

SUMMARY

PLC RESOURCES:

INPUTS(I)	These are elements used to collect and adapt the signal received from the outside
OUTPUTS(O)	These are elements used to send outside signals with which the plc operates in its environment
MARKS(M)	These are elements capable of memorizing information regarding the internal status of the plc, acting like an internal relay
REGISTERS(R)	These are elements which allow a numerical variable or discrete variable status to be memorized
TIMERS(T)	These are elements which alter their output for a specific time (Time constant)
COUNTERS(C)	These are elements capable of counting up or down a specific number of events

INPUTS

They supply information to the PLC from signals received from the outside world. The inputs are referenced by indicating the letter I and its number, ex I01. The maximum inputs that the CNC can have is 256 inputs, depending on the configuration.

OUTPUTS

PLC sends information outside through its outputs. They allow the PLC to turn on/off different devices. The maximum outputs that the CNC can have is 256 outputs depending on the configuration. With the Axes module only, there are 24 outputs. The outputs are referenced by indicating the letter O and its number, ex O16

MARKS

A mark, or internal relay, is a memory in which the information defined by the user is retained. Each mark stores a bit or logic state
Marks are referenced by indicating letter M and its number

MEANING

User marks	M1	-	M2000
Arithmetic flag marks	M2001	-	M2008
Clock marks	M2009	-	M2024
Fixed status marks	M2046	&	M2047
Marks associated with messages	M4000	-	M4127
Marks associated with errors	M4500	-	M4563
Screen marks	M4700	-	M4955
CNC communication marks	M5000	-	M5957

REGISTERS

They allow a numerical value to be stored in 32 bits or aid in CNC-PLC communications with logic CNC inputs - outputs. Their value will be stored in memory even when the system is turned off unless erased in the initial cycle. This is encouraged unless there is a specific register value you want to remember. They are represented by the letter R and there are 256 user registers and other special registers. It is also possible to reference a bit of a register. eg. B3 R200 (bit 3 of register 200)

MEANING			
User registers	R1	-	R256
Special registers	R500	-	R559

TIMERS

A Timer is a resource capable of maintaining its output at a specific logic level during a pre-selected time, after which the output changes its status. In order for the timer to count time, the TEN INPUT must be at a logic level of "1".

TEN:ENABLE INPUT

TRS:RESET INPUT

When there is a transition from logic level "0" to "1", the T status sets to "0" as well as the elapsed time t and the timing stops, if it was running.

TG1/4:TRIGGER INPUTS

The triggering is originated by a change of the logic state of any of these inputs from "0" to "1" depending on the selected input

ex. TG1 20 100
TG4 32 R40

Indicates the trigger input1 of timer 20 with a time constant of 1 second
Indicates the trigger input4 of the timer 32 with a time constant equal to the value stored in register 40, in hundredths of a second.

*T:STATUS

This OUTPUT indicates the logic state of the timer.

*t:ELAPSED TIME

16 bit binary output indicates the elapsed time within the timer.
can only be used in arithmetic and comparison operations

ex. CPU T1 GT 1000 This expression will check(cpu) whether the time elapsed in t1 is greater (GT) 1000 hundredths of a second (10 seconds)

OPERATING MODES OF A TIMER

MONOSTABLE

The timer generates a pulse whose width is determined by the time constant

ACTIVATION DELAY

This mode allows the creation of a delay from the time the trigger input TG2 is activated to the time the output T of the timer is activated.

eg.

I2 = TG1 T1 5000

T1 = O2

when input 2 is turned on, O2 will be on for 5 seconds.

DEACTIVAT. DELAY

This mode allows to create a delay from the time TG3 is deactivated to the time output T of the timer is deactivated.

eg. I3 = TG2 T1 5000
 T1 = O2
 when input 2 is turned on, O2 will wait 5 seconds then turn on.

SIGNAL LIMITER This mode allows to limit the duration of the signal at input TG4

COUNTERS

The counter is an element capable of counting up or down

*CEN:ENABLE INPUT	*CEN must be "1" in order to count.
*CUP:UP-COUNT INPUT	Each leading edge at this input increments the count by one
*CDW:DOWN-COUNT I/P	Each leading edge at this input decrements the count by one
*CPR:PRESET INPUT	A leading edge at this input will preset the counter with the specified count
ex. CPR 12 -10	indicates the preset input of counter 12 with an initial count of -10
*C:STATUS	This output indicates, with a logic level, the status of the counter
*c:COUNT VALUE	This 16 bit output indicates the count value; can only be used for arithmetic and comparison operations.

eg. DFU I5 = M1
 M1 AND M2018 = CUP3
 CPS C3 GE 300 =O20

When I5 is high, M1 and M2018 (4second pulse) is also high, it will activate Counter 3. When the count is at 300 (300 seconds, 5 min), o20 will turn on.

PROGRAMMING:

The PLC program is structured by modules and it could consist of:

- First Cycle module(CY1)
- Main module(PRG)
- Periodic Execution module(PE)

Programming with **real** values allows optimum execution speed of the plc
 DIRECTING INSTRUCTIONS:

END:	Indicates the end of any module
REA:	Indicates that from that point on real values must be used
IMA:	Indicates that from that point on image values must be used
PRG.PE1,CY1	Indicates the beginning of the modules that can be defined in plci user prog.
END	End of the module
L	Label. used to identify a program line
DEF	Definition of symbol. Allows a symbol to be associated with any plc variable

FLANK DETECTION

DFU:	Returns a "1" when a leading edge(up flank) has occurred during the running cycle at the input, output, or mark specified
DFD:	Returns a "1" when a trailing edge(down flank) has occurred during the running cycle at the input, output or mark specified

COMPARISON

CPU:	Unsigned
CPS:	Signed Comparison

OPERATORS

NOT
AND

GT: Greater than OR
 GE: Greater or equal XOR
 EQ: Equal ()
 NE: Not equal
 LE: Less or equal
 LT: Less than

ACTION INSTRUCTIONS

BINARY

assignment: The value(0/1) of the logic expression can be assigned to specified variable
 conditional: SET The result of a logic action is 1, this action assigns a 1 to the I,O,M,R
 RES The result of a logic action is 1, this action assigns a 0 to the I,O,M,R
 CPL The logic expression is a 1, this action complements the status of I,O,M,R
 The logic expression is a 0, this action will not modify the status

SEQUENTIAL

jump (JMP) Allows the program sequence to be interrupted and continue on another line
 The expression is 1, the program jumps to the line and continues the program
 calling a subroutine (CAL) The expression is 1, the program jumps to the line and continue the program
 return (RET) The expression is 1, this action indicates the end of subroutine & returns

ARITHMETIC ACTION

MOV Transfers the logic status of the origin indicated to specified destination

	Source	Destination	Source Code	Dest. Code	#bits to transmit
MOV	I1/256	I1/256	0 (Bin)	0 (Bin)	32
	O1/256	O1/256	1 (BCD)	1 (BCD)	28
	M1/5957	M1/5957			24
	T1/256	R1/559			20
	C1/256				16
	R1/559				12
	#				8, 4

ADS,SBS,MLS,DVS,MDS

If the logic expression result is 1, this will allow addition, subtraction, multiplication, division, and module or remainder of division

LOGIC ACTION

AND, OR, XOR The logic expression result is 1, these actions allow the logic operations

SPECIFIC ACTION

ERA Allows inputs, outputs, marks, or registers to be erased
 CNCRD Allows reading of internal variables
 CNCWR Allows writing of internal variables