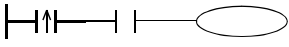
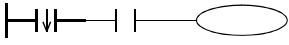
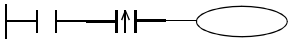
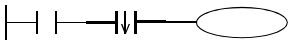
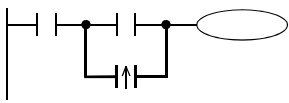
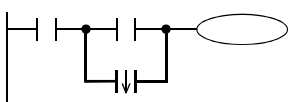
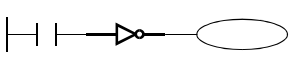


3 Basic Instructions

3-1 Basic Instruction Table

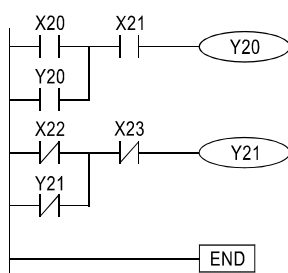
Mnemonic	Format	Devices	Function
LD (LOAD)		X, Y, M, S, T, C	Initial logical operation contact type NO (Normally Open)
LDI (LOAD INVERSE)		X, Y, M, S, T, C	Initial logical operation contact type NC (Normally Closed)
AND (AND)		X, Y, M, S, T, C	Serial connection of NO (Normally Open) contacts
ANI (AND INVERSE)		X, Y, M, S, T, C	Serial connection of NC (Normally Closed) contacts
OR (OR)		X, Y, M, S, T, C	Parallel connection of NO (Normally Open) contacts
ORI (OR INVERSE)		X, Y, M, S, T, C	Parallel connection of NC (Normally Closed) contacts
ANB (AND BLOCK)		—	Serial connection of multiple parallel circuits
ORB (OR BLOCK)		—	Parallel connection of multiple contact circuits
OUT (OUT)		X, Y, M, S, T, C	Final logical operation type coil drive
PLS (PULSE)		Y, M (excluding special M coil)	Rising edge pulse
PLF (PULSE FALLING)		Y, M (excluding special M coil)	Falling edge pulse
SET (SET)		Y, M, S	Sets component permanently "ON"
RST (RESET)		Y, M, S, T, C, D	Resets component permanently "OFF"
MC (MASTER CONTROL)		N0 ~ N7	Denotes the start of a master control block
MCR (MC RESET)		N0 ~ N7	Denotes the end of a master control block
MPS (POINT STORE)		—	Stores the current result of the internal PLC operations
MRD (POINT READ)		—	Reads the current result of the internal PLC operations
MPP (POINT POP)		—	Pops (recalls and removes) the currently stored result
END (END)		—	Force the current program scan to end
NOP (NO OPERATION)	—	—	No operation or null step

Mnemonic	Format	Devices	Function
LDP (LOAD PULSE)		X, Y, M, S, T, C	Initial logical operation Rising edge pulse
LDF (LOAD FALLING PULSE)		X, Y, M, S, T, C	Initial logical operation Falling edge pulse
ANDP (AND PULSE)		X, Y, M, S, T, C	Serial connection of Rising edge pulse
ANDF (AND FALLING PULSE)		X, Y, M, S, T, C	Serial connection of Falling edge pulse
ORP (OR PULSE)		X, Y, M, S, T, C	Parallel connection of Rising edge pulse
ORF (OR FALLING PULSE)		X, Y, M, S, T, C	Parallel connection of Falling edge pulse
INV (INVERSE)		—	Invert the current result of the internal PLC operations

3-2 LD,LDI,AND,ANI,OR,ORI,OUT and END

Mnemonic	Format	Devices	Function
LD (LOAD)		X, Y, M, S, T, C	Initial logical operation contact type NO (Normally Open)
LDI (LOAD INVERSE)		X, Y, M, S, T, C	Initial logical operation contact type NC (Normally Closed)
AND (AND)		X, Y, M, S, T, C	Serial connection of NO (Normally Open) contacts
ANI (AND INVERSE)		X, Y, M, S, T, C	Serial connection of NC (Normally Closed) contacts
OR (OR)		X, Y, M, S, T, C	Parallel connection of NO (Normally Open) contacts
ORI (OR INVERSE)		X, Y, M, S, T, C	Parallel connection of NC (Normally Closed) contacts
OUT (OUT)		Y, M, S, T, C	Final logical operation type coil drive
END (END)		—	Force the current program scan to end

