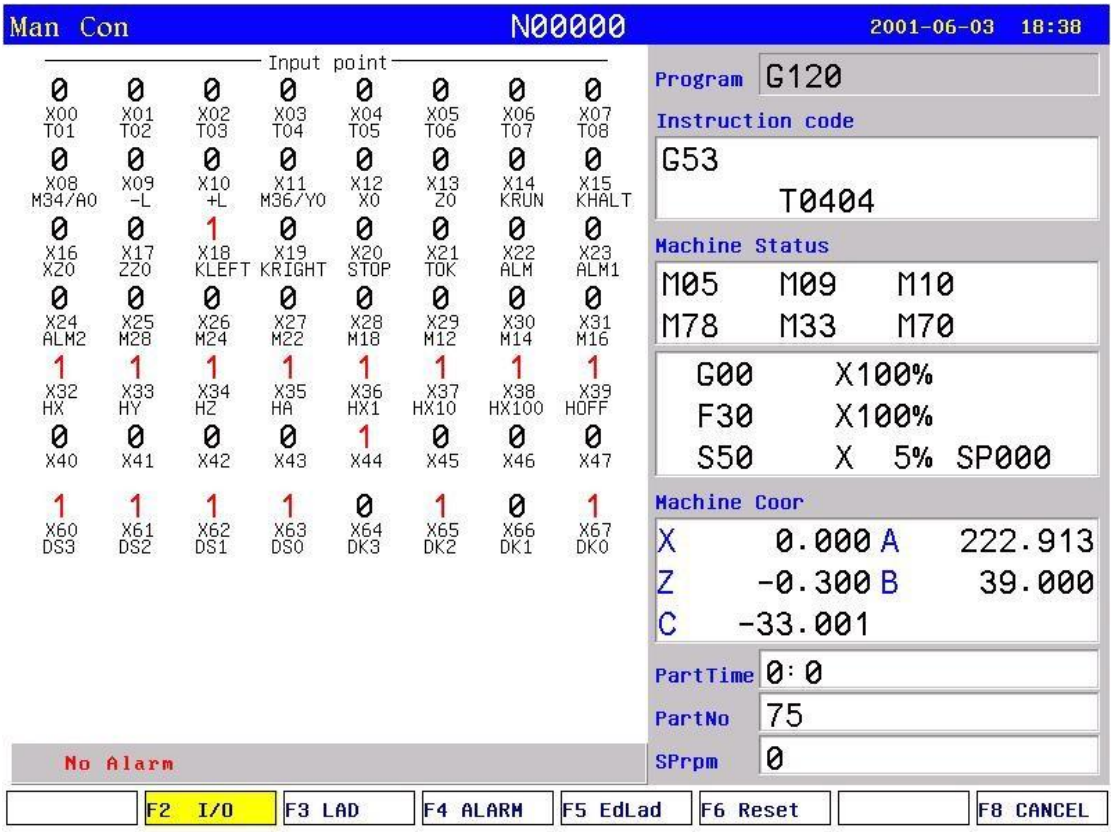
1、PLC instruction

1) PLC name: Backup from the controller into the U disk, the file named plc.lad is plc file in controller; (make a new folder in USB, connect USB with controller, press Program, open USB, get into the new folder, press backup, password is 111111)

2)PLC Editor: use NEWKer PLC editor program "NEWKer-PLC.EXE" to open and edit plc.lad, then install into controller after preservation of ladder diagram and instruction list.

3)NEW1000T/M CNC I/O ports（56 Input x32 Output）:



Note:

1) X32-X39, X60-X67 is normal close, and internal 5V power, never access higher than 5V voltage; others are normal open.

2) all the input and output 0V is effective.

3) pay attention: the function of editing PLC cannot cover the functions of original PLC and system.

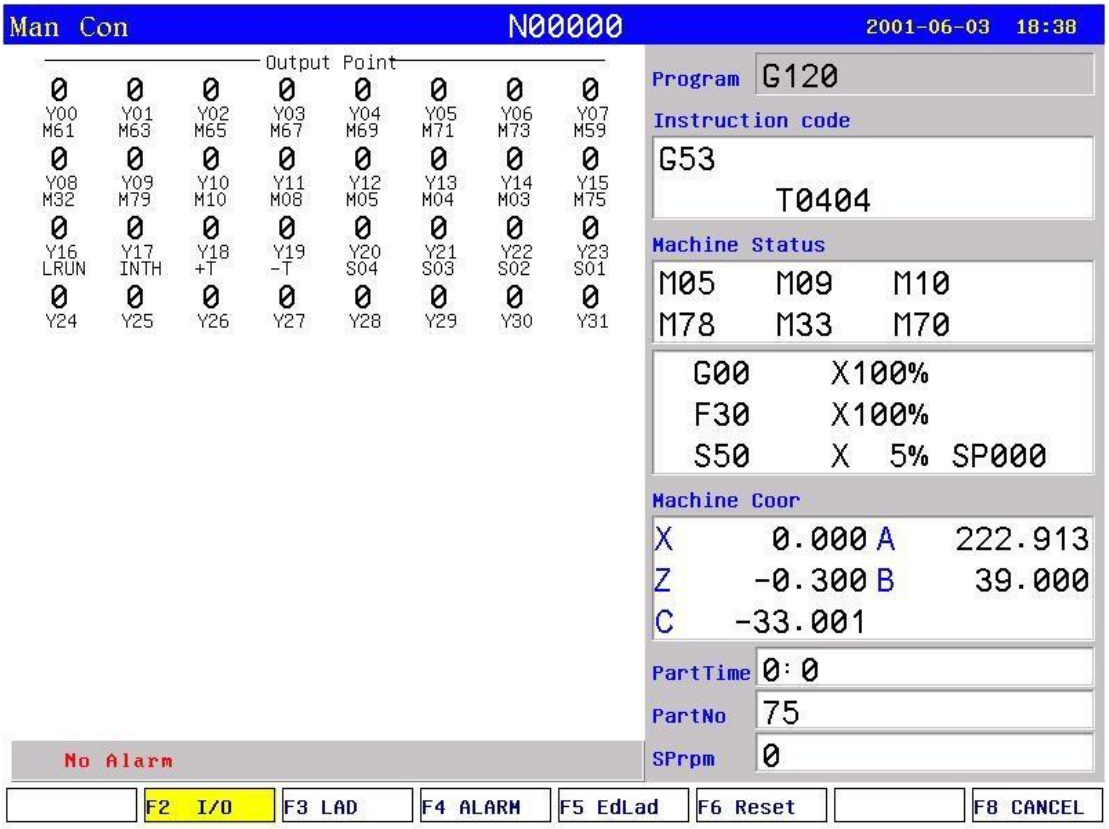
4） Parameter file configuration PLC input point and auxiliary relay method: (cncsystemeg.cfg) open by notebook from PC

a)'E' means modifies the normally open or normally closed state of the corresponding input point X in the PLC. (parameter value 0 means NO, 1 means NC, no value means there is no such contact in PLC).

