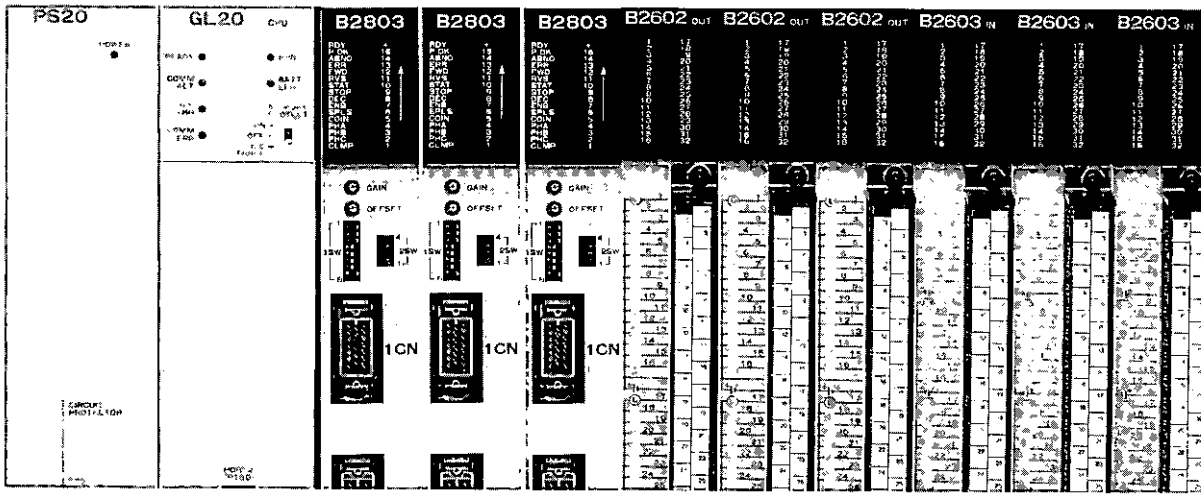
POSITIONING MODULE B2803

Memocon-SC2000 SERIES I/O

For PROGRAMMABLE CONTROLLER
Memocon-SC GL20, GL40S, GL60S, GL60H, GL70H
TYPE JAMSC-B2803



YASKAWA

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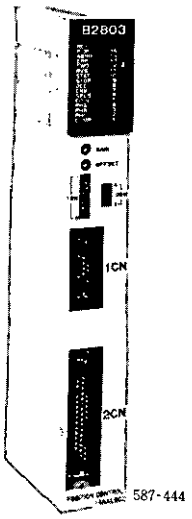
1. INTRODUCTION

The Memocon-SC 2000 Series I/O Positioning Module JAMSC-B2803, or B2803 for short, is designed to comprise a positioning system in combination with the Programmable Controller Memocon-SC GL20S, GL40S, GL60S, GL60H or GL70H (GL20, 40, 60, 70 for short) simply and conveniently.



Positioning Module
Type JAMSC-B2803

This module has the following features:

- Controllable either with absolute encoder or with incremental encoder.
- Simple point-to-point positioning function with linear acceleration/ deceleration.
- Simple on-line setting of travel distance, speed, and acceleration/ deceleration time from GL20, 40, 60, 70, for each positioning motion.
- Analog output speed references allowing direct connection to YASKAWA Servopack.

This manual describes the composition of a positioning system using the B2803. Following are additional reference manual.

- Memocon-SC GL20 USER'S MANUAL DESIGN AND MAINTENANCE (SIE-C815-13.1)
- AC Servo Drives R SERIES FOR SPEED CONTROL (TSE-S800-2.6)
- AC Servo Drives WITH ABSOLUTE ENCODER M, F, S, D SERIES FOR SPEED CONTROL (TSE-S800-5.1)
- Memocon-SC GL60S USER'S MANUAL-NO.1 DESIGN AND MAINTENANCE (SIE-C815-14.1)
- Memocon-SC GL60S USER'S MANUAL-NO.2 BASIC INFORMATION (SIE-C815-14.2)
- Memocon-SC GL60S USER'S MANUAL-NO.3 SFC INFORMATION (SIE-C815-14.3)
- Memocon-SC GL40S USER'S MANUAL DESIGN AND MAINTENANCE (SIE-C815-15•1)
- Memocon-SC GL40S USER'S MANUAL P150 PROGRAMMING PANEL (SIE-C815-15•2)
- Memocon-SC GL40S USER'S MANUAL P140 PROGRAMMING PANEL (SIE-C815-15•3)
- Memocon-SC GL60H/GL70H USER'S MANUAL (SIE-C815-17•1)

2. CONFIGURATION

Fig. 2.1 shows a system configuration for positioning module, Type JAMSC-B2803.

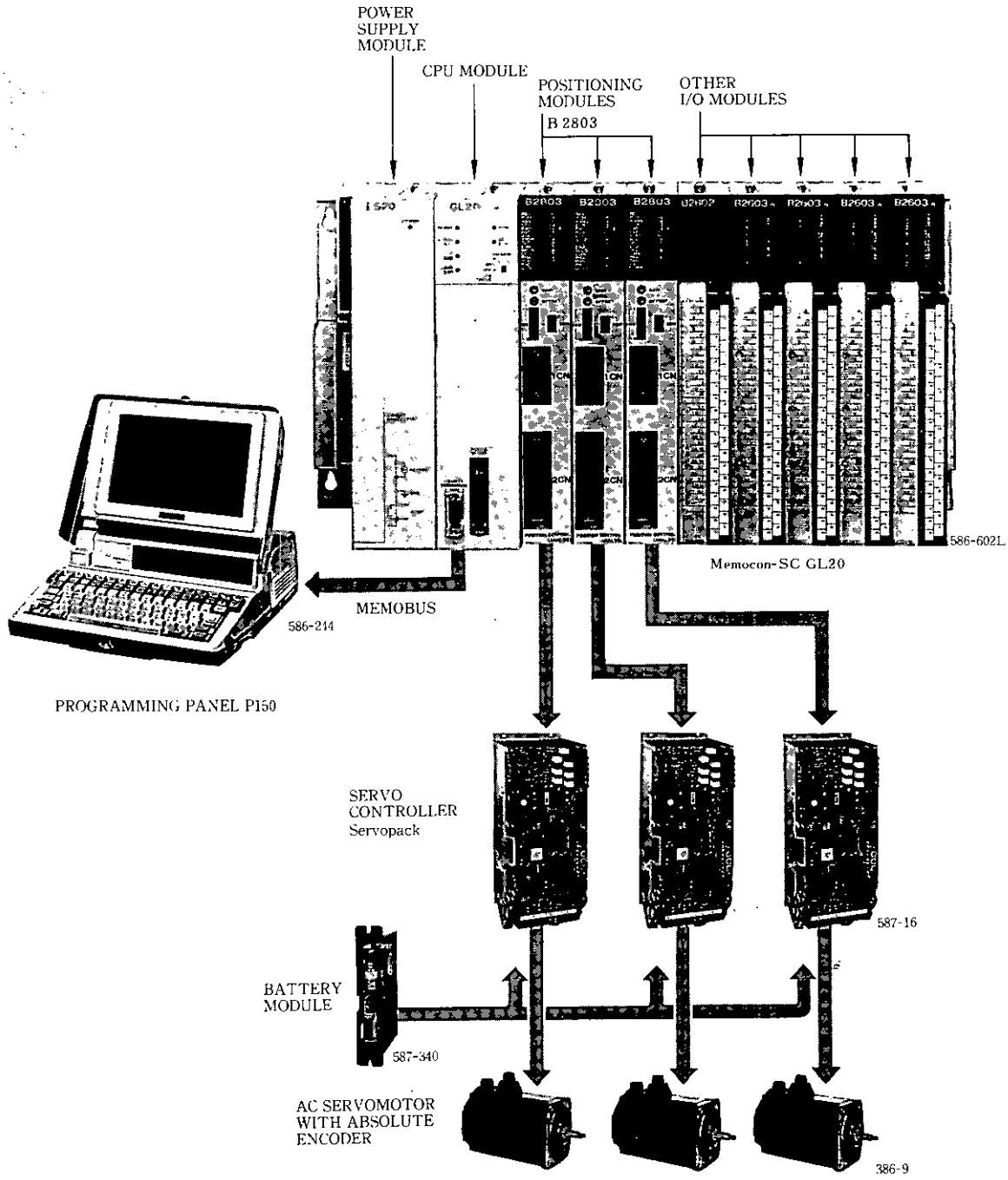


Fig. 2.1 System Configuration of B2803 for AC Servomotor with Absolute Encoder

3. SPECIFICATIONS

3.1 GENERAL SPECIFICATIONS

Table 3.1 General Specifications

Items	Specifications
Type	JAMSC-B2803
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	10G max in compliance with JIS* C0912.
Environmental Condition	Free from explosive, inflammable and corrosive gases.
Dimensions in mm (inch)	37 (1.46) W × 250 (9.84) H × 79 (3.11) D ; 1 span
Internal Consumed Current (Vcc)	0.25A 5VDC±3%
Approx Weight	0.6 kg (1.3 lb)

*Japanese Industrial Standard

3.2 PERFORMANCE

Table 3.2 Performance

Items		Specifications	Remarks
Function		Point-to-point automatic positioning	With linear accel/decel speed
Number of Control Axis		1 Axis	—
Applicable Mainframe		GL20, GL40S, GL60S, GL60H, GL70H	Selectable by switch
Number of I/O Allocation Points and Registers		• Input relay : 16 points • Output coil : 24 points (16 points available) • Input register : 4 registers • Output register : 4 registers	Number of I/O allocation in CPU module. I/O registers specified by binary.
Positioning Function	Motion Distance	−999,999 to +999,999 (GL20) −99,999,999 to +99,999,999 (GL40, 60, 70)	—
	Reference Speed	(1 to 9,999) × 10 pps (1 to 9,999) × 20 pps	Selectable by switch (10 pps/20 pps)
	Reference Accel/ Decel Speed Time	(1 to 99) × 10 ms (1 to 99) × 0.1 s	Selectable by initial setting (10 ms/0.1 s)
Positioning Mode		Absolute mode, incremental mode	Selectable by initial setting
Setting Data		Data for next one position	During operation, next setting possible.
Zero Return		Provided (2 modes)	Selectable by initial setting

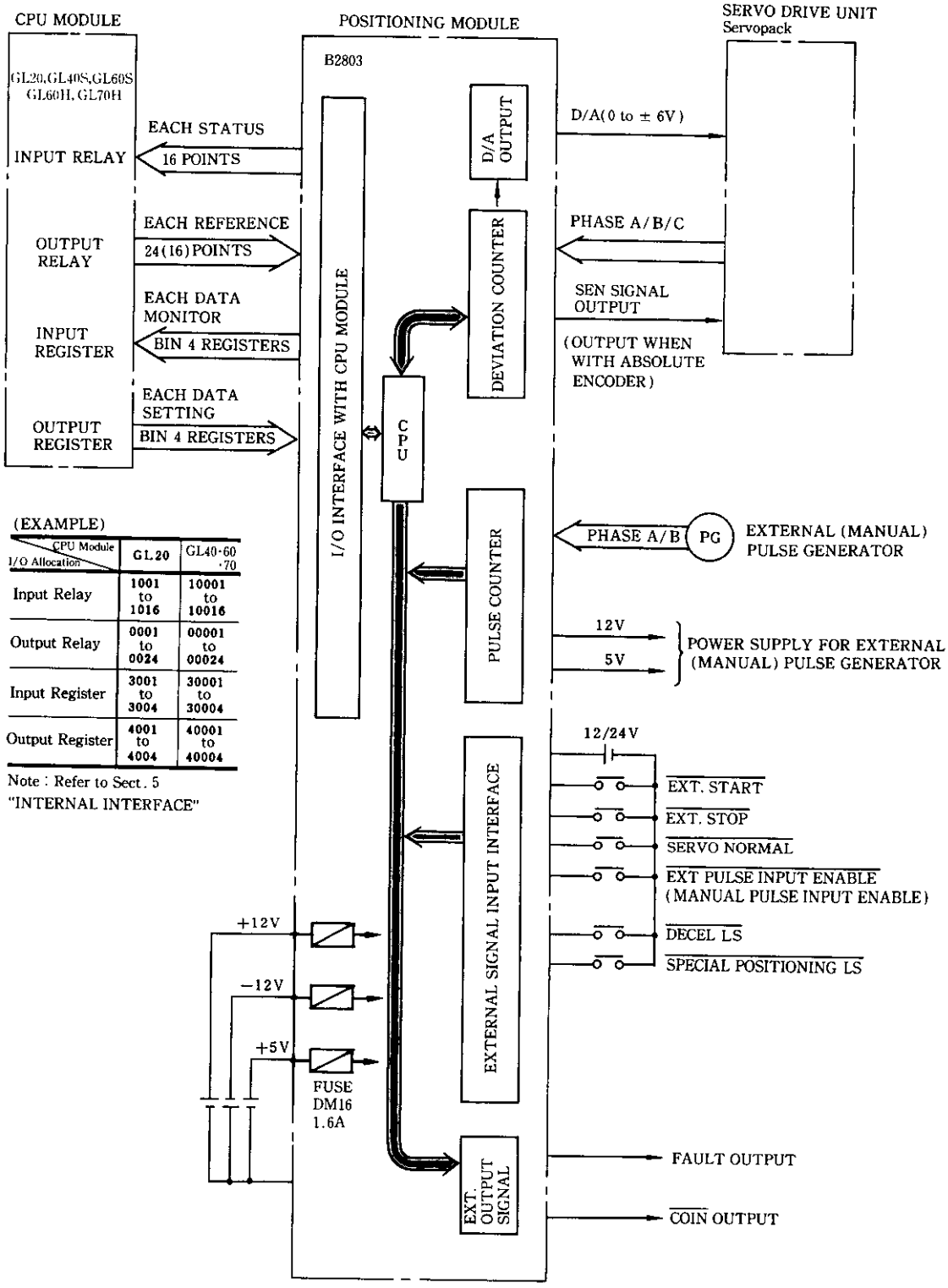
3.2 PERFORMANCE (Cont'd)

Table 3.2 Performance (Cont'd)

Items		Specifications	Remarks
JOG Function		High speed, low speed	Accel/decel and speed setting possible, separately.
PG Detection Function		Absolute/incremental encoder	Selectable by initial setting.
Special Positioning		Provided	–
Counter Specifications	Pulse System	A-/B-phase	–
	Pulse Input Voltage	+12 V +5 V (line receiver)	Selectable by switch
	Multiplier	×1, ×2, ×4	Selectable by switch
	Max. Counting Speed	200 kpps (×1), 400 kpps (×2), 800 kpps (×4)	–
External Pulse Input (Manual Operation)		Pulse input voltage : +12 V, +5V Max. counting speed : 100 kpps Pulse system : A-/B-phase Multiplier : ×1	Selectable by switch
Speed Reference Output		Analog : 0 to ±6 V	–
External Input Signal		$\overline{\text{External pulse input enable}}$, $\overline{\text{External START}}$, $\overline{\text{External STOP}}$, $\overline{\text{Servo normal}}$, $\overline{\text{DECEL LS}}$, $\overline{\text{S POSI LS}}$, 12 V/24 V	Selectable by switch For +12 V/+24 V
External Output Signal		$\overline{\text{COIN}}$, fault SEN	+12 V output + 5 V output
External Power Supply		−12 VDC ±3%, 50 mA +12 VDC ±3%, 0.3 A +5 VDC ±5%, 0.7 A	–
Indicator Lamp		32 lamps	See Par. 6.4.
Switch		4-/8-point switches	See Par. 6.5.
Self Diagnosis		ROM/RAM check Watchdog timer check	–

3.3 INTERFACE OF CPU MODULE AND EXTERNAL DEVICES

Fig. 3.1 shows the relationship between B2803 interfaces, CPU module and external devices.



(EXAMPLE)

CPU Module / I/O Allocation	GL20	GL40·60·70
Input Relay	1001 to 1016	10001 to 10016
Output Relay	0001 to 0024	00001 to 00024
Input Register	3001 to 3004	30001 to 30004
Output Register	4001 to 4004	40001 to 40004

Note : Refer to Sect. 5 "INTERNAL INTERFACE"

Fig. 3.1 Interface of CPU Module and External Devices

3.4 B2803 OPERATION FLOW

Fig. 3.2 shows B2803 operation outline.
(The reference numbers here are given as an example.)

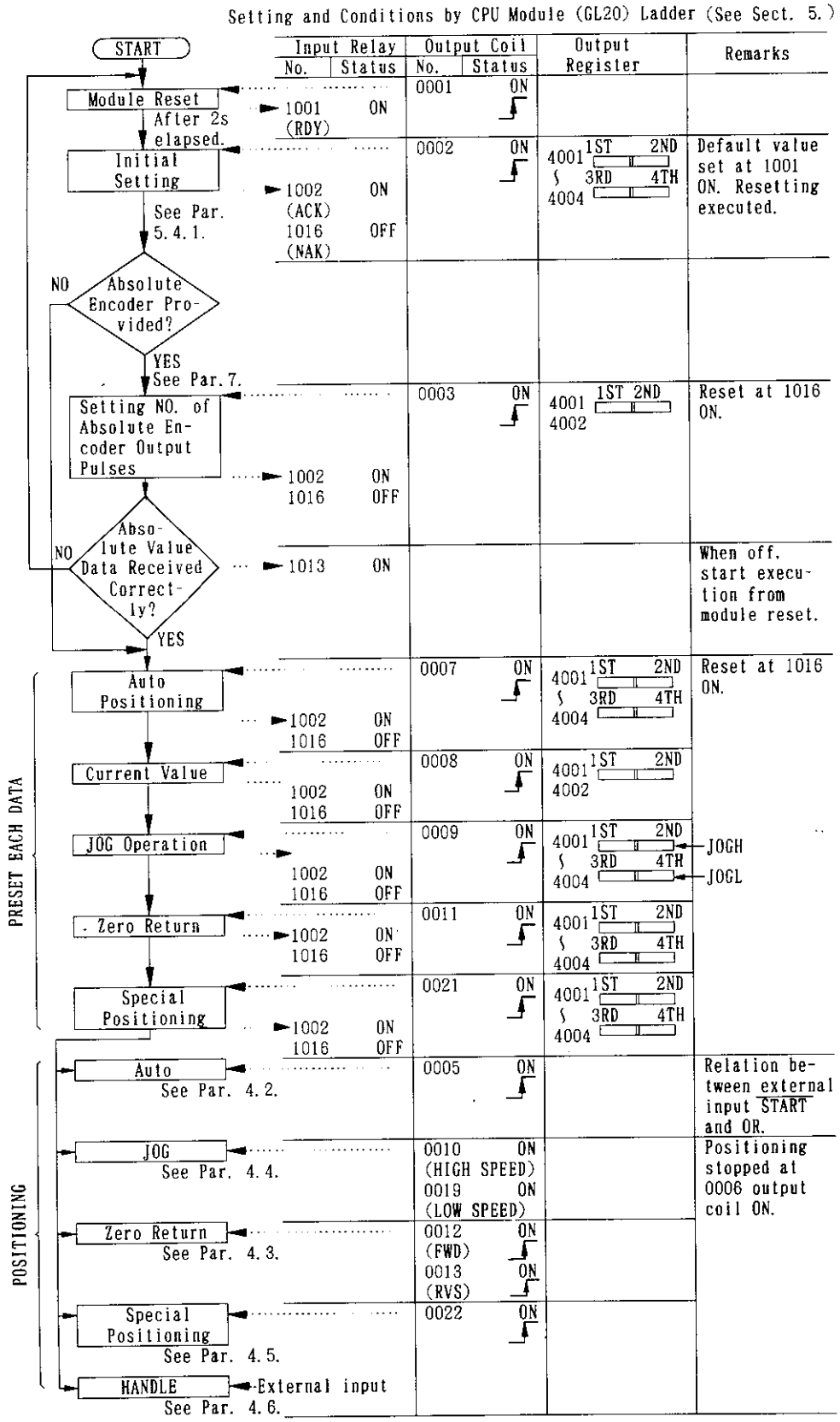


Fig. 3.2 B2803 Operation Flow

4. FUNCTIONS

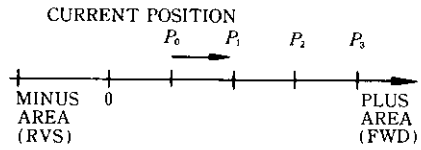
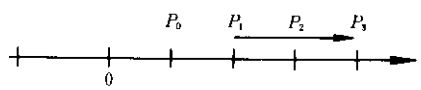
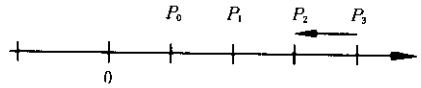
Positioning module functions are explained in the following paragraphs.

4.1 INCREMENTAL/ABSOLUTE MODE

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

4.1.1 Incremental Mode

(1) Position Command Setting
Motion distance is set as a position command.

	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. 4.1 shows a basic operation of current value counter.

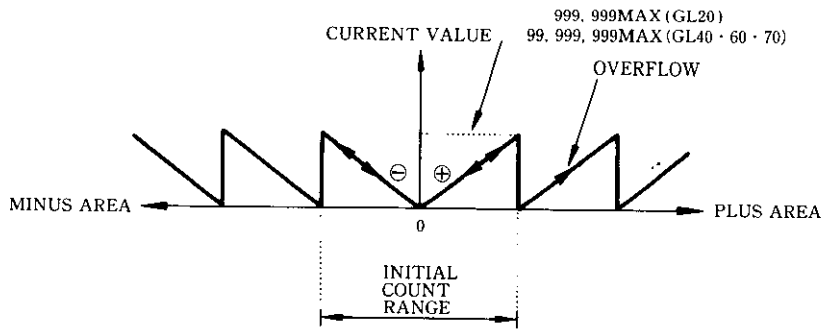
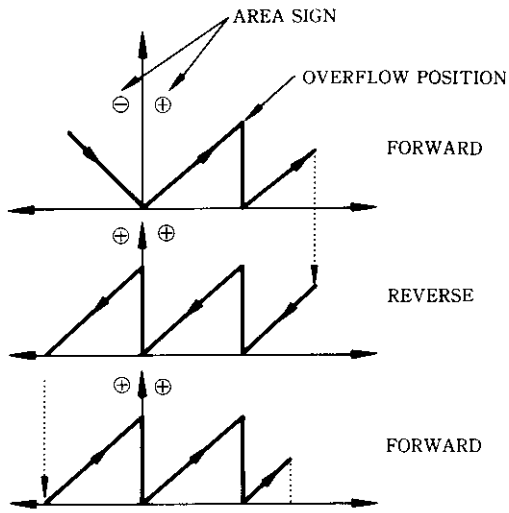


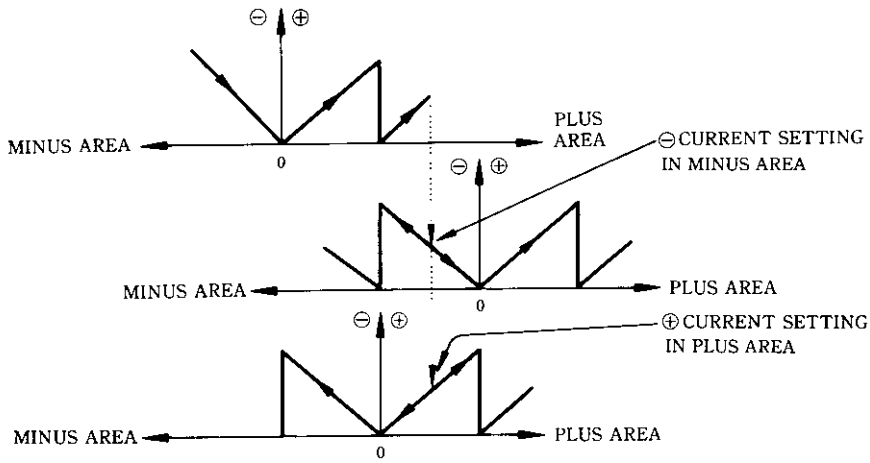
Fig. 4.1 Current Value Counter Operation

4.1.1 Incremental Mode (Cont'd)

(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 when a current value resetting, a current value 0 setting, or a zero return is executed.

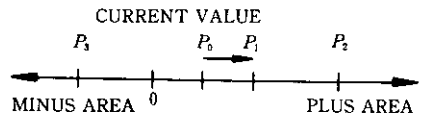
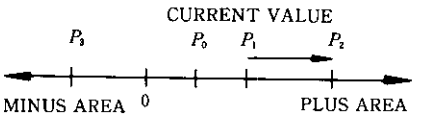
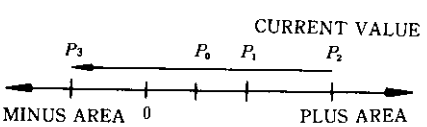


(C) An area sign is fixed when the current value has exceeded the initial count range at absolute encoder reading.

4.1.2 Absolute Mode

(1) Position Command Setting

Absolute position is set as the position command.

	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. 4.2 shows a basic operation of the current value counter.

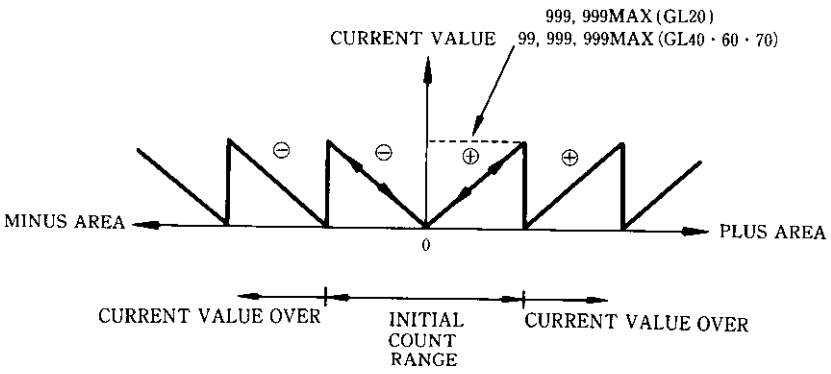


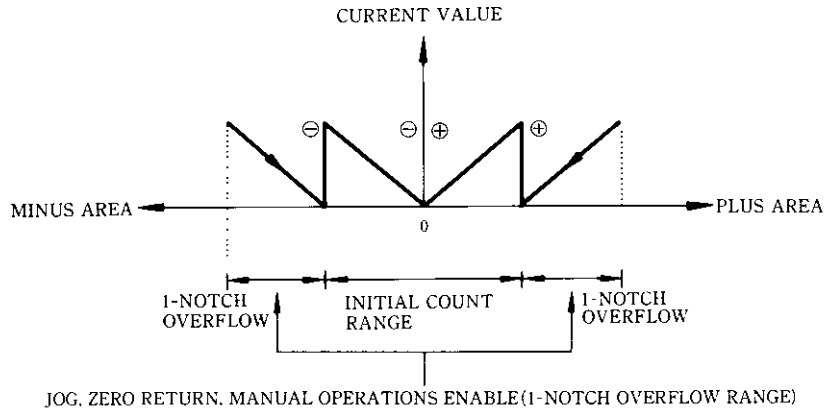
Fig. 4.2 Current Value Counter Operation

(a) If the current value counter has exceeded the initial count range (initial absolute position range) 0 to ±999,999 (0 to ±99,999,999), "CURRENT VALUE OVER" input relay is turned on (error code 24 is issued). At this time, automatic operation is prohibited.

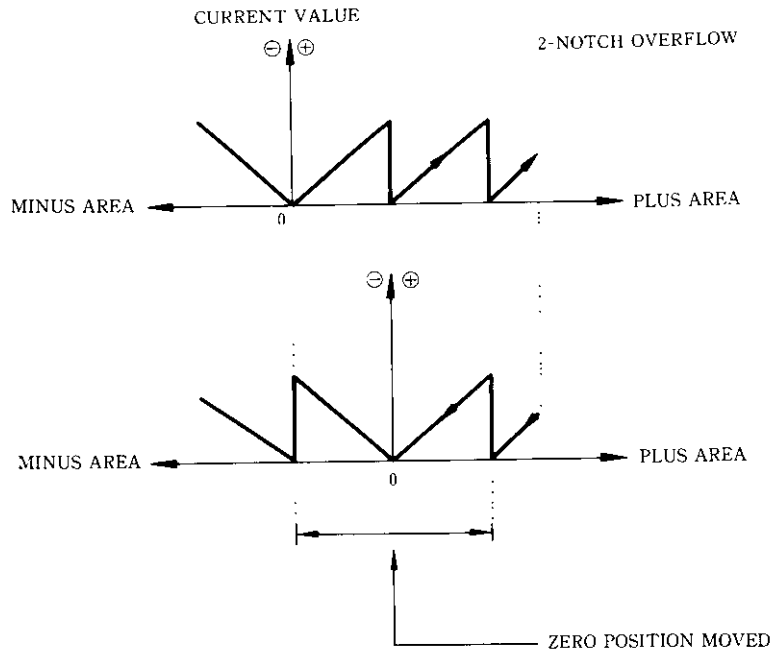
JOG, zero return and manual operations remain operational. On return to the initial count range, CURRENT VALUE OVER is released.

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

4.1.2 Absolute Mode (Cont'd)



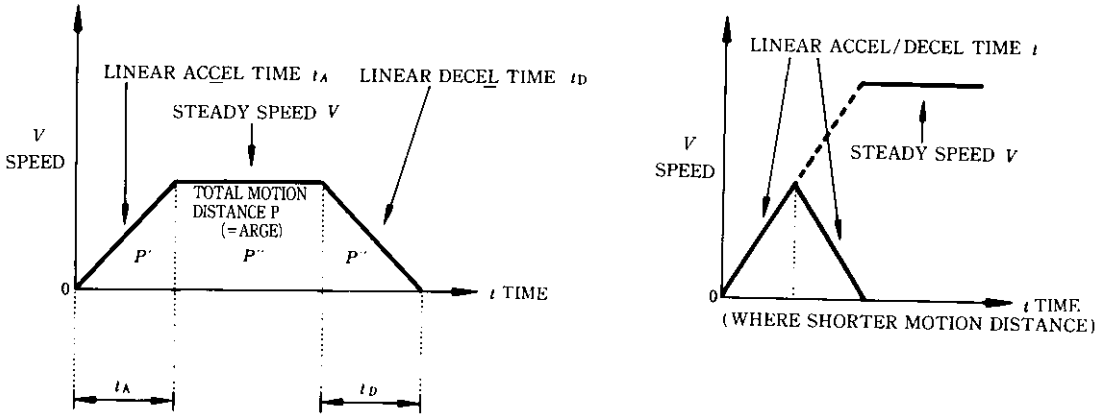
(b) If the current value counter exceeds more than 2-notch overflow, the normal range cannot be restored even on returning to the initial count range by JOG, zero return, or manual operation. In this case, the zero position moves.



4.2 AUTOMATIC POSITIONING

4.2.1 Basic Function

(1) 1-Step Speed Basic Pattern



Total Motion Distance P (=Area) = P' + P" + P"'
Linear Accel/Decel Time = Linear Accel Time t_A = Linear Decel Time t_D

Fig. 4.3 1-Step Speed Basic Operation

(a) Setting items

Motion distance P, steady speed V and linear accel/decel time t_A are set:

Setting Range

- Total motion distance P : 0 to ±999,999 pulses (GL20)
  0 to ±99,999,999 pulses (GL60)
- Steady speed V : 10 to 99,990 pps (in 10 pps)
  20 to 199,980 pps (in 20 pps)
- Linear accel/decel time t_A : 10 to 990 ms (in 10 ms)
  0.1 to 9.9 s (in 0.1 s)

4.2.1 Basic Function (Cont'd)

(2) 2-Step Speed Basic Pattern

(a) $V_1 < V_2$

(Total Motion Distance $P = P_1 + P_2$
Accel Time $t_A = t_{A1} + t_{A2}$ = Decel Time t_D)

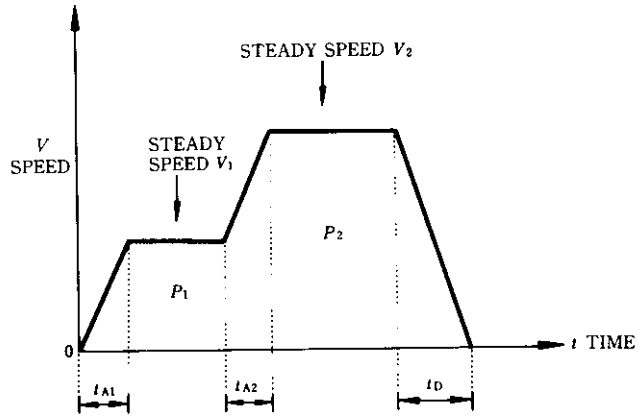


Fig. 4.4 $V_1 < V_2$

(b) $V_1 > V_2$

(Total Motion Distance $P = P_1 + P_2$
Accel Time t_A = Decel Time t_D
= $t_{D1} + t_{D2}$)

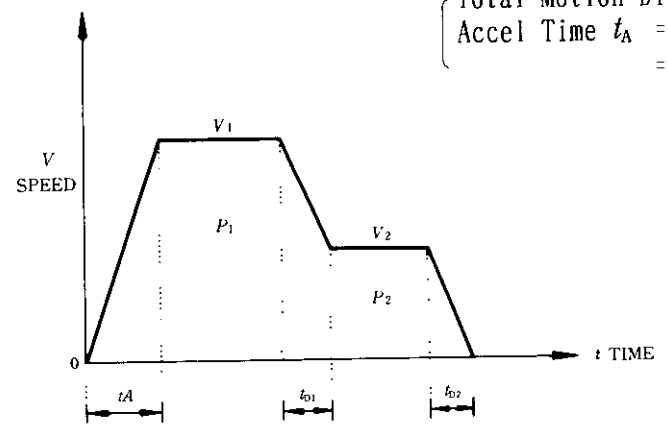


Fig. 4.5 $V_1 > V_2$

(c) $V_1 = V_2$

(Total Motion Distance $P = P_1 + P_2$
Accel Time t_A = Decel Time t_D)

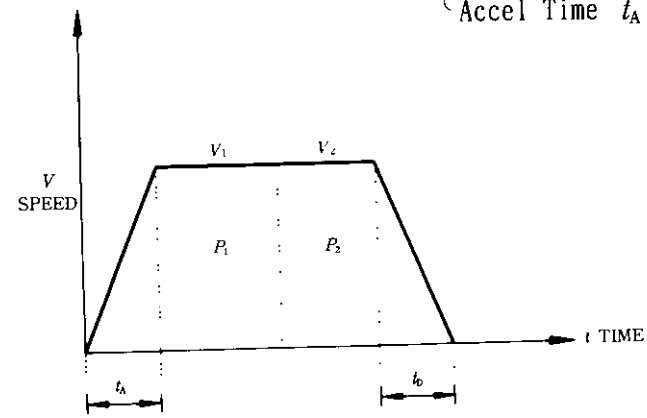


Fig. 4.6 $V_1 = V_2$

(d) Setting items

For 2-step speed pattern, motion distances P_1/P_2, steady speeds V_1/V_2 and acceleration time t_A (t_{A1}) need to be set. Linear accel/decel speed is effective on a single line.

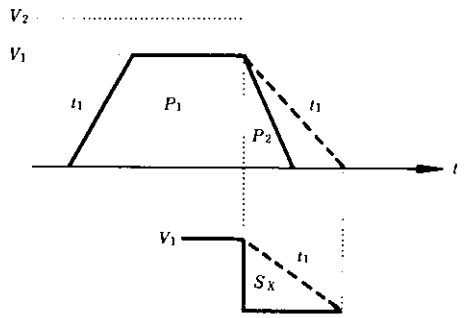
Setting Range

- Motion distances P_1, P_2 : 0 to ±999,999 (GL20)
  0 to ±99,999,999 (GL40•60•70)
- Steady speed V_1, V_2 : 10 to 99,990 pps (in 10 pps)
  20 to 198,980 pps (in 20 pps)
- Linear accel/decel time t_A (t_{A1}) : 10 to 990 ms (in 10 ms)
  0.1 to 9.9 s (in 0.1 s)

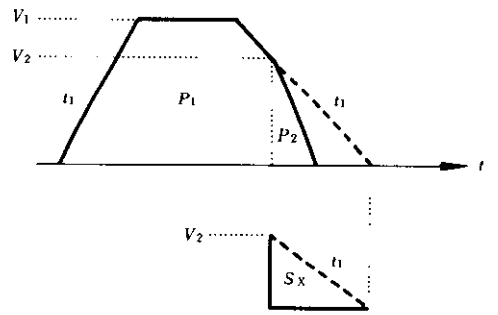
(e) Precaution on positioning

When P_2 distance is short, 2-step speed pattern operation is impossible, causing a setting error.

