <td>L</td> </tr> </tbody> </table> <p>(2) Accel/decel speed set value (1-, 2-step linear accel/decel, simplified S-curve accel/decel)</p> <table border="1"> <tbody> <tr> <td>Parameter No.</td> <td>4</td> <td>5</td> </tr> <tr> <td>Set Value</td> <td>V</td> <td>T</td> </tr> </tbody> </table>  <p>Accel speed α is determined by V/T and becomes constant if feed speed changes. (Accel speed constant control)</p> | Parameter | | | Speed Select Signal | | No | Name | Setting Range/Unit | $\overline{\text{SP2ND}}$ | $\overline{\text{SP3RD}}$ | 4 | (1st) Feeding Speed | 1 to 240000 | H | H | 31 | (2nd) Feeding Speed | $(\times 1000$ reference unit/min) | L | H | 32 | (3rd) Feeding Speed | H | L | 33 | (4th) Feeding Speed | | L | L | Parameter No. | 4 | 5 | Set Value | V | T |
| Parameter | | | Speed Select Signal | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| No | Name | Setting Range/Unit | $\overline{\text{SP2ND}}$ | $\overline{\text{SP3RD}}$ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | (1st) Feeding Speed | 1 to 240000 | H | H | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 31 | (2nd) Feeding Speed | $(\times 1000$ reference unit/min) | L | H | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 32 | (3rd) Feeding Speed | | H | L | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 33 | (4th) Feeding Speed | | L | L | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Parameter No. | 4 | 5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Set Value | V | T | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

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8.3 PARAMETER FUNCTION DETAILS (Cont'd)

| No. | Name | Contents |
|-----|---|--|
| 5 | Linear Accel/Decel Time 1 | <p>For linear accel/decel speed control, accel/decel speed is set with parameter 4. Unit: (ms), setting range: (8 to 60000)</p> <p>① For 1-step accel/decel, refer to the description of parameter 4. ② For 2-step accel/decel, (refer to the description of parameter 17 b2), the first-step accel/decel speed is set. ③ For simplified S-curve accel/decel (refer to the description of parameter 76), the second-step accel/decel speed is set.</p>  <p>α_1: 1st-step accel/decel speed (by V_1/T_1) α_2: 2nd-step accel/decel speed (Refer to the description of parameter 17.)</p> |
| 6 | Positioning Complete Range (Abbreviation: COIN Width) | <p>If distance difference (in reference units) between current position and target position provided by reference data becomes lower than the value set by parameter 6, COIN signal is output. (In serial communication, COIN is automatically sent.) Setting range: 1 to 250 (reference unit).</p>  <p>P: Positioning complete range x: Current position - target position COIN signal is output when $x \leq p$.</p> |

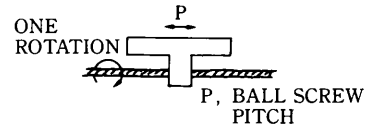
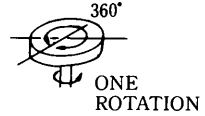
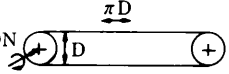
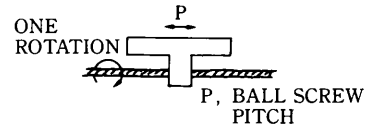
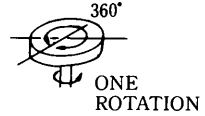
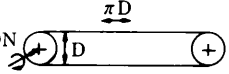
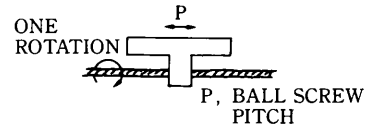
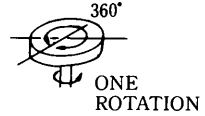
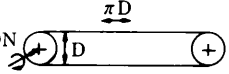
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| No. | Name | Contents | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------------------|---|---|-------------|-----------------------|-------------|--|----------|--|-----------------------|-------------|-----------------------|-------------|-----------------------|-------------|---|---|--|--|--|--|---------|---|--|--|--|--|---------|---|---------|----|---------|----|---------|---|---------|----|---------|----|---------|---|---------|----|---------|----|---------|---|---------|----|---------|----|---------|---|---------|----|---------|----|---------|---|---------|----|---------|----|
| 7 | Motor Selection Code | <p>In Servopack type CACR-HR, each constant required for control with matching motors is determined by the code set in parameter 7 for perfect matching of Servopack and motors.</p> <p>Since a code number is provided for each motor type, check matching motor type and set the code number.</p> <table border="1"><thead><tr><th colspan="2">M Series</th><th colspan="2">F Series</th><th colspan="2">G Series</th></tr><tr><th>Motor Type USAMED-</th><th>Code No.</th><th>Motor Type USAFED-</th><th>Code No.</th><th>Motor Type USAGED-</th><th>Code No.</th></tr></thead><tbody><tr><td>—</td><td>0</td><td></td><td></td><td></td><td></td></tr><tr><td>03L □ 1</td><td>1</td><td></td><td></td><td></td><td></td></tr><tr><td>06L □ 1</td><td>2</td><td>05L □ 1</td><td>12</td><td>05L □ 1</td><td>52</td></tr><tr><td>09L □ 2</td><td>3</td><td>09L □ 1</td><td>13</td><td>09L □ 1</td><td>53</td></tr><tr><td>12L □ 2</td><td>4</td><td>13L □ 2</td><td>14</td><td>13L □ 2</td><td>54</td></tr><tr><td>20L □ 2</td><td>5</td><td>20L □ 2</td><td>15</td><td>20L □ 2</td><td>55</td></tr><tr><td>30L □ 2</td><td>6</td><td>30L □ 2</td><td>16</td><td>30L □ 2</td><td>56</td></tr><tr><td>44L □ 2</td><td>7</td><td>44L □ 2</td><td>17</td><td>44L □ 2</td><td>57</td></tr></tbody></table> | M Series | | F Series | | G Series | | Motor Type USAMED- | Code No. | Motor Type USAFED- | Code No. | Motor Type USAGED- | Code No. | — | 0 | | | | | 03L □ 1 | 1 | | | | | 06L □ 1 | 2 | 05L □ 1 | 12 | 05L □ 1 | 52 | 09L □ 2 | 3 | 09L □ 1 | 13 | 09L □ 1 | 53 | 12L □ 2 | 4 | 13L □ 2 | 14 | 13L □ 2 | 54 | 20L □ 2 | 5 | 20L □ 2 | 15 | 20L □ 2 | 55 | 30L □ 2 | 6 | 30L □ 2 | 16 | 30L □ 2 | 56 | 44L □ 2 | 7 | 44L □ 2 | 17 | 44L □ 2 | 57 |
| M Series | | F Series | | G Series | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Motor Type USAMED- | Code No. | Motor Type USAFED- | Code No. | Motor Type USAGED- | Code No. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| — | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 03L □ 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 06L □ 1 | 2 | 05L □ 1 | 12 | 05L □ 1 | 52 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 09L □ 2 | 3 | 09L □ 1 | 13 | 09L □ 1 | 53 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 12L □ 2 | 4 | 13L □ 2 | 14 | 13L □ 2 | 54 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 20L □ 2 | 5 | 20L □ 2 | 15 | 20L □ 2 | 55 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 30L □ 2 | 6 | 30L □ 2 | 16 | 30L □ 2 | 56 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 44L □ 2 | 7 | 44L □ 2 | 17 | 44L □ 2 | 57 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 8 | Encoder Pulse | Encoder pulse resolution mounted at motor shaft opposite load side is set. Prior to shipping, value <input type="text" value="32768"/> (8192 × 4) is set. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 9 | Encoder Selection | Identification code of encoder to be used is set. Factory setting is <input type="text" value="0"/> . Absolute encoder identification code: 0 Incremental encoder identification code: 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 10 | Absolute Encoder Allowable Error Amount | Effective with parameter 9=0 Absolute encoder absolute value data are checked when Servopack power supply is turned on. At this time, if an error amount (difference of position compared to position before previous power-down) exceeds parameter 10 set value, an alarm (ABS0 error) occurs. Set value prior to shipping is <input type="text" value="32768"/> . | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

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8.3 PARAMETER FUNCTION DETAILS (Cont'd)

| No. | Name | Contents | | | | | | | | | | | | |
|--|---|--|--|----------------------------|--|---|------------|---|------|-------------|---|---------|------|---|
| 11 | Load Moving Amount at Load Side One Rotation (Reference unit) | <p>(1) Reference unit is the minimum unit of position data to move the load. (Example: 0.01mm, 1μm, 0.1° or 0.01 inch) For example, when reference unit is 1 μm, and position data value is 50000, actual moving amount will be:</p> $50000 \times 0.1 = 5000 \mu\text{m} = 5\text{mm.}$ <ul style="list-style-type: none"> • Determine reference unit, considering machine specifications, positioning accuracy, etc. • Position data unit for DG-SW, serial communication, etc. is the reference unit. • Speed data unit in DG-SW, serial communication or parameter setting is [$\times 1000$ reference unit/min]. <p>(2) (Parameter 11) set value $= \frac{\text{Moving amount per load side rotation}}{\text{Reference unit}}$ <p>The table below shows typical load moving amount rotation:</p> <table border="1"> <thead> <tr> <th>Load Moving Amount per Load Shaft Rotation</th> <th colspan="2">Typical Load Configuration</th> </tr> </thead> <tbody> <tr> <td>P</td> <td>Ball Screw</td> <td>  <p>P, BALL SCREW PITCH</p> </td> </tr> <tr> <td>360°</td> <td>Round Table</td> <td>  <p>ONE ROTATION</p> </td> </tr> <tr> <td>πD</td> <td>Belt</td> <td>  <p>ONE ROTATION</p> </td> </tr> </tbody> </table> <p>Parameter 11 setting range: 1 to 1500000</p> <p>(Example) When load moving amount per load shaft rotation is 12mm and reference unit is 0.01mm, the following value is set:</p> $(\text{Parameter 11}) = \frac{12}{0.01} = 1200$ </p> | Load Moving Amount per Load Shaft Rotation | Typical Load Configuration | | P | Ball Screw |  <p>P, BALL SCREW PITCH</p> | 360° | Round Table |  <p>ONE ROTATION</p> | πD | Belt |  <p>ONE ROTATION</p> |
| Load Moving Amount per Load Shaft Rotation | Typical Load Configuration | | | | | | | | | | | | | |
| P | Ball Screw |  <p>P, BALL SCREW PITCH</p> | | | | | | | | | | | | |
| 360° | Round Table |  <p>ONE ROTATION</p> | | | | | | | | | | | | |
| πD | Belt |  <p>ONE ROTATION</p> | | | | | | | | | | | | |

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| No. | Name | Contents | | | | | | | | | | | | | |
|-----------|--|---|-----------|---------------------|--------------------------------|---|---|-------------------|---|-------------------|---|---|-------------------|---|-------------------|
| 12 | Gear Ratio Setting m (Motor Shaft Rotation Speed) | (1) Assuming load shaft rotates ℓ times when motor shaft rotates m times according to applicable machine specifications by parameter to set gear ratio, the following values are set: <ul style="list-style-type: none"> • (Parameter 12) = m • (Parameter 13) = ℓ | | | | | | | | | | | | | |
| 13 | Gear Ratio Setting ℓ (Load Shaft Rotation Speed) | <p>(2) Parameter 12 or 13 unit is (rotation) and the setting range is 1 to 10000000.</p> <p>(3) By parameters 8 and 11 to 13, reference data and encoder pulse conversion can be possible.</p> <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;"> $\frac{B}{A} = \frac{(\text{PARAMETER } 8) \times (\text{PARAMETER } 12)}{(\text{PARAMETER } 11) \times (\text{PARAMETER } 13)}$ </div> <p>However, the above indicates the number of encoder pulses per reference unit, having limiting conditions as follows:</p> <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;"> $0.01 \leq \frac{B}{A} \leq 100$ </div> <p>(You must reconsider the machine specifications to omit this condition.)</p> <p>(4) Precautions when $\frac{B}{A} < 1$</p> <p>Since the reference unit becomes smaller than the encoder pulse resolution, positioning accuracy becomes lower as $\frac{B}{A}$ value becomes smaller.</p> | | | | | | | | | | | | | |
| 14 | <p>Mode Setting</p> <hr/> <p>b0 Motor Rotating Direction Setting</p> | <p>By setting b4, b3, b2, b1 or b0 to "0" or "1", mode is set (b0 is LSB).</p> <p>Used when motor rotating direction for reference direction (\pm) is changed.</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Set Value</th> <th>Reference Direction</th> <th>Motor Shaft Rotating Direction</th> </tr> </thead> <tbody> <tr> <td rowspan="2">0</td> <td>+</td> <td>Forward direction</td> </tr> <tr> <td>-</td> <td>Reverse direction</td> </tr> <tr> <td rowspan="2">1</td> <td>+</td> <td>Reverse direction</td> </tr> <tr> <td>-</td> <td>Forward direction</td> </tr> </tbody> </table> | Set Value | Reference Direction | Motor Shaft Rotating Direction | 0 | + | Forward direction | - | Reverse direction | 1 | + | Reverse direction | - | Forward direction |
| Set Value | Reference Direction | Motor Shaft Rotating Direction | | | | | | | | | | | | | |
| 0 | + | Forward direction | | | | | | | | | | | | | |
| | - | Reverse direction | | | | | | | | | | | | | |
| 1 | + | Reverse direction | | | | | | | | | | | | | |
| | - | Forward direction | | | | | | | | | | | | | |

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8.3 PARAMETER FUNCTION DETAILS (Cont'd)

| No. | Name | Contents | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|--|--|---|---|--|--|--|--|-------------|-------|----------------------|--|---------------|-------|--------|----------------------------|-----------------------|----------------|----------------|-------------------|----------------|-------------------------------|------------------------------------|-------------------|-------------------|--------------|--------------|
| 14 | b1 Finite Positioning/ Infinite Positioning Mode Setting | Set according to machine specification. | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | <table border="1"> <tr> <td>Finite Positioning Mode (Set Value = 0)</td> <td>Used for configuration with a moving limit. (Software overtravel function provided.)</td> </tr> <tr> <td>Infinite Positioning Mode (Set Value = 1)</td> <td>Used for configuration without moving limit (such as round table or press feeder one direction feeding). (Position reference fault detection provided.)</td> </tr> </table> | Finite Positioning Mode (Set Value = 0) | Used for configuration with a moving limit. (Software overtravel function provided.) | Infinite Positioning Mode (Set Value = 1) | Used for configuration without moving limit (such as round table or press feeder one direction feeding). (Position reference fault detection provided.) | | | | | | | | | | | | | | | | | | | | | |
| | | Finite Positioning Mode (Set Value = 0) | Used for configuration with a moving limit. (Software overtravel function provided.) | | | | | | | | | | | | | | | | | | | | | | | | |
| Infinite Positioning Mode (Set Value = 1) | Used for configuration without moving limit (such as round table or press feeder one direction feeding). (Position reference fault detection provided.) | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 14 | b2 Linear Type/Rotation Type Mode Setting | Set according to the machine specifications (Load is of linear type or rotating type). Positioning range is as shown below by mode. | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | <table border="1"> <tr> <td>Linear (b2=0)</td> <td>-99999999 ~ +99999999</td> </tr> <tr> <td>Rotation (b2=1)</td> <td>Positioning range is 0 to (parameter (11) set value - 1) regardless of rotating amount. (Range for one rotation)</td> </tr> </table> | Linear (b2=0) | -99999999 ~ +99999999 | Rotation (b2=1) | Positioning range is 0 to (parameter (11) set value - 1) regardless of rotating amount. (Range for one rotation) | | | | | | | | | | | | | | | | | | | | | |
| Linear (b2=0) | -99999999 ~ +99999999 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Rotation (b2=1) | Positioning range is 0 to (parameter (11) set value - 1) regardless of rotating amount. (Range for one rotation) | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 14 | b3 Position Reference Mode | <p>Determines whether position data is of absolute value or incremental value. When reference data value is x, the aimed position after start command (\overline{AST} signal or serial command \boxed{ST}) will be as shown below:</p> <table border="1"> <thead> <tr> <th rowspan="3">Position Reference Mode</th> <th colspan="5">Position Reference Method (by Parameter 15 Setting)</th> </tr> <tr> <th rowspan="2">Station No.</th> <th rowspan="2">DG-SW</th> <th colspan="2">Serial Communication</th> <th rowspan="2">Command table</th> </tr> <tr> <th>MOV x</th> <th>MOVI x</th> </tr> </thead> <tbody> <tr> <td>Absolute value (b3 = 0)</td> <td>x = Target station No</td> <td>Absolute value</td> <td>Absolute value</td> <td>Incremental value</td> <td>Absolute value</td> </tr> <tr> <td>Incremental value (b3 = 1)</td> <td>x = Number of stations to be moved</td> <td>Incremental value</td> <td>Incremental value</td> <td>(Do not use)</td> <td>(Do not use)</td> </tr> </tbody> </table> | Position Reference Mode | Position Reference Method (by Parameter 15 Setting) | | | | | Station No. | DG-SW | Serial Communication | | Command table | MOV x | MOVI x | Absolute value (b3 = 0) | x = Target station No | Absolute value | Absolute value | Incremental value | Absolute value | Incremental value (b3 = 1) | x = Number of stations to be moved | Incremental value | Incremental value | (Do not use) | (Do not use) |
| Position Reference Mode | Position Reference Method (by Parameter 15 Setting) | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Station No. | DG-SW | | Serial Communication | | Command table | | | | | | | | | | | | | | | | | | | | | |
| | | | MOV x | MOVI x | | | | | | | | | | | | | | | | | | | | | | | |
| Absolute value (b3 = 0) | x = Target station No | Absolute value | Absolute value | Incremental value | Absolute value | | | | | | | | | | | | | | | | | | | | | | |
| Incremental value (b3 = 1) | x = Number of stations to be moved | Incremental value | Incremental value | (Do not use) | (Do not use) | | | | | | | | | | | | | | | | | | | | | | |

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| No. | Name | Contents | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------------|----------------------------|---|--------------|-----|-----|-----|-----|-----|-----|-----|------|------|-----|------|------|------------|---|---|---|---|----|----|----|----|-----|-----|-----|-----|---------------|---|---|---|---|----|----|----|-----|-----|-----|------|------|
| 14 | b4 Position Reference Code | <p>Position data code (BCD or binary) is selected. (1) Station No. reference method</p> <table border="1" style="width: 100%; text-align: center;"> <tr> <td>Input Signal</td> <td>CD0</td><td>CD1</td><td>CD2</td><td>CD3</td><td>CD4</td><td>CD5</td><td>CD6</td><td>CD7</td><td>CD8</td><td>CD9</td><td>CD10</td><td>CD11</td> </tr> <tr> <td>BCD (b4=1)</td> <td>1</td><td>2</td><td>4</td><td>8</td><td>10</td><td>20</td><td>40</td><td>80</td><td>100</td><td>200</td><td>400</td><td>800</td> </tr> <tr> <td>Binary (b4=0)</td> <td>1</td><td>2</td><td>4</td><td>8</td><td>16</td><td>32</td><td>64</td><td>128</td><td>256</td><td>512</td><td>1024</td><td>2048</td> </tr> </table> <p>(2) Set BCD (b4 = 1) for DG-SW reference method (3) Set binary setting (b4 = 0) for command table method.</p> | Input Signal | CD0 | CD1 | CD2 | CD3 | CD4 | CD5 | CD6 | CD7 | CD8 | CD9 | CD10 | CD11 | BCD (b4=1) | 1 | 2 | 4 | 8 | 10 | 20 | 40 | 80 | 100 | 200 | 400 | 800 | Binary (b4=0) | 1 | 2 | 4 | 8 | 16 | 32 | 64 | 128 | 256 | 512 | 1024 | 2048 |
| Input Signal | CD0 | CD1 | CD2 | CD3 | CD4 | CD5 | CD6 | CD7 | CD8 | CD9 | CD10 | CD11 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BCD (b4=1) | 1 | 2 | 4 | 8 | 10 | 20 | 40 | 80 | 100 | 200 | 400 | 800 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Binary (b4=0) | 1 | 2 | 4 | 8 | 16 | 32 | 64 | 128 | 256 | 512 | 1024 | 2048 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| 15 | Position Reference Method | <p>Applicable position data reference method is set.</p> <table border="1" style="width: 100%; text-align: center;"> <thead> <tr> <th>Set Value</th> <th>Position Data Reference Method</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>Station No.</td> </tr> <tr> <td>1</td> <td>DG-SW</td> </tr> <tr> <td>2</td> <td>Serial Communication</td> </tr> <tr> <td>4</td> <td>Command Table</td> </tr> </tbody> </table> | Set Value | Position Data Reference Method | 0 | Station No. | 1 | DG-SW | 2 | Serial Communication | 4 | Command Table |
|-----------|--------------------------------|--|-----------|--------------------------------|---|-------------|---|-------|---|----------------------|---|---------------|
| Set Value | Position Data Reference Method | | | | | | | | | | | |
| 0 | Station No. | | | | | | | | | | | |
| 1 | DG-SW | | | | | | | | | | | |
| 2 | Serial Communication | | | | | | | | | | | |
| 4 | Command Table | | | | | | | | | | | |

| | Reference Method and Outline | Reference Input | Remarks |
|----------------------|---|-----------------|---------|
| Station No. | Positioning to a station No. provided by parallel contact data (12-bit). Rotating direction is determined by direction select signal. | | |
| DG-SW | Position reference by DG-SW (up to 8 digits) setting data. | | |
| Serial Communication | Position reference command. Data are set by MOV or MOV1. | | |
| Command Table | Positioning at position No. specified by parallel contact data (6-bit). | | |

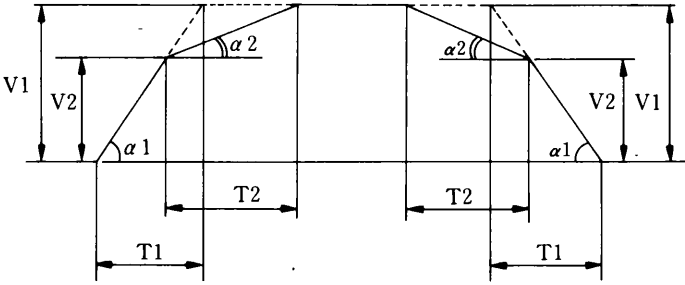
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8.3 PARAMETER FUNCTION DETAILS (Cont'd)

| No. | Name | Contents | | | | | | | | | | | | | | | | | | | | | | |
|---------------|--------------------------------|---|-------------------------|-------------------------|----------------------------------|-----------------------|--|-------------------------|-------------------------|----|---------------------|---|---|---|----|-------------------------------|---|---|---|----|--------------------------------|---|---|---|
| 16 | Number of Stations | <p>Parameter to set the number of stations when the station No. reference method is selected. Setting range: 1 to 4096.</p> <p>By setting the number of stations N, N stations divided equally on the load shaft circumference are determined.</p> <p>Whether the station No. is taken from 0 or 1 is set by parameter 20 b2.</p> | | | | | | | | | | | | | | | | | | | | | | |
| 17 | Function Selection 1 | <p>By setting (b4, b3, b2, b1, b0) to "0" or "1", each function can be selected.</p> | | | | | | | | | | | | | | | | | | | | | | |
| | b0 Current Limit | <p>b0 = 1 when current limit value setting parameter 34, 35 or 36 function is to be effective. b0 = 0 when ineffective.</p> <p>The table below shows effective current limit values marked with ○ when b0 = 1.</p> <table border="1"> <thead> <tr> <th rowspan="2">Parameter No.</th> <th rowspan="2">Parameter Name</th> <th rowspan="2">CUR Signal Not Turned ON (CUR-H)</th> <th colspan="2">CUR Signal ON (CUR-L)</th> </tr> <tr> <th>+Side Limit Value (CLP)</th> <th>-Side Limit Value (CLN)</th> </tr> </thead> <tbody> <tr> <td>34</td> <td>Current Limit Value</td> <td>○</td> <td>○</td> <td>○</td> </tr> <tr> <td>35</td> <td>Plus Side Current Limit Value</td> <td>×</td> <td>○</td> <td>×</td> </tr> <tr> <td>36</td> <td>Minus Side Current Limit Value</td> <td>×</td> <td>×</td> <td>○</td> </tr> </tbody> </table> <p>(The figures below show observed waveform in monitor output.)</p> <p>Note: Motor's maximum current limit value is effective when parameter set value is larger than motor's maximum current limit value. Motor's maximum current limit value is determined by parameter 7 motor code.</p> | Parameter No. | Parameter Name | CUR Signal Not Turned ON (CUR-H) | CUR Signal ON (CUR-L) | | +Side Limit Value (CLP) | -Side Limit Value (CLN) | 34 | Current Limit Value | ○ | ○ | ○ | 35 | Plus Side Current Limit Value | × | ○ | × | 36 | Minus Side Current Limit Value | × | × | ○ |
| Parameter No. | Parameter Name | CUR Signal Not Turned ON (CUR-H) | | | | CUR Signal ON (CUR-L) | | | | | | | | | | | | | | | | | | |
| | | | +Side Limit Value (CLP) | -Side Limit Value (CLN) | | | | | | | | | | | | | | | | | | | | |
| 34 | Current Limit Value | ○ | ○ | ○ | | | | | | | | | | | | | | | | | | | | |
| 35 | Plus Side Current Limit Value | × | ○ | × | | | | | | | | | | | | | | | | | | | | |
| 36 | Minus Side Current Limit Value | × | × | ○ | | | | | | | | | | | | | | | | | | | | |
| | b1 Feed forward Compensation | <ul style="list-style-type: none"> • By setting b1 = 1, feedforward compensation functions and compensated amount (0 to 100%) set in parameter 37 becomes effective. • When b1 = 0, the feedforward compensation is ineffective. (Parameter 37 set value is ineffective.) | | | | | | | | | | | | | | | | | | | | | | |

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| No. | Name | Contents | | | | | | | | | | | | | | | | | | | | | | |
|-----------------------|--|--|--------------------|--------------------|--------------------------------|--|-----------------------|--------------------|--------------------|---|--|----|---|--------|---|---|---|---|---|--------|----|----|----|----|
| 17 | b2 2-step Accel/Decel | <p>1-step or 2-step accel/decel is selected.</p> <table border="1"> <thead> <tr> <th rowspan="2">b2 Set Value</th> <th rowspan="2">Accel/Decel Type</th> <th colspan="4">Accel/Decel Setting Parameters</th> </tr> <tr> <th>4</th> <th>5</th> <th>38</th> <th>39</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>1-step</td> <td>V</td> <td>T</td> <td>—</td> <td>—</td> </tr> <tr> <td>1</td> <td>2-step</td> <td>V1</td> <td>T1</td> <td>V2</td> <td>T2</td> </tr> </tbody> </table> <p>• 2-step accel/decel type speed setting</p>  <p>Accel/decel speed $\alpha 1$ or $\alpha 2$ is determined by $V1/T1$ or $(V1-V2)/T2$. It is constant even if feeding speed changes.</p> | b2 Set Value | Accel/Decel Type | Accel/Decel Setting Parameters | | | | 4 | 5 | 38 | 39 | 0 | 1-step | V | T | — | — | 1 | 2-step | V1 | T1 | V2 | T2 |
| b2 Set Value | Accel/Decel Type | Accel/Decel Setting Parameters | | | | | | | | | | | | | | | | | | | | | | |
| | | 4 | 5 | 38 | 39 | | | | | | | | | | | | | | | | | | | |
| 0 | 1-step | V | T | — | — | | | | | | | | | | | | | | | | | | | |
| 1 | 2-step | V1 | T1 | V2 | T2 | | | | | | | | | | | | | | | | | | | |
| b3 | Speed Limit | <p>By setting b3 = 1, parameter 46 speed limit value becomes effective.</p> <table border="1"> <thead> <tr> <th>b3 Set Value</th> <th>Speed Limit Value</th> </tr> </thead> <tbody> <tr> <td>0</td> <td> <p>Max. r/min in motor specifications. (Determined by parameter 7.)</p> <p>*1 1500r/min for type USAMED-44L <input type="checkbox"/> 2</p> <table border="1"> <tr> <td>M Series 2000r/min *1</td> </tr> <tr> <td>F Series 2500r/min</td> </tr> <tr> <td>G Series 3000r/min</td> </tr> </table> </td> </tr> <tr> <td>1</td> <td>Smaller value (parameter 46 set value or the above motor max. speed)</td> </tr> </tbody> </table> | b3 Set Value | Speed Limit Value | 0 | <p>Max. r/min in motor specifications. (Determined by parameter 7.)</p> <p>*1 1500r/min for type USAMED-44L <input type="checkbox"/> 2</p> <table border="1"> <tr> <td>M Series 2000r/min *1</td> </tr> <tr> <td>F Series 2500r/min</td> </tr> <tr> <td>G Series 3000r/min</td> </tr> </table> | M Series 2000r/min *1 | F Series 2500r/min | G Series 3000r/min | 1 | Smaller value (parameter 46 set value or the above motor max. speed) | | | | | | | | | | | | | |
| b3 Set Value | Speed Limit Value | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | <p>Max. r/min in motor specifications. (Determined by parameter 7.)</p> <p>*1 1500r/min for type USAMED-44L <input type="checkbox"/> 2</p> <table border="1"> <tr> <td>M Series 2000r/min *1</td> </tr> <tr> <td>F Series 2500r/min</td> </tr> <tr> <td>G Series 3000r/min</td> </tr> </table> | M Series 2000r/min *1 | F Series 2500r/min | G Series 3000r/min | | | | | | | | | | | | | | | | | | | | |
| M Series 2000r/min *1 | | | | | | | | | | | | | | | | | | | | | | | | |
| F Series 2500r/min | | | | | | | | | | | | | | | | | | | | | | | | |
| G Series 3000r/min | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | Smaller value (parameter 46 set value or the above motor max. speed) | | | | | | | | | | | | | | | | | | | | | | | |

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8.3 PARAMETER FUNCTION DETAILS (Cont'd)

| No. | Name | Contents | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|--|---|-------------------------|--|-------------------------|--|-----------|--|---|----|---------------|----------------|--|-------------------------|---------------|-----------|---|----|----------------------------|--------|---|---|----|---------------|---|---|----|----------------------------|---|---|--|--|--|
| 17 | b4 Accel/Decel Type Setting | <p>Accel/decel type (linear or exponent) is specified by b4 setting.</p> <p style="text-align: center;">< Setting Method ></p> <table border="1" style="width: 100%;"> <thead> <tr> <th>b4 Set Value</th> <th>Accel/decel Type</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>1-step or 2-step linear accel/decel and simplified S-curve accel/decel. (Always linear type regardless of operation mode.)</td> </tr> <tr> <td>1</td> <td>Set the following parameters according to the accel/decel type in each operation mode:</td> </tr> <tr> <td colspan="2" style="text-align: center;"> <table border="1" style="width: 100%;"> <thead> <tr> <th>Parameter No.</th> <th>Operation Mode</th> <th>Linear Accel/Decel or Simplified S-Curve Accel/Decel</th> <th>Exponential Accel/Decel</th> </tr> </thead> <tbody> <tr> <td>68</td> <td>Automatic</td> <td>1</td> <td>0</td> </tr> <tr> <td>69</td> <td>Manual</td> <td>1</td> <td>0</td> </tr> <tr> <td>70</td> <td>Pulse command</td> <td>1</td> <td>0</td> </tr> <tr> <td>71</td> <td>Zero-point return (homing)</td> <td>1</td> <td>0</td> </tr> </tbody> </table> </td> </tr> <tr> <td colspan="2"></td> <td>Note: Refer to parameters 47 and 48 for exponential accel/decel setting.</td> </tr> </tbody> </table> | b4 Set Value | Accel/decel Type | 0 | 1-step or 2-step linear accel/decel and simplified S-curve accel/decel. (Always linear type regardless of operation mode.) | 1 | Set the following parameters according to the accel/decel type in each operation mode: | <table border="1" style="width: 100%;"> <thead> <tr> <th>Parameter No.</th> <th>Operation Mode</th> <th>Linear Accel/Decel or Simplified S-Curve Accel/Decel</th> <th>Exponential Accel/Decel</th> </tr> </thead> <tbody> <tr> <td>68</td> <td>Automatic</td> <td>1</td> <td>0</td> </tr> <tr> <td>69</td> <td>Manual</td> <td>1</td> <td>0</td> </tr> <tr> <td>70</td> <td>Pulse command</td> <td>1</td> <td>0</td> </tr> <tr> <td>71</td> <td>Zero-point return (homing)</td> <td>1</td> <td>0</td> </tr> </tbody> </table> | | Parameter No. | Operation Mode | Linear Accel/Decel or Simplified S-Curve Accel/Decel | Exponential Accel/Decel | 68 | Automatic | 1 | 0 | 69 | Manual | 1 | 0 | 70 | Pulse command | 1 | 0 | 71 | Zero-point return (homing) | 1 | 0 | | | Note: Refer to parameters 47 and 48 for exponential accel/decel setting. |
| b4 Set Value | Accel/decel Type | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | 1-step or 2-step linear accel/decel and simplified S-curve accel/decel. (Always linear type regardless of operation mode.) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | Set the following parameters according to the accel/decel type in each operation mode: | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table border="1" style="width: 100%;"> <thead> <tr> <th>Parameter No.</th> <th>Operation Mode</th> <th>Linear Accel/Decel or Simplified S-Curve Accel/Decel</th> <th>Exponential Accel/Decel</th> </tr> </thead> <tbody> <tr> <td>68</td> <td>Automatic</td> <td>1</td> <td>0</td> </tr> <tr> <td>69</td> <td>Manual</td> <td>1</td> <td>0</td> </tr> <tr> <td>70</td> <td>Pulse command</td> <td>1</td> <td>0</td> </tr> <tr> <td>71</td> <td>Zero-point return (homing)</td> <td>1</td> <td>0</td> </tr> </tbody> </table> | | Parameter No. | Operation Mode | Linear Accel/Decel or Simplified S-Curve Accel/Decel | Exponential Accel/Decel | 68 | Automatic | 1 | 0 | 69 | Manual | 1 | 0 | 70 | Pulse command | 1 | 0 | 71 | Zero-point return (homing) | 1 | 0 | | | | | | | | | | | | |
| Parameter No. | Operation Mode | Linear Accel/Decel or Simplified S-Curve Accel/Decel | Exponential Accel/Decel | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 68 | Automatic | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 69 | Manual | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 70 | Pulse command | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 71 | Zero-point return (homing) | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Note: Refer to parameters 47 and 48 for exponential accel/decel setting. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

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| No. | Name | Contents | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------------|--|--|------------------------------------|-----------|---------|--------------------|----|--------|-------------------------|---------------------|--------|---------------------------|------------------------------------|--------------|----------------------------------|--|-----------------|------------------|---|-----------|-----------|---|--------------------------|--------------------------|--------------|--|--|-----------|------------|---|-----------|-----------|---|--------------------------|--------------------------|----------------|---------------------|-----------|---|--------|--|-------|------------------------|---|-----------|--|--------|----------------------------------|--------|---|-------|
| 18 | Function Selection 2 | By setting (b4, b3, b2, b1, b0) to "0" or "1", each function can be selected. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| b0 | Software overtravel (Position Reference Fault Detection) | <p>(1) Software overtravel function is effective in finite positioning mode while position reference fault detection function is effective in infinite positioning mode.</p> <table border="1"> <thead> <tr> <th>Parameter No.</th> <th>Set Value</th> <th>Remarks</th> <th>Effective Function</th> </tr> </thead> <tbody> <tr> <td rowspan="2">14</td> <td>b1 = 0</td> <td>Finite positioning mode</td> <td>Software overtravel</td> </tr> <tr> <td>b1 = 1</td> <td>Infinite positioning mode</td> <td>Position reference fault detection</td> </tr> </tbody> </table> <p>(2)</p> <table border="1"> <thead> <tr> <th rowspan="2">b0 Set Value</th> <th colspan="2">Software Overtravel Set Position</th> </tr> <tr> <th>Plus Side (+LS)</th> <th>Minus Side (-LS)</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>+99999999</td> <td>-99999999</td> </tr> <tr> <td>1</td> <td>(Parameter 40) set value</td> <td>(Parameter 41) set value</td> </tr> </tbody> </table> <p>Note: When incremental encoder is used (Parameter 9 = 1), software overtravel becomes effective after zero-point return (homing).</p> <p>(3)</p> <table border="1"> <thead> <tr> <th rowspan="2">b0 Set Value</th> <th colspan="2">Position Reference Range (Limit Value)</th> </tr> <tr> <th>Plus Side</th> <th>Minus Side</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>+99999999</td> <td>-99999999</td> </tr> <tr> <td>1</td> <td>(Parameter 40) set value</td> <td>(Parameter 41) set value</td> </tr> </tbody> </table> <p>(4) Finite positioning mode By software overtravel detection, operation is prohibited and • Error signal ERR is output. • [ERR OV] is automatically sent from Servopack in serial communication. (For only one-axis)</p> <p>Detecting operation differs as follows depending on operation mode.</p> <table border="1"> <thead> <tr> <th>Operation Mode</th> <th>Detecting Operation</th> </tr> </thead> <tbody> <tr> <td>Automatic</td> <td>When position data exceed software overtravel set value, detection is performed at turning on start signal AST or command [ST].</td> </tr> <tr> <td>Manual</td> <td rowspan="2">When software overtravel set position is passed during operation, the operation stops at the position at a specified deceleration.</td> </tr> <tr> <td>Pulse</td> </tr> <tr> <td>Non-current conduction</td> <td>Detects when present position is out of software overtravel set position.</td> </tr> </tbody> </table> <p>(5) Infinite positioning mode When position reference value is out of the following range in the automatic operation mode, position reference fault error (alarm code output AL0 = 0, AL1 = 0, AL2 = 1, AL3 = 0) occurs. (Parameter 41) set value \leq position reference value \leq (Parameter 40) set value (Example) Parameter 14 b1 = 1: Infinite positioning mode b3 = 1: Incremental reference Parameter 15 = 1 : DG-SW reference method Parameter 18 b0 = 1: Parameters 40 and 41 are effective. Parameter 40 = 5000 Parameter 41 = 0</p> <p>When the parameters are set as shown above, by setting the digital switch to the following values and inputting the start signal:</p> <table> <tr> <td>Set value</td> <td></td> </tr> <tr> <td>+48000</td> <td>: Move to the plus side by 48000</td> </tr> <tr> <td>+52000</td> <td rowspan="2">: Does not start because of position reference fault.</td> </tr> <tr> <td>-2000</td> </tr> </table> | Parameter No. | Set Value | Remarks | Effective Function | 14 | b1 = 0 | Finite positioning mode | Software overtravel | b1 = 1 | Infinite positioning mode | Position reference fault detection | b0 Set Value | Software Overtravel Set Position | | Plus Side (+LS) | Minus Side (-LS) | 0 | +99999999 | -99999999 | 1 | (Parameter 40) set value | (Parameter 41) set value | b0 Set Value | Position Reference Range (Limit Value) | | Plus Side | Minus Side | 0 | +99999999 | -99999999 | 1 | (Parameter 40) set value | (Parameter 41) set value | Operation Mode | Detecting Operation | Automatic | When position data exceed software overtravel set value, detection is performed at turning on start signal AST or command [ST]. | Manual | When software overtravel set position is passed during operation, the operation stops at the position at a specified deceleration. | Pulse | Non-current conduction | Detects when present position is out of software overtravel set position. | Set value | | +48000 | : Move to the plus side by 48000 | +52000 | : Does not start because of position reference fault. | -2000 |
| Parameter No. | Set Value | Remarks | Effective Function | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 14 | b1 = 0 | Finite positioning mode | Software overtravel | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | b1 = 1 | Infinite positioning mode | Position reference fault detection | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| b0 Set Value | Software Overtravel Set Position | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Plus Side (+LS) | Minus Side (-LS) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | +99999999 | -99999999 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | (Parameter 40) set value | (Parameter 41) set value | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| b0 Set Value | Position Reference Range (Limit Value) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Plus Side | Minus Side | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | +99999999 | -99999999 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | (Parameter 40) set value | (Parameter 41) set value | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Operation Mode | Detecting Operation | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Automatic | When position data exceed software overtravel set value, detection is performed at turning on start signal AST or command [ST]. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Manual | When software overtravel set position is passed during operation, the operation stops at the position at a specified deceleration. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Pulse | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Non-current conduction | Detects when present position is out of software overtravel set position. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Set value | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| +48000 | : Move to the plus side by 48000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| +52000 | : Does not start because of position reference fault. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| -2000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

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8.3 PARAMETER FUNCTION DETAILS (Cont'd)

| No. | Name | Contents | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------------|---|--|-------------------------|--|--------------|--------------|------------------------|--|---|----------------------------------|---|-------|-------------|----------------|----------------------|---------------|---|-----------------------------------|-------|-------------------------|-------------|---|---|--|--|--|--|---|--|--|--|--------------|-----------|------------------------|----|---|----------------------------------|---|-------|---|----------------|---|-------------|
| 18 | b1 Backlash Compensation | <p>Sets whether backlash compensation function is provided or not</p> <table border="1"> <thead> <tr> <th>b1 Set Value</th> <th>Backlash Compensation</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>Not provided</td> </tr> <tr> <td>1</td> <td>Compensated amount is (parameter 42) set value</td> </tr> </tbody> </table> | b1 Set Value | Backlash Compensation | 0 | Not provided | 1 | Compensated amount is (parameter 42) set value | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| b1 Set Value | Backlash Compensation | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | Not provided | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | Compensated amount is (parameter 42) set value | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | b2 Speed Reference in Auto Operation Mode | <p>Selects speed reference setter in automatic operation mode.</p> <table border="1"> <thead> <tr> <th rowspan="2">b2 Set Value</th> <th colspan="4">Parameter 15 Setting (Position Reference Method)</th> </tr> <tr> <th>0</th> <th>1</th> <th>2</th> <th>4</th> </tr> </thead> <tbody> <tr> <td></td> <td>Station No.</td> <td>DG-SW</td> <td>Serial Communication</td> <td>Command table</td> </tr> <tr> <td>0</td> <td>Selected by parameter at contact.</td> <td>DG-SW</td> <td>Serial command (SPD×××)</td> <td>Speed table</td> </tr> <tr> <td>1</td> <td colspan="4">Speed reference setter can be selected regardless of position reference method.</td> </tr> <tr> <td></td> <td colspan="4"> <table border="1"> <thead> <tr> <th>Parameter No</th> <th>Set Value</th> <th>Speed Reference Setter</th> </tr> </thead> <tbody> <tr> <td rowspan="4">61</td> <td>0</td> <td>Selected by parameter at contact</td> </tr> <tr> <td>1</td> <td>DG-SW</td> </tr> <tr> <td>2</td> <td>Serial command</td> </tr> <tr> <td>4</td> <td>Speed table</td> </tr> </tbody> </table> </td> </tr> </tbody> </table> <p>Note. "Selected by parameter at contact" means to select parameter setting (1st speed) to (4th speed) by speed select signals SP2ND and SP3RD. Refer to the description of parameter 4.</p> | b2 Set Value | Parameter 15 Setting (Position Reference Method) | | | | 0 | 1 | 2 | 4 | | Station No. | DG-SW | Serial Communication | Command table | 0 | Selected by parameter at contact. | DG-SW | Serial command (SPD×××) | Speed table | 1 | Speed reference setter can be selected regardless of position reference method. | | | | | <table border="1"> <thead> <tr> <th>Parameter No</th> <th>Set Value</th> <th>Speed Reference Setter</th> </tr> </thead> <tbody> <tr> <td rowspan="4">61</td> <td>0</td> <td>Selected by parameter at contact</td> </tr> <tr> <td>1</td> <td>DG-SW</td> </tr> <tr> <td>2</td> <td>Serial command</td> </tr> <tr> <td>4</td> <td>Speed table</td> </tr> </tbody> </table> | | | | Parameter No | Set Value | Speed Reference Setter | 61 | 0 | Selected by parameter at contact | 1 | DG-SW | 2 | Serial command | 4 | Speed table |
| b2 Set Value | Parameter 15 Setting (Position Reference Method) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 0 | 1 | 2 | 4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Station No. | DG-SW | Serial Communication | Command table | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | Selected by parameter at contact. | DG-SW | Serial command (SPD×××) | Speed table | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | Speed reference setter can be selected regardless of position reference method. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | <table border="1"> <thead> <tr> <th>Parameter No</th> <th>Set Value</th> <th>Speed Reference Setter</th> </tr> </thead> <tbody> <tr> <td rowspan="4">61</td> <td>0</td> <td>Selected by parameter at contact</td> </tr> <tr> <td>1</td> <td>DG-SW</td> </tr> <tr> <td>2</td> <td>Serial command</td> </tr> <tr> <td>4</td> <td>Speed table</td> </tr> </tbody> </table> | | | | Parameter No | Set Value | Speed Reference Setter | 61 | 0 | Selected by parameter at contact | 1 | DG-SW | 2 | Serial command | 4 | Speed table | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Parameter No | Set Value | Speed Reference Setter | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 61 | 0 | Selected by parameter at contact | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 1 | DG-SW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 2 | Serial command | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 4 | Speed table | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

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| No. | Name | Contents | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------------|---|--|-------------------------|--|---|---|---|---|---|---|---|--|------------|-------|----------------------|---------------|---|-----------------------------------|-------|-------------------------|-------------|--------------|-----------|------------------------|----|---|----------------------------------|---|-------|---|----------------|---|-------------|
| 18 | b3 Speed Reference in Manual Operation Mode | <p>Selects speed reference setter in manual operation mode.</p> <table border="1"> <thead> <tr> <th rowspan="2">b3 Set Value</th> <th colspan="4">Parameter 15 setting (Position Reference Method)</th> </tr> <tr> <th>0</th> <th>1</th> <th>2</th> <th>4</th> </tr> </thead> <tbody> <tr> <td></td> <td>Station No</td> <td>DG-SW</td> <td>Serial Communication</td> <td>Command table</td> </tr> <tr> <td>0</td> <td>Selected by parameter at contact.</td> <td>DG-SW</td> <td>Serial command (SPD×××)</td> <td>Speed table</td> </tr> </tbody> </table> <p>1 Speed reference setter can be selected regardless of position reference method.</p> <table border="1"> <thead> <tr> <th>Parameter No</th> <th>Set Value</th> <th>Speed Reference Setter</th> </tr> </thead> <tbody> <tr> <td rowspan="4">62</td> <td>0</td> <td>Selected by parameter at contact</td> </tr> <tr> <td>1</td> <td>DG-SW</td> </tr> <tr> <td>2</td> <td>Serial command</td> </tr> <tr> <td>4</td> <td>Speed table</td> </tr> </tbody> </table> <p>Note: "Selected by parameter at contact" means to select parameter setting (1st speed) to (4th speed) by speed select signals SP2ND and SP3RD. Refer to the description of parameter 4</p> | b3 Set Value | Parameter 15 setting (Position Reference Method) | | | | 0 | 1 | 2 | 4 | | Station No | DG-SW | Serial Communication | Command table | 0 | Selected by parameter at contact. | DG-SW | Serial command (SPD×××) | Speed table | Parameter No | Set Value | Speed Reference Setter | 62 | 0 | Selected by parameter at contact | 1 | DG-SW | 2 | Serial command | 4 | Speed table |
| b3 Set Value | Parameter 15 setting (Position Reference Method) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 0 | 1 | 2 | 4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Station No | DG-SW | Serial Communication | Command table | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | Selected by parameter at contact. | DG-SW | Serial command (SPD×××) | Speed table | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Parameter No | Set Value | Speed Reference Setter | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 62 | 0 | Selected by parameter at contact | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 1 | DG-SW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 2 | Serial command | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 4 | Speed table | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | b4 Zero-point Return (Homing) | <p>Set b4 = 1 so that parameters 49 to 54 required for operation in zero-point return mode (refer to Par. 6.2 3 (1) (d)) will be effective.</p> <table border="1"> <thead> <tr> <th>b4 Set Value</th> <th>Operation in Zero-point Return Mode</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>Not : Parameters 49 to 54 setting are ineffective</td> </tr> <tr> <td>1</td> <td>Perform : Parameters 49 to 54 setting are effective</td> </tr> </tbody> </table> | b4 Set Value | Operation in Zero-point Return Mode | 0 | Not : Parameters 49 to 54 setting are ineffective | 1 | Perform : Parameters 49 to 54 setting are effective | | | | | | | | | | | | | | | | | | | | | | | | | |
| b4 Set Value | Operation in Zero-point Return Mode | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | Not : Parameters 49 to 54 setting are ineffective | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | Perform : Parameters 49 to 54 setting are effective | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 19 | Function Selection 3 | <p>By setting (b7, b6, b4, b3, b2, b1, b0) to "0" or "1", each function can be selected</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | b0 OT Signal | <p>Enables or disables overtravel LS input signal P-OT or N-OT.</p> <table border="1"> <thead> <tr> <th>b0 Set Value</th> <th>P-OT or N-OT Signal</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>Used (Closed input at normal operation)</td> </tr> <tr> <td>1</td> <td>Not used (Input can be opened.)</td> </tr> </tbody> </table> | b0 Set Value | P-OT or N-OT Signal | 0 | Used (Closed input at normal operation) | 1 | Not used (Input can be opened.) | | | | | | | | | | | | | | | | | | | | | | | | | |
| b0 Set Value | P-OT or N-OT Signal | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | Used (Closed input at normal operation) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | Not used (Input can be opened.) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

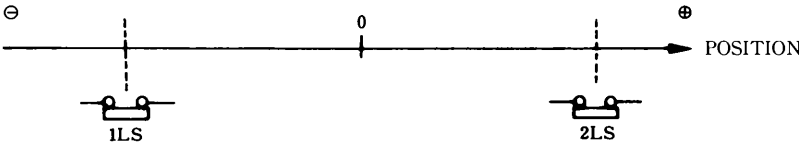
(Cont'd)

8.3 PARAMETER FUNCTION DETAILS (Cont'd)

| No. | Name | Contents | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|---|---|------------------------|---------------------|--|-----------------------------------|--|---------------------------------|-------|---------------------|----------------------|--|----|---|---|--------|--|----|---|---|----|---|---|--------------------|---|---|----|--|--|----|--|--|----------------------|---|---|----|--|--|----|--|--|
| 19 | b1 STOP Signal | <p>Enables or disables STOP signal operation. To perform automatic operation in serial communication, set b1 = 1. If STOP signal input (2CN-15) remains open, ST command becomes ERR SN</p> <table border="1"> <thead> <tr> <th>b1 Set Value</th> <th>STOP Signal</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>Used (Closed input at operation.)</td> </tr> <tr> <td>1</td> <td>Not used (Input can be opened.)</td> </tr> </tbody> </table> | b1 Set Value | STOP Signal | 0 | Used (Closed input at operation.) | 1 | Not used (Input can be opened.) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | b1 Set Value | STOP Signal | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 0 | Used (Closed input at operation.) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | Not used (Input can be opened.) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| b2 Brake Release Signal | <p>Set b2 = 1 so that parameter 43 and 44 required for brake release signal output \overline{BK} (refer to Par. 6.3.2 (2)) operation will be effective.</p> <table border="1"> <thead> <tr> <th>b2 Set Value</th> <th>\overline{BK} Signal</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>Not used (Parameters 43, and 44 setting are ineffective)</td> </tr> <tr> <td>1</td> <td>Used (Parameters 43, and 44 setting are effective)</td> </tr> </tbody> </table> | b2 Set Value | \overline{BK} Signal | 0 | Not used (Parameters 43, and 44 setting are ineffective) | 1 | Used (Parameters 43, and 44 setting are effective) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| b2 Set Value | \overline{BK} Signal | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | Not used (Parameters 43, and 44 setting are ineffective) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | Used (Parameters 43, and 44 setting are effective) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| b3 Pulse Reference Input | <p>Set together with parameter 63 according to input pulse signal form in pulse train operation mode.</p> <table border="1"> <thead> <tr> <th rowspan="2">Signal Form</th> <th colspan="2">Parameter No.</th> <th rowspan="2">Signal Name</th> <th colspan="2">Pulse Waveform</th> </tr> <tr> <th>63</th> <th>19 b3</th> <th>Plus Side Reference</th> <th>Minus Side Reference</th> </tr> </thead> <tbody> <tr> <td rowspan="3">90° phase difference 2-phase pulse train</td> <td>×4</td> <td>0</td> <td>0</td> <td rowspan="3"> CA </td> <td rowspan="3"> </td> </tr> <tr> <td>×2</td> <td>1</td> <td>1</td> </tr> <tr> <td>×1</td> <td>2</td> <td>2</td> </tr> <tr> <td rowspan="2">Sign + pulse train</td> <td rowspan="2">3</td> <td rowspan="2">1</td> <td>CA</td> <td> </td> <td> </td> </tr> <tr> <td>CB</td> <td> </td> <td> </td> </tr> <tr> <td rowspan="2">CCW + CW pulse train</td> <td rowspan="2">4</td> <td rowspan="2">1</td> <td>CA</td> <td> </td> <td> </td> </tr> <tr> <td>CB</td> <td> </td> <td> </td> </tr> </tbody> </table> | Signal Form | Parameter No. | | Signal Name | Pulse Waveform | | 63 | 19 b3 | Plus Side Reference | Minus Side Reference | 90° phase difference 2-phase pulse train | ×4 | 0 | 0 | CA | | ×2 | 1 | 1 | ×1 | 2 | 2 | Sign + pulse train | 3 | 1 | CA | | | CB | | | CCW + CW pulse train | 4 | 1 | CA | | | CB | | |
| Signal Form | Parameter No. | | Signal Name | Pulse Waveform | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 63 | 19 b3 | | Plus Side Reference | Minus Side Reference | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 90° phase difference 2-phase pulse train | ×4 | 0 | 0 | CA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | ×2 | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | ×1 | 2 | 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Sign + pulse train | 3 | 1 | CA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | CB | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CCW + CW pulse train | 4 | 1 | CA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | CB | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

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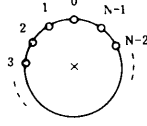
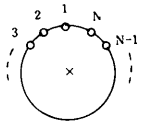
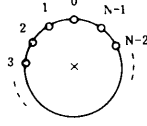
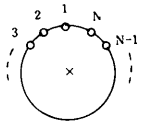
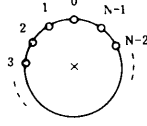
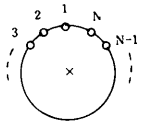
(Cont'd)

| No. | Name | Contents | | | | | | | | | |
|--------------|---|--|--------------|---------------------------------------|----------------|---|------|---|---|--------------|------|
| 19 | b4 Pulse Output | <p>PG dividing output signal (FA, FB) dividing ratio. (Refer to Fig. 5.12.)</p> <table border="1"> <thead> <tr> <th>b4 Set Value</th> <th>Parameter 64</th> <th>Dividing Ratio</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>—</td> <td>1</td> </tr> <tr> <td>1</td> <td>N(N=2 to 64)</td> <td>2/N</td> </tr> </tbody> </table> | b4 Set Value | Parameter 64 | Dividing Ratio | 0 | — | 1 | 1 | N(N=2 to 64) | 2/N |
| b4 Set Value | Parameter 64 | Dividing Ratio | | | | | | | | | |
| 0 | — | 1 | | | | | | | | | |
| 1 | N(N=2 to 64) | 2/N | | | | | | | | | |
| | b5 Positioning Near Signal and Station Near Signal | <p>For station near signal, refer to the description of parameter 65 b1. Set b5 = 1 so that (parameter 45) required for positioning near signal NEAR operation will be effective.</p> <table border="1"> <thead> <tr> <th>b5 Set Value</th> <th>Positioning Near Signal</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>Does not operate. (Parameter 45 setting is ineffective.)</td> </tr> <tr> <td>1</td> <td>When distance difference (reference unit) between current position and aimed position is less than the value set by parameter 45, NEAR signal is output. (In serial communication, NEAR is automatically sent.)</td> </tr> </tbody> </table> | b5 Set Value | Positioning Near Signal | 0 | Does not operate. (Parameter 45 setting is ineffective.) | 1 | When distance difference (reference unit) between current position and aimed position is less than the value set by parameter 45, NEAR signal is output. (In serial communication, NEAR is automatically sent.) | | | |
| b5 Set Value | Positioning Near Signal | | | | | | | | | | |
| 0 | Does not operate. (Parameter 45 setting is ineffective.) | | | | | | | | | | |
| 1 | When distance difference (reference unit) between current position and aimed position is less than the value set by parameter 45, NEAR signal is output. (In serial communication, NEAR is automatically sent.) | | | | | | | | | | |
| | b6 OT Signal Switching | <p>Function can be inverted without switching P-OT and N-OT signals.</p>  <table border="1"> <thead> <tr> <th>b6 Set Value</th> <th>1LS</th> <th>2LS</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>N-OT</td> <td>P-OT (Standard)</td> </tr> <tr> <td>1</td> <td>P-OT</td> <td>N-OT</td> </tr> </tbody> </table> <p>P-OT: Stops + direction reference N-OT: Stops - direction reference</p> | b6 Set Value | 1LS | 2LS | 0 | N-OT | P-OT (Standard) | 1 | P-OT | N-OT |
| b6 Set Value | 1LS | 2LS | | | | | | | | | |
| 0 | N-OT | P-OT (Standard) | | | | | | | | | |
| 1 | P-OT | N-OT | | | | | | | | | |
| | b7 Torque Reference Filter Time Constant Change | <p>b7 = 1 when the function of parameter 90 which sets torque reference filter time constant to prevent shaft oscillation is to be effective; b7 = 0 when ineffective.</p> <table border="1"> <thead> <tr> <th>b7 Set Value</th> <th>Torque Reference Filter Time Constant</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>0.45ms</td> </tr> <tr> <td>1</td> <td>Value set by parameter 90</td> </tr> </tbody> </table> | b7 Set Value | Torque Reference Filter Time Constant | 0 | 0.45ms | 1 | Value set by parameter 90 | | | |
| b7 Set Value | Torque Reference Filter Time Constant | | | | | | | | | | |
| 0 | 0.45ms | | | | | | | | | | |
| 1 | Value set by parameter 90 | | | | | | | | | | |



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8.3 PARAMETER FUNCTION DETAILS (Cont'd)

| No. | Name | Contents | | | | | | |
|---|--|--|---|--------------------------------|-----------|---|--|---|
| 20 | Function Selection 4 | By setting (b6. b5. b4. b3. b2. b1. b0) to "0" or "1". each function can be selected | | | | | | |
| | b0 | (Always set to 0) | | | | | | |
| | b1 External Position Indicator | When used by connecting to external position indicator (MCIF-L8 type), set to b1 = 1 Decimal position of the external position indicator is selected by parameter 67. | | | | | | |
| | b2 Station No 0 | In the station No reference method (parameter 15 setting = 0), the number of stations N is set by parameter 16 and how to take the station No. is set by b2. <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>b2 Set Value</td> <td>0</td> <td>1</td> </tr> <tr> <td>How to Take Station No.</td> <td>Station No 0 Provided </td> <td>Station No 0 Not Provided </td> </tr> </table> | b2 Set Value | 0 | 1 | How to Take Station No. | Station No 0 Provided  | Station No 0 Not Provided  |
| | b2 Set Value | 0 | 1 | | | | | |
| | How to Take Station No. | Station No 0 Provided  | Station No 0 Not Provided  | | | | | |
| | b3 Simplified S-curve Accel/Decel | Selects whether simplified S-curve accel/decel is used or not <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>b3 Set Value</td> <td>Simplified S-curve Accel/Decel</td> </tr> <tr> <td>0</td> <td>Not used Parameter 76 setting ineffective</td> </tr> <tr> <td>1</td> <td>Used Parameter 76 setting effective</td> </tr> </table> | b3 Set Value | Simplified S-curve Accel/Decel | 0 | Not used Parameter 76 setting ineffective | 1 | Used Parameter 76 setting effective |
| b3 Set Value | Simplified S-curve Accel/Decel | | | | | | | |
| 0 | Not used Parameter 76 setting ineffective | | | | | | | |
| 1 | Used Parameter 76 setting effective | | | | | | | |
| b4 Function Selection 7 Setting (Related to Parameter 72) | Set to 1 when parameter 72 function is to be effective. (Normally set to 0.) <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>b4 Set Value</td> <td>Parameter 72 Setting Contents</td> </tr> <tr> <td>1</td> <td>Effective</td> </tr> <tr> <td>0</td> <td>Same function as parameter 72 b0 = 0. b1 = 0. b2 = 0. b3 = 0. b4 = 0 or b5 = 0 setting</td> </tr> </table> | b4 Set Value | Parameter 72 Setting Contents | 1 | Effective | 0 | Same function as parameter 72 b0 = 0. b1 = 0. b2 = 0. b3 = 0. b4 = 0 or b5 = 0 setting | |
| b4 Set Value | Parameter 72 Setting Contents | | | | | | | |
| 1 | Effective | | | | | | | |
| 0 | Same function as parameter 72 b0 = 0. b1 = 0. b2 = 0. b3 = 0. b4 = 0 or b5 = 0 setting | | | | | | | |
| b5 Function Selection 5 Setting (Related to Parameter 65) | Set to 1 when parameter 65 function is to be effective (Normally set to 0.) <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>b5 Set Value</td> <td>Parameter 65 Setting Contents</td> </tr> <tr> <td>1</td> <td>Effective</td> </tr> <tr> <td>0</td> <td>Same function as parameter 65 b0 = 0. b1 = 0. b2 = 0. b3 = 0. b4 = 0. b5 = 0 or b6 = 0 setting.</td> </tr> </table> | b5 Set Value | Parameter 65 Setting Contents | 1 | Effective | 0 | Same function as parameter 65 b0 = 0. b1 = 0. b2 = 0. b3 = 0. b4 = 0. b5 = 0 or b6 = 0 setting. | |
| b5 Set Value | Parameter 65 Setting Contents | | | | | | | |
| 1 | Effective | | | | | | | |
| 0 | Same function as parameter 65 b0 = 0. b1 = 0. b2 = 0. b3 = 0. b4 = 0. b5 = 0 or b6 = 0 setting. | | | | | | | |
| b6 Function Selection 6 Setting (Related to Parameter 66) | Set to 1 when parameter 66 function is to be effective. (Normally set to 0.) <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>b6 Set Value</td> <td>Parameter 66 Setting Contents</td> </tr> <tr> <td>1</td> <td>Effective</td> </tr> <tr> <td>0</td> <td>Same function as parameter 66 b0 = 0. b1 = 0. b2 = 0. b3 = 0. b4 = 0. b5 = 0. b6 = 0 or b7 = 0 setting.</td> </tr> </table> | b6 Set Value | Parameter 66 Setting Contents | 1 | Effective | 0 | Same function as parameter 66 b0 = 0. b1 = 0. b2 = 0. b3 = 0. b4 = 0. b5 = 0. b6 = 0 or b7 = 0 setting. | |
| b6 Set Value | Parameter 66 Setting Contents | | | | | | | |
| 1 | Effective | | | | | | | |
| 0 | Same function as parameter 66 b0 = 0. b1 = 0. b2 = 0. b3 = 0. b4 = 0. b5 = 0. b6 = 0 or b7 = 0 setting. | | | | | | | |

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| No. | Name | Contents | | | | | | | | | | | | | | | | |
|-----------|---|--|---|-----------|-----------------------|------|----|------------|-------|----|-------------|---------------------------|---|-------|---|---|---|---|
| 31 | 2nd Feeding Speed | Speed reference value selected by speed select signal SP2ND or SP3RD. (selected by parameter at contact.) | | | | | | | | | | | | | | | | |
| 32 | 3rd Feeding Speed | Effective in mode selected by parameter at contact | <table border="1"> <tr> <td></td> <td>4 (1st Feeding Speed)</td> <td>31</td> <td>32</td> <td>33</td> </tr> <tr> <td>SP2ND</td> <td>H</td> <td>L</td> <td>H</td> <td>L</td> </tr> <tr> <td>SP3RD</td> <td>H</td> <td>H</td> <td>L</td> <td>L</td> </tr> </table> | | 4 (1st Feeding Speed) | 31 | 32 | 33 | SP2ND | H | L | H | L | SP3RD | H | H | L | L |
| | 4 (1st Feeding Speed) | | 31 | 32 | 33 | | | | | | | | | | | | | |
| SP2ND | H | | L | H | L | | | | | | | | | | | | | |
| SP3RD | H | H | L | L | | | | | | | | | | | | | | |
| 33 | 4th Feeding Speed | Setting range: 1 to 240000 Unit: ×1000 reference units/min | | | | | | | | | | | | | | | | |
| 34 | Current Limit Value | Effective by parameter 17 b0 = 1 | Current limit value in plus/minus direction. Current limit works regardless of current limit signal CUR. Setting range: 0 to 400 Unit: % | | | | | | | | | | | | | | | |
| 35 | Plus Side Current Limit Value | | Limit plus side current (activation current at motor FWD run) | | | | | | | | | | | | | | | |
| 36 | Minus Side Current Limit Value | | Limit minus side current (activation current at motor REV run) | | | | | | | | | | | | | | | |
| | | (The smaller value between parameter set value and motor maximum current limit value becomes effective.) | | | | | | | | | | | | | | | | |
| 37 | Feedforward Compensation Amount | Feedforward compensation amount becomes effective by parameter 17 b1 = 1. Setting range: 0 to 200, unit: % | | | | | | | | | | | | | | | | |
| 38 | Linear Accel/Decel Time 2 | Parameter to determine accel/decel speed at the second step in 2-step linear accel/decel type. In 2-step linear accel/decel, linear accel/decel type is selected by parameter 17 b4 and becomes effective by parameter 17 b2 = 1 setting. | | | | | | | | | | | | | | | | |
| 39 | 2-step Linear Accel/Decel Accel Speed Switching Speed | | | | | | | | | | | | | | | | | |
| | | <table border="1"> <thead> <tr> <th>Parameter</th> <th>Range</th> <th>Unit</th> </tr> </thead> <tbody> <tr> <td>38</td> <td>8 to 60000</td> <td>ms</td> </tr> <tr> <td>39</td> <td>0 to 240000</td> <td>×1000 reference units/min</td> </tr> </tbody> </table> | | Parameter | Range | Unit | 38 | 8 to 60000 | ms | 39 | 0 to 240000 | ×1000 reference units/min | | | | | | |
| Parameter | Range | Unit | | | | | | | | | | | | | | | | |
| 38 | 8 to 60000 | ms | | | | | | | | | | | | | | | | |
| 39 | 0 to 240000 | ×1000 reference units/min | | | | | | | | | | | | | | | | |

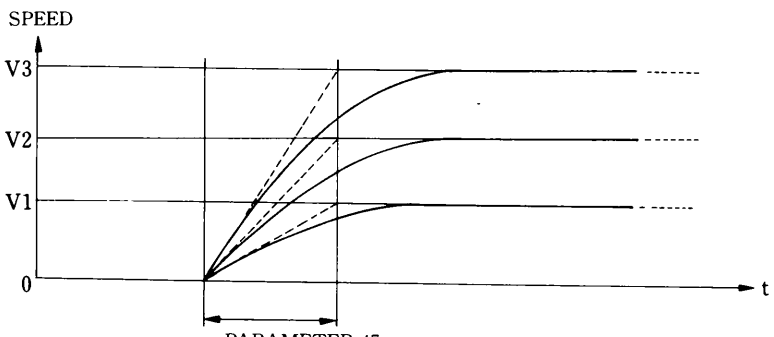
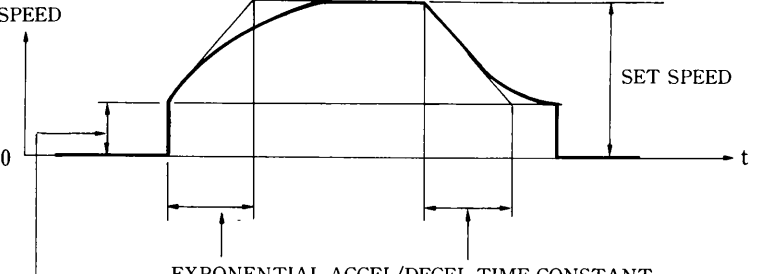


8.3 PARAMETER FUNCTION DETAILS (Cont'd)

| No. | Name | Contents |
|-----|--|--|
| 40 | Plus Side Software Overtravel (Plus Side Position Reference Fault Detection Value) | <p>(1) Parameter 14 b1 = 0 (finite positioning mode) Effective by parameter 18 b0 = 1 setting.</p> <p>(2) Parameter 14 b1 = 1 (infinite positioning mode) A position reference value exceeding the set value results in a position reference fault error.</p> |
| 41 | Minus Side Software Overtravel (Minus Side Position Reference Fault Detection Value) | <p>Range: ± 99999999 Unit: Reference unit Note: When incremental encoder is used (Parameter 9=1), software overtravel becomes effective after zero-point return (homing).</p> <p>(2) Parameter 14 b1 = 1 (infinite positioning mode) Effective by parameter 18 b0 = 1 setting. When the position reference value is out of the following range in the automatic operation, a position reference fault error occurs. $[\text{Parameter 41}] \text{ set value} \leq \text{position reference value} \leq [\text{Parameter 40}] \text{ set value}$</p> <p>(1) Parameter 14 b1 = 0 (finite positioning mode) Prohibits moving in - direction by set value.</p> <p>(2) Parameter 14 b1 = 1 (infinite positioning mode) A position reference value exceeding the set value results in a position reference fault error.</p> |
| 42 | Backlash Compensation Amount | <p>Effective by parameter 18 b2 = 1 setting.</p> <p>Setting range: 1 to ± 30000 Unit: Pulse (feedback pulse from encoder)</p> <p>[Relation between reference unit and pulse is indicated by B/A (refer to parameter 13.)]</p> |
| 43 | Brake Time | <p>Effective by parameter 19 b2 = 1.</p> <p>Setting range: 8 to 1000 Unit: ms</p> |
| 44 | Brake ON Motor Speed | <p>Refer to par. 6.3.2 (2) for operation.</p> <p>Setting range: 1 to 10000 Unit: r/min (motor speed)</p> |
| 45 | Positioning Near Range and Station Near Range | <p>Effective by parameter 19 b5 = 1.</p> <p>Setting range: 0 to 30000 Unit: Reference unit</p> <p>(Station near range when parameter 20 b5 = 1 or parameter 65 b1 = 1)</p> |
| 46 | Speed Limit Value | <p>Effective by parameter 17 b3 = 1. Set value becomes load maximum speed.</p> <p>Set value: 1 to 240000 Unit: $\times 1000$ reference unit/min</p> |

(Cont'd)

(Cont'd)

| No. | Name | Contents | | | | | |
|---------------------------------|--|---|---------------|------|-------------------------------|----------------|---------------------------------|
| 47 | Exponential Accel/Decel Time Constant | <p>Accel/decel speed varies depending on set speed</p>  <p>PARAMETER 47 (EXPONENTIAL ACCEL/DECEL TIME CONSTANT)</p> <p>Exponential accel/decel becomes effective in a specified operation mode when exponential accel/decel type is set by parameter 17 b4 = 1 and parameters 68 to 71.</p> | | | | | |
| 48 | Exponential Accel/Decel Bias Speed |  <p>EXPONENTIAL ACCEL/DECEL TIME CONSTANT (RANGE 8 TO 1000, UNIT ms)</p> <p>EXPONENTIAL ACCEL/DECEL BIAS SPEED (RANGE 0 TO 240000, UNIT 1000 REFERENCE UNIT/MIN)</p> | | | | | |
| 49 | Zero-point Return (Homing) Mode | <p>0 Zero-point return mode I (Decel LS and Cφ pulse used)</p> | | | | | |
| | | <p>1 Zero-point return mode II (STP signal used)</p> | | | | | |
| 50 | Zero-point Return Direction | <p>0 Zero-point return toward plus direction</p> <p>1 Zero-point return toward minus direction</p> | | | | | |
| 51 | Zero-point Return Feeding Speed | <p>Effective by parameter</p> | | | | | |
| 52 | Zero-point Return Approach Speed | <p>18 14b = 1 Setting range: 0 to 240000 Unit: ×1000 reference unit/min</p> | | | | | |
| 53 | Zero-point Return Creep Speed | | | | | | |
| 54 | Zero-point Return Final Traveling Distance | <table border="1"> <thead> <tr> <th>Setting Range</th> <th>Unit</th> </tr> </thead> <tbody> <tr> <td>Plus direction: 0 to 99999999</td> <td rowspan="2">Reference unit</td> </tr> <tr> <td>Minus direction: -99999999 to 0</td> </tr> </tbody> </table> | Setting Range | Unit | Plus direction: 0 to 99999999 | Reference unit | Minus direction: -99999999 to 0 |
| Setting Range | Unit | | | | | | |
| Plus direction: 0 to 99999999 | Reference unit | | | | | | |
| Minus direction: -99999999 to 0 | | | | | | | |



8.3 PARAMETER FUNCTION DETAILS (Cont'd)

| No. | Name | Conditioning Parameter | | Contents | | | | | | |
|------------------------|---|------------------------|-----------|--|--------------|--------------------------|---|--------------------------------------|---|---|
| | | No. | Set Value | | | | | | | |
| 61 | Feed Speed - Setting Method in Auto Operation Mode | 18 b2 | 1 | 0 Selected by parameter at contact | | | | | | |
| | | | | 1 DG-SW | | | | | | |
| | | | | 2 Serial command. | | | | | | |
| | | | | 4 Speed table | | | | | | |
| 62 | Feed Speed Setting Method in Manual Operation Mode | 18 b3 | 1 | 0 Selected by parameter at contact | | | | | | |
| | | | | 1 DG-SW | | | | | | |
| | | | | 2 Serial command | | | | | | |
| | | | | 4 Speed table | | | | | | |
| 63 | Pulse-Signal Form | 19 b3 | 1 | 0 <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td>×4</td></tr></table> | ×4 | | | | | |
| | | | | ×4 | | | | | | |
| | | | | 1 90° phase difference 2-phase pulse <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td>×2</td></tr></table> | ×2 | | | | | |
| | | | | ×2 | | | | | | |
| | | | | 2 <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td>×1</td></tr></table> | ×1 | | | | | |
| ×1 | | | | | | | | | | |
| 3 Sign + pulse train | | | | | | | | | | |
| 4 CCW + CW pulse train | | | | | | | | | | |
| 64 | Output Pulse Dividing Ratio | 19 b4 | 1 | Dividing ratio is 2/N when parameter set value is N (2 to 64) | | | | | | |
| 65 | Function Selection 5 | 20 b5 | 1 | By setting (b3, b2, b1, b0) to "0" or "1", each function can be selected. | | | | | | |
| | b0 Zone Signal | | | Set b0 = 1 when outputs of $\overline{P0}$ to $\overline{P4}$ are used as zone signals. <table border="1" style="margin-left: 20px;"><thead><tr><th>b0 Set Value</th><th>Zone Signal</th></tr></thead><tbody><tr><td>0</td><td>Not Used</td></tr><tr><td>1</td><td>Used</td></tr></tbody></table> | b0 Set Value | Zone Signal | 0 | Not Used | 1 | Used |
| b0 Set Value | Zone Signal | | | | | | | | | |
| 0 | Not Used | | | | | | | | | |
| 1 | Used | | | | | | | | | |
| | b1 Station Near Signal | | | Set to b1 = 1 so that \overline{NEAR} signal can function as station near signal. (\overline{NEAR} signal does not operate unless setting to parameter 19 b5 = 1.) <table border="1" style="margin-left: 20px;"><thead><tr><th>b1 Set Value</th><th>\overline{NEAR} Signal</th></tr></thead><tbody><tr><td>0</td><td>Operates as positioning near signal.</td></tr><tr><td>1</td><td>In the station No. reference method (parameter 15 setting = 0), if distance difference (reference unit) between the current position and the nearest station position to the current position becomes less than the value set by parameter 45, \overline{NEAR} signal is output. (In serial communication, \overline{NEAR} is automatically sent.) Note: In this case, \overline{NEAR} signal output lag time is up to 40ms.</td></tr></tbody></table> | b1 Set Value | \overline{NEAR} Signal | 0 | Operates as positioning near signal. | 1 | In the station No. reference method (parameter 15 setting = 0), if distance difference (reference unit) between the current position and the nearest station position to the current position becomes less than the value set by parameter 45, \overline{NEAR} signal is output. (In serial communication, \overline{NEAR} is automatically sent.) Note: In this case, \overline{NEAR} signal output lag time is up to 40ms. |
| b1 Set Value | \overline{NEAR} Signal | | | | | | | | | |
| 0 | Operates as positioning near signal. | | | | | | | | | |
| 1 | In the station No. reference method (parameter 15 setting = 0), if distance difference (reference unit) between the current position and the nearest station position to the current position becomes less than the value set by parameter 45, \overline{NEAR} signal is output. (In serial communication, \overline{NEAR} is automatically sent.) Note: In this case, \overline{NEAR} signal output lag time is up to 40ms. | | | | | | | | | |

(Parameter setting becomes effective by conditioning parameter setting.)

