Topic: The interrupt functions of DVP series PLCs

Applicable model	DVP-EH3 series, DVP-SV2 series, DVP-ES2/EX2 series, DVP-SX2 series, DVP-SA2 series, DVP-SS2 series, DVP-SE series, DVP-MC series, DVP-SX series, DVP-ES/EX series, DVP-EC3 series, TP04P series, TP70P series
Keyword	Interrupt function

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1　Preface and Purpose

Preface:
The control of PLCs by means of scan time is enough for most PLC application. However, the delay of scan time means the enlargement of an error for certain application which needs high-speed response. In this situation, only the use of interrupts can meet requirements.

In the scan time of a PLC, an interrupt is a signal to the PLC indicating an event that needs immediate attention. An interrupt alerts the PLC to a high-priority condition requiring the interruption of the current code the PLC is executing. The PLC responds by suspending its current activities, saving its state, and executing an interrupt service routine to deal with the event. After the interrupt service routine finishes, the PLC resumes normal activities.

This document introduces the application of interrupts. The models used in the examples below are Delta DVP series PLCs.

Purpose: Helping users know how to use the interrupt functions of Delta PLCs
1.　External interrupt
2.　Time interrupt
3.　High-speed counting interrupt
4.　Communication interrupt
5.　Pulse interrupt

2　Interrupt Functions

2.1　Applicable Models

Model / Interrupt type	EH3/SV2	ES2/EX2	SA2/SX2	SS2	SE	MC	SX	ES/EX/EC3	TP04P/TP70P
External interrupt	V	V	V	V	V	--	V	V	V
Time interrupt	V	V	V	V	V	V	V	V	V
High-speed counting interrupt	V	V	V	V	V	--	V	--	V
Communication interrupt	V	V	V	V	V	V	V	V	V
Pulse interrupt	V	--	--	--	--	--	--	--	--

Note: **V** means "Supported", and **--** means "Not supported".

2.2　Number of Interrupt Points for Models

EH3/SV2:

Model and number of points / Interrupt type	EH3/SV2	Number of points
External interrupt	I000/I001 (X0), I100/I101 (X1), I200/I201 (X2), I300/I301(X3), I400/I401 (X4), I500/I501 (X5), I600/I601 (X6), I700/I701 (X7), I900/I901 (X10), I910/I911 (X11), I920/I921 (X12), I930/I931 (X13), I940/I941 (X14), I950/I951 (X15), I960/I961 (X16), I970/I971 (X17) (01/9x1: Rising edge-triggered ⌐ ; 00/9x0: Falling edge-triggered ⌐)	16
Time interrupt	I602~I699, I702~I799 (Time base: 1 ms)	2
	I805~I899 (Time base: 0.1 ms)	1
High-speed counting interrupt	I010, I020, I030, I040, I050, I060	6
Communication interrupt	I150, I151, I153, I160, I161, I163, I170 (Please refer to point 5 in section 2.3 for more information.)	3
Pulse interrupt	I110, I120, I130, I140	4

ES2/EX2:

Model and number of points / Interrupt type	ES2/EX2	Number of points
External interrupt	I000/I001 (X0), I100/I101 (X1), I200/I201 (X2), I300/I301 (X3), I400/I401 (X4), I500/I501 (X5), I600/I601 (X6), I700/I701 (X7) (01: Rising edge-triggered ⌐ ; 00: Falling edge-triggered ⌐)	8
Time interrupt	I602~I699, I702~I799 (Time base: 1 ms)	2
	I805~I899 (Time base: 0.1 ms) (Supported by version 2.00 and above)	1
High-speed counting interrupt	I010, I020, I030, I040, I050, I060, I070, I080	8
Communication interrupt	I140 (COM1), I150 (COM2), I160 (COM3)	3

SA2/SX2:

Model and number of points / Interrupt type	SA2/SX2	Number of points
External interrupt	I000/I001 (X0), I100/I101 (X1), I200/I201 (X2), I300/I301 (X3), I400/I401 (X4), I500/I501 (X5), I600/I601 (X6), I700/I701 (X7) (01: Rising edge-triggered ⌐ ; 00: Falling edge-triggered ⌐)	8
Time interrupt	I602~I699, I702~I799 (Time base: 1 ms)	2
	I805~I899 (Time base: 0.1 ms) (Supported by version 2.00 and above)	1
High-speed counting interrupt	I010, I020, I030, I040, I050, I060, I070, I080	8
Communication interrupt	I140 (COM1), I150 (COM2), I160 (COM3),	3

SS2:

Model and number of points / Interrupt type	SS2	Number of points
External interrupt	I000/I001 (X0), I100/I101 (X1), I200/I201 (X2), I300/I301 (X3), I400/I401 (X4), I500/I501 (X5), I600/I601 (X6), I700/I701 (X7) (01: Rising edge-triggered ⌐ ; 00: Falling edge-triggered ⌐)	8
Time interrupt	I602~I699, I702~I799 (Time base: 1 ms)	2
	I805~I899 (Time base: 0.1 ms) (Supported by version 2.00 and above)	1
High-speed counting interrupt	I010, I020, I030, I040, I050, I060, I070, I080	8
Communication interrupt	I140 (COM1), I150 (COM2)	2

SE:

Model and number of points / Interrupt type	SE	Number of points
External interrupt	I000/I001 (X0), I100/I101 (X1), I200/I201 (X2), I300/I301 (X3), I400/I401 (X4), I500/I501 (X5), I600/I601 (X6), I700/I701 (X7) (01: Rising edge-triggered ⌐ ; 00: Falling edge-triggered ⌐)	8
Time interrupt	I602~I699, I702~I799 (Time base: 1 ms)	2
	I805~I899 (Time base: 0.1 ms) (Supported by version 1.60 and above)	1
High-speed counting interrupt	I010, I020, I030, I040, I050, I060, I070, I080	8
Communication interrupt	I150 (COM2), I160 (COM3)	2

MC:

Model and number of points / Interrupt type	MC	Number of points
Time interrupt	I602~I699, I702~I799 (Time base: 1 ms)	2
	I805~I899 (Time base: 0.1 ms)	1
Communication interrupt	I140 (COM1), I150 (COM2)	2

SX:

Model and number of points / Interrupt type	SX	Number of points
External interrupt	I001 (X0), I101 (X1), I201 (X2), I301 (X3), I401 (X4), I501 (X5) (01: Rising edge-triggered ⌐)	6
Time interrupt	I601~I699, I701~799 (Time base: 1 ms)	2
High-speed counting interrupt	I010, I020, I030, I040, I050, I060	6
Communication interrupt	I150 (COM2)	1

ES/EX/EC3:

Model and number of points / Interrupt type	ES/EX/EC3	Number of points
External interrupt	I001 (X0), I101 (X1), I201 (X2), I301 (X3) (01: Rising edge-triggered ⌐)	4
Time interrupt	I610~I699 (Time base: 1 ms) (Supported by version 5.7 and above)	1
Communication interrupt	I150 (COM2)	1

TP04P/TP70P:

Model and number of points / Interrupt type	TP04P/TP70P	Number of points
External interrupt	I000/I001 (X0), I100/I101 (X1) (01: Rising edge-triggered ⌐ ; 00: Falling edge-triggered ⌐)	2
Time interrupt	I602~I699, I702~799 (Time base: 1 ms)	2
High-speed counting interrupt	I010	1
Communication interrupt	I150(COM2)	1

2.3 Notes

1. If input points are used by a high-speed counter, they can not be used as interrupt points. For example, if C251 uses X0, X1, X2 and X3, the external interrupt points I000/I001 (X0), I100/I101 (X1), I200/I201 (X2), I300/I301 (X3) can not be used.
2. Only one of a pair of interrupt numbers can appear in a program. If interrupt pairs appear in a program, a syntax error will occur after the program is downloaded to a PLC. For example, either the external I000 or I001 can appear in a program.
3. If an interrupt service routine is executed, the next interrupt service routine will not be executed until the execution of the interrupt service routine is complete.
4. The scan time for interrupt service routines in a PLC affects the efficiency of the PLC. It is suggested that the program in a PLC is as short as possible.
5. The communication interrupts I151, I161, I153, and I163 are only applicable to EH3/EH3-L/SV2 version 2.0 and above. Besides, only three communication interrupts can appear in the program in EH3/SV2. Users can refer to the table below for more information about the interrupt numbers used by COM1, COM2, and COM3. (SV2 does not support COM3.)
   Example: If COM1 uses the communication interrupt I161, the communication interrupts I150 and I163 can not be used. No warning appears when users repeatedly write an interrupt number in software, but an error message saying that the interrupt number is used repeatedly will appear after the program is downloaded to a PLC.

Communication interrupt number	1	2	3
Communication interrupt for COM1	I161	I151	--
Communication interrupt for COM2	I150	I160	I170
Communication interrupt for COM3	I163	--	I153

3 Example 1: External Interrupt

Due to the special hardware design in a PLC, the PLC is not affected by its scan time, suspends its current activities, and executes an interrupt service routine when the input signal sent to an input terminal goes from low to high or from high to low. The PLC resumes normal activities after the instruction IRET is executed.

【Control requirement】
If an external interrupt is sent to X0, Y0 will decelerate immediately, and will stop after it outputs 50000 pulses. (EH3 is used in example 1.)

【Descriptions of devices】

Device in a PLC	Description
D1026	Number of masking/marking pulses output by Y0 (If M1156 is set to ON, and the value in D1026 is less than or equal to 0, Y0 will not output masking/marking pulses.
D1343	Acceleration/Deceleration time of CH0 (ms)
D1232	Number of pulses output by CH0 before CH0 stops
D100	Number of external interrupts
I001	I001 is executed when the input signal sent to X0 goes from low to high.
M0	M0 is used to enable DDRVI.
M1156	CH0 stops outputting pulses when an interrupt occurs.

