PM4C-06 SERIES
User's Manual

3073 (rev.1)

Contents

1. Abstract

1-1 Characteristics

- Can control 4 stepping motors at a time.
- Can set individual characteristics.
- Scan to set position by trapezoidal driving.
- Absolute/Relative movement is available
- Can stop when limit switch is detected.
- Limit switch status can be set individually. (status : N.O/N.C, Enable/Disable)
- Can stop by STOP button when scanning.
- Step driving. (1 step : 0~9999 pulse)
- Inching driving.
- Continuous driving.
- Enabled channels and their driving mode are shown in front panel LED lamp.
- Detecting home position.
- Can change driving mode. (mode : HP, REL, ABS, SCAN)
- Stop mode when limit switch is on or STOP button is pressed is selectable. (mode: SLOW, EM)
- Backup data over five years.
- Can start driving motors synchronously.
- Hand Box is useful for checking mechanical position.
- Can choose one of the motors and drive it by JOG lever in Hand Box.
- Can choose driving speed in Hand Box.
- Each channel has LED lamps that indicate the status of limit switch and pulse-out.
- Motor hold-off function for each channel.
- If you start driving hold-off motors, automatically the hold-off mode is disabled and returns to be enabled after motor stopping.
- Motor hold-off can be set by remote command.
- LAN, GP-IB (IEEE-488) and RS-232C communication port.

1-2 Concept of PM4C-06 control

PM4C-06 has five CPUs. One CPU is for controlling the whole system. The others are for controlling the stepping motor and control each channel individually. Current positions, speed data, acceleration rate in starting and stopping phase, etc. are stored in the memories. Those data can be read and renewed at any time.

Schematics of internal circuit
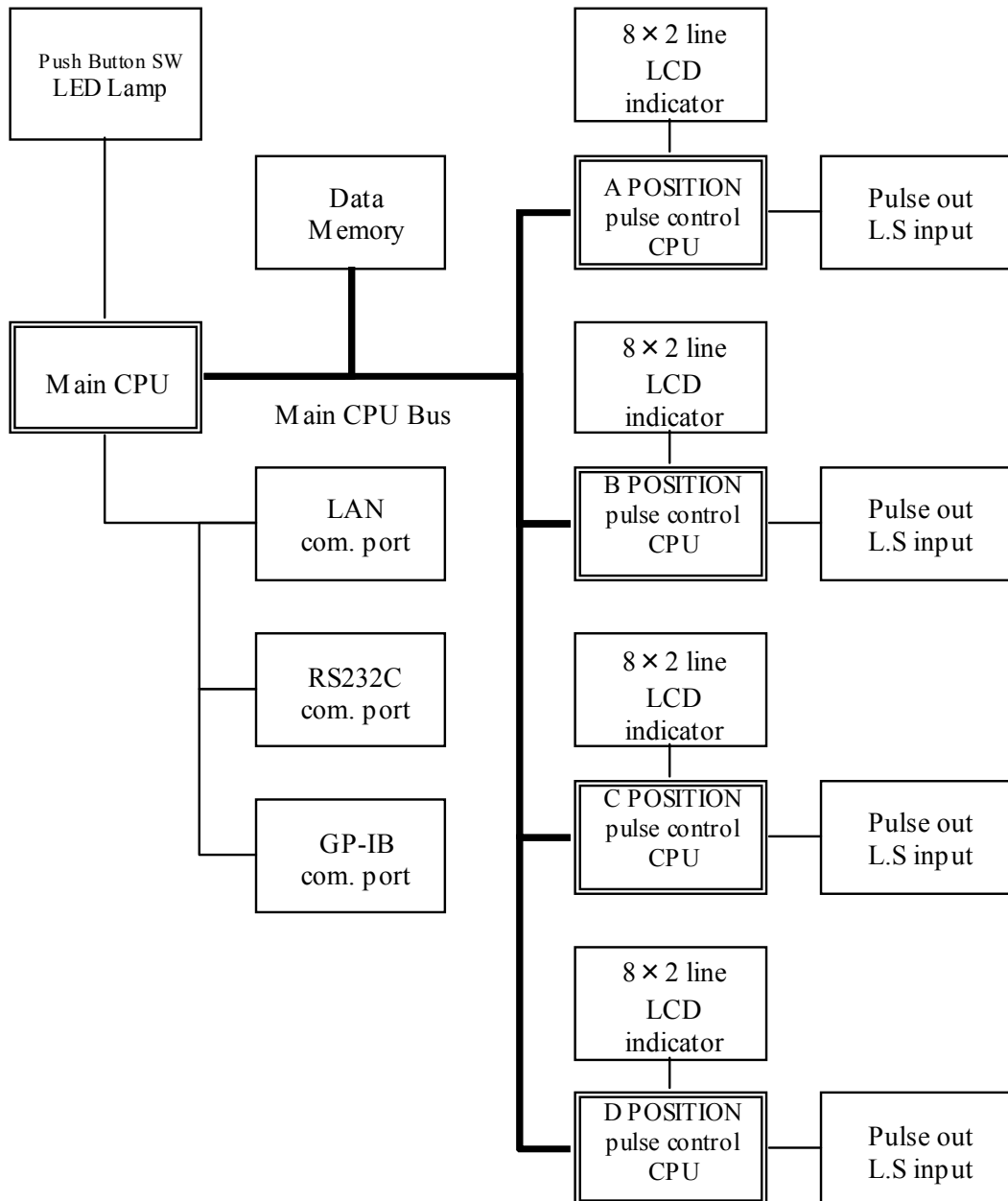
2. Panel layout

2-1   Front panel
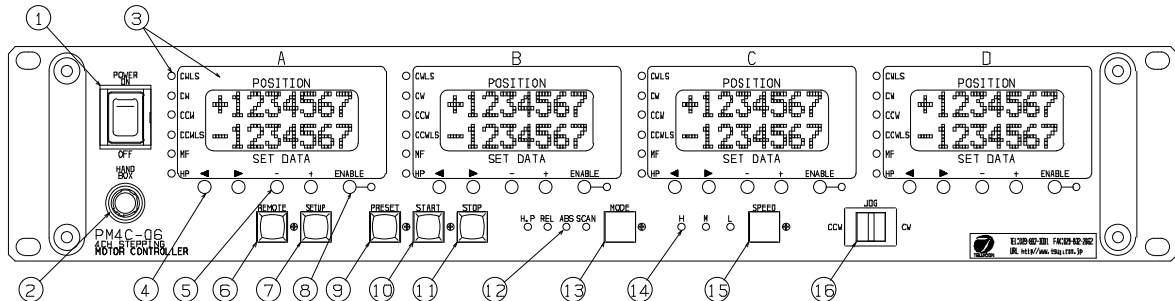
① POWER button
Power supply switch

② Connector for Hand Box
When using Hand Box, connect the Hand Box cable.

③ Status LED and LCD indicator

> Status LED

CWLS	Clockwise Limit Switch. It turns on when limit switch (LS) is on.
CW	Clockwise pulse output
CCW	Counter Clockwise pulse output
CCWLS	Counter Clockwise Limit Switch. It turns on when limit switch (LS) is on.
MF	Motor Free signal. (= HOLD OFF) It turns on when the motor is hold-off.
HP	Home Position switch. It turns on when the switch is on.

> LCD indicator

Upper   :   current position
Lower   :   pulse output count (REL mode)
                    absolute position (ABS mode)
                    preset position (SCAN mode)
Those values can be changed by ④,⑤.
In SETUP mode, it displays items for system control.

④ (←), (→) button
It changes digit when setting data.

⑤ (+), (-) button
It increases or decreases value.

⑥ REMOTE button
It changes pulse control mode.
    Light ON   :   REMOTE (control by command in LAN, RS232C, GP-IB)
    Light OFF   :   LOCAL   (control by button in Front panel)

⑦ SETUP button
It is for SETUP mode. Items for control can be changed or checked in SETUP mode. This button can be used in LOCAL mode only. In SETUP mode, LOCAL mode cannot be changed to REMOTE mode.

⑧ ENABLE button
It enables or disables each channel control. It can be used at LOCAL mode only.

Light ON : enable (JOG , SCAN , etc.)
Light OFF : disable

Scanning channel cannot be disabled. Please stop scanning when you want to disable the channel. In REMOTE mode, channels whose ENABLE LED lamp does not light can be controlled.

⑨ PRESET button
In LOCAL mode, current position in enabled channel can be set. Preset data is displayed at lower part in LCD indicator.

Note)
If PRESET button and STOP button are being pushed when power on, all items for control are initialized.

⑩ START button
In LOCAL mode, it starts pulse-out of enabled channel in mode of ⑫ with speed ⑭. In SCAN mode, it doesn't start pulse-out but the button LED lights. When it lights, JOG switch can starts pulse-out to its direction. When the START button is pressed during outputting pulses, the start operation for the pulse-outputting channel is ignored.

⑪ STOP button
In LOCAL and REMOTE mode, it stops pulse-out.

Note)
If both STOP and PRESET button are being pushed when power on, items for control are initialized.

⑫ RUN mode LED indicator
It indicates RUN mode. There are 4 modes.

1) H.P   : Continuous scan and stop at home position by home position sensor.
                    The direction (CW/CCW) of pulse-out in start should be set in SETUP mode in advance.

2) REL   : move to the relative position that is shown at lower part in LCD indicator.

3) ABS   : move to the absolute position that is shown at lower part in LCD indicator.

4) SCAN   : Continuous pulse-out to CW/CCW direction.
                    After preparation for scanning (START lamp on) by START button, then pulse-out direction is decided by JOG lever.
                    Pulse-out can be stopped by STOP button or LS (Limit Switch).

⑬ MODE button
In LOCAL mode, it changes RUN mode. Pressing it changes mode in order.
SCAN → ABS → REL → HP → SCAN

⑭ Speed select LED indicator
It indicates pulse-out speed. These are 3 modes.

1) H : Pulse-out in HSPD (Hi Speed) [1]

2) M : Pulse-out in MSPD (Mid Speed) [1]

3) L : Pulse-out in LSPD (Low Speed) [1]

[1] HSPD, MSPD, LSPD are set in SETUP mode

⑮ SPEED button
It changes pulse-out speed.

⑯ JOG lever
It is for inching drive of enabled channel. Throwing on it starts pulse-out to the CW/CCW direction. If throwing on it more than 0.5 seconds or after reaching pulse-out count of a JOG step, pulse-out continues. Throwing off stops pulse out. The lever is not available in REMOTE mode.

2-2   Rear panel
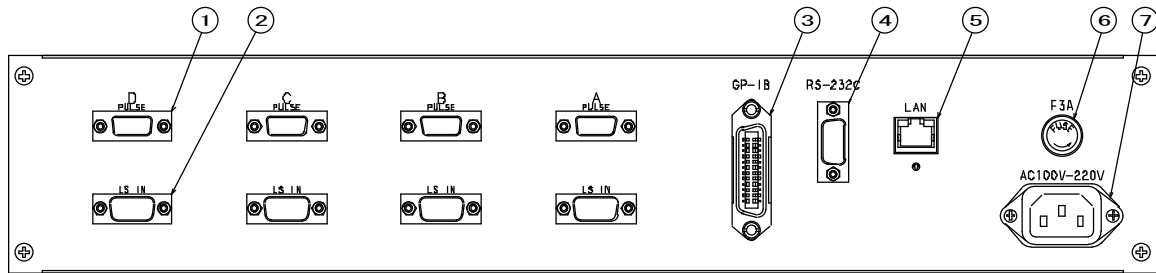
① Pulse output connector
    Three signals are out from this connector, CW, CCW pulse and hold-off signal.
    D-Sub 9P (socket type)
    Details are section 11.

② External switch input connector
    External switches (CW, CCW, Home position limit switch) are connected.
    D-Sub 9P (pin type)
    Details are section 11.

③ GP-IB
    24P connector for GP-IB

④ RS232C
    Connector for RS232C
    D-Sub 9pin (pin type)

⑤ LAN
    Connector for LAN (RJ-45)

⑥ Fuse Holder
    For safety of AC power line.
    If necessary, use 3A midget fuse.

⑦ AC100V/200V power supply connector
    Inlet type AC connector for AC100V/200V power supply
    Use attached AC cable.

3. Setting the motor characteristics

The data of four stepping motors can be set and stored, which is kept by battery back up. The data are kept until data-reset. The data realize accurate control for any system. In SETUP mode, pulse-out is forbidden. The data cannot be set during motor moving.

3-1 Setting Preparation and Completion

When PM4C-06 is powered on, Firmware version is displayed in LCD indicator for a few seconds, for example "PM4C-06 Ver 1.06". (after Ver1.06)
After that, display changes to normal mode and you can use PM4C-06.
Setting values (REM/LOC, MODE, SPEED, etc.) are kept by battery backup.

a) Go to LOCAL mode by REMOTE button. (REMOTE button LED turns off.)

b) Push SETUP button. (SETUP button LED turns on.)

