16CH STEPPING MOTOR CONTROLLER
PM16C-02Z
USER'S MANUAL

"SHEET No.2462" VER.1

APPLICATION OF ELECTRONIC DEVICES

TSUJI ELECTRONICS CO.,LTD

3739 Kandatsu-machi Tsuchiura-city
Ibaraki-pref., 300-0013 Japan
Telephone +81-29-832-3031
Fax +81-29-832-2662
e-mail info2@tsuji-denshi.co.jp
url http://www.tsujicon.jp

PM16C－02Z Command List (for RS232C, GP－IB)

mode	operation	command	remarks
R/L	remote/local select	S1□	S1R:remote change　S1L:local change
R/L	channel read	S10	receive form R□□
R	A channel select.	S11□	□：0～F
	B channel select.	S12□	□：0～F
	A service request	S1301	SRQ for A channel stop
	B service request	S1302	SRQ for B channel stop
	A,B service request	S1303	SRQ for A,B channel
	SRQ cancellation	S1380	or GP-IB command:"IFC"
	SRQ flag read out	S14	receive form R□□　(HEX)
R/L	A pos.data read	S20	receive form R□□□□□□　(HEX)
	A pos.status read	S21	receive form R□□　(HEX)
	B pos.data read	S22	receive form R□□□□□□　(HEX)
	B pos.status read	S23	receive form R□□
R	A pos.2 byte command	S30□□	A position 2 byte command 08:+jog, 09:-jog 0C:+CSPD scan 0D:-CSPD scan 0E:+scan 0F:-scan 16:pause on 17:pause off 18:hold off 19:hold on 1E:+scan&HP stop 1F:-scan & HP stop 40:slow stop 80:EM.stop
	B pos.2 byte command	S31□□	B position 2 byte command 08:+jog, 09:-jog 0C:+CSPD scan 0D:-CSPD scan 0E:+scan 0F:-scan 16:pause on 17:pause off 18:hold off 19:hold on 1E:+scan & HP STP 1F:-scan & HP stop 40:slow stop 80:EM.stop
R	Speed set command	S3□	S34:L speed　S35:M speed　S36:H speed
	A pos.8 byte command	S32XXX XXX□□ or S32XXX XXX□□B	A position 8 byte command XXXXXX:HEX position data 10:CSPD REL.IDX 11:CSPD ABS.IDX 12:REL.IDX 13:ABS.IDX character B for "back-lash correct"
	B pos.8 byte command	S33XXX XXX□□ or S33XXX XXX□□B	B position 8 byte command XXXXXX:HEX position data 10:CSPD REL.IDX 11:CSPD ABS.IDX 12:REL.IDX 13:ABS.IDX character B for "back-lash correct"
R/L	Data read command	S4XY	data read command X:channel No.　Y:data No. receive form R□□□□□□　(HEX) 3byte from read data address
R	Data write command	S5XY□□	data write command X:channel No.　Y:data No. □□:data (HEX)
R/L	Status & LS read	S6	status & LS read receive form R□□
	b-lash correct set	BX±DDDD	data set 0～±9999 (Decimal)
	〃　read out	BX?	receive form ±DDDD(DEC)

Contents

PM16C-02Z User's Manual

1. Introduction

1) Characteristics

① One PM16C can control les than 16 stepping motors.

*Characteristics (HSPD,MSPD,LSPD,RATE,LMSW) of each motors can be set as you like.

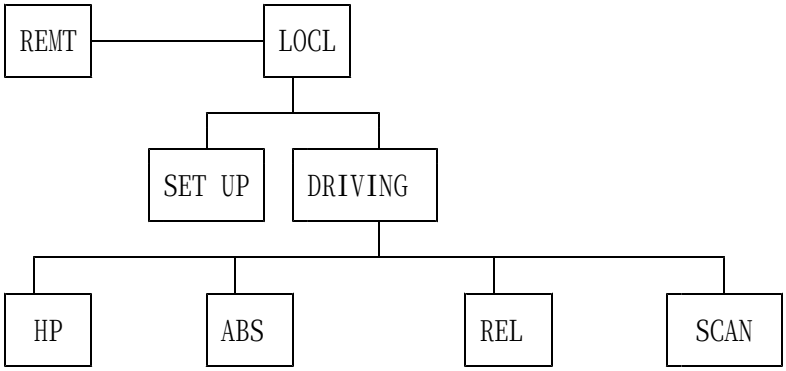
*Any channel can be inhibited to operate.

② Two motors can be driven synchronously.

*The two motors can be started at the same time.

*Limit SW status,Pulse out status and Position of the two motors are shown on the front panel.

③ Driving Mode



(all LED are turned off)

REMT :Controlled by other equipment through communication line
LOCL :Controlled by Switches on the front panel

SET UP :Setting of the motor driving procedure
DRIVING :Motor driving is possible in this mode(set up lump turn off)

SCAN :Simple driving (can be stopped only by Limit SW or Stop SW on front panel)
ABS :Absolute Position Set Driving
REL :Relative Position Set Driving
HP :Home Position Stop Driving

*Present driving mode is shown on the front panel by LED

*Modes,and position are memorized as back up data by battery for five years.

*The data can be set in REMT mode, as above shown.

*Use the data communication forms as below.

1 GP-IB (EX. NEC PC9801-29N)
2 RS232C
3 Handy console(PM16-HD1:option)

④ Motor is stopped,when

a. Limit Switch is detected.
b. Home Position Switch is detected.
c. Software Limit Switch is detected.
d. stop switch is pushed.

*Enable/disable can be set for each motor.(a,b,c)

*Contact type can be set for each motor.(a,b,c)

*(d) function is enable in both remote/local.
*(c) is a function in which the motor is stopped at the point set by front panel or by remote operation.
*In the case of a～d, the motor is stopped through slow stopping process to prevent detuning.

