LIYAN PROGRAMMABLE LOGIC CONTROLLER

LYPLC Ex2n1PG

USER'S   MANUAL

Chapter 0

Foreword

♦ Ex2n1PG Pulse Generation Unit (called 1PG) output pulse to driver of corresponding servo motor or stepping motor to execute control of independent one axis.

♦ Ex2n1PG 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 Ex2n1PG to execute multi-axes independent running.

♦ Programs of Ex2n1PG are made by PLC main unit, therefore there is no need to use programming panel.
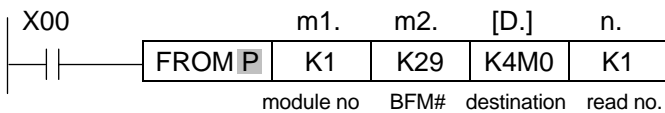
FROM/TO Instruction

◎ FROM

FNC(78)			16 bits: FROM(P) - 9 steps	EX	EX$_{1S}$	EX$_{1N}$	EX$_{2N}$
D	*FROM*	P	32 bits: (D)FROM(P) -17 steps				

Operands: ← [D.] →

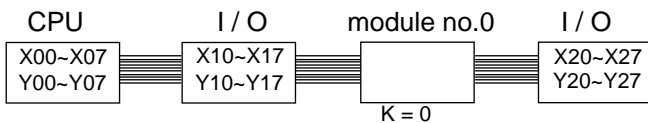| K.H.	KnX	KnY	KnM	KnS	T	C	D	V,Z
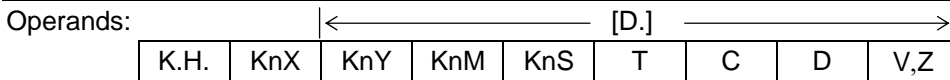
Operands: |← →| m1 = 0 ~ 7   no. of special module
m2.= 0 ~ 32767   no. of buffer memory (BFM)
n.= 1 ~ 31   no. of read (when D, n=1~15)

Flag:

```
 X00              m1.    m2.    [D.]    n.
──┤├──┌─────────┬──────┬──────┬──────┬──────┐
      │ FROM P  │  K1  │  K29 │ K4M0 │  K1  │
      └─────────┴──────┴──────┴──────┴──────┘
                 module no  BFM#  destination  read no.
```

♦ 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>>

```
   CPU           I / O      module no.0      I / O
┌─────────┐  ┌─────────┐  ┌─────────┐   ┌─────────┐
│ X00~X07 │  │ X10~X17 │  │         │   │ X20~X27 │
│ Y00~Y07 │══│ Y10~Y17 │══│         │═══│ Y20~Y27 │
└─────────┘  └─────────┘  └─────────┘   └─────────┘
                             K = 0
```
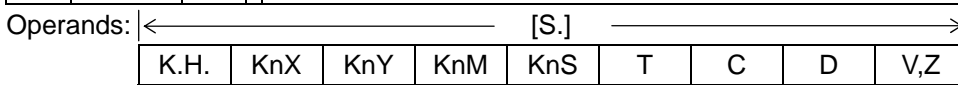
♦ The BFM is the memory address of special module.

♦ The number of special module is address to NO.0~NO.7 and beginning with the one closest to the CPU unit.

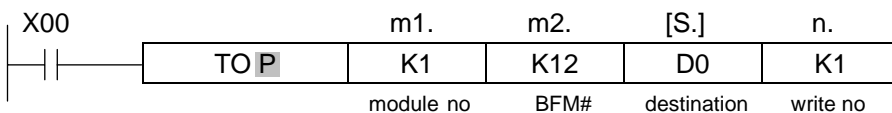♦ The special module can up to 8 maximum, and no occupy i/o points.

◎ TO

FNC(79)			16 bits: TO(P) - 9 steps	EX	EX$_{1S}$	EX$_{1N}$	EX$_{2N}$
D	*TO*	P	32 bits: (D)TO(P) - 17 steps				

Operands: |← [S.] →|

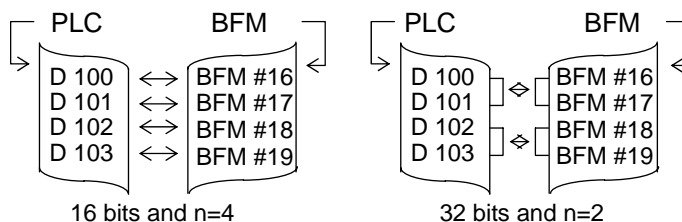| K.H.	KnX	KnY	KnM	KnS	T	C	D	V,Z

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:

```
 X00              m1.    m2.    [S.]    n.
──┤├──┌─────────┬──────┬──────┬──────┬──────┐
      │  TO P   │  K1  │  K12 │  D0  │  K1  │
      └─────────┴──────┴──────┴──────┴──────┘
                 module no  BFM#  destination  write no
```
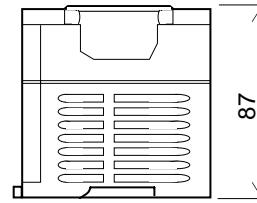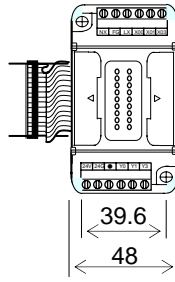
♦ When X00 ON, the content of D0 to be write into the buffer memory BFM#12 of the special module NO.1