【Program in WPLSoft】
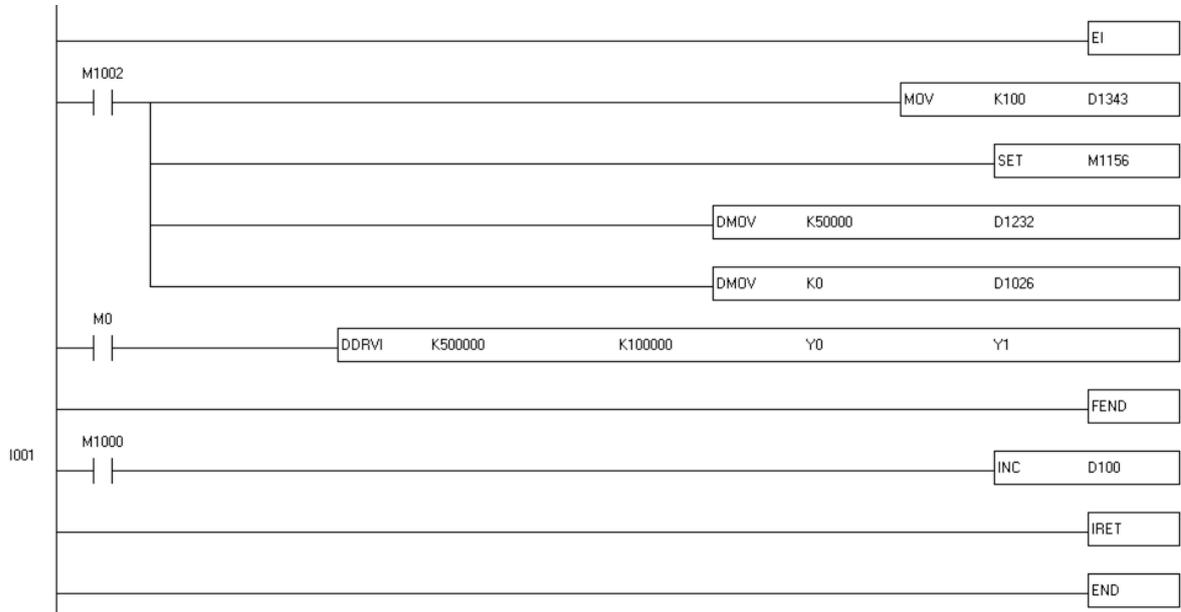
【Program in ISPSoft】
Cyclic POU:
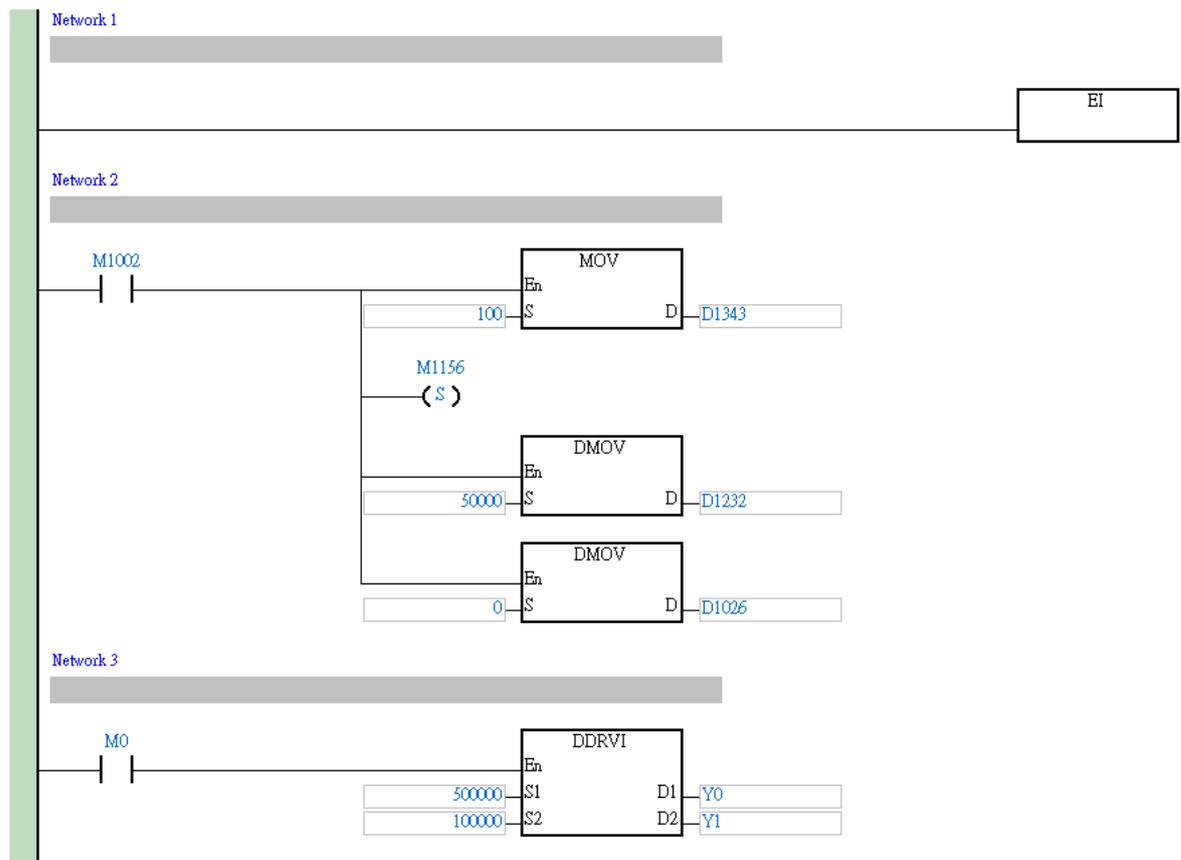
External interrupt: X0

Interrupt service routine: I001
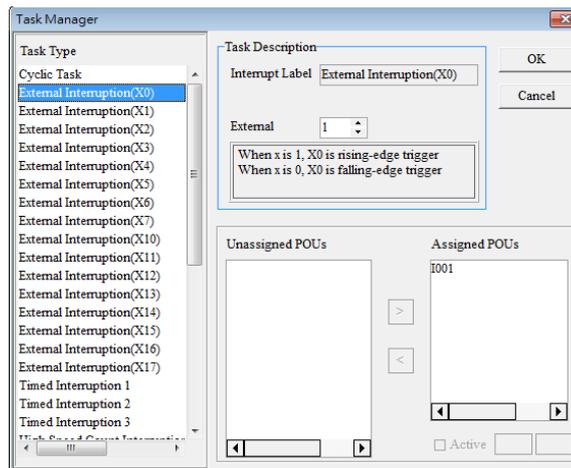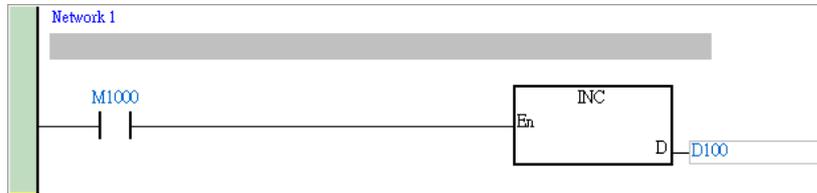
【Control description】
● When M0 is On, Y0 begins to output pulses. If an external interrupt is sent to X0, Y0 will decelerate immediately and stop after it outputs 50000 pulses, and M1538 will be set to On. The value in D100 indicates the number of interrupts.
● When M1538 is On, users can reset M1156. After M1156 is reset, the PLC will start to output the remaining pulses. After the remaining pulses are output, M1029 will be set to On.
● If an external interrupt occurs in the planned deceleration area, the output terminal will not decelerate and M1538 will not be set to On.

4 Example 2: Time Interrupt

A PLC can automatically suspend its current activities every specific period of time, and execute a time interrupt service routine.
The relation between time interrupt time and the time interrupt numbers in EH3/SV2 is described below.
I602~I699 (Time base: 1 ms): 2 ms~99 ms
I702~I799 (Time base: 1 ms): 2 ms~99 ms
I805~I899 (Time base: 0.1 ms): 0.5 ms~9.9 ms

【Control requirement】
An interrupt service routine is executed every 2 milliseconds, and an interrupt service routine is executed every 0.5 milliseconds. (EH3 is used in example 2.)
【Descriptions of devices】

Device in a PLC	Description
D0	The value in D0 indicates the number of times I602 is executed.
D100	The value in D100 indicates the number of times I805 is executed.
I602	I602 is an interrupt service routine which is executed every 2 milliseconds.
I805	I805 is an interrupt service routine which is executed every 0.5 milliseconds.

【Program in WPLSoft】

【Program in ISPSoft】
Cyclic POU:
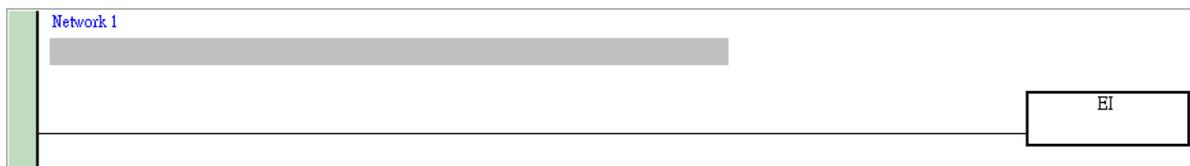
Time interrupt: I602
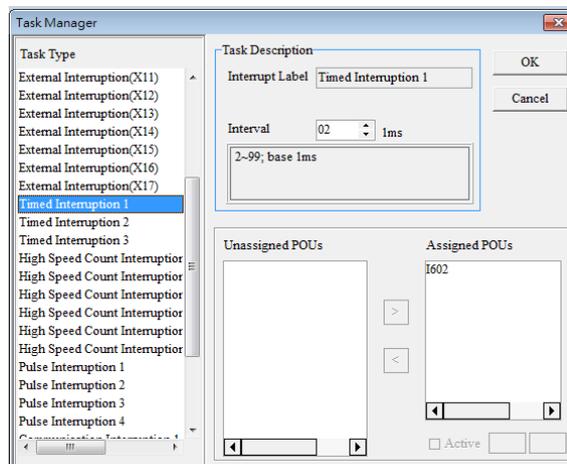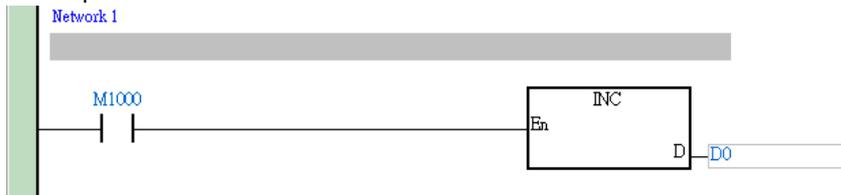
Time interrupt: I805
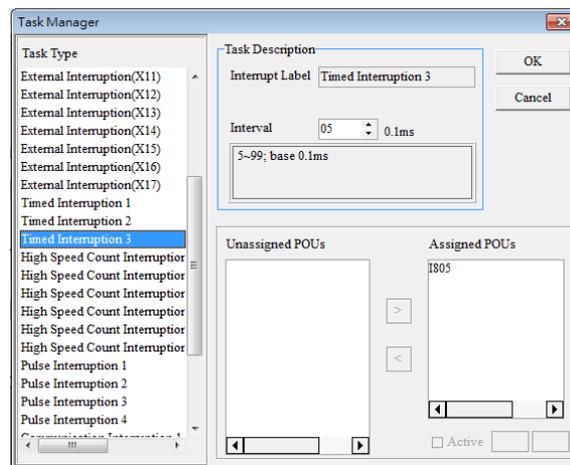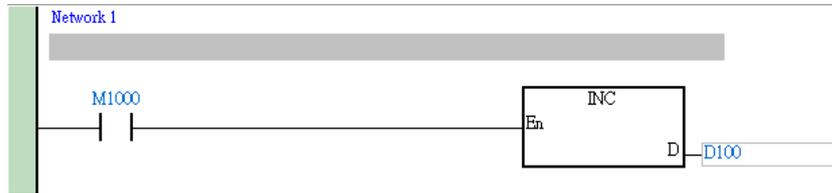
【Control description】
- I602 is an interrupt service routine which is executed every 2 milliseconds. When the program in the PLC is executed, I602 is executed every 2 milliseconds. The value in D0 indicates the number of times I602 is executed.
- I602 is an interrupt service routine which is executed every 0.5 milliseconds. When the program in the PLC is executed, I805 is executed every 0.5 milliseconds. The value in D100 indicates the number of times I805 is executed.

5 Example 3: High-speed Counting Interrupt

The instruction DHSCS can specify that a PLC suspends its current activities and executes a high-speed counting interrupt service routine when the value in a counter reaches a target value.

【Control requirement】
The instruction DHSCS uses the high-speed counter C251. If C251 counts to 5000, 10000, 20000, 40000, 80000, and 160000, the interrupt subroutines I010, I020, I030, I040, I050, and I060 will be executed. (EH3 is used in example 3.)

【Descriptions of devices】

Device in a PLC	Description
C251	High-speed counter
D1225	Counting mode of C251
D100~D110	The values in D100~D110 are the target values to which C251 counts
I010~I060	High-speed counting interrupt service routines
M0	M0 is used to enable the high-speed counter C251 and the instruction DHSCS.
M1264	C251 is not reset by means of an external control signal
M1265	C251 is not enabled by means of an external control signal
M1273	C251 is enabled by means of an internal control signal
Y10~Y15	Output coils used in I010~I060

【Program in WPLSoft】

```
                                                                          ┌──────┐
                                                                          │ EI   │
                                                                          └──────┘
     M1002
  ───┤ ├───┬──────────────────────────────────────────┬──────┬──────┬────────┐
           │                                           │ MOV  │ K1   │ D1225  │
           │                                           └──────┴──────┴────────┘
           │                                           ┌──────┬──────────────┐
           │                                           │ RST  │ C251         │
           │                                           └──────┴──────────────┘
           │                                           ┌──────┬──────────────┐
           │                                           │ SET  │ M1264        │
           │                                           └──────┴──────────────┘
           │                                           ┌──────┬──────────────┐
           └───────────────────────────────────────────│ SET  │ M1265        │
                                                       └──────┴──────────────┘

     M0
  ───┤ ├───┬──────────────────────────────────────────────────┬──────┬──────────────┐
           │                                                   │ SET  │ M1273        │
           │                                                   └──────┴──────────────┘
           │                                          ┌──────┬──────┬──────────────┐
           │                                          │ DCNT │ C251 │ K200000      │
           │                                          └──────┴──────┴──────────────┘
           │                 ┌───────┬────────┬──────────────┬──────────────┐
           ├─────────────────│ DHSCS │ K5000  │ C251         │ I010         │
           │                 └───────┴────────┴──────────────┴──────────────┘
           │                 ┌───────┬────────┬──────────────┬──────────────┐
           ├─────────────────│ DHSCS │ K10000 │ C251         │ I020         │
           │                 └───────┴────────┴──────────────┴──────────────┘
           │                 ┌───────┬────────┬──────────────┬──────────────┐
           ├─────────────────│ DHSCS │ K20000 │ C251         │ I030         │
           │                 └───────┴────────┴──────────────┴──────────────┘
           │                 ┌───────┬────────┬──────────────┬──────────────┐
           ├─────────────────│ DHSCS │ K40000 │ C251         │ I040         │
           │                 └───────┴────────┴──────────────┴──────────────┘
           │                 ┌───────┬────────┬──────────────┬──────────────┐
           ├─────────────────│ DHSCS │ K80000 │ C251         │ I050         │
           │                 └───────┴────────┴──────────────┴──────────────┘
           │                 ┌───────┬────────┬──────────────┬──────────────┐
           └─────────────────│ DHSCS │ K160000│ C251         │ I060         │
                             └───────┴────────┴──────────────┴──────────────┘
```

```
                                                              ┌──────┐
                                                              │ FEND │
                                                              └──────┘
      I010   M1000
       │──────┤├──────┐                                        ─( Y10 )
       │             │  ┌──────────────────────────────────┐
       │             └──│ DMOV      C251          D100       │
       │                └──────────────────────────────────┘
       │                                                      ┌──────┐
       │                                                      │ IRET │
       │                                                      └──────┘
      I020   M1000
       │──────┤├──────┐                                        ─( Y11 )
       │             │  ┌──────────────────────────────────┐
       │             └──│ DMOV      C251          D102       │
       │                └──────────────────────────────────┘
       │                                                      ┌──────┐
       │                                                      │ IRET │
       │                                                      └──────┘
      I030   M1000
       │──────┤├──────┐                                        ─( Y12 )
       │             │  ┌──────────────────────────────────┐
       │             └──│ DMOV      C251          D104       │
       │                └──────────────────────────────────┘
       │                                                      ┌──────┐
       │                                                      │ IRET │
       │                                                      └──────┘
      I040   M1000
       │──────┤├──────┐                                        ─( Y13 )
       │             │  ┌──────────────────────────────────┐
       │             └──│ DMOV      C251          D106       │
       │                └──────────────────────────────────┘
       │                                                      ┌──────┐
       │                                                      │ IRET │
       │                                                      └──────┘

      I050   M1000
       │──────┤├──────┐                                        ─( Y14 )
       │             │  ┌──────────────────────────────────┐
       │             └──│ DMOV      C251          D108       │
       │                └──────────────────────────────────┘
       │                                                      ┌──────┐
       │                                                      │ IRET │
       │                                                      └──────┘
      I060   M1000
       │──────┤├──────┐                                        ─( Y15 )
       │             │  ┌──────────────────────────────────┐
       │             └──│ DMOV      C251          D110       │
       │                └──────────────────────────────────┘
       │                                                      ┌──────┐
       │                                                      │ IRET │
       │                                                      └──────┘
       │                                                      ┌──────┐
       │                                                      │ END  │
       │                                                      └──────┘
```

【Program in ISPSoft】
Cyclic POU:

Network 1

```
                                                                    ┌──────┐
                                                                    │  EI  │
────────────────────────────────────────────────────────────────── └──────┘
```

Network 2

```
  M1002                          ┌──────────┐
───┤├───────────────────┬────────┤   MOV    │
                        │        │En        │
                        │     1 ─┤S       D ├─ D1225
                        │        └──────────┘
                        │
                        │       C251
                        ├───────(R)
                        │
                        │       M1264
                        ├───────(S)
                        │
                        │       M1265
                        └───────(S)
```

```
  M0                             M1273
───┤├───────────────────┬───────(S)
                        │        ┌──────────┐
                        │        │   DCNT   │
                        │        │En        │
                        │  C251 ─┤S1        │
                        │ 200000─┤S2        │
                        │        └──────────┘
                        │        ┌──────────┐
                        │        │  DHSCS   │
                        │        │En        │
                        │  5000 ─┤S1      D ├─ I010
                        │  C251 ─┤S2        │
                        │        └──────────┘
                        │        ┌──────────┐
                        │        │  DHSCS   │
                        │        │En        │
                        │ 10000 ─┤S1      D ├─ I020
                        │  C251 ─┤S2        │
                        │        └──────────┘
                        │        ┌──────────┐
                        │        │  DHSCS   │
                        │        │En        │
                        │ 20000 ─┤S1      D ├─ I030
                        │  C251 ─┤S2        │
                        │        └──────────┘
                        │        ┌──────────┐
                        │        │  DHSCS   │
                        │        │En        │
                        │ 40000 ─┤S1      D ├─ I040
                        │  C251 ─┤S2        │
                        │        └──────────┘
                        │        ┌──────────┐
                        │        │  DHSCS   │
                        │        │En        │
                        │ 80000 ─┤S1      D ├─ I050
                        │  C251 ─┤S2        │
                        │        └──────────┘
                        │        ┌──────────┐
                        │        │  DHSCS   │
                        │        │En        │
                        │160000 ─┤S1      D ├─ I060
                        │  C251 ─┤S2        │
                        └        └──────────┘
```
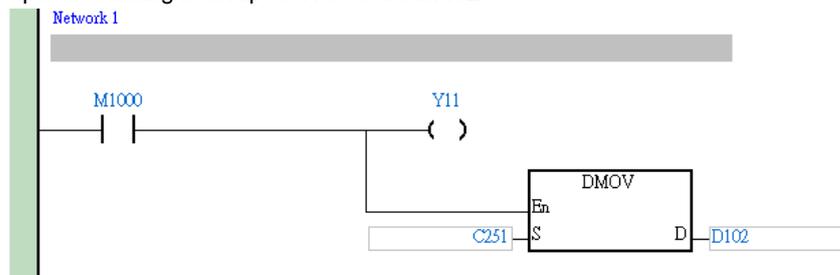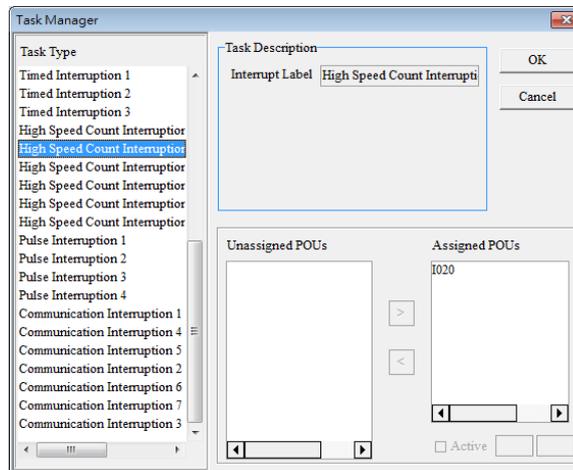
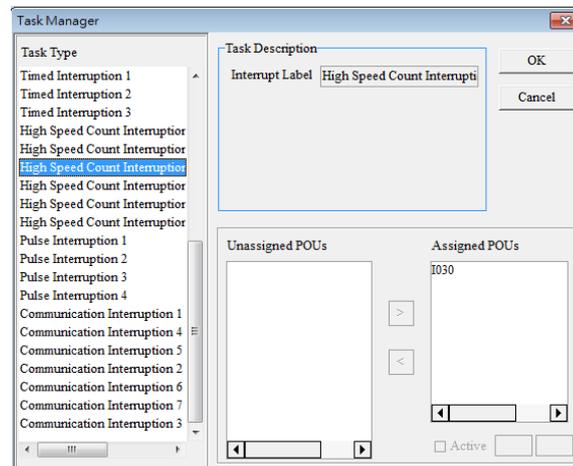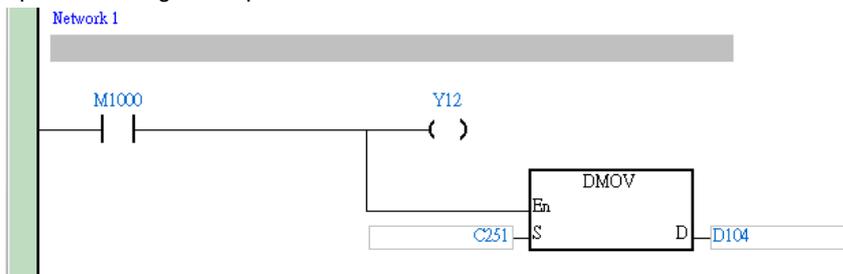High-speed counting interrupt service routine: I010