LCD indicators display Setting Item.

digit →	1	2	3	4	5	6	7	8		1	2	3	4	5	6	7	8
	+	0	1	2	3	4	5	6	→	H	I		0	0	9	0	0
	+	0	0	1	2	3	4	5				N	o	.	0	2	0
				NORMAL									SETUP				
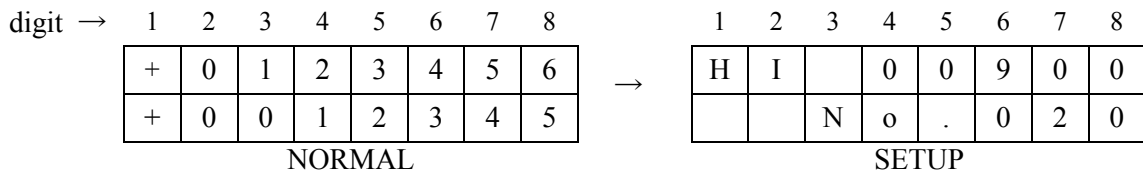
You can change data by (+)/(-) button. Appearance of Cursor depends on setting item. When the Cursor appears, you can change the position by (←)/(→) button. The item can be changed by JOG. Lever.

See the order of items below.

HSPD → MSPD → LSPD → RATE → JOG PLS → LS EN/DA → LS NC/NO → LS STOP FAST/SLOW → PB STOP FAST/SLOW → HOLD OFF EN/DA → HP START CW/CCW → HP NC/NO → PULS MODE P-P/P-D → DIG LS EN/DA → CW DIG LS → CCW DIG LS → 232C BAUD → GP-IB ADD → LAN IP1 → LAN IP2 → PORT NO → MAC ADD → HAND BOX

232C BAUD ~ MAC ADD are common for each channel. So they are displayed only in "A" channel LCD indicator. (MAC ADD is read-only.)

c) Press SETUP button again, then LCD return to NORMAL mode. PM4C-06 starts running in a new setting, except for "LAN IP:1", "LAN IP:2" and "Port no". If you change those setting, power off PM4C-06 after returning to NORMAL mode, and power on again.

3-2   Setting items

◆ HI
Can set HSPD (hi speed) by (+)/(-) button.
    < LCD >
        Upper :   velocity (5PPS~100,000PPS)
        Lower :   code (0~254)
Refer TABLE1.
The meaning of the code is same as PM4C-05(A).

When PPS is set by remote command, the value is displayed at Upper part in LCD indicator.
If you change code in Lower part by (+)/(-) button, PPS data is changed according to the code
data. Remote command only can set velocity from 1PPS to 100000PPS.

◆ MI
 Can set MSPD (mid speed) by (+)/(-) button.
    < LCD >
        Upper :   velocity (5PPS~100,000PPS)
        Lower :   code (0~254)
The other setting is same as HSPD.

◆ LO
Can set LSPD (low speed) by (+)/(-) button.
    < LCD >
        Upper :   velocity (5PPS~100,000PPS)
        Lower :   code (0~254)
The other setting is same as HSPD.

◆ RT
Can set acceleration and deceleration rate by (+)/(-) button.
    < LCD >
        Upper :   acceleration and deceleration rate. (1000ms/kHz~1ms/kHz)
        Lower :   code (0~21)
Refer TABLE2.
The meaning of the code is same as PM4C-05(A).

◆ JOG
Can set minimum pulse output number of JOG lever by (+)/(-) button.
Setting value is decimal number. (0~9999)

◆ LS.
Can select ENABLE or DISABLE of limit switch by (+)/(-) button.

◆ LS.CNTCT
Can select contact type (N.C/N.O) of limit switch by (+)/(-) button.

◆ LS.Stop
Can select stop mode (FAST/SLOW) of limit switch detection by (+)/(-) button.

◆ PB.Stop
Can select stop mode (FAST/SLOW) of STOP button by (+)/(-) button.

◆ HOLD OFF
　Can select ENABLE or DISABLE of hold-off by (+)/(-) button.

◆ HP.START
　Can set the direction of starting pulse-out when detecting home position.
　Can select pulse-out direction (CW/CCW) by (+)/(-) button.

◆ HP CNTCT
　Can select contact type (N.C/N.O) of home position limit switch by (+)/(-) button.

◆ PLS MODE
　Can select pulse output mode (P-P 2PLS/P-D 1PLS) by (+)/(-) button.

◆ DIGTL LS
　Can select ENABLE or DISABLE of digital limit switch by (+)/(-) button.

◆ CW DGLS
　Can set digital limit value in CW by (+)/(-) button and (←)/(→) button.
　Setting value is decimal number only.

◆ CCW DGLS
　Can set digital limit value in CCW by (+)/(-) button and (←)/(→) button.
　Setting value is decimal number only.

◆ 232C BRT
　Can select RS232C baud rate by (+)/(-) button.

◆ GPIB ADD
　Can change GP-IB address by (+)/(-) button.
　Setting value is decimal number only.

◆ LAN IP:1 (upper 2byte of IP address)
　Can change IP address by (+)/(-) button and (←)/(→) button.
　Setting value is decimal number only. Default value is "192.168."

◆ LAN IP:2 (lower 2byte of IP address)
　Can change IP address by (+)/(-) button and (←)/(→) button.
　Setting value is decimal number only. Default value is ".1.55"

◆ Port no
　Can set Port Number by (+)/(-) button and (←)/(→) button.
　Setting value is decimal number only. Default value is "07777".

◆ MAC
　Can see MAC address, but cannot change the address.

◆ HAND BOX
　Can set hand-box control mode (WHEN ENB/ALWAYS) by (+)/(-) button.
　　　WHEN ENB　：　controlling enabled channel only by hand-box.
　　　ALWAYS　　：　controlling all channel by hand-box.

TABLE 1 SPEED DATA

No.	PPS	No.	PPS	No.	PPS	No.	PPS	No.	PPS	No.	PPS
000	5	044	3300	088	7700	132	16180	176	33110	220	62800
001	10	045	3400	089	7800	133	16400	177	33780	221	63600
002	25	046	3500	090	7900	134	16610	178	34480	222	64500
003	50	047	3600	091	8000	135	16830	179	35210	223	65400
004	75	048	3700	092	8200	136	17060	180	35970	224	66300
005	100	049	3800	093	8400	137	17240	181	36500	225	67200
006	150	050	3900	094	8600	138	17420	182	37040	226	68100
007	200	051	4000	095	8800	139	17600	183	37600	227	69100
008	250	052	4100	096	9000	140	17800	184	38170	228	70000
009	300	053	4200	097	9200	141	17990	185	38760	229	71000
010	350	054	4300	098	9400	142	18180	186	39370	230	72000
011	400	055	4400	099	9600	143	18380	187	40000	231	73000
012	450	056	4500	100	9800	144	18660	188	40500	232	74000
013	500	057	4600	101	10000	145	18940	189	41100	233	75000
014	550	058	4700	102	10200	146	19230	190	41600	234	76000
015	600	059	4800	103	10400	147	19530	191	42200	235	77100
016	650	060	4900	104	10600	148	19840	192	42800	236	78100
017	700	061	5000	105	10800	149	20160	193	43400	237	79200
018	750	062	5100	106	11010	150	20500	194	44000	238	80300
019	800	063	5200	107	11210	151	20830	195	44600	239	81400
020	900	064	5300	108	11410	152	21190	196	45200	240	82500
021	1000	065	5400	109	11600	153	21550	197	45800	241	83700
022	1100	066	5500	110	11800	154	21930	198	46400	242	84800
023	1200	067	5600	111	11990	155	22320	199	47100	243	86000
024	1300	068	5700	112	12200	156	22730	200	47700	244	87200
025	1400	069	5800	113	12400	157	23150	201	48400	245	88400
026	1500	070	5900	114	12600	158	23590	202	49100	246	89600
027	1600	071	6000	115	12790	159	24040	203	49700	247	90800
028	1700	072	6100	116	12990	160	24510	204	50400	248	92100
029	1800	073	6200	117	13200	161	25000	205	51100	249	93300
030	1900	074	6300	118	13400	162	25510	206	51800	250	94600
031	2000	075	6400	119	13620	163	26040	207	52500	251	95900
032	2100	076	6500	120	13810	164	26600	208	53300	252	97300
033	2200	077	6600	121	14000	165	27170	209	54000	253	98600
034	2300	078	6700	122	14200	166	27620	210	54700	254	100000
035	2400	079	6800	123	14400	167	28090	211	55500		
036	2500	080	6900	124	14620	168	28570	212	56300		
037	2600	081	7000	125	14830	169	29070	213	57000		
038	2700	082	7100	126	15010	170	29590	214	57800		
039	2800	083	7200	127	15200	171	30120	215	58600		
040	2900	084	7300	128	15390	172	30680	216	59400		
041	3000	085	7400	129	15580	173	31250	217	60200		
042	3100	086	7500	130	15770	174	31850	218	61100		
043	3200	087	7600	131	15970	175	32470	219	61900		

TABLE 2 RATE DATA

No.	ms/1000PPS
000	1000
001	800
002	600
003	500
004	400
005	300
006	200
007	150
008	125
009	100
010	75
011	50
012	30
013	20
014	15
015	10
016	7. 5
017	5. 0
018	4. 0
019	2. 0
020	1. 5
021	1. 0

4. LOCAL mode driving

LOCAL mode driving is enabled when REMOTE button LED turn off. If its LED turns on, push the button and turn it off.

4-1   Select motor speed

The motor speed can be selected from HSPD, MSPD, and LSPD by SPEED button.
Detail of each speed is set in SETUP mode.

◆ HSPD or MSPD drive (trapezoidal form acceleration drive)
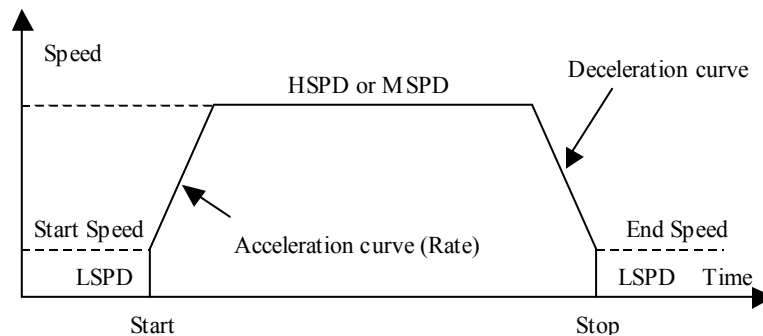
※ If motor is driven by remote command that doesn't include acceleration or deceleration, the motor don't accelerate or decelerate.
※ If the stop mode of STOP button and limit switch is EM (emergency stop), motor doesn't decelerate.

Caution)   If the speed in start (LSPD) is too fast, motors may not drive because of step out.

◆ LSPD drive
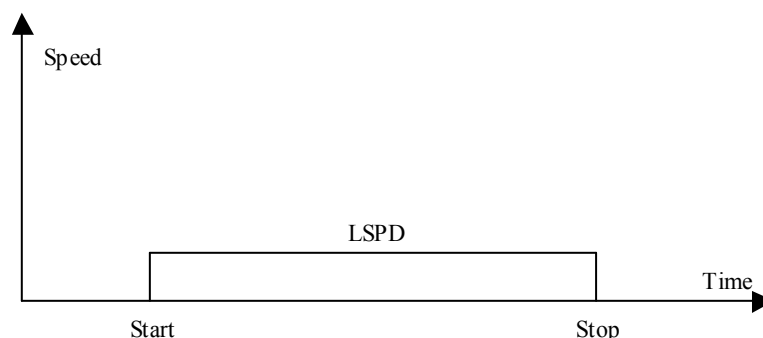
4-2   Motor driving mode selection

Motor driving mode can be selected by MODE button.

4-3   Channel selection

Each channel is enabled by ENABLE button. Enabled channels only can be controlled by front panel switch in LOCAL mode.

4-4   Relative Index mode (REL)

RUN mode LED indicator shows "REL". Pulse-out timing is controlled by START button. If some channels are enabled, these motors starts driving at the same time automatically by START button. Each channel's pulse-out count is set at lower part in LCD indicator. Pulse-out is stopped by limit switch or STOP button. The data at lower part in LCD indicator can be set by (+), (-), (←), (→) button.

4-5   Absolute index mode (ABS)

RUN mode LED indicator shows "ABS". Pulse-out timing is controlled by START button. If some channels are enabled, these motors starts driving at the same time automatically by START button. Each channel outputs pulse by the position at lower part in LCD indicator. Pulse-out direction is decided automatically. Pulse-out is stopped by limit switch or STOP button. The data at lower part in LCD indicator can be set by (+), (-), (←), (→) button.

