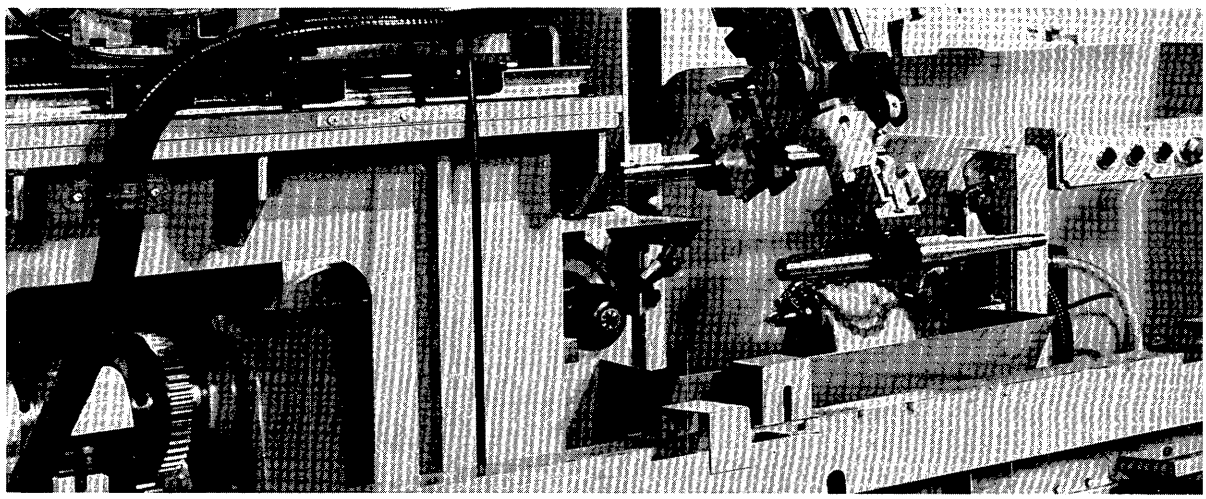
Motionpack FD MODEL 3

YASKAWA MOTION CONTROLLER

EXTENSION SYSTEM 3



YASKAWA

This manual describes the using method of Motionpack FD model 3 providing additional functions to model 0. Refer to user's manual of basic type model 0 for details.

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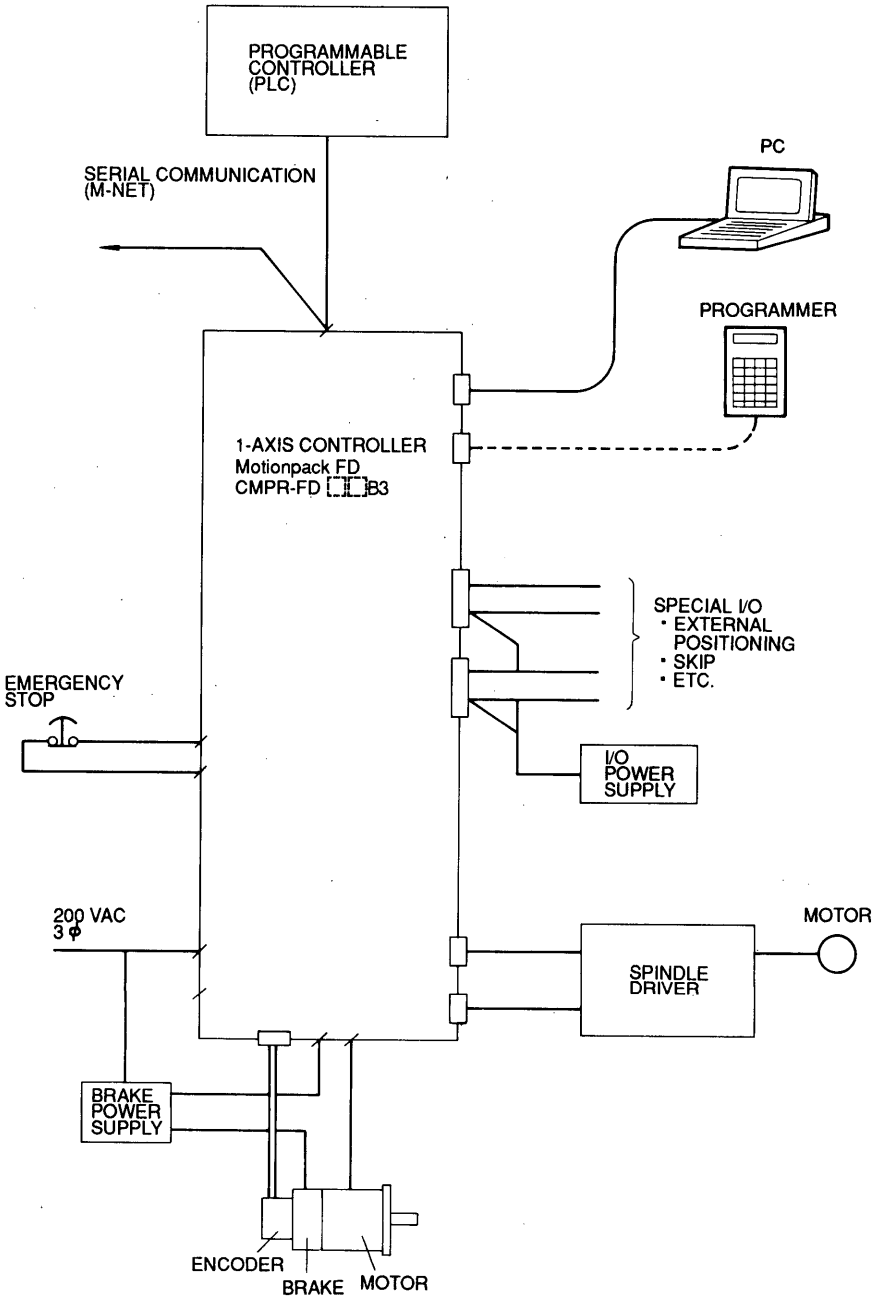
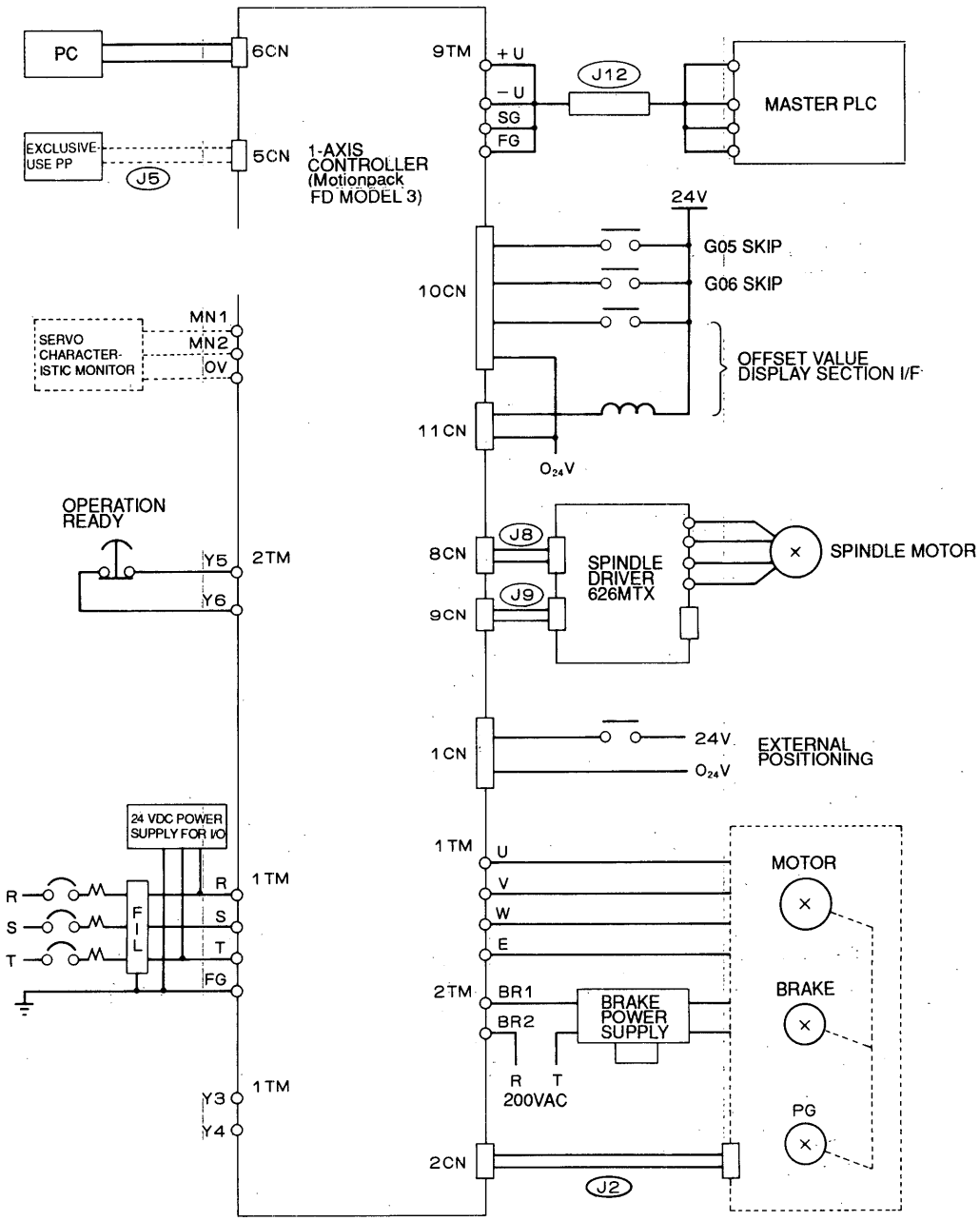
1. Motionpack FD MODEL 3

1.1 SYSTEM CONFIGURATION

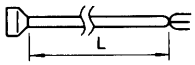
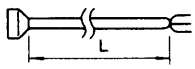
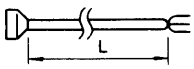
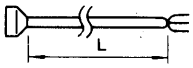
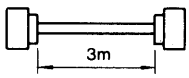
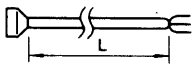
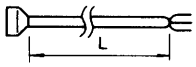
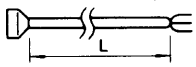
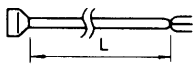