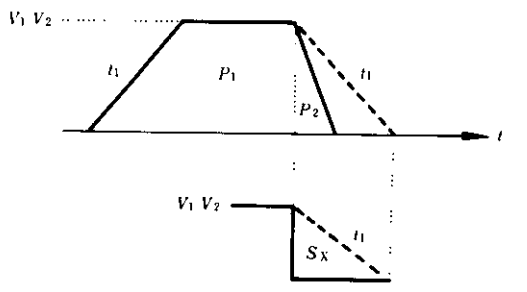
① $V_1 < V_2$



② $V_1 > V_2$



③ $V_1 = V_2$



Regardless of motion distance P_1, operation is impossible when motion distance P_2 is small with respect to the motion distance (S_X) required for deceleration and stop in t_1 time.

4.2.2 Automatic Positioning Operation Patterns

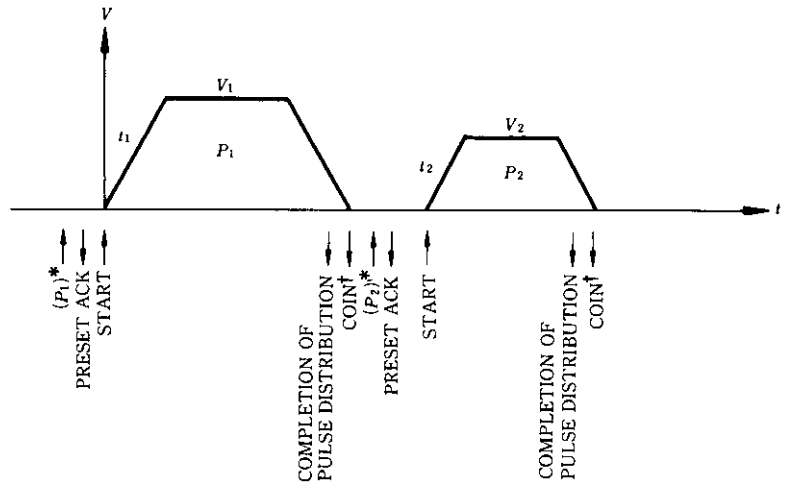
Descriptions of automatic positioning operation patterns are listed in Table 4.1.

Table 4.1 Operation Patterns

Drawing No.	Contents of Operation Pattern
	(1) 1-step speed pattern in incremental mode
Fig. 4.7	(a) Basic pattern
Fig. 4.8	(b) Omission of positioning setting
Fig. 4.9	(c) Start command during motion
Fig. 4.10	(d) Positioning setting during motion
Fig. 4.11	(e) Temporary pausing in incremental mode
	(2) 1-step speed pattern in absolute mode
Fig. 4.12	(a) Basic pattern
Fig. 4.13	(b) Positioning setting and start command during motion
Fig. 4.14	(c) Temporary pausing in absolute mode
Fig. 4.15	(d) Positioning setting after temporary pausing
	(3) 2-step speed pattern in incremental mode
Fig. 4.16	(a) Basic pattern
Fig. 4.17	(b) Omission of positioning setting
Fig. 4.18	(c) Positioning setting and start command during motion
Fig. 4.19	(d) Temporary pausing in incremental mode
Fig. 4.20	(4) 2-step speed pattern in absolute mode
	(a) Basic pattern
Fig. 4.21	(b) Positioning setting during motion
Fig. 4.22	(c) Temporary pausing in absolute mode

(1) 1-Step Speed Pattern in Incremental Mode

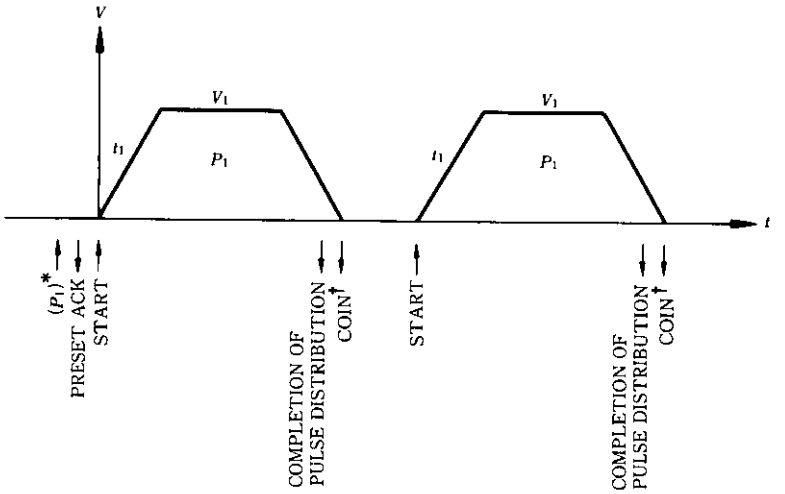
(a) Basic pattern



* Positioning setting
† Positioning completion signal

Fig. 4.7 Basic Pattern in Incremental Mode

(b) When the same operation is repeated, positioning setting is not required every time.

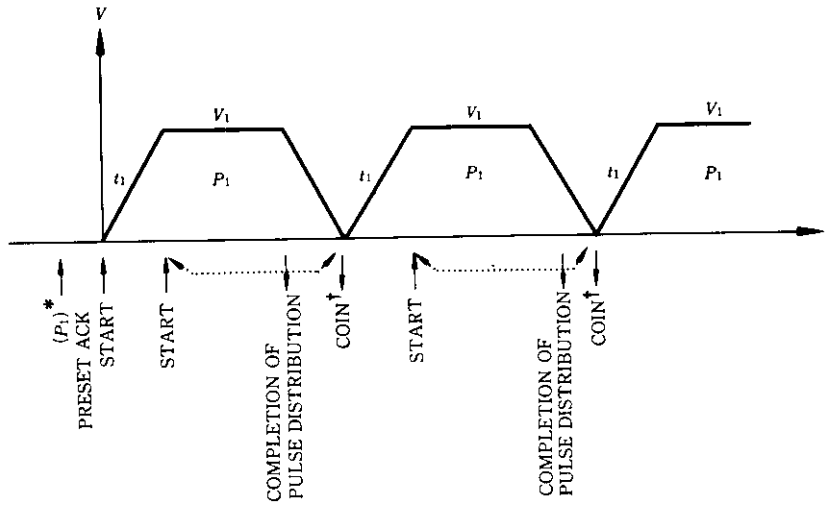


* Positioning setting
† Positioning completion signal

Fig. 4.8 Omission of Positioning Setting

4.2.2 Automatic Positioning Operation Patterns (Cont'd)

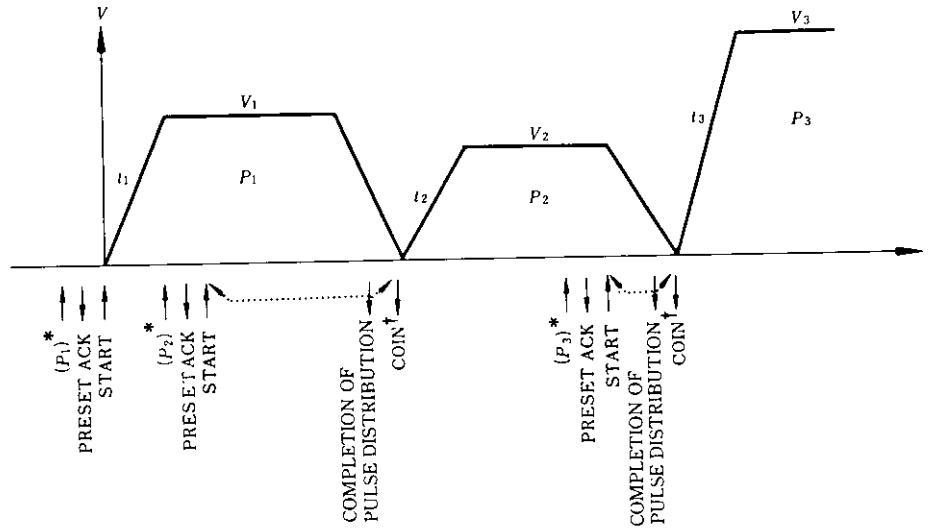
(c) During motion, start of the next positioning can be commanded. In this case, the next positioning will start immediately after completion of the current positioning (COIN).



Note : In actuality, COIN ON is delayed slightly due to lag in the servo system.
* Positioning setting
† Positioning completion signal

Fig. 4.9 Start Command during Operation

(d) During motion, the next positioning can be set.

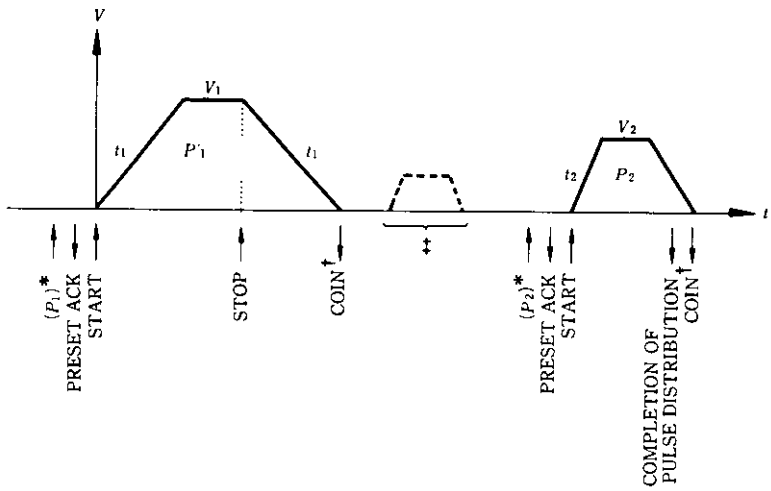


* Positioning setting
† Positioning completion Signal

Fig. 4.10 Positioning Setting during Motion

(e) Temporary pausing in incremental mode

When temporary pausing is effected in incremental mode, the remaining motion distance $|P_1-P'_1|$ is canceled. If trying restart without setting P_2 position, movement recurs by P_1. Start command of the next positioning (start reservation) is canceled by STOP. In case P_2 positioning is set during P_1 motion, the setting C (preset reservation) is not canceled even by STOP.

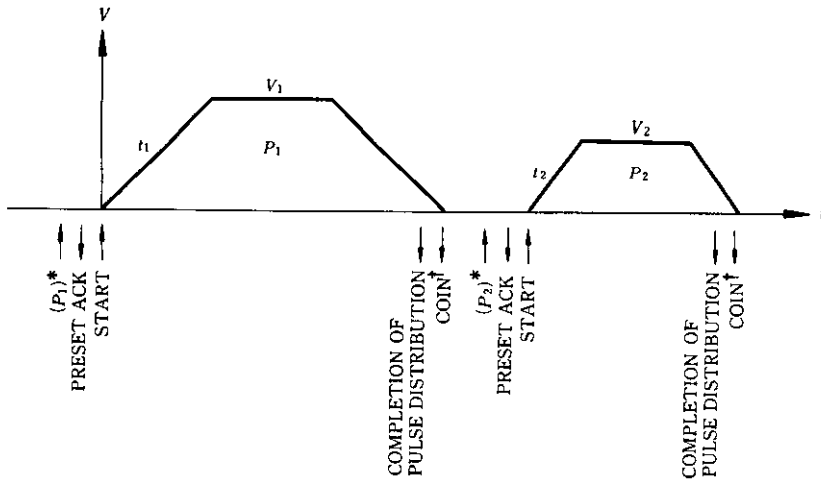


* Positioning setting
† Positioning completion signal
‡ During this time, JOG or EXTERNAL INPUT PULSE (MANUAL PULSE) can be input.

Fig. 4.11 Temporary Pausing in Incremental Mode

(2) 1-Step Speed Pattern in Absolute Mode

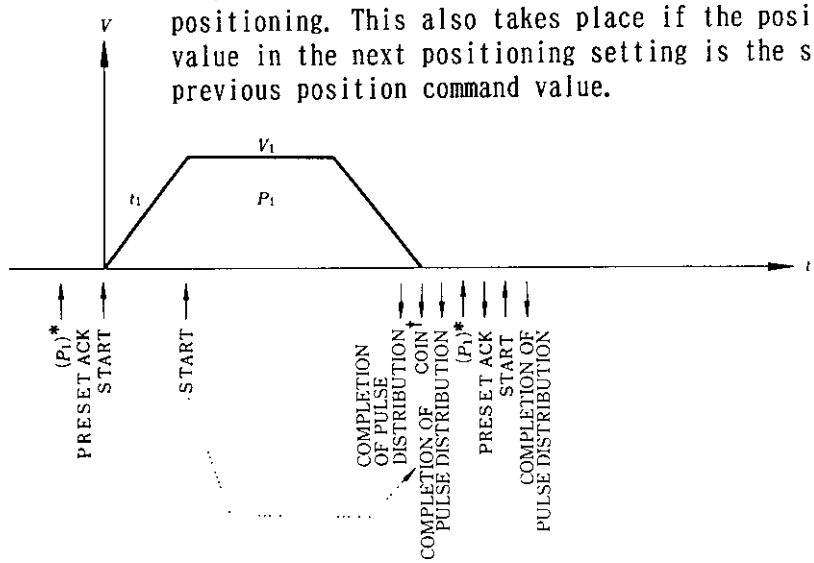
(a) Basic pattern



* Positioning setting
† Positioning completion signal

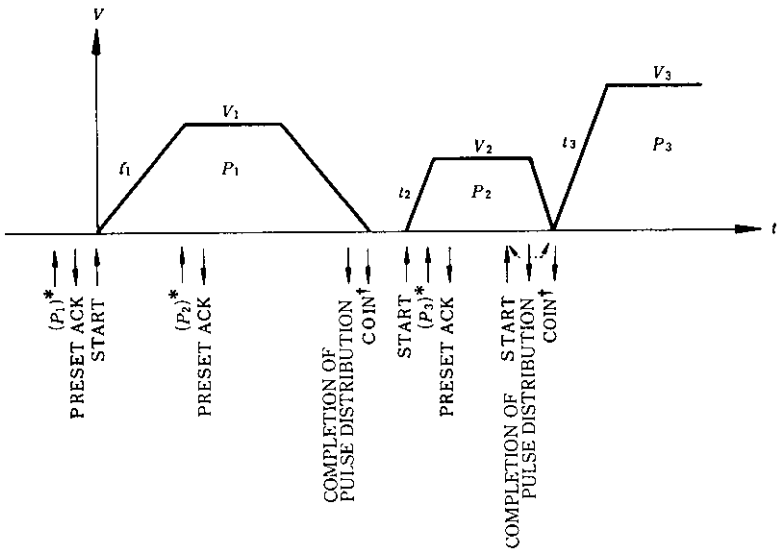
Fig. 4.12 Basic Pattern in Absolute Mode

Only the completion of pulse distribution is output when only the start command is issued without setting the next positioning. This also takes place if the position command value in the next positioning setting is the same as the previous position command value.



* Positioning setting
† Positioning completion signal

(b) During motion, the next positioning operation can be set and its start can be commanded.

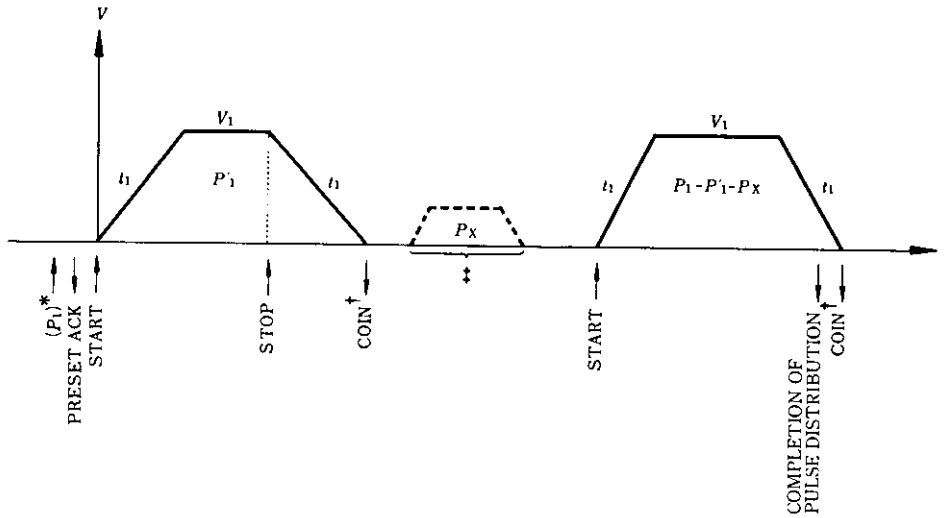


* Positioning setting
† Positioning completion signal

Fig. 4.13 Positioning Setting and its Start Command during Motion

(c) Temporary pausing in absolute mode and start command after pausing

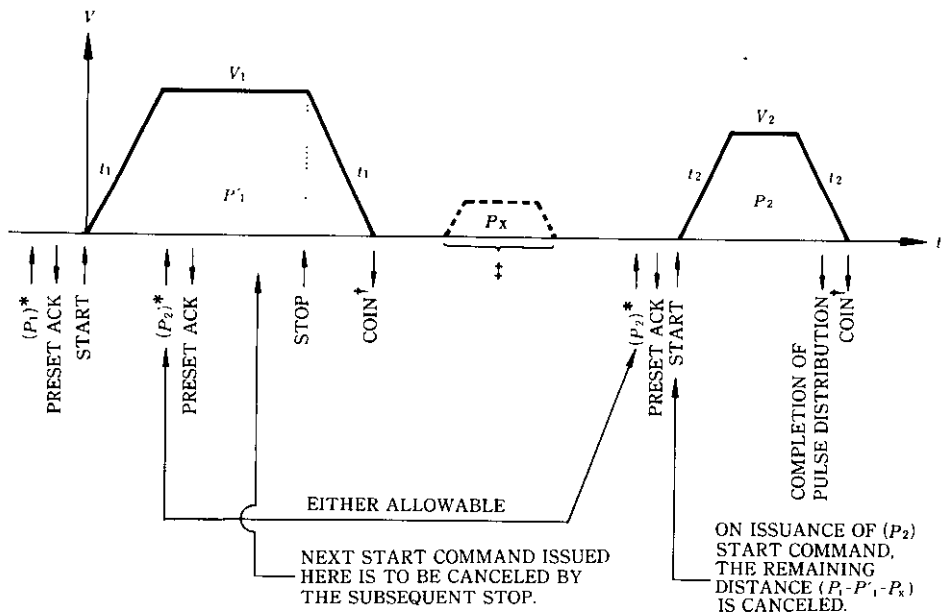
After temporary pausing, the machine moves over the remaining distance unless setting for the next positioning is made.



* Positioning setting
† Positioning completion signal
‡ During this time, JOG or EXTERNAL INPUT PULSE (MANUAL PULSE) can be input.

Fig. 4.14 Temporary Pausing in Absolute Mode

If the next positioning is set, positioning action starts toward the commanded position.



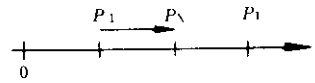
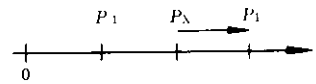
* Positioning setting
† Positioning completion signal
‡ During this time, JOG or EXTERNAL INPUT PULSE (MANUAL PULSE) can be input.

Fig. 4.15 Positioning Setting after Temporary Pausing

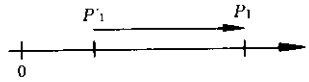
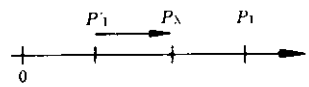
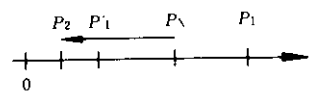
4.2.2 Automatic Positioning Operation Patterns (Cont'd)

(d) Action for JOG operation or handle operation (external command pulse input) after temporary pausing in absolute mode

- In case of start command without positioning setting after temporary pausing (Fig. 4.14)

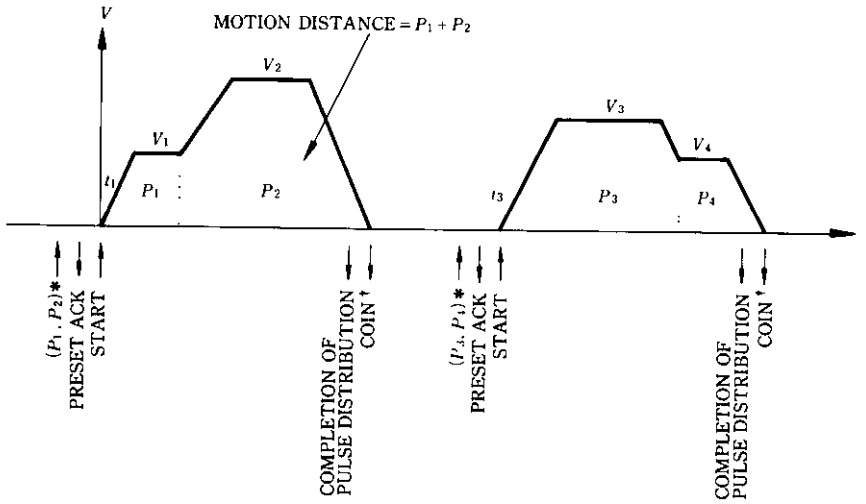
	Motion stops at absolute position P'1 according to STOP ON while positioning toward P1 position.
	Movement is effected from P'1 to PX by JOG operation or handle operation (external command pulse input).
	Movement toward P1 occurs up on issuing the start command of positioning again.

- In case of start command with positioning setting after temporary pausing (Fig. 4.15)

	Motion stops at absolute position P'1 according to STOP ON while positioning toward P1 position.
	Movement is effected from P'1 to PX by jog operation or handle operation (external pulse input).
	Operation starts toward P2 on distribution of start command with absolute position P2 set.

(3) 2-Step Speed Pattern in Incremental Mode

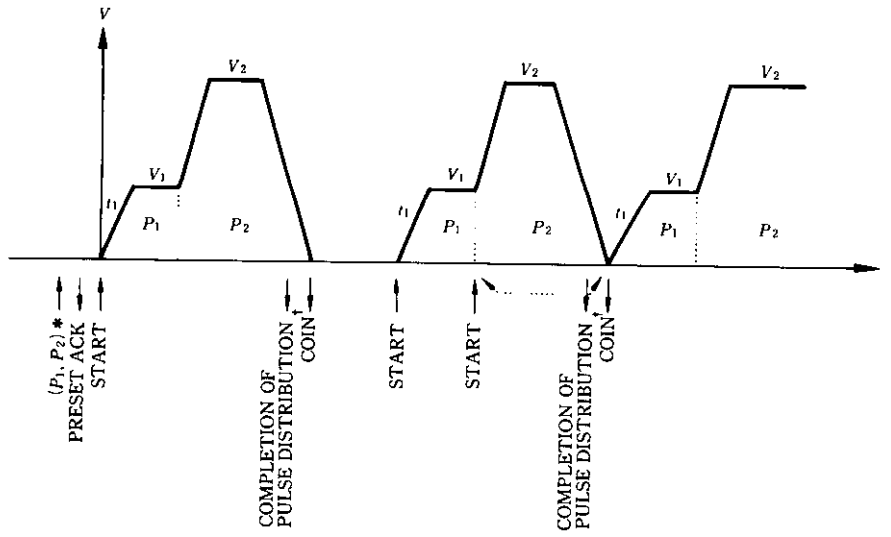
(a) Basic pattern



* Positioning setting
† Positioning completion signal

Fig. 4.16 Basic Pattern in Incremental Mode

(b) Omission the positioning setting

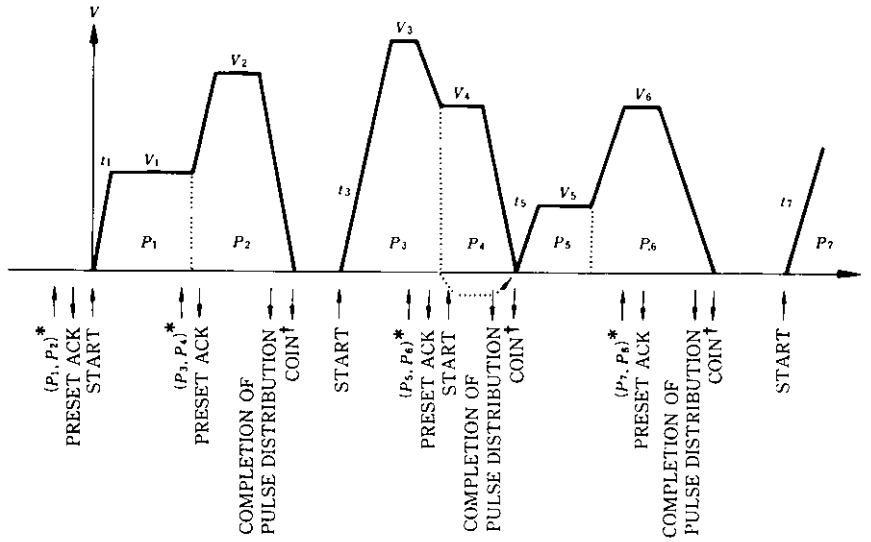


* Positioning setting
† Positioning completion signal

Fig.4.17 Omission the Positioning Setting

4.2.2 Automatic Positioning Operation Patterns (Cont'd)

(c) Positioning setting during motion and start command

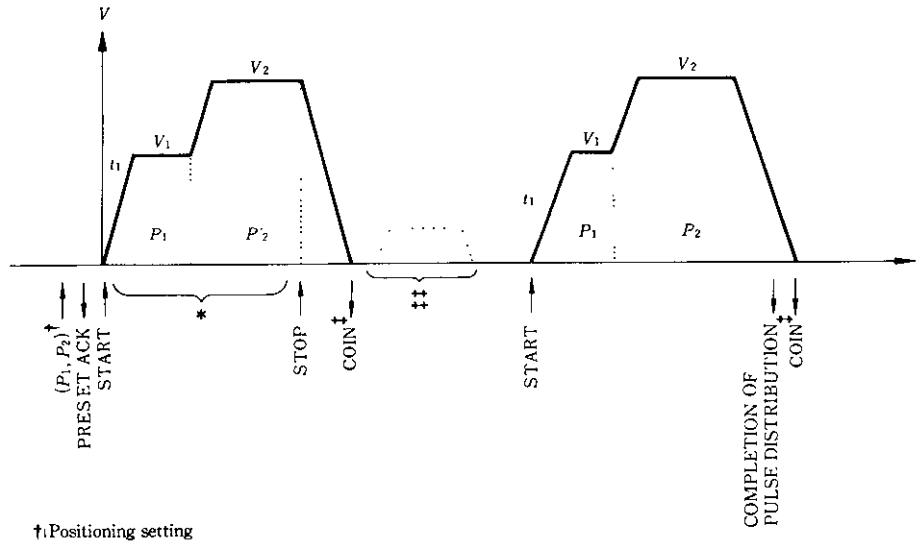


* Positioning setting
† Positioning completion signal

Fig. 4.18 Positioning Setting during Motion and Start Command

(d) Temporary pausing in incremental mode

Temporary pausing in incremental mode cancels the remaining distance $|P_2-P'_2|$. Within the asterisked (*) range, the start command of the next positioning is canceled. Within the asterisked (*) range, setting of the next positioning is not canceled.

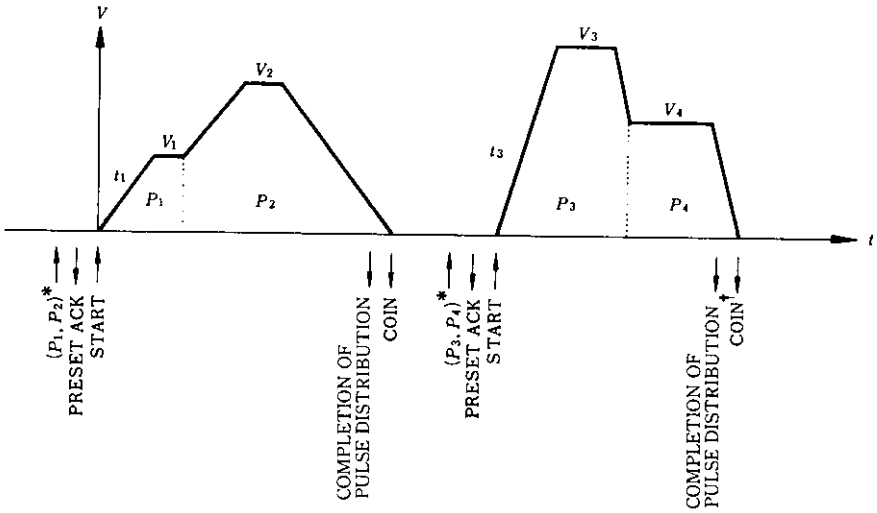


†Positioning setting
‡ Positioning completion signal
‡‡ During this time, JOG or EXTERNAL INPUT PULSE (MANUAL PULSE) can be input.

Fig. 4.19 Temporary Pausing in Incremental Mode

(4) 2-Step Speed Pattern in Absolute Mode

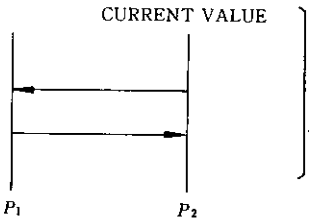
(a) Basic pattern



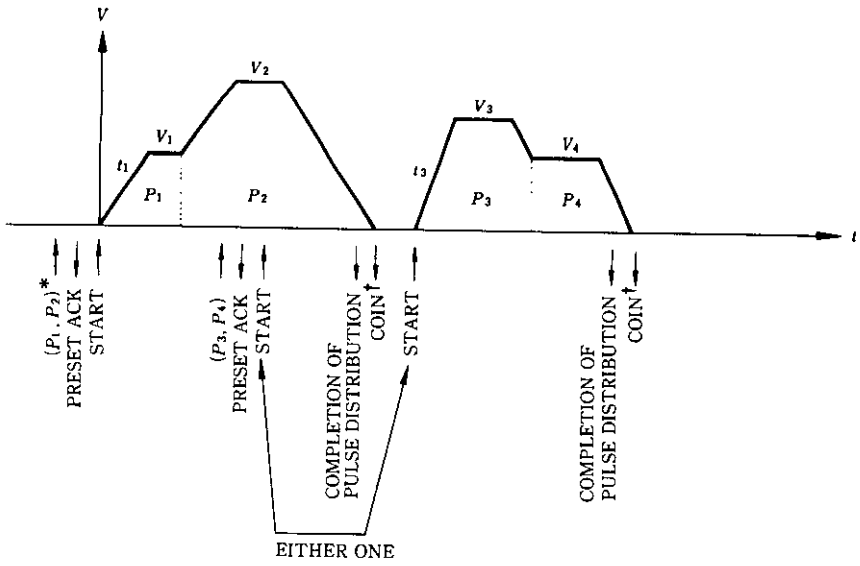
* Positioning setting
† Positioning completion signal

Fig. 4.20 Basic Pattern in Absolute Mode

When positioning setting is omitted, setting error may occur for the same position command value (this is because the operational direction is reversed between the first and second steps).



(b) Positioning setting during motion



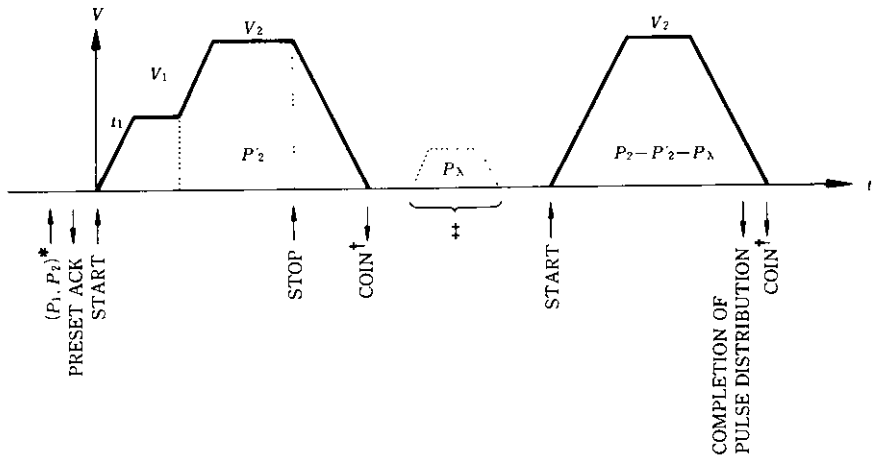
* Positioning setting
† Positioning completion signal

Fig. 4.21 Positioning Setting during Motion

4.2.2 Automatic Positioning Operation Patterns (Cont'd)

(c) Temporary pausing in absolute mode

After temporary pause in absolute mode, restart completes remaining distance unless new positional setting (including that in the course of motion) is made.



* Positioning setting
† Positioning completion signal
‡ During this time, JOG or EXTERNAL INPUT PULSE (MANUAL PULSE) can be input.

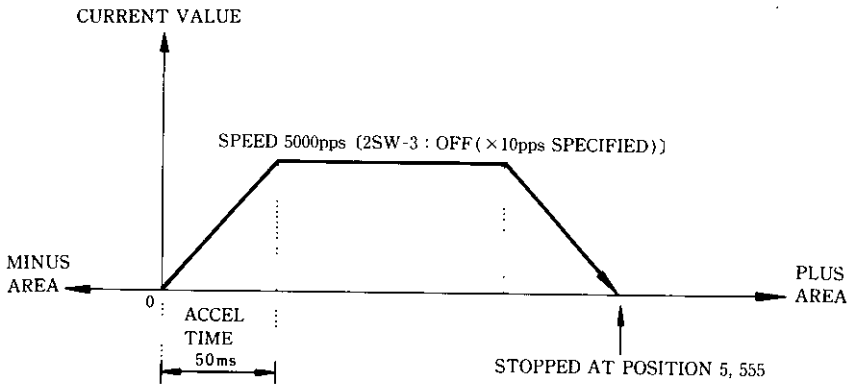
Fig. 4.22 Temporary Pausing in Absolute Mode

(d) Precaution on 2-step speed pattern in absolute mode

P_1/P_2 setting is restricted in absolute mode. If setting causes a reversing motion during the operation, setting error is detected to disable operation.

Positioning \ Decision	Enable	Disable
FWD Run	CURRENT VALUE P_1 P_2	CURRENT VALUE P_2 P_1
REV Run	P_2 P_1 CURRENT VALUE	P_1 P_2 CURRENT VALUE

(e) Shown below is the execution of automatic positioning according to GL20.
Stop is programmed under conditions: acceleration time 50 ms, speed 5,000 pps and distance 5,555 (pulses) toward the plus area (forward rotation).



Initial settings are as follows :

4001

0	1	0

- COIN WIDTH (10)
- OPERATION MODE (0 : 1-STEP SPEED PATTERN)

4002

1	1	3

- D/A GAIN (3:12-BIT)
- PULSE COUNT MODE (1 : 1 MULTIPLIER)
- SETTING FOR ABSOLUTE ENCODER (1 : EFFECTIVE)

4003

0	0	0

- ACCEL/DECEL TIME CHANGE (0 : × 10 ms)
- CURRENT VALUE RESET (0 : NOT RESET)
- POSITION COMMAND MODE (0 : INCREMENTAL MODE)

4004

0	0	0

- 0 SETTING
- ZERO RETURN MODE (0 : MODE B)
- JOG OPERATION START CONDITION (0 : NEXT START ENABLE WHEN COMPLETION OF PULSE DISTRIBUTION AND COIN ARE SATISFIED.)

