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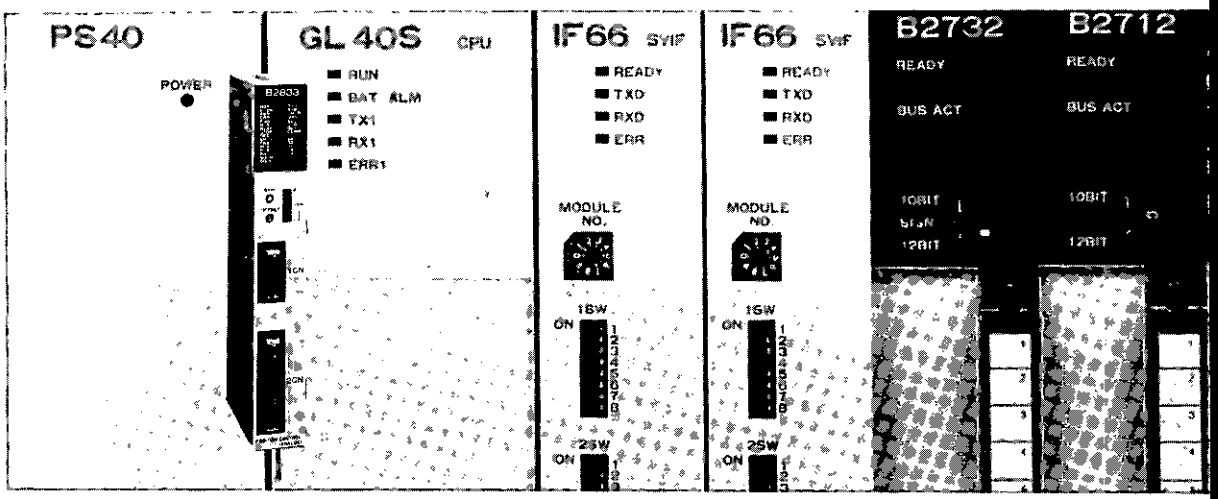
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MEMOCON-SC 2000 SERIES I/O POSITIONING MODULE B2833

DESCRIPTIVE INFORMATION

FOR PROGRAMMABLE CONTROLLER
MEMOCON-SC GL40S, GL60S, GL60H, GL70H, GL60V
TYPE JAMSC-B2833



YASKAWA

SIE-C815-13.17B

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NOTES FOR SAFE OPERATION

Read these manuals thoroughly before use of Positioning Module B2833. In these manuals, NOTES FOR SAFE OPERATION are classified as "WARNING" and "CAUTION."

⚠ WARNING : Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury to personnel.

⚠ CAUTION : Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury to personnel and damage to equipment. It may also be used to alert against unsafe practices.

Even items described in ⚠ CAUTION may result in a vital accident in some situations. In either case, follow these important notes.

The following shows the symbols of prohibition and mandatory action.

⃠ PROHIBITION : Specifies prohibited handling.

● MANDATORY ACTION : Specifies actions that must be taken.

After reading these manuals, keep them readily available for those using the equipment.

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1 INSTALLATION

⚠ CAUTION

- The installation environment must meet the environmental conditions given in the product catalog and manuals.
  Using the B2833 in environments subject to high temperatures, high humidity, excessive dust, corrosive gases, vibration, or shock can lead to electric shock, fire, or faulty operation.

  Do not use the MEMOCON-SC in the following locations.
  - Locations subject to direct sunlight or ambient temperatures not between 0 and 55℃.
  - Locations subject to relative humidity in excess of 95%, rapid changes in humidity, or condensation.
  - Locations subject to corrosive or flammable gas.
  - Locations that would subject the MEMOCON-SC to direct vibration or shock.
  - Locations subject to contact with water, oil, chemicals, etc.

- Install products correctly according to the instructions.
  Improper installation may result in accidents or malfunctions.
  ① Be sure all screws are tight.
  All screws for installation and terminal board should be securely tightened and checked for loosening. Malfunctions may occur as a result of loose screws.
  ② Install the mounting base correctly.
  Install the mounting base facing in the correct direction. Incorrect installation may result in accidents or malfunctions.

- When installing the mounting base, leave the cover on to prevent contamination from foreign matter.
  Foreign matter can cause malfunction in the MEMOCON-SC.

- Do not remove the cover of the connector where a module is not mounted.
  Foreign matter can cause malfunction in the MEMOCON-SC.

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2 WIRING

⚠ CAUTION

- Connect a power supply complying with the rated specifications.
  A power supply that does not comply with the rating may cause a fire.
- Wiring must be performed by qualified personnel.
  Mistakes in wiring can cause fires, product failure, or malfunctions.
- When wiring, do not allow foreign matters such as wire ship to enter the mounting base or the module.
  Foreign matter can cause fires, product failure, or malfunctions.

MANDATORY ACTION

- Ground the protective ground terminal to a resistance of 100 Ω max.
  Failure to observe this instruction may result in electric shock or malfunction.

INSERT THE INTERFACE CABLES PROPERLY

- Insert the connectors of the various interface cables that are connected to B2833 into the communication parts and secure them properly.
  Failure to observe this instruction may result in malfunctions.

NOISE REDUCTION MEASURES

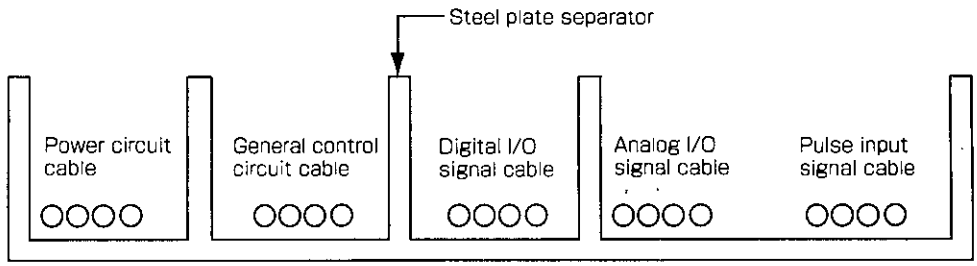
- When noise from external power supply lines causes problems, install an insulated transformer and noise filter for effective noise prevention.
  Insufficient noise reduction measure may cause malfunctions in the B2833.

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⚠ SEPARATE WIRING PROPERLY

- I/O lines connecting external devices to the B2833 must be selected based on the following considerations:
  Mechanical strength, resistance to noise, wiring distance, signal voltage, etc.
- I/O lines must be separated from power lines both within and outside of the control panel to minimize the affects of noise.
  Faulty operation can result if I/O lines are not sufficiently separated from power lines.

(Example of external wiring)



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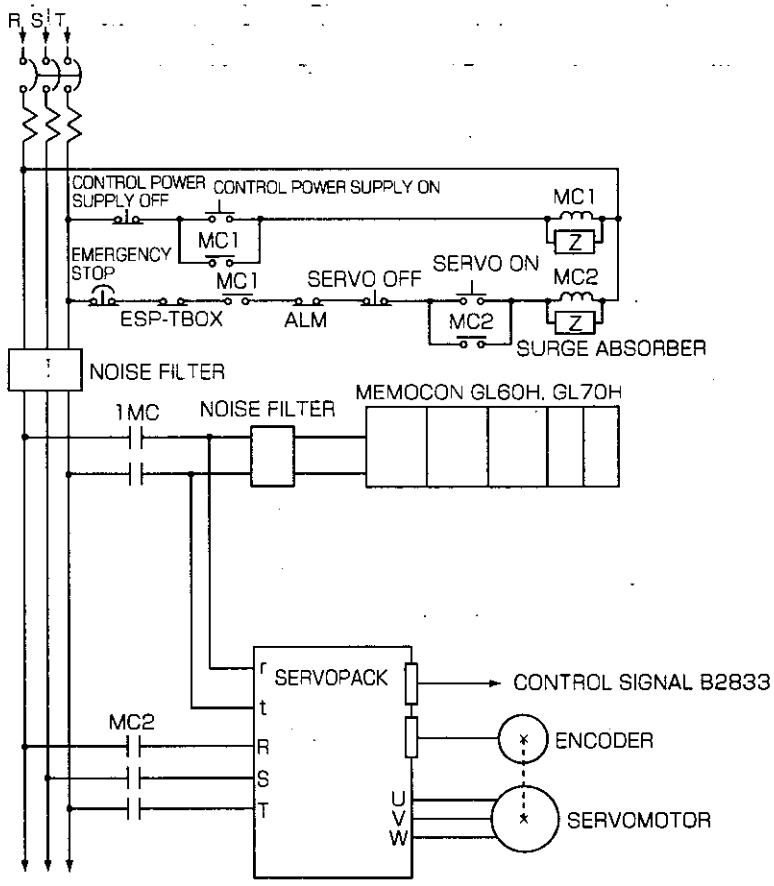
3 PRECAUTION UPON USE

⚠ WARNING

- Do not touch module terminals under current conditions.
  There is danger of electric shock.
- Provide an emergency stop circuit, interlock circuit, etc. at the exterior of B2833.
  Failure to observe this instruction may result in injury or damage to equipment.

Provide an emergency stop circuit at the exterior of B2833.

An emergency stop circuit for the control system should not be constructed using the ladder programming in the MEMOCON-SC. Install an emergency stop circuit to an external relay as shown below.
Use a NC contact (mechanical contact) to connect the emergency stop switch. The emergency stop switch should cut off the main power supply when depressed.
If these steps are not followed, the emergency switch will not engage even if input circuits are damaged or cables are cut. Failure to follow instructions may cause damage to machines and injury to personnel.



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4 MAINTENANCE

PROHIBITION

- Do not attempt to disassemble or modify the MEMOCON-SC in any way.
  Doing so can cause fires, product failure, or malfunctions.

CAUTION

- Attaching, installing or removing other Modules is only to be made after the power is turned OFF.
  Otherwise, electric shock, malfunction or breakdown will result.

5 GENERAL PRECAUTION

- MEMOCON-SC was not designed or manufactured for use in devices or systems that concern peoples' lives.
  Users who intend to use the product described in this manual for special purposes such as devices or systems relating to transportation, medical, space aviation, atomic power control, or underwater use must contact YASKAWA representatives beforehand.
- This product has been manufactured under strict quality control guidelines. However, if this product is to be installed in any location in which a failure of MEMOCON-SC involves a life and death situation or in a facility where failure may cause a serious accident, safety devices must be installed to minimize the likelihood of any accident.
- Any illustrations, photographs, or examples used in this manual are provided as examples only and may not apply to all product to which this manual is applicable.
- The products and specifications described in this manual or the content and presentation of the manual may be changed without notice to improve the product and/or the manual.
  A new version of the manual will be re-released under a revised document number when any changes are made.
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OVERVIEW OF MANUAL

- This manual describes functions, specifications, and application methods of the MEMOCON-SC GL40S, GL60S, GL60H, GL70H 2000 Series Positioning Modules B2833.
- Read this manual carefully in order to use the Positioning Modules properly. Also, keep it in a safe place so that it can be used whenever necessary.
- Refer to the following manuals as necessary.

	Document Title	Document Number	Content
CPU Module	MEMOCON-SC GL60S DESCRIPTIVE INFORMATION	SIE-C815-14.1	Describes system configuration devices and their functions, specifications, application methods, etc., for the MEMOCON-SC GL60S.
	MEMOCON-SC GL40S DESCRIPTIVE INFORMATION	SIE-C815-15.1	Describes system configuration devices and their functions, specifications, application methods, etc., for the MEMOCON-SC GL40S.
	MEMOCON-SC GL60H/GL70H DESCRIPTIVE INFORMATION	SIE-C815-17.1	Describes system configuration devices and their functions, specifications, application methods, etc., for the MEMOCON-SC GL60H/GL70H.
Man/ Machine Interface	MEMOCON-SC GL60S P150 RROGRAMMING PANEL DESCRIPTIVE INFORMATION	SIE-C815-14.2	Describes functions, specifications, application methods, etc., for the P150 PROGRAMMING PANEL.
	MEMOCON-SC GL60S P150 RROGRAMMING PANEL DESCRIPTIVE INFORMATION	SIE-C815-14.3	Describes the SFC functions, specifications, application methods, etc., for the P150 Programming Panel.
I/O Module	MEMOCON-SC GL40S, GL60S, GL70H 2000 SERIES I/O MODULES DESCRIPTIVE INFORMATION	SIE-C815-13.3	Describes functions, specifications, application methods, etc., for the 2000 Series Digital I/O Modules.

	Document Title	Document Number	Content
AC Servo Drive	AC SERVO DRIVE M・F・S・D SERIES WITH INCREMENTAL ENCODER FOR SPEED CONTROL BULLETIN	TSE-S800-2.1	Describes functions, specifications, application methods, etc., for the AC Servo Drive M・F・S・D Series (For speed control, with incremental encoder).
	AC SERVO DRIVE M・F・S・D SERIES WITH ABSOLUTE ENCODER FOR SPEED CONTROL BULLETIN	TSE-S800-5.1	Describes functions, specifications, application methods, etc., for the AC Servo Drive M・F・S・D Series (For speed control, with absolute encoder).
	AC SERVO DRIVE R SERIES FOR SPEED CONTROL BULLETIN	TSE-S800-2.6	Describes functions, specifications, application methods, etc., for the AC Servo Drive R Series (For speed control, with incremental encoder).

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(Cont'd)

	Document Title	Document Number	Content
AC Servo Drive	AC SERVO DRIVE R・P SERIES WITH INCREMENTAL ENCODER FOR SPEED CONTROL DESCRIPTIVE MANUAL	TSE-S800-2.8	Describes functions, specifications, application methods, etc., for the AC Servo Drive R・P Series (For speed control, with incremental encoder).
	AC SERVO DRIVE R・V SERIES WITH ABSOLUTE ENCODER FOR SPEED CONTROL BULLETIN	TSE-S800-5.6	Describes functions, specifications, application methods, etc., for the AC Servo Drive R・P Series (For speed control, with absolute encoder).
	AC SERVO DRIVES ALL DIGITAL, FOR SPEED CONTROL BULLETIN	TSE-S800-11.1	Describes functions, specifications, application methods, etc., for the AC Servo Drive M・F・G・S・D Series (For speed control, with incremental encoder).
	AC SERVO DRIVES ALL DIGITAL, FOR SPEED CONTROL BULLETIN	TSE-S800-11.2	Describes functions, specifications, application methods, etc., for the AC Servo Drive M・F・G・S・D Series (For speed control, with absolute encoder).

* Thoroughly check the specification and conditions of the product before use.

USING THIS MANUAL

This manual is written for those who already have basic knowledge of MEMOCON-SC. We recommend reading the MEMOCON-SC GL40S, GL60S and GL60H, GL70H Descriptive Information before reading this manual.

- Meaning of Basic Terms
  In this manual, the following terms indicate the meanings as described below, unless otherwise specified.
  - B2833 = 2000 Series Positioning Module JAMSC-B2833
  - PC = Programmable Controller
  - PP = Programming Panel
  - GL40S, GL60S = MEMOCON-SC GL40S, GL60S, GL60H, GL70H Programmable GL60H, GL70H Controllers

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1. CONFIGURATION

This section describes typical system configurations by combining the B2833 and Memocon-SC GL series CPU.

1.1 SYSTEM CONFIGURATION

To perform position control by using the B2833 synchronous operation function, the synchronous buffer module B2200 is needed. At this time, the B2833 and B2200 are mounted on extension racks. One B2200 can be mounted on one extention rack.

When the B2833 functions as an independent axis without using the synchronous operation function, it can be mounted on the CPU mounting base.

B2200 is not needed when synchronous operation is not performed in the system.

Refer to Fig. 1.2.

Note : The B2200 can be mounted only on local or remote extension racks. If it is mounted on the CPU mounting base, or remote first rack, synchronous operation is not enabled.

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1.1 SYSTEM CONFIGURATION (Cont'd)

(1) Typical 1-axis System Configuration

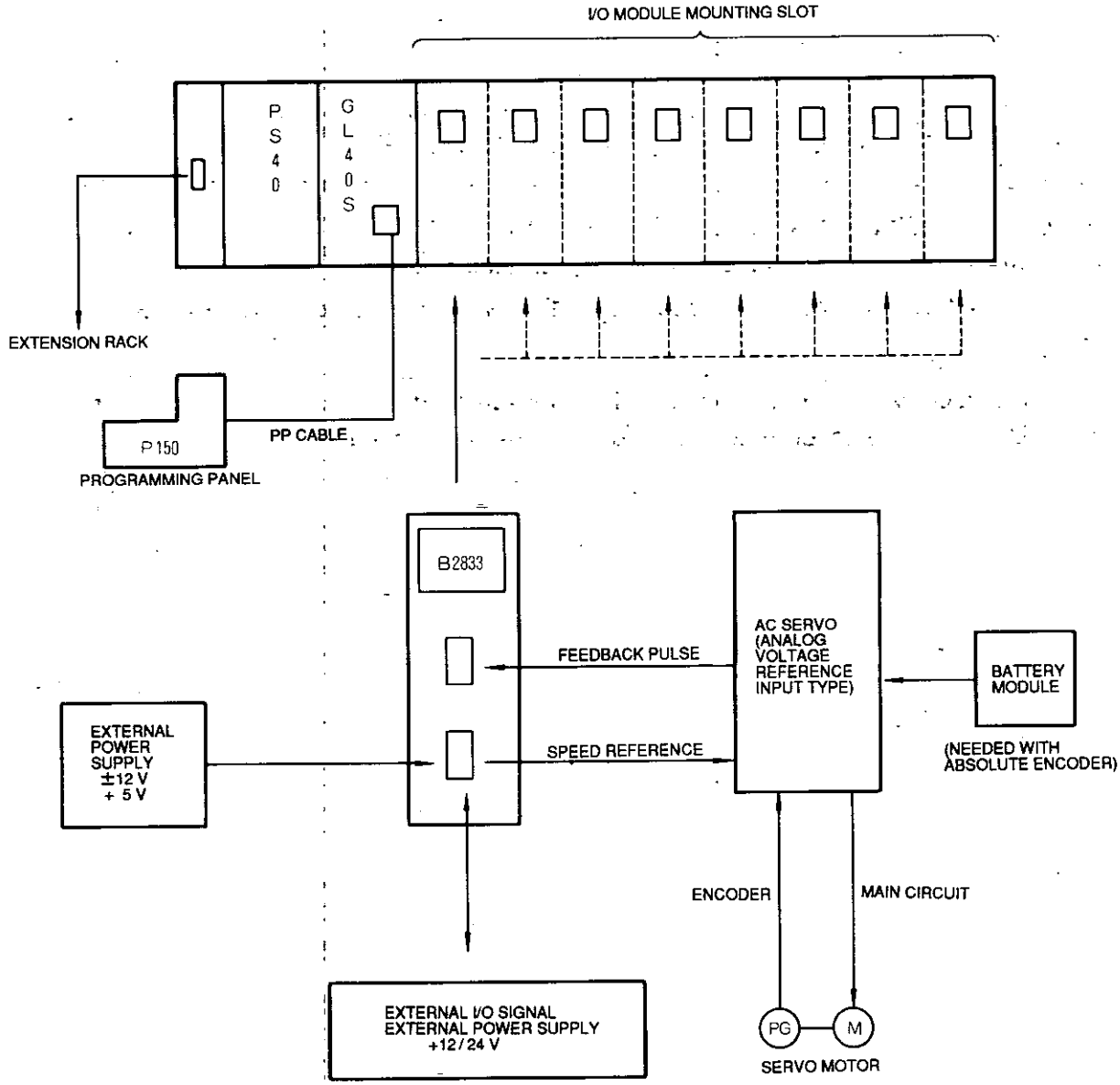
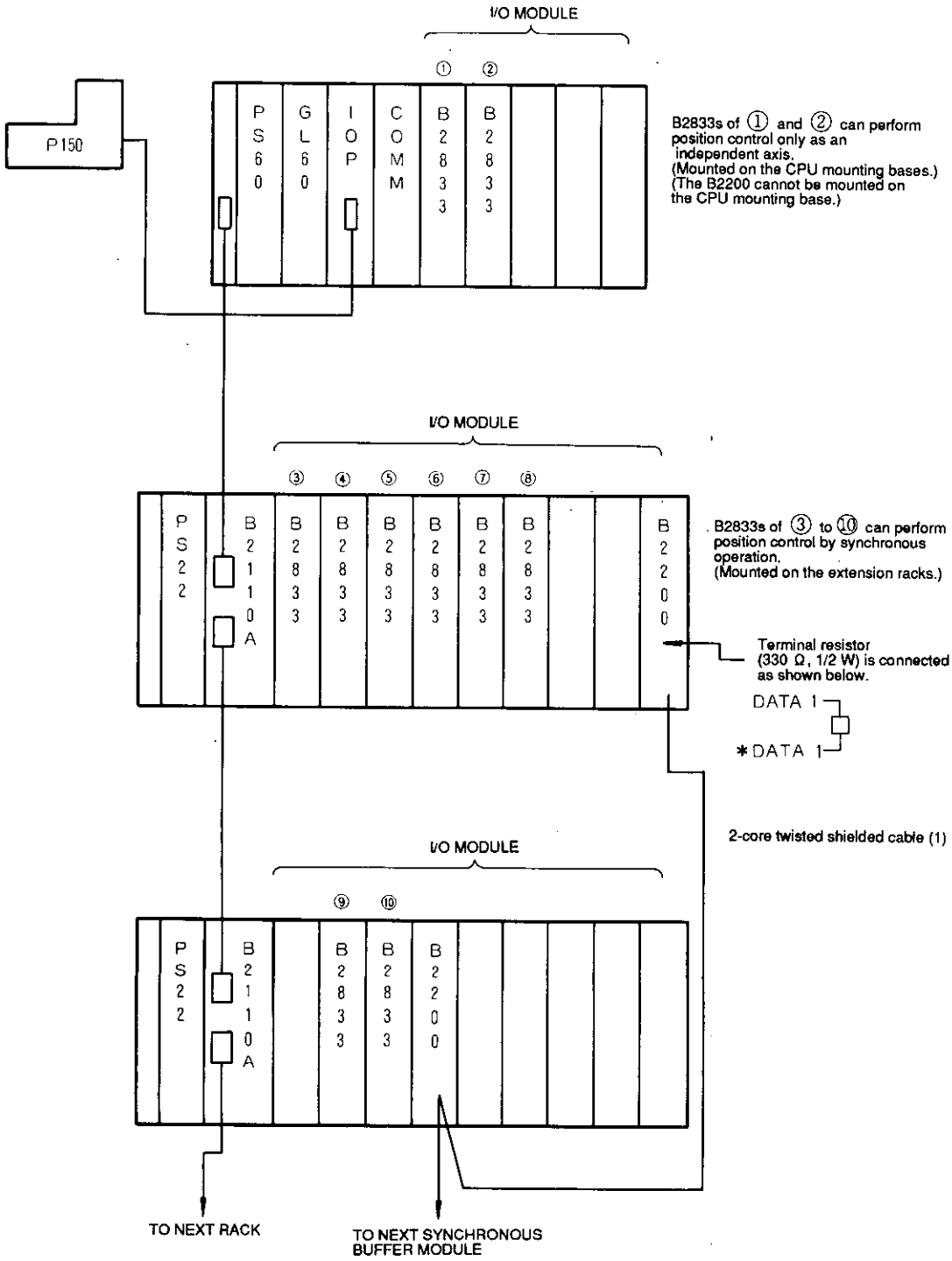


Fig. 1.1 Typical 1-axis System Configuration

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(2) Typical System Configuration at Synchronous Operation



B2833 : Positioning module
B2200 : Synchronous buffer module

Number of stations : 32 (B2200×32 units)
Vertical extension :
0.75 mm² (Braided shield) 150 m
1.25 mm² (Copper tape shield) 300 m

Fig. 1.2 Typical System Configuration at Synchronous Operation

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1.2 COMPONENT DEVICE

Table 1.1 shows the main devices required for configuration of a positioning system.

Table 1.1 List of Component Devices

Item		Name	Type	
Related to GL Series	Mounted on Basic Section	CPU Module	DDSCR-GL40S	DDSCR-GL60S DDSCR-GL60H DDSCR-GL70H
		Main Power Supply Module	JRMSP-PS40	JRMSP-PS60
		I/O Processor Module	Not needed	JAMSC-IF60
		CPU Mounting Base	JRMSI-MB40	JRMSI-MB60
		Communication Module	JAMSC-IF41A (For GL40S) JAMSC-IF61 (COMM), JAMSC-IF64 (PC-LINK), (Cannot be used for GL60S or 60S0.) Others	
	Mounted on Extension Section	I/O Buffer Module	JAMSC-B2110A	
		Auxiliary Power Supply	JRMSP-PS21, JRMSP-PS22	
		Extension Rack	JRMSI-MB22A	
		I/O Cable Extension	JZMSZ-W20-1 (0.5m), -2 (1.5m)	
		I/O Module	2000 series I/O	
		Programming Panel	DISCT-P150, DISCT-P140	
		PP Cable	JZMSZ-W1015-T1 (2.5m), -T2 (15m)	
Related to External Power Supply		±12 V, 5 V Power Supply	B2833 speed reference analog output, for logic section power supply	
		+12/24 V Power Supply	Power supply for external I/O interface	
Related to Servo		AC Servopack DC Servopack Servomotor	YASKAWA Servopack of speed reference input type (Refer to the technical instruction manuals for details of the Servopack or servomotors.)	

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2. SPECIFICATIONS

This section describes B2833 and B2200 general specifications, performance and interface for external device connection.

2.1 GENERAL SPECIFICATIONS

Table 2.1 B2833 General Specifications

Item	Specifications
Type	JAMSC-B2833
Ambient Temperature	0 to +55 ℃
Storage Temperature	−10 to +75 ℃
Humidity	10% to 90% RH (non-condensing)
Vibration Resistance	In compliance with JIS* C0911. (Range : 10 to 55 Hz, amplitude : 0.075 mm, No. of liftings : 10 times)
Shock Resistance	10 m/s^2 max in compliance with JIS* C0912.
Environmental Condition	Free from explosive, inflammable and corrosive gases.
Dimensions in mm (inches)	37.3 (1.47) W × 250 (9.84) H × 9 (3.70) D
Internal Consumed Current (Vcc)	0.5 A +5 VDC (Supplied from mounting base)
Approx Weight	0.6 kg (1.3 lb)

* Japanese Industrial Standard

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2.2 PERFORMANCE

Table 2.2 Performance

Item		Specifications	Remarks
Number of Control Axes		1 Axis	
Applicable PC		GL40S, GL60S, S0, S1, S2, S3, GL60H, GL70H/ GL60V	Selectable by switch
Number of I/O Allocation Points and Registers		• Input relay : 32 points 8 words • Output coil : 32 points 8 words	
Positioning Data	Position Reference Mode	Absolute value/incremental value mode	Initial setting
	Position Reference	−99,999,999 to +99,999,999 (pulses)	
	Accel/decel Mode	Two methods : Linear and S-curve accel/decel	Accel/decel speed setting
	Accel/decel Time Setting	(1 to 99) × 10 ms = 10 to 990 ms (1 to 99) × 100 ms = 100 to 9900 ms	Selection of ×10/100 : Initial setting
	Speed Reference	(1 to 9999) × 10 pps (10 pps unit) (1 to 9999) × 20 pps (20 pps unit)	Selection of ×10/20 : Initial setting
	Speed Reference Voltage	0 to ±6 VDC 0 to ±10 VDC	Selectable by switch
	Position Loop Gain (Kp)	1 to 80	
	Speed Compensation	(0 to 50) × 2% = 0 to 100%	Initial setting
	Accel Ratio Compensation	(0 to 50) × 2% = 0 to 100%	Initial setting
PG Detection	Encoder	With absolute encoder/incremental encoder	Selectable by switch
	Pulse Input Method	Phases A, B, C input	
	Pulse Input Voltage	+5 V line receiver input	
	Max Counting Speed	200 kpps (Phases A, B input ×1)	
	Input Pulse Division and Multiplication	A/B (A, B : 1 to 9999, A/B≦64)	Initial setting
Function	Multi-step Speed Operation	Automatic positioning operation by multi-step speed (The number of steps can be selected freely from 1 to 20.) (External input start/stop enabled)	
	Variable Speed Operation	Run as speed changing during operation (Final position designation in incremental value mode provided/not provided)	
	JOG Operation	Two steps of speed : High, low	
	Zero Return Operation	Two modes for operation after zero point LS ON : A, B	Selectable by switch
	Special Positioning Operation	Deceleration down to creep speed after external LS ON, stop after external LS OFF and then set moving amount is completed.	
	Handle Operation	Run by external pulse input (up to 200 kpps) (×1, 2, 4)	Multiplication selection : Initial setting
	Synchronous Operation	Synchronous operation is performed by using JAMSC-B2200 together. Linked with synchronous buffer module by communication (master/slave method) {Communication speed : 1Mbps Error check : 16-bit CRC} Up to 13 synchronous operation groups can be made. Synchronous operation modes : {1 : Reference pulse synchronization 2 : PG pulse synchronization 3 : Simultaneous start 4 : Set value start} Reference pulse dividing function from master axis M/N (M, N : 1 to 9999)	Initial setting Synchronous operation mode selection : Initial setting

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Table 2.2 Performance (Cont'd)

Item		Specifications	Remarks
External Input	External Start	Multi-step speed operation start command	+12 V or +24 V external power supply needed
	External Stop	Each operation stop command	
	Decel LS	Used for zero return operation	
	Special LS	Used for special positioning operation	
	External Pulse Input Enable	Used at handle operation (Command from CPU module is also effective.)	
	Servo OK	Speed reference output is enabled by ON.	
External Output	SEN Signal	Used with absolute encoder (Two types, transistor 5 V output and relay contact output are available.)	
	COIN	ON when the number of deviation counter lag pulses is within the setting range.	12 V transistor output
	Fault Output	ON when a fault occurs in the module.	
	Notch Output	ON at passing point detection	
Display	LED	External I/O signal status, deviation error, etc. (32 points)	
	Data	Monitor of current value, speed, setting data, etc. in input registers	
Diagnosis	Error Code	Error code displayed in input registers	
	Diagnosis	Self-diagnosis (ROM, RAM, WDT), PG disconnection, communication disconnection, others	
Power Supply	External Output Power Supply	+5 VDC ±3% 0.7 A +12 VDC ±5% 0.3 A −12 VDC ±3% 0.1 A	

Table 2.3 B2200 Specifications

Item		Specifications
Type		JAMSC-B2200
Function		Needed for systems to perform synchronous operation. Functions as a translator for synchronous signals of communication between B2833 modules. One B2200 is mounted on one extension rack.
Communication Specificatinos	Communication Method	Base-band method
	Communication Speed	1 Mbps
	Synchronization Method	Frame synchronization
	Frame Format	SDLC
	Number of Connected Units	Up to 32
	Communication Media	Twisted 2-pair copper braided shielded cable Recommended cable : JKEV-SB (For the details, refer to Par. 7.4.)
	Terminal Resistor	330Ω 1/2 W
	Maximum Communication Distance	150 m when 0.75 mm² used. 300 m when 125 mm² used.
Connection		Terminal stand M3 screw
Internal Consumed Current		0.3 A (+5 VDC : supplied from mounting base)
External Dimensions in mm (inches)		37.3 (1.47) W × 250 (9.84) H × 94 (3.70) D
Approx Weight		0.5 kg (1.1 lb)

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2.3 INTERFACE OF CPU MODULE AND EXTERNAL DEVICES

Fig. 2.1 shows the relationship between B2833 interfaces, CPU module (GL40S, GL60S, S0, S1, S2, S3, GL60H, GH70H) and external devices.

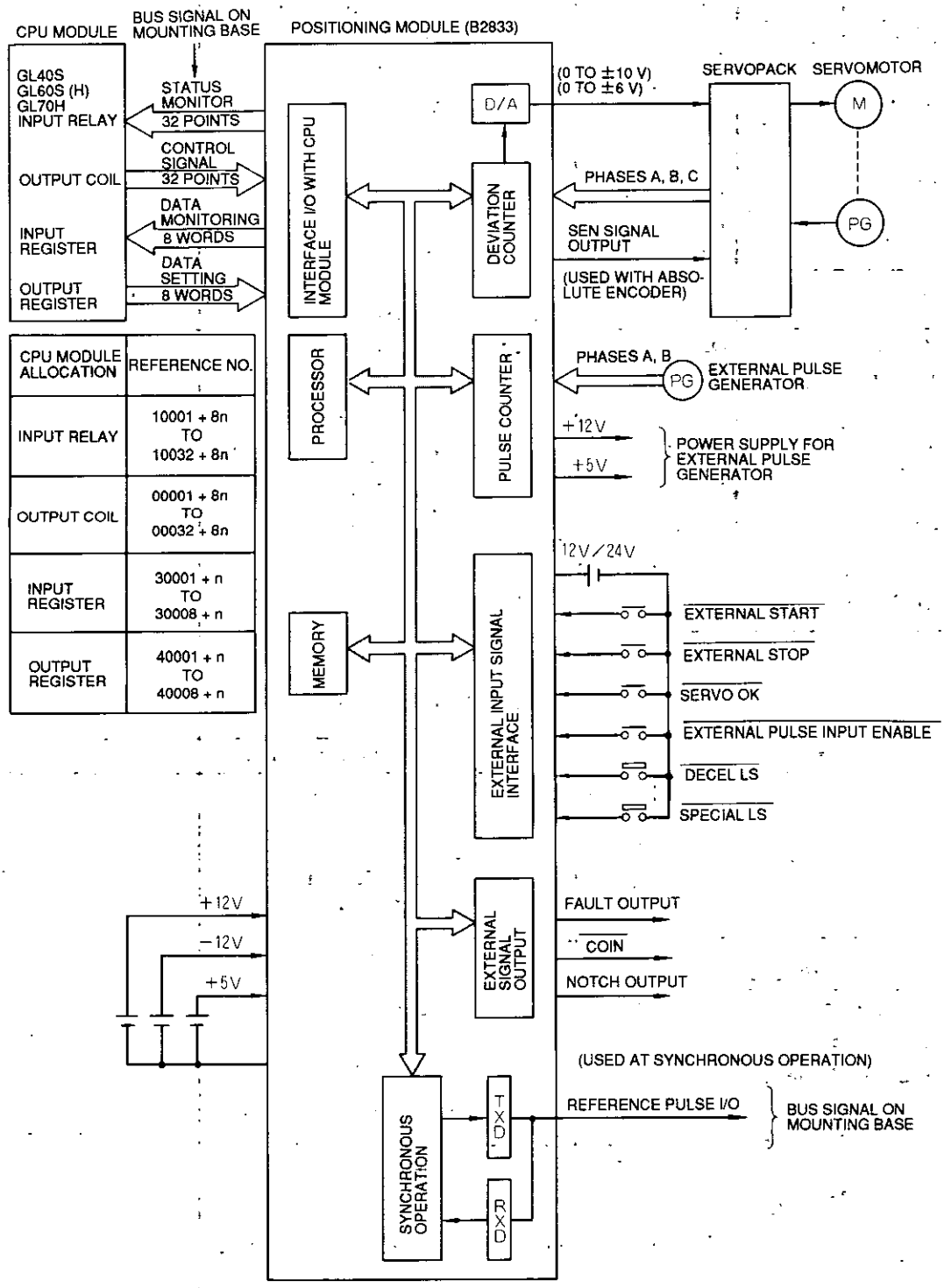


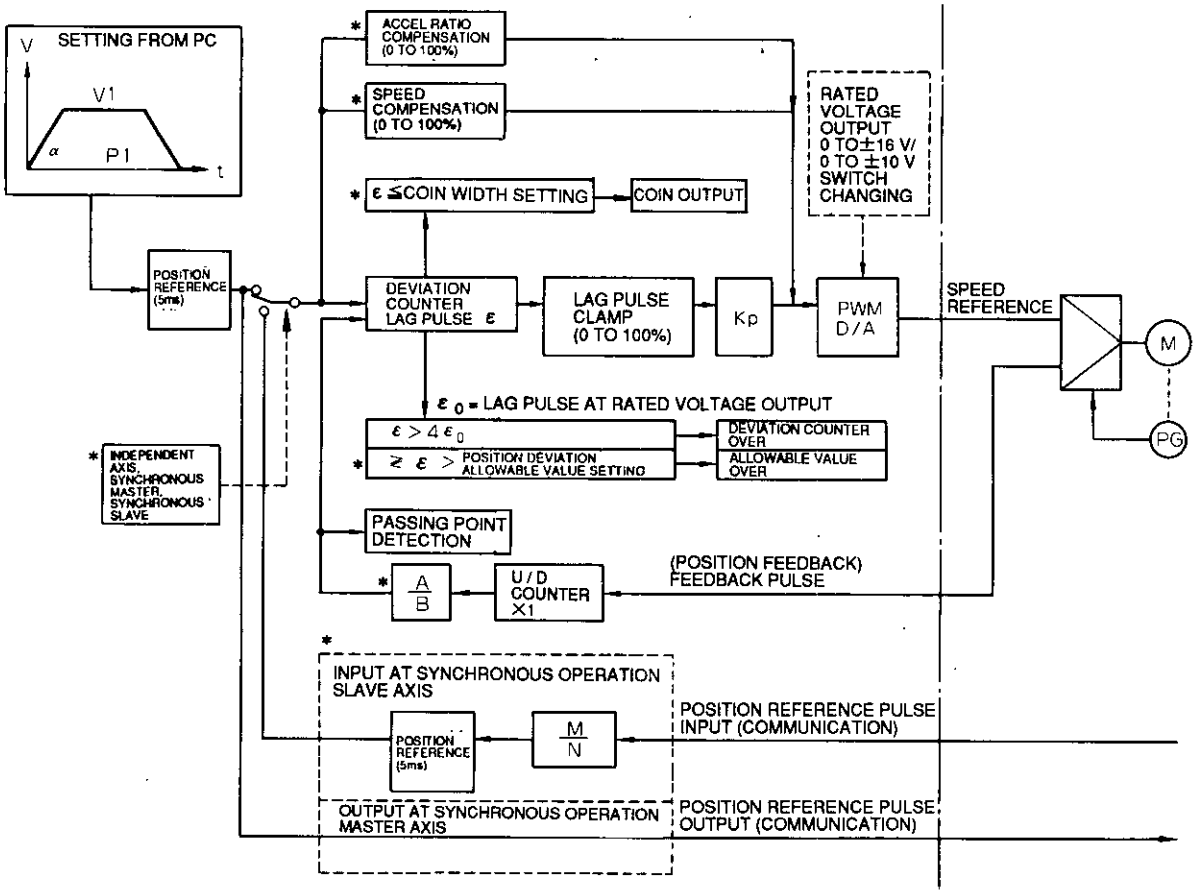
Fig. 2.1 Interface of CPU Module and External Devices

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2.4 B2833 POSITIONING OPERATION

2.4.1 INTERNAL CONFIGURATION OF B2833

Fig. 2.2 shows the B2833 control block diagram.



* is specified by intial setting.

Fig. 2.2 B2833 Control Block Diagram

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(1) Speed Control (Position Loop Control)

For speed reference, either output voltage range, 0 to ± 6 V or 0 to ±10 V can be selected. (Switch setting)

According to position, speed or accel/decel setting from the CPU module, position reference with pulse as a unit is input to the deviation counter at a certain period (5 ms).

Additionally, feedback pulses occurring from the encoder (PG) because of motor rotation are also input in the deviation counter.

The deviation counter calculates " ε (number of lag pulses) = number of position reference pulses − number of feedback pulses", and converts the deviation value to speed reference voltage to output to the Servopack.

When the value reaches the aimed position, the number of the deviation counter lag pulses becomes 0 and speed reference voltage becomes 0 V. Then the motor stops rotating.

The deviation counter under control performs deviation counter overload [refer to (9)], position deviation allowable value overload [refer to (10)], and COIN width (ε) checking [refer to (11)].

Speed reference voltage can be output up to 120% (at 6 V) or 110% (at 10 V) of the rated voltage.

(2) Position Loop Gain Kp

The motor responsibility is determined according to position reference pulse distribution.

Fig. 2.3 shows the time-speed curve and time-position curve.

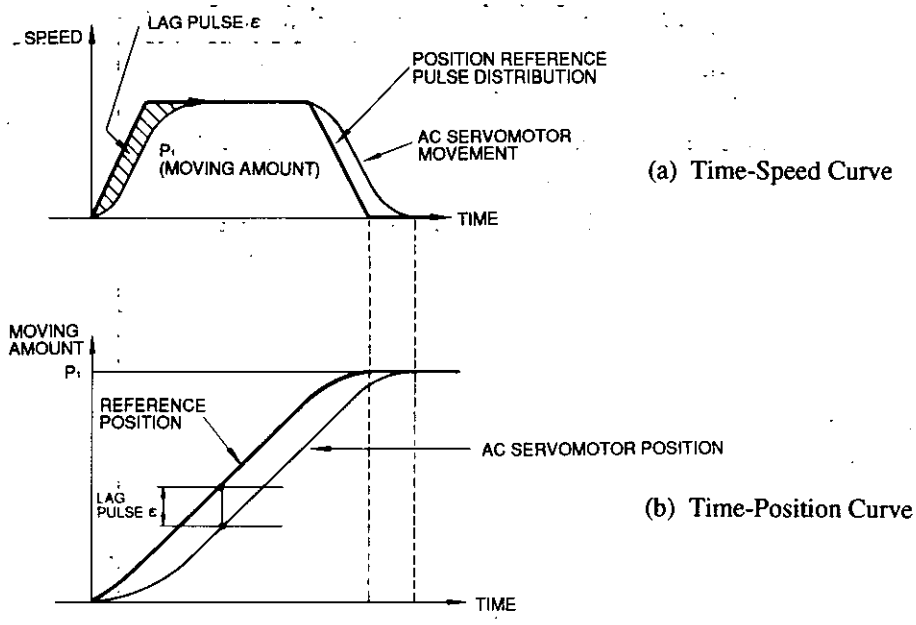


Fig. 2.3 Servomotor Responsibility

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The area of the shaded section in the figure indicates position deviation (lag pulses) between the numbers of position reference pulses and feedback pulses. This is also the motor follow-up delay against the reference position at time-position curve constant speed traveling.

The follow-up position deviation (lag pulses) when moving at the rated speed is determined by position loop gain Kp.

$$Kp = \frac{\text{fin (pps at rated speed)}}{\varepsilon \text{ (Lag pulses)}}$$

Kp varies depending on motor types or machine construction. Normally, it is approx. 30 s^{-1} ; 40 s^{-1} for stable machines and 20 s^{-1} for unstable machines.

(Example)

Motor rated r/min : 3000 [3000/60 (rev/s)]
Number of PG output pulses per motor rotation : 1500 P/R
B2833 feedback pulse division/multiplication : A/B =1
Position loop gain Kp : 30 s^{-1}
When the above conditions are provided, the following equation can be established.

$$30 = \frac{[3000 \times \frac{1}{60}] \times 1500 \times 1}{\varepsilon}$$

$$\therefore \quad \varepsilon = 2500 \text{ P}$$

When the number of lag pulses is 2500 P, rated voltage 6 V (10 V) is output. For Kp value in actual applications, set the optimum value at test run or adjustment. For details, refer to Par. 7.5.

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2.4.1 INTERNAL CONFIGURATION OF B2833 (Cont'd)

(3) Position Loop Speed Reference Voltage Clamp Function

This function limits speed reference voltage by position deviation, at every 2% in the range of 0 to 100%.

(Example)

Lag pulses at rated rotation ε : 2500

Rated speed reference voltage : 6 V

Assuming voltage is clamped 50%, speed reference voltage output at position loop deviation processing will be as shown in Fig. 2.4. (When voltage is clamped at 100%, speed reference voltage will be 0 V.)

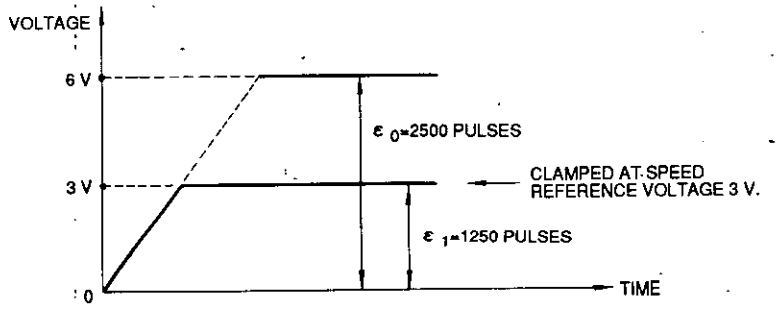


Fig. 2.4 Speed Reference Voltage Output Clamp by Position Loop

Note : Only speed reference voltage is clamped, and calculation of position deviation is the same as that when voltage is clamped at 0%. Therefore, since motor rotating speed is reduced by clamped speed reference voltage, the number of lag pulses exceeds $4\varepsilon_0$ and "deviation counter overload" easily occurs. Use this function together with normal speed compensation.

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(4) Speed Compensation

Speed compensation (feed forward) can be applied at every 2% in the range of 0 to 100%.

(Example)

Motor rated rotating speed : 3000 r/min

Number of PG output pulses per motor rotation : 1500 P/R (A/B=1)

When the above conditions are assumed,

fin = [3000 (r/min)/60 s] × 1500 = 75 kpps

When speed compensation is 100%, rated voltage of 6 V (10 V) is output as speed reference voltage at position reference pulse 75 kpps for speed compensation.

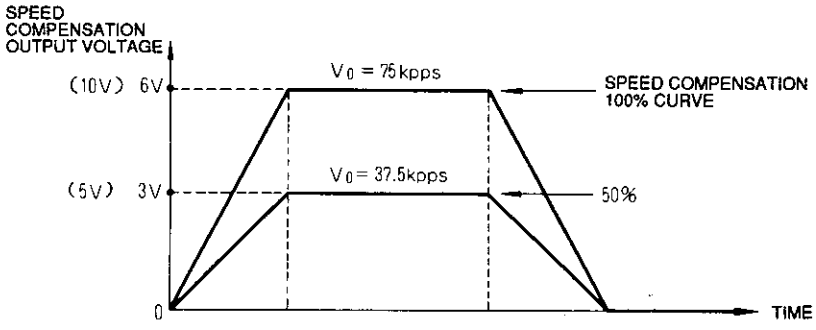


Fig. 2.5 Speed Compensation

Speed reference voltage output from the B2833 can be obtained as follows :

(Speed reference voltage) = (Speed reference voltage by position deviation)
+ (Speed reference voltage by speed compensation)

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(5) Acceleration Rate Compensation

Acceleration rate compensation can be applied at every 2% in the range of 0 to 100%. Rated voltage 6 V (10 V) at acceleration rate compensation can be calculated as shown below.

Initial Setting	×10 ms	×100 ms
×10 pps	$\frac{200\ \text{kpps}}{10\ \text{ms}} = 20\ \text{Mp/s}^2$	$\frac{200\ \text{kpps}}{100\ \text{ms}} = 2\ \text{Mp/s}^2$
×20 pps	$\frac{200\ \text{kpps}}{10\ \text{ms}} = 20\ \text{Mp/s}^2$	$\frac{200\ \text{kpps}}{100\ \text{ms}} = 2\ \text{Mp/s}^2$

The above values do not depend on speed setting (×10 pps, ×20 pps).

(Example)

Maximum speed : 100 kpps

Accel/decel time when fin is reached : 100 ms (×100 ms setting)

When the above conditions are assumed, the following equations can be established :

$$\text{Acceleration rate } \alpha = \frac{75\ \text{kpps}}{0.1\ \text{s}} = 750\ \text{kp/s}^2$$

$$\text{Acceleration rate compensation voltage} = \frac{750\ \text{kp/s}^2}{2\ \text{Mp/s}^2} \times 6\ \text{V (10 V)} = 2.25\ \text{V (3.75 V)}$$

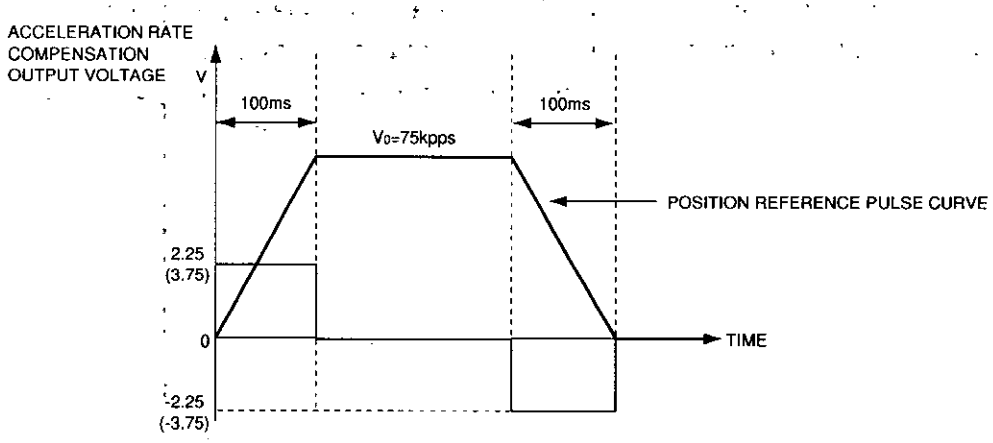


Fig. 2.6 Acceleration Rate Compensation

Speed reference voltage output from the B2833 can be obtained by the following equation :

(Speed reference voltage) = (Speed reference voltage by speed deviation)
+ (Speed reference voltage by speed compensation)
+ (Speed reference voltage by accel rate compensation)

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(6) Feedback Pulse Division/Multiplication (A/B)
Feedback pulses can be divided or multiplied. The range is as shown below :

$$\frac{1}{9999} \leqq A/B \leqq \frac{64}{1}$$

(7) Position Reference Input Pulse Division
Effective when the B2833 functions as slave axis at synchronous operation.

Position reference pulses of 5 ms period are received from the master axis and are divided or multiplied. Then the resultant value is to be the position reference pulses of the self-axis to control the motor position. The range is as shown below :

$$\frac{1}{9999} \leqq \frac{M}{N} \leqq \frac{9999}{1}$$

(8) How to Use Absolute Encoder
Absolute encoder output is composed of PA0, PB0 and PC0, and constructed as shown in Fig. 2.7.

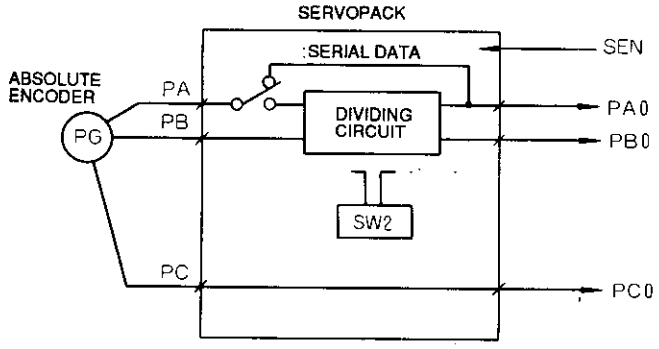


Fig. 2.7 Absolute Encoder Output

By inputting the SEN signal (L → H), absolute value data are output from PA0 as serial data, and then output as initial incremental pulses PA0, PB0 (90° phase difference 2-phase pulses).

After that, the same output operation is performed as that of a normal incremental encoder.

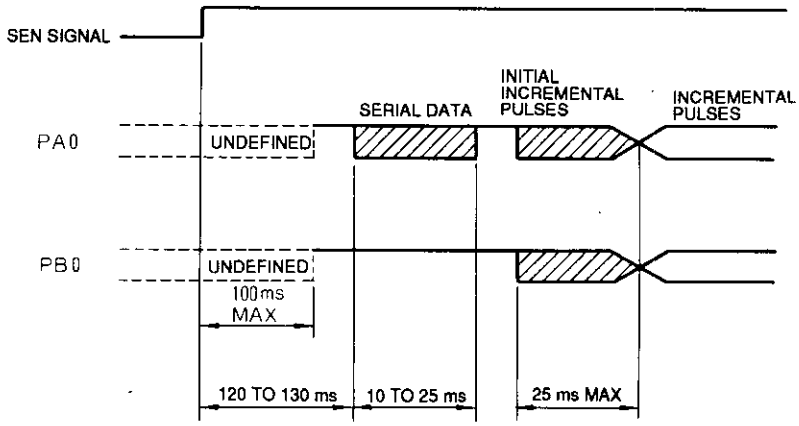


Fig. 2.8 Absolute Value Data Output

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[Absolute Value Data Contents]

- Serial data : Indicates at which position of rotations the motor axis is located from the reference position (the set value at setup).
- Initial incremental pulse : Pulses output at the same pulse speed as that of rotation at approx. 2747 r/min from the motor axis zero point to current motor axis position.

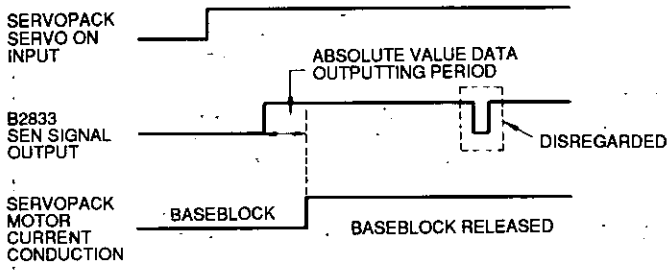
The B2833 outputs the SEN signal and waits for receipt of serial data output of the absolute encoder. After receiving the serial data, it starts receiving the initial incremental data.

After the B2833 receives both data, the current value can be obtained by the following equation :

$$P_E = M \times R \times A/B + P_0 \times A/B$$

P_E (pulses) : Current value
M (rotation) : Serial data value
P_0 (pulses) : Number of initial incremental pulse counts
R (P/R) : Number of output pulses per motor rotation (by Servopack dividing circuit setting)
A/B : B2833 feedback pulse division/multiplication
(Initial value : A/B=1)

The following figure shows the relation between the B2833 SEN signal and Servopack servo-on input signal.



(9) Deviation Counter Overload

If the motor cannot rotate for some reason and feedback pulses are not returned, the reference (voltage reference) is sustained when the deviation counter becomes the following value, to prevent motor from overloading, etc.

The relation between position loop gain (Kp), pps (fin) at rated motor rotation and lag pulses (ε) is as shown below :

$$Kp = \frac{fin}{\varepsilon} = \frac{\text{Encoder RPMs during rated motor rotation} \times (1/60) \times \text{Number of PG pulses per motor rotation} \times (A/B)}{\varepsilon}$$

When $\varepsilon = \varepsilon_0$ and the deviation counter exceeds the value by four times ($\varepsilon > 4\varepsilon_0$), "deviation counter overload" occurs, error relay and fault relay are turned on, and error code 04 is displayed to stop the reference.

Reactivation cannot be performed unless the module is reset.

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(10) Position Deviation Allowable Value Overload

Auxiliary function for deviation counter overload.

If the number of deviation counter lag pulses exceeds the set value, an alarm occurs and input relay "position deviation error" is turned ON.

However, operation is not stopped. Input the stop command if necessary.

Set a value from 0 to 9999 to the 4th register (position deviation allowable value setting) of initial setting 2.

However, since the deviation counter has some lag pulses even at normal operation, calculate the number of lag pulses according to the equation of Kp, fin and ε to determine the set value.

(11) COIN Width Check

Function to perform in-position check (set value $\geqq$ number of reference pulses $-$ number of feedback pulses).

If the deviation counter value becomes the set value or lower, input relay "COIN" and external output "COIN" are turned on.

This function can be one of the conditions for automatic positioning, etc.

Set a value from 0 to 999 to initial setting 1 first register (COIN width setting).

The deviation counter value may not be discharged completely because of some speed setting or mechanical systems. If the COIN width is set too small, the machine often stops (or does not startup).

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2.4.2 B2200 INTERNAL CONFIGURATION

The B2200 is a module needed for systems to perform synchronous operation.

Synchronous operation employing the B2833 and B2200 uses data communication (SDLC). The B2200 has synchronous clock signal generating function at data communication and communication extending function when it is mounted on the extension rack including the B2833.

Fig. 2.9 shows the internal configuration of the B2200.

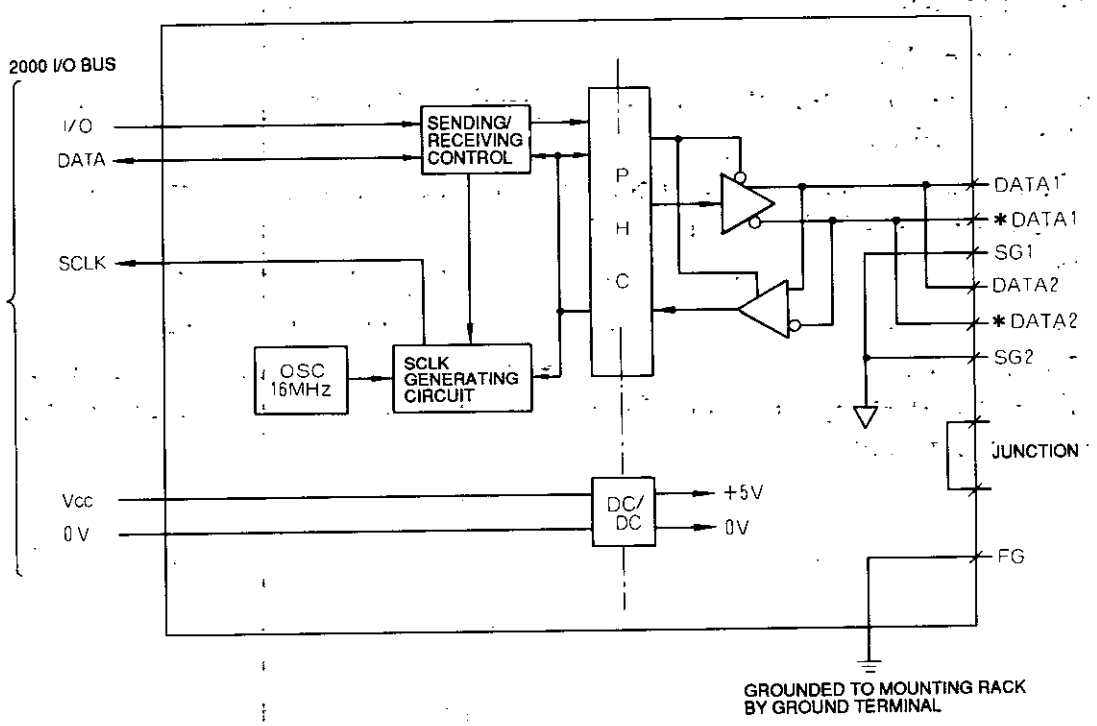


Fig. 2.9 B2200 Internal Configuration

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2.4.3 B2833 OPERATION FLOW

Fig. 2.10 shows B2833 operation outline. The reference numbers here are given as an example.

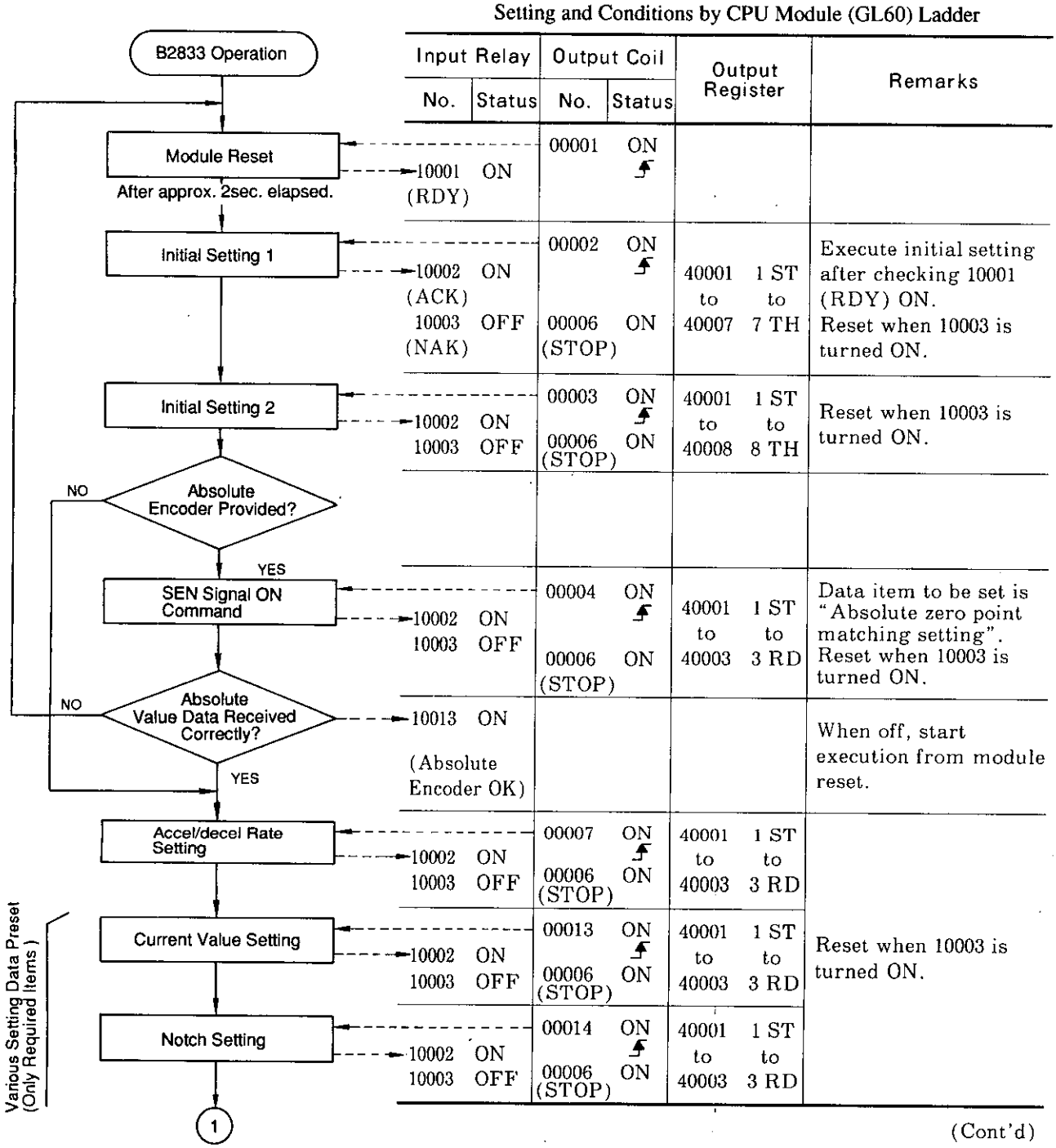
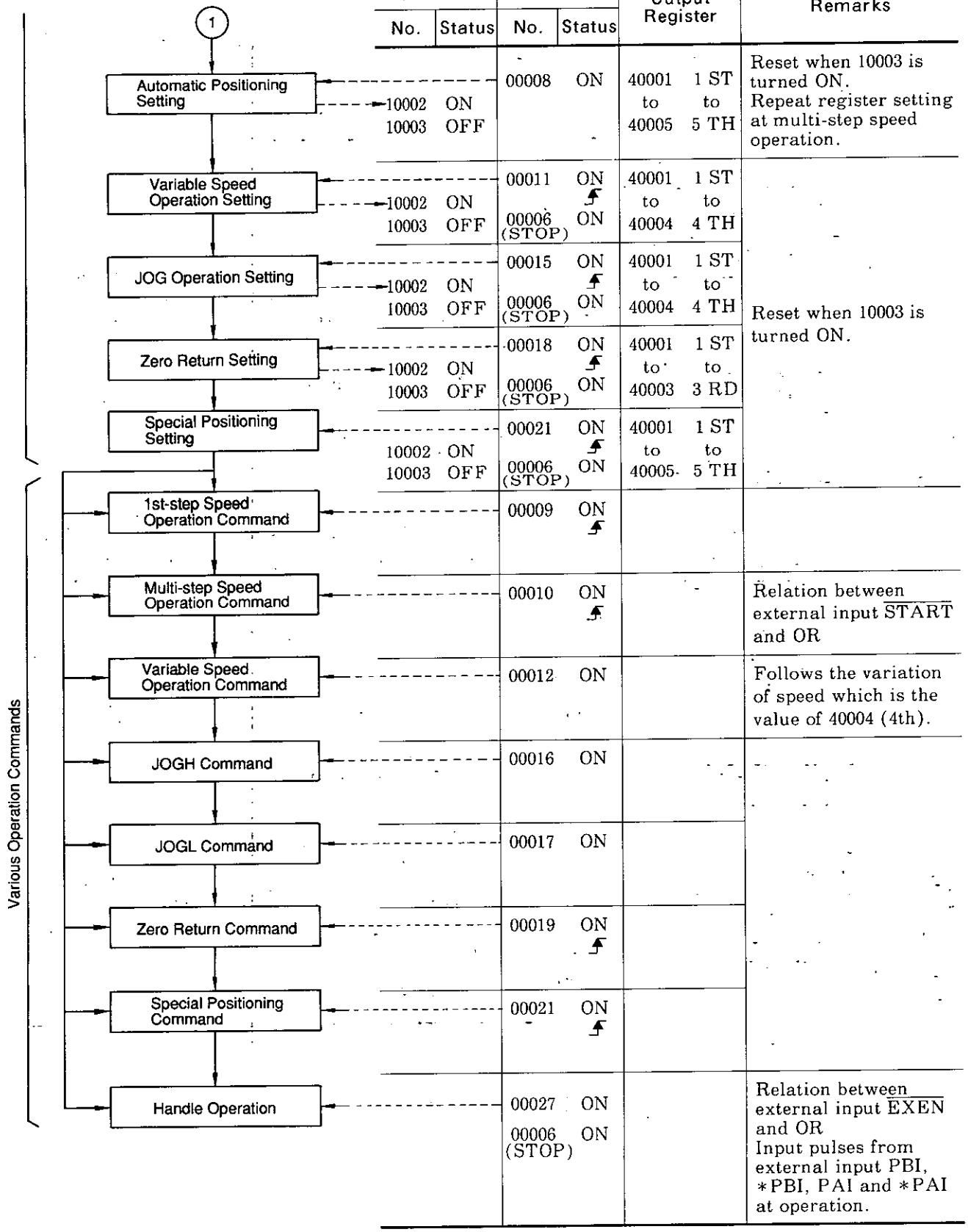


Fig. 2.10 B2833 Operation Flow

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2.4.3 B2833 OPERATION FLOW (Cont'd)

Setting and Conditions by CPU Module (GL60) Ladder (Cont'd)



Input Relay No.	Input Relay Status	Output Coil No.	Output Coil Status	Output Register	Remarks
		00008	ON	40001 to 40005 / 1 ST to 5 TH	Reset when 10003 is turned ON. Repeat register setting at multi-step speed operation.
10002 10003	ON OFF	00011 00006 (STOP)	ON ON	40001 to 40004 / 1 ST to 4 TH	
10002 10003	ON OFF	00015 00006 (STOP)	ON ON	40001 to 40004 / 1 ST to 4 TH	
10002 10003	ON OFF	00018 00006 (STOP)	ON ON	40001 to 40003 / 1 ST to 3 RD	Reset when 10003 is turned ON.
10002 10003	ON OFF	00021 00006 (STOP)	ON ON	40001 to 40005 / 1 ST to 5 TH	
		00009	ON		
		00010	ON		Relation between external input $\overline{\text{START}}$ and OR
		00012	ON		Follows the variation of speed which is the value of 40004 (4th).
		00016	ON		
		00017	ON		
		00019	ON		
		00021	ON		
		00027 00006 (STOP)	ON ON		Relation between external input $\overline{\text{EXEN}}$ and OR Input pulses from external input PBI, *PBI, PAI and *PAI at operation.

Fig. 2.10 B2833 Operation Flow (Cont'd)

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Notes:

1. Enter SERVO OFF when the SEN signal is turned ON.
2. Module reset and initial setting 1 clear the following items :
   - Accel/decel setting
   - Automatic positioning setting
   - Variable speed operation setting
   - JOG operation setting
   - Zero return setting
   - Special positioning setting
   - Error codes

   (The SEN signal is also cleared at module reset.)
3. Accel/decel setting clears each of the following operation settings :
   - Automatic positioning setting
   - Variable speed operation setting
   - JOG operation setting
   - Zero return setting
   - Special positioning setting
4. When A/B value is changed at initial setting 1, if absolute encoder is used, turn ON the SEN signal ; if incremental encoder is used, perform zero return.

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3. OPERATION FUNCTIONS

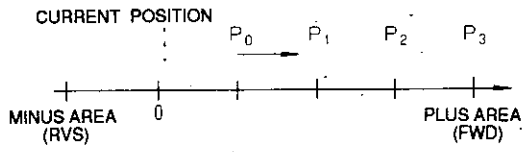
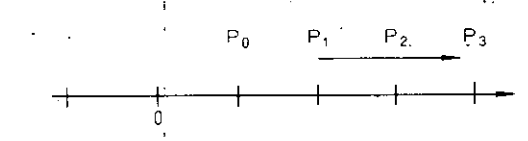
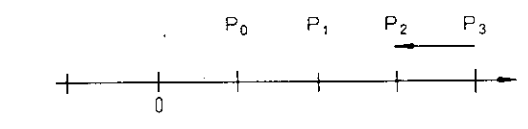
Positioning module functions are explained in the following paragraphs.

3.1 INCREMENTAL/ABSOLUTE MODE

Incremental mode or absolute mode can be selected on an initial setting stage.

3.1.1 INCREMENTAL MODE

(1) Position Command Setting
Motion distance is set as a position command. This mode is the optimum for continuous operation in one direction such as infinite length positioning, etc.

	For moving from current position P_0 to P_1, sign is set for forward, and motion distance $\lvert P_1 - P_0 \rvert$ is set as position command.
	For moving from current position P_1 to P_3, sign is set for forward, and motion distance $\lvert P_3 - P_1 \rvert$ is set as position command.
	For moving from current position P_3 to P_2, sign is set for reverse, and motion distance $\lvert P_3 - P_2 \rvert$ is set as position command.

(2) Current Value Counting Operation
Fig. 3.1 shows a basic operation of current value counter.

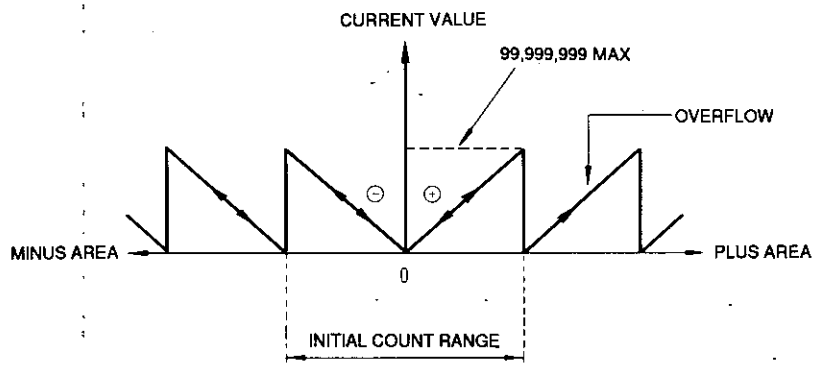
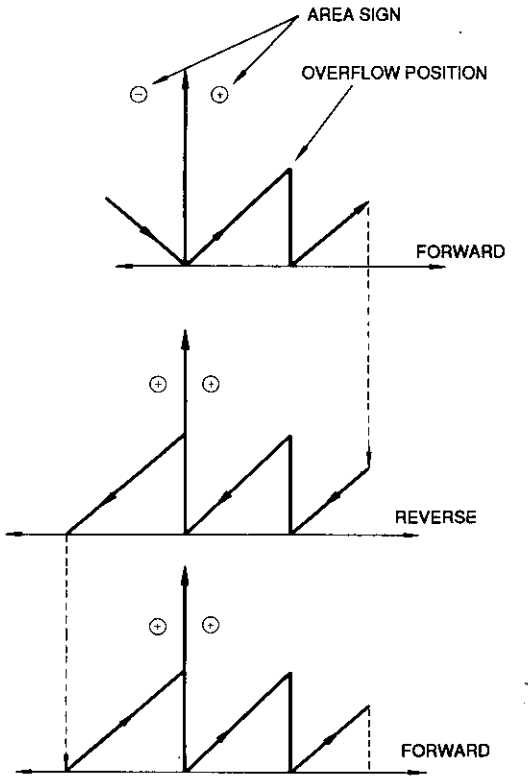


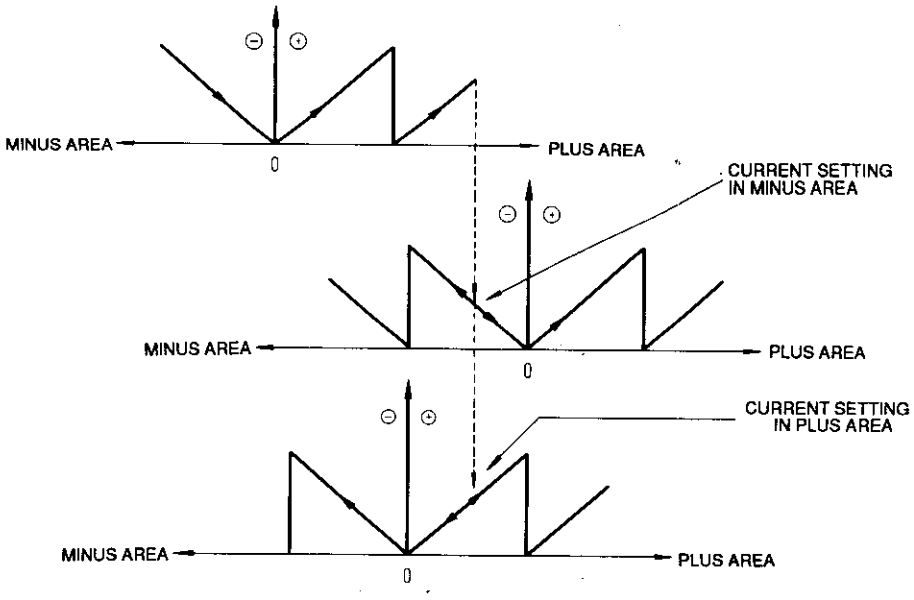
Fig. 3.1 Current Value Counter Operation

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(a) When the current value counter has exceeded the initial count range, an area sign is fixed.



(b) The current value counter is activated in the initial count range during positioning of current value resetting, current value setting, or zero return.



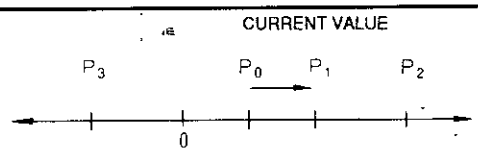
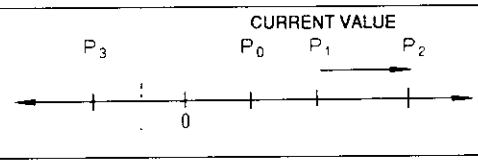
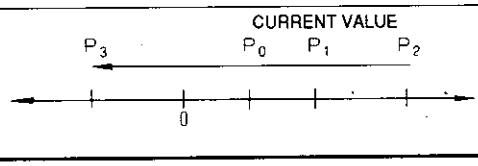
(c) An area sign is fixed when the current value has exceeded the initial count range at absolute encoder reading.

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3.1.2 ABSOLUTE MODE

(1) Position Command Setting

Absolute position is set as the position command. The range of absolute position is determined. This mode is the optimum for reciprocating positioning within the range.

	For moving from current position P_0 to P_1, sign is set in plus area and absolute position P_1 is set as position command.
	For moving from current position P_1 to P_2, sign is set in plus area and absolute position P_2 is set as position command.
	For moving from current position P_2 to P_3, sign is set in plus area and absolute position P_3 is set as position command.

(2) Current Value Counting Operation

Fig. 3.2 shows a basic operation of the current value counter.

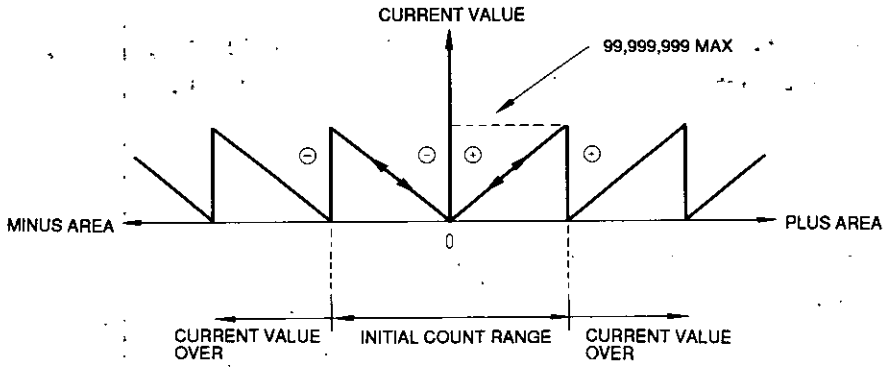


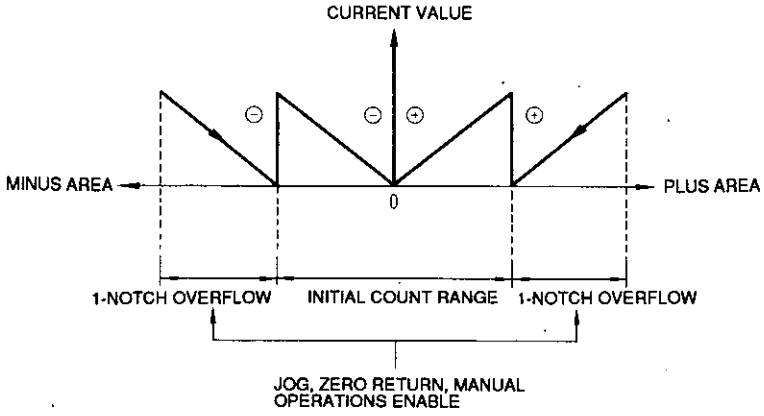
Fig. 3.2 Current Value Counter Operation

(a) If the current value counter has exceeded the initial count range (initial absolute position range) 0 to ±99,999,999, "CURRENT VALUE OVERLOAD" input relay is turned on (error code 43 is issued). At this time, automatic operation is prohibited.

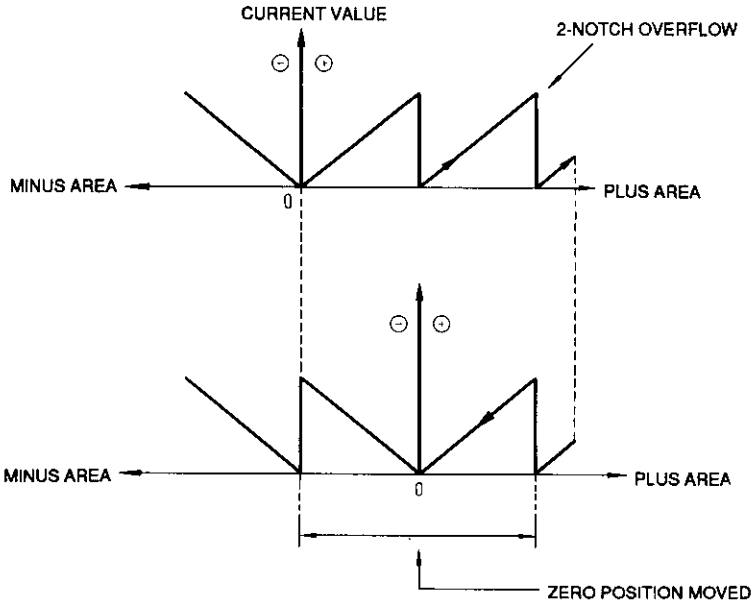
JOG, zero return and manual operations remain operational. On return to the initial count range, "CURRENT VALUE OVERLOAD" is released.

"CURRENT VALUE OVERLOAD" cannot be released by current value setting. "CURRENT VALUE OVERLOAD" is provided if absolute value data are read correctly but the current value has exceeded the initial count range. Even while "CURRENT VALUE OVERLOAD" is ON, the current value counter continues counting.

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(b) If the current value counter exceeds more than 2-notch overflow, the normal range cannot be restored even upon returning to the initial count range by JOG, zero return, or manual operation. In this case, the zero position moves.



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3.2 ACCEL/DECEL SPEED SETTING

(1) Basic Function of Accel/Decel Speed Setting

(a) There are two accel/decel patterns : linear and S-curve.

(b) Linear or S-curve accel/decel can be selected by accel/decel setting.

(c) Accel/decel speed determined by accel/decel setting is used in all operation modes in common.

(d) For synchronous operation mode command synchronization or setting as PG synchronization slave axis, operation is performed with reference pulses from the master slave. Therefore, the accel/decel differs from the set accel/decel. However, at single-unit stop such as stop command input or fault occurrence, perform accel/decel setting.

(e) Acceleration and deceleration rates are the same.

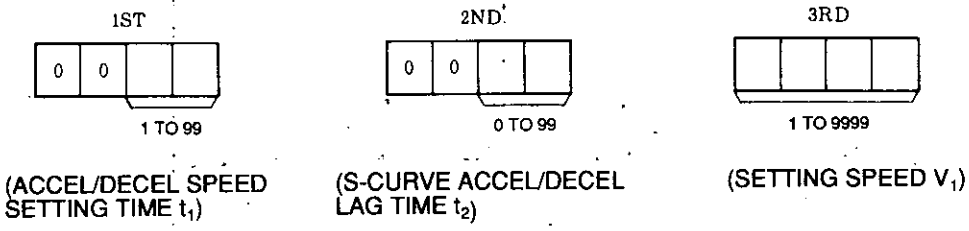
(2) Setting Items of Accel/Decel Speed Setting

In accel/decel speed setting, accel/decel speed setting time t_1, S-curve accel/decel lag time t_2 and setting speed V_1 are set.

[Setting Range]

Accel/decel speed setting time t_1 :	10 to 990 ms (units of 10 ms)
	0.1 to 9.9 s (units of 100 ms)
S-curve accel/decel lag time t_2 :	0 to 990 ms (units of 10 ms)
	0 to 9.9 s (units of 100 ms)
Setting speed V_1 :	10 to 99,990 pps (units of 10 pps)
	20 to 199,980 pps (units of 20 pps)

(3) Accel/Decel Speed Setting Output Register Setting



(ACCEL/DECEL SPEED SETTING TIME t_1)

(S-CURVE ACCEL/DECEL LAG TIME t_2)

(SETTING SPEED V_1)

Note : At setting of S-curve accel/decel lag time t_2, S-curve accel/decel is provided when $t_2 \neq 0$. Set $t_2 = 0$ when linear accel/decel is needed.

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(4) Linear Accel/Decel

Linear accel/decel is available when S-curve accel/decel lag time $t_2 = 0$.

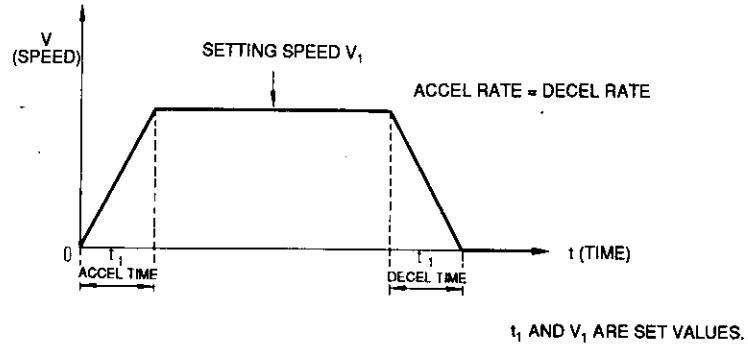


Fig. 3.3 Linear Accel/Decel

(5) S-curve accel/decel is available when S-curve accel/decel lag time $t_2 \neq 0$.

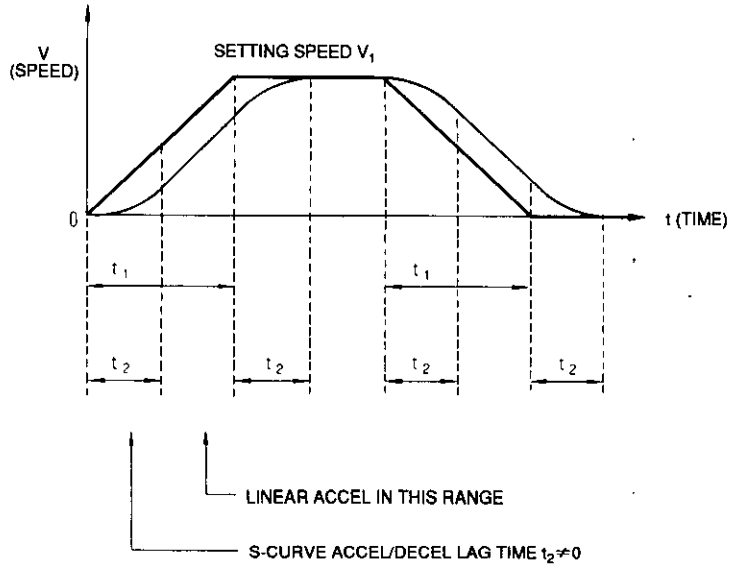


Fig. 3.4 S-curve Accel/Decel

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3.2 ACCEL/DECEL SPEED SETTING (Cont'd)

(6) Precautions on Accel/Decel Speed Setting

(a) Set speed in accel/decel speed setting can be different from steady speed at operation.

(Example)

At acceleration up to steady speed Vc = 30000 pps in steady speed accel/decel time t_{AD} = 300 ms, accel/decel speed operation does not change from when setting acceleration up to V_1 = 10000 pps in t_1 = 100 ms or up to V_1 = 60000 pps in t_1 = 600 ms. Accel/decel rate α = 100 kp/s².

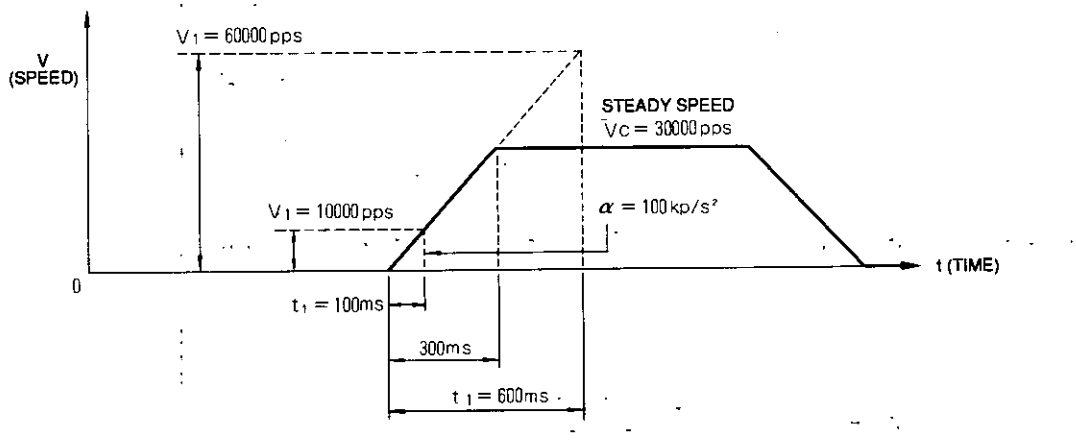
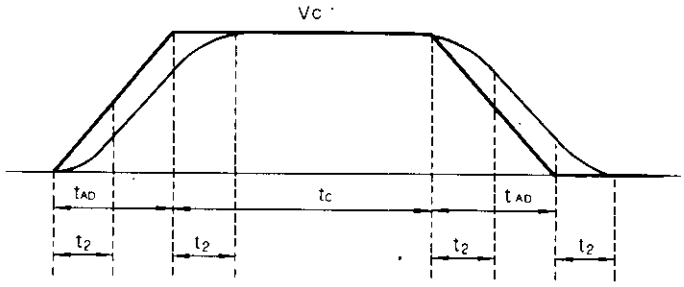


Fig. 3.5 Typical Accel/Decel Speed Setting

(b) When S-curve is set and acceleration is performed up to steady speed during operation in t_{AD} (ms), make S-curve accel/decel lag time $t_2 \leqq t_{AD}$.
When $t_2 > t_{AD}$ the sections of S-curve and linear accel/decel may not be separated properly.

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(c) When S-curve is set, positioning completing time is delayed for S-curve accel/decel lag time theoretically.



Vc : Steady speed
tAD: Time to accelerate up to steady speed or decelerate from steady speed
tc : Time to operate at steady speed
t2 : S-curve accel/decel lag time

Fig. 3.6 Typical S-curve Accel/Decel Lag Time

Theoretical positioning time at linear accel/decel tL can be obtained as shown below :

$t_L = t_{AD} + t_C + t_{AD} = 2t_{AD} + t_C$

Theoretical positioning time at S-curve accel/decel ts can be obtained as shown below :

$t_S = t_2 + (t_{AD} - t_2) + t_2 + (t_C - t_2) + t_2 + (t_{AD} - t_2) + t_2$

$= 2t_{AD} + t_C + t_2$

Therefore, $t_S = t_L + t_2$

(d) Accel/decel speed setting clears all operation settings.

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3.3 AUTOMATIC POSITIONING

Automatic positioning operation includes the 1st-step speed operation, multi-step speed operation and variable speed operation.

3.3.1 THE 1ST-STEP SPEED OPERATION

(1) Basic Function of the 1st-step Speed Operation

(a) According to the accel/decel speed set by "accel/decel speed setting," positioning is performed with the speed set in the first step of "automatic positioning setting" as steady speed (startup differential).

(b) Operation is started by output coil "the 1st-step speed operation command."

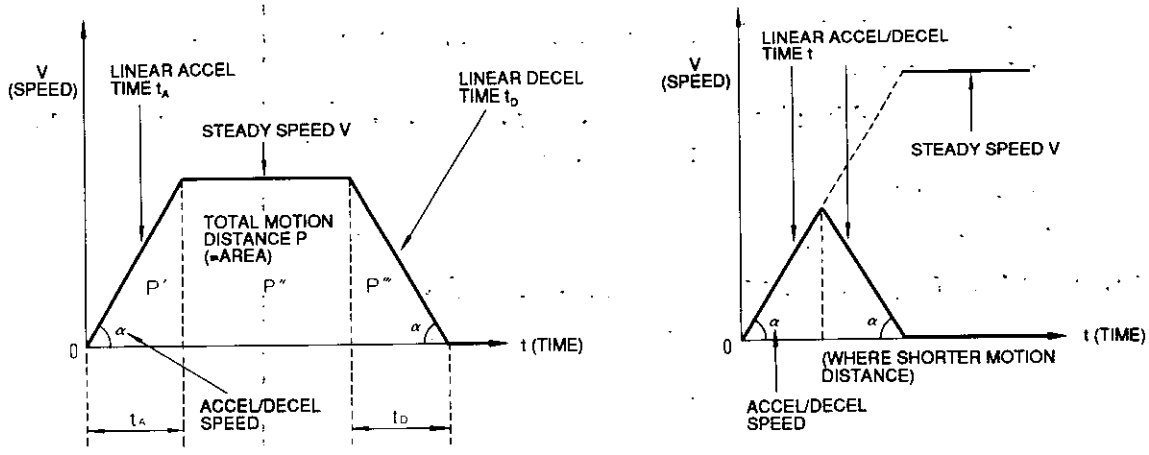
(c) Operation is canceled by output coil "stop command" ON or external input "external stop ($\overline{\text{STOP}}$)" ON. Deceleration is performed at the deceleration speed set by "accel/decel speed setting."

(d) Next start can be reserved during operation.

(e) Next operation reservation can be set during operation.

(2) The 1st-step Speed Operation Basic Pattern

(a) Fig. 3.7 shows the basic pattern of the 1st-step speed operation at linear accel/decel.



α : Accel/decel speed set by "Accel/decel speed setting"

P : Total Motion Distance [P (= Area) = P' + P'' + P''']

Linear Accel/Decel Time = Linear Accel Time t_A = Linear Decel Time t_D

Fig. 3.7 The 1st-step Speed Basic Operation

Note : Operates also at S-curve accel/decel.

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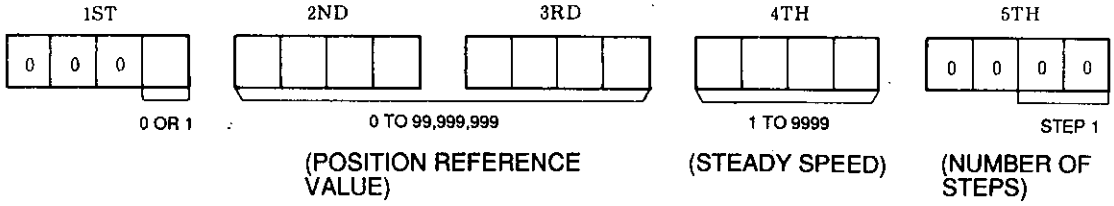
(3) The 1st-step Speed Operation Setting Items

In the1st-step speed operation (the 1st-step of "automatic positioning setting"), position reference value sign (absolute value mode) or motor rotating direction (incremental value mode) and position reference value P, steady speed V and number of steps (the 1st-step only) are set.

[Setting Range]

Position reference value sign or motor rotating direction : 0 or 1
Position reference value P : 0 to 99,999,999 P
Steady speed V : 10 to 99,990 pps (units of 10 pps)
20 to 199,980 pps (units of 20 pps)
No. of steps : 1

(4) Output Register Setting of the 1st-step Speed Operation



0 : Plus area (absolute value mode)
Plus direction (incremental value mode)
1 : Minus area (absolute value mode)
Minus direction (incremental value mode)

(5) Precautions on the1st-step Speed Operation

(a) Limitation of start reservation

To reserve start of "the 1st-step speed operation," turn ON output coil "the 1st-step speed operation command" during the 1st-step speed operation.

However, during other types of operation, reservation cannot be accepted.

In this case, error code "48" (operation command which cannot be reserved is entered) occurs and the reservation is disregarded. This reservation can be accepted only during the 1st-step speed operation.

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(b) Reservation setting disabled period

"Automatic positioning setting" (both the 1st-step and multi-step) can be performed at any time after completion of "initial setting 1," "initial setting 2" and "accel/decel speed setting." (It can also be set during other types of operation.)

However, it cannot be provided at the same time as the other settings. If it is provided, error code "21" (some setting commands are turned on simultaneously) occurs and the setting is disregarded.

Additionally, it cannot be set during variable speed operation. If it is set, error code "29" (multi-step or the1st-step speed operation setting is entered during variable speed operation) occurs, deceleration is performed to stop variable speed operation and the setting is disregarded.

(c) Items to be blocked by "automatic positioning setting"

While "automatic positioning setting" is performed, all operation start commands are prohibited.

If any start command is entered, error code " 52" (operation command is turned ON during "automatic positioning setting") and the operation command is disregarded.

When "variable speed operation command" is turned ON, "automatic positioning setting" in that scan is also disregarded.

However, operation continues at JOG operation.

"Automatic positioning setting" when start reservation has been entered clears the start reservation.

In this case, start reservation must be made again.

(d) Start command priority order

When output coils "the 1st-step speed operation command," "multi-step speed operation command" and external input "external start ($\overline{\text{START}}$)" (Same as multi-step speed operation command) are turned ON simultaneously in the same scan, they have priority in the following order :

"External start ($\overline{\text{START}}$)"> "the 1st-step speed operation command"> "Multi-step speed operation command"

However, when these commands are turned ON simultaneously with any other commands, error code "40" (some operation commands are turned ON simultaneously) occurs and both operation commands are disregarded.

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3.3.2 MULTI-STEP SPEED OPERATION

(1) Multi-step Speed Operation Basic Function

(a) Positioning is performed at multi-step speed up to 20 steps.

(b) According to the accel/decel speed set by "accel/decel speed setting", positioning is performed with the speed set in steps of 1 to 20 of "automatic positioning setting" as steady speed of each step.

(c) "Position reference value" set in the first step by "automatic positioning setting" is the final positioning moving distance ; "position reference values" set in the steps from 2 to 20 are moving distance of speed changing points. [For details, refer to (2).]

(d) Operation is started by output coil "multi-step speed operation command" ON or external input "external start ($\overline{\text{START}}$)" ON (startup differential).

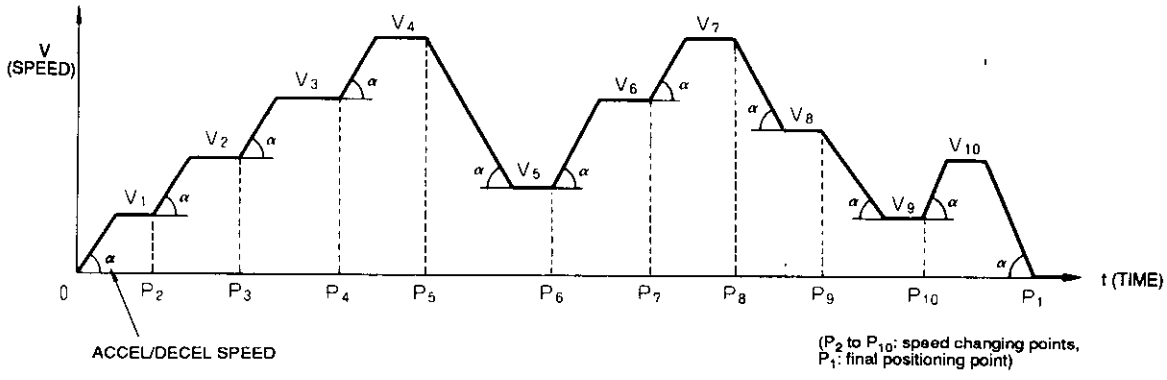
(e) Operation is canceled by output coil "stop command" ON or external input "external stop ($\overline{\text{STOP}}$)" ON. Deceleration is performed at the deceleration speed set by "accel/decel speed setting."

(f) Next start can be reserved during operation.

(g) Next operation reservation can be set during operation.

(2) Multi-step Speed Operation Basic Pattern

(a) Fig. 3.8 shows the basic pattern of multi-step speed operation at linear accel/decel. The figure shows the 10th step speed operation as an example.



Vn : Speed set in the nth step

Pn : Moving distance set in the nth step

α : Accel/decel speed set by "accel/decel speed setting"

Fig. 3.8 Multi-step Speed Operation at Linear Accel / Decel

Note : Operation can be performed also at S-curve accel/decel.

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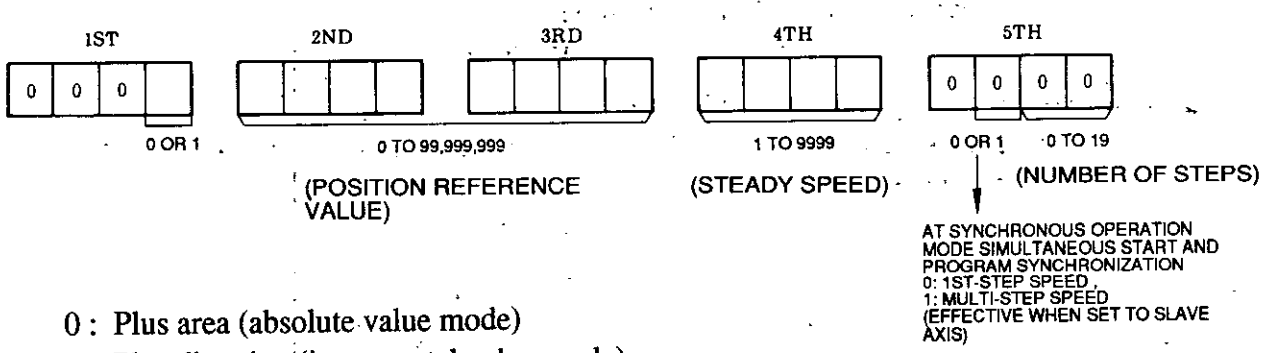
(3) Multi-step Speed Operation Setting items

In multi-step speed operation setting (setting in the nth step of "automatic positioning setting"), position reference value sign (absolute value mode) or motor rotating direction (incremental value mode) and position reference value P_n , steady speed V_n and number of steps n are set.

[Setting Range]

Position reference value sign or motor rotating direction : 0 or 1
Position reference value P_n : 0 to 99,999,999 P
Steady speed V_n : 10 to 99,999 pps (units of 10 pps)
20 to 199,980 pps (units of 20 pps)
Number of steps n : 1 to 20 steps

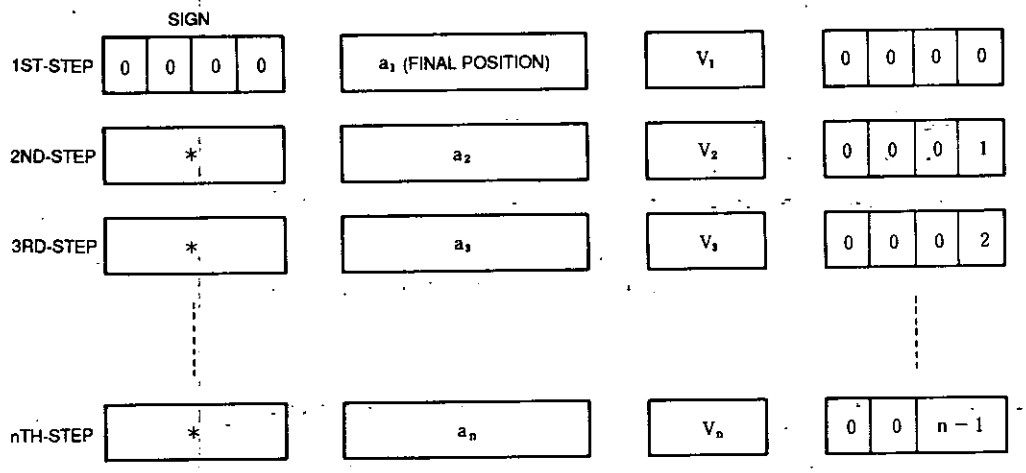
(4) Multi-step Speed Operation Output Register Setting



0 : Plus area (absolute value mode)
Plus direction (incremental value mode)
1 : Minus area (absolute value mode)
Minus direction (incremental value mode)

(Example)

At multi-step speed in plus area (plus direction)



n : Up to 20 * : DON'T CARE.
However, specify plus or minus in the absolute value mode.

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(5) Precautions on Multi-step Speed Operation

(a) Relation of each step moving value setting

The relation of each step moving value Pn (moving value set in the nth step) is to be as shown below.

Incremental value mode :

$P_2 + P_3 + ...+P_n < P_1 \ (n \neq 1)$

Absolute value mode :

$P_n < P_{n+1} < P_1 \ (n \neq 1)$

(b) Setting clear

Set the steps in order from the smallest number.

The settings of the next step and after the set step are cleared.

Only the latest stage is effective. Error code 23 "Operation Set Value Fault" will result and setting disregarded if an attempt to return to a previous step is made.

By setting the first step, the settings of the second step and after are cleared.

If changes are needed in any step on the way of setting, the steps must be set again from the beginning.

(c) Setting skip

When there is a step with setting which reverses the motor rotating direction from the 1st-step setting in "automatic positioning setting" or there is a step without setting, the step is skipped (disregarded).

In this case, error code "30" (skipping in multi-step speed operation setting) is displayed but the operation is continued.

(Example)

From zero-point position in the absolute value mode :

P_1 : +50 kP, P_2 : + kP, P_3 : + 20 kP

Final Position Skipped

From + 50 kP point position in the absolute value mode :

P_1 : + 70 kP, P_2 : + 20 kP, P_3 : + 60 kP

Final Position Skipped

(d) Setting omission

When the final positioning position is reached in the status where some setting steps still remain during multi-step speed operation, the steps after the final position are omitted (disregarded).

(Example)

In the incremental value mode :

P_1 : + 50 kP, P_2 : + 40 kP, P_3 : 30 kP

Final Position Omitted

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(e) Multi-step speed and the 1st-step speed operation setting
The setting area of multi-step speed operation first step and the 1st-step speed operation is the same (the first step of "automatic positioning setting").

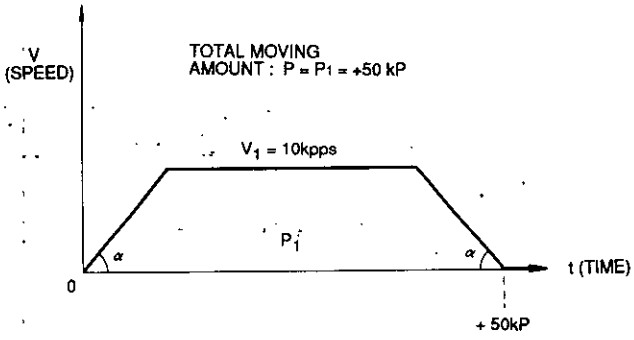
Therefore, by selecting " the1st-step speed operation command" in the same setting operation is performed in the 1st-step speed ; by selecting "multi-step speed operation command", it is performed in multi-step speed. However, positioning is performed in the same place in either operation.

(Example)

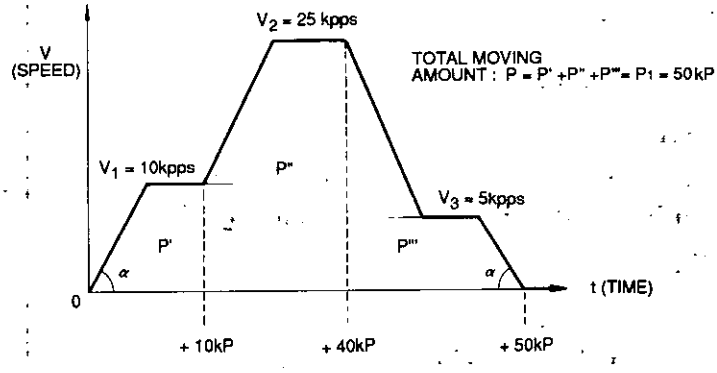
In the absolute value mode, in the setting of :

$\begin{bmatrix} P_1 : +50\ kP \\ V_1 : 10\ kpps \end{bmatrix}$ $\begin{bmatrix} P_2 : +10\ kP \\ V_2 : 25\ kpps \end{bmatrix}$ $\begin{bmatrix} P_3 : +40\ kP \\ V_3 : 5\ kpps \end{bmatrix}$

・When "the 1st-step speed operation command" is selected :



・When "multi-step speed operation command" is selected :



α : Accel/decel speed set by "accel/decel speed setting" (same in both figures).

(f) The 1st-step speed operation by "multi-step speed operation command"
By selecting "multi-step speed operation command" in the status where only the first step is set in "automatic positioning setting", the 1st-step speed operation is performed.
In this case, no error occurs.

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(g) External input "external start ($\overline{\text{START}}$)"
External input "external start ($\overline{\text{START}}$)" has the same meaning as output coil "multi-step speed operation command."

To perform multi-step speed operation, turn ON "external start ($\overline{\text{START}}$)" or "multi-step speed operation command."

(h) Limitation of start reservation
To make start reservation of "multi-step speed operation command" and external start ($\overline{\text{START}}$)", turn ON each command while multi-step speed operation is performed by "multi-step speed operation command" and "external start ($\overline{\text{START}}$)", respectively.

However, "multi-step speed operation command" can have start reservation only during multi-step speed operation by "multi-step speed operation command."

Also "external start ($\overline{\text{START}}$)" can have start reservation only during multi-step speed operation by "external start ($\overline{\text{START}}$)."

In any case other than the above, error code "48" (operation command which cannot be reserved is entered) occurs and the reservation is disregarded.

(i) Reservation setting disabled period
Same as item (b) in Par. 3.3.1 (5) "Precautions on the 1st-step Speed Operation."

(j) Items to be blocked by "automatic positioning setting"
Same as item (c) in Par. 3.3.1 (5) "Precautions on the 1st-step Speed Operation."

(k) Start command priority order
Same as item (d) in Par. 3.3.1 (5) "Precautions on the 1st-step Speed Operation."

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3.3.3 VARIABLE SPEED OPERATION

(1) Variable Speed Operation Basic Function

(a) According to the accel/decel speed set by "accel/decel speed setting", the positioning reference value set by "variable speed operation setting" is to be the positioning point, and positioning is performed with the contents of the fourth output register as steady speed each time.

(b) Steady speed is determined by the contents of the fourth output register checked at every CPU scan during operation.
Accel/decel speed at speed variation is the value set by "accel/decel speed setting."

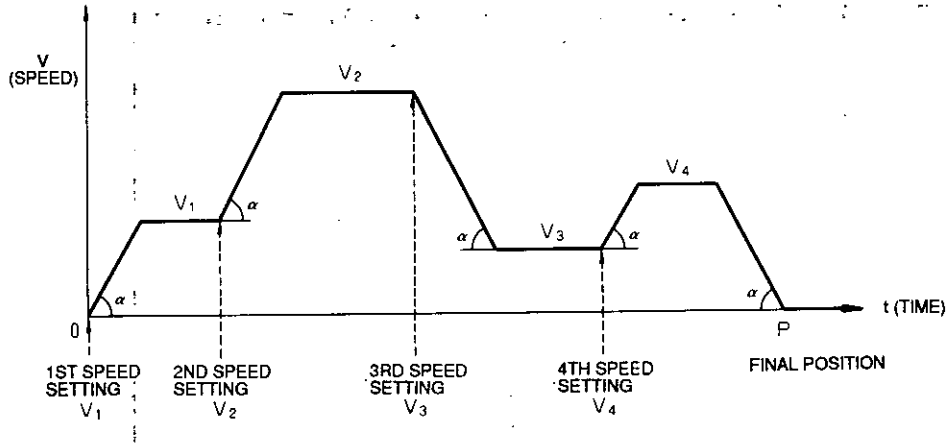
(c) Operation is started by turning on output coil "variable speed operation command" (status).

(d) Operation is canceled by turning OFF "variable speed operation command," turning ON output coil "stop command" or turning ON external input "external stop (STOP)."

(e) In the incremental value mode, when the position reference value is set to zero, variable speed without positioning can be performed. (This is the same as variable speed JOG operation.)

(2) Variable Speed Operation Basic Pattern

(a) Fig. 3.9 shows the variable speed operation basic pattern at linear accel/decel. The figure shows a case where the set speed value is changed four times (the value of fourth output register) as an example.



V_n : Speed set in the nth time
P : Position reference value
α : Accel/decel speed set by "accel/decel speed setting"

Fig. 3.9 Variable Speed Operation at Linear Accel / Decel

Note : Operation can be performed also at S-curve accel/decel.

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(3) Variable Speed Operation Setting Items

In variable speed operation setting, the position reference value sign (absolute value mode) or motor rotating direction (incremental value mode) and position reference value P are preset.

Additionally, speed V is set immediately before operation or during operation.

[Setting Range]

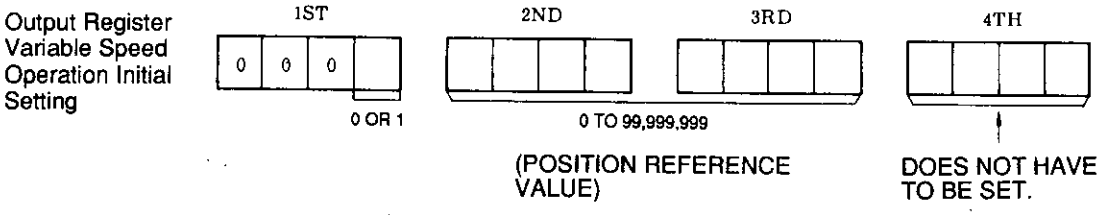
Position reference value sign or motor rotating direction : 0 or 1

Position reference value P : 0 to 99,999,999 P

Steady speed V : 10 to 99,990 pps (units of 10 pps)
20 to 199,980 pps (units of 20 pps)
Units are set by initial setting.

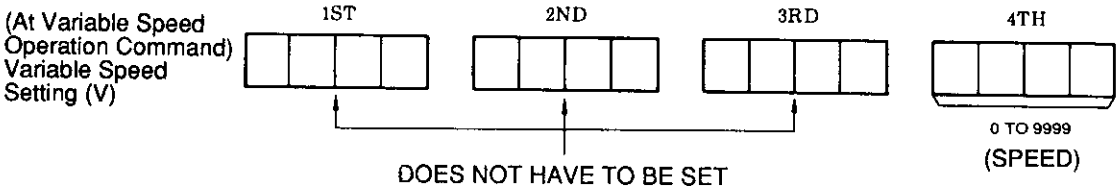
(4) Output Register Setting of Variable Speed Operation

(Setting)



0 : Plus area (absolute value mode)
Plus direction (incremental value mode)

1 : Minus area (absolute value mode)
Minus direction (incremental value mode)



Note : For setting example, refer to 4.4.3 VARIOUS DATA SETTINGS (2) (c) Variable speed operation setting.

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(5) Precautions on Variable Speed Operation

(a) Speed reference check before starting and during operation

In variable speed operation, the speed reference is read out from the fourth output register at operation startup or during operation, and the operation is performed according to the read-out speed reference.

Therefore, when the output register contents are changed by other settings, etc., operation is performed according to the changed value.

Be sure to input the speed reference for variable speed in the fourth output register before operation startup and during operation.

(b) Pause function

By setting 0 to the fourth output register during operation, speed becomes 0 to stop the operation. By setting any value, the operation is started again.

However, keep "variable speed operation command" in the ON status.

(c) Reactivation after stop signal input

Operation is stopped by turning on "stop command" or "external stop ($\overline{\text{STOP}}$)" during operation. However, releasing the "stop command" or "external stop ($\overline{\text{STOP}}$)" with "variable speed operation command" ON does not reactivate the operation.

Turn OFF "variable speed operation command" once and then turn it ON again to activate the operation.

(d) Prohibition of "automatic positioning setting" during operation

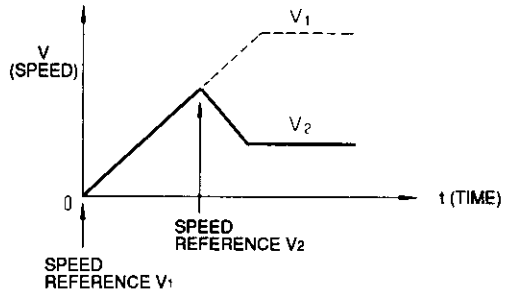
Do not perform "automatic positioning setting" during operation.

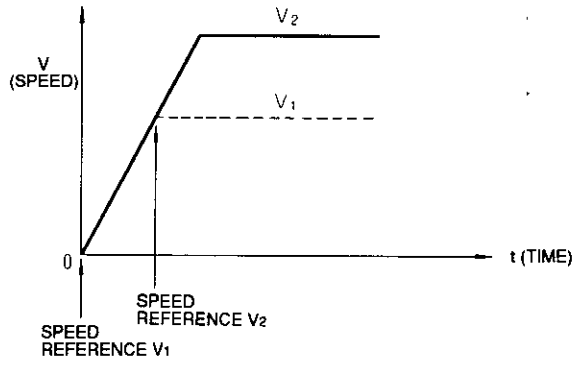
Otherwise, error code "29" (multi-step or the 1st-step speed operation is entered during variable speed operation) occurs and variable speed operation decelerates to a stop.

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(e) Speed reference over-writing

In variable speed operation, if speed reference V_2 is commanded during accel/decel toward speed reference V_1, speed reference V_1 is disregarded and operation is performed with speed reference V_2 as steady speed.





(f) Priority of positioning

In variable speed operation, position is reached during accel/decel toward speed reference V_1, positioning is performed, disregarding speed reference V_1.

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3.4 JOG OPERATION

(1) JOG Operation Basic Function

(a) According to the accel/decel speed set by "accel/decel speed setting", operation is performed in the rotating direction set by "JOG setting" with speed set by "JOG setting" as steady speed while "JOGL command" or "JOGH command" is turned ON.

(b) For JOG operation, two steps of speed are available : JOGL (low speed) and JOGH (high speed). JOGL can be larger than JOGH.

(c) Operation is started by turning on output coil "JOGL command" or "JOGH command" (status).

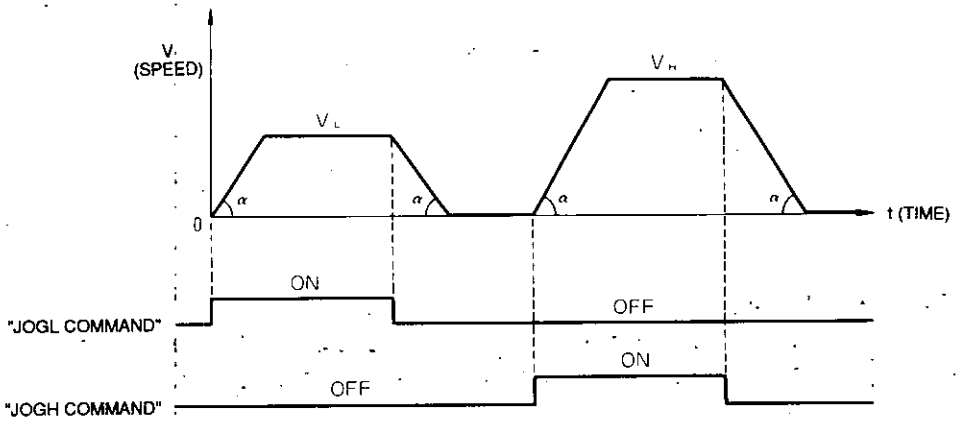
(d) Operation is stopped by turning OFF "JOGL command" or "JOGH command", or turning on output coil "stop command" or external input "external stop ($\overline{\text{STOP}}$)."

However, when "stop command" or "external stop ($\overline{\text{STOP}}$)" is turned ON, operation is automatically reactivated by releasing the stop command.

(e) "COIN" ON is not included in the conditions of JOG operation activation.

(2) JOG Operation Basic Pattern

(a) Fig. 3.10 shows the JOG operation basic pattern at linear accel/decel.



V_L : Speed for low speed set by "JOG setting"

V_H : Speed for high speed set by "JOG setting"

α : Accel/decel speed set by "accel/decel speed setting"

Fig. 3.10 JOG Operation at Linear Accel / Decel

Note : Operation can be performed also at S-curve accel/decel.

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(3) JOG Operation Setting Items

In JOG setting, the JOGL motor rotating direction, speed V_L , JOGH motor rotating direction and speed V_H are set.

[Setting Range]

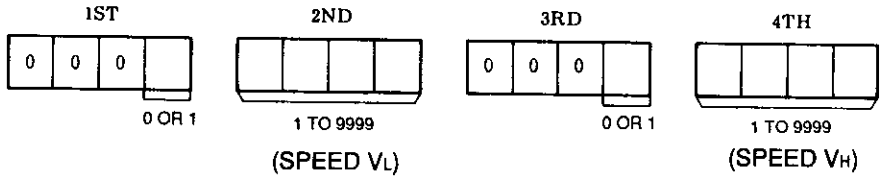
JOGL motor rotating direction : 0 or 1

JOGL speed V_L : 10 to 99,999 pps (units of 10 pps)
20 to 199,980 pps (units of 20 pps)

JOGH motor rotating direction : 0 or 1

JOGH speed V_H : 10 to 99,999 pps (units of 10 pps)
20 to 199,980 pps (units of 20 pps)

(4) Output Register Setting of JOG Operation



0 : Plus direction rotation
1 : Minus direction rotation
JOGL

0 : Plus direction rotation
1 : Minus direction rotation
JOGH

(5) Precautions on JOG Operation

(a) Command priority order

"JOGL command" and "JOGH command" are prioritized operations. That is, during JOGL operation, "JOGH command" is disregarded and vice versa. An error does not occur.

Additionally, if "JOGL command" and "JOGH command" are turned ON simultaneously, "JOGL command" has the priority.

However, if other operation commands are turned on simultaneously, error code "40" (some operation commands are turned on simultaneously) occurs and operation is not performed.

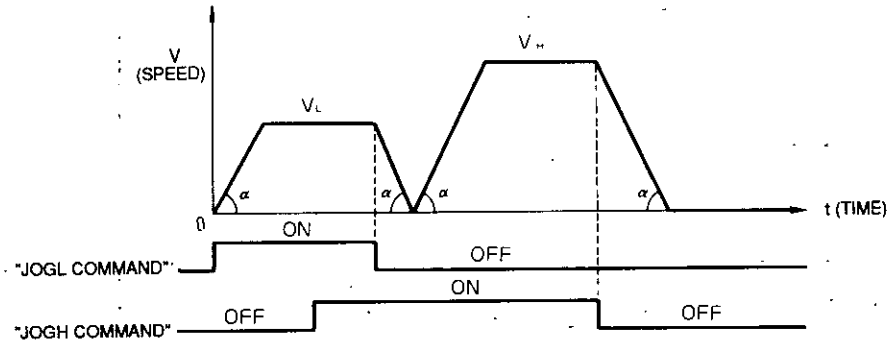
Or error code "48" (operation command which cannot be reserved is entered) occurs but the functions under operation continue and starting is disregarded.

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3.4 JOG OPERATION (Cont'd)

(b) Command overlapping

"JOGH command" is disregarded during JOGL operation. However, by turning OFF "JOGL command" with "JOGH command" ON, JOGH operation is automatically activated after JOGL decelerates to a stop, and vice versa.

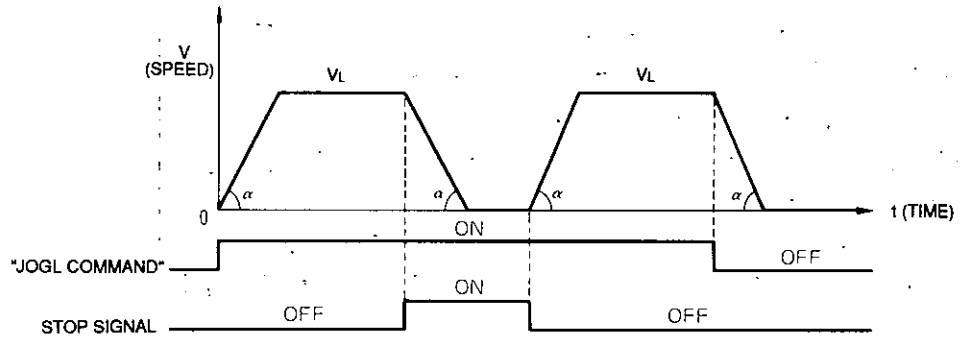


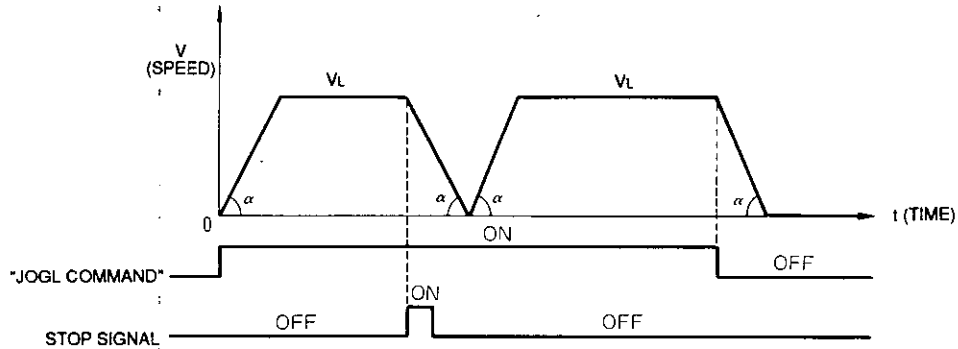
(c) Pause function

When the stop signal [output coil "stop command" or external input "external stop ($\overline{\text{STOP}}$)"] is turned ON during operation, deceleration to a stop is performed.

However, when the operation command is in the ON status and the stop signal is released, operation is reactivated automatically.

However, if the stop signal is turned OFF during deceleration with the stop signal ON, operation stops once and then starts again.

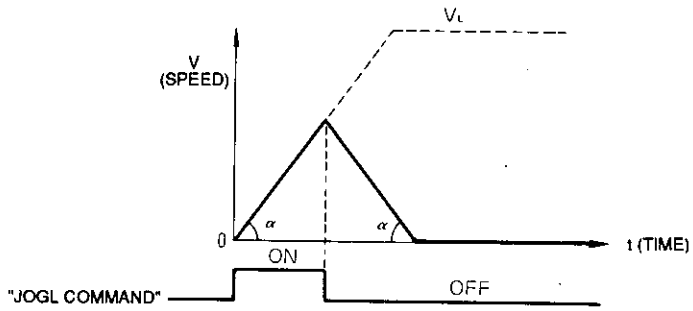




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(d) When command is short

When the operation command is released or stop signal is input during acceleration with the operation command ON, deceleration to a stop is performed at that time even if the steady speed has not been reached yet.



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3.5 ZERO RETURN OPERATION

Zero return operation has two modes : mode A and mode B.
Mode setting is selected by the front panel 1SW (dip switch).

3.5.1 ZERO RETURN OPERATION MODE A

(1) Zero Return Operation Mode A Basic Function

(a) According to the accel/decel speed set by "accel/decel speed setting," operation is started in the rotating direction set by "zero return setting" at the set speed (V).

When external input "decel LS ($\overline{\text{DEC}}$)" ON is detected, speed is reduced down to the creep speed (Vc) set by "zero return setting"; the first phase C pulse after the creep speed is reached is to be the zero point.

(b) Operation is started by turning ON output coil "zero return command" (startup differential).

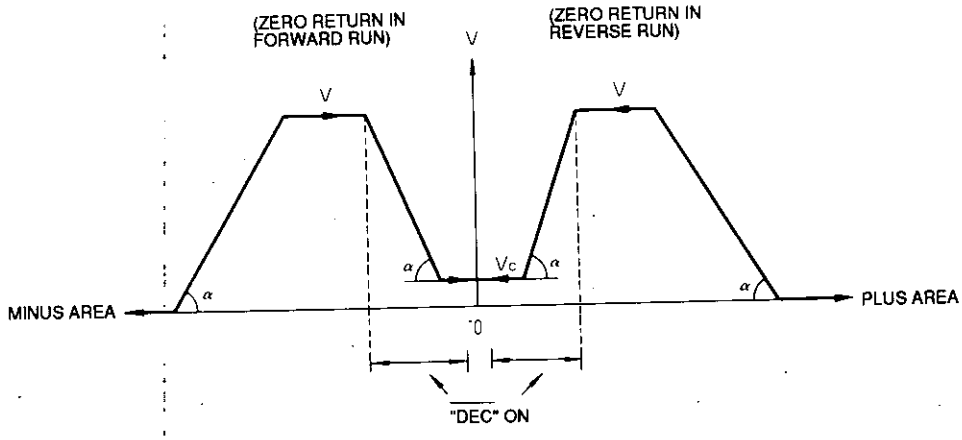
(c) Operation is canceled by turning ON output coil "stop command" or external input "external stop ($\overline{\text{STOP}}$)."
Then the motor decelerates to a stop.

(d) The following processes are conducted after completion of zero return mode A :
1) Current value clear
2) Feedback current value clear
3) Deviation counter clear

Note : The above processes are the same in either incremental value mode or absolute value mode.

(2) Zero Return Operation Mode A Basic Pattern

(a) Fig. 3.11 shows the zero return operation mode A basic pattern at linear accel/decel.



V : Zero return speed
Vc : Creep speed
α : Accel/decel speed set by "accel/decel speed command"

Fig. 3.11 Zero Return Mode A at Linear Accel / Decel

Note : Operation can be performed also at S-curve accel/decel.

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3.5.2 ZERO RETURN OPERATION MODE B

(1) Zero Return Operation Mode B Basic Function

(a) According to the accel/decel speed set by "accel/decel speed setting," operation is started in the rotating direction set by "zero return setting" at the set speed (V).

When external input "decel LS ($\overline{\text{DEC}}$)" ON is detected, speed is reduced down to the creep speed (Vc) set by "zero return setting"; the first phase C pulse after the creep speed is reached and "decel LS ($\overline{\text{DEC}}$)"OFF is detected is to be the zero point.

(b) Operation is started by turning ON output coil "zero return command" (startup differential).

(c) Operation is canceled by turning on output coil "stop command" or external input "external stop ($\overline{\text{STOP}}$)." Then the motor decelerates to a stop.

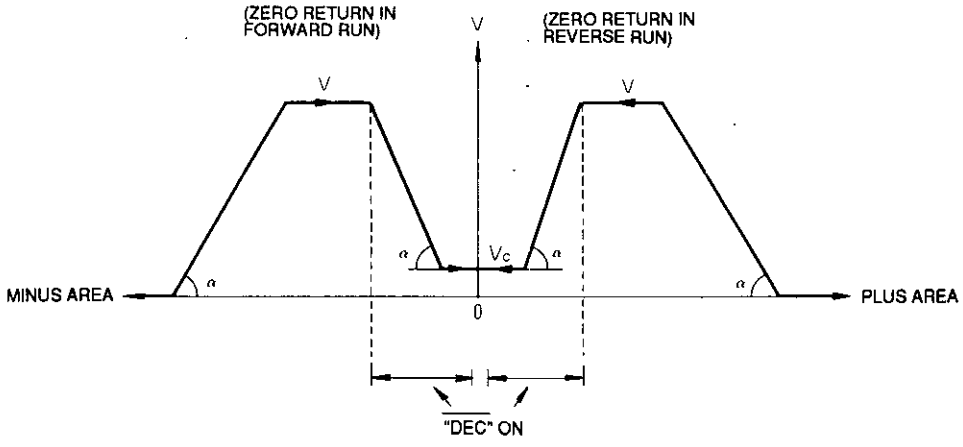
(d) The following processes are conducted after completion of zero return mode B :

1) Current value clear
2) Feedback current value clear
3) Deviation counter clear

Note : The above processes are the same in either incremental value mode or absolute value mode.

(2) Zero Return Operation Mode B Basic Pattern

(a) Fig. 3.12 shows the zero return operation mode B basic pattern at linear accel/decel.



V : Zero return speed
Vc : Creep speed
α : Accel/decel speed set by "accel/decel speed setting"

Fig. 3.12 Zero Return Mode B at Linear Accel / Decel

Note : Operation can be performed also at S-curve accel/decel.

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3.5.3 COMMON ITEMS IN MODES A AND B OF RETURN OPERATION

(1) Zero Return Operation Setting Items

In zero return operation (common in modes A and B), the motor rotating direction, steady speed V and creep speed Vc are set.

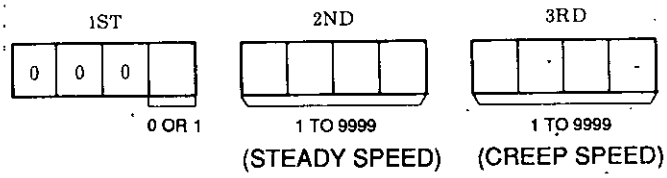
[Setting Range]

Motor rotating direction : 0 or 1

Steady speed V : 10 to 99,990 pps (units of 10 pps)
20 to 199,980 pps (units of 20 pps)

Creep speed Vc : 10 to 99,990 pps (units of 10 pps)
20 to 199,980 pps (units of 20 pps)

(2) Output Register Setting of Zero Return Operation



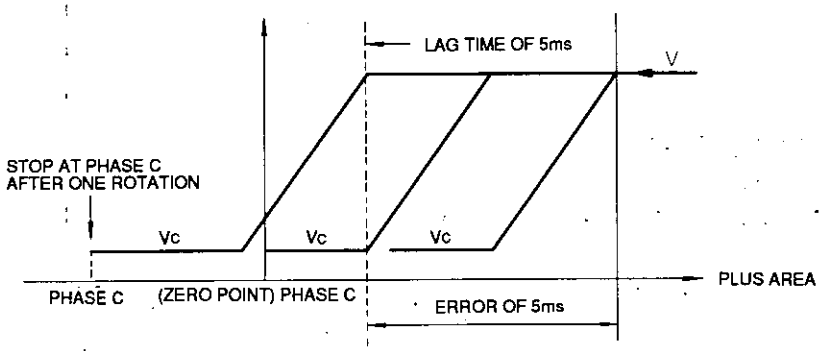
0 : Plus direction rotation
1 : Minus direction rotation

Note : The above setting range is applied for both modes A and B.

(3) Precautions on Zero Return Operation (Common in Modes A and B)

(a) "Decel LS ($\overline{\text{DEC}}$)" signal detection error

When zero return speed is too fast in the zero return operation mode A, since the position where creep speed is reached changes because of output coil "decel LS ($\overline{\text{DEC}}$)" signal detection time dispersion (up to 5 ms), stopping error for one rotation may be generated depending on adjustment of dog.



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(b) Relation between steady speed and creep speed

The relation between steady speed and creep speed is to be : steady speed≧creep speed.

If creep speed is larger than steady speed, error code "24" (steady speed≧creep speed is not satisfied) occurs.

(c) Start at "decel LS ($\overline{\text{DEC}}$)" ON

In the status of external input "decel LS ($\overline{\text{DEC}}$)" ON, operation is not started by turning ON "zero return command."

Error code "44" ("zero return command" is turned ON at decel LS ON) occurs. Move "decel LS ($\overline{\text{DEC}}$)" to OFF in other types of operation, and then turn ON "zero return command."

(d) Reactivation after "STOP command"

When operation is stopped by output coil "STOP command" or "external stop ($\overline{\text{STOP}}$)" during zero return operation, turn ON "zero return command" again for reactivation. Only releasing the stop signal does not reactivate the operation.

Additionally, reactivation is also disabled when "decel LS ($\overline{\text{DEC}}$)" is turned ON in the stopped status.

(e) Continuous zero return operation

It is possible to repeat zero return operation if zero return operation has been completed and "decel LS ($\overline{\text{DEC}}$)" has been turned OFF.

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3.6 SPECIAL POSITIONING OPERATION (PROVIDED WITH LS INPUT)

(1) Special Positioning Operation Basic Function

(a) Operation is enabled only when the incremental value mode is selected.

(b) According to the accel/decel speed set by "accel/decel speed setting," operation is performed in the rotating direction set by "special positioning setting" at the set speed (V).

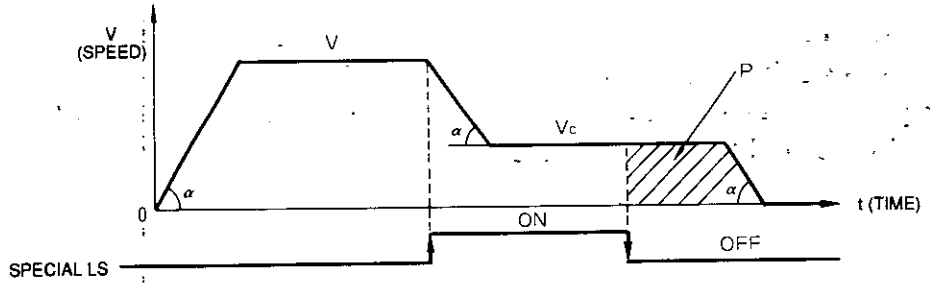
When external input "special LS ($\overline{\text{SPLS}}$)" ON is detected, speed is reduced down to the creep speed (Vc) set by "special positioning setting." Then when "special LS ($\overline{\text{SPLS}}$)" OFF is detected, pulses (P) for the set value are output and operation stops.

(c) Operation is started by turning ON output coil "special positioning command" (startup differential).

(d) Operation is canceled by turning ON output coil "stop command" or external input "external stop ($\overline{\text{STOP}}$)."

(2) Special Positioning Operation Basic Pattern

(a) Fig. 3.13 shows the special positioning operation basic pattern at linear accel/decel.



V : Steady speed
Vc : Creep speed
P : Pulse outputting value
α : Accel/decel speed set by "accel/decel speed setting"

Fig. 3.13 Special Positioning Operation at Linear Accel / Decel

Note : Operation can be performed also at S-curve accel/decel.

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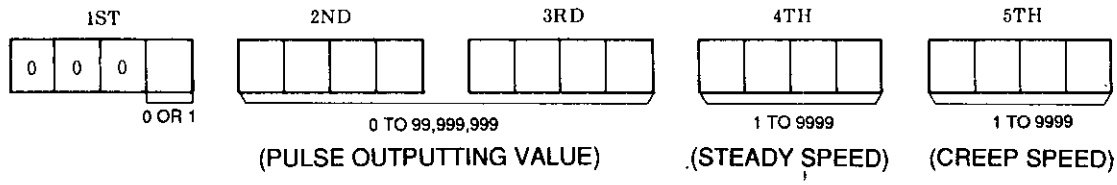
(3) Special Positioning Operation Setting Items

In special positioning operation, the motor rotating direction, pulse outputting value P, steady speed V and creep speed Vc are preset.

[Setting Range]

Motor rotating direction :	0 or 1
Pulse outputting value P :	0 to 99,999,999 P
Steady speed V :	10 to 99,990 pps (units of 10 pps)
	20 to 199,980 pps (units of 20 pps)
Creep speed Vc :	10 to 99,990 pps (units of 10 pps)
	20 to 199,980 pps (units of 20 pps)

(4) Output Register of Special Positioning Operation



0 : Plus direction rotation

1 : Minus direction rotation

(5) Precautions on Special Positioning Operation

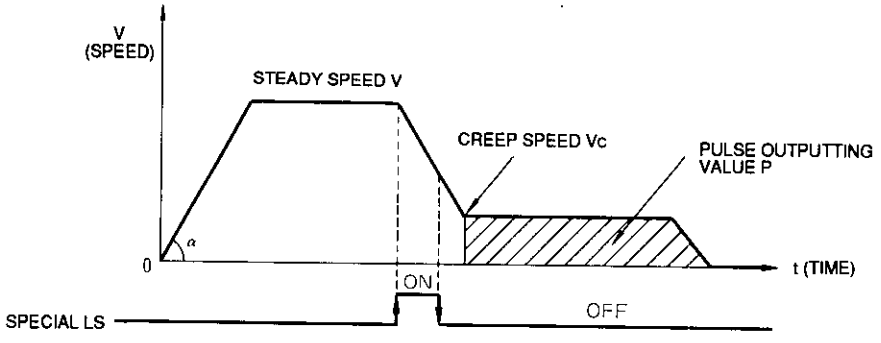
(a) Steady speed and creep speed

The relation between steady speed and creep speed is to be : steady speed ≧ creep speed.

If creep speed is larger than steady speed, error code "24" (steady speed ≧ creep speed is not satisfied) occurs.

(b) When "special LS ($\overline{\text{SPLS}}$)" ON is too short

If "special LS ($\overline{\text{SPLS}}$)" is turned ON before creep speed is reached during deceleration after "special LS ($\overline{\text{SPLS}}$)" is detected, pulses for the set value are output and operation stops after creep speed is reached.



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3.6 SPECIAL POSITIONING OPERATION (PROVIDED WITH LS INPUT) (Cont'd)

(c) Dispersion of "special LS ($\overline{\text{SPLS}}$)" detection time
Since there is dispersion of up to 5 ms at detection of each "special LS ($\overline{\text{SPLS}}$)" OFF to ON or ON to OFF during running, an error occurs in positioning accuracy.

(d) Lag pulse value error
Lag pulses are accumulated during running. (The faster the speed, the more the lag pulses are accumulated.)

Therefore, from when "special LS ($\overline{\text{SPLS}}$)" is turned off to when it stops, actual movement is made for (number of pulses output + number of lag pulses). To determine the position, the number of lag pulses must be considered. To reduce creep speed Vc sufficiently can be efficient.

3.7 HANDLE OPERATION

(1) Handle Operation Basic Function

(a) By inputting signal externally from the manual pulse generator, handle operation is enabled. By rotating the handle, movement is made in the plus or minus direction according to the handle rotating direction.

(b) Handle operation is enabled when either of the following AND conditions are filled :

1) Output coils "stop command" and "external command pulse input enable" are both ON.

2) External input "external stop ($\overline{\text{STOP}}$)" and "external pulse input enable ($\overline{\text{EXEN}}$)" are satisfied.

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3.8 SYNCHRONOUS OPERATION

(1) Synchronous Operation Basic Function

(a) In synchronous operation, command pulse synchronous operation, PG pulse synchronous operation, simultaneous start operation and set value start operation are available.

(b) Up to 13 synchronous groups (from A to M) can be composed.

There is one master axis in each group ; the other axes are slave axes in the group.

(c) It is not necessary to consider the order of A to M for group setting (or setting of master axes).

For example, groups A, E and L can be composed. However, master A is absolutely needed. Master A acts as group master, and at the same time, has a function as system master. All masters in the system operate with the timing from master A.

(d) Groups can be composed flexibly by "initial setting 2."

For example, if there are axes from (1) to (9) and axes are allocated as shown below :

(1) Master A (2) Slave A (3) Slave A
(4) Master B (5) Slave B (6) Slave B
(7) Master C (8) Slave C
(9) Single axis

Then they can be changed as shown below :

(1) Master A (Operates as single axis.)
(3) Master B (4) Slave B (5) Slave B
(7) Master C (6) Slave C
(2) Master D (9) Slave D
(8) Independent axis

However, only master A cannot be changed.

When there is no master A, error code "12" (receiving data have been faulty three times consecuitvely) occurs in all th other masters and comnmumication breaks down.

When only group A is used, master A can be changed.

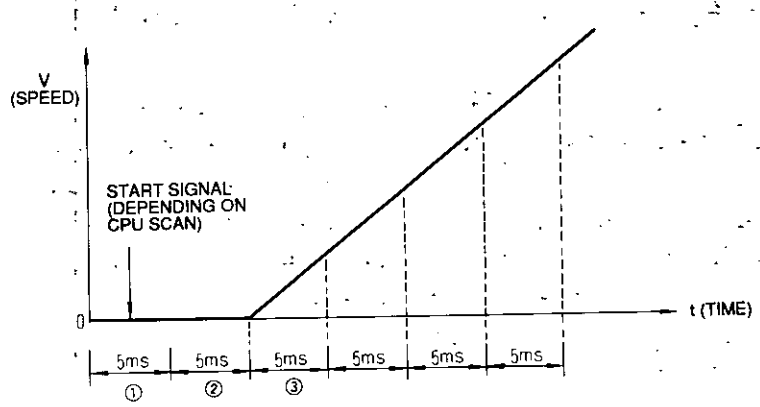
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3.8 SYNCHRONOUS OPERATION (Cont'd)

(e) Outputting start delay from command

At command pluse synchronous operation and simultaneuos start operation, pulse outputting is delayed, compared to independent axis.

(Example 1) Independent axis

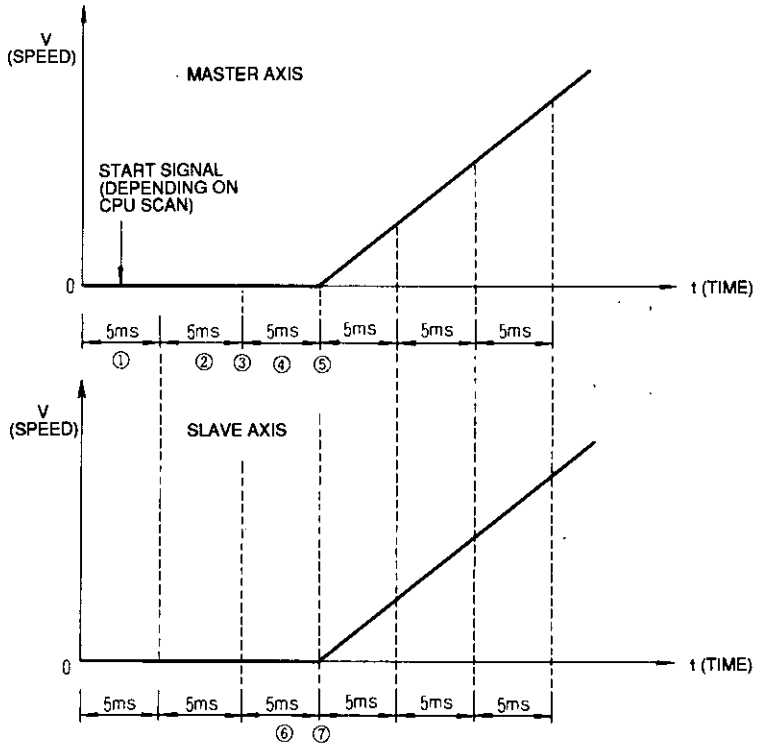


① Start signal detection error (0 to 5 ms)
② Outputting value calculation time (fixed to 5 ms)
③ Outputting start

Pulses start to be output 5 to 10 ms after the start signal.

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(Example 2) Command pulse synchronous operation



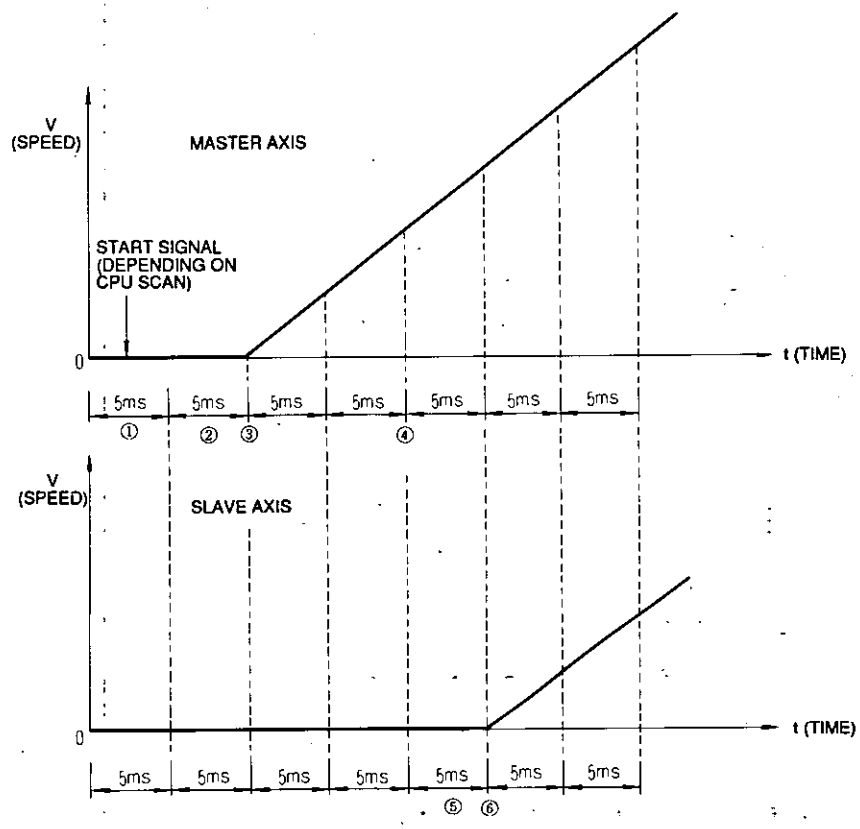
① Start signal detection error (0 to 5 ms)
② Master outputting value calculation time (fixed to 5 ms)
③ Transmission of first time moving value (command)
④ WAIT time for timing (fixed to 5 ms)
⑤ Master outputting start
⑥ Slave outputting value calculation time (fixed to 5 ms)
⑦ Slave outputting start

Pulses start to be output 5 to 10 ms after the start signal.
Master and slave start outputting at the same timing.

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3.8 SYNCHRONOUS OPERATION (Cont'd)

(Example 3) PG pulse synchronous operation

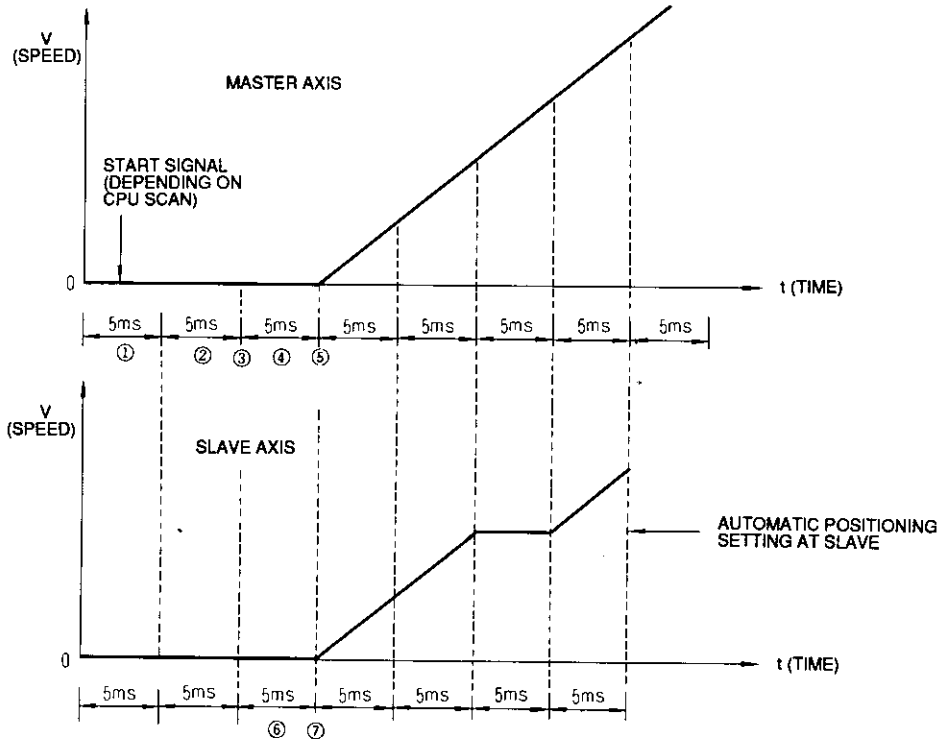


① Start signal detection error (0 to 5 ms)
② Master outputting value calculation time (fixed to 5 ms)
③ Master outputting start
④ Transmission of first time moving value (PG pulses)
⑤ Slave outputting value calculation time (fixed to 5 ms)
⑥ Slave outputting start

Pulses start to be output 5 to 10 ms after the start signal.
Slave starts outputting 15 ms after the master.

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(Example 4) Simultaneous start

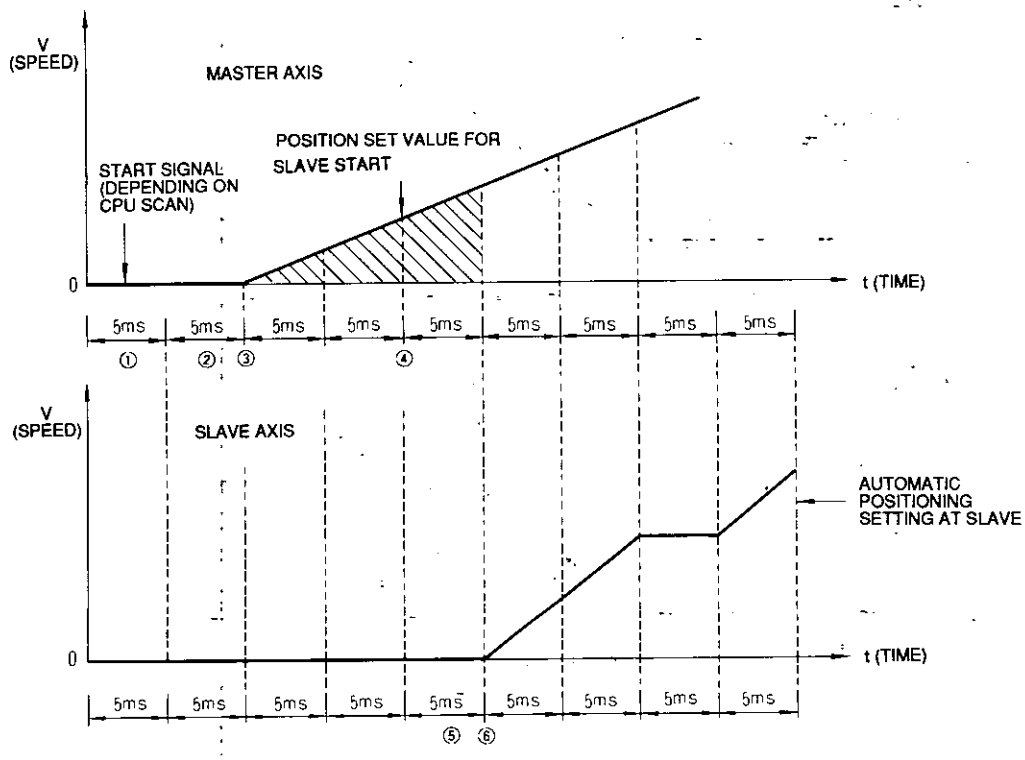


① Start signal detection error (0 to 5 ms)
② Master outputting value calculation time (fixed to 5 ms)
③ Start transmission from master to slave
④ WAIT time for timing (fixed to 5 ms)
⑤ Master outputting start
⑥ Slave outputting value calculation time (fixed to 5 ms)
⑦ Slave outputting start

Pulses start to be output 10 to 15 ms after the start signal.
Master and slave start outputting at the same timing.

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(Example 5) Set value start



① Start signal detection error (0 to 5 ms)
② Master outputting value calculation time (fixed to 5 ms)
③ Master outputting start, and slave start and moving estimation value transmission start
④ Data transmission when master moving estimation value exceeds slave operation starting position
⑤ Slave outputting value calculation time (fixed to 5 ms)
⑥ Slave outputting start

Pulses start to be output 5 to 10 ms after the start signal.
Slave start depends on master moving value (command pulse estimation value).

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(f) Table 3.1 shows the combination of synchronization methods and operation functions.

Table 3.1 Combination of Synchronization Method and Operation Functions

Operation Function \ Synchronization Method	Command Pulse Synchronization	PG Pulse Synchronization	Simultaneous Start	Set Value Start
1st-step Speed Operation	○	○	○	○
Multi-step Speed Operation	○	○	○	○
Variable Speed Operation	○	○	×	×
JOG Operation	○	○	×	×
Zero Return Operation	○ (Zero return not available for slaves.)	○ (Zero return not available for slaves.)	×	×
Special Positioning	○ (Special positioning not available for slaves.)	○ (Special positioning not available for slaves.)	×	×
Handle Operation	○	○	×	×

(g) Synchronization method must be set so that master and slaves are of the same method. Otherwise, error code "27" (slave synchronization method setting differs from master.) occurs.

3.8.1 COMMAND PULSE SYNCHRONOUS OPERATION

(1) Command Pulse Synchronous Operation Basic Function

(a) When the start command is input to the master module, the master axis calculates moving value per 5 ms according to the set accel/decel speed, speed, or position. The master module sends the resultant calculation to the slave module every 5 ms. The master axis sends the moving value and outputs the pulses of that moving value the next sending time. The slave axis receives the moving value and outputs the pulses of that moving value the next receiving time.

In this method, the master axis and slave axis are operated by the same command. Additionally, an error between outputting timing to the master axis and slave axis is reduced.

(b) The slave axis can be divided in M/N according to the moving value received from the master axis.

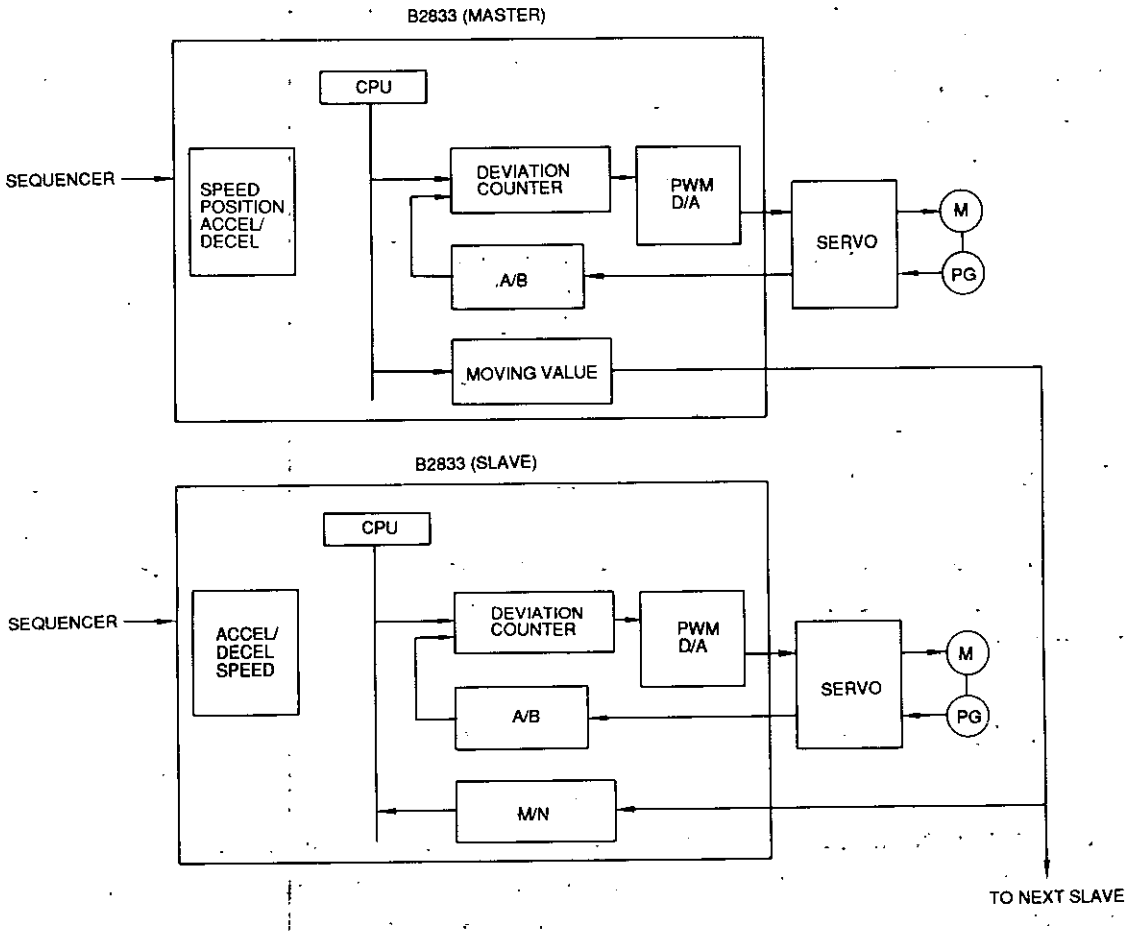
(c) Operation must be started in accordance with each operation starting method.

(d) Operation must be canceled in accordance with each operation stopping method.

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3.8 SYNCHRONOUS OPERATION (Cont'd)

(e) The following is the block diagram at command pulse synchronization.



(f) Master and slave reverse rotation direction

In synchronous operation of the command pulse method, the slave axis and master axis can be rotated in the reverse direction. The setting is performed by the 1st register of initial setting 2. When the reverse direction is set, the slave axis operates regarding all data signs sent from the master axis as opposite signs.

(g) Release of master and slave allocation after synchronous operation

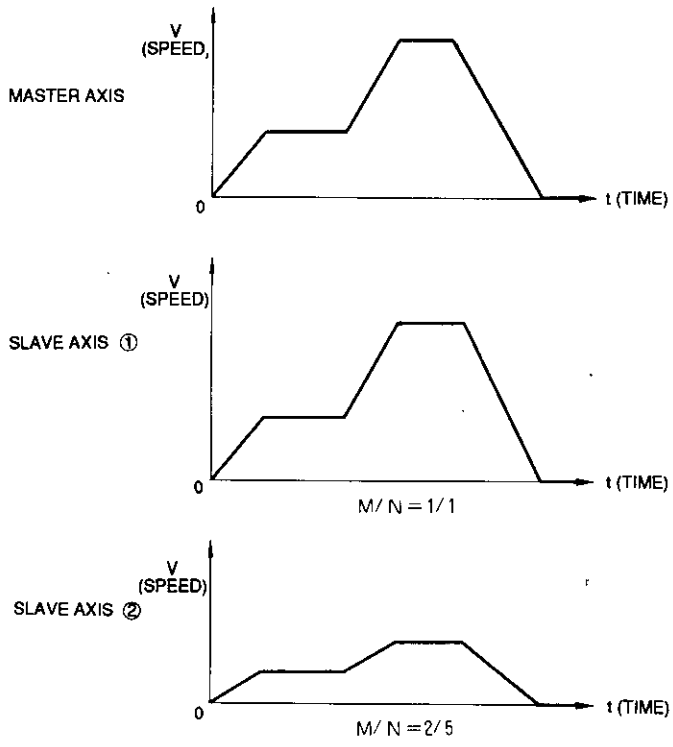
In synchronous operation of the command pulse method, master and slave allocation is automatically released after completion of one synchronous operation so that an independent axis can be set. The setting is performed by the 1st register of initial setting 2.

However, this is not applicable for master A.

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(2) Command Pulse Synchronous Operation Basic Pattern

(a) The basic pattern is in accordance with each operation basic pattern. The following shows typical patterns when M/N is varied.



Note : Moving value is reduced.

(3) Setting of Command Pulse Synchronous Operation

(a) Synchronization mode must be set for both master and slave by initial setting 2.

(b) Operation setting must be in accordance with each operation setting method. No operation setting is needed for slave axes. However, "accel/decel speed setting" is needed.

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3.8.1 COMMAND PULSE SYNCHRONOUS OPERATION (Cont'd)

(4) Precautions on Command Pulse Synchronous Operation

(a) Operation start command

Input the operation start command only to the master. If it is input to the slave, error code "49" (operation command is input to slave without releasing synchronization) occurs.

(b) Stop command

By inputting the operation stop command (differing on each operation) to the master axis, all axes decelerate to a stop.

By inputting output coil "stop command" or external input "external stop ($\overline{\text{STOP}}$)" to a slave axis, only that axis decelerates to a stop. This deceleration speed is in the accel/decel speed set independently to the slave by "accel/decel speed setting."

(c) Stop command and synchronization mode release command

When a slave axis is set to "stop command" ON, "external stop ($\overline{\text{STOP}}$)" ON or output coil "synchronization mode release" ON, only that axis does not operate.

However, an error does not occur.

(d) COIN detection

Slave axes do not check the COIN signal at operation start. The master axis checks the COIN signal in accordance with each operation COIN checking method.

3.8.2 PG PULSE SYNCHRONOUS OPERATION

(1) PG Pulse Synchronous Operation Basic Function

(a) When the start command is input to the master module, the master axis calculates moving value per 5 ms according to the set accel/decel speed, speed, or position. The master module outputs the resultant calculation every 5 ms. The master axis sends the feedback pulses from its PG as moving value to the slave. The slave axis receives the moving value and outputs the pulses of that moving value the next receiving time.

In this case, since the master axis sends the moving value to the slave axis after it operates, the slave axis starts outputting15 ms after the master axis.

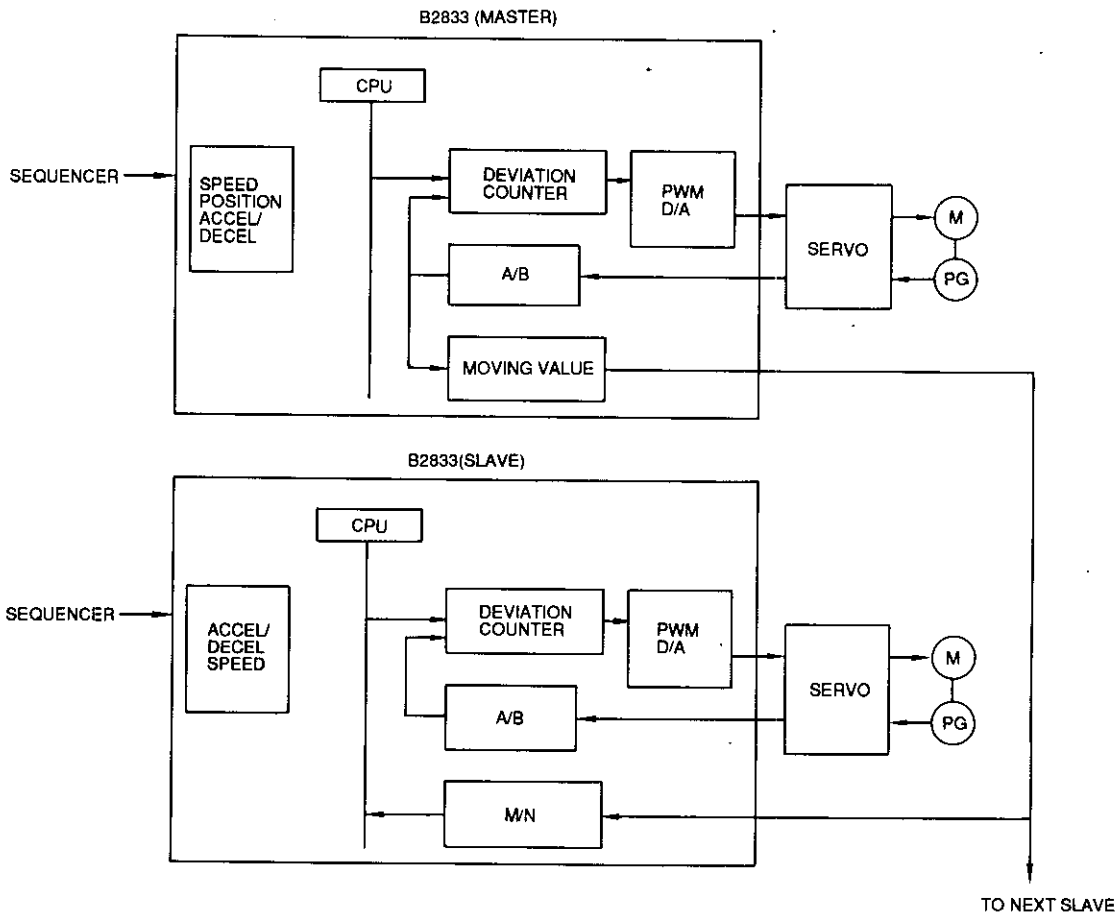
(b) The slave axis can be divided in M/N according to the moving value (PG pulses) received from the master axis.

(c) Operation must be started in accordance with each operation starting method.

(d) Operation must be canceled in accordance with each operation stopping method.

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(e) The following is the block diagram at PG pulse synchronization.



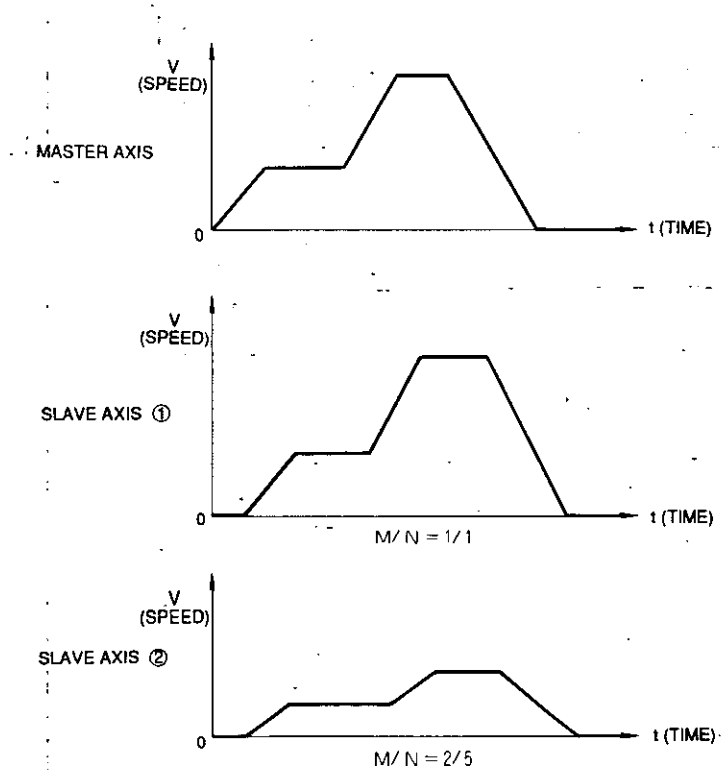
(f) Master and slave reverse rotation direction

In synchronous operation of the PG pulse method, the slave axis and master axis can be rotated in the reverse direction. The setting is performed by the 1st register of initial setting 2. When the reverse direction is set, the slave axis operates regarding all data signs sent from the master axis as opposite signs.

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(2) PG Pulse Synchronous Operation Basic Pattern

(a) The basic pattern is in accordance with each operation basic pattern. The following shows typical patterns when M/N is varied.



Note : Since the slave has the master PG pulses as reference, it does not operate in the same way as the master as shown above in actual applications.

(3) Setting of PG Pulse Synchronous Operation

(a) Synchronization mode must be set for both master and slave by initial setting 2.

(b) Operation setting must be in accordance with each operation setting method. No operation setting is needed for slave axes. However, "accel/decel speed setting" is needed.

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(4) Precautions on PG Pulse Synchronous Operation

(a) Operation start command

Input the operation start command only to the master. If it is input to the slave, error code "49" (operation command is input to slave without releasing synchronization) occurs.

(b) Stop command

By inputting the operation stop command (differing on each operation) to the master axis, all axes decelerate to a stop. By inputting output coil "stop command" or external input "external stop ($\overline{\text{STOP}}$)" to a slave axis, only that axis decelerates to a stop. This deceleration speed is in the accel/decel speed set independently to the slave by "accel/decel speed setting."

(c) Stop command and synchronization mode release command

When a slave axis is set to "stop command" ON, "external stop ($\overline{\text{STOP}}$)" ON or output coil "synchronization mode release" ON, only that axis does not operate.

However, an error does not occur.

(d) COIN detection

Slave axes do not check the COIN signal at operation start. The master axis checks the COIN signal in accordance with each operation COIN checking method.

3.8.3 SIMULTANEOUS START OPERATION

(1) Simultaneous Start Operation Basic Function

(a) Simultaneous starts are enabled in a group.

Set accel/decel speed, speed and position to each master and slave in advance. When the start command is input to the master module, the master axis sends the simultaneous start signal to the slave module. Each axis (master and slave) calculates moving value per 5 ms in accordance with the set accel/decel speed, speed and position. Each axis outputs the resultant calculation every 5 ms. Therefore, each axis operation pattern after starting can be set freely.

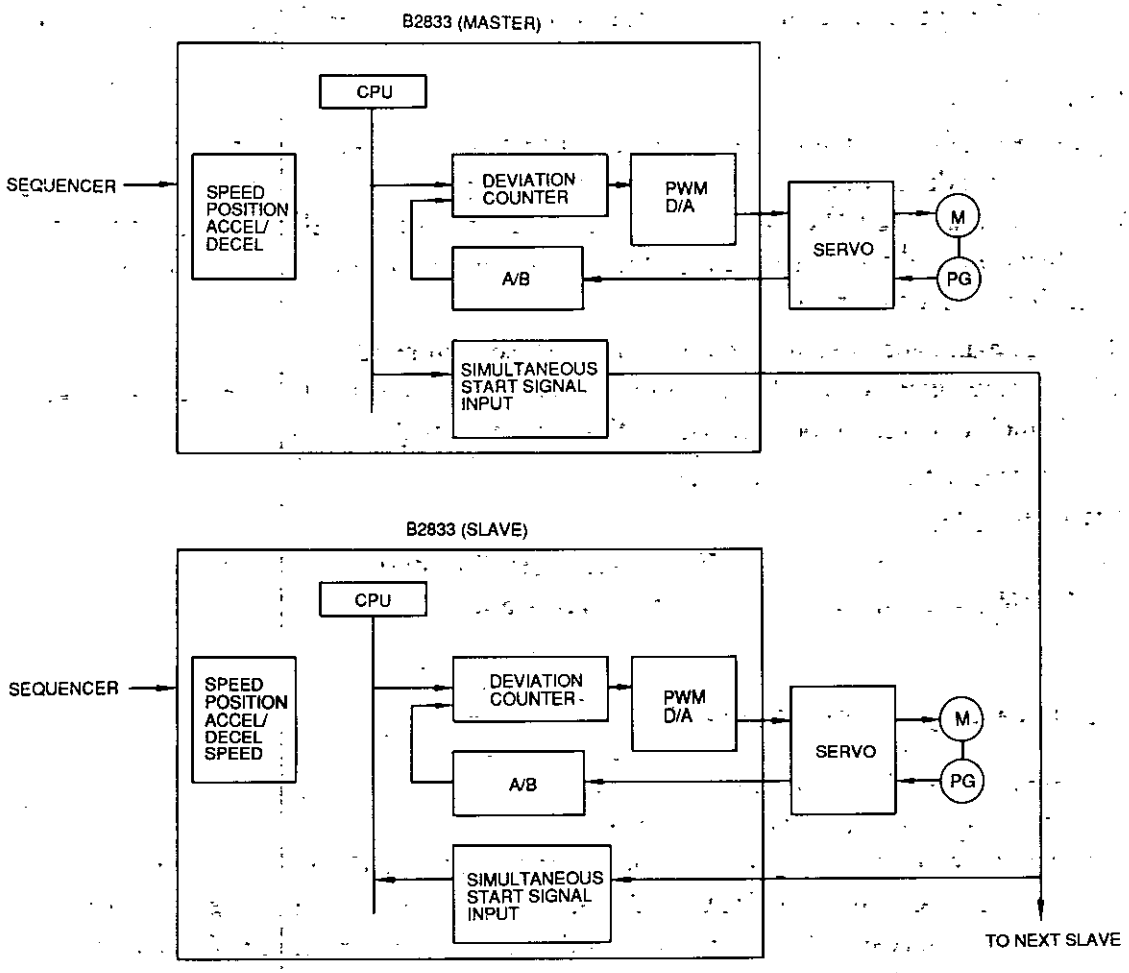
(b) Operation must be started by setting the 1st-step speed or multi-step speed operation start to the master axis.

(c) Operation must be canceled by setting internal coil "stop command" ON or external input" external stop ($\overline{\text{STOP}}$)" ON.

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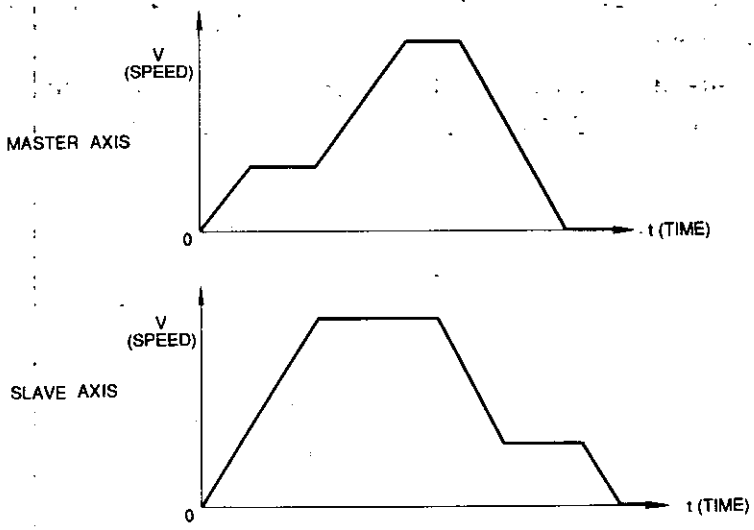
3.8.3 SIMULTANEOUS START OPERATION (Cont'd)

(d) The following shows the block diagram at simultaneous start.



(2) Simultaneous Start Operation Basic Pattern

(a) The basic pattern is in accordance with the 1st-step speed or multi-step speed operation basic pattern.



Note : Master and slave operation patterns can be set freely.

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(3) Setting of Simultaneous Start

(a) Synchronization mode must be set for both master and slave by initial setting 2.

(b) Operation setting must be in accordance with the 1st-step speed or multi-step speed operation setting. Operation setting must be made to each axis of master and slave axes.

(4) Precautions on Simultaneous Start Operation

(a) Operation start command

Input the operation start command only to the master. If it is input to the slave, error code "49" (operation command is input to slave without releasing synchronization) occurs.

(b) Stop command

To cancel operation, the stop command must be input to all axes to be stopped. Each axis decelerates to a stop at the deceleration speed set by "accel/decel speed setting."

(c) Stop command and synchronization mode release

When a slave axis is set to "stop command" ON, "external stop ($\overline{\text{STOP}}$)" ON or "synchronization mode release" ON, only that axis does not operate.

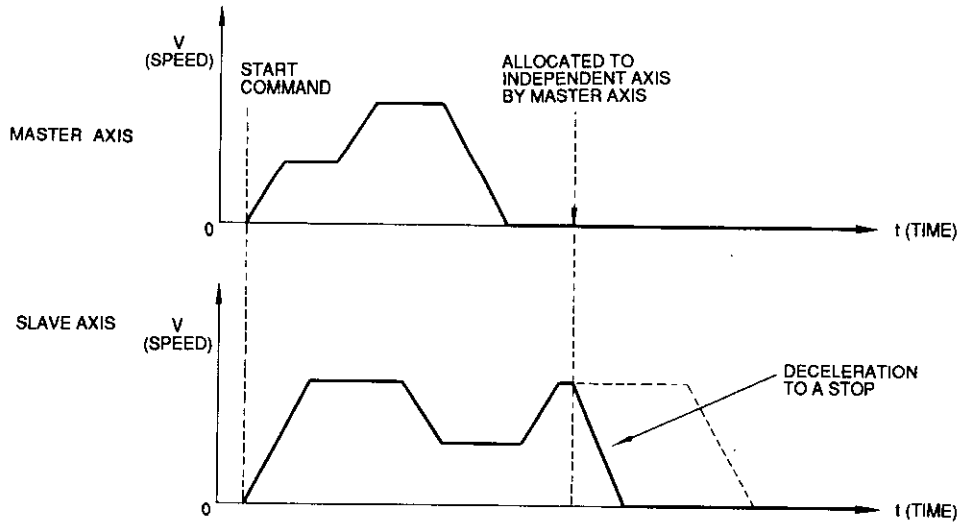
However, an error does not occur.

(d) COIN detection

Slave axes do not check the COIN signal at operation start.
The master axis checks the COIN signal.

(e) Master axis allocation release

When a slave axis releases master axis allocation during simultaneous start operation (i.e., the master axis is no longer master), the slave axis decelerates to a stop.



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3.8.4 SET VALUE START OPERATION

(1) Set Value Start Operation Basic Function

(a) When the master module moves to a certain position during operation, the slave axes start operating. For each master and slave axis, accel/decel speed, speed and position are set. Additionally, set value is provided to the slave in advance.

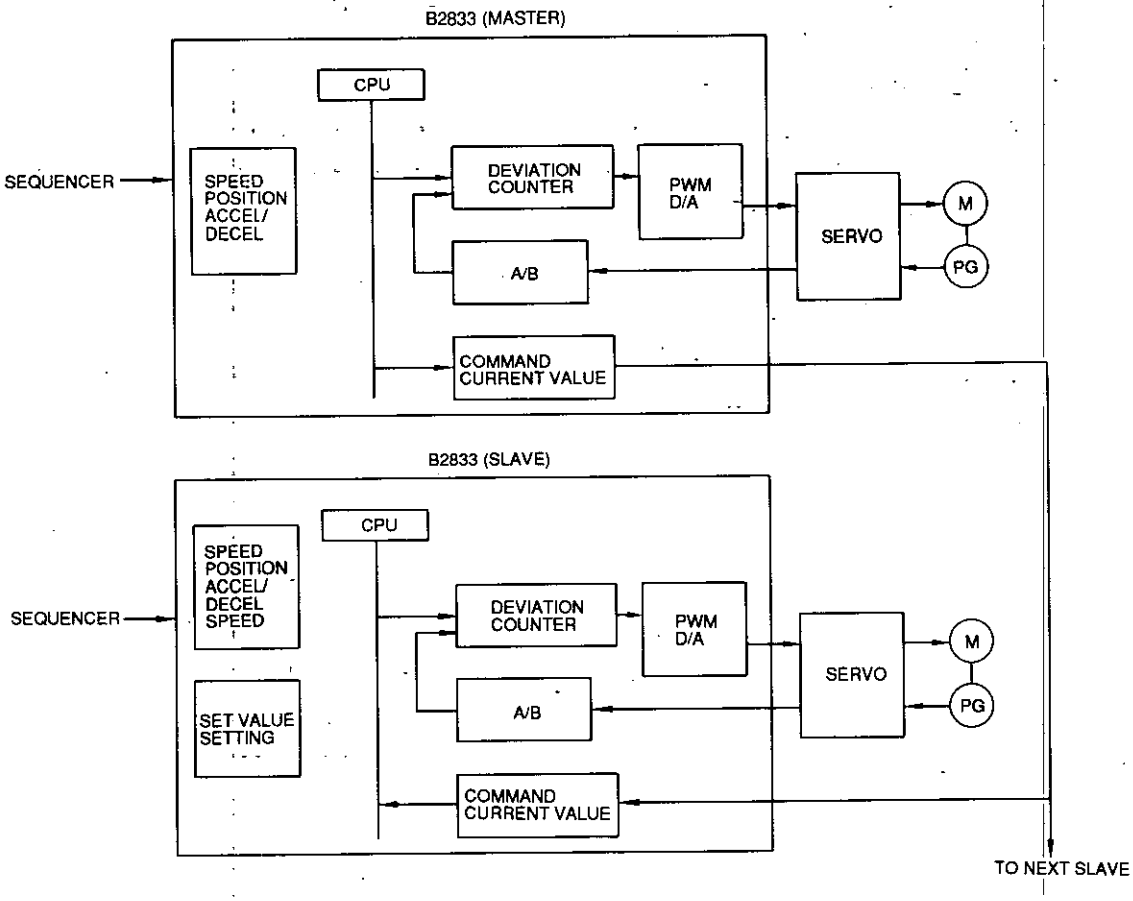
When the start command is input to the master module, the master axis calculates the moving value per 5 ms and outputs every 5 ms in accordance with the set accel/decel speed, speed and position. The master axis sends its command current position to slave every 5 ms. The slave axis compares the master command current value with the slave set value, and when they coincide, starts outputting at the set accel/decel speed, speed and position.

Therefore, each axis operation pattern after operation starts can be made freely by setting.

(b) Operation must be started by setting the 1st-step speed or multi-step speed operation start to the master axis.

(c) Operation must be canceled by setting internal coil "stop command" ON or "external input external stop ($\overline{\text{STOP}}$)" ON.

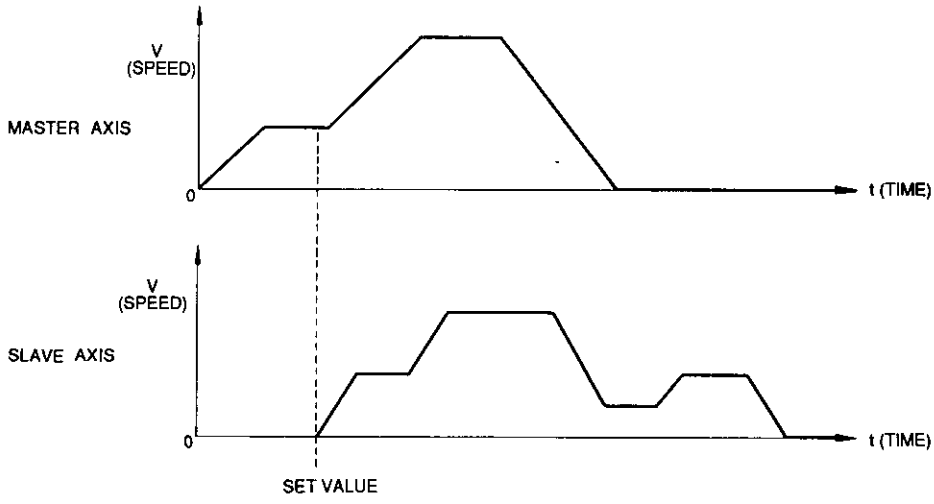
(d) The following shows the block diagram at set value start operation.



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(2) Set Value Start Operation Basic Pattern

(a) The basic pattern is in accordance with the 1st-step speed or multi-step speed operation.



Note : Master and slave operation patterns differ from each other.

(3) Setting of Set Value Start Operation

(a) Synchronization mode setting must be made for both master and slave by initial setting 2.

(b) Operation setting must be in accordance with the 1st-step speed operation or multi-step speed operation setting. For master and slave axes, operation setting must be made to each axis.

(4) Precautions on Set Value Start Operation

(a) Operation start command

Input the operation start command only to the master. If it is input to the slave, error code "49" (operation command is input to slave without releasing synchronization) occurs.

(b) Stop command

To cancel operation, the stop command must be input to all axes to be stopped. Each axis decelerates to a stop at the deceleration speed set by "accel/decel speed setting."

(c) Stop command and synchronization mode release

When a slave axis is set to "stop command" ON, "external stop ($\overline{\text{STOP}}$)" ON or "synchronization mode release" ON, only that axis does not operate.

However, an error does not occur.

(d) COIN detection

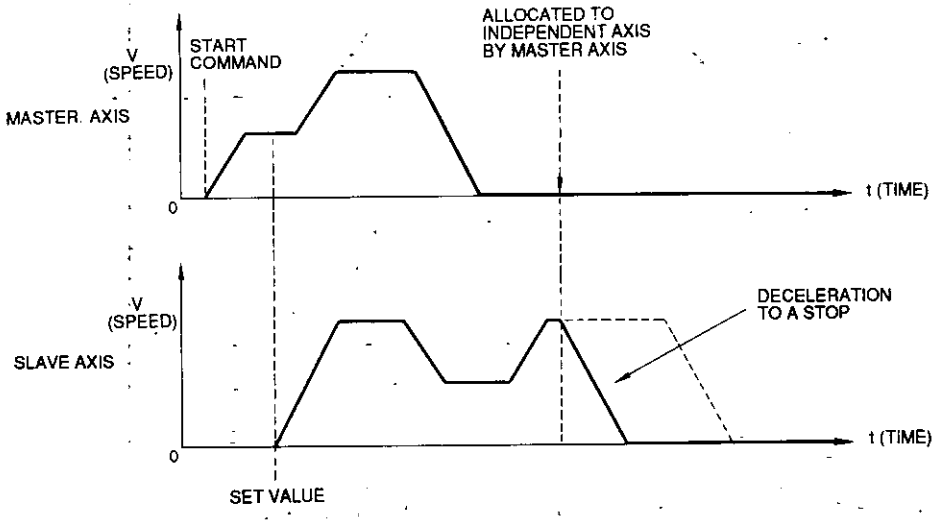
Slave axes do not check the COIN signal at operation start. The master axis checks the COIN signal.

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3.8.4 SET VALUE START OPERATION (Cont'd)

(e) Master axis allocation release

When a slave axis releases master axis allocation during simultaneous start operation (i.e., the master axis is no longer master), the slave axis decelerates to a stop.



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3.9 PASSING POINT DETECTION (NOTCH OUTPUT) FUNCTION

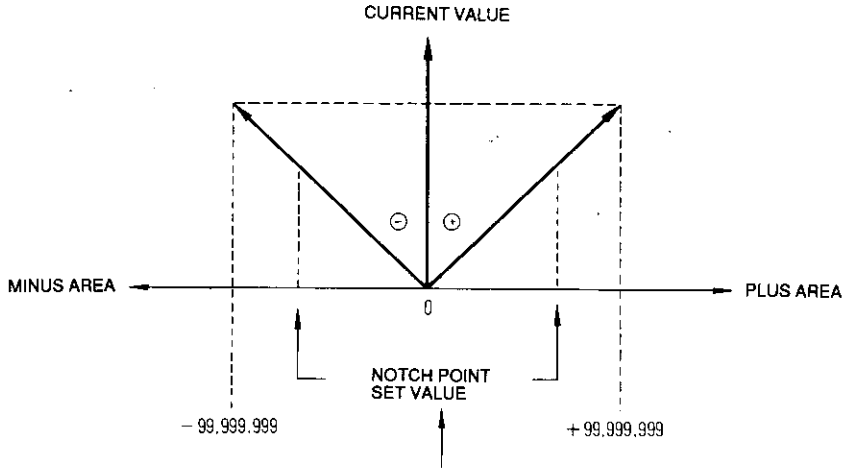
(1) Passing Point Detection Basic Function

(a) When the notch point set value and self axis feedback current value become equal, input relay "notch signal output" and external output "notch output ($\overline{\text{NOTCH}}$)" are turned ON.

(b) Passing point detection function becomes effective at independent axis and master axis.

(c) The timing to turn OFF the notch signal is at the next start command input.

(d) Notch point setting can be made only at one point in the range from -99,999,999 to +99,999,999 pulses.



Note : Setting must be made only at one point.

(2) Passing Point Detection Function Basic Pattern

(a) Fig. 3.14 shows the basic pattern of passing point detection function.

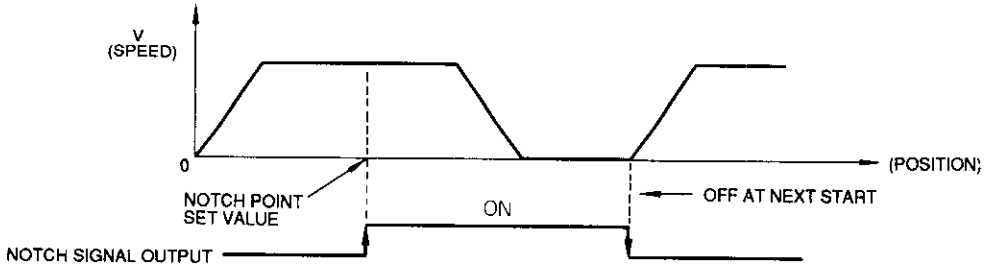


Fig. 3.14 Typical Passing Point Detection Function

(3) Setting Items of Passing Point Detection Function

(a) In passing point detection function setting, set value sign and setting position (notch point) P are set.

[Setting Range]

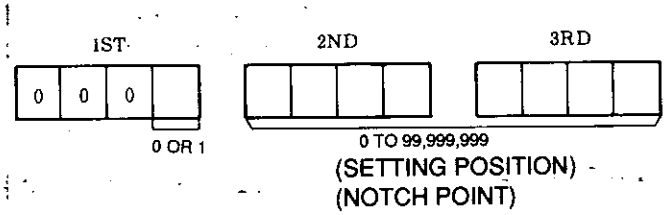
Sign : 0 or 1

Setting position (notch point) : 0 to 99,999,999 P

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3.9 PASSING POINT DETECTION (NOTCH OUTPUT) FUNCTION (Cont'd)

(4) Output Register Setting of Passing Point Detection Function



0 : Plus area
1 : Minus area

(5) Precautions on Passing Point Detection Function

(a) Set value and feedback pulses are compared with each other every 5 ms. Therefore, to detect coincidence, an error of up to 5 ms occurs.

(b) In handle operation, for the notch point signal, coil is turned ON only for one scan and external output (including LEDs) is turned ON for 500 ms.

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3.10 ABSOLUTE ENCODER ZERO-POINT MATCHING FUNCTION

(1) Absolute Encoder Zero-point Matching Basic Function

(a) Absolute encoder zero-point matching function (hereafter called zero-point set value) outputs the SEN signal to servo and receives the absolute position data sent by the servo ; then calculates zero-point set value and absolute position.

In this way, the current value with machine zero point as reference (0) is set as the self-axis current value.

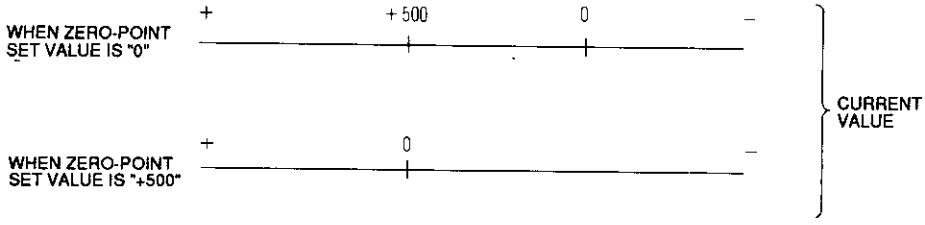
(b) To set zero-point set value, the machine zero point is determined and the absolute encoder absolute position at that position is stored in the holding register of the master CPU (GL60V, GL60S, etc.).

After the servo is turned off and the power supply is turned off and on, the value stored to the zero-point set value in advance is set.

(Example)

Machine is started up with zero-point set value "0." In this status, the machine is moved up to the machine zero point. If that position is +500, set the zero-point set value to "+500" and start the machine. (The servo must be turned off.)

By the above procedure, the current value with the machine zero point "0" is made the current self-axis value.



(2) Setting Items of Absolute Encoder Zero-point Matching Function

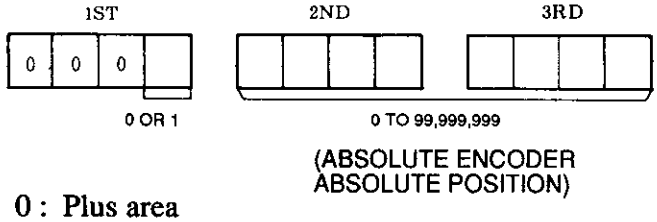
(a) In zero-point set value setting, set value sign and absolute encoder absolute position are set.

[Setting Range]

Sign : 0 or 1

Absolute encoder absolute position : 0 to 99,999,999 P

(3) Output Register Setting of Absolute Encoder Zero-point Matching Function



0 : Plus area

1 : Minus area

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3.11 CURRENT VALUE SETTING FUNCTION

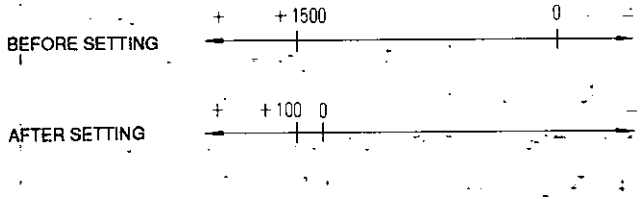
(1) Current Value Setting Basic Function

(a) Current value can be changed.

(Example)

Assume that the machine is at the position of +1500.

By setting current value set value "+100," the position is changed from (+1500) to +100.



(2) Setting Items of Current Value Setting

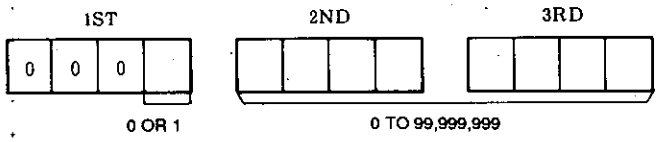
(a) In current value setting, set value sign and current value changed value are set.

[Setting Range]

Sign : 0 or 1

Current value changed value : 0 to 99,999,999 P

(3) Output Register Setting of Current Value Setting



0 : Plus area

1 : Minus area

(4) Precautions on Current Value Setting

When in the absolute value mode but not within the counting enabled range, even by current value setting, the value does not return to the counting enabled range.

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3.12 OPERATION PROHIBITION AT SETTING DATA ERROR

(1) If an error occurs in set values of initial setting, accel/decel speed setting or other operation setting, operation is not performed even by inputting the operation command.

Error code "51" (operation command is turned ON at set value error) occurs.

(2) To release operation prohibition, the relevant setting error code and error code "51" display must be cleared so that the operation will be enabled.

Error display can be cleared by error code reset, initial setting or module reset.

(3) Table 3.2 shows the setting errors related to operation prohibition.

Table 3.2 Setting Errors Related to Operation Prohibition

Error Code	Contents
20	Each setting command is turned on in the status of "stop" coil OFF.
21	Some setting commands are turned on simultaneously.
22	Values are not within the setting range at initial setting.
23	Operation set value error Operation setting without accel/decel speed setting
24	Steady speed ≧ creep speed is not satisfied. (Zero return, special positioning)
26	Current value setting or initial setting command is turned on during deceleration at "stop" coil ON.
29	Multi-step or the 1st-step speed operation setting is input during various speed operations.

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3.13 SETTING PARAMETER LIST

Table 3.3 shows the parameters required (or to be set) at each operation.

Table 3.3 Setting Parameter List

Operation Function	Parameter	Setting Method	Remarks
Accel/Decel Speed Setting	α	Set by ladder during STOP input	Common in all operation modes. For S-curve accel/decel.
1st-step Speed Operation	α	Set by ladder during STOP input	Set by accel/decel speed setting
	V, S	Always set by ladder (For reservation setting)	Disabled during variable speed operation
Multi-step Speed Operation	α	Set by ladder during STOP input	Set by accel/decel speed setting
	V_N, S	Always set by ladder (For reservation setting)	Nmax of V_N= 20 Disabled during variable speed operation
Variable Speed Operation	α	Set by ladder during STOP input	Set by accel/decel speed setting
	V_N	Set by ladder during variable speed operation	N of V_N not limited
	S	Set by ladder during STOP input	Setting not always needed
JOG Setting	α	Set by ladder during STOP input	Set by accel/decel speed setting
	V_L, V_H	Set by ladder during STOP input	—
Zero Return Operation	α	Set by ladder during STOP input	Set by accel/decel speed setting
	V, V_C	Set by ladder during STOP input	Two modes available
Special Positioning	α	Set by ladder during STOP input	Set by accel/decel speed setting
	V, V_C, S_P	Set by ladder during STOP input	—
Handle Operation	—	—	Set by ladder in internal coil in external pulse input enabled mode

Note :
α : Accel/decel apeed, V : Speed, V_C: Creep speed, S : Moving distance,
S_P : Pulse outputting value

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4. INTERNAL INTERFACE

4.1 I/O ALLOCATION OF CPU MODULE

For interface between the CPU module and B2833, output coil, input relay, output register and input register are allocated. I/O allocation points of the CPU module are listed in Table 4.1. (Allocation is not needed for B2200.)

Table 4.1 Number of I/O Allocations of CPU Modules

I/O Allocation	Points/Registers	Signal Flow	
		CPU Module	B 2833
Output Coil	32 Points *	→	
Input Relay	32 Points	←	
Output Register	8 Registers	→	
Input Register	8 Registers	←	

* Set to 48 points when using extended functions.

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4.2 OUTPUT COIL (CONTROL SIGNAL)

(1) List of Output Coils

32 output coils are provided and used as the control signals from the CPU module to B2833. Table 4.2 lists the output coils.

Table 4.2 List of Output Coils

Reference No.	GV60V bit	Signal Name
1 + 8n	OB×××× + 0	Module reset
2 + 8n	1	Initial setting 1
3 + 8n	2	Initial setting 2
4 + 8n	3	SEN signal ON command
5 + 8n	4	Synchronous operation mode release command
6 + 8n	5	Stop command
7 + 8n	6	Accel/decel speed setting
8 + 8n	7	Auto positioning setting
9 + 8n	8	1st-step speed command
10 + 8n	9	Multi-step speed command
11 + 8n	A	Variable speed setting
12 + 8n	B	Variable speed command
13 + 8n	C	Current value setting
14 + 8n	D	Notch point setting
15 + 8n	E	JOG setting
16 + 8n	F	JOGH command
17 + 8n	10	JOGL command
18 + 8n	11	Zero return setting
19 + 8n	12	Zero return command
20 + 8n	13	Special positioning setting
21 + 8n	14	Special positioning command
22 + 8n	15	Error code reset
23 + 8n	16	Deviation counter reset
24 + 8n	17	Monitor 1
25 + 8n	18	Monitor 2
26 + 8n	19	Monitor 3
27 + 8n	1A	External command pulse input enabled
28 + 8n	1B	Battery error command
29 + 8n	1C	Error code display changing command
30 + 8n	1D	External start DISABLE command
31 + 8n	1E	JOG/Zero return direction OFF : Forward ON : Reverse
32 + 8n	1F	Position Loop ON/OFF OFF : Normal ON : Position Loop OFF
33 + 8n	20	Reserved operation DISABLE
34 + 8n	21	Variable speed operation External start effective
35 + 8n	22	Filter constants setting

n = 0, 1, 2 ·····

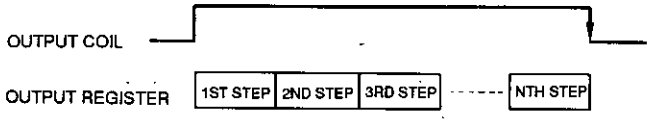
Shows the reference No. at output coil allocation.

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(2) Contents of Each Output Coil

32 output coils function as control signals which are detailed in Table 4.3. B2833 operates while confirming the ON/OFF condition of each output coil. (See Table 4.4 "Output Coil Conditions.")

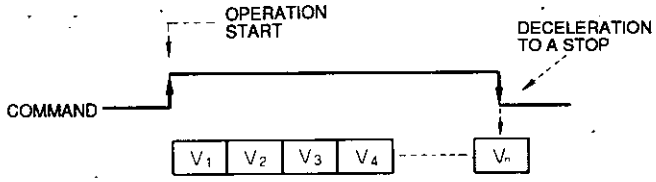
Table 4.3 Output Coils and Their Contents

Signal Name	Description
Module Reset	Module reset command. Upon receiving module reset, B2833 initializes the internal RAM and external input signal, and resets various setpoints, current value and deviation counter to zero. Initial values are set to default values. Effective when turned from OFF to ON.
Initial Setting 1, 2	Command to select module function. Initial setting 1 or 2 is used. Effective at OFF to ON. Each setting is cleared by initial setting 1 command. However, position counter value is not cleared. Initial setting 2 does not clear any setting.
SEN Signal ON Command	Command to output SEN signal to servo when absolute encoder is used (switch selection). Once SEN signal ON command is received, it remains effective until module reset. By setting zero-point matching data to output registers (1st to 3rd) at the same time as the command, position matching is automatically performed at machine zero-point coordinate in B2833. Effective at OFF to ON.
Synchronous Mode Release Command	Command used when slave axis is selected in synchronous operation mode. Effective at ON. While release command is ON, slave axis is released from synchronous operation mode and operation is enabled by the axis operation command. During ON, command pulse from master axis is ineffective. Operation is stopped by turning on release command during operation. During ON, communication errors 12 to 15 are disregarded.
Stop Command	Operation stop command. Effective at ON. When stop command is turned on during operation, machine decelerates to a stop at a curve set by accel/decel speed setting. Each setting (excluding automatic positioning setting) can be set only during stop command ON. (External stop command does not have relation with any setting.)
Accel/Decel Speed Setting	Accel/decel speed setting command. Effective at OFF to ON. By this setting, the same accel/decel speed is set to each setting. Each operation setting is cleared by accel/decel speed setting.
Automatic Positioning Setting	Positioning setting command for 1st-step and multi-step speed operation. Effective at ON (1 scan or more). Reservation setting is enabled.  When data with the same step number are set at several times in data setting, the last data become effective. If any faulty value is set or no value is set in step number setting during operation, that step is to be passed.
1st-step Speed Operation Command	Operation command with the contents of automatic positioning setting step number 0. Next start reservation is enabled during operation. Effective at OFF to ON.
Multi-step Speed Operation Command	Operation command with the contents of automatic positioning setting step numbers 0 to N. Start reservation is enabled during operation. Effective at OFF to ON. When there is a setting to make operation direction reverse in any of steps 0 to N, that step is skipped. When 1st-step speed operation is input simultaneously, 1st-step speed operation has priority. Becomes OR with external input "external start" signal ON.

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4.2 OUTPUT COIL (CONTROL SIGNAL) (Cont'd)

Table 4.3 Output Coils and Their Contents (Cont'd)

Signal Name	Description
Variable Speed Operation Setting	Variable speed operation setting command. Provides the final destination command or instruction without destination by using position reference value. Effective at OFF to ON.
Variable Speed Operation Command	Operation used for speed interruption during operation. Set speed is reached during variable speed operation command ON after variable speed operation setting.  Operation starts by OFF to ON command. By turning operation command OFF during operation, machine decelerates to a stop. When the final destination is reached during command ON, operation is stopped or the command remains effective.
Current Value Setting	Current value change setting command. Effective at OFF to ON.
Notch Point Setting	Notch point setting command. Effective at OFF to ON. Turn ON external output signal when notch point is passed and turn it OFF at operation start. However, by changing setting during external output signal ON, this setting becomes OFF.
JOG Setting	JOG operation rotating direction or speed setting command. JOGH < JOGL setting enabled. Effective at OFF to ON.
JOGH Command JOGL Command	JOGL or JOGH operation command. JOGL has priority to JOGH when they are set simultaneously. Effective at ON.
Zero Return Setting	Zero return operation rotating direction, speed, creep speed setting command. Effective at OFF to ON.
Zero Return Command	Zero return operation command. Effective at OFF to ON.
Special Positioning Operation Setting	Special positioning operation rotating direction pulse outputting value speed, creep speed setting. Effective at OFF to ON.
Special Positioning Command	Special positioning operation command. (Effective in incremantal mode.) Effective at OFF to ON.
Error Code Reset	Error code reset command. Stored error codes other than 06 and 11 are cleared. Effective at OFF to ON.
Deviation Counter Reset	Deviation counter reset command. Sets the number of lag pulses of deviation counter to 0. Effective at ON. When deviation counter reset ON status is changed to OFF, feedback current value is to be reference current value. Feedback pulse is counted even during deviation counter reset. COIN signal is turned ON during deviation counter reset.
Monitor 1 to 3	Data to be monitored are specified by these three monitor coils. Refer to the contents of input registers and monitor. Notes : 1. In multi-step speed setting monitor, data are updated approx every 1 second. 2. Monitored value of number of lag pulses is displayed when the number becomes the largest in one motion.

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Table 4.3 Output Coils and Their Contents (Cont'd)

Signal Name	Description
External Command Pulse Input Enabled	External pulse input is enabled. Effective at handle operation ON by using manual pulse generator, etc.
Battery Fault Command	Absolute encoder battery fault status command. ON : Fault OFF : Normal Outputs SEN signal as B2833 internal process and receives absolute value data. Then checks battery fault command. If it is ON, absolute encoder is regarded as faulty and operation function is stopped.
Error Code Display Change Command	If more than one error occurs, error code display is changed every time this command is input. Effective at OFF to ON
External Start DISABLE Command	Only external start is to be ineffective. Reserved external start is also disabled. Effective at ON.
JOG/ Zero Return Direction	Set the direction of JOG/Zero return operation. ON : Reverse OFF : Forward
Position Loop ON/OFF	During variable speed operation, only speed compensation function is enabled. Position loop can be reactivated near last position during deceleration for position control. Effective at vibration control. Effective at ON.
Reserved Operation DISABLE	The function protects against contact chattering during external start automatic positioning operation.
Variable Speed Operation External Start Effective	External start can be accomplished at variable speed operation as well as automatic positioning. Effective at ON.
Filter Constant Setting	Settings for all operations to insert software filter. Effective at ON.

Notes :

1. Start reservation or data setting reservation is enabled in automatic positioning (1st-step speed, multi-step speed).

2. Stop signals
   Output coil "STOP" : Operation stop conditions
   External command pulse input enabled coil conditions
   Data preset conditions

   External input "STOP" : Operation stop conditions
   External command pulse input enabled conditions

3. Only JOG operation command can proceed to the next motion at completion of pulse output. In other types of operation, next motion is available when pulse output is completed and COIN AND conditions are satisfied.
   However, since the axis of synchronous slave operates at master command pulse value, it has nothing to do with COIN.

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4.2 OUTPUT COIL (CONTROL SIGNAL) (Cont'd)

(3) List of Output Coil Conditions

Table 4.4 lists the output coil conditions. Any setting or command that does not meet the ON/OFF condition of output coil is judged as an error or disregarded according to the internal processing of B2833.

<Notes for Table 4.4>

1. 1 : ON, 0 : OFF, ⓯ : OFF to ON, - : status remains unchanged, blank : not applicable.
   ⓯ , ① : coil finally validated after conditions of other coils are arranged.
2. Priority is given to JOGH or JOGL operation depending on which is selected earlier, JOGH or JOGL command. At this time, the ON/OFF status of the later command is disregarded. If both commands are turned on simultaneously, priority is given to the JOGL command.
3. Synchronous operation release command is effective only when slave axis is selected.

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Table 4.4 Output Coils and B2833 Functions

	Output Coil	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
	Output Coil Signal Name / Module Operation	Module Reset	Initial Setting 1	Initial Setting 2	SEN Signal ON Command	Synchronous Operation Mode Release Command	Stop Command	Accel/Decel Speed Setting	Auto Positioning Setting	1st-step Speed Operation Command	Multi-step Speed Operation Command	Variable Speed Operation Setting	Variable Speed Operation Command	Current Value Setting	Notch Point Setting	JOG Setting	JOGH Command	JOGL Command
	Module Reset	ⓕ																
	Stop	—	—	—	—		①	—	0			—		—	—	—		
Setting	Initial Setting 1	—	ⓕ	—	—		1	—	0			—		—	—	—		
Setting	Initial Setting 2	—	—	ⓕ	—		1	—	0			—		—	—	—		
Setting	SEN Signal ON Command	—	—	—	ⓕ		1	—	0			—		—	—	—		
Setting	Variable Speed Initial Setting	—	—	—	—		1	—	0			ⓕ		—	—	—		
Setting	Accel Setting	—	—	—	—		1	ⓕ	0			—		—	—	—		
Setting	Positioning Setting	—	—	—	—			—	①			—	0	—	—	—		
Setting	Current Value Setting	—	—	—	—		1	—	0			—		ⓕ	—	—		
Setting	JOG Setting	—	—	—	—		1	—	0			—		—	—	ⓕ		
Setting	Zero Return Setting	—	—	—	—		1	—	0			—		—	—	—		
Setting	Special Positioning Setting	—	—	—	—		1	—	0			—		—	—	—		
Setting	Notch Point Setting	—	—	—	—		1	—	0			—		—	ⓕ	—		
Operation Command	1st-step Speed 1	—					0		0	ⓕ	—		0				0	0
Operation Command	Multi-step Speed 2	—					0		0	—	ⓕ		0				0	0
Operation Command	Variable Speed Command	—					0		0	—	—		①				0	0
Operation Command	JOGH Command	—					0			—	—		0				①	0
Operation Command	JOGL Command	—					0			—	—		0				0	①
Operation Command	Special Positioning Command	—					0		0	—	—		0				0	0

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4.2 OUTPUT COIL (CONTROL SIGNAL) (Cont'd)

Table 4.4 Output Coils and B2833 Functions (Cont'd)

	Output Coil	18	19	20	21	22	23	24 to 26	27	28	29	30	31	32	33	34	35
	Output Coil Signal Name / Module Operation	Zero Return Setting	Zero Return Command	Special Positioning Setting	Special Positioning Command	Error Code Reset	Deviation Counter Reset	Monitor 1 to 3	External Command Pulse Input Enabled	Battery Error Command	Error Code Changing Command	External Start Disabled Command	JOG/Zero Return Direction	Position Loop ON/OFF	Reserved Operation DISABLE	Variable Speed Operation External Start Effective	Filter Constant Setting
	Module Reset																
Setting	Stop	—		—													
Setting	Initial Setting 1	—		—													
Setting	Initial Setting 2	—		—													
Setting	SEN Signal ON Command	—		—													
Setting	Variable Speed Initial Setting	—		—													
Setting	Accel Setting	—		—													
Setting	Positioning Setting	—		—													
Setting	Current Value Setting	—		—													
Setting	JOG Setting	—		—													
Setting	Zero Return Setting	⊛		—													
Setting	Special Positioning Setting	—		⊛													
Setting	Notch Point Setting	—		—													
Operation Command	1st-step Speed 1		—		—												
Operation Command	Multi-step Speed 2		—		—												
Operation Command	Variable Speed Command		—		—												
Operation Command	JOGH Command		—		—												
Operation Command	JOGL Command		—		—												
Operation Command	Special Positioning Command		—		⊛												

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Table 4.4 Output Coils and B2833 Functions (Cont'd)

Output Coil	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Output Coil Signal Name / Module Operation	Module Reset	Initial Setting 1	Initial Setting 2	SEN Signal on Command	Synchronous Operation Mode Release Command	Stop Command	Accel/Decel Speed Setting	Auto Positioning Setting	1st-step Speed Operation Command	Multi-step Speed Operation Command	Variable Speed Operation Setting	Variable Speed Operation Command	Current Value Setting	Notch Point Setting	JOG Setting	JOGH Command	JOGL Command
Zero Return Command	—					0		0	—	—		0				0	0
Error Code Reset	—																
Deviation Counter Reset	—					1											
Battery Error Command	—																
External Command Pulse Input Enabled	—					1											
Monitor 1 to 3	—																
Synchronous Operation Release	—				①												
Error Code Display Changing Command	—																
External Start DISABLE Command	—																
Direction Setting by Coil during JOGL Operation	—					0			—	—		0				0	①
Direction Setting by Coil during JOGH Operation	—					0			—	—		0				①	0
Direction Setting by Coil during Zero Return Operation	—					0			—	—		0				0	0
No Position Loop during Variable Speed Operation	—					0		0	—	—		①				0	0
No Reservation for Multi-step Speed Operation	—					0		0	↑	—		0				0	0
No Reservation for Multi-step Speed Operation	—					0		0	—	↑		0				0	0
Variable Speed Operation during External Start	—					0			—	—		0				0	0
Filter Constant Setting	—	—	—	—				—			—		—		—		

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4.2 OUTPUT COIL (CONTROL SIGNAL) (Cont'd)

Table 4.4 Output Coils and B2833 Functions (Cont'd)

Output Coil / Output Coil Signal Name / Module Operation	18 Zero Return Setting	19 Zero Return Command	20 Special Positioning Setting	21 Special Positioning Command	22 Error Code Reset	23 Deviation Counter Reset	24 to 26 Monitor 1 to 3	27 External Command Pulse Input Enabled	28 Battery Error Command	29 Error Code Changing Command	30 External Start Disabled Command	31 JOG/Zero Return Direction	32 Position Loop ON/OFF	33 Reserved Operation DISABLE	34 Variable Speed Operation External Start Effective	35 Filter Constant Setting
Zero Return Command		ⓕ		—												
Error Code Reset					ⓕ											
Deviation Counter Reset						①										
Battery Error Command									①							
External Command Pulse Input Enabled								①								
Monitor 1 to 3							①									
Synchronous Operation Release																
Error Code Display Changing Command										ⓕ						
External Start DISABLE Command											①					
Direction Setting by Coil during JOGL Operation		—										*				
Direction Setting by Coil during JOGH Operation		—										*				
Direction Setting by Coil during Zero Return Operation		↑										*				
No Position Loop during Variable Speed Operation													1			
No Reservation for Multi-step Speed Operation														1		
No Reservation for Multi-step Speed Operation														1		
Variable speed operation during External Start															①	
Filter Constant Setting	—															①

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4.3 INPUT RELAY (STATUS MONITOR SIGNAL)

(1) List of Input Relays

32 input relays are provided and used as the status monitor signals from B2833 to the CPU module. Table 4.5 lists the input relays.

Table 4.5 List of Input Relays

Reference No.	GL60V bit	Signal Name
10001 + 8n	IB×××× + 0	READY
10002 + 8n	1	PRESET ACK
10003 + 8n	2	PRESET NAK
10004 + 8n	3	PLUS / MINUS
10005 + 8n	4	During FWD command
10006 + 8n	5	During RVS command
10007 + 8n	6	Current value exceeded
10008 + 8n	7	COIN
10009 + 8n	8	ERROR
10010 + 8n	9	Fault
10011 + 8n	A	Communication error 1
10012 + 8n	B	Communication error 2
10013 + 8n	C	Absolute encoder normal
10014 + 8n	D	Auto positioning pulse discharging completion
10015 + 8n	E	Zero return pulse discharging completion
10016 + 8n	F	Special operation pulse discharging completion
10017 + 8n	10	Pulse discharging completion
10018 + 8n	11	Decel LS input
10019 + 8n	12	Special LS input
10020 + 8n	13	External start input
10021 + 8n	14	External stop input
10022 + 8n	15	Servo normal input
10023 + 8n	16	Notch signal output
10024 + 8n	17	Position deviation error
10025 + 8n	18	Independent / synchronous
10026 + 8n	19	Position loop ON / OFF
10027 + 8n	1A	Reserved Operation DISABLE
10028 + 8n	1B	Reserved
10029 + 8n	1C	Filter ON
10030 + 8n	1D	For future use
10031 + 8n	1E	For future use
10032 + 8n	1F	For future use

n = 0, 1, 2 ·····

Shows the reference No. at input relay allocation.

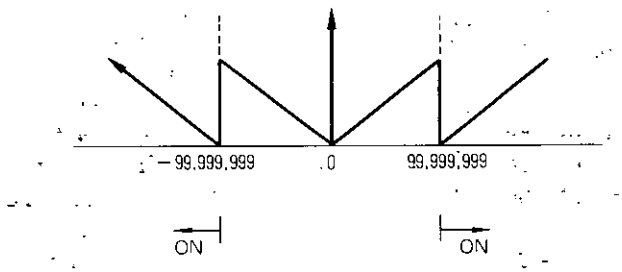
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4.3 INPUT RELAY (STATUS MONITOR SIGNAL) (Cont'd)

(2) Contents of Input Relay

16 input relays connect the control signals which are detailed in Table 4.6.

Table 4.6 Input Relays and Their Contents

Signal Name	Description
READY	The result of B2833 self-diagnosis is indicated. Normally ON, but OFF in the event of malfunction (ROM, RAM or WDT error).
PRESET ACK	Turned ON for only one scan after normal completion of preset action of any setting in B2833.
PRESET NAK	Turned ON for only one scan when any setting to B2833 is faulty.
$\overline{\text{PLUS/MINUS}}$	Indicates the area of current value counter. OFF : Plus area ON : Minus area
During FWD Command	ON while B2833 is outputting forward direction rotating command. Used in all operation modes in common.
During RVS Command	ON while B2833 is outputting reverse direction rotating command. Used in all operation modes in common.
Current Value Exceeded	Control signal valid only in absolute mode. Turned ON when the current value counter in B2833 exceeds absolute position area.  "Current value exceeded" cannot be released by current value setting. Change the value by JOG, zero return or manual operation within the absolute position area.
COIN	Turned ON when the deviation counter lag pulse is within the COIN detection width initially set.
ERROR	Turns ON if B2833 detects a setting error, operation command error, communication error or hardware error.
Fault	On when a hardware error occurs in B2833. If a fault occurs, pulse output is stopped and deviation counter is kept clearing.
Communication Fault 1 (Error Code 11 to 15)	ON when a fault occurs in receiving data at communication in synchronous operation mode. If a fault occurs, pulse output is stopped at the curve set by accel/decel speed setting. After fault occurrence, it is released by error code reset (OFF) and synchronous operation is enabled. ① A communication data error occurs three times consecutively after checking at least first receiving data. ② Receiving data time is over after receiving data from master at least one time. (communication period ×3) ③ Synchronous buffer module breakdown (during communication) ④ Two or more masters in one group

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Table 4.6 Input Relays and Their Contents (Cont'd)

Signal Name	Description
Communication Fault 2 (Error Code 11 to 14)	ON at only one scan when a minor communication fault occurs in synchronous operation mode. However, synchronous operation is continued. Minor faults : ① A receiving data fault occurs two timesconsecutively. ② No data are sent from mster within one minute after synchronous slave is set. ③ Synchronous buffer module breakdown (when communication is not perfornmed)
Absolute Encoder Normal	Turns ON when absolute data are received correctly from absolute encoder.
Completion of Auto Positioning Pulse Output	Turns ON for only one scan upon completion of 1st-step speed operation, multi-step speed operation, variable speed operation, or reaching aimed position. Does not turn ON for "stop" coil pausing.
Compleiton of Zero Return Pulse Output	Turns ON for only one scan upon completion of pulse output in zero return operation. Does not turn ON for "stop" coil pausing.
Completion of Pulse Output	ON at only one scan at completion of pulse output. However, handle operation by external pulse input is an exclusion. ON by command coil OFF at variable speed operation without aimed position.
Completion of Pulse Output in Special Operation	ON at only one scan at completion of pulse output at special positioning operation. However, it is not turned ON when stopped by "stop" coil.
Deceleration LS Input	Indicates external input signal "$\overline{\text{decel LS}}$" input status. Input relay ON when "$\overline{\text{decel LS}}$" is ON (L level).
Special LS Input	Indicates external input signal "$\overline{\text{special LS}}$" input status. Input relay ON when "$\overline{\text{special LS}}$" is ON (L level).
External Start Input	Indicates external input signal "$\overline{\text{external start}}$" input status. Input relay ON when "$\overline{\text{external start}}$" is ON (L level). Same function as multi-step speed operation command (output coil). Formed of OR. Start input used exclusively for multi-step speed operation.
External Stop Input	Indicates external input signal "$\overline{\text{external stop}}$." Input relay ON when "$\overline{\text{external stop}}$" is ON (L levl). External stop input is turned ON at H level or OFF at L level, selected by switch setting. Same function as stop command (output coil).

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4.3 INPUT RELAY (STATUS MONITOR SIGNAL) (Cont'd)

Table 4.6 Input Relays and Their Contents (Cont'd)

Signal Name	Description
Servo OK Input	Indicates external input signal "$\overline{\text{servo OK}}$" input status. Input relay ON when "$\overline{\text{servo OK}}$" is ON (L level). Pulse output processing is not performed when this input relay is in OFF status.
Notch Signal Output	Indicates external output signal "$\overline{\text{notch output}}$" output status. ON when notch point is passed, and input relay ON. Timing to turn off input relay is at next operation start or current value change setting execution.
Position Deviation Fault	ON in the following cases : • Master axis or independent axis Position deviation set value < self-axis command current value−self-axis feedback current value • Slave axis Position deviation set value < master command current value−slave FB current value
$\overline{\text{Independent/}}$ Synchronous	Indicates module function: OFF : Independent operation mode ON : Synchronous operation mode
Position Loop ON/OFF	ON : No position loop Excluding decel command speed is equal or less than clamp setting value (Decel command speed ≦ Clamp value), or when speed command is "0" during variable speed operation with position loop OFF.
Reserved Operation DISABLE	Reserved Operation DISABLE coil monitor.
Reserved	Turned ON when reserved operation is accepted. Turned OFF when reserved operation starts.
Filter ON	ON : Filter constant is set. OFF : Filter setting is 0, or when the filter is automatically cleared between the start of final deceleration and the start of next output.

* For details, refer to 10. EXPANDED FUNCTIONS.

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4.4 OUTPUT REGISTER (DATA SETTING)

To preset various setting data from the CPU module to B2833, eight consecutive output registers are used.

Table 4.7 Output Register Allocation

Reference No.	GL60V bit	Output Register No.
40001 + n	OW×××× + 0	1ST
40002 + n	1	2ND
40003 + n	2	3RD
40004 + n	3	4TH
40005 + n	4	5TH
40006 + n	5	6TH
40007 + n	6	7TH
40008 + n	7	8TH

n = 0, 1, 2 ·····

4.4.1 INITIAL SETTING

Initial setting of B2833 is to be made according to the "initial setting 1" and "initial setting 2" of output coil with an initial value set in output register.

(1) Initial Setting 1

Table 4.8 Initial Setting 1 Items

Setting Items	Description
Setting of COIN Detection Width	Specifies the detection width of positioning end signal COIN. Sets within a range of 0 to 999 pulses.
Setting of Speed Command and Accel/Decel Time Multiplication	Specifies each operation speed command and accel/decel time multiplication. 0 : Speed × 10 pps (for 100 kpps), accel/decel time × 10 ms 1 : Speed × 10 pps (for 100 kpps), accel/decel time × 100 ms 2 : Speed × 20 pps (for 200 kpps), accel/decel time × 10 ms 3 : Speed × 20 pps (for 200 kpps), accel/decel time × 100 ms
Setting of Position Command Mode	Specifies position command mode. 0 : Current value not reset in incremental value mode. 1 : Resets current value in incremental value mode. (Automatic positioning operation only) 2 : Absolute value mode
Manual Pulse Count Mode	Specifies count mode at manual pulse operation. 0 : ×1 multiplier 1 : ×2 multiplier 2 : ×4 multiplier
Setting of PG Pulse Count A/B Division Ratio	Sets feedback pulse division ratio. A : 1 to 9999 B : 1 to 9999 $\left\{ \left(\frac{1}{9999} < \frac{A}{B} < \frac{64}{1} \right) \text{ is recommended for setting range.} \right\}$
Motor Rated Rotating Speed	Encoder RPM during rated motor operation (r/min) of motor to be connected.
Number of Encoder Pulses	Sets the number of division output pulses (P/R) of encoder to be connected. Or sets the number of feedback pulses, input to B2833, per rotation.
Position Loop Gain	Kp : 1 to 80

Notes :
1. Accel/decel speed setting and each operation setting are cleared by initial setting 1 but the contents of initial setting 2 are not cleared.
2. Each operation setting is cleared by accel/decel speed setting.

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4.4.1 INITIAL SETTING (Cont'd)

(2) Initial Setting 2

Table 4.9 Initial Setting 2 Items

Setting Items	Description
Setting of Module Functions	0 : Independent axis 1 : Group A master axis 2 : Group A slave axis 3 : Group B master axis 4 : Group B slave axis 5 : Group C master axis 6 : Group C slave axis 7 : Group D master axis 8 : Group D slave axis 9 : Group E master axis 10 : Group E slave axis 11 : Group F master axis 12 : Group F slave axis 13 : Group G master axis 14 : Group G slave axis 15 : Group H master axis 16 : Group H slave axis 17 : Group I master axis 18 : Group I slave axis 19 : Group J master axis 20 : Group J slave axis 21 : Group K master axis 22 : Group K slave axis 23 : Group L master axis 24 : Group L slave axis 25 : Group M master axis 26 : Group M slave axis
Synchronization Method	0 : Master command pulse synchronous operation 1 : Master PG pulse synchronous operation 2 : Master simultaneous start synchronous operation 3 : Program synchronous operation 4 : Synchronization mode released after completion of master command pulse synchronous operation
Setting of M/N Division Ratio of Position Command Pulse Sent from Master to Slave	Effective at slave axis. Divides or multiplies position command pulses from master axis. M : 1 to 9999 N : 1 to 9999
Setting of Position Deviation Allowable Value	Input relay (25 + 8n) ON in the following cases : • Independent axis, master axis Position deviation set value<command current value−feedback current value • Slave axis Position deviation set value<master command current value−slave feedback current value Set value : 0 to 9999
Follow-up Position Set Value	Set at program synchronous operation. Set value : 0 to 99,999,999
Setting of Lag Pulse Clamp	(0 to 50%) × 2
Speed Compensation Value	(0 to 50%) × 2
Accel/Decel Compensation Value	(0 to 50%) × 2

Notes :
1. No setting is cleared by initial setting 2.
2. Each operation setting is cleared by accel/decel speed setting.
3. Module reset clears all data.
4. Error codes can be cleared by either initial setting 1 or 2.

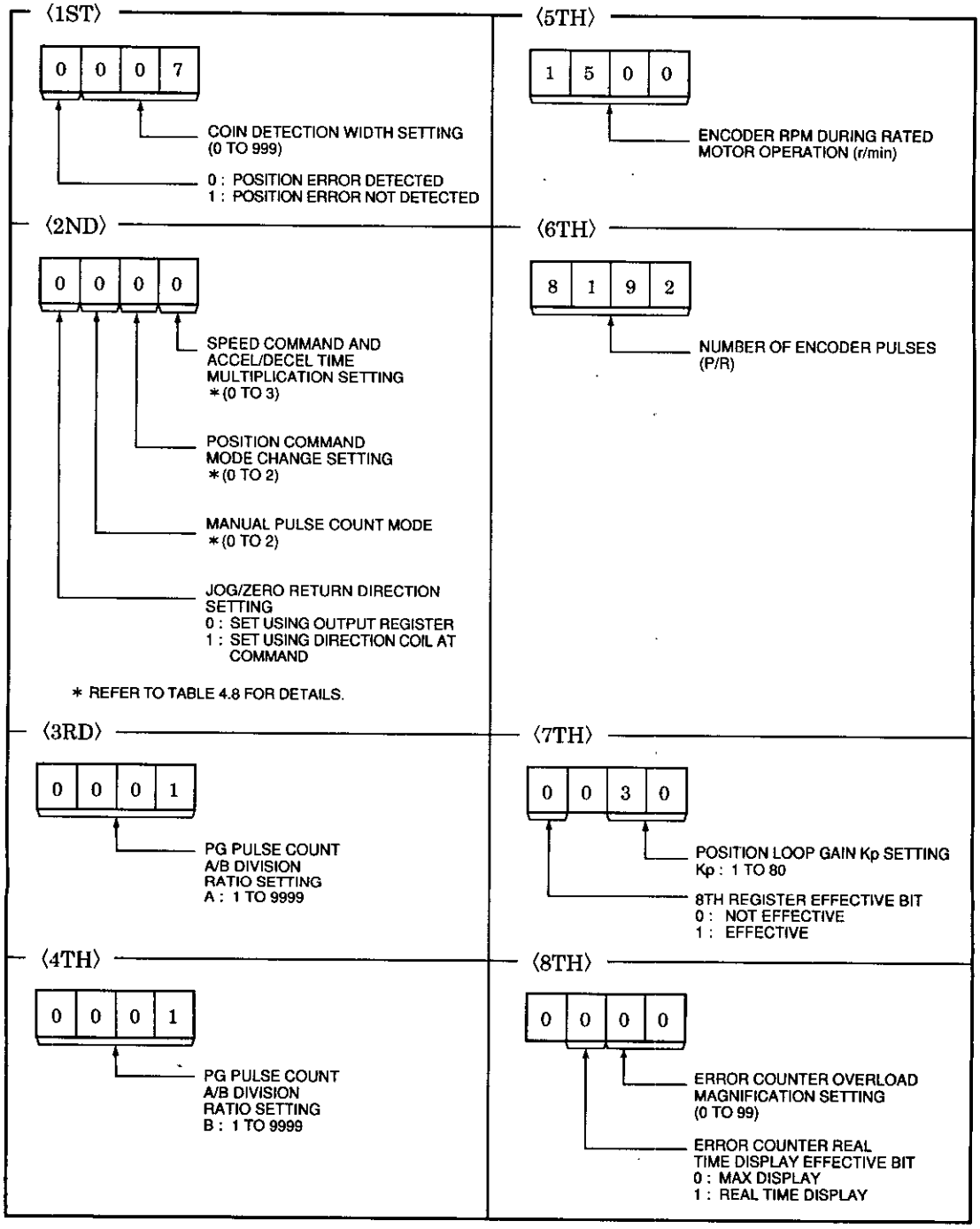
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4.4.2 SETTING METHOD OF INITIAL VALUE

Tables 4.10 and 4.11 show how to set initial set value to output registers.

(1) Initial Setting 1

Table 4.10 Initial Setting 1 to Output Register



Notes :

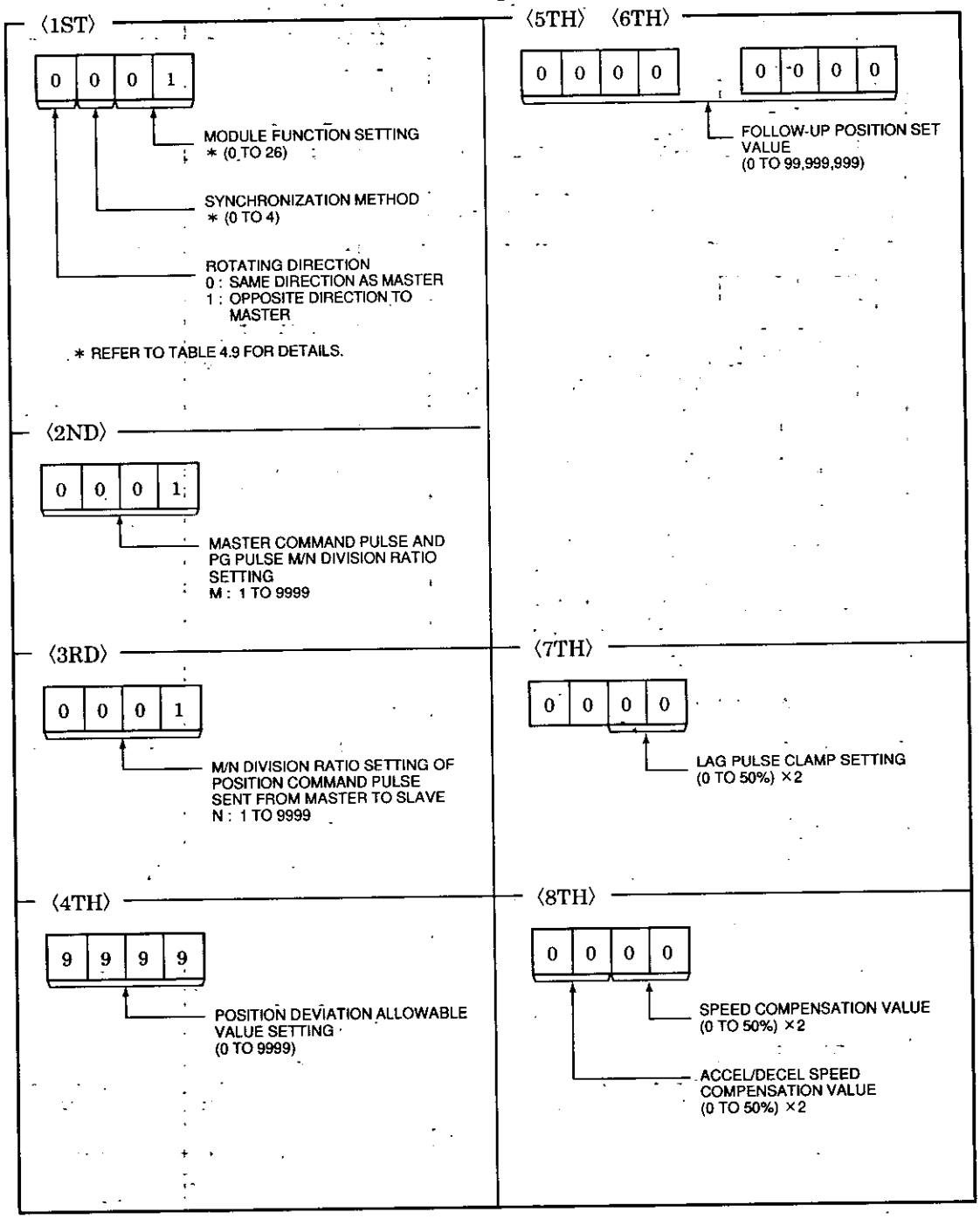
1. Values in the frames are default set values, and set when the power supply is turned ON or at module reset.
2. If a fault occurs in setting data at initial setting changing, the former set value is effective.
3. Accel/decel speed setting and operation setting are cheared by initial setting 1. However, no setting is cleared by initial setting 2.
4. Can be set without external power supply input.
5. Refer to 10. EXPANDED FUNCTIONS for position error detection, direction setting (during JOG/Zero point operation), and error counter setting.

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4.4.2 SETTING METHOD OF INITIAL VALUE (Cont'd)

(2) Initial Setting 2

Table 4.11 Initial Setting 2 to Output Register



Notes :

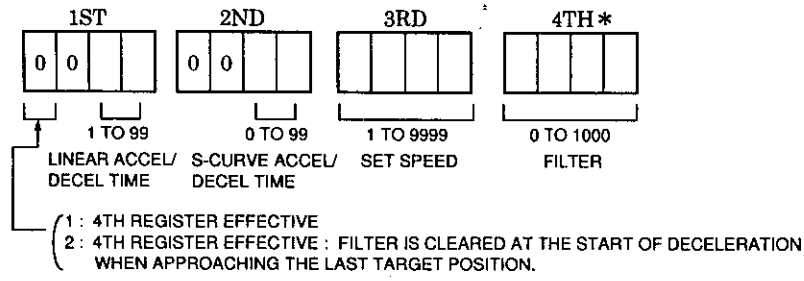
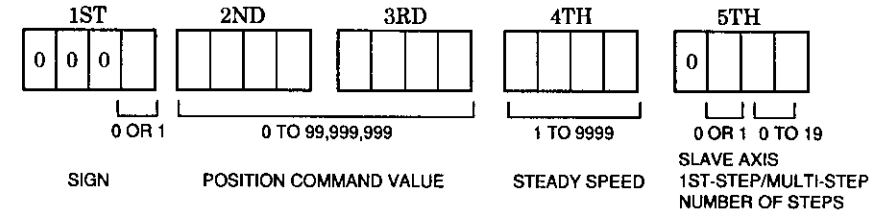
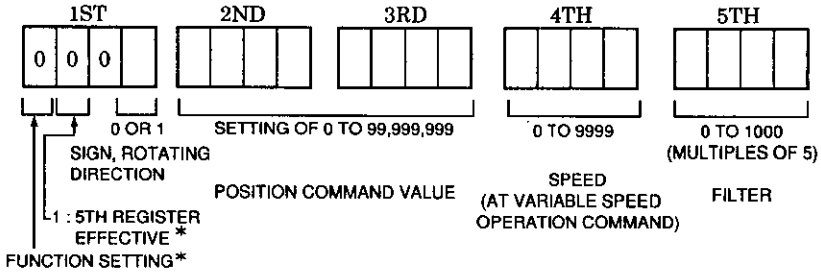
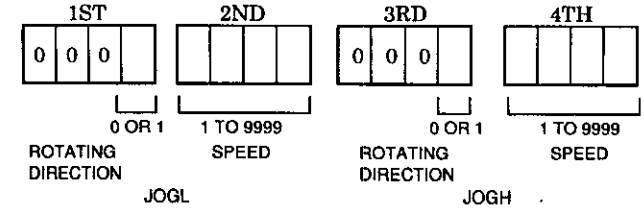
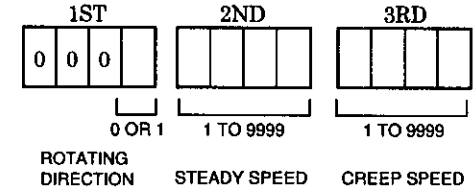
1. Values in the frames are default set values, and set when the power supply is turned ON or at module reset.
2. If a fault occurs in setting data at initial setting changing, the former set value is effective.
3. No setting is cleared by initial setting 2.
4. Can be set without external power supply input.

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4.4.3 VARIOUS DATA SETTINGS

(1) How to Set to Output Register

Table 4.12 How to Set Various Data

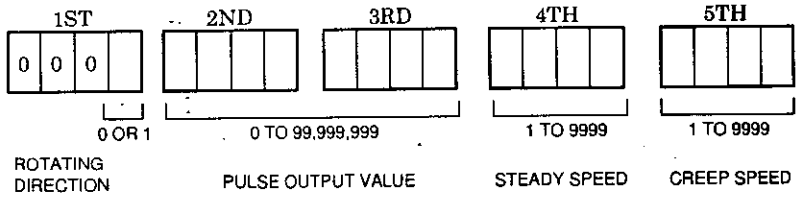
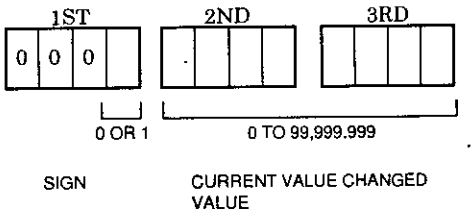
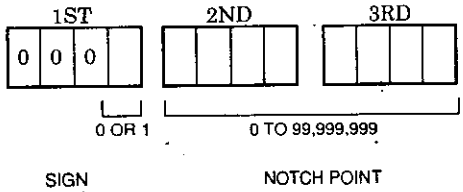
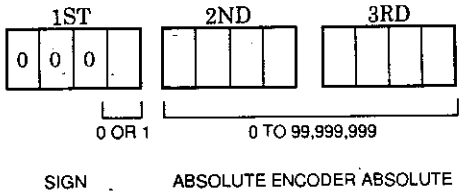
Setting Items	Output Register
Accel/Decel Speed Setting	
Automatic Positioning Setting	
Variable Speed Operation Setting	
JOG Operation Setting	
Zero Return Operation Setting	

* Refer to 10. EXPANDED FUNCTIONS.

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4.4.3 VARIOUS DATA SETTINGS (Cont'd)

Table 4.12 How to Set Various Data (Cont'd)

Setting Items	Output Register
Special Positioning Operation Setting	
Current Value Setting	
Notch Point Setting	
Absolute Value Zero-point Setting	

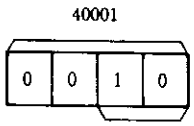
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(2) Typical Settings (When Output Registers 40001 to 40008 Are Used)

(a) Accel/Decel speed setting

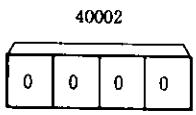
· Linear accel/decel

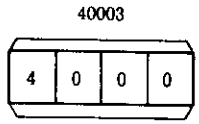
Inclination α of accel/decel speed which reaches steady speed 40 kpps at accel/decel speed setting of 100 ms. Set the following values to output registers 40001 to 40003 and turn OFF "accel/decel speed setting" output coil and then turn it ON again. (At this time, "STOP" output coil must be turned ON.)



ACCEL/DECEL SPEED SETTING TIME
10 × 10 = 100 ms

(WHEN ×10 ms SET BY INITIAL SETTING 1)

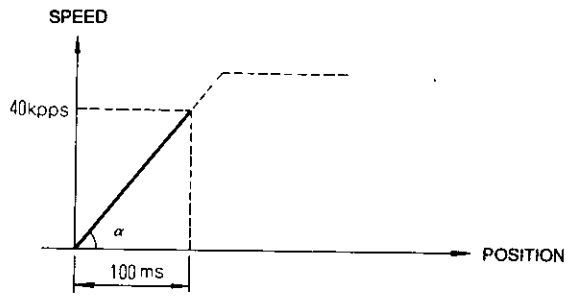




SPEED
4000×10 = 40000 pps (40 kpps)

(WHEN ×10 pps SET BY INITIAL SETTING 1)

(40004 to 40008 not defined)

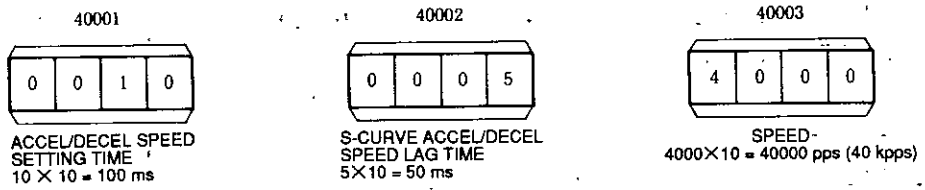


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4.4.3 VARIOUS DATA SETTINGS (Cont'd)

- S-curve accel/decel

  The following shows the setting when S-curve extension time of 50 ms is added to the above linear accel/decel.

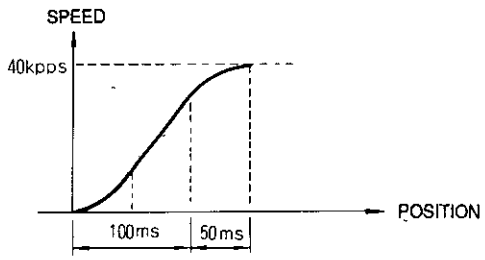


(WHEN ×10 ms SET BY INITIAL SETTING 1)

(WHEN ×10 ms SET BY INITIAL SETTING 1 FOR EITHER CASE)

(WHEN ×10 pps SET BY INITIAL SETTING 1)

(40004 to 40008 not defined)



Notes :

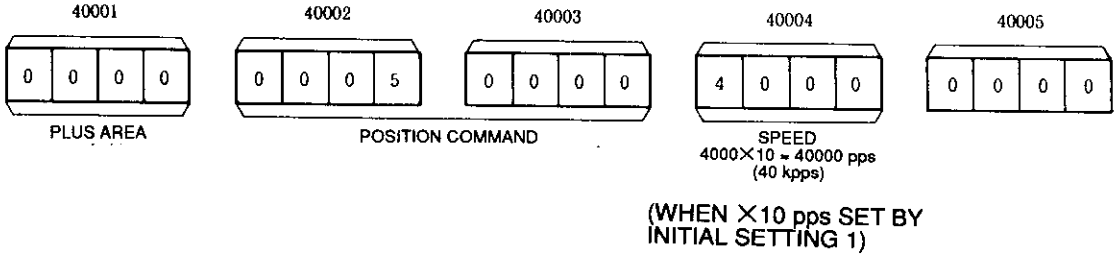
1. Accel/decel speed setting is used for all operation modes in common.
2. Slave axis operates at accel/decel speed setting of master axis in synchronous operation mode. However, it is also necessary to set accel/decel speed setting to slave axis.
3. Set S-curve accel/decel speed lag time ≦ accel/decel speed setting time.

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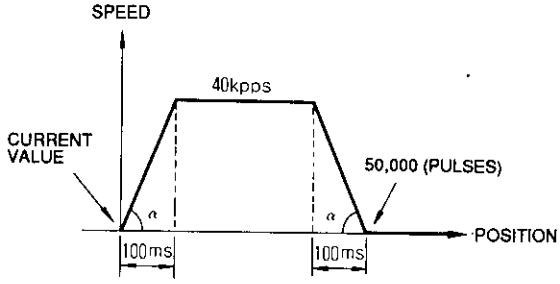
(b) Automatic positioning setting

· The 1st step speed type

Automatic positioning is performed at steady speed 40 kpps up to aimed position of 50,000 (pulses). [Assume that the accel/decel speed setting described in (a) has been set.] Set the following values to output registers 40001 to 40005 and turn OFF "automatic positioning setting" output coil and then turn it ON again.



(40006 to 40008 not defined)



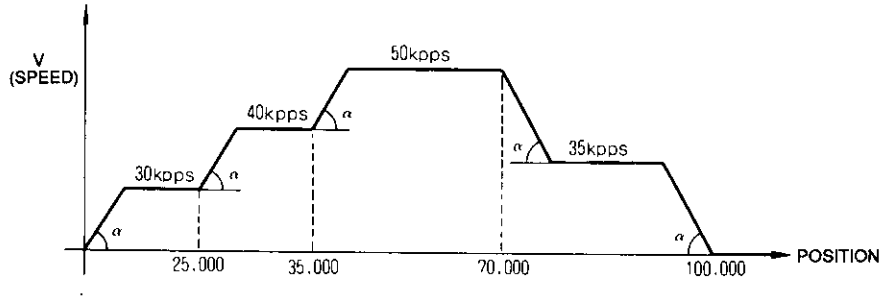
· Multi-step speed type

Automatic positioning is performed in speed of the 4th step up to the final aimed position of 100,000 (pulses).

Acceleration is made in the accel/decel speed setting of ① and operation is performed at a steady speed of 30 kpps of the 1st step.

- From the position of 25,000 (pulses), acceleration is made with the same inclination and operation is performed at a steady speed of 40 kpps of the 2nd step.
- From the position of 35,000 (pulses), acceleration is made with the same inclination and operation is performed at a steady speed of 50 kpps of the 3rd step.
- From the position of 75,000 (pulses), acceleration is made with the same inclination and operation is performed at a steady speed of 35 kpps of the 4th step.

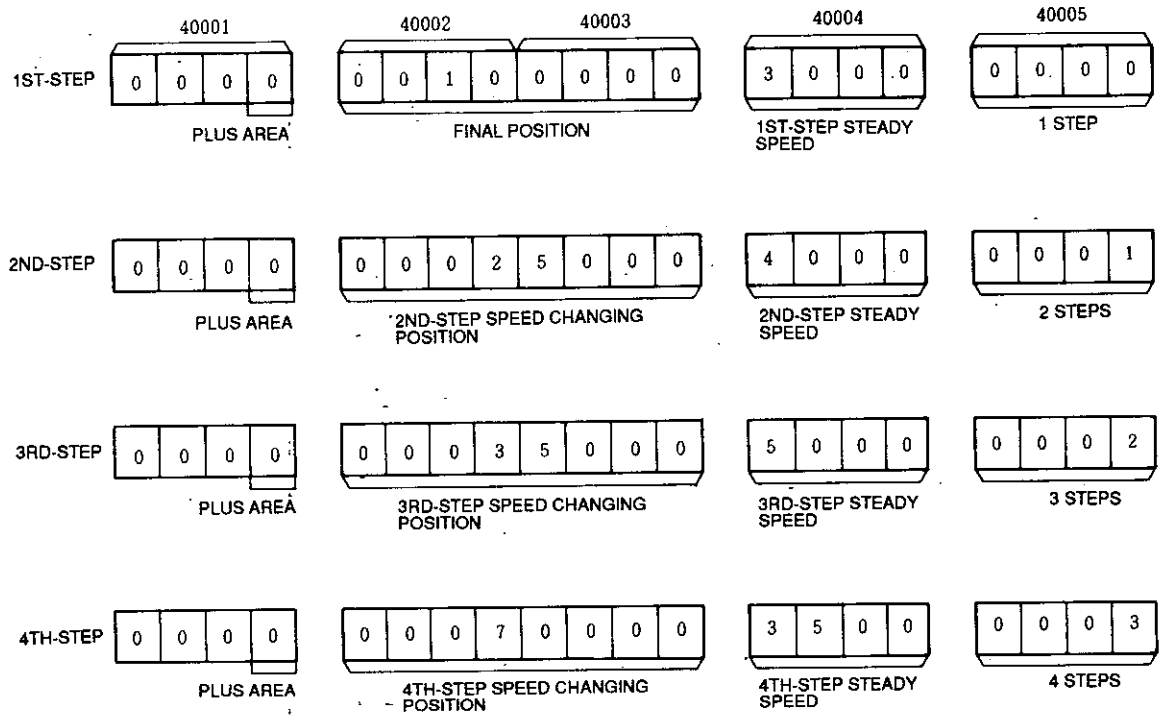
Deceleration is made with the same inclination and operation stops at the aimed position of 100,000 (pulses).



Every time the speed changing position and step number are changed, turn the "automatic positioning setting" output coil OFF and ON four times.

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4.4.3 VARIOUS DATA SETTINGS (Cont'd)



(WHEN ×10 pps SET BY INITIAL SETTING 1)

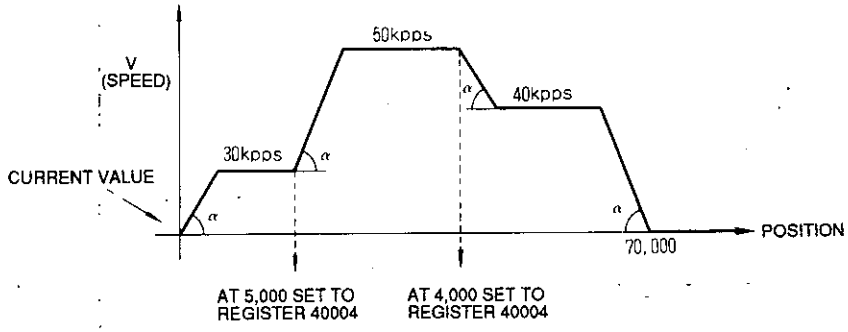
(40006 to 40008 not defined)

(c) Variable speed operation setting

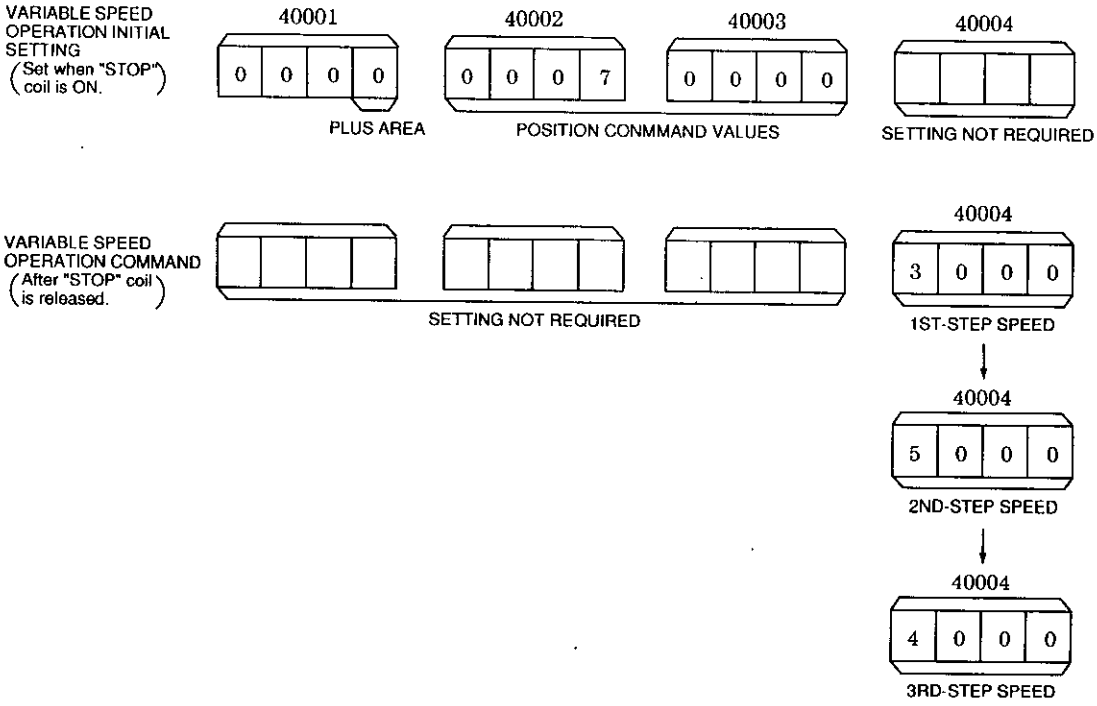
Positioning is performed by changing speed at any desired value during running up to the final aimed position of 70,000 (pulses) [assuming that linear accel/decel speed described in (a) has been set].

Set the following values to output registers 40001 to 40004 and turn OFF output coil and then turn it ON again. At this time, "STOP" coil must be turned ON.

When the operation command is turned ON after releasing "STOP," speed can be changed to any desired value by changing the contents of 40004 (CPU module scanning time may cause an actual delay in changing the setting speed).



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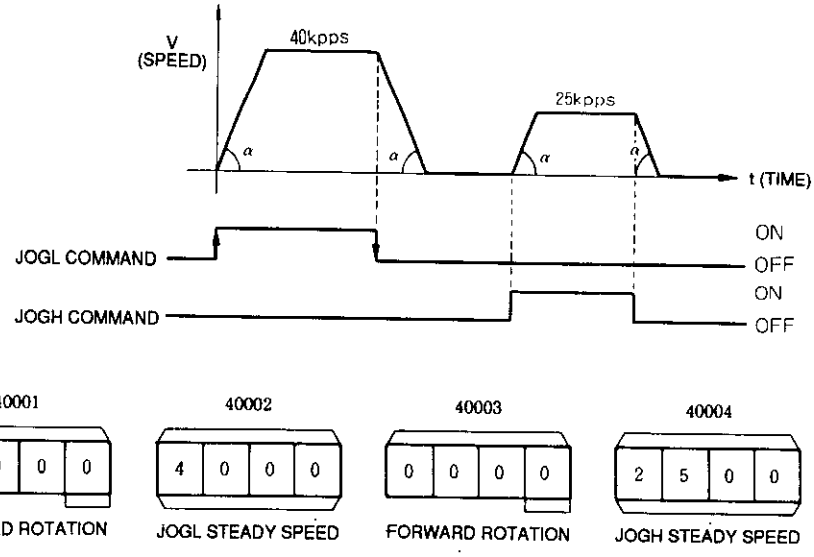
(WHEN ×10 pps SET BY INITIAL SETTING 1)

(40005 to 40008 not defined)

(d) JOG operation setting

In forward rotation, JOGL steady speed is set to 40 kpps and JOGH steady speed to 25 kpps [assuming linear accel/decel speed described in (a) has been set].

Set the following values to output registers 40001 to 40004 and turn OFF "JOG operation setting" and then turn it ON again. (At this time, "STOP" output coil must be turned ON.)



(40005 to 40008 not defined)

Note : When JOGL and JOGH commands are turned ON simultaneously, JOGL command has priority.

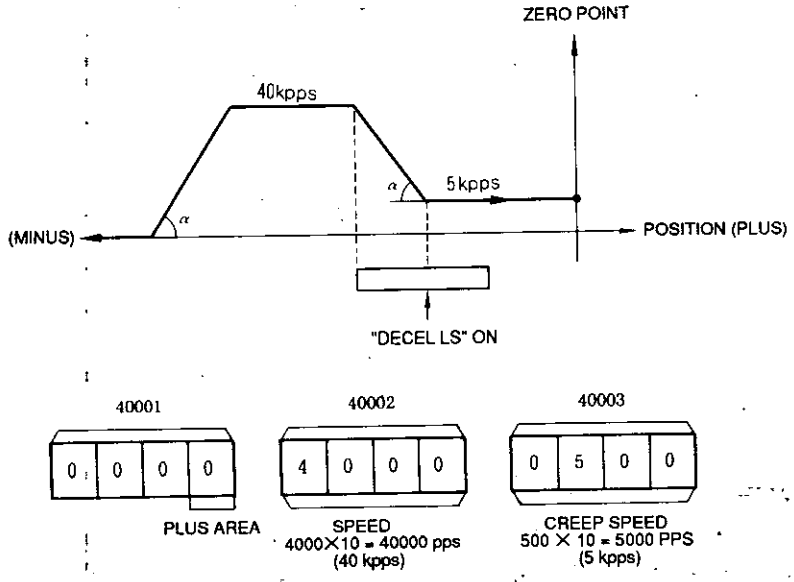
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4.4.3 VARIOUS DATA SETTINGS (Cont'd)

(e) Zero return operation setting (mode B)

Steady speed is set to 40 kpps and creep speed to 5 kpps, and zero return operation is performed in forward rotation [assuming linear accel/decel speed described in (a) has been set].

Set the following values to output registers 40001 to 40003 and turn OFF "zero return operation setting" output coil and then turn it ON again. (At this time, "STOP" coil must be turned ON.)



(WHEN ×10 pps SET BY INITIAL SETTING 1)

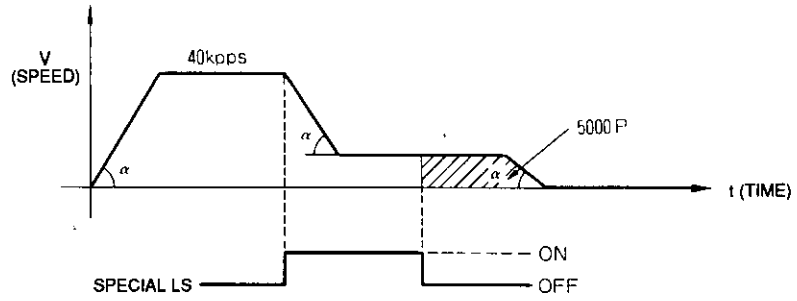
(40004 to 40008 not defined)

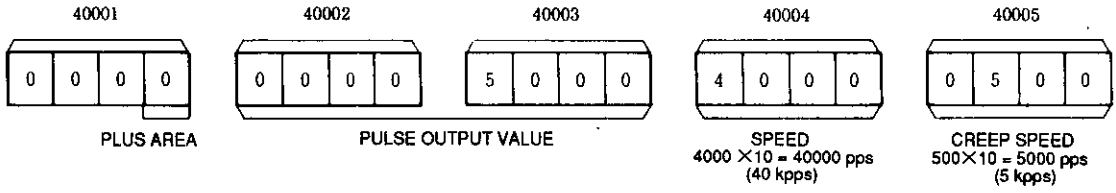
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(f) Special positioning operation setting (effective only when incremental value mode is selected by initial setting 1)

Creep speed is reduced down to 5 kpps after special LS ON during running in forward rotation at a steady speed of 40 kpps, and operation stops at 5000 P (number of output pulses) at special LS OFF [assuming linear accel/decel speed described in (a) has been set].

Set the following values to output registers 40001 to 40005 and turn OFF "special positioning setting" and then turn it ON again. (At this time, "STOP" output coil must be turned ON.)





(WHEN ×10 pps SET BY INITIAL SETTING 1)

(40006 to 40008 not defined)

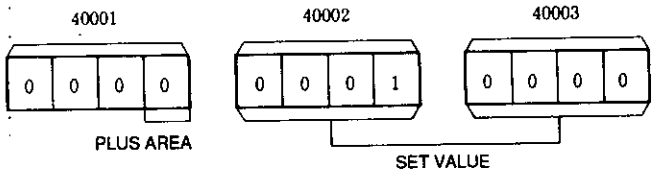
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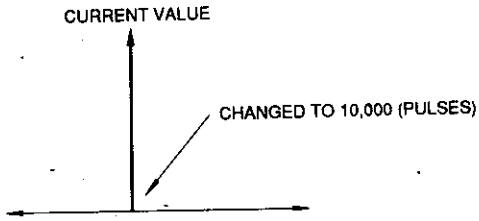
4.4.3 VARIOUS DATA SETTINGS (Cont'd)

(g) Current value setting

Current value is changed to +10,000 (pulses).

Set the following values to output registers 40001 to 40003 and turn OFF "current value change" output coil and then turn it ON again. (At this time, "STOP" output coil must be turned ON.)



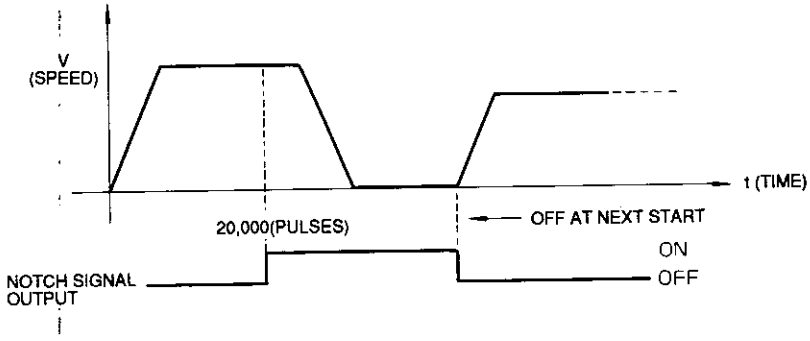


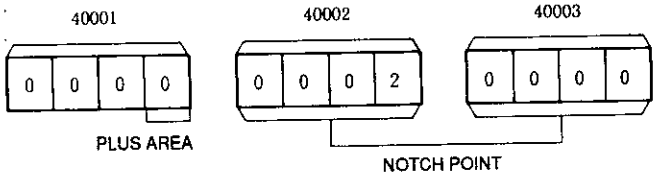
(40004 to 40008 not defined)

(h) Notch point setting (effective at independent axis)

When the position of +20,000 (pulses) is passed, external notch signal output and input relay are turned ON.

Set the following values to output registers 40001 to 40003 and turn OFF "notch point setting" output coil and then turn it ON again. (At this time, "STOP" output coil must be turned ON.)



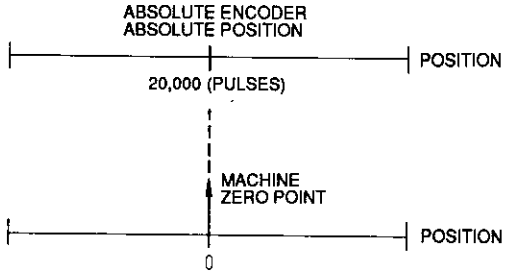


(40004 to 40008 not defined)

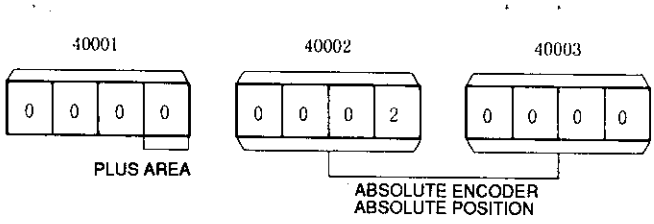
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(i) Absolute value zero point setting
Machine zero point is set to absolute encoder +20,000 (pulses).

Set the following values to output registers 40001 to 40003 and turn OFF "SEN signal output command" output coil and then turn it ON again. (At this time, "STOP" output coil must be turned ON.)



The position where the absolute encoder 20,000 (pulses) is set to machine zero point (0) position is regarded as self-axis current value.



(40004 to 40008 not defined)

Note : In order to know the machine zero point position, set the absolute encoder absolute position to 0, and turn OFF "SEN signal output command" and then turn it ON again. (Receiving data from the absolute encoder is to be the current position without changing). When the machine zero point is determined, the absolute encoder absolute position can be stored in the holding registers of master CPU (GL60S, 60V) so that operation can be performed with machine zero-point always as current value 0 by using the value at the next setting.

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4.5 INPUT REGISTER (DATA MONITOR)

When various data of the B2833 are monitored from the CPU module, eight consecutive input registers are used (See Table 4.13).

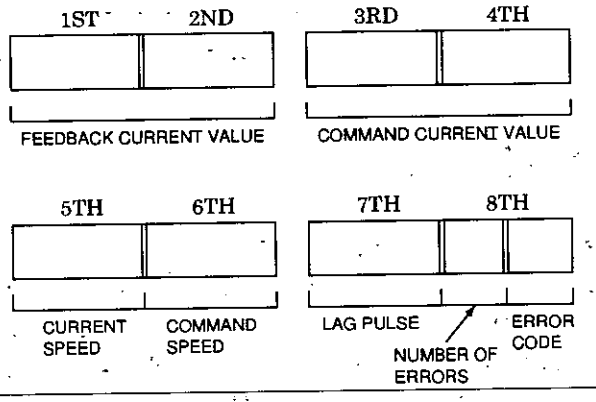
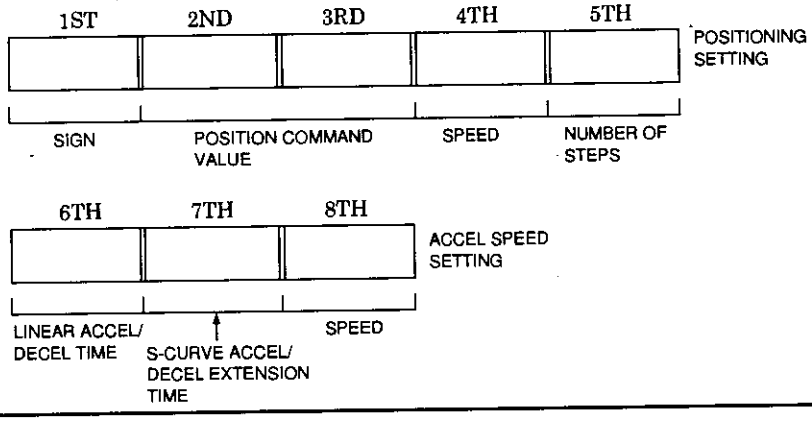
The contents of monitor data vary depending on monitor code designation (output coils : monitor 1 to monitor 3) (See Table 4.14).

Table 4.13 Input Register Allocation

Reference No.	GL60V bit	Input Register No.
3001 + n	IW×××× + 0	1ST
3002 + n	1	2ND
3003 + n	2	3RD
3004 + n	3	4TH
3005 + n	4	5TH
3006 + n	5	6TH
3007 + n	6	7TH
3008 + n	7	8TH

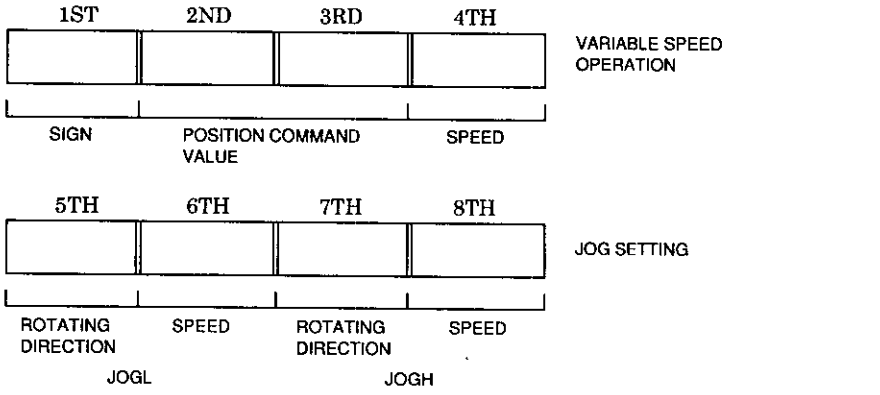
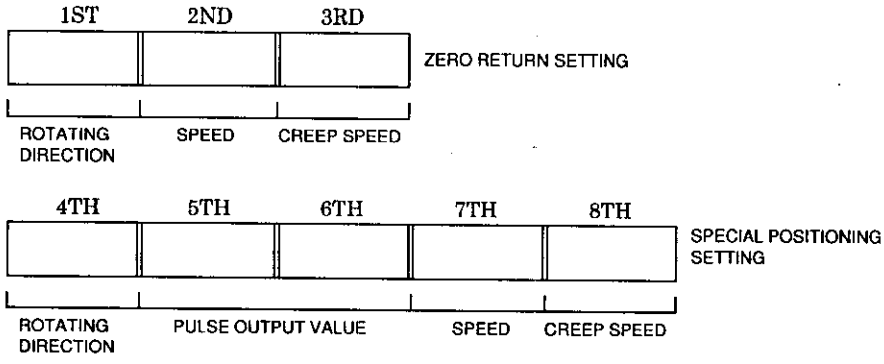
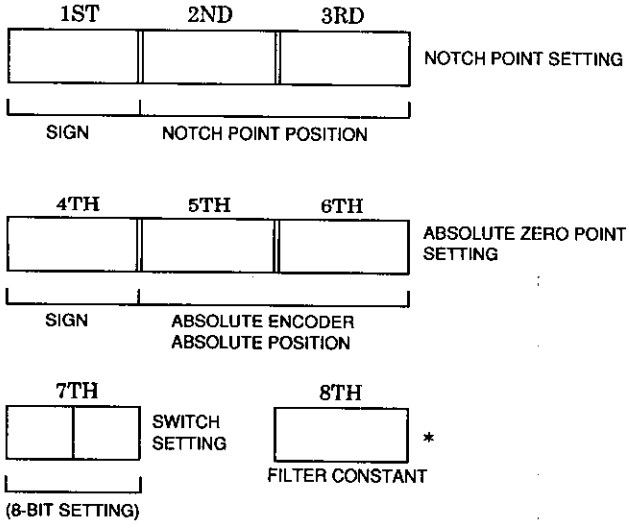
n = 0, 1, 2 ·····

Table 4.14 Monitor Code and Input Register Monitoring Contents

Monitor Code			Input Register Monitoring Contents
Monitor 1	Monitor 2	Monitor 3	
0	0	0	 Note : The number of lag pulses is a value obtained after mode release at handle operation.
1	0	0	

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Table 5.14 Monitor Code and Input Register Monitoring Contents (Cont'd)

Monitor Code			Input Register Monitoring Contents
Monitor 1	Monitor 2	Monitor 3	
0	1	0	
1	1	0	
0	0	1	
1	0	1	Error counter real time display register (7TH) Other registers are the same as (0. 0. 0)*
0	1	1	Initial setting 2
1	1	1	Initial setting 1

* Refer to 10. EXPANDED FUNCTIONS.

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5. EXTERNAL INTERFACE

5.1 FRONT PANEL

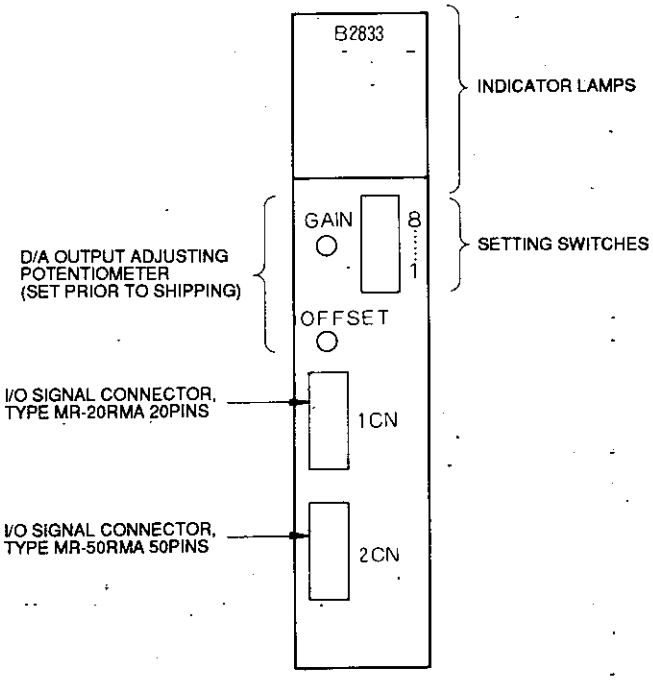


Fig. 5.1 B2833 Front Panel

5.2 B2833 CONNECTOR TERMINAL LAYOUT

(1) Connector (1CN) Terminal Layout

Table 5.1 Connector 1CN Terminal Layout for I/O Signals

1	2	3	4	5	6	7
0 V	0 V	0 V	+5 V	+5 V	+5 V	
PG Power Supply 0 V			PG Power Supply +5 V			
8	9	10	11	12	13	
SEN1	OSEN1	-	-	SEN2	OSEN2	
SEN Signal Output				SEN Signal Output (Relay Contact)		
14	15	16	17	18	19	20
PC	*PC	PA	*PA	PB	*PB	FG
PG Signal Input Phase C		PG Signal Input Phase A		PG Signal Input Phase B		Frame Grounding

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(2) Connector (2CN) Terminal Layout

Table 5.2 Connector 2CN Terminal Layout I/O Signals

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
12/24 V	$\overline{\text{STOP}}$	$\overline{\text{START}}$	0 V	0 V	0 V	0 V	0 V	0 V	0 V	0 V	0 V			FG	FG	FG	FG
Input Signal Power	External Stop Input	External Start Input	Fault Output Coin Output Notch Output 0 V		Reference Pulse Output 0 V		Manual Pulse Generator Power Supply Output 0 V		External Power Supply Input 0 V			—		Frame Grounding			

19	20	21	22	23	24	25	26	27	28	29	30	31	32
$\overline{\text{EXEN}}$	$\overline{\text{SVOK}}$			D/A output		+5 V	+5 V	+12 V	+12 V		−12 V	−12 V	−12 V
External Pulse Input Enable (Manually)	Servo Normal Input			Speed Reference Output		Manual Pulse Generator Power Supply Output +5 V		Manual Pulse Generator Power Supply Output +12 V			External Power Supply Input −12 V		

33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
12/24 V	SPLS	$\overline{\text{DEC}}$	Fault	$\overline{\text{COIN}}$	$\overline{\text{NOTCH}}$			PBI	*PBI	PAI	*PAI	+12 V	+12 V	+12 V	+5 V	+5 V	+5 V
Input Signal Power	Special LS Input	GELS Input	Fault Output	Coin Output	Notch Output			External Pulse Input Phase B		External Pulse Input Phase A		External Power Supply Input +12 V			External Power Supply Input +5 V		

(3) Specifications of Applicable Receptacles for 1CN, 2CN

Table 5.3 Specifications of Applicable Receptacles for I/O Signals

Connector Type Used in B2833	Applicable Receptacle Specifications			
	Soldered Type	Caulking Type	Case	Manufacturer
1CN MR-20RMA, Right Angle 20P	MR-20F*	MRP-20F01	MR-20L*	Honda Tsushin Co., Ltd.
2CN MR-50RMA, Right Angle 50P	MR-50F*	MRP-50F01	MR-50L*	

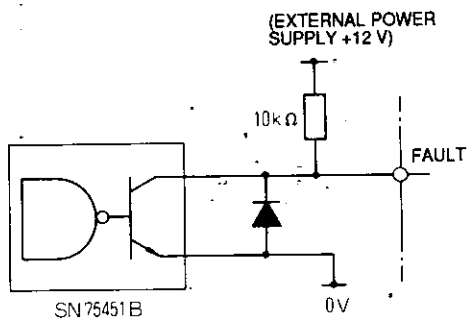
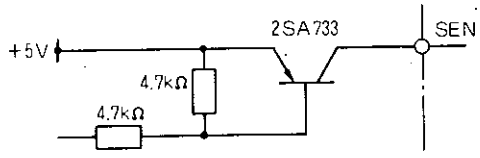
* Standard attachment of B2833

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5.3 1CN/2CN I/O SIGNALS

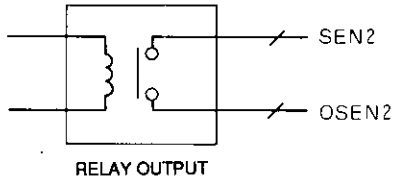
(1) External Output Signals

Table 5.4 External Output

Signal Name	CN Pin No.	I/O	Contents
Speed Reference Output (Analog Output)	2CN-23	OUT	Output voltage : 0 to ±6 V (±10 V) (Offset adjustment, gain adjustment)
	2CN-6, 7 (Internal common)		Speed reference output 0 V
Fault Output (FAULT)	2CN-36	OUT	"L" level under normal operation. "H" level in the following cases : • Hardware error is detected by self-diagnosis. • External input signal "$\overline{\text{SVOK}}$" becomes "H" level. • External power supply malfunctions. • Module deviation counter exceeds set value. • PG signal line is disconnected. (1) Output circuit  (2) Output voltage, current Load voltage : 12 V Load current : 100 mA (max) Output voltage at ON : 0.7 V or less
Coin Output ($\overline{\text{COIN}}$)	2CN-37	OUT	Becomes "L" when deviation counter value is within coin setting width range.
Notch Output ($\overline{\text{NOTCH}}$)	2CN-38	OUT	Same as fault output circuit. Becomes "L" at notch point passing.
	2CN-4, 5 (Internal common)		Fault output, coin output, notch output 0 V
Sensor ON (SEN)	1CN-8	OUT	Absolute encoder starts when SEN signal is changed from "L" to "H". (1) Output circuit I 

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Table 5.4 External Output (Cont'd)

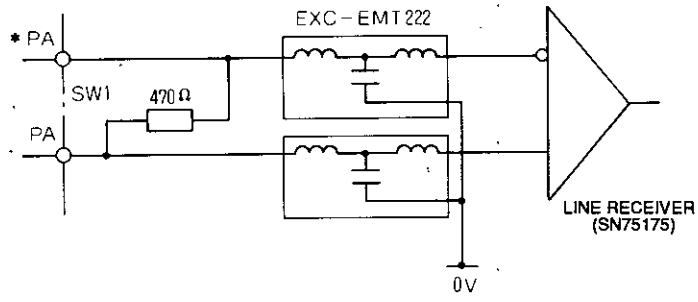
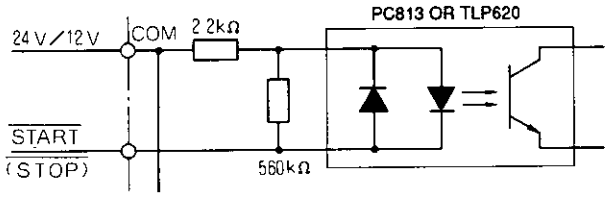
Signal Name	CN Pin No.	I/O	Contents
Sensor ON (SEN)	1CN-8	OUT	(2) Output voltage, current I (Output circuit I) "H" level : +4 V or more "L" level : +0.7 V or less * 4.8 kΩ at pull-down load Output current at "H" level : Approx 1 mA
	1CN-9		SEN signal output (output circuit I) 0 V
	1CN-12, 13	OUT	Absolute encoder starts when SEN signal is changed from "L" to "H". (1) Output circuit II  (2) Output voltage, current I (Output circuit II) Rated capacity : 0.5 A 30 VDC, 0.25 A 125 VAC Minimum application : 1 mA 5 VDC
+5 V Power Supply Output for PG	1CN-4, 5, 6 (Internal common)	OUT	Up to 200 mA can be used.
	1CN-1, 2, 3 (Internal common)		+5 V power supply output 0 V for PG
+5 V Power Supply Output for External Command PG	2CN-25, 26 (Internal common)	OUT	Up to 200 mA can be used for each connector.
+12 V Power Supply Output for External Command PG	2CN-27, 28 (Internal common)	OUT	Up to 200 mA can be used for each connector.

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5.3 1CN/2CN I/O SIGNALS (Cont'd)

(2) External Input Signals

Table 5.5 External Input Signals

Signal Name	CN Pin No.	I/O	Contents
PG Signal Input PA, *PA	1CN-16 : PA 1CN-17 : *PA	IN	(1) Input circuit  (2) PG output form • Line receiver (5 V) (3) Maximum counting frequency 200 kpps (×1 multiplier)
PG Signal Input PB, *PB	1CN-18 : PB 1CN-19 : *PB	IN	Same as above
PG Signal Input PC, *PC	1CN-14 : PC 1CN-15 : *PC	IN	Same as above
External Command Pulse Input Phase A PAI, *PAI	2CN-43 : PAI 2CN-44 : *PAI	IN	(1) Input circuit Same as feedback PG input (2) Maximum counting frequency 200 kpps (3) Pulse counting timing Phase A, B, ×1, ×2, ×4 multiplier
External Command Pulse Input Phase B PBI, *PBI	2CN-41 : PBI 2CN-42 : *PBI	IN	Same as above
External Start (START)	2CN-3	IN	Same function as output coil "multi-step speed operation command." Form of OR in module: Effective at ON. (1) Input circuit  (2) Input current Approx 10 mA (24 V) Approx 5 mA (12 V)

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Table 5.5 External Input Signals (Cont'd)

Signal Name	CN Pin No.	I/O	Contents
External Stop ($\overline{\text{STOP}}$)	2CN-2	IN	Same function as output coil "STOP command." Form of OR in module. Effective at ON. External "$\overline{\text{STOP}}$" is not effective under stop coil ON condition at various data settings. (1) Input circuit Same as above (2) Input current Same as above
Servo OK ($\overline{\text{SVOK}}$)	2CN-20	IN	Connected so that it will be turned ON when servo system is normal. Input circuit is the same as external start.
Decel LS ($\overline{\text{DEC}}$)	2CN-35	IN	Signal required for zero return operation. Inputs decel limit switch status. Effective at ON. Input circuit is the same as external start.
Special LS ($\overline{\text{SPLS}}$)	2CN-34	IN	Signal required for special positioning operation. Number of special positioning command pulses is output by turning it ON and then OFF again. Input circuit is the same as external start.
External Pulse Input Enabled ($\overline{\text{EXEN}}$)	2CN-19	IN	Used for position control by external pulse input. Effective at AND condition of external stop ON and this signal ON. (Possible to make external pulse effective by internal coil.)
External Power Supply Input +12 V	2CN-45, 46, 47 (Internal common)	IN	+12 V external power supply input
External Power Supply Input −12 V	2CN-30, 31, 32 (Internal common)	IN	−12 V external power supply input
External Power Supply Input +5 V	2CN-48, 49, 50 (Internal common)	IN	+5 V external power supply input
External Power Supply Input 0 V	2CN-10, 11, 12 (Internal common)		External power supply input 0 V
Input Signal Power Supply	2CN-1, 33 (Internal common)	IN	Power supply for 12/24 V input signal
FG	2CN-15, 16, 17, 18 (Internal common)		Frame ground
FG	1CN-20		Frame ground

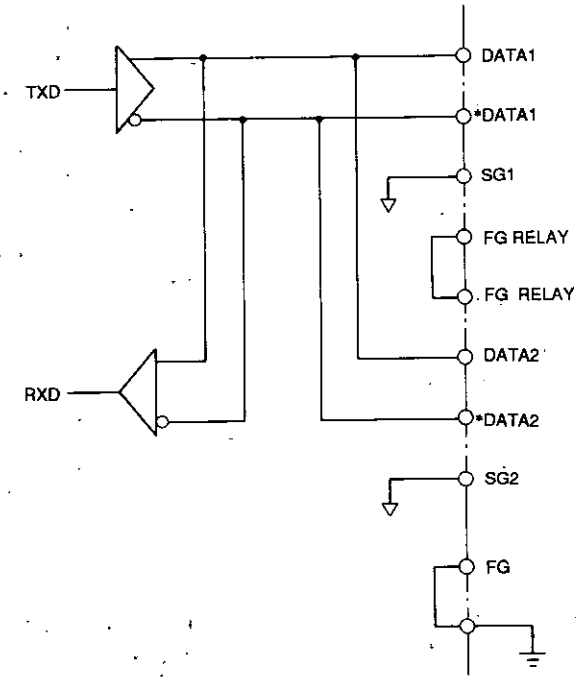
The following connector pins are also internal common.
(1) 1CN-1, 2, 3, 9
(2) 1CN-20, 2CN-15, 16, 17, 18
(3) 2CN-4, 5, 6, 7, 8, 9

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5.4 B2200 I/O SIGNALS

Table 5.6 B2200 I/O Signals

Signal Name	CN Terminal No.	Contents
		Communication terminals between racks.
DATA1	5	
*DATA1	6	
SG1	7	
FG RELAY	8	
FG RELAY	9	
DATA2	10	
*DATA2	11	
SG2	12	
FG	19, 20	



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5.5 LED INDICATOR LAMPS

Table 5.7 LED Indicator Lamps

Name	Color	Description
RDY	R	Indicates the self-diagnosis result of module. Linked with input relay "READY."
P. OK	R	Lit when external power supply input (+5 V, +12 V, −12 V) is normal.
ABNO	R	Lit when "FAULT" signal is output. Linked with input relay "FAULT."
ERR	R	Lit when the module detects any error. Linked with input relay "ERROR."
FWD	R	Lit while forward run command is output.
RVS	R	Lit while reverse run command is output.
START	R	Lit when external input signal "START" is at "L" level.
STOP	R	Lit when external input signal "STOP" is at "L" level.
DEC	R	Lit when external input signal "DEC" is at "L" level. Linked with input relay "DECEL LS."
SPLS	R	Lit when external input signal "SPLS" is at "L" level.
ENB	R	Lit when B2833 is ready to input external pulse from the manual pulse generator.
PHA	R	Lit when PA (phase A) signal is input.
PHB	R	Lit when PB (phase B) signal is input.
PHC	R	Lit when PC (phase C) signal is input.
NOCH	R	Indicates external output signal "notch output" output status. Linked with input relay "notch signal output."
COIN	R	Lit while "COIN" signal is distributed. Linked with input relay "COIN."
TXD	R	Lit when data for synchronous operation are sent.
RXD	R	Lit when data for synchronous operation are received.
CMER	R	Lit when any error is detected in communication for synchronous operation.
GL3	R	Display of synchronous group at synchronous operation. (Refer to Table 5.8.)
GL2	R	
GL1	R	
GL0	R	
MAS	R	Lit when master axis is specified at synchronous operation.
CLAMP	R	Lit when the number of deviation counter lag pulses exceeds the saturated value.
+	R	Lit when the sign of deviation counter lag pulse is plus.
32	R	Display for the number of deviation counter lag pulses. The contents of dip switches are monitored at TEST mode.
16	R	
8	R	
4	R	
2	R	
1	R	

Table 5.8 Display Method of Synchronous Groups

Group		Inde-pendent	A	B	C	D	E	F	G	H	I	J	K	L	M
LED	GL3	●	●	●	●	●	●	●	●	○	○	○	○	○	○
	GL2	●	●	●	●	○	○	○	○	●	◐	●	●	○	○
	GL1	●	●	○	○	●	●	○	○	●	◐	○	○	●	●
	GL0	●	○	●	○	●	○	●	○	●	○	●	○	●	○

○: Light ●: Dark

A Group = 1, B Group = 2, ····· M Group= 13 displayed in binary.

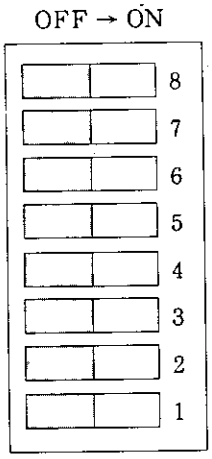
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5.6 1SW SETTING

(1) 1SW Setting Contents

The contents of 1SW setting are preset to the B2833 when the power supply is turned ON or at module reset.

To return from the test mode to normal mode, power supply must be turned ON again.



- NORMAL MODE/TEST MODE SELECTION
- EXTERNAL STOP INPUT NO/NC CONTACT SELECTION
- SPEED REFERENCE OUTPUT ±6V/±10V SELECTION
- ZERO RETURN OPERATION MODE A/B SELECTION
- FWD/REV COUNTING SELECTION
- FWD/REV ROTATION CONNECTION SELECTION (IN ACCORDANCE WITH SERVOPACK SETTING)
- INCREMENTAL/ABSOLUTE ENCODER SELECTION
- APPLICABLE CPU MODULE GL40S, 60S, 60H, 70H/60V SELECTION

Fig. 5.2 1SW Contents

Table 5.9 1SW Setting Contents

No.	Contents		
	OFF	ON	
8	Normal mode	TEST mode	
7	STOP —o o— (NO contact)	STOP —o—o— (NC contact)	
6	±6 V	±10 V	
5	Zero return mode-B	Zero return mode A	
4	Plus direction counting	Minus direction counting	*
3	Forward rotation connection	Reverse rotation connection	†
2	Incremental used	Absolute encoder used	
1	GL40S, 60S, 60H, 70H	GL60V	

* When Servopack for absolute encoder is used, the Servopack setting must be used. Setting opposite to the Servopack setting disables proper current value to be calculated.

† Used when a separately-mounted encoder is connected directly to the B2833. In feedback pulse counting of phases A and B, plus or minus direction counting is selected (phases A and B are reversed). When the separately-mounted encoder is of absolute value type, 1SW-3 must be turned ON if 1SW-4 is turned ON.

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(2) Factory Settings

1SW-8	OFF
1SW-7	OFF
1SW-6	OFF
1SW-5	ON
1SW-4	OFF
1SW-3	OFF
1SW-2	ON
1SW-1	OFF

(3) TEST Mode

When entering TEST mode by turning 1SW-8 ON, the feedback system is cut and fixed level is output by analog output (This function is used for adjusting offset and gain).

Table 5.10 TEST Mode Analog Output

1SW-1	1SW-2	Analog Output
ON	ON	0 V
OFF	ON	+6 V/10 V
ON	OFF	−6 V/10 V
OFF	OFF	No change

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6. CONNECTIONS

6.1 TYPICAL CONNECTION OF GL SERIES PERIPHERAL DEVICES

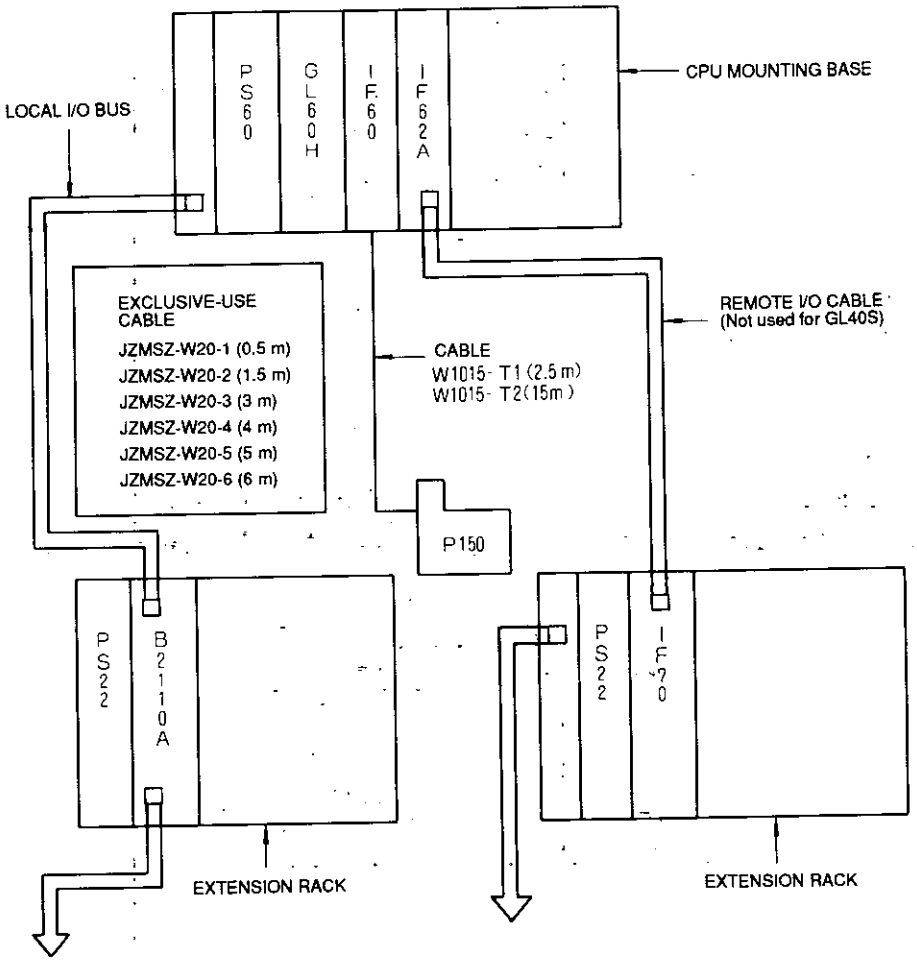


Fig. 6.1 Typical Connection of GL Series Peripheral Devices

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6.2 TYPICAL CONNECTION OF POWER SUPPLY

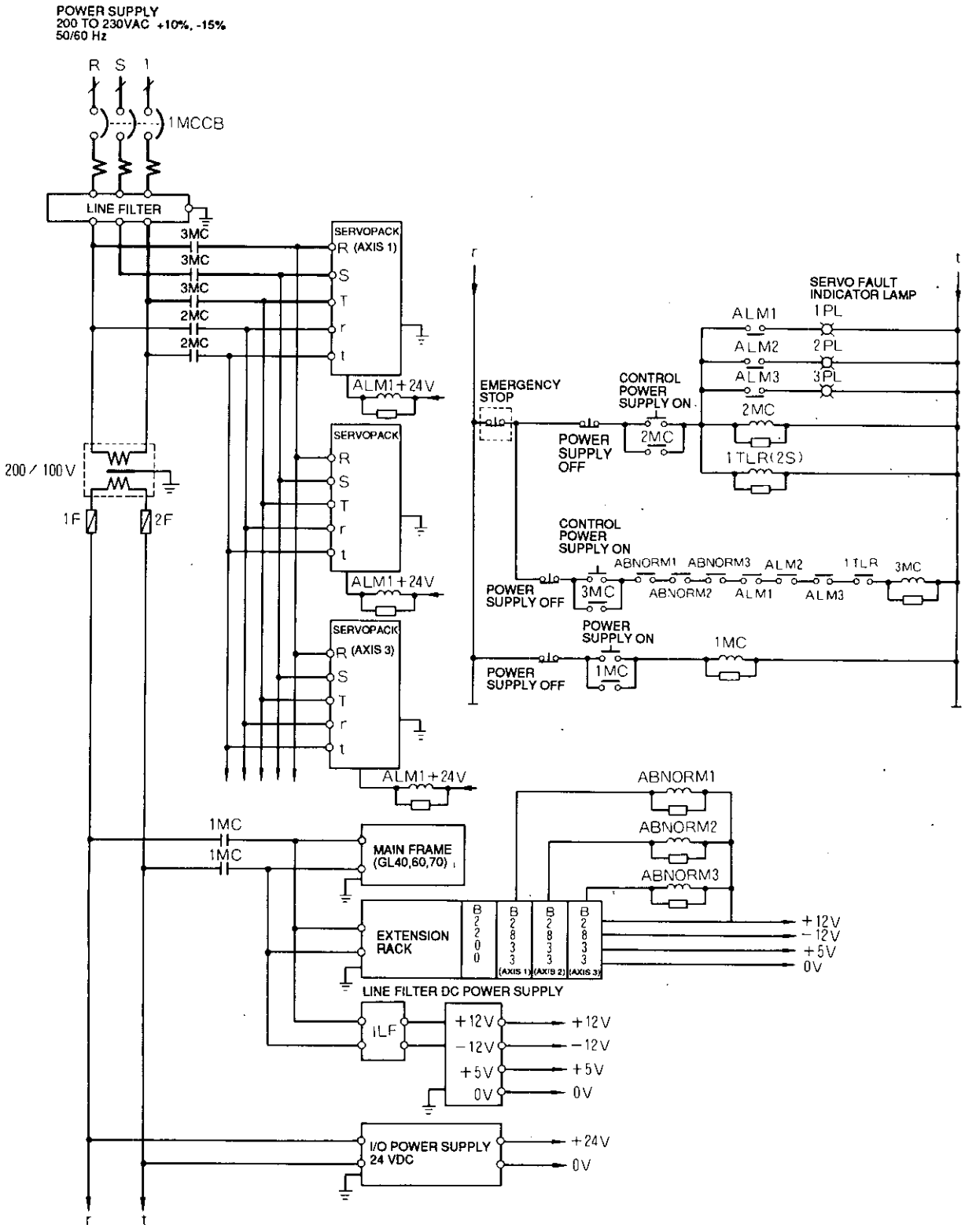


Fig. 6.2 Typical Connection of Power Supply ON Sequence

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6.3 TYPICAL INTERCONNECTION WITH SERVOPACK

(1) When Used with Servopack CACR-SR □ □ BZ1S □ (with Absolute Encoder)

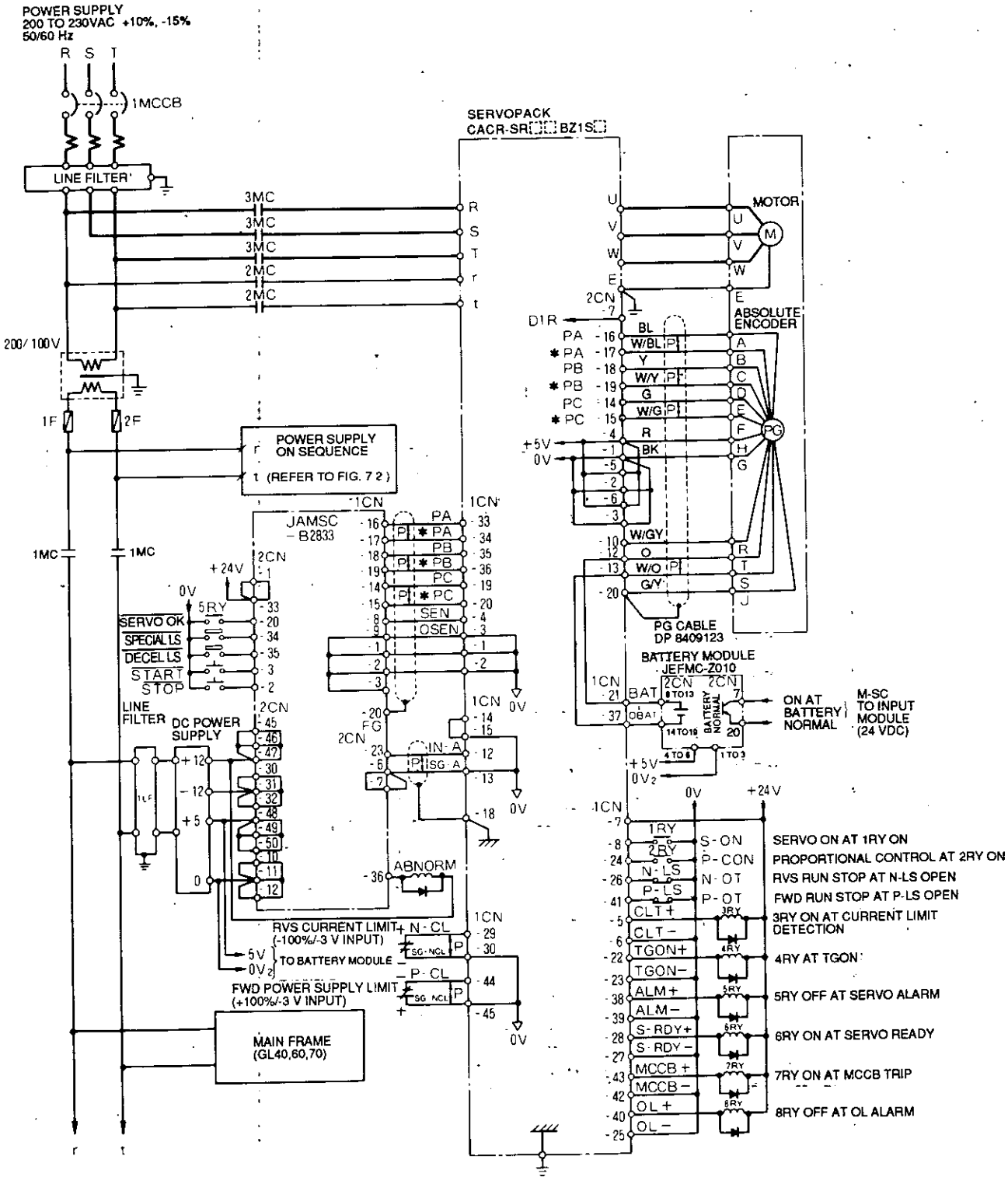


Fig. 6.3 Typical Connection (1)

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(2) When Used with Servopack CACR-SR□□BB□□□ (with Incremental Encoder)

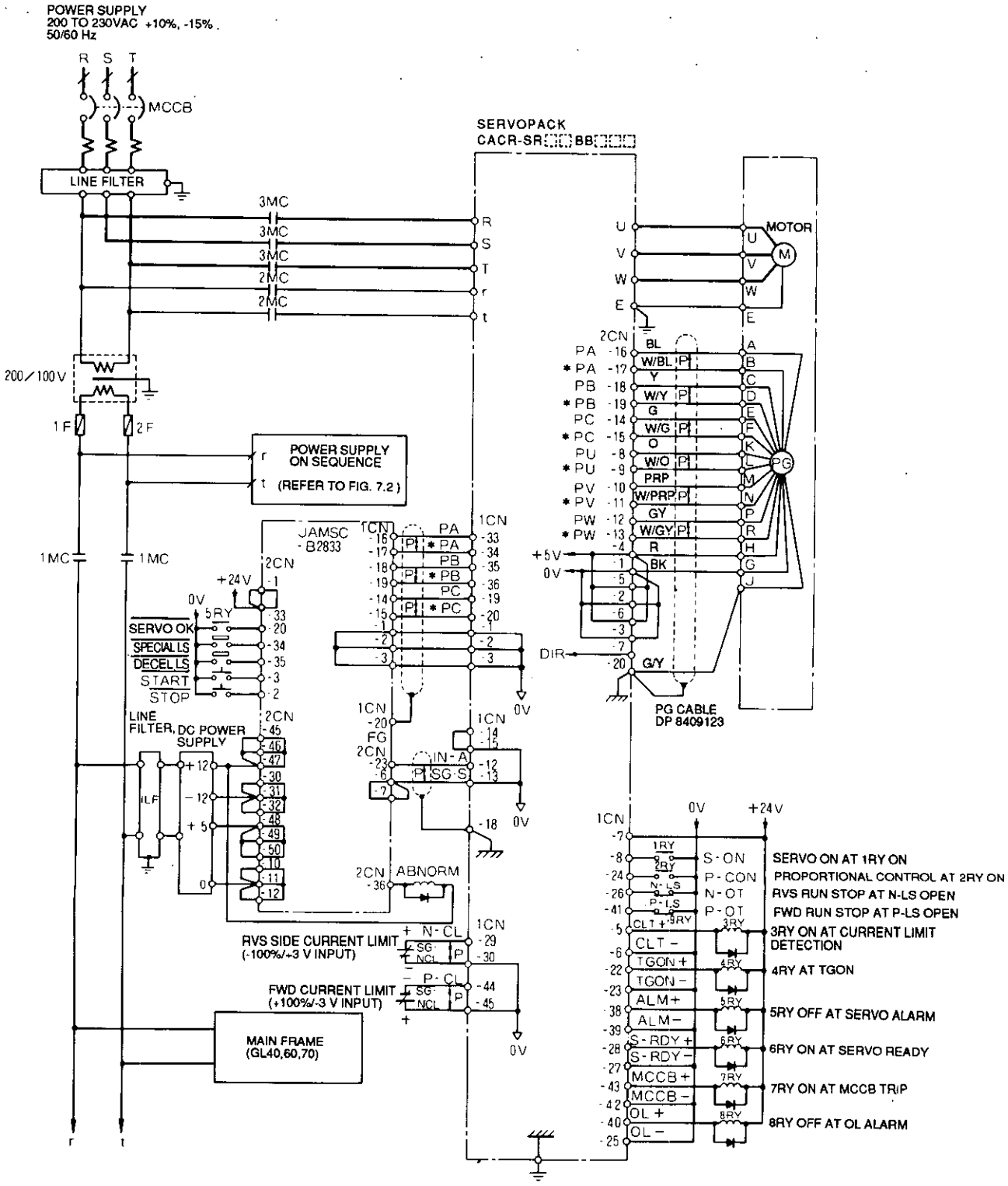
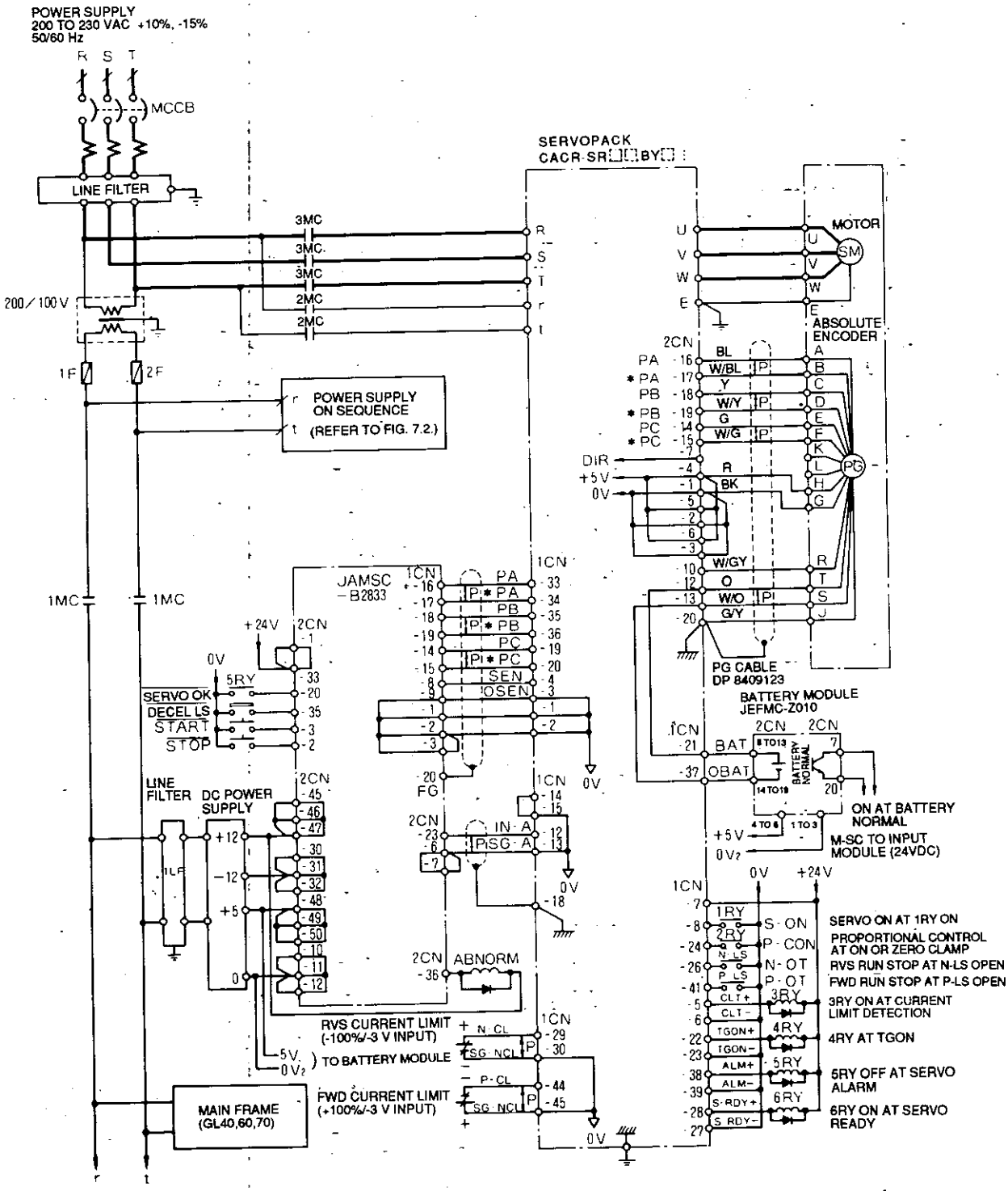


Fig. 6.4 Typical Connection (2)

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6.3 TYPICAL INTERCONNECTION WITH SERVOPACK (Cont'd)

(3) When Used with Servopack CACR-SR ☐ ☐ BY☐ (with Absolute Encoder)



* Use IN-A for B2833 operation command input. Set IN-B to "zero command" by Servopack parameter setting. Then, IN-B input terminal wiring can be opened.

† Input terminal wiring can be opened if unused signals among S-ON, P-OT and N-OT are masked by Servopack parameter setting.
By setting "S-ON signal is not used", servo is turned ON at SEN signal ON when absolute encoder is used.

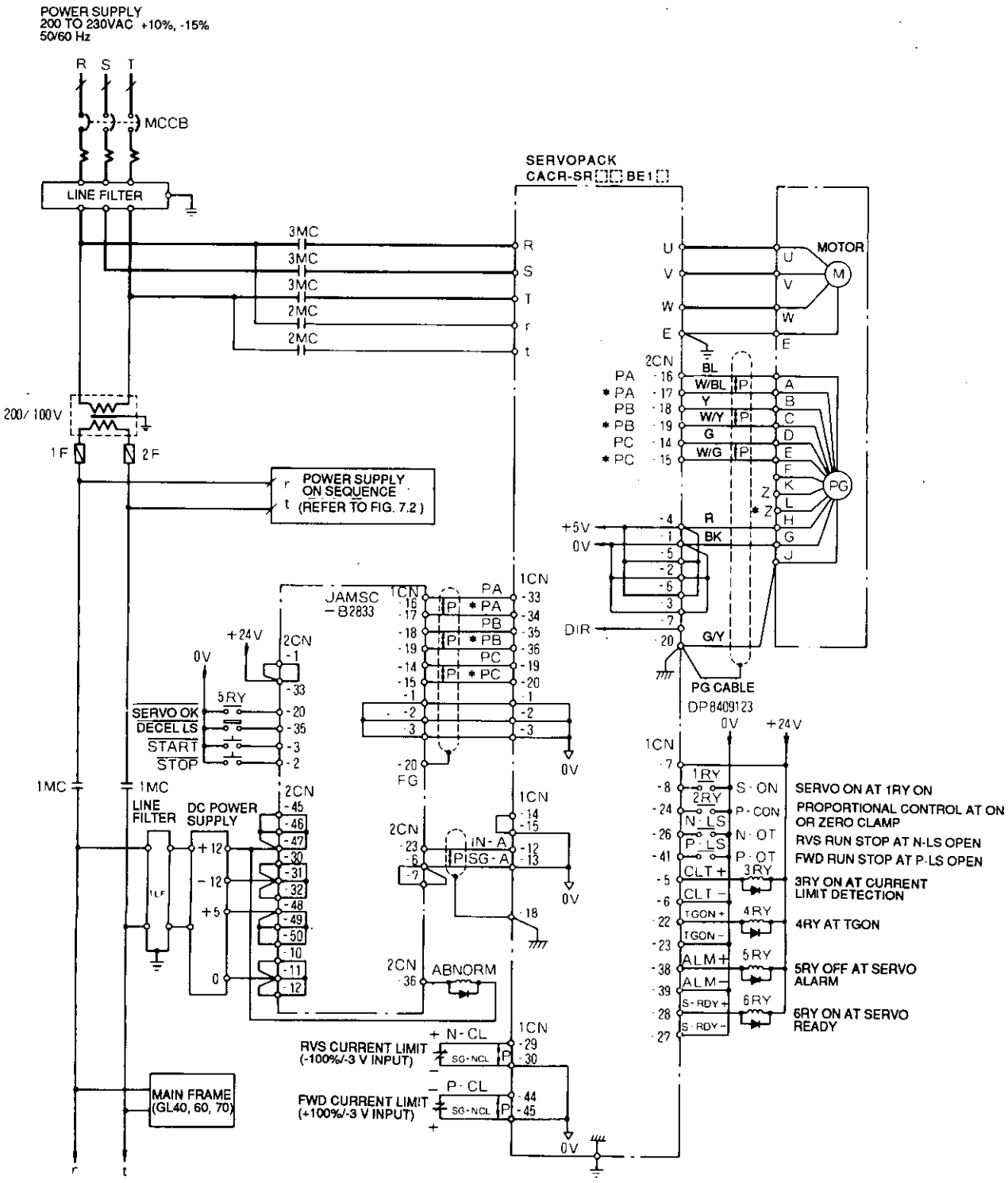
‡ A parameter to select control mode is to be "speed control" or "speed control with zero-clamp."

\# Access from PLC to B2833 must be performed more than 3 seconds after the Servopack control power supply is turned ON.

Fig. 6.5 Typical Connection (3)

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(4) When Used with Servopack CACR-SR □□BE1 □ (with New Type Incremental Encoder)



* Use IN-A for B2833 operation command input. Set IN-B to "zero command" by Servopack parameter setting. Then, IN-B input terminal wiring can be opened.

† Input terminal wiring can be opened if unused signals among S-ON, P-OT and N-OT are masked by Servopack parameter setting.
By setting "S-ON signal is not used," servo is turned ON at SEN signal ON when absolute encoder is used.

‡ A parameter to select control mode is to be "speed control" or "speed control with zero-clamp."

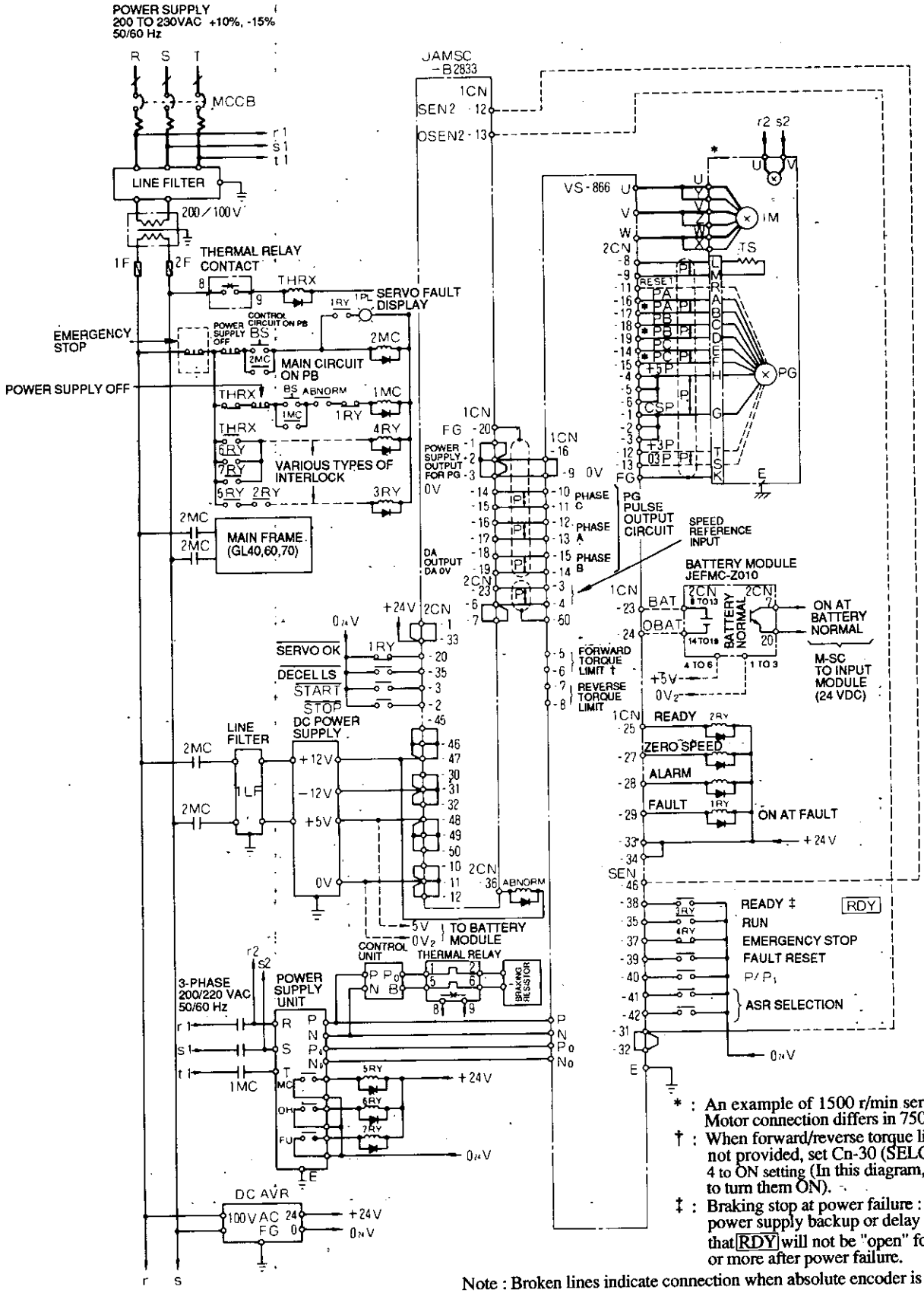
\# Access from PLC to B2833 must be performed more than 3 seconds after the Servopack control power supply is turned ON.

Fig. 6.6 Typical Connection (4)

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6.3 TYPICAL INTERCONNECTION WITH SERVOPACK (Cont'd)

(5) When VS-866 Used



* : An example of 1500 r/min series. Motor connection differs in 750 r/min series.

† : When forward/reverse torque limit input is not provided, set Cn-30 (SELCD2) bits 3 and 4 to ON setting (In this diagram, it is necessary to turn them ON).

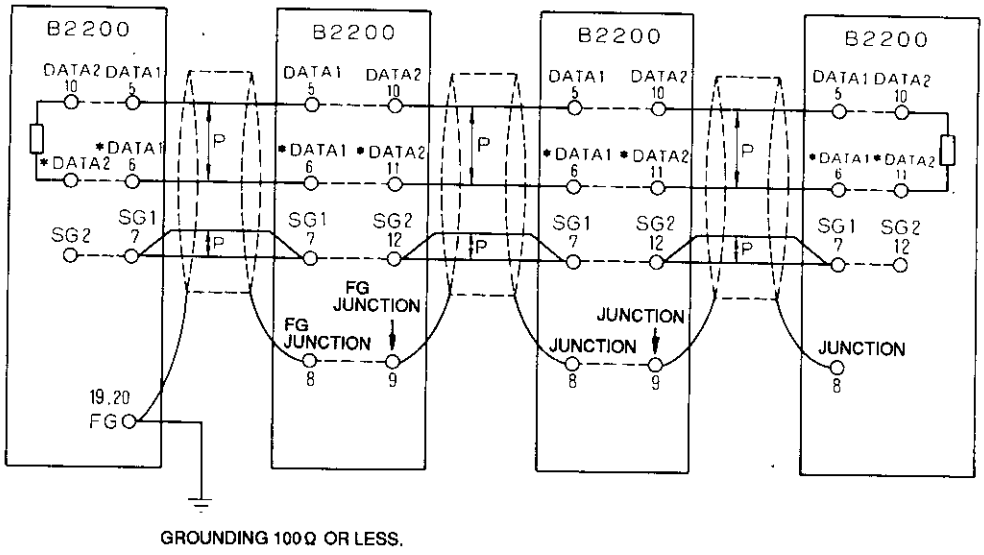
‡ : Braking stop at power failure : Use sequence power supply backup or delay release relay so that RDY will not be "open" for one second or more after power failure.

Note : Broken lines indicate connection when absolute encoder is used.

Fig. 6.7 Typical Connection (5)

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6.4 TYPICAL CONNECTION OF B2200 COMMUNICATION LINE



Note : Connect end resistors (330Ω 1/2 W) to both ends of the communication line.

P indicates twisted pair cable.

Recommended Cable
JKEV-SB 0.75 mm² × 2 P (standard name)
1.25 mm² × 2 P (standard name)
(Polyethylene insulation cable with twisted copper braid shield for instrumentation)
- Made by Sumitomo Electric DPEV-SB
- Made by Fujikura lPEV-SB
- Made by Furukawa Electric KPEV-SB

Extension of Communication Line
150 m when 0.75 mm² used
300 m when 1.25 mm² used

Arrangement of Edge Connector Terminals

Terminal	Signal Name
1	
2	
3	
4	
5	DATA1
6	*DATA1
7	SG1
8	Junction
9	Junction
10	DATA2
11	*DATA2
12	SG2
13	
14	
15	
16	
17	
18	
19	FG
20	FG

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6.5 SUPPLEMENTARY DESCRIPTION OF CONNECTIONS

(1) Typical Power Supply ON Sequence Connection (Fig. 6.2)

- Diagram shows an example of a circuit where the main circuit is disconnected if any of axes 1, 2 or 3 of Servopack or B2833 is faulty.
- When the power supply is turned ON, construct such a sequence that current will be supplied to the Servopack 0.5 second or more after DC power supply for digital control operates.
- When the power supply is turned OFF, construct such a sequence that, on the contrary, the Servopack power supply is turned OFF first, and DC power supply operation is released after 1 second or more.
- For vertical control, provide action to prevent the load from dropping (Load may drop when the Servopack power supply is turned OFF).
- If only the main frame power supply is turned OFF in servo ON status, motor may run away. Therefore, proper test run or adjustment is required.

(2) Wiring of Protective Devices

- Make sure that contacts of thermal relay (THR), thermostat for detection of fin temperature (1TS) and fuse (FUX) alarm are connected to the coil circuits of the relay and that the power supply to Servopack is interrupted if they should operate.
- When a driven machine has limited traveling distance, be sure to provide a limit switch for protection of the machine and control units, and make the following sequence.
  * Apply dynamic braking if alarm limit switch operates.
  * Disconnect all the power if overtravel limit switch operates.
- Overrunning of the motor as a result of failed TG or PG (breakage and disconnection of coil, etc.) cannot be prevented, so protect the machine and control unit by using alarms and overtravel limit switches.

(3) External I/O Signals of B2833

- All the external I/O signals do not always need to be connected. I/O signals unused in the system may be left open. However, use of "$\overline{\text{SVOK}}$" and "$\overline{\text{DEC}}$" input signals is mandatory. Whenever the "$\overline{\text{SVOK}}$" input signal is open, B2833 remains inactive. Zero return is possible in neither mode A nor B when "$\overline{\text{DEC}}$" input signal is open. Special positioning operation is impossible when "$\overline{\text{SPLS}}$" input signal is open.
- After turning on the internal power supply or resetting the module, B2833 waits until "FAULT" output is turned ON (normally) once and "$\overline{\text{SVOK}}$" input is turned ON. B2833 does not distribute D/A output until "$\overline{\text{SVOK}}$" input is turned ON.

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(4) Connection with Servopack

- Use the Servopack IN-B input when used in ±10 V mode.
- When CACR-SR □□BY □(with absolute encoder) or CACR-SR □□BE1 □(with new type incremental encoder) is used
  * Input terminal wiring can be opened if unused signals among IN-B, S-ON, P-OT and N-OT are masked by Servopack parameter setting.
  * A parameter to select the control mode is to be "speed control" or "speed control with zero-clamp".
  * Access from the PLC to B2833 must be performed 3 seconds or more after the Servopack control power supply is turned ON.
  * For other details of the Servopack parameters, refer to Technical Sheets (TSE-S800-11.1 and -11.2).

(5) Connection with VS-866

- ±6V/10V mode is selected by SELCD2 (ch30).
- For details of the VS-866, refer to Technical Sheet (TSE-S866-1).

(6) Wiring Precautions

- Multi-core twisted shielded wire should be used as signal lead to Servopack.
- Use a twisted shielded wire as feedback pulse signal lead from PG to Servopack.
- D/A output line : 3 m (max)
- PG feedback line +5 V line receiver input : 20 m (max)
- For pulse reference line grounding, connect the shielding to Servopack.
  For feedback line grounding, connect it to FG of B2833.
- To avoid malfunction caused by noise.
  * Install an insulating transformer (2T) and line filter (1LF) between DC power unit (1PS) and AC power supply.
  * Install the line filter, DC power unit, and B2833 as close as possible to each other.
  * Do not run connections to primary and secondary windings of the transformer and line filter together. Ground terminal should be connected to ground pole or the equivalent by ground conductor.
  * Connect surge-absorbing circuit to coils of relays, contactors and solenoids.
  * Make connection with a space of 30 cm between AC power lines and DC power lines or signal lines and do not run within the same bundle or duct.

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7. TEST OPERATION ADJUSTMENTS

7.1 WIRING CHECKS

Before turning on the power supply, carefully check the wiring.

(1) Incorrect connection of the power supply (±12 V, +5 V) to the B2833 may burn out or damage electrical parts in the B2833.

(2) If the wires are connected in reverse polarity to the motor, TG, or PG, the motor runs out of control. Make sure that the feedback loops for TG and PG are constructed in the negative feedback mode.

(3) To avoid unexpected mishaps before operation, where the test operation must be started with the motor coupled to the driven machine, start the motor after preparing for an immediate emergency stop.

7.2 TURNING ON POWER SUPPLY

(1) After B2833 setting and the wiring check have been completed, turn ON the power supply. The following LEDs light to indicate the correctly energized state.
- Servopack : [P] for control, [MP] for main circuit
- B2833 : [P. OK]

7.3 B2833 INITIAL SETTINGS

(1) [1SW] Switches

(a) 1SW-1
Applicable CPU module is set. Turn OFF this switch when GL40S, 60S, 60H or 70H is used and ON when GL60V is used.

(b) 1SW-2
Encoder to be used is set. Turn OFF this switch when incremental encoder is used and ON when absolute encoder is used.

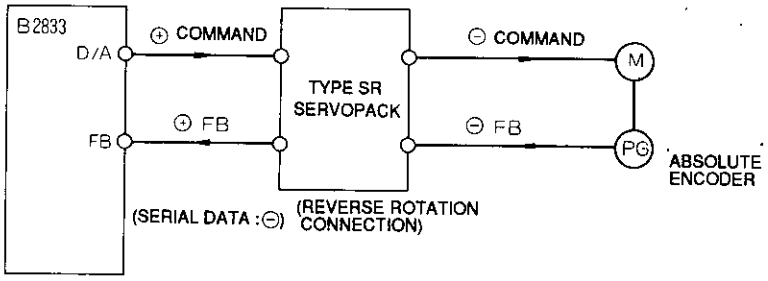
(c) 1SW-3
This switch is in accordance with the setting of Servopack rotating direction.
Turn it OFF when the Servopack is connected in forward run and ON when in reverse run.

(d) 1SW-4
Turn ON this switch ON at reverse rotation connection using separately-mounted encoder or VS-866. Refer to the typical setting described below.

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[Typical Setting of 1SW-3, 1SW-4]

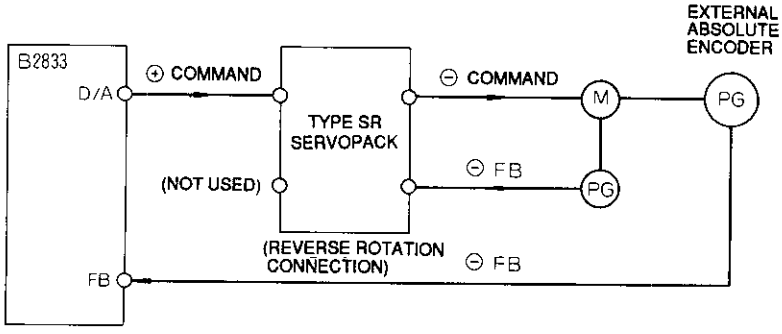
(Example 1)



1SW	Switch Setting
No. 4	OFF
No. 3	ON

When the Servopack setting is set to reverse rotation connection, incremental pulses fedback from the Servopack are reversed. But the sign of serial data output from the Servopack when the SEN signal is turned ON, is not reversed.
1SW-3 must be turned ON in order to know accurate current values since this sign must be reversed in the B2833.

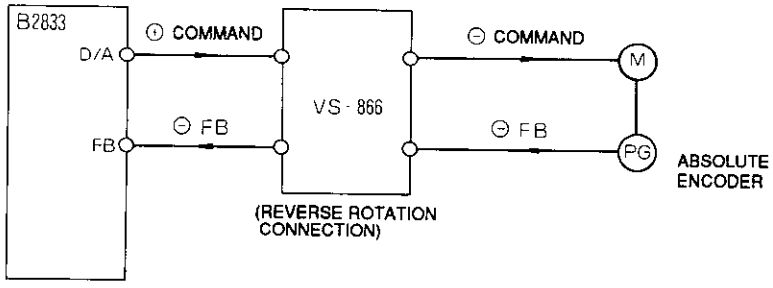
(Example 2)



1SW	Switch Setting
No. 4	ON
No. 3	ON

When separately-mounted PG is located as shown above with the Servopack setting in reverse rotation connection, since both serial data and incremental pulses are input to the B2833 without being reversed, 1SW-3 and 1SW-4 are turned ON.

(Example 3)



1SW	Switch Setting
No. 4	ON
No. 3	ON

When the VS-866 setting is set to reverse rotation connection, incremental pulses fedback from the VS-866 are not reversed. Therefore, 1SW-3 and 1SW-4 are turned ON as well as (Example 2).

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7.3 B2833 INITIAL SETTINGS (Cont'd)

(e) 1SW-5
The zero return operation mode is set. Turn this switch OFF when mode B is used and ON when mode A is used.

(f) 1SW-6
Speed reference output is set. Turn this switch OFF when used in ±6 V mode and ON when in ±10V mode.

(g) 1SW-7
External STOP input logic is set. Turn this switch OFF when used at NO contact input and ON when at NC contact input.

(h) 1SW-8
Normal mode/TEST mode is set. Turn this switch OFF in the normal mode and ON in the TEST mode. The TEST mode is used for offset or gain adjustment.

(2) GAIN OFFSET Volume

Speed reference output voltage gain and offset can be adjusted at the TEST mode. They have been adjusted to the optimum values prior to shipping at the factory. Do not adjust the values unnecessarily.

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7.4 MANUAL OPERATION AND MOVING DIRECTION CHECK

Manual operation is performed to check the movement and adjust position loop gain (Kp).

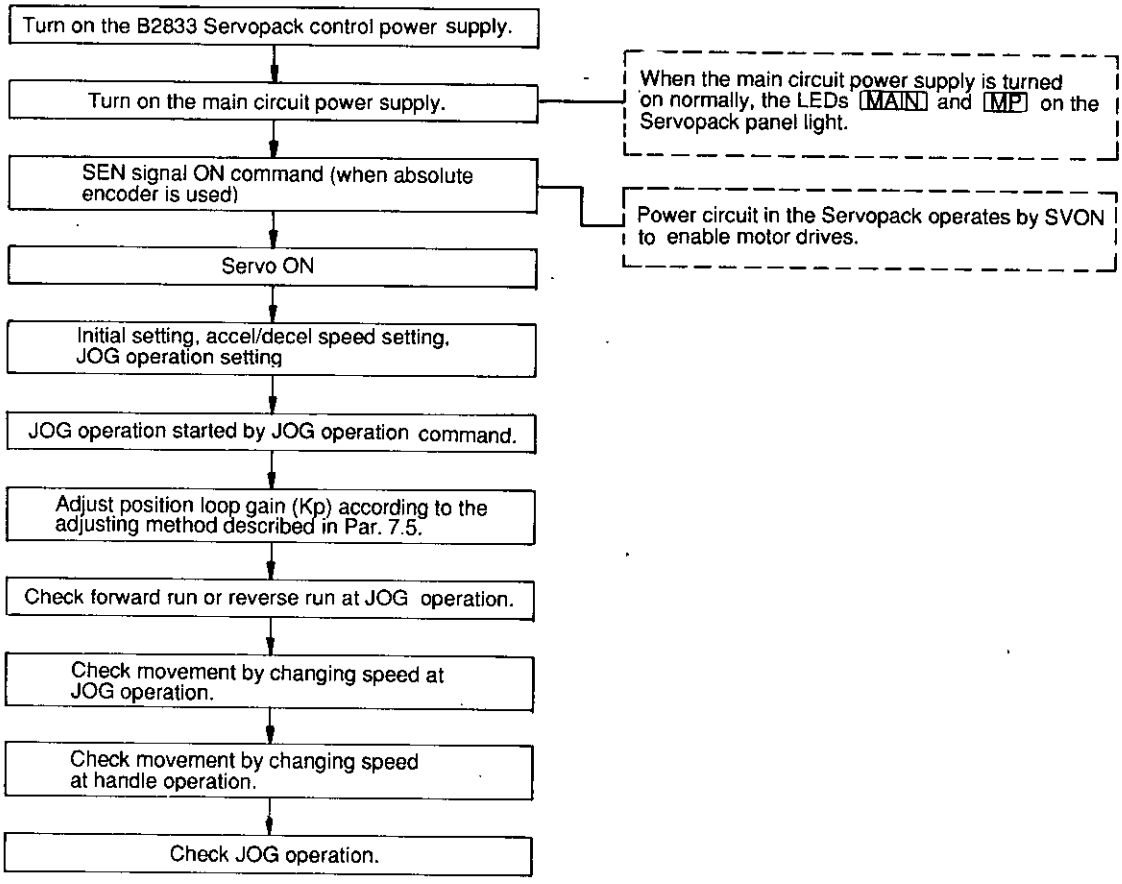


Fig. 7.1 JOG Operation and Adjustment Procedures

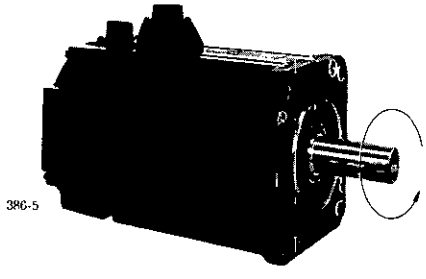


Fig. 7.2 Motor Rotating Direction at Forward Run Command

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7.5 POSITION LOOP GAIN (Kp) ADJUSTMENT

Position loop gain (Kp) is adjusted with the servomotor combined with matching machine. Fig. 7.3 shows the flow chart of adjustment.

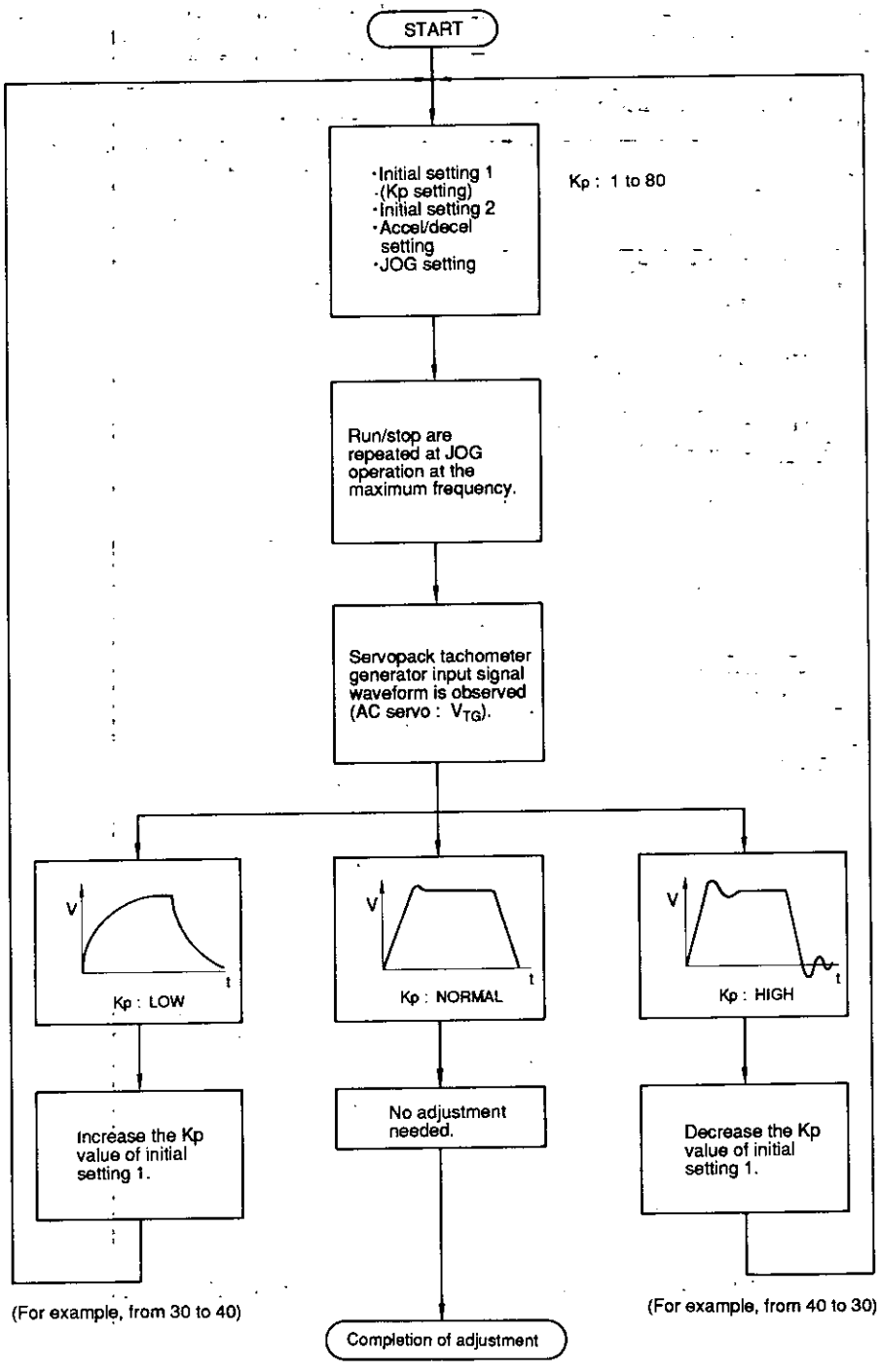


Fig. 7.3 Flow Chart of Adjustment

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7.6 OVERTRAVEL LIMIT SWITCH CHECK

Overtravel limit switch is checked at JOG operation at low speed.

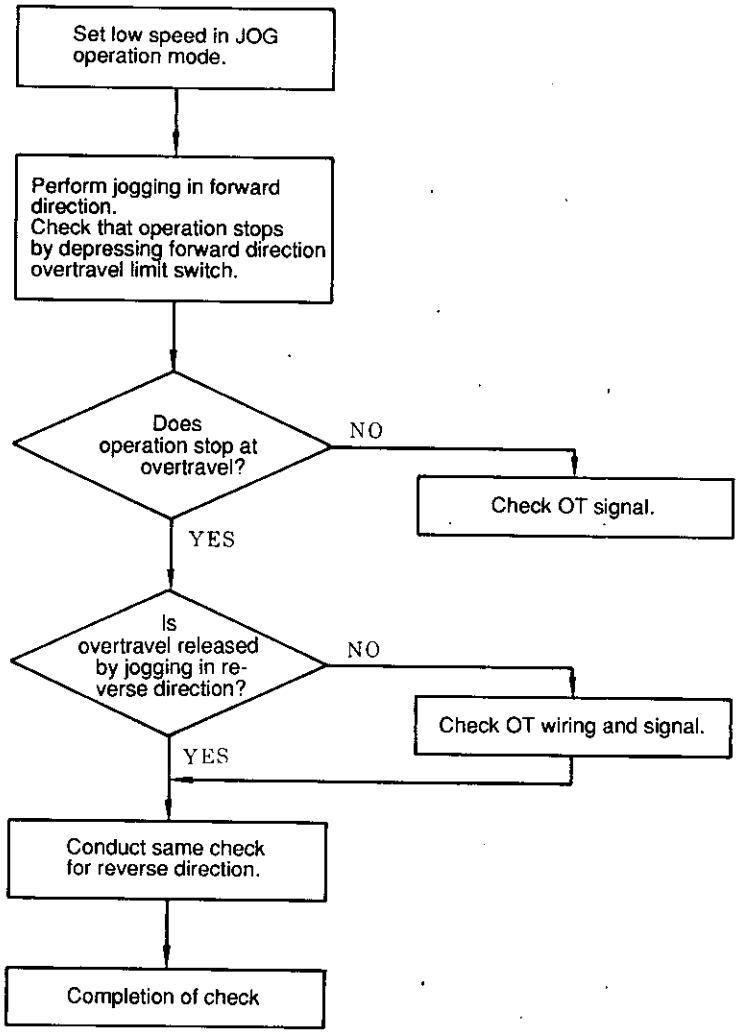


Fig. 7.4 Stroke Limit Checking Procedures

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7.7 HOW TO USE ABSOLUTE ENCODER

(1) Setup

When a motor with absolute encoder is built in the machine, it is necessary to set up the absolute encoder first of all.

The YASKAWA absolute encoder changes absolute position data into data of rotating angle and rotating speed to send.

- Serial data : Indicates at which number of revolutions the motor axis is located from the reference position (the value at setup).
- Initial incremental pulses : Outputs pulses at the same pulse speed as that when rotating at 2747 r/min from the motor zero point position to current motor axis.

Current position P can be obtained by P=M×R+PO assuming serial data value is M (revolutions), initial incremental pulse counting value PO (pulses) and number of output pulses per motor axis revolution R (P/R).

The data width is (8192 P/R) ×(±99999 revolutions).

Since rotating speed data initial value is not always 0, it is recommended to set the rotating speed data to zero before connecting the servomotor to the machine. This is called absolute encoder setup (See Fig. 7.5). Setup is performed by shortcircuiting backup power supply circuit capacitor in the encoder. Since sufficient voltage cannot be obtained for encoder backup and internal elements may not operate normally if the encoder is left without being connected to the battery for four days or more, do not fail to perform setup as described below:

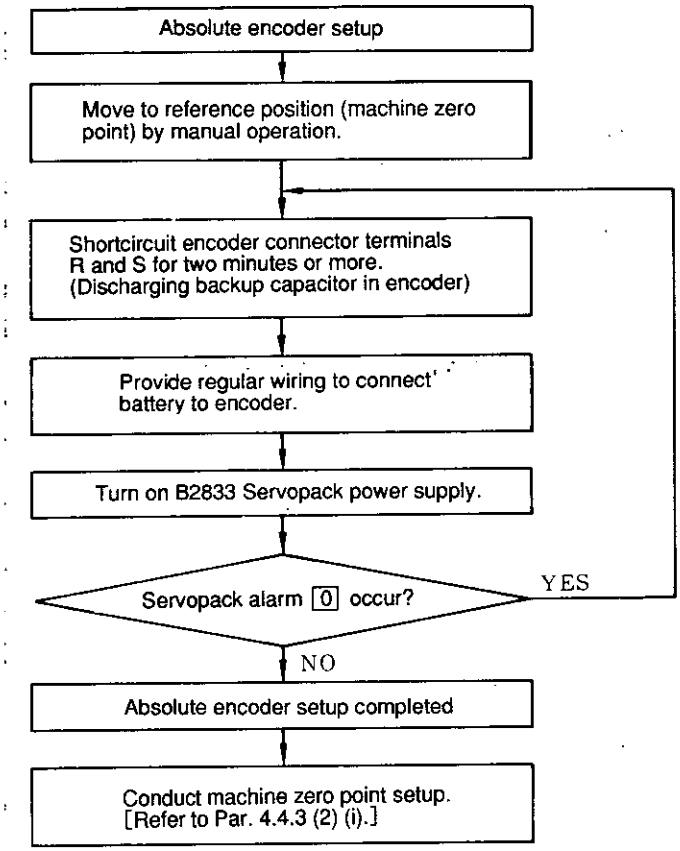


Fig. 7.5 Absolute Encoder Setup Procedures

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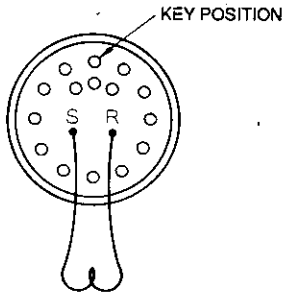


Fig. 7.6 Short-circuiting

Notes :

1. The motor revolution is set to 0 by this setup.
2. If the motor is built in the machine and setup must be performed without contacting the encoder connector, set the PG cable as shown in Fig. 7.7 and remove Servopack 3CN to short-circuit with Servopack side connectors.

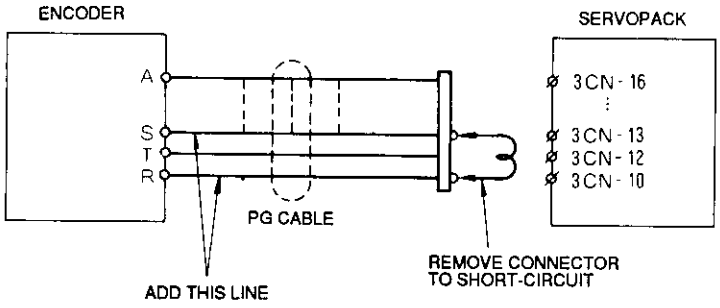


Fig. 7.7 Setup by PG Cable

- The B2833 has a function to set machine zero point to absolute encoder absolute position. For details, refer to Par. 4.4.3 (2)-(i).

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7.7 HOW TO USE ABSOLUTE ENCODER (Cont'd)

(2) Battery Module

Be sure to use battery to store position data in the event absolute encoder power should fail.

(a) The following battery is recommended :

- Lithium Battery (ER-6C 3.6 V× 1)
  Made by TOSHIBA.

(b) Connect the battery securely to prevent contact failure due to an environmental change or a change with the passage of time.

(c) Battery voltage is not monitored in the Servopack.
Prevent the voltage from falling below 2.8 V.

(d) If battery voltage lowering detection circuit is necessary in the system, a battery module (JEFMC-Z010) provided with voltage lowering detection alarm LED and I/O output is available. Fig. 7.8 shows the battery module.

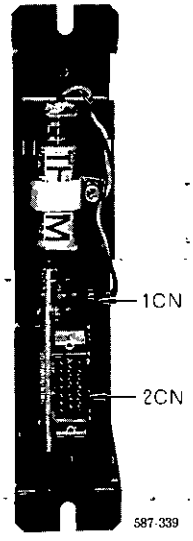


Fig. 7.8 Battery Module (JEFMC-Z010)

(3) Battery Replacement

Replace absolute encoder battery (provided by user) as follows.
Normally, lithium battery (BR-C) has a 10-year life.

(a) Turn on the Servopack power supply and keep SEN signal at a high level for 3 minutes or more. Then encoder capacitor is charged.

(b) Replace the battery. At this time, Servopack power supply can be turned either ON or OFF.

In this way, the battery can be replaced with encoder revolution data remaining.
(If step (a) is performed, encoder operates normally for 4 days after the battery is removed).

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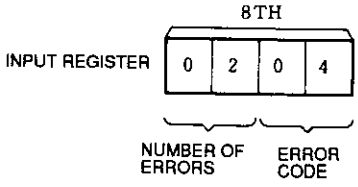
8. TROUBLESHOOTING

8.1 B2833 ERROR CODES

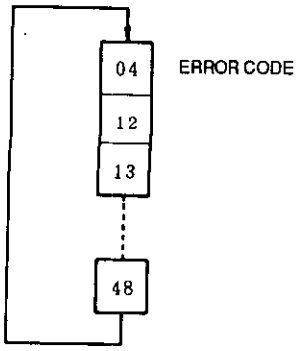
This paragraph describes the contents of various errors occurring when using the B2833, error codes and measures to be taken in the even of error.

(1) Monitoring of Error Codes

- Error codes can be monitored in input register.
  Error code monitor mode can be assumed by turning output coils "monitor 1" to "monitor 3" to OFF.



- As described above, the number of errors and error code can be seen in the eighth input register.
- The number of errors indicates the number of errors for each error code.
  Even if more than one error code occurs, it is counted as one.
- The smallest error code is displayed among occurring errors. However, every time output coil "error code display change" is turned OFF to ON (↓↑), all error codes can be displayed one by one.



Every time output coil "error code display change" is turned OFF to ON (↓↑), error codes are displayed in sequential rotation.

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8.1 B2833 ERROR CODES (Cont'd)

(2) Hardware Errors

Error Code	Cause	Corrective Action
—	ROM check error RAM check error WDT error	Self-diagnosis error. Module must be reset or internal power supply must be turned OFF and then ON again. If the same error recurs, replace the module.
01	External power supply fault ("P.OK" LED lamp OFF.)	Check external power supply (±12 V and +5 V). Upon elimination of cause, error code disappears to enable continuing operation.
02	Servo fault External input signal "SERVO OK" is at H level.	Check the "SERVO OK" input continuity. Upon elimination of cause, error code disappears to enable resuming operation.
03	Absolute encoder fault Indicates absolute data fault or battery fault.	PG signal line is checked. Reactivation is enabled by module reset, initial setting and SEN signal ON.
04	Deviation counter over Indicates the number of lag pulses at absolute encoder overflow. $Kp = \frac{fin}{\varepsilon}$ (Fault at lag pulses > $4\varepsilon_0$)	Review the servo system. Decrease position loop gain Kp. Decrease PG division ratio. Returns by the error code reset coil (22 + 8n).
05	PG disconnection (Phases A, B)	PG signal line disconnection is checked and input signal wiring is rechecked. By removing the cause, operation can be continued.
06	Position error	Wrong encoder wiring or noise interruption in PG signal. Recheck the encoder wiring. Operation can be continued.

(3) Communication Error

Error Code	Cause	Corrective Action
11	In synchronous operation, master module has not completed sending in communication process.	Replace the module.
12	Receiving data have been faulty for three times consecutively.	Check synchronous buffer module. Check communication line wiring. Recheck wiring route. B2833 pulse output is stopped, and operation is enabled by error code reset.
13	Receiving data has been faulty for a few times consecutively.	Recheck communication line wiring route.
14	No data has been sent from master axis.	Check synchronous buffer module. Check master axis in the same group. Check A master for master axis.
15	Two A masters exist. *	Check ladder.

* Data transmission does not occur for more than one minute after being set at the slave axis or the master axis other than A.

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(4) Setting Errors

Error Code	Cause	Corrective Action
20	Any setting command is turned ON in "stop" coil OFF status.	The former setting is effective. Turn ON "stop" coil and set it again.
21	Some setting commands are turned ON simultaneously.	Setting commands are ineffective. Setting must be performed again.
22	Setting range is not met in initial setting.	Proper setting is needed.
23	Operation set value fault. Operation setting without accel/decel speed setting. A value exceeding the setting range is set.	
24	Steady speed ≧ creep speed is not satisfied. (Zero point return, special positioning)	
25	Special positioning setting is performed in absolute value mode.	
26	Current value setting or initial setting command is turned on during deceleration at "STOP" coil ON.	Setting command is ineffective. Setting must be performed again after stopping operation.
27	Slave synchronization method differs from that of master.	Synchronous operation is performed in slave setting.
28	SEN signal ON command for incremental mode.	Not needed
29	Multi-step or the 1st-step speed operation setting is input during variable speed operation.	Operation stops and the setting is disregarded.
30	Skip in multi-step speed operation setting	Operation continues.

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8.1 B2833 ERROR CODES (Cont'd)

(5) Operation Errors

Error Code	Cause	Corrective Action
40	Some operation commands are turned ON simultaneously. (Excluding the case that automatic positioning and JOG operation are turned ON simultaneously in the same mode.) (Including the case that other operation command is input in the same scan as scan to be started by reservation.)	Start is disregarded. (In the same scan as reservation start, the reserved start is enabled.)
41	Operation command in "stop" coil ON status	Start is disregarded.
42	Data with different rotating direction exist during multi-step speed operation.	Data with different rotating direction are disregarded and operation is performed with the next data immediately.
43	Count enabled range exceeded in absolute value mode.	Set the value within the allowable range by JOG, zero return or manual pulse operation.
44	Zero return operation command is turned ON in decel LS ON status.	Operation is not performed. Turn OFF the LS by other operation.
45	CPU module scan time is too short. (An error occurs when bus interruption enters during processing.)	Increase the CPU scan time by using constant sweep.
46	Operation command is turned ON when no operation condition is provided.	Start is disregarded.
47	Operation command is turned ON before SEN signal is turned ON.	
48	Previous operation has not completed. Operation command which cannot be reserved is input in COIN OFF status. (Including the case that automatic positioning operation reservation is input during any type of operation other than automatic positioning.)	Reservation is disregarded.
49	Operation command without synchronization release in slave	Start is disregarded.
50	Operation command exceeding current value	
51	Operation command is turned ON at set value fault.	
52	Operation command is turned ON during multi-step or the 1st-step speed setting.	
53	External start is turned ON in external start disabled status. (Occurs also when already input external start reservation becomes disabled.)	Start is disregarded.

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8.2 STATUS INDICATION AT ERROR

Table 8.1 Status Indication at Error

Error		Input Relay			Indicator Lamp			External Output
		"READY"	"FAULT"	"ERROR"	"RDY"	"ABNO"	"ERR"	"FAULT"
Hardware Error	ROM Checksum Error RAM Check Error WDT Check Error	OFF	OFF	Undefined	OFF	OFF	Undefined	Not output
	Error Code 01	ON	ON	ON	ON	ON	ON	Output
	Error Code 02					OFF		
	Error Code 03					ON		
	Error Code 04					OFF		
	Error Code 05					ON		
	Error Code 06		OFF			OFF		
Setting Error Operational Error		ON	OFF	ON	ON	OFF	ON	Not output

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8.3 SYSTEM TROUBLESHOOTING

If a malfunction occurs, checking must be started with the assumption that the failure was caused by either erroneous operation or faulty equipment.

8.3.1 DC POWER SUPPLY

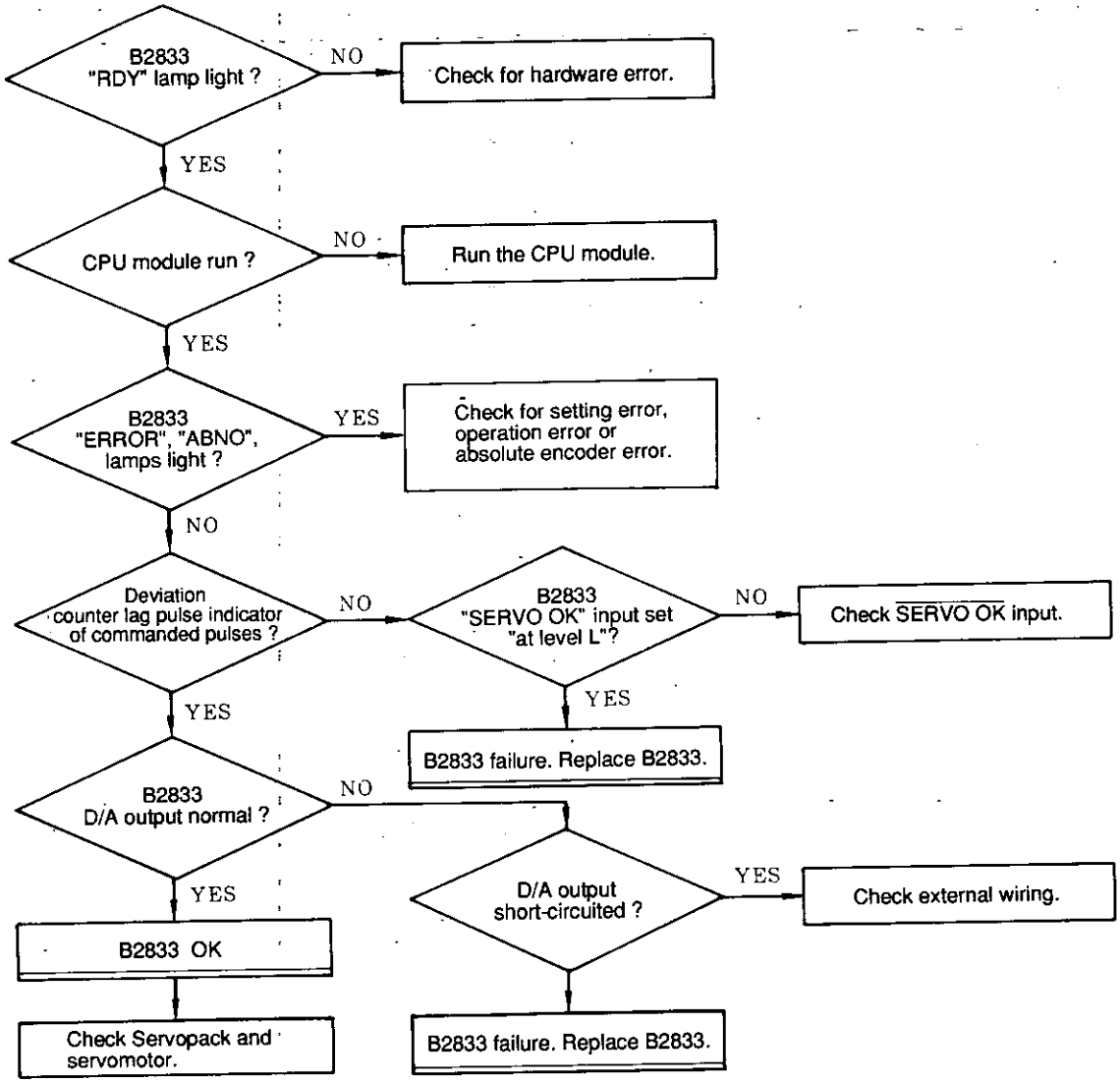
Faulty, or fluctuation of, DC power supply voltage exceeding limits shown below, may cause overrunning of the motor or inaccurate control.

Terminals No.

2CN-45, 46, 47 : +12 V ±3%
2CN-30, 31, 32 : −12 V ±3%
2CN-48, 49, 50 : +5 V ±5%
2CN-10, 11, 12 : 0 V

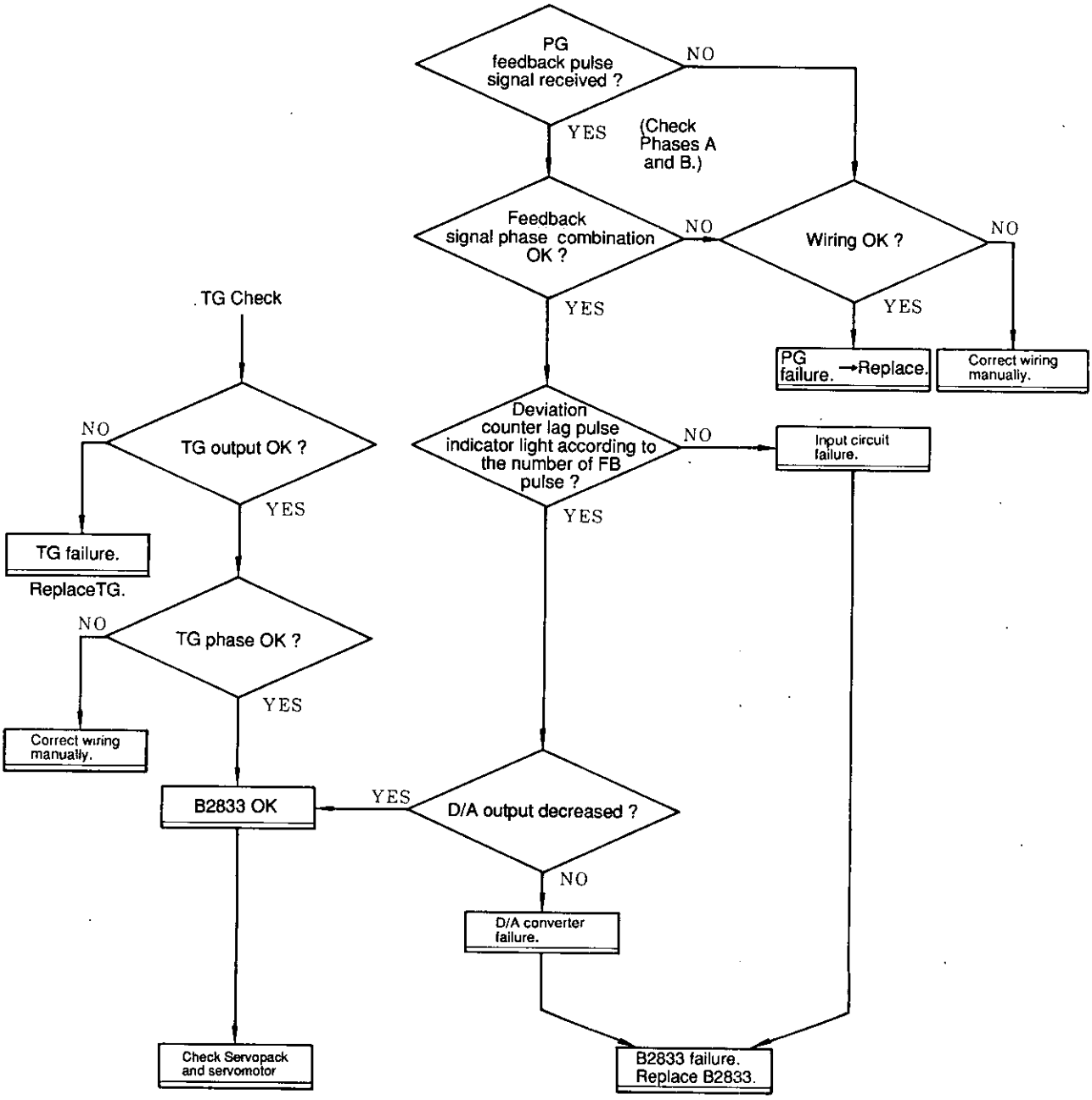
If measured voltage exceeds the above limits, check the DC power supply unit and wiring. Wire size should be 2 mm^2 or larger.

8.3.2 MOTOR DOES NOT ROTATE



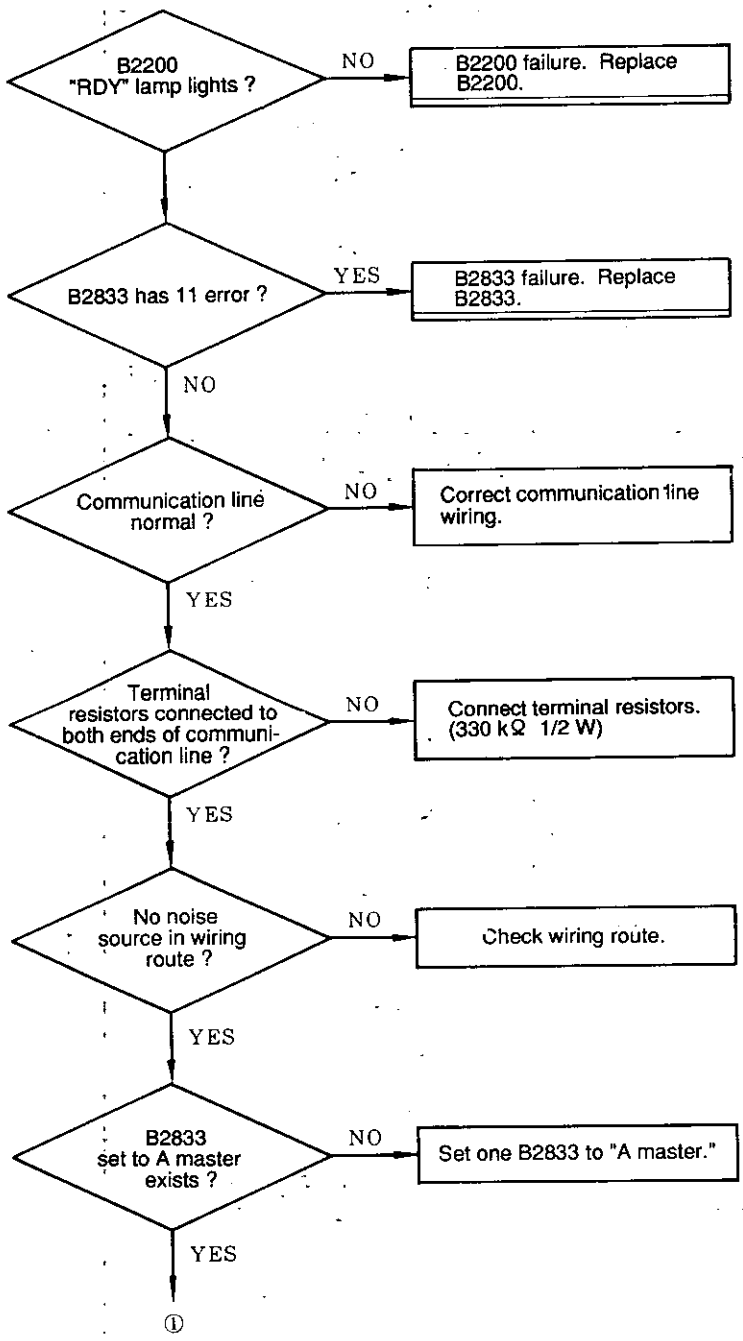
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8.3.3 MOTOR RUNS BUT DOES NOT STOP (INCLUDING OVERRUN)

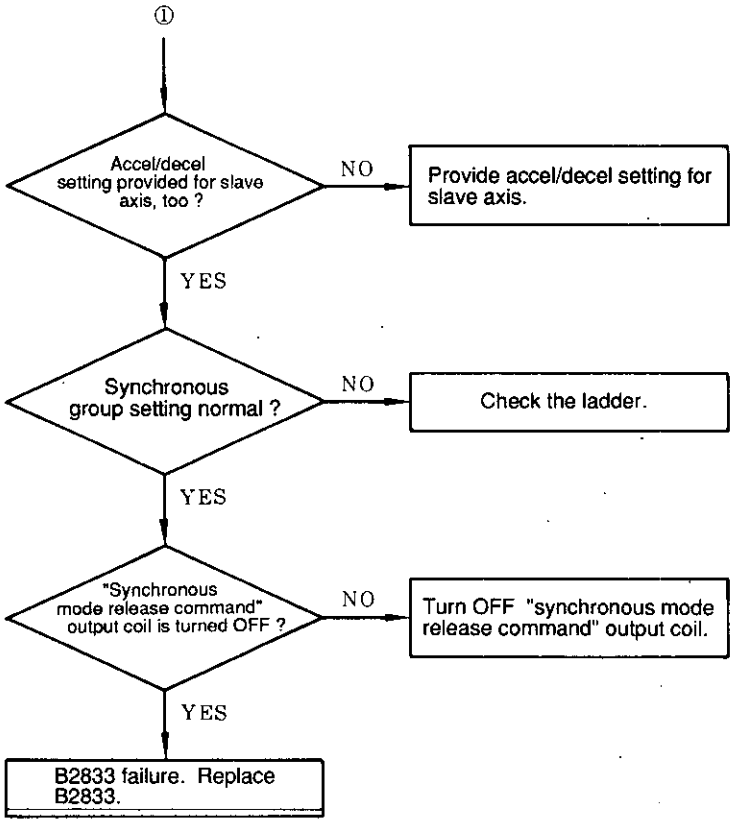


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8.3.4 SYNCHRONOUS OPERATION IS NOT ENABLED (MOTOR ROTATES BY SINGLE-AXIS, BUT SYNCHRONOUS OPERATION IS NOT ENABLED)



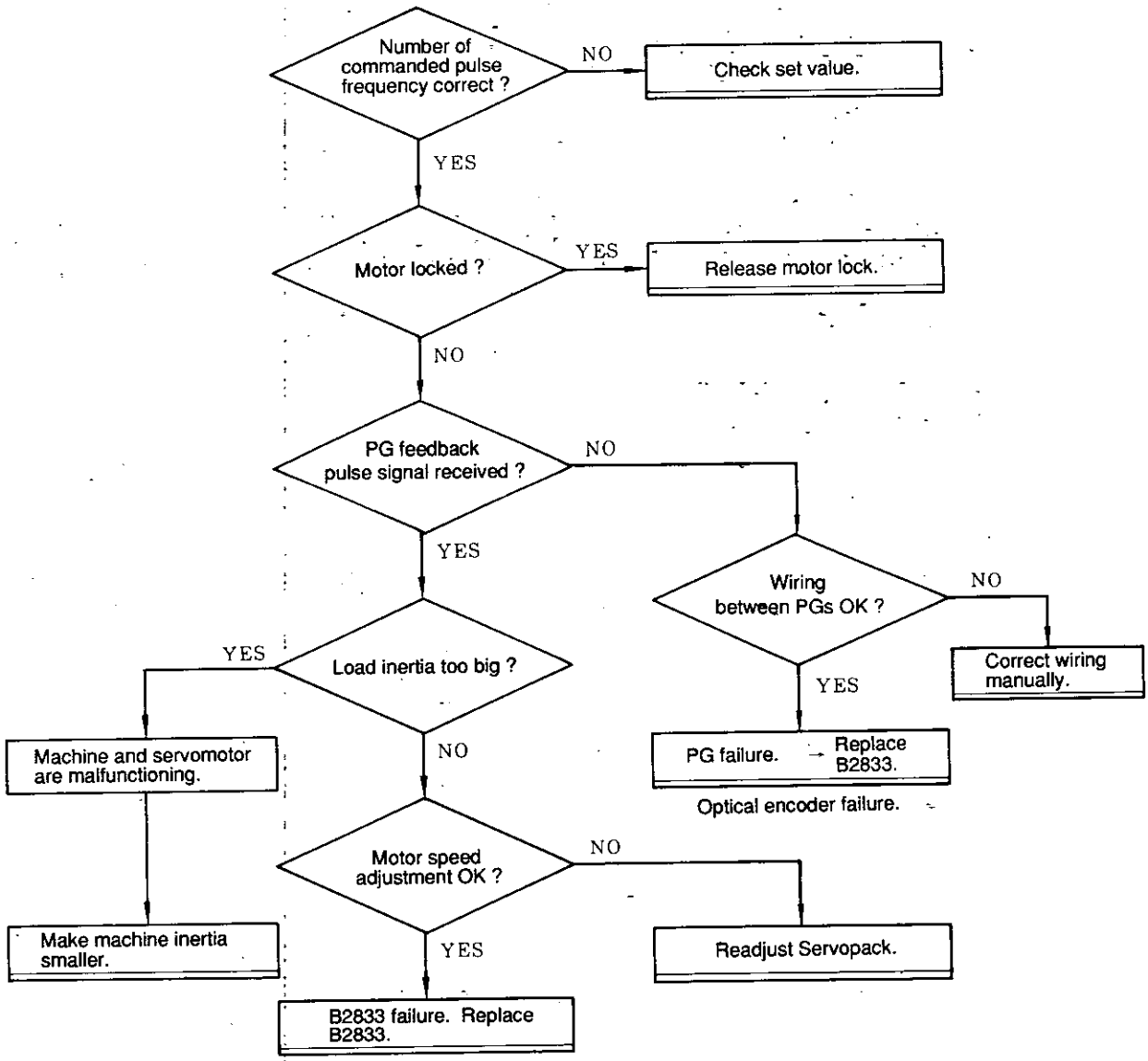
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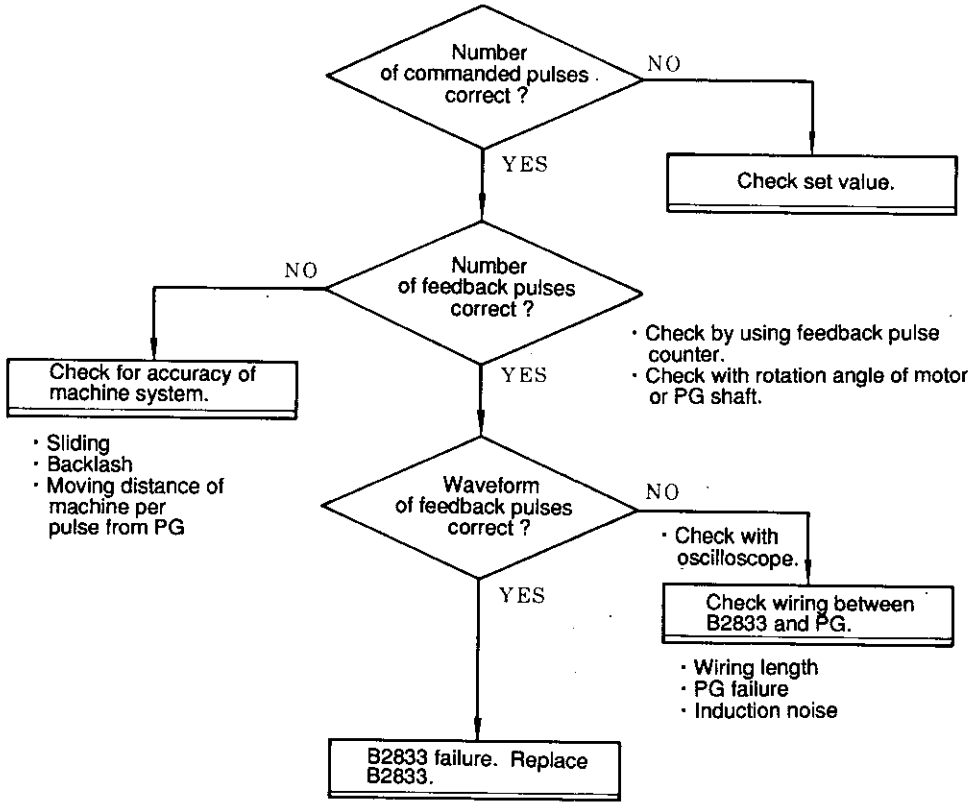
8.3.5 DEVIATION COUNTER OVER EXCEEDED (04 ERROR)

$$fin = \frac{\text{Motor r/min}}{60} \times \text{No. of PG pulses } \frac{\text{pulse}}{\text{rev}} \times \text{multiplier}$$



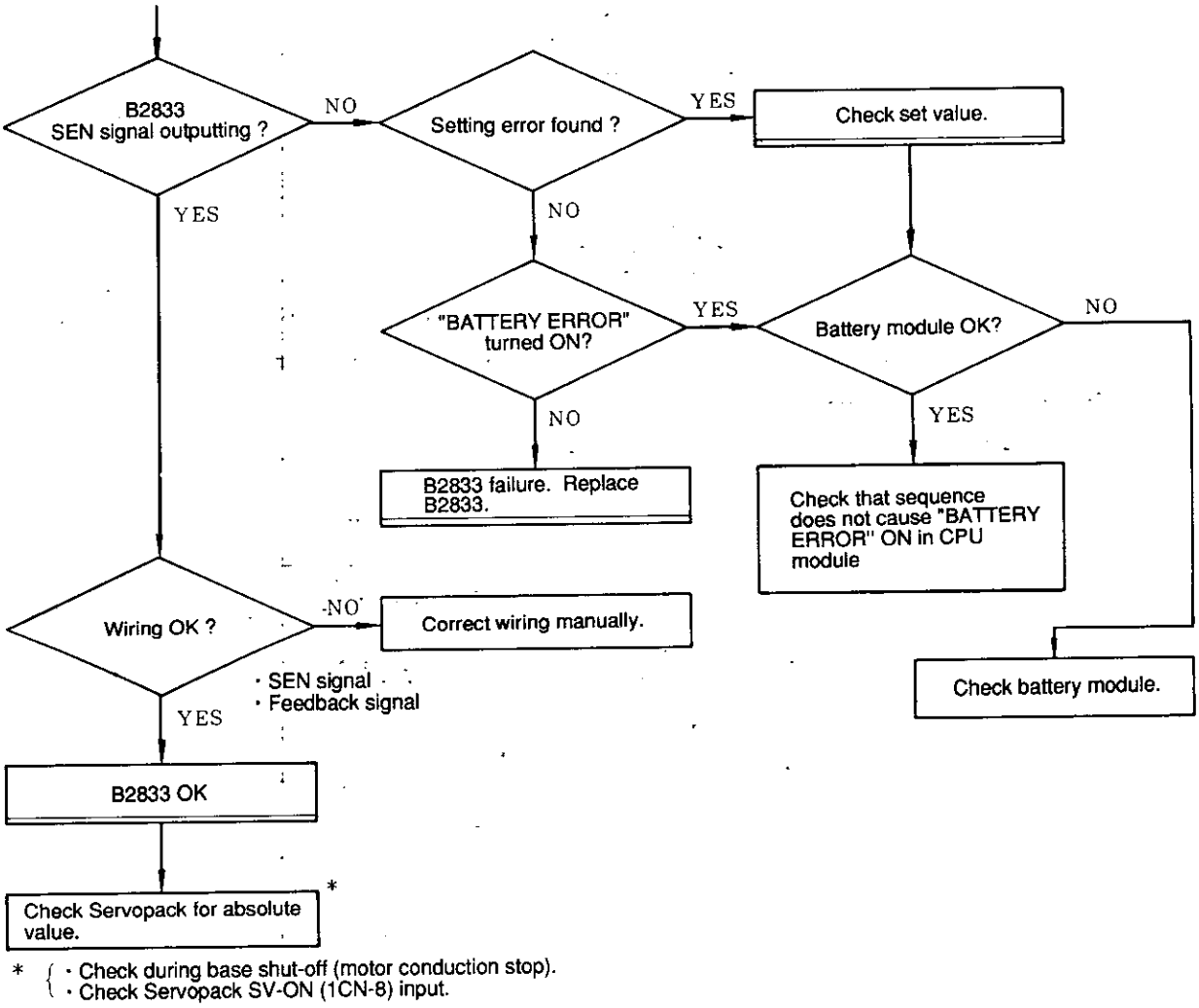
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8.3.6 POSITIONING ACCURACY IS NOT GOOD



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8.3.7 ABSOLUTE ENCODER IS MALFUNCTIONING



When absolute encoder is malfunctioning, reset B2833 module or turn ON the power supply again.

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9. DIMENSIONS in mm (inches)

9.1 B2833

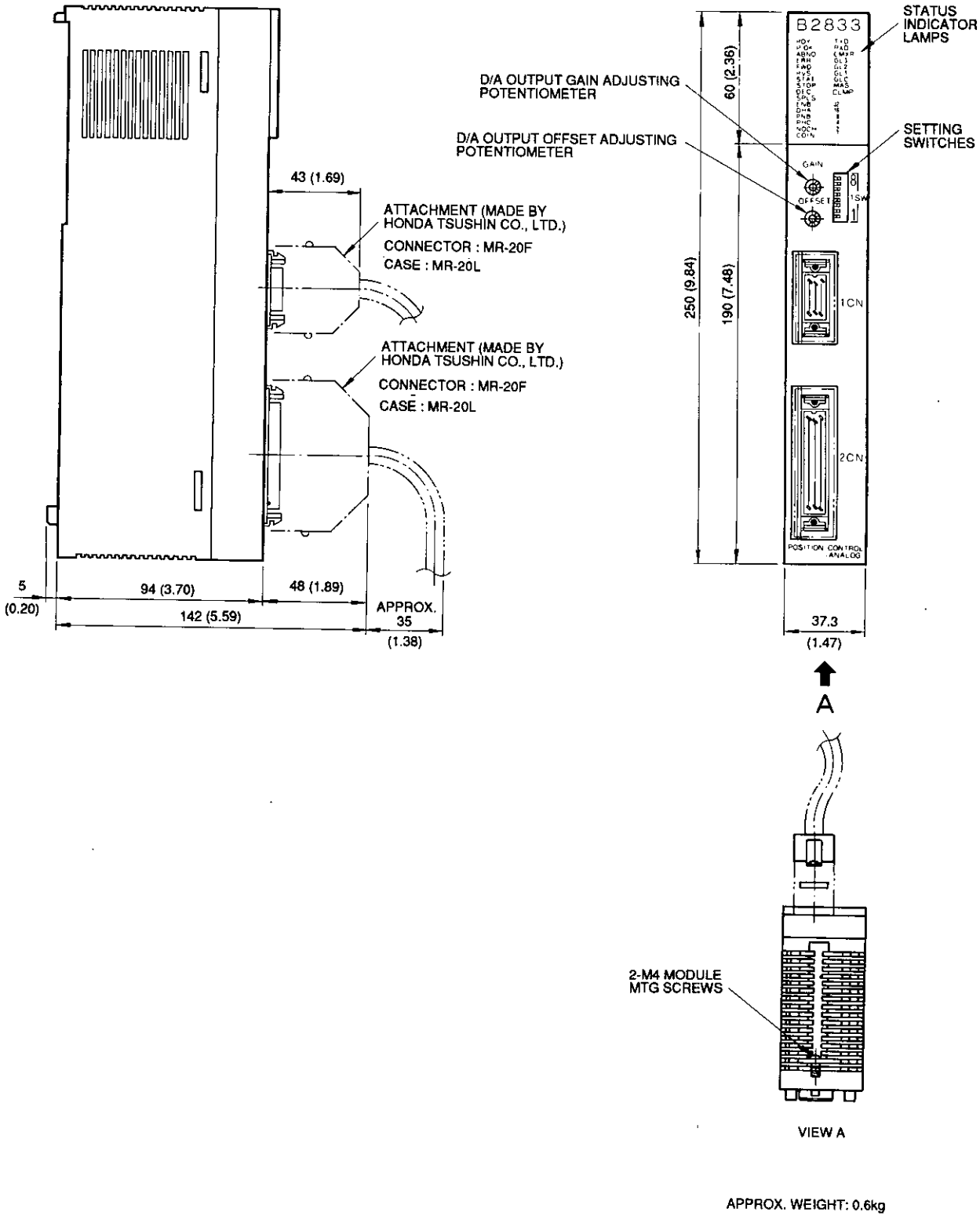


Fig. 9.1 Positioning Module JAMSC-B2833

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9.2 B2200

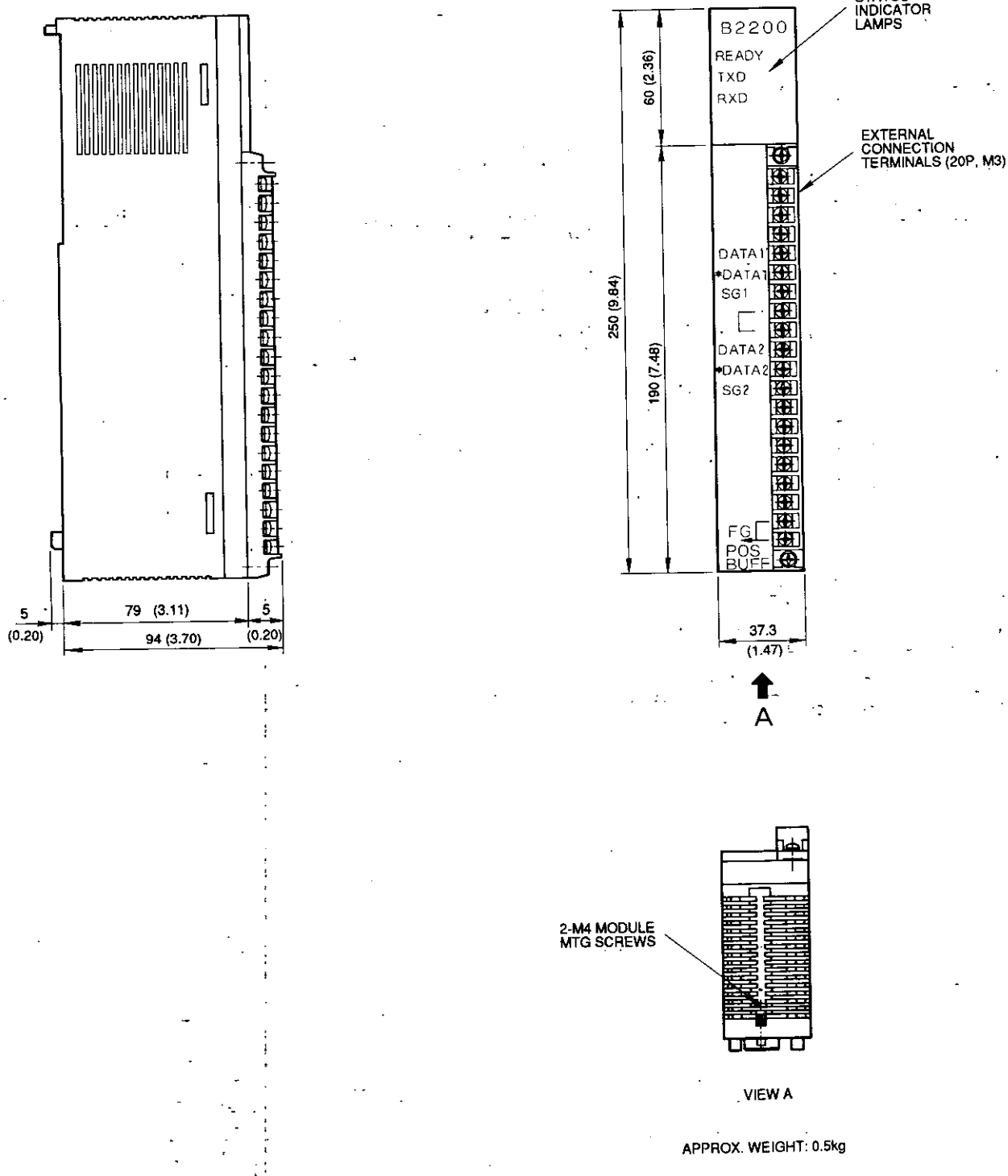


Fig. 9.2 Synchronous Buffer Module JAMSC-B2200

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10. EXPANDED FUNCTIONS

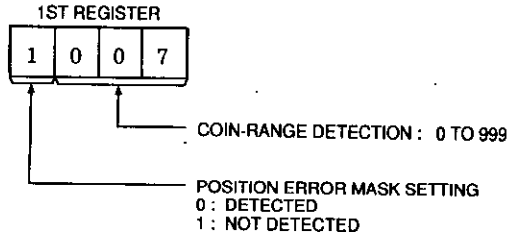
The following functions have been added to further upgrade your equipment. Make sure you have the correct software version before use.

	Added Functions	Applying Software Version (Seal marked on bottom of case)
1	Position error (Error code 06) masking function	Effective for version E and following
2	JOG/Zero return operation direction switch	
3	Deviation counter overload settings	Effective for version K and following
4	Deviation counter real time display	
5	COIN override and error 48 masking function with variable speed operation	
6	External start for variable speed operation	
7	Automatic positioning operation masking function	
8	Software filter function	
9	Position loop control function with variable speed operation	

(1) Position Error (error code 06) Masking Function

Select whether position error is to be detected : pulse from one C-phase to the next is counted and compared with encoder pulse setting values. Error occurs when the two values are different.

〈Initial Setting 1〉



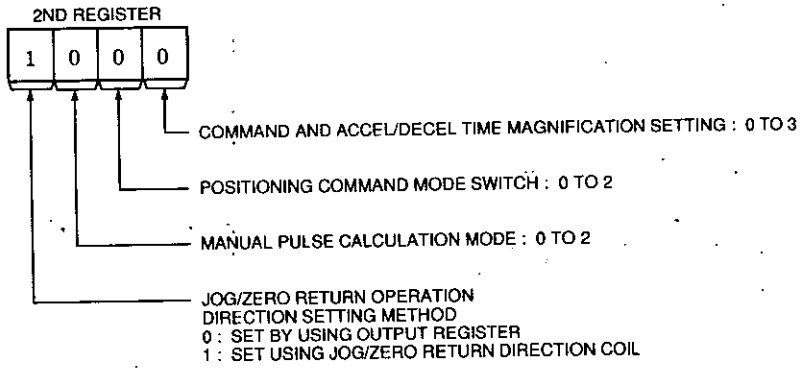
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10. EXPANDED FUNCTIONS (Cont'd)

(2) JOG/Zero Return Operation Direction Switch

JOG/Zero return operation for forward or reverse operation can be set with the register or by using the output coil when entering a command.

〈Initial Setting 1〉



JOG/Zero return direction coil : 31+8n (Reference No.)

OFF : Forward

ON : Reverse

(3) Deviation Counter Overload Value Setting

Deviation counter overload value (4 ε) can be set by measuring the value N* ε (N : 1 to 99).

When 1 is set on the fourth digit of the 7th register on the initial setting 1, operation is effective for the 8th register. The last two digits are set for values 1 to 99.

Normal operation occurs when "00" is set for the last two digits, or a "0" for the top digit of the 7th register on the initial setting 1.

Note : The maximum counter size for software is a 2000000H (33554432DEC) pulse. Deviation counter overload will be applied regardless of the setting values for N* ε if ε is greater than 2000000H.

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(4) Deviation Counter Real Time Display

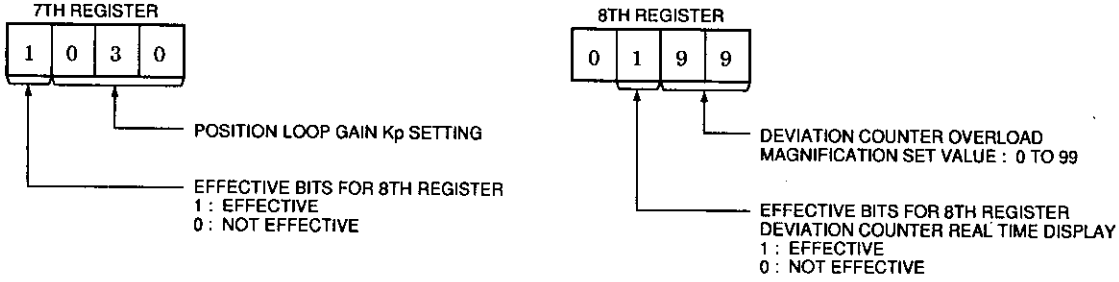
Deviation counter monitored by the register can be changed to the real time display. When 1 is set on the fourth digit of the 7th register on the initial setting 1, operation is effective for the 8th register. The third digit of the 8th register is set at 1.

(Monitor 1, 2, 3) = (0, 0, 0) : Deviation counter real time values are displayed at the input 7th register.

(Monitor 1, 2, 3) = (1, 0, 1) : Deriation counter maximum values are displayed at the input 7th register.

Normal operation occurs when "0" is set for the third digit of the 8th register on the initial setting 1.

〈Initial Setting 1〉

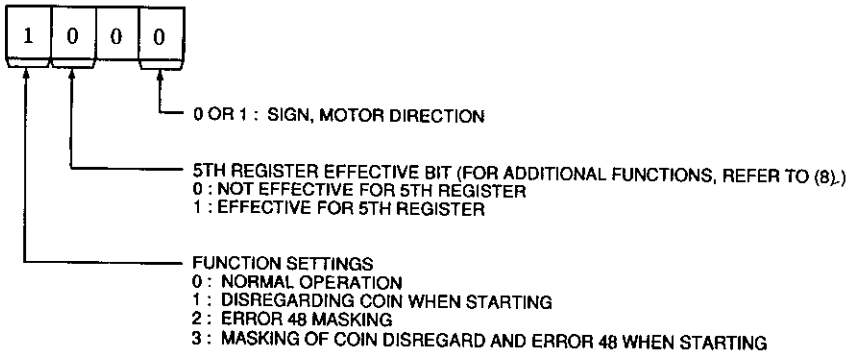


(5) Disregarding COIN Conditions and Error 48 Masking Function

- "COIN ON" condition can be disregarded from the starting conditions of variable speed operation. ("Output completion" condition is essential for starting.)
- Error 48 masking can be performed on variable speed operation command. Error 48 will not be displayed when both output completion and COIN ON are not satisfied.

Output register settings for specification changes

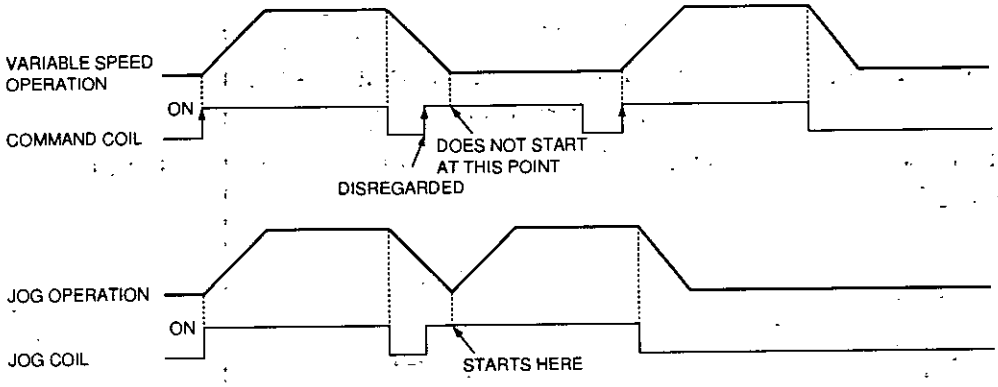
〈Variable Speed Operation Setting〉



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10. EXPANDED FUNCTIONS (Cont'd)

Note : Even when error 48 masking is performed, it is still necessary to turn OFF/ON variable speed operation command coil (after the outputs complete) for restart.



(6) External Start Function at Variable Speed Operation

External start can be accomplished at variable speed operation as well as automatic positioning.

〈Method〉

- Output coil allocation of JAMSC-B2833 : 48 points
- Turn the output coil "34 + 8n" to "Variable speed operation external start effective."
  OFF : Effective for external start of automatic positioning operation
  ON : Effective for external start of variable speed operation

When output coil 34 + 8n is "ON"

- Normal operation will be made when using variable speed operation command coil (12 + 8n).
- External start operation does not synchronize with the scan.
- Operation will continue when "command coil" or "external start" is ON.
  (Operation will continue if external start is "ON" even when coil 34 + 8n is "OFF" during external start operation.)

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(7) Automatic Positioning Operation Masking Function

This function protects against contact chattering when using external start automatic positioning operation.

〈Method〉

The following output coil and input relay are used.
(Output coil allocation of JAMSC-B2833 : 48 points)

- Turn output coil "33 + 8n" to "Reserved operation DISABLE."
- Turn input relay "10027 + 8n" to "Reserved operation DISABLE."
- Turn input relay "10028 + 8n" to "Reserved."

① When output coil "33 + 8n" is ON

- Input relay "10027 + 8n (Reserved operation DISABLE)" is turned ON.
- Reserved operation will be disregarded and will not output errors. When output coil 33 + 8n is turned OFF during operation, remaining reservation will be accepted.

	Single-step Command	Multi-step Command	External Start
Single-step Operation	Disregarded (No error)	Error 48	Error 48
Multi-step Operation	Error 48	Disregarded (No Error)	Error 48
External Start Operation	Error 48	Error 48	Disregarded (No Error)

② When output coil "33 + 8n" is OFF

- Input relay "10028 + 8n" will be turned ON when reserved operation is accepted.
- Input relay "10028 + 8n" will be turned OFF during reserved operation.

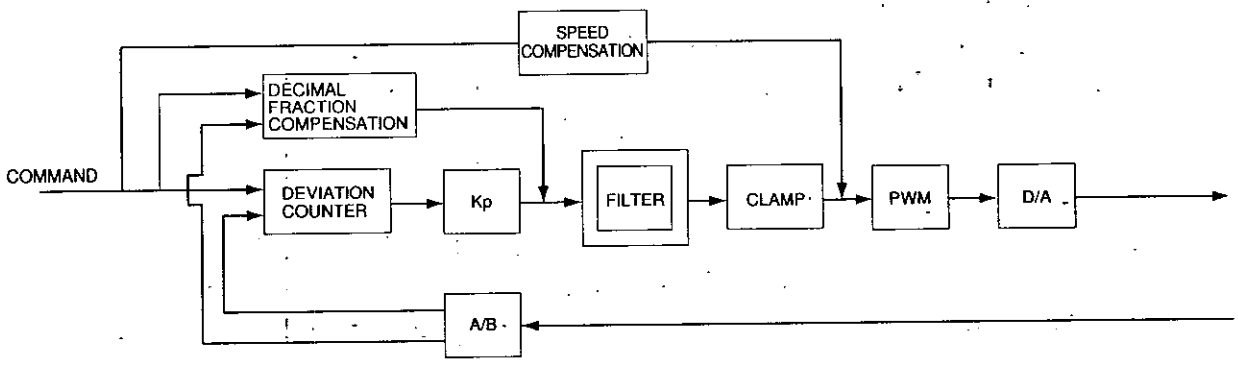
	Single-step Command	Multi-step Command	External Start
Single-step Operation	Reserved	Error 48	Error 48
Multi-step Operation	Error 48	Reserved	Error 48
External Start Operation	Error 48	Error 48	Reserved

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10. EXPANDED FUNCTIONS (Cont'd)

(8) Software Filter Function

The following diagram illustrates how installation of a primary lag filter can be made on the B2833 positioning loop according to software applications. This function is effective in controlling mechanical vibration.

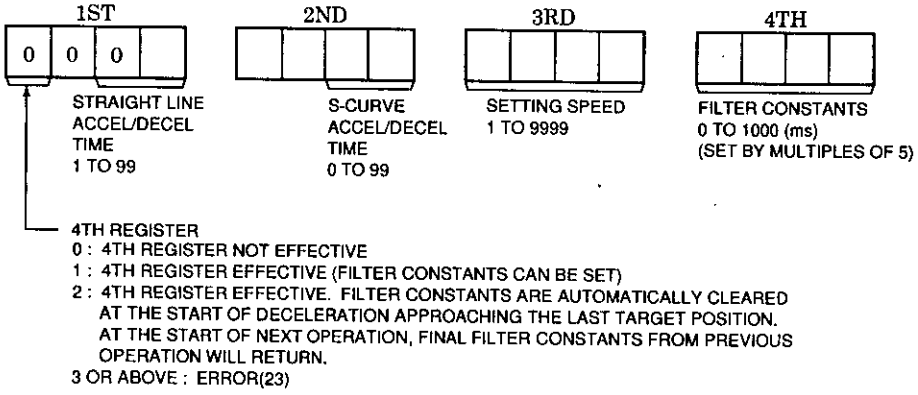


〈Method〉

① Set filter constants according to accel/decel settings.
② Set filter constants according to variable speed operation settings.
③ Set filter constants according to filter constant settings.
④ Input Relay
10029 + 8n : "Filter ON"
ON : Filter constants are set between 5 and 1000
OFF : Filter constant is 0, or filter is automatically cleared between the start of final deceleration and the start of next output
⑤ Monitor
Newest values for filter constants can be monitored on the 8th register of monitor coil (0, 0, 1).

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① With variable speed setting



Notes :

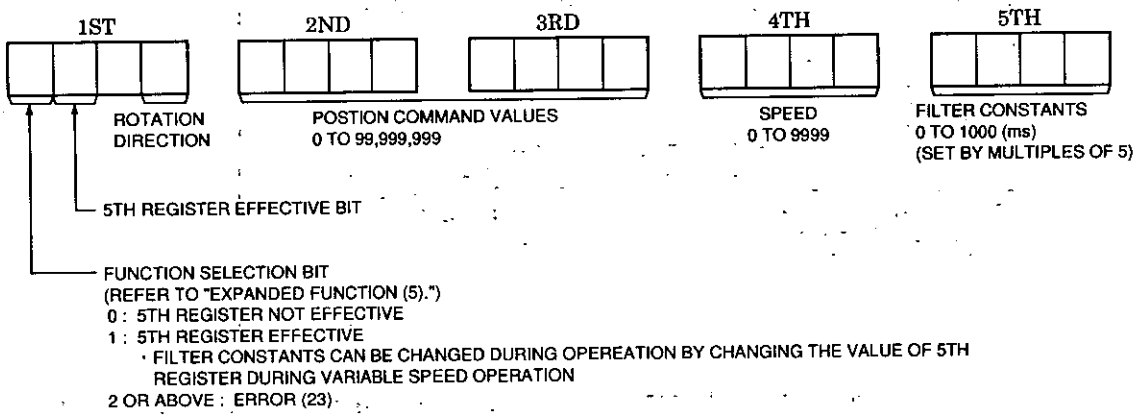
- When "2" is selected, and either independent or master axis is used, filter constants are automatically cleared by its own status (flag). When slave axis is selected, constants are automatically cleared by the status transmitted from the master.
- When halting operation in progress on "2" with the stop coil ON, turning OFF variable speed operation command before positioning is completed, or when restarting operation, completion values are not regarded as final deceleration values. Final deceleration values are valid at operation completion for automatic and special positioning, variable speed operation, and with JOG command OFF.
- On "2", filter constant settings are reset according to the STOP coil ON when operation is completed and automatically cleared.
- On "2", with the variable speed operation command or filter constant settings ON, any filter constants in the 5th register will be automatically cleared at the start of final deceleration. (At the start of the next operation, final filter constants from previous operation will return.)
- When filter constants are set repeatedly (using variable speed operation or filter constant setting), the last setting value is effective.

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10. EXPANDED FUNCTIONS (Cont'd)

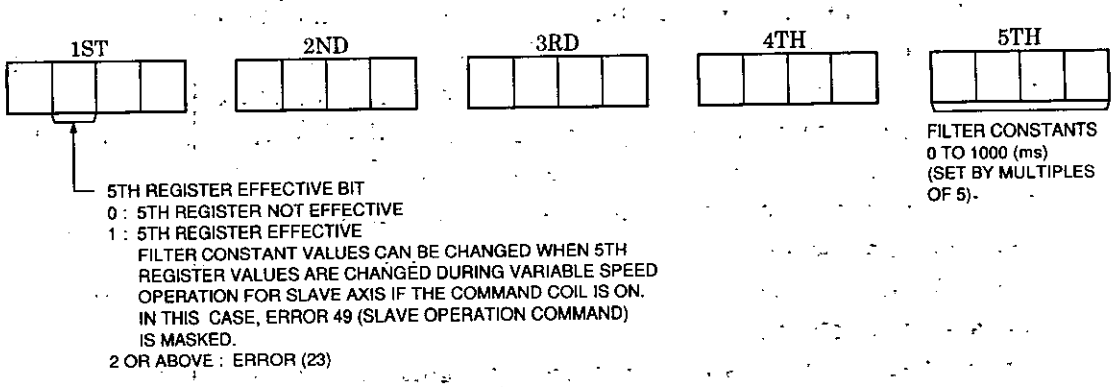
② Variable speed operation settings

〔For independent axis, master axis〕



〔For slave axis〕

Filter constants can be set when making variable speed operation settings for slave axis.



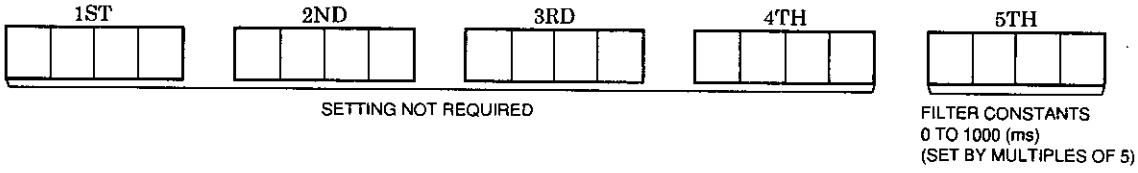
Note : Error 23 will occur when turning ON or OFF variable speed operation if filter constant setting values are set outside the variable speed operation range. However, outside values will be overlooked and no error will occur even if values are outside the range if 5th register values are changed with the variable speed operation command ON. In this case, previous setting values are effective.

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③ Filter constant setting

〈Method〉

- Set output coil (35 + 8n) to "Filter constant setting."
- Filter constants can be changed even with operations other than variable speed operation.



- Effective during operation or with operation stopped.
- Operation is enabled even when commands overrap.
- Previously set filter constants continue even when setting coil is turned off.

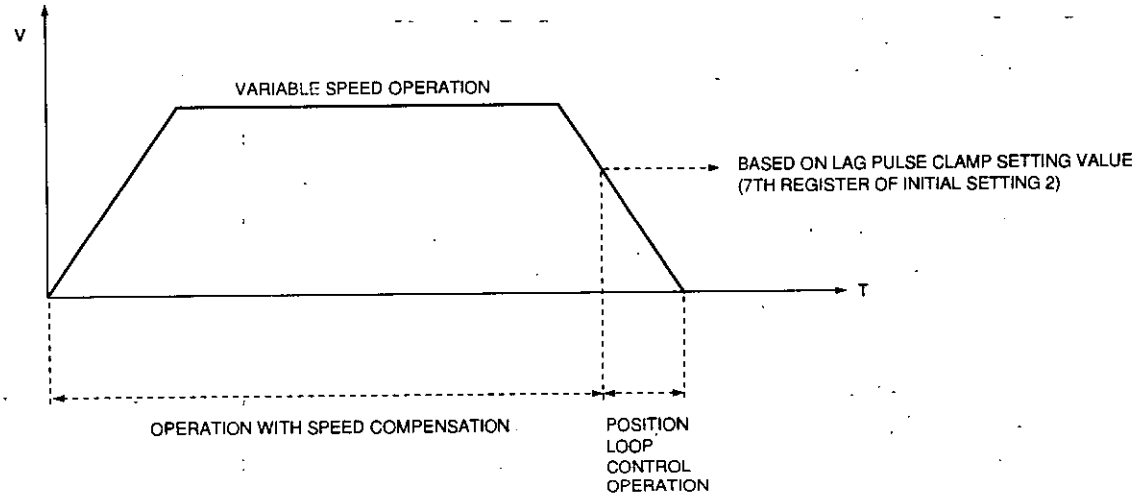
Note : Error 23 will occur when turning ON or OFF variable speed operation if filter constant setting values are set outside the variable speed operation range. However, outside values will be overlooked and no error will occur even if values are outside the range if 5th register values are changed with the variable speed operation command ON. In this case, previous setting values are effective.

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10. EXPANDED FUNCTIONS (Cont'd)

(9) Position Loop Control Function During Variable Speed Operation

During variable operation, only speed compensation is enabled. Position loop can be reactivated near the last position during deceleration for positioning control. Effective at vibration control.



〈Method〉

- Turn output coil "32 + 8n" to "Position loop ON/OFF."

When ON :

Independent and master axes : Effective when ON at the start of local axis variable speed operation

Slave axis : Effective when ON at the start of command pulse synchronous operation

OFF : Normal variable speed operation

Note : Position loop ON/OFF coil is checked at start of variable speed operation (changes during operation are disregarded).

- Position loop ON/OFF status is displayed by input relay (10025 + 8n).

With position loop : OFF

Without position loop : ON

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11. APPENDIX

11.1 INTERNAL I/O INTERFACE LIST

Table 11.1 List of Output Coils

Reference No.	GV60V bit	Signal Name
1 + 8n	OB×××× + 0	Module reset
2 + 8n	1	Initial setting 1
3 + 8n	2	Initial setting 2
4 + 8n	3	SEN signal ON command
5 + 8n	4	Synchronous operation mode release command
6 + 8n	5	Stop command
7 + 8n	6	Accel/decel speed setting
8 + 8n	7	Auto positioning setting
9 + 8n	8	1st-step speed command
10 + 8n	9	Multi-step speed command
11 + 8n	A	Variable speed setting
12 + 8n	B	Variable speed command
13 + 8n	C	Current value setting
14 + 8n	D	Notch point setting
15 + 8n	E	JOG setting
16 + 8n	F	JOGH command
17 + 8n	10	JOGL command
18 + 8n	11	Zero return setting
19 + 8n	12	Zero return command
20 + 8n	13	Special positioning setting
21 + 8n	14	Special positioning command
22 + 8n	15	Error code reset
23 + 8n	16	Deviation counter reset
24 + 8n	17	Monitor 1
25 + 8n	18	Monitor 2
26 + 8n	19	Monitor 3
27 + 8n	1A	External command pulse input enabled
28 + 8n	1B	Battery error command
29 + 8n	1C	Error code display changing command
30 + 8n	1D	External start DISABLE command
31 + 8n	1E	JOG/Zero return direction OFF : Forward ON : Reverse
32 + 8n	1F	Position Loop ON/OFF OFF : Normal ON : Position Loop OFF
33 + 8n	20	Reserved operation DISABLE
34 + 8n	21	Variable speed operation External start effective
35 + 8n	22	Filter constants setting

n = 0, 1, 2 ·····

└ Shows the reference No. at output coil allocation.

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11.1 INTERNAL I/O INTERFACE LIST (Cont'd)

Table 11.2 Output Coils and B2833 Function

	Output Coil	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
	Module Operation \ Output Coil Signal Name	Module Reset	Initial Setting 1	Initial Setting 2	SEN Signal ON Command	Synchronous Operation Mode Release Command	Stop Command	Accel/Decel Speed Setting	Auto Positioning Setting	1st-step Speed Operation Command	Multi-step Speed Operation Command	Variable Speed Operation Setting	Variable Speed Operation Command	Current Value Setting	Notch Point Setting	JOG Setting	JOGH Command	JOGL Command
Setting	Module Reset	(F)																
	Stop	—	—	—	—		(1)	—	—			—		—	—	—		
	Initial Setting 1	—	(F)	—	—		1	—	—			—		—	—	—		
	Initial Setting 2	—	—	(F)	—		1	—	—			—		—	—	—		
	SEN Signal ON Command	—	—	—	(F)		1	—	—			—		—	—	—		
	Variable Speed Initial Setting	—	—	—	—		1	—	—			(F)		—	—	—		
	Accel Setting	—	—	—	—		1	(F)	—			—			—	—		
	Positioning Setting	—	—	—	—		—	—	(1)			—			—	—		
	Current Value Setting	—	—	—	—		1	—	—			—		(F)	—	—		
	JOG Setting	—	—	—	—		1	—	—			—		—	—	(F)		
	Zero Return Setting	—	—	—	—		1	—	—			—		—	—	—		
	Special Positioning Setting	—	—	—	—		1	—	—			—		—	—	—		
	Notch Point Setting	—	—	—	—		1	—	—			—		—	(F)	—		
Operation Command	1st-step Speed 1						0		0	(F)	—							
	Multi-step Speed 2						0		0	—	(F)							
	Variable Speed Command						0		0				(1)					
	JOGH Command						0		0								(1)	—
	JOGL Command						0		0								—	(1)
	Special Positioning Command						0		0									

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Table 11.2 Output Coils and B2833 Functions (Cont'd)

	Output Coil	18	19	20	21	22	23	24 to 26	27	28	29	30	31	32	33	34	35
	Output Coil Signal Name / Module Operation	Zero Return Setting	Zero Return Command	Special Positioning Setting	Special Positioning Command	Error Code Reset	Deviation Counter Reset	Monitor 1 to 3	External Command Pulse Input Enabled	Battery Error Command	Error Code Changing Command	External Start Disabled Command	JOG/Zero Return Direction	Position Loop ON/OFF	Reserved Operation DISABLE	Variable Speed Operation External Start Effective	Filter Constant Setting
	Module Reset																
	Stop	—		—													
Setting	Initial Setting 1	—		—													
	Initial Setting 2	—		—													
	SEN Signal ON Command	—		—													
	Variable Speed Initial Setting	—		—													
	Accel Setting	—		—													
	Positioning Setting	—		—													
	Current Value Setting	—		—													
	JOG Setting	—		—													
	Zero Return Setting	↯		—													
	Special Positioning Setting	—		↯													
	Notch Point Setting	—		—													
Operation Command	1st-step Speed 1																
	Multi-step Speed 2																
	Variable Speed Command																
	JOGH Command																
	JOGL Command																
	Special Positioning Command				↯												

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11.1 INTERNAL I/O INTERFACE LIST (Cont'd)

Table 11.2 Output Coils and B2833 Functions (Cont'd)

Output Coil	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Output Coil Signal Name / Module Operation	Module Reset	Initial Setting 1	Initial Setting 2	SEN Signal on Command	Synchronous Operation Mode Release Command	Stop Command	Accel/Decel Speed Setting	Auto Positioning Setting	1st-step Speed Operation Command	Multi-step Speed Operation Command	Variable Speed Operation Setting	Variable Speed Operation Command	Current Value Setting	Notch Point Setting	JOG Setting	JOGH Command	JOGL Command
Zero Return Command						0		0									
Error Code Reset																	
Deviation Counter Reset						1											
Battery Error Command																	
External Command Pulse Input Enabled						1											
Monitor 1 to 3																	
Synchronous Operation Release					①												
Error Code Display Changing Command																	
External Start DISABLE Command																	
Direction Setting by Coil during JOGL Operation	—					0			—	—		0				0	①
Direction Setting by Coil during JOGH Operation	—					0			—	—		0				①	0
Direction Setting by Coil during Zero Return Operation	—					0			—	—		0				0	0
No Position Loop during Variable Speed Operation	—					0		0	—	—		①				0	0
No Reservation for Multi-step Speed Operation	—					0		0	↑	—		0				0	0
No Reservation for Multi-step Speed Operation	—					0		0	—	↑		0				0	0
Variable Speed Operation during External Start	—					0			—	—		0				0	0
Filter Constant Setting	—	—	—	—				—			—		—		—		

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Table 11.2 Output Coils and B2833 Functions (Cont'd)

Output Coil	18	19	20	21	22	23	24 to 26	27	28	29	30	31	32	33	34	35
Output Coil Signal Name / Module Operation	Zero Return Setting	Zero Return Command	Special Positioning Setting	Special Positioning Command	Error Code Reset	Deviation Counter Reset	Monitor 1 to 3	External Command Pulse Input Enabled	Battery Error Command	Error Code Changing Command	External Start Disabled Command	JOG/Zero Return Direction	Position Loop ON/OFF	Reserved Operation DISABLE	Variable Speed Operation External Start Effective	Filter Constant Setting
Zero Return Command		↯														
Error Code Reset					↯											
Deviation Counter Reset						①										
Battery Error Command									①							
External Command Pulse Input Enabled								①								
Monitor 1 to 3							①									
Synchronous Operation Release																
Error Code Display Changing Command										↯						
External Start DISABLE Command											①					
Direction Setting by Coil during JOGL Operation		—										*				
Direction Setting by Coil during JOGH Operation		—										*				
Direction Setting by Coil during Zero Return Operation		↑										*				
No Position Loop during Variable Speed Operation													1			
No Reservation for Multi-step Speed Operation														1		
No Reservation for Multi-step Speed Operation														1		
Variable Speed Operation during External Start															①	
Filter Constant Setting	—		—													①

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11.1 INTERNAL I/O INTERFACE LIST (Cont'd)

Table 11.3 List of Input Relays

Reference No.	GL60V bit	Signal Name
10001 + 8n	IB×××× + 0	READY
10002 + 8n	1	PRESET ACK
10003 + 8n	2	PRESET NAK
10004 + 8n	3	PLUS / MINUS
10005 + 8n	4	During FWD command
10006 + 8n	5	During RVS command
10007 + 8n	6	Current value exceeded
10008 + 8n	7	COIN
10009 + 8n	8	ERROR
10010 + 8n	9	Fault
10011 + 8n	A	Communication error 1
10012 + 8n	B	Communication error 2
10013 + 8n	C	Absolute encoder normal
10014 + 8n	D	Auto positioning pulse discharging completion
10015 + 8n	E	Zero return pulse discharging completion
10016 + 8n	F	Special operation pulse discharging completion
10017 + 8n	10	Pulse discharging completion
10018 + 8n	11	Decel LS input
10019 + 8n	12	Special LS input
10020 + 8n	13	External start input
10021 + 8n	14	External stop input
10022 + 8n	15	Servo normal input
10023 + 8n	16	Notch signal output
10024 + 8n	17	Position deviation error
10025 + 8n	18	Independent / synchronous
10026 + 8n	19	Position loop ON / OFF
10027 + 8n	1A	Reserved Operation DISABLE
10028 + 8n	1B	Reserved
10029 + 8n	1C	Filter ON
10030 + 8n	1D	For future use
10031 + 8n	1E	For future use
10032 + 8n	1F	For future use

n = 0, 1, 2 ·····

Shows the reference No. at input relay allocation.

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Table 11.4 Output Register Allocation

Reference No.	GL60V bit	Output Register No.
40001 + n	OW×××× + 0	1ST
40002 + n	1	2ND
40003 + n	2	3RD
40004 + n	3	4TH
40005 + n	4	5TH
40006 + n	5	6TH
40007 + n	6	7TH
40008 + n	7	8TH

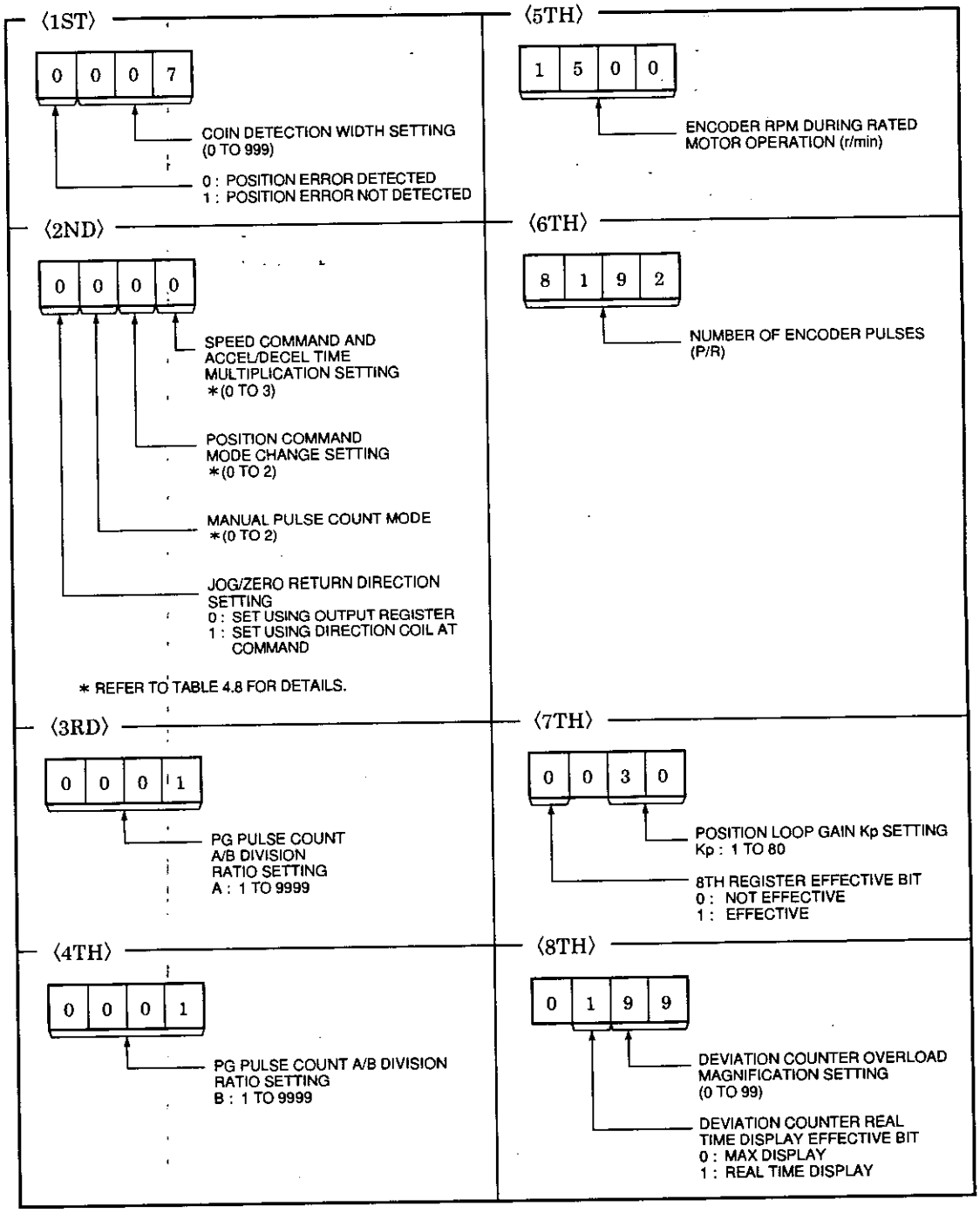
n = 0, 1, 2 ·····

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11.1 INTERNAL I/O INTERFACE LIST (Cont'd)

Table 11.5 Setting to Initial Value Output Registers

(a) Initial Setting 1

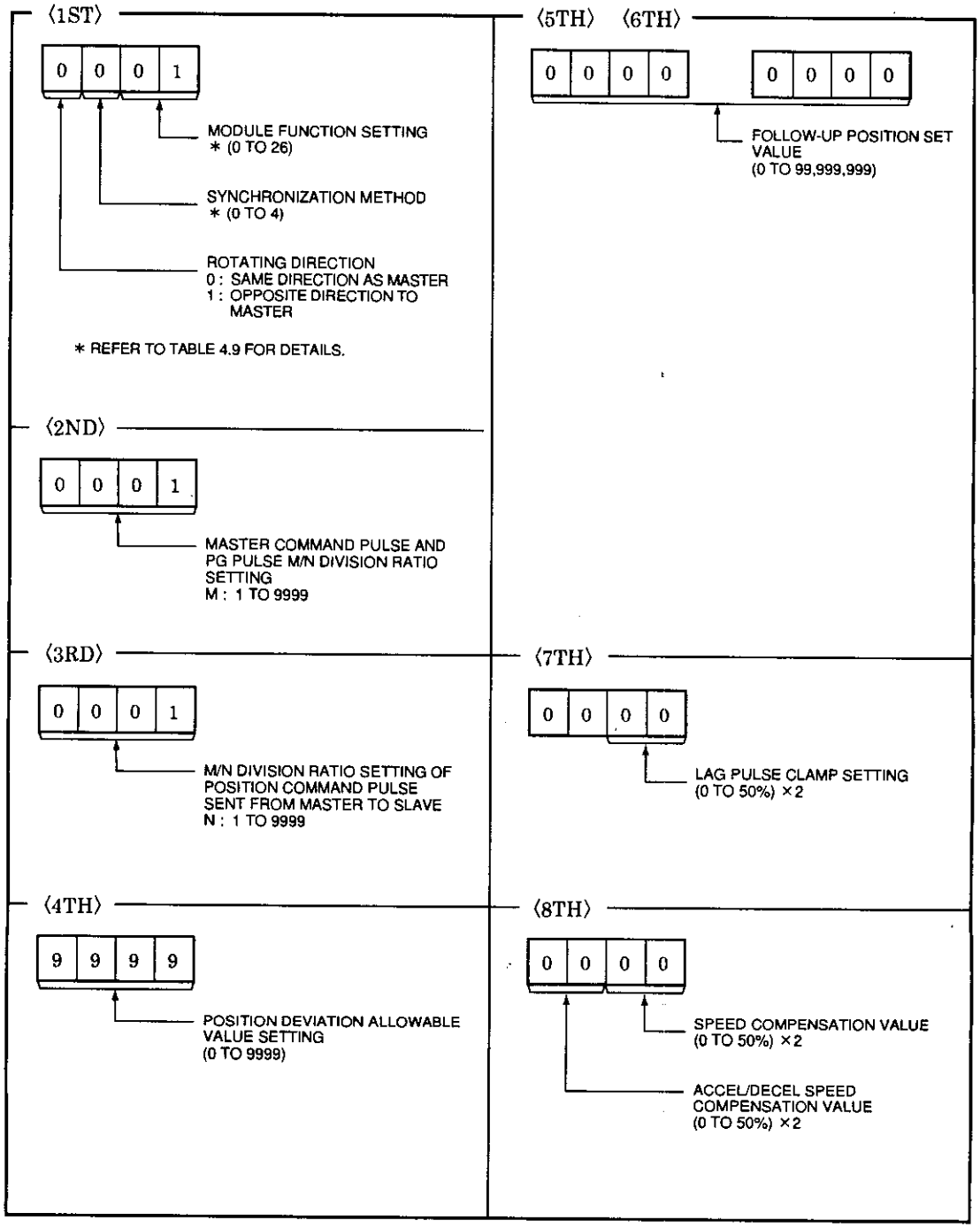


Notes :

1. Values in the frames are default set values, and set when the power supply is turned ON or at module reset.
2. If a fault occurs in setting data at initial setting changing, the former set value is effective.
3. Accel/decel speed setting and operation setting are cleared by initial setting 1. However, no setting is cleared by initial setting 2.
4. Can be set without external power supply input.
5. Refer to 10. EXPANDED FUNCTIONS for position error detection, direction setting (during JOG/Zero point operation), and error counter setting.

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Table 11.5 Setting to Initial Value Output Registers (Cont'd)
(b) Initial Setting 2



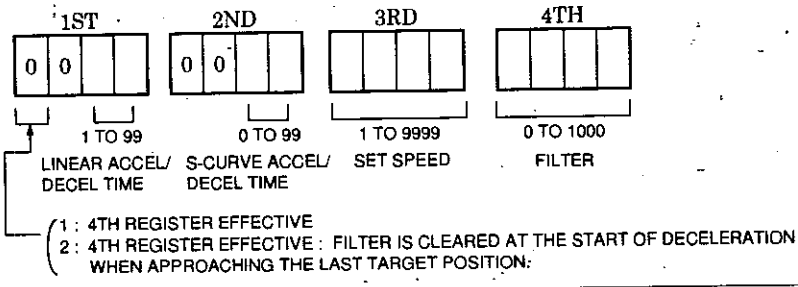
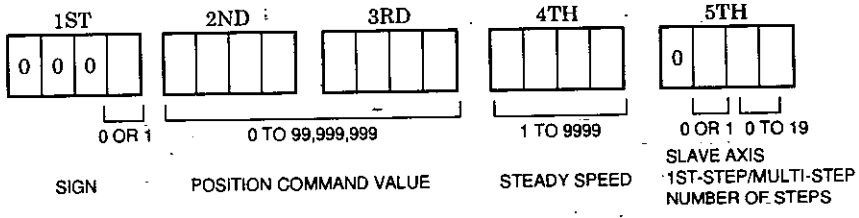
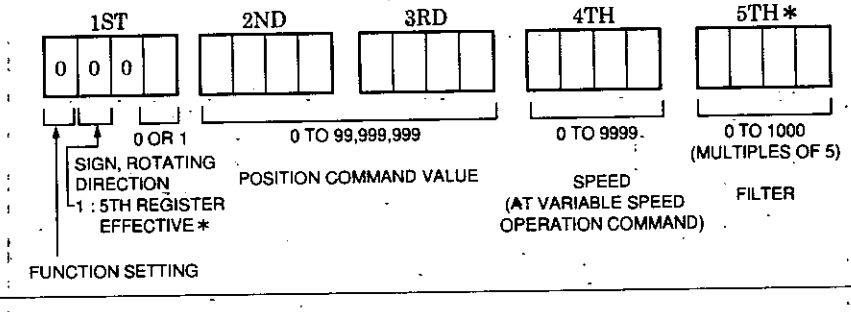
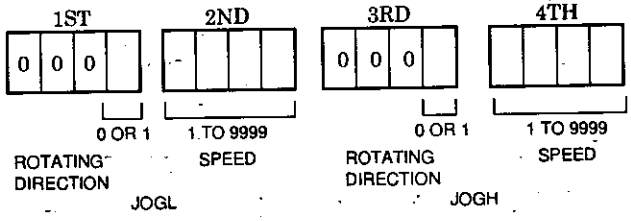
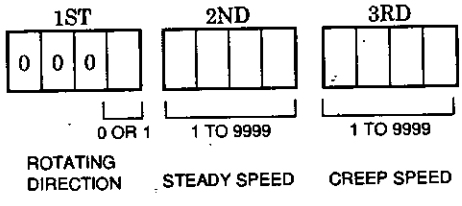
Notes :

1. Values in the frames are default set values, and set when the power supply is turned ON or at module reset.
2. If a fault occurs in setting data at initial setting changing, the former set value is effective.
3. No setting is cleared by initial setting 2.
4. Can be set without external power supply input.

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11.1 INTERNAL I/O INTERFACE LIST (Cont'd)

Table 11.6 How to Set Various Data

Setting Items	Output Register
Accel/Decel Speed Setting	
Automatic Positioning Setting	
Variable Speed Operation Setting	
JOG Operation Setting	
Zero Return Operation Setting	

* Refer to 10. EXPANDED FUNCTIONS.

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Table 11.6 How to Set Various Data (Cont'd)

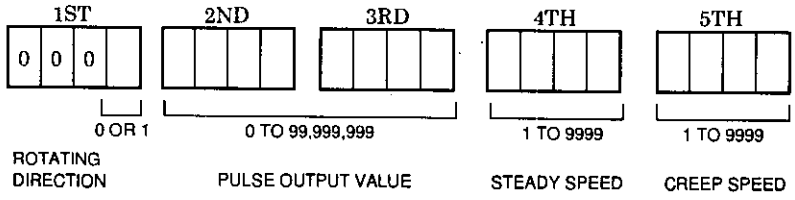
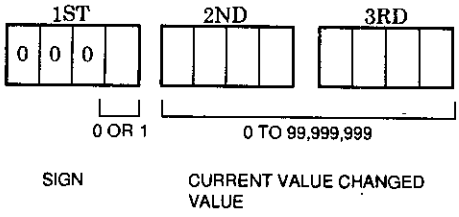
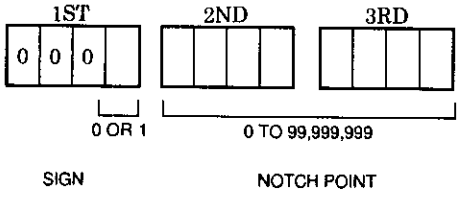
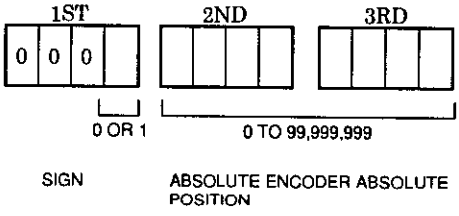
Setting Items	Output Register
Special Positioning Operation Setting	
Current Value Setting	
Notch Point Setting	
Absolute Value Zero-point Setting	

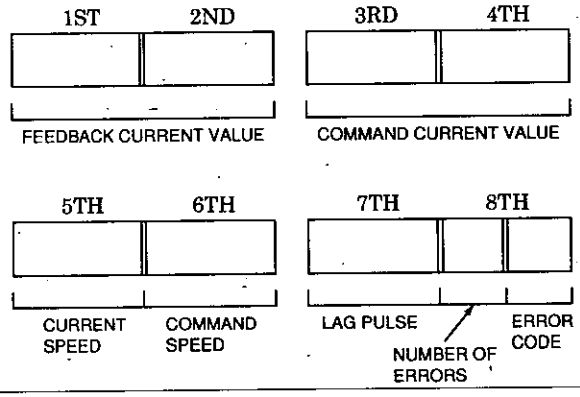
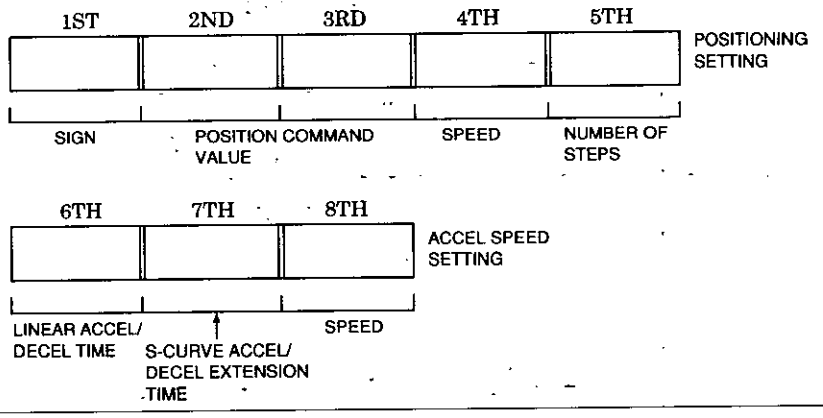
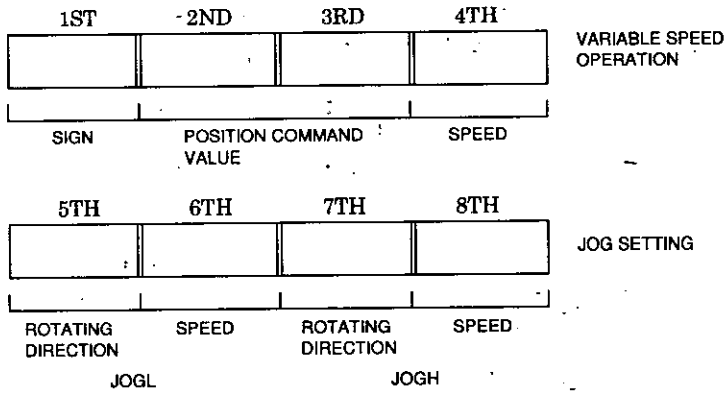
Table 11.7 Input Register Allocation

Reference No.	GL60V bit	Input Register No.
3001 + n	IW × × × × + 0	1ST
3002 + n	1	2ND
3003 + n	2	3RD
3004 + n	3	4TH
3005 + n	4	5TH
3006 + n	5	6TH
3007 + n	6	7TH
3008 + n	7	8TH

n = 0, 1, 2 ·····

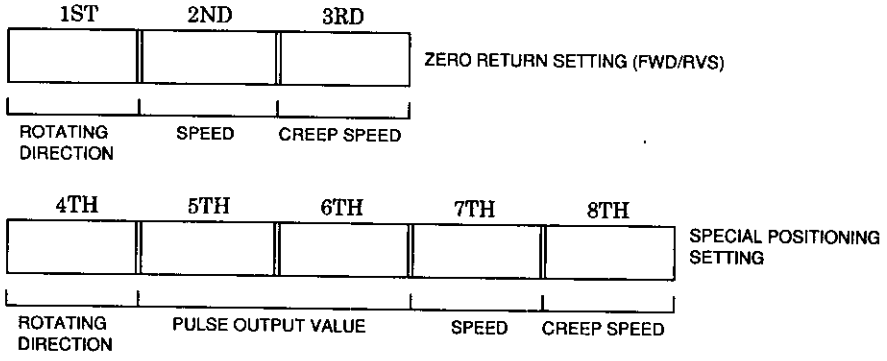
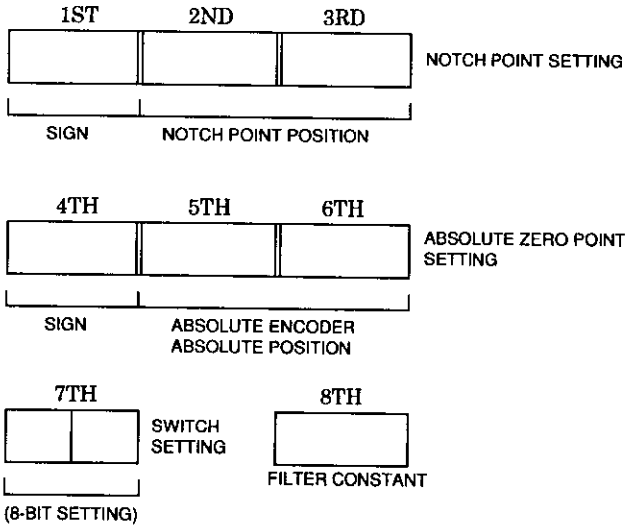
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Table 11.8 Monitor Code and Input Register Monitoring Contents

Monitor Code			Input Register Monitoring Contents
Monitor 1	Monitor 2	Monitor 3	
0	0	0	 Note : The number of lag pulses is a value obtained after mode release at handle operation.
1	0	0	
0	1	0	

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Table 11.8 Monitor Code and Input Register Monitoring Contents (Cont'd)

Monitor Code			Input Register Monitoring Contents
Monitor 1	Monitor 2	Monitor 3	
1	1	0	
0	0	1	
1	0	1	Error counter real time display register (7TH) Other registers are the same as (0. 0. 0)
0	1	1	Initial setting 2
1	1	1	Initial setting 1

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11.2 INITIAL SETTING LIST

The following describes sample ladders in group A (2-axis), absolute encoder and absolute value mode.

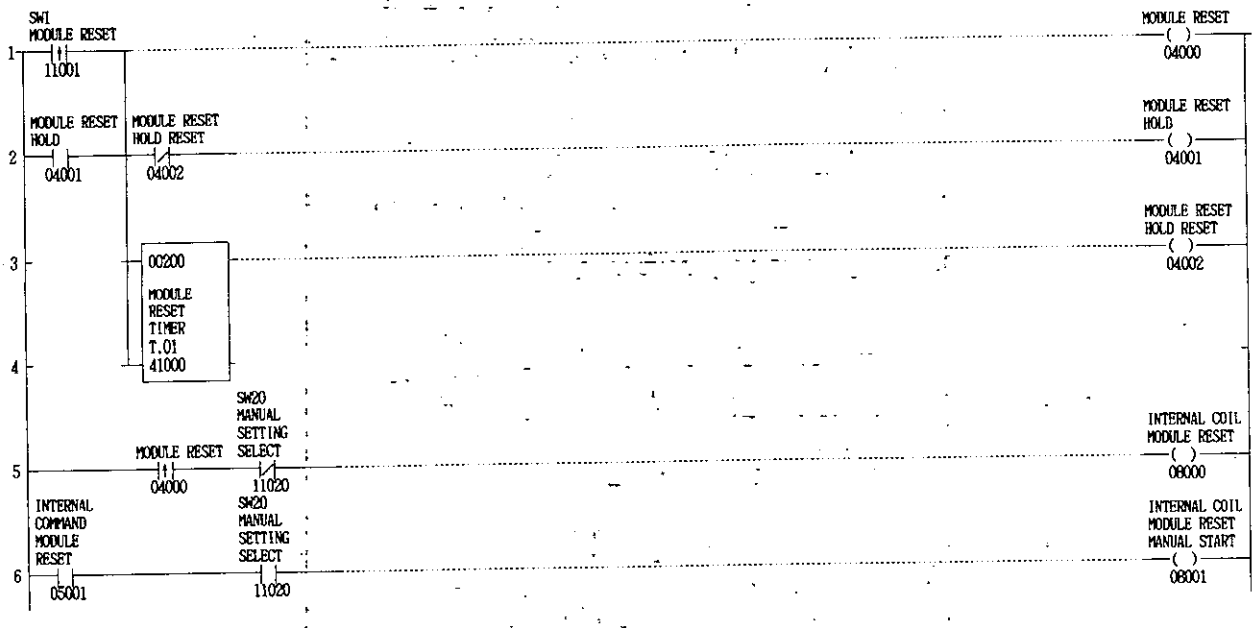
The first axis setting is similar to the contents of Par. 4.4.3 VARIOUS DATA SETTING (2) "Typical Setting." Refer to this paragraph.

The following shows ladders only of operation without interlocking.

Module reset startup circuit N

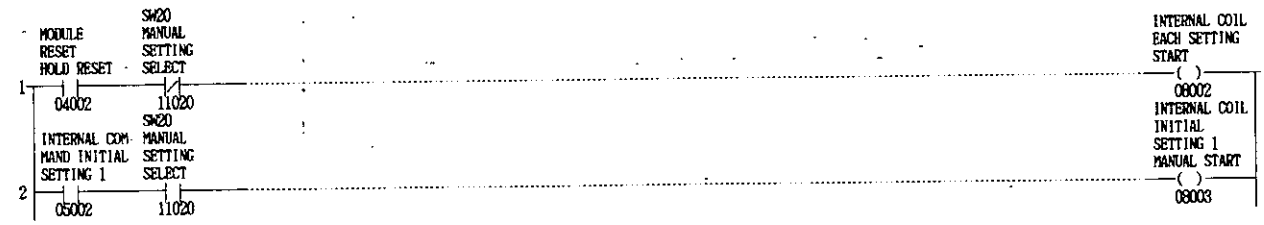
Network N1

Perform initial setting 1 approx. 2 seconds after module reset.



Initial setting 1 startup circuit N

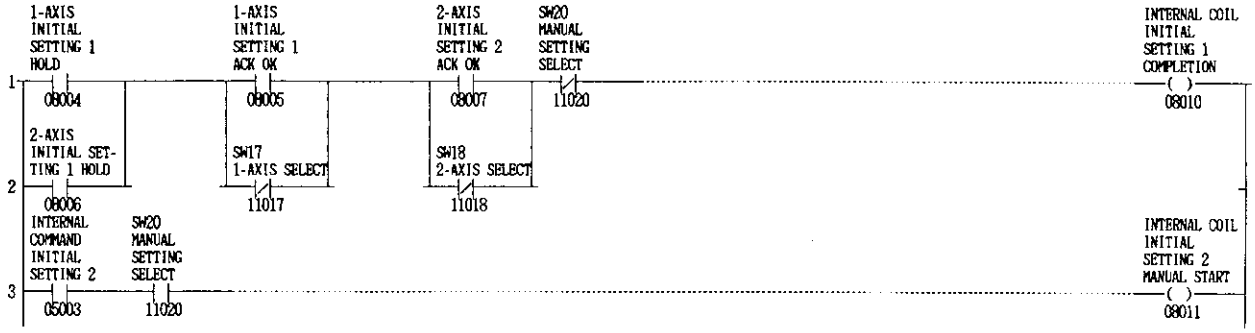
Network N2



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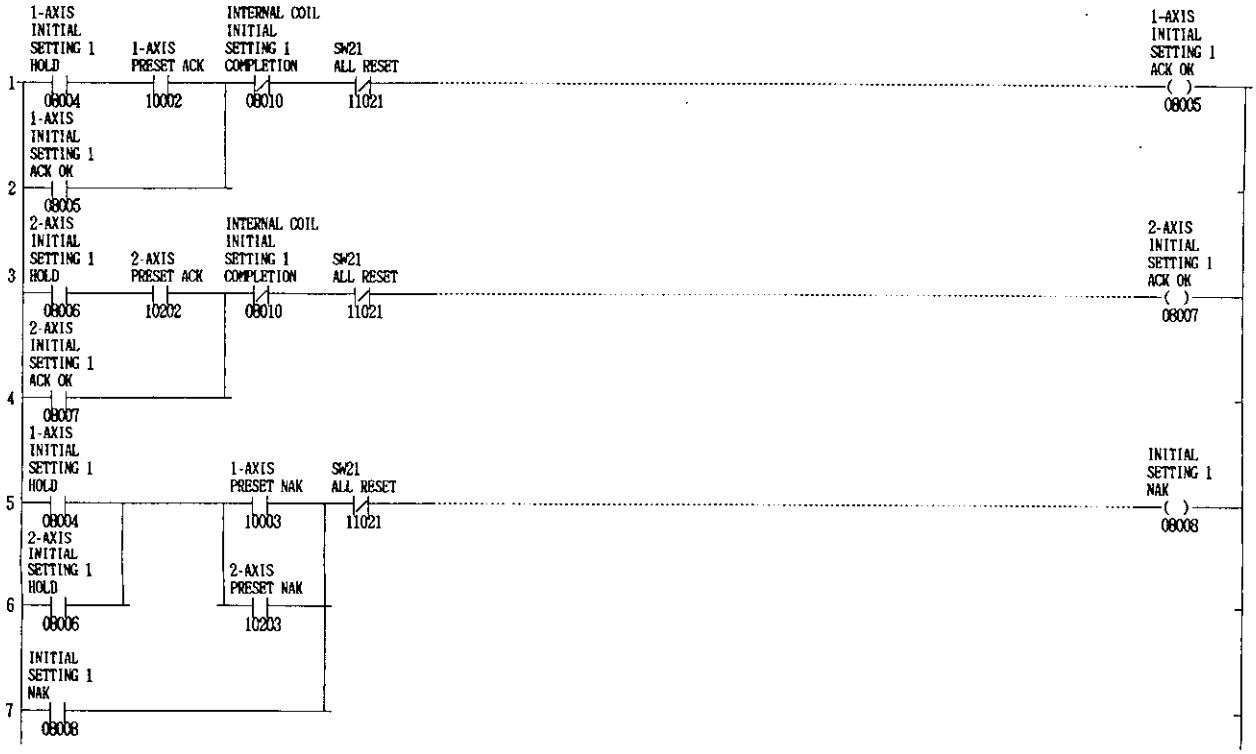
Initial setting 1 completion and initial setting 2 startup circuit N

Network N3



Initial setting 1 ACK or NAK waiting circuit N

Network N4



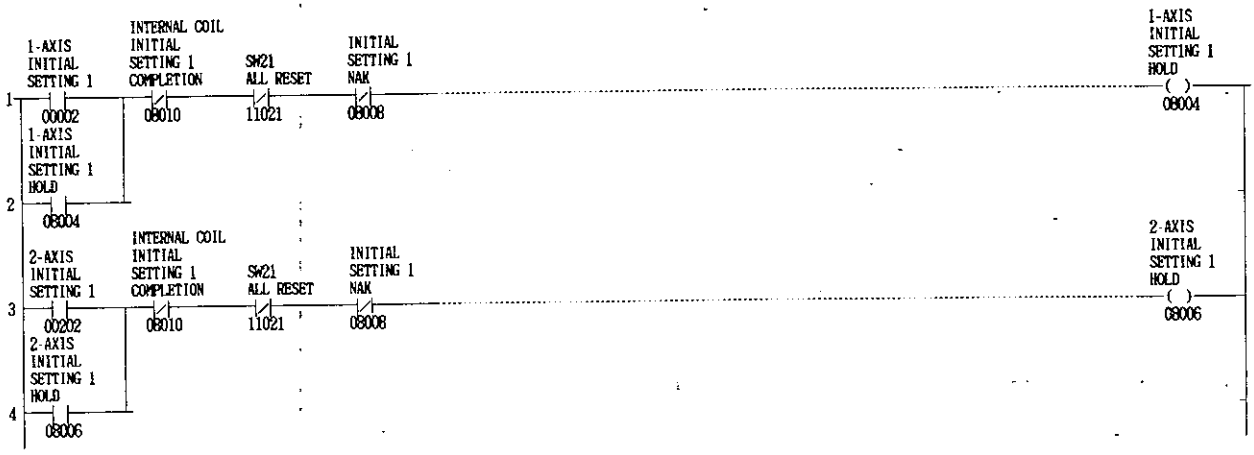
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11.2 INITIAL SETTING LIST (Cont'd)

Initial setting 1 output holding circuit

N

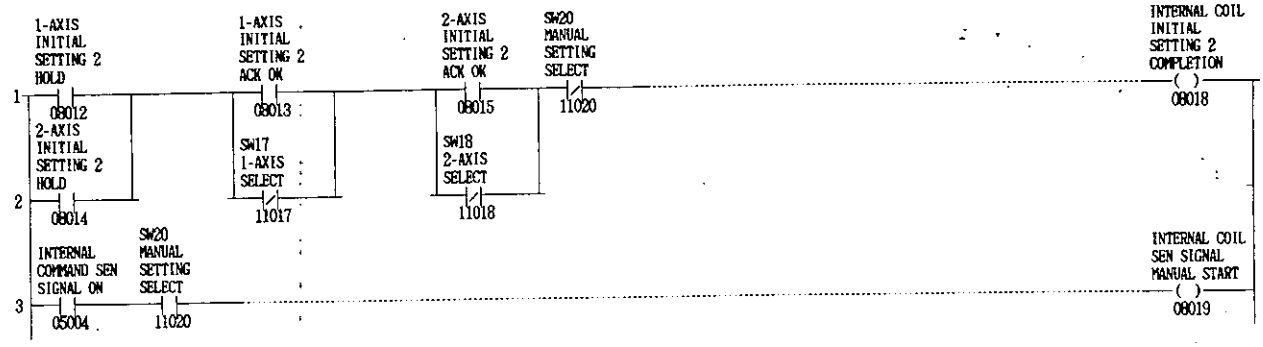
Network N5



Initial setting 2 completion and SEN signal startup circuit

N

Network N6

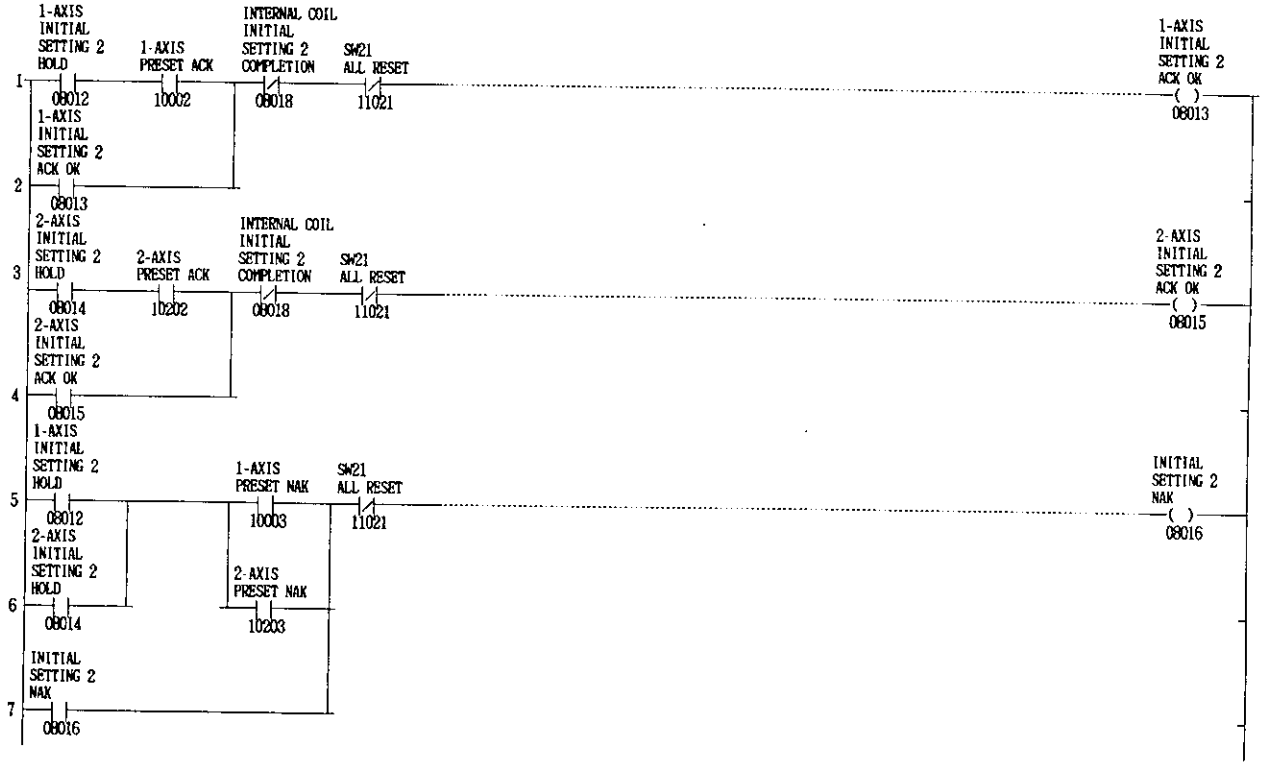


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Initial setting 2 ACK or NAK waiting circuit

N

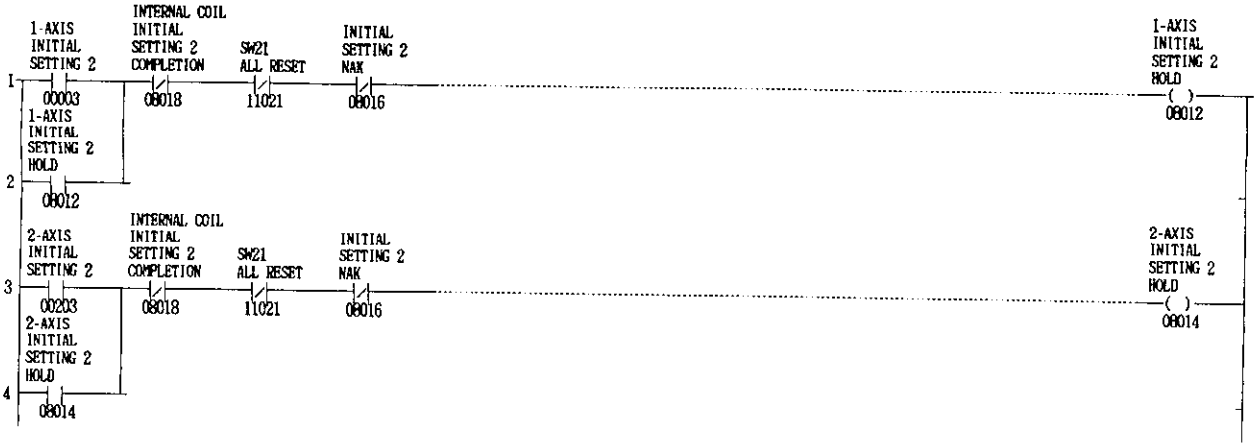
Network N7



Initial setting 2 output holding circuit

N

Network N8



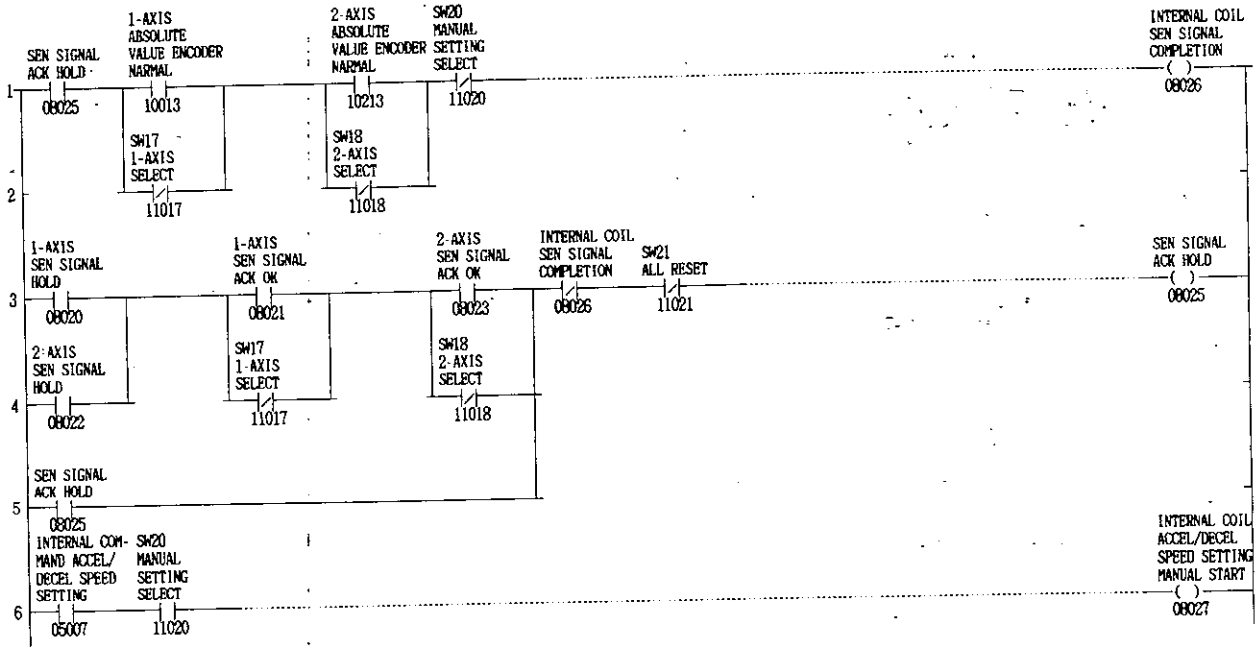
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11.2 INITIAL SETTING LIST (Cont'd)

SEN signal completion and accel/decel speed setting startup circuit N

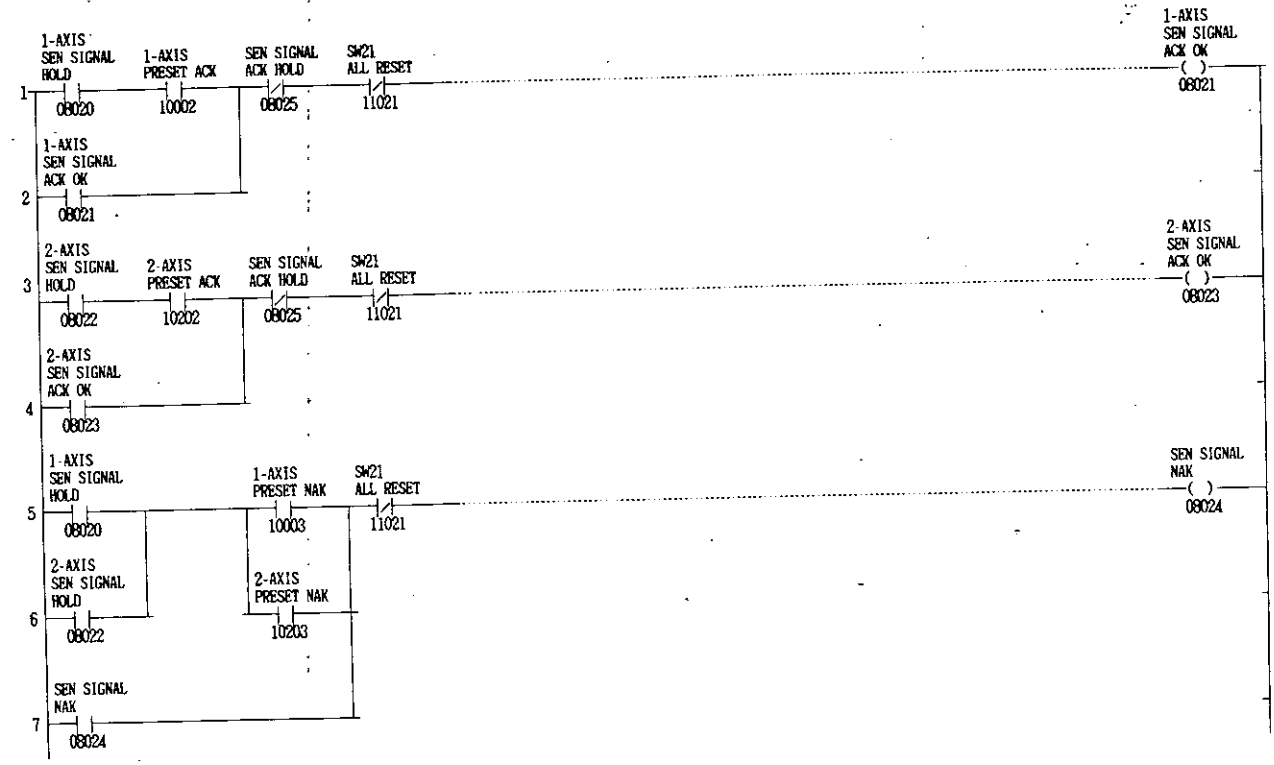
Network N9

The first and second lines in the network are absolute encoder normal checking circuits by using SEN signal.



SEN signal ACK or NAK waiting circuit N

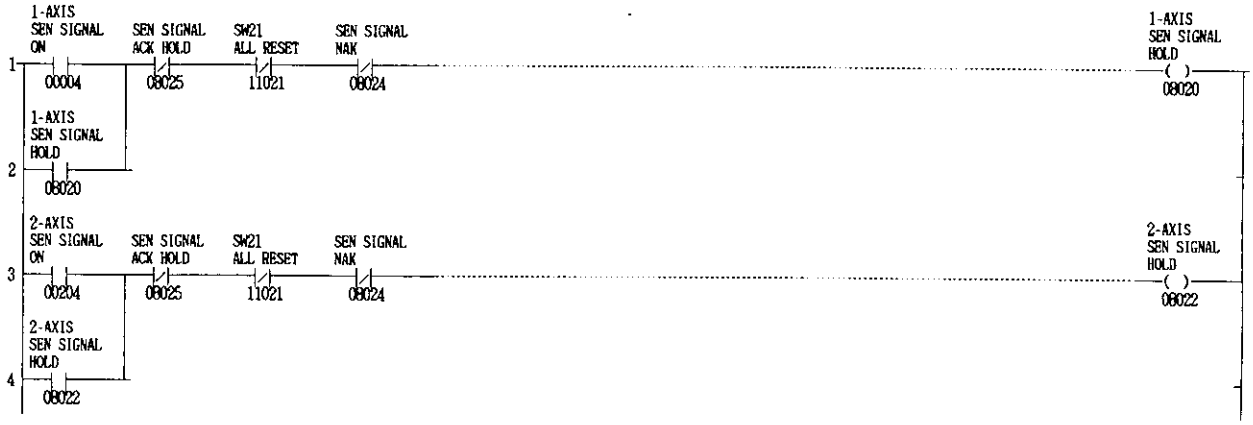
Network N10



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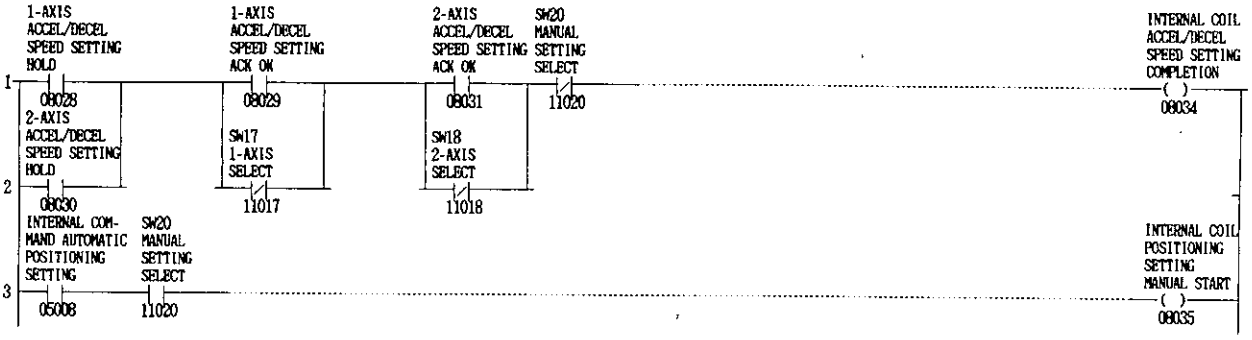
SEN signal output holding circuit N

Network N11



Accel/decel speed setting completion and automatic positioning setting startup circuit N

Network N12

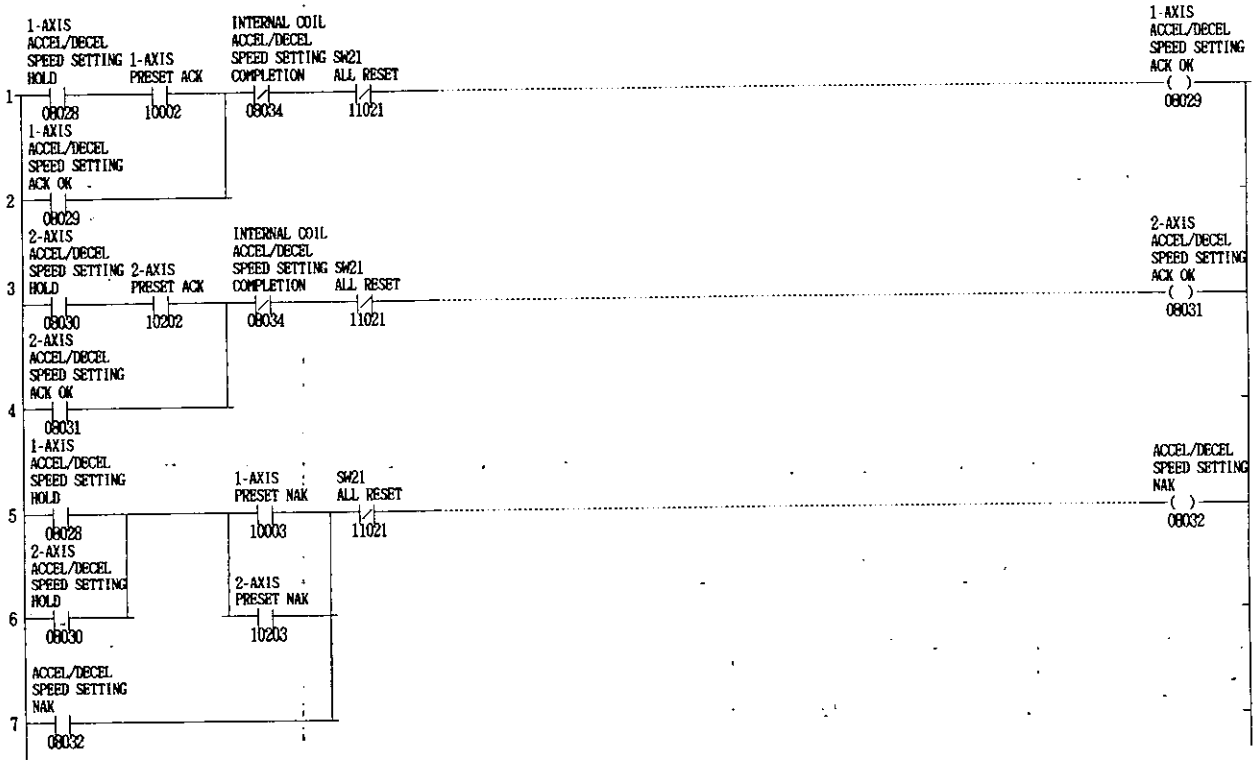


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Accel/decel speed setting ACK or NAK waiting circuit

N

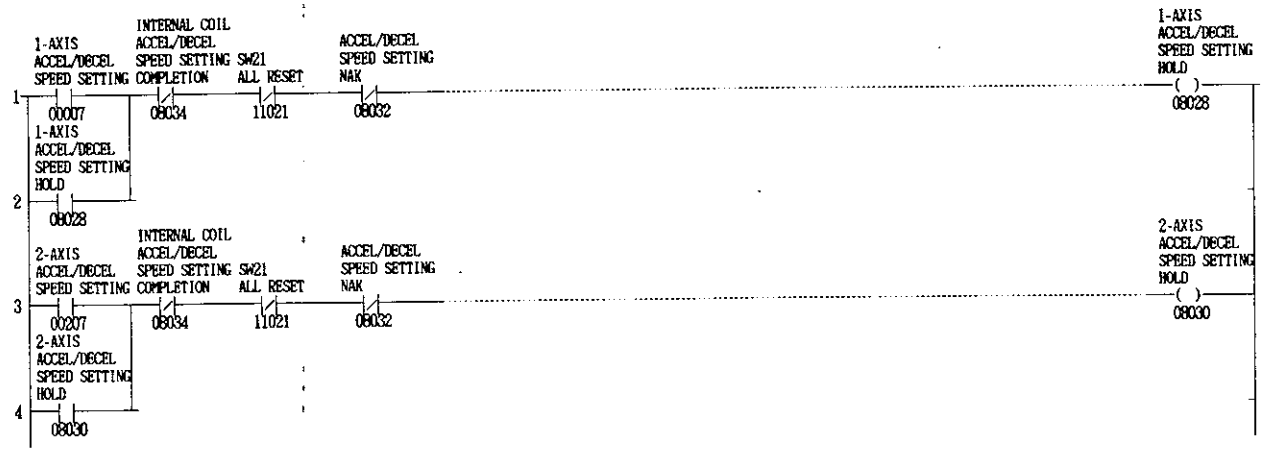
Network N13



Accel/decel speed setting output holding circuit

N

Network N14

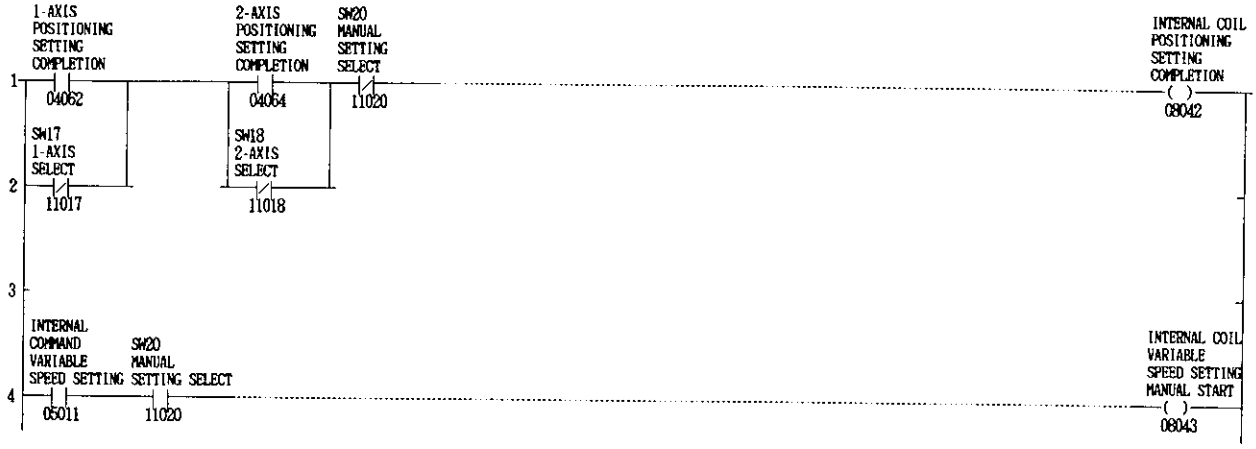


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Automatic positioning setting completion and variable speed operation setting startup circuit

N

Network N15

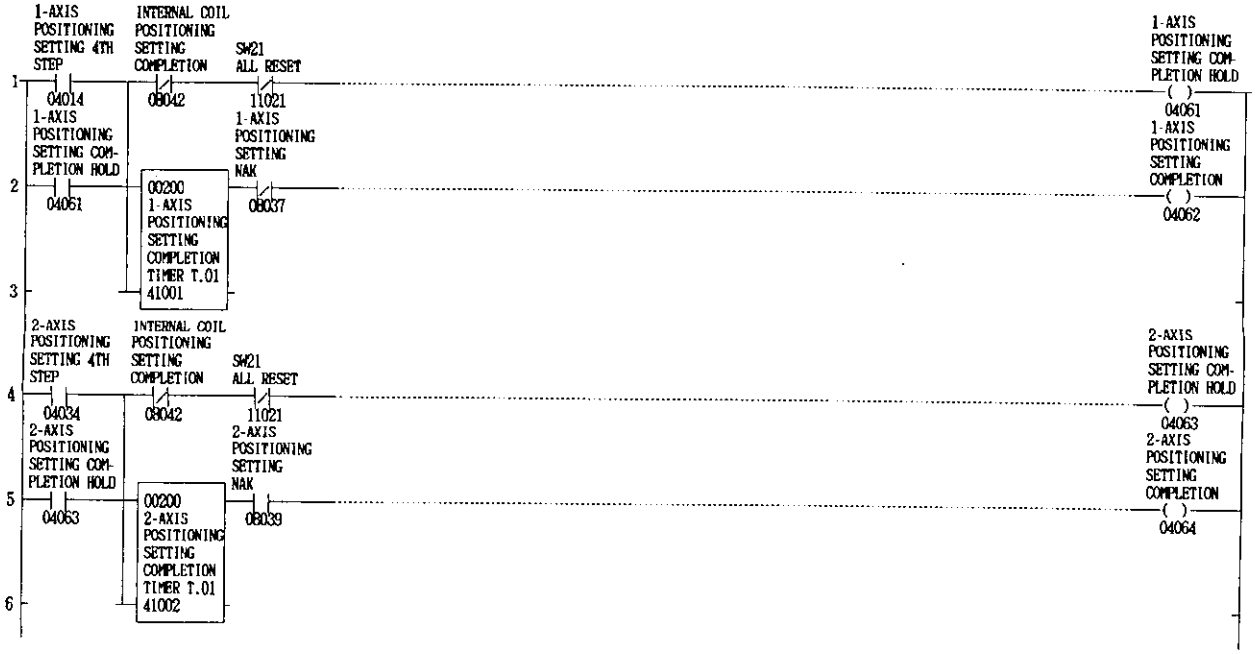


Automatic positioning completion waiting circuit

N

Network N16

Set the timer in the ladders to a time of approx. 3 scans. (Since ACK returns at every step setting, check that NAK does not return during setting.)

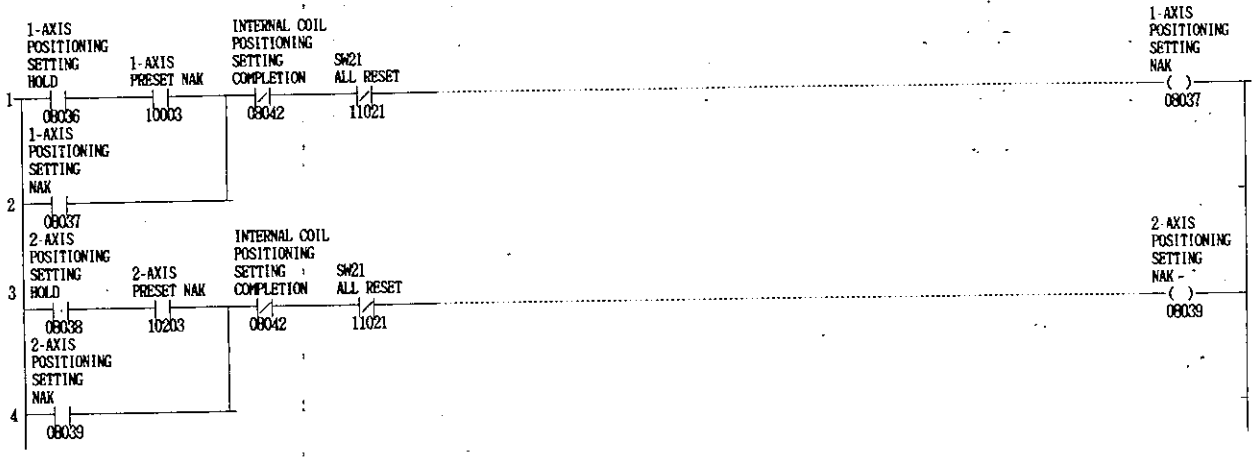


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Automatic positioning setting NAK detecting circuit

N

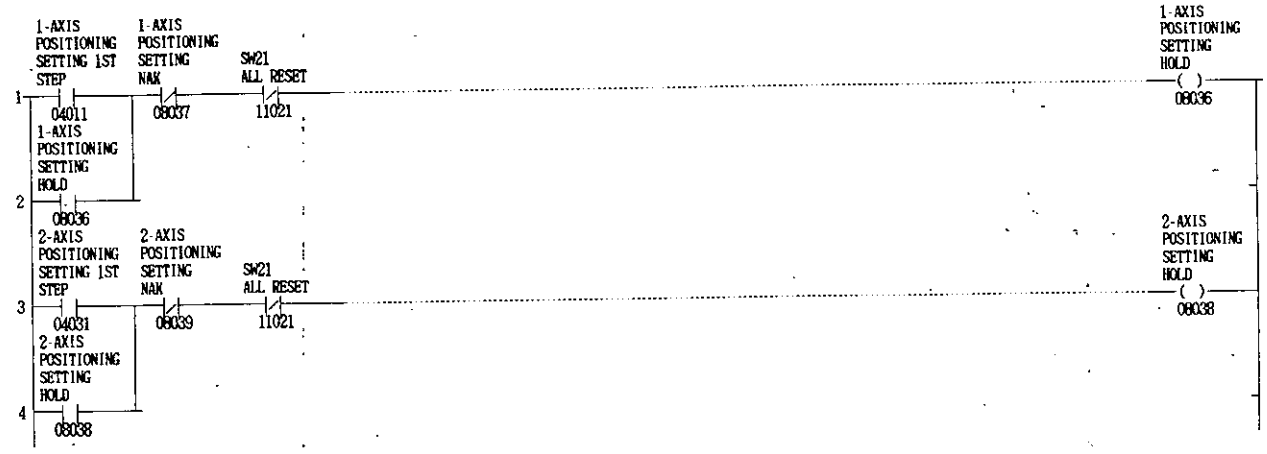
Network N17



Automatic positioning setting startup holding circuit

N

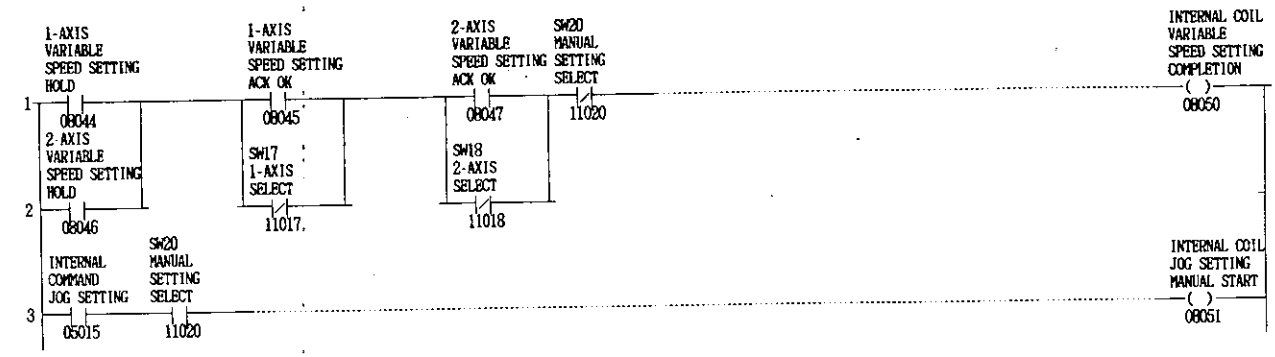
Network N18



Variable speed operation setting completion and JOG setting startup circuit

N

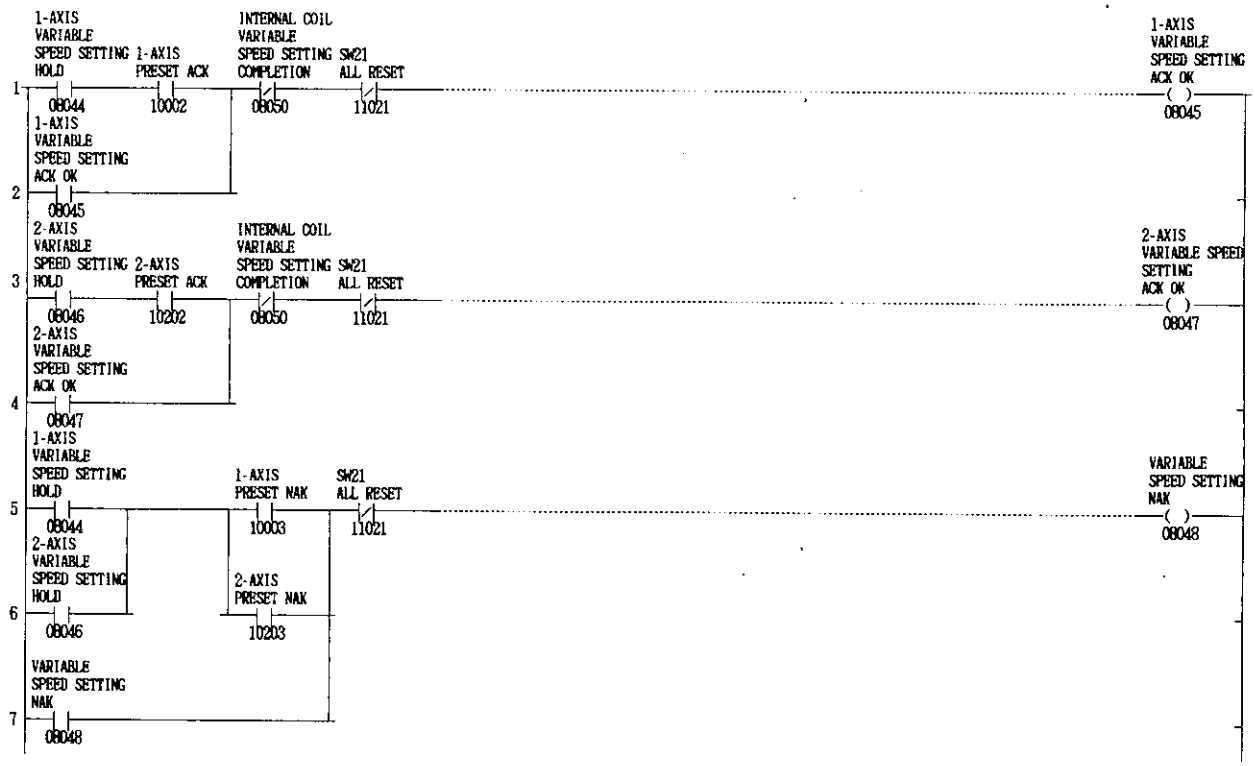
Network N19



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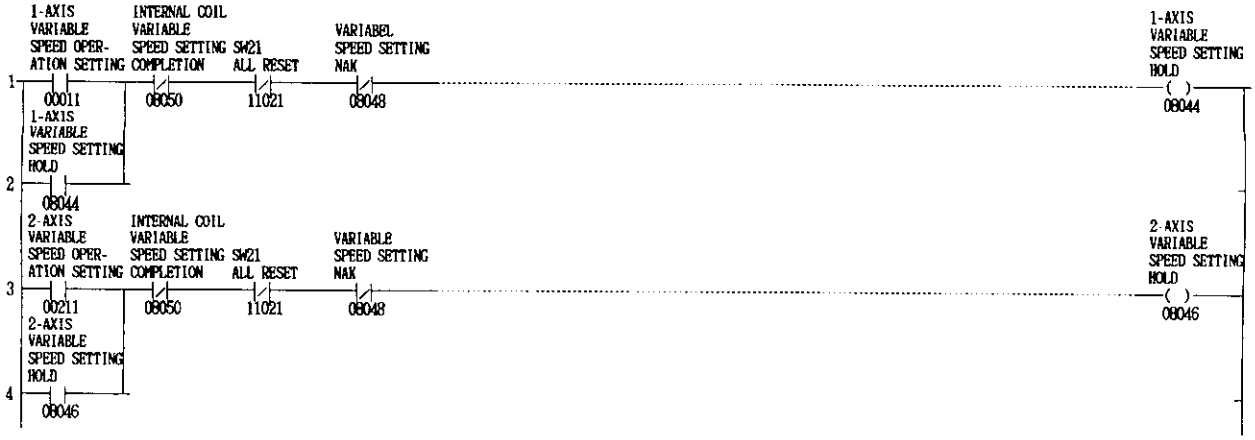
Variable speed operation setting ACK or NAK waiting circuit N

Network N20



Variable speed operation setting output holding circuit N

Network N21



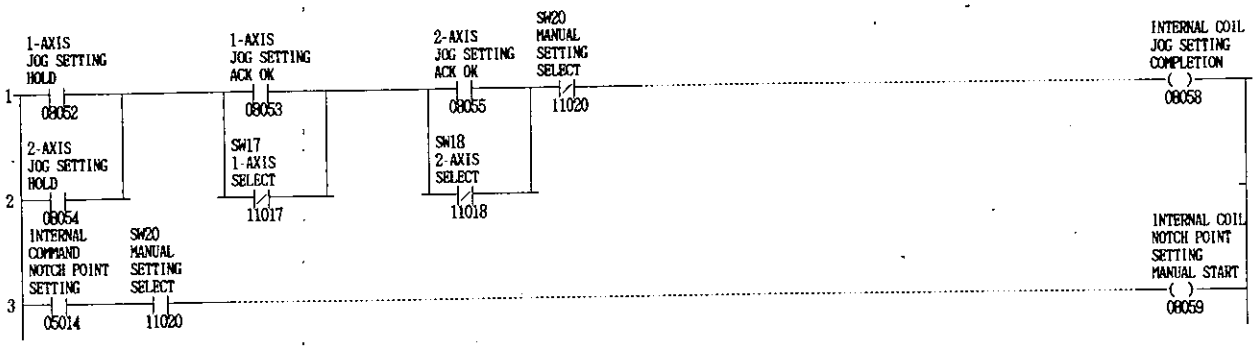
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11.2 INITIAL SETTING LIST (Cont'd)

JOG setting completion and notch-point setting startup circuit

N

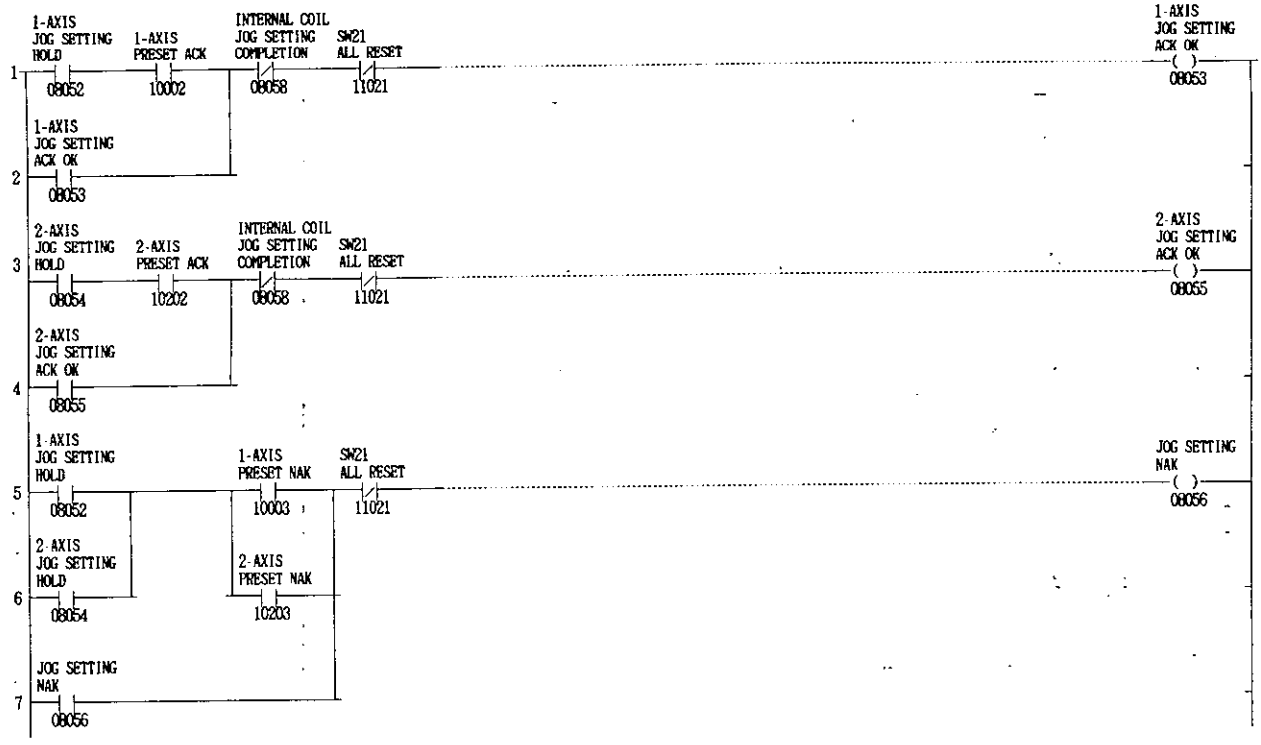
Network N22



JOG setting ACK or NAK waiting circuit

N

Network N23

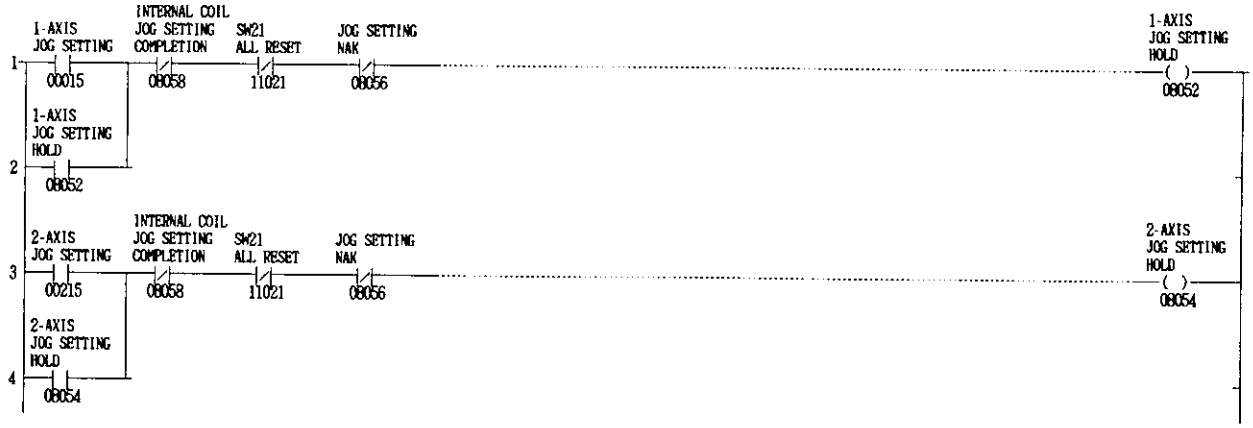


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JOG setting output holding circuit

N

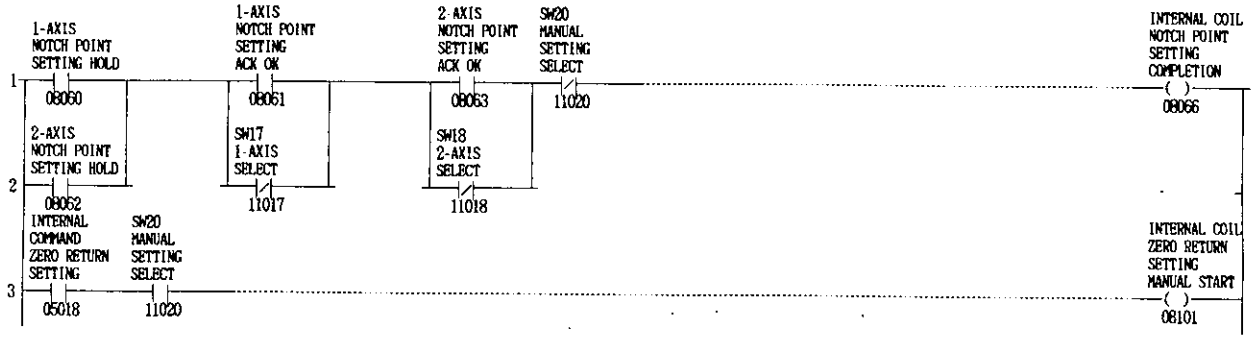
Network N24



Notch point setting completion and zero return setting startup circuit

N

Network N25

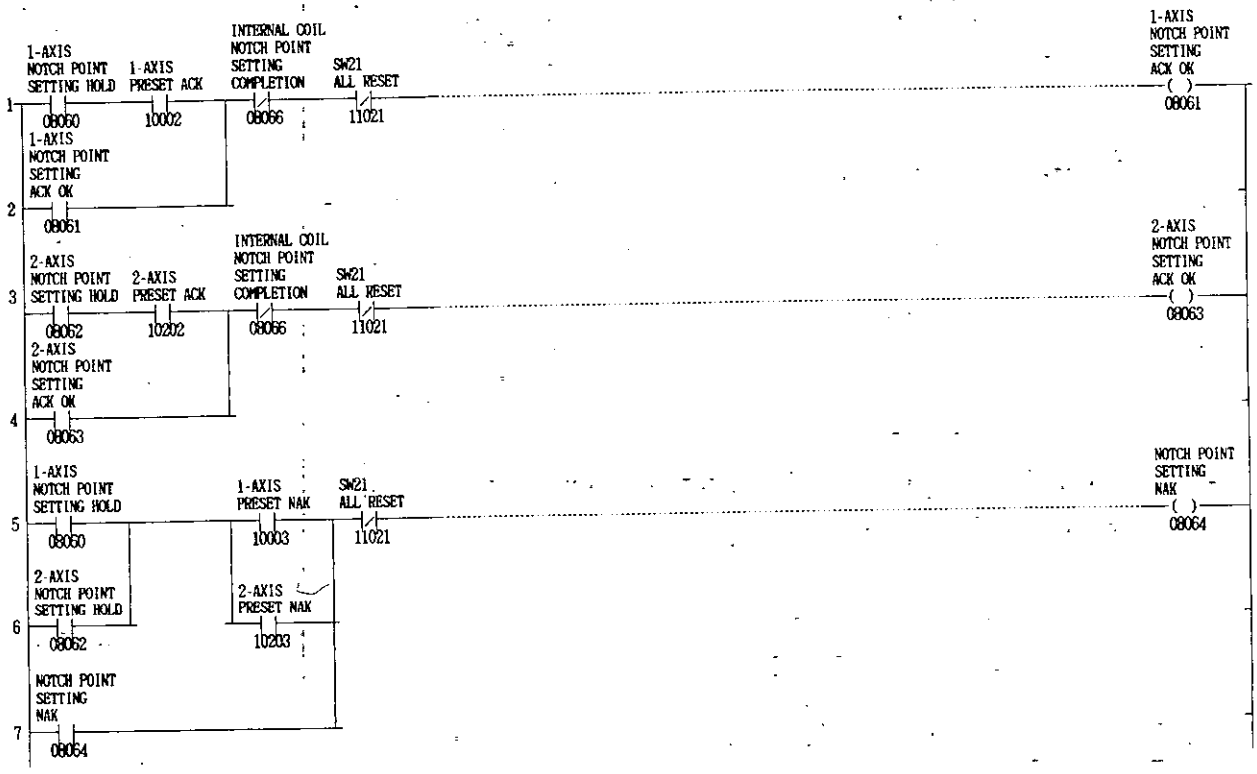


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Notch-point setting ACK or NAK waiting circuit

N

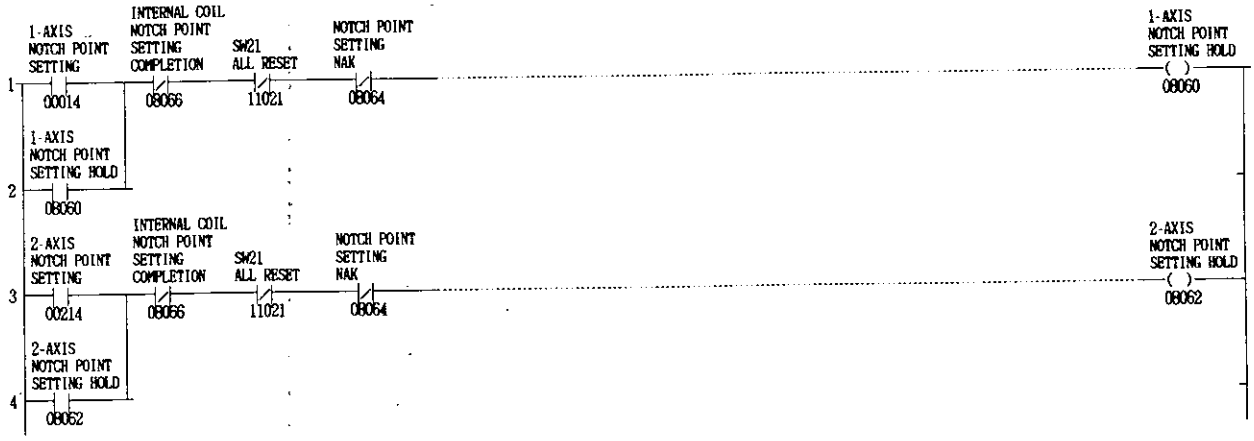
Network N26



Notch-point setting output holding circuit

N

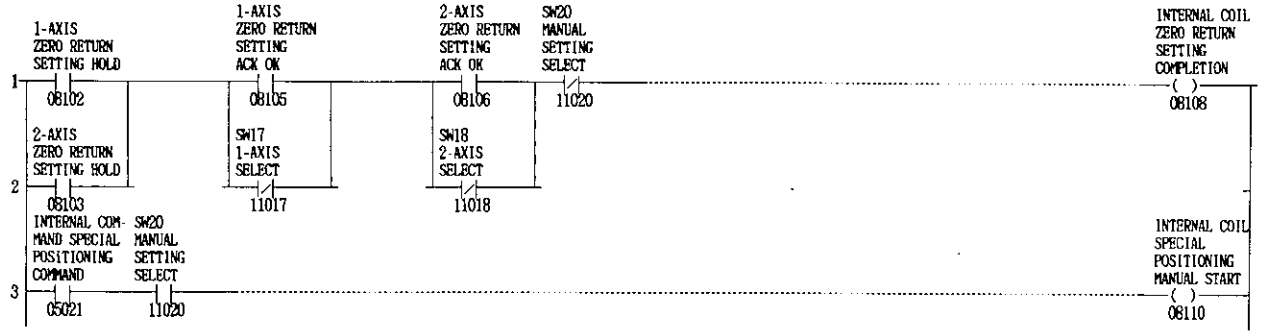
Network N27



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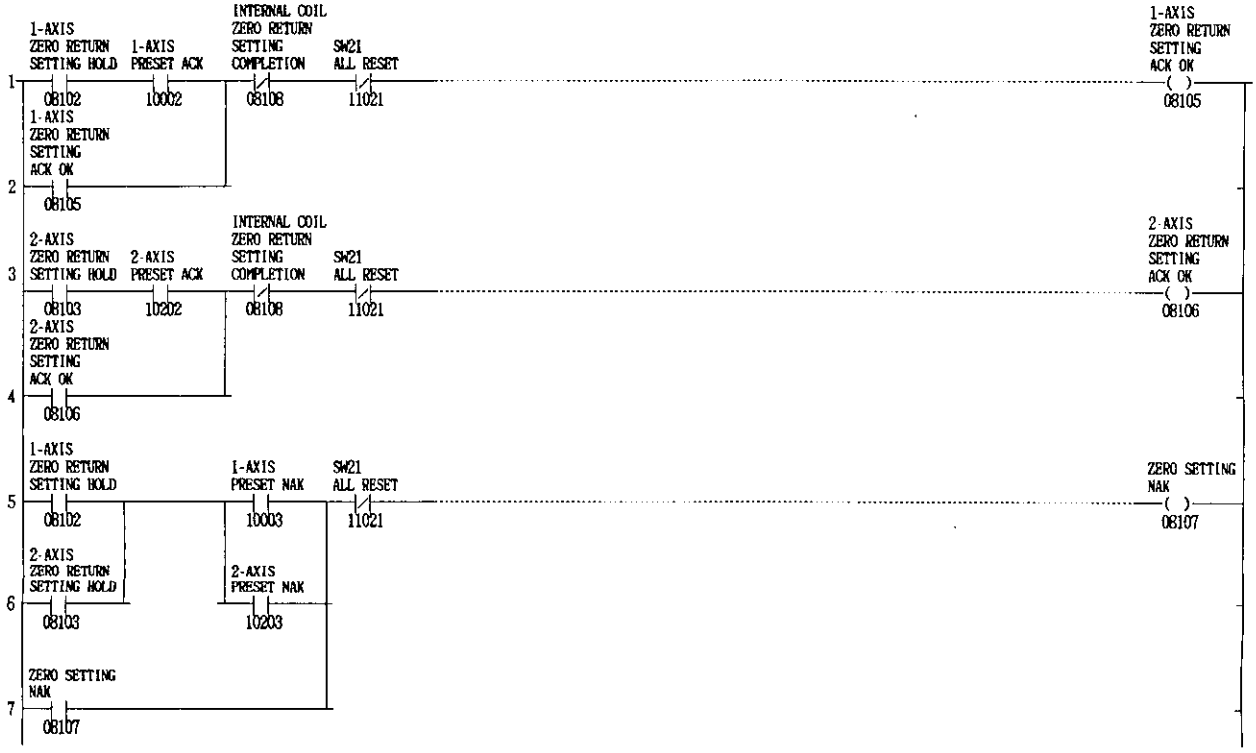
Zero return setting completion and special positioning startup circuit N

Network N28



Zero return setting ACK or NAK waiting circuit N

Network N29



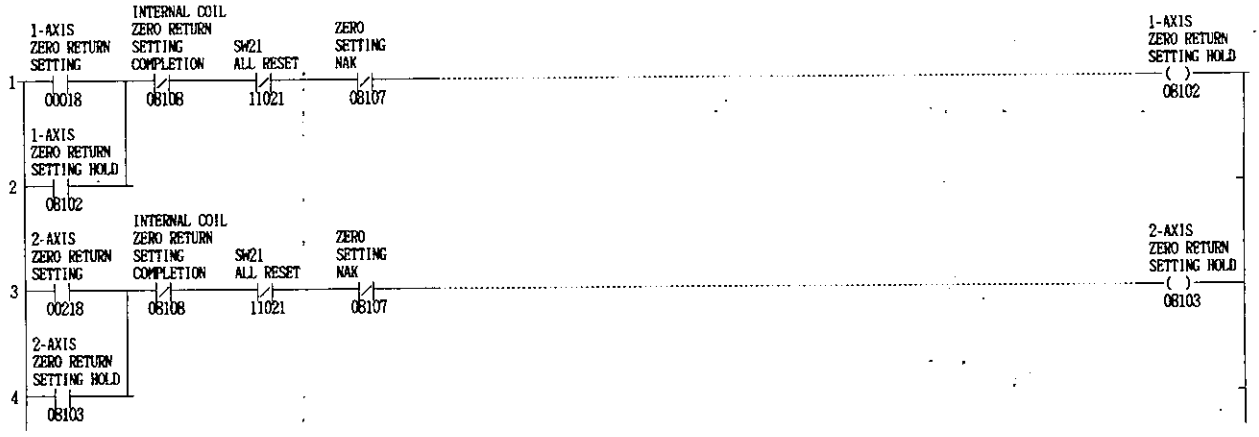
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11.2 INITIAL SETTING LIST (Cont'd)

Zero return setting output holding circuit

N

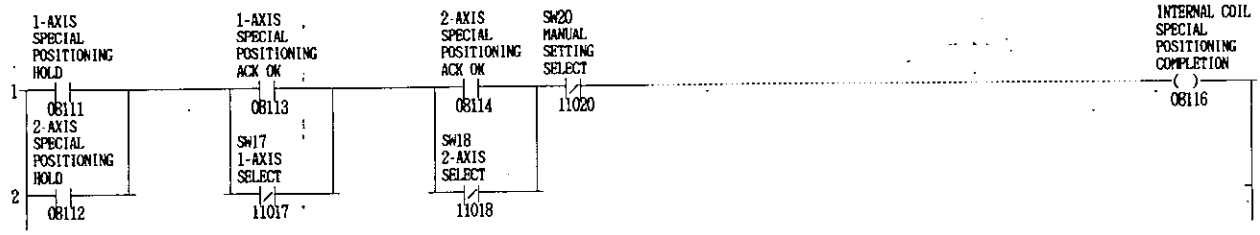
Network N30



Special positioning setting completing circuit

N

Network N31

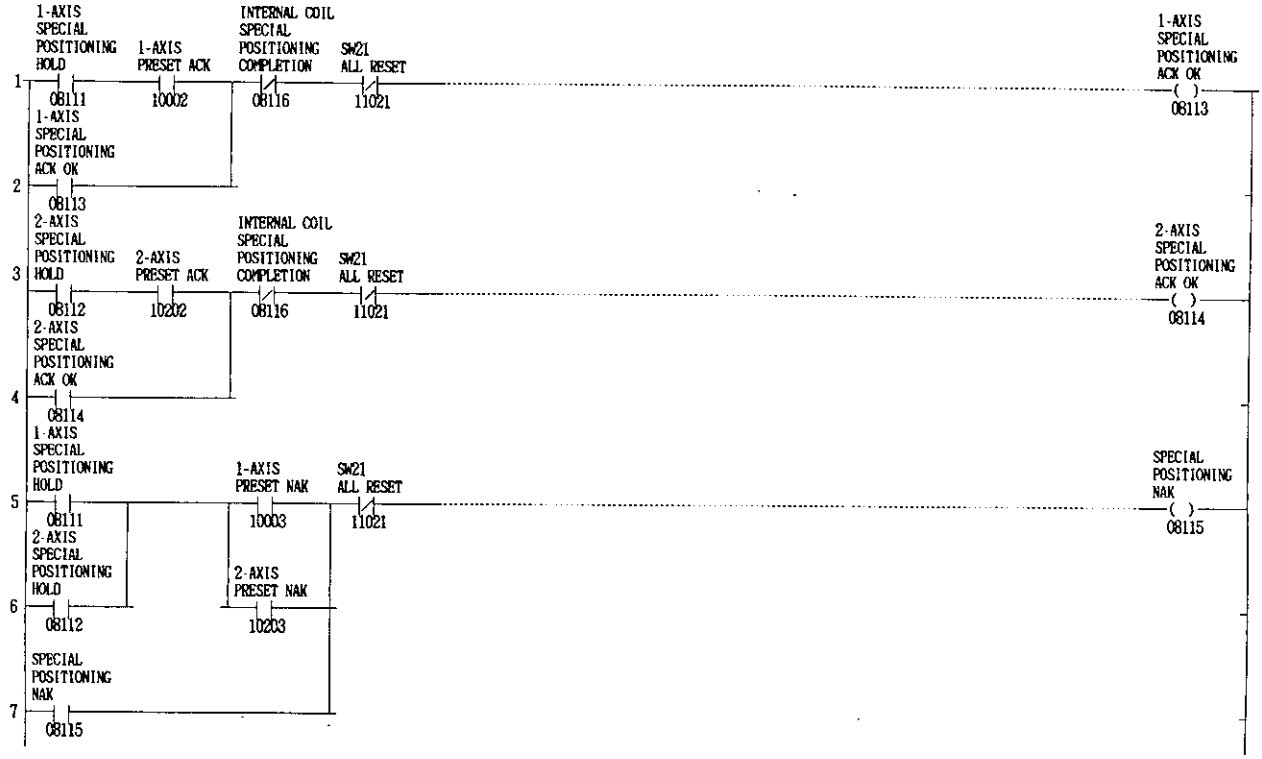


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Special positioning setting ACK or NAK waiting circuit

N

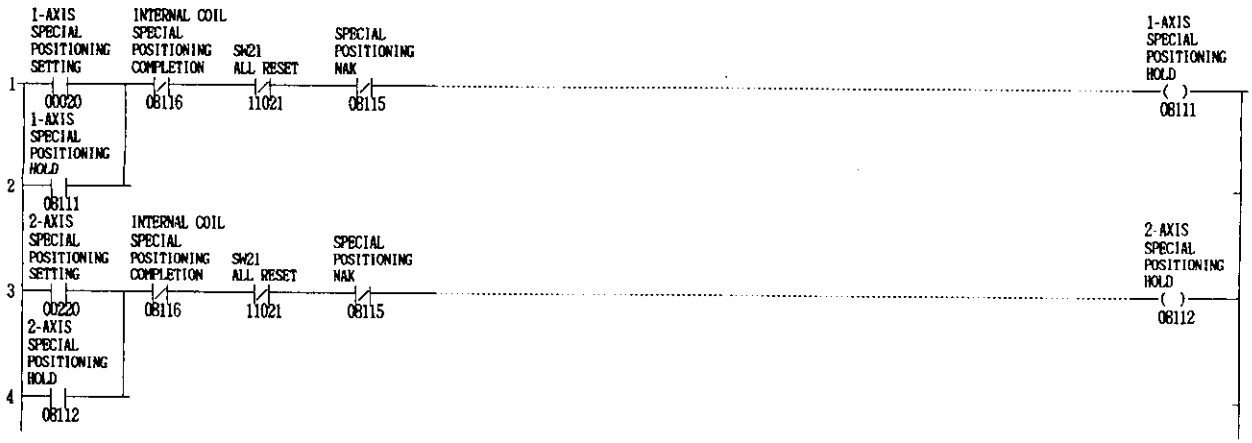
Network N32



Special positioning setting output holding circuit

N

Network N33



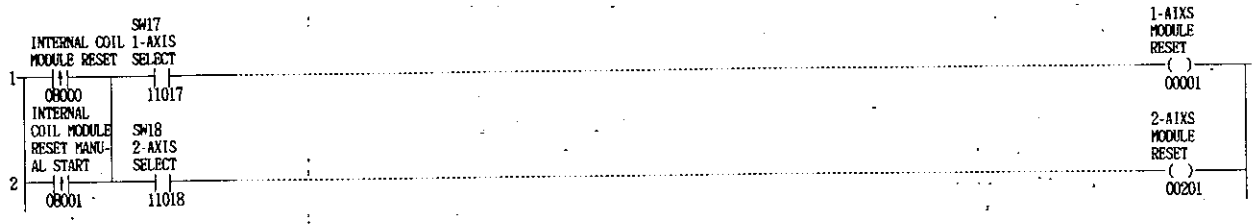
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11.2 INITIAL SETTING LIST (Cont'd)

Module reset output circuit

N

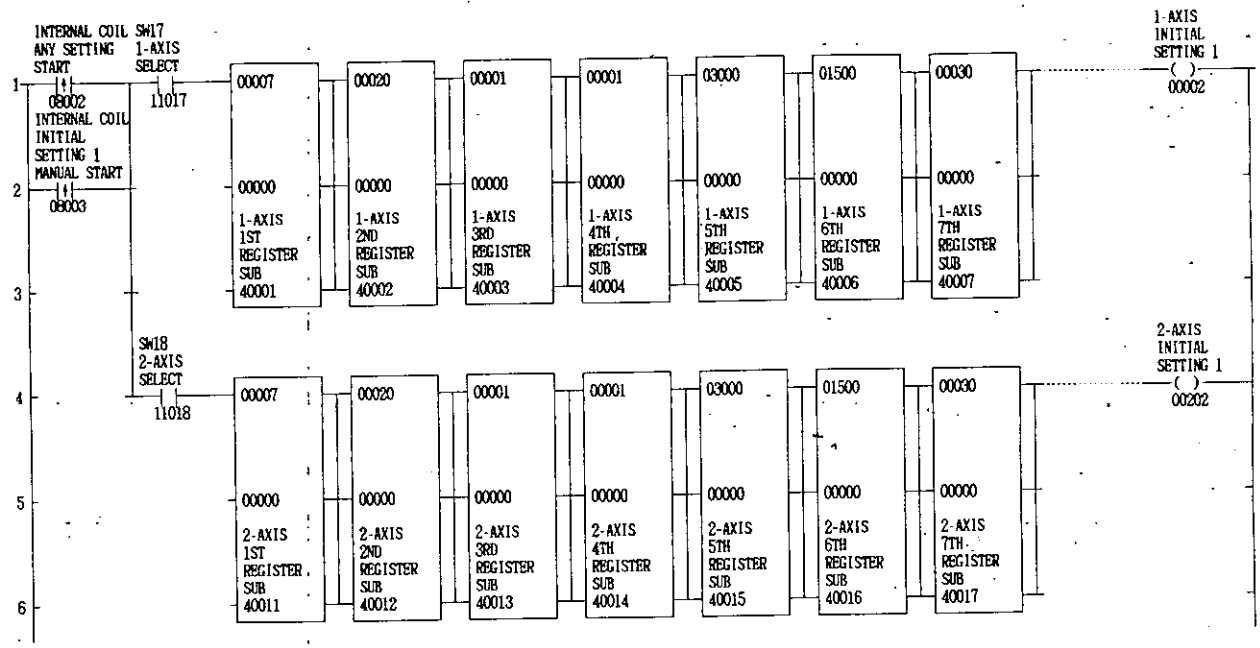
Network N34



Initial setting 1 setting and output circuit

N

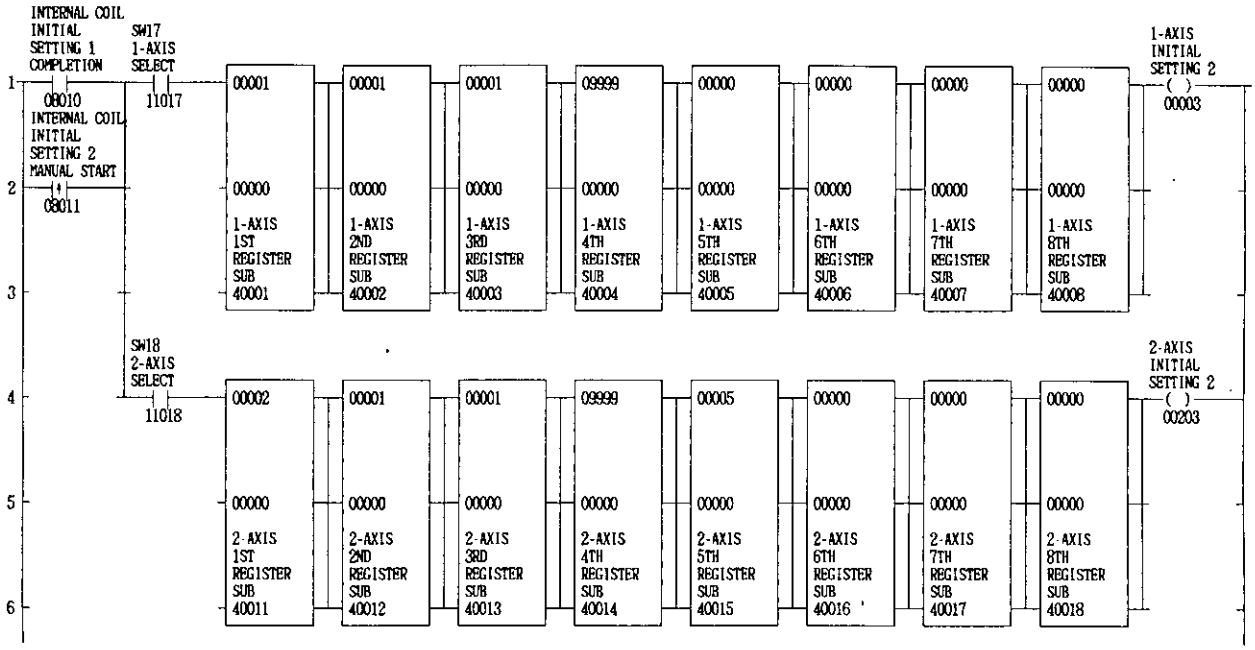
Network N35



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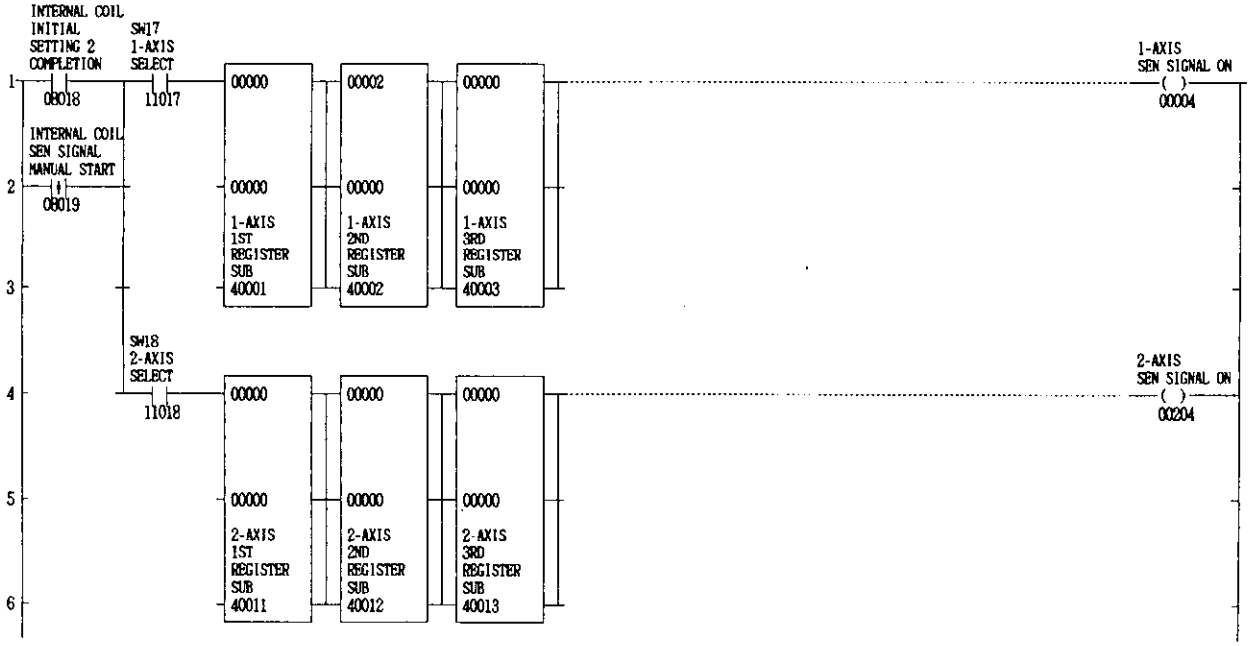
Initial setting 2 setting and output circuit N

Network N36



SEN signal (absolute value zero point matching) setting and output circuit N

Network N37

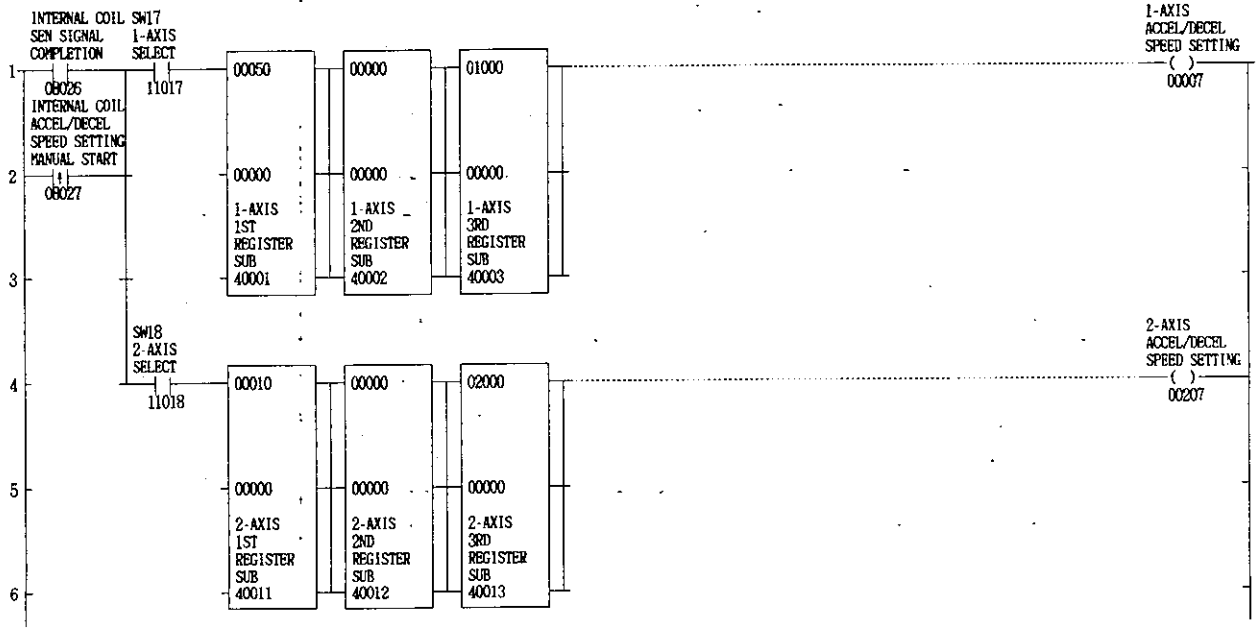


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11.2 INITIAL SETTING LIST (Cont'd)

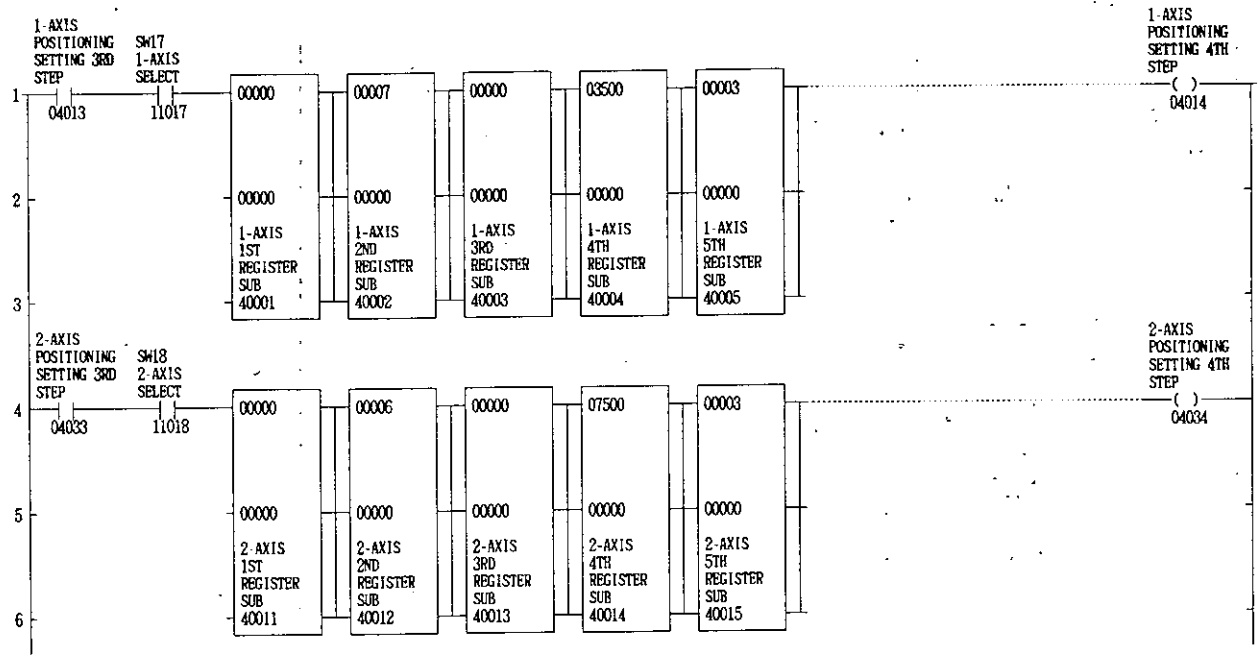
Setting of accel/decel speed setting and output circuit N

Network N38



Automatic positioning setting the 4th-step setting circuit N

Network N39

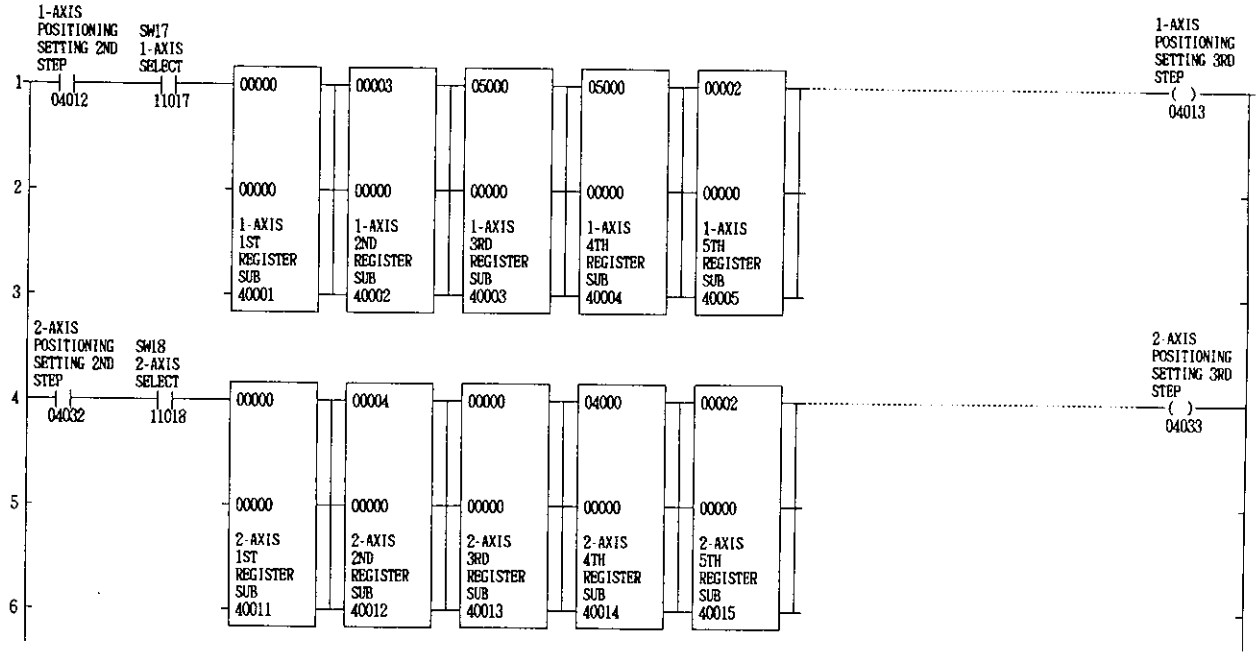


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Automatic positioning setting the 3rd-step setting circuit

N

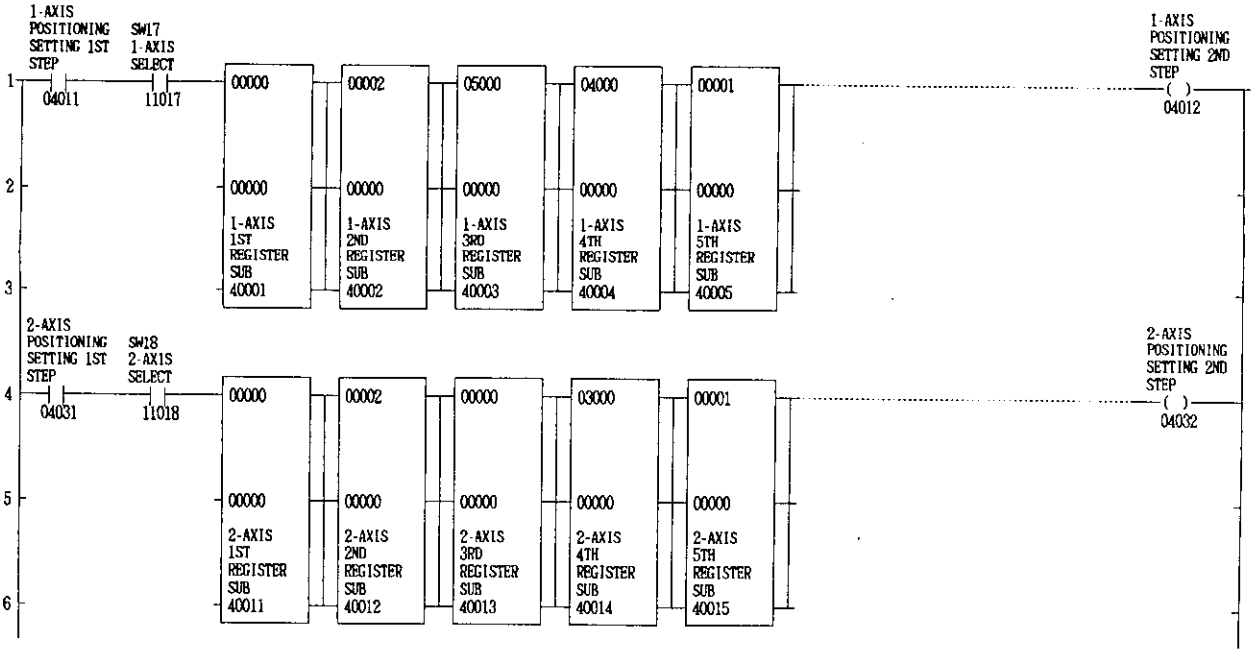
Network N40



Automatic positioning setting the 2nd-step setting circuit

N

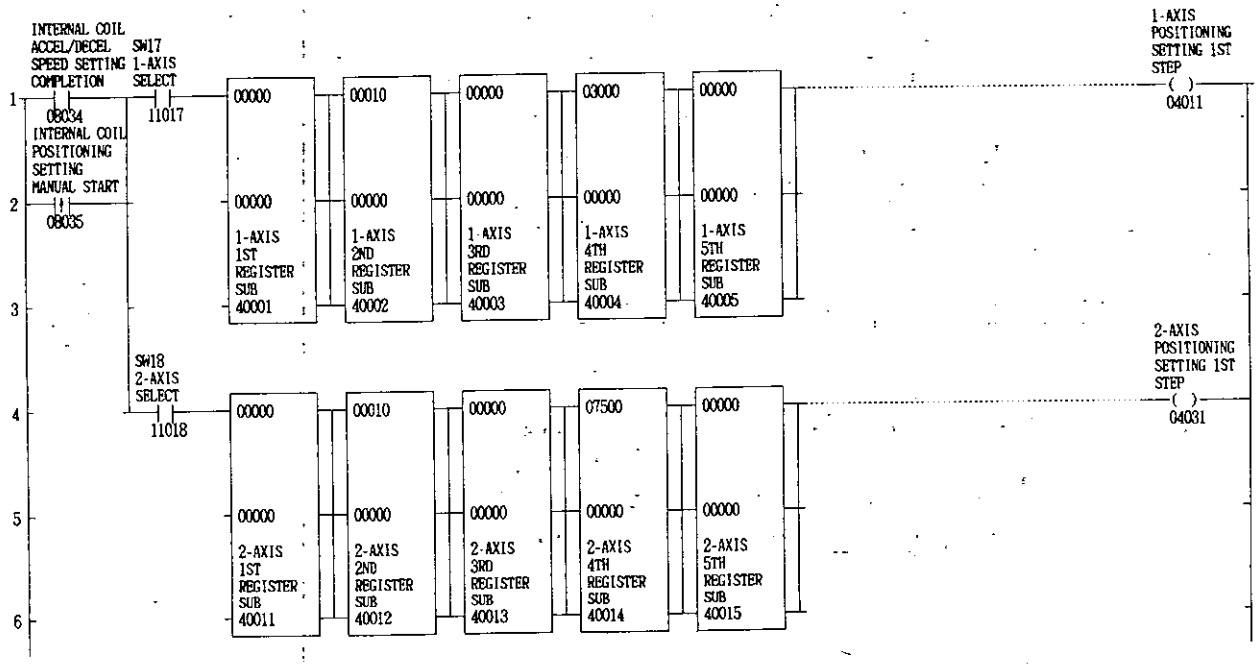
Network N41



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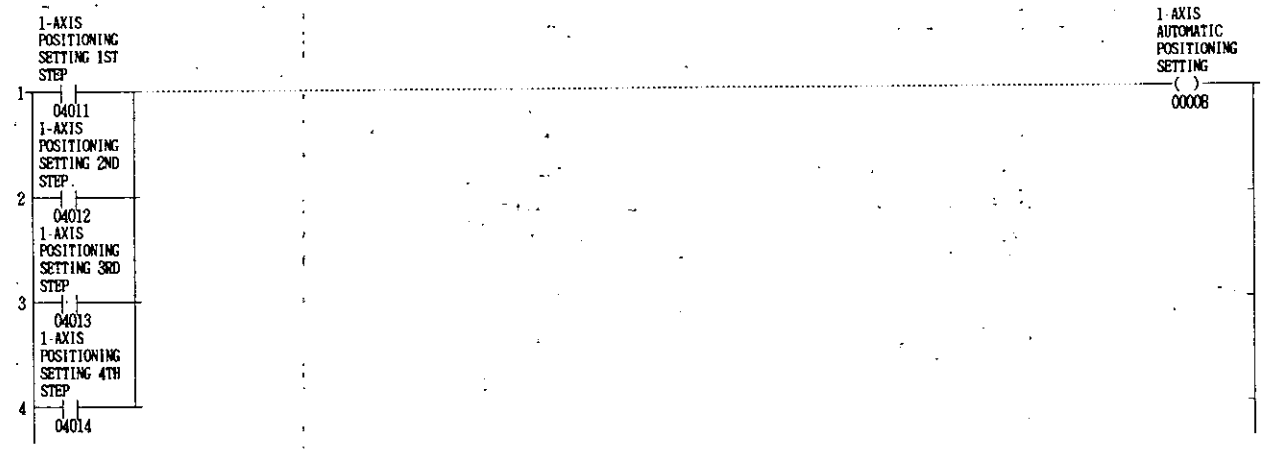
Automatic positioning setting the 1st-step setting circuit N

Network N42



1-axis automatic positioning setting output circuit N

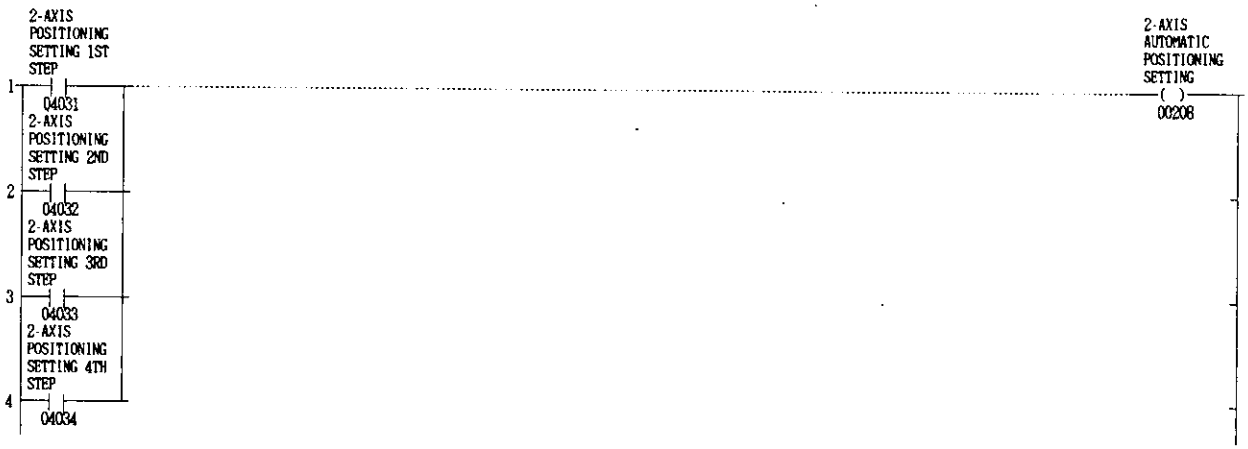
Network N43



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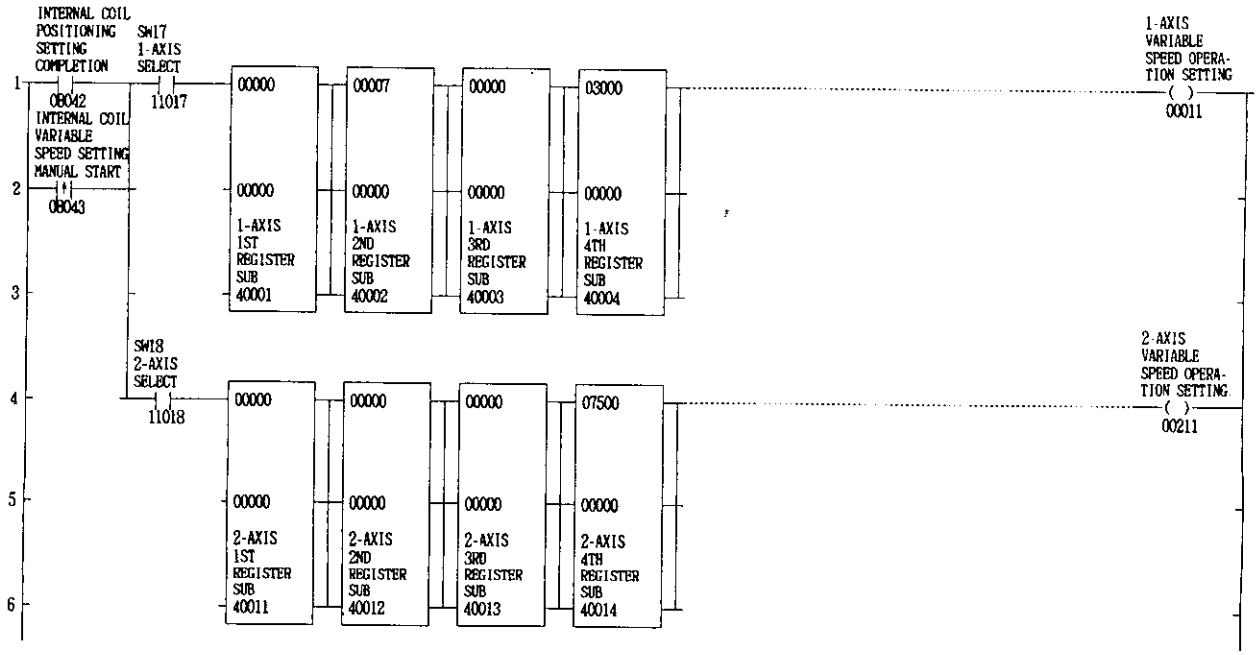
2-axis automatic positioning setting output circuit N

Network N44



Setting of variable speed operation and output circuit N

Network N45

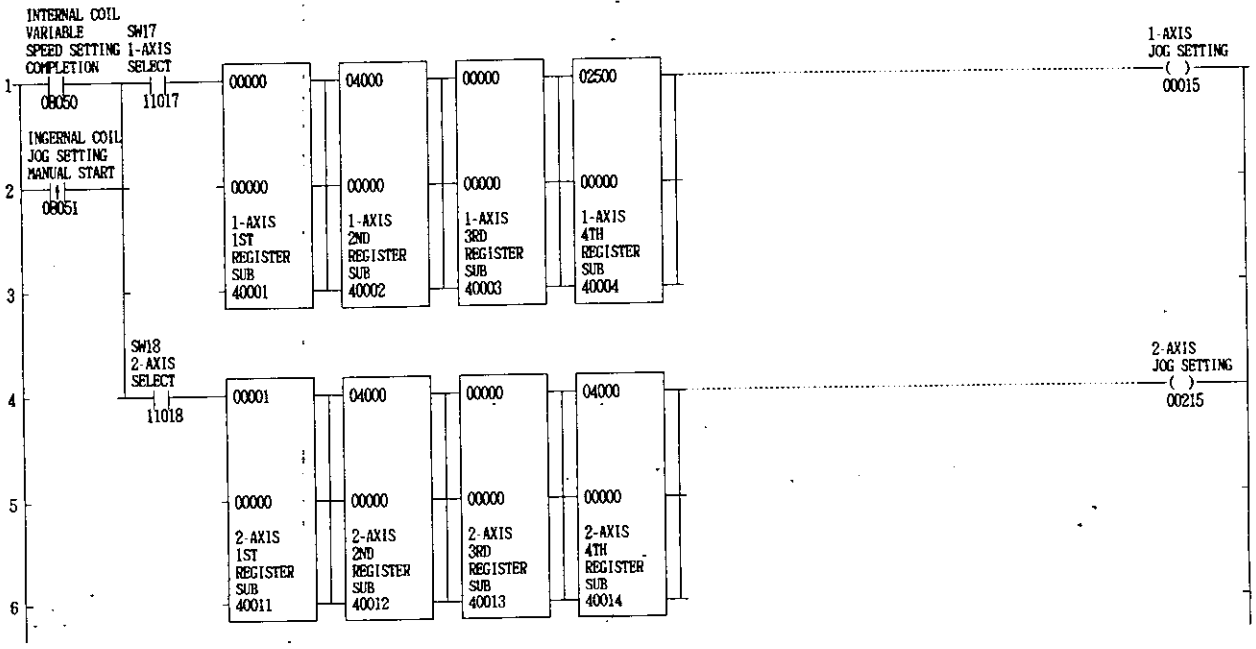


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Setting of JOG setting and output circuit

N

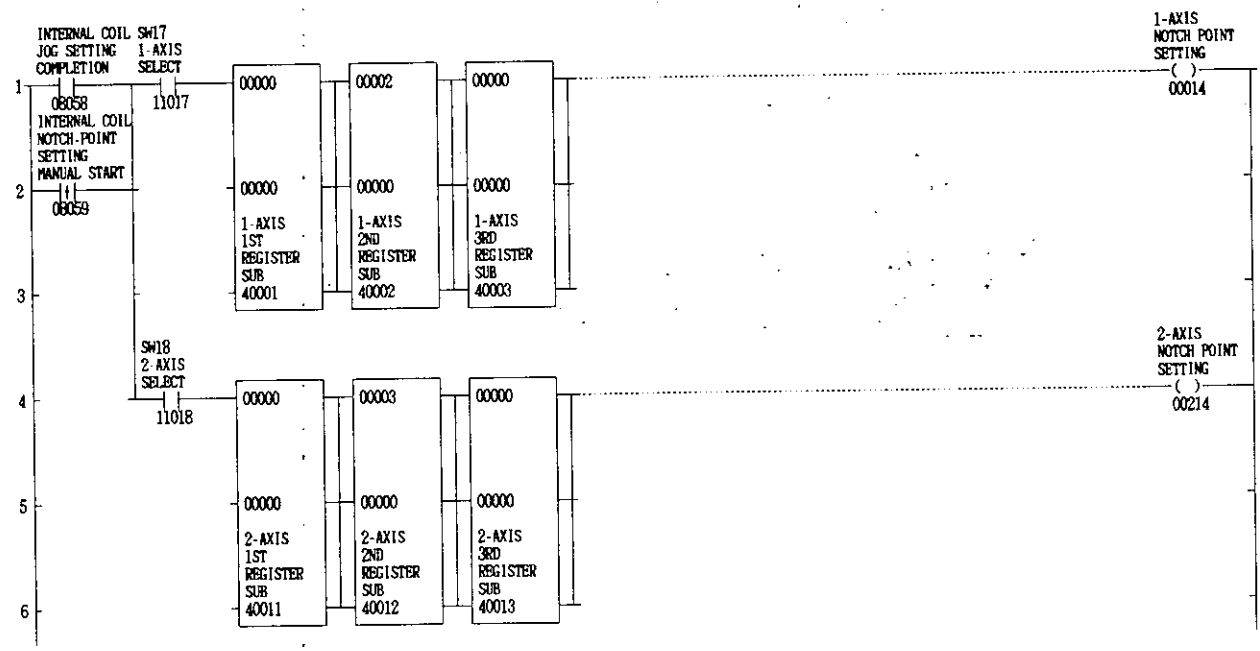
Network N46



Setting of notch-point setting and output circuit

N

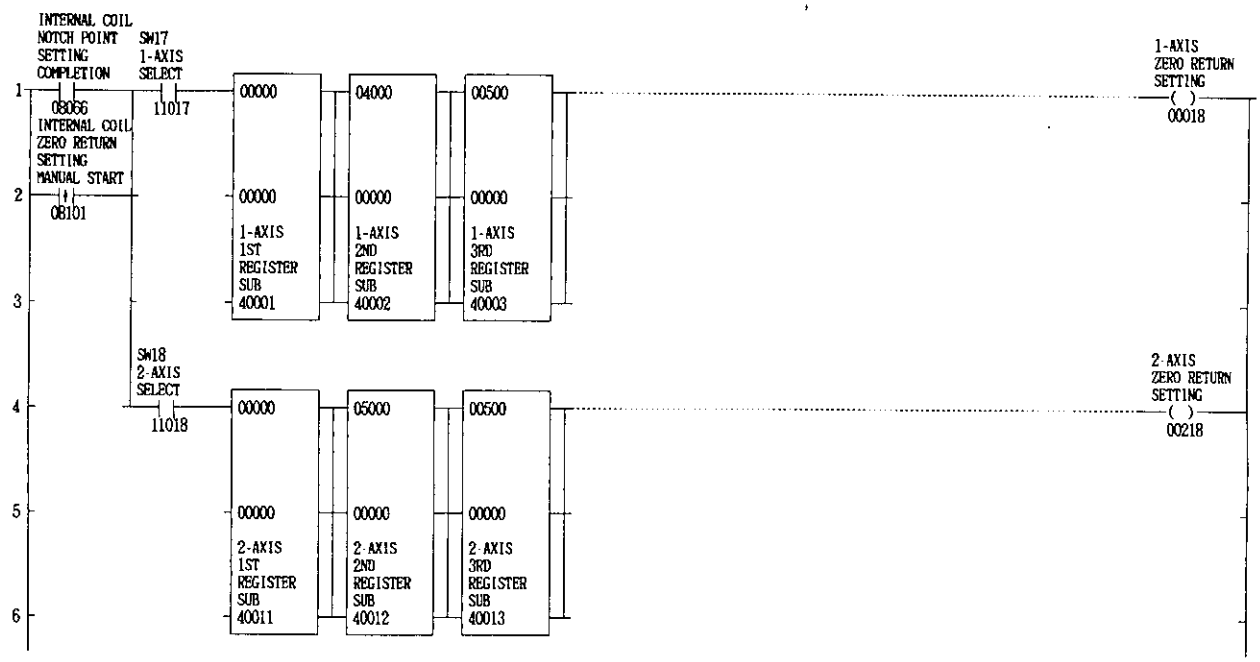
Network N47



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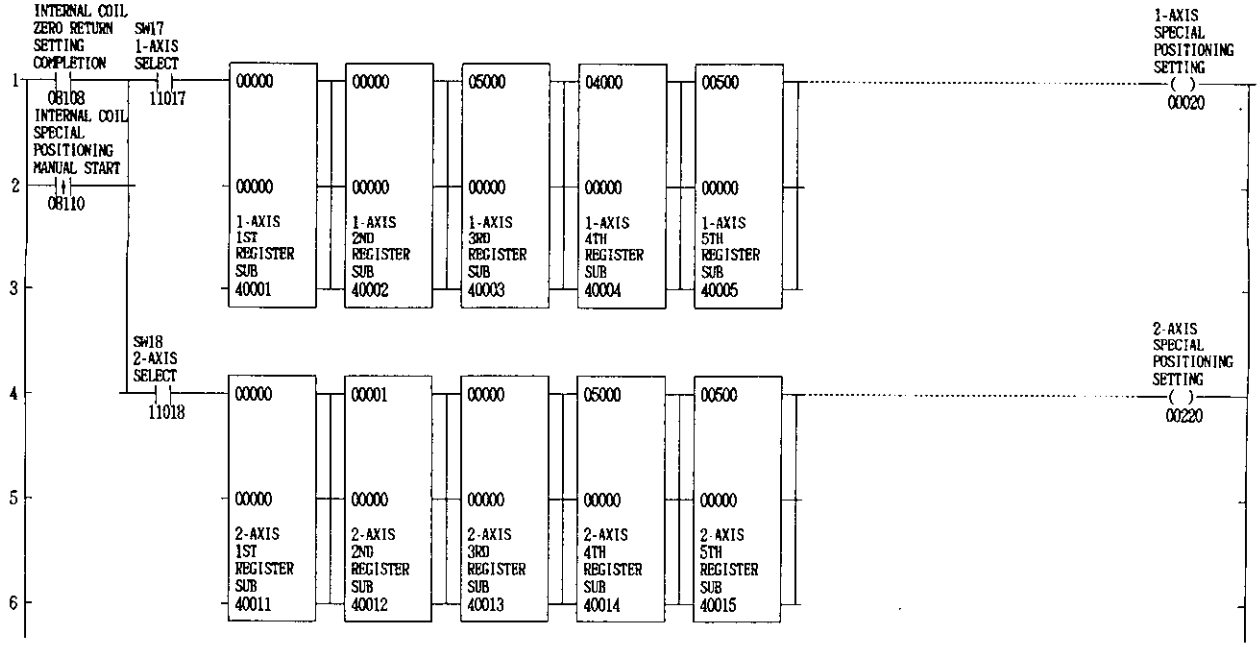
Setting of zero return setting and output circuit N

Network N48



Setting of special positioning setting and output circuit N

Network N49



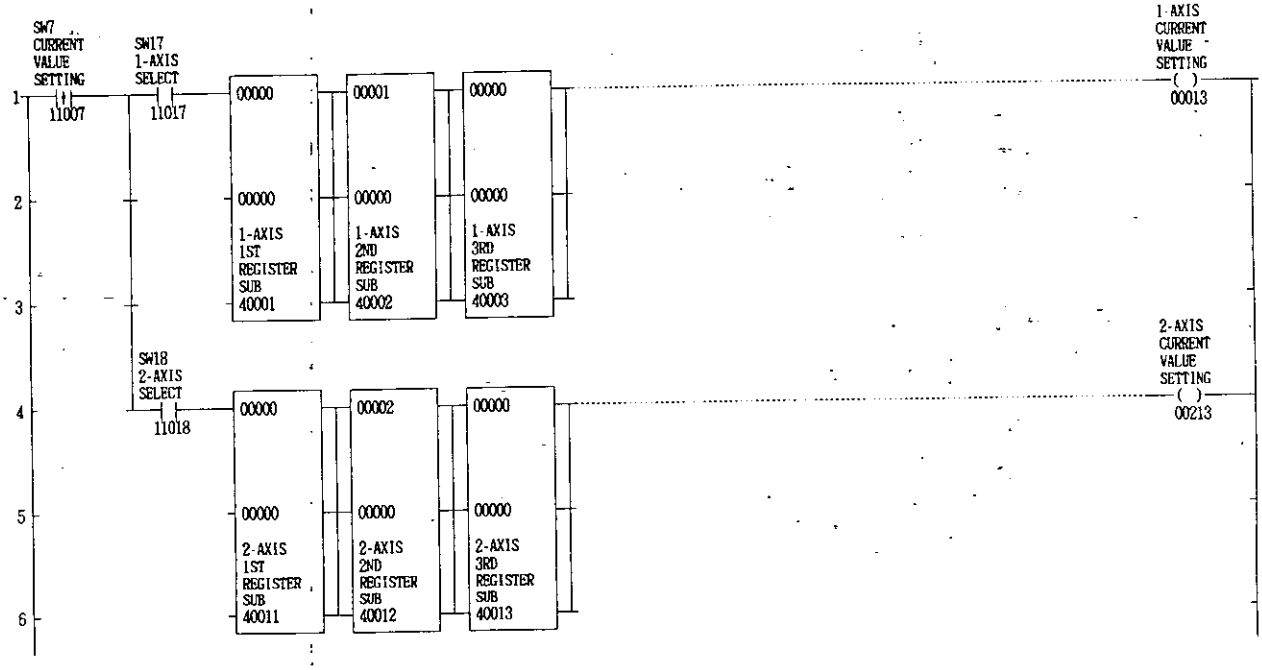
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11.2 INITIAL SETTING LIST (Cont'd)

Setting of current value setting and output circuit

N

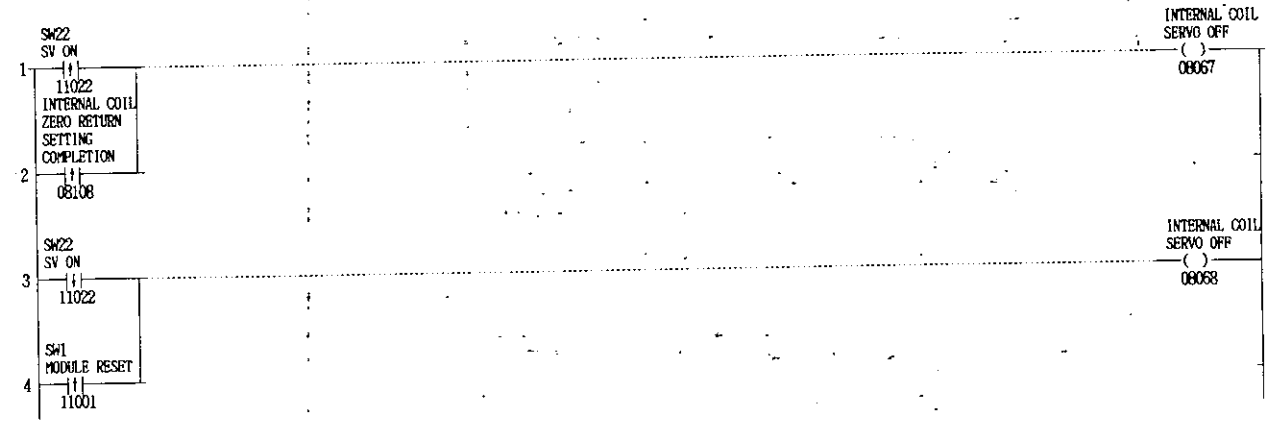
Network 50



Servo ON/OFF command circuit

N

Network N51

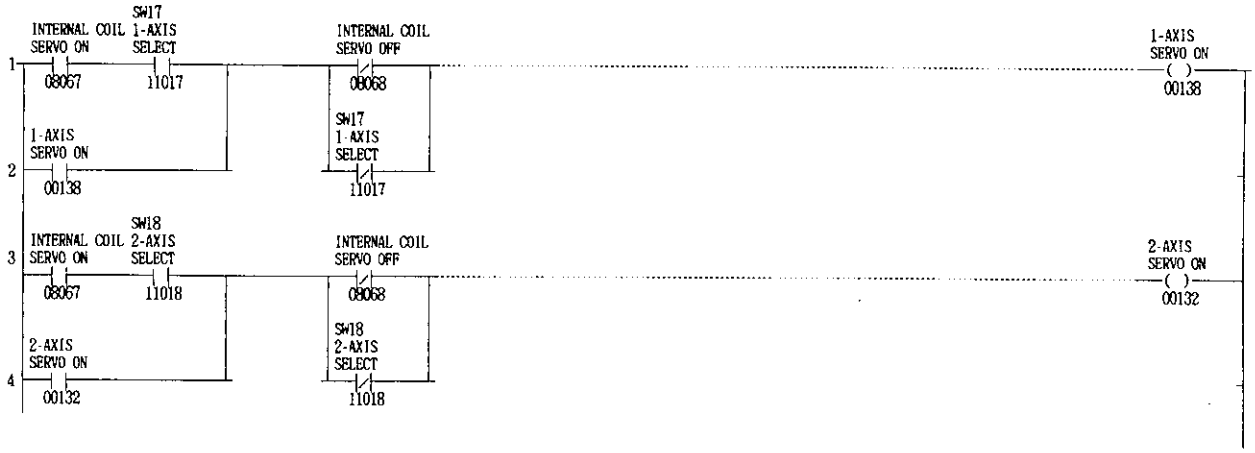


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Servo ON/OFF output circuit

N

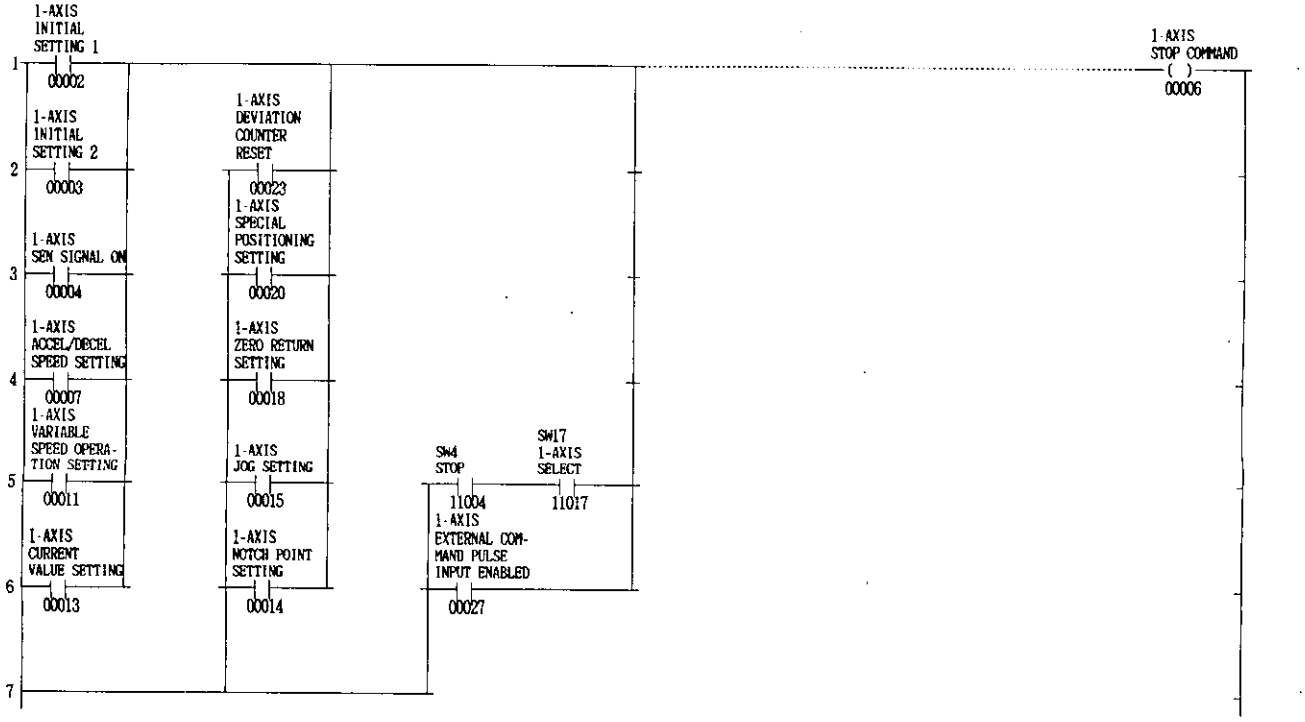
Network N52



1-axis stop command output circuit

N

Network N53



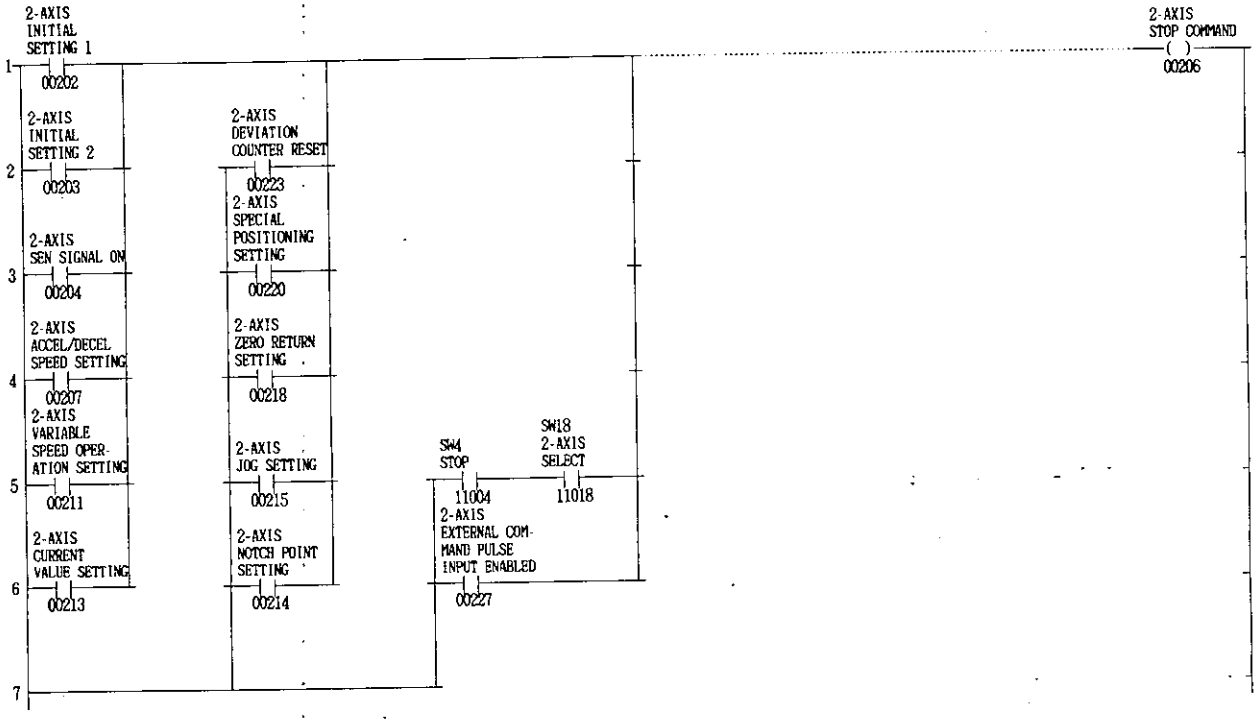
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11.2 INITIAL SETTING LIST (Cont'd)

2-axis stop command output circuit

N

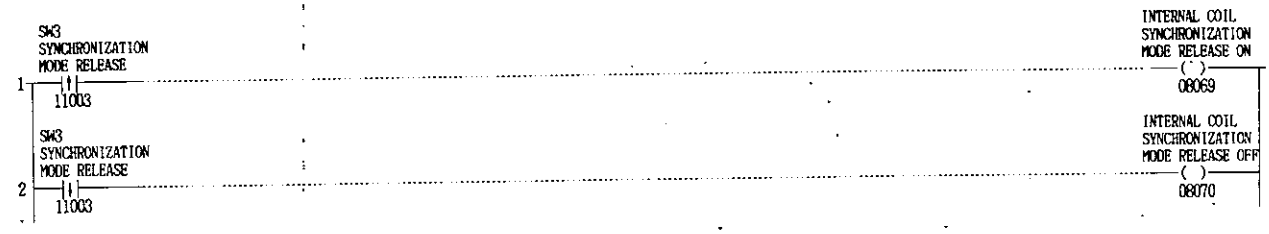
Network N54



Synchronization mode release command circuit

N

Network N55

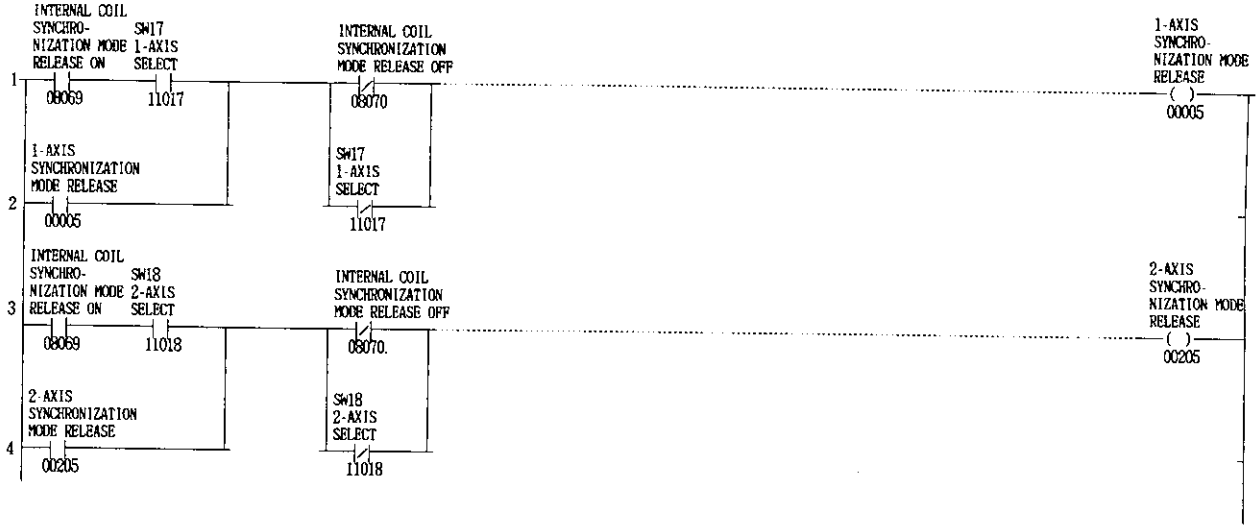


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Synchronization mode release output circuit N

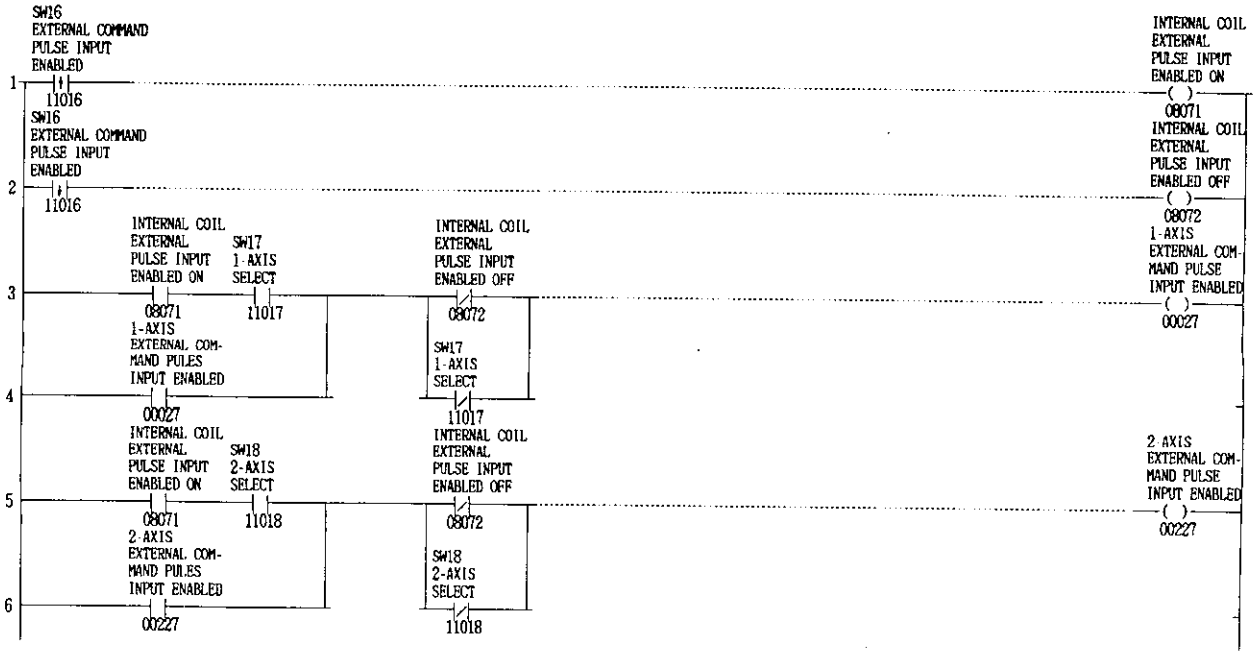
Network N56

The first and second lines in the network do not have to be fixed to master axis (1-axis).



External pulse input enabled command and output circuit N

Network N57



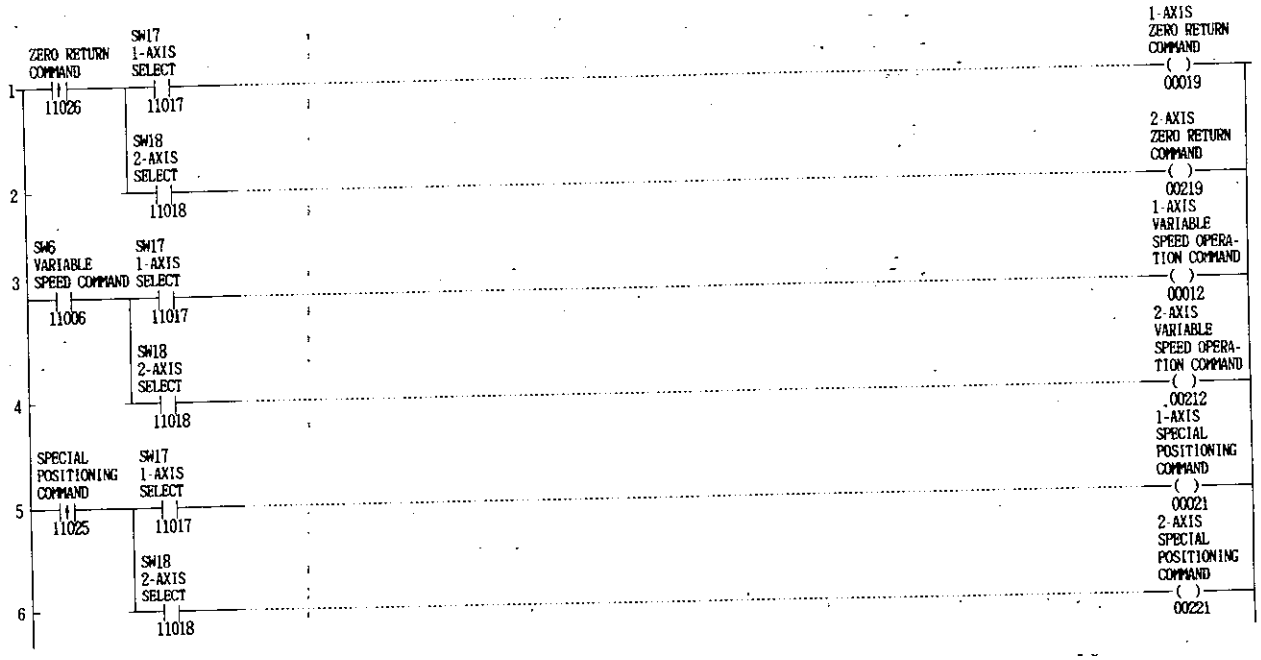
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11.2 INITIAL SETTING LIST (Cont'd)

Various operation commands (1)

N

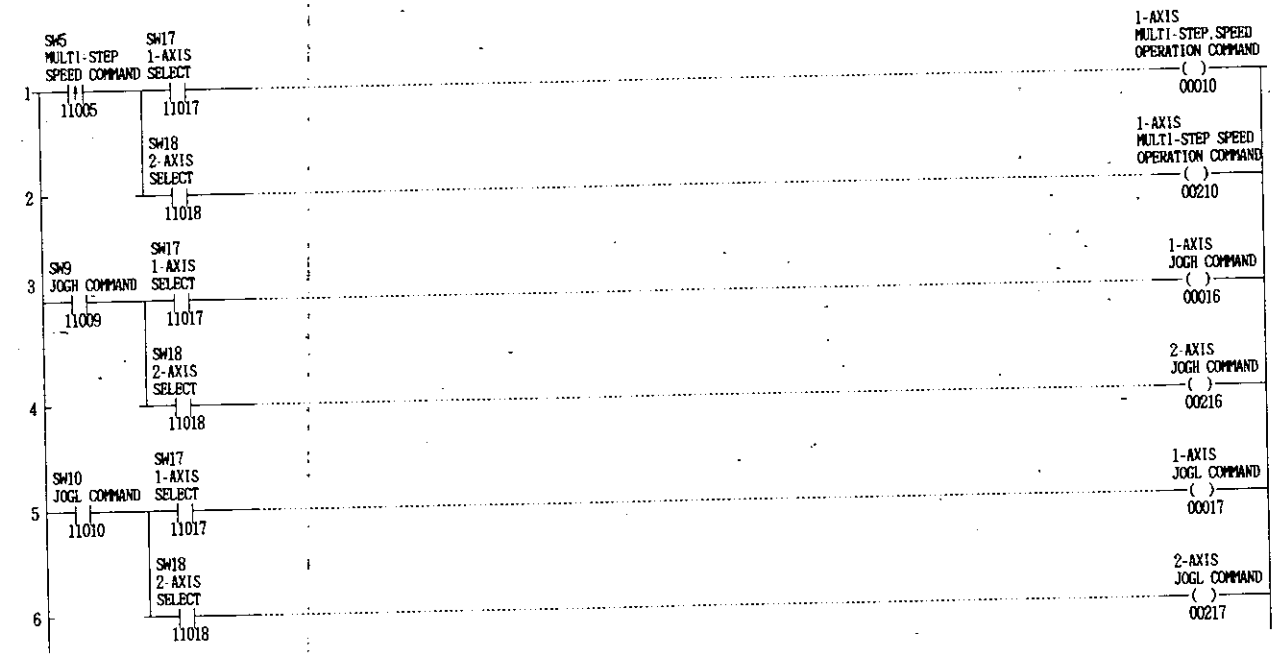
Network N58



Various operation commands (2)

N

Network N59



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Error code reset and display changing output circuit

N

Network N60



Monitor selecting circuit

N

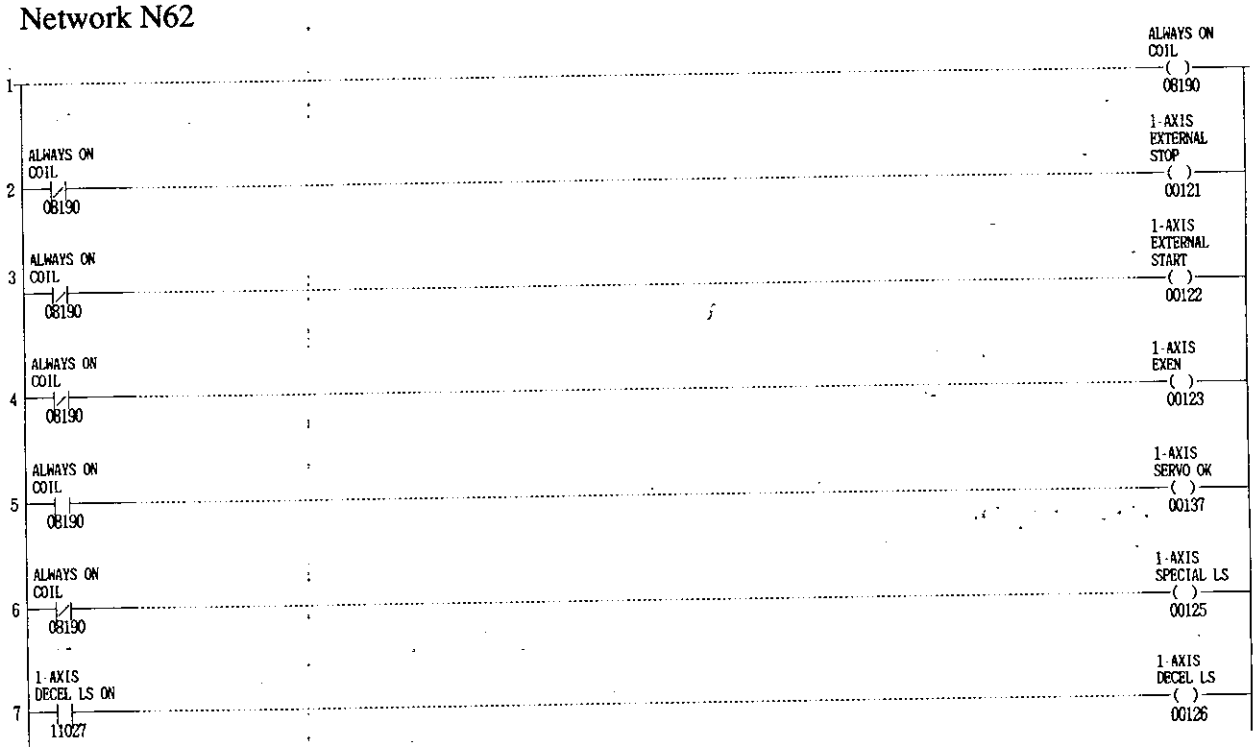
Network N61



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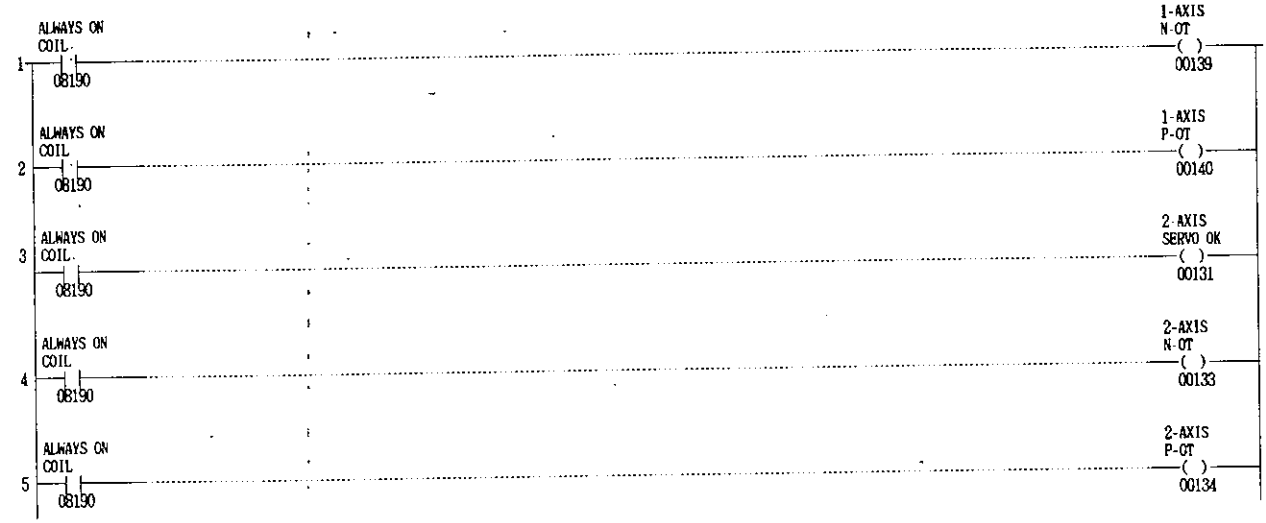
Other output circuits (1) N

Network N62



Other output circuits (2) N

Network N63



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MEMOCON-SC 2000 SERIES I/O POSITIONING MODULE B2833

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