

COOLMAY

**(D) CX2N/FX2NC/DX2N (S)
PLC**

programming manual

Catalog

Chapter 1 Summary.....	1
Chapter 2 PLC Programming.....	2
2.1 PLC Programming type selection.....	2
2.2 resource set.....	3
Chapter 3 PLC instruction set introduction.....	5
3.1 Basic Program Instructions.....	5
3.2 STL Instructions.....	6
3.3 Function Instructions (Contrast with MITSUBISHI)	7
3.4 Device Numbers and Error Codes.....	9
Chapter 4 Analog usage.....	11
4.1 Analog Classification.....	11
4.1.1 Analog input selection.....	11
4.1.2 Analog Sampling.....	13
4.1.3 Analog Reading.....	13
4.2 Analog output.....	19
4.3 Analog interference processing.....	20
Chapter 5 High speed counter application.....	21
5.1 Assignment table of built-in high speed counter.....	21
5.2 Wiring of High-speed Counting AB(Z).....	23
Chapter 6 4-5 channels High-speed Pulse Application.....	24
6.1Pulse Output Wiring.....	24
6.2 Pulse output point and direction.....	24
6.3 Special Devices Used by Pulse Instructions.....	25
Chapter 7 Limitations of counters and pulses.....	27
7.1 Counter Limitations.....	27
7.2 Pulses Limitations.....	27
Chapter 8 Extension Module Application (Networking).....	29
8.1 Extension application.....	29
Chapter 9 Coolmay PLC Anti-interference Solution.....	30
Appendix 1 : Coolmay PLC Modbus Communication User Manual.....	31
1. Overview.....	31
2.PLC worked as a master.....	33
3.PLC worked as a slave.....	34
4.Program Example.....	35

Chapter 1 Summary

COOLMAY series PLC is a cost-effective PLC, developed and produced by Shenzhen Coolmay Technology Co., Ltd.

At present, the products are mainly divided into the following series according to the [high-speed pulse](#); among them, please refer to the [6th part](#) of this manual for high-speed pulses usage.

Sorts	A	B
Series	EX2N-40A programmable Text Monitor	EX2N-30A programmable Text Monitor
	EX2N-50A programmable Text Monitor	EX2N-30B/40B Text PLC All in one
	EX2N-70H(A/AS) HMI/PLC All in one	EX2N-43H(A) HMI/PLC All in one
	EX2N-100HA HMI/PLC All in one	DX2N/DX2NS PLC (no cover)
	DX2NA-44M PLC (no cover)	FX2NC
	DX2NT-68M PLC (no cover)	CX2N/DCX2N/CX2N-HM-16M
	CX2N/DCX2N/CX2N-HM-48M(-8AD4DA)	CX2N/DCX2N/CX2N-HM-10M(-2AD2DA)
	CX2N/DCX2N/CX2N-HM-36M(-16AD8DA)	CX2N/DCX2N/CX2N-HM-22M
	CX2N/DCX2N/CX2N-HM-64M(-8AD4DA)	CX2N/DCX2N/CX2N-HM-16M(-4AD2DA)
	CX2N/DCX2N/CX2N-HM-68M(-16AD8DA)	CX2N/DCX2N/CX2N-HM-32M(-2AD)
	CX2N/DCX2N/CX2N-HM-68M(-20AD4DA)	CX2N/DCX2N/CX2N-HM-30M(-2AD2DA)
	CX2N/DCX2N/CX2N-HM-80M(-8AD4DA)	CX2N/DCX2N/CX2N-HM-22M(-8AD4DA)
		CX2N/DCX2N/CX2N-HM-24M(-6AD4DA)

Compared with other PLCs, COOLMAY PLC has the following **advantages**:

- ◆ PC programming software is compatible with GX Developer 8.52/Works 2 (Support Ladder and SFC language, But don't support structure programming and labels).

- ◆ It adopts military-grade 32-bit CPU, which is fast and more suitable for industrial environment with high electromagnetic interference.

- ◆ Special encryption function to completely prevent illegal reading. By setting the user password to 12345678, you can completely close the function of reading the ladder program, thus protecting the user's program.

- ◆ PLC supports real-time clock and uses rechargeable battery.

- ◆ One or more 485/232 communication interfaces can be selected for external human machine interface and converters etc.

- ◆ Support Mitsubishi PLC programming port protocol / MODBUS protocol / RS protocol, easy to achieve PLC interconnection and communication with external devices.

- ◆ Support 4-5 high-speed pulse output, and can output 4-5 channels 200KHz high-speed pulses at the same time.(When choose 5channels high speed pulse, analog output function is unavailable.)

- ◆ Regular high-speed counting supports 2 channels of single-phase or AB phase 10K high-speed counting. Up to 6 single-phase counts or 3 AB(Z) phase counts can be made according to customer requirements.

- ◆ Support multiple channels of various types of analog single or mixed input and output, analog input precision 12 bits, output accuracy 10 bits. The analog input has an optional temperature/current/voltage input and the analog output has an optional voltage/current output.

- ◆ Switching output Optional relay/transistor or relay and transistor hybrid output.

- ◆ The terminal blocks are all pluggable terminals for customer convenience.

- ◆ Flexible use, can be customized according to customer requirements.

Chapter 2 PLC Programming

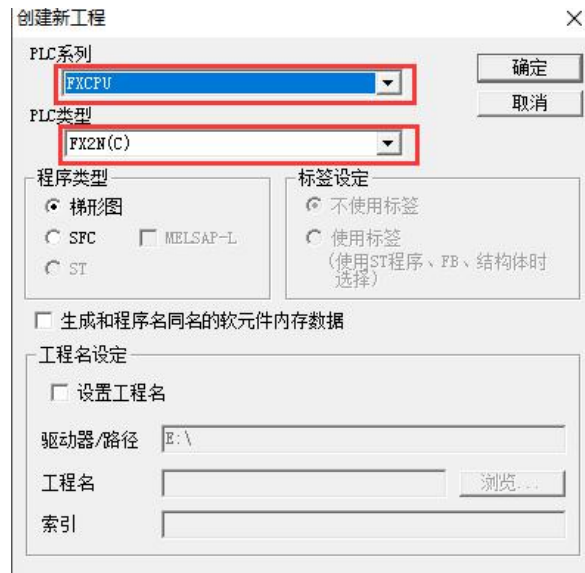
2.1 PLC Programming type selection

The PLC is compatible with GX Developer 8.52 / Works 2 and lower programming software. If you use the higher version software, may occur incompatibility .

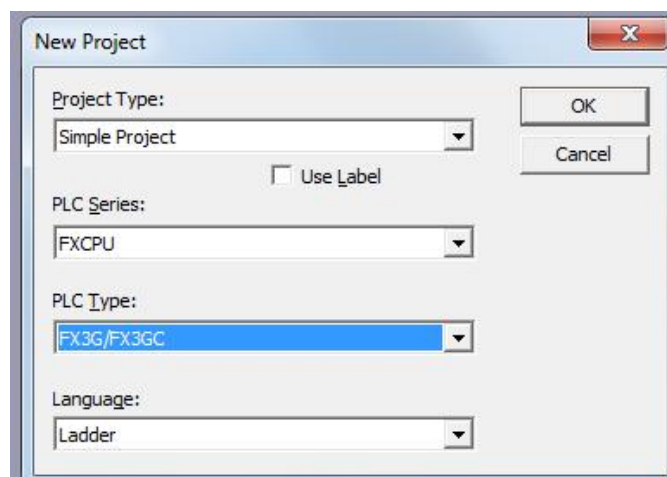
If prompt error appear “com port cannot be specified” when downloading the PLC program, In GX 8.52 software: online-transfer settings to change the com port; In Works 2: all targets-all connected targets to change the com port;

If there are prompts such as abnormal communication and abnormal cable, eliminate it by powering off, detecting the cable, checking whether the power supply is normal, or replacing the computer.