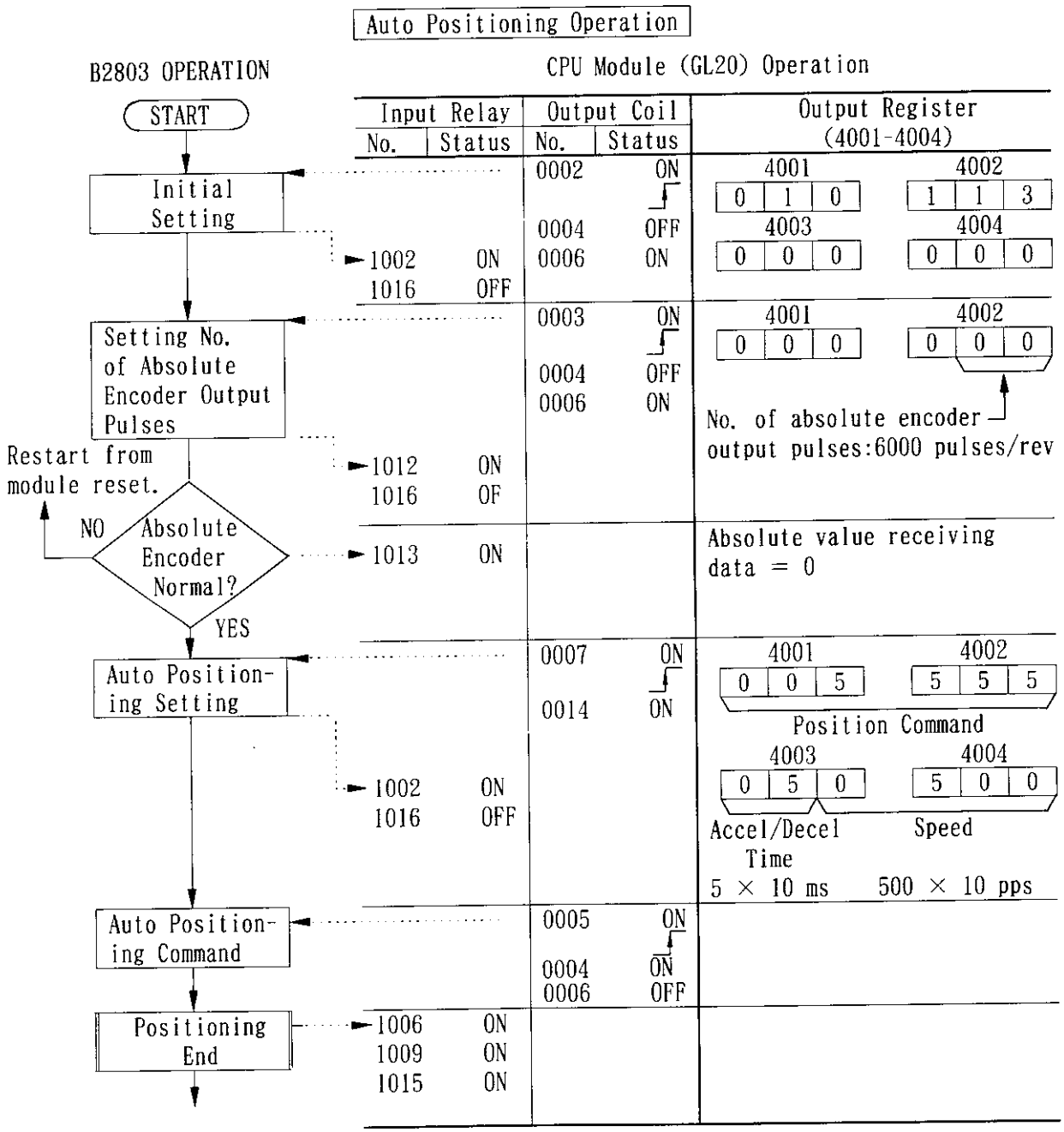
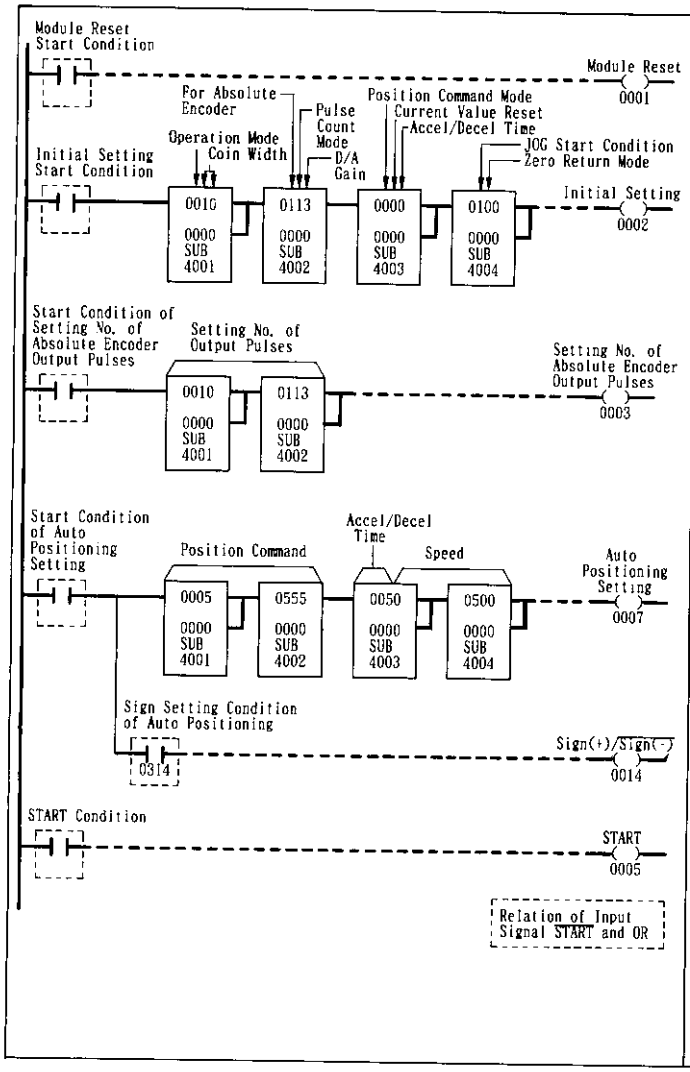
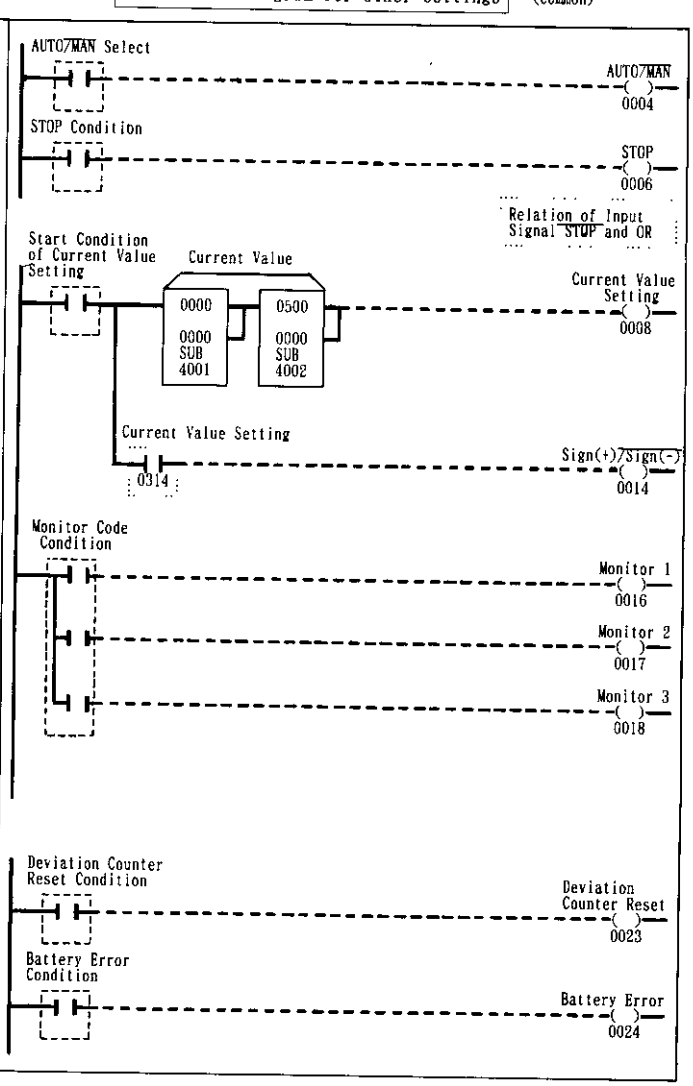


Fig. 4.23 Execution of Auto Positioning Operation

GL20 Auto Positioning Action Diagram



GL20 Ladder Diagram for Other Settings (Common)



4.3 ZERO RETURN

Zero return is possible in either mode A or B, which must be selected in the initial setting. Operation is effective when the output coil "AUTO/MAN" is turned on.

(1) Zero Return in Mode A

(a) Operation

When zero return (FWD or RVS) command is turned on, the machine starts moving toward the zero position in the predetermined acceleration/deceleration time and at a preset speed. When the external input signal DECEL LS ON is detected, the machine decelerates down to creep speed (V_c). The first phase C pulse after arrival at creep speed becomes the zero point.

When the module detects the zero point, the current command value and the current feedback value and then diviation counter are cleared. In addition, the input relay "zero return pulse distribution end" is turned on.

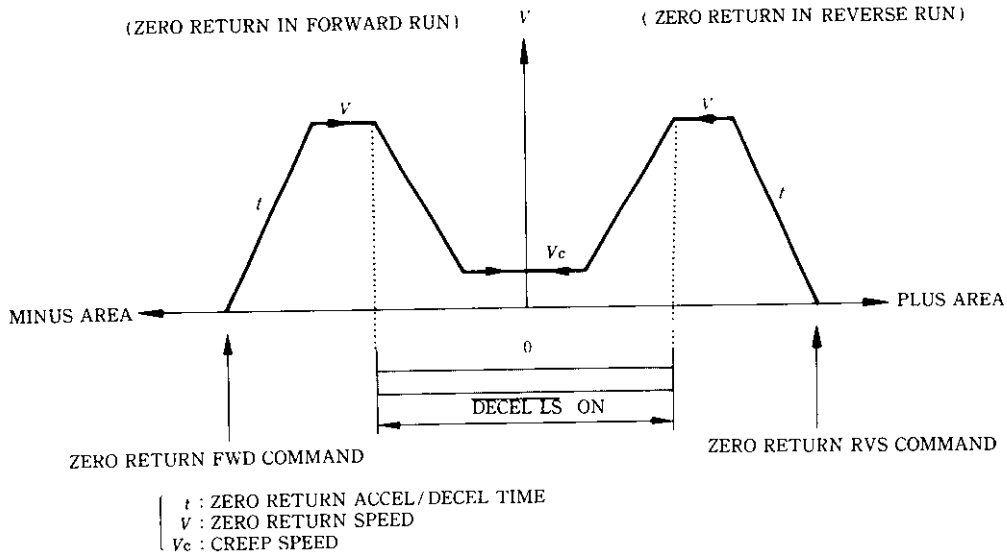


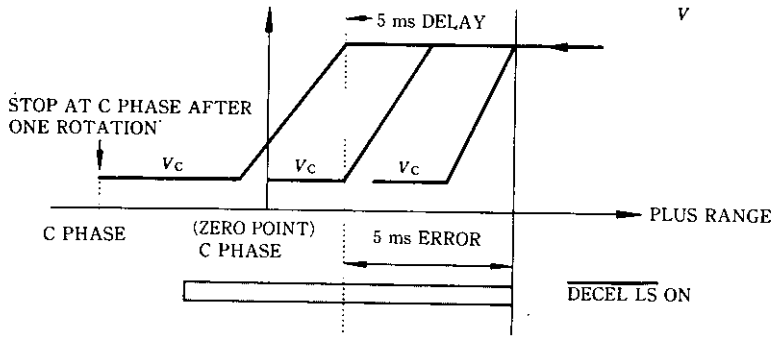
Fig. 4.24 Zero Return in Mode A

(b) Setting items

Zero return speed V, zero return accel/decel time t and creep speed Vc need to be set.

(c) Zero return speed and stopping accuracy

If the zero return speed is too high, the creep speed achieving position varies due to deviation (5 ms max.) in DECEL LS signal detection time. Therefore, a stop position error corresponding to one rotation may occur if dog adjustment is poor.



(2) Zero Return in Mode B

(a) Operation

When turning on the zero return (FWD or RVS) command, the machine begins moving to the zero point in the predetermined accel/decel time and at the preset speed. On detection of the external input signal DECEL LS ON, speed is reduced down to the creep speed (V_c). The first phase-C pulse after arrival at the creep speed becomes the zero point.

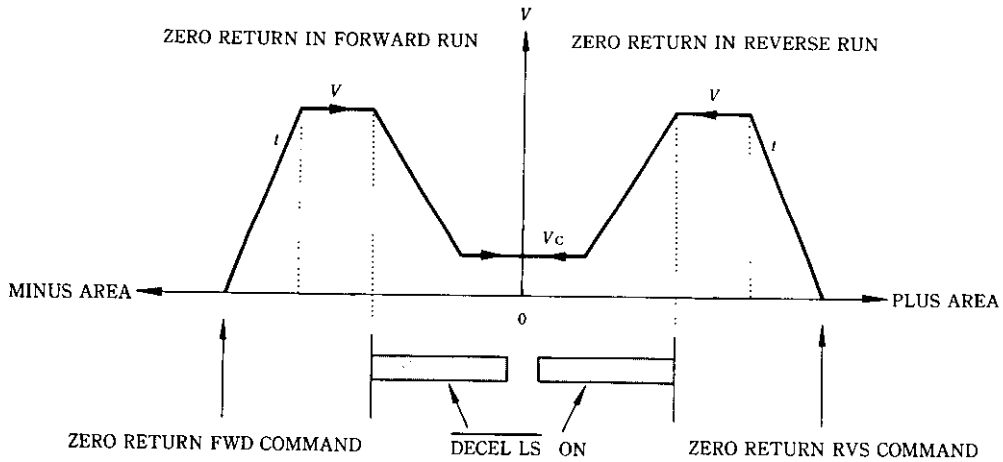


Fig. 4.25 Zero Return in Mode B

(b) Setting items

Zero return speed V, zero return accel/decel time t and creep speed V_c need to be set.

4.3 ZERO RETURN (Cont'd)

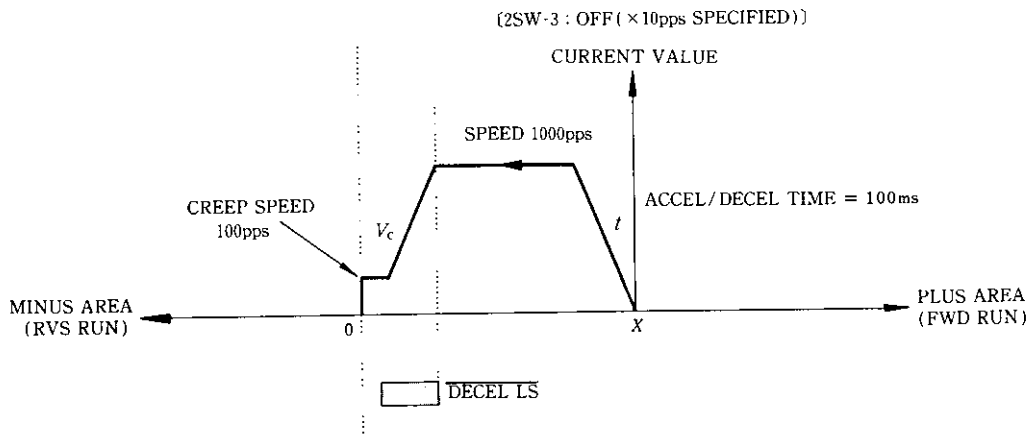
(3) Precautions Zero Return

- If zero return speed is equal to or smaller than creep speed, setting error occurs (error code : 20).
- Error is detected (error code : 21) if the zero return command is used without zero setting.
- Even though the zero return command is turned on, it is disregarded in other operations (automatic positioning or special positioning).
- When temporarily stopping operation at zero return speed, zero return operation will not be recovered unless the zero return command is turned on again.
- Zero return operation is disregarded immediately after completion of the previous zero return. It is possible again after any of automatic positioning, JOG or handle operations.
- When $\overline{\text{DECEL LS}}$ is turned on, the zero return command is disregarded(error code:23).

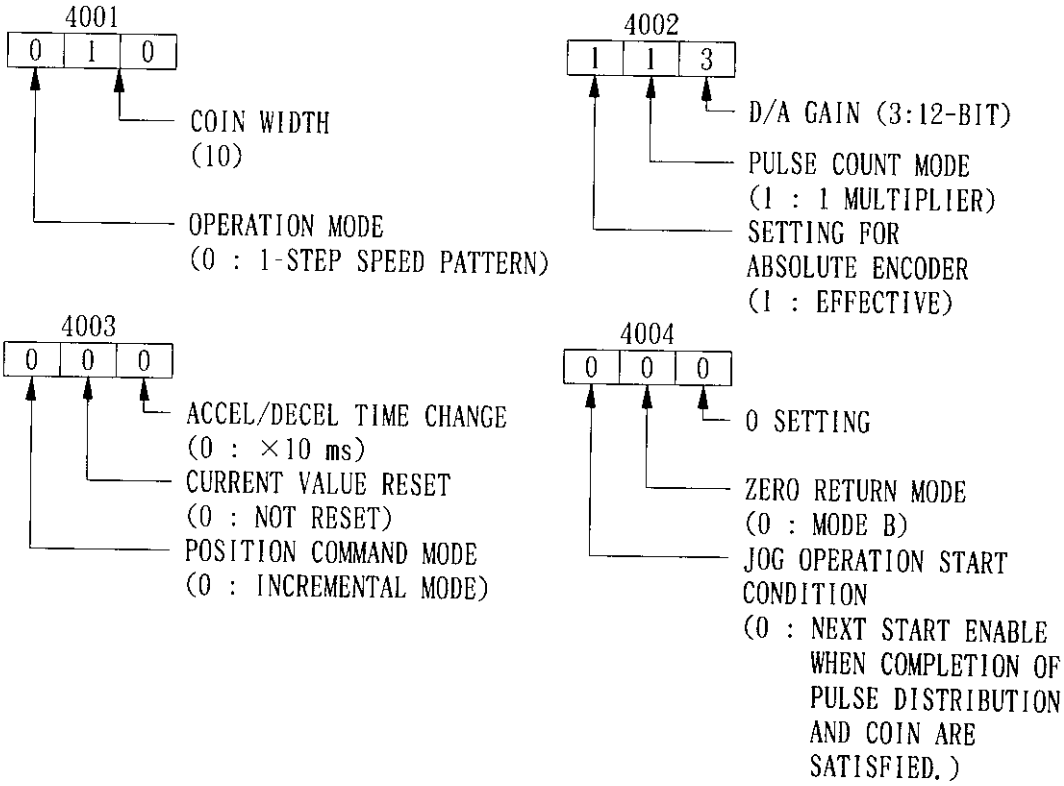
  The command needs to be issued after movement to the $\overline{\text{DECEL LS}}$ OFF position by any operation other than zero return.
- When temporarily pausing operation at zero return or creep speed, or turning off the output coil, the machine stops in the specified accel/decel time.

(4) Shown below is the zero return in mode B according to GL20.

The figure below corresponds to zero return from the X position in the plus area by reverse movement. Speed, accel/decel time and creep speed are assumed to be set at 1,000 pps, 100 ms and 100 pps, respectively.



Initial settings are as follows :



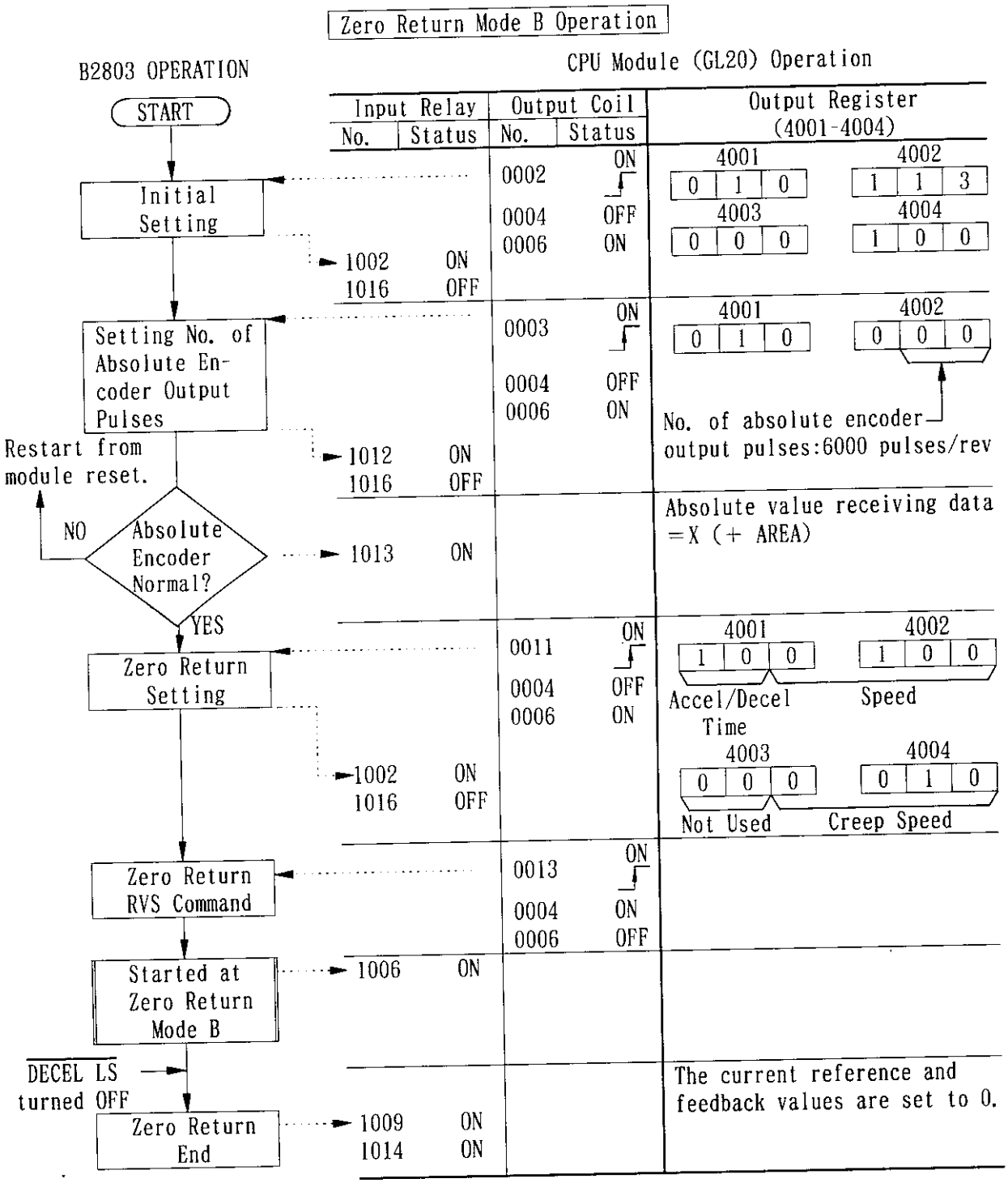
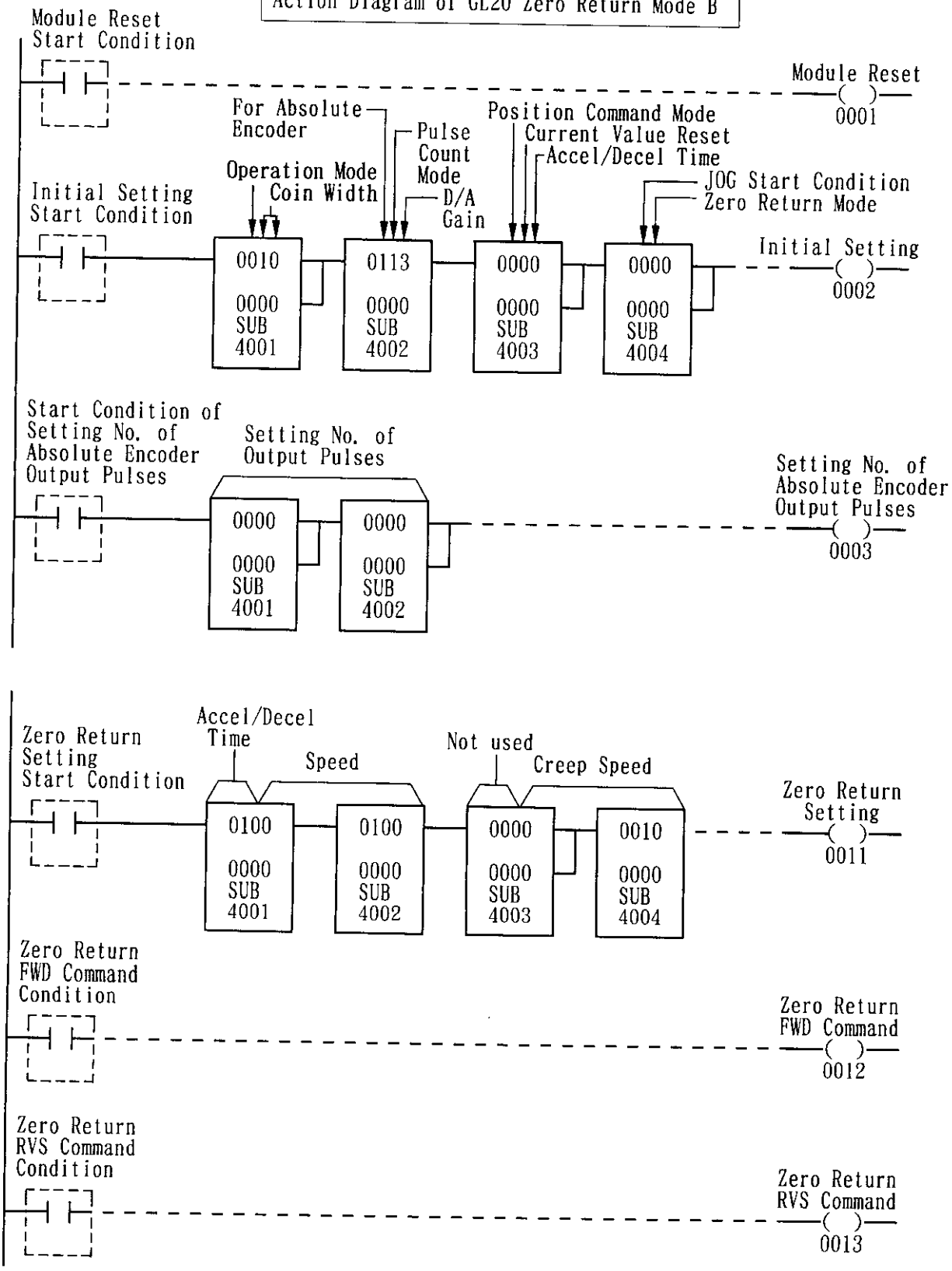


Fig. 4.26 Execution of Zero Return Mode B Operation

Action Diagram of GL20 Zero Return Mode B



4.4 JOG OPERATION

JOG operation is selectable between JOGL (low speed) and JOGH (high speed).

(1) Operation

When turning on the JOGL or JOGH command, operation starts so as to meet the predetermined JOGL or JOGH accel/decel time and speed, and the machine decelerates and stops when the JOG command is turned off. Deceleration and stop also occur when the STOP command is turned on.

Speed setting (JOGL > JOGH) is available. JOGL/JOGH is prior to call up operation. During JOGL operation, JOGH is disregarded, and JOGL is disregarded during the course of JOGH operation. In case JOGL and JOGH are turned on simultaneously, priority is given to JOGL. Attempt to change sign is disregarded during JOG operation.

Decel/stop occurs when turning to the AUTO mode (turning on the output coil AUTO/$\overline{\text{MAN}}$) during JOG operation.

JOG operation can be started in one of the two modes as selected in the initial setting.

0 : Enables the next start when the completion of pulse issuance and COIN are both satisfied.
1 : Enables the next start on completion of pulse distribution.
Modes 0 and 1 differ only in the presence or absence of starting condition COIN (see input relay COIN).

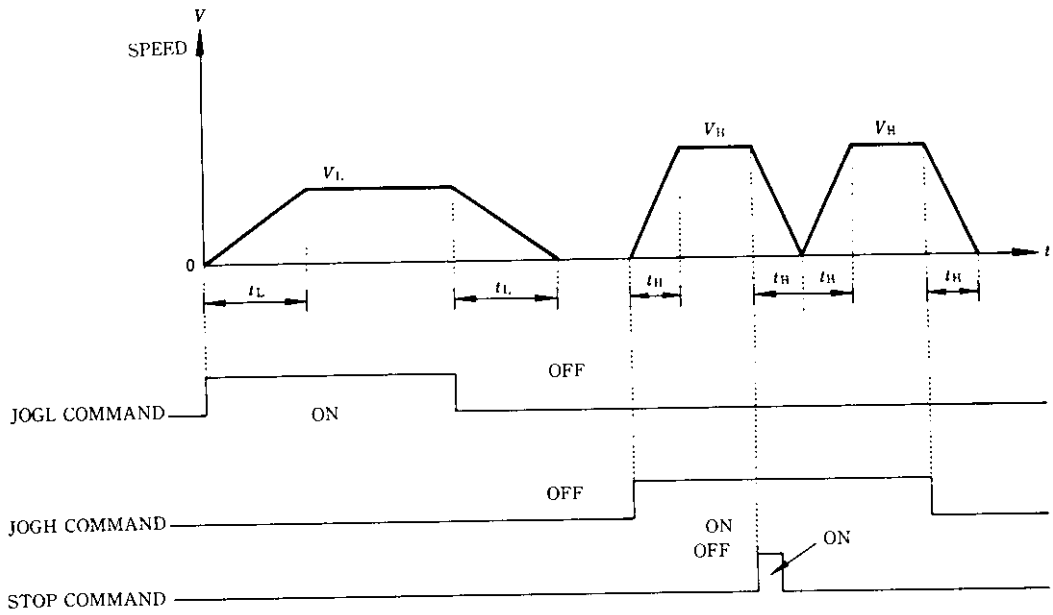
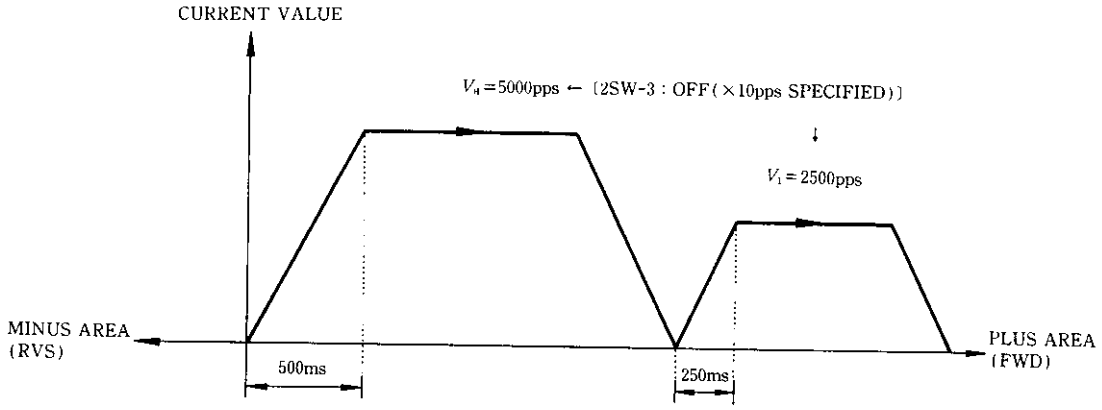


Fig. 4.27 JOG Action Time Chart

(2) Setting Items

JOGH operation speed V_H and accel/decel time t_H, and JOGL operation speed V_L and accel/decel time t_L need to be set.

(3) Example of JOG Action Time Chart (GL20)



JOGH operation toward plus area first, then JOGL operation.
Where, JOGH speed = 5000 pps, accel/decel time = 500 ms,
JOGL speed = 2500 pps, accel/decel time = 250 ms.

Initial settings are as follows :

4001

0	1	0

- COIN WIDTH (10)
- OPERATION MODE (0 : 1-STEP SPEED PATTERN)

4002

1	1	3

- D/A GAIN (3:12-BIT)
- PULSE COUNT MODE (1 : 1 MULTIPLIER)
- SETTING FOR ABSOLUTE ENCODER (1 : EFFECTIVE)

4003

0	0	0

- ACCEL/DECEL TIME CHANGE (0 : ×10 ms)
- CURRENT VALUE RESET (0 : NOT RESET)
- POSITION COMMAND MODE (0 : INCREMENTAL MODE)

4004

0	0	0

- 0 SETTING
- ZERO RETURN MODE (0 : MODE B)
- JOG OPERATION START CONDITION (0 : NEXT START ENABLE WHEN COMPLETION OF PULSE DISTRIBUTION AND COIN ARE SATISFIED.)

