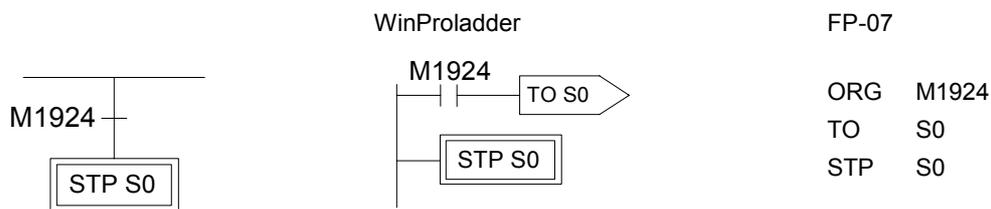


8.3 Introduction of Step Instructions: STP, FROM, TO and STPEND

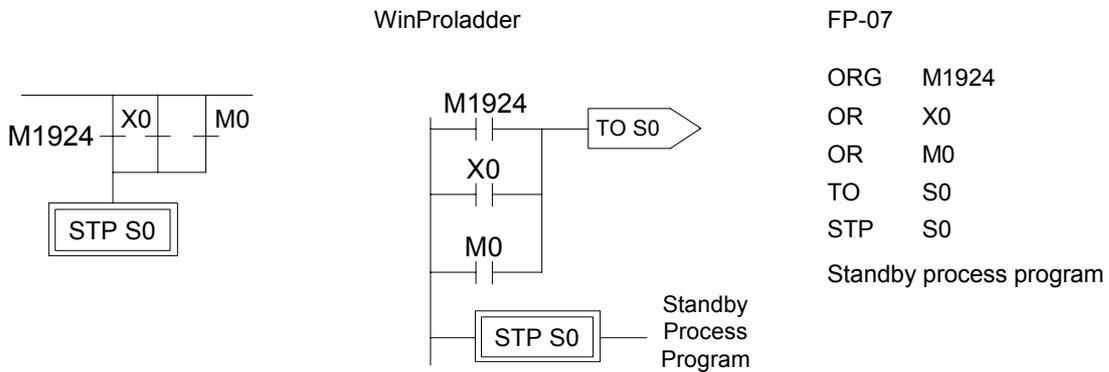
- **STP Sx** : $S0 \leq Sx \leq S7$ (Displayed in WinProladder)
 or
STP Sx : $S0 \leq Sx \leq S7$ (Displayed in FP-07)

This instruction is the initial step instruction from where the step control of each machine process can be derived. Up to 8 initial steps can be used in the FBs series, i.e. a PLC can make up to 8 process controls simultaneously. Each step process can operate independently or generate results for the reference of other processes.

【Example 1】 Go to the initial step S0 after each start (ON)



【Example 2】 Each time the device is start to run or the manual button is pressed or the device is malfunction, then the device automatically enters the initial step S0 to standby.



【Description】 X0: Manual Button, M0: Abnormal Contact.

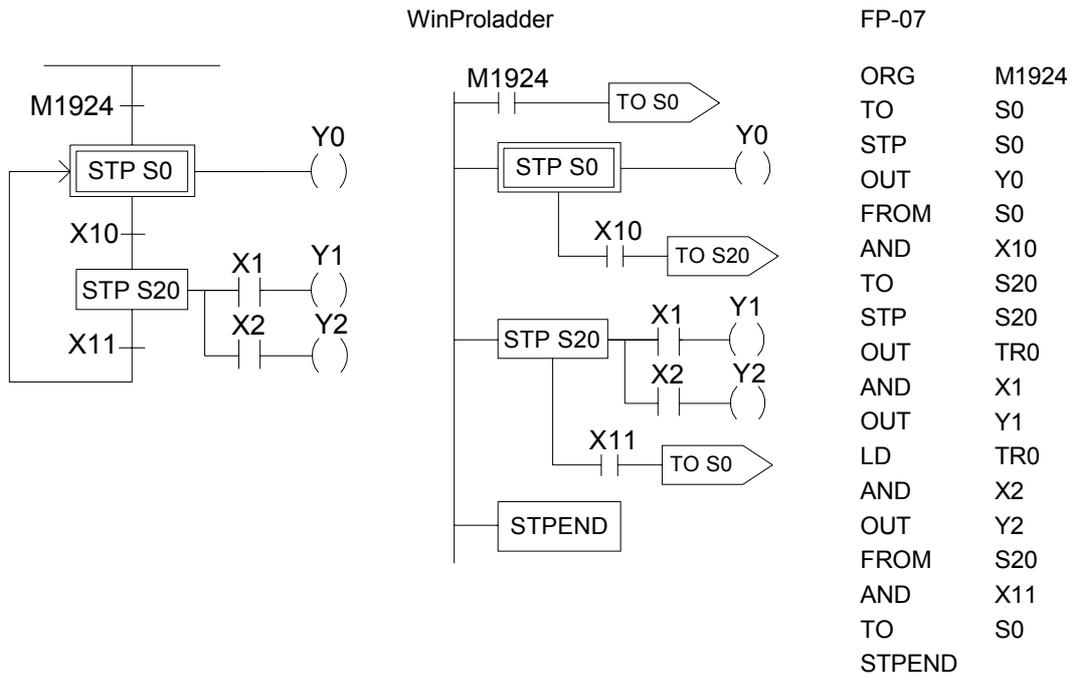
● **STP Sxxx** : $S20 \leq Sxxx \leq S999$ (Displayed in WinProladder)

or

STP Sxxx : $S20 \leq Sxxx \leq S999$ (Displayed in FP-07)

This instruction is a step instruction, each step in a process represents a step of sequence. If the status of step is ON then the step is active and will execute the ladder program associate to the step.

【Example】



【Description】 1. When ON, the initial step S0 is ON and Y0 is ON.

2. When transfer condition X10 is ON (in actual application, the transferring condition may be formed by the serial or parallel combination of the contacts X, Y, M, T and C), the step S20 is activated. The system will automatically turn S0 OFF in the current scan cycle and Y0 will be reset automatically to OFF.

$$\text{i.e. } X10 \text{ ON} \Rightarrow \begin{cases} S20 \text{ ON} \\ S0 \text{ OFF} \end{cases} \Rightarrow \begin{cases} X1 \text{ ON} \rightarrow Y1 \text{ ON} \\ X2 \text{ ON} \rightarrow Y2 \text{ ON} \\ Y0 \text{ OFF} \end{cases}$$

3. When the transfer condition X11 is ON, the step S0 is ON, Y0 is ON and S20, Y1 and Y2 will turn OFF at the same time.

$$\text{i.e. } X11 \text{ ON} \Rightarrow \begin{cases} S0 \text{ ON} \\ S20 \text{ OFF} \end{cases} \Rightarrow \begin{cases} Y0 \text{ ON} \\ Y1 \text{ OFF} \\ Y2 \text{ OFF} \end{cases}$$

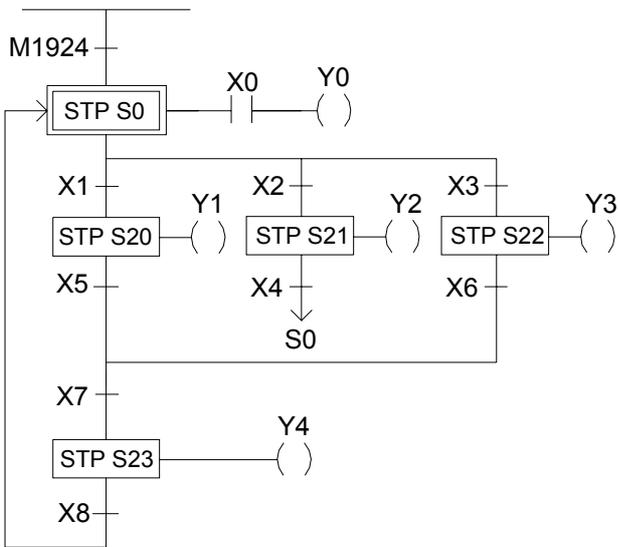
● FROM Sxxx : $S0 \leq Sxxx \leq S999$ (Displayed in WinProladder)