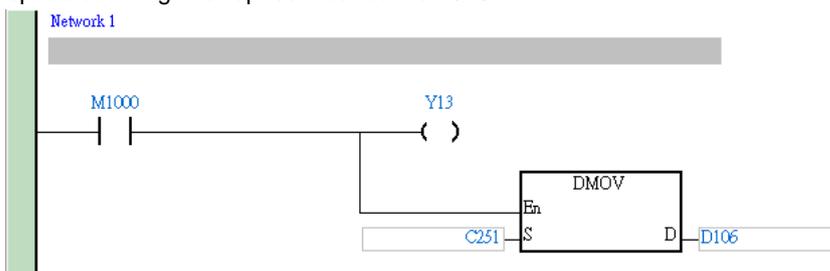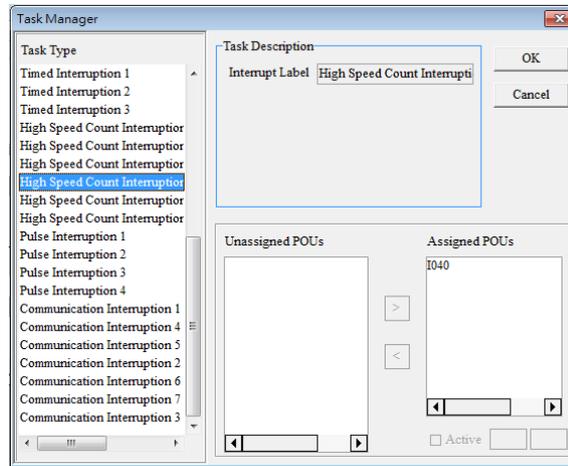High-speed counting interrupt service routine: I020

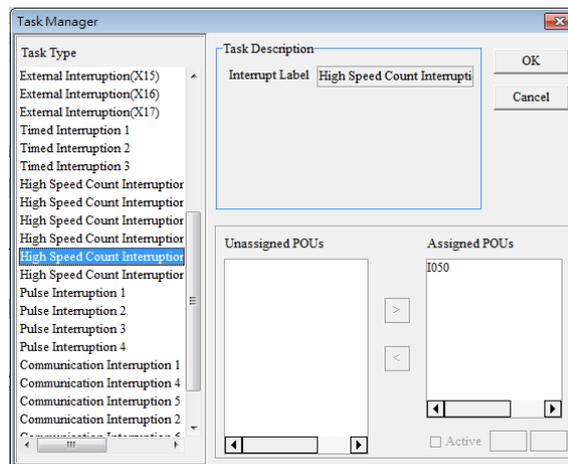High-speed counting interrupt service routine: I030
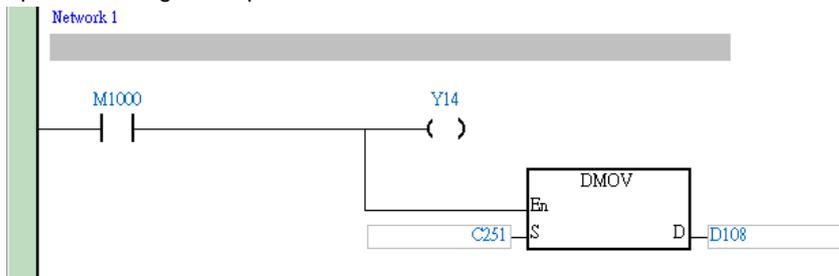

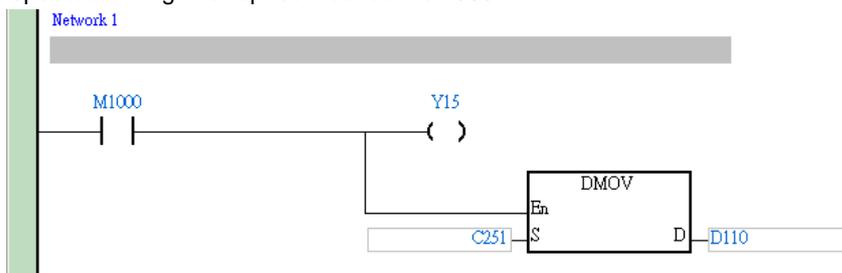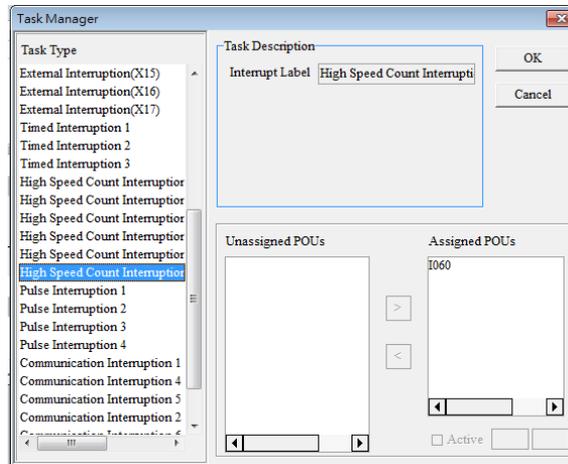

High-speed counting interrupt service routine: I040

High-speed counting interrupt service routine: I050

High-speed counting interrupt service routine: I060

【Control description】
● If M0 is set to ON, the high-speed counter C251 and the instruction DHSCS will be enabled.
● If C251 counts from 4999 to 5000 or from 5001 to 5000, the interrupt service routine I010 will be executed, Y10 will be On, and the value to which C251 counts will be stored in D100.
● If C251 counts from 9999 to 10000 or from 10001 to 10000, the interrupt service routine I020 will be executed, Y11 will be On, and the value to which C251 counts will be stored in D102.
● If C251 counts from 19999 to 20000 or from 20001 to 20000, the interrupt service routine I030 will be executed, Y12 will be On, and the value to which C251 counts will be stored in D104.
● If C251 counts from 39999 to 40000 or from 40001 to 40000, the interrupt service routine I040 will be executed, Y13 will be On, and the value to which C251 counts will be stored in D106.
● If C251 counts from 79999 to 80000 or from 80001 to 80000, the interrupt service routine I050 will be executed, Y14 will be On, and the value to which C251 counts will be stored in D108.
● If C251 counts from 159999 to 160000 or from 160001 to 160000, the interrupt service routine I060 will be executed, Y15 will be On, and the value to which C251 counts will be stored in D110.

6   Example 4: Communication Interrupt

The instruction RS can specify that an interrupt request will be sent after a specific character or a specific length of data is received by COM1 (RS-232 port), COM2 (RS-485 port), or COM3 (RS-485 port). Users can set a specific character or a specific data length by means of the low byte in a special D device.

6.1   I150 (COM2)

【Control requirement】
The instruction RS can specify that an interrupt request will be sent after a specific character is received by COM2. Users can set a specific character by means of the low byte in D1168. If the specific character set is received, I150 will be executed. (EH3 is used in this example.)

【Descriptions of devices】

Device in a PLC	Description
D0	The value in D0 is the value which is sent first.
D50	The value in D50 is the value received first.
D100	The value in D100 indicates the number of times I150 is executed.
D1120	The value in D1120 indicates the communication protocol used by COM2.
D1129	The value in D1129 indicates the communication timeout for COM2. (Unit: ms)
D1168	The value in D1168 indicates a specific character.
I150	Communication interrupt service routine

Device in a PLC	Description
M0	M0 is used to set M1122 to On, and enable the instruction RS.
M1120	If M1120 is set to ON, the communication protocol set will not be changed.
M1122	M1122 is used to request the sending of data.
M1123	If the receiving of data is complete, M1123 will be On.
M1143	ASCII/RTU mode (On: RTU mode; Off: ASCII mode)
M1161	8-bit/16-bit processing mode (On: 8-bit processing mode; Off: 16-bit processing mode)

【Program in WPLSoft】

【Program in ISPSoft】
Cyclic POU:

Network 1

```
                                                                              ┌──────┐
                                                                              │  EI  │
                                                                              └──────┘
```

Network 2

```
  M1002                              ┌──────MOV──────┐
──┤ ├──────────────────────────────En│              │
                              16#86─S│             D│─D1120
                                     └───────────────┘
                                     ┌──────MOV──────┐
                                   En│              │
                                200─S│             D│─D1129
                                     └───────────────┘
              M1143
            ──(R)
              M1120
            ──(S)
              M1161
            ──(S)
                                     ┌──────MOV──────┐
                                   En│              │
                              16#41─S│             D│─D1168
                                     └───────────────┘
```

Network 3

```
   M0                   M1122
──┤↑├──────────────────(S)
```

Network 4

```
   M0                   ┌──────RS──────┐
──┤ ├─────────────────En│             │
                   D0─S│            D│─D50
                    0─m│             │
                   10─n│             │
                        └──────────────┘
```

Network 5

```
  M1123                 M0
──┤ ├──────────────────(R)
                        M1123
                      ──(R)
```
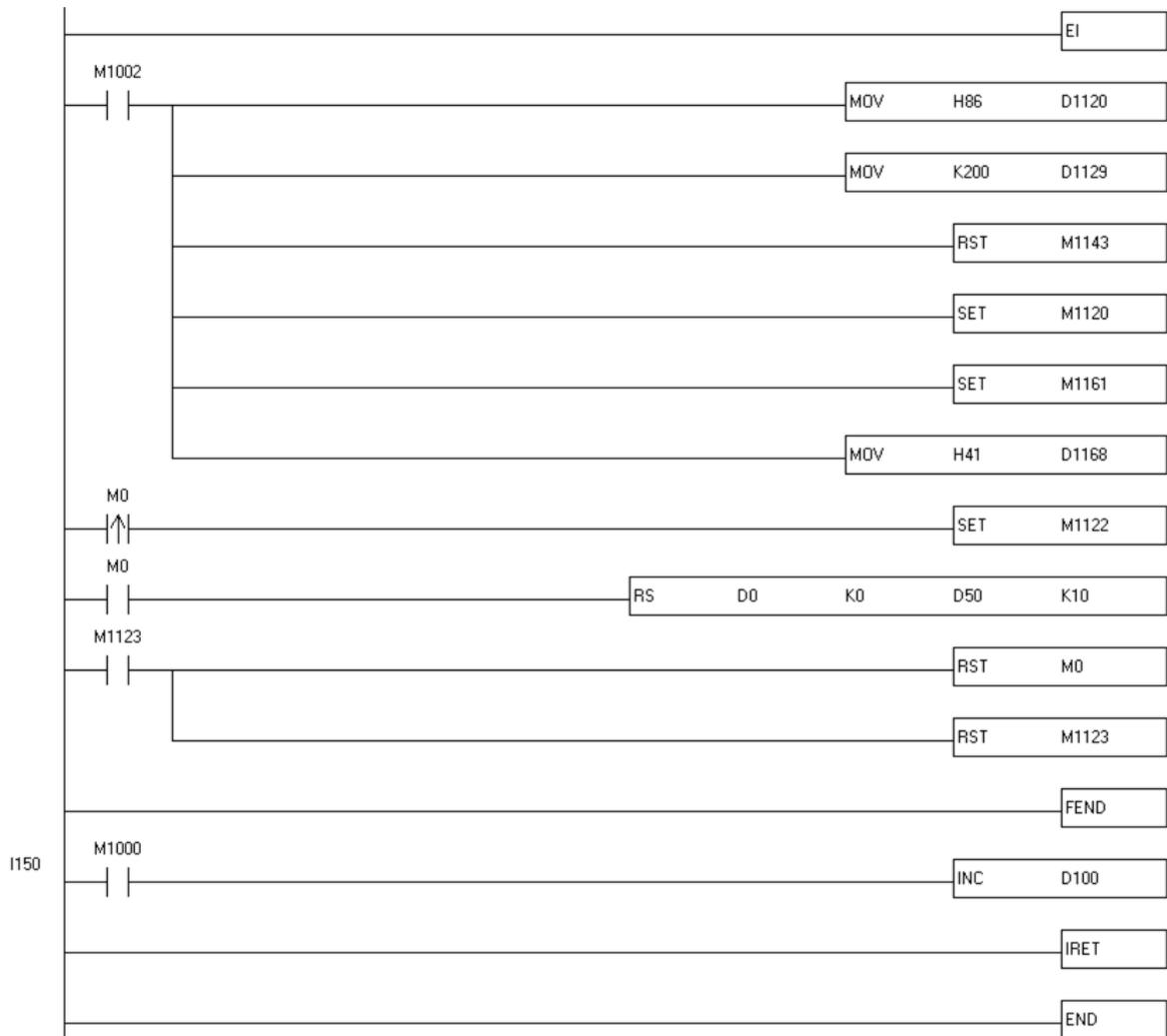
Communication interrupt service routine: I150

【Control description】
- The specific character set by means of D1168 is A (H'41).
- If M0 is On, it will set M1122 to On, and enable the instruction RS.
- If RS is executed, the PLC will receive ten values, and store them in D50~D59.
- If the specific character A is the tenth value which is sent to the PLC, the communication interrupt service routine I150 will be executed after A is received by the PLC. The value in D100 indicates the number of times I150 is executed. The PLC stores the data it receives in D50~D59. After the PLC finishes receiving data, M1123 will be set to On automatically. After M1123 is set to ON, M0 and M1123 will be set to Off.