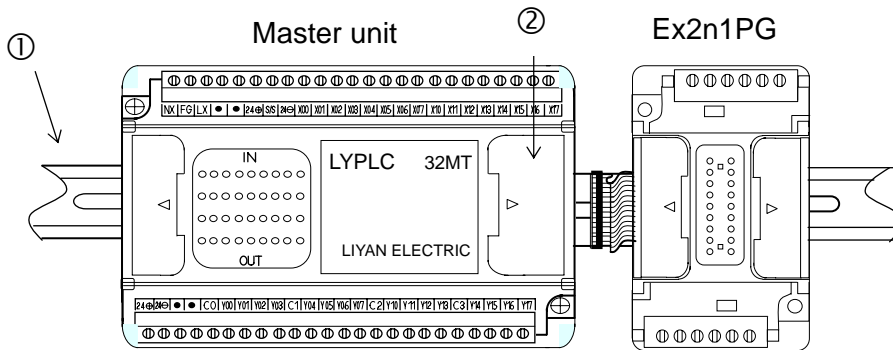♦ If used pulse command can decrement cycle time.

<< Number of Read   n >>

```
  ┌ PLC      BFM ┐            ┌ PLC      BFM ┐
  │ D 100 ←→ BFM #16 │        │ D 100 ⇔ BFM #16 │
  │ D 101 ←→ BFM #17 │        │ D 101    BFM #17 │
  │ D 102 ←→ BFM #18 │        │ D 102 ⇔ BFM #18 │
  │ D 103 ←→ BFM #19 │        │ D 103    BFM #19 │

       16 bits and n=4              32 bits and n=2
```

Chapter 1

1-1 Product appearance and Dimensions

87

39.6
48

unit : mm

1-2 Installation

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

♦Open ② connector cover and connect Ex2n1PG 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.

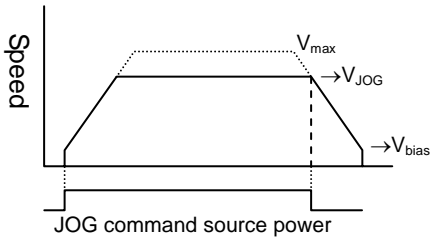*1 zero-point signal PG0 signal, current from terminal PG0+ to PG0- .

♦ The general environment specifications as same as Ex1n series PLC main unit.

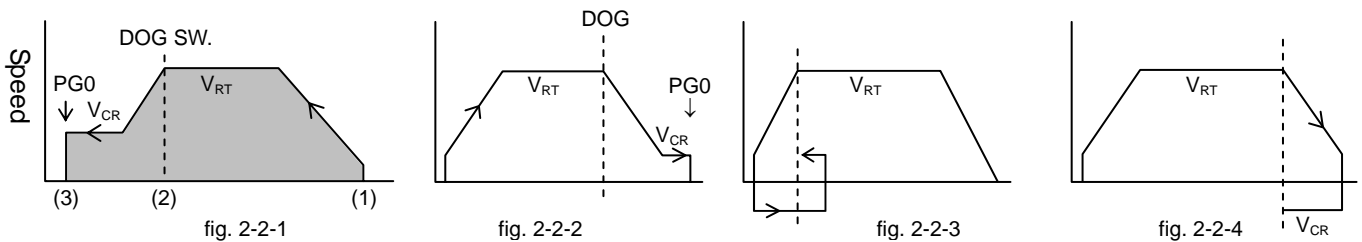# Chapter 2

Operation mode summary

2-1. JOG running：

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

JOG command source power

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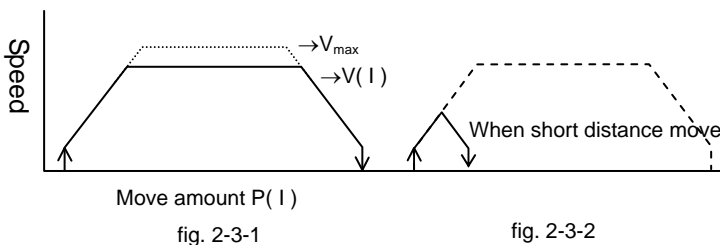fig. 2-2-1 : set BFM#03 b11=0, b10=0, forward mode, reverse.
fig. 2-2-2 : set BFM#03 b11=0, b10=1, forward mode, forward direction.
fig. 2-2-3 : set BFM#03 b11=1, b10=0, reverse mode, reverse.
fig. 2-2-4 : set BFM#03 b11=1, b10=1, reverse mode, forward direction.

2-3. Single speed position operation：
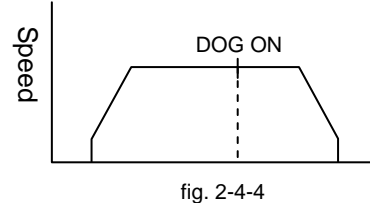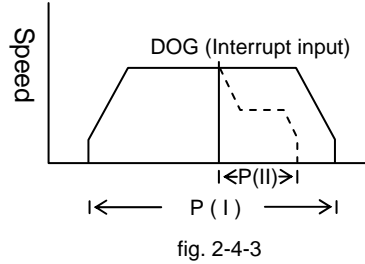
When BFM#25 b8 from 0→1, execute as follows,
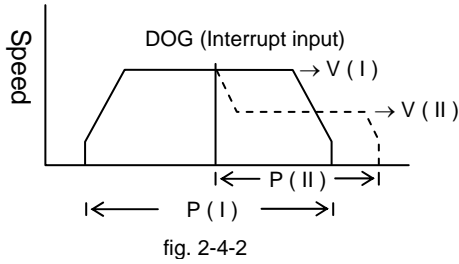

Move amount P(I)

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).

3

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
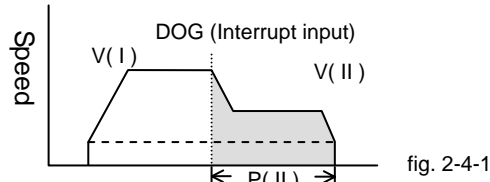
♦ When P(Ⅰ) = "0", use V(Ⅰ) speed without target address operation. After receive interrupt signal DOG point signal, speed change to V(II). Stop after move P(II) setting distance.(just can assign relative move amount)
♦ Operation direction is decided by positive or negative sign of V(Ⅰ) (BFM#20, #19). 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
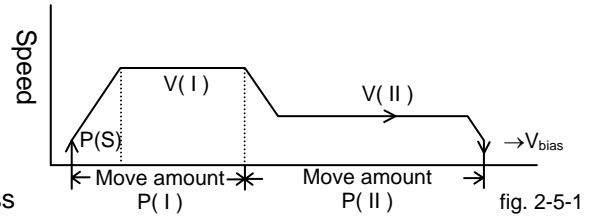
♦ P(Ⅰ) can be assigned to relative address or absolute address, but P(II) only can be assigned to relative address. P(Ⅱ) can not be assigned to negative value.
♦ If P(II) distance is too short in this mode, i.e., P(II) is smaller than P(S), then there will be vibration of stop rapidly of motor.
♦ If 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.
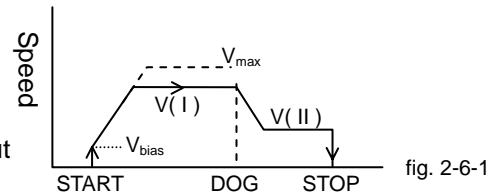
2-7. Variable speed operation：

♦ 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
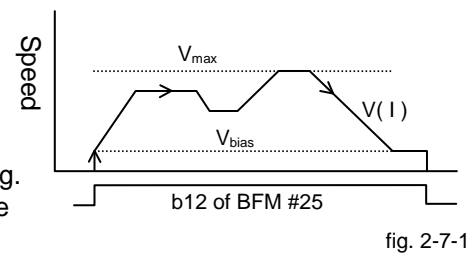
2-8. Ratio Command Position Operation：

