16ch STEPPING MOTOR CONTROLLER
PM16C-16HW2
USER'S MANUAL

No. 4071(rev.5)

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1 Abstract

1-1 Introduction

Like the PM16C-HW, the PM16C-HW2 is a stepping motor controller that has two Ethernet connection ports. It has 2 IP addresses and 8 connection ports for each IP address, and high-speed Ethernet communication is possible. H LAN is a high-speed communication LAN port that can read the location information of all 16 channels within 1ms. An operation system is almost the same as PM16C-04XDL and PM16C-16.

The difference with PM16C-04XDL is described below.

1. PM16C-16HW2 controls 16 motors at the same time by Ethernet, RS-232C, and GP-IB communication.
2. The command which reads the state of all channel was added.
3. "Answer all mode" which adds an answer to all the commands was added.
4. Two axis interpolation commands which starts with "C0" or "C1" and Oscillation drive command which starts with "Y" are not mounted now

The difference with PM16C-16 is described below.

1. Independent IP addresses can be set for the two Ethernets. Each has 8 ports, and a total of 16 locations can be connected at the same time.
2. Response time has been reduced to a maximum of 25ms for all commands.
3. With H_LAN, all 16ch positions can be read within 1ms.
4. The "STOPx" response, which is a pseudo SRQ signal related to "LN_SRQ", is sent to the port that last sent "SRQx1" (x: 0 to F). The settings are independent for each connection port.

Take over the following functions of PM16C-04XDL.

1. Count pulse step bit is 32bits. Numerical range is -2,147,483,647 to +2,147,483,647.
2. Each characteristics（HSPD, MSPD, LSPD, RATE, LMSW, DGLS）is available for each channel.
3. Absolute position drive, relative position drive, continuous drive, and find home position drive is available. These drive have 3 acceleration and deceleration mode, constant, trapezoid, and "S" shaped.
4. The output of trigger pulse or gate signal (TTL) is available at the arbitrary sections and intervals.
5. There are five kinds of the way of stopping motor.
    ・ by the limit switch signal
    ・ by the home position limit switch signal
    ・ by the digital limit switch signal
    ・ when the "STOP" button is pushed
    ・ when the stop command is published
6. Firmware ROM update via communication line is available.

1-2 Architecture
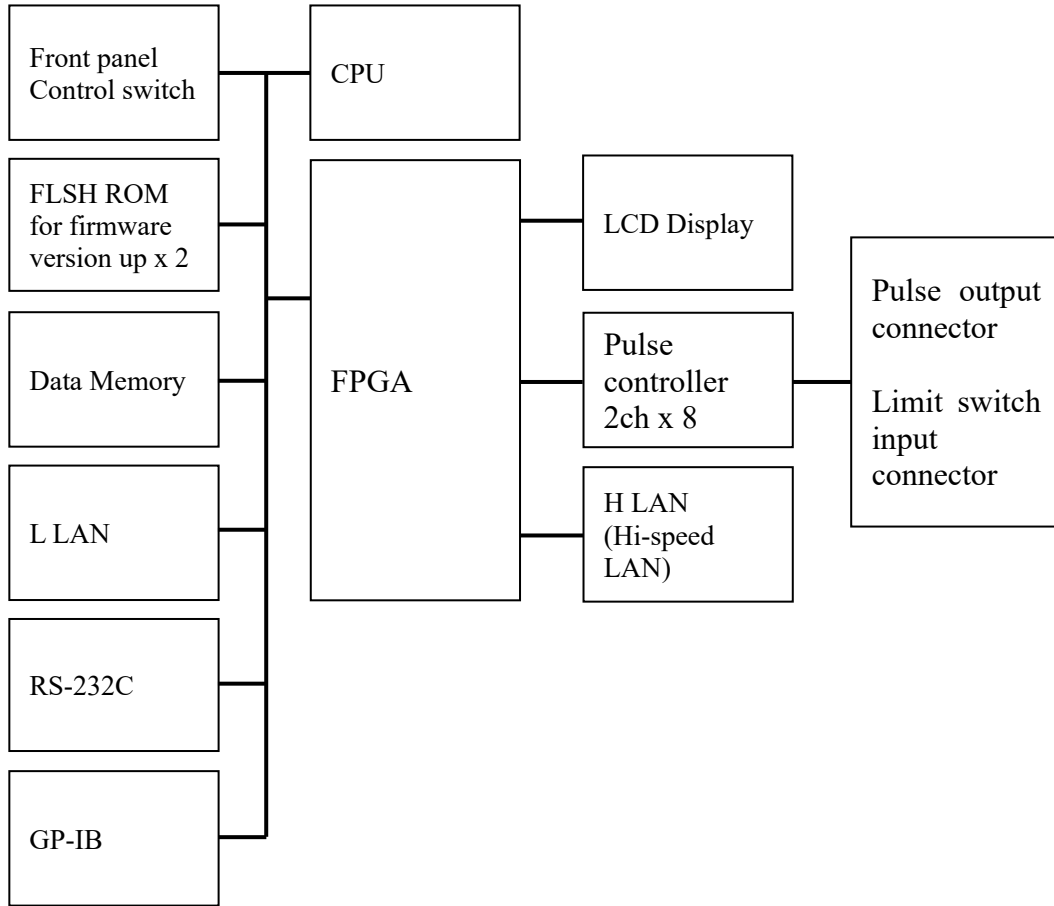
1-3 Connection Diagram
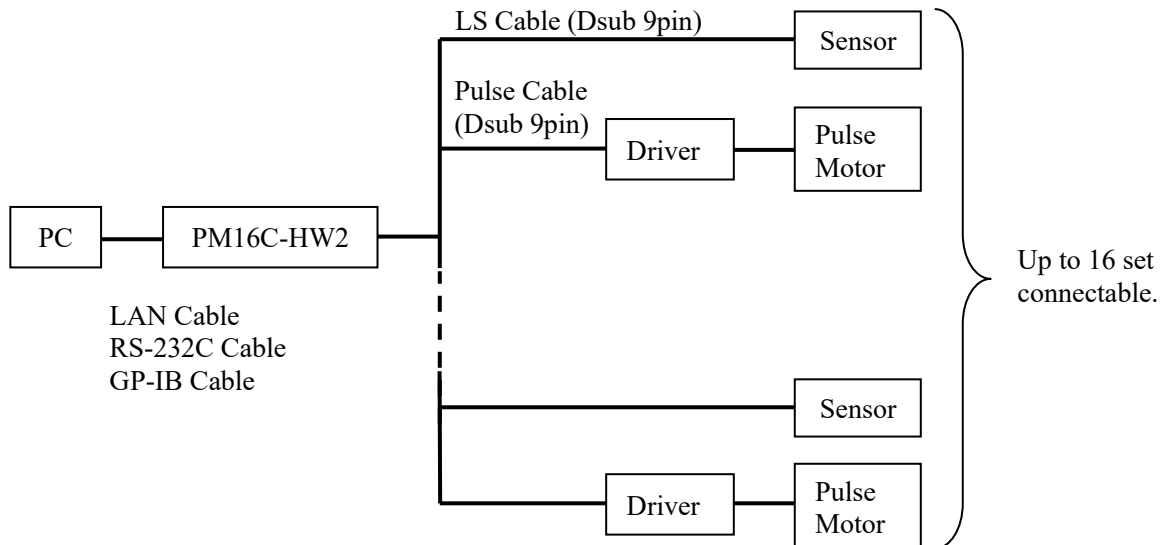
2 Parts names and function

2-1 Front Panel
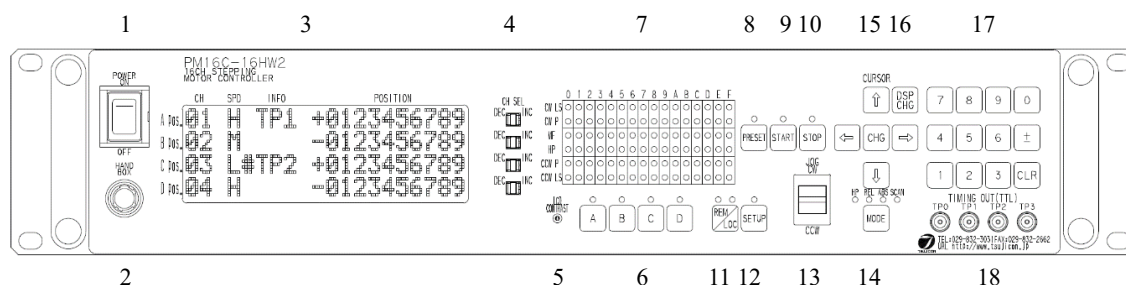
No.	Name	Function
1	POWER switch	This is the power switch of PM16C-16HW2.
2	Hand Box connector	Connect the Hand Box here (option). See page 19.
3	LCD display	20 character and 4 line LCD. Motor drive status and each channel data are displayed here.
4	CH select switch	Any 16 motor channel is allocated to A, B, C, D position. Select the motors to control with this switch. In SETUP mode, setup channel No. is changeable with a pos. ch select switch.
5	LCD contrast volume	Adjusts LCD contrast with + screw driver.
6	Motor active button	Set motor drive active or non-active for each position. Bright position shows active state. In local mode, motor drives active position only.
7	Motor status LED	These LED shows the motor status. Details are shown at page 7.
8	PRESET button	When motor drive mode is scan, current pulse position is set to preset value.
9	START button	All activated motor start driving according to the motor drive mode.
10	STOP button	All activated driving motor stop at local mode. All driving motor stop at remote mode.
11	REM/LOC button	Exchanges local mode and remote. If you push this button when turning on the power, various types of parameter except the current pulse value are initialized.
12	SETUP button	Goes to motor initial data setting mode (SETUP) when all motors are stop and local mode. If push it again, exits SETUP mode.

No.	Name	Function
13	JOG switch	Starts CW or CCW JOG operation. Motor drives just JOG set pulse with one push. If you hold over 0.4 sec., motor drives while holding. In SETUP mode, changes the page of setup function.
14	MODE button	Select the drive mode when pushing start button. Bright LED mode is selected mode. Drive mode changes every pushing.
15	cursor button	Move the cursor position with these keys. Changes set data at SETUP mode with "CHG" button.
16	DSPCHG button	Exchanges motor drive screen and mode disp. screen.
17	numeric keys	Entry the numeric data at SETUP mode. Sign inversion with "+-" button, data input cancel with "CLR" button. If you push "CLR" button when turning on the power, pulse value of all channels are reset to zero.
18	TIMING/OUT connector (LEMO)	TTL level pulse signal or gate signal according to pulse position data are output. See "8 Timing out signal output" (Page 54) in details.

● MOTOR STATUS LED

	0	1	···	E	F	
						The channel is shown.
CW LS	🔴	🔴	···	🔴	🔴	LED lights when CW direction limit switch is activated.
CW P	🟢	🟢	···	🟢	🟢	LED lights when CW direction pulse is output.
MF	🟡	🟡	···	🟡	🟡	LED lights when motor hold off signal is output.
HP	🟡	🟡	···	🟡	🟡	LED lights when Home Position limit switch is activated.
CCW P	🟢	🟢	···	🟢	🟢	LED lights when CCW direction pulse is output.
CCW LS	🔴	🔴	···	🔴	🔴	LED lights when CCW direction limit switch is activated.

LED of limit switch blinks when digital limit switch described at page 25 was turned on.

2-2 Rear Panel
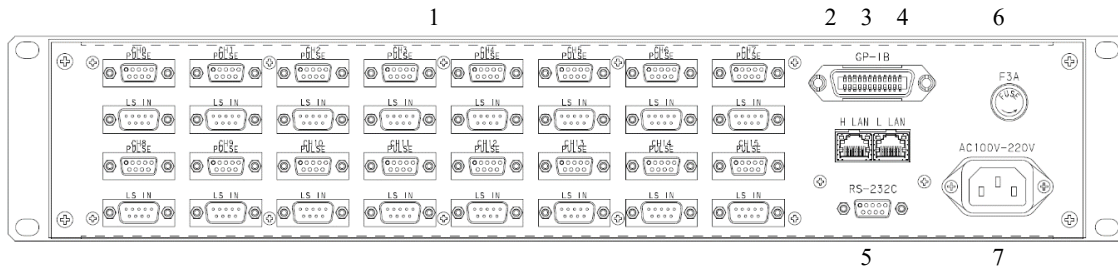
No.	Name	Function
1	Pulse out connector (PULSE) Limit switch connector (LS IN)	CH0 to CH15 pulse output Dsub9 female connector and limit switch input Dsub9 male connector are attached. Pin assignment are shown below.
2	GP-IB connector	Connect the GP-IB cable here.
3	RS-232 connector	Connect the RS-232C cross cable here.
4	H LAN connector	Connector for Hi-speed LAN (for command PC_16?) Connect the LAN cable here. Available to connect from 8 locations at the same time.
5	L LAN connector	Connect the LAN cable here. Available to connect from 8 locations at the same time.
6	Fuse holder (250 V 3A)	250V, 3A fuse is equipped here.
7	Power cable connector	Insert attached AC cable here. 100 ~ 220V AC power is available.

● Pulse out Dub connector（PULSE）Pin assignment

Function	Pin No.
CWP (PULSE) −	1
CWP (PULSE) +	2
CCWP (DIRECTION) −	3
CCWP (DIRECTION) +	4
F.G	5
HOLD OFF −	6
HOLD OFF +	7
(+5V)	8
N.C	9

DRIVER

300ohm

dotted line is for + common driver (in this case, 2, 4, 7 Pin are no connection.)
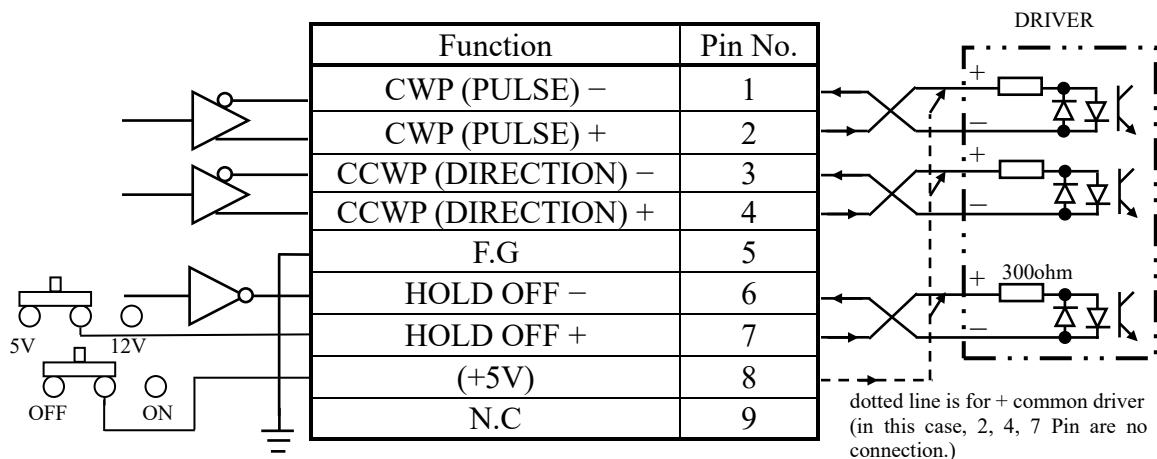
CWP (pins 1 and 2) and CCWP (pins 3 and 4) have a differential output of +5V-0V.