4.4 JOG OPERATION (Cont'd)

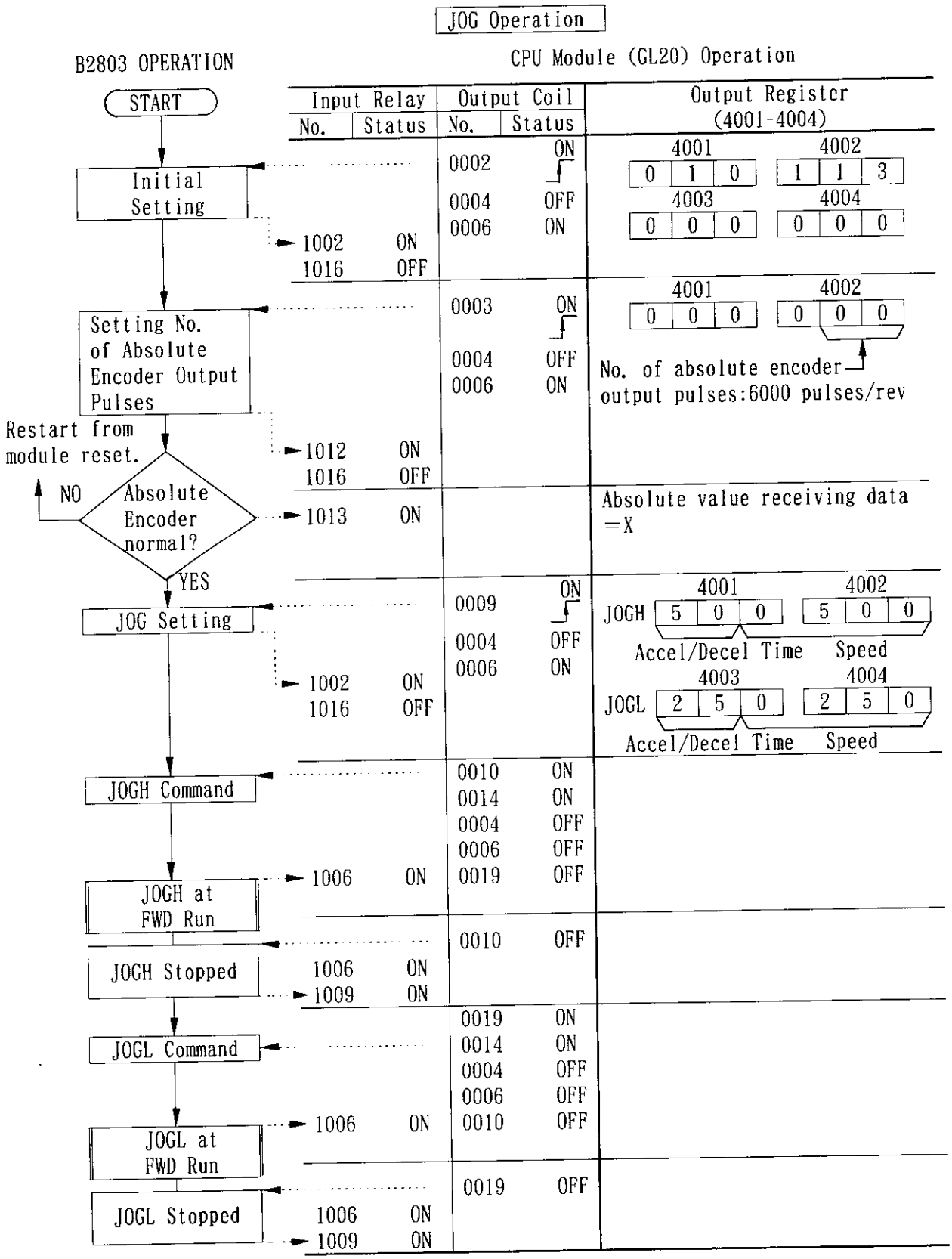
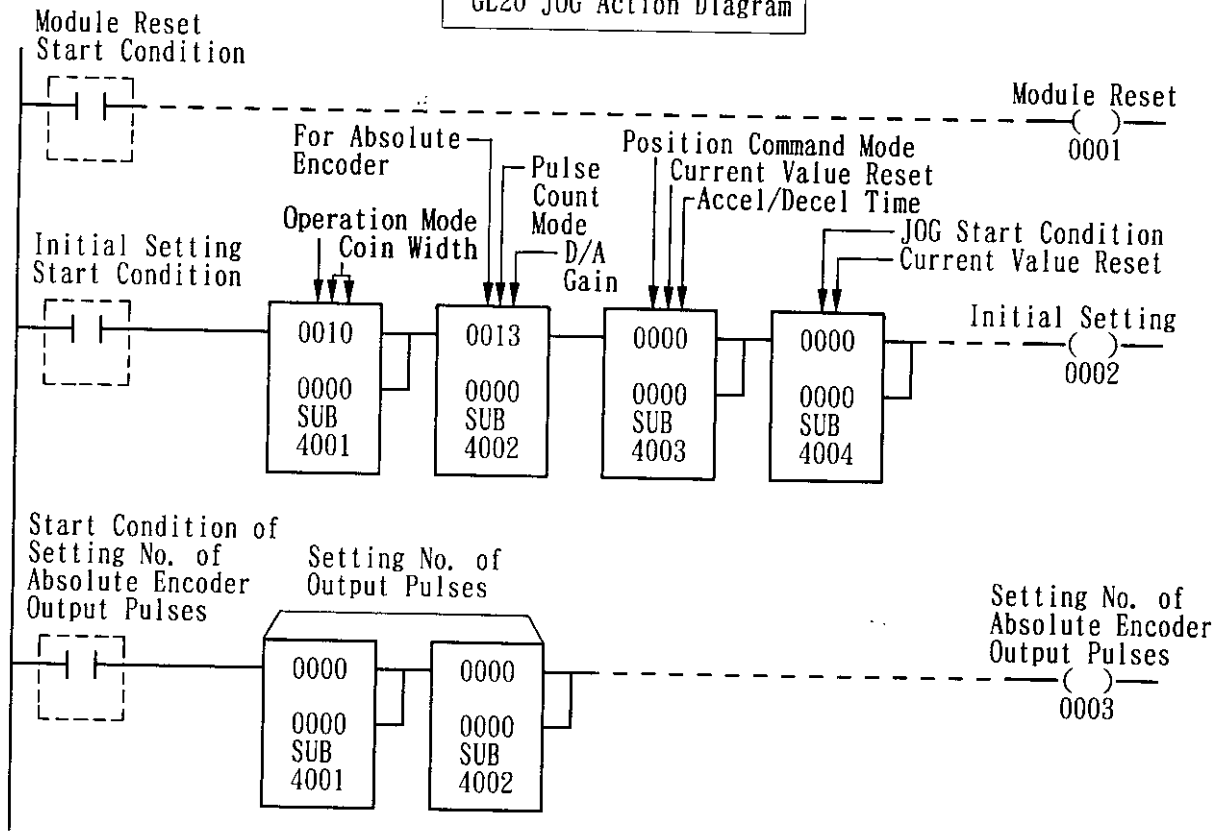
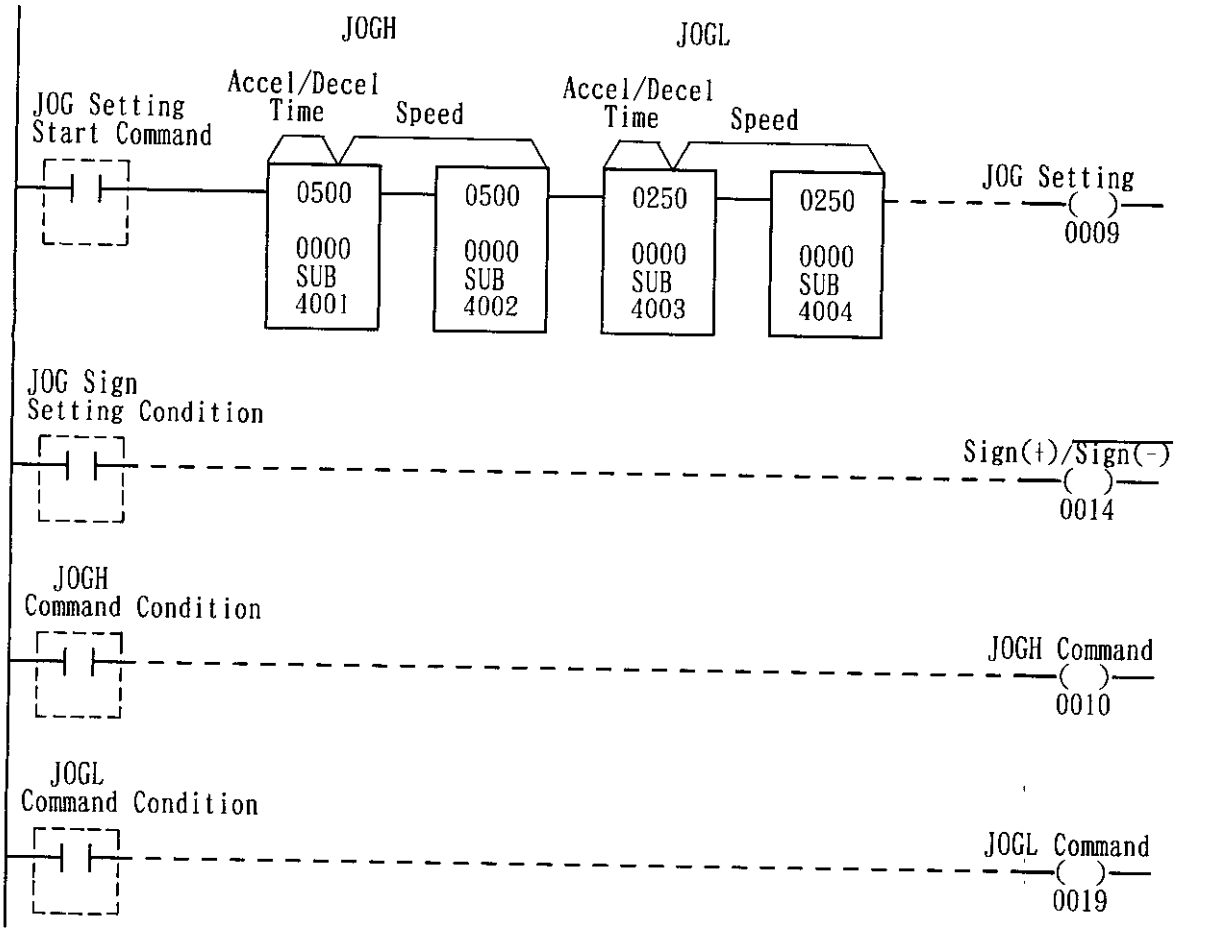


Fig. 4.28 Execution of JOG Operation

GL20 JOG Action Diagram





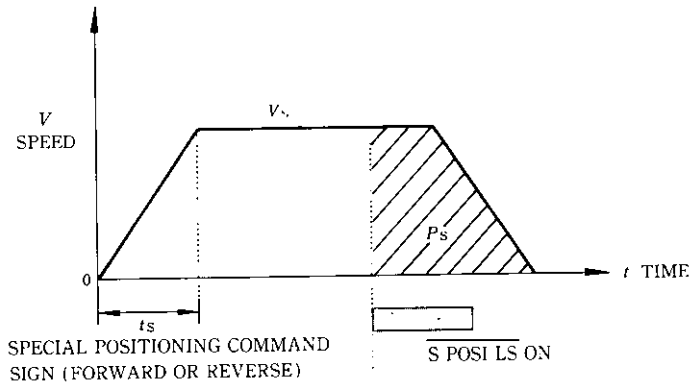
4.5 SPECIAL POSITIONING OPERATION

Possible only when the incremental mode is selected.

(1) Basic Operation

When turning on the special positioning command, operation starts so as to meet the preset special positioning accel/decel time (t_S) and speed (Vs) in the + or − (forward or reverse) direction.

When the ON status of external input signal $\overline{\text{S POSI LS}}$ (special positioning limit switch) is detected, the machine stops after distributing the set number of pulses (Ps).



If $\overline{\text{S POSI LS}}$ is already turned ON, the machine stops after distributing the set number of pulses.

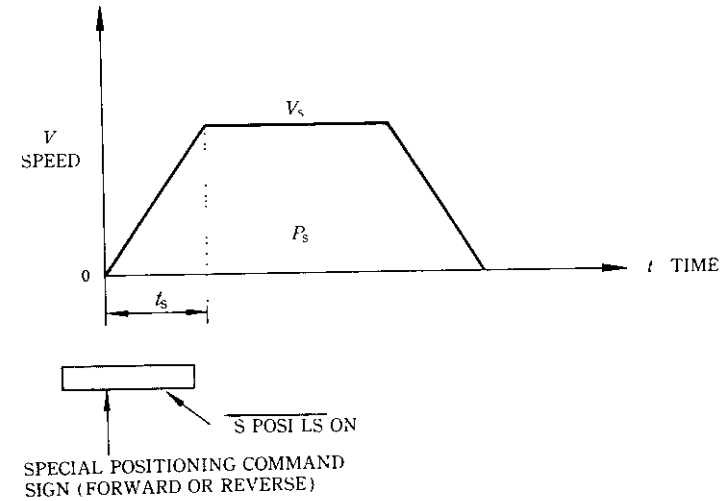


Fig. 4.29 Special Positioning Operation

(2) Setting Items

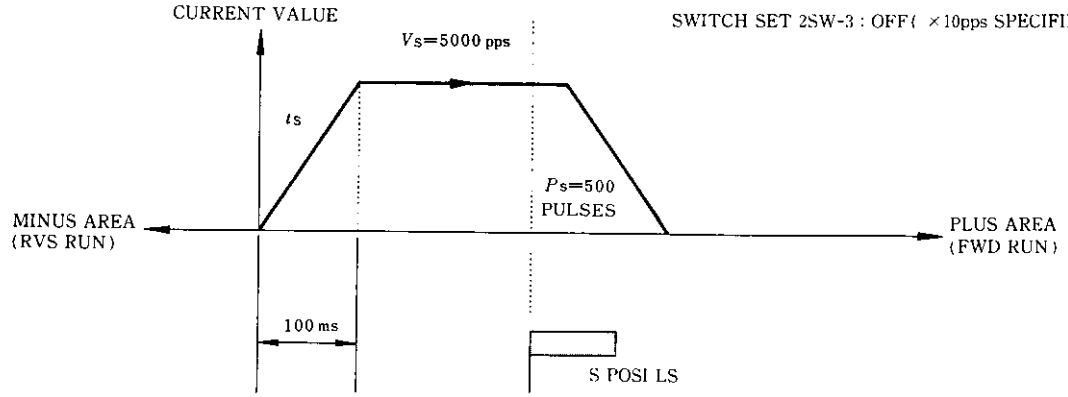
Special positioning speed Vs, accel/deccl time t_S and number of pulses issued Ps need to be set.

(3) Special Positioning Precautions

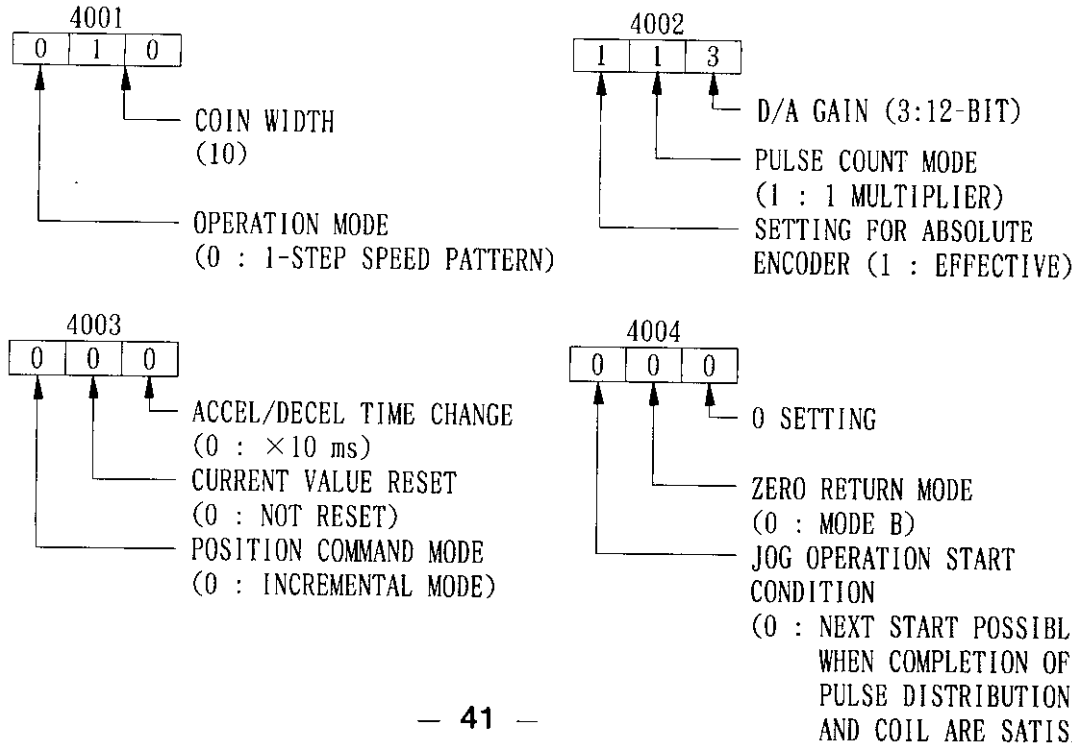
- Special command will cause error without special positioning setting in incremental mode.
- Turning ON the special positioning command is disregarded except for special positioning.
- Once interrupted, special positioning operation requires turning on the special positioning command again for its restart.
- Turning $\overline{\text{S POSI LS}}$ from OFF to ON in the course of special positioning operation is detected with a variation of 5 ms at maximum. This incurs positioning error.

(4) Shown below is action during special positioning operation.

The machine moves at a speed of 5,000 pps and in accel/decel time 100 ms in the plus direction. When "S POSI LS" ON is detected, 500 pulses are distributed followed by a stoppage.



Initial settings are as follows :



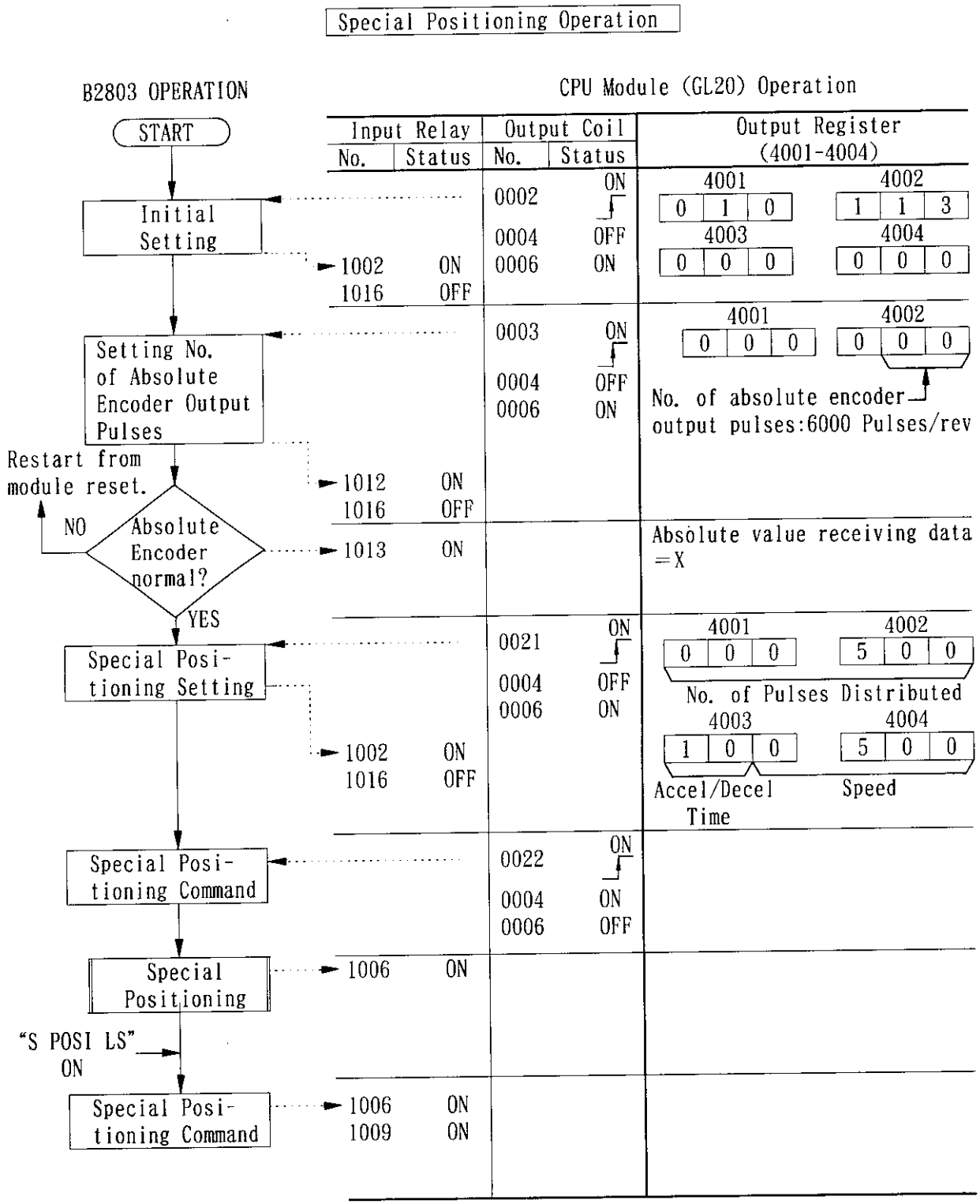
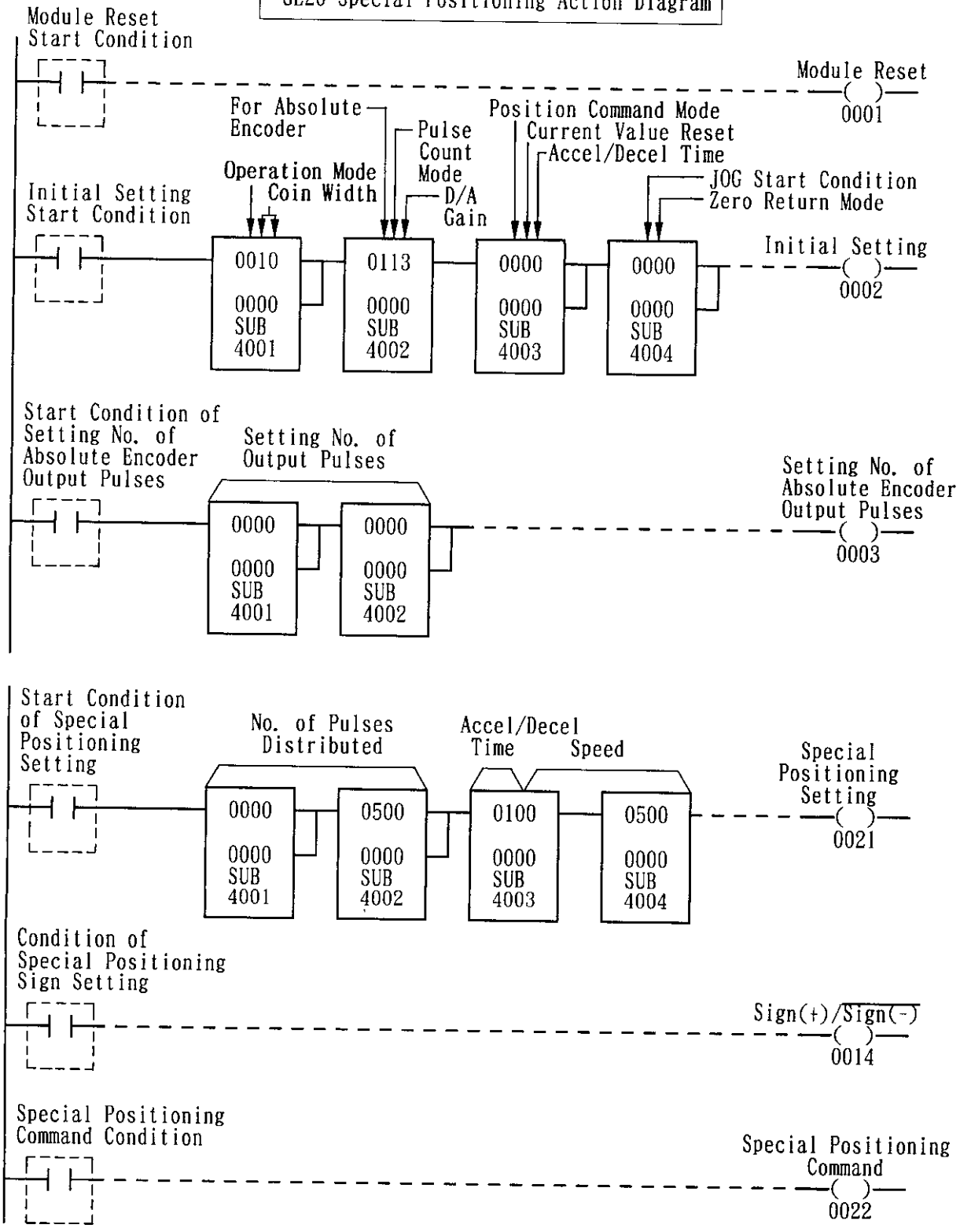


Fig. 4.30 Execution of Special Positioning Operation

GL20 Special Positioning Action Diagram



4.6 HANDLE OPERATION

Handle operation is enabled by external input of signals from the manual pulse generator. When turning the handle in the positive or negative direction, movement occurs in the relevant direction.

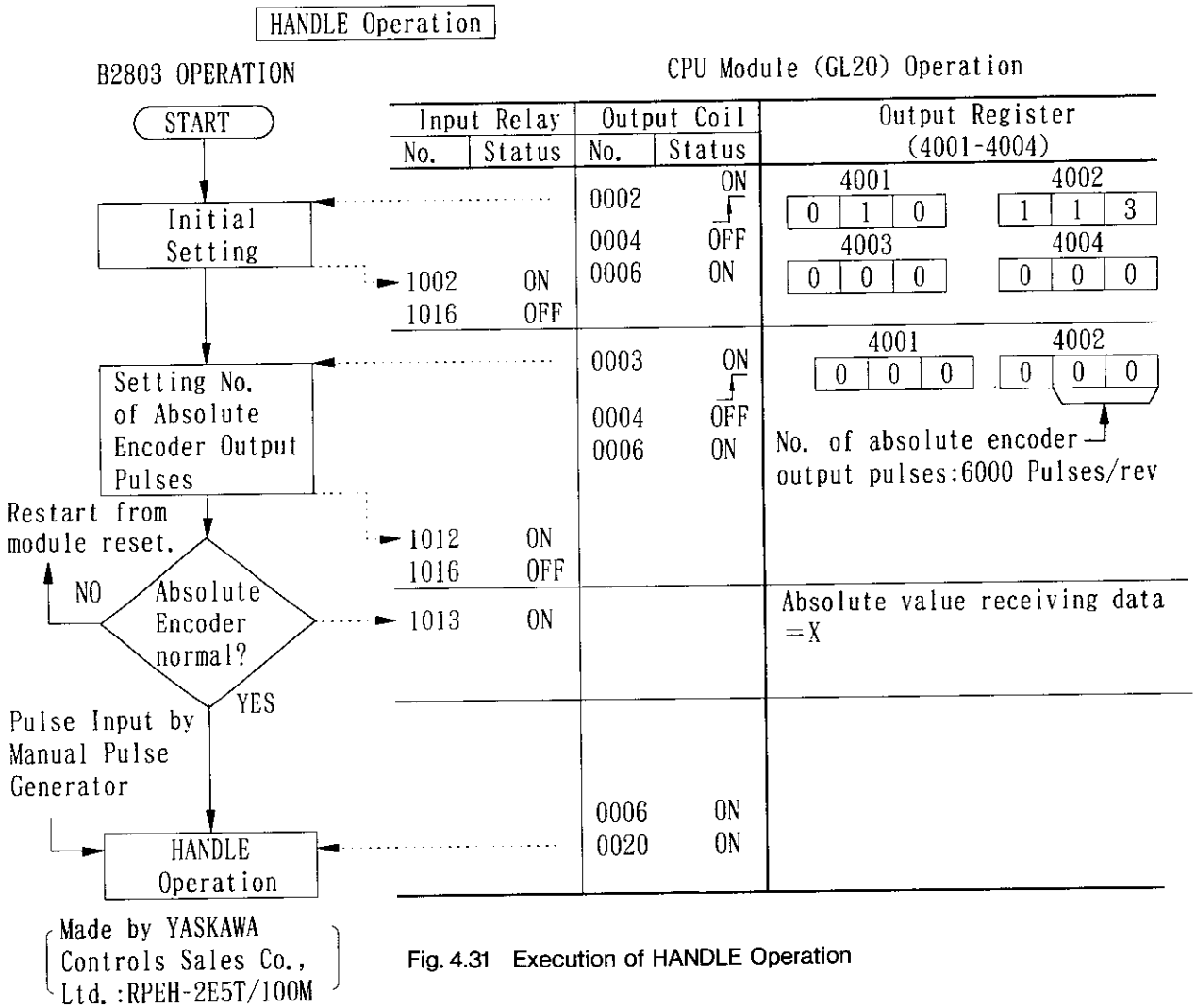
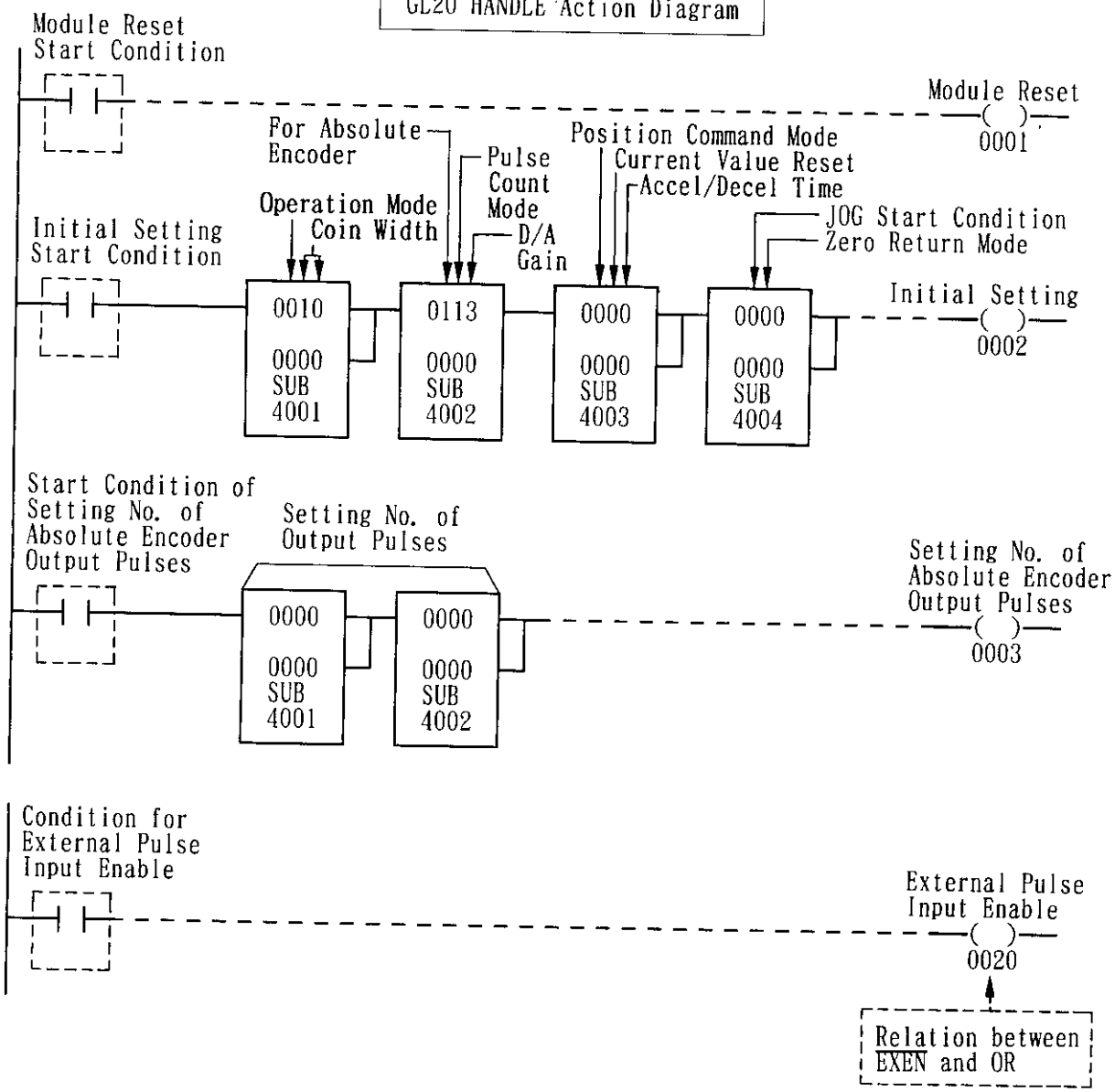


Fig. 4.31 Execution of HANDLE Operation

GL20 HANDLE Action Diagram



4.7 ABSOLUTE VALUE DETECTING FUNCTION

(1) B2803 is applicable for a detector either of standard incremental or absolute encoder by initial setting. In absolute value detection, absolute value data can be received by executing the steps as shown in Fig. 4. 32.

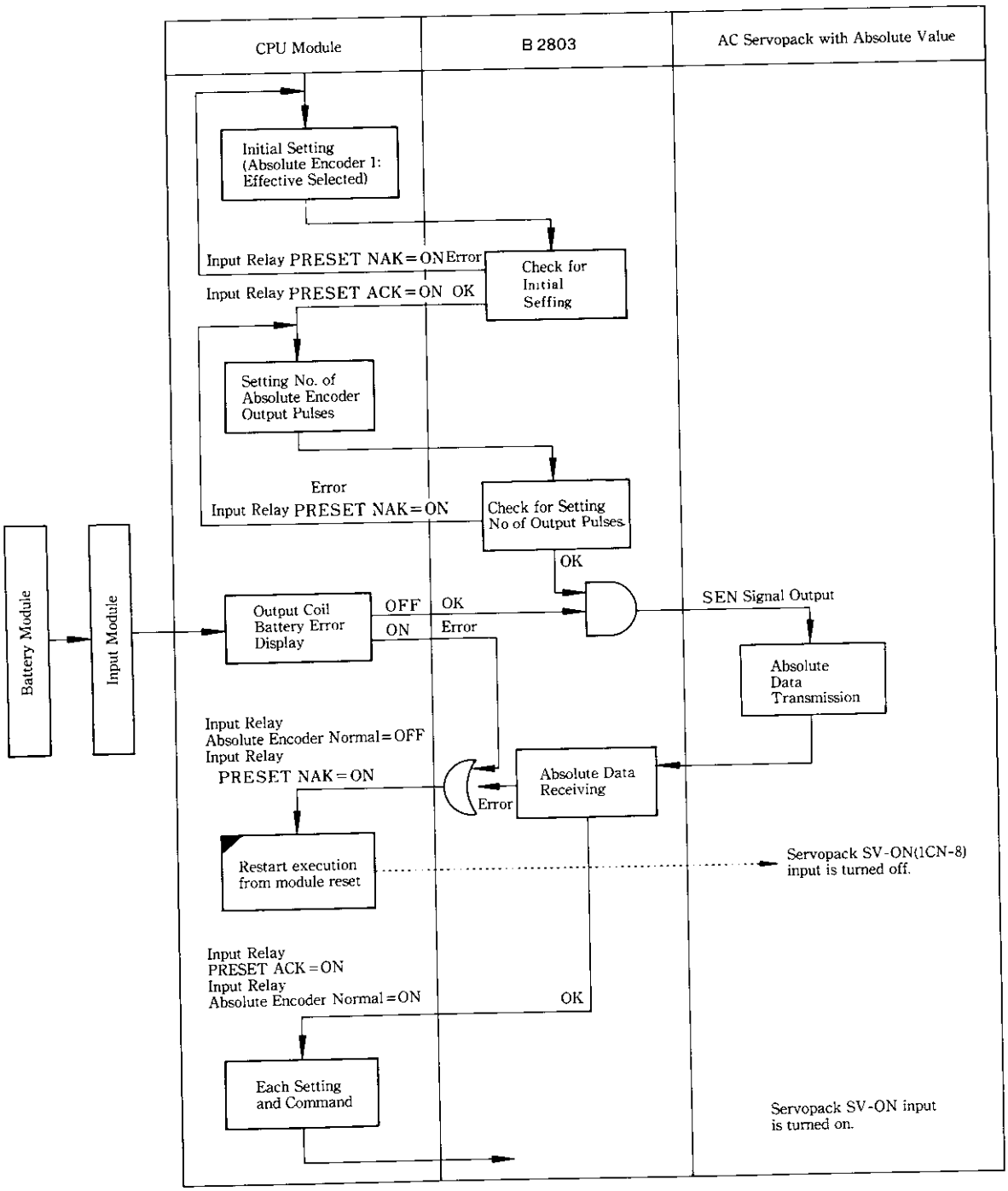


Fig. 4.32 Absolute Value Data Receiving

(2) Precautions for Absolute Value Detecting Function

(a) Initial setting cannot be made ineffective except by module reset or turning on the power supply again once the setting for absolute encoder has been designated by 1 (Effective). Designation of 0 (Ineffective) is disregarded.

(b) Other commands are disregarded between the times of the commands of initial setting and setting No. of absolute encoder output pulses. (No error, ACK, NAK provided)

Operation command in AUTO mode is disregarded and an error (21) occurs in JOG operation.

(c) When setting No. of absolute encoder output pulses is correctly preset in B2803, BATTERY ERROR output is checked. If it is OK, SEN signal is output and absolute data start to be received.

If the battery is defective, SEN signal is not output PRESET=NAK is turned on, an error occurs (absolute encoder error 03) and B2803 stops functioning.

(d) While absolute data are being received, all setting commands (except module reset) and operation commands are disregarded, however an error will not occur.

(e) Normally, when finishing receiving absolute data, PRESET ACK and ABSOLUTE ENCODER NORMAL is turned on. If there is an error, PRESET NAK is turned on, an error (03) occurs and B2803 stops functioning.

(f) Once absolute encoder becomes normal, setting No. of absolute encoder output pulses causes an error (20).

(g) In absolute value mode, if received absolute data exceed initial count range, input relay CURRENT VALUE OVER is turned on and an error (24) occurs.

5. INTERNAL INTERFACE

5.1 I/O ALLOCATION OF CPU MODULE

For interface between the CPU module and B2803, output coil, input relay, output register and input register are allocated. I/O allocation points of the CPU module are listed in Table 5.1. Binary specification is required for allocating the output and input registers.

Table 5.1 Number of I/O Allocations of CPU Modules

I/O Allocation	Points/ Registers	Signal Flow	
		CPU Module	B2803
Output Coil	24 or 16 Points		→
Input Relay	16 Points	←	
Output Register	4 Registers		→
Input Register	4 Registers	←	

5.2 OUTPUT COIL (CONTROL SIGNAL) FROM CPU MODULE TO B2803

(1) List of Output Coils

24 (or 16) output coils are provided and used as the control signals from the CPU module to B2803. Table 5.2 lists the output coils.

Table 5.2 List of Output Coils

GL20	GL40, 60, 70	Signal Name	
0001 + 8n	00001 + 8n	Module reset	
0002 + 8n	00002 + 8n	Initial setting	
0003 + 8n	00003 + 8n	Setting No. of absolute encoder output pulses	
0004 + 8n	00004 + 8n	AUTO / $\overline{\text{MAN}}$	
0005 + 8n	00005 + 8n	START	
0006 + 8n	00006 + 8n	STOP	
0007 + 8n	00007 + 8n	Auto positioning setting	
0008 + 8n	00008 + 8n	Current value setting	
0009 + 8n	00009 + 8n	JOG setting	
0010 + 8n	00010 + 8n	JOGH command	
0011 + 8n	00011 + 8n	Zero return setting	
0012 + 8n	00012 + 8n	FWD command for zero return	
0013 + 8n	00013 + 8n	RVS command for zero return	
0014 + 8n	00014 + 8n	Sign(+) / $\overline{\text{Sign(-)}}$	
0015 + 8n	00015 + 8n	Error code reset	
0016 + 8n	00016 + 8n	Monitor 1	
0017 + 8n	00017 + 8n	Monitor 2	
0018 + 8n	00018 + 8n	Monitor 3	
0019 + 8n	00019 + 8n	JOGL command	
0020 + 8n	00020 + 8n	External pulse input enable (Manual pulse input enable)	At 16-point allocation, these signals are OFF in the module.
0021 + 8n	00021 + 8n	Special positioning setting	
0022 + 8n	00022 + 8n	Special positioning command	
0023 + 8n	00023 + 8n	Deviation counter reset	
0024 + 8n	00024 + 8n	Battery Error	

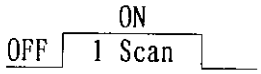
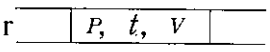
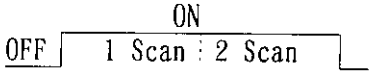
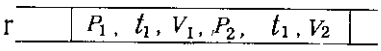
n = 0, 1, 2 • • • •

Show the reference No. at output coil allocation.

(2) Contents of Each Output Coil

24 output coils function as control signals which are detailed in Table 5.3. B2803 operates while confirming the ON/OFF condition of each output coil. (See Table 5.4 "Output Coil Conditions.")

Table 5.3 Output Coils and Their Contents

Signal Name	Description
Module Reset	Module reset command. Upon receiving module reset, B2803 initializes the internal RAM and external input signal, and resets various setpoints, current value and deviation counter to zero. Effective when turned from OFF to ON.
Initial Setting	Initial setting command of B2803 (initial value preset in output register). Effective when turned from OFF to ON. (B2803 clears various operational settings on reception of the initial setting command.)
Set No. of Absolute Encoder Output Pulses	Command for setting No. of absolute encoder output pulses per revolution. Receiving start command of absolute data. Effective when turned from OFF to ON.
AUTO/$\overline{\text{MAN}}$	Selection of auto or manual operation. ON ... Selects auto operation (automatic positioning, zero return, special positioning) OFF .. Selects manual operation (JOG operation). Independent of handle operation.
START	Start command for automatic positioning. Effective when turned from OFF to ON.
STOP	Positioning stop command. Effective at ON. Stops the machine in linear accel/decel time.
Automatic Positioning	Position command automatic positioning and setting command for accel/decel time and speed. (Relevant values are preset in output register.) Effective when turned from OFF to ON. ON only for scan 1 in case of 1-step speed pattern and only for scan 2 in case of 2-step speed pattern (1-step speed pattern) "Positioning setting" Output coil  Output register  (2-step speed pattern) "Positioning setting" Output coil  Output register 

5.2 OUTPUT COIL (CONTROL SIGNAL) FROM CPU MODULE TO B2803 (Cont'd)

Table 5.3 Output Coils and Their Contents (Cont'd)

<table>
<tr><th>Signal Name</th><th>Description</th></tr>
<tr><td>Current Value Setting</td><td>Command for updating current value (current value preset in output register). Effective when turned from OFF to ON.</td></tr>
<tr><td>JOG Setting</td><td>Command for setting accel/decel time and speed in JOGH/JOGL operation.
Effective when turned from OFF to ON.</td></tr>
<tr><td>JOGH Command</td><td>Command of JOGH (high speed) operation.
ON ... Starts operation.
OFF .. Stops operation.</td></tr>
<tr><td>Zero Return Setting</td><td>Command for setting accel/decel time, speed and creep speed in zero return.
(Relevant values are preset in output register.)
Values remain the same between FWD and RVS.
Effective when turned from OFF to ON.</td></tr>
<tr><td>Zero Return FWD Command</td><td>Start command for zero return in forward rotation.
Effective when turned from OFF to ON.</td></tr>
<tr><td>Zero Return RVS Command</td><td>Start command for zero return in reverse rotation.
Effective when turned from OFF to ON.</td></tr>
<tr><td>Sign(+)/$\overline{\text{Sign(-)}}$</td><td>Command for selecting plus/minus area or forward/reverse rotation linked with other settings or commands.
(1) The following is effective when turning "current value setting" from OFF to ON.
ON : Commands plus area.
OFF : Commands minus area.
(2) The following is effective when turning "positioning setting" from OFF to ON.
<table>
<tr><th>Operation Mode</th><th>Sign(+)/$\overline{\text{Sign(-)}}$</th><th>Command</th></tr>
<tr><td rowspan="2">Incremental Mode</td><td>ON</td><td>Forward</td></tr>
<tr><td>OFF</td><td>Reverse</td></tr>
<tr><td rowspan="2">Absolute Mode</td><td>ON</td><td>Plus area</td></tr>
<tr><td>OFF</td><td>Minus area</td></tr>
</table>
(3) The following is effective when JOG operation (JOGH or JOGL command) is activated.
ON : Commands forward rotation.
OFF : Commands reverse rotation.
(4) The following is effective when special positioning command is turned from OFF to ON.
ON : Commands forward rotation.
OFF : Commands reverse rotation.</td></tr>
<tr><td>Error Code Reset</td><td>Command for resetting error code.
Effective when turned from OFF to ON. (All error codes stored in memory are cleared.)</td></tr>
</table>

Table 5.3 Output Coils and Their Contents (Cont'd)

<table>
<tr><th>Signal Name</th><th>Description</th></tr>
<tr><td>Monitor 1
2
3</td><td>Data to be monitored is specified by using these three output coils.
(In case of allocating 16 output coils, monitors 2 and 3 remain OFF.)
<table>
<tr><th colspan="3">Monitor Code</th><th colspan="2">Contents Monitor</th></tr>
<tr><th>Monitor 1</th><th>Monitor 2</th><th>Monitor 3</th><th>1st, 2nd Input Registers</th><th>3rd, 4th Input Registers</th></tr>
<tr><td>0</td><td>0</td><td>0</td><td rowspan="3">Current feedback value</td><td>Current command value</td></tr>
<tr><td>1</td><td>0</td><td>0</td><td>Error code</td></tr>
<tr><td>0</td><td>1</td><td>0</td><td>Current value setting</td></tr>
<tr><td>1</td><td>1</td><td>0</td><td>No. of specially distributed pulses</td><td>Special accel/decel time, speed</td></tr>
<tr><td>0</td><td>0</td><td>1</td><td>Auto position command value</td><td>Auto accel/decel time, speed</td></tr>
<tr><td>1</td><td>0</td><td>1</td><td>JOGH accel/decel time, speed</td><td>JOGL accel/decel time, speed</td></tr>
<tr><td>0</td><td>1</td><td>1</td><td>Accel/decel time, speed of zero return</td><td>Creep speed</td></tr>
<tr><td>1</td><td>1</td><td>1</td><td colspan="2">Initial setting</td></tr>
</table>
0 : OFF 1 : ON
Note : In case of 2-step speed pattern, (P_1, t_1, V_1) and (P_2, t_1, V_2) are alternately displayed about every 3 seconds.</td></tr>
<tr><td>JOGL Command</td><td>Command for JOGL (low speed) operation
ON : Starts operation.
OFF : Stops operation.</td></tr>
<tr><td>External Pulse Input Enable</td><td>Enables input of external pluse. Upon input of external command pulse (from manual pulse generator), handle operation is enabled.
Effective at ON.</td></tr>
<tr><td>Special Positioning Setting</td><td>Command for setting the number of pulses distributed, accel/decel time and speed in special positioning operation.
(Possible only in incremental mode.)
Effective when turned from OFF to ON.</td></tr>
<tr><td>Special Positioning Command</td><td>Command for starting the special positioning (possible only in incremental mode).
Effective when turned from OFF to ON.</td></tr>
<tr><td>Deviation Counter Reset</td><td>Command for resetting deviation counter
Resets the deviation counter to 0.
Effective when turned ON.
(Feedback current value is set as current command value when the deviation counter reset is turned from ON to OFF.)</td></tr>
<tr><td>Battery Error</td><td>Command for indicating battery error for absolute encoder
ON : Wrong
OFF : Normal
(The battery is checked at absolute data reading. If ON, B2803 stops functioning as absolute encoder error.)</td></tr>
</table>

(3) List of Output Coil Conditions

Table 5.4 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 B2803.

Table 5.4 Output Coils and B2803 Functions

	Coil Name / Module Function	Module Reset	AUTO/MAN	STOP	Initial Setting	Current Value Setting	Auto Positioning Setting	Zero Return Setting	Special Positioning Setting	JOG Setting	Setting of No. of Absolute Encoder Output Pulses	START	Zero FWD Point	Zero RVS Point	Special Positioning Command	JOGH Command	JOGL Command	External Pulse Input Enable	Deviation Counter Reset	Erro Code Reset
Setting	Module Reset	↑									–									
	STOP	–		1	–	–	–	–	–	–	–									
	Initial	–	0	1	↑	–	–	–	–	–	–									
	Current Value	–		1	–	↑	–	–	–	–	–									
	Auto Positioning	–			–	–	↑	–	–	–	–									
	Zero Return	–	0	1	–	–	–	↑	–	–	–									
	Special Positioning	–	0	1	–	–	–	–	↑	–	–									
	JOG	–	0	1	–	–	–	–	–	↑	–									
	Setting of No. of Absolute Encoder Output Pulses	–	0	1	–	–	–	–	–	–	↑									
Operation	Auto Positioning Start	–	1	0			–					↑	–	–	–					
	Zero Return Start at RVS Run	–	1	0			–					–	↑	–	–					
	Zero Return Start at RVS Run	–	1	0			–					–	–	↑	–					
	Special Positioning Start	–	1	0			–					–	–	–	↑					
	JOGH	–	0	0			–									1	0			
	JOGL	–	0	0			–									0	1			
	HANDLE	–		1	–													1		
	Deviation Counter Reset	–	0	1															1	
	Error Code Reset	–			–															↑

<Notes for Table 5.4>

1. 1 : ON, 0 : OFF, ⓕ : OFF to ON, — : status remains unchanged, blank : not applicable.
   ⓕ, 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. If two or more output coils are turned on simultaneously among START, zero return FWD command, RVS command or special positioning command, commands are invalidated with no error code assigned.

(1) For setting zero return in forward rotation

Output Coil	ON/OFF Condition	
AUTO/$\overline{\text{MAN}}$	OFF	Finally, zero return setting ⓕ : OFF to ON
STOP	ON	
Module Reset	—	
Other Various Settings	—	

(2) For starting zero return in forward rotation

Output Coil	ON/OFF Condition	
AUTO/$\overline{\text{MAN}}$	ON	Finally, zero return FWD command ⓕ : OFF to ON
STOP	OFF	
Module Reset	—	
Other Various Operation Commands	—	

5.3 INPUT RELAY (CONTROL SIGNAL) FROM B2803 TO CPU MODULE

(1) List of Input Relays

16 input relays are provided and used as the control signals from B2803 to the CPU module. Table 5.5 lists the input relays.

Table 5.5 List of Input Relays

GL20	GL40, 60, 70	Signal Name
1001+ 8n	10001+ 8n	READY
1002+ 8n	10002+ 8n	PRESET ACK
1003+ 8n	10003+ 8n	SIGN(+)/$\overline{\text{SIGN(-)}}$
1004+ 8n	10004+ 8n	Multi-step speed monitor 1
1005+ 8n	10005+ 8n	Multi-step speed monitor 2
1006+ 8n	10006+ 8n	PLUS/$\overline{\text{MINUS}}$
1007+ 8n	10007+ 8n	Current value over
1008+ 8n	10008+ 8n	Not used
1009+ 8n	10009+ 8n	COIN
1010+ 8n	10010+ 8n	DECEL LS
1011+ 8n	10011+ 8n	ERROR
1012+ 8n	10012+ 8n	Fault
1013+ 8n	10013+ 8n	Absolute encoder normal
1014+ 8n	10014+ 8n	Zero return pulse output completion
1015+ 8n	10015+ 8n	Positioning pulse output completion
1016+ 8n	10016+ 8n	PRESET NAK

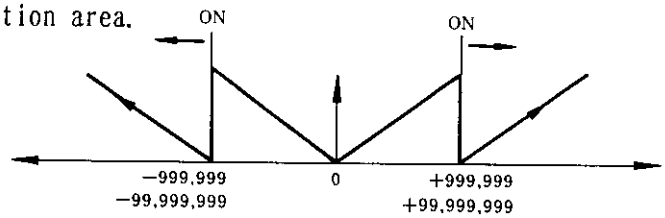
n=0, 1, 2 • • • • •

Show the reference No. at input relay allocation.

(2) Contents of Input Relay

16 input relays connect the control signals which are detailed in Table 5.6.

Table 5.6 Input Relays and Their Contents

<table>
<tr><th>Singal Name</th><th>Description</th></tr>
<tr><td>READY</td><td>The result of B2803 self-diagnosis is indicated.
Normally ON, but OFF in the event of malfunction (ROM total check error, RAM check error or WDT error).
Turned OFF for about 0.5 sec on energization or module resetting.</td></tr>
<tr><td>PRESET ACK</td><td>Turned ON for only one scan after normal completion of preset action (initial setting, current value setting, positioning setting, zero return setting, special positioning setting, JOG setting or setting No. of Absolute Encoder Output Pulses) in B2803.</td></tr>
<tr><td>Sign (+)/$\overline{\text{Sign (-)}}$</td><td>Monitors sign (+)/$\overline{\text{sign (-)}}$ preset for monitoring "current value setting" and "auto position command value.
(1) When monitor code (0101) is "current value setting"
ON : Plus area
OFF : Minus area
(2) When monitor code (001) is "auto position command value"
<table>
<tr><th>Operation Mode</th><th>Sign (+)/$\overline{\text{Sign (-)}}$</th><th>Command</th></tr>
<tr><td rowspan="2">Incremental Mode</td><td>ON</td><td>Forward run</td></tr>
<tr><td>OFF</td><td>Reverse run</td></tr>
<tr><td rowspan="2">Absolute Mode</td><td>ON</td><td>Plus area</td></tr>
<tr><td>OFF</td><td>Minus area</td></tr>
</table>
Note: In case of multi-step speed pattern, the sign is monitored about every 3 seconds.</td></tr>
<tr><td>Multi-step Speed Pattern Monitor 1, Multi-step Speed Pattern Monitor 2</td><td>Indicate which step of multi-step speed pattern the "auto position command value, accel/ decel time and speed"monitor is supervising.
<table>
<tr><th>Monitor</th><th>1st Step</th><th>2nd Step</th></tr>
<tr><td>Multi-step Speed Pattern Monitor 1</td><td>OFF</td><td>ON</td></tr>
<tr><td>Multi-step Speed Pattern Monitor 2</td><td>OFF</td><td>OFF</td></tr>
</table></td></tr>
<tr><td>PLUS/$\overline{\text{MINUS}}$</td><td>Indicates the area of current value counter.
ON : Plus area
OFF : Minus area</td></tr>
<tr><td>Current Value Over</td><td>Control signal valid only in absolute mode.
Turned ON when the current value counter in B2803 exceeds absolute position area.
 
</td></tr>
</table>

5.3 INPUT RELAY (CONTROL SIGNAL) FROM B2803 TO CPU MODULE (Cont'd)

Table 5.6 Input Relays and Their Contents (Cont'd)

Signal Name	Description
COIN	Effective only when 0 is selected in the initial setting of various operation start conditions. Turned ON when reading on the deviation counter is within the COIN detection width initially set.
DECEL LS	Indicates the input status of external input signal DECEL LS. Turned ON when DECEL LS comes ON.
ERROR	Turns ON if B2803 detects any error. For error codes, refer to Sect. 9 "TROUBLESHOOTING."
FAULT	Indicates that B2803 is outputting external "FAULT" signal. For error codes, refer to Sect. 9 "TROUBLESHOOTING."
Absolute Encoder Normal	Turns ON when absolute data are received correctly from absolute encoder.
Completion 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 temporary pausing.
Completion of Positioning Pulse Output	Turns ON for only one scan upon completion of pulse output in automatic positioning operation. Does not turn ON at the time of temporary pausing. Effective when AUTO/$\overline{\text{MAN}}$ is ON.
PRESET NAK	Turns ON for only one scan if data preset action in B2803 is abnormal.

5.4 OUTPUT REGISTER (SETTING DATA) FROM CPU MODULE TO B2803

To preset various setting data from the CPU module to B2803, four consecutive output registers are used.

Table 5.7 Output Register Allocation

GL20	GL40, 60, 70	Output Register No.
4001+n	40001+n	1ST
4002+n	40002+n	2ND
4003+n	40003+n	3RD
4004+n	40004+n	4TH

n=1, 2, 3·····

└Show the reference No. at allocation of output registers.

5.4.1 Initial Setting

Initial setting of B2803 is to be made according to the "initial setting command" of output coil with an initial value set in output register.

(1) Initial Setting Items

B2803 initial setting includes the items listed in Table 5.8.

Table 5.8 Initial Setting Items

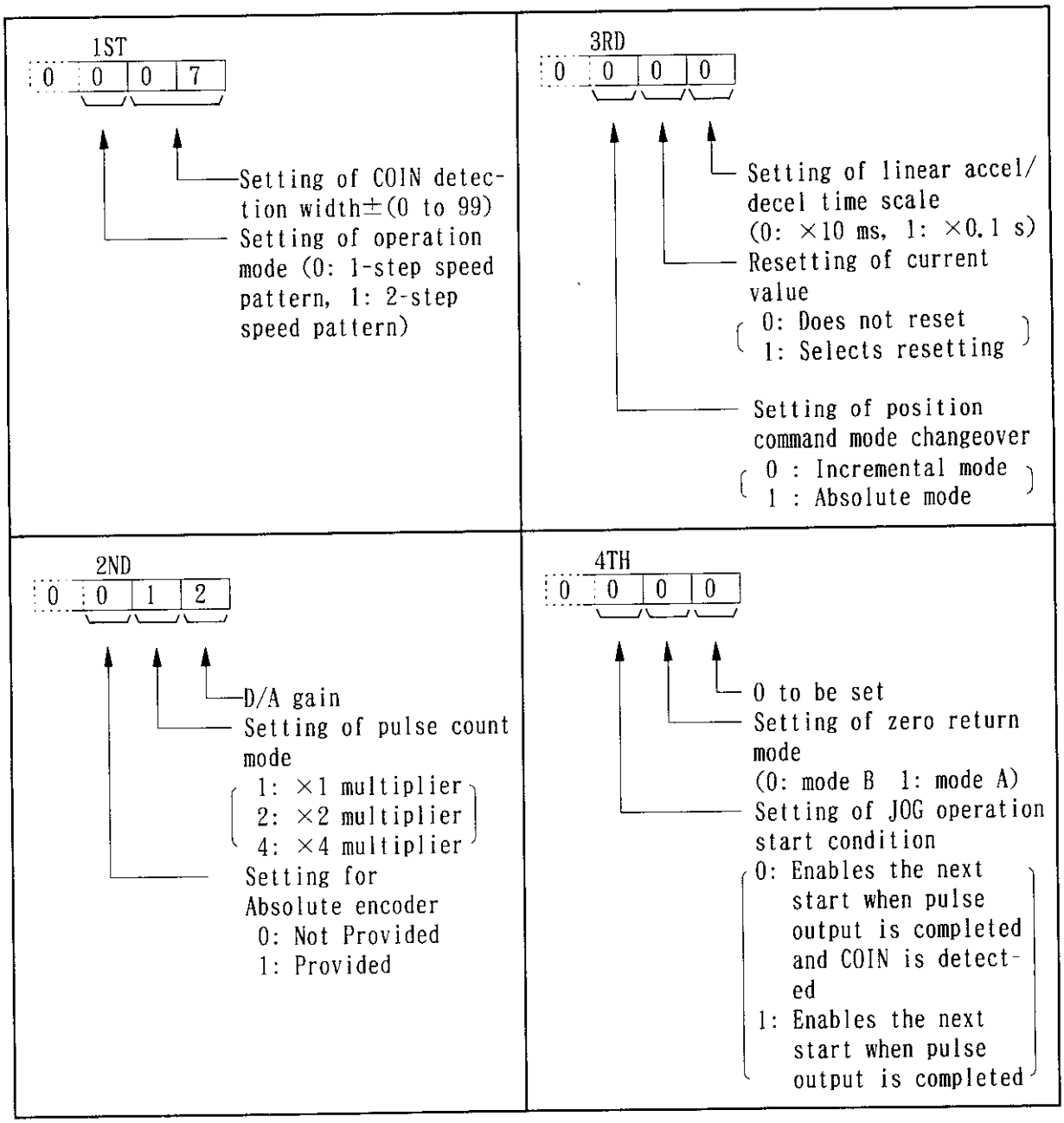
Setting Items	Description
Setting of COIN Detection Width	Specifies the detection width of positioning end signal COIN. Settable within a range of (0 to 99) pulses.
Setting of Operation Mode	Specifies either 1-step or 2-step speed pattern for automatic positioning operation. 0: 1-step speed pattern 1: 2-step speed pattern
D/A Gain Setting	Specifies No. of bits of an analog command D/A converter. Any No. can be set between 6 and 13 bits. 0: Not used 5: 10 bits 1: Not used 6: 9 bits 2: 13 bits 7: 8 bits 3: 12 bits 8: 7 bits 4: 11 bits 9: 6 bits Designation of 0 or 1 does not cause an error.
Setting of Pulse Count Mode	Specifies count mode for feedback pulse phase A/B. 1: ×1 multiplier 2: ×2 multiplier 4: ×4 multiplier
Setting for Absolute Encoder	Specifies if setting for absolute encoder is provided. 0: Not provided 1: Provided
Scale Setting for Linear Accel/Decel Time	Specifies scale of linear accel/decel time for various operations. 0 : ×10 ms ⟶ 10 to 990 ms 1 : ×0.1 s ⟶ 0.1 to 9.9 s
Resetting of Current Value	Specifies selection or non-selection of resetting the current value on start of automatic positioning in incremental mode. 0 : Resetting not selected 1 : Selects resetting When selecting 1, automatic positioning always starts at current value 0. Selection is impossible in absolute mode (will cause a setting error.)
Setting of Position Command Mode	Specifies incremental or absolute mode. (Refer to Par. 4.1.) 0 : Selects incremental mode. 1 : Selects absolute mode.
Setting of Zero Return Mode	Specifies zero return mode. (Refer to Par. 4.3.) 0: Mode B 1: Mode A
Setting of Start Conditions for JOG Operations	Specifies start conditions for JOGH or JOGL operation. 0: Enables the next start when completion of pulse output and COIN are both satisfied. 1: Enables the next start when pulse output is completed.

(2) Setting of Initial Value

Table 5.9 shows the method of setting the initial Value in the output register.

Table 5.9 Setting of Initial Value in Output Register

(GL20 □□□ (3 digits) GL40, 60, 70S □□□□ (4 digits))



Notes:

1. The framed numerals are default values, which are automatically set upon energization or module resetting.
2. If malfunction occurs in updated initial setting data, the previous data are validated.
3. Settable even without external power supply input.

5.4.2 Data Set

(1) Setting Method to Output Register

Table 5.10 shows how to set the data for output register.

Table 5.10 Data Set

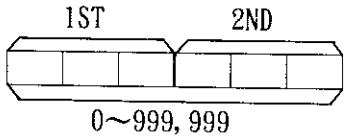
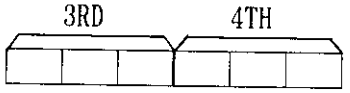
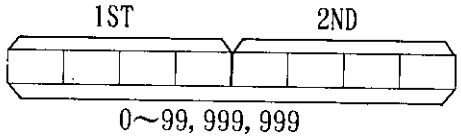
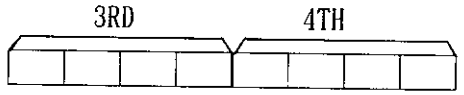
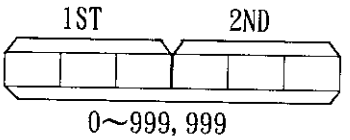
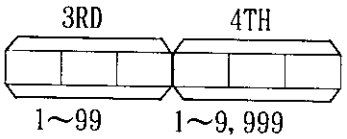
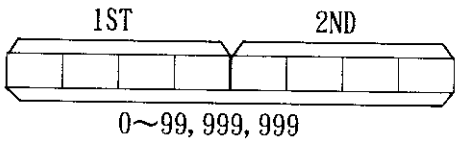
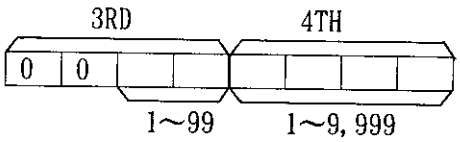
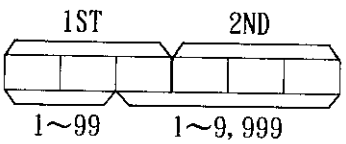
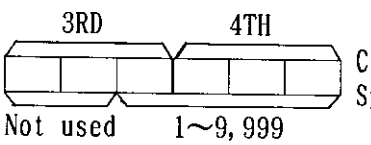
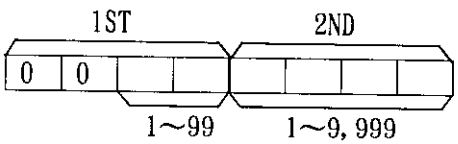
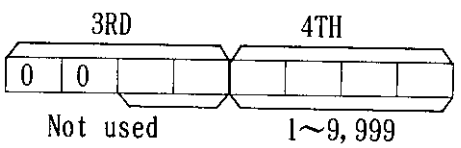
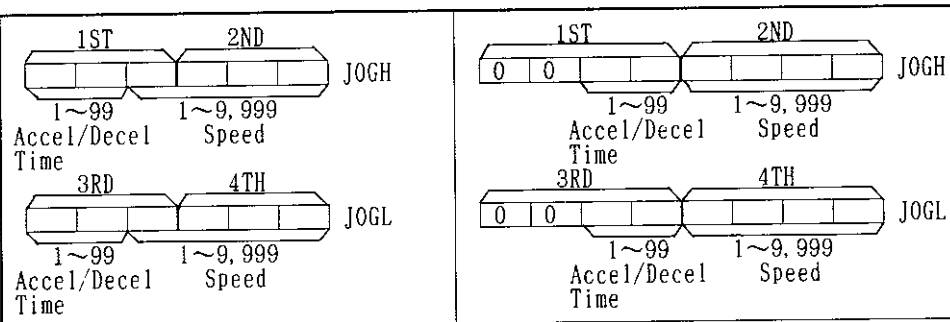
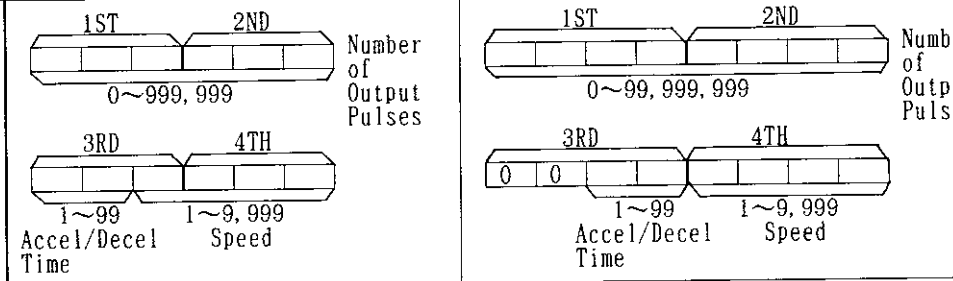
Setting Items	Output Registers	
	GL20	GL40, 60, 70
Current Value	 	 
Auto Positioning: • Position Command • Accel/Decel Time • Speed	 	 
Zero Return Operation: • Accel/Decel Time • Speed • Creep Speed	  Where speed≦creep speed, the setting results in error.	  Where speed≦creep speed, the setting results in error.

Table 5.10 Data Set (Cont'd)

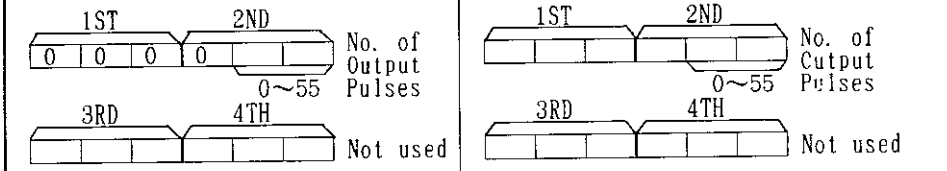
JOG Operation:
- JOGH Accel/Decel Time, Speed
- JOGL Accel/Decel Time, Speed



Special Positioning:
- Number of Output Pulses
- Accel/Decel Time
- Speed



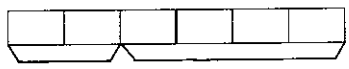
- Setting No. of Absolute Encoder Output Pulses



Setting List of No. of Output Pulses

Setting	No. of Output Pulses	Setting	No. of Output Pulses	Setting	No. of Output Pulses
0	6000	20	320	40	2048
1	5000	21	300	41	1024
2	4000	22	250	42	512
3	3000	23	240	43	256
4	2500	24	200	44	128
5	2400	25	160	45	64
6	2000	26	150	46	3600
7	1600	27	125	47	2160
8	1500	28	120	48	1800
9	1250	29	100	49	1440
10	1200	30	80	50	1080
11	1000	31	75	51	720
12	800	32	60	52	360
13	750	33	50	53	80
14	625	34	40	54	90
15	600	35	30	55	45
16	500	36	25		
17	480	37	20		
18	400	38	8192		
19	375	39	4096		

Setting of No. of output pulses per motor revolution must be in accordance with the setting of the frequency divider at Servopack.



ACCEL/DECEL TIME, SPEED

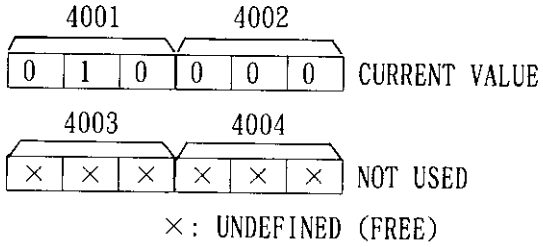
SPEED : pps is a value of 1 to 9,999 multiplied by 10 or 20. (×10pps/×20pps unit is selected by switch 2SW-3.)

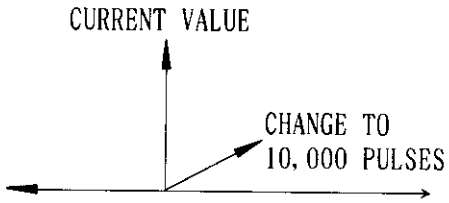
Accel/Decel Time : Accel/Decel time is a value of 1 to 99 multiplied by 10ms or 0.1s. (×10ms/×0.1s is selected by initial setting.)

(2) Examples of Various Settings --- When output registers 4001 to 4004 are used for GL20

(a) Setting of current value

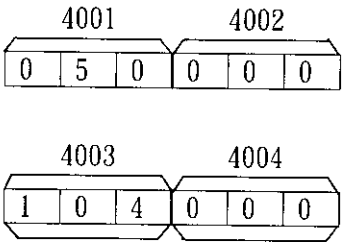
Current value is to be updated to 10,000 (pulses).
Set the output registers 4001 through 4004 as follows and turn the "current value change" output coil from OFF to ON. (In this case, the STOP output coil needs to be turned ON.)

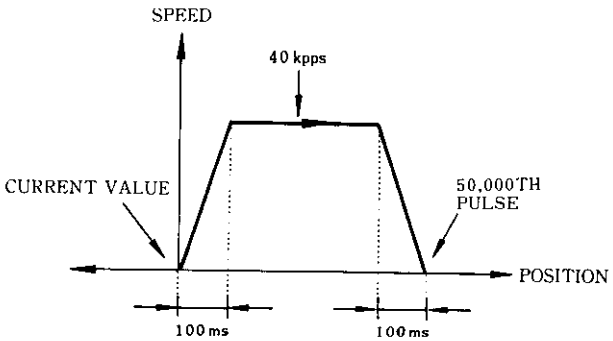




(b) Setting in automatic positioning operation (in case of 1-step speed pattern)

Automatic positioning is to be effected toward the targeted position (50,000th pulse) in a linear accel/decel time of 100 ms and at a steady speed of 40 kpps (in 1-step speed pattern and absolute mode). Set the output registers 4001 through 4004 as follows and turn the "automatic positioning setting" output coil from OFF to ON.





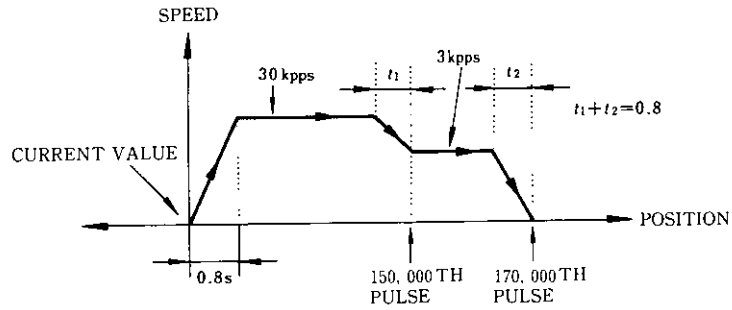
SPEED:
4,000 ×10= 40,000 pps
(40 kpps)
(with 2SW-3 set at ×10 pps)

ACCEL/DECEL TIME:
10 × 10 = 100
(with ×10 ms selected in initial setting)

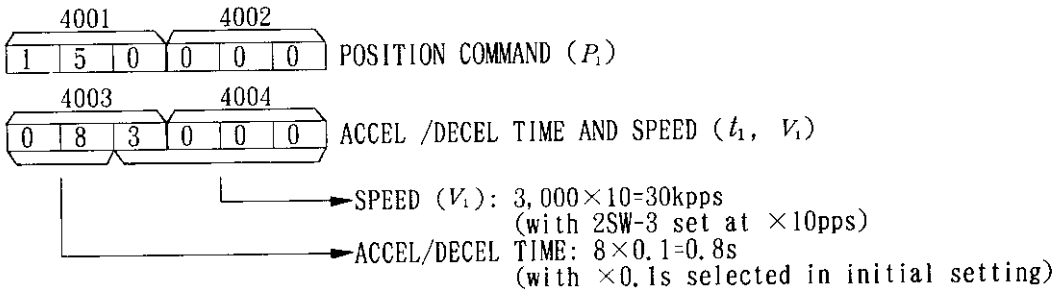
5.4.2 Data Set (Cont'd)

(c) Setting in automatic positioning operation (in case of 2-step speed pattern)

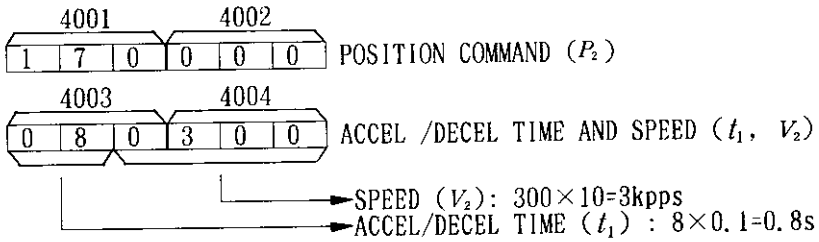
Automatic positioning is to be effected toward the targeted position (150,000th pulse) in acceleration time of 0.8 sec and at a steady speed of 30 kpps and from there to the final position 170,000th pulse at decelerated steady speed of 3 kpps (in 2-step speed pattern and absolute mode).



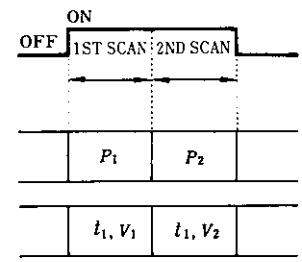
For the scan in which the "automatic positioning setting" output coil is turned from OFF to ON, set the output registers 4001 through 4004 as follows.



For the next scan, set output registers 4001 through 4004 as shown below. The "positioning setting" output coil must be turned ON up to this scan. In other words, the output coil must be turned ON for only two scans.



The above explanation can be seen in the timing chart below.



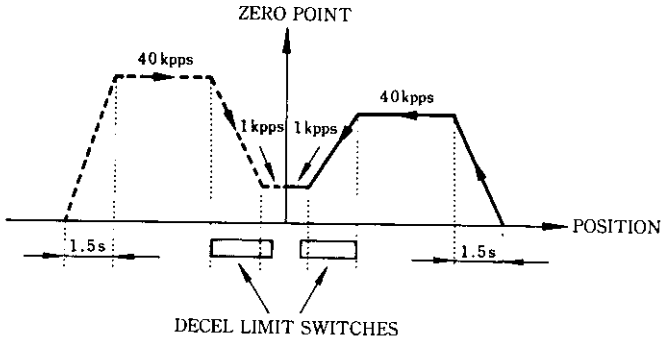
"Automatic positoning setting" output coil

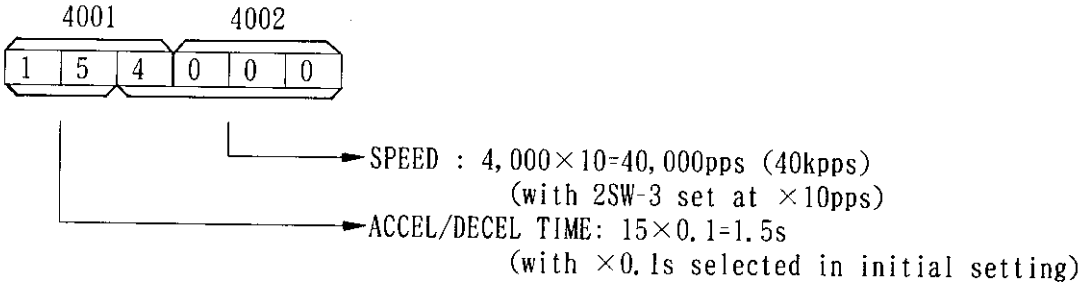
Output registers { 1st, 2nd registers (for position); 3rd, 4th registers (for accel/decel time and speed) }

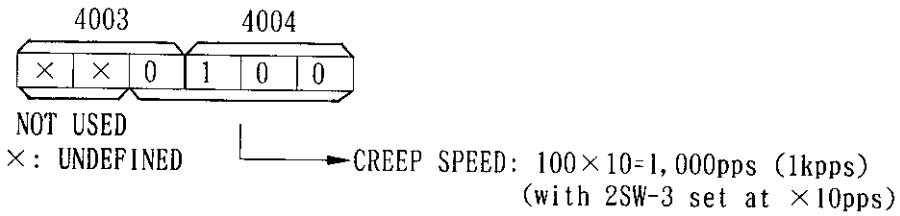
Note: Set the accel/decel time for the second scan the same as for the first scan.