6.2 I160 (COM2)

【Control requirement】
The instruction RS can specify that an interrupt request will be sent after a specific length of data is received by COM2. Users can set a data length by means of the low byte in D1169. If the specific length of data set is received, I160 will be executed. (EH3 is used in this example.)

【Descriptions of devices】

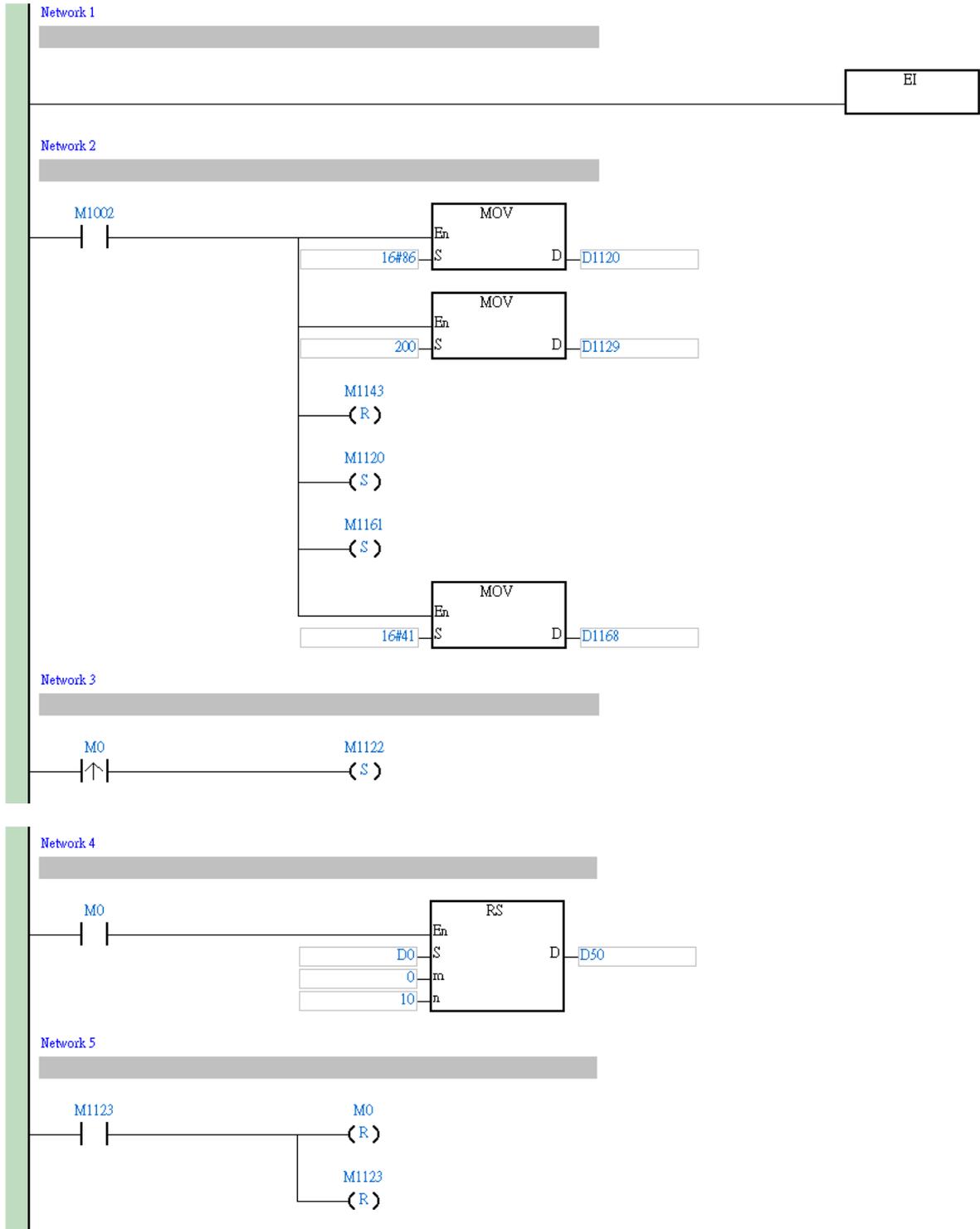| Device in a PLC	Description
D0	The value in D0 is the value which is sent first.
D50	The value in D50 is the value received first.
D100	The value in D100 indicates the number of times I160 is executed.
D1120	The value in D1120 indicates the communication protocol used by COM2.
D1129	The value in D1129 indicates the communication timeout for COM2. (Unit: ms)
D1169	The value in D1168 indicates a specific data length.
I160	Communication interrupt service routine
M0	M0 is used to set M1122 to On, and enable the instruction RS.
M1120	If M1120 is set to ON, the communication protocol set will not be changed.
M1122	M1122 is used to request the sending of data.
M1123	If the receiving of data is complete, M1123 will be On.

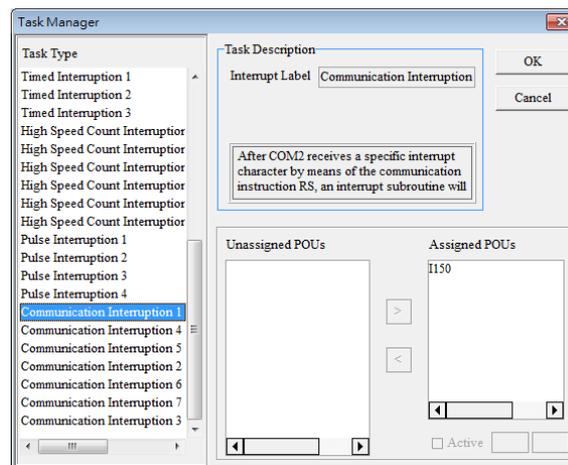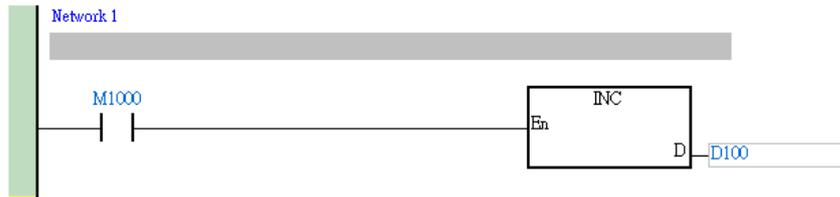| Device in a PLC	Description
M1143	ASCII/RTU mode (On: RTU mode; Off: ASCII mode)
M1161	8-bit/16-bit processing mode (On: 8-bit processing mode; Off: 16-bit processing mode)

【Program in WPLSoft】

```
                                                              ┌──────────────────────┐
                                                              │ EI                   │
                                                              └──────────────────────┘
   M1002
   ─┤ ├──┬──────────────────────────────────┬─[ MOV    H86      D1120 ]
         │                                   │
         │                                   ├─[ MOV    K200     D1129 ]
         │                                   │
         │                                   ├─[ RST    M1143 ]
         │                                   │
         │                                   ├─[ SET    M1120 ]
         │                                   │
         │                                   ├─[ SET    M1161 ]
         │                                   │
         └───────────────────────────────────┤─[ MOV    K8       D1169 ]
   M0
   ─┤↑├──────────────────────────────────────[ SET    M1122 ]
   M0
   ─┤ ├──────────────────────[ RS    D0    K0    D50    K10 ]
   M1123
   ─┤ ├──┬──────────────────────────────────[ RST    M0 ]
         │
         └──────────────────────────────────[ RST    M1123 ]
                                                              ┌──────────────────────┐
                                                              │ FEND                 │
                                                              └──────────────────────┘
   M1000
I160─┤ ├──────────────────────────────────────[ INC    D100 ]
                                                              ┌──────────────────────┐
                                                              │ IRET                 │
                                                              └──────────────────────┘
                                                              ┌──────────────────────┐
                                                              │ END                  │
                                                              └──────────────────────┘
```
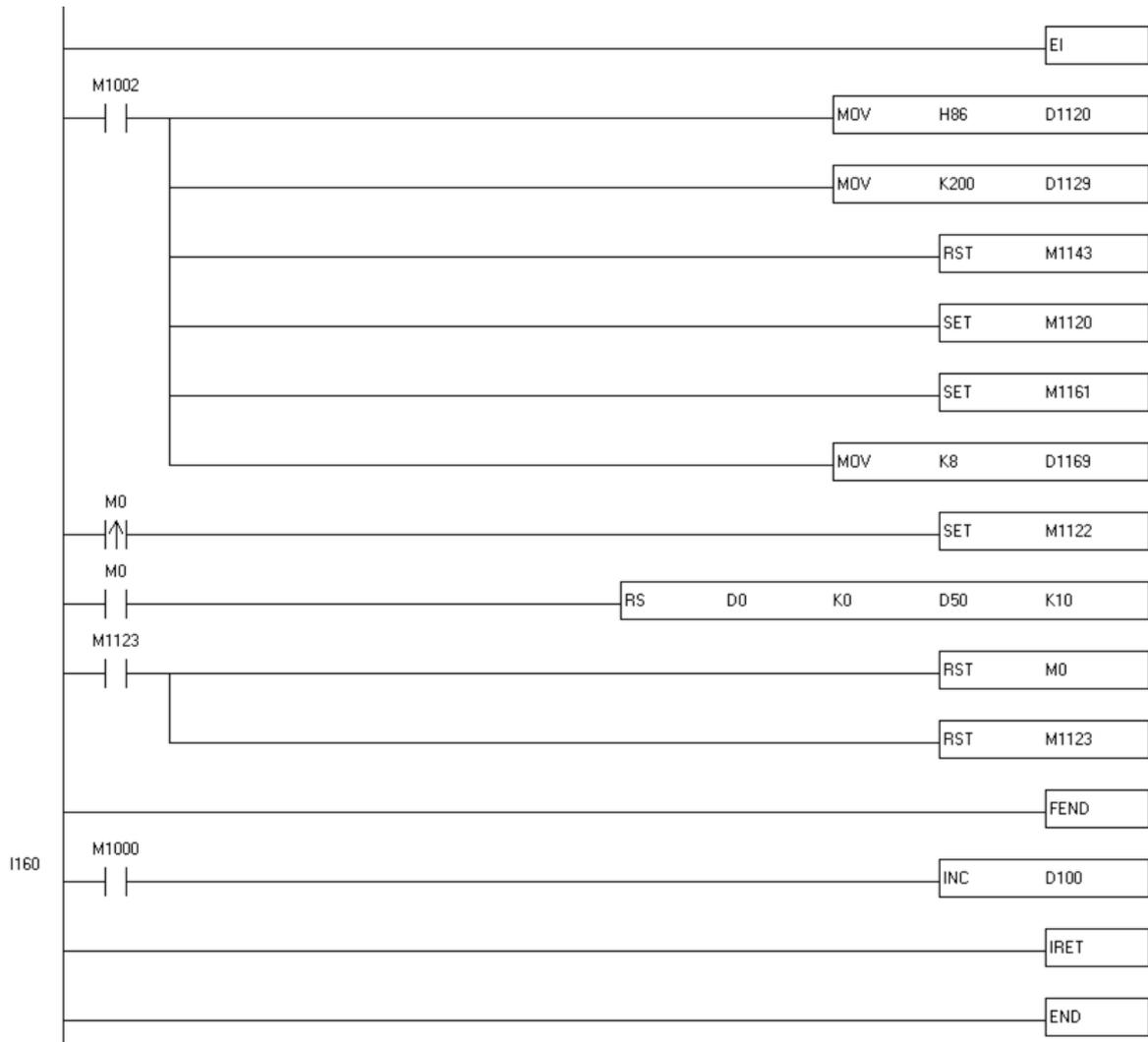
【Program in ISPSoft】
Cyclic POU:
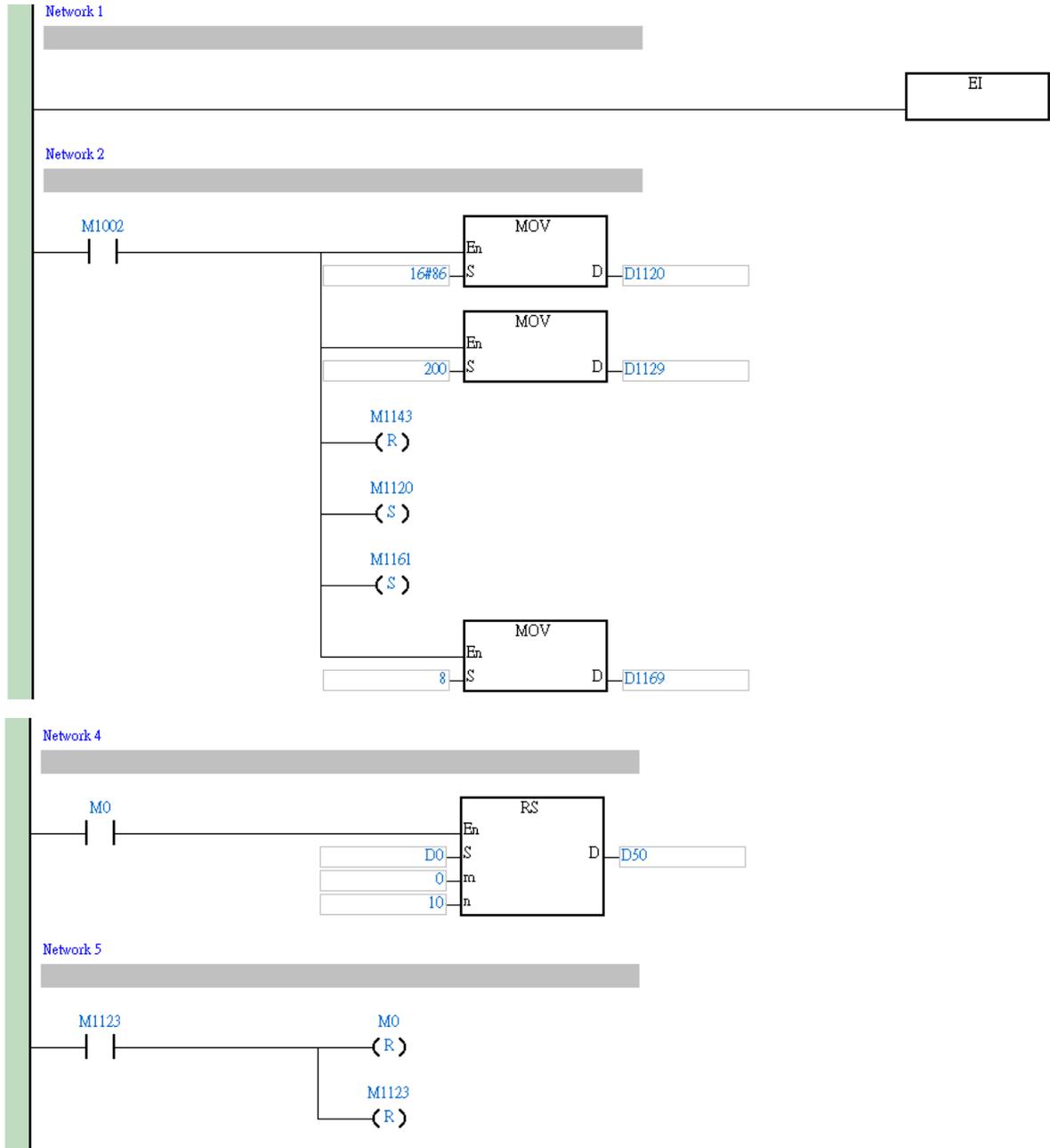
Communication interrupt service routine: I160

【Control description】
- The specific data length set by means of D1169 is eight words.
- If M0 is On, it will set M1122 to On, and enable the instruction RS.
- If RS is executed, the PLC will receive ten values, and store them in D50~D59.
- Owing to the fact that the specific data length set is eight words, the communication interrupt service routine I160 will be executed after eight values are received by the PLC. The value in D100 indicates the number of times I160 is execut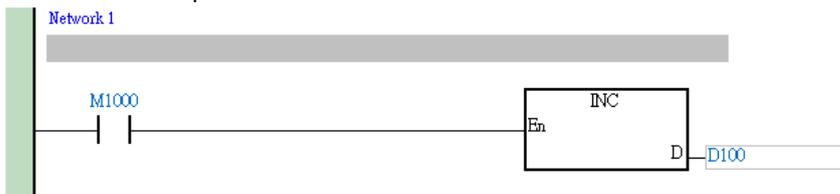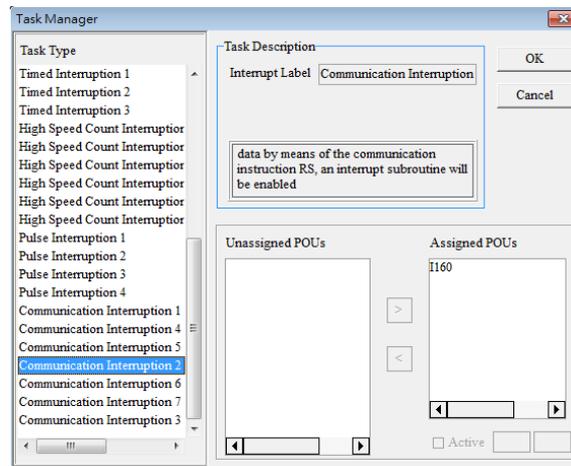ed. The PLC stores the data it receives in D50~D59. After the PLC finishes receiving ten values, M1123 will be set to On automatically. After M1123 is set to ON, M0 and M1123 will be set to Off.

6.3 I170 (COM2)

【Control requirement】
Generally, the communication data which is received by a communication port functioning as a slave station on a PLC is not processed until the PLC executes the instruction END. If the scan time of the PLC is long, I170 can be used, and the communication data received will be processed immediately.
If COM2 functions as a slave station, I170 will be executed after COM2 finishes receiving communication data. (EH3 is used in this example.)

【Descriptions of devices】

Device in a PLC	Description
D100	The value in D100 indicates the number of times I170 is executed.
D1120	The value in D1120 indicates the communication protocol used by COM2.
D1129	The value in D1129 indicates the communication timeout for COM2. (Unit: ms)
I170	Communication interrupt service routine
M1120	If M1120 is set to ON, the communication protocol set will not be changed.
M1143	ASCII/RTU mode (On: RTU mode; Off: ASCII mode)

【Program in WPLSoft】
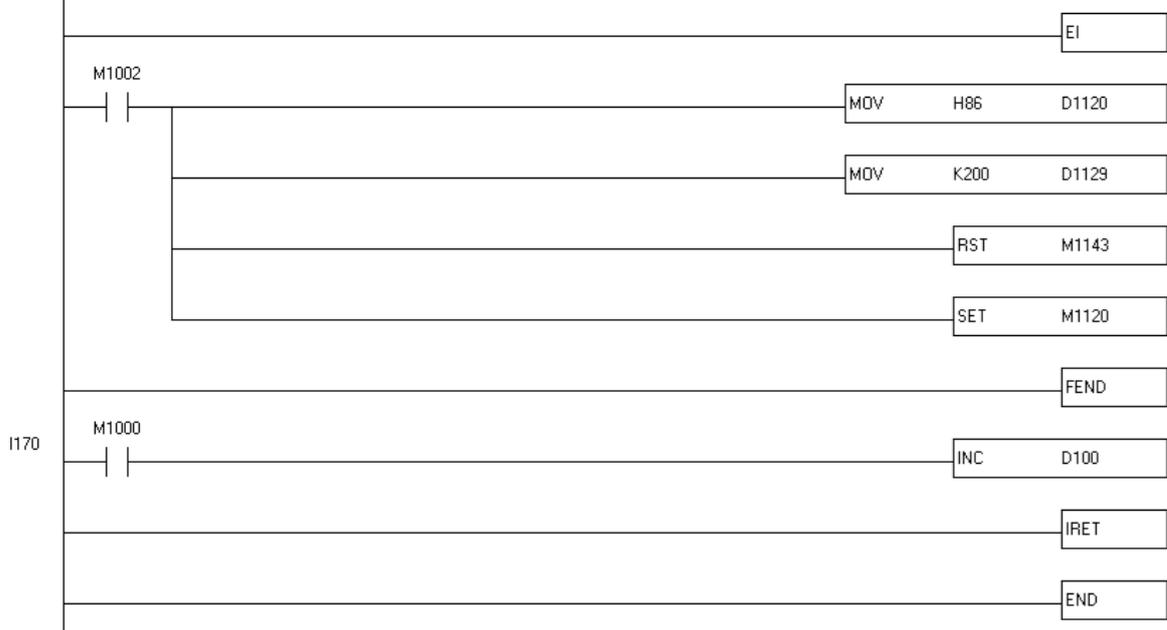
```
                                                                    ┤EI├
        M1002
        ─┤ ├──┬────────────────────────────────────┤MOV   H86   D1120├
             │
             ├────────────────────────────────────┤MOV   K200  D1129├
             │
             ├────────────────────────────────────┤RST   M1143├
             │
             └────────────────────────────────────┤SET   M1120├

                                                                    ┤FEND├

        M1000
  I170  ─┤ ├─────────────────────────────────────────────┤INC   D100├

                                                                    ┤IRET├

                                                                    ┤END├
```

【Program in ISPSoft】
Cyclic POU:

Network 1

```
                                                            ┌──────┐
                                                            │  EI  │
                                                            └──────┘
```

Network 2

```
    M1002                        ┌──────────┐
   ─┤ ├──┬─────────────────────  │   MOV    │
         │                       En         │
         │            16#86──────S        D │──D1120
         │                       └──────────┘
         │                       ┌──────────┐
         │                       │   MOV    │
         │                       En         │
         │              200──────S        D │──D1129
         │                       └──────────┘
         │      M1143
         ├──────( R )
         │      M1120
         └──────( S )
```

Communication interrupt service routine: I170

Network 1

```
    M1000                   ┌──────────┐
   ─┤ ├────────────────────│   INC    │
                           En         │
                                    D │──D100
                            └──────────┘
```
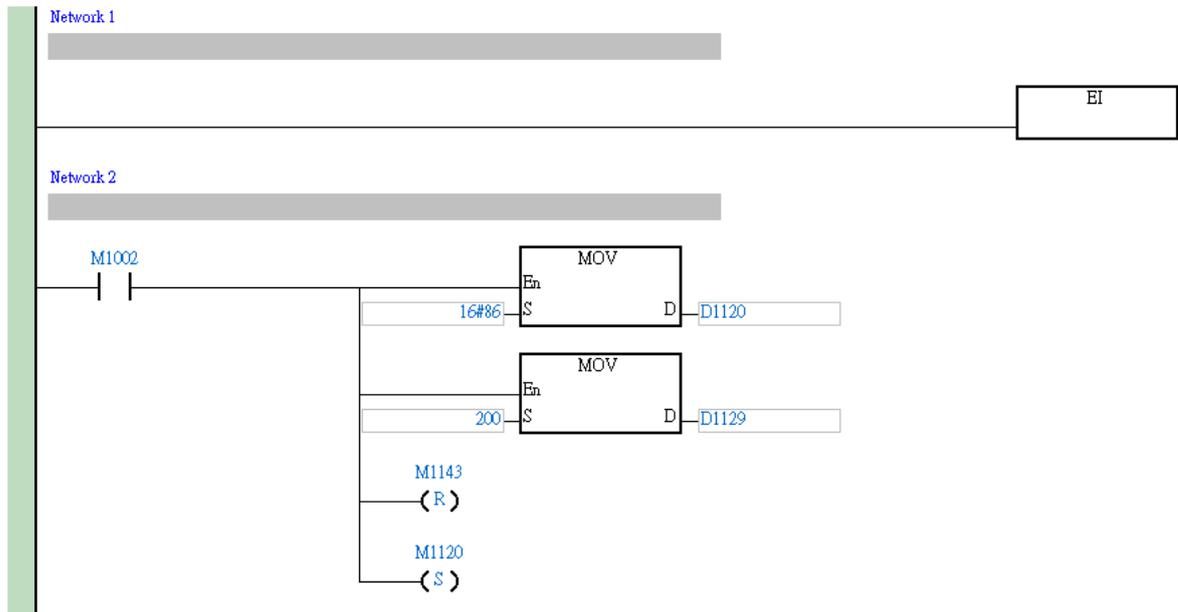
【Control description】
● If the interrupt service routine I170 is added to the program in EH3, and COM2 functions as a slave station, the PLC will immediately process the communication data it receives. The value in D100 indicates the number of times I170 is executed.

7 Example 5: Pulse Interrupt

The instruction PLSY can specify that an interrupt is sent at the same time as the first pulse is sent. M1342 and M1343 are used to enable the interrupts which are sent at the same time as the first pulse. They correspond to I130 and I140. Besides, PLSY can specify that an interrupt will be sent after the last pulse is sent. M1340 and M1341 are used to enable the interrupts which will be sent after the last pulse is sent. They correspond to I110 and I120.

【Control requirement】
When the first pulse is sent by means of PLSY, the interrupt request I130/I140 is sent at the same time. After the last pulse is sent by means of PLSY, the interrupt request I110/I20 will be sent.

【Descriptions of devices】

Device in a PLC	Description
D100~D106	The values in D100~D106 indicate the number of times I110~I140 are executed.
I130, I140	Pulse interrupt service routine for the first output pulse
I110, I120	Pulse interrupt service routine for the last output pulse
M0	M0 is used to enable the instruction DPLSY (CH0).
M1	M1 is used to enable the instruction DPLSY (CH1).
M1029	After CH0 finishes sending pulses, M1029 will be On.
M1030	After CH1 finishes sending pulses, M1030 will be On.
M1340	If M1340 is On, the interrupt request I110 will be sent after CH0 finishes sending pulses.
M1341	If M1341 is On, the interrupt request I120 will be sent after CH1 finishes sending pulses.
M1342	If M1342 is On, the interrupt request I130 is sent as CH0 sends the first pulse.
M1343	If M1343 is On, the interrupt request I140 is sent as CH1 sends the first pulse.

【Program in WPLSoft】

```
                                                                              ┌─────────┐
                                                                              │EI       │
                                                                              └─────────┘
      M1002                                                              ┌─────────────────┐
    ──┤ ├──┬─────────────────────────────────────────────────────────── │SET      M1340   │
           │                                                             └─────────────────┘
           │                                                             ┌─────────────────┐
           │                                                             │SET      M1341   │
           │                                                             └─────────────────┘
           │                                                             ┌─────────────────┐
           │                                                             │SET      M1342   │
           │                                                             └─────────────────┘
           │                                                             ┌─────────────────┐
           └──────────────────────────────────────────────────────────  │SET      M1343   │
                                                                         └─────────────────┘
      M0                      ┌──────────────────────────────────────────────────────────┐
    ──┤ ├──┬──────────────────│DPLSY    K50000        K50000        Y0                    │
           │                  └──────────────────────────────────────────────────────────┘
         M1029                                                           ┌─────────────────┐
        ──┤ ├──────────────────────────────────────────────────────────│RST      M0      │
                                                                         └─────────────────┘
      M1                       ┌──────────────────────────────────────────────────────────┐
    ──┤ ├──┬──────────────────│DPLSY    K100000       K100000       Y2                    │
           │                  └──────────────────────────────────────────────────────────┘
         M1030                                                           ┌─────────────────┐
        ──┤ ├──────────────────────────────────────────────────────────│RST      M1      │
                                                                         └─────────────────┘

                                                                              ┌─────────┐
                                                                              │FEND     │
                                                                              └─────────┘
I130  M1000                                                              ┌─────────────────┐
    ──┤ ├──────────────────────────────────────────────────────────────│INC      D100    │
                                                                         └─────────────────┘
                                                                              ┌─────────┐
                                                                              │IRET     │
                                                                              └─────────┘
I140  M1000                                                              ┌─────────────────┐
    ──┤ ├──────────────────────────────────────────────────────────────│INC      D102    │
                                                                         └─────────────────┘
                                                                              ┌─────────┐
                                                                              │IRET     │
                                                                              └─────────┘
I110  M1000                                                              ┌─────────────────┐
    ──┤ ├──────────────────────────────────────────────────────────────│INC      D104    │
                                                                         └─────────────────┘
                                                                              ┌─────────┐
                                                                              │IRET     │
                                                                              └─────────┘
I120  M1000                                                              ┌─────────────────┐
    ──┤ ├──────────────────────────────────────────────────────────────│INC      D106    │
                                                                         └─────────────────┘
                                                                              ┌─────────┐
                                                                              │IRET     │
                                                                              └─────────┘
                                                                              ┌─────────┐
                                                                              │END      │
                                                                              └─────────┘
```
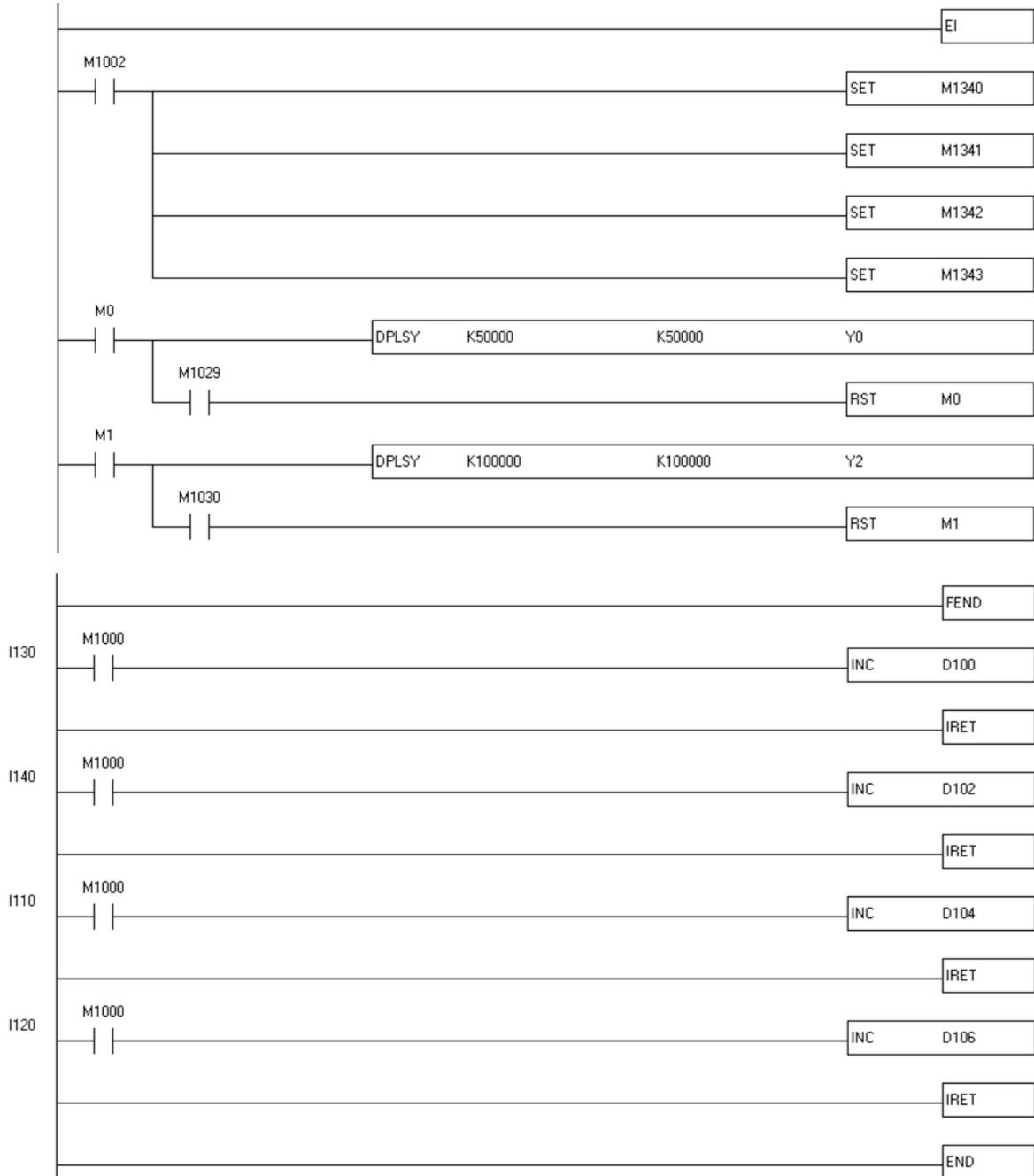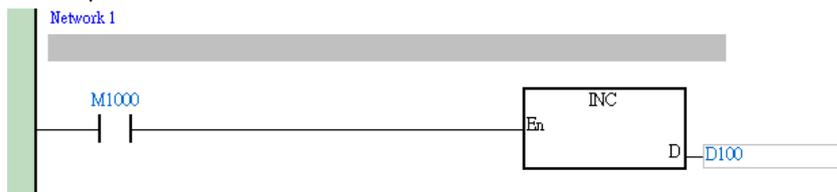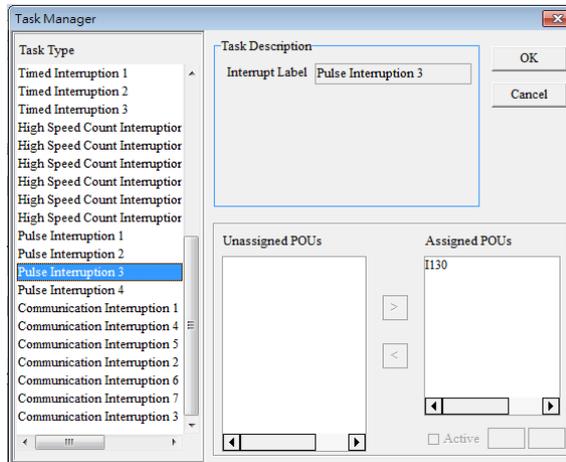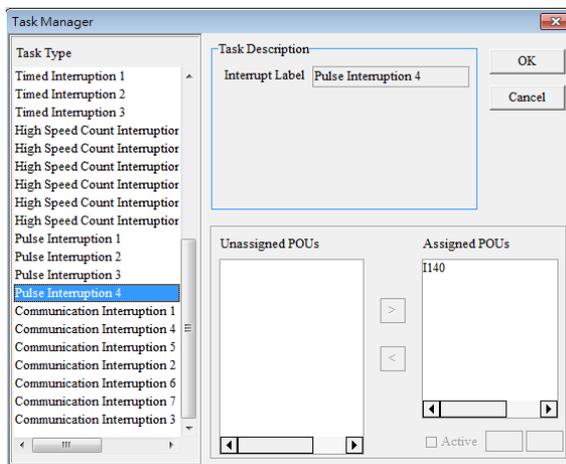
【Program in ISPSoft】
Cyclic POU:
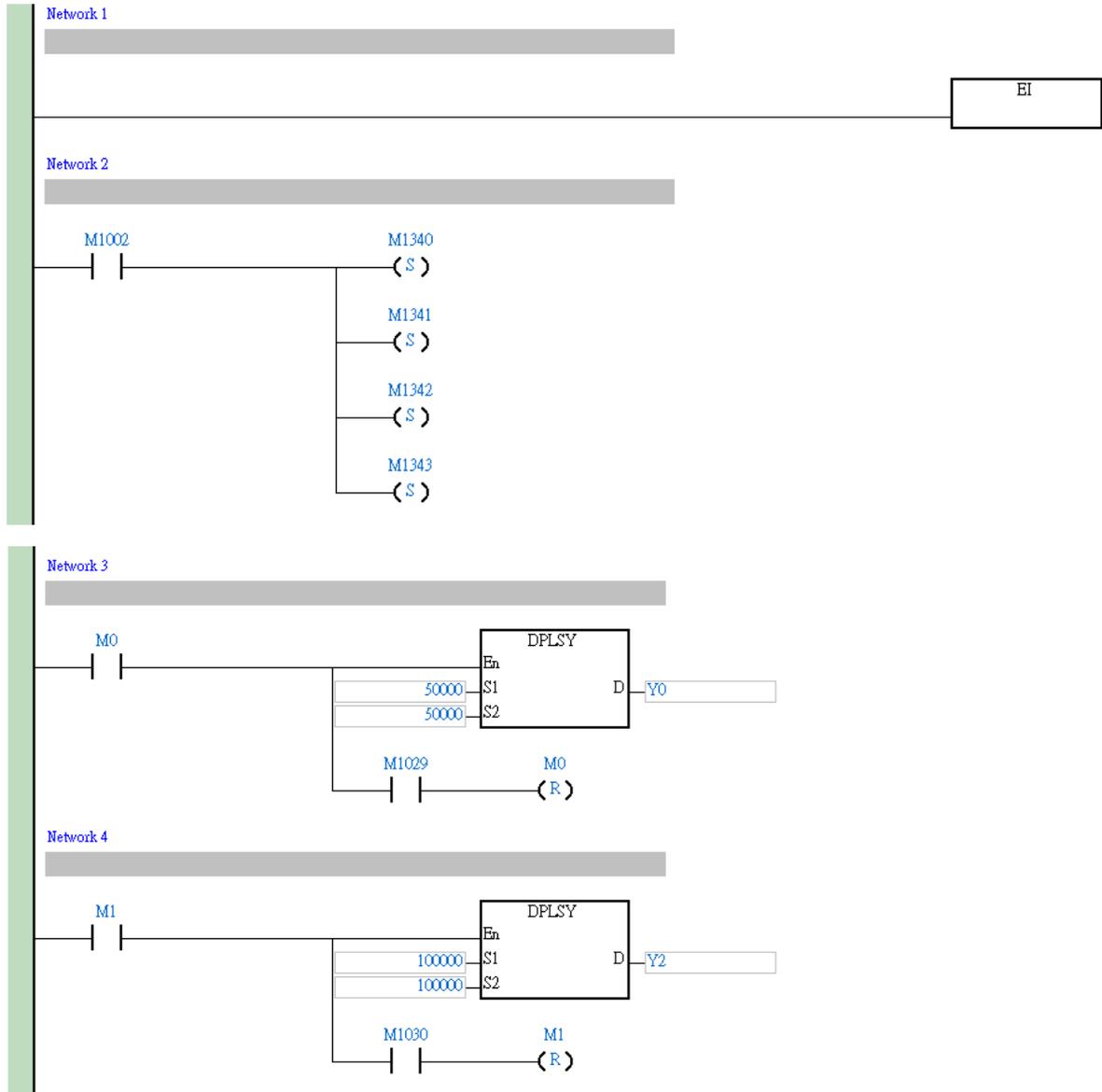
Pulse interrupt service routine: I130

Pulse interrupt service routine: I140

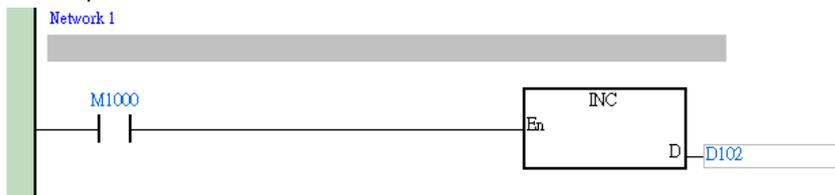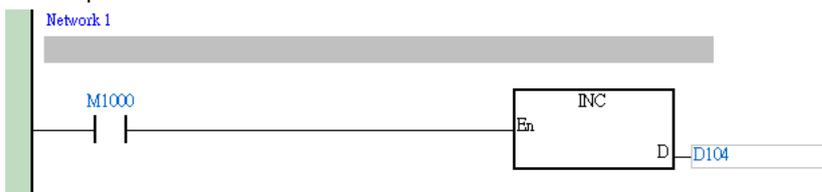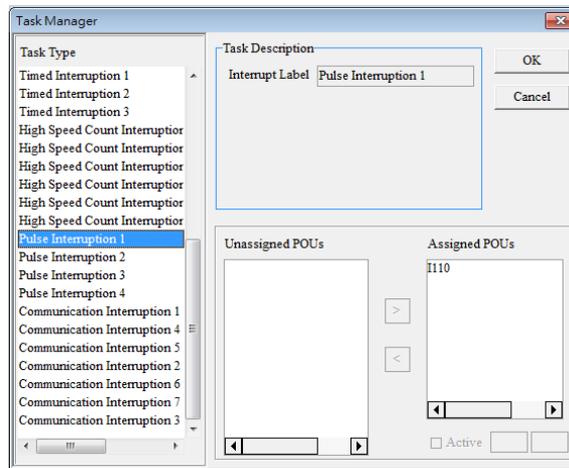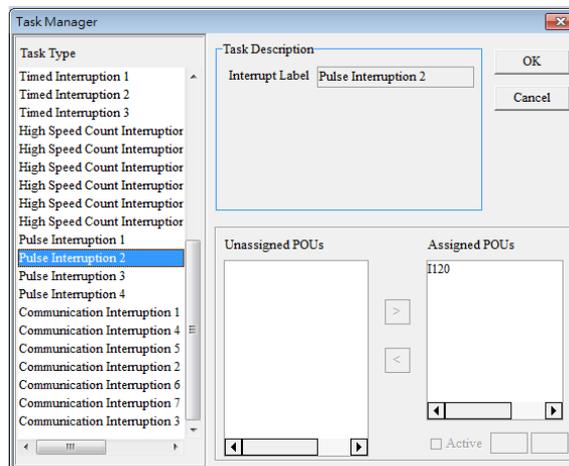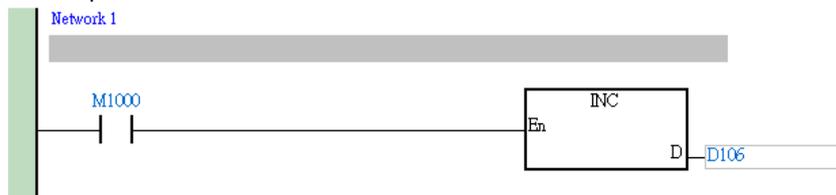

Pulse interrupt service routine: I110

Pulse interrupt service routine: I120

【Control description】

● After M0 is set to On, the instruction DPLSY will be executed. As CH0 sends the first pulse, the interrupt request I130 is sent. The value in D100 indicates the number of times the interrupt service routine I130 is executed. After CH0 finishes sending pulses, the interrupt request I110 will be sent. The value in D104 indicates the number of times the interrupt service routine I110 is executed. After CH0 finishes sending pulses, M1029 will be On, and M0 will be Off.

● After M1 is set to On, the instruction DPLSY will be executed. As CH1 sends the first pulse, the interrupt request I140 is sent. The value in D102 indicates the number of times the interrupt service routine I140 is executed. After CH1 finishes sending pulses, the interrupt request I120 will be sent. The value in D106 indicates the number of times the interrupt service routine I120 is executed. After CH1 finishes sending pulses, M1030 will be On, and M1 will be Off.