or

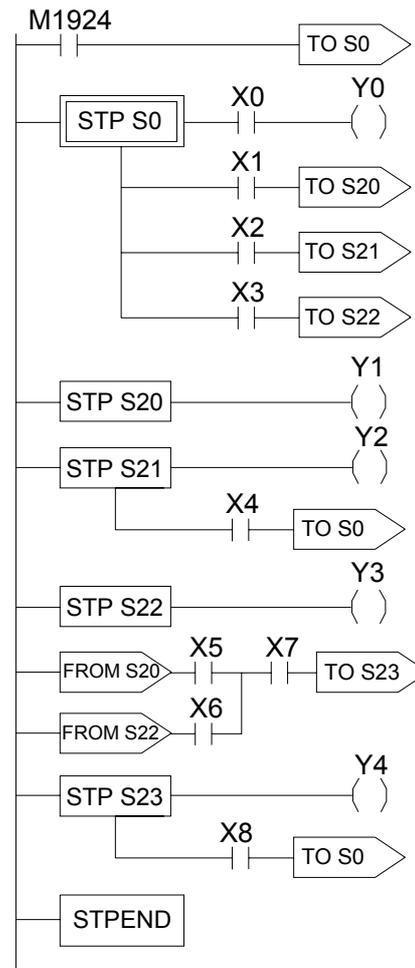
FROM Sxxx : $S0 \leq Sxxx \leq S999$ (Displayed in FP-07)

The instruction describes the source step of the transfer, i.e. moving from step Sxxx to the next step in coordination with transfer condition.

【Example】



WinProladder



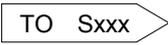
FP-07

```

ORG      M1924
TO       S0
STP      S0
AND      X0
OUT      Y0
FROM     S0
OUT TR   0
AND      X1
TO       S20
AND      X2
TO       S21
AND      X3
TO       S22
LD TR    0
AND      X2
TO       S21
LD TR    0
AND      X3
TO       S22
STP      S20
OUT      Y1
STP      S21
OUT      Y2
FROM     S21
AND      X4
TO       S0
STP      S22
OUT      Y3
STP      S23
FROM     S23
AND      X8
TO       S0
STPEND

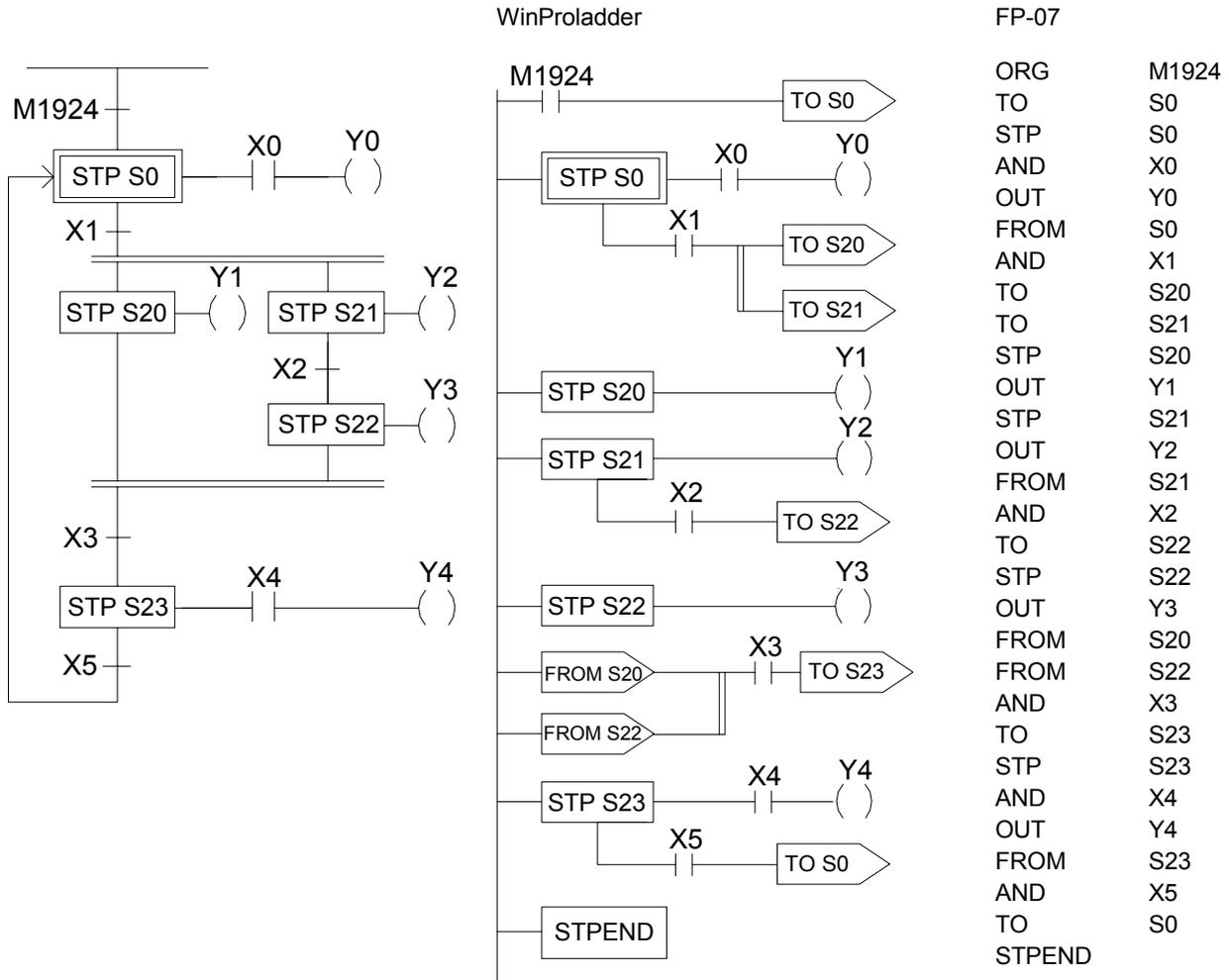
```

