LIYAN PROGRAMMABLE LOGIC CONTROLLER

LYPLC Ex1n1PG

USER'S MANUAL

Chapter 0

Foreword

- ♦ Ex1n1PG Pulse Generation Unit (called 1PG) output pulse to driver of corresponding servo motor or stepping motor to execute control of independent one axis.
- ♦ Ex1n1PG is for Special extension module of LYPLC EX1n series to use FROM/TO command to do data transmission, not occupy any PLC points. Maximum is connection of 8 units of Ex1n1PG to execute multi-axes independent running.
- ♦ Programs of Ex1n1PG are made by PLC main unit, therefore there is no need to use programming panel.

FROM/TO Instruction

◎ FROM

FNC(78)			16 bits: FROM(P) - 9 steps
D	*FROM*	P	32 bits: (D)FROM(P) -17 steps

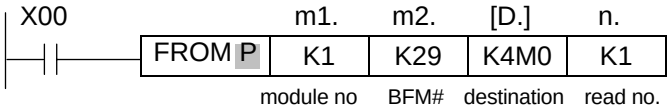
EX	EX_{1S}	EX_{1N}	EX_{2N}

Operands: ← [D.] →

K.H.	KnX	KnY	KnM	KnS	T	C	D	V,Z

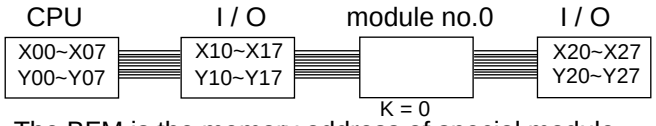
Operands: ← →
m1 = 0 ~ 7 no. of special module
m2.= 0 ~ 32767 no. of buffer memory (BFM)
n.= 1 ~ 31 no. of read (when D, n=1~15)

Flag:



♦When X00 ON, the buffer memory of special module BFM#29 to be read out and stored into M00~M15.

<< Special Device Module Number m1>>



- ♦ The BFM is the memory address of special module.
- ♦ The number of special module is address to NO.0~NO.7 and beginning with the one closest to the CPU unit.
- ♦ The special module can up to 8 maximum, and no occupy i/o points.

◎ TO

FNC(79)			16 bits: TO(P) - 9 steps
D	*TO*	P	32 bits: (D)TO(P) - 17 steps

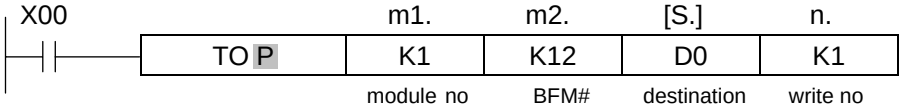
EX	EX_{1S}	EX_{1N}	EX_{2N}

Operands: ← [S.] →

K.H.	KnX	KnY	KnM	KnS	T	C	D	V,Z

Operands: ← →
m1 = 0 ~ 7 no. of special module
m2.= 0 ~ 32767 no. of buffer memory (BFM)
n.= 1 ~ 31 no. of write (when D, n=1~15)

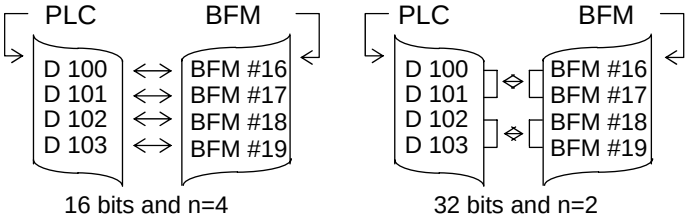
Flag:



♦When X00 ON, the content of D0 to be write into the buffer memory BFM#12 of the special module NO.1

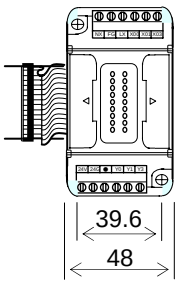
♦If used pulse command can decrement cycle time.

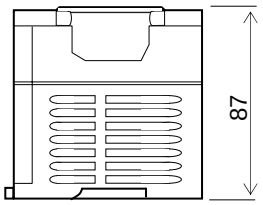
<< Number of Read n >>



Chapter 1

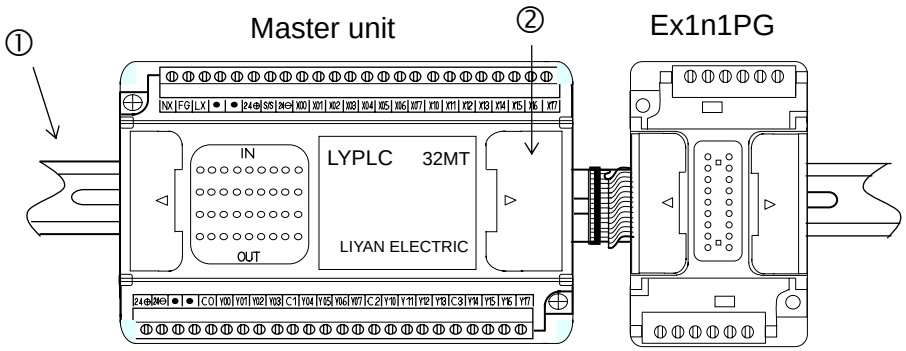
1-1 Product appearance and Dimensions





unit : mm

1-2 Installation



♦LIYAN PLCs all can be assembled to ① (35mm).