♦ When operation instruction BFM#25 b13 from 0→1, system output pulse by AB-phase pulse from X0, X1 input, and count by electronic gear.
♦ Under this mode, numerator of electronic gear has to be smaller than denominator.
♦ External STOP signal have to disable, i.e., BFM#03 bit13 have to set to "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	Fly-cut return distance register	0 ~ ±999,999	0	Ex2n1PG only	W
#86	#85	Reserved	---	---		X
#88	#87	Reserved	---	---		X
---	#89	Error counter of Feedback	0 ~ 65535	200	When Output pulse-feedback pulse>value error	W
#91	#90	Pulse counter of Feedback	For monitor			R
---	#92	Electronic gear (Cmx)	1 ~ 65535	1	Encoder Pulse Rate (MPG numerator)	W
---	#93	Electronic gear (Cdv)	1 ~ 65535	1	Motor Pulse Rate (MPG denominator)	W
#95	#94	AB phase counter	For monitor		AB phase high-speed counter(4 倍波)	R
#97	#96	Acceleration pulse (master axis)	1 ~ 65535	---	As fig.3-14 : ③	W
#99	#98	Start following point	1 ~ 65535	0	Relative to absolute zero-point pulse As fig.3-14 ④	W
#101	#100	Mark point reference position	1 ~ 65535	0	Prevent Error Mark signal	W
#103	#102	Reserved	---	---		R
#105	#104	Master axis operation speed (pps)	System measure number of pulse of master axis Encoder (fourfold pulse)			R
#107	#106	Slaver acceleration pulse	For monitor, can't execute "WRITE"		As fig.3-14 : ⑦	R
#109	#108	Slaver synchronized pulse	For monitor, can't execute "WRITE"		As fig.3-14 : ⑧	R
#111	#110	Slaver moved pulse	For monitor, can't execute "WRITE"		As fig.3-14 : ⑦+⑧+⑨	R
#113	#112	Idly pulse	For monitor, can't be negative value		As fig.3-14 : ⑥	R
#114 ~ #117		System reserved				
---	#118	MPG following time				
---	#119	System reserved				
#121	#120	MPG moving pulse				
#123	#122	Encoder relative position	---	---	Relative to Z phase position	R
#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.

b2   Ratio command mode selection flag   Value at shipment：0

Set [0] : Forward direction and reverse pulse all effective.
Set [1] : Only forward direction pulse effective.
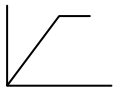
b3   Fly cutting mode return position select flag   Value at shipment：0

Set [0] : Use BFM#22, 21 to be return distance
Set [1] : Use BFM#84, 83 to be return distance

b4   Fly cut mode acceleration curve mode selection flag   Value at shipment：0

Set [0] :

b5   Fly cutting mode mark function   Value at shipment：0

Set [0] : Without mark function, use fixed length to start
Set [1] : Mark signal input, this signal is for starting to perform
When BFM#101, 100=0, Mark signal of the whole course is effective.
When BFM#101, 100≠0, the range of absolute position 0 ~ its content value is ineffective Mark signal.

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
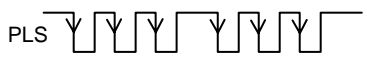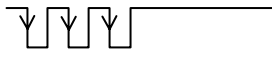
Set [0] : Open-loop mode
Set [1] : Close-loop mode
         When select Close-loop mode, bit13 of BFM#03 have to set to 1.

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	
FP	PLS (pulse waveform)	CW	(pulse waveform)
RP	SIGN forward reverse	CCW	(pulse waveform)

| 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 (V_{max})   Value at shipment：100,000pps

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

BFM #6 Bias Speed (V_{bias})   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, $V_{bias} < V_{JOG} < V_{max}$ Set range：10 ~ 200,000

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

♦Reach to DOG switch speed value. $V_{bias} < V_{RT} < V_{max}$ 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   Set range：10 ~ 10,000
execute machinery zero-return action.

BFM #12 ZERO SIGNAL COUNT   Value at shipment：1

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

♦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.

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| **BFM #15** | ACCELERATION / DECELERATION TIME

Value at shipment：100ms

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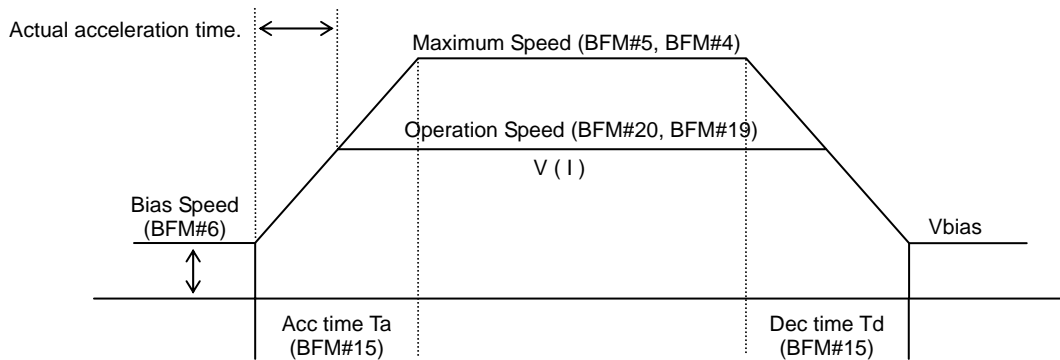
Set range：100 ~ 50,000

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)

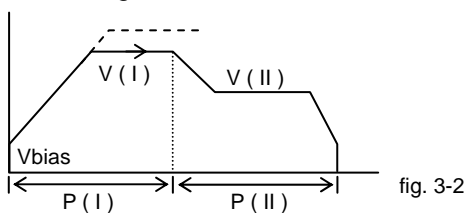♦This BFM is used to Two speed position operation.
Refer to fig.3-2.

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. When Close-loop mode, clear register of pulse-feedback.

| 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

$\boxed{\text{b6}}$ Zero Return operation ($\_\sqcap\_$: Trigger Signal)

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

$\boxed{\text{b7}}$ Relative (b7=1) / Absolute (b7=0) Position select flag

b7=1 relative position operation, b7=0 absolute position operation.

$\boxed{\text{b8}}$ Single speed position operation (Trigger Signal)

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

$\boxed{\text{b9}}$ Interrupt command position operation

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

$\boxed{\text{b10}}$ Two speed position operation

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

$\boxed{\text{b11}}$ External signal position operation

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

$\boxed{\text{b12}}$ Variable speed operation

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

$\boxed{\text{b13}}$ Ratio command position operation

When b13 from 0→1, Ratio command position operation start, then have to set BFM#03 b7 to "0".

♦ Have to disable External STOP signal, i.e., BFM#03 bit13 set to "1".

♦ Set Electronic gear of BFM#92 numerator and BFM#93 denominator (numerator can't be bigger than denominator).

♦ AB-phase pulse decide no. of output pulse by X0, X1 input system according to following principle,

No. of output pulse(No) = no. of input pulse(Ni) × numerator ÷ denominator

♦ Set parameter BFM#03 bit02. Can select two-way pulse output or one-way pulse output mode.

$\boxed{\text{b14}}$ Fly-cut operation

When b14 from 0→1, Fly-cut operation start; when b14 from 1→0, 2n1PG complete proceeded action and stop at A position.
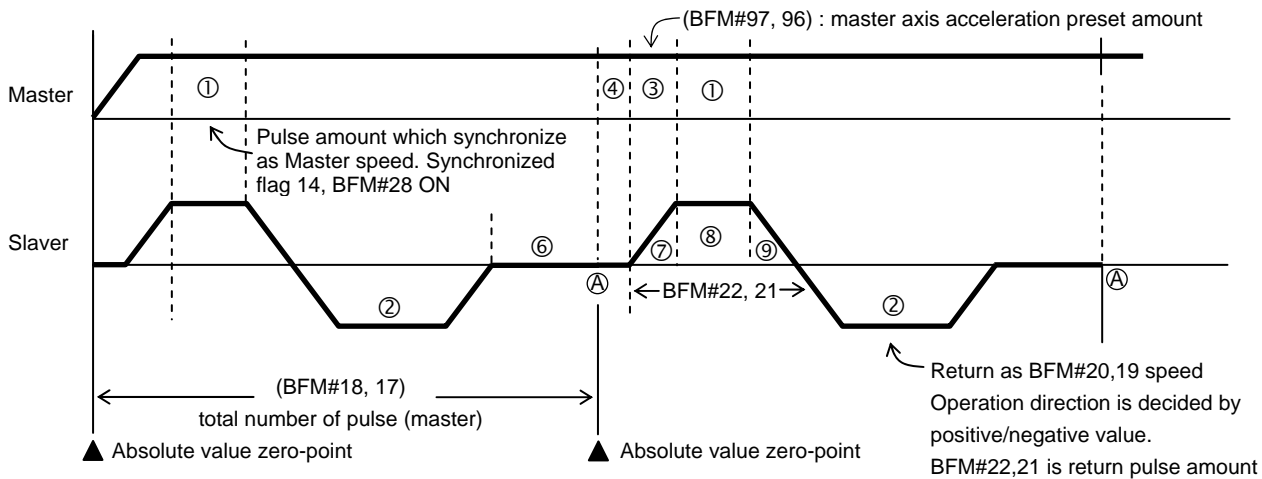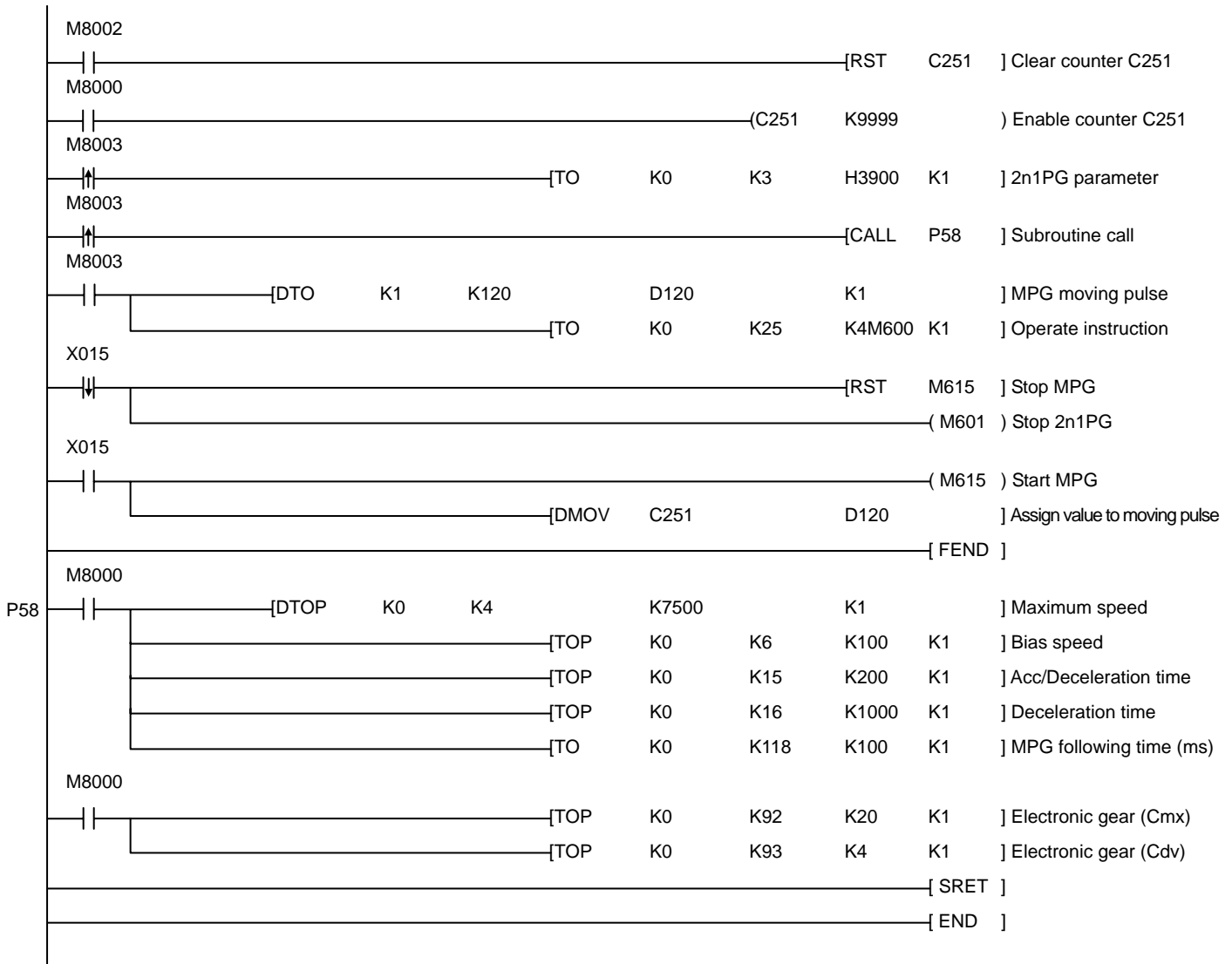

