16CH STEPPING MOTOR CONTROLLER

ＰＭ１６Ｃ－０４ＸＤ(Ｌ)

USER'S MANUAL

(FOR REMOTE CONTROL)

2658, 2735 (V4/171013=V17JP)

TSUJICON

APPLICATION OF ELECTRONIC DEVICES

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COMMAND LIST (LAN,RS-232C,GP-IB)

x:0～F(motor)　dd･･･d:decimal data

mode	command	reply
R	ABSx±ddddddddddd	absolute index scan
R	ABSxB±ddddddddddd	absolute index scan,both dir.backlash reject
R	ABSxS±ddddddddddd	absolute index scan,single dir.backlash reject
R	ASSTP,AESTP	all moving motor slow stop or fast stop
R	BLx±ddddddd	set backward digital limit
R/L	BL?x	read backward digital limit reply:±ddddddd(decimal)
R	CSCANPx,CSCANNx	constant speed scan to cw or ccw direction
R	FDHPx	find home position(start auto find sequence)
R	FLx±ddddddd	set forward digital limit position
R/L	FL?x	read forward digital limit reply:±ddddddd(decimal)
R	GTHPx	go to home position if it exists
R	JOGPx,JOGNx	Jog command(one step to cw or ccw direction)
R	LOC	Local mode change
R/L	LS?	LS read　reply:abcdHJKL
R	PAUSE ON, PAUSE OFF, PAUSE?	set pause, clear pause, read out/reply: ON or OFF
R	PSx±ddddddd	preset position data
R/L	PS?x	read position data reply:±ddddddd(decimal)
R	RELx±ddddddddddd	relative index scan
R	RELxB±ddddddddddd	relative index scan,both dir.backlash remove
R	RELxS±ddddddddddd	relative index scan,single dir.backlash remove
L	REM	Remote mode change
R	RTExddd	acc. rate set　ddd:0～115(see rate table p　)
R/L	RTE?x	read acc. RATE　reply:ddd
R	SABSx±ddddddd	set abs pos data for local mode
R/L	SABS?x	read abs pos data for local mode reply:±ddd･･･dd
R	SACTxY	set active for local Y:0/non active 1/active
R/L	SACT?x	read active for local reply:0 or 1
R	SCANHPx,SCANHNx	accelerative scan to cw or ccw direction if HP switch then stop
R	SCANPx,SCANNx	accelerative scan to cw or ccw direction
R	SETHPx0XYZ	HP find information set X:found/1,not found/0 Y:found dir. 0/cw,1/ccw Z:auto start dir. 0/cw,1/ccw
R/L	SETHP?x	read HP find information reply:0XYZ
R	SETJGxdddd	set Jog pulse for manual PB
R/L	SETJG?x	read JOG pulse for manual PB　reply:DDDD
R	SETLSxDYYY0yyy	se LS characteristics D:digital limit enable/1, disable/0 Y:LS enable/1, disable/0 y:LS N.C/1, N.O/0
R/L	SETLS?x	read LS setting　reply:DYYY0yyy(see SETLSx)
R	SETMTxABCD	motor drive set A:1/drive enable 0/disable B:1/hold on　0/hold off C:0/const　1/trapezoidal 2/S character D:0/Pulse-Pulse 1/Pulse-Direction 2/PDR

mode	command	reply
R/L	SETMT?x	read motor set reply:ABCD
R	SHPx±ddddddd	set home position data
R/L	SHP?x	read home position reply:±ddddddd or NO H.P
R	SHPFxdddd	set home position offset
R/L	SHPF?x	read home position offset reply:dddd
R	SPCxdddd···	change speed while moving (1～5,000,000)
R	SPDHx,SPDMx,SPDLx	change speed
R/L	SPD?x	read speed reply:HSPD or MSPD or LSPD
R/L	SPDAL?	active axis and their set speed read reply: abcd/Hxxxxxxx/Mxxxxxxx/Lxxxxxxx/Hxxxxxxx (busy axis will reply "000000")
R	SPDHxdddd···	set HSPD to ddd··· in pps unit(1～5,000,000)
R/L	SPDH?x	read HSPD reply:dddddd
R	SPDLxdddd···	set LSPD to ddd··· in pps unit(1～5,000,000)
R/L	SPDL?x	read LSPD reply:dddddd
R	SPDMxdddd···	set MSPD to ddd··· in pps unit(1～5,000,000)
R/L	SPDM?x	read MSPD reply:dddddd
R	SPRSx±ddddddd	set preset data for local mode
R/L	SPRS?x	read preset data for local mode reply:±DDD···DD
	SRELx±ddddddd	set rel pos data for local mode
R/L	SREL?x	read rel pos data for local mode reply:±DDD···DD
R/L	SRQx1 (ONLY FOR GP-IB)	SRQ flag set auto reset after SRQ out
	SRQx0 (ONLY FOR GP-IB)	SRQ flag reset
	SRQ?x (ONLY FOR GP-IB)	SRQ flag read reply:1 or 0
R	SSTPx,ESTPx	slow stop or fast stop
R	STOPMDxAB	set PB and LS stop mode A:0/LS slow stop 1/LS fast stop B:0/PB slow stop 1/PB fast stop
R/L	STOPMDx?	read PB & LS stop mode reply:AB A,B:0,1
R/L	STQ?	Remote/Local mode and moving motor information reply: Rn or Ln n:0 ～ 4 stopping motor number (if n = 0 then you can't start another motor)
R/L	STS?	Status read out reply: R(L)abcd/PNNS/VVVV/HHJJKKLL/±uu···/±vv···/±ww···/±xx··· PNNS:P:cw moving N:ccw moving S:stopped VVVV:LS status & hold off status HH,JJ,KK,LL:mcc status uu···,vv···,ww···,xx··· :current position
R/L	STSx? (available from V1.47)	Channel x status read out reply:R(L)aPVHH±uu··· reply data and sequence are matched with "STS?" command except "/".
R	TMGEx±ddddddd	timing out end point set
R/L	TMGE?x	read timing out end point reply:±DDD···DD
R	TMGIxddddddd	timing out interval step set
R/L	TMGI?x	read timing out interval step reply:DDD···DD
R	TMGMxY	timing out mode set Y:0/disable 1/gate 2/200ns 3/10us 4/100us 5/1ms pulse out
R/L	TMGM?x	read timing out mode reply: 0 ～ 5

mode	command	reply
R	TMGRx　TMGCx	timing out ready set or ready clear
R/L	TMGR?x	read timing ready　reply: YES or NO
R	TMGSx±ddddddd	timing out start point set
R/L	TMGS?x	read timing out start point reply:±DDD･･･DD
R	(Continuous) interpolation function command A pair of position controller A,B or position controller C,D is available "C0･･･" command is to use controller A,B pair "C1･･･" command is to use controller C,D pair Speed of synthesis depend on the motor that is seto to A,C controller	
R	C0ALNab±xx･･･/±yy･･･ C1ALNab±xx･･･/±yy･･･	absolute address a,b axis straight line interpolative move to the destination. a,b:0～F xx･･･,yy･･･:decimal under 9 digit
R	C0RLNab±xx･･･/±yy･･･ C1RLNab±xx･･･/±yy･･･	relative address a,b axis straight line interpolative move to the destination a,b:0～F xx･･･,yy･･･:decimal under 9 digit
R	C0ACPab±xx･･･/±yy･･･/±uu･･･/±vv･･･ C1ACPab±xx･･･/±yy･･･/±uu･･･/±vv･･･	absolute address a,b axis cw direction circular interpolation with center position data. a,b:0～F　x,y:destination u,v:center position x･･･,y･･･,u･･･,vv･･･ : decimal under 9 digit perfect circle interpolation will be done by setting the destination to currnt position.
R	C0ACNab±xx･･･/±yy･･･/±uu･･･/±vv･･･ C1ACNab±xx･･･/±yy･･･/±uu･･･/±vv･･･	absolute address a,b axis ccw direction circular interpolation with center position data. another data are same as above.
R	C0RCPab±xx･･･/±yy･･･/±uu･･･/±vv･･･ C1RCPab±xx･･･/±yy･･･/±uu･･･/±vv･･･	relative address a,b axis cw direction circular interpolation with center position data. a,b:0～F　x,y:destination u,v:center position x･･･,y･･･,u･･･,vv･･･ : decimal under 7 digit perfect circle interpolation will be done by setting the destination to (0,0) position.
R	C0RCNab±xx･･･/±yy･･･/±uu･･･/±vv･･･ C1RCNab±xx･･･/±yy･･･/±uu･･･/±vv･･･	relative address a,b axis ccw direction circular interpolation with center position data. another data are same as above.
R	C0AACab±xx･･･/±yy･･･/±uu･･･/±vv･･･ C1AACab±xx･･･/±yy･･･/±uu･･･/±vv･･･	absolute address a,b axis circular interpolation with bypass point data. a,b:0～F　x,y:destination u,v:bypass point x･･･,y･･･,u･･･,vv･･･ : decimal under 9 digit
R	C0RACab±xx･･･/±yy･･･/±uu･･･/±vv･･･ C1RACab±xx･･･/±yy･･･/±uu･･･/±vv･･･	relative address a,b axis circular interpolation with bypass point data. a,b:0～F　x,y:destination u,v:bypass point x･･･,y･･･,u･･･,vv･･･ : decimal under 7 digit
R	C0ACCab±xx･･･/±yy･･･/±uu･･･/±vv･･･ C1ACCab±xx･･･/±yy･･･/±uu･･･/±vv･･	absolute address a,b axis perfect circule interpolation with two bypass point data. a,b:0～F　x,y:bypass point 1　u,v:bypass point 2 x･･･,y･･･,u･･･,vv･･･ : decimal under 9 digit
R	C0RCCab±xx･･･/±yy･･･/±uu･･･/±vv･･･ C1RCCab±xx･･･/±yy･･･/±uu･･･/±vv･･･	relative address a,b axis perfect circule interpolation with two bypass point data. a,b:0～F　x,y:bypass point 1　u,v:bypass point 2 x･･･,y･･･,u･･･,vv･･･ : decimal under 7 digit

New added command.
V1.13 -

mode	command	reply
R	(Auto change scan command) ACSxyyy/PNT/JJJ‥J/FNC/LLL‥L	set data command x :channnel 0,1,2,･･･,9,A,B,C,D,E,F yyy:sequence number 0 to 127max PNT:END should be written at next to end seq. :ADD relative address from start point :TIM relative time from previous point :ACC speed data while accelerration :DEC speed data while deceleration JJJ:relative address ±2,147,483,647max :time 0 to 65,535ms FNC:SPD LLL･･･L means speed data in pps :RTE LLL･･･L means rat data :SLW slow stop :FST fast stop :NOP no operation(skip this seq. number) LLL:speed 1 to 5,000,000pps :rate rate data number in the same range
R	ACS?xyyy	data read command x :channnel 0,1,2,･･･,9,A,B,C,D,E,F yyy:sequence number 0 to 127max reply: xyyy/PNT/JJJ･･･J/FNC/LLL･･･L
R	ACSPx	auto change scan ready set command
R/L	ACSP?x	auto change scan ready read command reply:ready, not ready
R	ACSCx	auto change scan ready clear command
R	PAUSE ON PAUSE?	send before scan start command reply ON or OFF
R	ABSx(B)±dddddddd RELx(B)±dddddddd SCANPx SCANNx	auto change scan start command when the axis is auto change scan ready
R	PAUSE OFF	send after scan start command for synchronous scan start of multi channels