EQUIPMENT INTERCONNECTION



1.2 CABLE LIST

Table 1.1 Cables for Model 3

Name	Usage	Motionpack Connector Code	Motionpack Side Connector Type	Type	Length	Specification	Cable-side Connector Type
J1	SV-I/O cable	1CN	MR-20RFA	CMPR-W10	1 m	CM-1CN 	MR-20M/ MR-20L
				CMPR-W11	2 m		
				CMPR-W12	5 m		
J2	Servo PG cable	2CN	MR-20RMA	CMPR-W20	5 m	CM-2CN 	MR-20F/ MR-20L
				CMPR-W21	10 m		
				CMPR-W22	20 m		
J3	Standard input cable	3CN	MR-34RMA	CMPR-W30	1 m	CM-3CN 	MR-34F/ MR-34L
				CMPR-W31	2 m		
				CMPR-W32	5 m		
J4	Standard output cable	4CN	MR-34RFA	CMPR-W40	1 m	CM-4CN 	MR-34M/ MR-34L
				CMPR-W41	2 m		
				CMPR-W42	5 m		
J5	Programmer cable	5CN		JEFMC-WU13	3 m		
J7	Handle PG cable	7CN	MR-8RMD2	CMPR-W70	1 m	CM-7CN 	MR-8F/ MR-8L
				CMPR-W71	2 m		
				CMPR-W72	5 m		
J8	Spindle output cable	8CN	MR-16RFD2	CMPR-W80	1 m	CM-8CN 	MR-16M/ MR-16L
				CMPR-W81	2 m		
				CMPR-W82	5 m		
J10	Extensive input cable	10CN	MR-34RMA	CMPR-W100	1 m	CM-10CN 	MR-34F/ MR-34L
				CMPR-W101	2 m		
				CMPR-W102	5 m		
J11	Extensive output cable	11CN	MR-34RFA	CMPR-W110	1 m	CM-11CN 	MR-34M/ MR-34L
				CMPR-W111	2 m		
				CMPR-W112	5 m		

Note: Cable-side connectors are not attached. Order required cables as shown in the table above.

1.3 MODEL 3 SPECIFICATIONS

The table below shows possible-use functions of model 3 compared with the basic system (model 0).

Table 1.2 Model 3 Specifications

Specification Items	Basic System (Model 0)	Extension System 3 (Model 3)
Type CMPR-FD ☐	B0 ☐	B3 ☐
Hardware	Basic section	Basic section + Optional board
Built-in PLC	Not available	Not available
Ladder PROM	Not available	By Yaskawa
Solid Tap	Not available	Not available
No. of Programs	Up to 16	Up to 32
No. of Program Blocks	Up to 1000	Up to 1000
Standard I/O	I/O = 24/24	I/O = 24/24
Additional I/O	Not available	I/O = 24/24
Interface between Modules	Not available	Available (Y-mode, T-mode)
Spindle Command	Analog reference ±10 V S-command available	Analog reference ±10 V S-command available
No. of Indirect Registers	R01 to R99	R01 to R99
Indirect Register Data Setting	Programmer	Programmer
External Data Setting	Not available	Not available
Coordinate Compensation	Provided (T1 to T9)	Provided (T1 to T9)
External Compensation	Not available	Not available
ALM History	Not available	Available
Wave form Monitor	Provided	Provided
Offset Counter I/F	Not available	Available
J3100 Personal Computer PP	Connectable	Connectable

1.4 TYPE DESIGNATION

1.4.1 Motionpack FD: CMPR-FD □B3□

NOMINAL CAPACITY

DESIGN REVISION ORDER

MODEL 3

Nominal Capacity	M Series	F Series	G Series	Remarks
05		USAFED-02CS	USAGED-02AS	• Use of same hardware and software. • Parameter setting for motor output and series.
	USAMED-03BS	USAFED-03CS	USAGED-03AS	
		USAFED-05CS	USAGED-05AS	
10	USAMED-06BS			Same as above
	USAMED-09BS	USAFED-09CS	USAGED-09AS	
15	USAMED-12BS	USAFED-13CS	USAGED-13AS	
20	USAMED-20BS	USAFED-20CS	USAGED-20AS	
30	USAMED-30BS	USAFED-30CS	USAGED-30AS	
44	USAMED-44BS	USAFED-44CS	USAGED-44AS	

1.4.2 Programmer

Motionpack FD Programmer: CMPR-PFD30 □

DESIGN REVISION ORDER

Motionpack FD PROGRAMMER

1.4.3 AC Servomotor

USAFED-05CS1□□

AC SERVOMOTOR

SERIES
- AM : M Series
- AF : F Series
- AG : G Series

ENCLOSURE
- E : Totally-enclosed, Self-cooled Type

MAGNET TYPE
- D : Ferrite
- F : Rare Earth

MOTOR OUTPUT*

DESIGN REVISION ORDER

DETECTOR
- S : 8192 pulses/rev (Absolute)

DRIVE END SPECIFICATION
- Blank : Standard
- O : Standard (With Brake)
- K : With Keyway
- S : With Oil Seal
- T : With Keyway & Oil Seal

SHAFT TYPE
- 1 : Taper
- 2 : Straight

OPPOSITE DRIVE END SPECIFICATION
- Blank : Standard
- B : With Brake (For M Series 44)
- E : With Brake (For M Series 03 to 30, F Series 02 to 44)

*

	M Series	F Series	G Series
02	—	0.15 kW	0.15 kW
03	0.3 kW	0.3 kW	0.3 kW
05	—	0.45 kW	0.45 kW
06	0.6 kW	—	—
08	—	—	—
09	0.9 kW	0.85 kW	0.85 kW
10	—	—	—
12	1.2 kW	—	—
13	—	1.3 kW	1.3 kW
15	—	—	—
20	2.0 kW	1.8 kW	1.8 kW
22	—	—	—
30	3.0 kW	2.9 kW	2.9 kW
37	—	—	—
44	4.4 kW	4.4 kW	4.4 kW

2. M-NET INTERFACE

I/O signals can be input/output through the serial port by M-NET interface. Since it takes some time to transmit signals through the serial port, signals that require a shorter time can be input/output through the normal I/O channels.

2.1 SPECIFICATIONS OF M-NET INTERFACE

Table 2.1 Specifications of M-NET Interface

Item	Specifications	
Transmission Method	Semi-double method	
Synchronization	Asynchronous method	
Transmission Distance	Up to 100 m (total)	
Bit Configuration	JIS 7-unit system 10-bit (Start 1, data 7, even parity 1, stop 1)	
Parity Check	Vertical parity detection (even parity) Horizontal parity detection (even parity)	
Signal Level	In accordance with EIA standard RS-422	
Transmission Cable*	JKEV-SB 0.75 sq.×2 (polyethylene insulation sequence cable with instrumentation paired copper braided shield)	
Internal Consumed Current (Vcc)	+ 5 V, 0.3 A/module	
Transmission Speed	9.6 kbps, 19.2 kbps, 31.2 kbps, 38.4 kbps	
Number of Connected Stations	Max 8 stations (master : 1, slave : 7)	
Transmission Mode	T mode	Y mode
Number of Discrete Transmission Points	256 points Input : 128 points Output : 128 points	256 points Input : 128 points Output : 128 points
Number of Register Transmission Points		14 sets Input : 7 sets Output : 7 sets
Parallel off Function †	Not provided	Provided

*: JKEV-SB (transmission cable specifications) is a standard of Japan Cable Industrial Association. The following shows the names for makers :
Sumitomo Denki Kogyo : DPEV-SB
Fujikura Densen : IPEV-SB
Furukawa Denki Kogyo : KPEV-SB

†: When transmission error is detected, master stations separate slave stations having the error, and continue transmitting with normal slave stations. Master stations gain access to separated slave stations every two cycles. Transmission is restarted after assuring normal return of slave stations.

2.2 DATA SIGNAL CONNECTION

(1) Data Signal Terminals (TM4)

Table 2.2 Data Signal Terminals

Terminal No.	Signal Name	Contents
TM4-1	+D	Data line (active high)
TM4-2	−D	Data line (active low)
TM4-3	SG	Signal line
TM4-4	FG	Frame grounding

(2) Terminators (SW)

The final slave station must be provided with termination processing of transmission lines by connecting the TERM terminal and 0 terminal.

Table 2.3 Terminators

No.	Signal Name	Contents
1	TERM	Terminator
2	0	0 V
3	Dmy	Dummy

(3) Connection

Connect the stations in the crossover method as shown below and perform TERM terminal processing for the final station.

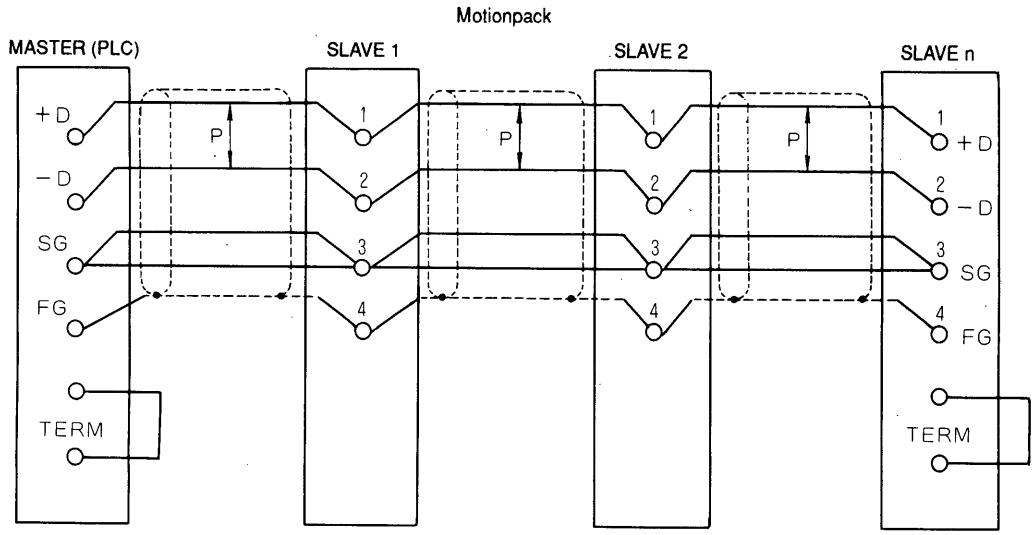


Fig. 2.1 Data Signal Connection

2.3 SETTING

(1) Parameter Setting

Set the Motionpack FD parameters.