4-6   Home position stop mode (HP)

RUN mode LED indicator shows "HP". Pulse-out timing is controlled by START button. Pulse-out direction is set in SETUP mode. Pulse-out is stopped when HP limit switch is detected. Pulse-out is stopped by limit switch or STOP button too.

4-7   Continuous Stepping mode (SCAN)

RUN mode LED indicator shows "SCAN". First, push START button. Next, push JOG lever to the pulse-out direction, then pulse-out starts. Pulse-out is stopped by limit switch or STOP button.

4-8   JOG step movement

Pushing JOG lever is for inching of enabled channel. Throwing on this switch cause pulse-out to the CW/CCW direction. Pulse-out count of a JOG step is set in SETUP mode. If throwing on it more than 0.5 seconds or after reaching pulse-out count of a JOG step, pulse-out continues. Throwing off stops pulse-out. JOG lever is available in HP, REL, ABS, and SCAN mode.

4-9   Preset position data

Can set current position data. Preset data is displayed at Lower part in the LCD indicator.

4-10   Start driving motors at the same time

Channels selected by ENABLE button can be started driving at the same time.

4-11   Automatic hold-off

In LOCAL and REMOTE mode, if you start driving hold-off motors, automatically the hold-off mode is disabled and returns to be enabled after motor stopping.

4-12 Hand-box control (Optional)

Hand Box is useful in LOCAL mode. Hand-box enables you to control motors seeing mechanical movement. Control channel can be selected by rotary switch on the hand-box. A, B, C, D channels can be controlled far from 3meter of PM4C-04. Preset speed is indicated in LED on the Hand Box. Pushing JOG lever is for inching in enabled channel. Throwing on this switch cause pulse-out to the CW/CCW direction. JOG pulse number is set in SETUP mode. This function is same as JOG lever on the front panel of PM4C-06. If "ALWAYS" is set at hand-box page in SETUP mode, all channels can be controlled by hand-box even if the cannels are disable in front panel. If "WHEN ENB" is set, only enabled channels can be controlled.

5. REMOTE mode driving

REMOTE mode is enabled when REMOTE button LED turns on. If its LED turns off, push the button and turn the LED on. REMOTE/LOCAL mode can be selected by remote command too.

5-1 Signals and Commands

◆ data for read
CHANNEL POSITION DATA, HSPD, MSPD, LSPD, RATE, STOP MODE & LS, REM/LOC etc.

◆ data for write
HSPD, MSPD, LSPD, RATE, LMSW

◆ Command
+JOG, -JOG, SCAN, CONSTANT SPEED RELATIVE SCAN, CONSTANT SPEED ABSOLUTE SCAN, RELATIVE SCAN, ABSOLUTE SCAN SPEED SELECT, PAUSE ON/OFF, HOLD OFF SET/RESET, SLOW STOP, EM STOP

Commands for data-read is enable in both REMOTE and LOCAL mode.

5-2 Communication standard

◆ Abstract
PM4C-06 series support three communication types, LAN, RS232C, GP-IB (IEEE-488).

Error command and un-executable command are ignored.

Receive data format is "□・・・・・・□CR+LF".
PM4C-06 counts received command when it gets "CR+LF". PM4C-06 executes the commands in order.

In GP-IB, PM4C-06 stops handshaking until the correct reply for pre-received command is prepared even if it is set as a TALKER. The wait is within 1ms. You can use SRQ function to each channel independently when you use GP-IB. There is no need to check whether the motor stops or not. PM4C-06 reply format is "□・・・・・・□CR+LF"

◆ Setting for LAN (Ethernet TCP/IP) communication
➢ Go to LOCAL mode by REMOTE button.
➢ Go to SETUP mode by SETUP button.
➢ Go to "LAN IP:1" page by JOG lever.
➢ Move cursor to the data that is to be changed.
➢ Upper IP address can be changed by (←), (→), (−), (＋) button.
➢ Go to "LAN IP:2" page by JOG lever.
➢ Move cursor to the data that is to be changed.
➢ Lower IP address can be changed by (←), (→), (−), (＋) button.
➢ Go to "Port no" page by JOG lever.
➢ Move cursor to the data that is to be changed.
➢ Port No. can be changed by (←), (→), (−), (＋) button.

Default IP address is [192.168.1.55], and port number is [7777].
These data can be changed according to your network.
If you need to change port number, 10001 to 10999 are recommended.
You must power off and power on the unit to enable the new setting.

To confirm the new setting, you should try whether a command ("VER?" for example) is received and the reply is sent out by the unit or not, by using client PC connected to PM4C-06 by telnet.

◆ Setting for GP-IB communication
  ➢ Go to LOCAL mode by REMOTE button.
  ➢ Go to SETUP mode by SETUP switch.
  ➢ Go to "GPIB ADD" page by JOG lever.
  ➢ GP-IB address can be changed by using (−), (＋) button.

After changing the address, push the "SETUP" button, then it has changed and the setting will be finished. There is no need to power on again. You can check whether the communication is OK or NOT by the command "VER?" for example.

◆ Setting for RS232C communication
  ➢ Go to LOCAL mode by REMOTE button.
  ➢ Go to SETUP mode by SETUP switch.
  ➢ Go to "232C BRT" page by JOG lever.
  ➢ BAUD RATE can be changed by (−), (＋) button.

After changing BAUD RATE, push the "SETUP" button, then the mode will be changed and setting will be finished. There is no need to power on again. You can check whether the communication is OK or NOT by the command "VER?" for example.

Pin assignment of the connector is as follows.
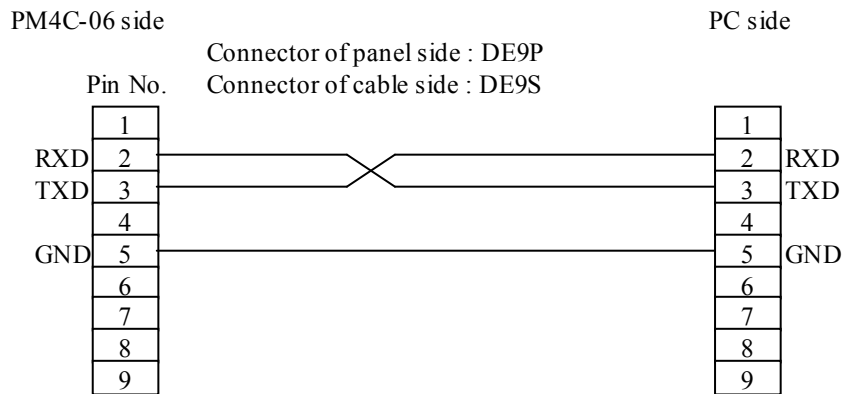
The setting data for RS232C is only BAUD RATE data.
Another parameters of RS232C communication are fixed as follows.

DATA BIT : 8
STOP BIT : 1
NO FLOW CONTROL
NO PARITY

The delimiter for the data is "CR+LF".

6. Command in detail (LAN, RS232C, GP-IB)

The format of command is ASCII data, and the delimiter is "CR+LF" (0Dh + 0Ah). After receiving "CR+LF", command interpretation begins. When the unit receives the command without delimiter, the receiving data will be considered to be front part characters of the command. If followed commands are lost, command interpretation will be impossible. When sending commands, "CR+LF" must be added at the end of the command. ("CR+LF" are omitted in the command explained below.)

6-1   REMOTE/LOCAL command

These commands are acceptable in REMOTE and LOCAL mode.
These commands are acceptable when all channel motors are stopped.

LOC   Set into the LOCAL mode

REM   Set into the REMOTE mode

6-2   SRQ command (SRQ signal is one of GP-IB signal lines.)

These commands are acceptable in REMOTE and LOCAL mode

SRQx1   Set SRQ flag to channel x : x means motor channel 0~3.
               When channel x motor stopped at this state, SRQ line of this unit goes "H" to inform PC of the state and the SRQ status flag of this unit is set to "1".
               Once SRQ status flag read out from PC, SRQ status flag is cleared automatically and the SRQ line goes "L".
               SRQ flag is cleared automatically just after SRQ line of this unit goes "H".
               If you use SRQ signal when motor stopped, you have to set the flag every time before start.

SRQx0   Clear the SRQ flag of channel x.

SRQ?x   Read out the status of SRQ flag of channel x.
               The reply is "1" or "0".

6-3   Status read out command

These commands are acceptable in REMOTE and LOCAL mode.

STQ?   Read out the LOCAL/REMOTE mode and the number of stopped motors.
            The reply is   when REMOTE MODE : Rn   (n:0~4)
                            when LOCAL MODE   : Ln   (n:0~4)
            The maximum number of motors driving simultaneously is 4.
            When the numbers of stopped motors is 0, there is no left motor to activate.
            In this case, access command is ignored.
            Before activating motors, you can check whether activated motor is left or not by
            this command if you need.

STS?   Read out the LOCAL/REMOTE mode and the details of each motor state.
            The format of reply data is like this.

            R(L)abcd/PNNS/VVVV/HHJJKKLL/±uu···/±vv···/±ww···/±xx···

            R or L   R: REMOTE mode
                          L: LOCAL mode

            a,b,c,d   The selected motor channel number for each display channel 0~3.

            PNNS   The state of motor action for each channel.
                             P : driving to CW direction
                             N : driving to CCW direction
                             S : stopped

            VVVV   The states of limit switch and motor hold-off function for each
                          channel in hexadecimal.
                             < data bit >
                             b3: Motor hold off status
                             b2: The limit switch status of home position
                             b1: The limit switch status of CCW direction
                             b0: The limit switch status of CW direction

            HHJJKKLL   This value shows the status of motor driving for each channel in
                          2digit hexadecimal data.
                             < data bit >
                             b7: ESEND received emergency stop command
                             b6: SSEND received deceleration stop command
                             b5: LSEND stopped by limit switch
                             b4: COMERR occurs error
                             b3: ACCN decelerating
                             b2: ACCPD accelerating
                             b1: DRIVE stepping
                             b0: BUSY data processing or stepping(= busy)

        uu···,vv···,ww···,xx···
                          These are the latest pulse position data for each channel.

6-4　Motor control command

① JOG Command
　　This command is acceptable only for REMOTE mode.

　　　JOGPx　　　　　　　Moves one pulse of motor channel x(0~3) to CW direction.

　　　JOGNx　　　　　　　Moves one pulse of motor channel x(0~3) to CCW direction.

② Speed Select Command
　　These commands are acceptable only for REMOTE mode.

　　　SPDHx　　　　　　　Motor speed selection of channel x(0~3) is "H"

　　　SPDMx　　　　　　　Motor speed selection of channel x(0~3) is "M"

　　　SPDLx　　　　　　　Motor speed selection of channel x(0~3) is "L"

　　Next command is acceptable for REMOTE and LOCAL mode.

　　　SPD?x:　　　　　　　Read out the speed of channel x(0~3).
　　　　　　　　　　　　　The replay is HSPD, MSPD or LSPD.

③ SCAN Command
　　These commands are acceptable only for REMOTE mode.

　　　SCANPx　　　　　　　Continuous movement of motor channel x(0~3) to CW direction.

　　　SCANNx　　　　　　　Continuous movement of motor channel x(0~3) to CCW direction.

　　The speed of the movement is determined by speed select command　②.

④ SCAN command set with absolute position data
　　This command is acceptable only for REMOTE mode.

　　　ABSx±ddddddd　　　The motor of channel x(0~3) goes to the set position absolutely.
　　　　　　　　　　　　　The range of ddd・・・・ is -8,388,607 ~ +8,388,607.
　　　　　　　　　　　　　(Digit number is arbitrarily specified.)

⑤ SCAN command set by relative position data
　　This command is acceptable only for REMOTE mode.

　　　RELx±ddddddd　　　The motor of channel x(0~3) moves at specified relative data.
　　　　　　　　　　　　　The range of ddd・・・・ is -8,388,607 ~ +8,388,607.
　　　　　　　　　　　　　(Digit number is arbitrarily specified.)

⑥ SLOW STOP, FAST STOP command
　　These commands are acceptable both in REMOTE and LOCAL mode.

　　　SSTPx　　　　　　　Stop the driving motor channel x(0~3) with deceleration.

　　　ESTPx　　　　　　　Stop the driving motor channel x(0~3) without deceleration.

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ASSTP	Stop all the driving motors with deceleration.
AESTP	Stop all the driving motors without deceleration.

Another commands concerning motor moving

⑦ PAUSE ON/OFF command
These commands are acceptable only for REMOTE mode.

PAUSE ON (S3016)	This command means the motion hold. Once received this command, further commands are in suspended. Those commands are in waiting state. This suspended mode is released by the command "PASE OFF". This command is useful when you activate some motors simultaneously. This command doesn't affect any motor that is already moving.
PAUSE OFF (S3017)	This command releases the suspended mode. Motors that are in suspended mode by command "PASE ON" are released. Those motors start simultaneously after this command.
PAUSE?	Read out pause status. reply: ON or OFF

⑧ HOLD ON/OFF command
These commands are acceptable only for REMOTE mode.

