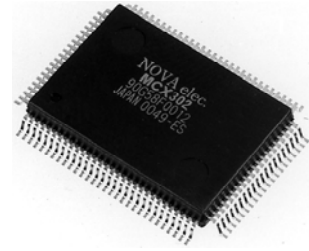


MCX302 is 2-axis motion control IC which can independently control each 2 axes of either stepper motor driver or pulse type servo motor for position and speed control. This IC is pin-compatible with MCX312.

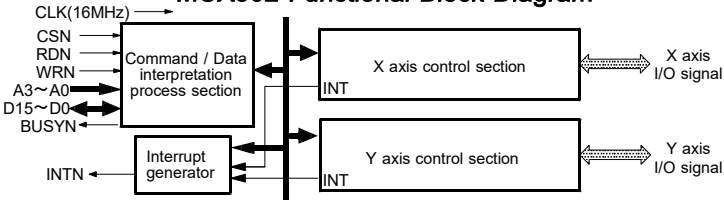


Specification

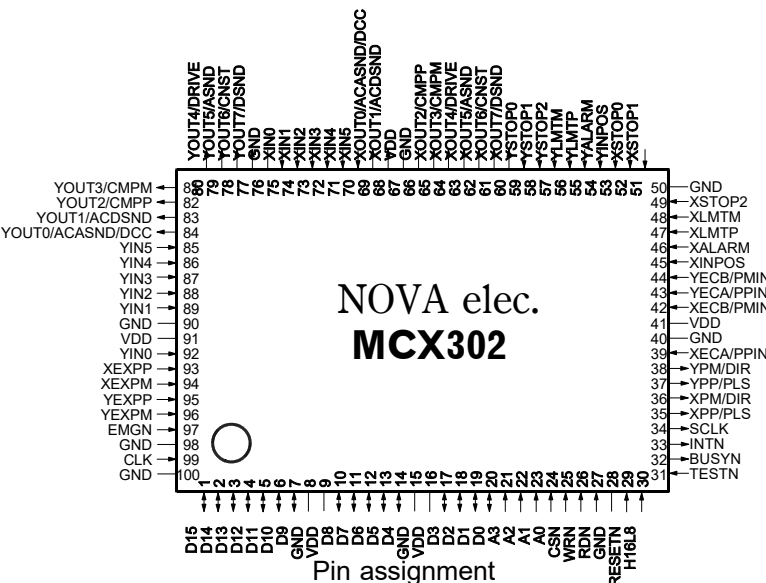
- Control axis 2 axes
- Data bus width 16/8 bit selectable
- Drive output pulse(at CLK=16MHz)
- Output speed range 1 PPS ~ 4 MPPS
- Output speed accuracy ±0.1%(according to the setting value)
- S-curve jerk 954 ~ 31.25×10⁹ PPS/SEC²
- Accelerating/decelerating speed 125 ~ 500×10⁶ PPS/SEC
- Initial speed 1 ~ 4×10⁶ PPS
- Drive speed 1 ~ 4×10⁶ PPS
- Output pulse number 0 ~ 268,435,455 (Fixed drive) or Unlimited(Continuous drive)
- Speed curve
- Constant, linear acceleration/deceleration or parabola S-curve acceleration/deceleration
- Deceleration mode for fixed pulse Auto(Non-symmetry linear interpolation is allowed)/manual
- Output pulse number and speed during driving are changeable.
- Independent 2 pulse system or 1 pulse 1 direction system is selectable.
- Logical levels of pulse are selectable.
- Encoder input pulse
- 2 phase pulse style or Up/Down pulse style is selectable.
- 2 phase pulse single, double or quad counter edge evaluation is selectable.
- Position counter
- Logical position counter(for output pulse) -2,147,483,648 ~ +2,147,483,647
- Real position counter(for input pulse) -2,147,483,648 ~ +2,147,483,647
- Comparison register
- COMP+ register comparison range -1,073,741,824 ~ +1,073,741,823
- COMP-register comparison range -1,073,741,824 ~ +1,073,741,823
- Status and signal outputs for the comparisons of position counters.
- To work as software limit
- Automatic home search
- Automatic of execution of Step1(high-speed near home search)→Step2(low-speed home search)→Step3(low-speed encoder Z-phase search)→Step4(high-speed offset drive).
- Enable/disable and search direction for each step are selectable.
- Deviation counter clear output
- Clear pulse width within the range of 10μ ~ 20msec and logical level are selectable.
- Interrupt
- ..the start/finish of a constant-speed drive during the acceleration/deceleration driving
- ..the end of the driving
- ..transition to "position counter ≥ the volume of COMP-
- ..transition to "position counter < the volume of COMP-
- ..transition to "position counter ≥ the volume of COMP+
- ..transition to "position counter < the volume of COMP+

