4CH PULSE MOTOR CONTROLLER
UPM4C-01

USER'S MANUAL

(3579 rev.2)

APPLICATION OF ELECTRONIC DEVICES

Tsuji Electronics Co., Ltd.

Contents

1 Abstract

1-1 Feature

UPM4C-01 is the succeeding model which extracted the communication function of NPM2C-01 only to USB. Contol command is upward compatible with NPM2C-01. The parameter which can be set is also extended and it is also miniaturized. It can control immediately only by connecting with USB cable because a power supply is supplied directly from a USB port of PC. It is controllable with the control software of NPM2C-01 because the command of NPM2C-01 can be used.

The main extending points and the changed part from NPM2C-01 are as follows.

- Extension of the number of pulses which can be treated (24bit → 32bit)
  (−8,388,607 - +8,388,607) → (−2,147,483,647 - +2,147,483,647)
- Extension of the number of output pulse frequency
  (1PPS - 100KPPS) → (1PPS - 5MPPS)
- It corresponds to constant-speed drive and sigmate drive other than trapezoidal drive.
- You can upgrade of firmware (ROM) by USB communication.
- The addition of new commands.
- A large small weight saving and price reduction.

  The function of NPM2C-01, UPM2C-01 and PM4C-06 is also succeeded.
- You can control characteristics of two pulse motors, such as HSPD, MSPD, LSPD, RATE and LMSW individually.
- You can start two motors at a time.
- There are relative position movement, absolute position movement and continuation movement in the move method.
- You can stop the motor by signal from the limit switch and stop command. Slowdown stop and sudden stop can be chosen in each stop procedures.
- Configuration data and positioning data are saved by battery backup.

Difference between UPM2C-01 with UPM4C-01
1. Due to the change of the motor control IC, the speed setting specification changed slightly. (See page 6)
2. Biaxial interpolation operation installed in V1.04 or later of UPM2C-01 is not yet implemented at V 1.00.
3. It is now possible to invert the Direction polarity of the Pulse-Direction signal.

> CAUTION
>
> This device consumes 300mA on an average, and consumes about 350mA at the maximum. When you use it, please connect directly with PC or connect a USB hub with AC power supply. When it is used with other USB device which consumes current on a PC, this device does not start due to a shortage of current or other USB device may be affected. In that case, please use optional AC adapter.
> Be sure to turn off the power of the motor driver before connecting USB cable.
> Make sure that UPM4C-01 power led is lit and then turn on the motor driver.

1-2 Controller composition

< Controller diagrammatic illustration >

Data Memory		Main CPU		A, B pulse controller		Pulse out	CH A

- Data Memory → Main CPU
- USB comport → Main CPU
- ROM x2 Version-up → Main CPU
- Main CPU → A, B pulse controller
- Main CPU → C, D pulse controller
- A, B pulse controller → Pulse out / L.S input : CH A
- A, B pulse controller → Pulse out / L.S input : CH B
- C, D pulse controller → Pulse out / L.S input : CH C
- C, D pulse controller → Pulse out / L.S input : CH D

1-3 Cconnection diagram

- PC — USB cable — UPM4C-01
- UPM4C-01 → Pulse cable → Driver → Stepping motor
- UPM4C-01 → LS cable → Sensor
- Driver / Sensor → Stepping motor (x4)

LS : Limit Switch

2 Appearance

2-1 Front & Rear panel

1. Power LED
2. ACCESS LED
3. USB connector
4. Sensor power supply
5. LS input connector
6. Pulse output connector
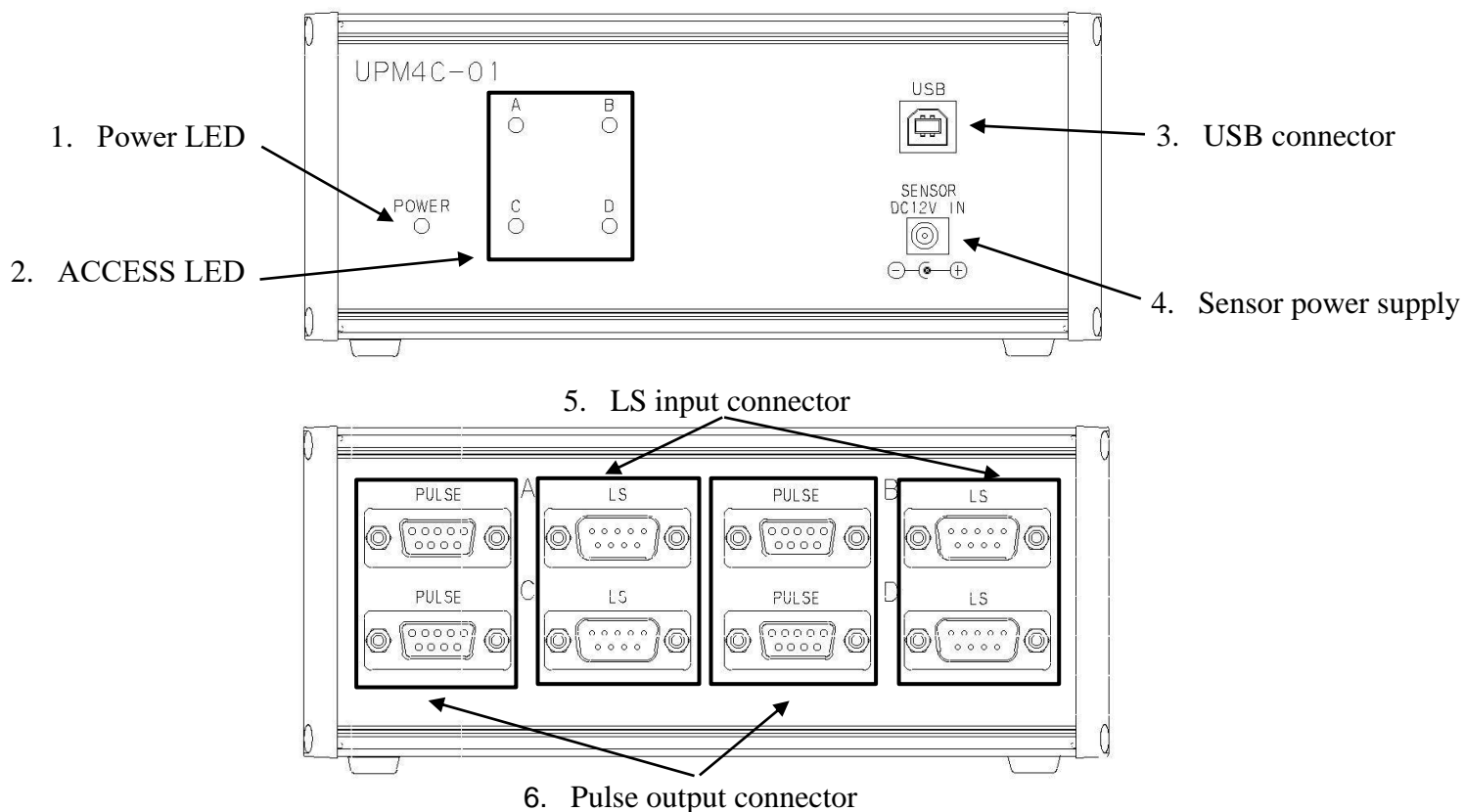
No.	Name	Function
1	POWER LED	Power LED lights when the power is on. There is no power switch. Power is applied to this unit when you connect a USB connector.
2	ACCESS LED	Access LED lights on according to the busy state of internal motor IC. Moreover, when updating the firmware, LED announce you an internal state by blink and lighting.
3	USB connector	The connector for USB communication. Connector shape is USB-B type. Be sure to turn off the power of the motor driver before connecting USB cable.
4	Sensor power supply	Power input connector of EIAJ-4 size for 12 V DC. When you supply 12 V DC to LS, or when stable power supply is required, please connect an AC adapter of 12 V DC (T3168AC) to this connector.
5	Limit sensor input connector	Please connect the external limit sensor signal to this connector. Connector shape is DE9P (M) type. Since the interval of a connector is 38mm, please use a D-sub hood with a size of 35 mm or less.
6	Pulse output connector	Pulse signal is output from this connector.　Connector shape is DE9S (F) type.