HOLDxON	Set Motor in channel x(0~3) hold on.
HOLDxOFF	Set Motor in channel x(0~3) hold off.
HOLD?x	Read out the state of hold on/off in channel x(0~3). reply: ON or OFF

⑨ Constant speed SCAN command
These commands are acceptable only for REMOTE mode.

CSCANPx	Activate the motor channel x(0~3) to CW direction at constant speed.
CSCANNx	Activate the motor channel x(0~3) to CCW direction at constant speed.
SCANHPx	To detect the home position of motor channel x(0~3) along CW direction. When the home position is detected, motor stops suddenly. So you need to move slowly to avoid step-out of motor. When there is no home position, motor will be stopped at CW or CCW limit switch. If you know the home position roughly, you can check the home position in a short time.
SCANHNx	This command is as same as "SCANHPx" without the direction CW. The starting direction is CCW.

6-5　Command for set and read out parameters

① Commands for set and read out motor parameters
　　The setting commands are acceptable only for REMOTE mode.
　　The read out commands are acceptable for REMOTE and LOCAL mode.

　　　　SETMTxABCD　　　Set the fundamental characteristics of motor channel x(0~3)

　　　　　　　　　　　　A :　1/drive enable　　0/drive disable
　　　　　　　　　　　　　　If you set the motor disable, you can't activate it and you can avoid unexpected moving by the operation error.
　　　　　　　　　　　　　　Unless you set enable, you can't move the motor.

　　　　　　　　　　　　B :　1/hold on　　　0/hold off
　　　　　　　　　　　　　　When you set the motor hold off, this unit outputs the hold off signal to external devices.

　　　　　　　　　　　　C :　1/trapezoidal (fixed)
　　　　　　　　　　　　　　The acceleration and deceleration mode of moving motor is fixed to trapezoidal form.

　　　　　　　　　　　　D :　0/Pulse-Pulse　　1/Pulse-Direction
　　　　　　　　　　　　　　Output signal to motor driver that is set outside of this unit is selectable.

　　　　SETMT?x　　　　　This command is readout command above motor characteristics.
　　　　　　　　　　　　The reply data is in order ABCD. The default data is "1010".

　　　　STOPMDxAB　　　　This command is set to stop motor channel x(0~3), slowly or fast.

　　　　　　　　　　　　A :　0/PB slow stop, 1/PB fast stop
　　　　　　　　　　　　　　It means slow stop or fast stop by STOP switch on front panel.

　　　　　　　　　　　　B :　0/LS slow stop, 1/LS fast stop
　　　　　　　　　　　　　　It means slow stop or fast stop by limit switch.

　　　　STOPMD?x　　　　This command is readout command above motor stop way.
　　　　　　　　　　　　The reply data is in order AB. The default data is "00".

② Commands for set and read out speed parameters
　　The setting commands are acceptable only for REMOTE mode.
　　The read out commands are acceptable for REMOTE and LOCAL mode.

　　　　SPDHxdddd･･･　　The high speed of motor channel x(0~3) is dddd･･･. Unit is PPS.

　　　　SPDH?x　　　　　This command is readout command above SPDHx.
　　　　　　　　　　　　The reply is dddd･･･. Unit is PPS.

　　　　SPDMxdddd･･･　　The middle speed of motor channel x(0~3) is dddd･･･. Unit is PPS.

　　　　SPDM?x　　　　　This command is readout command above SPDMx.
　　　　　　　　　　　　The reply is dddd･･･. Unit is PPS.

SPDLxdddd・・・   The low speed of motor channel x(0~3) is dddd・・・・. Unit is PPS.

SPDL?x   This command is readout command above SPDLx(0~3).
The reply is dddd・・・. Unit is PPS.

③ Commands for set and read out acceralaton and deceleration parameters
    The setting commands are acceptable only for REMOTE mode.
    The read out commands are acceptable for REMOTE and LOCAL mode.

RTExddd   The acceleration and deceleration of motor channel x(0~3) is set by this command.
ddd: 0~021
This is a code number. See TABLE 2 RATE DATA.

RTE?x   This command is for reading the acceleration and deceleration value of motor channel x(0~3). The reply is ddd.

④ Commands for set and read out latest pulse position parameters
    The setting commands are acceptable only for REMOTE mode.
    The read out commands are acceptable for REMOTE and LOCAL mode.

PSx±dddddd   Set the current position data of motor channel x(0~3).
The range of dddd・・・・・ is -8,388,607 ~ +8,388,607.
(The number of digit is arbitrary.)

PS?x   Read out the current data of motor channel x(0~3).
The reply is ±ddddddd (decimal number).

⑤ Commands for set and read out digital limit position parameters
    The setting commands are acceptable only for REMOTE mode.
    The read out commands are acceptable for REMOTE and LOCAL mode.

FLx±ddddddd   Set the digital limit data to CW side of motor channel x(0~3).
When you set the digital limit switch available, the motor doesn't move over the preset position.
(When limit switch stop mode is deceleration stop mode, motor overrun at some range.)
If you set digital limit switch available and present position is out of moving area, motor could move to the moving area direction.

FL?x   Read out the digital limit data to CW side of motor channel x(0~3).
The reply is ±ddddddd (decimal number).

BLx±ddddddd   Set the digital limit data to CCW side of motor channel x(0~3).
When you set the digital limit switch available, the motor doesn't move over the preset position.
(When limit switch stop mode is deceleration stop mode, motor overrun at some range.)
If you set digital limit switch available and present position is out of moving area, motor could move to the moving area direction.

BL?x   Read out the digital limit data to CCW side of motor channel x(0~3).
The reply is ±ddddddd (decimal number).

⑥　Commands for set and read out home position status flag parameters
　　The setting commands are acceptable only for REMOTE mode.
　　The read out commands are acceptable for REMOTE and LOCAL mode.

　　　　SETHPx0XYZ　　Set the parameters of home position setting for motor channel x(0~3).

　　　　　　　　　　　　　X :　0/not found　　　1/LS already found
　　　　　　　　　　　　　　　Home position data is already found or not.

　　　　　　　　　　　　　Y :　0/CW direction　1/CCW direction
　　　　　　　　　　　　　　　The direction when detecting the home position

　　　　　　　　　　　　　Z :　0/CW direction　1/CCW direction
　　　　　　　　　　　　　　　The start moving direction of motor channel x when detecting
　　　　　　　　　　　　　　　the home position in automatic detecting mode

　　　　SETHP?x　　　　Read out the state of home position setting for motor channel x(0~3).
　　　　　　　　　　　　　The meaning of reply data is above command.
　　　　　　　　　　　　　The reply data format is :0XYZ. Example is "0100".

⑦　Commands for set and read out data in LOCAL mode
　　The setting commands are acceptable only for REMOTE mode.
　　The read out commands are acceptable for REMOTE and LOCAL mode.
　　These data are useful only for LOCAL mode.

　　　　SPRSx±ddddddd　Set the preset position of motor channel x(0~3).
　　　　　　　　　　　　　If you select SCAN mode in LOCAL, sent data is displayed at lower
　　　　　　　　　　　　　part in LCD indicator. Push PRESET button and current position data
　　　　　　　　　　　　　turn to preset data.

　　　　SPRS?x　　　　　Read out the preset position of motor channel x(0~3).
　　　　　　　　　　　　　The reply is ±ddddddd (decimal number).

　　　　SETJGxdddd　　　Set the JOG steps of motor channel x by LOCAL mode.
　　　　　　　　　　　　　When you put on JOG lever, motor moves by JOG steps at one time in
　　　　　　　　　　　　　LOCAL mode.
　　　　　　　　　　　　　The range of dddd is 0 ~9999.

　　　　SETJG?x　　　　Read out the JOG steps of motor channel x(0~3) by LOCAL mode.
　　　　　　　　　　　　　The reply is ±dddd (4 digits decimal number).

6-6   Command for set and read out limit switch data parameters

The setting commands are acceptable only for REMOTE mode.
The read out commands are acceptable for REMOTE and LOCAL mode.

SETLSxDYYY0yyy   Set the states of limit switch of motor channel x(0~3).

D   : 0/Digital limit switch disable, 1/Enable

YYY : 0/Limit switch disable, 1/Enable
(State of CW and CCW LS become same state of
HP LS. All LS become enabled only or disable only.)

yyy : 0/Limit switch set is N.O, 1/N.C
(State of CW LS becomes same state of CW LS.
Their contact has to be same type.)

YYY,yyy   The order is H.P LS, CCW LS, CW LS.

SETLS?x   Read out the states of limit switch of motor channel x(0~3).
The reply is DYYY0yyy. (Meaning is shown above.)

LS?   Read out the motor channel and the states of limit switch for channels.
The reply data is abcdHJKL.

a,b,c,d : It means the motor channel for A,B,C,D channel.
It's a hexadecimal number.(One character)

H,J,K,L : It means the state of limit switch for channels.

b3 (hold off)	b2 (HP LS)	b1 (CCW LS)	b0 (CW LS)
1:holdoff	1:LS on	1:LS on	1:LS on
0:hold on	0: LS off	0: LS off	0: LS off

HDSTLS?   Read out the state of hardware and software limit switch for channels.
The reply data is abcdHHHHSSSS.

a,b,c,d : It means the motor channel for A,B,C,D channel.
It's a hexadecimal number.(One character)

H,H,H,H : state of hardware limit switch for A,B,C,D channel.

S,S,S,S : state of software limit switch for A,B,C,D channel.

b3	b2 (HP LS)	b1 (CCW LS)	b0 (CW LS)
0	1:LS on	1:LS on	1:LS on
0	0: LS off	0: LS off	0: LS off

※ HP LS is hardware limit switch only.

6-7 Others

VER?   Read out version information of inside firmware program.
The reply will be like "1.00 10-10-01 PM4C-06" in PM4C-06.
The same firmware is installed to PM4C-06 series.

VERH?   For maintenance
Read out the hardware version of this unit.

FROM0,FROM1   For maintenance
You can select the active flash ROM.

                          NOTICE :   When you use this command and power on this unit or send command "REST", program starts again by specified ROM and all parameters are initialized.

FROM?   For maintenance
There are two flash ROM for program memory inside.
You can check which one is active for flash ROM.
The reply is FROM0/FROM1.

REST   For maintenance
Can restart the program without power switch operation

STEM?   For maintenance
Can be read out status port 1 of inner IC MCC05.
Reply is aaaa/bbbb/cccc/dddd.
The status of control IC A,B,C,D are read out in hexadecimal style.

7. Firmware version up

You can perform firmware upgrade of PM4C-06 series via communication line. To keep safety you had better cut off the connection from unit to motor driver, or put off the power line of motor drivers. It's convenient to use RS232C or LAN connection.

We have firmware-upgrading program for Windows.

> http://www.tsuji-denshi.co.jp/download_file/lan_rs_file_send.EXE
> http://www.tsuji-denshi.co.jp/manual_pdf/pm16c_04xd_vup_soft.pdf

The procedures of upgrade via LAN communication using "Tera Term" free software

① Download the text-file for version upgrade from TSUJI-ELECTRIC HP, and unzip it to your PC.

② Launch the program "Tera Term".
  Select TCP/IP and enter IP address and port No of PM4C-06.
  Operation is SETUP -> Terminal then setting of New-Line is to be CR+LF in Receive and Transmit set.
  Mark on Local echo and "OK". Send the command VER? , and reply is like
  "1.00 10-10-01 PM4C-06" then the connection will be good.

③ Set PM4C-06 to REMOTE mode by local operation or remote operation.
  To change in remote operation sends the command "REM".

④ Operation is File -> Send file then click the file name.
  Specify the file name and "OPEN".
  It begins the download procedure.

⑤ You can see the process of transferring the file data to PM4C-06 on your PC.
  The "REMOTE" lamp on the PM4C-06 is blinking on and off slowly that indicates receiving the file by PM4C-06.

⑥ For about 90 seconds download procedures continues, then "REMOTE" lamp turns on quick blinking mode. Then the data write procedure begins to start for about 20 seconds.
  After finishing data write procedure to flash ROM, "REMOTE" lamp turns off.
  Program upgrade procedure is finished

⑦ Set TCP/IP line off, and then finish the TeraTerm program.
  Put off the power line of PM4C-06, and then put on this unit again.
  If you don't want to put off the unit, send command "REST".
  Thus the unit runs again from new version program.

If trouble occurred in download process, when put on the unit again, sometimes program runs out of control. In this case once put off the unit and put on it again pushing STOP button and SPEED button. The unit runs from previous ROM version again. And you can try again upgrading procedure.

Even if by the above operation, program runs out of control you can start again next procedure.
There is a communication program in CPU-ROM.

When you use this mode you have to pay attention to following procedures.

CAUTION: When you open the cover of this unit, be careful to get shock.