(Cont'd)

(Cont'd)

| No. | Name | Conditioning Parameter | | Contents | | | | | | |
|--------------------------------------|--|---|--|--|---|---|---|------|--|------------------------|
| | | No. | Set Value | | | | | | | |
| 65 | b2 DG-SW Read-in Time Change | 20 b5 | 1 | <p>Set to b2 = 1 when DG-SW read-in time (data strobe output pulse width) is required to change in DG-SW reference method (parameter 15 setting = 1),</p> <table border="1"> <thead> <tr> <th>b2 Set Value</th> <th>DG-SW Read-in Time (Data Strobe Output Pulse Width)</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>24ms</td> </tr> <tr> <td>1</td> <td>Parameter 77 set value</td> </tr> </tbody> </table> <p>When YASKAWA digital unit is used, it is not necessary to change DG-SW read-in time</p> | b2 Set Value | DG-SW Read-in Time (Data Strobe Output Pulse Width) | 0 | 24ms | 1 | Parameter 77 set value |
| | b2 Set Value | DG-SW Read-in Time (Data Strobe Output Pulse Width) | | | | | | | | |
| | 0 | 24ms | | | | | | | | |
| | 1 | Parameter 77 set value | | | | | | | | |
| | b3 DG-SW Shift Digit Number | | | <p>Set to b3 = 1 when position or speed input is multiplied by 10, 100, etc. in DG-SW reference method (parameter 15 setting = 1)</p> <p>Number of digits to be shifted is set by parameter 67.</p> | | | | | | |
| b4 | | | (Normally set to 0) | | | | | | | |
| b5 | | | (Normally set to 0.) | | | | | | | |
| b6 Position Completion Signal Change | | | <p>Set to b6 = 1 to change the specifications of positioning completion signal (COIN, CN5-5).</p> <table border="1"> <thead> <tr> <th>b6 Set Value</th> <th>Specifications of Positioning Completion Signal (COIN Signal)</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>ON when reference is not being discharged and position error is smaller than parameter 6. OFF while start command input signal (\bar{AST}) is ON and until zero-point return is completed in the zero-point return (homing) mode. (Normal specifications)</td> </tr> <tr> <td>1</td> <td>OFF when power supply is turned ON. ON when operation is started in automatic operation mode and positioning is completed normally (reference discharge is completed and position error becomes smaller than parameter 6 set value.) Also OFF in the following cases: <ul style="list-style-type: none"> • Starting again in automatic operation mode • In baseblock status • Changing mode • At overtravel • While start command input signal is ON </td> </tr> </tbody> </table> | b6 Set Value | Specifications of Positioning Completion Signal (COIN Signal) | 0 | ON when reference is not being discharged and position error is smaller than parameter 6. OFF while start command input signal (\bar{AST}) is ON and until zero-point return is completed in the zero-point return (homing) mode. (Normal specifications) | 1 | OFF when power supply is turned ON. ON when operation is started in automatic operation mode and positioning is completed normally (reference discharge is completed and position error becomes smaller than parameter 6 set value.) Also OFF in the following cases: <ul style="list-style-type: none"> • Starting again in automatic operation mode • In baseblock status • Changing mode • At overtravel • While start command input signal is ON | |
| b6 Set Value | Specifications of Positioning Completion Signal (COIN Signal) | | | | | | | | | |
| 0 | ON when reference is not being discharged and position error is smaller than parameter 6. OFF while start command input signal (\bar{AST}) is ON and until zero-point return is completed in the zero-point return (homing) mode. (Normal specifications) | | | | | | | | | |
| 1 | OFF when power supply is turned ON. ON when operation is started in automatic operation mode and positioning is completed normally (reference discharge is completed and position error becomes smaller than parameter 6 set value.) Also OFF in the following cases: <ul style="list-style-type: none"> • Starting again in automatic operation mode • In baseblock status • Changing mode • At overtravel • While start command input signal is ON | | | | | | | | | |

(Cont'd)

8.3 PARAMETER FUNCTION DETAILS (Cont'd)

| No. | Name | Conditioning Parameter | | Contents | | | | | | | | | | |
|-----|---|--|-----------------------|--|--|---|----|--|----|--|----|----|----|----|
| | | No | Set Value | | | | | | | | | | | |
| 66 | Function Selection 6 | 20 | 1 | <p>By setting (b7, b6, b5, b4, b3, b2, b1, b0) to "0" or "1", each function can be selected.</p> <p>(Normally set to 0)</p> <hr/> <p>Set to b4 = 1 when alarm code outputs ($\overline{AL0}$ to $\overline{AL3}$) are used as station No outputs (P5 to P8).</p> <table border="1"> <tr> <td>b4 Set Value</td> <td>CN5-19, 20, 21, 22 output at parameter 15 = 0</td> </tr> <tr> <td>0</td> <td>Alarm code output ($\overline{AL0}$ to $\overline{AL3}$)</td> </tr> <tr> <td>1</td> <td>Station No output ($\overline{P5}$ to $\overline{P8}$)</td> </tr> </table> <p>(Normally set to 0)</p> <hr/> <p>Set to b7 = 1 when axis address is provided for Servopack response. However, axis address can be provided only in multi-axis control (Example)</p> <p>Command <input type="checkbox"/> 3PRM30 → 3PRM30 = ××... × (Sent from Servopack)</p> <p>Command <input type="checkbox"/> 5ALM → 5ALM .COIN (Sent from Servopack)</p> | b4 Set Value | CN5-19, 20, 21, 22 output at parameter 15 = 0 | 0 | Alarm code output ($\overline{AL0}$ to $\overline{AL3}$) | 1 | Station No output ($\overline{P5}$ to $\overline{P8}$) | | | | |
| | b4 Set Value | CN5-19, 20, 21, 22 output at parameter 15 = 0 | | | | | | | | | | | | |
| | 0 | Alarm code output ($\overline{AL0}$ to $\overline{AL3}$) | | | | | | | | | | | | |
| | 1 | Station No output ($\overline{P5}$ to $\overline{P8}$) | | | | | | | | | | | | |
| | b0 | | | | | | | | | | | | | |
| | b1 | | | | | | | | | | | | | |
| | b2 | | | | | | | | | | | | | |
| b3 | | | | | | | | | | | | | | |
| b4 | Station No. Output Extension | | | | | | | | | | | | | |
| b5 | | | | | | | | | | | | | | |
| b6 | | | | | | | | | | | | | | |
| b7 | Servopack Response Axis Address | | | | | | | | | | | | | |
| 67 | External Position Indicator Decimal Point Position and DG-SW Shift Digit Number | 20 | 1 | <p>When external position indicator is used (set to parameter 20 b1 = 1), decimal point which is indicated by value set by parameter 67 lights.</p> <p style="text-align: center;">7 6 5 4 3 2 1 0 ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓</p> <table border="1" style="margin: auto;"> <tr> <td style="text-align: center;">+</td> <td style="text-align: center;">-</td> <td style="text-align: center;">8.</td> <td style="text-align: center;">8.</td> <td style="text-align: center;">8.</td> <td style="text-align: center;">8.</td> <td style="text-align: center;">8.</td> <td style="text-align: center;">8.</td> <td style="text-align: center;">8.</td> <td style="text-align: center;">8.</td> </tr> </table> <p style="text-align: center;">External position indicator (Unit Reference unit)</p> <p>When setting to parameter 65 b3 = 1, DG-SW position or speed input is shifted to the left by the number of digits of the value set in parameter 67.</p> <p>(Digital switch reference) ×10^(PARAMETER 67 SET VALUE)</p> <p>Example. When parameter 67 = 2 and DG-SW reference = 123; 123 × 10² = 12300 is referenced</p> | + | - | 8. | 8. | 8. | 8. | 8. | 8. | 8. | 8. |
| | | + | - | | 8. | 8. | 8. | 8. | 8. | 8. | 8. | 8. | | |
| b1 | | | | | | | | | | | | | | |
| 68 | Accel/Decel Type Setting | Automatic Operation Mode | 17 | 1 | 0 | Linear or simplified S-curve accel/decel | | | | | | | | |
| 69 | | | Manual Operation Mode | 1 | Exponent | | | | | | | | | |
| | | | | 0 | Linear or simplified S-curve accel/decel | | | | | | | | | |
| 70 | | | Pulse Operation Mode | 1 | Exponent | | | | | | | | | |
| | 0 | Linear or simplified S-curve accel/decel | | | | | | | | | | | | |
| 71 | Zero-Point Return (Homing) Operation Mode | | 0 | Linear or simplified S-curve accel/decel | | | | | | | | | | |
| | | | 1 | Exponent | | | | | | | | | | |

(Parameter setting becomes effective by conditioning parameter setting.)

(Cont'd)

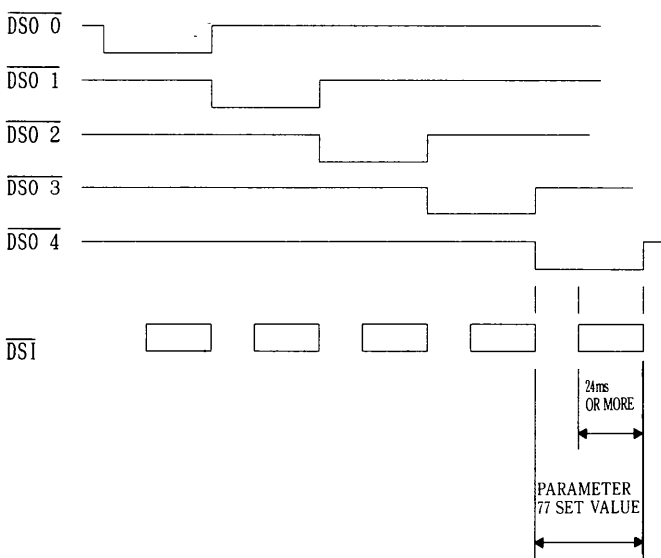
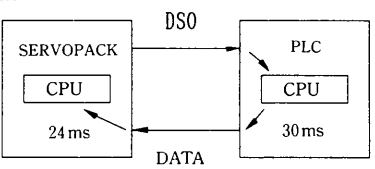
(Cont'd)

| No. | Name | Conditioning Parameter | | Contents | | |
|-----|--|--|---|--|-------------------------|----------------------------|
| | | No. | Set Value | | | |
| 72 | Function Selection 6 | By setting (b0, b1, b2, b3, b4) to "0" or "1", the following function can be selected: | | Set Value and Function Provided/Not Provided | | |
| | | 20 b4 | 1 | | 0 | 1 |
| | | b0 | Ovrrun Alarm Process | | Set | Not set |
| | | b1 | Remaining Data Process after STOP signal is input | | Hold (Feedhold) | Abandon (No feedhold) |
| | | b2 | PG (L-PG/M-PG) Selecting Method at Positioning Completion when Line PG Used | | Selected by L-PG signal | Motor PG selected by force |
| | | b3 | Echo-back at Initialization | | Not set | set |
| | | b4 | OK Response for Command | | Not set | set |
| b5 | Monitor Data Transmission Specification Change | | Monitor data are sent repeatedly from Servopack. | Monitor data are sent only once from Servopack. | | |
| 76 | Simplified S-curve Accel/Decel Time | 20 b3 | 1 | <p>Set accel/decel speed in simplified S-curve accel/decel control together with parameter 4.</p> <p>Unit: ms Setting range: 0 to 124</p> <p>1st or 3rd step accel/decel speed is set by this parameter.</p> <p>Positioning time is extended by (parameter 76 value + 2) (ms).</p> <p>Simplified S-curve accel/decel becomes effective by 20 b3 = 1 setting when linear accel/decel type is selected by parameter 17 b4.</p> | | |
| | | | | <p> V_1 : Parameter 4 set value T_1 : parameter 5 set value T_2 : parameter 76 set value + 2 (ms) α_1 : 1st-step accel/decel speed ($\alpha_2/2$) α_2 : 2nd-step accel/decel speed (V_1/T_1) α_3 : 3rd-step accel/decel speed (Same as α_1) </p> | | |

(Parameter setting becomes effective by conditioning parameter setting.)

(Cont'd)

8.3 PARAMETER FUNCTION DETAILS (Cont'd)

| No. | Name | Conditioning Parameter | | Contents |
|-----|---------------------------------------|------------------------|-----------|--|
| | | No. | Set Value | |
| 77 | DG-SW Read-in Scanning Time | 65 b2 | 1 | <p>When position or speed reference is provided other than in exclusive-use digital switch unit in DG-SW reference method (set to parameter 15 = 1), DG-SW read-in scanning time (data strobe output pulse width) is set.</p> <p>Setting range: 24 to 2000 (ms)</p> <p>More than 24ms is needed for Servopack to read the data. Therefore, set a value added with 24ms to a time required to send the data at reference setter (sequencer) side. (Refer to Par. 5.6.3 (3).)</p>  <p>Example</p>  <p>(Parameter 77 set value) = 30ms + 24ms = 54ms or more</p> |
| 90 | Torque Reference Filter Time Constant | 19 b7 | 1 | <p>Set torque reference filter time constant. Used to prevent oscillation.</p> <p>Setting range: 0 to 100 [$\times 32.5 (\mu s)$]</p> |

(Parameter setting becomes effective by conditioning parameter setting.)

9

DISPLAY/SETTING/MONITOR FUNCTIONS

9.1 DISPLAY AND SETTING FUNCTIONS

9.1.1 Display

Status of drive is displayed by LED indicators or 7-segment indicators. Fault contents are displayed in the data display section.

Table 9.1 LED Indicators


| Display Specifications | HR  UB | Conditions at Lighting |
|------------------------|---|---|
| Power Supply Display | MP (green) | Servopack DC main circuit voltage normal |
| | P (green) | Servopack control power supply (+5V) normal |
| Alarm Display | ALM (red) | At alarm occurrence |



Table 9.2 7-segment LED (Red) Display Specifications and Fault Contents Display Specifications

| Fault Contents Display in Data Display Section | 7-segment LED Display | Display Contents |
|--|-----------------------|--|
| . ? ? ? ? *1 | . | Baseblock is released. (Indicates current conduction to motor.) |
| - b b | - | Baseblocking (Stops current conduction.) |
| P.P - 0 t | P. | P-side overtravel |
| n n - 0 t | n. | N-side overtravel |
| P.P - L S | P | P-side software overtravel |
| n n - L S | n | N-side software overtravel |
| d. b R t | d. Blinks | Battery voltage low-level detection |
| 0. R b S | 0. | ABS0 error |
| 1. 0 C | 1. | Overcurrent |
| 2. F R n | 2. | FAN stop |
| 3. r G | 3. | Regenerative error |
| 4. 0 U | 4. | Overvoltage |
| 5. 0 S | 5. | Overspeed |
| 6. 0 U | 6. | Undervoltage |
| 7. 0 L | 7. | Overload |
| 8. P 0 S | 8. | Position error |
| R. 0 H | R. | Heat sink overheat |
| E. P G | E. | PG disconnection |
| F. 0 - P H | F. | Open phase |
| H. H R r d | H. | Hardware error |
| J. 0 F | J. | Overflow |
| L. r u Y | L. | Overrun |
| Y. P r ? ? *2 | Y. | Parameter error |

- Servopack power circuit is base-blocked.
- Self-holding until resetting
- Servo alarm output

*1 . ? ? ? ? varies as follows depending on the status:

At positioning completion: C 0 t n.
 At positioning near: n E R r .
 At positioning: r U n .
 At feedholding: H 0 L d

*2 ?? indicates parameter No.

9.1.2 Display and Setting Functions

The setting of parameter etc. can be performed using parameter display/setting functions built into Servopack.

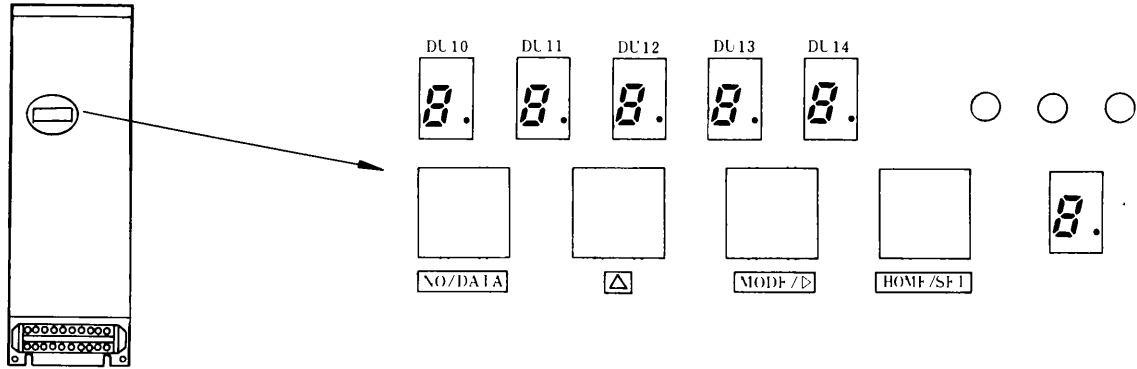


Fig. 91 Setting/Display Section

Table 9.4 Setting/Display Setting Mode Selection

| No. | Switch Depressed | Display | Contents |
|-----|------------------|--------------|--|
| 0 | Initial Status | -. bb | Alarm/status display |
| 1 | NO/DATA | RL-00 | Alarm record display (See Table 9.5.) |
| 2 | MODE/▷ | cn-0! | Parameter display/setting (See Table 9.6.) |
| 3 | MODE/▷ | 05-00 | Machine zero-point setting (See Table 9.7.) |
| 4 | MODE/▷ | 55-00 | Serial communication setting (See Table 9.8.) |
| 5 | MODE/▷ | Un-0! | Monitor data display (See Table 9.9.) |
| 6 | MODE/▷ | !n-0! | Input signal status display (See Table 9.10.) |
| 7 | MODE/▷ | 0n-0! | Output signal status display (See Table 9.11.) |
| 8 | MODE/▷ | RL-00 | Alarm record display (Return to No.1) |

Depressing **HOME/SET** in the above 1 to 8, returns to initial status (alarm/status display).

Depressing **HOME/SET** in the above 0 status, resets an alarm when it occurs (same as serial command ARES) or performs Servopack initial reset when an alarm does not occur (same as serial command RES).

Table 9.5 Alarm Record Display Mode

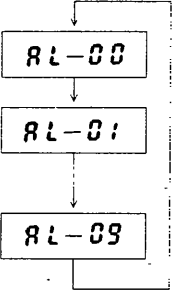
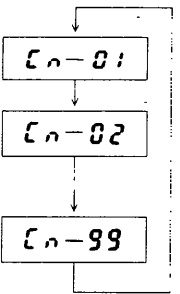
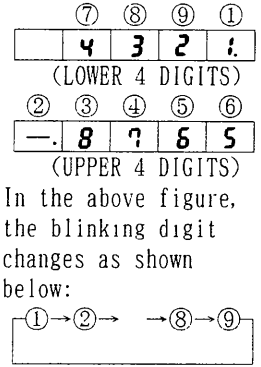
| △ | NO/DATA | MODE/▷ | HOME/SET |
|---|--|--|---|
| <p>• Alarm No. display</p>  <p>1. (MOST RECENT ALARM) 2. (ALARM 1 TIME BEFORE) 3. (ALARM 9 TIMES BEFORE)</p> | <p>Exchange alarm No. with alarm content display. For alarm content display, refer to Table 9.2.</p> | <p>• Alarm No. display</p> <p>Parameter display/setting mode is entered.</p> | <p>• Alarm No. display</p> <p>Alarm/status (initial status) is displayed.</p> |

Table 9.6 Parameter Display/Setting Mode

| △ | NO/DATA | MODE/▷ | HOME/SET |
|--|--|--|---|
| <p>• Parameter No. display</p>  <p>(PARAMETER No. 1) (PARAMETER No. 2) (PARAMETER No. 99)</p> <p>• Parameter data display</p> <p>Change the value which is blinking.</p> | <p>Exchange parameter No. with parameter data display.</p> | <p>• When parameter No. is displayed.</p> <p>Machine zero-point setting mode is entered.</p> <p>• When parameter data is displayed.</p> <p>Blinking digit (to be changed) is moved.</p>  <p>(LOWER 4 DIGITS) (UPPER 4 DIGITS)</p> <p>In the above figure, the blinking digit changes as shown below:</p> | <p>• When parameter No. is displayed.</p> <p>Alarm/status (initial status) is displayed.</p> <p>• When parameter data is displayed.</p> <p>Displayed data are set. (Reset is required for off-line parameters.)</p> |

Note: For parameters, refer to Par.8 "PARAMETER".

Table 9.7 Machine Zero-point Setting Mode

| △ | NO/DATA | MODE/▷ | HOME/SET |
|---|---|---|--|
| <ul style="list-style-type: none"> Zero-point No. display Ineffective Zero-point data display Change the value which is blinking. | Exchange zero-point No. display (only 05 - 00) and zero-point data display. | <ul style="list-style-type: none"> When zero-point No. is displayed. Serial communication setting mode is entered. When zero-point data is displayed. Blinking digit (to be changed) is moved. <div style="text-align: center;"> <p>(LOWER 4 DIGITS)</p> <p>(UPPER 4 DIGITS)</p> </div> <p>In the above figure, the blinking digit changes as shown below:</p> <div style="text-align: center;"> </div> | <ul style="list-style-type: none"> When zero-point No. is displayed. Alarm/status (initial status) is displayed. When zero-point data is displayed. Motor current position is set to displayed machine position.* (Reset is required after the setting.) |

* Same as serial command ZEROSET ±nnnnnnnn.

Table 9.8 Serial Communication Setting Mode

| △ | NO/DATA | MODE/▷ | HOME/SET |
|---|--|--|--|
| <ul style="list-style-type: none"> Set No. display <div style="text-align: center;"> </div> <ul style="list-style-type: none"> Set data display Change set data as follows: In baud rate setting 9600→4800→2400→1200 In axis address setting 0→1→2→3→4→5→6→7→8→9 | Exchange set No. display with set data display | <ul style="list-style-type: none"> When set No. is displayed. Monitor data display mode is entered. | <ul style="list-style-type: none"> When set No. is displayed. Alarm/status (initial status) is displayed. When set data is displayed. Displayed data are set. (Reset is required after the setting.) |

Note: For how to use axis address (setting range), refer to Par. 7.3.2.

Table 9.9 Monitor Data Display Mode

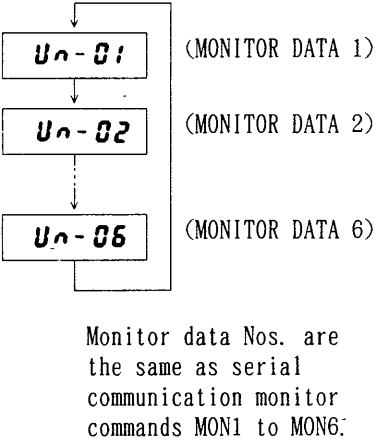
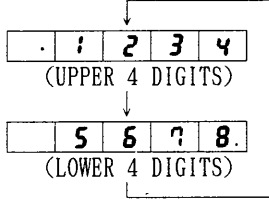
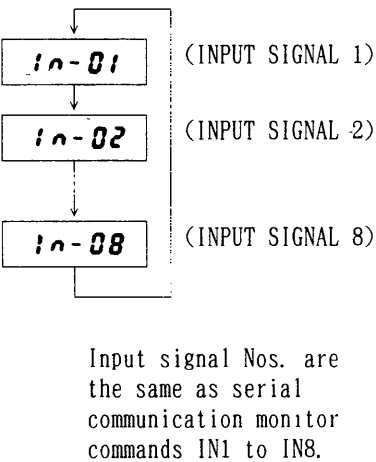
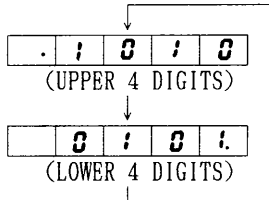
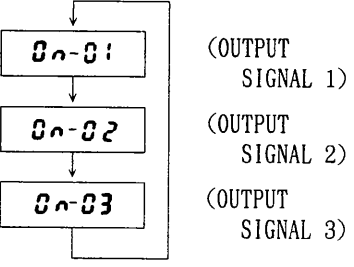
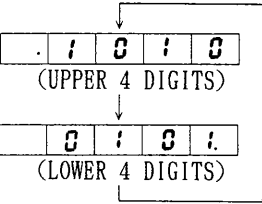
| △ | NO/DATA | MODE/▷ | HOME/SET |
|---|---|--|--|
| <p>• Monitor data No. display.</p>  <p>Monitor data Nos. are the same as serial communication monitor commands MON1 to MON6.</p> | <p>Exchange monitor data No. with monitor data display.</p> | <ul style="list-style-type: none"> When monitor No. is displayed. Input signal status display mode is entered. When monitor data is displayed. Exchange monitor data upper 4 digits with lower 4 digits  | <ul style="list-style-type: none"> When monitor No. is displayed. Alarm/status (initial status) is displayed. |

Table 9.10 Input Signal Status Display Mode

| △ | NO/DATA | MODE/▷ | HOME/SET |
|---|--|---|---|
| <p>• Input signal No. display.</p>  <p>Input signal Nos. are the same as serial communication monitor commands IN1 to IN8.</p> | <p>Exchange input signal with input data display</p> | <ul style="list-style-type: none"> When input signal No. is displayed. Output signal status display mode is entered. When input signal data is displayed. Exchange input signal data upper 4 digits with lower 4 digits.  | <ul style="list-style-type: none"> When input signal No. is displayed. Alarm/status (initial status) is displayed. |

Note: For serial commands, refer to Par. 7.8 "SERIAL COMMANDS".

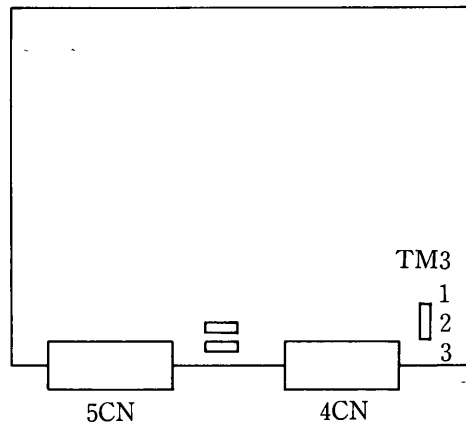
Table 9.11 Output Signal Status Display Mode

| △ | NO/DATA | MODE/▷ | HOME/SET |
|---|---|---|---|
| <p>• Output signal No. display</p>  <p>(OUTPUT SIGNAL 1) (OUTPUT SIGNAL 2) (OUTPUT SIGNAL 3)</p> <p>Output signal Nos. are the same as serial communication monitor commands OUT1 to OUT3.</p> | <p>Exchange output signal with output data display.</p> | <p>• When output signal No. is displayed. Alarm record display mode is entered.</p> <p>• When output signal data is displayed. Exchange output signal data upper 4 digits with lower 4 digits.</p>  | <p>• When output signal No. is displayed. Alarm/status (initial status) is displayed.</p> |

Note: For serial commands, refer to Par. 7.8 "SERIAL COMMANDS".



9.2 MONITOR FUNCTION



| Pin No. | Signal Name | Name | Output Voltage |
|---------|------------------|---------------------------|--|
| TM3-1 | V _{TM} | Motor speed | $\mp 2.0 \times \frac{P^*}{8192} \text{ V}/\pm 1000\text{r/min}$ |
| TM3-2 | T _{MON} | Torque or speed reference | Torque reference: $\mp 3.0\text{V}/\pm 100\%$ Speed reference: $\pm 2.0\text{V}/\pm 1000\text{r/min}$ |
| TM3-3 | GND | 0V for signal | 0V |

* P value is number of encoder pulses per revolution (P/R) to be used.

Notes:



- Torque reference or speed reference selection is performed by serial command. Torque reference is selected when power supply is turned ON.
- Accuracy; $\pm 10\%$
- 8-bit D/A converter is used. Output may have 1-bit ripple.

| Command | T _{MON} Output |
|---------|-------------------------|
| MU = 1 | Torque reference |
| MU = 2 | Speed reference |

10 PERIPHERAL DEVICES

10.1 COMBINATION OF PERIPHERAL DEVICES

Table 10.1 Combination of SERVOPACK, SERVOMOTOR M Series and Peripheral Devices

| SERVOPACK Type CACR- | AC SERVOMOTOR Type USAMED- | Power Capacity per SERVOPACK* ¹ kVA | Current Capacity Per MCCB of Fuse A | Applicable Noise Filter | Recommended Noise Filler* ² | | Power ON/OFF Switch |
|-------------------------|--------------------------------|---|--|--|--|--------------|---------------------------|
| | | | | | Type | 200VAC Class | |
| HR03UB | 03L <input type="checkbox"/> 1 | 0.65 | 5 | Good  Poor  | LF-305 | 5A | Contactor 30A or above |
| HR10UB | 06L <input type="checkbox"/> 1 | 1.5 | 8 | | LF-310 | 10A | |
| | 09L <input type="checkbox"/> 2 | 2.1 | 8 | | LF-315 | 15A | |
| HR15UB | 12L <input type="checkbox"/> 2 | 3.1 | 10 | | LF-320 | 20A | Contactor 35A or above |
| HR20UB | 20L <input type="checkbox"/> 2 | 4.1 | 12 | | LF-330 | 30A | |
| HR30UB | 30L <input type="checkbox"/> 2 | 6.0 | 18 | | LF-340 | 40A | |
| HR44UB | 44L <input type="checkbox"/> 2 | 8.0 | 24 | | | | |

*1 Values at rated load
 *2 Made by Tokin Corp.



Table 10.2 Combination of SERVOPACK, SERVOMOTOR F Series and Peripheral Devices





| SERVOPACK Type CACR- | AC SERVOMOTOR Type USAFED- | Power Capacity per SERVOPACK kVA | Current Capacity per MCCB of Fuse A | Applicable Noise Filter | Recommended Noise Filter | | Power ON/OFF Switch |
|-------------------------|-------------------------------|-------------------------------------|--|---|--------------------------|--------------|---------------------------|
| | | | | | Type | 200VAC class | |
| HR05UB | 05L □ 1 | 1.1 | 5 | Good  | LF-305 | 5A | Contactor 30A or above |
| HR10UB | 09L □ 1 | 2.1 | 8 | | LF-315 | 15A | |
| HR15UB | 13L □ 2 | 3.1 | 10 | | | | |
| HR20UB | 20L □ 2 | 4.1 | 12 | Poor  | LF-320 | 20A | Contactor 35A or above |
| HR30UB | 30L □ 2 | 6.0 | 18 | | LF-330 | 30A | |
| HR44UB | 44L □ 2 | 8.0 | 24 | | LF-340 | 40A | |

Table 10.3 Combination of SERVOPACK, SERVOMOTOR G Series and Peripheral Devices

| SERVOPACK Type CACR- | AC SERVOMOTOR Type USAFED- | Power Capacity per SERVOPACK kVA | Current Capacity per MCCB of Fuse A | Applicable Noise Filter | Recommended Noise Filter | | Power ON/OFF Switch |
|-------------------------|-------------------------------|-------------------------------------|--|---|--------------------------|--------------|---------------------------|
| | | | | | Type | 200VAC class | |
| HR05UB | 05L □ 1 | 1.1 | 5 | Good  | LF-305 | 5A | Contactor 30A or above |
| HR10UB | 09L □ 1 | 2.1 | 8 | | LF-315 | 15A | |
| HR15UB | 13L □ 2 | 3.1 | 10 | | | | |
| HR20UB | 20L □ 2 | 4.1 | 12 | Poor  | LF-320 | 20A | Contactor 35A or above |
| HR30UB | 30L □ 2 | 6.0 | 18 | | LF-330 | 30A | |
| HR44UB | 44L □ 2 | 8.0 | 24 | | LF-340 | 40A | |

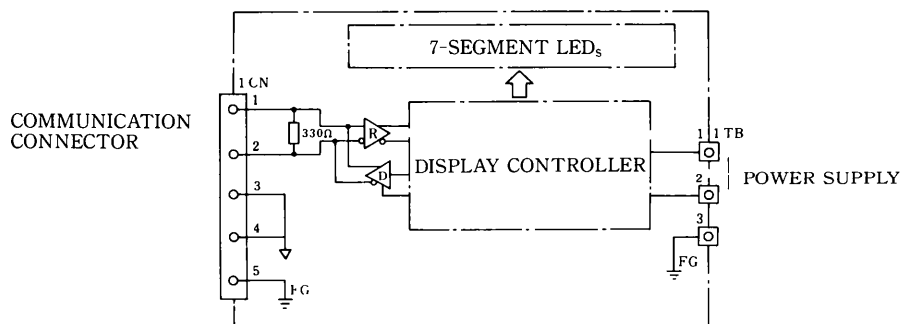
10.2 EXTERNAL POSITION INDICATOR (TYPE MCIF-L8)

(1) Specifications

| Item \ Type | MCIF-L8 | MCIF-L8-24* | MCIF-L8-A1 * |
|-------------------------------|--|-------------|--------------|
| Power supply | 5VDC, 1A | 24VDC, 0.5A | 100VAC, 0.2A |
| Power supply variation range | 4.75 to 5.25V | 18 to 27VDC | 85 to 120VAC |
| Operating temperature | 0 to +55°C | | |
| Storage temperature | -20 to +80°C | | |
| Operating/storage humidity | 90% or less | | |
| Vibration or shock resistance | Vibration resistance: 4.9m/s ² (0.5G) (10 to 55Hz) Shock resistance: 19.6m/s ² (2G) | | |
| Number of display digits | - sign indication and 8-digit number | | |
| Connecting method | Serial communication, connected to connector CN4, of CACR-HR. | | |

Note: Types marked with * are manufactured on order.