- 【Description】** : 1. When ON, the initial step S0 is ON. If X0 is ON, then Y0 will be ON.
2. When S0 is ON: a. if X1 is ON, then step S20 will be ON and Y1 will be ON.
b. if X2 is ON, then step S21 will be ON and Y2 will be ON.
c. if X3 is ON, then step S22 will be ON and Y3 will be ON.
d. if X1, X2 and X3 are all ON simultaneous, then step S20 will have the priority to be ON first and either S21 or S22 will not be ON.
e. if X2 and X3 are ON at the same time, then step S21 will have the priority to be ON first and S22 will not be ON.
3. When S20 is ON, if X5 and X7 are ON at the same time, then step S23 will be ON, Y4 will be ON and S20 and Y1 will be OFF.
4. When S21 is ON, if X4 is ON, then step S0 will be ON and S21 and Y2 will be OFF.
5. When S22 is ON, if X6 and X7 are ON at the same time, then step S23 will be ON, Y4 will be ON and S22 and Y3 will be OFF.
6. When S23 is ON, if X8 is ON, then step S0 will be ON and S23 and Y4 will be OFF.

-  : $S0 \leq Sxxx \leq S999$ (Displayed in WinProLadder)
or
TO Sxxx : $S0 \leq Sxxx \leq S999$ (Displayed in FP-07)

This instruction describes the step to be transferred to.