First take out power cable of it.
If you have some troubles to do next procedure please contact us.

1. Put off the power switch of this unit and opens the top cover.
   Set the DIPswitch 1 to side "ON". (DIPswitch 2 is still side "OFF".)
   DIPswitch is beside connector 9 on print circuit board "TEP178"

2. Put on the power line pushing STOP and MODE button.
   The "RED" led lamp that indicate "REMOTE" is flashing on and off for 15 seconds, then "RED"
   lamp turn on red continuously.
   At this stage LCD display is not correct yet.

3. Put off the power switch of this unit again, then set the DIPswitch 1 to side "OFF".
   (DIPswitch 2 is still side "OFF".)

4. Put on the power line pushing REMOTE button.
   Program starts by Version 1.00 firmware.
   (In this stage if LCD display may not be correct, but don't care of it. It's OK if you can change
   remote-local mode by REMOTE button.)

Next procedure is above described ①~⑦.

When you change firmware program all preset data are cleared, and setting data will become default
state.

8. Old command in detail (for LAN, RS232C, GP-IB)

Commands are available in ASCII code only.
De-limiter is fixed to be "CR+LF" both in send data and receive data.

8-1 "S1" command

It can be used only GP-IB communication and is for SRQ request on GP-IB line. It can be used during motor stop state. If SRQ is set to one channel, SRQ signal occurs when the channel motor stops. This command is available only in REMOTE mode.[1] Send form of the commands are below. The SRQ flags, which were set once before, are cleared at the SRQ send out timing.

< Command form >

S1 ○ △   CR+LF

0 : A Position	0 : SRQ clear
1 : B Position	1 : SRQ set
2 : C Position	
3 : D Position	
8 : current SRQ flag	
9 : SRQ reply channel read 2)	
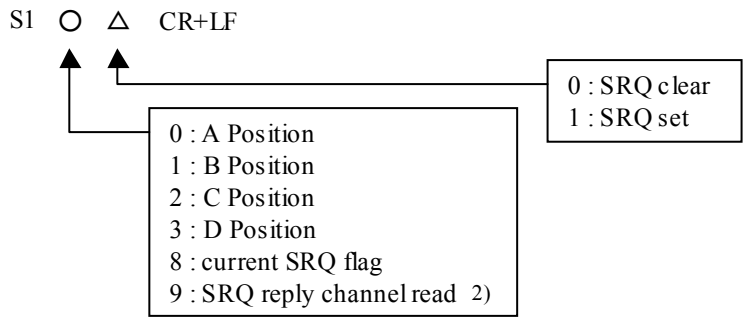
< Command sample >

A POSITION SRQ set	・・・	S101CR+LF
B POSITION SRQ clear	・・・	S110CR+LF
Current SRQ flag read	・・・	S18CR+LF
SRQ reply channel read	・・・	S19CR+LF

1) "S18" command is available both REMOTE and LOCAL mode.
2) Can get channel information that replied SRQ by "S19" command.
   After reply to "S19" command, channel information is cleared in the memory.

< Reply form>
 Reply to "S18", "S19" command

R0 □ CR+LF

total value of bit 1~4 in hex							
7							0
0	0	0	0				

A position
B positon
C position
D position
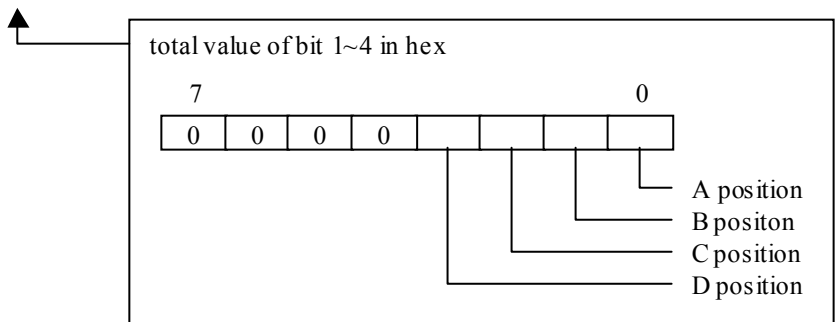
8-2 "S2" command

Commands are useful in LAN, RS232C and GP-IB communication.
It is used to read position data, status, LS, HP and Hold-off status.
It can be used in all modes (REM / LOC / SETUP).
Command form and reply forms are below.

< Command form >

S2 ○ △ CR+LF

0 : A Position 1 : B Position 2 : C Position 3 : D Position	0 : pulse count data 1 : internal CPU status 2 : LS・HP・H.OFF status
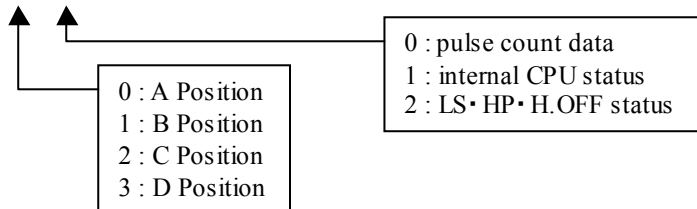
< Command sample >

A POSITION pulse counter read	・・・	S200CR+LF
B POSITION internal CPU status read	・・・	S211CR+LF
C POSITION LS・HP・H.OFF status read	・・・	S222CR+LF
D POSITION internal CPU status read	・・・	S231CR+LF

＜Reply form＞

a) For S2※0 command

R ○ △ (7digit decimal data) CR+LF

polarity (+ or -)

position (A, B, C, D)
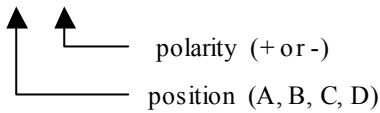
b) For S2※1 command

R ○ (2digit hex data) CR+LF

position (A, B, C, D)

2digit hex data bit map

7   0

BUSY
DRIVE
not used
not used
COM ERR
LSEND
SSEND
ESEND
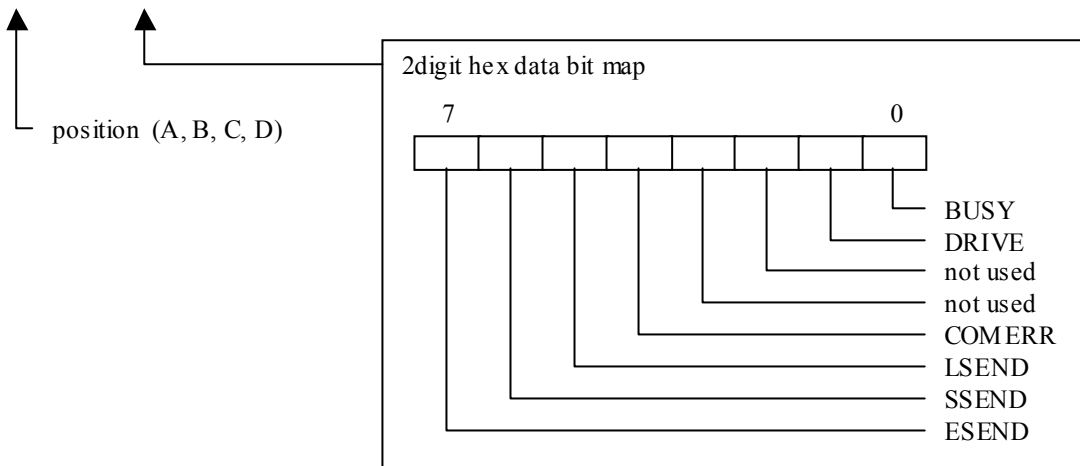
bit information

BUSY   : internal CPU is busy. Any command are receivable when bit=0 [1]
DRIVE   : internal CPU is now on pulse out status.
COMERR : command is not regal [2]
LSEND   : PULSE was stopped by limit switch. [2,3]
SSEND   : PULSE was stopped by slow stop command. [2,3]
ESEND   : PULSE was stopped by EM command. [2,3]

1) Only SLOW STOP, EM STOP command are available in BUSY=1,DRIVE=1 (on driving) state.
2) COMERR, LSEND, SSEND, ESEND BIT are valid in BUSY=0 status.
   These bit are cleared by next command.
3) LSEND, SSEND, ESEND BIT are valid only after end of driving.

c) For S2※2 command

R ○ (1digit hex data) CR+LF

position (A, B, C, D)

1digit hex data bit map

3   0

CW LS status (0:Non active 1:Active)
CCW LS status (0:Non active 1:Active)
HP LS status (0:Non active 1:Active)
H.OFF status (0:H.ON   1:H.OFF)
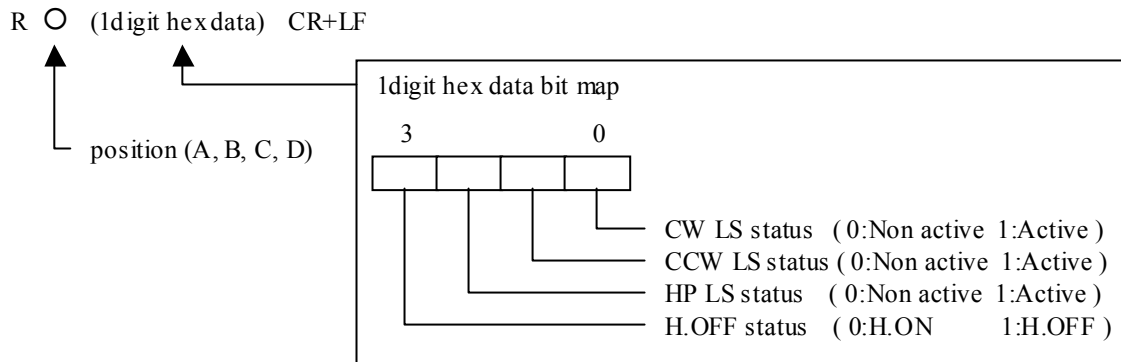
8-3 "S3" command

Commands are useful in LAN, RS232C and GP-IB communication.
"S3" command is used to pulse out or pulse stop and set condition data.
If the channel is scanning (BUSY BIT=1) these commands are ignored except pulse stop command.

< Command form type 1 >

S3 ○ (2digit HEX data) CR+LF

```
0 : A Position
1 : B Position
2 : C Position
3 : D Position
```

```
08, 0A : +JOG (1pulse)
09, 0B : -JOG (1pulse)
0C      : +SCAN (no acc.)
0D      : -SCAN (no acc.)
0E      : +SCAN (with acc.)
0F      : -SCAN (with acc.)
16      : PAUSE ON  1)
17      : PAUSE OFF 1)
18      : HOLD OFF set
19      : HOLD OFF clear
1E      : HP STOP +SCAN (with acc.)
1F      : HP STOP +SCAN (with acc.)
40      : SLOW STOP
80      : EM STOP
```
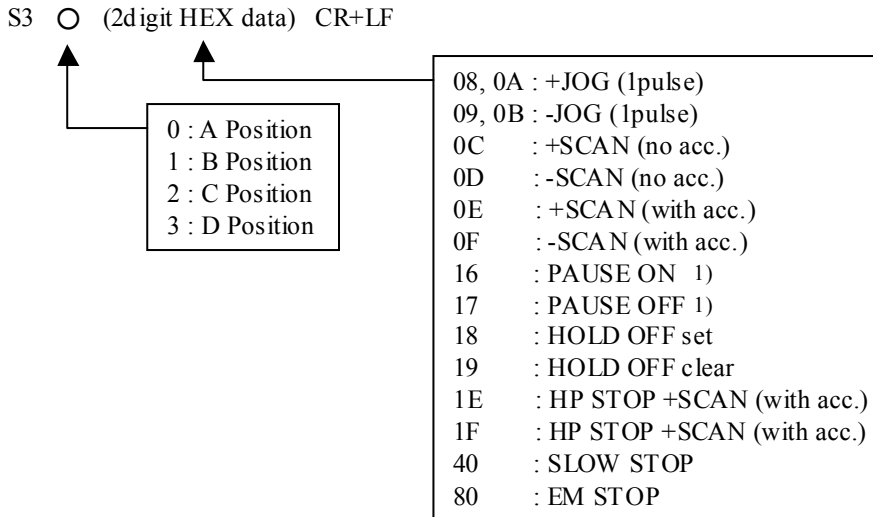
1) PAUSE ON/OFF command controls one circuit line on the board,
   any position mark (A, B, C, D) will work as the same command.

< Command Sample >

A POSITION +JOG command	・・・	S3008CR+LF（or S300ACR+LF）
B POSITION HOLD OFF set	・・・	S3118CR+LF
C POSITION +SCAN command	・・・	S320ECR+LF
D POSITION slow stop command	・・・	S3340CR+LF

< Command form type 2 >

S38 ○ (±7digit decimal data) (2digit HEX data) CR+LF

```
0 : A Position
1 : B Position
2 : C Position
3 : D Position
```

```
±8388607
(0 ~ FFFFFF in HEX)
```

```
10 : INDEX SCAN (no acc.)
11 : ABSOLUTE SCAN (no acc.)
12 : INDEX SCAN (with acc.)
13 : ABSOLUTE SCAN (with acc.)
```
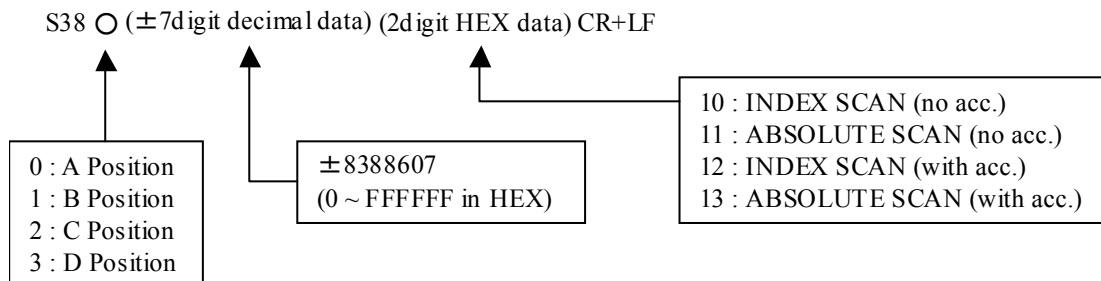
< Command sample >

A POSITION +1234567 INDEX SCAN(no acc.)	・・・S380+123456710CR+LF
B POSITION -0200000 ABSOLUTE SCAN(no acc.)	・・・S381-020000011CR+LF
C POSITION +0000000 INDEX SCAN(with acc.)	・・・S382+000000012CR+LF
D POSITION -0000100 ABSOLUTE SCAN(with acc.)	・・・S383-000010013CR+LF

< Command form type 3 >

S39 ○ △ <const.1> CR+LF

0 : A Position 1 : B Position 2 : C Position 3 : D Position		

0 : HSPD change	3digit (000 ~ 187) 2)	
1 : MSPD change	3digit (000 ~ 187) 2)	
2 : LSPD change	3digit (000 ~ 161) 2)	
3 : RATE change	2digit (00 ~ 18) 3)	
4 : JOG pulse set	4digit (0000 ~ 9999) 4)	
5 : LS STOP MODE set	1digit (0:SLOW STOP / 1:EM STOP)	
6 : PB STOP MODE set	1digit (0:EM STOP / 2:SLOW STOP)	
7 : H.OFF set/clear	1digit (0:clear / 4:set)	
8 : HP SCAN DIR set	1digit (0:CCW / 8:CW)	
9 : couter preset	±7digit decimal (max ±8388607)	

2) It must be 3 digit data
3) It must be 2 digit data
4) It must be 4 digit data

Caution) Speed data change by this "S39" needs "S71" command to effective new data.
"S71" command is the sign to start changing speed data.

< Command sample >

A POSITION	HSPD	set to 100	・・・ S3900100CR+LF
B POSITION	MSPD	set to 15	・・・ S3911015CR+LF
C POSITION	LSPD	set to 5	・・・ S3922005CR+LF
D POSITION	RATE	set to 10	・・・ S393310CR+LF
A POSITION	JOG pulse set to 1234		・・・ S39041234CR+LF
B POSITION	LS STOP set to slow stop		・・・ S39150CR+LF
C POSITION	LS STOP set to EM stop		・・・ S39251CR+LF
D POSITION	PB STOP set to slow stop		・・・ S39362CR+LF
A POSITION	H.OFF clear		・・・ S39070CR+LF
B POSITION	H.OFF set		・・・ S39174CR+LF
C POSITION	HP SCAN DIR set to CCW		・・・ S39280CR+LF
D POSITION	HP SCAN DIR set to CW		・・・ S39399CR+LF
A POSITION	counter preset +1234567		・・・ S3909+1234567CR+LF

8-4   "S4" command

Commands are useful in LAN, RS232C and GP-IB communication.
"S4" command is mainly used to read setting data for each channel.
It can be used at any time whether pulse control CPU is busy or not, REMOTE or LOCAL mode.

< Command form >

S4 ○ △ CR+LF

```
0 : A Position
1 : B Position
2 : C Position
3 : D Position
8 : status of panel
```

```
0 : HSPD data read
1 : MSPD data read
2 : LSPD data read
3 : RATE data read
4 : JOG pulse data read
5 : status data read
```
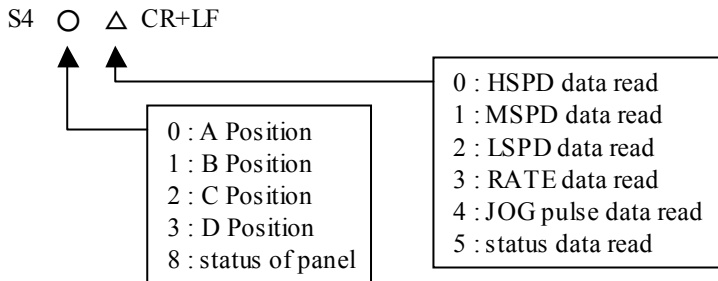
< Receive data form >

a) POSITION data read

R ○ □ <const.2> CR+LF

4digit decimal data

```
0 : A Position
1 : B Position
2 : C Position
3 : D Position
```

```
H : HSPD data read
M : MSPD data read
L : LSPD data read
R : RATE data read
JP: JOG pulse data read
S : status data read
```

b) Status information for the panel

R ○ □ <const.3> <const.4> CR+LF

```
C : SETUP mode
N : NORMAL mode
```

```
L : LOCAL mode
R : REMOTE mode
```

2digit HEX code bit map

7							0
0							

- ABS mode
- REL mode
- H.P mode
- SCAN mode
- SPEED Low
- SPEED Mid
- SPEED Hi

2digit decimal data bit map

7							0
0	0	0	0				
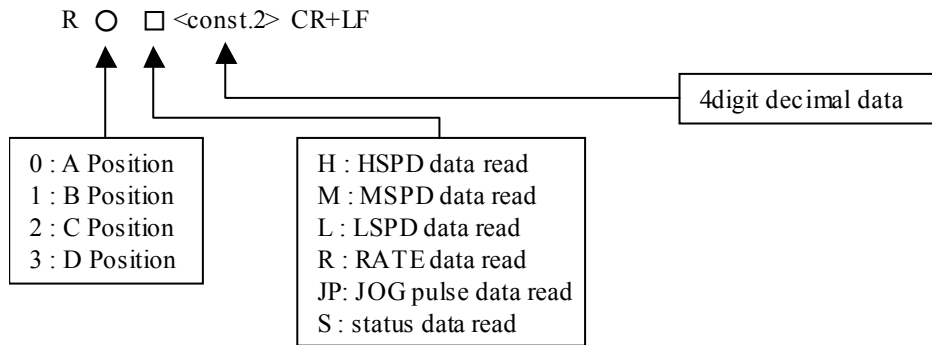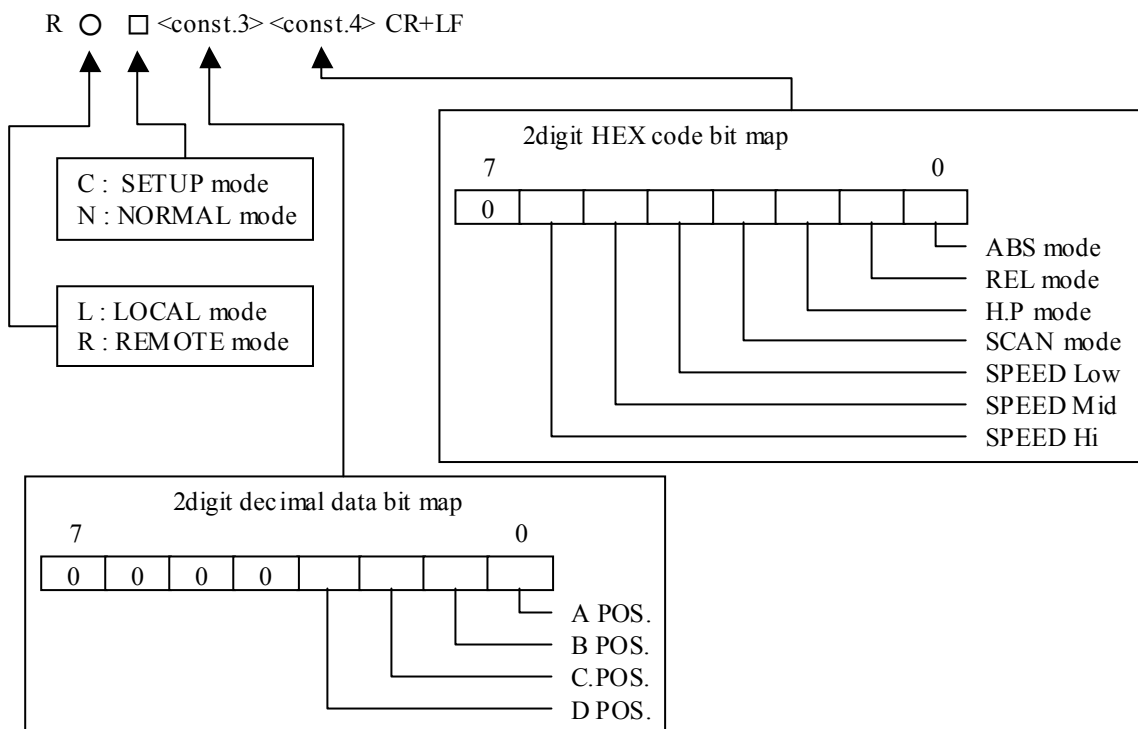
- A POS.
- B POS.
- C.POS.
- D POS.

< Command sample >

A POSITION	HSPD data read	・・・	S400CR+LF
B POSITION	MSPD data read	・・・	S411CR+LF
C POSITION	LSPD data read	・・・	S422CR+LF
D POSITION	RATE data read	・・・	S433CR+LF
A POSITION	JOG pulse data read	・・・	S404CR+LF
D POSITION	status data read	・・・	S435CR+LF
status information for the panel		・・・	S48CR+LF

8-5 "S7" command

Commands are useful in LAN, RS232C and GP-IB communication.
It is used to change status of the panel.

< Command form >

S7 ○ △ CR+LF

0 : REM/LOC change	R : REMOTE mode change
	L : LOCAL mode change
1 : SPEED change	H : Speed Hi change
	M : Speed Mid change
	L : Speed Low change
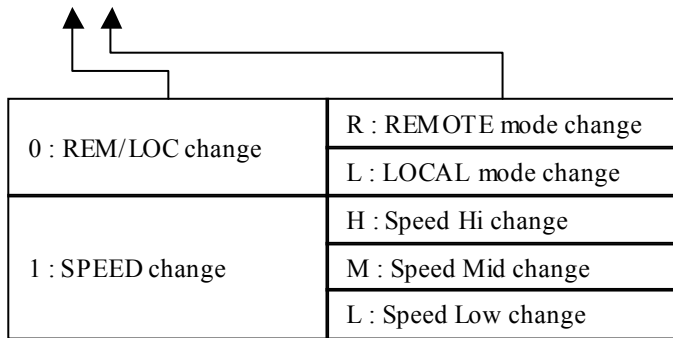
< Command sample >

PM4C-06	REMOTE mode change	・・・	S70RCR+LF
PM4C-06	LOCAL mode change	・・・	S70LCR+LF
PM4C-06	SPEED Hi change	・・・	S71HCR+LF
PM4C-06	SPEED Mid change	・・・	S71MCR+LF
PM4C-06	SPEED Low change	・・・	S71LCR+LF

9. Hand Box control (Optional)

This controller is useful in local mode.
You can control A,B,C,D channels far from 3meter of PM16C.
Preset speed is indicated by LED display.