HOLD OFF (pin 6) is an open collector output. The 7th pin is set to +5V at the factory setting, but it is possible to output +12V from the 7th pin of the same channel by switching SW0~15 (corresponding to the ch number) to the +12V side. For pin 8, +5V can be supplied by opening the top lid and turning ON/OFF the red slide switch (SW16) on the board behind the connector. The factory setting is OFF.
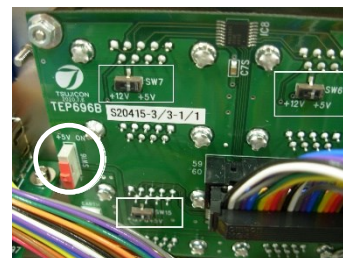
- Limit switch input Dsub connector（LS IN） Pin assignment

Function	Pin No.
CWLS+	1
CWLS-	2
CCWLS+	3
CCWLS-	4
F.G	5
HPLS+	6
HPLS-	7
+12V(MAX 0.8A)	8
F.G	9
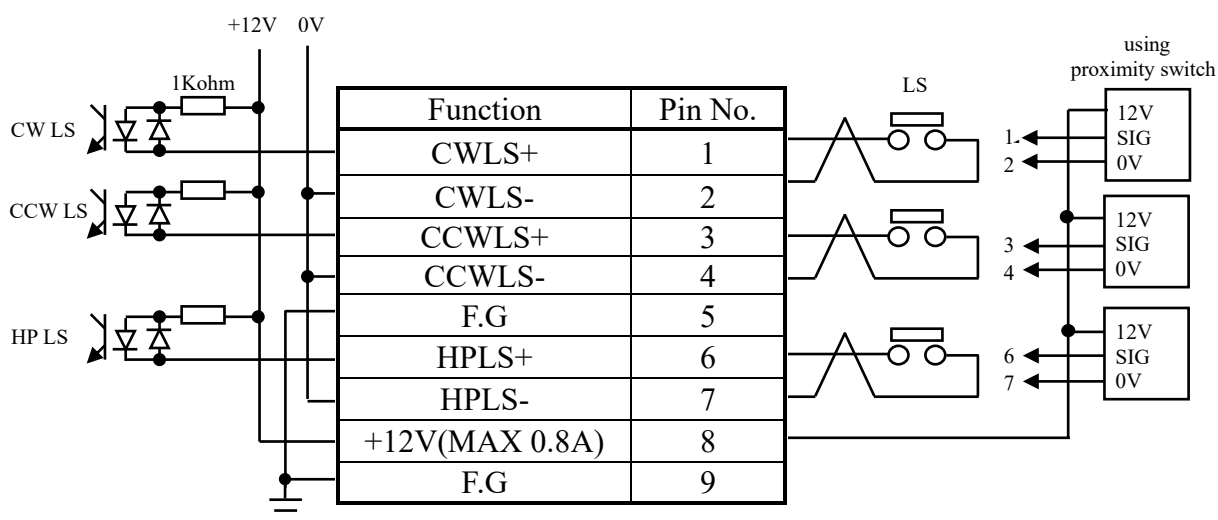
Both a-contact limit switch and b-contact are available.

Logic inverting is also available at PM16C-16HW2 settings.

Use Dsub connector which shell width is under 35mm, since each Dsub connector pitch is 37.6mm.

DE-C1-J6 (JAE), XM2S-0911 (OMRON), HDE-CTF (HIROSE) etc. are recommended connectors.

- RS-232C connector

The pin assignment of Dsub 9pin connector at PM16C-HW2 side is shown right. Use cross cable between PM16C-16HW2 and your PC.

Function	Pin No.
—	1
RXD	2
TXD	3
—	4
GND	5
—	6
—	7
—	8
—	9

3 Preparation of a communication line

3-1 The outline of communication control

PM16C-16HW2 is equipped communication control by LAN (2 ports), RS-232C, and GP-IB as same as PM16C-16HW. Initial setting is required of each communications. Any initial setting can be performed in SETUP mode.

- The display method of a SETUP screen
    After Power on, the 1.REM/LOC button is pushed and a green LED is made turn on.
    Since a screen will change if the 2.SETUP button is pushed, please push down 3.JOG switch in the direction of CW or CCW, and change a page.
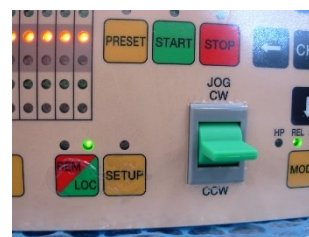
3-2 Configuration of LAN communication

JOG switch is moved to the CW position several times, and page 10 (LAN_H), page 11 (LAN_L) are displayed. Right photograph is the state of initial setting, and MAC address different for every equipment.

To change the IP address, port number, subnet mask, and gateway address, move the blinking cursor with the CURSOR button and enter the number directly with the numeric keypad.

As for a port number, 10001 to 10999 is a recommended value. There are eight port numbers [0] to [7] for each of LAN_H and LAN_L, and you can check or change other port numbers with the CH SEL lever switch or numeric keypad at the bottom.

If change is completed, the SETUP button will be pushed, and escape from SETUP screen. The change will be reflected. Please check that communication is established by the "VER?" command etc.
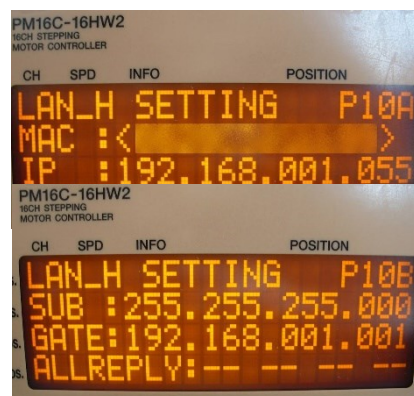
3-3 Differences between LAN_L (normal LAN) and LAN_H (hi-speed LAN)

The difference is that the hi-speed LAN port has a structure that can respond to the command "PS_16?" That reads the counters for all 16 channels within 1ms. Responses other than "PS_16?" on the hi-speed LAN port side are the same speed as normal LAN.

Normal LAN port also responds to the command "PS_16?", but the specifications are about 10 to 20ms.

3-4 Configuration of RS-232C and GP-IB communication

JOG switch is moved to the CW position several times, and page 9 (right screen) are displayed. Right photograph is the state of initial setting.

The blinking cursor is moved on the figure of B.RATE by CURSOR button. If the central CHG button is pushed, baud rate can be chosen from 1200, 2400, 4800, 9600, 19200, and 38400. It is only baud rate that can set up and other values are being fixed to DATA BIT: 8, STOP BIT: 1, NO FLOW CONTROL, NO PARITY.

A configuration of GP-IB only sets up address. A cursor is moved on the figure of ADDRESS and address is set up within the limits of 2 to 31.

IF change is completed, the SETUP button will be pushed, and escape from SETUP screen.

3-5 About delimiter character

The format of command is ASCII data, and the delimiter is CR + LF (0x0d + 0x0a).

After receiving CR + LF, command interpretation begins. When sending commands, "CR + LF" must be added at the end of the command, though the "CR + LF" are omitted in the command.

4 The outline of motor control

4 The outline of motor control

4-1 Remote mode and Local mode

PM16C-16HW2 have two ways of control mode, remote mode and local mode. In local mode, PM16C-16HW2 controls motor with switches attached front panel and hand box. Commands from communication line which drives motor and overwrite the motor setting are invalid, but which reads the data are available.

In remote, switches attached front panel are unable except STOP and REM LOC .

4-2 Drive mode

There are 4 drive modes at motor control, ABS, REL, SCAN, and H.P.

In local mode, you can change the drive mode with MODE . Current drive mode is indicated by LED above MODE . In remote mode, you can select drive mode with command directly.

- ・REL mode   Relative pulse drive mode
  - LOCAL: Push START , and motor drives toward the destination by preset value from present position.
  - REMOTE: Motor drives by entered value.

- ・ABS mode   Absolute pulse drive mode
  - LOCAL: Push START , and motor drives to preset destination value.
  - REMOTE: Motor drives by entered position.

- ・SCAN mode   Continuous drive mode to CW, CCW direction
  - LOCAL: Push START , and click "CW or CCW" jog switch, motor drives to dedicated direction continuously.
    A push on the PRESET button will set a pulse to the value set up beforehand.

- ・HP mode   Drive detecting origin point of pulse count for each channel.
    Details are in chap5.6 "Home position setting".

All motor drive are stopped with STOP or limit switch or HP switch signal, or enter motor stop command.

4-3 Drive speed setting

High speed (HSPD), middle speed (MSPD), low speed (LSPD) and acceleration rate is set individually for each channel. These setting are modified by remote commands or SETUP mode "5-1 Page1 speed setting (Page 24)".

Acceleration and deceleration method have the three modes, "Const", "Trape", and "Schar". These setting are modified by remote commands or SETUP mode "5-2 Page2 Motor operation, hold-off function setting (Page 23)". Refer to the page 48 for the setting command of speed.

● Constant drive (Const)
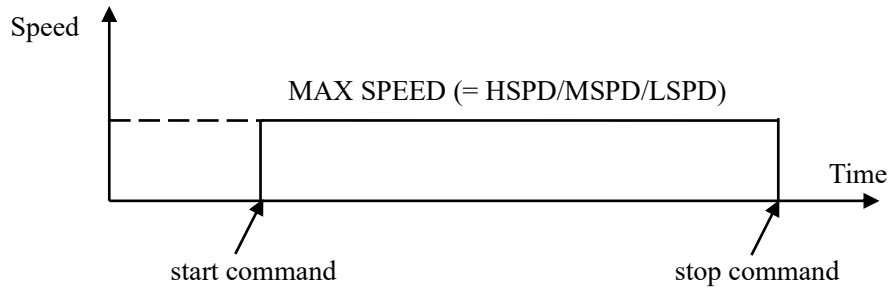
Motor drives at MAX speed as soon as drive execution, and stops immediately as soon as stop operation. Too fast drive speed causes motor step out.
<u>Low speed drive is always constant drive at all drive mode.</u>

● Trapezoidal form acceleration drive (Trape)
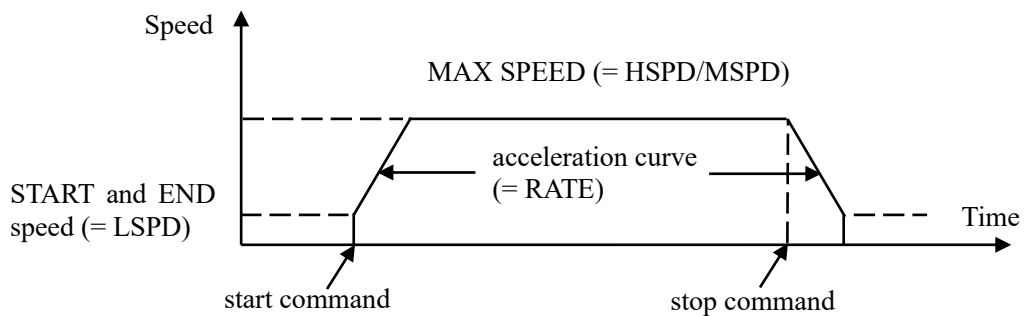
Acceleration operation is carried out until it will reach MSPD or HSPD by making LSPD into initial velocity, if a motion command is executed.
When a stop command is input, the motor starts deceleration. And the motor stop when speed reached LSPD. Acceleration and deceleration curve become rapid, and time to reach maximum speed shortens so that Rate value shown by acceleration and deceleration code (See page 48) is large.
<u>Large value of "LSPD" may not make smooth start of the motor.</u>

● S shaped form acceleration drive (Schar)

Max speed > 1500000, A, B = 80000 pps
Max speed > 150000, A, B = 10000 pps
Max speed <= 150000, A, B = 1000 pps
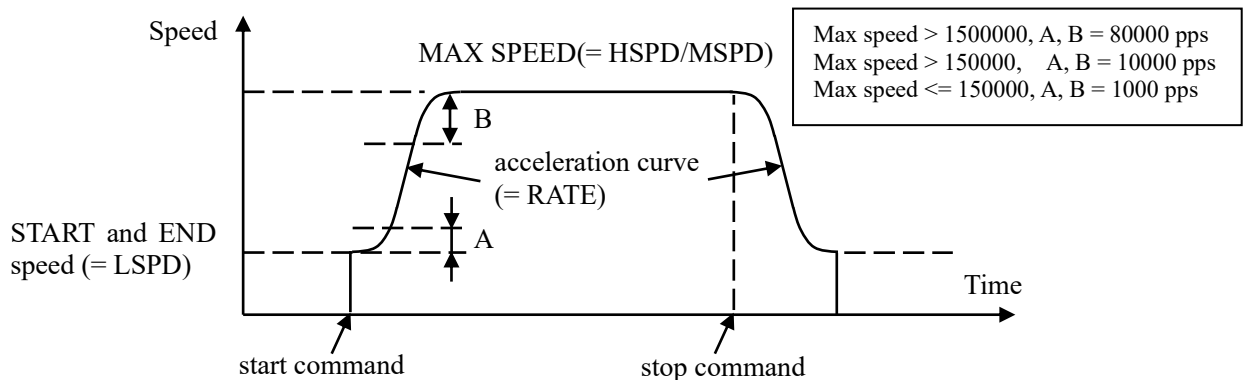
Although it is fundamentally the same as trapezoidal form acceleration drive, the velocity change at the time of acceleration and deceleration start and the time of acceleration and deceleration stop is performed according to S shaped form approximated to the parabola.

<u>Large value of "LSPD" may not make smooth start of the motor.</u>

The acceleration / deceleration curve start area A and end area B fluctuate according to the maximum speed.

When LSPD + 1000pps <= HSPD, automatic calculation is performed so that the curve becomes smooth.

4-4 Control screen

● Initial screen

*	*	*	*	P	M	1	6	C	–	1	6	H	W	2	*	*	*	*	*
S	T	E	P	P	I	N	G		M	O	T	O	R						
C	O	N	T	R	O	L	L	E	R		V	e	r	<	1	.	0	0	>
T	S	U	J	I	–	D	E	N	S	H	I		C	o	.	L	T	D	,

Current firmware version is displayed at screen just after turning on the power.
(Firmware version 1.08 or later does not display the version on the upper screen, but automatically switches to the following page and the firmware and hardware versions are displayed.)

*	*	*	*	P	M	1	6	C	–	1	6	H	W	2	*	*	*	*	*
F	I	R	M	W	A	R	E		V	e	r	.		<	1	.	0	8	>
H	A	R	D	W	A	R	E		V	e	r	.		:	3				

● Motor drive screen

A Pos.	0	0		H		T	P	0		0	1	2	3	4	5	6	7	8	9
B Pos.	0	1		H	#	T	P	1	-	0	1	2	3	4	5	6	7	8	9
C Pos.	0	2		M	#	T	P	2	-	0	1	2	3	4	5	6	7	8	9
D Pos.	1	5		L		T	P	3		0	1	2	3	4	5	6	7	8	9

   1   2   3   4   5

This is default screen when you control the motors. 4 channels which allocated Pos. A to D pulse position are displayed. Colored area means cursor moveable area at local mode.

No.	Data	Function
1	Channel No.	The display of the allocated channel at A to D Position. You can change these channel with "CH SEL" switch and numeric keys. The same channel at two position is prohibited.
2	Drive speed	You can select motor driving speed from "HSPD", "MSPD", and "LSPD" with "CHG" button. Please check the exact speed at SETUP mode 5-1 Page1 speed setting (page 24) or remote commands.
3	Timing signal	The display of timing out signal status. If displayed "#" here, timing out signal output status is ready. If not, signal is not outputted. Each time the "CHG" button is pushed, a state changes. See "8 Timing out signal output" (page 54) in detail.
4	Timing signal output port Channel comment	The display of channel comments can be switched, and comments can be displayed on each channel using 3 alphanumerical characters. For comment settings, refer to "9-1 Channel comment setting" (page 59). With the CHG button, when this display and timing signal are output, you can switch the display indicated by TP0-3 from which port to output. If it is not assigned to any port, "---" is displayed. (V1.08 ~) Battery When the backup battery (CR2032) becomes empty and various settings cannot be saved, "BATT EMPTY" is displayed at regular intervals in this column. If this symptom does not improve after turning the power off and then on again, replace the battery.
5	Current pulse position	Displays current pulse position for each position.

● Mode setup screen

0	0		M		R	E	L			0	1	2	3	4	5	6	7	8	9
0	1		M		R	E	L		–	0	1	2	3	4	5	6	7	8	9
0	2		M		R	E	L		–	0	1	2	3	4	5	6	7	8	9
1	5		L		R	E	L			0	1	2	3	4	5	6	7	8	9

Push 1: [DSP CHG] at motor drive screen, display changes into mode setup screen.

On this screen, various parameter setup at the time of a motor drive is performed.
Push 2: [MODE], changes motor active mode "REL –> ABS –> SCN –> H.P –> REL". Setting value differ in each mode.
LED on the 3: [SETUP] blinks during mode setup screen.

Display value for each motor active mode are below.

REL :   Enter relative drive pulse value when you push [START] .
ABS :   Enter absolute drive pulse value when you push [START] .
SCN :   Enter preset value when you push [PRESET] .
H.P :   If you have found the home position at this position, displays
            its data. If not, displays "NO_HOME POS.". Home position data
            is rewritable if you have found it.

When you change these values, move the cursor where you change with cursor button and enter the new value with numeric keys. Inverts the Sign of value with [±] , resets entering value with [CLR] .
Entering value is displayed with zero suppression. If you move cursor up and down, entering value is fixed and displayed with zero-fill.

4-5 Home Position Set and Search drive

Home position of the unit is set by home position search drive. If the sensor of the origin point (H.P switch) is detected, motor will stop automatically and the moving direction and the origin point at the time of detection are memorized on a main unit.

● At the beginning

A setup of H.P can be set up by connecting with H.P LS switch of LS connector and detecting the origin point sensor arranged at the mechanical origin point.
To set H.P, you need to decide the direction of detecting origin point.
In the case of the following figure, detect way is CW.

mechanical cam for detect origin point

CCW   CW

origin sensor (H.P LS)
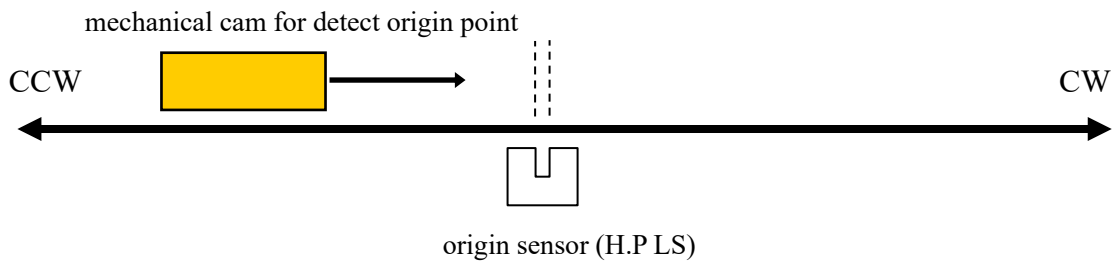
Once detect the origin point, motor stopped automatically and memorize the direction and H.P pulse data. In this case, motor speed must be low within response time of sensor. You need to check the set speed.

● Selection of detecting ways

There are three ways of detecting origin point.
Some are in case of memorized data had existed and another is in case of no memorized data.

METHOD	ORIGINAL STATE	DETECT WAY	PROCEDURES	ACCURACY	TIME
A	NO MEMORIZED DATA	MANUAL	Manual operation JOG CW, CCW or START + JOG CW,CCW	AVERAGE	SHORT
B	NO MEMORIZED DATA	SEMI AUTOMATICAL	Hold "START" switch more than 1 sec.	GREAT	LONG
C	EXISTED MEMORIZED DATA	SEMI AUTOMATICAL	Push "START" switch.	GREAT	SHORT

[METHOD A]

mechanical cam for detect origin point

CCW   CW
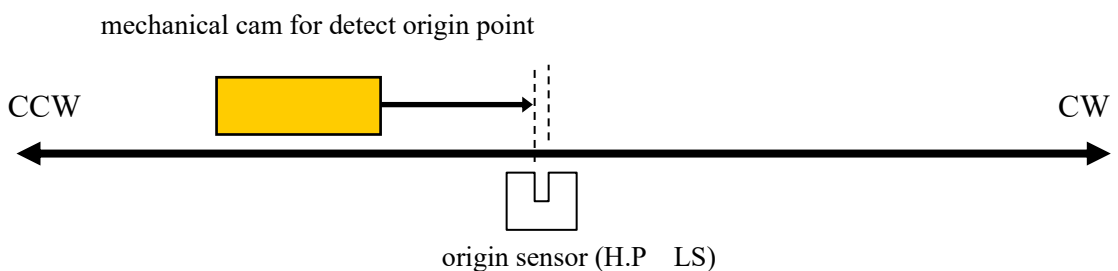
origin sensor (H.P   LS)

When you set H.P to direction CW, you have to set motor position to CCW side against origin sensor, then move motor from CCW to CW side by operation switch
JOG CW or START + JOG CW.
Once detect the origin point, motor stopped suddenly, origin point procedures finished. Then the position of pulse data is memorized and the direction approaching a sensor is also memorized. (In the case of the above figure the CW direction)
This way is applicable also to the detection in the case of using HP sensor as CWLS or CCWLS. (In that case, input CWLS or CCWLS also into HPLS)

....

[METHOD B]
The following example is the case that the direction of the origin point detection is CW. The start direction of the origin point detection set in the opposite direction of the direction of the origin point detection.
(You can set at " Page6 Home position setting

Page6 Home position setting" (Page 29))

(a). In case of start position is in CW side against origin point

2. Detect the origin point then back
   to CW side at low speed.

1. It starts present speed H, M, L.

Cam

CCW

CW

3. Again detect the origin point at low speed.

origin sensor (H.P LS)
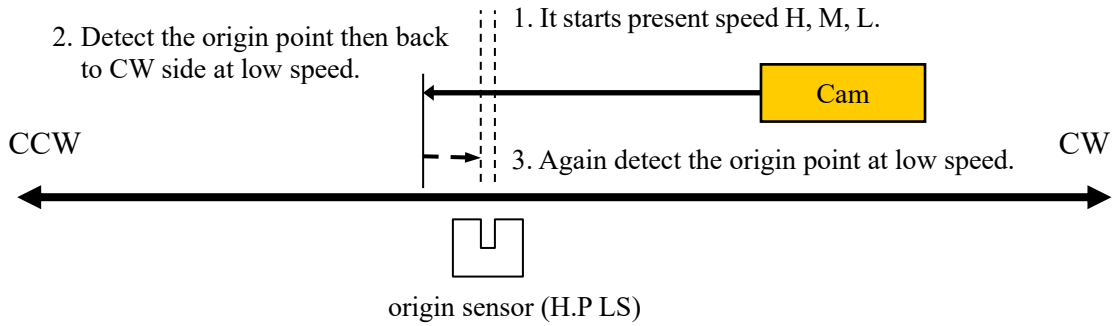
(b). In case of start position is in CCW side against origin point

Cam

1. It starts present speed H, M, L.

2. Detect the CCW limit switch then back to CW side.

3. Detect the origin point then goes to
   CCW side at low speed.

4. Again move to CW side and detect
   the origin point and stop.

CCW

CW

CCW limit switch

origin sensor (H.P LS)
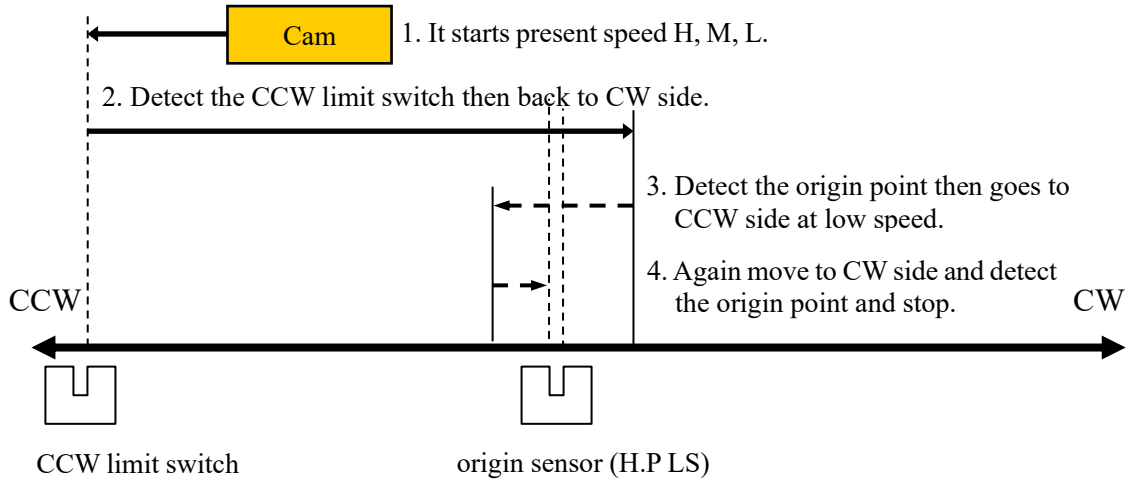
If a starting point sensor is detected, it will pass at first. And it will stop, if it passes completely, and it goes to the origin point by LSPD. Motor stopped suddenly, if the origin point sensor is detected from a direction opposite to the direction which started detection of the origin point. Then the position of pulse data is memorized and the direction approaching a sensor is also memorized.

While in this procedures, if you stop this operation by "STOP" switch or command, H.P hadn't been finished.

If in this procedures, CW or CCW limit switch or digital limit switch is activate, detecting procedures continue until "STOP" switch on.

[METHOD C]

origin sensor (H.P LS)
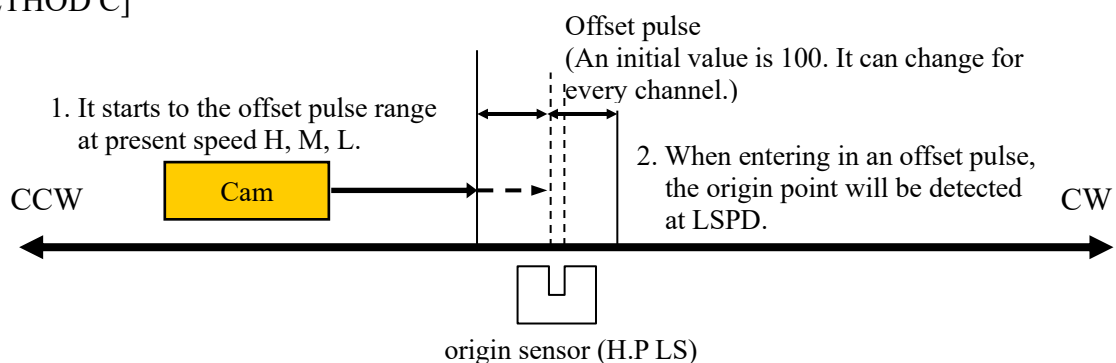
This way is used when the origin point information is memorized by the way previously described. The origin point is detected automatically based on the information memorized.

If you push START button, motor goes to origin point ± offset pulse area by preset speed. When motor enter the offset area, then goes to origin point at low speed. Motor stopped suddenly, if the origin point sensor is detected, and H.P procedures finished.

While in this procedures, CW, CCW limit switch activate or push STOP button, this procedure stopped. In this case the origin point position information is cleared.

When you want to set up the origin point using old origin point detection data, setting data can be returned by "

Page6 Home position setting" (Page 29) of SETUP screen.

4-6 Hand box (Optional)

In local mode operation, you can control a motor using the panel directly.

In addition, you can control a motor using Hand box (sold separately).

Connect the Hand box to HAND BOX connector.

And select the type of the Hand box in the item "HAND BOX CONT" in the page 9 of the SETUP mode from the below types.

● 04TYPE Hand box controller (PM16-HDX   4 axis control)
You can select one channel from A, B, C, D that are displayed on LCD, and you can control it.

1. Channel select switch
    Select one channel from A, B, C, D that are displayed on LCD.

2. Speed change switch
    In local mode, you can change the speed of the specified channel from HSPD, MSPD and LSPD.
    In remote mode, it becomes the STOP button.
    (see below)

3. JOG switch
    When you press once, it gives the instruction once in the direction (CW or CCW) in which you move the JOG switch.
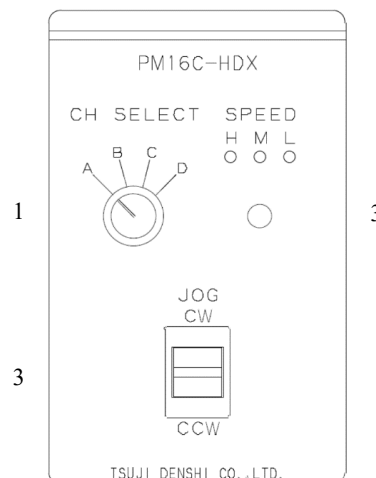
It is same function of the JOG switch of PM16C-16HW2 front panel.

● 02TYPE Hand box controller (PM16-HDX   2 axis simultaneous control)
Simultaneous control of channels A and B, which is displayed on the display is possible.

1. Speed change switch
    In local mode, you can change the speed of the channel A, B from HSPD, MSPD and LSPD.
    In remote mode, it becomes the STOP button.
    (see below)

2. CH A JOG switch
    It is the same function as the JOG switch of the front panel of PM16C-16, and it operates the channel A which is displayed on LCD display.
    When you press once, it gives the instruction once in the direction (CW or CCW) in which you move the JOG switch.
    If press and hold, it continues to operate.

3. CH B JOG switch
    It is the same function as the JOG switch of the front panel of PM16C-16HW2, and it operates the channel B which is displayed on LCD display.
    When you press once, it gives the instruction once in the direction (CW or CCW) in which you move the JOG switch. If press and hold, it continues to operate.
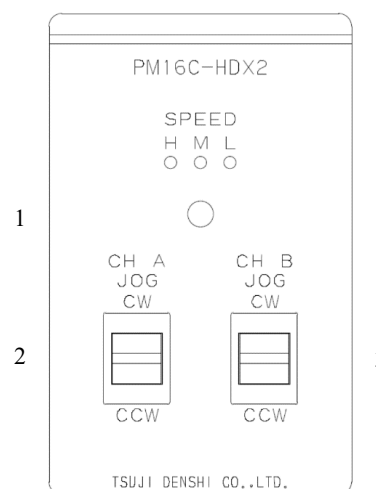
● 16TYPE Hand box controller（PM16-HDX16　16 axis selected control）
  Control a channel that is selected from 16 channels.

1. Channel indicated LED
   It displays the channel that is controlled, and it displays a channel as Hexadecimal number (0 ~ F).

2. Channel select switch (useful in local mode）
   Select the channel that want to control by this switch.

3. Speed change switch (useful in local mode)
   In local mode, you can change the speed of the channel A, B from HSPD, MSPD and LSPD.
   In remote mode, it becomes the STOP button. (see below)

4. JOG switch (useful in local mode)
   When you press once, it gives the instruction once in the direction (CW or CCW) in which you move the JOG switch. If press and hold, it continues to operate.

・About Speed change switch
   In remote mode, all of LED H/M/L will light, if the button is pressed and held more than 3 seconds. And Speed change switch will act as STOP button at this time.
   This feature will be canceled, if the button is pressed and held more than 3 seconds, again.

5 SETUP MODE

All channel motor initial data and communication line setting operation is available at this mode. Push SETUP button at Local mode, LOCAL drive mode and SETUP mode are exchanged. SETUP mode contains 11 pages. You can increment the page with clicking JOG switch to CW, and decrement to CCW.

The colored area shows cursor moveable point.
Unless specified otherwise, you can change the parameters by the center of the cursor key "CHG" button.

5-1 Page1 speed setting

```
            1
C H : 0 3       S P E E D ( P P S )   P 1
H : 5 0 0 0 0 0 0     J O G : 9 9 9 9 9   3
M : 1 0 0 0 0 0 0     R A T E :   0 3 2   4
L : 0 1 0 0 0 0 0     1 0 . 5 0 m s / k
```

1.   : SETUP channel selection
        It shows the channel under setting. You can change the channel by the numeric keypad. "+-" button increments channel number. "CLR" button decrements channel number. You can use Channel select switch in A.pos to change setting channel.

2.   : Driving speed setting
            Setting range: 5 ~ 9,999,999
                    (can be set in increments of 5 and rounded up if there is a remainder)
            Initial Value: HSPD/3,700   MSPD/650   LSPD/10
        You can set the speed when moving HSPD (high speed), MSPD (middle speed), and LSPD (low speed). The setting unit is pps (pulse per second).
        Please enter it using the numeric keypad.
        These rates will be used in Drive speed setting on page 12.

