

# MELSEC-L CPU Module (Built-in I/O Function High-speed Counter)

## Sample Ladder Reference Manual

Applicable modules:

L02CPU,L26CPU-BT,L02CPU-P,L26CPU-PBT

### <Contents>

Reference Manual Revision History .....	2
1. Overview .....	3
2. Normal mode common .....	9
3. Preset function.....	11
4. Coincidence output function .....	12
5. Latch counter 1 .....	14
6. Latch counter 2.....	16
7. Count disable function .....	17
8. Sampling counter function .....	19
9. Latch counter and preset function .....	21
10. Overflow detection processing.....	22
11. Frequency measurement mode .....	23
12. Rotation speed measurement mode.....	24
13. Pulse measurement mode.....	25
14. PWM output mode.....	27
15. Error and warning reset .....	28
16. Coincidence detection interrupt function.....	30

## Reference Manual Revision History

Reference Manual Number	Date	Description
LDM-M004-A	2011/09/26	First edition

# 1. Overview

## Overview of the Sample Ladder Programs

The sample ladder programs support a system that uses the built-in I/O function (high-speed counter function) of MELSEC-L CPU module (LCPU).

## Applicable Hardware and Software

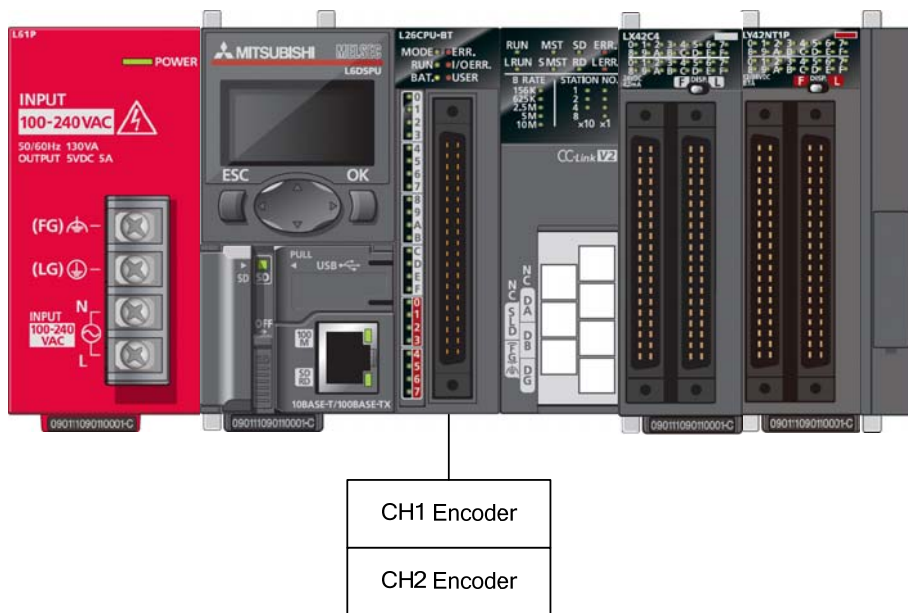
The following are the hardware and software applicable to the sample ladder programs.

Model	Description
CPU module	Series
	MELSEC-L series
	Model
	LCPU
Input Module	MELSEC-L series input module
Output Module	MELSEC-L series output module
Compatible software	GX Works2, GX Developer *1
	*1 For software versions applicable to the module used, refer to "Relevant manuals".

## System Configuration

The following system configuration is used for the sample ladder programs.

Power supply module	CPU module L26CPU-BT	Input module LX42C4	Output module LY42NT1P
		X/Y30	X/Y70
		~	~
		X/Y6F	X/YAF



## Sample Ladder Program Functions

The programs have the following functions.

No.	Project name	Program name	Item	Description	Version
1	LD-LCPU_CN T_V100A_E	01CmnPgm	Normal mode common	Performs common processing in the normal mode.	1.00A
2		02PreSet	Preset function	Turns ON/OFF the preset command	1.00A
3		03MchOut	Coincidence output function	Turns ON/OFF the coincidence output reset command for channel 1.	1.00A
4		04Lcnt1	Latch counter 1	Gets the latch count value of the latch counter 1.	1.00A
5		05Lcnt2	Latch counter 2	Gets the latch count value of the latch counter 2.	1.00A
6		06DisCnt	Count disable function	Turns ON/OFF the selected counter function start signal for channel 1.	1.00A
7		07SplCnt	Sampling counter function	Gets the sampling count data of channel 1.	1.00A
8		08LcPre	Latch counter and preset function	Gets the latch count value 1 of channel 1.	1.00A
9		09ChkOvr	Overflow detection processing	Detects the overflow and underflow of channel 1.	1.00A
10		10ChkFrq	Frequency measurement mode	Gets the measured frequency value of channel 1.	1.00A
11		11ChkRsp	Rotation speed measurement mode	Gets the measured rotation speed value of channel 1.	1.00A
12		12ChkPls	Pulse measurement mode	Gets the measured pulse value of channel 1.	1.00A
13		13OutPwm	PWM output mode	Outputs the PWM pulses from channel 1.	1.00A
14		14RstErr	Error and warning reset	Resets the error and warning of channel 1.	1.00A
15		15Match	Coincidence detection interrupt function	Executes the coincidence detection interrupt function.	1.00A

## Conditions for Using Sample Ladder Programs

### ● Built-in I/O function settings

The following explains the settings of the L26CPU-BT's built-in I/O function used in this program.

#### 1. High-Speed Counter CH1/CH2 Detailed Settings

a) Select the "Use high-speed counter function (CH1)" checkbox.

b) Set parameters for the high-speed counter.

\*Set the "High-speed Counter Function CH2 Setting" in the same way.

\*Make sure to start the Common Program in Normal Mode before starting the programs for each function in the normal mode.

\*The following table shows the programs that can be used in each operation mode.

The screenshot shows the 'L-Parameter Setting' window with the 'Built-in I/O Function Setting' tab selected. A red arrow points from the 'High-speed Counter CH1 Setting' button in the 'High-speed Counter' section to the 'High-speed Counter CH1 Detailed Setting' dialog box. In the dialog box, a red circle highlights the 'Use high-speed counter function (CH1)' checkbox, which is checked. Another red circle highlights the 'Operation Mode Setting' dropdown menu, which is set to 'Normal Mode'. The dialog box also contains various other settings for the high-speed counter, such as 'Count Source Selection', 'Pulse Input Mode', 'Counting Speed Setting', and 'Counter Format'.

Output Signal	Output Signal Function Selection	Error Time Output Mode
n0	Counter CH1 Coincidence Output No.1	Clear
n1	Counter CH2 Coincidence Output No.1	Clear
n2	Counter CH1 Coincidence Output No.2	Clear
n3	Counter CH2 Coincidence Output No.2	Clear
n4	General Output	Clear
n5	General Output	Clear
n6	General Output	Clear
n7	General Output	Clear

Make settings for the programs according to each operation mode as shown in the table below.

Please note the following points when making settings for the programs.

(1) Set used programs as a scan program in the program setting.

Set unused programs as a standby program in the program setting or delete them.