♦Open ② connector cover and connect Ex1n1PG to master unit through cable.

1-3 Performance specifications

Item	Specifications
Drive power	(1)+24V(for input signal) : DC24V±10% consumption current: less than 40mA, supplied from external power or +24 of PLC. (2)+5V(for internal control) : DC5V 55mA is supplied from PLC by extension cable.
Occupied points	None
Control axis	1 axis (for PLC, the maximum is 8 axes running independently).
Command speed	♦10PPS ~ 100KPPS。 ♦unit : pulse / sec。
Setting pulse	♦-2,147,483,648 ~ 2,147,483,647 (32bit) pulse。 ♦absolute position assign / relative movement amount position assign。 ♦unit : um。
Pulse output method	pulse(PLS) / direction(DIR), open collector output, less than DC5V 20mA
Input signal and Output signal	♦photo-coupler isolation, attach LED action to indicate. ♦input: 4 points (X0/X1/DOG) DC24V / 7mA (PG0*1) DC24V 20mA ♦output: 3 points (FP/RP/CLR) each less than DC5~24V / 20mA.
Transmission with PLC	♦1PG with buffer memories (BFM) #0~#63 of 16bit RAM (without battery back-up). ♦use FROM/TO command of PLC to do data transmission, data of 32bit combined to 2 points BFM.

*1 zero-point signal PG0 signal, current from terminal PG0+ to PG0- .

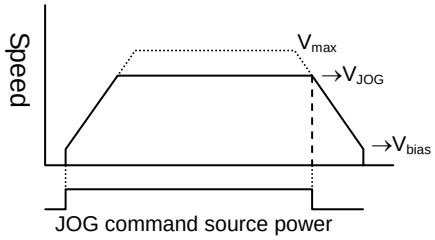
♦ The general environment specifications as same as Ex1nPLC main unit.

Chapter 2

Operation mode summary

2-1. JOG running：

When BFM#25 b4 or b5 from 0→1, execute as follows,



V_{JOG} Manual operation speed (BFM#8, BFM#7) must be between Vbias and Vmax, then effective.

2-2. Machinery zero-return operation：

When BFM#25 b6 from 0→1, execute as follows,

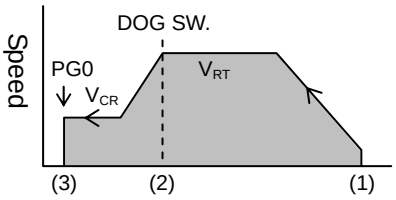


fig. 2-2-1

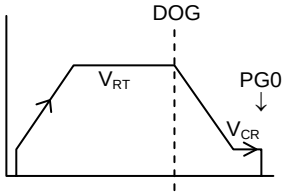


fig. 2-2-2

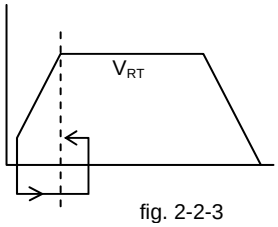


fig. 2-2-3

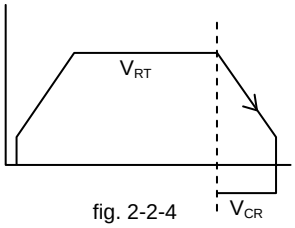


fig. 2-2-4

(1)：When BFM#25 b6 is set, 1PG operation as V_{RT} (BFM#10, BFM#9) DOG return speed, start to search DOG point.
(2)：When DOG signal from OFF→ON or ON→OFF, then start to decelerate to V_{CR} (BFM#11) zero-return speed to search PG0 signal.
(3)：Stop operation after through BFM#12 (Zero Signal Count) setting value and use this point to be machinery zero-point. When zero-return is finished, zero-point address (BFM#14, BFM#13) is write automatically to current address (BFM#27,BFM#26), and BFM#28 b2 zero-return finished flag is set.

♦If connect to stepping motor, due to without PG0 signal, so have to set BFM#12 (Zero Signal Count) to ”0”, then 1PG use DOG point to machinery zero-point.

fig. 2-2-1 : set BFM#03 b11=0, b10=0, forward mode, reverse.
fig. 2-2-2 : set BFM#03 b11=0, b10=1, forward mode, forward direction.
fig. 2-2-3 : set BFM#03 b11=1, b10=0, reverse mode, reverse.
fig. 2-2-4 : set BFM#03 b11=1, b10=1, reverse mode, forward direction.

2-3. Single speed position operation：

When BFM#25 b8 from 0→1, execute as follows,

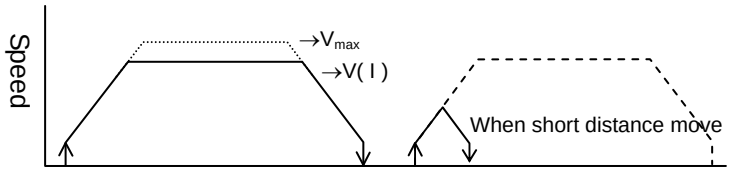


fig. 2-3-1

fig. 2-3-2

♦When START instruction start, use V(I) speed (BFM#20, BFM#19) to operate, stop at P(I) target address (BFM#18, BFM#17).
♦If the time of moving to P(I) is shorter than the demand time of reaching V(I) speed, then decelerate and stop automatically before 1PG reach to V(I) speed.
♦Target address can be assigned to absolute address start from zero-point or relative address start from current position.
♦ When assign to relative address mode, if content of P(I) is a positive number, then forward direction. If content of P(I) is a negative number, then reverse.
♦When assign to absolute address mode, operation direction is decided by comparison of P(I) and current address (CP).

2-4. Interrupt Command Position Operation：

♦ When Operation instruction BFM#25 b9 from 0→1, execute as follows,
have connect Interrupt instruction to DOG input point of 1PG。(Close-loop mode is ineffective)

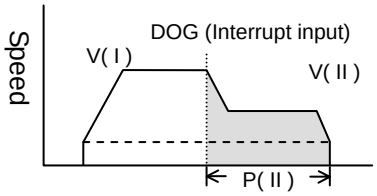


fig. 2-4-1

♦When P(I) = “0”, use V(I) speed without target address operation. After receive interrupt signal DOG point signal, speed change to V(II). Stop after move P(II) setting distance.(just can assign relative move amount)

♦Operation direction is decided by positive or negative sign of V(I) (BFM#20, #19). Positive value is forward direction, negative sign is reverse.

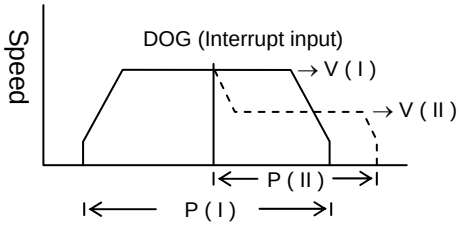


fig. 2-4-2

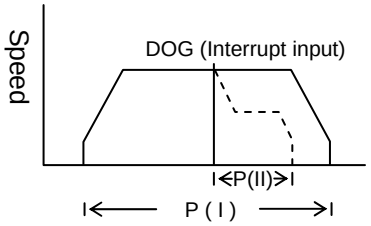


fig. 2-4-3

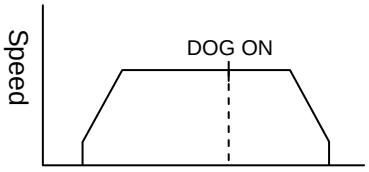


fig. 2-4-4

♦When P(I) ≠ 0, operate by V(I) speed. If DOG signal not input, then move P(I) distance and stop. As fig.2-4-2 or 2-4-3. If the middle DOG signal ON, then change speed V(II) and move P(II) distance, then stop. If P(II)=0, then stop immediately. As fig.2-4-4.

♦Setting range of P(II) is 0 ~ 65,535。

2-5. Two Speed Position Operation：

♦When BFM#25 b10 from 0→1, execute as follows,

♦When START instruction start, use V(I) speed (BFM#20, BFM#19) to operate, move to P(I) target address (BFM#18, BFM#17), then stop after use V(II) (BFM#24, BFM#23) speed to move to (BFM#22, BFM#21) target address

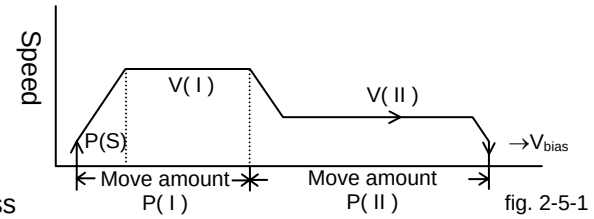


fig. 2-5-1

♦P(I) can be assigned to relative address or absolute address, but P(II) only can be assigned to relative address. P(II) can not be assigned to negative value.

