21 Using Scripts

(Programming without Parts)

This chapter explains how you can use GP-Pro EX to "Program without Parts" and how to create scripts.
Please start by reading "21.1 Settings Menu" (page 21-2) and then turn to the corresponding page.

21.1 Settings Menu

You can use D-Scripts to create simple programs. Using this feature, you can perform operations on the GP or communicate between the GP and unsupported peripheral devices.

⚠ WARNING

Be sure to not use D-Scripts/Global D-Scripts to control systems that can cause life-threatening or serious injury.

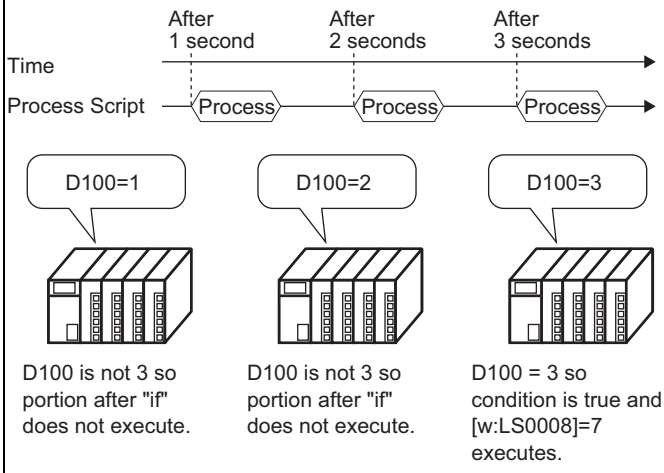
NOTE

- D-Scripts are set up on a Base Screen. That Base Screen looks at the conditions while it is displayed and executes the script.
- When the GP is running, a Global D-Script runs based on the trigger, regardless of the screen displayed.
- Extended Scripts should be used for high-level communication programs.
- In addition to scripts, you can use logic programs for control applications.

☞ "28.1 Settings Menu" (page 28-2)

Conditional Operations

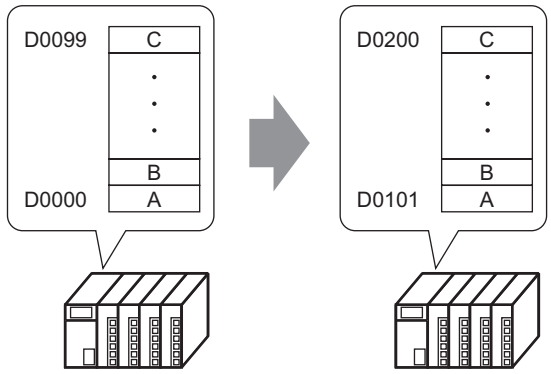
Create a script which automatically changes screens to screen number 7 after 3 seconds.



☞ Setup Procedure (page 21-7)
☞ Introduction (page 21-6)

Copying Data in Blocks

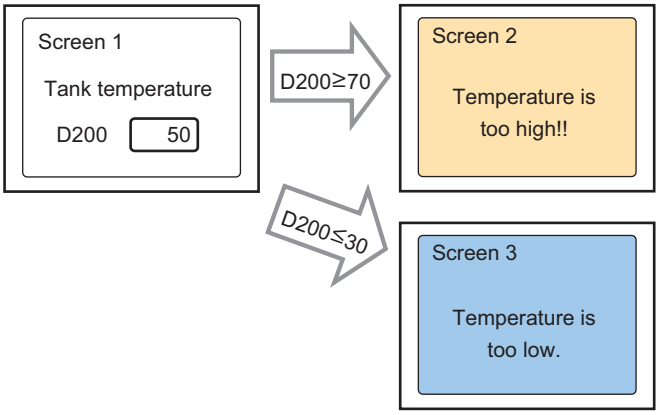
Create a script which detects the rising edge (0 to 1) of bit address M0100 and copies data stored in the connected device into another address.



☞ Setup Procedure (page 21-13)
☞ Introduction (page 21-12)

Displaying an Alarm When an Error Occurs

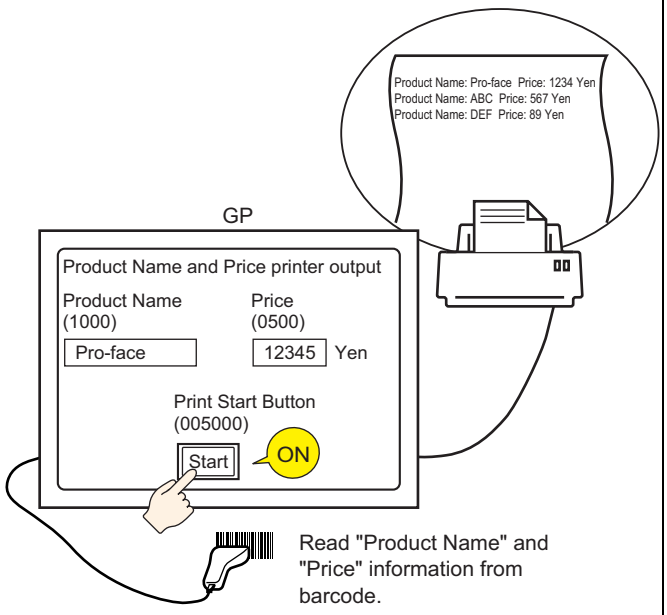
The temperature management system detects an error bit from the connected device and displays alarm messages when the temperature information storage address (D200) rises to 70 degrees C or higher, or falls to 30 degrees C or lower. Also, this script counts the number of detected errors.



☞ Setup Procedure (page 21-18)
☞ Introduction (page 21-17)

Communicating with Unsupported Peripheral Devices

Create an extended script to read data from a bar code connected to the USB port and output the data to a serial printer connected to COM1.



☞ Setup Procedure (page 21-34)
☞ Introduction (page 21-21)

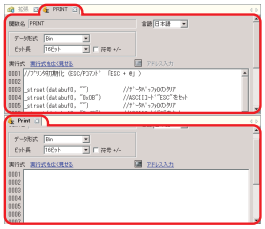
Referencing Other Scripts

On the [D-Script] dialog box, split the screen into two screens horizontally or vertically.

Screens are switched by clicking the tabs

Display/Edit two screens beside each other.

Tile Horizontally



Tile Vertically

☞ Operating Procedure (page 21-39)
☞ Introduction (page 21-38)

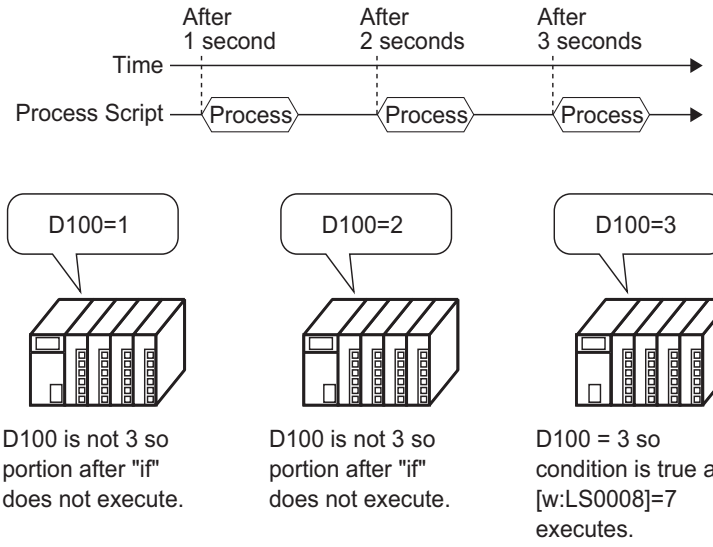
21.2 Conditional Operations

NOTE

- Please refer to the Settings Guide for details.
☞"21.9.1 D-Script/Common [Global D-Script] Settings Guide" (page 21-54)
- See the following for further information about commands that are available for scripts.
☞"21.11 Program Commands/Conditional Expressions" (page 21-68)

Action

Create a script which automatically changes screens to screen number 7 after 3 seconds.



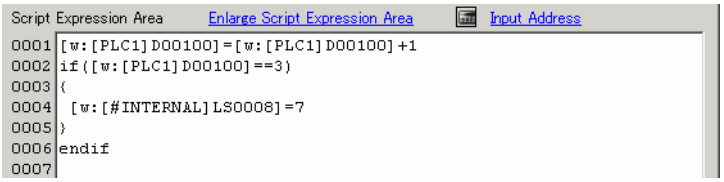
Commands Used

Command	Function Summary
Assignment (=)	Assign the value on the right hand side to the left hand side. ☞"21.11.10 Operator" (page 21-155)
Addition (+)	Adds a constant to a Word device's data. ☞"21.11.10 Operator" (page 21-155)
if ( )	When a condition becomes true, the process following the "if ( )" statement is executed. ☞"21.11.8 Conditional Expressions" (page 21-148)
Equivalent (==)	Compares the value on the right and left sides. Becomes true if the left side equals the right side. ☞"21.11.9 Comparison" (page 21-153)
LS0008	Changes to the screen number stored in this value. ☞"A.1.4.2 System Data Area" (page A-11)

Trigger

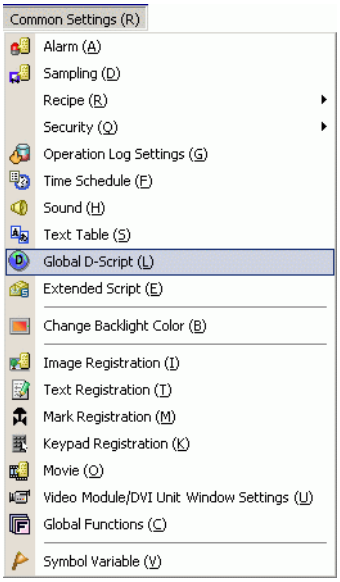
Select Timer and set the [Timer Settings] to 1 second.

Completed Script

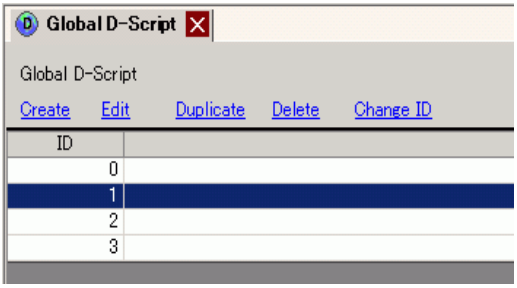


Creation Procedure

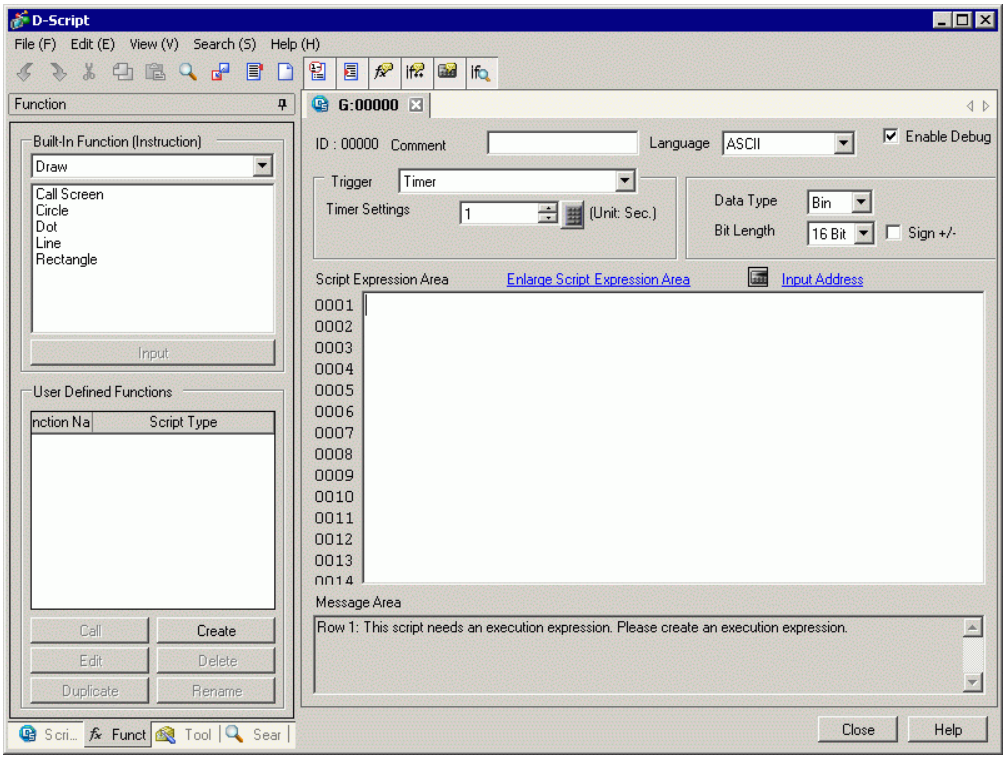
1 From the [Common Settings (R)] menu, select [Global D-Script (L)].



2 Click [Create]. To view an existing script, select the ID number and click [Edit], or double-click the ID number row.

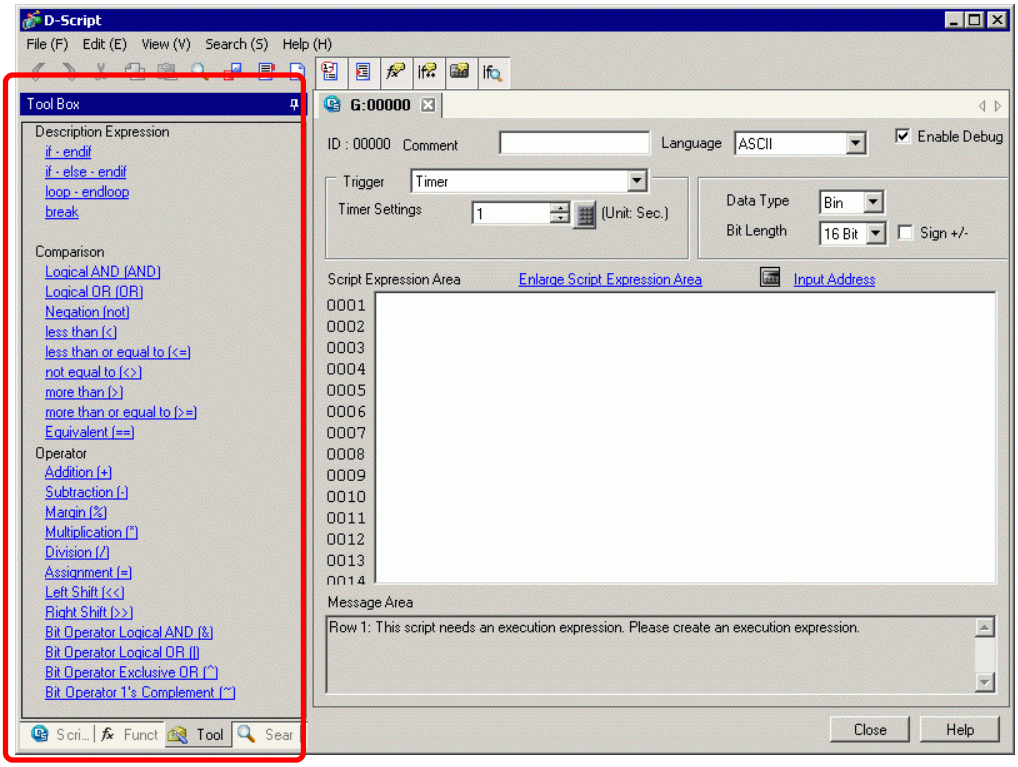


3 The [D-Script] dialog box is displayed.

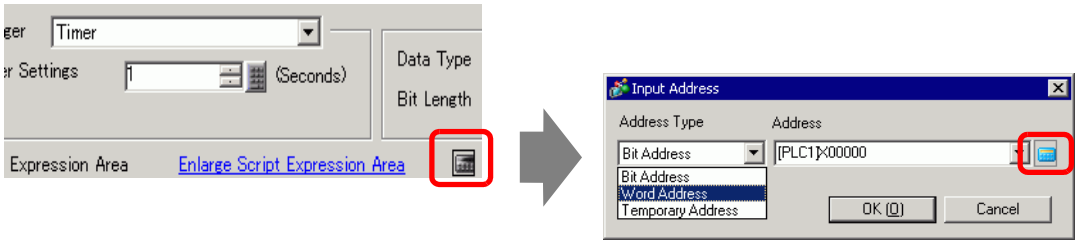


4 In [Trigger], select [Timer] and specify the [Timer Settings] as 1 second.

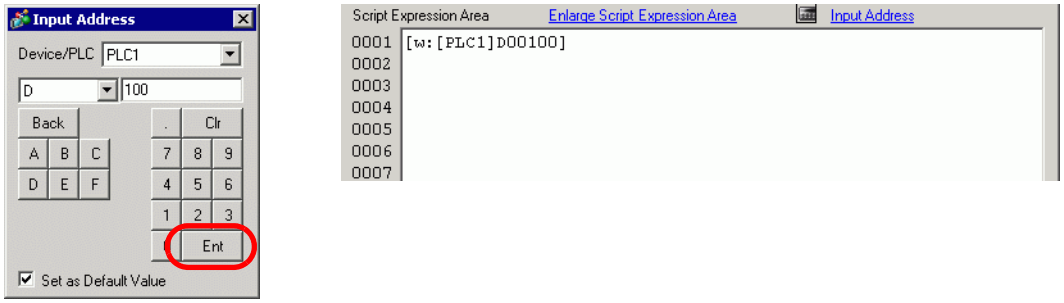
5 Click the [Tool Box] tab. The toolbox allows you to easily place a command to use in the script.



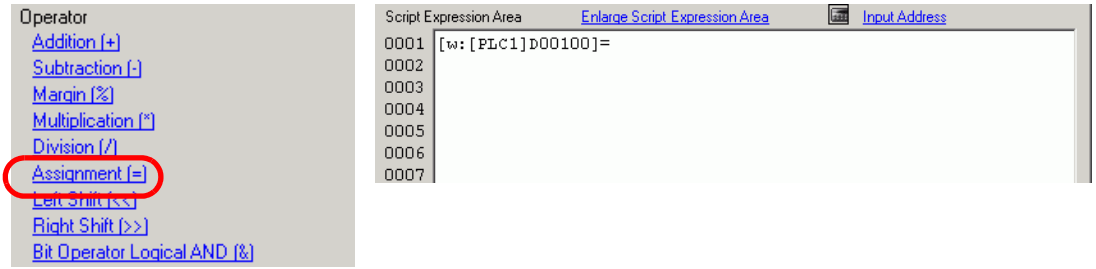
6 Create the first line of script. If you specify the D00100 default value as 0, the first line operation is a count operation that increases and stores the count every time a process completes.
Click [icon] and select [Word Address], then click [icon].



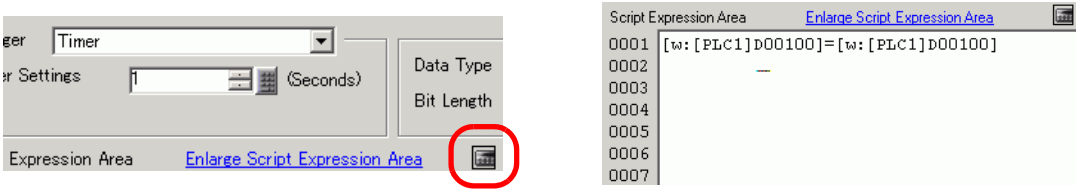
7 Input D00100, and click [ENT]. Click [OK] in the [Address Input] dialog box.



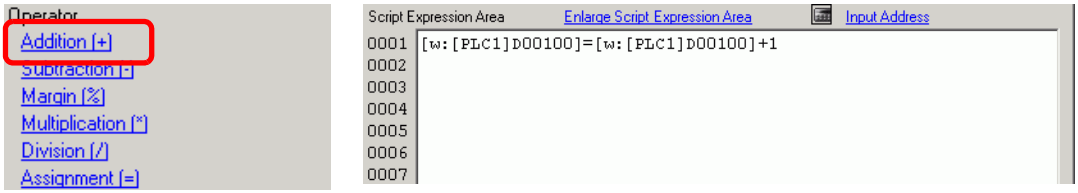
8 Click [Assignment (=)] in the Toolbox.



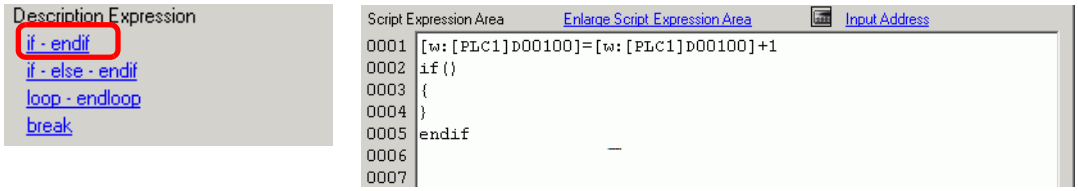
9 Place D00100 in the same way as steps 6 to 7.



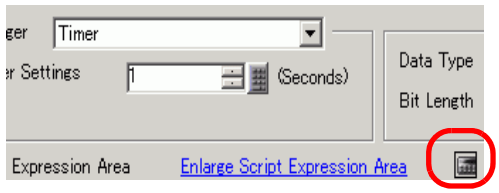
10 Click [Addition (+)] and type "1". The first row is now complete.

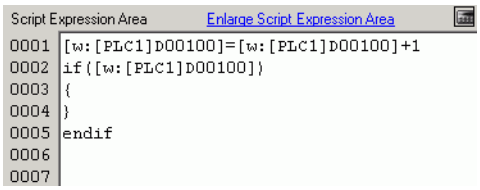


11 Create the second row of the script. In the second row, when a condition becomes true, the process following the "if ( )" statement is executed.
Click [if - endif].

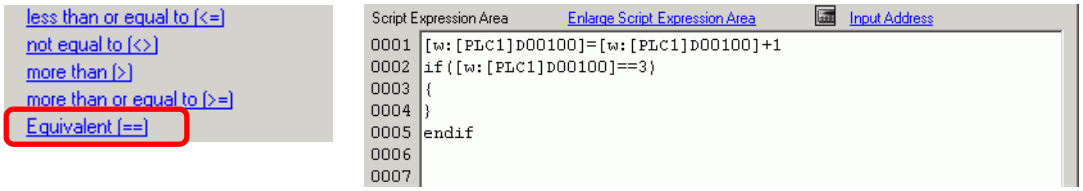


12 Create the conditional expression inside the brackets "( )" following "if". The conditional expression compares the value stored in D00100 to "3", and turns true if they are equal.Place the cursor inside the brackets "( )" and repeat steps 6 to 7 to place another D00100.

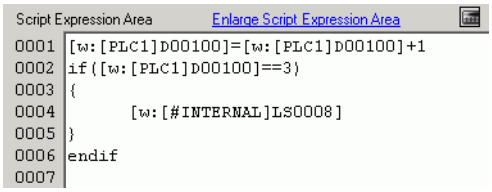




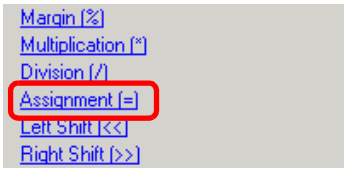
13 Click [Equivalent (==)] and input "3". The second row is now complete.

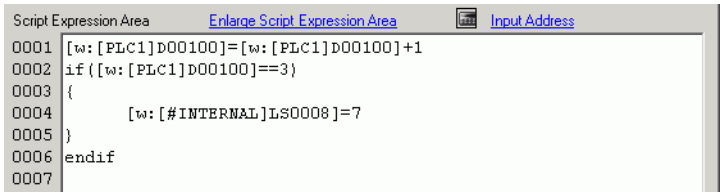


14 Place the cursor inside the "{ }" brackets and press Enter. Repeat steps 6 to 7 to place another LS0008.

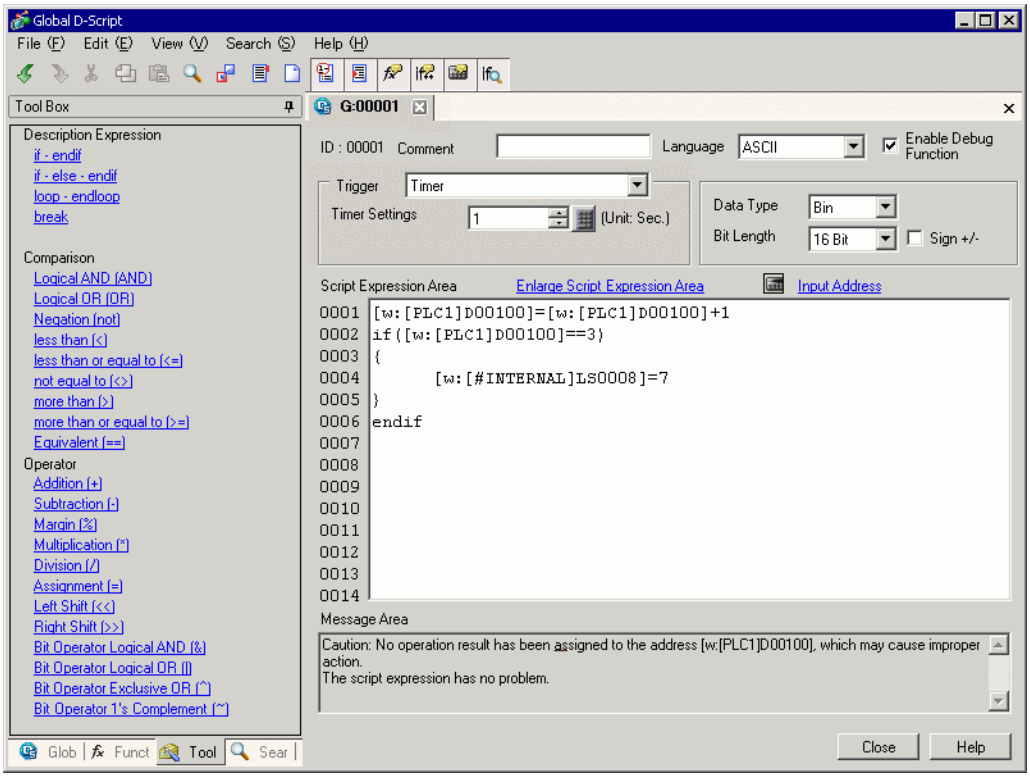


15 Click [Assignment (=)] and input "7".





16 The script is now complete.



NOTE

- When selecting text, press the [Ctrl] key + the [Shift] key + the [Right Arrow] key/[Left Arrow] key to select an entire block of text.
- Press the [Ctrl] key + the [F4] key to close the currently selected screen.
- Press the [Esc] key to overwrite and save the script or to delete it and exit.

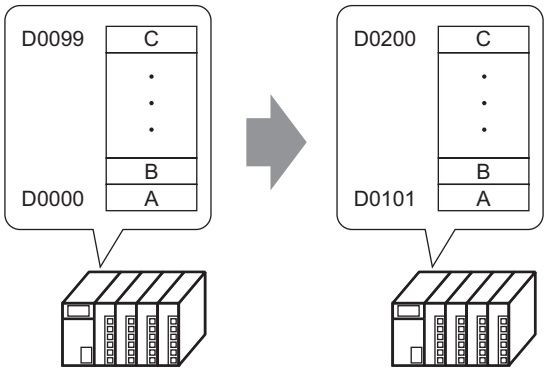
21.3 Copying Data in Blocks

NOTE

- Please refer to the Settings Guide for details.
☞"21.9.1 D-Script/Common [Global D-Script] Settings Guide" (page 21-54)
- See the following for further information about commands that are available for scripts.
☞"21.11 Program Commands/Conditional Expressions" (page 21-68)

Action

Create a script which detects the rising edge (0 to 1) of bit address M0100 and copies data stored in the connected device into another address.



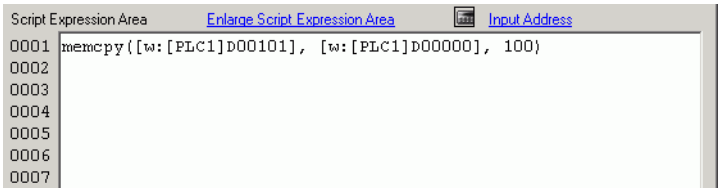
Commands Used

Command	Function Summary
Copy Memory memcpy ( )	Copies a stored value into a device in one operation. Data for the number of Addresses will be copied to the copy destination Word Addresses beginning from the source data's first Word Address. [Format] memcpy ([Copy To Address], [Copy From Address], Words) ☞"21.11.3 Memory Operation" (page 21-78)

Trigger

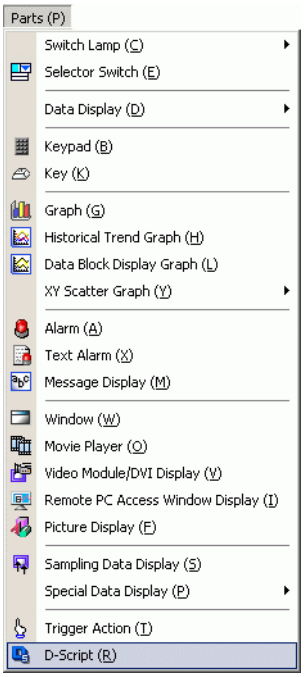
In [Trigger], select [Bit ON], and set the [Bit Address] to M000100.

Completed Script

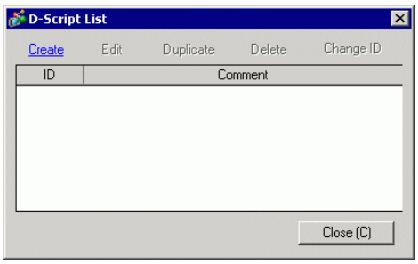


Creation Procedure

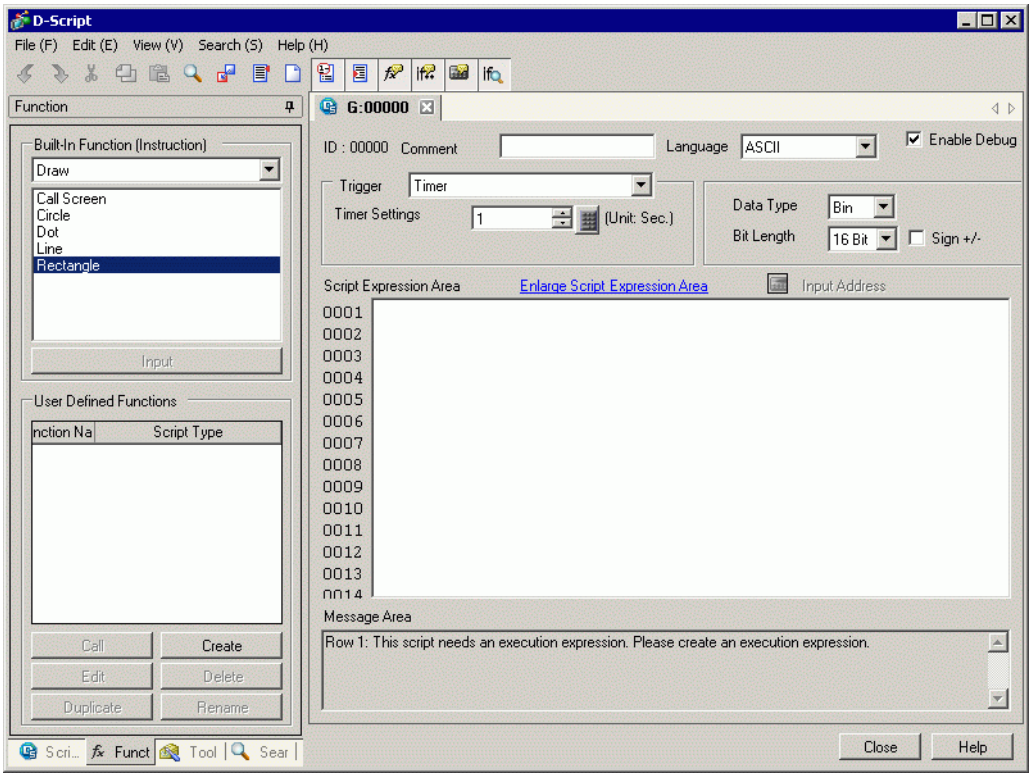
1 From the [Parts (P)] menu, select [D-Script (R)] or click  from the toolbar.



2 Click [Create]. The IDs for existing scripts are displayed in the [D-Script List].

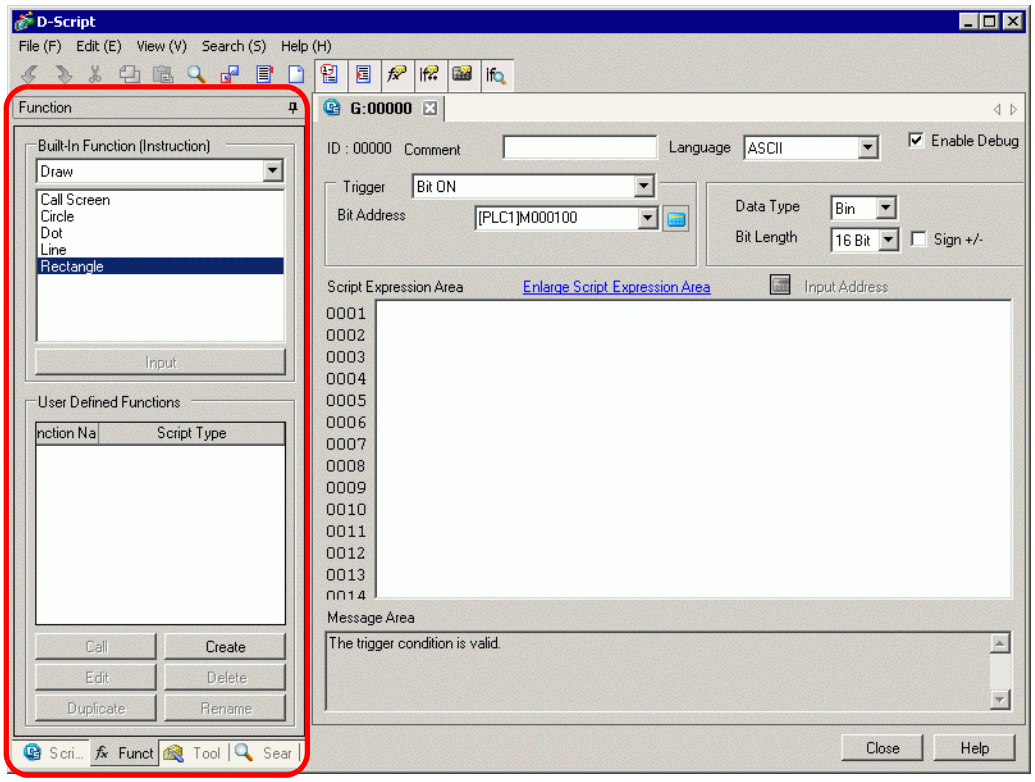


3 The [D-Script] dialog box is displayed.



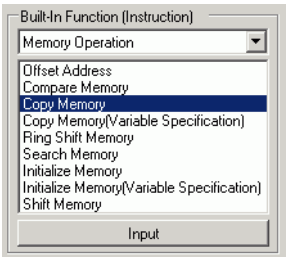
4 Select [Bit ON] in [Trigger] and specify M000100 as [Bit Address].

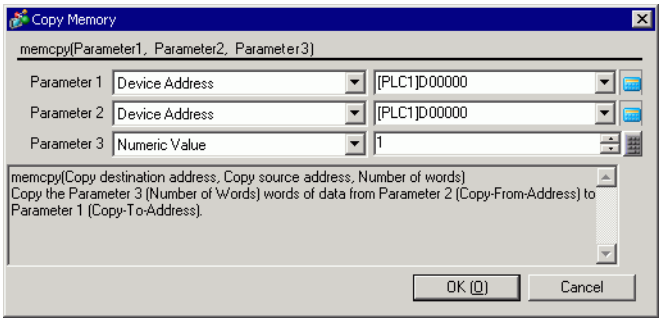
5 Click the [Function] tab. The built-in functions allow you to easily place a command to use in the script.



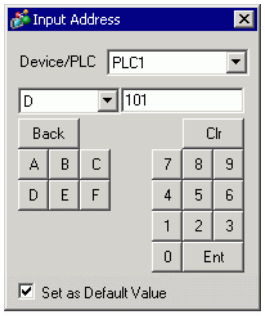
6 From [Built-in Function (Instruction)], select [Memory Operation].

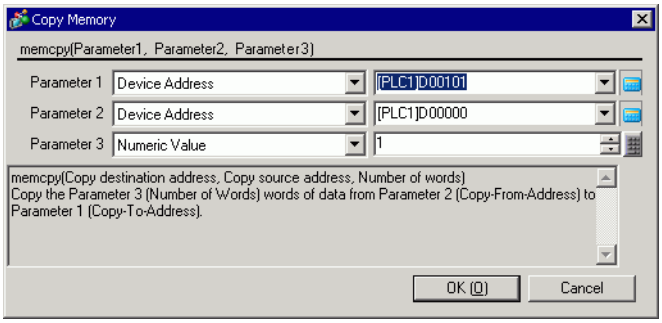
7 Double-click [Copy Memory], and in the dialog box that follows, define the parameters for the destination address, source address, and number of words. Click 





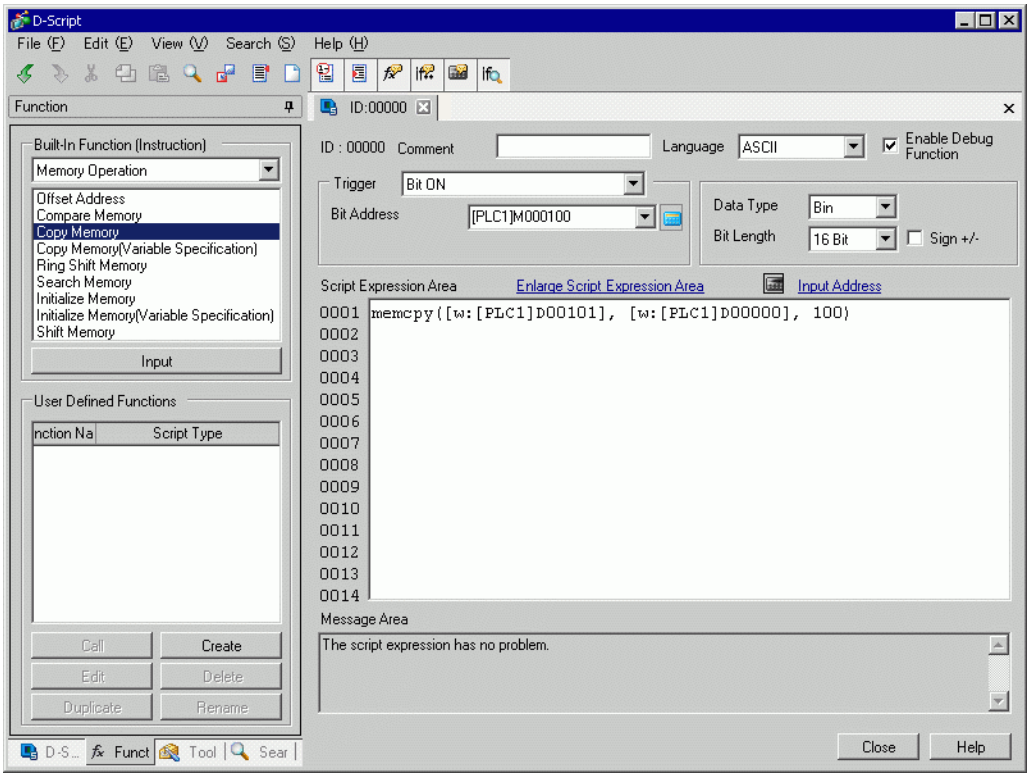
8 For [Parameter 1], enter D00101, and click [ENT].





9 For [Parameter 2] enter D00000, and click [OK].

10 The script is now complete.



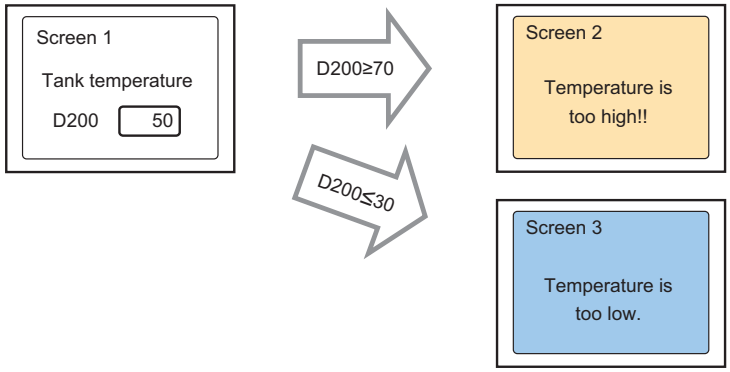
21.4 Displaying an Alarm When an Error Occurs

NOTE

- Please refer to the Settings Guide for details.
☞"21.9.1 D-Script/Common [Global D-Script] Settings Guide" (page 21-54)
- See the following for further information about commands that are available for scripts.
☞"21.11 Program Commands/Conditional Expressions" (page 21-68)

Action

The temperature management system detects an error bit from the connected device and displays alarm messages when the temperature information storage address (D200) rises to 70 degrees C or higher, or falls to 30 degrees C or lower. Also, this script counts the number of detected errors.