(2) Circuit block diagram

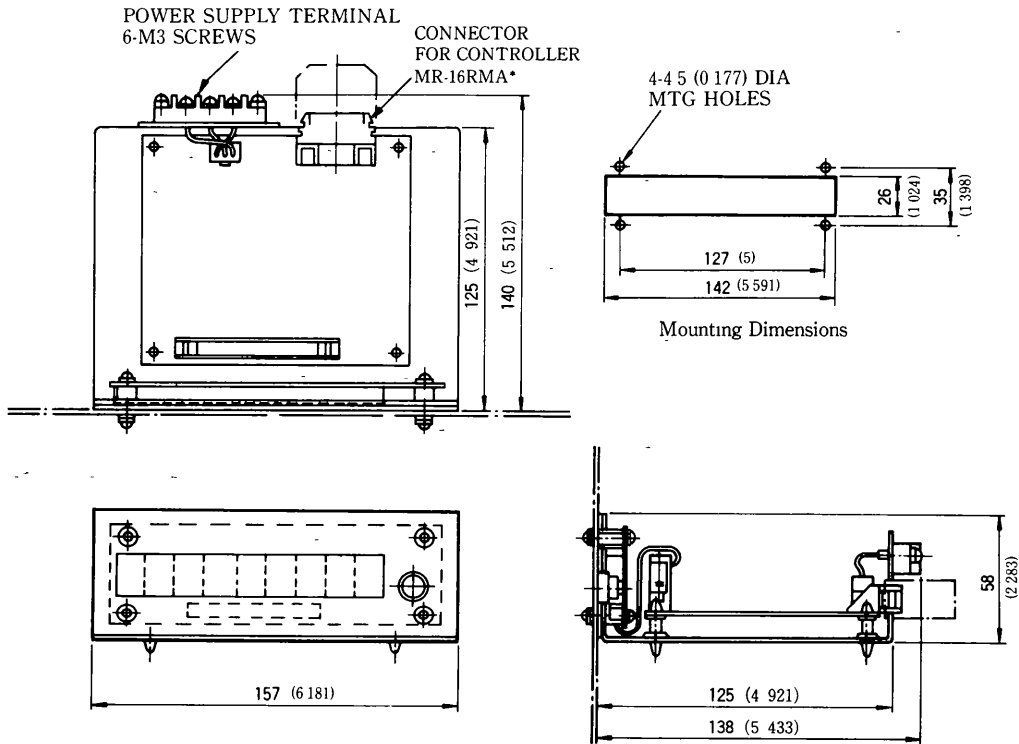


Note: Do not connect anything to 1CN pin 7 or 8 since they are for test. Other pins are not used.

Power Supply and Connection

| Type \ ITB | 1 | 2 | 3 |
|------------|--------|----------|----|
| MC1F-L8 | +5V | 0 | FG |
| MC1F-L8 24 | +24V | 0 | FG |
| MC1F-L8-A1 | AC100V | (AC100V) | FG |

(3) Dimensions in mm (inches)
 Type MCIF-L8



Surface processing
 Electrodeposition coating, N1 5 in Munsell notation (black)
 Mass 0 6kg (1 31b)

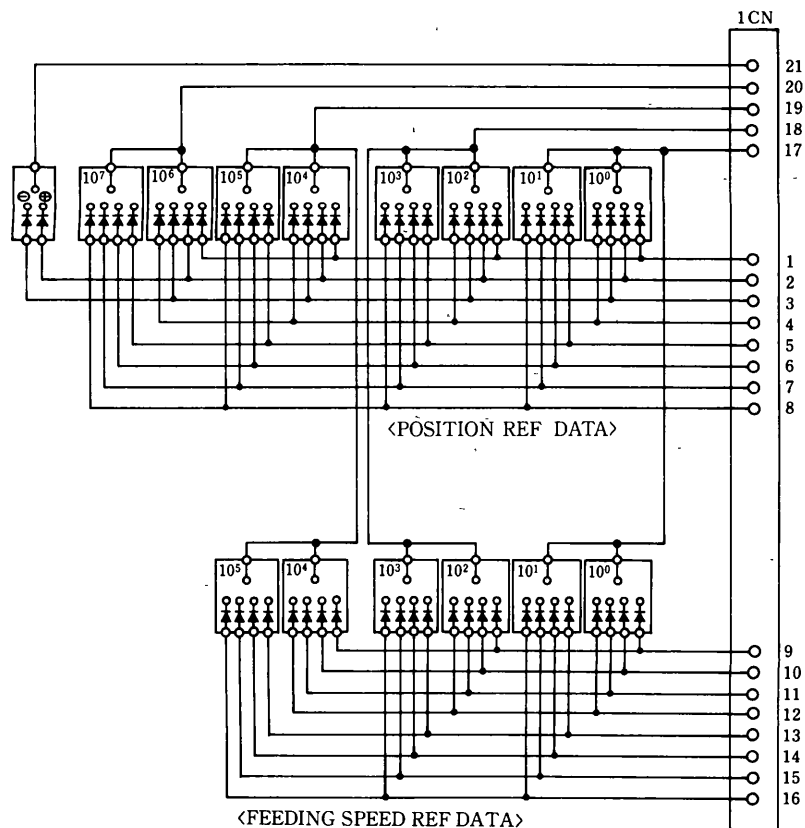
*Applicable receptacle
 soldered type MR-16F
 caulking type MRP-16F01
 case MR-16L

10.3 DIGITAL SWITCH UNIT (TYPE MCIF-D)

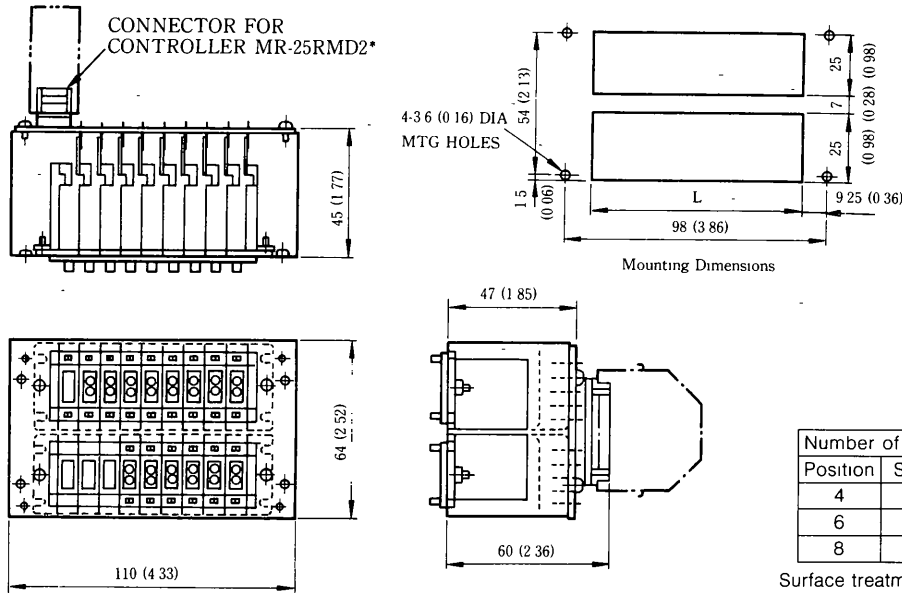
(1) Specifications

| Item \ Type | MCIF-D86 | MCIF-D66 | MCIF-D44 | MCIF-D80 | MCIF-D60 | MCIF-D40 |
|-------------------------------|---|-------------|-------------|---------------------------------------|-------------|-------------|
| Data contents | 2-step(position/speed reference data) | | | 1-step(only position reference data)* | | |
| Position reference data | BCD 8-digit | BCD 6-digit | BCD 4-digit | BCD 8-digit | BCD 6-digit | BCD 4-digit |
| Speed reference data | BCD 6-digit | BCD 6-digit | BCD 4-digit | None | | |
| Operating temperature | 0 to +55°C | | | | | |
| Storage temperature | -20 to +80°C | | | | | |
| Vibration or shock resistance | Vibration resistance: 4.9m/s ² (0.5G)(10 to 55Hz) Shock resistance: 19.6m/s ² (2G) | | | | | |
| Connecting method | Connect CN5 to CACR-HR. | | | | | |

(2) Circuit Diagram



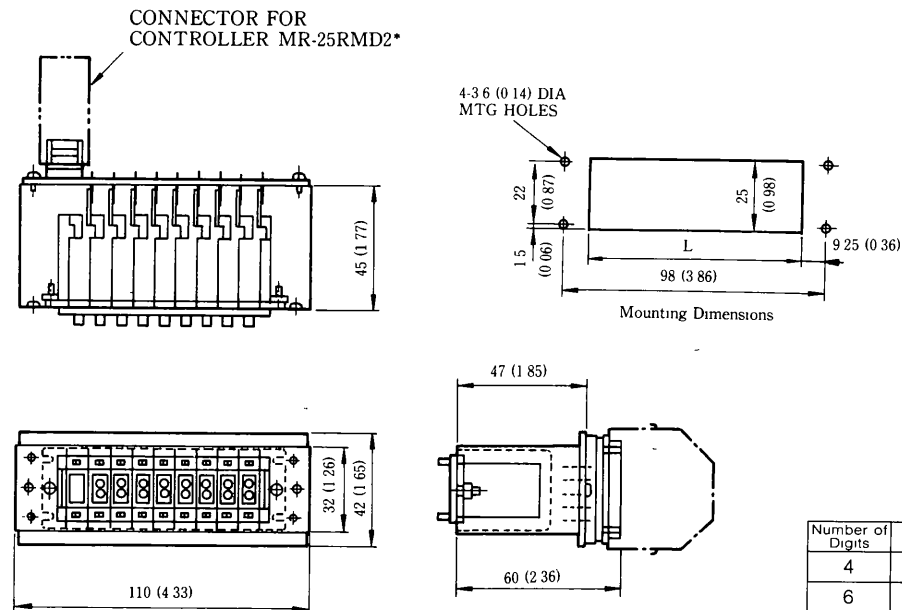
(3) Dimensions in mm (inches)
 Type MCIF-D44, -D66, -D86



| Number of Digits | | Type | L mm(in) |
|------------------|-------|----------|-------------|
| Position | Speed | | |
| 4 | 4 | MCIF-D44 | 47.5 (1.87) |
| 6 | 6 | MCIF-D66 | 63.5 (2.5) |
| 8 | 6 | MCIF-D86 | 79.5 (3.13) |

Surface treatment
 Electrodeposition N1.5 in Munsell notation (black)
 Approx Mass 0.3kg (0.7lb)

Type MCIF-D40, -D60, -D80



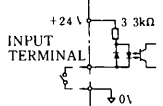
| Number of Digits | Type | L mm(in) |
|------------------|----------|-------------|
| 4 | MCIF-D40 | 47.5 (1.87) |
| 6 | MCIF-D60 | 63.5 (2.5) |
| 8 | MCIF-D80 | 79.5 (3.13) |

Surface treatment
 Electrodeposition N1.5 in Munsell notation (black)
 Approx Mass 0.2kg (0.4lb)

*Applicable receptacle
 soldered type MR-25F
 caulking type MRP-25F01
 case MR-25L

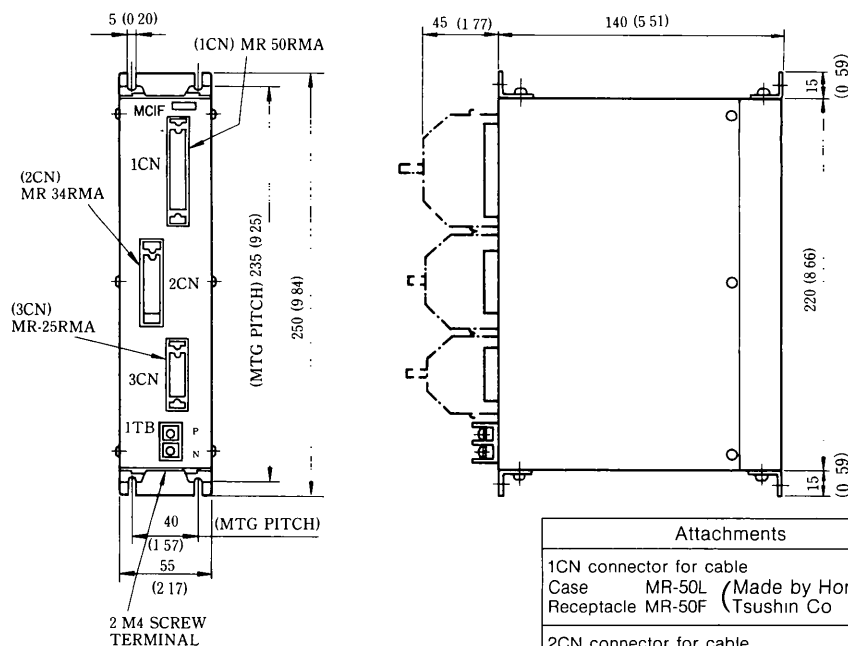
10.4 CONTACT INPUT UNIT (TYPE MCIF-R86)

(1) Specifications

| Item | Type | MCIF-R86 |
|-------------------------------|------|---|
| Data contents | | Position reference (sign signal and 8-digit BCD signal) Speed reference (6-digit BCD signal) |
| Operating temperature | | 0 to +55°C |
| Storage temperature | | -20 to +80°C |
| Operating/storage humidity | | 99% or less |
| Vibration or shock resistance | | Vibration resistance: 4.9m/s ² (0.5G)(10 to 55Hz) Shock resistance: 19.6m/s ² (2G) |
| Input conditions | | <ul style="list-style-type: none"> • Power supply 24VDC, photocoupler input (drive current 7mA) • Dry contact and transistor open collector input • Position data: 1CN connector • Speed data: 2CN connector  |
| Connecting method | | Connect 3CN to CACR-HR CN5 |

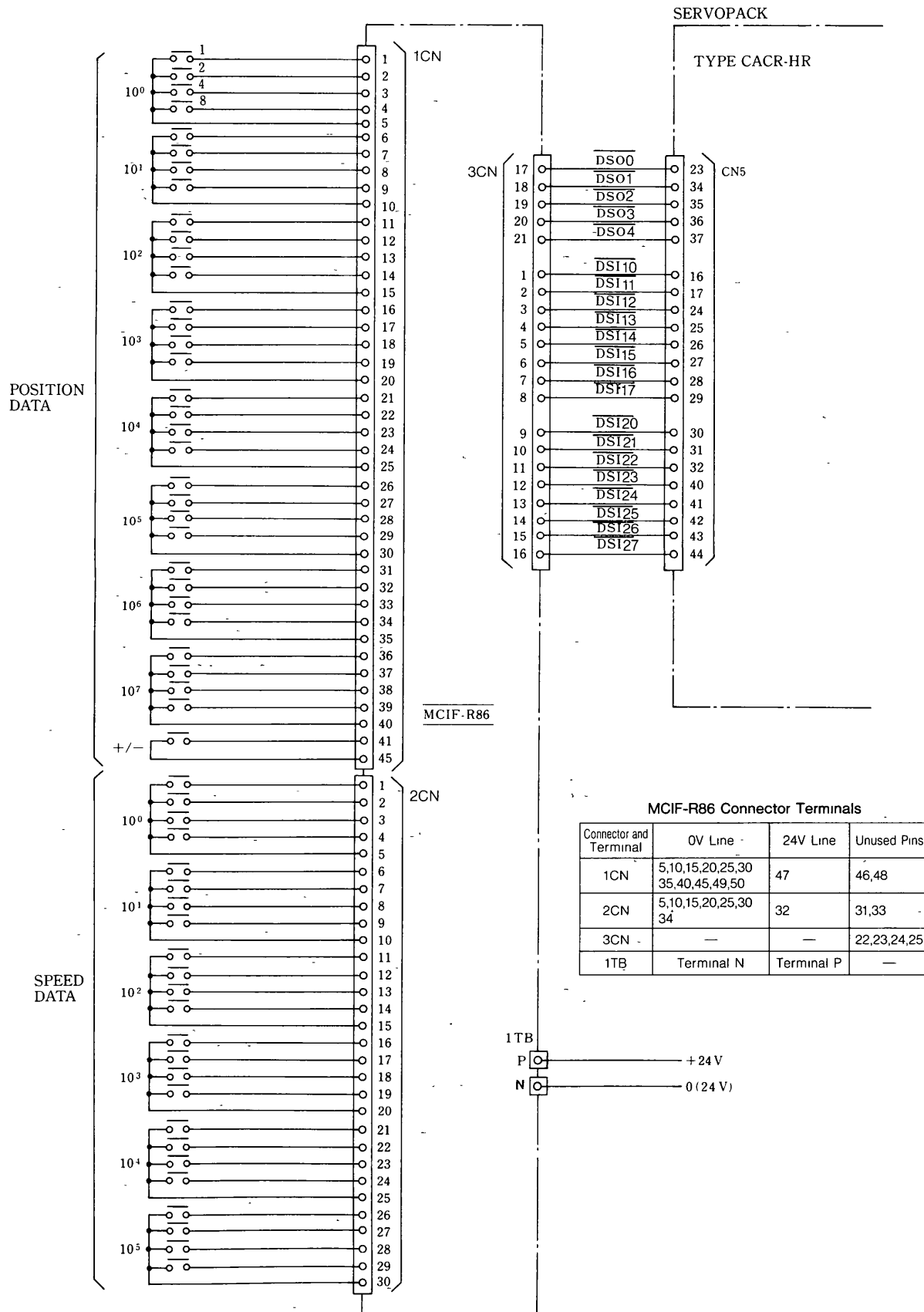
(2) Dimensions in mm (inches)

Type MCIF-R86



| Attachments |
|--|
| 1CN connector for cable Case MR-50L (Made by Honda) Receptacle MR-50F (Tsushin Co) |
| 2CN connector for cable Case MR-34L (Made by Honda) Receptacle MR-34F (Tsushin Co) |
| 3CN connector for cable Case MR-25L (Made by Honda) Receptacle MR-25F (Tsushin Co) |

(3) Circuit block diagram



POSITION DATA

SPEED DATA

MCIF-R86

SERVOPACK

TYPE CACR-HR

MCIF-R86 Connector Terminals

| Connector and Terminal | 0V Line - | 24V Line | Unused Pins |
|------------------------|------------------------------------|------------|-------------|
| 1CN | 5,10,15,20,25,30 35,40,45,49,50 | 47 | 46,48 |
| 2CN | 5,10,15,20,25,30 34 | 32 | 31,33 |
| 3CN | — | — | 22,23,24,25 |
| 1TB | Terminal N | Terminal P | — |

1TB

P

+24V

N

0 (24V)

10.5 MANUAL PULSE GENERATOR (TYPE PREH-2C3T/100-M1)

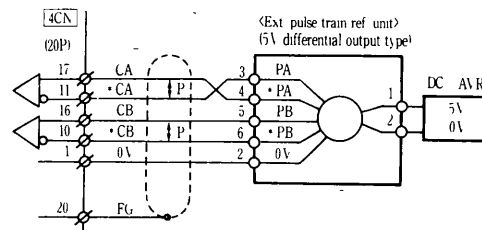
(1) Specifications

| Item | Type | PREH-2C3T/100-M1 |
|--|------|---|
| Power supply | | 5VDC \pm 10%, 150mA |
| Output waveform, output type | | Rectangular wave, line driver output |
| Number of output pulses, output signal | | 100 pulses/rev. 90° phase difference 2 signals (phases A and B) |
| Operating temperature | | 0 to +50°C |
| Storage temperature | | -30 to +70°C |
| Operating/storage humidity | | 20 to 80% RH |
| Vibration or shock resistance | | Vibration resistance: 4.9m/s ² (0.5G)(10 to 55Hz) Shock resistance: 19.6m/s ² (2G) |
| Connecting method | | Connect to CACR-HR CN4 |

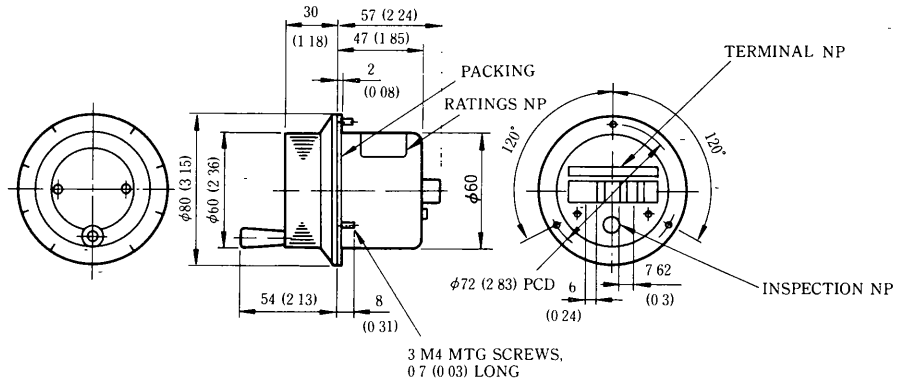
(2) Output terminal Arrangement

| Symbol | Function |
|--------|----------------|
| 1 | +V (DC5V) |
| 2 | V (0V) |
| 3 | SIG. A |
| 4 | SIG. \bar{A} |
| 5 | SIG. B |
| 6 | SIG. \bar{B} |

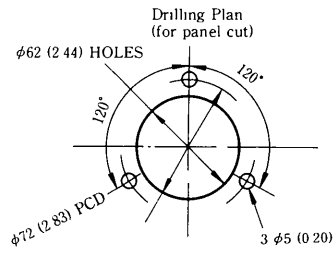
Note: When connecting to Servopack, reverse SIG. A and SIG. \bar{A} on Par 5.1, as follows:



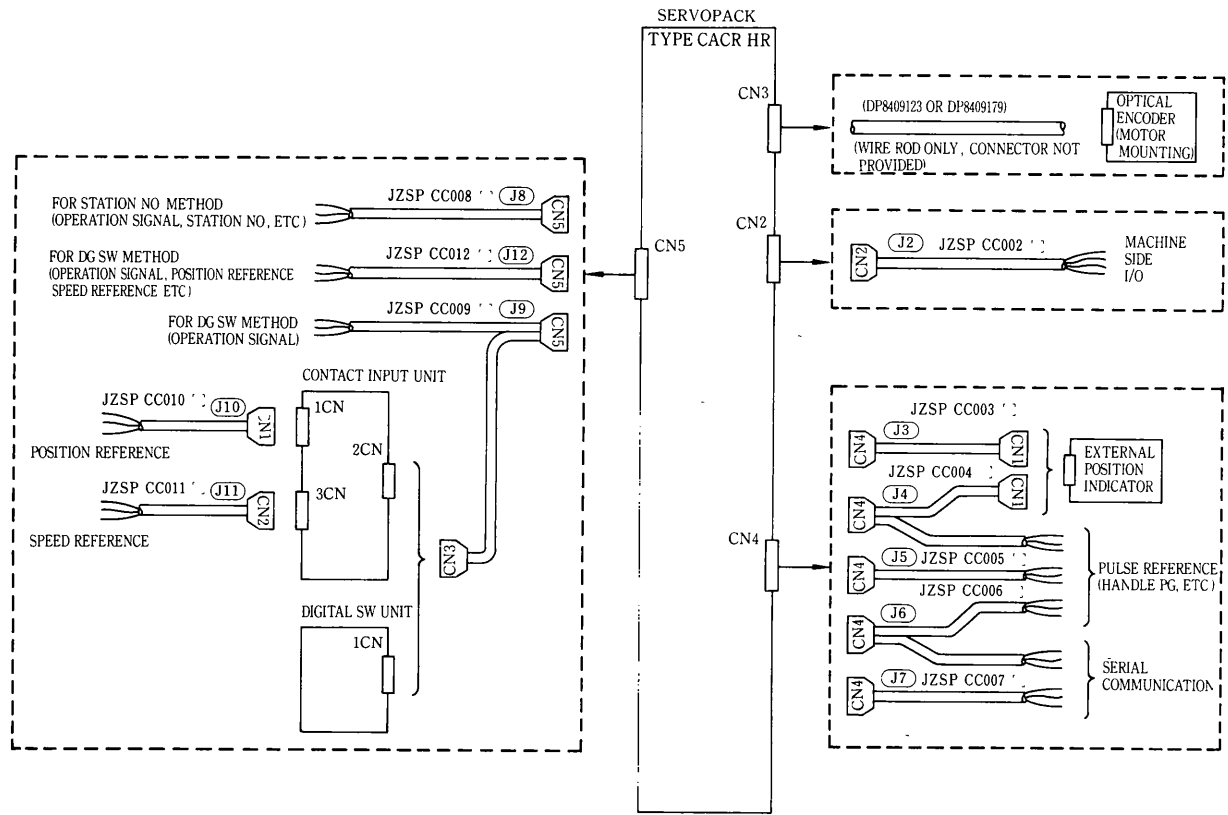
(3) Dimensions in mm (inches)



Note Receiver IC is AM26LS32C,
SN75175 or equivalent



10.6 CONNECTING CABLE



Note Cable length 1,3 or 5 meters (39.37, 118.11 or 196.85 inches)
 For CN4 or CN5, select one cable suitable for the system

10.7 PARAMETER SETTER (PF803)

10.7.1 Specifications

(1) Display

| | |
|-------------------------------|--|
| Display element | TN type LCD |
| Display screen | 20 columns × 4 lines |
| Display character composition | 5 × 7 dots matrix |
| Display character size | 4.75 × 2.95 mm/character (0.19 × 0.12 in./character) |
| Display character type | Alphabets (capital, small), numeric, symbols (Total 195 types) |
| Cursor display method | Blinked block |
| Status display | 4 LED lamps <ul style="list-style-type: none">• Alphabet small letters mode: red• On-line mode: orange• Edit mode: green• Transmission mode: yellow |
| Backup battery check display | 1 red LED lamp |

(2) Control

| | |
|-------------------------|--|
| CPU | 8-bit CMOS micro-processor (Basic clock: 7.37MHz) |
| Buffer memory | 2000 bytes for terminal. 100000 bytes for file data |
| Built-in backup battery | 1 NiCd battery (3.6V, 40mAh, rechargeable) Exclusive-use for buffer memory backup |
| Buzzer | 1 piezoelectric buzzer |

(3) Keyboard

| | |
|---------------------|---|
| Key top | Membrane shielded type |
| Switch for keys | Switch with click feedback |
| Data input keys | 44 keys |
| Shift key | 1 key for key top lower data input |
| Capital key | 1 key for switching alphabet capital/small |
| Window key | 1 key for window up/down |
| Battery check key | 1 key for check voltage of battery exclusive use for buffer memory backup |
| Reset key | 1 key |
| Key input code type | JIS code mode : 192 types ASCII code mode: 128 types |
| Function keys | For 5 keys Max. 64-code train registration possible per key |

(4) Interface

| | |
|--------------------------|--|
| Using codes | JIS 7-bit, 8-bit or ASCII code |
| Character composition | Asynchronous type 9, 10, 11 or 12 bits |
| Parity | Even, odd, mark, space, or no-parity |
| Data type | Bit serial |
| Data communication speed | 110, 150, 300, 600, 1200, 2400, 4800, 9600 or 19200 bps |
| Data signal type | • Host system port : RS-232C (in accordance with EIA-232D /JIS C6361) |

(5) Power Supply

| | |
|---------------------|--|
| Using battery | Exclusive-use nickel-cadmium set battery (Type: FA4/700AAF) Nominal capacity: 700mAh |
| Power supply switch | 1 |
| Recharging jack | 1 |
| Consumed power | At normal operation: • Local mode At standby: 115mW At data processing: 300mW • Online mode At data processing: 580mW |

(6) External Dimensions and Mass

| | |
|----------------------------|--|
| Main body | 205D × 110W × 35H mm (8.07D × 4.33W × 1.38H inches) Mass: 580 g (1.281b) |
| Interface cable, connector | Shielded cable, Host system side connector: D-sub(25pins) Removable from the main body Standard 2m (78.74in.) long (type PEC803-02) |

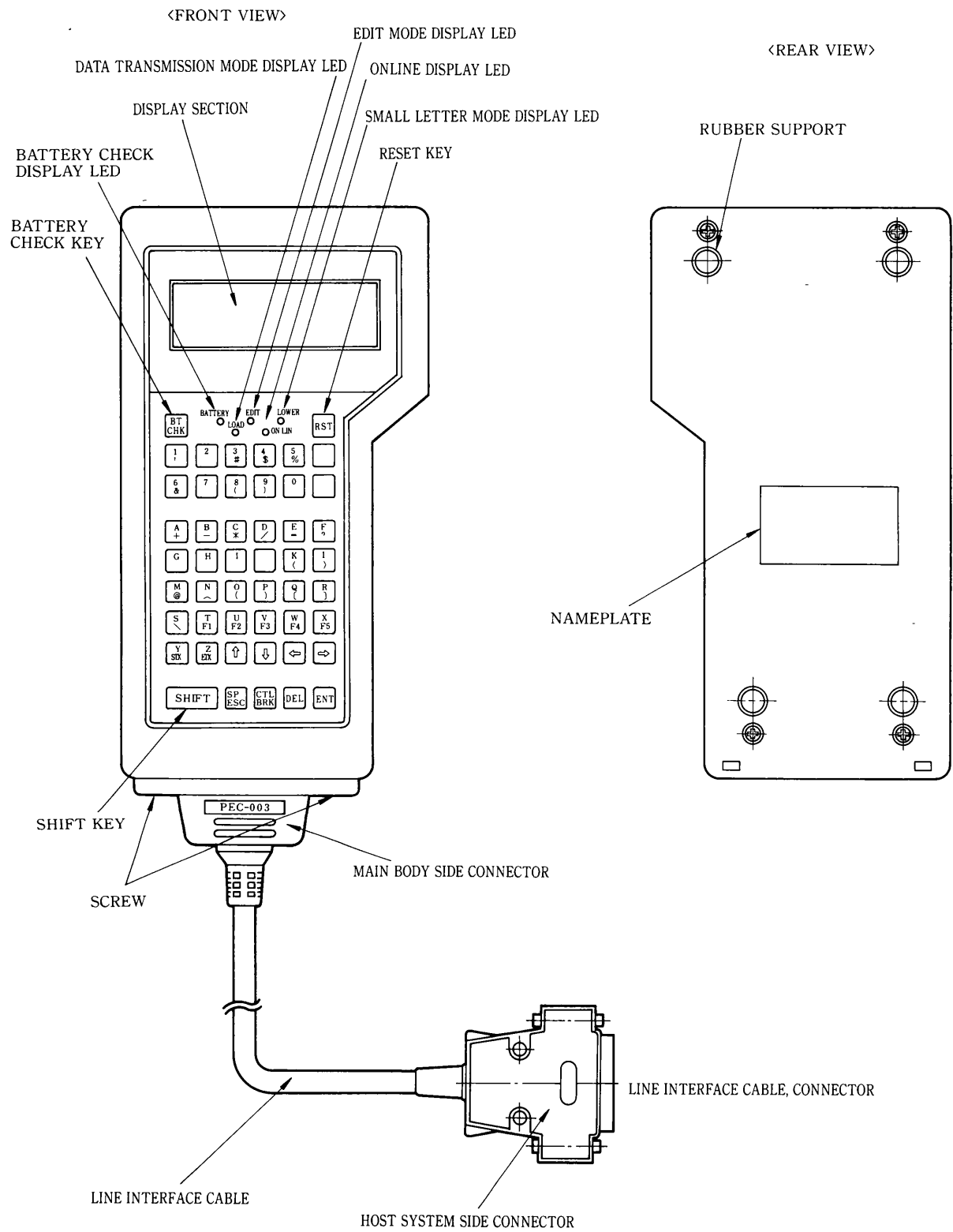
(7) Operational Environment

| | |
|---------------------|---|
| Environment | Shockproof, dustproof and noise resistant specifications in standard interface cable (PEC803-02 type) |
| Ambient temperature | At operation: 0 to +45°C At storage : -10 to +60°C |
| Humidity | 5 to 90% RH |

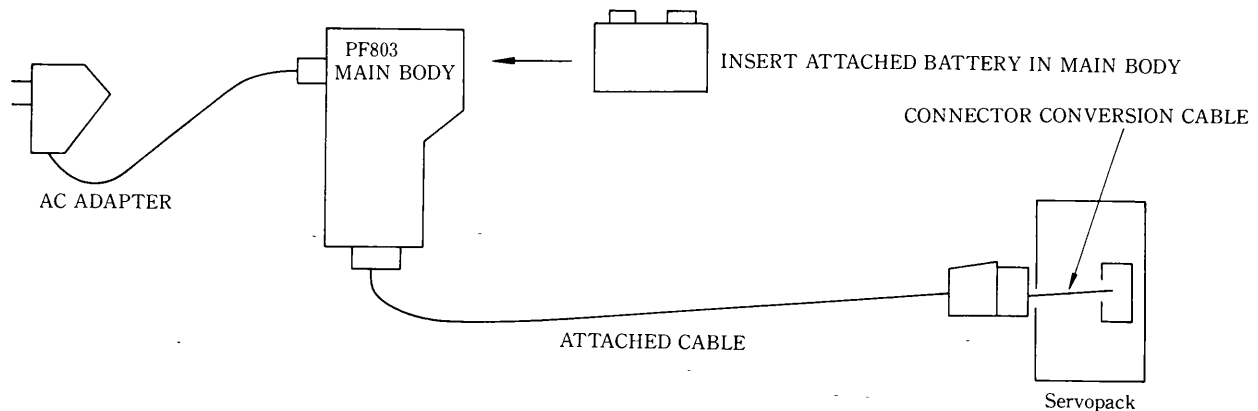
(8) AC Adapter (Type PAC803-A)

| | |
|---------------------------|--|
| Output | 7.5VDC±1V, 2.25W |
| Power supply | 100±10VAC (50/60Hz) |
| External dimensions, mass | • Main body: 60D × 50W × 40H mm (2.36D × 1.97W × 1.57H inches) 210g (0.461b) • DC output cable: 1.9m (74.8 in.) |
| Operating temperature | +10 to +40°C |
| Applicable type | PF803-AS type, operation possible during recharging |

10.7.2 External View



10.7.3 How to Use






Power Supply:

- Can be used with AC adapter connected.
- Can be recharged fully for 48 hours and used for 10 hours without AC adapter.
- If not used for 40 days or more, charge it, for at times setup information or files may disappear.

Key Operation:

- Do not depress **SHIFT** simultaneously with other keys. Depress **SHIFT** key and release it before depressing another key.

(Depressing **SHIFT** key changes the cursor from  to  .)

- After depressing **CTL BRK** key (control key), release it, depress another key.
- When used connecting with SERVOPACK, if wrong key input is made, **DEL** and  key cannot be used.

In this case, input any character to cause an error by **ENT** and start key input again from the beginning.