♦If P(II) distance is too short in this mode, i.e., P(II) is smaller than P(S), then there will be vibration of stop rapidly of motor.

♦If assign to absolute address method, operation direction is decided by comparison of P(I) and current address(CP).

♦If assign to relative address method, operation direction is decided by P(I) positive/negative value.(positive: forward, negative: reverse)

2-6. External signal position operation：

♦When Operation instruction BFM#25 b11 from 0→1, Use V(I) assigned speed without target address to output pulse.

♦When DOG signal input, speed change to V(II), and continue to without target address operate

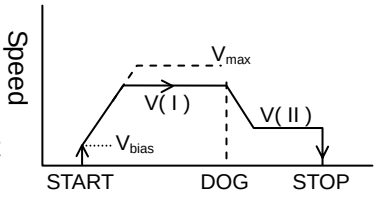


fig. 2-6-1

♦When STOP signal input, stop pulse output immediately. (BFM#03 bit6 need to set to ”1”)

♦ Operation direction is decided by V(I) (BFM#20, #19) positive/negative sign.

♦ This operation mode, Close-loop mode is ineffective.

2-7. Variable speed operation：

♦When operation instruction BFM#25 b12 from 0→1, use V(I)(BFM#20, BFM#19) assigned speed to output pulse. (without target address operation)。

♦When pulse output, use PLC to change V(I) value, then can change operation speed.

♦When V(I) value is “0”, won’t stop operating, continue to operate by Vbias speed

♦When operation instruction BFM#25 b12 is set to 0, then stop operating.

♦ Operation direction is decided by V(I)(BFM#20,#19) positive/negative sign. Positive value is forward, negative is reverse.

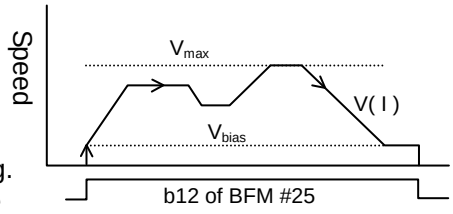


fig. 2-7-1

Chapter 3 Buffer Memories (BFM) Configuration

No. of BFM		No. of BFM	Setting range	Initial setting value (When ON)	Note	R: for read W: for write
Upper 16bit	Lower 16bit					
---	# 0	Pulse rate A	1 ~ 32,767 / R	2,000	Pulse / 1 revolution	W
# 2	# 1	Feed rate B	1 ~ 65,535	1,000	Movement / 1 revolution	W
---	# 3	Parameter			System parameter	W
# 5	# 4	Maximum speed Vmax	10PPS ~ 100kPPS	100,000PPS	All speeds can't be more than Vmax	W
---	# 6	Bias speed Vbia	0 ~ 10kPPS	100PPS	Bias speed setting	W
# 8	# 7	JOG speed V_{JOG}	10PPS ~ 100Kpps	10,000PPS	V_{JOG} = Vmin ~ Vmax	W
#10	# 9	Home speed V_{RT}	10PPS ~ 100Kpps	50,000PPS	V_{RT} = Vmin~ Vmax	W
---	#11	Creep speed V_{CR}	10PPS ~ 10kPPS	1,000PPS	V_{CR} << V_{RT}	W
---	#12	No. of zero-point signal N	32767 count	0	0 : zero-return action, not search Z-phase	W
#14	#13	origin address HP	0 ~ ± 999,999	0		W
---	#15	acc/dec time Ta	50 ~ 5,000ms	100ms	Vmin ~ Vmax time	W
---	#16	deceleration time Td	50 ~ 5,000ms	100ms	Vmax ~ Vmin time	W
#18	#17	target address(I) P(I)	0 ~ ± 999,999	0	V(I) = Vbia ~ Vmax	W
#20	#19	operate speed (I) V(I)	10PPS ~ 10kPPS	10		W
#22	#21	target address (II) P(II)	0 ~ ± 999,999	0		W
#24	#23	operate speed (II) V(II)	10PPS ~ 10kPPS	10	V(II) = Vbia ~ Vmax	W
---	#25	Operate instruction	b0 ~ b15	H0000	START command	W
#27	#26	Current position CP	Write into -2,147,483,648 ~ +2,147,483,647 automatically			R
---	#28	System status	---		Refer to BFM#28 instruction	R
---	#29	Error Code	Error code buffer register, no error is "00"		Refer to BFM#29 instruction	R
---	#30	Model Code, Version	51xx			R
---	#31	Reserved	---	---		X
#32 ~ #63		System Reserved				X
#65	#64	Relative move amount	Write into -2,147,483,648 ~ +2,147,483,647 automatically			R
#67	#66	Remaining pulse amount	Write into -2,147,483,648 ~ +2,147,483,647 automatically			R
#69	#68	Reserved	---	---		X
#71	#70	Accelerate to Max. speed pulse	Write into -2,147,483,648 ~ +2,147,483,647 automatically			R
#73	#72	Reserved	---	---		X
#75	#74	Reserved	---	---		X
#77	#76	Positive limit address	0 ~ 2,147,483,647	0	0 : software positive limit address ineffective (positive value)	W
#79	#78	Negative limit address	-2,147,483,648 ~ 0	0	0 : software negative limit address ineffective (negative value)	W
#81	#80	Current speed	Write into 10PPS ~ 100kPPS automatically			R
---	#82	Number of Vbias Pulse	0 ~ 65535	0		W
#84	#83	Reserved	---	---		X
#86	#85	Reserved	---	---		X
#88	#87	Reserved	---	---		X
---	#89	Reserved	---	---		X
#91	#90	Reserved	---	---		X
---	#92	Electronic gear (Cmx)	1 ~ 65535	1	Encoder Pulse Rate	W
---	#93	Electronic gear (Cdv)	1 ~ 65535	1	Motor Pulse Rate	W
#95	#94	AB phase counter	For monitor		AB phase high-speed counter(4 倍波)	R
#97	#96	Reserved	---	---		X
#99	#98	Reserved	---	---		X
#101	#100	Reserved	---	---		X
#103	#102	Reserved	---	---		X
#105	#104	Master axis operation speed (pps)	System measure number of pulse of master axis Encoder (fourfold pulse)			R
#107	#106	Reserved	---	---		X
#109	#108	Reserved	---	---		X
#111	#110	Reserved	---	---		X
#113	#112	Reserved	---	---		X
#115	#114	Reserved	---	---		X
---	#116	Reserved	---	---		X
#117 ~ #121		System reserved				
#123	#122	Reserved	---	---		X
#124 ~ #127		System reserved				

