EEM 451 Industrial Control Systems
Programmable Logical Controllers -II

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Outline

- Review the last lecture notes
- Internal Flags
- Arithmetic Operations
Usage of Timers and Counters in Programming as an Output

Symbol | Description
--- | ---
nn ⇒ | Identification number
Kmm ⇒ | Duration time for activating the timer coil
Khh ⇒ | Required pulses for activating the counter coil

\[
(T_{nn} \ K10) = 1 \text{sec for } 0 \leq nn \leq 32
\]

\[
(T_{nn} \ K10) = 0.1 \text{sec for } 32 < nn < 56
\]
The diagram shows a control circuit with the following components:

1. An input signal labeled X7.
2. A time delay element T1.
3. A relay labeled T1 K500.
4. An output signal labeled Y0.

The timing diagrams indicate the following:

- **X7 Input:** A 1-second pulse at the beginning.
- **Y0 Output:** A repeating 1-second pulse every 80 seconds.

The time axis is labeled in seconds and ranges from 0 to 180 seconds.
Internal Flags

Symbol Description

\( nn \Rightarrow \text{Identification number} \)
Programming MELSEC-FX

<table>
<thead>
<tr>
<th>Function</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SET</td>
<td>Sets a bit device (Y,M,C) permanently ON</td>
</tr>
<tr>
<td>RST</td>
<td>Resets a bit device (Y,M,C,T) permanently OFF</td>
</tr>
<tr>
<td>PLS</td>
<td>Rising edge pulse for bit device (Y,M)</td>
</tr>
<tr>
<td>PLF</td>
<td>Falling edge pulse for bit device (Y,M)</td>
</tr>
<tr>
<td>END</td>
<td>Ends the scanning of the current program</td>
</tr>
</tbody>
</table>

\[\text{[SET (RST,PLS,PLF) \ Device nn]}\]
Some Remarks in Programming MELSEC-FX -2-

```plaintext
X1
X0
M0
X2
M1

C0 K5
PLS M0
SET Y0
PLF M1
RST C0
END
```
X1
X0
M0
X2
M1
C0 K5
PLS M0
SET Y0
PLF M1
RST C0
END

X0 input

M0 pulse

Y0 output

Time in seconds
Arithmetic Operations In MELSEC-FX

- Add
- Subtract
- Multiply
- Division
- Increment
- Decrement
\[\begin{array}{c|c|c|c|c|c}
\text{Fnc} & \text{S 1} & \text{S 2} & \text{D} \\
\hline
\text{ADD} & T,C,D = S1 + S2 \\
\text{SUB} & T,C,D = S2 - S1 \\
\text{MUL} & T,C,D = S2 \times S1 \\
\text{DIV} & T,C,D = S1 / S2 \\
\end{array}\]

(remainder is moved to D+1)
Arising problems in programming MELSEC FX

- Using buttons
- using push buttons