Setup (For the first use, perform the following setup.)

| < Operation > | <Description> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|-------------------------|-------|-----------|------------|----------------|-----------|---|------|--|------------|--------|---------|---|-----------|-------|---|--|---------------|----------|------------------|--|------|-------|--------|------|------|------|----------|--------|------------|---------|-----------|--|-----------|-------|
| <p>1.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td colspan="2" style="text-align: center;">MENU</td></tr> <tr><td>F1=TELCOM</td><td>F2=TEXT</td></tr> <tr><td>F3=SET UP</td><td>F4=TEST</td></tr> </table> <p style="text-align: center;"><Display 1></p> | MENU | | F1=TELCOM | F2=TEXT | F3=SET UP | F4=TEST | <p>Displayed when turning the power on.</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MENU | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| F1=TELCOM | F2=TEXT | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| F3=SET UP | F4=TEST | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <p>2. <input type="button" value="SHIFT"/> + <input type="button" value="V F3"/></p> | <p>Select SET UP.</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <p>3.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td colspan="2" style="text-align: center;">SETUP-MODE</td></tr> <tr><td>F1=COM</td><td>F2=DISPLAY</td></tr> <tr><td>F3=KEY</td><td>F4=RS232C</td></tr> <tr><td>F5=MENU</td><td></td></tr> </table> | SETUP-MODE | | F1=COM | F2=DISPLAY | F3=KEY | F4=RS232C | F5=MENU | | <p>Displayed setup-mode. Set by using the following keys.</p> <p><input type="button" value="⇒"/> : selects an item to be set.</p> <p><input type="button" value="↓"/> : sets data. See next page.</p> <p><input type="button" value="ENT"/> : ends the setting.</p> | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SETUP-MODE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| F1=COM | F2=DISPLAY | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| F3=KEY | F4=RS232C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| F5=MENU | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <p>4. Set the setup data as the following procedure.</p> | <p>COM is selected.</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <p>① <input type="button" value="SHIFT"/> + <input type="button" value="T F1"/></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td>COMMUNICATION</td><td>SPEED</td></tr> <tr><td>9600 bps</td><td></td></tr> <tr><td>CODE PARITY</td><td>STOP</td></tr> <tr><td>ASCII Even</td><td>1Bit</td></tr> </table> <p style="text-align: center;"><input type="button" value="ENT"/></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td>XON/XOFF</td><td>LOCAL ECHO</td></tr> <tr><td>Enable</td><td>Disable</td></tr> <tr><td>DELIMITER</td><td>CHARACTER</td></tr> <tr><td>Cr.Lf</td><td></td></tr> </table> <p style="text-align: center;"><input type="button" value="ENT"/></p> | COMMUNICATION | SPEED | 9600 bps | | CODE PARITY | STOP | ASCII Even | 1Bit | XON/XOFF | LOCAL ECHO | Enable | Disable | DELIMITER | CHARACTER | Cr.Lf | | <p>• Data to be set</p> <table border="0"> <tr><td>COMMUNICATION</td><td>9600 bps</td></tr> <tr><td>SPEED</td><td></td></tr> <tr><td>CODE</td><td>ASCII</td></tr> <tr><td>PARITY</td><td>Even</td></tr> <tr><td>STOP</td><td>1Bit</td></tr> <tr><td>XON/XOFF</td><td>Enable</td></tr> <tr><td>LOCAL ECHO</td><td>Disable</td></tr> <tr><td>DELIMITER</td><td></td></tr> <tr><td>CHARACTER</td><td>Cr.Lf</td></tr> </table> | COMMUNICATION | 9600 bps | SPEED | | CODE | ASCII | PARITY | Even | STOP | 1Bit | XON/XOFF | Enable | LOCAL ECHO | Disable | DELIMITER | | CHARACTER | Cr.Lf |
| COMMUNICATION | SPEED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 9600 bps | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CODE PARITY | STOP | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ASCII Even | 1Bit | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| XON/XOFF | LOCAL ECHO | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Enable | Disable | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| DELIMITER | CHARACTER | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Cr.Lf | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| COMMUNICATION | 9600 bps | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SPEED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CODE | ASCII | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PARITY | Even | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| STOP | 1Bit | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| XON/XOFF | Enable | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| LOCAL ECHO | Disable | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| DELIMITER | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CHARACTER | Cr.Lf | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <p>② <input type="button" value="SHIFT"/> + <input type="button" value="U F2"/></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td>SET H-TAB</td><td>STOP</td></tr> <tr><td>1</td><td></td></tr> <tr><td>CR OPERATION</td><td></td></tr> <tr><td>Cr</td><td></td></tr> </table> <p style="text-align: center;"><input type="button" value="ENT"/></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td>MEMORY</td><td>RETENTION</td></tr> <tr><td>Yes</td><td></td></tr> </table> <p style="text-align: center;"><input type="button" value="ENT"/></p> | SET H-TAB | STOP | 1 | | CR OPERATION | | Cr | | MEMORY | RETENTION | Yes | | <p>DISPLAY is selected.</p> <p>• Data to be set</p> <table border="0"> <tr><td>SET-H-TAB</td><td>STOP</td><td>1</td></tr> <tr><td>CR OPERATION</td><td></td><td>Cr</td></tr> <tr><td>MEMORY RETENTION</td><td></td><td>Yes</td></tr> </table> | SET-H-TAB | STOP | 1 | CR OPERATION | | Cr | MEMORY RETENTION | | Yes | | | | | | | | | | | | | |
| SET H-TAB | STOP | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CR OPERATION | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Cr | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MEMORY | RETENTION | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Yes | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SET-H-TAB | STOP | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CR OPERATION | | Cr | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MEMORY RETENTION | | Yes | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

③ SHIFT + V
F3

KEY CLICK
Yes
AUTO REPEAT
Yes

ENT

④ SHIFT + W
F4

Control RS-232C Input Signals
CS DSR CD
No No No

ENT

⑤ SHIFT + X
F5

MENU
F1=TELCOM F2=TEXT
F3=SET UP F4=TEST

<Display 1>

KEY is selected.

| | |
|------------------|-----|
| • Data to be set | |
| KEY CLICK | Yes |
| AUTO REPEAT | Yes |

RS-232C is selected.

| | |
|------------------|----|
| • Data to be set | |
| CS | No |
| DSR | No |
| CD | No |

Returns to MENU.

Using method when connecting with Servopack (Turn ON the Servopack control power supply.)

< Operation >

MENU
F1=TELCOM F2=TEXT
F3=SET UP F4=TEST

<Display 1>

1. SHIFT + T
F1

TELCOM-MODE
F1=TERM F2=UPLOAD
F3=DOWNLOAD
F5=MENU

<Display 4>

2. SHIFT + T
F1
3. CTL
BRK + E
-
4. Check that characters are displayed by key input.

<Description>

Select TELCOM.

Select TERM.
Perform echo-back.

NOTE If strange characters are displayed, clear the screen by depressing CTL
BRK and L
> keys.

5. Set the parameter.

(ex)

• Enter 20 to parameter No. 1.

[P] [R] [M] [1] [SHIFT] [-] [2] [0] [ENT]

• Enter 11110 to parameter No. 14.

[P] [R] [M] [1] [4] [SHIFT] [-] [1] [1] [1] [1] [0] [ENT]
(b4) (b3) (b2) (b1) (b0)

6. [R] [E] [S] [ENT]

7. After approx. 3 seconds:

[CTL BRK] [E] [P] [R] [M] [ENT]

8. Check by all parameter display
(Do not use it after PRM 21).

9. [SHIFT] + [X F5]

```
TELCOM-MODE
F1=TERM      F2=UPLOAD
F3=DOWNLOAD
F5=MENU
```

< Display 4 >

10. When entering parameter to PF803 file.

① [SHIFT] + [V F3]

```
File Name? *DNLOAD*
Free Memory [ ]
[ ] Byte
```

REMAINING MEMORY

< Display 5 >

② "File Name" + [ENT]
(8 max.)

③ [P] [R] [M] [ENT]

④ Ends when decreasing remaining memory value stops.

When setting is completed, send reset command.

NOTE

- 1. Parameter is not displayed.
2. The amount of over-operation can be checked by using

[Up Arrow]

key.

[Down Arrow]

Return to <Display 4>.

Select DOWNLOAD.

CURRENT NUMBER OF FILES

Input file name (within 8 characters)

and depress [ENT] key.

NOTE

Wrong key input is cleared by

[DEL]

key.

(No display provided.)

11. Send parameter entered in PF803 file to Servopack.

① **SHIFT** + **U F2**

| | |
|-------------|----------------------|
| File Name? | *UPLOAD* |
| Select File | <input type="text"/> |

< Display 6 >

Completes when the cursor comes under File Name? after buzzer rings.

② **SHIFT** + **X F5**

Select UPLOAD.

Use following keys.

→ : enters to file name mode.

↑ **↓** : selects the file.

ENT : sends the data.

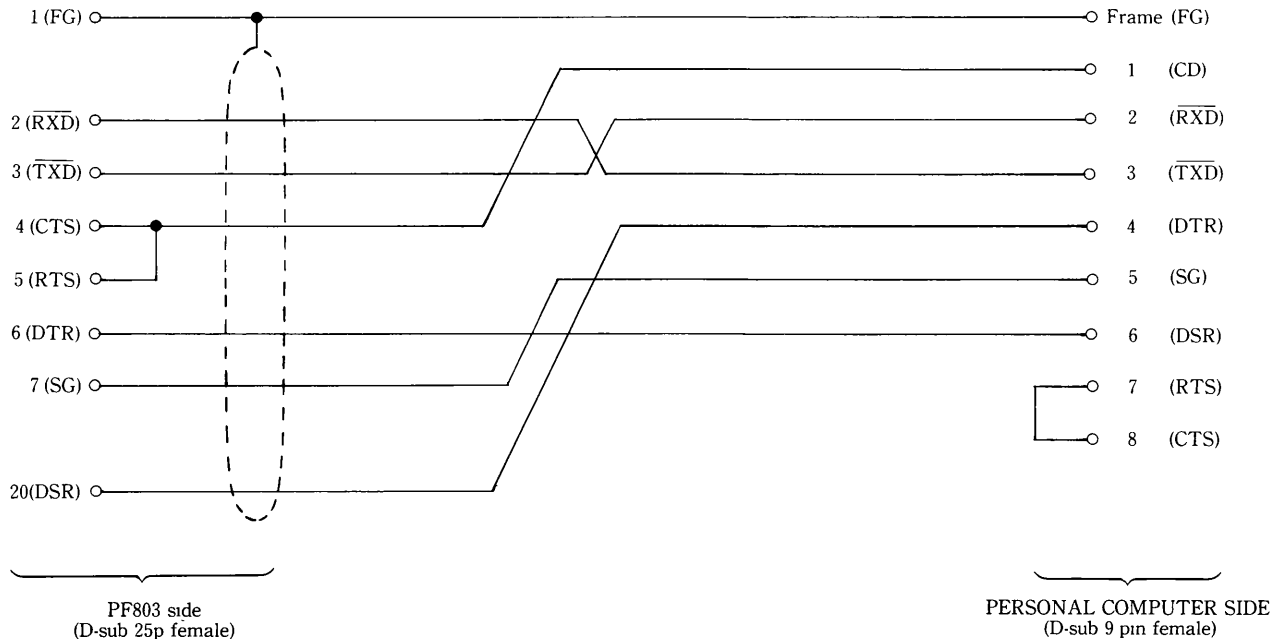
Returns to <Display 4>.

Personal computer

File exchanging method with IBM* PC-AT* or 100% compatible (PC-DOS* used)

* These brand and product names are trademarks or registered trademarks of International Business Machines Corporation

- Connection with a personal computer, use the connector conversion cable shown below.



- Personal computer setting : Set COM1 by MODE command as follows.

MODE COM1:BAUD=12, PARITY=E, DATA=7, STOP=1 **↵**
 or MODE COM1:12, E, 7, 1 **↵**

(baud rate=1200 baud, even parity, character=7 bit, stop bit=1 bit)

• Parameter Setter Setting

< Operation >

1.

| | |
|-----------|---------|
| MENU | |
| F1=TELCOM | F2=TEXT |
| F3=SET UP | F4=TEST |

<Display 1>
2. +
3.

| | |
|------------|------------|
| SETUP-MODE | |
| F1=COM | F2=DISPLAY |
| F3=KEY | F4=RS232C |
| F5=MENU | |
4. Set the setup data as the following procedure.
 - ① +

| | | |
|---------------|--------|------|
| COMMUNICATION | SPEED | |
| 1200 bps | | |
| CODE | PARITY | STOP |
| ASCII | Even | 1Bit |

| | |
|-----------|------------|
| XON/XOFF | LOCAL ECHO |
| Disable | Disable |
| DELIMITER | CHARACTER |
| Cr.Lf | |
 - ② +

| | |
|--------------|------|
| SET H-TAB | STOP |
| 1 | |
| CR OPERATION | |
| Cr | |

| | |
|--------|-----------|
| MEMORY | RETENTION |
| Yes | |
 - ③ +

| | |
|-------------|--|
| KEY CLICK | |
| Yes | |
| AUTO REPEAT | |
| Yes | |

<Description>

Displayed when turning the power on.

Select SET UP.

Displayed setup-mode.

Set by using the following keys.

: selects an item to be set.

: sets data. See below.

: ends the setting.

COM is selected.

• Data to be set

COMMUNICATION 1200 bps

SPEED

CODE ASCII

PARITY Even

STOP 1Bit

XON/XOFF Disable

LOCAL ECHO Disable

DELIMITER

CHARACTER Cr.Lf

DISPLAY is selected.

• Data to be set

SET-H-TAB STOP 1

CR OPERATION Cr

MEMORY RETENTION Yes

KEY is selected.

• Data to be set

KEY CLICK Yes

AUTO REPEAT Yes

④ +

| | | |
|---------|---------|---------------|
| Control | RS-232C | Input Signals |
| CS | DSR | CD |
| Yes | Yes | No |

⑤ +

| | |
|-----------|---------|
| MENU | |
| F1=TELCOM | F2=TEXT |
| F3=SET UP | F4=TEST |

<Display 1>

RS-232C is selected.

• Data to be set

| | |
|-----|-----|
| CS | Yes |
| DSR | Yes |
| CD | No |

Returns to MENU.

• PF803 → Personal computer

- ① Personal computer side : COPY/A COM1
- ② PF803 side : Same as sending to Servopack. (Display 6)
 After sending, sent and in TERM mode.

• Personal computer → PF803

- ① PF803 side : Same as receiving from Servopack.
 But, do not send .
- ② Personal computer side : COPY/A COM1
- ③ PF803 side : After receiving, .

Perform setup (See pages 186 and 187) again after file exchanging with personal computers.

NOTE

11 DIMENSIONS

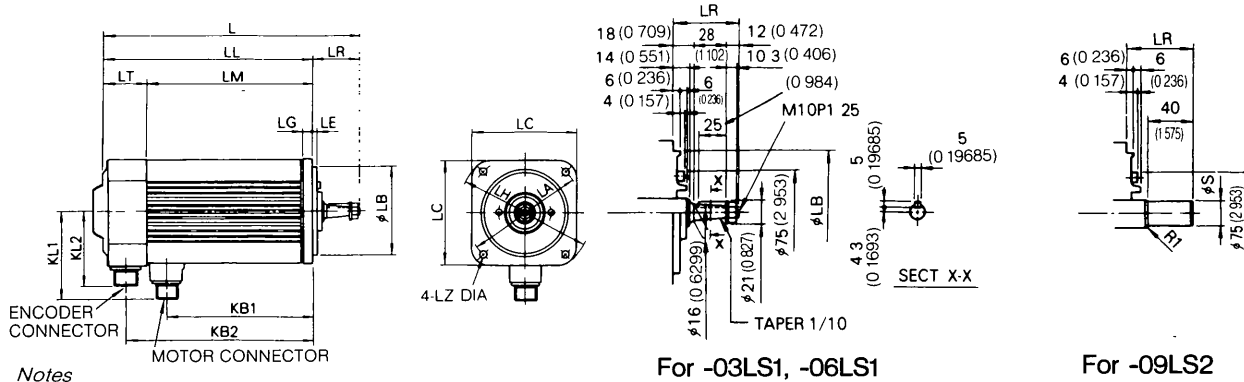
11.1 AC SERVOMOTOR WITH ABSOLUTE ENCODER

(1) M Series

Dimensions in mm (inches)

• Standard Type

Drawing 1 USAMED-03LS1, -06LS1 (Taper Shaft), -09LS2 (Straight Shaft)

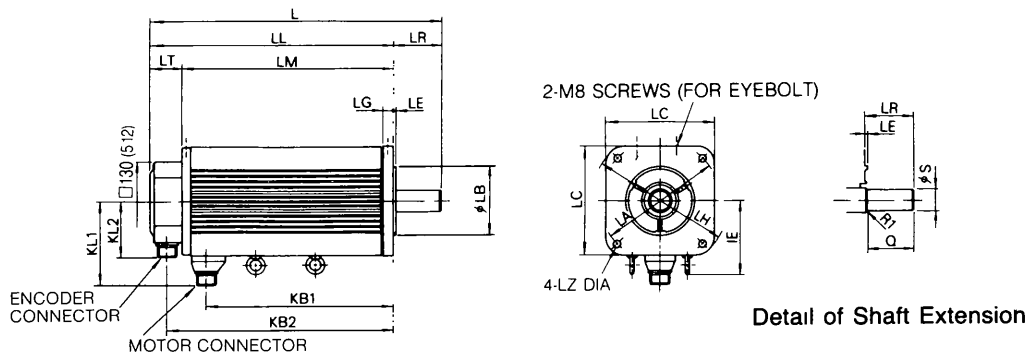


Notes

- 1 Plug and clamp are not attached for receptacle connection
- 2 Key and keyway comply with JIS B 1301-1976 (Parallel key, keyway common class)
- 3 Motor should be mounted with connectors down

Detail of Shaft Extension

Drawing 2 USAMED-12LS2 to -44LS2 (Straight Shaft)



Notes

- 1 Plug and clamp are not attached for receptacle connection
- 2 Motor should be mounted with connectors down

| AC SERVOMOTOR Type USAMED- | Dwg No | Flange Surface | | | | | | | | | | | Shaft Extension | | Approx Mass kg (lb) | | | | | | | |
|----------------------------|--------|----------------|-----|-----|-----|----|-----|-----|-----|-----|-----|-----|-----------------|-----|---------------------|----|-----|-----|----|----|-----------|------------|
| | | L | LL | LM | LR | LT | KB1 | KB2 | IE | KL1 | KL2 | LA | LB | LC | | LE | LG | LH | LZ | S | Q | |
| | | | | | | | | | | | | | | | | | | | | | | |
| 03LS1 * | 1 | 277 | 219 | 150 | 58 | 69 | 127 | 177 | — | 109 | 92 | 145 | 110 | 130 | 6 | 12 | 165 | 9 | — | — | 9 (19.8) | |
| 06LS1 * | | 334 | 276 | 207 | 58 | 69 | 184 | 234 | — | 109 | 92 | 145 | 110 | 130 | 6 | 12 | 165 | 9 | — | — | 14 (30.9) | |
| 09LS2 * | | 403 | 345 | 276 | 58 | 69 | 253 | 303 | — | 109 | 92 | 145 | 110 | 130 | 6 | 12 | 165 | 9 | 22 | 40 | 20 (44.1) | |
| 12LS2 * | 2 | 344 | 265 | 211 | 79 | 54 | 171 | 237 | — | 139 | 92 | 200 | 1143 | 180 | 3 | 2 | 18 | 230 | 13 | 35 | 76 | 22 (48.5) |
| 20LS2 | | 401 | 322 | 268 | 79 | 54 | 229 | 294 | 123 | 139 | 92 | 200 | 1143 | 180 | 3 | 2 | 18 | 230 | 13 | 35 | 76 | 29 (63.9) |
| 30LS2 | | 486 | 407 | 353 | 79 | 54 | 314 | 379 | 123 | 139 | 92 | 200 | 1143 | 180 | 3 | 2 | 18 | 230 | 13 | 35 | 76 | 41 (90.4) |
| 44LS2 | | 688 | 578 | 524 | 110 | 54 | 476 | 550 | 123 | 149 | 92 | 200 | 1143 | 180 | 3 | 2 | 18 | 230 | 13 | 42 | 110 | 66 (145.5) |

* Not provided with an eyebolt

CONNECTOR TYPES

| AC SERVOMOTOR Type USAMED- | Motor Connector Types | | | | Absolute Encoder Connector Types | | | |
|----------------------------|-----------------------|-------------------|-------------------|----------------|----------------------------------|-------------------|-------------------|----------------|
| | Receptacle | L-type Plug | Straight Plug | Cable Clamp | Receptacle | L-type Plug | Straight Plug | Cable Clamp |
| 03LS1 06LS1 09LS2 | MS3102 A18-10P | MS3108 B18-10S | MS3106 B18-10S | MS3057 -10A | 97F3102E 20-29P | MS3108 B20-29S | MS3106 B20-29S | MS3057 -12A |
| 12LS2 20LS2 30LS2 | MS3102 A22-22P | MS3108 B22-22S | MS3106 B22-22S | MS3057 -12A | | | | |
| 44LS2 | MS3102 A32-17P | MS3108 B32-17S | MS3106 B32-17S | MS3057 -20A | | | | |

MECHANICAL SPECIFICATIONS

| Accuracy (T. I. R)* | Reference Diagram |
|---|-------------------|
| Flange surface perpendicular to shaft (A) | |
| Flange diameter concentric to shaft (B) | |
| Shaft run out (C) | |

Servomotors with a brake or a modified shaft extension are also available

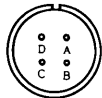
* T I R (Total Indicator Reading)

† Accuracy for motor type USAMED-44LS2

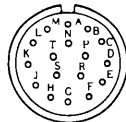
CONNECTOR SPECIFICATIONS

Motor Receptacle

Absolute Encoder Receptacle



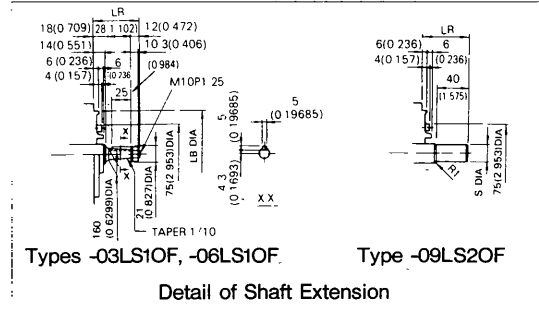
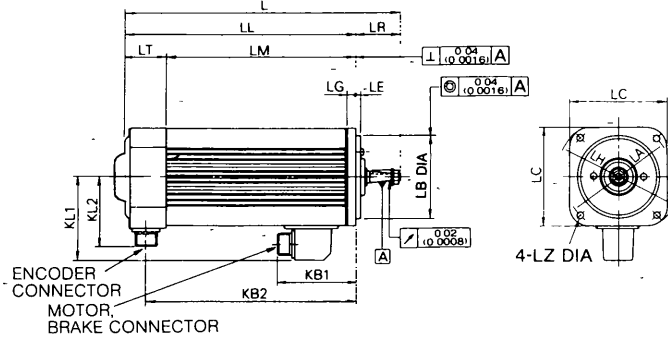
| | |
|---|--------------|
| A | Phase U |
| B | Phase V |
| C | Phase W |
| D | Frame ground |



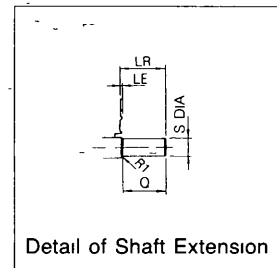
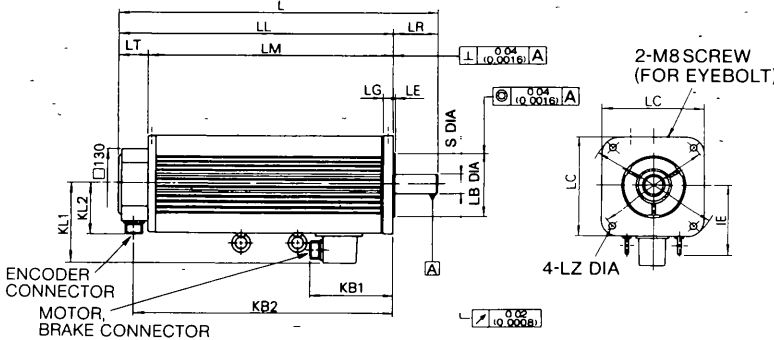
| | | | |
|---|-------------------|---|---------------|
| A | Channel A output | K | — |
| B | Channel Ā output | L | — |
| C | Channel B output | M | — |
| D | Channel B̄ output | N | — |
| E | Channel C output | P | — |
| F | Channel C̄ output | R | For reset |
| G | 0V | S | 0V (battery) |
| H | +5VDC | T | 36V (battery) |
| J | Frame ground | — | — |

• With Brake

(a) Types USAMED-03LS1OF, -06LS1OF (Taper Shaft), -09LS2OF (Straight Shaft)



(b) Types USAMED-12LS2OF, -20LS2OF, -30LS2OF (Straight Shaft)



| AC SERVO MOTOR Type USAMED- | L | LL | LM | LR | LT | KB1 | KB2 | IE | KL1 | KL2 | Flange Surface | | | | | | Shaft Extension | | Approx Mass kg (lb) | Brake | | |
|--------------------------------|----------------|----------------|----------------|--------------|--------------|---------------|----------------|---------------|---------------|--------------|----------------|-----------------|---------------|---------------|--------------|--------------|-----------------|----------------|---------------------------|------------|--------------------------------|--|
| | | | | | | | | | | | LA | LB | LC | LE | LG | LH | LZ | S | | Q | Braking Torque N·m(Kg·m) | Inertia ($\frac{GD^2}{4}$) kg·m ² |
| 03LS1OF* | 334 (13.15) | 276 (10.87) | 207 (8.15) | 58 (2.28) | 69 (2.72) | 128 (5.04) | 234 (9.21) | - | 113 (4.45) | 92 (3.62) | 145 (5.71) | 110 (4.3307) | 130 (5.12) | 6 (0.24) | 12 (0.47) | 165 (6.5) | 9 (0.35) | - | - | 11.5(25.4) | 5.88 (0.6) | 0.85x10 ⁻⁴ |
| 06LS1OF* | 380 (14.96) | 322 (12.68) | 253 (9.97) | 58 (2.28) | 69 (2.72) | 118 (4.65) | 280 (11.02) | - | 113 (4.45) | 92 (3.62) | 145 (5.71) | 110 (4.3307) | 130 (5.12) | 6 (0.24) | 12 (0.47) | 165 (6.5) | 9 (0.35) | - | - | 15(33.1) | 8.83 (0.9) | 0.9x10 ⁻⁴ |
| 09LS2OF* | 450 (17.72) | 392 (15.43) | 323 (12.73) | 58 (2.28) | 69 (2.72) | 118 (4.65) | 350 (13.78) | - | 113 (4.45) | 92 (3.62) | 145 (5.71) | 110 (4.3307) | 130 (5.12) | 6 (0.24) | 12 (0.47) | 165 (6.5) | 9 (0.35) | 22 (0.8661) | 40 (1.575) | 23(50.7) | 8.83 (0.9) | 0.9x10 ⁻⁴ |
| 12LS2OF | 422 (16.61) | 343 (13.50) | 289 (11.38) | 79 (3.11) | 54 (2.13) | 164 (6.46) | 315 (12.4) | 123 (4.84) | 143 (5.63) | 92 (3.62) | 200 (7.87) | 114.3 (4.5) | 180 (7.08) | 3.2 (0.13) | 18 (0.71) | 230 (9.1) | 13.5 (0.53) | 35 (1.3779) | 76 (2.992) | 30(66.2) | 35.3 (3.6) | 6.25x10 ⁻⁴ |
| 20LS2OF | 486 (19.13) | 407 (16.02) | 354 (13.94) | 79 (3.11) | 54 (2.13) | 164 (6.46) | 379 (14.92) | 123 (4.84) | 143 (5.63) | 92 (3.62) | 200 (7.87) | 114.3 (4.5) | 180 (7.08) | 3.2 (0.13) | 18 (0.71) | 230 (9.1) | 13.5 (0.53) | 35 (1.3779) | 76 (2.992) | 37(81.6) | 35.3 (3.6) | 6.25x10 ⁻⁴ |
| 30LS2OF | 567 (22.32) | 488 (19.21) | 435 (17.13) | 79 (3.11) | 54 (2.13) | 164 (6.46) | 460 (18.11) | 123 (4.84) | 143 (5.63) | 92 (3.62) | 200 (7.87) | 114.3 (4.5) | 180 (7.08) | 3.2 (0.13) | 18 (0.71) | 230 (9.1) | 13.5 (0.53) | 35 (1.3779) | 76 (2.992) | 49(108) | 35.3 (3.6) | 6.25x10 ⁻⁴ |

* Not provided with an eyebolt

† TIR Total Indicator Reading

Notes 1 Absolute encoder 8192 pulses/rev is used as a detector

2 Vibration 15 μm or below

3 Plug and clamp are not attached for receptacle connection

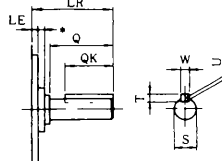
4 Connector specifications Refer to Par 3.3

5 It is recommended that the motor be mounted with its connector placed down

6 Power supply for brake is 24VDC

• Shaft Extension of Straight Shaft with Keyway

Both Servomotors with brake and without brake have the same dimensions except for shaft extension. Shaft extensions are shown below



*6mm (0.236in) for USAMED-03LS2 to 09LS2

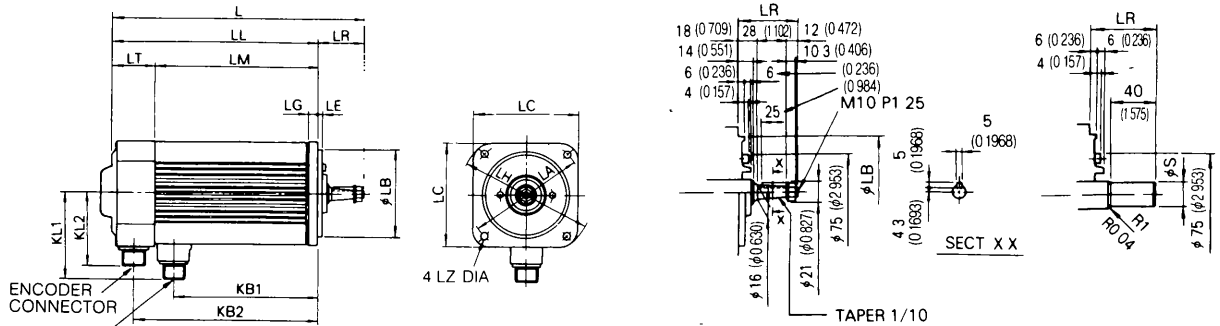
| Motor type | | LR | LE | Dimensions of Shaft Extension | | | | | |
|----------------|-----------------|---------------|---------------|-------------------------------|---------------|--------------|---------------|-----------------|----------------|
| Without Brake | With Brake | | | S | Q | QK | T | U | W |
| *USAMED-03LS2K | *USAMED-03LS2KF | 58 (2.28) | 6 (0.24) | 19 (0.7480) | 40 (1.57) | 25 (0.98) | 5 (0.1968) | 3 (0.1181) | 5 (0.1968) |
| *USAMED-06LS2K | *USAMED-06LS2KF | 58 (2.28) | 6 (0.24) | 19 (0.7480) | 40 (1.57) | 25 (0.98) | 5 (0.1968) | 3 (0.1181) | 5 (0.1968) |
| *USAMED-09LS2K | *USAMED-09LS2KF | 58 (2.28) | 6 (0.24) | 22 (0.8661) | 40 (1.57) | 25 (0.98) | 6 (0.2362) | 3.5 (0.1378) | 6 (0.2362) |
| USAMED-12LS2K | USAMED-12LS2KF | 79 (3.11) | 3.2 (0.13) | 35 (1.3779) | 76 (2.99) | 60 (2.36) | 8 (0.3149) | 5 (0.1968) | 10 (0.3937) |
| USAMED-20LS2K | USAMED-20LS2KF | 79 (3.11) | 3.2 (0.13) | 35 (1.3779) | 76 (2.99) | 60 (2.36) | 8 (0.3149) | 5 (0.1968) | 10 (0.3937) |
| USAMED-30LS2K | USAMED-30LS2KF | 79 (3.11) | 3.2 (0.13) | 35 (1.3779) | 76 (2.99) | 60 (2.36) | 8 (0.3149) | 5 (0.1968) | 10 (0.3937) |
| USAMED-44LS2K | - | 110 (4.33) | 3.2 (0.13) | 42 (1.6535) | 110 (4.33) | 90 (3.54) | 8 (0.3149) | 5 (0.1968) | 12 (0.4724) |

(2) F Series

Dimensions in mm (inches)

• Standard Type

Drawing 1 USAFED-05LS1, -09LS1 (Taper Shaft), -13LS2 (Straight Shaft)

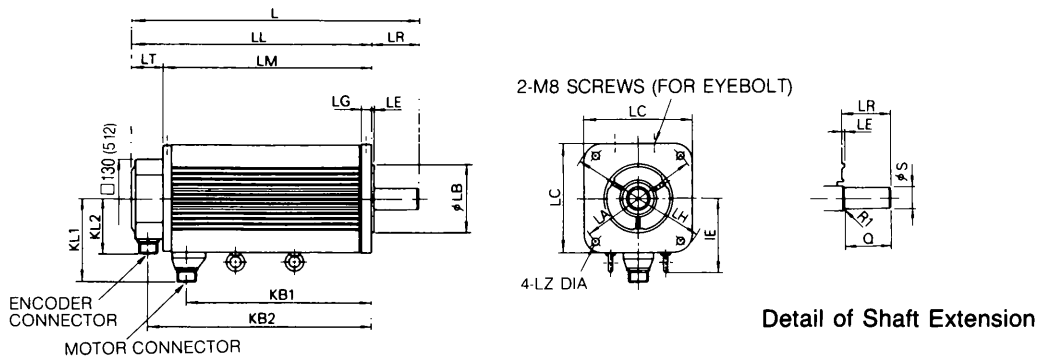


For -05LS1, -09LS1 For -13LS2
Detail of Shaft Extension

Notes

- 1 Plug and clamp are not attached for receptacle connection
- 2 Key and keyway comply with JIS B 1301-1976 (Parallel key, keyway common class)
- 3 Motor should be mounted with connectors down

Drawing 2 USAFED-20LS2 to -44LS2 (Straight Shaft)



Notes

- 1 Plug and clamp are not attached for receptacle connection
- 2 Motor should be mounted with connectors down



| AC SERVO MOTOR Type USAFED- | Dwg No | L | LL | LM | LR | LT | KB1 | KB2 | IE | KL1 | KL2 | Flange Surface | | | | | | Shaft Extension | | Approx Mass kg (lb) | |
|--------------------------------|-----------|---------------|---------------|---------------|-------------|-------------|---------------|---------------|--------------|--------------|-------------|----------------|---|--------------|--------------|-------------|--------------|-----------------|---|---------------------------|-----------|
| | | | | | | | | | | | | LA | LB | LC | LE | LG | LH | LZ | S | | Q |
| 05LS1* | 1 | 277 (1090) | 219 (862) | 150 (591) | 58 (228) | 69 (272) | 127 (50) | 177 (697) | — | 109 (429) | 92 (362) | 145 (571) | 110 ⁰ _{-0.035} (43307 ⁰ _{-0.004}) | 130 (512) | 6 (024) | 12 (047) | 165 (65) | 9 (035) | — | — | 9 (19.9) |
| 09LS1* | | 334 (1314) | 276 (1086) | 207 (816) | 58 (228) | 69 (272) | 184 (724) | 234 (921) | — | 109 (429) | 92 (362) | 145 (571) | 110 ⁰ _{-0.035} (43307 ⁰ _{-0.004}) | 130 (512) | 6 (024) | 12 (047) | 165 (65) | 9 (035) | — | — | 14 (30.9) |
| 13LS2* | | 403 (1587) | 345 (1359) | 276 (1087) | 58 (228) | 69 (272) | 253 (996) | 303 (1193) | — | 109 (429) | 92 (362) | 145 (571) | 110 ⁰ _{-0.035} (43307 ⁰ _{-0.004}) | 130 (512) | 6 (024) | 12 (047) | 165 (65) | 9 (035) | 22 ⁰ _{-0.003} (0.8661 ⁰ _{-0.006}) | 40 (157) | 20 (44.1) |
| 20LS2* | 2 | 344 (1354) | 265 (1043) | 211 (83) | 79 (311) | 54 (213) | 172 (677) | 237 (933) | — | 139 (547) | 92 (362) | 200 (788) | 1143 ⁰ _{-0.025} (45 ⁰ _{-0.001}) | 180 (709) | 3.2 (013) | 18 (071) | 230 (906) | 13.5 (053) | 35 ⁰ _{-0.01} (1.3379 ⁰ _{-0.004}) | 76 (299) | 22 (48.5) |
| 30LS2 | | 401 (1579) | 322 (1268) | 268 (1055) | 79 (311) | 54 (213) | 229 (902) | 294 (1157) | 123 (485) | 139 (547) | 92 (362) | 200 (788) | 1143 ⁰ _{-0.025} (45 ⁰ _{-0.001}) | 180 (709) | 3.2 (013) | 18 (071) | 230 (906) | 13.5 (053) | 35 ⁰ _{-0.01} (1.3379 ⁰ _{-0.004}) | 76 (299) | 29 (63.9) |
| 44LS2 | | 486 (1914) | 407 (1602) | 353 (1390) | 79 (311) | 54 (213) | 314 (1236) | 379 (1492) | 123 (485) | 139 (547) | 92 (362) | 200 (788) | 1143 ⁰ _{-0.025} (45 ⁰ _{-0.001}) | 180 (709) | 3.2 (013) | 18 (071) | 230 (906) | 13.5 (053) | 35 ⁰ _{-0.01} (1.3379 ⁰ _{-0.004}) | 76 (299) | 41 (90.4) |

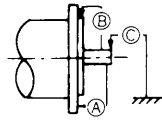
* Not provided with an eyebolt

CONNECTOR TYPES

| AC SERVO MOTOR Type USAFED- | Motor Connector Types | | | | Absolute Encoder Connector Types | | | |
|--------------------------------|-----------------------|-------------------|-------------------|----------------|----------------------------------|-------------------|-------------------|----------------|
| | Receptacle | L-type Plug | Straight Plug | Cable Clamp | Receptacle | L-type Plug | Straight Plug | Cable Clamp |
| 05LS1 09LS1 13LS2 | MS3102 A18-10P | MS3108 B18-10S | MS3106 B18-10S | MS3057 -10A | 97F3102E 20-29P | MS3108 B20-29S | MS3106 B20-29S | MS3057 -12A |
| 20LS2 30LS2 44LS2 | MS3102 A22-22P | MS3108 B22-22S | MS3106 B22-22S | MS3057 -12A | | | | |

MECHANICAL SPECIFICATIONS

| Accuracy (T I R)* | Reference Diagram |
|--|-------------------|
| Flange surface perpendicular to shaft (A) | 0.04 (0.0016) |
| Flange diameter concentric to shaft (B) | 0.04 (0.0016) |
| Shaft run out (C) | 0.02 (0.0008) |



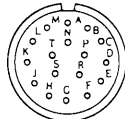
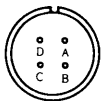
Servomotors with a brake or a modified shaft extension are also available

* T I R (Total Indicator Reading)

CONNECTOR SPECIFICATIONS

Motor Receptacle

Absolute Encoder Receptacle

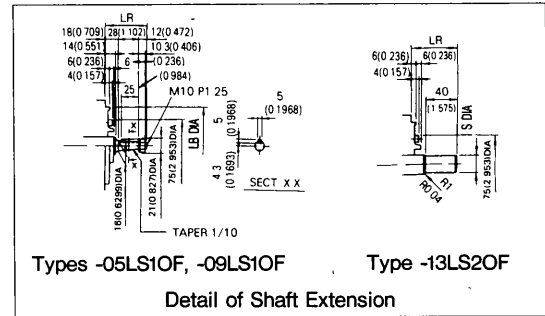
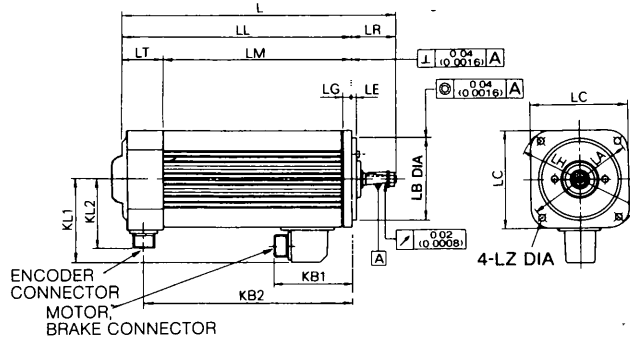


| | |
|---|--------------|
| A | Phase U |
| B | Phase V |
| C | Phase W |
| D | Frame ground |

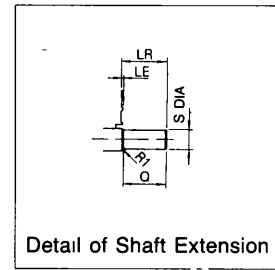
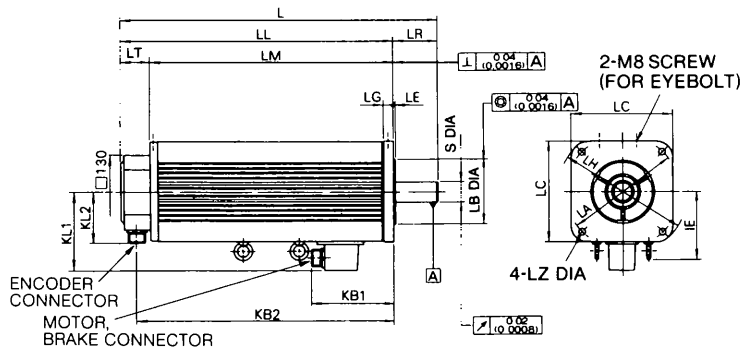
| | | | |
|---|------------------|---|-----------------|
| A | Channel A output | K | — |
| B | Channel A output | L | — |
| C | Channel B output | M | — |
| D | Channel B output | N | — |
| E | Channel C output | P | — |
| F | Channel C output | R | For reset |
| G | 0 V | S | 0 V (battery) |
| H | +5VDC | T | 3.6 V (battery) |
| J | Frame ground | — | — |

• With Brake

(a) Types USAFED-05LS1OF, -09LS1OF (Taper Shaft), -13LS2OF (Straight Shaft)



(b) Types USAFED-20LS2OF, -30LS2OF, -44LS2OF (Straight Shaft)



| AC SERVO MOTOR Type USAFED- | L | LL | LM | LR | LT | KB1 | KB2 | IE | KL1 | KL2 | Flange Surface | | | | | | Shaft Extension | | Approx Mass kg (lb) | Brake | | |
|--------------------------------|----------------|----------------|----------------|--------------|--------------|---------------|----------------|---------------|---------------|--------------|----------------|-----------------|---------------|--------------|--------------|---------------|-----------------|----------------|---------------------------|----------|---------------------------------|--|
| | | | | | | | | | | | LA | LB | LC | LE | LG | LH | LZ | S | | Q | Braking Torque N·m (kg·m) | Inertia ($\frac{GD^2}{4}$) kg·m ² |
| 05LS1OF* | 334 (13.15) | 276 (10.87) | 207 (8.15) | 58 (2.28) | 69 (2.72) | 128 (5.04) | 234 (9.21) | - | 113 (4.45) | 92 (3.62) | 145 (5.71) | 110 (4.3307) | 130 (5.12) | 6 (0.24) | 12 (0.47) | 165 (6.5) | 9 (0.35) | - | - | 12(26.5) | 5.88 (0.6) | 0.85x10 ⁻⁴ |
| 09LS1OF* | 380 (14.96) | 322 (12.68) | 253 (9.97) | 58 (2.28) | 69 (2.72) | 118 (4.65) | 280 (11.02) | - | 113 (4.45) | 92 (3.62) | 145 (5.71) | 110 (4.3307) | 130 (5.12) | 6 (0.24) | 12 (0.47) | 165 (6.5) | 9 (0.35) | - | - | 16(35.3) | 5.88 (0.6) | 0.85x10 ⁻⁴ |
| 13LS2OF* | 450 (17.72) | 392 (15.43) | 323 (12.73) | 58 (2.28) | 69 (2.72) | 118 (4.65) | 350 (13.78) | - | 113 (4.45) | 92 (3.62) | 145 (5.71) | 110 (4.3307) | 130 (5.12) | 6 (0.24) | 12 (0.47) | 165 (6.5) | 9 (0.35) | 22 (0.8661) | 40 (1.57) | 23(50.7) | 8.83 (0.9) | 0.9x10 ⁻⁴ |
| 20LS2OF | 422 (16.61) | 343 (13.50) | 289 (11.38) | 79 (3.11) | 54 (2.13) | 164 (6.46) | 315 (12.4) | 123 (4.85) | 143 (5.63) | 92 (3.62) | 200 (7.88) | 114 (4.5) | 180 (7.09) | 32 (0.13) | 18 (0.71) | 230 (9.06) | 13.5 (0.53) | 35 (1.3779) | 76 (2.99) | 30(66.2) | 35.3 (3.6) | 6.25x10 ⁻⁴ |
| 30LS2OF | 486 (19.13) | 407 (16.02) | 353 (13.90) | 79 (3.11) | 54 (2.13) | 164 (6.46) | 379 (14.92) | 123 (4.85) | 143 (5.63) | 92 (3.62) | 200 (7.88) | 114 (4.5) | 180 (7.09) | 32 (0.13) | 18 (0.71) | 230 (9.06) | 13.5 (0.53) | 35 (1.3779) | 76 (2.99) | 37(81.6) | 35.3 (3.6) | 6.25x10 ⁻⁴ |
| 44LS2OF | 567 (22.32) | 488 (19.21) | 434 (17.09) | 79 (3.11) | 54 (2.13) | 164 (6.46) | 460 (18.11) | 123 (4.85) | 143 (5.63) | 92 (3.62) | 200 (7.88) | 114 (4.5) | 180 (7.09) | 32 (0.13) | 18 (0.71) | 230 (9.06) | 13.5 (0.53) | 35 (1.3779) | 76 (2.99) | 49(108) | 35.3 (3.6) | 6.25x10 ⁻⁴ |

* Not provided with an eyebolt

† TIR Total Indicator Reading

Notes 1 Absolute encoder 8192 pulses/rev is used as a detector

2 Vibration 15µm or below

3 Plug and clamp are not attached for receptacle connection

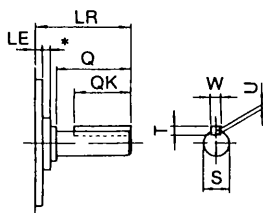
4 Connector specifications Refer to Par 3.3

5 It is recommended that the motor be mounted with its connector placed down

6 Power supply for brake is 24VDC

• Shaft Extension of Straight Shaft with Keyway

Both Servomotors with brake and without brake have the same dimensions except for shaft extension. Shaft extensions are shown below



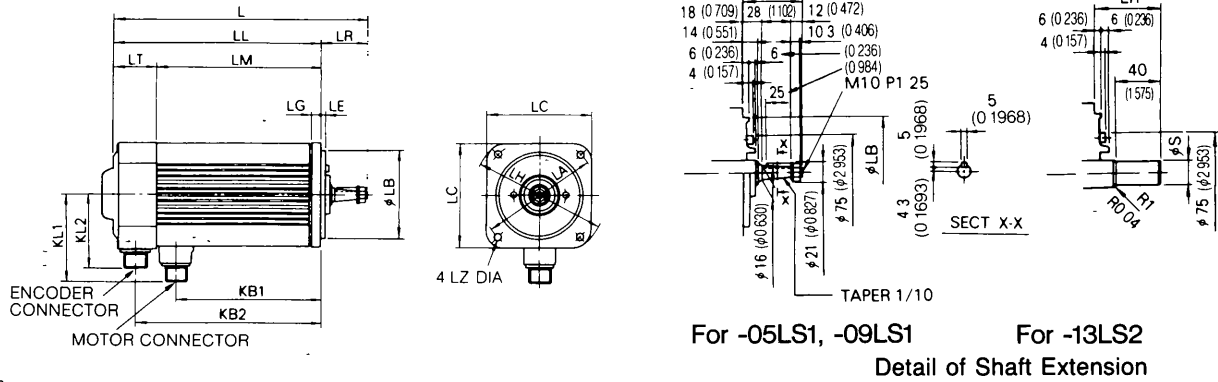
| Motor Type | | LR | LE | Dimensions of Shaft Extension | | | | | |
|----------------|-----------------|--------------|---------------|-------------------------------|--------------|--------------|---------------|-----------------|----------------|
| Without Brake | With Brake | | | S | Q | QK | T | U | W |
| *USAFED-05LS2K | *USAFED-05LS2KF | 58 (2.28) | 6 (0.24) | 19 (0.7480) | 40 (1.57) | 25 (0.98) | 5 (0.1968) | 3 (0.1181) | 5 (0.1968) |
| *USAFED-09LS2K | *USAFED-09LS2KF | 58 (2.28) | 6 (0.24) | 19 (0.7480) | 40 (1.57) | 25 (0.98) | 5 (0.1968) | 3 (0.1181) | 5 (0.1968) |
| *USAFED-13LS2K | *USAFED-13LS2KF | 58 (2.28) | 6 (0.24) | 22 (0.8661) | 40 (1.57) | 25 (0.98) | 6 (0.2362) | 3.5 (0.1378) | 6 (0.2362) |
| USAFED-20LS2K | USAFED-20LS2KF | 79 (3.11) | 3.2 (0.13) | 35 (1.3379) | 76 (2.99) | 60 (2.36) | 8 (0.3149) | 5 (0.1968) | 10 (0.3937) |
| USAFED-30LS2K | USAFED-30LS2KF | 79 (3.11) | 3.2 (0.13) | 35 (1.3379) | 76 (2.99) | 60 (2.36) | 8 (0.3149) | 5 (0.1968) | 10 (0.3937) |
| USAFED-44LS2K | USAFED-44LS2KF | 79 (3.11) | 3.2 (0.13) | 35 (1.3379) | 76 (2.99) | 60 (2.36) | 8 (0.3149) | 5 (0.1968) | 10 (0.3937) |

* 6mm (in) for USAFED-05LS2 to 13LS2

(3) G Series
 • Standard Type

Dimensions in mm (inches)

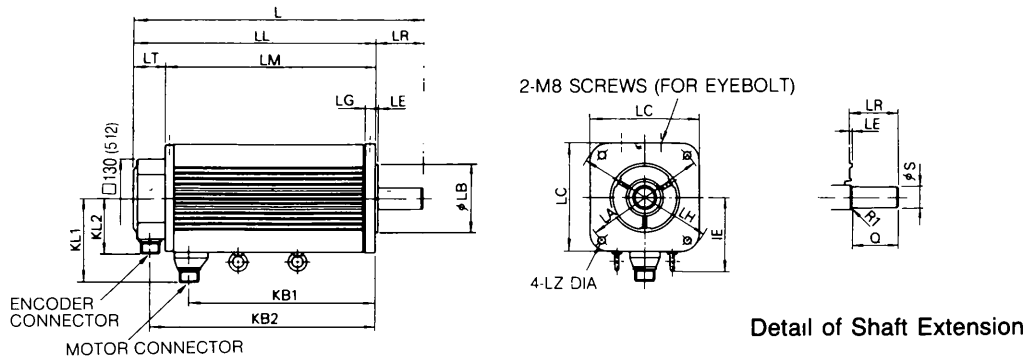
Drawing 1 USAGED-05LS1, -09LS1 (Taper Shaft), -13LS2 (Straight Shaft)



Notes .

- 1 Plug and clamp are not attached for receptacle connection
- 2 Key and keyway comply with JIS B 1301-1976
 (Parallel key, keyway common class)
- 3 Motor should be mounted with connectors down

Drawing 2 USAGED-20LS2 to -44LS2 (Straight Shaft)



Notes .

- 1 Plug and clamp are not attached for receptacle connection
- 2 Motor should be mounted with connectors down

| AC SERVO MOTOR Type USAGED- | Dwg No | Flange Surface | | | | | | | | | | | | Shaft Extension | | Approx Mass kg (lb) | | | | | | | |
|--------------------------------|-----------|----------------|---------|--------|---------|---------|---------|--------|--------|--------|--------|----------|-------------------|-------------------|--------|---------------------------|--------|----------|----------|------------------|-------------------|-----------|-----------|
| | | L | LL | LM | LR | LT | KB1 | KB2 | IE | KL1 | KL2 | LA | LB | LC | LE | | LG | LH | LZ | S | Q | | |
| 05LS1* | 1 | 277 | 219 | 150 | 58 | 69 | 127 | 177 | — | 109 | 92 | 145 | 110 | 0.005 (0.0014) | 130 | 6 | 12 | 165 | 9 | — | — | 9 (19.9) | |
| (10.90) | | (8.62) | (5.91) | (2.28) | (2.72) | (5.0) | (6.97) | — | (4.29) | (3.62) | (5.71) | (4.3307) | (0.0014) | (5.12) | (0.24) | (0.47) | (6.5) | (0.35) | — | — | — | — | |
| 09LS1* | | 334 | 276 | 207 | 58 | 69 | 184 | 234 | — | 109 | 92 | 145 | 110 | 0.005 (0.0014) | 130 | 6 | 12 | 165 | 9 | — | — | 14 (30.9) | |
| (13.14) | | (10.86) | (8.16) | (2.28) | (2.72) | (7.24) | (9.21) | — | (4.29) | (3.62) | (5.71) | (4.3307) | (0.0014) | (5.12) | (0.24) | (0.47) | (6.5) | (0.35) | — | — | — | — | |
| 13LS2* | | 403 | 345 | 276 | 58 | 69 | 253 | 303 | — | 109 | 92 | 145 | 110 | 0.005 (0.0014) | 130 | 6 | 12 | 165 | 9 | 22 | 0.013 (0.0006) | 40 | 20 (44.1) |
| (15.87) | | (13.59) | (10.87) | (2.28) | (2.72) | (9.96) | (11.93) | — | (4.29) | (3.62) | (5.71) | (4.3307) | (0.0014) | (5.12) | (0.24) | (0.47) | (6.5) | (0.35) | (0.8661) | (0.0006) | (1.57) | — | |
| 20LS2* | 2 | 344 | 265 | 211 | 79 | 54 | 172 | 237 | — | 139 | 92 | 200 | 114.3 | 0.005 (0.0014) | 180 | 3.2 | 18 | 230 | 13.5 | 35 | 0.01 (0.0004) | 76 | 22 (48.5) |
| (13.54) | | (10.43) | (8.3) | (3.11) | (2.13) | (6.77) | (9.33) | — | (5.47) | (3.62) | (7.88) | (4.5) | (0.0014) | (7.09) | (0.13) | (0.71) | (9.06) | (0.53) | (1.3379) | (0.0004) | (2.99) | — | |
| 30LS2 | | 401 | 322 | 268 | 79 | 54 | 229 | 294 | 123 | 139 | 92 | 200 | 114.3 | 0.005 (0.0014) | 180 | 3.2 | 18 | 230 | 13.5 | 35 | 0.01 (0.0004) | 76 | 29 (63.9) |
| (15.79) | | (12.68) | (10.55) | (3.11) | (2.13) | (9.02) | (11.57) | (4.85) | (5.47) | (3.62) | (7.88) | (4.5) | (0.0014) | (7.09) | (0.13) | (0.71) | (9.06) | (0.53) | (1.3379) | (0.0004) | (2.99) | — | |
| 44LS2 | 486 | 407 | 353 | 79 | 54 | 314 | 379 | 123 | 139 | 92 | 200 | 114.3 | 0.005 (0.0014) | 180 | 3.2 | 18 | 230 | 13.5 | 35 | 0.01 (0.0004) | 76 | 41 (90.4) | |
| (19.14) | (16.02) | (13.90) | (3.11) | (2.13) | (12.36) | (14.92) | (4.85) | (5.47) | (3.62) | (7.88) | (4.5) | (0.0014) | (7.09) | (0.13) | (0.71) | (9.06) | (0.53) | (1.3379) | (0.0004) | (2.99) | — | | |

* Not provided with an eyebolt

CONNECTOR TYPES

| AC SERVO MOTOR Type USAGED- | Motor Connector Types | | | | Absolute Encoder Connector Types | | | |
|--------------------------------|-----------------------|-------------------|-------------------|----------------|----------------------------------|-------------------|-------------------|----------------|
| | Receptacle | L-type Plug | Straight Plug | Cable Clamp | Receptacle | L-type Plug | Straight Plug | Cable Clamp |
| 05LS1 09LS1 13LS2 | MS3102 A18-10P | MS3108 B18-10S | MS3106 B18-10S | MS3057 -10A | 97F3102E 20-29P | MS3108 B20-29S | MS3106 B20-29S | MS3057 -12A |
| 20LS2 30LS2 44LS2 | MS3102 A22-22P | MS3108 B22-22S | MS3106 B22-22S | MS3057 -12A | | | | |

MECHANICAL SPECIFICATIONS

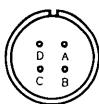
| Accuracy (T I R)* | Reference Diagram |
|---|-------------------|
| Flange surface perpendicular to shaft (A) 0.04 (0.0016) | |
| Flange diameter concentric to shaft (B) 0.04 (0.0016) | |
| Shaft run out (C) 0.02 (0.0008) | |

Servomotors with a brake or a modified shaft extension are also available

* T I R (Total Indicator Reading)

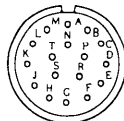
CONNECTOR SPECIFICATIONS

Motor Receptacle



| | |
|---|--------------|
| A | Phase U |
| B | Phase V |
| C | Phase W |
| D | Frame ground |

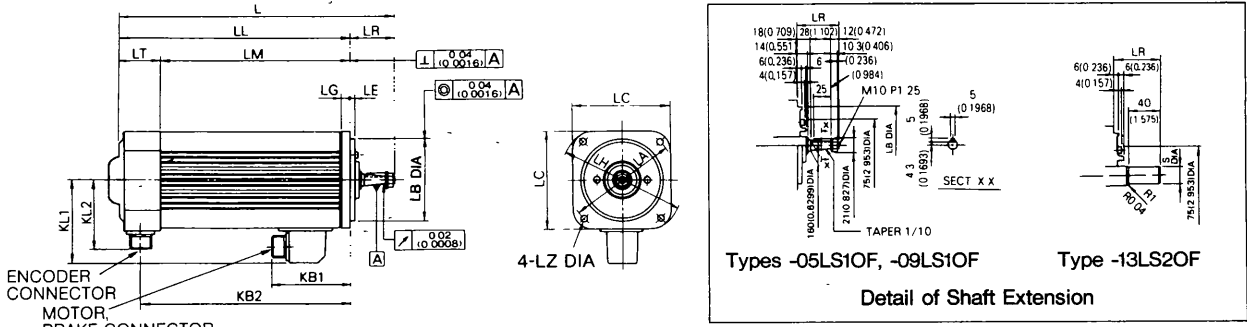
Absolute Encoder Receptacle



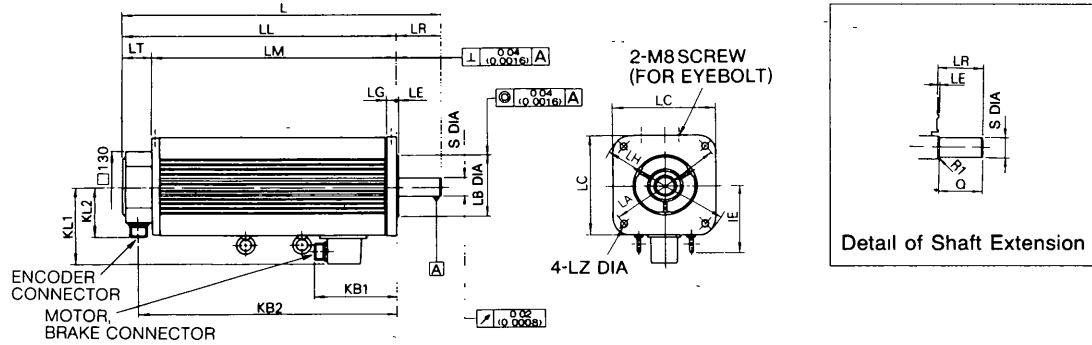
| | | | |
|---|-------------------|---|----------------|
| A | Channel A output | K | — |
| B | Channel Ā output | L | — |
| C | Channel B output | M | — |
| D | Channel B̄ output | N | — |
| E | Channel C output | P | — |
| F | Channel C̄ output | R | For reset |
| G | 0V | S | 0V (battery) |
| H | +5VDC | T | 3.6V (battery) |
| J | Frame ground | — | — |

• With Brake

(a) Types USAGED-05LS1OF, -09LS1OF (Taper Shaft), -13LS2OF (Straight Shaft)



(b) Types USAGED-20LS2OF, -30LS2OF, -44LS2OF (Straight Shaft)



| AC SERVO MOTOR Type USAGED- | L | LL | LM | LR | LT | KB1 | KB2 | IE | KL1 | KL2 | Flange Surface | | | | | | Shaft Extension | | Approx Mass kg (lb) | Brake | | |
|--------------------------------|---------------|---------------|---------------|-------------|-------------|--------------|---------------|--------------|--------------|-------------|----------------|----------------|--------------|--------------|--------------|-------------|-----------------|----------------|---------------------------|----------|---------------------------------|---|
| | | | | | | | | | | | LA | LB | LC | LE | LG | LH | LZ | S | | Q | Braking Torque N·m (kg·m) | Inertia ($\frac{GD^2}{4}$) kg·w |
| 05LS1OF* | 334 (1315) | 276 (1087) | 207 (815) | 58 (228) | 69 (272) | 128 (504) | 234 (921) | - | 113 (445) | 92 (362) | 145 (571) | 110 (43307) | 130 (512) | 6 (0.24) | 12 (0.47) | 165 (65) | 9 (0.35) | - | - | 12(26.5) | 5.88 (0.6) | 0.85×10 ⁻⁴ |
| 09LS1OF* | 380 (1496) | 322 (1268) | 253 (997) | 58 (228) | 69 (272) | 118 (465) | 280 (1102) | - | 113 (445) | 92 (362) | 145 (571) | 110 (43307) | 130 (512) | 6 (0.24) | 12 (0.47) | 165 (65) | 9 (0.35) | - | - | 16(35.3) | - | - |
| 13LS2OF* | 450 (1772) | 392 (1543) | 323 (1273) | 58 (228) | 69 (272) | 118 (465) | 350 (1378) | - | 113 (445) | 92 (362) | 145 (571) | 110 (43307) | 130 (512) | 6 (0.24) | 12 (0.47) | 165 (65) | 9 (0.35) | 22 (0.8661) | 40 (1.57) | 23(50.7) | 8.83 (0.9) | 0.9×10 ⁻⁴ |
| 20LS2OF | 422 (1661) | 343 (1350) | 289 (1138) | 79 (311) | 54 (213) | 164 (646) | 315 (124) | 123 (485) | 143 (563) | 92 (362) | 200 (788) | 114 (45) | 180 (709) | 32 (0.13) | 18 (0.71) | 230 (96) | 135 (0.53) | 35 (1.3779) | 76 (2.99) | 30(66.2) | - | - |
| 30LS2OF | 486 (1913) | 407 (1602) | 353 (1390) | 79 (311) | 54 (213) | 164 (646) | 379 (1492) | 123 (485) | 143 (563) | 92 (362) | 200 (788) | 114 (45) | 180 (709) | 32 (0.13) | 18 (0.71) | 230 (96) | 135 (0.53) | 35 (1.3779) | 76 (2.99) | 37(81.6) | - | - |
| 44LS2OF | 567 (2232) | 488 (1921) | 434 (1709) | 79 (311) | 54 (213) | 164 (646) | 460 (1811) | 123 (485) | 143 (563) | 92 (362) | 200 (788) | 114 (45) | 180 (709) | 32 (0.13) | 18 (0.71) | 230 (96) | 135 (0.53) | 35 (1.3779) | 76 (2.99) | 49(108) | - | - |

* Not provided with an eyebolt

† TIR Total Indicator Reading

Notes 1 Absolute encoder 8192 pulses/rev is used as a detector

2 Vibration 15µm or below

3 Plug and clamp are not attached for receptacle connection

4 Connector specifications Refer to Par 3.3

5 It is recommended that the motor be mounted with its connector placed down

6 Power supply for brake is 24VDC

• Shaft Extension of Straight Shaft with Keyway

Both Servomotors with brake and without brake have the same dimensions except for shaft extension. Shaft extensions are shown below

| Motor Type | | LR | LE | Dimensions of Shaft Extension | | | | | |
|----------------|-----------------|--------------|--------------|-------------------------------|--------------|--------------|---------------|-----------------|----------------|
| Without Brake | With Brake | | | S | Q | QK | T | U | W |
| *USAGED-05LS2K | *USAGED-05LS2KF | 58 (2.28) | 6 (0.24) | 19 (0.7480) | 40 (1.57) | 25 (0.98) | 5 (0.1968) | 3 (0.1181) | 5 (0.1968) |
| *USAGED-09LS2K | *USAGED-09LS2KF | 58 (2.28) | 6 (0.24) | 19 (0.7480) | 40 (1.57) | 25 (0.98) | 5 (0.1968) | 3 (0.1181) | 5 (0.1968) |
| *USAGED-13LS2K | *USAGED-13LS2KF | 58 (2.28) | 6 (0.24) | 22 (0.8661) | 40 (1.57) | 25 (0.98) | 6 (0.2362) | 3.5 (0.1378) | 6 (0.2362) |
| USAGED-20LS2K | USAGED-20LS2KF | 79 (3.11) | 32 (0.13) | 35 (1.3779) | 76 (2.99) | 60 (2.36) | 8 (0.3149) | 5 (0.1968) | 10 (0.3937) |
| USAGED-30LS2K | USAGED-30LS2KF | 79 (3.11) | 32 (0.13) | 35 (1.3779) | 76 (2.99) | 60 (2.36) | 8 (0.3149) | 5 (0.1968) | 10 (0.3937) |
| USAGED-44LS2K | USAGED-44LS2KF | 79 (3.11) | 32 (0.13) | 35 (1.3779) | 76 (2.99) | 60 (2.36) | 8 (0.3149) | 5 (0.1968) | 10 (0.3937) |

* 6mm for USAGED-05LS2 to 13LS2

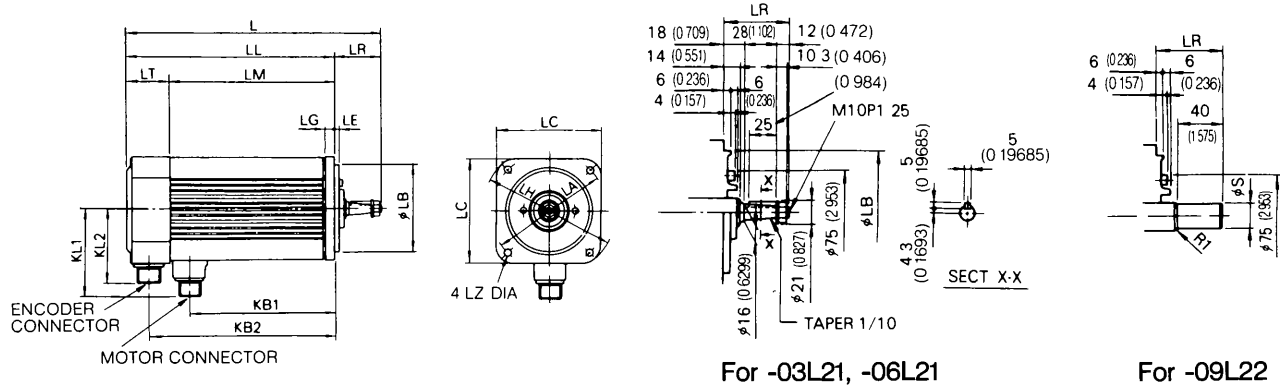
11.2 AC SERVOMOTOR WITH INCREMENTAL ENCODER

(1) M Series

Dimensions in mm (inches)

• Standard Type

Drawing 1 USAMED-03L21, -06L21 (Taper Shaft), -09L22 (Straight Shaft)

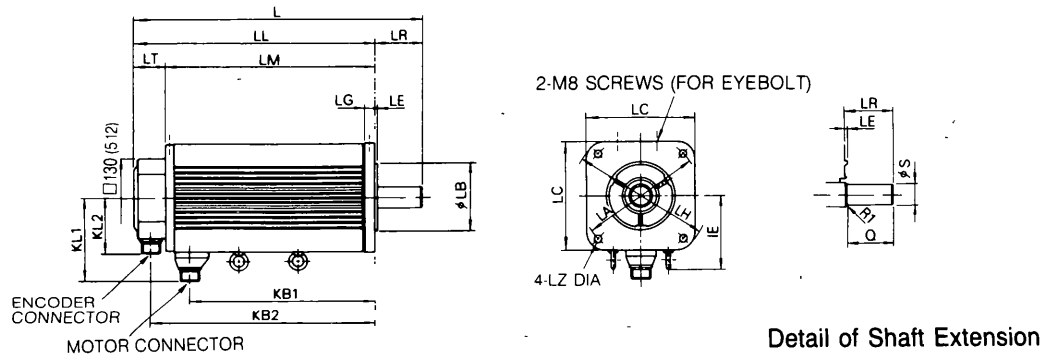


Notes

- 1 Plug and clamp are not attached for receptacle connection
- 2 Key and keyway comply with JIS B 1301-1976
(Parallel key, keyway common class)
- 3 Motor should be mounted with connectors down

Detail of Shaft Extension

Drawing 2 USAMED-12L22 to -44L22 (Straight Shaft)



Notes

- 1 Plug and clamp are not attached for receptacle connection
- 2 Motor should be mounted with connectors down



| AC SERVO MOTOR Type USAMED- | Dwg No | Flange Surface | | | | | | | | | | | Shaft Extension | | Approx Mass kg (lb) | | | | | | |
|--------------------------------|-----------|----------------|----------------|----------------|---------------|--------------|----------------|----------------|---------------|---------------|--------------|---------------|-----------------|---------------|---------------------------|--------------|--------------|----------------|----------------|---------------|------------|
| | | L | LL | LM | LR | LT | KB1 | KB2 | IE | KL1 | KL2 | LA | LB | LC | | LE | LG | LH | LZ | S | Q |
| 03L21* | 1 | 263 (10.34) | 205 (8.06) | 150 (5.9) | 58 (2.28) | 55 (2.16) | 127 (5.0) | 177 (6.97) | — | 109 (4.29) | 92 (3.62) | 145 (5.71) | 110 (4.3307) | 130 (5.12) | 6 (0.24) | 12 (0.47) | 165 (6.5) | 9 (0.35) | — | — | 85 (18.7) |
| 06L21* | | 320 (12.59) | 262 (10.31) | 207 (8.15) | 58 (2.28) | 55 (2.16) | 184 (7.24) | 234 (9.21) | — | 109 (4.29) | 92 (3.62) | 145 (5.71) | 110 (4.3307) | 130 (5.12) | 6 (0.24) | 12 (0.47) | 165 (6.5) | 9 (0.35) | — | — | 13 (28.7) |
| 09L22* | | 389 (15.31) | 331 (13.03) | 276 (10.87) | 58 (2.28) | 55 (2.16) | 253 (9.96) | 303 (11.93) | — | 109 (4.29) | 92 (3.62) | 145 (5.71) | 110 (4.3307) | 130 (5.12) | 6 (0.24) | 12 (0.47) | 165 (6.5) | 9 (0.35) | 22 (0.8661) | 40 (1.575) | 20 (44.1) |
| 12L22* | | 344 (13.54) | 265 (10.43) | 211 (8.30) | 79 (3.11) | 54 (2.13) | 172 (6.77) | 237 (9.33) | — | 139 (5.47) | 92 (3.62) | 200 (7.87) | 114.3 (4.5) | 180 (7.08) | 3.2 (0.13) | 18 (0.71) | 230 (9.1) | 13.5 (0.53) | 35 (1.3779) | 76 (2.992) | 22 (48.5) |
| 20L22 | | 401 (15.79) | 322 (12.68) | 268 (10.55) | 79 (3.11) | 54 (2.13) | 229 (9.01) | 294 (11.57) | 123 (4.84) | 139 (5.47) | 92 (3.62) | 200 (7.87) | 114.3 (4.5) | 180 (7.08) | 3.2 (0.13) | 18 (0.71) | 230 (9.1) | 13.5 (0.53) | 35 (1.3779) | 76 (2.992) | 29 (63.9) |
| 30L22 | | 486 (19.13) | 407 (16.02) | 353 (13.90) | 79 (3.11) | 54 (2.13) | 314 (12.36) | 379 (14.92) | 123 (4.84) | 139 (5.47) | 92 (3.62) | 200 (7.87) | 114.3 (4.5) | 180 (7.08) | 3.2 (0.13) | 18 (0.71) | 230 (9.1) | 13.5 (0.53) | 35 (1.3779) | 76 (2.992) | 41 (90.4) |
| 44L22 | 2 | 688 (27.09) | 578 (22.76) | 524 (20.63) | 110 (4.33) | 54 (2.13) | 476 (18.74) | 550 (21.65) | 123 (4.84) | 149 (5.87) | 92 (3.62) | 200 (7.87) | 114.3 (4.5) | 180 (7.08) | 3.2 (0.13) | 18 (0.71) | 230 (9.1) | 13.5 (0.53) | 42 (1.6535) | 110 (4.33) | 66 (145.5) |

* Not provided with an eyebolt

CONNECTOR TYPES

| AC SERVO MOTOR Type USAMED- | Motor Connector Types | | | | Incremental Encoder Connector Types | | | |
|--------------------------------|-----------------------|-------------------|-------------------|----------------|-------------------------------------|-------------------|-------------------|----------------|
| | Receptacle | L-type Plug | Straight Plug | Cable Clamp | Receptacle | L-type Plug | Straight Plug | Cable Clamp |
| 03L21 06L21 09L22 | MS3102 A18-10P | MS3108 B18-10S | MS3106 B18-10S | MS3057 -10A | 97F3102E 20-29P | MS3108 B20-29S | MS3106 B20-29S | MS3057 -12A |
| 12L22 20L22 30L22 | MS3102 A22-22P | MS3108 B22-22S | MS3106 B22-22S | MS3057 -12A | | | | |
| 44L22 | MS3102 A32-17P | MS3108 B32-17S | MS3106 B32-17S | MS3057 -20A | | | | |

MECHANICAL SPECIFICATIONS

| Accuracy (T. I. R)* | Reference Diagram |
|---|-------------------|
| Flange surface perpendicular to shaft (A) 0.04 (0.0016) | |
| Flange diameter concentric to shaft (B) 0.04 (0.0016) | |
| Shaft run out (C) 0.02 (0.0008) 0.04† (0.0016†) | |

Servomotors with a brake or a modified shaft extension are also available. For detailed information, refer to related Bulletins (TSE-S800-11.1)

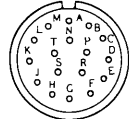
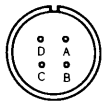
* T. I. R. (Total Indicator Reading)