Table 2.4 Parameter Setting

<table>
<tr><th>Pr. No.</th><th>Name (Range/Unit)</th><th>Change</th><th>Description</th></tr>
<tr><td>Pr150</td><td>M-NET Interface Setting</td><td>P</td><td>
Pr150 = □□
└-- Baud Rate Setting
<table>
<tr><th>Set Value</th><th>Baud Rate</th></tr>
<tr><td>0</td><td>4.8 kbps</td></tr>
<tr><td>1</td><td>9.6 kbps</td></tr>
<tr><td>2</td><td>19.2 kbps</td></tr>
<tr><td>3</td><td>38.4 kbps</td></tr>
</table>
└---- M-NET Interface Setting
<table>
<tr><th>Set Value</th><th>M-NET</th></tr>
<tr><td>0</td><td>Not provided</td></tr>
<tr><td>1</td><td>T-type</td></tr>
<tr><td>2</td><td>Y-type</td></tr>
</table>
EXAMPLE 1) Pr150 = 0 : M-NET not provided
EXAMPLE 2) Pr150 = 21 : Y-type provided
M-NET baud rate 9.6 kbps
</td></tr>
</table>

Table 2.4 Parameter Setting (Cont'd)

Pr. No.	Name (Range/Unit)	Change	Description
Pr151	Transmission Information Conditions	P	The following three conditions are set to Pr151. (1) No. of discrete input data transmission points (RSW1) (2) No. of discrete output data transmission points (RSW2) (3) No. of register data transmission points (RSW3) Pr151 is expressed in 5-decimal digit. Pr151 = □□□□□ RSW2 (0 to 15) RSW1 (0 to 15) RSW3 (0 to 7)

	RSW1	RSW2	
No.	DI (Point)	DO (Point)	No. of Connectable Slave Stations 1 2 3 4 5 6 7
0	0	0	
1	8	8	
2	16	16	
3	24	24	
4	32	32	
5	40	40	
6	48	48	
7	56	56	
8	64	64	
9	72	72	
10	80	80	
11	88	88	
12	96	96	
13	104	104	
14	120	120	
15	128	128	

	RSW3		
No.	RI (Point)	RO (Point)	No. of Connectable Slave Stations 1 2 3 4 5 6 7
0	0	0	
1	1	1	
2	2	2	
3	3	3	
4	4	4	
5	5	5	
6	6	6	
7	7	7	
8	Setting Error		

2.3 SETTING (Cont'd)

(2) Slave Setting

Set the slave numbers by the rotary switch on the additional board.

Table 2.5 Slave Setting

RSW No.	Slave No.	RSW No.	Slave No.
0	Default	8	Not used
1	Slave 1	9	Not used
2	Slave 2	A	Not used
3	Slave 3	B	Not used
4	Slave 4	C	Not used
5	Slave 5	D	Not used
6	Slave 6	E	Not used
7	Slave 7	F	Not used

Note : Do not use any other numbers than those mentioned above.

2.4 PARTS ARRANGEMENT AND FUNCTIONS

(1) Arrangement

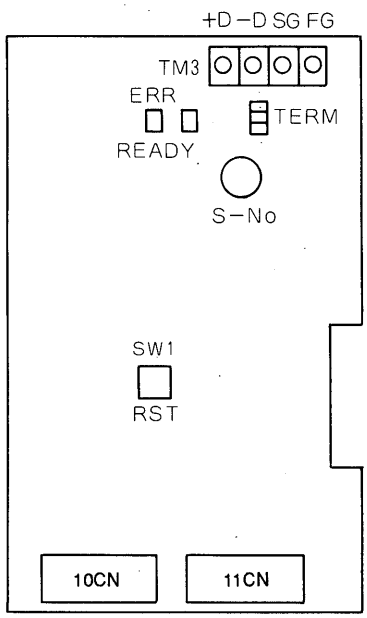


Fig. 2.2 Parts Arrangement

(2) Functions

Table 2.6 Parts Functions

	Type	Name	Contents
Display	LED	READY (green)	Indicates that M-NET interface is in the "READY" status.
		ERR (red)	Indicates that a transmission error occurs in M-NET interface.
Setting SW	Digital Rotary Switch	S-No	Sets a slave number of built-in sequencer [Refer to Par. 2.3 (2).]
RST	Pushbutton SW for reset	SW1	A transmission error of interface between modules can be reset.
SW	Short-circuit SW	TERM/0 V	Termination processing of transmission lines of M-NET interface. When TERM and 0 V are shortcircuited, a termination resistance is inserted.
Terminal/ connector	Terminal	TM3	For M-NET interface
	Connector	10CN 11CN	Connector for extended I/O 10CN : Input signal 11CN : Output signal

2.5 I/O SIGNAL ALLOCATION (M-NET)

(1) Input Signals

SVON	SERVO ON	# 42200
EDIT	EDIT Mode	
PLAY	PLAY Mode	
JOG	JOG Mode	to
JSPD	Plus Feed	
+JS	Minus Feed	
−JS	M Completion	
MFIN	Return to Home Position	# 42207
ZRN	Return to Home Position	# 42210
PGST	Program Start	
ERS	Error Reset	
PGSL1	Program Select 1	to
PGSL2	Program Select 2	
PGSL3	Program Select 3	
PGSL4	Program Select 4	
PGSL5	Program Select 5	# 42217
SBLK	Single Block	# 42220
+INC	+Incremental	
−INC	−Incremental	to
INC 8/9	INC T8/T9	
G34F	External Positioning Completion	# 42224

(2) Output Signals

MRDY	MP Ready Completion	# 43200
SALM	System Alarm	
BALM	Battery Alarm	
M30	Automatic Operation Completion	to
STL	In Operation	
PSW1	Zone Signal 1	
PSW2	Zone Signal 2	
PSW3	Zone Signal 3	# 43207
M50	M Code BCD 1ST-digit D0	# 43210
M51	M Code BCD 1ST-digit D1	
M52	M Code BCD 1ST-digit D2	
M53	M Code BCD 1ST-digit D3	to
M58	M Code BCD Strobe	
INCD	±Incremental Completion	
OFR	Offset Amount 0	
OFM	Offset Amount 0 ± Max Approach	# 43217
M54	M Code BCD 2ND-digit D0	# 43220
M55	M Code BCD 2ND-digit D1	
M56	M Code BCD 2ND-digit D2	
M57	M Code BCD 2ND-digit D3	to
G34	External Positioning Completion	
EPALM	External Positioning Alarm	
CLD	Current Limit	
PSW4	Zone Signal 4	# 43227

2.6 FUNCTIONS OF I/O SIGNALS

2.6.1 Input Signals

Table 2.7 Input Signals

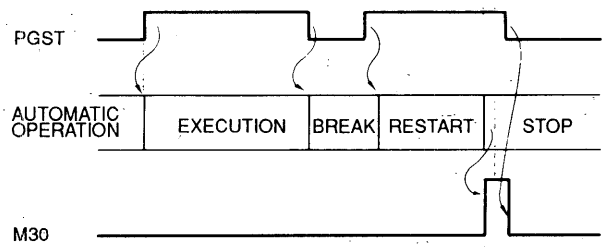
No.	Mode	Function	Connector Pin No.
1	Edit Mode (EDIT)	Sets Motionpack controller in EDIT mode with EDIT signal ON, and permits programming and setting of parameter by programmer. Servo clamp operation continues even in EDIT mode.	3CN-26
2	Play Mode (PLAY)	Permits automatic operation. When EDIT mode signal is turned on while PLAY mode signal is ON, edit mode signal takes precedence. When other mode signals are turned on at the same time, the priority order of modes is : EDIT, HANDL, JOG, AUTO.	3CN-5
3	Single Block (SBLK)	When single-block signal is turned on during automatic operation mode, the mode is changed to single-block operation. In this mode, one block of selected program is executed every time PGST signal is turned on. At M30 execution, the program is returned to the head blocks and executes one block.	3CN-29
4	Alarm Reset (ERS)	Turning on ERS signal resets alarm; however, some major alarms cannot be reset.	3CN-10
5	Program Start (PGST)	Starts program execution when PGST signal is turned on. Turning off the signal causes feed-hold state and turning on again restarts operation. Turn the signal off after program completion M30 signal is turned on. 	3CN-18

Table 2.7 Input Signals (Cont'd)

No.	Mode	Funciton	Connector Pin No.
6	Program Select 1 (PGSL1) Program Select 2 (PGSL2) Program Select 3 (PGSL3) Program Select 4 (PGSL4) Program Select 5 (PGSL5)	Turn on PGSL signal and wait at least 35 msec before turning on PGST signal. The following table shows the head blocks of program selected by combination of PGSL 1 to 5. Jump command to each block executes each program.	3CN-30 3CN-9 3CN-20 3CN-31

PGSL1	PGSL2	PGSL3	PGSL4	PGSL5	Head Blocks
0	0	0	0	0	000
1	0	0	0	0	001
0	1	0	0	0	002
1	1	0	0	0	003
0	0	1	0	0	004
1	0	1	0	0	005
0	1	1	0	0	006
1	1	1	0	0	007
0	0	0	1	0	008
1	0	0	1	0	009
0	1	0	1	0	010
1	1	0	1	0	011
0	0	1	1	0	012
1	0	1	1	0	013
0	1	1	1	0	014
1	1	1	1	0	015
0	0	0	0	1	016
			⋮		≈
1	1	1	1	1	031

2.6.1 Input Signals (Cont'd)

Table 2.7 Input Signals (Cont'd)

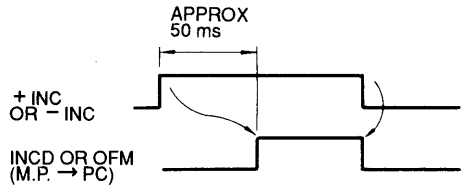
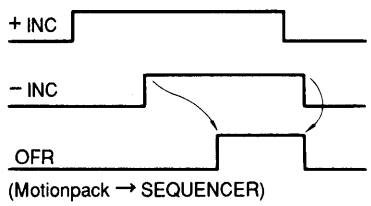
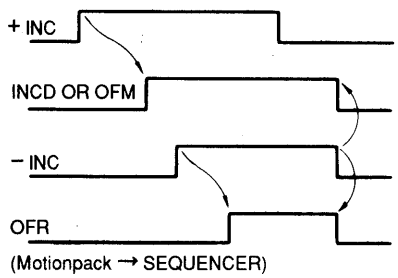
<table>
<tr><th>No.</th><th>Mode</th><th>Function</th><th>Connector Pin No.</th></tr>
<tr><td>7</td><td>M Completion
(M FIN)</td><td>The signal that clears the M decode outputs (M50-M59) and advances the program to the next block. When signal M FIN turns on, the M decode outputs are cleared. When M FIN turns off after that, the program of the next block is executed.</td><td>3CN−8</td></tr>
<tr><td>8</td><td>Jog Mode
(JOG)</td><td>Turning on JOG signal starts jog mode when EDIT and HANDL signals are OFF.
When a JOG signal is received (turned on) during HANDL or AUTO operation, the motion decelerates to a stop. During AUTO operation, the program block under execution is cleared and the program is changed to JOG mode. Also, output signals change as follows :

(1) The following output signals are turned off.
(a) In-operation (STL)
(b) M decodes (M50−M58)
(c) External positioning alarm (EPALM)
(d) External positioning alarm (G34)
(e) Automatic operation completion (M30)
(f) NC alarm (excess stored limit only)

(2) The following output signals maintain their states.
(a) Motionpack ready (MRDY)
(b) Battery alarm (BALM)</td><td>3CN−16</td></tr>
<tr><td>9</td><td>Jog Speed
(JSPD)</td><td>The functions vary as follows, depending on whether Motionpack is in JOG or HANDL mode.