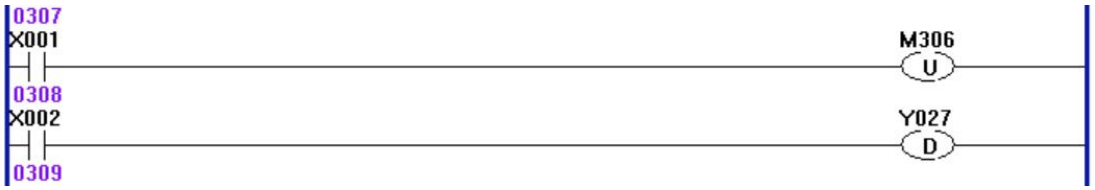
For example: Param#E12G1= //set the normally open or normally closed state of X12.

b) 'F' means modifies the normally open or normally closed state of the corresponding auxiliary relay M in the PLC. (parameter value is 0 It means NO, 1 means NC, no value means there is no such contact in PLC).

For example: Param#F250G1= //set the normally open or normally closed state of M250.



5) Invert the output point method when the input point rises or falls, for example; add the following line at the end of the PLC



When the rising edge of X01 is valid, M306 (Y24) is reversed;

Y27 is inverted when the falling edge of X02 is valid;

Auxiliary relay table corresponding to direct control output point in PLC:

990/1000/16i/18i cnc controller			
Program instruction	Function	Auxiliary relay	Output
M61/M60	User-defined 1	M59	Y00
M63/M62	User-defined 2	M63	Y01
M65/M64	User-defined 3	M52	Y02

M67/M66	User-defined 4	M60	Y03
M69/M68	User-defined 5	M105	Y04
M71/M70	User-defined 6	M56	Y05
M73/M72	User-defined 7	M57	Y06
M59/M58	User-defined 8	M50	Y07
M32/M33	Lubrication	M51	Y08
M79/M78	Tailstock	M61	Y09
M10/M11	Chuck	M09	Y10
M08/M09	Cooling	M48	Y11
M05	Spindle stop	M55	Y12
M03	Spindle CW	M54	Y13
M04	Spindle CCW	M53	Y14
M75/M74	User-defined 9	M58	Y15
	Running light<Drive enable>	M122<M317>	Y16
	Drive reset		Y17
	Turret CW		Y18
	Turret CCW		Y19
M204<M44>	Second spindle CCW <Forth gear of spindle>	M232<M111>	Y20
M203<M43>	Second spindle CW <third gear of spindle>	M231<M110>	Y21
M42	Second gear of spindle	M65	Y22
M41	First gear of spindle	M64	Y23
OUT+M306	K1	M306	Y24
OUT+M307	K2	M307	Y25
OUT+M308	K3	M308	Y26
OUT+Y27			Y27
<M203>	<Second spindle CW>	<M231>	Y28
<M204>	<<Second spindle CCW>	<M232>	Y29
	<First spindle enable>		Y30
	<Second spindle enable>		Y31

说明:
1,<>red words are the function for 16i/18i controller;
2,In PLC, control the output must control the auxiliary relay;
3,Y24-Y31 only 1000/16i/18i controller got;

2. Definition of PLC internal auxiliary relay

Relay	Function	Definition
M00	Forbidden Move	When effective, forbid servo axis move(State)

M01	Manual state	Effective means manual mode, Infective means auto mode(State)
M02	Just start	When the system has just started, the relay is effective and maintained.(State)
M03	Stop program	When effective, the program is forbidden to automatically run.(State)
M04	Emergency Stop	Effective when system is in emergency stop (State)
M05	Choosing tool	Effective when controller is choosing tool(cutter rotating)(State)
M06	Changing tool	Effective when controller is changing tool(tool exchange)(State)
M07	Magazine home	Effective when tool magazine is homing(State)
M08	Feed running	Effective when feed axis coordinate runs.(State)
M09	Chuck state Original point of mechanical hand magazine	Effective when output M10;(State) Ineffective when output M11; Original point of mechanical hand magazine, effective when tool changing
M10	Door open	Effective when protective door open(State)
M11	Mechanical hand take tool	Effective when ATC mechanical hand is taking tool(between clamp tool and tool change position)(State)
M12	Alarm output	when controller is in emergency stop, drive alarm or user defined alarm or hard limit. This relay is effective(Output)
M13	Tool exist detection	Effective when tool exchange position tool seat exists tool in umbrella atc (Input)
M14	Spindle orientation	When effective, controller executes spindle orientation function(Output)
M15	Clamp detection	When effective, it means tool clamp detect ready after M10(input)
M16	X positive limit	When effective, it means X axis is in the positive hard limit state(input)
M17	X negative limit	When effective, it means X axis is in the negative hard limit state (input).
M18	Y positive limit	When effective, it means Y axis is in the positive hard limit state (input).
M19	Y negative limit	When effective, it means Y axis is in the negative hard limit state (input).
M20	Z positive limit	When effective, it means Z axis is in the positive hard limit state (input).
M21	Z negative limit	When effective, it means Z axis is in the negative hard limit state (input).
M22	A positive limit	When effective, it means A axis is in the positive hard limit state (input).
M23	A negative limit	When effective, it means A axis is in the negative hard limit state (input).
M24	B positive limit	When effective, it means B axis is in the positive hard limit state (input).
M25	B negative limit	When effective, it means B axis is in the negative hard

		limit state (input).
M26	M01 condition pause	Program pauses if this relay on when run M01(Input).
M27	High-speed input	When effective, it mean ahead corresponding input point is high-speed input point (Input).
M28	Magazine goes forward/tool seat falls	When effective, Magazine goes forward(umbrella ATC)/tool seat falls(mechanical hand ATC). if not atc controller, it is user-defined.(Input).
M29	Magazine backward/tool seat lifts	When effective, Magazine goes backward(umbrella ATC)/tool seat lifts(mechanical hand ATC). if not atc controller, it is user-defined.(Input).
M30	Magazine forward ready/falls ready	When effective,Magazine goes forward ready(umbrella ATC)/tool seat falls ready(mechanical hand ATC). if not atc controller, it is can be used as high speed puncher switch M18 input.(Input).
M31	Magazine backward ready /tool seat lifts ready	When effective, Magazine goes backward ready (umbrella ATC)/tool seat lifts ready (mechanical hand ATC). if not atc controller, it is user-defined.(Input).
M32	X driver alarm	When effective, it means X axis driver is in alarm state(input).
M33	Y driver alarm	When effective, it means Y axis driver is in alarm state(input)
M34	Z driver alarm	When effective, it means Z axis driver is in alarm state(input).
M35	A driver alarm	When effective, it means A axis driver is in the alarm state(input).
M36	B driver alarm	When effective, it means the B axis driver is in the alarm state(input).
M37	C driver alarm	When effective, it means the C axis driver is in the alarm state(input).
M38	Run/skip ()	In the process of automatic operation, when the relay is effective, the section "()" in the program will be executed, when ineffective, skip the section() (input)
M39	Spindle alarm	When effective, the spindle drive is in alarm state.(input)
M40	Spindle high-gear detection	When effective, the spindle is in the high gear state.(input)
M41	Spindle low-gear detection	When effective, the spindle is in the low gear state.(input)
M42	Loose tool detection	When effective, it means tool loose ready during M11.(input)
M43	Spindle home	When effective, it means spindle back home ready(input).
M44	Cooling overload	When effective, the cooling motor is in the state of overload alarm (input).
M45	Cooling fluid alarm	When effective, it means the cooling liquid is in the alarm state of liquid lack(liquid level is insufficient). (input).

M46	Lubrication overload	When effective, it means that lubricant motor is state of overload alarm.(input).
M47	Lubricant oil shortage	When effective, it means lubricating oil of machine is in shortage (the oil is insufficient) alarm state (input).
M48	Cooling	When effective,controller turn on cooling(M08 on/M09 off)(Output)
M49	Loose tool	When effective,controller loose tool(M10 on/M11 off)(Output)
M50	User-defined output	When effective,controller turn on output(M59 on/M58 off)(Output)
M51	lubrication	When effective,controller turn on lubrication(M32 on/M33 off)(Output)
M52	user-defined	When effective,controller turn on output(M65 on/M64 off)(Output)
M53	Spindle CW	When effective,first spindle rotates CW(M03 on/M05 off)(Output)
M54	Spindle CCW	When effective,first spindle rotates CCW(M04 on/M05 off)(Output)
M55	Spindle stop	When effective,spindle stops(Output)
M56	user-defined output	When effective, output is on(command M71 on/M70 off)(Output)
M57	user-defined output	When effective, output is on(command M73 on/M72 off)(Output)
M58	user-defined output	When effective, output is on(command M75 on/M74 off)(Output)
M59	user-defined output	When effective, output is on(command M61 on/M60 off)(Output)
M60	user-defined output	When effective, output is on(command M67 on/M66 off)(Output)
M61	Tail stock thimble	When effective, output is on(command M79 on/M78 off)(Output)
M62	Thimble double signal	When effective, it means loosen(command M79 on/M78 off)(Output)
M63	User-defined output	When effective, output is on(command M63 on/M62 off)(Output)
M64	Spindle high-gear	When effective, spindle switch into high gear(Output).
M65	Spindle low-gear	When effective, spindle switch into low gear(Output).
M66	Spindle servo mode switch	When the relay is effective, the system converts spindle into servo mode.(Output)
M67	Spindle lock	When effective, system controls spindle drive to keep spindle motor is in lock tight state (Output).
M68	Spindle back home	When effective, spindle back home position.(Output)
M69	Spindle speed ready	When effective, it means spindle speed reaches command speed(Input)
M70	Chuck double signal	When effective, if inward chuck, it means loosen tool(M10 tighten/M11 loosen)(Output) When effective, if outward chuck, it means tighten tool(M10 loosen/M11 tighten)(Output)

M71	User-defined input	User-defined input(command M12)(Input)
M72	User-defined input	User-defined input(command M18)(Input)
M73	User-defined input	User-defined input(command M28)(Input)
M74	User-defined input	User-defined input(command M14)(Input), High-speed punching switch
M75	User-defined input	User-defined input(command M16)(Input)
M76	Auto lubricant	When effective, it means auto lubricant function is open(State)
M77	Chuck double signal	When effective, it means Chuck double signal function is open(State)
M78	Thimble double signal	When effective, it means Thimble double signal function is open(State)
M79	System occupied	
M80	User-define alarm	When effective, it means turret motor overload alarm. (input)
M81	User-define alarm	When effective, it means air pressure alarm.(input)
M82	User-define alarm	When effective, it means chip remove motor overload alarm.(input)
M83	User-define alarm	When effective, it means spindle fan overload alarm.(input)
M84	User-define alarm	When effective, it means turret check signal alarm.(input)
M85	User-define alarm	When effective, it means door switch M12 alarm.(input)
M86	User-define alarm	When effective, it means servo driver signal X20 alarm.(input)
M87	User-define alarm	When effective, it means servo driver signal X21 alarm.(input)
M88-M95	User-define alarm	When effective, it means corresponding alarm No. 8-alarm No.15(input)
M96-M99	Stand-by	
M100	Bit 0	Electric Tool coding.
M101	Bit 1	
M102	Bit 2	
M103	Bit 3	
M104	Stand-by	

Tool number	M100	M101	M102	M103
T1	1	0	0	0
T2	0	1	0	0
T3	1	1	0	0
T4	0	0	1	0
T5	1	0	1	0
T6	0	1	1	0
T7	1	1	1	0
T8	0	0	0	1

M105	user-define output	When effective, output is on(command M69 on/M68 off)(Output)
M106	Standard-by	
M107	System occupied	
M108	System occupied	
M109	Stand-by	
M110	Spindle third gear	When effective,spindle switches into the third gear(command M43)(output)
M111	Spindle fourth gear	When effective,spindle switches into the fourth gear(command M44)(output)
M112	Spindle third gear checking	When effective, it means spindle is in the third gear.(input)
M113	Spindle fourth gear checking	When effective, it means spindle is in the fourth gear.(input)
M114	Remote run	When effective, run program by external running button(input)
M115	Remote stop	when effective, stop program by external stop button(input)
M116-M119	Stand-by	
M120	Tool magazine rotate CW	When effective, system executes the tool magazine rotating CW.(output)
M121	Tool magazine rotate CCW	When the relay is effective, system executes the tool magazine rotating CCW.(output)
M122	Program run	When effective, it means system is in the process of automatic program operation.(State)
M123	Program pause	When effective, it means system is in the state of program pause.(State)
M124	Spindle speed 0	4 bits binary code output of spindle gear, corresponding to the instruction S0-S15.
M125	Spindle speed 1	
M126	Spindle speed 2	
M127	Spindle speed 3	
M128	Forbidden X axis	When effective, X axis motion is prohibited(input)
M129	Forbidden Y axis	When effective, Y axis motion is prohibited(input)
M130	Forbidden Z axis	When effective, Z axis motion is prohibited(input)
M131	Forbidden A axis	When effective, A axis motion is prohibited(input)
M132	Forbidden B axis	When effective, B axis motion is prohibited(input)
M133	Forbidden C axis	When effective, C axis motion is prohibited(input)
M134 M150	System occupied	
M151-M170	Stand-by	
M171	K1	Last state of K1
M172	K2	Last state of K2
M173	K3	Last state of K3
M174-	Stand-by	

M199		
M200	running state	X axis forward running(state)
M201	running state	X axis negative running(state)
M202	running state	Y axis forward running(state)
M203	running state	Y axis negative running(state)
M204	running state	Z axis forward running(state)
M205	running state	Z axis negative running(state)
M206	running state	A axis forward running(state)
M207	running state	A axis negative running(state)
M208	running state	B axis forward running(state)
M209	running state	B axis negative running(state)
M211	running state	C axis negative running(state)
M212	running state	Xs axis forward running(state)
M213	running state	Xs axis negative running(state)
M214	running state	Ys axis forward running(state)
M215	running state	Ys axis negative running(state)
M212	Homing state	X axis home already ready state(State)
M213	Homing state	Y axis home already state(State)
M214	Homing state	Z axis home already state(State)
M215	Homing state	A axis home already state(State)
M216-M219	System occupied	
M220	System occupied	When effective, it means idle running(State)
M221	System occupied	When effective, it means auxiliary function MST lock(State)
M222	System occupied	When effective, it means controller +5V power is low(State)
M223	System occupied	When effective, it means controller +24V power is low(State)
M224-M230	Stand-by	
M231	2nd spindle rotate CW	When effective, 2nd spindle rotate CW(command M203 on/M205 off)(Output)
M232	2nd spindle rotate CCW	When effective, 2nd spindle rotate CCW(command M204 on/M205 off)(Output)
M233-M241	Stand-by	
M242	Magazine tighten state	ATC servo magazine tighten/loosen(Output)
M243	Magazine tighten ready state	ATC servo magazine tighten/loosen ready(Input)
M244	Stand-by	
M245	Wait input	Alarm set when wait time expires.(State)
M246-M249	Stand-by	
M250	System occupied	
M251	System occupied	

M252-M264	Stand-by	
M265	Reset	When effective, it means Reset button is pressed just now(State)
M266-M274	Stand-by	
M275	System occupied	When effective, it means during rigid tapping, spindle drive ratio is 2:1(State)
M276	System occupied	When effective, it means following tapping mode(State)
M277	System occupied	When effective, it means under executing of user-define program(State)
M278	System occupied	When effective, it means under executing of Z axis drop setting function.
M279-M280	Stand-by	
M281	Rigid tapping	When effective, it means retracting tool during rigid tapping(State)
M282--M289	Stand-by	
M290	Spindle gear initialize	When effective, it means spindle gear is initialized ready when power on.
M291	System occupied	
M292	System occupied	
M293	Teach function	Effective when external input of teach function is effective(Input)
M294	Teach endpoint	Effective when external input of teach endpoint is effective(Input)
M295	System occupied	Effective when M18 is on, user high-speed punching(Input)
M296	Reset output	Parameter set if Reset button reset output point(State)
M297	System occupied	Effective when M14 is on, user high-speed punching(Input)
M298	System occupied	
M299	Teach middle point	Effective when external input of teach middle point is effective(Input)
M300	Servo driver alarm 1	Bus type controller parameter set driver alarm 1 NO/NC mode(State)
M301	Spindle gear S1	When effective, it means spindle gear S1 on, power-off protection, equal to M64
M302	Spindle gear S2	When effective, it means spindle gear S2 on, power-off protection, equal to M65
M303	Spindle gear S3	When effective, it means spindle gear S3 on, power-off protection, equal to M110
M304	Spindle gear S4	When effective, it means spindle gear S4 on, power-off protection, equal to M111
M305	Servo Alarm 2	Set Servo alarm 2 NO/NC in Bus type controller parameter(State)

M306-M308	K1K2K3	NEW1000 series controller K1K2K3 button
M309	K1	When effective, it means K1 is pressed(State)
M310	K2	When effective, it means K2 is pressed(State)
M311	K3	When effective, it means K3 is pressed(State)
M312	System occupied	
M313	Lubricant alarm	Lubricant alarm can be set NO/NC in parameter(State)
M314	C axis driver alarm	When effective, it means C axis servo driver is alarming(Input)
M315	Xs axis driver alarm	When effective, it means Xs axis servo driver is alarming(Input)
M316	Ys axis driver alarm	When effective, it means Ys axis servo driver is alarming(Input)
M317	Run state lamp	When effective, it means run state lamp on(Output)
M318 -M329	System occupied	
M330-M361	Output command	Bus controller command: M330/M4330-M3361/M4361(Output)
M400-M717	Stand-by	Bus controller
M822	Send Pulse	Sending pulse when effective
M824	Home state	Bus controller X axis home already state(State)
M825	Home state	Bus controller Y axis home already state(State)
M826	Home state	Bus controller Z axis home already state(State)
M827	Home state	Bus controller A axis home already state(State)
M828	Home state	Bus controller B axis home already state(State)
M829	Home state	Bus controller C axis home already state(State)
M830	Home state	Bus controller Xs axis home already state(State)
M831	Home state	Bus controller Ys axis home already state(State)
M999	High-speed mark	PLC before M999 is high-speed PLC(State)
M1014	E-stop mark	Reset mark of emergency decelerating stop(State)
M1050	Auto mark	Switch set into Automatic status(State)
M1051	Teaching function	When effective, it means external input of teaching function is on(Input)
M1052	Teaching endpoint	When effective, it means external input of teaching endpoint is on(Input)
M1053	Teaching middle point of arc	When effective, it means external input of middle point of arc is on(Input)
M1069	Manual mark	Switch set into Automatic status(State)

M1070 -1079	Macro program	Corresponding to macro programs ProgramUser0-9, example: when M1070 is on, ProgramUser0 will be executed(Input)
M1087	Exit teach function	
M1091	Record the first(Fast)point	
M1126		Chuck
M1127		Tailstock

3. Special relays of robot controller:

1) Coordinate system switch auxiliary relay M1056--M1060

2) Spindle's ratio spectrum switch auxiliary relay M258-M259-M260-M261

M1025: increase ratio of spindle

M1023: ratio of spindle 100%

M1024: reduce ratio of spindle

3) Auxiliary relay for arc(welding) starting detection

Effective M71 means starting arc(welding) successfully, ineffective M71 means end arc(welding) successfully.

Input point of starting arc(welding) detection: X0. only if X0 signal keep a period specified by parameter(the time could be changed in PLC), will auxiliary relay M71 changes correspondingly.

4) Starting arc(welding) controlling auxiliary relay

Effective M56 means starting arc(welding), ineffective M56 means ending arc(welding).

Instruction of reappear program: M71 start arc(welding), M70 end arc(welding).

Output point of starting arc(welding) controlling: Y16.

5) Auxiliary relay for feed and back solder wire

Auxiliary relay of feeding welding wire: M53

Auxiliary relay of backing welding wire: M54

Auxiliary relay of stopping feeding/backing: M55

Program instruction: M3 feed wire; M4 back wire; M5 stop.

Output points: Y14 feed wire; Y13 back wire; Y12 stop.

6) Output points

Y106 definition: BELL buzzer, each press outputs 0.3S(high level); if alarm, keep effective.

Y107 definition: ALARM alarm signal, output high level when alarming.

4. Special relays of robot controller and bus type controller:

1) 32 auxiliary relays including M282--M297, M298--M313, are reserved for user definition.
2) Auxiliary relay M298-M313 can save state when power off.
3) In PowerLink or etherCAT bus type system, M282-M289 correspond to connection state of 1--8 slave station, effective relay indicates successful connection, ineffective relay indicates failed connection.
4) Additional auxiliary relay of bus type system: M314--M329; M330--M377;M400-M719

M314: The 6th axis drive alarm
M315: The 7th axis drive alarm
M316: The 8th axis drive alarm
M317: Effective when cnc controller is ready
M318: The 6th axis running is forbidden
M319: The 7th axis running is forbidden
M320: The 8th axis running is forbidden
M321: Reserve
M322: The 6th axis positive limit alarm
M323: The 7th axis positive limit alarm
M324: The 8th axis positive limit alarm
M325: Reserve, for robot collision detection
M326: The 6th axis negative limit alarm
M327: The 7th axis negative limit alarm
M328: The 8th axis negative limit alarm
M329: Reserve, drag mode detection

5) Auxiliary relays M330--M377; M400-M719 are user defined.

6) Auxiliary relay for status of system: M800--M831

M800 --system reserved(Attention: defined as status of the 5th axis home status in non-bus controller)
M801 -- executing home process
M802 -- single block mode(In auto mode, means automatic single block; In manual mode, means manual incremental or handle pulse state)
M803 -- simulation run
M804 -- manual incremental or handwheel 0.1 mode

M805 -- manual incremental or handwheel 0.01 mode

M806 -- manual incremental or handwheel 0.001 mode

M807 -- manual mode

M808 -- hand wheel mode

M809 -- automatic mode

M810 -- MDI mode

M811 -- diagnosis mode

M812 -- parameter mode

M813 -- program mode

M814 -- effective when operating life is less or equal to 5 days

M815 -- effective when operating life expired

M816 -- D0 bit of handwheel's current axis

M817 -- D1 bit of handwheel's current axis

M818 -- D2 bit of handwheel's current axis

The state of M818, M817, M816 of X axis: 0, 0, 1

The state of M818, M817, M816 of Y axis: 0, 1, 1

The state of M818, M817, M816 of Z axis: 0, 1, 1

The state of M818, M817, M816 of 4 axis: 1, 0, 0

The state of M818, M817, M816 of 5 axis: 1, 0, 1

The state of M818, M817, M816 of 6 axis: 1, 1, 0

The state of M818, M817, M816 of 7 axis: 1, 1, 1

The state of M818, M817, M816 of 8 axis: 0, 0, 0

M819 -- executing home process in program

M820 -- Robot control system is in remote running mode

M821 -- system reserve

M822 -- system reserve

M823 -- system reserve

M824 -- M831 indicates state of 1-8 axis home

M200 -- M215 indicates running direction state of 1-8 axis

M200: X+; M201: X-;

M202: Y+; M203: Y-;

M204: Z+; M205: Z-;

M206: A+; M207: A-;

M208: B+; M209: B-;

M210: C+; M211: C-;

M212: Xs+; M213: Xs-;

M214: Ys+; M215: Ys-;

Attention: M212/M213/M214/M215 are defined as home status of 1-4 axis in non-bus controller.

7) M821: used for channel status in double channel controller, 1 means current channel displayed in foreground, 0 means current channel is under background.

Double channel use the auxiliary relay together: M346-M361, when two channels control the same one auxiliary relay, in PLC, output this auxiliary relay to corresponding Y output will be fine.

8) State auxiliary relay:

M1050: Auto mode(not switch into main interface)
M1069: Manual mode(not switch into main interface)
M1080: Handwheel mode(not switch into main interface)
M1083: Incremental mode(not switch into main interface)
M1084: Single step mode(auto&manual)
M1085: Continuous mode(auto&manual)
M1029: Switch between single/continuous
M1054: Condition pause
M1055: Skip
M1032: Start from real line
M1033: Start from mark line
M1034: Start from tool line
M1035: X1 gear
M1036: X10 gear
M1037: X100 gear
M1082: Rapid ratio up
M1027: Rapid ratio 100%
M1028: Rapid ratio down
M1021: Feed ratio up
M1022: Feed ratio 100%
M1020: Feed ratio down
M1025: Spindle ratio up
M1023: Spindle ratio 100%
M1024: Spindle ratio down
M1019: Tool seat No. setting
M1042: Driver power
M1043: MDI mode
M1044: Machine lock
M1045: Auxiliary lock

M1046: Idle run (dry run)

M1030: Spindle switch into high gear(1st gear)

M1038: Spindle switch into low gear(2nd gear)

M1039: Spindle switch into 3rd gear

M1040: Spindle switch into 4th gear

M1003: Spindle CW

M1031: Spindle CW jogging

M1006: Spindle stop

M1004: Spindle CCW

M1041: Spindle CW jogging

M1015: Spindle orientation

M1016: Feed axis go to tool change point

M1017: Tool magazine CW

M1018: Tool magazine CCW

M1126: Chuck

M1013: Home

M1009: Coolant

M1008: Lubricant on

M1108: Lubricant off

M1007: Huff

M1127: Tail stock

M1002: Clear spindle jogging

M1005: Program run

M1047: Program Pause(if under pause state, then ignore)

M1001: Program Stop

M1014: Reset

M1088: Exit controller

M1010: incremental switch

M1011: switch single/continuous(only auto)

M1012: Switch Coor/Graphic

M1048: Switch auto/manual(not switch into main interface)

M1049: Chuck&tailstock on at the same time(M1126 AND m1127 on at the same time)

M1051: In teach mode when editing program

M1052: Record the current end point in teach mode

M1053: Record the current arc middle point in teach mode

M1056: Robot controller switch into User coordinate

M1057: Robot controller switch into Tool coordinate

M1058: Robot controller switch into World coordinate

M1059: Robot controller switch into Joint coordinate

M1060: Robot controller cycle through coordinate system

M1061: switch panel mpg into X

M1062: switch panel mpg into Y

M1063: switch panel mpg into Z

M1064: switch panel mpg into A

M1065: switch panel mpg into B

M1066: switch panel mpg into C

M1067: switch panel mpg into Xs

M1068: switch panel mpg into Ys

M1051: Teach mode in program editing interface

M1052: record endpoint in teach mode

M1053: record arc middle point in teach mode

M1070-M1079: corresponding to macro program ProgramUser0-ProgramUser9. for example, when M1070 is on, controller will execute ProgramUser0 automatically.

M1091: record first/Fast point in teach mode

M1081: Robot external axis switch

M1086: Channel display switch in bichannel controller

8) KB code of button is number of auxiliary relay address subtracting by 1000:

For example:

Rapid speed ratio up:

```
X170      M170
-|  |-----|/|-------------(S)  M1026  Rapid speed ratio up
```

Home：

```
 X173     M173
-|  |-----|/|-------------(S)  M1013  Home
```

Spindle jogging：

```
 X171     M171
-|  |-----|/|-------------(S)  M1031  Spindle jogging CW
 X172     M172
-|  |-----|/|-------------(S)  M1041  Spindle jogging CCW
 X171     M171
-|/|-----|  |-------------(S)  M1002  Clear spindle jogging CW
 X172     M172
-|/|-----|  |-------------(S)  M1002  Clear spindle jogging CCW
```

Lubricant jogging：

```
 X174     M174
-| |-----|/|-------------(S) M1008 Lubricant on
 X174     M174
-|/|-----| |-------------(S) M1108 Lubricant off
```

Lubricant button cycle：

```
 X174     M174      M51
-| |-----|/|------|/|----(S) M1008 Lubricant on
                |     M51
                 ----| |----(S) M1108 Lubricant off
```

Remote Start button：

```
     X21    M290
----| |---|/|---------------(S)M1005
     X21
----| |---------------------( )M290
```

Remote Stop button：

```
     X22    M291
----| |---|/|---------------(S)M1001
     X22
       ----| |---------------------( )M291
```

5. PLC functional module:

5.1 Counter&Timer

System has 16 counter totally inside (C0-C15), 80 timers (T1-T79).

10ms general timer: T0---3, T16---31;

10ms integrating timer: T4---T7, T32---T47; (power-off protection)

1s general timers: T8---11, T48---61;

1s integrating timer: T12---15 T64---77.(power-off protection)

1min general timers: T62---63

1min integrating timer:T78---79

5.2 Elementary instruction

1) --[/]: Reverse output coil

When the X00 is not valid, the Y00 output signal.
When the X00 valid, Y00 output signal is not valid.

2) --[U]: the rising-edge output coil.

OutputY02. when X01 rises edge from ineffective to effective

3) --[D]: The falling-edge of the output coil

Output Y03. when X02 falls edge from effective to ineffective

4) -- [US]: The rising-edge set coil.

When the X03 rising edge from ineffective to effective, Y04 will be set.

5) -- [DS]: The falling-edge set coil..

When the X04 rising edge from ineffective to effective, Y05 will be set.

6) -- [UR]: The rising-edge reset coil.

When the X05 rising edge from ineffective to effective, Y06 will be reset.

7) -- [DR]: The falling-edge reset coil

When the X06 rising edge from ineffective to effective, Y07 will be reset.

5.3 Rules of logical operation function block

Note: 1) the parameter C is always address.

2) the range of constants is 0---255.

5.3.1. CMP: data control comparison

1) Control condition:

0 means 8 bits data, both parameter A and parameter B are address;

1 means 16 bits data, both parameter A and parameter B are address;

2 means 8 bits data. A parameters for the address, parameter B is constant;

3 means 16 bits data, parameters A is address, parameter B is constant;

4 means 8 bits data, the parameter A is constant and the parameter B for the address;

5 means 16 bits data, the parameter A is constant and the parameters B for the address ;

8 means both the parameter A and the parameter B are constant;

16 mean both parameter A and parameter B are codes of macro variable, 0-99 correspond to #900-#999.

48 means both parameter A and parameter B are codes of macro variable, 0-99 correspond to #900-#999.(effective in bus type controller)

When parameter A >= parameter B, M auxiliary relay corresponding to parameter C is set as effective.

When parameter A < parameter B, M auxiliary relay corresponding to parameter C is set as ineffective.

2) Rules of operation:

When parameter A > parameter B, assign parameter C (low 3 bits) as 1.

When parameter A = parameter B, assign parameter C (low 3 bits) as 2.

When parameter A < parameter B, assign parameter C (low 3 bits) as 4.

When control condition is added by 32 on the base of original value, rules of operation becomes to be:

When parameter A >= parameter B, M auxiliary relay corresponding to parameter C is set as effective.

When parameter A < parameter B, M auxiliary relay corresponding to parameter C is set as ineffective

Sample 1:

Sample 2

Control condition is 0, the parameter A is the address, and the parameter B is the address.

When X10 is valid, parameter A = 01000101, parameter B =00010010, compare the results of A>B and assign R103, if original R103 is 0, then assigned value is R103=00000001.

Sample 2:

Control condition is 1, the parameter A is address, and the parameter B is address.

When the X10 is valid, parameter A = 0000010110100001, parameter B =0000010110100000,

compare the results of A>B and assign the r103, if the original R103 is 0, then assigned value is R103=0000000000000001.

Control condition is set as 48:
When both parameter A and parameter B are macro variables, 0--99 correspond to macro variable #900--999.

When parameter A >= parameter B, M auxiliary relay corresponding to parameter C is set as effective; When parameter A < parameter B, M auxiliary relay corresponding to parameter C is set as ineffective.

Other parameter

P140: Auxiliary relay M78 indicate state of current coordinate compared with reference point.

P141: Auxiliary relay M77 indicate state of current coordinate compared with reference point.

Definition:

1001: compare with reference point No.1 of X axis;

1002: compare with reference point No.2 of X axis;

1003: compare with reference point No.3 of X axis;

1004: compare with reference point No.4 of X axis;

2001: compare with reference point No.1 of Y axis;

2002: compare with reference point No.2 of Y axis;

2003: compare with reference point No.3 of Y axis;

2004: compare with reference point No.4 of Y axis;

3001: compare with reference point No.1 of Z axis;

3002: compare with reference point No.2 of Z axis;

3003: compare with reference point No.3 of Z axis;

3004: compare with reference point No.4 of Z axis;

4001: compare with reference point No.1 of A axis;

4002: compare with reference point No.2 of A axis;

4003: compare with reference point No.3 of A axis;

4004: compare with reference point No.4 of A axis;

5001: compare with reference point No.1 of B axis;

5002: compare with reference point No.2 of B axis;

5003: compare with reference point No.3 of B axis;

5004: compare with reference point No.4 of B axis;

When current machine coordinate is less than coordinate of reference point, M77/M78 will be on, otherwise M77/M78 off. If above parameter is not set, M77/M78 are user-defined auxiliary relay.

5.3.2. MOV: data movement.

1) Control conditions:

0 means 8 bits of data, both parameter A and parameter B are address;

1 means 16 bits of data，Parameter B and parameter A are both addresses;

2 means 8 bits of data,The parameter A is the address, and the parameter B is constant;

3 means 16 bits of data，The parameter A is the address, and the parameter B is constant.

2) Operation rules:

The parameter B is assigned to the parameter A, and parameter B always are address.

The control condition is 2, the parameter A is the address, and the parameter B is constant. When X03 is effective, parameter B =7, and 00000111, will be transmitted to parameter A =R105, and R105=00000111.

5.3.3. BIT: data movement.

1) Control conditions: two-digit composition.

2) Single digit on the left:

1 means AND;

2 means OR;

3 means XOR;

4 means Logical NON, non A will be directly assigned to the C, has nothing to do with parameter B.

5 means Left shift.

6 means Right shift.

3) Single digit on the right:

0 means 8 bits of data, both parameter B and parameter A are addresses;

1 means 16 bits of data, both parameter A and parameter B are addresses;

2 means 8 bits of data, parameter A is address, and parameter B is constant;

3 means 16 bits of data, parameter A is address, and parameter B is constant;

4 means 8 bits of data, parameter A is constant, and parameter B is address;

5 means16 bits of data, parameter A is constant, and parameter B is address;

8 means both parameter B and parameter A are constants.

For example: the control condition is equal to 305: 16 bit data is XOR, parameter A is constant, and parameter B is address.

4) Operation rules:

(a) AND: parameter C = (parameter A & parameter B)

When M77 is valid, the control condition is 10, which means logic AND, both parameter A and parameter B are address. When parameter A is the address 10=10000111, parameter B is the address 12=01100001, then parameter C is the address 15=00000001.

(b) OR: parameter C = (parameter A | parameter B)

When M77 is valid, the control condition is 20, which means logic OR, and both parameter A and parameter B are the address. When parameter A is the address 10=10000111, parameter B is the address 12=01100001, then parameter C is the address 15=11100111.

(c) XOR: parameter C = (parameter A ^ parameter B)

When M77 is valid, the control condition is 30, which means logic XOR, both parameter A and parameter B are the address. When the parameter A is address 10=10000111, parameter B is address 12=01100001, then parameter C is address 15=11100110.

(d) NON: parameter C = (~ parameter A)

When M77 is valid, the control condition is 40, which means logic non, and the parameter A is the address. When parameter A is the address 10=10000111, then parameter C is the address 15=01111000.

(e) Left shift: parameter C = (parameter A << parameter B) (Parameter B specifies left-shift value)

When M77 is valid, the control condition is 50, which means logical left shift, and both parameter A and parameter B are address. When parameter A is address 10=10000111, parameter B is the address 11=00000011, then parameter C is the address 15=00111000.

(f) Right shift: parameter C = (parameter A >> parameter B) (parameter B specifies right-shift value)

When M77 is valid, the control conditions is 60, which means logical right shift, both of parameters A and parameter B are the address. When parameter A is address 10=10000111, parameter B is address 11=00000011, then parameter C is address 15=00010000.

5.3.4. ADD: Data addition

1) Control conditions:

0 means 8 bits of data, both parameter A and parameter B are addresses;

1 means 16 bits of data, both parameter A and parameter B are addresses;

2 means8 bits of data, parameter A is the address, and the parameter B is constant;

3 means 16 bits of data, parameter A is the address, and parameter B is constant;

4 means 8 bits of data, parameter A is constant, and parameter B is the address;

5 means16 bits of data, parameter A is constant, and parameter B is the address;

8 means both parameter A and parameter B are constants.

2) Operation rules:

Parameter C = parameter A + parameter B

When M71 is valid, the control condition is 0, both parameter A and parameter B are the address. When the a parameter is the address B, the 23=10000111 parameter is the address 34=01100001, then parameter C is the address 32=11101000.

5.3.5. SUB: data subtract

1) Control conditions:

0 means 8 bits of data, both parameter A and parameter B are addresses;

1 means16 bits of data, both parameter A and parameter B are addresses;

2 means 8 bits of data, parameter A is address, and parameter B is constant;

3 means 16 bits of data, parameter A is address, and parameter B is constant;

4 means 8 bits of data, parameter A is constant, and parameter B is address;

5 means 16 bits of data, parameter A is constant, and parameter B is address;

8 means both parameter A and parameter B are constants.

2) Rule of operation:

Parameter C = parameter A - parameter B

When X22 is valid, the control condition is 0, both parameter A and the parameter B are the address. When parameter A is the address 30=10100000, parameter B is the address 11=01100000, then parameter C is the address 45=01000000.

5.3.6 MUL: data multiply

1) Control conditions:

0 means 8 bits of data, both parameter A and parameter B are addresses;

1 means16 bits of data, both parameter A and parameter B are addresses;

2 means 8 bits of data, parameter A is address, and parameter B is constant;

3 means 16 bits of data, parameter A is address, and parameter B is constant;

4 means 8 bits of data, parameter A is constant, and parameter B is address;

5 means 16 bits of data, parameter A is constant, and parameter B is address;

8 means both parameter A and parameter B are constants.

2) Operation rules:

Parameter C = parameter A × parameter B

When the M70 is valid, the control condition is 0, both parameter A and the parameter B are address. When parameter A is the address 10=10100111, parameter B is the address 20=00000101, then parameter C is the address 15=01000011.

5.3.7 DIV: data division

1) controlling condition:

0 means 8 bits of data, both parameter A and parameter B are addresses;

1 means 16 bits of data, both parameter A and parameter B are addresses;

2 means 8 bits of data, parameter A is the address, and parameter B is constant;

3 means 16 bits of data, parameter A is the address, and parameter B is constant;

4 means 8 bits of data, parameter A is a constant, and parameter B is the address;

5 means 16 bits of data, parameter A is a constant, and parameter B is the address;

8 means both parameter A and parameter B are constants.

2) Operation rules:

Parameter C = Parameter A / Parameter B

When the X00 is valid, the control condition is 0, both parameter A and the parameter B are the address. When parameter A is the address 1=10100111, parameter B is the address 2=00000101, then parameter C is the address 111=00100001.

5.4 Flow control function block

5.4.1 END1 : First-stage end

PLC before End1 is high-speed scanning, each scan cycle is 8ms。

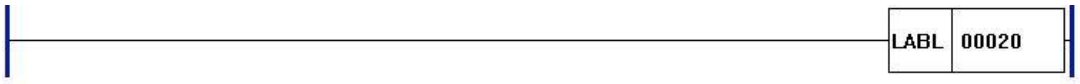
5.4.2 END2 : Second-stage end.

PLC before End2 is low speed scanning, each scan cycle is 100ms。

5.4.3 LABL : Label of position

In the ladder diagram to specify a tag number, that is, the designation of jumping, a LABL label.

Example：



LABL parameter setting is 1-9999.

5.4.4 JUMP : Conditional or unconditional jump.

Immediately transfer the program to the location where the label sets to execute. With the following characteristics, many jumps can share the same label; prohibit skipping End1 and End2; prohibit jumping out of the subroutine; can jump forward or backward.

Example 1：

Control conditions:

When M78 is invalid, do not jump, execute the statement next to JUMP.

When M78 is valid, jump to the specified tag number and execute the next instruction after the tag number.

JUMP　Jump label parameter setting is1-9999.

Example 2：

Note:

When X11 is valid, jump skips 45-49 line, then directly executes 51 line .

When the X11 is not valid, 45 line will be executed directly.

5.4.5 CALL : Conditional or unconditional call subprogram.

Calling the specified subroutine, with the following characteristics, different call instructions can call the same subroutine; call instruction can be nested; calling the subroutine in the first stage program is prohibited; subroutine must be written after End2.

Example 1：

Note:

When M72 is valid, then execute the called subroutine whose number is specified.(such as CALL 16)

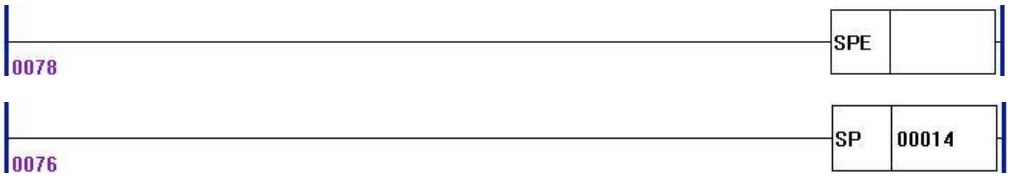
When M72 is invalid, then execute the next instruction after CALL.

5.4.6 SP: Start Subroutine.

5.4.7 SPE: End Subroutine.

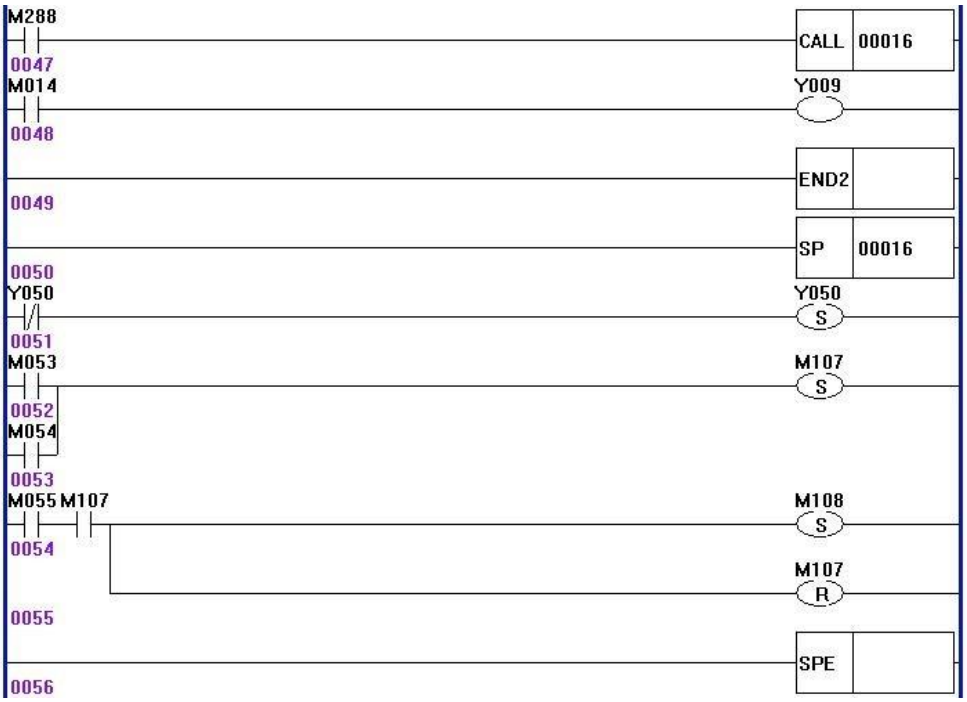
SP is used to generate a subroutine, the number of subroutine is the name, SPE is end symbol subroutine. When the instruction is executed, control returns to the main program which calls subroutine, SP and SPE are used to specify the range of subroutines. Usage of subroutine must be edited after END2.

Example 1：



Such as the following SP16 subroutine.

Example 2：



Note:

When M288 is valid, execute calling subroutine SP16.

When M288 is invalid, not execute calling subroutine SP16.

5.4.8 RETN : Subroutine return.

When the conditions meet the implementation of the call subroutine, the RETN conditions satisfied in subroutine, directly return to the main program.

When the conditions meet the implementation of the call subroutine,the RETN conditions unsatisfied in subroutine, return to the main program after finishing called subroutine.

Note:

when X11 is valid, execute calling subroutine SP22; when M285 in subroutine is effective, RETN conditions are satisfied, directly return to the main program, then execute the line 13. When X11 is valid, execute the call subroutine SP22; when M285 in subroutine is ineffective, RETN conditions are unsatisfied, execute the subroutine 18 lines till the end, and then return to the main program.

5.5 Address list of parameters:

1) IO point parameter address definition:

Parameter address	Parameter
1	X0-X7
2	X8-X15
3	X16-X23
4	X24-X31
7	X50-X57
8	X58-X65
9	X66-X73
10	X74-X81
13	X151-X158
14	X159-X166
15	X167-X174
16	X175-X182
17	X183-X190
18	X191-X198
31	X200-X207
32	X208-X208
51	Y0-Y7
52	Y8-Y15
53	Y16-Y23
54	Y24-Y31
55	Y50-Y57
57	Y71-Y78
58	Y79-Y80

2) definition of auxiliary relay parameters

Parameter address	parameter
101	M0--M7
102	M8--M15
103	M16--M23
104	M24--M31
105	M32--M39

106	M40--M47
107	M48--M55
108	M56--M63
109	M64--M71
110	M72--M79
111	M80--M87
112	M88--M95
113	M100--M107
114	M108--M115
115	M120--M127
116	M128--M135
117	M200--M207
118	M208--M215
119	M250--M257
120	M258--M265
121	M266--M273
122	M274--M281
123	M218--M225
124	M226--M233
125	M234--M241
126	M242--M249
127	M282--M289
128	M290--M297
129	M298--M305
130	M306--M313
131	M800--M807
132	M808--M815
151	The total number of tools.
153	The current tool number.
155	The current tool case number.

Attention:

1. For an odd number of address, it can be used for 8 bit parameter, and 16 bit parameter too.
2. But for an even number of address, it can only be used for 8 bit parameters, can not be used for 16 bit parameters.

3. The 16 bit address of odd number, in fact, contains the odd number addresses and the parameter of next even number address.

4. Constant is 8 digits at most.

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