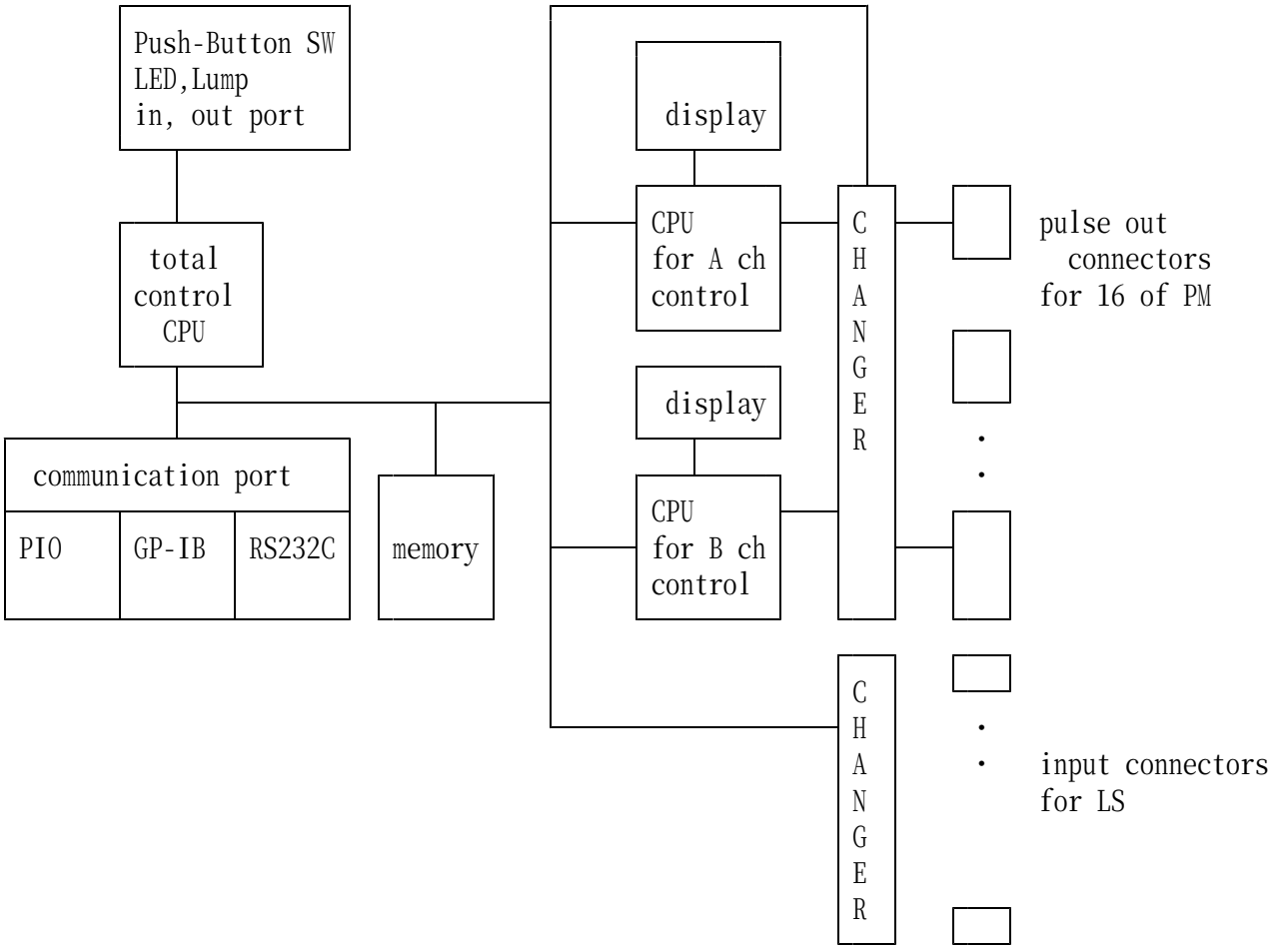
⑤ Hand box operation
*Only 2 channel can be operated, which are displayed on the front panel.
*CW/CCW jog operation is possible.
*By use of the Hand box, you can operate PM16C, while you watch the machine moving.
If you need more multi-function, handy console :PM16-HD1 is useful.
Please contact us, and order please.

⑥ Hold off :When motor is stopped, power is automatically turned off.
*Each channel can be set to take the hold-off function,or not.
*The hold-off can be set externally by command through communication line.

⑦Jog switch is used for:
a. Any numbers of steps(1～9999) driving.
b. Inching driving; Only when you keep to push the jog SW, Jogging continues.

2) Concept of PM16C control

Pulse motor controller ;PM16C-02Z has ①a CPU which controls the hole of the system, ② two CPU which control the stepping motors. The connections between the two CPU and 16 of stepping motors are changed properly. Present positions, present velocities, differential velocities in starting and stopping phase, etc. are stored in the memories as battery back up, which are read out and renewed any time you need.



2. Panel layout

1)Front panel layout Fig.1
Rear panel layout Fig.2

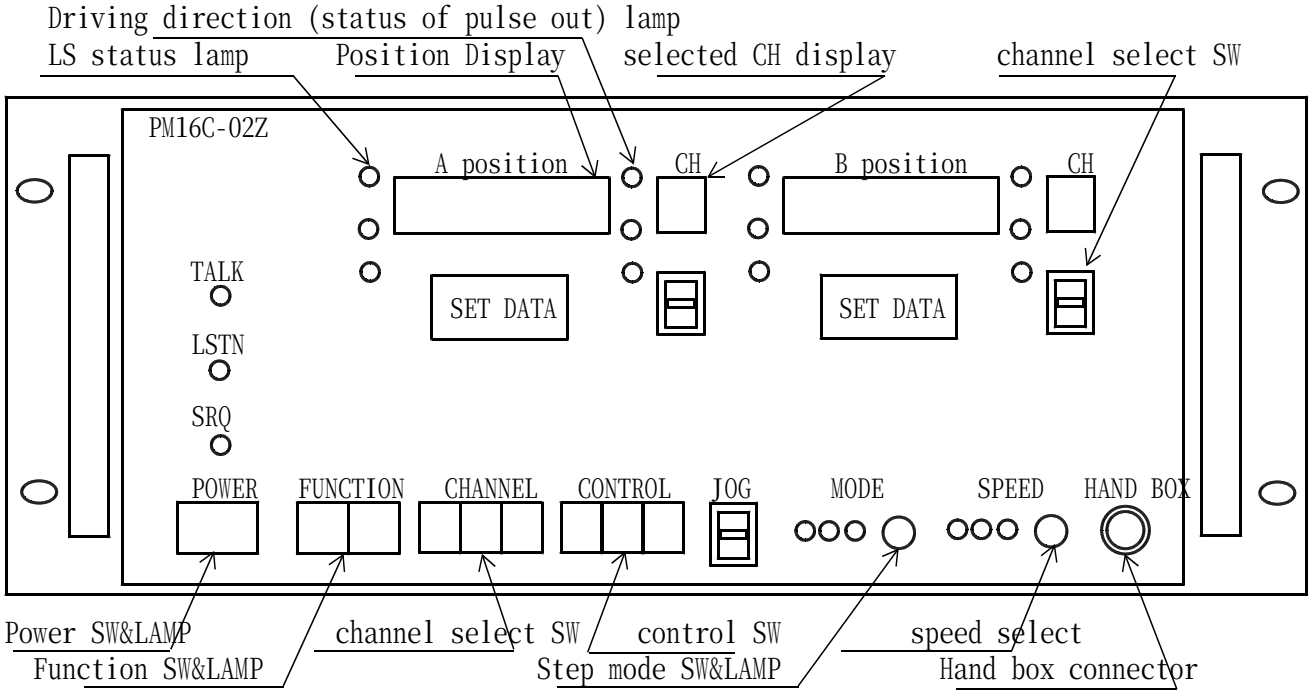


Fig.1 Front panel layout

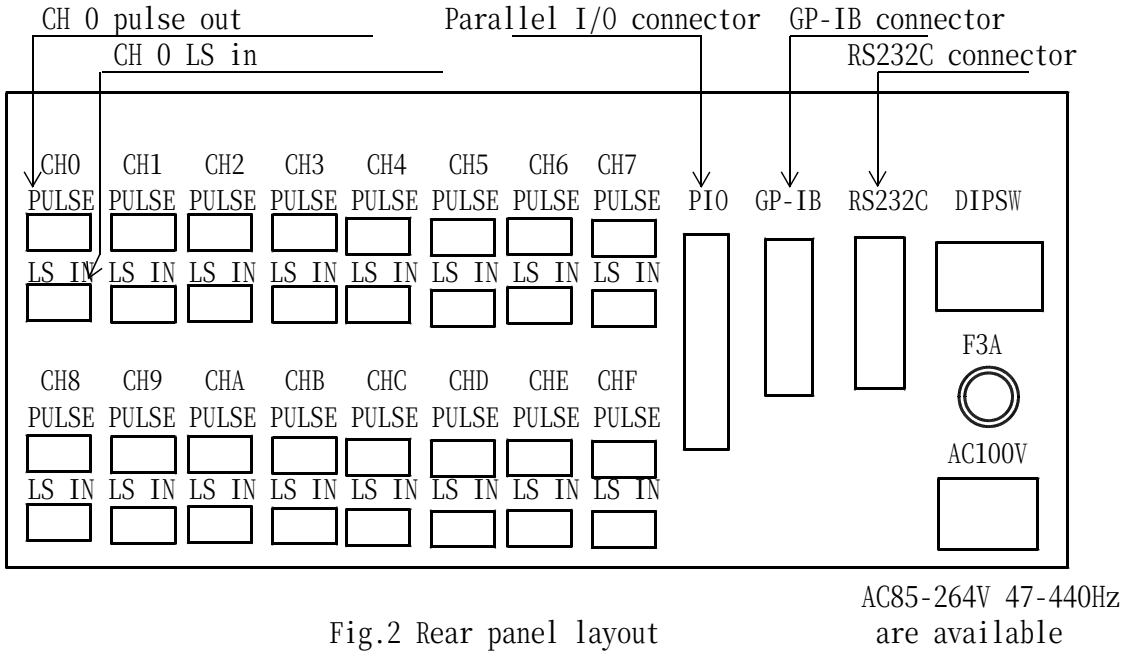
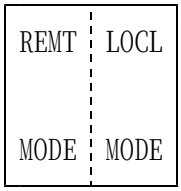
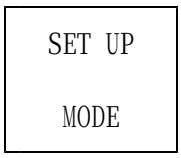