<table><tr><th rowspan="2">JSPD</th><th>JOG Mode</th><th>HANDL Mode</th></tr><tr><th>JOG Speed*</th><th>Pulse Multiplication Factor</th></tr><tr><td>OFF</td><td>Low</td><td>× 1</td></tr><tr><td>ON</td><td>High</td><td>× 100</td></tr></table>* JOG speed is set by parameters :
Pr 1 − Low
Pr 2 − High</td><td>3CN−6</td></tr>
</table>

Table 2.7 Input Signals (Cont'd)

No.	Mode	Function	Connector Pin No.
10	+ Incremental (+INC) − Incremental (−INC)	When one of these signals is turned on, an increment (set with parameter Pr20 or 22) will be added to (or subtracted from) the offset register corresponding to the coordinate system specified by INC 8/9. This is executed in AUTO mode and not during travel. If +INC and −INC turn on simultaneously, offset register will be cleared to zero. An offset +/−max signal (OFM) will be output if the contents of offset register are equal to or greater than offset +/− max (set with parameter Pr21 or 23) after addition to the tool offset register by +INC or −INC or otherwise a +/− increment end signal (INCD) will be output.  If +/− incremental commands are ON simultaneously, offset register will be cleared to zero with offset zero signal (OFR) output. (1) When +INC turns on before the end signal (INCD or OFM) of +INC is output :  (2) When −INC turns on after completion signal of +INC is output :  	3CN−21 3CN−32

2.6.1 Input Signals (Cont'd)

Table 2.7 Input Signals (Cont'd)

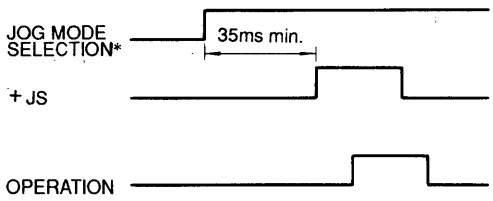
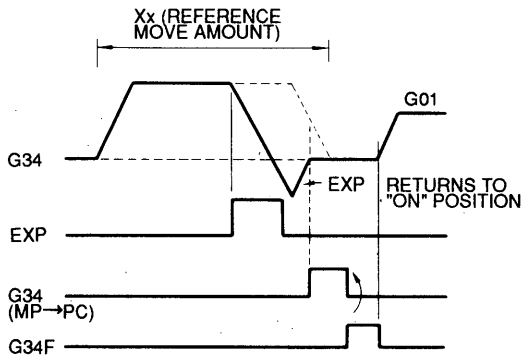
No.	Mode	Function	Connector Pin No.
11	INCT$_8$/T$_9$ (INC8/9)	These signals specify coordinates for compensation (T$_8$ or T$_9$) by +INC or −INC. INC8/9 = OFF → Specifies T$_8$. INC8/9 = ON → Specifies T$_9$.	3CN−11
12	+JOG (+JS)	Commands the machine to move in the plus direction in JOG mode. While +JS signal is ON, the machine slide moves in the plus direction, through the distance set by JOG speed (JSPD). Turning off the signal decelerates the machine to a stop. (TIMING)  * Turn on +JS at least 35 ms after JOG mode and JOG speed have been selected. While automatic operation is executed, +JS is disregarded.	3CN−17
13	−JOG (−JS)	The same as for +JOG operation mode except for movement in minus direction.	3CN−28
14	Return to Home Position (ZRN)	When ZRN signal is turned on, functions under execution are immediately interrupted to make positioning at waiting position (defined by Pr). When ZRN signal is turned off during the operation, deceleration to stop is performed. Quick-return is valid for AUTO and JOG modes. Quick-return speed is defined by Pr73. In ABS-PG automatic home position setting-up method, when ZRN signal turns on after setting Pr78 = 1, PG home position setting-up is started.	3CN−7

Table 2.7 Inut Signals (Cont'd)

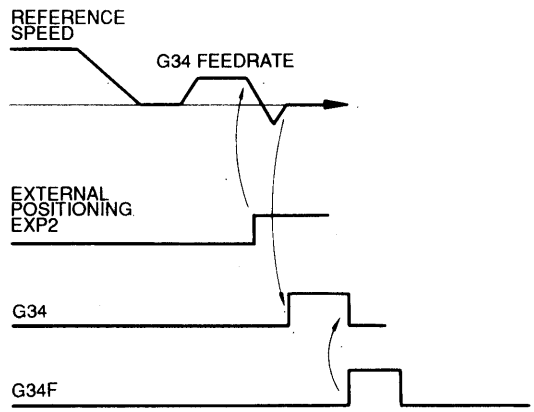
No.	Mode	Function	Connector Pin No.
15	External Position Completion (G34F)	FIN signal that clears the "external positioning end" output signal (G34) of the Motionpack and advances the program to the next block. If an external positioning alarm signal (EPALM) is output from the Motionpack, G34F input clears the signal EPALM. When G34F turns OFF, the program advances to the next block.  Note : Response delay from EXP2 "ON" to "ON" position memorized is 50 μs.	3CN−8
16	Servo ON (SVON)	SVON signal enables servo clamp to turn on/off. (S/ON) = ON → Servo clamp ON (S/ON) = OFF → Servo clamp OFF When servo clamp is unavailable by turning off SVON signal, Motionpack ready completion (MRDY) turns off. When "Pr39 = 1" is set, MRDY signal does not turn off if the conditions are satisfied (except "SVON signal = OFF").	3CN−12

2.6.2 Output Signals

Table 2.8 Output Signals

No.	Mode	Function	Connector Pin No.
1	Controller Ready Completion (MRDY)	This signal indicates Motionpack FD ready completion. MRDY = (Controller RUN) · (Controller operation mode) · (S / ON = ON) · (Servo main circuit power ON) · ($\overline{\text{System alarm}}$) · (Absolute value data read-in completion) When all of the above conditions are satisfied, the controller ready is completed.	4CN−26
2	System Alarm (SALM)	Alarm output of the Motionpack FD system. The datails of alarm are indicated by programmer. The error reset signal ERS resets SALM.	4CN−5
3	Range Signal 1 (PSW1)	PSW signal is output in the range set by parameter. This mode consists of four signals (PSW 1 to 4). Each of four areas are set individually with parameter. PSW signal is output after completion of absolute value data read-in whether program is executed or not.	4CN−32
4	Range Signal 2 (PSW2)	PSW signal is output in the range set by parameter. This mode consists of four signals (PSW 1 to 4). Each of four areas are set individually with parameter. PSW signal is output after completion of absolute value data read-in whether program is executed or not.	4CN−11
5	Range Signal 3 (PSW3)	PSW signal is output in the range set by parameter. This mode consists of four signals (PSW 1 to 4). Each of four areas are set individually with parameter. PSW signal is output after completion of absolute value data read-in whether program is executed or not.	4CN−22
6	Range Signal 4 (PSW4)	PSW signal is output in the range set by parameter. This mode consists of four signals (PSW 1 to 4). Each of four areas are set individually with parameter. PSW signal is output after completion of absolute value data read-in whether program is executed or not.	4CN−33

Table 2.8 Output Signals (Cont'd)

No.	Mode	Function	Connector Pin No.
7	In Operation (STL)	STL indicates that Motionpack FD 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 Mode has changed. ② Execution of M30 has been completed. ③ Emergency stop has occurred.	4CN−16
8	External Positioning Completion (G34)	The external positioning command (G34) causes the machine to decelerate to a stop, when the external positioning signal (EXP) 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. 	4CN−28

2.6.2 Output Signals (Cont'd)

Table 2.8 Output Signals (Cont'd)

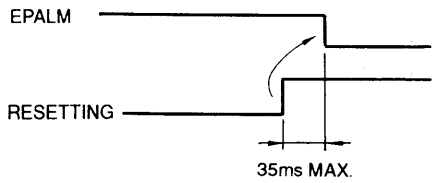
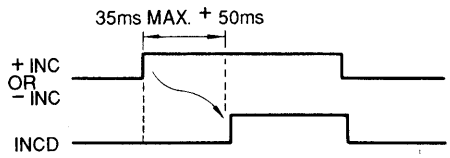
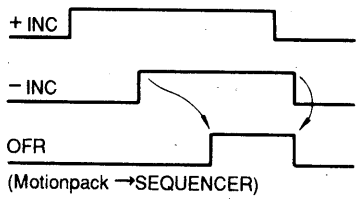
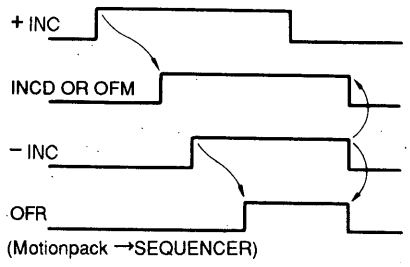
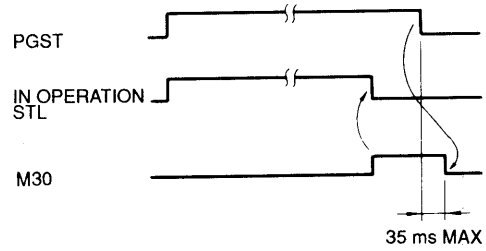
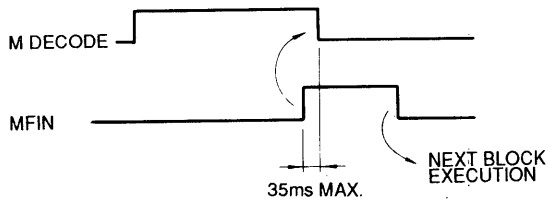
No.	Mode	Function	Connector Pin No.
9	External Positioning Alarm (EPALM)	EPALM is the alarm signal of external positioning (G34 command). It turns ON under any of the following conditions: ① EXP does not turn ON when the position designated with X (U) of a G34 command has been reached. ② If EXP or G34F is already ON, and the signal which is ON has not turned OFF within 2 seconds after a G34 command has started execution. EPALM is reset under any of the following conditions: ① The G34F signal has turned ON. ② Mode has changed. ③ The new program has started. 	4CN−7
10	±Incremental Command Completion (INCD)	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. 	4CN−27

Table 2.8 Output Signals (Cont'd)

No.	Mode	Function	Connection Pin No.
11	Offset Amount Reset (OFR)	If +/− incremental commands turn ON simultaneously, the offset register will be cleared to zero and an offset amount register 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 M50 to 58 turns on according to the M function command executed. It is reset when the M end signal (M FIN) turns ON.	4CN−6
12	Offset Amount ±Max Approach (OFM)	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" in page 24.	4CN−17

2.6.2 Output Signals (Cont'd)

Table 2.8 Output Signals (Cont'd)

No.	Mode	Function	Connection Pin No.
13	Automatic Operation Completion (M30)	M30 turns ON when a program end command (M30) has executed in programmed operation. It is reset when a program start signal (PGST) turns OFF. 	4CN−12
14	M50 M51 M52 M53 M54 M55 M56 M57 M58	Proper decodes of M50 to M58 are turned on by execution of M function command. M completion signal (M FIN) is turned on to reset. 	4CN−18 4CN−29 4CN−8 4CN−19 4CN−30 4CN−9 4CN−20 4CN−31 4CN−10
15	Battery Alarm (BALM)	BALM turns ON when the voltage of the memory backup and absolute encoder battery have fallen below a certain level. Replace the battery within 30 days. BALM signal cannot be reset by ERS signal. Also, even if the alarm signal is output, the operation of Motionpack is not affected.	4CN−34
16	Current Limit (CLD)	CLD signal is ON while motor load current exceeds set current limit value.	

3. INPUT SIGNALS FOR SKIP AND EXTERNAL POSITIONING

3.1 WIRING SIGNALS

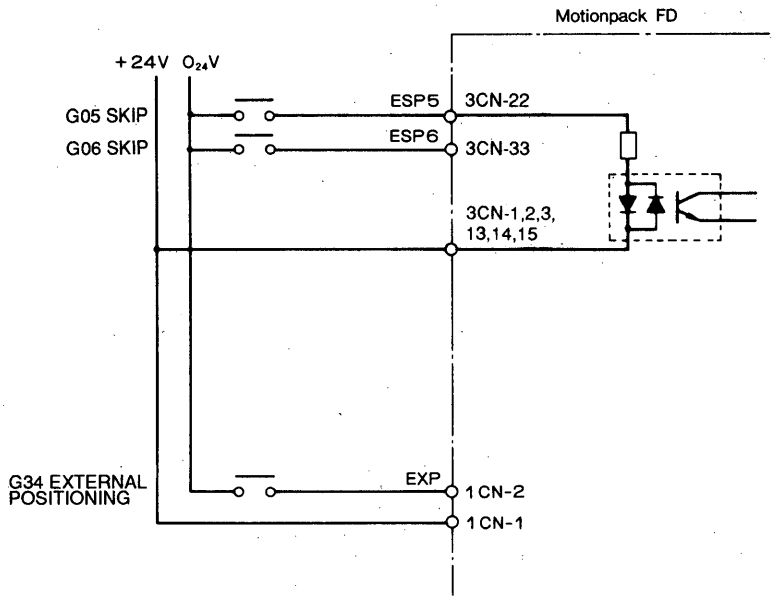


Fig. 3.1 Wiring Signals

3.2 SIGNAL FUNCTIONS

Table 3.1 Signal Functions

No.	Name	Functions
1	External Skip 5 (ESP5)	If ESP5 turns ON during feed with a G05 command, the tool decelerates to a stops then goes to the next block.
2	External Skip 6 (ESP6)	Skip signal for G06.
3	External Positioning (EXP)	Positioning signal for G34 and G35. The external positioning command (G34) causes the machine to decelerate to a stop, when the external positioning signal (EXP) turns ON, and to return to the position at which EXP turned ON. G35 makes position according to the position at which external positioning signal (EXP) turned ON when the EXP turns ON.

4. SPINDLE DRIVER WIRING

4.1 WIRING DIAGRAM

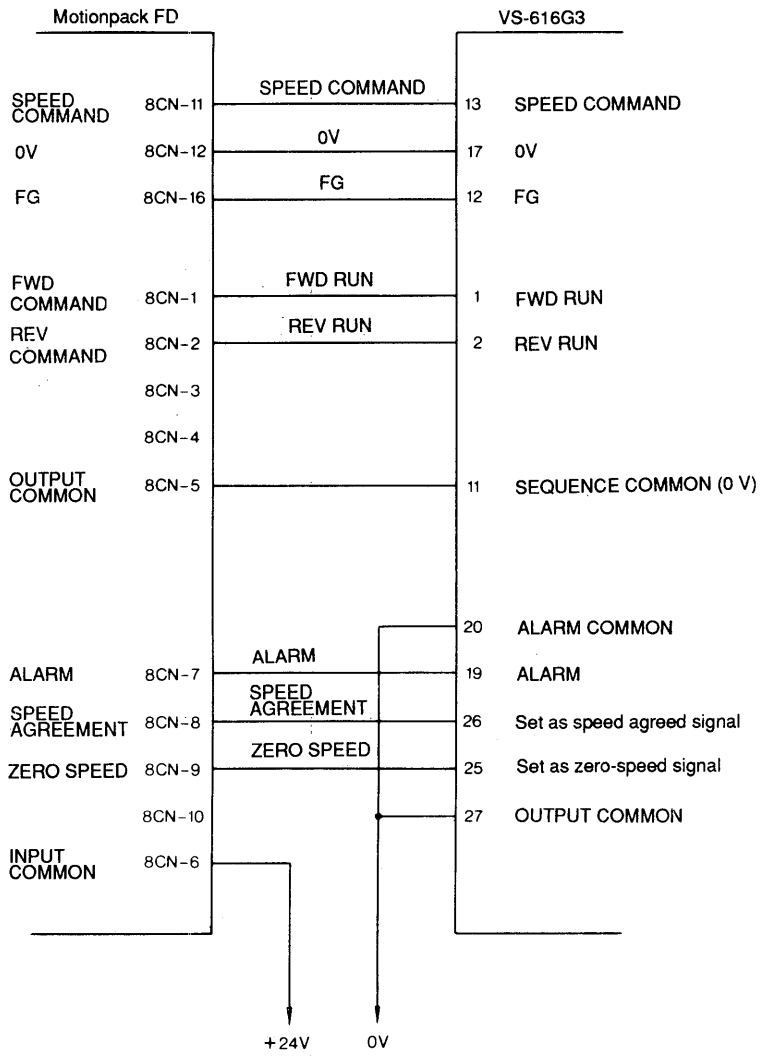


Fig. 4.1 Wiring Diagram

5. CONNECTION WITH OFFSET COUNTER CP-601D

5.1 WIRING DIAGRAM

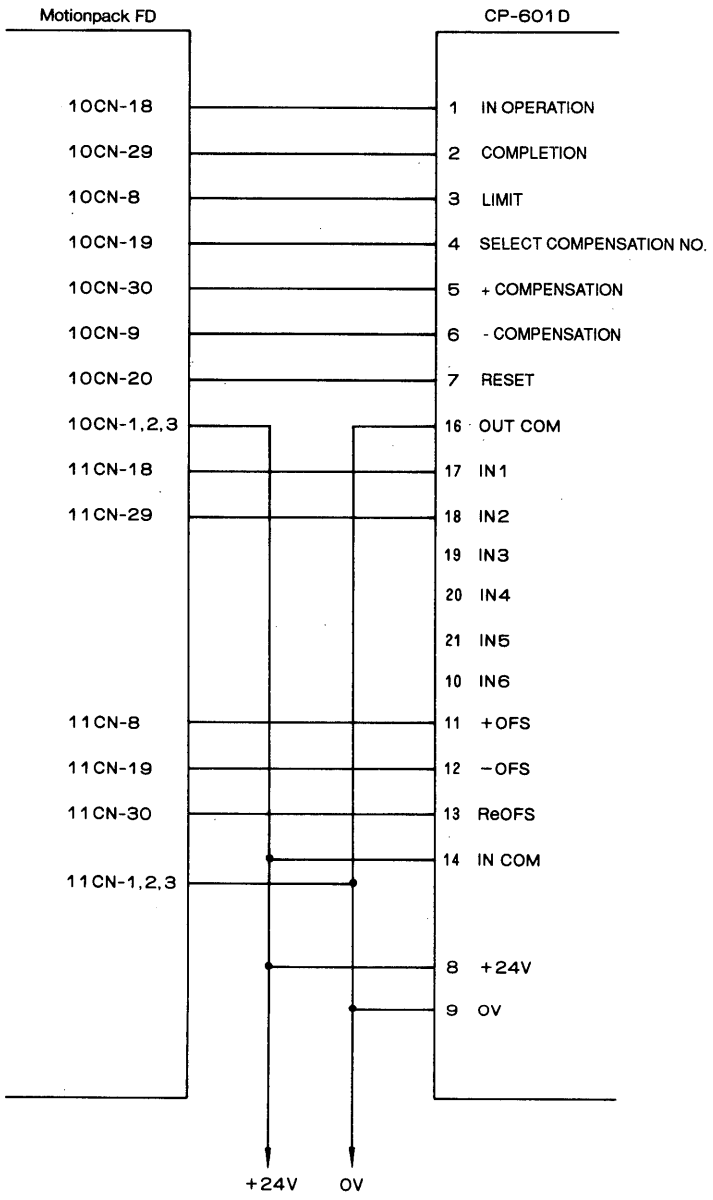
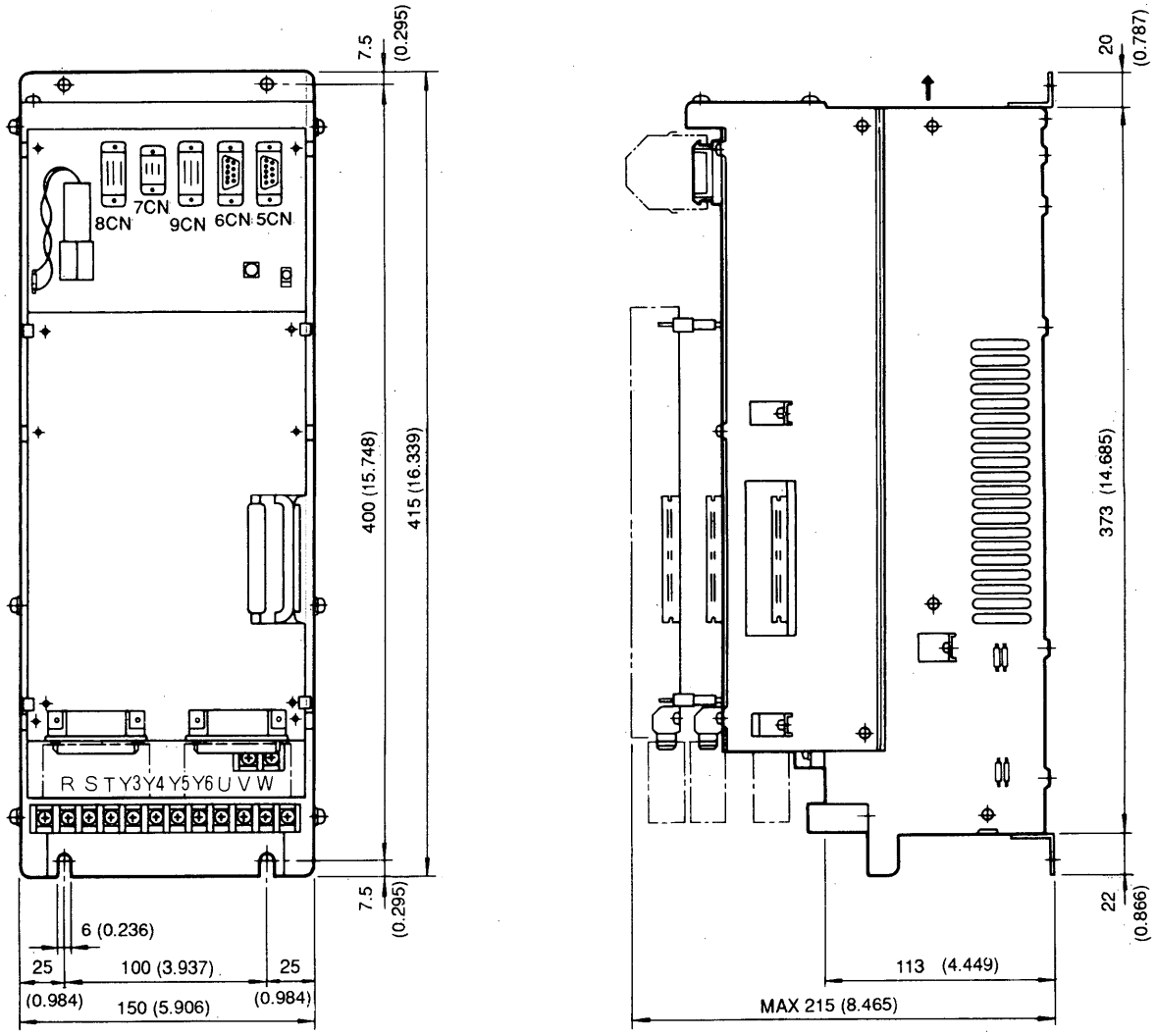


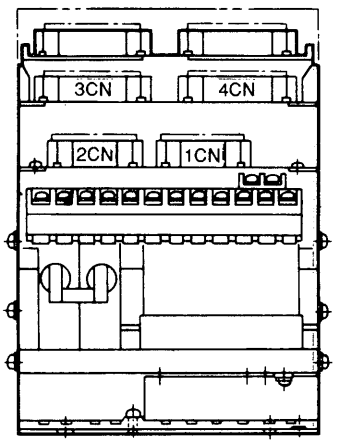
Fig. 5.1 Wiring Diagram

6. EXTERNAL DIMENSIONS in mm (inches)

The figures show the external dimensions of controller and programmer. See the manual of model 0 (No. SIE-C883-1.1) for motor external dimensions.

6.1 CONTROLLER





Approx Weight (kg)

FD05 ~ 15B3	FD20B3	FD30B3	FD44B3
7.6	8.8	9.2	9.5

Fig. 6.1 Controller (Type:CMPR-FD05 to -44B3)

6.2 PROGRAMMER

Type: CMPR-PFD30 Dimensions in mm (inches)

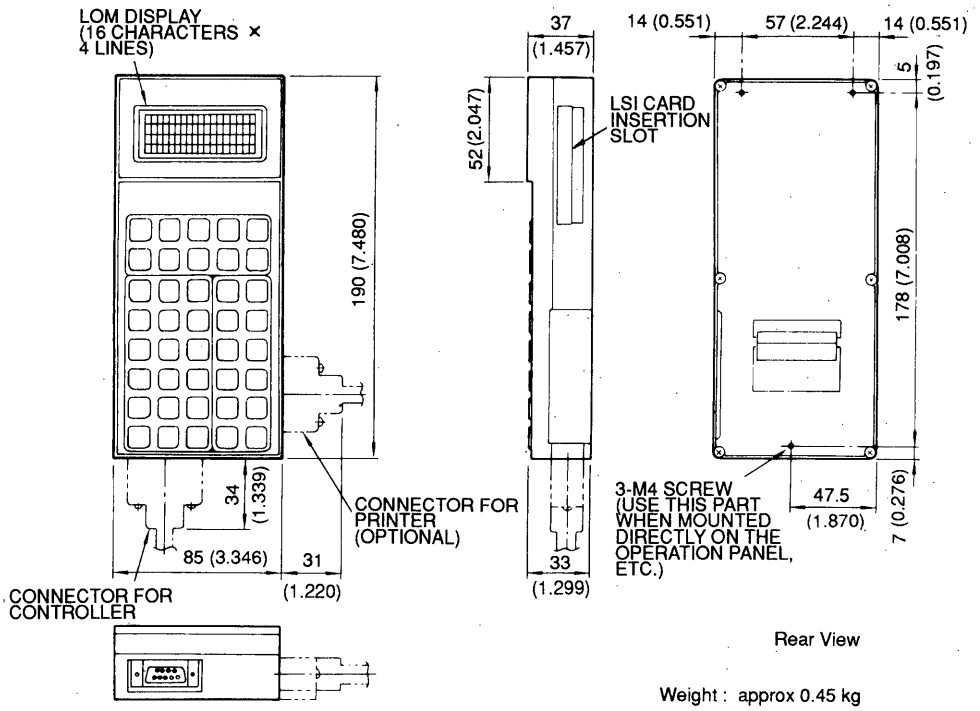


Fig. 6.2 Programmer

APPENDIX COMPARISON OF Motionpack FD AND Motionpack-34
(CHARACTERISTICS, FUNCTIONS)

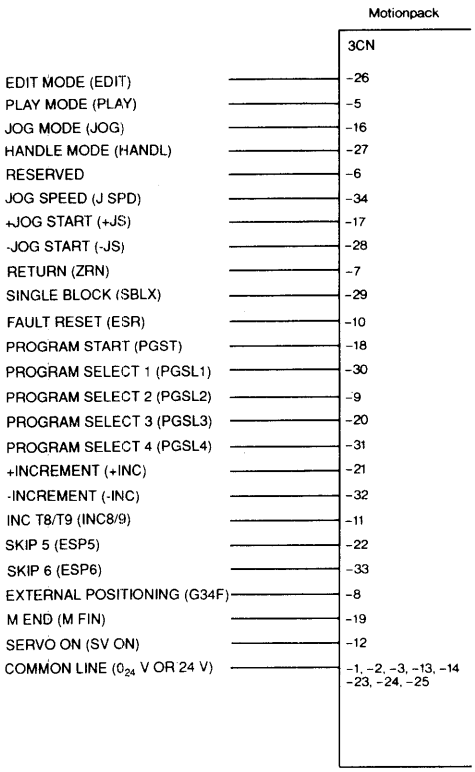
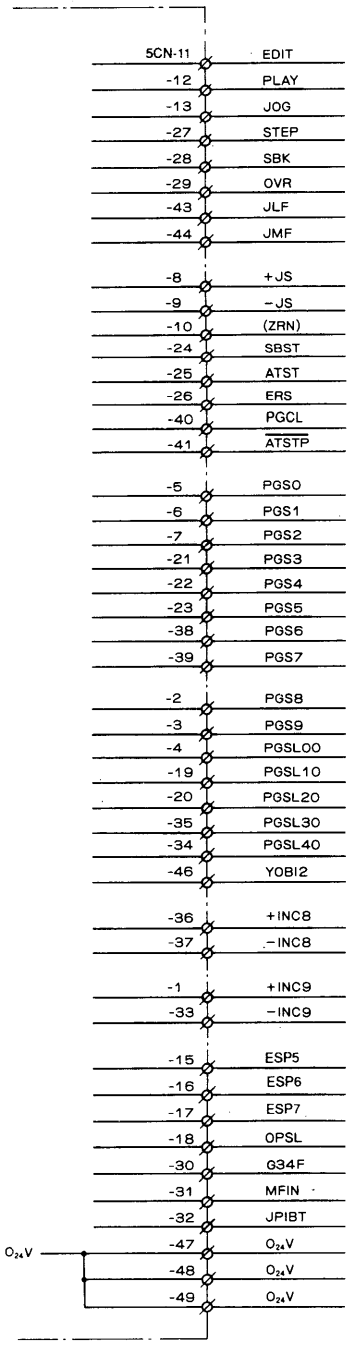
No.	Item	Motionpack FD	Motionpack-34
1	Configuration	Controller, servo incorporated	MP-34 controller (CMPC-CM34C) +Servopack (CACR-SR ☐ TZ6S ☐) +servomotor (USAMED-☐ MS1) Controller, Servopack provided separately
2	Applicable Motor	Servomotor with absolute encoder (new model) M series (USAMED-☐ BS1) F series (USAFED-☐ CS1) G series (USAGED-☐ AS1) Conventional model servomotor with absolute encoder can be driven.	Servomotor with absolute encoder M series (USAMED-☐ MS1) F series (USAFED-☐ FS1)
3	Encoder	8192 p/rev, absolute encoder, 3.6 V battery backup	8192 p/rev, absolute encoder, 3.6 V battery backup
4	Programmer	Exclusive-use programmer CMPR-PFD30 Personal computer J-3100 (under development)	Exclusive-use programmer CMPF-PM33F Personal computer J-3100
5	Holding Brake	Holding brake control signal provided. Brake power supply should be provided by user.	Brake controller and its power supply built in Servopack.
6	Environment	Operation temperature : 0 to +55℃ Storage temperature : −20 to +85℃ Humidity : 90% RH or less (non-condensing) Atmosphere : Free from corrosive gases, dust or metallic powder	Operation temperature : 0 to +55℃ Storage temperature : −20 to +85℃ Humidity : 25 to 95% RH (controller) } Non- 90% RH or less (Servopack) } condensing Atmosphere : Free from corrosive gases, dust or metallic powder
7	Number of Axes	One axis + spindle (reference)	One axis
8	Position Reference Value	Signs + decimal 8 digits	Signs + decimal 7 digits
9	Speed Reference Value	Decimal 5 digits	Decimal 5 digits
10	Max. Pulse Speed	4 Mpps (after multiplied by 4)	600 kpps (after multiplied by 4)

(Cont'd)

No.	Item	Motionpack FD	Motionpack-34
11	Torque Limit	10 to 400% of rated torque can be set. However, it is limited by either applicable servomotor maximum torque value or programmed limit value that is smaller.	10 to 250% of rated torque
12	Automatic Accel/Decel Control	Linear accel/decel, S-curve accel/decel	Linear accel/decel
13	Coordinate Home Position Matching	① Full-automatic setup method (stopper applied) ② Semi-automatic setup method	① Full-automatic setting method ② Semi-automatic setting method ③ Manual setting method
14	Program	Up to 32 (1000 blocks)	Up to 40 (400 blocks)
15	Operation Mode	① EDIT mode ② JOG mode ③ HANDL mode ④ AUTO mode ⑤ SET UP mode No STEP mode provided.	① EDIT mode ② JOG mode ③ STEP mode ④ HANDL mode ⑤ AUTO mode
16	Overtravel	Soft stroke limit	Soft stroke limit
17	Coordinate System	T_0 to T_9 T_0 : ABSO-PG coordinate + home position offset T_1 to T_7 : Set by G52 command T_8, T_9 : G52 command and compensation T_1 to T_9 : Preset by programmer	T_0 to T_9 T_0 : ABSO-PG coordinate + home position offset T_1 to T_7 : Set by G52 command T_8, T_9 : G52 command and compensation T_1 to T_9 : Preset by programmer
18	Compensation Function (T_8, T_9)	① Compensation Parameters × number of compensation signals ② Compensation by external compensation data input	① Compensation parameters × number of compensation signals ② Compensation by external compensation data input
19	Zone Signal	① 4 signals (PSW1 to PSW4) : 4 zones can be set individually by each signal.	① Basic function : 2 signals, total 4 zones ② Extensive function A : 4 signals (PSW1 to PSW4) 4 zones can be set individually by each signal ③ Extensive function B : Same as A. Only allocated signal lines are different.
20	Spindle Reference	Analog reference : ±10 V Digital signals : I/O = 4/4	Not provided.

APPENDIX COMPARISON OF Motionpack FD AND Motionpack-34 (Cont'd)

(Cont'd)

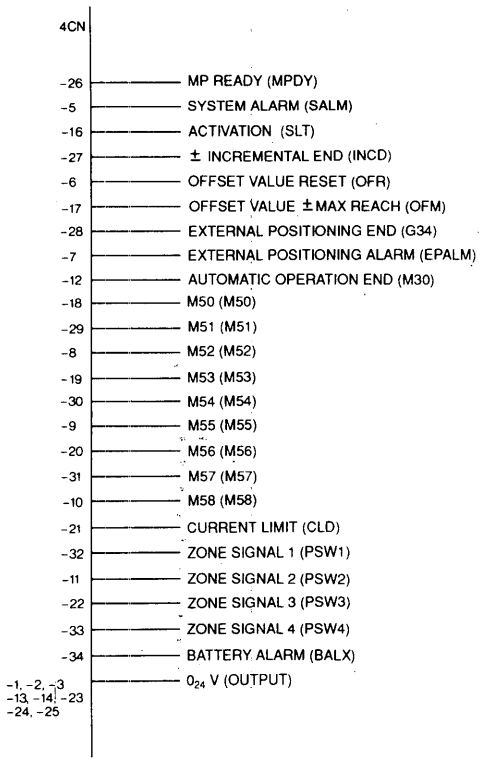
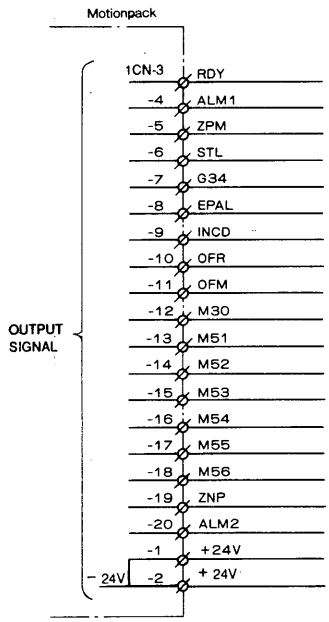
No.	Item	Motionpack FD	Motionpack-34
	Digital Input Signal	Serial input by M-NET interface is possible. (See the below for signal names and connector disposition for individual input.)	Individual Input
21	Signal List		

(Cont'd)

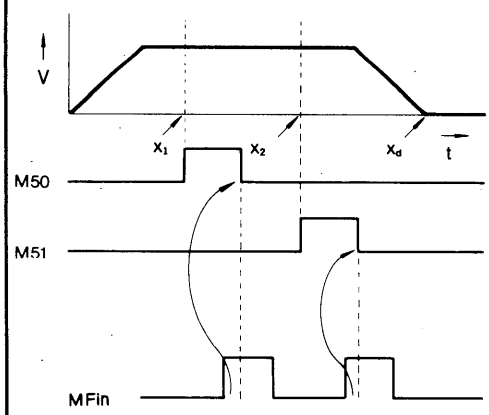
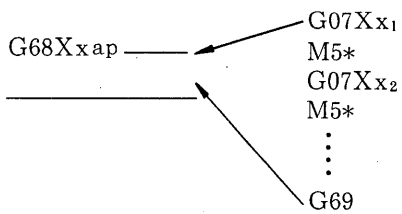
No.	Item	Motionpack FD	Motionpack-34
21	Signal Specifications (Cont'd)	5 mA at 24 VDC ON, 1 μA at OFF Power supply provided separately 0 V common (sink), + 24 V common (source) selectable	5 mA at 24 VDC ON, 1 μA at OFF Power supply provided separately 0 V common (sink current) type
22	JOG Mode	① Signal Mode : JOG ON Speed : One speed is specified among two steps by JSPD ON/OFF Run : During +J/S or −J/S ON ② Speed : Parameter setting Low/high speed (2-step)	① Signal Mode : PLAY, JOG ON Speed : One speed is specified among three steps by JLF, JMF . Run : During +J/S or −J/S ON ② Speed : Parameter setting Low/medium/high speed (3-step)
23	HANDL Mode	① Signal Mode : JOG ON Multiplication : × 1 or 100 selected by JSPD. Speed reference run : Motor stops immediately when HANDL is stopped by Pr5 = 1.	① Signal Mode : PLAY, JOG, STEP ON Multiplication : × 1, × 10 or × 100 selected by JLF, JLM, Speed reference run : Not possible
24	Single-block Operation	Single-block operation executed by program start (PGST) ON at signal-block (SBLK) ON.	Single-block operation executed by sing le-block start (SBST) in the signal-block mode (SBK ON).
25	Automatic Operation	① Mode : PLAY ON EDIT JOG ② Start by program start (PGST) ON after program select PGSL* ON. ③ Program selection One block among 0 to 15 is specified by PGSL. JUMP/head block designation is set to 0 to 15 blocks.	① Mode : PLAY ON EDIT JOG STEP ② Start by program PGS* ON after program select PGSL* ON ③ Program block selection Selected by start block ** 0 in code of PGS* and PGSL**.
26	Compensation	① T_8 coordinate : INC T_8/T_9 : OFF ② T_9 coordinate : INC T_8/T_9 : ON +INC/−INC	① T_8 coordinate : +INC8/−INC8 ② T_9 coordinate : +INC9/−INC9
27	Skip	① G05, G06 ② ESP5, ESP6	① G05, G06, G07 ② ESP5, 6, 7
28	Speed Limit	Not provided.	Speed limit signal (OVR) ON creep speed Pr10

APPENDIX COMPARISON OF Motionpack FD AND Motionpack-34 (Cont'd)

(Cont'd)

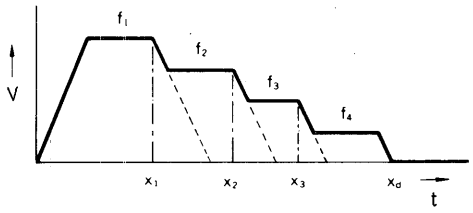
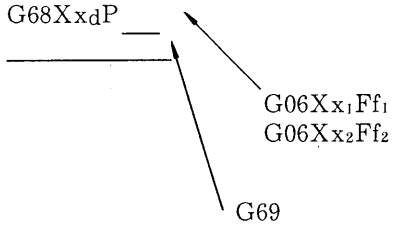
No.	Item	Motionpack FD	Motionpack-34
29	Feed-hold	① Program starts during automatic operation. ② Operation restarts by turning on PGST again.	① PGS* or ATST is turned off during automatic operation. ② Operation restarts by turning ON PGS* or ATST again. ③ Feed-hold is also enabled by turning off ATSTP during automatic operation. In this case, operation restarts by turning off and then on ATST or PGS .
30	Program Clear	Program is cleared when PGSL* changes after feed-hold.	PGCL ON after feed-hold
31	Digital Input Signal	Serial input by M-NET interface is possible.(See the below for signal names and connector disposition for individual input.)	Individual Input
	Signal List		
	Signal Specifications	24 VDC 50 mA (sink) Surge suppressor required for output protection.	24 VDC 100 mA (sink) Surge suppressor required for output protection.

(Cont'd)

No.	Item	Motionpack FD	Motionpack-34
32	Positioning	G01X____ F____ I____S U____ Spindle reference and feeding interlock not provided. Spindle reference is modal.	G01X____ F____ I____ U____ Spindle reference : Not provided.
33	Skip Positioning	G05X____ F____ I____S U____ Spindle reference provided. Spindle reference is modal. Spindle reference and feeding interlock not provided. Reference discharging stops during torque limit. G05 : ESP5 G06 : ESP6	G05X____ F____ I____ U____ Spindle reference : Not provided. Reference destribution stops during torque limit. Relation with skip signals G05 : ESP5 G06 : ESP6 G07 : ESP7
34	Positioning with Passing Signal Output	Specified by G07. Signal output position is specified by G12. G07X x_d F____ I____ G12X x_1 F____ I____ M50 G12X x_2 F____ I____ M51 ⋮  	For extensive functions, parameter designation is premised. Specified by G07 and M in subprogram in accordance with end point position subprogram call (G68). 

APPENDIX COMPARISON OF Motionpack FD AND Motionpack-34 (Cont'd)

(Cont'd)

No.	Item	Motionpack FD	Motionpack-34
35	Speed Profile Positioning	Specified by G08. Variable speed points and speed are specified by G12. G08X xd G12X x_1 Ff_1 Ii G12X x_2 Ff_2 G12X x_3 Ff_3 G12X xd Ff_4  	For extensive functions, parameter designation is premised. Variable speed and speed are specified by G06 in subprogram in accordance with end point position designation subprogram call (G68). G68XxdP___ 
36	External Positioning	G34 X____ F____ I____ U____ When EXP signal is turned on during positioning, positioning is performed at that position.	G34 X____ F____ I____ U____ When EXP signal is turned on during positioning, positioning is performed at that position.
37	Secondary External Positioning	G35 X____ F____ I____ U____ Operation keeps being performed until EXP signal is turned on. When EXP signal is turned on, positioning is performed at the programmed position with the position (where EXP signal is turned on) as a reference.	For extensive functions, parameter designation is premised. G34 X____ F____ I____ U____ Operation keeps being performed until EXP signal is turned on. When EXP signal is turned on, positioning is performed at the programmed position with the position (where EXP signal is turned on) as a reference.
38	S-curve Accel/Decel Positioning	Positioning command (G01, G05, G06, G34, G35) between G10 and G11 is for S-curve accel/decel. G10 G01 X____ F____ I____ ← S-curve accel/decel G11 S-curve is set by parameter.	Parameter setting is necessary because this is an extended function. G35 X____ F____ I____ U____ S-curve is set by parameter.

(Cont'd)

No.	Item	Motionpack FD	Motionpack-34
39	Time Waiting	G04D____	G04D____
40	In-position Waiting	G04	G04
41	Coordinate Setting	G52	G52
42	Coordinate Change	G53	G53
43	Reach Check	G67	G67
44	Subprogram Call Repeating Number Designation	G68L____P____ L = 1 to 99	G68L____P____ L = 1 to 9
45	End Point Position Designation Subprogram Call	G68X____P____ U____	G68X____P____ U____
46	Single Jump	G69P____	G69P____
47	Subprogram Return	G69	G69
48	Spindle Designation	S+____ : Forward run S−____ : Reverse run Output signal Pr91 = 0 S+____ : +voltage analog reference Forward run command signal ON S−____ : −voltage analog reference Reverse run command signal ON Pr91 = 1 S+____ : +voltage Operation signal ON S−____ : −voltage Operation signal ON	Not provided.
49	Auxiliary Function	M50 to M58 ① Pr101 = 0 Single signal output ② Pr101 ≠ 0 Encoded M output M40 to M89	M51 to M56

APPENDIX COMPARISON OF Motionpack FD AND Motionpack-34 (Cont'd)

(Cont'd)

No.	Item	Motionpack FC	Motionpack-34
50	Program End	M30	M30
51	Ineffective Command	NOP	Not provided.
52	Angle Indexing	Not provided.	Extended function
53	Clamp Free	SV-ON signal is turned on.	Extended function
54	G67 Jump Prohibit	Not provided.	Extended function
55	Activation Single Extensive Function	Not provided.	Extended function
56	Program Select Signal Encoding	Not provided.	Extended function
57	External Data Setting	Provided. External data : Set in R**.	Extended function External data : Set in Pr2**.
58	External Compensation	Provided.	Extended function
59	Parameters		Pr1 = JOG low speed (speed unit) Pr2 = JOG medium speed (speed unit) Pr3 = JOG high speed (speed unit) Pr1 to Pr3 = 0 to 60000 Pr8 = Torque limit value at JOG low speed operation (%) (0 to 250%)
	(1) Related to JOG	Pr1 = JOG low speed (speed unit) P at JSPD signal = OFF Pr2 = JOG high speed (speed unit) P at JSPD signal = ON Pr1, Pr2 : 0 to 99999 Pr4 = JOG low speed feeding torque (0 to 400%)	
	(2) Related to STEP	Not provided.	Pr5 = Short (reference unit) Pr6 = Medium (reference unit) Pr7 = Long (reference unit) Pr4 = Moving Speed (speed unit) Pr8 = Torque limit value when "short" is specified. Pr5 = Pr7 : 0 to 999999

	Low Speed	Medium Speed	High Speed
JLF	OFF	ON	ON
JMF	OFF	OFF	ON

(Cont'd)

No.	Item	Motionpack FD	Motionpack-34
59	(3) Related to HANDL	Pr3 = HANDL max. speed (speed unit) (0 to 99999) Pr5 = HANDL reference, speed/position change	
	(4) Overtravel Detection	Pr8 = Hard OT effective/ineffective Pr60 = Minus direction soft stroke limit (reference unit) Pr61 = Plus direction soft stroke limit (reference unit) (−99999999 to 99999999)	Pr60 = Minus direction soft stroke limit (reference unit) Pr61 = Plus direction soft stroke limit (reference unit) (−9999999 to 9999999)
	(5) Coordinate Compensate	Pr20 = T_8 coordinate system one-time compensated value (0 to 255) (reference unit) Pr21 = T_8 coordinate system max. compensated value (0 to 99999999) (reference unit) Pr22 = T_9 coordinate system one-time compensated value Pr23 = T_9 coordinate system max. compensated value	Pr20 = T_8 coordinate system one-time compensated value (0 to 255) (reference unit) Pr21 = T_8 coordinate system max. compensated value (0 to 9999999) (reference unit) Pr22 = T_9 coordinate system one-time compensated value Pr23 = T_9 coordinate system max. compensated value (0 to 9999999)
	(6) Related to Accel/Decel	Pr30 = Max. speed (0 to 99999) (speed unit) Pr31 = Linear accel/decel time (0 to 60000) (msec) Pr32 = All S-curve accel/decel time (0 to 10000) (msec) Pr33 = S-curve section accel/decel time (0 to 2000) (msec)	Pr40 = Max. speed (0 to 60000) (speed reference) Pr41 = Accel/decel time (50 to 60000) (msec) Pr56 = All S-curve accel/decel time (60 to 1000) (msec) Pr57 = S-curve accel/decel time (30 to 500) (msec)
	(7) Related to Servo	Pr34 = Position loop gain (0 to 255) (S^{-1}) Pr35 = Speed loop gain (0 to 600) (Hz) Pr37 = Servo error deviation (0 to 999999) (number of pulses) Pr38 = Motor selection code	Pr42 = Position loop gain (200 to 30000) (number of pulses) Pr44 = Servo error detection (0 to 60000) (number of pulses)
	(8) In-position Range	Pr36 = In-position range (1 to 255) (number of pulses)	Pr45 = In-position range (1 to 255) (number of pulses)

APPENDIX COMPARISON OF Motionpack FD AND Motionpack-34 (Cont'd)

(Cont'd)

No.	Item	Motionpack FD	Motionpack-34
59	(9) Position Reference	Pr50 = Min. reference unit (0 to 5) (10^{-N} mm) Pr51 = Ball screw pitch (1000 to 99999) (μm/rev) Pr52 = Gear Ratio (1 to 999999) Pr53 = Gear Ratio (1 to 999999) Pr54 = Decimal point position (speed reference) (0 to 5) (reference unit × 10^{N}/min) Pr55 = Number of encoder pulses (1000 to 32768) (pulse)	Pr50 = Pulse rate (M) Pr51 = Pulse rate (D) Pr52 = Decimal point position
	(10) Home Position Coordinate Setup	Pr70 = Home position coordinate setting method Pr71 = T_0 coordinate offset (−99999999 to +99999999) (reference unit) Pr72 = Reference point coordinate (−99999999 to +99999999) (reference unit) Pr73 = Home position setup command (0.1) Pr74 = Home position matching speed (0 to 60000) (speed unit) Pr75 = Pushing torque (10 to 200) (%) Pr76 = Stopper pushing time (0 to 60000) (msec) Pr77 = Encoder allowable moving amount (0 to 99999999) (reference unit) Pr78 = ABS-PG alarm reset command (0.1)	Pr70 = Home position coordinate setting method Pr71 = T_0 coordinate offset (−9999999 to +9999999) (number of pulses) Pr72 = Waiting position (−9999999 to +9999999) Pr73 = Quick return speed (0 to 60000) (speed) Pr74 = Home position matching speed (0 to 60000) (speed unit) Pr75 = Pushing torque (10 to 200) (%) Pr76 = Number of encoder pulses (pulses/rev) Pr77 = Allowable deviation value (1 to 255) (number of pulses) Pr78 = Encoder allowable error (0 to 9999999) (reference unit) Pr79 = Pushing time (0 to 3000) (10 ms) Pr80 = Home position setup command (0.1) Pr81 = Reference point coordinate value (−9999999 to +9999999) Pr82 = ABS-PG error reset command (0.1)
	(11) Related to Spindle	Pr90 = Spindle max. r/min (0 to 99999) (r/min) Pr91 = Spindle reference method selection Pr92 = Spindle PG disconnection detection (0.1)	Not provided.
	(12) PSW	Pr111 to Pr118 = PSW1 Pr121 to Pr128 = PSW2 Pr131 to Pr138 = PSW3 Pr141 to Pr148 = PSW4	Pr111 to Pr118 = PSW1 Pr121 to Pr128 = PSW2 Pr131 to Pr138 = PSW3 Pr141 to Pr148 = PSW4
	(13) External Data Setting	R01 to R99 external setting (register designation possible)	Pr201 to Pr296 = External data

Motionpack FD MODEL 3

YASKAWA MOTION CONTROLLER

EXTENSION SYSTEM 3

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Due to ongoing product modification/improvement, data subject to change without notice.