- External signal for driving
- EXPP and EXPM signal for +/- direction fixed/continuous pulse drive.
- Driving in manual pulsar mode(Encoder input).
- External decelerating/instant stop signal
- STOP0 ~ 2 3 points for each axis.
- Enable/disable and logical levels are selectable.
- Input signal for servo motor
- ALARM(Alarm) and INPOS(In position check)
- General input/output signal
- IN 0~5 6 points for each axis
- OUT 0~7 8 points for each axis(pin sharing with drive status output signal)
- Drive status signal output
- DRIVE(Driving), ASND(accelerating), DSND(decelerating),
- CMPP(Position ≥COMP+), CPM(Position <COMP-), ACASND
- (accelerating/decelerating speed increasing) and ACDSND
- (accelerating/decelerating speed decreasing).
- Limit signal input
- 1 point for each +/-direction
- Logical levels and decelerating/instant stop are selectable.
- Emergency stop signal
- EMGN 1 point for all axes
- Stop the drive pulse of all axes immediately in Low level.
- Integral filter built-in.
- Equipped integral filter in the input column of each input signal.
- One time constant can be selected from 8 types.
- Electrical characters
- Temperature range for operating 0 ~ + 85°C (32°F ~181°F)
- Power voltage +5V ± 5 % (Consumption current 50 mA max.)
- Input/output signal level TTL / CMOS level
- Input clock 16.000MHz (Standard.)
- Dimension(including pins) 23.8×17.8×3.05mm
- 100-pin plastic QFP, pin pitch=0.65

MCX302 Functional Block Diagram



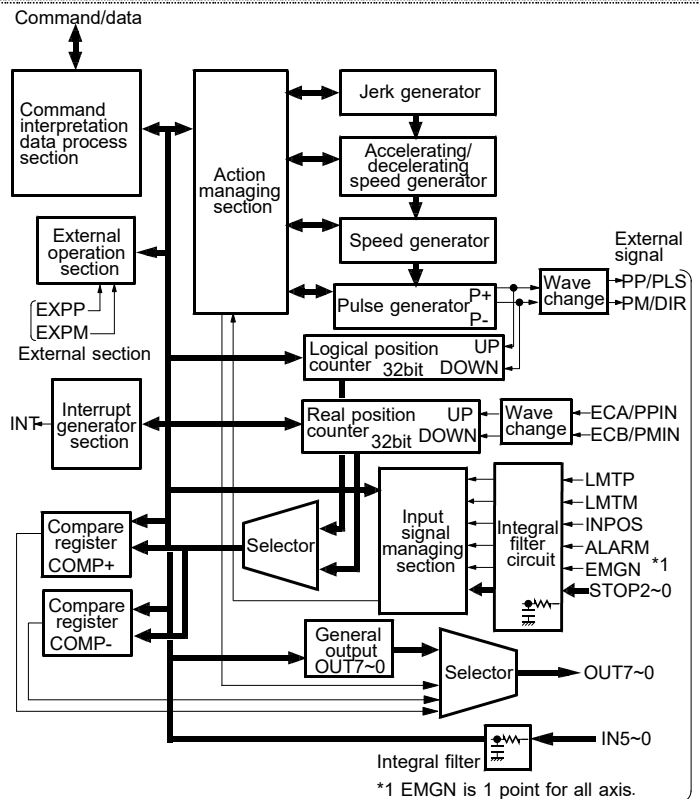
The block diagram of the whole function of MCX302



NOVA elec.
MCX302

Pin assignment

- Input/Output signals ((I): Input (O): Output (B): Bidirectional Each X and Y axis has nOOOO signal. "n" means each X and Y axis.)
- D15~0(B) Data bus ● A3~0(I) Address ● CSN(I) Chip select ● WRN(I) Write strobe ● RDN(I) Read strobe ● RESETN(I) Reset ● H16L8(I) 16/8 Data bit bus width selectable
- BUSYN(O)Executing the command ● INTN(O) Interrupt ● SCLK(O) 1/2CLK ● nPP/PLS(O) + direction drive pulse/Drive pulse ● nPM/DIR(O) - direction drive pulse/Direction
- nECA/PPIN(I) Encoder A-phase/Up pulse ● nECB/PMIN(I) Encoder B-phase/Down pulse ● nINPOS(I) In-position for servo driver ● nALARM(I) Servo driver alarm ● nLMTM(I) + direction limit ● nLMTM(I) - direction limit ● nSTOP2~0(I) 3points for decelerating/instant stop ● nOUT0~7(O) General output 8 points (DSND:Decelerating, CNST:Constant speed driving, ASND:Accelerating, DRIVE:Drive pulse output status, CPM:Position <COMP-, CMPP:Position ≥COMP+, ACDSND:accelerating/decelerating speed decreasing, ACASND/DCC:accelerating/decelerating speed increasing/pin sharing with deviation counter clear and signal)
- nIN5~0(I) General input 6 points ● nEXPP(I) External + direction drive, manual pulsar A-phase ● nEXPM(I) External -direction drive, manual pulsar B-phase
- EMGN(I) Emergency stop ● CLK(I) Clock 16MHz(Standard)



Block Diagram of the X and Y-axis Control Section

*1 EMGN is 1 point for all axis.

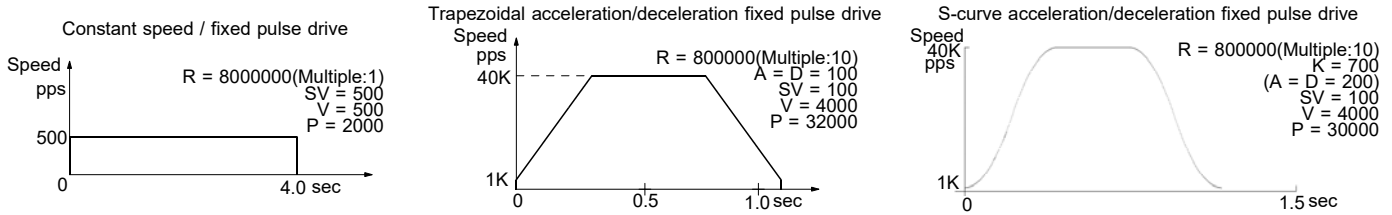
Individual control for 2 Axes

MCX302 has 32 bit position counter for each X and Y axis and function to drive constant speed, linear and S-curve acceleration/deceleration to the maximum speed 4MPPS. Drive command is operated by +/- direction fixed pulse drive or continuous drive basically.

● Fixed pulse: Output the specified pulse number.

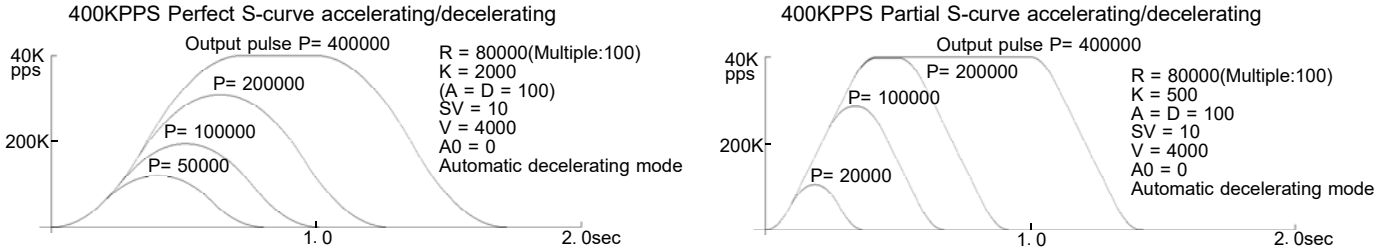
● Continuous pulse: Keep outputting the pulse unlimitedly until the stop factor is generated.

Either drive can be operated in constant speed and linear/S-curve acceleration/deceleration by operation parameter and mode setting.



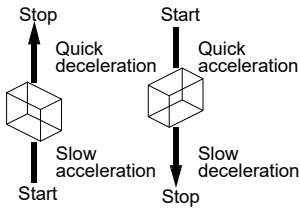
■ S-curve acceleration/deceleration drive

S-curve acceleration/deceleration has a style to increase or decrease accelerating/decelerating speed by linear function. Therefore, its speed curve moves as parabola S-curve. Triangle forms during S-curve acceleration/deceleration are prevented by a special method as the following figure however the number of output pulse is small. Perfect S-curve acceleration/deceleration drives as quadratic curve without linear acceleration/deceleration at all during accelerating/decelerating, contrarily, partial S-curve acceleration/deceleration drives as combining linear and curve driving during accelerating/decelerating.

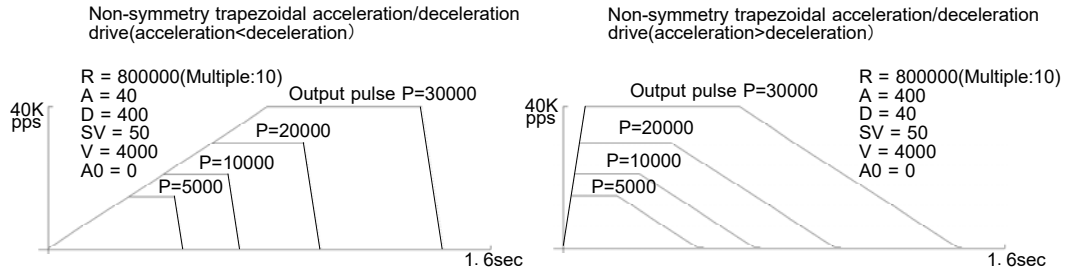


■ Automatic deceleration for non-symmetrical trapezoidal drive

In non-symmetrical trapezoidal acceleration/deceleration drive whose accelerating and decelerating speed are different, automatic decelerating is started since the start point of decelerating is calculated inside MCX302. There is no need to set the start point of decelerating from CPU for users.



As the above figure shows, when the objects are moved in up/down direction, gravity acceleration is added. For effective transporting, non-symmetry trapezoidal drive is needed.



Individual acceleration/deceleration: WR3/D1 = 1,
 Preventing triangle forms ON: WR3/D5 = 1

[Note] In acceleration > deceleration, there is limitation for the rate of acceleration and deceleration which can be operated by automatic deceleration. The limitation depends on the value of driving speed. For example, when the driving speed is 100kpps, its rate is to 1/40.

Automatic home search

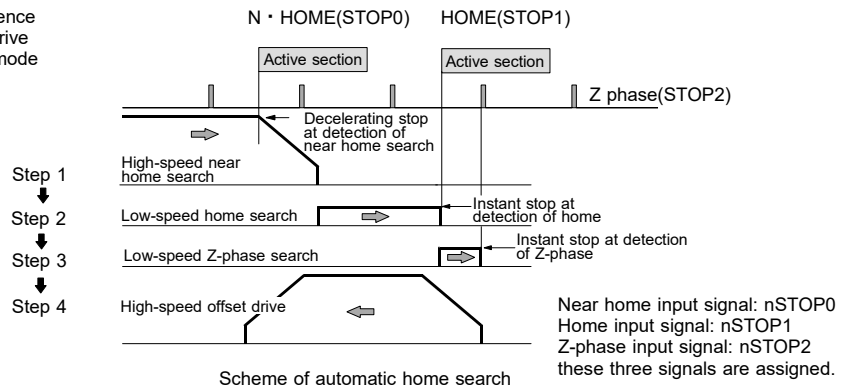
The automatic home search function executes the home search sequence from step 1: high-speed near home search to step 4: high-speed offset drive as the right figure. Set execution/non-execution and search direction mode for each step.

■ Search speed

In step 1 and 4, search action is executed by high speed which is set as the drive speed (V). Or, in step 2 and 3, search action is executed by low speed which is set as the home detection speed (HV)

■ Irregular operation

In irregular case, for example, the signal is already active in sensor active part before the searching starts or which is detecting the limit for the direction of movement during searching, the correct home search is executed.



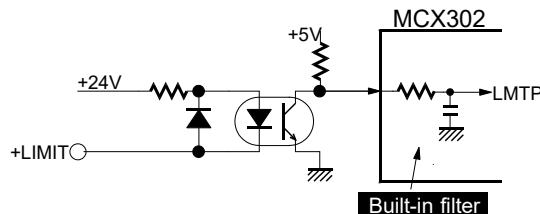
Built-in integral filter

The signal of limit and driving stop for each axis are influenced by external noise.

To cut these noises, photo coupler or CR integral filter is mounted on the circuit normally.

However MCX302 is equipped with integral type filters in the input stage of each input signal. It is possible to set a number of input signals whether the filter function is enabled or the signal is passed through.

A filter time constant is selectable from eight stages, min. 22µsec ~ max. 16msec.



FL2~0	Input delay time
0	2µSEC
1	256µSEC
2	512µSEC
3	1.024mSEC
4	2.048mSEC
5	4.096mSEC
6	8.192mSEC
7	16.384mSEC

Write register

Address A2 A1 A0			Symbol	Name	Contents																																	
0	0	0	WR0	Command register	<p>Axis assignment and writing the command code.</p> <table border="1" style="width:100%; border-collapse: collapse;"> <tr> <td>D15</td><td>D14</td><td>D13</td><td>D12</td><td>D11</td><td>D10</td><td>D9</td><td>D8</td><td>D7</td><td>D6</td><td>D5</td><td>D4</td><td>D3</td><td>D2</td><td>D1</td><td>D0</td> </tr> <tr> <td>RESET</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>Y</td><td>X</td><td>0</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> </table> <p style="text-align: center;">Axis assignment Command code</p> <p>● D9,8 Axis assignment 0:non-select/1:select (Mult-axis are selectable at one time) ● D15 1:Reset</p>	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0	RESET	0	0	0	0	0	Y	X	0								
D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0																							
RESET	0	0	0	0	0	Y	X	0																														
0	0	1	XWR1 YWR1	X axis mode register 1 Y axis mode register 1	<p>Setting of the logical levels and enable/disable of external decelerating/instant stop, interruption enable/disable and the operation mode setting for real position counter for each axis</p> <table border="1" style="width:100%; border-collapse: collapse;"> <tr> <td>D15</td><td>D14</td><td>D13</td><td>D12</td><td>D11</td><td>D10</td><td>D9</td><td>D8</td><td>D7</td><td>D6</td><td>D5</td><td>D4</td><td>D3</td><td>D2</td><td>D1</td><td>D0</td> </tr> <tr> <td>D-END</td><td>C-STAC</td><td>ENDP</td><td>≥C+</td><td>P<C+</td><td>P<C-</td><td>P≥C-</td><td>SMODE</td><td>EPIN</td><td>VEPCL</td><td>R</td><td>SP2-E</td><td>SP2-L</td><td>SP1-E</td><td>SP1-L</td><td>SP0-E</td><td>SP0-L</td> </tr> </table> <p style="text-align: center;">Interrupt enable/disable Drive decelerating/instant stop input signal</p> <p>● D5~0 ***-E 0:disable/1:enable ***-L Logical level 0:Low/1:Hi ● D6: Real position counter cleared by STOP2 signal 0:disable/1:enable ● D7:Real position counter increase/decrease inversion function 0:disable/1:enable ● D8:Speed prior in S-curve acceleration/deceleration 0:disable/1:enable ● D15~9 0:Interrupt enable/1:disable ● D9:Logical/real position counter≥COMP-variation ● D10:Logical/real position counter<COMP-variation ● D11:Logical/real position counter<COMP+variation ● D12:Logical/real position counter≥COMP+variation ● D13:The termination of constant speed drive during acceleration/deceleration driving ● D14:The start of constant speed drive during acceleration/deceleration driving ● D15:Termination of driving</p>	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0	D-END	C-STAC	ENDP	≥C+	P<C+	P<C-	P≥C-	SMODE	EPIN	VEPCL	R	SP2-E	SP2-L	SP1-E	SP1-L	SP0-E	SP0-L
D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0																							
D-END	C-STAC	ENDP	≥C+	P<C+	P<C-	P≥C-	SMODE	EPIN	VEPCL	R	SP2-E	SP2-L	SP1-E	SP1-L	SP0-E	SP0-L																						
0	1	0	XWR2 YWR2	X axis mode register 2 Y axis mode register 2	<p>Setting of enable/disable of software limit, the mode of the limit input signal, the mode of drive pulse, the mode of encoder input signal and the logical levels and enable/disable of servo motor signal for each axis.</p> <table border="1" style="width:100%; border-collapse: collapse;"> <tr> <td>D15</td><td>D14</td><td>D13</td><td>D12</td><td>D11</td><td>D10</td><td>D9</td><td>D8</td><td>D7</td><td>D6</td><td>D5</td><td>D4</td><td>D3</td><td>D2</td><td>D1</td><td>D0</td> </tr> <tr> <td>INP-E</td><td>INP-L</td><td>ALM-E</td><td>ALM-L</td><td>PIND1</td><td>PIND0</td><td>PINMD</td><td>DIR-L</td><td>PLS-L</td><td>PLSMD</td><td>CMPSL</td><td>HLMT-</td><td>HLMT+</td><td>LMTMD</td><td>SLMT-</td><td>SLMT+</td> </tr> </table> <p>● D1, 0 Software limit 0:disable/1:enable ● D2 Hardware limit 0:instant/1:decelerating stop ● D4, 3 Logical level of limit signal 0:Low/1:Hi ● D5 COMP+/- register comparison 0:logical position counter/1:real position counter ● D6 Drive pulse outputting type 0:2-pulse system /1:1-pulse 1-direction system ● D7 Logical level of drive pulse 0:positive logical pulse / 1:negative logical pulse ● D8 Logical level of the direction signal 0:Low level for + direction/1:Hi level for + direction ● D9 Encoder input signals 0:2-phase pulse/1:Up/Down pulse ● D11, 10 Encoder input divide 00:1/1, 01:1/2, 10:1/4 ● D12 Logical level of ALARM signal 0:Low/1:Hi ● D13 ALARM signal 0:disable/1:enable ● D14 Logical level of INPOS signal 0:Low/1:Hi ● D15 INPOS signal 0:disable/1:enable</p>	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0	INP-E	INP-L	ALM-E	ALM-L	PIND1	PIND0	PINMD	DIR-L	PLS-L	PLSMD	CMPSL	HLMT-	HLMT+	LMTMD	SLMT-	SLMT+	
D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0																							
INP-E	INP-L	ALM-E	ALM-L	PIND1	PIND0	PINMD	DIR-L	PLS-L	PLSMD	CMPSL	HLMT-	HLMT+	LMTMD	SLMT-	SLMT+																							
0	1	1	XWR3 YWR3	X axis mode register 3 Y axis mode register 3	<p>Setting of the manual deceleration, symmetry/non-symmetry of acceleration/deceleration, acceleration/deceleration mode, external operation mode, switching between general purpose output and drive status output and input signal filter.</p> <table border="1" style="width:100%; border-collapse: collapse;"> <tr> <td>D15</td><td>D14</td><td>D13</td><td>D12</td><td>D11</td><td>D10</td><td>D9</td><td>D8</td><td>D7</td><td>D6</td><td>D5</td><td>D4</td><td>D3</td><td>D2</td><td>D1</td><td>D0</td> </tr> <tr> <td>FL2</td><td>FL1</td><td>FL0</td><td>FE4</td><td>FE3</td><td>FE2</td><td>FE1</td><td>FE0</td><td>OUTSL</td><td>VRING</td><td>AVTRI</td><td>EXOP1</td><td>EXOP0</td><td>SACC</td><td>DSNDE</td><td>MANLD</td> </tr> </table> <p>Filter time constant Input signal filter enable/disable</p> <p>● D0 Deceleration of fixed pulse drive 0:automatic/1:manual ● D1 Decelerating speed 0:using the value of accelerating speed(Symmetry)/1:using the value of decelerating speed(non-symmetry) ● D2 Acceleration/deceleration mode 0:Trapezoidal/1:S-curve ● D4,3 External driving operation 00:disable/01:continuous drive/10:fixed pulse drive/11>manual pulsar ● D5 Prevention of the triangle forms at linear acceleration/deceleration driving 0:disable/1:enable ● D6 Enable the variable ring function of position counter 0:disable/1:enable ● D7 nOUT7~0 outputting pin 0:outputting OUT7~0/ 1:outputting drive status(DSND,CNST,ASND,DRIVE,CMPP,ACDSND,ACASND) ● D8 EMG,LMTMP,M,STOP0,1 signal filter 0:disable/1:enable ● D9 STOP2 signal filter 0:disable/1:enable ● D10 INPOS and ALARM signal filter 0:disable/1:enable ● D11 EXPP/M signal filter 0:disable/1:enable ● D12 IN5~0 signal filter 0:disable/1:enable ● D15~D13 Setting of input filter time constant(000:0.002msec/ 001:0.02msec/ 010:0.05msec/ 011:1msec/ 100:2msec/ 101: 4msec/ 110:8msec/111:16msec)</p>	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0	FL2	FL1	FL0	FE4	FE3	FE2	FE1	FE0	OUTSL	VRING	AVTRI	EXOP1	EXOP0	SACC	DSNDE	MANLD	
D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0																							
FL2	FL1	FL0	FE4	FE3	FE2	FE1	FE0	OUTSL	VRING	AVTRI	EXOP1	EXOP0	SACC	DSNDE	MANLD																							
1	0	0	WR4	Output register	<p>Setting of the outputting value of general output signal nOUT7~0. 0:Low/ 1:Hi</p> <table border="1" style="width:100%; border-collapse: collapse;"> <tr> <td>D15</td><td>D14</td><td>D13</td><td>D12</td><td>D11</td><td>D10</td><td>D9</td><td>D8</td><td>D7</td><td>D6</td><td>D5</td><td>D4</td><td>D3</td><td>D2</td><td>D1</td><td>D0</td> </tr> <tr> <td>YOUT7</td><td>YOUT6</td><td>YOUT5</td><td>YOUT4</td><td>YOUT3</td><td>YOUT2</td><td>YOUT1</td><td>YOUT0</td><td>XOUT7</td><td>XOUT6</td><td>XOUT5</td><td>XOUT4</td><td>XOUT3</td><td>XOUT2</td><td>XOUT1</td><td>XOUT0</td> </tr> </table>	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0	YOUT7	YOUT6	YOUT5	YOUT4	YOUT3	YOUT2	YOUT1	YOUT0	XOUT7	XOUT6	XOUT5	XOUT4	XOUT3	XOUT2	XOUT1	XOUT0	
D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0																							
YOUT7	YOUT6	YOUT5	YOUT4	YOUT3	YOUT2	YOUT1	YOUT0	XOUT7	XOUT6	XOUT5	XOUT4	XOUT3	XOUT2	XOUT1	XOUT0																							
1	0	1	WR5		None																																	
1	1	0	WR6	Write data register 1	Setting of the low word 16-bit for data writing. (D15~D0)																																	
1	1	1	WR7	Write data register 2	Setting of the high word 16-bit for data writing. (D31~D16)																																	

● The above table indicates the address for 16-bit data bus. In 8-bit data bus access, the 16-bit data bus are divided into the high word byte (D15~8) and the low word byte (D7~0) by using address signal A3~A0.

● Each axis has WR1,WR2 and WR3 (mode register 1, 2 and 3). Writing the data in these registers by the same address. It depends on the axis assignment of the last command to write the data in the mode register of which axis. Or, user can select the axis by writing the NOP command which is assigned an axis just before.

● At resetting, all the bits of nWR1, nWR2, nWR3, WR4 and WR5 registers are cleared to 0(n=X and Y). The other registers are undetermined.

Automatic home search mode setting

Mode setting of automatic home search is executed by the setting command of automatic home search mode (60h), writing the axis assignment and the command code 60h in WR0 register after setting each bit of WR6 register as follows.

Address A2 A1 A0			Symbol	Name	Contents																																
1	1	0	WR6	Write data register 1	<table border="1" style="width:100%; border-collapse: collapse;"> <tr> <td>D15</td><td>D14</td><td>D13</td><td>D12</td><td>D11</td><td>D10</td><td>D9</td><td>D8</td><td>D7</td><td>D6</td><td>D5</td><td>D4</td><td>D3</td><td>D2</td><td>D1</td><td>D0</td> </tr> <tr> <td>DCCW2</td><td>DCCW1</td><td>DCCW0</td><td>DCC-L</td><td>DCC-E</td><td>LIMIT</td><td>SAND</td><td>PCLR</td><td>ST4-D</td><td>ST4-E</td><td>ST3-D</td><td>ST3-E</td><td>ST2-D</td><td>ST2-E</td><td>ST1-D</td><td>ST1-E</td> </tr> </table> <p>Setting of deviation counter clear outputting Step4 Step3 Step2 Step1</p> <p>● D6,4,2,0 STm-E Stepm execution 0:non-execution/1:execution ● D7,5,3,1 STm-D Stepm search direction 0:+ direction /1:- direction ● D8 Logical/real position counter clear after Step4 is executed 0:disable/1:enable ● D9 AND of Z-phase signal and home signal at Step3 0:disable/1:enable ● D10 Using limit signal as home signal 0:disable/1:enable ● D11 Deviation counter clear outputting 0:disable/1:enable ● D12 Deviation counter clear outputting and logical level 0:active Hi/1:Low ● D15~13 Deviation counter clear outputting active pulse width(000:0.01msec/ 001:0.02msec/ 010:0.1msec/ 011:0.2msec/ 100:1msec/ 101:2msec/ 110:10msec/ 111:20msec)</p>	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0	DCCW2	DCCW1	DCCW0	DCC-L	DCC-E	LIMIT	SAND	PCLR	ST4-D	ST4-E	ST3-D	ST3-E	ST2-D	ST2-E	ST1-D	ST1-E
D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0																						
DCCW2	DCCW1	DCCW0	DCC-L	DCC-E	LIMIT	SAND	PCLR	ST4-D	ST4-E	ST3-D	ST3-E	ST2-D	ST2-E	ST1-D	ST1-E																						

■ Read register

Address			Symbol	Name	Contents																																
A2	A1	A0																																			
0	0	0	RR0	Main status register	Displaying the drive and error status and automatic home search execution status of each axis . <table border="1"> <tr> <td>D15</td><td>D14</td><td>D13</td><td>D12</td><td>D11</td><td>D10</td><td>D9</td><td>D8</td><td>D7</td><td>D6</td><td>D5</td><td>D4</td><td>D3</td><td>D2</td><td>D1</td><td>D0</td> </tr> <tr> <td>-</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>Y-HOM</td><td>X-HOM</td><td>-</td><td>-</td><td>Y-ERR</td><td>X-ERR</td><td>-</td><td>-</td><td>Y-DRV</td><td>X-DRV</td> </tr> </table> Automatic home search execution Error Drive ●D1~0 1:driving ●D7~4 1:error occurring(become "1" whichever from RR2/D7~0,RR1/D15~12.) ●D9,8 1:automatic home search executing	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0	-	0	0	0	0	0	Y-HOM	X-HOM	-	-	Y-ERR	X-ERR	-	-	Y-DRV	X-DRV
D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0																						
-	0	0	0	0	0	Y-HOM	X-HOM	-	-	Y-ERR	X-ERR	-	-	Y-DRV	X-DRV																						
0	0	1	XRR1 YRR1	X axis status register 1 Y axis status register 1	Displaying the comparison of position counter and COMP± register. status of acceleration/deceleration during the driving and driving termination status. <table border="1"> <tr> <td>D15</td><td>D14</td><td>D13</td><td>D12</td><td>D11</td><td>D10</td><td>D9</td><td>D8</td><td>D7</td><td>D6</td><td>D5</td><td>D4</td><td>D3</td><td>D2</td><td>D1</td><td>D0</td> </tr> <tr> <td>EMG</td><td>ALARM</td><td>LMT</td><td>LMT+</td><td>-</td><td>STOP2</td><td>STOP1</td><td>STOP0</td><td>ADSN</td><td>ACNST</td><td>AASND</td><td>DSND</td><td>CNST</td><td>ASND</td><td>CMP-</td><td>CMP+</td> </tr> </table> Driving execution status ●D0 1:position counter≥COMP+ ●D1 1:position counter<COMP- ●D2 1:accelerating ●D3 1:constant speed driving ●D4 1:decelerating ●D5 1:increasing accelerating/decelerating speed ●D6 1:constant accelerating/decelerating speed ●D7 1 decreasing accelerating/decelerating speed ●D15~8 1:factor of driving termination	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0	EMG	ALARM	LMT	LMT+	-	STOP2	STOP1	STOP0	ADSN	ACNST	AASND	DSND	CNST	ASND	CMP-	CMP+
D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0																						
EMG	ALARM	LMT	LMT+	-	STOP2	STOP1	STOP0	ADSN	ACNST	AASND	DSND	CNST	ASND	CMP-	CMP+																						
0	1	0	XRR2 YRR2	X axis status register 2 Y axis status register 2	Displaying the error information and the state of automatic home search. <table border="1"> <tr> <td>D15</td><td>D14</td><td>D13</td><td>D12</td><td>D11</td><td>D10</td><td>D9</td><td>D8</td><td>D7</td><td>D6</td><td>D5</td><td>D4</td><td>D3</td><td>D2</td><td>D1</td><td>D0</td> </tr> <tr> <td>-</td><td>-</td><td>-</td><td>HMST4</td><td>HMST3</td><td>HMST2</td><td>HMST1</td><td>HMST0</td><td>HOMEL</td><td>0</td><td>EMG</td><td>ALARM</td><td>HLMT-</td><td>HLMT+</td><td>LSMT-</td><td>LSMT+</td> </tr> </table> Automatic home searching state Error information ●D0 1:+direction software limit ●D1 1:-direction software limit ●D2 1:+direction limit signal on ●D3 1:-direction limit signal on ●D4 1:alarm signal for servo motor on ●D5 1:emergency stop signal on ●D7 1:automatic home search error ●D12~8 1:automatic home searching state(contents of driving)	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0	-	-	-	HMST4	HMST3	HMST2	HMST1	HMST0	HOMEL	0	EMG	ALARM	HLMT-	HLMT+	LSMT-	LSMT+
D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0																						
-	-	-	HMST4	HMST3	HMST2	HMST1	HMST0	HOMEL	0	EMG	ALARM	HLMT-	HLMT+	LSMT-	LSMT+																						
0	1	1	XRR3 YRR3	X axis status register 3 Y axis status register 3	Displaying the factor of interrupt occring. <table border="1"> <tr> <td>D15</td><td>D14</td><td>D13</td><td>D12</td><td>D11</td><td>D10</td><td>D9</td><td>D8</td><td>D7</td><td>D6</td><td>D5</td><td>D4</td><td>D3</td><td>D2</td><td>D1</td><td>D0</td> </tr> <tr> <td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>D-END</td><td>C-STA</td><td>C-END</td><td>P≥C+</td><td>P<C+</td><td>P<C-</td><td>P≥C-</td><td>-</td> </tr> </table> 1: interrupt occurring Each bit of D7~D0 is corresponding to D15~D9 bit of WR1(mode register1)	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0	-	-	-	-	-	-	-	-	D-END	C-STA	C-END	P≥C+	P<C+	P<C-	P≥C-	-
D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0																						
-	-	-	-	-	-	-	-	D-END	C-STA	C-END	P≥C+	P<C+	P<C-	P≥C-	-																						
1	0	0	RR4	Input register 1	Displaying the input signal status of X axis. 0:Low 1:Hi <table border="1"> <tr> <td>D15</td><td>D14</td><td>D13</td><td>D12</td><td>D11</td><td>D10</td><td>D9</td><td>D8</td><td>D7</td><td>D6</td><td>D5</td><td>D4</td><td>D3</td><td>D2</td><td>D1</td><td>D0</td> </tr> <tr> <td>X-L</td><td>M-X</td><td>L-M</td><td>X-IN5</td><td>X-IN4</td><td>X-IN3</td><td>X-IN2</td><td>X-IN1</td><td>X-IN0</td><td>X-ALM</td><td>X-INP</td><td>X-EX-</td><td>X-EX+</td><td>EMG</td><td>X-ST2</td><td>X-ST0</td> </tr> </table>	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0	X-L	M-X	L-M	X-IN5	X-IN4	X-IN3	X-IN2	X-IN1	X-IN0	X-ALM	X-INP	X-EX-	X-EX+	EMG	X-ST2	X-ST0
D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0																						
X-L	M-X	L-M	X-IN5	X-IN4	X-IN3	X-IN2	X-IN1	X-IN0	X-ALM	X-INP	X-EX-	X-EX+	EMG	X-ST2	X-ST0																						
1	0	1	RR5	Input register 2	Displaying the input signal status of Y axis. 0:Low 1:Hi <table border="1"> <tr> <td>D15</td><td>D14</td><td>D13</td><td>D12</td><td>D11</td><td>D10</td><td>D9</td><td>D8</td><td>D7</td><td>D6</td><td>D5</td><td>D4</td><td>D3</td><td>D2</td><td>D1</td><td>D0</td> </tr> <tr> <td>Y-L</td><td>M-Y</td><td>L-M</td><td>Y-IN5</td><td>Y-IN4</td><td>Y-IN3</td><td>Y-IN2</td><td>Y-IN1</td><td>Y-IN0</td><td>Y-ALM</td><td>Y-INP</td><td>Y-EX-</td><td>Y-EX+</td><td>-</td><td>Y-ST2</td><td>Y-ST0</td> </tr> </table>	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0	Y-L	M-Y	L-M	Y-IN5	Y-IN4	Y-IN3	Y-IN2	Y-IN1	Y-IN0	Y-ALM	Y-INP	Y-EX-	Y-EX+	-	Y-ST2	Y-ST0
D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0																						
Y-L	M-Y	L-M	Y-IN5	Y-IN4	Y-IN3	Y-IN2	Y-IN1	Y-IN0	Y-ALM	Y-INP	Y-EX-	Y-EX+	-	Y-ST2	Y-ST0																						
1	1	0	RR6	Read register 1	Displaying the low word 16-bit for the read data.(D15~D0)																																
1	1	1	RR7	Read register 2	Displaying the high word 16-bit for the read data.(D31~D16)																																

●The above table indicates the address for 16-bit data bus. In 8-bit data bus access, the 16bit data bus are divided into the high word byte (D15~8) and the low word byte (D7~0) by using address signal A3~A0.

●Each axis has RR1,RR2 and RR3 (status register 1,2 and 3). It can be read the data in these registers by the same address. It depends on the axis assignment of the last command to read the data in the mode register of which axis. Or, user can select the axis by writing the NOP command which is assigned an axis just before.

■ Data writing commands

Code	Setting Command	Symbol	Data range	Data length (byte)
00	Range	R	R8,000,000(multiple=1) ~ 16,000(=500)	4 bytes
01	Jerk	K	1 ~ 65,535	2
02	Acceleration	A	1 ~ 8,000	2
03	Deceleration	D	1 ~ 8,000	2
04	Initial speed	SV	1 ~ 8,000	2
05	Drive speed	V	1 ~ 8,000	2
06	Output pulse numbers	P	0 ~ 268,435,455	4
07	Manual deceleration point	DP	0 ~ 268,435,455	4
09	Logical position counter	LP	-2,147,483,648 ~ +2,147,483,647	4
0A	Real position counter	EP	-2,147,483,648 ~ +2,147,483,647	4
0B	COMP+ register	CP	-1,073,741,824 ~ +1,073,741,823	4
0C	COMP- register	CM	-1,073,741,824 ~ +1,073,741,823	4
0D	Acceleration counter offset	AO	-32,768 ~ +32,767	2
0F	NOP(for switching)			
60	Automatic home search mode	HM		2
61	Home search speed	HV	1 ~ 8,000	2

■ Parameter calculation at CLK= 16MHz

$$\text{Multiple}(M) = \frac{8,000,000}{R}$$

$$\text{Initial speed(PPS)} = SV \times M$$

$$\text{Drive speed(PPS)} = V \times M$$

$$\text{Accelerating speed(PPS/SEC)} = A \times 125 \times M$$

$$\text{Jerk(PPS/SEC}^2) = \frac{62.5 \times 10^6}{K} \times M$$

$$\text{Decelerating speed(PPS/SEC)} = D \times 125 \times M$$

$$\text{Decelerating speed increasing (PPS/SEC}^2) = \frac{62.5 \times 10^6}{L} \times M$$

■ Data reading commands

Code	Reading Command	Symbol	Data range	Data length (byte)
10	Logical position counter	LP	-2,147,483,648~+2,147,483,647	4 bytes
11	Real position counter	EP	-2,147,483,648~+2,147,483,647	4
12	Current drive speed	CV	1 ~ 8,000	2
13	Acceleration / deceleration	CA	1 ~ 8,000	2

■ Driving commands

Code	Commands
20	+direction fixed pulse drive
21	-direction fixed pulse drive
22	+direction continuous drive
23	-direction continuous drive
24	drive start holding
25	drive start holding release
26	/termination status clear
27	decelerating stop
27	instant stop

■ Other commands

Code	Commands
62	Automatic home search execution
63	Deviation counter clear output

The Specifications are subject to change without notice due to the technical development. 2019.4

Distributor



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