♦For read: Sometimes there will be error occur if force to write. For write: can read and write.

Parameter setting

BFM #0 PULSE RATE (ignore) Value at shipment：2,000

♦Pulse number / 1 revolution (PLS / REV)。 Set range：A = 1 ~ 32,767

BFM #2、#1 FEED RATE (ignore) Value at shipment：1,000

♦moved distance / 1 revolution (μm / REV)。 Set range：B = 1 ~ 32,767

BFM #3 PARAMETER

b0 Value at shipment：0

Set [0] : Motor system, unit : pulse

b1 Acceleration/Deceleration separate flag Value at shipment：0

Set [0] : Acc/Deceleration slope is the same.

Set [1] : Acc/Deceleration slope is separate.

b6 Value at shipment：0

Set [0] : with slope control flag (when STOP signal ON)

Set [1] : without slope control flag (when STOP signal ON), don't do deceleration stop flag.

b7 Value at shipment：0

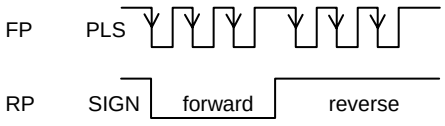
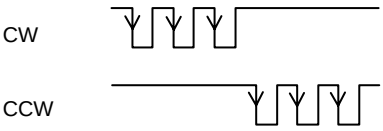
Set [0] : Open-loop mode

Set [1] : Close-loop mode(Ex2n1PG effective)。

b8 PULSE TYPE FORMAT Value at shipment：1

Set [1] : B.TYPE pulse form FP: Pulse，RP: Symbol

Set [0] : A. TYPE pulse form FP: CW，RP: CCW

Set [1] (B TYPE) FP : Pulse RP : Symbol	Set [0] (A TYPE) FP : CW RP : CCW
	

b9 DIRECTION Value at shipment：0

Set [0] : Forward direction Pulse, the value of Current value register (CP) in 1PG is increased.
Reverse Pulse, the value of Current value register (CP) in 1PG is decreased.

Set [1] : Forward direction Pulse, the value of Current value register (CP) in 1PG is decreased.
Reverse Pulse, the value of Current value register (CP) in 1PG is increased.

b10 ZERO RETURN DIRECTION Value at shipment：0

Set [0] : Reverse Pulse.

Set [1] : Forward direction Pulse.

b11 ZERO RETURN MODE Value at shipment：0

Set [0] : select zero-return of forward mode, like fig.2-2-1, 2-2-2.

Set [1] : select zero-return of reverse mode, like fig.2-2-3, 2-2-4.

b12 DOG input polarity Value at shipment：0

Set [0] : select DOG signal ON. (rising edge signal)

Set [1] : select DOG signal OFF. (falling edge signal)

b13 DISABLE EXTERNAL STOP SIGNAL Value at shipment：0

When set [0], external STOP signal (X01) is effective.

When set [1], external STOP signal (X01) is ineffective.

b14 STOP input polarity — Value at shipment：0

Set [0] : when input is ON, operation stop (Rising edge)

Set [1] : when input is OFF, operation stop (Falling edge)

b15 STOP MODE — Value at shipment：1

Set [0] : when STOP ON, deceleration stop. Ignore the remaining distance which isn't moved.

Set [1] : when STOP ON, deceleration stop, then start again, continue to move the remaining distance of this step.

BFM #5、#4 MAXIMUM SPEED (Vmax) — Value at shipment：100,000pps

♦The maximum value of operation speed. — Set range：10 ~ 200,000

BFM #6 Bias Speed (Vbias) — Value at shipment：100pps

♦The basic speed of motor bias. — Set range：10 ~ 10,000

BFM #8、#7 JOG SPEED (V_{JOG}) — Value at shipment：10,000pps

♦Speed setting value of external JOG forward/reverse, Vbias<V_{JOG}<Vmax — Set range：10 ~ 200,000

BFM #10、#9 HOME SPEED (V_{RT}) — Value at shipment：10,000pps

♦Reach to DOG switch speed value. Vbias < V_{RT} < Vmax — Set range：10 ~ 200,000

BFM #11 CREEP SPEED (V_{CRP}) — Value at shipment：1,000pps

♦ The speed value from work axis touch DOG point to Z-phase stop when execute machinery zero-return action. — Set range：10 ~ 10,000

BFM #12 ZERO SIGNAL COUNT — Value at shipment：1

♦Zero signal count is counted when execute zero-return, use CREEP SPEED to operate. — Set range：0 ~ 255

♦If set to 0, then not search zero signal count. Use DOG to be machinery zero-point.

BFM #14、#13 ZERO POINT ADDRESS — Value at shipment：0

♦Execute zero-return is finished, write the defined value of this point into current position register.

BFM #15 ACCELERATION / DECELERATION TIME — Value at shipment：100ms

♦The time which accelerate to maximum speed, unit: ms。 — Set range：100 ~ 50,000

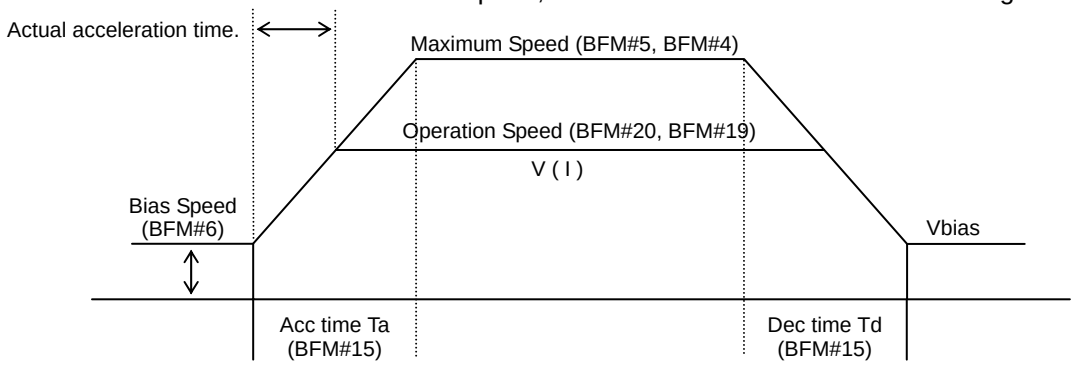


fig. 3-1

BFM #16 Deceleration Time (Td)

♦The time from Maximum speed to decelerate to Bias Speed stop, unit : ms.

BFM #18、17 Position (I) P(I)

♦When use absolute position, data is target position.
When use relative position, data is move distance.
Refer to fig.3-2.

BFM #20、19 Operation Speed (I) V(I)

♦Actual operation speed between Bias Speed and Maximum Speed.
Refer to fig.3-2.

BFM #22、21 Position (II) P(II)

♦This BFM is used to Two speed position operation.
Refer to fig.3-2.

BFM #24、23 Operation Speed (II) V(II)

♦This BFM is used to Two speed position operation.
Refer to fig.3-2.