3.   : JOG STEP value   Setting range: 1 ~ 99,999   initial value: 1
        Set the number of steps of the JOG switch in local mode by numeric keypad.
4.   : Acceleration and deceleration rate   Setting range: 0 ~ 115 initial value:13
        Set the acceleration when the motor is accelerating or decelerating by numeric keypad. It becomes sudden stop or sudden acceleration this value is larger.
        At the bottom, the real value of the set acceleration code is displayed in the time required to accelerate 1000pps.
        For more information, please refer to the rate table "Details of acceleration / deceleration rate". (pages 48)

5-2 Page2 Motor operation, hold-off function setting

	1			2	

C	H	:	0	0			M	O	T	O	R	:	E	N	A			P	2
P	.	M	O	D	:	P	-	P		H	.	O	F	F		:	E	N	A
A	C	C	:	T	r	a	p	e		H	.	I	N	V		:	D	I	S
O	N	:	0	1	0	0	m	s		O	F	F	:	0	5	0	0	m	s

1. : SETUP channel selection
     Same as Page 1.

2. : Motor control   ENA/DIS   default: ENA
      ENA: Motor control is enable.
      DIS: Motor control is disable. CW/CCW LS light.
3. : Pulse output mode   P_P/P_D/PDR   default: P_P
      Selection of the motor driving system.
      P_P: PULSE-PULSE motor access
      P_D: PULSE-DIRECTION motor access
          DIRECTION signal becomes H in the CW operation.
      PDR: PULSE-DIRECTION REVERSE motor access
          DIRECTION signal becomes H in the CCW operation.

4. : Selection of acceleration and deceleration format
       Const / Trape / Schar   default: Trape
      Select a deceleration mode from Constant-velocity operation (Const) or Trapezoidal
      acceleration and deceleration operation (Trape) or S-curve acceleration and
      deceleration operation (Schar).
      Refer to 4-3 Drive speed setting on page 12 for more information.

5. : Motor hold off   ENA/DIS   default: DIS (~V1.06 ENA)
      The hold-off function, you can set whether or not to enable you to release the power
      supply current to the motor when the motor is stopped.
      ENA: hold-off signal is enable.
      DIS: hold-off signal is disable.
6. : Hold off inversion   ENA/DIS   default: DIS
      Inverts the polarity of the holdoff signal output logic.
      ENA: Inverts the polarity of the holdoff signal so it can be used as a motor
          energization signal.
      DIS: Otput as a holdoff signal.
7. : Hold-off ON and OFF delay settings   Initial value: ON: 80ms   OFF: 500ms
      Set ON time to delay start of motor operation after the hold-off signal released.
      Set OFF time to delay output of the hold-off signal after stop of motor operation.
      Both ON and OFF can be set in 10 ms increments within the range of 50 to 3000
      ms .

5-3 Page3 Limit switch setting

1

C	H	:	0	0			L	I	M	I	T		S	W				P	3
C	W		.	L	S	:	E	N	A		N	.	C		-				
C	C	W	.	L	S	:	E	N	A		N	.	C		□				
S	T	O	P		L	S	:	F	A	S	T		P	B	:	F	A	S	T

2 — CW / CCW rows · 3 · 4 · 5

1. : SETUP channel selection
     Same as Page 1.

2. : Limit Switch   ENA/DIS   default : ENA
     Set independently in CW / CCW the enable or disable of the limit switch.
     ENA: Motor will stop when it detects a signal limit.
     DIS: Motor does not stop even if the detection limit signal.

3. : Contact setting of the limit switch   N.O/N.C   default : N.O
     Set independently CW / CCW the contact logic of the limit switch.
     The right "_" will change to "□" When the limit switch is active.
     N.O: Select when using the limit switch normally open (A contact).
     N.C: Select when using the limit switch normally close (B contact).

4. : Selection of stop mode: In case of limit switch
     SLOW/FAST   default: SLOW
     Select from the FAST (Sudden stop) or SLOW (Deceleration stop) how to stop when
     it detects a limit switch.

5. : Selection of stop mode: In case of push button. (Panel operation)
     SLOW/FAST   default: SLOW
     Select from FAST (Sudden stop) or SLOW (Deceleration stop) how to stop when
     you push the STOP button in local mode.

5-4 Page4 Digital limit switch setting

1

C	H	:	0	0			D	I	G	I	T	A	L		L	S		P	4
C	W		:	D	I	S			0	1	2	3	4	5	6	7	8	9	-
C	C	W	:	D	I	S		-	0	1	2	3	4	5	6	7	8	9	□
B	A	C	K	L	A	S	H				:	-	9	9	9	9	9		

2   3

4

1. : SETUP channel selection
   Same as Page 1.

2. : Digital limit switch   ENA/DIS   default: DIS   (~V1.11)ENA
   Set enable or disable of digital limit switch.
   It will be set simultaneously in CW / CCW direction.
   If enabled, when the CCWLS value less than or more than the CWLS value, it does
   not work in that direction.
   ENA: Digital limit switch is enabled.
   DIS: Digital limit switch is disabled.
3. : Digital limit switch value
   Setting range: -2,147,483,647 ~ +2,147,483,647
   Initial value: CW/+1,000,000   CCW/-1,000,000,
   Set the limit value when digital limit switch is enabled with numeric keypad.
4. :Backlash data   Setting range:-9999 ~ +9999 Initial value:+100
   You can set the amount of backlash movement to be performed in remote mode with
   numeric keypad.

● For digital limit switch
   In the case of CWLS, digital limit switch is activated when it exceeds the set value, the
   motor will not work in that direction. In the case of CCWLS, digital limit switch is
   activated when it becomes less than the set value, the motor will not work in that
   direction.
   Since entering the stop operation at the time the digital limit switch is on, it will overrun
   the set value if the speed setting is fast. It does not mean that we are guaranteeing the
   motor will not move out of range of the limit switch, set the value to be able to secure a
   sufficient stop interval when setting.
   Default setting is changed enable to disable from firmware version 1.12.

5-5 Page5 REL/ABS/SCAN PRESET data setting

1

C	H	:	0	0			M	O	D	E	_	D	A	T	A			P	5
R	E	L				:		–	0	1	2	3	4	5	6	7	8	9	
A	B	S				:		–	0	1	2	3	4	5	6	7	8	9	
P	R	E	S	E	T	:			0	1	2	3	4	5	6	7	8	9	

2
3
4

Also in the "mode display screen", settings on this page is available.

1. : SETUP channel selection
   Same as Page 1.

2. : REL mode set value
   Setting range: -2,147,483,647 ~ +2,147,483,647
   Initial value: +10,000
   Set the pulse value that relative movement when you press the START button in local mode.

3. : ABS mode set value
   Setting range: -2,147,483,647 ~ +2,147,483,647
   Initial value: 0
   Set the absolute movement of the pulse value when you press the START button in local mode.

4. : SCAN mode set value
   Setting range: -2,147,483,647 ~ +2,147,483,647
   Initial value: 0
   Set the value to be preset when you press the PRESET button in local mode.

5-6 Page6 Home position setting

			1									2				3			
C	H	:	0	0		H	P	L	S	:	E	N	A		N	O	_	P	6
O	R	G	.	S	T	A	R	T	:	C	C	W	M	(	C	C	W	)	
O	F	F	S	E	T	.	P	U	L	S	E	:			9	9	9	9	9
M	E	M	.	P	O	S	:		N	O	_	H	O	M	E	.	P	O	S

Right-side labels: row2 → 5, row2 center W → 4, row3 → 6, row4 → 7

1. : SETUP channel selection
   Same as Page 1.

2. : Home position switch setting: ENA/DIS default: ENA
   Set the enable or disable of the home position switch.
   ENA: It detects the home position signal
   DIS: It does not detect the home position signal.

3. : Home position switch contact setting: N.O/N.C default :N.O
   Set the contact logic of the home position switch.
   The right "_" will change to "□" when home position switch is active.
   N.O: Select when using the home position switch normally open (A contact).
   N.C: Select when using the home position switch normally close (B contact).

4. : Selection of running direction for detect the origin point: CW/CCW default:CW
   In carrying out the home position detection in automatic, it is the direction you want
   to move to the first by pressing the START button.
   CW: Set to CW the origin detection start direction
   CCW: Set to CCW the origin detection start direction

5. : Origin detection direction: CW/CCW
   When it is stopped by detecting the origin, direction heading for the origin will be
   recorded . You cannot change this value.

6. : Origin detection offset pulse: Setting range: 1 ~ 9999 initial value: 100
   In carrying out the re-detection of the origin, set the range to be detected at a reduced
   speed at the origin around the position.

7. : Home position of origin point:
   Setting range: -2,147,483,647 ~ +2,147,483,647
   Initial value: NO_HOME.POS
   When origin point had been set, this position data is displayed.
   When origin point hadn't been set, display is "NO H.P.".
   In the case of undetected origin, the origin that was last set will be set by the "CHG"
   button. When the origin has been set, you can change the origin position by entering
   a value in the numeric keypad. In addition, it is possible to cancel to the state of
   origin undetected in the "CHG" button at this time.

5-7 Page7 TIMING OUT setting

For more information about the TIMING OUT signal, see page 54.

				1								2									
C	H	:	0	0		T	.	O	U	T	:	P	.	1	m	s			P	7	
S	T	A	R	T		:			-	0	1	2	3	4	5	6	7	8	9		3
S	T	O	P			:			-	0	1	2	3	4	5	6	7	8	9		4
P	.	I	N	T	V	:			-	0	1	2	3	4	5	6	7	8	9		5

1. : SETUP channel selection
      Same as Page 1.

2. : TIMING OUT mode set
           DIS/GATE/P.200ns/P.10us/P.100us/P.1ms
           Manual/M.1us/M.10us/M.100us/M.1ms
           default: P.1ms
      Select the type of when outputting TIMING OUT signal.
      DIS   : Signal output disabled.
      GATE   : GATE mode output. Signal out between START and STOP.
      P.200ns~1ms   : Pulse output of 200ns, 10us, 100us, 1ms.
      Manual   : Manual output.
      M.1us~1ms   : Outputs a pulse with a manually set width once.

3. : TIMING OUT Start Position
           Setting range:-2,147,483,647 ~ +2,147,483,647
           Initial value: +1000
      Set the starting point of the interval to perform TIMING OUT signal output of the
      above.

4. : TIMING OUT Stop Position
           Setting range: -2,147,483,647 ~ +2,147,483,647
           Initial value: +10000
      Set the end point of the interval to perform TIMING OUT signal output of the above.

5. : TIMING OUT Interval Pulse
           Setting range: 0 ~ +2,147,483,647
           Initial value: 200
      When TIMING OUT signal is a pulse, you can set the pulse interval in TIMING
      OUT output period.

5-8 Page8 TIMING OUT channel setting

It displays which channels are assigned to TIMING OUT four output ports
TIMING OUT in channel fixed mode, set which channel to assign on this screen.

T	I	M	I	N	G			T	P	0	:	C	H	0	0		P	8
O	U	T						T	P	1	:	C	H	0	1			
C	H	A	N	N	E	L			T	P	2	:	C	H	0	2		
M	O	D	E	:	D	S	P		T	P	3	:	C	H	0	3		

          1   2

1.   : TIMING OUT mode setting   DSP/FIX   default: NOM
    Select the TIMING OUT output channel setting mode.
    DSP: Output from the channel being displayed.
             (This is the same as PM16C-04XDL.)
    FIX: Output from the channel that has been set.
             (TIMING OUT channel fixed mode)
             Regardless of the display, the signal of the channel that has been set is output.

2.   : TIMING OUT output channel
    When you select the FIX in 1, you can set the channels that will be assigned.
    Set by using the CH SEL switch or numeric keypad.
    It cannot be set to the same channel as two or more locations.

5-9 Page9 Parameters of remote mode setting

R	E	M	O	T	E		C	O	N	T	R	O	L				P	9	
R	S	-	2	3	2	C		B	.	R	A	T	E	:	3	8	4	0	0
G	P	I	B		A	D	D	R	E	S	S	:						3	1
H	A	N	D		B	O	X		T	Y	P	E	:		H	D	X	0	4

                                               1   2   3

1.   : RS-232C baud rate set   Initial value: 38400
    Select the baud rate of the RS-232C communication from 2400, 4800, 9600, 19200, 38400

2.   : GP-IB address   Setting range: 2 ~ 31   Initial value: 7
    Set the address of the GP-IB communication with numeric keypad.

3.   : Hand box type   04TYPE/02TYPE/16TYPE   default: 04TYPE
    Set this parameter to match the type of hand box connected.
    See "Hand box (Optional)" (page 19) for details of the hand box.

5-10 Page10A, 10B, 11A, 11B LAN setting

Page 10~ sets LAN_H (high-speed LAN) , and page 11 sets LAN_L (normal speed LAN) .

L	A	N	_	H		S	E	T	T	I	N	G			P	1	0	A	
M	A	C		:	<	0	A	1	.	2	A	3	E	4	3	5	F	>	1
I	P			:	1	9	2	.	1	6	8	.	0	0	1	.	0	5	5	2
P	O	R	T	.	N	O	[	0	]	:				0	7	7	7	7	4

<center>3</center>

1. : MAC address
   It's MAC address inside LAN module.

2. : IP address   Initial value: 192.168.1.55 (LAN_L: 192.168.1.56)
   Set the IP address of PM16C-16HW2 with the cursor keys and a numeric keypad.

3. : Port selection (0 ~ 7)
   With LAN communication module upgrade it is now possible to connect up to 8 ports at the same time.
   You can change the setting of each port with the numeric keypad or the CH SEL lever switch at the bottom.

4. : PORT number   Initial value: 7777~7784
   Set the PORT number of PM16C-16HW2 with numeric keypad.
   Can be set up to 1-32767, but the recommended value is 10000-10999.

L	A	N	_	H		S	E	T	T	I	N	G			P	1	0	B	
S	U	B		:	2	5	5	.	2	5	5	.	2	5	5	.	0	0	0	5
G	A	T	E	:	1	9	2	.	1	6	8	.	0	0	1	.	0	0	1	6
A	L	L	R	E	P	L	Y	:	L	H		L	L		R	S		G	P	7

5. Subnet mask setting   Initial value: 255.255.255.0
   PM16C-16HW2 with the numeric keypad and cursor keys.

6. Gateway address setting   Initial value: 192.168.1.1
   PM16C-16HW2 with the numeric keypad and cursor keys.

7. Settings for all response mode   Default: All disabled (-- -- -- --   displayed)
   This item is displayed on page 10B.
   Set whether to enable / disable the mode to add a response such as "OK" or "NG" to commands that otherwise has no response. See "9-2 All Response Modes" (page 60) for details.
   The state changes each time the CHG button is pressed.
   When LH is displayed high-speed LAN, and LL - low-speed LAN is enabled for all response mode.
   When RS is displayed, RS-232C is enabled, and when GP is displayed GPIB port is enabled for all response mode.

5-11 Page12 Firmware version change and other settings

1

F	I	R	M	W	A	R	E		C	H	A	N	G	E			P	1	2
					N	E	W		v	e	r		<	1	.	0	8	>	
D	S	P	/	C	H	G		R	E	T	U	R	N			:	9	9	S
L	C	D		B	R	I	G	H	T	N	E	S	S	:		1	0	0	%

    2

    3

1. : To change software version   NEW/OLD
       Select the firmware version.
       See "10 Firmware version up" (Page 67) for more information.

2. : Return time from mode set screen   Setting range: 0 ~ 99   Initial value: 60
       In the "control screen", it changes to "mode display screen" by pressing the "DSP
       CHG" button. If you do not operate during the number of seconds set here, the screen
       will return to the "control screen".
       It does not return until you press the "DSP CHG" button again if it is set to 00.

3. : LCD brightness adjustment   Setting range: 1 ~ 100   Initial value: 100
       Set the brightness of LCD with numeric keypad or CHG button.

6 Operation of Motor

Here, you will move the motor actually.
Prior to actually drive, complete the following settings.

・Connecting to an external device driver, limit switches, etc. (Page 8)
・Configuring the driving speed. (Page 24)
・Configuring the amount of movement (only the absolute value and relative value movement)
  (Page 14)

Operate the motor, after the setup is complete.

6-1 Local mode operation

1: Display the channel of the motor moving on LCD.
   If it does not appear, try changing the channel using the CH SEL switch.
2: Press the A ~ D button that corresponds to move the motor, and light the LED on upper
   side of button.
   Motor that is indicated by LED, will move when you operate the JOG switch or press
   green START button.
3: Press the MODE button, and choose how to move from four types of REL, ABS, SCAN,
   and HP.
   The moving method that is showed by lit, is currently selected.

4: Start the motor moving, when the START button is pressed.
   (REL)   Move relative movement amount that has been set.
   (ABS)   Move for absolute point amount that has been set.
   (SCAN)   Green lamp at start button keep blighting, and start moving for the direction
              of jog switch you pushed.
   (HP)   See 4-5 Home Position Set and Search drive (Page 17) in detail.

5: Motor stops moving if you press the STOP button or limit switch is activated or etc.

6-2 Remote/Local switching command
On REMOTE mode, you can choose the motor for driving by commands.
Commands for motor move and setting are ignored at LOCAL mode.

Command	REM	LOC	Select REMOTE control mode or LOCAL control mode.
Reply	Nothing		
Remarks	It is valid only when all motor is stopped.		

6-3 Command to read out of motor status

<ch>: 0 ~ F(Hexadecimal) for channel.

Command	STS?	Read motor status which is displayed on LCD.
Reply	<RL><0123>/<DIR>/<LS>/<MT>/<POS>/<POS>/<POS>/<POS>	
	<RL>	R/ REMOTE control mode L/ LOCAL control mode
	<0123>	Show displayed motor CH No. at 1 digit hex. The order of this data is applied on <DIR>, <LS>, <MT>, and <POS>.
	<DIR>	P/ Moving for CW direction S/ Stopping N/ Moving for CCW direction
	<LS>	Hold off and LS status (hex) When these signals are activating, its bits stands 1. b3: HOLD off b2: HP LS b1: CCW LS b0: CW LS
	<MT>	Indicate current motor status by 2 digit hex. b7:ESEND :Emergency stop command executed. b6:SSEND :Normal stop command executed. b5:LSEND :Stopped by LS signal. b4:COMERR : Command error b3:ACCN :Decelerating b2:ACCP :Accelerating b1:DRIVE :Motor is moving. b0:BUSY :Driving or dealing with command.
	<POS>	Displaying current position with signed 10 digit decimal. Digit is increased if data is more than 10 million.
Example	STS? Reply: R1234/PSSN/0A80/07300003/+0000002784/+0000000000/ -0000001239/-0000005009	
Remarks		

Command	STS<ch>?	Read the specified CH motor data. Data format is same of "STS" command.
Reply	<RL><CH><DIR><LS><MT><POS> Data format is same as "STS?" except <CH>.	
	<CH>	Shows read out CH on hex.
Example	STS1? Reply: R1P007+0000002784	
Remarks		

<ch>: 0 ~ F(Hexadecimal) for channel.

Command	STS_16?	Read all 16ch motor status.	
Reply	<DIR><DIR>···<DIR>/<MT><MT><MT><MT>···<MT><MT><MT><MT>		
	<DIR>	P/ Moving for CW direction S/ Stopping N/ Moving for CCW direction The order of data is from CH0 to CHF, and one character a motor, and describes 16 characters.	
	<MT>	Indicate current motor status by 2 digit hex. b7:ESEND :Emergency stop command executed. b6:SSEND :Normal stop command executed. b5:LSEND :Stopped by LS signal. b4:COMERR : Command error b3:ACCN :Decelerating b2:ACCP :Accelerating b1:DRIVE :Motor is moving. b0:BUSY :Driving or dealing with command. The data is in order from CH0 to CHF.	
Example	STS_16? Reply: SSSSPSSSSSSNSSSS/0000008003000000000003000000000		
Remarks			

- Limit switch(LS) status read command

Command	LS?<a>	Read displayed 4 CH motor on LCD LS status.	
Argument	<a>	(No input) / Hard or soft limit (conventional specifications) H / hard limit S / soft limit	
Reply	<0123><LS>		
	<0123>	Show displayed motor CH No. at 1 digit hex. The order of this data is applied on <LS>.	
	<LS>	Hold off and LS status (hex) When these signals are activating, its bits stands 1. CWLS and CCWLS read the state of the externally connected LS when H is assigned to <a>, and the state of the internal software LS when S is assigned. If not assigned, it will be "or" of hard and soft. b3: HOLD off b2: HP LS b1: CCW LS b0: CW LS	
Example	LS? Reply : 01230006 HPLS, CCWLS is entered in CH3. LS?H Reply: 01230006 HPLS, external CCWLS is entered in CH3.		
Remarks	Arguments have been added from FW Ver1.09 and can be read separately for hardware and software.		

<ch>: 0 ~ F(Hexadecimal) for channel.

Command	HDSTLS?	Read displayed 4 CH motor on LCD hardware and software LS status.
Reply	<0123><HDLS><STLS>	
	<0123>	Show displayed motor CH No. at 1 digit hex. The order of this data is applied on <LS>.
	<HDLS> <STLS>	Hold off and LS status (hex) When these signals are activating, its bits stands 1. <HDLS> means from connected LS signal. <STLS> means from software LS signal. Data bit at b3 and b2 is always 0 on <STLS>. b3: 0 　　(fixed value) b2: HP LS b1: CCW LS b0: CW LS
Example	HDSTLS?　　Reply:　0123888B0000	
Remarks		

Command	LS_16?<a>	Read all 16CH motor LS status.
Argument	<a>	(No input) / Hard or soft limit (conventional specifications) H / hard limit　　S / soft limit
Reply	<LS><LS>・・・<LS><LS>	
	<LS>	Hold off and LS status (hex) When these signals are activating, its bits stands 1. When H is assigned to <a>, the state of the externally connected LS is read, and when S is assigned, the state of the internal software LS is read. If not assigned, it will be "or" of hard and soft. b3: HOLD off b2: HP LS b1: CCW LS b0: CW LS The data is in order from CH0 to CHF.
Example	LS_16?H　　Reply: 0004000000000000　　HPLS is input to CH3 LS_16?S　　Reply: 1004000000000002　　CW software LS is input to CH0, HPLS is input to CH3, and CCW software LS is input to CHF.	
Remarks		

● Commands for current positon read or set

Command	PS? <ch>		Read current position of specified motor.
Argument	<ch>	Channel	Specify in the Hexadecimal number 0~F to read out the motor.
Reply	± dddddddddd　　(Signed Integer 10-digit and more)		
Example	PS?4　　Reply:　-0000000135		
Remarks	Arguments have been added from FW Ver1.09 and can be read separately for hardware and software.		

<ch>: 0 ~ F(Hexadecimal) for channel

Command	PS_16?	Display current position for all channel.	
Reply	<POS>/<POS>/···/<POS>		
	<POS>	Display the current position with the signed Integer 7-digit and more, in order from ch0. Each channel is separated by "/".	
Example	PS_16?　　Reply: +0000000/-0015000/-0004500/···/+0018000/+0001000		
Remarks	If you send a command on the LAN_H port, it will respond within 1ms.		

Command	PS<ch><pos>		Preset current position.
Argument	<pos>	position	-2,147,483,647 ~ +2,147,483,647
Reply	Nothing		
Example	PS2+10000　　Current position of CH2 set to +10000.		
Remarks	Only remote mode. And the motor is stopped.		

6-4　Motor control command

● JOG step drive command

Command	JOG<d><ch>		Move 1 pulse.
Argument	<d>	Direction	P/CW　　N/CCW
Reply	Nothing		
Example	JOGP1　　CH1 moves 1 pulse for CW direction.		
Remarks	Only remote mode. And the motor is stopped.		

● Speed select command

Command	SPD<sp><ch>		Select motor move speed.
Argument	<sp>	Speed	L/LSPD(Start speed, low speed)　M/MSPD H/HSPD
Reply	Nothing		
Example	SPDHA　　Motor move speed of CH10 set to HSPD		
Remarks	Only remote mode. And the motor is stopped.		

Command	SPD?<ch>	Check the motor speed setting.
Reply	LSPD/MSPD/HSPD	
Example	SPD?1　　Reply:　HSPD Motor move speed of CH1 is HSPD.	
Remarks		

<ch>: 0 ~ F(Hexadecimal) for channel

● Continuous move commands

Command	SCAN<d><ch>		Start continuous move. Same as SCAN move on LOCAL mode.
Argument	<d>	Direction	P/CW N/CCW
Reply	Nothing		
Example	SCANN2 Start continuous move for CCW direction at CH2.		
Remarks	Only remote mode. And the motor is stopped.		

Command	CSCAN<d><ch>		Start constant-speed continuous move. (No acceleration and deceleration)
Argument	<d>	Direction	P/CW N/CCW
Reply	Nothing		
Example	CSCANN2 Start continuous move for CCW direction at CH2.		
Remarks	Only remote mode. And the motor is stopped. Be careful of LSPD value, because too fast LSPD value causes motor step out.		

Command	SCANH<d><ch>		It is the same as "SCAN" command, except stop moving if home position sensor activates. It is a move that corresponds to the method 1 of the Home Position Set and Search drive (page 17).
Argument	<d>	Direction	P/CW N/CCW
Reply	Nothing		
Example	SCANHN2 Start continuous move for CCW direction at CH2.		
Remarks	Only remote mode. And the motor is stopped.		

<ch>: 0 ~ F(Hexadecimal) for channel.

- Absolute drive command(ABS)

| Command	ABS<ch><b><deg>		Start absolute move.
Argument	<b>	Backlash	(None)/ Without backlash move 　　B/ With backlash (no auto adjust)* 　　S/ With backlash (auto adjust)*
	<deg>	Destination	-2,147,483,647 ~ +2,147,483,647
Reply	Nothing		
Example	ABS3+10000　　Start absolute move to 10000 point at CH3. ABS0S-2500　　Start absolute move to -2500 point with auto adjust backlash at CH0.		
Remarks	Only remote mode. And the motor is stopped. Please see below topics about backlash move.		

- Relative drive command (REL)

| Command	REL<ch><b><deg>		Start relative move.
Argument	<b>	Backlash	(None)/ Without backlash move 　　B/ With backlash (no auto adjust)* 　　S/ With backlash (auto adjust)*
	<deg>	Value	-2,147,483,647 ~ +2,147,483,647
Reply	Nothing		
Example	RELC+10000　　Start CW 10000 pulse move at CH12. REL0S-5000　　Start CCW 5000 pulse move with auto adjust backlashat CH0.		
Remarks	Only remote mode. And the motor is stopped. Please see below topics about backlash move.		

*Backlash adjustment move
When you execute absolute or relative move, moves extra backlash adjustment value before reaching the destination point.
For example, adjustment value is +500, moves destination point plus 500 point and moves relative -500 value. Backlash adjustment move pattern is changed by sign of adjustment value and motor move direction. Please see the example below.

Ex.1) Move direction is CW and adjustment value is positive
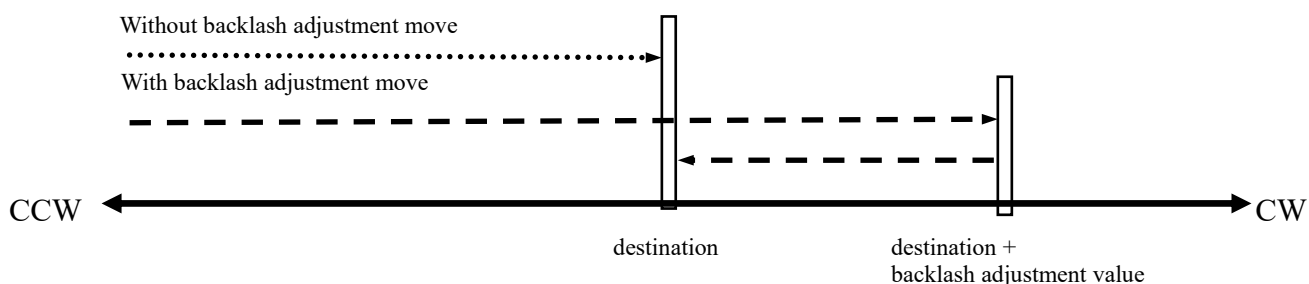
Ex.2) Move direction is CW and adjustment value is negative
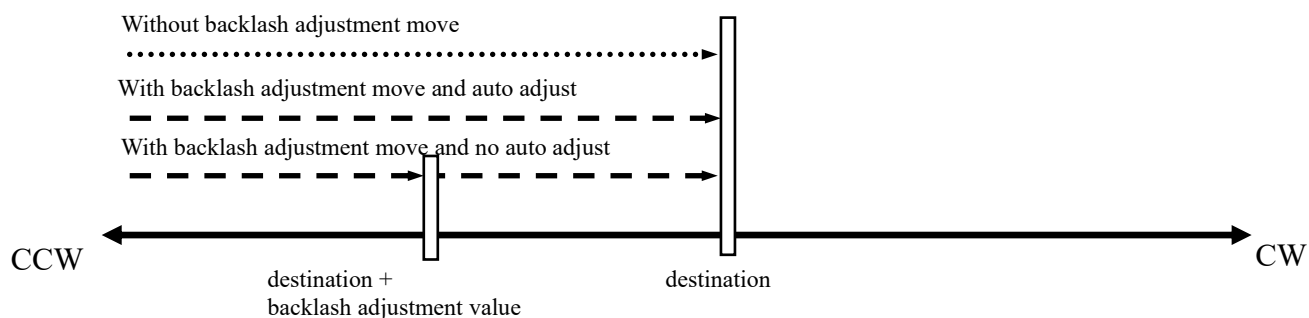
If move direction is CCW, these two drive routine are exchanged.
Backlash adjustment value is checked and changed at Page 2 on SETUP mode or this command.
<ch>: 0 ~ F(Hexadecimal) for channel

Command	B?<ch>	Check the backlash adjustment value.
Reply	±dddd (signed 4 digit decimal.)	
Example	B?3　　　Reply:　+0500　Backlash adjustment value of CH3 is 500.	
Remarks		

Command	B<ch><deg>	Set the backlash adjustment value.
Argument	<deg>	Value	-99,999 ~ +99,999
Initial value	+100		
Reply	Nothing		
Example	B0+400　　　Set backlash adjustment value of CH3 to 500.		
Remarks	Only remote mode. And the motor is stopped.		

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<ch>: 0 ~ F(Hexadecimal) for channel.

● Home position return commands

Command	FDHP<ch>	If you have not found home position, start home position search move. It is a move that corresponds to the method 2 of the Home Position Set and Search drive (page 17).
Reply	Nothing	
Example	FDHP2　　Start home position search move at CH2.	
Remarks	Only remote mode. And the motor is stopped.	

Command	GTHP<ch>	If you have found home position, move for memorized home position. It is a move that corresponds to the method 3 of the Home Position Set and Search drive (page 17).
Reply	Nothing	
Example	GTHP2　　Start home position search move at CH2.	
Remarks	Only remote mode, and the motor is stopped.	

6-5 STOP commands

These commands are available both REMOTE mode and LOCAL.

Command	SSTP<ch>	ESTP<ch>	Stop the specified motor.
Reply	Nothing		
Example	SSTP1　　Stop the motor at CH 1. ESTP7　　Stop the motor at CH 7 immediately.		
Remarks	SSTP is stop with deceleration, and ESTP is stop without it.		

Command	ASSTP	AESTP	Stop all motor.
Reply	Nothing		
Example	ASSTP　　Stop all motor. AESTP　　Stop all motor immediately.		
Remarks	ASSTP is stop with deceleration, and AESTP is stop without it.		

6-6 Speed change command while driving

Command	SPC<ch><deg>		Moving motor speed changes on PPS unit.
Argument	<deg>	Speed	5 ~ 10,000,000
Reply	Nothing		
Example	SPC110　　CH1 motor moving speed changes to 10 pps.		
Remarks	Only remote mode and the motor is moving.		

6-7 Command for Synchronous start for action pending

These commands are for synchronous start of motors.
All motor except moving are changed standby status by "PAUSE ON" command.
In this status, PM16C-16HW2 reserves all motor moving commands.
If release standby status by "PAUSE OFF" command, reserved commands are all executed.

Command	PAUSE ON PAUSE OFF	Set all motor standby status or release it.
Reply	Nothing	
Example	PAUSE ON All stopped motors get standby status.	
Remarks	Only remote mode.	

Command	PAUSE?	Check the motor standby status.
Reply	ON/OFF	
Example	PAUSE? Reply: ON All motor is standby status.	
Remarks		

6-8 Command of SRQ output function

This function is to notify the motor stop on GPIB, LAN, and RS-232C communication.
Outputs SRQ signal on GPIB line, sends "STOPx" (x: SRQ output CH) command on LAN and RS-232C communication.

- SRQ for GPIB communication
  Serial poll register on GPIB is always 0x10 when SRQ signal is outputted.
  To check which CH have sent the SRQ signal, send "SRQ_OUT?" command.

Command	SRQ_OUT?	Check the CH that SRQ signal have outputted.
Reply	HHHH(4 digit hex) b15:CHF ～ b0:CH0	
Example	SRQ_OUT? Reply :0201 This reply shows SRQ signal has output on CH 0 and 9.	
Remarks	If you have checked the response, SRQ output flag will be cleared. Different from PM16C-04XDL, serial pool resister does not show which ch have sent SRQ signal.	

<ch>: 0 ~ F(Hexadecimal) for channel

Command	SRQ<ch><md>		Set or reset SRQ signal output flag.
Argument	<md>	Mode	0/SRQ flag reset 1/SRQ flag set
Reply	Nothing		
Example	SRQ71 Set SRQ output flag for the channel 7.		
Remarks	Command SRQG0 cancels SRQ output flag of all channels. Flag will be cleared when SRQ signal is outputted.		

Command	SRQ?<ch> SRQ?G	Check SRQ output flag. In the case of "SRQ?G", check all CH.
Reply	0/SRQ output flag off 1/SRQ output flag on HHHH(4 digit hex) b15:CHF ~ b0:CH0 (SRQ?G sent) Bit has been set as "1", and SRQ output flag has been set to this bit.	
Example	SRQ?0 Reply:1 SRQ output flag at CH 0.	
Remarks		

● SRQ for LAN/RS-232C communication

These commands are for LAN communication.
If you use them on RS-232C communication, replace "LN_" to "RS_" on the commands.
The SRQ output flag is independent for LAN_H, LAN_L, and RS-232C.
In PM16C-16HW2, there are 8 ports for LAN_H and LAN_L respectively, but the port where SRQ is output is the port that sent "LN_SRQx1" (x: 0 to F) at the end.

Example)
    Send "LN_SRQ11" to LAN_H, port 1
    Send "LN_SRQ11" to LAN_L, port 1
    Send "LN_SRQ21" to LAN_H, port 2
If you do these in sequence, the SRQ will be
"STOP1" and "STOP2" are output to LAN_H and port 2, and "STOP1" is output to LAN_L and port 1.

<ch>: 0 ~ F(Hexadecimal) for channel.

Command	LN_SRQ<ch><md>		Set or reset SRQ output flag. The SRQ is output to the port that last sent this command.
Argument	<md>	Mode	0/SRQ reset 1/SRQ set
Reply	Nothing		
Example	LN_SRQ71 Set SRQ output flag at CH7.		
Remarks	All CH SRQ flag are cleared by "LN_SRQG0" command. SRQ flag is cleared after SRQ signal is outputted. The SRQ output flag is independent for LAN_H and LAN_L.		

Command	LN_SRQ?<ch> LN_SRQ?G	Check SRQ output flag on LAN or RS-232C. In the case of "LN_SRQ?G", check all CH.
Reply	0/SRQ output flag off 1/SRQ output flag on HHHH(4 digit hex) b15:CHF ~ b0:CH0 (when LN_SRQ?G is sent.) Bit has been set as "1", and SRQ output flag has been set to this bit.	
Example	LN_SRQ?0 Reply:1 SRQ output flag has been set to CH0.	
Remarks	The SRQ output flag is independent for LAN_H and LAN_L.	

7 Commands for parameter set up

This section explains the commands for parameter set up when the motor is working.

7-1 Basic configuration of motor

<ch>: 0 ~ F(Hexadecimal) for channel

Command	SETMT<ch><en><hd><ac><pl>		Set basic configuration of motor
Argument	<en>	Motor enable	0/ Disable Motor operation 1/ Enable Motor operation When set to 0, The situation is a state similar as LS (CW and CCW) activation. And the operation involving the movement is disabled.
	<hd>	Hold off	0/ Output hold off signal 1/ No output hold off signal 2/ Hold signal output during motor operation 3/ Always hold signal output 0 or 2 , the hold-off signal is sent while the motor is stopped. It is output to the external driver. In 2 and 3, the polarity of the signal is inverted from 0 and 1 and can be used as a motor energization signal.
	<ac>	Acceleration and deceleration method	0/ Constant 1/ Trapezoidal 2/ S-character Please refer to Drive speed setting (page12) for details.
	<pl>	Pulse output method	0/ Pulse-Pulse 1/ Pulse-Direction (In CW, direction = H.) 2/ Pulse-Direction-Reverse (In CCW, direction = H)
Reply	Nothing		
Example	SETMT01110 Selected ch0, enable motor operation, no output hold off signal, trapezoidal mode, pulse-pulse output.		
Remarks	Only remote mode. Item that is shaded is the default settings at parameter reset.		

Command	SETMT?<ch>	Confirm basic configuration of motor
Reply	<en><hd><ac><pl> Please refer to "SETMTx" for meaning.	
Example	SETMT?3 reply: 1011	
Remarks		

Command	HOLD<ch><on>		Set the output of hold off signal.
Argument	<on>	state	OFF/ Enable the output of hold off signal. ON/ Disable the output of hold off signal.
Reply	Nothing		
Example	HOLD3ON Disable the output of ch3's hold off signal.		
Remarks	Only remote mode. Item that is shaded is the default settings at parameter reset. It is the same as the hold off setting of the command SETMT.		

<ch>: 0 ~ F(Hexadecimal) for channel.

Command	HOLD?<ch>	Confirm the output of hold off signal.
Reply	OFF/ Enable the output of hold off signal. ON/ Disable the output of hold off signal.	
Example	HOLD?3 reply: ON CH3's hold off signal has disabled.	
Remarks		

Command	H_ONTM<ch><t>		Set the time from excitation to the motor to actual movement.
Argument	< t >	Excitation time	Setting range: 50 to 3000 msec. Initial value in 10ms increments 80msec.
Reply	None		
Example	H_ONTM7500 Channel 7 operates 500ms after the holdoff is released.		
Remarks	Only remote mode.		

Command	H_ONTM?<Ch>	Check the time from exciting the motor to the actual movement.
Reply	DDDmsec.	
Example	H_ONTM? A Reply: 100 msec. Channel A will start operating 100ms after the holdoff is released.	
Remarks		

Command	H_OFTM<ch><t> HOLDTM<ch><t>		Set the time to output the hold-off signal after the motor has stopped. Both commands have the same behavior.
Argument	<t>	Excitation time	Setting range: 50 to 3000 msec. Initial value in 10ms increments 500 m sec.
Reply	none		
Example	H_OFTMC1200 Channel C outputs a holdoff signal 1200ms after it has stopped.		
Remarks	Only remote mode.		

Command	H_OFTM?<Ch> HOLDTM?<Ch>	Check the time to output the hold-off signal after the motor has stopped. Both commands have the same behavior.
Reply	DDDmsec.	
Example	H_OFTM? 5 Reply: 1000 msec. Channel 5 starts operation 1000ms after the holdoff is released.	
Remarks		

<ch>: 0 ~ F(Hexadecimal) for channel.

Command	STOPMD<ch><pb><ls>	Set the way to stop motor.	
Argument	<pb>	Stop by STOP botton	0/ deceleration stop
	<ls>	Stop by limit switch	1/ emergency stop
Initial value	<pb>:0 <ls>:0		
Reply	Nothing		
Example	STOPMD001 In CH0, the STOP botton is set to the deceleration stop, and LS switch is set to the emergency stop.		
Remarks	Only remote mode.		

Command	STOPMD?<ch>	Confirm the way to stop motor.
Reply	<pb><ls> Please refer to "STOPMDx" for meaning.	
Example	STOPMD?3 reply: 01	
Remarks		

7-2 Moving speed setting

Command	SPD<sp><ch><pps>		Set the speed for LSPD, MSPD, HSPD.
Argument	<sp>	Speed	L/ LSPD M/ MSPD H/ HSPD Select the speed at which you want to set.
	<pps>	Speed (pps)	Set the speed at 5~10,000,000. 5pps units. (pps: pulses per second)
Initial value	LSPD/10pps MSPD/650pps HSPD/3,700pps		
Reply	Nothing		
Example	SPDH02000 Set the speed to 2000pps for when ch0's HSPD is selected. SPDLF50 Set the speed to 50pps for when chF's LSPD is selected.		
Remarks	Only remote mode. And the motor is stopped.		

<ch>: 0 ~ F(Hexadecimal) for channel.

Command	SPD<sp>?<ch>	Confirmed the speed for HSPD, NSPD, HSPD.
Argument	H/HSPD M/MSPD L/LSPD Display the speed of the setting value in the motor.	
Reply	DDDDDD (Integer of 6 or more digits)	
Example	SPDL?F reply: 000050 LSPD of chF is 50pps.	
Remarks		

<ch>: 0 ~ F(Hexadecimal) for channel.

<

Command	SPDAL?	Display the speed that has been set to the motor that displays in LCD.
Reply	<0123>/<sp>dddddd/<sp>dddddd/<sp>dddddd/<sp>dddddd	
	<0123>	Expressed in hexadecimal notation of four-digit channel which is displayed on the display. Display the following parameters in this order.
	<sp>	H/HSPD M/MSPD L/LSPD Display the speed that has been set to the motor.
	dddddd	Display the speed as pps.
Example	SPDAL? Reoky: 0123/M000650/H010000/L000100/M000650	
Remarks	If the motor is in operation, display of dddddd part appears in 000000.	

7-3 Acceleration and deceleration Rate Setting

Command	RTE<ch><cd>	Set the code in the acceleration and deceleration rate.	
Argument	<cd>	acceleration and deceleration code	Enter the code a number between 0 - 115. Refer to page 48 about the relationship of acceleration and deceleration of the actual code.
Initial value	013		
Reply	Nothing		
Example	RTE040 Set to 40 for the acceleration and deceleration rate of CH0.		
Remarks	Only remote mode. And the motor is stopped.		

Command	RTE?<ch>	Confirm the code in the acceleration and deceleration rate.
Reply	DDD (3-digit integer)	
Example	RTE?0 reply: 050 The acceleration and deceleration rate of CH0 is 50.	
Remarks		

Command	RRATE<ch><rrt>	Set the acceleration / deceleration rate as a real number.	
Argument	<rrt>	Rate value	1000~0.00125
Initial value	300.000		
Reply	none		
Example	RTE02.5 Set the acceleration / deceleration rate of channel 0 to 2.5ms / 1000pps.		
Remarks	Valid only when the motor is stopped and when remote, see the next page for details.		

Command	RRATE?<ch>	Check the acceleration / deceleration rate with a real number.
Reply	DDD .ddd (real number with 3 decimal places)	
Example	RRATE? 0 reply: 2.500 The acceleration / deceleration rate for channel 0 is 2.5ms / 1000 pps .	
Remarks		

7-4 Details of acceleration / deceleration rate

  The acceleration / deceleration rate is a coded number from 0 to 115, but it corresponds to each code.

The acceleration / deceleration values are as shown in the table below.

  Units: ms / 1000pps (time required to reach speeds from 0pps to 1000pps)

NO	RATE	NO	RATE	NO	RATE	NO	RATE	NO	RATE	NO	RATE
0	1000	20	150	40	22	60	3.3	80	0.47	100	0.068
1	910	21	130	41	20	61	3	81	0.43	101	0.062
2	820	22	120	42	18	62	2.7	82	0.39	102	0.056
3	750	23	110	43	16	63	2.4	83	0.36	103	0.051
4	680	24	100	44	15	64	2.2	84	0.33	104	0.047
5	620	25	91	45	13	65	2	85	0.3	105	0.043
6	560	26	82	46	12	66	1.8	86	0.27	106	0.039
7	510	27	75	47	11	67	1.6	87	0.24	107	0.036
8	470	28	68	48	10	68	1.5	88	0.22	108	0.033
9	430	29	62	49	9.1	69	1.3	89	0.2	109	0.030
10	390	30	56	50	8.2	70	1.2	90	0.18	110	0.027
11	360	31	51	51	7.5	71	1.1	91	0.16	111	0.024
12	330	32	47	52	6.8	72	1	92	0.15	112	0.022
13	300	33	43	53	6.2	73	0.91	93	0.13	113	0.020
14	270	34	39	54	5.6	74	0.82	94	0.12	114	0.018
15	240	35	36	55	5.1	75	0.75	95	0.11	115	0.016
16	220	36	33	56	4.7	76	0.68	96	0.1		
17	200	37	30	57	4.3	77	0.62	97	0.091		
18	180	38	27	58	3.9	78	0.56	98	0.082		
19	160	39	24	59	3.6	79	0.51	99	0.075		

Real rate setting

  With PM16C-16HW2, it is possible to set with real values only when setting remotely. The settable range varies depending on the maximum speed (HSPD, MSPD value) of each axis. If it is set outside the settable range, the upper and lower limits will be set according to the maximum speed.

  Max speed is 150,000 or less: 1000 ~ 0.1 (ms/1000pps, 0.1steps)
  Max speed is 1,500,000 or less: 100 ~ 0.01 (ms/1000pps, 0.01steps)
  Max speed is faster than 1,500,000: 20 ~ 0.00125 (ms/1000pps, 0.00125steps)

7-5 Setting of the limit switch-related

<ch>: 0 ~ F(Hexadecimal) for channel.

Command	SETLS<ch><D><lsen>0<lsiv>		Set the basic operation of the limit switch.	
Argument	<D>	Digital LS enable	0/ Disable digital limit switch	
			1/ Enaable digital limit switch	
	<lsen>	LS enable	0/ LS disable 1/ LS enable	
			In lsen=0, motor does not stop, even if the limit switch detects the limit. Expressed in three-digit binary number like 111, it will be displayed in the order of HPLS, CCWLS, and CWLS.	
	<lsiv>	LS polarity	0/ N.Open (A-contact) 1/ N.Close (B-contact)	
			Select the polarity of the limit switch. Format similar to <lsen>. Expressed in three-digit binary number.	
Reply	Nothing			
Example	SETLS201110011 Disable digital LS of CH2, enable all of LS, set N.Open in HPLS, set N.Close in CCWLS, and set N.Close in CWLS.			
Remarks	Only remote mode. Item that is shaded is the default settings at parameter reset.			

Command	SETLS?<ch>	Confirm the basic operation of the limit switch.
Reply	<D><lsen>0<lsiv> Refer to "SETLS" for meaning.	
Example	SETLS?2 reply: 01110000	
Remarks		

Command	<D>L<ch><dls>		Set the threshold of digital LS that is enabled.
Argument	<D>	Setting side	F/ CW side B/ CCW side
	<dls>	Setting value	-2,147,483,647 ~ +2,147,483,647
Initial value	CCW side: -1,000,000 CW side: +1,000,000		
Reply	Nothing		
Example	FL0+10000000 Set 10,000,000 to CW digital LS value of CH0. BL0-1000 Set -1,000 to CCW digital LS value of CH0.		
Remarks	Only remote mode. And the motor is stopped.		

Command	<D>L?<ch>		Confirmed the threshold of digital LS that is enabled.
Argument	<D>	Setting side	F/ CW side B/ CCW side
Reply	±ddddddd (Signed Integer 7-digit and more)		
Example	FL?2 reply: +1000000		
Remarks			

7-6 Setting of the home position related

<ch>: 0 ~ F(Hexadecimal) for channel.

Command	SETHP<ch>0<hpf><hpd><atd>		Change How to set the home position, and rewrite the detection situation.
Argument	<hpf>	state of home position	0/ not found 1/ found
	<hpd>	direction of home position	0/ CW 1/ CCW Record the direction that had been moved when detects the home position.
	<atd>	direction of start of automatic home position detection	0/CW 1/CCW If the home position is not set, this is the direction to move first when the automatic home position is detected.
Reply	Nothing		
Example	SETHP00001 CH0, hpf is "not found", hpd is CW, atd is CCW		
Remarks	Only remote mode. Item that is shaded is the default settings at parameter reset.		

Command	SETHP?<ch>	Confirm the information of the home position, and how to set the home position.
Reply	0<hpf><hpd><atd> refer to "SETHP" for meaning.	
Example	SETHP?2 reply: 0110 detected the home position.	
Remarks		

Command	SHP<ch><pos>		Normally the home position data is automatically set by HP mode, but this command changes the data by force.
Argument	<pos>	position	-2,147,483,647 ~ +2,147,483,647
Reply	Nothing		
Example	SHP5+10000 Set 10,000 to CH5's home position.		
Remarks	Only remote mode.		

Command	SHP?<ch>	Read out the home position data.
Reply	The home position was found. / ±ddddddd(Signed Integer 7-digit and more) The home position was not found. / NO H.P	
Example	SHP?5 reply: +0010000	
Remarks		

<ch>: 0 ~ F(Hexadecimal) for channel.

Command	SHPF<ch><off>		Set the home position offset. When you detect home position by command "GTHPx", home position searching starts from the distance of offset value from current home position.
Argument	<off>	offset	0 ~ 99,999
Initial value	100		
Reply	Nothing		
Example	SHPF51000 Set 1,000 to the offset of CH5.		
Remarks	Only remote mode.		

Command	SHPF?<ch>	Confirm the home position offset.
Reply	dddd (4-digit)	
Example	SHPF?5 replty: 0100	
Remarks		

7-7 Setting of the local mode data

Command	S<mode><ch><pos>		Set the various values to be used in local mode.
Argument	<mode>	Mode	REL/ Value of the relative movement by START button in REL mode. ABS/ Value of the absolute movement by START button in ABS mode. PRS/ Value to be set by PRESET button in SCAN mode.
	<pos>	Set posotion	-2,147,483,647 ~ +2,147,483,647
Initial value	REL: +10000 ABS: 0 PRS: 0		
Reply	Nothing		
Example	SPRSB+10000 Set +10000 to the preset value of CH11 for when PRESET button will be pressed.		
Remarks	Only remote mode.		

Command	S<mode>?<ch>		Confirm the various values to be used in local mode.
Argument	<mode>	Mode	REL/ Value of the relative movement by START button in REL mode. ABS/ Value of the absolute movement by START button in ABS mode. PRS/ Value to be set by PRESET button in SCAN mode.
Reply	±ddddddd (Signed integer 7 digits or more)		
Example	SPRS?1 reply: +0002500 Preset value is +2500, when PRESET button on the CH1 is pressed.		
Remarks			

<ch>: 0 ~ F(Hexadecimal) for channel.。

Command	SETJG\<ch>\<pos>		In locak mode, set the amount of movement of a operation of JOG switch.
Argument	\<pos>	Step number	1 ~ 99,999
Initial value	1		
Reply	Nothing		
Example	SETJG7200 Outputted 200 pulse when JOG switch for CH7 is operated one time.		
Remarks	Only remote mode.		

Command	SETJG?\<ch>	Confirm the amount of movement of a operation of JOG switch.
Reply	dddd (4-digit integer)	
Example	SETJG?1 reply: 0050	
Remarks		

7-8 Display setting

Command	SETCH\<ch>\<ch>\<ch>\<ch>		Select channels to be displayed on LCD.
Argument	\<ch>	channel	Set the channel number (Hexadecimal) to display in order as A, B, C, D. Please enter "-" if the channel doesn't change. It is not possible to display two or more places at the same time the same CH.
Reply	Nothing		
Example	SETCH0123 Display CH0,1,2,3 in order from Pos.A on the LCD. SETCH--8A Display CH8 to Pos.C of LCD. And display CH10 to Pos.D .		
Remarks	Only remote mode. And it is effective when the motor that is displayed on the LCD has stopped all.		

Command	SETCH?	Confirm channels to be displayed on LCD.
Reply	XXXX (4-digit, hexadecimal) Display in order as A, B, C, D .	
Example	SETCH? reply: 0123	
Remarks		

<ch>: 0 ~ F(Hexadecimal) for channel.

Command	LCDB <brt>		Adjust the brightness of the LCD backlight.
Argument	<brt>	brightness	Please enter an integer of 1 ~ 100.
Initial value	100		
Reply	Nothing		
Example	LCDB 50		
Remarks	Only remote mode.		

Command	LCDB?	Confirm the brightness of the LCD backlight.
Reply	001 ~ 100, 3-digit integer	
Example	LCDB? reply: 050	
Remarks		

8 Timing out signal output

From the four channels that are displays on the LCD, you can get output signal of TTL level according to the current pulse position from LEMO connector on the front panel. Type of signal is available pulse signal and GATE signal.

● GATE signal
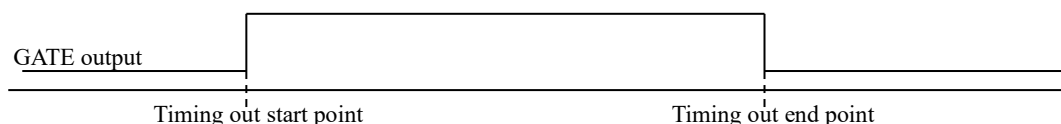
When the position is within the range of the end point from the start of the current point, the output is H level. The output is similar even if a number of start and end points are replaced.
When you have the same value of the start and end points, it will be output when the signal of the width of the pulse output speed has passed that point.

(Example) Set START=10000, STOP=10000 and 1000PPS,
GATE signal having a pulse width of 1ms is output when it has passed through the position 10000.

● Pulse signal
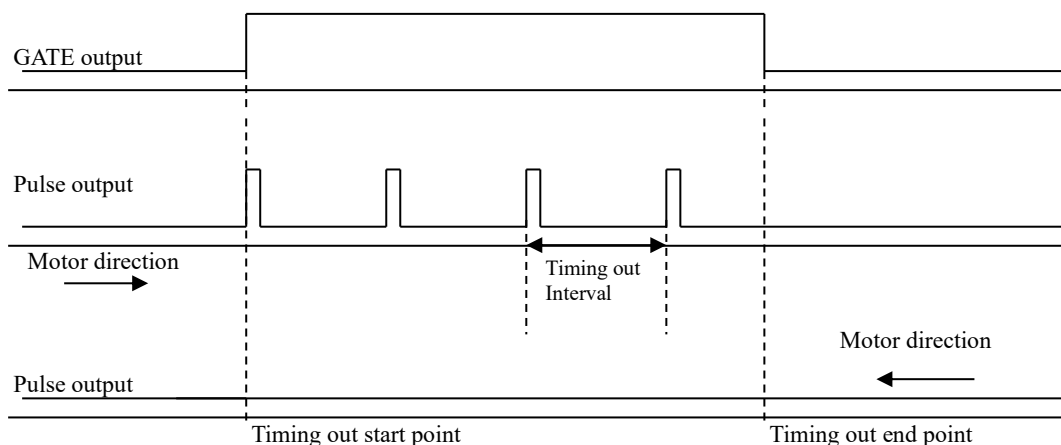
When the motor direction is to the end point from the start point, the pulse signal (width: 200ns ~ 1ms) is outputted if it passes through START. And the pulse signal is outputted every time the value of the interval only proceed until it passes through STOP from START.
If the motor direction is reversed, the pulse signal doesn't generated.
When the motor direction is CCW, and if you want to output the pulse, please set the value of the start point that is larger than the end point.

- Output method
  1. Set the timing signal
     In LOCAL mode, please refer to "Page7 TIMING OUT setting" (page28) for setting.
     In REMOTE mode, you can be set by the following commands.

     <ch>: 0 ~ F(Hexadecimal) for channel

Command	TMGM<ch><type>		Select type of timing signal.
Argument	<type>	Type of signal	0/ no signal 1/ GATE signal 2/ 200ns pulse 3/ 10us pulse 4/ 100us pulse 5/ 1ms pulse 6/ Manual level output 7/ manual 1us pulse output 8/ manual 10us pulse output 9/ Manual 100us pulse output A/ Manual 1ms pulse output
Reply	nothing		
Example	TMGM15		
Remarks	Only remote mode Item that is shaded is the default parameter settings at reset.		

Command	TMGM?<ch>	Confirm type of timing signal.
Reply	0 ~ A (HEX 1-digit integer) please refer to "TMGMx" <type> for meaning.	
Example	TMGM?2 reply: 1	
Remarks		

Command	TMG<md>?<ch>		Read out the timing signal start point, or the timing signal end point.
Argument	<md>	mode	S/ start point E/ end point
Reply	±ddddddd (Signed 7-digit integer)		
Example	TMGE?2 reply: +0050000		
Remarks			

Command	TMGI<ch><data>		Set the interval of the timing pulse output.
Argument	<data>	interval	1 ~ 2,147,483,647
Initial value	200		
Reply	Nothing		
Example	TMGIF1000 CH-F's the interval of timing pilse will be set to 1000.		
Remarks	Only remote mode		

<ch>: 0 ~ F(Hexadecimal) for channel.

Command	TMGI?<ch>	Confirm the interval of the timing pulse output.
Reply	dddddddd (8-digit integer)	
Example	TMGI?F reply: 00001000	
Remarks		

Command	TMG<md><ch><data>	Set the timing signal start point and end point.
Argument	<md> mode	S/ set start point E/ set end point
	<data> start/end point	-2,147,483,647 ~ +2,147,483,647
Initial value	Start point: +1,000 end point: +10,000	
Reply	Nothing	
Example	TMGS2+10000 CH2's timing signal start point will be set to 10,000. TMGE2+50000 CH2's timing signal end point will be set to 50,000.	
Remarks	Only remote mode	

2. In the case of pulse, the motor is moved on the outside of the start and end points of the timing signal.
Please move to the CCW side than the starting point if you want to observe the pulse in the move to the CW. And also, please move to the CW side than the starting point if you want to observe the pulse in the move to the CCW.
If the gate, you do not need this operation.

3. Prepare the timing signal output.
In local mode, please add "#" to the appropriate channel on Motor drive screen (page 14). In remote mode, please enter the following command.

Command	TMG<md><ch>	Set / clear the timing signal output preparation mode.
Argument	<md> state	R/ Ready, H level, Pulse output (Manual) C/ Clear, L level output (Manual)
Initial value	Clear	
Reply	Nothing	
Example	TMGR0 Make the timing signal output preparation of ch0. In manual mode, if it is a level output, TMGR outputs an H level signal. Output L level with TMGC. If it is a pulse output, a pulse with the width set by TMGR is output once.	
Remarks	Only remote mode	

Command	TMGR?<ch>	Confirm the timing signal output preparation mode. When manual output, the current output is answered.
Reply	YES/ The timing signal output preparation mode is ready. NO/ The timing signal output preparation mode is not ready. HIGH, LOW/ (manual output) Responds to the current output. PULSE/ (manual output) Pulse output mode.	
Example	TMGR?F reply: NO	
Remarks		

4. Motor is move to the end point direction, and the signal is generated from the time that has passed through the start point.
In gate mode, the signal is outputted between the start point with the end point until releasing the output preparation state of the timing signal.
In pulse mode, the output ready status is canceled and the output pulse once. However, the pulse is generated, if the motor has resumed to move in the same direction, until the motor pass through the end point, even if the motor stops in the middle.
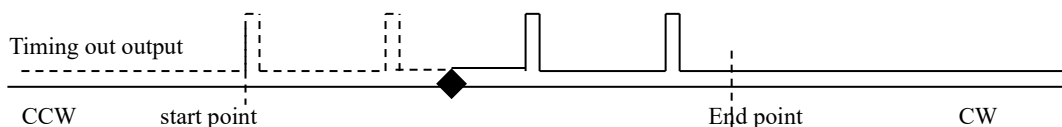
In the moving to the CW direction, If you resume the operation from ◆ in the above figure that is stopped, the pulse is output with the solid line of Timing out output. The dotted line area is considered that has been already outputted. And, the pulse is not outputted, even if it has moved to the CCW direction.
If you don't want to output the pulse if it is moved to the CW direction after stop at ◆, please cancel the output ready by "TMGCx" command. And then, pulse is not output until the ready state to the next.

● Timing signal manual output mode
If you set <type> to 6 with the command "TMGM <ch> <type>", you can output the timing signal to the level output arbitrarily, and if you set 7 to A, you can output 1 pulse. In case of 6, H level is output by TMGR <ch> and L level is output by TMGC <ch>.
For 7 to A, a pulse with the set width is output once each time TMGR <ch> is input.

● Timing output channel fixed mode
In addition to the conventional mode (the timing signal output channels are linked to the display position on the LCD), mode to fix the output channel is now available.
An example, If TP0 has been set to CH0, CH0's timing signal is outputted from TP0, even if it has not been displayed on the LCD top line. And this is the feature of the output channel fixed mode.
In local mode operation, you can change settings by "5-8 Page8 TIMING OUT channel setting" (page 29). In remote mode operation, make the setting with the following command.

Command	TMGFX <md>		Set the output channel mode of the timing signal.
Argument	<md>	Output mode	DS/ Output from the channel in the display. EN/ Output channel fixed mode
Reply	Nothing		
Example	TMGFX EN		
Remarks	Only remote mode, it's effective only when the motor of all channels is stopped. Item that is shaded is the default parameter settings at reset.		

<ch>: 0 ~ F(Hexadecimal) for channel.

Command	TMGFX?	Confirm the output channel mode of the timing signal.
Reply	DS/ Output from the channel in the display. EN/ Output channel fixed mode	
Example	TMGFX? reply: EN	
Remarks		

Output channel fixed mode when enabled, Set up the output channel by the command below. Confirmation is possible at any time, but the settings have not reflected that it is not the fixed mode.

Command	TMGCH<ch><ch><ch><ch>		Set the channel of the timing signal.
Argument	<ch>	channel	In order to TP3 from TP0, must be entered in hexadecimal notation the channel to output the signal. Please enter "-" in place that does not change the display. Can not be set at the same time two or more the same ch.
Reply	Nothing		
Example	TMGCH48CF Set TP0: CH4, TP1: CH8, TP2 CH12, TP3: CH15.		
Remarks	It is effective when the timing signal output channel fixed mode. At remote mode, before setting and after setting, it is effective when both channels are stopped. In remote mode, it is effective when both channels (before setting and after setting) are stopped.		

Command	TMGCH?	Confirm the channel of the timing signal.
Reply	<ch><ch><ch><ch> order: TP0,TP1,TP2,TP3 (hexadecimal)	
Example	TMGCH? Reply: 48CF	
Remarks		

Supplement: For channel switching of the timing signal output channel fixed mode

In timing signal output channel fixed mode, switching of the LCD display channel is possible by CH SEL switch "SETCH" command, even if it is the remote mode.

9 Other Operation

9-1 Channel comment setting

You can leave 3 characters for each channel.   Channel comment is not displayed at the initial state.   You can use the following methods to view comments.

Timing signal output port display

0	0		H		T	P	0		0	1	2	3	4	5	6	7	8	9
0	1		H	#	T	P	1	–	0	1	2	3	4	5	6	7	8	9
0	2		M	#	T	P	2	–	0	1	2	3	4	5	6	7	8	9
1	5		L		T	P	3		0	1	2	3	4	5	6	7	8	9

Channel comment display

0	0		H		C	H	0		0	1	2	3	4	5	6	7	8	9
0	1		H	#	C	H	1	–	0	1	2	3	4	5	6	7	8	9
0	2		M	#	C	H	2	–	0	1	2	3	4	5	6	7	8	9
1	5		L		C	H	F		0	1	2	3	4	5	6	7	8	9

In the communication command, you can display switching with the following command.

Command	LCD_DISP <md>		Switch the display of the LCD.
Argument	<md>	state	T/ Timing signal output port display C/ Channel comment display
Initial value	Timing signal output port display		
Reply	Nothing		
Example	LCD_DISP C		
Remarks	Remote mode only		

● How to set the channel comments (local mode)

1. Move the cursor to where you want to enter a character.
2. Select a letter kind by the letter kind selection button assigned to the numeric keypad.
3. You can push feed button and return button many times until the target letter comes out.

The symbol which can be inputted with a ten key are the below.
+ , - . / : ; < = > ? [¥] ^ _

		Z Y X :		z y x :		9 8 7		‾ ^
Feed	7	:	8	:	9	6	0	~ < ;
Letter kind selecting	4	M	5	m	6	5	±	:
Retuen	1	: : C B A	2	: : c b a	3	4 3 2 1 0	CLR	/ . - , +

Example) If you want to comment as "A-4" to CH1.

0	0		H		C	H	0			0	1	2	3	4	5	6	7	8	9
0	1		H	#	**C**	H	1		–	0	1	2	3	4	5	6	7	8	9
0	2		M	#	C	H	2		–	0	1	2	3	4	5	6	7	8	9
1	5		L		C	H	F			0	1	2	3	4	5	6	7	8	9

1. In the channel comment display mode, move the cursor to the location where colored in the figure below.
2. In order to enter the "A", please press the numeric keypad "4" for select the uppercase letters.
   The "M" will appear in the cursor location. And press the numeric keypad "1" repeatedly until the uppercase letter "A" is displayed.
   After completed to input, the display shows as follows.

0	0		H		C	H	0			0	1	2	3	4	5	6	7	8	9
0	1		H	#	A	**H**	1		–	0	1	2	3	4	5	6	7	8	9
0	2		M	#	C	H	2		–	0	1	2	3	4	5	6	7	8	9
1	5		L		C	H	F			0	1	2	3	4	5	6	7	8	9

3. In order to enter "-", move the cursor to the location where colored in the figure above.
   Please press the numeric keypad "±" for select the symbol.
   The ":" will appear in the cursor location. And press the numeric keypad "CLR" repeatedly until the uppercase letter "-" is displayed.

0	0		H		C	H	0			0	1	2	3	4	5	6	7	8	9
0	1		H	#	A	–	1		–	0	1	2	3	4	5	6	7	8	9
0	2		M	#	C	H	2		–	0	1	2	3	4	5	6	7	8	9
1	5		L		C	H	F			0	1	2	3	4	5	6	7	8	9

4. In order to enter "4", move the cursor to the location where colored in the figure above.
Please press the numeric keypad "9" 3 times.
The input was completed, and "A-4" has been set in the comments of CH1.

● How to set the channel comments (remote mode)
The configuration and verification command of the channel comment is as follows.

<ch>: 0 ~ F(Hexadecimal) for channel.

Command	CHCMNT<ch> <cmt>		Set the comment to channel.
Argument	<cmt>	comment	Please enter alphanumeric up to three characters.
Initial value	CH<ch>		
Reply	Nothing		
Example	CHCMNTA A-3 Set the comment "A-3" to CH10.		
Remarks	Only remote mode.		

Command	CHCMNT?<ch>	You can confirm the channel comments. You can check the comments of all channels, if you enter "a" to <ch>.

Reply	ccc Comment is returned.
	ccc ccc ccc ... ccc If you send a "CHCMNT?a",
	                    the comments are returned with separation by space
	                    in ascending order from ch0.	

Example	CHCMNT?A reply:A-3	
Remarks		

9-2 All reply mode

In PM16C-16HW2, All reply mode have been added to add a response to the command with no response. Response that is added is the following five types. The command will reply with original response.

・OK	Command arrives, and the process has completed successfully.
・MCC06 BUSY ERROR	Motor control IC was busy and process did not complete.
・PARAMETER ERROR	The input value is not in the configurable range.
・COMMAND ERROR	The command that can be executed is not found.
・NG	The command arrived, but the process did not complete.

Even if the reply is OK, it is not guarantee the behavior of as intended. So, please use as a tool of communication debugging only.

You can set this by SETUP mode "5-10 Page10A, 10B, 11A, 11B LAN setting (Page 30)" for local mode.   And you can set this by the following command for remote mode.

Command	ALL_REP <md> ALL_REP_<md>		Set All reply mode. (V1.12~) Both commands are available.
Argument	<md>	setting	EN/ Enable all reply mode DS/ Disable
Initial value	DS		
Reply	Nothing (the reply is OK when setting is EN.)		
Example	ALL_REP EN		
Remarks	Only remote mode, set only the communication port when sending commands.		

Command	ALL_REP?	Confirm All reply mode or not
Reply	EN/ Enable All reply mode DS/ Disable	
Example	ALL_REP? Reply: DS	
Remarks	The settings on the communication port when the command is sent are read.	

9-3 Maintenance command

Command	VER?	Read out firmware version.
Reply	Example) V1.00 20-09-03 PM16C-16HW2	
Remarks		

Command	VERH?	Read out hardware version.
Reply	Example) HD-VER 211111	
Remarks	(V1.08 ~) The first character is displayed on the startup screen.	

Command	STSM?	Read contents of control IC (MCC06)'s Status port1.
Reply	AAAA/BBBB/CCCC/DDDD Regarding 4channels that are displayed, MCC06's status is displayed in hexadecimal four-digit.	
Example	0000/0000/0000/0000	
Remarks		

Command	ERRF? ERR?	Read out error status.	
Reply	ERRF?	HH	Hexadecimal two-digit. b7/BATTERY EMPTY b3/OTHER ERROR b2/PARAMETER ERROR b1/MCC06 BUSY ERROR b0/COMMAND ERROR
	ERR?	Example) MCC09 BUSY ERROR	
		Displays the error information of the lower most of the bits that are happening in error. "NO ERROR", if there is no error.	
Example	ERR? Reply: COMMAND ERROR ERRF? Replu: 01		
Remarks			

Command	ERRC\<e>	Clear error flags	
Argument	\<e>	Error type	No input/ clear all errors 0/ clear COMMAND ERROR 1/ clear MCC06 BUSY ERROR 2/ clear PARAMETER ERROR 3/ clear OTHER ERROR 7/ BATTERY EMPTY clear
Reply	Nothing		
Example	ERRC Clear all errors		
Remarks			

Command	FROM?	Firmware is stored on two ROM. Confirm ROM which has been used for the firmware.
Reply	FROM0, FROM1	
Remarks		

Command	FROM0 FROM1	Select the one of two ROM that are saved the firmware.
Reply	Nothing	
Remarks	Please note that when you restart the equipment after you run this command, various parameters will be initialized. (V1.08 ~) Parameters are no longer initialized.	

Command	REST	Restart the equipment. This is the same as pressing power switch.
Reply	Nothing	
Remarks		

10 Firmware version up

   PM16C-16 HW2 can upgrade the firmware (hereinafter referred to as FW) by sending a file through a communication line other than a high-speed LAN and writing it to ROM.
There are two ROMs for saving FW, and you can boot with two different versions by switching the ROM used when booting.
The high-speed LAN port (LAN_H) side does not support FW version UP.

When updating the FW, for safety, disconnect the cable between the main unit and the driver, or turn off the power of the driver.
Also, if you upgrade the version or switch the ROM with a FW V1.07 or earlier, various settings including the current pulse value will be initialized. If necessary, write down the setting values, or save the parameters with the trial software for PM16C-04XDL.
If the two ROMs contain V1.08 or later FW, various settings will no longer be reset by switching between version UP and FW. When upgrading to V1.08 or later FW for the first time, please perform the version upgrade work twice to write to two ROMs.
If you upgrade the version from V1.07 or earlier, or return to the FW of V1.07 or earlier, the settings will be reset as before.
http://www.tsuji-denshi.co.jp/manual_pdf/pm16c_04xd_vup_soft.pdf (PDF file)
Instruction manual for file transmission software,
http://www.tsuji-denshi.co.jp/download_file/lan_rs_file_send.EXE (EXE file)
File transmission software has been uploaded.
* Depending on the network conditions, for file transmission and upload with the above file transmission software
It may take some time.

The below explanation is how to perform firmware version up by using normal speed LAN (LAN_L) communication and Tera Term (free software).

> Note:
> When switching the FW used in "FIRMWARE CHANGE", if you change the ROM used for the next boot after downloading the latest FW, all the position data will be reset to 0 and the various setting values will be reset to the initial values.
> (V1.08 or later) When both FWs are V1.08 or later, both the position and the set value are no longer reset.

1. Download the version upgrade file from PM16C-16HW2 section of the URL as follows.
   https://www.tsuji-denshi.co.jp/product/upgrade/up_stepping/
2. Launch the program "Tera Term".
3. Operation is File -> New connection, then TCP/IP, LAN-L's IP address and port number is entered, and select the Telnet service.
4. 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 the connection will be good if there is reply.
5. Set PM16C-16HW2 to REMOTE MODE. All response modes are forcibly disabled for all communications.
   (In local mode, even if a file for version UP is sent, it will not be recognized.)

6. Operation is Tera Ter's File -> Send file, and then the window displays a screen to select a file to send.
    Choose the text file of version up that you prepared in the above section 1 (16CHW2_V1.xx.S). Upload will begin.
    DO NOT turn off the power while REM lamp is blinking.
    Depending on network conditions, it may take some time to send the file.
    In that case, increase the window size of Tera Term.
7. REM lamp on the PM16C-16 is blinking on and off slowly that indicate receiving the file by PM16C-16HW2.
    After received all data, REM lamp turns on quick blinking mode. Then the data write procedure begins.
    After finishing data write procedure to ROM, REM lamp turns off. And then LOC lamp turns on.
    Program upgrade procedure is finished.
8. Please disconnect the Tera Term and exit.
    Restart the main unit, or enter the "REST" command, it will start with the new version.

    You can use the "FIRMWARE CHANGE" on Page11 at SETUP mode, to switch the firmware you want to use.
       NEW: Firmware that you downloaded to the last.
       OLD: Firmware that you have downloaded to 2 times before.

    Remark:
    The position data will be set to all zero if the firmware is changed and started. (Switched the firmware to be used in the "PROGRAM CHANGE". Or, downloaded the latest firmware.)

In case of the failure of receiving version up file, REM lamp keeps blinking slowly over 5 minutes, or continue to light without quick blinking phase. Please reboot the main unit and retry sending the file.
If you shutdown the unit while the REM lamp is blinking quickly, firmware data may not be correctly written to the ROM, which causes program to run out of control, and initial display may not be displayed.
In this case, please power off and power with pushing ten-key "8" switch.
The unit runs from previous ROM version again. And you can try again upgrade procedure.

This method is useful at any time, but the display "NEW","OLD" those are shown in LCD display in SETUP mode will not be changed. "NEW","OLD" display changes after V1.08.

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

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

Please be careful about an electrical shock, when you have opening the cover of this unit.
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 open the top cover. Please find dip switch is on print circuit board "TEP743" Set the dip switch 1No.2 to side "ON". (Dip switch 1 is still side "OFF".)
2. Put on the power line pushing ten-key switch "5". 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 dip switch 1 No.2 to side "OFF".
   (Dip switch 1 is still side "OFF".)
4. Put on the power line pushing REL/LOC button. Program starts by Version 1.00 firmware. It's OK if you press the REM / LOC button and the LEDs on the top light up alternately. You can change the IP address, port number, etc. by pressing the SETUP button.
5. Please upload the latest file again with the normal firmware version up method 1 ~ 8.
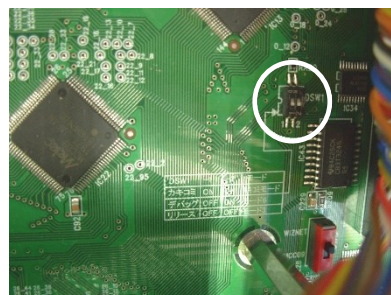
11 Appendix

11-1 Command List

## 11-2 Battery backup battery replacement

PM16C-16HW2 uses a button battery for battery backup, even if the power is turned off. It holds the settings of each axis and the current position.

It has a life of 5 years or more, but if the battery runs out, it will not be possible to set and retain location information when the power is turned off. If you turn on the power in that state, " BATT EMPTY" will be displayed on the LCD at regular intervals, and the "ERR? " Command will respond with "BATTERY EMPTY".

Please have one CR2032 ready when you replace the backup battery.

When you open the top lid of the main body, the battery is stored in BAT1 at the lower left of the board in the center.

Push the battery in the opposite side of the claws on the battery (the part surrounded by the circle in the figure on the right), remove the battery, and replace it with a new one. When the replacement is complete, push the battery in so that the claws catch on the battery.
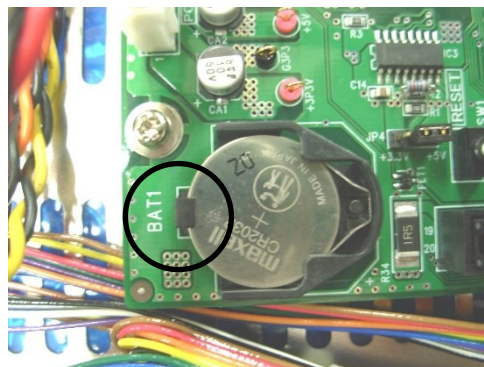
After replacing the battery, turn on the power of the main unit. "BATT EMPTY" is displayed when the power is turned on for the first time, but after that, the power is turned on again, and when the previous display disappears after the second time, the battery replacement is complete.

12 Revision History

Revision	Date	Revision history
4	2022/07/19	First version release. English version4 is matched with Japanese version4.
5	2024/03/12	Updated the detail of "10. Firmware Version UP". Matched with Japanese manual version 6.

13 Performance and Specifications

Power	AC85V ~ 264V, 47 ~ 440Hz, 50VA Battery Backup: CR2032 x1	
IN/OUT	Control motor	16 motors can be controlled
	Capability	Local mode: controls 4 motor units at the same time. Remote mode: controls 16 motor units at the same time.

	Out put	For each 16 motor driver,
		  CW, CCW (5V, 8mA: line driven)
		  HOLE OFF (+common can be selected from + 5V and +12 V for each CH)

	Pulse rate	5 ~ 10MPPS
	Pulse control number	0 ~ ±2,147,483,647
	Acceleration and deceleration rate	1000.00～0.00125 ms/kHz
	Acceleration and deceleration form	Constant speed, S-character form, trapezoidal form
	Output format	Pulse-Pulse, Pulse direction (Polarity of direction can be switched.)
	Pulse out connector	Dsub9S
	Limit switch input	CW-LS, CCW-LS, HOME-LS 12V 5mA (minus common) and power supply +12V for censer for each motor (total 1A).
	Limit switch connector	Dsub9P
LCD display	Characters and lines of display device	20charactors × 4 lines (Size : 9.2H ×4.8W)
	Display contents in control mode	channel number, current position of ±10 digit number, speed display, contents of limit switch, relative moving value, preset count value, home position information, panel operation ready/not ready
	Display contents in data set mode	limit switch setting information, pulse output mode, value of speed HSPD/MSPD/LSPD, acceleration and deceleration rate value, Push button stop mode, origin detect function, timing pulse generate function, RS232C settings, GP-IB settings, HAND BOX selection, FIRMWARE version selection
Remote control	Communication way	LAN, GP-IB, RS232C port
Case	EIA 2 UNIT rack mount t type (88H×482W×325D)	

For the further information, feel free to ask us.