① channel select switch

② speed change switch

③ JOG switch

```
        PM16C-HDX

    CH SELECT    SPEED
                 H  M  L
       B   C     O  O  O
     A       D
```

```
      JOG
      CW
```

```
      CCW
```

```
   TSUJI DENSHI CO.,LTD.
```

Operation

① Select channel by ①

② Select motor speed by ②

③ Access CW,CCW motor
   access by ③

36
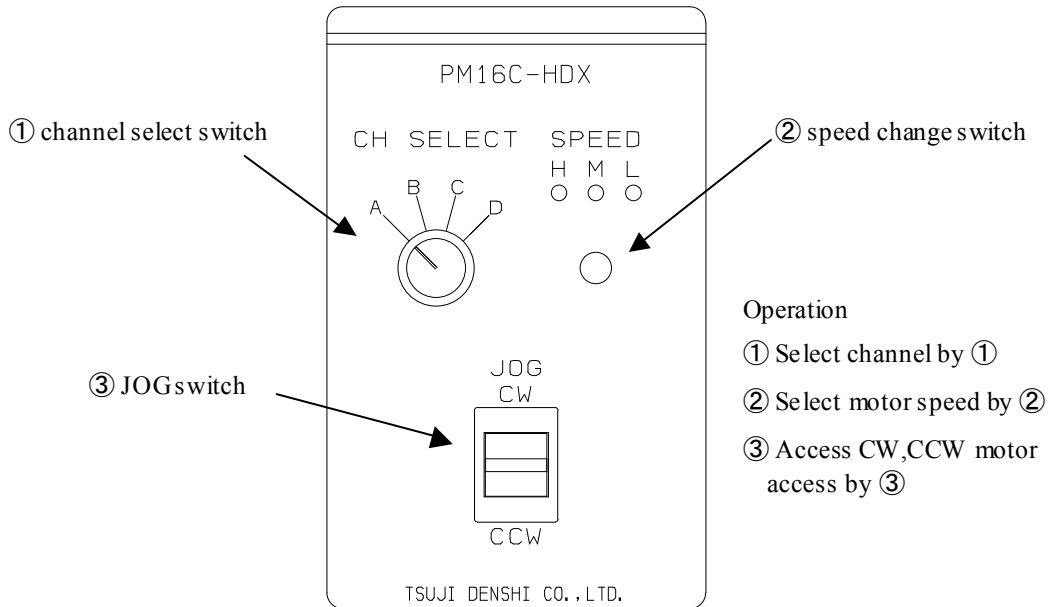
10. Data initialization

If PRESET button and STOP button are being pushed when power on reset, all setting data are initialized. In case of updating firmware, they are initialized too.

Initialized data are below.

Item	Default
HSPD	048(3700PPS)
MSPD	016(650PPS)
LSPD	001(10PPS)
RATE	005(300ms)
Current position	0
Preset data	0
JOG PULSE	1
LS	ENABLE
LS CONTACT	N.C
LS STOP	FAST
PB STOP	SLOW
HOLD OFF	ENABLE
HP.START	CW
HP CONTACT	N.O
PULES MODE	P-P MODE
DIGITAL LS	DISABLE
DIGITAL CWLS	1000000
DIGITAL CCWLS	-1000000
RS232C	38400 BAUD
GPIB ADD	07
IP ADD	192.168.1.55
PORT No.	7777
HAND BOX	WHEN ENB

11. Additional function

By using additional function, you can control disabled channel by Hand Box.
At SETUP mode, open Hand Box setting page. If you select "ALWAYS" in the page, you can always control all channels by Hand Box.

12. Connection with outer equipment

Connection cables are recommended to be shielded twist pair cable. (more than $0.2mm^2$)
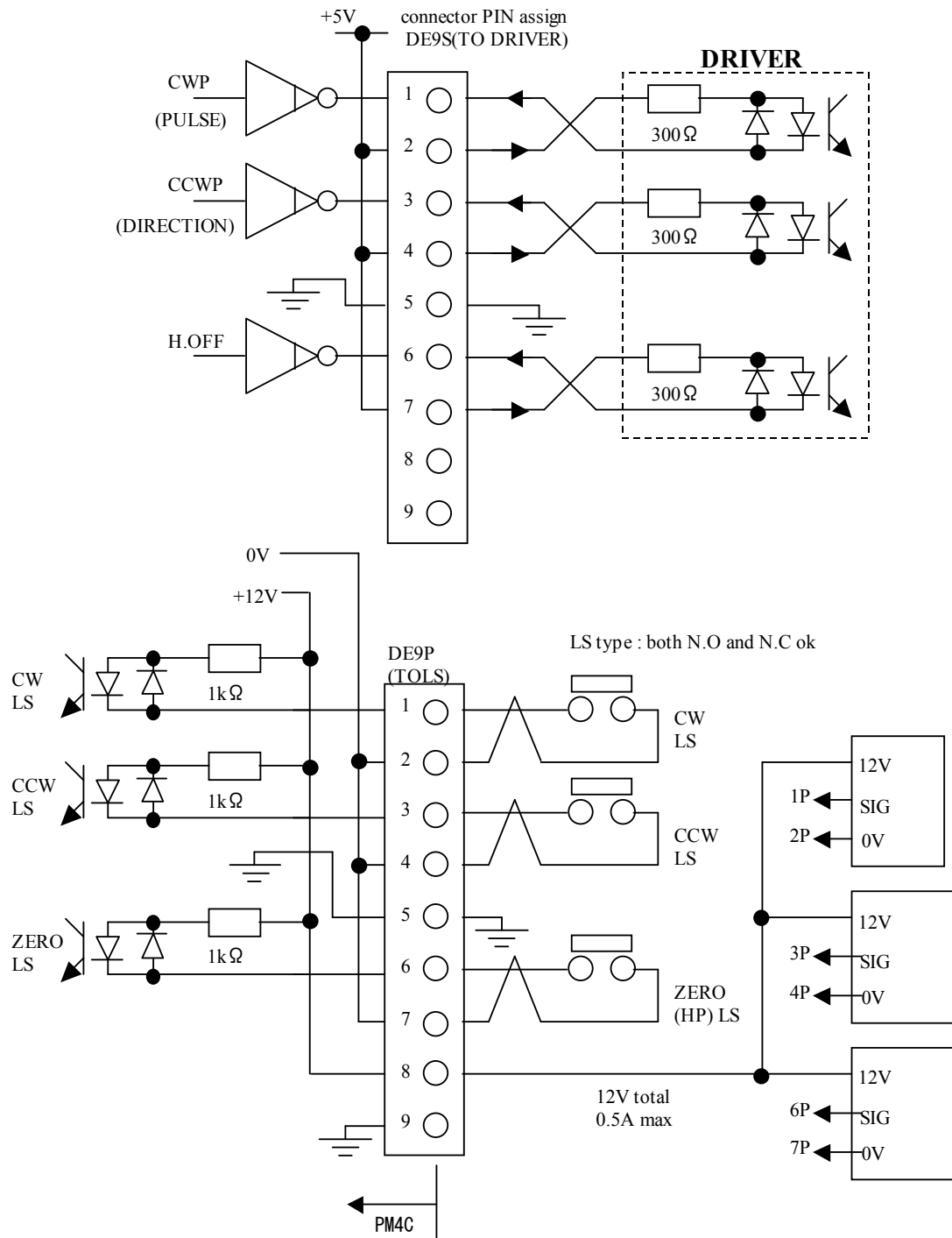
Caution)
N.G (the origin proximity) is not used now.
Connector shell size of DE9P and 9S is varied from each maker's.
Outward form <35W can be used for PM4C-06.
DE-C1-J6(JAE), XM2S-0911(OMRON) and HDE-CTF(HIROSE) are possible to be used.

13. Performance and specifications

	PRODUCT	PMCD-06N, X	PM2C-06	PM3C-06	PM4C-06
Input/ Output	Control motor	1	2	3	4
	Capability	1	2	3	4
	Output	CW, CCW, HOLD OFF (5V, 8mA:line driven) for each motor driver			
	Pulse rate	5 ～ 100,000PPS(LOC) / 1 ～ 100,000PPS(REM)			
	Pulse control number	0 ～ ±8,388,607			
	Acceleration and Deceleration rate	1000ms ～ 1.0 ms/KHz			
	Acceleration and Deceleration form	Constant speed, trapezoidal form			
	Output format	2pulse / 1pulse			
	Pulse out connector	DE9S (F)			
	Limit switch input	CW-LS, CCW-LS, HOME-LS 12V 5mA (minus common) and power supply +12v for censer for each motor (Max. 0.5A).			
	Limit switch connector	DE9P (M)			
LCD display	Characters and lines of Display device	8characters × 2lines (character size : 11.4H × 6.1W)			
	Display default	Upper line : current position Lower line : preset value			
	Display contents in Data set mode	HSPD, MSPD, LSPD, RATE, JOG PULSE, LS EN/DA, LS NO/NC, LS STOP FAST/SLOW, PB STOP FAST/SLOW, HOLD OFF, HP DIR, HP NO/NC, P-P/P-D, RS232C BAUD, GP-IB ADD, IP ADD, MAC ADD, HAND BOX			
Panel push button and lamp	All channel	Button : REM/LOC, SETUP, PRESET, START, STOP, MODE, SPEED, JOG CW/CCW Lamp : REM/LOC, MODE/HP-REL-ABS-SCAN, SPEED/H-M-L			
	Each channel	Button : UP, DOWN, INC, DEC, ENABLE Lamp : ENABLE, CWLS, CWP, CCWP, CCWLS, MF, HP			
Control	PRESET START STOP JOG	preset specified data to the ready channel moving start for ready channel according to the mode stop moving for ready channel jog stepping for ready channel			
Stepping mode	SCAN MODE	continuous stepping operation of ready channel. Stepping direction is according JOG switch.			
	ABS IDX MODE	moving to specified position of ready channel			
	REL IDX MODE	moving specified steps of ready channel			
	HP STOP MODE	stop by Home Position Limit Switch			
Remote		LAN, GP-IB, RS232C			
Case		EIA 2 UNIT rack mount type (88H×482W×325D)			
Power		AC 85V ～ 264V 47 – 440Hz 50VA			

PM4C-06 series command list

Below commands are not only for 4ch controller (PM4C) but also for 1ch~3ch controller.
・for LAN, RS232C, GP-IB (delimiter:CR+LF(fixed))
・COMPATIBLE TO PM16C-04XD(L)

 x : 0~3(channel)   dd・・・d : decimal data

MODE	COMMAND	NOTE
R	ABSx±ddddddd	absolute index scan
R	ASSTP, AESTP	all moving motor slow stop or fast stop
R	BLx±ddddddd	set backward digital limit
R/L	BL?x	read backward digital limit reply:±ddddddd(decimal)
R	CSCANPx, CSCANNx	constant speed scan to cw or ccw direction
R	FLx±ddddddd	set forward digital limit position
R/L	FL?x	read forward digital limit reply:±ddddddd(decimal)
R	JOGPx, JOGNx	Jog command (one step to cw or ccw direction)
R	LOC	LOCAL mode change
R/L	LS?	LS read reply:abcdHJKL
R	PAUSE ON	set pause. send before scan start command.
R	PAUSE OFF	clear pause. send after scan start command for synchronous scan start of multi channels
R	PAUSE?	read out / reply: ON or OFF
R	PSx±ddddddd	preset position data
R/L	PS?x	read position data reply:±ddddddd(decimal)
R	RELx±ddddddd	relative index scan
L	REM	REMOTE mode change
R	RTExddd	acc. rate set ddd:0~021(see RATE TABLE p9)
R/L	RTE?x	read acc. RATE reply:ddd
R	SCANHPx, SCANHNx	accelerative scan to cw or ccw direction if HP switch then stop
R	SCANPx, SCANNx	accelerative scan to cw or ccw direction
R	SETHPxOXYZ	HP find information set X: found/1, not found/0(reserved) Y: found dir. 0/cw, 1/ccw(reserved) Z: auto start dir. 0/cw, 1/ccw
R/L	SETHP?x	read HP find information reply:OXYZ
R	SETJGxdddd	set Jog pulse for manual PB
R/L	SETJG?x	read JOG pulse for manual PB reply:DDDD
R	SETLSxDYYY0yyy	set LS characteristics D:digital limit enable/1, disable/0 Y:LS enable/1, disable/0 y:LS N.C/1, N.0/0
R/L	SETLS?x	read LS setting reply:DYYY0yyy(see SETLSx)
R	SETMTxABCD	motor drive set A:1/drive enable 0/disable B:1/hold on 0/hold off C:1/trapezoidal(fixed) D:0/Pulse-Pulse 1/Pulse-Direction 2/PDR
R/L	SETMT?x	read motor set reply:ABCD

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MODE	COMMAND	NOTE
R	SPDHx,SPDMx,SPDLx	change speed(can set 0~3ch individually)
R/L	SPD?x	read speed reply:HSPD or MSPD or LSPD
R	SPDHxdddd…	set HSPD to ddd… in pps unit(1~100,000)
R/L	SPDH?x	read HSPD reply:dddddd
R	SPDLxdddd…	set LSPD to ddd… in pps unit(1~100,000)
R/L	SPDL?x	read LSPD reply:dddddd
R	SPDMxdddd…	set MSPD to ddd… in pps unit(1~100,000)
R/L	SPDM?x	read MSPD reply:dddddd
R	SPRSx±dddddddd	set preset data for LOCAL mode
R/L	SPRS?x	read preset data for LOCAL mode reply:±DDD…DD
R/L	SRQx1 (ONLY FOR GP-IB)	SRQ flag set auto reset after SRQ out
R/L	SRQx0 (ONLY FOR GP-IB)	SRQ flag reset
R/L	SRQ?x (ONLY FOR GP-IB)	SRQ flag read reply:1 or 0
R	SSTPx,ESTPx	slow stop or fast stop
R	STOPMDxAB	set PB and LS stop mde A:0/LS slow stop 1/LS fast stop B:0/PB slow stop 1/PB fast stop
R/L	STOPMDx?	read PB & LS stop mode reply:AB A,B:0,1
R/L	STQ?	REMOTE/LOCAL mode and moving motor information reply: Rn or Ln n:0 ~ 4 stopping motor number (if n = 0 then you can't start another motor)
R/L	STS?	Status read out reply: R(L)abcd/PNNS/VVVV/HHJJKKLL/±uu…/±vv…/±ww…/±xx… PNNS:P:cw moving N:ccw moving S:stopped VVVV:LS status & hold off status HH,JJ,KK,LL:mcc status uu…,vv…,ww…,xx… :current position
R/L	HDSTLS?	hard and soft limit sw read reply:abcdHHHHSSSS abcd/ch, HHHH/hard SSSS/soft
R/L	HOLD?x	hold on/off state read x:ch(0,1,…9,A,B,C,D,E,F) reply: ON or OFF
R	HOLDxON	hold on set to ch x
R	HOLDxOFF	hold off set to ch x