Select the figure in GX Developer 8.52 version:



Select the figure in GX Works 2 version: (Note: the label is forbidden)



2.2 resource set

Items		contents
Operation Control Method		Cyclic operation by stored program
IO Control Method		Batch processing method (when END instruction is executed),I/O refresh instruction is available
Programming language		Relay symbolic language+step ladder (compatible with Mitsubishi software FXGP_WIN-C)
Operation time	Basic instruction	0.08μs
	Applied instruction	10-30μs
storage	Build-in	8000 steps EEPROM
	Storage boxes	
Numbers of instructions	Basic instruction sequence	27
	STL instruction	2
	Applied instruction	94
Auxiliary relays	general	500points M0-M499
	Latched	1036points M500-M1535
	special	256points M8000-M8255
State relays	general	500points S0-S499
	initial	10points S000-S009
	latched	500points S500-S999
timers	100ms	200points T0-T199
	10ms	46points T200-T245
	1ms integrating	4points T246-T249
	100ms integrating	6points T250-T255
counters	General 16 bit	100points C0-C99

	Latched 16 bit	100points C100-C199
	General 32 bit	
	latched 32 bit	35points C200-C234
High-speed counters	Single phase	At most 6 points,C235-X0 C236-X1 C237-X7 C238-X3 C239-X4 C240-X5;Normally 2 points,C235-X0 C238-X3
	A/B phase	At most 3 points,C251-X0/X1 C253-X3/X4 C254-X10/X11,normally 2 points ,C251-X0/X1 C253-X3/X4
Data register (D.V.Z)	General	200points D0-D199
	Power-down save	800points D200-D999
	File register	
	Externally adjusted	
	Special	256points D8000-D8255
	Index	16points V0-V7 Z0-Z7
Pointers	For use with call	128points P0-P127
	For use with interrupts	
Nest levels	Mater	8points: N0-N7
Constants	Decimal K	16bit : -32768 to +32767
		32bit: -2147483648 to +2147483647
	Hexadecimal H	16bit: 0000-FFFF
		32bit: 00000000-FFFFFFFF

Chapter 3 PLC instruction set introduction

3.1 Basic Program Instructions

Mnemonic	Function	Devices	Program steps
LD (Load)	Initial logical operation contact type NO (normally open)	X,Y,M,S,T,C	1
LDI(Load Inverse)	Initial logical operation contact type NO (normally closed)	X,Y,M,S,T,C	1
LDP(Load pulse)	Initial logical operation -Rising edge pulse	X,Y,M,S,T,C	2
LDF(Load falling pulse)	Initial logical operation Falling/ trailing edge pulse	X,Y,M,S,T,C	2
AND (AND)	Serial connection of NO (normally open) contacts	X,Y,M,S,T,C	1
ANI(AND Inverse)	Serial connection of NC (normally closed) contacts	X,Y,M,S,T,C	1
AND (AND Pulse)	Serial connection of Rising edge pulse	X,Y,M,S,T,C	2
ANDF (ANd Falling pulse)	Serial connection of Falling / Trailing pulse	X,Y,M,S,T,C	2
OR (OR)	Parallel connection of NO (normally open) contacts	X,Y,M,S,T,C	1
ORI(OR Inverse)	Parallel connection of NC (normally closed) contacts	X,Y,M,S,T,C	1
ORP (OR pulse)	Parallel connection of rising edge pulse	X,Y,M,S,T,C	2
ORF (Or failing pulse)	Parallel connection of Falling / trailing edge pulse	X,Y,M,S,T,C	2
ANB (AND Block)	Serial connection of multiple parallel circuits		1
ORB (OR Block)	Parallel connection of multiple contact circuits		1
OUT(OUT)	Final logical operation type coil drive	Y,M,S,T,C	Note 1
SET(SET)	Sets a bit device permanently ON	Y,M,S	Note 2
RST (RESET)	Resets a bit device permanently OFF	Y,M,S,T,C,D,V,Z	
MC(Master control)	Denotes the start of a master control block	Y,M (Except special M)	3
MCR(Master control reset)	Denotes the end of a master control block		2
MPS(Point store)	Stores the current result of the internal PLC operations		1

MRD(Read)	Reads the current result of the internal PLC operations		1
MPP(Pop)	Pops (recalls and removes) the currently stored result		1
INV (Inverse)	Invert the current result of the internal PLC operations		1
NOP(No operation)	No operation or null step		1
END(END)	Forces the current program scan to end		1

- Device is Y and program step of general M is 1. Program step of S/ Special auxiliary relay M/Timer T/Counter C is 2. Program step of data register D and index register V and Z is 3.

3.2 STL Instructions

Mnemonic	Function	Devices	Program steps
STL	Start a STL program	S	1
RET	End a STL program	NULL	1

Note: Positioning instructions cannot be used in STL programs.

3.3 Function Instructions (Contrast with MITSUBISHI)

Sort	FN	Mnemoni	Function	support	Sort	FN	Mnemoni	Function	supp
	NO.					NO.			
Program Flow	00	CJ	Conditional Jump	★	Data operation	40	ZRST	Zone Reset	★
	01	CALL	Call Subroutine	★		41	DECO	Decode	★
	02	SRET	Subroutine Return	★		42	ENCO	Encode	★
	03	IRET	Interrupt Return			43	SUM	The sum of Active	★
	04	EI	Enable Interrupt			44	BON	Check Specified	★
	05	DI	Disable Interrupt			45	MEAN	Mean	★
	06	FEND	First End	★		46	ANS	(Timed)	
	07	WDT	Watchdog Timer	★		47	ANR	(Timed)	
	08	FOR	Start Of A	★		48	SQR	Square Root	★
	09	NEXT	End A For/Next	★		49	FLT	Floot.(floating	★
Move and compare	10	CMP	Compare	★	High speed processing	50	REF	Refresh	★
	11	ZCP	Zone Compare	★		51	REFF	Refresh and Filter	
	12	MOV	Move	★		52	MTR	Input Matrix	
	13	SMOV	Shift Move			53	HSCS	High Speed	
	14	CML	Compliment	★		54	HSCR	High Speed	
	15	BMOV	Block Move	★		55	HSZ	High Speed	
	16	FMOV	Fill Move	★		56	SPD	Speed Detect	★
	17	XCH	Exchange	★		57	PLSY	Pulse Y Output	★
	18	BCD	Binary Coded	★		58	PWM	Pulse Width	★
	19	BIN	Binary	★		59	PLSR	Ramp Pulse	★
Arithmetic and logical operation	20	ADD	Addition	★	Handy instructions	60	IST	Initial State	
	21	SUB	Subtraction	★		61	SER	Search	
	22	MUL	Multiplication	★		62	ABSD	Absolute Drum	
	23	DIV	Division	★		63	INCD	Incremental Drum	
	24	INC	Increment	★		64	TTMR	Teaching Timer	
	25	DEC	Decrement	★		65	STMR	Special	
	26	WAND	Word AND	★		66	ALT	Alternate State	★
	27	WOR	Word Or	★		67	RAMP	Ramp-variable	★
	28	WXOR	Word Exclusive	★		68	ROTC	Rotary Table	
	29	NEG	Negation	★		69	SORT	Sort Data	
Rotation and shift	30	ROR	Rotation Right	★	External I/O devices	70	TKY	Ten key Input	
	31	ROL	Rotation Left	★		71	HKY	Hexadecimal Input	
	32	RCR	Rotation right With	★		72	DSW	Digital	
	33	RCL	Rotation Left with	★		73	SEGD	Seven Segment	★
	34	SFTR	(Bit)Shift Right	★		74	SEGL	Seven Segment	
	35	SFTL	(Bit)Shift Left	★		75	ARWS	Arrow Switch	
	36	WSFR	Word Shift Right	★		76	ASC	ASC II Code	
	37	WSFL	Word Shift Left	★		77	PR	Print To A Display	
	38	SFWR	Shift Register	★		78	FROM	Read from A	
	39	SFRD	Shift Register Left	★		79	TO	Write from A	

Sort	FN	Mnemoni c	Function	support	Sort	FNC	Mnem onic	Function	support	
	C					NO.				
External service SER	80	RS	RS Communications	★	Contact comparison	224	LD=	(SI)=(S2)	★	
	81	PRUN	Parallel Run			225	LD >	(SI) > (S2)	★	
	82	ASCI	Hexadecimal to ASCII	★		226	LD <	(SI) < (S2)	★	
	83	HEX	ASCII to Hexadecimal	★		228	LD◇	(SI)◇(S2)	★	
	84	CCD	Check Code			229	LD≥	(SI)≥(S2)	★	
	85	VRRD	FX-8AV Volume Read			230	LD≤	(SI)≤(S2)	★	
	86	VRSC	FX-8AV Volume Scale			232	AND=	(SI)=(S2)	★	
	87					233	AND	(SI) > (S2)	★	
	88	PID	PID Control Loop	★		234	AND	(SI) < (S2)	★	
	89					236	AND	(SI)◇(S2)	★	
Floating point	11	DECOMP	Compares Two	★		237	AND≥	(SI)≥(S2)	★	
	11	DEZCP	Compares a float	★		238	AND≤	(SI)≤(S2)	★	
	11	DEBCD	Converts floating point	★		240	OR=	(SI)=(S2)	★	
	11	DEBIN	Converts scientific	★		241	OR >	(SI) > (S2)	★	
	12	DEADD	Adds two floating point	★		242	OR <	(SI) < (S2)	★	
	12	DESUB	Subtracts one floating	★		244	OR◇	(SI)◇(S2)	★	
	12	DEMUL	Multiplies two floating	★		245	OR≥	(SI)≥(S2)	★	
	12	DEDIV	Divides one floating	★		246	OR≤	(SI)≤(S2)	★	
	12	DESQR	Calculates the square	★		<p>NOTE:</p> <p>1、★ means function instructions supported by coolmay PLC</p> <p>2、There isn't position instructions for FX2N,needs to build FX1N program firstly, and then be copied from 1N program.</p> <p>3、Support PID, but don't support Auto turning.</p> <p>4、Specific usage of instructions please refer to "The FX Series of Programmable Control".</p>				
	12	INT	Float to Integer	★						
	13	SIN	Sine	★						
	13	COS	Cosine	★						
	13	TAN	Tangent	★						
	14	SWAP	Float to scientific	★						
Localization	15	ABS	Generates multiple							
	15	ZRN	Return original	★						
	15	PLSV	Pulse with variable	★						
	15	DRVI	Relative localization	★						
	15	DRVA	Absolute localization	★						
Real time clock control	16	TCMP	Compares two times -	★						
	16	TZCP	Time Zone Compare	★						
	16	TADD	Time Add	★						
	16	TSUB	Time subtract	★						
	16	TRD	Read RTC data	★						
	16	TWR	Set RTC data	★						
	16	HOUR	timer	★						
External device	17	GRY	Decimal to gray code							
	17	GBIN	Gray code to demical							
	17	RD3A	Analog module read							
	17	WR3A	Analog module write							