V1.14 -

mode	command	reply
R/L	HDSTLS?	hard and soft limit sw read reply:abcdHHHHSSSS abcd/ch, HHHH/hard SSSS/soft
R	SETCHabcd	set ch a,b,c,d to control window A,B,C,Dposition. a,b,c,d: 0～9,A,B,C,D,E,F(HEX) "-" not changed.
R/L	SETCH?	read channel setting to current control A,B,C,D

V1.17 -

mode	command	reply
R/L	HOLD?x	hold on/off state read x:ch(0,1,･･･9,A,B,C,D,E,F) reply: ON or OFF
R	HOLDxON HOLDxOFF	hold on set to ch x hold off set to ch x

V1.39 -

mode	command	reply
R/L	LCDB?	LCD brightness of back light read. 1～100% reply: LCD BRIGHT 100
R	LCDB 100	LCD brightness of back light write. 1～100 no reply.
R/L	CHCMNT?x	Chanel comment read x:ch(0,1,･･･9,A,B,C,D,E,F) reply cnannelx comment :a (all chanel data)
R	CHCMNT0 AB1	Channel No 0 comment AB1 write. no reply.
R	LCD_DISP T	LCD disp is TIMING OUT PORT No.
R	LCD_DISP C	LCD disp is comment of each channel

V1.42 - x:0～F:Each channel G:All channels

mode	command	reply
R/L	SRQG0	All channels of SRQ flag via GPIB are reset.
R/L	SRQ?G	All channels of SRQ flag via GPIB read. Reply data is HEX(8000) when channel F active.
R/L	RS_SRQx1	STOPx reply set via RS232C when channel x motor stopped. Auto reset after STOPx reply out.
R/L	RS_SRQx0	STOPx reply reset via RS232C when channel x motor stopped.
R/L	RS_SRQG0	All channels of RS_SRQ flag via RS232C are reset.
R/L	RS_SRQ?x	SRQ flag of channnel x is read reply:1 or 0
R/L	RS_SRQ?G	All channels of SRQ flag via RS232C read. Reply data is HEX(8000) when channel F active.
R/L	LN_SRQx1	STOPx reply set via ethernet when channel x motor stopped. Auto reset after STOPx reply out.
R/L	LN_SRQx0	STOPx reply reset via ethernet when channel x motor stopped.
R/L	LN_SRQG0	All channels of LN_SRQ flag via LAN are reset.
R/L	LN_SRQ?x	SRQ flag of channnel x is read. reply:1 or 0
R/L	LN_SRQ?G	All channels of SRQ flag via LAN read. Reply data is HEX(8000) when channel F active.

V1.43 -

mode	command	reply
R	YMDabc	Oscillation drive mode set command. a: drive mode 2: 2 axis 3: 3 axis b: A-D axis synchro mode 0: disable 1: enable c: B axis jump drive 0: disable J: enable
R/L	YMD?	Oscillation drive mode status read. Reply: YMDabc XXXX XXXX: STOP/START/PAUSE
R	YAP±ddd...d	A axis drive pulse set command on oscillation mode. No reply.
R/L	YAP?	A axis drive pulse read on oscillation mode. Reply: ±ddddddd
R	YBP±ddd...d	B axis drive pulse set command on oscillation mode. No reply.
R/L	YBP?	B axis drive pulse read on oscillation mode. Reply: ±ddddddd

mode	command	reply
R	YBJ±ddd...d	B axis jump pulse set command on oscillation mode. No reply.
R/L	YBJ?	B axis jump pulse read on B axis jump mode. Reply: ±ddddddd
R	YRPddd...d	Oscillation repeat times set command. No reply.
R/L	YRP?	Oscillation repeat times read. Reply: ddd
R	YCP±ddd...d	C axis drive pulse set command on oscillation mode. No reply.
R/L	YCP?	C axis drive pulse read on oscillation mode. Reply: ±ddddddd
R	YCRddd...d	C axis repeat count set command on oscillation mode. No reply.
R/L	YCR?	C axis repeat count read on oscillation mode. Reply : ddd
R	YDP±ddd...d	D axis drive pulse set command on oscillation mode. No reply.
R/L	YDP?	D axis drive pulse read on oscillation mode. Reply: ±ddddddd
R/L	YSTS?	Read current repeat count of oscillation and C axis. Reply: RPaaa CRccc aaa: oscillation repeat count ccc: C axis repeat count
R/L	YCY?	A axis 1 cycle counter read. Reply: dddd(msec)
R	YSTRT	Oscillation drive start command.
R	YPAUS	Oscillation drive suspend command. If oscillation drive is suspending, release suspending status.
R/L	YSTOP	Oscillation drive stop command. All oscillation driving motor are stopped.

V1.48 -

mode	command	reply
R/L	HOLDTM?x	Read hold on time before motor drives. Reply: xxxms xxx:hold on time (50～500ms)
R	HOLDTMxddd	Preset hold on time before motor drives. ddd: 50～500(msec) no reply.

FOR MAINTENANCE

MODE	COMMAND	NOTE
R/L	ACSK?x Auto change scan data read	reply aabb,hhhh,hhhh aa: code(00:END,01:ADD,02:TIM,80:ACC,81:DEC) bb: sequence number(0 to 7F) hh･･･hh: data
R/L	ACSH?x Auto change scan data read	reply aabb,hhhh,hhhh aa: code(00:SPD,01:RTE,02:SLW,03:FST,0F:NOP) bb: sequence number(0 to 7F) hh･･･hh: data
R/L	FROM0, FROM1	FROM select
R/L	FROM?	current FROM read reply: FROM0,FROM1
R	REST	restart without power off-on
R/L	STSM?	read status port1 of MCC06 aaaa/bbbb/cccc/dddd
R/L	VER?	read version reply: 1.00 06-10-14 PM16C-04X
R/L	VERH?	hardware version read reply: HD-VER0,1,2,5,6

Existing commands below are available to PM16C-04XD and PM16C-04XDL.

OLD COMMAND LIST

COMPATIBLE COMMANDS with PM16C-02N,-02Z,-04,-04S series.

mode	command	reply
R/L	S1R	remote mode change
R/L	S1L	local mode change
R/L	S10	R□□□□ motor channel No. reply of "A, B, C, D" for -04 type R□□ motor channel No. reply of "A, B" for -02 type
R	S11□	set motor channel □ to A
	S12□	set motor channel □ to B
	S1301	SRQ set when A motor stopped
	S1302	SRQ set when B motor stopped
	S1304	SRQ set when C motor stopped
	S1308	SRQ set when D motor stopped
	S130F	SRQ when A,B,C,D motor stopped (combination available)
	S1380	SRQ cancel (also with GP-IB COMMAND "IFC")
R/L	S14	SRQ flag read R□□ (HEX)
R	S15□	set motor channel □ to C
	S16□	set motor channel □ to D
R/L	S20	A position data read reply:R□□□□□□ (HEX)
	S20D	A position data read reply:±DDDDDDD (DEC)
	S21	A position status read reply:R□□ (HEX)
	S22	B position data read reply:R□□□□□□ (HEX)
	S22D	B position data read reply:±DDDDDDD (DEC)
	S23	B position status read reply:R□□ (HEX)
	S24	C position data read reply:R□□□□□□ (HEX)
	S24D	C position data read reply:±DDDDDDD (DEC)
	S25	C position status read reply:R□□ (HEX)
	S26	D position data read reply:R□□□□□□ (HEX)
	S26D	D position data read reply:±DDDDDDD (DEC)
	S27	D position status read reply:R□□ (HEX)
R	S30□□	A position 2 byte command □□ : command 08:+jog, 09:-jog 0C:+CSPD scan 0D:-CSPD scan 0E:+scan 0F:-scan 16:pause on 17:pause off 18:hold off 19:hold on 1E:+scan & HP stop 1F:-scan & HP stop 40:slow stop 80:EM.stop
	S31□□	B position 2 byte command □□ : command 08:+jog, 09:-jog 0C:+CSPD scan 0D:-CSPD scan 0E:+scan 0F:-scan 16:pause on 17:pause off 18:hold off 19:hold on 1E:+scan & HP stop 1F:-scan & HP stop 40:slow stop 80:EM.stop
	S32XXXXXX □□ or S32XXXXXX □□B	A position 8 byte command XXXXXX:HEX position data □□:command 10:CSPD REL.IDX 11:CSPD ABS.IDX 12:REL.IDX 13:ABS.IDX auto backlash correction with "B"
	S32□ ±DDDDDDD or S32□ ±DDDDDDDB	A position DEC index command □: A: absolute index scan, R: relative index scan ±DDDDDDD:DEC position data auto backlash correction with "B"
	S33XXXXXX □□ or S33XXXXXX □□B	B position 8 byte command XXXXXX:HEX position data □□: command 10:CSPD REL.IDX 11:CSPD ABS.IDX 12:REL.IDX 13:ABS.IDX auto backlash correction with "B"

mode	command	reply
R	S33□ ±DDDDDDD or S33□ ±DDDDDDDB	B position DEC index command □: A: absolute index scan, R: relative index scan ±DDDDDDD:DEC position data auto backlash correction with "B"
	S3□	speed change S34:L SPEED S35:M SPEED S36:H SPEED
	S38□□	C position 2 byte command □□ : command 08:+jog, 09:-jog 0C:+CSPD scan 0D:-CSPD scan 0E:+scan 0F:-scan 16:pause on 17:pause off 18:hold off 19:hold on 1E:+scan & HP stop 1F:-scan & HP stop 40:slow stop 80:EM.stop
	S39□□	D position 2 byte command □□ : command 08:+jog, 09:-jog 0C:+CSPD scan 0D:-CSPD scan 0E:+scan 0F:-scan 16:pause on 17:pause off 18:hold off 19:hold on 1E:+scan & HP stop 1F:-scan & HP stop 40:slow stop 80:EM.stop
	S3AXXXXXX □□ or S3AXXXXXX □□B	C position 8 byte command XXXXXX:HEX position data □□: command 10:CSPD REL.IDX 11:CSPD ABS.IDX 12:REL.IDX 13:ABS.IDX auto backlash correction with "B"
	S3A□ ±DDDDDDD or S3A□ ±DDDDDDDB	C position DEC index command □: A: absolute index scan, R: relative index scan ±DDDDDDD:DEC position data auto backlash correction with "B"
	S3BXXXXXX □□ or S3BXXXXXX □□B	D position 8 byte command XXXXXX:HEX position data □□: command 10:CSPD REL.IDX 11:CSPD ABS.IDX 12:REL.IDX 13:ABS.IDX auto backlash correction with "B"
	S3B□ ±DDDDDDD or S3B□ ±DDDDDDDB	D position DEC index command □: A: absolute index scan, R: relative index scan ±DDDDDDD:DEC position data auto backlash correction with "B"
R/L	S4XY	data read command X: channel No.(0-F) Y: data No.(0-F) reply:R□□□□□□ (HEX) 3 byte data from read data address
	S4XPS	position data read X: channel No.(0-F) PS: position data read reply:±DDDDDDD (DEC)
	S4XFL	forward DGLS read X: channel No.(0-F) FL: forward DGLS read reply:±DDDDDDD (DEC)
	S4XBL	backward DGLS read X: channel No.(0-F) BL: backward DGLS read reply:±DDDDDDD (DEC)
R	S5XY□□	data write command X: channel No. Y: data No. □□: write data (HEX)
	S5XPS ±DDDDDDD	position data write X: channel No.(0-F) PS: position data write ±DDDDDDD : write data (DEC)
	S5XFL ±DDDDDDD	forward DGLS write X: channel No.(0-F) FL: forward DGLS read ±DDDDDDD: write data (DEC)
	S5XBL ±DDDDDDD	backward DGLS write X: channel No.(0-F) BL: backward DGLS read ±DDDDDDD: write data (DEC)
R/L	S6	status & LS read (a row of data is B,A,D,C for "-02N" compatible) reply:R□□□□ □ : HEX CODE REM/LOC, LIMIT SW
	BXhhhh	backlash correction data(for CH X) set (h:HEX,D8F1～270F)
	BXH?	backlash correction data(for CH X) read reply: Rhhhh(HEX)
	BX±DDDD	backlash correction data(for CH X) set 0～±9999 (decimal)
	BX?	backlash correction data(for CH X) read reply: ±DDDD(DEC)
R	FHPA	Find Home Position of channel A
	FHPB	Find Home Position of channel B
	FHPC	Find Home Position of channel C
	FHPD	Find Home Position of channel D

mode	command	reply
R	RTHPA	Return Home Position of channel A
	RTHPB	Return Home Position of channel B
	RTHPC	Return Home Position of channel C
	RTHPD	Return Home Position of channel D
	DPX	change start direction of channel X to positive
	DNX	change start direction of channel X to negative
	GFXDDDD	write offset data X: channel D: decimal
	SPHXDDDDD	write HSPD X: channel DDDDD: PPS unit speed data
	SPMXDDDDD	write MSPD X: channel DDDDD: PPS unit speed data
	SPLXDDDDD	write LSPD X: channel DDDDD: PPS unit speed data
	SPCXDDDDD	change speed while scanning X: channel DDDDD: PPS unit speed data
R/L	G?X	read home position status X:0 - F(channel) reply RHH :H ASCII hex
	GF?X	read offset data X: channel reply RDDDD :d ASCII dec.
	HP?X	read home position X: channel reply ±DDDDDDD ASCII 7 dec.
	SPH?X	read HSPD of channel X reply RDDDDD D: ASCII 5 dec.
	SPM?X	read MSPD of channel X reply RDDDDD D: ASCII 5 dec.
	SPL?X	read LSPD of channel X reply RDDDDD D: ASCII 5 dec.

CONTENTS

PM16C－04XD(L)
REMOTE MODE USER'S MANUAL

1.Abstract

This manual shows the remote operation via RS232C,GP-IB and LAN(Ethernet TCP/IP). About the local operation, please see the other manual called "PM16C-04XD(L) LOCAL MODE USER'S MANUAL".

In addition to manual operation by front panel and hand box controller, you can operate PM16C-04XD(L) via communication line by your PC.

Existing commands for PM16C-02Z series, PM16C-04 and PM16C-04S are available to this one.

New commands for this one are available to select the access motor number directly (0 to 9, A to F) without considering the exchange of control channel.

2.Preparation for command communication

Control commands are acceptable when REMOTE/LOCAL switch is in REMOTE side.

But inquiry commands are acceptable at any time.

When REMOTE/LOCAL mode is in LOCAL side, press REMOTE/LOCAL button or give the command "REM" via communication line before using in "REMOTE" mode.

Remote mode operation can be used in three ways.

(1) LAN
(2) GP-IB
(3) RS232C

These are details regarding to each REMOTE control method.

1) Setting for LAN(Ethernet TCP/IP) communication

Easy setting using front panel switches in LOCAL mode(V 1.09 -)

- Turn on the power.
- Go to LOCAL mode by REM/LOC switch, and go to SETUP mode by SETUP switch.
- Go to P9 by CW switch in SETUP mode(PM16C-04XD).
  (In case of PM16C-04XDL, go to P10 in SETUP mode by CW lever type switch)
- Move cursor to the data that is to be changed.
- Push numeric keys to change the data.
- Default IP address data is [192.168.1.55], port number is [7777].
- You can change these data according to your LAN.
- If you need to change port number, 10001 to 10999 are recommended.
- After setting you must power off the unit to enable the new setting.
- To confirm the new setting, you may try if command ("VER?" for example) is received and reply is sent out by the unit, using client PC after connecting by telnet to the unit.
- If you change the detail connection setting such as the Gateway IP address and subnet mask, please contact us.

2) Setting for GP-IB communication

The only way of setting GP-IB is put in GP-IB address from front panel.

The delimiter for the data is fixed to CR + LF + (EOI).

PM16C-04DX can receive data whether (EOI) exists or not.

When sending data, (EOI) is always added to data end.

The procedure of GP-IB address setting from front panel is as follows.
Put on power switch of the unit. Set into "LOC" mode by "REN/LOC" button.
Then set into setup mode by "SETUP" button.

In case of PM16C-04XD, open the setup screen P7 of LCD by "CW" button.
When over the page you can set back page by "CCW" button.
In case of PM16C-04XDL, open the setup screen P9 of LCD by "CW/CCW" lever switch.
Set the cursor of LCD display to GP-IB address. Set into the numeric by ten-key.
GP-IB address must be 2 to 31. When the setting number is incorrect,
you'll see the number is blinking.
After changing the address, push the "SETUP" button, then the mode has changed
and setting will be finished.

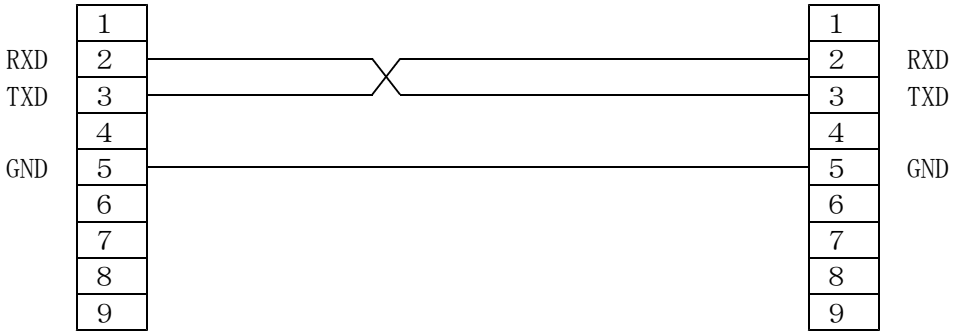
There is no need to power on again. You can check the communication is OK or NOT by the command "VER?" for example.

3) Setting for RS232C communication

The pin assignment of connector is as follows.

PM16C-04XD(L) side PC side

Pin No Connector of panel side: DE9P
Connector of cable side: DE9S



The way of setting RS232C is only put in BAUD RATE data from front panel.
Another parameters of RS232C communication is fixed as follows.

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

The delimiter for the data is CR + LF.
The procedure of setting BAUD RATE from front panel is as follows.

Put on power switch of the unit. Set into "LOC" mode by "REN/LOC" button.
Then set into setup mode by "SETUP" button.
In case of PM16C-04XD, open the setup screen P6 of LCD by "CW" button.
When over the page you can set back page by "CCW" button.
In case of PM16C-04XDL, open the setup screen P9 of LCD by "CW/CCW" lever switch.
Set the cursor of LCD display to BAUD RATE. Press the CHG button.
BAUD RATE value is changing 1200, 2400, 4800, 9600, 19200, 38400 in rotation.
After changing BAUD RATE, push the "SETUP" button, then the mode will be changed
and setting will be finished.

There is no need to power on again. You can check the communication is OK or NOT by the command "VER?" for example.

3. The detail of communication commands

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

1) REMOTE/LOCAL command

These commands are acceptable both Remote and Local mode.
These commands are acceptable when all channel motors are stopped.

LOC	Set into the Local mode
REM	Set into the Remote mode

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

These commands are acceptable in REMOTE and LOCAL mode.

SRQx1	Set SRQ flag to channel x : x means motor channel 0 ～ F. When channel x motor stopped at this state, SRQ line of this unit goes "H" to inform the state to PC and the SRQ status flag of this unit is set to "1". Once SRQ status flag read out from PC, SRQ status flag is cleared automatically and the SRQ line goes "L". SRQ flag is cleared automatically just after SRQ line of this unit goes "H". If you use SRQ signal when motor stopped, you may set this flag every time.
SRQx0	Clear the SRQ flag of channel x.
SRQG0	Clear the SRQ flag at all channel.
SRQ?x	Read out the status of SRQ flag of channel x. The reply is "1" or "0".
SRQ?G	Read out All channel SRQ status flag hex format. For example, if channel E and F are set, the reply is "C000".

(V1.42 - available)
Imitated SRQ signal command added for RS-232C and LAN communication.
When channel x motor have stopped, the coomand of "STOPx" is sent from PM16C.

for RS-232C communication

RS_SRQx1	Set RS-232C SRQ flag to channel x. Once "STOPx" command have sent from PM16C, this flag is cleared.
RS_SRQx0	Clear the RS-232C SRQ flag of channel x.
RS_SRQG0	Clear the RS-232C SRQ flag at all channel.
RS_SRQ?x	Read out RS-232C SRQ flag of channel x. If flag is on, reply is "1". Otherwise "0".
RS_SRQ?G	Read out All channel RS-232C SRQ status flag hex format. For example, if channel E and F are set, the reply is "C000".

for LAN communication

LN_SRQx1	Set LAN SRQ flag to channel x. Once "STOPx" command have sent from PM16C, this flag is cleared.
LN_SRQx0	Clear the LAN SRQ flag of channel x.
LN_SRQG0	Clear the LAN SRQ flag at all channel.

LN_SRQ?x　　Read out LAN SRQ flag of channel x.
If flag is on, reply is "1". Otherwise "0".

LN_SRQ?G　　Read out All channel LAN SRQ status flag hex format.
For example, if channel E and F are set, the reply is "C000".

3) Status read out commands
These commands are acceptable in REMOTE and LOCAL mode.

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

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

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

R or L　　R: Remote mode　L: Local mode

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

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

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

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

uu・・・,vv・・・,ww・・・,xx・・・
These are the latest pulse position data for each channel.
If the number is less than ±7 digit number, the reply data ±7 digit number.
In case of more than ±7 digit number, the digit will be expanded according to the number.

(available from V1.47 -)

STSx? Read out the detail status of channel x.
The reply is this: R(L)aPVHH±uu･･･
The response data and order are the same of "STS?" command except "/" symbol. If there is no channel x at LCD, V and HH is displayed "-".

4) Motor control commands

① JOG Command

This command is acceptable only for REMOTE mode.

JOGPx Moves one pulse of motor channel x to CW direction.
JOGNx Moves one pulse of motor channel x to CCW direction.

② Speed select Command

These commands are acceptable only for REMOTE mode.

SPDHx Motor speed selection of channel x is "H"
SPDMx Motor speed selection of channel x is "M"
SPDLx Motor speed selection of channel x is "L"

Next command is acceptable for REMOTE and LOCAL mode.
SPD?x: Read out the set speed of channel x
The replay is HSPD, MSPD or LSPD.

③ SCAN Command

These commands are acceptable only for REMOTE mode.

SCANPx Continuous movement of motor channel x to CW direction.

SCANNx Continuous movement of motor channel x to CCW direction.

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

④ SCAN command set with absolute position data(including backlash remove scan)

These commands are acceptable only for REMOTE mode.

ABSx±ddddddddd
The motor of channel x goes to the set position absolutely.
The range of dddd･････ is -2,147,483,647 ～ +2,147,483,647.
(Digit number is arbitrarily specified.)

ABSxB±ddddddddd
The motor of channel x goes to the set position absolutely.
The range of dddd･････ is -2,147,483,674 ～ +2,147,483,647.
(Digit number is arbitrarily specified)
First the motor goes to a specified backlash compensation position, then goes to a target position at slow speed.
(Backlash compensation at every moving)
If the specified backlash compensation position is over the range command will be ignored. At this occasion by using the status read command "ERR?", you'll get "BAD ABS COMMAND" as a reply.

ABSxS±ddddddddd

The motor of channel x goes to the set position absolutely.
The range of dddd····· is -2,147,483,647 ～ +2,147,483,647.
(Digit number is arbitrarily specified)
When the direction of backlash compensation and the direction to target position are same, motor goes to target position directly. Otherwise once motor goes to specified backlash compensation position, then goes to a target position at slow speed.
(Backlash compensation if needed)
If the specified backlash compensation position is over the range command will be ignored. At this occasion by using the status read command "ERR?", you'll get "BAD ABS COMMAND" as a reply.

⑤ SCAN command set by relative position data(including backlash data)
These commands are acceptable only for REMOTE mode.

RELx±ddddddddddd

The motor of channel x moves at specified relative data.
The range of dddd····· is -2,147,483,647 ～ +2,147,483,647.
(Digit number is arbitrarily specified.)

RELxB±ddddddddddd

The motor of channel x moves at specified relative data.
The range of dddd····· is -2,147,483,647 ～ +2,147,483,647.
(Digit number is arbitrarily specified.)
First motor goes to a specified backlash compensation position then goes to a target position at slow speed.
(Backlash compensation at every moving)

RELxS±ddddddddddd

The motor of channel x moves at specified relative data.
The range of dddd····· is -2,147,483,647 ～ +2,147,483,647.
(Digit number is arbitrarily specified.)
When the direction of backlash compensation and the direction to target position are same, motor goes to target position directly. Otherwise once motor goes to specified backlash compensation position, then goes to a target position at slow speed.
(Backlash compensation if needed)

⑥ Speed change command while driving
This command is acceptable only for REMOTE mode.

SPCxddd··· The motor speed of channel x can be changed while moving.
The unit of speed is PPS.
The range of dddd····· is 1 to 5,000,000.

⑦ SLOW STOP,FAST STOP command
These commands are acceptable both in REMOTE and LOCAL mode.

SSTPx Stop the driving motor channel x with deceleration.

ESTPx Stop the driving motor channel x without deceleration.

ASSTP Stop all the driving motors with deceleration.

AESTP　　Stop all the driving motors without deceleration.

Another commands concerning motor moving

⑧ PAUSE ON/OFF command

These commands are acceptable only for REMOTE mode.

PAUSE ON (S3016)　　PAUSE ON command. This command means the motion hold.
Once received this command, further commands are in suspended.
Those commands are in waiting state.
This suspended mode is released by the command "PASE OFF".
This command is useful when you activate some motors simultaneously.
This command doesn't affect any motor that is already moving.

PAUSE OFF (S3017)　　PAUSE OFF command. This command release the suspended mode.
Motors that are in suspended mode by command "PASE ON" are released.

Those motors start simultaneously after this command.

PAUSE?　　Read out pause status
reply: ON or OFF

⑨ Constant speed SCAN command

These commands are acceptable only for REMOTE mode.

CSCANPx　　Activate the motor channel x to CW direction at constant speed.

CSCANNx　　Activate the motor channel x to CCW direction at constant speed.

⑩ Detect home position drive command

These commands are acceptable only for REMOTE mode.

These commands are related to Local Mode Operation.
See the instruction manual "Local Mode Operation".
4.4 Setting of home position, 5.5 Setting of home position original point(PM16C-04XD)
4.6 Setting of home position, 5.3 Setting of home position original point(PM16C-04XDL)

FDHPx　　Auto home position search sequence for channel x starts.
First start home position sensor search moving to one direction
that is set in advance by "SETHPx" etc., as a start direction(A).
If the sensor find the home position along this direction(A) and go through the sensor, motor stops slowly.
Then back to opposite side slowly and find the home position and stops. (finished)
Otherwise motor begins to start to direction(A), then find limit switch along this direction, motor stops slowly and move to opposite direction(B).
In this case motor find the home position rising edge then stops.
Next motor begins start for direction(A) again.
Then find the home position and go through the sensor and stops slowly.
Then starts for direction(B) slowly, finally find the home position and stops. (finished)

Thus start moving direction(A) and detecting home position direction (B) is always opposite for each other by this command.
The home position value is memorized as home position data and set the status flag that means home position was memorized.
And the direction for detecting is also memorized because the other way to detect home position may alter detecting direction.
These information can be read out by "SHP?x" and "SETHP?x".

(NOTES)
If there is no home position in moving by this command, motor will go and return between CW LS and CCW LS.
(Including digital limit switch)
In this case, "STOP" command and "STOP" button is available.
If digital limit switch position is set near the limited range (near ±2,147,483,647), during the deceleration moving the sign of position will be changed.
The home position detect process won't be finished correctly.

GTHPx — This command is useful when repeat the home position detect process again. If the home position is already saved to the unit, motor can move to certain area and goes to the home position slowly.
The home position detect direction is as same as the memorized one.

SCANHPx — To detect the home position of motor channel x along CW direction.
When detect the home position, motor stops suddenly.
So you need to move slowly to avoid step-out of motor.
When there is no home position, motor will be stops at CW or CCW limit switch. If you know the home position roughly, you can check the home position in a short time. After detecting home position by this command, using "GTHPx" command, you can detect the home position in a short time totally.

SCANHNx — This command is as same as "SCANHPx" without the direction CW.
The starting direction is CCW.

5) Commands for set and read out parameters

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

SETMTxABCD — Set the fundamental characteristics of motor channel x

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

B: 1/hold on, 0/hold off
When you set the motor hold off, this unit outputs the hold off signal to external devices. Before you send motor active commands, you have to set "hold on". After motor stopping you have to set "hold off" again if you need to set the motor hold off state. *1)
In LOCAL mode these "hold on" action are done automatically.

C: 0/constant, 1/trapezoidal, 2/ S character
The acceleration and deceleration mode of moving motor is selectable.
That is constant form, trapezoidal form or S character form.

D: 0/Pulse-Pulse, 1/Pulse-Direction 2/Pulse-Direction-Reverse *2)
Output signal to motor driver that is set outside of this unit is selectable.
They are P-P way, P-D way or PDR way. *2)

*1) V1.15～ Automatic hold on/off moving in REMOTE mode supported.
*2) V1.30～ PDR can be chosen for hard ware type "HD-VERn" n>4 replied by the command "VERH?".

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

HOLDxOFF Outputs the hold off signal to external devices when motor have stopped and passed 500ms.
Before activating the motor, hold off signal turns off and waits from 50ms to 500ms(changeable this time with "HOLDTM" command).

HOLDxON PM16C does not output the hold off signal.

HOLD?x Read out the hold off signal setting.
The response is ON or OFF.

(V1.48 - available)

HOLDTMxddd When hold off signal is enable, adjusts the waiting time before activating the motor. ddd: 50 to 500, by 10 unit: msec.
Factory setting is 80msec.

HOLDTM?x Read out the waiting time which you can set with "HOLDTM" command.
Response shows "dddms".

STOPMDxAB This command is set to stop motor channel x, slowly or fast.
A: 0/PB slow stop, 1/PB fast stop
It means slow stop or fast stop by STOP switch on front panel.
B: 0/LS slow stop, 1/LS fast stop
It means slow stop or fast stop by limit switch.

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

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

SPDHxdddd···· The high speed of motor channel x is dddd····. Unit is PPS.

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

SPDMxdddd···· The middle speed of motor channel x is dddd····. Unit is PPS.

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

SPDLxdddd···· The low speed of motor channel x is dddd····. Unit is PPS.

SPDL?x　　This command is readout command above SPDLｘ.
The reply is dddd‥‥.　Unit is PPS.

SPDAL?　　This command is readout preset speed values for 4 channel motors.
The reply is like these. Abcd/Hdddddddd/Mdddddddd/Ldddddddd/Hdddddddd
a,b,c,d:　0～F　means motor channel
ddddddd:　preset speed value. (1～5,000,000)　Unit is PPS.
While at least one motor is moving, the reply of it is "0000000".

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

RTExddd　　The acceleration and deceleration of motor channel x is set by this command.
ddd: 0～115　　This is a code number. See "RATE DATA TABLE"

RTE?x　　This command is readout　the acceleration and deceleration value of motor channel x.
The reply is ddd.

RATE DATA TABLE(unit: ms/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	3.0	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	2.0	85	0.30	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	0.20	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	1.0	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	0.10		
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		

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

PSx±dddddd　　Set the current position data of motor channel x.
The range of dddd‥‥‥　is -2,147,483,674 ～ +2,147,483,647.
(the number of digit is arbitrary.)

PS?x　　Read out the current data of motor channel x.
The reply is ±ddddddd(decimal number).
When the digit of reply data is over 7 digit, the digit of reply data will increase.

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

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

FL?x　　Read out the digital limit data to CW side of motor channel x.
The reply is ±ddddddd(decimal number).
When the digit of reply data is over 7 digit, the digit of reply data will increase.

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

FL?x　　Read out the digital limit data to CCW side of motor channel x.
The reply is ±ddddddd(decimal number).
When the digit of reply data is over 7 digit, the digit of reply data will increase.

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

SETHPx0XYZ　　Set the parameters of home position setting for motor channel x.
X: 0/not found, 1/LS already found
Home position data is already found or not.
Y: 0/CW direction, 1/CCW direction
The direction when detecting the home position.
Z: 0/CW direction, 1/CCW direction
The start moving direction of motor channel x when detecting the home position in automatic detecting mode.

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

SHPx±ddddddd　　Set the home position data of motor channel x.
Normally the home position data is automatically set by HP mode, but this command changes the data by force.

SHP?x　　Read out home position data. The reply is ±ddddddd (decimal number).
When the digit of reply data is over 7 digit, the digit of reply data will increase.
When the home position was not found, the reply data is "NO H.P".
(The origin detect flag that is in the reply for the command "SETHP?x" X is 0.)

SHPFxdddd　　Set the home position offset for motor channel x.
When you detect home position by command "GTHPx", home position searching starts from the distance of offset value from current home position. When there is no home position even if motor moves two times of distance of this offset value, then this detection is failure and memorized original point data were lost.
The range of dddd is 0 ～ 9999.
When you set this value over 9999, set data will be 9999.

SHPF?x　　Read out the original point offset position data of motor channel x.
The reply is ±dddd (4 digit decimal number).

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

SABSx±ddddddd　　Set the absolute position data of motor channel x by LOCAL mode.
This value is shown on LCD in ABS scan motion by LOCAL mode .
(shown on the second screen for the type XDL)

SABS?x　　Read out the absolute position data of motor channel x by LOCAL mode.
The reply is ±ddddddd(decimal number).
When the digit of reply data is over 7 digit, the digit of reply data will increase.

SRELx±ddddddd　　Set the relative moving data of motor channel x by LOCAL mode.
This value is shown on LCD in REL scan motion by LOCAL mode .
(shown on the second screen for the type XDL)

SREL?x　　Read out the relative moving data of motor channel x by LOCAL mode.
The reply is ±ddddddd(decimal number).
When the digit of reply data is over 7 digit, the digit of reply data will increase.

SPRSx±ddddddd　　Set the preset position of motor channel x by LOCAL mode.
This value is shown on LCD in SCAN motion by LOCAL mode .
(shown on the second screen for the type XDL)

SPRS?x　　Read out the preset position of motor channel x by LOCAL mode.
The reply is ±ddddddd(decimal number).
When the digit of reply data is over 7 digit, the digit of reply data will increase.

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

This value is shown on LCD in SETUO screen by LOCAL mode .

SETJG?x Read out the JOG steps of motor channel x by LOCAL mode.
The reply is ±dddd(4 digits decimal number).
When the digit of reply data is over 4 digit, the digit of reply data will increase.

SACTxY No use.
SACT?x No use.

6) Command for set and read out limit switch data parameters
The setting commands are acceptable only for REMOTE mode.
The read out commands are acceptable for REMOTE and LOCAL mode.

SETLSxDYYYOyyy Set the states of limit switch of motor channel x.
D: 0/Digital limit switch disable, 1/Enable
YYY: 0/Limit switch disable, 1/Enable
yyy: 0/Limit switch set is N.O, 1/N.C
YYY,yyy Order is H.P LS, CCW LS, CW LS.

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

LS? Read out the motor channel and the states of limit switch for each drive channels.
The reply data is abcdHJKL.
a,b,c,d: Shows the motor channel for A,B,C,D drive channel.
Display with hex one digit number.
H,J,K,L: Shows the state of limit switch for each drive channel.
Also detail meaning of H is shown below.

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

HDSTLS? Read out the motor channel and hardware and software limit switch status for each drive channels.
The reply data is abcdHJKLhjkl.

a,b,c,d: Shows the motor channel for A,B,C,D drive channel.
Display with hex one digit number.
H,J,K,L: Shows the state of hard limit switch for each drive channel.
h,j,k,l: Shows the state of soft limit switch for each drive channel.
Detail of H and h is shown below.

b3	b2(HP LS)hard only	b1(CCW LS)	b0(CW LS)
-	1: LS on	1: LS on	1: LS on
always 0	0: LS off	0: LS off	0: LS off

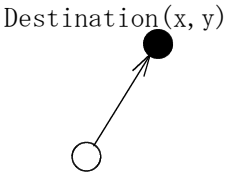
7) Interpolation drive command for two axes

By two axis interpolation drive command, you can move 2 motors as straight line move, circular move and perfect circle move on a X-Y flat plane.
The setting commands are acceptable only for REMOTE mode.
There are 4 motor channels (A,B,C,D) those can be driven independently each other.
Two axis interpolation driving command is applicable to a combination of A and B or C and D.
Interpolation driving command using channel A-B begins "C0····".
Interpolation driving command using channel C-D begins "C1····".
The speed of interpolation move is preset value of channel A and C.

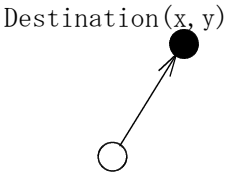
command	details of command	FIG
C0ALNab±xx···/±yy··· C1ALNab±xx···/±yy···	absolute address a,b axis straight line interpolatin to the destination. a,b:0～F xx···,yy···:decimal under 9 digit	A
C0RLNab±xx···/±yy··· C1RLNab±xx···/±yy···	relative address a,b axis straight line interpolation to the destination a,b:0～F xx···,yy···:decimal under 9 digit	B
C0ACPab±xx···/±yy···/±uu···/±vv··· C1ACPab±xx···/±yy···/±uu···/±vv···	absolute address a,b axis cw direction circular interpolation with center position data. a,b:0～F x,y: destination u,v: center position x···,y···,u···,vv··· : decimal under 9 digit perfect circle interpolation will be done by setting the destination to current position.	C
C0ACNab±xx···/±yy···/±uu···/±vv··· C1ACNab±xx···/±yy···/±uu···/±vv···	absolute address a,b axis ccw direction circular interpolation with center position data. another data are same as above.	D
C0RCPab±xx···/±yy···/±uu···/±vv··· C1RCPab±xx···/±yy···/±uu···/±vv···	relative address a,b axis cw direction circular interpolation with center position data. a,b:0～F x,y: destination u,v: center position x···,y···,u···,vv··· : decimal under 7 digit perfect circle interpolation will be done by setting the destination to (0,0) position.	E
C0RCNab±xx···/±yy···/±uu···/±vv··· C1RCNab±xx···/±yy···/±uu···/±vv···	relative address a,b axis ccw direction circular interpolation with center position data. another data are same as above.	F
C0AACab±xx···/±yy···/±uu···/±vv··· C1AACab±xx···/±yy···/±uu···/±vv···	absolute address a,b axis circular interpolation with bypass point data.(Destination setting to current position aren't allowed, use "C0ACC" command)a,b:0～F x,y:destination u,v:bypass point x···,y···,u···,vv··· : decimal under 9 digit	G
C0RACab±xx···/±yy···/±uu···/±vv··· C1RACab±xx···/±yy···/±uu···/±vv···	relative address a,b axis circular interpolation with bypass point data.(Destination setting to current position aren't allowed, use "C0RCC" command)a,b:0～F x,y:destination u,v:bypass point x···,y···,u···,vv··· : decimal under 7 digit	H
C0ACCab±xx···/±yy···/±uu···/±vv··· C1ACCab±xx···/±yy···/±uu···/±vv··	absolute address a,b axis perfect circle interpolation with two bypass point data. a,b:0～F x,y:bypass point 1 u,v:bypass point 2 x···,y···,u···,vv··· : decimal under 9 digit	I

command	details of command	FIG
C0RCCab±xx･･･/±yy･･･/±uu･･･/±vv･･･ C1RCCab±xx･･･/±yy･･･/±uu･･･/±vv･･･	relative address a,b axis perfect circle interpolation with two bypass point data. a,b:0～F x,y:bypass point 1 u,v:bypass point 2 x･･･,y･･･,u･･･,vv･･･:decimal under 7 digit	J

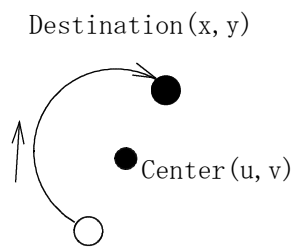
A. Absolute data



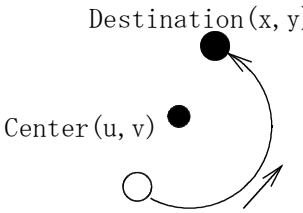
B. Relative data



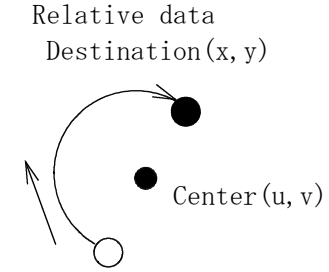
C. Absolute data CW



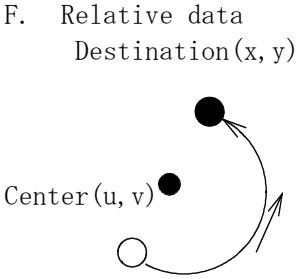
D. Absolute data CCW



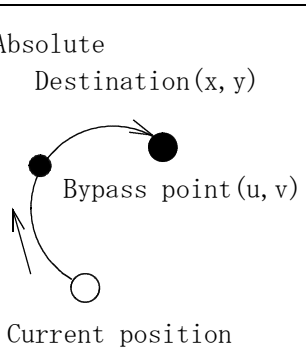
E. Relative data



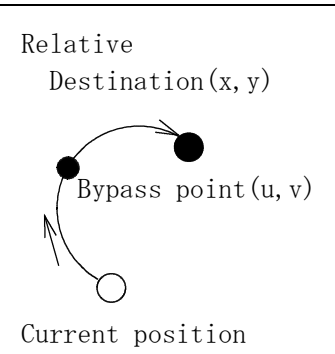
F. Relative data



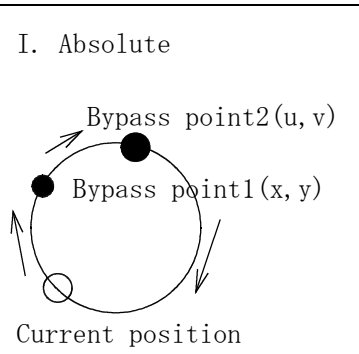
G. Absolute



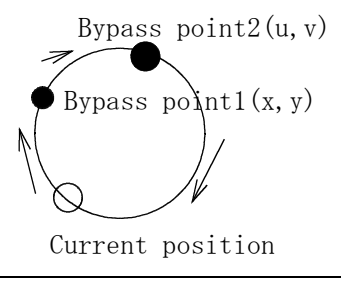
H. Relative



I. Absolute



J. Relative



8) Timing pulse out commands

(A) This unit outputs the TTL level signal in these two modes.
One is gate mode, gate signal outputs between start point and stop point.
Those setting must be done in advance.
Another is interval output mode, pulse outputs from pulse start point every interval p reset pulse.
The pulse width of this mode is selectable 200 ns, 10μs, 100μs and 1 ms.
These mode and parameters are configurable for each motor channel.
The setting commands are acceptable only for REMOTE mode.
The read out commands are acceptable for REMOTE and LOCAL mode.

(B) Command Explanations

① TMGMxY Preset the timing mode of motor channel x
Y: 0 Disable output of timing pulse.
Y: 1 Gate mode. Gate signal outputs between start point and stop point.
Y: 2 Interval mode. Output pulse width is 200 ns.
Y: 3 Interval mode. Output pulse width is 10 μs.
Y: 4 Interval mode. Output pulse width is 100 μs.
Y: 5 Interval mode. Output pulse width is 1 ms.
In interval mode, timing pulse output every interval preset pulse between start and stop pulse area.

② TMGM?x Read out the mode of timing pulse o motor channel x.
The Reply data is 0～5, above content.

③ TMGRx Timing out mode of motor channel x becomes "ready".
This command is acceptable only for the motor x stopped.
For interval mode (timing out mode is 2～5), this command works correctly only in the position that is before the start pulse position.
Mode "ready" means the preparation of pulse out has finished.
When in ready mode, timing pulse outputs after motor passed the start position.
In case of interval mode, once the motor has passed the start point, "ready" condition is cleared. But the output action continues until the stop position.
When motor stopped in the midstream, even if the ready flag is cleared, timing pulse outputs until the stop position.
But once pulse are output, pulses never output in the same area again.
If you want to stop output pulse signal in midstream, you need to send the command "TMGCx", then "ready" flag is cleared and pulse out is cancelled.
Another case of gate mode (timing out mode is 1), the "ready" flag is not cancelled after motor passed the start point.
Gate signal continues output "H" within the limited area despite of the motor direction.
If you want to stop output signal in midstream, you need to send the command "TMGCx", then "ready" flag is cleared and gate out is cancelled (goes to "L").

④ TMGCx The "ready" flag of motor channel x is cleared.
This command is acceptable only for motor stopped period.

⑤ TMGR?x Read out the "ready" flag state of motor channel x.
The reply is that when in "ready" mode reply is "YES", otherwise reply is "NO".

You can also check the "ready" flag to see the LCD display of front panel.

For PM16C-04XD

non active(can no control in LOCAL mode)	_CH05_
active(can control in LOCAL mode)	*CH05*
active and timing pulse ready	#CH05#

For PM16C-04XDL

non active(can no control in LOCAL mode)	orange LED lamp on
active(can control in LOCAL mode)	orange LED lamp off
active and timing pulse ready	"#" display on LCD

② TMGSx±ddddddd Set the start position of motor x timing out mode

⑦ TMGS?x Read out the start position of motor x timing out mode

③ TMGSx±ddddddd Set the stop position of motor x timing out mode

④ TMGS?x Read out the stop position of motor x timing out mode

⑩ TMGSx±ddddddd Set the interval pulse count of motor x timing out mode

⑪ TMGS?x Read out the interval pulse count of motor x timing out mode

(C) The procedure of setting timing out mode

① Set the activate motor channel to control display channel(A-D, TP0-TP3) by channel set command "SETCHabcd".
The output timing pulse for window A is gotten from TP0 and B, C, D for TP1, 2, 3.
To confirm the setting "SETCH?" is convenient.
These setting can be done by old command below too.

S11x	Motor channel x to display channel A
S12x	Motor channel x to display channel B
S15x	Motor channel x to display channel C
S16x	Motor channel x to display channel D

To check the preset motor channel, "S10","STS?" and "LS?" commands are useful. .

② You need to set these parameters to motor channel x.

To set timing out mode	"TMGMxY"
To set timing out start position	"TMGSx±ddddddd"
To set timing out stop position	"TMGEx±ddddddd"
To set timing out interval pulse count	"TMGIx±ddddddd"

Once you have set these parameters, these data are stored in this unit and never changed until your next data change operation.
In factory shipment default data are installed.

③ Move the timing out motor channel to outside the range of timing start position.
If the motor position is outside the range of timing start position, you don't need to move it.
In case of gate mode (timing out mode is 1), you don't need above operation.
But when the motor position is within start and stop position, output signal goes "High" when this motor channel becomes "ready".

④ Set timing out mode "ready" (Command "TMGRx")
(Preparation of signal out is finished)

⑤ Move the motor position toward to stop position.
You can use absolute position move command, relative data move command and continuous move command.
If you set timing out parameters to several channels (2-4), start them simultaneously, you can use this unit as a timing generator that has four kinds of signal output.
(Note)
When in interval out mode (timing out mode is 2,3,4 and 5), if output pulse width >= interval pulse period output signal goes "High" and remain the status instead of pulse shape.

9) Auto change drive function while moving
While trapezoidal drive moving, speed, acceleration/deceleration rate can be changed by the data scheduled in advance. This function can be started by S-character drive command, but the result moving become trapezoidal.
The timing and the contents of the change data can be set to maximum 128 data.
The timing of the change can be set by relative position data from the start point, the time (ms) from change point before or drive pulse speed (pps).
The contents of change data are speed, acceleration/deceleration rate (*1) and stop comm and.

1. Data write command
This command are acceptable only in REMOTE mode.
Scheduled data can be written by this command.
Synchronous start driving by two or more motors, the data must be written for each axes. You don't need to rewrite the data again if the data have no change.

ACSxyyy/PNT/JJJ･･･J/FNC/LLL･･･L
ACS:Auto Change Speed command(fixed)
x: channel(0 - F)
yyy: data number(0 - 127)
PNT:END(no more data)
After the end of data, "ACSxyyy/END/" must be sent.
ADD(relative address from start point)
TIM(relative time from previous point)
ACC(speed data while acceleration)
DEC(speed data while deceleration)
JJJ･･･J:relative address(±2,147,483,647) or time(0-65,535ms) or speed data(1 - 5,000,000pps)
FNC:SPD(speed in pps) means LLL･･･L is speed data
RTE(rate number) means LLL･･･L is rate data
SLW(slow stop) SLOW STOP(LLL･･･L:not used)
FST(fast stop) FAST STOP(LLL･･･L:not used)
NOP(no operation) no operation, skip this data
LLL･･･L:speed data(1 - 5,000,000pps) or RATE(rate data number in the range)

(*1)
Rate can be changed only in the same range where current rate belongs.
The range that can be changed are below.
The group where current rate number belongs is the upper range in the list below. Then, for example, if you need to change rate in group M2 you must set the rate number 31 to 91 in advance.

Rate group	RATE No.
L1 TYPE	0 - 60
L2 TYPE	17 - 76
M1 TYPE	24 - 84
M2 TYPE	31 - 91
H1 TYPE	41 - 100
H2 TYPE	55 - 115

Sample: Speed change at same position of CH0 and CH1 with synchronous start.

```
ACS0000/ADD/5000/SPD/3000       :speed change to 3000pps at position 5000
ACS0001/ADD/10000/SPD/6000      :speed change to 6000pps at position 10000
ACS0002/ADD/20000/SPD/10000     :speed change to 10000pps at position 20000
ACS0003/ADD/30000/SLW           :slow stop at position 300000
ACS0004/END                     :program end(must be written)

ACS1000/ADD/5000/SPD/3000       :speed change to 3000pps at position 5000
ACS1001/ADD/10000/SPD/6000      :speed change to 6000pps at position 10000
ACS1002/ADD/20000/SPD/10000     :speed change to 30000pps at position 20000
ACS1003/ADD/30000/SLW           :slow stop at position 30000
ACS1004/END                     :program end(must be written)
```

Sample: Speed change at same timing of CH2 and CH3 with synchronous start.

```
ACS2000/TIM/0/SPD/1000  (dummy) :speed change to 1000pps at 0 ms
ACS2001/TIM/1000/SPD/3000       :speed change to 6000pps at 1000ms
ACS2002/TIM/1500/SPD/6000       :speed change to 10000pps at 1500ms
ACS2003/TIM/2000/SLW            :slow stop at 2000ms
ACS2004/END                     :program end(must be written)

ACS3000/TIM/0/SPD/1000  (dummy) :speed change to 1000pps at 0 ms
ACS3001/TIM/1000/SPD/3000       :speed change to 6000pps at 1000ms
ACS3002/TIM/1500/SPD/6000       :speed change to 10000pps at 1500ms
ACS3003/TIM/2000/SLW            :slow stop at 2000ms
ACS3004/END                     :program end(must be written)
```

You must prepare dummy data,
If you intend to change first data by time more than one motor synchronously, you must prepare dummy data at the top of the list.

2. Data read command

This command are acceptable both in REMOTE and LOCAL mode.
Can read out the data prepared by "ACSxyyy/PNT/JJJ･･･/FNC/LLL･･･L"

ACS?xyyy
reply:xyyy/PNT/JJJ･･･J/FNC/LLL･･･L

Read out sample(assume data set as previous clause)

Send command	reply	
ACS?0000	0000/ADD/005000/SPD/003000	6 digit at least replied,
ACS?0001	0001/ADD/010000/SPD/006000	
ACS?2000	2000/TIM/000000/SPD/001000	
ACS?2001	2001/TIM/001000/SPD/003000	

3. Ready set command for auto chagne scan
This command are acceptable only in REMOTE mode.
This command must be send to every motors if more than one motor are to start synchronously.
Must be send before auto change scan moving.

ACSPx set ready auto change scan data
Can confirm ready status by the command next clause.
Can't set ready if the "END" is not written at the end of the list.

4. Ready set confirmation for auto change scan
This command are acceptable both in REMOTE and LOCAL mode.
Can know if the status is ready or not.

ACSP?x
reply: ready, not ready

After starting auto change scan, the reply of this command become "not ready".
After sending data write command "ACSxyyy/PNT/JJJ··· ", the reply of this command become "not ready".
At "not ready" status, auto change scan drive can't work.

5. Clear ready flag for auto change scan
This command are acceptable only in REMOTE mode.
Clear ready flag for auto change scan.

ACSCx
Only channel x become "not ready" by this command.
By this command you can stop the auto chagne scan drive already prepared before.
At "not ready" status the moving does not become auto change scan drive.

6. "PAUSE ON" or "S3016" command for auto change scan
This command are acceptable only in REMOTE mode.
Use when synchronous start for more than one motor is needed.

PAUSE ON or S3016

7. Auto change scan command
This command are acceptable only in REMOTE mode.
Send this command to every motors when synchronous start for more than one motor is needed.

Four commands below work as auto change scan command when ready for auto change scan are set.

ABSx(B)±ddddddddd	absolute position moving
RELx(B)±ddddddddd	relative position moving
SCANPx	scan to positive direction
SCANNx	scan to negative direction

8. "PAUSE OFF" of "S3017" for synchronous start
This command are acceptable only in REMOTE mode.
Use when synchronous start for more than one motor is needed as a pare with "PAUSE ON" or "S3016" command described in term 6. above.

PAUSE OFF or S3017

The moving motors by auto change scan command always can be stopped by normal stop command for example "SSTPx", "ESTPx","ASSTP" or "AESTP".

9. About timing error when using auto change scan command

The change start time after detection of the change condition when moving in auto change scan drive are below and they are different when moving in constant speed or moving in acceleration or deceleration.

in constant speed : < 320μs
in acceleration : < 160μs + period of acceleration
in deceleration : < 160μs + period of deceleration

Further if the condition of auto change scan are detected simultaneously for A pos, B pos, C pos and D pos then the timing of B, D pos are delayed 80 μs than those of A, B pos. So be careful to use these function synchronously to four motors.

Period data for speed change (extract) unit : ms

RATE No	ms/KHz	L1 type	L2 teyp	M1 type	M2 type	H1 type	H2 type
0	1,000.000	50.000					
7	510.000	25.500					
17	200.000	10.000	50.000				
24	100.000	5.000	25.000	50.000			
31	51.000	2.550	12.750	25.500	51.000		
41	20.000	1.000	5.000	10.000	20.000	50.000	
55	5.100	0.255	1.275	2.550	5.100	12.750	51.000
60	3.300	0.165	0.825	1.650	3.300	8.250	33.000
67	1.600		0.400	0.800	1.600	4.000	16.000
74	0.820		0.205	0.410	0.820	2.050	8.200
76	0.680		0.170	0.340	0.680	1.700	6.800
82	0.390			0.195	0.390	0.975	3.900
84	0.330			0.165	0.330	0.825	3.300
89	0.200				0.200	0.500	2.000
91	0.160				0.160	0.400	1.600
98	0.082					0.205	0.820
100	0.068					0.170	0.680
106	0.039						0.390
113	0.020						0.200
115	0.016						0.160

10) Other commands

VER?		Read out version information of inside firmware program. The reply will be like "1.00 06-10-14 PM16C04X". The same firmware is installed to PM16C-05XD and PM16C-04XDL.
ACSK?x		Read out auto change scan data written inner IC MCC06. The data indicate the point where change occurs.
	reply	aabb,hhhh,hhhh aa:code(00:END,01:ADD,02:TIM,80:ACC,81:DEC) bb:sequence number(0 to 7F) hh･･･hh:data
ACSH?x		Read out auto change scan data written inner IC MCC06. The data indicate the contents of change.
	reply	aabb,hhhh,hhhh aa:code(00:SPD,01:RTE,02:SLW,03:FST,0F:NOP) bb:sequence number(0 to 7F) hh･･･hh:data
ERR?		Error status read out ommand. If there are more than one error, the reply will be the information that is stored to lower bit of error flag.
ERRF?		Read out error flag.(can be read in two digits of hexadecimal)
	reply	HH B0:COMMAND ERROR, B1:MCC06 BUSY ERROR, B2:BAD ABS COMMAND
ERRC		All error flag clear
ERRCx		Indexed error flag clear x:0 COMMAND ERROR clear x:1 MCC06 BUSY ERROR clear x:2 BAD ABS COMMAND clear
FROM?		For maintenance command. There are two flash ROM for program memory inside. You can check which one is active for flash ROM. The reply is FROM0 or FROM1.
FROM1,FROM2		For maintenance command. You can select the active flash ROM. **NOTICE: When you set this command and power on this unit or send command "REST", program starts again by specified ROM and all parameters are initialized.**
STEM?		For maintenance command. Can be read out status port 1 of inner IC MCC06.
	reply	aaaa/bbbb/cccc/dddd The status of control IC A,B,C,D are read out in hexadecimal style.
VERH?		For maintenance command. Read out the hardware version of this unit. The reply is like this "HD-VER0", "HD-VER1" ･･･ and "HD-VER6". It means the hardware version of PM16C-04XD and PM16C-04XDL.
REST		For maintenance command. You can restart the program without power switch operation.

11) Added command and function

(V1.14 -)

SETCHabcd　　Set channel(0～9,A,B,C,D,E,F) to the control window A,B,C,D position.
By using "-" like "SETCH01--", the "-" channel won't be changed.
This command is acceptable only in REMOTE mode.
If the channel is busy while moving etc., the command is ignored.

SETCH?　　Read out current setting channel.
reply : "34AB" in order A,B,C,D position.

(V1.14 -)

Motor stop function by speed change button on hand box(PM16C-HDX, -HDX2)

This function can be used only in REMOTE mode.
Press the speed change button on the hand box while REMOTE mode more than 3 second, H, M, L LED on it all lighten and the speed change button become stop button.
At this status, moving motor by the remote command can be stopped by this button.
Also by 3 seconds pressing this button, this button return back to normal speed change button.

(V1.39 -)

You can leave three character comment to all 16 channel.

CHCMNT?x　　Read the comment of channel x.
If you input "a" on x, you can read all channel comment.

CHCMNTx ***　　Set the comment "***" to channel x.

LCD_DISP T　　Display timing out port.

LCD_DISP C　　Display channel comment data.

Adjust the LCD illuminance.

LCDB?　　Read LCD illuminance data. Response: LCD BRIGHT 100 1 to 100.

LCDB 100　　Set LCD illuminance data. 1 to 100

(V1.47 -)

One channel version of "STS?" command.

STSx?　　Read the detail data of channel x.
Response format is R(L)aPVHH±uu･･･u.
See "STS?" command(Page 9) in detail.

(V1.48 -)

Adjust the wait time before motor activating when hold off signal is enable.

HOLDTM?x　　Read this wait time on channel x.
Response: dddms (ddd: 50 to 500 by 10 msec.)

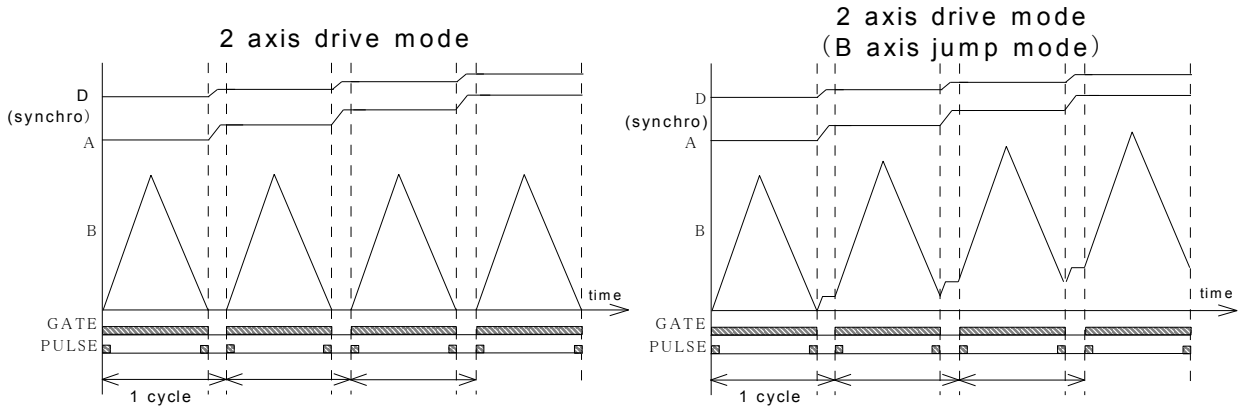
HOLDTMxddd　　Set this wait time on channel x.
ddd: 50 to 500 by 10 msec.

(V1.43 -) Oscillation drive mode

Available the oscillation drive mode.
This drive mode is repeating the drive cycle, which drives the motor allocated at A position every B position have done one reciplocating drive.
2 axis driving mode, using A and B position, and 3 axis driving mode, using A, B, and C position, are main mode at oscillation drive.
D position is also available which drives concurrently with A positon.
To fix oscillation drive cycle, PM16C-04XD(L) measures the cycle.
In this way, you can read cycle time at A position driving.
By using timing out signal, outputs TTL gate or pulse signal from TP1 according to B position driving.

·Two axis drive mode

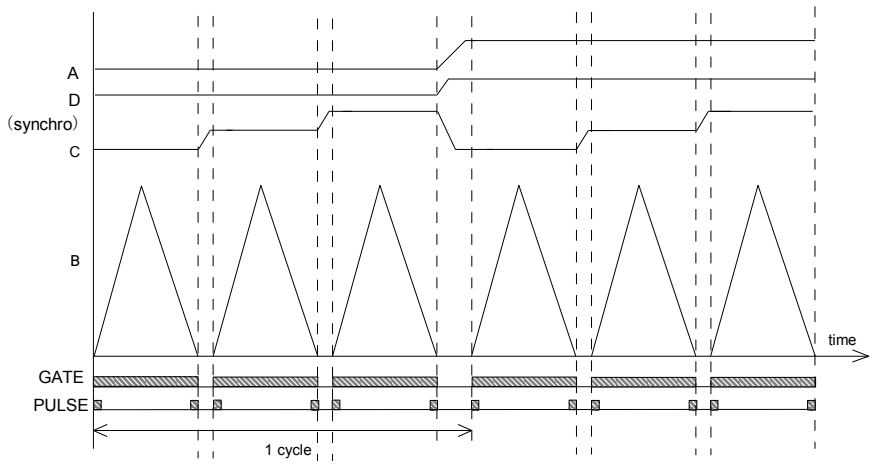
This figure shows oscillation drive motion when A position activating times is 4. At first, position B drives between and waits 5 or 10 msec. Next position A starts driving. If D synchro mode, also starts position D. If B jump mode, also starts for step drive position B. These sequential drive are defined 1 cycle drive. If finished 1 cycle, waits 5 or 10 msec and if remains activatiing time, repeats 1 cycle drive again.



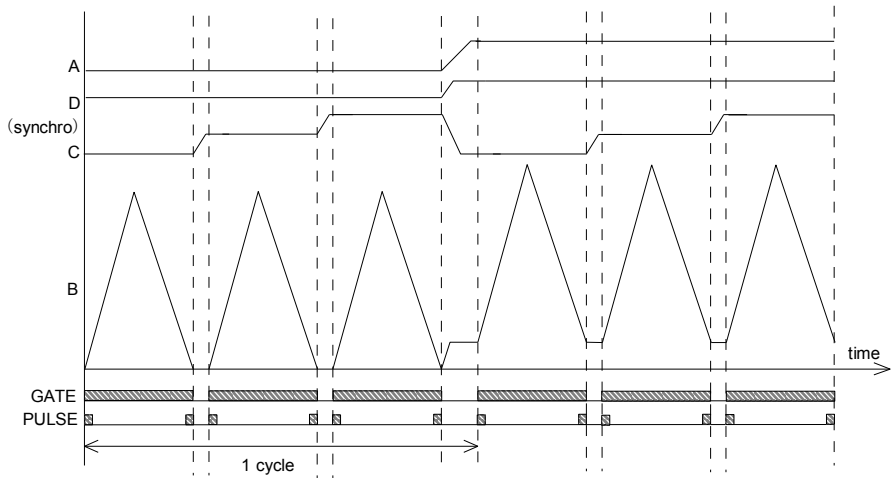
·Three axis drive mode

This figure shows 3 axis oscillation drive motion when position A activating times is 2 and C is 3. The differenses of 2 axis mode are these.
A position does not activate and C position activates alternately if current C position activation times is less than C position repeat times. If current C activation times is equal to repeat times, C position goes back to start position and activates A position. If D synchro mode, also starts position D. If B jump mode, also starts for step drive position B. These sequential drive to activation of A position are defined 1 cycle drive on 3 axis drive mode.

3 axis drive mode



3 axis drive mode
(B axis jump mode)



・Signal output
If timing out pulse mode is enable, outputs TTL signal from "TP1" at the timing of GATE or PULSE shown on the above figures.
Please use this commands to set timing out pulse mode.

TMGMxY x:channel allocated at B position (0 to F)
Y:signal mode 0/disable(no output) 1/GATE
2/200ns 3/10μsec. 4/100μsec. 5/1msec. PULSE

TMGM?x Read timing out pulse setting. Reply: 0 to 5

・Oscillation drive command list

(R) shows that only remote mode, and (R/L) shows that enable every time.
Commands which presets oscillation drive parameter will be ignored while oscillation drive activates including pause status. Be sure to enter these commands while oscillation drive status is stop.

YMDabc (R)	Select the oscillation drive mode. a: Number of axis Select usage axis. 2/two axis drive 3/three axis drive b: D axis synchro mode D position activates at the timing of A starts. 0/disable 1/enable c: B axis jump mode When A position activates, B position also drives. 0/disable J/enable
YMD? (R/L)	Read current oscillation drive mode and status. Reply: YMDabc xxxx xxxx: START/STOP/PAUSE
YSTRT (R)	Starts oscillation drive. This command is ignored if motor that is going to drive is driving or the sum of drive parameter and current position results in overflow. Hold off signal is disable during oscillation drive.
YPAUS (R)	Pauses oscillation drive. Send "YPAUS" or "YSTRT", and restarts oscillation drive. Please use this command after A position have activated because PM16C have not measured 1 cycle time. This causes the loss of accurate cycle time for oscillation drive.
YSTOP (R/L)	Stops oscillation drive. All motors that is using this drive are stopped the same way of pushing stop button.
YSTS? (R/L)	Read step count of A and C position. Response format is "RPaaa CRccc". aaa: step count of A. ccc: step count of C. smore than 3 digit integer. If 2 axis mode, ccc equals to "000".
YCY? (R/L)	Read the cycle time at A position. The reply is over 4 digit msec. units integer. Replies "0000" if there is no activation at A position.
YAP±d..ddd (R)	Set step pulse value at A position. ±d...ddd: -2,147,483,647 to +2,147,483,647 arbitrary signed digits of number. It is the same hereinafter during oscillation drive description.
YAP? (R/L)	Read step pulse value at A position. Reply is signed integer more than 7 digits.
YBP±d..ddd (R)	Set pulse value for reciplocating drive of B position.
YBP? (R/L)	Read pulse value for reciplocating drive of B position. Reply is signed integer more than 7 digits.
YRPd..ddd (R)	Set repeat times of activation on A position. d...ddd: 1 to 2,147,483,647

YRP? (R/L)	Read repeat times of activation on A position. Reply is unsigned integer more than 3 digits.
YBJ±d..ddd (R)	Set step pulse value at B position at B jump mode.
YBJ? (R/L)	Read step pulse value at B position at B jump mode. Reply is signed integer more than 7 digits.
YCP±d..ddd (R)	Set step pulse value at C position.
YCP? (R/L)	Read step pulse value at C position. Reply is signed integer more than 7 digits.
YCRd..ddd (R)	Set repeat times at C position. d...ddd: 1 to 2,147,483,647
YCR? (R/L)	Set repeat times at C position. Reply is unsigned integer more than 3 digits.
YDP±d..ddd (R)	Set step pulse value at D position at D synchro mode.
YDP? (R/L)	Read step pulse value at D position at D synchro mode. Reply is signed integer more than 7 digits.

·Oscillation drive example

Drive speed, rate, usage motor, and start position are already set.

Case 1: Step pulse of A position:1000, repeat times:100
pulse value for reciplocating drive of B position:1000
2 axis drive.

YMD200	Set to 2 axis drive mode.
YAP50	Set step pulse value at A position to 50.
YBP1000	Set pulse value for reciplocating for B position to 1000.
YRP100	Set drive repeat times to 100.
YSTRT	Start oscillation drive.

Case 2: Step pulse of A position:120, repeat times:50
pulse value for reciplocating drive of B position:2500
Step pulse of C position:100, repeat times at C:5
3 axis drive.

YMD300	Set to 3 axis drive mode.
YAP120	Set step pulse value at A position to 120.
YBP2500	Set pulse value for reciplocating for B position to 2500.
YCP100	Set step pulse value at C position to 100.
YRP50	Set drive repeat times to 50.

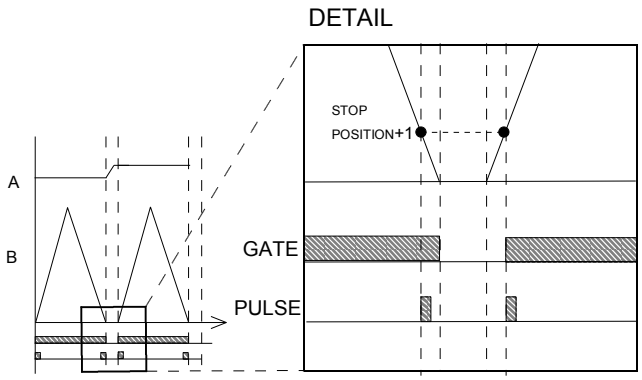
```
YCR5            Set drive repeat times at C position to 5.
YSTRT           Start oscillation drive.
```

Case 3: Step pulse of A position:10, repeat times:200
pulse value for reciplocating drive of B position:-1000
Jump pulse of B position:10
Step pulse of D position:20
2 axis B jump D synchro drive.

NOTICE:
You can use not only positive number but also 0 and negative for drive pulse and step pulse. If you set negative number for pulse value for reciplocating drive of B position, changes drive pattern from CW to CCW drive to CCW to CW drive. If you set to 0, there is no drive on B position.

```
YMD21J          Set to 2 axis, D synchro, and B jump drive mode.
YAP10           Set step pulse value at A position to 10.
YBP-1000        Set pulse value for reciplocating for B position to -1000.
YBJ10           Set jump pulse value at B position to 10.
YDP-20          Set step pulse value at D position to -20.
YRP200          Set drive repeat times to 200.
YSTRT           Start oscillation drive.
```

·NOTICE: GATE, PULSE signal
GATE and PULSE signal are linked with B position drive.
Signal output timing between GATE and PULSE when B position returnd are strictly different. Falls GATE signal when B position reached stop point. Outputs PULSE signal when B positon reached 1 pulse before at stop point.



4. The firm-ware version-up

1) Upgrade the firmware

You can perform firmware upgrade of PM16C-04XD(L) via communication line.
To keep safety you had better cut off the connection from unit to motor driver, or put off the power line of motor drivers.
It's convenient to use RS232C or LAN connection.
These are the procedures of upgrade via LAN communication using "Tera Term" free software.

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

② Launch the program "TeraTerm".
Select TCP/IP and enter IP address and port No of PM16C-04XD(L).
Operation is SETUP -> Terminal then setting of New-Line is to be CR+LF in Receive and Transmit set.
Mark on Local echo and "OK". Send the command VER?, and reply is like "1.00 06-10-14 PM16C04X" then the connection will be good.

③ Set PM16C-04XD(L) to REMOTE MODE by local operation or remote operation.
To change in remote operation send the command "REM".

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

⑤ You can see the process of transferring the file data to PM16C-04XD(L) on your PC.
The "REMOTE" lamp on the PM16C-04XD(L) is blinking on and off slowly that indicate receiving the file by PM16C-04XD(L).

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

⑦ Set TCP/IP line off, then finish the TeraTerm program.
Put off the power line of PM16C-05XD(L), then put on this unit again.
If you don't want to put off the unit, send command "REST"(V1.09～).
Thus the unit runs again from new version program.

2) If troubles occurred,

If trouble occurred in download process, when put on the unit again, sometimes program runs out of control.
Initial display character isn't correct. In this case once put off the unit and put on it again pushing ten-key "0" switch. (Type XD: ten-key "0", type XDL: ten-key "8")
The unit runs from previous ROM version again. And you can try again upgrade procedure.

(NOTE)
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.

Even if by the above operation, program runs out of control you can start again next procedure.
There is a communication program inside CPU-ROM.
When you use this mode you have to pay attention to following procedures.

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

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

1. Put off the power switch of this unit and open the top cover.

Set the dip switch 2 to side "ON". (Dip switch 1 is still side "OFF".)
Dip switch is beside the button battery on print circuit board "TEP036" (XD).
In case of XDL, the print circuit board is "TEP063".

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 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.
   Parameters for communication are initialized and fixed on V1.00 firmware.
   IP address: 192.168.1.55
   Port No.: 7777
   RS-232C baudrate: 9600
   (In this stage if LCD display may not be correct, but don't care of it. It's OK if you can change remote-local mode by REM/LOC button.)

Next procedure is above describes ① - ⑦.

In local mode you can change NEW/OLD program by button control.
(In setup mode XD: p8 or XDL: p11) If you try to use by previous version program, this function is useful.
When you change firmware program all preset data are cleared, and setting data will become default state.

5. Manual and Firmware History

2007.09.13(manual rev.1 / rev.4 at Japanese manual)
"PAUSE ON", "PAUSE OFF" command added(Firmware V1.13 -)
Auto change drive function added(V1.13 -)
While moving speed change etc. can be done by previous setting.

2008.07.17(manual rev.9 at Japanese manual)
Altered the order of "A", "B" data in the sentence of "STOPMDxAB" explanation.
Add command "SETCHabcd", "SETCH?", "HDSTLS?" (Firmware V1.14 -)
Auto hold on/off function added for REMOTE mode(Firmware V1.15 -)

2009.09.16(manual rev.2 / rev.10 at Japanese manual)
"HOLDxON", "HOLDxOFF", "HOLD?x"/reply:"ON" or "OFF" added(Firmware V1.17 -)
V1.20 ～ V1.29 : skipped
Direction logic change available when Direction - Pulse output mode for those that has hardware type "VERH?"/"HD-VERn" n > 4.(V1.30 -)
Motor stop while REMOTE mode contorl by speed change button on the hand box.(V1.31 -)

2014.05.15(manual rev.3 / rev.15 at Japanese manual)
Added the mention of firmware version up program at 4.The firm-ware version-up section.
Added new function of LCD brightness adjustment and 3 character channel comment for all channel.(V1.39 -) (rev.11 at Japanese manual)

Added SRQ imitated LAN and RS-232C commands.(V1.42 -)
"STOPx" command are sent on LAN and RS-232C communication when motor is stopped.
(rev.12 at Japanese manual)

Added Oscillation drive mode and commands for it.(V1.43 -)
(rev.13 at Japanese manual)

Added "STSx?" command. This is one channel version of "STS?" command.(V1.47 -)
(rev.14 at Japanese manual)

Added the commands which adjusts the interval between hold off signal release and motor drive time.(V1.48 -)

2014.06.19(manual rev.4 / rev.16 at Japanese manual)
Deleted "Existing connection method" of LAN connection setting.
There is no necessary for setting IP address and Port No. with this method at current PM16C version.

2017.10.19(manual rev.5 / rev.17 at Japanese manual)
Added the description on IP address and port number and RS-232C baudrate are initialized.

For the further information, feel free to ask us.

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6. Specifications

Power	Voltage and Freq	AC 85V - 264V 47 - 440Hz 50VA
IN/OUT	Control	16 motors can be controlled
	Capability	4 motors can be controlled synchronously or simultaneously
	Out put	CW, CCW, HOLE OFF (5V, 8mA: line driven) for each 16 motor
	Pulse rate	1 - 5MPPS
	Pulse control	-2,147,483,647 - +2,147,483,647
	Acc/dec rate	1048.56 - 0.0125 ms/KHz
	Acc/dec form	Constant speed, S-character form, Trapezoidal form
	Output format	2 pulse / 1pulse and direction
	Pulse out	DE9S(F)/PM16C-04XD(L), RJ-4/PM16C-04XR(L)
	LS signal in	CW-LS, CCW-LS, HOME-LS 12V 5mA(GND - common) Power supply +12V(MAX 1A) for sensor
	LS in	DE9P(M)/PM16C-04XD(L), RJ-4/PM16C-04XR(L)
LCD display	LCD display specification	PM16C-04XD : 40 characters×4 lines(Size: 4.9H*2.8W) PM16C-04XDL: 20 characters×4 lines(Size: 9.2H*4.8W)
	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, paneloperation ready/not ready
	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
panel push button and lamp	PM16C-04XD	switch/button : JOG CW/CCW, PRESET,START,STOP,REM/LOC,SETUP REM/LOC,CURSOR,CHG,MODE,TEN-KEY lamp : REM/LOC,START,STOP,SETUP,HP/REL/ABS/SCAN
	PM16C-04XDL	switch/button: CH-SEL, JOG CW/CCW, channel act,REM/LOC, SETUP, PRESET, START, STOP, CURSOR, CHG, MODE, NUMERIC KEYS lamp: limit switch, home position, hold off, motor select, PRESET, START, STOP, REM/LOC, SETUP, MODE
numeric keys and cursor key		channel selection by numeric keys and cursor key. Selection of control ready/not ready for each channel, and change preset values. selectable speed of H, M, L for each channel. and preset speed value of H,M,L for each channel.
control	PRESET START STOP JOG	preset specified data to the selected display moving start for selected channel according to the mode stop moving for selected channel jog stepping for selected channel
stepping mode	SCAN MODE	continuous stepping of ready ch. Stepping direction is according to JOG switch
	ABS IDX MODE	move ready ch to absolute position
	REL IDX MODE	move ready ch specified steps relatively
	HP STOP MODE	Stop by HOME POSITION LS total 3 moving style. One is for with HP detection memory, another two are for no HP detection memory.
remote	communication	LAN, GP-IB, RS232C port
case	size	EIA 2 UNIT rack mount type (88H×482W×325D)