3 Connection with outer

UPM4C-01

PULSE
DE9S (female)

DRIVER

CWP
(PULSE)

CCWP
(DIRECTION)

HOLD OFF
(open collector output)

+5V

300ohm

1 (−)
2 (+)
3 (−)
4 (+)
5
6 (−)
7 (+)
8
9

(+)
(−)
(+)
(−)
(+)
(−)

+12V   0V

2KΩ

CW LS

CCW LS

H.P

LS
DE9P (male)

1
2
3
4
5
6
7
8
9

CW LS

CCW LS

H.P

1P
2P

3P
4P

6P
7P

12V
SIG
0V

12V
SIG
0V

12V
SIG
0V

+12V

12V 0.5A max

Valid only AC adapter is connected
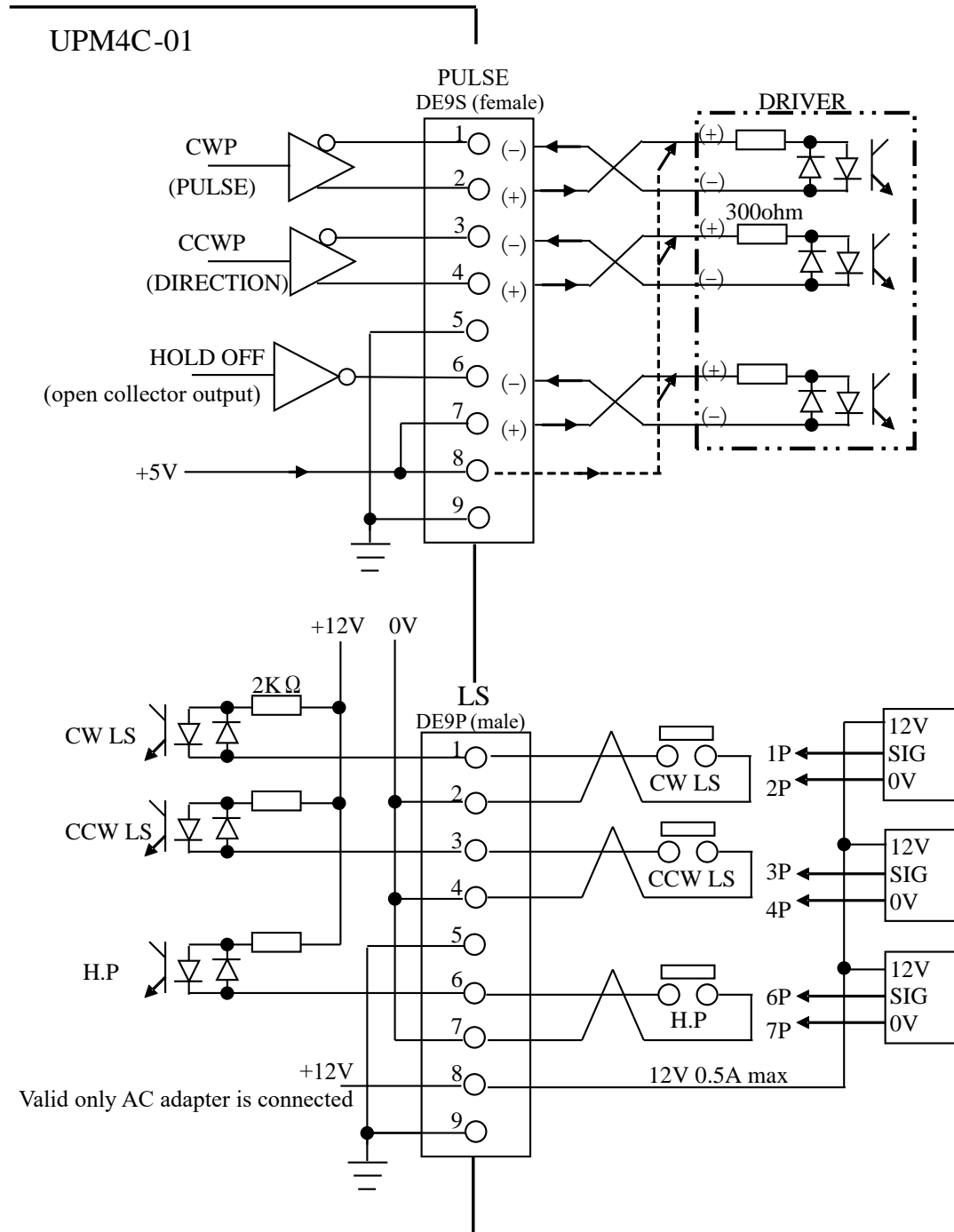
Connection cables are recommended to be shielded twist pair cable. (more than $0.2mm^2$)

(NOTE)

Connector shell size of DE9P and 9S is varied from each maker's.
Please use the shell whose width is 35mm or less.
DE-C1-J6 (JAE), XM2S-0911 (OMRON) and HDE-CTF (HIROSE) are possible to be used.

4 Setting USB communication

4-1 Outline

A driver software used in UPM4C-01 to do the USB communication that considered a USB port to be a COM port. For the reason, there is the necessity of downloading from our homepage and installing driver software. However, there is no necessity of installing driver software when USB communication has been established with other products of our companies, such as UPM2C-01 and NCT08-01B.

4-2 Preparation

1. VCP driver software for USB operation is downloaded from our web server.
2. Switch on a UPM4C-01 and connect USB cable, then there will be message box that shows "New hardware device was found".
3. According to PC directions, specify the folders of downloaded driver software.
4. When the driver software installs are done, open the "Control Panel" (START → Control Panel), click the "System" icon. Then property display of system appears.
5. Select the "Device Manager". Confirm the USB Serial Port (Com*) number in the tree between Port display.
6. Select the USB Serial Port (Com*), click advanced in port setting display. It's possible to change COM Port number.

4-3 Connecting test

Launch RS-232C communication software such as hyper-terminal including PC. Set COM port number which is known in previous item, it is need to check communication line is available or not. In this case it's no need to set baud rate. Send the command data "VER?", then get the reply such as "1.00 14-04-20 UPM4C-01", there is no problem for communication.

5 The basic operations

There is no operation panel on a UPM4C-01, so all the operations, a setup of various parameters, and a state check are performed by USB communication. If "Setting USB communication" of the preceding clause is completed, various parameters will be set and a motor will be operated.

High speed (HSPD), middle speed (MSPD), low speed (LSPD) and acceleration rate is set individually for each channel. Acceleration and deceleration method have the three modes, "Const", "Trape", and "Schar".

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*Specification change of speed setting at UPM4C-01

In UPM4C-01, the specifications for speed and rate setting have been slightly changed due to the change of the motor control IC. The settable range of initial speed (LSPD) and rate changes depending on the maximum speed (MSPD, HSPD) value. If you try to change to a value outside the settable range, the command is invalid and setting is not changed.

Case 1: (MSPD, or HSPD) <= 150,000
      Both the initial and the maximum speed can be set in 5 increments of 5 to 150,000.
   Available range of the rate code is No.0 to No.96 (1000~0.1ms/PPS).

Case 2: 150,000 < (MSPD, or HSPD) <= 1,500,000
      Both the initial and the maximum speed can be set in 50 increments of
      50 to 1,500,000.
      Available range of the rate code is No.20 to No.115 (150~0.016ms/PPS).

Case 3: 1,500,000 < (MSPD, or HSPD) <= 5,000,000
   Both the initial and the maximum speed can be set in 200 increments of
      200 to 5,000,000.
      Available range of the rate code is No.39 to No.115 (40~0.016ms/PPS).

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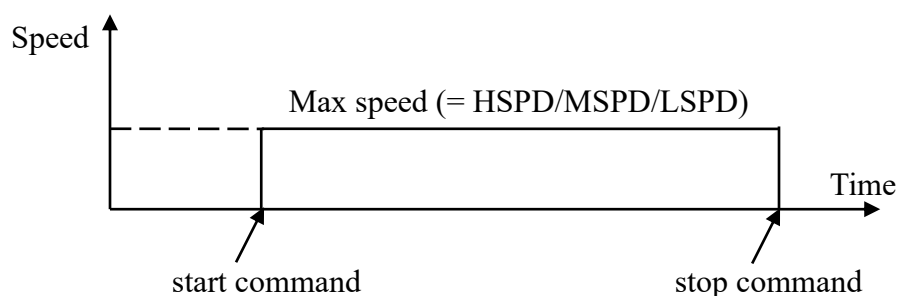
Motor drives at MAX speed as soon as drive execution, and stops immediately as soon as stop operation. Too fast drive speed causes motor step out.
Low speed drive is always constant drive at all drive mode.

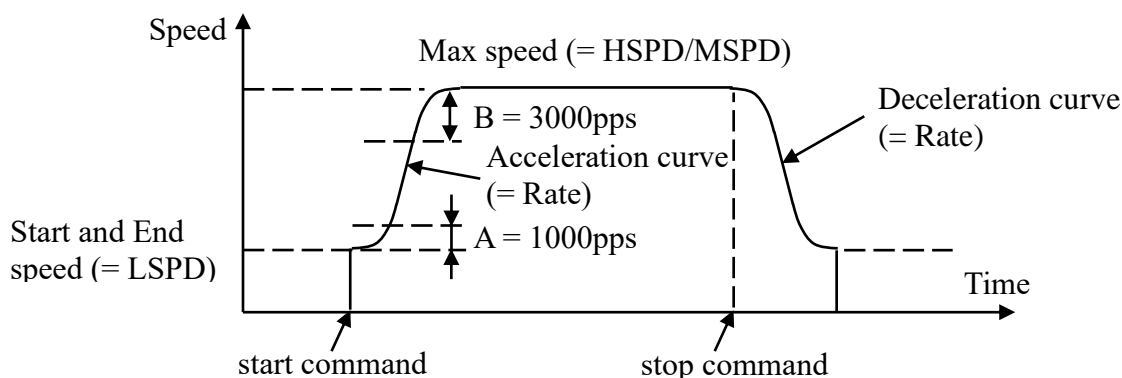(2) Trapezoidal form acceleration drive (Trape)
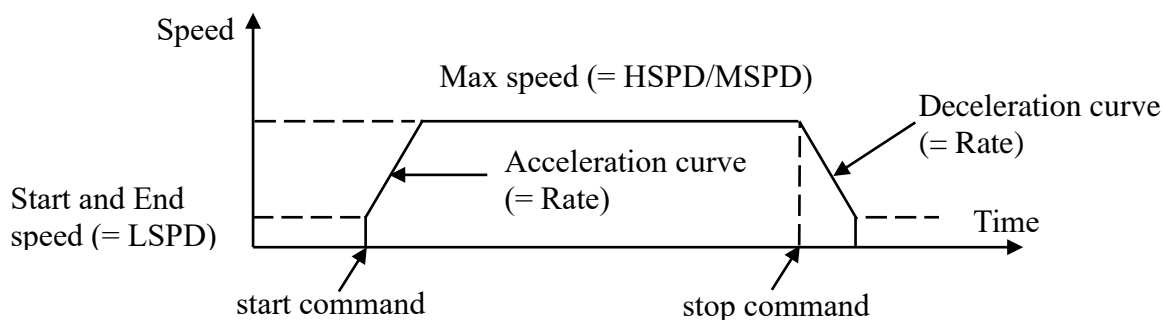
Acceleration operation is carried out until it will reach MSPD or HSPD by making LSPD into initial velocity, if a motion command is executed.

When a stop command is input, the motor starts deceleration. And the motor stop when speed reached LSPD. Acceleration and deceleration curve become rapid, and time to reach maximum speed shortens so that Rate value shown by acceleration and deceleration code (See page 64) is large.