【Example】



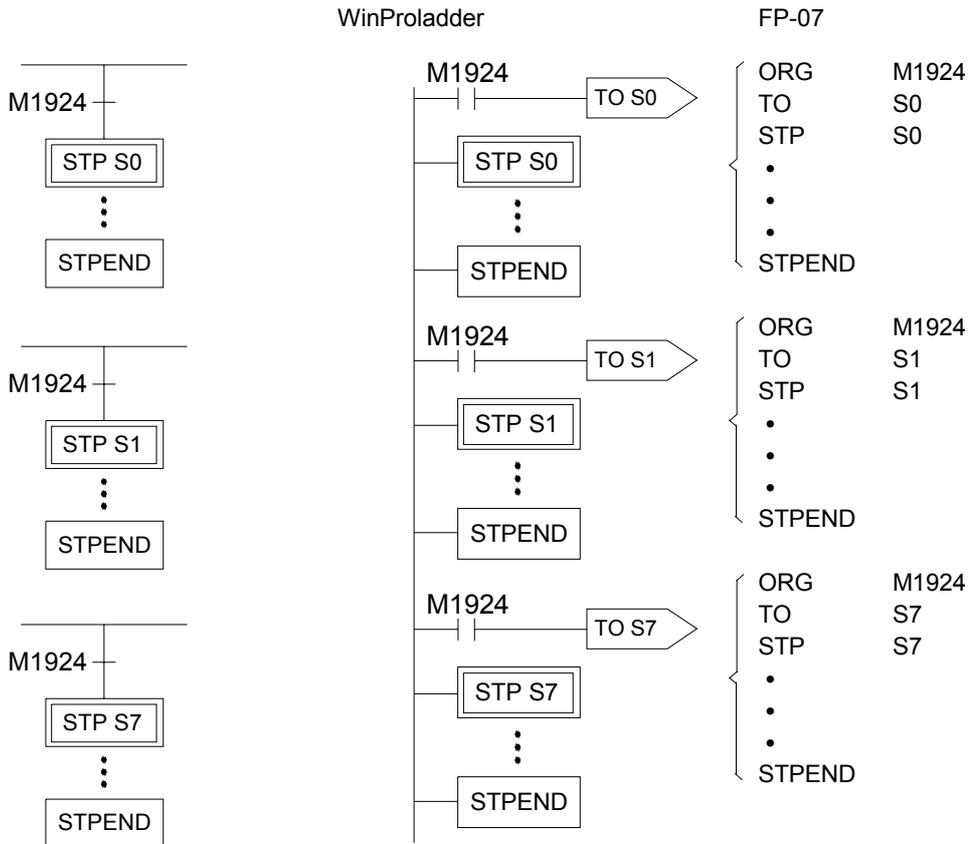
- 【Description】** :
1. When ON, the initial step S0 is ON. If X0 is ON, then Y0 will be ON.
 2. When S0 is ON: if X1 is ON, then steps S20 and S21 will be ON simultaneously and Y1 and Y2 will also be ON.
 3. When S21 is ON: if X2 is ON, then step S22 will be ON, Y3 will be ON and S21 and Y2 will be OFF.
 4. When S20 and S22 are ON at the same time and the transferring condition X3 is ON, then step S23 will be ON (if X4 is ON, then Y4 will be ON) and S20 and S22 will automatically turn OFF and Y1 and Y3 will also turn OFF.
 5. When S23 is ON: if X5 is ON, then the process will transfer back to the initial step, i.e. S0 will be ON and S23 and Y4 will be OFF.

- **STPEND** : (Displayed in WinProladder)
- or
- STPEND** : (Displayed in FP-07)

This instruction represents the end of a process. It is necessary to include this instruction so all processes can be operated correctly.

A PLC can have up to 8 step processes (S0~S7) and is able to control them simultaneously. Therefore, up to 8 STPEND instructions can be obtained.

【Example】

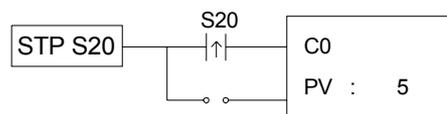


【Description】 When ON, the 8 step processes will be active simultaneously.

8.4 Notes for Writing a Step Ladder Diagram

【Notes】

- In actual applications, the ladder diagram can be used together with the step ladder.
- There are 8 steps, S0~S7, that can be used as the starting point and are called the “initial steps”.
- When PLC starts operating, it is necessary to activate the initial step. The M1924 (the first scan ON signal) provided by the system may be used to activate the initial step.
- Except the initial step, the start of any other steps must be driven by other step.
- It is necessary to have an initial step and the final STPEND instruction in a step ladder diagram to complete a step process program.
- There are 980 steps, S20~S999, available that can be used freely. However, used numbers cannot be repeated. S500~S999 are retentive(The range can be modified by users), can be used if it is required to continue the machine process after power is off.
- Basically a step must consists of three parts which are control output, transition conditions and transition targets.
- MC and SKP instructions cannot be used in a step program and the sub-programs. It's recommended that JMP instruction should be avoided as much as possible.
- If the output point is required to stay ON after the step is divergent to other step, it is necessary to use the SET instruction to control the output point and use RST instruction to clear the output point to OFF.
- Looking down from an initial step, the maximum number of horizontal paths is 16. However, a step is only allowed to have up to 8 branch paths.
- When M1918=0 (default) , if a PULSE type function instruction is used in master control loop (FUN 0) or a step program, it is necessary to connect a TU instruction before the function instruction. For example,



When M1918=1, the TU instruction is not required, e.g.:

