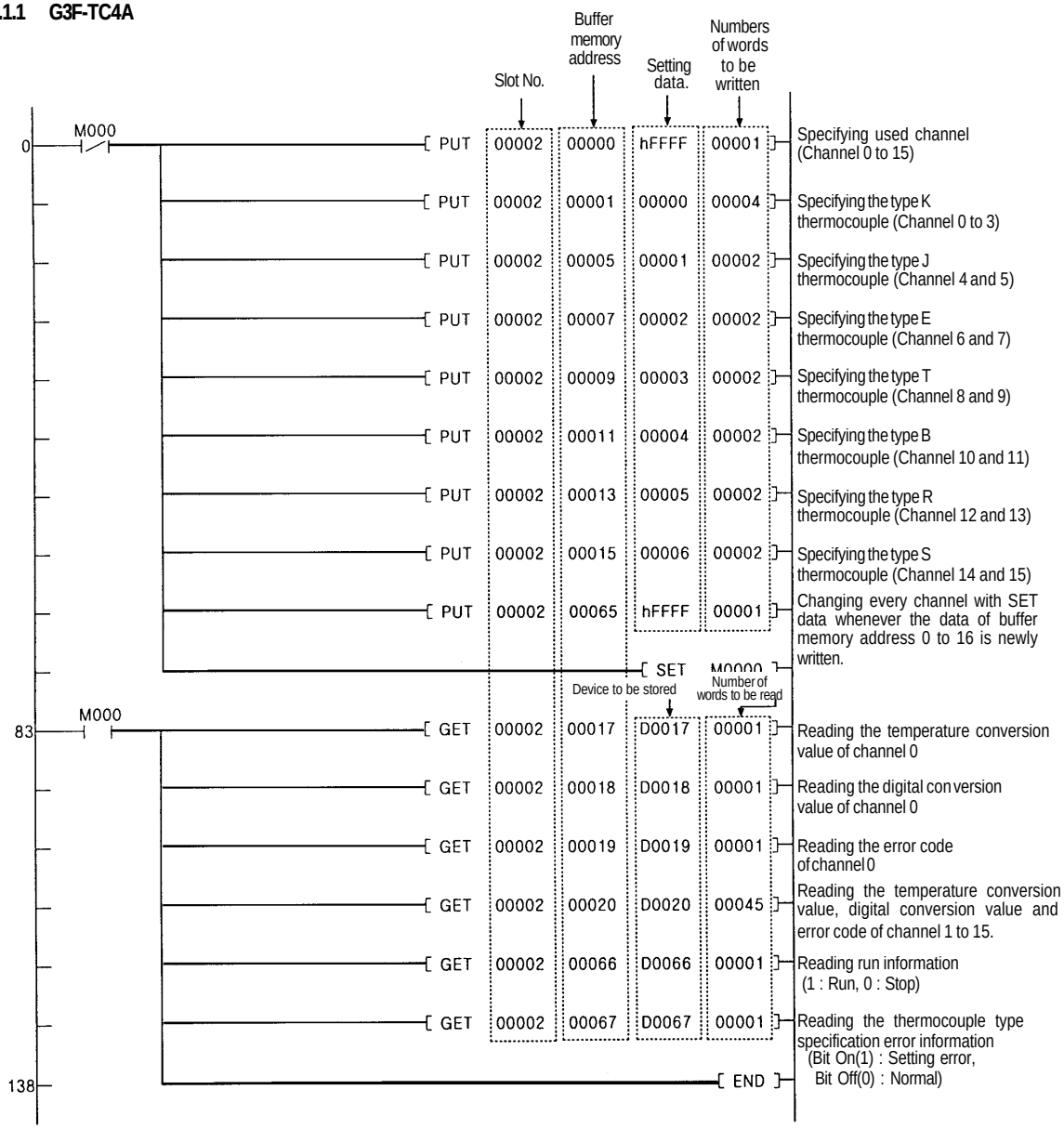
Chapter 8. PROGRAMMING

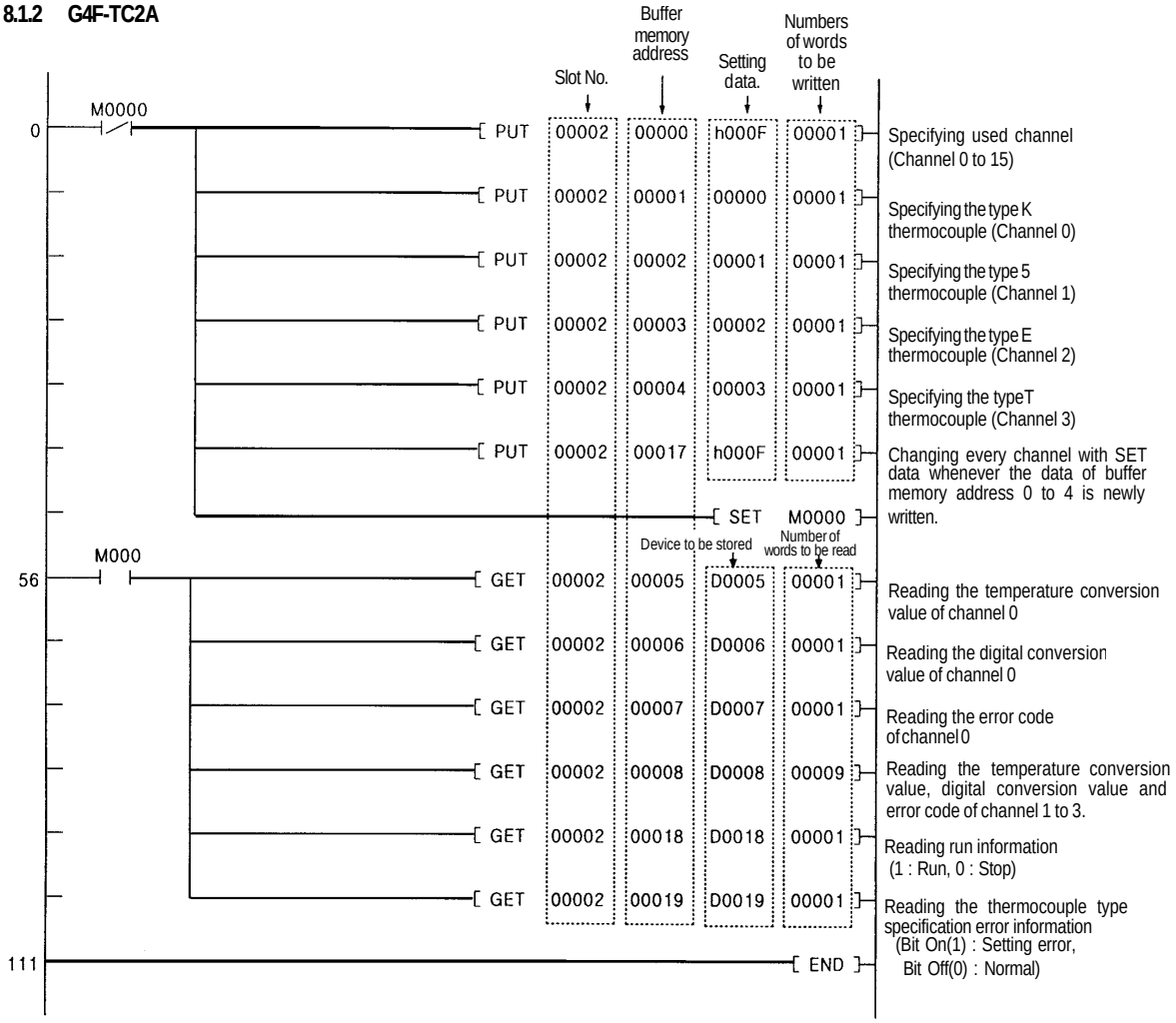
8.1 Basic Programming

- The following describes the method to set the running conditions in the buffer memories of the thermocouple-input module.
- The thermocouple input module is already mounted on the slot 2.
- The thermocouple input module occupies 16 I/O points.

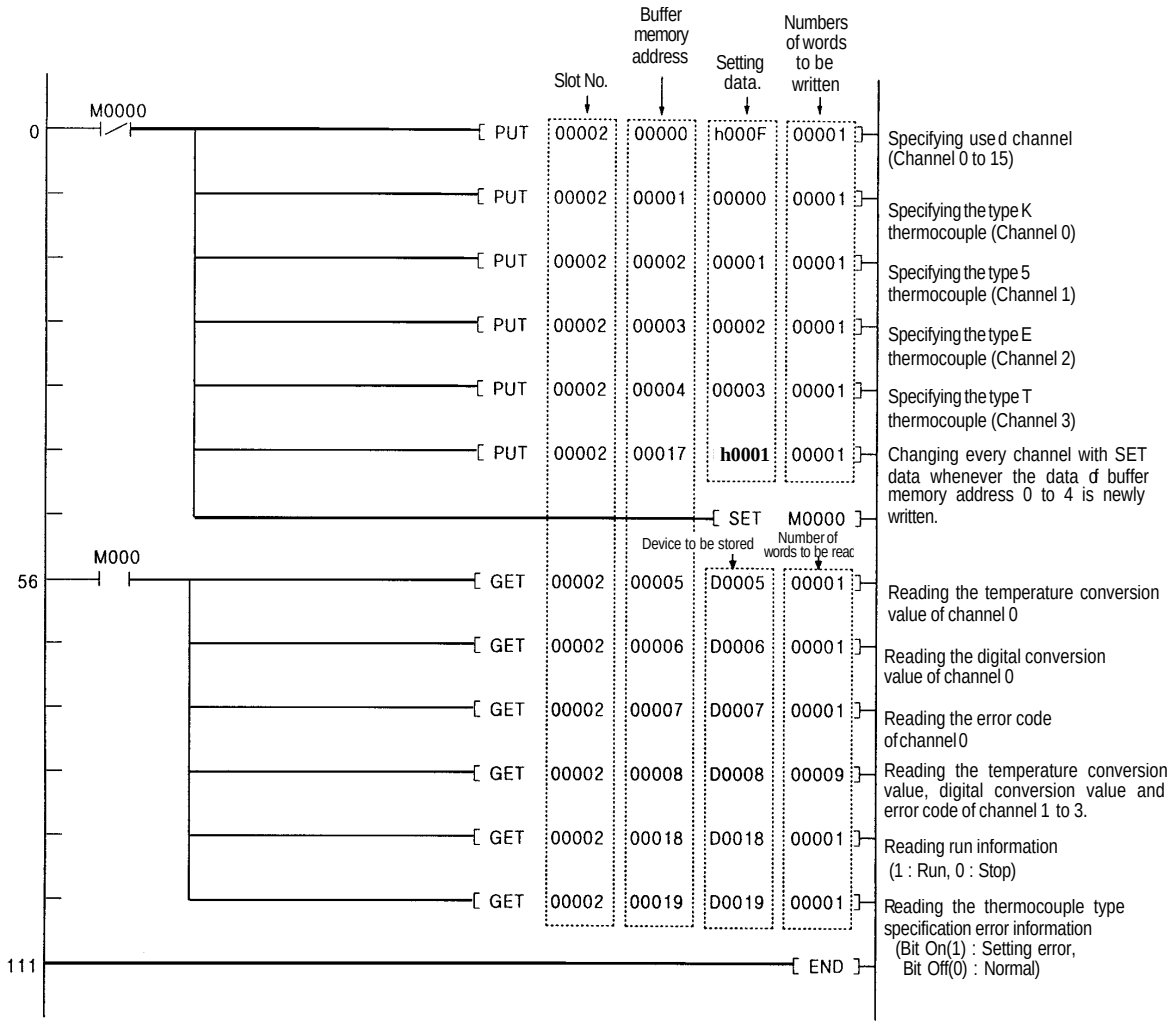
8.1.1 G3F-TC4A



8.1.2 G4F-TC2A


Slot No.
Buffer memory address
Setting data.
Numbers of words to be written
0
M0000
PUT 00002 00000 h000F 00001
Specifying used channel (Channel 0 to 15)
PUT 00002 00001 00000 00001
Specifying the type K thermocouple (Channel 0)
PUT 00002 00002 00001 00001
Specifying the type 5 thermocouple (Channel 1)
PUT 00002 00003 00002 00001
Specifying the type E thermocouple (Channel 2)
PUT 00002 00004 00003 00001
Specifying the type T thermocouple (Channel 3)
PUT 00002 00017 h000F 00001
Changing every channel with SET data whenever the data of buffer memory address 0 to 4 is newly written.
SET M0000
Device to be stored
Number of words to be read
56
M000
GET 00002 00005 D0005 00001
Reading the temperature conversion value of channel 0
GET 00002 00006 D0006 00001
Reading the digital conversion value of channel 0
GET 00002 00007 D0007 00001
Reading the error code of channel 0
GET 00002 00008 D0008 00009
Reading the temperature conversion value, digital conversion value and error code of channel 1 to 3.
GET 00002 00018 D0018 00001
Reading run information (1 : Run, 0 : Stop)
GET 00002 00019 D0019 00001
Reading the thermocouple type specification error information (Bit On(1) : Setting error, Bit Off(0) : Normal)
111
END