The address that counts each time D200 rises to 70 degrees C or higher and stores the number of times: LS0300
The address that counts each time D200 falls to 30 degrees C or lower and stores the number of times: LS0301
Address that stores the alarm screen number: LS0008

Commands Used

Command	Function Summary
if ( )	When the "if" condition, enclosed in brackets "( )", is true, the expression following the "if ( )" statement is run. ☞"21.11.8 Conditional Expressions" (page 21-148)
Greater than or equal to (>=)	True if N1 is greater than or equal to N2 (N1 >= N2). ☞"21.11.9 Comparison" (page 21-153)
Assignment (=)	Assign the value on the right hand side to the left hand side. ☞"21.11.10 Operator" (page 21-155)
Addition (+)	Adds a constant to a Word device's data. ☞"21.11.10 Operator" (page 21-155)
Less than or equal to (<=)	True if N1 is less than or equal to N2 (N1 <= N2). ☞"21.11.9 Comparison" (page 21-153)

Trigger

In [Trigger], select [Bit ON], and set the [Bit Address] to M000100.

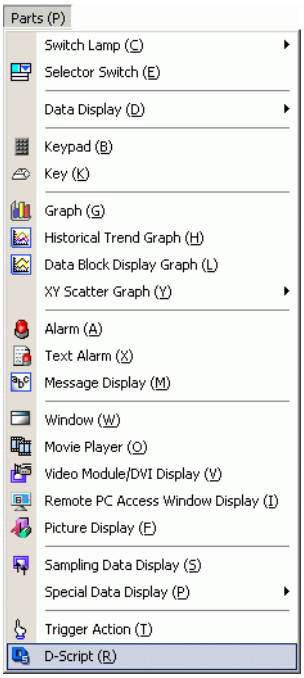
Completed Script

Script Expression Area Enlarge Script Expression Area Input Address

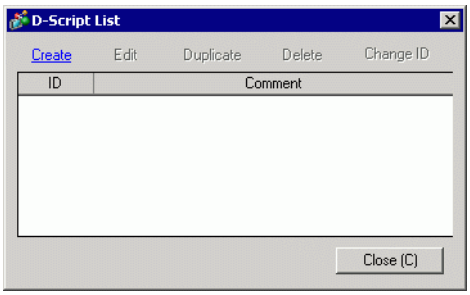
```
0001 if([w:[PLC1]D00200]>=70)                          //When temp is greater than 70 degrees
0002 {
0003     [w:[#INTERNAL]LS0302]=100                     //Greater than 70 degrees alarm screen number 100
0004     [w:[#INTERNAL]LS0300]=[w:[#INTERNAL]LS0300]+1 //Increase error count
0005 }
0006 endif
0007
0008 if([w:[PLC1]D00200]>=30)                          //When temp is greater than 30 degrees
0009 {
0010     [w:[#INTERNAL]LS0302]=101                     //Greater than 30 degrees alarm screen number 101
0011     [w:[#INTERNAL]LS0301]=[w:[#INTERNAL]LS0301]+1 //Increase error count
0012 }
0013 endif
0014
```

Creation Procedure

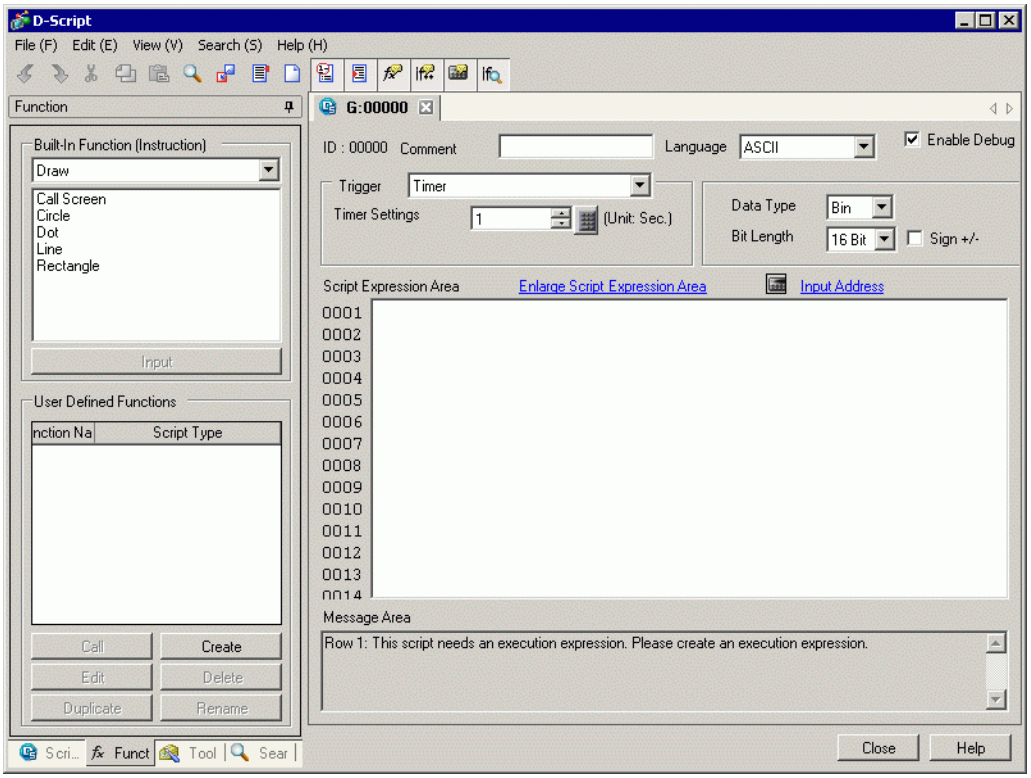
1 From the [Parts] menu, click [D-Script (R)] or click  .



2 Click [Create]. The IDs for existing scripts are displayed in the [D-Script List].



3 The [D-Script] dialog box is displayed.



4 Set up comments. Enter "Alarm Display".

5 In [Trigger], select [Bit ON], and specify the [Bit Address] as M00100.

6 Create a program by adding Functions, Statements, and Expressions to the Script Expression Area, to complete the script.

Script Expression Area Enlarge Script Expression Area Input Address

```
0001 if([w:[PLC1]D00200]>=70)                              //When temp is greater than 70 degrees
0002 {
0003     [w:[#INTERNAL]LS0302]=100                         //Greater than 70 degrees alarm screen number 100
0004     [w:[#INTERNAL]LS0300]=[w:[#INTERNAL]LS0300]+1     //Increase error count
0005 }
0006 endif
0007
0008 if([w:[PLC1]D00200]>=30)                              //When temp is greater than 30 degrees
0009 {
0010     [w:[#INTERNAL]LS0302]=101                         //Greater than 30 degrees alarm screen number 101
0011     [w:[#INTERNAL]LS0301]=[w:[#INTERNAL]LS0301]+1     //Increase error count
0012 }
0013 endif
0014
```

NOTE

- When selecting text, press the [Ctrl] key + the [Shift] key + the [Right Arrow] key/[Left Arrow] key to select an entire block of text.
- Press the [Ctrl] key + the [F4] key to close the currently selected screen.
- Press the [Esc] key to overwrite and save the script or to delete it and exit.

21.5 Communicating with Unsupported Peripheral Devices

NOTE

- Please refer to the Settings Guide for details.

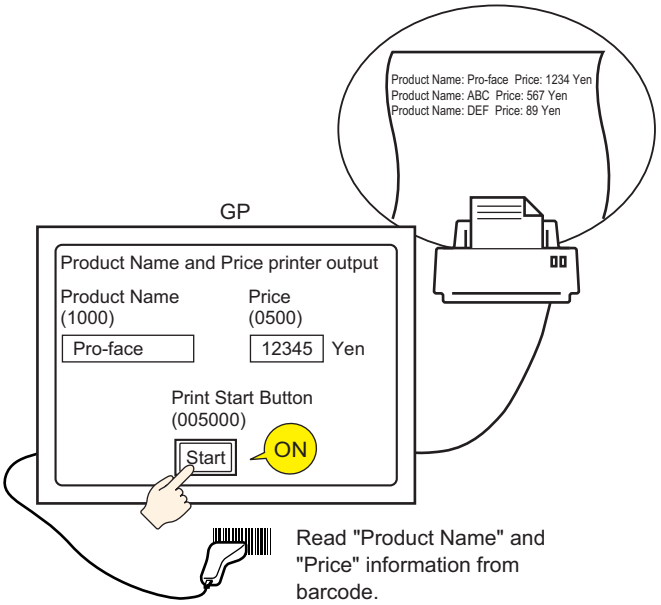
☞"21.9.1 D-Script/Common [Global D-Script] Settings Guide" (page 21-54)

- See the following for further information about commands that are available for scripts.

☞"21.11 Program Commands/Conditional Expressions" (page 21-68)

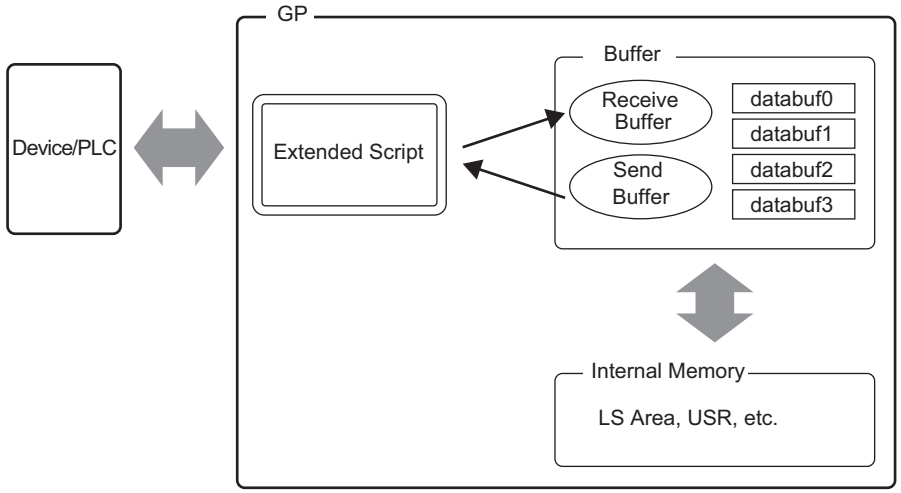
■ Operation

Create an extended script to read data from a bar code reader connected to the USB port and output the data to a serial printer connected to COM1.



■ Structure of Extended Scripts

Extended Scripts are scripts used for communicating between the GP internal Serial Port and connected input/output devices.
For Extended Script data management, as shown in the following picture, data is stored in databuf0 to databuf3 via the Send/Receive Buffer. Databuf is not divided by address, so store the data in internal memory before editing the data on the device/PLC.



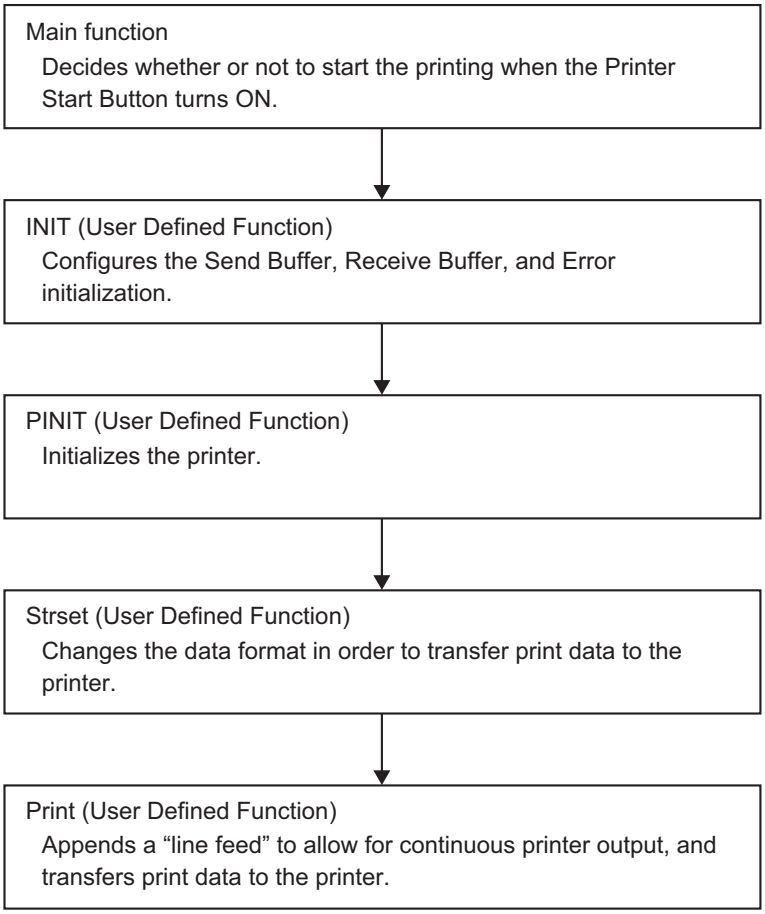
Receive Buffer/Send Buffer

For communication with the device/PLC, this acts as a bit memory space which distinguish sent and received data in real time.

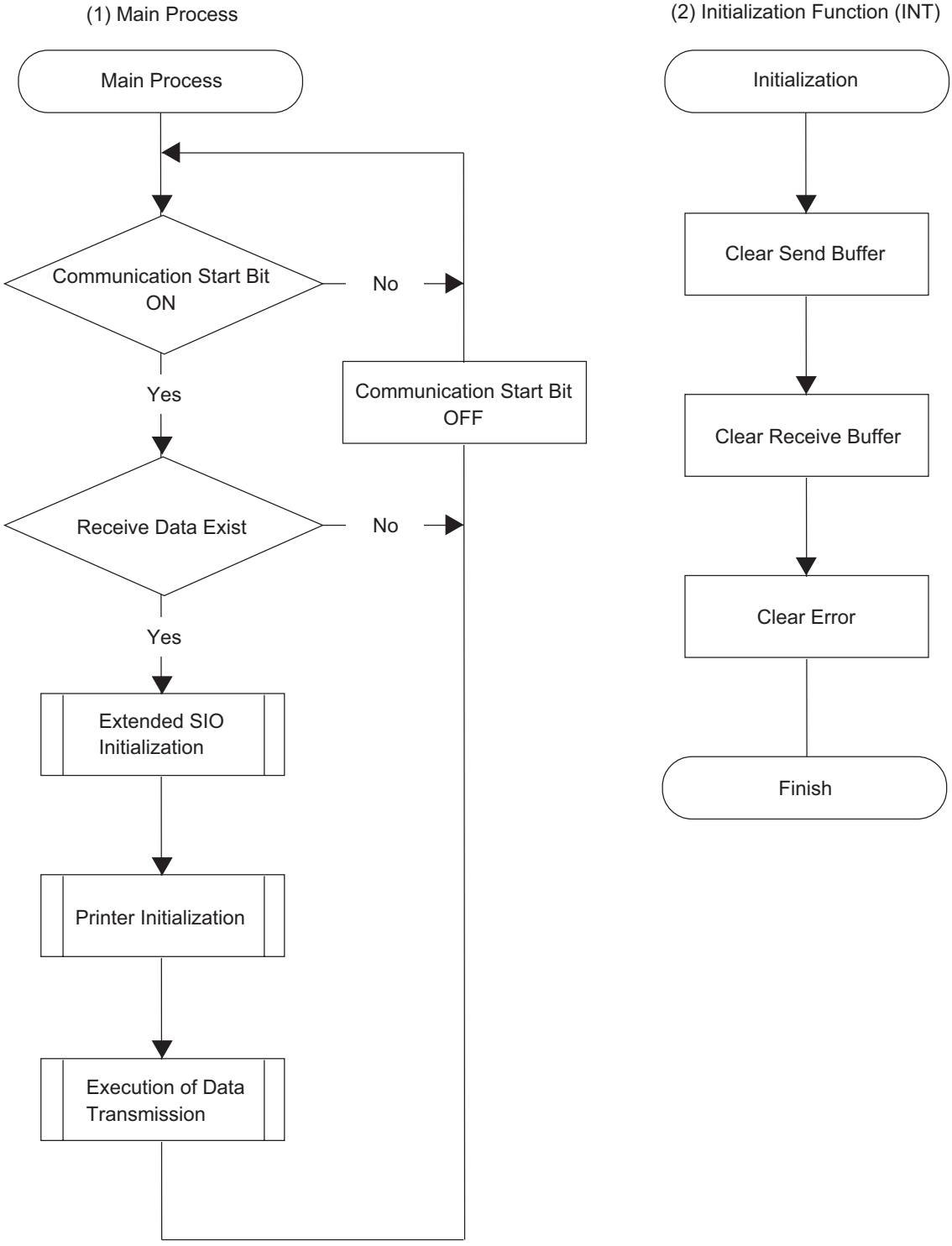
databuf0 - databuf3

These are byte (8-bit) memory spaces used for data storage. The buffer size is 1 KB.

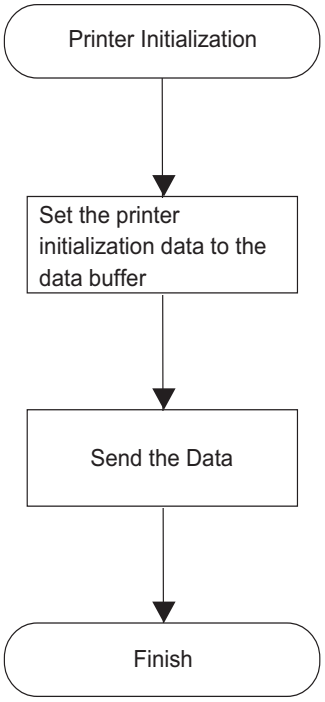
■ Procedure for Creating Scripts



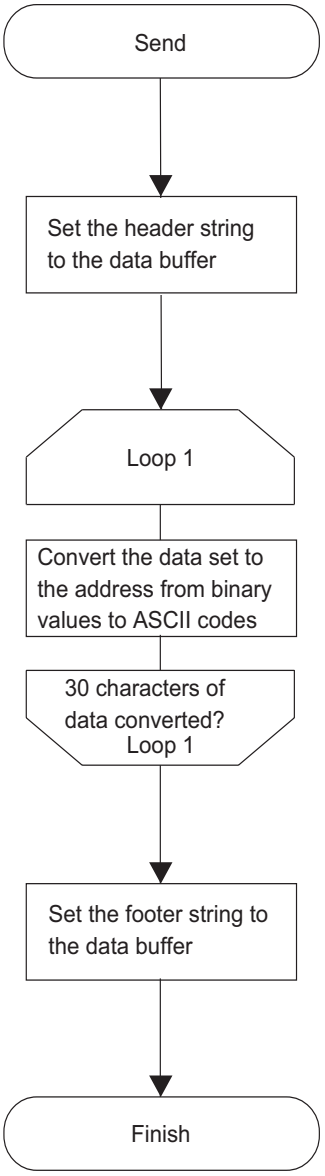
■ Flow Chart


(1) Main Process
Main Process
Communication Start Bit ON
No
Yes
Communication Start Bit OFF
Receive Data Exist
No
Yes
Extended SIO Initialization
Printer Initialization
Execution of Data Transmission
(2) Initialization Function (INT)
Initialization
Clear Send Buffer
Clear Receive Buffer
Clear Error
Finish

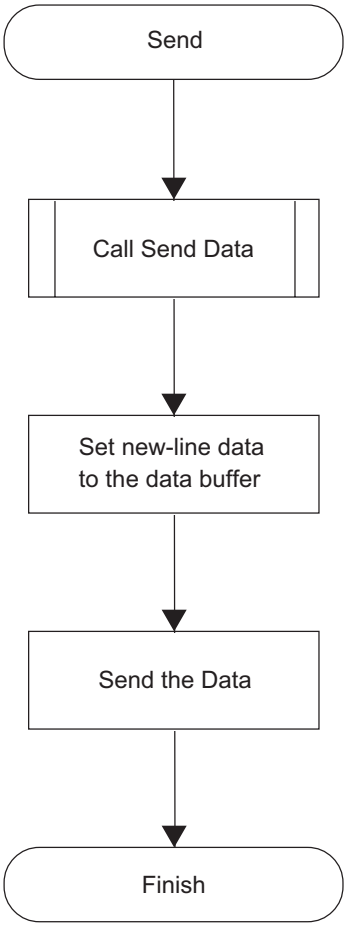
(3) Printer Initialization Function (PINIT)



(4) String Function (Strset)



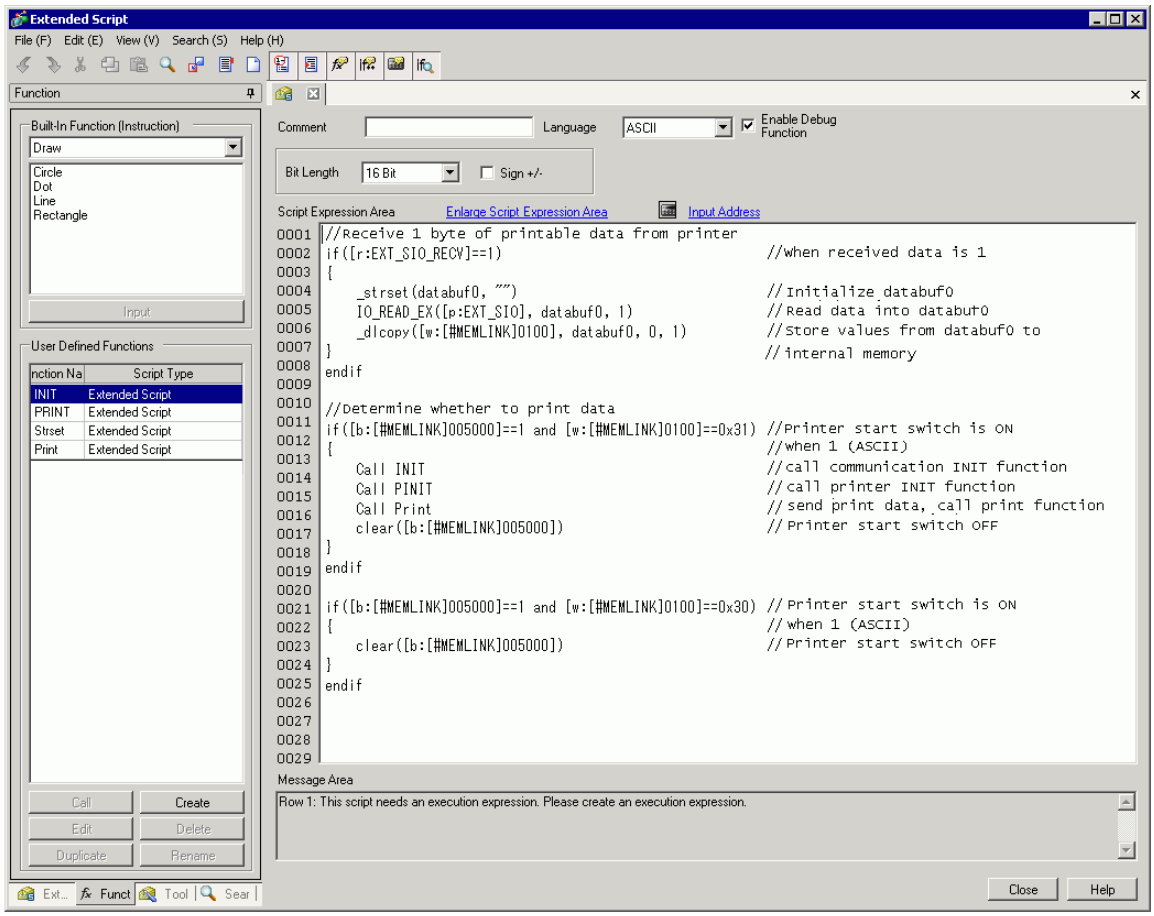
(5) Send Function (Print)



■ Script Operation Overview

◆ Main Functions

Completed Script



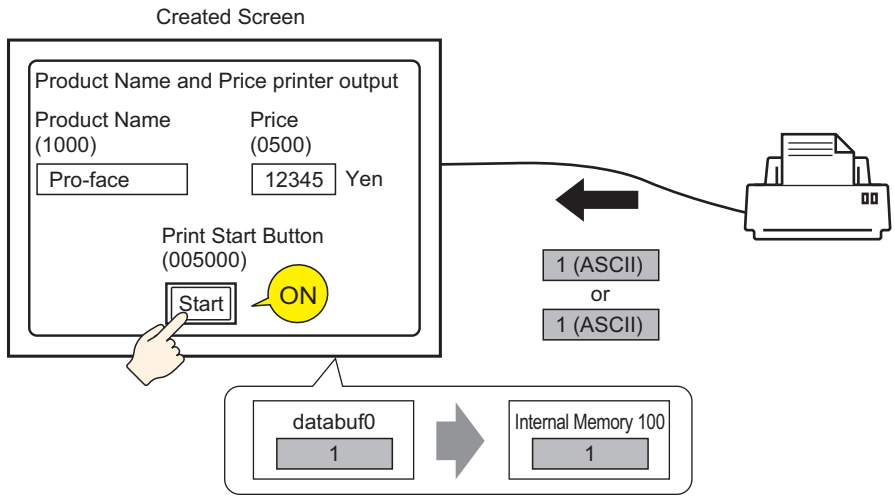
Function Summary

When the Printer Start Button (internal memory 005000) turns ON, the script decides whether or not to start printing from the 1st byte of Print Permit data.
The Print Permit data performs the following actions as an example of the printer specifications.

Print Preparation OK: Send 0x31 (ASCII code "1") to the device/PLC.
Print Preparation Invalid: Send 0x30 (ASCII code "0") to the device/PLC.

The GP receives the Print Permit data in databuf0 and this data is moved to accessible internal memory 100 with the following script handling.

When internal memory 100 = 0x31 (ASCII code for the value "1"), printing starts. When internal memory is 0x30 (ASCII code for "0"), the GP returns to the beginning of the script and repeats this process until it receives the 0x31 data.



◆ INIT (User Defined Function)

Completed Script

Script Expression Area Enlarge Script Expression Area Input Address

```
0001 [c:EXT_SIO_CTRL00]=1    //Send buffer clear
0002 [c:EXT_SIO_CTRL01]=1    //Receive buffer clear
0003 [c:EXT_SIO_CTRL02]=1    //Error buffer clear
0004
```

Function Summary

Configure the Send Buffer, Receive Buffer, and Error initialization.

◆ PINIT (User Defined Function)

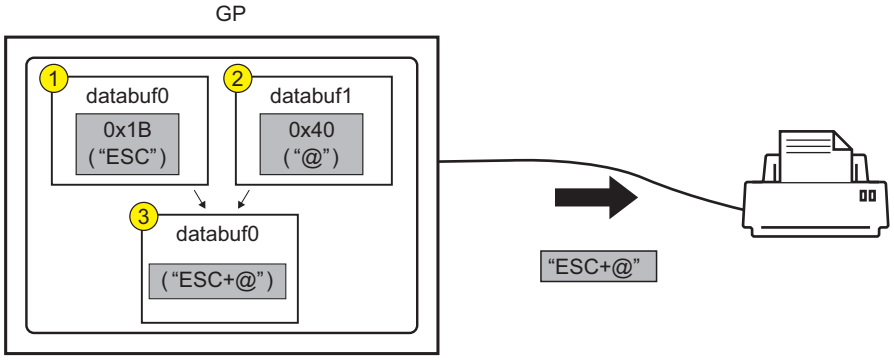
Completed Script

Script Expression Area Enlarge Script Expression Area Input Address

```
0001 _strset(databuf0, "")          // Clear databuf0
0002 _strset(databuf0, 0x1B)        // Set ASCII code "ESC"
0003 _strset(databuf1, "")          // Clear databuf1
0004 _strset(databuf1, 0x4D)        // Set ASCII code "@"
0005 _strcat(databuf0, databuf1)    // Append databuf1 to databuf0
0006 _strlen([t:0000], databuf0)    // Convert data length to numerical format and store in temporary
0007                                   address
0008
0009 // Send data over serial port
0010
0011 IO_WRITE_EX([p:EXT_SIO], databuf0, [t:0000]) // Send databuf0, amount defined in temporary
0012                                                  address
```

Function Summary

Initializes the printer. Send the ESC/P command "ESC+@" to the printer.



◆ Strset (User Defined Function)

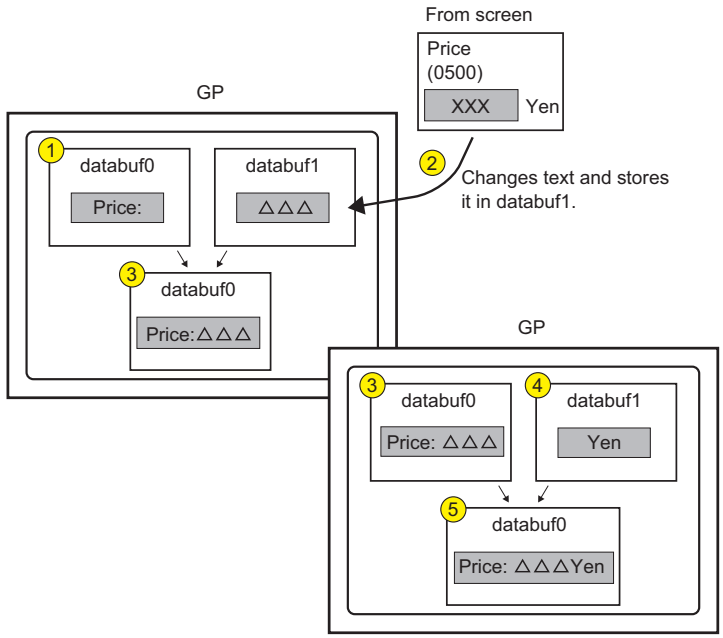
Completed Script

Script Expression Area Enlarge Script Expression Area Input Address

```
0001 //String example, add "Price:" and "$"
0002 _strset(databuf0, "")                          //Initialize databuf0
0003 _strset(databuf0, "Price:")                    //Store text "Price:" to databuf0
0004 _bin2decasc(databuf0,[w:[#MEMLINK]0500])       //Convert value to string and store in databuf1
0005 _strcat(databuf0, databuf1)                    //Add databuf1 to end of databuf0
0006 _strset(databuf1, "")                          //Initialize databuf1
0007 _strset(databuf1, "$")                         //Store text "$" to databuf1
0008 _strcat(databuf0, databuf1)                    //Add databuf1 to end of databuf0
0009
0010 //Initialize temporary address
0011 [t:0001]=0
0012 [t:0002]=0
0013
0014 //Store to internal memory word units, consecutive characters into byte units(30 characters)
0015 loop()
0016 {
0017  [w:[#MEMLINK]2000]#[t:0002]=[w:[#MEMLINK]1000]#[t:0001]>>8      //Store top byte into bottom byte
0018  [w:[#MEMLINK]2001]#[t:0002]=[w:[#MEMLINK]1000]#[t:0001]& 0*FF   //Erase top byte and store in next address
0019  [t:0001]=[t:0001]+1                                            //Address offset + 1
0020  [t:0002]=[t:0002]+2                                            //Address offset + 2
0021  if([t:0001]==15)                                               //Store 2 words into 2 byte and repeat 15 times
0022  {
0023   break
0024  }
0025  endif
0026 }
0027 endloop
0028 _ldcopy(databuf2, [w:[#MEMLINK]2000],30)        //Store internal memory 2000~2030 to data buffer as characters
0029
0030 //Add string "Item:"
0031 _strset(databuf1, "")                           //Initialize databuf1
0032 _strset(databuf1, "Item:")                      //Store string "Item:" into databuf1
0033 _strcat(databuf1, databuf2)                     //Add databuf1 to end of databuf0
0034
0035 //Add Item and Price strings
0036 _strcat(databuf1, databuf0)                     //Add databuf0 to end of databuf1
```

Function Summary

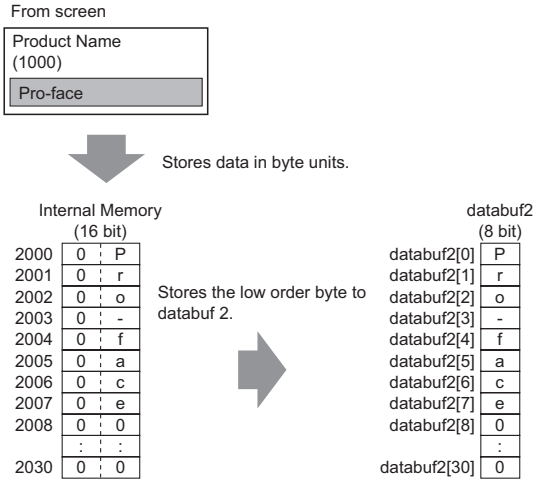
1 Append the text "Price:" and "Yen" to the price data stored internal memory 0500.



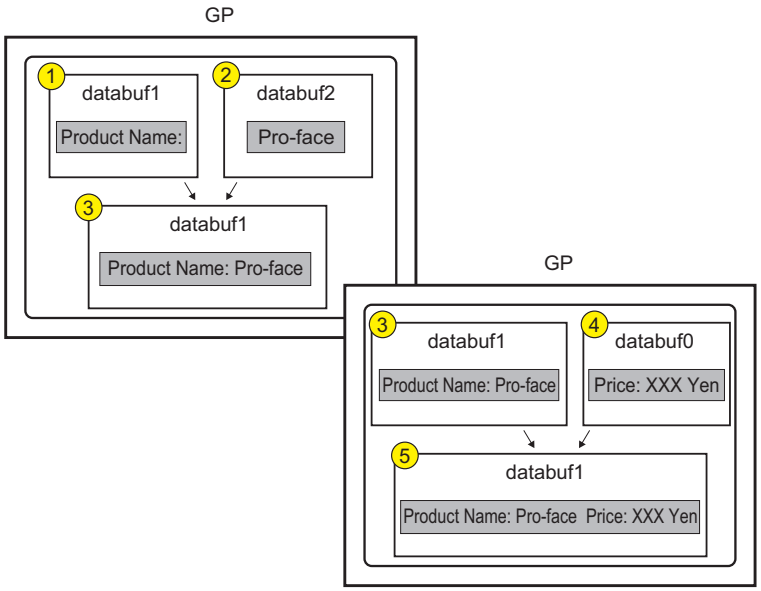
2 Change the data format in order to send print data to the printer. Divide the string data (Product Name) stored sequentially in internal memory 1000 into byte units, and store into internal memory 2000 to 2030 as low order byte string data.Use the function _ldcopy and store the data in databuf2 in order of the consecutive word address's lowest byte.

NOTE

- The _ldcopy function takes data stored as Words, and stores only the lower order bytes in the buffer, while higher order byte data is ignored.



3 Append the text "Product Name:" and "Price" to databuf2.



◆ **Print (User Defined Function)**

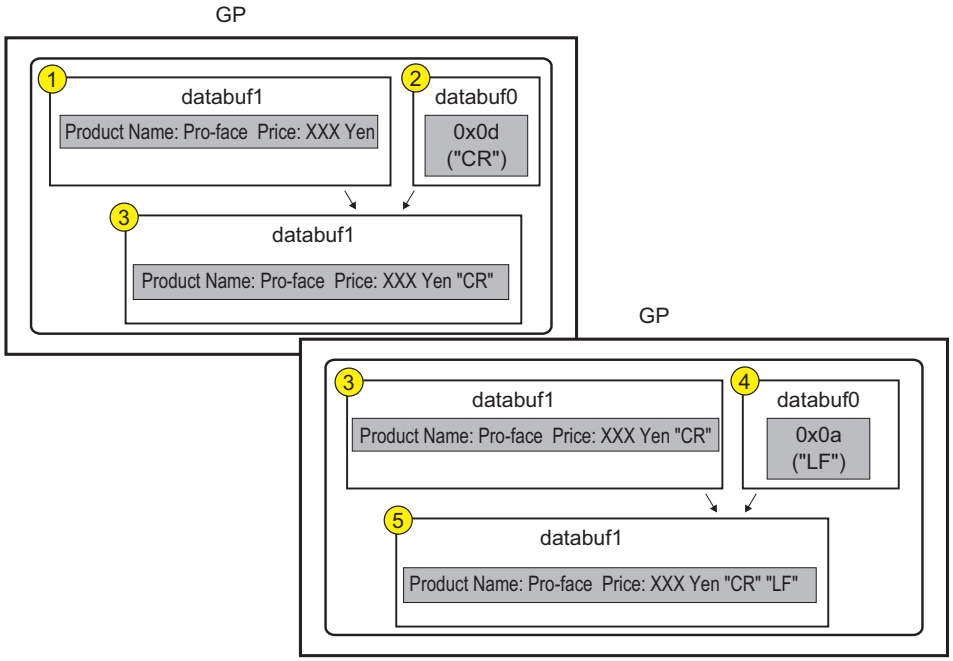
Completed Script

Script Expression Area Enlarge Script Expression Area Input Address

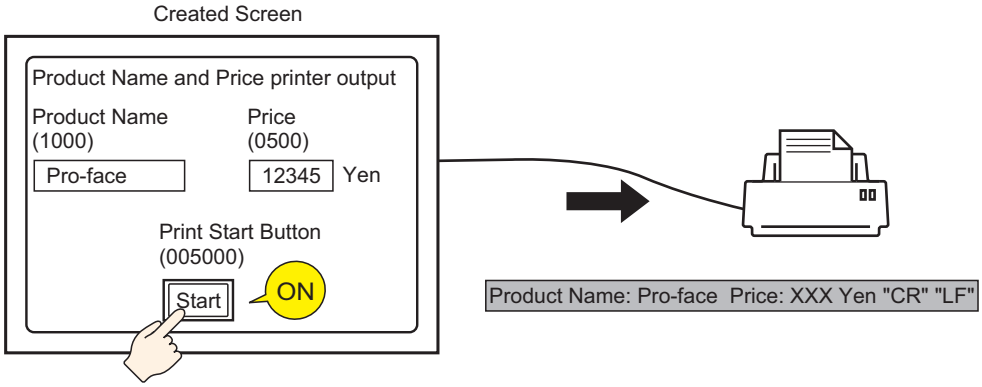
```
0001 Call Street                        //Call string data function
0002 _strset(databuf0,"")               //Clear databuf1
0003
0004 //Text delimiter
0005
0006 _strset(detabuf0, 0*0d)            //Return to start of row
0007 _strset(databuf1, databuf0)        //Add databuf1 to end of databuf0
0008 _strset(databuf0, "")              //Clear databuf1
0009 _strset(databuf0, 0*0a)            //New line
0010 _strset(databuf1, databuf0)        //Add databuf1 to end of databuf0
0011
0012 _strset([t:0000], databuf1)        //Store data length to temporary address
0013
0014 //Send data over serial port
0015
0016 IO_WRITE_EX([p:EXT_SIO], databuf1, [t:0000] //Send databuf0, amount defined by temporary address value
0017
```

Function Summary

1 Append a "line feed" to allow for continuous printer output.



2 Send the print data to the printer.

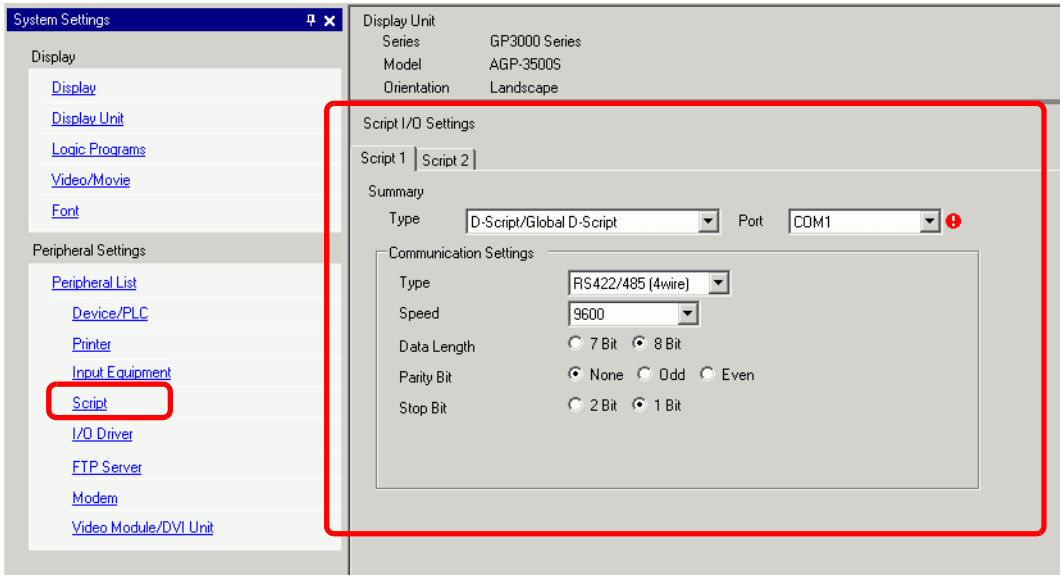


■ Commands Used

Command	Function Summary
if ( )	When the "if" condition, enclosed in brackets "( )", is true, the expression following the "if ( )" statement is run. ☞"21.11.8 Conditional Expressions" (page 21-148)
Label Settings [r:EXT_SIO_RECV]	Shows the quantity of data (number of bytes) received at that time. The received data size is read-only. ☞"21.11.4 SIO Port Operation" (page 21-100)
Equivalent (==)	True if N1 is equal to N2 (N1 = N2). ☞"21.11.9 Comparison" (page 21-153)
Text Settings (_strset)	A fixed string is stored in the data buffer. ☞"21.11.11 Text Operation" (page 21-159)
Extended Receive (IO_READ_EX)	Receives data of the size indicated in Received Data Size (bytes) from the Extended SIO and stores it in the data buffer. ☞"21.11.4 SIO Port Operation" (page 21-100)
From Data Buffer to Internal Device (_dlcopy)	Each byte of string data stored in the offset of the data buffer is copied to the LS area according to the number of strings. ☞"21.11.11 Text Operation" (page 21-159)
Label Settings [c:EXT_SIO_CTRL**]	This control variable is used to clear the Send buffer, Receive buffer, and error status. ☞"21.11.8 Conditional Expressions" (page 21-148)
Connect Text (_strcat)	A character string or character code is concatenated with the text buffer. ☞"21.11.11 Text Operation" (page 21-159)
Text Length (_strlen)	Obtains the length of the stored string. ☞"21.11.11 Text Operation" (page 21-159)
Extended Send (IO_WRITE_EX)	Sends the data in the data buffer with Extended SIO according to the size of Number of Send Bytes. ☞"21.11.4 SIO Port Operation" (page 21-100)
Assignment (=)	Assign the value on the right hand side to the left hand side. ☞"21.11.10 Operator" (page 21-155)
Addition (+)	Adds a constant to a Word device's data. ☞"21.11.10 Operator" (page 21-155)
Numeric Value Decimal String Conversion (_bin2decasc)	This function is used to convert an integer to a decimal string. ☞"21.11.11 Text Operation" (page 21-159)
From Internal Device To Data Buffer (_ ldcopy)	The data of the string stored in the LS area is copied to the data buffer according to the number of strings in a byte-by-byte transfer. ☞"21.11.11 Text Operation" (page 21-159)

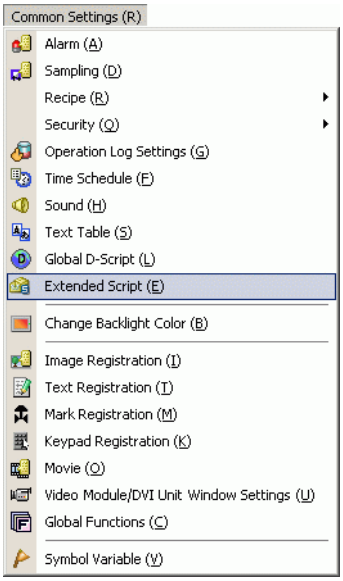
■ Creation Procedure

1 Set up the script settings to use Extended Script to communicate. From the [Project (F)] menu, click [System Settings (C)]. Select [Script]. Set the [Type] to [Extended Script].



There are two tabs for the script settings. Set the [Port] to COM1 or COM2.
Set the [Communication Settings] to match the Extended SIO.

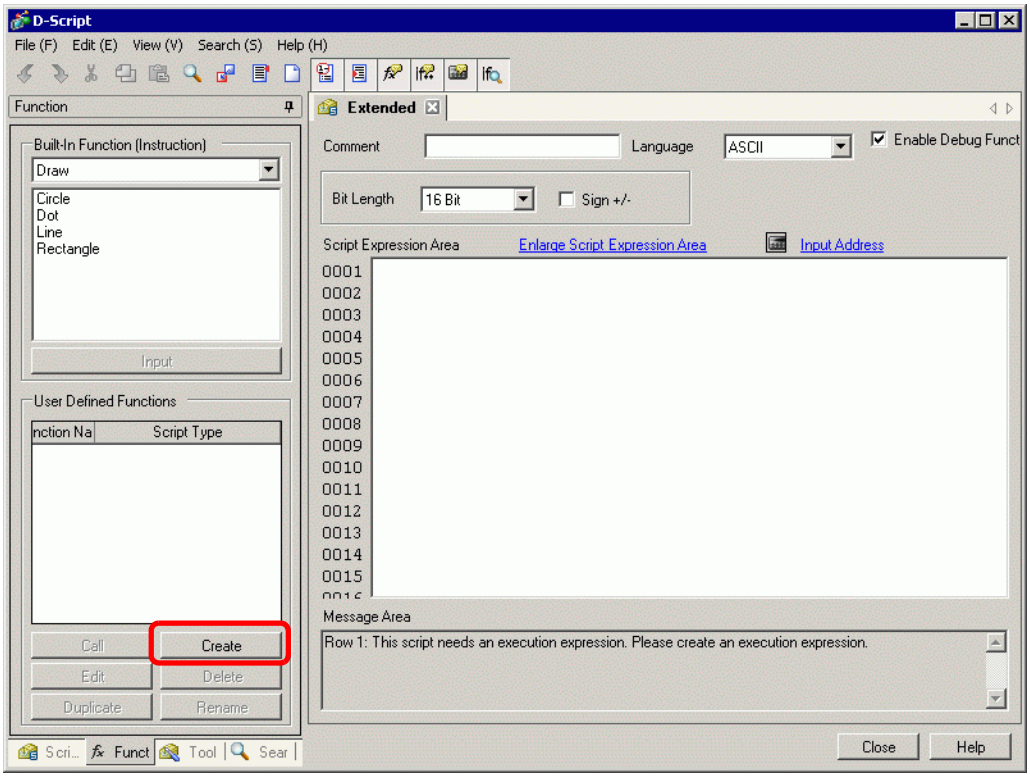
2 From the [Common Settings (R)] menu, select [Extended Script (E)].



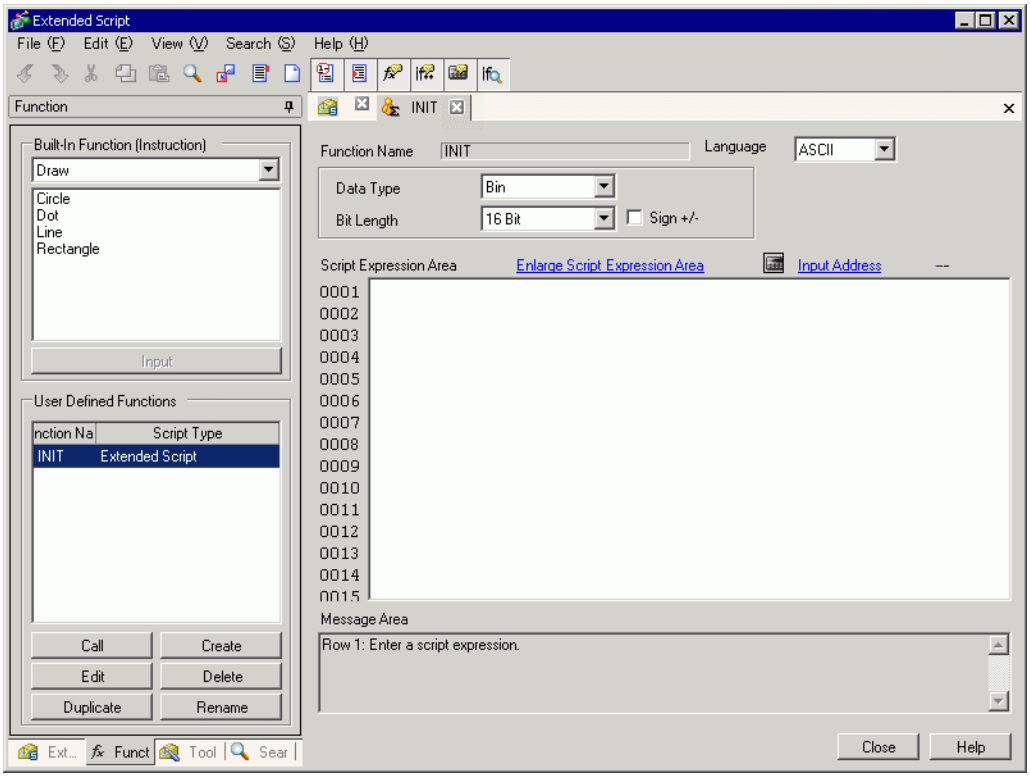
NOTE

- When the message "The Extended Script will be used. Continue?" appears, click [Yes].

3 Register "INIT" as a User-Defined Function. Click the [Function] tab and click the user-defined function frame's [Create] button.



4 Input [INIT] as the function name, click [OK]. The following screen appears.



5 Create a script in the Execution Expression with Commands, Statements, and Constant input.

Script Expression Area Enlarge Script Expression Area Input Address

```
0001 [c:EXT_SIO_CTRL00]=1    //Send buffer clear
0002 [c:EXT_SIO_CTRL01]=1    //Receive buffer clear
0003 [c:EXT_SIO_CTRL02]=1    //Error buffer clear
0004
```

6 In the same manner, register "PINIT" as a User-Defined Function. Enter [PINIT] as the function name and create the following script in Execution Expression.

Script Expression Area Enlarge Script Expression Area Input Address

```
0001 _strset(databuf0, "")          // Clear databuf0
0002 _strset(databuf0, 0x1B)        // Set ASCII code "ESC"
0003 _strset(databuf1, "")          // Clear databuf1
0004 _strset(databuf1, 0x4D)        // Set ASCII code "@"
0005 _strcat(databuf0, databuf1)    // Append databuf1 to databuf0
0006 _strlen([t:0000], databuf0)    // Convert data length to numerical format and store in temporary
0007                                   address
0008
0009 // Send data over serial port
0010
0011 IO_WRITE_EX([p:EXT_SIO], databuf0, [t:0000]) // Send databuf0, amount defined in temporary
0012                                                  address
```

7 In the same manner, register "Strset" as a User-Defined Function. Enter [Strset] as the function name and create the following script in Execution Expression.

Script Expression Area Enlarge Script Expression Area Input Address

```
0001 //String example, add "Price:" and "$"
0002 _strset(databuf0, "")                        //Initialize databuf0
0003 _strset(databuf0, "Price:")                 //Store text "Price:" to databuf0
0004 _bin2decasc(databuf0,[w:[#MEMLINK]0500])    //Convert value to string and store in databuf1
0005 _strcat(databuf0, databuf1)                 //Add databuf1 to end of databuf0
0006 _strset(databuf1, "")                       //Initialize databuf1
0007 _strset(databuf1, "$")                      //Store text "$" to databuf1
0008 _strcat(databuf0, databuf1)                 //Add databuf1 to end of databuf0
0009                                                                                          1
0010 //Initialize temporary address
0011 [t:0001]=0
0012 [t:0002]=0
0013
0014 //Store to internal memory word units, consecutive characters into byte units(30 characters)
0015 loop()
0016 {
0017  [w:[#MEMLINK]2000]#[t:0002]=[w:[#MEMLINK]1000]#[t:0001]>>8      //Store top byte into bottom byte
0018  [w:[#MEMLINK]2001]#[t:0002]=[w:[#MEMLINK]1000]#[t:0001]& 0*FF   //Erase top byte and store in next address
0019  [t:0001]=[t:0001]+1                                             //Address offset + 1
0020  [t:0002]=[t:0002]+2                                             //Address offset + 2
0021  if([t:0001]==15)                                                //Store 2 words into 2 byte and repeat 15 times
0022  {                                                                                       2
0023   break
0024  }
0025  endif
0026 }
0027 endloop
0028 _ldcopy(databuf2, [w:[#MEMLINK]2000],30)        //Store internal memory 2000~2030 to data buffer as characters
0029
0030 //Add string "Item:"
0031 _strset(databuf1, "")                           //Initialize databuf1
0032 _strset(databuf1, "Item:")                      //Store string "Item:" into databuf1
0033 _strcat(databuf1, databuf2)                     //Add databuf1 to end of databuf0
0034                                                                                          3
0035 //Add Item and Price strings
0036 _strcat(databuf1, databuf0)                     //Add databuf0 to end of databuf1
```

8 In the same manner, register "Print" as a User-Defined Function. Enter [Print] as the function name and create the following script in Execution Expression.

Script Expression Area Enlarge Script Expression Area Input Address

```
0001 Call Street                        //Call string data function
0002 _strset(databuf0,"")               //Clear databuf1
0003
0004 //Text delimiter
0005
0006 _strset(detabuf0, 0*0d)            //Return to start of row
0007 _strset(databuf1, databuf0)        //Add databuf1 to end of databuf0
0008 _strset(databuf0, "")              //Clear databuf1
0009 _strset(databuf0, 0*0a)            //New line
0010 _strset(databuf1, databuf0)        //Add databuf1 to end of databuf0
0011
0012 _strset([t:0000], databuf1)        //Store data length to temporary address
0013
0014 //Send data over serial port
0015
0016 IO_WRITE_EX([p:EXT_SIO], databuf1, [t:0000] //Send databuf0, amount defined by temporary address value
0017
```

9 Create the main script. Create the following script in Execution Expression to complete the script.

Script Expression Area Enlarge Script Expression Area Input Address

```
0001 //Receive 1 byte of printable data from printer
0002 if([r:EXT_SIO_RECV]==1)                                  //When received data is 1
0003 {
0004     _strset(databuf0,"")                                 //Initialize databuf0
0005     IO_READ_EX([p:EXT_SIO], databuf0, 1)                 //Read data into databuf0
0006 _dlcopy([w:[#MEMLINK]0100], databuf0, 0, 1)              //Store values from databuf0 to internal memory
0007 }
0008 endif
0009
0010 //Determine whether to print data
0011 if([b:[#MEMLINK]005000]==1 and [w:[#MEMLINK]0100]==0x31)  //Printer start switch is ON
0012 {                                                        //when 1 (ASCII)
0013    Call INIT                                             //call communication INIT function
0014    Call PINIT                                            //call printer INIT function
0015    Call Print                                            //send print data, call print function
0016    clear([b:[#MEMLINK]005000]                            //Printer start switch OFF
0017 }
0018 endif
0019
0020 if([b:[#MEMLINK]005000]==1 and [w:[#MEMLINK]0100]==0x30)  //Printer start switch is ON
0021 {                                                        //when 0 (ASCII)
0022    clear([b:[#MEMLINK]005000]                            //Printer start switch OFF
0023
0024 }
0025 endif
```

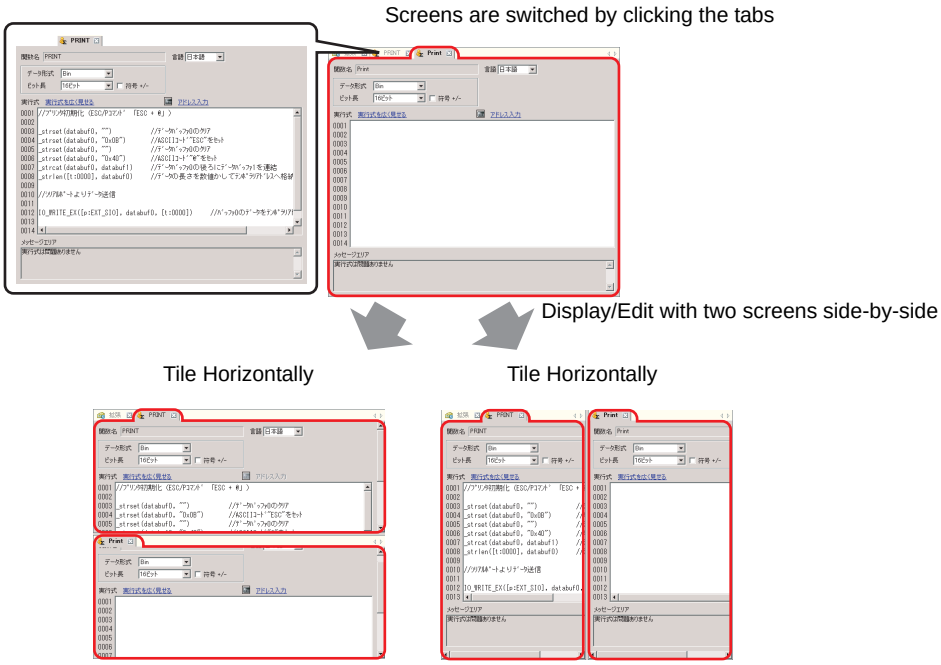
NOTE

- When placing the user-defined functions created in steps 3 to 9 into the main script, select the function to be placed and click [Call] on the [Function] tab. The function will be placed using "Call Function Name".
- When selecting text, press the [Ctrl] key + the [Shift] key + the [Right Arrow] key/[Left Arrow] key to select an entire block of text.
- Press the [Ctrl] key + the [F4] key to close the currently selected screen.
- Press the [Esc] key to overwrite and save the script or to delete it and exit.

21.6 Referencing Other Scripts

21.6.1 Introduction

You can display an user defined function side-by-side with a D-Script, Global D-Script, Extended Script, or another user defined function.
You can write the function while comparing them, or you can edit both at the same time.



NOTE

- You can also edit different types of user-defined scripts at the same time.

21.6.2 Operating Procedure

NOTE

- Please refer to the Settings Guide for details.

☞ "21.9.1 D-Script/Common [Global D-Script] Settings Guide" (page 21-54)

- See the following for further information about commands that are available for scripts.

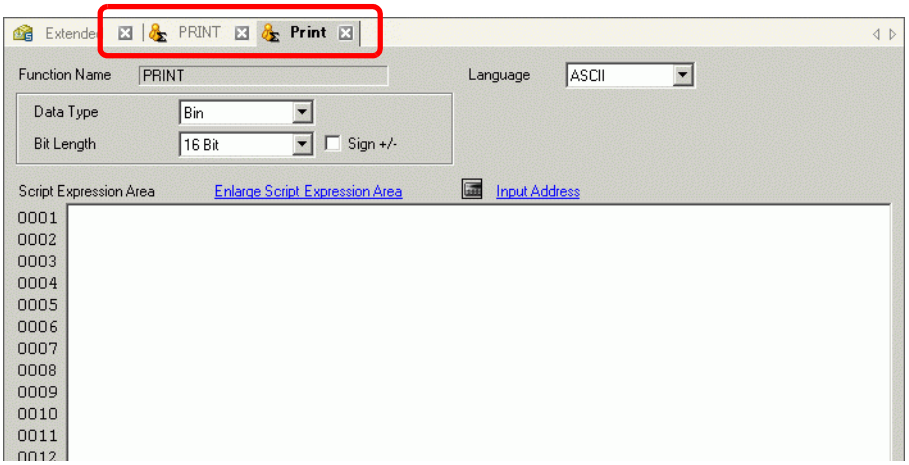
☞ "21.11 Program Commands/Conditional Expressions" (page 21-68)

- See the following for further information about commands that are available for scripts.

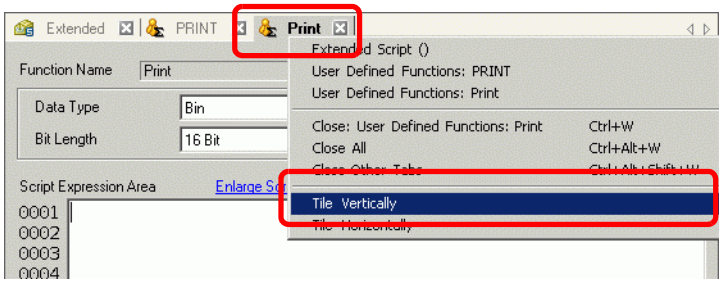
☞ "21.11 Program Commands/Conditional Expressions" (page 21-68)

On the [D-Script] dialog box, split the screen into two screens horizontally or vertically.
For example, while displaying the user created function "PRINT" from a previous procedure, create "Print".

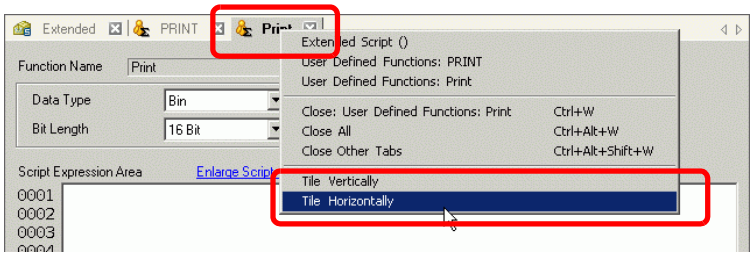
1 On the [D-Script] dialog box, open the script and user defined function you want to display simultaneously.



2 If you want to tile horizontally, right-click the "screen tab to display on the bottom" and then click [Tile Horizontally].

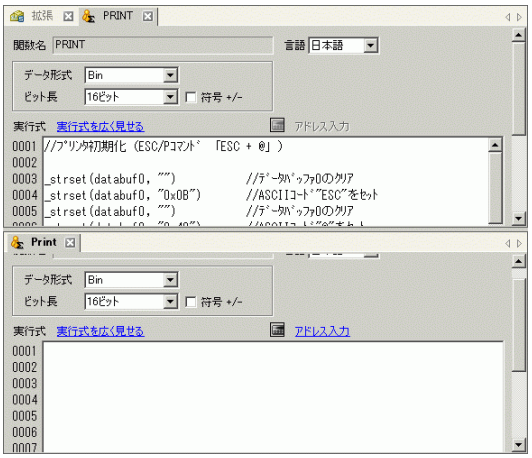


If you want to tile vertically, right-click the "screen tab to display on the right" and then click [Tile Vertically].

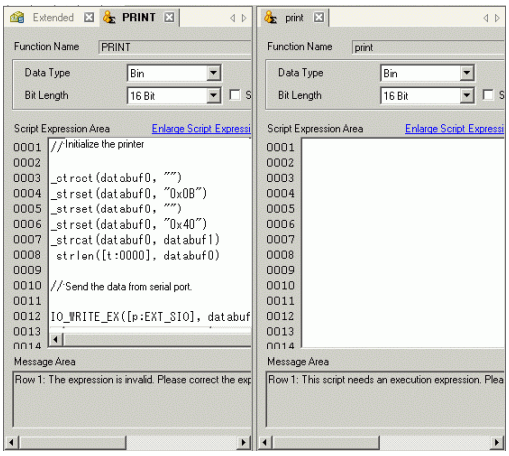


3 Screens are tiled horizontally or vertically.

Tile Horizontally



Tile Vertically

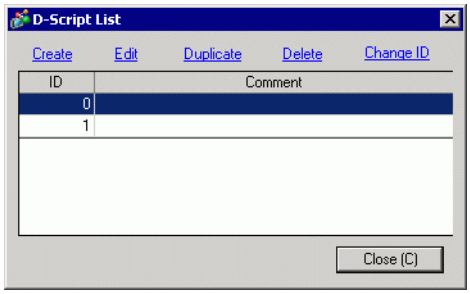


21.7 Creating Scripts

21.7.1 Procedure for Creating D-Scripts/Global D-Scripts

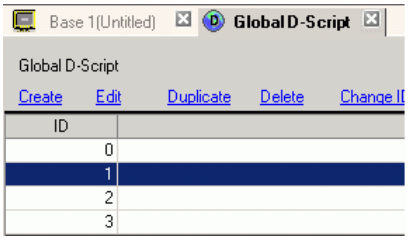
From the [Parts (P)] menu, select [D-Script (R)].

Click [Create]. To view an existing script, select the ID number and click [Edit], or double-click the ID Number row.

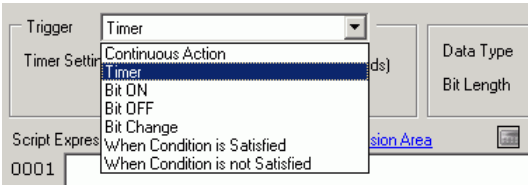


From the [Common Settings (R)] menu, select [Global D-Script (L)].

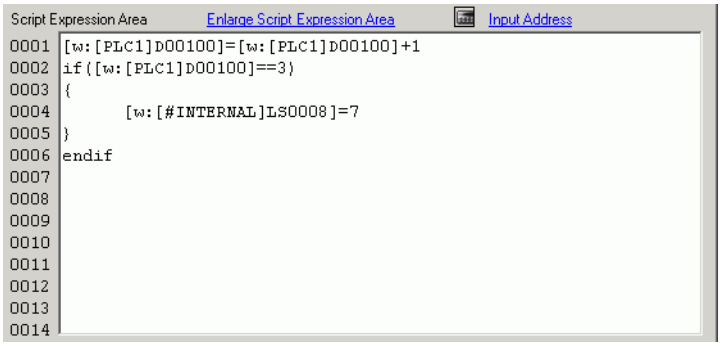
Click [Create]. To view an existing script, select the ID number and click [Edit], or double-click the ID Number row.



Set the trigger condition that causes the script to execute. For more information about this function, please refer to "21.8 Trigger Condition Setup" (page 21-47).



Create the script (Execution Expression). For more information about commands and functions, please refer to "21.11 Program Commands/Conditional Expressions" (page 21-68).

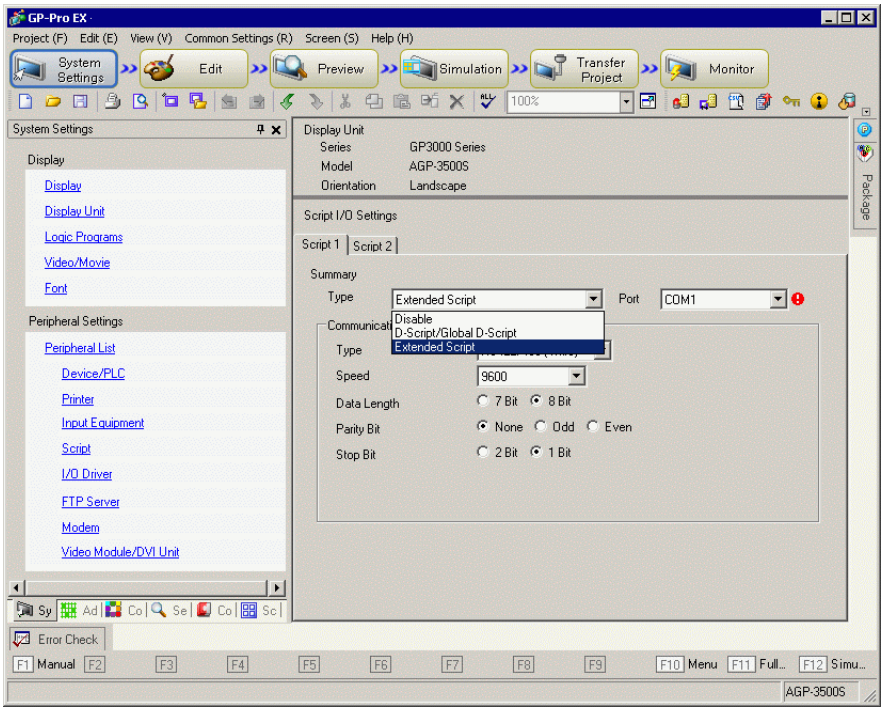


NOTE

- The component tray displays registered D-scripts in the order they are created. To change the order in the component tray, change the ID number for registered items, then from the [Edit] menu select [Auto-Align Trays]. You can change ID settings by double-clicking items in the component tray to display their edit dialog box.

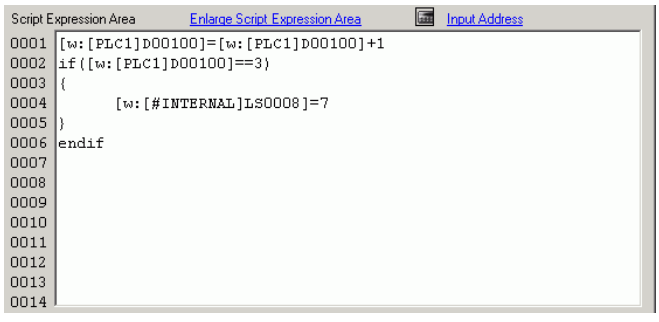
21.7.2 Procedure for Creating Extended Scripts

From the [Project (F)] menu, select [System Settings (C)]. Click [Script I/O Settings] to display the following dialog box.
When using an extended script, set [Type] to [Extended Script] and select the appropriate [Port].



From the [Common Settings (R)] menu, select [Extended Script (E)].

Create the script (Execution Expression). For more information about commands and functions, please refer to "21.11 Program Commands/Conditional Expressions" (page 21-68).



21.7.3 Setting Up User-Defined Functions

Register an existing script as a user-defined function so you can use it within other scripts. The registered function can be used by a D-Script, Global D-Script, or Extended Script.

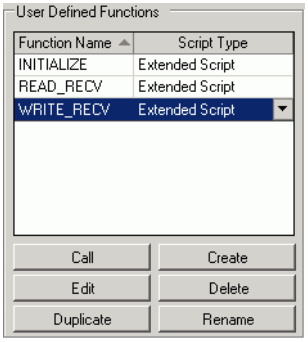
■ Setup Procedure

When creating a new User-Defined Function

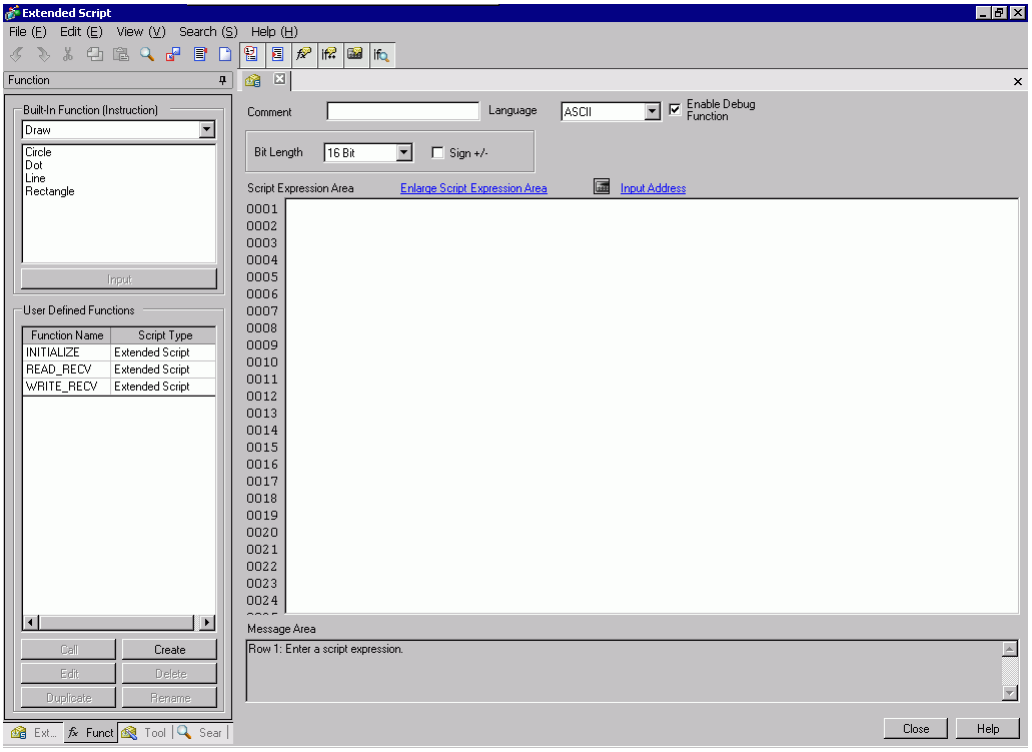
Click on [Create]. The User-Defined Function dialog box appears.

When editing a previously registered User-Defined Function

Select the User-Defined Function you want to modify and click [Edit]. The User-Defined Function dialog box appears.



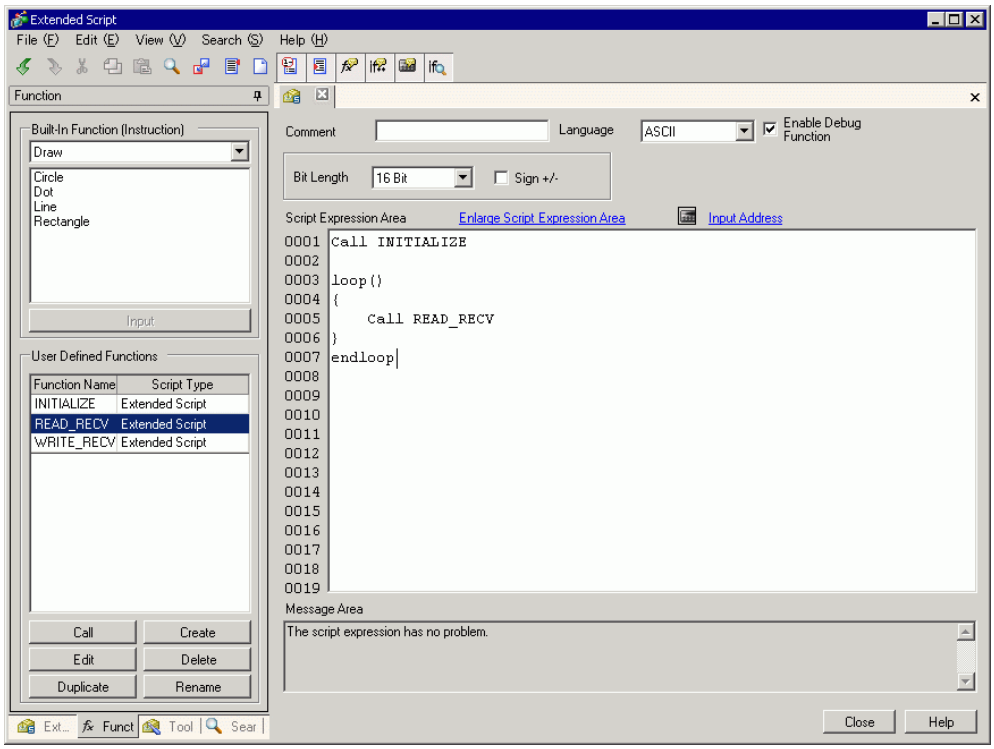
Enter the function name and create the script in the Execution field. Click [OK] to save the user-defined function.



NOTE

- Restrictions apply to Function Names. For more details, see "21.10.3 Restrictions on User-Defined Functions" (page 21-65).

Select the user-defined function to call, click [Call] and "Call Function Name" will be placed in the Execution field.



21.8 Trigger Condition Setup

A created script can use any of the following 7 types of trigger conditions.

Setting		Description
Continuous Action		The script is triggered regularly.
Timer		The script is triggered after a designated time elapses.
Bit	Bit ON	When the GP detects the designated bit rise from 0 to 1, the script is triggered.
	Bit OFF	When the GP detects the defined bit falling from 1 to 0, the script is triggered.
	Bit Change	When the GP detects the designated bit rise from 0 to 1 or fall from 1 to 0, the script is triggered.
Conditional Expressions	When Condition is True	When the GP detects true for a designated expression, the script is triggered.
	When Condition is False	When the GP detects false for a designated expression, the script is triggered.

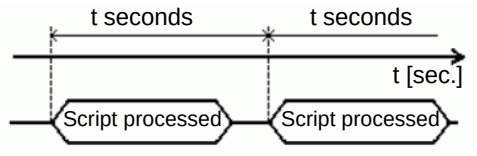
21.8.1 Continuous Action

Executes each display scan time.

21.8.2 Timer

■ Timer

Each time the designated time elapses, the script is executed one time. The timer duration can be set from 1 to 32767 seconds.



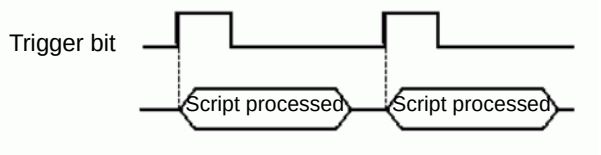
NOTE

- When setting the timer function's time, the time value includes the set time + display scan time error. Also, depending on the time taken to draw a screen item or to printout data, the timer function may be slowed. For more information about the Display Scan Time, please refer to " ■ Restrictions on the Triggered Bit" (page 21-51).
- When using D-Script, switching the screen causes the timer function to restart counting from 0.

21.8.3 Bit

■ Bit ON

When the GP detects the designated bit address (trigger bit) rise from 0 to 1, the script is triggered.

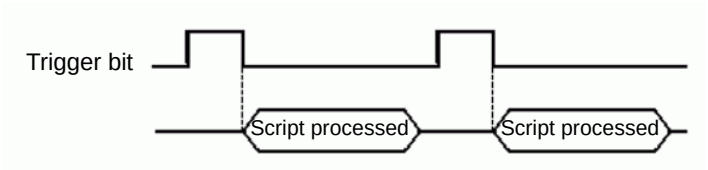


NOTE

- For the trigger bit's ON/OFF, make sure to leave an interval longer than the communication cycle time or display scan time, whichever is longer. For more information about this function, please refer to " ■ Restrictions on the Triggered Bit" (page 21-51).

■ Bit OFF

When the GP detects the designated bit address (trigger bit) fall from 1 to 0, the script is triggered.

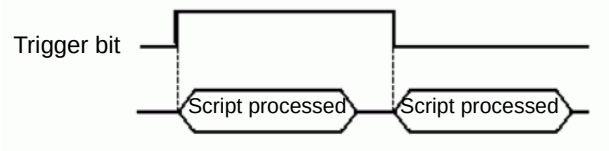


NOTE

- For the trigger bit's ON/OFF, make sure to leave an interval longer than the communication cycle time or display scan time, whichever is longer. For more information about this function, please refer to " ■ Restrictions on the Triggered Bit" (page 21-51).

■ Bit Change

When the GP detects the designated bit address (trigger bit) rise from 0 to 1 or fall from 1 to 0, the script is triggered.



NOTE

- For the trigger bit's ON/OFF, make sure to leave an interval longer than the communication cycle time or display scan time, whichever is longer. For more information about this function, please refer to " ■ Restrictions on the Triggered Bit" (page 21-51).

21.8.4 Conditional Expressions

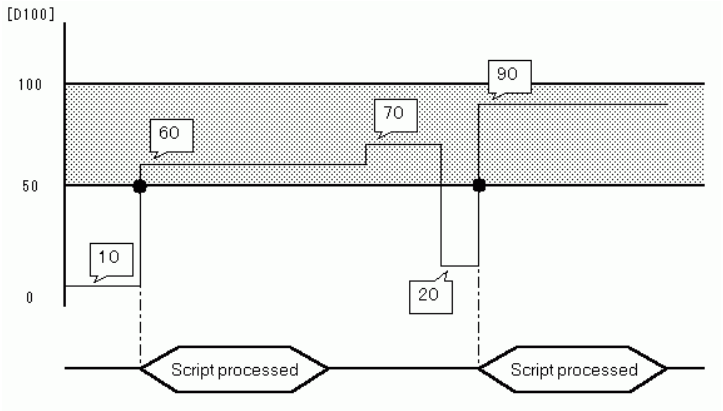
■ When Condition is True

When the GP evaluates the trigger condition as true, the script runs one time.

When the Triggered Condition is set to 100>[D100]>50, the script will execute with the following timing.

[False] –→ [True] is detected, the script executes, and 70 is assigned to D100.

The script does not execute when [True]–→[True].



NOTE

- For the Triggered Condition, leave an interval longer than the communication cycle time or display scan time, whichever is longer. For more information about this function, please refer to " ■ Restrictions on the Triggered Bit" (page 21-51).

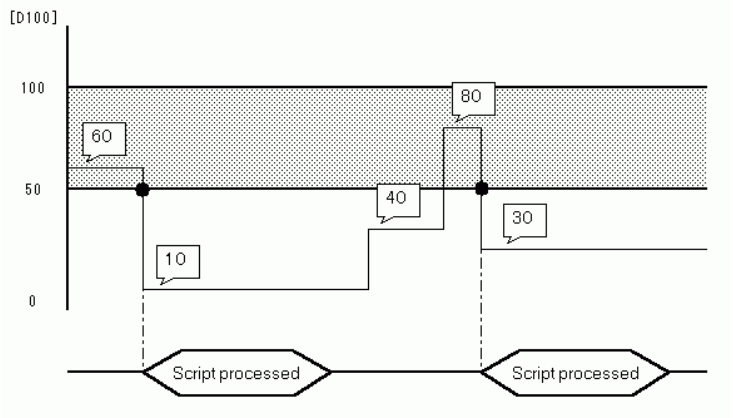
■ When Condition is False

When the GP detects false for a designated expression in a triggering program, the script is executed once.

When the Triggered Condition is set to 100>[D100]>50, the script will execute with the following timing.

[False] −−> [True] is detected, the script executes, and 20 is assigned to D100.

The script does not execute when [True] −−> [True].



NOTE

- For the Triggered Condition, leave an interval longer than the communication cycle time or display scan time, whichever is longer. For more information about this function, please refer to " ■ Restrictions on the Triggered Bit" (page 21-51).

■ Restrictions on the Triggered Bit

- Make sure to leave an interval longer than the communication cycle time for executing write operations onto the connected device. When write operations onto the connected device are executed frequently by using the scan counter of GP internal special relay, communication errors or system errors may result.
- When the bit used for the D-Script Triggered Condition is set for "touch" and that bit turns OFF during D-Script processing, the timing used when pressing the touch area repeatedly can prevent the detection of the bit's rise.The D-Script trigger compares the previously read out value to the currently read out value to determine if the trigger is now "True". However, during a single scan, the value that is stored in the bit address used during the Triggered operation is kept the same, even if the value is changed during execution. The new value is read out only after the next scan begins.

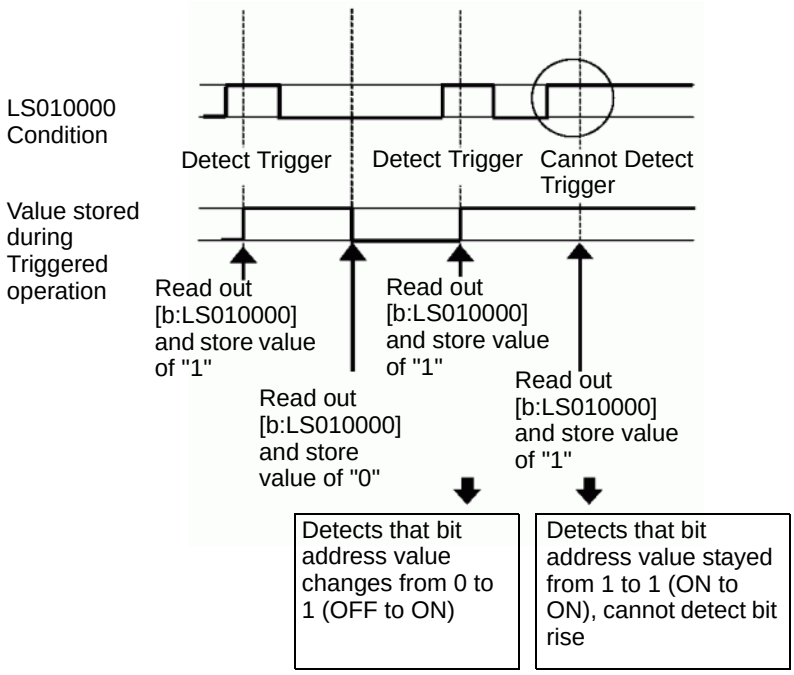
Communication Cycle Time:	The Communication Cycle Time is the time from when the display unit requests data from the device/PLC, until the display unit receives the data. It is stored in the internal device LS2037 as binary data. The unit is milliseconds (ms). There is a variance of +/-10 ms.
Display Scan Time:	Display Scan Time is the time required to process one screen. It is stored in the internal device LS2036 as binary data. The unit is milliseconds (ms). There is a variance of +/-10 ms.

For example, when Touch is used to turn ON the trigger bit (LS010000), and D-Script turns the value OFF:

Triggered Condition: Bit ON [#INTERNAL] LS010000

Execution Expression: clear ([b:[#INTERNAL]LS010000])

◆ D-Script Processing Timing Chart



For example, if the D-Script touch timing is not used, and only detection is performed, the processing is as follows.

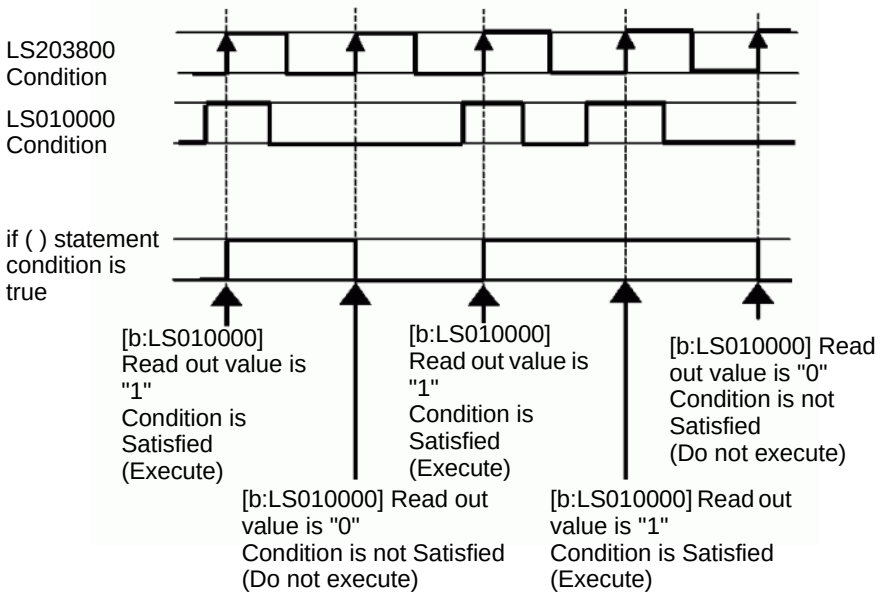
Using an if ( ) statement to detect a trigger:
Use an if statement to determine if a touch operation sets the bit. Each time the if () statement runs, it reads the value and runs a comparison check.

Triggered Condition: Bit ON ([#INTERNAL]LS203800 *1)
Execution Expression: if ([b:[#INTERNAL]LS010000]==1)
{
clear ([b:[#INTERNAL]LS010000])
:
:

*1 GP internal counter. The counter increments each time the Part set on the display screen processes.

When using the previous D-script, even if you input consecutive touches, the script is run only if the condition matches. As shown in the following timing chart, every display scan the value is read and checked for a match, and if there is a match, regardless of the previous value, the script is run.

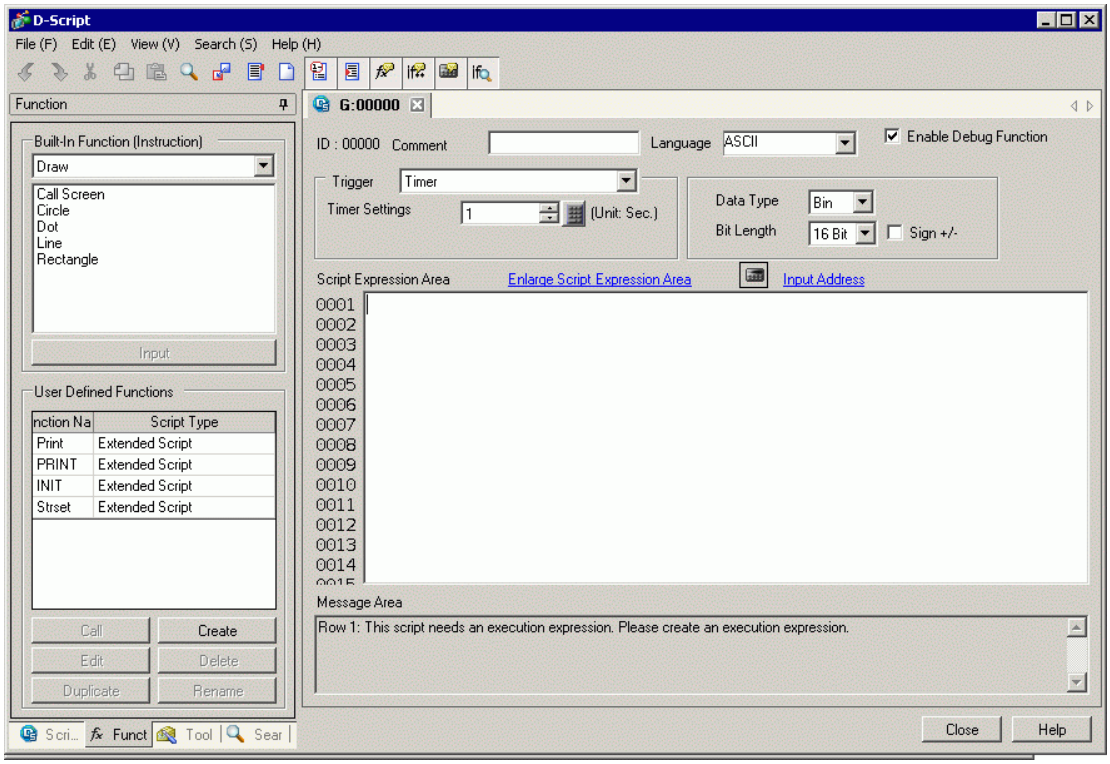
◆ D-Script Processing Timing Chart



21.9 Settings Guide

21.9.1 D-Script/Common [Global D-Script] Settings Guide

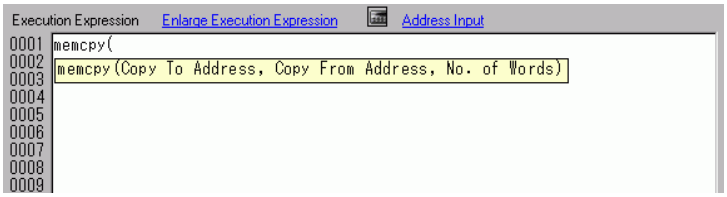
The following is the Common [Global D-Script] dialog box. The settings you can specify for the D-Script are the same as those in the dialog box. ID and trigger settings are not specified for Common [Extended Script], however, the other settings are the same.



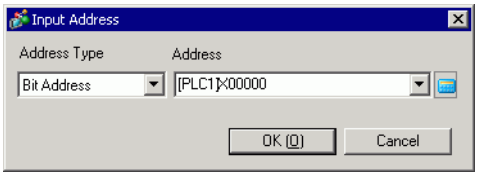
Setting	Description
Export	This can be selected from the File menu. Export writes a created script to a text file (.txt) which can then be imported into other scripts.
Import	This can be selected from the File menu. Import reads in an exported script (text file).
Row Number	Shows the row number to the right of the program.

Auto Indent Control	Automatically indents statements as below.
	Script Expression Area Enlarge Script Expression Area Input Address
	0001 if([b:[PLC1]D00000.0]==1)
	0002 {
	0003 if([b:[PLC1]D00001.0])
	0004 {
	0005 [b:[PLC1]D00002.0]
	0006 }
	0007 endif
	0008 }
	0009 endif

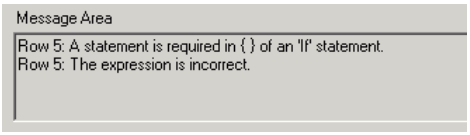
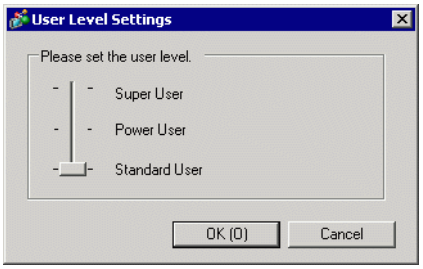
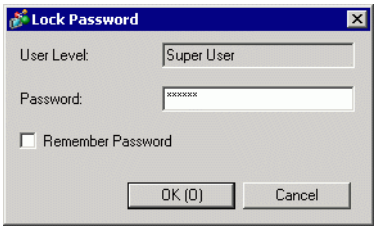
Continued

Setting	Description
Function Input Assistance 	When the function and the initial bracket "(" are inputted as below, the function's format gets displayed. 
Auto Syntax Completion 	When "if" or "loop" is entered from the keypad, the remaining syntax is automatically placed.

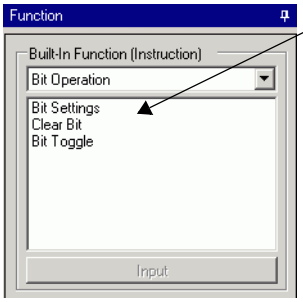
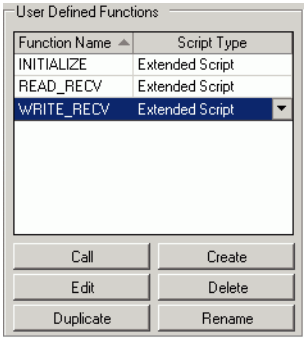
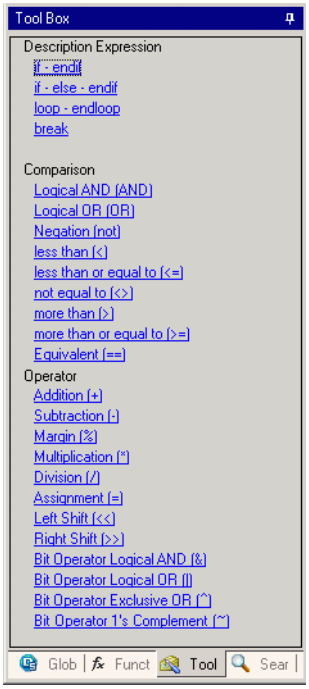
Continued

Setting	Description
Address Input	When creating a script, enter a left square bracket ([ ) to display the [Input Address] dialog box.  Select the address type from [Bit Address], [Word Address], [Temporary Address]. • Bit Address You can specify the Device/PLC address, GP Internal Device and Bit Variable. • Word Address You can specify the Device/PLC address, GP Internal Device and Integer Variable. • Temporary Address This address can only be used for scripts. Refer to the following for details on the internal device. ☞ "A.1.2 Communicating with a Device/PLC Using the Direct Access Method" (page A-4) ☞ "A.1.3 Using the Memory Link Method with Unsupported Devices/PLCs" (page A-6) IMPORTANT • In the scripts, please do NOT set any passwords, and so on, that begin with "0". All numeric values beginning with "0" will be processed as Oct (base-8) data. • How to describe different input data formats For example: • DEC (Base-10) : Non-zero starting value For example, 100 • HEX (Base-16) : Value starting with 0x For example, 0x100 • OCT (Base-8) : Value starting with 0x For example, 0100 • Example of operation with different data formats using the AND operator (Hex and BCD) Hex only 0x270F & 0xFF00 Result: 0x2700 BCD and Hex 9999 9999 & 0xFF00 Result: 0x9900

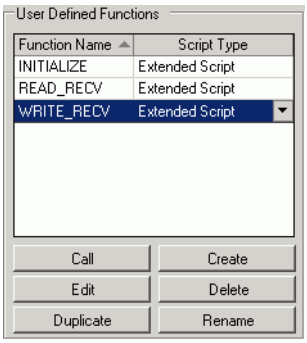
Continued

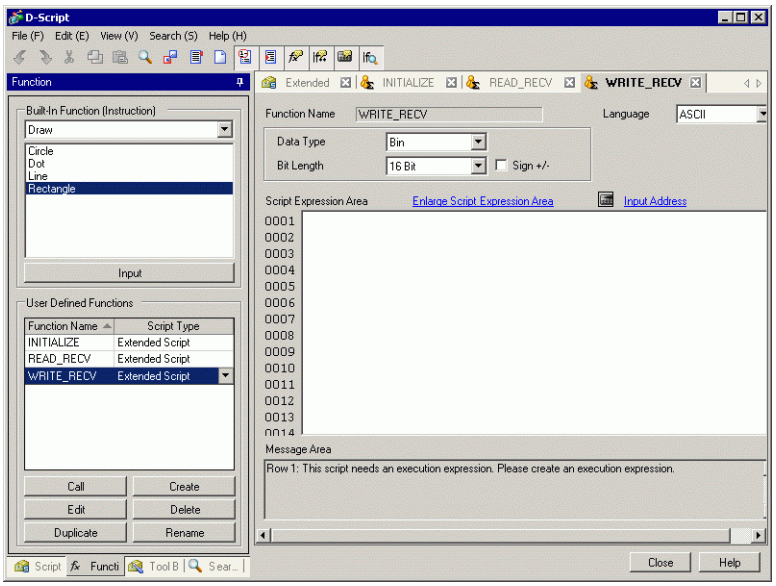
Setting	Description
Auto Syntax Analysis 	Checks the syntax during script creation. The check results will be displayed in the bottom portion of the window. 
ID	Scripts are managed by an ID number. When creating multiple scripts with different trigger conditions, set a value from 0 to 65535.
Comment	Input a comment for the script.
Language	Choose a language from the drop-down list: [ASCII], [Japanese], [Chinese (Traditional)], [Chinese (Simplified)], or [Korean].
Enable Debug Function	Set whether or not to enable the debug function. If the _debug function exists in the body of the script, the _debug function will execute. For more information about this function, please refer to " ■ Debug Function" (page 21-143).
Lock Password	Select whether to enable the Lock Password feature. (1) Select the check box to display the [User Level Settings] screen. (2) Select the user level from among [Standard User], [Power User] and [Super User], and then click [OK].  (3) Enter [Password] and click [OK]. When you select the [Remember Password] check box, the password is saved and the Unlock Password dialog box will not display. 
Trigger	Set the trigger condition that causes the script to execute. For more information about this function, please refer to "21.8 Trigger Condition Setup" (page 21-47). Extended scripts do not have the trigger condition setting.
Data Type	Set the data format for the script to Bin or BCD. For Extended Scripts, Bin is fixed.
Bit Length	Set the data length for the script to 16 bit or 32 bit.
Sign +/–	Select this when you want to insert negative numbers. This can only be set when the data type is Bin.
Execution Expression	The contents of the script.

Continued

Setting	Description
Built-in Function (Instruction)	From the toolbar, select commands and functions to more easily add them to the script. For more information about available commands and functions that can be used, see ☞ "21.11 Program Commands/Conditional Expressions" (page 21-68) Built-in Functions  Select a category from [Built-In Function (Instruction)]. The related functions appear in the bottom area. Select the function and click [Input]. The corresponding settings dialog box appears.
User-Defined Functions	Register a script as a user-defined function and it can be used by other scripts.  **NOTE** • For more details about user-defined functions, see "21.9.2 User-Defined Functions Settings Guide" (page 21-59).
Tool Box	As a shortcut, select commands from the Toolbox to use in the script. Also, you can select commands such as search and position text used in scripts. For more information about available commands, see "21.11 Program Commands/ Conditional Expressions" (page 21-68). 

21.9.2 User-Defined Functions Settings Guide





Setting	Description
Function Name	Displays the names of user defined functions.
Script Type	Displays the script type. You can toggle between [D-Script] or [Extended Script] using the pull-down menu.
Call	Call a created function. Select the function to call, click [Call] and "Call Function Name" is placed in the Execution field.
Create	Create a new function. Click on [Create]. The [Function Name] dialog box appears.
Edit	Edit an existing function. Select the function to edit, click on [Edit]. The [D-Script Function] dialog box appears.
Delete	Delete an existing function. Select the function to delete and click [Delete].
Duplicate	Copy an existing function. Select the function to copy and click [Copy] to display the dialog box to create the name of the copy of the function.
Rename	Change the name of an existing function. Click on [Rename]. The Rename Function dialog box appears.

21.10 Restrictions

21.10.1 D-Script/Global D-Script Restrictions

- In D-Script programming, three addresses occupy the same amount of memory as one Part. The maximum number of addresses available for a D-Script is 255[*1]. Use the fewest possible addresses, since the more devices that are used, the slower the response.
- D-Script cannot run calculations on floating point values (Float Variables or Real Variables). You cannot run calculations on structured variables either. However, you can run calculations on individual elements from structure variables.
- The size of a D-Script affects the Display Scan Time. Note that using a large number of addresses may significantly degrade the program performance.
- Do not specify [Continuous Action] in the Trigger Conditions for the script to write to device/PLC addresses. An error will be displayed because the communication processing cannot keep up with the large amount of write instructions. To enable [Continuous Action], use the GP internal device or temporary address.
- When calling a function from a function, the maximum number of nested levels is 9. Please do not set up more.
- Up to 9 levels of nested calls can be created.
- Up to 254 Functions can be created.

◆ Depending on the devices specified for trigger conditions, the D-script operations activated by a trigger after the screen changes are as follows:

Trigger Condition / Current Value or Condition	Any Connected Device other than [#MEMLINK]				[#MEMLINK]			
	Bit "0"	Bit "1"	Condition is not Satisfied	Condition is Satisfied	Bit "0"	Bit "1"	Condition is not Satisfied	Condition is Satisfied
Leading edge of bit	X	O	–	–	X	X	–	–
Falling edge of bit	O	X	–	–	X	X	–	–
Bit Change	O	O	–	–	X	X	–	–
Timer setting	X	X	X	X	X	X	X	X
Detecting true	–	–	X	O	–	–	X	O
Detecting false	–	–	O	X	–	–	O	X

O: Operation is performed immediately after the screen is changed, or the power is turned ON.

X: Operation is not performed immediately after the screen is changed, or the power is turned ON.

- When the timer is operating, the timer starts counting immediately after the screen changes.

*1 Total number of devices used in trigger expressions and script programs.

- When using Global D-Script, the operations mentioned above are performed only when the GP power is turned ON. With the GP screen changes, however, the operation mentioned above is not performed and the trigger conditions are continuously monitored.
- When a Global D-Script includes a timer, the timer starts counting immediately after the GP power is turned ON.

NOTE

- Do not use the touch panel key to set the trigger bit or to operate the start bit in a program. The timing of the touch input may not be correct, resulting in the bit being improperly entered.

◆ When a value is assigned to an address for switching screens while a D-Script command is being executed, the screen switching operation is processed after all D-Scripts have been processed

For example:

ID	00000			
Data Type	Bin	Data Length 16 Bit	Sign +/–	None
Trigger	Leading Bit([b:M0000])			

```
[w:[PLC1]D0100]=0                  // (1)
[w:[#INTERNAL]LS0008]=30           // (2) Switches to Base screen Number 30
[w:[PLC1]D0101]=1                  // (3)
[w:[PLC1]D0102]=2                  // (4)
```

When the above D-Script is executed, processing of the screen switch is performed after (3) and (4) have been processed.

◆ When data used in a D-Script is set up with a GP touch operation, make sure the data write operation is complete before running the D-script.

◆ Restrictions Specific to Global D-Script

- When the GP power is turned ON, the actions shown in the table on the previous page are performed. At the screen change, the above table is not applied, and the trigger conditions are continuously monitored.
- Global D-Script operation is suspended during screen changes or other GP operations.
- After the GP power is turned ON, Global D-Script actions are not performed until all data reads are completed for the initial screen.After the initial screen changes, Global D-Script actions may be performed before the data reads are completed.
- The maximum number of devices in Global D-Scripts is 255[*1]. When this number is exceeded, the D-Script does not function. Since these devices always read data regardless of the screens, be sure to use only the minimum number of device settings in your D-Script. Otherwise, operation performance can be degraded.
- The maximum number of Global D-Scripts available is 32. The currently used function also counts as one Global D-Script. When the number of the Global D-Scripts reaches 32, any subsequent Global D-Scripts are ignored.

*1 Total number of devices used in trigger expressions and script programs.

◆ Restrictions for SIO Port Operations

- Addresses designated in the Send/Receive functions are not added to the D-Script address count.
- The Control is a write-only variable, while Status and Received Data are read-only variables. Reading the Control variable or writing data to the Status variable causes the operation to fail.
- Create independent D-Scripts (or functions) for Send and Receive operations.For more information about the flow charts of data transfers, see
  ☞" ■ Flow Chart" (page 21-24)
- The User area in the LS device (LS20 to LS2031 and LS2096 to LS8191) can store data for Send/Receive functions.
- In the [System Settings] workspace [Script I/O Settings] page, when the [Type] is not set to [D-Script/Global D-Script], the 13th bit in address LS2032 turns ON when the [D-Script/Global D-Script] runs the [SIO Port Operation]'s Label Settings functions (Send, Receive, Control, Read Status, and Receive Data Size).For information about special relays:
  ☞"A.1.4.3 Special Relay" (page A-24)
- When using the Send/Receive functions, set the bit length of the D-Script to 16 bits. Note that the operation fails if the bit length is set to 32 bits.
- The size of the Send buffer is 2048 bytes, while the Receive buffer is 8192 bytes. The ER signal (output) RS signal (output) is turned OFF after at least 80% of the Receive buffer is full of received data.

◆ Limitations on BCD Format Operations

If a value which cannot be converted into BCD format is found during operation, the program stops running.
These values include A to F in hexadecimal format.
Do not use such values. If the program stops due to non-BCD values, bit 7 in common relay information (LS2032) in the GP turns ON. This bit does not turn OFF until the GP is turned OFF or goes offline.
For example:

[w:[PLC1]D0200]=([w:[PLC1]D0300]<<2)+80
If D300 is 3, shifting two bits to the left results in 0x000C, which cannot be converted into BCD format, and interrupts program execution.

[w:[PLC1]D0200]=[w:[PLC1]D0300]<<2 If D300 is 3, shifting two bits to the left results in 0x000C.
Unlike the above example, 0x000C is the result of the operation to be stored in the memory, and does not cause the program to stop.

◆ Limitations of Zero Operations

If you divide by zero in division (/) and modulus (%) operations, execution will stop. Do not divide by zero.
If the program stops due to the above error, bit 8 in the common relay (LS2032) in the GP turns ON. This bit does not turn OFF until the GP is turned OFF or goes offline.

◆ Notes on Delay During Assign Operation

Using a device address in an assign operation may cause write delay because the GP has to read the address data from the connected device. Consider the following:
For example:

[w:[PLC1]D0200]=([w:[PLC1]D0300]+1 ...
[w:[PLC1]D0201]=([w:[PLC1]D0200]+1 ...

Statement (1) assigns (D0300+1) into D0200. However, in statement (2), the result of statement (1) has not been assigned in D0200 because of time-consuming communication with the device/PLC. In such cases, program so that the result of statement (1) is stored in the LS area before it is executed, as shown below.

[w:[#INTERNAL]LS0100]=[w:[PLC1]D0300]+1
[w:[PLC1]D0200]=[w:[#INTERNAL]LS0100]
[w:[PLC1]D0201]=[w:[#INTERNAL]LS0100]+1

◆ Notes on dealing with negative numbers

For functions where a negative number is entered for an argument that does not accept negative numbers[*1], the entered number operates as unsigned[*2].

*1 For example, "the number of bytes" of the _CF_read () argument cannot accept negative numbers because it is the size of data to be read.

*2 For example, –1 is handled as 65535 for 16 Bit, and 4294967295 for 32 Bit.

21.10.2 Extended Script Restrictions

- For Device Addresses, only the LS Area and USR Area (Extended User Area) can be used.
- The temporary addresses of D-Scripts and Global D-Scripts are managed independently from the temporary address of Extended Scripts. Therefore, changes made to the temporary addresses of D-Scripts and Global D-Scripts are not reflected in the temporary address of Extended Scripts.
- You can call user-defined functions created with D-Script/Global D-Script, but if you access a device address outside the range of the internal device in the function, it may not operate normally. Also, when transferred (during the creation of data for the GP), user-defined functions are created independently for D-Scripts, Global D-Scripts, and Extended Scripts.
- When calling a function from a function, the maximum number of nested levels is 9.
- Up to 254 functions can be called. (The number of functions available with "Call" is 254.)
- Extended Script does not affect the tag count.
- Functions supported only by Extended Script, for example string operations, do not function if called with D-Script or Global D-Script.
- The available data format is Bin. BCD data format is disabled.
- The size of the Send buffer is 2048 bytes, while the Receive buffer is 8192 bytes. The CTS line is turned OFF after at least 80% of the Receive buffer is full of received data.
- D-Script/Global D-Script and Extended Script cannot be selected simultaneously. Note the combinations listed in the table below.

Extended SIO Setting	D-Script/ Global D-Script Extended SIO function for Extended Script	Extended SIO function for Extended Script
D-Script/Global D-Script	O: Operation possible	X: Will not operate
Extended Script	X: Will not operate	O: Operation possible

- Notational conventions for the character string setting

When using character strings with "_strset ( )" and other functions, enclose the character string in double quotation marks ("). To display double quotation marks in the character strings, append the "\" symbol and express as [\"].\There is no way to represent a single "\" symbol.When necessary, use the character code format setting (_strset (databuf0, 92).
For example:

"ABC\"DEF" ABC"DEF
"ABC\DEF" ABC\DEF
"ABC\\"DEF" ABC\"DEF
"ABC\\DEF" ABC\\DEF

- For functions where a negative number is entered for an argument that does not accept negative numbers[*1], the entered number operates as unsigned[*2].

*1 For example, "the number of bytes" of the _CF_read () argument cannot accept negative numbers because it is the size of data to be read.

*2 For example, –1 is handled as 65535 for 16 Bit, and 4294967295 for 32 Bit.

◆ **Size of the dedicated Extended SIO buffers (databuf0, databuf1, databuf2, and databuf3)**

Buffer	Buffer Name	Size
Data buffer 0	databuf0	1 KB
Data buffer 1	databuf1	1 KB
Data buffer 2	databuf2	1 KB
Data buffer 3	databuf3	1 KB

21.10.3 Restrictions on User-Defined Functions

- Portions of the commands that can be used differ with each script. When using commands, please refer to "21.11 Program Commands/Conditional Expressions" (page 21-68).
- For the function name, you may use any English letters or the underscore character "_." (However, the function name must begin with an alphanumeric character.)
- Do not use the following as Function Names.

and	b_call	Bcall	_bin2hexasc	break	Call
_CF_delete	_CF_dir	_CF_read	_CF_read_csv	_CF_rename	_CF_write
_USB_delete	_USB_dir	_USB_read	_USB_read_csv	_USB_rename	_USB_write
clear	databuf0	databuf1	databuf2	databuf3	_decasc2bin
_dlcopy	dsp_arc	dsp_circle	dsp_dot	dsp_line	dsp_rectangle
else	endif	fall	_hexasc2bin	if	IO_READ
IO_READ_EX	IO_READ_WAIT	IO_WRITE	IO_WRITE_EX	loop	_memcmp
memcpy	_memcpy_EX	memring	_memsearch	memset	_memset_EX
_memshift	not	or	return	rise	rise_expr
set	_strcat	_strlen	_strmid	_strset	timer
toggle	_wait				

21.10.4 Notes on Operation Results

■ Overflowing Digits

Overflowing digits resulting from operations are truncated.
When performing an operation on unsigned 16-bit data:

- 65535 + 1 = 0 (Produces overflowing digits)
- (65534 ∗ 2) / 2 = 32766 (Produces overflowing digits)
- (65534 / 2) ∗ 2 = 65534 (Does not produce overflowing digits)

■ Difference in Residual Processing

The result of residual processing depends on whether the left and right sides are signed or unsigned.

- –9 % 5 = –4
- 9 % –5 = 4

■ Truncated Decimal Places

Fractional values resulting from division are truncated.

- 10 / 3 ∗ 3 = 9
- 10 ∗ 3 / 3 = 10

■ Notes on Operating BCD Data

A BCD-data operation which produces overflowing digits does not give the correct result.

21.10.5 Errors

The following error message is displayed when a Script is configured incorrectly. The error will be displayed on the bottom of the GP screen.
Error codes are written to the LS91XX addresses. The number written in the error code area will be the number portion following RAAA in the table below. (For example, when error RAAA130 occurs, '130' will be written.)

Script Error Code List

D-Script (Error Address=LS9120)	Global D-Script (Error Address=LS9110)	Extended Script (Error Address=LS9100)
–	RAAA130	RAAA140
Unused	Global D-Script Error. (The Total Number of Global D-Scripts exceeds the maximum of 32.)	Extended D-Script Error (The total no. of functions exceeds the maximum of 255.)
–	RAAA131	–
Unused	Global D-Script Error. (The total no. of devices exceeds the maximum of 255[*1].)	Unused
RAAA120	RAAA132	RAAA141
D-Script Error (The specified function does not exist or the function has an error.)	Global D-Script Error (The specified function does not exist or the function has an error.)	Extended D-Script Error (The specified function does not exist or the function has an error.)
RAAA121	RAAA133	RAAA142
D-Script Error (These functions are nested to 10 levels or more.)	Global D-Script Error (These functions are nested to 10 levels or more.)	Extended D-Script Error (These functions are nested to 10 levels or more.)
RAAA122	RAAA134	RAAA143
D-Script Error (An expression exists, that is not supported by this version.)	Global D-Script Error (An expression exists, that is not supported by this version.)	Extended D-Script Error (An expression exists, that is not supported by this version.)
RAAA123	RAAA135	RAAA144
D-Script Error (The SIO operation function is used in a condition where no device/PLC has been set.)	Global D-Script Error (The SIO operation function is used in a condition where no device/PLC has been set.)	Extended D-Script Error (The SIO operation function is used in a condition where no device/PLC has been set.)
RAAA124	RAAA136	RAAA145
The D-Script has an error.	The Global D-script has an error.	The Extended D-Script has an error.

*1 Total number of devices used in trigger expressions and script programs.

21.11 Program Commands/Conditional Expressions

■ Function

Item	Command/Function	D-Script/Global D-Script	Extended Script
Data Type	Bin, BCD	O	Bin only
Bit Length	16 bit, 32 bit	O	O
Signed +/-	Enabled/Disabled	O	O
Trigger	Timer setting	O	X
	Leading edge of bit	O	X
	Falling edge of bit	O	X
	Toggle bit	O	X
	Expression is true	O	X
	Expression is false	O	X
Draw	Load Screen	O	X
	Dot	O	O
	Line	O	O
	Circle	O	O
	Rectangle	O	O
Operator	Addition (+)	O	O
	Subtraction (–)	O	O
	Modulus (%)	O	O
	Multiplication (*)	O	O
	Division (/)	O	O
	Assignment (=)	O	O
Comparison	Logical AND	O	O
	Logical OR	O	O
	Negation (NOT)	O	O
	Less than (<)	O	O
	Less than or equal to (<=)	O	O
	Not equal to (<>)	O	O
	Greater than (>)	O	O
	Greater than or equal to (>=)	O	O
	Equals (==)	O	O

Continued

Item	Command/Function	D-Script/Global D-Script	Extended Script
Memory Operation	Copy Memory: memcpy ( )	O	O
	Initialize Memory: memset ( )	O	O
	Copy Memory (Variable Specification) _memcpy_EX ( )	O	O
	Initialize Memory (Variable Specification) _memset_EX ( )	O	O
	Offset Address	O	O
	Shift Memory	O	O
	Memory Ring	O	O
	Search Memory	O	O
	Compare Memory	O	O
Bit Operation	Shift Left (<<)	O	O
	Shift Right (>>)	O	O
	Bitwise AND (&)	O	O
	Bitwise OR (|)	O	O
	Bitwise XOR (^)	O	O
	1's Complement	O	O
	Set Bit: set ( )	O	O
	Clear Bit: clear ( )	O	O
	Toggle Bit: toggle ( )	O	O
Conditional Expressions	if ( )	O	O
	if ( ) else	O	O
	loop ( ), break	O	O
	loop ( ) infinite loop	X	O
Address	Bit Address	O	Internal Device
	Word Address	O	Internal Device
	Temporary Working Address	O	O*1
Constant	Dec, Hex, Oct	O	O

Continued

Item	Command/Function	D-Script/Global D-Script	Extended Script
SIO Function	Receive: IO_READ ([p:SIO])	O	O
	Send: IO_WRITE ([p:SIO])	O	O
	Extended Receive: _IO_READ_EX ( )	X	O
	Extended Send _IO_WRITE_EX ( )	X	O
	Standby Reception Function _IO_READ_WAIT ( )	X	O
	Control [c:EXT_SIO_CTRL]	O	O
	Status [s:EXT_SIO_STAT]	O	O
	Received Data Size [r:EXT_SIO_RCV]	O	O
	Pause: _wait ( )	X	O

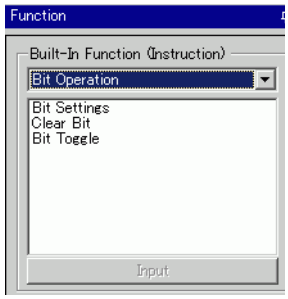
Item	Command/Function	D-Script/Global D-Script	Extended Script
Text Operation	Text	X	O
	Data Buffer databuf0, databuf1, databuf2, databuf3	X	O
	Write String _strset ( )	X	O
	From Data Buffer to Internal Device _dlcopy ( )	X	O
	Copy from Internal Device to Data Buffer: _ldcopy ( )	X	O
	Hexadecimal Text-To-Integer Conversion _hexasc2bin ( )	X	O
	Decimal Text-To-Integer Conversion _decasc2bin ( )	X	O
	Hexadecimal Number to String Conversion _bin2hexasc ( )	X	O
	Decimal Number to String Conversion _bin2decasc ( )	X	O
	String Length _strlen ( )	X	O
	String Concatenate _strcat ( )	X	O
	Copy Partial Strings _strmid ( )	X	O
	Status [e:STR_ERR_STAT]	X	O

Continued

Item	Command/Function	D-Script/Global D-Script	Extended Script
Function	Call	O	O
	return	X	O
CF File Operation	Read CSV File	O	O
	Output File List _CF_dir ( )	O	O
	Read File _CF_read ( )	O	O
	Read CSV File CF_read_csv ( )	O	O
	Write File _CF_write ( )	O	O
	Delete File _CF_delete ( )	O	O
	Change File Name _CF_rename ( )	O	O
USB File Operation	USB Read File	O	O
	Output File List _USB_dir ( )	O	O
	Read File _USB_read ( )	O	O
	Read CSV File USB_read_csv ( )	O	O
	Write File _USB_write ( )	O	O
	Delete File _USB_delete ( )	O	O
	Change File Name _USB_rename ( )	O	O
Printer Operation	Output COM Port: IO_WRITE ([p:PRN])	O	O
Debug	_debug ( )	O	O

*1 The temporary address exists separate from the D-script and global D-script.

21.11.1 Bit Operation

Bit Operation	Function Summary
	Bit Settings ☞" ■ Bit Settings" (page 21-73) Changes the specified bit address from 0 –> 1.
	Clear Bit ☞" ■ Clear Bit" (page 21-73) Changes the specified bit address from 1 –> 0.
	Bit Toggle ☞" ■ Bit Toggle" (page 21-73) Changes the specified bit address from 1 –> 0 or from 0 –> 1.

■ Bit Settings

Item	Description
Summary	Changes the specified bit address from 0 –> 1.
Format	set( )

Example expression:

set ([b:[#INTERNAL]LS010000])

In the above example, the 00th bit of LS0100 is changed from 0 –> 1.

■ Clear Bit

Item	Description
Summary	Changes the specified bit address from 1 –> 0.
Format	clear()

Example expression:

clear ([b:[#INTERNAL]LS010000])

In the above example, the 00th bit of LS0100 is changed from 1 –> 0.

■ Bit Toggle

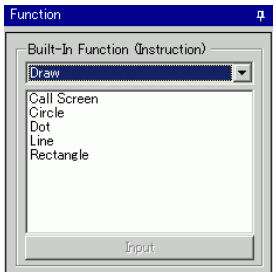
Item	Description
Summary	Changes the specified bit address from 1 -> 0 or from 0 -> 1.
Format	toggle( )

Example expression:

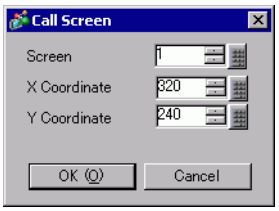
toggle([b:[#INTERNAL]LS010000])

In the above example, the 00th bit of LS0100 is changed from 1 –> 0 or from 0 –> 1.

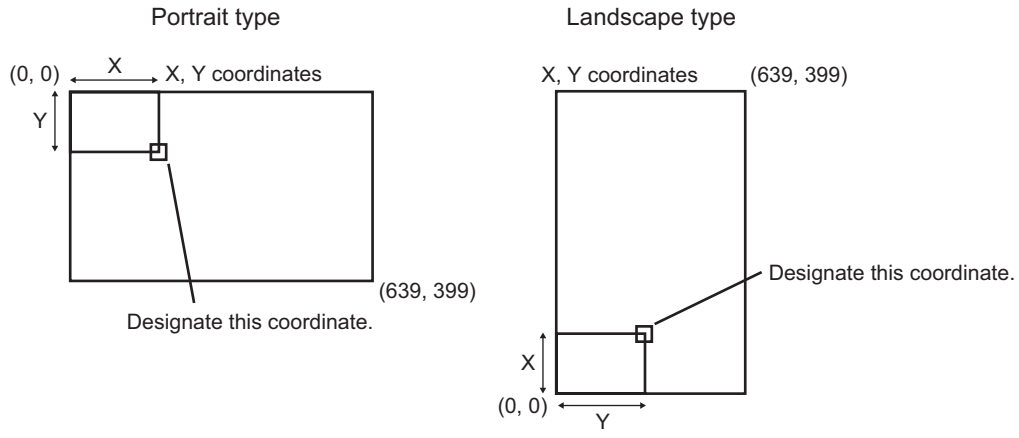
21.11.2 Draw

Draw	Function Summary
	Call Screen ☞" ■ Call Screen" (page 21-74) Calls the screen (base screen) with the designated screen number. It cannot be used in an Extended Script.
	Circle ☞" ■ Line" (page 21-76) Draws the designated circle.
	Dot ☞" ■ Dot" (page 21-76) Draws the designated dot.
	Line ☞" ■ Line" (page 21-76) Draws the designated line.
	Rectangle ☞" ■ Rectangle" (page 21-77) Draws the designated rectangle.

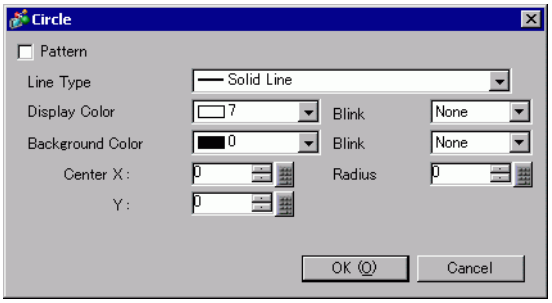
■ Call Screen

Item	Description
Summary	This function calls a registered Library Item. The designated screen (Base screen) is called at the designated X,Y coordinates. It cannot be used in an Extended Script.
Format	b_call (Screen Number, X Coordinate, Y Coordinate)  **NOTE** • Set the called screen's center coordinate with the X coordinate and Y coordinate.

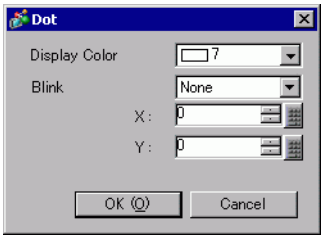
Coordinate Position



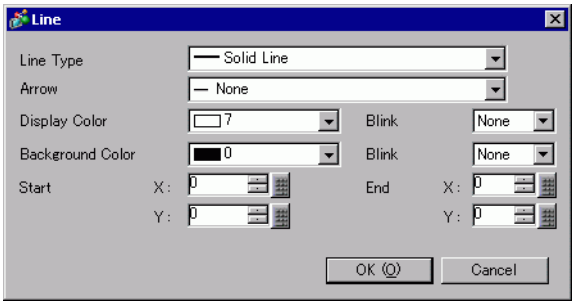
■ Circle

Item	Description
Summary	Draws a circle at the designated point. When you select the [Pattern] check box, a filled circle is drawn. Select and enter the line type (or fill pattern when selecting a pattern), color attributes, center coordinates, and radius value. Center coordinates and radius can be set indirectly.
Format	dsp_circle (X Coordinate, Y Coordinate, Radius, Display Color Blink + Display Color, Background Color Blink + Background Color, Line Type)  **NOTE** • When both black and Blink are set, the background color becomes transparent.

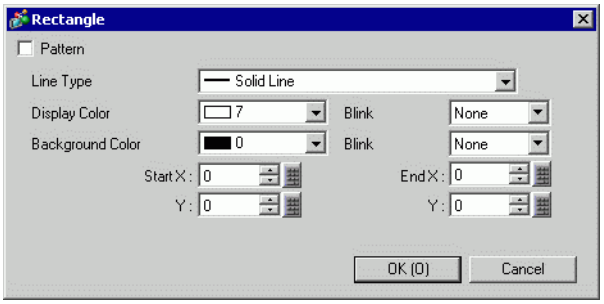
■ Dot

Item	Description
Summary	Draws a dot at the designated point. Set the X,Y coordinates, and display color.
Format	dsp_dot (X Coordinate, Y Coordinate, Blink + Display Color)  **NOTE** • When both black and Blink are set, the background color becomes transparent.

■ Line

Item	Description
Summary	Draws a line at the designated position. Set the line type, color attributes, and start and end coordinates.
Format	dsp_line (Start Point X Coordinate, Start Point Y Coordinate, End Point X Coordinate, End Point Y Coordinate, Display Color Blink + Display Color, Background Color Blink + Background Color, Line Type and Arrow)  **NOTE** • When both black and Blink are set, the background color becomes transparent.

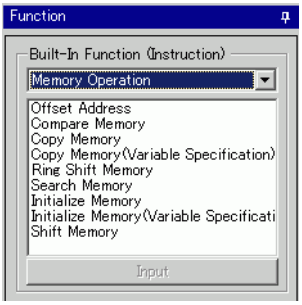
■ Rectangle

Item	Description
Summary	Draws a rectangle at the designated position. When you select the [Pattern] check box, draws a filled rectangle. Select and enter the line type (or fill pattern when selecting a pattern), color attributes, and start and end coordinates.
Format	dsp_rectangle (Start Point X Coordinate, Start Point Y Coordinate, End Point X Coordinate, End Point Y Coordinate, Display Color Blink + Display Color, Background Color Blink + Background Color, Pattern and Line Type)  **NOTE** • When both black and Blink are set, the background color becomes transparent.

IMPORTANT

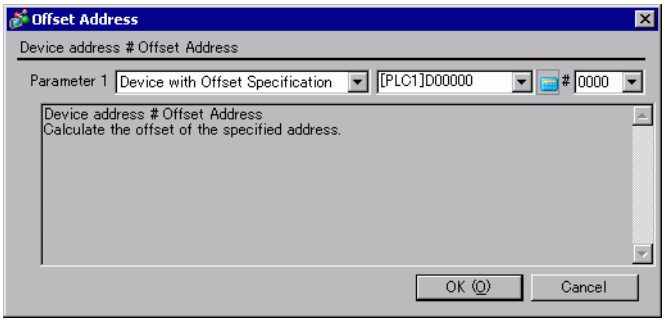
- When using colors in the draw functions, set the color codes from 0 to 255. If you set E1 to E12 and save the script, an error occurs.

21.11.3 Memory Operation

Memory Operation	Function Summary
	Offset Address ☞" ■ Offset Address" (page 21-79) Sets an address offset.
	Compare Memory ☞" ■ Compare Memory" (page 21-81) Compares two blocks of data at the specified positions (offset), and writes the comparison result to the storage address.
	Copy Memory ☞" ■ Copy Memory" (page 21-83) Copies device memory in one operation.
	Copy Memory (Variable Specification) ☞" ■ Copy Memory (Variable)" (page 21-87) Copies device memory in one operation. The source (copy from) address, destination (copy to) address, and number of addresses can be modified.
	Memory Ring ☞" ■ Memory Ring" (page 21-88) Ring-shifts the data in memory by the designated number of word blocks.
	Search Memory ☞" ■ Search Memory" (page 21-91) Performs a data search in block units, and returns (saves) the search result to the specified storage address.
	Initialize Memory ☞" ■ Initialize Memory" (page 21-95) Initializes all devices at once.
	Initialize Memory (Variable Specification) ☞" ■ Initialize Memory (Variable)" (page 21-96) Initializes all devices at once. The top address, set data, and number of addresses can be modified.
	Shift Memory ☞" ■ Shift Memory" (page 21-97) Shifts block units up.

■ Offset Address

Item	Description
Summary	Offset Addresses can be designated. Only temporary Word Addresses can be designated for offset value storage Addresses.
Format	[Device Address] # [Offset Address]



Constant Input Ranges

Data Type	Constant Input	
	Min	Max
Bin16	0	65535
Bin32	0	4294967295
Bin16+/–	–32768	32767
Bin32+/–	–2147483648	2147483647
BCD16	0	9999
BCD32	0	99999999

Example expression 1:

[w:[PLC1]D0200]=[w:[PLC1]D0100]#[t:0000]

In the above example, when [t:0000]'s value is 2, the value stored in D0102 are offset to D0200.

Example expression 2:

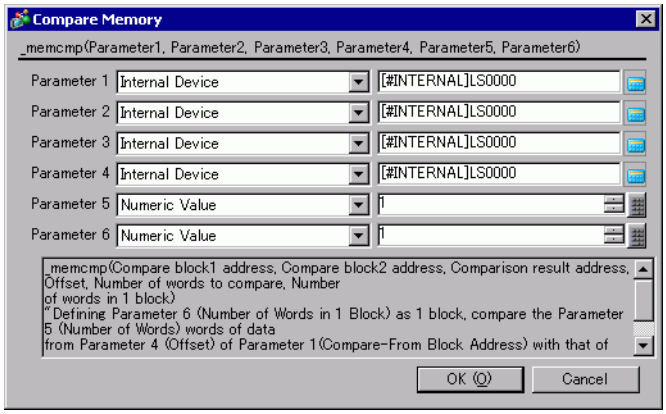
[w:[PLC1]D0100]#[t:0000]=30

In the above example, when [t:0000]'s value is 8, 30 is offset to D0108.

IMPORTANT

- Word Addresses used in the offset address format are not counted as D-Script Addresses.
- Data from a device designated by an offset address is not continuously read from the connected device. It is read when the D-Script is run. When an error occurs during the readout, the read-out value is treated as "0". Also, Bit 12 of the display unit internal special relay LS2032 turns ON. When data read is completed normally, Bit 12 is OFF.
- If the address offset result exceeds 16 bits (maximum value: 65535), bits up to bit 15 are valid, and bits 16 and higher are discarded.
- When defining a variable as the address, specify an integer array. Make sure the integer array is large enough to house all the consecutive addresses. Operations will be invalid if the array is not large enough to store consecutive addresses. Operations will also be invalid if the integer variable is not an array.

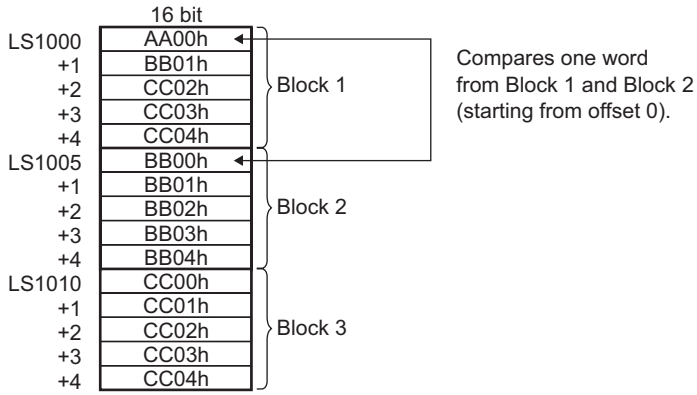
■ Compare Memory

Item	Description
Summary	Compares two blocks of data at the specified positions (offset), and writes the comparison result to the storage address. The following values are stored as the comparison result: When the values are equal: When the target data is larger than the original data: When the target data is smaller than the original data: When an error occurs, the error status value is written to LS9152.
Format	_memcmp ([Compared block Address], [Compare To Block Address], [Comparison Result Storage Address], Offset from Start of Block, Number of Compared Words, Words in 1 Block)  Parameter 1: Internal Device Parameter 2: Internal Device Parameter 3: Internal Device Parameter 4: Numeric Value (0 to 639), Internal Device, Temporary variable Parameter 5: Numeric Value (1 to 640) Parameter 6: Numeric Value (1 to 640) Data to be stored 0: Match 1: Compare From < Compare To 2: Compare From > Compare To

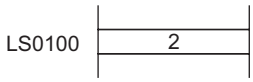
Example expression 1:

_memcmp ([w:[#INTERNAL]LS1000], [w:[#INTERNAL]LS1005], [w:[#INTERNAL]LS0100], 0, 1, 5)

(Compares one word from Block 1 and Block 2 (starting from offset 0) and saves the comparison result in LS0100)



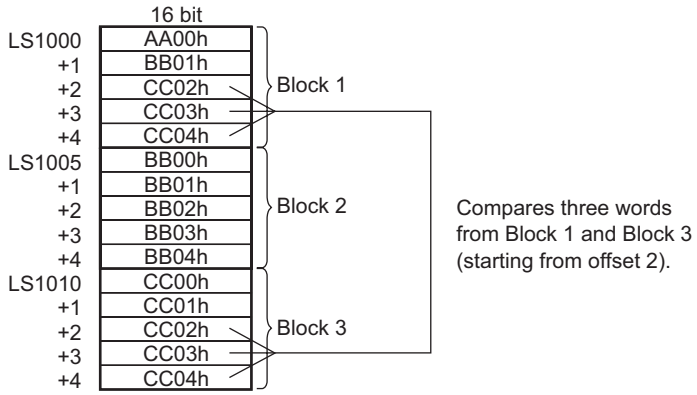
Since the source value is smaller than the target value, the comparison result "2" is stored in LS0100.



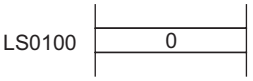
Example expression 2:

_memcmp ([w:[#INTERNAL]LS1000], [w:[#INTERNAL]LS1010], [w:[#INTERNAL]LS0100], 2, 3, 5)

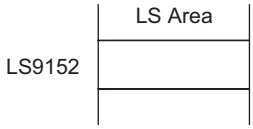
(Compares one word from Block 1 and Block 3 (starting from offset 2) and saves the comparison result in LS0100).



Since the values of the original and target data match, the comparison result "0" is stored in LS0100.



Error Status

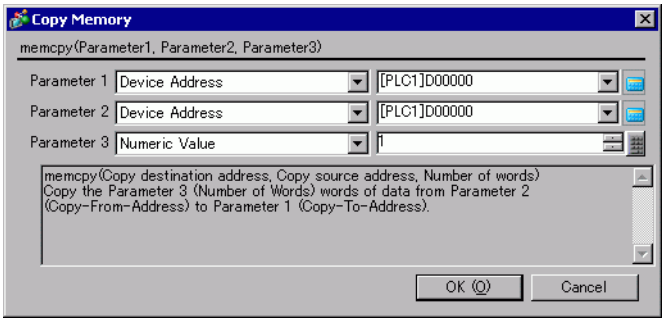


Editor Function Name	LS Area	Error Status	Cause
_memcmp ( )	LS9152	0000h	Completed Successfully
		0001h	Parameter error
		0003h	Write/Read error

IMPORTANT

- The effective LS device range that can be specified is limited to the designated user area (LS20 to LS2031 and LS2096 to LS8191).
- When you specify a value that is larger than the number of words in one block to the offset of a block, this feature does not work.
- When the number of words to compare is larger than one block, this feature does not work.

■ Copy Memory

Item	Description
Summary	Copies device memory in one operation. Data for the number of Addresses is copied to the copy destination Word Addresses beginning from the source data's first Word Address. The number of addresses that can be used is from 1 to 640.
Format	memcpy ([Copy To Address], [Copy From Address], Words) 

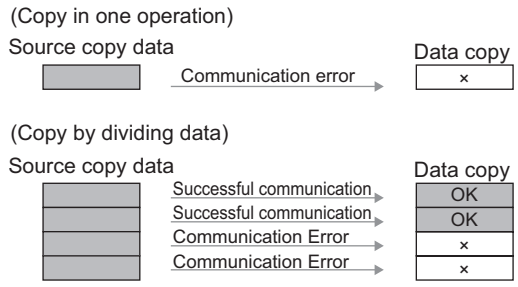
Example expression:

memcpy ([w:[PLC1]D0200], [w:[PLC1]D0100], 10)

In the above example, data is copied from D0100 to D0109 to D0200 to D0209.

IMPORTANT

- Source copy data is read from the connected device only once, when required. If a communication error occurs during data read, the display unit's internal special relay LS2032's Bit 12 is turned ON. When data read is completed normally, Bit 12 is OFF.
- Reading from the source copy data and writing the data to the destination is performed in one operation, or it is accomplished by dividing the data into several items equivalent to the number of Addresses used for the source copy data. If a communication error occurs during data read, the result of the data copy varies as follows, depending on whether the data was processed in one operation or in several items. (Result of data write operation O: Write complete, X: Unable to write)

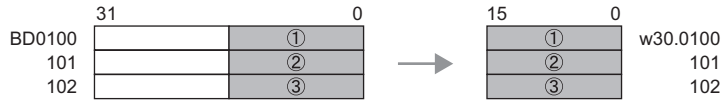


- As the number of Addresses increases, more time is required for writing data to the PLC. Depending on the number of Addresses, it may take from 20 seconds to several minutes.
- If data to be written exceeds the designated device range, a communication error occurs. In this case, you must turn OFF then ON the GP to reset the GP from the error.
- When data is written to the LS Area with the Copy Memory function (memcpy), the data is written only to the User area. Data cannot be written into the System Data area (LS0000 to LS0019), Special area (LS2032 to S2047), or Reserved area (LS2048 to LS2095). However, you can read data from these areas.

Continued

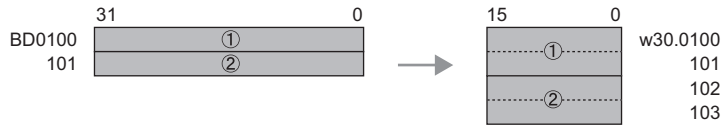
IMPORTANT

- When using D-Script to copy 32-bit device data to a 16-bit device, and the bit length is designated as 16 bits, only data in the lower 16 bits will be copied.
  For example, memcpy ([w:[PLC1]w30.0100], [w:[PLC1]BD0100], 3)

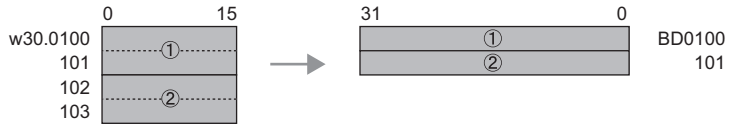


  Also, when 16 bit device data is copied to a 32 bit device, data is copied to the bottom 16 bits and "0" is set for the top 16 bits.
  For example, memcpy ([w:[PLC1]BD0100], [w:[PLC1]w30.0100], 3)

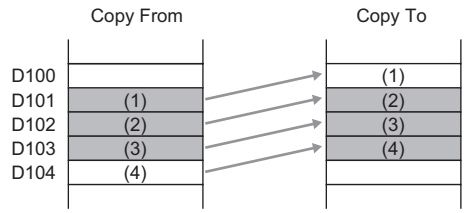
- When 32-bit device data is copied to a 16-bit device, or when 16-bit device data is copied to a 32-bit device, and the D-Script bit length defined in the script is 32 bits, the copy operation works as follows. When one of the devices is a 32-bit device and the other is a 16-bit device, the memcpy ( ) function will use 16 bits as its data length parameter.
  For example, memcpy ([w:[PLC1]w30.0100], [w:[PLC1]BD0100], 4)



  For example, memcpy ([w:[PLC1]BD0100], [w:[PLC1]w30.0100], 4)



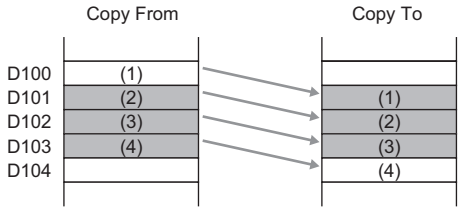
- If the original and destination data ranges overlap, all overlapping data will be rewritten as follows:
  For example, when copying D101-D104 to D100-D103
  Data is copied to a smaller number Address.



Continued

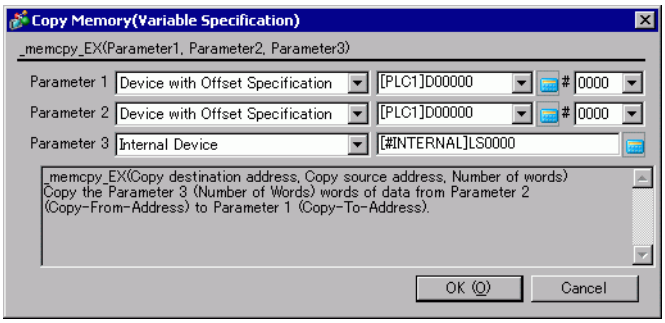
IMPORTANT

For example, when copying D100-D103 to D101-D104
Data is copied to a larger number Address.



- Although this example's function designates 2 Addresses, these Addresses will not be counted as D-Script Addresses.
- When using a device address for assignment, communication with the device/PLC causes a slight delay in assigning the value.

■ Copy Memory (Variable)

Item	Description
Summary	Copies device memory in one operation. The data of addresses specified with Parameter 3 are copied from the source word address specified with Parameter 2 to the destination word address specified with Parameter 1. The number of addresses that can be used is from 1 to 640. With the "_memcpy_EX" function, the source address, destination address, and number of addresses can be designated indirectly.
Format	_memcpy_EX ([Copy To Address], [Copy From Address], Words) Parameter 1: Device address + Temporary address Parameter 2: Device address + Temporary address Parameter 3: Numeric Value, Internal Device, Temporary address (The valid range for Parameter 3 is from 1 to 640.) 

Example expression:

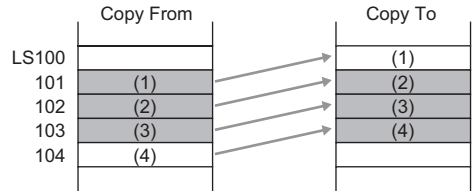
[t:0000]=10, [t:0001]=20

_memcpy_EX ([w:[#INTERNAL]LS0100]#[t:0000], [w:[PLC1]D0100]#[t:0001], 5)

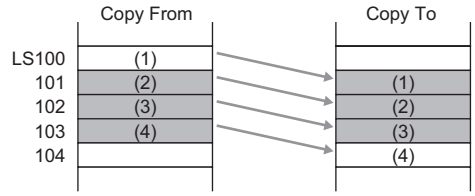
In the example above, five words of data are read out from D0120 and written into LS0110 to LS0114.

IMPORTANT

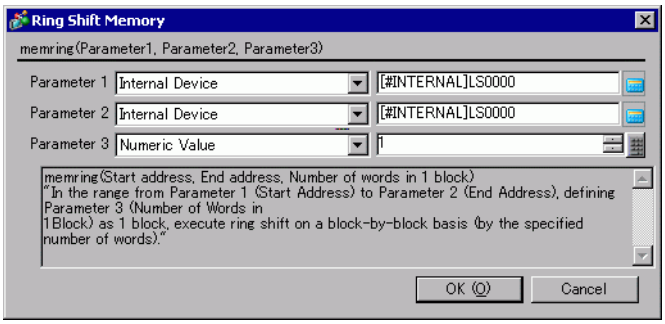
- If the original and destination data ranges overlap, all overlapping data will be rewritten as follows:
  For example, when copying LS101-LS104 to LS100-LS103
  Data is copied to a smaller number Address.



  For example, when copying LS100-LS103 to LS101-LS104
  Data is copied to a larger number Address.

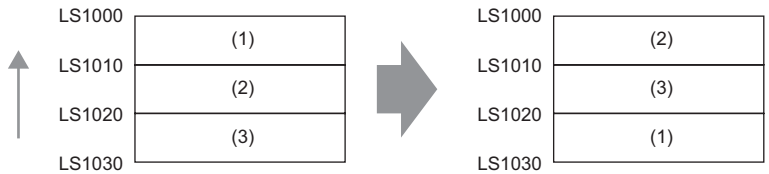


■ Memory Ring

Item	Description
Summary	Ring-shifts the data in memory in blocks. Performs ring-shift between the start and ending addresses in block units (by the specified number of words). When an error occurs, the error status is written to LS9150.
Format	memring ([Start Address], [End Address], Words in 1 Block)  Parameter 1: Internal Device Parameter 2: Internal Device Parameter 3: Numeric Value (1 to 640) - When Parameter 1 is smaller than Parameter 2 (P1 < P2), the block data is shifted upward. - When Parameter 1 is larger than Parameter 2 (P1 > P2), the block data is shifted downward. IMPORTANT • Make sure that the Start Address and End Address are set to the same type of device (LS or USR).

Example expression 1:

memring ([w:[#INTERNAL]LS1000], [w:[#INTERNAL]LS1030], 10)
(When Parameter 1 is greater than Parameter 2 (P1 < P2))

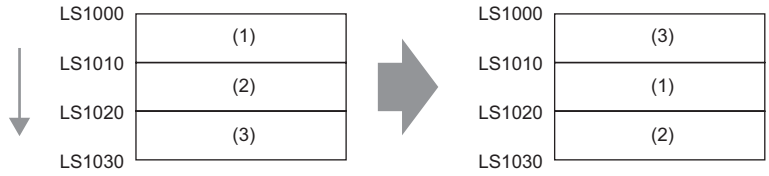


Data moves upward in 10-word block units.

Example expression 2:

memring ([w:[#INTERNAL]LS1030], [w:[#INTERNAL]LS1000], 10)

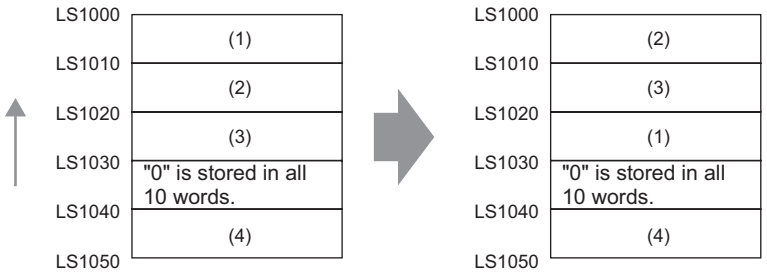
(When Parameter 1 is greater than Parameter 2 (P1 > P2))



Data moves downward in 10-word block units.

Example expression 3:

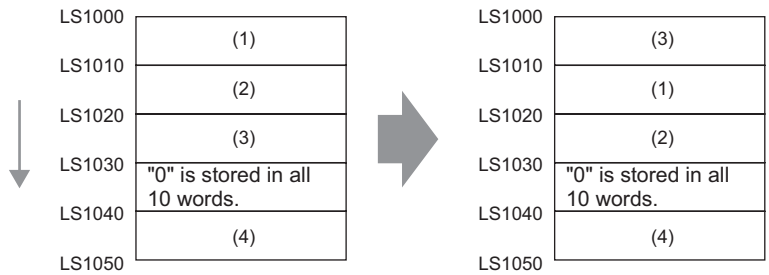
memring ([w:[#INTERNAL]LS1000], [w:[#INTERNAL]LS1050], 10)
(When the range contains a block where all words are "0".)



Data moves upward in 10-word block units only, from the starting block to the block with "0" data. If data exists after the block with "0" data, the data is ignored.

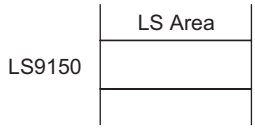
Example expression 4:

memring ([w:[#INTERNAL]LS1050], [w:[#INTERNAL]LS1000], 10)
(When a block with "0" data exists within the range.)



Data moves downward in 10-word block units only, from the starting block to the block with "0" data. If data exists after the block with "0" data, the data is ignored.

Error Status

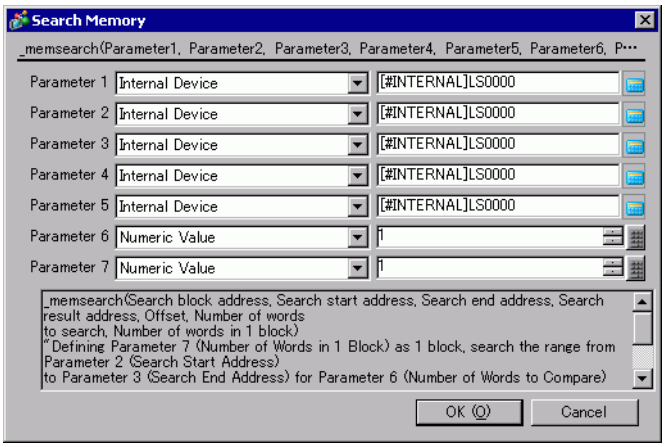


Editor Function Name	LS Area	Error Status	Cause
memring ( )	LS9150	0000h	Completed Successfully
		0001h	Parameter error
		0003h	Write/Read error

IMPORTANT

- The processing time required is proportional to the range designated by the start and end addresses. The larger the designated range, the longer the processing time becomes. The Part is not refreshed until processing is completed.
- The effective LS device range that can be specified is limited to the designated user area (LS20 to LS2031 and LS2096 to LS8191).

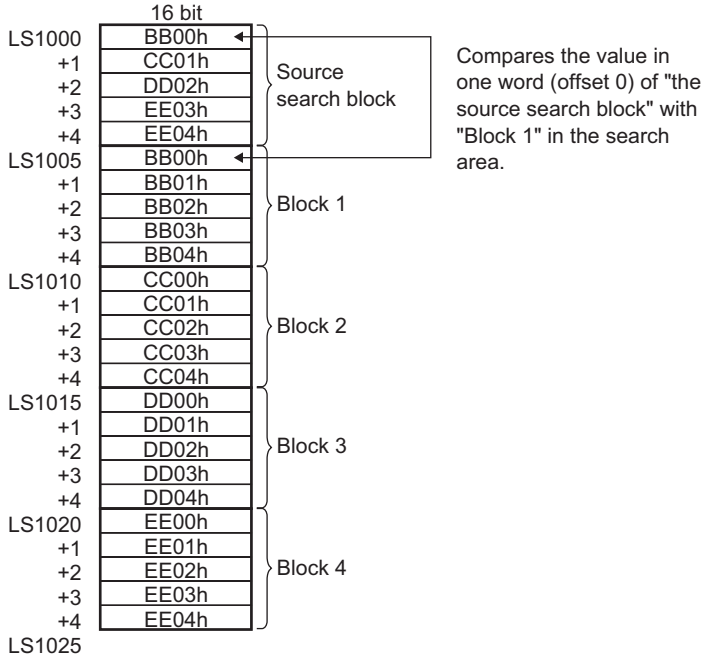
■ Search Memory

Item	Description
Summary	Performs a data search in block units, starting from the first item in the specified range. Compares data blocks, starting from the specified (offset) blocks and returns (saves) the search result to the specified storage address. When a matching block is found, the offset value of the block (1 or higher) is saved. When no matching block is found, "FFFFh" is saved. When an error occurs, the error status value is written to LS9153.
Format	_memsearch ([Searched Block Address], [Search Start Address], [Search End Address], [Search Result Storage Address], Offset from Start Block, Number of Compared Words, Words in 1 Block)  Parameter 1: Internal Device Parameter 2: Internal Device Parameter 3: Internal Device Parameter 4: Internal Device Parameter 5: Numeric Value (0 to 639), Internal Device, Temporary variable Parameter 6: Numeric Value (1 to 640) Parameter 7: Numeric Value (1 to 640) Data to be written When there are matching blocks: The block's offset value ("1" or higher) When there are no matching blocks: "FFFFh" IMPORTANT • Make sure that the search start address and search ending address are set to the same type of device (LS or USR). However, the [Searched Block Address] and [Search Result Storage Address] can be set to the Internal Device. • Be sure that [Parameter 2] is smaller than [Parameter 3]. Otherwise, an error occurs.

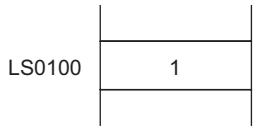
Example expression 1:

_memsearch ([w:[#INTERNAL]LS1000], [w:[#INTERNAL]LS1005], [w:[#INTERNAL]LS1025], [w:[#INTERNAL]LS0100], 0, 1, 5)

(Searches from LS1005 to LS1025 for a block with the same value. Starts from offset 0 of the source search block, and stores the result in LS0100.)



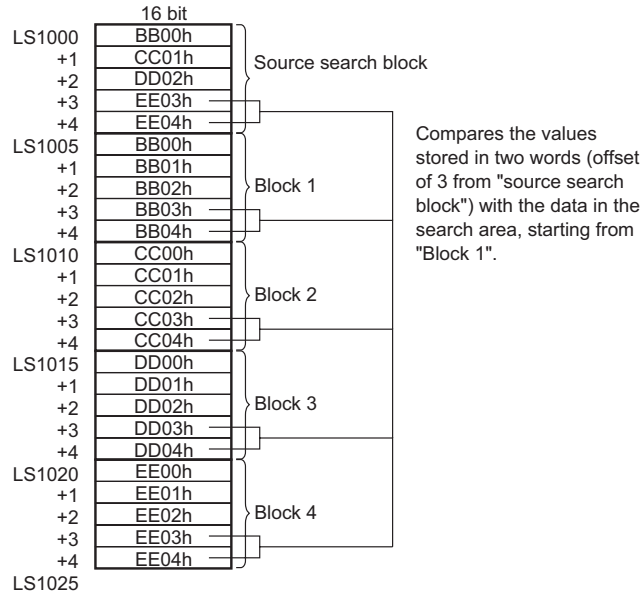
In this case, the value of "Block 1" matches the value of "the source search block". As a result the search result "1" is stored in LS0100.



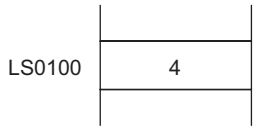
Example expression 2:

_memsearch ([w:[#INTERNAL]LS1000], [w:[#INTERNAL]LS1005],
[w:[#INTERNAL]LS1025],
[w:[#INTERNAL]LS0100], 3, 2, 5)

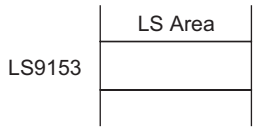
(Searches from LS1005 to LS1025 for a block with the same value. Uses two words, starting from an offset of 3, and stores the result in LS0100.)



In this case, the value of "Block 4" matches the value of "the source search block". As a result the search result "4" is stored in LS0100.



Error Status

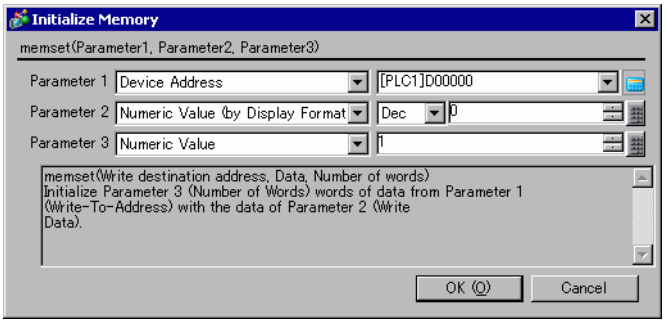


Editor Function Name	LS Area	Error Status	Cause
_memsearch ( )	LS9153	0000h	Completed Successfully
		0001h	Parameter error
		0003h	Write/Read error

IMPORTANT

- The processing time required is proportional to the range designated by the start and end addresses. The larger the designated range, the longer the processing time becomes. The Part is not refreshed until processing is completed.
- The effective LS device range that can be specified is limited to the designated user area (LS20 to LS2031 and LS2096 to LS8191).

■ Initialize Memory

Item	Description
Summary	Initializes all devices at once. Setting data for the number of Addresses is taken from the Set Word Address. The valid range for the number of addresses is from 1 to 640.
Format	memset ([Write-To Address], Write Data, Words) 

Example expression:

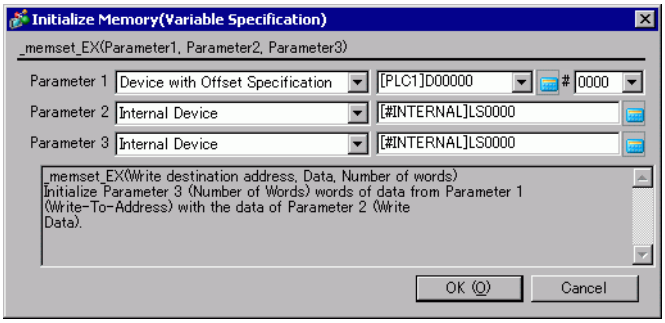
memset ([w:[PLC 1]D0100], 0, 10)

In the above example, "0" is set for the addresses D0100 to D0109.

IMPORTANT

- As the number of Addresses increases, more time is required for writing data to the PLC. Depending on the number of Addresses, it may take from 20 seconds to several minutes.
- If data to be written exceeds the designated device range, a communication error occurs. In this case, you must turn OFF then ON the GP to reset the GP from the error.
- Although this function designates addresses, they are not counted as D-Script addresses.
- When writing data to the LS Area with the Memory Reset (memset) function, the data can be written only into the User area. Data cannot be written into the System Data area (LS0000 to LS0019), Special area (LS2032 to S2047), or Reserved area (LS2048 to LS2095).
- When using device addresses for the Assign operation, the write values are not assigned immediately, due to the GP to PLC transmission time.
  For example:
  memset ([w:[PLC1]D0100], 0, 10) //Initialize D100 to D109 to 0
  [w:[PLC1]D200]=[w:[PLC1]D100] //Substitute D100 to D200
  In this case, the operation result of zero written to D100 is not assigned to D200 yet.

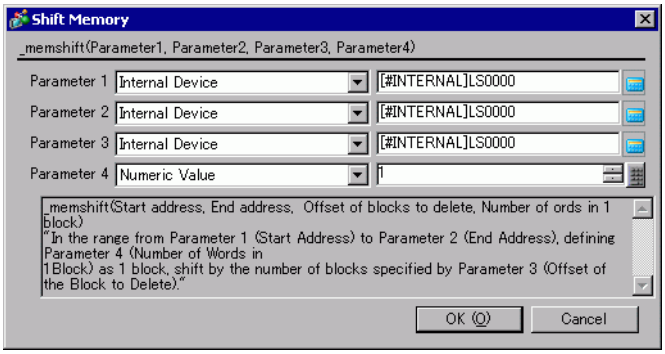
■ Initialize Memory (Variable)

Item	Description
Summary	Initializes all devices at once. The Set data specified with Parameter 2 are set from the Set Word Address specified with Parameter 1 into the addresses specified with Parameter 3. The valid range for the number of addresses is from 1 to 640. The Write-To Address, Write Data, and number of addresses can each be designated indirectly.
Format	_memset_EX ([Write-To Address], Write Data, Words)  Parameter 1: Device address + Temporary address Parameter 2: Numeric Value, Internal Device, Temporary address (The valid range for Parameter 2 is from 0 to 65535 for Dec, and from 0 to FFFF for Hex.) Parameter 3: Numeric Value, Internal Device, Temporary address (The valid range for Parameter 3 is from 1 to 640.)

Example expression:

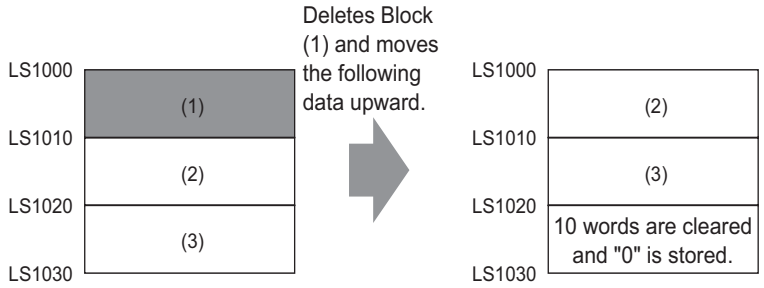
[t:0000]=10
[w:[#INTERNAL]LS0050]=0
[w:[#INTERNAL]LS0051]=5
_memset_EX ([w:[#INTERNAL]LS0100]#[t:0000], [w:[#INTERNAL]LS0050], [w:[#INTERNAL]LS0051])
In the example above, "0" will be written into the five words from LS0100 to LS0114.

■ Shift Memory

Item	Description
Summary	Deletes the specified block and moves the following data blocks upward. The block to be deleted is designated using an offset. When an error occurs, the error status is written to LS9151.
Format	_memshift ([Start Address], [End Address], Offset of Block to Delete, Words in 1 Block)  Parameter 1: Internal Device Parameter 2: Internal Device Parameter 3: Numeric Value (1 to 65,535), Internal Device, Temporary variable Parameter 4: Numeric Value (1 to 640) IMPORTANT • Make sure that the Start Address and End Address are set to the same type of device (LS or USR). • Be sure that [Parameter 1] is smaller than [Parameter 2]. Otherwise, an error occurs.

Example expression 1:

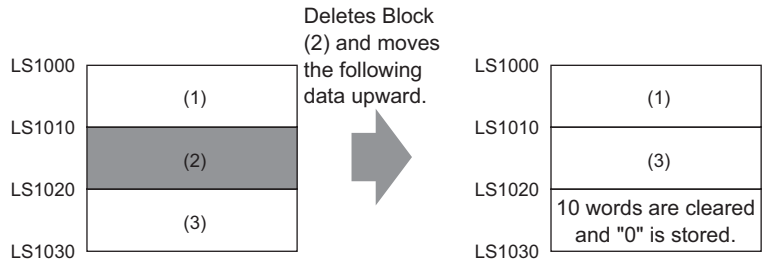
_memshift ([w:[#INTERNAL]LS1000], [w:[#INTERNAL]LS1030], 1, 10)



Data moves upward in block units (1 block = 10 words), and the last block (10 words) is cleared to zero.

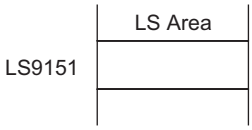
Example expression 2:

_memshift ([w:[#INTERNAL]LS1000], [w:[#INTERNAL]LS1030], 2, 10)



The data moves upward in block units (1 block = 10 words) starting from the offset 2 position, and the last block (10 words) is cleared to zero.

Error Status

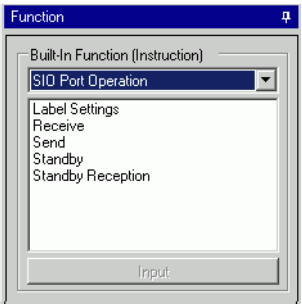


Editor Function Name	LS Area	Error Status	Cause
_memshift ( )	LS9151	0000h	Completed Successfully
		0001h	Parameter error
		0003h	Write/Read error

IMPORTANT

- The processing time required is proportional to the range designated by the start and end addresses. The larger the designated range, the longer the processing time becomes. The Part is not refreshed until processing is completed.
- When a value exceeding the range specified for the start and end addresses is designated as the offset of the block to delete, this feature does not operate correctly.
- The effective LS device range that can be specified is limited to the designated user area (LS20 to LS2031 and LS2096 to LS8191).

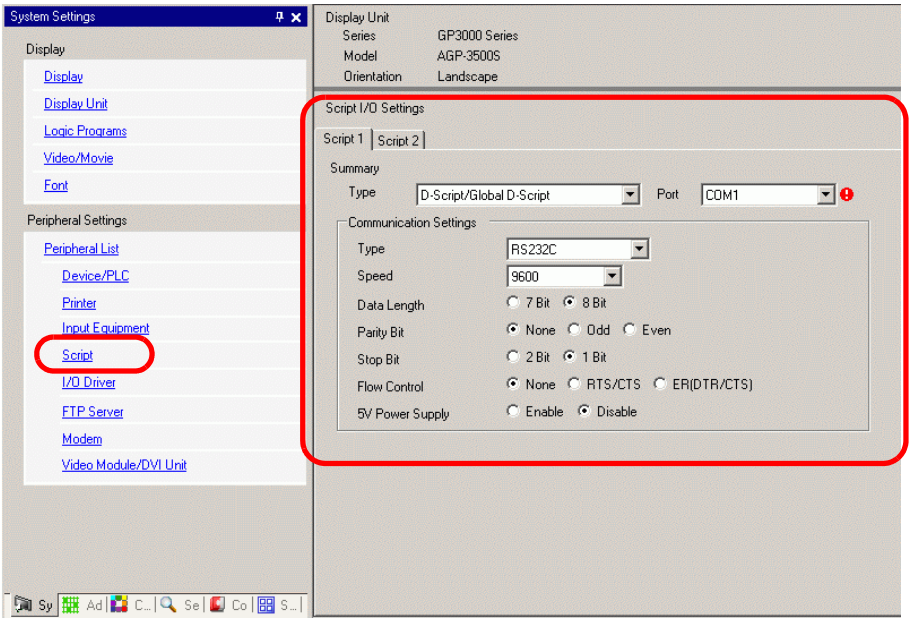
21.11.4 SIO Port Operation

SIO Port Operation	Function Summary
	Label Settings ☞" ■ Label Settings" (page 21-102) Set from the Control, Status, Receive Data Count, Receive Function, and Send Function.
	Receive ☞" ■ Receive" (page 21-104) Reads received data from the designated serial port (COM1 or COM2).
	Send ☞" ■ Send" (page 21-105) Writes to the designated serial port (COM1 or COM2).
	Extended Receive ☞" ■ Extended Receive" (page 21-106) Reads received data from the designated serial port (COM1 or COM2). It can only be used in an Extended Script.
	Extended Send ☞" ■ Extended Send" (page 21-107) Writes to the designated serial port (COM1 or COM2). It can only be used in an Extended Script.
	Standby Reception Function ☞" ■ Standby Receive Function" (page 21-108) Stays in standby receive mode until it receives specified text. It can only be used in an Extended Script.
	Standby Function ☞" ■ Standby Function" (page 21-109) The system waits for the specified period of time. It can only be used in an Extended Script.

IMPORTANT

- Label Settings, Send, and Receive can be easily included in a D-Script/Global D-Script.
- To communicate with D-Scripts/Global D-Scripts, set the following script settings. If script settings are not designated, they cannot execute.

  [D-Script/Global D-Script I/O Procedure]
  In the [System Settings] window, click [Script].
  Set the [Type] to [D-Script/Global D-Script].



  There are two tabs for the script settings. The above example uses [Script1]. Set the [Port] to COM1 or COM2, and set the [Communication Settings] to match the Extended SIO.
- When creating a communication program with more advanced functionality than the SIO port operation, it is recommended to use an [Extended Script]. See the following for examples on how to use extended scripts,
  ☞"21.5 Communicating with Unsupported Peripheral Devices" (page 21-21)

■ Label Settings

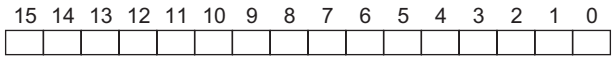
Control

Item	Description
Summary	This control variable is used to clear the Send buffer, Receive buffer, and error status. This control variable is write-only.
Format	When designating the bit: [c:EXT_SIO_CTRL**]**: 00 to 15) When designating the word: [c:EXT_SIO_CTRL]

◆ Example Expression

When designating the bit: [c:EXT_SIO_CTRL00] = 1
When designating the word: [c:EXT_SIO_CTRL] = 0x0007

◆ EXT_SIO_CTRL



Bit	Content
15	Reserved
14	
13	
12	
11	
10	
9	
8	
7	
6	
5	
4	
3	1: Clear Receive timeout
2	1: Clear error
1	1: Clear Receive buffer
0	1: Clear Send buffer

NOTE

- When a word is selected, and two or more bits are set simultaneously, the processing is executed in the following order: Clear Error –> Clear Receive Buffer –> Clear Send Buffer

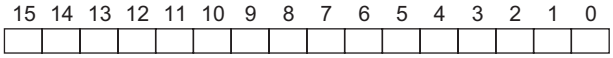
Status

Item	Description
Summary	Status includes the following information. This status variable is write-only.
Format	When designating the bit: [s:EXT_SIO_STAT**] (**: 00 to 15) When designating the word: [s:EXT_SIO_STAT]

◆ Example Expression

When designating the bit: if ([s:EXT_SIO_STAT 00] == 1)
When designating the word: if (([s:EXT_SIO_STAT] & 0x0001) <> 0)

◆ Contents of EXT_SIO_STAT



Bit	Content
15	0: No D-Script/Global D-Script 1: D-Script/Global D-Script exists
14	0: No extended script 1: Extended script exists
13	Reserved
12	
11	
10	
9	
8	
7	
6	
5	
4	0: Normal 1: Receive timeout
3	0: Normal 1: Receive error
2	0: No receive data 1: Receive data exists
1	0: Normal 1: Send error
0	0: Data exists in Send buffer 1: Send buffer is empty

NOTE

- The reserved bits may be assigned in the future. Therefore, be sure to check only the necessary bits.
- Two types of transmission errors exist: the transmission timeout error and the transmission buffer-full error. When either of the two errors occurs, the transmission error bit turns ON. The transmission timeout period is five seconds.
- There are four types of receive errors: parity error, overrun error, framing error, and overflow. When one of these four errors occurs, the bit for the receive error turns ON.
- If a transmission error is detected, the send data remains in the transmission buffer. If a transmission error cannot be detected, the send data is sent from the transmission buffer.
- When using the serial interface COM2, which is RS-422, the CS (CTS) signal cannot be detected. As a result, disconnection of a cable cannot be detected.

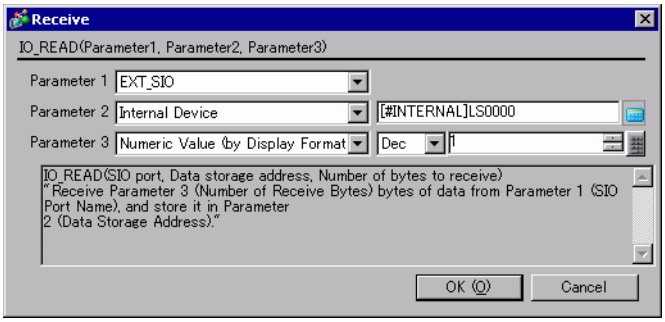
Received Data Size

Item	Description
Summary	Shows the quantity of data (number of bytes) received at that time. The received data size is read-only.
Format	[r:EXT_SIO_RECV]

IMPORTANT

- Label name of the Number of Received Data (number of bytes)
  With GP-PRO/PB III V.6.0 and earlier versions, the Label name designated for the received data size is [r: EXT_SIO_RCV]. However, you are not required to revise the description because the function is the same whether [r: EXT_SIO_RCV] or [r: EXT_SIO_RECV] expression is selected.

■ Receive

Item	Description
Summary	Write the statement as follows when reading out the received data from the Extended SIO.
Format	IO_READ ([p:EXT_SIO], Data Storage Address, Number of Receive Bytes)  Parameter 1: EXT_SIO Parameter 2: Internal Device Parameter 3: Numeric Value

Example expression:

IO_READ ([p:EXT_SIO], [w:[#INTERNAL]LS0100], 10)

In the above example, the number of bytes received is stored in LS0100. 10 bytes of data is stored starting from LS0101. The following image shows the stored received data.

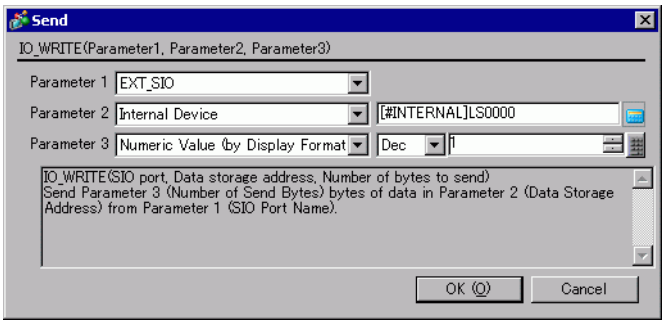
NOTE

- The maximum number of transfer bytes during data reception is 2011. The data is written to each word address in units of 1 byte.

LS0100	Received Data Size		... 10 bytes
LS0101	00	Byte 1	
LS0102	00	Byte 2	
LS0103	00	Byte 3	
LS0104	00	Byte 4	
LS0105	00	Byte 5	
LS0106	00	Byte 6	
LS0107	00	Byte 7	
LS0108	00	Byte 8	
LS0109	00	Byte 9	
LS0110	00	Byte 10	

Received Data Storage Method

■ Send

Item	Description
Summary	Write the statement as follows when writing data to the Extended SIO.
Format	IO_WRITE ([p:EXT_SIO], Data Storage Address, Number of Send Bytes)  Parameter 1: EXT_SIO Parameter 2: Internal Device Parameter 3: Numeric Value

Example expression:

IO_WRITE ([p:EXT_SIO], [w:[#INTERNAL]LS0100], 10)

In the above example, 10 bytes of data starting from LS0100 are sent. The following image shows the stored sent data.

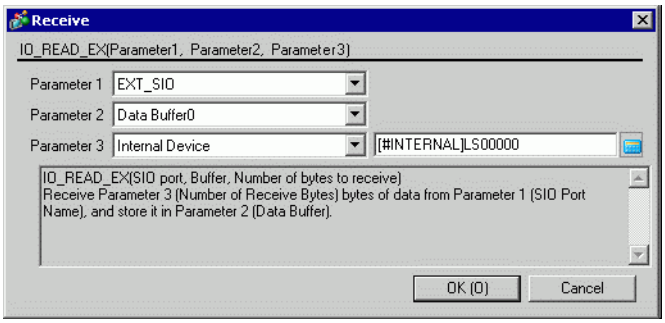
NOTE

- The maximum number of transfer bytes when receiving data is 2012.
- As the LS device for the Send buffer, write the data in single bytes to each word address.

LS0100	00	Byte 1
LS0101	00	Byte 2
LS0102	00	Byte 3
LS0103	00	Byte 4
LS0104	00	Byte 5
LS0105	00	Byte 6
LS0106	00	Byte 7
LS0107	00	Byte 8
LS0108	00	Byte 9
LS0109	00	Byte 10

Sent Data Storage Method

■ Extended Receive

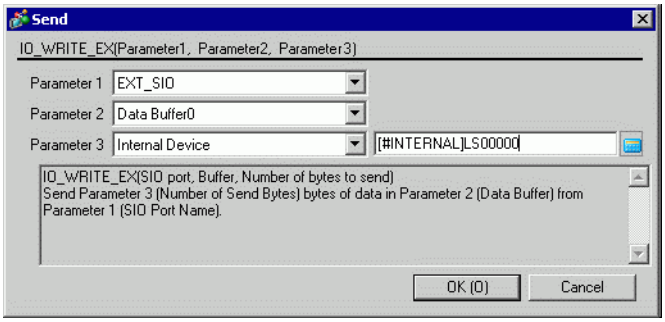
Item	Description
Summary	Receives data of the size indicated in Received Data Size (bytes) from the Extended SIO and stores it in the data buffer. The number of bytes specified with Parameter 3 is received from the Extended SIO and stored in the data buffer specified with Parameter 2. It can only be used in an Extended Script.
Format	IO_READ_EX ([p:EXT_SIO], Data Buffer, Number of Receive Bytes)  Parameter 1: [p:EXT_SIO] Parameter 2: Data Buffer Parameter 3: Numeric Value, Internal Device, Temporary address (The valid range for Parameter 3 is from 1 to 1024.)

Example expression:

IO_READ_EX ([p:EXT_SIO], databuf1, 10)

In the above example, 10 bytes of data in the data received by the Extended SIO are received and stored in "databuf1".

■ Extended Send

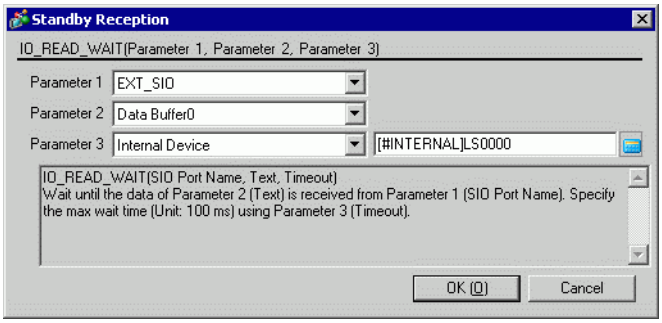
Item	Description
Summary	Sends the data in the data buffer with Extended SIO according to the size of Number of Send Bytes. The contents of the data buffer specified with Parameter 2 are sent from Extended SIO by the length specified with Parameter 3. It can only be used in an Extended Script.
Format	IO_WRITE_EX ([p:EXT_SIO], Data Buffer, Number of Send Bytes)  Parameter 1: [p:EXT_SIO] Parameter 2: Data Buffer Parameter 3: Numeric Value, Internal Device, Temporary address (The valid range for Parameter 3 is from 1 to 1024.)

Example expression:

IO_WRITE_EX ([p:EXT_SIO], databuf0, 10)

In the example above, 10 bytes of data in "databuf0" are sent from Extended SIO.

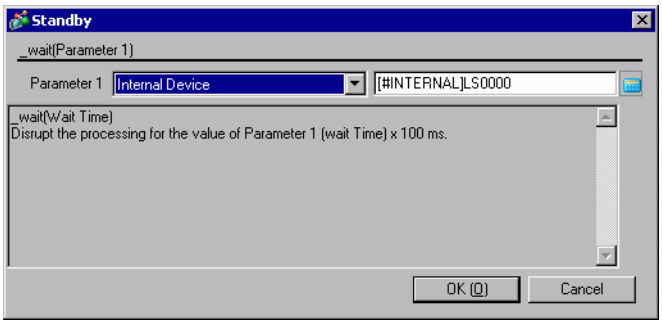
■ Standby Receive Function

Item	Description
Summary	Stays in standby receive mode until it receives specified text. After the timeout period has expired, Bit 4 (Receive time-out error) of Status [s: EXT_SIO_STAT] is set. The timeout duration can be set in 100 ms increments. The system is in standby receive mode until it receives the character string or character code specified with Parameter 2. Configure the timeout duration with Parameter 3. It can only be used in an Extended Script.
Format	IO_READ_WAIT([p:EXT_SIO], Text, Time-out)  Parameter 1: [p:EXT_IO] Parameter 2: Numeric Value, Text, Data Buffer Parameter 3: Numeric Value, Internal Device, Temporary address (The valid range for Parameter 3 is from 1 to 600.)

IMPORTANT

- The received data cannot be used until the specified text is received. (Otherwise, the data are abandoned.)
- Up to 128 characters (bytes) can be specified. Note that the standby receive operation cannot be performed successfully when strings exceeding the limit are specified.

■ Standby Function

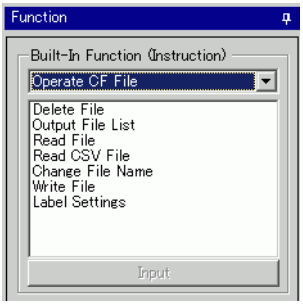
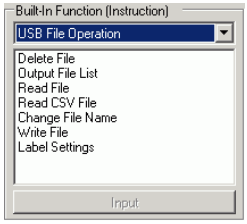
Item	Description
Summary	The system waits for the specified period of time. The time can be configured in 100 ms increments. It can only be used in an Extended Script.
Format	_wait(Wait Time)  Parameter 1: Internal Device, Temporary address, Numeric Value (The valid range for Parameter 1 is from 1 to 600.)

Example expression:

_wait (10)

In the example above, the system waits one second.

21.11.5 CF File Operation/USB File Operation

CF File Operation	Function Summary
	Label Settings ☞" ■ Label Settings" (page 21-111) Set from the Number of Files Listed, Number of Read Bytes, and CF Card/USB Storage Error Status.
	Write File ☞" ■ Write File" (page 21-121) Any one of three modes can be selected:
	Change File Name ☞" ■ Change File Name" (page 21-125) Modifies the file name.
	Read CSV File ☞" ■ Read CSV File" (page 21-127) Reads data in cell units from a CSV file and writes it to a word address.
	Read File ☞" ■ Read File" (page 21-130) Reads the specified number of bytes of data in the file after the specified offset and writes it in the destination address.
	Output File List ☞" ■ Output File List" (page 21-133) The list of files that exist in the specified folder is written in the Internal Device.
	Delete File ☞" ■ Delete File" (page 21-135) Deletes the file.

■ Label Settings

The following are possible status values for CF Card/USB Storage Status.

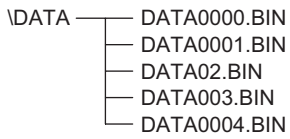
Status name	Label name	Description
Listed Files	[s:CF_FILELIST_NUM] [s:USB_FILELIST_NUM]	Stores the number of files actually listed when the File List Output function "_CF_dir ( )" or "_USB _dir ( )" is executed.
Number of Read Bytes	[s:CF_READ_NUM] [s:USB_READ_NUM]	Stores the number of bytes that can actually be read out when the File Read function "_CF_read ( )" or "_USB_read ( )" is executed.
CF Card/USB Storage Error Status	[s:CF_ERR_STAT] [s:USB_ERR_STAT]	Stores the error status generated when the CF Card or USB Storage is accessed.

Listed Files

When the File List Output function "_CF_dir ( )" ( ) or "_USB_dir" ( ) is executed, the number of file lists that are actually written in the LS Area is stored in "Listed Files [s:CF_FILELIST_NUM]/[s:USB_FILELIST_NUM]".

◆ Usage example

_CF_dir ("\DATA*.*", [w:[#INTERNAL]LS0100], 10, 0)
[w:LS0200] = [s:CF_FILELIST_NUM]



When obtaining a file list of the 10 files and the specified folder contains only five files, "5" is stored in [s:CF_FILELIST_NUM].

IMPORTANT

- When no files are written, the total number of files contained in the specified folder is written in [s:CF_FILELIST_NUM].

Number of Read Bytes

When the File Read function "_CF_read ( )" or "_USB_read" ( ) is executed, the number of bytes actually read out is stored in "Readout Bytes [s:CF_READ_NUM] / [s:USB_READ_NUM].

◆ Usage example

_CF_read ("\DATA", "DATA0001.BIN", [w:[#INTERNAL]LS0100], 16, 16)
[w:[#INTERNAL]LS0200] = [s:CF_READ_NUM]

When an attempt is made to read 16 bytes but only 12 bytes are read successfully, "12" is stored in [s:CF_READ_NUM].

CF Card/USB Storage Error Status

Stores the error status generated when the CF Card or USB Storage is accessed.

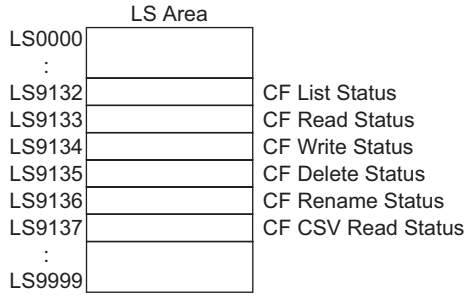
Bit Position	Error Name	Description
15	Reserved	Reserved
14		
13		
12		
11		
10		
9		
8		
7		
6	File rename error	• CF Card/USB Storage is removed during execution. • Specified file does not exist.
5	File delete error	• CF Card/USB Storage is removed during execution. • Specified file does not exist. • An attempt was made to delete a file with a read-only attribute.
4	File write error	• CF Card/USB Storage is removed during execution. • Free space of CF Card/USB Storage capacity exceeded. • An attempt was made to write data to a file with a read-only attribute. • An attempt was made to "overwrite" a file that does not exist.
3	File read error	• CF Card/USB Storage is removed during execution. • Specified file does not exist.
2	File list error	• CF Card/USB Storage is removed during execution. • Specified folder does not exist.
1	CF/USB Storage Card Error	• CF Card/USB Storage is invalid. • The media inserted is not a CF Card.
0	CF/USB Storage Card Missing	• CF Card/USB storage is not inserted. • Cover is open.

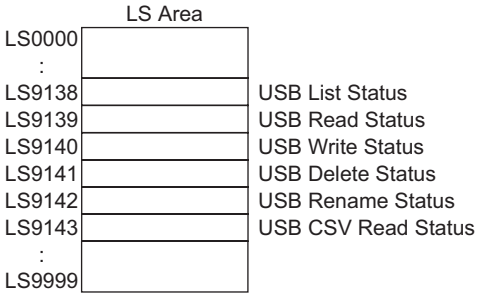
- Even when a CF Card/USB storage Error occurs, processing will continue. Be sure to write the script so that it checks for errors when you use the file operation functions of a CF Card/USB storage.
  For example:

```
_CF_dir ("\DATA\*.*", [w:[#INTERNAL]LS0100], 2, 1) Outputs a file list.
if ([s:CF_ERR_STAT02] <> 0)          // Checks the error status.
{
    set ([b:[#INTERNAL]LS005000]) // Sets the bit address for error display.
}
endif
```

◆ CF Card/USB storage Error Detail Status Storage Area

Each Bit will be set when an error occurs. You can check what factors lead to the error by setting Detail Status. In each function, Detail Status is stored in LS9132 to LS9137 for Extend System Area (LS9138 to LS9143 for USB storage). These areas are only for Read-in.





◆ Error list for each function

Editor Function Name		Error Status	Cause
_CF_dir ( )	LS9132	0010h	Invalid D-Script data (Error in retrieving folder name specified with fixed string)
		0012h	File name (path name) error
		0018h	LS Area writing range error
		0020h	No CF Card
		0021h	Invalid CF Card
		0100h	Directory open error

Continued

Editor Function Name		Error Status	Cause
_CF_read ( )	LS9133	0010h	Invalid D-Script data (Error in retrieving folder name/file name specified with fixed string)
		0011h	LS Area reading range error
		0012h	File name (path name) error
		0018h	LS Area writing range error
		0020h	No CF Card
		0021h	Invalid CF Card
		0101h	File seek error (Offset error)
		0102h	Number of readout bytes error
		0110h	File creation (open) error
_CF_write ( )	LS9134	0010h	Invalid D-Script data (Error in retrieving folder name/file name specified with fixed string)
		0011h	LS Area reading range error
		0012h	File name (path name) error
		0020h	No CF Card
		0021h	Invalid CF Card
		0101h	File seek error (Offset error)
		0104h	Folder creation error
		0108h	Write mode error
		0110h	File creation (open) error
		0111h	File write error (For example, insufficient space on CF Card)

Continued

Editor Function Name		Error Status	Cause
_CF_delete ( )	LS9135	0010h	Invalid D-Script data (Error in retrieving folder name/file name specified with fixed string)
		0011h	LS Area reading range error
		0012h	File name (path name) error
		0020h	No CF Card
		0021h	Invalid CF Card
		0112h	File delete error (For example, specified file does not exist. Specified file is read-only.)
_CF_rename ( )	LS9136	0010h	Invalid D-Script data (Error in retrieving folder name/file name specified with fixed string)
		0011h	LS Area reading range error
		0012h	File name (path name) error
		0020h	No CF Card
		0021h	Invalid CF Card
		0114h	File rename error (For example, specified file does not exist. File name already exists.)
_CF_read_csv ( )	LS9137	0001h	Parameter error
		0002h	CF Card error (No CF Card, Open file error, File read error)
		0003h	Write Error

Continued

Editor Function Name		Error Status	Cause
__USB_dir ( )	LS9138	0010h	Invalid D-Script data (Error in retrieving folder name specified with fixed string)
		0012h	File name (path name) error
		0018h	LS Area writing range error
		0020h	No USB storage
		0021h	Invalid USB storage
		0100h	Directory open error
__USB_read ( )	LS9139	0010h	Invalid D-Script data (Error in retrieving folder name/file name specified with fixed string)
		0011h	LS Area reading range error
		0012h	File name (path name) error
		0018h	LS Area writing range error
		0020h	No USB storage
		0021h	Invalid USB storage
		0101h	File seek error (Offset error)
		0102h	Number of readout bytes error
		0110h	File creation (open) error
__USB_write ( )	LS9140	0010h	Invalid D-Script data (Error in retrieving folder name/file name specified with fixed string)
		0011h	LS Area reading range error
		0012h	File name (path name) error
		0020h	No USB storage
		0021h	Invalid USB storage
		0101h	File seek error (Offset error)
		0104h	Folder creation error
		0108h	Write mode error
		0110h	File creation (open) error
		0111h	File write error (For example: insufficient space on USB storage)

Continued

Editor Function Name		Error Status	Cause
__USB_delete ( )	LS9141	0010h	Invalid D-Script data (Error in retrieving folder name/file name specified with fixed string)
		0011h	LS Area reading range error
		0012h	File name (path name) error
		0020h	No USB storage
		0021h	Invalid USB storage
		0112h	File delete error (For example, specified file does not exist. Specified file is read-only.)
__USB_rename ( )	LS9142	0010h	Invalid D-Script data (Error in retrieving folder name/file name specified with fixed string)
		0011h	LS Area reading range error
		0012h	File name (path name) error
		0020h	No USB storage
		0021h	Invalid USB storage
		0114h	File rename error (For example, specified file does not exist. File name already exists.)
__USB_read_csv ( )	LS9143	0001h	Parameter error
		0002h	USB storage error (No USB storage, File open error, File read error)
		0003h	Write Error

◆ Data Storage Mode

When data is read/written from/to device addresses at the execution of the File Read/File Write function, the storage order of the written (readout) data can be specified.
Setting the data storage mode in LS9130 can change the storage order. The mode can be selected from four options: 0, 1, 2 or 3.

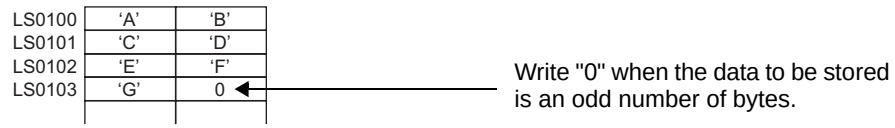
NOTE

- Use the following to reference LS9130.
  _CF_write() CF file operation: Write to file
  _CF_read() CF file operation: Read file
  _CF_read_csv() CF file operation: Read CSV file
  _USB_write() USB file operation: Write to file
  _USB_read() USB file operation: Read file
  _USB_read_csv() USB file operation: Read CSV file
  IO_WRITE([p:PRN],...)Printer operation: Send
- When writing or reading to device addresses, instead of using the LS9130 storage mode, you can use the following functions to interact with the [Text Data Mode] property in the [System Settings] window's [Device/PLC] page.
  _CF_dir() CF file operation: Output file list
  _USB_dir() USB file operation: Output file list

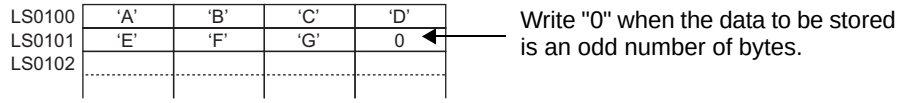
- Mode 0

When the File Read function is used to write a string "ABCDEFG" in a device address
[w:[#INTERNAL]LS9130] = 0
_CF_read ("\DATA", "DATA0001.BIN", [w:[#INTERNAL]LS0100], 0, 7)

- When the device address length is 16 bits



- When the device address length is 32 bits

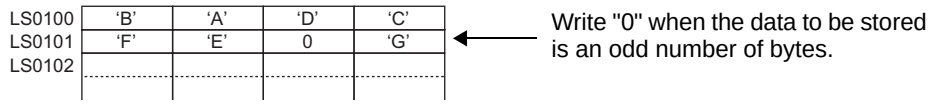


- Mode 1

For example, when the File Read function is used to write a string "ABCDEFG" in a device address
[w:[#INTERNAL]LS9130] = 1
_CF_read ("\DATA", "DATA0001.BIN", [w:[#INTERNAL]LS0100], 0, 7)

- When the device address length is 16 bits

- When the device address length is 32 bits



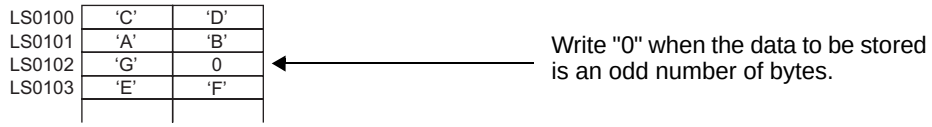
- Mode 2

For example, when the File Read function is used to write a string "ABCDEFG" in a device address

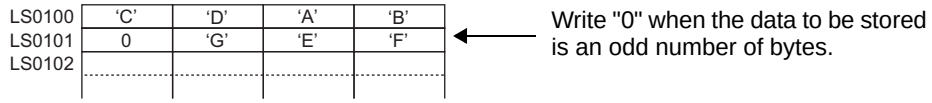
[w:[#INTERNAL]LS9130] = 2

_CF_read ("\DATA", "DATA0001.BIN", [w:[#INTERNAL]LS0100], 0, 7)

- When the device address length is 16 bits



- When the device address length is 32 bits



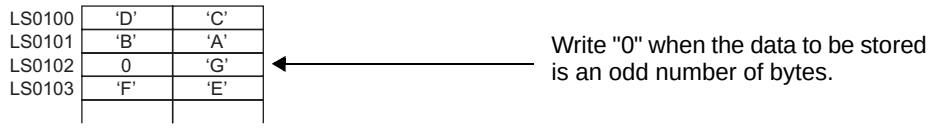
- Mode 3

For example, when the File Read function is used to write a string "ABCDEFG" in a device address

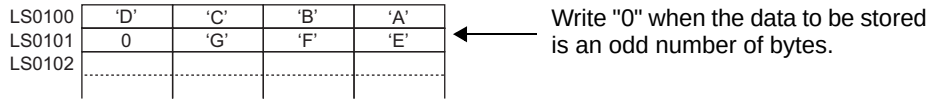
[w:[#INTERNAL]LS9130] = 3

_CF_read ("\DATA", "DATA0001.BIN", [w:[#INTERNAL]LS0100], 0, 7)

- When the device address length is 16 bits



- When the device address length is 32 bits



IMPORTANT

- The data storage mode is not the same as the string data mode in the system setting. The relationship with the string data mode is shown in the following table.

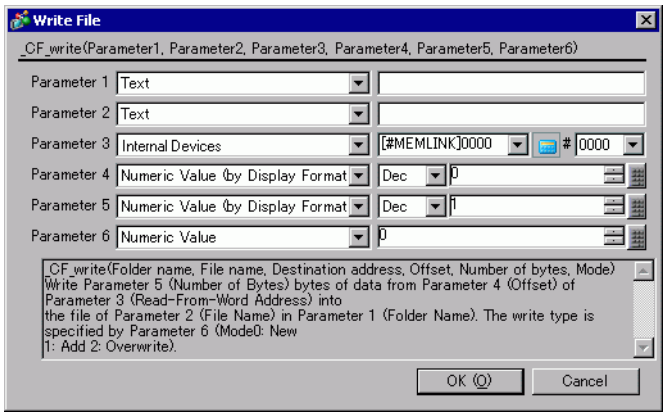
Data Device Storage Order	Word Byte LH/HL Storage Order	Double-word Byte LH/HL Storage Order	D-Script data storage mode	Text Data Mode
Store from Start Data	HL Order	HL Order	0	1
	LH Order		1	2
	HL Order	LH Order	2	5
	LH Order		3	4
Store from Last Data	HL Order	HL Order	–	3
	LH Order		–	7
	HL Order	LH Order	–	8
	LH Order		–	6

- There is a limit to the frequency that data can be rewritten to the CF Card. Therefore, be sure to backup all CF Card data regularly to another storage media. Assuming that 500 KB of DOS format data is overwritten, the limit is 100,000 times.
- If an error occurs during CF Card/USB storage processing, the error is written to the CF Card Error/USB storage error status [s:CF_ERR_STAT]/ [s:USB_ERR_STAT]. For more details, see " CF Card/USB Storage Error Status" (page 21-112).
- The following symbols and characters cannot be used in folder names or file names. Use of these symbols and characters in a folder name or file name will generate an error.

:	,	=	+	/	"	[
]	|	<	>	(space)	?	

- To specify a root folder (directory), specify " " (empty string) as the folder name.

■ Write File

Item	Description
Summary	Any one of three modes can be selected: "New", "Add" or "Overwrite". See the "Data Storage Mode" section below for more details about data storage order.
Format	_CF_write/_USB_write (folder names, file names, read from addresses, offset, number of bytes, mode)  Parameter 1 Folder name: Fixed string (Maximum length: 32 single-byte characters) Parameter 2 File name: Fixed text (up to 32 single-byte characters), Internal Device (up to 14 single-byte characters), offset defined device (internal device) (internal address + temporary address, up to 14 single-byte characters) Parameter 3 Read From Address: Device address, Device address + Temporary address Parameter 4 Offset: Numeric Value, Device address, Temporary address (Maximum number that can be specified: 65,535 for 16-bit length, 4,294,967,295 for 32-bit length) Parameter 5 Number of bytes: Numeric Value, Device address, Temporary address (Maximum length: 1280) Parameter 6 Mode: Numeric Value, Device address, Temporary address (Available values: 0, 1, 2)

Storage Format Overview

Mode	Name	Description
0	New	Create a new file. If a file with the same name exists, it is deleted.
1	Add	Add the data to a specified file. If the specified file does not exist, a new file is created.
2	Overwrite	Overwrite part of the file. If the specified offset is larger than the file size, the surplus area is filled with 0s and the data is written after the area. If the offset is specified at the end of the file data, the operation is equivalent to adding the data to the file. If the file does not exist, an error occurs. For more information about this error, please see " CF Card/USB Storage Error Status" (page 21-112).

Example expression:

[w:[#INTERNAL]LS0200] = 0//Offset ("0" when the mode is "New")
[w:[#INTERNAL]LS0202] = 100 // Number of Bytes (100 bytes)
[w:[#INTERNAL]LS0204] = 0//Mode (New)
_CF_write ("\DATA", "DATA0001.BIN", [w:[#INTERNAL]LS0100],
[w:[#INTERNAL]LS0200],
[w:[#INTERNAL]LS0202], [w:[#INTERNAL]:LS0204])

In the previous example, 100 bytes of data is read from LS0100 and stored in the \DATA folder as DATA0001.BIN. You can indirectly define the byte count and mode by defining the offset, byte count, and mode with internal devices.

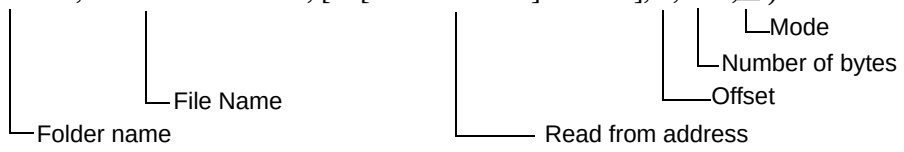
IMPORTANT

- The offset setting is effective only in "Overwrite" mode. The offset setting is disabled in "New" and "Add" modes. Set the offset value to "0" in modes other than "Overwrite" mode.
- When "New" mode is specified and a file with the same name already exists, it is overwritten.
- When the LS Area is specified for "File name", "Read From Address" is not counted as a D-Script address.
- When a PLC device is defined as the "Read From Address", data is read from the PLC only once when the function is executed. If an error occurs during data read, it results in a CF Card or USB storage read error: [s:CF_ERR_STAT] or [s:<USB_ERR_STAT]. The error is cleared when the data read is successfully completed.
- The data is divided into items and read from the source, although this depends on the number of bytes to be read. Therefore, even if a communication error occurs during data read, the data may have been partially written to the specified file.
- To specify a full path for a file name, specify "*" (asterisk) as the folder name. For example, _CF_read ("*", "\DATA\DATA0001.BIN", [w:[#INTERNAL]LS0100], 0, 10)

Storage format example expression

◆ When "New" mode is specified

```
_CF_write ("\DATA", "DATA0001.BIN", [w:[#INTERNAL]LS0100], 0, 100, 0 )
```



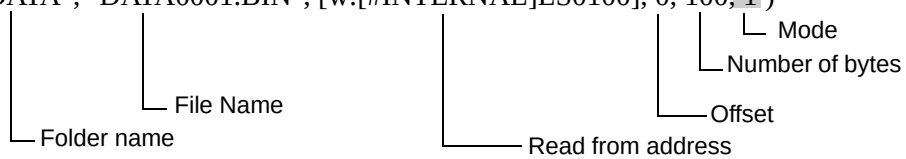
In the example above, 100 bytes of data are read from LS0100 and the DATA0001.BIN file is newly created in the \DATA folder.

IMPORTANT

- Only the 8.3 format (a maximum of 12 characters, with 8 characters for the file name, the period, and 3 characters for the extension) can be used for the file name. A file name longer than this format cannot be used.

◆ When "Add" mode is specified

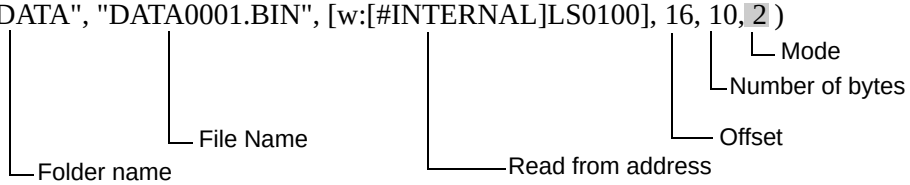
```
_CF_write ("\DATA", "DATA0001.BIN", [w:[#INTERNAL]LS0100], 0, 100, 1 )
```



If the specified file (DATA0001.BIN in the example) already exists and the statement above is executed, 100 bytes of data are read from LS0100 and following areas and added to the DATA0001.BIN file in the \DATA folder.

◆ When "Overwrite" mode is specified (1)

```
_CF_write ("\DATA", "DATA0001.BIN", [w:[#INTERNAL]LS0100], 16, 10, 2 )
```

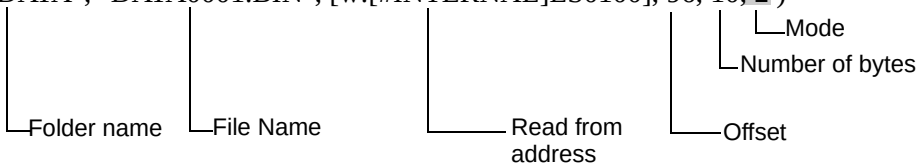


If the specified file (DATA0001.BIN in the example) already exists and the above statement is executed, 10 bytes of data stored in LS0100 and following areas are read and overwritten over the 10 bytes of data stored in the 17th and following bytes after the offset in the DATA0001.BIN file in the \DATA folder.

◆ When "Overwrite" mode is specified (2)

(The file to be overwritten is less than the sum of the offset value and number of added bytes.)

```
_CF_write ("\DATA", "DATA0001.BIN", [w:[#INTERNAL]LS0100], 96, 10, 2 )
```

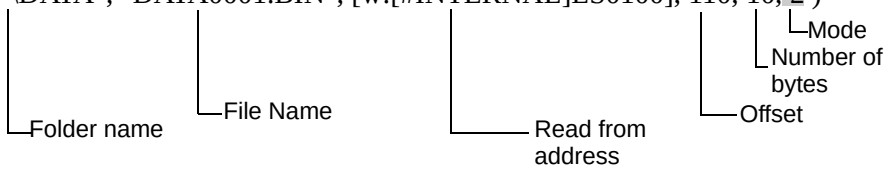


The specified file (DATA0001.BIN in the example) already exists and the file size is 100 bytes. When the offset is set to 96 bytes and the number of bytes is set to 10 bytes for the overwrite operation, 10 bytes of data stored in LS0100 and following areas are read. Then, the first 4 bytes of readout data overwrite the 4 bytes of data stored in the 97th and following bytes in the file, and the remaining 6 bytes of data are added to the end of the file data. The resulting file contains 106 bytes of data.

◆ When "Overwrite" mode is specified (3)

(The file to be overwritten is smaller than the offset value.)

_CF_write ("\DATA", "DATA0001.BIN", [w:[#INTERNAL]LS0100], 110, 10, 2)



The specified file (DATA0001.BIN in the example) already exists and the file size is 100 bytes. When the offset is set to 110 bytes and the number of bytes is set to 10 bytes for the overwrite operation, the area between the 101st byte and 110th bytes is filled with 0s and the 10 bytes of data read from LS0100 and following areas are written in the 111th and following bytes. The resulting file contains 120 bytes of data.

IMPORTANT

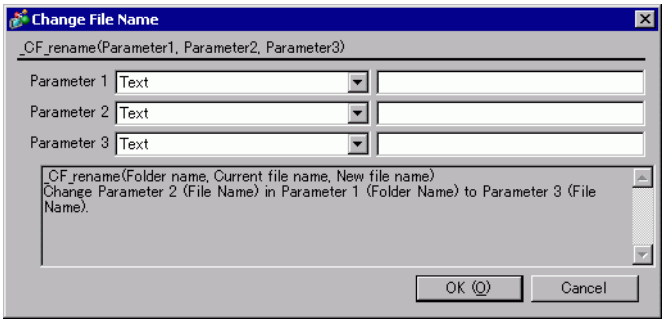
- The maximum allowable number of characters for the first parameter (Folder name) and the second parameter (File name) is 32 single-byte characters.
- An Internal Device can be specified for the second parameter (File name). Specifying the Internal Device allows indirect addressing of a file name. However, when internal device is specified, the file name is limited to 14 single-byte characters.
  For example, _CF_write ("\DATA", [w:[#INTERNAL]LS0100], [w:[#INTERNAL]LS0200], 0, 100, 0)
  Storing a file name in LS0100 allows indirect addressing of a file name. In this example, a file name is stored in LS0100 through LS0106 as follows.

	16 bit	
LS0100	'D'	'A'
LS0101	'T'	'A'
LS0102	'0'	'0'
LS0103	'0'	'1'
LS0104	'.'	'B'
LS0105	'I'	'N'
LS0106	'\0'	'\0'
	:	

← The end of the file name must be a NULL character. The display device recognizes the data before the NULL character as the file name.

  In the example above, 100 bytes of data are read from LS0200 and a new file "\DATA\DATA0001.BIN" is created for storing the data.
- In the second parameter, you can specify a folder name as part of the file name.
  For example, \DATA\01\DATA.bin
- As for the file name, only the "8.3 format" (a maximum of 12 characters, with 8 characters for the file name, the period, and 3 characters for the extension) may be used. Long file names cannot be used.

■ Change File Name

Item	Description
Summary	Modifies the file name. Parameter 1 designates the CF Card data folder. Parameter 2 designates the original file name. Parameter 3 designates the new name.
Format	_CF_rename/_USB_rename (folder names, file names, changed file names) The file name can also be designated indirectly with the LS Address.  Parameter 1 Folder name: Fixed text (up to 32 single-byte characters) Parameter 2 File name: Fixed text (up to 32 single-byte characters), Internal Device (up to 14 single-byte characters), offset defined device (internal device) (internal address + temporary address, up to 14 single-byte characters) Parameter 3 File name: Fixed text (up to 32 single-byte characters), Internal Device (up to 14 single-byte characters), offset defined device (internal device) (internal address + temporary address, up to 14 single-byte characters)

Example expression:

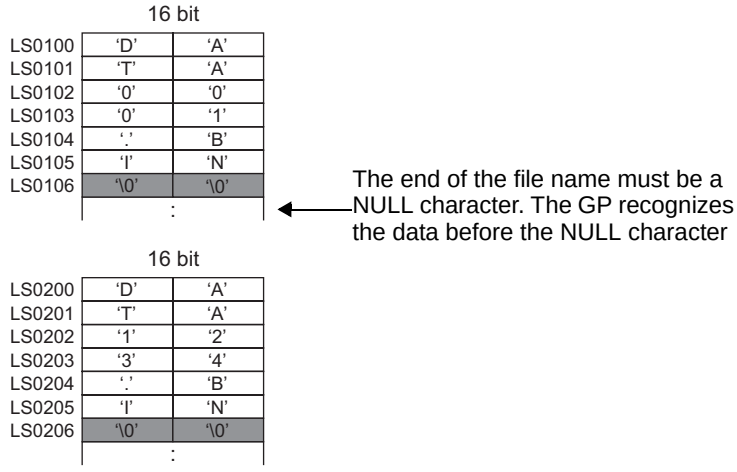
_CF_rename ("\DATA","DATA0001.BIN","DATA1234.BIN")

In the example above, the file name "\DATA\DATA0001.BIN" changes to "\DATA\DATA1234.BIN".

IMPORTANT

- As for the file name, only the "8.3 format" (a maximum of 12 characters, with 8 characters for the file name, the period, and 3 characters for the extension) may be used. Long file names cannot be used.
- In the second parameter, you can specify a folder name as part of the file name.
  For example, \DATA\01\DATA.bin
- The maximum number of characters for the folder name (parameter 1) and file names (parameter 2 and 3) is 32 single-byte characters.
- An internal device can be specified for the second and third parameters (File names). Specifying the Internal Device allows indirect addressing of a file name. However, when internal device is specified, the file name is limited to 14 single-byte characters.
  For example,
  _CF_rename ("\DATA", [w:[#INTERNAL]LS0100], [w:[#INTERNAL]LS0200])
  Storing the file name in LS0100 and LS0200 enables indirect addressing of the file name.

- Store the file names in LS0100 through LS0106 as follows:

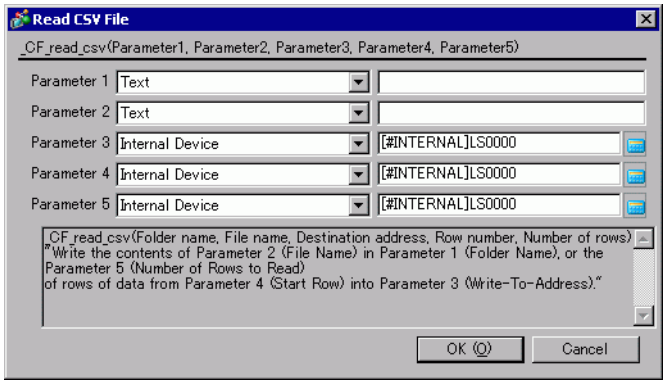


In the statement above, the "\DATA\DATA0001.BIN" file is renamed to "\DATA\DATA1234.BIN".

- When the LS Area is specified for "File name", it is not counted as a D-Script Address.
- To specify a root folder (directory), specify " " (empty string) as the folder name.
- To specify a full path for a file name, specify "*" (asterisk) as the folder name.

■ Read CSV File

Item	Description
Summary	Reads data in cell units from a CSV file (constructed from a cell image delimited with ","), and writes it to a word address.
Format	_CF_read_csv/_USB_read_csv (folder names, file names, save in addresses, start line, the number of lines read)



Parameter 1: Text (Up to 32 single-byte characters)
Parameter 2: Fixed text (up to 32 single-byte characters), Internal Device (up to 14 single-byte characters), offset defined device (internal device) (internal address + temporary address, up to 14 single-byte characters)
Parameter 3: Internal Device, Internal Device designated with offset
Parameter 4: Numeric Value (1 to 65,535), Internal Device, Temporary variable
Parameter 5: Numeric Value (1 to 65,535), Internal Device, Temporary variable

Example expression:

_CF_read_csv ("\CSV", "SAMPLE.CSV", [w:[#INTERNAL]LS1000], 1, 2)

(When reading two lines of data, starting from the first line of the [\CSV\SAMPLE.CSV] file in the CF memory card using the "_CF_read_csv ( )" function.)

SAMPLE.CSV

001, "DAT01-01", "DAT01-2"
002, "DAT02-01", "DAT02-2"

Reads two lines of data, starting from the first line of the CSV file. When the first character is a numerical value ("0" to "9" or "–"), the data is stored as a numerical value. When the first character is ["], the data is treated as a character and "00h" is stored at the end of the text string. For example, when storing "DAT01-01" the data size is 8 characters, which is an even number, and a total of five words are used: Four words are used for storing the text string, and one word is used for storing "00h" at the end. For example, when storing "DAT01-2" the data size is 7 characters, which is an odd number, and a total of 4 words are used to store the text, with "00h" stored at the end.

16 bit

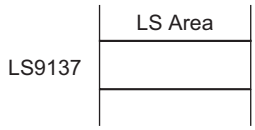
	1	
LS1000		
+1	'D'	'A'
+2	'T'	'0'
+3	'1'	'-'
+4	'0'	'1'
+5	00h	00h
+6	'D'	'A'
+7	'T'	'0'
+8	'1'	'-'
+9	'2'	00h
LS1010	2	
+1	'D'	'A'
+2	'T'	'0'
+3	'2'	'-'
+4	'0'	'1'
+5	00h	00h
+6	'D'	'A'
+7	'T'	'0'
+8	'2'	'-'
+9	'2'	00h

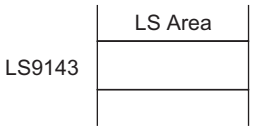
When the Data Storage Mode is 0

NOTE

- When the first character in the cell is a numerical value ("0" to "9", "–"), it converts the value to numerical data and then writes the data to the LS device. The allowed range is from –32,768 to 32,767.
- When the first character in the cell is ["], it writes the range with ["] to the LS device as text string data. When the size of the text string data is an odd number of bytes, "0x00" is appended to the end. When the size of the text data is an even number of bytes, "0x0000" is written to the address following the last address.
- When a CSV file has two or more lines of data, the desired number of lines can be read out starting from the specified line. Up to 200 single-byte characters can be entered in a line, and up to 65,535 lines can be entered in a CSV file.
- When an error occurs, the error status is written in LS9137 (LS9143 for USB storage).
- When writing CSV file text data to the LS device, the data storage order depends on the data storage mode.

Error Status



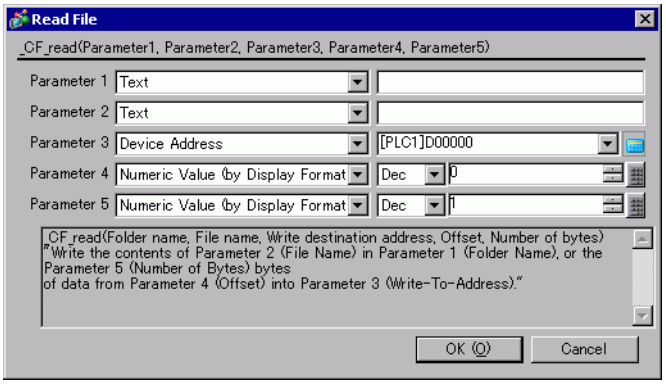


Editor Function Name	LS Area	Error Status	Cause
_CF_read_csv ( )/ _USB_read_csv ( )	LS9137/ LS9143	0000h	Completed Successfully
		0001h	Parameter error
		0002h	CF Card/USB storage error No CF Card or USB storage/ File open error/File read error
		0003h	Write/Read error

IMPORTANT

- When "∗" is specified for the folder name, the full path can be designated for the file name.
- Only the 8.3 format (a maximum of 12 characters, with 8 characters for the file name, the period, and 3 characters for the extension) can be used for the file name. A file name longer than this format cannot be used.
- In the second parameter, you can specify a folder name as part of the file name.
  For example, \DATA\01\DATA.bin
- The maximum number of characters for the folder name (parameter 1) and file name (parameter 2) is 32 single-byte characters.
- As the second parameter's file name, you can define an internal device. By using an internal device, you can indirectly specify the file name. However, when using an internal device, the file name is limited to 14 single-byte characters.
- The effective LS device area for storing data imported from a CSV file is limited to the designated user area (LS20 to LS2031 and LS2096 to LS8191).
- The processing time required for importing data is proportional to the data volume of the CSV file to be read out. Parts are not refreshed until processing is complete. (It takes approximately 10 seconds to read the data from the first to the 100th line of a CSV file containing 100 lines, with 40 characters per line.)
- Unlike the "_CF_read()/_USB_read()" function, the status is not saved to [s:CF_ERR_STAT]/[s:USB_ERR_STAT] immediately after the function is executed. (In some cases, undefined values may be stored.)
- Be sure to insert ["] at the beginning and end of text strings that start with a numeral.
  For example:
  [123, 2-D4EA] [123, "2-D4EA"]
  X O

■ Read File

Item	Description
Summary	Reads the specified number of bytes of data in the file after the specified offset and writes it in the destination address. See the "Data Storage Mode" section below for more details about data storage order.
Format	_CF_read/_USB_read (folder names, file names, save in addresses, offset, the number of bytes)  Parameter 1 Folder name: Fixed string (Maximum length: 32 single-byte characters) Parameter 2 File name: Fixed text (up to 32 single-byte characters), Internal Device (up to 14 single-byte characters), offset defined device (internal device) (internal address + temporary address, up to 14 single-byte characters) Parameter 3 Write-To Address: Device Address, Device Address + Temporary address Parameter 4 Offset: Numeric Value, Device address, Temporary address (Maximum number that can be specified: 65,535 for 16-bit length, 4,294,967,295 for 32-bit length) Parameter 5 Number of bytes: Numeric Value, Device address, Temporary address (Maximum length: 1280)

Example expression:

To read 16 bytes of data in the specified file when the offset is 16:

_CF_read ("\DATA", "DATA0001.BIN", [w:[#INTERNAL]LS0100], 16, 16)

In the example above, the 16 bytes of data starting from the 17th byte in the "\DATA\DATA0001.BIN" file are written to the area starting from LS0100.

IMPORTANT

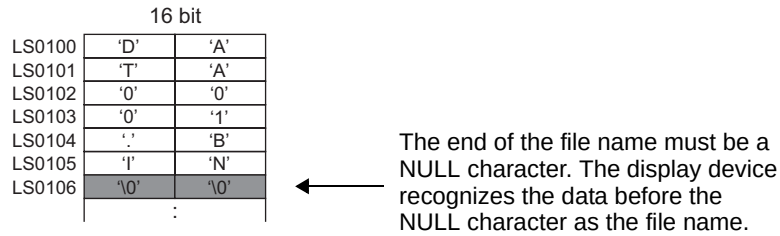
- As for the file name, only the "8.3 format" (a maximum of 12 characters, with 8 characters for the file name, the period, and 3 characters for the extension) may be used. Long file names cannot be used.
- As part of the second parameter's file name, you can add a folder name. For example, \DATA\01\DATA.bin
- The maximum allowable number of characters for the first parameter (Folder name) and the second parameter (File name) is 32 single-byte characters.
- An Internal Device can be specified for the second parameter (File name). Specifying the Internal Device allows indirect addressing of a file name. However, when internal device is specified, the file name is limited to 14 single-byte characters.

  Example

  To read 10 bytes of data stored in a file when the file is specified in LS0100 and later and the offset is 0:

  _CF_read ("\DATA", [w:LS0100], [w:LS0200], 0, 10)

  Storing a file name in LS0100 allows indirect addressing of a file name. In this example, a file name is stored in LS0100 through LS0106 as follows.



  In the example above, the 10 bytes of data at the beginning of the "\DATA\DATA0001.BIN" file are read and written into the area starting from LS0200.

- The number of bytes that are successfully read is written in CF Card/USB storage Readout Bytes [s:CF_READ_NUM]/[s:USB_READ_NUM]. For more details, see "21.11.5 CF File Operation/USB File Operation CF Card/USB Storage Error Status" (page 21-112).
- The internal device designated in "File Name" and the "Write-To Address" are not counted as D-Script Addresses.
- When a PLC device is specified for the Write-To Address, more time is required for writing data to the PLC as the number of words (bytes) increases. Several seconds may be required, depending on the number of words.
- If the data read out from the file exceeds the designated device range of the PLC, a communication error occurs. In this case, you must turn the power to the PLC OFF and ON once to reset the PLC from the error.

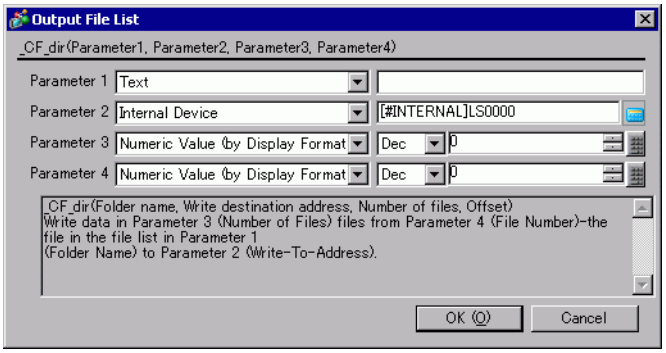
Continued

IMPORTANT

- When a PLC device is specified as a destination, the values are not written immediately due to the GP to PLC transmission time.
  Example
  In the script below, statement (1) reads 10 bytes of data from the file and writes the data into [w:D0100]. The data, however, has not yet been written into [w:[PLC1]D0100] at the execution of statement (2) due to the transmission time.
  _CF_read ("\DATA", "DATA0001.BIN", [w:[PLC1]D0100], 0, 10) .....(1)
  [w:[PLC1]D0200] = [w:[PLC1]D0100] + 1 .....(2)

  In such a case, store the data once in the LS Area and then execute the second statement, as follows.
  _CF_read ("\DATA", "DATA0001.BIN", [w:[PLC1]D0100], 0, 10)
  memcpy ([w:[#INTERNAL]LS0100], [w:[PLC1]D0100], 10)
  [w:[PLC1]D0200] = [w:[#INTERNAL]LS0100] + 1

■ Output File List

Item	Description
Summary	The list of files that exist in the specified folder is written in the Internal Device. Parameter 1 indicates the CF Card data folder. Parameter 4 indicates the offset used to select a file/files within that folder. Parameter 3 indicates the number of files selected within that folder. Parameter 2 specifies the LS Area into which the files will be written. When the offset is specified as "0", the list starts from the first (starting) file.
Format	_CF_dir/_USB_dir (folder names, save in addresses, the number of files, offset)  Parameter 1 Folder name: Fixed text (Maximum length: 32 single-byte characters) Parameter 2 Write-To Address: Internal Device, Internal Device designated with offset Parameter 3 Number of files: Numeric Value, Device address, Temporary address (Maximum length: 32) Parameter 4 Numeric Value, Device address, Temporary address

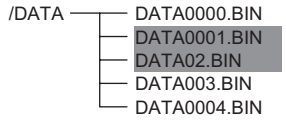
Example expression:

To output a file list containing two files when the offset is 1 (second file):

_CF_dir ("\DATA*.*", [w:[#INTERNAL]LS0100], 2, 1)

When the statement above is executed while the following files exist in the DATA folder, file names "DATA0001.BIN" and "DATA02.BIN" are written to LS0100 and later areas.

(Contents of folder)



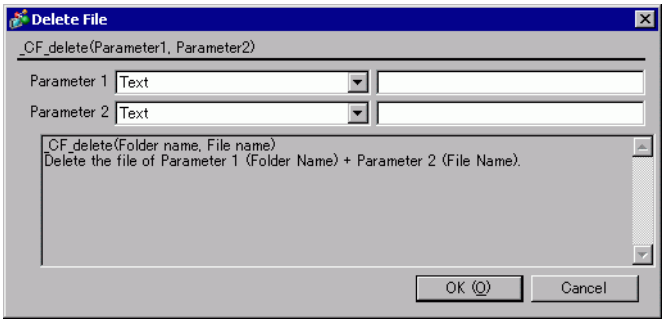
(Contents of LS Area)

	16 bit		
LS0100	'D'	'A'	7 words are used.
LS0101	'T'	'A'	
LS0102	'0'	'0'	
LS0103	'0'	'1'	
LS0104	'.'	'B'	
LS0105	'I'	'N'	
LS0106	'\0'	'\0'	
LS0107	'D'	'A'	7 words are used.
LS0108	'T'	'A'	
LS0109	'0'	'2'	
LS0110	'.'	'B'	
LS0111	'I'	'N'	
LS0112	'\0'	'\0'	
LS0113	'\0'	'\0'	

IMPORTANT

- When the offset is specified as "0", the list starts from the first (starting) file.
- As for the file name, only the "8.3 format" (a maximum of 12 characters, with 8 characters for the file name, the period, and 3 characters for the extension) may be used. Long file names cannot be used.
- If the specified folder does not have enough files as specified, the remaining LS Area is filled with NULL characters ('\0').
- If a file name has fewer than 12 characters, the empty positions are filled with NULL characters ('\0').
- When specifying a folder name, such as "\DATA*.*", make sure you add "*.*". The asterisks *.* means to display all files.
- The number of files actually listed is written in CF Card/USB Storage Listed Files [s:CF_FILELIST_NUM]/[s:USB_FILELIST_NUM].
  For details," CF Card/USB Storage Error Status" (page 21-112)
- Write-To LS Addresses are not counted as D-Script Addresses.
- The file names are not sorted when they are written into the LS Area. They are written in order of creation (the order of FAT entry).
- You can create the list by specifying a file extension. To list files with a certain extension, use a format such as "\DATA*.BIN". However, you cannot use "*" within a file name.

■ Delete File

Item	Description
Summary	Deletes the specified file from the CF Card. Parameter 1 indicates the CF Card data folder. Parameter 2 indicates the name of the file to be deleted.
Format	_CF_delete/_USB_delete (folder names, file names) The file name can also be designated indirectly with the LS Address.  Parameter 1 Folder name: Fixed text (up to 32 single-byte characters) Parameter 2 File name: Fixed text (up to 32 single-byte characters), Internal Device (up to 14 single-byte characters), offset defined device (internal device) (internal address + temporary address, up to 14 single-byte characters)

Example expression:

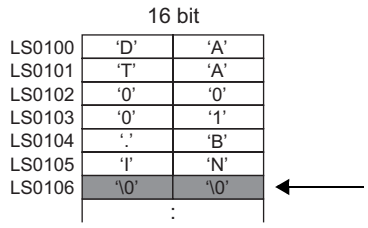
_CF_delete ("\DATA", "DATA0001.BIN")

The above example deletes the "\DATA\DATA0001.BIN" file.

IMPORTANT

- As for the file name, only the "8.3 format" (a maximum of 12 characters, with 8 characters for the file name, the period, and 3 characters for the extension) may be used. Long file names cannot be used.
- In the second parameter, you can specify a folder name as part of the file name.
  For example, \DATA\01\DATA.bin
- The maximum allowable number of characters for the first parameter (Folder name) and the second parameter (File name) is 32 single-byte characters.
- An Internal Device can be specified for the second parameter (File name). Specifying the Internal Device allows indirect addressing of a file name. However, when internal device is specified, the file name is limited to 14 single-byte characters.

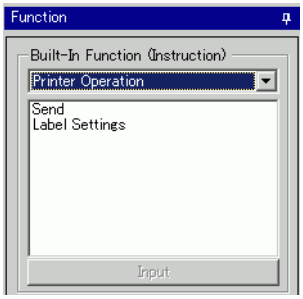
  In this example, a file name is stored in LS0100 through LS0106 as follows.



The end of the file name must be a NULL character. The display device recognizes the data before the NULL character as the file name.

  In the example above, the "\DATA\DATA0001.BIN" file is deleted.
- To specify a root folder (directory), specify " " (empty string) as the folder name.
- When the LS Area is specified for "File name", "Write-To Addresses" are not counted as D-Script Addresses.
- To specify a full path for a file name, specify "*" (asterisk) as the folder name.

21.11.6 Printer Operation

Printer Operation	Function Summary
	Label Settings ☞" ■ Label Settings" (page 21-137) Designated from the Control and Status variables.
	Send ☞" ■ Send" (page 21-139) Outputs the designated number of bytes to the COM port.

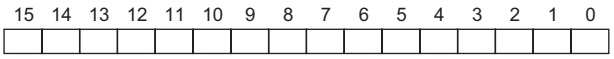
IMPORTANT
- COM1 or USB/PIO (USB-PIO) are ports which can be used as a Printer Operation Function.

■ Label Settings

Control

Control (PRN_CTRL) is a variable to clear the Send Buffer and the Error Status. This variable is write-only.

- Control (PRN_CTRL) Summary



Bit	Content
15	Reserved
14	
13	
12	
11	
10	
9	
8	
7	
6	
5	
4	
3	
2	1: Clear error
1	Reserved
0	1: Clear Send buffer

IMPORTANT
- When a word is selected, and two or more bits are set simultaneously, the processing is executed in the following order:

  Clear error

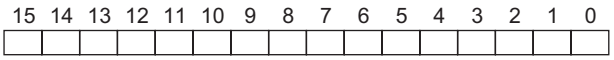
  ↓

  Clear send buffer
- Do not use reserved bits. Set only the bits that are required.

Status

The status variable (PRN_STAT) is used in order to check for the presence/absence of data in the Send Buffer and to get the Error Status. This status variable is write-only.

- Contents of Status Variable (PRN_STAT)

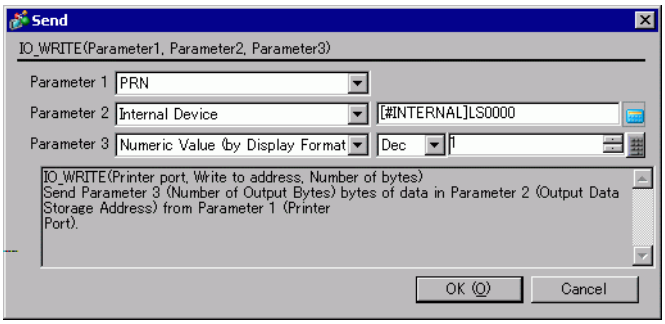


Bit	Content
15	Reserved
14	The status of the Printer I/F ERROR signal Printer Error (Input): 0: Error 1: Normal
13	The status of the Printer I/F SLCT signal Select (Input): 0: Offline 1: Online
12	The status of the Printer I/F PE signal Paper Empty (Input): 0: Normal 1: Paper Empty
11	Reserved
10	
9	
8	
7	
6	
5	
4	
3	
2	
1	0: Normal 1: Send error
0	0: Data exists in Send buffer 1: Send buffer is empty

IMPORTANT

- If the Send buffer overflows, an error occurs. When this error occurs, the transmission error bit turns ON.
- The Send buffer is 8,192 bytes.
- The reserved bits may be assigned in the future. Therefore, be sure to check only the necessary bits.

■ Send

Item	Description
Summary	Outputs the designated number of bytes to the COM port. The data is output regardless of the printer type specified.
Format	IO_WRITE ([p:PRN], Output Data Storage Address, Number of Output Bytes)  Parameter 1: [p:PRN] Parameter 2: Internal Device Parameter 3: Integer value, Device address, Temporary address

IMPORTANT

- The maximum value that can be assigned to Parameter 3 is 1024. Even when specifying values larger than 1024, only 1024 bytes of data is output from the COM port.

Example expression 1:

IO_WRITE ([p:PRN], [w:[#INTERNAL]LS1000], 10)

In the example above, 10 bytes of data stored in LS1000 and later areas are output from the COM port.

Example expression 2:

IO_WRITE ([p:PRN], [w:[#INTERNAL]LS1000], [w:[#INTERNAL]LS0800])

In the example above, the data stored in LS1000 and later areas are output from the COM port. The number of bytes is that same as that written in LS0800.

Example expression 3:

IO_WRITE ([p:PRN], [w:[#INTERNAL]LS 1000], [t:0010])

In the example above, the data stored in LS1000 and later areas are output from the COM port. The number of bytes is that same as that written in the Temporary address [t:0010].

Data Storage Mode

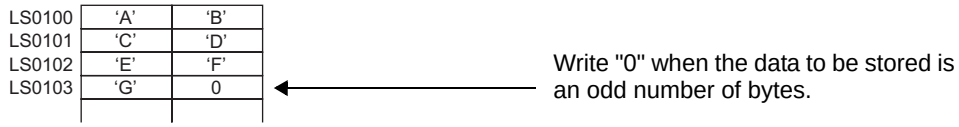
When data is read from device addresses upon execution of the COM Port Operation function, you can specify the storage order of the readout data.
Setting the data storage mode in LS9130 can change the storage order.
The mode can be selected from four options: 0, 1, 2 or 3.

◆ Mode 0

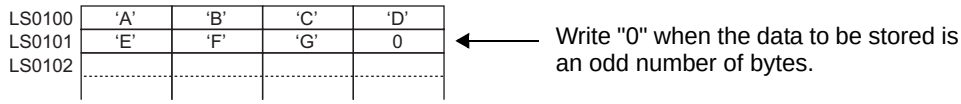
For example, When the COM Port Operation function is used to read the string "ABCDEFG" from a device address

[w:[#INTERNAL]LS9130] = 0
IO_WRITE ([p:PRN], [w:[#INTERNAL]LS1000], 7)

- When the device address length is 16 bits



- When the device address length is 32 bits



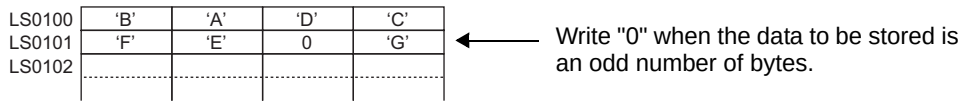
◆ Mode 1

For example, When the COM Port Operation function is used to read the string "ABCDEFG" from a device address

[w:[#INTERNAL]LS9130] = 1
IO_WRITE ([p:PRN], [w:[#INTERNAL]LS1000], 7)

- When the device address length is 16 bits

- When the device address length is 32 bits



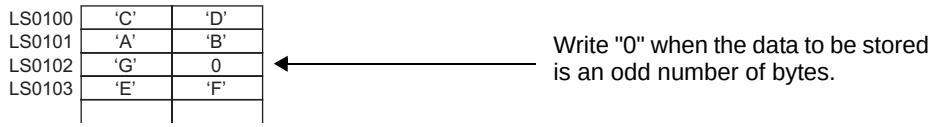
◆ Mode 2

For example, When the COM Port Operation function is used to read the string "ABCDEFG" from a device address

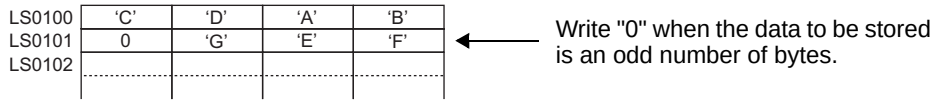
[w:[#INTERNAL]LS9130] = 2

IO_WRITE ([p:PRN], [w:[#INTERNAL]LS1000], 7)

- When the device address length is 16 bits



- When the device address length is 32 bits



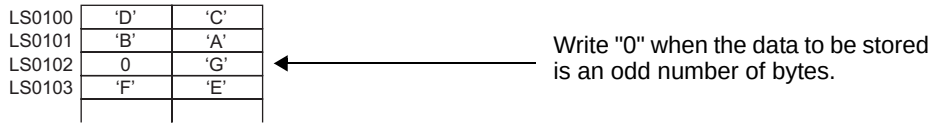
◆ Mode 3

For example, When the COM Port Operation function is used to read the string "ABCDEFG" from a device address

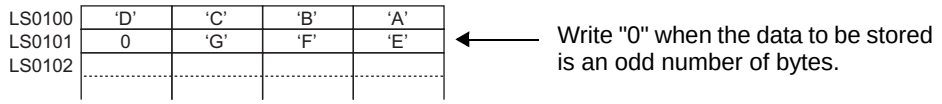
[w:[#INTERNAL]LS9130] = 3

IO_WRITE ([p:PRN], [w:[#INTERNAL]LS1000], 7)

- When the device address length is 16 bits



- When the device address length is 32 bits

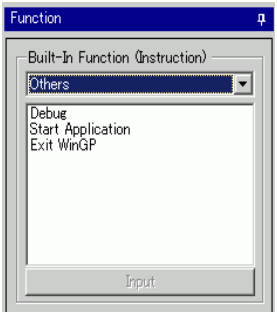


IMPORTANT

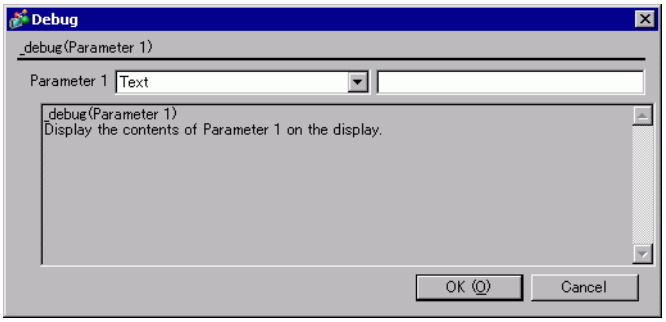
- The data storage mode is not the same as the string data mode in the system setting. The relationship with the string data mode is shown in the following table.

Data Device Storage Order	Word Byte LH/HL Storage Order	Double-word Byte LH/HL Storage Order	D-Script data storage mode	Text Data Mode
Store from Start Data	HL Order	HL Order	0	1
	LH Order		1	2
	HL Order	LH Order	2	5
	LH Order		3	4
Store from Last Data	HL Order	HL Order	–	3
	LH Order		–	7
	HL Order	LH Order	–	8
	LH Order		–	6

21.11.7 Others

Others	Function Summary
	Debug Function ☞" ■ Debug Function" (page 21-143) Displays the designated address or text on the screen to debug it.
	Application Trigger ☞" ■ Application Trigger" (page 21-145) Runs the specified range and start the application.
	WinGP, exiting ☞" ■ Exit WinGP" (page 21-147) Exit WinGP.

■ Debug Function

Item	Description
Summary	Displays the designated address or text on the screen to debug it. After you finish debugging and you clear the script editor's [Enable Debug Function] check box, none of the scripts are deleted. Only the debug screen does not appear.
Format	_debug (Parameter 1)  Parameter 1: Text (Up to 32 single-byte, 16 double-byte characters)

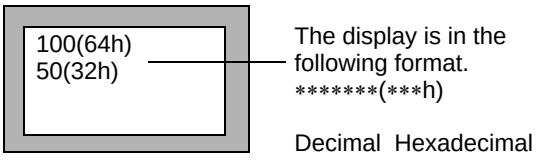
Contents of Parameter 1

Parameter 1	Format	Description
Text	_debug ("ABC")	Displays the text inside " ". The text can be up to 32 single-byte characters.
Word Address or Temporary Address	_debug (w:[PLC1]D1000)	Displays the value of the set Word Address or Temporary Address.
Line Feed	_debug (_CRLF)	Moves the cursor to the start of the next line.
Carriage Return	_debug (_CR)	Moves the cursor to the start of the same line.

◆ Example expression 1:

The following script displays the value of the Word Address.

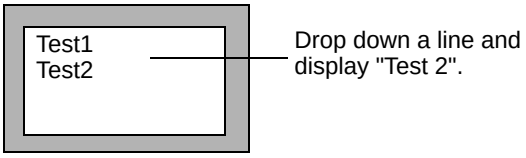
```
[w:[#INTERNAL]LS0100]=100
_debug ([w:[#INTERNAL]LS0100])
_debug (_CRLF)
[w:[#INTERNAL]LS0100]=50
_debug ([w:[#INTERNAL]LS0100])
```



◆ Example expression 2:

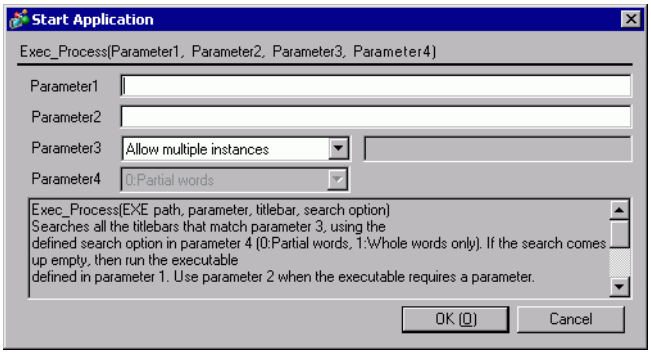
The following script displays a line feed and text.

```
_debug ("Test1")
_debug (_CRLF)
_debug ("Test2")
```



■ Application Trigger

This feature does not function on models other than the IPC Series.

Item	Description
Summary	Runs the specified range and start the application. You can specify settings such as the startup parameters and the watch on multiplex start.
Format	Exec Process (Parameter 1, Parameter 2, Parameter 3, Parameter 4)  Parameter 1 EXE path: Input the absolute path of the executable file (.exe) for the application you want to start. You can input up to 255 characters. Parameter 2 Parameter: Input the startup argument of the executable file. You can input up to 255 characters. Parameter 3 Window Title: If you do not want to allow multiple instances, select "Do not allow multiple instances" and input the [Window Title]. You can input up to 63 characters. The application cannot start if another window with the same title as [Window Title] is found.Multiple instances are allowed if you select [Allow multiple instances] or if [Window Title] is not specified. Parameter 4 Find whole window titles only: Enabled only when you select the Parameter3 - "Do not allow multiple instances". When "0: Partial Words" is selected, the specified application is not executed if a window is found with a title partially the same as that in [Window Title]. When "1: Whole Words Only" is selected, the specified application is not executed if a window is found with a title completely the same as that in [Window Title].

NOTE

- Parameter1 requires text (EXE path). An error occurs when you do not input text.
- This feature does not function on models other than the IPC Series.

Parameter 1 (EXE path) input method

There are 3 ways to input the EXE path:

The following description gives an example of executing a sample.exe in C:Example running sample.exe from \Documents and Settings\user\Local Settings\Temp.

1. Full Path Specification
   For example, C:\Documents and Settings\user\Local Settings\Temp\sample.exe
2. EXE Name only
   If the executable file is in a folder specified as the path in the Environment Settings on an IPC Series.
   For example, sample.exe
   (Start if the setting is Path=C:\Documents and Settings\user\Local Settings\Temp)
3. Define Path with Environment Variable
   If the executable file is in a folder specified by the environment parameters in the Environment Settings on an IPC Series.
   For example, %TEMP%\sample.exe
   (Start if Environment Parameter is specified as TEMP=C:\Documents and Settings\user\Local Settings\Temp)

Example expression 1:

Allow multiple instances (Start the notepad and display the Readme.txt)

Exec_Process ("C:\WINDOWS\SYSTEM32\notepad.exe","D:\TEMP\Readme.txt","",0)
Exec_Process("%SystemFolder%\notepad.exe","D:\TEMP\Readme.txt","",1)

Example expression 2:

Do not allow multiple instances:
Partial Words (Start the notepad and display the Readme.txt) Exec_Process ("C:\WINDOWS\SYSTEM32\notepad.exe","D:\TEMP\Readme.txt","Readme",0)

Example expression 3:

Do not allow multiple instances: Whole Words Only (Start the notepad and display the Readme.txt)

Exec_Process ("C:\WINDOWS\SYSTEM32\notepad.exe","D:\TEMP\Readme.txt","Readme.txt - Notepad",1)

Example expression 4:

Do not allow multiple instances: Partial Words (Start the notepad)

Exec_Process ("C:\WINDOWS\SYSTEM32\notepad.exe","","Notepad",0)

Example expression 5:

No parameter (Start the notepad)

Exec_Process ("C:\WINDOWS\SYSTEM32\notepad.exe","","",0)

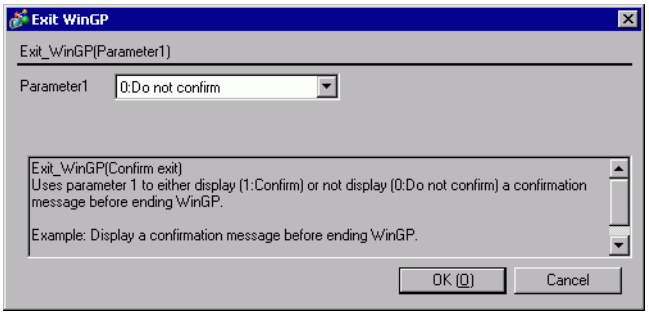
Example expression 6:

Multiple Parameter (Start the sample.exe)

Exec_Process ("C:\WINDOWS\SYSTEM32\sample.exe","/v /a/s","",1)

■ Exit WinGP

This feature does not function on models other than the IPC Series.

Item	Description
Summary	Exit WinGP. You can display an acknowledgment message upon exiting.
Format	Exit_WinGP(Parameter1)  Parameter 1 Folder Name: Select "0: Do not Confirm" or "1: Confirm".

NOTE

- Parameter1 requires text (EXE path). An error occurs when you do not input text.
- The feature does not operate when you transfer the "Exit WinGP" script to a non-IPC Series models.

Example expression:

Displaying an acknowledgment message when exiting WinGP.

Exit_WinGP(1)

21.11.8 Conditional Expressions

Conditional Expressions	Function Summary
Description Expression if - endif if - else - endif loop - endloop break return	if - endif ☞" ■ if-endif" (page 21-148) When the "if" condition, enclosed in brackets "( )", is true, the expression following the "if ( )" statement is run.
	if - else - endif ☞" ■ if-else-endif" (page 21-148) When the "if" condition, enclosed with brackets "( )", is true, the expression following the "if ( )" statement is run. When the condition is false, the "else" expression is run.
	loop - endloop ☞" ■ loop - endloop" (page 21-149) Loop processing is repeated according to the number stored in the temporary Addresses designated in the brackets "( )" following "loop".
	break ☞" ■ break" (page 21-152) Halts loop operation while the loop ( ) equation is being executed.
	return ☞" ■ return" (page 21-152) Executes again from the beginning. It can only be used in an Extended Script.

■ if-endif

When the "if" condition, enclosed in brackets "( )", is true, the expression following the "if ( )" statement is run.

NOTE

- The Assign "=" character cannot be used in a conditional expression.

■ if-else-endif

When the "if" condition, enclosed with brackets "( )", is true, the expression following the "if ( )" statement is run. When the condition is false, the "else" expression is run.

NOTE

- The Assign "=" character cannot be used in a conditional expression.

■ loop - endloop

Loop processing is repeated according to the number stored in the temporary Addresses designated in the brackets "( )" following "loop".

Infinite Loop

The loop is infinite when there is no statement in the loop brackets ( ).
You can use infinite loops in Extended Scripts.

Example expression:

```
loop ( )
{
    [w:[#INTERNAL]LS0100]=[w:[#INTERNAL]LS0100]+1
    if ( [w:[#INTERNAL]LS0100] >10)
    {
        break
    }
    endif
}
endloop
```

NOTE

- The loop ( ) format is as follows:
  For example:

```
loop (number of loops)// Defines the temporary Address that stores the number of loops.
  {
    Action equation
    break     // Use to exit the loop part way through (optional)
  } endloop   // Defines the end of the loop
```

- Only a temporary Word Address can be entered in the parentheses. (For example, loop ([t:000]))
- "loop ( )" cannot be used for a trigger equation.
- The temporary Word Address value used to define the number of loops decreases for every loop. When the value changes to 0, the loop operation ends. If the temporary Word Address value defined for the number of loops is modified, the loop could become endless. The temporary Word Address used is designated as Global. Therefore, simultaneously using this temporary Word Address for other purposes could result in an infinite loop.
- Until a loop operation completes, screen displays of Parts and so on are not updated or refreshed.
- loop ( ) can also be nested. When it is nested, the innermost loop ( ) is skipped via the "break" command.

```
loop ([t:0000])  // loop 1
{
    loop ([t:0001]) // loop 2
    {
      break      // Escape from loop 2
    }endloop

    break        // Escape from loop1
}endloop
```

- If loop operation is finished without using the escape command, the temporary Word Address value becomes 0.

NOTE

- The range available for the temporary Word Address value differs depending on the data format (Bin, BCD), bit length, and code +/– used. If code +/- has been set and the temporary Word Address becomes a negative value, the condition is judged at the beginning of the loop and the loop processing stops.
- DO NOT use a PLC device in the loop formula. Instead, use the display unit internal LS area user area address or a temporary Word Address.For example, the following description performs data write to the PLC many times in a short period (100 times in the following example). This can cause a system error since communication processing (the time required to write to the PLC) cannot be performed at this speed.

  For example:

```
[t:0000] = 100                                          // 100 loops
loop ([t:0000])
{
  [w:[PLC1]D0200] = [w:[#INTERNAL]LS0100]               // Write to D0200
  [w:[#INTERNAL]LS0100] =
  [w:[#INTERNAL]LS0100] + 1                             // Increment LS0100
}endloop
```

  Please change as follows:

```
[t:0000] = 100                                          // 100 loops
loop ([t:0000])
{
  [w:[#INTERNAL]LS0200] =
  [w:[#INTERNAL]LS0100]                                 // Write to D0200
  [w:[#INTERNAL]LS0100] =
  [w:[#INTERNAL]LS0100] + 1                             // Increment LS0100
}endloop
[w:[PLC1]D0200]=[w:[#INTERNAL]LS0200]                   //LS0200 contents, write
                                                        into D0200
```

- Using "loop" or "break" as a function name for a D-Script function causes an error.

■ break

Exits the loop operation in the middle of the loop ( ) operation.

NOTE

- The "break" command can be used only in the { } section of loop ( ).
- Scripts will not operate properly if you use the "break" command in if {} expressions.

■ return

When the "User Defined Function" includes "return", the processing of the Function is terminated and control returns to the caller of the Function.

When Execution (main Function) includes "return"
The processing of the main Function is momentarily aborted, and is restarted from the start of the main Function.

NOTE

- The Assign "=" character cannot be used in a conditional expression.

Example expression:

```
[w:[#INTERNAL]LS0100]=([w:[#INTERNAL]LS0200]>> 8) & 0xFF
if ([w:[#INTERNAL]LS0100]==0)        // When LS0100 is "0", processing is no longer
                                        executed
{
    set([b:[#INTERNAL]LS005000])     // Sets the bit address for error display
    return                           //End
}
endif
```

21.11.9 Comparison

Comparison	Function Summary
Comparison Logical AND (AND) Logical OR (OR) Negation (not) less than (<) less than or equal to (<=) not equal to (<>) more than (>) more than or equal to (>=) Equivalent (==)	Logical AND (and) ☞" ■ Logical AND (and)" (page 21-153) N1 and N2: True if both N1 and N2 are ON.
	Logical OR (or) ☞" ■ Logical OR (or)" (page 21-153) N1 or N2: True if either N1 and N2 are ON.
	Negation (not) ☞" ■ Negation (not)" (page 21-153) not N1: Becomes 0 if N1 is 1, and 1 if N1 is 0.
	Less than (<) ☞" ■ Less than (<)" (page 21-154) True if N1 is greater than N2 (N1 < N2).
	Less than or equal to (=) ☞" ■ Less than or equal to (<=)" (page 21-154) True if N1 is less than or equal to N2 (N1 <= N2).
	Not equal to (<>) ☞" ■ Not equal to (<>)" (page 21-154) True if N1 is not equal to N2 (N1 <> N2).
	Greater than (>) ☞" ■ Greater than (>)" (page 21-154) True if N1 is greater than N2 (N1 > N2).
	Greater than or equal to (>=) ☞" ■ Greater than or equal to (>=)" (page 21-154) True if N1 is greater than or equal to N2 (N1 >= N2).
	Equivalent (==) ☞" ■ Equal to (==)" (page 21-154) True if N1 is equal to N2 (N1 = N2).

■ Logical AND (and)

ANDs the right and left sides. Value 0 (zero) is regarded as OFF, and other values as ON.
N1 and N2: True if both N1 and N2 are ON. Otherwise false.

■ Logical OR (or)

ORs the right and left sides. Value 0 (zero) is regarded as OFF, and other values as ON.
N1 or N2: True if either N1 and N2 are ON. Otherwise false.

■ Negation (not)

Inverts the value. 0 (zero) is regarded as 1, and other values as 0.
not N1: Becomes 0 if N1 is 1, and 1 if N1 is 0.

■ Less than (<)

Compares the data in two word addresses, or the data in a word address and a constant. True if N1 is greater than N2 (N1 < N2).

■ Less than or equal to (<=)

Compares the data in two word addresses, or the data in a word address and a constant. True if N1 is less than or equal to N2 (N1 <= N2).

■ Not equal to (<>)

Compares the data in two word addresses, or the data in a word address and a constant. True if N1 is not equal to N2 (N1 <> N2).

■ Greater than (>)

Compares the data in two word addresses, or the data in a word address and a constant. True if N1 is greater than N2 (N1 > N2).

■ Greater than or equal to (>=)

Compares the data in two word addresses, or the data in a word address and a constant. True if N1 is greater than or equal to N2 (N1 >= N2).

■ Equal to (==)

Compares the data in two word addresses, or the data in a word address and a constant. True if N1 is equal to N2 (N1 = N2).

Command		For example
Logical AND	and	if ((Operation) and (Operation))
Logical OR	or	if ((Operation) or (Operation))
Negation	not	if (not (Operation))
Less than	<	(Term 1) < (Term 2)
Less than or equal to	<=	(Term 1) <= (Term 2)
Not equal to	<>	(Term 1) <> (Term 2)
Greater than	>	(Term 1) > (Term 2)
Greater than or equal to	>=	(Term 1) >= (Term 2)
Equal to	==	(Term 1) == (Term 2)

21.11.10 Operator

Operator	Function Summary
Operator Addition (+) Subtraction (-) Margin (%) Multiplication (*) Division (/) Assignment (=) Left Shift (<<) Right Shift (>>) Bit Operator Logical AND (&) Bit Operator Logical OR (|) Bit Operator Exclusive OR (^) Bit Operator 1's Complement (~	Addition (+) ☞ " ■ Addition (+)" (page 21-156) Adds the data in two word addresses, or the data in a word address and a constant.
	Subtraction (–) ☞ " ■ Subtraction (–)" (page 21-156) Subtracts the data in two word addresses, or the data in a word address and a constant.
	Modulus (%) ☞ " ■ Modulus (%)" (page 21-156) Detects a remainder of a division performed on the data in two word addresses, or the data in a word address and a constant.
	Multiplication (*) ☞ " ■ Multiplication (*)" (page 21-156) Multiplies the data in two word addresses, or the data in a word address and a constant.
	Division (/) ☞ " ■ Division (/)" (page 21-156) Divides the data in two word addresses, or the data in a word address, by a constant.
	Assignment (=) ☞ " ■ Assignment (=)" (page 21-156) Assign the value on the right hand side to the left hand side.
	Left Shift (<<) ☞ " ■ Shift Left (<<)" (page 21-156) Shifts the data on the left side to the left by the number on the right side.
	Right Shift (>>) ☞ " ■ Shift Right (>>)" (page 21-157) Shifts the data on the left side to the right by the number on the right side.
	Bit Operator Logical AND (&) ☞ " ■ Bitwise AND (&)" (page 21-157) Performs logical AND of data between word devices, or between word device data and constant.
	Bit Operator Logical OR (|) ☞ " ■ Bitwise OR (|)" (page 21-157) Performs logical OR of data between word devices, or between word device data and constant.

Continued

Operator	Function Summary
Operator	Bit Operator Exclusive OR (^) ☞" ■ Bitwise Exclusive OR (^)" (page 21-157) Performs exclusive OR of data between word devices, or between word device data and constant.
	Bit Operator 1's Complement (~) ☞" ■ Bitwise 1's Complement (~)" (page 21-157) Inverts the bits.

■ Addition (+)

Adds the data in two word addresses, or the data in a word address and a constant. When the results of computing overflow, figures are truncated.

■ Subtraction (–)

Subtracts the data in two word addresses, or the data in a word address and a constant. When the results of computing overflow, figures are truncated.

■ Modulus (%)

Detects a remainder of a division performed on the data in two word addresses, or the data in a word address and a constant. The operation result may depend on the sign of the left and right sides.

■ Multiplication (*)

Multiplies the data in two word addresses, or the data in a word address and a constant. When the results of computing overflow, figures are truncated.

■ Division (/)

Divides the data in two word addresses, or the data in a word address, by a constant. Fractional values resulting from the operation are truncated. When the results of computing overflow, figures are truncated.

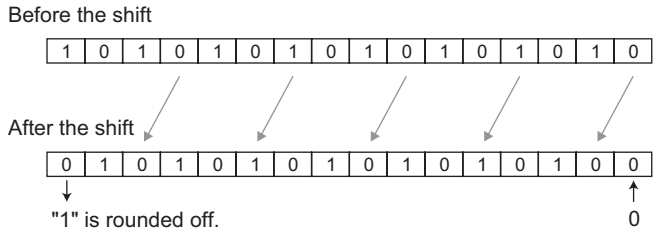
■ Assignment (=)

Assign the value on the right hand side to the left hand side. Only addresses can be specified on the left side. Addresses and Constants can be used on the right side. When the results of computing overflow, figures are truncated.

■ Shift Left (<<)

Shifts the data on the left side to the left by the number on the right side. This feature supports logical shifts only.

For example, Shift Left operation (shifts to the left by one bit.)



■ Shift Right (>>)

Shifts the data on the left side to the right by the number on the right side. This feature supports logical shifts only.

■ Bitwise AND (&)

Performs logical AND of data between word devices, or between word device data and constant. Used to extract a specific bit or to mask a specific string of bits.

■ Bitwise OR (|)

Performs logical OR of data between word devices, or between word device data and constant. Used to turn ON a specific bit.

■ Bitwise Exclusive OR (^)

Performs exclusive OR of data between word devices, or between word device data and constant.

■ Bitwise 1's Complement (~)

Inverts the bits.

NOTE

- For information about truncating fractional values or overflowing digits caused by operation results, see

☞"21.10.4 Notes on Operation Results" (page 21-66)

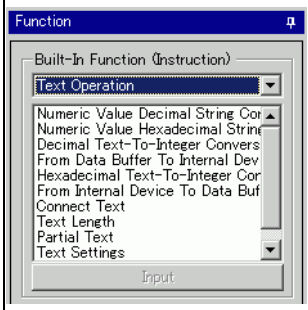
Order of Precedence and Associativity

The following table shows the order of precedence of operators. If two or more operators have the same order of precedence, follow the direction shown by the associativity.

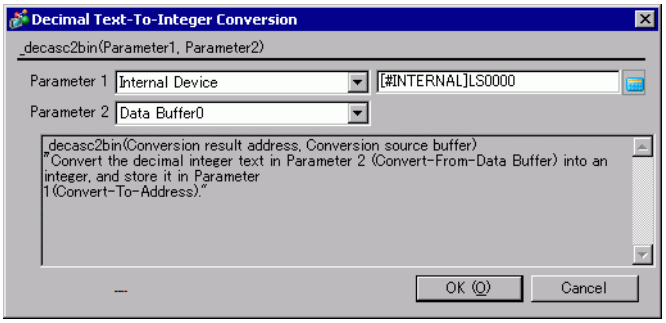
Priority	Operator	Associativity
High	( )	–>
	not ~	<–
	* / %	–>
	+ –	–>
	<< >>	–>
	< <= > >=	–>
	== <>	–>
	& ^ |	–>
	and or	–>
Low	=	<–

21.11.11 Text Operation

Text Operation functions can only be used in an Extended Script.

Text Operation	Function Summary
	Decimal Text-To-Integer Conversion ☞" ■ Decimal Text-To-Integer Conversion" (page 21-160) This function is used to convert decimal text to integers.
	Hexadecimal Text-To-Integer Conversion ☞" ■ Hexadecimal Text-To-Integer Conversion" (page 21-162) This function converts hexadecimal text to integers.
	From Internal Device To Data Buffer ☞" ■ Internal Device To Data Buffer" (page 21-164) The data of the string stored in the Internal Device is copied to the data buffer.
	From Data Buffer to Internal Device ☞" ■ Data Buffer To Internal Device" (page 21-166) The data of the string stored in the data buffer is copied to the Internal Device.
	Status ☞" ■ Text Operation Error Status" (page 21-168) Stores any error that has occurred.
	Numeric Value Decimal String Conversion ☞" ■ Numeric Value Decimal String Conversion" (page 21-170) This function is used to convert an integer to a decimal string.
	Numeric Value Hexadecimal String Conversion ☞" ■ Numeric Value Hexadecimal String Conversion" (page 21-171) This function is used to convert binary data into a hexadecimal string.
	Copy Partial Strings ☞" ■ Partial Text" (page 21-172) Data are retrieved from the specified offset of the string according to the length of the string and stored in another data buffer.
	Text Settings ☞" ■ Text Settings" (page 21-173) A fixed string is stored in the data buffer.
	String Length ☞" ■ Text Length" (page 21-174) Obtains the length of the stored string.
	String Concatenate ☞" ■ String Concatenate" (page 21-175) A character string or character code is concatenated with the text buffer.

■ Decimal Text-To-Integer Conversion

Item	Description
Summary	This function is used to convert a decimal string to integers. Convert the decimal integer text in Parameter 2 (Convert-From Data Buffer) into an integer, and store it in Parameter 1 (Convert-To Address).
Format	_decasc2bin ([Convert-To Address], [Convert-From Data Buffer])  Parameter 1: Internal Device, Temporary address Parameter 2: Data Buffer

Example expression 1 (When the data length is 16 bits)

_decasc2bin ([w:[#INTERNAL]LS0100], databuf0)

The content of "databuf0" is as follows:

	8 bit	
databuf0[0]	31h	'1'
databuf0[1]	32h	'2'
databuf0[2]	33h	'3'
databuf0[3]	34h	'4'
databuf0[4]	00h	NULL

The above data are converted as follows.

	16 bit
LS0100	1234

Example expression 2 (When the data length is 32 bits)

_decasc2bin ([w:[#INTERNAL]LS0100], databuf0)

The content of "databuf0" is as follows:

	8 bit	
databuf0[0]	31h	'1'
databuf0[1]	32h	'2'
databuf0[2]	33h	'3'
databuf0[3]	34h	'4'
databuf0[4]	35h	'5'
databuf0[5]	36h	'6'
databuf0[6]	37h	'7'
databuf0[7]	38h	'8'
databuf0[8]	00h	NULL

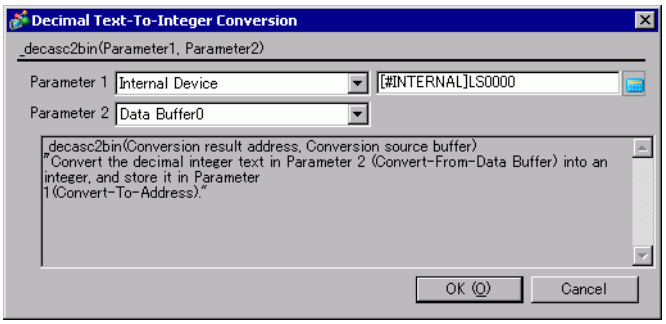
The above data are converted as follows.

	32 bit
LS0100	12345678
LS0102	

IMPORTANT

- An error occurs when the converted bit length is greater than the bit length of the D-Script Editor.
  For example, When the bit length of the script is 16 bits:
  _strset (databuf 0, " 123456") // When a 6-digit decimal string is set accidentally
  _decasc2bin ([w:[#INTERNAL]LS0100], databuf0)
  When the above expression is executed, Error Number 2 (string conversion error) of the String error status [e: However, the bit returns to the beginning of the Main function when an error occurs. Therefore, you cannot reference other functions directly after _decasc2bin executes. (If the command comes while a function is running, it returns to the line that called that function.)
- An error occurs during conversion of a string of data containing characters other than "0" to "9".
  For example, When the bit length of the script is 16 bits:
  _strset (databuf0, "12AB") // When a non-decimal string is set accidentally
  _decasc2bin ([w:[#INTERNAL]LS0100], databuf0)
  When the above expression is executed, Error Number 2 (string conversion error) of the String error status [e: However, the bit returns to the beginning of the Main function when an error occurs. Therefore, you cannot reference other functions directly after _decasc2bin executes. (If the command comes while a function is running, it returns to the line that called that function.)
- The processing is terminated when an error occurs and returns to the beginning of the Main function. (If the command comes while a function is running, it returns to the line that called that function.)

■ Hexadecimal Text-To-Integer Conversion

Item	Description
Summary	This function converts a hexadecimal string to binary data. Convert the hexadecimal integer text in Parameter 2 (Convert-From Data Buffer) into an integer, and store it in Parameter 1(Convert-To Address).
Format	_hexasc2bin ([Convert-To Address], [Convert-From Data Buffer])  Parameter 1: Internal Device, Temporary address Parameter 2: Data Buffer

Example expression 1 (When the data length is 16 bits)

_hexasc2bin ([w:[#INTERNAL]LS0100], databuf0)

The content of "databuf0" is as follows:

	8 bit	
databuf0[0]	31h	'1'
databuf0[1]	32h	'2'
databuf0[2]	33h	'3'
databuf0[3]	34h	'4'
databuf0[4]	00h	NULL

The above data are converted as follows.

	16 bit
LS0100	1234h

Example expression 2 (When the data length is 32 bits)

_hexasc2bin ([w:[#INTERNAL]LS0100], databuf0)

The content of "databuf0" is as follows:

	8 bit	
databuf0[0]	31h	'1'
databuf0[1]	32h	'2'
databuf0[2]	33h	'3'
databuf0[3]	34h	'4'
databuf0[4]	35h	'5'
databuf0[5]	36h	'6'
databuf0[6]	37h	'7'
databuf0[7]	38h	'8'
databuf0[8]	00h	NULL

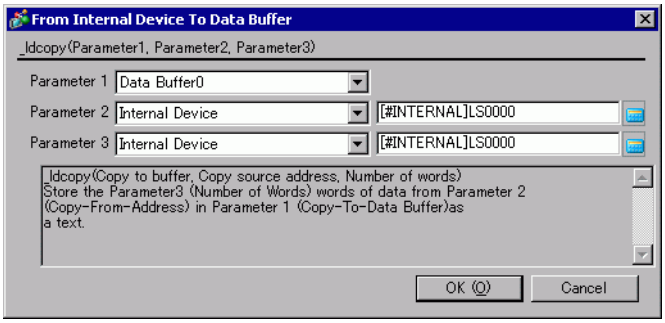
The above data are converted as follows.

	32 bit
LS0100	12345678h
LS0102	

IMPORTANT

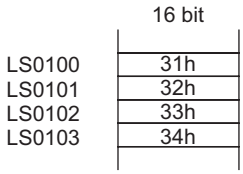
- An error occurs when the converted string is greater than 16 bits or 32 bits.
  For example, When the bit length of the script is 16 bits:
  _strset (databuf0, "123456")
  _hexasc2bin ([w:[#INTERNAL]LS0100], databuf0)
  When the above expression is executed, Error Number 2 (string conversion error) of the String error status [e:
- An error occurs during conversion of a string of data containing characters other than "0" to "9", "A" to "F", or "a" to "f".
  For example, When the bit length of the script is 16 bits:
  _strset (databuf 0, "123G")
  _hexasc2bin ([w:[#INTERNAL]LS0100], databuf0)
  When the above expression is executed, Error Number 2 (string conversion error) of the String error status [e:
- The processing is terminated when an error occurs and returns to the beginning of the Main function. (If the command comes while a function is running, it returns to the line that called that function.)

■ Internal Device To Data Buffer

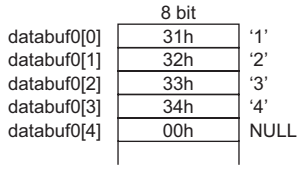
Item	Description
Summary	The data of the string stored in the LS area is copied to the data buffer according to the number of strings in a byte-by-byte transfer. Store the Parameter 3 (Words) words of data from Parameter 2 (Copy-From Address) in Parameter 1 (Copy-To Data Buffer) as a text.
Format	_ldcopy (Copy-To Data Buffer, [Copy-From Address], Words)  Parameter 1: Data Buffer Parameter 2: Internal Device Parameter 3: Integer value, Internal Device, Temporary address (The valid range for Parameter 3 is from 1 to 1024.)

Example expression 1:

_ldcopy (databuf0, [w:[#INTERNAL]LS0100], 4)



The data in LS0100 to LS0103 is written into the 4 bytes of the data buffer sequentially starting from "databuf0". The LS area is read in each byte (the lowest bits).



IMPORTANT

- The low 1 byte of the LS area is read out and the specified quantity of data is written into the data buffer.
- The maximum value that can be assigned for Parameter 3 is 1,024. When a value exceeding the limit is set, Error Number 1 (string overflow) of the String error status [e: STR_ERR_STAT] is triggered.
- Even when there is data in the upper byte of the internal device, only data from the bottom byte is read.
- The processing is terminated when an error occurs and returns to the beginning of the Main function. (If the command comes while a function is running, it returns to the line that called that function.)

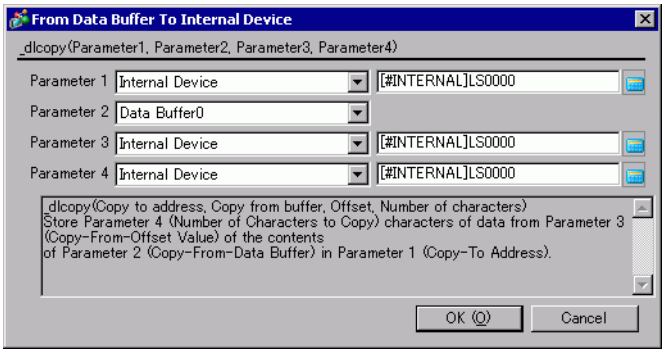
_ldcopy (databuf0, [w:[#INTERNAL]LS0100], 4)

	16 bit
LS0100	3132h
LS0101	3334h
LS0102	3536h
LS0103	3738h

When data is stored as illustrated above, data from the bottom byte is read and written to the data buffer.

	8 bit	
databuf0[0]	32h	'2'
databuf0[1]	34h	'4'
databuf0[2]	36h	'6'
databuf0[3]	38h	'8'
databuf0[4]	00h	NULL

■ Data Buffer To Internal Device

Item	Description
Summary	Each byte of string data stored in the offset of the data buffer is copied to the LS area according to the number of strings. Stores Parameter 4 (Characters to Copy) characters of data from Parameter 3 (Copy-From Offset Value) of the contents of Parameter 2 (Copy-From Data Buffer) in Parameter 1 (Copy-To Address).
Format	_dlcopy ([Copy-To Address], Copy-From Data Buffer, Copy-From Offset Value, Number of Copied Characters)  Parameter 1: Internal Device Parameter 2: Data Buffer Parameter 3: Numeric Value, Internal Device, Temporary address (The valid range for Parameter 3 is from 0 to 1024.) Parameter 4: Numeric Value, Internal Device, Temporary address (The valid range for Parameter 4 is from 1 to 1024.)

Example expression 1:

_dlcopy ([w:[#INTERNAL]LS0100], databuf0, 2, 4)

	8 bit	
databuf0[0]	31h	'1'
databuf0[1]	32h	'2'
databuf0[2]	33h	'3'
databuf0[3]	34h	'4'
databuf0[4]	35h	'5'
databuf0[5]	36h	'6'
databuf0[6]	37h	'7'
databuf0[7]	38h	'8'

4 bytes of data retrieved from "offset 2" of "databuf0" are written into LS0100 to LS0103. The data are written into the LS area in units of 1 byte.

	16 bit
LS0100	33h
LS0101	34h
LS0102	35h
LS0103	36h

IMPORTANT

- 1 byte of data is read out from the data buffer and written into the LS area. That means only the lowest 8 bits (1 byte) of the LS area will be used. The significant 8 bits (1 byte) will be cleared with "0".
- When the specified value [source offset value + number of characters to be copied] is greater than the data buffer size, error Number 3 (string extraction error) of the string error status [e: STR_ERR_STAT] is issued.
- The processing is terminated when an error occurs and returns to the beginning of the Main function. (If the command comes while a function is running, it returns to the line that called that function.)

■ Text Operation Error Status

When an error occurs during execution of text operation, an error is set to the Text Operation Error Status [e: STR_ERR_STAT]. "0" in [e: STR_ERR_STAT] indicates a normal condition, and values other than "0" stored in [e: STR_ERR_STAT] indicate error states. The most recent error is stored in the Text Operation Error Status [e: STR_ERR_STAT]. The Text Operation Error Status can be set up with [SIO Port Operation/Label Settings] under the D-Script Toolbox menu. The following table lists the text operation errors.

Error Number	Error Message	Description
0	Normal	No error
1	Text overflow	A string of at least 256 bytes is directly included in the argument for the following Functions: _strset ( ), _strlen ( ), _strcat ( ), _strmid ( ), and IO_READ_WAIT ( ). Or, a string exceeding the data buffer size is created during execution of the _strcat ( ) or _ldcopy ( ) function. For example: _strcat (databuf0, databuf1) The above function is executed when a string of 1020 bytes is stored in databuf0, and a string of 60 bytes is stored in databuf 1. (A string exceeding 1024 bytes, the size of the data buffer, results in an error status.)
2	String conversion error	Invalid character code is given to the _hexasc2bin ( ) or _decasc2bin ( ) Function. For example: A character code other than "0" to "9", "A" to "F", or "a" to "f" is included in the second argument of _hexasc2bin ( ).
3	String retrieval error	Retrieval of a character string longer than the character string specified with the "_strmid ( )" Function is attempted. Or, an offset value greater than the specified string is designated. For example: _strmid (databuf0, "12345678", 2, 8) Retrieval of an 8-character string from offset 2 is attempted.

The String Control Error Status cannot be used with D-Scripts and Global D-Scripts. If it is read out accidentally, "0" will be loaded.

It is stored in the Error Status during execution of each function.

To check the error [e: STR_ERR_STAT], write the following statements. You can confirm the error with the following expression.

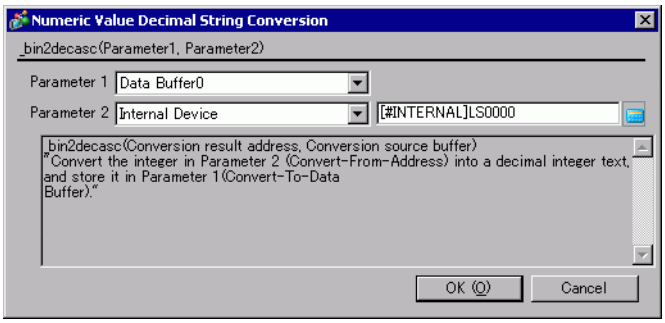
Example expression:

```
if ([e:STR_ERR_STAT] <> 0)              // Checks the error status.
{
    set ([b:[#INTERNAL]LS005000])       // Sets bit on Error Display Lamp
}
endif
```

IMPORTANT

- The processing is terminated when an error occurs and returns to the beginning of the Main function. (If the command comes while a function is running, it returns to the line that called that function.)

■ Numeric Value Decimal String Conversion

Item	Description
Summary	This function is used to convert an integer to a decimal string. Convert the integer in Parameter 2 (Convert-From Address) into a decimal integer text, and store it in Parameter 1 (Convert-To Data Buffer).
Format	_bin2decasc(Conversion result address, Conversion source buffer)  Parameter 1: Data Buffer Parameter 2: Internal Device, Temporary address

Example expression 1 (When the data length is 16 bits)

_bin2decasc (databuf0, [w:[#INTERNAL]LS0100])

	16 bit
LS0100	1234

The above data are converted as follows: Note that "NULL (0x00)" is added.

	8 bit	
databuf0[0]	31h	'1'
databuf0[1]	32h	'2'
databuf0[2]	33h	'3'
databuf0[3]	34h	'4'
databuf0[4]	00h	NULL

Example expression 2 (When the data length is 32 bits)

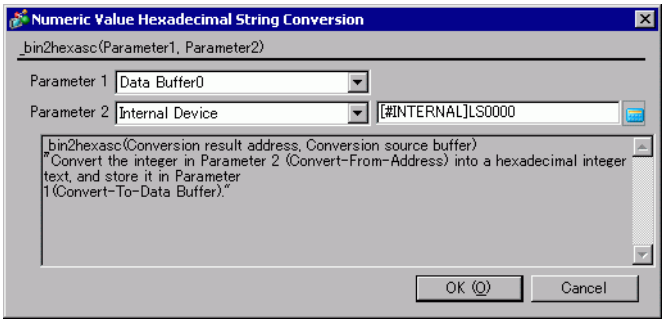
_bin2decasc (databuf0, [w:[#INTERNAL]LS0100])

	32 bit
LS0100	12345678
LS0102	

The above data are converted as follows.

	8 bit	
databuf0[0]	31h	'1'
databuf0[1]	32h	'2'
databuf0[2]	33h	'3'
databuf0[3]	34h	'4'
databuf0[4]	35h	'5'
databuf0[5]	36h	'6'
databuf0[6]	37h	'7'
databuf0[7]	38h	'8'
databuf0[8]	00h	NULL

■ Numeric Value Hexadecimal String Conversion

Item	Description
Summary	This function is used to convert binary data into a hexadecimal string. Convert the integer in Parameter 2 (Convert-From Address) into a hexadecimal integer text, and store it in Parameter 1 (Convert-To Data Buffer).
Format	_bin2hexasc (Convert-To Data Buffer, [Convert-From Address])  Parameter 1: Data Buffer Parameter 2: Internal Device, Temporary address

Example expression 1 (When the data length is 16 bits)

_bin2hexasc (databuf0, [w:[#INTERNAL]LS0100])

	16 bit
LS0100	1234h

The above data are converted as follows: Note that "NULL (0x00)" is added.

	8 bit	
databuf0[0]	31h	'1'
databuf0[1]	32h	'2'
databuf0[2]	33h	'3'
databuf0[3]	34h	'4'
databuf0[4]	00h	NULL

Example expression 2 (When the data length is 32 bits)

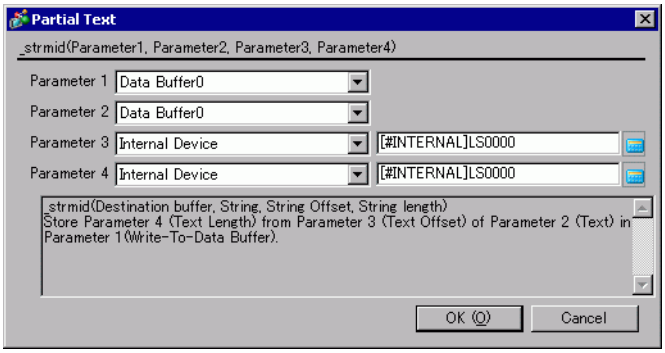
_bin2hexasc (databuf0, [w:[#INTERNAL]LS0100])

	32 bit
LS0100	12345678h
LS0102	

The above data are converted as follows.

	8 bit	
databuf0[0]	31h	'1'
databuf0[1]	32h	'2'
databuf0[2]	33h	'3'
databuf0[3]	34h	'4'
databuf0[4]	35h	'5'
databuf0[5]	36h	'6'
databuf0[6]	37h	'7'
databuf0[7]	38h	'8'
databuf0[8]	00h	NULL

■ Partial Text

Item	Description
Summary	Data are retrieved from the specified offset of the string according to the length of the string and stored in another data buffer. Store Parameter 4 (Text Length) from Parameter 3 (Text Offset) of Parameter 2 (Text) in Parameter 1 (Write-To Data Buffer).
Format	_strmid (Write-To Data Buffer, Text, Text Offset, Text Length)  Parameter 1: Data Buffer Parameter 2: String, Data Buffer Parameter 3: Numeric Value, Internal Device, Temporary address (The valid range for Parameter 3 is from 0 to 1024.) Parameter 4: Numeric Value, Internal Device, Temporary address (The valid range for Parameter 4 is from 1 to 1024.)

Example expression:

_strmid (databuf0, "12345678", 2, 4)

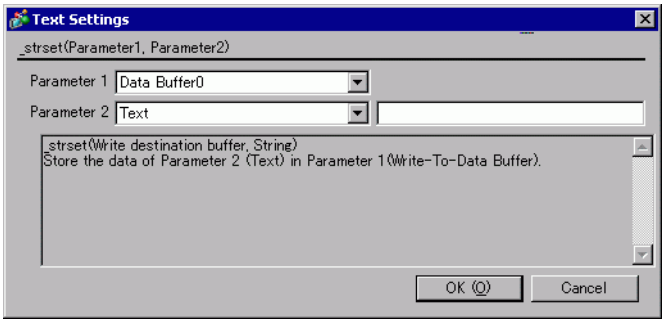
4 bytes of data retrieved from offset 2 of string "12345678" are stored in "databuf0".

	8 bit	
databuf0[0]	33h	'3'
databuf0[1]	34h	'4'
databuf0[2]	35h	'5'
databuf0[3]	36h	'6'
databuf0[4]	00h	NULL

IMPORTANT

- When attempting to retrieve a string longer than the string specified with the "strmid ( )" function, or when specifying an offset value greater than the specified string, error Number 3 (string extraction error) of the string error status [e: STR_ERR_STAT] is issued.
- The processing is terminated when an error occurs and returns to the beginning of the Main function. (If the command comes while a function is running, it returns to the line that called that function.)

■ Text Settings

Item	Description
Summary	A fixed string is stored in the data buffer. Stores the data of Parameter 2 (Text) in Parameter 1 (Write-To Data Buffer).
Format	_strset(Write destination buffer, String)  Parameter 1: Data Buffer Parameter 2: Text, Numeric Value (Text Code) (The valid range for Parameter 2 is 0 and from 1 to 255.)

Example expression:

_strset (databuf0, "ABCD")

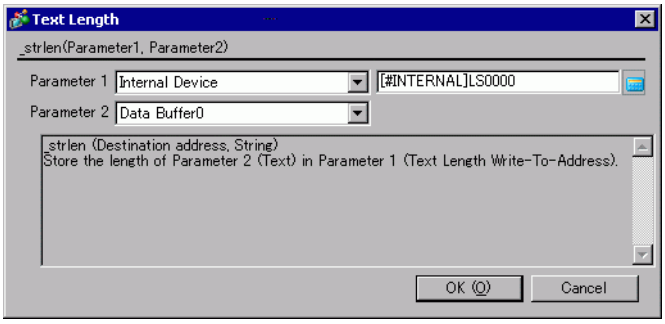
The string is stored in the data buffer as illustrated below:

	8 bit	
databuf0[0]	41h	'A'
databuf0[1]	42h	'B'
databuf0[2]	43h	'C'
databuf0[3]	44h	'D'
databuf0[4]	00h	NULL

IMPORTANT

- A string of up to 255 characters can be specified. To create strings longer than this limit, store the string in another buffer and concatenate the strings with the string-concatenating function (_strcat).
- To clear the data buffer, create an empty string.
  For example: _strset (databuf0,"")
  _strset (databuf0,0)

■ Text Length

Item	Description
Summary	Obtains the length of the stored string. Stores the length of Parameter 2 (Text) in Parameter 1 (Text Length Write-To Address). (The NULL character is not included.)
Format	_strlen (Destination address, String)  Parameter 1: Internal Device, Temporary address Parameter 2: String, Data Buffer

Example expression 1:

_strlen ([w:[#INTERNAL]LS0100], "ABCD")

When the above statement is executed, the length of the string is written into LS0100 as illustrated below.

LS0100	4

Example expression 2:

_strlen ([t:0000], databuf0)

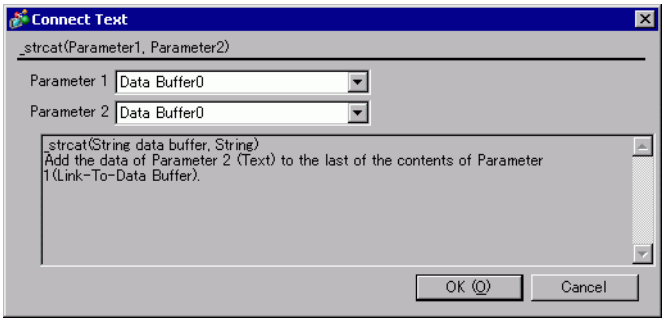
The content of "databuf0" is as follows:

	8 bit	
databuf0[0]	31h	'1'
databuf0[1]	32h	'2'
databuf0[2]	33h	'3'
databuf0[3]	34h	'4'
databuf0[4]	00h	NULL

When the above statement is executed, the length of the string is written into [t: 0000] as illustrated below.

t0000	4

■ String Concatenate

Item	Description
Summary	A character string or character code is concatenated with the text buffer. Adds the data of Parameter 2 (Text) to the last of the contents of Parameter 1 (Contact Data Buffer).
Format	_strcat(String data buffer, String)  Parameter 1: Data Buffer Parameter 2: Text, Numeric Value (Text Code), Data Buffer (The valid range for Parameter 2 is 0 and from 1 to 255.)

Example expression 1:

_strcat (databuf0, "ABCD")

	8 bit	
databuf0[0]	31h	'1'
databuf0[1]	32h	'2'
databuf0[2]	33h	'3'
databuf0[3]	34h	'4'
databuf0[4]	00h	NULL

When "ABCD" is concatenated according to the above, the result is as follows. Note that "NULL (0x00)" is added.

	8 bit	
databuf0[0]	31h	'1'
databuf0[1]	32h	'2'
databuf0[2]	33h	'3'
databuf0[3]	34h	'4'
databuf0[4]	41h	'A'
databuf0[5]	42h	'B'
databuf0[6]	43h	'C'
databuf0[7]	44h	'D'
databuf0[8]	00h	NULL

IMPORTANT

- A string of up to 255 characters can be specified.
- If you set an empty string for the numeric value 0 to Parameter 2, Parameter 1's data buffer does not change.For example: _strcat (databuf0,"")
  _strcat (databuf0,0)

21.11.12 Operation Example

■ Logical Operation Examples

The following shows logical operation examples.

◆ **((100 > 99) and (200 <> 100))**
Result: ON

◆ **((100 > 99) and (200 <> 200))**
Result: OFF

◆ **((100 > 99) or (200 <> 200))**
Result: ON

◆ **((100 < 99) or (200 <> 200))**
Result: OFF

◆ **not (100 > 99)**
Result: OFF

◆ **not (100 < 99)**
Result: ON

◆ **[w:[PLC1]D200] < 10**
Result: True if D200 is smaller than 10.

◆ **not [w:[PLC1]D200]**
Result: True if D200 is 0.

◆ **([w:[PLC1]D200] == 2) or ([w:[PLC1]D200] == 5)**
Result: True if D200 is 2 or 5.

◆ **([w:[PLC1]D200] < 5) and ([w:[PLC1]D300] < 8)**
Result: True if D200 is smaller than 5, and D300 is smaller than 8.

◆ **[w:[PLC1]D200] < 10**
Result: True if D200 is smaller than 10.

◆ **not [w:[PLC1]D200]**
Result: True if D200 is 0.

◆ **([w:[PLC1]D200] == 2) or ([w:[PLC1]D200] == 5)**
Result: True if D200 is 2 or 5.

◆ **([w:[PLC1]D200] < 5) and ([w:[PLC1]D300] < 8)**
Result: True if D200 is smaller than 5, and D300 is smaller than 8.

■ Bit Operation Examples

The following shows bit operation examples.

◆ [w:[PLC1]D200] << 4

Result: The data in D200 is shifted 4 bits to the left.

◆ [w:[PLC1]D200] >> 4

Result: The data in D200 is shifted 4 bits to the right.

◆ 12(0000Ch) is stored in D301, using the BIN format.

[w:[PLC1]D200] = [w:[PLC1]D300] >> [w:[PLC1]D301]
Result: The data in D300 is shifted 12 bits to the right and assigned to D200.

◆ [w:[PLC1]D200] << 4

Result: The data in D200 is shifted 4 bits to the left.

◆ [w:[PLC1]D200] >> 4

Result: The data in D200 is shifted 4 bits to the right.

◆ 12(0000Ch) is stored in D310, using the BIN format.

[w:[PLC1]D200] = [w:[PLC1]D300] >> [w:[PLC1]D310]
Result: The data in D300 is shifted 12 bits to the right and assigned to D200.

◆ Bitwise AND

0 & 0	Result: 0
0 & 1	Result: 0
1 & 1	Result: 1
0x1234 & 0xF0F0	Result: 0x1030

◆ Bitwise OR

0 | 0	Result: 0
0 | 1	Result: 1
1 | 1	Result: 1
0x1234 | 0x9999	Result: 0x9BBD

◆ Bitwise XOR

0 ^ 0	Result: 0
0 ^ 1	Result: 1
1 ^ 1	Result: 0

◆ Bitwise 1's Complement (When the Data Format is BIN16+)

~ 0	Result: 0xFFFF
~ 1	Result: 0xFFFE

■ Conditional Branch Usage Calculation Examples

Control program flow using "if-endif" and "if-else-endif"

◆ if-endif

```
if (condition)
{Process 1}
endif
```

If the condition is true, Process 1 is run. If false, skips Process 1.

For example:

```
if ( [ w:[PLC1]D200 ] < 5 )
{
    [ w:[PLC1]D100 ] = 1
}
endif
```

If data in D200 is less than 5, then assigns 1 to D100.

◆ if-else-endif

```
if (condition)
{Process 1}
else
{Process 2}
endif
```

If the condition is true, runs Process 1. If false, runs Process 2.

For example:

```
if ( [ w:[PLC1]D200 ] < 5 )
{
    [ w:[PLC1]D100 ] = 1
}
else
{
    [ w:[PLC1]D100 ] = 0
}
endif
```

If the value in D200 is less than 5, assigns 1 to D100. Otherwise, assigns 0.

■ Offset Address Usage Calculation Examples

Offset Specification: Special Calculation Examples Using [w:D00100]#[t:0000].

◆ **Script I/O: 16 bit unsigned, [t:0000]= 65526, the resulting address is [w:[PLC1]D00090].**

100 + 65526 = 64(Hex) + FFF6(Hex) = 1005A(Hex) --> 005A(Hex) = 90

Bottom 16 bits are valid

◆ **Script I/O: 16 bit signed, [t:0000]= -10, the resulting address is [w:[PLC1]D00090].**

100 + (-10) = 64(Hex) + FFF6(Hex) = 1005A(Hex) --> 005A(Hex) = 90

Bottom 16 bits are valid

◆ **Script I/O: 32 bit unsigned, [t:0000]= 4294901840, the resulting address is [w:[PLC1]D00180].**

100 + 4294901840 = 64(Hex) + FFFF0050(Hex) = FFFF00B4(Hex) --> 00B4(Hex) = 180

Bottom 16 bits are valid

◆ **Script I/O: 32 bit signed, [t:0000]= -65456, the resulting address is [w:[PLC1]D00180].**

100 + (-65456) = 64(Hex) + FFFF0050(Hex) = FFFF00B4(Hex) --> 00B4(Hex) = 180

Bottom 16 bits are valid

IMPORTANT

- Offset addresses are always treated as 16 bit Bin values, regardless of the script's Bit Length and Data Type settings. If the result exceeds 16 bits (Maximum Value: 65535), Bits 0 to 15 are treated as the valid bits, and bits 16 and higher are discarded.