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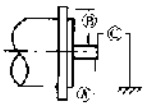
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③ Workmanship accuracy

Table 4.37 shows accuracy of AC Servomotor output shaft and its periphery.

Table 4. 37 Mechanical Specifications in mm

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

*T.I.R.(Total Indicator Reading)
†Accuracy for motor types USAMED-44 MA2 and USAMKD-60MA2.

④ Impact resistance

When mounted horizontally and exposed to vertical shock impulses, the motor can withstand up to two impacts with impact acceleration of 10G (Fig. 4.83). A precision detector is mounted on the opposite drive end AC servomotor. Care should be taken to protect the shaft from impacts that could damage the detector.

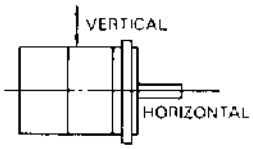


Fig. 4.83 Impact Resistance

⑤ Vibration resistance

When mounted horizontally, the motor can withstand vibration (vertical, lateral, axial) of 2. 5 G (Fig. 4.84)

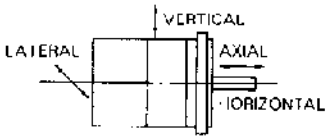


Fig. 4.84 Vibration Resistance

⑥ Vibration calss

Vibration of the motor runnig at rated speed is 15μm or below (Fig. 85)

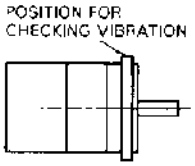


Fig. 4.85 Vibration Checking

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4.4.3 Direction of Rotation

AC servomotors rotate counterclockwise viewed from drive end when motor and detector leads are connected as shown below.

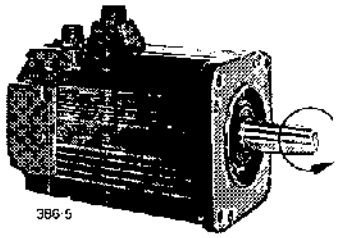
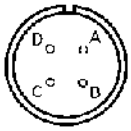


Fig. 4.86 AC Servomotor

(1) Connector Specifications for Standard Servomotors

(a) Motor receptacle

• M,F Series



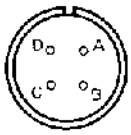
A	Phase U
B	Phase V
C	Phase W
D	Ground

• S Series

(Type USASEM-02A)

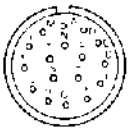
Color of Lead	Applicable
Red	Phase U
White	Phase V
Blue	Phase W
Green	Frame ground

(Type USASEM-03A to 30A)



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

(b) Detector receptacle

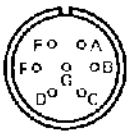


A	Channel A output	K	
B	Channel $\overline{A}$ output	L	–
C	Channel B output	M	–
D	Channel $\overline{B}$ output	N	–
E	Channel Z output	P	–
F	Channel $\overline{Z}$ output	R	For reset
G	0V	S	0V (battery)
H	+5VDC	T	3V (battery)
J	Frame ground	–	

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(2) Connector Specifications for Servomotor with Brake

- M,F Series



A	Phase U	E	Brake terminal
B	Phase V	F	
C	Phase W	G	–
D	Ground	–	–

- S Series

(Type USASEM-02A)

Color of Lead	Applicable	Color of Lead	Applicable
Red	Phase U	Black	Brake
White	Phase V	Black	
Blue	Phase W	Green	Frame Ground

(Type USASEM 03A, −05A)



A	Phase U
B	Phase V
C	Phase W
D	Brake terminal
E	
F	Frame ground

(Type USASEM-08A to 30A)



A	Phase U
B	Phase V
C	Phase W
D	Brake terminal
E	
F	Frame ground

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(3) Fan Terminal Connection

(for only type USAMKD-60MA2)

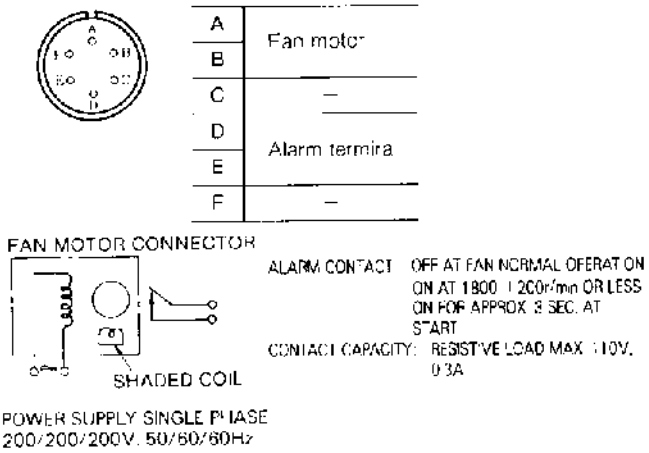


Fig.4.87 Fan Terminal Connection

The cooling fan is not of dripproof protected construction.

If the alarm for cooling fan occurs, perform the following:

- The control circuit (provided by user) should be formed to stop the main motor and fan motor if the alarm for cooling fan occurs. (Contact is ON when alarm occurs.)

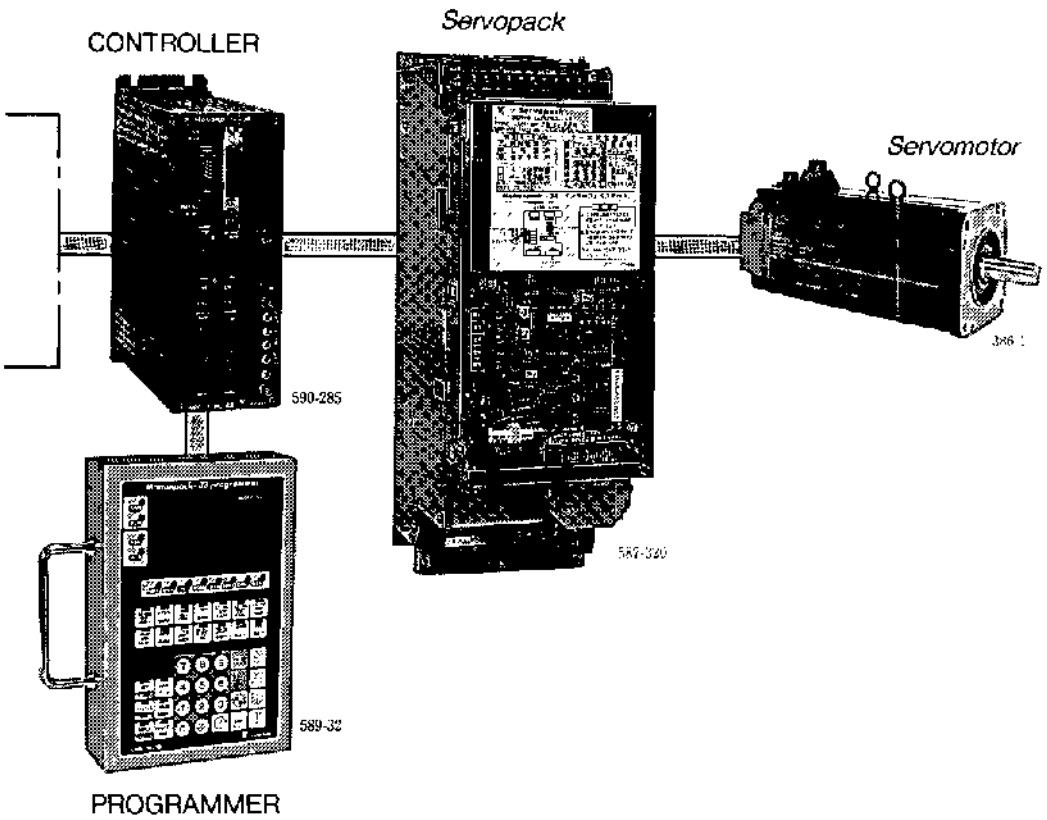
  The action from alarm signal output to nonconducting state should be executed within five minutes, because the self-cooled protection of main motor lasts for five minutes.
- When the cooling fan is started, error detection signal comes ON for three seconds. Therefore, integrate delay relay in the circuit.

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5. CONNECTION (1)

This section describes I/O signal specifications of each unit composing Motionpack-34. Read thoroughly before designing since this section is important for designing system circuit or drawing connection configuration between units.

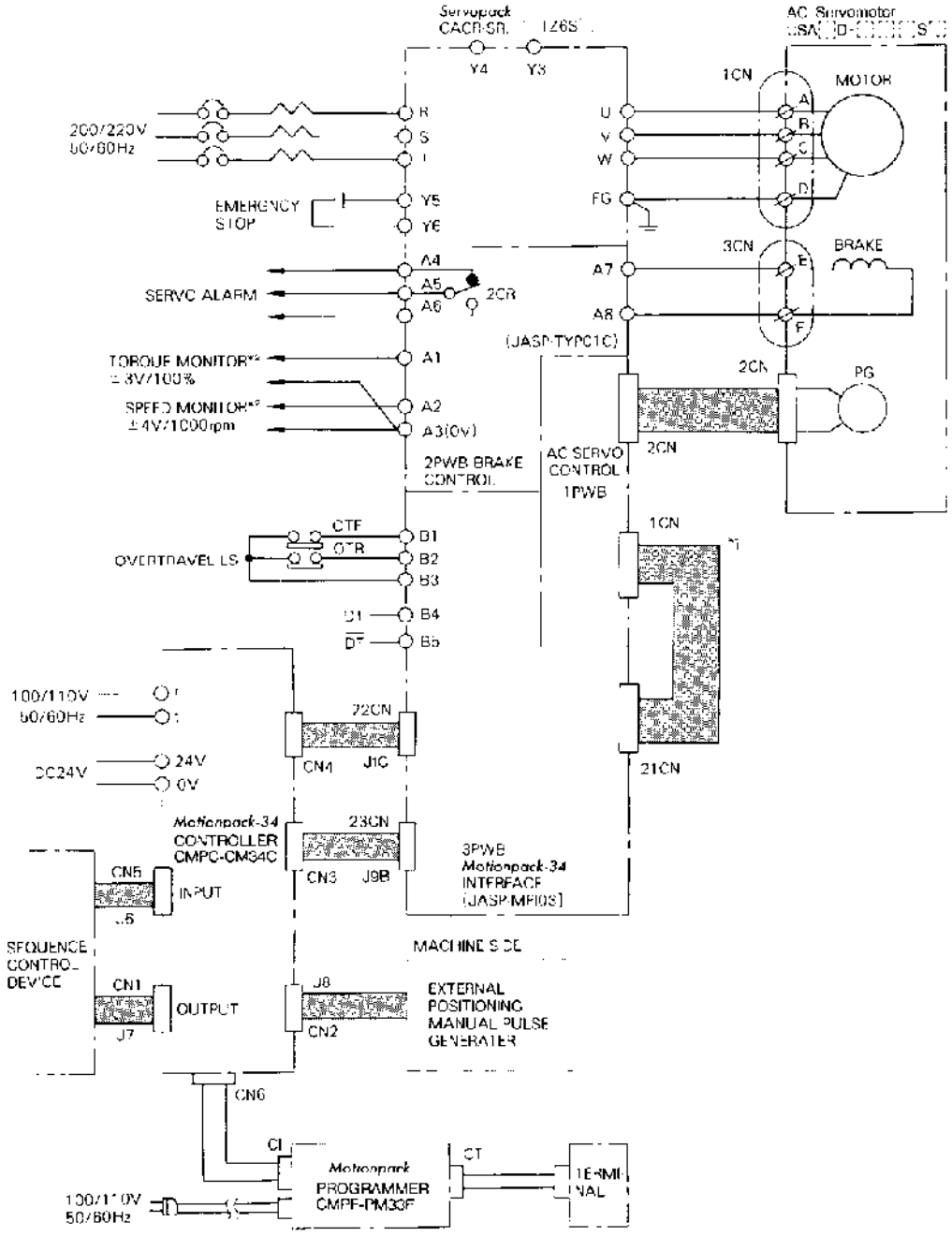
Functions or timings of signals are individually explained in details.



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5. CONNECTION (1)

5.1 INTERCONNECTION



*1: 1CN to 21CN cables have already been connected
*2: Following are recommended for torquemeter and tachometer (scale: 1mA)
- Torquemeter: +7.5 full scale (In memory specification, 70 is displayed.)
- Tachometer: ±7.5 full scale

Note: There is no condition in the order of power-on procedure

Fig. 5.1 Interconnection Configuration

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5.2 Motionpack-34 CONTROLLER I/O SIGNALS

Fig. 5.2 Shows the I/O signal of Motionpack-34 Controller (CM34C).

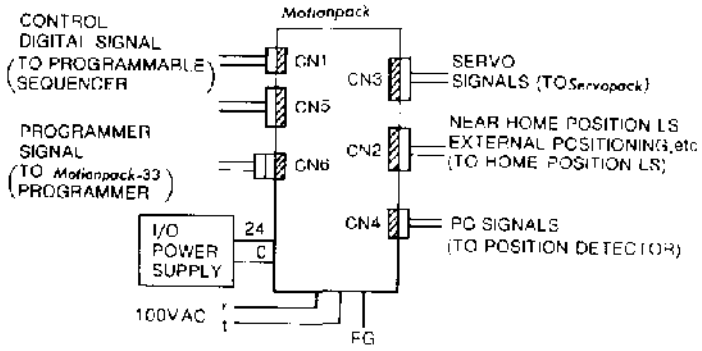


Fig. 5. 2 Input Output Signals

5.2.1 Digital Input Control Signals (Connector CN5)

5

5.2.1.1 Specifications of the signals

The signals of connector CN5 are classified into two groups.

(a) Scan-read signal

This type of signal enters through varying channels scanned by software. It comes from the machine (or sequencer) to the Motionpack-34 controller and the specifications are as follows.

(i) The input contact should be rated at 30V, 20mA or more, and chattering time not longer than 5 msec.

(ii) ON or OFF lasting 35 msec or more is effective as an input signal.



Fig. 5. 3

In the state of "1," $\triangle e$ is voltage drop of 2V or less at 10mA when the machineside contact is ON.

$\triangle e < 2.0V$ (at 10mA)

In the state of "0," the contact is OFF or $\triangle e$ is 12V or more.

The state may be uncertain if $2V \leqq e \leqq 12V$.

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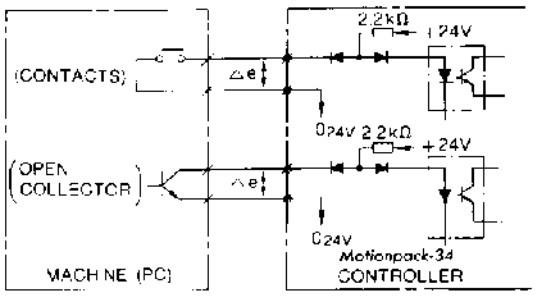


Fig. 5. 4

This type of signal enters through channels (.0 to .4). Fig. 5.5 shows the timing.

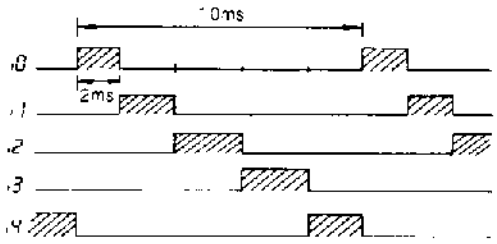


Fig. 5. 5

The signal SEL (see Fig. 5. 6) is 24V in a selected channel and it is separated from the power line in an unselected channel, so that signal of the selected channel alone will be read -in. It repeats cyclically at intervals of 2msec.

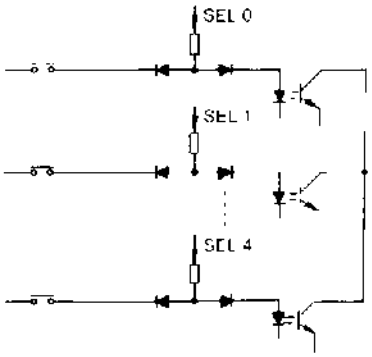


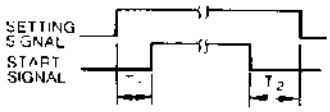
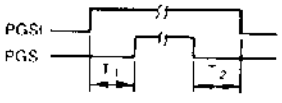
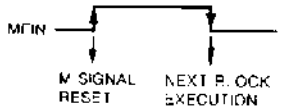
Fig. 5. 6

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(b) Individually read signal

This type of signal does not come in from varying channels.

Table 5. 1 Motionpack-34 Input Signal Characteristics

Input/Output Signal		Signal Name	Characteristics	Timing
Setting Signal	Mode Signal	EDIT, PLAY, JOG STEP, SRX, $\overline{\text{ATSTP}}$	Level Signal	 T_1, T_2 > 8ms OVR is variable at any time speed changes with OVR
	Speed Setting	OVR, JLF, JMF	Level Signal	
Start Signal	Operation Signal	+ JS, - JS, ZRN SBST, ATST	Transient signal L→H : ON H→L : OFF	For transient signal reset is performed.
	Program Select Signal	PGS 0 to PGS 9 PGSL 00 to PGSL 30	Transient signal L→H : ON H→L : OFF	 T_1, T_2 > 35 ms
	Incremental Command	+ INC 8, - INC 8 + INC 9, - INC 9	Transient signal L→H : ON H→L : OFF	Effective at standstill in Auto mode.
	Skip Input	EPS 5, EPS 6, EPS 7, G 34 F	Transient signal L→H : ON H→L : OFF	
	M Completion Signal	MFIN	Transient signal L→H : ON H→L : OFF	
	Fault Reset	ERS	Transient signal L→H : ON H→L : OFF	Effective during Err ERS resets Err flag and ineffective on the other operations. Home position return completion signal is reset.

Note:
1. The set signals must be entered 35 msec or more before a start signal turns on
This is the signals
2. The Program Select signal (PGSL) must be ON before the program start signal (PGS), if used to start, turn on.
3. Only the Override signal (OVR), one of the speed setting signals, may change at any time. Speed changes as soon as OVR varies.

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5.2.1.2 Input signal connections

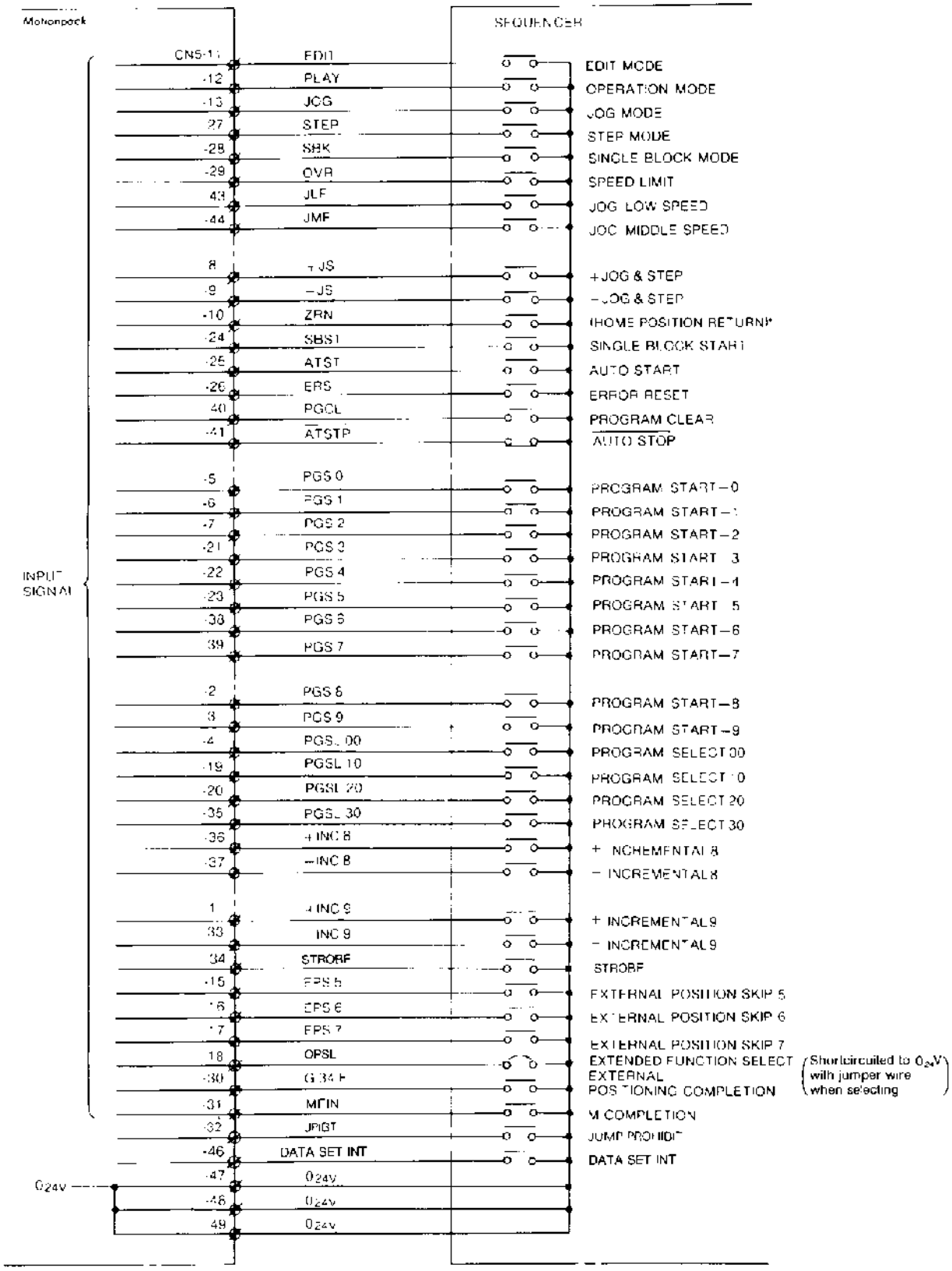


Fig. 5. 7

* ZRN Signal becomes quickreturn signal in absolute value control method

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5.2.1.3 Functions of Input Signals (Function and Timing)

Functions and timing of each signal are those when main function is used. For modes marked with *, refer to description of extended function since they will change the functions when the extended function is used.

Table 5. 2 Examples of Channel Display

(12-3 : 2 input channed 10^3 − digit)(Refer to Table 5. 1.)

Mode	Signal Name	Function and Timing
EDIT Mode	EDIT (Scan reading in 10-0)	Sets Motionpack controller in EDIT mode with EDIT signal ON, and permits writing and editing of programs and parameters with Motionpack programmer. JOG, STEP, HANDL, and AUTO operations cannot be made, but servo clamp is effective.
PLAY Mode	PLAY (Scan reading-in 10-1)	Sets Motionpack controller in any mode of JOG, STEP, HANDL, or AUTO, depending on the states of the JOG and STEP signals. Enables JOG, STEP, HANDL, or AUTO Operation, and returns to origin. Programs and/or parameters cannot be written through the programmer but status can be displayed.
JOG Mode	JOG (Scan reading-in 10-2)	Selects any of the below listed operation modes with combination of JOG and STEP signals, when PLAY signal is ON.

JOG	STEP	Operation Mode
ON	OFF	JOG
OFF	ON	STEP
ON	ON	HANDL
OFF	OFF	AUTO

When a JOG signal is received (turned ON) during AUTO operation, the motion stops after deceleration. The program block under execution is cleared and output signals change as follows.

(1) The following output signals are turned off.

(a) In-operation (STL)
(b) M decodes (M51 M56)
(c) External positioning alarm (EPAL)
(d) External positioning alarm (G34)
(e) Automatic operation completion (M30)
(f) NC alarm (Stored limit over only)

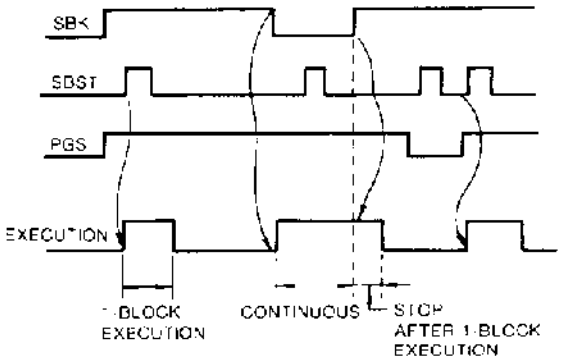
(2) The following output signals maintain their states.

(a) Motionpack ready (RDY)
(b) Battery alarm (ALM2)

STEP Mode	STEP (Scan reading-in 10-3)	See description for JOG mode.
SINGLE BLOCK Operation	SBK (Scan reading-in 10-4)	When a single-block mode signal is turned on, the machine stops after completing the execution of the current block, and the control data enters the single-block operation mode. When a single-block start signal (SBST) is turned on in this state, the machine executes the next block and then stops. When the single block operation signal is turned off, the execution of the program is restarted, regardless of an SBST signal, and the program is executed continuously.

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Table 5. 2 Examples of Channel Display (Cont'd)

Mode	Signal Name	Function and Timing
SINGLE BLOCK Operation (Cont'd)	SBK (Scan reading-in 10-4)	When program start signals (PGS 0 to 9) are turned on while a single block operation mode signal is on, the program is not started; it is started only when a single-block start (SBST), signal is turned on. However, if no program start signals (PGS 0 - 9), are on, a single-block start signal is ineffective. When the single-block operation mode signal is cleared after the completion of one program, a subsequent program start (PGS 0 - 9) signal will start the program. 
SPEED LIMIT	OVR (Scan reading-in 10-5)	Determines the speed set by parameter Pr10 as maximum when OVR signal is ON. When OFF, the maximum speed is set as programmed.
JOG at Middle Speed JOG at Low Speed	JMF, JLF (Scan reading-in 10-6 10-7)	JMF and JLF are used in combination. The functions vary as follows, depending on whether Motionpack is in JOG, STEP, or HANDLE mode.

JMF	JLF	JOG Mode	STEP Mode	HANDL Mode
		JOG Feedrate*	STEP Distance†	Pulse Multiplication Factor
OFF	OFF	Stop	*	*
OFF	ON	Low	Short	×1
ON	OFF	Middle	Middle	×10
ON	ON	High	Long	×100

* JOG feedrate is set by parameters:

Parameter Pr1 - Low

Parameter Pr2 Middle

Parameter Pr3 - High

† STEP distance is set by parameters:

Parameter Pr5 - Short

Parameter Pr6 - Middle

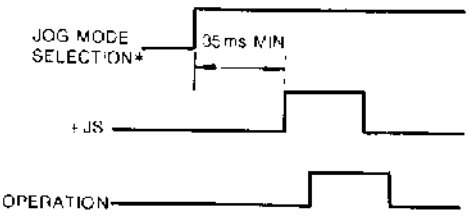
Parameter Pr7 - Long

STEP speed is set by parameters set by Pr4.

+JOG & STEP	-JS (Scan reading-in 11-0)	Commands the machine to move in the plus direction in JOG and STEP modes. (1) In JOG mode While +JS signal is ON, the machine slide moves in the plus direction, through the distance set by JMF (middle speed), or JOG (low speed). Turning off the signal decelerates the machine to a stop.

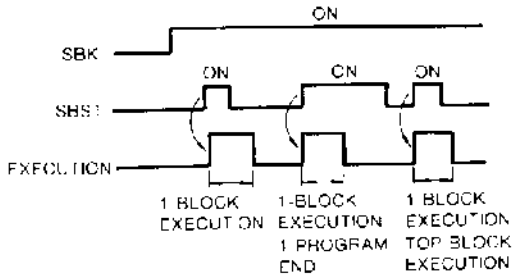
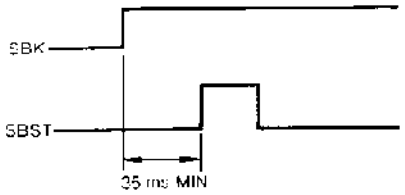
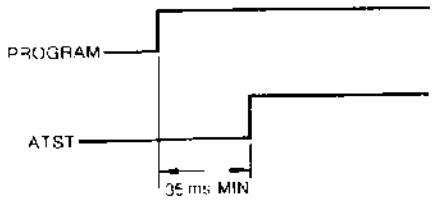
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Table 5. 2 Examples of Channel Display (Cont'd)

Mode	Signal Name	Function and Timing
+JOG & STEP (Cont'd)	+JS (Scan reading-in I1-0)	(2) In STEP mode When the signal is changed from OFF to ON, Motionpack starts the operation in the STEP operation mode. The distance for STEP is set by Pr6 to Pr7 and selected by JLF and JMF signals. TIMING  *Turn ON +JS at least 35 ms after JOG (or STEP) mode and JOG speed or (STEP distance) have been selected.
-JOG & STEP	-JS (Scan reading-in I1 1)	The same as for +JOG & STEP operation mode except for movement in minus direction.
Return to Home Position (*)	ZRN (Scan reading-in I1-2)	In absolute value method, this signal changes to quick return signal. When ZRN signal is turned on, functions under execution is immediately interrupted to make positioning at waiting position (defined by Pr 72). When ZRN signal is turned off during the operation, deceleration is performed to stop. Quick-return is valid for any of PLAY modes except for HANDLE mode. Quick-return speed is defined by Pr 73. This function is valid only in absolute value method (Pr 70 = 3). In incremental method, it is return to home position. In ABS-PG automatic home position setup system, when ZRN signal is turned OFF to ON after "1" is set in Pr80, PG home position setup operation is started.
Single Block Start	SBST (Scan reading-in I1 3)	Start signal in single-block operation mode. When a single block mode (SBK) signal is turned on, the machine stops after completing the execution of the current block, and the control enters the single-block operation mode. If an SBST signal is turned on after the completion of a program, the top block is executed.

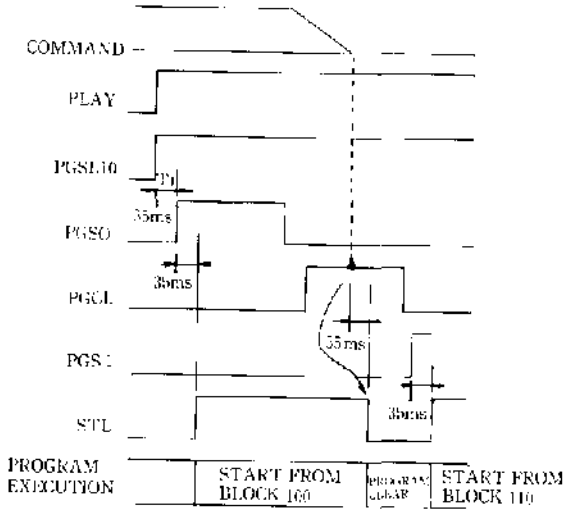
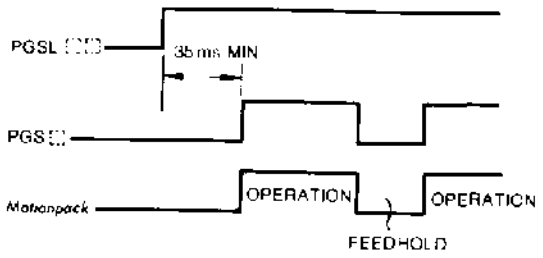
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Table 5. 2 Examples of Channel Display (Cont'd)

Mode	Signal Name	Function and Timing
Single Block Start (Cont'd)	SBST (Scan reading-in II 3)	 When program start signals (PGS 0 to 9) are turned off, SBST signals are ineffective. TIMING  Turn on SBST signals 35 ms after the Single-Block Operation mode is selected.
Auto Operation	ATST (Scan reading-in II-4)	Motionpack executes programs when ATST signal is ON after specifying the block to be executed by program start signals (PGS 0 to PGS 9) and program select signals (PGSL 00 to PGSL 30) in AUTO operation mode. In this case, the automatic stop ($\overline{\text{ATSTP}}$) signal should be turned on. If the automatic start signal (ATST) is not used as program start signal, connect it to 0 V.  Turn ATST signal on 35 ms or more after AUTO operation mode is selected and program block to be executed is specified.
Alarm Reset	ERS (Scan reading-in II-5)	Turning on ERS signal resets MP alarm (ALM 1) output.

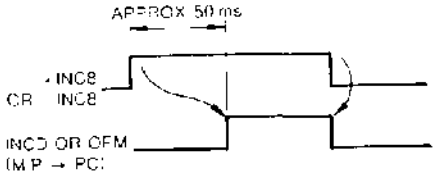
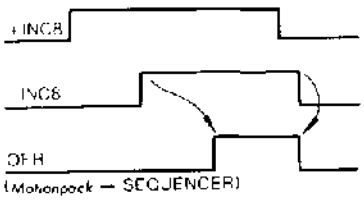
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Table 5. 2 Examples of Channel Display (Cont'd)

Mode	Signal Name	Function and Timing
Program Clear	PGCL (Scan reading-in 11-6)	PGCL signal is effective when the program start signal is turned off (FEEDHOLD STATE) during the execution of a program. When this signal is turned on, the program returns to the top of the current block. When the next program start signal is turned on, the program will be started from the top. When an incremental command is specified at the top of the program, the motion after Program Clear execution may differ from that mentioned above. TIMING 
Automatic Stop	$\overline{\text{ATSTP}}$ (Scan reading-in 11-7)	Program operation stop (feedhold state) signal for automatic start (ATST). Connect I/C power to 0 V when not in use.
Program Start (*)	PGS0 to PGS9 (Scan reading-in 12-0 to 12-7, 13-0, 13-1)	Start signal in AUTO mode. One of PGS0 to PGS9, when turned ON, designates the ten digit of the start block number. It also works as the start signal of AUTO operation. The hundred digit of the start block number is designated by turning on one of PGSL00 to PGSL30.
Program Select (*)	PGSL00 to PGSL30 (Scan reading-in 13-2 to 13-5)	The machine decelerates and stops (feedhold state) if PGS0 to PGS9 turn OFF during AUTO operation. Execution restarts when they turn ON. The timing of the signals PGSL□□ and PGS□ is shown below. 

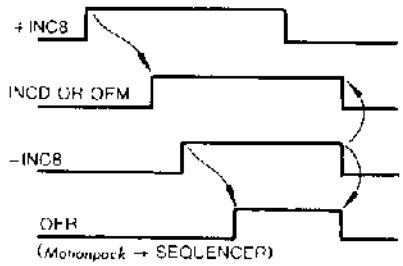
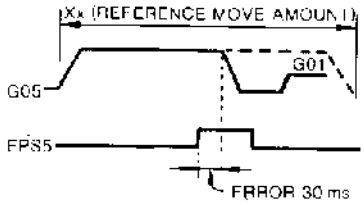
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Table 5. 2 Examples of Channel Display (Cont'd)

Mode	Signal Name	Function and Timing
Program Select (*) (Cont'd)	PGSL00 to PGSL30 (Scan reading-in 13-2 to 13-5)	The following requirements must be met for signals PGSL□□ and PGST. (1) PGSL□□ should not be duplicated. A program executed by PGSn may be switched to another PGSn' in the following cases. Alarm Err. 058L appears in other cases. (a) After PGSn has turned OFF, with execution of the current program completed, and M30 executed. (b) After returning to the top of the blocks to be executed the next time and the Program Clear signal (PGCL) turns ON in the feedhold state. (2) Only one PGSL□□ should be ON when PGST turns ON. Err. 058L appears if no, or a duplicated PGSL□□ is ON. The Motionpack starts a program after checking PGSL□□ and other starting conditions when it has detected the rise (from L to H) of PGST. At that time only one PGSL signal must be present. (3) PGSL□□ and PGSL□□ must not change during execution of a program. Err. 058L appears if M30 executes and PGSL□□ or PGSL□□ changes before the Run Signal (STL) disappears.
+Incremental Command 8 Incremental Command 8 (*)	+INC8, -INC8 (Scan reading-in 13-6, 13-7)	When +INC8 or -INC8 turns on, an increment (set with parameter Pr20) will be added to (or subtracted from) the offset register 8 corresponding to the coordinate number 8 (C8). This is executed in AUTO mode and not during travel. If +INC8 and -INC8 turn on simultaneously, offset register 8 will be cleared to zero. An Offset +/- Max. signal (OFM) will be output if the contents of offset register 8 are equal to or greater than offset +/- max. (set with parameter Pr21) after addition to the tool offset register by +INC8 or -INC8 or otherwise a +/- increment end signal (INCD) will be output.  If +INC8 and -INC8 are on simultaneously, offset register 8 will be cleared to zero with offset zero signal (OFR) output. (1) When -INC8 turns on before the end signal (INCD or OFM) of +INC8 is output: 

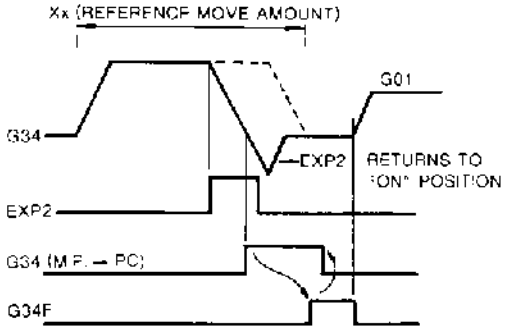
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Table 5. 2 Examples of Channel Display (Cont'd)

Mode	Signal Name	Function and Timing
I Incremental Command 8 −Incremental Command 8 (*) (Cont'd)	+ INC8, − INC8 Scan reading-in I3-6, I3-7	(2) When −INC8 turns on after completion signal of +INC8 is output : 
+Incremental Command 9 +Incremental Command 9 (*)	+ INC9, − INC9 Scan reading-in I4-0, I4-1	Same as +INC8 and −INC8 except that these correspond to the coordinate number 9 (T9) +INC8/−INC8 +INC9/−INC9 Coordinate number 8 (T8) ← Coordinate number 9 (T9) Offset register8 ← Offset register 9 Correction made at a time Pr20 ——→ Pr22 Maximun correction Pr21 ——→ Pr23 +/− increment end signal INCD (common) Offset zero OFM (common) Offset +/− max OFM (common) Refer to the description of +INC8/ INC8 for details of the functions.
External Position Skip 5 (*)	EPS 5 Independent reading-in I5-0	If EPS5 turns ON during feed with a G05 command, the tool decelerates and stops then goes to the next block 
External Postion Skip 6 (*)	EPS 6 Independent reading-in I5-1	Skip signal for G06
External Postion Skip 7 (*)	EPS 7 Indopendent reading-in I5-2	Skip signal for G07
Extended Function Select (*)	OPSL Independent reading-in	Set this signal at 0V when the extended function is used. If it is not set at 0V when the power is turned on, reading-in will not be operated, which turning on from sequencer during operation is not valid in the extended function.

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Table 5. 2 Examples of Channel Display (Cont'd)

Mode	Signal Name	Function and Timing
External Positioning Completion (*)	G34F Independent reading-in I5-4	Fin signal that clears the "external positioning end" output signal (G34) of the Motionpack and advances the program to the next block. If an external positioning alarm signal (EPAL) is output from the Motionpack, G34F input clears the signal EPAL. When G34F turns OFF, the program advances to the next block  Note: Response delay from EXP2 "ON" to "ON" position memorized is 50 μs.
M Completion (*)	MFIN Independent reading-in I5-5	The signal that clears the M decode outputs (M51-M56) and advances the program to the next block When signal MFIN turns on, the M decode outputs are cleared. When MFIN turns off after that, the program of the next block starts.
Jump Prohibit	JP1BT Independent reading-in I5-6	In the exended function G67 jump prohibit function, this signal prohibits G67 jump execution. When this signal is ON, G67 is prohibited.
Strobe	STROBE Scan reading-in I4-2	See Par. 11.3 and Par. 11.4.
Data Setting	DATA SET INT Independent reading-in I5-7	See Par. 11.3 and Par. 11.4.

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5.2.2 DIGITAL OUTPUT CONTROL SIGNALS (CONNECTOR CN1)

5.2.2.1 Specifications of the Signals

The signals coming from the Motionpack-34 controller to the machine (or sequencer) must meet the following requirements.

① The output capacity is 24 VDC and 100 mA or less.

② Output is non-contact.

③ Non-contact output needs protection as follows.

(a) When the load is inductive, be sure to connect a spark killer in parallel to and within 20 cm of the load. Never connect the spark killer in the reverse polarity for the Motionpack-34 controller will be broken.

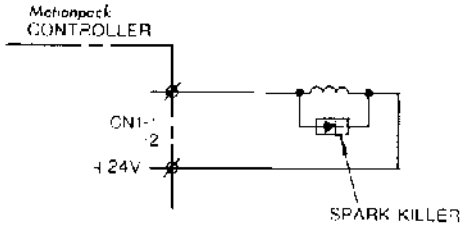


Fig. 5. 8 Connections of Spark Killer Diode IS2462
(VRM = 220V I_0 = 100mA)

(b) When the load is a lamp, insert a preheating resistor and do not permit the ratings to be exceeded even when a rush current flows.

Let the preheating resistor limit the current flowing through the lamp to 20-30% of the lamp rating. Sample calculation

Sample calculation

Preheating resistor : R

Lamp rated current : I Lamp (A)

$$R = \frac{24V}{(0.2 \text{ to } 0.3)\ I\ \text{Lamp (A)}}$$

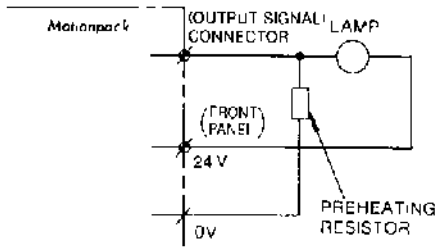


Fig. 5. 9

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5.2.2.2 Output Signal Connections

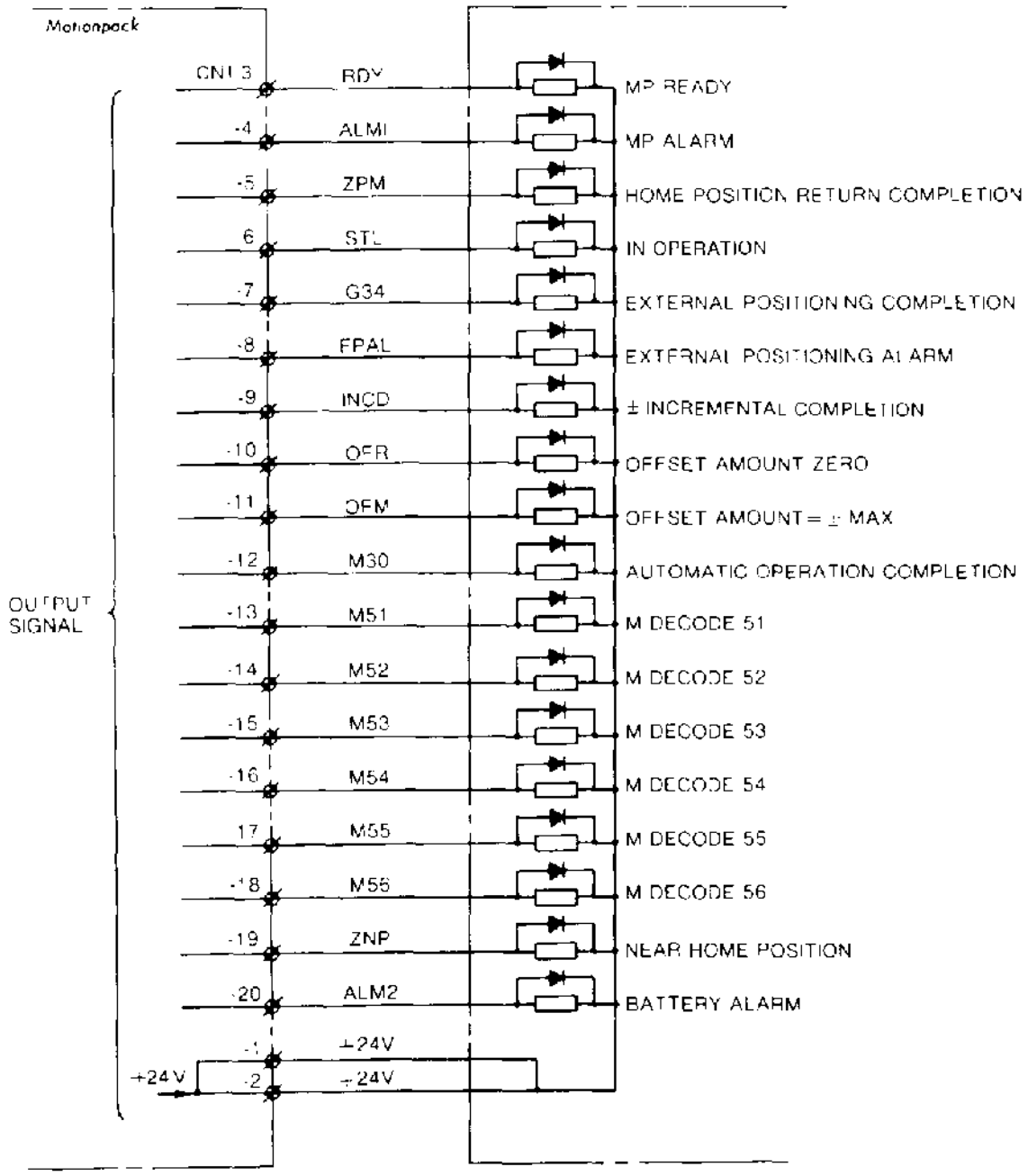


Fig. 5. 10

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5.2.2.3 Functions of output signals

Function and timing of each signal are those when main function is used. For modes marked with *, refer to the description of extended function since they will change the functions when the extended function is used.

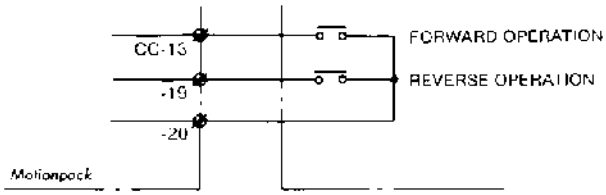
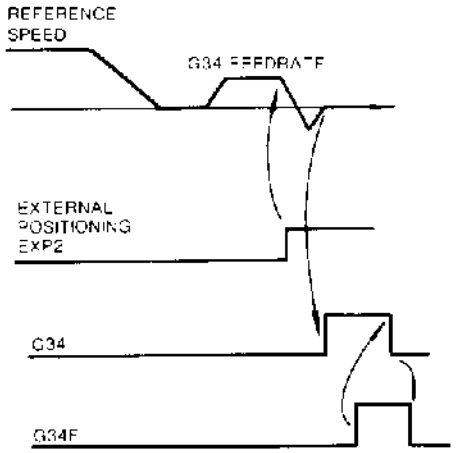
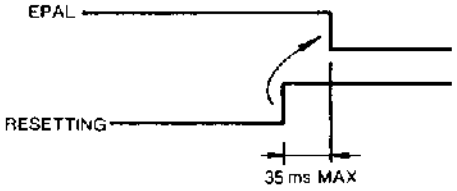
Table 5. 3 Examples of Channel Display (2-3 : output channel 10^2-digit)

Output signal	Symbol	Function and Timing
MP Ready Completion	RDY $O_{2\text{-}2}$ CN1-3	This signal indicates that the Motionpack is ready to receive commands from a high-order controller (such as a sequencer). RDY is output (ON) under the following conditions: ① The Motionpack is operating properly ... "Good" indication is ON. ② The Motionpack is in any of AUTO, JOG, STEP or HANDLE modes ...Signal PLAY = ON, signal EDIT = OFF ③ The servo main circuit power is ON and the servo circuit is good. ... [signal $\overline{SAL}$ (CN3-7) = ON; signal $\overline{OTF}$ (CN3-13) of OTR (CN3-13) = ON] → $\overline{SAL}$, ($\overline{OTF}$ - $\overline{OTR}$) = ON ④ When all of the above conditions (① through ③) are met, RDY output = ON
MP Alarm	ALM1 $O_{0\text{-}0}$ CN1-4	Alarm output of the Motionpack system. For alarm conditions indicated by ALM1, refer to section 11, Tables 11.1 and 11.2 The error reset signal ERS resets ALM1
Zone Signal Return-to-Home Position Completion	ZPM $O_{0\text{-}1}$ CN1-5	In absolute value method system, ZPM signal changes to zone signal. When the feedback position is in the set zone, this signal is turned ON. For details, refer to Par. 4.1.4 Functions of Motionpack-34 Controller for basic zone signal and Par. 11.5/11.6 for extended zone signal (A)/(B).
IN Operation (*)	STL $O_{2\text{-}2}$ CN1-6	STL indicates that Motionpack-34 is operating automatically. It is ON during programmed operation or single-block operation. It does not turn OFF even when the program start input signal turns OFF (feedhold state) STL turns OFF under any of the following conditions: ① The program clear signal (PGCL) is ON. ② Mode has changed. ③ Execution of M30 has been completed. ④ Emergency stop has occurred.* * Motionpack-34 stops in an emergency if both the F-direction and R-direction movable signals have turned OFF.

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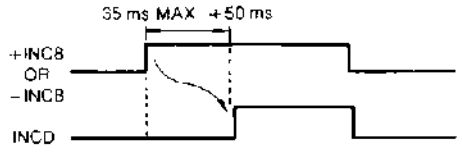
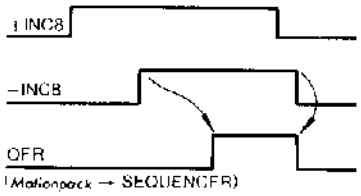
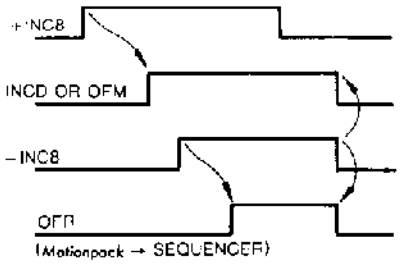
5.2.2.3 Functions of output signals (Cont'd)

Table 5. 3 Examples of Channel Display (Cont'd)

Output signal	Symbol	Function anc Timing
In Operation (*) (Cont'd)	STL O0-2 CN1-6	
External Positioning Completion	G34 O0-3 CN1-7	The external positioning command (G34) causes the machine to decelerate and stop, when the external positioning signal (EXP2) turns ON, and to return to the position at which EXP2 turned ON. In-position check is performed after positioning. If there is no error, the external positioning end signal (G34) turns ON. This signal turns OFF when the external positioning end input signal (G34) turns ON. 
External Positioning Alarm (*)	EPAL O0-4 CN1-8	EPAL is the alarm signal of external positioning (G34 command) It turns ON under any of the following conditions: ① EXP2 does not turn ON when the position designated with X (U) of a G34 command has been reached ② If EXP2 or G34F is already ON, and the signal which is ON has not turned OFF within 2 seconds after a G34 command has started execution EPAL is reset under any of following conditions: ① The G34F signal has turned ON. ② Mode has changed ③ The program clear has been executed 

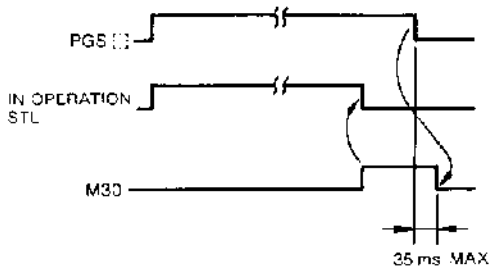
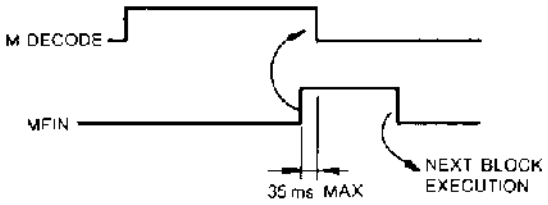
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Table 5. 3 Examples of Channel Display (Cont'd)

Output signal	Symbol	Function and Timing
± Incremental Command Completion (*)	INCD O0-6 CN1-9	A + or − increment end signal (INCD) will be output if the contents of the offset register are smaller than the max offset + / − value after the completion of addition to the offset register initiated by a + (or −) incremental command. INCD will be output with a maximum delay of 85 msec because of the presence of a 50-msec timer (software) that checks for simultaneous turn-on of + INC and − INC and a signal read time that takes a maximum of 35 msec Resetting condition + INC (or − INC) has turned OFF. 
Offset Amount 0 (*)	OFR O0-6 CN1-10	If + / − incremental commands turn ON simultaneously, the offset register will be cleared to zero and an offset zero signal (OFR) output. (1) − INC turns ON before end signal (INCD or OFM) of + INC is output.  (2) − INC turns ON after end signal of + INC is output.  One of M51-56 turns on according to the M function command executed. It is reset when the M end signal (MFIN) turns ON.
Offset Amount ± Max Approach	OFM O0-7 CN1-11	OFM turns ON when the absolute value of offset which the offset register holds has exceeded the maximum value set with a parameter. This turns on and is reset following the same timing sequence as INCD. Refer to "± incremental command completion" above

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Table 5. 3 Examples of Channel Display (Cont'd)

Output Signal	Symbol	Function and Timing
Automatic Operation Completion	M30 $O_{1\text{-}0}$ CN1-12	M30 turns ON when a program end command (M30) has executed in programmed operation It is reset when a program start signal (PGS0 PGS9) or auto start signal (ATST) turns OFF. 
M Decode 51 to M decode 56 (*)	M51 to M56 $O_{1\text{-}1}$ to $O_{1\text{-}6}$ CN1-13 to CN1-18	Proper decodes of M51 to M56 are turned on by execution of M function command. M completion signal (MFIN) is turned on to reset 
Zone Signal Near Home Position	ZNP $O_{1\text{-}7}$ CN1-19	In absolute value method system, ZNP signal changes to zone signal When the feedback position is in the set zone, this signal is turned ON For details, refer to Par.4.1.4 Functions of Motionpack 34 Controller for basic zone signal and Par.11.5/11.6 for extended zone signal (A)/(B).
Battery Alarm	ALM2 $O_{2\text{-}0}$ CN1-20	ALM2 turns ON when the voltage of the memory backup battery has fallen below a certain level. (The memory contains machining programs, parameters, shift values,offset, etc.) ALM2 is an alarm signal. The Motionpack does not take any action when ALM2 has turned on. As soon as ALM2 turns ON, the "battery out" lamp lights on the Motionpack controller panel If ALM2 comes ON, replace the battery within 30 days. Keep supply power ON when replacing the battery. (Refer to 8.5 "BATTERY REPLACEMENT") If the power has been ON more than 3 minutes, the battery can be replaced when turning off the power.

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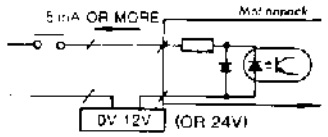
5.2.3 External Positioning Signals (CN2 Connector)

5.2.3.1 Specifications of the signals

Signal voltage is 24V or 12V. Use appropriate terminals according to the signal voltage.

Table 5.4 shows specifications of signals.

Table 5. 4 Specifications of Signals

signal voltage	24V, 12V
"ON"	Input current: 5mA or more 
"OFF"	Input current: 1mA or below (The direction is the same as above.)

Note:
1. Precautions for a proximity switch. With a proximity switch, current may leak ON condition may be satisfied even when output is OFF. If the above requirements cannot be met, insert a relay designed for low-level signals. Try to avoid chattering of the relay. If chattering is anticipated, connect a CR type surge suppressor (CR 50500, for example) in parallel with the relay.
2. For limit switch, use one of plunger types.

5.2.3.2 Signal connections

(1) For use of 24V LS (For use of contact LS for 24V)

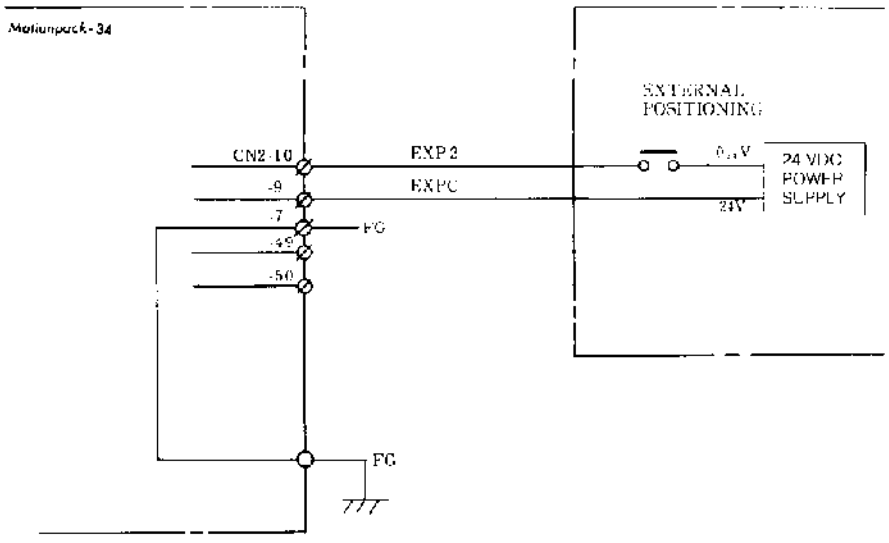


Fig. 5. 11

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5.2.3.2 Signal connections (Cont'd)

(2) For use of non-contact LS for 12V

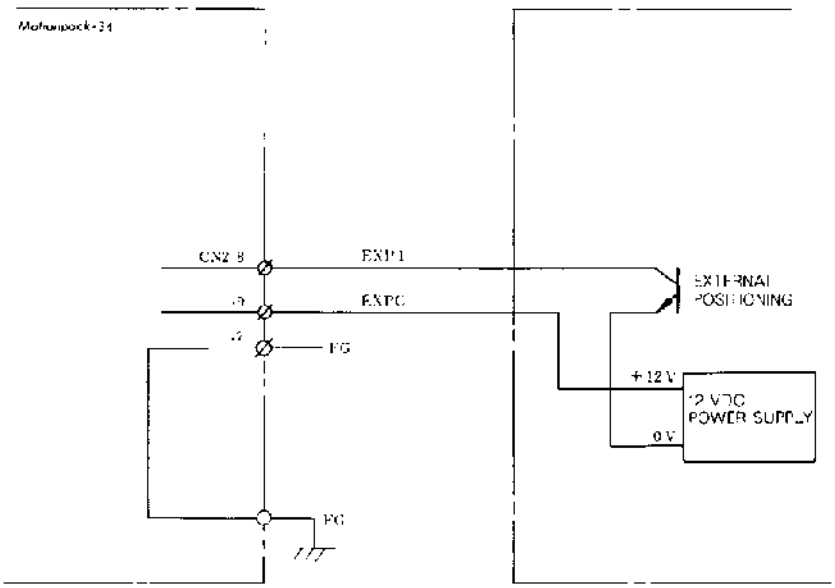


Fig. 5. 12

5.2.3.3 Signal functions

Table 5. 5 Signal Functions

Signal	Signal Name	Functions and Timing
External Positioning	EXPn	When external positioning signal EXPn is ON, the motion is decelerated to stop and returns to the EXPn ON position to make positioning.

Note :
- n – 1 when using 12 V power supply.
- n – 2 when using 24 V power supply.

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5.2.3.4 Manual pulse generator

Manual Pulse generator signal is read-in by CN2 connector. Fig 5.13 shows the connecting method.

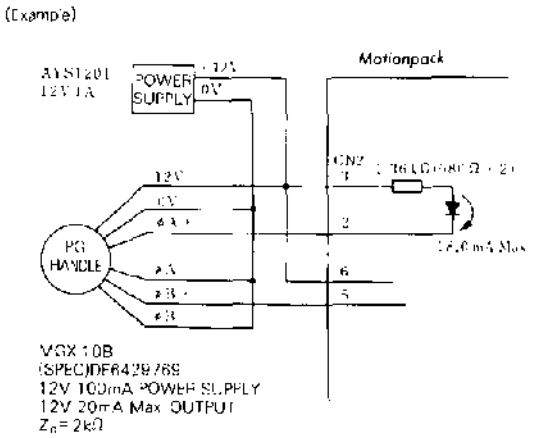


Fig. 5. 13

5.2.4 Servo Related Signals (CN3 Connector)

5.2.4.1 Signal connection

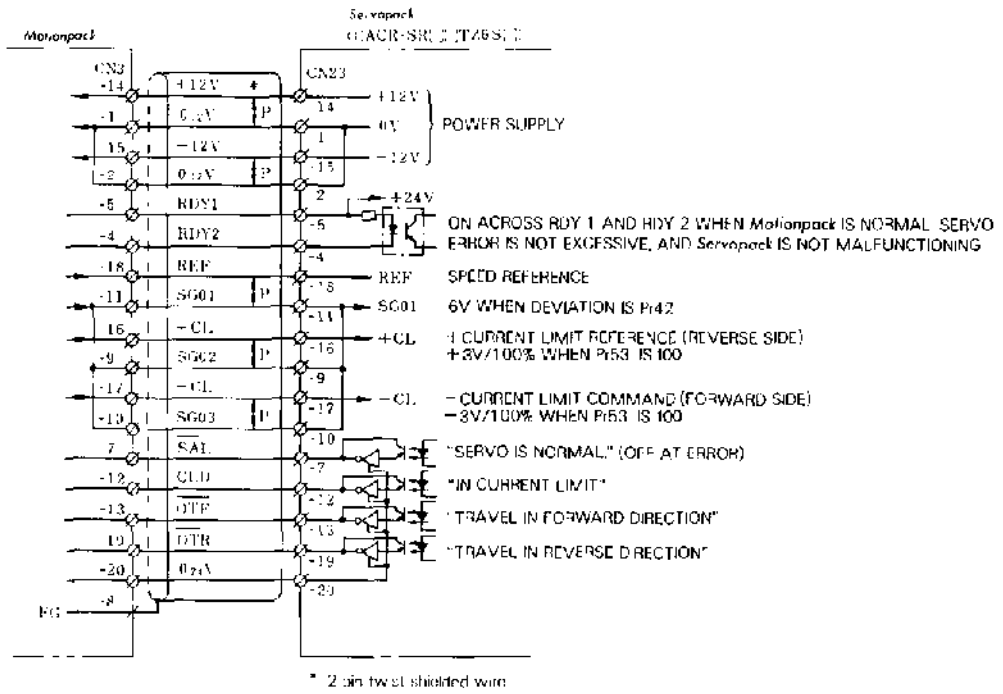
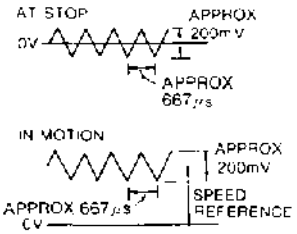


Fig. 5. 14

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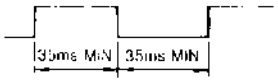
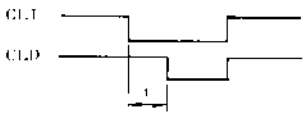
5.2.4.2 Signal Specifications

Table 5. 6 Signal Specifications

	Signal	Symbol	Function	Specifications
Output	MP Ready	RDY 1 RDY 2 (CN3-5) (CN3-4)	On across RDY 1 and RDY 2 when Motionpack is normal, servo error is not excessive, and Servopack is not malfunctioning. Indicates thet Motionpack and Servopack are in normal condition and ready to operate. This signal changes to Servopack "Servo ON" signal on MP-34 interface board Condition of (RDY 1-RDY 2) ON = (MP RUN)·($\overline{\text{dEr Over}}$)·($\overline{\text{Servo Alarm}}$)·($\overline{\text{ABS-PG Alarm}}$)	Across RDY2 and RDY1 Current flow direction at ON RDY1 → RDY2
	Speed Reference	REF SG01 (CN3-18) (CN3-11)	Speed reference output of Motionpack Connect this signal to the speed command input of Servopack The plus command causes the motor to run in a forward direction. IN-A input is standard. IN-B input is also available by switching Pin connection of SW2 or SW3. IN-A: SW2 ①-②, SW3 ①-② IN-B: SW2 ②-③, SW3 ②-③	±6V output at Error do = Pr 42 Signal form is sawtooth waveform at 1.5 kHz REF : reference value SG01 : 0V 
	+Current Limit Reference	+CL SG02 (CN3-16) (CN3-9)	The positive signal of the current limit command output of Motionpack limits current when the motor runs in reverse direction Connect to the external current limit command input terminal of Servopack. Note: As the external current limit reference of Servopack, apply negative voltage (-3V/+100% torque) to terminate 23CN-17 for positive current and a positive voltage (+3V/-100% torque) to terminal 23CN-16 for negative current.	Outputs 3V at 100% current limit. (Pr 53 = 100) Waveform the same as for speed reference. +CL : signal SG02 : 0V
	-Current Limit Reference	-CL SG03 (CN3-17) (CN3-10)	The negative signal of the current limit command output of Motionpack limits current when the motor runs in forward direction Connect to the external current limit command input terminal Servopack See the note of the + current limit reference above.	Outputs -3V at 100% current limit. (Pr 53 = 100) Waveform: the same as for speed reference. -CL : signal SG03 : 0V

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Table 5. 6 Signal Specifications (Cont'd)

	Signal	Symbol	Function	Specdcifications
Input	Servo Error	$\overline{SAL}$ (CN3-7)	When Servopack is malfunctioning, this signal turns off. When Servopack is normal, $\overline{SAL}$ is 0V.	(a) The input contact capacity is rated at 30V and 20 mA or more. Chattering time should not exceed 5 msec. (b) ON and OFF of input signal lasting for 35 msec or more is effective. 
	Current Limit	CLD (CN3-12)	This signal indicates that Servopack is limiting current  t = 0.01, 0.03S IS SET BY SW1 When CLD ON, Motionpack stops sending motion pulses. It continues sending motion pulses during execution of G01 and G04 (optional).	The same as $\overline{SAL}$
	Travel in Forward Direction	OTF (CN3-13)	Trevel in forward direction is possible when $\overline{OTF}$ = ON. The Motionpack stops in an emergency when both $\overline{OTF}$ and $\overline{OTR}$ are OFF. When Servopack S-RDY is OFF, both $\overline{OTF}$ and $\overline{OTR}$ are OFF.	The same as $\overline{SAL}$
	Travel in Reverse Direction	$\overline{OTR}$	Travel in reverse direction is possible when $\overline{OTR}$ = ON	The same as $\overline{SAL}$

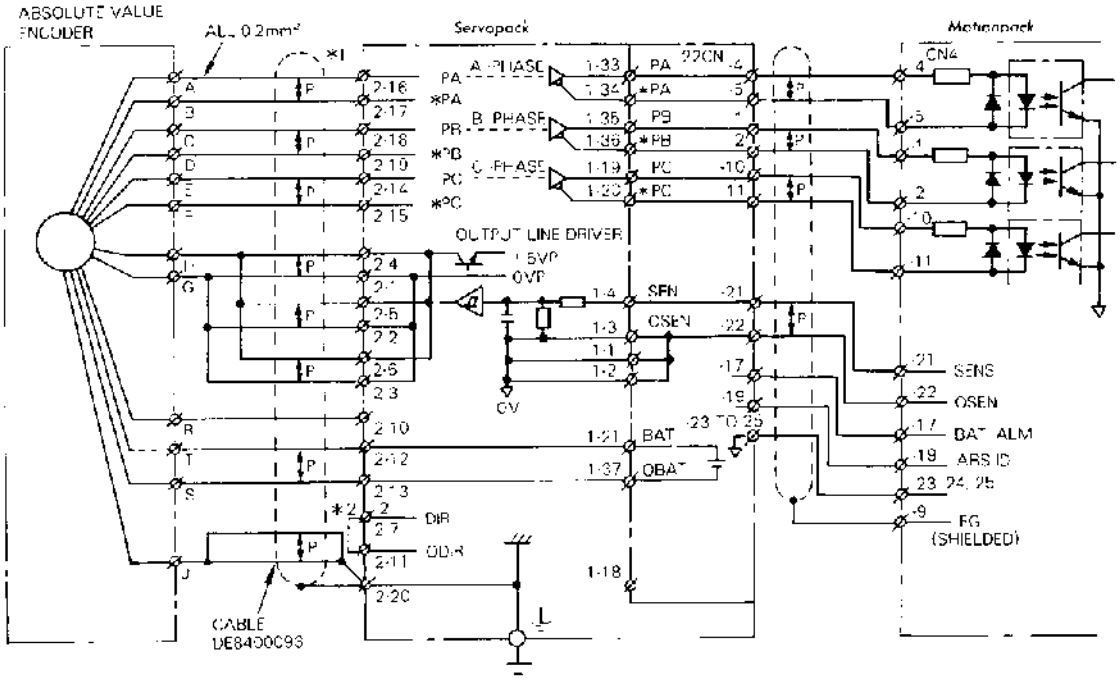
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5.2.5 PG Related Signals

Motionpack-34 has input terminals both for 12VPG and 5VPG, which can be combined with Motionpack-34.

Servopack (CACR-SR[ ][ ]TZ 6[ ]) PG output signal is 5V line driver output (output circuit SN 75174 or equivalent) to be connected with Motionpack-34 5VPG signal input terminal.

5.2.5.1 PG signal connection



*1 [P] shows twisted shielded wire.

*2 shows connection at reverse connection. In this case setting Motionpack Pr 50 at " " (number of pulses) is also required

Fig. 5. 15 PG Signal Connection

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5.2.5.2 Motor rotating direction

In case of the connection as shown in par 5.2.5.1, the motor rotates in forward direction (or counterclockwise from drive end) for Motionpack-34 + direction movement command.

When the motor is used for reverse rotation (the motor rotates clockwise from drive end for − direction moving command), the following two methods are available :

Motor reverse rotaion setting

① Input servopack DIR signal

(2CN−7) − (2CN−11) to be shortcircuited.

② Set negative number to Motionpack Parameter 50.

Pr 50 = − n n = number of pulses

AC Servomotor rotates in forward direction, or counterclockwise from drive end.

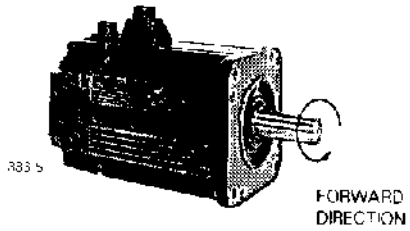


Fig. 5. 16 AC Servomotor

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5.3 Motionpack PROGRAMMER INTERFACE

5.3.1 Interface with Controller

Interface between Motionpack-34 controller and Programmer complies with RS422.

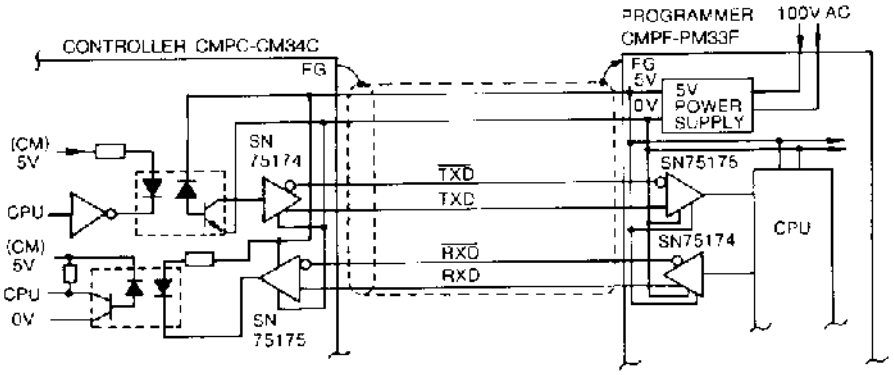


Fig 5.17 Interface Circuit between CM and PM

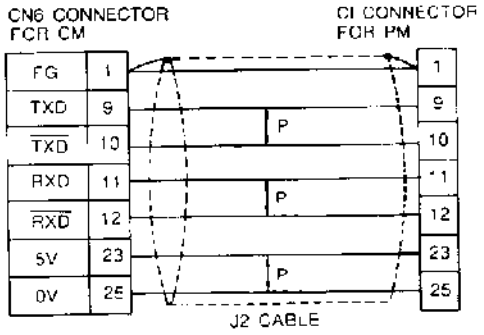


Fig 5.18 Cables Connecting CM and PM

5.3.2 Interface of Tape Device

5.3.2.1 Interface specifications

Motionpack-34 controller can be connected to tape device through Motionpack-33 programmer and inputs or outputs parameters.

Transmission is RS232C.

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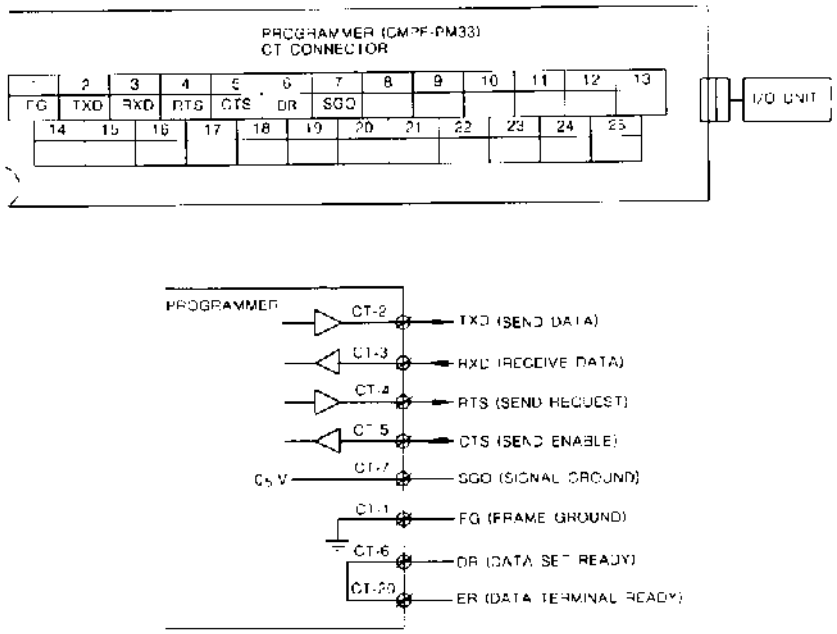


Fig 5. 19

(1) Transmission

Transmission is asynchronous, that is, a start bit precedes the data bit and stop bits follow them.

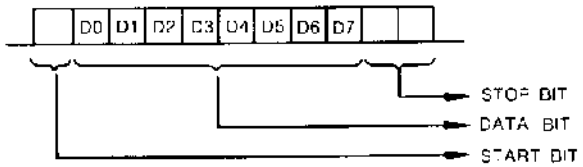


Fig 5. 20

(2) Code : ISO

(3) Signal logic : See Table 5. 7.

Table 5. 7

	+ 3V or more	− 3V or below
Data Signal	0	1
Control Signal	ON	OFF

(4) Transmission rate (baud rate)

The transmission rate is the number of bits transmitted per second. It is possible to select any one given in Table 5. 8.

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The transmission rate is selected with a parameter. Refer to par. 4. 1. 3. 8 (2) "Tape device baud rate".

Table 5. 8

Transmission Rate
110
300
1200
2400

(5) Cable and connector

The cable connector is Model DB-25P D-subconnector (made by JAE). Normally, the cable should be prepared by the user. The cable prepared by Yaskawa is designated J4. If assistance is required, contact your YASKAWA representative.

5.3.2.2 Connecting to protyper

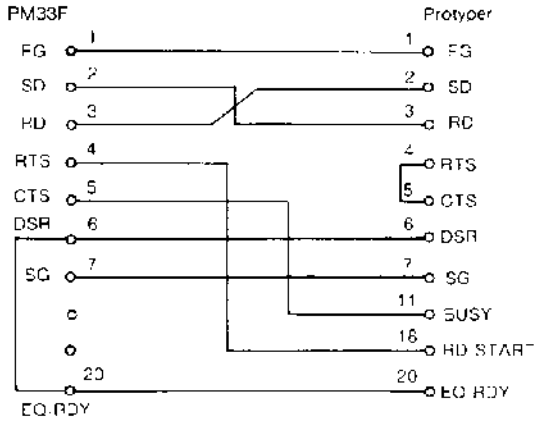


Fig. 5. 21

5.3.2.3 Connecting to Motionpack data recorder

Connection between data recorder and Motionpack programmer requires special cable.

When purchasing the data recoder, request the cable for connecting Motionpack-33 programmer.

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5.3.2.4 Connecting to hand-held computer (EPSON HC-40)

Fig 5.21 shows connections of hand-held computer EPSON IIC-40, used as a terminal equipment, to Motionpack programmer.

The programs and parameters of Motionpack are stored in the file of microcassette of HC-40.

(1) Hand held computer

EPSON IIC-40: Microcassette with drive Power Supply: With AC adaptor

(2) Cable

(3) Transmission speed (Baud rate)

Baud rate is 2400 bps. Set Pr 97 – 2400

(4) HC-40 Programs

HC 40 loader program and connection cable must be provided by the user. HC-40 should be provided with microcasstte drive.

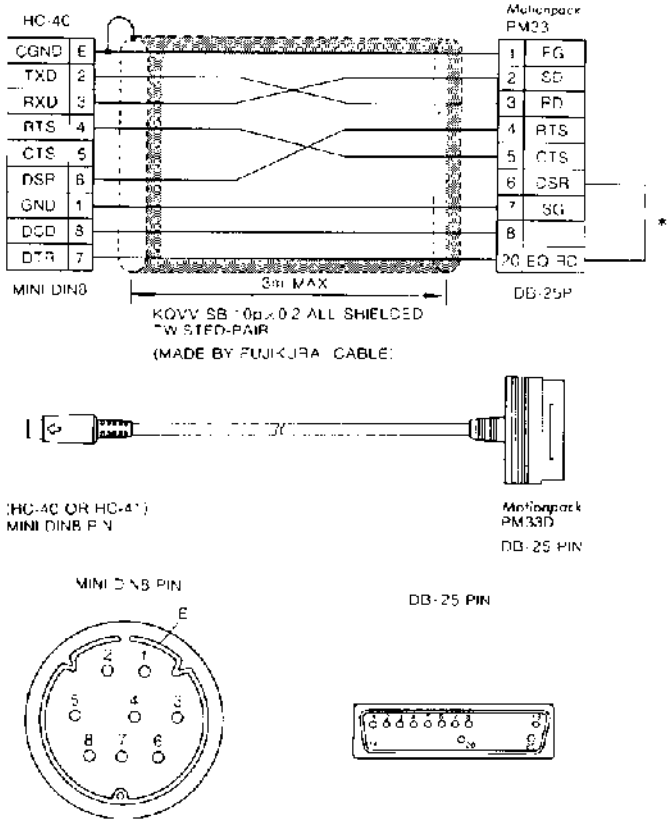


Fig 5. 22 Example of Cables

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5.4 Servopack INTERFACE (IN CASE OF M SERIES)

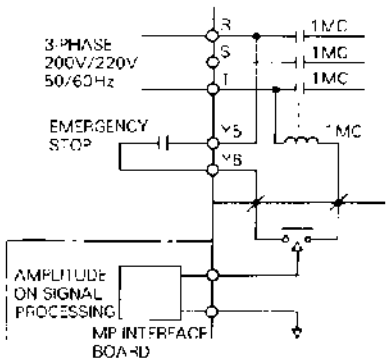
For total connection configuration, see par. 6.5.

5.4.1 Servopack Basic Section Signals

(1) Main unit external terminals

Table 5.9 Description of Main Unit External Terminals

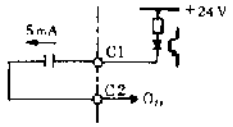
Sign	Name	Description
Ⓡ Ⓢ Ⓣ	Power input terminal	3-phase AC 200/220V + 10%/−15% 50/60Hz
Ⓤ Ⓥ Ⓦ	Motor connection terminal	Ⓤ with motor Ⓐ terminal, Ⓥ with motor Ⓑ terminal and Ⓦ with motor Ⓒ terminal are connected
⊖	Ground terminal	Connected with motor Ⓓ terminal for grounding
Ⓨ3 Ⓨ4	Regenerating resistor connection terminal	Usualy not used. They change to external resistor when the interral regenerating resistor cannot manage processing.
Ⓨ5 Ⓨ6	Emergency stop terminal	They turn or and off internal contactor (1MC) directly and make power cut off together with "AMP ON" signal. Opening the cirwit between Ⓨ5 and Ⓨ6 enables emerg stop tofunction. However, Motionpack will have alarm



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(2) Brake control board external terminals

Table 5.10 Description of Brake Control Board External Terminals

Sign	Name	Description
A7 A8	Brake power terminals	When the motor is provided with brake, A7 with motor C terminal, A8 with motor U terminal are connected. When the brake is not provided, no terminal is connected.
A4 A5 A6	Alarm output terminals	When Servopack made defective detection (2CR ON) A4 – A5 ····· OFF A6 – A5 ··· ON (at normal status, 2CR OFF) • Contact capacity 100V 0.5A • A4 A5 ··· NC A6 A5 ··· NO • 2CR is ON for approx. 1 second when the power is turned on. (For initializing the control device.)
A1 A3 (0V)	Torque monitor output terminals	3.0V ± 10% Voltage is output for 100% motor torque. They can be used for checking 1 mA meter connection and torque recorded with pen.
A2 A3 (0V)	Revolution monitor output terminal	4.0V + 10% current is output for 1000 rpm motor rotation. They can be used for checking 1 mA meter connection and torque recorded with pen.
C1 C2	Brake control	They are not usually used since timing of motor holding blake ON/OFF is performed inside sequence. For use 2PWB 22SW is short-circuited between C and B. (Normally between 1 and C) Thus, brake will be released by external command ON. However, inside sequence does not have its operation function. 

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5.4.2 Connection with Motionpack-34

5.4.2.1 Connection

(1) PG Signal (Servopack 22CN ↔ Motionpack-34 CN4 Connector)

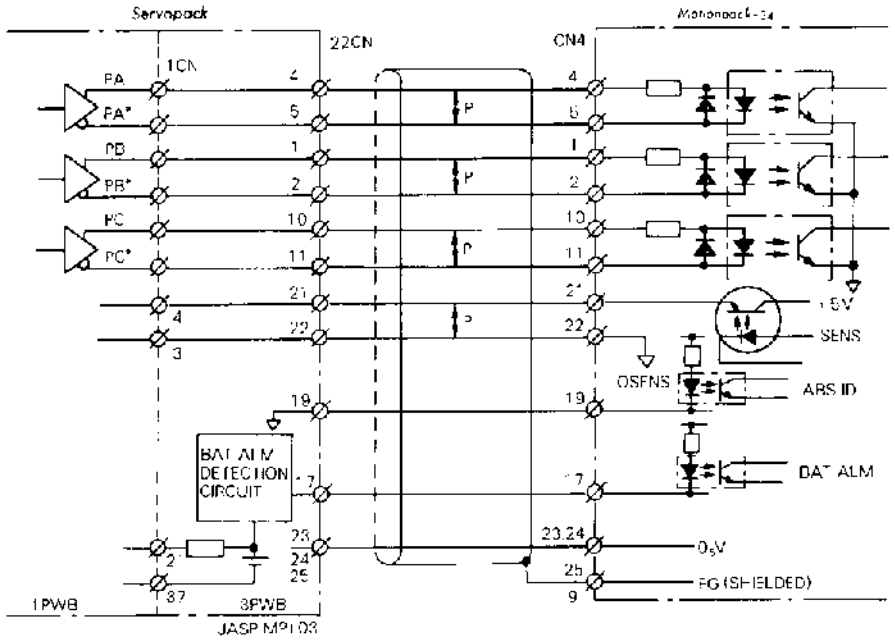


Fig. 5. 23

(2) Servo signal (Servopack 23CN ↔ Motionpack-34 CN3 Connector)

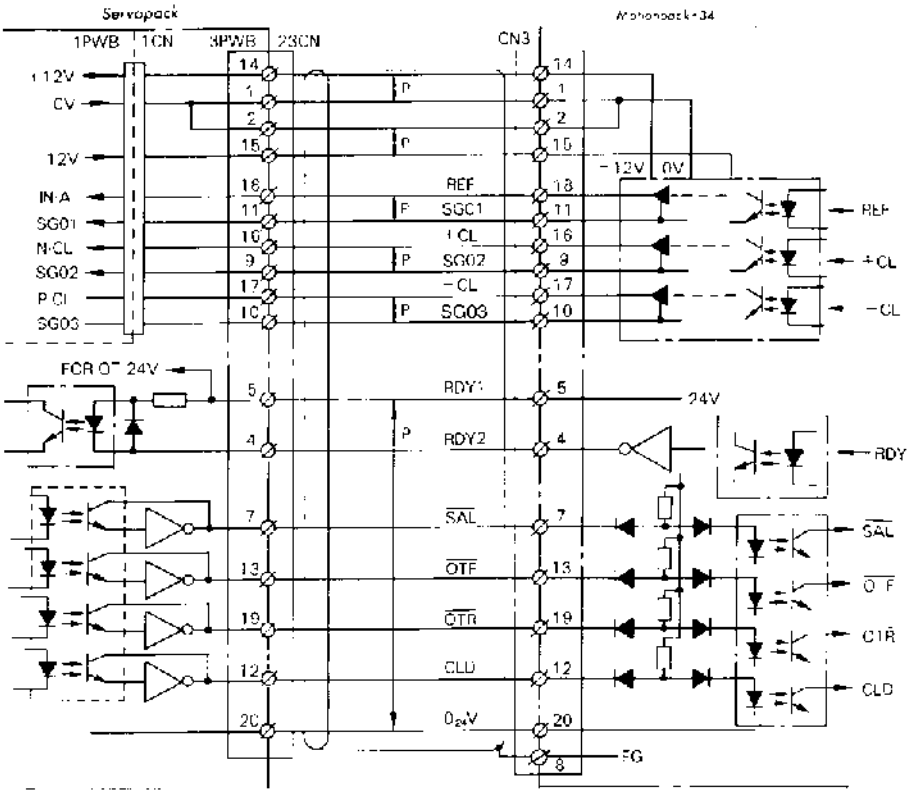


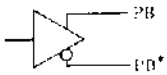
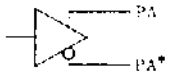
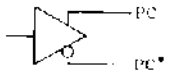
Fig. 5. 24

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5.4.2.2 Signal specifications

(1) PG Signal (Servopack 22CN)

Table 5.11 Specifications

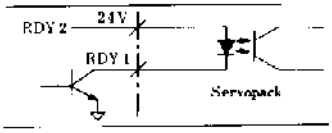
Pin No.	Name	Specifications
1	PB B-phase (+) signal	Output signal relay of AC Servopack main unit Output driver SN75174 MC3487 or equivalent 
2	PB * B-phase (−) signal	
4	PA A-phase (+) signal	Output signal continuation of AC Servopack main unit Output driver SN75174 MC3487 or equivalent 
5	PA * A-phase (−) signal	
10	PC C-phase (+) signal	Output signal relay of AC Servopack main unit Output driver SN75174 MC3487 or equivalent 
11	PC * C-phase (−) signal	
21	SENS	They are signals for ABS and encoder to turn on 5V power supply. PG starts to transmit ABS data approx. 1 second after SENS signal is turned on
22	OSENS	
17	BATALM	This is an alarm signal to inform BAT voltage lowering.
19	ABS ID	This is a signal checking if Servopack is in the absolute value method. When it is, the voltage becomes 0V.
3, 6 to 8, 12 to 16, 18, 20	Not used	
23 24 25	0V	0V (Circuit power supply)
9	FG	FG

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5.4.2.2 Signal specifications (Cont'd)

(2) Servo signal (Servopack 23CN)

Table 5.12 Specifications

Pin No.	Name	Direction MP ⟵ ⋯⋯ SP	Specifications
1	0_{12} V	M ⟵⋯⋯ S	Analog reference power supply output 0V side
2	0_{12} V	M ⟵ S	
3	Not used		
4	RDY2	M ⋯⋯⟶ S	By turning on Motionpack output RDY signal, Servopack will receive "Servo ON" signal.
5	RDY1 (24V)	M ⋯⋯⟶ S	
7	$\overline{SAL}$	M ⟵⋯⋯ S	Servo alarm signal (reverse output), output capacity 24VDC 100mA max. Turned on at non-alarm State.
9	SG02	M ⋯⋯⟶ S	+CL signal ground
10	SG03	M ⟶ S	-CL signal ground
11	SG01	M ⋯⋯⟶ S	REF signal ground
12	CLD Current limit	M ⟵ S	Turned on when Servopack exceeds current limit. Output capacity 24VDC, 100 mA max.
13	$\overline{OTF}$ Overtravel detection	M ⟵⋯ S	Turned off when overtravel is detected. Travel in forward direction is available when this signal is ON. Output capacity 24VDC 100 mA max.
14	+12V	M ⟵ S	Analog reference power supply output (+/-12V) 1- and 2-pin is 0V
15	-12V	M ⟵⋯ S	
16	+CL Current limit command	M ⋯⋯⟶ S	This signal gives Servopack reverse side current limit input (N-CL). * +3.0V/ 100% torque limit
17	-CL Current limit command	M ⋯⋯⟶ S	This signal gives Servopack forward side current limit input (P-CL). * -3.0V/+100% torque limit
18	REF Speed reference input	M ⋯⋯⟶ S	This signal gives Servopack speed reference input (IN-A) as a standard * F/R rated revolution is 1000r/min at +/-6V.
19	$\overline{OTR}$ Overtravel detection	M ⟵⋯⋯ S	Turned off when over travel is defected. Traval in reverse direction is available when this signal is ON. Output capacity 24VDC 100 mA max
20	0_{24} V	M ⋯⋯⟶ S	0V side of I/O power supply 24V.

Input	SW 2	SW 3
IN-A	①-②	①-②
IN-B	②-③	②-③

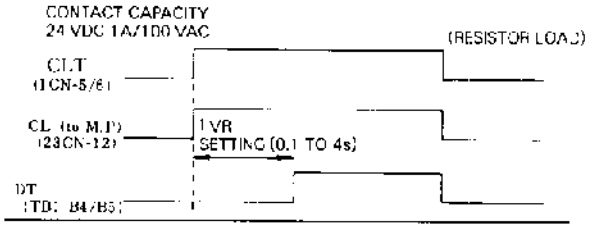
*: Needs Motionpack -34
Parameter setting Pn 53 = 100

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5.4.3 Overtravel Limit Switch

External terminals on the Motionpack-34 interface board comprise forward direction overtravel detection limit signal, reverse direction overtravel detection limit switch and current limit detection signal DT (relay contact output).

Table 5.13 Interface Board External Terminal (TB1) Specifications

Terminal No.	Signal Names	Specifications
1	OTF Forward direction overtravel detection limit switch	Connect forward direction overtravel detection limit switch. The contact is turned off when forward direction overtravel is detected. When servopack is ready (SV. RDY ON) and $\overline{OTF}$ is turned on, P-OT = ON is fed to Servopack. (Via CN1) At the same time OTF = ON is fed to Motionpack-34. For the operation to detect overtravel, refer to (Note)
2	$\overline{OTR}$ Reverse direction overtravel detection limit switch	Connect reverse direction overtravel limit switch. The contact is turned off when reverse direction overtravel is detected. When Servopack is ready (SV. RDY ON) and $\overline{OTR}$ is turned on, N-OT = ON is fed to Servopack. (Via CN1) At the same time $\overline{OTR}$ = ON is fed to Motionpack-34. For the operation to detect overtravel, refer to (Note).
3	G_2 (0_{24}V)	0V of 24 VDC power supply for reading-in $\overline{OTF}$, $\overline{OTR}$ limit switch. This signal is be the same as Motionpack-34 I/O signal power supply (24VDC) ground
4	DT	These output signals are closed when servopack exceeds current limit. For contact, delay time of 0.1 to 4 seconds can be set by TVR.
5	/DT	

NOTE

Overtravel detection signal processing

(1) In case of overtravel occurring by forward opration

(A) Where $\overline{OTF}$ → OFF

(a) The signal next to Servopack input is turned off.

P-OT, P-CON, AMP-ON

However, AMP-ON signal provided with return function is turned on after the motor stops.

(b) Motionpack-34 input $\overline{OTF}$ signal is turned off.

(B) After the motor stops, return operation is performed by JOG operation.

At this time AMP-ON signal has already returned: The motor is in reverse direction under drive-able state.

(C) When entering in drive-able range by return, OTF turns ON to be the normal condition.

(2) In case of overtravel occurring by reverse operation same as above.

(3) When Servopack output signal SERVO READY (SV. RDY) signal is turned off, both of $\overline{OTF}$ and $\overline{OTR}$ are turned off to be in emergency stop condition.

(4) SW1 is used to set CLD signal output delay time (See Par. 5. 2. 4. 2 Table 5.6).

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5.4.4 Optical Encoder (PG) Signal (Servomotor › Servopack)

AC Servomotor optical encoder output is line driver output. The opposed Servopack input circuit is line receiver circuit, which is used as magnetic pole detection signal in Servopack and outputs A-, B- and C-phase signals as PG signal from the line driver.

5.4.5 Servopack 1CN Related Signals

Servopack 1CN and Motionpack-34 interface board 21CN are already connected by 50-pin cable at shipping from the factory so that the customers do not have to connect them. However, when main unit (CACR-SR ▯▯TZ6S▯▯) is used as general-use Servopack, the signal content is required. Fig. 5.25 shows the signal content and pin No. (This signal content is slightly different from generaluse Servopack 1CN.)

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For reference — Servopack 1CN Connection

In Servopack Type CACR-SR[ ]TZ6S[ ], 1CN is already connected. When Motionpack inter-face board is removed and Servopack only (speed control type) is used, 1CN is required to be connected. For details, reter to Servopack bulletin.

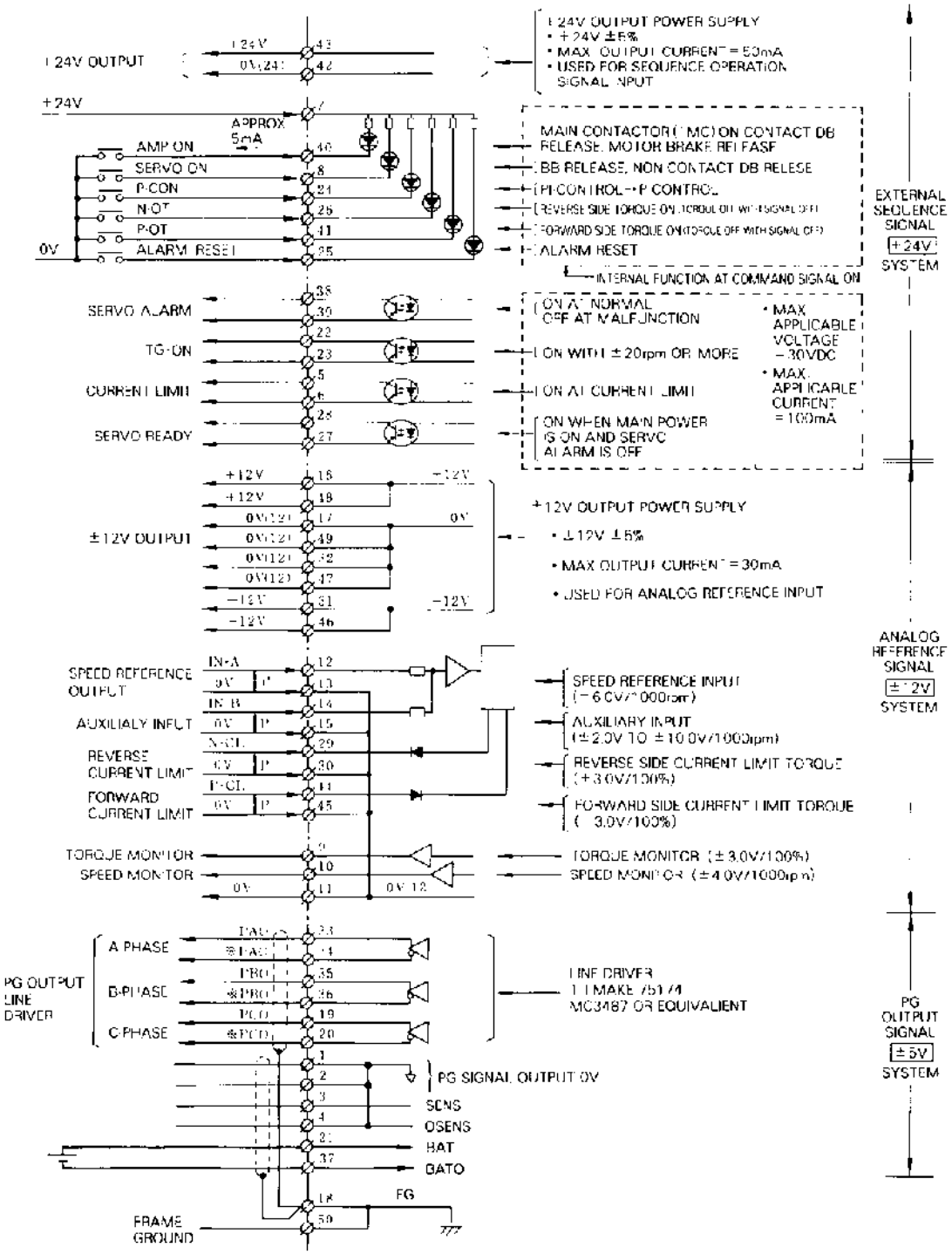


Fig. 5.25 Servopack 1CN Connection

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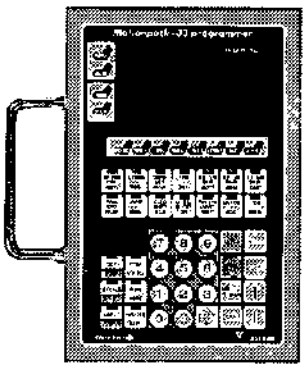
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6. CONNECTION (2)

This section describes details of each unit signal connector type or pin arrangement, cable specifications, applicable cable building method, wiring method, etc.

Read thoroughly before designing control panel or wiring in the panel, or building applicable cable. If cable specifications, wiring routes or grounding method is not proper, malfunction may occur by noise.

Component-to-component connection configuration is provided in Par. 6.5.



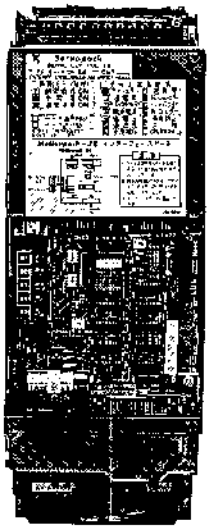
589-30

PROGRAMMER



590-284

CONTROLLER



587-316

Servopack

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6. CONNECTION (2)

6.1 CONNECTOR TERMINAL NO.

6.1.1 Controller CM34C Connector Terminals and Signal Names

Six connectors CN1 to CN6 are built on the panel of Motionpack-34 controller. In anddition, a terminal board TB for the 100VAC and 24VDC power is also built on it.

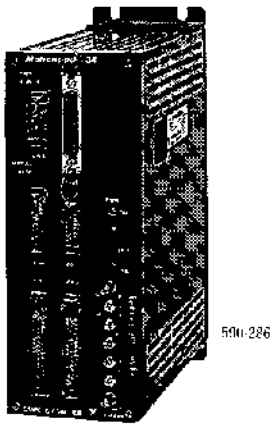


Fig. 6.1 Motionpack-34 CONTROLLER

CN1 CONNECTOR (MR-25RMA)

1	2	3	4	5	6	7	8	9
PB 1	OPB	PB 2	PA 1	OPA	PA 2			FG

10	11	12	13	14	15	16
PC 1	OPC	PC 2		5 V	5 V	5 V

17	18	19	20	21	22	23	24	25
PG BATALM		ABSID		SEN	OSEN	0 5 V	0 5 V	0 5 V

CN2 CONNECTOR (MR-50RMA)

1	2	3	4	5	6	7	8	9	10	11	12*	13*	14*	15	16*	17*	18*
HA 1	HAC	HA 2	HB 1	HBC	HB 2	FG	EXP 1	EXPC	EXP 2	FG	LSB 1	LSBC	LSB2		LSA 1	LSAC	LSA 2

19	20	21	22	23	24	25	26	27	28	29*	30*	31*	32*
										2 A	2 B	2 D	2 C

33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
																+ 24 V	0 24 V

Do not connect the connectors marked with * in absolute method

CN3 CONNECTOR (MR-20RMA)

1	2	3	4	5	6	7
0 12 V	0 12 V		RDY 2	RDY 1		$\overline{SAI}$

8	9	10	11	12	13
FG	SG 02	SG 03	SG 01	CLD	$\overline{OTF}$

14	15	16	17	18	19	20
− 12 V	− 12 V	+ CL	− CL	REF	$\overline{OTR}$	0 24 V

CN4 CONNECTOR (MR-20RMA)

1	2	3	4	5	6	7
+ 24 V	+ 24 V	RDY	ALM 1	ZPM	STL	G 34

8	9	10	11	12	13
EPAL	INCD	OFR	OFM	M 30	M 51

14	15	16	17	18	19	20
M 52	M 53	M 54	M 55	M 56	ZNP	ALM 2

CN5 CONNECTOR (MR-50RMA)

1	2	3	4	5	6	7	8	9	10*	11	12	13	14	15	16	17	18
− INC 9	PGS 8	PGS 9	PGSL 10	PGS 0	PGS 1	PGS 2	+ JS	− JS	ZRN	EDIT	PLAY	JOG		EPS 5	EPS 6	EPS 7	OPSL

19	20	21	22	23	24	25	26	27	28	29	30	31	32
PGSL 10	PGSL 20	PGS 3	PGS 4	PGS 5	SBST	ATST	ERS	STEP	SBK	OVR	G 34 F	MFIN	JPBT

33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
− INC 9	STROBE	PGSL 30	+ INC 8	INC 8	PGS 6	PGS 7	PGCL	$\overline{ATSTP}$		JLF	JMF	FG	DATA SET IN	0 24 V	0 24 V	0 24 V	+ 24 V

The connectors marked with * change their function in absolute method

CN6 CONNECTOR (3483-1000)

1	2	3	4	5	6	7	8	9	10	11	12	13
FG								TXD	$\overline{TXD}$	RXD	$\overline{RXD}$	

14	15	16	17	18	19	20	21	22	23	24	25
									5 V		0 V

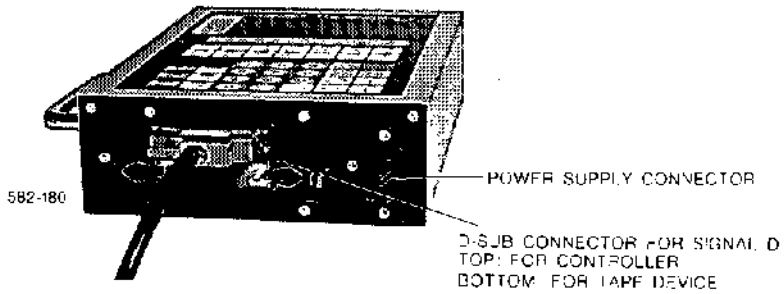
Note: Pin Nos. and signal names are entered as shown on the right

PIN NO
SIGNAL NAME

Fig. 6.2

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6.1.2 Programmer Connectors and Signal Names



C1 CONNECTOR (3483-1000)

1	2	3	4	5	6	7	8	9	10	11	12	13
FG								TXD	TXD	RXD	$\overline{\text{RXD}}$	

14	15	16	17	18	19	20	21	22	23	24	25
									5V		0V

CT CONNECTOR (3483-1000)

1	2	3	4	5	6	7	8	9	10	11	12	13
FG	TXD	RXD	RTS	CTS	DR*	SGO						

14	15	16	17	18	19	20	21	22	23	24	25
						ER*					

Note. Conductor marked with * are connected within the programmer

Fig. 6.3

6.1.3 Servopack Connector Terminals and Signal Names

Servopack related signals are Motionpack-34 connector 22CN (PG signal), 23CN (servosignal) and optical encoder 2CN and external terminal TB1.

22CN (PG signal)

1	2	3	4	5	6	7	8	9
PB1	*PB1		PA1	*PA1				FG

10	11	12	13	14	15	16
PC1	*PC1					

17	18	19	20	21	22	23	24	25
BATALM		ABSID		SEN	OSEN	0.5V	0.5V	0.5V

External terminal (TB1)

1	2	3	4	5
$\overline{\text{OTF}}$	OTR	COM	$\overline{\text{DT}}$	DT

23CN (Servo signal)

1	2	3	4	5	6	7
0.12V	0.12V		RDY2	RDY1 (24V)		$\overline{\text{SAL}}$

8	9	10	11	12	13
	SG02	SG03	SG01	CLD	$\overline{\text{OTF}}$

14	15	16	17	18	19	20
+12V	−12V	+CL	−CL	REF	$\overline{\text{OTR}}$	0.24V

2CN (Optical encoder signal)

1	2	3	4	5	6	7
0.5P	0.5P	0.5P	+5P	−5P	+5P	DIR

8	9	10	11	12	13
			ODIR	BAT	$\overline{\text{BATO}}$

14	15	16	17	18	19	20
PC	*PC	PA	*PA	PB	*PB	FG

Fig. 6.4

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6.2 CABLE

6.2.1 Motionpack-34 Related Cable

(1) PG signal related cable (J1C cable)

Since PG signal is output to Servopack 22CN, connect it to Motionpack-34 CN4 connector. Output circuit is line driver; use twisted shielded cable for mating signal.

For connection, refer to par. 5.23.

Ground cable shielded wire at controller side ; use CN4-9 pin for FG terminal.

Use twisted shield cable; KQVV-SB10P × 0.2mm² (made by Fujikura Ltd.) 0.2mm² twisted shielded cable is recommended.

(2) Terminal device (J4) cables

The terminal device is connected to the Motionpack-34 via J4 cable for input and output of parameters and program.

A D-subconnector (DB-25P made by JAE) is fitted on the programmer side of the cable. In most cases, a D-subconnector is used also on the terminal side. Fig 6.5 shows the pin assignments of the cable fitted with D-subconnectors on both ends.

This cable connector is not provided with Motionpack programmer.

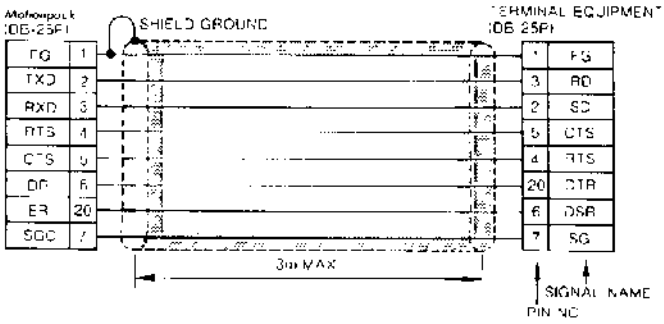


Fig. 6. 5 Cables for Terminal Equipment

(3) Motionpack input/output signals (J6 AND J7) cables

Signals are exchanged between the Motionpack and the programmable controller through the J6 and J7 cables.

J6 : for input signals (PC → Motionpack-34)

J7 : for output signals (Motionpack-34 → PC)

Prepare the cables according to the pin assignments described in par. 6.1.1. Leave the unused pins open.

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Lay only as many lines of 0 or 24V of J6 and J7 as are described in par. 5.2.1.2 and par. 5.2.2.2 all in parallel. This will prevent voltage drop which would occur if current flows through the power line (or the line of 0V), inducing noise to the signal voltage.

The J6 and J7 cables are available on order.

J6 cable : 3 meters long, connector fitted on one end KQVV-SB cable of 50C × 0.2mm²

J7 cable : 3 meters long, connector fitted on one end, KQVV cable of 20C × 0.2mm²

Normally, digital signals should be exchanged between identical control panels. The cable length should not exceed 10 meters.

(4) Motionpack-34 LS signal (J8) cables

J8 cables include external positioning signals. Limit switches are provided to the machine and each of them separates; take proper wiring into consideration.

For proper wiring, as shown in Fig 6.6, relay wiring with relay terminal and provide 24V cable common to improve noise immunity.

For wiring in Fig. 6.6 *1, twist a and b, c and d, e and f. If peripheral noise causes big trouble or electronic limit switch way has trouble by the noise, as shown in Fig. 6.6 *3 EXP, use shielded cable and connect shieled grounding with FG at the control side.

For the cable in Fig. 6.6 *2, shielded cable is suitable KQVV-SB50C × 0.2mm² (made by Fujikura Ltd.) 0.2mm² 50-pin shielded cable is recommended.

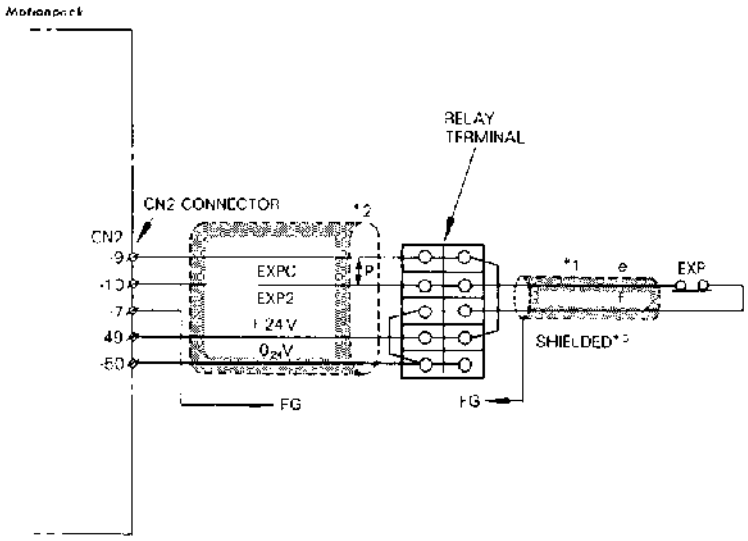


Fig. 6. 6 Connection Configuration

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(5) Servo signal (J9) cables

The signals transmitted through these cables include those related to servo control described for the Motionpack Controller CN3 connecter.

Cable connecting Motionpack-34 controller and Servopack is J9 cable which is the same as one of DC Servopack DB unit.

When preparing the cable, twisted pairs must conform exactly to the designated connector pins as shown in Fig, 6.7. If twisted pairs are shifted, noise interference could occur with the resultant effect of twisted pairs lost.

The J9 cable should be a shielded cable. Recommended is KQVV-SB10p × 0.2mm² made by The Fujikura Ltd.

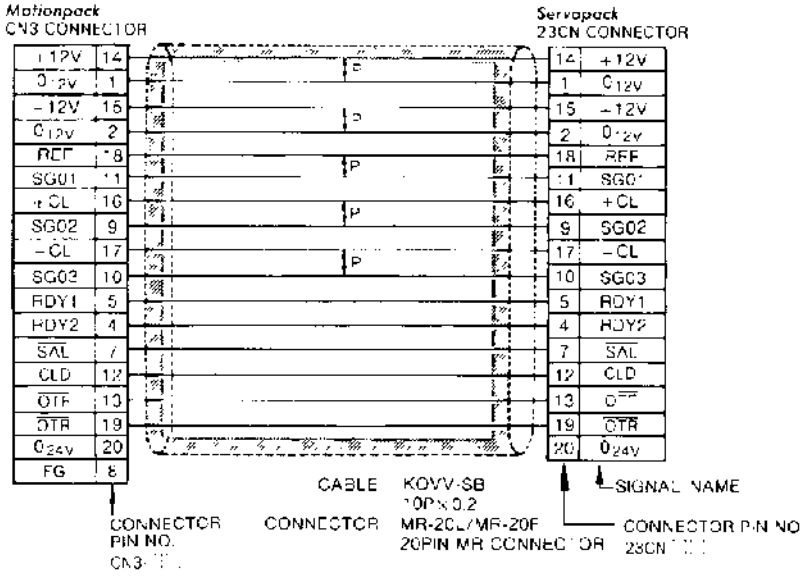


Fig. 6. 7 J9 Cable

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(6) Signal cables materials

The signal lines between the Motionpack-34 controller and the sequence are to be connected with the MR connector on the Motionpack-34.

Select a cable by referring to Table 6.1. The suitable twisted-pair cable is the KQVV-SB10P × 0.2mm² shown in Table 6.2.

Signal lines between Motionpack-33 and sequencer should be connected with MR connectors. Cables Should be selected in accordance with Tables 7. 6 and 7. 7 Twisted cables should be KQVV-SB10P × 0.2mm² (or3P × AWG26) shown in Table 6. 3.

Table 6. 1 Signal Cables

	MR-50L／MR-50F	MR-20L／MR-20F
Type	Solder type	Solder type
No. of Cores	50 cores	20 cores
Applicable Wire	AWG #24-#28	AWG #24-#28
Cutter Diameter	16 mm dia max	10 mm dia max
Recommended Cable	Plastic multicore control cable (Example) KQVV50C×0.2 (0.2mm², 50 cores) manufactured by Fujikura Ltd.	(Example) KQVV20C×0.2 (0.2mm², 20 cores) manufactured by Fujikura Ltd.
	Cores: 0.2mm² tin-plated soft copper stranged wires. 16／0.12 (cores／mm) Insulating material: Cross-linked vinyl Thickness: 0.3 mm Finished outer dia: 1.1 mm	

Table 6. 2 Dimensions of Cores

AWG	Sectional Area of Conductor mm²	Standard Outer Dia of Vinyl insulation mm
#24	0.21	1.5 < Recommended
#26	0.13	1.3
#28	0.08	1.2

Table 6. 3 Twisted Cables

Name		Unit	Specifications KQVV-SB
No. of Pairs		Pair	10
Conductor	Material		Tin-plated soft copper stranded wires
	Nominal Sectional Area	mm²	0.2
	Configuration	Numbers／mm	16／0.12
	Outer Diameter	mm	0.55
Insulation	Material	–	Cross-linked vinyl
	Thickness	mm	0.3
Circuit Configuration			Paired strands with pitch of 18, 22, 25, 32
Holding		–	Wound with paper tape
Shielding		–	Tin-platec soft copper wire braiced
Sheath	Material and Color		Vinyl, black
	Thickness	mm	1.2
Approx Finished Outer Dia.		mm	10.0
Approx Weight		kg／km	130

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〈Wiring to mobile device〉

There are special considerations for a cable connected to a mobile device. The cable undergoes repeated bending or twisting as the mobile device moves. It exposes the cable conductors to fatigue, leading to breakdown, should some PG signal line break, the moter might run wild and a serious accident occur.

Cable makers advise that the resistance of the cable to bending and twisting is determined by the following factors.

Bending strength

(1) Curvature of bend
(2) Cable tension
(3) Multiple number of twisting pitches of cable core leads
(4) Area of conductor
(5) Structure of conductor

Twisting strength

(1) Twisting angle
(2) Twisting pitch of cable core leads
(3) Cable twisting span

For cables connecting mobile devices, it is recommended to use cables that are made for industrial robots and are capable of withstanding the rigors of bending, twisting, est.

For precise details, address inquiries to the cable makers.

Examples of movable device cables are shown below.

〈Example of Robot Cable〉

Type : CO-FHV-SB 10P × 0.3mm²

Manufacturer : Hitachi Cable, Ltd.

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Table 6. 4 Cable Specifications

Item		Unit	Standara Value
Number of cores (pair)		–	10
Conductor	Nominal sectional area	mm^2	0.3
	Composition	No./mm	60/0.08
	Outside diameter	mm	0.72
Insulation thickness		mm	0.3
Insulation diameter		mm	1.32
Pair outside diameter		mm	2.64
Twisted cable outside diameter (approx)		mm	8.5
Shielded braid thickness		mm	0.3
Sheath thickness		mm	1.0
Finished outside diameter (max)		mm	11.0
Conductor resistor (20℃)		Ω/km	65
Test voltage		V/min	AC500/1
Insulation resistor (20℃)		MΩ · km	100
Approximately weight		kg/km	160
Standard length		m	200
Packaging method		–	Bundle

Table 6. 5

Pair No.	1st Core	2nd Core	Pair No.	1st Core	2nd Core
1	White	Black	6	Red	Brown
2	White	Red	7	Red	Yellow
3	White	Brown	8	Black	Brown
4	White	Yellow	9	Black	Yellow
5	Red	Black	10	Yellow	Brown

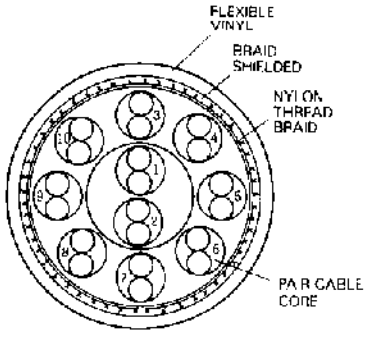


Fig. 6. 8

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6.2.1 Motionpack-34 Related Cable (Cont'd)

(7) Cable List

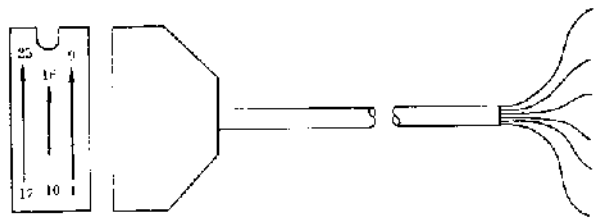
The following cables are available upon request.

Cable	Application	Connecter	request	Standard Cable Specification	Symbol	Length(L)	No. of Cables
J1C	PG Signal [CM34 AC Servopacks]	MR-25L/MR-25F	KQVV-SB 0.2×10P	CM-CN4	J1C	3m	
J4	PM33F ⋮ PC	D-Sub Connector DB-25P	KQVV-SB 0.2×10P shielded	CT	J4	3m	
J6	CM34 (IN) ⋮ Sequencer(OUT)	MR-50L/MR-50F	KQVV SB 0.2×50C	CM-CN5	J6	3m	
J7	CM34 (OUT) ⋮ Sequencer (IN)	MR-20L/MR-20F	KQVV-SB 0.2×20C	CM-CN1	J7	3m	
J8	CM34 Handle PG Ext. Positioning Signal	MR-50L/MR-50F	KQVV-SB 0.2×50C	CM-CN2	J8	3m	
J9B	Servo Signal [CM34-AC Servopack]	MR-20L/MR-20F	KQVV-SB 0.2×10P shielded	CM-CN3	J9B	3m	

Cables mentioned above, are provided with only one connector at Motionpack side.
For connector at the opposite side, select and use a connector according to your requirements.

(a) J1C Cable (PG Signal CM34 • CN4 ↔ AC Servopack)

25	0 5V			9	Shielded
24	0 5V	16		8	
23	0 5V	15		7	
22	OSEN*7	14		6	
21	SEN*7	13		5	OPA*2
20		12		4	PA 1 *2
19	ABS ID	11	OPC*3	3	
18		10	PC 1 *3	2	OPB*1
17	BATALM			1	PB 1 *1



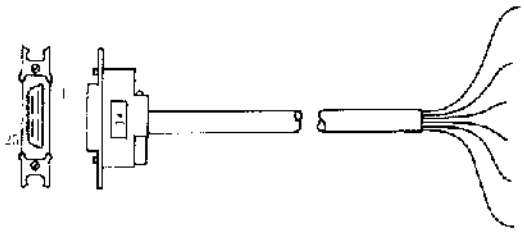
Connector Pin Layout

Note : Cable with * of the same No. are of twisted pair.

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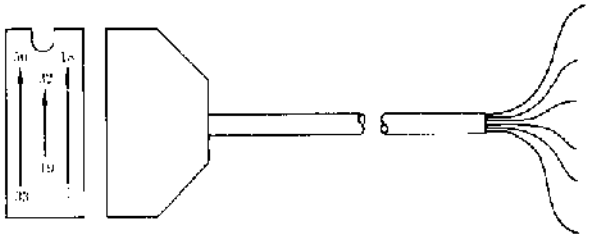
(b) J4 Cable (Programmer ↔ PC)

14		1	FG
15		2	TXD
16		3	RXD
17		4	RTS
18		5	CTS
19		6	
20		7	SGO
21		8	
22		9	
23		10	
24		11	
25		12	
		13	



(c) J6 Cable (Digital input signal, CM34 • CN5 ↔ Sequencer)

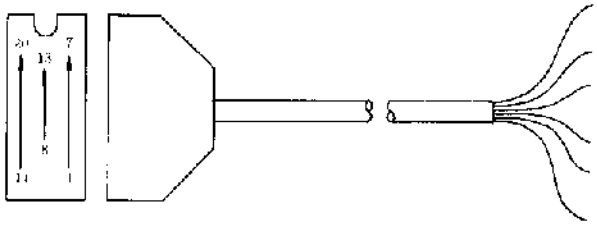
50				18	OPSL
49	O_{24} V			17	EPS 7
48	O_{24} V	32	SEL	16	EPS 6
47	O_{24} V	31	MFIN	15	EPS 5
46	SET INT	30	G34F	14	
45	FG	29	OVR	13	JOG
44	JMF	28	SBK	12	PLAY
43	JLF	27	STEP	11	EDIT
42		26	ERS	10	ZRN
41	ATSTP	25	ATST	9	−JS
40	PGCL	24	SBST	8	+JS
39	PGS 7	23	PGS 5	7	PGS 2
38	PGS 6	22	PGS 4	6	PGS 1
37	−INC 8	21	PGS 3	5	PGS 0
36	+INC 8	20	PGSL20	4	PGSL00
35	PGSL30	19	PGSL10	3	PGS 9
34	STROBE			2	PGS 8
33	−INC 9			1	+INC 9



Connector Pin Layout

(d) J7 Cable (Digital output signal CM34 • CN1 ‹ › Sequencer)

20	ALM 2			7	G34
19	ZNP	13	M51	6	STL
18	M56	12	M30	5	ZPM
17	M55	11	OFM	4	ALM 1
16	M54	10	OFR	3	RDY
15	M53	9	INCD	2	+24V
14	M52	8	EPAL	1	+24V

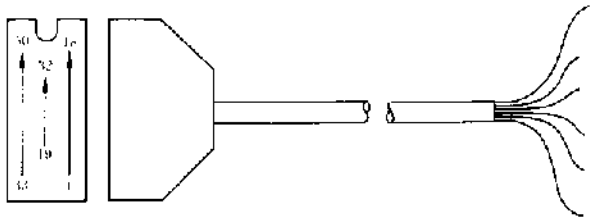


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6.2.1 Motionpack 34 Related Cable (Cont'd)

(e) J8 Cable (External Cable CM34 · CN2 ↔ External Circuit)

50	O_{24} V			18	LSA 2	＊2
49	$+24^{V}$			17	LSAC	
48		32	2 C＊1	16	LSA 1	
47		31	2 D＊1	15		
46		30	2 B＊1	14	LSB 2	＊2
45		29	2 A＊1	13	LSBC	
44		28		12	LSB 1	
43		27		11	FG	
42		26		10	EXP 2	＊2
41		25		9	EXPC	
40		24		8	EXP 1	
39		23		7	FG	
38		22		6	HB 2	＊2
37		21		5	HBC	
36		20		4	HB 1	
35		19		3	HA 2	
34				2	HAC	＊2
33				1	HA 1	



Note:

＊1 Common across the following pins:
- ⑤ ㉜
- ⑬ ㉙

When removing a common lead, cut off the both ends of the lead from the contacts.

＊2 Each signal of HA, HB, EXP, LSA, LSB is provided with two leads for power switching.

HA 2 (HB 2), HA C (HB C), HA 1 (HB 1)] 12 V / 5 V

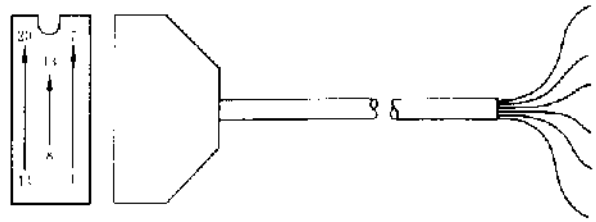
EXP 2, EXP C] 24 V
EXP 1] 12 V

LSA 2 (LSB 2), LSA C (LSB C)] 24 V
LSA 1 (LSB 1)] 12 V

Cut off an unnecessary lead from the bottom.

(f) J9 Cable (Servo Signal CM34 · CN3 ↔ AC Servopack)

20	0_{24}V			7	SAL	＊
19	OTR	13	OTF	6	NODB	
18	REF	12	CLD	5	RDY 1	
17	−CL	11	SG01	4	RDY 2	
16	+CL	10	SG03	3		
15	-12^{V}	9	SG02	2	0_{12}V	
14	$+12^{V}$	8	FG	1	0_{12}V	



＊When using AC Servopack for absolute value system, cut off a lead for ⑥ NODB signal from the bottom.

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6.2.2 Servopack Related Cable

(1) Optical encoder (PG) cable

Applicable receptacle and cable specifications are as shown in Table 6.6.

Fig. 5.15 shows connecting method of optical encoder connecting Servopack connector 2CN and optical encoder, and slso PG output (connector 1CN) processing method.

Table 6. 6 Applicable Receptacle and Applicable Cable Specifications

Servopack Applicable*1 Connector Specifications	Applicable Receptale Type				Connection Cable Specifications
	Soldered type	Caulking type*3	Case	Manufacturer	
MR-20RMA Right Angle	MR-20F*2	MRP-20F01 Contact MRP-#62 (Continuous termination) MRP-#12 (Single termination)	MR-20L*2	Honda Tsushin Co.	DP8409123 or DE8400093

*1: Made by Honda Tsushin Co.
*2: Servopack standard attachment
*3: Not Servopack standard attachment

NOTE

Though the cable with the following specifications are prepared as connecting cable they are not attached to Servopack or motors.

If required, give an order by preparatory length unit. (See Table 6.7.)

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Table 6. 7 Details of Specificable of Applicable Cables

Connection	Soldered Type	Caulking Type
Yaskawa Drawing No.	DP8409123	DE8400093
Manufactuer	Fujikura Cable Co.	
Approx Specifications	Double, KQVV SW AWG22 × 3C AWG26 × 6P	KQVV-SB AWG26 × 10P
Recommended Receptacle Type	For Soldered Type	For Caulking Type
Internal Composition and Lead Color DP8409123 Standard Application	A_1 Red A_2 Black A_3 Green-yellow B_1 Blue-White/blue B_2 Yellow-White/yellow B_3 Green-White/green B_4 Orange-White/orange B_5 Purple-White/purple B_6 Grey-White/grey Twisted Cable	1 Blue-White 2 Yellow-White 3 Green-White 4 Red-White 5 Purple-White 6 Blue-Brown 7 Yellow-Brown 8 Green-Brown 9 Red-Brown 10 Purple-Brown Twisted Cable
Yaskawa Standard Specifications	Standard length: 5m, 10m, 20m Terminal ends are not provided (without connectors).	

NOTE

1. Allowable wiring distance between Servopack and motor (PG) is maximum 20m when applicable cable is used.
2. When the wiring distance exceeds 20m contact YASKAWA representative asking for 50m cable (YASKAWA DWG NO DP8409179). DP8409179 composition is AWG16 × 3C, AWG26 × 6P; the lead colors are the same those of DP8409123.

To prevent noise interference, extending the single PG cable is preferable to connecting two cables via terminals at the outlet from the control panel. If connecting cables at terminals is unavoidable, connect the shields as shown in Fig. 6.9.

(2) PG signal related cable

Refer to par. 6.2.1 (1) "PG signal related cable (J1C Cable)"

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(3) Servo related signal cable

Refer to par. 6.2.1 (5) "servo related signal cable".

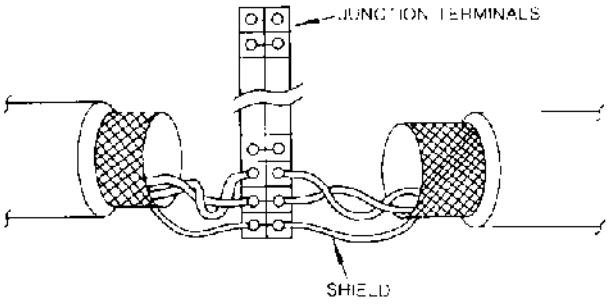


Fig. 6. 9 Junction of Cables

6.2.3 Main Circuit Related Wiring

(1) Rated current and applicable cable size Tables 6.8 and 6.9 show description of external terminals and rated current, and applicable size. Applicable cables and their sizes are choosen for applicable environment and current capacity. Example of applicable cable size is given under the condition of ambient temperature 40° and rated current running on 3 lead bundles.

Table 6. 8 Rated Current

External Terminal Name		Type CACR- / Terminal Sig	Rated Current						
			SR03TZ	SR06TZ	SR12TZ	SR20TZ	SR30TZ	SR44TZ	SR60TZ
On-line terminal	Main circuit power supply input terminal	ⓇⓈⓉ	2 Arms	6 Arms	8 Arms	10 Arms	18 Arms	24 Arms	32 Arms
	Motor connection terminal	ⓊⓋⓌ	3.0	5.8	11.7	18.8	26	33 Arms	45 Arms
	Regeneration resistor connection terminal	Ⓨ3 Ⓨ4	3.8 A Max.		7.6 A Max.	15.2 A Max.	30.4 A Max.		46 Arms
	Emergency stop connection terminal	Ⓨ5 Ⓨ6	0.2 Arms						
	Brake connection terminal	Ⓐ7 Ⓐ8	DC0.5A						
Off-line terminal	Control I/O Single connector	15 CN	DC100mA Max.						
	PG Signal connector	2 CN	100mA Max. power line DC 500mA						
	Grounding connector	⏚	—						

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6.2.3 Main Circuit Related Wiring (Cont'd)

Table 6. 9 Example of Applicable Cable Size

External Terminal Name		Type CACR- / Termina. Sign	Example of Applicable Cable Size					
			SR03TZ	SR06TZ	SR12TZ	SR20TZ	SR30TZ	SR44TZ
On-line terminal	Main circuit power supply input terminal	ⓇⓈⓉ	HIV 2.0 min.			IEB 3.5 min.	HIV	HIV
	Motor connection terminal	ⓊⓋⓌ	HIV 2.0 min.		HIV 3.5 min.		5.5 min.	2.2 min.
	Regeneration resistor connection terminal	ⓎⓃ	HIV 2.0 min.		HIV 3.5 min.		HIV 5.5 min.	
	Emergency stop connection terminal	ⓎⓄ	HIV 1.25 min. (SR60TZ terminals Ⓢ HIV 1.25 min.)					
	Brake connection terminal	ⒶⒷ						
Off-line terminal	Control I/O Single connector	15 CN	Twisted cable or twisted shielded cable Tin-plated annealed copper twisted cable Cable finishing externals: 15CN-φ 15 max. 26CN-φ 11 max.					
	PG Signal connector	2 CN						
	Grounding connector	⏚	HIV 2.0 min.					

Table 6. 10 Applicable Cable

Type		Conductor Applicable Temp. (°C)
Mark	Name	
PVC	General vinyl cable	–
IV	600 V vinyl cable	60
HIV	Special heat-proof vinyl cable	75

NOTE

1. Use pressure-proof cable of 600V at minimum for the main circuit.
2. For strand, pay attention to cable allowable current reduction ratio if the cable is put in the duct (hard vinyl tube, metal tube).
3. When ambient temperture (panel temperature) is high, use heat-proof cable since general vinyl cable would be heat deteriorated in a short time.

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6.3 PRECAUTIONS FOR WIRING

6.3.1 Prevention of Interference between Wires

In the Motionpack system, cables of varying power levels such as the lines of PG and digital signals, mix with the motor main circuit through which large current flows. If a high speed signal line such as the PG signal line is laid close to the motor main circuit, noise might be induced in the signal line and result in a failure of positioning.

It is therefore very important to prevent interference between lines.

(1) Wiring division

The lines can be divided into three groups as given in Table 6.11.

Table 6. 11 Group of Lines

	Category I	Category II	Category III
Conditions	May cause noise interference due to large current and highspeed signals.	Vulnerable to serious damage due to external noise induction.	Relatively stabled for both digital or analog.
Connection specifications	• Servopack ⟷ motor • Servopack 200 VAC power input line	• PG leads • Servopack reference input (J9)	• CM I/O signals (J6, J7)

Do not lay lines belonging to different categories in the same duct or bundle.

Observe the following precautions for category II PG signal lines.

(a) Never lay the lines of PG signals close to or parallel to any categoly I lines.

(b) Never lay the lines of PG signals close to parts and units generating noise or parallel to the lines wired to them.

(c) For better results, connect the shielding of any cable coming from PG to the frame ground terminal of the control panel.

(2) Wiring for PG

A serious error, such as mispositioning, would occur if noise added to PG signals. Follow the instructions listed below. Do not braid with category I line or lay lines in the same duct.

(3) Motionpack origin signal (J8) cables

The signals transmitted through the J8 cable include the origin slow down signal, origin confirmation signal, and external positioning signal.

The cable to the machine may be of considerable length. LS contacts sometimes open during operation and, if this happens, noise is likely to be induced in the cable. Take the following precautions against noise.

(a) Connect a surge supperssor in parallel with each LS contact.

Surge suppressor : CR50500 (of Okaya Industry) or a capacitor (metalized film, 600V／0.1μF)

(b) Lay the cable away from and not parallel to the main circuit wiring.

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(4) Connecting surge absorber to coil

Be sure to connect a surge absorber to every device having a coil in it, such as relays, contactors, and solenoids.

Surge absorbers :

(a) Use 200 VAC : Surge suppressor CR50500 (of Okaya Industry)

(b) Use 100 VAC : Surge suppressor AU1201 (of Okaya Industry)

(c) Use 24 VDC : Diode IS2462 (of Toshiba Corporation)

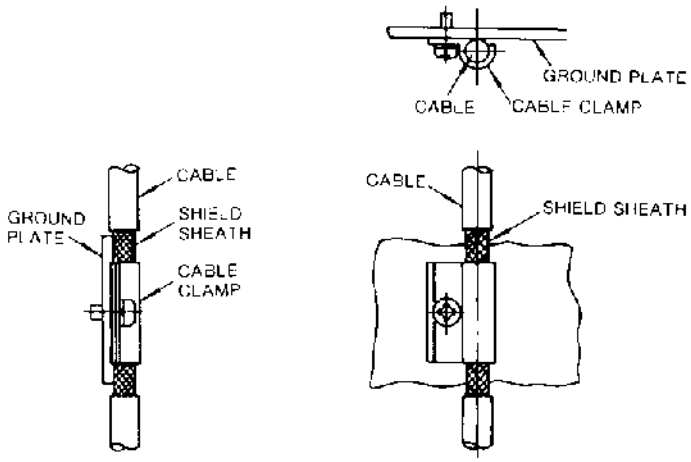
The surge absorbers above are usable at the specified voltages.

(5) Fastening cables

Be sure to tighten the locking screw of the MR connector on the cable.

Clamp the cable so that the weight and tension of the cable will not pull on the connector.

The clamp shown in Fig. 6.10 is very effective. The sheath of the shielded cable can be removed to connect the shielding to FG (frame ground).



Note: To clamp the cable (which is not shielded), cable armor should not be stripped.

Fig. 6. 10 Cable Clamp

(6) Assuring correct connection of cable connectors

Input/output circuits of the Motionpack-34 may be damaged, for correct pairs of male and female cable connactors are not mated properly. Observe the following precautions to prevent such an mishap.

(a) Write the name of the cable connector on the nameplate provided and bond it to the connector immediately after you have prepared the cable.

(b) After laying the cables, bind them together so that the cable connectors come to fixed positions.

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6.3.2 Connection of the Input/Output Power Supply Unit

One input/output power supply unit can supply power to more then one Motionpack-34. In this case, string the power cable carefully to prevent noise interference occurring duc to voltage drop.

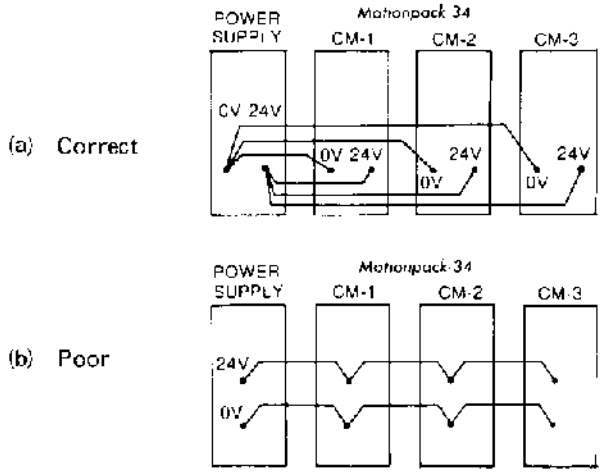


Fig. 6. 11 Input/Output Power Connections

6.3.3 Noise Source Measurement

When sharing the power supply with electrical welder or electrical discharge machine, or there is a high-frequency noise source nearby, provide noise filter or insulation transformer to the power supply or input circuit.

Following must be observed:

(1) Separete the leads of the primary circuit of the noise filter or isolation transformer completely from those of the secondary circuit.

(2) Connect the ground line of the noise filter or isolation transformer to system ground via the shortest path with a heavy wire.

(3) Reduce the length of the line to the input terminal of the noise filter or isolation transformer to the minmum. Take care to prevent noise feom being induced in the circuit. (Refer to instructions above.)

(4) For the control panel, take power from the secondary circuit of noise or isolation transformer.

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6.3.4 Grounding

Connect all grounding leads to the ground at one position (grounding better then class 3, grounding resistance 100 ohms or less). Use a thick wire (flat braided wire of 3.5mm^2 or more) for the grounding lead.

Fig. 6.12 shows a methed for grounding an axis. The frame grounds of the Motionpack -34 controller, DB unit, Servopack, and programmable controller are connected to the ground terminal of the control panel and a single grounding lead of class 3 (100 ohms or less) or better are installed there. The "other circuits" referred to there include the inverter driving the main axis.

The inverter must be grounded directly to the location where the collective grouding of the other components converge.

Fig. 6.13 shows a method for grounding many axes. Such a system includes many units and it would be troublesome to lay grounding leads individually. It indicates an example of laying many individual grounding lines, one for each axis. It is not good to connect units of the same kind together, like controller to controller and Servopack to Servopack.

• Motor frame grounding

When the motor is grounded through the frame at machine side, cf/dv/dt current is given from PWM power section through motor floating capacity (cf). To prevent the influence by this current, connect motor E terminal (motor frame) to Servopack ⏚ terminal for use. (Servopack ⏚ terminal should be directly grounded.)

• Servopack SGOV

When the noise gets on the input signal line, ground SGOV to use.

When the motor wiring is in metal conduit, ground both conduit and box.

Grounding methods mentioned above are single grounding.

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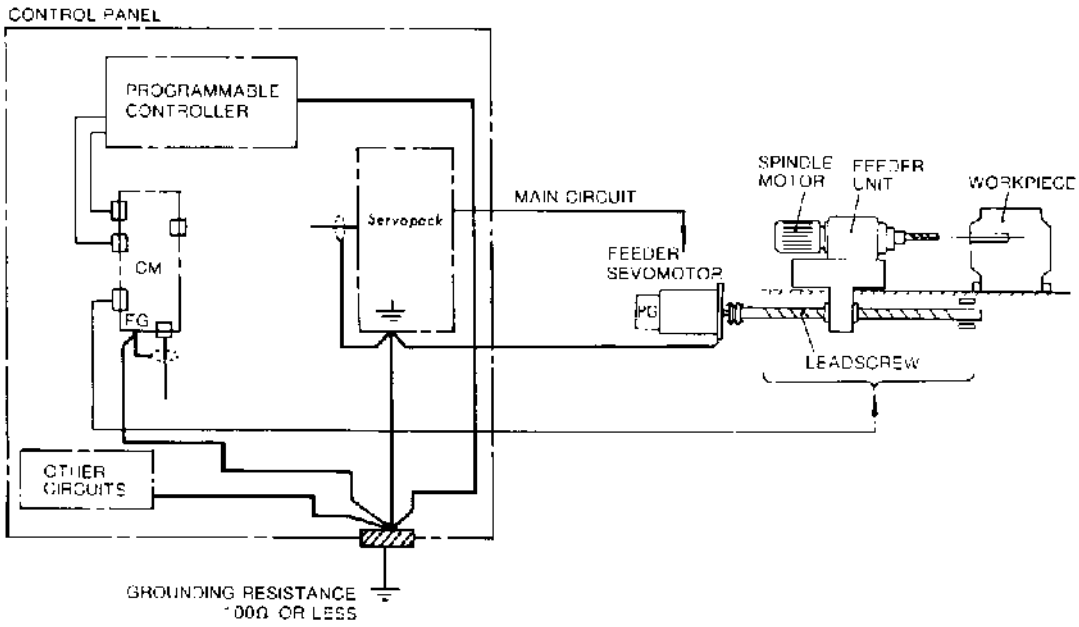
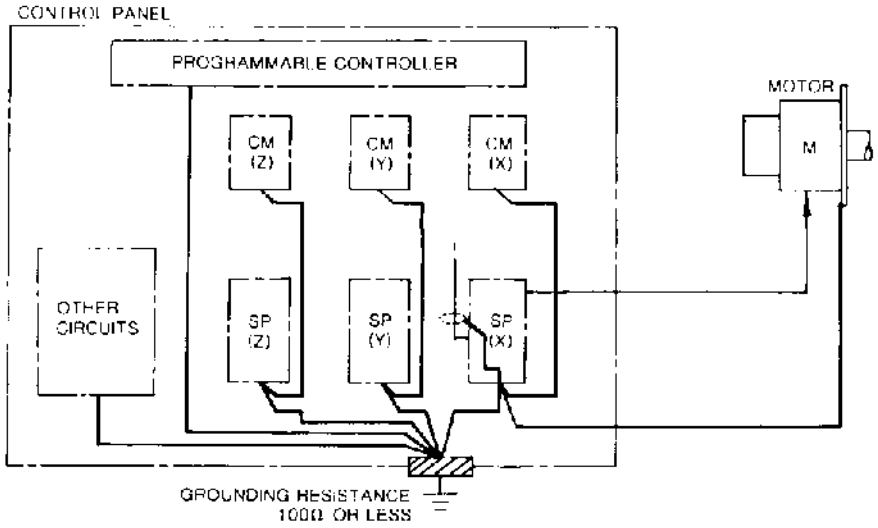


Fig. 6. 12 Grounding for One Axis



Note: Motors for Y and Z axes and their connectors are not shown.

Fig. 6. 13 Grounding for Multiple Axes

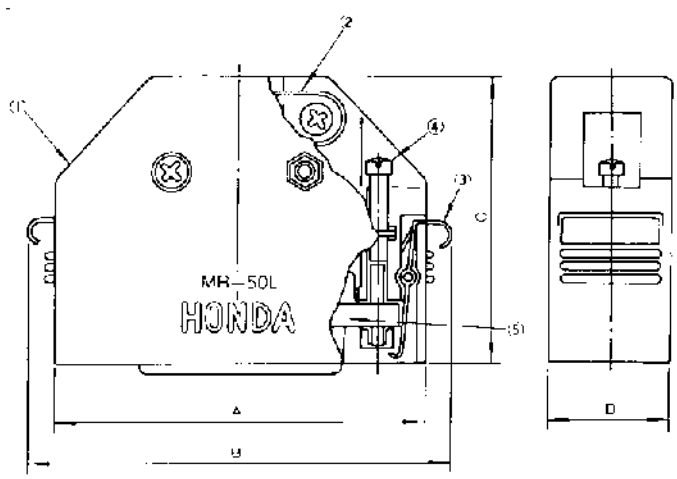
6.3.5 Precautions for Servopack Related Wiring

(1) Separete power line (strong electrical circuit such as AC line, motor line, etc.) and signal line by more then 30cm for wiring.
Do not conduct in the same duct or not strand together.

(2) When electrometer is connected to torque monitor terminals ((A1) - (A3)) and speed monitor terminals ((A2) - (A3)), set the electrometer as close to the control unit as possible and do not strand wires together with power line.

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6.4 CONNECTOR DIMENSIONS (Maker : Honda Tsushin Co.)



Code / Model	A	B	C	D
MR-20L	39.3	44.9	39.8	18
MR-25L	44.5	50.1	40.5	18
MR-50L	67.9	73.5	44.8	18

Code	Name
①	Connector cover
②	Cable clamp
③	Connector clamp spring
④	Connector clamp screw
⑤*	Connector (MRP-$^{20F}_{50F}$ MR-$^{20F}_{50F}$)

*

1. MRP 20F, -25F, -50F: Solderless type.
   MR -20F, -25F, -50F: Soldered type

2. Applicable cable OD: MR-20L 10mm dia max
   MR-25L 13.5mm max
   MR-50L 16mm dia max

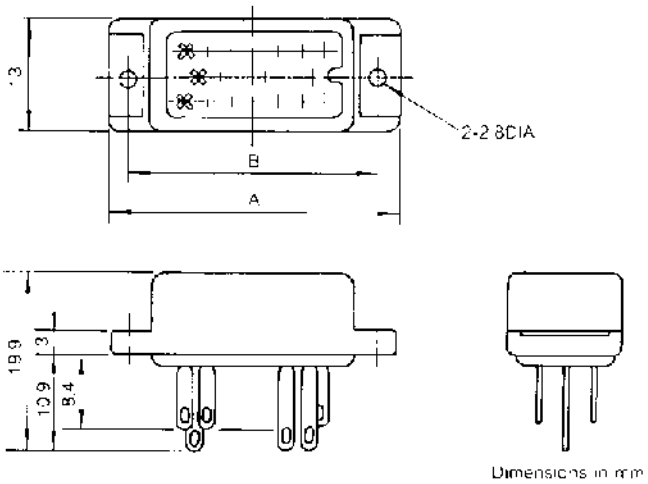
3. The Motionpack accessory set includes an MR-20F (with MR 20L) and MR 50F (with MR-50F) (soldered type).

   When solderless type connectors (MRP-20F01, MRP-25F01, MRP-50F01) are to be used they must be prepared by the machine builder.

Fig. 6. 14

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(1) Model MR-20F, MR 25F, MR 50F connectors (Soldered Type)

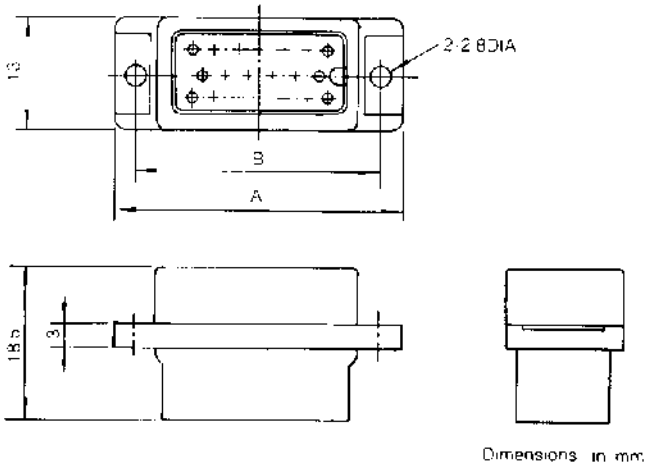


Dimensions in mm

Model \ Code	A	B	No. of Terminals
MR-20F	32.8	27.8	20
MR-25F	38.0	33.0	25
MR-50F	61.4	56.4	50

Fig. 6. 15

(2) Model MRP 20F01, MRP-25F01, MRP-50F01 connectors (Solderless Type)



Dimensions in mm

Model \ Code	A	B	No. of Terminals
MRP-20F01	32.8	27.8	20
MRP-25F01	38.0	33.0	25
MRP-50F01	61.4	56.4	50

Fig. 6. 16

Note: To use the solderless type connectors, a crimping tool is required, for which inquiries are to be made to Honda Tsushin Co.

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6.4 CONNECTOR DIMENSIONS (Maker : Honda Tsushin Co.) (Cont'd)

(3) Terminal No.

Dimensions in mm

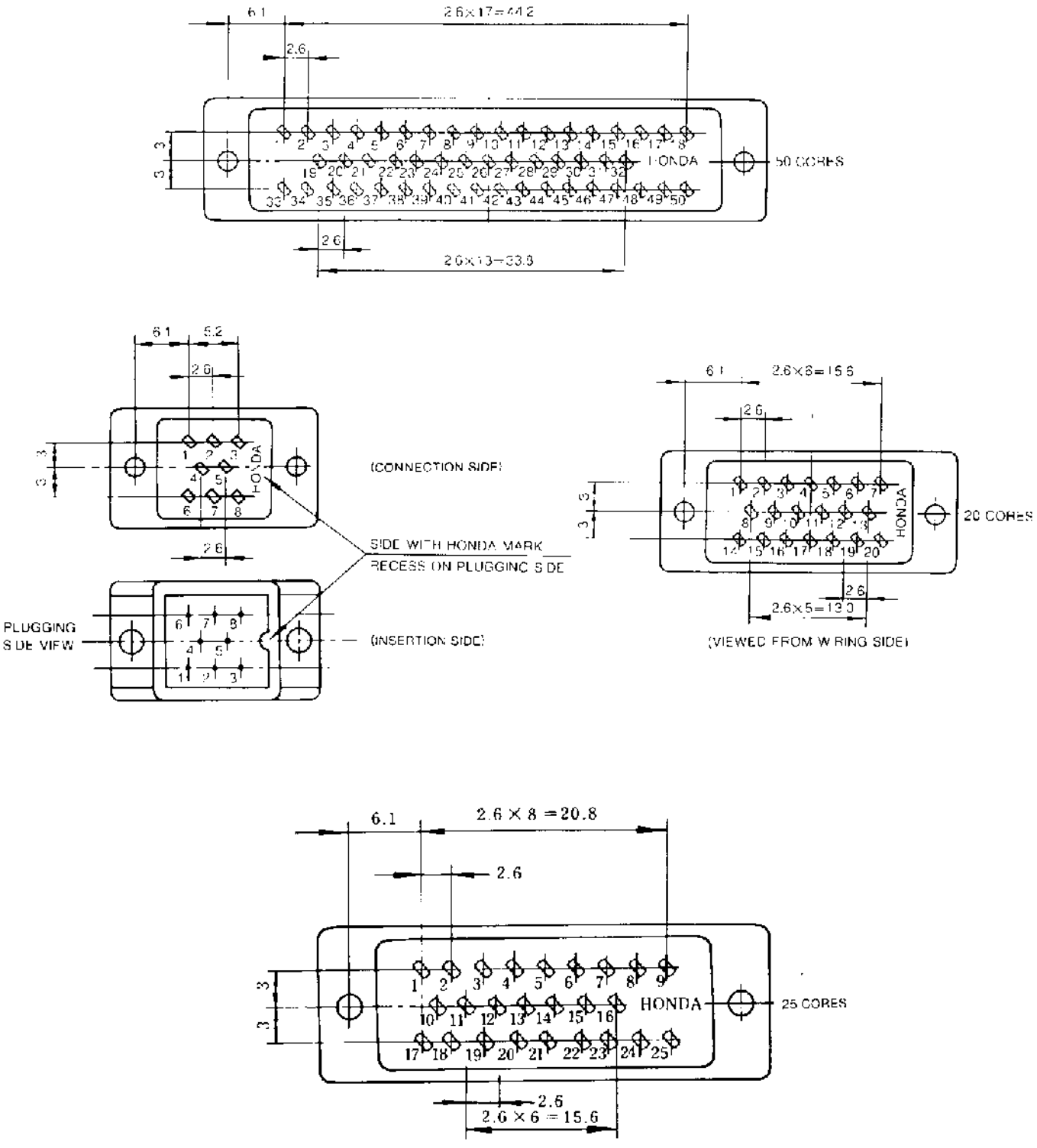


Fig. 6. 17

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6.5 COMPONENT-TO-COMPONENT TOTAL CONNECTION

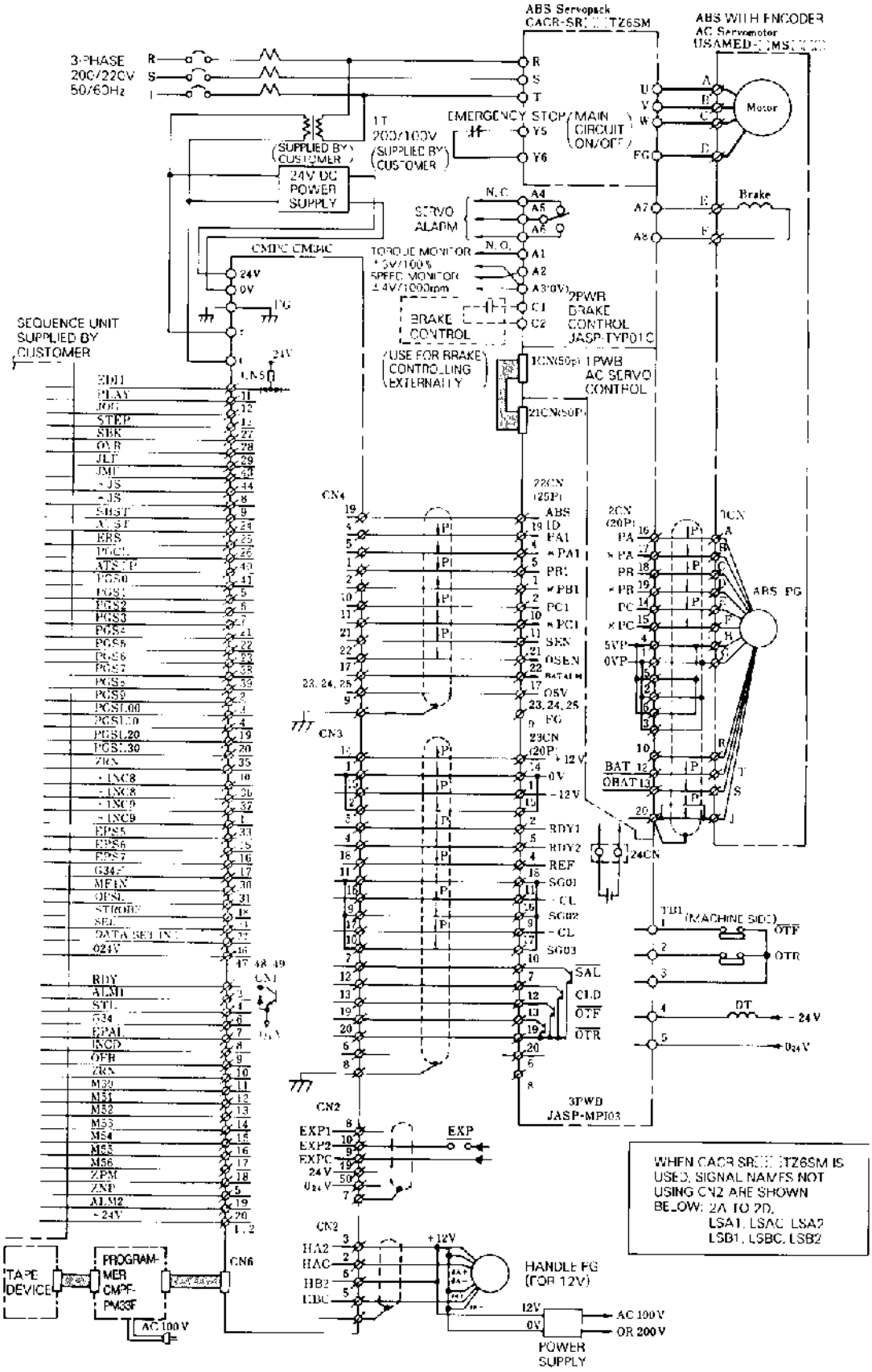


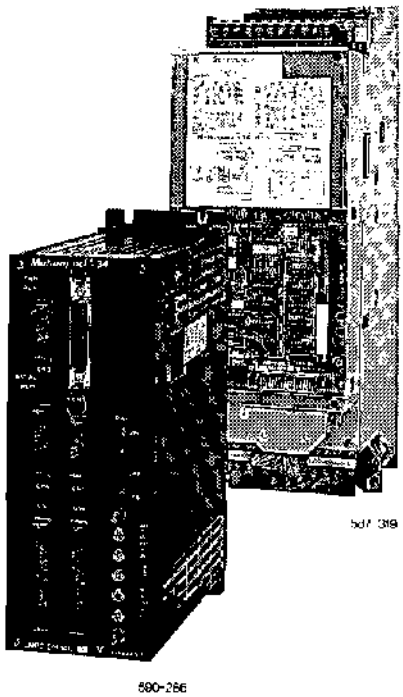
Fig. 6. 18 Motionpack-34 Component-to-Component Total Connection Configuration (When CACR-SR TZ6SM is used.)

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7. INSTALLATION, TEST RUN

This section describes the procedures of installing the Motionpack-34 and adjusting it during trial operation.
Installation of units will be described first, together with precautions. The procedures of trial operation and adjustment are flowcharted in Par. 7.2.
Setting up the reference of the coordinate system for absolute positioning is explained in Par. 7.2.6.
Never fail to set up the coordinate point.



Servopack
TYPE CACR-SR20TZ 6S□

CONTROLLER
Motionpack-34

TYPE CMPC-34C

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7. INSTALLATION, TEST RUN

7.1 INSTALLATION

7.1.1 Motionpack-34 Controller

7.1.1.1 Installation and connection

(1) Installation

The Motionpack-34 Controller has ventilation openings on its sides. Install the unit so that those openings are kept clear (Fig. 7.1).

When installing the Controller, use the four holes provided at the top and bottom of the unit. Install it so that the requirements for environmental conditions given in par. 3.1, "Motionpack-34 CONTROLLER" are satisfied.

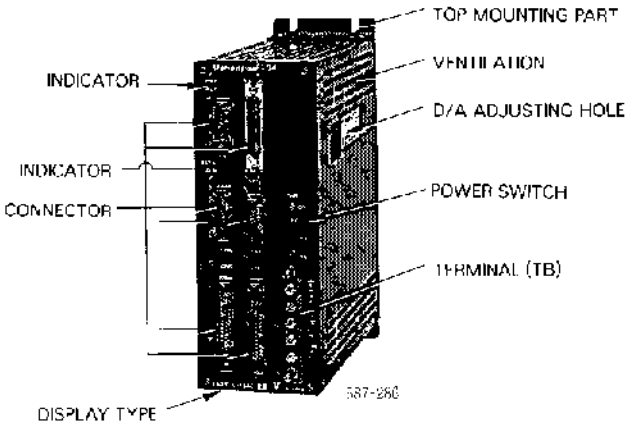


Fig. 7.1 Motionpack-34 Controller

(2) Connecting supply power

Use single-phase 100 VAC (85 120V, 50/60Hz) power as the power supply. Connect the power leads to r and t of terminal TB on the controller front panel. The controller becomes active when the power switch is ON.

Connect 24VDC power supply to terminals 24V and 0V.

(3) Connecting the cables

Mate the cable connectors with the corresponding connectors on the controller, and tighten them securely with screws.

Do not allow the weight and/or tension of the cable to be borne by the connector or the controller.

The cable used for connection with the Motionpack Programmer is provided with the programmer. Use connector CI and tighten the connection.

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7.1.1.2 Indications

The indicators on the front panel are explained in Table 7.1. The locations of the indicators are shown in Fig. 7.2.

Table 7.1 Description of Indicators

Display	Color	Content	Procedure
RUN	Green	Lit···Normal operation Off···CPU malfunctioning	Operational Refer to par. 7.1.1.6.
PWR	Green	Lit···Power on	—
ALM	Red	Lit···System malfunctioning Off···System normal	Refer to par. 7.1.1.6. Operational
BAT AL	Red	Lit···Battery voltage low Off···Battery normal	Replace battery. Operational

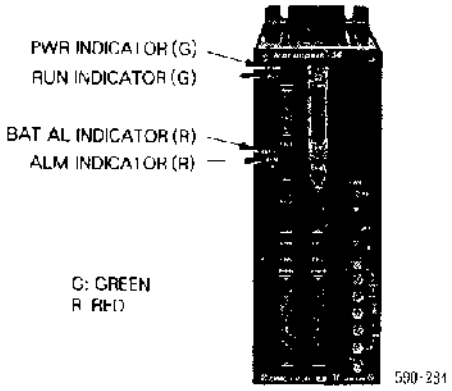


Fig. 7.2 Front Panel Indicators

7.1.1.3 Low pass filter drift adjustement

Automatic drift adjustment starts at 2 seconds after turn-on of the Servopack drive power. The range of adjustment is within ± 511.

When the value of adjustment (indicated with d 1) is nearly maximum, adjust zero of the Servopack to reduce the value of adjustment close to zero.

7.1.1.4 Setting up parameters

Set up parameters before starting operation.

There are two ways of setting parameters : through the keyboard of the Motionpack Programmer or through a tape device with tape. After setting the parameters, turn power off and then on again. For operating procedures, see par. 4.2.1.

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7.1.1.5 Setting up the program

Set up the program before starting operation.

There are two ways of setting up the program : through the keyboard of the Motionpack Programmer or through a tape device with tape. For operating procedures, see par. 4.2.1.

7.1.1.6 Operation

Turn on the Motionpack-34 Controller and the RUN (green) and PWR (green) indicators light on the controller panel, indicating that the Motionpack-34 Controller is supplied with power and operating properly.

If RUN does not light while power is on, the Motionpack-34 Controller is defective : replace the unit.

If the ALM (red) indicator lights, locate the cause of trouble through the programmer. ALM will light up immediately after powcron if parameters are not set up. The lamp goes out as soon as the parameter is set.

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7.1.2 Motionpack Programmer

7.1.2.1 Connection

(1) Connecting supply power

Use single-phase 100VAC (85-120V, 50/60Hz) power as the power supply.

Use the power cable provided.

(2) Connecting the signal cables

The programmer has two connectors at its bottom ; one for connection with the controller and the other for a tape device.

Be sure to lock the connectors while the programmer is in use. Cover the connector which is not in use with a red cap provided with the connector, for protection.

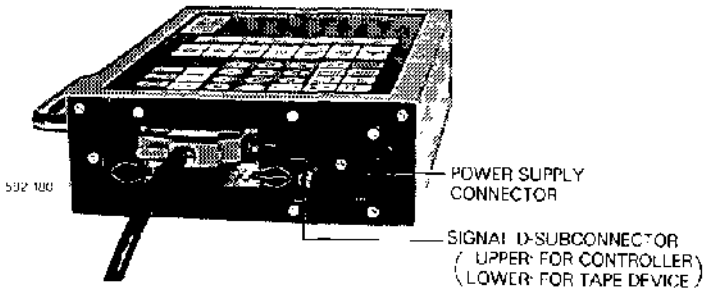


Fig. 7. 3 Motionpack Programmer

7.1.2.2 Operation

The Motionpack Programmer has no power switch of its own. So, it starts operating as soon as the power is connected. (See Table 7.2.)

The Programmer has no reset key, either. If it must be reser, unplug the power cable and reconnect it again (the unit will be automatically reset when the supply voltage rises).

Table 7. 2 Normal/Malfunction Indicator

Display	Color	Description
Normal	Green	Lit when the programmer is in normal operation
Malfunction	Red	Transmission to controller is not enabled.

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7.1.3 Servopack

7.1.3.1 Installation

(1) Installation

Servopack model CACR-SR ☐ TZ 6S ☐ is of base mounting type.

(2) Conditions of installation

• Installation inside an enclosure

Temperature may rise higher in the inside of an enclosure than in the outside, though it depends on energy loss of the devices installed inside and the size of the enclosure.

Consider the size of the enclosure, heat dissipation and layout so that the environment of the Servopack must be under 55 °C (Fig. 7.4).

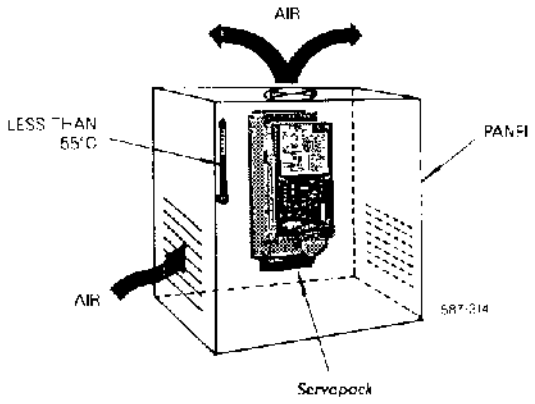


Fig. 7. 4 Example of Housing

• Installation adjacent to heat sources keep temperature (by convection and/or radiation) under 55 °C in the area of the power supply unit and the Servopack (Fig. 7.5).

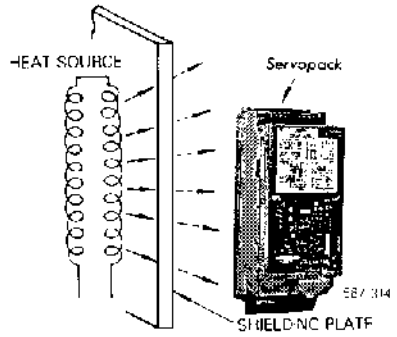


Fig. 7. 5 PROCEDURE EXAMPLE for HEAT SOURCE

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- Installation near vibration sources install some shock absorbers between the Servopack and the base.
- Installation in an environment of corrosive gases. Though the existence of corrosive gases does not result in immediate trouble, they can lead to contact failure in electromagnetic contactors and relays used in the main and command circuits.
- Avoid places of high temperature and high humidity and dusty (particularly metallic particles) environment.

(3) Installation

- Directions

  Do not use any method other than the wallmounted installation with the base erected vertically (Fig. 7.6), since cooling is accomplished by natural convection.

- Holes for installation

  Use four holes on the base.

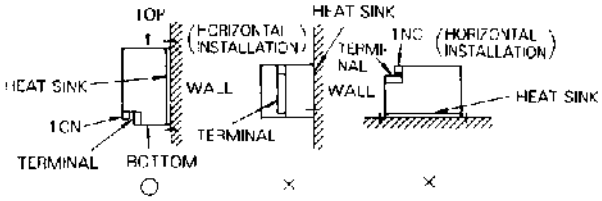


Fig. 7. 6 Installation

7.1.3.2 Power loss

Table 7.3 shows Servopack power loss.

Table 7. 3 Power Loss at Rated Output

Servopack Type CACR-	Output Current (Effective Value) A	Main Circuit Power Loss W	Regenerative Resistance Power Loss W	Control Circuit Power Loss W	Total Power Loss W	Input Capacity kVA
SR03TZ6	3.0	20	10	80	110	0.65
SR06TZ6	5.8	60	20		160	1.5
SR09TZ6	7.6	70	20		170	2.1
SR12TZ6	11.7	80	20		180	3.1
SR20TZ6	18.8	100	40		220	4.1
SR30TZ6	26.0	160	80		320	6.0
SR44TZ6	33.0	210	100		390	8.0
SR60TZ6	45.0	300	120		500	11.0

Note : Regenerative resistance power loss occurs at motor reduction.
Power loss can be disregarded other than for frequent start/stop operation.

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7.1.4 Servomotor

The AC Servomotor can be installed horizontally or vertically. If the type of installation or the environmental conditions of the motor is unfavorable, its service life may be shortened or accidents may occur. For correct installation, follow the procedure below.

(1) Installation

Anti-corrosion coating is applied to the tip of the shaft and the flange surface. Before installing the motor, remove the coating using thinner. Be careful to keep the thinner away from any other parts.

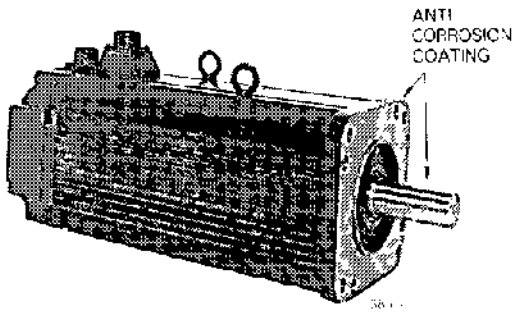


Fig. 7. 7 AC Servomotor

(2) Location of installation

The AC Servomotor is designed for ordinary indoor use. Install it where the following conditions will be met.

- Indoors and out of corrosive or explosive gases
- Ambient temperature of 0 to +40°C
- Good ventilation with little dust or moisture
- Ease of maintenance and cleaning

If the AC Servomotor is subjected to water splashes or oil mist, install a protective cover.

(3) Environmental conditions

Ambient temperature : 0 to 1 40 °C

Storage temperature : − 20 to + 60 °C

Humidity : 20 - 80% r.h.(non-condensing)

(4) Matching with the coupled machine

It is important that the motor shaft correctly aligned with the machine axis. If the alignment is off, vibration may occur, damaging the bearings (Fig. 7.8).

Align the motor shaft with axis of the machine accurately. When installing a coupling, reduce shocks that may apply to the shaft by tapping with a wood mallet (or the like) to prevent the bearings from being subjected to excessive force.

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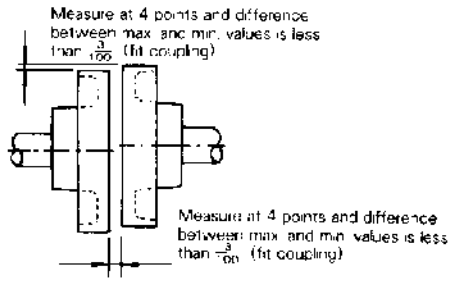


Fig. 7. 8 Aligning

(5) Setting up the encoder when installing the motor with a machine

When the motor has been installed with a machine, set up the absolute encoder by the procedure in par. 7.2.6.1.

(6) Permissible load of the bearings

Do not apply excessive thrust or radial loads to the AC Servomotor. When installing a gear, coupling, or pulley, reduce shocks that may affect the shaft by tapping with a wood mallet (or the like) to prevent the bearings from being subjected to excessive force.

During operation, keep the thrust and radial loads under the values shown in Table 4.35.

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7.2 TEST RUN

Table 7.9 shows Motionpack-34 system operation summary.

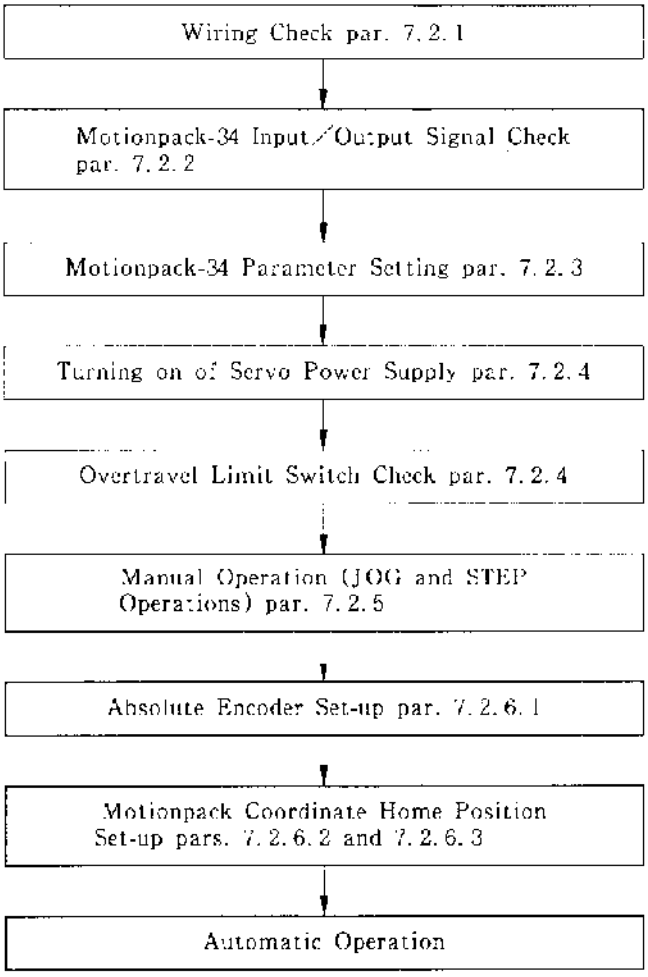


Fig. 7.9

Each step will be explained below. For alarm status and actions to be taken, see sect. 11.

7.2.1 Checking the wiring

Through checking of wiring is very important. Failure to check the wiring completely, may result in trouble, often in a late stage of adjustment during trial operation. This usually is more difficult to locate. So, complete check of the wiring is fundamental to smooth adjustment in trial operation.

The flowchart in Fig. 7.10 outlines the procedures of wiring check. Checks must include : connections, arrangement of wires, the sizes and types of wires, the presence and polarity of the surge suppressor.

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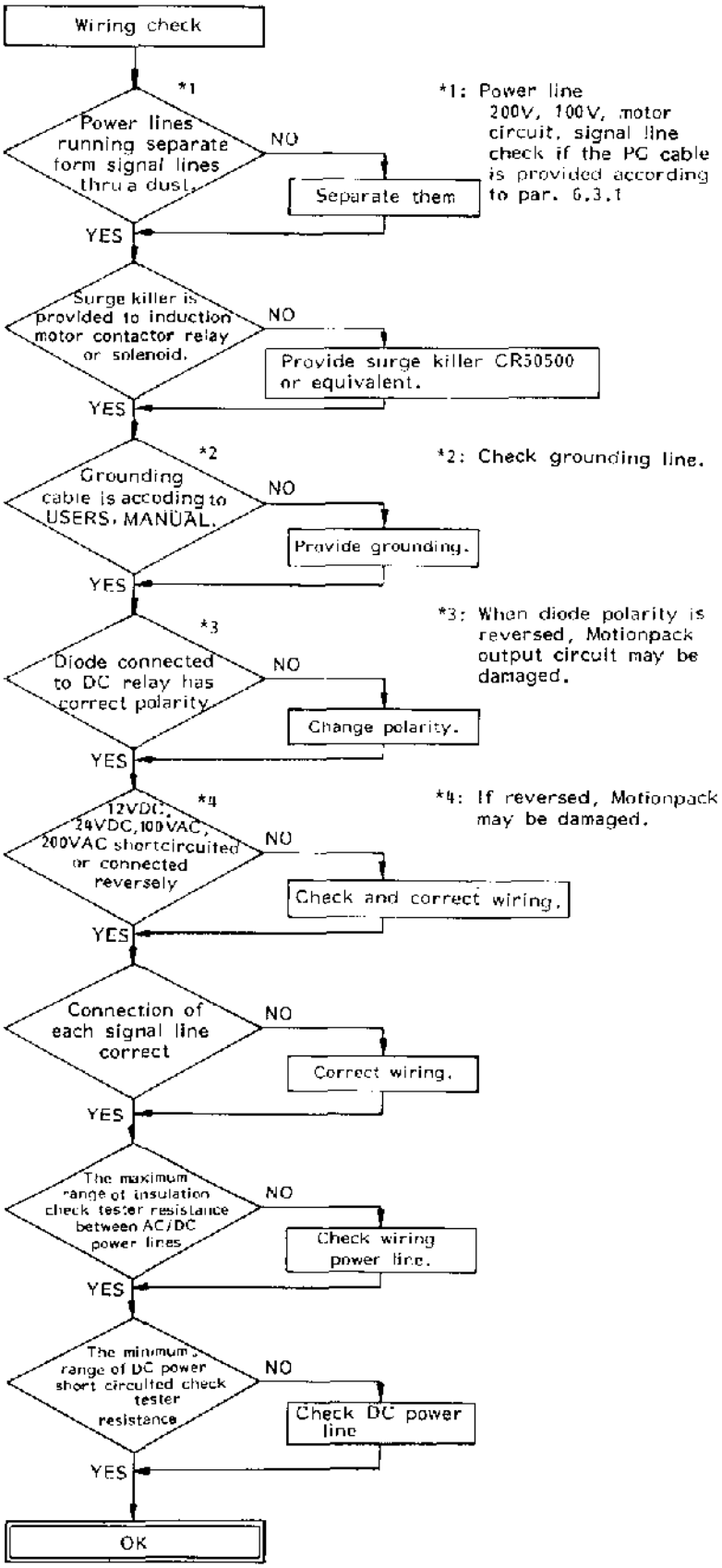


Fig. 7. 10 Wiring Check

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7.2.2 Checking I/O signals

Turn on the Motionpack-34 Controller, Programmer and I/O supply power (24VDC) and check I/O signals. First, check the AC and DC supply voltages. Next, with AC power on, make sure that the indicators of the Motionpack-34 Controller indicate the proper status. Then check I/O signals.

* PG is not valid Servopack power is on.

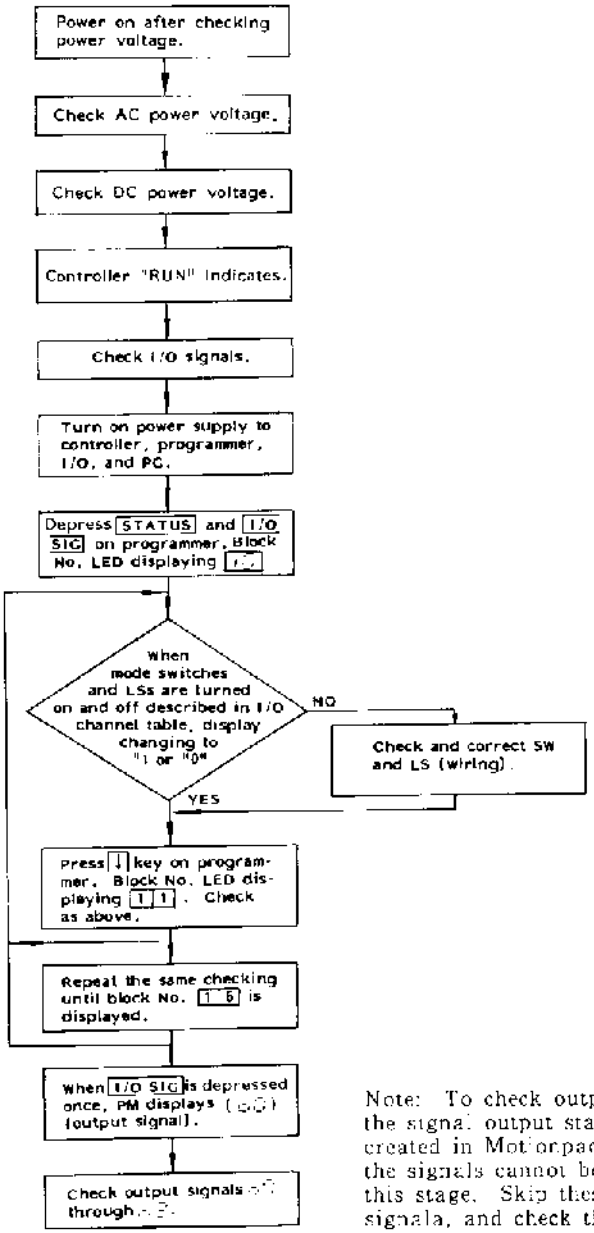


Fig. 7. 11 I/O Signal Check Flow Chart

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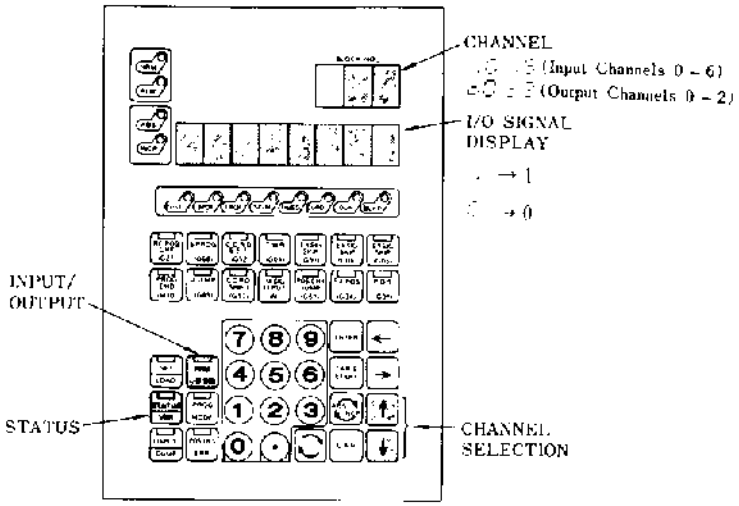


Table 7. 4 I/O Channel List

	Programmer Display	Channel (Digit Position: Column)	10^7	10^6	10^5	10^4	10^3	10^2	10^1	10^0
Input Signal	.07	0	JMF Jog Middle	JLF Job Low	OVR Override	SKB Single Block	STEP	JOG	PLAY	EDIT
	.17	1	$\overline{\text{ATS TP}}$ Auto Stop	PGCL Program Clear	ERS Fault Reset	ATST Auto Start	SBST Single Block Start	ZRN Home position Return	-JS -Direction Jog & Step	+JS +Direction Jog & Step
	.27	2	PGS7	PGS6	PGS5	PGS4	PGS3	PGS2	PGS1	PGS0 Program Start
	.37	3	-INC8	-INC8	PGSL30	PGSL20	PGSL10	PGSL00	PGS9	PGS8
	.47	4	$\overline{\text{OTR}}$ Over-travel(R)	$\overline{\text{OTF}}$ Over-travel(F)	CLD Current Limit On	$\overline{\text{SAL}}$ Servo Alarm	NODB	STROBE	INC9	-INC9
	.57	5	DATA SET INT	JPIBT (SEL)	MFIN	G34F	Extended Function Selection OPSL	EPS7	EPS6	EPS5 External Skip b
	.67	6	LSB	LSA LS Near Home	EXP External Positioning LS	PB Phase B Pulse	PA Phase A Pulse	PC Home Position Pulse	PC Battery Reduction PGBATAL	
Output Signal	.07	0	OFM Offset Max.	OFR Offset 0	INCD Incremental End	EPAL External Positioning Alarm	G34 External Positioning End	STL In-operation	ZPM Home Return End	ALM1 NC Alarm
	.17	1	ZNP Near Home	M56	M55	M54	M53	M52	M51	M30
	.27	2						RDY (PC) MP Ready (PG)	RDY (DB)	ALM2 Battery Alarm

Note: When the signals listed below are input or output, the corresponding column becomes 1 and when not input or output, the column shows 0.

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7.2.3 Setting up Parameters

In the Motionpack-34 system, the controller receives information on system specifications in the form of parameters. So, the parameters must be set up for the controller before operation starts. The system will fail if some parameters are given wrong values or not set. Set all the unused parameters except "Pr53" as zero.

The programmer (Fig. 7.12) is used normally to set parameters. But, if a parameter tape is prepared, the parameters can be set from a tape reader via the programmer.
After setting parameters, be sure to turn the controller off and then on again.

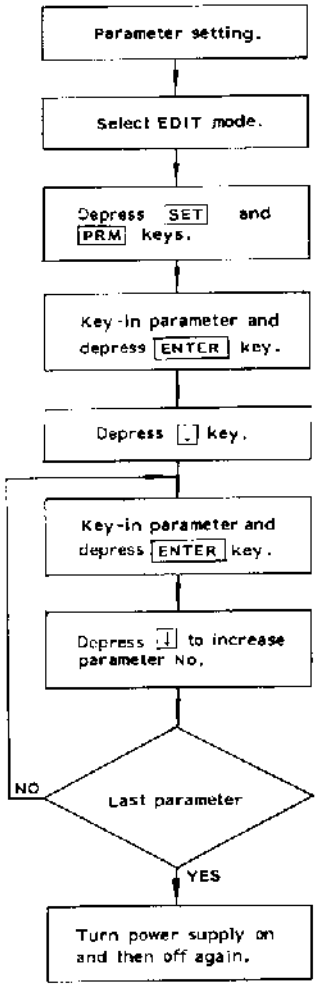
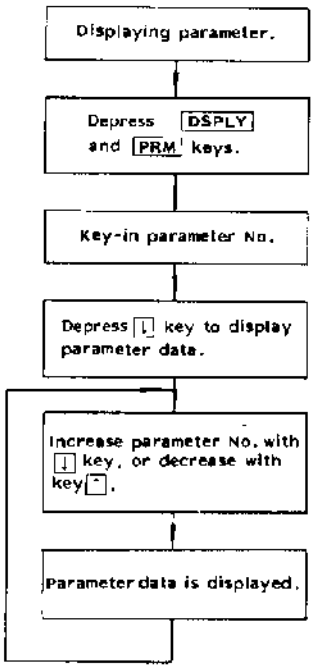


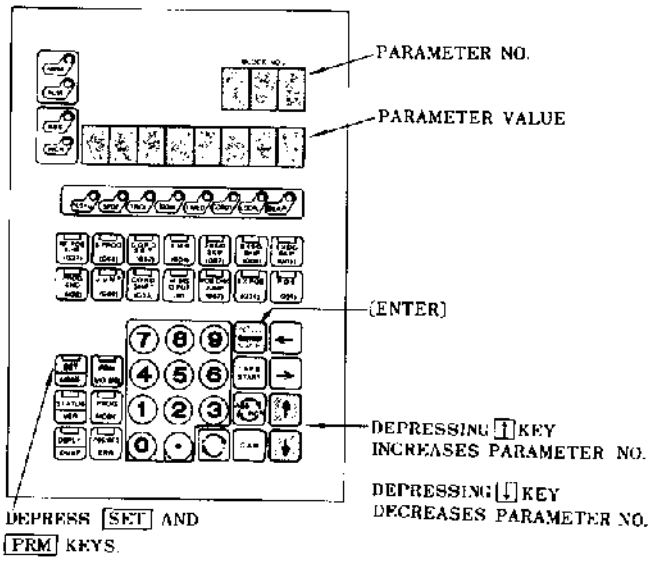
Fig. 7. 12 Parameter Setting Flow Chart

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Note: FAULT indicator on the controller panel may light and the parameter error code is displayed, before setting parameters. As long as NORMAL indicator is ON on the controller simultaneously, this is not a fault. When the parameters are set, the FAULT indicator goes out.

Fig. 7. 13 Parameter Check Flow Chart



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7.2.4 Checking Power ON to Servo

Checking Overtravel LS
(Standard Connection)

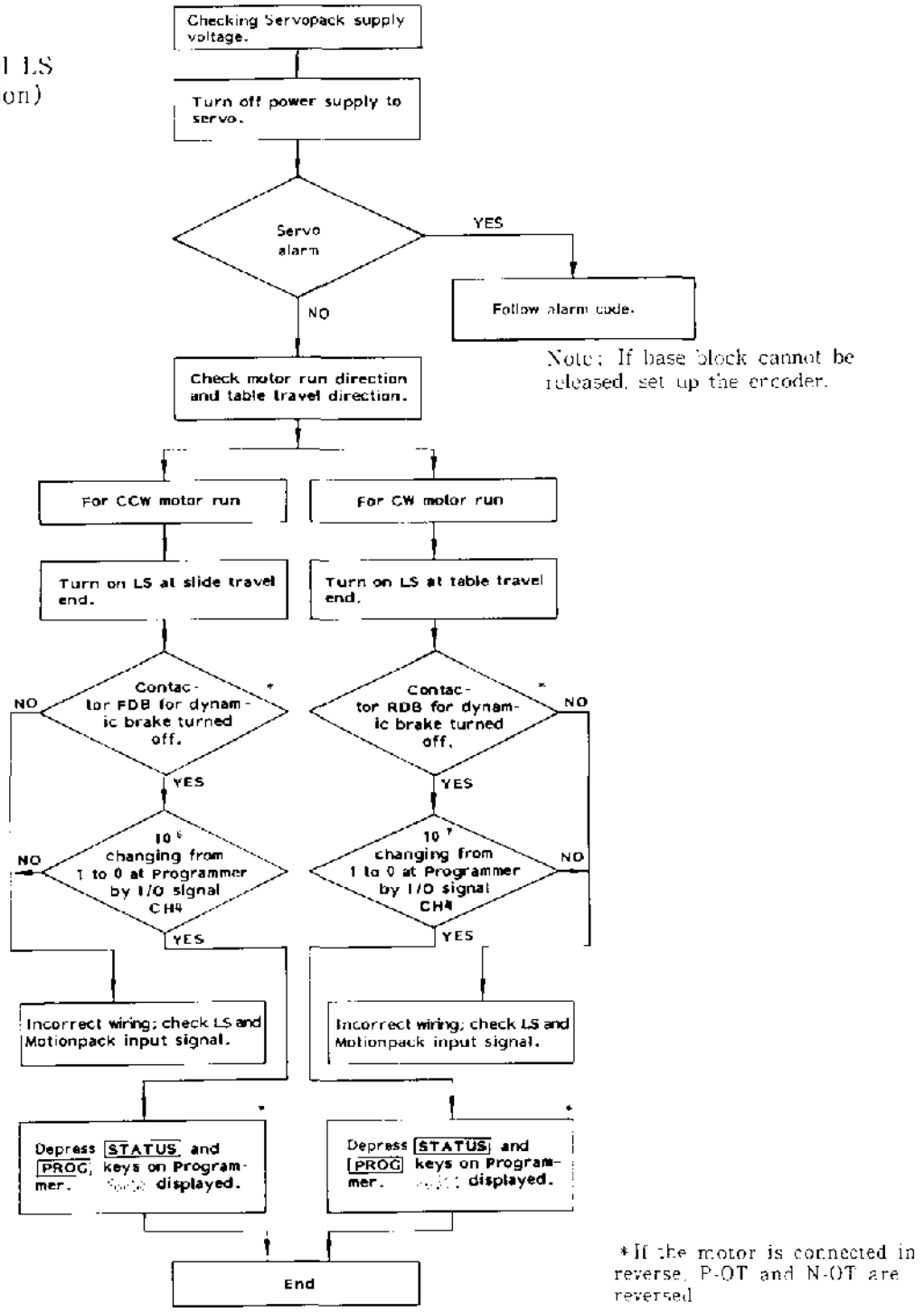


Fig. 7. 14 Dynamic Brake Function Check Flow Chart

- If an alarm status occurs with the motor running at a high speed, the polarity of PG is wrong. Check the polarity. The wiring of PG will be reversed between the Servopack and the Motionpack.

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• If the motor shaft rotates in the opposite direction for long intervals, gain is set up improperly. Reduce the value of parameter Pr42 and set the speed loop gain 6VR of the Servopack at a higher position by 1 or 2 marks.

7.2.5 Manual Operations (JOG, STEP) Check, Adjustment and Measurement

Check manual operations and adjust servo related parameters.

7.2.5.1 JOG operation and parameter adjustment

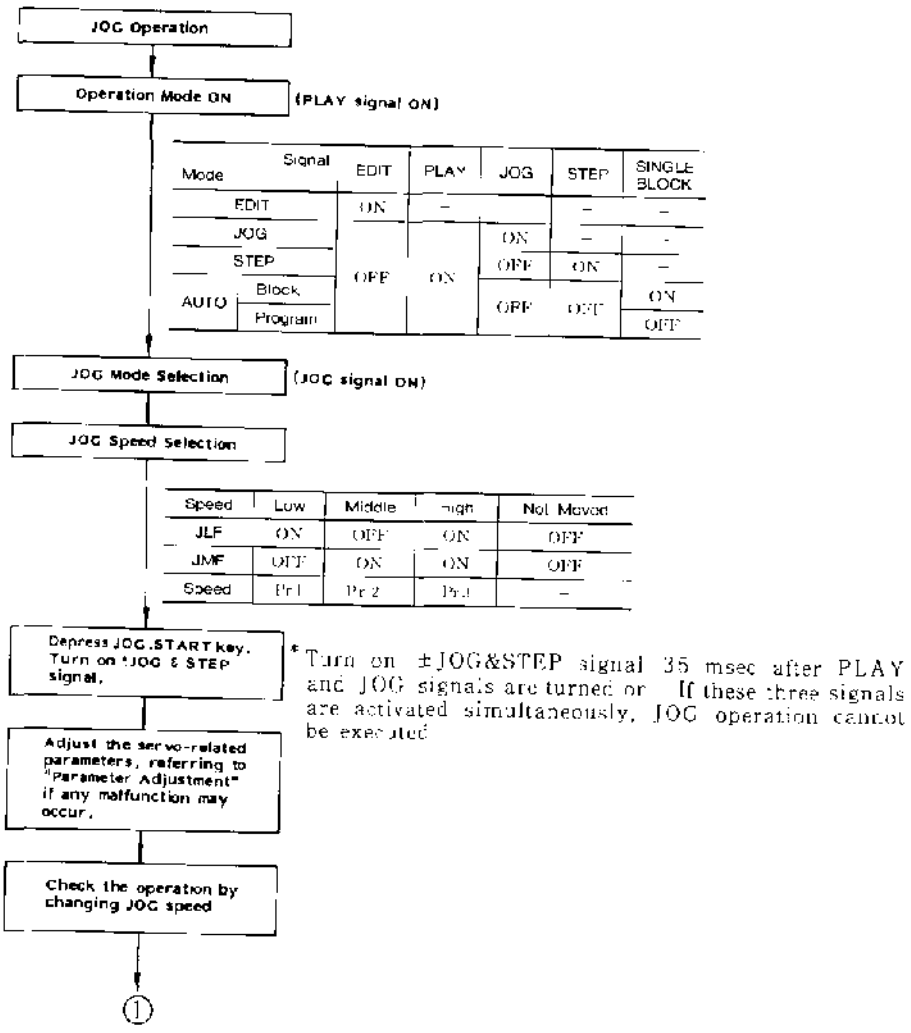
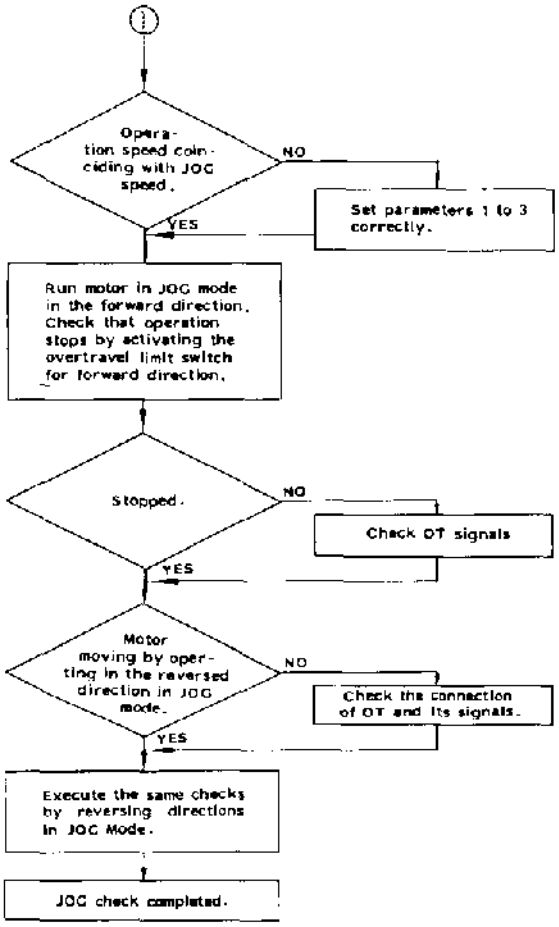


Fig. 7. 15 JOG Operation Flow Chart

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(1) Basic requirement

Pr50-52 must be set correctly.

(2) Adjustment of position loop gain

The system must operate properly

if $10 \leq kp < 50$. Reduce the value of Pr42 to make the machine move more smoothly or increase it if necessary.

Calculate the value of Pr42 from the following formula.

$$Pr42 = \frac{\text{Rated r/min} \times \frac{1}{60} \times \text{P/rev}^{*} \times 4}{kp\ (\text{s}^{-1})^{*3}}$$

*: Pulse count after division by the Servopack

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MALFUNCTIONS

(a) Running out of control

(b) Hunting

(c) Error messages such as dEr Over, IMPO Err as displayed.

If any of these occurs, check if the parameters are correct.

(a) Check that 10 ≦ kp ≦ 50 it met.

If the value of Pr42 is wrong the motor will run abnormally if kp is too large. If kp is too small, the target may not be reached, resulting in INPO Err, or hunting may occur because of correction for drift.

(b) Check that Pr50-52 are set properly.

Pr42, Pr50 and Pr51 have the following relation:

$$Pr42 \times \frac{Pr51}{Pr50} = d_0 \pm 10\%$$

were d0 is the value at rated rpm.

(3) Adjustment of starting and stopping times.

Pr40 and Pr41 define the starting and stopping times.

Faulty Actions

(1) Excessive deviation (dEr Over)

(2) Hunting

(a) When any of these occurs, check Pr40 and Pr41.

If the motor stops due to dEr Over while Pr40 and Pr41 are set, increase Pr41 (to extend the starting time) so that the motor continues to run and check the motor starting current by the following method.

(b) Check speed and current using an oscilloscope (Fig. 7.16).

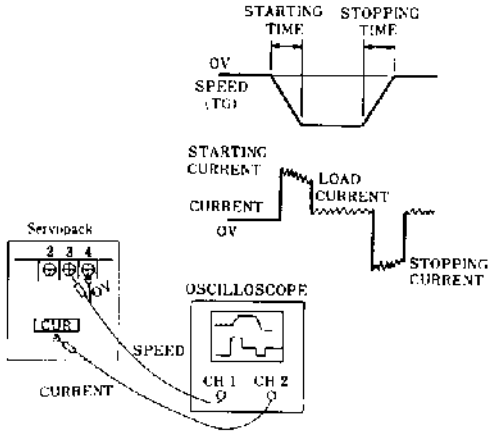


Fig. 7. 16 Checking Speed and Current

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7.2.5.1 JOG operation and parameter adjustment (Cont'd)

Measure the starting and stopping currents as shown in Fig. 7.18. The limit at which the starting and stopping currents saturate is the minimum value of Pr41. If the value of Pr41 is far from the designed value, check the starting and stopping times of the machine.

The starting time tv is given as follows.

$$tv = \frac{4(J_M + J_L) \times N}{375 \times \left(\frac{I_P}{I_R} \times T_M - T_L \right)} \times 1.3 \text{ (s)}$$

Where I_P : Servopack maximum output current (A)

I_R : Servomotor rated current

J_M : Motor inertia

J_L : Load inertia

N : Rated rpm

T_N : Servomotor rated torque

T_L : Load torque

(c) If the motor is used at a speed above the rated rpm, increase Pr41 (extend the starting time) as appropriate.

(d) Set Pr40 at the system maximum speed.

PRECAUTIONS

- When setting a parameter which defines a speed, take note of its unit. Such a parameter is defined in the same unit of speed as follows.

  Unit of speed = Max. command unit × 10 (Pr52)/min

  (Example)

  Suppose Pr50 = 1, Pr51 = 3 and the minimum command unit 0.001mm.

  Then,

  Unit of speed = 0.001mm

  × 10^3/min = 1mm/min.

  So, to set JOG high speed at 10 m/mim.

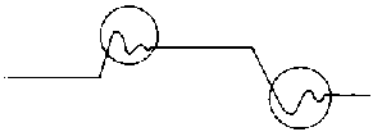
  Pr3 = 10000.

- Note that the value of Pr42 is given as a pulse count.

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(4) Waveform of monitors speed

Observe the waveform of V_{TC} in the same way as above. It is no problem even if the waveform includes switching noises of the Servopack. Check if the waveform overshoots.



Position loop gain (Pr42) and acceleration time (Pr41)

The speed loop gain (6VR) of the Servopack is important. Increase Pr42 by some 1000 pulse counts and Pr41 by 50 ms or so until overshoot disappears. It may be advisable to increase the speed loop gain (6VR of the Servopack) by 1 or 2 marks.

(Data)

(1) The output voltage of V_{TC} is DC ± 4V ± 10%/1000 rpm (M series).

(2) Monitoring Servopack current

(a) Checkpoint TM3-4

± 3.0VDC/100% when (motor torque monitor) is used.

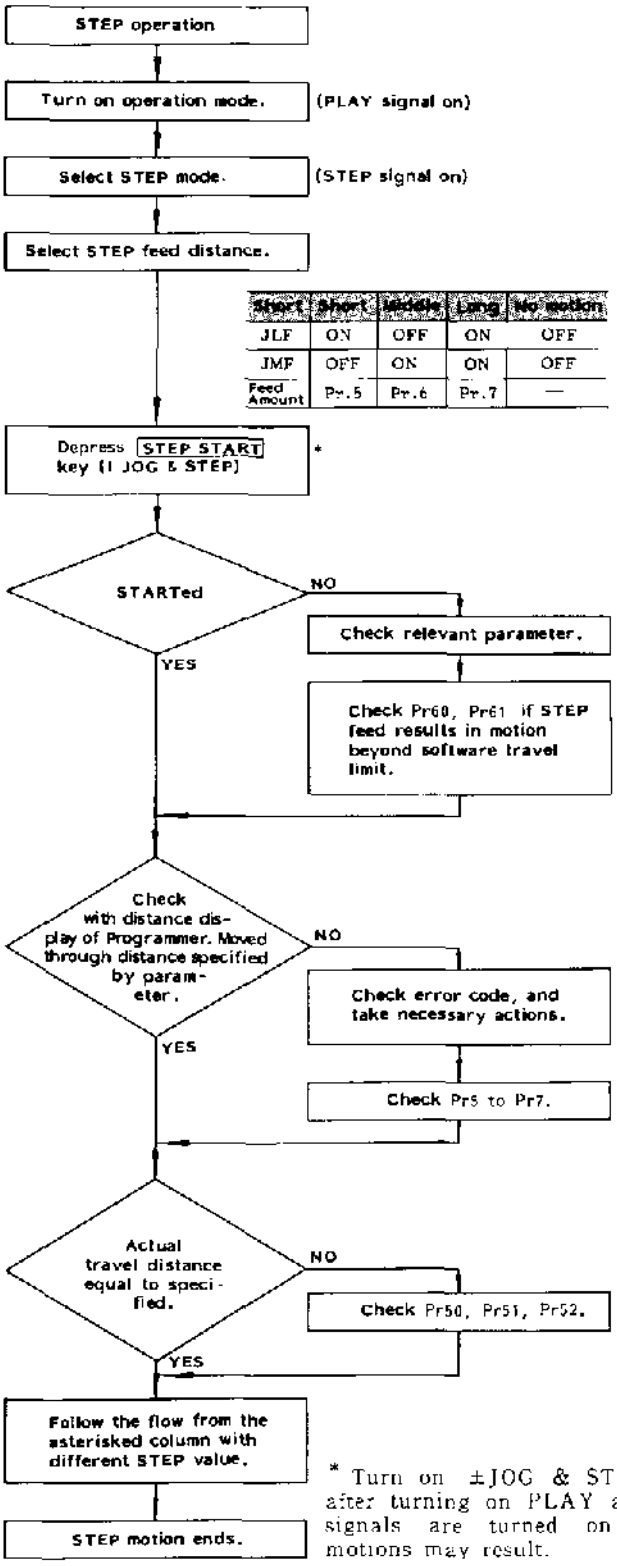
(b) Checkpoint TM4-1

See the table below when TM4-1 (current monitor of U phase) or TM4-2 (current monitor of V phase) is used.

Type	03	06	09	12	20	30	44 60
Monitor Voltage (V/A)	0.4	0.2	0.16	0.08		0.04	

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7.2.5.2 STEP operation



	Short	Short	Middle	Long	No motion
JLF	ON	OFF	ON	OFF	
JMF	OFF	ON	ON	OFF	
Feed Amount	Pr.5	Pr.6	Pr.7	—	

* Turn on ±JOG & STEP signals at least 30msec after turning on PLAY and STEP signals. If these signals are turned on simultaneously, abnormal motions may result.

Fig. 7. 17 STEP Operation Flow Chart

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7.2.6 Setting up

Set up then absolute type Motionpack-34 system by the following procedures.

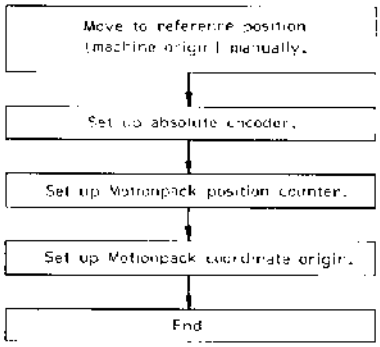


Fig. 7. 18

7.2.6.1 Setting up the absolute encoder

When installing a machine with a motor which is coupled with an absolute encoder set up encoder first.

Yaskawa's encoder delivers absolute position data in the form of rotation angle and revolution number.

- Serial data : Indicates how many turns the motor shaft is rotated from the reference position (defined by setting up).
- Initial incremental pulse : Pulses will be transmitted at the same pulse speed as when the motor shaft rotates from the origin to the current position at about 2747 rpm.

The current position P is given as

$$P = M \times R + P_0$$

where M (rotation) is the value of serial data, P_0 (pulse) the initial incremental pulse count, and R the output pulse count per motor revolution (depending on the setting of a dividing circuit). The width of data is (8192 pulses/revolution) × (+/- 99999 revolutions).

The initial value of the revolution number data is not necessarily zero. It is recommended that you initialize the data to zero during assmbly with the machine. This is the set-up of the absolute encoder.

The set-up is performed by short circuiting a capacitor in the backup supply circuit inside the encoder. It you have left the encoder without any battery connected for more than four days, the internal circuits may not work properly due to fall of the backup voltage. In this case too, you have to set up the encoder again.

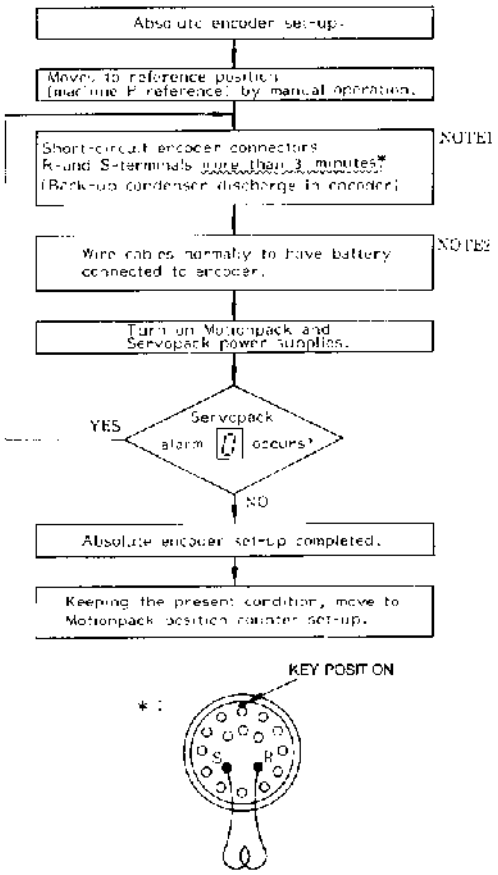
Perform the following procedure to set up the encoder. Never fail to do the following procedure : otherwise the encoder may fail.

(1) Short the terminals R and S of the encoder (see *1).

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7.2.6.1 Setting up the absolute encoder (Cont'd)

(2) Connect the battery before turning on power (see *2 and *3).



Notes: 1 After set up, the motor revolution number is reset to 0.

2 If the encoder connector is not accessible because motor is already assembled with a machine, remove CN2 of the Servopack and short the leads of the PG cable at the Servopack side connector as shown in Fig. 7.19.

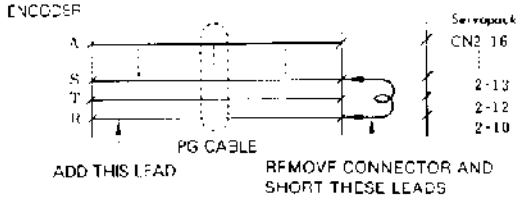
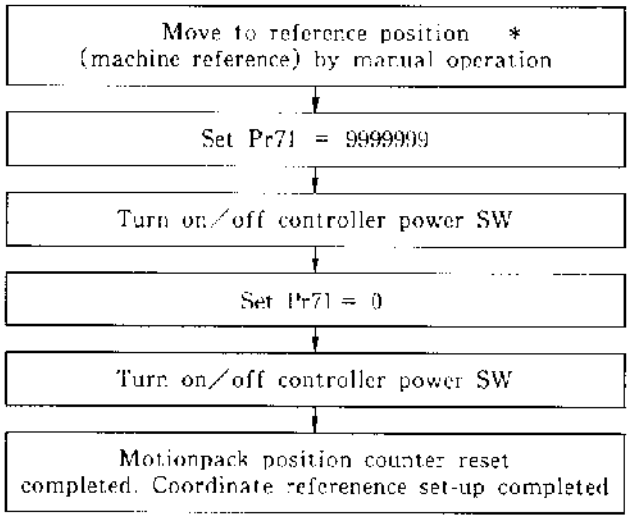


Fig. 7. 19 Setting up by Shorting Leads of the PG Cable

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7.2.6.2 Resetting the Motionpack's absolute position counter

The position counter built in the Motionpack will never be reset because it deals with absolute method. During setui8o
eset the counter by the following procedure.



*: Do not change if it is already in that position.

Fig. 7. 20

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7.2.6.3 Setting up the Motionpack coordinate reference point

It is actually impossible to accurately align the machine home position with that of the absolute encoder, considering the assembly characteristics of the motor. In the Motionpack, the offset of the absolute encoder home position from the coordinate reference point will be set with Pr71, so that the coordinate system (TO coordinates) of the Motionpack can be aligned with machine home position. This aligning procedure is called setting up the Motionpack coordinate reference point.

The procedure of manual setting up is as follows.

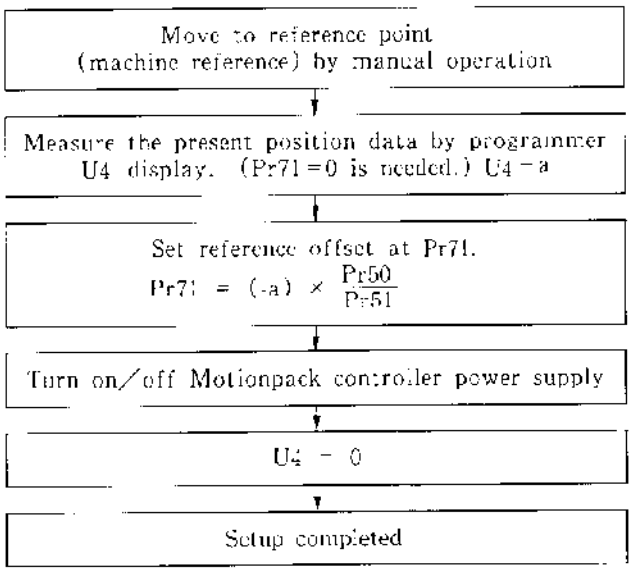


Fig. 7. 21

NOTE

For semi-automatic home position setup system and full-automatic home position setup system, refer to Par. 11.2.

7.2.6.4 Setting up encoder at machine reinstallation

After test run, when the machine is reinstalled, set up the encoder in accordance with encoder setup procedure before turning on the power.

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7.2.7 Automatic Operation

To check the automatic operation, first check the single block operation. If the single block operation mode is not used, execute the step after *2.

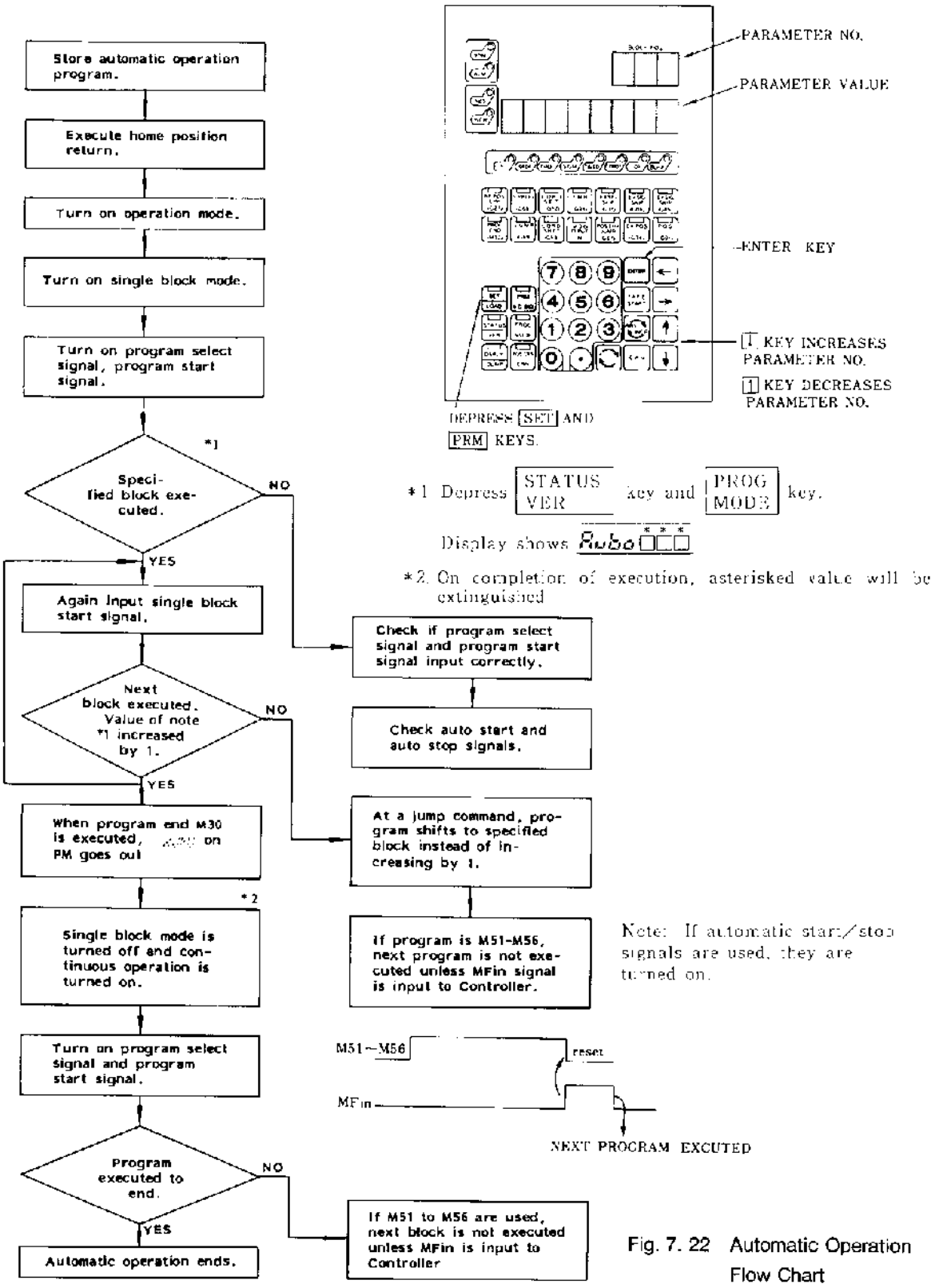


Fig. 7. 22 Automatic Operation Flow Chart

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Single block operation

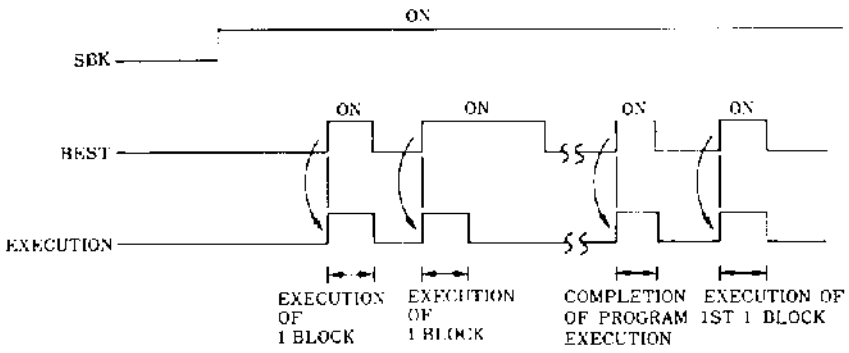


Fig. 7. 23 Single Block Operation

Automatic operation

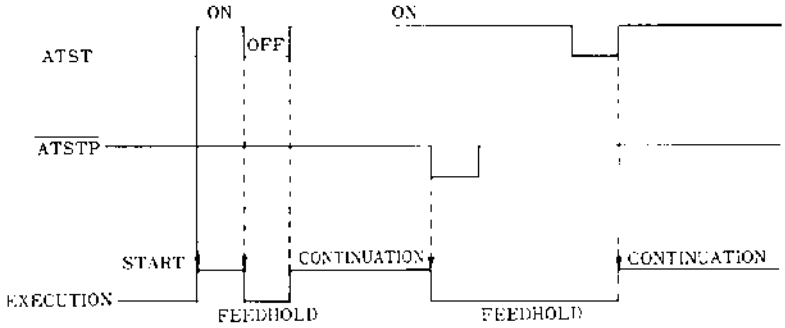


Fig. 7. 24 Automatic Operation

7.3 ALARMS AND REMEDIES

If faults are detected by Motionpack, alarm signals are output. The fault conditions can be checked by programmer. Par. 11.2 describes details of alarm output and its solution.

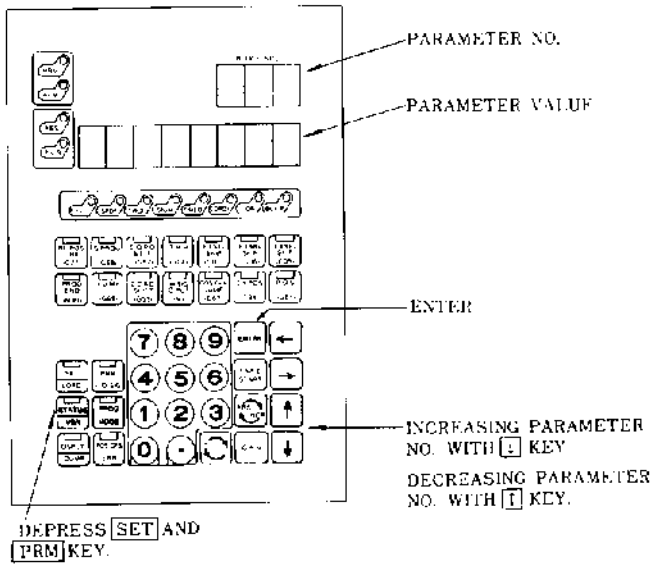
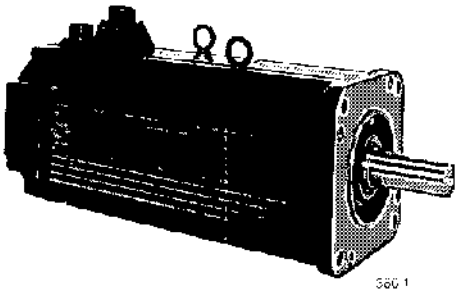


Fig. 7. 25

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8. MAINTENANCE

This section describes how to solve problems if the Motionpack 34 system fails to operate properly.
Par. 8.1 shows troubleshooting flowcharts. If a system that has been operating properly fails, possible causes include disconnection of some leads or failure of units. So, the troubleshooting procedures may end by replacing a unit.
This differs very much from the procedures of test run (as failure of units is less likely than wrong wiring, inappropriately defined parameters or programs, etc.) For this reason, it is not recommended to apply the procedures of this chapter to adjustment during test run.



AC Servomotor
TYPE USAMED-40MS2

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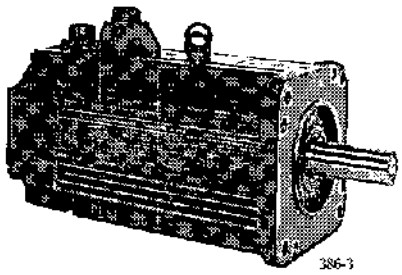
8. MAINTENANCE

This section describes how to solve problems of the Motionpack 34 that may fail to operation properly. If the Motionpack-34 fails, check functions, condition of the Servo system, programmable controller and the Motionpack-34 Controller, to locate the cause. A programmer is available with the Motionpack-34 system, which helps locate the cause of trouble by giving information on the trouble status, indicating position data, etc.

If trouble occurs, inform the person in charge of maintenance. It is best to preserve the trouble status if possible and have the person in charge of maintenance examine the problem.

Actually, however, immediate action may have to be taken to prevent production stoppages or devices break down. In such cases, note the status of trouble quickly in order to facilitate taking action later. Thus, preserving and noting trouble status and then taking immediate action is the key to successful troubleshooting. The person in charge of maintenance should ask questions like the following of the person who first, discovered the trouble.

- What function was the machine performing when trouble occurred?
- How were the control panel and switches set?
- What did the RUN and ALM indicators indicate on the Motionpack 34 panel?
- What were the contents of Er, Ho, 5t and U 0.3?
- Did the Servopack indicate any error status?



8.1 TROUBLESHOOTING

If trouble has occurred, the Motionpack programmer indicates an error code from which detailed error information can be obtained. Referring to the alarm code indication (see par. 11.2.4), check if the machine can perform simpler operations and try to determine the cause of trouble by dividing operations into two groups : one that machine can execute successfully and the other that it connot.

In the Motionpack 34 system, service basically consists of replacing one or more units. Locate the defective unit and replace it.

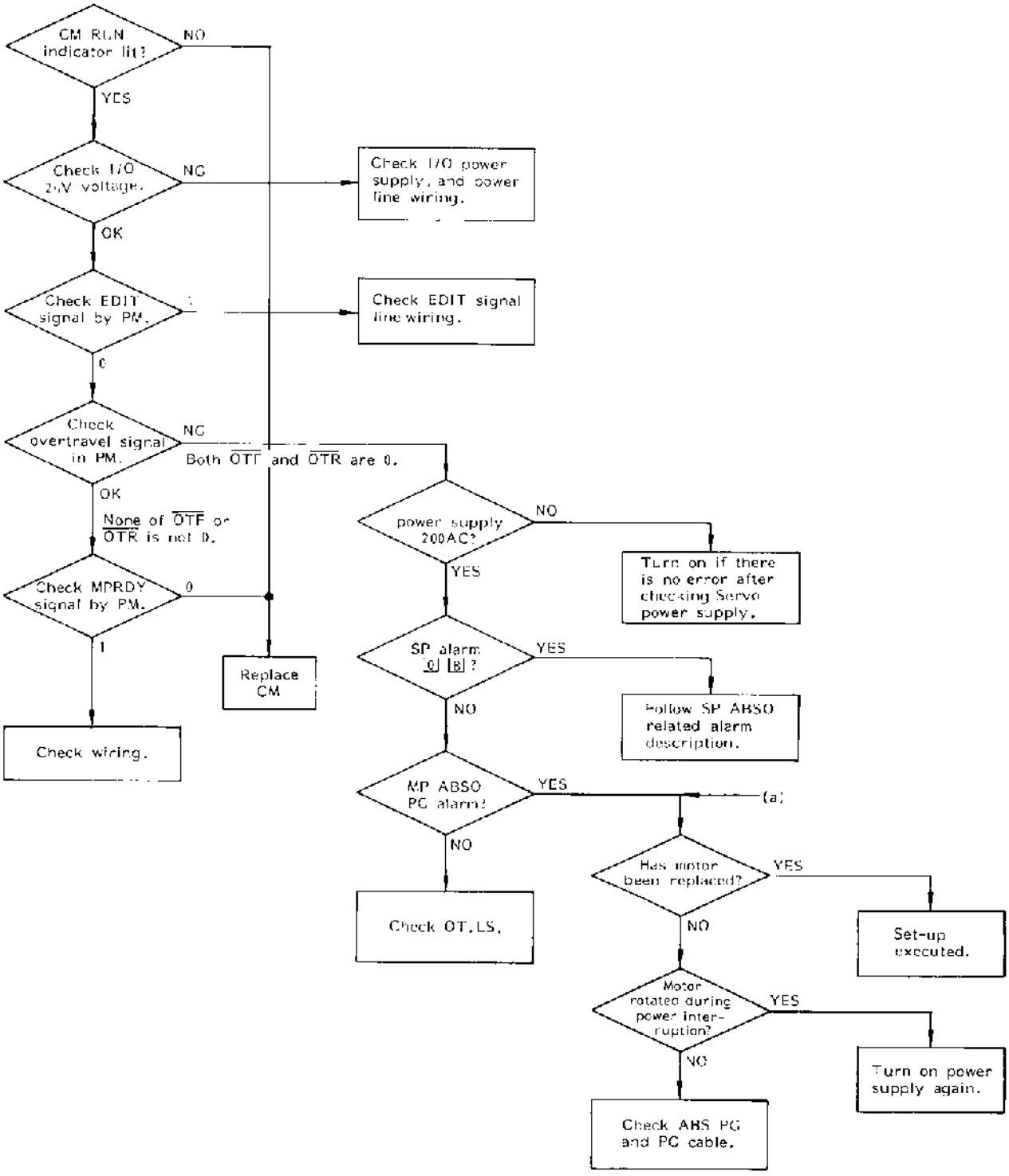
NOTE

In the flow charts, the units are represented with symbols as follows.

Motionpack-34 :	MP
Motionpack Controller :	CM
Motionpack Programmer :	PM
Servopack :	SP

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(1) MP RDY Signal is not output

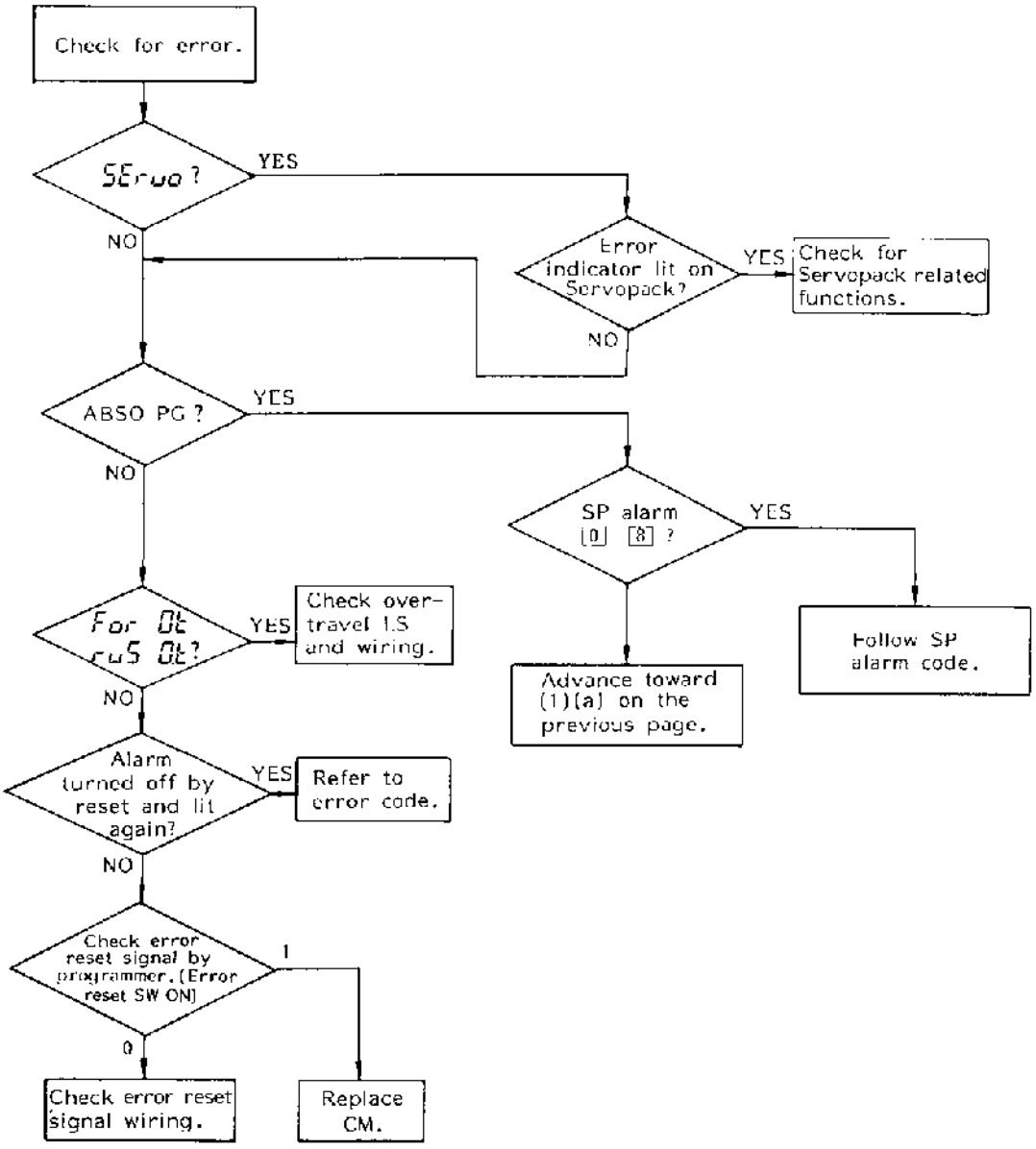


NOTE

When both $\overline{OTF}$ and $\overline{OTR}$ signals are OFF (Servopack drive power supply is OFF)

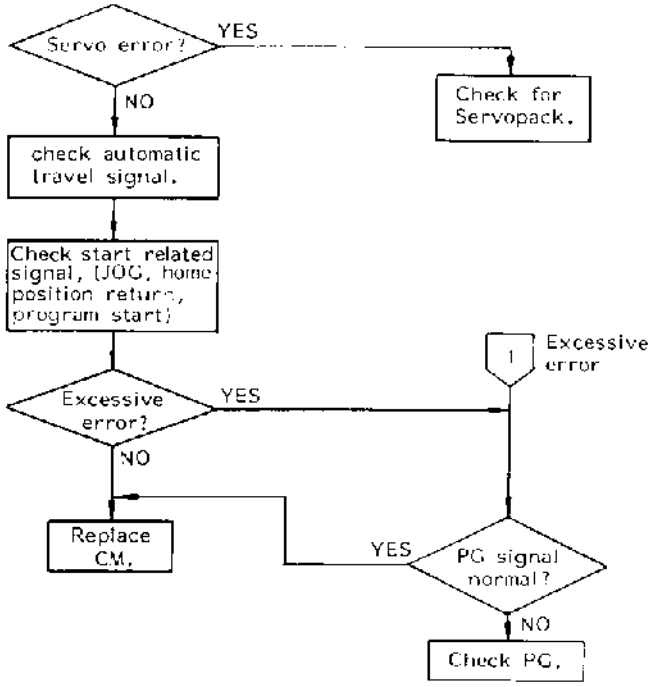
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(2) MP alarm cannot be reset.

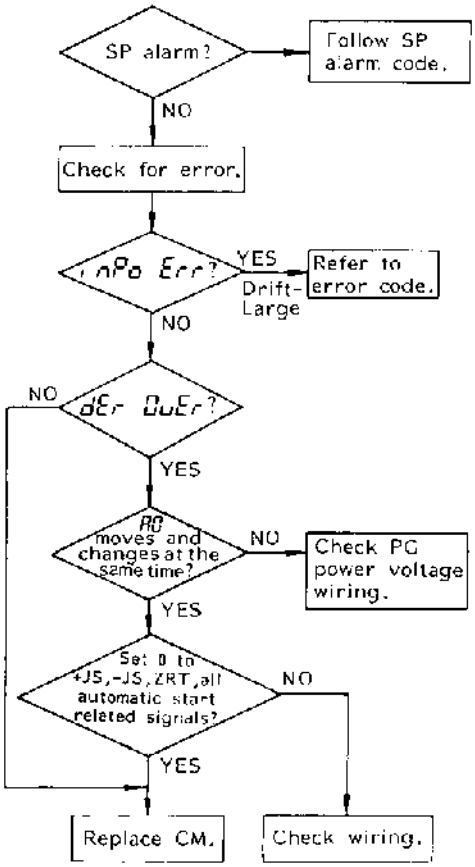


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(3) MP alarm occurs by servo power ON



(4) Runaway by servo power-ON (MP alarm occurs after momentary runaway.)

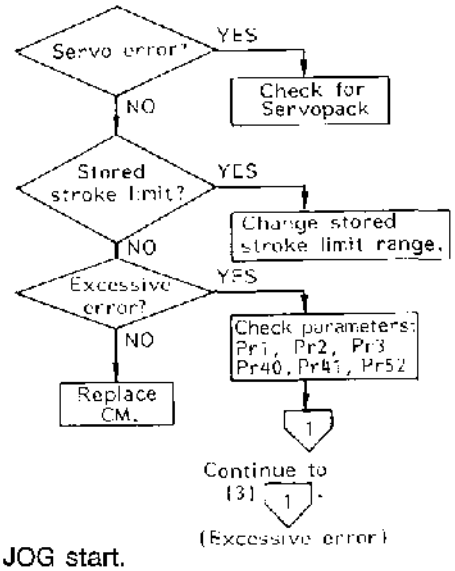


NOTE

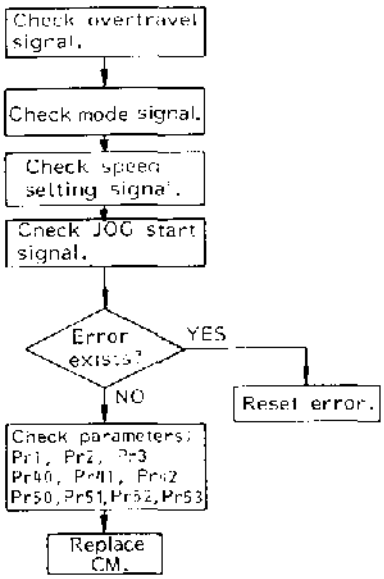
When Servo power is turned OFF error may not be checked with indicator.
In this case, without resetting error, turn on servo power to check error code.

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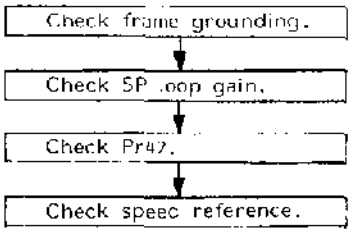
(5) MP alarm occurs by JOG start.



(6) Does not operate by JOG start.



(7) Malfunction at JOG



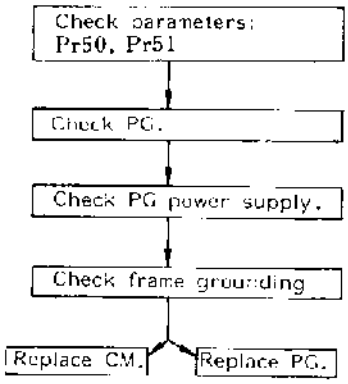
(a) Vibrations may occur if any of the loop gain of SP and the position loop (Pr 42) is too large.

(b) Vibrations may occur if you reduce the loop gain of the Servopack with Pr 42 kept large and servo clamp applied.

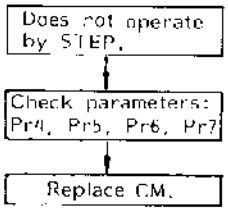
(c) If current is too large, check load torque.

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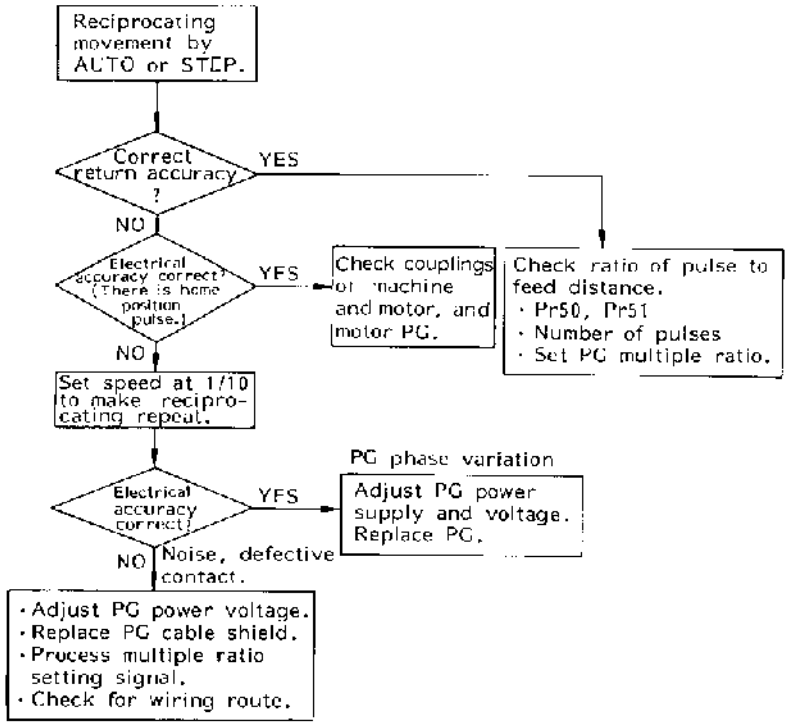
(8) Accuracy malfunction by JOG



(9) Does not oparate by step.



(10) Position accuracy malfunction.

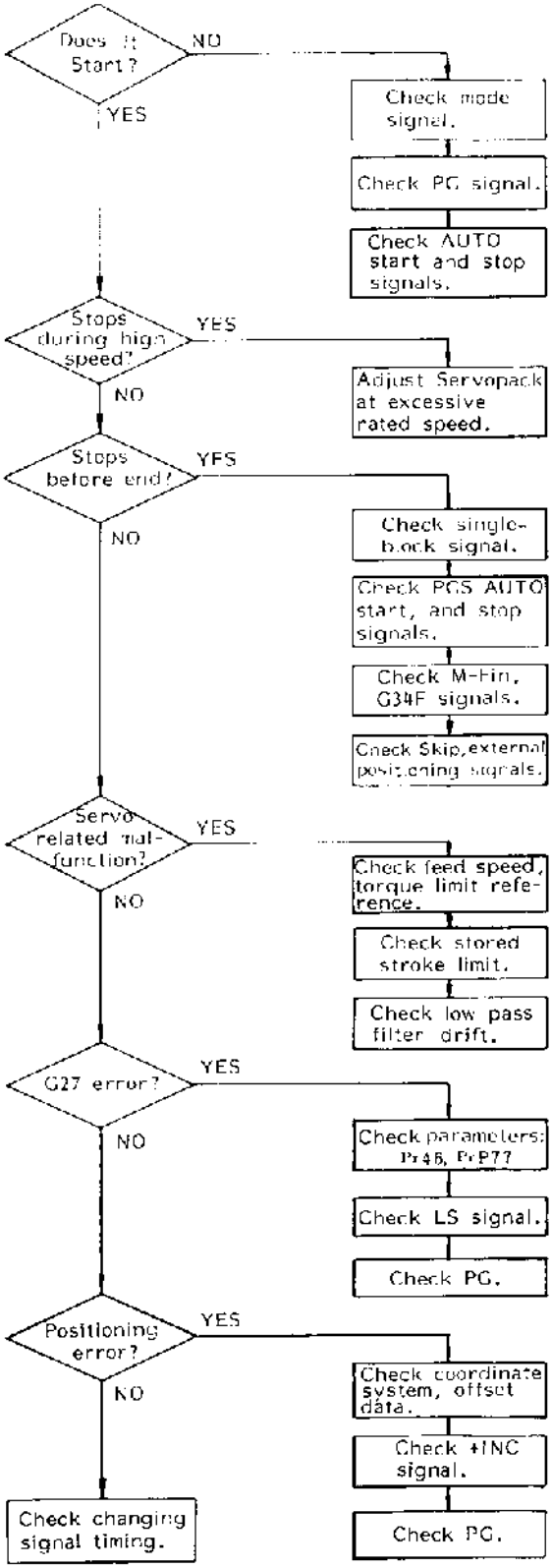


· Set dial gauge on home position pulse and check home position pulse.

· Check dial gauge and home position pulse after starting from home position pulse and several repeats of reciprocating movement.

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(11) Auto operation malfunction



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8.2 CHECKING SIGNALS USING THE Motionpack PROGRAMMER

Check the states of the input and output signals of the Motionpack-34 Controller with the aid of Motionpack Programmer.

Depress [STATE] and [INPUT/OUTPUT] keys, then 'n' (input channel n) or 'n' (output channel n) will be displayed. Depress [INPUT/OUTPUT] key to switch' (input channel) into ' ' (output channel) or reverse. Use ↓ and ↑ to change n.

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8.2.1 Status of Input/Output Signals

The Motionpack Programmer will indicate the status of signals read into the Motionpack-34 Controller. Of the signals shown in Table 8.1, those of channels 1-4 are read in by channel switching and time division.

Check the 24V signals (EPS5, EPS6, EPS7, G34F, MFIN, EXP, LSA, LSB) of channels 5 and 6 with a multimeter. But, use an oscilloscope for the signals of channels 0-4.

Table 8. 1 I/O Channel List

Digit Position (Column) / Programer Displa / Channel		10^7	10^6	10^5	10^4	10^3	10^2	10^1	10^0
,0	0	JMF Jog Middle	JLF Job Low	OVR Override	SBK Single-Block	STEP	JOG	PLAY	EDIT
,1	1	ATS TP Auto Stop	PGCL Program Clear	ERS Fault Reset	ATST Auto Start	SBST Single-Block Start	ZRN Home position Return	−JS −Direction Jog & Step	+JS +Direction Jog & Step
,2	2	PGS7	PGS6	PGS5	PGS4	PGS3	PGS2	PGS1	PGS0 Program Start
,3	3	−INC8	+INC8	PGSL30	PGSL20	PGSL10	PGSC0 Program Start	PGS9	PGS8
,4	4	OTR Over-travel (R)	OTR Over-travel (F)	CLD Current Limit On	SAL Servo Alarm	NODB	STROBE	−INC9	+INC9
,5	5	DATA SET INT	JPIBT	MFIN	G34F	①	EPS7	EPS6	EPS5 External Skip 5
,6	6	LSB*	LSA* LS Near Home	EXP External Positioning LS	PB Phase B Pulse	PA Phase A Pulse	PC Home position Pulse	②	

Note :
① Extended Function Selection OPSL.
② PG Battery Reduction PG BATAL.

* Not used in absolute method : Set at 0.

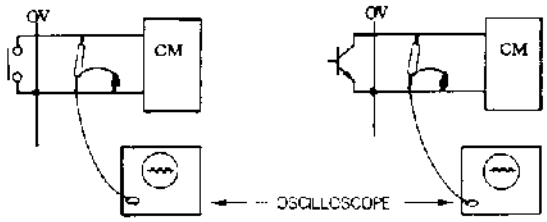


Fig. 8. 1 Measured by Oscilloscope

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8.2.2 Output Signal Status

When checking signals by Motionpack programmer, status which Motionpack-34 controller is trying to output is displayed :

Digit Position (Column) / Programmer Display / Channel	10^7	10^5	10^6	10^4	10^3	10^2	10^1	10^0
10 / 0	OFM Offset Max.	OFR Offset 0	INCD Incremental End	EPAL External Positioning Alarm	G34 External Positioning End	STL In-operation	ZPM Home Return End	ALM1 MP Alarm
11 / 1	ZNP Near Home	M56	M55	M54	M53	M52	M51	M30
12 / 2						RDY MP Ready (PC)	RDY (DB)	ALM2 Battery Alarm

The status may be different from actual external status output.

8.3 CHECKING DC VOLTAGES

When the cause of trouble is likely to be in the wrong supply voltage, check not only the voltage but also ripples using an oscilloscope.

For the supply voltages (+12V and −12V) of analog commands, permissible fluctuation including ripples is within ±5%. For the supply voltage (+24V) of I/O signals, permissible fluctuation including ripples is within ±15%. Check the PG supply voltage at the PG side terminal and the analog command supply voltages at the terminals of DB.

8.4 CHECKING SPEED COMMAND SIGNAL

The speed command of the Motionpack-34 is a sawtooth wave of 1.5 kHz. If the waveform is flat, the device is outside the range of control or has failed.

The speed command voltage is a sawtooth wave as shown in Fig.8.2, but the motor does not vibrate as the motor itself and load absorb the sawtooth changes of the voltage.

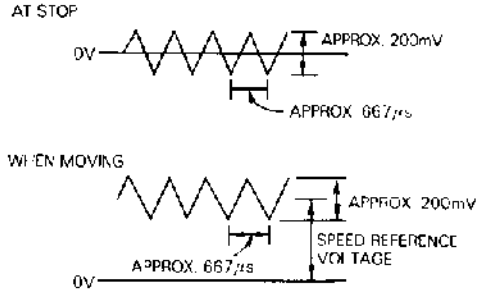


Fig. 8. 2 Speed Reference Signal

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8.5 REPLACING THE BATTERIES

The Motionpack-34 system includes two backup batteries. One, installed in the CM34, backs up the memory of the Motionpack 34 Controller (see Fig.8.3).

The other is for the absolute encoder and installed on the Motionpack interface board in the Servopack (see Fig.8.4). The two batteries have the same specifications as follows.

Type : Thionyl chloride lithium battery

Model : ER6-C (with leads and socket)

Ratings : 3.6 V, 2000 mA•h

Maker : TOSHIBA BATTERY CO. LTD

The voltages of the two batteries are monitored separately. When that of either battery reaches the lower limit, the indicator "Battery voltage low" lights and ALM2 occurs. If this happens, check the alarm message by program (see below) and replace the low battery.

"bAt doun" → CM34 battery dead low/dead

"PG bAtt" → Absolute encoder battery dead low/dead

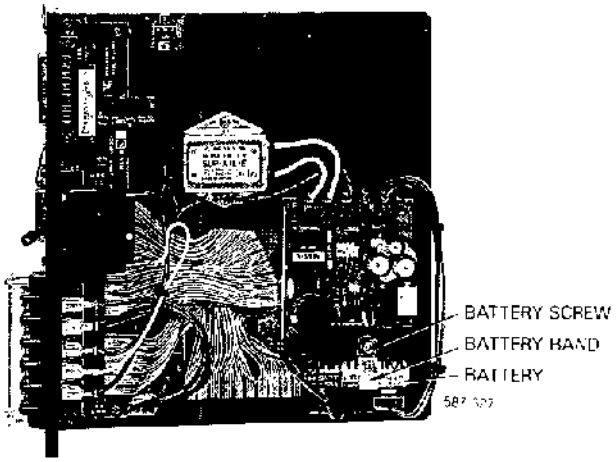


Fig 8.3 Battery in Controller

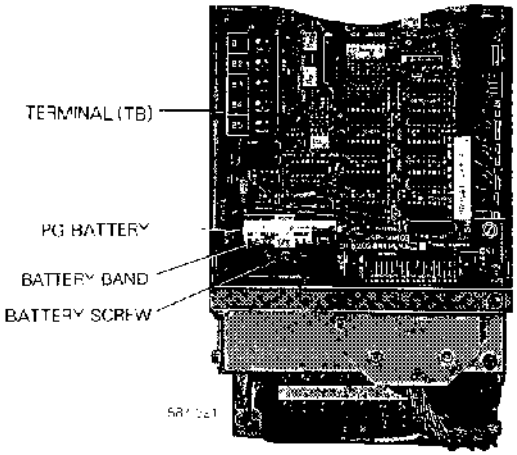


Fig. 8. 4 Battery in Servopack

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8.5.1 Replacing the CM34C battery

The battery used for memory backup has a service life of about 5 years. When the BATAL (battery voltage low) indicator is lit, replace the battery within a month.

The memory backup circuit is doubled by a super capacitor and a lithium battery. The super capacitor is charged when power has been kept on for more than 3 minutes and then, even if the power is turned on to replace the battery, the contents of memory will be held unchanged.

Always keep AC power on for more than 3 minutes before turning off power and replacing the battery. Replace the battery as follows :

① Remove four screws on the Motionpack-34 Controller front panel.
② Pull out the base, and the battery is accessible on the right side of the base.
③ Remove the socket and then the battery.
④ Fit the socket of the new battery and install the battery.
⑤ Put the Motionpack-34 base back into position and tighten the four screws.
⑥ Make sure the BAT-AL (battery voltage low) indicator is out.

8.5.2 Replacing The Absolute Encoder Battery

The battery for the absolute encoder is installed on the Motionpack interface board in the Servopack. It has a life of 5 years. When the indication of low battery voltage is given, replace the battery as follows :

(1) Keep power supply of the Motionpack and Servopack on for more than 3 minutes (to charge the super capacitor in the encoder).

(2) Remove the battery socket mounted on the Motionpack interface board and replace the battery. (Leave the Servopack either on or off.)

(3) After spep (1) above, the encoder will operate properly for four days even when AC power is turned off. So, the encoder absolute value data will not be erased during battery replacement.

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8.6 ERROR INDICATIONS

Alarm signal will be output if the Motionpack-34 system fails. Alarm signals include ALM1 (Motionpack-34 alarm), ALM2 (battery alarm) and EPAL (external positioning alarm).

8.6.1 Error Code

The state and cause of the Motionpack error can be checked by the Programmer error code indication (Er).

8.6.2 Indicator

(1) Motionpack-34 Programmer

The Motionpack Programmer indicates status when status mode is selected. It indicates not only error status but operating mode, feed hold state, output signal state and contents of the error counter, etc. This information will provide the status of the Motionpack-34 system when it has failed.

There are Normal (green) and Error (red) indicators, too.

Normal : Lights when the Programmer is normal. If not lit, check the power supply and fuses.

Error : Lights when data cannot be transmitted to or from the Motionpack-34 Controller. Check the Motionpack-34 Controller, cable and connectors.

(2) Motionpack-34 Controller

The Motionpack 34 Controller has four indicators : PWR (green), RUN (green), ALM (red) and BAT-AL (red). Use PM for more detailed information on status.

When a Motionpack-34 alarm occurs, the ALM indicator lights. But, this does not mean that the Motionpack-34 Controller has failed, but there may be something wrong with the system. Use the Programmer to get more detailed information on the error.

Error indications and actions to be taken are explained below.

RUN : Lights when the CPU at the Motionpack-34 Controller is normal and system program is running properly. If not lit, the Motionpack-34 Controller may be defective.

ALM : Lights, with an MP alarm signal produced, when the Motionpack-34 has a malfunction. Check and correct the error with the programmer.

BAT-AL : Lights when the voltage of a battery falls. (This lights only when the 100 VAC power is turned on.) When lit, replace the battery within a month.

PWR : Lights when the power supply is on. When not lit, check the 100 VAC power supply. This does not indicate the states of 24 V power supply for 1/0 signals or 12 V for analog commands.

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8.7 REPLACING THE MOTOR

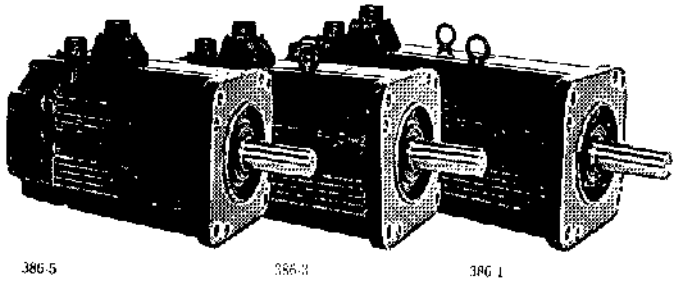
When replacing the motor, follow the procedures in the Servomotor BULLETIN. After replacement, set up the machine origin since the relation of the absolute encoder and machine origin may vary.

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9. SPARES

This section describes battery specifications as spares.



386-5 386-3 386-1

TYPE USAMED 20MS2

TYPE USAMED-09MS2 TYPE USAMED-40MS2

AC SERVOMOTORS

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9.1 BATTERY

Lithium battery is used for Motionpack-34 Controller and Servopack. Battery specifications ane shared by Motionpack-34 and Servopack.

For easy replacement, spare battery with socket and lead are available. (See Fig 9.1.)

Name : Motionpack-34 battery (lithium battery with socket and lead)

Manufacturer : Toshiba Battery Co., Ltd.

Content : Lithium battrry ER6-C type is provided with Motionpack-34 socket and lead. Accordingly soldreing is not needed for replacement : just insert socket.

Order : Contact your YASKAWA representative on price or delivery.

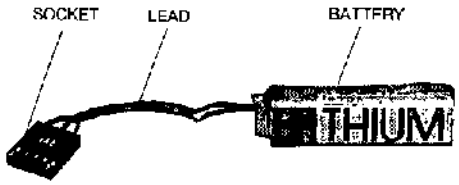


Fig. 9. 1 TYPE ER6 C BATTERY

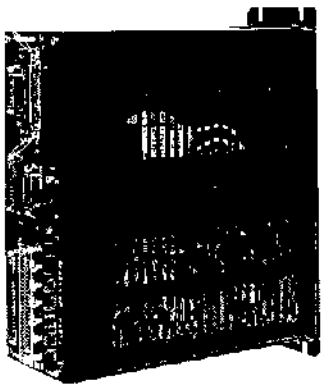
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10. EXTERNAL DIMENSIONS

This section describes external dimensions of following units:

(1) Motionpack-34 controller
(2) Motionpack Programmer
(3) Servopack
(4) Pulse generator
(5) I/O signal power supply
(6) Tape device

Motionpack-34 CONTROLLER
TYPE CMPC-CM34C

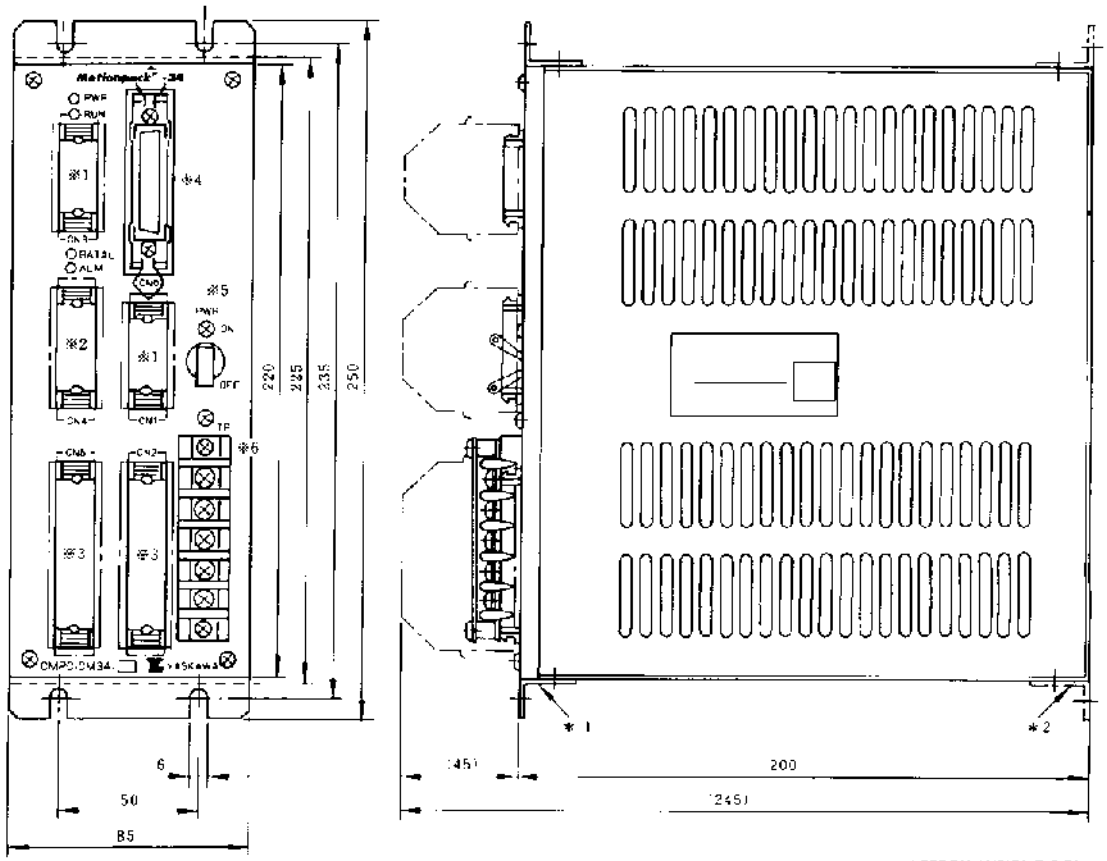


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10. EXTERNAL DIMENSIONS in mm

10.1 Motionpack 34 CONTROLLER (TYPE CMPC-CM34)



APPROX WEIGHT 2.5kg

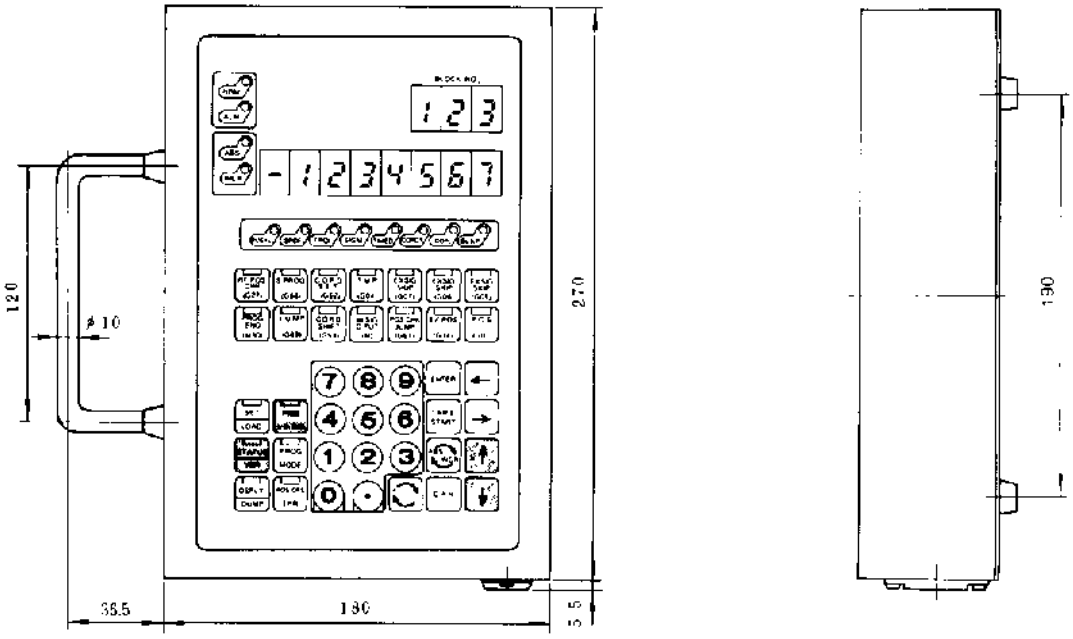
※1: Installation metal position for rack mount
※2: Installation metal position for base mount

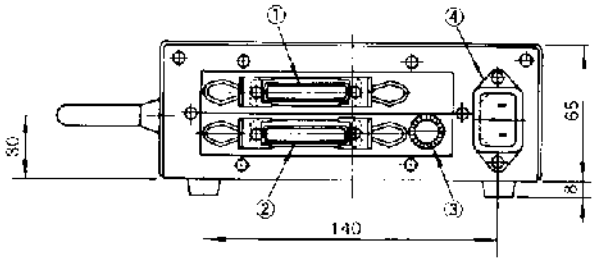
NO.	Equipment sign	Connector Type	Cable Side Connector Attachment	Remarks
※1	CN1, CN3	MR Connector MR-20RMA	Housing MR20F Hood MR20L Soldered type	Honda Tsushin Co.
※2	CN4	MR Connector MR-25RMA	Housing MR50F Hood MR50L Soldered type	Honda Tsushin Co.
※3	CN2, CN5	MR-Connector MR-50RMA	Housing MR20F Hood MR50L Soldered type	Honda Tsushin Co.
※4	CN6	D-sub Connector DB-25SA	Dust Cover DB-59-20	Japan Aviation Electronics Industry, Ltd

NO.	Equipment sign	Name	Electricals Specifications	Remarks
※5	1MCB(PWR)	Circuit Protector	SPA-1-600F-2.5A	
※6	TB	Power Supply Terminal	Terminal F2035EW.5P With M4 Screw Cover	

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10.2 Motionpack PROGRAMMER





Code	Element Code	Name and Specification
①	C1	Connector DBSF-25 S
②	CT	
③	FU	Fuse SM 1101-1
④	CC	Plug receptacle 125 VAC

Approx. Weight: 2.3kg

Item	H	Application
A	8	CMPF-PM 33 C PM 33 D
B	3	CMPF-PM 33 F

Motionpack Programmer connector terminals and signal names

C1 connector (3483-1000)

1	2	3	4	5	6	7	8	9	10	11	12	13
FG								TXD	$\overline{\text{TXD}}$	RXD	$\overline{\text{RXD}}$	

14	15	16	17	18	19	20	21	22	23	24	25
									5V		0V

CT connector (3483-1000)

1	2	3	4	5	6	7	8	9	10	11	12	13
FG	TXD	RXD	RTS	CTS	DR*	SGO						

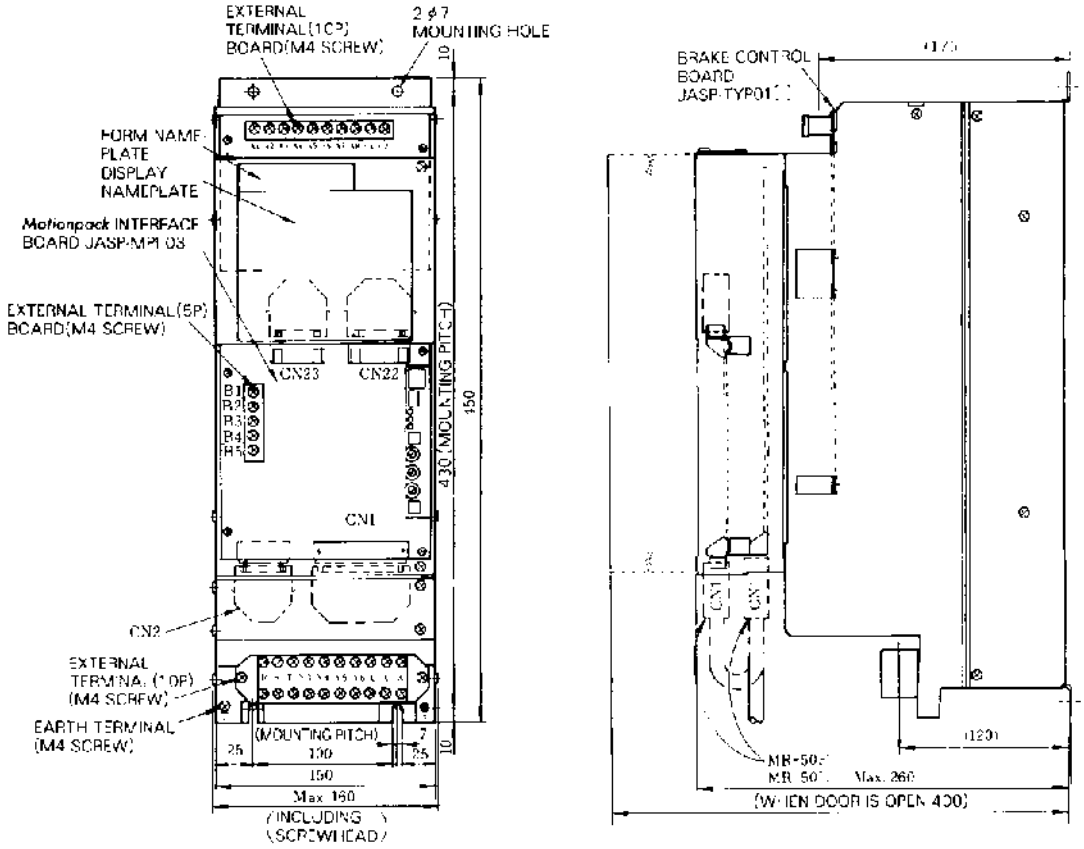
14	15	16	17	18	19	20	21	22	23	24	25
							ER*				

Pins marked with * are connected each other inside the programmer.

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10.3 Servopack

(1) Type CACR-SR03 to 12TZ6S

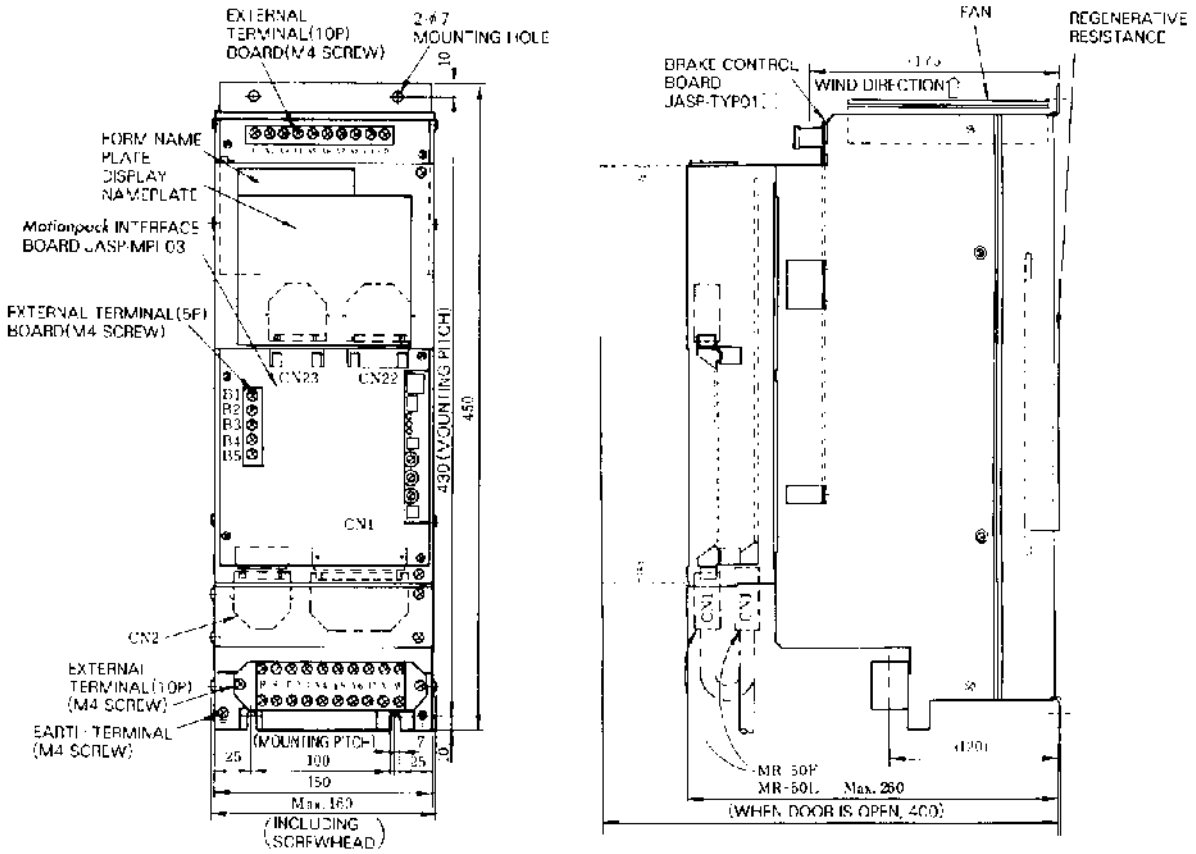


APPROX. WEIGHT SR-03, -06: 8.0kg
SR-09, -12: 11.0kg

	Servopack Side Connector	Cable Side Connector	Remarks
CN2	MR-20RMA	Servopack attachment Housing MR-20F (Soldered type) Hood MR-20L	Honda Tsushin Co.,
CN22	MR-25RMA	Servopack attachment Housing MR-25F (Soldered type) Hood MR-25L	Honda Tsushin Co.,
CN23	MR-20RMA	Servopack attachment Housing MR-20F (Soldered type) Hood MR-20L	Honda Tsushin Co.,

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(2) Type CACR-SR20,-30TZ6S



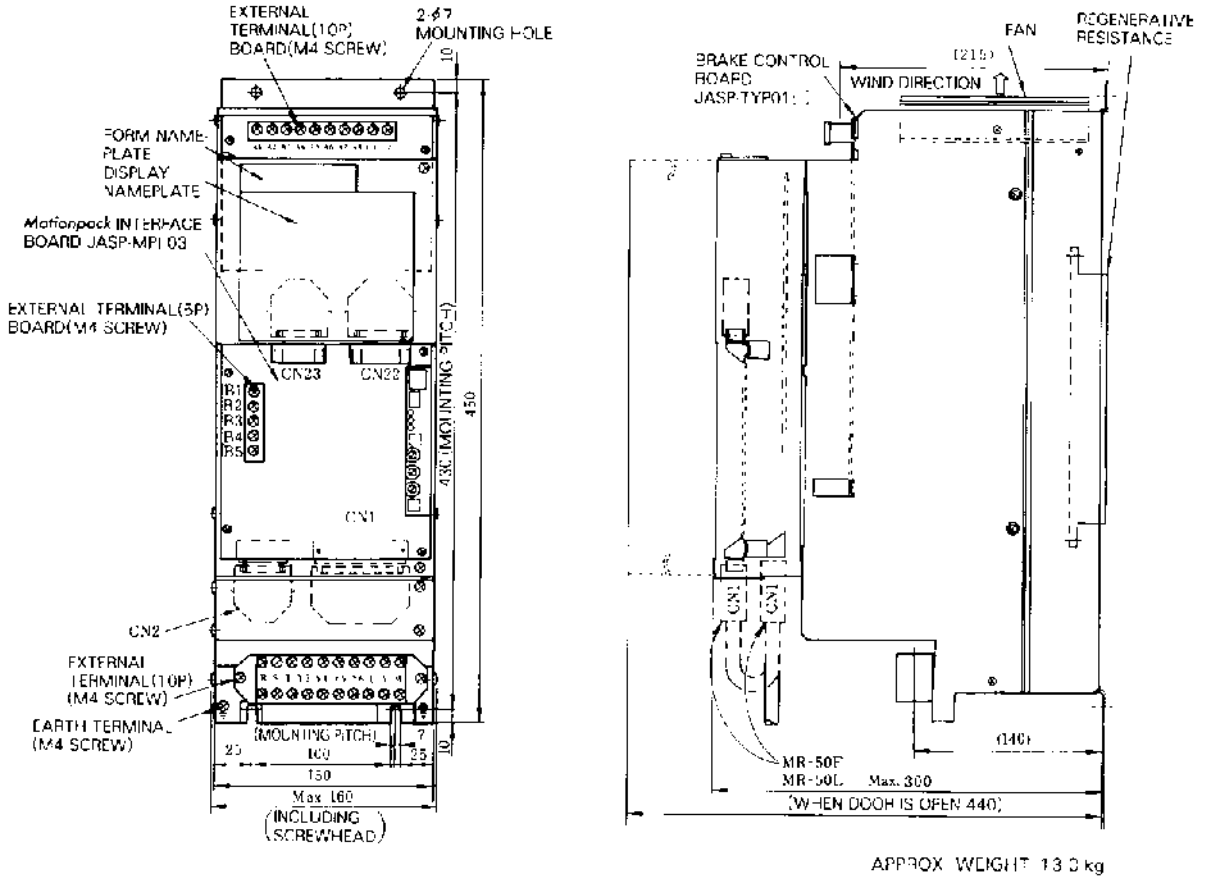
APPROX. WEIGHT SR-20 11.5 kg
SR-30 12.0 kg

	Servopack Side Connector	Cable Side Connector	Remarks
CN2	MR-20RMA	Servopack attachment Housing MR-20F (Soldered type) Hood MR-20L	Honda Tsushin Co.,
CN22	MR-25RMA	Servopack attachment Housing MR-25F (Soldered type) Hood MR-25L	Honda Tsushin Co.,
CN23	MR-20RMA	Servopack attachment Housing MR-20F (Soldered type) Hood MR-20L	Honda Tsushin Co.,

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10.3 Servopack (Cont'd)

(3) Type CACR-SR44TZ6S



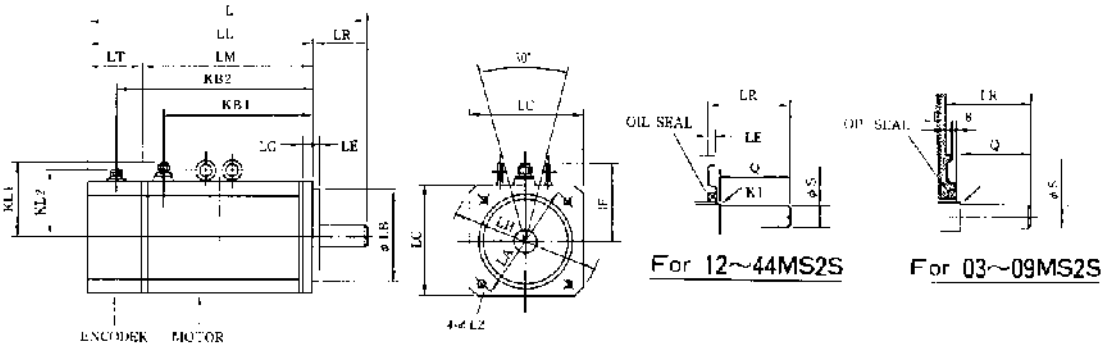
	Servopack Side Connector	Cable Side Connector	Remarks
CN2	MR-20RMA	Servopack attachment Housing MR-20F (Soldered type) Hood MR-20L	Honda Tsushin Co.,
CN22	MR-25RMA	Servopack attachment Housing MR-25F (Soldered type) Hood MR-25L	Honda Tsushin Co.,
CN23	MR 20RMA	Servopack attachment Housing MR-20F (Soldered type) Hood MR-20L	Honda Tsushin Co.,

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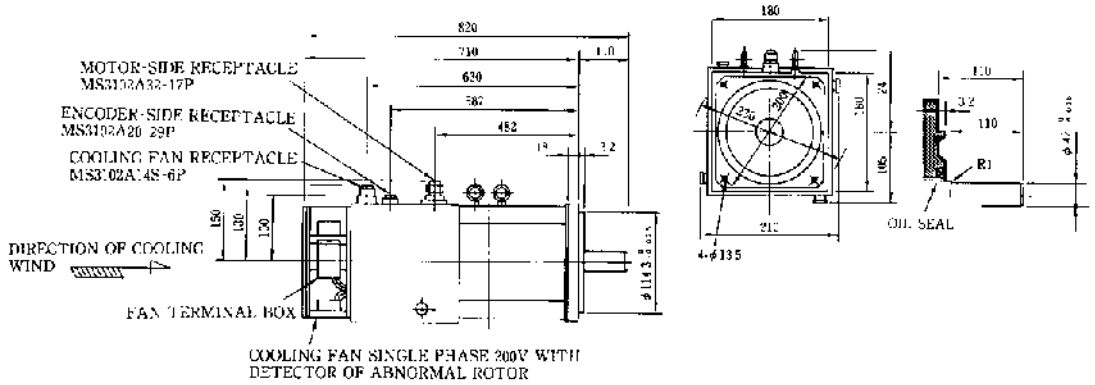
10.4 SERVOMOTOR (For AC Mechanical Feed)

(1) M Series (Straight shaft, without Brake)

• Types USAMED-03MS2S (0.3kw) to -44MS2S (4.4kw)

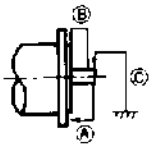


• Type USAMKD-60MS2S (6kw)



AC Servomotor Type USAMED-	L	LL	LM	LR	LT	KB1	KB2	1E	KL1	KL2	Flange Surface LA	LB	LC	LE	LG	LH	LZ	Shaft Extension φS	Q	Receptacle Type Motor	Receptacle Type Encoder	Approx Weight kg
03 MS 2 S*	280	228	182	58	46	124	201	—	112	93	145	110 $^{0}_{-0.035}$	130	6	12	165	9	19 $^{0}_{-0.013}$	40	MS3102A18-10P	MS3102A20-29P	10
06 MS 2 S*	343	285	239	58	46	181	258	—	112	93	145	110 $^{0}_{-0.035}$	130	6	12	165	9	19 $^{0}_{-0.013}$	40			15
09 MS 2 S*	424	366	308	58	58	247	339		112	100	145	110 $^{0}_{-0.035}$	130	6	12	165	9	22 $^{0}_{-0.013}$	40			21
12 MS 2 S*	366	276	218	79	58	171	237	—	137	110	200	114.3 $^{0}_{-0.025}$	180	3.2	18	230	13.5	35 $^{+0.01}_{0}$	76	MS3102A22-22P		24
20 MS 2 S	413	334	276	79	58	229	295	124	137	110	200	114.3 $^{0}_{-0.025}$	180	3.2	18	230	13.5	35 $^{+0.01}_{0}$	76			32
30 MS 2 S	498	419	361	79	58	314	380	124	137	110	200	114.3 $^{0}_{-0.025}$	180	3.2	18	230	13.5	35 $^{+0.01}_{0}$	76			43
44 MS 2 S	725	615	557	110	58	482	587	124	150	100	200	114.3 $^{0}_{-0.025}$	180	3.2	18	230	13.5	42 $^{+0.018}_{+0.002}$	110	MS3102A32-17P		70

MECHANICAL SPECIFICATIONS

Accuracy (T. I. R.)*		Reference Diagram
Flange surface perpendicular to shaft Ⓐ	0.04 0.06†	
Flange diameter concentric to shaft Ⓑ	0.04 0.06†	
Shaft run out Ⓒ	0.02 0.04†	

* T.I.R (Total Indicator Reading)
† Accuracy for motor types USAMED 44MS2S

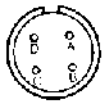
* Not provided with an eyebolt.
Note : 1. Absolute encoder is used as a detector.
2. Vibration : 15μm or below.
3. Plug and clamp are not attached for receptacle connection.

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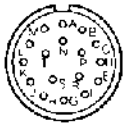
10.4 SERVOMOTOR (For AC Mechanical Feed) (Cont'd)

CONNECTOR SPECIFICATIONS

● Incremental Encoder Receptacle ● Motor Receptacle



A	Phase U
B	Phase V
C	Phase W
D	Ground

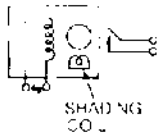


A	Channel A output	K	–
B	Channel $\overline{A}$ output	L	
C	Channel B output	M	–
D	Channel $\overline{B}$ output	N	–
E	Channel Z output	P	–
F	Channel $\overline{Z}$ output	R	For reset
G	0 V	S	0 V (battery)
H	+5 VDC	T	3 V (battery)
J	Frame ground	–	–

FAN TERMINAL CONNECTION (For Only 60MS2S)



A	Fan motor
B	Fan motor
C	
D	Alarm terminal
E	Alarm terminal
F	



Alarm contact

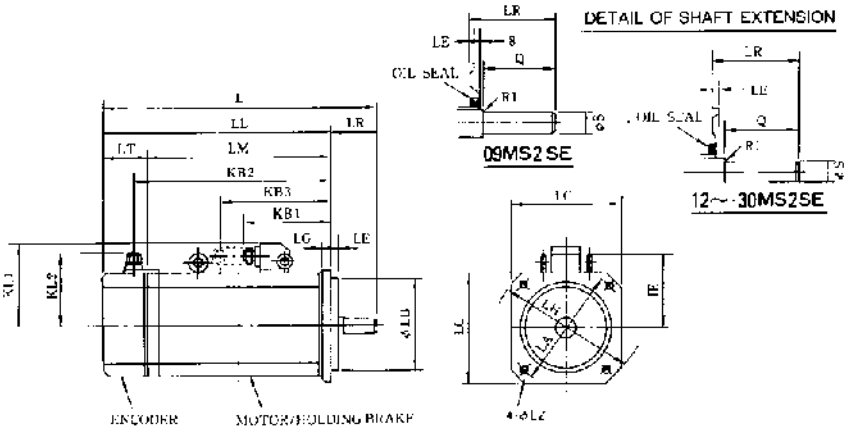
OFF at normal fan rotation
ON at 1800 ± 200 r/m n or less
(ON during 3 seconds at s art-up)

Contact Capacity

Max resistive load 110V 0.3A

(2) M Series (Straight shaft, with Brake)

• Type USAMED-09MS2SE(0.9kW)to~USAMED-30MS2SE(3kW)



CONNECTOR SPECIFICATIONS

Motor/Brake

A	Phase U	E	Brake Terminal
B	Phase V	F	Brake Terminal
C	Phase W	G	—
D	Ground		

Encoder

A	Channel A output	K	—
B	Channel $\overline{A}$ output	L	—
C	Channel B output	M	
D	Channel $\overline{B}$ output	N	—
E	Channel Z output	P	—
F	Channel $\overline{Z}$ output	R	For reset
G	0 V	S	0 V (battery)
H	+ 5 V DC	T	3.6 V (battery)
J	Frame ground		

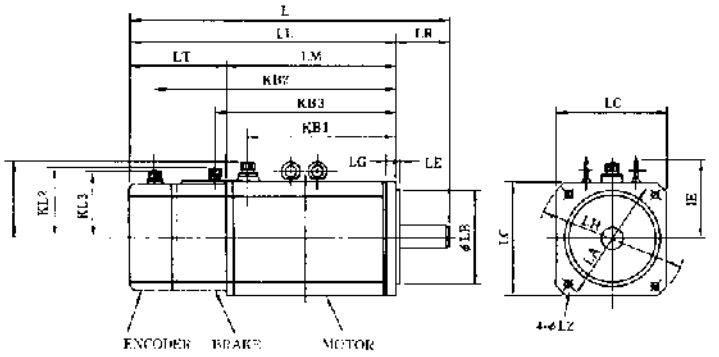
AC Servomotor Type USAMED	L	LL	LM	LR	LT	KB1	KB2	KB3	LE	KL1	KL2	Flange Surface LA	φLB	LC	LE	LG	LH	LZ	Shaft Extension φS	Q	Approx. Weight (kg)	Brake Torque (kg·m)
09MS2SE*	458	400	356	58	44	116	376	158	–	113	93	145	110 $^{0}_{-0.035}$	130	6	12	165	9	22 $^{0}_{-0.013}$	40	25	0.6
12MS2SE	432	353	298	79	53	165	317	220	124	143	110	200	114.3 $^{0}_{-0.025}$	180	3.2	18	230	13.5	35 $^{+0.01}_{-0.015}$	76	33	3.6
20MS2SE	496	417	362	79	55	165	381	220	124	143	110	200	114.3 $^{0}_{-0.025}$	180	3.2	18	230	13.5	35 $^{+0.01}_{-0.015}$	76	41	
30MS2SE	577	498	443	79	55	165	462	220	124	143	110	200	114.3 $^{0}_{-0.025}$	180	3.2	18	230	13.5	35 $^{+0.01}_{-0.015}$	76	52	

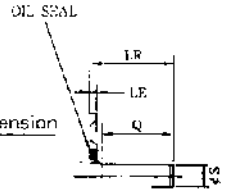
AC Servomotor Type USAMED	Receptacle Type Motor/Brake	Receptacle Type Encoder	Shaft Run Out T.I.R†	Flange Surface Perpendicular to Shaft T.I.R†	Flange Diameter Concentric to Shaft T.I.R†
09MS2SE*	MS3102A20-15P	MS3102A20-29P	0.02	0.04	0.04
12MS2SE	MS3102A24-10P				
20MS2SE					
30MS2SE					

* Not provided with an eyebolt.
† T. I. R. (Total Indicator Reading)
Note : 1. Absolute encoder is used as a detector.
2. Vibration : 15μm or below.
3. Plug and clamp are not attached for receptacle connection.
4. Brake power supply is 90 V DC.

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• USAMED-44MS2SB (4.4kW)

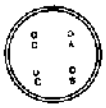




Detail of Shaft Extension

CONNECTOR SPECIFICATIONS

Motor



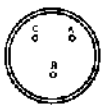
A	Phase U
B	Phase V
C	Phase W
D	Ground

Encoder



A	Channel A output	K	—
B	Channel $\overline{A}$ output	L	—
C	Channel B output	M	—
D	Channel $\overline{B}$ output	N	
E	Channel Z output	P	—
F	Channel $\overline{Z}$ output	R	For reset
G	0 V	S	0 V (battery)
H	+5 V DC	T	3.6 V (battery)
J	Frame ground		

Brake



A	Brake terminal
B	Brake terminal
C	

AC Servomotor Type USAMED-	L	LL	LM	LR	LT	KB1	KB2	KB3	1E	KL1	KL2	KL3	Flange Surface LA	LB	LC	LE	LG	LH	LZ	Shaft Extension ϕS	Q	Approx. Weight (kg)	Brake Torque (kg·m)
44MS2SB	820	710	527	110	183	482	683	577	134	150	93	110	260	114.3 $^{0}_{-0.05}$	180	3.2	18	230	13.5	42 $^{+0.018}_{+0.002}$	110	80	6

AC Servomotor Type USAMED-	Receptacle Type			Shaft Run-Out T.I.R*	Flange Surface Perpendicular to Shaft T.I.R*	Flange Diameter Concentric to Shaft T.I.R*
	Motor	Brake	Encoder			
44MS2SB	MS3102A32-17P	MS3102A14S-7P	MS3102A20-29P	0.04	0.04	0.04

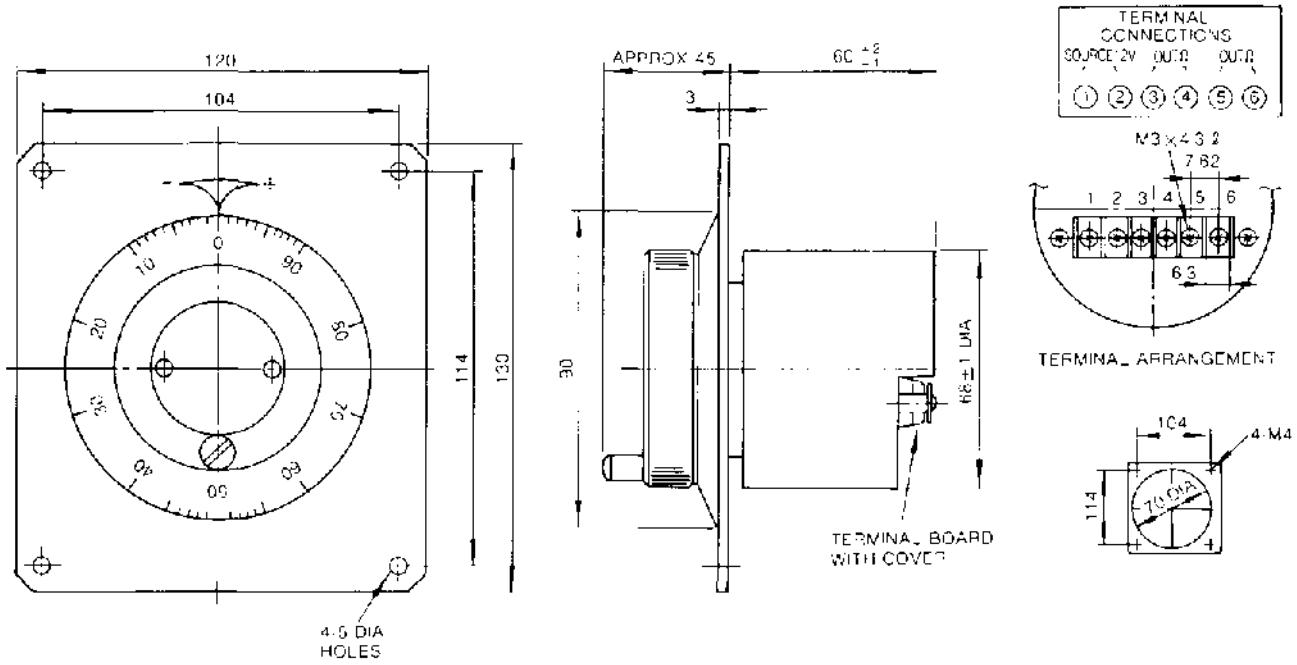
* T.I.R. (Total Indicator Reading)

Note: 1. Absolute encoder is used as a detector.
2. Vibration: 15 μm or below.
3. Plug and clamp are not attached for receptacle connection.

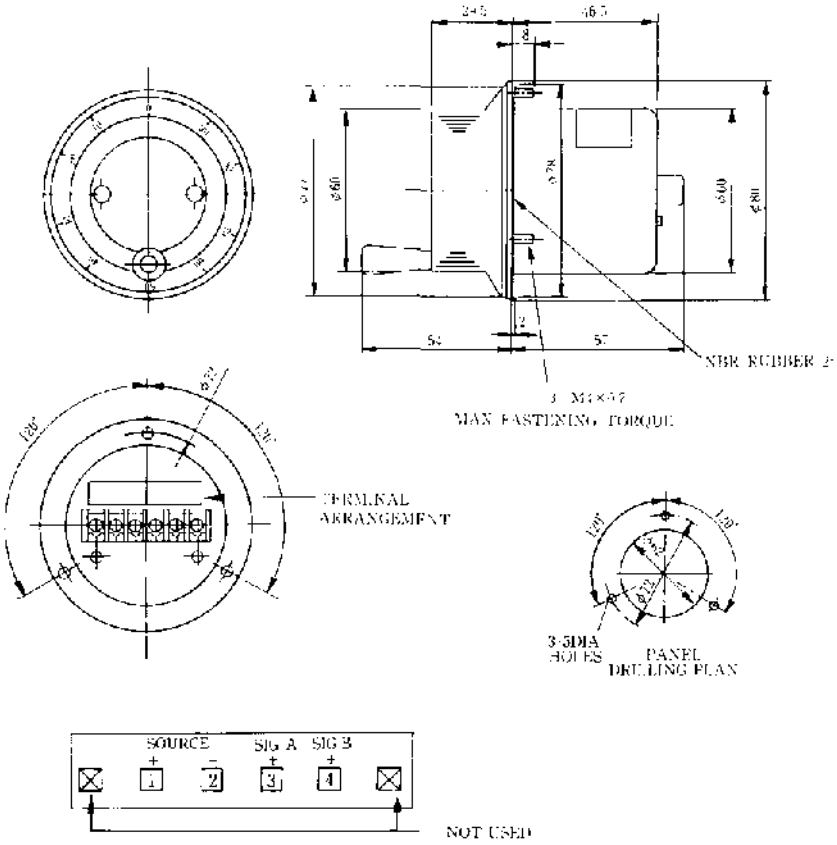
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10.5 PULSE GENERATOR

(1) Type MGZ-10B



(2) Type PREH-2E5T/100-M1

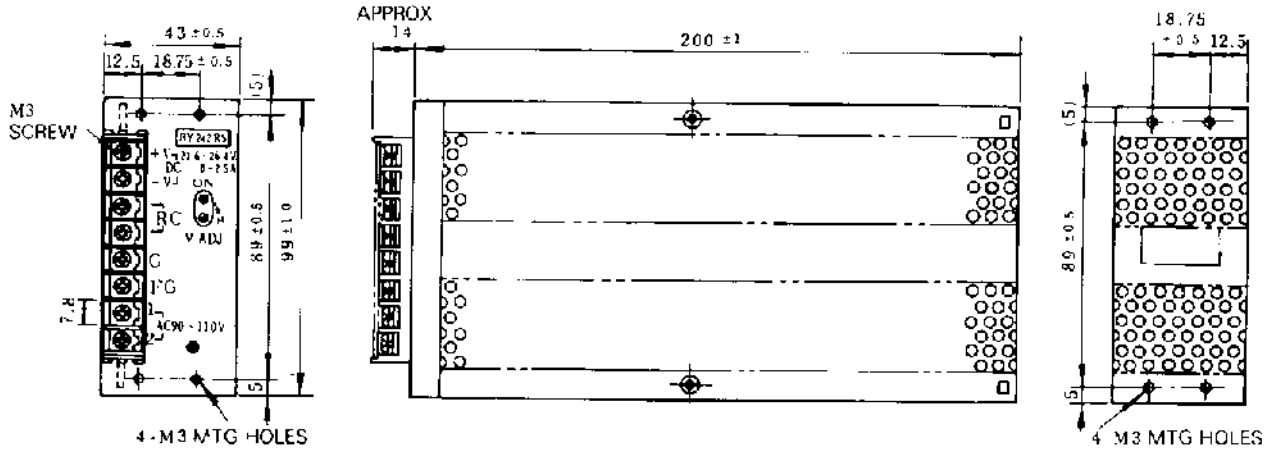


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10.6 I/O SIGNAL POWER SUPPLY

Model : BY242R5

Maker : Shindengen Kogyo, KK.



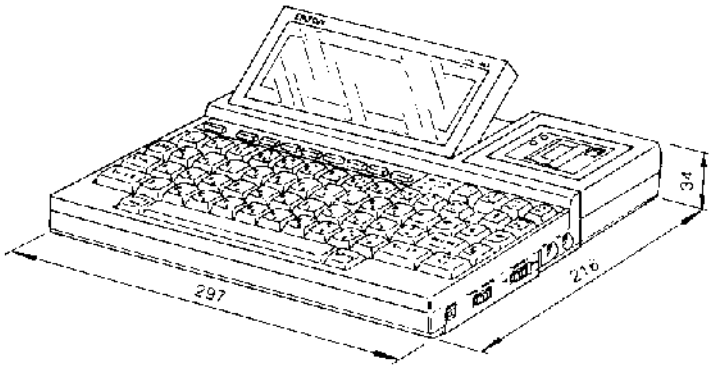
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10.7 TAPE DEVICE

(1) Hand-held Computer

Type : EPSON HC-40

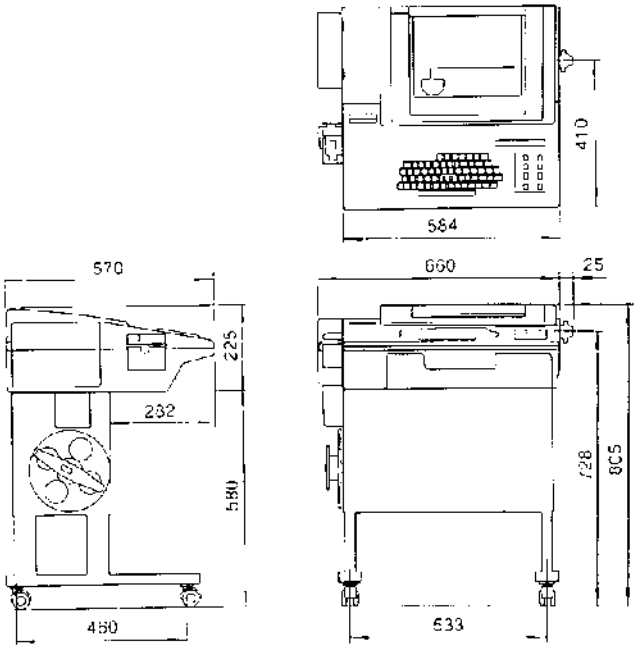
Maker : EPSON Corporation



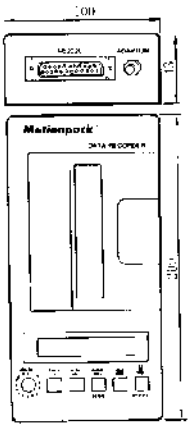
(2) PRO-TYPER High Speed ASR Input Terminal

Type : MODEL 7652

Maker : Citizen



(3) Motionpack Data Recorder

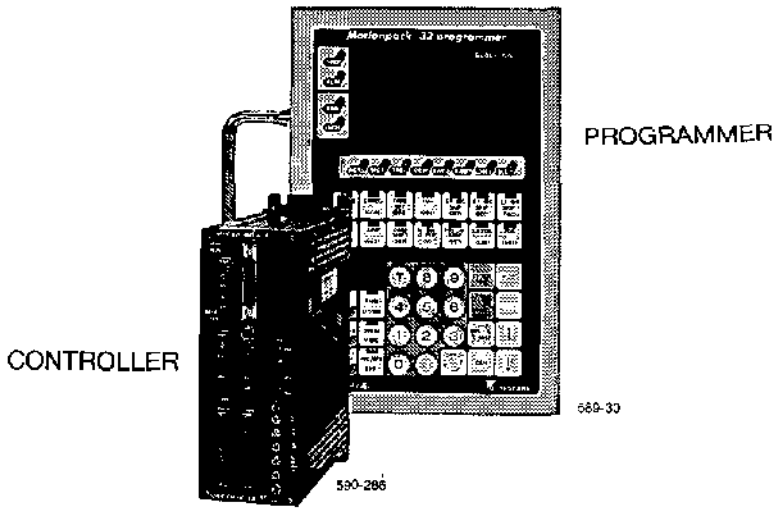


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11. EXTENDED FUNCTIONS

This section describes the following extended functions newly added :

(1) S-curve Accel/Decel Positioning
(2) ABS-PG Automatic Home Position Setup System
(3) External Data Setting
(4) External Offset
(5) Extended Zone Signal Output (A)
(6) Extended Zone Signal Output (B)



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11.1 S CURVE ACCEL/DECEL POSITIONING

11.1.1. Features

(1) This is a function to expand the skip positioning function (G05~G07) by setting the accel/decel time in Pr56 and S curve accel/decel time in Pr57.

(2) The S-curve of accel/decel of positioning motion which means a constant time change rate in accel/decel dampens shock at start and stop.

11.1.2 Specifications

(1) Designation of Function

The designation of this function requires, as in the designation of other expansion functions, setting of parameter and inputting of expansion function selection signals.

(a) Setting of parameter

Set Pr43 = 1000.

(b) Expansion function selection signal

Connect No. 18 terminal of the CN5 connector to $O_{24}V$.

CN5-18 → $O_{24}V$

(2) Definition of S-curve Accel/Decel Curve

(a) The S curve accel/decel curve consists of 3 zones, as shown in Fig. 1.

- Time change rate in acceleration zone
- Constant acceleration zone
- Reduced acceleration zone

(b) Accel and decel are symmetrical.

(c) The S-curve accel/decel is defined by the following 3 parameters.

- V1 = Pr40 ··· Maximum speed (Same as setting of basic function)
- ta = Pr56 ··· Acceleration time (in msec. 60 ~ 1000)
- t1 = P457 ··· S-curve time (in msec. 30 ~ 500)

The upper limit value of Pr57 is 500ms or Pr56 × 1/2 whichever smaller.

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(d) Relation between command speed and S-curve

- When the command speed F is smaller than V1, the speed increases along the path C' to the speed F.
- When travel is short, the speed increases along the path C.

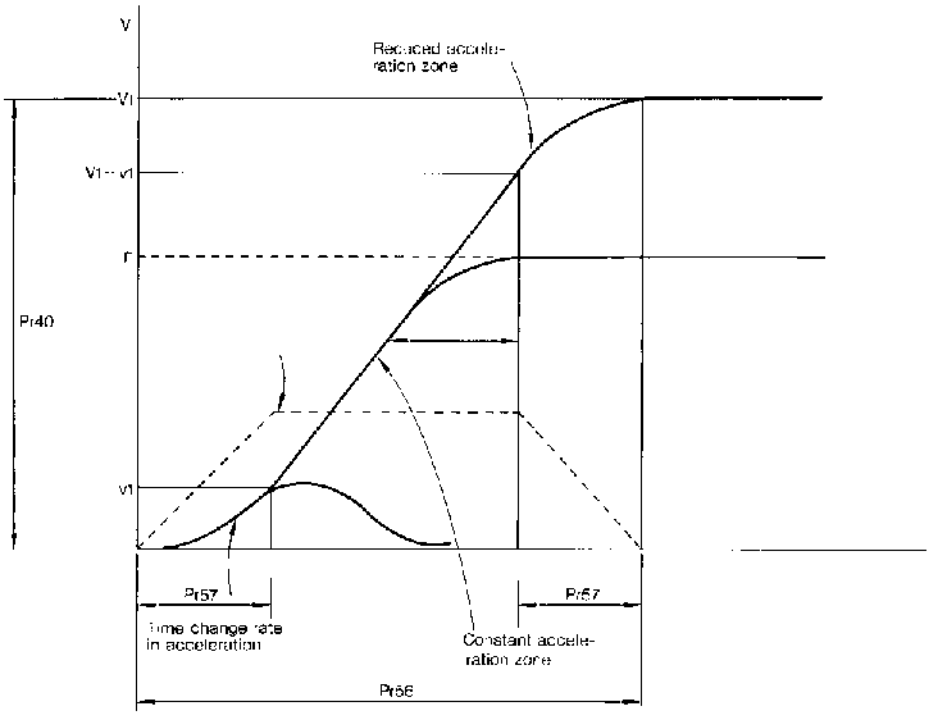


Fig. 11. 1 S-curve Accel/Decel

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(3) Motion

```
G 0 5 X□□□□.□□□F□□□□I□□□
G 0 5 U□□□□.□□□F□□□□I□□□
```

(G06 and G07 are the same)

The basic motion is the same as the G01 positioning motion.
Only the curve is the S-curve. The time of the S-curve are the same as symmetrical.
The speed curve for the S curve positioning motion is as shown below. Note that if a stop signal is input during operation, the motion will follow the curve shown in Fig. 11.4 depending on the timing of input.

(a) Normal operation

Positioning by symmetrical S-curve shown in Fig. 11.2 is executed.

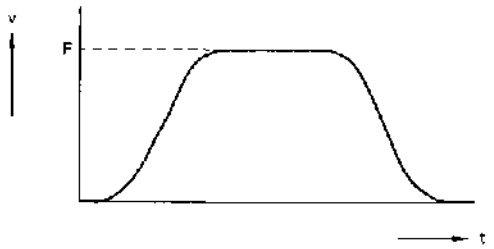


Fig. 11. 2 Normal Speed Curve

(b) Operation when travel distance is short.

When the command travel distance is short, positioning by the curve in Fig. 3 having no constant acceleration and constant speed zones is executed.

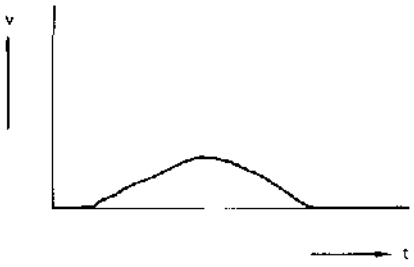


Fig. 11. 3 Speed Curve When Travel Distance is Small

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(c) Speed curve at temporary stop

When the motion is stopped temporarily, the speed curve of the motion changes as follows depending on the timing of the stop.

①Stop during acceleration: The motion stops by the symmetrical curve as the (a) curve.

②Stop during constant speed: The motion stops by the deceleration curve of the S-curve accel/decel.

③Stop during deceleration: The motion continues deceleration and stops.

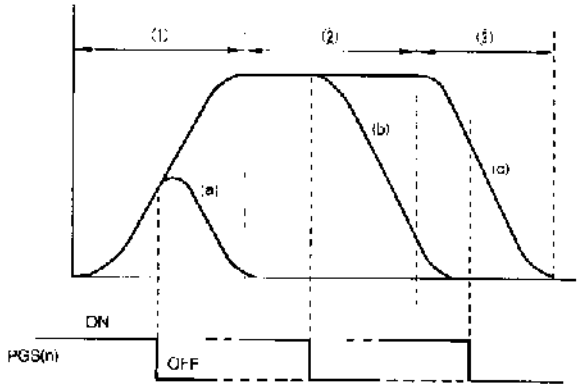


Fig. 11. 4 Speed Curve at Temporary Stop

(d) Speed control signal (OVR)

The speed control signal (OVR) is disregarded during execution of the S-curve accel/decel positioning function. This means that the feed speed cannot be limited to the creep speed by the speed control signal.

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(4) Compatibility with Conventional Functions

The compatibility of the S-curve accel/decel function with other expansion functions using G05, G06 and G07 is as shown in Table 11.1.

Table 11.1 Compatibility with Other Expansion Functions

Expansion Function Name	G Code Used	Compatibility with S-Letter	Parameter Setting (Pr43)	Remarks
Variable speed positioning	G06	Compatible	3000	
Passing signal output	G07	Compatible	5000	
Angle indexing	G05 G06 G07	Compatible	2001000	
Clamp free	G05 G06 G07	Incompatible		Use may be divided (Example) G05 : S-letter, G06 : Clamp free
External compensation		Incompatible		
External data setting		Incompatible		

The positioning commands, G01, G27 and G34,other than skip positioning, move the unit at linear accel/decel speed when the S-curve accel/decel function is specified.

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11.1.3 Operation

(1) Acceleration (Deceleration) Torque

In S-curve accel/decel positioning, the start and end of acceleration time and start and end of deceleration time involve S-curve accel/decel defined by Pr56, as shown in Fig. 5. And by the rate that the accel/decel speed is restricted by S-curve accel/decel, the accel/decel speed of linear accel/decel at the middle is increased. The linear accel/decel speed becomes the same as when the accel/decel time is Pr56-Pr57, which is the peak torque in S-curve accel/decel positioning.

$$\text{Peak torque of S-curve accel/decel} = \frac{Pr56}{Pr56-Pr57} \times \text{Peak torque of linear accel/decel}$$

From the above formula, the peak torque of S-curve accel/decel and the peak torque of linear accel/decel are equal when Pr57 = 0.

When $Pr57 = \frac{Pr56}{2}$ (or no linear portion), the peak torque of S-curve accel/decel is double the peak torque of linear accel/decel.

NOTE

In practice, Pr57 cannot be set larger than 30 because of restriction of the setting range of Pr57.

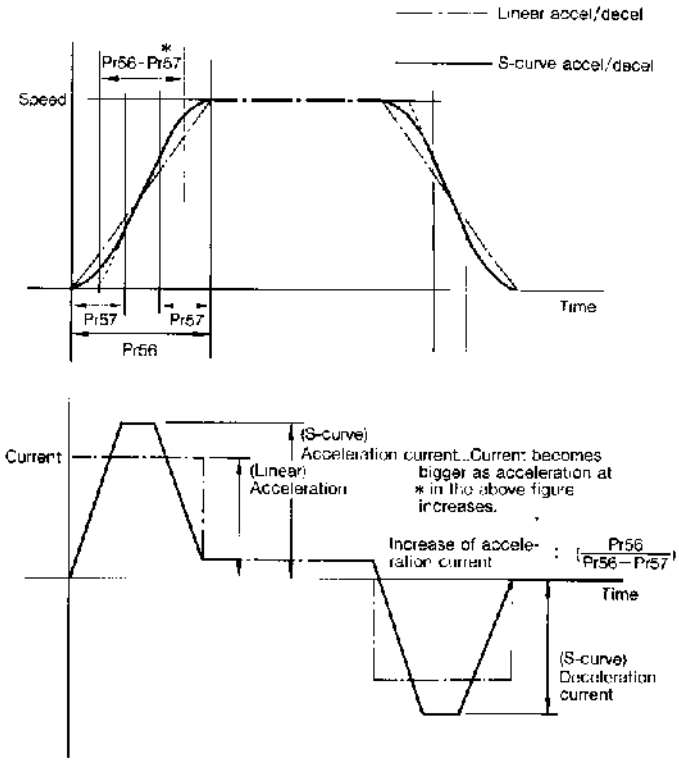


Fig. 11. 5 Torque Curve of S-curve Accel/Decel

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The relation between Pr57/Pr56 and increase of peak torque is as shown in Fig. 11.6.

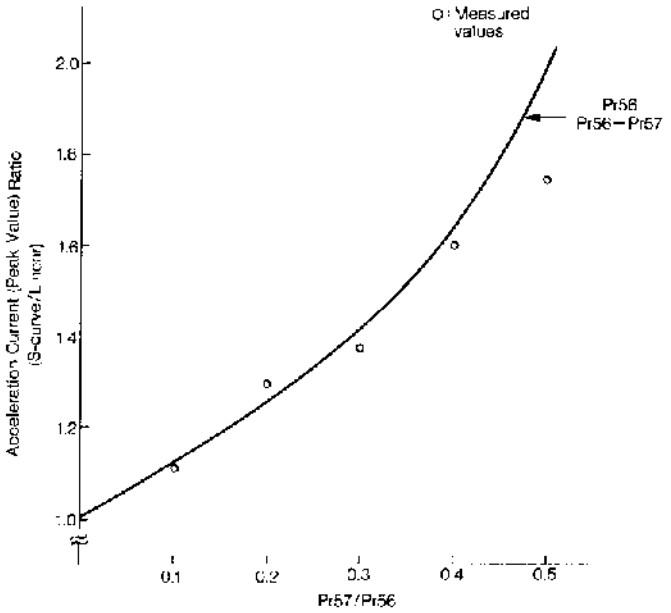


Fig. 11. 6 Increase of Peak Torque

(2) Programing of Torque Limiter

The S-curve accel/decel positioning motion is programed by the following G codes.

G05 X ..... F ..... I .....
(U) (G06 and G07 are the same)

As explained earlier, because the peak torque of accel/decel increases twice as large as the peak torque of linear accel/decel, the accel/decel torque may be insufficient even at I = 200(%). Therefore, it is required to set the program value of I much bigger according to the following rules.

- Max. value of I 250%
- Program value of I × Pr53 (thrust ratio) ≦ 300%

Note that the peak current exceeding the momentary maximum current of the Servopack is not allowed to flow. Refer to Servopack Bulletin.

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(3) Adjustment

If necessary, adjust the accel/decel time in the S-curve accel/decel positioning motion by the following procedure.

〈Procedure〉

1. Measure acceleration current waveforms of linear accel/decel motion with an oscilloscope.
2. Calculate the ratio of the linear acceleration current to the motor rated current.

$$a = \frac{\text{Motor rated current} \times 2^{*}}{\text{Linear acceleration current}}$$

* With Motionpack-34, normally $I = 200\% I_R$

If torque is insufficient, I can be set upto $250\% I_R$

(provided that the Servopack can output this torque).

3. Based on "a" obtained in (2) above,

   $a \leqq 1$: Linear acceleration current is limit of Servopack momentary current.

   To use S-curve accel/decel, the acceleration time must be lengthened.

   $a > 1$: S-curve accel/decel can be used.
4. From Fig. 11.6, obtain the Pr57/Pr56 ratio at acceleration current ratio = a.

   This Pr57 is the limit of the S-curve acceleration time.

(4) Reselection of Servopack

If the above adjustment cannot give a desired accel/decel time and the specifications of accel/decel time cannot be slackened, reselect the capacity of the Servopack.

This means selection of a Servopack of one step larger capacity only for the peak torque at accel/decel. But, this is a servo drive capacity required for quick shockless motion.

If the servo capacity is not to be increased, adjust Pr57 in consideration of a desired shockless motion and keep the peak torque within the range of the momentary maximum current.

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11.1.4 Characteristics

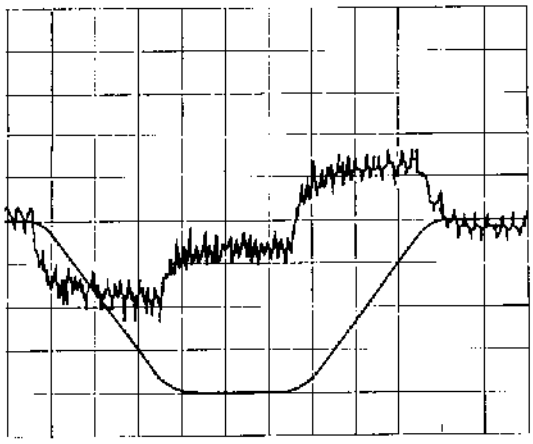
(1) S-curve Accel/Decel Motion

The speed and current of S-curve accel/decel motion are compared with those of linear accel/decel in Fig. 11.7.

Conditions

Moter : M series 1.2 kW/Moter alone

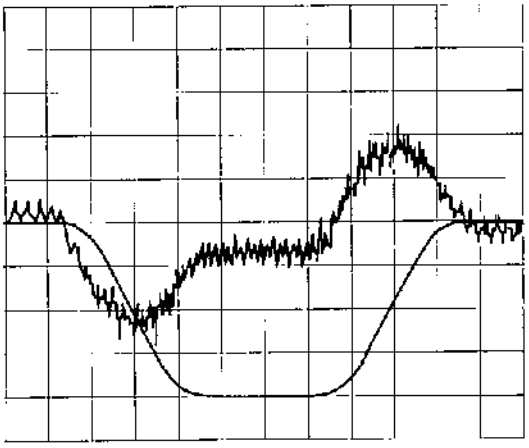
Linear Accel / Decel



Measuring Range
Speed monitor : 1V/div (±4V/1000 r/min)
Torque monitor : 500mV/div (±3V/100%)
Time : 100ms/div

Accel/Decel Condition
Feedrate : 1000r/min (Rating)
Accel/decel time : 300ms

S-curve Accel / Decel



Measuring Range
Speed monitor : 1V/div (±4V/1000r/min)
Torque monitor : 500 mV/div (±3V/100%)
Time : 100ms/div

Accel/Decel Condition
Feedrate : 1000r/min (Rating)
Accel/decel time : 300ms
Accel·accel/decel time : 100ms

Fig. 11. 7

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(2) Current Waveform

The current waveforms in positioning motion by S curve accel/decel and linear accel/decel are shown in Fig. 11.8.

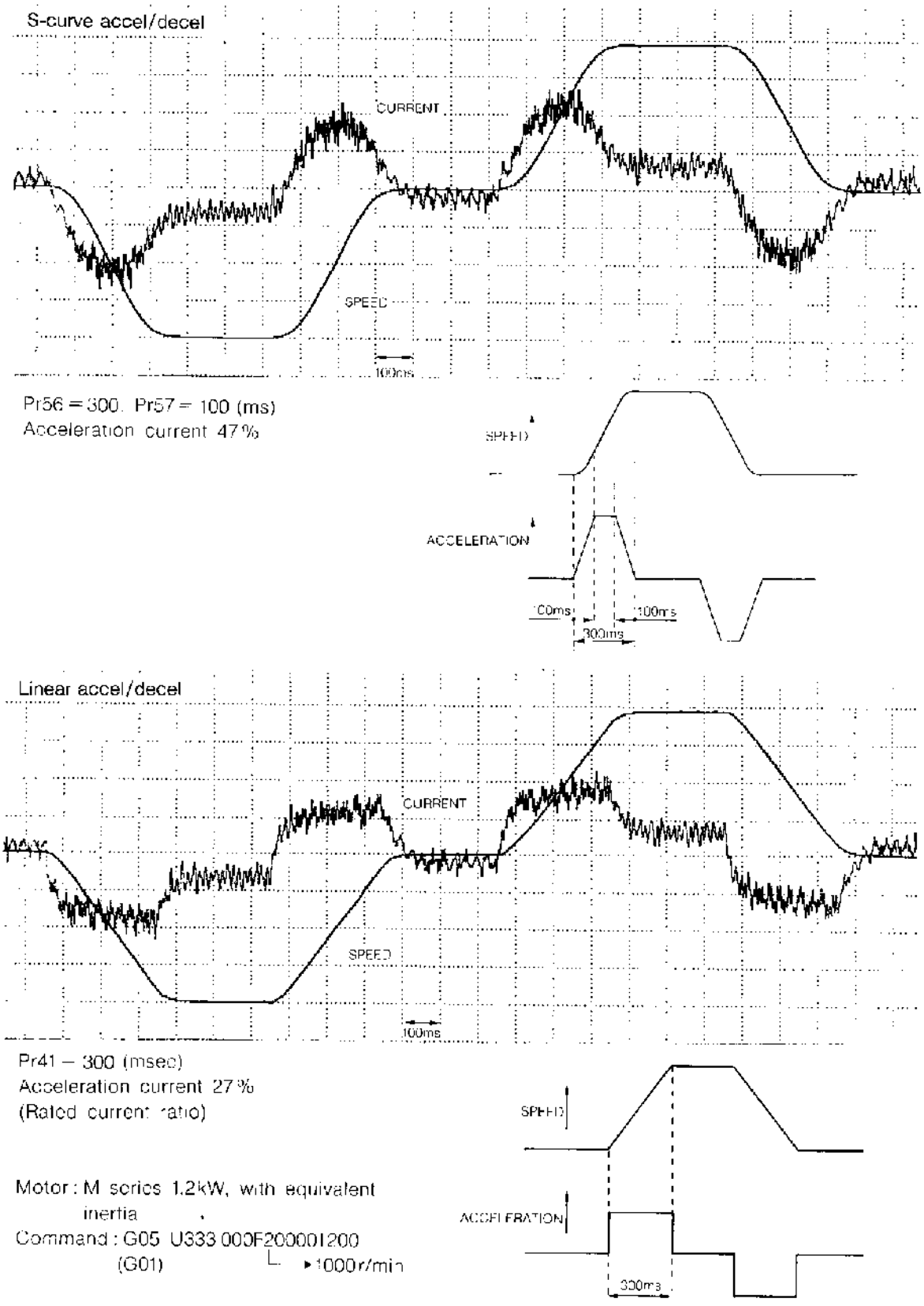


Fig. 11. 8

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(3) S-Curve Accel/Decel Motion and In-Position Fig. 11.9 shows the time from the end of pulse generation of the move command to in-Position.

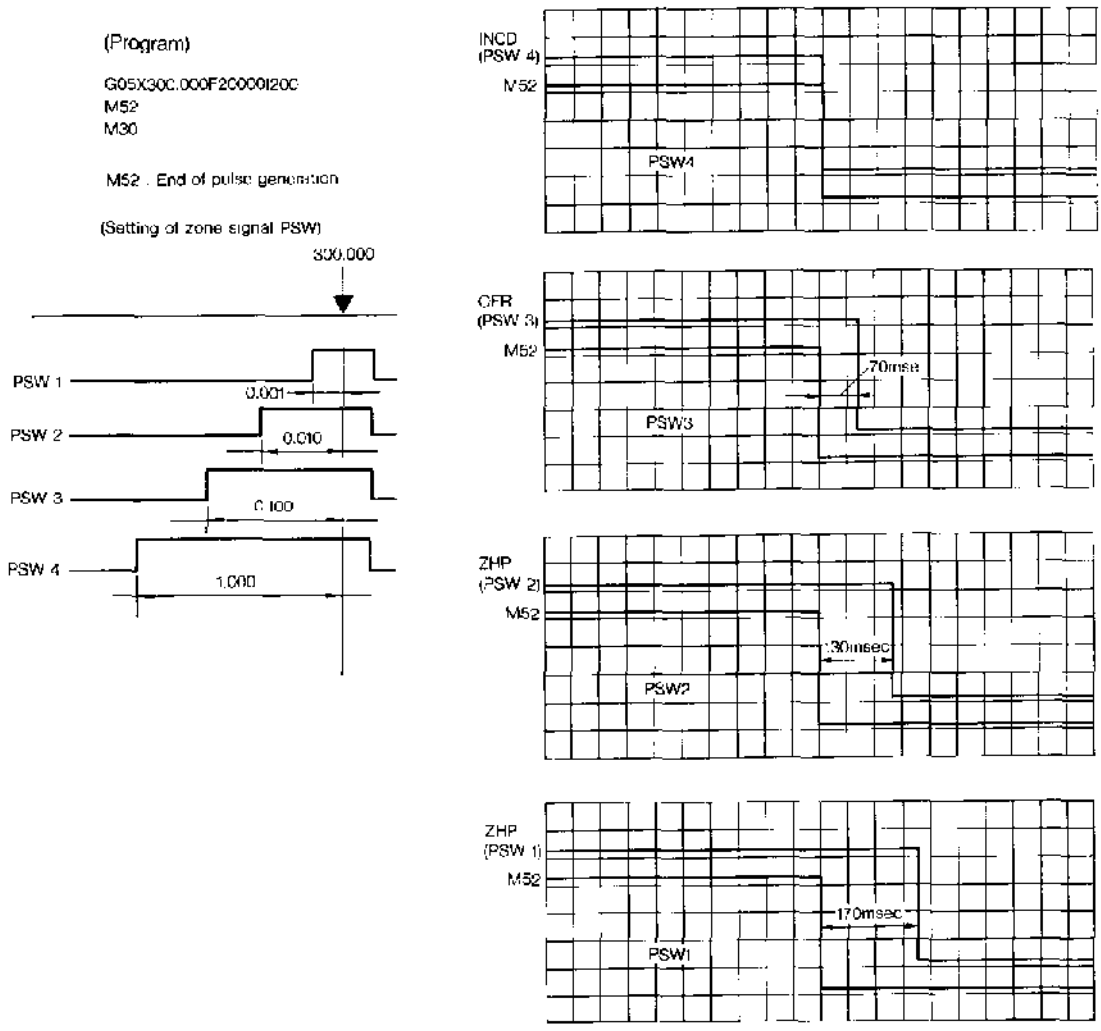


Fig. 11. 9

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11.2 ABS-PG AUTOMATIC HOME POSITION SETUP SYSTEM

11.2.1 Introduction

This covers the specifications of the automatic home position setup system to be added to the absolute encoder home position setup procedure with the Motionpack-34 system.

11.2.2 Major Contents of Added Functions

〈Conventional System〉

(1) After manually pushing or moving to the reference point, the feedback position data at that position are ready by the programer.

(2) Then, the feedback position data are multiplied by the pulse dividing ratio and the product is set in Pr71.

(3) These operations make the reference position $A_0 = 0.000$.

〈Contents of Added Functions〉

The addition of the following automatic home position setup system improves home position setup substantially.

(1) When the home position setup signal is input after setting the home position setup command in parameter Pr80 (newly added), Pr71 is automatically set so that the current position becomes the specified coordinate value.

This system requires manually moving to the reference point and is therefore called the semi-automatic home position setup system.

(2) If the push home position system is set in parameter Pr70, when the home position setup signal is input after setting the home position setup command in parameter Pr80 (newly added), Pr71 is automatically set so that the unit is moved and pushed at the reference point and that position becomes the specified coordinate value.

This system automatically performs all the sequence including move to the reference point and therefore is called the full-automatic home position setup system.

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11.2.3 Addition of Associated Parameters

In relation to the addition of the specifications, some parameters are added and revised.

(1) Pr70 (Reference point coordinate system)

(a) The following item is added to F of Pr70.

Pr70 = ABCDEF

Automatic home position setup system F = 4 added

Setting of F = 4 designates this automatic home position setup system.

(b) When the full-automatic home position setup system is designated, C of Pr70 should have the same value as the push home position system.

Pr70 = ABCDEF

Reference point push system C=4 set

(2) Setting of Pr71 (Offset of To coordinate)

Pr71 is offset of the To coordinate as before, but is automatically set by home position setting.

(3) Setting of Pr72(Waiting position)

Pr72 is the same as before and defines the rapid return position.

The rapid return position is the point positioned by the rapid return motion executed when the reference point return signal (ZRN) is input. As explained earlier, when the home position setup command is set in Pr80, the home position setting motion is executed and in other cases, the rapid return motion is executed.

(4) Setting of Pr73 (Rapid return speed)

Pr73 is the speed setting parameter at the rapid return motion mentioned above.

The unit is a speed unit and the numerical range is 0~60000.

(5) Setting of Pr74 (Home Position setting speed) ··· Newly added

The pushing move speed in the reference point push system is set in Pr74.

Setting is made in the speed command unit and the numerical range is 0 ~ 60000.

(6) Setting of Pr75 (Push torque) ··· Newly added

The push torque limit value in the reference point push system is set in Pr75.

The setting unit is percentage (%) of the rated torque of the servomotor and the numerical range is 10~250.

(7) Setting of Pr76 (Number of encorder pulses)

Same as before.

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(8) Setting of Pr77 (Allowable deviation)

Same as before.

(9) Setting of Pr79 (Pushing time) ··· Newly added

In the reference point push system, the waiting time until setup after the torque limit value is exceeded by pushing against the stopper is set in Pr79.

The setting unit is 10 ms and the numerical range is 0~3000.

(10) Setting of Pr80 (home position setup command) ··· Newly added

When the home position is set by the absolute encoder automatic home position setup system, "1" is set in Pr80 in advance.

This operation sets the Motionpack in the home position setup mode to make it ready for setup.

When the home position setup has been completed, this parameter is automatically reset to "0".

(11) Setting of Pr81 (Reference point coordinate) ··· Newly added

The coordinate value in the coordinate system after home position setting is set in Pr81.

The setting unit is the minimum command unit.

(12) Pr82 (ABS • PG alarm reset command) ··· Newly added

In the case of ABS-PG ALM, Pr82 should be set to 1.

And the power of MP34 be turned off/on to reset alarm.

(13) Setting of Pr78 (Encoder allowable error)

Same as before.

11.2.4 Setting of Parameter Pr70 (Reference Point Coordinate System)

(1) Semi automatic home position setup system

"4" is set at the least significant place of the parameter setting Pr70=40003 when the conventional absolute value system is used.

Then, when the home position setup signal (ZRN signal) is turned OFF to ON after the home position setup command is set in parameter Pr80 (newly added), Pr71 is automatically set so that the current position becomes the specified coordinate value.

(Example) Pr70 = 40003 (Conventional system)

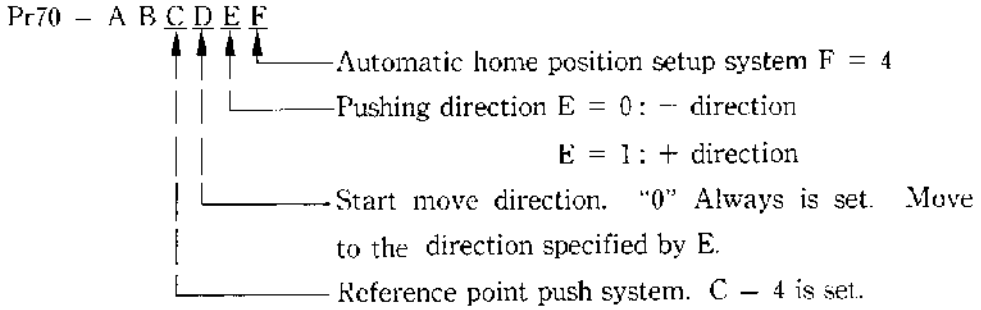
→ Pr70=40004

When the home position setup signal is input, Pr71 is automatically set so that the current position becomes the specified coordinate value.

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(2) Setting of reference point push (Full-automatic home position setup) system

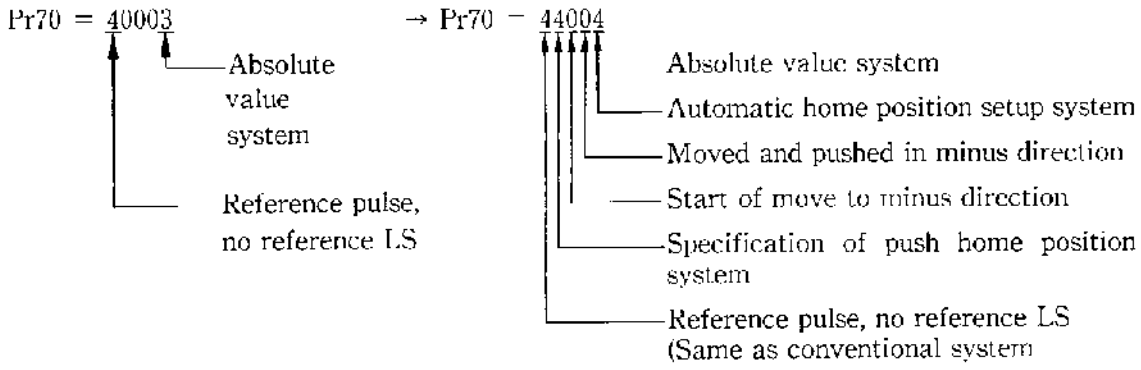
The push home position system is set at C of Pr70.



The above contents are set in Pr70 and the home position setup command is set in Pr80 just before executing home position setup. Then, when the home position setup signal is input, the unit is moved to the reference point according to the specified sequence and pushed against the stopper.

Next, Pr71 is automatically set so that the stopper position becomes the specified coordinate value.

Example



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11.2.5 Home Position Setting Operation

The setting operation described below follows the setup of the Motionpack position counter and the absolute encoder described in Section 7 of this Manual.

(1) Push home position (Full-automatic home position setup) system

(a) The following parameters are set in the EDIT mode and the power is turned OFF and ON.

Pr70 − 440□4 Move direction : □ = 0 → − direction

□ = 1 → + direction

Pr80 = 1 home position setup command

Pr81 = Coordinate value of reference point after home position setup (Ao)

Pr74, Pr75, Pr79 and other associated parameters are to be set.

(b) The home position setup signal (ZRN signal) is turned OFF → ON.

The unit starts moving in the direction specified in E or Pr70 at a speed Set in Pr74.

(c) When the unit arrives at the stopper position after stopper pushing time (set at Pr79), it moves to the provisional home position (Ao = 0.000) once with the coordinate value of reference point (Ao) − Pr81 at a move speed of Pr74.

(d) The unit starts again to the reference point from the provisional home position and after it arrives at the reference point, it is pushed against the stopper at a torque limit value set in Pr75. Move speed = Pr74.

(e) After the stopper push time (set in Pr79), after the push torque has reached the torque limit value, home position setup is executed.

(f) Pr71 (home position offset value) is revised so that the coordinate value (Ao) of the reference point becomes the specified value set in Pr81.

At this time, Pr71 is revised in the PLAY mode and the power need not be turned OFF/ON.

(g) Then the unit waits at the home position (Ao = 0.000) again.

(h) Pr80 is automatically reset to "0" to complete home position setup. (Note : During setup operation, software stroke limits are disregarded.)

(2) Semi-automatic home position setup system ··· System to set reference point by manual operation.

(a) Select the EDIT mode and set the following parameters.

Pr70 = 40004

Pr80 = 1

Pr81 = Coordinate value (Ao) of reference point after home position setup.

Then, turn OFF/ON the controller power.

(b) Select the JOG mode. The speed is the JOG low speed.

Set the torque limit Pr8 = 60 ~ 80.

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11.2.5 Home Position Setting Operation (Cont'd)

(c) Turn OFF/ON the JOG start signal and set the unit at the reference point by the JOG operation.

(d) Turn OFF/ON the original setup signal (ZRN signal).

(e) Pr71 is automatically rewritten to the home position offset value so that the coordinate value (Ao) of the reference point becomes the specified value.

At this time, Pr71 is revised in the PLAY mode and the power need not be turned OFF /ON.

(f) Pr80 is automatically reset to "0" to complete home position setup.

11.2.6 PSW Signal after Home Position Setup Command

After setting Pr80 = 1, the PSW signal becomes invalid.
It becomes valid when Pr80 is reset to "0" after completion of home position setup.

11.2.7 Relation with Conventional System

This system is compatible with the conventional system.

This means that the controller with this system added is much enhanced compared with the conventional controller.

11.2.8 Setup Errors at Full-Auto Reference Point Setup Mode

In the full-auto reference point setup mode if the direction set by Pr70 and the sign set by Pr81 are contradicting, setup error occurs and motor doesn't move when ZRN signal goes on.

In this mode the direction set by Pr70 and the sign of Pr81 should be set according to the table below.

Table. 11. 2

Pr 70	Pr 81
0 ( )	−
1 (+)	+

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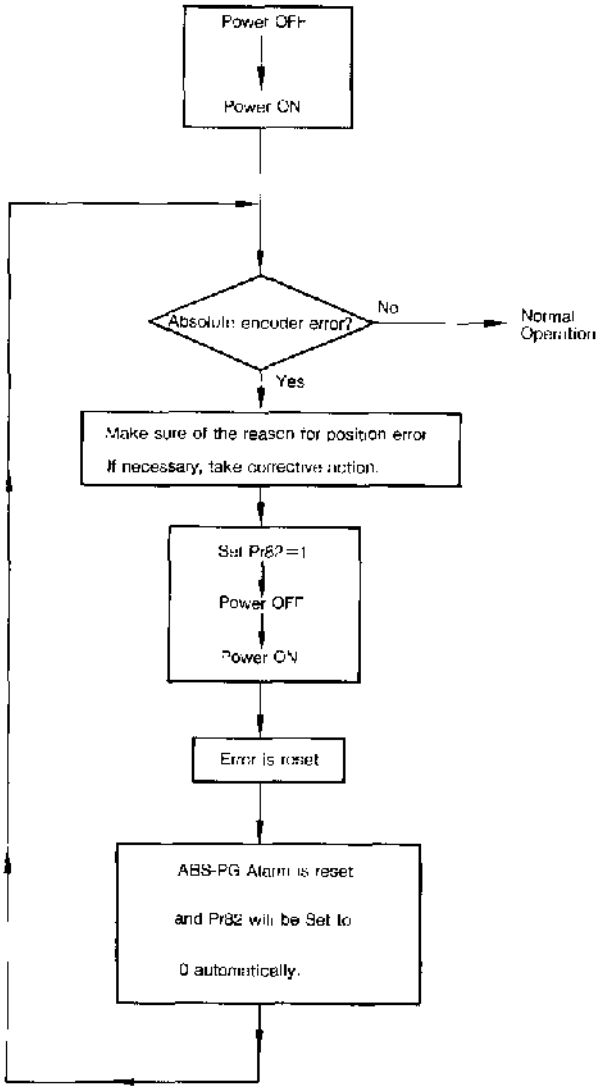
11.2.9 Reset Method of Absolute Encoder Error

If the full-auto reference point setup mode is seleeted (Pr70 = [illegible]), the reset methed of absolute encoder error is different from conventional ones.

Absolute encoder error is detected when the data read at power ON are different from the data memorized at power OFF over allowable data (set in Pr78).

In this case refer to the flow chart on the next page and reset error.

If the absolute encoder error is caused by another reason, the reset proccdure is the same as a conventional one. Just turn power OFF and ON and the error is reset.



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11.3 EXTERNAL DATA SETTING

11.3.1 Introduction

This presents the specifications of the external data setting function which are available with Motionpack-34.

11.3.2 Settings

Before the external data setting function can be used, the following extended functions must be set :

Input line connection : Short across CN5 connector pin 18 and O_{24} (V).

Parameter setting : Pr47 = 20 (No CHECKSUM) or Pr47 = 30 (CHECKSUM)

11.3.3 Functional Overview

Main features of the exernal data setting function are as follows :

(1) Programmable controller (PC) acts as the master unit and inputs data to Motionpack-34.

(2) Motionpack-34 accepts external data and stores it in the corresponding parameter.

(3) Motionpack-34 can execute program operations that are indirectly specified by registers.

(4) When the external data setting function is being used, program selection is performed by special codes.

NOTE

To make programmer available to operate Pr200 series, turn the power of MP-34 off/on after this parameter setting and check the display of Pr47 again.

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11.3.4 Hardware Configuration

11.3.4.1 Motionpack 34

The standard specification Motionpack-34 is used.

11.3.4.2 Configuration Diagram

Fig. 11.10 is a block diagram of the Motionpack-34 system that incorporates the external data setting function. The external data set by the digital switch is input via the PC to Motionpack -34.

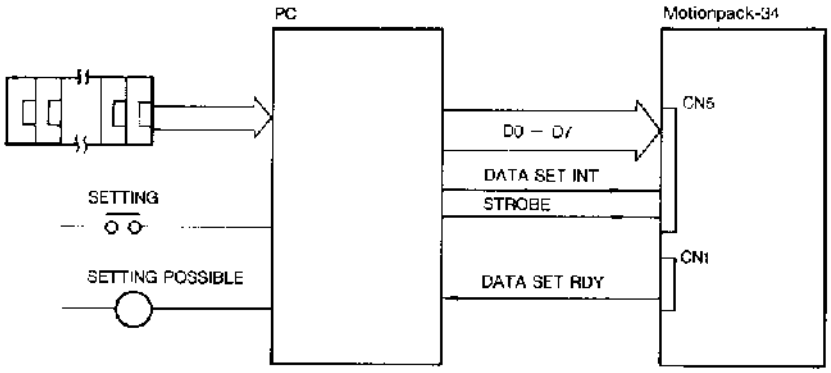


Fig. 11. 10 Motionpack-34 Block Diagram

11.3.5 External Data

11.3.5.1 Types of External Data

The position, speed and torque data for feed command can be set externally.

11.3.5.2 Data Storage

The external data has been input from PC is stored in Pr201-Pr296.
Because specific parameter numbers are not assigned to position, speed and torque data, the user must be careful to avoid confusing the data (e.g., using position data as torque data or speed data).

11.3.5.3 Parameter Initialization

Parameter error (PAr Err) occurs if nothing is set for Pr201-Pr296. Therefore, 0 must be set for each unused parameter.

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11.3.5.4 Data Format

(1) Data is input to Motionpack-34 in the following format :
〔Parameter Number〕 + 〔Setting Data〕 + 〔FF〕 $_{HEX}$

(2) Each decimal digit is converted to 4 bits of BCD code, so that two decimal digits make up 1 byte.

(3) The first byte is the least significant 2 digits of the parameter number.

(4) The leading zeros of the setting data are suppressed.

(5) Input data must end with the End of Data code (〔FF〕 $_{HEX}$).

(6) Position data format :
〔N_2N_1〕 〔SP_7〕 〔P_6P_5〕 〔P_4P_3〕 〔P_2P_1〕 〔FF〕 $_{HEX}$
* Maximum data length is 6 bytes.
* 〔S〕 is the sign for the position data. (+) may be omitted. For (−), use 〔F〕 $_{HEX}$.
* $P_7P_6P_5P_4P_3P_2P_1$ constitutes the position data. Decimal point does not need to be specified.

(7) Speed data format :
〔N_2N_1〕 〔OF_5〕 〔F_4F_3〕 〔F_2F_1〕 〔FF〕 $_{HEX}$
* Maximum data length is 5 bytes.

(8) Torque data format :
〔N_2N_1〕 〔OI_3〕 〔I_2I_1〕 〔FF〕 $_{HEX}$
* Maximum data length is 4 bytes.

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11.3.6 Operations

11.3.6.1 Signal Line Connection

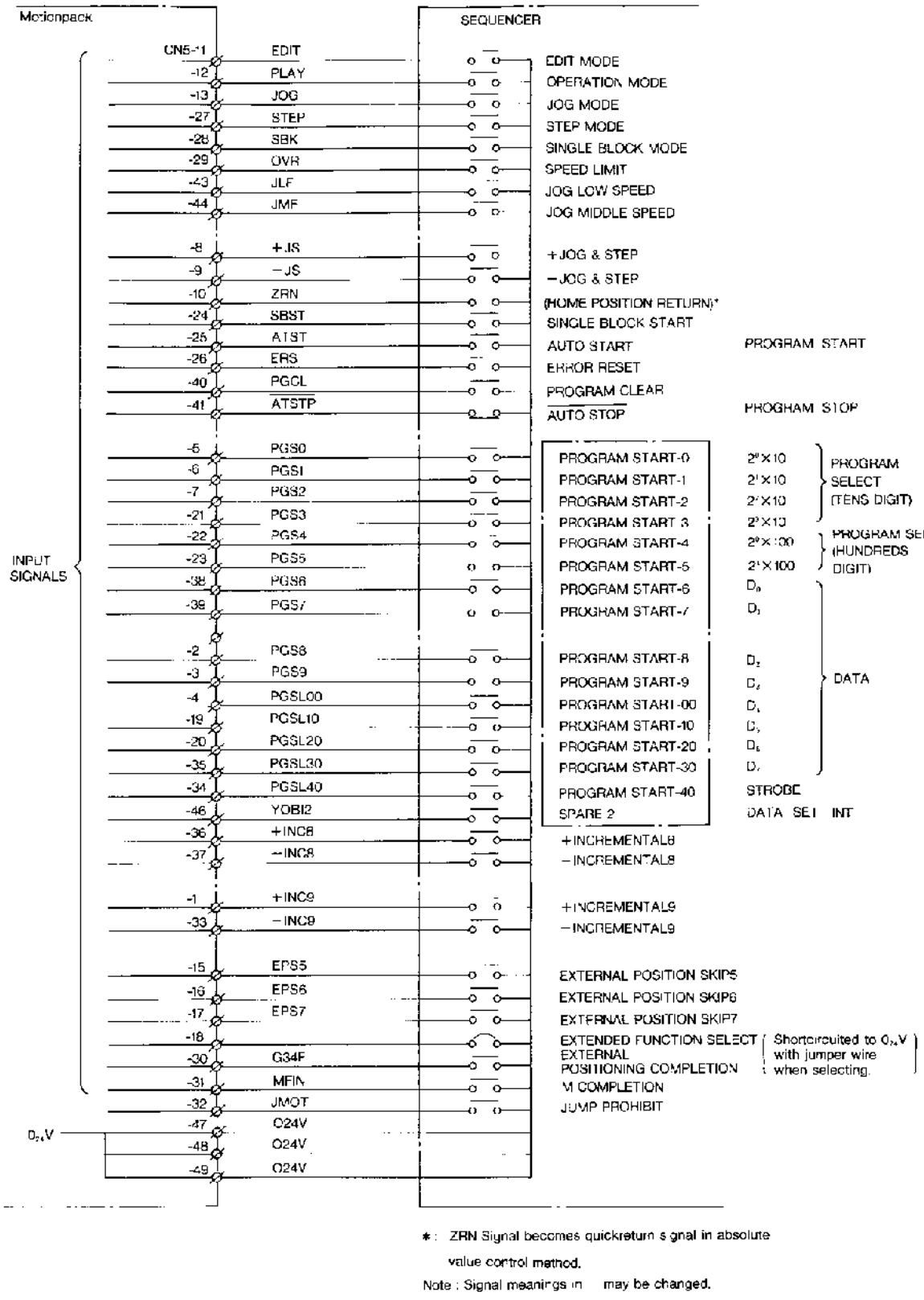
(1) Thes is an extended function, and the meaning of signal line differs from that of the basic system.

(2) Figs. 11.11 and 11.12 illustrate how the signal lines are connected.

(3) The standard I/O signal specifications apply.

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11.3.6.1 Signal Line Connection (Cont'd)



*: ZRN Signal becomes quickreturn signal in absolute value control method.

Note : Signal meanings in may be changed.

Fig. 11. 11 Input Signal Connections

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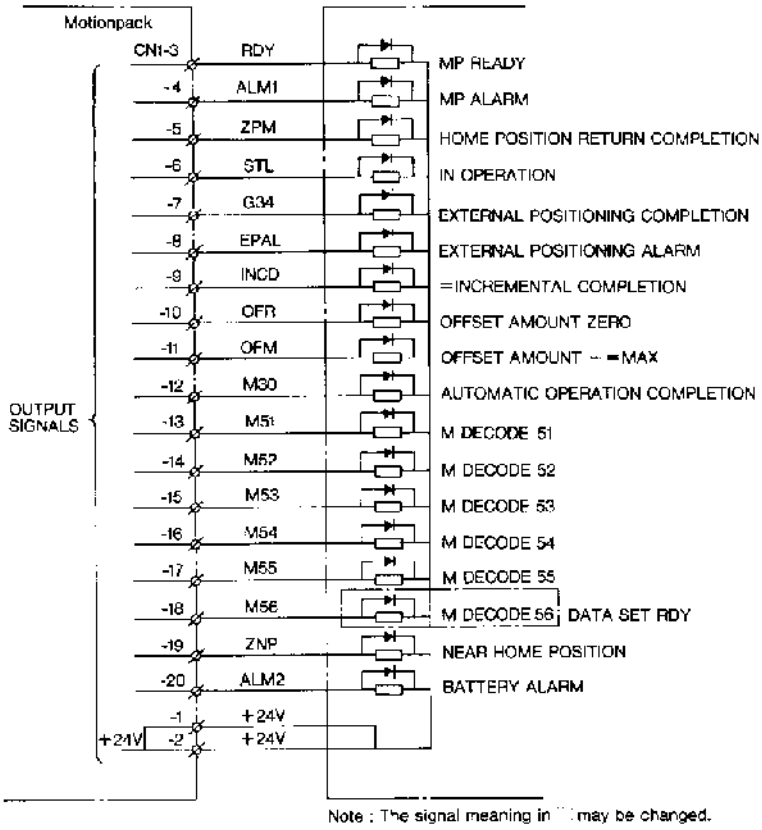
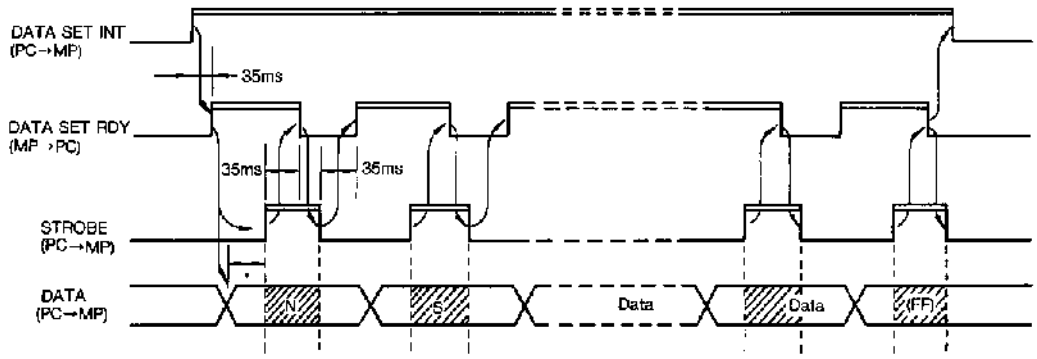


Fig. 11. 12 Output Signal Connections

11.3.6.2 Timing

(1) Fig. 11.13 is the timing diagram for data setting.



*Setting time
Data Set Time = 35ms + (setting Time + 35ms + PC Reading Time + 35ms) × Number of Data
(Example) : Setting Time : 100ms
PC reading time : 20ms
Where No. of data is 6 bytes (max),
Data Set Time=35ms+(100ms−90ms)×6
=117ms
≒1.2s

Fig. 11. 13 Signal Timing Diagram

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11.3.6.3 Operations

(1) External data setting operation is possible only in the AUTO mode and when the motor has stopped (i.e., while move pulse is not being output).

(2) The external data setting function is activated only when the PC turns the external data setting interrupt (DATA SET INT) signal ON.

(3) When Motionpack 34 receives the DATA SET INT signal, it changes to the external data setting mode and sets the data setting ready (DATA SET RDY) signal ON. (The condition described in (1) must be present ; otherwise, Motionpack-34 waits until that condition is established before setting the DATA SET RDY signal ON.)

(4) When the PC recognizes that the DATA SET RDY signal has been set (ON), it sends the data signal (D_0~D_7) and the strobe signal (STROBE).

(5) When Motionpack-34 receives the data signal, it checks the data and if the data is correct, the DATA SET RDY signal is turned OFF.

(6) The PC turns OFF the STROBE signal when the DATA SET RDY signal is turned OFF.

(7) Motionpack-34 turns the DATA SET RDY signal ON when the STROBE signal is turned OFF.

(8) Motionpack-34 completes the external data setting operation when it receives the $(FF)_{HEX}$ code. In order words, it does not set the DATA SET RDY signal ON when $(FF)_{HEX}$ is received.

(9) When Motionpack-34 is executing the external data setting operation, the PC must not input the operation starting signal to Motionpack-34. (See Par. 11.3.7.3(4).)

(10) Fig. 11.13 is the signal timing diagram.

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11.3.6.4 Data Check

Data check mode is selected by setting Pr47 as follows:

Pr47 = 20 Use the CHECKSUM function

Pr47 = 30 Do not use the CHECKSUM function

(1) When the CHECKSUM Function is Selected

(a) When the CHECKSUM function is selected by setting Pr47 = 30, checksum data must be input as the last data following the End of Data (FF)$_{HEX}$ code. The checksum data must be specified in such a way that the least significant 8 bits of the summation result including the End of Data code become (FF)$_{HEX}$.

(b) Checksum error processing

When a checksum error is detected, Motionpack-34 will not set the DATA SET RDY signal ON. Therefore, the PC can detect data error by using the timeover function.

(c) Data check

In addition to checksum check, data check is performed to make sure that each piece of data consists only of the permitted characters. When a data check error is detected, Motionpack -34 does not turn the DATA SET RDY signal OFF, so that the PC can detect this error by using the timeover function.

(2) When the CHECKSUM Function is Not Selected

Only the data check operation, described in (1)-(c), above, is performed.

11.3.6.5 Setting by the Programmer

The external data setting parameters can be entered in the Edit mode from the Programmer.

11.3.6.6 Error Reset

When a data error or a checksum error occurs, the error can be reset and the external data setting operation repeated from the beginning by turning the DATA SET INT signal OFF.

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11.3.7 Programming Procedures

11.3.7.1 Indirect Register Specification Programs

The data set in Pr201-Pr296 can be specified by the indirect register specification programs.

11.3.7.2 Indirect Register Specification Commands

(1) Indirect register specification setting function (M89)

M89 is the function for declaring indirect register specification, and it does not output the M decode signal. It does not require the M FIN signal. The feed commands (G01, G34, G05, GC6, G07, G68*) at the block numbers that follow M89 become indirectly register specified.

*G68 ; Destination point specified subprogram call command

(2) Indirect register specification release function (M99)

M99 is the function for declaring release of indirect register specification, and it does not output the M decode signal. The feed commands (G01, G34, G05, G06, G07, G68*) at the block numbers that follow M99 are released from indirect register specification.

(3) Indirect register specification functions

The following feed functions, if specified between M89 and M99, and indirectly register specified including when the extended functions are used (See Par. 11.3.8.1) but not when the G27 command is used :

- G01
- G34
- G05
- G06
- G07
- G68 (Destination point specified subprogram call command)

(4) Indirect register specification and the jump command

The jump command can be used within an indirect register specification block. However, the jump command should not be used in the following situations to avoid possible abnormal operation :

(a) Jumping from an indirect register specification block to a normal block.

(b) Jumping from a normal block to an indirect register specification block.

(5) Coding Procedure (Pr52 – 1)

Example 1 : G01 X0.1 F33 I65

Specifies to go to the position specified in Pr201 at speed specified in Pr233 and torque specified in Pr265.

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Example 2 : G01 U0.1 F33 I65

The target position is specified by an incremental expression. Specifies to move by the distance specified in Pr201 at the same speed and torque as specified by Example 1.

Example 3 : G01 U-0.1 F____ I____

A sign can be specified in front of a register number if the register stores position data. If Pr201 = 100, the command is to move −100.

Position, speed and torque must be either all indirectly register specified or none at all. Speed and torque specifications may be omitted. If omitted, the previously set values are used. The effectiveness range of previously set values is not influenced by whether or not the indirect register specification function is used. Indirect register specification of position must be accomplished in the right-justified format according to the specification of Pr52.

Examples : X 0.01 if Pr52 = 2 ;

X 0.001 if Pr52 = 3.

11.3.7.3 Program Selection

When the external data setting function is in use, a special code selection procedure is used for program selection. Note that this is different from that the extended function "Program select signal codification" (Pr43 = 40000).

(1) Program selection method

The same program selection method as for the basic function is used (i. e., every 10 blocks).

(2) Program select signal

Program selection is performed by BCD coding of the three signals PGS0 ~ PGS3 for the 10 digits of the block number and of the two signals PGS4 and PGS5 for the 100 digits of the block number.

(3) Start/stop signal

Because the program select signal is now a coded signal, program start occurs only when the auto start (ATST) signal begins to rise.

The auto stop (/ATSTP) signal works in the same way as with the basic function. In other words, the program stops when the /ATSTP signal turns OFF. Normally, this signal is set to ON.

To restart a program after having been stopped by the /ATSTP signal, the /ATSTP signal must be turned ON and then the ATST signal turned OFF and ON again.

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11.3.7.3 Program Selection (Cont'd)

(4) Program start during external data setting operation

If the ATST signal turns ON when the external data setting operation is in progress, Motionpack-34 begins automatic operation.

Be aware that the external data being set will be lost.

11.3.7.4 M Decode Signal

When using the external data setting function, the specifications for the M decode signals will change as described below.

(1) When Pr43 – * * * * 00

Because the least significant 2 digits of Pr43 are 00, the M decode signals are basically the same as when using the basic function. Note, however, that only five M decode signals (M51 ~ M55) can be used because one M decode signal is used by the external data setting function. The same relationship to the M FIN signal exists as when using the basic function.

(2) When Pr43 = * * * * XY (where XY = 01 ~ 99)

In this case, the five decode signals (M51 ~ M55) are output as coded signals, with M55 acting as the strobe signal. The value of XY is the delay time (unit : 10 ms) of the strobe signal.

Table. 11. 3 Coded M Signal

M**	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
M51	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1
M52	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1
M53	0	0	0	1	1	1	1	0	0	0	0	1	1	1	1
M54	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1

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11.3.8 Compatibility with Extended Functions

Table. 11. 4 Compatibility with Extended Functions

Function / Extended Function Specification	External Data Setting	External Offset Function	Extended Zone Signal A / B	Standard Zone Signal	Number of M Signals	Standard Offset (± INC)	G67 Prohibit Function	Specification Parameter Setting	Extended Function Selection Signal
Basic Specification	Not Possible	Not Possible	Not Possible	Possible (×2)	×6	Possible	Possible	Not required	Not required
External Data Setting	Possible	Not Possible	Not Possible	Possible (×2)	×6	Possible	Possible	Pr47 = −20 (No CHECKSUM) = 30 (CHECKSUM)	
Extended Zone A Signal / B	Not Possible	Not Possible	Possible (×4)	Not Possible	×6 / ×4	Not Possible	Possible	Pr43 = 100000	
External Offset Function	Not Possible	Possible	Not Possible	Possible (×2)	×5	Not Possible	Not Possible	Pr47 = −20 (No CHECKSUM) = 30 (CHECKSUM)	Short across CN5 Pin 18 and 0_{24} V.
[External Data Setting] — [Extended Zone Signal]	Possible	Not Possible	Possible (×4)	Not Possible	×5	Not Possible	Possible	Pr43 = 100000 Pr47 = −20 = −30	
[External Offset] — [Extended Zone Signal]	Not Possible	Possible	Possible (×4)	Not Possible	×5	Not Possible	Not Possible	Pr43 = 100000 Pr47 = 40 = 50	

11.3.8.1 Using with the Angular Index Function

When the rotating direction specified angular index function (G05), which is one of the angular index function options, is used by indirect register specification, the rotating direction will be determined by the sign preceding the register number. This must be kept in mind to avoid rotation in a direction opposite to the intended direction.

Example : G05 X-0.01 F33 I65

- If Pr201 = −100, it rotates in the minus direction for positionign at X = 100.
- If Pr201 = 100, it rotates in the minus direction for positioning at X = −100.

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11.4 EXTERNAL OFFSET FUNCTION

11.4.1 Introduction

This presents the specifications of the External Offset Function which is provided as an extended function for Motionpack-34.

11.4.2 Functional Overview

Motionpack-34 basic functions include a coordinate shifting function for the T8 and T9 coordinate systems that uses parameters and shift pulses to compensate for tool length variation.

The external offset function described in this document extends this basic function and enables direct setting of the coordinate shift amounts for the T8 and T9 coordinate systems by external data.

Motionpack-34 basic function allows three methods for coordinate shifting on theT8 and T9 coordinate systems :

(1) By the coordinate setting command (G52)

(2) By the +INC/−INC signal

(3) Presetting by the programmer

The external offset function keeps (1) and (3) unchanged but changes (2) to direct specification by external data.

NOTE

Coordinate shifting by +INC/−INC is disabled.

This extended function enables an operator to directly set the offset value from the operator panel, thereby improving productivity.

11.4.3 Specification of Functions

11.4.3.1 Prerequisite Conditions

The external offset function is enabled only when the following hardware and software conditions are satisfied when the power is turned ON :

(1) Extended function select signal must be 1.

Short across CN5 pin 18 and 0_{24}V.

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(2) Pr47 must be specified as follows :

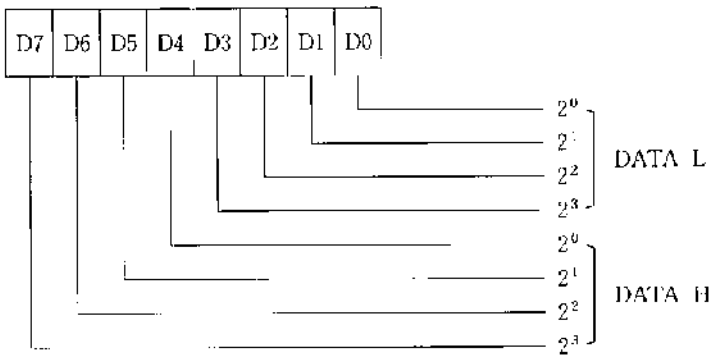
Pr47 = 40 (No parity check)

Pr47 = 50 (Parity check)

11.4.3.2 External Offset Data

The data for the T8 and T9 coordinate system offset registers (O_8 and O_9, respectively) are set externally using this function. The range of external offset data is 0 ~ ± 9999999 (unit is that specified for the position command).

11.4.3.3 Format of External Offset Data



One piece of external offset data is specified by 8-bit data which represents a 2-digit decimal value. Each decimal digit (0-10) is represented by a 4-bit BCD code.

(1) Data Length : Fixed at 4 bytes

(2) Real Number Offset Value : (+/− S_8) (S_5 S_4) (S_3 S_2) (S_1 S_0)

(3) Differential Offset Value : (+/− ¥) (S_8 S_4) (S_3 S_2) (S_1 S_0)

(4) Clear Offset Value : (+/ 0) (0 0) (0 0) (0 0)

(5) Data Codes

	Code		Code
0	0000	7	0111
1	0001	8	1000
2	0010	9	1001
3	0011	+	(0000)
4	0100	−	1101
5	0101	¥	1100
6	0110		

Note : " + " sign is omitted (e.g., 0000).

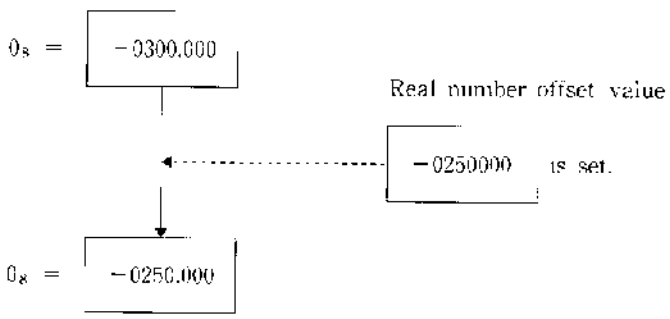
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11.4.3.3 Format of External Offset Data (Cont'd)

(1) Real number offset value

When external offset data are specified as a real number offset value, the specified data set in the offset register O_8 or O_9.

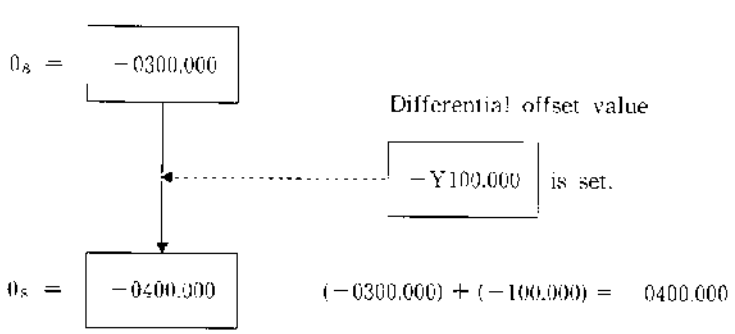
Example :



(2) Differential offset value

When external offset data are specified as a differential offset value, the specified data are added to or subtracted from the current offset register value.

Example :



If the differential offset value is (+)¥100.000, O_8 changes to −0200.000.

(3) Clear offset value

By setting the external offset data as 0000.000 , the specified offset register is cleared to 0. This is the same as setting a real number offset value 0.

11.4.3.4 Signal Lines Used

This section describes the signal lines used by the external offset function. Fig. 11.14 summarizes all signal lines that are used when the external offset function is used.

As described above, each piece of external offset data is input as 8-bit data representing two digits. The timing of external offset data input is determined by the strobe signal.

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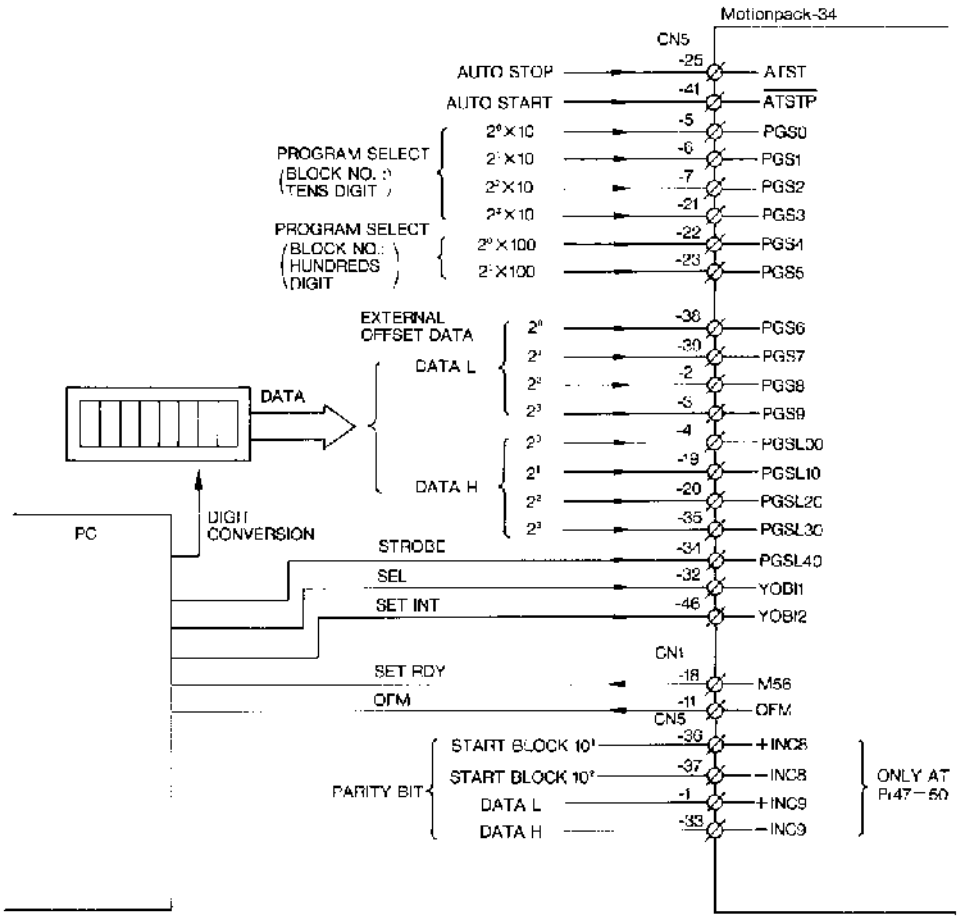


Fig. 11. 14 Signal Line Connection for External Offset Function

(1) External offset data (DATA)

PGS6 ~ PGS9 and PGSL00 ~ PGSL30 are used. These signals are assigned as follows:

PGS6 → 2^0
PGS7 → 2^1
PGS8 → 2^2
PGS9 → 2^3
} DATA L

PGSL00 → 2^0
PGSL10 → 2^1
PGSL20 → 2^2
PGSL30 → 2^3
} DATA H

(2) Parity bit (PARITY)

When use of parity bit is specified, the four signal lines −INC8, −INC8, +INC9 and −INC9 are used as the parity bit lines for the following data (odd parity):

+INC8 : Start block 10^1
INC8 : Start block 10^2
+INC9 : DATA L
−INC9 : DATA H

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When use of no parity bit is specified and SET INIT is OFF, the ±INC8 and ±INC9 are the increment signals for regular 0_8 and 0_9 registers, respectively.

(3) Strobe signal (STROBE)

The PGSL40 signal is used as the strobe signal for external offset data.

(4) Program select signal (PGSL)

Because the signal lines that are used for program selection by the basic function are used for external offset, as described above, there are less than the necessary number of signal lines available for the program select signals. Therefore, the program select signals are converted to coded signals and transferred via six signal lines (PGS0 ~ PGS5).

The coded signals are defined as follows:

PGS0 → 2^0
PGS1 → 2^1
PGS2 → 2^2
PGS3 → 2^3 } These BCD codes specify the 10 digits of the program block number.

PGS4 → 2^0
PGS5 → 2^1 } These BCD codes specify the 100 digits of the program block number.

(5) Register select signal (SEL)

The YOBI 1 signal is used to specify whether the offset data are for the 0_8 register (T8 coordinate) or the 0_9 register (T9 coordinate):

YOBI 1 = 0 : 0_8
YOBI 1 = 1 : 0_9

(6) External offset interrupt signal (SET INT)

External offset interrupt is activated by setting YOBI2 signal ON.

(7) Ready signal (SET RDY)

When Motionpack-34 receives external offest data, it checks the data and, if valid, turns the SET RDY signal OFF. The PC must verify that the SET RDY signal has been turned OFF before turning the strobe signal OFF. When the strobe signal turns OFF, the SET RDY signal is turned ON again for the next data.

(8) Offset ⊥MAX reached (OFM)

As in the case of the standard ±INC offset procedure, the OFM signal turns ON when the offset register absolute value reaches the maximum set by parameter (Pr 21 or Pr23). When this occurs, the offset value is not updated and remains the same.

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11.4.3.5 Signal Specifications

The signal specifications are the same as for the basic function.
The timing relations are presented in Fig. 11.15.

The setting data signals (DAT L, DATA H) are 8-bit parallel signals, so that attention must be paid to the possible bit-to-bit skew (variation). The strobe signal must be input only after the data signals have stabilized. The SET RDY = OFF condition must be verified before the strobe signal is turned OFF. Motionpack-34 requires approximately 35 msec to read each signal.

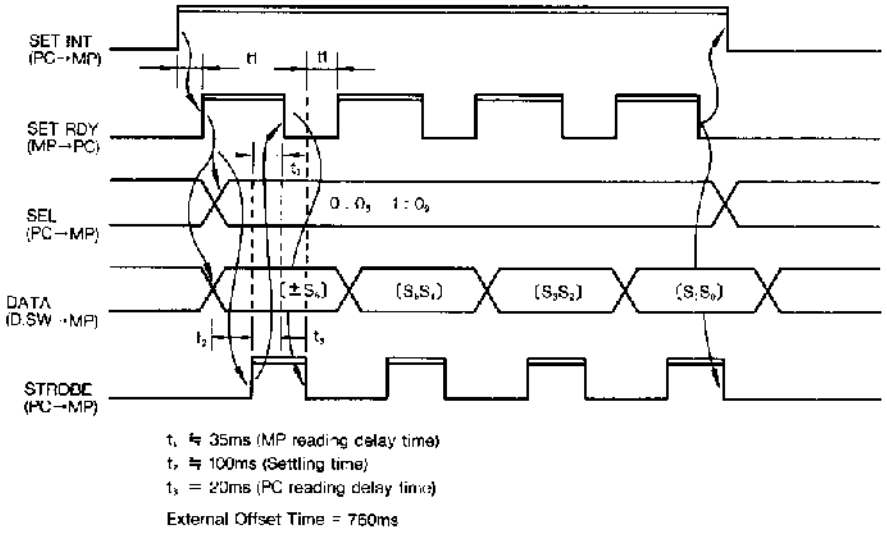


Fig. 11. 15 Signal Timing Diagram

11.4.3.6 Executing External Offset

The external offset function can be executed only when Motionpack-34 satisfies the condition stated below. If the condition is not satisfied, the function is executed when the condition is satisfied. The SET RDY signal is not output until that time.

Condition : The mode is AUTO and move command pulse is not being output (i.e., motor is stopped).

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11.4.3.7 Interruption of External Offset

(1) Interruption during offset operation

If the power fails or the external offset interrupt signal (SET INT) turns off while the external offset operation is in progress, the operation is interrupted. In this case, the offset data being used are cleared so that the external offset data must be input again from the beginning when operation is resumed.

(2) ±MAX offset value reached

The offset operation is not executed when execution of the offset operation will cause the offset register content to reach or exceed the maximum value set by parameter (Pr21 or Pr23). Instead, the ±MAX offset reached signal (OFM) is turned ON and the verify signal (SET RDY) remains ON.

When the external offset interrupt signal (SET INT) turns OFF, the OFM and SET RDY signals turn OFF and the error condition is reset (cleared).

(3) Offset data error

When the offset data read by Motionpack-34 does not consist of the codes listed in Par. 11.4.3.3(5) or a parity error is detected, the SET RDY signal remains ON.

By turning the SET INT signal OFF, the SET RDY signal can be turned OFF and the error condition reset.

(4) Interruption by the ATST signal

If the ATST signal turns ON during external offset operation, the offset operation is interrupted and programmed operation begins.

When this occurs, the offset data being used is cleared.

11.4.3.8 Program Selection

When the external offset function is in use, a special code selection procedure is used for program selection. Note that this is different from taht of the extended function "Program select signal codification" (Pr43 = 40000).

(1) Program selection method

The same program selection method as for the basic function is used (i.e., every 10 blocks).

(2) Program select signal

Program selection is performed by BCD coding of the four signals (PGS0 ~ PGS3) for the 10 digits of the block number and of the two signals (PGS4 and PGS5) for the 100 digits of the block number.

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(3) Start/stop signal

Because the program select signal is now a coded signal, program start occurs only when the auto start (ATST) signal begins to rise.

The auto stop (/ATSTP) signal works in the same way as with the basic function. In other words, the program stops when the /ATSTP signal turns OFF. Normally, this signal is set to ON.

To restart a program after having been stopped by the /ATSTP signal, the /ATSTP signal must be turned ON and then tha ATST signal turned OFF and ON again.

11.4.3.9 M Decode Signal

When using the external offset function, the specifications for the M decode signals will change as described below.

(1) When Pr43 – ＊＊＊＊00

Because the least significant 2 digits of Pr43 are 00, the M decode signals are basically the same as when using the basic function.

Note, however, that only five M decode signals (M51 ~ M55) can be used because one M decode signal is used by the external offset function. The same relationship to the M FIN signal exists as when using the basic function.

(2) When Pr43 – ＊＊＊＊XY (XY = 01 ~ 99)

In this case, the five decode signals (M51 ~ M55) are output as coded signals, with M55 acting as the strobe signal. The value of XY is the delay time (unit : 10ms) of the strobe signal.

Table. 11. 5 Coded M Signals

M**	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
M51	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1
M52	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1
M53	0	0	0	1	1	1	1	0	0	0	0	1	1	1	1
M54	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1

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11.4.4 Compatibility with Extended Functions

Table. 11. 6 Compatibility with Extended Functions

Function / Extended Function Specification	External Data Setting	External Offset Function	Extended Zone Signal A / B	Standard Zone Signal	Number of M Signals	Standard Offset (± INC)	G67 Prohibit Function	Specification Parameter Setting	Extended Function Selection Signal
Basic Specification	Not Possible	Not Possible	Not Possible	Possible (×2)	×6	Possible	Possible	Not required	Not required
External Data Setting	Possible	Not Possible	Not Possible	Possible (×2)	×5	Possible	Possible	Pr47 = 20 (No CHECKSUM) = 30 (CHECKSUM)	
Extended Zone Signal A	Not Possible	Not Possible	Possible (×4)	Not Possible	×5	Not Possible	Possible	Pr43 = 100000	
Extended Zone Signal B	Not Possible	Not Possible	Possible (×4)	Not Possible	×4	Not Possible	Possible	Pr43 = 100000	
External Offset Function	Not Possible	Possible	Not Possible	Possible (×2)	×5	Not Possible	Not Possible	Pr47 = 40 (No CHECKSUM) = 50 (CHECKSUM)	Short across CN5 Pin 18 and 0_{24} V.
[External Data Setting] + [Extended Zone Signal]	Possible	Not Possible	Possible (×4)	Not Possible	×5	Not Possible	Possible	Pr43 = 100000 Pr47 = 20 = 30	
[External Offset] + [Extended Zone Signal]	Not Possible	Possible	Possible (×4)	Not Possible	×5	Not Possible	Not Possible	Pr43 = 100000 Pr47 = 40 = 50	

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11.4.5 Example

Assume that feeding occurs as illustrated in Fig. 11. 6 Fast feed is executed up to X = 40.000 mm and then cutting feed is executed to X = 45.000 mm. Then, the leading edge is advanced by 0.300 mm.

Up to X = 40.000 mm, the T0 coordinate system is used as shown in the Sample Program below. Then, the coordinate system is switched to T8 for cutting feed operation. If there is no coordinate shift on the T8 coordinate system, T8 and T0 coordinate systems will be matched as in Fig. 11.6. Here, shift S = −0.300 mm is set by external data. This causes the T8 coordinate system to shift by the specified amount.

This enables shifting the leading edge.

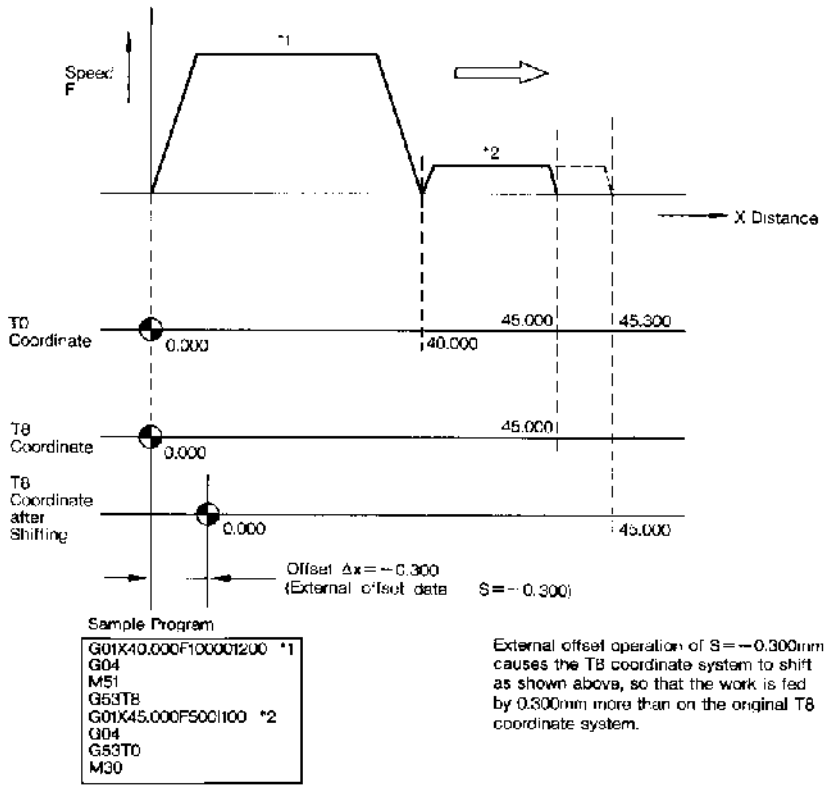


Fig. 11. 16

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11.5 EXTENDED ZONE SIGNAL OUTPUT (A)

11.5.1. Introduction

This presents the specifications of the extended zone signal output function (A) which are available with Motionpack-34.

11.5.2 Functional Overview

Main features of the extended zone signal output function are as follows:

(1) There are four zone signal output lines.

(2) Four zones can be set by each signal for a total of 16 zones.

(3) Zones are set in parameters Pr111 ~ Pr148.

(4) Before the extended zone signal output function can be used, the extended function specifying signal and parameter setting must be performed. When this function is specified, the standard extended zone signal output function is disabled.

11.5.3 SETTINGS

The following extended function settings must be made to use this function:

Input line connection : Short across CN5 connector pin 18 and O_{24} (V).

Parameter setting : Pr43 = 100000

11.5.4. SPECIFICATIONS

11.5.4.1 Motionpack-34

The standard specification Motionpack-34 is used.

11.5.4.2 Extended Zone Signal Output Lines

The following four output lines are used by the extended zone signal function:

- ZPM (zero return completed) ——→ PSW1 (CN1-5)
- ZNP (zero point approached) ——→ PSW2 (CN1 19)
- OFR (offset zeero) —→ PSW3 (CN1-10)
- INCD (±INC completed) —→ PSW4 (CN1-9)

When the extended zone signal output function is specified, the above listed four signal lines are used for zone signals PSW ~ PSW4.

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11.5.4.3 Zone Definition Parameter Setting (Pr111 ~ Pr148)

(+9999999 ~ −9999999 at the Minimum Command Unit)

Each zone signal (PSW1 ~ PSW4) can define up to four zones. Each zone is defined by two end positions, so that up to 8 parameters can be specified for each zone signal. The zones defined by each zone signal are associated with the parameters as presented in Table 11.7.

Note that the following parameter value relationship must be observed:

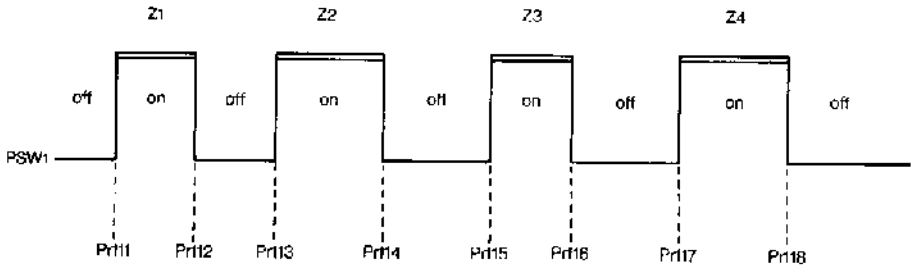
Pr111 < Pr112, Pr113 < Pr114, Pr115 < Pr116, Pr117 < Pr118

If the parameter value relationship is reversed or otherwise violated, the corresponding zone becomes undefined. (Example: Pr111 = Pr112) Therefore, the best procedure is to set both parameters for each unused zone to zero.

Table. 11. 7 Relationship between Zone and Parameter

Signal Name	Zone No.							
	Z1		Z2		Z3		Z4	
PSW 1	Pr 111	Pr 112	Pr 113	Pr 114	Pr 115	Pr 116	Pr 117	Pr 118
PSW 2	Pr 121	Pr 122	Pr 123	Pr 124	Pr 125	Pr 126	Pr 127	Pr 128
PSW 3	Pr 131	Pr 132	Pr 133	Pr 134	Pr 135	Pr 136	Pr 137	Pr 138
PSW 4	Pr 141	Pr 142	Pr 143	Pr 144	Pr 145	Pr 146	Pr 147	Pr 148

For example, the zones defined by PSW1 have the following relationships to the parameters and output signals:



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11.5.4.4 Zone Signals

When the current position is inside a zone that has been set by parameters, the corresponding PSW signal is set to the ON state.

There are four PSW signals (PSW1 ~ PSW4), and each PSW signal can define four zones (Z1 ~ Z4) using eight parameters. The zones defined by different PSW signals may overlap.

The zones, parameters and output signal states have the relationships described in Par. 11. 5.4.3

The PSW signal become effective when the power is turned ON, transmission of the initial data for absolute position is completed and the controller becomes ready (RDY). After that, the PSW signals are output according to the current position regardless of whether or not a program is executed.

(The PSW signals will fluctuate until the RDY condition is established, so that they should be disregarded.)

Presence of the PSW signals when a program is not being executed allows checking the interference limit switches before starting a program.

11.5.5 Compatibility with Other Functions

When the extended zone signal output function is specified, the following functions will be disabled :

(1) +INC function of the T8 and T9 coordinates (the external offset function (an extended function) becomes usable, however).

(2) The basic zone signal output function

The extended zone signal output function is compatible with all other functions so that they may be specified concurrently. See Table 11.8.

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Table. 11. 8 Compatibility with Other Functions

Function / Extended Function Specification	External Data Setting	External Offset Function	Extended Zone Signal A / B	Standard Zone Signal	Number of M Signals	Standard Offset (INC)	G67 Prohibit Function	Specification Parameter Setting	Extended Function Selection Signal
Basic Specification	Not Possible	Not Possible	Not Possible	Possible (×2)	×6	Possible	Possible	Not required	Not required
External Data Setting	Possible	Not Possible	Not Possible	Possible (×2)	×5	Possible	Possible	Pr47 = 20 (No CHECKSUM) = 30 (CHECKSUM)	
Extended Zone Signal A	Not Possible	Not Possible	Possible (×4)	Not Possible	×6	Not Possible	Possible		
Extended Zone Signal B	Not Possible	Possible	Not Possible	Possible (×2)	×4				
External Offset Function	Not Possible	Possible	Not Possible	Possible (×2)	×5	Not Possible	Not Possible	Pr47 = 40 (No CHECKSUM) = 50 (CHECKSUM)	Short across CN5 Pin 18 and 0_{FA} V.
[External Data Setting] + [Extended Zone Signal]	Possible	Not Possible	Possible	Not Possible	×5	Not Possible	Possible	Pr43 = 100000 Pr47 = 20 = 30	
[External Offset] + [Extended Zone Signal]	Not Possible	Possible	Possible (×4)	Not Possible	×5	Not Possible	Not Possible	Pr43 = 100000 Pr47 = 40 = 50	

11.5.6 Applicable Programmer

A higher version programmer is required because the number of parameters used increases.

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11.6 EXTENDED ZONE SIGNAL OUTPUT (B)

11.6.1 Introduction

This presents the specifications of the extended zone signal output (B) function which are available with Motionpack-34.

11.6.2 Functional Overview

Main features of the extended zone signal output (B) function are as follows:

(1) There are four zone signal output lines.

(2) Four zones can be set by each signal for a total of 16 zones.

(3) Zones are set in parameters Pr111 ~ Pr148.

(4) Before the extended zone signal output function can be used, the extended function specifying signal and parameter setting must be performed. When this function is specified, the standard extended zone signal output function and extended zone signal output (A) function are disabled.

11.6.3 Settings

The following extended function settings must be made to use this function:
Input line connection : Short across CN5 connector pin 18 and 0_{24} (V).
Parameter setting : Pr43 = 200000

11.6.4 Specifications

11.6.4.1 Motionpack-34

The standard specification Motionpack-34 is used.

11.6.4.2 Extended Zone Signal Output Lines

The following four output lines are used by the extended zone signal function:

- ZPM (zero return completed) → PSW1 (CN1-5)
- ZNP (zero point approached) → PSW2 (CN1-19)
- M54 → PSW3 (CN1-16)
- M55 → PSW4 (CN1-17)

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When the extended zone signal output function is specified, the above listed four signal lines are used for zone signals PSW1 ~ PSW4.

11.6.4.3 Zone Definition Parameter Setting (Pr111 ~ Pr148)

(+9999999 ~ 9999999 at the Minimum Command Unit)

Each zone signsl (PSW1 ~ PSW4) can define up to four zones. Each zone is defined by two end positions, so that up to 8 parameters can be specified for each zone signal. The zones defined by each zone signal are associated with the parameters as presented in Table 1

Note that the following parameter value relationship must be observed :

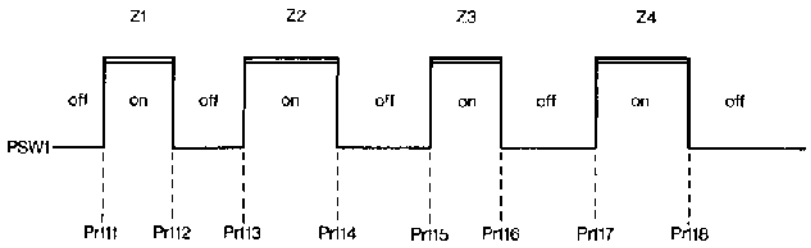
Pr111 < Pr112, Pr113 < Pr114, Pr115 < Pr116, Pr117 < Pr118

If the parameter value relationship is reversed or otherwise violated, the corresponding zone becomes undefined. (Example : Pr111 = Pr112) Therefore, the best procedure is to set both parameters for each unused zone to zero.

Table. 11. 9 Relationship between Zone and Parameter

Signal Name	Zone No.							
	Z1		Z2		Z3		Z4	
PSW 1	Pr 111	Pr 112	Pr 113	Pr 114	Pr 115	Pr 116	Pr 117	Pr 118
PSW 2	Pr 121	Pr 122	Pr 123	Pr 124	Pr 125	Pr 126	Pr 127	Pr 128
PSW 3	Pr 131	Pr 132	Pr 133	Pr 134	Pr 135	Pr 136	Pr 137	Pr 138
PSW 4	Pr 141	Pr 142	Pr 143	Pr 144	Pr 145	Pr 146	Pr 147	Pr 148

For example, the zones defined by PSW1 have the following relationships to the parameters and output signals :



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11.6.4.4 Zone Signals

When the current position is inside a zone that has been set by parameters, the corresponding PSW signal is set to the ON state. There are four PSW signals (PSW1 ~ PSW4), and each PSW signal can define four zones (Z1 ~ Z4) using eight parameters. The zones defined by different PSW signals may overlap. The zones, parameters and output signal states have the relationships described in Par. 11.6.4.3.

The PSW signal become effective when the power is turned ON, transmission of the initial data for absolute position is completed and the controller becomes ready (RDY). After that, the PSW signals are output according to the current position regardless of whether or not a program is executed. The PSW signals will fluctuate until the RDY condition is established, so that they should be disregarded.

Presence of the PSW signals when a program is not being executed allows checking the interference limit switches before starting a program.

When the set-up procedure of absolute encoder is executed, PSWs are turned off after Pr80 is set to 1. And PSWs become available when the setup procedure is completed and pr80 is 0

11.6.5 Compatibility with Other Functions

When the extened zone signal output (B) function is specified, the following functions will be desabled :

(1) M54, M55 output signal

(2) The basic zone signal output function

(3) The extended zone signal output (A) function

(4) M56 output signal is available. But in the case that both EXTERNAL OFFSET FUNCTION and EXTERNAL DATA SETTING FUNCTION are specified, M56 will be disabled.

11.6.6 Applicable Programmer

A higher version programmer is required because the number of parameters used increases.

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12. APPENDIX

This section describes the following items appendix.

(1) Selecting Servomotor

(2) Motionpack Display List
(including error code details)

(3) I/O Signal Channel

(4) Parameter List

(5) Servomotor Maintenance

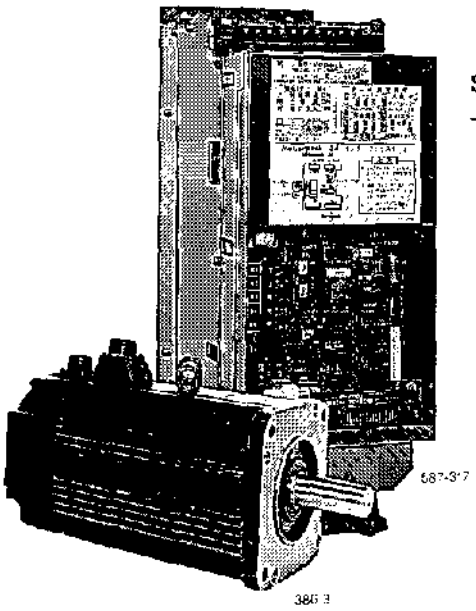
(6) Servomotor Defective Diagnosis

(7) Motionpack Version Upgrade

(8) Motionpack-34 Parameter Sheet

(9) Motionpack-34 Program Sheet

Make copies of (8) and (9) sheet for use



Servopack
TYPE CACR-SR20TZ6S□

AC Servomotor
TYPE USAMED 20MS2

12

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12. APPENDIX

12.1 SELECTING SERVOMOTOR

The selection process for servomotors for use with conventional leadscrew feed units are described below.

(1) Mechanical system

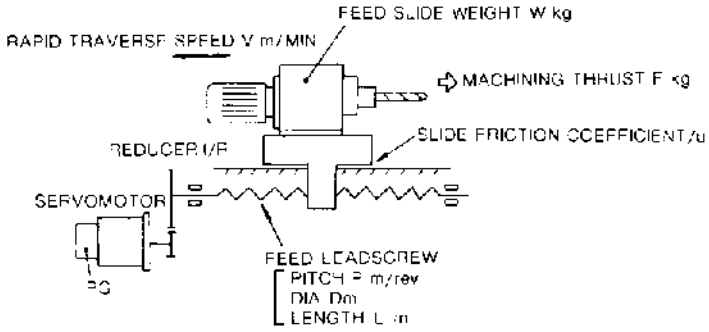


Fig. 12. 1 Servomotor Mechanical System

(2) Determining Servomtor Operational Speed Leadscrew r/min : N_B

$$N_B = \frac{V}{P} (r/min)$$

DC servomtor service rpm : N

$$N = N_B \times R \ (r/min)$$

$$\boxed{N < N_M}$$

N_M : Servomotor rated speed

(3) Evaluation of load torque

Load torque :T_L

$$T_L = \frac{\mu W - F}{2 \times \pi} \times P \times \frac{1}{R} \times \frac{1}{\eta_B} \ (kg \cdot m)$$

$$\boxed{T_L < T_M}$$

T_M : Servomotor rated torque

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(4) Evaluation of load inertia

The inertia of the feed system weight, the lead screw inertia, and the reducer inertia are calculated indivdually.

• Inertia of feed system weight :

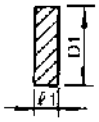
$$GD_W^2 = W \times \left(\frac{P}{\pi}\right)^2 \quad [kg \cdot m^2]$$

• Leadscrew inertia : GD_B^2

$$GD_B^2 = \frac{\pi}{8} \times \rho \times 10^3 \times L \times D^4 \quad [kg \cdot m^2]$$

ρ = Specific weight (= 7.87 for steel)

• Reducer inertia : GD_G^2



$$GD_{G1}^2 = \frac{\pi}{8} \times \rho \times 10^3 \times L_1 \times D_1^4 \quad [kg \cdot m^2]$$



$$GD_{G2}^2 = \frac{\pi}{8} \times \rho \times 10^3 \times L_2 \times D_2^4 \quad [kg \cdot m^2]$$

Therefore, load inertia at motor shaft GD_L^2 is as follows.

$$GD_L^2 = \frac{GD_W^2 + GD_B^2 + GD_{G1}^2}{R^2} + G_{G2}^2 \quad [kg \cdot m^2]$$

$$\boxed{GD_L^2 < 5GD_M^2}$$

(5) Tentative selection of servomotor

From the conditions

$N < N_M$, $T_L < T_M$, $GD_L^2 < 2$ to $3GD_M^2$

a suitable motor is selected tentatively out of the servomotor series.

(6) Setting acceleration/deceleration time

Determine the acceleration parameter (Pr41) for Motionpack-34 controller as follows.

Start time for speed loop : t_v

$$t_v = \frac{(GD_M^2 + GD_L^2) \times N}{375 \times \left(\frac{I_P}{I_M} \times T_M - T_L\right)} \times 1.3 \text{ (sec)}$$

where

I_P : Servopack max. output current [A]

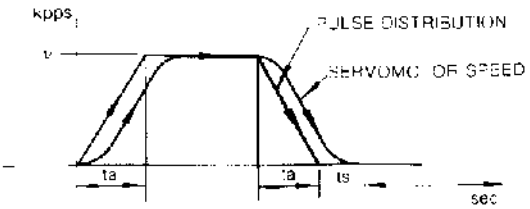
I_M : Servomtor rated current [A]

Set Pr41 to satisfy Pr41 > t_v.

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(7) Determining speed diagram

The response to pulse distribution is as shown in Fig. 12.2, and varies with the servomotor and the maximum speed.



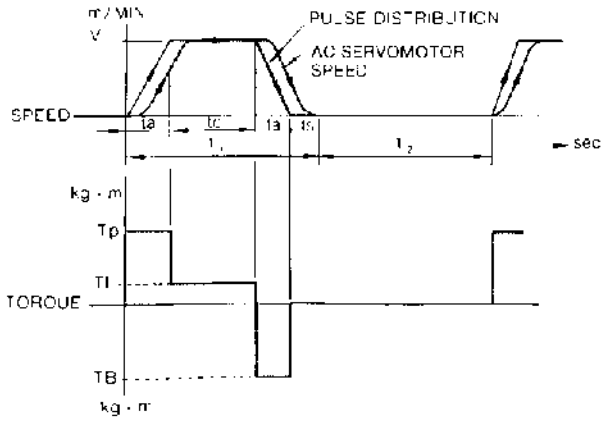
AC Servomotor M Series	$Kp = 30\text{sec}^{-1}$ — v≤100 kpps $t_s = 0.2$sec; v≥100 kpps $t_s = 0.3$sec

Pulse speed here is a multiplied value. Satisfy Motionpack-34 pulse input Specifications (150kpps or less at 1 multiplier conversion)

Fig. 12. 2 Servomotor Speed and Pulses

(8) Torque check

Calculate the effective torque in one cycle, and check that it is within the rated torque of the DC servomotor.



• Acceleration torque: T_A

$$T_A = \frac{(GD_M^2 + GD_L^2) \times N}{375 \times t_a} \quad (kg \cdot m^2)$$

• Effective torque: Trms

$$Trms = \sqrt{\frac{(T_A + T_L)^2 \times t_a + T_L^2 t_c + (T_A - T_L)^2 \times t_s}{t_1 + t_2}}$$

Applicable where $Trms < T_M$ •

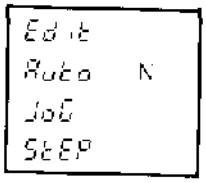
Fig. 12. 3 Servomotor Speed and Torque

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12.2 Motionpack-34 DISPLAY LIST

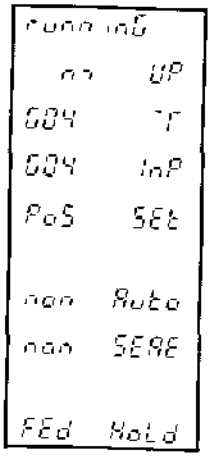
12.2.1 Motionpack Controller StatusDisplay St

1. EDIT MODE
2. AUTO MODE
3. JOG MODE
4. STEP MODE



12.2.2 Motionpack Controller Hold Status Ho Display

1. Command in execution
2. Waiting for M-FIN
3. Waiting G04 time up
4. G04 in position
5. G01-27 waiting for positioning finish
6. Waiting for auto mode
7. Waiting for operation start
8. Feed hold



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12.2.3 Controller Error Display

Table 12.1 Motionpack Alarm List

Alarm \ Operation when Alarm Occurs.	MP RUN OFF	Immediately Stopped	Decelerates to Stop	Stopped at Block End	Battery Alarm Lamp lights up.	MP Alarm Signal Outputs. MP ALM LAMP lights up.	MP Alarm (ALM 2)	MP Ready (RDY) Signal OFF.	READY (RDY1-RDY2) Signal OFF (Breaking ON).	Reset by Error Reset Signal.	Automatically Reset after Counteracting Alarms.	Reset by Servopack Error Reset.	Reset by Mode Selector Signal.	Reset by Program Clear Signal.	Reset by External Positioning Completion Signal
CPU Error	○	○				○		○	○	Repeat turning on and off.					
Program Error				○		○				○					
Parameter Error				○						○					
Emergency Stop		○						○			○	○			
Servo Error		○				○		○	○			○			
Circuit Saturation											○				
-Overtravel		○				○					○				
-Overtravel		○				○					○				
Home Position Return				○		○				○					
G77 Error				○						○					
Work Selection Error				○		○				○					
Power Down				○		○				○					
Battery Error					○		○				○				
-Stored Limit Over		○ JOG		○ AUTO STEP		○				○	○			○	
-Stored Limit Over		○ JOG		○ AUTO STEP		○				○	○		○	○	
Excessive Deviation		○				○			○	○					
In-Position Error				○		○				○					
Skip Signal				○		○				○					
External Positioning Error													○		○
Encoder Position Error	Impossible to turn on					○		○		○	○*				
PG Battery Reduction					○		○				○*				
PG Signal Line Breaking		○			○	○	○		○	○	○*				

*Power OFF/ON operation is required

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12.2.4 Condition Alarm Code Display

The condition and cause Motionpack 34 malfunctions can be checked by program alarm code display (Er display). Table 12.2 shows the alarm code descriptions.

Table 12. 2 Error Code List

Error Code	Error Condition	Remedial measure
CPU Err	Fault conditions detected by the self-diagnostic function of the CM. If no strong noise source is in the vicinity, and the 100 VAC power supply is in order, the cause must be in the CM itself.	Replace the CM.
Ec StoP	① This code is displayed when OT, LS is tripping in both + and − directions, or the common wire for the OT, LS is broken. ② When the servo drive power supply is turned off, the DB operates in both + and − directions. ③ No MP ready (RDY) signal is output.	(No MP alarm is output.) ① Check OT.LS ② Check the servo drive power voltage (200V) ③ Check the CM.
For O.t	+OT.LS (overtravel limit switch in + direction) has tripped.	① Check the machine position. ② Check the OT.LS signals.
rvS O.t	The -OT, LS (minus direction overtravel limit switch) has tripped.	① Check the machine position. ② Check the OT, LS signals.
SErvo	Servo error dipiay. Servo alarm signal is turned off.	Check the error display of Servopack and take remediary measures.
P OvEr	+ direction stored stroke limit over	Check if the values of A0 (at JOG) or C0 (except for JOG) exceed or ecual Pr 61.
P-OvEr	− direction stored stroke limit over	Check if the values of A0 (at JOG) or C0 (except for JOG) exceed or equal Pr 60.
PG bAt	PG battery voltage has reduced.	Replace PG battery with in a month.
AbS PG	Following were found at absolute position data transmission when power was turned on: ① Data were not sent in time. ② Absolute position data have exceeded Pr78 (encoder allowable error). ③ PG Signal line has been broken from Servopack to Motionpack. ④ Rewrite the contents of Pr71. In this case, turn the power supply on/off twice.	① Check Servopack, encoder and wiring to if SEN signal is being fed. ② (a)When Pr70=[illegible]0003 is set,check for the cause of exceeding position. If there is no problem,turn on/off the power supply after error reset. (b)When Pr=70[illegible]0004is set,check for the cause of exceeding position. If there is no problem, perform the following procedure after error reset. 1.set Pr78 to 0, then turn off/on the power supply. 2.Reset Pr78 to original value, then turn the power supply off/on again. ③ Check PG signal line breaking.
PG LinE	Motionpack PG signal input line is broken. This can be invalid by setting Pr70.	Check PG signal cable, convector, PG I/O circuit breaking between Servopack and Motionpack.

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12.2.4 Condition Alarm Code Display (Cont'd)

Table 12. 2 Error Code List (Cont'd)

Error Code	Error Condition	Remedial measure
Err nSEL	Program selection error ① More than 2 program start signals of PGS0 to PGS9 have been input. ② When PGS0 to PGS9 are turned on, no signal or more than 2 are input. ③ Before M30 is executed and start signal (STL) are turned off, PGS0 to PGS9 or PGSL00 to PGSL30 have been switched.	Select PGSL00 to PGSL30 35ms before automatic start.
Pro Err	Program error, A block with destroyed program has been designated.	Check the program.
PAr Err	Parameter error. Parameters with destroyed data are present.	Check the parameters. After correcting the parameter, be sure turn off the power supply and then turn it on.
dEr OuEr	Excessive servo delay. The servo delay (dO) in acceleraiton or deceleration exceeded the servo error permissible limit.	(a) The load inertia is too large relative to the motor torque. Change Pr40 and Pr 41 to reduce acceleration. (b) The servo error permissible limit (Pr44) is too small. Normally set Pr40 at 1.5 -2 times the tracking error (Pr42). However, this setting is a good standard below the rated motor speed, and if the maximum feedrate up to 1.4 times the motor rated speed is used. Pr44 = Pr42 × (1.5 × to 2) × 1.4. When only positioning is intended, and slight overshooting is permissible, the setting must be 2 to 4 times the Pr42 value. The maximum limit for Pr44 is 30,000. (c) Acceleration cannot be obtained sufficietly due to current restriction. • Check the ratio parameter of CM. The max, current is required to be approx. 130% of averaje acceleration current.
InPo Err	In-position error ① When G04' command is executed, servo error (dO) remains larger than Pr45 × $\frac{Pr51}{Pr50}$ setting after the lapse of 2 seconds, and the in-position does not occur. ② D/A drift automatic correction over-correction. In this case, when the alarm is reset, the slide suddenly jerks after the lapse of 2 seconds, and again the alarm state occurs. Since an alarm occurs when the correction valve (dO) exceeds ±512, adjust near 0 when zeroing the servopack.	(a) The load is too heavy compared with the current limit. • If the operation is OK when the Servo-pack current limit commands 13, 14 are disconnected, raise the current limit to the maximum level. Check the current limit parameter (Pr53) and the feed program current limit value. • Check the in-position range (Pr45). • Machine adjustment Let the slide stop from low feedrates in the forward travel and reverse travel, and reduce the frictional resistance in the machine slide until the stopping current becomes within 20% of the rated value. • Do not execute G04 during a current limit dwell.

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Table 12. 2 Error Code List (Cont'd)

Error Code	Error condition	Remedial measure
InPo Err (cont'd)		(b) Zero the Servopack. • Turn the knob so that the post-alarm error (dU) approaches 0. (Unless the alarm is reset, the deviation does not change.) • Check the +12V and -12V power supply voltage from the Servopack at the external terminal. (difference must be within 3%.) • When the voltage difference from the Servopack +12V and -12V is between 3 and 8%, adjustment is possible with the D/A zeroing VR in the CM. When the left cover of the CM is removed, the D/A zeroing VR (IVR) becomes accessible.
SP Err	Skip signal fault.	Check EPS5, EPS6 and EPS7 signals.
EE OuEr	Current saturation. A current signal from the Servopack is turned on	Check the Servopack. (No MP alarm occurs.)
OutP Err	External positioning error. External positioning error signal (EPAL) is output	Check the signals related to external positioning. (No MP alarm occurs.)
bAt dAun	Battery voltage has dropped.	Replace the battery within one month.
PS doun	Instantaneous power failure The power is turned off and then on under the following condition. (a) While the STL signal is being output. (b) During slide movement in the JOG or STEP mode. (c) During return home motion.	Check the power supply. Check the program if the power supply has been OFF before M30.
Err G27	The following errors have been found at G27 execution: ① Home position pulse coordinate value deflects more than Pr 77 ② Home position pulse could not be read-in within the range of coordinate ± Pr 4 6.	
C Err	Transmission data failure. Transmission failure between CM and PM. (Data from CM is not correct.) PG battery voltage has reduced.	In parameter display or program display, re-write parameter or program, if C Err error occurs at the specified parameter No. or block. (The data may be broken.)
SEL UP	See Par.11.2.	

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12.2.5 Indicator Lamp

(1) Motionpack programmer

The Motionpack programmer can display various states as selected by the mode select keys. In addition to error states, also operation modes, feedhold state, output signal states, and error counter contents are displayed, which can be utilized in troubleshooting. In addition to these universal display data, the NORMAL (green) and FAULT (red) indicator lamps are also used. NORMAL indicator lights when no fault is found in the programmer. When it is off, check the power supply and the fuses.

FAULT indicator lights when the Motionpack programmer cannot exchange signals with the Motionpack controller. Check the Motionpack connection cable, and the connector.

(2) Motionpack controller

The Motionpack-34 controller is provided with four indicator lamps ; PWR (green), RUN (green), ALM (red) and BATAL (red). For checking detailed state, checking with PM is required.

PWR lights when the internal power supply is energized. When it is off, check the 100 VAC power supply. With this indicator, the I/O 24 V and analog command 12 V power supplies cannot be checked.

RUN lights when no fault is present in the Motionpack-34 controller. If it is off, the Motionpack 34 controller is faulty.

ALM lights when faults are discovered in the Motionpack-34 system. In this case, and MP alarm signal is also output. Check the fault by the programmer, and repair. (This is not controller error.)

BAT • AL lights when the battery, for supplying power to the program and parameter memories during power failure, runs down. (It lights only while the 100 VAC power is on.) When it lights, replace the battery within a month. There is no problem if the battery is replaced more than 3 minutes after the power supply is turned off.

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12.3 INPUT/OUTPUT SIGNAL CHANNEL LIST

Table 12. 3 Input Signal List

Programmer Display	Channel	10^7	10^6	10^5	10^4	10^3	10^2	10^1	10^0
i0	0	JMF Jog Middle	JLF Jog Low	OVR Override	SBK Single Block	STEP	JOG	PLAY	EDIT
i1	1	Auto stop /ATSTP	PGCL Program Clear	ERS Fault Reset	ATST Auto Start	SBST Single Block Start	ZRN Home Return	-JS -Direction JOG & Step	+JS +Direction JOG & Step
i2	2	PGS7	PGS6	PGS5	PGS4	PGS3	PGS2	PGS1	PGS0 Program Start
i3	3	INC8	+INC8	PGSL30	PGSL20	PGSL10	PGSL00 Program Select	PGS9	PGS8
i4	4	$\overline{\text{OTR}}$ -Overtravel (R)	OTF +Overtravel (F)	CLD Current Limit on	$\overline{\text{SAL}}$ Servo Alarm	NODB	STROBE	-INC9	-INC9
i5	5	DATA SET INT	JPIBT	MFIN	G34F	OPSL	EPS7	EPS6	EPS5 External Skip 5
i6	6	LSB	LSA LS Near Home	EXP2 External Positioning LS	PB Phase B Pulse	PA Phase A Pulse	PC Home Position Pulse	PG Battery Reduction PG BATAL	

Table 12. 4 Output Signal List

Programmer Display	Channel	10^7	10^6	10^5	10^4	10^3	10^2	10^1	10^0
o0	0	OFM Offset Max.	OTR Offset 0	INCD Incremental End	EPAL External Positioning Alarm	G34 External Positioning End	STL In-Operation	ZPM Home Return End	ALM1 NC Alarm
o1	1	ZNP Near Home	M56	M55	M54	M53	M52	M51	M50
o2	2						RDY MP Ready (PC)	RDY (DB)	ALM2 Battery Alarm

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12.4 PARAMETER LIST

Table 12. 5 Parameter List

Parameter No.	Name	Rang	Unit
1	JOG low speed	0 to 60000	Speed unit
2	JOG medium speed		
3	JOG high speed		
4	STEP speed	0 to 60000	Speed unit
5	STEP feed distance short	0 to 999999	Min. reference unit
6	STEP feed distance medium		
7	STEP feed distance long		
8	JOG (low)/STEP (short) torque limit	0 to 200	%
9	Not used	—	—
10	Creep speed	0 to 60000	Speed unit
11 to 19	Not used	—	—
20	Single correction for coordinate system 8	0 to 255	Min. reference unit
21	Max. correction for coordinate system 9	0 to 9999999	
22	Single correction for coordinate system 9	0 to 255	
23	Max. correction for coordinate system 9	0 to 9999999	
24 to 29	Not used	—	—
30	Range 1 definition	−9999999 to +9999999	Min. reference unit
31	Range 1 definition	−9999999 to +9999999	Min. reference unit
32	Range 2 definition	−9999999 to +9999999	Min. reference unit
33	Range 2 definition	−9999999 to +9999999	Min. reference unit
34	Range 3 definition	−9999999 to +9999999	Min. reference unit
35	Range 3 definition	−9999999 to +9999999	Min. reference unit
36 to 39	Not used	—	—
40	Max. speed	1 to 60000	Speed unit
41	Acceleration time	50 to 60000	ms
42	Position loop gain	200 to 30000	Number of pulses
43	Extended function designation	—	—
44	Servo error deviation	60000 Max.	Number of digits
45	In-position range	1 to 255	Number of pulses
46	G27 allowable deviation	0 to 999999	Number of pulses
47	Extended function designation	—	—
48 to 49	Not used	—	—
50	Pulse ratio M	3999999 Max.	Number of pulses
51	Pulse ratio D	3999999 Max.	Min. reference unit
52	Decimal point position	0 to 5	Number of pulses
53	Thrust ratio	10 to 250	%
54	Axis No. designation	0 to 9	—
55	Not used	—	—
56	Acce./decel time	50 to 1000	ms
57	S-curve accel/decel time	30 to 500	ms
58 to 59	Not used	—	
60	−Direction stored stroke limit	−9999999 to +9999999	Min. reference unit
61	+Direction stored stroke limit	−9999999 to +9999999	Min. reference unit
62 to 69	Not used	—	—
70	Referance point coordinate system	—	—
71	TO coordinate offset	−9999999 to +9999999	Number of pulses
72	Waiting position	−9999999 to +9999999	Min. reference unit
73	Rapid return speed	0 to 60000	Speed unit
74	Home position setting speed	0 to 60000	Speed unit
75	Push torque	1 to 200	%
76	Number of encoder pulses		Pulse/rev
77	Allowable deviation	1 to 255	Number of pulses
78	Encoder allowable deviation	0 to+9999999	Min. reference unit
79	Pushing time	0 to 3000	10 ms
80	Home position setup command	0, 1	—
81	Reference Point coordinate	−9999999 to +9999999	Min. reference unit
82	ABS-PG alarm reset command	0, 1	—
83 to 96	Not used	—	—
97	Baud rate	110, 300, 1200, 2400	bps
98 to 110	Not used	—	—
111 to 148	Extended Zone setting	9999999 to +9999999	Min. reference unit
149 to 200	Not used	—	—
201 to 296	External setting data	—	—

* 1 : The name and contents in absolute value method differ from those of incremental method.

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	Function	Related Alarm Code and Countermeasure
	Setting speed at JOG operation	(1) Not function by JOG (2) JOG speed does not change → Check setting parameter. (3) Runaway by JOG
	Setting speed at STEP operation	Defective speed or not move at STEP → Check setting parameter
	Setting moving distance at STEP	STEP is disabled → Check setting parameter.
	Torfui linut for JOG (low) and STEP (short)	
	Setting creep speed when override signal is ON, the speed reference will not exceed the value. Used at test run and program check.	
	Setting correction and its max. value of coordinates by + INC8 (+ INC9), − INC8 (− INC9) signals	Coordinate System 8 or 9 deflects → Check any noise on + INC8 (+ INC9) and − INC8 (− INC9). Note : When the correction is not required, set the parameter at 0.
	Range definition Pr 30 < Pr 31	Reversed when undefined
		Reversed when undefined
	Range definition Pr 32 < Pr 33	Reversed when undefined
		Reversed when undefined
	Range definition Pr 34 < Pr 35	Reversed when undefined
		Reversed when undefined
	With P41, specifies the time to reach the speed specified by Pr 40 and determines acceleration speed or deceleration speed.	Excessive error alarm (d Er Ou Er)
	The Number of following error pulses when moving by rated speed (error counter) Pr = pps at rated speed/kp	(1) Hunting of machine motion (2) Overshot motor → Set Pr 42 so that Kp can adaptable for the machine
	Limit value to generate excessive error alarm Pr 44 = Pr 42 × 2	Excessive error alarm (d Er Ou Er) → Setting value is too small.
	Allowable deposit pulse capacity at in-position check by G04 command	In-position error (InPoErr) → Pr 45 is too small.
	No G27 check with in the range of Pr46 − 9 to search for home position pulse at G27 command execution	G27Err → Pr 46 setting servo system
	Setting the relation between position and number of pulses	Actual moving distance is different that of program.
	Determines at which digit of the minimum different unit a decimal point should be displayed. Position unit of this decimal point position becomes speed unit per minute.	Speed is different.
	Motor output torque becomes torque setting(%) × P53(%) of the program	SETTING torque is different from actual torque.
	Axis No. designation for distinction of program tape	
	To determine accel / decel curve at S letter	accel /decel control.
	Setting the max movable range on the program	JOG or STEP is disabled. p-Ou Er p-Ou Er
		SET UP
	(For details, refer to each related paragraph.)	
	To reset ABS-PG alarm in full-automatic home position setup system	
	Setting transmission distance between termina. unit and PM	Reset since it is turned off at PM power-on.
	(For details, refer to each related paragraph.)	

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(2) Troubleshooting Guide

WARNING

Remedies in [ ] should be practiced after turning off the power.

Table 12. 7 Troubleshooting Guide for AC Srevomotor

Trouble	Cause	What to do
Motor does not start	Voltage below rated	Measure voltage across motor terminals U, V, and W with a tester and correct to rated value.
	Loose connection	Tighten connection.
	Wrong wiring	Correct.
	Over oad	Reduce load or use a larger motor
	Motor defective	Measure voltage across motor terminals U, V and W with a tester. When correct, replace motor
Unstable operation	Wrong wiring	Inspect and correct wiring across motor terminals U, V, and W, and PG
Motor overheats.	Excessive ambient temperature	Reduce below 40 °C.
	Motor dirty	Clean motor surface.
	Over oad	Reduce load or use a larger motor
Unusual noise	Motor loosely mounted	Tighten foundation bolts
	Motor misaligned	Realign
	Coupling out of balance	Balance coupling.
	Noisy bearing	Check alignment, loading of bearing, lubrication and contact Yaskawa representative.
	Vibration of driven machine	Contact the machine manufacturer

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12.6 Servopack TROUBLESHOOTING GUIDE

(1) LED Indication (8-segment) for Troubleshooting

Table 11.8 LED Indication for Troubleshooting

LED	Detection	Lighting Condition	Probable Cause	Corrective Action
1.	Over-current	Goes on when power is supplied to the control circuit	• Defective control circuit board (1 PWB)	• Replace Servopack.
		Goes on when power is supplied to the main circuit and servo power is turned on. • MCCB does not trip.	• Defective current feedback circuit • Defective main circuit transistor module	• Replace Servopack.
		Goes on when power is supplied to the main circuit and servo power is turned on • MCCB trips	• Defective motor grounding • Defective main circuit transistor module.	• Replace the motor. • Replace Servopack.
		Goes on when power is supplied to the main circuit	• Defective main circuit transistor module	• Replace Servopack.
		Goes on when the motor starts or slows down.	• Incomplete (1 PWB) VR5 adjustment	• Refer to Par. 4.3.3.1 (3).
2.	Circuit protector tripped	Goes on when power is supplied to the control circuit	• Defective control circuit board (1 PWB)	• Replace Servopack.
		Goes on when power is supplied to the main circuit	• Defective main circuit thyristor-diode module	• Replace Servopack
			• MCCB trips	Wiring check in Servopack. • Disconnection • Conduction of connection part
3.	Regenerative trouble	Goes on when power is supplied to the control circuit.	• Defective control circuit board (1 PWB)	• Replace Servopack
		Goes on approximate 0.5 to 1 second after power is supplied to the main circuit	• Defective regenerative transistor	• Replace Servopack.
			• Regenerative resistor disconnection.	• Check and replace the regenerative resistor. (Replace the Servopack.)
4.	Over-voltage	Goes on when the motor starts or slows down	• Load inertia (GD²) too large	• Check the inertia of the machine with the value converted to the motor shaft
			• Defective regenerative circuit	• Replace Servopack.
5.	Over-speed	When the reference is input, the motor runs fast and 5. goes on	• Motor connection error • Absolute encoder connection error.	• Correct the motor connection. • Check and correct pulses in phase A, B, C, U, V and W with 2CN.
			• The reference input voltage too large	• Decrease the reference input voltage.
6.	Voltage drop	Goes on when power is supplied to the main circuit	• Defective main circuit thyristor-diode module.	• Replace Servopack.
		Goes on when power is supplied to the control circuit.	• Defective control circuit board (1 PWB)	• Replace Servopack.
7.	Overload	Goes on during operation • When power to the control circuit is turned off and then turned on again, the operation starts.	• Operation with 105% to 130% or more of the rated load	• Check and correct the load (may be overload).
A.	Heat sink overheat	Goes on during operation • When power to the control circuit is turned off and then turned on again, 7. or A. goes on again. When reset later, the operation starts.	• Fan has stopped.	• Check the fan (SR20, 30, 44, 60)
			• Temperature around the Servopack exceeds 55°C.	• Decrease the temperature below 55°C (The heat sink may be overheated.)
		The motor rotates, but the torque is unavailabe. When power to the control circuit is turned off and then turned on again, the operation starts, but the torque is still unavailable	• Motor circuit error connection, such as U→V, V→W, W→U or single-phase connection.	• Correct the connection.

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Table 12. 8 LED Indication for Troubleshooting (Cont'd)

LED	Detection	Lighting Condition	Probable Cause	Corrective Action
b.	A/D error	Goes on when power is supplied to the control circuit.	• Defective control circuit board (1PWB)	• Replace Servopack
	CPU error	Goes on during operation.	• Faulty internal elements	• Resume after reset operation
			• Defective internal elements.	• Replace Servopack.
F.	Open phase	Goes on when power is supplied to the control circuit	• Defective control circuit board (1 PWB).	• Replace Servopack.
		Goes on when power is supplied to the main circuit	• Poor connection to 3-phase power supply	• Check and correct the connection
		Goes on when power is supplied to the control circuit	• Defective control circuit board (1 PWB)	• Replace Servopack
E.	Overrun prevention	The motor starts momentarily, then C goes on	• Motor connection error.	• Correct the motor connection
			• Absolute encoder connection error	• Check and correct pulses in phases A, B and C with 2CN.
U.	Absolute control error	Goes on when power is supplied to the control circuit	• Defective control circuit board. (1PWB).	• Replace Servopack
		Goes on approximately 1 second after SEN signal is input.	• Faulty absolute encoder • Faulty internal elements	• Drop the SEN signal* and then input the SEN signal again
			• Faulty absolute encoder. • Battery not yet connected	• Reattempt the setup of absolute encoder.
			• Absolute encoder connection error	• Correct the absolute encoder connection.
			• Defective absolute encoder	• Replace the motor.
8.	Positioning error	Goes on when power is supplied to the control circuit.	• Defective control circuit board (1PWB)	• Replace Servopack.
		Goes on frequently during operati operation	• Defective encoder connection error	• Check and correct pulses in phases A, B and C with 2CN.
			• Faulty internal PG pulse counter.	• Drop the SEN signal* and then input the SEN signal again. • Consider countermeasure for possible noise interference

* Alarm of absolute control error is reset by dropping SEN signal. (Reset button need not be depressed.) SEN signal input is possible again by turning Motionpack-34 power to OFF then ON.

(2) Examples of Troubleshooting for Defective Wiring or Parts

Table 12. 9 Example of Troubleshooting for Defective Wiring or Parts

Trouble	Check Items	What to do
MCCB trips immediately after Power On and Servo On.	• Main circuit wiring (such as the ground of motor)	• Correct the wiring.
The reference is input, but the motor does not run.	• Voltage across ⓡ, ⓢ, and ⓣ. • LED P and MP on	• Check the AC power supply circuit.
	• Trouble LED off	• If LEDs are on, check the cause.
	• Speed reference voltage • LED IN on	• Check servo signal cable.

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12.6 Servopack TROUBLESHOOTING GUIDE (Cont'd)

(3) Examples of Troubleshooting for Incomplete Adjustment

Table 12. 10 Examples of Troubleshooting for Incomplete Adjustment

Trouble	Cause	What to do
Motor rotates even if the speed reference voltage is 0 V.	ncomp ete ZERO potentiometer adjustment	Adjust VR3 [ZERO] correctly
Motor vibrates or vibration frequency is too high, approx 200 to 300 Hz (When vibration frequency equals commercial frequency.)	Speed loop gain too high • Excessively long lead of *Servopack* input circuit • Noise interference due to bundling of signal line and power line	Turn VR6 [LOOP] CCW to decrease the speed loop gain • Decrease length of lead • Separate input circuit line from power line or connect input circuit to low impedance less than several 100 ohms
Motor speed overshoot is too large at starting or stopping.	• Speed loop gain too high	• Turn [LOOP] CCW to decrease the speed loop gain

12.7 History of Version Upgrade

12.7.1 Applicable Combination

○ : Possible

△ : Not possible for added function
Possible for conventional function

	Unit. Ver	Main Revision	Programmer (CMPF−PM33 ⬚) C: MMP113	D: MMP133	D3: MMP133/34	F: Handle Dimension Change
Controller	Motionpack-33 (CMPC−CM33D)		○	△	○	○
	Motionpack-34 (CMPC−CM34−⬚)		△	○	○	○
	—	First product				
	B	① Torque limit (Pr8) added for JOG/STEP feedrate	△	△	○	○
	B6	① External data setting function added ② External offset function added ③ Extended zone signal output function added ④ Pr0 added in PROM =	△	△	○	○
	C	① Incremental encoder system available	△	△	○	○

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12.7.2 Compatibility with Other Functions

Table. 12.11 Compatibility with Other Functions

Function / Extended Function Specification	External Data Setting	External Offset Function	Extended Zone Signal A/B	Standard Zone Signal	Number of M Signals	Standard Offset	G67 Prohibit Function	Specification Parameter Setting	Extended Function Selection Signal
Basic Specification	Not Possible	Not Possible	Not Possible	Possible (×2)	×6	Possible	Possible	Not required	Not required
External Data Setting	Possible	Not Possible	Not Possible	Possible (×2)	×5	Possible	Possible	Pr47 =20 (No CHECKSUM) =30 (CHECKSUM)	
Extended Zone A Signal / B	Not Possible	Not Possible	Possible (×4)	Not Possible	×6 ×4	Not Possible	Possible	Pr43 100000	
External Offset Function	Not Possible	Possible	Not Possible	Possible (×2)	×5	Not Possible	Not Possible	Pr47 =20 (No CHECKSUM) =30 (CHECKSUM)	Short across CNE Pin 18 and 0 V.
[External Data Setting] + [Extended Zone Signal]	Possible	Not Possible	Possible (×4)	Not Possible	×5	Not Possible	Possible	Pr43 100000 Pr47 =20 =30	
[External Offset] + [Extended Zone Signal]	Not Possible	Possible	Possible (×4)	Not Possible	×5	Not Possible	Not Possible	Pr43 =100000 Pr47 =40 =50	

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12.8 Motionpack-34 PARAMETER SHEET

Table 12.12 Parameter Setting

Parameter No.	Set Value	Setting Range	Contents		Unit
Pr 1		0 to 6000	JOG STEP group	JOG low speed	Speed unit
Pr 2				JOG medium speed	
Pr 3				JOG high speed	
Pr 4		0 to 60000		STEP speed	
Pr 5		0 to +9999999		STEP feed distance, short	Min. reference unit
Pr 6				STEP feed distance, medium	
Pr 7				STEP feed distance, long	
Pr 8		0 to 200		Torque limit	%
Pr 9	Not used				
Pr 10		0 to 60000		Creep speed	Speed unit
Pr 10 to Pr 19	Not used				
Pr 20		0 to 255	Offset value group	Single correction for Coordinate system 8	Min. reference unit
Pr 21		0 to 9999999		Max. correction for Coordinate system 8	Min. reference unit
Pr 22		0 to 255		Single correction for Coordinate system 9	Min. reference unit
Pr 23		0 to 9999999		Max. correction for Coordinate system 9	Min. reference unit
Pr 24 to Pr 29	Not used				
Pr 30		−9999999 to +9999999	Range definition	Range 1 definition	Min. reference unit
Pr 31		−9999999 to −9999999		Range 1 definition	Min. reference unit
Pr 32		−9999999 to −9999999		Range 2 definition	Min. reference unit
Pr 33		9999999 to −9999999		Range 2 definition	Min. reference unit
Pr 34		−9999999 to +9999999		Range 3 definition	Min. reference unit
Pr 35		−9999999 to +9999999		Range 3 definition	Min. reference unit
Pr 36 to Pr 39	Not used				
Pr 40		1 to 60000	Servo group	Max. speed	Speed unit
Pr 41		50 to 60000		Acceleration time	msec
Pr 42		200 to 30000		Position loop gain	No. of pulses
Pr 43				Extended function selection	
Pr 44		60000 Max.		Servo error deviation	No. of pulses
Pr 45		1 to 255		In-position range	No. of pulses
Pr 46		0 to 9999999	G 27 group	G 27 allowable deviation	No. of pulses
Pr 47				Extended function selection	
Pr 48 to Pr 49	Not used				
Pr 50		399999 Max.	Unit group	Pulse ratio M	
Pr 51		399999 Max.		Pulse ratio D	
Pr 52		0 to 5		Decimal point position	No. of digits
Pr 53		10 to 200		Thrust rate	%
Pr 54		0 to 9	Coordinate address designation		
Pr 55	Not used				
Pr 56		60 to 1000	Servo group	Accel/decel time	ms
Pr 57		30 to 500		S-letter accel/decel time	ms
Pr 58 to Pr 59	Not used				
Pr 60		−9999999 to +9999999	Overtravel group	−Direction stored stroke limit	Min. reference unit
Pr 61				+Direction stored stroke limit	
Pr 62 to Pr 69	Not used				
Pr 70		−9999999 to +9999999	Home position group	Reference point coordinate system	
Pr 71				Offset of T0 Coordinate	No. of digits
Pr 72				Waiting position	Min. reference unit
Pr 73		0 to 60000		Rapid return speed	Speed unit
Pr 74	Setting 0	0 to 60000		Home position setting speed	
Pr 75	Setting 0	10 to 200		Push torque	%
Pr 76		1 to 255		No. of encoder pulses	P/sec/rev
Pr 77				Allowable deviation	No. of pulses
Pr 78		−9999999 to +9999999		Encoder allowable deviation	Min. reference unit
Pr 79		0 to 3000		Pushing time	10 ms
Pr 80		0, 1		Home position steup command	
Pr 81		−9999999 to +9999999		Reference point coordinate	Min. reference unit
Pr 82		0, 1		ABS • PG alarm reset command	
Pr 83 to Pr 96	Not used				
Pr 97		110, 300, 1200, 2400	Tape device baud rate setting		bps
Pr 98 to Pr 110	Not used				
Pr 111 to Pr 148		−9999999 to +9999999	Extended zone setting		Min. reference unit
Pr 201 to Pr 296			External setting data		Depends on position, speed, torque

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No. _____

Date _____

12.9 Motionpack-34 PROGRAM SHEET

Machine No. _____ Machine Name _____ Work Name _____ Programmed by: _____

Block	M Function	Function	Position	Speed	Torque	Wait Time	Loop	Jump	Coordinate	Remarks
N 0	M	G	X/U	F	I	D	L	P	T	
N 1	M	G	X/U	F	I	D	L	P	T	
N 2	M	G	X/U	F	I	D	L	P	T	
N 3	M	G	X/U	F	I	D	L	P	T	
N 4	M	G	X/U	F	I	D	L	P	T	
N 5	M	G	X/U	F	I	D	L	P	T	
N 6	M	G	X/U	F	I	D	L	P	T	
N 7	M	G	X/U	F	I	D	L	P	T	
N 8	M	G	X/U	F	I	D	L	P	T	
N 9	M	G	X/U	F	I	D	L	P	T	
N 0	M	G	X/U	F	I	D	L	P	T	
N 1	M	G	X/U	F	I	D	L	P	T	
N 2	M	G	X/U	F	I	D	L	P	T	
N 3	M	G	X/U	F	I	D	L	P	T	
N 4	M	G	X/U	F	I	D	L	P	T	
N 5	M	G	X/U	F	I	D	L	P	T	
N 6	M	G	X/U	F	I	D	L	P	T	
N 7	M	G	X/U	F	I	D	L	P	T	
N 8	M	G	X/U	F	I	D	L	P	T	
N 9	M	G	X/U	F	I	D	L	P	T	

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