Ladder Chart Format

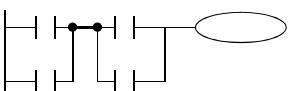
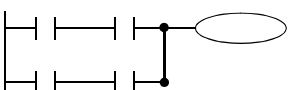


Instructions Format

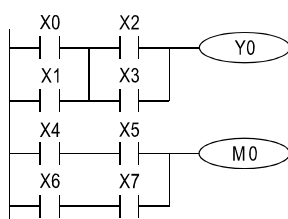
LD	X20	Initial logical operation contact type NO (Normally Open)
OR	Y20	Parallel connection of NO (Normally Open) contacts
AND	X21	Serial connection of NO (Normally Open) contacts
OUT	Y20	Final logical operation type coil drive
LDI	X22	Initial logical operation contact type NC (Normally Closed)
ORI	Y21	Parallel connection of NC (Normally Closed) contacts
ANI	X23	Serial connection of NC (Normally Closed) contacts
OUT	Y21	Final logical operation type coil drive
END		Force the current program scan to end

- The OUT T and OUT C Instructions will be specified in Section 3-8.
- When the PLC executes the END instruction, it forces that program to end the current scan and carry out the updating processes for both inputs and outputs. All instructions in the program after the END instruction will not be executed.
- The END instruction can be inserted into the middle of the program, it helps program debugging as the section after the END instruction is disabled and isolated from the area that is being checked.

3-3 Instruction ANB and ORB

Mnemonic	Format	Devices	Function
ANB (AND BLOCK)		—	Serial connection of multiple parallel circuits
ORB (OR BLOCK)		—	Parallel connection of multiple contact circuits

Ladder Chart Format

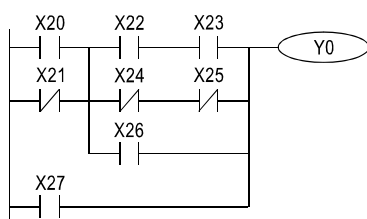


Instructions Format

LD	X0	Initial logical operation contact type NO (Normally Open)
OR	X1	Parallel connection of NO (Normally Open) contacts
LD	X2	Initial (the starting point of the circuit block) logical operation contact type NO (Normally Open)
OR	X3	Parallel connection of NO (Normally Open) contacts
ANB		Serial connection of multiple parallel circuits
OUT	Y0	Final logical operation type coil drive
LD	X4	Initial logical operation contact type NO (Normally Open)
AND	X5	Serial connection of NO (Normally Open) contacts
LD	X6	Initial (the starting point of the circuit block) logical operation contact type NO (Normally Open)
AND	X7	Serial connection of NO (Normally Open) contacts
ORB		Parallel connection of multiple contact circuits
OUT	M0	Final logical operation type coil drive

- To declare the starting points of the circuit block, please use an LD or LDI instruction. After completing the serial circuit block, connect it to the preceding block in series/parallel using the ANB/ORB instruction.
- When using ANB/ORB instructions in a batch, use no more than 8 LD and LDI instructions in the definition of the program blocks (to be connected in serial/parallel). Ignoring this will result in a program error.
- Please refer to the following program example, it is used both the ANB and ORB instructions in a circuit block.

Ladder Chart Format



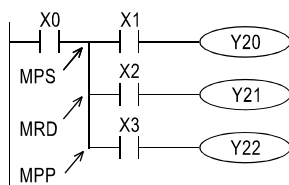
Instructions Format

LD	X20
ORI	X21
LD	X22
AND	X23
LDI	X24
ANI	X25
ORB	
OR	X26
ANB	
OR	X27
OUT	Y0

3-4 Instruction MPS, MRD and MPP

Mnemonic	Format	Devices	Function
MPS (POINT STORE)		—	Stores the current result of the internal PLC operations
MRD (POINT READ)		—	Reads the current result of the internal PLC operations
MPP (POINT POP)		—	Pops (recalls and removes) the currently stored result

Ladder Chart Format

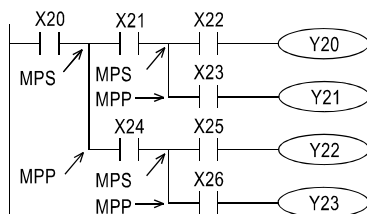


Instructions Format

LD	X0	Initial logical operation contact type NO (Normally Open)
MPS		Stores the current result of the internal PLC operations
AND	X1	Serial connection of NO (Normally Open) contacts
OUT	Y20	Final logical operation type coil drive
MRD		Reads the current result of the internal PLC operations
AND	X2	Serial connection of NO (Normally Open) contacts
OUT	Y21	Final logical operation type coil drive
MPP		Pops (recalls and removes) the currently stored result
AND	X3	Serial connection of NO (Normally Open) contacts
OUT	Y22	Final logical operation type coil drive

- The MPS instruction stores the connection point of the ladder circuit so that further coil branched can recall the value later.
- The MRD instruction recalls or reads the previously stored connection point data and forces the next contact to connect to it.
- The MPP instruction pops (recalls and removes) the stored connection point data of the last array and removes the connection point from the result. The last contact or coil circuit must connect to an MPP instruction.
- In any continuous connection circuit block, the difference between the number of the active MPS instruction and the number of the active MPP instruction shall be no greater than 11; When all connection circuit blocks are ended, the total number of the MPS instruction and the total number of the MPP instruction have been used in the program must be the same (there must has a MPP instruction corresponding to every signal MPS instruction).
- A Multiple-connection program example:

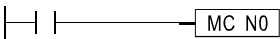
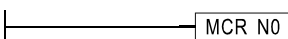
Ladder Chart Format



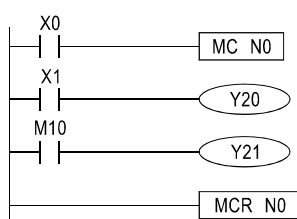
Instructions Format

LD	X20	OUT	Y22
MPS		MPP	
AND	X21	AND	X26
MPS		OUT	Y23
AND	X22		
OUT	Y20		
MPP			
AND	X23		
OUT	Y21		
MPP			
AND	X24		
MPS			
AND	X25		

3-5 Instruction MC and MCR

Mnemonic	Format	Devices	Function
MC (MASTER CONTROL)		N0 ~ N7	Denotes the start of a master control block
MCR (MC RESET)		N0 ~ N7	Denotes the end of a master control block

Ladder Chart Format

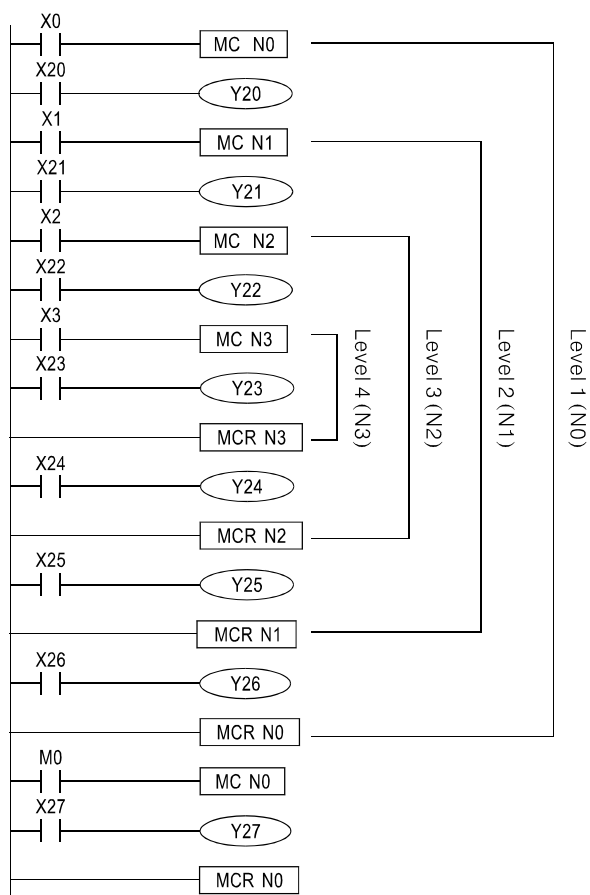


Instructions Format

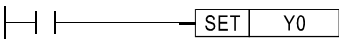
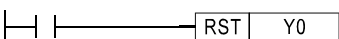
LD	X0	X0 is a conditional contact
MC	N0	Become a master control block which is controlled by X0.
LD	X1	
OUT	Y20	If X0="ON" { Status of Y20 = Status of X1
LD	M10	then { Status of Y21 = Status of M10
OUT	Y21	If X0="OFF" { Y20="OFF"
MCR	N0	then { Y21="OFF"

- When input point X0 (conditional contact) is "ON", all instructions between the MC and MCR instructions will be executed.
- When input point X0 (conditional contact) is "OFF", all instructions between the MC and MCR instructions will NOT be executed. All Timers and the coils which are driven by the OUT instruction, will be turned "OFF"; while the status of Retentive Timers, Counters and the coils driven by the SET / RST instruction will be kept.
- Use an MC instruction to shift the bus line (LD, LDI points) to a point after the conditional contact and use an MCR instruction to return to the original bus line.
- A master control block allows contains another master control blocks inside, which makes a nest level. This structure at the most can use 8 level (N0 ~ N7). The top nest level shall be N0, and then, N1, N2..., and the deepest level shall be N7.
- A multiple-level program example:

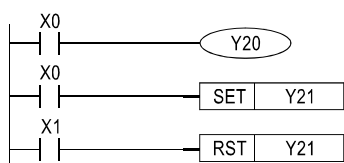
Ladder Chart Format



3-6 Instruction SET and RST

Mnemonic	Format	Devices	Function
SET (SET)		Y, M, S	Sets a bit device permanently "ON"
RST (RESET)		Y, M, S, T, C, D	Resets a bit device permanently "OFF"

Ladder Chart Format



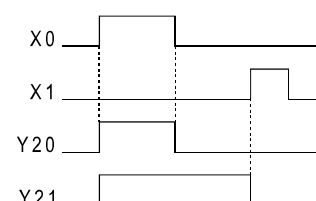
Instructions Format

```

LD    X0
OUT   Y20
LD    X0
SET   Y21
LD    X1
RST   Y21

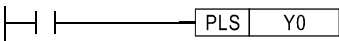
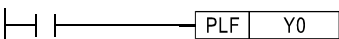
```

Active I/O Duration Time Sheet

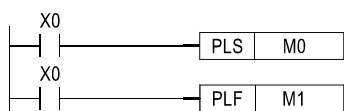


- The SET instruction sets the output coil permanently "ON" when it has been operated.
- The RESET instruction resets the output coil permanently "OFF" or resets the current value of a Timer, Counter or Register to zero.
- The SET instruction and the RESET instruction can be used for the same output coil as many times as necessary.
- The RST C instruction will be specified in Section 3-8.

3-7 Instruction PLS and PLF

Mnemonic	Format	Devices	Function
PLS (PULSE)		Y, M (excluding special M coil)	Rising edge pulse
PLF (PULSE FALLING)		Y, M (excluding special M coil)	Falling edge pulse

Ladder Chart Format



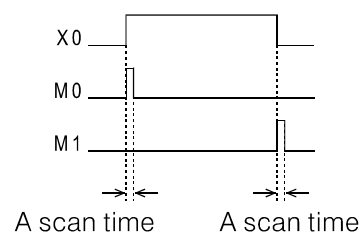
Instructions Format

```

LD    X0
PLS   M0
LD    X0
PLF   M1

```

Active I/O Duration Time Sheet



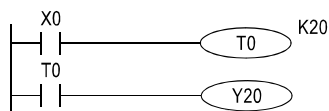
- When X0="OFF" → "ON", M0 will output a pulse for a scan time.
- When X0="ON" → "OFF", M1 will output a pulse for a scan time.