3.4 Device Numbers and Error Codes

Devices	Operation	Devices	Operation
M8000	RUN Monitor No contact	D8001	PLC type and version
M8001	RUN Monitor NC contact	D8002	Memory capacity
M8002	Initial pulse NO contact	D8003	Memory type
M8003	Initial pulse NC contact	D8011	Minimum cycle/scan time in units of 0.1msec
M8011	Oscillates in 10 msec cycles	D8012	Maximum cycle/scan time in units of 0.1msec
M8012	Oscillates in 100 msec cycles	D8013-D8019	Sec/min/hour/day/month/year/weekday data for use with an RTC cassette
M8013	Oscillates in 1 sec cycles	D8020	Input filter setting for devices X000 to X017 default is 10MSEC,(0-15)
M8014	Oscillates in 1 min cycles	A analog	See below table
M8020	Set when the result of an ADD is "0"	D8030-D8041	Values of AD0-AD11
M8021	Set when the result of an SUB is less than the min. Negative number	D8042	Value of cold end temperature input
M8022	Set when "Carry"occurs during an ADD or when an overflow occurs as a result of a data shift operation	D8213	Switch between E type and K type thermocouple
M8029	The execution complete flag	D8200-D8211	AD0-AD11 magnification correction
M8039	Constant scan mode	D8220-D8231	AD0-AD11size correction
M8035	Forced operation mode	D8212、D8232	Cold end magnification correction/ size correction
M8037	Forced STOP signal	D8039/D39	Constant scan duration (a defaulted setting 0 msec will be initiated during power ON) ; NOTE : if be used by analog, please use D39 instead
M8068	Operation error latch	B analog	See below table
M8080	Start analog output	D8030-D8037	Values of AD0-AD7
M8235	C235 as a down counter	D8038	Value of cold end temperature input
M8236	C236 as a down counter	D8049	Switch between E type and K type thermocouple
M8238	C238 as a down counter	D8040-D8047	AD0-AD7 magnification correction
M8239	C239 as a down counter	D8070-D8077	AD0-AD7 size correction
M8240	C240 as a down counter	D8048、D8078	Cold end magnification correction/ size correction

C analog	See below table	D8039	Constant scan duration (a defaulted setting 0 msec will be initiated during power ON) ;
D8030-D8049	Values of AD0-AD19	EX2N-30A	See below table (others refer to B type)
D8049(only when used as cold end)	Value of cold end temperature input	D8034	Value of cold end temperature input
D8240	Switch between E type and K type thermocouple	D8045	Switch between E type and K type thermocouple
D8200-D8219	AD0-AD19 magnification correction	D8044、D8039	Cold end magnification correction/ size correction
D8220-D8239	AD0-AD19 size correction	FX2NC before 2016	See below table
D8212、D8232	Cold end magnification correction/ size correction	D8030-D8033	Values of AD0-AD3
D8039/D39	Constant scan duration (a defaulted setting 0 msec will be initiated during power ON) ; NOTE : if be used by analog, please use D39 instead	D8034	Value of cold end temperature input
D8050-69	Analog scan time adjust	D8045	Switch between E type and K type thermocouple
D8065	Syntax error	D8040-D8043	AD0-AD3 magnification correction
D8068	Operation error step number latched	D8035-D8038	AD0-AD7 size correction
D8080-D8087	Values of DA0-DA7	D8044、D8039	Cold end magnification correction/ size correction
		D8039/D39	Constant scan duration (a defaulted setting 0 msec will be initiated during power ON) ; NOTE : if be used by analog, please use D39 instead

When error occurs, the indicator light will be flashing. Error steps can be confirmed by monitoring M8065/D8065.

Chapter 4 Analog usage

4.1 Analog Classification

According to the analog correction and cold-end registers, the products can be divided into the following four categories:

Sorts	A	B	C	D
Series	EX2N-40A-44M(-12AD8DA)	EX2N-30A-24M(-4AD2DA)	CX2N/DCX2N/CX2N-HM-68M(-20AD4DA)	CX2N/DCX2N/CX2N-HM-36M(-16AD8DA)
	EX2N-50A-44M(-12AD8DA)	EX2N-30B-24M(-4AD2DA)		CX2N/DCX2N/CX2N-HM-68M(-16AD8DA)
	EX2N-70H(A/AS)-44M(-12AD8DA)	EX2N-40B-44M(-8AD4DA)		EX2N-100HA-44M(-16AD8DA)
	DX2NA-44M(-12AD8DA)	EX2N-43H(A)-24M(-4AD2DA)		
	DX2NT-68MR/MT/MRT(-12AD8DA)	DX2N-24M(-4AD2DA)		
	CX2N/DCX2N/CX2N-HM-48M(-8AD4DA)	DX2N-44M(-4AD4DA)		
	CX2N/DCX2N/CX2N-HM-64M(-8AD4DA)	DX2NS-32M(-8AD4DA)		
	CX2N/DCX2N/CX2N-HM-80M(-8AD4DA)	FX2NC-12M(-2AD2DA)		
		FX2NC-24M(-4AD2DA)		
		CX2N/DCX2N/CX2N-HM-10M(-2AD2DA)		
		CX2N/DCX2N/CX2N-HM-16M(-4AD2DA)		
		CX2N/DCX2N/CX2N-HM-32M(-2AD)		
		CX2N/DCX2N/CX2N-HM-30M(-2AD2DA)		
		CX2N/DCX2N/CX2N-HM-22M(-8AD4DA)		
	CX2N/DCX2N/CX2N-HM-24M(-6AD4DA)			

4.1.1 Analog input selection

Analog inputs (Temperature) which can be customized are as follows:

Input signals	Measurement range	Registers value read	Resolution	Accuracy (whole measuring range)	Registers D8213/D8049/D804 <u>5</u>
E-type thermocouple	Environmental temperature-599.9℃	Room temperature-5999	0.1℃	1%	0
K-type thermocouple (Regular)	Environmental temperature-999.9℃	Room temperature-9999	0.1℃	1%	1
K-type thermocouple (Special)	Environmental temperature-1399℃	Room temperature-13999	0.1℃	1%	1
J-type thermocouple	Environmental temperature-999.9℃	Room temperature-9999	0.1℃	1%	/
S-type thermocouple	Environmental temperature-1799.9℃	Room temperature-17999	0.1℃	1%	/
B-type thermocouple	Environmental temperature~1819.9℃	Room temperature~18199	0.1℃	1%	/
PT100	-99.9-499.9℃	-999-4999	0.1℃	1%	/
PT1000	-99.9~499.9℃	-999~4999	0.1℃	1%	/
NTC10K	-19.9-109.9℃	-199-1099	0.1℃	1%	/
NTC50K	-40-199.9℃	-400-1999	0.1℃	1%	/
NTC100K	-40-299.9℃	-400-2999	0.1℃	1%	/
Voltage	0-10V	0-4000	2.5mV	1%	/
Current Type1	0-20mA	0-4000	5uA	1%	/
Current Type2	4-20mA	0-4000	4uA	1%	/

Diagram 1 :Analog input type

The transmitter which is integrated inside PLC is one of the above table or mixed ones.

● **Temperature Sensor**

Below are some suggestions according to our products:

1. Better to choose sensors suit for temperature with smaller measuring range, for example, if you want to measure tens temperature, then max temperature range should be less 110℃. NTC 10K is

more accurate than thermocouple. NTC50K should be used if the highest temperature should less than 200°C while the testing temperature is about 100°C.

2. If there is a long distant from sensors to PLC, better to use other sensors than PT100. Generally the line-loss of NTC type is less.

3. Thermocouple is the last choice if there is a high request for temp accuracy. Customers should adjust it according to the actual demand.

● Application of thermocouple

To ensure measurement accuracy, there are cold end temperature sensor inside transmitters of E and K-type themocouple. Thus the tested temperature should not below the cold temperature. While using thermocouple, cold end processing has been done inside, the measurement is based on the cold end (room temperature), namely the lowest measurement temperature is same with the control box.

A series products can flexibly choose E-type or K-type thermocouple by setting D8213, defaulted as 0, E type. While choosing K type, set **D8213=1**.

B series products choose K-type thermocouple, set **D8049=1**. The cold end of EX2N-30A and some FX2NC is D8034, cold side magnification correction is D8044, size correction is D8039. While choosing K type, set **D8045=1**..

C series products (CX2N-68M PLC, DCX2N-68M PLC and CX2N-HM-68M text plc) choose EK, only 19AI/AD can be made, the relevant cold end register is D8049. cold end amplification correction is D8219, size correction is D8239. While choosing K type, set **D8240=1**.

When the sensor is power off, values of the register may exceed the Max measuring range. If choosing E type, AD0 will be power off and D8030 >6000

4.1.2 Analog Sampling

The sampling period of analog can be automatically set. D8050-D8069 act on D8030-D8049 separately. For example, AD0 sampling time=D8050* PLC scan time. If D8050=1, every time when a sample is taken, value of D8030 changes. The setting range is 1-32767. Value of D8050 is larger, the result is more stable.

4.1.3 Analog Reading

The Analog inputs accuracy of Coolmay PLC and All-in-one is 12, Read registers of every analog directly when using, Errors can be corrected If met. Cold end is the reference temperature of sensor,

namely the environmental temperature, only used for EK.

A series analog registers and diagnostic registers refer to diagram 2 as below:

SN	Register value	Amplification Correction (units: milli)	Size Correction
AD0	D8030	D8200	D8220
AD1	D8031	D8201	D8221
AD2	D8032	D8202	D8222
AD3	D8033	D8203	D8223
AD4	D8034	D8204	D8224
AD5	D8035	D8205	D8225
AD6	D8036	D8206	D8226
AD7	D8037	D8207	D8227
AD8	D8038	D8208	D8228
AD9	D8039	D8209	D8229
AD10	D8040	D8210	D8230
AD11	D8041	D8211	D8231
Cold end	D8042	D8212	D8232

NOTE: D8042 is the cold end of thermocouple, K type set D8213=1

Diagram 2: A type Analog read and correction registers

B series analog registers and diagnostic registers refer to diagram 3 as below:

SN	Register value	Amplification correction (units: milli)	Size correction
AD0	D8030	D8040	D8070
AD1	D8031	D8041	D8071
AD2	D8032	D8042	D8072
AD3	D8033	D8043	D8073
AD4	D8034	D8044	D8074
AD5	D8035	D8045	D8075
AD6	D8036	D8046	D8076
AD7	D8037	D8047	D8077
Cold end	D8038	D8048	D8078

NOTE: D8038 is the cold end of thermocouple, K type set D8049=1

Diagram 3:B type Analog read and correction registers

*EX2N-30A,PLC cold end is D8034,When choosing K type thermocouple,set **D8045=1**; cold end

amplification correction is D8044, size correction is D8039. refer to diagram4.

SN	Register value	Amplification correction (units: milli)	Size correction
AD0	D8030	D8040	D8070
AD1	D8031	D8041	D8071
AD2	D8032	D8042	D8072
AD3	D8033	D8043	D8073
Cold end	D8034	D8044	D8039
NOTE: D8034 is the cold end of thermocouple, K type set D8045=1			

Diagram 4: EX2N-30A Analog read and correction registers

*Part FX2NC before 2016 orders,PLC cold end isD8034.When choosing K type thermocouple,set **D8045=1**; cold end amplification correction is D8044, size correction is D8039. refer to diagram5.

(Others , refer to B series)

SN	Register value	Amplification correction (units: milli)	Size correction
AD0	D8030	D8040	D8035
AD1	D8031	D8041	D8036
AD2	D8032	D8042	D8037
AD3	D8033	D8043	D8038
Cold end	D8034	D8044	D8039
NOTE: D8034 is the cold end of thermocouple, K type set D8045=1			

Diagram 5: Part FX2NC before 2016 orders Analog read and correction registers

C series analog registers and diagnostic registers refer to diagram 6 as below:

SN	Register value	Amplification correction (units: milli)	Size correction
AD0	D8030	D8200	D8220
AD1	D8031	D8201	D8221
AD2	D8032	D8202	D8222
AD3	D8033	D8203	D8223
AD4	D8034	D8204	D8224

AD5	D8035	D8205	D8225
AD6	D8036	D8206	D8226
AD7	D8037	D8207	D8227
AD8	D8038	D8208	D8228
AD9	D8039	D8209	D8229
AD10	D8040	D8210	D8230
AD11	D8041	D8211	D8231
AD12	D8042	D8212	D8232
AD13	D8043	D8213	D8233
AD14	D8044	D8214	D8234
AD15	D8045	D8215	D8235
AD16	D8046	D8216	D8236
AD17	D8047	D8217	D8237
AD18	D8048	D8218	D8238
AD19	D8049	D8219	D8239
AD19 is cold end while used only as thermocouple	D8049	D8219	D8239
Note: D8049 is cold end while used only as thermocouple, K-type set D8240=1			

Diagram 6: C series Analog read and correction registers

Dseries analog registers and diagnostic registers refer to diagram 7 as below:

SN	Register value	Amplification correction (units: milli)	Size correction
AD0	D8030	D8200	D8220
AD1	D8031	D8201	D8221
AD2	D8032	D8202	D8222
AD3	D8033	D8203	D8223
AD4	D8034	D8204	D8224
AD5	D8035	D8205	D8225
AD6	D8036	D8206	D8226
AD7	D8037	D8207	D8227
AD8	D8038	D8208	D8228
AD9	D8039	D8209	D8229
AD10	D8040	D8210	D8230
AD11	D8041	D8211	D8231
AD12	D8042	D8212	D8232
AD13	D8043	D8213	D8233
AD14	D8044	D8214	D8234

AD15	D8045	D8215	D8235
AD15 is cold end while used only as thermocouple	D8045	D8215	D8235
Note: D8045 is cold end while used only as thermocouple, K-type set D8240=1			

Diagram 7: D series Analog read and correction registers

Below is an example of gathering the signal of 1 channel analog AD0 of EX2N-70H:

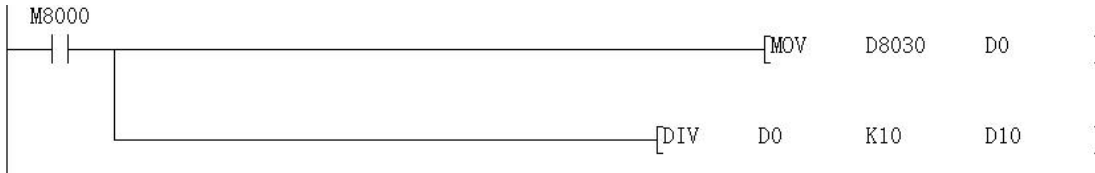


Figure 1: Analog input acquisition routine

Connect the signal port of temperature sensor into AD0 of HMI/PLC All-in-on, another port connected with GND. While PLC is working, the data register D8030 send data to D0 and performing division operations to D0, then D10 is the actual temperature. In the ladder diagram, division operations can also be performed to D8030 directly.

Note: When the input signal is 0-10v, the actual analog value=register value/400

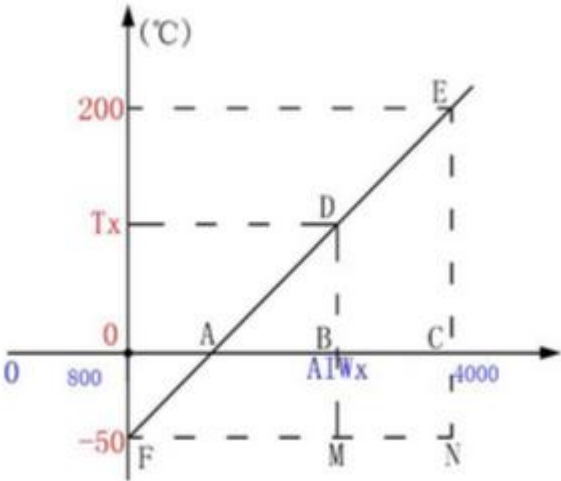
When the input signal is temperature, the actual analog value=register value/10

When the input signal is 0-20mA, the actual analog value=register value/200

When the input signal is 4-20mA, the actual analog value=(register value/250)+4

*When the optional input is 0-20mA analog input, while the sensor signal is 4-20mA, take a temperature transmitter as an example, if the measurement temperature range is -50 °C ~ 200 °C, the corresponding output current of -50 °C is 4mA, the corresponding output current at 200 °C is 20mA. However, the analog input of the 4AD analog module is set to 0-20mA, so that when input 0-20mA signal to the analog input of 4AD, 4AD converts its current signal 0-20mA to a digital value of 0-4000.

That is: the case of changing from 0-20mA analog input to 4-20mA analog input, as follows: 4mA corresponding digital value is: $4\text{mA} = (4000 \div 20) * 4 = 800$ Therefore, when inputting 4-20mA current signal to 4AD At the analog input end, the digital quantity converted by 4AD is 800-4000. The relationship between the measured temperature Tx and the corresponding converted digital quantity AIW0 is shown in Figure 1:



The programming of Coolmay PLC is as below: operation program of temperature.

$$\frac{BD}{CE} = \frac{AB}{AC}$$

$$\frac{MD}{NE} = \frac{FM}{FN}$$

$$\frac{T_x+50}{200+50} = \frac{AIW_x-800}{4000-800}$$

$$T_x = \frac{(AIW_x-800) 250}{3200} - 50$$

There are two ways for **analog correction**: size correction and amplification correction .

Below is an example of correction after AD0 temperature gathering of diagram 1.

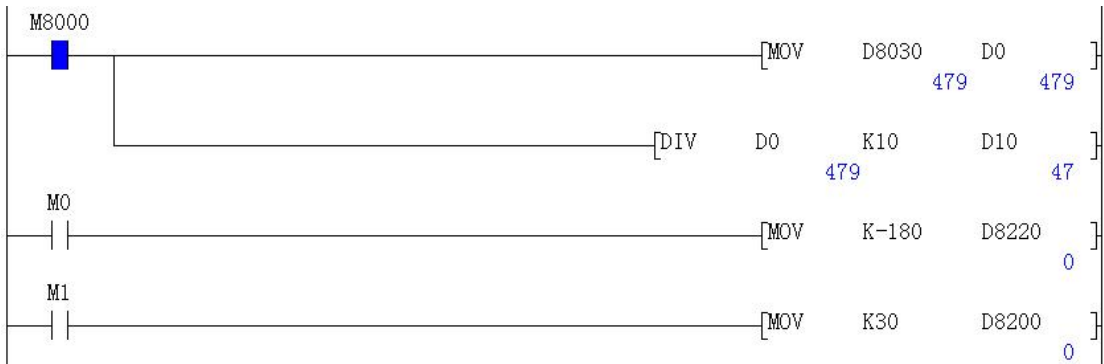


Figure 2: Analog correction 1

If the present temperature is 29°C, the testing temperature is 47°C, the error is 18°C , then the size correction register should be set as below to correct.

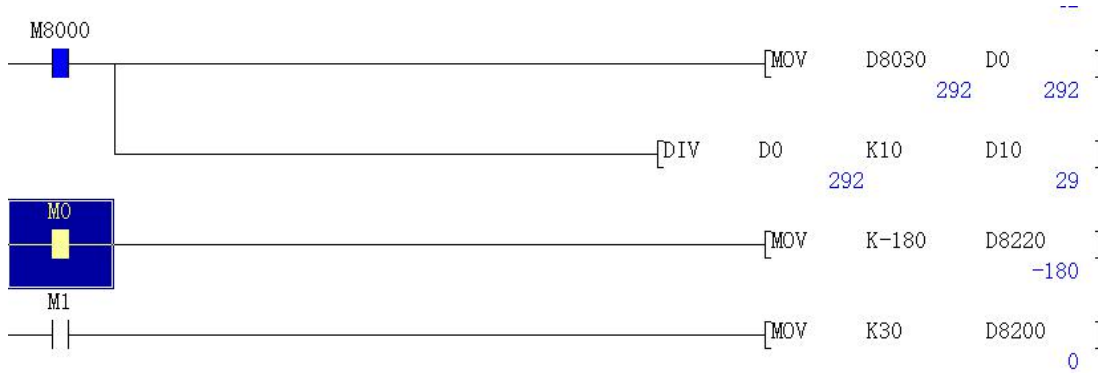


Figure 3: Analog correction 2

When M0 is closed In “Figure 3”, transmit -180 to D8220, then the actual testing temperature D10 value is approaching the target 29°C

It can be set by amplification correction if the target temperature is very high. If M1 is closed, assign D8200, what is amplification correction. Normally only if size correction is right, there is no need to set magnification correction.

The relationship between the two corrections is as below:

If D8030 should be decreased to 990%, D8200 should be set as -10.

If D8030 should increase 5 values, D8220 should be set as 5.

4.2 Analog output

Assign D8080-8087 directly can realize the analog output of Coolmay PLC. DA0-DA7 are AO ports, GND is the public port. 0-10V, 0-20mA is optional. The output accuracy is 10bit, 0-10V/0-20mA correspond to 0-1000.

Range of analog output registers and output voltage(current):

	AO Register	Range	Output voltage/current	Resolution	Start contact
DA0	D8080	0-1000	0-10V/0-20mA	10mV/0.02mA	M8080: ON
DA1	D8081	0-1000	0-10V/0-20mA	10mV/0.02mA	
DA2	D8082	0-1000	0-10V/0-20mA	10mV/0.02mA	
DA3	D8083	0-1000	0-10V/0-20mA	10mV/0.02mA	
DA4	D8084	0-1000	0-10V/0-20mA	10mV/0.02mA	M8084: ON
DA5	D8085	0-1000	0-10V/0-20mA	10mV/0.02mA	
DA6	D8086	0-1000	0-10V/0-20mA	10mV/0.02mA	
DA7	D8087	0-1000	0-10V/0-20mA	10mV/0.02mA	

Figure 4: Analog output

- M8080 is the start contact of DA0-DA3, there have output signal only when M8080 is set ON.
- M8084 is the start contact of DA4-DA7, there have output signal only when M8084 is set ON.

Below is an example of analog output 0-10V :

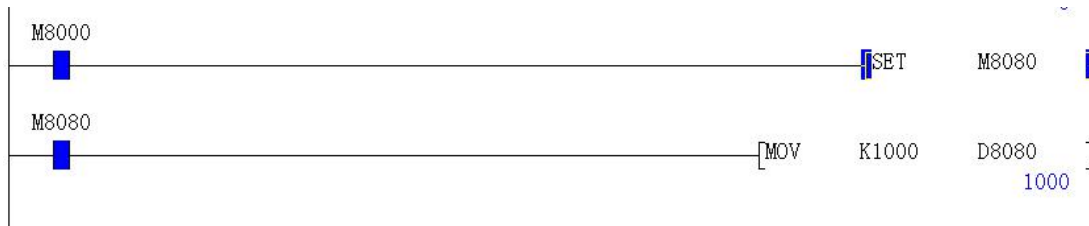


Figure 5: Analog output

After setting M8080, directly assign 1000 to D8080, connect the red meter of the multimeter to DA0, and connect the black meter to GND. At this time, there will be 10V voltage output.

4.3 Analog interference processing

In case of analog interference, 104 ceramic capacitor can be connected with the input/output ports. One port of 104 ceramic capacitor connected with the positive electrode of analog inputs, the other port connected with ground.

More details, pls refer to [<PLC Anti-interference solution>](#)

Chapter 5 High speed counter application

5.1 Assignment table of built-in high speed counter

	Single phase counter input						AB phase counter input			ABZ phase counter input		
	C235 10KHz/ 100KHz	C236 100KHz	C238 10KHz/ 100KHz	C239 100KHz	C240 10KHz	C237 10KHz	C251 10KHz/ 100KHz	C253 10KHz/ 100KH z	C254 10KHz	C252 10KHz/ 100KH z	C253 10KHz/ 100KH z	C254 10KHz
X000	U/D						A			A		
X001		U/D					B			B		
X002										Z		
X003			U/D					A			A	
X004				U/D				B			B	
X005					U/D			R			Z	
X007						U/D						
X010									A			A
X011									B			B
X012												Z

Normal[U]:up counter [D]:down counter [A]: A phase counter [B]: B phase counter [R]: reset

	Single phase counter input					C237 10KHz
	C235 10KHz/100KHz	C236 100KHz	C238 10KHz/100KHz	C239 10KHz	C240 10KHz	
M8235	Down counter while driving; Up counter without driving					
M8236		Down counter while driving; Up counter without driving				
M8238			Down counter while driving; Up counter without driving			
M8239				Down counter while driving; Up counter without driving		
M8237					Down counter while driving; Up counter without driving	
						Down counter while driving; Up counter without driving

- The max frequency of single phase counter is 10KHz, Up to make 6channels single phase 10KHz-100KHz, 3channels AB(Z) phase 10KHz-100KHz.
- Single phase 10KHz is X00/X03 regularly, corresponding to C235/238. At most 6 single phase counters can be added, corresponding to C235-X0; C236-X1; C237-X7; C238-X3; C239-X4; C240-X5; C237 should be connected with X2 for high speed counting, now be changed to X7. X0/X1/X3/X4 can be customized to 100KHz, X5/X7 can be customized to 10KHZ
- While 6 single phase counters be used, there is no conflicts with other counters and pulses,

but conflict with ZRN, ZRN will be useless. Only when X3 isn't used, ZRN of Y7/X7 is useful.

- AB phase counter is 2 times frequency, regularly is 10KHz 2channels X00-X01/X03-X04, corresponding to C251/C253. It can also be customized into 3channels AB phase counter, add 1 channel X10-X11, corresponding to C254; among it, X00-X01/X03-X04 can be customized to 100KHz, X10-X11 can be customized to 10KHz.

5.2 Wiring of High-speed Counting AB(Z)

- AB rotary encoder count function added, wiring of C251 is: A connected with X0, B with X1, Z not connected, C251 for PLC ladder diagram.
- AB(Z) rotary encoder count function added, wiring of C252 is: A connected with X0, B with X1, Z with X2, C252 for PLC ladder diagram.
- AB(Z) rotary encoder count function added, wiring of C253 is: A connected with X3, B with X4, Z with X5, C253 for PLC ladder diagram.
- AB(Z) rotary encoder count function added, wiring of C254 is: A connected with X10, B with X11, Z with X12, C254 for PLC ladder diagram. Do not conflict with other counters and pulse output.

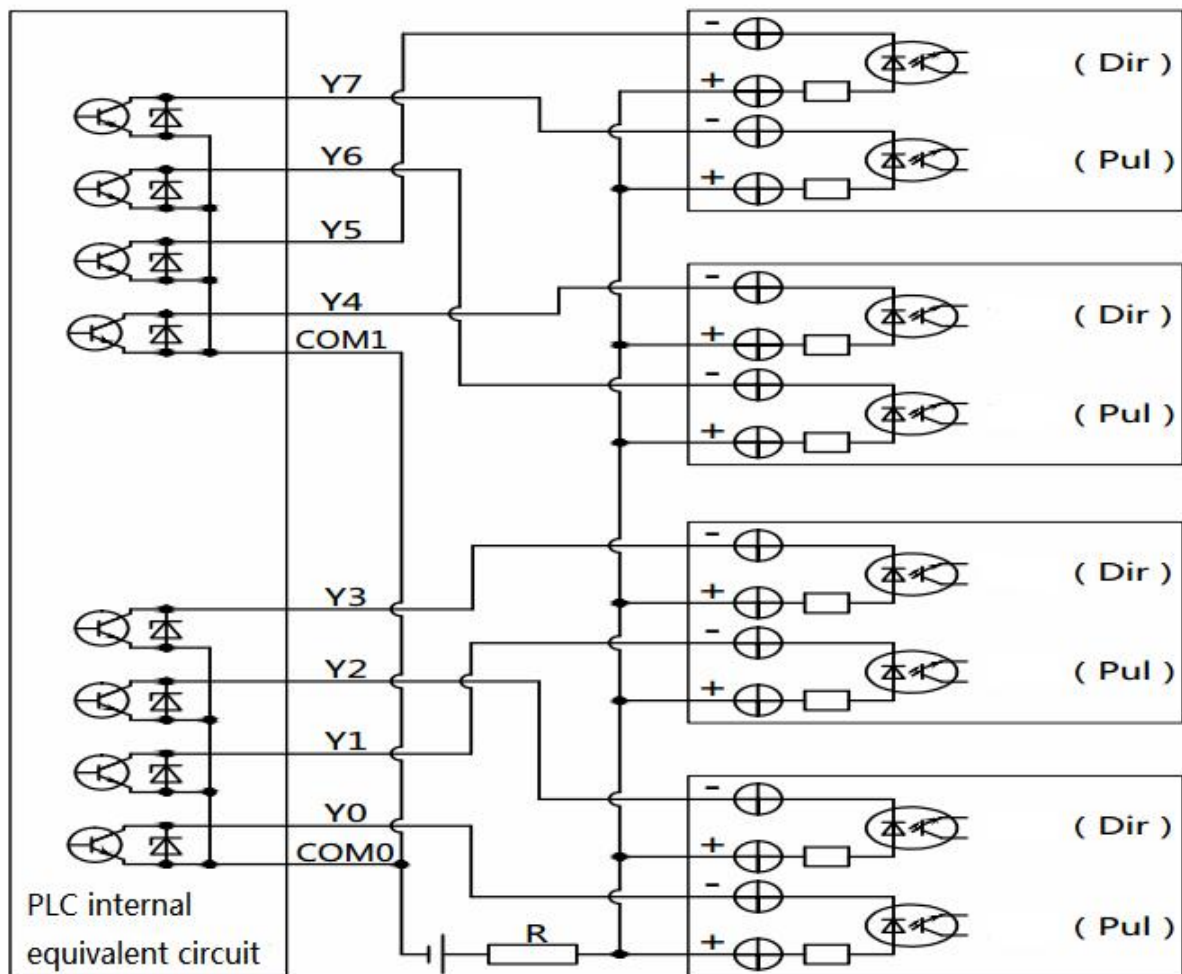
Note: Normally there are only single phase and AB phase, Z phase is optional and can be customized according to customers.

Chapter 6 4-5 channels High-speed Pulse Application

Coolmay PLC can be made 4-5channels high speed pulse output at same time as Clients requirements,supporting pulse commands and positioning commands, which can be output simultaneously without affecting each other. The Y output point with the same number allows multiple drives in the ladder diagram to facilitate user programming.

6.1 Pulse Output Wiring

Wiring: Stepper or servo motor wiring as shown below, 5V drive must add a 2KΩ resistor on DC24V.



DC24V (5V drive must add a 2KΩ resistor)

6.2 Pulse output point and direction

- Y0 sending pulse, Y2 control direction
- Y1 sending pulse, Y3 control direction
- Y6 sending pulse, Y4 control direction

- Y7 sending pulse, Y5 control direction
- Y10 sending pulse, Y11 control direction

Direction controlling can also be defined, regularly as stated above. More details pls refer to PLC program <4channels high speed pulse output>

6.3 Special Devices Used by Pulse Instructions

Special devices used by PLSY、PLSR are as below table:

	Y0	Y1	Y6	Y7	Y10
Send end flag	M8029	M8029	M8029	M8029	M8029
No. of pulse (32bit)	D8140	D8142	D8150	D8152	D8154
	D8141	D8143	D8151	D8153	D8155

Special device used by DRVI、DRVA、ZRN、PLSV are as below table:

	Y0	Y1	Y6	Y7	Y10
Send end flag	M8029	M8029	M8029	M8029	M8029
Current location	D8140	D8142	D8150	D8152	D8154
	D8141	D8143	D8151	D8153	D8155
ACC/DEC time during execution	D8148	D8148	D8148	D8148	D8148
Pulse stop bit	M8145	M8146	M8155	M8156	M8159
Pulse busy flag	M8147	M8148	M8157	M8158	M8161

- Regularly Y0,Y1,Y6,Y7 can send 20KHz pulse, and can also be customized to 100-200KHz.
- Please note that when changed to 100K-200K, the current load of pulse output port is very small and can only be used to send pulse, not suitable for normal digital output.
- If pulses should be more accurate, please connect COM ports of pulse output and input. Besides ,please connect COM port of pulse output to 0V of step driver DC24V power supply .
- Please note that 2N instructions don't support location/Position, whiling using them, please program it well with 1N instructions and then copy it to the program of 2N.
- The Near- point input signal of ZRN is fixed as X2、X5、X6、X7、X12, corresponding to Y0、Y1、Y6、Y7、Y10 of pulse output.
- At most 5 200K high-speed pulse outputs can be customized,once 5 channels be made, analog output function will be useless.

- When 100k-200k pulse be customized, the frequency is among 20KHz-60KHz. If the duty cycle is inaccurate (the normal duty cycle of the square wave is 50%, that is, the time taken by the positive level is 0.5 cycle), it may cause the phenomenon of large motor noise and pulse inaccuracy. M8149(PWM) should be driven ON.

Chapter 7 Limitations of counters and pulses

Coolmay products can be divided into 2 groups according to the limitations of **counters** and **pulses**.As below:

Sorts	A	B
Series	EX2N-40A	EX2N-30A
	EX2N-50A	EX2N-30B/40B
	EX2N-70H(A/AS)	EX2N-43H(A)
	EX2N-100HA	DX2N/DX2NS
	DX2NA-44M	FX2NC
	DX2NT-68M	CX2N/DCX2N/CX2N-HM-16M
	CX2N/DCX2N/CX2N-HM-48M(-8AD4DA)	CX2N/DCX2N/CX2N-HM-10M(-2AD2DA)
	CX2N/DCX2N/CX2N-HM-36M(-16AD8DA)	CX2N/DCX2N/CX2N-HM-22M
	CX2N/DCX2N/CX2N-HM-64M(-8AD4DA)	CX2N/DCX2N/CX2N-HM-16M(-4AD2DA)
	CX2N/DCX2N/CX2N-HM-68M(-16AD8DA)	CX2N/DCX2N/CX2N-HM-32M(-2AD)
	CX2N/DCX2N/CX2N-HM-68M(-20AD4DA)	CX2N/DCX2N/CX2N-HM-30M(-2AD2DA)
	CX2N/DCX2N/CX2N-HM-80M(-8AD4DA)	CX2N/DCX2N/CX2N-HM-22M(-8AD4DA)
		CX2N/DCX2N/CX2N-HM-24M(-6AD4DA)

Note: A series: could customize up to 5 channels pulses; B series: could customize up to 4 channels pulses

7.1 Counter Limitations

Limitations of B type products

- Y6 can not be used when C235(1phase X0),C251 (AB phase X0/X1) be used.
- Y0 and ZRN instruction can not be used when C238 (1phase X3) ,C253 (AB phase X3/X4) be used

7.2 Pulses Limitations

Limitations of A series products

1, limitations of 4 pulses

- When Y6 is used for pulse output, X0 can not be used for counter input.
- When Y7 is used for pulse output, X3 can not be used for counter input.

2, Limitations of 5 pulses

- When Y6 is used for pulse output, X0 can not be used for counter input.
- When Y7 is used for pulse output, X3 can not be used for counter input.
- When 5channels 20KHz-200KHz pulses is made, the analog output function will be useless.

Limitations of B series products(Up to 4 pulses can be added)

- When Y0 is used for pulse output, DA0-DA3 can not be used.
- When Y7 is used for pulse output, X3 can not be used for counter input.
- When Y6 is used for pulse output or X0 used for counter input, DA4-DA7 will be useless.

Chapter 8 Extension Module Application (Networking)

8.1 Extension application

The RS485 communication interface of the CX2N PLC can be combined with multiple PLCs to form a large-scale control system. Refer to "*COOLMAY PLC MODBUS Communication User Manual*" and the program "*MODBUS Networking Sample*".

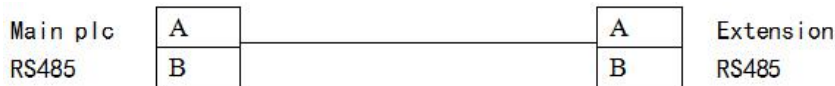
If the I/O points of one PLC isn't enough, another PLC can be connected to act as I/O extension module.

Below is an example of how to get 96 I/O system by 2 pieces CX2N-48MR/MT.

Steps of extension as below:

1. Main 2pieces PLC: Master: CX2N-48MR/MT Extension: CX2N-48MR/MT

2. Wiring method :



3. Pls visit [HTTP://WWW.COOLMAY.NET](http://www.coolmay.net) to download program <48 to 48 points extension program>

Chapter 9 Coolmay PLC Anti-interference Solution

For details, please refer to the manual “Coolmay PLC anti-interference solution”, which specifies the analog input and output anti-interference processing methods, switching anti-interference processing methods, Inhibition of inverter interference, correct grounding method of grounding wire, anti-interference processing method of communication port (RS232 port, RS485 port, RS422 port), anti-interference treatment method of power supply end.

For more problems about Coolmay PLC and HMI/PLC all in one, please refer to "*Coolmay Products FAQ 100*".

Appendix 1 : Coolmay PLC Modbus Communication User Manual

1. Overview

Modbus Serial Communication as a standard Industrial communication protocol has been widely used in each area. RS485 ports of Coolmay PLC support this protocol so that Coolmay PLC can communicate with devices which also support MODBUS, such as transducer, temperature and humidity module, configure network, sensors and so on.

There are two serial communication modes: ASCII and RTU. While setting PLC, users should set communication mode and parameters of RS485. (Baud rate, parity, etc.), all devices on the Modbus bus should have the same communication mode and serial communication parameters. To use Modbus communication, the relevant special components of each PLC must be set in the ladder diagram.

Coolmay PLC has its own programming port (RS232 or RS422). In addition, two communication ports (RS232 or RS485) can be installed to meet the external connection of the three types of devices.

★ RS232 or RS422 (PLC programming port): Support Mitsubishi programming port protocol;

★ RS485 (A[485+] B[485-] port)/RS232: Support Mitsubishi programming port protocol, Mitsubishi serial port protocol and MODBUS protocol (Modbus RTU/ASCII protocol communication parameters are set in D8120, station number is set in D8121, Can be used as a master or slave);

★ RS485 (A1[485+] B1[485-] port): Support Mitsubishi programming port protocol and MODBUS protocol (Modbus RTU/ASCII protocol communication parameters are set in D8160, station number is set in D8161, regular can only be used as slave use).

◆ **It can be specially customized into 2 channels RS485 Com port, support Modbus protocol master station.**

The 2nd RS485 communication port (A1 B1 port) to be used as the MODBUS master communication function:

1. Set the communication parameters in D8160 so that the PLC ladder diagram runs under the MODBUS host communication condition. When M8161=ON, the RD3A and WR3A commands are switched to the communication of the 2nd RS485 communication port (A1 B1 port).
2. Use the following registers D8166 (D8126), D8169 (D8129), M8169 (M8129), M8163 (M8123), D8103 (D8063), M8103 (M8063). Same method as the first RS485 communication port.
3. () is the first RS485 communication port (A B port) MODBUS communication register.

※ Please refer to the RS command description in <Mitsubishi FX Programming Manual> for how

to use the Mitsubishi serial protocol.

※ Please refer to this manual or “Coolmay PLC Modbus Communication User Manual” for how to use MODBUS protocol.

Register of D8120/D8160 communication parameter selection :

b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
-----	-----	-----	-----	-----	-----	----	----	----	----	----	----	----	----	----	----

b0	Data length 0:7bit 1:8bit
b2	Parity 00:None
b1	01:Odd 11:Even
b3	Stop bit 0:1bit 1:2bit
b7	Baud Rate
b6	0100:600bps 0111:4800bps
b5	0101:1200bps 1000:9600bps
b4	0110:2400bps 1001:19200bps
b8	Irrelevance with Modbus, set 0
b9	Irrelevance with Modbus, set 0
b11	Irrelevance with Modbus, set 0
b10	Irrelevance with Modbus, set 0
b12	Irrelevance with Modbus, set 0
b13	Communication Mode 0:RTU 1:ASCII
b14	Start communication protocol 0: programming port protocol or RS command 1: MODBUS Serial
b15	Slave or Master selection 0: Slave 1:Master

D8121/D8161 Slave station registers: Range 1-247

When PLC is slave, there must be a station number setting for D8121/D8161 in ladder.

Delay register before D8126/D8166 be sent. Range 0-1000, units:ms

Leave 5-20ms for receiving devices to prepare.

2. PLC worked as a master

When PLC worked as a master, only support below MODBUS functions

03: Read the holding register, get the current binary value from the holding registers, valid range:1-32

06: Write the binary value into a holding register(write register), valid range:1

16: Preset multiply registers, write specific binary value to a sequence of holding register (write several registers), valid range: 1-32.

Read slave data example: RD3A K1 H0 D0

RD3A originally is analog module read instruction, the original instruction can not be used. RD3A correspond to 03 function of MODBUS, read(4x) register. K1 means the station number of the slave which is read, valid range:1-247;H0 means the address NO. 0000(hexadecimal)of data being read from slave. Value of D0 represents the numbers of registers being read, valid range1-32, data being read successively stored in D1,D2,D3.....

Write data to slave example: WR3A K1 H0 D0

WR3A originally is analog module write instruction, the original instruction can not be used. WR3A correspond to NO.16 function of MODBUS, write data to each register(4x) of slave devices. If only one register is written, the WR3A instruction corresponds to the MODBUS No. 06 function, and one data is written to one (4 ×) register of the slave device.K1 means the station number of the slave to be written, valid range:1-247;H0 represents the starting address NO. 0000(hexadecimal) in slave devices of register which is been written. value of D0 represents the numbers of registers being written, valid range1-32, data being read successively stored in D1,D2,D3.....

D8129/D8169 (M8129/M8169) timeout register: Valid Range 0-32767, units:10ms

When reception is overtime or has errors, **M8129/M8169=ON**。

M8123/M8163 one completed communication flag

When a communication completed, **M8123/M8163=ON**, regardless of whether it is completed successful or not.

When RD3A or WR3A not be executed, there is no effect to **M8129/M8169** and **M8123/M8163**. When executed, if in the process of communication, **M8129/M8123** will be driven OFF automatically. If the communication completed, **MM8123/M8163** and **M8129/M8169** will output the corresponding status.

Multiple times Programmable

RD3A or WR3A can be multiple times programmed. Since communication is a long term process, it should be maintained executive and can not be in pulse form. When there are several instructions

for communication at same time, signals will be distribute in turns automatically. The upper delay of M8123/M8163 can easily find out the executive condition of this communication.

D8063/D8103 (M8063/D8103) Communication Error

The upper delay of the M8063 can conveniently detect the error information of this communication.

The values of D8063 represent their respective error messages.

6315: Modbus slave number is out of range > 255

6316: Modbus read/write Registers number exceeds the supported range, regularly 1-32.

6317: Modbus Receive Timeout

6318: Responding Station numbers is inconsistent

6319: Illegal Response

6320: LCR error

6321: Illegal address for saving data

6322: CRC error

6323: Illegal Data format

6324: Not Set as Master

6325: Address Over Range

6326: Modbus Send Timeout

3. PLC worked as a slave

Once PLC is set as Modbus slave, it can communicate through MODBUS no matter in the state of STOP or RUN.

Modbus functions supported by slave

01: Read Coils, get the current state of logic coils (ON/OFF), valid range:1-512

02: Read input states, get the current state pf inputs (ON/OFF), valid range:1-512

03: Read Holding Registers, read binary from holding registers, valid range:1-32

04: read binary from one or mutiply input registers, valid range:1-32

05: write single coil, write the state of logic coils (write bit), valid range: 1

06: Write specific binary value to a register (write register), valid range:1

15: write multiply coils,write on-off of a sequence of logic coils (write bit), valid range:1-512

16: write multiply registers, write specific binary value into a sequence of holding registers (write registers),valid range:1-32

Addresses corresponded to plc registers during modbus communication:

Hexadecimal address number	Registers
0000-01FF	D0-D511
1F40-203F	D8000-D8255
A140-A23F	T0-T255
A340-A407	C0-C199
A408-A477	C200-C255, 32bit occupy two address

Addresses corresponded to plc bit element during modbus communication:

Hexadecimal address number	Bit element
0000-05FF	M0-M1535
1E00-1EFF	M8000-M8255
2000-23E7	S0-S999
3000-30FF	T0-T255
3200-32FF	C0-C255
3300-33B7	Y0-Y267
3400-34B7	X0-X267

Note: when PLC communicate with kingview as a slave, If Hexadecimal address number corresponded to registers and bit elements should move backward for one bit. For example, while D0 corresponds to 40000, In Kingview it corresponds to 40001. while Y0 corresponds to 13056, In Kingview it corresponds to 13057, M0 corresponds to 00000, In Kingview it corresponds to 00001. If registers correspond to floating-point number, the address which kingview corresponds to should move backward for 2 bits. For example, D0 corresponds to 40000, In Kingview it corresponds to 400002.

4. Program Example

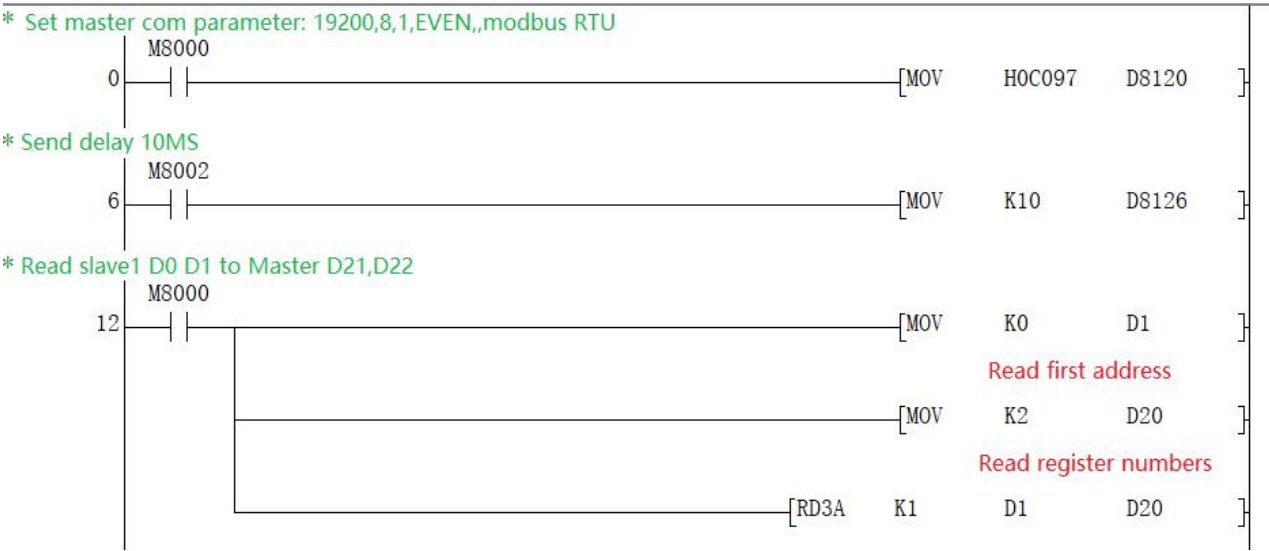
RS485 (A[485+] B[485-]□) /RS232: Support Mitsubishi programming port protocol, Mitsubishi serial port protocol and MODBUS protocol (Modbus RTU / ASCII protocol communication parameters are set in D8120, station number is set in D8121, can be used as master or slave).

(1) RD3A program example.

Slave:



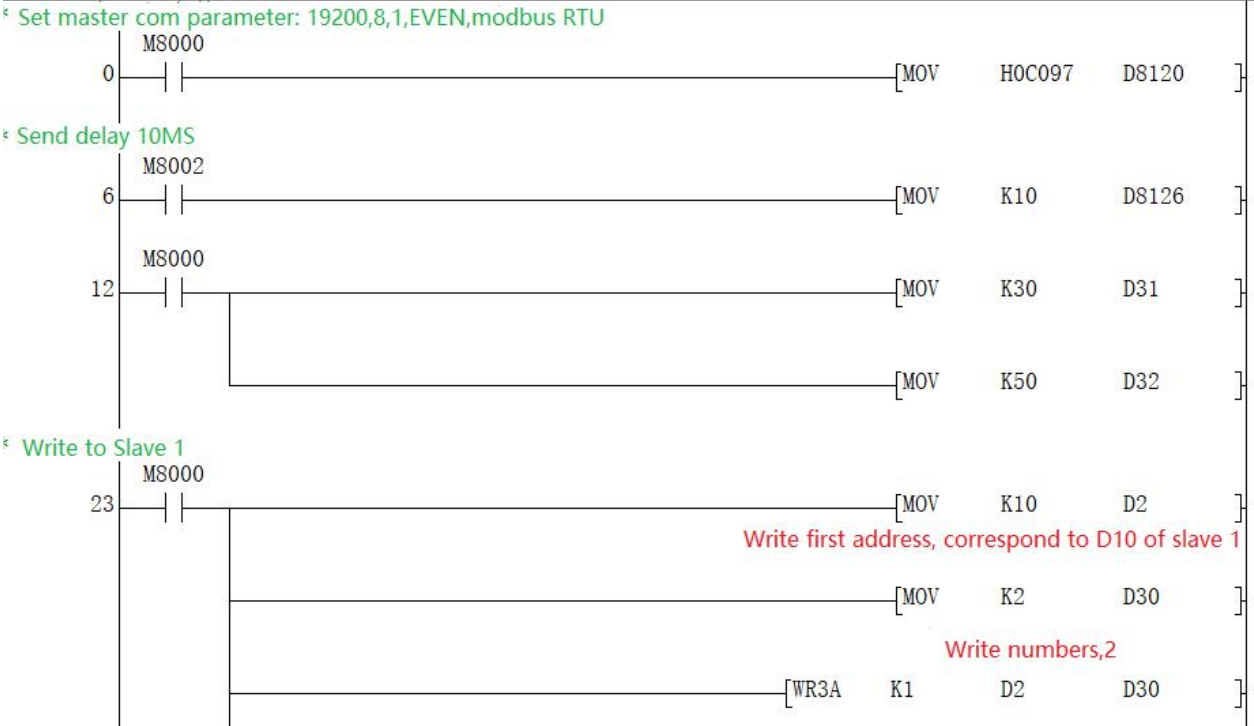
Master:



Program explanation: D20 saves the number of registers read, here means reading 2 data. The program indicates that the data of two registers D0-D1 in the PLC with slave station 1 is read and stored in the registers D21-D22 of the master PLC.

(2) WR3A Program example.

Master:



Slave:



Program explanation: Write the two data of the registers D31 and D32 in the master PLC to the slave station 1 PLC, and save them in the registers D10 and D11 of slave station PLC.

RS485 (A1[485+] B1[485-]□) : Support Mitsubishi programming port protocol and MODBUS protocol (Modbus RTU / ASCII protocol communication parameters are set in D8160, the station number is set in D8161, normally can only be used as a slave).

The 2nd is made as master specially. Program Example:

