# MELSEC-L Temperature Control Module Sample Ladder Reference Manual

Applicable Modules: L60TCTT4, L60TCTT4BW, L60TCRT4, L60TCRT4BW

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# Reference Manual Revision History

Reference Manual Number	Date	Description
LDM-M024-A	2012/01/16	First edition

# 1. Overview

# **Overview of the Sample Ladder Programs**

The sample ladder programs support a system that uses the MELSEC-L L60TC4 temperature control module.

# Sample Ladder Program Functions

The programs have the following functions.

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11	N VVNAN I ISINO	i the iviodule in Standar	a Svetem Contiduration	IVVNAN LISING INTAIIIC	ient Flinction Module Paral	netersi
1			a oystern oornigaration	Which Obing muche		notors,

No.	Project name	Program	Item	Description	Version
		name			
1	LD-L60TC4_PRM1	01RdTmp	Temperature input	Performs the temperature input	1.00A
	_V100A_E			using the configuration function.	
2	LD-L60TC4_PRM2	01Tuning	Tuning	Performs the auto tuning,	1.00A
	_V100A_E			self-tuning and error code read	
				operations using the configuration	
				function.	
3	LD-L60TC4_PRM3	01PekHet	Peak current	Performs the peak current	1.00A
	_V100A_E		suppression,	suppression and simultaneous	
			simultaneous	temperature rise using the	
			temperature rise	configuration function.	
4	LD-L60TC4_PRM4	01HetCol	Heating-cooling	Performs the heating-cooling	1.00A
	_V100A_E		control	control using the configuration	
				function.	

(2) When Using the Module in Standard System Configuration (When Not Using Intelligent Function Module Parameters)

No.	Project name	Program	Item	Description	Version
		name			
1	LD-L60TC4_NPM1	01RdTmp	Temperature input	Performs the temperature input	1.00A
	_V100A_E			without using the configuration	
				function.	
2	LD-L60TC4_NPM2	01Tuning	Tuning	Performs the auto tuning,	1.00A
	_V100A_E			self-tuning and error code read	
				operations without using the	
				configuration function.	
3	LD-L60TC4_NPM3	01Peak	Peak current	Performs the peak current	1.00A
	_V100A_E		suppression	suppression without using the	
				configuration function.	

No.	Project name	Program	Item	Description	Version
		name			
4	LD-L60TC4_NPM3	02Heat	Simultaneous	Performs the simultaneous	1.00A
	_V100A_E		temperature rise	temperature rise without using the	
				configuration function.	
5	LD-L60TC4_NPM4	01HetCol	Heating-cooling	Performs the heating-cooling	1.00A
	_V100A_E		control	control without using the	
				configuration function.	

### (3) When Connecting the Module to the Head Module

No.	Project name	Program	Item	Description	Version
		name			
1	LD-L60TC4_IEF_V	01RdTmp	Temperature input	Performs the temperature input	1.00A
	100A_E			using the configuration function.	

#### **Relevant Manuals**

MELSEC-L Temperature Control Module User's Manual MELSEC-Q CC-Link IE Field Network Master/Local Module User's Manual MELSEC-L CC-Link IE Field Network Master/Local Module User's Manual MELSEC-L CC-Link IE Field Network Head Module User's Manual QCPU User's Manual (Hardware Design, Maintenance and Inspection) MELSEC-L CPU Module User's Manual (Hardware Design, Maintenance and Inspection) GX Works2 Version1 Operating Manual (Common) GX Developer Version8 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 Temperature Control Module User's Manual. The descriptions of the sample ladder programs in this manual may be different from the ones found in the MELSEC-L Temperature Control Module User's Manual depending on the date created.

Operating procedures are explained using GX Works2. When using GX Developer, refer to the MELSEC-L Temperature Control Module User's Manual.

- 2. When Using the Module in Standard System Configuration (When Using Intelligent Function Module Parameters)
- 2.1. When Using the Module as a Temperature Input Module
- 2.1.1. Temperature Input

# Function Overview

This program performs the temperature input using the intelligent function module parameters in the standard system configuration.

# Program

This function uses the project (program name).

•LD-L60TC4\_PRM1\_V100A\_E(01RdTmp)

# Applicable Hardware and Software

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

Description			
L60TCTT4, L60TCTT4BW,	L60TCRT4, L60TCRT4BW *1		
*1 The type of usable tempe	erature sensors and the temperature measurement		
range depend on the mo	dule used. Parameters must be configured to match		
the connected devices a	nd systems.		
Series	Model		
MELSEC-L series	LCPU		
MELSEC-L series input module			
MELSEC-L series output module			
GX Works2 *1			
*1 For information on the software versions applicable to the module used, refer			
to the related manual.			
	Description L60TCTT4, L60TCTT4BW, *1 The type of usable temperange depend on the month the connected devices and Series MELSEC-L series MELSEC-L series input month MELSEC-L series output month GX Works2 *1 *1 For information on the series to the related manual.		

# System Configuration

Input module(LX42C4) Temperature control module(L60TCTT4) CPU module(L02CPU) Output module(LY42NT1P) Power supply module(L61P) END cover(L6EC) A X/Y10 X/Y00 X20 Y60 to to X/Y0F X/Y1F to Y9F to X5F CH1 Type-K thermocouple -200°C to 1300°C CH3 Type-K thermocouple -200°C to 1300°C

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

No.	Device	Data Type	Application	Remarks
1	X10	Bit	Module READY flag	Used by the system and cannot be
2	X12	Bit	Error occurrence flag	used by the user.
3	X22	Bit	Error code reset instruction	-
4	X23	Bit	Operation mode setting instruction	-
5	X25	Bit	Temperature process value read	-
			instruction	
6	Y11	Bit	Setting/operation mode instruction	-
7	Y12	Bit	Error reset instruction	-
8	Y1B	Bit	Setting change instruction	-
9	Y60 to Y6F	Word	Error code output	-

This program uses the following XY devices.

#### **Conditions for Using Sample Ladder Programs**

•Parameter Settings for the Temperature Control Module

The following explains the settings for the L60TCTT4 temperature control module that the programs use.

- (1) Addition of L60TCTT4 Temperature Control Module
  - a) Open the new module window and configure the setting as follows.

Project window→[Intelligent Function Module]→Right-click→[New Module]

New Module					
Module Selection					
Module Type	Temperature Control Module				
Module Name	L60TCTT4				
Mount Position					
Base No,	Mounted Slot No. 0				
Specify start XY	address 0010 (H) 1 Module Occupy [16 points]				
Title Setting					
Title					
	OK Cancel				

# (2) Switch Setting

a) Open the switch setting window and configure the settings as follows.

Project window→[Intelligent Function Module]→Module name→[Switch Setting]

witch Setting	0010:L60TCTT4							
- Toput Made Se	detter.							
	Input Mode Selection							
e rempera								
O Temperal	ture Control Mode							
- Temperature (	Control Mode Setting							
Output Setting	at CPU Stop Error							
СН	Output Setting at CPU Stop Error							
CH1	0:CLEAR							
CH2	0:CLEAR							
СНЗ	0:CLEAR							
CH4	0:CLEAR							
Setting Change 0:Temperal Control Output	e Rate Limiter Setting ture Rise/Temperature Drop Batch Setting           true Rise/Temperature Drop Batch Setting           t Cycle Unit Selection Setting							
0:1s Cycle								
Auto-setting at I 0:Disable	nput Range Change							
Sampling Cycle Selection								
1:250ms								
(caucion) This dialog setting is linked to the Switch Setting of the PLC parameter. Default value will be shown in the dialog if the Switch Setting of the PLC parameter contains an out-of-range value. OK Cancel								

#### Table 2-1 Switch setting

Item	Set value
Input mode selection	Temperature input mode
Control mode selection	0: Standard control
Setting change rate limiter setting	0: Temperature rise/temperature drop batch setting
Control output cycle unit selection setting	0: 1 s cycle
Auto-setting at input range change	0: Disable
Sampling cycle selection	1: 250 ms

#### (3) Parameter Setting

a) Open the parameter setting window.

Project window→[Intelligent Function Module]→Module name→[Parameter]

b) Click the [Clear Value for Gray Cells] button to set unnecessary items to 0.

c) Set the following parameters.

Item	CH1	CH2	СНЗ	CH4
Basic setting	Set the temperature conve	rsion system.		
Input range	49: Thermocouple K Measured Temperature Range (-200.0 to	49:Thermocouple K Measured Temperature Range (-200.0 to	49:Thermocouple K Measured Temperature Range (-200.0 to	2:ThermocoupleK Measured Temperature Range(0 to 1300
<ul> <li>Set value (SV) setting</li> </ul>	0.0 C	0.0 C	0.0 C	0 C
Unused channel setting	0:Used	0:Used	0:Used	0:Used
<ul> <li>Conversion enable/disable setting</li> </ul>	0:Enable	0:Enable	0:Enable	1:Disable
Control basic parameter setting	The Q64TC exercises temp	erature adjustment control a	automatically by merely sett	ing the PID constants
Proportional band (P) 	0.0 %	0.0 %	0.0 %	0.0 %
Cooling proportional band (Pc) setting	0.0 %	0.0 %	0.0 %	0.0 %
<ul> <li>Integral time (I) setting</li> </ul>	0 s	0 s	0 s	0 s
<ul> <li>Derivative time (D) setting</li> </ul>	0 s	0 s	0 s	0 s
Control output cycle setting/Heating control output cycle setting.	0 s	0 s	0 s	0 s
Control response parameter	0:Slow	0:Slow	0:Slow	0:Slow
Stop Mode Setting	0:Stop	0:Stop	0:Stop	0:Stop
<ul> <li>PID continuation flag</li> </ul>	0:Stop			
Control detail parameter setting	The Q64TCTT(BW) allows ye temperatures of the above	ou to set the temperature m thermocouples.	easurement ranges which m	eet the operating
Forward/reverse action setting	0:Forward Action	0:Forward Action	0:Forward Action	0:Forward Action
<ul> <li>Upper limit setting limiter</li> </ul>	0.0 C	0.0 C	0.0 C	0 C
Lower limit setting limiter	0.0 C	0.0 C	0.0 C	0 C
Setting change rate limiter or Setting change rate limiter (Temperature rise)	0.0 %	0.0 %	0.0 %	0.0 %
Setting change rate limiter (Temperature drop)	0.0 %	0.0 %	0.0 %	0.0 %
Sensor correction value setting	0.00 %	0.00 %	0.00 %	0.00 %
Primary delay digital filter setting	0 s	0 s	1 s	0 s
Upper limit output limiter/Heating	0.0 %	0.0 %	0.0 %	0.0 %
apper minic oucput miniter				

#### **Table 2-2 Parameter setting**

Item	Item	CH1	CH2	CH3	CH4
Basic	Input range	49: Thermocouple	49: Thermocouple	49: Thermocouple	2: Thermocouple K
setting		K Measured	K Measured	K Measured	Measured
		Temperature	Temperature	Temperature	Temperature
		Range (-200.0 to	Range (-200.0 to	Range (-200.0 to	Range (0 to
		1300.0°C)	1300.0°C)	1300.0°C)	1300°C)
	Conversion enable/disable setting	0: Enable	0: Enable	0: Enable	1: Disable
Control	Primary delay digital filter setting				
detail		0s	0s	15	0s
parameter		00	00	10	00
setting					
Alert function	Process alarm alert output enable/disable setting	1: Disable	0: Enable	1: Disable	1: Disable
setting	Process alarm lower lower limit value	0.0°C	200.0°C	0.0°C	0°C
	Process alarm lower upper limit value	0.0°C	205.0°C	0.0°C	0°C
	Process alarm upper lower limit value	1300.0°C	295.0°C	1300.0°C	1300°C
	Process alarm upper upper limit value	1300.0°C	300.0°C	1300.0°C	1300°C
	Rate alarm alert output enable/disable setting	1: Disable	1: Disable	0: Enable	1: Disable
	Rate alarm alert detection cycle	1 Times	1 Times	4 Times	1 Times
	Rate alarm upper limit value	0	0	5	0
	Rate alarm lower limit value	0	0	-5	0

\*For parameters other than above, use the default values.

# (4) Auto Refresh Setting

a) Open the auto refresh window and configure the settings as follows.

Project window→[Intelligent Function Module]→Module name→[Auto Refresh]

🕴 0010:L60TCTT4[]-Auto_Refresh					
Display Filter Display All	•				
		7110			
Item		CH2	CH3	CH4	
- Transfer to LPU	The data of the burrer men	fory is transmitted to the sp	ecinea aevice.		
Temperature process value (PV)	D51	D52	D53		
Manipulated value (MV)		502			
Transistor output flag					
Alert definition		D55	D56		
Manipulated value (MV)/Heating-side manipulated value (MVh) for another analog module output					
Temperature rise judgment flag					
Set value (SV) monitor					
AT Simultaneous temperature rise parameter calculation flag					
Self-tuning flag					
Temperature conversion completion flag	D60				
<ul> <li>Process value (PV) scaling value</li> </ul>					
Simultaneous temperature rise status					
Cooling-side manipulated value (MVc)					
Cooling-side transistor output flag					
Cooling-side manipulated value (MVc) for another analog module output					
The data of the buffer memory is transmit	tted to the specified device.				

#### Table 2-3 Auto refresh setting

	CH1	CH2	CH3	CH4	
Transfer to CPU	Error code	D50			
	Temperature process value (PV)	D51	D52	D53	-
	Alert definition	-	D55	D56	-
	Temperature conversion completion flag	D60			

# Devices

This program uses the following devices.

No.	Device	Data Type	Application	Remarks
1	X10	Bit	Module READY flag	Used by the system and cannot be
2	X12	Bit	Error occurrence flag	used by the user.
3	X22	Bit	Error code reset instruction	-
4	X23	Bit	Operation mode setting instruction	-
5	X25	Bit	Temperature process value read	-
			instruction	
6	Y11	Bit	Setting/operation mode instruction	-
7	Y12	Bit	Error reset instruction	-
8	Y1B	Bit	Setting change instruction	-
9	Y60 to Y6F	Word	Error code output	-
10	D11	Word	CH1 Temperature process value	-
			(PV)	
11	D12	Word	CH2 Temperature process value	-
			(PV)	
12	D13	Word	CH3 Temperature process value	-
			(PV)	
13	D50	Word	Error code	-
14	D51	Word	CH1 Temperature process value	-
			(PV)	
15	D52	Word	CH2 Temperature process value	-
			(PV)	
16	D53	Word	CH3 Temperature process value	-
			(PV)	
17	D55	Word	CH2 Alert definition	-
18	D56	Word	CH3 Alert definition	-
19	D60	Word	Temperature conversion completion	-
			flag	
20	D998	Word	Process alarm processing counter	-
21	D999	Word	Rate alarm processing counter	-

# Version Upgrade History

Version	Date	Description
1.00A	2012/01/16	First edition

Prograi	m							
* Sampl * Funct * Versio *	e ladder pr ion : Tempo on : Ver.1.0	ogram Nam erature inpu OA	e:01RdTmp ut					
* <prog< th=""><th>ram that cl</th><th>hanges the</th><th>setting/operation mode&gt;</th><th></th><th></th><th></th><th></th><th></th></prog<>	ram that cl	hanges the	setting/operation mode>					
*					<change s<="" th="" to=""><th>etting/oper</th><th>ation mode&gt;</th><th>,</th></change>	etting/oper	ation mode>	,
0	X23 Operatio n mode s et instr uction	Y1B Setting change i nstructi on					(Y11) Setting/ operatio n mode i nst	>
* * <prog *</prog 	ram that re	ads temp F	V and processes when alarm occ	urs>				
	V25	¥10	D60.0		<transfer ch<="" td=""><td>l1 Temp PV</td><td>to D11 &gt;</td><td>,  </td></transfer>	l1 Temp PV	to D11 >	, 
108	Temperat ure PV r ead inst ruction	Module R EADY fla g	Temperat ure conv ersion c omp flag		—[моv	D51 CH1 Temp erature process value	D11 CH1 Temp erature process value	3
			500.4		<transfer ch<="" td=""><td>l2 Temp PV</td><td>to D12 &gt;</td><td>,</td></transfer>	l2 Temp PV	to D12 >	,
			Temperat ure conv ersion c omp flag		—[моv	D52 CH2 Temp erature process value	D12 CH2 Temp erature process value	3
					<transfer ch<="" td=""><td>13 Temp PV</td><td>to D13 &gt;</td><td>,</td></transfer>	13 Temp PV	to D13 >	,
			D60.8 Temperat ure conv ersion c omp flag		—[моv	D53 CH3 Temp erature process value	D13 CH3 Temp erature process value	J
					<pre><processing< pre=""></processing<></pre>	at CH2 Prod	cess alarm >	,
210	X10 Module R EADY fla g	D55.2 CH2 Aler t defini tion D55.3 CH2 Aler t defini tion				-[inc	D998 Process alarm pr ocessing counter	3
					<pre><processin;< pre=""></processin;<></pre>	g at CH3 Ra	te alarm >	,
234	X10 Module R EADY fla g	D56.4 CH3 Aler t defini tion D56.5 11 CH3 Aler t defini tion				-[INC	D999 Rate ala rm proce ssing co unter	}
Continu	es on ne	xt page.						1



- \*CH2 D998 is incremented when a process alarm occurs.
- \*CH3 D999 is incremented when a process alarm occurs.

# 2.2. Standard Control (Such as Auto Tuning, Self-Tuning, and Error Code Read)

2.2.1. Tuning

### Function Overview

This program performs the auto tuning, self-tuning and error code read operations using the intelligent function module parameters in a standard system configuration.

#### Program

This function uses the project (program name).

•LD-L60TC4\_PRM2\_V100A\_E(01Tuning)

#### Applicable Hardware and Software

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

Model	Description		
Temperature control module	L60TCTT4, L60TCTT4BW,	L60TCRT4, L60TCRT4BW *1	
	*1 The type of usable temp	erature sensors and the temperature measurement	
	range depend on the mo	odule used. Parameters must be configured to match	
	the connected devices a	and systems.	
CPU module			
	Series	Model	
	MELSEC-L series	LCPU	
Input Module	MELSEC-L series input mo	dule	
Output Module	MELSEC-L series output m	odule	
Compatible software	GX Works2 *1		
	*1 For information on the software versions applicable to the module used, refer		
	to the related manual.		

# System Configuration



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

This program uses the following XY devices.

No.	Device	Data Type	Application	Remarks
1	X10	Bit	Module READY flag	Used by the system and cannot be
2	X12	Bit	Error occurrence flag	used by the user.
3	X22	Bit	Error code reset instruction	-
4	X23	Bit	Operation mode setting instruction	-
5	X24	Bit	Memory of PID constants read	-
			instruction	
6	X30	Bit	CH1 Set value (SV) change	-
			instruction	
7	Y11	Bit	Setting/operation mode instruction	-
8	Y12	Bit	Error reset instruction	-
9	Y18	Bit	Set value backup instruction	-
10	Y1B	Bit	Setting change instruction	-
11	Y60 to Y6F	Word	Error code output	-

#### **Conditions for Using Sample Ladder Programs**

•Parameter Settings for the Temperature Control Module

The following explains the settings for the L60TCTT4 temperature control module that the programs use.

- (1) Addition of L60TCTT4 Temperature Control Module
  - a) Open the new module window and configure the setting as follows.

Project window→[Intelligent Function Module]→Right-click→[New Module]

New Module	
Module Selection	
Module Type	Temperature Control Module
Module Name	L60TCTT4
Mount Position Base No,	Mounted Slot No. 0 Acknowledge I/O Assignment address 0010 (H) 1 Module Occupy [16 points]
Title Setting	
	OK Cancel

# (2) Switch Setting

a) Open the switch setting window and configure the settings as follows.

Project window→[Intelligent Function Module]→Module name→[Switch Setting]

witch Setting	0010:L60TCTT4					
	Input Mode Selection					
O Tempera	iture Input Mode					
Tempera	iture Control Mode					
Temperature	Control Mode Setting					
Output Setting	g at CPU Stop Error					
СН	Output Setting at CPU Stop Error					
CH1	0:CLEAR					
CH2	0:CLEAR					
CH3	0:CLEAR					
CH4	U:CLEAR					
Control Mode :	Selection					
0:Standard	0:Standard Control					
Setting Change Rate Limiter Setting						
0:Temperature Rise/Temperature Drop Batch Setting						
Control Output Cycle Unit Selection Setting						
0:1s Cycle						
Auto-setting at 1	Input Range Change					
0:Disable						
Sampling Cycle Selection						
0:500ms						
(Caucion)						
This dialog settin	ng is linked to the Switch Setting of the PLC parameter.					
if the Switch Set	II be snown in the dialog ting of the PLC parameter contains an out-of-range value.					
. the principale						

#### Table 2-4 Switch setting

Item	Set value
Input mode selection	Temperature control mode
Control mode selection	0: Standard control
Setting change rate limiter setting	0: Temperature rise/temperature drop batch setting
Control output cycle unit selection setting	0: 1 s cycle
Auto-setting at input range change	0: Disable
Sampling cycle selection*	0: 500 ms

#### (3) Parameter Setting

a) Open the parameter setting window.

Project window→[Intelligent Function Module]→Module name→[Parameter]

b) Click the [Clear Value for Gray Cells] button to set unnecessary items to 0.

c) Set the following parameters.

terrises temperature adjust 0.00% 2.10% 2.10% 2.10% 2.10% 2.10% 2.10% 2.10% 3.0% 0.0% 2.40 s 60 s 50 s 3.0 s 0.50% 0.50	the value of differences a yreans to an ecosyl yr	CH4 CH4 CH4 CH4 CH4 CH4 CH4 Cemperature Range(0 to 1300 0 C 1:Unused 0:Enable cerely setting the PID constants 3.0 % 0.0 % 240 s 60 s 30 s
It     CF       crature conversion system.     2:Thermcouple       nge(0 to 1300)     Temperature Ra       0 C     1:Unused       0:Enable     0:Enable       ercises temperature adjustr     3.0 %       240 s     60 s       60 s     30 s       0:Slaw     0.Slaw	12     CH3       K Measured inge(0 to 1300     2:ThermocoupleK Me Temperature Range( 0 C       no C     1:Unused       0:Enable     3.0 %       0.0 %     240 s       60 s     30 s	CH4 2:ThermocoupleK Measured (0 to 1300 0 C 1:Unused 0:Enable 3.0 % 240 s 60 s 30 s
rature conversion system. Measured 2:Thermocupile Imperature Ra 0 C 1:Unused 0:Enable ercises temperature adjustr 3.0 % 240 s 60 s 30 s 0:Show	K Measured Inge(0 to 1300 0 C 1:Unused 0:Enable ment control automatically by m 3:0 % 240 s 60 s 30 s	2:ThermocoupleK Measured (0 to 1300 0 C 1:Unused 0:Enable arerely setting the PID constants 3.0 % 240 s 60 s 30 s
K Measured nge(0 to 1300) C Emperature Ray 0 C 1:Unused 0:Enable ercises temperature adjustr 3.0 % 0.0 % 240 s 60 s 30 s 0:Show	K Measured ange(0 to 1300 C 1:Unused 0 C 1:Unused 0:Enable automatically by m 3.0 % 0.0 % 240 s 60 s 30 s	2:ThermocupleK Measured (0 to 1300) Temperature Range(0 to 1300) 0 C 1:Unused 0:Enable erely setting the PID constants 3.0 % 0.0 % 240 s 60 s 30 s
0 C 1:Unused 0:Enable ercises temperature adjustr 3.0 % 0.0 % 240 s 60 s 30 s 0:Show	0 C 1:Unused 0:Enable automatically by m 3.0 % 0.0 % 240 s 60 s 30 s	0 C 1:Unused 0:Enable erely setting the PID constants 3.0 % 0.0 % 240 5 60 s 30 s
1:Unused 0:Enable ercises temperature adjustr 3.0 % 0.0 % 240 s 60 s 60 s 30 s	1:Unused           0:Enable           nent control automatically by m           3.0 %           0.0 %           240 s           60 s           30 s	1:Unused 0:Enable erely setting the PID constants 3.0 % 0.0 % 240 s 60 s 30 s
0:Enable ercises temperature adjustr 3.0 % 0.0 % 240 s 60 s 30 s 0.5km	0.Enable ment control automatically by m 3.0 % 0.0 % 240 s 60 s 30 s	0:Enable erely setting the PID constants 3.0 % 0.0 % 240 s 60 s 30 s
ercises temperature adjustr 3.0 % 0.0 % 240 s 60 s 30 s 0.5km	ment control automatically by m 3.0 % 0.0 % 240 s 60 s 30 s	erely setting the PID constants 3.0 % 0.0 % 240 5 60 5 30 s
3.0 % 0.0 % 240 s 60 s 30 s	3.0 % 0.0 % 240 s 60 s 30 s	3.0 % 0.0 % 240 s 60 s 30 s
0.0 % 240 s 60 s 30 s	0.0 % 240 s 60 s 30 s	0.0 % 240 s 60 s 30 s
240 s 60 s 30 s	240 s 60 s 30 s	240 s 60 s 30 s
60 s 30 s	60 s 30 s	60 s 30 s
30 s	30 s	30 s
0.Slow		
0.000	0:Slow	0:Slow
1:Monitor	1:Monitor	1:Monitor
BW) allows you to set the te of the above thermocouple	mperature measurement range s.	s which meet the operating
n 1:Reverse Actio	n 1:Reverse Action	1:Reverse Action
1300 C	1300 C	1300 C
0 C	0 C	0 C
0.0 %	0.0 %	0.0 %
0.0 %	0.0 %	0.0 %
0.00 %	0.00 %	0.00 %
0 s	1 s	0 s
100.0 %	100.0 %	100.0 %
	BW) allows you to set the the of the above thermocouple in 1:Reverse Action 1300 C 0 C 0.0 % 0.0 % 0.0 % 0.0 % 0.0 % 100.0 %	BW) allows you to set the temperature measurement range of the above thermocouples. n 1:Reverse Action 1:Reverse Action 1:300 C 1:300 C 0 C 0 C 0 C 0 C 0.0 % 0.0 % 0.0 % 0.0 % 0.00 % 0 s 1:s 100.0 %

#### **Table 2-5 Parameter setting**

Item	Item	CH1	CH2	CH3	CH4
Basic setting	Input range	2: Thermocouple K	2: Thermocouple K	2: Thermocouple K	2: Thermocouple K
		Measured	Measured	Measured	Measured
		Temperature Range	Temperature Range	Temperature Range	Temperature Range
		(0 to 1300°C)	(0 to 1300°C)	(0 to 1300°C)	(0 to 1300°C)
	Set value (SV) setting	200°C	0°C	0°C	0°C
	Unused channel setting	0: Used	1: Unused	1: Unused	1: Unused
Control basic	Control output cycle				
parameter setting	setting/Heating control	30s	30s	30s	30s
	output cycle setting				
Control detail	Upper limit setting limiter	400°C	1300°C	1300°C	1300°C
parameter setting	Lower limit setting limiter	0°C	0°C	0°C	0°C
	Self-tuning setting	1: Starting ST (PID	0: Do not run the ST	0: Do not run the ST	0: Do not run the ST
		constant only)	0. D0 1101 111 111 31	0. Do not run the S1	0. D0 1101 101 11e 31
Alert function setting	Alert 1 mode setting	1: Upper limit input	0. Not warning	0: Not warning	0: Not warning
		alert	0. Not warning	0. Not warning	0. Not warning
	Alert set value 1	500 °C	0°C	0°C	0°C

\*For parameters other than above, use the default values.

# (4) Auto Refresh Setting

a) Open the auto refresh window and configure the settings as follows.

Project window→[Intelligent Function Module]→Module name→[Auto Refresh]

0010:L60TCTT4[]-Auto_Refres	;h			
Display Filter Display All	•			
Item	CH1	CH2	CH3	CH4
🖃 Transfer to CPU	The data of the buffer men	ory is transmitted to the spe	cified device.	
Error code	D50			
<ul> <li>Temperature process value (PV)</li> </ul>	D51			
Manipulated value (MV)				
Transistor output flag				
Alert definition				
(MV)/Heating-side manipulated				
value (MVh) for another analog				
module output				
Temperature rise judgment flag				
Set value (SV) monitor				
AT Simultaneous temperature rise parameter calculation flag				
Self-tuning flag				
Temperature conversion completion flag				
Process value (PV) scaling value				
Simultaneous temperature rise status				
Cooling-side manipulated value (MVc)				
Cooling-side transistor output flag				
Cooling-side manipulated value				
<ul> <li>(MVc) for another analog module output</li> </ul>				
The data of the buffer memory is transm	itted to the specified device.			<u>^</u>
				×

#### Table 2-6 Auto refresh setting

	Item	CH1	CH2	CH3	CH4
Transfer to CPU	Error code	D50			
	Temperature process value (PV)	D51	-	-	-

# Devices

This program uses the following devices.

No.	Device	Data Type	Application	Remarks
1	X10	Bit	Module READY flag	Used by the system and cannot be
2	X12	Bit	Error occurrence flag	used by the user.
3	X22	Bit	Error code reset instruction	-
4	X23	Bit	Operation mode setting instruction	-
5	X24	Bit	Memory of PID constants read	-
			instruction	
6	X30	Bit	CH1 Set value (SV) change	-
			instruction	
7	Y11	Bit	Setting/operation mode instruction	-
8	Y12	Bit	Error reset instruction	-
9	Y18	Bit	Set value backup instruction	-
10	Y1B	Bit	Setting change instruction	-
11	Y60 to Y6F	Word	Error code output	-
12	D50	Word	Error code	-
13	D51	Word	CH1 Temperature process value	-
			(PV)	
14	M20	Bit	CH1 Read completion flag	-
15	M21	Bit	CH2 Read completion flag	-
16	M22	Bit	CH3 Read completion flag	-
17	M23	Bit	CH4 Read completion flag	-
18	M24	Bit	CH1 Write completion flag	-
19	M25	Bit	CH2 Write completion flag	-
20	M26	Bit	CH3 Write completion flag	
21	M27	Bit	CH4 Write completion flag	

# Version Upgrade History

Version	Date	Description
1.00A	2012/01/16	First edition



Continues on next page.



### 2.3. Standard Control (Peak Current Suppression Function, Simultaneous Temperature Rise Function)

2.3.1. Peak Current Suppression, Simultaneous Temperature Rise

### Function Overview

This program performs the peak current suppression and simultaneous temperature rise using the intelligent function module parameters in the standard system configuration.

#### Program

This function uses the project (program name).

•LD-L60TC4\_PRM3\_V100A\_E(01PekHet)

#### Applicable Hardware and Software

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

Model	Description	Description			
Temperature control module	L60TCTT4, L60TCTT4BW, L60TCRT4, L60TCRT4BW *1				
	*1 The type of usable temperature sensors and the temperature measurement				
	range depend on the mo	odule used. Parameters must be configured to match			
	the connected devices a	and systems.			
CPU module					
	Series Model				
	MELSEC-L series	LCPU			
Input Module	MELSEC-L series input mo	dule			
Output Module	MELSEC-L series output m	odule			
Compatible software	GX Works2 *1				
	*1 For information on the se	oftware versions applicable to the module used, refer			
	to the related manual.				

# System Configuration



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

No.	Device	Data Type	Application	Remarks
1	X10	Bit	Module READY flag	Used by the system and cannot be
2	X12	Bit	Error occurrence flag	used by the user.
3	X22	Bit	Error code reset instruction	-
4	X23	Bit	Operation mode setting instruction	-
5	X24	Bit	Memory of PID constants read	-
			instruction	
6	Y11	Bit	Setting/operation mode instruction	-
7	Y12	Bit	Error reset instruction	-
8	Y18	Bit	Set value backup instruction	-
9	Y1B	Bit	Setting change instruction	-
10	Y60 to Y6F	Word	Error code output	-

This program uses the following XY devices.

#### **Conditions for Using Sample Ladder Programs**

•Parameter Settings for the Temperature Control Module

The following explains the settings for the L60TCTT4 temperature control module that the programs use.

- (1) Addition of L60TCTT4 Temperature Control Module
  - a) Open the new module window and configure the setting as follows.

Project window→[Intelligent Function Module]→Right-click→[New Module]

New Module	
Module Selection	
Module Type	Temperature Control Module
Module Name	L60TCTT4
Mount Position Base No,	Mounted Slot No. 0 Acknowledge I/O Assignment address 0010 (H) 1 Module Occupy [16 points]
Title Setting	
	OK Cancel

# (2) Switch Setting

a) Open the switch setting window and configure the settings as follows.

Project window→[Intelligent Function Module]→Module name→[Switch Setting]

witch Setting	0010:L60TCTT4	×
Input Mode Se	election	L
C Tempera	ture Input Mode	L
Tempera	ture Control Mode	J
Temperature	Control Mode Setting	1
Output Setting	g at CPU Stop Error	
СН	Output Setting at CPU Stop Error	
CH1	0:CLEAR	
CH2	0:CLEAR	
CH3	0:CLEAR	
	0:CLEAR	
Control Mode :	Selection	V
0:Standard	i Control 🗾	L
Setting Chang	e Rate Limiter Setting	L
0:Tempera	ture Rise/Temperature Drop Batch Setting 📃 📃	L
Control Outpu	t Cycle Unit Selection Setting	L
0:1s Cycle		L
		L
Auto-setting at i	Input Range Change	L
0.Disable		L
Jordisable		L
Sampling Cycle 9	Selection	
0:500ms		
(Caution)		
This dialog settin	ng is linked to the Switch Setting of the PLC parameter.	
if the Switch Set	ting of the PLC parameter contains an out-of-range value.	
	OK Cancel	1

#### Table 2-7 Switch setting

Item	Set value
Input mode selection	Temperature control mode
Control mode selection	0: Standard control
Setting change rate limiter setting	0: Temperature rise/temperature drop batch setting
Control output cycle unit selection setting	0: 1 s cycle
Auto-setting at input range change	0: Disable
Sampling cycle selection	0: 500 ms

#### (3) Parameter Setting

a) Open the parameter setting window.

Project window→[Intelligent Function Module]→Module name→[Parameter]

b) Click the [Clear Value for Gray Cells] button to set unnecessary items to 0.

c) Set the following parameters.

trol Mode:Standard Control	Clear Value fo	r Gray Cells * Set the value of (	unnecessary items for control mo	de to 0.
Item	CH1	CH2	СНЗ	CH4
Basic setting	Set the temperature conve	rsion system.		
- Input range	2:ThermocoupleK Measured Temperature Range(0 to 1300			
Set value (SV) setting	200 ⊂	250 C	300 C	350 C
Unused channel setting	0:Used	0:Used	0:Used	0:Used
Conversion enable/disable setting	0:Enable	0:Enable	0:Enable	0:Enable
Control basic parameter setting	The Q64TC exercises tempe	erature adjustment control a	automatically by merely set	ting the PID constants
Proportional band (P) setting/Heating control proportional band setting (Ph)	3.0 %	3.0 %	3.0 %	3.0 %
Cooling proportional band (Pc) setting	0.0 %	0.0 %	0.0 %	0.0 %
Integral time (I) setting	240 s	240 s	240 s	240 s
Derivative time (D) setting	60 s	60 s	60 s	60 s
Control output cycle setting/Heating control output cycle setting.	20 s	20 s	20 s	20 s
Control response parameter	0:Slow	0:Slow	0:Slow	0:Slow
Stop Mode Setting	1:Monitor	1:Monitor	1:Monitor	1:Monitor
PID continuation flag	0:Stop			
Control detail parameter setting	The Q64TCTT(BW) allows yo temperatures of the above	ou to set the temperature m thermocouples.	easurement ranges which m	neet the operating
Forward/reverse action setting	1:Reverse Action	1:Reverse Action	1:Reverse Action	1:Reverse Action
Upper limit setting limiter	1300 C	1300 ⊂	1300 C	1300 C
Lower limit setting limiter	0 C	0 C	0 C	0 C
Setting change rate limiter or Setting change rate limiter (Temperature rise)	0.0 %	0.0 %	0.0 %	0.0 %
Setting change rate limiter (Temperature drop)	0.0 %	0.0 %	0.0 %	0.0 %
Sensor correction value setting	0.00 %	0.00 %	0.00 %	0.00 %
Primary delay digital filter setting	0 s	0 s	1 s	0 s
Upper limit output limiter/Heating	100.0 %	100.0 %	100.0 %	100.0 %

#### **Table 2-8 Parameter setting**

Item	Item	CH1	CH2	CH3	CH4
Basic	Input range	2: Thermocouple K	2: Thermocouple K	2: Thermocouple K	2: Thermocouple K
setting		Measured	Measured	Measured	Measured
		Temperature Range	Temperature Range	Temperature Range	Temperature Range
		(0 to 1300°C)	(0 to 1300°C)	(0 to 1300°C)	(0 to 1300°C)
	Set value (SV) setting	200 °C	250 °C	300 °C	350 °C
	Unused channel setting	0: Used	0: Used	0: Used	0: Used
Control	Control output cycle setting/Heating	20s	20s	20s	20s
basic	control output cycle setting				
parameter					
setting					
Control	Simultaneous temperature rise group	1: Group 1	1: Group 1	2: Group 2	2: Group 2
detail	setting				2. 01000 2
parameter	Peak current suppression control group	1: Group 1	2: Group 2	3. Group 3	4: Group 4
setting	setting			5. Cloup 5	4. Oloup 4
	Simultaneous temperature rise AT mode	1: AT for	1: AT for	1: AT for	1: AT for
	selection	Simultaneous	Simultaneous	Simultaneous	Simultaneous
		Temperature Rise	Temperature Rise	Temperature Rise	Temperature Rise

\*For parameters other than above, use the default values.

# (4) Auto Refresh Setting

a) Open the auto refresh window and configure the settings as follows.

Project window→[Intelligent Function Module]→Module name→[Auto Refresh]

🕼 0010:L60TCTT4[]-Auto_Refresh						
Display Filter Display All	<b>•</b>					
Item	CH1	CH2	CH3	CH4		
😑 Transfer to CPU	The data of the buffer mem	ory is transmitted to the sp	ecified device.			
Error code	D50					
Temperature process value (PV)	D51	D52	D53	D54		
Manipulated value (MV)						
Transistor output flag						
Alert definition						
Manipulated value (MV)/Heating-side manipulated value (MVh) for another analog module output						
Temperature rise judgment flag						
Set value (SV) monitor						
AT Simultaneous temperature rise parameter calculation flag						
Self-tuning flag						
Temperature conversion completion flag						
Process value (PV) scaling value						
Simultaneous temperature rise status						
Cooling-side manipulated value (MVc)						
The data of the buffer memory is transmi	tted to the specified device.			<u>^</u>		
				✓		

#### Table 2-9 Auto refresh setting

			-		
	CH1	CH2	CH3	CH4	
Transfer to CPU	Error code	D50			
	Temperature process value (PV)	D51	D52	D53	D54

# Devices

This program uses the following devices.

No.	Device	Data Type	Application	Remarks
1	X10	Bit	Module READY flag	Used by the system and cannot be
2	X12	Bit	Error occurrence flag	used by the user.
3	X22	Bit	Error code reset instruction	-
4	X23	Bit	Operation mode setting instruction	-
5	X24	Bit	Memory of PID constants read	-
			instruction	
6	Y11	Bit	Setting/operation mode instruction	-
7	Y12	Bit	Error reset instruction	-
8	Y18	Bit	Set value backup instruction	-
9	Y1B	Bit	Setting change instruction	-
10	Y60 to Y6F	Word	Error code output	-
11	D50	Word	Error code	-
12	D51	Word	CH1 Temperature process value	-
			(PV)	
13	D52	Word	CH2 Temperature process value	-
			(PV)	
14	D53	Word	CH3 Temperature process value	-
			(PV)	
15	D54	Word	CH4 Temperature process value	-
			(PV)	
16	M20	Bit	CH1 Read completion flag	-
17	M21	Bit	CH2 Read completion flag	-
18	M22	Bit	CH3 Read completion flag	-
19	M23	Bit	CH4 Read completion flag	-
20	M24	Bit	CH1 Write completion flag	-
21	M25	Bit	CH2 Write completion flag	-
22	M26	Bit	CH3 Write completion flag	-
23	M27	Bit	CH4 Write completion flag	-

# Version Upgrade History

Version	Date	Description
1.00A	2012/01/16	First edition

Program									
	* Sample * Functi * Versio *	e ladder program Name : 01 PekHet on: Peak current suppression, simultaneou n : Ver.1.00A	us temp rise						
3	* <progi *</progi 	am that changes the setting/operation m	ode>						
		X23 Y1B				<change td="" to<=""><td>setting/ope</td><td>eration mode)</td><td>,</td></change>	setting/ope	eration mode)	,
	0	Operatio Setting n mode s change i et instr nstructi uction on						-(Y11 Setting/ operatio n mode i nst	>
3	*		1-#ile						
3	* < Progr	am that reads PID constants from non-vo	latile memory/			/014 M			
	125	X24 X10 Y1B Y18 Mem of P Module R Setting Set valu ID const EADY fla change i e backup ants rea g nstructi instruc d inst on tion		-{тор	U1	H3E	K1	K1	3
						<ch2 mem<="" td=""><td>of PID cst r</td><td>read inst:Yes)</td><td>&gt;</td></ch2>	of PID cst r	read inst:Yes)	>
				-{тор	U1	H5E	K1	K1	}
						(018 M			
				-Гтор	1.11	CH3 Mem	of PID ost r	read instites,	1
				LIOF	01	n/L	KI	KI	1
						CH4 Mem	of PID cet :	and inst:Yes	<u> </u>
				-Гтор	U1	H9E	K1	K1	٦
						<pid cst<="" td=""><td>read/write</td><td>comp flag 🔾</td><td>,</td></pid>	read/write	comp flag 🔾	,
				-[from	U1	H1F	K2M20 CH1 Rea complet ion flag	K1	}
						<ch1 mem<="" td=""><td>of PID cst</td><td>read inst:No &gt;</td><td>&gt;</td></ch1>	of PID cst	read inst:No >	>
	283	M20 X10 H H CH1 Read Module R complet EADY fla ion flag g		-{тор	U1	H3E	KO	К1	}
						(CH2 Mem	of PID cetu	read inst:No `	, I
	308	M21 X10		-Гтор	U1	H5E	КО	K1	7
		CH2 Read Module R complet EADY fla ion flag g		2					
		M00 ¥10				<ch3 mem<="" td=""><td>of PID cst</td><td>read inst:No &gt;</td><td>,</td></ch3>	of PID cst	read inst:No >	,
	333	CH3 Read Module R complet EADY fla ion flag g		-{тор	U1	H7E	KO	K1	}
						<ch4 mem<="" td=""><td>of PID cst</td><td>read inst:No &gt;</td><td>&gt;</td></ch4>	of PID cst	read inst:No >	>
	358	M23 X10 CH4 Read Module R complet EADY fla ion flag g		[тор	U1	H9E	KO	K1	}

Continues on next page.

- \*
- \* < Program that reads an error code>
- \*



### 2.4. When Performing the Heating-Cooling Control

### 2.4.1. Heating-Cooling Control

### Function Overview

This program performs the heating-cooling control using the intelligent function module parameters in the standard system configuration.

#### Program

This function uses the project (program name).

•LD-L60TC4\_PRM4\_V100A\_E(01HetCol)

#### Applicable Hardware and Software

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

Model	Description			
Temperature control module	L60TCTT4, L60TCTT4BW, L60TCRT4, L60TCRT4BW *1			
	*1 The type of usable temp	erature sensors and the temperature measurement		
	range depend on the mo	odule used. Parameters must be configured to match		
	the connected devices and systems.			
CPU module				
	Series	Model		
	MELSEC-L series	LCPU		
Input Module	MELSEC-L series input mo	dule		
Output Module	MELSEC-L series output module			
Compatible software	GX Works2 *1			
	*1 For information on the software versions applicable to the module used, refer			
	to the related manual.			

# System Configuration



The following system configuration is used for the sample ladder programs.
No.	Device	Data Type	Application	Remarks
1	X10	Bit	Module READY flag	Used by the system and cannot be
2	X12	Bit	Error occurrence flag	used by the user.
3	X22	Bit	Error code reset instruction	-
4	X23	Bit	Operation mode setting instruction	-
5	X24	Bit	Memory of PID constants read	-
			instruction	
6	Y11	Bit	Setting/operation mode instruction	-
7	Y12	Bit	Error reset instruction	-
8	Y18	Bit	Set value backup instruction	-
9	Y1B	Bit	Setting change instruction	-
10	Y60 to Y6F	Word	Error code output	-

This program uses the following XY devices.

#### **Conditions for Using Sample Ladder Programs**

•Parameter Settings for the Temperature Control Module

The following explains the settings for the L60TCTT4 temperature control module that the programs use.

- (1) Addition of L60TCTT4 Temperature Control Module
  - a) Open the new module window and configure the setting as follows.

Project window→[Intelligent Function Module]→Right-click→[New Module]

New Module	
Module Selection	
Module Type	Temperature Control Module
Module Name	L60TCTT4
Mount Position Base No,	Mounted Slot No. 0 Acknowledge I/O Assignment address 0010 (H) 1 Module Occupy [16 points]
Title Setting	
	OK Cancel

# (2) Switch Setting

a) Open the switch setting window and configure the settings as follows.

Project window→[Intelligent Function Module]→Module name→[Switch Setting]

witch Setting	0010:L60TCTT4	×						
Input Mode Se	election							
C Tempera								
Temperature Control Mode								
Temperature Control Mode Setting								
Output Setting	g at CPU Stop Error							
СН	Output Setting at CPU Stop Error							
CH1	0:CLEAR							
CH2	0:CLEAR							
СНЗ	0:CLEAR							
CH4	U:CLEAR							
Control Mode :	Selection	Ν						
3:Mix Cont	rol (Normal Mode) 📃 💌							
Setting Chang	e Rate Limiter Setting							
0:Tempera	ture Rise/Temperature Drop Batch Setting 📃 🗾							
Control Outpu	t Cycle Unit Selection Setting							
0:1s Cycle	<b>•</b>							
		-						
Auto-setting at i	Input Range Change							
0.Dicable								
Sampling Cycle S	Selection							
0:500ms								
(Caution)								
This dialog settin	ng is linked to the Switch Setting of the PLC parameter.							
if the Switch Set	II be shown in the dialog ting of the PLC parameter contains an out-of-range value							
a and princer poo								

#### Table 2-10 Switch setting

Item	Set value
Input mode selection	Temperature control mode
Control mode selection	3: Mix control (normal mode)
Setting change rate limiter setting	0: Temperature rise/temperature drop batch setting
Control output cycle unit selection setting	0: 1 s cycle
Auto-setting at input range change	0: Disable
Sampling cycle selection	0: 500 ms

#### (3) Parameter Setting

a) Open the parameter setting window.

Project window  $\rightarrow$  [Intelligent Function Module]  $\rightarrow$  Module name  $\rightarrow$  [Parameter]

b) Click the [Clear Value for Gray Cells] button to set unnecessary items to 0.

c) Set the following parameters.

Item	CH1	CH2	СНЗ	CH4
Basic setting	Set the temperature conve	ersion system.		
Input range	2:ThermocoupleK Measured Temperature Range(0 to 1300			
Set value (SV) setting	200 C	0C	0C	0 C
Unused channel setting	0:Used	0:Used	1:Unused	1:Unused
Conversion enable/disable setting	0:Enable	0:Enable	0:Enable	0:Enable
ontrol basic parameter setting	The Q64TC exercises temp	erature adjustment control a	automatically by merely sett	ing the PID constants
Proportional band (P) setting/Heating control proportional band setting (Ph)	3.0 %	0.0 %	3.0 %	3.0 %
Cooling proportional band (Pc) setting	3.0 %	0.0 %	0.0 %	0.0 %
Integral time (I) setting	240 s	0 s	240 s	240 s
Derivative time (D) setting	60 s	0 s	60 s	60 s
Control output cycle setting/Heating control output cycle setting.	30 s	0 s	30 s	30 s
Control response parameter	0:Slow	0:Slow	0:Slow	0:Slow
Stop Mode Setting	1:Monitor	0:Stop	1:Monitor	1:Monitor
PID continuation flag	0:Stop			
Control detail parameter Setting	The Q64TCTT(BW) allows ye temperatures of the above	ou to set the temperature m thermocouples.	easurement ranges which n	eet the operating
Forward/reverse action setting	0:Forward Action	0:Forward Action	1:Reverse Action	1:Reverse Action
Upper limit setting limiter	1300 C	0 C	1300 C	1300 C
Lower limit setting limiter	0 C	0 C	0 C	0 C
Setting change rate limiter or Setting change rate limiter (Temperature rise)	0.0 %	0.0 %	0.0 %	0.0 %
Setting change rate limiter (Temperature drop)	0.0 %	0.0 %	0.0 %	0.0 %
Sensor correction value setting	0.00 %	0.00 %	0.00 %	0.00 %
Primary delay digital filter setting	0 s	0 s	0 s	0 s
Upper limit output limiter/Heating upper limit output limiter	100.0 %	0.0 %	100.0 %	100.0 %
the temperature conversion system			-	

#### Table 2-11 Parameter setting

Item	Item	CH1	CH2	CH3	CH4
Basic	Input range	2: Thermocouple K	2: Thermocouple K	2: Thermocouple K	2: Thermocouple K
setting		Measured	Measured	Measured	Measured
		Temperature	Temperature	Temperature	Temperature
		Range (0 to	Range (0 to	Range (0 to	Range (0 to
		1300°C)	1300°C)	1300°C)	1300°C)
	Set value (SV) setting	200°C	0°C	0°C	0°C
	Unused channel setting	0: Used	0: Used	1: Unused	1: Unused
Control	Control output cycle setting/Heating control				
basic	output cycle setting	300	00	06	00
parameter		505	05	05	05
setting					
Control	Cooling method setting	0: Air Cooled	0: Air Cooled	0: Air Cooled	0: Air Cooled
detail	Cooling control output cycle setting	30s	0s	30s	30s
parameter setting	Overlap/Dead band setting	-0.3%	0.0%	0.0%	0.0%

\*For parameters other than above, use the default values.

## (4) Auto Refresh Setting

a) Open the auto refresh window and configure the settings as follows.

Project window→[Intelligent Function Module]→Module name→[Auto Refresh]

0010:L60TCTT4[]-Auto_Refresh						
Display Filter Display All	-					
Item	CH1	CH2	CH3	CH4		
- Transfer to CPU	The data of the buffer mem	ory is transmitted to the spe	cified device.			
Error code	D50					
Temperature process value (PV)	D51					
Manipulated value (MV)						
Transistor output flag						
Alert definition						
(MV)/Heating-side manipulated						
value (MVh) for another analog						
module output						
Temperature rise judgment flag						
Set value (SV) monitor						
AT Simultaneous temperature rise						
parameter calculation flag						
Self-tuning flag						
Temperature conversion						
Dresses using (DV) cooling using						
Simultaneous temperature vice						
status						
Cooling-side manipulated value						
(MVc)						
The data of the buffer and the buffer	inter al the the second field also inter					
The data of the burrer memory is transm	litted to the specified device.					

#### Table 2-12 Auto refresh setting

	CH1	CH2	CH3	CH4	
Transfer to CPU	CPU Error code		D50		
	Temperature process value (PV)	D51	-	-	-

# Devices

This program uses the following devices.

No.	Device	Data Type	Application	Remarks
1	X10	Bit	Module READY flag	Used by the system and cannot be
2	X12	Bit	Error occurrence flag	used by the user.
3	X22	Bit	Error code reset instruction	-
4	X23	Bit	Operation mode setting instruction	-
5	X24	Bit	Memory of PID constants read	-
			instruction	
6	Y11	Bit	Setting/operation mode instruction	-
7	Y12	Bit	Error reset instruction	-
8	Y18	Bit	Set value backup instruction	-
9	Y1B	Bit	Setting change instruction	-
10	Y60 to Y6F	Word	Error code output	-
11	D50	Word	Error code	-
12	D51	Word	CH1 Temperature process value	-
			(PV)	
13	M20	Bit	CH1 Read completion flag	-
14	M21	Bit	CH2 Read completion flag	-
15	M22	Bit	CH3 Read completion flag	-
16	M23	Bit	CH4 Read completion flag	-
17	M24	Bit	CH1 Write completion flag	-
18	M25	Bit	CH2 Write completion flag	-
19	M26	Bit	CH3 Write completion flag	-
20	M27	Bit	CH4 Write completion flag	-

# Version Upgrade History

Version	Date	Description
1.00A	2012/01/16	First edition



LDM-M024-A

- 3. When Using the Module in Standard System Configuration (When Not Using Intelligent Function Module Parameters)
- 3.1. When Using the Module as a Temperature Input Module
- 3.1.1. Temperature Input

## **Function Overview**

This program performs the temperature input directly using the intelligent function module devices in the standard system configuration.

## Program

This function uses the project (program name).

•LD-L60TC4\_NPM1\_V100A\_E(01RdTmp)

## Applicable Hardware and Software

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

Model	Description			
Temperature control module	L60TCTT4, L60TCTT4BW, L60TCRT4, L60TCRT4BW *1			
	*1 The type of usable temp	erature sensors and the temperature measurement		
	range depend on the mo	odule used. Parameters must be configured to match		
	the connected devices a	and systems.		
CPU module				
	Series	Model		
	MELSEC-L series	LCPU		
Input Module	MELSEC-L series input mo	dule		
Output Module	MELSEC-L series output m	odule		
Compatible software	GX Works2, GX Developer *1			
	*1 For information on the so	oftware versions applicable to the module used, refer		
	to the related manual.			

#### System Configuration

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



No.	Device	Data Type	Application	Remarks
1	X10	Bit	Module READY flag	Used by the system and cannot be
2	X12	Bit	Error occurrence flag	used by the user.
3	X13	Bit	Hardware error flag	
4	X1B	Bit	Setting change completion flag	
5	X20	Bit	Set value write instruction	-
6	X22	Bit	Error code reset instruction	-
7	X23	Bit	Operation mode setting instruction	-
8	X25	Bit	Temperature process value read	-
			instruction	
9	Y11	Bit	Setting/operation mode status	-
10	Y12	Bit	Error reset instruction	-
11	Y1B	Bit	Setting change instruction	-
12	Y60 to Y6F	Word	Error code output	-

This program uses the following XY devices.

#### **Conditions for Using Sample Ladder Programs**

•Parameter Settings for the Temperature Control Module

The following explains the settings for the L60TCTT4 temperature control module that the programs use.

- (1) PLC Parameter Settings
  - a) Open the PLC parameter setting window and configure the setting as follows.
    - Project window  $\rightarrow$  [Parameter]  $\rightarrow$  [PLC parameter]  $\rightarrow$  [I/O assignment]

Blo.							<ul> <li>Intermediate state</li> </ul>
NO.	Slot	Туре	Model Name	Points	i	Start XY 🔺	Switch Setting
0	PLC	PLC	<b>•</b>		-		
1	PLC	Built-in I/O Function	<b>*</b>	16Points	-	0000	Detailed Setting
2	0(*-0)	Intelligent	▼ L60TCTT4	16Points	-	0010	
3	1(*-1)	Input	▼ LX42C4	64Points	-	0020	
4	2(*-2)	Output	▼ LY42NT1P	64Points	-	0060 —	
5	3(*-3)		•		-		
6	4(*-4)		•		-		
7	5(*-5)		•		-	-	2
Evt. I	lain Base1						C Detail
		· · · · · · ·			- 11		Base Mode
M	lain 📃					-	• Auto
Ext.	Base1					-	C Detail
Ext.	Base2					-	
Ext.	Base3					<u> </u>	8 Slot Default
Ext.I	Base4					<b>•</b>	12 Slot Default
Ext.	Base5					-	
Ext.	Base6					-	
Ext.	Base7					•	
						4	
				Import Multiple CPU P	arameter	Read PL	C Data
				-			

#### Table 3-1 I/O assignment setting

No.	Slot	Туре	Module name	Points	StartXY
0	CPU	CPU	-		
1	0(*-0)	Intelli.	L60TCTT4	16point	0010
2	1(*-1)	Input	LX42C4	64point	0020
3	2(*-2)	Output	LY42NT1P	64point	0060

b) Open the switch setting window and configure the setting as follows.

Project window	v→[Paramete	r]→[PLC parar	neter]→[I/O a	ssignment]→S	witch setting
		1 L - P			

Swi	itc	h Setting for I/O	and Intelligent Fu	inction Module						
Input Format HEX										
ſ		Slot	Туре	Model Name	Switch1	Switch2	Switch3	Switch4	Switch5	
	0	PLC	PLC							
	1	PLC	Built-in I/O Function							
	2	0(*-0)	Intelligent	L60TCTT4	0000	0100	1000	0000	0000	
T	3	1(*-1)	Input	LX42C4						
H	4	2(*-2)	Output	LY42NT1P						
H	5	3(*-3)								
H	6	4(*-4)								
H	7	5(*-5)								
H	8	6(*-6)								
H	9	7(*-7)								
Н	10	8(*-8)								
L	11	9(*-9)								
				End Ca	ancel					

# Table 3-2 Switch setting

No.	Slot	Туре	Model name	Switch 1	Switch 2	Switch 3	Switch 4	Switch 5
0	CPU	CPU						
1	0(*-0)	Intelli.	L60TCTT4	0000	0100	1000	0000	0000
2	1(*-1)	Input	LX42C4					
3	2(*-2)	Output	LY42NT1P					

# Devices

This program uses the following devices.

No.	Device	Data Type	Application	Remarks
1	X10	Bit	Module READY flag	Used by the system and cannot be
2	X12	Bit	Error occurrence flag	used by the user.
3	X13	Bit	Hardware error flag	
4	X1B	Bit	Setting change completion flag	
5	X20	Bit	Set value write instruction	-
6	X22	Bit	Error code reset instruction	-
7	X23	Bit	Operation mode setting instruction	-
8	X25	Bit	Temperature process value read	-
			instruction	
9	Y11	Bit	Setting/operation mode instruction	-
10	Y12	Bit	Error reset instruction	-
11	Y1B	Bit	Setting change instruction	-
12	Y60 to Y6F	Word	Error code output	-
13	D11	Word	CH1 Temperature process value	-
			(PV)	
14	D12	Word	CH2 Temperature process value	-
			(PV)	
15	D13	Word	CH3 Temperature process value	-
			(PV)	
16	D50	Word	Error code	-
17	D55	Word	CH2 Alert definition	-
18	D56	Word	CH3 Alert definition	-
19	D60	Word	Temperature conversion completion	-
			flag	
20	D998	Word	Process alarm processing counter	-
21	D999	Word	Rate alarm processing counter	-
22	MO	Bit	Flag 0 for writing set value	-
23	M1	Bit	Flag 1 for writing set value	-
24	M2	Bit	Flag 2 for writing set value	-

# Version Upgrade History

Version	Date	Description
1.00A	2012/01/16	First edition



		<ch1< th=""><th>Input range</th><th>: 49</th><th>&gt;</th></ch1<>	Input range	: 49	>
[тор	U1	H20	K49	K1	Ъ
		<ch2< td=""><td>Input range</td><td>: 49</td><td>&gt;</td></ch2<>	Input range	: 49	>
[тор	U1	H40	K49	К1	Ъ
		КСНЗ	Input range	: 49	>
[тор	U1	H60	K49	K1	3
		<conversio< td=""><td>n: CH1,2,3=</td><td>Yes, CH4</td><td>4:No &gt;</td></conversio<>	n: CH1,2,3=	Yes, CH4	4:No >
[тор	U1	H2B5	K8	K1	3
		<ch1 pro<="" td=""><td>c alarm alei</td><td>⁺ output</td><td>::No &gt;</td></ch1>	c alarm alei	⁺ output	::No >
[тор	U1	H0C4	K1	K1	Э
		KCH2 Pro	c alarm aler	t output	:Yes >
[тор	U1	H0D4	KO	K1	3
		<ch2 pro<="" td=""><td>alarm lwr lw</td><td>r:200.0d</td><td>eg C&gt;</td></ch2>	alarm lwr lw	r:200.0d	eg C>
[ТОР	U1	H0D5	K2000	K1	Э
		<ch2 pro<="" td=""><td>alarm lwr up</td><td>or:205.0d</td><td>eg C&gt;</td></ch2>	alarm lwr up	or:205.0d	eg C>
[тор	U1	H0D6	K2050	K1	3
		KCH2 Pro	alarm upr lw	/r:295.0d	eg C>
[тор	U1	H0D7	K2950	K1	3
		<ch2 :<="" pro="" td=""><td>alarm upr up</td><td>or:300.0d</td><td>eg C&gt;</td></ch2>	alarm upr up	or:300.0d	eg C>
[тор	U1	H0D8	K3000	К1	3
		<ch3 pro<="" td=""><td>c alarm alei</td><td>⁺ output</td><td>::No &gt;</td></ch3>	c alarm alei	⁺ output	::No >
[тор	U1	H0E4	K1	K1	3
		<ch1 rat<="" td=""><td>e alarm aleı</td><td>⁺ output</td><td>::No &gt;</td></ch1>	e alarm aleı	⁺ output	::No >
[тор	U1	H0C9	K1	К1	3
		<ch2 rat<="" td=""><td>e alarm aleı</td><td>⁺ output</td><td>::No &gt;</td></ch2>	e alarm aleı	⁺ output	::No >
[тор	U1	H0D9	К1	К1	3
		<ch3 rat<="" td=""><td>e alarm aler</td><td>t output</td><td>:Yes &gt;</td></ch3>	e alarm aler	t output	:Yes >
[тор	U1	H0E9	KO	K1	3
		<ch3 ra<="" td=""><td>te alarm ale</td><td>ert detec</td><td>t: 4 &gt;</td></ch3>	te alarm ale	ert detec	t: 4 >
[тор	U1	HOEA	K4	K1	3
		<ch3 rat<="" td=""><td>e alarm upr</td><td>lmt:5.0de</td><td>∍gC&gt;</td></ch3>	e alarm upr	lmt:5.0de	∍gC>
[тор	U1	HOEB	K50	K1	3
		<ch3 rate<="" td=""><td>e alarm lwr l</td><td>mt:-5.0d</td><td>eg C&gt;</td></ch3>	e alarm lwr l	mt:-5.0d	eg C>
[тор	U1	HOEC	K-50	K1	3

171	M1	M2	X10	X13	Y11	[To p
171		$F \log 2 f$	Modulo R	Hardwara	Sotting/	LIOD
	or writi	or writi	EADY fla	error f	operatio	
	ng set v	ng set v	g	lag	n mode i	
	alue	alue			nst	Гтор
						2.0.
						-
						[TOP
						_
						ТОР
						LIOP
						[тор
						_
						[тор
						Гтор
						_
						[тор
						Гтор
						2101
						-
						LTOP
						Гтор
						_
						[
						LIOP
						[тор
						10P
						-





\* < Program that reads temp PV and processes when alarm occurs>





Continues on next page.



MELSEC-L Temperature Control Module Sample Ladder Reference Manual LDM-M024-A

## 3.2. Standard Control (Such as Auto Tuning, Self-Tuning, and Error Code Read)

3.2.1. Tuning

### **Function Overview**

This program performs the auto tuning, self-tuning and error code read operations directly using the intelligent function module devices in the standard system configuration.

#### Program

This function uses the project (program name).

•LD-L60TC4\_NPM2\_V100A\_E(01Tuning)

#### Applicable Hardware and Software

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

Model	Description			
Temperature control module	L60TCTT4, L60TCTT4BW,	L60TCRT4, L60TCRT4BW *1		
	*1 The type of usable temp	erature sensors and the temperature measurement		
	range depend on the module used. Parameters must be configured to match			
	the connected devices and systems.			
CPU module				
	Series	Model		
	MELSEC-L series	LCPU		
Input Module	MELSEC-L series input mo	dule		
Output Module	MELSEC-L series output m	nodule		
Compatible software	GX Works2, GX Developer	*1		
	*1 For information on the se	oftware versions applicable to the module used, refer		
	to the related manual.			

# System Configuration



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

This program uses the following XY devices.

No.	Device	Data Type	Application	Remarks
1	X10	Bit	Module READY flag	Used by the system and cannot be
2	X11	Bit	Setting/operation mode status	used by the user.
3	X12	Bit	Error occurrence flag	
4	X13	Bit	Hardware error flag	
5	X14	Bit	CH1 Auto tuning status	
6	V10	Bit	Back-up of the set value completion	
0	×10		flag	
7	X1B	Bit	Setting change completion flag	
8	X20	Bit	Set value write instruction	-
9	X21	Bit	Auto tuning execute instruction	-
10	X22	Bit	Error code reset instruction	-
11	X23	Bit	Operation mode setting instruction	-
12	X24	Bit	Memory of PID constants read	-
12			instruction	
12	X30	Bit	CH1 Set value (SV) change	-
13			instruction	
14	Y11	Bit	Setting/operation mode instruction	-
15	Y12	Bit	Error reset instruction	-
16	Y14	Bit	CH1 Auto tuning instruction	
17	Y18	Bit	Set value backup instruction	-
18	Y1B	Bit	Setting change instruction	-
19	Y60 to Y6F	Word	Error code output	-

#### **Conditions for Using Sample Ladder Programs**

•Parameter Settings for the Temperature Control Module

The following explains the settings for the L60TCTT4 temperature control module that the programs use.

- (1) PLC Parameter Settings
  - a) Open the PLC parameter setting window and configure the setting as follows.
    - Project window  $\rightarrow$  [Parameter]  $\rightarrow$  [PLC parameter]  $\rightarrow$  [I/O assignment]

	Assignment					645		
No.	Slot	Туре		Model Name	Points		Start XY 🔺	Switch Setting
0	PLC	PLC	-	97 9000 07 900 07 97 90 90 90		-		
1	PLC	Built-in I/O Function	-		16Points	-	0000	Detailed Setting
2	0(*-0)	Intelligent	▼ L60TCTT4		16Points	-	0010	
3	1(*-1)	Input	▼ LX42C4		64Points	-	0020	
4	2(*-2)	Output	<ul> <li>LY42NT1P</li> </ul>		64Points	+	0060 —	
5	3(*-3)		+			-		
6	4(*-4)		•			-		
7	5(*-5)		+			-	-	
1	Main						<b></b>	Auto
lase	Setting		78					- Roco Modo
,	Main	Base Model Name	Pow	er Model Name	Extension	Lable	Slots	Auto
Evt	Bacel		=¦					C Detail
Ext	.Base2						-	
Ext	.Base3						-	8 Slot Default
Ext	.Base4						-	Internet and the second
Ext	.Base5						-	12 Slot Default
Ext	.Base6						-	
Ext	Base7						-	
				T	mport Multiple CPU P	arameter	Read PL	C Data
				-				

#### Table 3-3 I/O assignment setting

No.	Slot	Туре	Module name	Points	StartXY
0	CPU	CPU	-		
1	0(*-0)	Intelli.	L60TCTT4	16point	0010
2	1(*-1)	Input	LX42C4	64point	0020
3	2(*-2)	Output	LY42NT1P	64point	0060

b) Open the switch setting window and configure the setting as follows.

Project window $\rightarrow$	[Parameter]-	→[PLC	parameter]	→[I/C	) assignment	l→Switch	setting

Sv	ritc	h Setting for I/O	and Intelligent Fi	inction Module						×
				Inpul	: Format 🔳	x J	[			
		Slot	Туре	Model Name	Switch1	Switch2	Switch3	Switch4	Switch5	
	0	PLC	PLC							
	1	PLC	Built-in I/O Function							
l	2	0(*-0)	Intelligent	L60TCTT4	0000	0000	0000	0000	0000	
	3	1(*-1)	Input	LX42C4						
	4	2(*-2)	Output	LY42NT1P						
	5	3(*-3)								
	6	4(*-4)								
	7	5(*-5)								
	8	6(*-6)								
	9	7(*-7)								
	10	8(*-8)								
	11	9(*-9)								
				End Ca	ocel					
					incor					

# Table 3-4 Switch setting

No.	Slot	Туре	Model name	Switch 1	Switch 2	Switch 3	Switch 4	Switch 5
0	CPU	CPU						
1	0(*-0)	Intelli.	L60TCTT4	0000	0000	0000	0000	0000
2	1(*-1)	Input	LX42C4					
3	2(*-2)	Output	LY42NT1P					

# Devices

This program uses the following devices.

No.	Device	Data Type	Application	Remarks
1	X10	Bit	Module READY flag	Used by the system and cannot be
2	X11	Bit	Setting/operation mode status	used by the user.
3	X12	Bit	Error occurrence flag	
4	X13	Bit	Hardware error flag	
5	X14	Bit	CH1 Auto tuning status	
6	V10	Bit	Back-up of the set value completion	
0	X10		flag	
7	X1B	Bit	Setting change completion flag	
8	X20	Bit	Set value write instruction	-
9	X21	Bit	Auto tuning execute instruction	-
10	X22	Bit	Error code reset instruction	-
11	X23	Bit	Operation mode setting instruction	-
10	X24	Bit	Memory of PID constants read	-
12			instruction	
12	X30	Bit	CH1 Set value (SV) change	-
15			instruction	
14	Y11	Bit	Setting/operation mode instruction	-
15	Y12	Bit	Error reset instruction	-
16	Y14	Bit	CH1 Auto tuning instruction	
17	Y18	Bit	Set value backup instruction	-
18	Y1B	Bit	Setting change instruction	-
19	Y60 to Y6F	Word	Error code output	-
20	D50	Word	Error code	-
21	D51	Word	CH1 Temperature process value	-
21			(PV)	
22	MO	Bit	Flag 0 for writing set value	
23	M1	Bit	Flag 1 for writing set value	
24	M2	Bit	Flag 2 for writing set value	
25	M10	Bit	CH1 Auto tuning completion flag	
26	M20	Bit	CH1 Read completion flag	-
27	M21	Bit	CH2 Read completion flag	-
28	M22	Bit	CH3 Read completion flag	-
29	M23	Bit	CH4 Read completion flag	-
30	M24	Bit	CH1 Write completion flag	-

No.	Device	Data Type	Application	Remarks
31	M25	Bit	CH2 Write completion flag	-
32	M26	Bit	CH3 Write completion flag	-
33	M27	Bit	CH4 Write completion flag	-

# Version Upgrade History

Version	Date	Description
1.00A	2012/01/16	First edition

#### Program



Continues on next page.



		24.0	×40	VID				<ch1 ale<="" th=""><th>ert set value</th><th>1:500deg C &gt;</th></ch1>	ert set value	1:500deg C >
406	Flag 2 f orwriti ngset v alue	Module R EADY fla	Hardware error f lag	Setting change c ompletio n flag		———[тор	U1	H26	K500	К1 ]
								<ch1 se<="" td=""><td>t value settii</td><td>ng:200deg C &gt;</td></ch1>	t value settii	ng:200deg C >
						[тор	U1	H22	K200	К1 ]
								<ch1 td="" up<=""><td>r Imt set lim</td><td>iter:400deg C&gt;</td></ch1>	r Imt set lim	iter:400deg C>
						———[тор	U1	H37	K400	К1 ]
								<ch1 l<="" td=""><td>wr limit set l</td><td>imiter:Odeg C&gt;</td></ch1>	wr limit set l	imiter:Odeg C>
						[тор	U1	H38	KO	К1 ]
								<flag 1<="" td=""><td>for writing s</td><td>set value:0FF&gt;</td></flag>	for writing s	set value:0FF>
*									[RST	M1 ] Flag 1 f orwriti ngset v alue
* <pgm *</pgm 	that exes	auto tuning	/backs up	PID cst in	non-volatile>			<ch1 au<="" td=""><td>to tuning ins</td><td>truction: ON &gt;</td></ch1>	to tuning ins	truction: ON >
540	X21 Auto tun ing exec ute inst ruction	X10 Module R EADY fla g	X13 Hardware error f lag	X11 Setting/ operatio n mode s tatus					{Set	Y14 ] CH1 Auto tuning instruct ion
								<ch1 aut<="" td=""><td>o tuning ins</td><td>truction: OFF&gt;</td></ch1>	o tuning ins	truction: OFF>
603	X14 H↓ CH1 Auto tuning status								[RST	Y14 ] CH1 Auto tuning instruct ion
								<ch1 au<="" td=""><td>to tuning co</td><td>mp flag: ON &gt;</td></ch1>	to tuning co	mp flag: ON >
									—-[SET	M10 ] CH1 Auto tuning completi on flag
								<set td="" valu<=""><td>ue backup in:</td><td>struction: ON&gt;</td></set>	ue backup in:	struction: ON>
641	CH1 Auto tuning completi on flag	Set valu e backup instruc tion							{SET	Y18 ] Set valu e backup instruc tion



					<read ch1="" t<="" th=""><th>emperature</th><th>, PV to D51</th><th>&gt;</th></read>	emperature	, PV to D51	>
931	X10 Module R EADY fla g	X11 Setting/ operatio n mode s tatus	—[from	U1	H9	D51 CH1 Tem erature process value	К1 1р	}
*								
* < Progi *	ram that c	hanges the set value (SV)>						
					<change c<="" td=""><td>H1 SV to 25</td><td>50deg C</td><td>&gt;</td></change>	H1 SV to 25	50deg C	>
955	X30 CH1 Set value ch ange ins truction	x10 Module R EADY fla g	—[тор	U1	H22	K250	К1	}
					<return c<="" td=""><td>H1 SV to 20</td><td>00deg C</td><td>&gt;</td></return>	H1 SV to 20	00deg C	>
1007	X30 CH1 Set value ch ange ins truction	X10 Module R EADY fla g	—[тор	U1	H22	K200	K1	}
1029							-[END	}

### 3.3. Standard Control (Peak Current Suppression Function, Simultaneous Temperature Rise Function)

#### 3.3.1. Peak Current Suppression

### Function Overview

This program performs the peak current suppression directly using the intelligent function module devices in the standard system configuration.

#### Program

This function uses the project (program name).

•LD-L60TC4\_NPM3\_V100A\_E(01Peak)

#### Applicable Hardware and Software

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

Model	Description				
Temperature control module	L60TCTT4, L60TCTT4BW, L60TCRT4, L60TCRT4BW *1				
	*1 The type of usable temp	perature sensors and the temperature measurement			
	range depend on the module used. Parameters must be configured to match				
	the connected devices a	and systems.			
CPU module					
	Series	Model			
	MELSEC-L series	LCPU			
Input Module	MELSEC-L series input mo	odule			
Output Module	MELSEC-L series output m	nodule			
Compatible software	GX Works2, GX Developer *1 For information on the s to the related manual.	<sup>-</sup> *1 oftware versions applicable to the module used, refer			

#### System Configuration

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



This program uses the following XY devices.

No.	Device	Data Type	Application	Remarks
1	X10	Bit	Module READY flag	Used by the system and cannot be
2	X11	Bit	Setting/operation mode status	used by the user.
3	X12	Bit	Error occurrence flag	
4	X13	Bit	Hardware error flag	
5	X14	Bit	CH1 Auto tuning status	
6	X15	Bit	CH2 Auto tuning status	
7	X16	Bit	CH3 Auto tuning status	
8	X17	Bit	CH4 Auto tuning status	
9	X18	Bit	Back-up of the set value completion	
			flag	
10	X1B	Bit	Setting change completion flag	
11	X20	Bit	Set value write instruction	-
12	X21	Bit	Auto tuning execute instruction	-
13	X22	Bit	Error code reset instruction	-
14	X23	Bit	Operation mode setting instruction	-
15	X24	Bit	Memory of PID constants read	-
			instruction	
16	Y11	Bit	Setting/operation mode instruction	-
17	Y12	Bit	Error reset instruction	-
18	Y14	Bit	CH1 Auto tuning instruction	-
19	Y15	Bit	CH2 Auto tuning instruction	-
20	Y16	Bit	CH3 Auto tuning instruction	-
21	Y17	Bit	CH4 Auto tuning instruction	-
22	Y18	Bit	Set value backup instruction	-
23	Y1B	Bit	Setting change instruction	-
24	Y60 to Y6F	Word	Error code output	-

#### **Conditions for Using Sample Ladder Programs**

•Parameter Settings for the Temperature Control Module

The following explains the settings for the L60TCTT4 temperature control module that the programs use.

- (1) PLC Parameter Settings
  - a) Open the PLC parameter setting window and configure the setting as follows.

Project window  $\rightarrow$  [Parameter]  $\rightarrow$  [PLC parameter]  $\rightarrow$  [I/O assignment]

No	2 <b>-1</b> 2222	-	1					Switch Sotting
0 010	Slot	lype		Model Name	Points		Start XY	Switch Security
1 PLC		PLC Puilt in I/O Eurotion	<u> </u>		16Doints	-	0000	Detailed Setting
2 0/*-		Intelligent			16Points	-	0000	
2 1/*-	<i></i>	Incelligenc	- 194264		64Points	-	0020	
J 2/*-	2)	Output	- 1 V42NT1D		64Points	-	0020	
F 3/*-	2)	Output			OTFOILICS	-		
6 4/*-	4)		-			-		
7 5/*-	5)		-			-		
Main		Base Model Name	Powe	r Model Name	Extension	Cable	Slots	C Auto
		Base Model Name	Powe	Model Name	Extension	Cable	Slots	6 Auto
Main							<u> </u>	C Detail
Ext.Base	2							• Docan
Ext.Dase	3							8 Slot Default
Ext. Base	4							0 Diot Doradic
Ext.Base	5						-	12 Slot Default
Ext.Base	6							
Ext.Base	7						•	
							1	1
				1	mport Multiple CPU P	arameter	Read PLC	I Data

#### Table 3-5 I/O assignment setting

		-		_	
No.	Slot	Туре	Module name	Points	StartXY
0	CPU	CPU	-		
1	0(*-0)	Intelli.	L60TCTT4	16point	0010
2	1(*-1)	Input	LX42C4	64point	0020
3	2(*-2)	Output	LY42NT1P	64point	0060

b) Open the switch setting window and configure the setting as follows.

Project window→[Parameter]→[PLC parameter]→[I/O assignment]→Switch setting

Input Format HEX								
	Slot	Туре	Model Name	Switch1	Switch2	Switch3	Switch4	Switch5
0	PLC	PLC						
1	PLC	Built-in I/O Function						
2	0(*-0)	Intelligent	L60TCTT4	0000	0000	0000	0000	0000
3	1(*-1)	Input	LX42C4					
4	2(*-2)	Output	LY42NT1P					
5	3(*-3)							
6	4(*-4)							
7	5(*-5)							
8	6(*-6)							
9	7(*-7)							
0	8(*-8)							
1	9(*-9)							

#### Table 3-6 Switch setting

No.	Slot	Туре	Model name	Switch 1	Switch 2	Switch 3	Switch 4	Switch 5
0	CPU	CPU						
1	0(*-0)	Intelli.	L60TCTT4	0000	0000	0000	0000	0000
2	1(*-1)	Input	LX42C4					
3	2(*-2)	Output	LY42NT1P					

# Devices

This program uses the following devices.

No.	Device	Data Type	Application	Remarks
1	X10 Bit M		Module READY flag	Used by the system and cannot be
2 X11 Bit		Bit	Setting/operation mode status	used by the user.
3	X12	Bit	Error occurrence flag	
4	X13	Bit	Hardware error flag	
5	X14	Bit	CH1 Auto tuning status	
6	X15	Bit	CH2 Auto tuning status	
7	X16	Bit	CH3 Auto tuning status	
8	X17	Bit	CH4 Auto tuning status	
9	X18	Bit	Back-up of the set value completion	
			flag	
10	X1B	Bit	Setting change completion flag	
11	X20	Bit	Set value write instruction	-
12	X21	Bit	Auto tuning execute instruction	-
13	X22	Bit	Error code reset instruction	-
14	X23	Bit	Operation mode setting instruction	-
15	X24	Bit	Memory of PID constants read	-
			instruction	
16	Y11	Bit	Setting/operation mode instruction	-
17	Y12	Bit	Error reset instruction	-
18	Y14	Bit	CH1 Auto tuning instruction	-
19	Y15	Bit	CH2 Auto tuning instruction	-
20	Y16	Bit	CH3 Auto tuning instruction	-
21	Y17	Bit	CH4 Auto tuning instruction	-
22	Y18	Bit	Set value backup instruction	-
23	Y1B	Bit	Setting change instruction	-
24	Y60 to Y6F	Word	Error code output	-
25	D50	Word	Error code	-
26	D51	Word	CH1 Temperature process value	-
			(PV)	
27	D52	Word	CH2 Temperature process value	-
			(PV)	
28	D53	Word	CH3 Temperature process value	-
			(PV)	
No.	Device	Data Type	Application	Remarks
-----	--------	-----------	---------------------------------	---------
29	D54	Word	CH4 Temperature process value	-
			(PV)	
30	MO	Bit	Flag 0 for writing set value	-
31	M1	Bit	Flag 1 for writing set value	-
32	M2	Bit	Flag 2 for writing set value	-
33	M10	Bit	CH1 Auto tuning completion flag	-
34	M11	Bit	CH2 Auto tuning completion flag	-
35	M12	Bit	CH3 Auto tuning completion flag	-
36	M13	Bit	CH4 Auto tuning completion flag	-
37	M20	Bit	CH1 Read completion flag	-
38	M21	Bit	CH2 Read completion flag	-
39	M22	Bit	CH3 Read completion flag	-
40	M23	Bit	CH4 Read completion flag	-
41	M24	Bit	CH1 Write completion flag	-
42	M25	Bit	CH2 Write completion flag	-
43	M26	Bit	CH3 Write completion flag	-
44	M27	Bit	CH4 Write completion flag	-

# Version Upgrade History

Version	Date	Description
1.00A	2012/01/16	First edition

* Sample ladder program Name ::0 Peak * Function : Deak current suppression * Version : Ver.1.00A * (Change to setting/ope * 0 223 YIB 0 Dearatic Setting n mode's change i et instr retructi uction on * * (Initial setting program) * 112 20 112 20 Set valu e write instruct ion (Flag 0 for writing set instruct ion (Flag 1 for writing set instruct ion (Flag 1 for writing set instruct ion (CH1 Unused channel s (CH2 Unused channel s (CH3 Unused channel									rogran
* Version : Ver1.00A * (Program that changes the setting/operation mode) * (Change to setting/operation mo								der program Name : 01 Peak Peak current suppression	* Sample * Functic
* (Program that changes the setting/operation mode) * (Change to setting/operation get in the setting program) * (Initial setting program) * (Initial setting program) * (Initial setting program) * (Flag 0 for writing set in the set in t								er.1.00A	* Versior
* Change to setting/ope Operatio Setting Decretio Setting Decretio Setting Decretio Setting Decretio Setting Decretio Setting Decretio Setting To provide Schanes i Set value Se							eration mode>	hat changes the setting/ope	* * <progra< td=""></progra<>
Change to setting operation Setting in models of change is setting operation in models of change is setting of the instruct is in the instruct is instruct is in the instruct is in the instruct is in the instruct is in the instruct is instructed in the	ation mode	cotting (ono	ta aatti	(Change t					*
O Derato Setting     n modes change i     et instring     n modes change i     et instring     in modes change i     et instruct     ion         (Flag 0 for writing set         in g set v         alue         (CH1 Unused channel s	ation mode.	setting/oper	to setti	∖onange (				23 Y1B	
* * * * * * * * * * * * * * * * * * *	{Y11 Setting∕							atio Setting	0
<pre>* uction on * * (Initial setting program) * 112 x20</pre>	operatio n mode i							odes changei str nstructi	
* * (Initial setting program) *  (Flag 0 for writing set instruct ion (Flag 1 for writing set 112	nst							on on	
* (Flag 0 for writing so (Flag 0 for writing so Set valu write instruct ion (Flag 1 for writing so (Flag 1 for writing so (Flag 1 for writing so (Flag 1 for writing so (SET alue (CH1 Unused channel s (CH1 Unused channel s (CH2 Unused channel s (CH2 Unused channel s (CH2 Unused channel s (CH3 Unused channel s									*
X20       (Flag 0 for writing satisfies of the second								ing program≻	* <initial ∗</initial 
112 Set valu Set valu instruct ion	t value: ON	or writing se	0 for w	<flag (<="" td=""><td></td><td></td><td></td><td>20</td><td></td></flag>				20	
Set Value instruct ion (Flag 1 for writing set 157 Flag 0 f or writi ng set v alue (CH1 Unused channel s (CH1 Unused channel s (CH1 Unused channel s (CH2 Unused channel s (CH2 Unused channel s (CH3 Unused channel s	M0 Flago f	[PLS	[Pl					20 	112
<pre>Instruct ion </pre> <pre></pre>	or writi							ite	
(Flag 1 for writing set or writing set value       157     Flag 0 f     [SET       157     Flag 0 f     [SET       177     Flag 1 f     Module R       177     Flag 1 f     Module R       177     Flag 1 f     Module R       178     Flag 1 f     Module R       179     Flag 1 f     Module R       170     U1     H3D       171     K0       172     Flag 1 f       173     Module R       174     Flag 1 f       175     CH2 Unused channel s       176     U1       177     H3D       178     K0       179     K0       170     U1       170     K0	ng set v alue							uct	
157       M0       [SET         Flag 0 f       or writi       rset v         alue        (CH1 Unused channel s         177       Flag 1 f       Module R       Hardware         or writi       EADY fla       error f       [TO       U1       H3D       K0         (CH2 Unused channel s         alue         (CH2 Unused channel s         (CH2 Unused channel s         (CH2 Unused channel s         (CH3 Unused channel s	t value: ON	or writing se	1 for w	<flag '<="" td=""><td></td><td></td><td></td><td></td><td></td></flag>					
Flag 0 f or writi ng set v alue	MI	SET	[ SE					10 	157 -
All X10 X13 177 M1 X10 X13 Flag 1 f Module R Hardware or writi EADY fla error f ng set v g lag alue (CH2 Unused channel s (CH2 Unused channel s (CH2 Unused channel s (CH3 Unused channel s	Flag 1 f or writi		2					Ó f riti	
CH1 Unused channel s CH1 Unused channel s CH1 Unused channel s CH2 Unused channel s CH2 Unused channel s CH2 Unused channel s CH3 Unused channel s CH3 Unused channel s CH3 Unused channel s CH3 Unused channel s	ng set v alue							et v	
177       M1       X10       X13         177       Flag 1 f       Module R       Hardware or writi       [TO       U1       H3D       K0         (CH2 Unused channel s alue         (CH2 Unused channel s         (CH2 Unused channel s         (CH3 Unused channel s         (CH3 Unused channel s         (CH3 Unused channel s				2014.11					
177 HI HID KO	etting: Used,	d channel se	used ch	KCH1 Unu		_		11 X10 X13	
or writi EADY fla error f ng set v g lag alue	К1	KO	KO	H3D	U1	—_[то		1 f Module R Hardware	177 -
alue CH2 Unused channel s [TO U1 H5D K0 CH3 Unused channel s [TO U1 H7D K0								riti EADYfla errorf et v g lag	ľ
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[TO U1 H5D K0 (CH3 Unused channel s [TO U1 H7D K0	etting: Used)	ed channel se	used ch	KCH2 Unu					
CH3 Unused channel s [TO U1 H7D K0	K1	KO	KO	H5D	U1	—[то			
<ch3 channel="" s<br="" unused="">[TO U1 H7D K0</ch3>									
CH3 Unused channel s [TO U1 H7D K0									
CH3 Unused channel s [TO U1 H7D K0									
[то и н7р ко	atting: Usedi	d channel s	used ch	<ch3 td="" unu<=""><td></td><td></td><td></td><td></td><td></td></ch3>					
	- K1	KΟ	κŋ	<u> Н7 П</u>	1.11	Гто			
		i to	1.0	100	01	210			
	atting: Lload	d channal a	ucad ab						
	stang. Used.		useu Ch			[ <del></del>			
LTO U1 H9D K0	К1	KO	KO	H9D	U1	- <u>L</u> TO		I	



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								<ch1 se<="" th=""><th>t value settir</th><th>ng: 200deg C &gt;</th></ch1>	t value settir	ng: 200deg C >
520	M2 Flag2f orwriti ngsetv alue	X10 Module R EADY fla g	X13 Hardware error f lag	X1B Setting change c ompletio n flag		—[то	U1	H22	K200	К1 }
								<ch2 se<="" td=""><td>t value settir</td><td>ng: 250deg C &gt;</td></ch2>	t value settir	ng: 250deg C >
						—[то	U1	H42	K250	К1 }
								⟨CH3 Se	t value settir	ng: 300deg C >
						—[то	U1	H62	K300	К1 }
								<ch4 se<="" td=""><td>t value settir</td><td>ng: 350deg C &gt;</td></ch4>	t value settir	ng: 350deg C >
						—[то	U1	H82	K350	K1 }
								<flag 1<="" td=""><td>for writing s</td><td>et value:OFF&gt;</td></flag>	for writing s	et value:OFF>
									—{RST	M1 } Flag1f orwriti ngsetv alue
								<flag 2<="" td=""><td>for writing s</td><td>et value:OFF&gt;</td></flag>	for writing s	et value:OFF>
*									{RST	M2 } Flag 2 f or writi ng set v alue
* <pgm *</pgm 	that exes	auto tuning	/backs up	PID ost in i	ion-volatile>			KCH1 A	ito tuning ins	truction: ON >
654	X21 Auto tun ing exec ute inst	X10 Module R EADY fla g	X13 Hardware error f lag	X11 Setting/ operatio n mode s					{SET	Y14 } CH1 Auto tuning instruct
	ruction			latus				KCH2 Au	ito tuning ins	truction: ON >
									[SET	Y15 } CH2 Auto tuning instruct ion
								<ch3 au<="" td=""><td>ito tuning ins</td><td>truction: ON &gt;</td></ch3>	ito tuning ins	truction: ON >
									[SET	Y16 } CH3 Auto tuning instruct ion
								KCH4 Au	ito tuning ins	truction: ON >
									—{SET	Y17 } CH4 Auto tuning instruct ion

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Continues on next page.



### 3.3.2. Simultaneous Temperature Rise

### **Function Overview**

This program performs the simultaneous temperature rise directly using the intelligent function module devices in the standard system configuration.

#### Program

This function uses the project (program name).

•LD-L60TC4\_NPM3\_V100A\_E(02Heat)

### Applicable Hardware and Software

Same as for 3.3.1 Peak Current Suppression.

## System Configuration

Same as for 3.3.1 Peak Current Suppression.

# **Conditions for Using Sample Ladder Programs**

Same as for 3.3.1 Peak Current Suppression.

### Devices

No.	Device	Data Type	Application	Remarks
1	X10	Bit	Module READY flag	Used by the system and cannot be
2	X11	Bit	Setting/operation mode status	used by the user.
3	X12	Bit	Error occurrence flag	
4	X13	Bit	Hardware error flag	
5	X14	Bit	CH1 Auto tuning status	
6	X15	Bit	CH2 Auto tuning status	
7	X16	Bit	CH3 Auto tuning status	
8	X17	Bit	CH4 Auto tuning status	
9	X18	Bit	Back-up of the set value completion	
			flag	
10	X1B	Bit	Setting change completion flag	
11	X20	Bit	Set value write instruction	-
12	X21	Bit	Auto tuning execute instruction	-
13	X22	Bit	Error code reset instruction	-
14	X23	Bit	Operation mode setting instruction	-

This program uses the following devices.

No.	Device	Data Type	Application	Remarks
15	X24	Bit	Memory of PID constants read	-
			instruction	
16	Y11	Bit	Setting/operation mode instruction	-
17	Y12	Bit	Error reset instruction	-
18	Y14	Bit	CH1 Auto tuning instruction	-
19	Y15	Bit	CH2 Auto tuning instruction	-
20	Y16	Bit	CH3 Auto tuning instruction	-
21	Y17	Bit	CH4 Auto tuning instruction	-
22	Y18	Bit	Set value backup instruction	-
23	Y1B	Bit	Setting change instruction	-
24	Y60 to Y6F	Word	Error code output	-
25	D50	Word	Error code	-
26	D51	Word	CH1 Temperature process value	-
			(PV)	
27	D52	Word	CH2 Temperature process value	-
			(PV)	
28	D53	Word	CH3 Temperature process value	-
			(PV)	
29	D54	Word	CH4 Temperature process value	-
			(PV)	
30	MO	Bit	Flag 0 for writing set value	-
31	M1	Bit	Flag 1 for writing set value	-
32	M2	Bit	Flag 2 for writing set value	-
33	M10	Bit	CH1 Auto tuning completion flag	-
34	M11	Bit	CH2 Auto tuning completion flag	-
35	M12	Bit	CH3 Auto tuning completion flag	-
36	M13	Bit	CH4 Auto tuning completion flag	-
37	M20	Bit	CH1 Read completion flag	-
38	M21	Bit	CH2 Read completion flag	-
39	M22	Bit	CH3 Read completion flag	-
40	M23	Bit	CH4 Read completion flag	-
41	M24	Bit	CH1 Write completion flag	-
42	M25	Bit	CH2 Write completion flag	-
43	M26	Bit	CH3 Write completion flag	-
44	M27	Bit	CH4 Write completion flag	-

# Version Upgrade History

Version	Date	Description
1.00A	2012/01/16	First edition

Program	n							
* Sampl * Euroti	e ladder program Name : 02Heat ion : Simultaneous temperature r	<u>م</u>						
* Versio	n : Ver.1.00A							
* * <prog< td=""><td>ram that changes the setting/ope</td><td>ration mode&gt;</td><td></td><td></td><td></td><td></td><td></td><td></td></prog<>	ram that changes the setting/ope	ration mode>						
*	 				(0)			
	X23 Y1B				<change t<="" td=""><td>o setting/o</td><td>peration mo</td><td>de&gt;</td></change>	o setting/o	peration mo	de>
0	/ /  Operatio Setting						(Y11 Setting/	거
	n modes changei et instr nstructi						operatio n mode i	
	uction on						nst	
*	I							
* <initia *</initia 	l setting program>							
					<flag c<="" td=""><td>) for writing</td><td>set value: C</td><td>N&gt;</td></flag>	) for writing	set value: C	N>
115						[PLS	MO	3
	Set valu e write						Flag 0 f orwriti	
	instruct ion						ng set v alue	, I
					/Ebg 1	for writing	aat value: C	
400	Μ				∖riag i	Form	set value. C	
160	FlagOf					—[SEI	M1 Flag1f	1
	or writi ng set v						or writi ng set v	,
	alue						alue	
	M4 V10 V10				<ch1 td="" unu<=""><td>sed channe</td><td>l setting: Use</td><td>ed&gt;</td></ch1>	sed channe	l setting: Use	ed>
180			——[то	U1	H3D	KO	К1	Э
	orwriti EADYfla errorf							
	ngsetv g lag alue							
						cod channo	Leatting: Lle	42
			[ TO			seu channe	i setting. Os	-1
			[10	UI	HDD	KU	K1	ľ
					<ch3 td="" unu<=""><td>sed channe</td><td>l setting: Use</td><td>ed&gt;</td></ch3>	sed channe	l setting: Use	ed>
			——[то	U1	H7D	KO	K1	3
					≺CH4 ∐nu	sed channe	l cotting: Llea	 khe
			[To	1.14			124	- 
			[10	UI	HAD	κυ	KI.	1

								<ch1< th=""><th>Input rang</th><th>ge: 2</th><th>&gt;</th></ch1<>	Input rang	ge: 2	>
275	Flag 1 f orwriti ng set v alue	Flag 2 f or writi ng set v alue	X10 Module R EADY fla g	X13 Hardware error f lag	Setting/ operatio n mode i nst	—[то	U1	H20	К2	K1	}
								KCH2	Input rang	ge: 2	>
						—[то	U1	H40	K2	K1	}
								<ch3< td=""><td>Input rang</td><td>ge: 2</td><td>&gt;</td></ch3<>	Input rang	ge: 2	>
						—[то	U1	H60	K2	К1	}
								<ch4< td=""><td>Input rang</td><td>ge: 2</td><td>&gt;</td></ch4<>	Input rang	ge: 2	>
						—[то	U1	H80	К2	К1	}
								<ch1 co<="" td=""><td>ntrol outpu</td><td>ut cycle: 20s</td><td>&gt;</td></ch1>	ntrol outpu	ut cycle: 20s	>
						—[то	U1	H2F	K20	К1	}
								<ch2 c₀<="" td=""><td>ntrol outpu</td><td>ut cycle: 20s</td><td>&gt;</td></ch2>	ntrol outpu	ut cycle: 20s	>
						—[то	U1	H4F	K20	К1	}
								<ch3 c₀<="" td=""><td>ntrol outpu</td><td>ut cycle: 20s</td><td>&gt;</td></ch3>	ntrol outpu	ut cycle: 20s	>
						—[то	U1	H6F	K20	K1	}
								<ch4 co<="" td=""><td>ntrol outpu</td><td>ut cycle: 20s</td><td>&gt;</td></ch4>	ntrol outpu	ut cycle: 20s	>
						—[то	U1	H8F	K20	К1	}



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								<ch1 set<="" th=""><th>t value setti</th><th>ng: 200deg C &gt;</th><th></th></ch1>	t value setti	ng: 200deg C >	
668	M2 Flag 2 f or writi ng set v alue	X10 Module R EADY fla g	X13 Hardware error f lag	X1B Setting change c ompletio n flag		——[то	U1	H22	K200	К1 }	
								<ch2 set<="" td=""><td>: value setti</td><td>ng: 250deg C &gt;</td><td></td></ch2>	: value setti	ng: 250deg C >	
						——[то	U1	H42	K250	К1 }	
								<ch3 set<="" td=""><td>: value setti</td><td>ng: 300deg C &gt;</td><td></td></ch3>	: value setti	ng: 300deg C >	
						——[то	U1	H62	K300	К1 }	
								<ch4 set<="" td=""><td>t value setti</td><td>ng: 350deg C &gt;</td><td></td></ch4>	t value setti	ng: 350deg C >	
						——[то	U1	H82	K350	К1 }	
								<flag 1<="" td=""><td>for writing s</td><td>et value:OFF&gt;</td><td></td></flag>	for writing s	et value:OFF>	
									[RST	M1 } Flag1f orwriti ngsetv alue	
								<flag 2<="" td=""><td>for writing s</td><td>et value:OFF&gt;</td><td></td></flag>	for writing s	et value:OFF>	
									[RST	M2 } Flag2f orwriti ngsetv alue	
* * <pgm *</pgm 	' that exes	auto tuning	/backs up	PID cst in r	on-volatile>						
	X21	X10	X13	X11				<ch1 au<="" td=""><td>to tuning ins -</td><td>truction: ON &gt;</td><td></td></ch1>	to tuning ins -	truction: ON >	
802	Auto tun ing exec ute inst ruction	Module R EADY fla g	Hardware error f lag	Setting/ operatio n mode s tatus					—Į SET	Y14 } CH1 Auto tuning instruct ion	
								<ch2 au<="" td=""><td>to tuning ins</td><td>truction: ON &gt;</td><td></td></ch2>	to tuning ins	truction: ON >	
									—[SET	Y15 } CH2 Auto tuning instruct ion	
								<ch3 au<="" td=""><td>to tuning ins</td><td>truction: ON &gt;</td><td></td></ch3>	to tuning ins	truction: ON >	
									[SET	Y16 } CH3 Auto tuning instruct ion	
								<ch4 au<="" td=""><td>to tuning ins</td><td>truction: ON &gt;</td><td></td></ch4>	to tuning ins	truction: ON >	
									—{SET	Y17 } CH4 Auto tuning instruct ion	





\*

\* < Program that reads error code and temperature process value>

\*



# 3.4. When Performing the Heating-Cooling Control

## 3.4.1. Heating-Cooling Control

### Function Overview

This program performs the heating-cooling control directly using the intelligent function module devices in the standard system configuration.

#### Program

This function uses the project (program name).

•LD-L60TC4\_NPM4\_V100A\_E(01HetCol)

### Applicable Hardware and Software

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

Model	Description				
Temperature control module	L60TCTT4, L60TCTT4	4BW, L60TCRT4, L60TCRT4BW *1			
	*1 The type of usable	temperature sensors and the temperature measurement			
	range depend on th	ne module used. Parameters must be configured to match			
	the connected devi	ces and systems.			
CPU module					
	Series	Model			
	MELSEC-L series	LCPU			
Input Module	MELSEC-L series input	ut module			
Output Module	MELSEC-L series out	put module			
Compatible software	GX Works2, GX Deve	loper *1			
	*1 For information on the software versions applicable to the module used, refer				
	to the related manu	ual.			

### **System Configuration**

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



This program uses the following XY devices.

No.	Device	Data Type	Application	Remarks
1	X10	Bit	Module READY flag	Used by the system and cannot be
2	X11	Bit	Setting/operation mode status	used by the user.
3	X12	Bit	Error occurrence flag	
4	X13	Bit	Hardware error flag	
5	X14	Bit	CH1 Auto tuning status	
6	X18	Bit	Back-up of the set value completion	
			flag	
7	X1B	Bit	Setting change completion flag	
8	X20	Bit	Set value write instruction	-
9	X21	Bit	Auto tuning execute instruction	-
10	X22	Bit	Error code reset instruction	-
11	X23	Bit	Operation mode setting instruction	-
12	X24	Bit	Memory of PID constants read	-
			instruction	
13	Y11	Bit	Setting/operation mode instruction	-
14	Y12	Bit	Error reset instruction	-
15	Y14	Bit	CH1 Auto tuning instruction	-
16	Y18	Bit	Set value backup instruction	-
17	Y1B	Bit	Setting change instruction	-
18	Y60 to Y6F	Word	Error code output	-

### **Conditions for Using Sample Ladder Programs**

Parameter Settings for the Temperature Control Module

The following explains the settings for the L60TCTT4 temperature control module that the programs use.

- (1) PLC Parameter Settings
  - a) Open the PLC parameter setting window and configure the setting as follows.
    - Project window  $\rightarrow$  [Parameter]  $\rightarrow$  [PLC parameter]  $\rightarrow$  [I/O assignment]

U PLC	Slot Type PLC	•	Model Name	Po	ints 👻	Start XY	Switch Setting
1 PLC	Built-in I/O Function	•	774	16Points	-	0000	Detailed Setting
3 1(*-1)	Incelligent	▼ L801C	4	64Points		0010	
4 2(*-2)	Output		ITIP	64Points	-	0060	
5 3(*-3)		-			•		
6 4(*-4)		-			-		
7 5(*-5)		•			•		
Main	Base Model Name		Power Model Name	Extens	on Cable	Slots	C Auto
	Base Model Name		Power Model Name	Extens	on Cable	Slots	C Auto
Fyt Base1	-						C Detail
Ext.Base2							
Ext.Base3							8 Slot Default
Ext.Base4		_					12 Slot Default
Ext.Base5		_					
Ext.Baseb							-
EXCIDENCE	1	_					1
				Import Multiple CP	I Darameter	Pead D	ICData
				Import materials or			EC Data

Table 3-7 I/O assignment setting

No.	Slot	Туре	Module name	Points	StartXY
0	CPU	CPU	-		
1	0(*-0)	Intelli.	L60TCTT4	16point	0010
2	1(*-1)	Input	LX42C4	64point	0020
3	2(*-2)	Output	LY42NT1P	64point	0060

b) Open the switch setting window and configure the setting as follows.

Project window→[Parameter]→[PLC parameter]→[I/O assignment]→Switch setting

Input Format HEX										
	Slot	Туре	Model Name	Switch1	Switch2	Switch3	Switch4	Switch5		
0	PLC	PLC								
1	PLC	Built-in I/O Function								
2	0(*-0)	Intelligent	L60TCTT4	0000	0003	0000	0000	0000		
3	1(*-1)	Input	LX42C4							
4	2(*-2)	Output	LY42NT1P							
5	3(*-3)									
6	4(*-4)									
7	5(*-5)									
8	6(*-6)									
9	7(*-7)									
10	8(*-8)									
11	9(*-9)									

### Table 3-8 Switch setting

No.	Slot	Туре	Model name	Switch 1	Switch 2	Switch 3	Switch 4	Switch 5
0	CPU	CPU						
1	0(*-0)	Intelli.	L60TCTT4	0000	0003	0000	0000	0000
2	1(*-1)	Input	LX42C4					
3	2(*-2)	Output	LY42NT1P					

# Devices

This program uses the following devices.

No.	Device	Data Type	Application	Remarks
1	X10	Bit	Module READY flag	Used by the system and cannot be
2	X11	Bit	Setting/operation mode status	used by the user.
3	X12	Bit	Error occurrence flag	
4	X13	Bit	Hardware error flag	
5	X14	Bit	CH1 Auto tuning status	
6	X18	Bit	Back-up of the set value completion	
			flag	
7	X1B	Bit	Setting change completion flag	
8	X20	Bit	Set value write instruction	-
9	X21	Bit	Auto tuning execute instruction	-
10	X22	Bit	Error code reset instruction	-
11	X23	Bit	Operation mode setting instruction	-
12	X24	Bit	Memory of PID constants read	-
			instruction	
13	Y11	Bit	Setting/operation mode instruction	-
14	Y12	Bit	Error reset instruction	-
15	Y14	Bit	CH1 Auto tuning instruction	-
16	Y18	Bit	Set value backup instruction	-
17	Y1B	Bit	Setting change instruction	-
18	Y60 to Y6F	Word	Error code output	-
19	D50	Word	Error code	-
20	D51	Word	CH1 Temperature process value (PV)	-
21	MO	Bit	Flag 0 for writing set value	-
22	M1	Bit	Flag 1 for writing set value	-
23	M2	Bit	Flag 2 for writing set value	-
24	M10	Bit	CH1 Auto tuning completion flag	-
25	M20	Bit	CH1 Read completion flag	-
26	M21	Bit	CH2 Read completion flag	-
27	M22	Bit	CH3 Read completion flag	-
28	M23	Bit	CH4 Read completion flag	-
29	M24	Bit	CH1 Write completion flag	-
30	M25	Bit	CH2 Write completion flag	-
31	M26	Bit	CH3 Write completion flag	-
32	M27	Bit	CH4 Write completion flag	-

# Version Upgrade History

Version	Date	Description
1.00A	2012/01/16	First edition





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\*

\* <Pgm that exes auto tuning/backs up PID cst in non-volatile>



Continues on next page.

\*



# 4. When Connecting the Module to the Head Module

# 4.1. Temperature Input

# Function Overview

This program performs the temperature input using the intelligent function module parameters in the standard system configuration.

### Program

This function uses the project (program name).

•LD-L60TC4\_IEF\_V100A\_E(01RdTmp)

### Applicable Hardware and Software

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

Model	Description	
Temperature control module	L60TCTT4, L60TCTT4BW,	L60TCRT4, L60TCRT4BW *1
	*1 The type of usable tempe	erature sensors and the temperature measurement
	range depend on the mo	dule used. Parameters must be configured to match
	the connected devices a	nd systems.
CC-Link IE Field Network	CC-Link IE Field Network m	aster/local module
module	CC-Link IE Field Network he	ead module
CPU module		
	Series	Model
	MELSEC-Q series	Universal model QCPU *1
	MELSEC-L series	LCPU *2
	*1 The first five digits of the	serial number are "12012" or later.
	*2 The first five digits of the	serial number are "13012" or later.
Input Module	MELSEC-Q series input mo	dule
Output Module	MELSEC-Q series output m	odule
Compatible software	GX Works2 *1	
	*1 For information on the so	ftware versions applicable to the module used, refer
	to the related manual.	

### System Configuration

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



### This program uses the following XY devices.

No.	Device	Data Type	Application	Remarks
1	X22	Bit	Error code reset instruction	-
2	X23	Bit	Operation mode setting instruction	-
3	X24	Bit	Memory of PID constants read	-
			instruction	
4	X1000	Bit	Module READY flag	Used by the system and cannot be
5	X1002	Bit	Error occurrence flag	used by the user.
6	Y60 to Y6F	Word	Error code output	-
7	Y1001	Bit	Setting/operation mode instruction	-
8	Y1002	Bit	Error reset instruction	-
9	Y1008	Bit	Set value backup instruction	-
10	Y100B	Bit	Setting change instruction	-

### **Conditions for Using Sample Ladder Programs**

Use GX Works2 when connecting to the head module.

Parameter Settings for the Temperature Control Module

The following explains the settings for the L60TCTT4 temperature control module that the programs use.

- (1) Settings for the Master Station
- a) Configure settings for the master station.

### Project window $\rightarrow$ [Parameter] $\rightarrow$ [Network Parameter] $\rightarrow$ [Ethernet/CC IE/MELSECNET]

🛱 Network Parameter - MELSECN	ET/CC IE/Ethernet Module Configuratio	л			
	Module 1		Module 2	Module 3	
Network Type	CC IE Field (Master Station)	•	N <mark>one -</mark>	None 👻	None
Start I/O No.	00	000			
Network No.		1			
Total Stations		1			
Group No.					
Station No.		0			
Mode	Online (Normal Mode)	-	-	-	
	Network Configuration Settings				
	Network Operation Settings				
	Refresh Parameters				
	Interrupt Settings				
	Specify Station No. by Parameter	•			

### Table 4-1 Network parameter setting

	Module 1
Network Type	CC IE Field (Master Station)
Start I/O No.	0000
Network No.	1
Total Stations	1

b) Open the network configuration setting screen and configure the setting as follows.

Project window $\rightarrow$ [Parameter] $\rightarrow$ [Network Parameter] $\rightarrow$ [Ethernet/CC IE/MELSECNET] $\rightarrow$ Network Configuration Setting

ß	Network Parameter - CC IE Field - Network Configuration Settings - Module No.: 1											
	Set up Network configuration.  Assignment Method  Points/Start Please reopen the window after completing refresh parameter setting when changing refresh parameter.  Start/End											
				RX	/RY Setti	ng	RWW	/RWr Se	tting			
	Number of PLCs Station No. Station Type Points Start End Points Start End RX											
	1	1	Intelligent Device Station	256	0000	00FF	256	0000	00FF			

#### Table 4-2 Network configuration setting

	Station		RX/RY	Setting	RWw/RW	/r Setting
	No.	Station Type	Start	End	Start	End
1	1	Intelligent Device Station	0000	00FF	0000	00FF

c) Open the refresh parameter setting screen and configure the setting as follows.

Project window $\rightarrow$ [Parameter] $\rightarrow$ [Network Parameter] $\rightarrow$ [Ethernet/CC IE/MELSECNET] $\rightarrow$ Refresh parameters setting screen

Network Parameter - CC IE Field - Refresh Parameters - Module No.: 1												
Assignment Method												
		_	Link Si	ide					PLC S	ide		
	Dev. N	ame	Points	Start	End		Dev. N	ame	Points	Start	End	
Transfer SB	SB		512	0000	01FF	+	SB	-	512	0000	01FF	
Transfer SW	SW		512	0000	01FF	- ₩	SW	-	512	0000	01FF	
Transfer 1	RX	-	256	0000	00FF	÷	X	-	256	1000	10FF	
Transfer 2	RY	٠	256	0000	00FF	+	γ	-	256	1000	10FF	
Transfer 3	RWw	4	256	0000	00FF	+	W	-	256	000000	0000FF	
Transfer 4	RWr	-	256	0000	00FF	+	W	-	256	001000	0010FF	
Transfer 5						- + + -						
Transfer 6		-				+		-				
Transfer 7		-				+		-				
Transfer 8		-				+		-			-	
Default Check End Cancel												

### Table 4-3 Refresh parameters setting

Link Side				PLC Side		
Device Name	Start	End		Device Name	Start	
SB	0000	01FF	$\leftrightarrow$	SB	0000	
SW	0000	01FF	$\leftrightarrow$	SW	0000	
RX	0000	00FF	$\leftrightarrow$	Х	1000	
RY	0000	00FF	$\leftrightarrow$	Y	1000	
RWw	0000	00FF	$\leftrightarrow$	W	000000	
RWr	0000	00FF	$\leftrightarrow$	W	001000	

- (2) Settings for the intelligent device station.
  - a) Select [LCPU] in [PLC Series] and [LJ72GF15-T2] for [PLC Type] and create a project. [Project]→[New Project]

New Project		
Project Type: Simple Project	~	OK Cancel
PLC Series:	_	
PLC Type:		
LJ72GF15-T2	⊡	
Language; Ladder	v	

b) Open the PLC parameter setting screen and configure the setting as follows.

Project window→[Parameter]→[PLC Parameter]→[Communication Head Setting]

C-Link IE Field Communication Head Parameter Setting						
Communication Head Setting PLC Name PLC System PLC RAS Operation Setting I/O Assignment						
CC-Link IE Field Network Setting						
Mode Online						
Network No. 1 (1 to 239)						
Station No. 1 (1 to 120)						
* Operating with station No. setting of CC IE Field diagnostics in master station when network No. and station No. are blank in online setting.						
Hold (Store in flash ROM) PLC diagnostic error history and system error history by POWER-OFF/RESET.						

	Set value
Mode	Online
Network No.	1
Station No.	1

c) Open the new module setting screen and configure the setting as follows.

Project window→[Intelligent Function Module]→right-click→[New Module]

New Module	
Module Selection	
Module Type	Temperature Control Module
Module Name	L60TCTT4
Mount Position	Mounted Slot No. 0 Advoculadae I/O Accientment
Specify start XY	address 0000 (H) 1 Module Occupy [16 points]
Title Setting	
Title	
	OK Cancel

d) Open the switch setting screen and configure the setting as follows.

Project window  $\rightarrow$  [Intelligent Function Module]  $\rightarrow$  Module name  $\rightarrow$  [Switch Setting]

Switch S	etting (	0000:L60TCTT4	×
- Input C	: Mode Se Temperat Temperat	lection ure Input Mode ure Control Mode	٦
- Temp Outpu	erature ( ut Setting	Control Mode Setting at CPU Stop Error	
	CH CH1 CH2	Output Setting at CPU Stop Error 0:CLEAR 0:CLEAR	
	CH3 CH4	0:CLEAR 0:CLEAR	
Contro 0::	ol Mode S Standard	Control	
	Temperat	reace Limiter Secting     vire Rise/Temperature Drop Batch Setting     vire Linit Selection Setting	[
0:	1s Cycle	▼	
Auto-se	etting at I	nput Range Change	
0: Samplin	Disable g Cycle S	election	
O:	500ms	•	リ
This dia Default if the Sv	log settin value will witch Sett	g is linked to the Switch Setting of the PLC parameter. be shown in the dialog ing of the PLC parameter contains an out-of-range value. OK Cancel	

# Table 4-5 Switch setting

Item	Set value
Input mode selection	Temperature control mode
Control mode selection	0: Standard control
Setting change rate limiter setting	0: Temperature rise/temperature drop batch setting
Control output cycle unit selection setting	0: 1 s cycle
Auto-setting at input range change	0: Disable
Sampling cycle selection	0: 500ms

- e) Open the parameter setting window and configure the settings as follows.
- Project window→[Intelligent Function Module]→Module name→[Parameter]
- f) Click the [Clear Value for Gray Cells] button to set unnecessary items to 0.
- g) Set the following parameters.

ontrol Mode:Standard Control	Clear Value for	r Gray Cells * Set the value of un	necessary items for control mode	to 0.
Item	CH1	CH2	CH3	CH4
Basic setting	Set the temperature conve	rsion system.		
Input range	2:ThermocoupleK Measured Temperature Range(0 to 1300 C)			
Set value (SV) setting	200 C	0 C	0 C	0 C
Unused channel setting	0:Used	1:Unused	1:Unused	1:Unused
Conversion enable/disable setting	1:Disable	1:Disable	1:Disable	1:Disable
Control basic parameter setting	The Q64TC exercises tempe	rature adjustment control au	tomatically by merely setting	g the PID constants
Proportional band (P) 	3.0 %	3.0 %	3.0 %	3.0 %
Cooling proportional band (Pc) setting	3.0 %	3.0 %	3.0 %	3.0 %
Integral time (I) setting	240 s	240 s	240 s	240 s
<ul> <li>Derivative time (D) setting</li> </ul>	60 s	60 s	60 s	60 s
Control output cycle setting/Heating control output cycle setting.	30 s	30 s	30 s	30 s
Control response parameter	0:Slow	0:Slow	0:Slow	0:Slow
Stop Mode Setting	1:Monitor	1:Monitor	1:Monitor	1:Monitor
<ul> <li>PID continuation flag</li> </ul>	0:Stop			
Control detail parameter setting	The Q64TCTT(BW) allows yo temperatures of the above	u to set the temperature me thermocouples.	asurement ranges which mee	t the operating
Forward/reverse action setting	1:Reverse Action	1:Reverse Action	1:Reverse Action	1:Reverse Action
<ul> <li>Upper limit setting limiter</li> </ul>	400 C	1300 C	1300 C	1300 C
<ul> <li>Lower limit setting limiter</li> </ul>	0 C	0 C	0 C	0 C
Setting change rate limiter or Setting change rate limiter (Temperature rise)	0.0 %	0.0 %	0.0 %	0.0 %
Setting change rate limiter (Temperature drop)	0.0 %	0.0 %	0.0 %	0.0 %
Sensor correction value setting	0.00 %	0.00 %	0.00 %	0.00 %
Primary delay digital filter setting	0 s	0 s	0 s	0 s
Upper limit output limiter/Heating upper limit output limiter	100.0 %	100.0 %	100.0 %	100.0 %

#### **Table 4-6 Parameter setting**

Item	Item	CH1	CH2	CH3	CH4
Basic	Input range	2: Thermocouple K	2: Thermocouple K	2: Thermocouple K	2: Thermocouple K
setting		Measured Temperature	Measured Temperature	Measured Temperature	Measured Temperature
		Range (0 to 1300°C)	Range (0 to 1300°C)	Range (0 to 1300°C)	Range (0 to 1300°C)
	Set value (SV) setting	200°C	0°C	0°C	0°C
	Unused channel setting	0: Used	1: Unused	1: Unused	1: Unused
Alert	Upper limit setting limiter	400°C	1300°C	1300°C	1300°C
function	Lower limit setting limiter	0°C	0°C	0°C	0°C
setting	Alert 1 mode setting	1: Upper limit input alert	0: Not warning	0: Not warning	0: Not warning
	Alert set value 1	500°C	0°C	0°C	0°C

\*For parameters other than above, use the default values.
h) Open the auto refresh window and configure the settings as follows.

Project window→[Intelligent Function Module]→Module name→[Auto Refresh]

Item	CHI	CH2	CH3	CH4
ransfer to CPU	The data of the buffer m	emory is transmitted to the sp	ecified device.	
Error code	W1050			
<ul> <li>Temperature process value (PV)</li> </ul>	W1051			
Manipulated value (MV)				
Transistor output flag				
Alert definition				
Manipulated value				
value (MVb) for another analog				
module output				
Temperature rise judgment flag				
- Set value (SV) monitor				
AT Simultaneous temperature rise				
parameter calculation flag				
<ul> <li>Self-tuning flag</li> </ul>				
Temperature conversion completion flag				
<ul> <li>Process value (PV) scaling value</li> </ul>				
Simultaneous temperature rise status				
Cooling-side manipulated value				
(MVc)				

## Table 4-7 Auto refresh setting

	Item	CH1	CH2	CH3	CH4		
Transfer to CPU	Error code	W1050					
	Temperature process value (PV)	W1051	-	-	-		

## Devices

This program uses the following devices.

No.	Device	Data Type	Application	Remarks
1	X22	Bit	Error code reset instruction	-
2	X23	Bit	Operation mode setting instruction	-
3	X24	Bit	Memory of PID constants read	-
			instruction	
4	X1000	Bit	Module READY flag	Used by the system and cannot be
5	X1002	Bit	Error occurrence flag	used by the user.
6	Y60 to Y6F	Word	Error code output	-
7	Y1001	Bit	Setting/operation mode instruction	-
8	Y1002	Bit	Error reset instruction	-
9	Y1008	Bit	Set value backup instruction	-
10	Y100B	Bit	Setting change instruction	-
11	D9	Word	Data storage device for	-
			Z(P).REMTO instruction	
12	D10	Word	Data storage device for Z(P).REMFR	-
			instruction	
13	D11	Word	Data storage device for	-
			Z(P).REMTO instruction	
14	MO	Bit	Master module status check device	-
15	M300	Bit	CH1 Memory of PID constants read	-
			flag	
16	M301	Bit	CH1 Memory of PID constants read	-
			flag	
17	M302	Bit	CH1 Memory of PID constants read	-
			flag	
18	M303	Bit	CH1 Memory of PID constants read	-
			flag	
19	M304	Bit	CH1 Memory of PID constants read	-
			flag	
20	M305	Bit	CH1 Memory of PID constants read	-
			flag	
21	M310	Bit	Z(P).REMTO instruction	-
			completion/result device	
22	M311	Bit	Z(P).REMTO instruction	-
			completion/result device	

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No.	Device	Data Type	Application	Remarks
23	M312	Bit	Z(P).REMFR instruction	-
			completion/result device	
24	M313	Bit	Z(P).REMFR instruction	-
			completion/result device	
25	M314	Bit	Z(P).REMTO instruction	-
			completion/result device	
26	M315	Bit	Z(P).REMTO instruction	-
			completion/result device	
27	W1050	Word	Error code	-
28	W1051	Word	CH1 Temperature process value	-
			(PV)	
29	SB49	Bit	Data link status (own station)	-
30	SW0B0.0	Bit	Data link status (each station)	-
			(station number 1)	

## Version Upgrade History

Version	Date	Description
1.00A	2012/01/16	First edition

## Program

* Sampl * Funct * Versic * * <prog *</prog 	e ladder progr ion : Tempera on : Ver.1.00A ram that chec I	ram Name ture input cks the da	:01 RdTm; ta link sta	o tus of the	head mo	dule>				(Chack ba	ad modulo (	lata link 🔉
	SB49 S1	WOB0.0								CONECK NE	au mouule (	
0	Data lin Ea k status da (own st ks ation) , s	ach st ata lin status st No1								—-[мс	NO	M0 } Masterm odulest atusche ckdev
* * < Prog	ram that chan	ngee the e	etting/on	aration mo	(ab)							
*		igeo trie o	ctung, op		/uc/							
	V02 \	V100P								<change s<="" td="" to=""><td>etting/ope</td><td>ration mode≻</td></change>	etting/ope	ration mode≻
113	Operatio Se n mode s ch et instr ns uction or	etting nange i structi n										(Y1001) Setting/ operatio n mode i nst
*												
* < Prog *	ram that reads	s PID con:	stants froi	m non-vol	latile mer	nory>						
									<ch1 mem="" o<="" td=""><td>f PID cst re</td><td>ad inst:Yes≻</td></ch1>	f PID cst re	ad inst:Yes≻	
168	X24 Mem of P Ma ID const EA ants rea g d inst	X1000 	Y100B Setting change i structi	Y1008 Set valu e backup instruc tion						—[MOVP	K1	D9 } Z(P).REM TO data storage device
		Ŭ										40000
											-[SET	M300 } CH1 Mem of PID c st read flag
232	M300  1  CH1 Mem of PID c st read flag	[	ZP.REMT(	)	″J1″	K1	K1	HO	H3E	D9 Z(P).REM TO data storage device	К1	M310 } Z(P).REM TO compl etion/re sult dev
252	M310 Z(P).REM Z( TO compl TC etion/re et sult dev su	M311 (P).REM Ocompl tion/re ult dev									-[SET	M301 } CH1 Mem of PID c st read flag
255	M301 CH1 Mem CH of PID c of st read st flag fla	M302 H1 Mem C fPID c o :read s ag f	M303 HI Mem of PID c t read lag	M304 CH1 Mem of PID c st read flag							-[set	M302 } CH1 Mem of PID c st read flag

Continues on next page.

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