Large value of "LSPD" may not make smooth start of the motor.

(3) S shaped form acceleration drive (Schar)

Although it is fundamentally the same as trapezoidal form acceleration drive, the velocity change at the time of acceleration and deceleration start and the time of acceleration and deceleration stop is performed according to S shaped form approximated to the parabola.

Large value of "LSPD" may not make smooth start of the motor.

The start region A and the stop region B are fixation. When LSPD is more than or equal LSPD + 4000pps, it calculates automatically so that a curve may become smooth.

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6 The detail of communication commands

6-1 Command to read out of motor status

Command	Explanation

STS?	Read out current motor operation status.
	
	Reply:
	R0123/<ABCD>/<CCCC>/<HHJJKKLL>/<±aaaaaaa>/<±bbbbbbb>/<±ccccccc>/<±ddddddd>
	
	<ABCD> A:ch A, B:ch B, C:ch C, D:ch D
	  P/ Moving for CW direction
	  S/ Stop
	  N/ Moving for CCW direction
	
	<CCcc>
	Hold off and LS status by hex.
	When these signals are activating, its bits stands 1.
	CC indicates ch A and B status, cc indicates ch C and D.
	
	  b7: ch A(C) HOLD off b3: ch B(D) HOLD off
	  b6: ch A(C) HP LS b2: ch B(D) HP LS
	  b5: ch A(C) CCW LS b1: ch B(D) CCW LS
	  b4: ch A(C) CW LS b0: ch B(D) CW LS
	
	<HHJJKKLL> HH:ch A, JJ:ch B, KK:ch C, LL:ch D
	Indicate current motor status by 2 digit hex.
	
	  b7: Emergency stop command executed.
	  b6: Stop with deceleration command executed.
	  b5: Stopped by LS signal.
	  b4: Command error
	
	  b3: Decelerating
	  b2: Accelerating
	  b1: Motor is moving.
	  b0: Driving or dealing with command.
	
	<±aaaaaaa> <±bbbbbbb> <±ccccccc> <±ddddddd>
	Displaying current position of each motor with signed 7 digit decimal.
	Digit is increased if data is more than 10 million.

(Old version) ・・・・Compatible command of NPM2C-01.
　　x: 0/channel A　1/ch B　2/ch C　3/ch D

Command	Explanation
STSx?	Read out the specified CH motor data. Reply: Rx/\<A>/\<CC>/\<HH>/\<±aaaaaaa> \<A> 　P/ Moving for CW direction 　S/ Stopping 　N/ Moving for CCW direction \<CC> Hold off and LS status by hex. When these signals are activating, its bits stands 1. \<HH> Indicate current motor status by 2 digit hex. \<±aaaaaaa> Displaying current position of each motor with signed 7 digit decimal. Digit is increased if data is more than 10 million. Data format is the same as "STS?" except [x].
STSM?	Read out contents of control IC (MCC09)'s status. Reply: aaaa/bbbb/cccc/dddd Regarding 2channels that are displayed, MCC06's status is displayed in hexadecimal four-digit.
S2x1 (old version)	Read out contents of control IC (MCC09)'s status by 2 digit hex. Reply: RXHH Data format is the same as HHJJ of "STS?".

6-2 GP-IB simulated SRQ command

When the motor stops moving, GP-IB simulated SRQ signal is output automatically. It can be used during motor stop state. Send form of the commands are below. The SRQ flags, which were set once before, are cleared at the SRQ send out timing.

(old version) ・・・・Compatible command of NPM2C-01.
x: 0/channel A   1/ch B   2/ch C   3/ch D

Command	Explanation
SRQ?x	Read out SRQ output flag of channel x. Reply: a a: 0/Unsetting 1/Setting
S18 (old version)	Read out SRQ output flag. Reply: R0H H: b1/ch B, b0/ch A
SRQx1 S1x1 (old version)	Set SRQ flag of channel x.
SRQx0 S1x0 (old version)	Clear SRQ flag set for channel x.

6-3 Motor control command

Command	Explanation
JOGPx JOGNx	JOGPx: Motor drives one pulse to CW direction. JOGNx: Motor drives one pulse to CCW direction.
S3x08 S3x09 (old version)	S3x08: Motor drives one pulse to CW direction. S3x09: Motor drives one pulse to CCW direction.
SPDx(L/M/H)	Select motor move speed of channel x. L/LSPD M/MSPD H/HSPD
S71(L/M/H) (old version)	Select motor move speed of both channel. L/LSPD M/MSPD H/HSPD

Compatible command of NPM2C-01.
    x: 0/channel A   1/ch B   2/ch C   3/ch D

Command	Explanation
SPD?x	Read out the motor speed setting of channel x. Reply: LSPD/MSPD/HSPD
S48 (old version)	Read out the motor speed setting of both channel. Reply: RRN03<ab> a: ch A, b: ch B a, b: 1/LSPD, 2/MSPD, 3/HSPD Example RRN0321: Ch A is set to MSPD and ch B is set to LAPD.
SCANPx SCANNx	SCANPx: Motor drives to CW direction continuously at the above selected speed. SCANNx: Motor drives to CCW direction continuously at the above selected speed.
S3x0E S3x0F (old version)	S3x0E: Motor drives to CW direction continuously at the above selected speed. S3x0F: Motor drives to CCW direction continuously at the above selected speed.
CSCANPx CSCANNx S3x0C S3x0D (old version)	It is the same as the above command "SCANPx", "SCANNx", "S3x0E" and "S3x0F", but moves without acceleration / deceleration. Becareful of SPD setting value, because too fast SPD value causes motor step out.
SCANHPx SCANHNx S3x1E S3x1F (old version)	It is the same as the above command "SCANPx", "SCANNx", "S3x0E" and "S3x0F", except that the motor stops suddenly if the home position sensor operates. If you know the approximate home position, it can detect the home position in a short period of time.
SSTPx S3x40 (old version)	Decelerate and stop the motor of the selected channel.
ESTPx S3x80 (old version)	Suddenly stop the motor of the selected channel.

(old version) ・・・・Compatible command of NPM2C-01.　d:decimal
　　x: 0/channel A　1/ch B　2/ch C　3/ch D

Command	Explanation
ASSTP	Decelerate and stop the motors of both ch A and ch B.
AESTP	Suddenly stop the motors of both ch A and ch B.
ABSx±ddd...d ABSxBddd…d	Move the selected motor by absolute position specification. If you enter B, the motor moves while performing backlash correction. ddd…d: −2,147,483,647 to +2,147,483,647 Example ABS03000: Move the motor of ch A to the position of +3000. ABS1B−1500: Move the motor of ch B to the position of 　　　　　−1500 with backlash correction.
S38x±DDDDDDDbb (old version)	Move the selected motor by absolute position specification. ±DDDDDDD: −9,999,999 to +9,999,999 (decimal) bb: 11/constant movement 　　13/acceleration and deceleration movement Example S381+002000013: Move the motor of ch B to the position of 　　　　　+20000 with acceleration and deceleration 　　　　　movement.
S3aA±DDDDDDD S3aA±DDDDDDDB (old version)	Move the selected motor by absolute position specification. If you enter B, the motor moves while performing backlash correction. a: 2/ch A, 3/ch B ±DDDDDDD: −9,999,999 to +9,999,999 (decimal) Example S32A+0020000: Move the motor of ch A to the position of 　　　　　+20000.

(old version) ・・・・Compatible command of NPM2C-01.
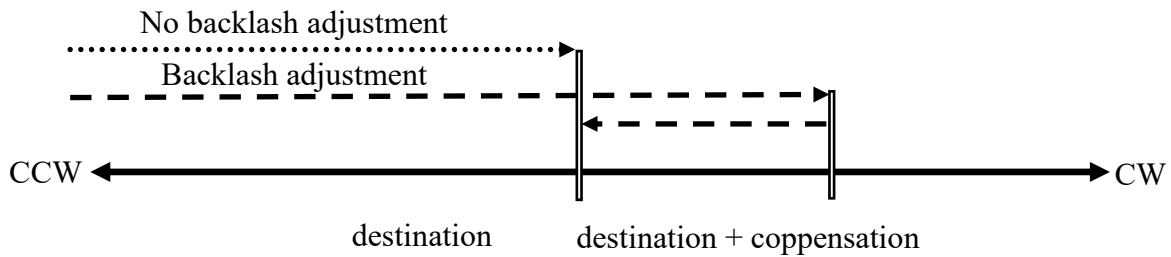   x: 0/channel A   1/ch B   2/ch C   3/ch D

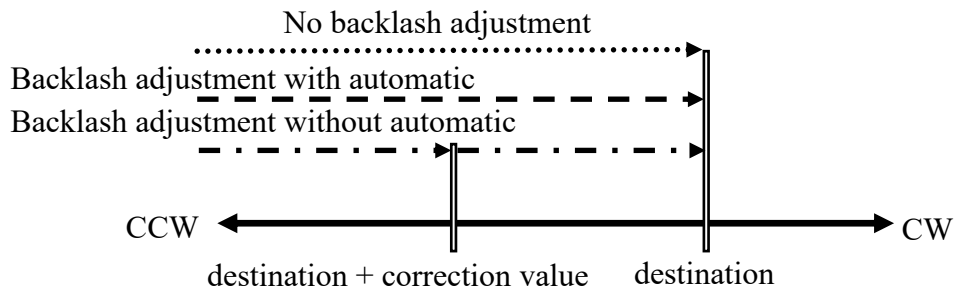| Command	Explanation
RELx±ddd...d RELxBddd…d	Move the selected motor with relative position specification. If you enter B, the motor moves while performing backlash correction. ddd…d: −2,147,483,647 to +2,147,483,647 Example REL03000: Move the motor of ch A by +3000 pulses. REL1B−1500: Move the motor of ch B by −1500 pulses with backlash correction.

S38x
±DDDDDDbb
(old version)
	Move the selected motor with relative position specification.
	
	±DDDDDDD: −9,999,999 to +9,999,999 (decimal)
	bb: 10/constant movement
	    12/acceleration and deceleration movement
	
	Example
	S381−002000012: Move the motor of ch B by +3000 pulses with
	                  acceleration and deceleration movement.

S3aR ±DDDDDDD S3aR ±DDDDDDDB (old version)	Move the selected motor with relative position specification. If you enter B, the motor moves while performing backlash correction. a: 2/ch A, 3/ch B ±DDDDDDD: −9,999,999 to +9,999,999 (decimal) Example S32R+0020000: Move the motor of ch A by +20000 pulses.
PAUSE ON S3x16 (old version)	These commands are for synchronous start of motors. All motor except moving are changed standby status by "PAUSE ON" command. If release standby staus by "PAUSE OFF" command, reserved commands are all executed.
PAUSE OFF S3x17 (old version)	
PAUSE?	Check the motor standby status. Reply: ON/OFF

・Backlash adjustment

It is a function to return to destination after moving a set pulse number extra. For example, if the corrected step number is +500, the motor move point that added +500 to destination. After that the motor return 500 steps and positioning is completed.

Backlash correction move has different behavior by plus and minus of correction and how to approach to destination from CCW direction or CW direction. Please refer below to two example.

Ex.1) Move direction is CW and adjustment value is positive

No backlash adjustment

Backlash adjustment

CCW ← → CW

destination   destination + coppensation

Ex.2) Move direction is CW and adjustment value is negative

No backlash adjustment

Backlash adjustment with automatic

Backlash adjustment without automatic

CCW ← → CW

destination + correction value   destination

When the automatic adjustment is effective, backlash correction move is the same as no backlash correction. When the automatic adjustment is ineffective, as soon as the motor once stops at correction value, the motor drives to destination soon.

(Old version) ・・・・Compatible command of NPM2C-01.   d:decimal
    x: 0/channel A   1/ch B   2/ch C   3/ch D

Command	Explanation
Bx±dddd (old version)	Backlash correction data set. dddd: −9,999 to +9,999 (decimal)
Bx? (old version)	Backlash correction data read. Reply: ±DDDD: −9,999 to +9,999 (decimal)
BADJxd	Set whether backlash correction is valid or invalid. d: 0/invalid, 1/valid
BADJ?x	Check the set value of backlash correction. Reply: 0/invalid, 1/valid

6-4 Motor parameter setting and Reading command commentary

(Old version) ・・・・Compatible command of NPM2C-01.　d:decimal
　　x: 0/channel A　1/ch B　2/ch C　3/ch D

Command	Explanation
SETMTxabcd	Set the basic characteristics of the selected motor. a: 1/ Motor operation possible　　　　This setting is fixed to 1. b. 1/ hold on　　　　　　　　　　0/ hold off In the hold off state, a hold off signal is output to an externally installed driver. When motor operation is performed in this state, automatically hold on state is set immediately before operation, and it returns to the hold off state again at the end of operation. c: 0/Const (Constant) ,1/ Trape (Trapezoid) ,2/ Character (S shape drive) 　　Set the motor acceleration / deceleration form. d: 0/ Pulse – Pulse　　　1/ Pulse – Direction 　　Set the signal output form to the externally installed motor driver.
SETMT?x	Reply: abcd　　　　Read the basic setting of the selected motor. 　　　　　　　　For the contents of abcd, refer to the section on SETMT command. Example: The response is 1010 　・・・・ This motor is in hold off state, trapezoidal acceleration / deceleration form, Pulse - Pulse output.
SPDH?x	Reply: dddddd (An integer of 6 digits or more) Read the HSPD value of the selected motor in PPS units.
SPH?x (old version)	Reply: Rdddddd (An integer of 6 digits)
S4x0 (old version)	Reply: RXHDDDD Read the HSPD value of the selected motor in code (Reference at the end of the document). DDDD: Code value
SPDHxddd… SPHxdddddd (old version)	Set the HSPD value of the selected motor in PPS units. ddd… 1～5,000,000 (Any number of digits) dddddd: 000001～999,999 (6 digits)
S39x0DDD (old version)	Set the HSPD value of the selected motor with 3 digits code. (See P21) DDD: 000～254 (3 digits)
SPDM?x	Reply: dddddd (An integer of 6 digits or more) Read the MSPD value of the selected motor in PPS units.
SPM?x (old version)	Reply: Rdddddd (An integer of 6 digits)
S4x1 (old version)	Reply: RXMDDDD Read the MSPD value of the selected motor in code (See P21).
SPDMxddd… SPMxdddddd (old version)	Set the MSPD value of the selected motor in PPS units. ddd… 1～5,000,000 (Any number of digits) dddddd: 000001～999,999 (6 digits)
S39x1DDD (old version)	Set the MSPD value of the selected motor with 3 digits code. (See P21) DDD: 000～254 (3 digits)
SPDL?x	Reply: dddddd (An integer of 6 digits or more) Read the LSPD value of the selected motor in PPS units.
SPL?x (old version)	Reply: Rdddddd (An integer of 6 digits)
S4x2 (old version)	Reply: RXLDDDD Read the LSPD value of the selected motor in code. (See P21)

(Old version) ・・・・Compatible command of NPM2C-01.　d:decimal
　　x: 0/channel A　1/ch B　2/ch C　3/ch D

Command	Explanation
SPDLxddd…	Set the LSPD value of the selected motor in PPS units.
SPLxdddddd (old version)	ddd… 1〜5,000,000 (Any number of digits)
	dddddd: 000001〜999,999 (6 digits)
S39x2DDD (old version)	Set the LSPD value of the selected motor with 3 digits code. (See P21) DDD: 000〜254 (3 digits)
RTE?x	Reply: ddd (An integer of 3 digits) Read the acceleration / deceleration rate of the selected motor with 3 digits code. (See P22)
S4x3 (old version)	Reply: RXRddd DDD: Code value
RTExddd	Set the acceleration / deceleration rate of the selected motor with code.
S39x3ddd (old version)	ddd: 0〜115

6-5 Current position setting and Reading command commentary

Command	Explanation
PS?x	Reply: ±ddd・・・d (Signed 7 or more digit integer) Read the current position of the selected motor.
S2x0 (old version)	Reply: RX±DDDDDDD (Signed 7 digits integer)
S4xPS (old version)	Reply: RX±DDDDDDD (Signed 7 digits integer)
PSxddd…	Set the current position of the selected motor. ddd….: -2,147,483,647 〜 +2,147,483,647 The number of digits and the sign are arbitrary.
S5xPS±DDDDDDD (old version)	±DDDDDDD: -9,999,999〜9,999,999　　Signed 7 digits integer

6-6 Commands related to HOLD OFF

Command	Explanation
HOLD?x	Reply: ON/OFF Read the HOLD OFF signal output state of the selected motor.
HOLDxON	
S3x19 (old version)	The hold off signal of the selected motor is canceled.
HOLDxOFF	
S3x18 (old version)	The hold off signal is output to the selected motor.

6-7 Command for set and read out limit switch data parameters

(old version) ・・・・Compatible command of NPM2C-01.

x: 0/channel A   1/ch B   2/ch C   3/ch D

Command	Explanation

SETLSxdaaa0bbb	Set the states of limit switch of motor channel x.
	  d: Soft limit switch 0/disable, 1/enable
	  aaa: limit switch 0/disable, 1/enable (From the left, HP, CCW, CW)
	  bbb: Contact switching 0/N.O, 1*N.C (From the left, HP, CCW, CW)

SETLS?x	Reply: daaa0bbb Read the states of limit switch of motor channel x setted up by the above command.
LS?	Reply: 0123ABCD Read the states of limit switch and HOLD OFF signal. A, B, C, D: Displays the state of the limit switch and HOLD OFF signals at all channels in hexadecimal digit. A bit with 1 indicates there is an output. <table><tr><td>b3: Hold off</td><td>b1: CCW LS</td></tr><tr><td>b2: HP LS</td><td>b0: CW LS</td></tr></table>
S2x2 (old version)	Reply: RXH H: Display the states of limit switch and HOLD OFF signal with hex digit number.
HDSTLS?	Reply: 01ABCDabcd Read the states of limit switch and soft limit switch. A,B,C,D: Display the state of each limit switch at all channels in hexadecimal digit. a,b,c,d: Display the state of each soft limit switch at all channels in hexadecimal digit. A bit with 1 indicates there is an output. <table><tr><td>b3: NO USE</td><td>b1: CCW LS</td></tr><tr><td>b2: HP LS</td><td>b0: CW LS</td></tr></table>
LSEN? (old version)	Reply: RHHhh Read the ENABLE/DISABLE of limit switch of the each channels with hex two digits number. HH(hh): 0/ DISABLE, 1/ ENABLE HH shows chD and C, hh is chB and A. <table><tr><td>b7: Channel D(B), HP limit switch</td><td>b3: Channel C(A), HP limit switch</td></tr><tr><td>b6: NO USE</td><td>b2: NO USE</td></tr><tr><td>b5: Channel D(B),CCW limit switch</td><td>b1: Channel C(A),CCW limit switch</td></tr><tr><td>b4: Channel D(B), CW limit switch</td><td>b0: Channel C(A), CW limit switch</td></tr></table> Example: When the reply was RFFFF, all limit switches are enabled.
LSENHHhh (old version)	Set the ENABLE/DISABLE of limit switch of each channels with hex four digits number.
LSIV? (old version)	Reply: RHHhh Read the contact of limit switch of each channels with hex two digits number. HH(hh): 0/ DISABLE, 1/ ENABLE HH shows chD and C, hh is chB and A. <table><tr><td>b7: Channel B(D), HP limit switch</td><td>b3: Channel A(C), HP limit switch</td></tr><tr><td>b6: NO USE</td><td>b2: NO USE</td></tr><tr><td>b5: Channel B(D),CCW limit switch</td><td>b1: Channel A(C),CCW limit switch</td></tr><tr><td>b4: Channel B(D), CW limit switch</td><td>b0: Channel A(C), CW limit switch</td></tr></table> Example: When the reply was RFFFF, all limit switches are N.C.
LSIVHHhh (old version)	Set the contact of limit switch of each channels with hex four digits number.

(Old version) ・・・・Compatible command of NPM2C-01.　d:decimal
　　　x: 0/channel A　1/ch B　2/ch C　3/ch D

Command	Explanation
STOPMDxa S39x5a (old version)	Set stop method when limit switch is detected. a: 0/ Deceleration stop, 1/ Sudden stop
STOPMD?x	Reply: a　　Read stop method when limit switch is detected.
S39x6HH (old version)	Set various flags. HH: Hex two digits number. <table><tr><td>b7: NO USE</td><td>b3: NO USE</td></tr><tr><td>b6: NO USE</td><td>b2: NO USE</td></tr><tr><td>b5: Automatic backlash adjustment</td><td>b1: NO USE</td></tr><tr><td>b4: Soft limit switch state</td><td>b0: Limit switch stop mode</td></tr></table> ・When the automatic backlash adjustment bit is set to "1", backlash movement is performed regardless of the moving direction when the backlash correction command is executed. When it is set to 0, move direction is judged and if there is a value of the movement destination in the correction direction (When the correction value is positive the CCW direction), move without performing backlash compensation movement. ・When the soft limit state is set to "1", the soft limit switch is enabled. ・When the limit switch stop mode is set to "1", it does sudden stop when the limit switch is detected. When it is set to "0", deceleration stops.
S4x5 (old version)	Reply: RxS00HH　　　　Read various flags. HH:　Refer to the command of S39x6.
FLxddd・・・ S5xFL±DDDDDDD (old version)	Set soft limit value of CW side to be used when soft limit is enabled. ddd…: -2,147,483,647 ～ +2,147,483,647 The number of digits and the sign are arbitrary. ±DDDDDDD:　Signed 7 digits integer
FL?x	Reply: ±ddddddd Read the digital limit value on the CW side.
S4xFL (old version)	Reply: ±ddddddd　　　Signed 7 digits integer
BLxddd・・・ S5xBL±DDDDDDD (old version)	Set soft limit value of CCW side to be used when soft limit is enabled. ddd…: -2,147,483,647 ～ +2,147,483,647 The number of digits and the sign are arbitrary. ±DDDDDDD:　Signed 7 digits integer
BL?x	Reply: ±ddddddd Read the digital limit value on the CCW side.
S4xBL (old version)	Reply: ±ddddddd　　　Signed 7 digits integer

6-8 Other commands

Command	Explanation
VER?	Reply: 1.00 15-03-27 UPM4C-01 etc. Read the version information of the built-in firmware.
VERH?	Reply: HD-VER etc. Read the version information of the hardware.
FROM?	Reply: FROM0/1 Read the flash ROM for saving the firmware currently in use.
FROM0 FROM1	Set the flash memory to be used out of the two firmware save flash ROMs. After inputting this command, restart the power supply or start up with the firmware of the flash ROM selected by inputting the REST command.
REST	Reset the UPM4C-01. This is the same operation as unplugging the USB cable and inserting it again.
REST_INIT	In addition to executing the REST command, return the parameter to the factory setting.

6-9 The initialization of setting data

Input the "REST_INIT" command, various setting data of "UPM4C-01" are initialized to the following values. Data to be set is common to channels A and B. If the motor stops working, save the set value and then initialize the setting data with the above command, it will operate normally.

Current position	0	HOLD OFF signal	ON (Signal output at stop)
Speed	MSPD	Acceleration/ Deceleration form	Trapezoidal acceleration/ deceleration
HSPD	3700	Pulse output mode	Pulse-Pulse
HSPD(code)	48	Limit switch	Enable
MSPD	650	Soft LS	Disable
MSPD(code)	16	Contact of LS	All N.O
LSPD	10	Stop mode of LS	Deceleration stop
LSPD(code)	1	Automatic backlash adjustment	Enable
RATE	13	CCW soft LS	-1,000,000
Backlash value	+100	CW soft LS	1,000,000

7　Firmware version up

You can perform firmware upgrade of UPM4C-01 via USB communication line.
To keep safety you had better pull out the cables between unit and motor driver, or put off the power line of motor drivers.
In addition, the setting including the pulse value is initialized after firmware version up.
Please save the parameter of the UPM4C-01 by using trial software or please write out the parameter from setting as necessary.
You can find the file transmit for firmware version up software and its user's manual in the product web page.

File transmit for firmware version up software (for windows)
　http://www.tsuji-denshi.co.jp/download/lan_rs_file_send.EXE
User's manual (PDF)
　http://www.tsuji-denshi.co.jp/manual_pdf/pm16c_04xd_vup_soft.pdf

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

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1. Download the text file for version upgrade from Tsuji-Electronics HP.
   Firmware update information and update files are informed this page.
   http://www.tsuji-denshi.co.jp/support/ver_11.html
2. Launch the program "Tera Term".
3. Click File -> New connection, and select com port for UPM4C-01 is connected.
4. Click SETUP -> Terminal, and set New-Line code to CR+LF both Receive and Transmit. Select Local Echo checkbox, and click OK button and exit setting.
5. Send the command "VER?", and if there is reply, the connection is OK.
6. Click File -> Send file, and appear send file select window. Choose the version up file that you have prepared at section 1(UPM4C_01_V1.xx.S).
7. "ACCESS" lamp is blinking while downloading firmware. If blinking is more quickly, this is the sign of writing new firmware to ROM. If stop blinking, this is the sign of firmware update is completed.
8. Disconnect the UPM4C-01 communication and pull USB cable out from UPM4C-01 or send "REST" command. Insert USB cable again, and start with new firmware.

UPM4C-01 contains two flash rom for writing firmware. The newer firmware is written on the unused flash rom, and will be selected new rom on next startup.
You can know which rom is current using by "FROM?" command, reply is "FROM0" or "FROM1". If you are going to compare the operation for firmware version difference, you can select the firmware for next startup with "FROM0" or "FROM1" command.

If trouble occurred in download process and failed to connect to UPM4C-01, you can restore with first written firmware on CPU-ROM. The restore process is below.

1. Pull USB cable and AC adaptor cable out from UPM4C-01, and remove the top plate.
2. Turn ON dip switch 1 and OFF dip switch 2 at DSW1 on circuit board.
3. Connect USB cable, and blink quickly "ACCESS" lamp. If stop blinking, pull cable out.
4. Turn OFF dip switch 1 and 2, and connect USB cable again.
5. UPM4C-01 turns on with factory firmware version.

8 Data1 SPEED code

The SPEED CODE used in the command to set the drive speed, but the speed corresponding to each code is undermentioned.

SPEED code Table (unit: PPS/Pulse Per Second)

No.	PPS	No.	PPS	No.	PPS	No.	PPS	No.	PPS	No.	PPS
0	5	43	3200	86	7500	129	15580	172	30680	215	58600
1	10	44	3300	87	7600	130	15770	173	31250	216	59400
2	25	45	3400	88	7700	131	15970	174	31850	217	60200
3	50	46	3500	89	7800	132	16180	175	32470	218	61100
4	75	47	3600	90	7900	133	16400	176	33110	219	61900
5	100	48	3700	91	8000	134	16610	177	33780	220	62800
6	150	49	3800	92	8200	135	16830	178	34480	221	63600
7	200	50	3900	93	8400	136	17060	179	35210	222	64500
8	250	51	4000	94	8600	137	17240	180	35970	223	65400
9	300	52	4100	95	8800	138	17420	181	36500	224	66300
10	350	53	4200	96	9000	139	17600	182	37040	225	67200
11	400	54	4300	97	9200	140	17800	183	37600	226	68100
12	450	55	4400	98	9400	141	17990	184	38170	227	69100
13	500	56	4500	99	9600	142	18180	185	38760	228	70000
14	550	57	4600	100	9800	143	18380	186	39370	229	71000
15	600	58	4700	101	10000	144	18660	187	40000	230	72000
16	650	59	4800	102	10200	145	18940	188	40500	231	73000
17	700	60	4900	103	10400	146	19230	189	41100	232	74000
18	750	61	5000	104	10600	147	19530	190	41600	233	75000
19	800	62	5100	105	10800	148	19840	191	42200	234	76000
20	900	63	5200	106	11010	149	20160	192	42800	235	77100
21	1000	64	5300	107	11210	150	20500	193	43400	236	78100
22	1100	65	5400	108	11410	151	20830	194	44000	237	79200
23	1200	66	5500	109	11600	152	21190	195	44600	238	80300
24	1300	67	5600	110	11800	153	21550	196	45200	239	81400
25	1400	68	5700	111	11990	154	21930	197	45800	240	82500
26	1500	69	5800	112	12200	155	22320	198	46400	241	83700
27	1600	70	5900	113	12400	156	22730	199	47100	242	84800
28	1700	71	6000	114	12600	157	23150	200	47700	243	86000
29	1800	72	6100	115	12790	158	23590	201	48400	244	87200
30	1900	73	6200	116	12990	159	24040	202	49100	245	88400
31	2000	74	6300	117	13200	160	24510	203	49700	246	89600
32	2100	75	6400	118	13400	161	25000	204	50400	247	90800
33	2200	76	6500	119	13620	162	25510	205	51100	248	92100
34	2300	77	6600	120	13810	163	26040	206	51800	249	93300
35	2400	78	6700	121	14000	164	26600	207	52500	250	94600
36	2500	79	6800	122	14200	165	27170	208	53300	251	95900
37	2600	80	6900	123	14400	166	27620	209	54000	252	97300
38	2700	81	7000	124	14620	167	28090	210	54700	253	98600
39	2800	82	7100	125	14830	168	28570	211	55500	254	100000
40	2900	83	7200	126	15010	169	29070	212	56300		
41	3000	84	7300	127	15200	170	29590	213	57000		
42	3100	85	7400	128	15390	171	30120	214	57800		

9 Data2 Acceleration / Deceleration rate

The acceleration / deceleration rate is a coded value from 0 to 115, but the acceleration / deceleration values corresponding to each rate data are undermentioned. unit: ms/1000pps (The time it takes to reach the speed of 1000 pps).

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	81	0.43	101	0.062
2	820	22	120	42	18	62	2.7	82	0.39	102	0.056
3	750	23	110	43	16	63	2.4	83	0.36	103	0.051
4	680	24	100	44	15	64	2.2	84	0.33	104	0.047
5	620	25	91	45	13	65	2	85	0.3	105	0.043
6	560	26	82	46	12	66	1.8	86	0.27	106	0.039
7	510	27	75	47	11	67	1.6	87	0.24	107	0.036
8	470	28	68	48	10	68	1.5	88	0.22	108	0.033
9	430	29	62	49	9.1	69	1.3	89	0.2	109	0.030
10	390	30	56	50	8.2	70	1.2	90	0.18	110	0.027
11	360	31	51	51	7.5	71	1.1	91	0.16	111	0.024
12	330	32	47	52	6.8	72	1	92	0.15	112	0.022
13	300	33	43	53	6.2	73	0.91	93	0.13	113	0.020
14	270	34	39	54	5.6	74	0.82	94	0.12	114	0.018
15	240	35	36	55	5.1	75	0.75	95	0.11	115	0.016
16	220	36	33	56	4.7	76	0.68	96	0.1		
17	200	37	30	57	4.3	77	0.62	97	0.091		
18	180	38	27	58	3.9	78	0.56	98	0.082		
19	160	39	24	59	3.6	79	0.51	99	0.075		

10 Performance and Specifiation

Power	Supply DC 5 V from USB port, or supply DC +12V from an optional AC adapter (T3168AC)	
INPUT OUTPUT	Control motor	4 motors can be controlled
	Capability	4 motors can be controlled simultaneously.
	Control output	CW and CCW (+5V 8mA: line driver) for each motor driver.
		HOLD OFF signal for each motor driver (Open collector output and +5V common)
	Output frequency	5～5MPPS
	Control pulse	0～±2,147,483,647
	Acceleration and Deceleration rate	1000～0.125 ms/KHz
	Acceleration and Deceleration form	Constant and Trapezoid, S shape form
	Output specification	2 pulses (pulse - pulse) 1 pulse (pulse – direction, dir signal polarity reversible)
	Pulse out connector	Dsub9S(F)
	Limit switch input	CW-LS, CCW-LS, HOME-LS 12V 5mA (minus common) for each control motor. Using the AC adapter, power supply +12V for censer is available (MAX 0.5A).
	Limit switch connector	Dsub9P(M)
Stepping mode	SCAN MODE	Continuously stepping the selected motor.
	ABS IDX MODE	Move the selected motor to the set value.
	REL IDX MODE	Move the selected motor by the set value.
Communication port	USB	Communication conector: USB-B, USB1.1, USB 2.0 compatible. Communication for virtual Com port driver similar to serial port.
Case and Weight	Stationary type (70H×170W×100D) 500g	

For the further information, feel free to ask us.