FOR MAINTENANCE

MODE	COMMAND	NOTE
R/L	FROM0, FROM1	FROM select
R/L	FROM?	current FROM read reply:FROM0,FROM1
R	REST	restart without power off-on
R/L	STSM?	read status port1 of MCC06 aaaa/bbbb/cccc/dddd
R/L	VER?	read version reply: 1.00 10-10-01 PM4C-06
R/L	VERH?	hardware version read reply:HD-VER0,1,2,5,6

OLD COMMAND LIST（Existing commands below are available to PM4C-06.）

MODE	COMMAND	NOTE
R	S100	cancel A CH SRQ GP-IB only
R	S101	SRQ set when A MOTOR stopped 〃
R	S110	cancel B CH SRQ 〃
R	S111	SRQ set when B motor stopped 〃
R	S120	cancel C CH S 〃
R	S121	SRQ set when C motor stopped 〃
R	S130	cancel D CH SRQ 〃
R	S131	SRQ set when D motor stopped 〃
R/L	S18	SRQ flag read RO□ □：1/A POS., 2/B POS. 3/A,B POS. ・・・
R	S19	SRQ out CH read RO□ □：1/A POS., 2/B POS. 3/A,B POS. ・・・
R/L	S200	A CH position data read RA±DDDDDDD D：decimal
R/L	S201	A CH CPU status read RAHH H：hex code, b0 BIT:BUSY
R/L	S201	A CH LS, HP, HOLD OFF status read 0:CWLS, b1:CCWLS, b2:HP, b3:H.OFF
R/L	S210	B CH position data read RB±DDDDDDD D：decimal
R/L	S211	B CH CPU status read RBHH H：hex code, b0 BIT:BUSY
R/L	S212	B CH LS, HP, HOLD OFF status read 0:CWLS, b1:CCWLS, b2:HP, b3:H.OFF
R/L	S220	C CH position data read RC±DDDDDDD D：decimal
R/L	S221	C CH CPU status read RCHH H：hex code, b0 BIT:BUSY
R/L	S222	C CH LS, HP, HOLD OFF status read 0:CWLS, b1:CCWLS, b2:HP, b3:H.OFF
R/L	S230	D CH position data read RD±DDDDDDD D：decimal
R/L	S231	D CH CPU status read RDHH H：hex code, b0 BIT:BUSY
R/L	S232	D CH LS, HP, HOLD OFF status read 0:CWLS, b1:CCWLS, b2:HP, b3:H.OFF
R	S30□□	A POSITION 2 BYTE COMMAND □□ : COMMAND 08:+JOG 09:−JOG 0C:+CSPD SCAN 0D:−CSPD SCAN 0E:+SCAN 0F:−SCAN 16:PAUSE ON 17:PAUSE OFF 18:HOLD OFF 19:HOLD ON 1E:+SCAN & HP STOP 1F:−SCAN & HP STOP 40:SLOW STOP 80:EM.STOP
R	S31□□	B POSITION 2 BYTE COMMAND □□ : COMMAND 08:+JOG 09:−JOG 0C:+CSPD SCAN 0D:−CSPD SCAN 0E:+SCAN 0F:−SCAN 16:PAUSE ON 17:PAUSE OFF 18:HOLD OFF 19:HOLD ON 1E:+SCAN & HP STOP 1F:−SCAN & HP STOP 40:SLOW STOP 80:EM.STOP
R	S32□□	C POSITION 2 BYTE COMMAND □□ : COMMAND 08:+JOG 09:−JOG 0C:+CSPD SCAN 0D:−CSPD SCAN 0E:+SCAN 0F:−SCAN 16:PAUSE ON 17:PAUSE OFF 18:HOLD OFF 19:HOLD ON 1E:+SCAN & HP STOP 1F:−SCAN & HP STOP 40:SLOW STOP 80:EM.STOP
R	S33□□	D POSITION 2 BYTE COMMAND □□ : COMMAND 08:+JOG 09:−JOG 0C:+CSPD SCAN 0D:−CSPD SCAN 0E:+SCAN 0F:−SCAN 16:PAUSE ON 17:PAUSE OFF 18:HOLD OFF 19:HOLD ON 1E:+SCAN & HP STOP 1F:−SCAN & HP STOP 40:SLOW STOP 80:EM.STOP

MODE	COMMAND	NOTE	
R	S380±DDDDDDDHH	A POSITION DECIMAL INDEX COMMAND HH: 10:CSPD RELATIVE SCAN 11:CSPD ABSOLUTE SCAN 12:RELATIVE SCAN 13:ABSOLUTE SCAN	
R	S381±DDDDDDDHH	B POSITION DECIMAL INDEX COMMAND HH: 10:CSPD RELATIVE SCAN 11:CSPD ABSOLUTE SCAN 12:RELATIVE SCAN 13:ABSOLUTE SCAN	
R	S382±DDDDDDDHH	C POSITION DECIMAL INDEX COMMAND HH: 10:CSPD RELATIVE SCAN 11:CSPD ABSOLUTE SCAN 12:RELATIVE SCAN 13:ABSOLUTE SCAN	
R	S383±DDDDDDDHH	D POSITION DECIMAL INDEX COMMAND HH: 10:CSPD RELATIVE SCAN 11:CSPD ABSOLUTE SCAN 12:RELATIVE SCAN 13:ABSOLUTE SCAN	
R	S3900DDD	A POSITION HSPD set DDD:3digit(000～254)	data availabe
R	S3901DDD	A POSITION MSPD set DDD:3digit(000～254)	after "S71"
R	S3902DDD	A POSITION LSPD set DDD:3digit(000～254)	command
R	S3903DD	A POSITION RATE set DD:2digit(00～21)	
R	S3904DDDD	A POSITION JOG pulse DDDD:4digit(0000～9999)	
R	S3905D	A POSITION LS STOP MODE set D: 0:SLOW STOP 1:FAST STOP	
R	S3906D	A POSITION PB STOP MODE set D: 0:FAST STOP 2:SLOW STOP	
R	S3907D	A POSITION HOLD OFF set/reset D: 0:reset 4:set	
R	S3908D	A POSITION HP SCAN DIR set D: 0:CCW 8:CW	
R	S3909±DDDDDD	A POSITION counter preset DDDDDDD:7digit(0000000～8388607)	
R	S3910DDD	B POSITION HSPD set DDD:3digit(000～254)	data availabe
R	S3911DDD	B POSITION MSPD set DDD:3digit(000～254)	after "S71"
R	S3912DDD	B POSITION LSPD set DDD:3digit(000～254)	command
R	S3913DD	B POSITION RATE set DD:2digit(00～21)	
R	S3914DDDD	B POSITION JOG pulse DDDD:4digit(0000～9999)	
R	S3915D	B POSITION LS STOP MODE set D: 0:SLOW STOP 1:FAST STOP	
R	S3916D	B POSITION PB STOP MODE set D: 0:FAST STOP 2:SLOW STOP	
R	S3917D	B POSITION HOLD OFF set/reset D: 0:reset 4:set	
R	S3918D	B POSITION HP SCAN DIR set D: 0:CCW 8:CW	
R	S3919±DDDDDD	B POSITION counter preset DDDDDDD:7digit(0000000～8388607)	
R	S3920DDD	C POSITION HSPD set DDD:3digit(000～254)	data availabe
R	S3921DDD	C POSITION MSPD set DDD:3digit(000～254)	after "S71"
R	S3922DDD	C POSITION LSPD set DDD:3digit(000～254)	command
R	S3923DD	C POSITION RATE set DD:2digit(00～21)	
R	S3924DDDD	C POSITION JOG pulse DDDD:4digit(0000～9999)	
R	S3925D	C POSITION LS STOP MODE set D: 0:SLOW STOP 1:FAST STOP	
R	S3926D	C POSITION PB STOP MODE set D: 0:FAST STOP 2:SLOW STOP	
R	S3927D	C POSITION HOLD OFF set/reset D: 0:reset 4:set	
R	S3928D	C POSITION HP SCAN DIR set D: 0:CCW 8:CW	
R	S3929±DDDDDD	C POSITION counter preset DDDDDDD:7digit(0000000～8388607)	
R	S3930DDD	D POSITION HSPD set DDD:3digit(000～254)	data availabe
R	S3931DDD	D POSITION MSPD set DDD:3digit(000～254)	after "S71"
R	S3932DDD	D POSITION LSPD set DDD:3digit(000～254)	command
R	S3933DD	D POSITION RATE set DD:2digit(00～21)	
R	S3934DDDD	D POSITION JOG pulse DDDD:4digit(0000～9999)	
R	S3935D	D POSITION LS STOP MODE set D: 0:SLOW STOP 1:FAST STOP	
R	S3936D	D POSITION PB STOP MODE set D: 0:FAST STOP 2:SLOW STOP	
R	S3937D	D POSITION HOLD OFF set/reset D: 0:reset 4:set	
R	S3938D	D POSITION HP SCAN DIR set D: 0:CCW 8:CW	
R	S3939±DDDDDD	D POSITION counter preset DDDDDDD:7digit(0000000～8388607)	

MODE	COMMAND	NOTE
R	S3933DD	D POSITION RATE set DD: 2digit(00〜21)
R	S3934DDDD	D POSITION JOG pulse DDDD: 4digit(0000〜9999)
R	S3935D	D POSITION LS STOP MODE set D: 0:SLOW STOP 1:FAST STOP
R	S3936D	D POSITION PB STOP MODE set D: 0:FAST STOP 2:SLOW STOP
R	S3937D	D POSITION HOLD OFF set/reset D: 0:reset 4:set
R	S3938D	D POSITION HP SCAN DIR set D: 0:CCW 8:CW
R	S3939±DDDDDD	D POSITION counter preset DDDDDDD: 7digit(0000000〜8388607)
R/L	S400	A POSITION HSPD read RAH□□□□
R/L	S401	A POSITION MSPD read RAM□□□□
R/L	S402	A POSITION LSPD read RAL□□□□
R/L	S403	A POSITION RATE read RAR□□□□
R/L	S404	A POSITION JOG pulse read RAJP□□□□
R/L	S405	A POSITION status read RAS□□□□
R/L	S410	A POSITION HSPD read RBH□□□□
R/L	S411	B POSITION MSPD read RBM□□□□
R/L	S412	B POSITION LSPD read RBL□□□□
R/L	S413	B POSITION RATE read RBR□□□□
R/L	S414	B POSITION JOG pulse read RBJP□□□□
R/L	S415	B POSITION status read RBS□□□□
R/L	S420	C POSITION HSPD read RCH□□□□
R/L	S421	C POSITION MSPD read RCM□□□□
R/L	S422	C POSITION LSPD read RCL□□□□
R/L	S423	C POSITION RATE read RCR□□□□
R/L	S424	C POSITION JOG pulse read RCJP□□□□
R/L	S425	C POSITION status read RCS□□□□
R/L	S430	D POSITION HSPD read RDH□□□□
R/L	S431	D POSITION MSPD read RDM□□□□
R/L	S432	D POSITION LSPD read RDL□□□□
R/L	S433	D POSITION RATE read RDR□□□□
R/L	S434	D POSITION JOG pulse read RDJP□□□□
R/L	S435	D POSITION status read RDS□□□□
R/L	S48	Front panel information read 　RO○□HHhh 　　○ :　L:LOCAL　　R:REMOTE 　　□ :　C:CONDITION　N:NORMAL 　　HH :　b0:A POS.　b1:B POS.　b2:C POS.　b3:D POS. 　　hh :　b0:ABS　　b1:IND　　b2:H.P　　b3:SCAN 　　　　　b4:H speed　b5:M speed　b6:L speed
R/L	S70R	REMOTE MODE CHANGE
R/L	S70L	LOCAL MODE CHANGE
R	S71H	H SPEED CHANGE
R	S71M	M SPEED CHANGE
R	S71L	L SPEED CHANGE