† Accuracy for motor type USAMED-44L22

CONNECTOR SPECIFICATIONS

Motor Receptacle

Incremental Encoder Receptacle



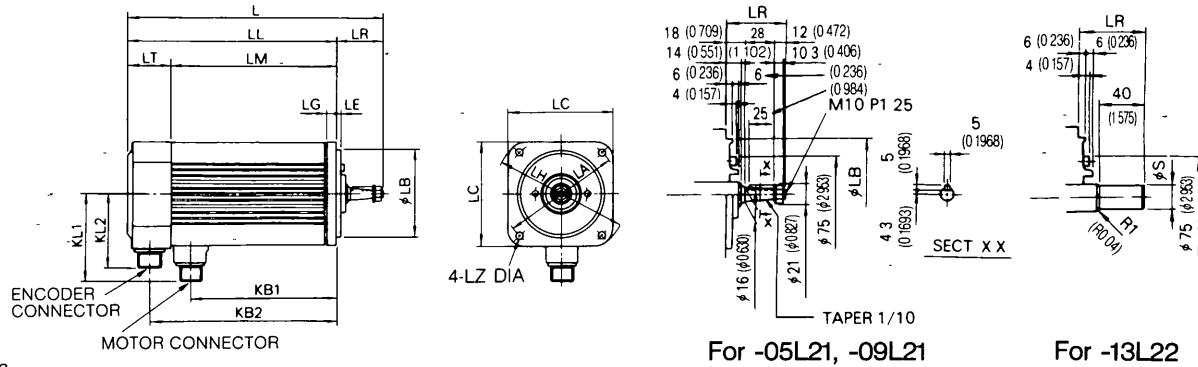
| | |
|---|--------------|
| A | Phase U |
| B | Phase V |
| C | Phase W |
| D | Frame ground |

| | | | |
|---|-------------------|---|---|
| A | Channel A output | K | — |
| B | Channel Ā output | L | — |
| C | Channel B output | M | — |
| D | Channel B̄ output | N | — |
| E | Channel C output | P | — |
| F | Channel C̄ output | R | — |
| G | 0V | S | — |
| H | +5VDC | T | — |
| J | Frame ground | — | — |

(2) F Series
 · Standard Type

Dimensions in mm (inches)

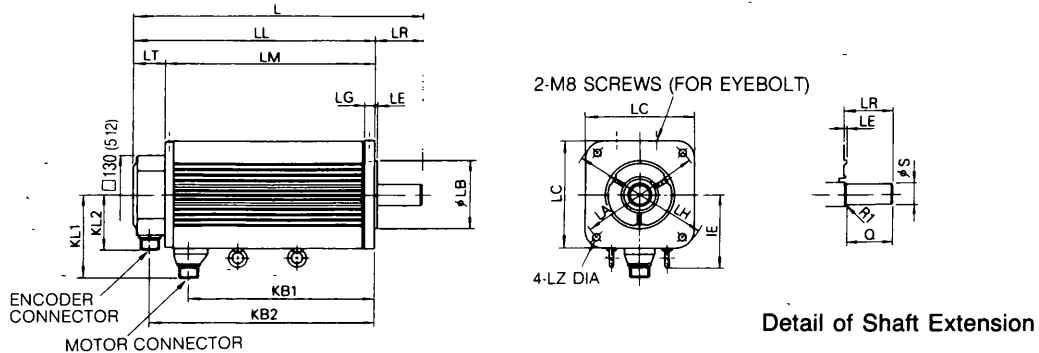
Drawing 1 USAFED-05L21, -09L21 (Taper Shaft), -13L22 (Straight Shaft)



Notes

- 1 Plug and clamp are not attached for receptacle connection
- 2 Key and keyway comply with JIS B 1301-1976
(Parallel key, keyway common class)
- 3 Motor should be mounted with connectors down

Drawing 2 USAFED-20L22 to -44L22 (Straight Shaft)



Notes :

- 1 Plug and clamp are not attached for receptacle connection
- 2 Motor should be mounted with connectors down

| AC SERVO MOTOR Type USAFED- | Dwg No | Flange Surface | | | | | | | | | | | | | | Shaft Extension | | Approx Mass kg (lb) | | | |
|--------------------------------|-----------|----------------|----------------|----------------|--------------|--------------|----------------|----------------|---------------|---------------|--------------|---------------|--|---------------|---------------|-----------------|---------------|---------------------------|---|--------------|-----------|
| | | L | LL | LM | LR | LT | KB1 | KB2 | IE | KL1 | KL2 | LA | LB | LC | LE | LG | LH | | LZ | S | Q |
| 05L21* | 1 | 263 (10.35) | 205 (8.07) | 150 (5.91) | 58 (2.28) | 55 (2.16) | 127 (5.0) | 177 (6.97) | — | 109 (4.29) | 92 (3.62) | 145 (5.71) | 110 ^{0-0.005} (4.3307 ^{-0.0004}) | 130 (5.12) | 6 (0.24) | 12 (0.47) | 165 (6.5) | 9 (0.35) | — | — | 85 (187) |
| 09L21* | | 320 (12.6) | 262 (10.32) | 207 (8.16) | 58 (2.28) | 55 (2.16) | 184 (7.24) | 234 (9.21) | — | 109 (4.29) | 92 (3.62) | 145 (5.71) | 110 ^{0-0.005} (4.3307 ^{-0.0004}) | 130 (5.12) | 6 (0.24) | 12 (0.47) | 165 (6.5) | 9 (0.35) | — | — | 13 (287) |
| 13L22* | | 389 (15.31) | 331 (13.03) | 276 (10.87) | 58 (2.28) | 55 (2.16) | 253 (9.96) | 303 (11.93) | — | 109 (4.29) | 92 (3.62) | 145 (5.71) | 110 ^{0-0.005} (4.3307 ^{-0.0004}) | 130 (5.12) | 6 (0.24) | 12 (0.47) | 165 (6.5) | 9 (0.35) | 22 ^{0-0.013} (0.8661 ^{-0.0005}) | 40 (1.57) | 20 (44.1) |
| 20L22* | 2 | 344 (13.54) | 265 (10.43) | 211 (8.3) | 79 (3.11) | 54 (2.13) | 172 (6.77) | 237 (9.33) | — | 139 (5.47) | 92 (3.62) | 200 (7.87) | 1143 ^{0-0.025} (45 ^{-0.001}) | 180 (7.09) | 3.2 (0.13) | 18 (0.71) | 230 (9.06) | 13.5 (0.53) | 35 ^{0-0.01} (1.3779 ^{-0.0004}) | 76 (2.99) | 22 (48.5) |
| 30L22 | | 401 (15.79) | 322 (12.68) | 268 (10.55) | 79 (3.11) | 54 (2.13) | 229 (9.02) | 294 (11.57) | 123 (4.85) | 139 (5.47) | 92 (3.62) | 200 (7.87) | 1143 ^{0-0.025} (45 ^{-0.001}) | 180 (7.09) | 3.2 (0.13) | 18 (0.71) | 230 (9.06) | 13.5 (0.53) | 35 ^{0-0.01} (1.3779 ^{-0.0004}) | 76 (2.99) | 29 (63.9) |
| 44L22 | | 486 (19.14) | 407 (16.02) | 353 (13.90) | 79 (3.11) | 54 (2.13) | 314 (12.36) | 379 (14.92) | 123 (4.85) | 139 (5.47) | 92 (3.62) | 200 (7.87) | 1143 ^{0-0.025} (45 ^{-0.001}) | 180 (7.09) | 3.2 (0.13) | 18 (0.71) | 230 (9.06) | 13.5 (0.53) | 35 ^{0-0.01} (1.3779 ^{-0.0004}) | 76 (2.99) | 41 (90.4) |

* Not provided with an eyebolt

CONNECTOR TYPES

| AC SERVO MOTOR Type USAFED- | Motor Connector Types | | | | Incremental Encoder Connector Types | | | |
|--------------------------------|-----------------------|-------------------|-------------------|----------------|-------------------------------------|-------------------|-------------------|----------------|
| | Receptacle | L-type Plug | Straight Plug | Cable Clamp | Receptacle | L-type Plug | Straight Plug | Cable Clamp |
| 05L21 09L21 13L22 | MS3102 A18-10P | MS3108 B18-10S | MS3106 B18-10S | MS3057 -10A | 97F3102E 20-29P | MS3108 B20-29S | MS3106 B20-29S | MS3057 -12A |
| 20L22 30L22 44L22 | MS3102 A22-22P | MS3108 B22-22S | MS3106 B22-22S | MS3057 -12A | | | | |

MECHANICAL SPECIFICATIONS

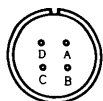
| Accuracy (T. I. R)* | Reference Diagram |
|---|-------------------|
| Flange surface perpendicular to shaft (A) 0.04 (0.0016) | |
| Flange diameter concentric to shaft (B) 0.04 (0.0016) | |
| Shaft run out (C) 0.02 (0.0008) | |

Servomotors with a brake or a modified shaft extension are also available. For detailed information, refer to related Bulletins (TSE-S800-11.1)

* T I R (Total Indicator Reading)

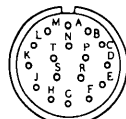
CONNECTOR SPECIFICATIONS

Motor Receptacle



| | |
|---|--------------|
| A | Phase U |
| B | Phase V |
| C | Phase W |
| D | Frame ground |

Incremental Encoder Receptacle

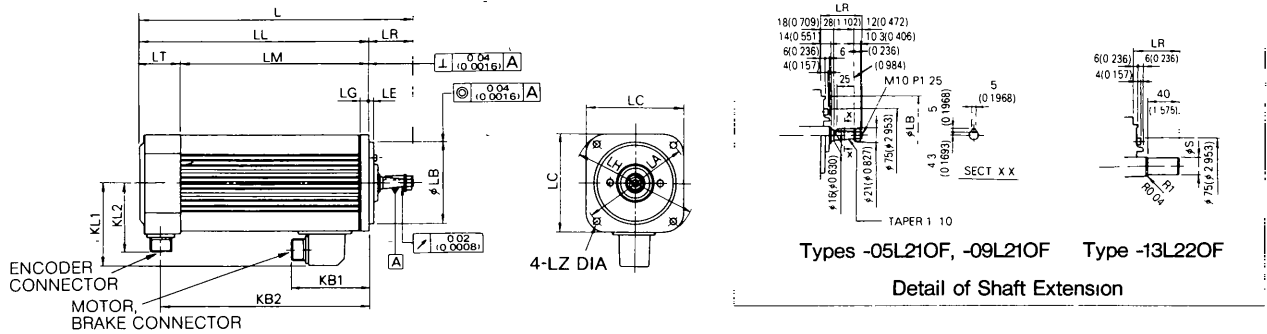


| | | | |
|---|-------------------|---|---|
| A | Channel A output | K | — |
| B | Channel Ā output | L | — |
| C | Channel B output | M | — |
| D | Channel B̄ output | N | — |
| E | Channel C output | P | — |
| F | Channel C̄ output | R | — |
| G | 0V | S | — |
| H | +5VDC | T | — |
| J | Frame ground | — | — |

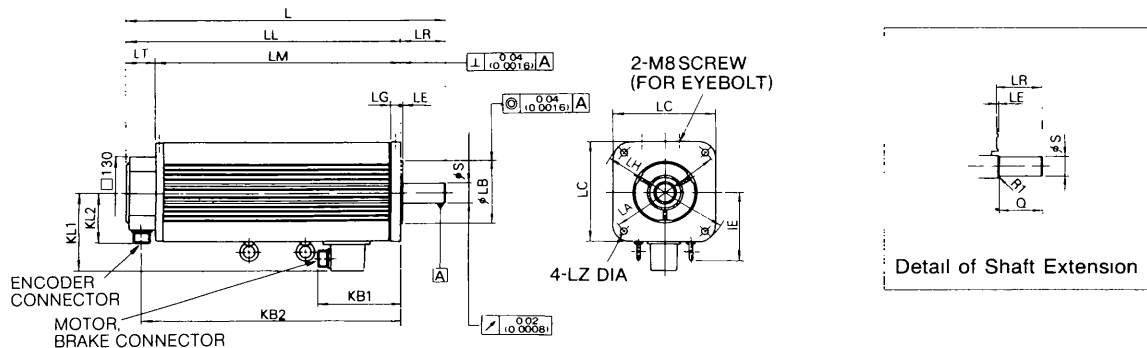


• With Brake

(a) Types USAFED-05L21OF, -09L21OF (Taper Shaft), -13L22OF (Straight Shaft)



(b) Types USAFED-20L22OF, -30L22OF, -44L22OF (Straight Shaft)



| AC SERVO MOTOR Type USAFED- | L | LL | LM | LR | LT | KB1 | KB2 | IE | KL1 | KL2 | Flange Surface | | | | | | Shaft Extension | | Approx Mass kg (lb) | Brake | | |
|--------------------------------|----------------|----------------|----------------|--------------|--------------|---------------|----------------|---------------|---------------|--------------|----------------|-----------------|---------------|--------------|--------------|---------------|-----------------|----------------|---------------------------|----------------|-------------------------------|---|
| | | | | | | | | | | | LA | LB | LC | LE | LG | LH | LZ | S | | Q | Braking Torque N·m/kg·m | Inertia ($\frac{S^2}{4}$) kg·m ² |
| 05L21OF* | 320 (12 60) | 262 (10 31) | 207 (8 15) | 58 (2 28) | 55 (2 16) | 128 (5 04) | 234 (9 21) | - | 113 (4 45) | 92 (3 62) | 145 (5 71) | 110 (4 3307) | 130 (5 12) | 6 (0 24) | 12 (0 47) | 165 (6 5) | 9 (0 35) | - | - | 11 5 (25 4) | 5 88 (0 6) | 0 85×10 ⁻⁴ |
| 09L21OF* | 366 (14 41) | 308 (12 13) | 253 (9 97) | 58 (2 28) | 55 (2 16) | 118 (4 65) | 280 (11 02) | - | 113 (4 45) | 92 (3 62) | 145 (5 71) | 110 (4 3307) | 130 (5 12) | 6 (0 24) | 12 (0 47) | 165 (6 5) | 9 (0 35) | - | - | 15 (33 1) | 5 88 (0 6) | 0 85×10 ⁻⁴ |
| 13L22OF* | 436 (17 17) | 378 (14 89) | 323 (12 73) | 58 (2 28) | 55 (2 16) | 118 (4 65) | 350 (13 78) | - | 113 (4 45) | 92 (3 62) | 145 (5 71) | 110 (4 3307) | 130 (5 12) | 6 (0 24) | 12 (0 47) | 165 (6 5) | 9 (0 35) | 22 (0 8661) | 40 (1 57) | 23 (50 7) | 8 83 (0 9) | 0 9×10 ⁻⁴ |
| 20L22OF | 422 (16 61) | 343 (13 50) | 289 (11 38) | 79 (3 11) | 54 (2 13) | 164 (6 46) | 315 (12 4) | 123 (4 85) | 143 (5 63) | 92 (3 62) | 200 (7 88) | 114 (4 5) | 180 (7 09) | 32 (0 13) | 18 (0 71) | 230 (9 06) | 13.5 (0 53) | 35 (1 3379) | 76 (2 99) | 30 (66 2) | 35 3 (3 6) | 6 25×10 ⁻⁴ |
| 30L22OF | 486 (19 13) | 407 (16 02) | 353 (13 90) | 79 (3 11) | 54 (2 13) | 164 (6 46) | 379 (14 92) | 123 (4 85) | 143 (5 63) | 92 (3 62) | 200 (7 88) | 114 (4 5) | 180 (7 09) | 32 (0 13) | 18 (0 71) | 230 (9 06) | 13.5 (0 53) | 35 (1 3379) | 76 (2 99) | 37 (81 6) | 35 3 (3 6) | 6 25×10 ⁻⁴ |
| 44L22OF | 567 (22 32) | 488 (19 21) | 434 (17 09) | 79 (3 11) | 54 (2 13) | 164 (6 46) | 460 (18 11) | 123 (4 85) | 143 (5 63) | 92 (3 62) | 200 (7 88) | 114 (4 5) | 180 (7 09) | 32 (0 13) | 18 (0 71) | 230 (9 06) | 13.5 (0 53) | 35 (1 3379) | 76 (2 99) | 49 (108 1) | 35 3 (3 6) | 6 25×10 ⁻⁴ |

* Not provided with an eyebolt

† TIR Total Indicator Reading

Notes 1 Optical encoder 8192 pulses/rev is used as a detector

2 Vibration 15µm or below

3 Plug and clamp are not attached for receptacle connection

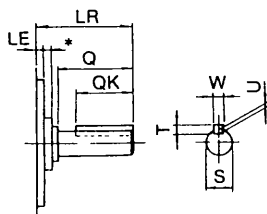
4 Connector specifications Refer to Par 3 3

5 It is recommended that the motor be mounted with its connector placed down

6 Power supply for brake is 24VDC

• Shaft Extension of Straight Shaft with Keyway

Both Servomotors with brake and without brake have the same dimensions except for shaft extension. Shaft extensions are shown below



| Motor Type | | LR | LE | Dimensions of Shaft Extension | | | | | |
|----------------|-----------------|--------------|---------------|-------------------------------|--------------|--------------|---------------|-----------------|----------------|
| Without Brake | With Brake | | | S | Q | QK | T | U | W |
| *USAFED-05L22K | *USAFED-05L22KF | 58 (2 28) | 6 (0 24) | 19 (0 7480) | 40 (1 57) | 25 (0 98) | 5 (0 1968) | 3 (0 1181) | 5 (0 1968) |
| *USAFED-09L22K | *USAFED-09L22KF | 58 (2 28) | 6 (0 24) | 19 (0 7480) | 40 (1 57) | 25 (0 98) | 5 (0 1968) | 3 (0 1181) | 5 (0 1968) |
| *USAFED-13L22K | *USAFED-13L22KF | 58 (2 28) | 6 (0 24) | 22 (0 8661) | 40 (1 57) | 25 (0 98) | 6 (0 2362) | 3 5 (0 1378) | 6 (0 2362) |
| USAFED-20L22K | USAFED-20L22KF | 79 (3 11) | 3 2 (0 13) | 35 (1 3379) | 76 (2 99) | 60 (2 36) | 8 (0 2835) | 5 (0 1968) | 10 (0 3937) |
| USAFED-30L22K | USAFED-30L22KF | 79 (3 11) | 3 2 (0 13) | 35 (1 3379) | 76 (2 99) | 60 (2 36) | 8 (0 2835) | 5 (0 1968) | 10 (0 3937) |
| USAFED-44L22K | USAFED-44L22KF | 79 (3 11) | 3 2 (0 13) | 35 (1 3379) | 76 (2 99) | 60 (2 36) | 8 (0 2835) | 5 (0 1968) | 10 (0 3937) |

* 6mm (in) for USAFED-05L22 to 13L22

| AC SERVO MOTOR Type USAGED- | Dwg No | Flange Surface | | | | | | | | | | | | | | Shaft Extension | | Approx Mass kg (lb) | | | | | |
|--------------------------------|-----------|----------------|----------------|----------------|--------------|--------------|----------------|----------------|---------------|---------------|--------------|---------------|-----------------|---------------------|---------------|-----------------|--------------|---------------------------|----------------|----------------|---------------------|--------------|-----------|
| | | L | LL | LM | LR | LT | KB1 | KB2 | IE | KL1 | KL2 | LA | LB | LC | LE | LG | LH | | LZ | S | Q | | |
| 05L21* | 1 | 263 (10.35) | 205 (8.07) | 150 (5.91) | 58 (2.28) | 55 (2.16) | 127 (5.0) | 177 (6.97) | - | 109 (4.29) | 92 (3.62) | 145 (5.71) | 110 (4.3307) | 0.005 0.0014 | 130 (5.12) | 6 (0.24) | 12 (0.47) | 165 (6.5) | 9 (0.35) | - | - | 85 (18.7) | |
| 09L21* | | 320 (12.6) | 262 (10.32) | 207 (8.16) | 58 (2.28) | 55 (2.16) | 184 (7.24) | 234 (9.21) | - | 109 (4.29) | 92 (3.62) | 145 (5.71) | 110 (4.3307) | 0.005 0.0014 | 130 (5.12) | 6 (0.24) | 12 (0.47) | 165 (6.5) | 9 (0.35) | - | - | 13 (28.7) | |
| 13L22* | | 389 (15.31) | 331 (13.03) | 276 (10.87) | 58 (2.28) | 55 (2.16) | 253 (9.96) | 303 (11.93) | - | 109 (4.29) | 92 (3.62) | 145 (5.71) | 110 (4.3307) | 0.005 0.0014 | 130 (5.12) | 6 (0.24) | 12 (0.47) | 165 (6.5) | 9 (0.35) | 22 (0.8661) | 0.013 0.0005 | 40 (1.57) | 20 (44.1) |
| 20L22* | | 344 (13.54) | 265 (10.43) | 211 (8.3) | 79 (3.11) | 54 (2.13) | 172 (6.77) | 237 (9.33) | - | 139 (5.47) | 92 (3.62) | 200 (7.87) | 114.3 (4.5) | 0.025 0.001 | 180 (7.09) | 3.2 (0.13) | 18 (0.71) | 230 (9.06) | 13.5 (0.53) | 35 (1.3779) | 0.01 0.0004 | 76 (2.99) | 22 (48.5) |
| 30L22 | | 401 (15.79) | 322 (12.68) | 268 (10.55) | 79 (3.11) | 54 (2.13) | 229 (9.02) | 294 (11.57) | 123 (4.85) | 139 (5.47) | 92 (3.62) | 200 (7.87) | 114.3 (4.5) | 0.025 0.001 | 180 (7.09) | 3.2 (0.13) | 18 (0.71) | 230 (9.06) | 13.5 (0.53) | 35 (1.3779) | 0.01 0.0004 | 76 (2.99) | 29 (63.9) |
| 44L22 | | 486 (19.14) | 407 (16.02) | 353 (13.90) | 79 (3.11) | 54 (2.13) | 314 (12.36) | 379 (14.92) | 123 (4.85) | 139 (5.47) | 92 (3.62) | 200 (7.87) | 114.3 (4.5) | 0.025 0.001 | 180 (7.09) | 3.2 (0.13) | 18 (0.71) | 230 (9.06) | 13.5 (0.53) | 35 (1.3779) | 0.01 0.0004 | 76 (2.99) | 41 (90.4) |

* Not provided with an eyebolt

CONNECTOR TYPES

| AC SERVO MOTOR Type USAGED- | Motor Connector Types | | | | Incremental Encoder Connector Types | | | |
|--------------------------------|-----------------------|-------------------|-------------------|----------------|-------------------------------------|-------------------|-------------------|----------------|
| | Receptacle | L-type Plug | Straight Plug | Cable Clamp | Receptacle | L-type Plug | Straight Plug | Cable Clamp |
| 05L21 09L21 13L22 | MS3102 A18-10P | MS3108 B18-10S | MS3106 B18-10S | MS3057 -10A | 97F3102E 20-29P | MS3108 B20-29S | MS3106 B20-29S | MS3057 -12A |
| 20L22 30L22 44L22 | MS3102 A22-22P | MS3108 B22-22S | MS3106 B22-22S | MS3057 -12A | | | | |

MECHANICAL SPECIFICATIONS

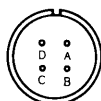
| Accuracy (T. I. R)* | Reference Diagram |
|---|-------------------|
| Flange surface perpendicular to shaft (A) 0.04 (0.0016) | |
| Flange diameter concentric to shaft (B) 0.04 (0.0016) | |
| Shaft run out (C) 0.02 (0.0008) | |

Servomotors with a brake or a modified shaft extension are also available. For detailed information, refer to related Bulletins (TSE-S800-11 1)

* T I R (Total Indicator Reading)

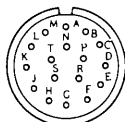
CONNECTOR SPECIFICATIONS

Motor Receptacle



| | |
|---|--------------|
| A | Phase U |
| B | Phase V |
| C | Phase W |
| D | Frame ground |

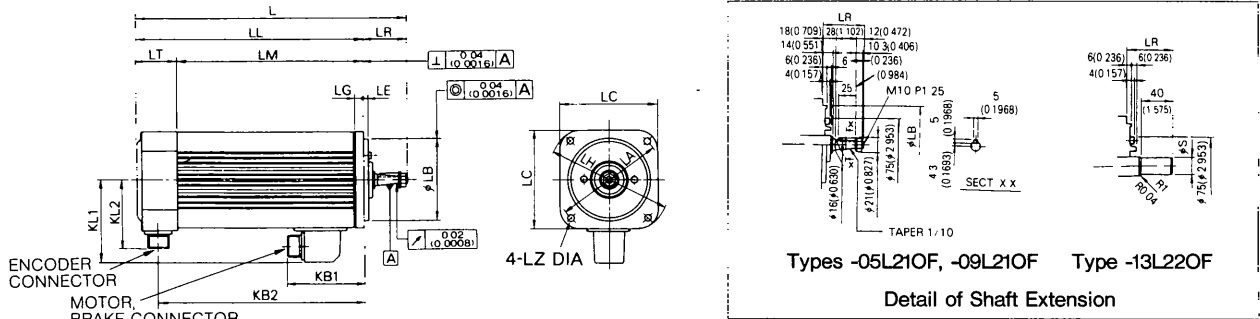
Incremental Encoder Receptacle



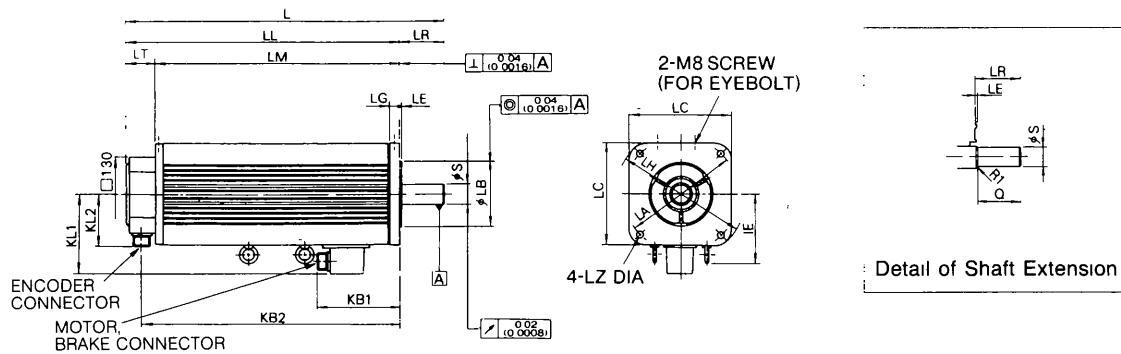
| | | | |
|---|----------------------|---|---|
| A | Channel A output | K | - |
| B | Channel A-bar output | L | - |
| C | Channel B output | M | - |
| D | Channel B-bar output | N | - |
| E | Channel C output | P | - |
| F | Channel C-bar output | R | - |
| G | 0V | S | - |
| H | +5VDC | T | - |
| J | Frame ground | - | - |

• With Brake

(a) Types USAGED-05L21OF, -09L21OF (Taper Shaft), -13L22OF (Straight Shaft)



(b) Types USAGED-20L22OF, -30L22OF, -44L22OF (Straight Shaft)



| AC SERVO MOTOR Type USAGED- | L | LL | LM | LR | LT | KB1 | KB2 | IE | KL1 | KL2 | Flange Surface | | | | | | Shaft Extension | | Approx Mass kg (lb) | Brake | | |
|--------------------------------|----------------|----------------|----------------|--------------|--------------|---------------|----------------|---------------|---------------|--------------|----------------|----------------------------------|---------------|---------------|--------------|--------------|-----------------|---------------------------------|---------------------------|-------------|---------------------------------|---|
| | | | | | | | | | | | LA | LB | LC | LE | LG | LH | LZ | S | | Q | Braking Torque N·m (kg·m) | Inertia (GD ² / ₄) kg·m ² |
| 05L21OF* | 320 (12 60) | 262 (10 31) | 207 (8 15) | 58 (2 28) | 55 (2 16) | 128 (5 04) | 234 (9 21) | - | 113 (4 45) | 92 (3 62) | 145 (5 71) | 110 (4 3307 $\frac{1}{2}$ mm) | 130 (5 12) | 6 (0 24) | 12 (0 47) | 165 (6 5) | 9 (0 35) | - | - | 11 5 (25 4) | 5 88 (0 6) | 0 85x10 ⁻⁴ |
| 09L21OF* | 366 (14 41) | 308 (12 13) | 253 (9 97) | 58 (2 28) | 55 (2 16) | 118 (4 65) | 280 (11 02) | - | 113 (4 45) | 92 (3 62) | 145 (5 71) | 110 (4 3307 $\frac{1}{2}$ mm) | 130 (5 12) | 6 (0 24) | 12 (0 47) | 165 (6 5) | 9 (0 35) | - | - | 15 (33 1) | 5 88 (0 6) | 0 85x10 ⁻⁴ |
| 13L22OF* | 436 (17 17) | 378 (14 89) | 323 (12 73) | 58 (2 28) | 55 (2 16) | 118 (4 65) | 350 (13 78) | - | 113 (4 45) | 92 (3 62) | 145 (5 71) | 110 (4 3307 $\frac{1}{2}$ mm) | 130 (5 12) | 6 (0 24) | 12 (0 47) | 165 (6 5) | 9 (0 35) | 22 (0 8661 $\frac{1}{2}$ mm) | 40 (1 57) | 23 (50 7) | 8 83 (0 9) | 0 9x10 ⁻⁴ |
| 20L22OF | 422 (16 61) | 343 (13 50) | 289 (11 38) | 79 (3 11) | 54 (2 13) | 164 (6 46) | 315 (12 4) | 123 (4 85) | 143 (5 63) | 92 (3 62) | 200 (7 88) | 114 3 (4 5) | 180 (7 09) | 3 2 (0 13) | 18 (0 71) | 230 (9 1) | 13 5 (0 53) | 35 (1 3379 $\frac{1}{2}$ mm) | 76 (2 99) | 30 (66 2) | 35 3 (3 6) | 6 25x10 ⁻⁴ |
| 30L22OF | 486 (19 13) | 407 (16 02) | 353 (13 90) | 79 (3 11) | 54 (2 13) | 164 (6 46) | 379 (14 92) | 123 (4 85) | 143 (5 63) | 92 (3 62) | 200 (7 88) | 114 3 (4 5) | 180 (7 09) | 3 2 (0 13) | 18 (0 71) | 230 (9 1) | 13 5 (0 53) | 35 (1 3379 $\frac{1}{2}$ mm) | 76 (2 99) | 37 (81 6) | 35 3 (3 6) | 6 25x10 ⁻⁴ |
| 44L22OF | 567 (22 32) | 488 (19 21) | 434 (17 09) | 79 (3 11) | 54 (2 13) | 164 (6 46) | 460 (18 11) | 123 (4 85) | 143 (5 63) | 92 (3 62) | 200 (7 88) | 114 3 (4 5) | 180 (7 09) | 3 2 (0 13) | 18 (0 71) | 230 (9 1) | 13 5 (0 53) | 35 (1 3379 $\frac{1}{2}$ mm) | 76 (2 99) | 49 (108 1) | 35 3 (3 6) | 6 25x10 ⁻⁴ |

* Not provided with an eyebolt

† TIR Total Indicator Reading

Notes 1 Optical encoder 8192 pulses/rev is used as a detector

2 Vibration 15µm or below

3 Plug and clamp are not attached for receptacle connection

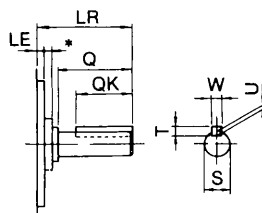
4 Connector specifications Refer to Par 3 3

5 It is recommended that the motor be mounted with its connector placed down

6 Power supply for brake is 24VDC

• Shaft Extension of Straight Shaft with Keyway

Both Servomotors with brake and without brake have the same dimensions except for shaft extension. Shaft extensions are shown below



| Motor Type | | LR | LE | Dimensions of Shaft Extension | | | | | |
|----------------|-----------------|--------------|---------------|-------------------------------|--------------|--------------|---------------|-----------------|----------------|
| Without Brake | With Brake | | | S | Q | QK | T | U | W |
| *USAGED-05L22K | *USAGED-05L22KF | 58 (2 28) | 6 (0 24) | 19 (0 7480) | 40 (1 57) | 25 (0 98) | 5 (0 1968) | 3 (0 1181) | 5 (0 1968) |
| *USAGED-09L22K | *USAGED-09L22KF | 58 (2 28) | 6 (0 24) | 19 (0 7480) | 40 (1 57) | 25 (0 98) | 5 (0 1968) | 3 (0 1181) | 5 (0 1968) |
| *USAGED-13L22K | *USAGED-13L22KF | 58 (2 28) | 6 (0 24) | 22 (0 8661) | 40 (1 57) | 25 (0 98) | 6 (0 2362) | 3 5 (0 1378) | 6 (0 2362) |
| USAGED-20L22K | USAGED-20L22KF | 79 (3 11) | 3 2 (0 13) | 35 (1 3379) | 76 (2 99) | 60 (2 36) | 8 (0 315) | 5 (0 1968) | 10 (0 3937) |
| USAGED-30L22K | USAGED-30L22KF | 79 (3 11) | 3 2 (0 13) | 35 (1 3379) | 76 (2 99) | 60 (2 36) | 8 (0 315) | 5 (0 1968) | 10 (0 3937) |
| USAGED-44L22K | USAGED-44L22KF | 79 (3 11) | 3 2 (0 13) | 35 (1 3379) | 76 (2 99) | 60 (2 36) | 8 (0 315) | 5 (0 1968) | 10 (0 3937) |

* 6mm (in) for USAGED-05L22 to 13L22

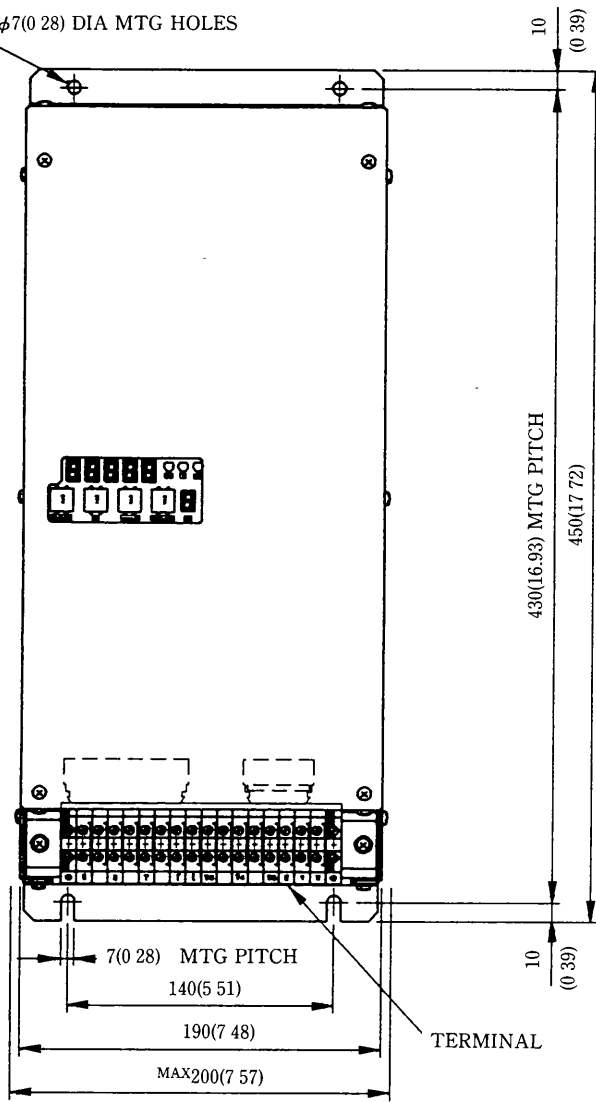


11.3 SERVOPACK

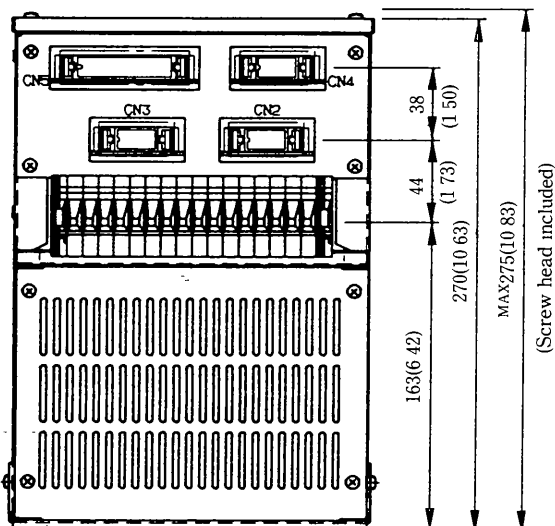
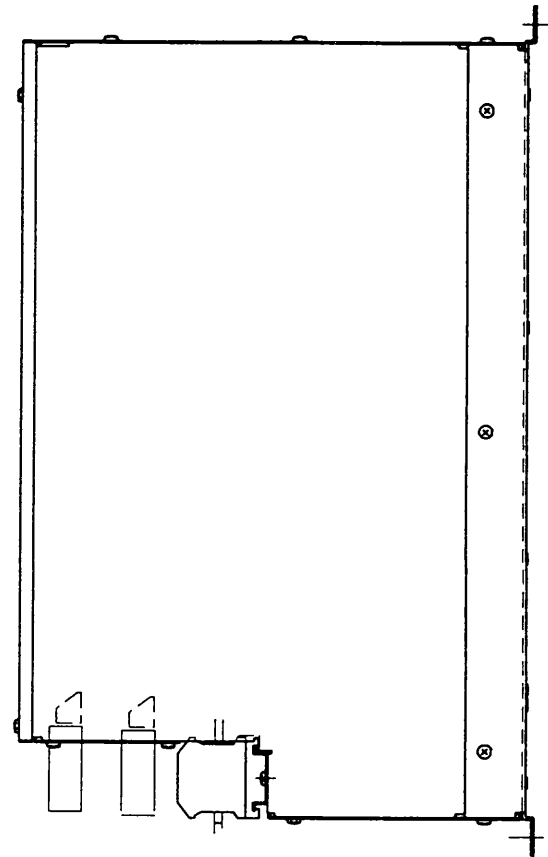
CACR-HR03UB to - HR10UB