3-8 Instruction OUT and RST for a Timer or Counter

If the OUT instruction is used for the component T or C, it must input a setting value.

Timer

Ladder Chart Format

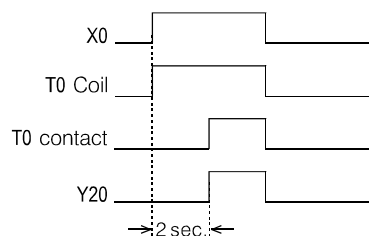


Instructions Format

```
LD    X0
OUT   T0
      K20

LD    T0
OUT   Y20
```

Active I/O Duration Time Sheet



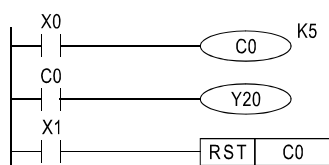
- The setting value of a Timer can be set either use a K (Constant) or Data Register D (Parameter).
- The Operative Range of the setting value:

Timer ID No.	Timing Unit	Type of the Timer	The Operative Range	Real Setting Time
T0 ~ T199 (T0 ~ T62)	100mS	General Timer	1 ~ 32,767 (If the setting value beyond the range, it will default to 1)	0.1 ~ 3276.7 sec.
T200 ~ T245 (T32 ~ T62)	10mS			0.01 ~ 327.67 sec.
(T63)	1mS			0.001 ~ 32.767 sec.
T246 ~ T249	1mS	Retentive Timer		0.001 ~ 32.767 sec.
T250 ~ T255	100mS			0.1 ~ 3276.7 sec.

- The Timer ID No. in the midst of square brackets () are for the VH series.
- To reset the Current values of Retentive Timer T246 ~ T255 must using the RST instruction.

Counter

Ladder Chart Format



Instructions Format

```
LD    X0
OUT   C0
      K5

LD    C0
OUT   Y20

LD    X1
RST   C0
```

The Action Exposition

- When X0 = "OFF" → "ON", C0 will executes up count once, until the Current Value of C0=5 and then the output contact of C0 = "ON", where the Current Value will not be increased anymore and the contact will stay permanently "ON".
- When X1 = "ON", the Current Value of C0 will be reset to "0" and the contact of C0 will become "OFF".

- The setting value of a Counter can be set either use a K (Constant) or Data Register D (Parameter).
- The Operative Range of the setting value:

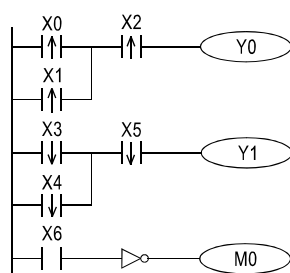
Counter ID No.	Type of the Counter		The Operative Range
C0 ~ C99 (C0 ~ C15)	General	16 bits, Up Counter	1 ~ 32,767 (If the setting value beyond the range, it will default to 1)
C100 ~ C199 (C16 ~ C31)	Latched		
C200 ~ C219	General	32 bits, Up/Down Counter	- 2, 147, 483, 648 ~ 2, 147, 483, 647
C220 ~ C234	Latched		
C235 ~ C255 (C235 ~ C254)	High Speed Counter (Latched)		

- The Counter ID No. in the midst of square brackets () are for the VH series.
- When using High Speed Counters, please refer to the section 2-7 "High Speed Counter".

3-9 Instruction LDP, LDF, ANDP, ANDF, ORP, OPF and INV

Mnemonic	Format	Devices	Function
LDP (LOAD PULSE)		X, Y, M, S, T, C	Initial logical operation Rising edge pulse
LDF (LOAD FALLING PULSE)		X, Y, M, S, T, C	Initial logical operation Falling edge pulse
ANDP (AND PULSE)		X, Y, M, S, T, C	Serial connection of Rising edge pulse
ANDF (AND FALLING PULSE)		X, Y, M, S, T, C	Serial connection of Falling edge pulse
ORP (OR PULSE)		X, Y, M, S, T, C	Parallel connection of Rising edge pulse
ORF (OR FALLING PULSE)		X, Y, M, S, T, C	Parallel connection of Falling edge pulse
INV (INVERSE)		—	Invert the current result of the internal PLC operations

Ladder Chart Format

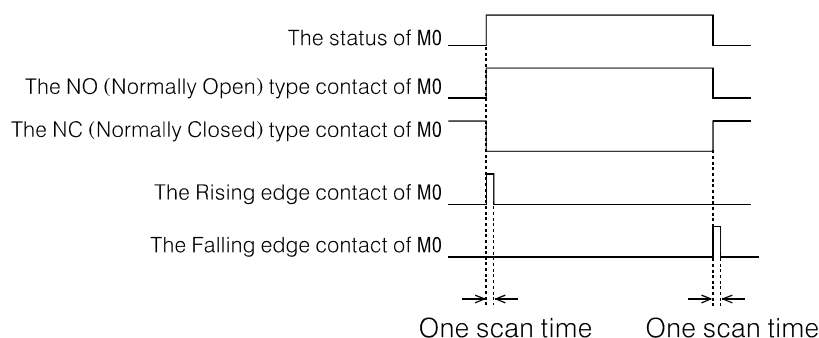


Instructions Format

LDP	X0	Initial logical operation Rising edge pulse
ORP	X1	Parallel connection of Rising edge pules
ANDP	X2	Serial connection of Rising edge pulse
OUT	Y0	Final logical operation type coil drive
LDF	X3	Initial logical operation Falling edge pulse
ORF	X4	Parallel connection of Falling edge pules
ANDF	X5	Serial connection of Falling edge pulse
OUT	Y1	Final logical operation type coil drive
LD	X6	Initial logical operation contact type NO (Normally Open)
INV		Invert the current result of the internal PLC operations
OUT	M0	Final logical operation type coil drive

- The Rising edge contact will be active for one program Scan Time after the associated device status changes from "OFF" to "ON".

- The Falling edge contact will be active for one program Scan Time after the associated device status changes from "ON" to "OFF".

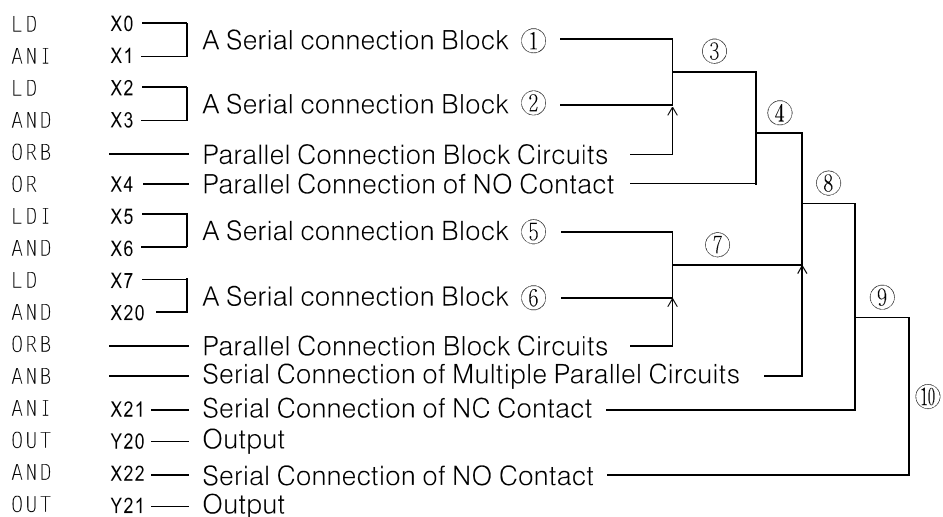
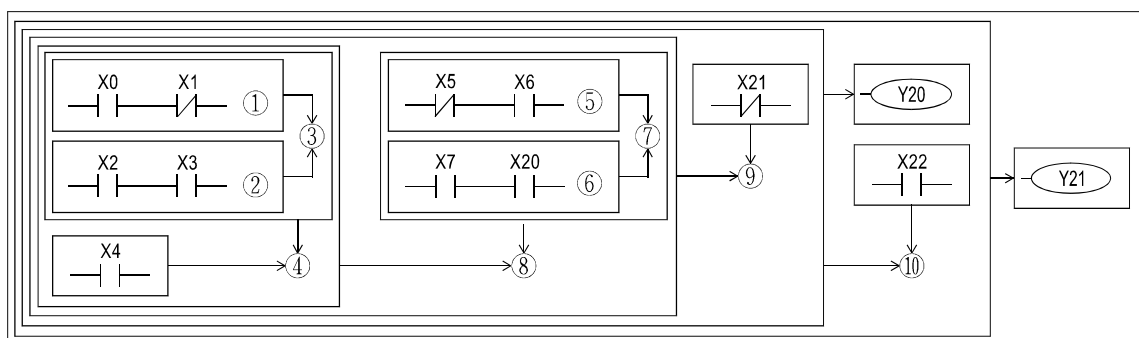
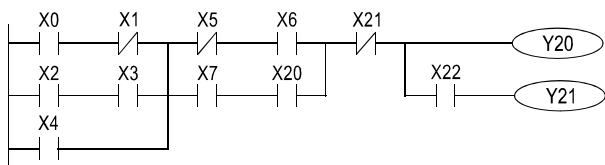


- The output contact status of the Rising or Falling edge ON/OFF is produced by OUT, SET, RST, PLS and PLF instructions; BUT, if the status of a bit component is changed by an instruction, its Rising or Falling edge contact WILL NOT get a output. For example, to operate the instruction `CMP D0 D1 M0` may change the statuses of M0 ~ M2, but the statuses change will not make the Rising or Falling edge contact outputs at the moment. If use the Rising or Falling edge contact of M0, M1 or M2 in the program, it may cause a wrong response.

3-10 Significant Notes For Programming

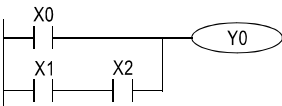
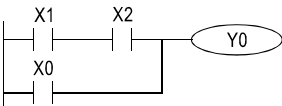
3-10-1 The Ladder Chart Format Converts To The Instruction Format

The rule to convert a program from Ladder Chart to Instruction Format is follow the order: from left to right and from top to bottom.

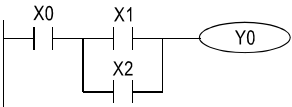
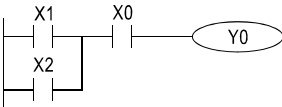


3-10-2 Programming Technics

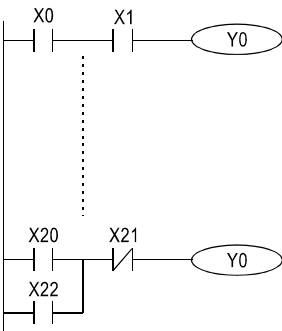
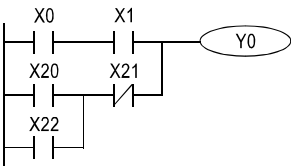
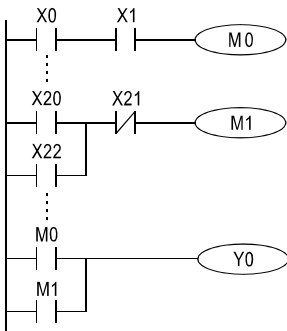
1. If the program used Parallel Connection Block Circuits, then put a bigger serial connection block on the upper place, which will be simpler and easier for the programming.

Ladder Chart Format	Instructions Format		Ladder Chart Format	Instructions Format
	LD X0 LD X1 AND X2 ORB OUT Y0	➔		LD X1 AND X2 OR X0 OUT Y0

2. It's recommended to place a circuit with more parallel link contacts on the left side.

Ladder Chart Format	Instructions Format		Ladder Chart Format	Instructions Format
	LD X0 LD X1 OR X2 ANB OUT Y0	➔		LD X1 OR X2 AND X0 OUT Y0

3. Reuse a output coil or Double Coiling is not a incorrect syntax. But the coil operation designated last is the effect coil. Hence, conditional signal contacts should be revised, and use of the output coil of the same ID number should be avoided.

Ladder Chart Format	Ladder Chart Format	Ladder Chart Format
		



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