Table 1-1 Programs That Can Be Used in Each Operation Mode

Program name	Normal mode						Frequency measurement function mode	Rotation speed measurement function mode	Pulse measurement function mode	PWM output function mode
	Count disable function		Latch counter function	Sampling counter function	Count disable/preset function	Latch counter/preset function				
	Ring counter	Linear counter								
01CmnPgm	Yes	Yes*1	Yes*1	Yes*1	Yes*1	Yes*1	No	No	No	No
02PreSet	Yes	No	Yes	Yes	Yes	Yes	No	No	No	No
03MchOut	Yes	No	No	No	No	No	No	No	No	No
04Lcnt1	No	No	Yes	No	No	Yes	No	No	No	No
05Lcnt2	No	No	Yes	No	No	Yes	No	No	No	No
06DisCnt	Yes	No	No	No	Yes	No	No	No	No	No
07SplCnt	No	No	No	Yes	No	No	No	No	No	No
08LcPre	No	No	No	No	No	Yes	No	No	No	No
09ChkOvr	No	Yes	No	No	No	No	No	No	No	No
10ChkFrq	No	No	No	No	No	No	Yes	No	No	No
11ChkRsp	No	No	No	No	No	No	No	Yes	No	No
12ChkPls	No	No	No	No	No	No	No	No	Yes	No
13OutPwm	No	No	No	No	No	No	No	No	No	Yes
14RstErr	Yes	No	No	No	No	No	No	No	No	No
15Match	Yes	No	No	No	No	No	No	No	No	No

Yes: Used program

No: Unused program

\*1: To use a linear counter, change the program so that the ring counter upper/lower limit value write instruction (ICRNGWR1) is not executed.

## 2. Input/Output Signal Settings

a) Select the high-speed counter functions from the "Input signal function selection" and "Output signal function selection".

a-1 Set the "Input Signal".

a-2 Set the "Output Signal".

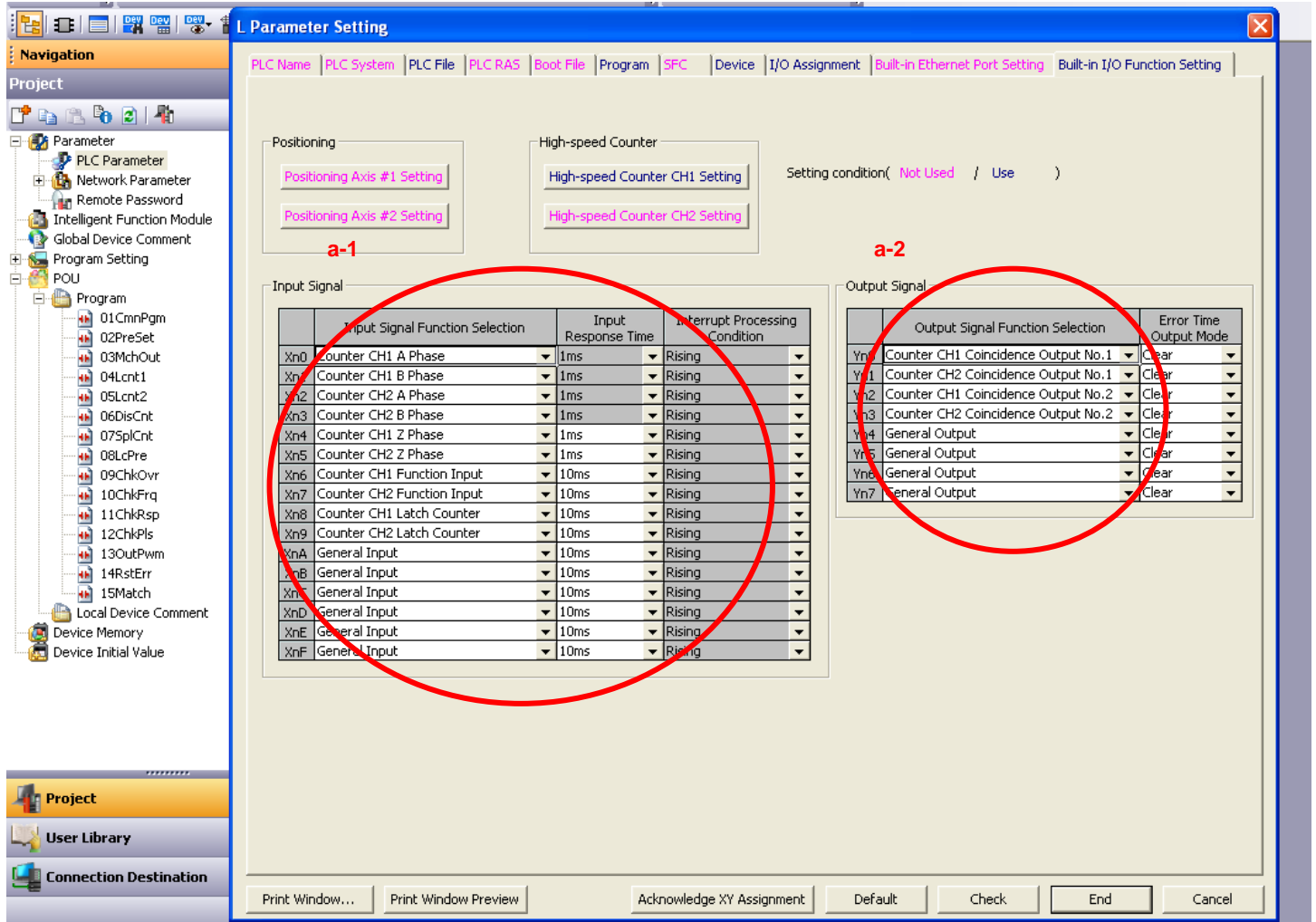


Table 1-2 I/O signal allocation for high-speed counter function

External input signal	
X0 (High-speed)	Counter CH1 A Phase*1
X1 (High-speed)	Counter CH1 B Phase*1
X2 (High-speed)	Counter CH2 A Phase*1
X3 (High-speed)	Counter CH2 B Phase*1
X4 (High-speed)	Counter CH1 Z Phase*2
X5 (High-speed)	Counter CH2 Z Phase*2
X6 (Standard)	Counter CH1 Function Input*2
X7 (Standard)	Counter CH2 Function Input*2

External output signal	
Y0	CH1 Coincidence Output No.1*1
Y1	CH2 Coincidence Output No.1*1
Y2	CH1 Coincidence Output No.2*2
Y3	CH2 Coincidence Output No.2*2
Y4	×*3
Y5	×*3
Y6	×*3
Y7	×*3

External input signal	
X8 (Standard)	Counter CH1 Latch Counter*2
X9 (Standard)	Counter CH2 Latch Counter*2
XA (Standard)	×*3
XB (Standard)	×*3
XC (Standard)	×*3
XD (Standard)	×*3
XE (Standard)	×*3
XF (Standard)	×*3

\*1 When using the high-speed counter function, this signal cannot be used as an interrupt input. Other functions such as the general-purpose input can be used.

\*2 When this signal is not required, the input signal can be used for other functions such as the general-purpose input.

\*3 When the corresponding function (the high-speed counter function or positioning function) is selected at function selection, this signal is not used for the function. The input signal can be used for other function such as the general-purpose input.

×: No combination

#### External output signal

\*1 This signal must be used depending on parameter settings. When this signal is not used, the output signal can be used for the general-purpose output function.

\*2 When this signal is not used, the output signal can be used for the general-purpose output function.

\*3 When the corresponding function (the high-speed counter function or positioning function) is selected at function selection, this signal is not used for the function. The output signal can be used for the general-purpose output function.

#### Relevant Manuals

MELSEC-L CPU Module User's Manual (Function Explanation, Program Fundamentals)

MELSEC-L CPU Module User's Manual (Built-in I/O Function)

MELSEC-L CPU Module User's Manual (Hardware Design, Maintenance and Inspection)

GX Works2 Version 1 Operating Manual (Common)

GX Developer Version 8 Operating Manual

#### Note

This manual describes the functions of the sample ladder programs.

It does not include information on restrictions of use such as combination with modules or programmable controller CPUs.

Before using any Mitsubishi products, please read all the relevant manuals.

For information on the detailed specifications and operation timings of the sample ladder programs, refer to the MELSEC-L CPU Module User's Manual (Built-in I/O Function). The descriptions of the sample ladder programs in this manual may be different from the ones found in the MELSEC-L CPU Module User's Manual (Built-in I/O Function) depending on the date created.



## 2. Normal mode common

### Function overview

This program performs common processing in the normal mode.

### Program

This function uses the project (program name).

- LD-LCPU\_CNT\_V100A\_E(01CmnPgm)

### Devices

This program uses the following device.

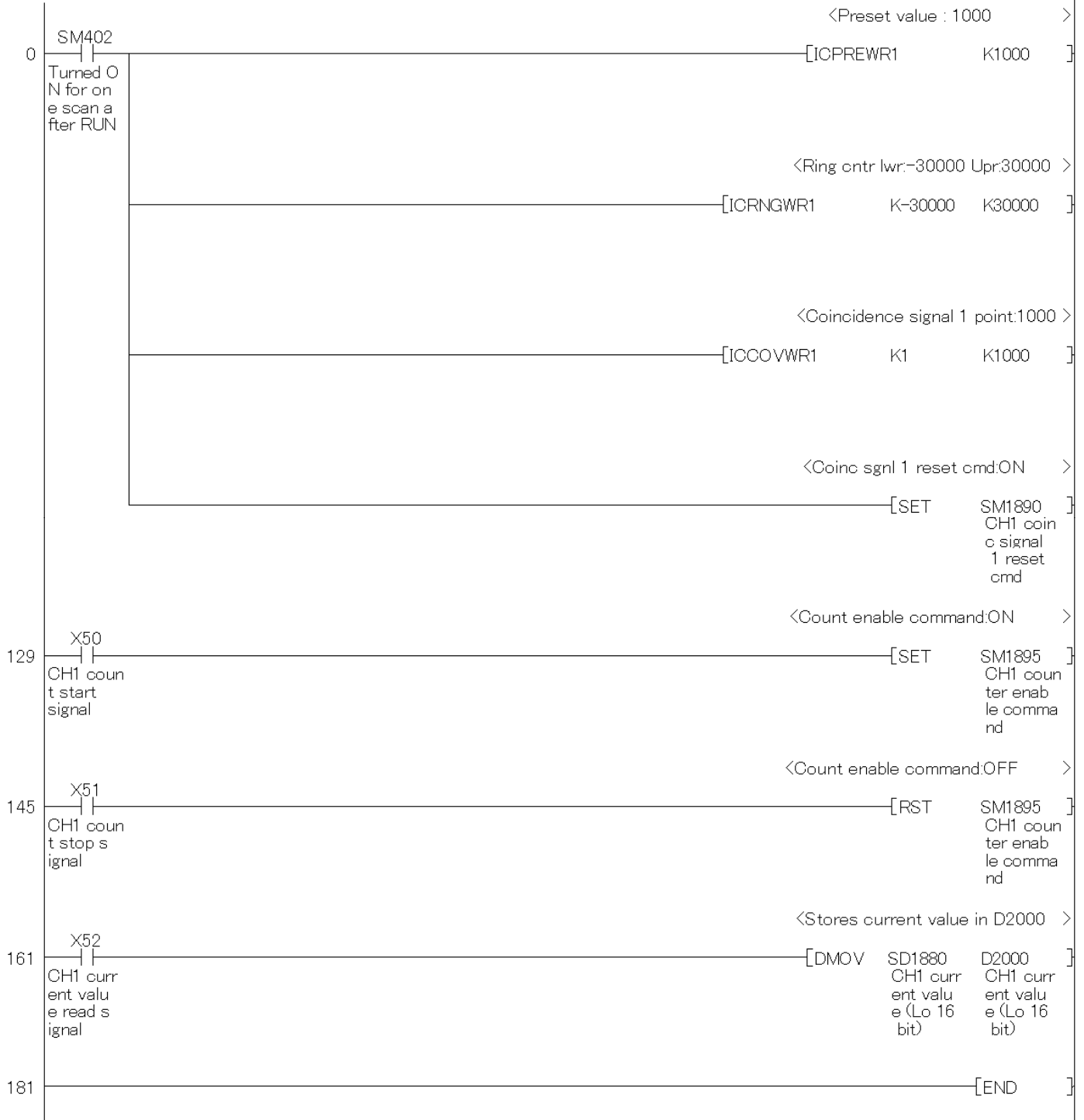
No.	Device	Data Type	Application	Remarks
1	SM402	Bit	Normal mode common program start trigger	Turns ON for one scan after RUN.
2	SM1890	Bit	CH1 coincidence signal No.1 reset command	—
3	SM1895	Bit	CH1 counter enable command	—
4	SD1880	Word (Binary)	CH1 current value (Lo 16 bit)	—
5	SD1881	Word (Binary)	CH1 current value (Hi 16 bit)	
6	X50	Bit	CH1 count start signal	Retains the count start signal for channel 1.
7	X51	Bit	CH1 count stop signal	Retains the count stop signal for channel 1.
8	X52	Bit	CH1 current value read signal	Retains the current value read signal for channel 1.
9	D2000	Word (Binary)	CH1 current value (Lo 16 bit)	Stores the current value of channel 1.
10	D2001	Word (Binary)	CH1 current value (Hi 16 bit)	

### Version Upgrade History

Version	Date	Description
1.00A	2011/09/26	First edition

# Program

\* Sample ladder name : 01CmnPgm  
 \* Function : Normal mode common  
 \* Version : Ver.1.00A  
 \*



### 3. Preset function

#### Function overview

This program turns ON/OFF the preset command.

#### Program

This function uses the project (program name).

- LD-LCPU\_CNT\_V100A\_E(02PreSet)

#### Devices

This program uses the following device.

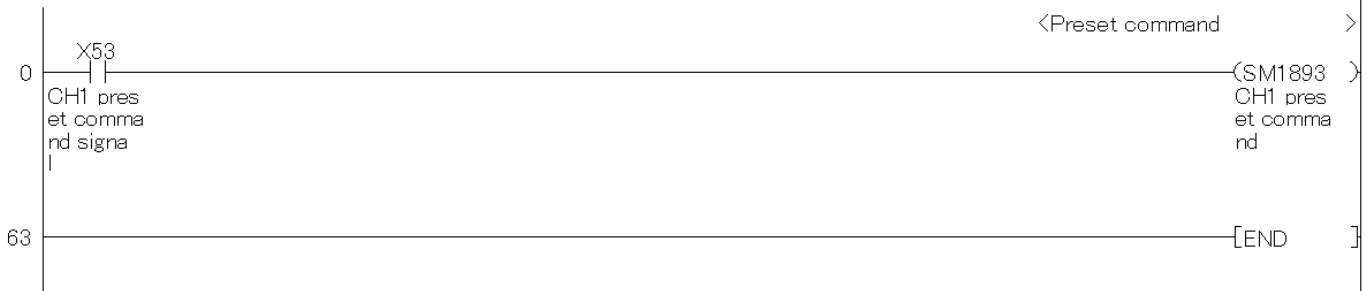
No.	Device	Data Type	Application	Remarks
1	SM1893	Bit	CH1 preset command	—
2	X53	Bit	CH1 preset command signal	Retains the preset command signal for channel 1.

#### Version Upgrade History

Version	Date	Description
1.00A	2011/09/26	First edition

#### Program

- \* Sample ladder name : 02PreSet
- \* Function : Preset function
- \* Version : Ver.1.00A
- \*



## 4. Coincidence output function

### Function overview

This program turns ON/OFF the coincidence output reset command for channel 1.

### Program

This function uses the project (program name).

- LD-LCPU\_CNT\_V100A\_E(03MchOut)

### Devices

This program uses the following device.

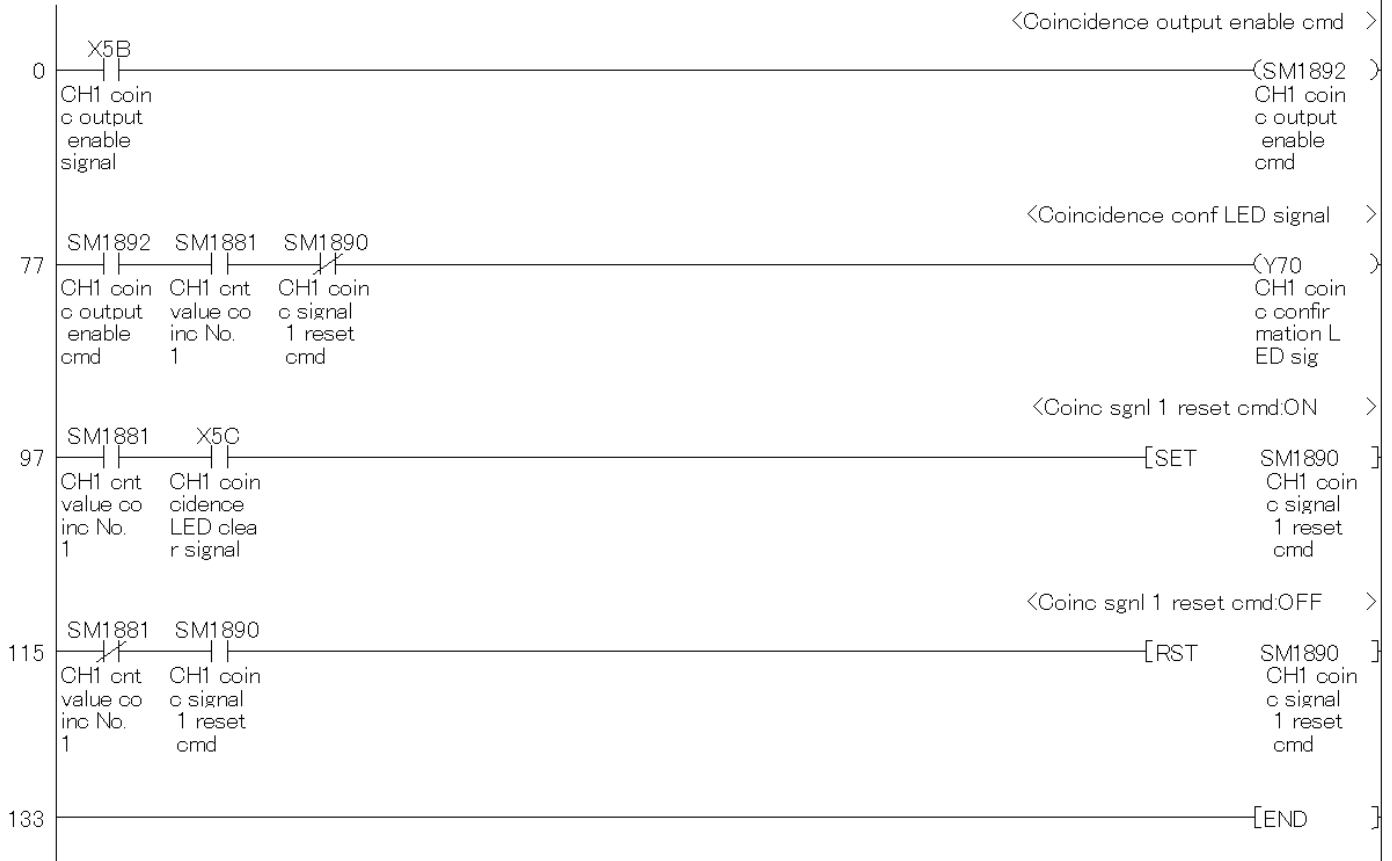
No.	Device	Data Type	Application	Remarks
1	SM1881	Bit	CH1 counter value coincidence No. 1	Retains the counter value coincidence No. 1 for channel 1.
2	SM1890	Bit	CH1 coincidence signal No.1 reset command	—
3	SM1892	Bit	CH1 coincidence output enable command	—
4	X5B	Bit	CH1 coincidence output enable signal	Retains the coincidence output enable signal for channel 1.
5	X5C	Bit	CH1 coincidence LED clear signal	Retains the coincidence LED clear signal for channel 1.
6	Y70	Bit	CH1 coincidence confirmation LED signal	Outputs the coincidence confirmation LED signal for channel 1.

### Version Upgrade History

Version	Date	Description
1.00A	2011/09/26	First edition

## Program

\* Sample ladder name : 03MchOut  
 \* Function : Coincidence output function  
 \* Version : Ver.1.00A  
 \*



## 5. Latch counter 1

### Function overview

This program gets the latch count value of the latch counter 1.

### Program

This function uses the project (program name).

- LD-LCPU\_CNT\_V100A\_E(04Lcnt1)

### Devices

This program uses the following device.

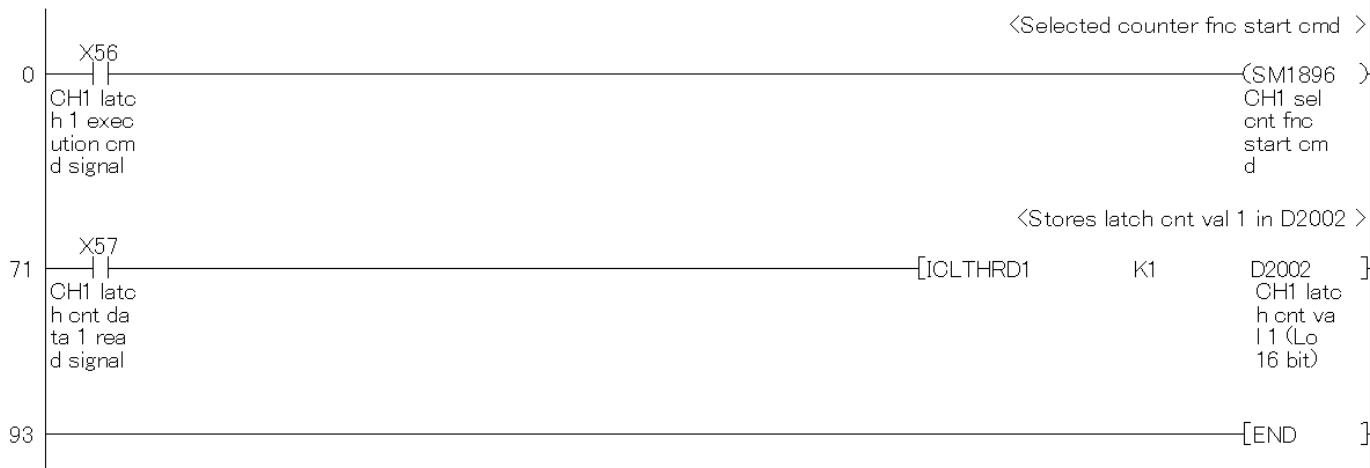
No.	Device	Data Type	Application	Remarks
1	SM1896	Bit	CH1 selected counter function start command	—
2	X56	Bit	CH1 latch 1 execution command signal	Retains the latch 1 execution command signal for channel 1.
3	X57	Bit	CH1 latch count data 1 read signal	Retains the latch count data 1 read signal for channel 1.
4	D2002	Word (Binary)	CH1 latch count value 1 (Lo 16 bit)	Stores the latch count value 1 of channel 1.
5	D2003	Word (Binary)	CH1 latch count value 1 (Hi 16 bit)	

### Version Upgrade History

Version	Date	Description
1.00A	2011/09/26	First edition

# Program

\* Sample ladder name : 04Lont1  
 \* Function : Latch counter 1  
 \* Version : Ver.1.00A  
 \*



## 6. Latch counter 2

### Function overview

This program sets the latch count value of the latch counter 2.

### Program

This function uses the project (program name).

- LD-LCPU\_CNT\_V100A\_E(05Lcnt2)

### Devices

This program uses the following device.

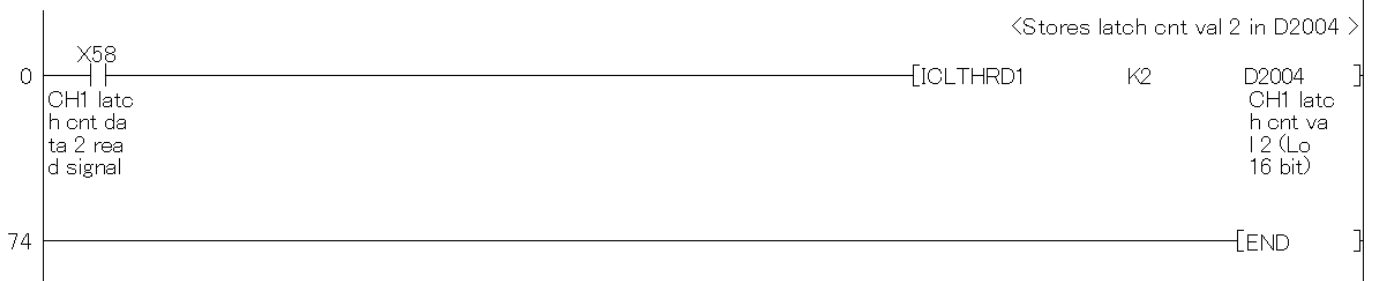
No.	Device	Data Type	Application	Remarks
1	X58	Bit	CH1 latch count data 2 read signal	Retains the latch count data 2 read signal for channel 1.
2	D2004	Word (Binary)	CH1 latch count value 2 (Lo 16 bit)	Stores the latch count value 2 of channel 1.
3	D2005	Word (Binary)	CH1 latch count value 2 (Hi 16 bit)	

### Version Upgrade History

Version	Date	Description
1.00A	2011/09/26	First edition

### Program

- \* Sample ladder name : 05Lcnt2
- \* Function : Latch counter 2
- \* Version : Ver.1.00A
- \*





## 7. Count disable function

### Function overview

This program turns ON/OFF the selected counter function start signal for channel 1.

### Program

This function uses the project (program name).

- LD-LCPU\_CNT\_V100A\_E(06DisCnt)

### Devices

This program uses the following device.

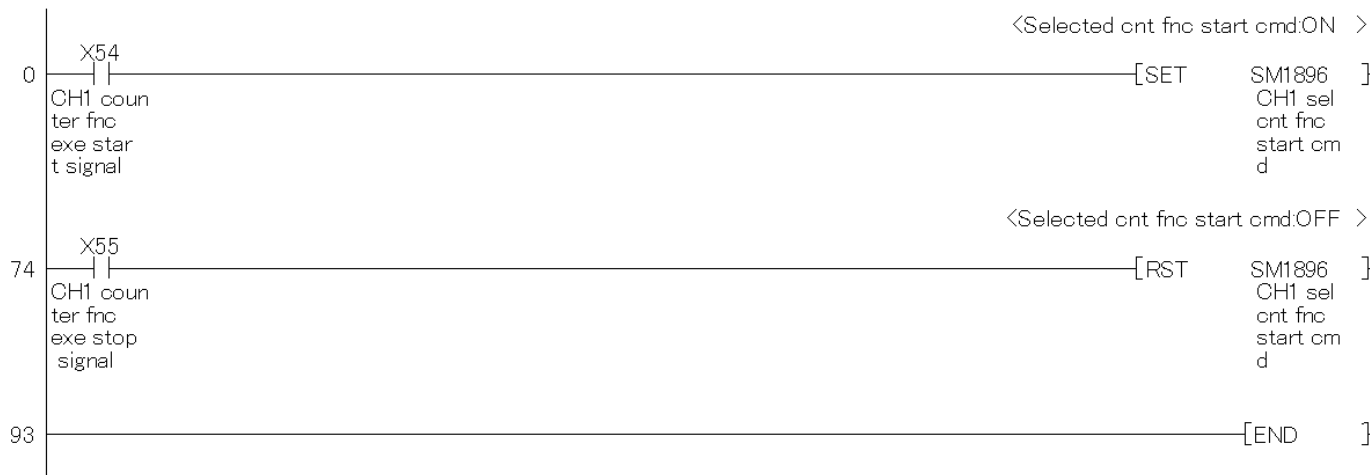
No.	Device	Data Type	Application	Remarks
1	SM1896	Bit	CH1 selected counter function start command	—
2	X54	Bit	CH1 counter function execution start signal	Retains the counter function execution start signal for channel 1.
3	X55	Bit	CH1 counter function execution stop signal	Retains the counter function execution stop signal for channel 1.

### Version Upgrade History

Version	Date	Description
1.00A	2011/09/26	First edition

## Program

\* Sample ladder name : 06DisCnt  
\* Function : Count disable function  
\* Version : Ver.1.00A  
\*



## 8. Sampling counter function

### Function overview

This program gets the sampling count data of channel 1.

### Program

This function uses the project (program name).

- LD-LCPU\_CNT\_V100A\_E(07SplCnt)

### Devices

This program uses the following device.

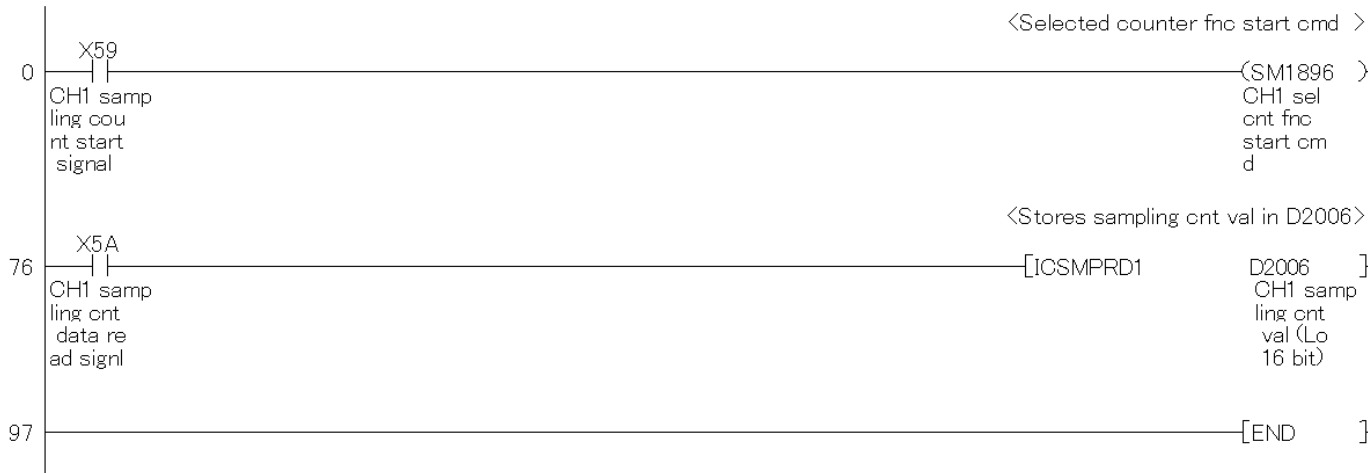
No.	Device	Data Type	Application	Remarks
1	SM1896	Bit	CH1 selected counter function start command	—
2	X59	Bit	CH1 sampling count start signal	Retains the sampling count start signal for channel 1.
3	X5A	Bit	CH1 sampling count data read signal	Retains the sampling count data read signal for channel 1.
4	D2006	Word (Binary)	CH1 sampling count value (Lo 16 bit)	Stores the sampling count value of channel 1.
5	D2007	Word (Binary)	CH1 sampling count value (Hi 16 bit)	

### Version Upgrade History

Version	Date	Description
1.00A	2011/09/26	First edition

# Program

\* Sample ladder name : 07SplCnt  
 \* Function : Sampling counter function  
 \* Version : Ver.1.00A  
 \*



## 9. Latch counter and preset function

### Function overview

This program gets the latch count value 1 of channel 1.

### Program

This function uses the project (program name).

- LD-LCPU\_CNT\_V100A\_E(08LcPre)

### Devices

This program uses the following device.

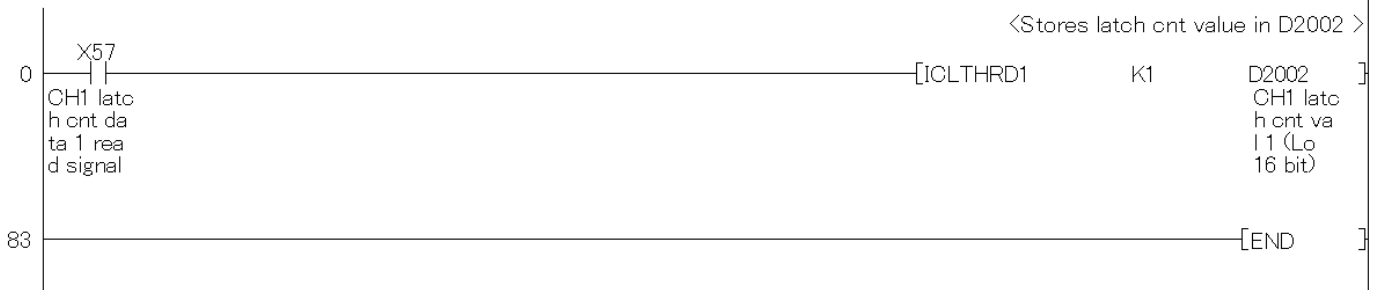
No.	Device	Data Type	Application	Remarks
1	X57	Bit	CH1 latch count data 1 read signal	Retains the latch count data 1 read signal for channel 1.
2	D2002	Word (Binary)	CH1 latch count value 1 (Lo 16 bit)	Stores the latch count value 1 of channel 1.
3	D2003	Word (Binary)	CH1 latch count value 1 (Hi 16 bit)	

### Version Upgrade History

Version	Date	Description
1.00A	2011/09/26	First edition

### Program

- \* Sample ladder name : 08LcPre
- \* Function : Latch counter and preset function
- \* Version : Ver.1.00A
- \*



## 10. Overflow detection processing

### Function overview

This program detects the overflow and underflow of channel 1.

### Program

This function uses the project (program name).

- LD-LCPU\_CNT\_V100A\_E(09ChkOvr)

### Devices

This program uses the following device.

No.	Device	Data Type	Application	Remarks
1	SD1882	Word (Binary)	CH1 status monitor	b1: Underflow detection flag of channel 1. b2: Overflow detection flag of channel 1.
2	Y71	Bit	CH1 overflow occurrence confirmation LED signal	Stores the overflow occurrence confirmation LED signal for channel 1.

### Version Upgrade History

Version	Date	Description
1.00A	2011/09/26	First edition

### Program

- \* Sample ladder name : 09ChkOvr
- \* Function : Overflow detection process
- \* Version : Ver.1.00A
- \*



## 11. Frequency measurement mode

### Function overview

This program gets the measured frequency value of channel 1.

### Program

This function uses the project (program name).

- LD-LCPU\_CNT\_V100A\_E(10ChkFrq)

### Devices

This program uses the following device.

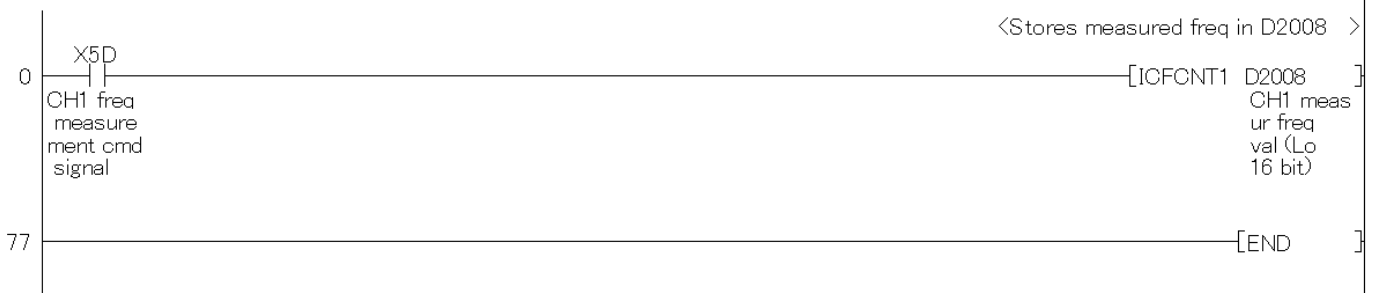
No.	Device	Data Type	Application	Remarks
1	X5D	Bit	CH1 frequency measurement command signal	Retains the frequency measurement command signal for channel 1.
2	D2008	Word (Binary)	CH1 measured frequency value (Lo 16 bit)	Stores the measured frequency value of channel 1.
3	D2009	Word (Binary)	CH1 measured frequency value (Hi 16 bit)	

### Version Upgrade History

Version	Date	Description
1.00A	2011/09/26	First edition

### Program

- \* Sample ladder name : 10ChkFrq
- \* Function : Frequency measurement mode
- \* Version : Ver.1.00A
- \*



## 12. Rotation speed measurement mode

### Function overview

This program sets the measured rotation speed value of channel 1.

### Program

This function uses the project (program name).

- LD-LCPU\_CNT\_V100A\_E(11ChkRsp)

### Devices

This program uses the following device.

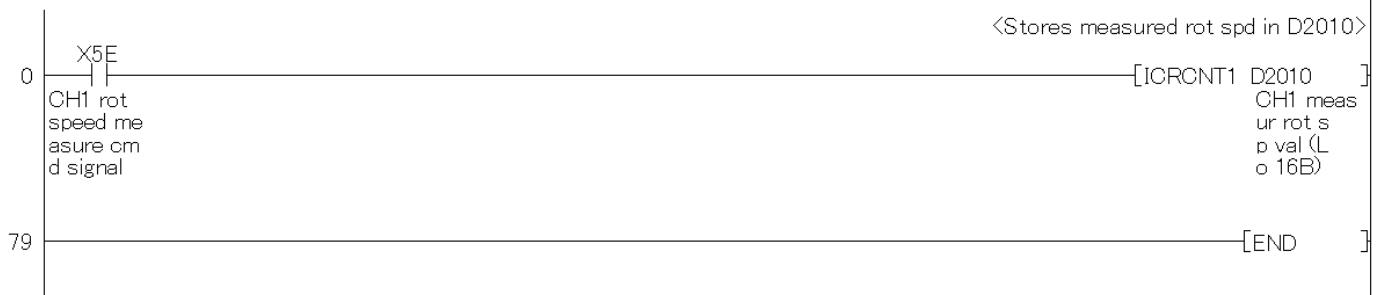
No.	Device	Data Type	Application	Remarks
1	X5E	Bit	CH1 rotation speed measurement command signal	Retains the rotation speed measurement command signal for channel 1.
2	D2010	Word (Binary)	CH1 measured rotation speed value (Lo 16 bit)	Stores the measured rotation speed value of channel 1.
3	D2011	Word (Binary)	CH1 measured rotation speed value (Hi 16 bit)	

### Version Upgrade History

Version	Date	Description
1.00A	2011/09/26	First edition

### Program

- \* Sample ladder name : 11ChkRsp
- \* Function : Rotation speed measure mode
- \* Version : Ver.1.00A
- \*





### 13. Pulse measurement mode

#### Function overview

This program gets the measured pulse value of channel 1.

#### Program

This function uses the project (program name).

- LD-LCPU\_CNT\_V100A\_E(12ChkPIs)

#### Devices

This program uses the following device.

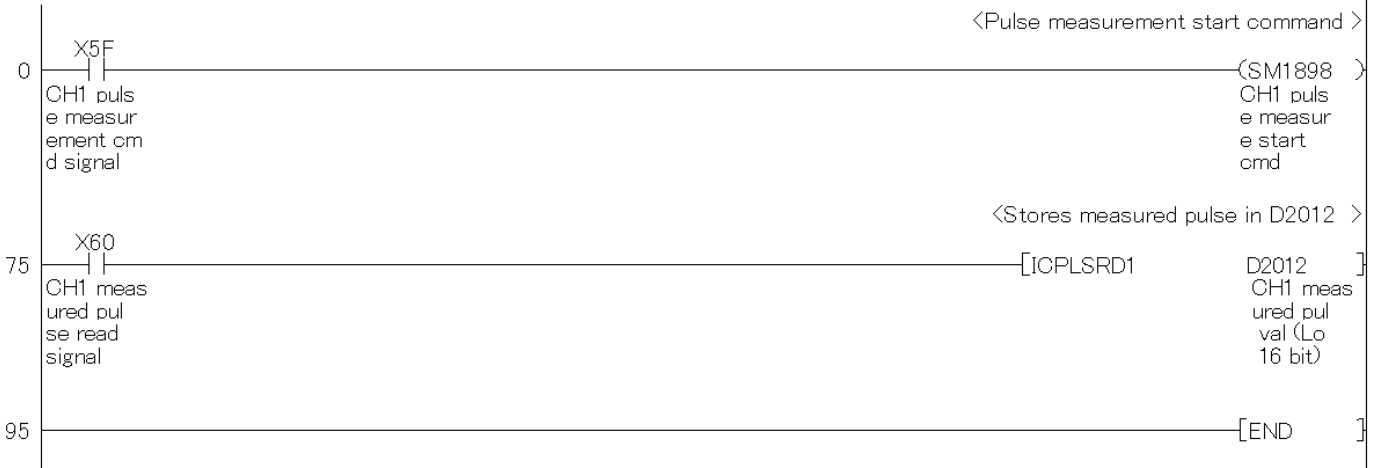
No.	Device	Data Type	Application	Remarks
1	SM1898	Bit	CH1 pulse measurement start command	—
2	X5F	Bit	CH1 pulse measurement command signal	Retains the pulse measurement command signal for channel 1.
3	X60	Bit	CH1 measured pulse value read signal	Retains the measured pulse value read signal for channel 1.
4	D2012	Word (Binary)	CH1 measured pulse value (Lo 16 bit)	Stores the measured pulse value of channel 1.
5	D2013	Word (Binary)	CH1 measured pulse value (Hi 16 bit)	

#### Version Upgrade History

Version	Date	Description
1.00A	2011/09/26	First edition

# Program

\* Sample ladder name : 12ChkPIs  
 \* Function : Pulse measurement mode  
 \* Version : Ver.1.00A  
 \*



## 14. PWM output mode

### Function overview

This program outputs the PWM pulses from channel 1.

### Program

This function uses the project (program name).

- LD-LCPU\_CNT\_V100A\_E(13OutPwm)

### Devices

This program uses the following device.

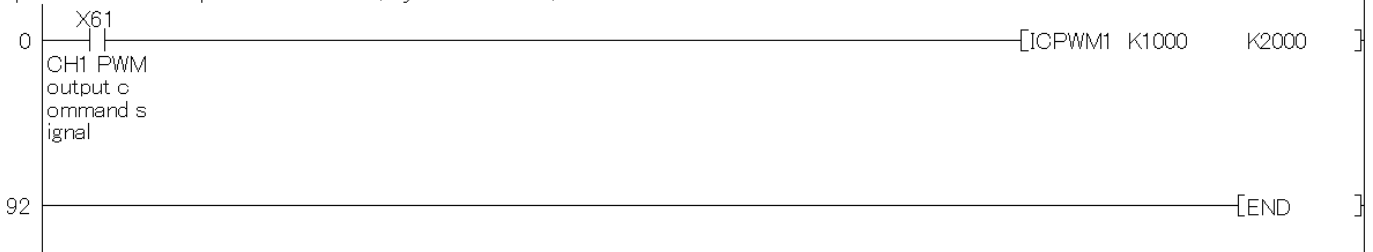
No.	Device	Data Type	Application	Remarks
1	X61	Bit	CH1 PWM output command signal	Retains the PWM output command signal for channel 1.

### Version Upgrade History

Version	Date	Description
1.00A	2011/09/26	First edition

### Program

- \* Sample ladder name : 13OutPwm
- \* Function : PWM output mode
- \* Version : Ver.1.00A
- \*
- \* Outputs with PWM output ON time:0.1ms, cycle time:0.2ms, 5kHz



## 15. Error and warning reset

### Function overview

This program resets the error and warning of channel 1.

### Program

This function uses the project (program name).

•LD-LCPU\_CNT\_V100A\_E(14RstErr)

### Devices

This program uses the following device.

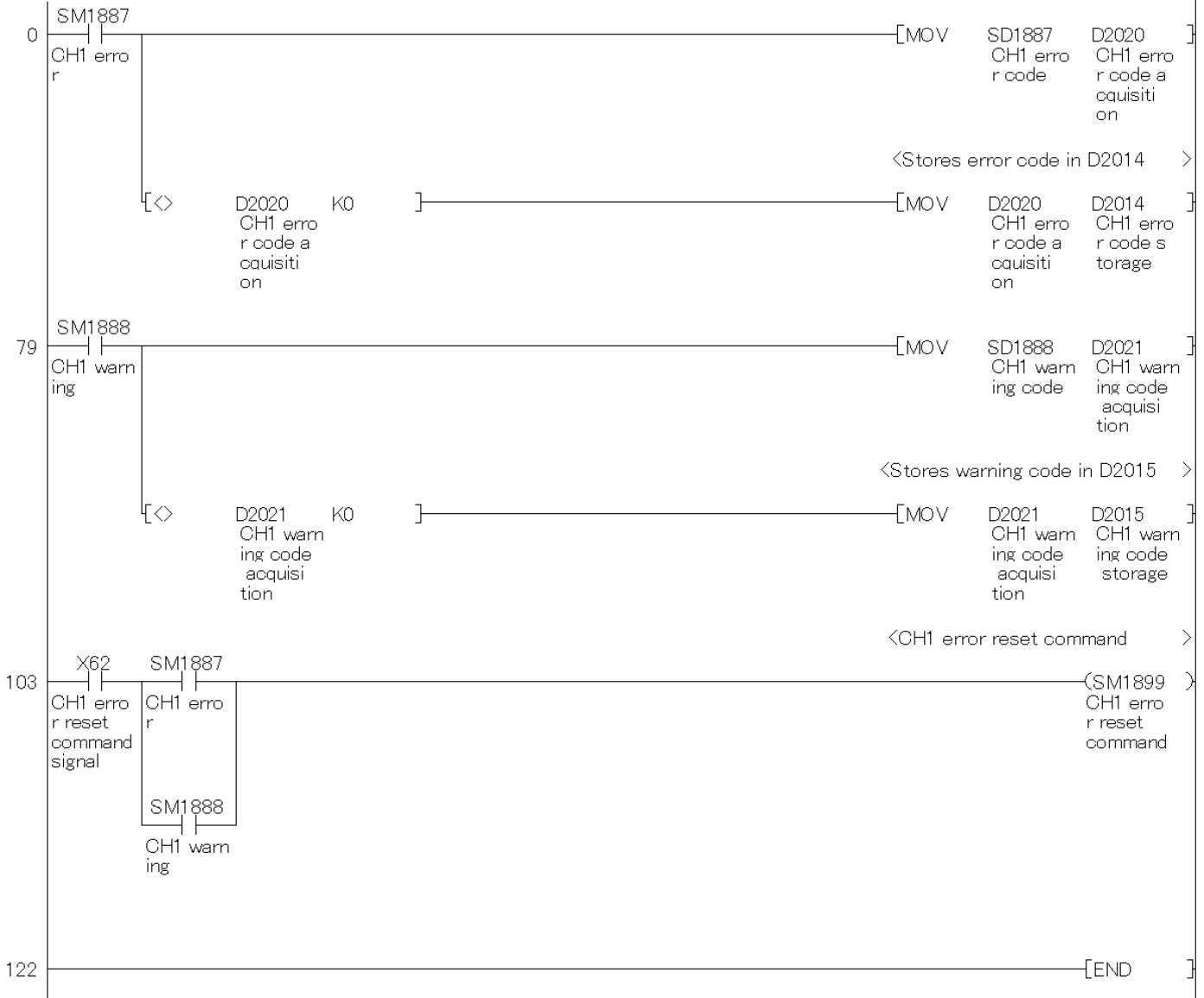
No.	Device	Data Type	Application	Remarks
1	SM1887	Bit	CH1 error	—
2	SM1888	Bit	CH1 warning	—
3	SM1899	Bit	CH1 error reset command	—
4	SD1887	Word (Binary)	CH1 error code	—
5	SD1888	Word (Binary)	CH1 warning code	—
4	X62	Bit	CH1 error reset command signal	Retains the error reset command signal for channel 1.
5	D2014	Word (Binary)	CH1 error code storage	Stores the error code of channel 1.
6	D2015	Word (Binary)	CH1 warning code storage	Stores the warning code of channel 1.
7	D2020	Word (Binary)	CH1 error code acquisition	Gets the error code of channel 1.
8	D2021	Word (Binary)	CH1 warning code acquisition	Gets the warning code of channel 1.

### Version Upgrade History

Version	Date	Description
1.00A	2011/09/26	First edition

# Program

\* Sample ladder name : 14RstErr  
 \* Function : Error and warning reset  
 \* Version : Ver.1.00A  
 \*



## 16. Coincidence detection interrupt function

### Function overview

This program executes the coincidence detection interrupt function.

### Program

This function uses the project (program name).

- LD-LCPU\_CNT\_V100A\_E(15Match)

### Devices

This program uses the following device.

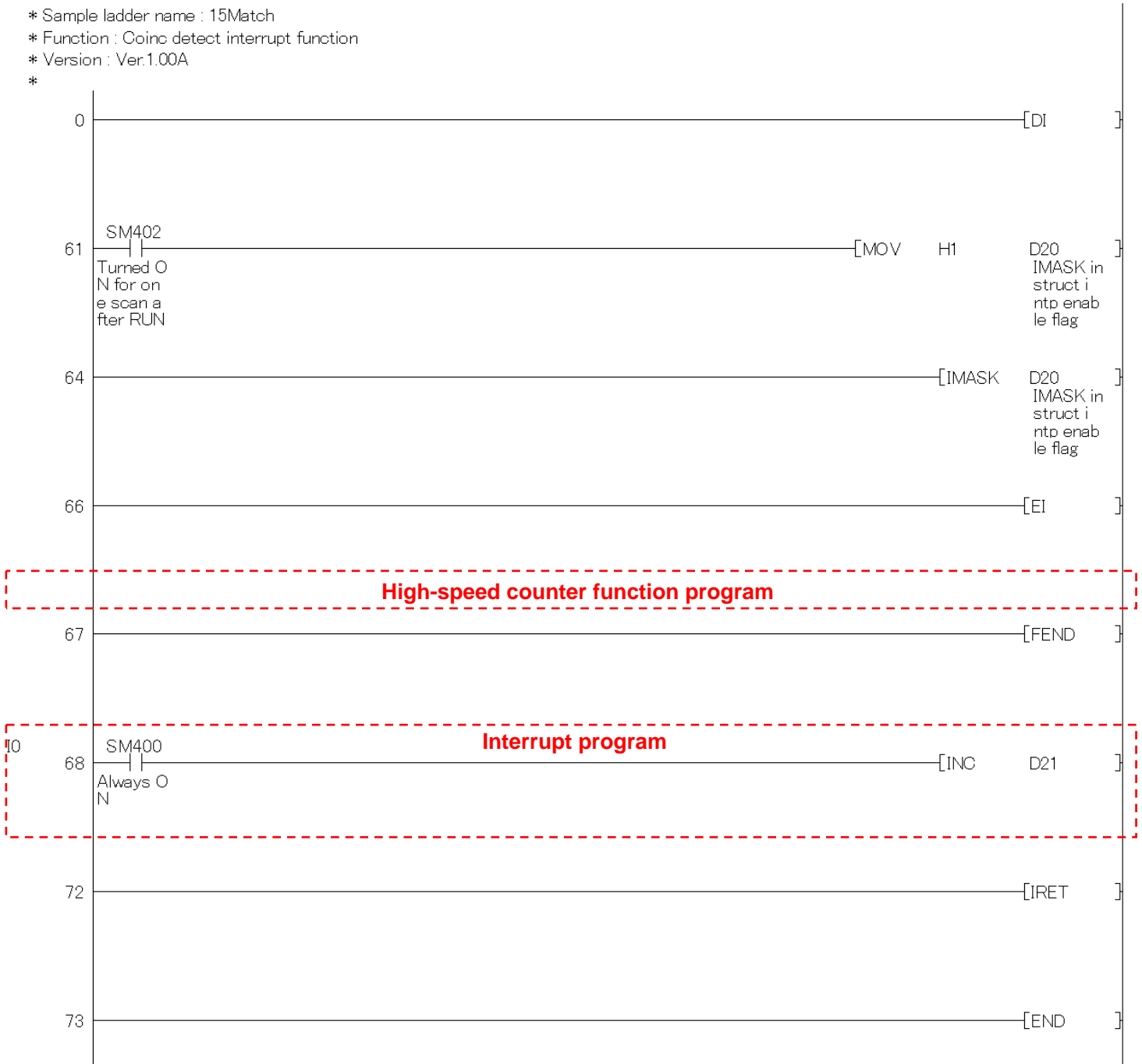
No.	Device	Data Type	Application	Remarks
1	SM402	Bit	Coincidence detection interrupt program trigger	Turns ON for one scan after RUN.
2	D20	Word (Binary)	IMASK instruction interruption enable flag storage device	Stores the IMASK instruction interruption enable flag.

### Version Upgrade History

Version	Date	Description
1.00A	2011/09/26	First edition

## Program

\* Sample ladder name : 15Match  
 \* Function : Coinc detect interrupt function  
 \* Version : Ver.1.00A  
 \*



\*D21 is always incremented during execution of the interrupt program.