Fig.2 Rear panel layout

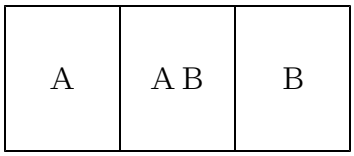
2)Function SW (in detail)



REMT ; External control mode
LOCL ; Manual driving mode. PM16C is operated by Panel SW.
If you keep the SW to be pushed,and turn the power on, then Motor Speed is set to be default data.
Default : HSPD=3700PPS,MSPD=650PPS,LSPD=10PPS,
RATE=300mS/1000PPS,hold off mode,LS/N.O
jog pulse counts=1,CWLS=+1000000,CCWLS=-1000000
*Each pushing changes the remote/local alternately.
It can be also operated externally.



SET UP ; If you push this SW when motor remains stationary in LOCL, then the mode is changed into set up mode.
Please set the data for motor driving in this mode.



By these SWs, you can select which motor is driven.
If you select SW AB,two motors are driven at the same time.

INC

PRESET ; a. In DRIVING mode:data of digital SWs are set as present data.
By A/AB/A SW, you can select the CH to which data are preset.

b. In set up mode:The values of data are increased.
(The value of Soft ware LS is set by digital SW.)

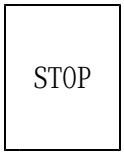
Data

START ; a. In DRIVING mode:Function is changed in accordance with mode display lamp

mode lmp	mode	movement when ST sw is on
all off	scan	prepare scan. waiting to set direction
ABS on	ABS	scan start to ABS. pos. set by digital SW.
REL on	REL	scan start to REL counts set by digit. SW.
HP on	HP	prepare scan till HP LS stopping

*In scan and HP, scanning is prepared by pushing this SW.
However, the scanning can not start without setting CW/CCW decision by jog SW.

b. In set up mode:Showing data are changed by this SW.
Right after entering into set up mode, CW LS data is shown.
And,CCW LS,HSPD,MSPD,RATE,LS status are shown next to next.



DEC

STOP ; a. In DRIVING mode:Motor is stopped in both REMT and LOCL modes.
b. In set up mode:The value of the data are decreased.
(Software LS value is set by digital SW.)

---

caution

* mode change SW : ABS→REL→HP→scan are circular changed.
* speed change SW :L→M→H are circular changed.

3. Setting the motor characteristics

In PM16C-02Z, each data of 16 stepping motors can be set and stored, which is kept as battery back up. The data are kept to be memorized until reset. Then, accurate control is realized for any system. In setting mode, pulse out is stopped. data can not be set during JOGGING.

1) Power on

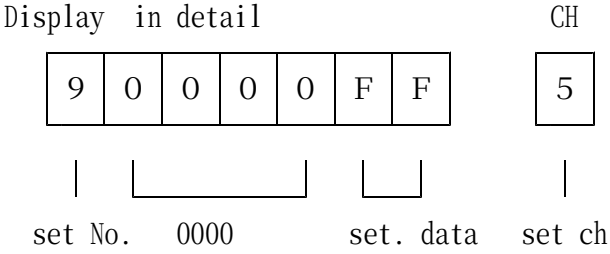
When Power SW is turned on, status become to be default mode within 1s.

	operation mode	driving mode	driving position	speed setting
default	LOCL	REL	A	MID

Other data are set as the value which are the one last time turned off the power, because the all of these data are kept by battery back up.

2) Prepare the data setting

In LOCL mode, set up mode is selected by set up SW.
Then, A position display shows the data.
Caution) The display shows the number as HEX(0～F), then 6 and b might be complex. Please take care this point.



The channel you want to set data is shown in A position display. The channel can be changed by INC/DEC SW under the display. You can not set the channel shown in B position display.

Then, you should change the channel of B position.

3) Procedure of data setting

A. Digital CW LS setting No. 7 *Right after entering the set up mode

a) Push the data SW (AB SW), and select the setting No. 7 .(7 is not shown, but it is after E.)
b) Set the data by INC SW (A SW) and DEC SW (B SW).
The data's mean the absolute position where you want to stop the motor during CW driving.
c) Channel can be changed by the SW under the display.

B. digital CCW LS setting setting No. 8

a) Push the data SW (AB SW), and select the setting No. 8 .
b) Set the data by use of INC SW (A SW) or DEC SW (B SW).
The data mean the absolute position where you want to stop the motor during CCW driving.
c) Channel can be changed by the SW under the display.

C. HSPD (Highest Speed) setting Setting No. 9

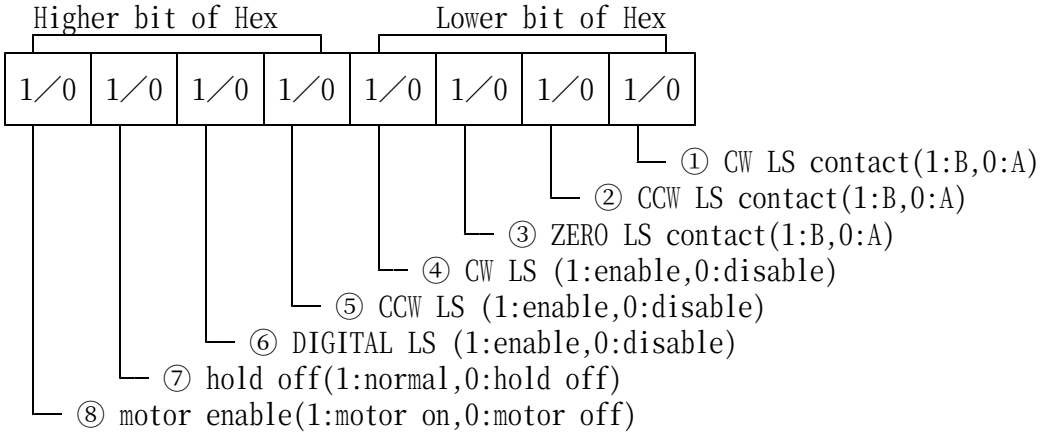
a) Push the data SW (AB SW), and select setting No.9.
b) Set data by use of INC SW (A SW) or DEC SW (B SW).
A relationship between data and speed can be known by use of table 1.
c) Channel can be changed by the SW under the display.

D. MSPD (Middle Speed) setting Setting No.A
a) Push the data SW (AB SW), and select setting No.9.
b) Set data by use of INC SW (A SW) or DEC SW (B SW).
A relationship between data and speed can be known by use of table 1.
c) Channel can be changed by the SW under the display.