2 - $\phi 7(0.28)$ DIA MTG HOLES

Dimensions in mm (inches)



(Screw head included)

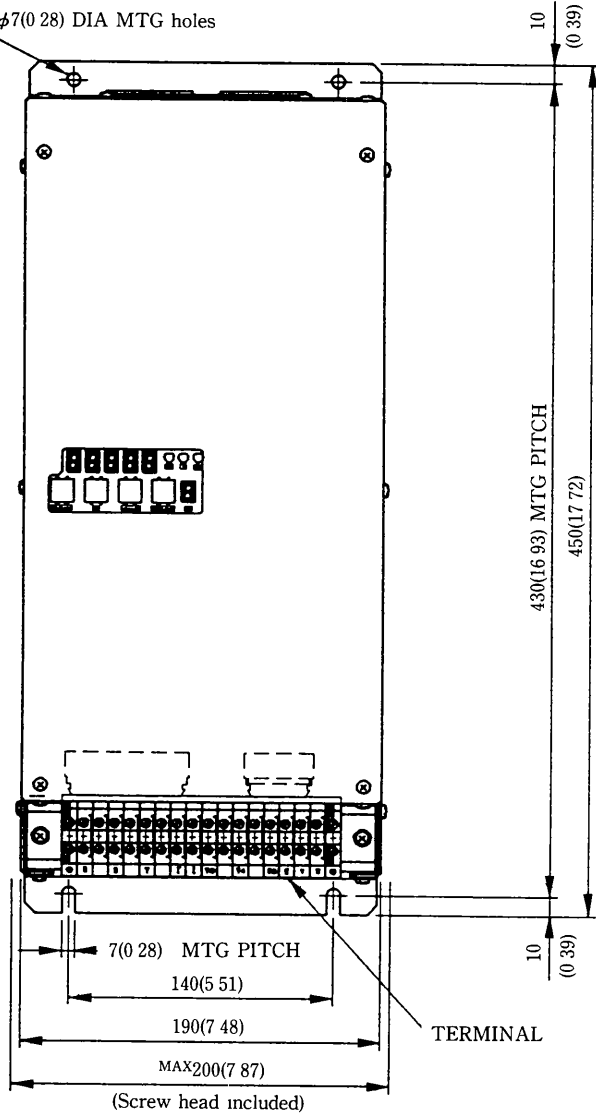


| Item | Connector Type | Accessory | |
|------|----------------|--------------|------------------|
| CN2 | MR-20RFA | case housing | MR-20L MR-20M |
| CN3 | MR-20RMA | case housing | MR-20L MR-20F |
| CN4 | MR-20RMA | case housing | MR-20L MR-20F |
| CN5 | MR-50RMA | case housing | MR-50L MR-50F |

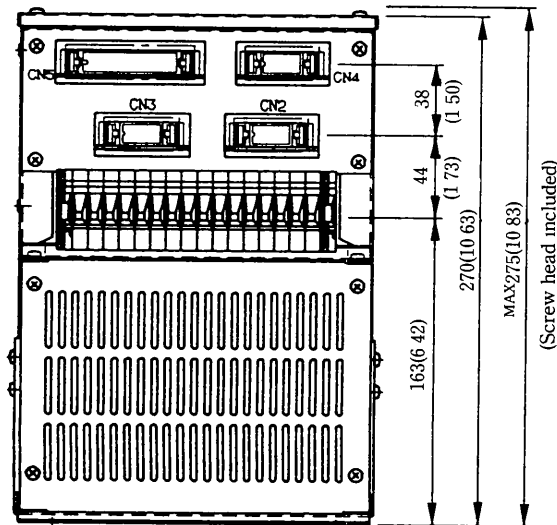
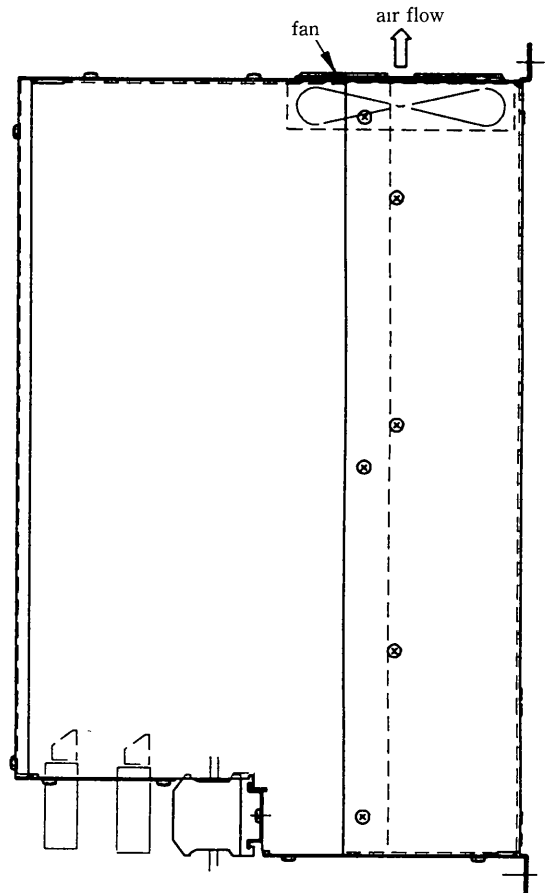
Made by HONDA TSUSHIN Co

CACR-HR15UB to - HR44UB

2 - $\phi 7(0.28)$ DIA MTG holes



Dimensions in mm (inches)



| Item | Connector Type | Accessory | |
|------|----------------|--------------|------------------|
| CN2 | MR-20RFA | case housing | MR-20L MR-20M |
| CN3 | MR-20RMA | case housing | MR-20L MR-20F |
| CN4 | MR-20RMA | case housing | MR-20L MR-20F |
| CN5 | MR-50RMA | case housing | MR-50L MR-50F |

Made by HONDA TSUSHIN Co.

12 APPENDIX PARAMETER SETTING

AC Servopack type CACR-HR is a position control provided with all constant setting and function selections using parameters. It is necessary to set the parameters before use.

For details of each parameter content, refer to the Section 8 in this manual. This section briefly describes parameter settings in checking method.

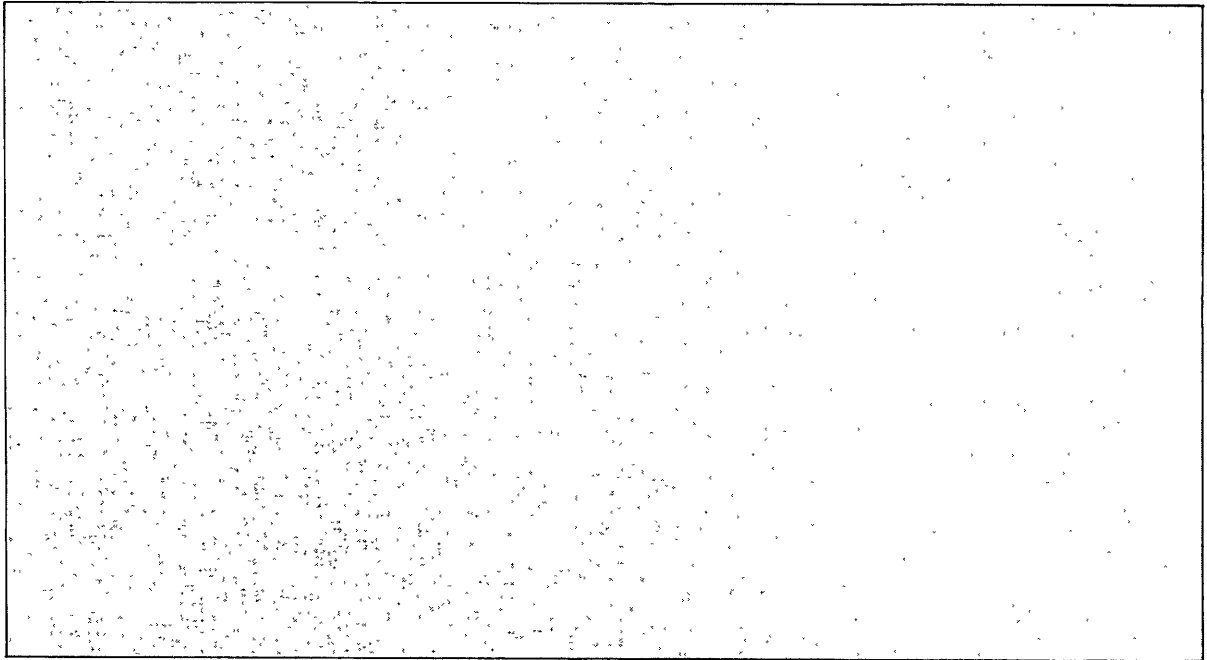
When it is required for YASKAWA to set parameters before delivery, fill out your machine configuration and specifications (sections) and the required items in Par. 12.7 and contact your YASKAWA representative.

12.1 APPLICATIONS

12.2 ORDER ELECTRICAL DEVICES

| Name | Type/Specifications | Q'ty |
|-----------------------------|---|------|
| AC Servomotor | with encoder pulses/rev | |
| AC Servopack | | |
| External Position Indicator | MCIF-L8 (Sigh + 8-digit) | |
| DG-SW (1 Set) | MCIF-D80 (Only position reference data) | |
| DG-SW (2 Set) | MCIF-D86 (Position and speed reference) | |
| Parameter Setter | PF803-ASY | |

12.3 MACHINE CONFIGURATION

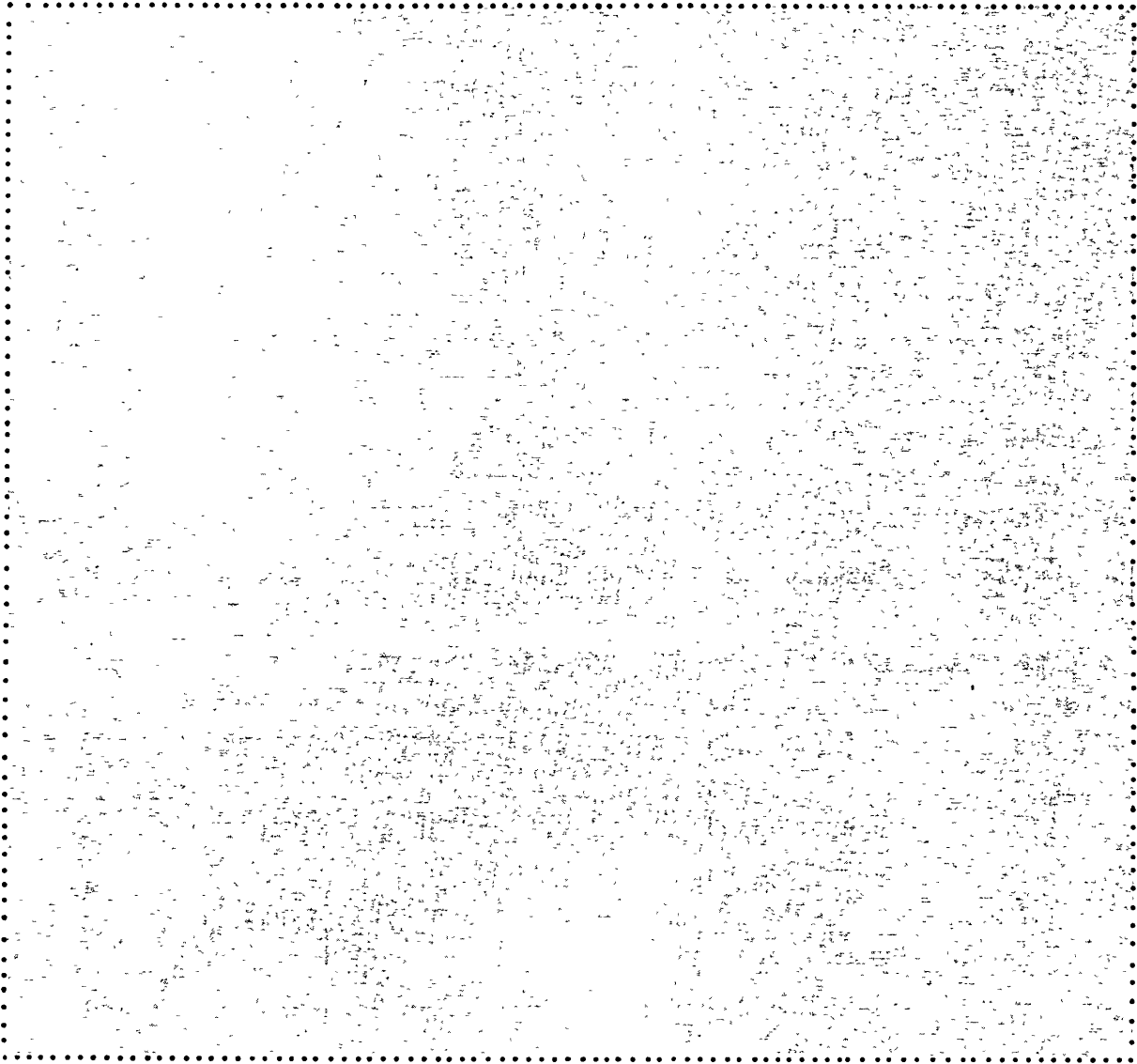


12.4 SPECIFICATIONS

| Machine Specifications | | SERVOMOTOR Specifications | | SERVOPACK Specification |
|--|--|---------------------------|--|---------------------------|
| Using Axis | Horizontal Vertical | Rated Output | kW | Input Power Supply |
| Max. Speed of Movable Section | | Rated Speed | r/min | Continuous Output Current |
| Total Deceleration Rate | | Max. Speed | r/min | Max. Output Current |
| Load Moving Amount per Load Shaft Rotation | | Used Speed | r/min | |
| Load Torque * | N·m | Rated Torque | N·m (lb·in) | |
| Load Inertia J_L^* | kg·m ² (lb·in·s ²) | Rated Current | Arms | |
| Reference Unit(min.) | | Rotor Inertia J_M | kg·m ² (lb·in·s ²) | |

* Motor shaft conversion

12.5 SPEED DIAGRAM



12.6 PARAMETER SETTING TABLE

| No | Name | Setting Range | Unit | Set Value |
|----|--|---|---|-----------|
| 1 | Position Loop Gain | 0 to 200 | S ⁻¹ | |
| 2 | Speed Loop Gain | 1 to 200 | ×5J _v /(J _v +J _l)Hz | |
| 3 | Integral Time Constant | 1 to 255 | ×2ms | 10 |
| 4 | 1st Feeding Speed (V ₁) | 1 to 240000 | (×1000) reference unit | |
| 5 | Linear Accel/Decel Time(t ₁) | 8 to 60000 | ms | |
| 6 | Positioning Complete Range | 1 to 250 | Reference unit/min | |
| 7 | Motor Selection Code | 0 to 79 | | |
| 8 | Number of Encoder Pulses | 4096 to 32768 | Pulses/rev (at×4) | |
| 9 | Encoder Selection Code | 0: absolute, 1: incremental | | |
| 10 | ABS0 Error Detection Range | 0 to 99999999 | Pulse (at×4) | |
| 11 | Load Moving Amount per Load Shaft Rotation | 1 to 15000000 | Reference unit | |
| 12 | Gear Ratio Setting | Motor Shaft Speed | 1 to 10000000 Rotation | |
| 13 | | Load Shaft Speed | | |
| 14 | Mode Setting | 0 to 11111 | | |
| | b0: Motor rotating direction (+at reference) | 0: FWD run, 1: REV run (CCW) (CW) | | |
| | b1: Finite/infinite positioning mode | 0: finite, 1: infinite | | |
| | b2: Linear/rotating motion | 0: linear, 1: rotation | | |
| | b3: Position reference mode | 0: absolute, 1: incremental | | |
| | b4: Position data code | 0: binary, 1: BCD | | |
| 15 | Position Reference Input Method | 0: station No., 1: DG-SW, 2: serial communication 4: command table | | |
| 16 | Number of Stations | 1 to 4096 | | |
| 17 | Function Selection 1 | 0 to 11111 | | 0 |
| | b0: Current limit | 0: motor fixed value, 1: set | | |
| | b1: Feed forward compensation | 0: ineffective, 1: effective | | 0 |
| | b2: Linear accel/decel 1-step/2-step | 0: 1-step, 1: 2-step | | |
| | b3: Speed limit | 0: motor max. speed, 1: set | | |
| | b4: Accel/decel type setting | 0: linear (1-or 2-step), 1: selected in operation mode | | |
| 18 | Function Selection 2 | 0 to 11111 | | |
| | b0: Software overtravel (position reference fault detection) | 0: ±99999999, 1: set | | |
| | b1: Backlash compensation | 0: not provided, 1:set | | |
| | b2 Speed reference input method | Automatic mode | 0: fixed by position reference method, 1: set | |
| | b3 | Manual mode | | |
| | b4: Zero-point return (homing) mode | 0: not used, 1: used | | |

12.6 PARAMETER SETTING TABLE (Cont'd)

| No | Name | Setting Range | Unit | Set Value | |
|--|---|---|-------------------------------------|--------------------------------------|-------------------|
| 19 | Function Selection 3 | 0 to 11111111 | | | |
| | b0: OT signal | 0: used, 1: not used | | | |
| | b1: STOP signal | 0: used, 1: not used | | | |
| | b2: Holding brake release signal | 0: not used, 1: used | | | |
| | b3: Pulse status in pulse mode | 0: $A\phi + B\phi \times 4$ (fixed), 1: select | | | |
| | b4: Pulse output division rate | 0: fixed dividing ratio 1:1 1: set dividing ratio | | | |
| | b5: Positioning (station) near signal | 0: not used, 1: used | | | |
| | b6: OT signal switching | 0: P-OT, N-OT operation in plus/minus direction, 1: N-OT, P-OT operation in plus/minus direction | | | |
| b7: Torque reference filter time constant change | 0: no change, 1: change | | | | |
| 20 | Function Selection 4 | 0 to 11111111 | | 0 | |
| | b0: | 0 | | 0 | |
| | b1: External position indicator | 0: not used, 1: used | | | |
| | b2: Station No. (0) | 0: provided, 1: not provided | | | |
| | b3: Simplified S-curve Accel/Decel | 0: not used, 1: used | | | |
| | b4: Pr72 function setting | 0: not provided, 1: provided | | | |
| | b5: Pr65 function setting | 0: not provided, 1: provided | | | |
| | b6: Pr66 function setting | 0: not provided, 1: provided | | | |
| 31 | Feeding Speed | 2nd speed | reference unit/min | | |
| 32 | | 3rd speed | | 1 to 240000 | ($\times 1000$) |
| 33 | | 4th speed | | | |
| 34 | Current Limit Value | Plus/minus side | % | | |
| 35 | | Plus side | | 0 to 400 | |
| 36 | | Minus side | | | |
| 37 | Forward Feed Compensation Value | 0 to 200 | % | 0 | |
| 38 | Linear 2-step Accel/Decel | Time (t_5) | ms | | |
| 39 | | Switching speed (V_5) | 0 to 240000 | ($\times 1000$)reference unit /min | |
| 40 | Software over-travel (position reference fault detection value) | Plus side | Reference unit | | |
| 41 | | Minus side | | ± 99999999 | |
| 42 | Backlash Compensation | 0 to ± 30000 | Pulse | | |
| 43 | Braking Time | 8 to 1000 | ms | | |
| 44 | Brake ON Motor Speed | 1 to 10000 | r/min | | |
| 45 | Positioning (station) Near Range | 0 to 30000 | Reference unit | | |
| 46 | Speed Limit Value | 1 to 240000 | ($\times 1000$)reference unit/min | | |
| 47 | Exponential Accel/Decel | Time constant (t_6) | ms | | |
| 48 | | Bias speed (V_6) | 0 to 240000 | ($\times 1000$)reference unit/min | |

(Cont'd)

| No | Name | Setting Range | Unit | Set Value |
|----|--|--|--|-----------|
| 49 | Method | 0 mode I, 1 mode II | | |
| 50 | Direction | 0, plus direction, 1, minus direction | | |
| 51 | Zero-point Return (Homing) | Feeding speed | (×1000) | |
| 52 | | Approach speed | reference unit/min | |
| 53 | | Creep speed | | |
| 54 | | Final traveling distance | Reference unit | |
| 61 | Speed | Automatic mode | 0: internal speed selection at contact. | |
| 62 | Reference Input Method | Manual mode | 1 DG-SW 2. serial command. 4 speed table | |
| 63 | Pulse Signal Status (with Pulse Mode) | 0: Aφ + Bφ×4. 1.Aφ + Bφ×2. 2 Aφ + Bφ×1. 3 sign + pulse train. 4: CCW pulse + CW pulse | | |
| 64 | Output Pulse Dividing Ratio | 2 to 60 | 2/N | |
| 65 | Function Selection 5 | 0 to 1111111 | | |
| | b0: Zone signal | 0 not used, 1. used | | |
| | b1: Station near signal | 0. not used, 1. used | | |
| | b2: DG-SW read-in time change | 0: not change, 1 change | | |
| | b3: DG-SW digit number shift | 0 no shift, 1. shift | | |
| | b4: | 0 | | |
| | b5: | 0 | | |
| | b6: Position completion signal change | 0. not change 1 change | | |
| 66 | Function Selection 6 | 0 to 11111111 | | |
| | b0 | 0 | | |
| | b1: | 0 | | |
| | b2 | 0 | | |
| | b3: | 0 | | |
| | b4: Station No. output extension | 0: not extend 1 extend | | |
| | b5 | 0 | | |
| | b6: | 0 | | |
| | b7: Servopack axis address | 0: not provided 1 provided | | |
| 67 | External Position Indicator Decimal Point Position and Digit Number to Shift DG-SW Digit | 0 to 7 | | |
| 68 | Accel/Decel | Automatic mode | 0: linear or simplified S-curve, 1: exponent | |
| 69 | Type | Manual mode | | |
| 70 | Selection | Pulse mode | | |
| 71 | | Zero-point return mode (Homing) | | |
| 72 | Function Selection 7 | 0 to 11111 | | |
| | b0. Overrun detection alarm | 0: detect, 1 not detect | | |
| | b1. Remaining data after STOP signal | 0: hold, 1: abandon | | |
| | b2: PG selection when using line PG | 0: by L-PG signal, 1: Forcing motor PG | | |
| | b3: Echo-back at initialization | 0: not echo back 1: echo back | | |
| | b4: OK response for command | 0. no response, 1: response | | |
| | b5 Monitor data transmission spec change | 0: sent repeatedly 1. sent only once | | |
| 76 | Simplified S-curve Accel/Decel Time | 0 to 124 | (+2)ms | |
| 77 | DG-SW Read-in Scanning Time | 24 to 2000 | ms | |
| 90 | Torque Reference Filter Time Constant | 0 to 100 | (×32.5) μs | |

Parameters 21 to 30, 55 to 60, 66, 73 to 75, 78 to 89, 91 to 99 are for future use and all are set to "0".

12.7 PARAMETER CHECK LIST

12.7.1 Parameters Related to Motor Used

Motor Type: _____ (Pr7 = Codes as shown in the following table)

| M Series | | F Series | | G Series | |
|-----------------------|------|-----------------------|------|-----------------------|------|
| Motor Type USAMED- | Code | Motor Type USAFED- | Code | Motor Type USAGED- | Code |
| | 0 | | | | |
| 03L [] 1 | 1 | | | | |
| 06L [] 1 | 2 | 05L [] 1 | 12 | 05L [] 1 | 52 |
| 09L [] 2 | 3 | 09L [] 1 | 13 | 09L [] 1 | 53 |
| 12L [] 2 | 4 | 13L [] 2 | 14 | 13L [] 2 | 54 |
| 20L [] 2 | 5 | 20L [] 2 | 15 | 20L [] 2 | 55 |
| 30L [] 2 | 6 | 30L [] 2 | 16 | 30L [] 2 | 56 |
| 44L [] 2 | 7 | 44L [] 2 | 17 | 44L [] 2 | 57 |

Encoder type

- Method: Absolute encoder (Pr9 = 0)
 Incremental encoder (Pr9 = 1)
- Number of pulses: 1024 pulses/rev (Pr8 = 4096)
 2048 pulses/rev (Pr8 = 8192)
 8192 pulses/rev (Pr8 = 32768)

12.7.2 Parameters Related to Machine Specifications

- ① Linear motion (Pr14b2=0) ② Finite positioning (Pr14b1=0)
 Rotating motion (Pr14b2=1) Infinite positioning (Pr14b1=0)
- ③ Total reduction ratio _____ (=Pr13/Pr12)
- ④ Motor rotating direction when load moves in plus direction (viewed from load side)
 CCW (Pr14b0=0)
 CW (Pr14b0=1)
- ⑤ Reference unit(minimum) A = _____(mm): position resolution
- ⑥ Load moving amount-per load shaft rotation P= _____ (mm)(Pr11=P/A)
(Note) Limiting conditions: $0.01 \leq (\text{Pr}8 \times \text{Pr}12)/(\text{Pr}11 \times \text{Pr}13) \leq 100$

12.7.2 Parameters Related to Machine Specifications (Cont'd)

⑦ Accel/Decel type

| | <input type="checkbox"/> All-mode Linear 1-step Accel/Decel Speed | <input type="checkbox"/> All-mode Linear 2-step Accel/Decel Speed | <input type="checkbox"/> All-mode Simplified S-curve Accel/Decel Speed | <input type="checkbox"/> Set in each Mode (Pr17b4=1) | | | |
|---|---|---|--|--|---|---|---|
| | | | | Linear 1-step | Linear 2-step | Simplified S-curve | Exponential Accel/Decel Speed |
| <input type="checkbox"/> Automatic Mode | | | | <input type="checkbox"/> Pr17b2=0 Pr68=0 | <input type="checkbox"/> Pr17b2=1 Pr68=0 | <input type="checkbox"/> Pr20b3=1 Pr68=0 | <input type="checkbox"/> Pr68=1 Pr17b2, Pr20b3 Setting are not required. |
| <input type="checkbox"/> Manual Mode | Pr17b2=0 Pr17b4=0 | Pr17b2=1 Pr17b4=0 | Pr17b4=0 Pr20b3=1 | <input type="checkbox"/> Pr17b2=0 Pr69=0 | <input type="checkbox"/> Pr17b2=1 Pr69=0 | <input type="checkbox"/> Pr20b3=1 Pr69=0 | <input type="checkbox"/> Pr69=1 Pr17b2, Pr20b3 Setting are not required. |
| <input type="checkbox"/> Pulse Mode | <input type="checkbox"/> Pr68 to Pr71 Settings are not required. | <input type="checkbox"/> Pr68 to Pr71 Settings are not required. | <input type="checkbox"/> Pr68 to Pr71 Settings are not required. | <input type="checkbox"/> Pr17b2=0 Pr70=0 | <input type="checkbox"/> Pr17b2=1 Pr70=0 | <input type="checkbox"/> Pr20b3=1 Pr70=0 | <input type="checkbox"/> Pr70=1 Pr17b2, Pr20b3 Setting are not required. |
| <input type="checkbox"/> Zero-point Return Mode | | | | <input type="checkbox"/> Pr17b2=0 Pr71=0 | <input type="checkbox"/> Pr17b2=1 Pr71=0 | <input type="checkbox"/> Pr20b3=1 Pr71=0 | <input type="checkbox"/> Pr71=1 Pr17b2, Pr20b3 Setting are not required. |

| |  |  |  |  |
|------------|---|---|--|---|
| Pr | | | | |
| V1(mm/min) | 4 | | | |
| V5(mm/min) | 39 | — | | |
| V6(mm/min) | 48 | — | — | |
| t1(ms) | 5 | | | |
| t5(ms) | 38 | — | | |
| t6(ms) | 47 | — | — | |
| t7(ms) | 76 | — | — | — |

$$(\text{Pr4}, 39, 47) = (\text{Speed}) / (1000 \cdot A)$$

12.7.3 Parameters Related to Position Reference Method

① Reference input method

= Setting not required

| | <input type="checkbox"/> Station No. Input | <input type="checkbox"/> DG-SW Input | <input type="checkbox"/> Serial Communication Input | <input type="checkbox"/> Command Table No. Input |
|--------|--|---|---|---|
| Pr15 | 0 | 1 | 2 | 4 |
| Pr16 | Number of Stations _____ | | | |
| Pr14b4 | Position Data <input type="checkbox"/> Binary (= 0) <input type="checkbox"/> BCD (= 1) | | 1 | 0 |
| Pr20 | b1 | Position Display <input type="checkbox"/> Not used (= 0) <input type="checkbox"/> Used (= 1) | | |
| | b2 | Station No. "0" <input type="checkbox"/> Provided (= 0) <input type="checkbox"/> Not provided (= 1) | | |
| Pr65b0 | | | | Zone Signal <input type="checkbox"/> Not used (= 0) <input type="checkbox"/> Used (= 1) |
| Pr167 | | Position Display Decimal Point Position | | |

② Reference mode

- Absolute value (Pr14b3=0)
 Incremental value (Pr14b3=1)

12.7.4 Speed Reference Method

① Reference input method

= Setting not required

| Speed Reference | Position Reference | <input type="checkbox"/> Station No. Input | | | <input type="checkbox"/> DG-SW Input | | | <input type="checkbox"/> Serial Communication Input | | | <input type="checkbox"/> Command Table No. Input | | |
|-----------------|---|--|------|------|--------------------------------------|------|------|---|------|------|--|------|------|
| | | Pr18 | Pr61 | Pr62 | Pr18 | Pr61 | Pr62 | Pr18 | Pr61 | Pr62 | Pr18 | Pr61 | Pr62 |
| Automatic Mode | <input type="checkbox"/> Contact* | b2=0 | | | b2=1 | 0 | | b2=1 | 0 | | b2=1 | 0 | |
| | <input type="checkbox"/> DG-SW | Cannot be used | | | b2=0 | | | b2=1 | 1 | | Cannot be used | | |
| | <input type="checkbox"/> Serial Command | b2=1 | 2 | | b2=1 | 2 | | b2=0 | | | b2=1 | 2 | |
| | <input type="checkbox"/> Command Table | Cannot be used | | | Cannot be used | | | b2=1 | 4 | | b2=0 | | |
| Manual Mode | <input type="checkbox"/> Contact* | b3=0 | | | b3=1 | | 0 | b3=1 | | 0 | b3=1 | | 0 |
| | <input type="checkbox"/> DG-SW | Cannot be used | | | b3=0 | | | b3=1 | | 1 | Cannot be used | | |
| | <input type="checkbox"/> Serial Command | b3=1 | | 2 | b3=1 | | 2 | b3=0 | | | b3=1 | | 2 |
| | <input type="checkbox"/> Command Table | Cannot be used | | | Cannot be used | | | b3=0 | | 4 | b3=0 | | |

* Select from internal speed by contact (only speed to be used is set.)

- 1st speed: V1= _____ mm/min (in/min) (Pr4)
 2nd speed: V2= _____ mm/min (in/min) (Pr31)
 3rd speed: V3= _____ mm/min (in/min) (Pr32)
 4th speed: V4= _____ mm/min (in/min) (Pr33)

$$\text{Pr4, Pr31 to 33} = (\text{Speed}) / (1000 \cdot A)$$

↑ Reference unit

12.7.5 Parameters Related to Position Control

① Speed loop gain

Motor inertia $J_M =$ _____

Load inertia $J_L =$ _____

$Pr2 = 20 \times (J_L + J_M)/J_M$

} (Motor shaft conversion value)

Note: When mechanical system rigidity is low and oscillation occurs, lower the above value.

② Positioning complete range

$C =$ _____ mm (inch) ($Pr6 = C/A$)

③ Positioning near range

Not used ($Pr19b5=0$, $Pr45$ setting not required)

Used ($Pr19b5=1$)

↳ Positioning near range $N =$ _____ mm (inch)
($Pr45 = N/A$)

12.7.6 Selection Function

① Zero-point return (homing) mode: Not used

($Pr18b4=0$, $Pr49$ to 54 setting not required)

Used ($Pr18b4=1$)

| | Pr | <input type="checkbox"/> Mode I (Decel LS + Cφ pulse) $Pr49 = 0$ | <input type="checkbox"/> Mode II (STP signal) $Pr49 = 1$ |
|--|----|---|--|
| Operation Pattern | | <p>ZERO POINT RETURN FEEDING SPEED</p> <p>ZERO POINT RETURN APPROACH SPEED</p> <p>ZERO POINT RETURN CREEP SPEED</p> <p>ZERO POINT RETURN FINAL TRAVELING DISTANCE</p> | <p>ZERO POINT RETURN APPROACH SPEED</p> <p>ZERO POINT RETURN CREEP SPEED</p> <p>ZERO POINT RETURN FINAL TRAVELING DISTANCE</p> |
| Zero-point Return Feeding Speed | 50 | <input type="checkbox"/> Motor FWD direction(=0) | <input type="checkbox"/> Motor REV direction(=1) |
| Feeding Speed*1 mm/min (inch/min) | 51 | Setting not required | |
| Approach Speed*1 mm/min (inch/min) | 52 | | |
| Creep Speed*1 mm/min (inch/min) | 53 | | |
| Final Traveling Distance*1 mm (inch) | 54 | | |

* 1 $Pr51$ to $Pr53 = (\text{Speed})/(1000 \cdot A)$

* 2 $Pr54 = (\text{Distance})/A$

- ② Pulse mode Not used (Pr19b3, Pr63 setting not required)
 Used (Pr19b3=1)

↳ Signal form

- 90 ° phase difference 2-phase pulse ×4 (Pr63=0)
 90 ° phase difference 2-phase pulse ×2 (Pr63=1)
 90 ° phase difference 2-phase pulse ×1 (Pr63=2)
 Sign + pulse train (Pr63=3)
 CW + CCW pulse train (Pr63=4)

- ③ Current limit Not used (Pr17b0=0, Pr34 to 36 setting not required)
 Used (Pr17b0=1)

- ↳ Plus/minus sides current limit value _____ % (=Pr34)
 Plus side current limit value _____ % (=Pr35)
 Minus side current limit value _____ % (=Pr36)

- ④ Speed limit Not used (Pr17b3=0, Pr46 setting not required)
 Used (Pr17b3=1)

↳ Speed limit value _____ mm/min
 _____ (inch/min)
 $Pr46 = (Speed)/(1000 \cdot A)$

- ⑤ Software overtravel

- Fixed (Pr18b0=0, Pr40, 41 setting not required)
 Parameter setting (Pr18b0=1)

- ↳ Plus side software overtravel $I_p =$ _____ mm(inch) (Pr40)
 Minus side software overtravel $I_n =$ _____ mm(inch) (Pr41)

Note : When incremental encoder is used (Parameter 9 = 1),
 software overtravel becomes effective after zero-point return
 (homing).

- ⑥ OT signal Not used (Pr19b0=1)
 Used (Pr19b0=0)
- ⑦ STOP signal Not used (Pr19b1=1, Pr20b4, Pr72b1 setting not required)
 Used (Pr19b1=0)

- ↳ Remaining data processed after STOP signal
 Leave (Pr20b4=0 or Pr20b4=1, Pr72b1=0)
 Abandon (Pr20b4=1, Pr72b1=1)

- ⑧ Holding brake release signal

- Not used (Pr19b2=0, Pr43 and Pr44 setting not required)
 Used (Pr19b2=1)

- ↳ Braking time _____ ms (=Pr43)
 Brake ON motor speed _____ r/min(=Pr44)

12.7.6 Selection Function (Cont'd)

⑨ Backlash compensation

Not used (Pr18b1=0, Pr42 setting not required)

Used (Pr18b1=1)

↳ Compensation value $\delta =$ _____ mm(inch) (Pr42)

$$\text{Pr42} = (\delta \times 32768 \times \text{Pr12}) / (A \times \text{Pr11} \times \text{Pr13})$$

⑩ Pulse output Not used (Pr19b4=0, Pr64 setting not required)

Used (Pr19b4=1)

↳ Dividing ratio (2/N) N = _____ (Pr64 = N)

⑪ Line PG Not used (Pr20b4, Pr72b2 setting not required)

Used → PG selection after positioning complete

By L-PG signal

(Pr20b4=0 or Pr20b4=1, Pr72b2=0)

Motor PG by force (Pr20b4=1, Pr72b2=1)

NOTE

NOTE

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