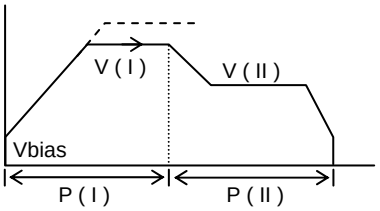


fig. 3-2

BFM #25 Operation instruction

♦After write data of BFM #0 ~ BFM #24, then execute the setting of BFM #25.

b0 ERROR RESET
When b0=1, ERROR flag is RESET.

b1 STOP
When 0→1, 1PG stop operating, with same function of 1PG external STOP input.

b2 Reserved

b3 Reserved

b4 JOG+ operation
When b4=1, output forward pulse, current position (CP) accelerate.

b5 JOG- operation
When b5=1, output reverse pulse, current position (CP) deceleration

b6 Zero Return operation
When b6 from 0→1,zero-return operation start.

b7 Relative (b7=1) / Absolute (b7=0) Position select flag
b7=1 relative position operation, b7=0 absolute position operation.

b8 Single speed position operation
When b8 from 0→1, single speed position operation is started. (refer to fig.2-3-1)

b9 Interrupt command position operation
When b9 from 0→1, interrupt command position operation is started. (refer to fig.2-4-1)

b10 Two speed position operation
When b10 from 0→1, two speed position operation is started. (refer to fig.2-5-1)

b11 External signal position operation
When b11 from 0→1, external signal position operation is started. (refer to fig.2-6-1)

b12 Variable speed operation
When b12 from 0→1, variable speed operation is started. (refer to fig.2-7-1)

BFM #27、26 CURRENT POSITION CP

♦Operating system write current position into 32bits register automatically.

BFM #28 STATUS INFORMATION

♦The status of 1PG is stored into BFM #28 automatically, PLC can use FROM instruction to read.

b0 1PG Ready (b0=1) / 1PG Busy (b0 = 0)
When 1PG output pulse, it is Busy status.

b1 Pulse upper (b1=1) / lower (b1=0)

b2 Zero-return finished flag (b2=1) / zero-return not execute (b2=0)

b3 b3=1: PG0 input ON

b4 b4=1: X00 input ON

b5 b5=1: X01 input ON

b6 b6=1: DOG input ON

b7 When 1PG ERROR (b7 = 1), ERROR content is stored into BFM #29.

b8 position finished flag (b8=1)

b9 Error counter error flag (Error code 8001)

b10 exceed software positive limit error flag (Error code 2001)

b11 exceed software negative limit error flag (Error code 3001)

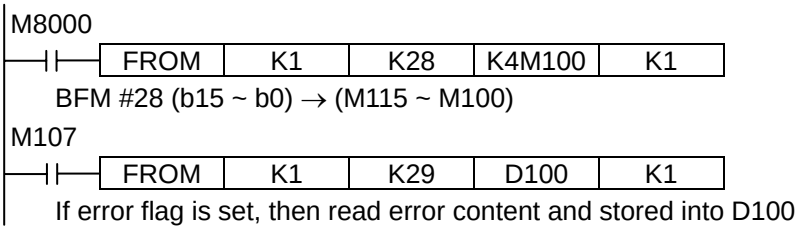
b12 Reserved

b13 Reserved

b14 Fly-cut mode synchronized flag

b15 Reserved

<<Status information read>>



BFM #29 ERROR CODE

♦When there is ERROR in 1PG, write ERROR into it automatically.

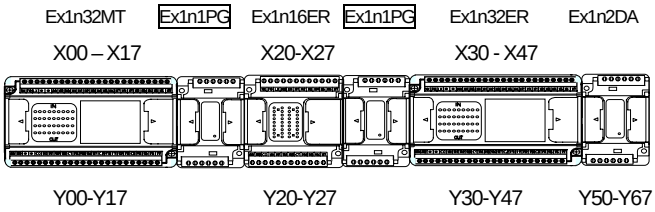
BFM #30 MODEL CODE, VERSION

♦ 5 1 1 0
Version : V1.10
MODEL CODE

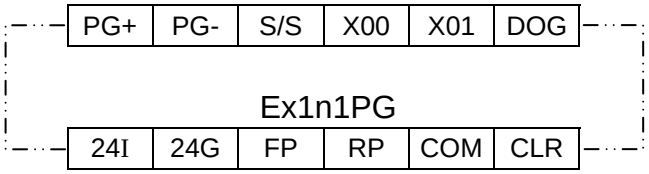
BFM #31 Reserved

Chapter 4

4-1 Connection with PLC

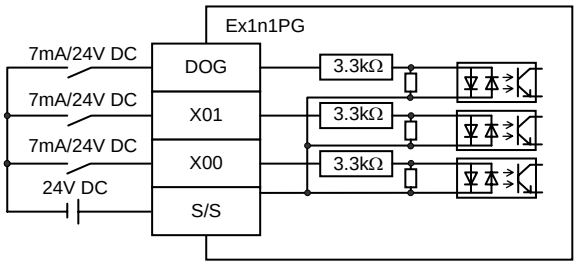


4-2 Signal of Ex1n1PG terminal

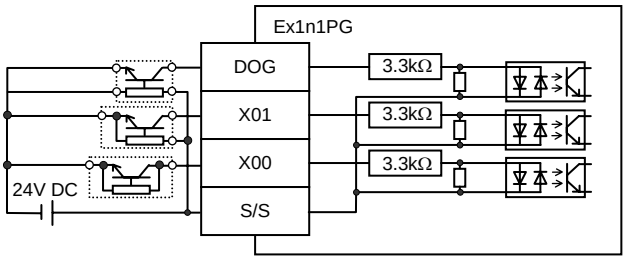


4-3 Input wiring

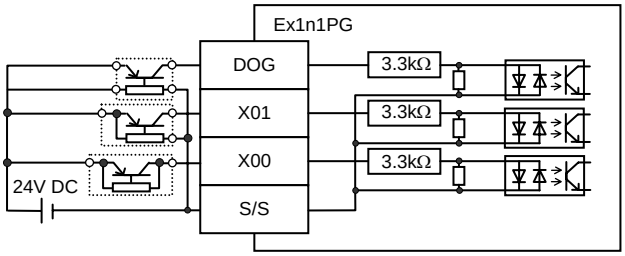
1) When contacts are used



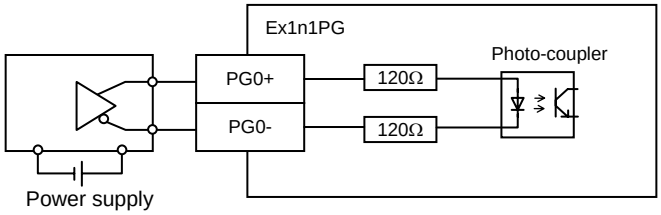
2) When NPN open collector transistors are used



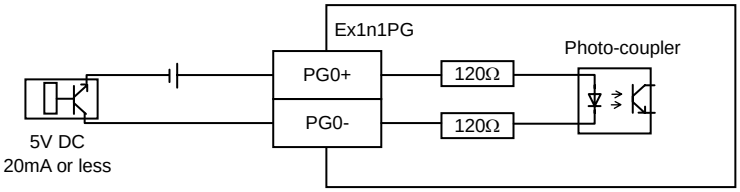
3) When PNP open collector transistors are used



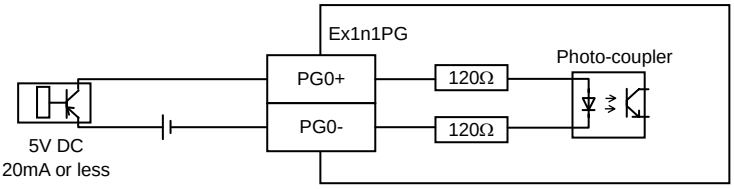
4) When a differential line driver is used



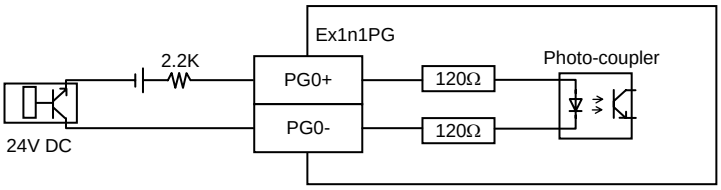
5) When NPN open collector transistor is used (power supply : 5VDC)



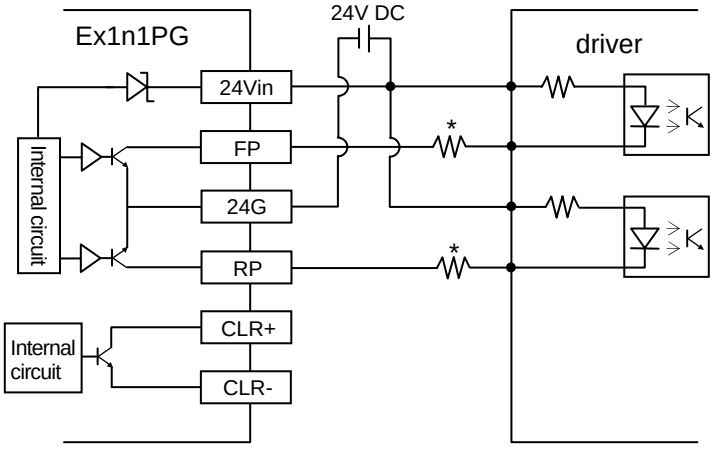
6) When PNP open collector transistor is used (power supply : 5VDC)



7) When NPN open collector transistor is used (power supply : 24VDC)



4-4 Output wiring



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