Fig. 3-14

① Synchronized operation area as Master Axis speed, value of BFM#22, 21(⑦+⑧+⑨) is number of synchronized pulse.

② Use BFM#20, 19 assigned speed to return waiting point. When value of BFM#20, 19 is negative, then execute reverse. When value is positive, then forward.
When return distance is different with BFM#22, 21+⑦+⑨, set BFM#03 bit3 to "1" and set return distance at BFM#84, 83 at the same time.

③ BFM#97, 96 acceleration pulse : set by user.

④ BFM#99, 98 : Start following point. Number of pulse which is relative to absolute zero-point.

⑦ BFM#107, 106 : slaver pulse which accelerate to synchronize as Master axis. (for monitor).

⑧ BFM#109, 108 : slaver pulse which synchronize as Master axis (for monitor).

⑨ BFM#111, 110 : slaver total moved pulse, is equal to ⑦+⑧+⑨ (for monitor).

⑥ BFM#113, 112 : idly pulse, this value can be for determine to adjust Master axis speed.

Note:

1. Please select Encoder attached Z phase, A phase→X0 terminal, B phase→X1 terminal, Z phase→PG0 terminal.

2. After enable BFM#25 bit14, have to wait Z phase signal trigger, then 1PG just start to execute following motion.

3. Please select B Type pulse output form, i.e., b8, BFM#03=1.

| b15 | Manual Pulse Generator (MPG) function |

♦Sample program

```
   M8002
   ──┤├──────────────────────────────────────────────[RST    C251   ] Clear counter C251
   M8000
   ──┤├──────────────────────────────────(C251    K9999  ) Enable counter C251
   M8003
   ──┤↑├─────────────────────────[TO     K0     K3    H3900    K1  ] 2n1PG parameter
   M8003
   ──┤↑├──────────────────────────────────[CALL   P58  ] Subroutine call
   M8003
   ──┤├────────[DTO    K1     K120         D120         K1  ] MPG moving pulse
           └──────────────────[TO     K0     K25   K4M600 K1 ] Operate instruction
   X015
   ──┤↓├──────────────────────────────────[RST    M615 ] Stop MPG
           └───────────────────────────────────( M601 ) Stop 2n1PG
   X015
   ──┤├───────────────────────────────────────( M615 ) Start MPG
           └──────────────[DMOV   C251         D120  ] Assign value to moving pulse
                                            ─[ FEND ]
        M8000
P58  ──┤├──────────[DTOP   K0     K4      K7500        K1  ] Maximum speed
           ├─────────────────[TOP    K0     K6    K100     K1 ] Bias speed
           ├─────────────────[TOP    K0     K15   K200     K1 ] Acc/Deceleration time
           ├─────────────────[TOP    K0     K16   K1000    K1 ] Deceleration time
           └─────────────────[TO     K0     K118  K100     K1 ] MPG following time (ms)
        M8000
   ──┤├──────────────────────[TOP    K0     K92   K20      K1 ] Electronic gear (Cmx)
           └─────────────────[TOP    K0     K93   K4       K1 ] Electronic gear (Cdv)
                                            ─[ SRET ]
                                            ─[ END  ]
```

| BFM #27、26 | CURRENT POSITION CP |

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

| BFM #28 | STATUS INFORMATION |

♦The status of Ex2n1PG 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.
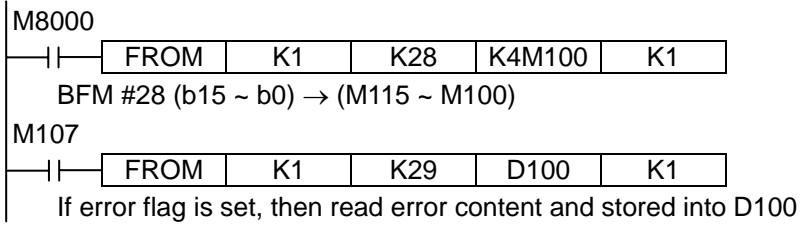
| b8 | position finished flag (b8=1)

| 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)

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| b12 | still not reach to target address flag |
b13	Reserved
b14	Fly-cut mode synchronized flag
b15	Reserved

<<Status information read>>

```
M8000
├──┤├──┤  FROM  │   K1   │   K28   │  K4M100  │   K1   │
       BFM #28 (b15 ~ b0) → (M115 ~ M100)
M107
├──┤├──┤  FROM  │   K1   │   K29   │   D100   │   K1   │
       If error flag is set, then read error content and stored into D100
```

| **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
```
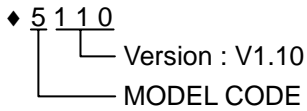
| **BFM #31** | Reserved   Using is prohibited |

| **BFM #32** | Close-loop delayed time |

| **BFM #34** | number of backlash pulse 1 |

| **BFM #36** | number of backlash pulse 2 |

| **BFM #62** | Reserved |

| **BFM #89** | Error Counter (close loop) |

♦When feedback pulse and actual sending pulse are over this setting value, then 1PG will stop outputting pulse.

Chapter 4

4-1 Connection with PLC

Ex1n32MT Ex2n1PG Ex1n16ER Ex2n1PG Ex1n32ER Ex1n2DA

X00 – X17   X20-X27   X30 - X47

Y00-Y17   Y20-Y27   Y30-Y47   Y50-Y67
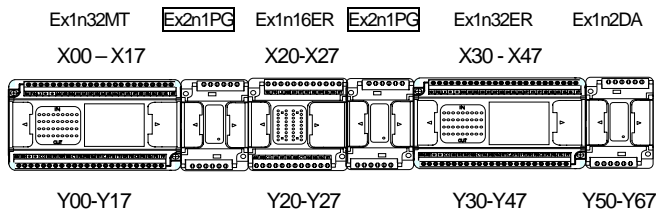
4-2 Signal of Ex1n1PG terminal

PG+	PG-	S/S	X00	X01	DOG

Ex2n1PG

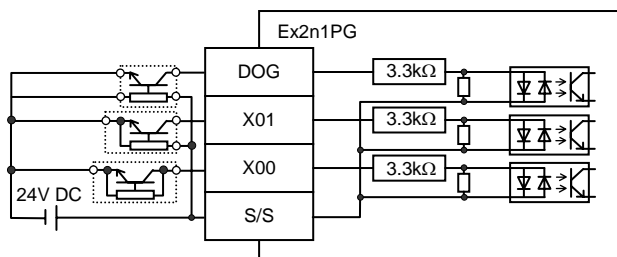| 24I	24G	FP	RP	COM	CLR
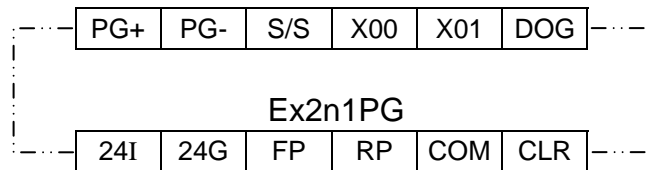
4-3 Input wiring

1) When contacts are used
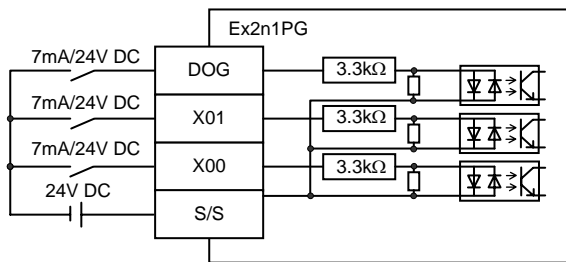
2) When NPN open collector transistors are used

3) When PNP open collector transistors are used

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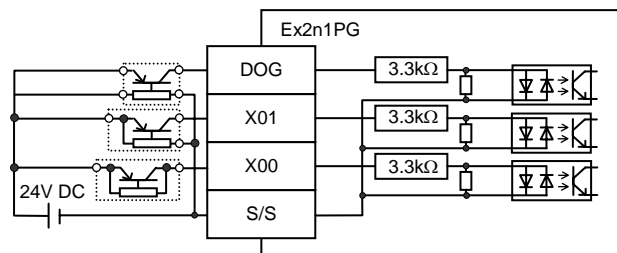
4) When a differential line driver is used
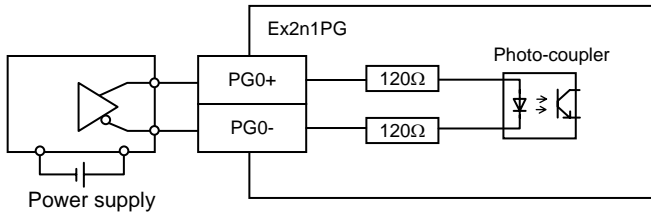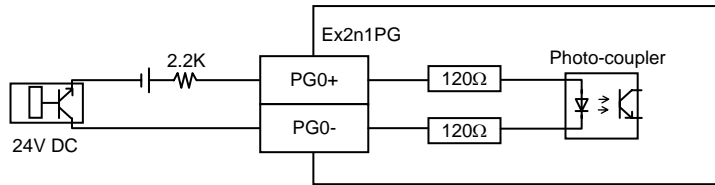

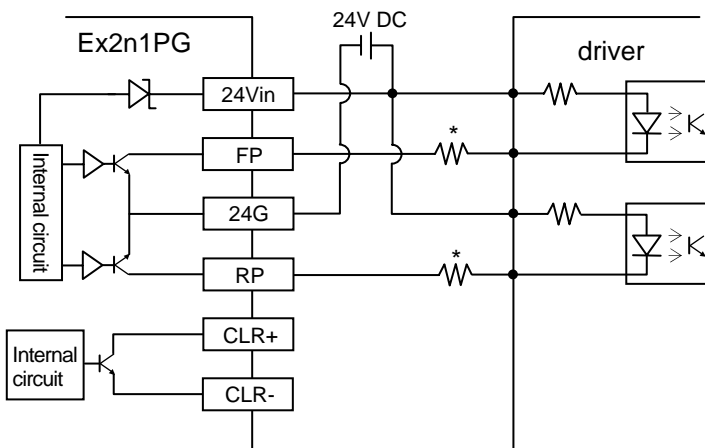5) When NPN open collector transistor is used (power supply : 5VDC)
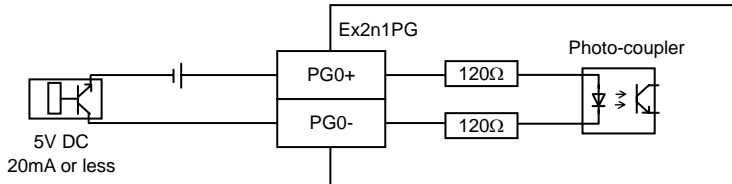
6) When PNP open collector transistor is used (power supply : 5VDC)
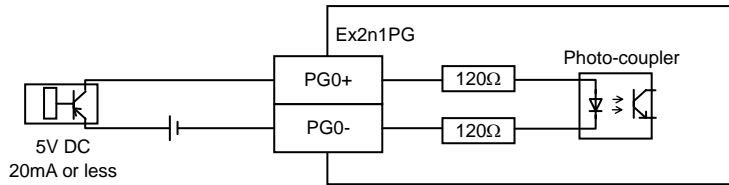
7) When NPN open collector transistor is used (power supply : 24VDC)

4-4 Output wiring

LIYAN PROGRAMMABLE LOGIC CONTROLLER