E. LSPD (Lowest Speed) setting Setting No.B
a) Push the data SW (AB SW), and select setting No.B.
b) Set data by use of INC SW (A SW) or DEC SW (B SW).
A relationship between data and speed can be known by use of table 1.
This is the speed which is the primary value in accelerational driving, or the final value of decelerational driving
c) Channel can be changed by the SW under the display.

F. RATE (accelerational/decelerational rate) setting setting No.C
a) Push the data SW (AB SW), and select setting No.C.
b) Set data by use of INC SW (A SW) or DEC SW (B SW).
A relationship between data and speed can be known by use of table 2.
c) Channel can be changed by the SW under the display.

G. LMSW (Limit SW etc.) setting setting No.D
a) Push the data SW (AB SW), and select setting No.D.
b) Set data by use of INC SW (A SW) or DEC SW (B SW).
c) LS status can be set, while you see the LED to know the present status. (turned on:LS on, turned off:LS off) (details are shown in next page "LS data structure)
d) If highest bit is set to zero (<7FH), which means motor off, then CW and CCW LS lamps are switched to show that the motor can not be driven.
e) Channel can be changed by the SW under the display.
*LS data structure



①,② CW/CCW LS A/B contact type setting
When these bits are 1, they are B contacts. when they are 0, A contacts.
A contacts :when LS is struck, the contact becomes electrically to be CLOSE.
It is normally open. (so it is also called as N.O contact)
Drawing: —o o—
B contacts :When LS is struck, the contact becomes electrically to be open.

. It is normally CLOSE. (so it is also called as N.C contact)
Drawing:

③～⑤ ZERO,CW and CCW LS enable
Each LS can be set to be enable or disable.
When this bit is 1, the LS is enable. When this bit is 0, the LS is disable.
Please care that motor can not stop when LS is kept to be disable.

⑥ Digital LS enable
digital LS can be also set to be disable or enable.
When this bit is 1, it is enable. When this bit is 0, it is disable.
If digital LS is enable, motor can stop at the absolute position where is internally set by digital SW(CW/CCW) as same as hardware LS.

⑦ hold off
IF some torque is required to keep the motor remaining stationary, power should be kept to be turned on.
But, if there is not such a requirement, some motor drivers can be hold off to prevent the heating up and to save the power.
When you use these types of drivers, motor can be more effectively driven by this bit operation. When this bit is 1, hold off signal is disable so that power is kept to be turned on all time. When this bit is 0 in manual mode, the power is turned on 0.1s before jog starting, and turned off 0.1S after jog finishing.

*The motor, whose power is required to be hold off in remote mode, should be controlled by the sequence, in which the "hold off" is set to be disable before jog starting, and reset to be enable after jog finishing.

⑧Motor enable
You can set some motors impossible to drive by use of this bit setting.
When this bit is 1, it is normal driving mode that motor can be driven as you like.

When this bit is 0, motor can not be driven by any manual SW operation.
*If you set the motor impossible to drive by this way, the motor becomes that can not be driven by any remote operation.

H. Jogging count setting setting No. E
a) Setting No.E is selected by pushing the data SW (AB SW).
b) Set the data by INC SW (A SW) and DEC SW (B SW).
The possible dates' range is 1～9999.
c) You can change the channel by the SW under the display.

4) Finish to set data
Turn off the set up SW, and get back to driving mode.

4. LOCAL mode driving
Only when remote/local SW is set to be local, the motor can be driven in local mode.
If this SW is remote, you need to push the SW once, and reenter into local mode.
1) Speed selection
By use of speed selecting PB, any speed can be selected from the three speed that are preset in each channel, which are HSPD,MSPD and LSPD.
Starting speed of acceleration and final speed of deceleration is LSPD.

2) Changing the driving mode
By use of driving mode selecting PB, you can select the mode as you like:HP,REL,ABS and scan (scan mode is the case that all LED which show driving mode are turned off.) .
a. HP jogging

When Start PB is pushed, motor is prepared to start, and then start lamp is turned on.
And after that, when the driving direction is given by jog SW operation , the motor is started to search the HP in the given direction, and stop at the HP LS. You can stop the motor at any position by use of stop SW. These preparation can be reset by stop PB.

b. REL/ABS index jogging
In REL mode,when you push the start SW, motor is relatively driven by pulse counts which is preset with digital SW.
IN ABS mode,when you push the start SW, motor is driven to the ABS position where is set by digital SW.
The motor is also stopped by LS and stop SW.

c. Scan jogging
When you push the START SW, START lamp is turned on to show stand-by OK. Next, you give the direction by jog SW, then scan is started in the direction you set.
The motor is stopped at LS, and also stopped by stop PB.
These preparation can be reset by stop PB.

3) Channel selection
While pulse is not being sent, the channel you like to control can be changed by CH select SW in local mode. In the display, the position of the last selected motor is shown. If the SW is operated during pulse-sending, the channel is not changed until finishing the pulse out. Two display (A/B)can not control same channel at the same time.The system are programmed that same CH can not be selected at the same time.

4) Jog driving
In the direction which is set by jog SW, pulses are sent and motor is driven.
If you keep the SW to be pushed more than 0.5 seconds, this scan is started.

5) Position data preset
Index data can be shown and set in the display by use of PR PB and A/AB/B PB.

6) Synchronous driving
Both A and B can be synchronously driven. Then, two motors are started at the same time. Push AB PB.

7) Auto hold-off
If you set the motor hold off, the power of the motor is turned on only when the motor is being driven.

8) Inhibiting Jog
If you set the motor off, any operations shown above can't drive motors. (refer P.6 3-3)-G.)

9) Hand box operation
By use of hand box,you can drive motors while you watch the mechanical moving.
Then, two CH displayed front panel can be operated as CW/CCW jog driving.
You can change control CH on the front panel.

Table 1 speed data

No.	PPS	No.	PPS	No.	PPS	No.	PPS
0	5	30	3,700	60	9,000	90	18,660
1	10	31	3,800	61	9,200	91	18,940
2	25	32	3,900	62	9,400	92	19,230
3	50	33	4,000	63	9,600	93	19,530
4	75	34	4,100	64	9,800	94	19,840
5	100	35	4,200	65	10,000	95	20,160
6	150	36	4,300	66	10,200	96	20,500
7	200	37	4,400	67	10,400	97	20,830
8	250	38	4,500	68	10,600	98	21,190
9	300	39	4,600	69	10,800	99	21,550
A	350	3A	4,700	6A	11,010	9A	21,930
B	400	3B	4,800	6B	11,210	9B	22,320
C	450	3C	4,900	6C	11,410	9C	22,730
D	500	3D	5,000	6D	11,600	9D	23,150
E	550	3E	5,100	6E	11,800	9E	23,590
F	600	3F	5,200	6F	11,990	9F	24,040
10	650	40	5,300	70	12,200	A0	24,510
11	700	41	5,400	71	12,400	A1	25,000
12	750	42	5,500	72	12,600	A2	25,510
13	800	43	5,600	73	12,790	A3	26,040
14	900	44	5,700	74	12,990	A4	26,600
15	1,000	45	5,800	75	13,200	A5	27,170
16	1,100	46	5,900	76	13,400	A6	27,620
17	1,200	47	6,000	77	13,620	A7	28,090
18	1,300	48	6,100	78	13,810	A8	28,570
19	1,400	49	6,200	79	14,000	A9	29,070
1A	1,500	4A	6,300	7A	14,200	AA	29,590
1B	1,600	4B	6,400	7B	14,400	AB	30,120
1C	1,700	4C	6,500	7C	14,620	AC	30,680
1D	1,800	4D	6,600	7D	14,830	AD	31,250
1E	1,900	4E	6,700	7E	15,010	AE	31,850
1F	2,000	4F	6,800	7F	15,200	AF	32,470
20	2,100	50	6,900	80	15,390	B0	33,110
21	2,200	51	7,000	81	15,580	B1	33,780
22	2,300	52	7,100	82	15,770	B2	34,480
23	2,400	53	7,200	83	15,970	B3	35,210
24	2,500	54	7,300	84	16,180	B4	35,970
25	2,600	55	7,400	85	16,400	B5	36,500
26	2,700	56	7,500	86	16,610	B6	37,040
27	2,800	57	7,600	87	16,830	B7	37,600
28	2,900	58	7,700	88	17,060	B8	38,170
29	3,000	59	7,800	89	17,240	B9	38,760
2A	3,100	5A	7,900	8A	17,420	BA	39,370
2B	3,200	5B	8,000	8B	17,600	BB	40,000
2C	3,300	5C	8,200	8C	17,800		
2D	3,400	5D	8,400	8D	17,990		
2E	3,500	5E	8,600	8E	18,180		
2F	3,600	5F	8,800	8F	18,380		