(d) Setting of zero return operation (in mode B)

Set the accel/decel time at 1.5 seconds, steady speed at 40 kpps, and creep speed at 1 kpps. Set the output registers 4001 through 4004 as shown below and turn the "zero return setting" output coil from OFF to ON. (At this time, the AUTO/$\overline{\text{MAN}}$ output coil and STOP output coil need to be at OFF and ON, respectively.)



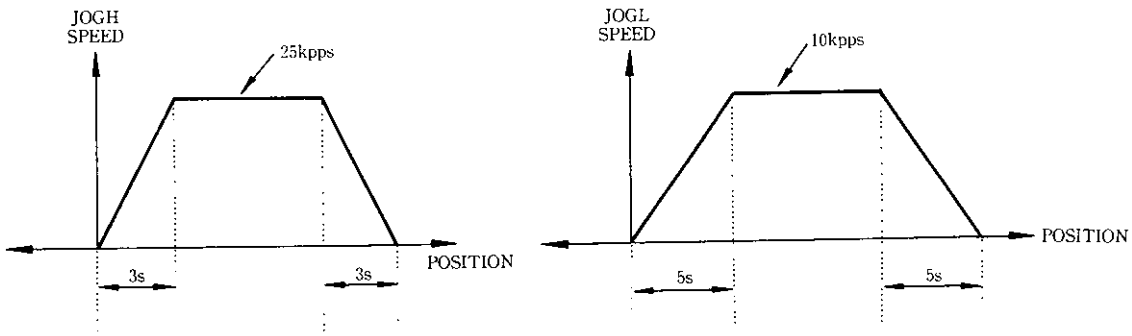


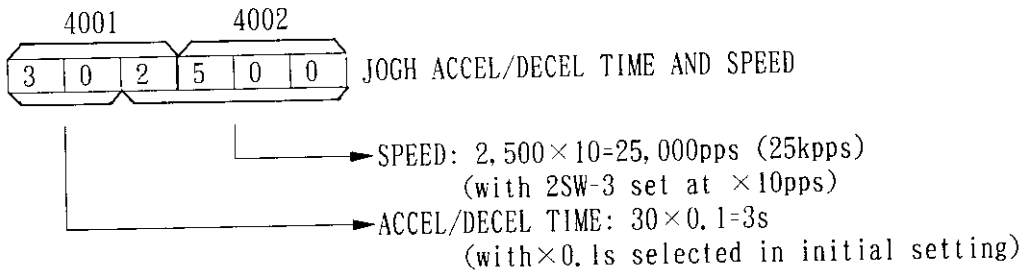


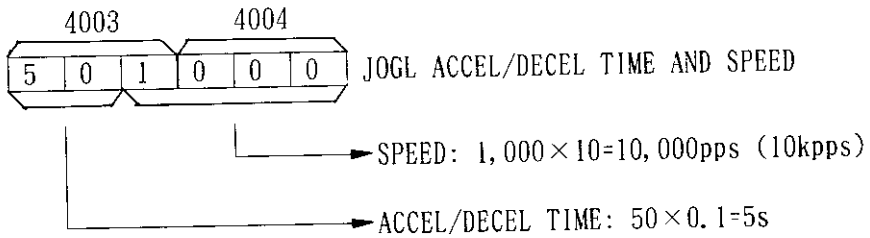
5.4.2 Data Set (Cont'd)

(e) Setting of JOG operation

Set JOGH accel/decel time at 3 seconds, and steady speed at 25 kpps.
Set JOGL accel/decel time at 5 seconds, and steady speed at 10 kpps.
Set the output registers 4001 through 4004 as shown below and turn the "jog setting" coil from OFF to ON. (At this time, the AUTO/$\overline{\text{MAN}}$ output coil and STOP output coil need to be at OFF and ON, respectively.)



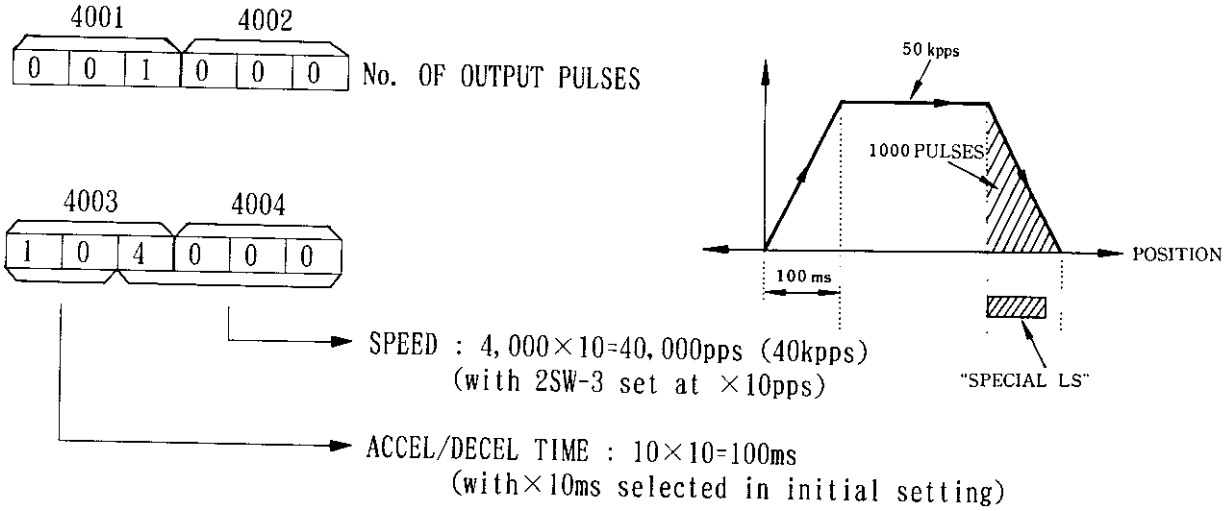




(f) Setting of special positioning

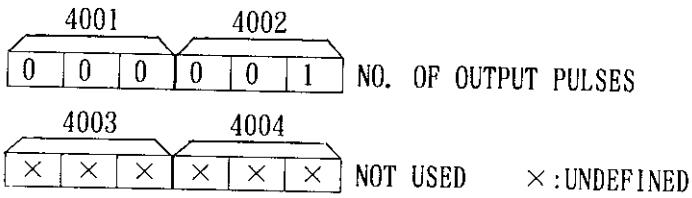
Set the linear accel/decel time at 100ms, speed at 50 kpps, and the number of pulse output at 1000 pulses after "S POSI LS" ON.

Set output registers 4001 through 4004 as shown below and turn the "special positioning setting" output coil from OFF to ON. (At this time, the AUTO/$\overline{\text{MAN}}$ output coil and STOP output coil need to be at OFF and ON, respectively.)



(g) Setting of No. of Absolute Encoder Output Pulses

Set the number of output pulses per motor revolution to 5000.
Set the next value "SETTING NO. OF ABSOLUTE ENCODER OUTPUT PULSES" to output register 4001 to 4004 and turn output coil from OFF to ON. Then AUTO/$\overline{\text{MAN}}$ output coil must be OFF and STOP output coil must be ON.



5.5 INPUT REGISTER (MONITOR DATA) FROM B2803 TO CPU MODULE

To monitor various data in B2803 from the CPU module, four consecutive input registers are used. The contents of monitor data are varied depending on specification of monitor code (output coil: monitors 1 through 3).

Table 5.11 Input Register Allocation

GL20	GL40, 60, 70	Input Register No.
3001+n	30001 +n	1ST
3002+n	30002 +n	2ND
3003+n	30003 +n	3RD
3004+n	30004 +n	4TH

n=0, 1, 2 ·····

Show the reference No. at allocation of input registers.

Table 5.12 Monitoring Contents of Monitor Code Input Registers

Monitor Code Output Coil			Monitoring Contents			
			Input Registers 1ST, 2ND		Input Registers 3RD, 4TH	
Monitor 1	Monitor 2	Monitor 3	GL20	GL40, 60, 70	GL20	GL40, 60, 70
0	0	0	Current Value (PG Feedback) 1ST 2ND 0-999,999	1ST 2ND 0-99,999,999	Command Current Value 3RD 4TH 0-999,999	3RD 4TH 0-99,999,999
1	0	0			Error Code 3RD 4TH 0 0 0 0-9 0-99 No. of Errors Error Code	3RD 4TH 0 0 0 0 0 0-9 0-99 No. of Errors Error Code
0	1	0			Current Value Setting 3RD 4TH 0-999,999	3RD 4TH 0-99,999,999
1	1	0	Special Positioning Setting : No. of Output Pulses 1ST 2ND 0-999,999	1ST 2ND 0-99,999,999	Special Positioning Setting : Accel/Decel Time and Speed 3RD 4TH 1-99 Accel/Decel Time 1-999,999 Speed	3RD 4TH 0 0 1-99 Accel/Decel Time 1-99,999,999 Speed
0	0	1	Auto Positioning Setting: Position Command 1ST 2ND 0-999,999	1ST 2ND 0-99,999,999	Auto Positioning Setting : Accel/Decel Time and Speed 3RD 4TH 1-99 Accel/Decel Time 1-999,999 Speed	3RD 4TH 0 0 1-99 Accel/Decel Time 1-9,999 Speed
1	0	1	JOG Setting : JOGH Accel/Decel Time and Speed 1ST 2ND 1-99 Accel/Decel Time 1-9,999 Speed	1ST 2ND 0 0 1-99 Accel/Decel Time 1-9,999 Speed	JOG Setting : JOGL Accel/Decel Time and Speed 3RD 4TH 1-99 Accel/Decel Time 1-9,999 Speed	3RD 4TH 0 0 1-99 Accel/Decel Time 1-9,999 Speed
0	1	1	Zero Return Setting : Accel/Decel Time and Speed 1ST 2ND 1-99 Accel/Decel Time 1-9,999 Speed	1ST 2ND 0 0 1-99 Accel/Decel Time 1-9,999 Speed	Zero Return Setting : Creep Speed 3RD 4TH Not Used 1-9,999 Creep Speed	3RD 4TH 0 0 Not Used 1-9,999 Creep Speed
1	1	1	Initial Setting (same as that of output register) See Table 5.9.			

Note : The number of errors covers those classified according to error codes.
Even if multiple errors of the same error code occur, they are counted as 1.
As an error code, the smallest error code of those which occurred is indicated.

6. EXTERNAL INTERFACE

6.1 FRONT PANEL

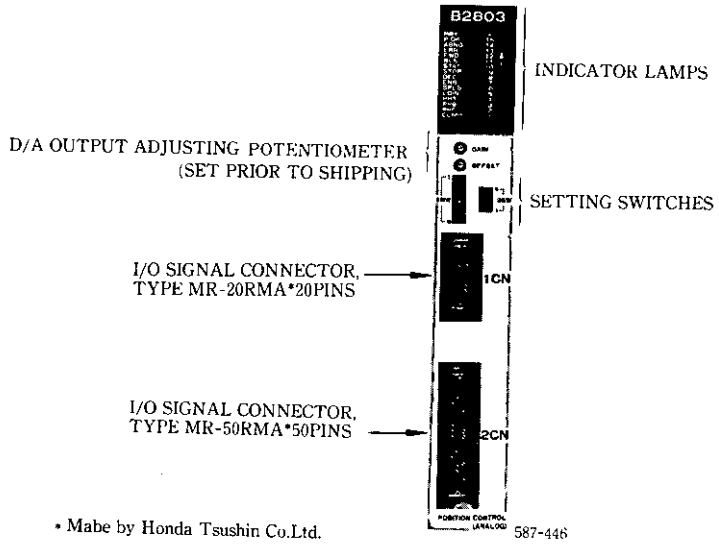


Fig. 6.1 B2803

6.2 CONNECTOR TERMINAL LAYOUT

(1) Connector (1CN) Terminal Layout

Table 6.1 Connector 1CN Terminal Layout for I/O Signals

1	2	3	4	5	6	7
0V	0V	0V	+ 5V	+ 5V	+ 5V	
PG Power Supply 0V			PG Power Supply + 5V			
8	9	10	11	12	13	
SEN	OSEN	+ TG	− TG			
SEN Signal Output		TG Signal Junction Input				
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

6.2 CONNECTOR TERMINAL LAYOUT (Cont'd)

(2) Connector (2CN) Terminal Layout

Table 6.2 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
12/24V	$\overline{\text{STOP}}$	$\overline{\text{START}}$	0V	0V	0V	0V	0V	0V	0V	0V	0V	−TG	+TG	FG	FG	FG	FG
Input Signal Power	External Stop Input	External Start Input	Fault Output 0V	Coin Output 0V	Reference Pulse Output 0V		Manual Pulse Generator Power Supply 0V		External Power Supply 0V			TG Signal Junction Output		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		+5V	+5V	+12V	+12V		−12V	−12V	−12V
Ext. Pulse Input Enable (Manually)	Servo Normal Input			Speed Reference Output		Manual Pulse Generator Power Supply +5V		Manual Pulse Generator Power Supply +12V			External Power Supply Input −12V		

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

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

Table 6.3 Specifications of Applilcable Receptacles for I/O Signals

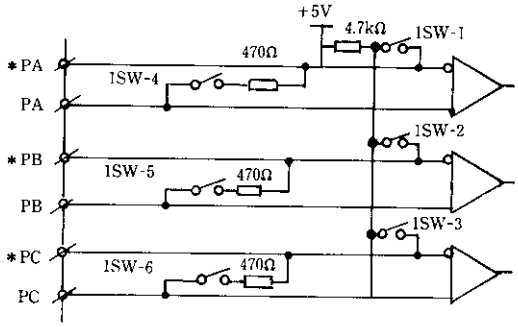
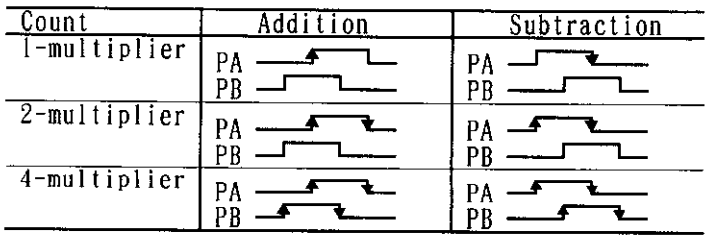
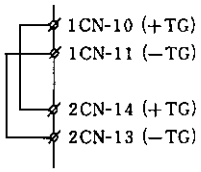
Connector Type Used in B2803	Applicable Receptacle Specifications			
	Soldered Type	Caulking Type	Case	Manufacturer
1CN MR-20RMA, Right Angle 20P	MR-20F*	MRP-20F01	MR-20L*	Honda Tsushin Co., Ltd.
2CN MR-50RMA, Right Angle 50P	MR-50F*	MRP-50F01	MR-50L*	

*Standard attachment of B2803

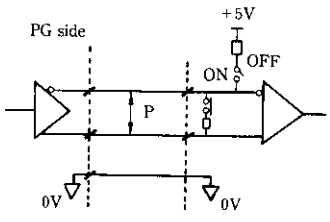
6.3 1CN/2CN I/O SIGNALS

(1) 1CN I/O Signals

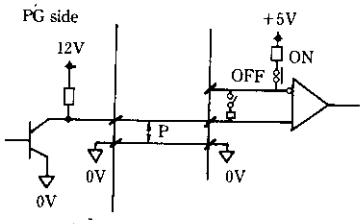
Table 6.4 1CN Input Signals

Signal Name	1CN Pin No.	Contents
PA * PA PB * PB PC * PC	16 17 18 19 14 15	PG feedback pulse input terminal (1) Input circuit  (2) PG output form • Line driver (5V) • Voltage output (12V) : } Switchable (See Table 6.5.) (3) Input level (in voltage output) • "H" level: +10V to + 12V • "L" level: 0V to + 1.2V (4) Max count frequency 200 kpps (1-multiplier) 400 kpps (2-multiplier) 800 kpps (4-multiplier) (5) Pulse count timing 
+TG −TG	10 11	TG pulse junction input terminal, common in B2803. 

Note : Feedback pulse signal connection



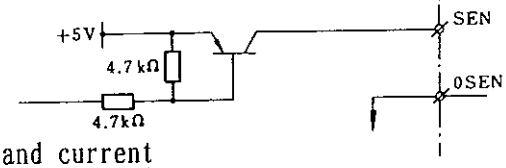
At Line Driver (5V) Connection



At Voltage Output (12V) Connection

6.3 1CN/2CN I/O SIGNALS (Cont'd)

Table 6.5 1CN Output Signals

Signal Name	1CN Pin No.	Contents
SEN OSEN	8 9	Sensor ON signal output The signal level L changes to H when 1 (Effective) is selected for absolute encoder in initial setting and setting of No. of absolute encoder output pulses is executed. (1) Output circuit  (2) Output voltage and current • Level H : +4V or more • Level L : +0.7V or less } at 4.8kΩ pulldown load • Output Current in Level H : 1mA (at 4.8kΩ load)
+5V 0V	4, 5, 6 1, 2, 3	For +5V power supply for encoder Max. output current: 200 mA

(2) 2CN I/O Signals

Table 6.6 2CN Input Signals

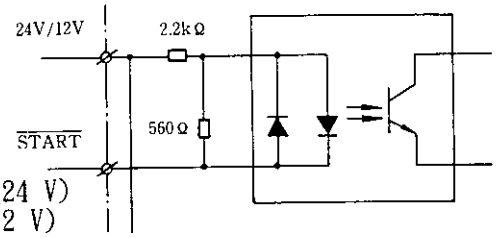
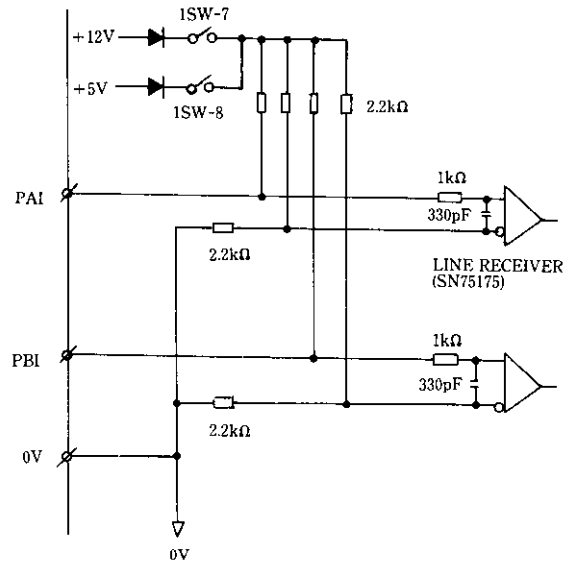
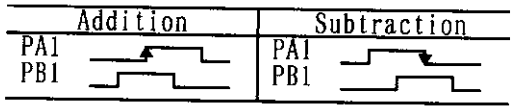
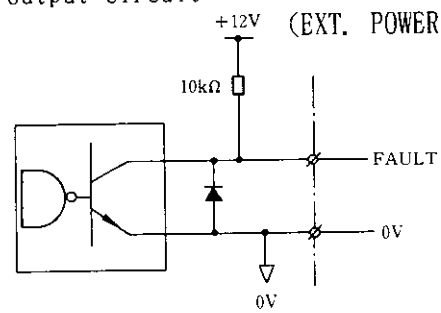
Signal Name	2CN Pin No.	Contents
$\overline{\text{START}}$ (Ext. Start)	3	Inputs external start command. Provides the same function as of the output coil START and composes OR in B2803. Effective at ON. (1) Input circuit  (2) Input current About 10 mA (24 V) About 5 mA (12 V)
$\overline{\text{STOP}}$ (Ext. Stop)	2	Inputs external stop command. Provides the same function as of the output coil STOP and composes OR in B2803. Effective at ON. (1) Input circuit Same as in $\overline{\text{START}}$.
$\overline{\text{SVOK}}$ (Servo Normal)	20	Makes L level connection when the servo system is normal. (1) Input circuit Same as in $\overline{\text{START}}$.
$\overline{\text{EXEN}}$ (Ext. Pulse Input Enable)	19	Enables pulse input from the manual pulse generator at L level. (1) Input circuit Same as in $\overline{\text{START}}$.
$\overline{\text{DEC}}$ (Decel LS)	35	Makes L level connection when the deceleration limit switch is at ON. Input signal required for zero return. (1) Input circuit Same as in $\overline{\text{START}}$.

Table 6.6 2CN Input Signals (Cont'd)

Signal Name	2CN Pin No.	Contents
$\overline{\text{SPLS}}$ (Special LS)	34	Makes L level connection when the special positioning limit switch is turned ON. Signal necessary for special positioning operation. Output at ON. Stop occurs after output of the set number of pulses. (1) Input circuit Same as in $\overline{\text{START}}$.
12 / 24 V	1, 33	External power supply for 2CN-2, -3, -19, -20, -34, -35. Prepare 12 or 24 VDC power supply.
+12 V −12 V + 5 V 0 V	45, 46, 47 30, 31, 32 48, 49, 50 10, 11, 12	±12 and +5 V external power supply inputs + 5 VDC ±5% 0.7A +12 VDC ±3% 0.3A (1.6A protective fuse built in) −12 VDC ±3% 50mA
PAI(Phase A) PBI(Phase B)	44 43	External pulse input from manual pulse generator (1) Input circuit  (2) Input voltage and current • 12V system H level: 10 to 12V L level: 0 to 1.2V Input current: 5.5 mA (current flowing through input terminal with input at 0V) • 5V system H level: 3.5 to 5V L level: 0 to 1.2V Input current: 2.3 mA (current flowing through input terminal with input at 0V) (3) PG output form • Open collector • Pull-up type collector output (selection with 12V/+5V switch) (4) Max. count frequency 100kpps (5) Pulse count timing A/B phase 1 × frequency alone 

6.3 1CN/2CN I/O SIGNALS (Cont'd)

Table 6.7 2CN Output Signals

Signal Name	2CN Pin No.	Contents
D/A (D/A Output) 0V (D/A Output 0V)	23 6, 7	Analog speed reference • Output voltage : 0 to ±6V • Output impedance : 220Ω • D/A gain 6 to 13 bits (Set by initial setting) • offset, gain adjustment : Possible (Factory-adjusted by lock paint)
FAULT (Fault Output) 0V (Fault Output 0 V)	36 4	Normally at L level. H level reached under the following conditions: • Hardware error is detected during self-diagnosis. • External input signal $\overline{\text{SVOK}}$ is turned to H level. • External power supply is fault. • B2803 deviation counter is overshot. (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 (Coin Output) 0 V (Coin Output 0 V)	37 5	Turns to L level when the number of lag pulses on the deviation counter enters the set range of COIN detection width. (1) Output circuit Same as in FAULT output.
+12 V 0 V	27, 28 8, 9	+12 V power supply for manual pulse generator Max output current : 200 mA
+5 V 0 V	25, 26 8, 9	+5 V power supply for manual pulse generator Max output current : 200 mA
+TG −TG	14 13	TG signal junction output

6.4 LED INDICATOR LAMP

Table 6.8 LED Indicator Lamps

Name	Color	Description	
RDY	R	Indicates the self-diagnosis result of module. Linked with input relay READAY.	
P. OK	R	Lit when external power supply input (+5 V, +12 V, −12V) 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.	Lit in run mode.
RVS	R	Lit while reverse run command is output.	
STAT	R	Lit when external input signal $\overline{\text{START}}$ is at L level.	
STOP	R	Lit when external input signal $\overline{\text{STOP}}$ is at L level.	
DEC	R	Lit when external input signal $\overline{\text{DEC}}$ is at L level. Linked with input relay DECEL LS.	
ENB	R	Lit when B2803 is ready to input external pulse from the manual pulse generator.	
SPLS	R	Lit when external input signal $\overline{\text{SPLS}}$ is at L level.	
COIN	R	Lit while COIN signal is distributed. Linked with input relay COIN.	
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.	
CLMP*	R	Lit when the number of deviation counter lag pulses exceeds the saturated value.	
+	R	Lit when the sign of deviation counter lag pulses is plus.	
15	R	Display 16,384 for the number of deviation counter lag pulses.	
14	R	Display 8,192 for the number of deviation counter lag pulses.	
13	R	Display 4,096 for the number of deviation counter lag pulses.	
12	R	Display 2,048 for the number of deviation counter lag pulses.	
11	R	Display 1,024 for the number of deviation counter lag pulses.	
10	R	Display 512 for the number of deviation counter lag pulses.	
9	R	Display 256 for the number of deviation counter lag pulses.	
8	R	Display 128 for the number of deviation counter lag pulses.	
7	R	Display 64 for the number of deviation counter lag pulses.	
6	R	Display 32 for the number of deviation counter lag pulses.	
5	R	Display 16 for the number of deviation counter lag pulses.	
4	R	Display 8 for the number of deviation counter lag pulses.	
3	R	Display 4 for the number of deviation counter lag pulses.	
2	R	Display 2 for the number of deviation counter lag pulses.	
1	R	Display 1 for the number of deviation counter lag pulses.	

* Deviation counter saturated value (CLMP) varies depending on D/A gain setting in initial setting.

Table 6.9 PG Output Form Selection

D/A Gain	Saturated Value ("CLMP" lit)	Deviation Counter Flow (Error Code 04)
6 bits	42 pulses or more	64 pulses or more
7 〃	84 pulses or more	128 pulses or more
8 〃	168 pulses or more	256 pulses or more
9 〃	336 pulses or more	512 pulses or more
10 〃	672 pulses or more	1,024 pulses or more
11 〃	1,344 pulses or more	2,048 pulses or more
12 〃	2,688 pulses or more	4,096 pulses or more
13 〃	5,376 pulses or more	8,192 pulses or more

6.5 SWITCH SET

(1) 1 SW Setting

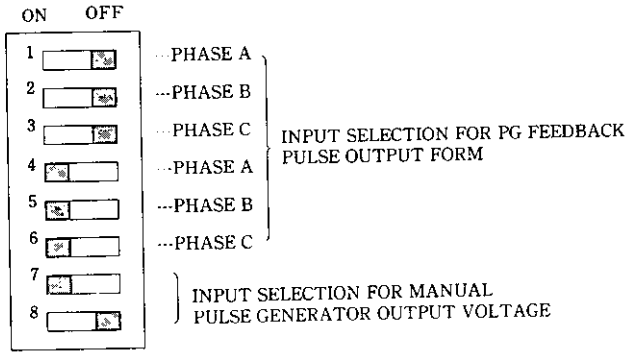


Fig. 6.2 1SW

Table 6.10 PG Output Form Selection

	Phase A		Phase B		Phase C	
	1SW-1	1SW-4	1SW-2	1SW-5	1SW-3	1SW-6
+12 V Voltage Output	ON	OFF	ON	OFF	ON	OFF
+5 V Line Driver	OFF	ON	OFF	ON	OFF	ON

Note: Turn ON one of the switch pairs below and turn off the other.
Switch combinations: 1SW-1 and 1SW-4, 1SW-2 and 1SW-5, and 1SW-3 and 1SW-6.

Table 6.11 Manual Pulse Output Voltage Selection

	1SW-7	1SW-8
+12 V	ON	OFF
+5 V	OFF	ON

Note: Be sure to set either one of 1SW-7 or 1SW-8 to ON.

(2) 2 SW Setting

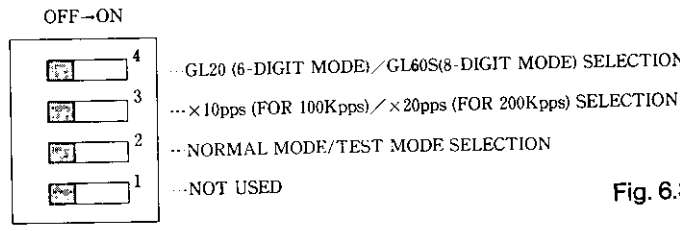


Fig. 6.3 2 SW

The contents of 2 SW setting is preset in B2803 when turning on power supply or resetting the module. For returning from the test mode to normal mode, power supply must be turned on again.

Table 6.12 2 SW Setting

2 SW	OFF	ON
2 SW-4	GL20 (6-digit mode)	GL40, 60, 70(8-digit mode)
2 SW-3	×10pps(For 100kpps)	×20pps(For 200kpps)
2 SW-2	Normal mode	TEST mode
2 SW-1	Not used	Not used

(3) Factory Setting

1 SW

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

2 SW

2 SW-4	OFF
2 SW-3	OFF
2 SW-2	OFF
2 SW-1	OFF

(4) TEST Mode

When entering TEST mode by turning 2 SW-2 on, the feedback system is cut and fixed level is output by analog output. This function is used for adjusting offset and gain.

Table 6.13 TEST Mode Analog Output

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

7. TEST OPERATION ADJUSTMENT

7.1 CHECKS BEFORE TEST OPERATION

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

(1) Incorrect connection of the power supply (±12 V, +5 V) to the B2803 may burn out or damage electrical parts in the B2803.

(2) If the wires are connected in reverse polarity to the motor, TG, and 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 the 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 B2803 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
- B2803 : [P.OK]

(2) Run the motor by giving reference pulses of a low frequency.

- When FB pulses phases A and B are input correctly, [PHA] [PHB] blinks, respectively.
- With the reference for foward running, the number of deviation counter lag pulses is indicated as ⊕ and LED ⊞ lights.
  Check that commanded rotation direction is the same as that of the motor.
- With the reference for forward running, the motor runs CCW when viewed from the load side.
- Check that the motor stops when the reference pulse is discontinued.

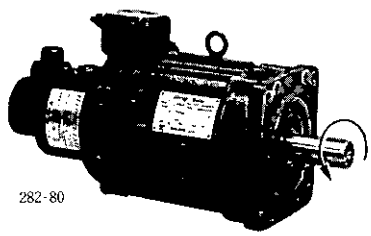


Fig. 7.1 Direction of Motor Rotation at Forward Running Command

(a) The number of lag pulses can be monitored by deviation display LED.

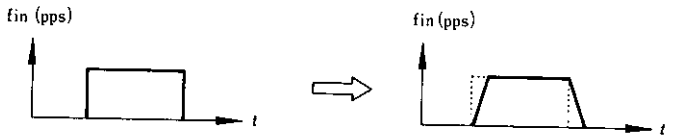
(b) If the number of lag pulses is within the setting range of D/A bit, its adjustment has been completed.

(c) When the number of D/A converter bits is changed from 13 to 6 and D/A gain sets 1 gain = 13 bits, the number is doubled (×2, ×4, ×8). Therefore, after changing D/A bit, turn the Servopack IN-B potentiometer to the left by two scales and adjust the number again.

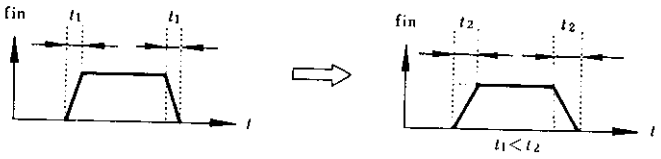
• Corrective action when adjustment is disabled

When D/A gain is set to 13 bits and overshoot or undershoot cannot be provided even by turning the potentiometer fully to the left, further adjustment is impossible. Take action as follows.

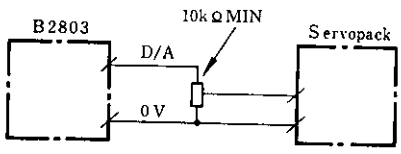
① Provide accel/decel control for command pulse train input and enter lamp input.



② If lamp input is entered, make accel/decel time longer.



③ Divide the resistance of B2803 D/A output to make reference voltage to Servopack smaller.



7.3 ADJUSTMENT

Perform the adjustment when servomotor is combined with the matching machine.

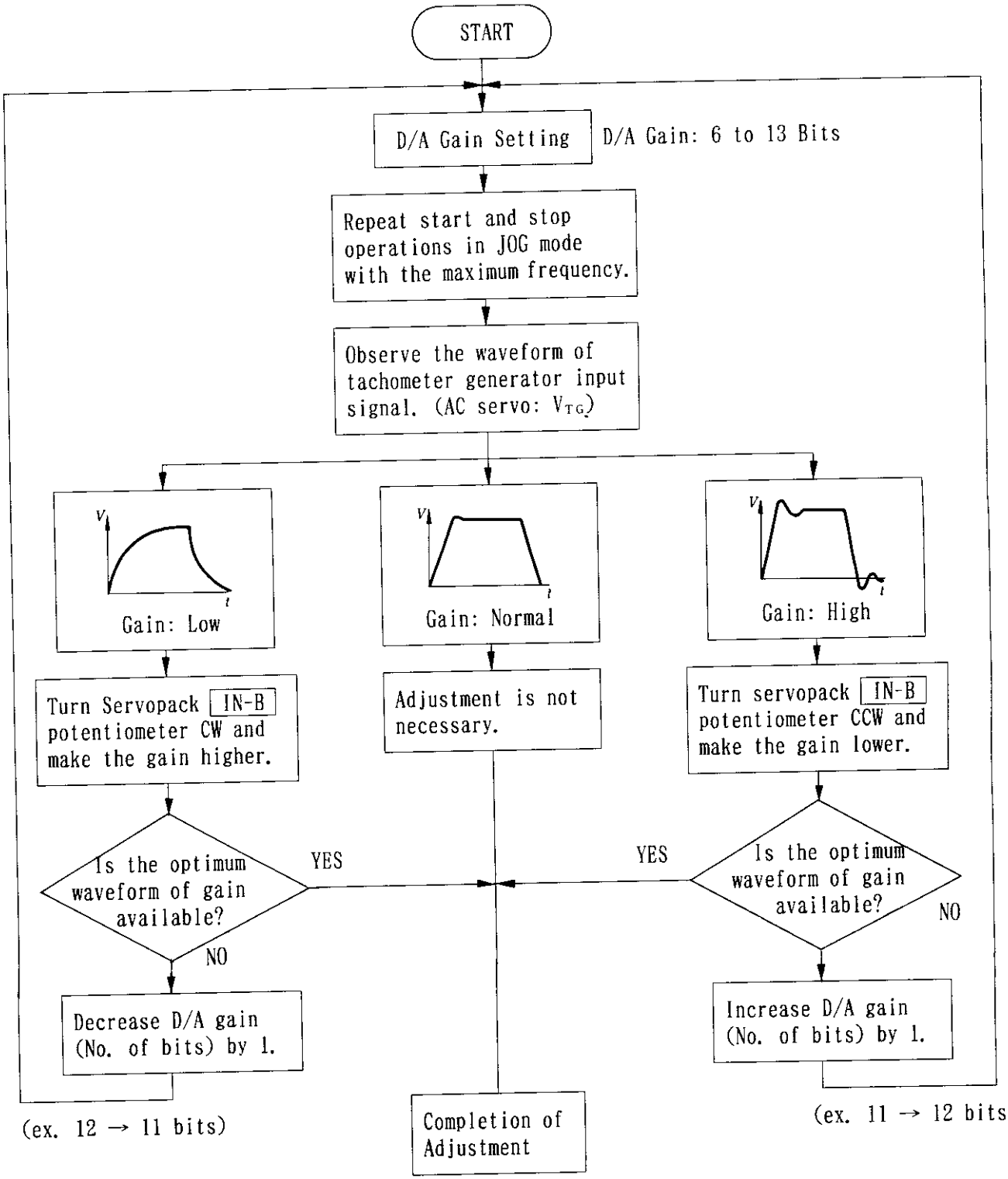


Fig. 7.2 Adjustment Flow Chart

7.4 D/A GAIN SETTING

(1) For setting D/A converter gain, first calculate the starting time and position loop gain. Table 7.1 shows calculation method of the starting time and loop position gain by using a formula for mechanical items and electrical specifications.

Table 7.1 Mechanical Items and Electrical Specifications

Mechanical Items		Motor Used		Applicable Servopack	
Axis to be used		Motor type		Type	CACR- CPCR-
Drive section speed (Max)	/min	Rated speed(N)	rpm	AC input	V. ϕ
Total reduction ratio		Motor rated torque(T_M)	kg • cm	Max output voltage	V
Motor shaft converted load torque (T_L)	kg • cm	Rotor inertia (GD^2_n)	kg • cm^2	Max output Current	A
Motor shaft converted load inertia (GL^2_L)	kg • m^2	Motor rated current (Ia)	A	Continuous output current	A
Electrical resolution	/pulse	Feedback unit type	TFUE	Max current set value (IP)	A
Electrical accuracy (at the motor shaft end)	±pulse	TG−___V／_____rpm PG−___P／rev		Ip is adjusted according to mechanical specifications. When required, refer to Technical Sheet of Servopack.	