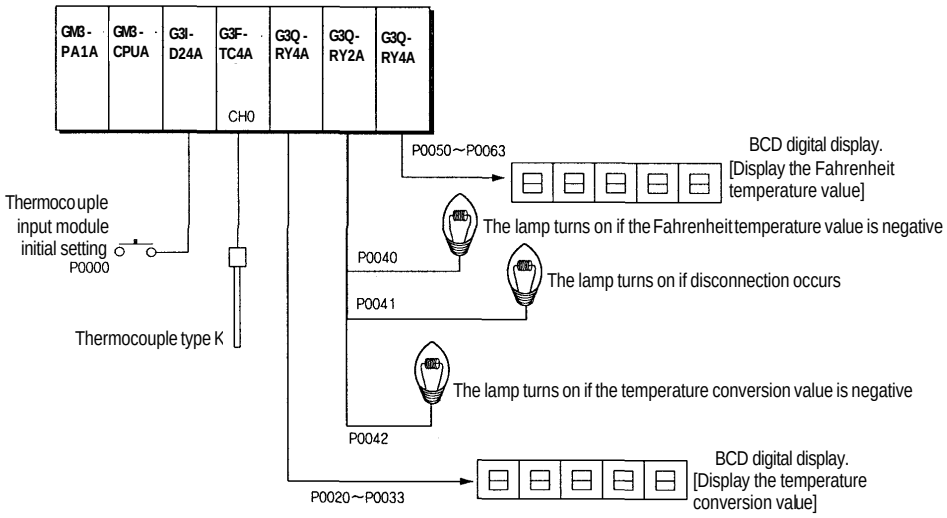
8.1.3 G6F-TC2A


Buffer memory address
Numbers of words to be written
Slot No.
Setting data.
M0000
0
PUT 00002 00000 h000F 00001
Specifying used channel (Channel 0 to 15)
PUT 00002 00001 00000 00001
Specifying the type K thermocouple (Channel 0)
PUT 00002 00002 00001 00001
Specifying the type 5 thermocouple (Channel 1)
PUT 00002 00003 00002 00001
Specifying the type E thermocouple (Channel 2)
PUT 00002 00004 00003 00001
Specifying the type T thermocouple (Channel 3)
PUT 00002 00017 h0001 00001
Changing every channel with SET data whenever the data of buffer memory address 0 to 4 is newly written.
SET M0000
Device to be stored
Number of words to be reac
M000
56
GET 00002 00005 D0005 00001
Reading the temperature conversion value of channel 0
GET 00002 00006 D0006 00001
Reading the digital conversion value of channel 0
GET 00002 00007 D0007 00001
Reading the error code of channel 0
GET 00002 00008 D0008 00009
Reading the temperature conversion value, digital conversion value and error code of channel 1 to 3.
GET 00002 00018 D0018 00001
Reading run information (1 : Run, 0 : Stop)
GET 00002 00019 D0019 00001
Reading the thermocouple type specification error information (Bit On(1) : Setting error, Bit Off(0) : Normal)
111
END

8.2 Application Programming

8.2.1 A program for Conversing a Detected Temperature Value(°C) into Fahrenheit(°F) and Outputting as a BCD Value

1) System



2) Initial Setting

(1) Specifying used channel : Channel 0
(2) Specifying the type of the thermocouple : Type K

3) Expression for conversion of a temperature conversion value into a Fahrenheit temperature(°F)

$$\text{Temperature conversion value} = \text{Detected temperature value} \times 10$$

$$\text{Fahrenheit temperature}(^\circ F) = \text{Detected temperature value} \times 1.8 + 32$$

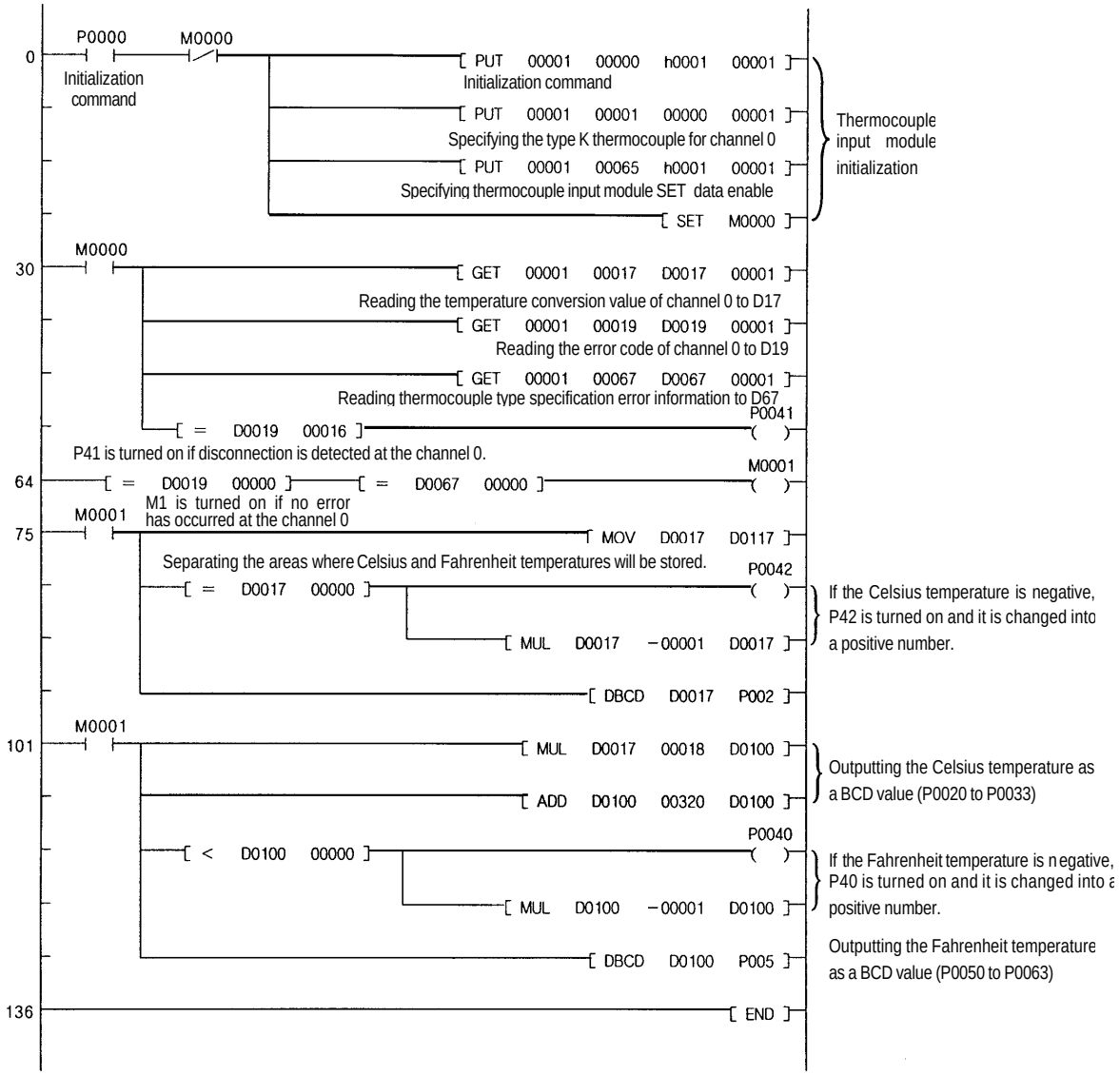
$$= \frac{\text{Temperature conversion value}}{10} \times 1.8 + 32$$

$$= \frac{\text{Temperature conversion value} \times 18 + 320}{10}$$

4) Program Description

(1) If P0000 turns on then the thermocouple input module would be initialized.
(2) The temperature conversion value is displayed on the BCD digital display of P0020 to P0033 If the value is negative the ramp P0042 will turn on.
(3) After the conversion of the temperature conversion value into a Fahrenheit temperature (°F), it will be displayed on the BCD digital display ofP0050 to P0063. If it is negative the ramp P0040 will turn on.
(4) If disconnection is detected during conversion of temperature of the channel 0, the ramp P0041 will turn on.

5) Program


0
P0000
M0000
Initialization command
[PUT 00001 00000 h0001 00001]
Initialization command
[PUT 00001 00001 00000 00001]
Specifying the type K thermocouple for channel 0
[PUT 00001 00065 h0001 00001]
Specifying thermocouple input module SET data enable
[SET M0000]
Thermocouple input module initialization
30
M0000
[GET 00001 00017 D0017 00001]
Reading the temperature conversion value of channel 0 to D17
[GET 00001 00019 D0019 00001]
Reading the error code of channel 0 to D19
[GET 00001 00067 D0067 00001]
Reading thermocouple type specification error information to D67
[= D0019 00016]
P0041
P41 is turned on if disconnection is detected at the channel 0.
64
[= D0019 00000]
[= D0067 00000]
M0001
M1 is turned on if no error has occurred at the channel 0
75
M0001
[MOV D0017 D0117]
Separating the areas where Celsius and Fahrenheit temperatures will be stored.
[= D0017 00000]
P0042
[MUL D0017 -00001 D0017]
If the Celsius temperature is negative, P42 is turned on and it is changed into a positive number.
[DBCD D0017 P002]
101
M0001
[MUL D0017 00018 D0100]
[ADD D0100 00320 D0100]
Outputting the Celsius temperature as a BCD value (P0020 to P0033)
[< D0100 00000]
P0040
[MUL D0100 -00001 D0100]
If the Fahrenheit temperature is negative, P40 is turned on and it is changed into a positive number.
[DBCD D0100 P005]
Outputting the Fahrenheit temperature as a BCD value (P0050 to P0063)
136
[END]

8.2.2 A Program for Magnitude Comparison of a Detected Temperature Value

1) System Configuration

GM3-PA1A	GM3-CPUA	G3F-TC4A	G3Q-RY2A		

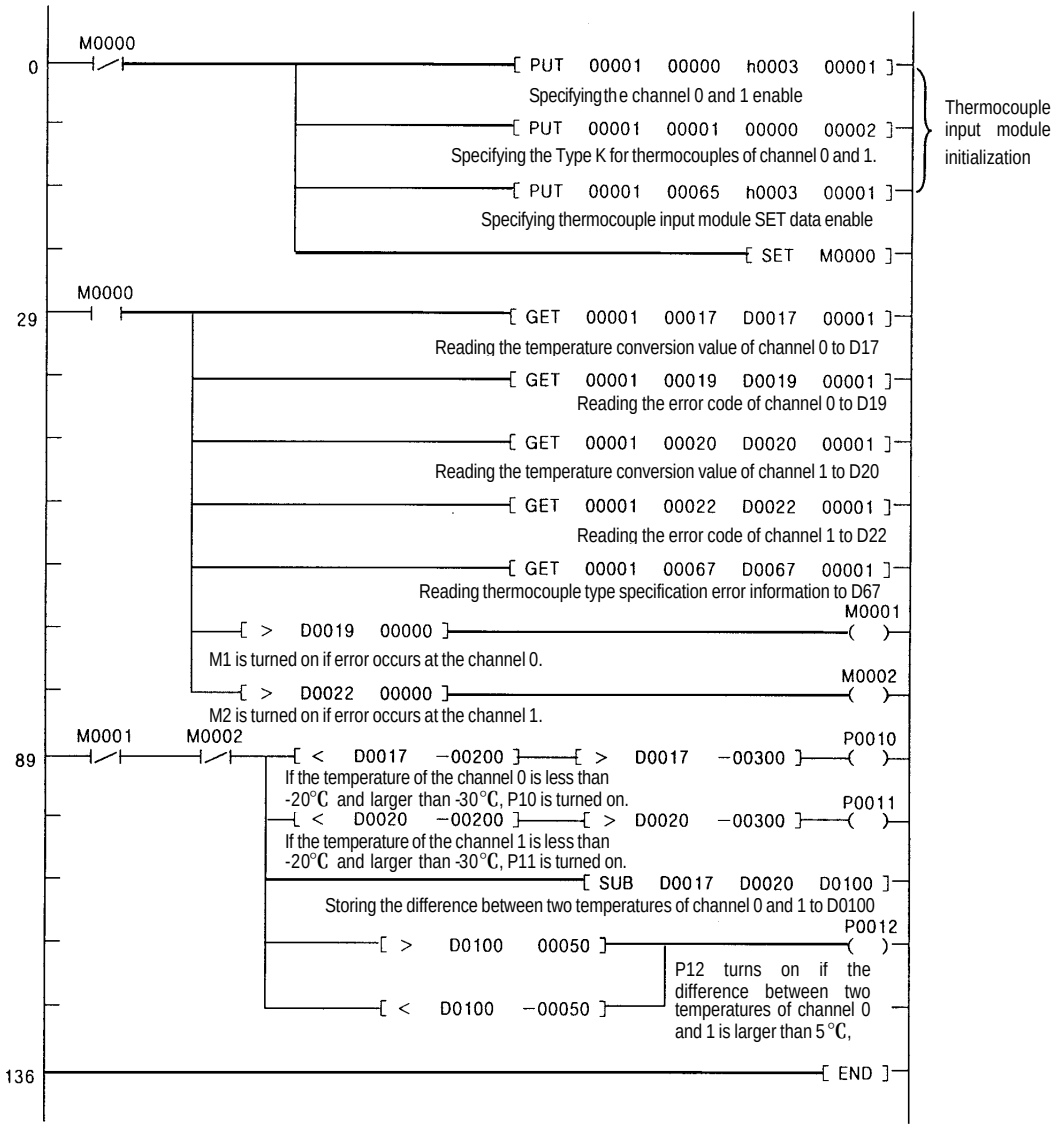
2) Initial Settings

(1) Specifying used channel : Channel 0, 1
(2) Specifying the type of the thermocouple : Type K

3) Program Description

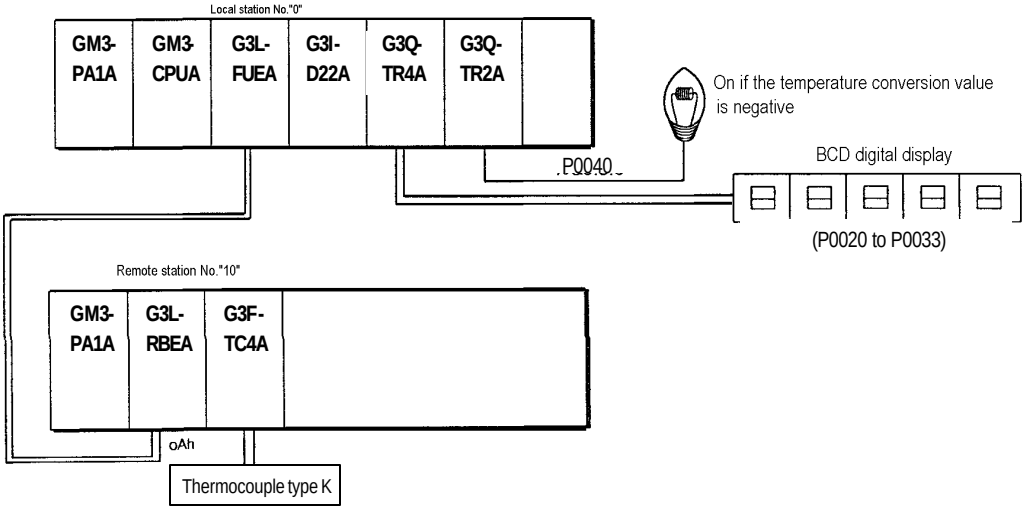
(1) If the temperature that is input through the channel 0 of the thermocouple input module is less than -20°C or larger than –30 °C, P0010 turns on.
(2) If the temperature that is input through the channel 1 of the thermocouple input module is less than -20°C or larger than –30 °C, P0011 turns on.
(3) If the difference between the two temperatures that are input through the channel 0 and 1 is larger than 5°C, P0012 turns on.

4) Program


M0000
0
[PUT 00001 00000 h0003 00001]
Specifying the channel 0 and 1 enable
[PUT 00001 00001 00000 00002]
Specifying the Type K for thermocouples of channel 0 and 1.
[PUT 00001 00065 h0003 00001]
Specifying thermocouple input module SET data enable
[SET M0000]
Thermocouple input module initialization
M0000
29
[GET 00001 00017 D0017 00001]
Reading the temperature conversion value of channel 0 to D17
[GET 00001 00019 D0019 00001]
Reading the error code of channel 0 to D19
[GET 00001 00020 D0020 00001]
Reading the temperature conversion value of channel 1 to D20
[GET 00001 00022 D0022 00001]
Reading the error code of channel 1 to D22
[GET 00001 00067 D0067 00001]
Reading thermocouple type specification error information to D67
[> D0019 00000]
M0001
M1 is turned on if error occurs at the channel 0.
[> D0022 00000]
M0002
M2 is turned on if error occurs at the channel 1.
M0001
M0002
89
[< D0017 −00200]
[> D0017 −00300]
P0010
If the temperature of the channel 0 is less than -20℃ and larger than -30℃, P10 is turned on.
[< D0020 −00200]
[> D0020 −00300]
P0011
If the temperature of the channel 1 is less than -20℃ and larger than -30℃, P11 is turned on.
[SUB D0017 D0020 D0100]
Storing the difference between two temperatures of channel 0 and 1 to D0100
[> D0100 00050]
[< D0100 −00050]
P0012
P12 turns on if the difference between two temperatures of channel 0 and 1 is larger than 5℃,
136
[END]

8.2.3 A Program Used When Mounting a Thermocouple Input Module on the Remote I/O Station

1) System Configuration



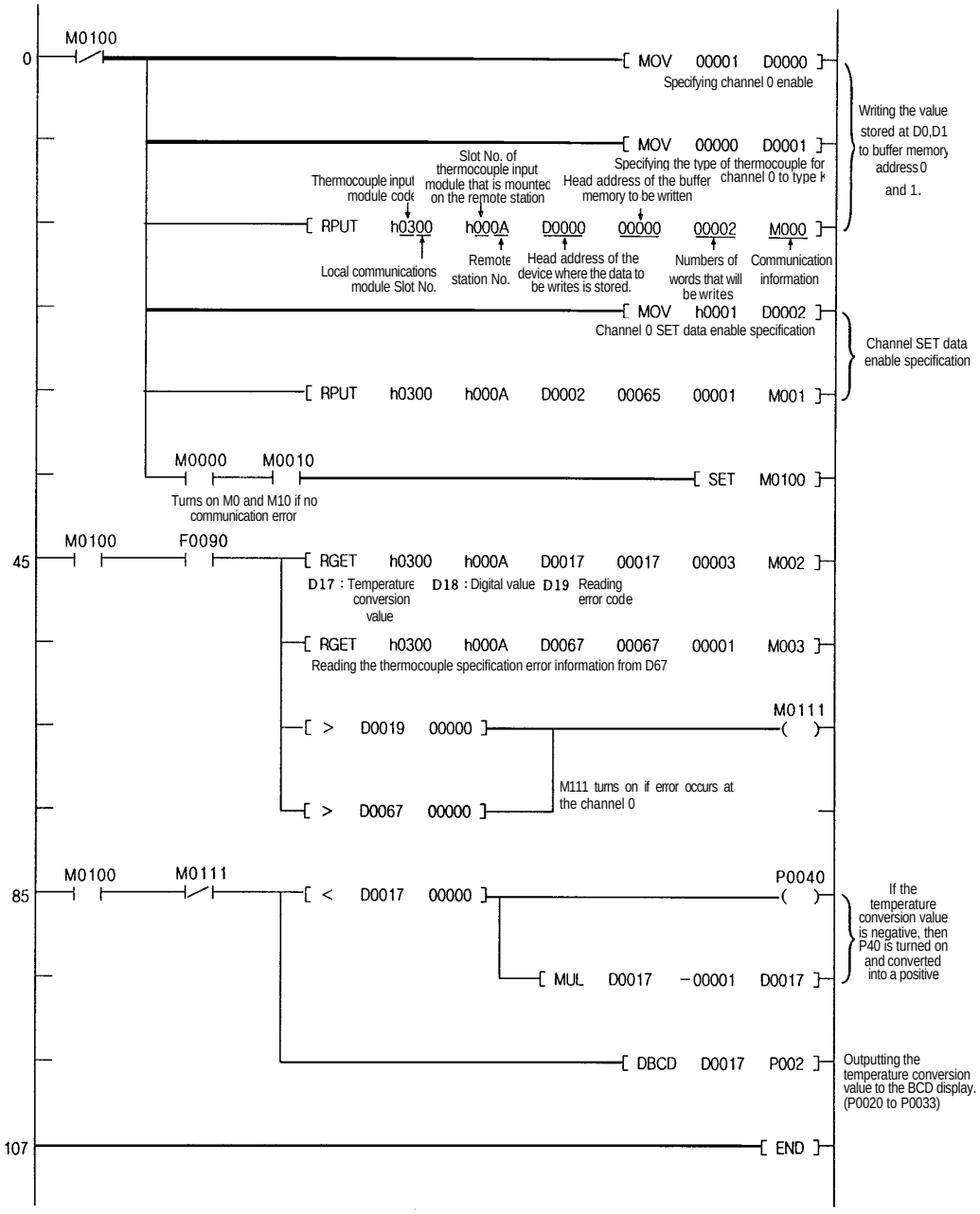
2) Initial Settings

(1) Specifying used channel : Channel 0
(2) Specifying the type of the thermocouple : Type K

3) Program Description

(1) P0040 will be turned on if the temperature conversion value is negative and the value will be converted into positive.
(2) If no error occurs, the temperature conversion value will be output to P0020 to P0033.

4) Program


0
M0100
[MOV 00001 D0000]
Specifying channel 0 enable
[MOV 00000 D0001]
Specifying the type of thermocouple for channel 0 to type K
Writing the value stored at D0,D1 to buffer memory address 0 and 1.
Thermocouple input module code
Slot No. of thermocouple input module that is mounted on the remote station
Head address of the buffer memory to be written
[RPUT h0300 h000A D0000 00000 00002 M000]
Local communications module Slot No.
Remote station No.
Head address of the device where the data to be writes is stored.
Numbers of words that will be writes
Communication information
[MOV h0001 D0002]
Channel 0 SET data enable specification
Channel SET data enable specification
[RPUT h0300 h000A D0002 00065 00001 M001]
M0000 M0010
[SET M0100]
Turns on M0 and M10 if no communication error
45
M0100 F0090
[RGET h0300 h000A D0017 00017 00003 M002]
D17 : Temperature conversion value
D18 : Digital value
D19 Reading error code
[RGET h0300 h000A D0067 00067 00001 M003]
Reading the thermocouple specification error information from D67
[> D0019 00000]
M0111
M111 turns on if error occurs at the channel 0
[> D0067 00000]
85
M0100 M0111
[< D0017 00000]
P0040
[MUL D0017 -00001 D0017]
If the temperature conversion value is negative, then P40 is turned on and converted into a positive
[DBCD D0017 P002]
Outputting the temperature conversion value to the BCD display. (P0020 to P0033)
107
[END]