Table 2 rate data

No.	mS/1000PPS
0	1,000.0
1	800.0
2	600.0
3	500.0
4	400.0
5	300.0
6	200.0
7	150.0
8	125.0
9	100.0
A	75.0
B	50.0
C	30.0
D	20.0
E	15.0
F	10.0
10	7.5
11	5.0
12	3.0

The setting Range
HSPD＝0～BB
MSPD＝0～BB
LSPD＝5～A1
RATE＝0～12
Care) HSPD＜LSPD
or MSPD＜LSPD
If you set as above, no acceleration/deceleration is operated. However, simply HSPD or MSPD drive are done.

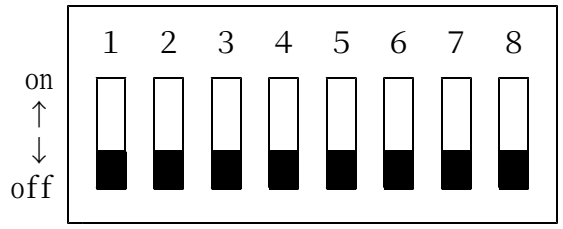
5. Remote mode driving
This mode is possible when remote/local SW shows to be REMT.

If the remote/local SW shows LOCL, push the SW again or send the command externally to change the mode to be REMT. And ,after that, continue to operate as below.

Remote mode driving can be operated by;

1 Parallel I/O
2 GP-IB
3 RS232C

These communication mode can be selected by setting SW of rear panel.(as shown below) The setting SW should be pushed before power turned on.



1 : ON→RS232C port enable
2 : ON→GP-IB port enable (*1)
3 :
4 : ┐
5 : │ GP-IB my address or
6 : │ RS232C baud rate
7 : │ setting
8 : ┘

↑ ↑ ↑ ↑ ↑
↑ ↑ ↑ ↑ ↑

When GP-IB is selected → 2^4 2^3 2^2 2^1 2^0 (my address)

↑ ↑ ↑ ↑ ↑

When RS232C is selected →(N.C) A B C D→→→→

A : 9600 baud If more than
B : 4800 baud two SWs are
C : 2400 baud on, higher
D : 1200 baud is selected.

*When both RS232C and GP-IB are ordered at the same time, RS232C is selected. *1)

By use of the optional handy console (PM16-HD1) is connected to RS232C port in GP-IB mode, less than additional 6 motors can be controlled (position monitoring, jog,scan,REL.IDX,ABS IDX and preset) during GP-IB control.

1) Parallel I/O data communication(omitted)
2) RS232C,GP-IB data communication
   a) Introduction

A PM16C-02Z has a GP-IB control IC;TMS9914A. and has a RS232C control IC; HD64941. In this system, nonsense command or impossible command (EX. reverse drive during normal drive) are ignored so that almost all time you can access from these communication lines(protect from hung up).

Receive form should be S□・・・・□CR+LF*.

When CR(0DH)+LF(0AH)is detected during receiving, the command is rapidly analyzed and done by PM16C-02Z. However, top character is not ”S”, no operation is done.

When PM16C receives information that some data should be returned back, the data are rapidly prepared and sent back. These operations are done for about less than 1mS.

Drive command form is;R□・・・・□CR+LF.

Remote controls such as receiving, analyzing and doing from RS232C/GPIB line are operated by interrupting in PM16C-02Z. Therefore, these operations need not have waiting time.

Then, three types of commands are possible.

TYPE 1:rapid done・・・data reading/motor stop
TYPE 2:waiting for some status done・・・CH select
TYPE 3:some status requiring done・・・motor control

In the case of that the data are read out after sending the command of TYPE 2/3, it is important as above shown.

*De-limitter is fixed to be CR+LF.

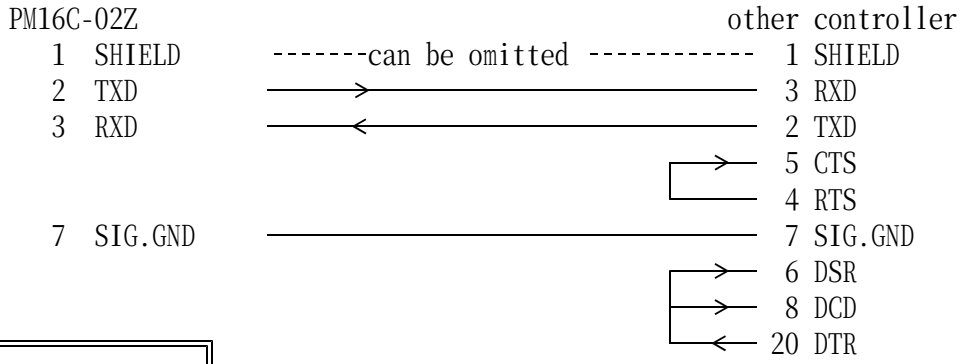
   b)Baud rate /address set SW : as above mentioned
   c)character structure

1.RS232C data are 1START bit ＋8 bit data ＋1stop bit no parity(fixed)
2.De-limitter is fixed to be CR+LF.
3.Send/receive command code is ASCII.

d)In RS232C communication, software hand shake (XON,XOFF) is not supported.

e)Connection between PM16C and other controller(in the case of RS232C. GP-IB is omitted here.)

1.PANEL：DB25S　CABLE:DB25P
2.PIN ASSIGN　(→shows the flow of data)



RS23C2C debug tool

If RS232C line can not work well, the cause of that is hard to be found. Therefore, we prepared the tool for helping to solve these problems. Please keep the stop PB on while power is turned on, then received character is displayed echo back. You can refer the character and get some information about the problem you meet. If echo back is not well displayed, the RS232C line is possible to be badly wired. Or, if you get curious characters, baud rate and parity should be examined.

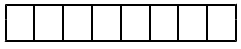
2-1)Command in detail (for both RS232C and GP-IB)

a) Channel select,channel read and remote/local change command

If these commands are received during pulse sending, any operations are not started before finishing the pulse out. It is enable only in REMT mode. CH reading out and REM/LOCL changing can be operated both in remote/local. Dates are read out as the receive form below.

command form

S　1　□　□ ——— channel data(0～F)
(In Ch reading and remote/local changing, it can be ignored.)
R:Remote mode change　(TYPE 3)
L:LOCL mode change　(TYPE 3)
0:　position channel read　(TYPE 1)
1:A position channel select(TYPE 2)
2:B position channel select(TYPE 2)
3:SRQ (next 2characters are 8 bit pattern)
4:SRQ status read out (automatically cleared after SRQ status reading out)



B0:A pos.stop SRQ
B1:B pos.stop SRQ
B7:ignore SRQ(reset)

command
EX) S1301 : A pos.stop SRQ

S1302 : B pos.stop SRQ
S1380 : SRQ reset,SRQ clear

Receive form

R □ □ ——— B Ch data (0～F),SRQ status lower bites
└——— A ch data (0～F),SRQ status higher bites

* When ch is selected, old data are saved and new data are set. These process takes a few times.(about 30mS) Therefore, you should send the command after completing the ch selection . The completing can be known by Ch reading out command.

b) Data & status read command

At any time, position data and status are usually read out by this command. This is enable in whichever modes remote/local.

command form

S 2 □ ——— 0:A position data read (TYPE 1)
1:A position status read(〃)
2:B position data read (〃)
3:B position status read(〃)

Receive form

R □ □ □ □ □ □ position data (2's compliment of 6 hex code)
HEX CODE ASCII
R □ □ Status data(2 hex code)
HEX CODE ASCII

Status REG.

D7	D6	D5	D4	D3	D2	D1	D0

D0 — BUSY
D1 — DRIVE
D2 — DREND(V1.30～)
D3 — COMERR(V1.30～)
D4 — COMERR(～V1.29, "0":V1.30～)
D5 — LDEND
D6 — SSEND
D7 — ESEND

*) Firmware version "V1.30" etc. can be read out by "VER?" command.

BUSY:shows Pulse controller is being operated now. During the moving, speed change and pulse out command are ignored, though slow stop and EM stop command are effective. BUSY status of 0D17 shows CPU status which controls hole of the system. On the other hand, the BUSY here shows two CPU's status (A/B) which control A and B motors.

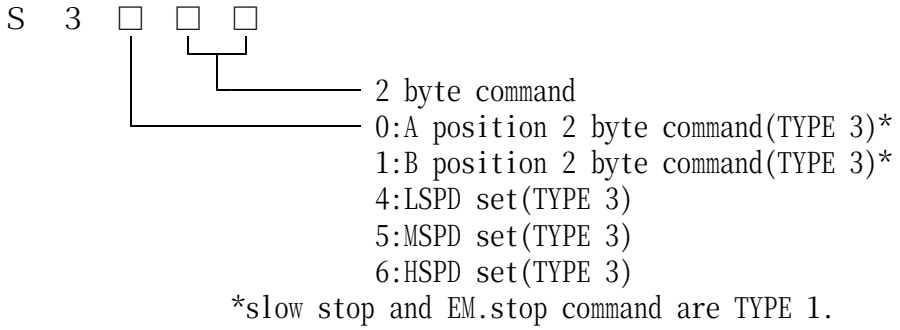
DRIVE :Pulse out is being continued.
DREND :Pulse out drive finished.
COMERR :The command is nonsense.
LDEND :Pulse out is stopped by CWLS and CCWLS.
SSEND :Pulse out is slowly stopped by slow stop command.
ESEND :Pulse out is rapidly stopped by EM stop command.

caution) COMERR,LSEND,SSEND and ESEND are enable, only if BUSY=0.
These bits are cleared by rewriting the next command.
LSEND,SSEND and ESEND bit are nonsense, when pulse are not sent out by the command.

c) Motor control command

Data and command are written for A position and B position control

2 bytes command form



*slow stop and EM.stop command are TYPE 1.

① +,- jog command command for jog drive

command
08 :+(CW) jog drive
09 :-(CCW) jog drive

② +,- constant speed scan command

By this command, motor speed is set to be constant value which is preset (*) as you like.

command
0C :+(CW) constant scan drive
0D :-(CCW) constant scan drive

* The speed is set at the value which is last selected by push SW (H,M and L) in LOCL mode, or which is last selected by speed select command ⑧ in REMT mode. This procedure is same in other controls shown below.

③ +,- scan command

Motor speed is increased from LSPD to set value as trapezoidal driving.

command
0E :+(CW) scan drive
0F :-(CCW) scan drive

④ speed selection command

By this command, the motor speed is selected from HSPD,MSPD or LSPD. Both A POS and B POS are set as same value.

This command is effective for the channel whose motor remains stationary. The channel of the moving motor is kept to store the old value.

command
EX) S34 : LSPD select
S35 : MSPD select
S36 : HSPD select

⑤ The command used to stop the motors which are started at the same time, and the command used to reset the stop command

The below commands should be sent to PM16C before starting the two motors at the same time.(*) If jog command is sent after stop command, motors can not be driven until cancellation of the stop command.

command
16 : pause
17 : pause off
EX) S3016 : pause
S3017 : pause off

* The sequence of Synchronous start is that; 16H(pause) is given to the each controller, and after that, 17H(pause off) is given to start two motors synchronously.
The third character shows channel, and then both 1 and 0 are effective for both A and B channel.

⑥ hold off set/rest command

command
18 : hold off set
19 : hold off reset
EX) S3018 : A pos.hold off set
S3019 : A pos.hold off reset
S3118 : B pos.hold off set

*When you need to start the motor from the state of hold off, you should cancel the hold off state enough time before sending the control pulse in accordance with motor's character. Of course, when you set hold off again ,you should send the command enough time after finishing to send the control pulse.

⑦ scan & HP stop command
By this command, scan and home position LS detection are done.
command
1E : +scan & HP stop
1F : -scan & HP stop
EX) S301E : A pos. +scan & HP stop

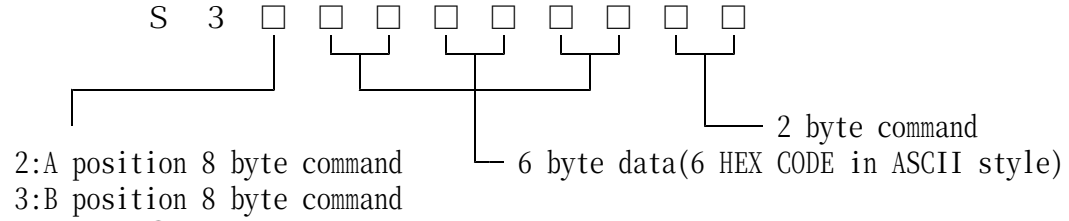
⑧ slow stop command
Velocity is decreased by the rate whose value is preset.

command
40 : slow stop
EX) S3040 : A pos.slow stop

⑨ EM stop command
by this command, pulse out is rapidly stopped.

Care for motor speed, because motor is possible to be detuned.
command
80 : EM stop
EX) S3180 : B pos. EM stop

8 bytes command form (TYPE 3)



⑨ constant speed relative index scan
Motor is driven at the preset constant speed.
command
□□ □□ □□ 10 : constant speed REL.IX drive
2^{22}～2^{16} 2^{7}～2^{0}(data3)
(data1) 2^{15}～2^{8}
(data2)

Sample(Out put pulse is 2's complement)

PULSE OUT	data 1	data 2	data 3
0	00H	00H	00H
(CW) +10	00H	00H	0AH
(CW)+8,388,607	7FH	FFH	FFH
(CCW) -10	FFH	FFH	F6H
(CCW)-8,388,608	80H	00H	00H

⑩ constant speed absolute index command

By this command, motor is driven at preset constant speed.

command

□□ □□ □□ 11 : constant speed ABS.IX drive

2^{22}～2^{16} 2^{7}～2^{0}(data3)

(data1) 2^{15}～2^{8}

(data2)

Setting sample

Objective address is shown as 2's complement

objective address	data 1	data 2	data 3
0	00H	00H	00H
+10	00H	00H	0AH
+8,388,607	7FH	FFH	FFH
-10	FFH	FFH	F6H
-8,388,608	80H	00H	00H

＊caution：When the number is not coincident in absolute command operation, Counter is possible to be different between display and control. Then, you should select channel again. When you use the command other than explained in this manual, these troubles are possible to happen.

⑪ incremental index command

Relative setting index drive is done by this command.

The speed is increased and decreased between LSPD and MSPD.

command

□□ □□ □□ 12 : incremental IDX. drive

2^{22}～2^{16} 2^{7}～2^{0}(data3)

(data1) 2^{15}～2^{8}(data2)

pulse counts are shown as 2's complement

setting sample

pulse out	data 1	data 2	data 3
0	00H	00H	00H
(CW) +10	00H	00H	0AH
(CW)+8,388,607	7FH	FFH	FFH
(CCW) -10	FFH	FFH	F6H
(CCW)-8,388,608	80H	00H	00H

⑫ absolute index command

Absolute setting index drive is done by this command.

The motor speed is increased and decreased between LSPD and MSPD.

command

□□ □□ □□ 13 : incremental IDX. drive

2^{22}～2^{16} 2^{7}～2^{0}(data3)

(data1) 2^{15}～2^{8}(data2)

objective is shown as 2's complement.

sample

objective address	data 1	data 2	data 3
0	00H	00H	00H
+10	00H	00H	0AH
+8,388,607	7FH	FFH	FFH

-10	FFH	FFH	F6H
-8,388,608	80H	00H	00H

＊caution ：When absolute command is done, it is doubtful that display counter and control counter are different from each other. Then, the values are not coincident. In such cases, please select the channel again. That case might be happened when the nonsense command is used.

d) Data read out command

Each channel is read out by this command, which is enable both in REMT and LOCL modes.

command form

S 4 □ □ (TYPE 1)

- □ : read data address(0-F)
- □ : read channel address(0-F)

receive form

R □ □ □ □ □ □ data (HEX CODE ASCII)

3 bytes are returned from read data address.

data address	contents	
0	position data	$(16^5,16^4)$
1	〃	$(16^3,16^2)$
2	〃	$(16^1,16^0)$
3	digital CWLS	$(16^5,16^4)$
4	〃	$(16^3,16^2)$
5	〃	$(16^1,16^0)$
6	digital CCWLS	$(16^5,16^4)$
7	〃	$(16^3,16^2)$
8	〃	$(16^1,16^0)$
9	HSPD	
$A	MSPD	
$B	LSPD	
$C	RATE	
$D	LMSW etc.	

b0:CW LS A/B
b1:CCWLS A/B
b2:Z LS A/B
b3:CW LS enable
b4:CCWLS enable
b5:digital LS enable
b6:hold (1:ON 0:OFF)
b7:motor off

$E	jog pulse counts	jog pulse counts	MDA+$E
$F	〃		MDA+$F

e) Data write on command

By this command, basic data stored in each ch can be rewritten. This is enable in REMT mode. However,speed data cannot be rewritten while motor is driving, and the data are rewritten automatically after stopping the motor.

command form

S 5 □ □ □ □ (TYPE 1)

- write data(2 HEX CODE in ASCII style)
- write data address(0-F)
- write channel address(0-F)

f) Limit SW & remote/local mode read

By this command,LS status and remote/local mode status are read out in any time. However, it is required for approximately 30ms that the ch is changed by the command. In LS status read,more 10mS is required.

command form

S 6 (TYPE 1)

receive form

R □ □ data (HEX CODE in ASCII style)

upper HEX CODE
- B7:
- B6:B POS Z. LS on → 0
- B5:B POS CCW LS on → 0
- B4:B POS CW LS on → 0

lower HEX CODE
- B3:REM/LOC status(1:REM)
- B2:A POS Z. LS on → 0
- B1:A POS CCW LS on → 0
- B0:A POS CW LS on → 0

2-2) Procedure of data communication by GP-IB/RS232C

Ⅰ) External controller gives the command to GP-IB/RS232C lines.

Ⅱ) When all command is received by PM16C02Z, analyzed and driven rapidly. Time for doing the command is vary for status of system, for command types, etc.

Ⅲ) In command with receiving operation, data prepared by the command is returned back to the external controller when PM16C02Z is set as a talker.

Ⅳ) All command can be sent as the form which is divided by comma(","). In receiving data, comma is recognized as the pause between two commands. Then, each command is rapidly recognized and done. If there are non-sense commands, they are ignored.(EX. speed change during jogGING) There are some commands which requires some time for operating.

EX.) When you want to set 3ch to A position, and A ch to B position:

S１１３, S１２A RETURN+LF

2-3) Sample Program of data communication(address of PM16C02Z:7,delimiter:CR+LF)

a)select A position as 8 CH

```
PRINT@ 7;"S118"
```

b)select B position as C CH

```
PRINT@ 7;"S12C"
```

c)+scan is operated in A position

```
PRINT@ 7;"S300E"
```

d)write 80H to 5 ch address 9 data(HSPD)

```
PRINT@ 7;"S55980"
```

e)read out the present A position pulse count

```
PRINT@ 7;"S20"          :data read out command
INPUT@ 7,1;A$           :data input
PRINT A$                :data print
```

6. Additional Functions１('96.10.01～)　"Auto Backlash elimination"

It can be operated only by ＧＰ－ＩＢ or ＲＳ２３２Ｃ communication lines.

What is the Auto Backlash Elimination?

By this function, you can preset the value of elimination step, then motor is driven to position where you want to stop the motor after the elimination step driving.

For example; If you set -５０００ as the elimination step, at first the motor is driven to the position where the count is X-５０００. And after that, the motor is driven back to the position for +５０００ steps, then driving is finished to reach the position of X.

If the elimination step is +, the motor approaches to the final point from + site.

(if the elimination step is -,the motor approaches to the final point from - site.)

By this function, backlash of the mechanics is eliminated.

◎ Command Reference

elimination step count set (kept by battery back up)

set command

ＢＸ±ＤＤＤＤ

Ｂ：elimination step count　　Ｘ：channel（０～Ｆ）

±：＋or－ (direction from which motor is driven to approach the final position)

ＤＤＤＤ：decimal counts（０００００～９９９９）

example

Ｂ０＋５０００, ＢＦ－３０００

read out the elimination step counts (it's read out any time you can.)

read out command

ＢＸ？

receive form

±ＤＤＤＤ

±：＋ or － (approach direction)　ＤＤＤＤ:decimal counts（０００００～９９９９）

example

＋５０００, －３０００

◎ auto backlash eliminative driving

move command

Auto backlash eliminative driving can be operated by adding "B" to A/B position 8 byte command.

例）Ｓ３２ＸＸＸＸＸＸ□□Ｂ

Ｓ３２　：A position 8byte command　ＸＸＸＸＸＸ：driving data (HEX)

□□　　：command (relative driving、absolute driving)

Ｂ：auto backlash elimination is operated.

Ｓ３３ＸＸＸＸＸＸ□□Ｂ

Ｓ３３　：A position 8byte command　ＸＸＸＸＸＸ：driving data (HEX)

□□　　：command (relative driving、absolute driving)

Ｂ：auto backlash elimination is operated.

◎ When you use backlash elimination;

1.If the stop command is sent to PM16C externally, or front panel stop SW,the motor is slowly stopped at the point.

After that,the backlash elimination sequence is normally cancelled.

2.If you have set the stopping SRQ, the SRQ is expressed after motor stopping.

3.During the sequence of backlash elimination, if LS in driving direction is struck,

the motor is slowly stopped and after that the sequences cancelled.

4.By addition of this function, the direction of motor driving become to be more complex, therefore limit SW setting should be required to be care.

7. Additional Functions 2 "Pulse output style change "

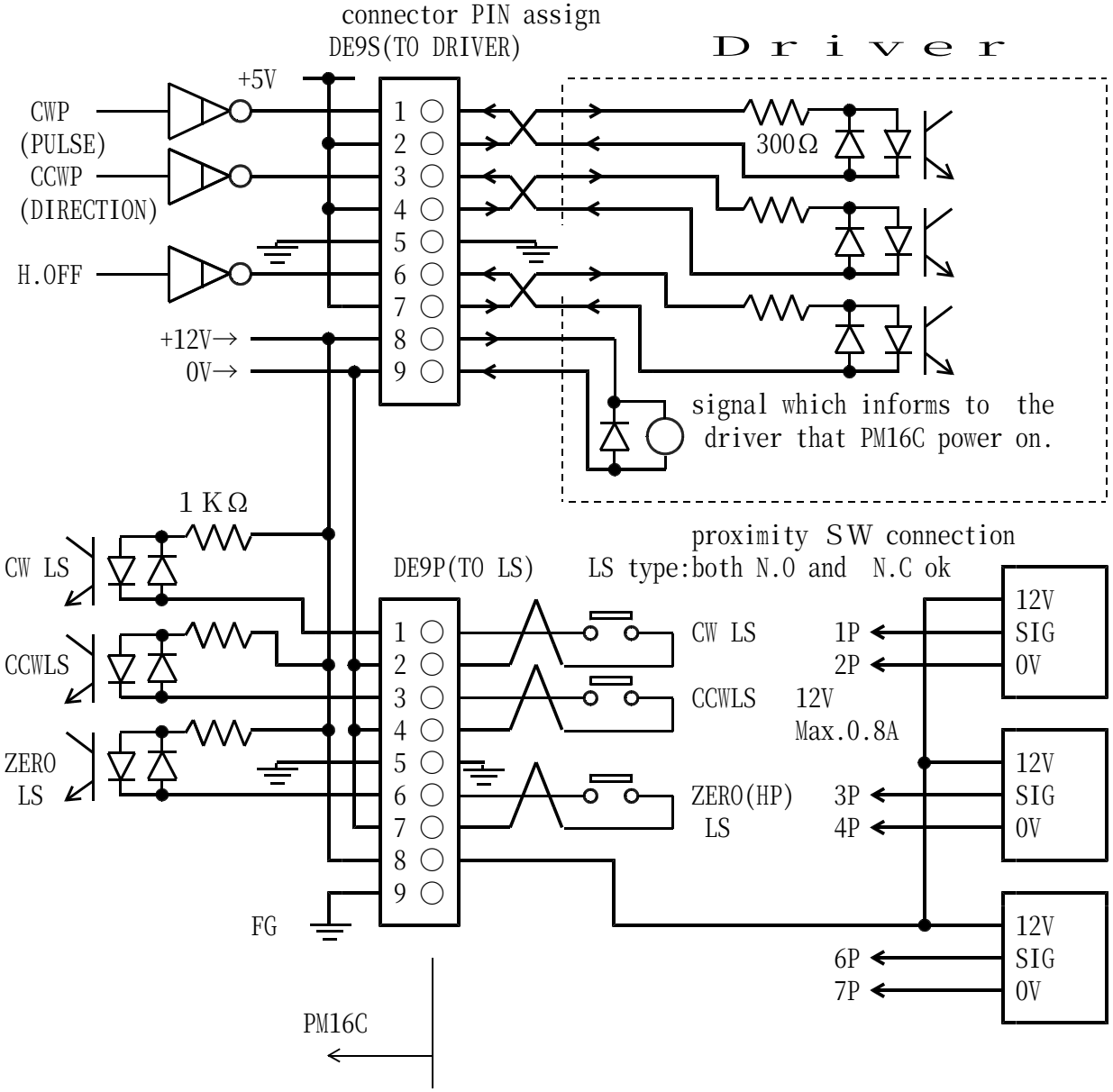
PM16C-02Z has two pulse output styles for the Driver's requirement.
One is CW pulse + CCW pulse style (P-P style) and the other is pulse + direction (P-D style).
PM16C-02Z is set P-P style as a default setting when shipping.
This function can change the pulse output style if necessary.
The pulse output style is set to A position and B position control IC in the PM16C-02Z individually.
So you can set P-P style to A position and P-D style to B position, for example.
The motor control using one control window (ex. A position) is the same style pulse outp ut instead of selected channels.
A position control and B position control can also be set to P-D style.

Setting check and change

1. Press SETUP button in local mode and go into setup mode.
2. When pressing the REM/LOC button, A, B control button lamp indicate the pulse output style. If the lamp off, the button indicate P-P style and if the lamp on, the button indicate P-D style. (Confirmation pulse output style)
3. While pressing the REM/LOC button, pressing A button or B button cause the change of lamp on/off status alternately. (Change of pulse output style)
4. If the setting is changed, new setting will be valid after next power on. The pulse output style will be memorized by the backup battery.

8. connection with outer equipment

1) connection with drivers



caution) Connector shell size of DE9P and 9S is varied from each maker's.
Outward form <35W can be used for PM16C.
DE-C1-J6(JAE), XM2S-0911(OMRON) and HDE-CTF(HIROSE) are possible to be used.

9. Specifications.

Power	AC 85V ～ 264V 47 - 440Hz 50VA	
IN/OUT	control	１６ motors can be controlled.
	capability	2 motors can be controlled synchronously.
	out put	CW, CCW, HOLD OFF(5V 8mA:plus common)for each 16 motor driver. can choose PULSE, DIR output signal.
	pulse rate	１～４０ＫＰＰＳ
	pulse con.	D sub 9S (female)
	limit sw input	CW-LS, CCW-LS, HOME-LS 12V 5mA(minus common) and power supply +12V for sensor (total 1A) for each motor
	limit sw con.	D sub 9P (male)
display	position	7 digit position display For each 2ch(A,B)
	channel	1 digit channel display For each 2ch(A,B)
digital sw	±7 digit digital sw	counter preset, relative data for REL and ABS index moving digital limit data set, For each 2ch(A,B)
ch.sel.sw		call channel to the two control windows(A,B)
ctl.sel.sw		decide control enable/disable for A,B control
control	PRESET	preset digital sw data to the selected display
	START	moving start for selected channel according to the mode
	STOP	stop moving for selected channel
	JOG	jog stepping for selected channel
step mode	SCAN MODE	continuous scan for selected channel. directed by JOG sw
	ABS IDX MODE	moving to the indicated position by the digital sw
	REL IDX MODE	moving indicated value by the digital sw
	HP STOP MODE	stop by Home Position Limit Sw
speed sel.	select L, M, H speed. can set freely for each channel	
rem.control	remote control over PIO, GP-IB, RS232C port (Ethernet for -02Z-NT instead of RS232C)	
cace	EIA 3 UNIT rack mount type (132H×482W×420D)	

For the other information, feel free to ask us.

Tsuji Electronics Co., Ltd.
Tel:+81-(0)29-832-3031 Fax:+81-(0)29-832-2662
E-mail: info@tsujicon.jp
URL : http://www.tsujicon.jp
3739 Kandatsu-machi Tsuchiura-city, Ibaraki 300-0013, Japan