• Starting time

$$ta=\frac{(GD^2_n+GD^2_L)\times N\times 10^{-2}}{9.55\times(I_p/I_a\times T_M\times 0.95-T_L)}=\square\text{s}$$

• Position loop gain

$$K_p=1.4\times\frac{1}{ta}=\square\,s^{-1}$$

• No. of deviation counter lag pulses

$$\varepsilon=\frac{fin}{K_p}=\square\text{pulses}$$

fin: command pulse frequency

(2) For setting the number of D/A converter bits (gain), select the number from Table 7.2 by using a calculated value of the number of deviation counter lag pulses ε.

Table 7.2 Bits of D/A Converter

No. of Deviation Counter Lag Pulses: ε	No. of D/A Converter Bits
$\leqq \varepsilon <$ 42	6 bits
42 $\leqq \varepsilon <$ 84	7 bits
84 $\leqq \varepsilon <$ 168	8 bits
168 $\leqq \varepsilon <$ 336	9 bits
336 $\leqq \varepsilon <$ 672	10 bits
672 $\leqq \varepsilon <$ 1, 334	11 bits
1, 334 $\leqq \varepsilon <$ 2, 688	12 bits
2, 688 $\leqq \varepsilon <$ 5, 376	13 bits

Note : Since the number of bits differs in 1000 I/O B1083C and D/A converter. Attention must be paid at switching 1000 I/O to 2000 I/O.

7.4 D/A GAIN SETTING (Cont'd)

(3) Fig. 7.3 shows the relation of the number of deviation counter lag pulses (ε) and D/A converter output with D/A gain setting bits.

CLMP is provided when N bit (6 to 13) is designated in D/A gain and the number of lag pulses is more than $2^N \times 0.65625$.

If the number of lag pulses exceeds 2^N, deviation counter overshoots.

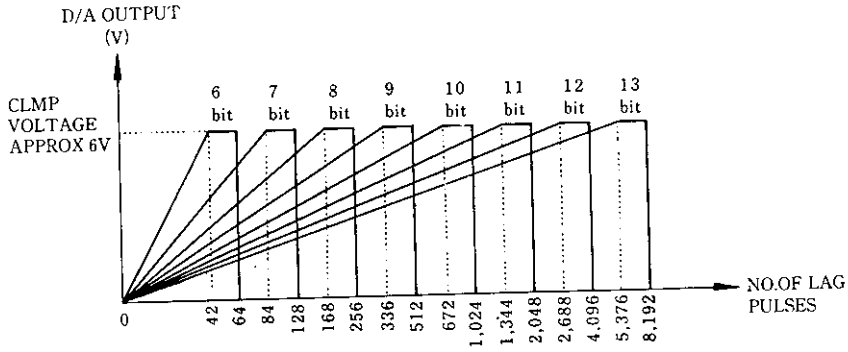


Fig. 7.3 Relation of Lag Pulses and D/A Output

7.5 USE OF ABSOLUTE ENCODER

(1) Current Position Exceeding the Range

In a system provided with an absolute encoder, the current position data stored in the absolute encoder may not be in the range of absolute position when operating in absolute mode. (B2803 turns on CURRENT VALUE OVER input relay and prohibits automatic positioning operation.)

In this case, move the current position within the range of absolute position by performing JOG operation, handle operation and zero return setting. CURRENT VALUE OVER cannot be released in the current position setting.

Otherwise reset the encoder by the following procedures:

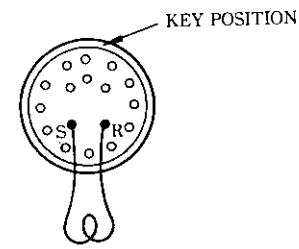
(2) Setup Method

If revolution data amount is to be set to 0 at motor start or the absolute encoder is not connected to the battery for more than four days, the following setup is required: (This is because the encoder capacitor is discharged and the internal elements may not operate normally.)

(a) Short-circuit across R and S pins of encoder connector for two minutes or more (discharge of the encoder capacitor).

(b) Wire the cable normally to connect battery to the encoder.

(c) Turn on the Servopack power and make the SEN signal high level. If an alarm is output at that time, start from (a) again.



Note:

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. 7.4 and remove Servopack CN2 to short-circuit with Servopack side connectors.
3. At setup, turn off the Servopack power supply.

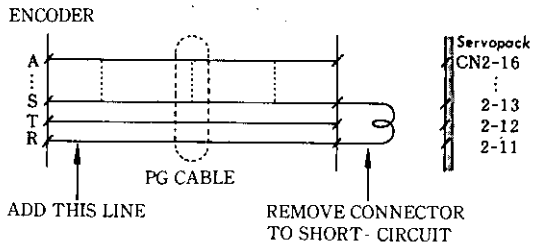


Fig. 7.4 Setup by PG Cable

(3) Battery Module

Be sure to use battery to store position data if absolute encoder power should fail.

① The following battery is recommended:
- Lithium Battery (ER-6C 3.6V × 1)
  Made by Toshiba Battery Industrial Co., Ltd.

② Securely connect the battery so as to prevent an environmental change or a change with the passage of time, causing contact failure.

③ Battery voltage is not monitored in the Servopack. Prevent the voltage from falling below 2.8 V.

④ 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 are available. Fig. 7.5 shows the battery module.

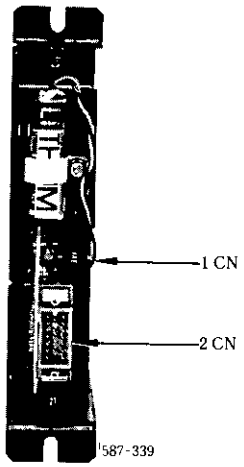


Fig 7.5 Battery Module (JEFMC-Z010)

(4) Battery Replacement

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

(a) Turn on the Servopack power supply and keep SEN signal at a high level for three 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.

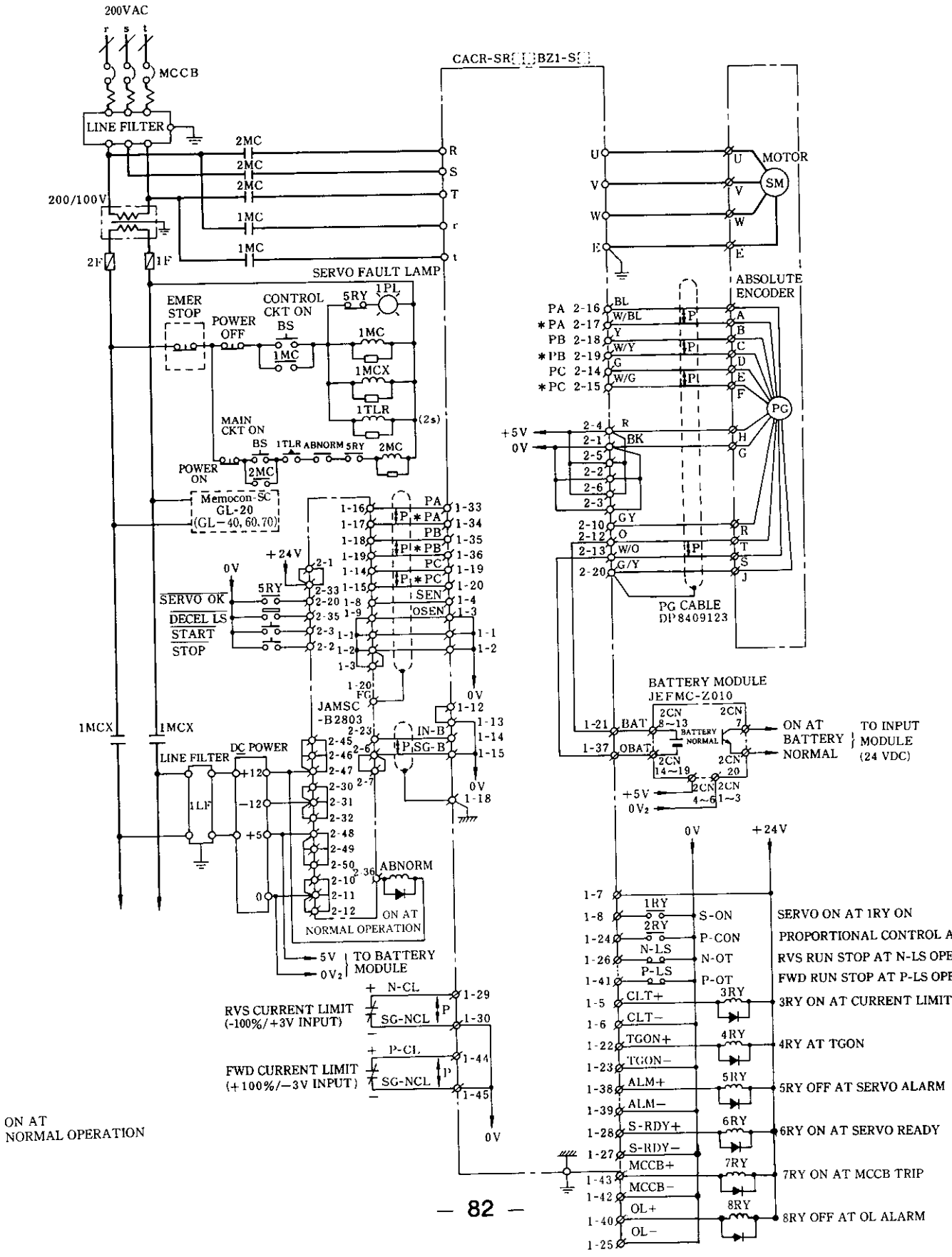
In this way, battery can be replaced with encoder revolution data remaining.
If step (a) is performed, encoder operates normally for four days after the battery is removed.

- The number of lag pulses is monitored by deviation display LED.
- When the number of lag pulses is in the range of D/A bit setting value, the adjustment is completed.

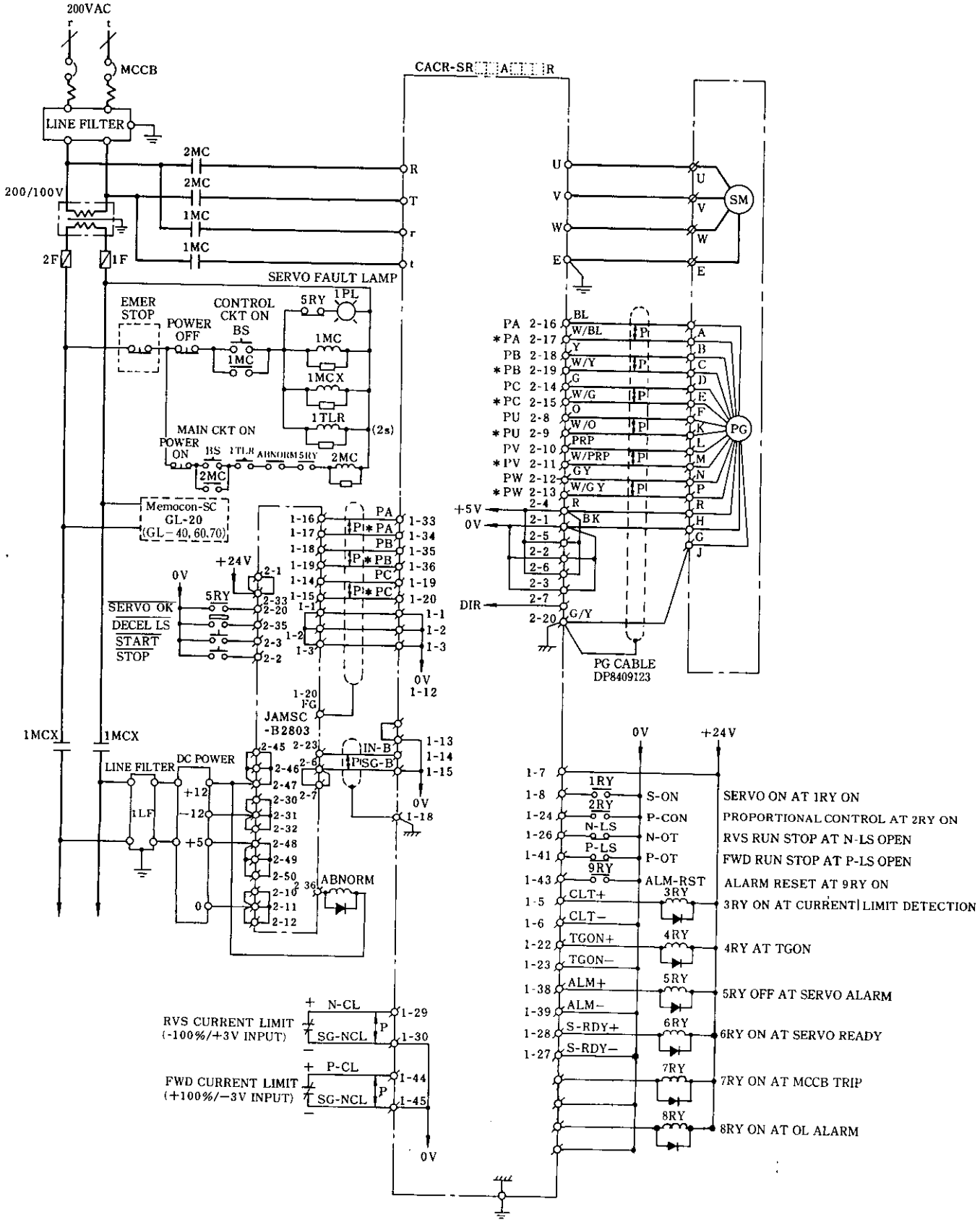
8. CONNECTION

8.1 TYPICAL INTERCONNECTION DIAGRAM

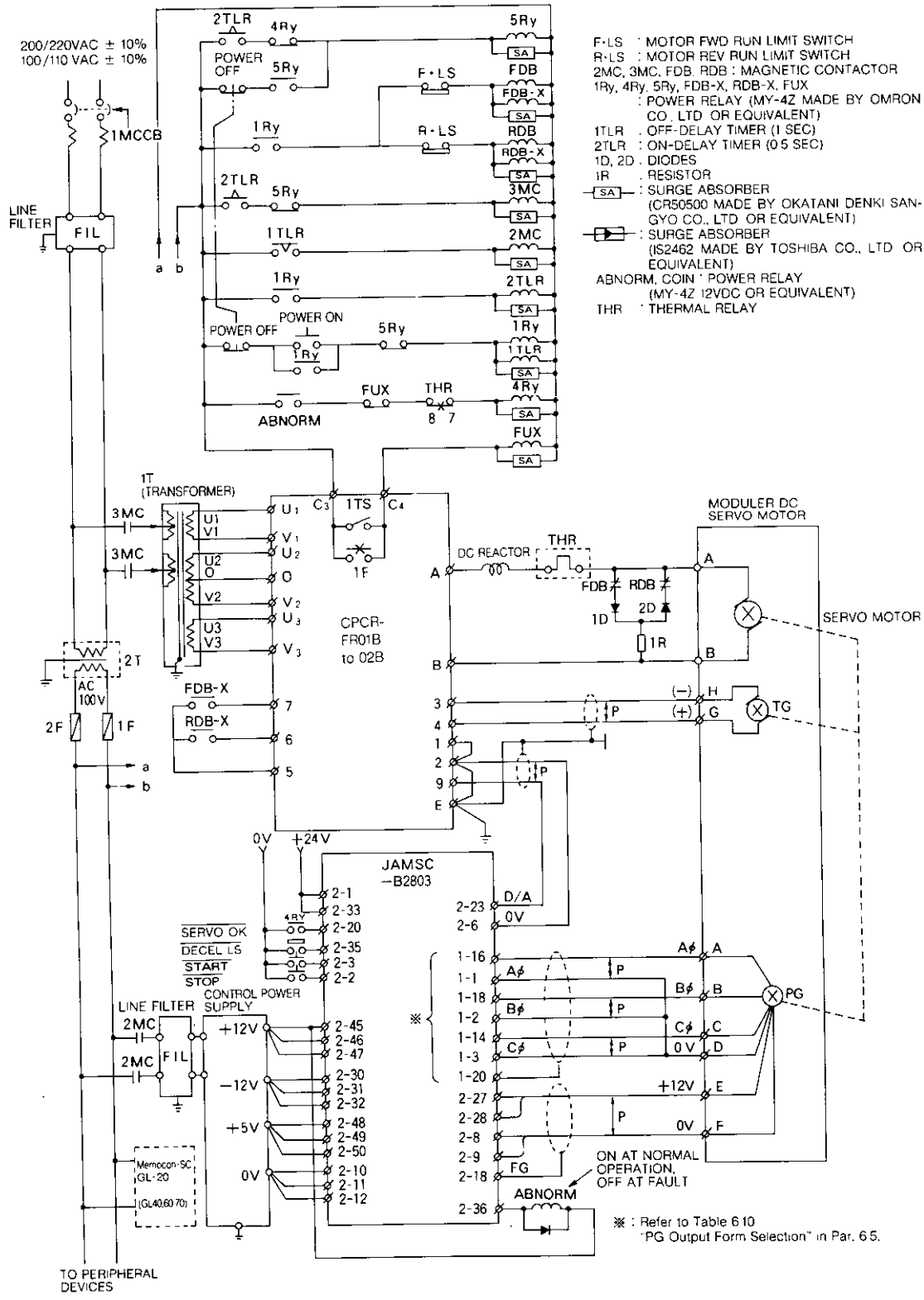
(1) When Used with Servopack Type CACR-SR□□□BZIS□ (Absolute)



(2) When used with Servopack Type CACR-SR □□A□□□□R(Incremental)

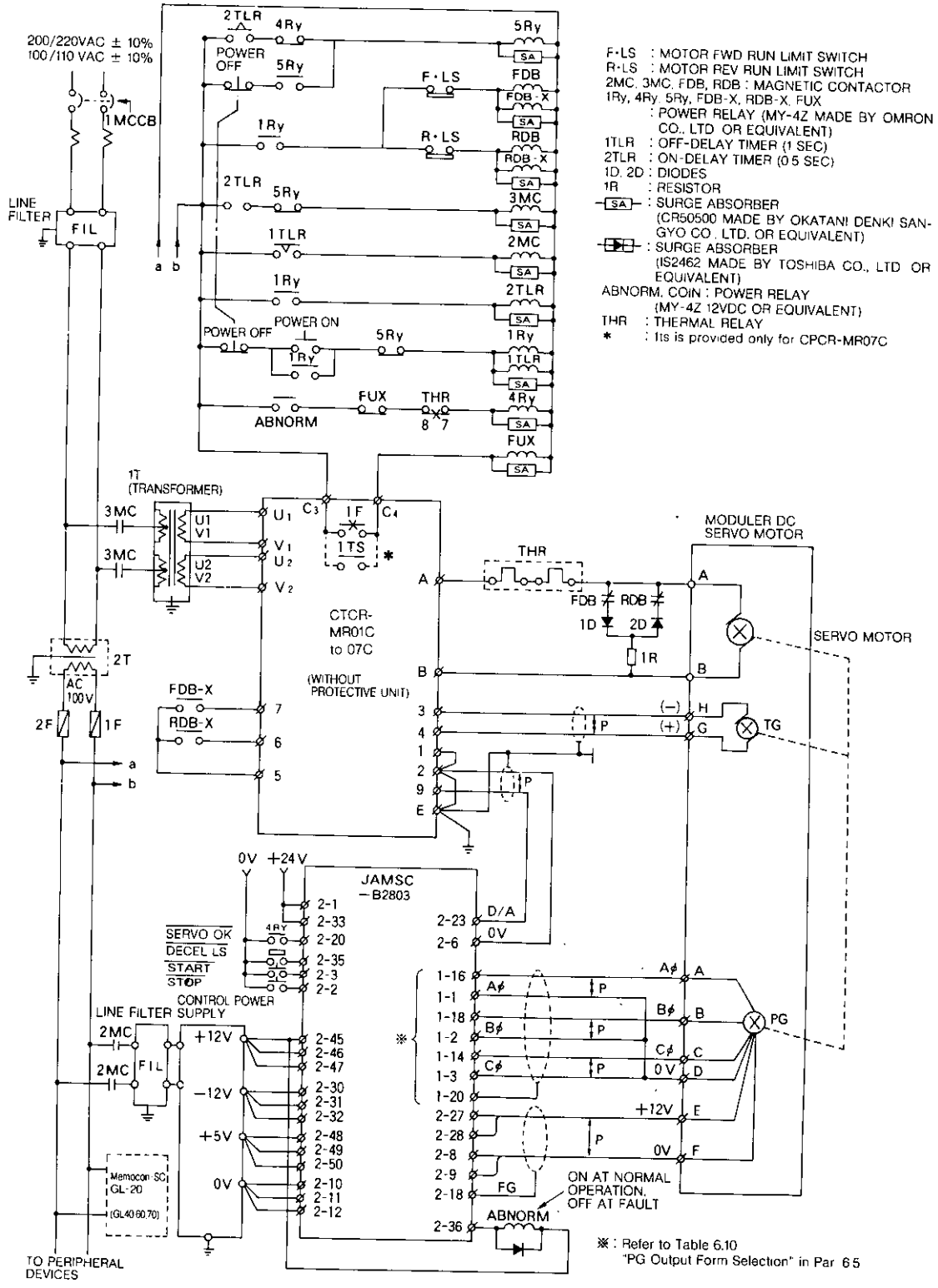


(3) When Used with Servopack Types CPCR-FR01B and 02B

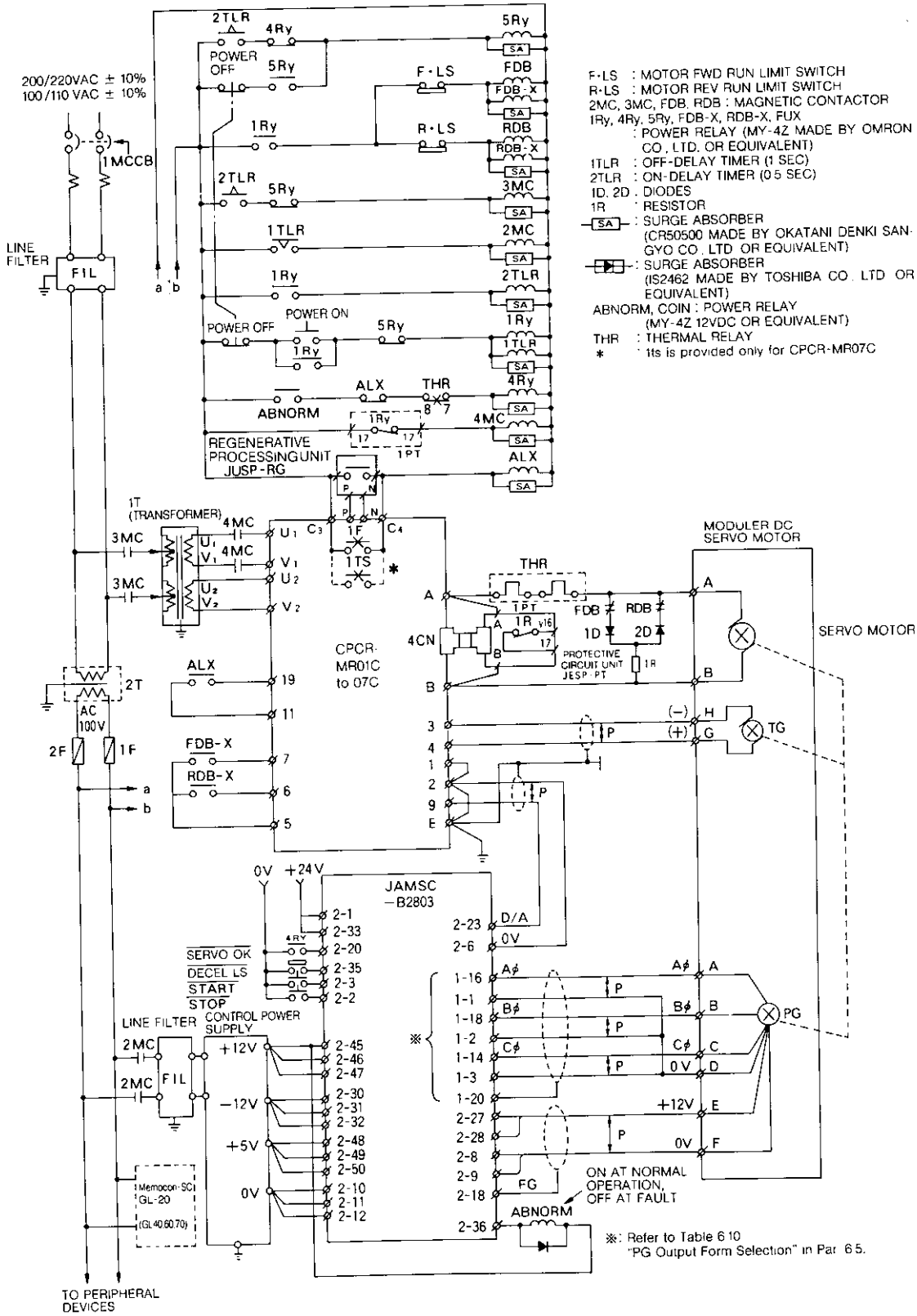


F·LS : MOTOR FWD RUN LIMIT SWITCH
R·LS : MOTOR REV RUN LIMIT SWITCH
2MC, 3MC, FDB, RDB : MAGNETIC CONTACTOR
1Ry, 4Ry, 5Ry, FDB-X, RDB-X, FUX
: POWER RELAY (MY-4Z MADE BY OMRON CO., LTD OR EQUIVALENT)
1TLR : OFF-DELAY TIMER (1 SEC)
2TLR : ON-DELAY TIMER (0.5 SEC)
1D, 2D : DIODES
1R : RESISTOR
SA : SURGE ABSORBER (CR50500 MADE BY OKATANI DENKI SANGYO CO., LTD OR EQUIVALENT)
: SURGE ABSORBER (IS2462 MADE BY TOSHIBA CO., LTD OR EQUIVALENT)
ABNORM, COIN : POWER RELAY (MY-4Z 12VDC OR EQUIVALENT)
THR : THERMAL RELAY

(4) When Used with Servopack Types CPCR-MR01C to 07C (without Protective Unit)

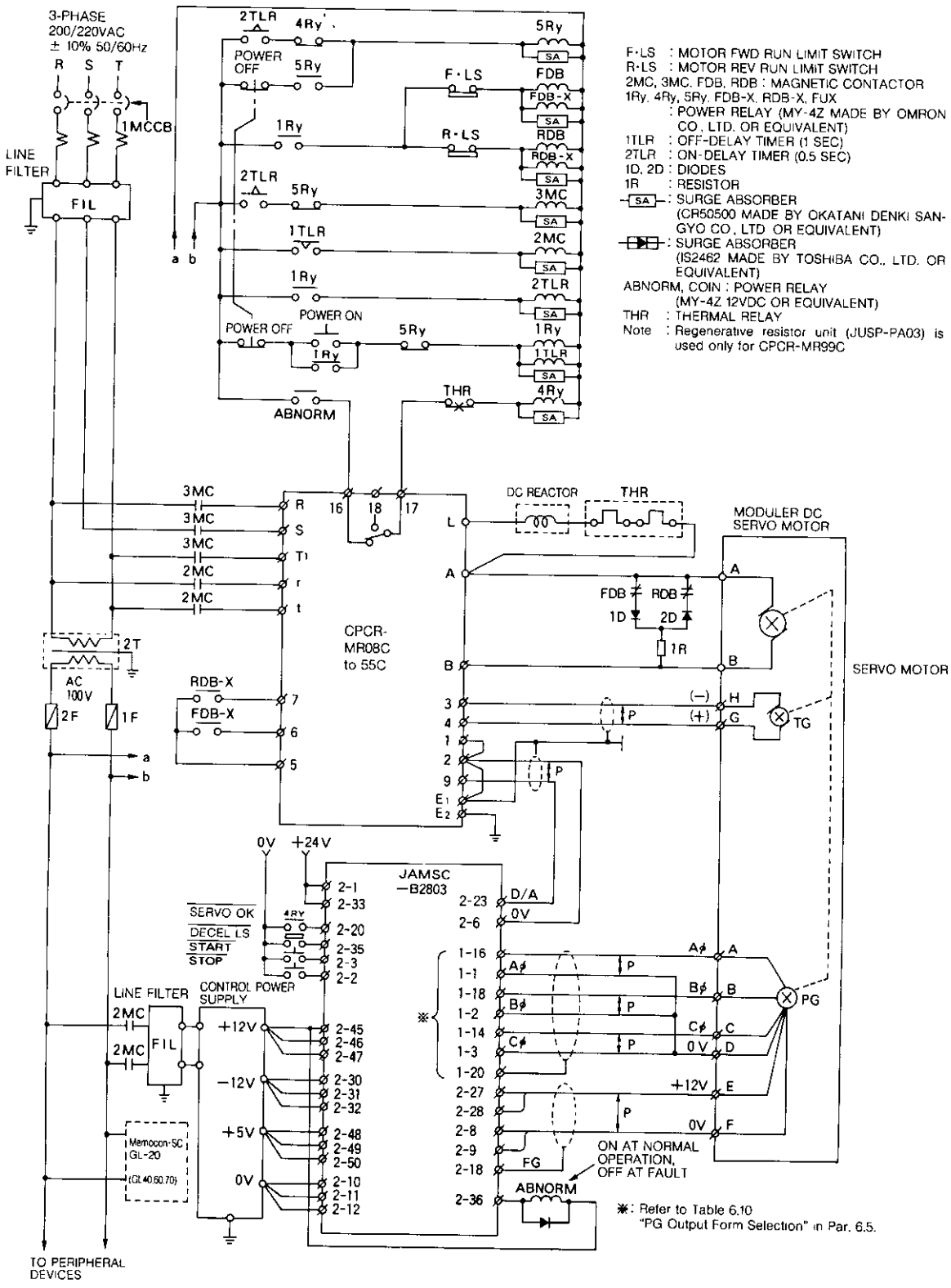


(5) When Used with Servopack Types CPCR-MR01C to 07C (with Protective Unit, Regenerative Processing Unit)

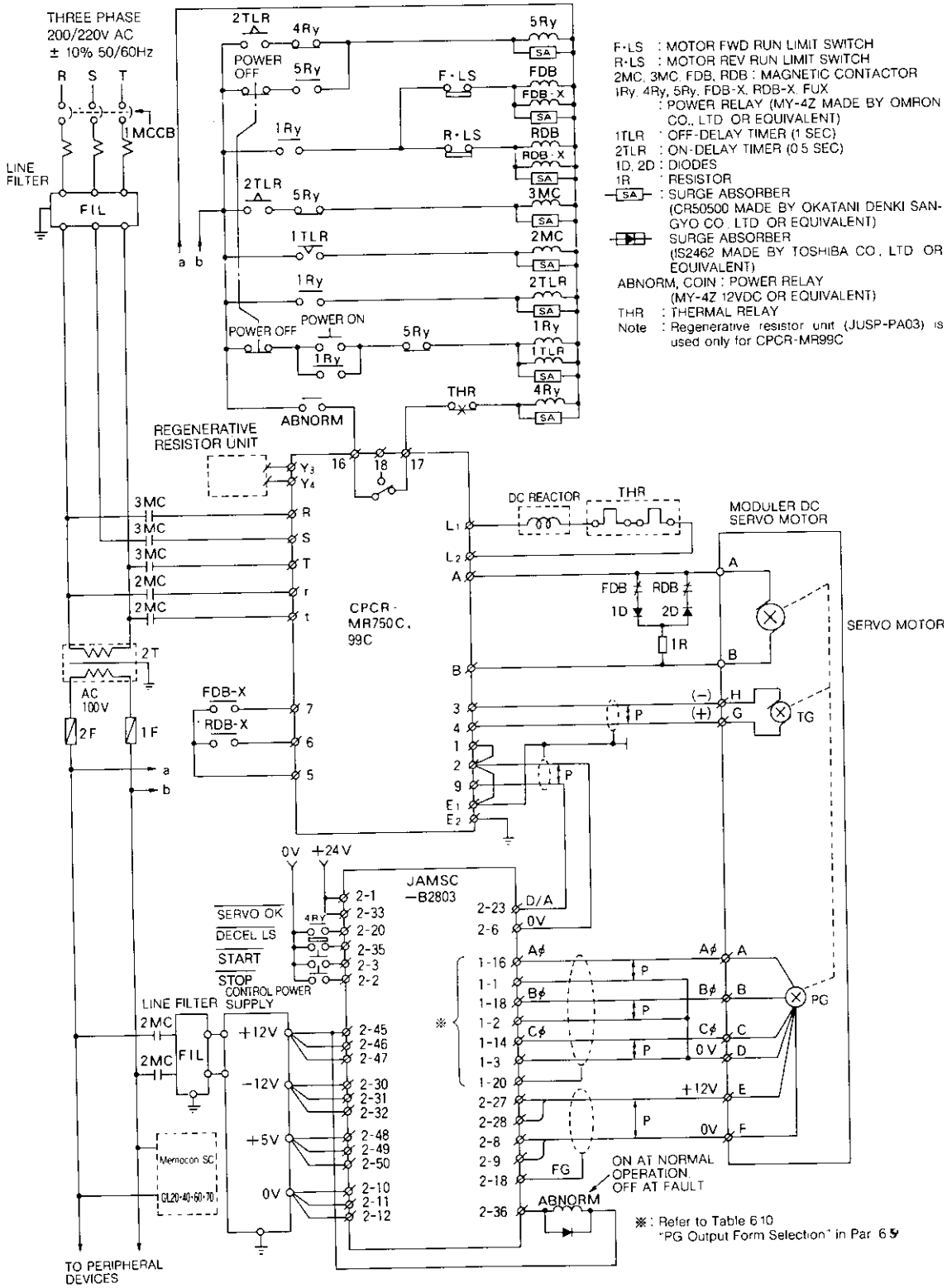


F·LS : MOTOR FWD RUN LIMIT SWITCH
R·LS : MOTOR REV RUN LIMIT SWITCH
2MC, 3MC, FDB, RDB : MAGNETIC CONTACTOR
1Ry, 4Ry, 5Ry, FDB-X, RDB-X, FUX : POWER RELAY (MY-4Z MADE BY OMRON CO., LTD. OR EQUIVALENT)
1TLR : OFF-DELAY TIMER (1 SEC)
2TLR : ON-DELAY TIMER (0.5 SEC)
1D, 2D : DIODES
1R : RESISTOR
SA : SURGE ABSORBER (CR50500 MADE BY OKATANI DENKI SANGYO CO., LTD. OR EQUIVALENT)
SURGE ABSORBER (IS2462 MADE BY TOSHIBA CO., LTD. OR EQUIVALENT)
ABNORM, COIN : POWER RELAY (MY-4Z 12VDC OR EQUIVALENT)
THR : THERMAL RELAY
* : 1ts is provided only for CPCR-MR07C

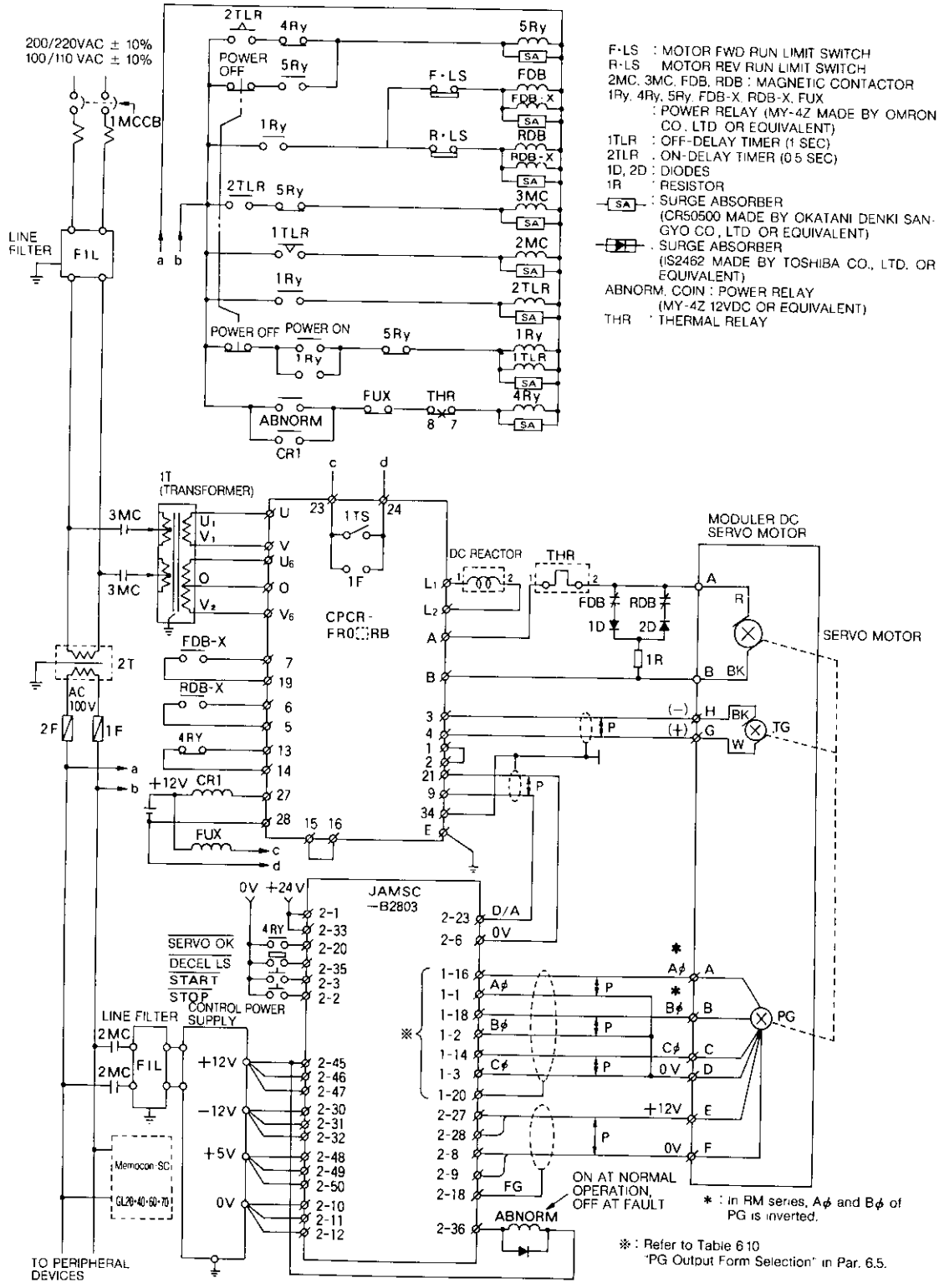
(6) When Used with Servopack Types CPCR-MR08C to 55C



(7) When Used with Servopack Types CPCR-MR75C and 99C



(8) When Used with Servopack Types CPCR-FR01RB to 02RB

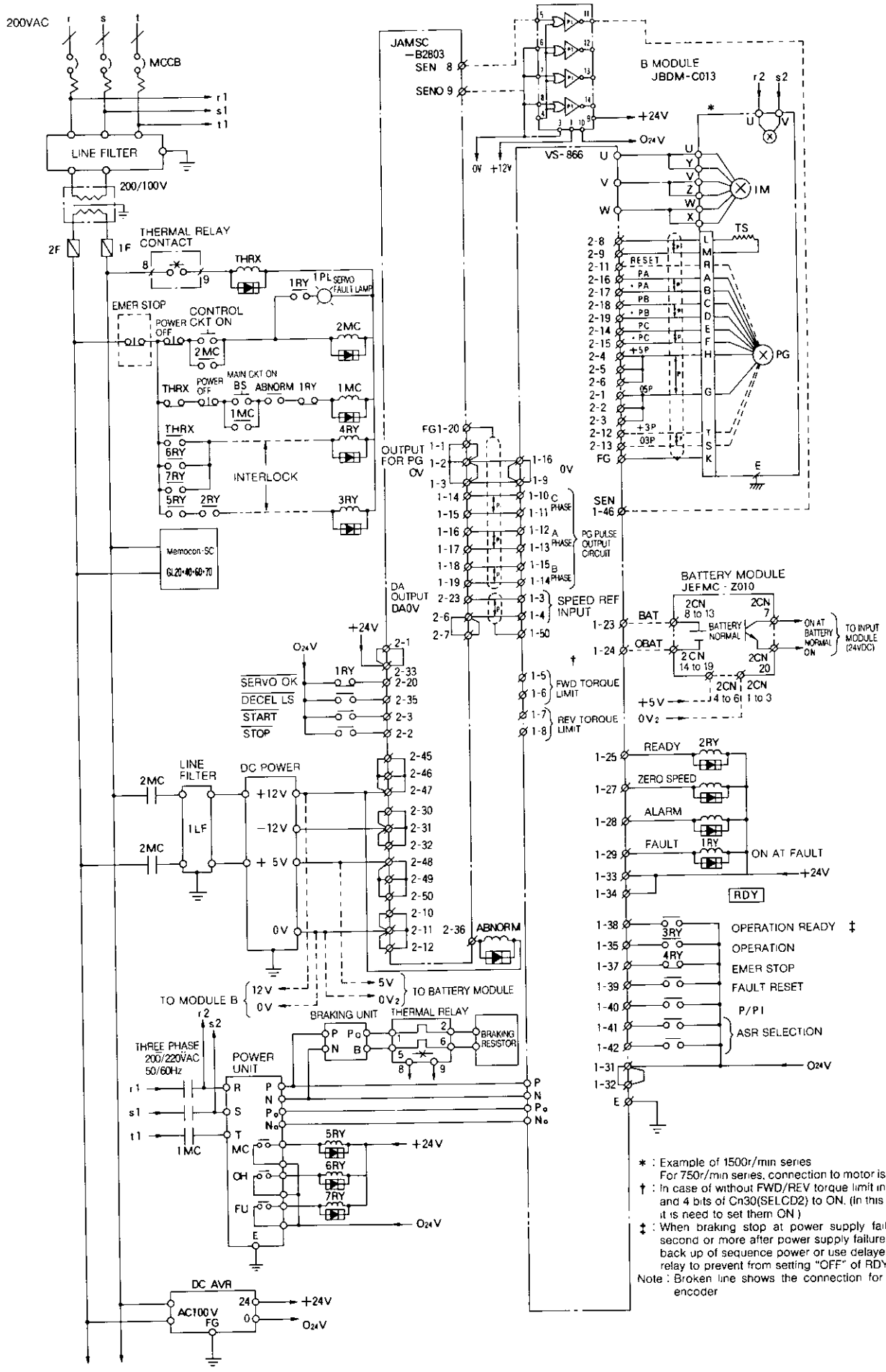


F·LS : MOTOR FWD RUN LIMIT SWITCH
R·LS : MOTOR REV RUN LIMIT SWITCH
2MC, 3MC, FDB, RDB : MAGNETIC CONTACTOR
1Ry, 4Ry, 5Ry, FDB-X, RDB-X, FUX : POWER RELAY (MY-4Z MADE BY OMRON CO., LTD OR EQUIVALENT)
1TLR : OFF-DELAY TIMER (1 SEC)
2TLR : ON-DELAY TIMER (0.5 SEC)
1D, 2D : DIODES
1R : RESISTOR
SA : SURGE ABSORBER (CR50500 MADE BY OKATANI DENKI SANGYO CO., LTD OR EQUIVALENT)
SA : SURGE ABSORBER (IS2462 MADE BY TOSHIBA CO., LTD. OR EQUIVALENT)
ABNORM, COIN : POWER RELAY (MY-4Z 12VDC OR EQUIVALENT)
THR : THERMAL RELAY

* : In RM series, Aϕ and Bϕ of PG is inverted.

※ : Refer to Table 6.10 "PG Output Form Selection" in Par. 6.5.

(9) When Used with Inverter Drive Varispeed-866



8.2 EXTERNAL I/O SIGNALS OF B2803

(1) 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 SERVO OK and DECEL LS input signals is mandatory. Whenever the SERVO OK input signal is open, B2803 remains inactive. Zero return is possible in either mode A nor B when DECEL LS input signal is open.

(2) After turning on the internal power supply or resetting the module, B2803 waits until FAULT output is turned on (normally) once and SERVO OK input is turned on B2803 does not distribute D/A output.

8.3 WIRING FOR POWER SUPPLY

(1) Be sure to make sequence so that AC power is supplied to Servopack at 0.5 seconds and over after DC power supply unit (1PS) is energized. (Make sequence so that CLEAR signal will be applied to the digital control unit within the above period)

(2) Disconnect the AC power supply to the Servopack at least 1 second before DC power supply unit (1PS) is de-energized.

(3) If B2803 is applied for vertical axis control, avoid dropping of object at power-on or power-off.

8.4 WIRING OF PROTECTIVE DEVICES

(1) 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 relay and that the power supply to Servopack is interrupted if they should operate.

(2) 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 following sequence.

- Apply dynamic braking if alarm limit switch operates.
- Disconnect all the power if overtravel limit switch operates.

(3) 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 alarm and overtravel limit switch.

8.5 WIRING PRECAUTIONS

(1) Multi-core twisted shielded wire should be used as signal lead to Servopack.

(2) Use a twisted shielded wire as feedback pulse signal lead from PG to Servopack.

(3) • D/A output line: 3m (max)
• PG feedback line
+5V line receiver input: 20m (max)
+12V line receiver input: 5m (max)

(4) For pulse reference line grounding, connect the shielding to Servopack.
For feedback line grounding, connect it to FG of B2803.

(5) 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 B2803 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.

9. TROUBLESHOOTING

9.1 B2803 ERROR CODE

This paragraph describes the contents of various errors occurring when using the B2803, error codes and measures to be taken in the event of error.

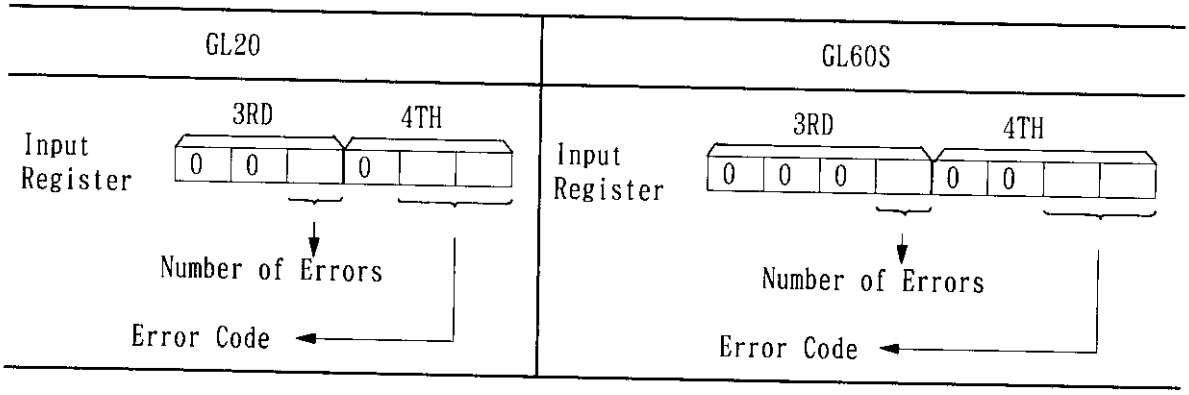
(1) Monitoring of Error Code

Error code can be monitored with the aid of the programing panel or RAP. For monitoring, implement the following procedures.

1. Error code monitor mode is assumed by turning output coil monitor 1 to ON, monitor 2 to OFF and monitor 3 to OFF.

2. The error code and the number of errors can be checked with the third and fourth input registers.

3. The number of errors covers those classified according to error code. Therefore, even when multiple errors of the same error code occur, they are counted as 1. The smallest error code of those occurring is displayed as an error code.



9.1 B2803 ERROR CODE (Cont'd)

(2) Hardware Error

Table 9.1 Hardware Error

Error Code	Cause	Corrective Action
—	ROM total check 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 B2803.
—	RAM check error	
—	WDT error	
01	External power supply fault ("P.OK" indicator lamp goes out.)	Check external power supply (+12V and+5V). On elimination of cause, error code disappears to enable continuing operation.
02	Servo fault External input signal SVOK (SERVO OK) is at H level.	Check the SVOK input signal line. On elimination of cause, error code disappears to enable resuming operation.
03	Absolute encoder fault Indicates absolute data fault or battery fault.	Setting at Servopack and checking feedback signal system and battery module are performed. Operates normally by module resetting, initial setting and correct setting of the number of absolute encoder output pulses.
04	Deviation counter over Indicates the number of lag pulses at absolute encoder overflow.	Review the servo system. For restoring the normal status, the module must be reset or the internal power supply must be turned off and then on again.

Notes:

1. If a hardware error occurs during any B2803 operation, pulse output stops (with deceleration time 0) and deviation counter continues to be cleard. (at 5msec interval)
2. When the external power supply or the servo system is faulty, eliminating the cause turns off the error code and restores the normal status.
3. Even if the operation of B2803 stops during positioning due to servo fault the current value remains correct so far as the feedback signal line is normally operating.
4. The internal power supply means the power supply for the CPU module.

(3) Setting and Operational Errors

Table 9.2 Setting and Operational Errors

Error Code	Cause	Corrective Action
20	(1) Set data range is not met. (2) Output coil condition is not satisfied at the time of setting. (3) Initial setting or current value setting was attempted at other than stop (before completion of pulse output). (4) When setting 2-step speed pattern positioning, "auto positioning setting" output coil turns on only for one scan. (5) When setting 2-step speed pattern positioning, the relative positions of P_1 and P_2 are not in the same turning direction. (6) When setting 2-step speed pattern positioning, distance P_2 is too short to secure an interval for speed V_2. (7) Special positioning was attempted in absolute mode.	Make correct setting again.
21	(1) START is turned on without setting the automatic positioning. (2) Zero return FWD or RVS command is turned on without setting the zero return. (3) Special positioning command is turned on without setting the special positioning. (4) JOGH or JOGL is turned on without JOG setting.	Each start command is disregarded. After selecting the required setting, distribute the start command.
22	Scan time of CPU module is too short.	May occur when the CPU module contains no ladder circuit. Save ladder circuit or assign dummy to prevent error.
23	Zero return was attempted when $\overline{\text{DECEL}}$ LS is turned on.	Move until DECEL LS OFF by JOG or handle operation, and then try zero return again.
24	Current value over When countable range is exceeded in absolute mode, "current value over" input relay is turned on.	Return to the countable range by JOG, handle or zero return operation.

(4) Status Indication at Error

Table 9.3 Status Indication at Error

Error Contents	Input Relay			Indicator Lamp			External Output
	"READY"	"FAULT"	"ERROR"	"RDY"	"ABNO"	"ERR"	"FAULT"
Hardware Error (Self-diagnosis Error)	OFF	ON	Undifin-ed	OFF	ON	Undifin-ed	Output
Hardware Error (Error Codes 01, 02, 03, 04)	ON	ON	ON	ON	ON	ON	Output
Set Error, Operational Error	ON	OFF	ON	ON	OFF	ON	Not output

9.2 TROUBLESHOOTING FOR SYSTEM

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

9.2.1 DC Power Supply

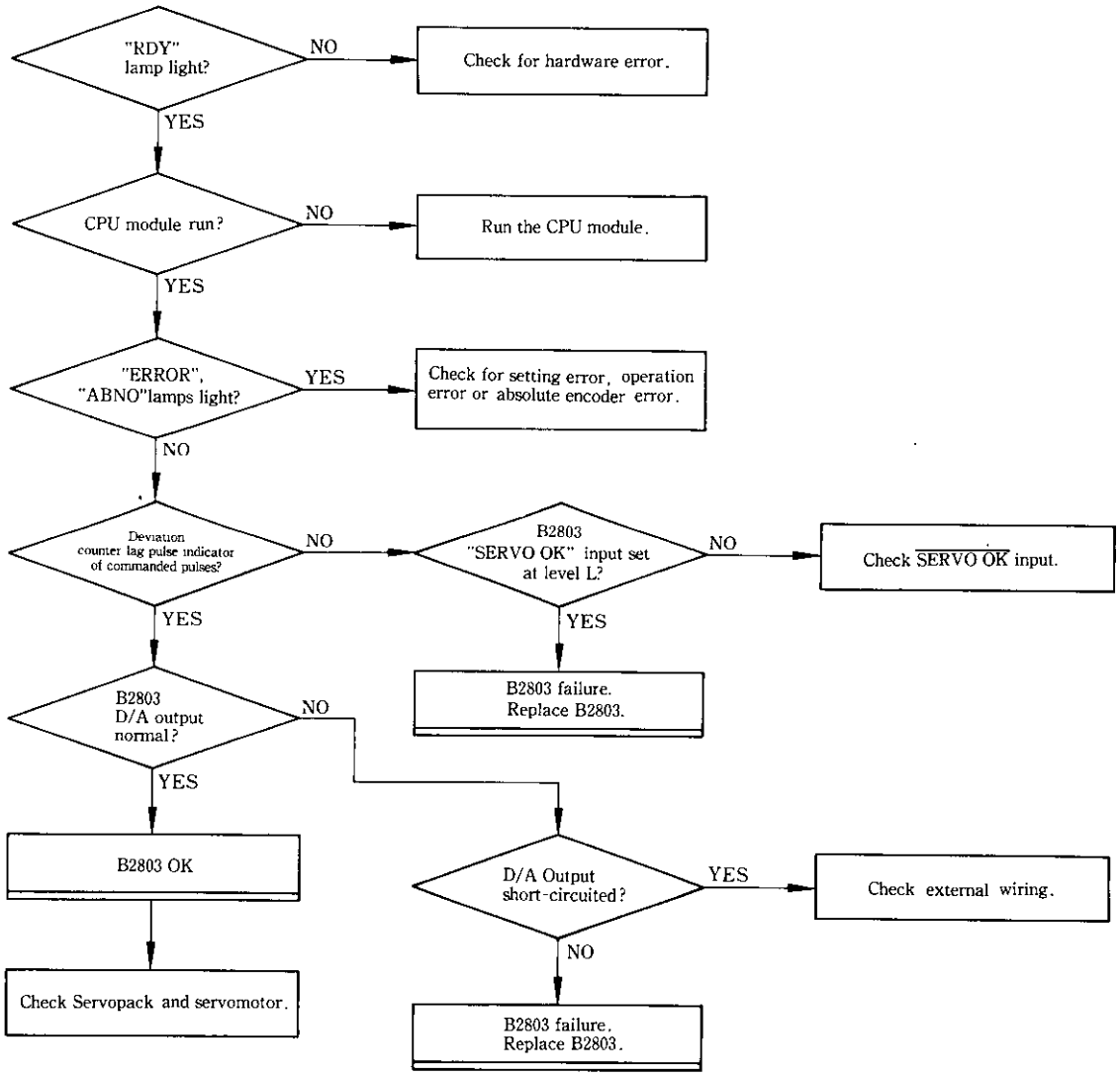
Faulty, or fluctuation of, DC power supply voltage exceeding limits shown below, may cause overrunning of the motor or inaccurate control. Voltage measured at the following terminals in B2803 should not exceed the limits given below.

Terminals No.

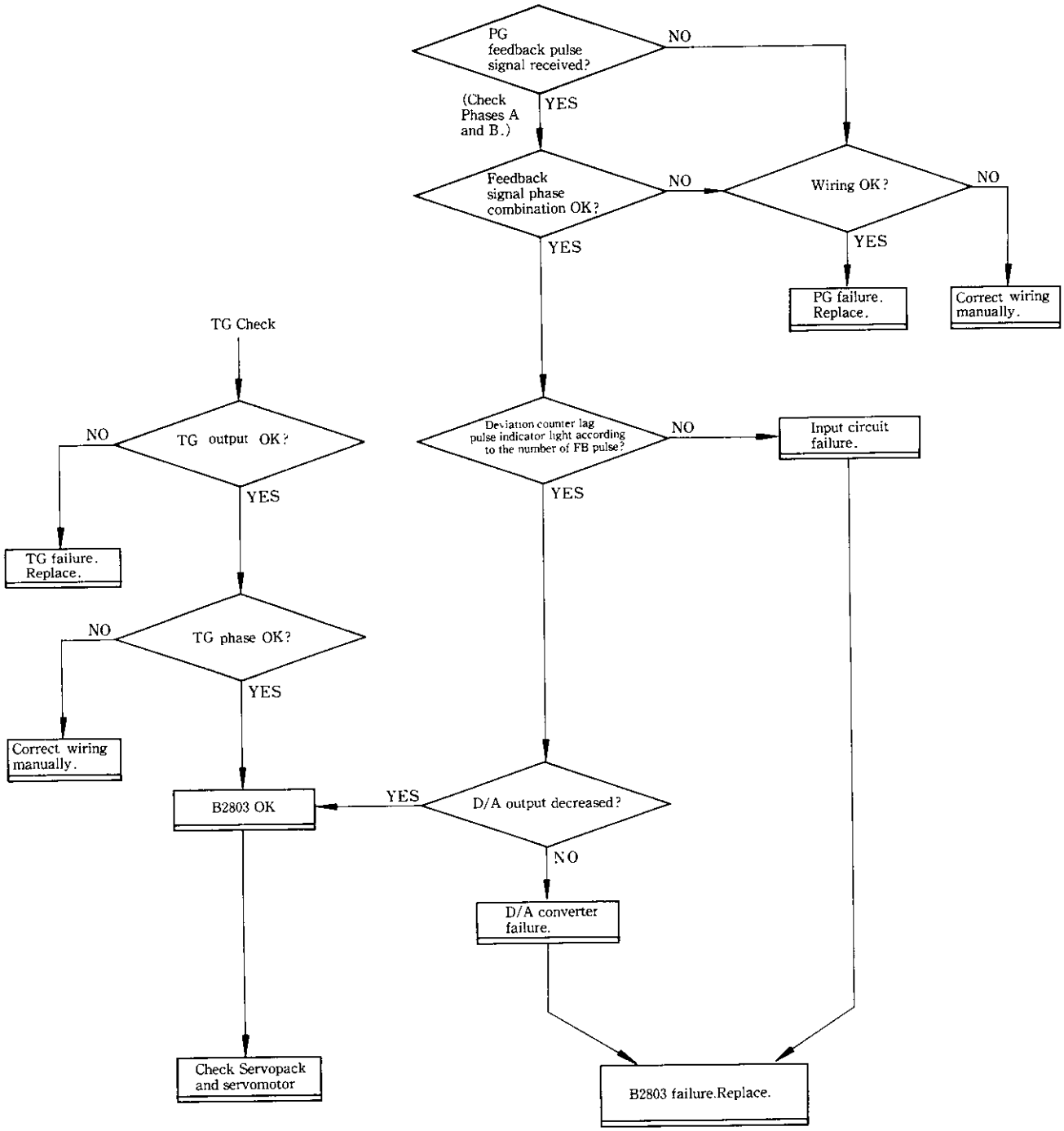
2CN-45, 46, 47: +12 V ±3%
2CN-30, 31, 32: −12 V ±3%
2CN-48, 49, 50: +5 V ±5%
2CN-10, 11, 12: 0 V

If measured voltage exceeds the above limit, check the DC power supply unit and wiring.

9.2.2 Motor does not Rotate

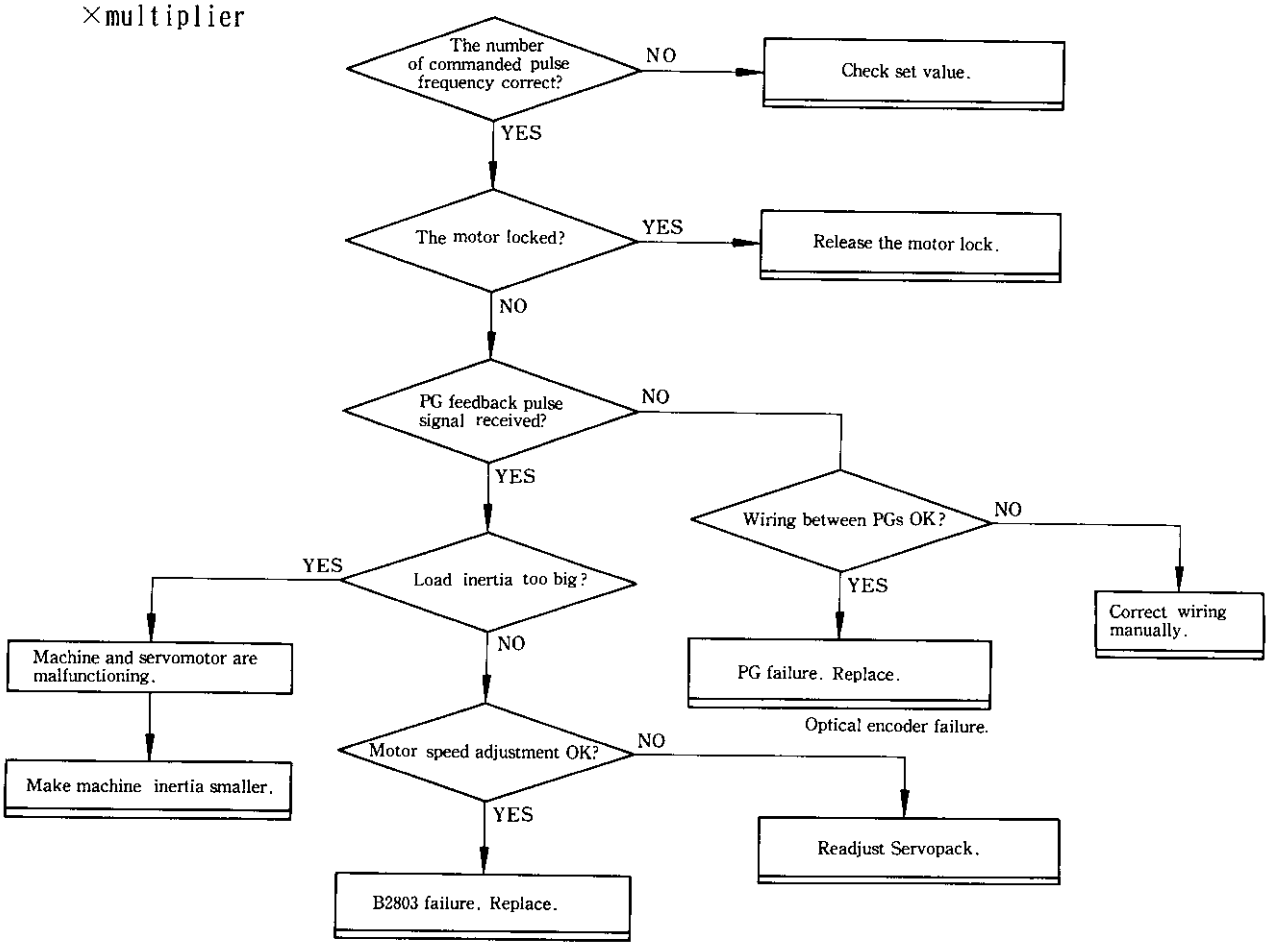


9.2.3 Motor Runs but dose not Stop (Including Overrun)

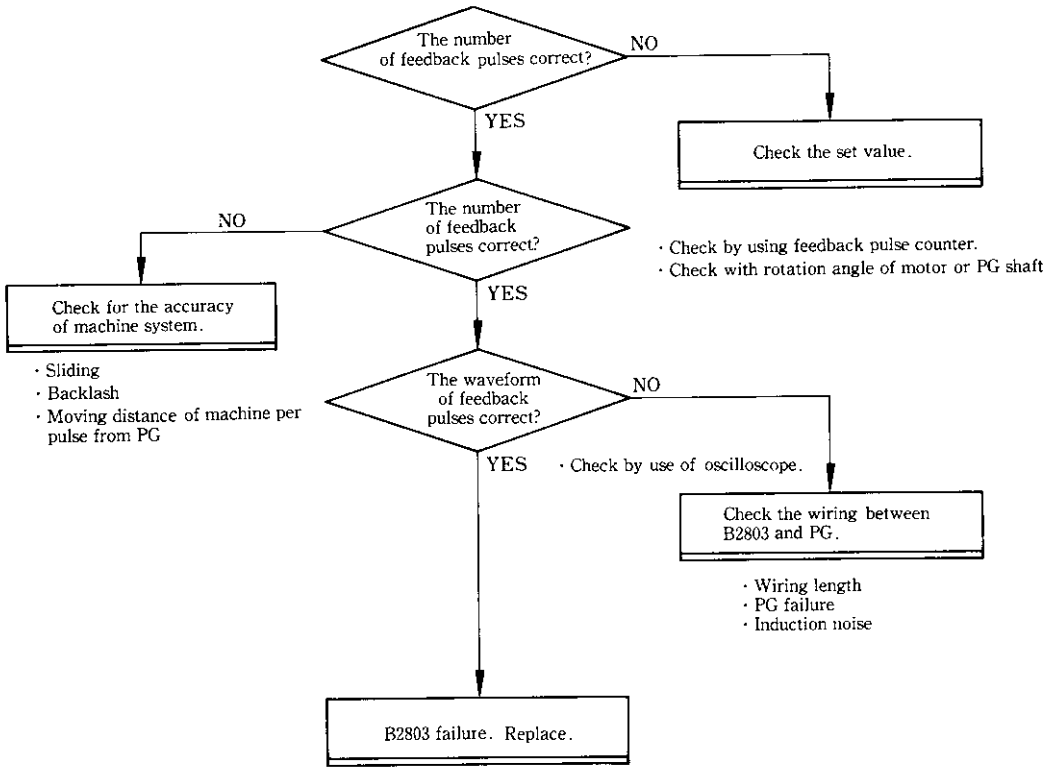


9.2.4 Overflow Signal Often Appears

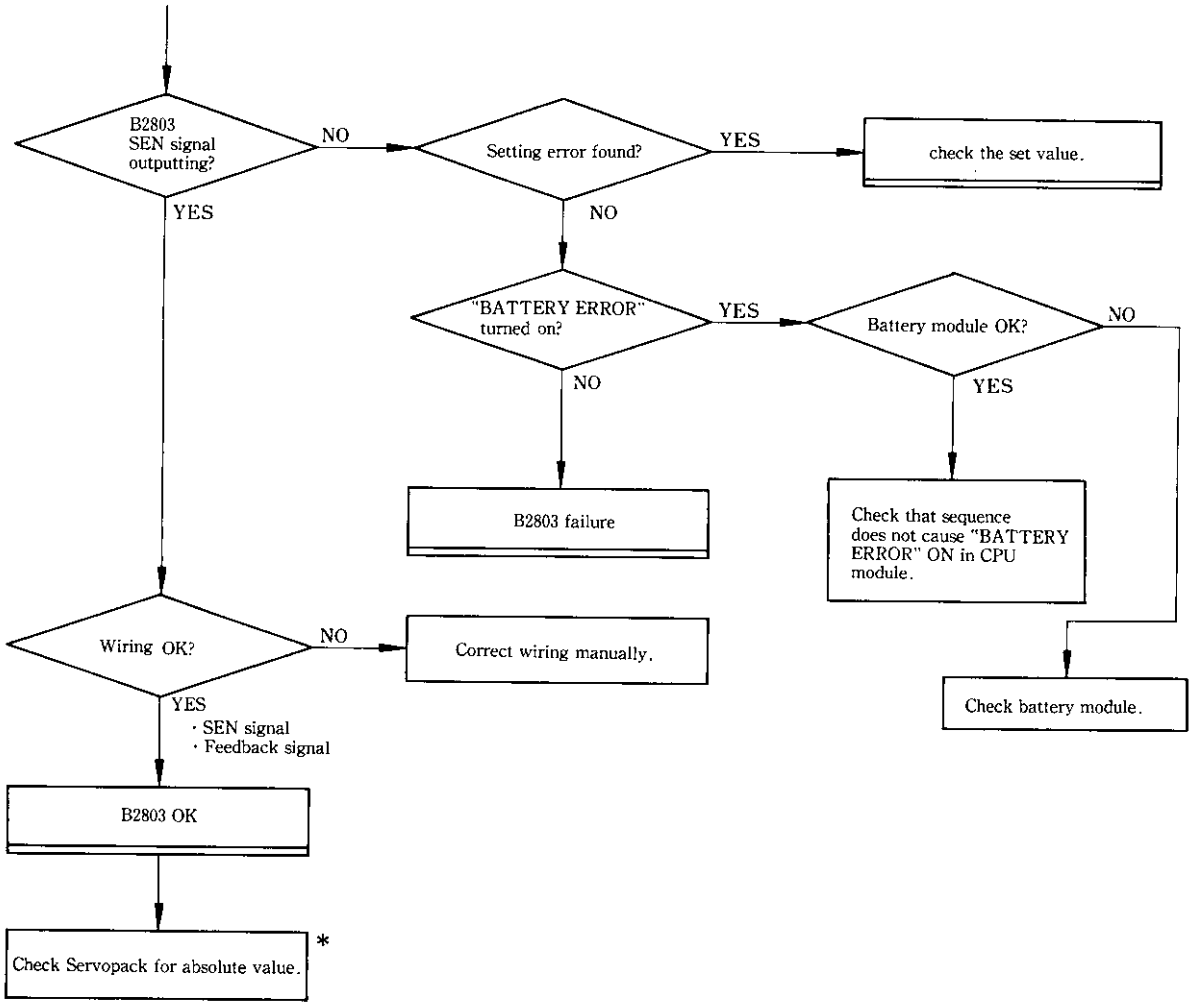
$$fin = \frac{\text{Motor rpm}}{60} \times \text{No. of PG pulses } \frac{\text{pulse}}{\text{rev}} \times \text{multiplier}$$



9.2.5 Positioning Accuracy is not Good



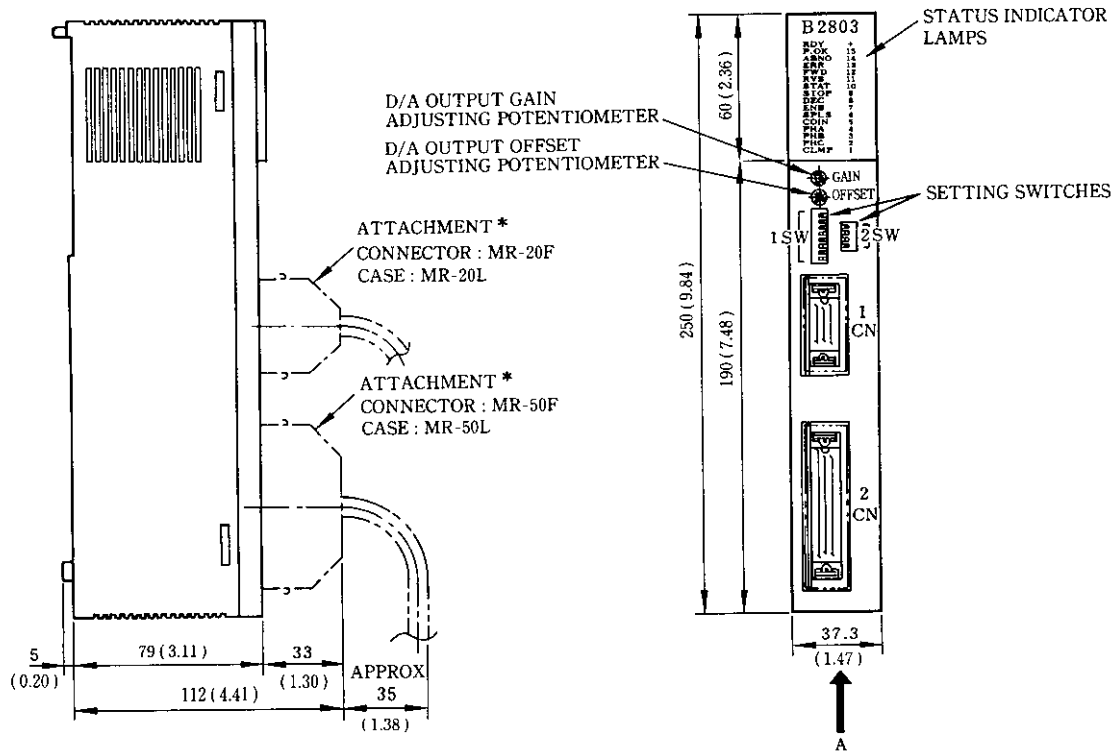
9.2.6 Absolute Encoder is Malfunctioning



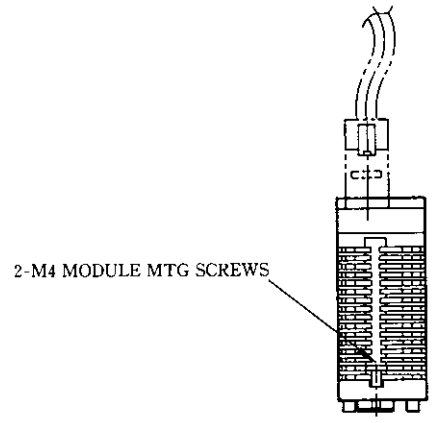
* • Check during base shut-off (motor conduction stop).
  • Check Servopack SV-ON (1CN-8) input.

When absolute encoder is malfunctioning, reset B2803 module or turn on the power supply again.

10. DIMENSIONS in mm (inches)



• Made by Honda Tsushin Co., Ltd.



VIEW A

POSITIONING MODULE B280

Memocon-SC2000 SERIES I/O

For PROGRAMMABLE CONTROLLER : Memocon-SC GL20, GL40S, GL60S, GL60H, GL70
TYPE JAMSC-B2803

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