Chapter 24 Macro

This chapter mainly covers the types of macros and macro commands supported by DOPSoft and how to configure macro commands.

- Macro types:

Type of Macro	ON Macro
	OFF Macro
	Before Execute Macro
	After Execute Macro
	Screen Open Macro
	Screen Close Macro
	Screen Cycle Macro
	Submacro
	Initial Macro
	Background Macro
	Clock Macro

Table 24-1-1 Types of Macros

DOPSoft provides a list of macro commands for users to perform various operations. They are grouped based on their natures, including the following categories: Arithmetic, Logical, Data transfer, Data conversion, Comparison, Flow control, Bit setting, Communication and Drawing, File Access, and Other macros.

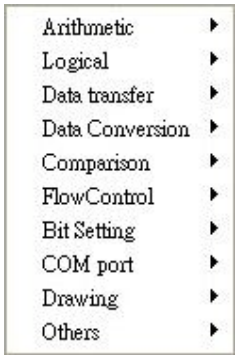


Figure 24-1-1 Categories of Macro Commands

24-1 Types of Macros

Macros consist of independent commands processing procedures written by users. Each macro supports 512 lines of commands and the table below outlines the main features of each type of macro.

Macro Type	Feature
ON Macro	➢ Executed once after ON Macro is triggered. ➢ Only available for ON Button, OFF Button, Maintained Button and Momentary Button
OFF Macro	➢ Executed once after OFF Macro is triggered. ➢ Only available for ON Button, OFF Button, Maintained Button and Momentary Button.
Before Execute Macro	➢ After users touch the onscreen button element, this macro will be executed first before all other procedures programmed for this button element. If the state of the button is not changed by user touches, then this macro will not be executed (ex. Commands of external controllers or other macro commands). ➢ Available for all button elements and input elements.
After Execute Macro	➢ After users touched the onscreen button element, this macro will be executed first before all other procedures programmed for this button element. If the state of the button is not changed by user touches, then this macro will not be executed (ex. Commands of external controllers or other macro commands). ➢ Available for all button elements and input elements.
Screen Open Macro	➢ Executed only once after users open a screen.
Screen Close Macro	➢ Executed only once after users close a screen.
Screen Cycle Macro	➢ Executed continuously. If screen open macro is used, then it will be executed first before this macro.
Sub Macro	➢ One Submacro supports a maximum of 512 submacros and 512 statements can be written within each submacro. ➢ A submacro is similar to a subprogram found in other programming languages. Users can put repeated functions or procedures into a submacro and call it when necessary.
Initial Macro	➢ First executed macro after a HMI system is initialized and this macro is only executed once.
Background Macro	➢ Continuously executed during HMI operations. Whether it is executed one line or several lines at a time (does not stop after the first sequence), this macro will continue to be executed and repeated from the first line after it reaches the last line.
Clock Macro	➢ Continuously executed during HMI operations. This macro will finish executing all commands within the macro rather than one line or several lines at once.

Table 24-1-2 Features of Macro

24-1-1 ON Macro/OFF Macro

On button and off button will only become available after ON button, OFF button, Maintained button, or Momentary button are created.

When a user touches the onscreen button and changes the state to on, the HMI will execute the ON Macro. When the user touches the onscreen button and changes the button state to off, the HMI will execute the OFF Macro. If the button state is not changed by touching the screen button elements (ex. by commands of external controllers or other macros), then On/Off Macro will not be executed.

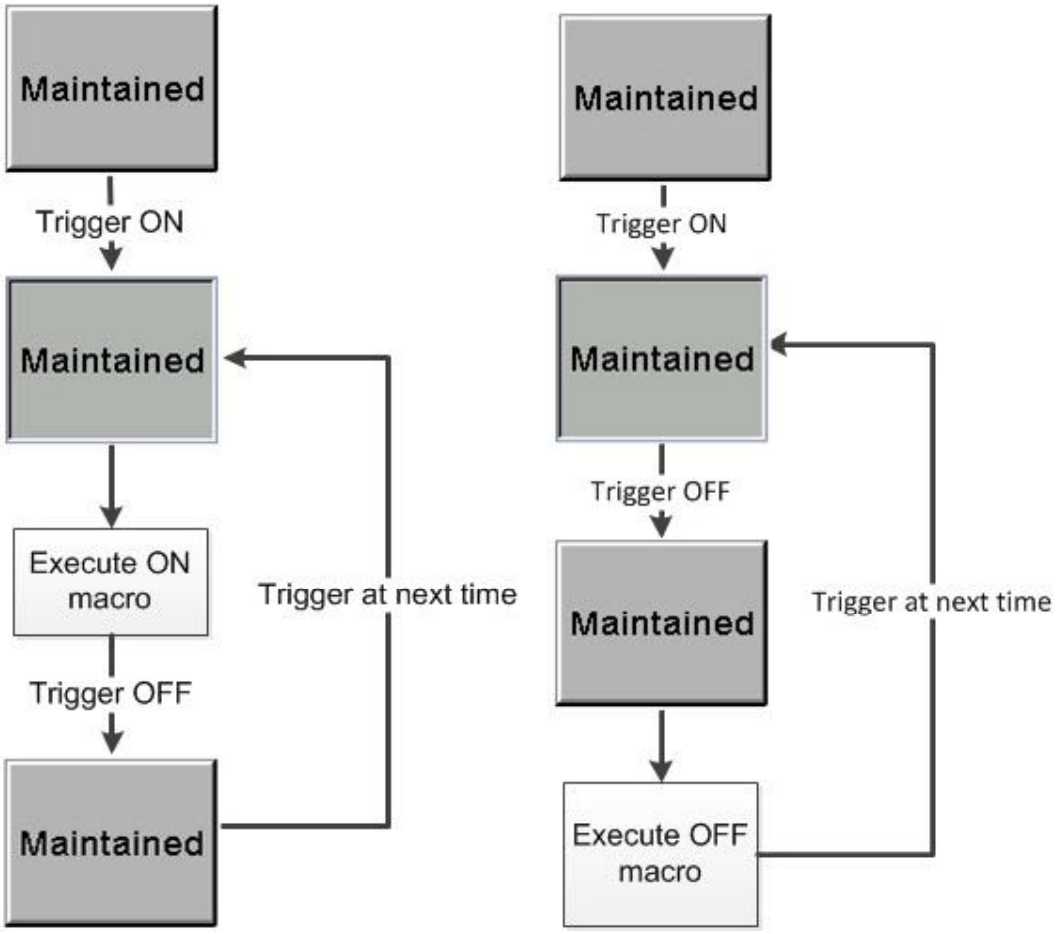


Figure 24-1-1-1 ON/OFF Macro Flowchart

24-1-2 Before Execute Macro

This macro only becomes available after onscreen elements established are button elements or input elements. When users press the onscreen button element, this macro will be executed first before all other procedures programmed for this button element. If the state of the button is not changed by user touches, then this macro will not be executed (ex. Commands of external controllers or other macro commands).

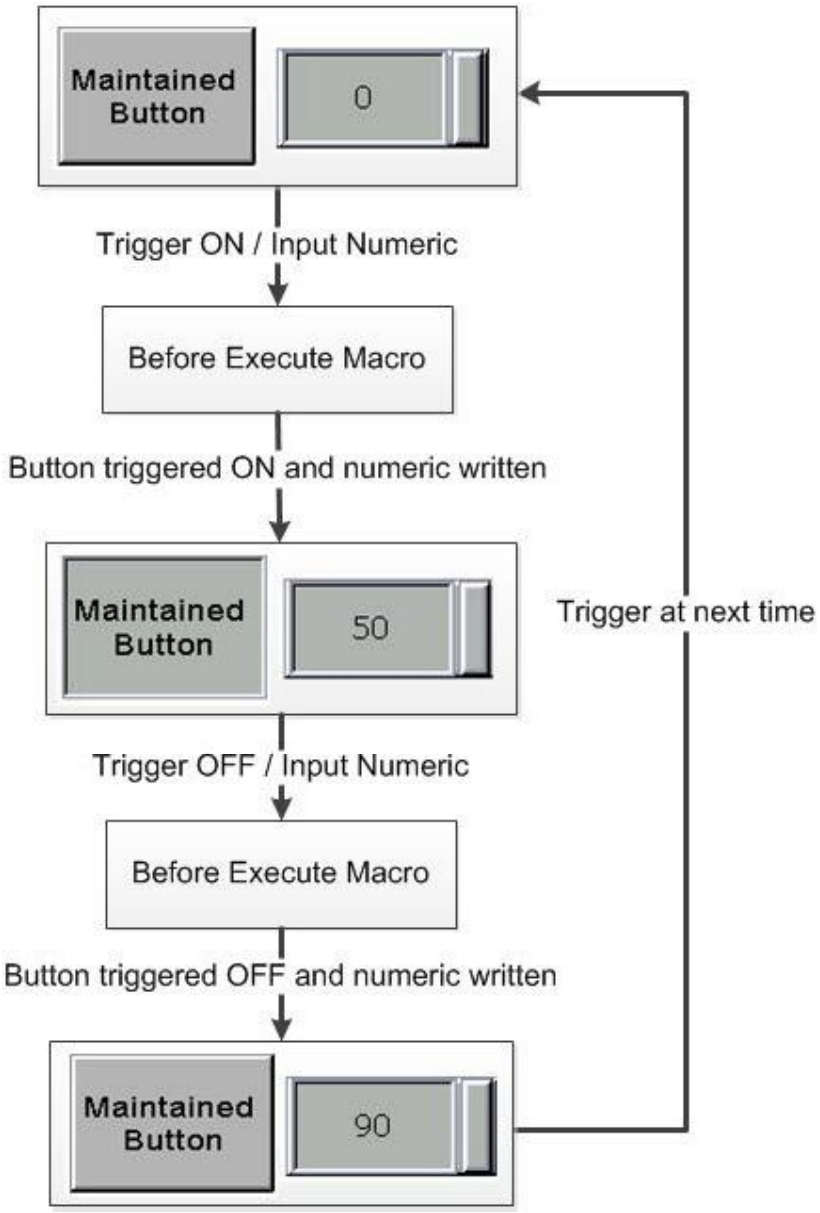


Figure 24-1-2-1 Before Execute Macro Flowchart

24-1-3 After Execute Macro

This macro only becomes available after onscreen elements established are button elements or input elements. When users press the onscreen button element, this macro will be executed first before all other procedures programmed for this button element. If the state of the button is not changed by user touches, then this macro will not be executed (ex. Commands of external controllers or other macro commands).

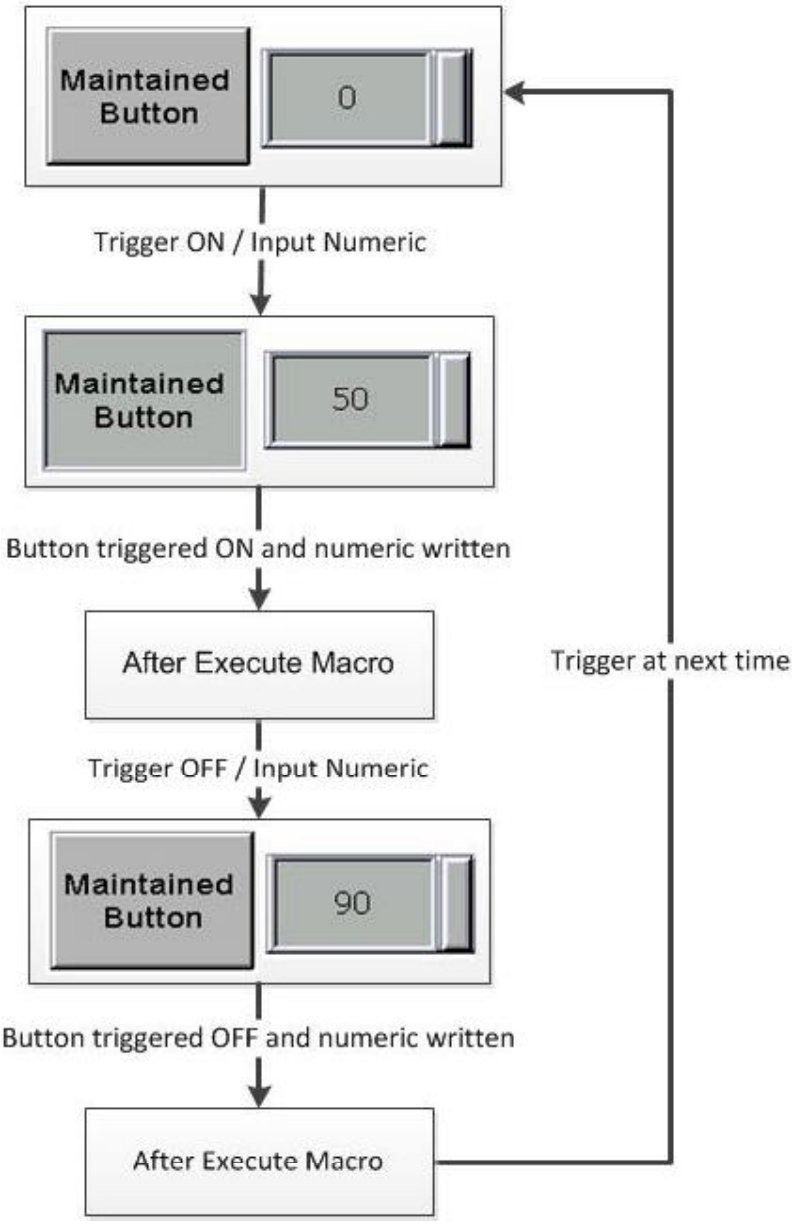


Figure 24-1-3-1 After Execute Macro Flowchart

24-1-4 Screen Open Macro

The Screen Open Macro can be edited by going into [Screen] → [Screen Open Macro].

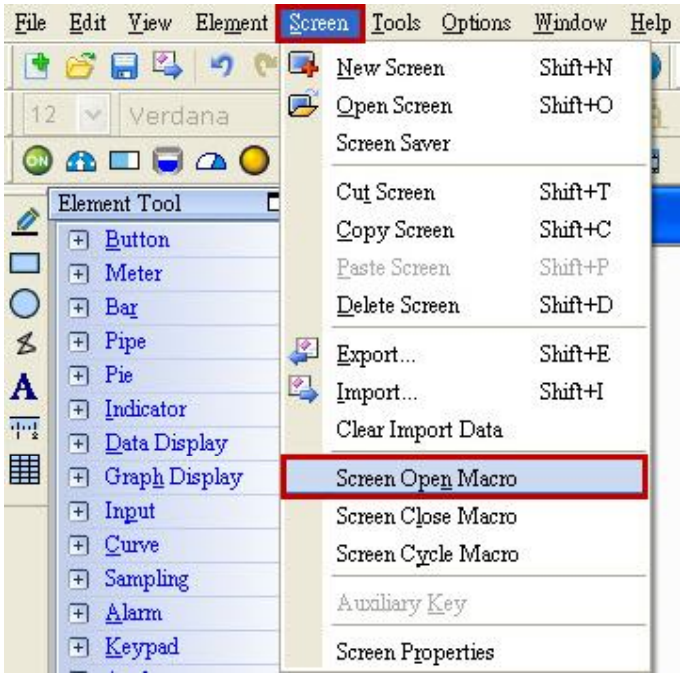


Figure 24-1-4-1 Screen Open Macro

Each screen created within DOPSoft contains a Screen Open Macro and it is executed each time a screen is opened or switched to another. Other macros or commands are executed after the Screen Open Macro.

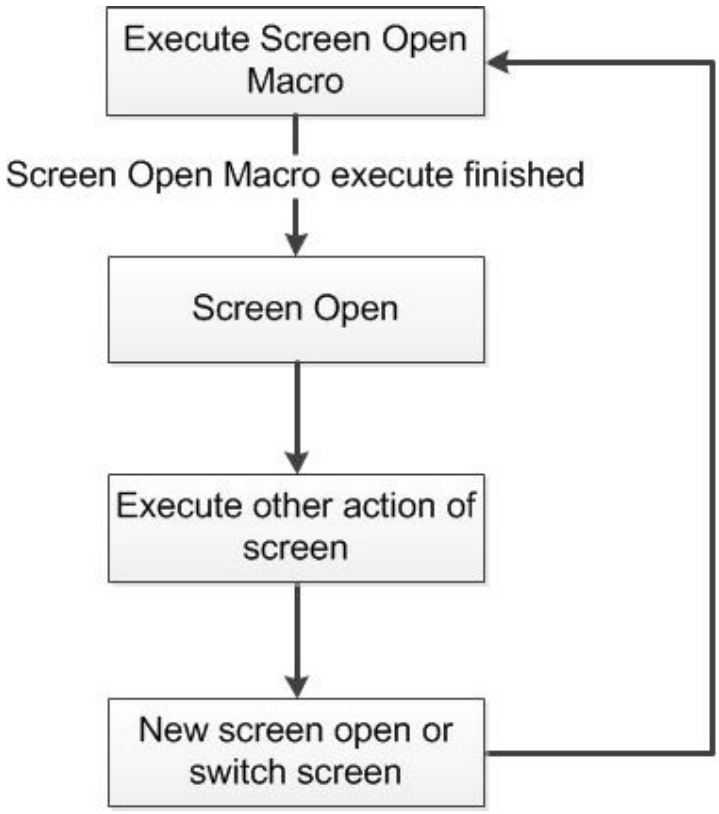


Figure 24-1-4-2 Screen Open Macro Flowchart

24-1-5 Screen Close Macro

The Screen Close Macro can be edited by going into [Screen] → [Screen Close Macro].

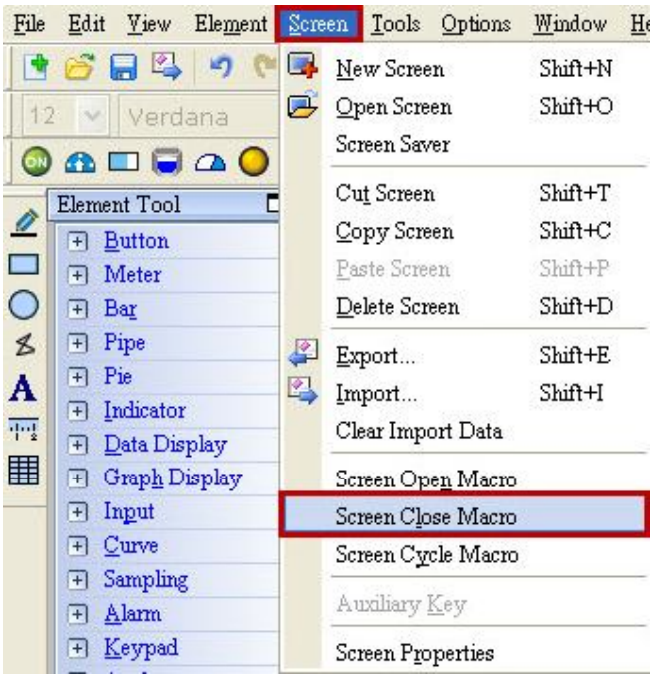


Figure 24-1-5-1 Screen Close Macro

Each screen created within DOPSoft contains a Screen Close Macro and it is executed each time a screen is closed or switched to another. Other macros or commands are executed after the Screen Close Macro.

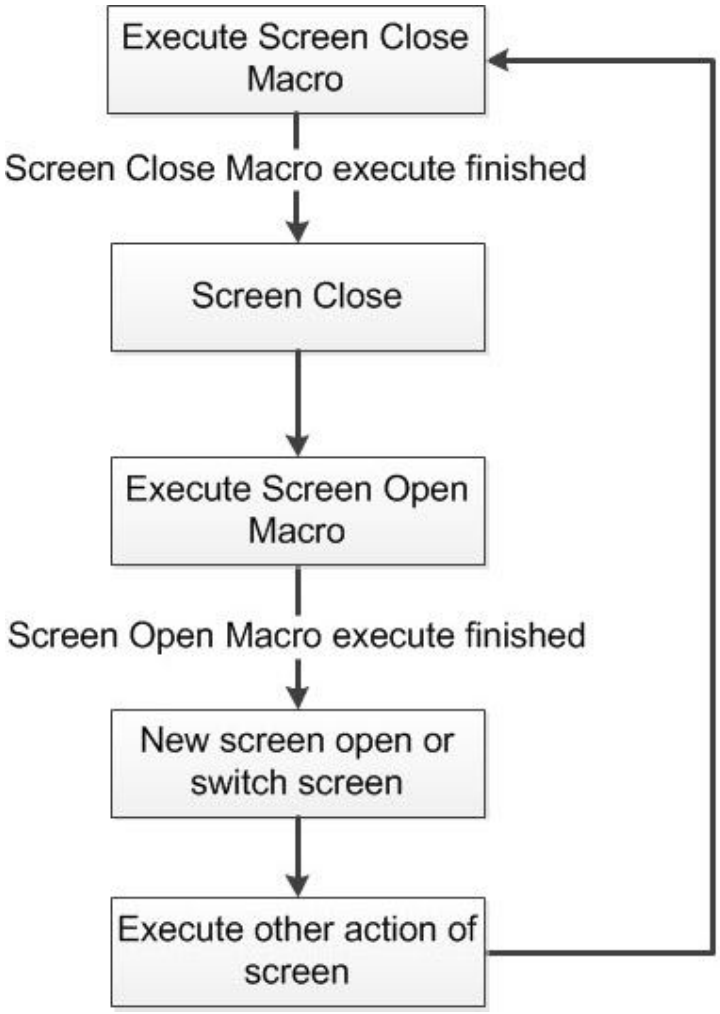


Figure 24-1-5-2 Screen Close Macro Flowchart

24-1-6 Screen Cycle Macro

The Screen Cycle Macro can be edited by going into [Screen] → [Screen Cycle Macro].

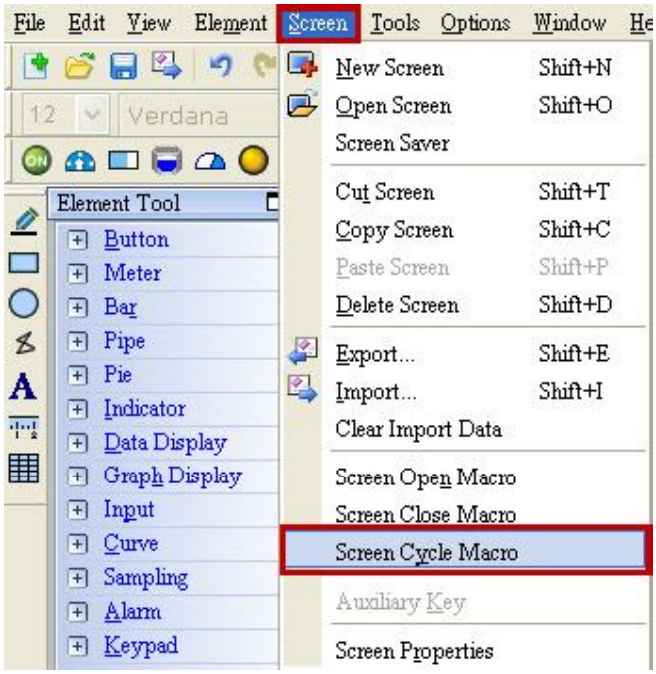


Figure 24-1-6-1 Screen Cycle Macro

Each screen created within DOPSoft contains a Screen Cycle Macro and it is executed, based on the preset delay duration, after the Screen Open Macro. Users can double click on the screen to set the macro cycle delay in the screen properties dialog window. The delay duration refers to how long it will takes before executing the Screen Cycle Macro again. The default unit is 100ms.

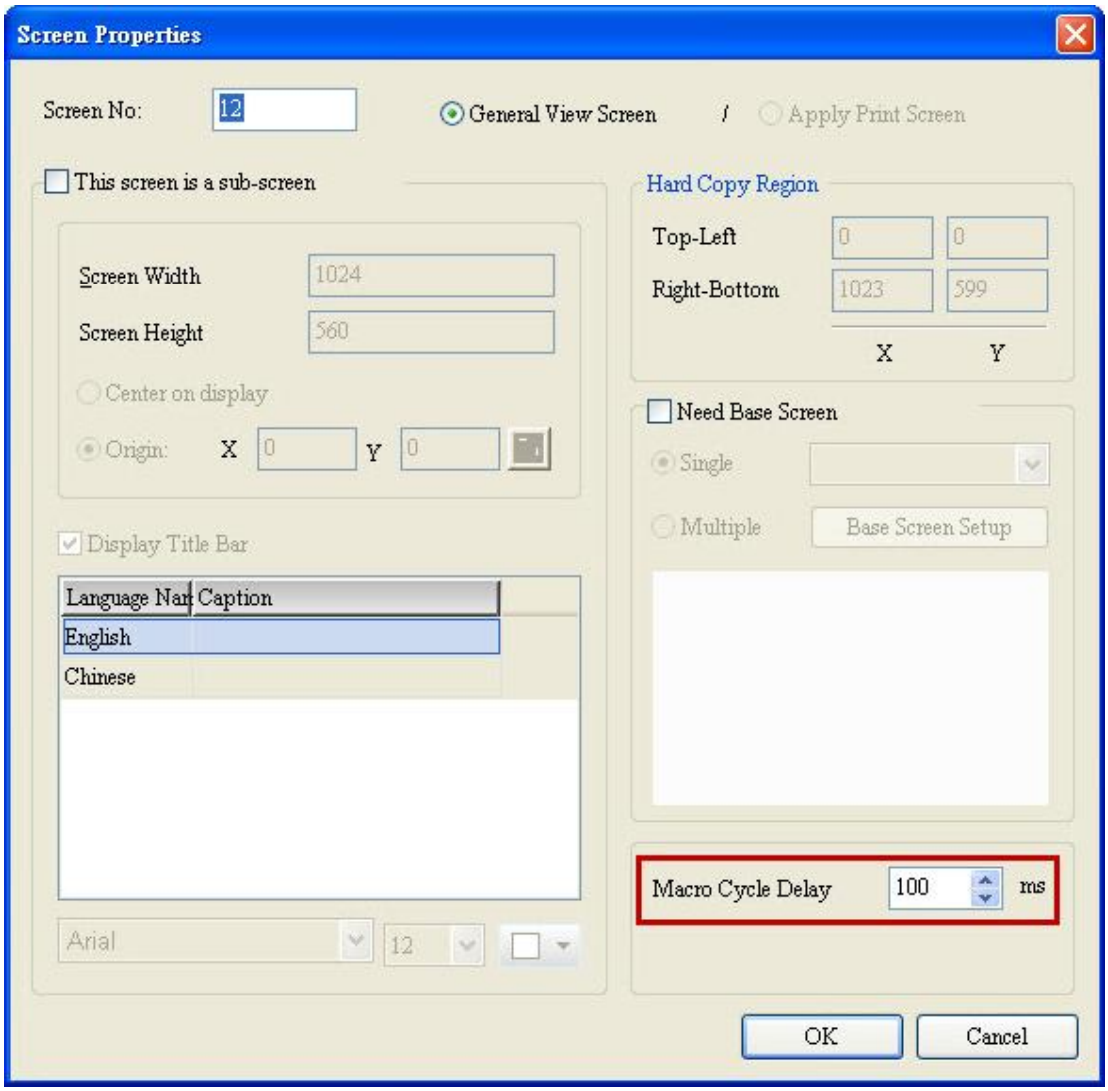


Figure 24-1-6-1 Setting of Macro Cycle Delay

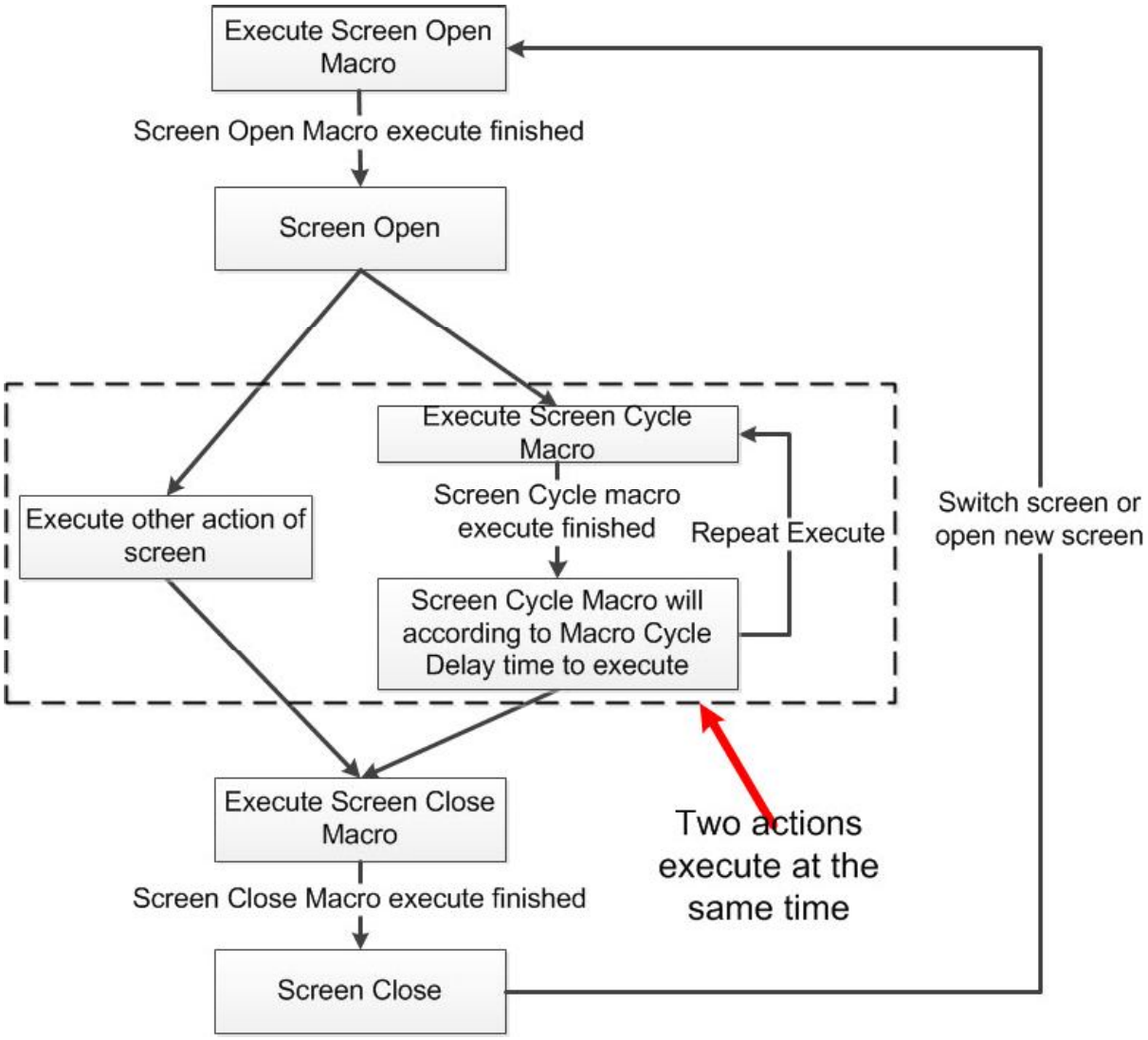


Figure 24-1-6-2 Screen Cycle Macro Flowchart

24-1-7 Submacro

The Submacro can be edited by going into [Options] → [Submacro].

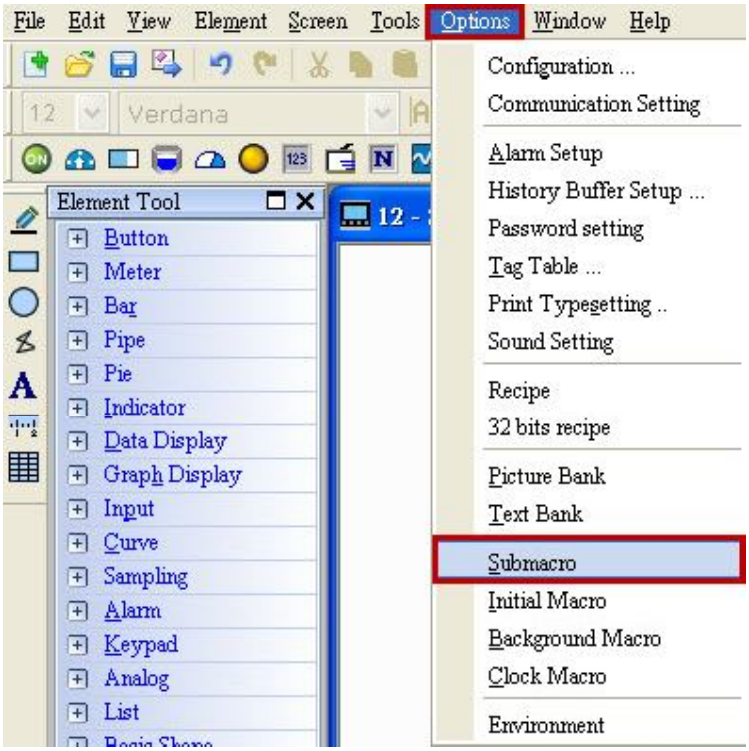


Figure 24-1-7-1 Submacro

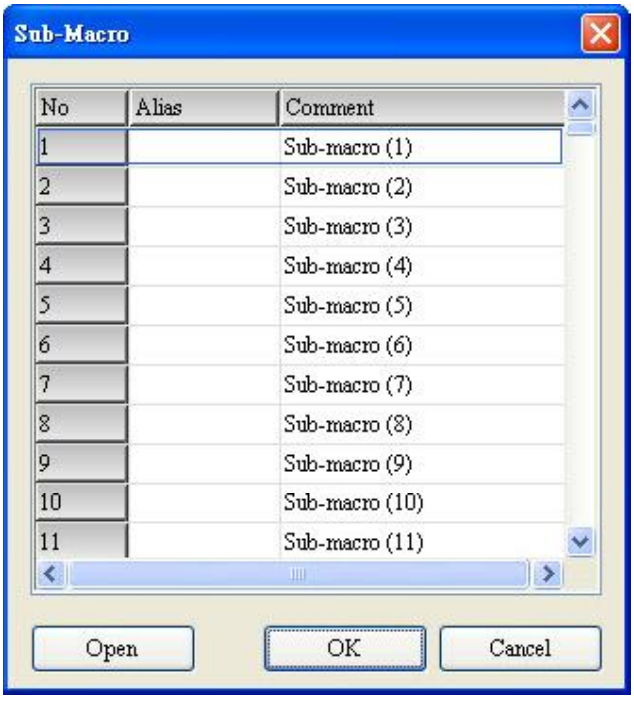


Figure 24-1-7-2 Submacro Configuration Dialog Window

One Submacro supports a maximum of 512 submacros (identified by their number from 1 ~ 512). A submacro is similar to a subprogram found in other programming languages. Users can put repeated functions or procedures into a submacro and call it when necessary. This not only saves time to write repeated macro codes but is also easier to maintain.

Note: only six submacros can be used within one submacro.

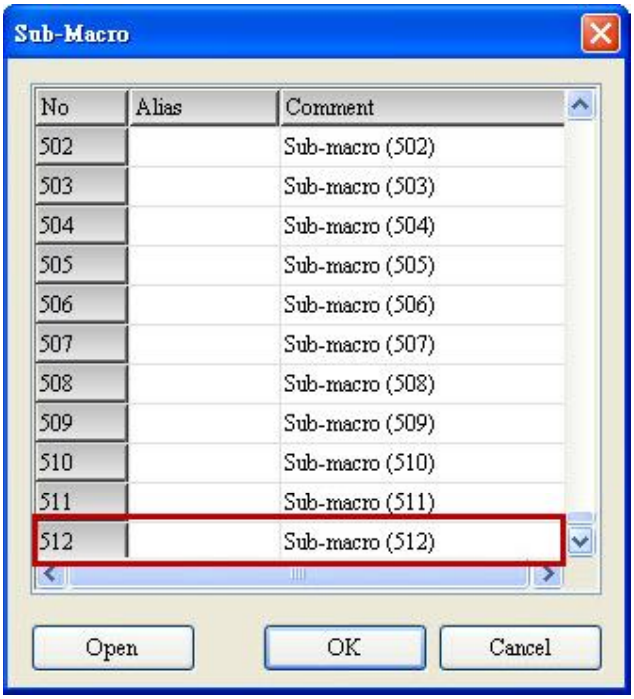


Figure 24-1-7-3 Submacro Screenshot I

Users can call a submacro by its NO or its alias given by users. The name of a submacro can be either numerical value, English, or Chinese characters, and a maximum of 64 characters are allowed for the name.

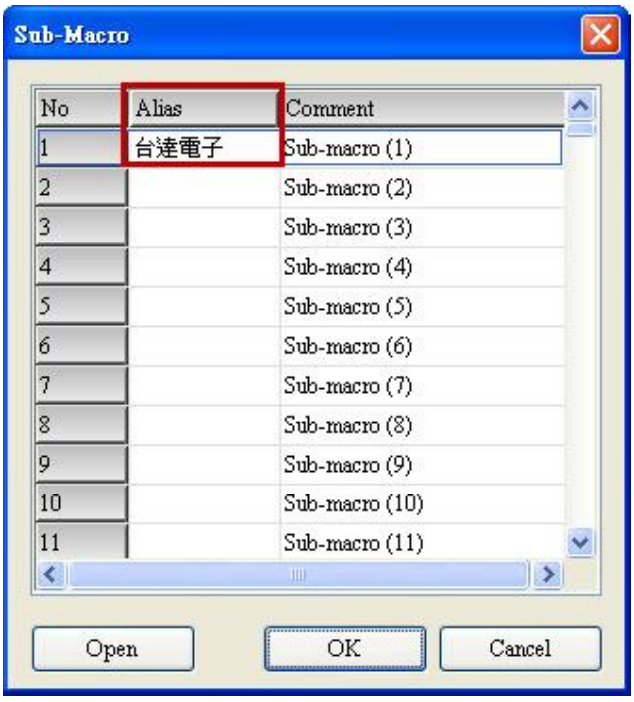


Figure 24-1-7-4 Submacro Screenshot II

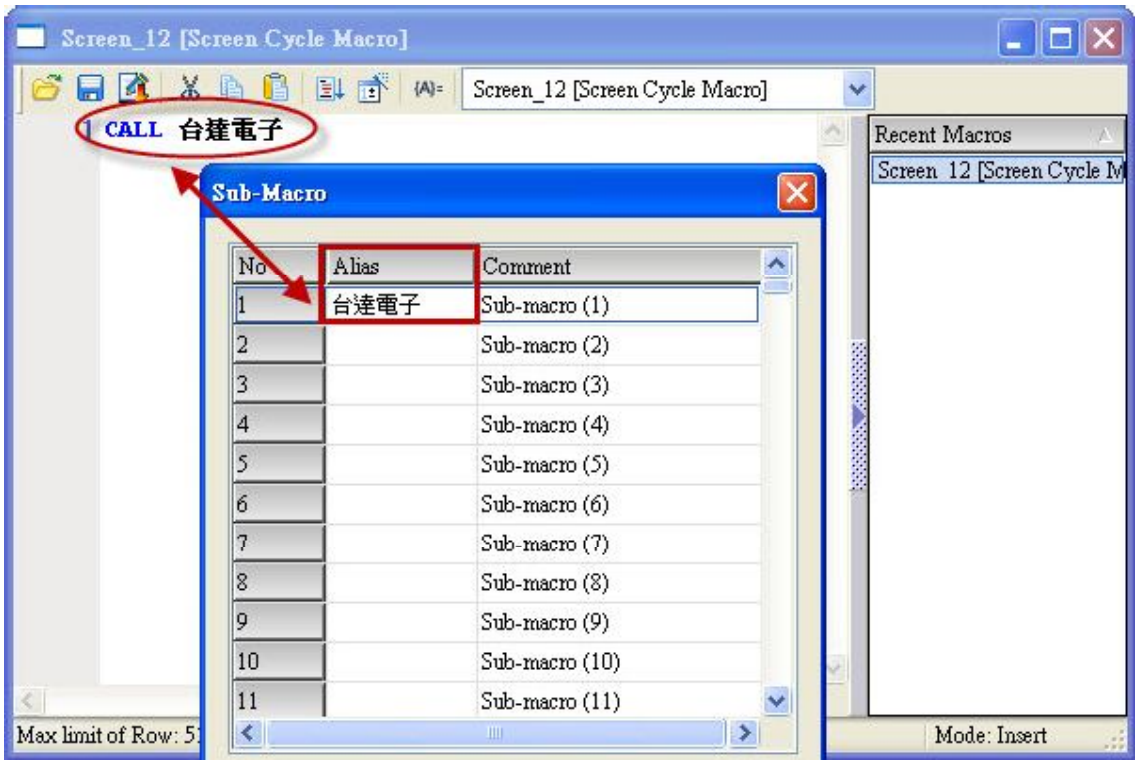


Figure 24-1-7-5 Submacro Screenshot III

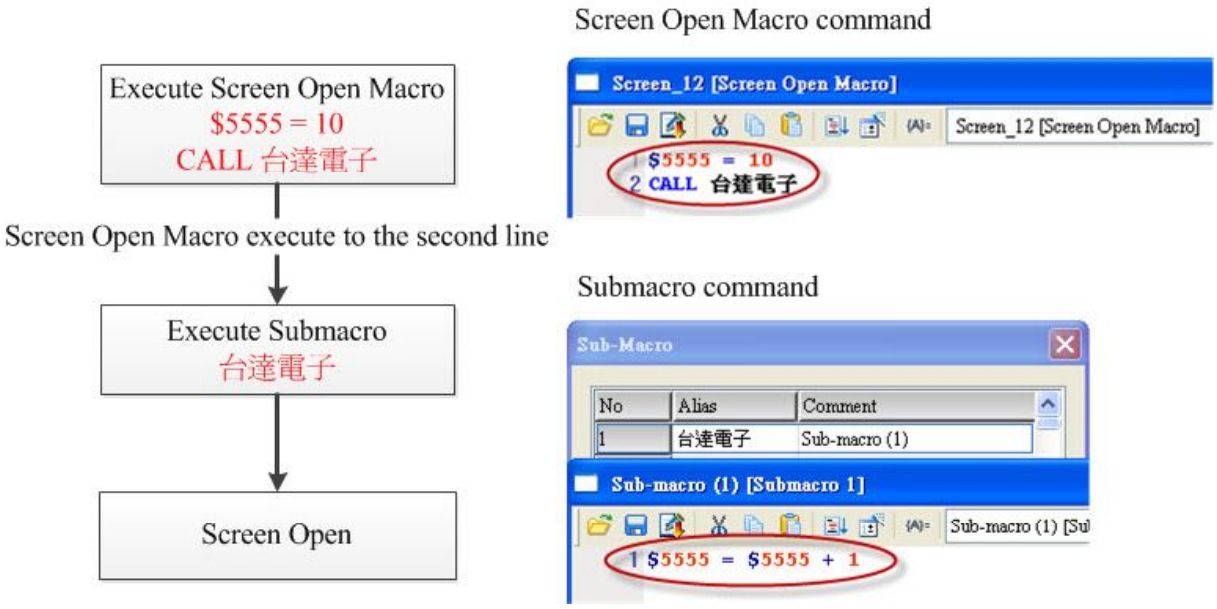


Figure 24-1-7-6 Submacro Flowchart

Submacro also provides the function of password protection. Users can encrypt each submarco.

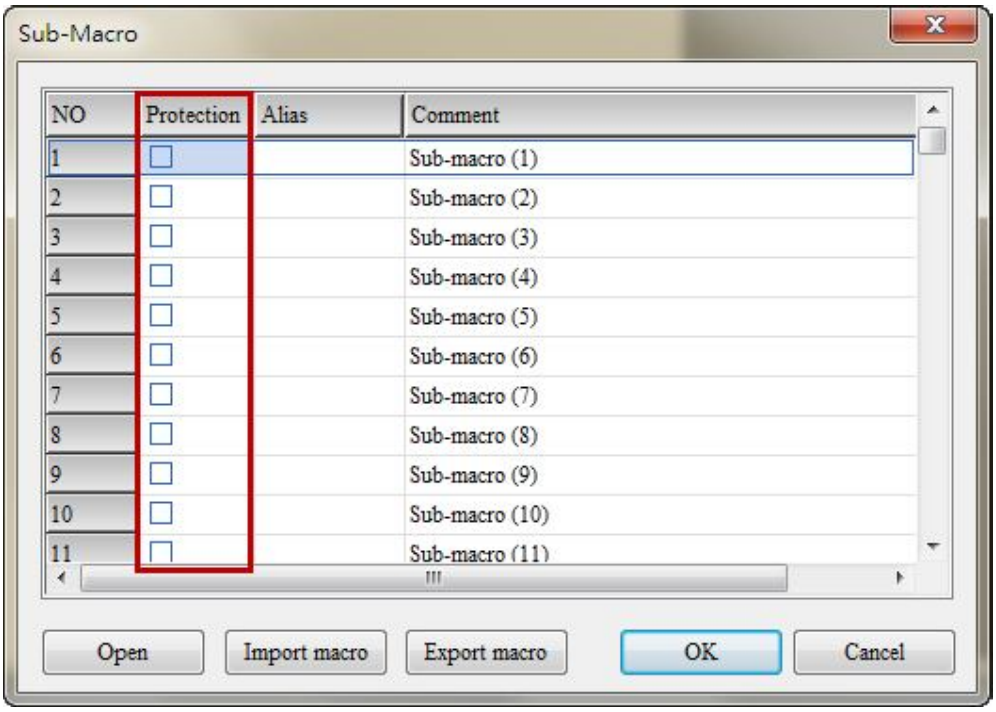


Figure 24-1-7-7 Protection from sub-macro

When check “protection” function, users will be asked to enter the password.
If sub-macro (1) has been encrypted, users have to enter the password to decrypt it and edit sub-macro (1).

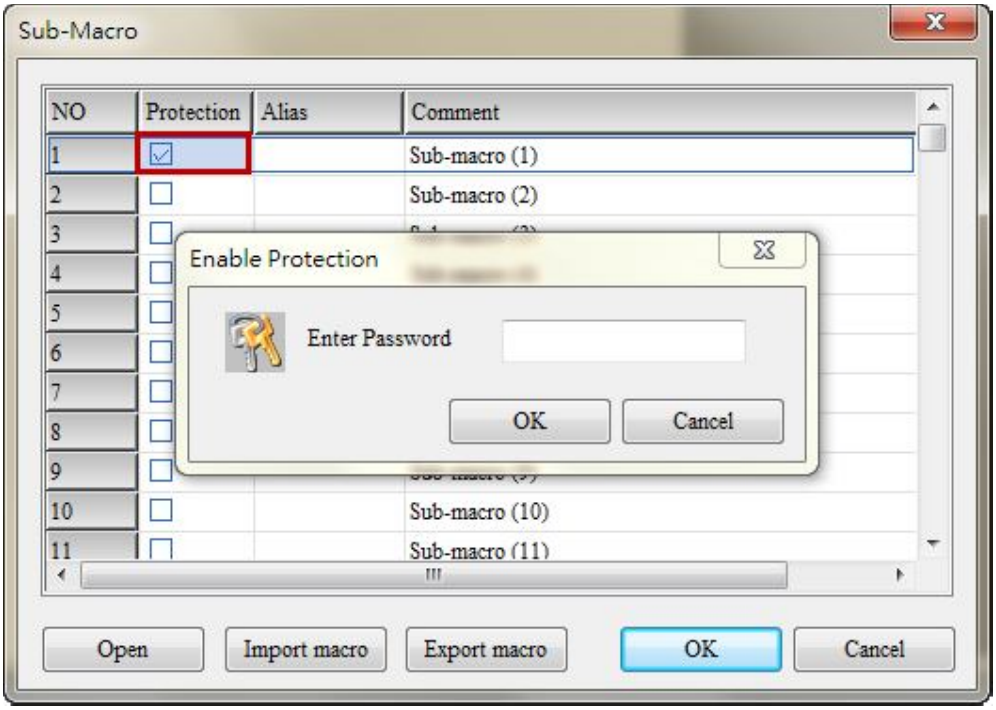


Figure 24-1-7-8 Sub-macro encryption

To disable the protection function, users will be asked to enter the password that just set for sub-marco (1).

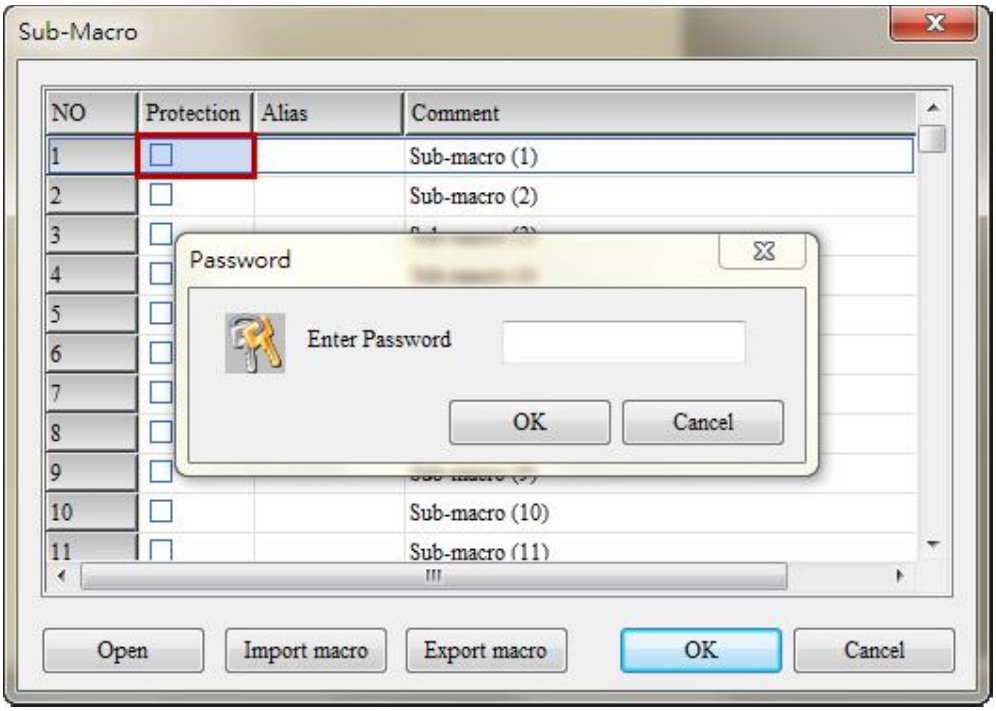
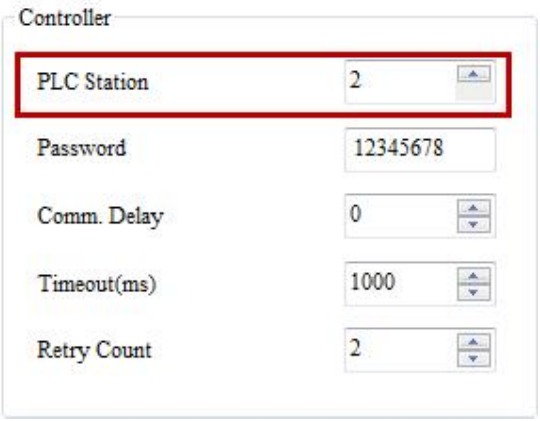
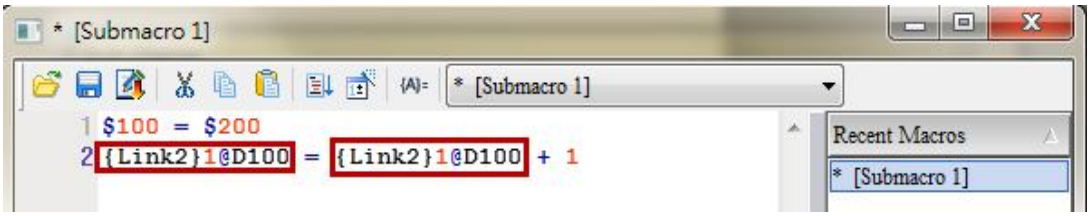
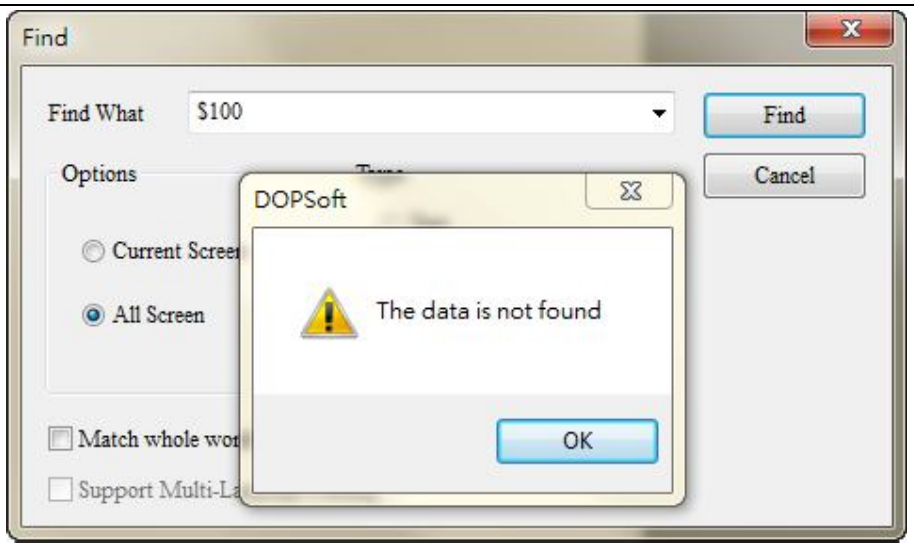
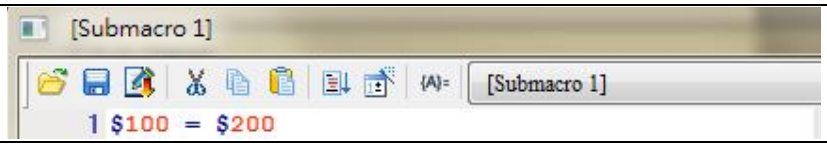


Figure 24-1-7-9 Sub-macro decryption

When the sub-macro is set with protection, functions that would be influenced are shown as below:

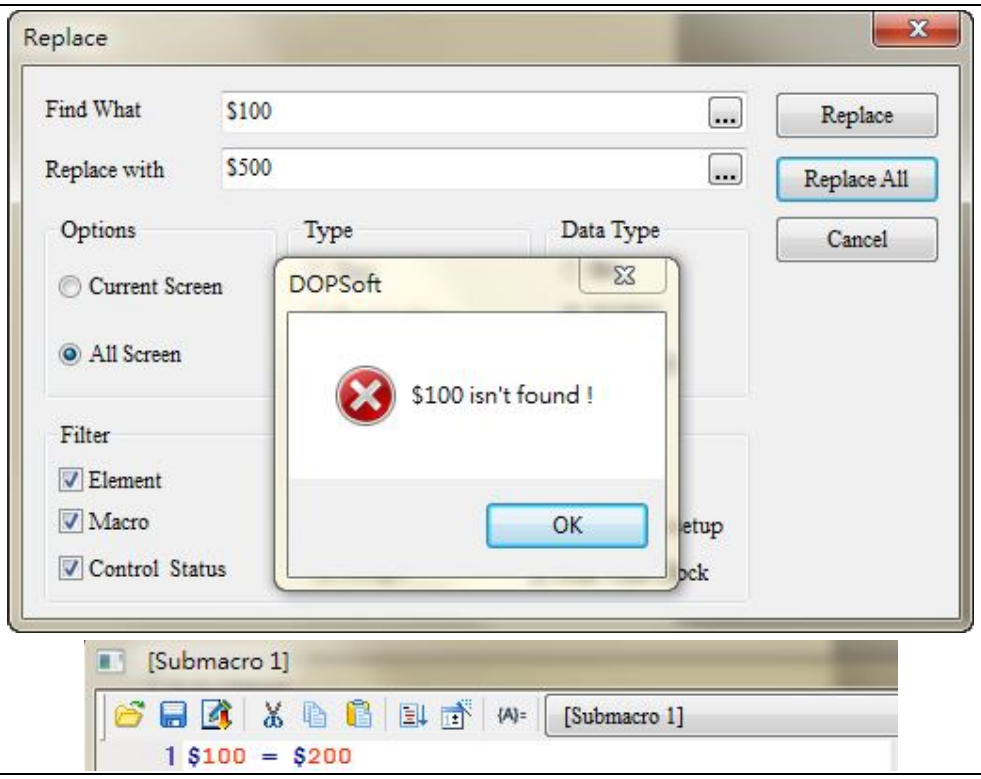
<table>
<tr><td rowspan="2">(1)</td><td>If the protected sub-macro is set with station number for communication, it will be failed to change the station number.</td></tr>
<tr><td>➢ If the station number of the protected sub-macro is 1, change the default station number of PLC to 2, and then check the protected sub-macro. You will find that the station number has to be 1, which is unchangeable.
 


</td></tr>
<tr><td rowspan="2">(2)</td><td>If $100 is set in the protected macro, $100 cannot be found when searching the address.</td></tr>
<tr><td> 
</td></tr>
</table>



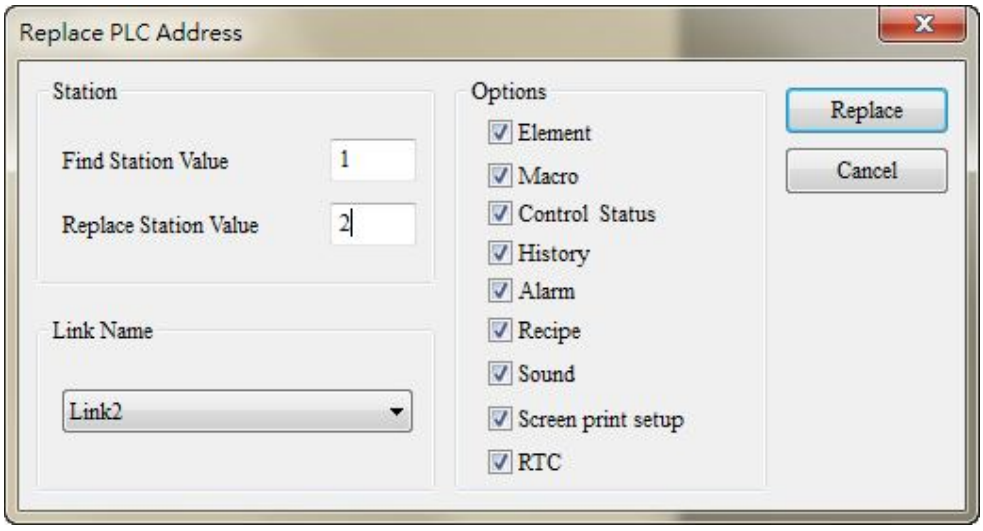
(3)

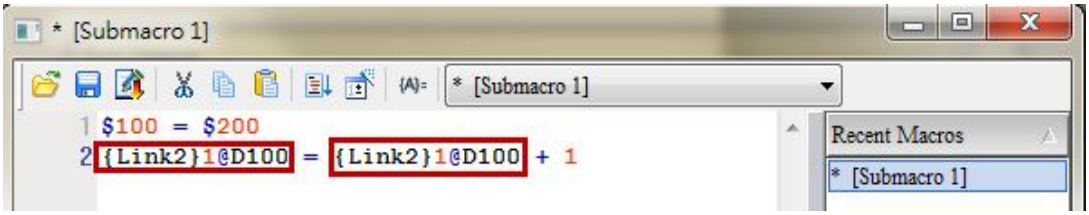
If $100 is set in the protected macro, $100 cannot be replaced by $500 when executing Replace function.



(4)

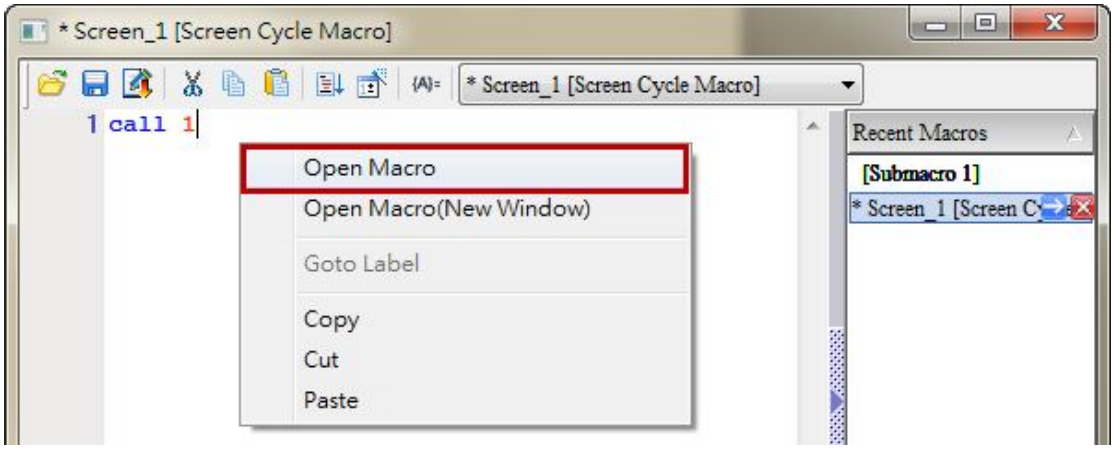
If the station number of the protected sub-macro is 1, it cannot be changed to 2 when executing the function of Replace Station Value.

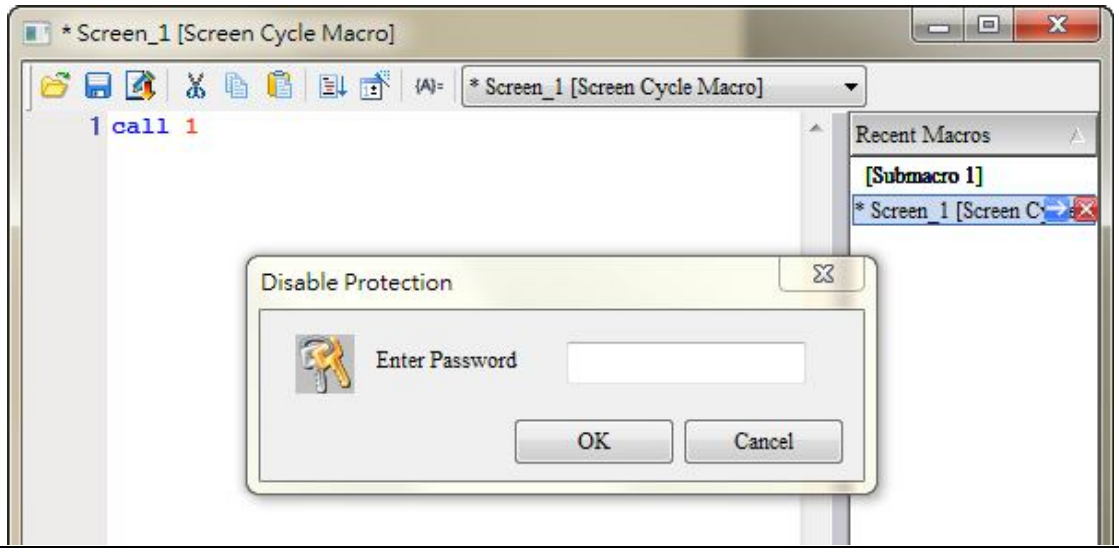




(5)

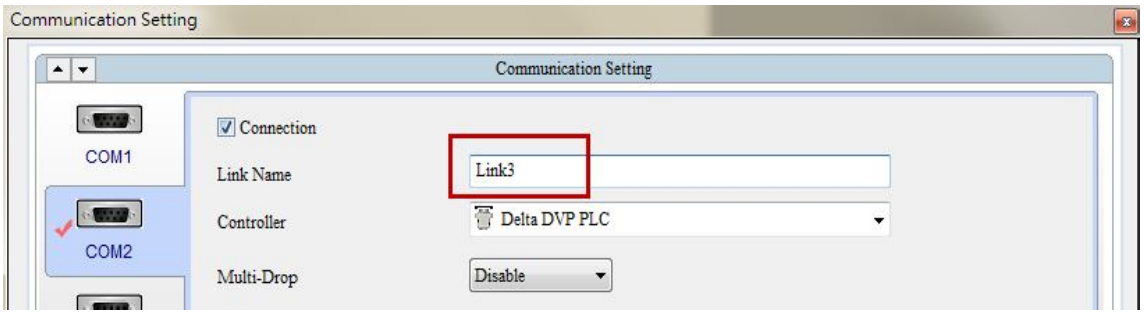
Assuming that Call command is included in macro, right click to open sub-macro window. If it is protected, users will be asked to enter the password.

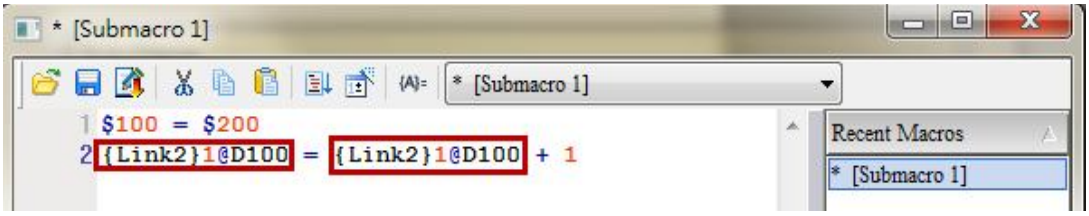




(6)

Change the Link Name to Link3. In protected sub-macro, Link2 cannot be changed to Link3.




* [Submacro 1]
* [Submacro 1]
1 $100 = $200
2 {Link2}1@D100 = {Link2}1@D100 + 1
Recent Macros
* [Submacro 1]

24-1-8 Initial Macro

The Initial Macro can be edited by going into [Options] → [Initial Macro].

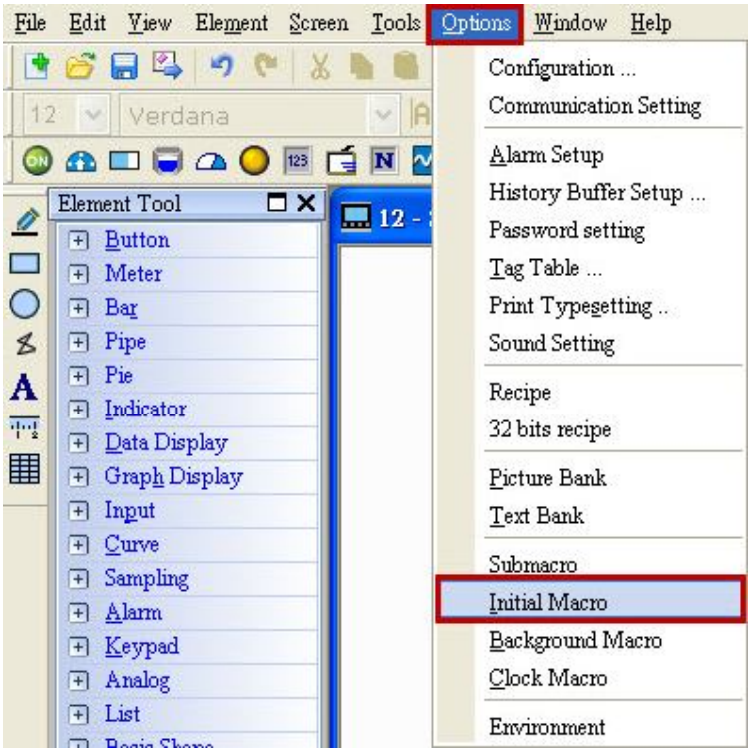


Figure 24-1-8-1 Initial Macro

The Initial Macro is the first macro to be executed right after the HMI starts up, and hence, users can write common HMI initial values into this macro.

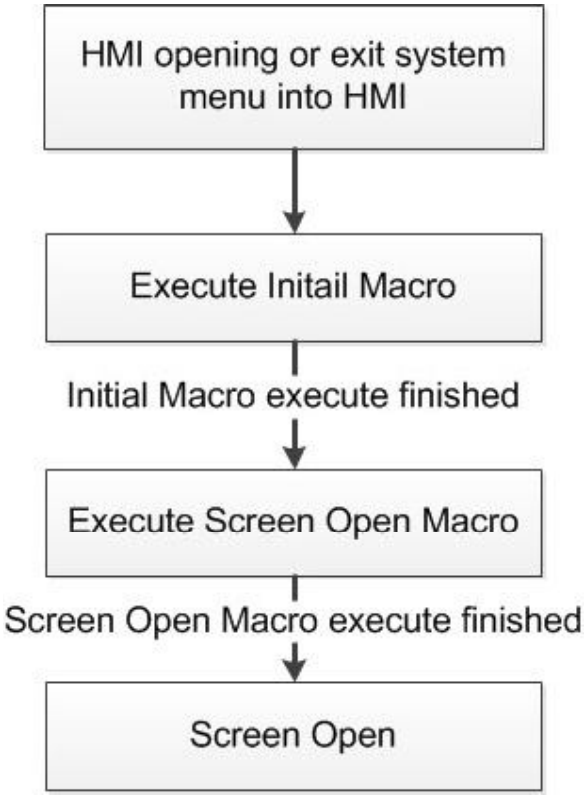


Figure 24-1-8-2 Initial Macro Flowchart

24-1-9 Background Macro

The Background Macro can be edited by going into [Options] → [Background Macro].

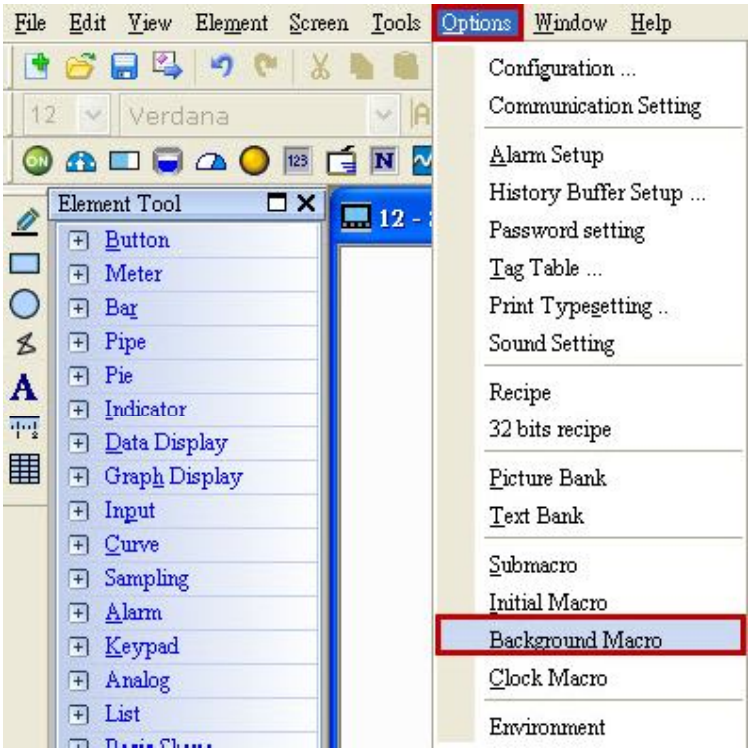


Figure 24-1-9-1 Background Macro

The Background Macro will be continuously executed during HMI operations. Whether it is executed one line or several lines at a time (does not stop after the first sequence), this macro will continue to be executed and repeat from the first line after it reaches the last line. To define the number of lines to be executed each time, please go to [Options] → [Configuration…] to set the [Background Macro Update Cycle] and the maximum number of lines for each update cycle is 512.

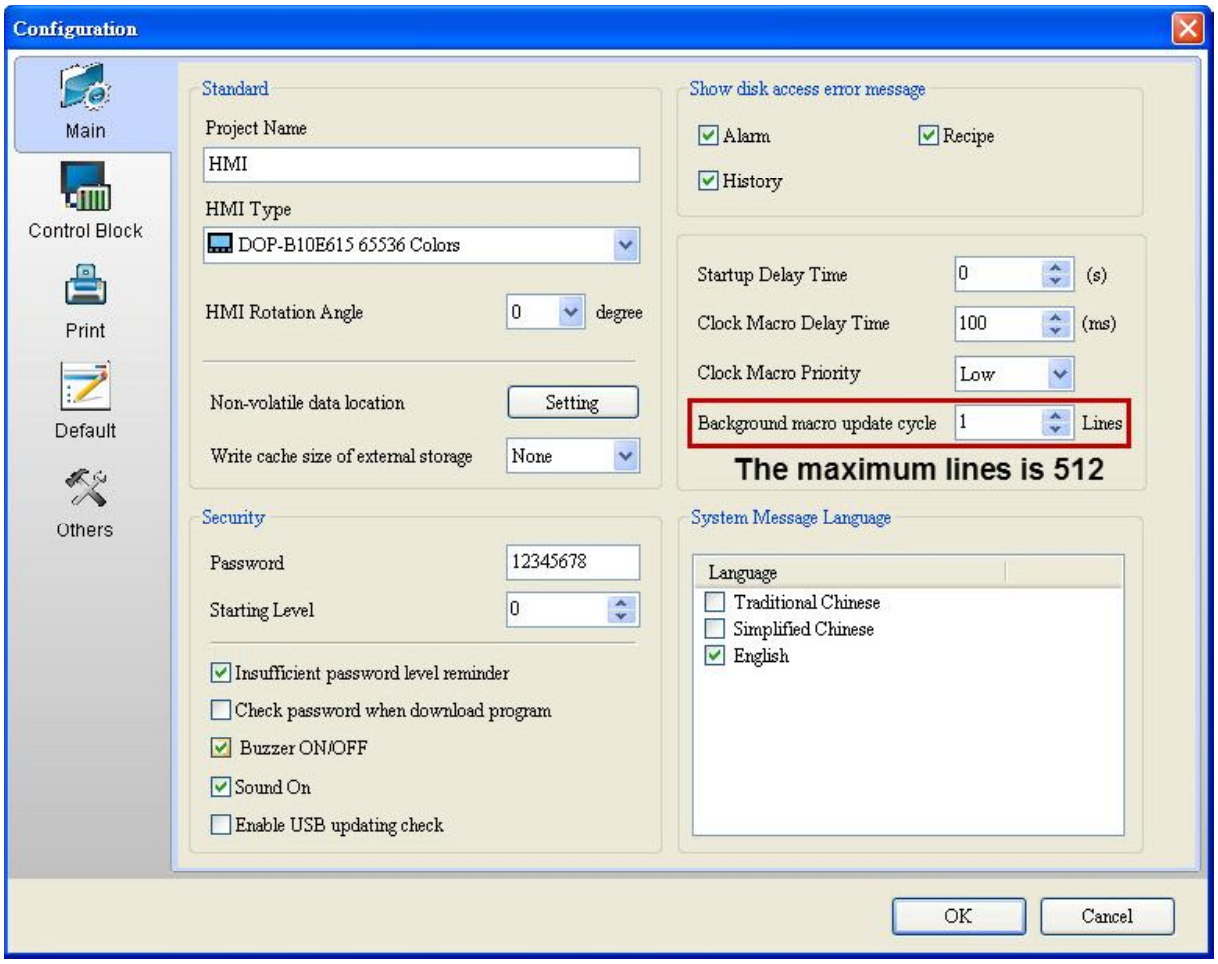


Figure 24-1-9-2 Background Macro Update Cycle

Suppose there are 10 elements created onscreen and 6 macro commands are written within the Background Macro. If the background macro update cycle is set to 3, then the flow of the process is shown below:

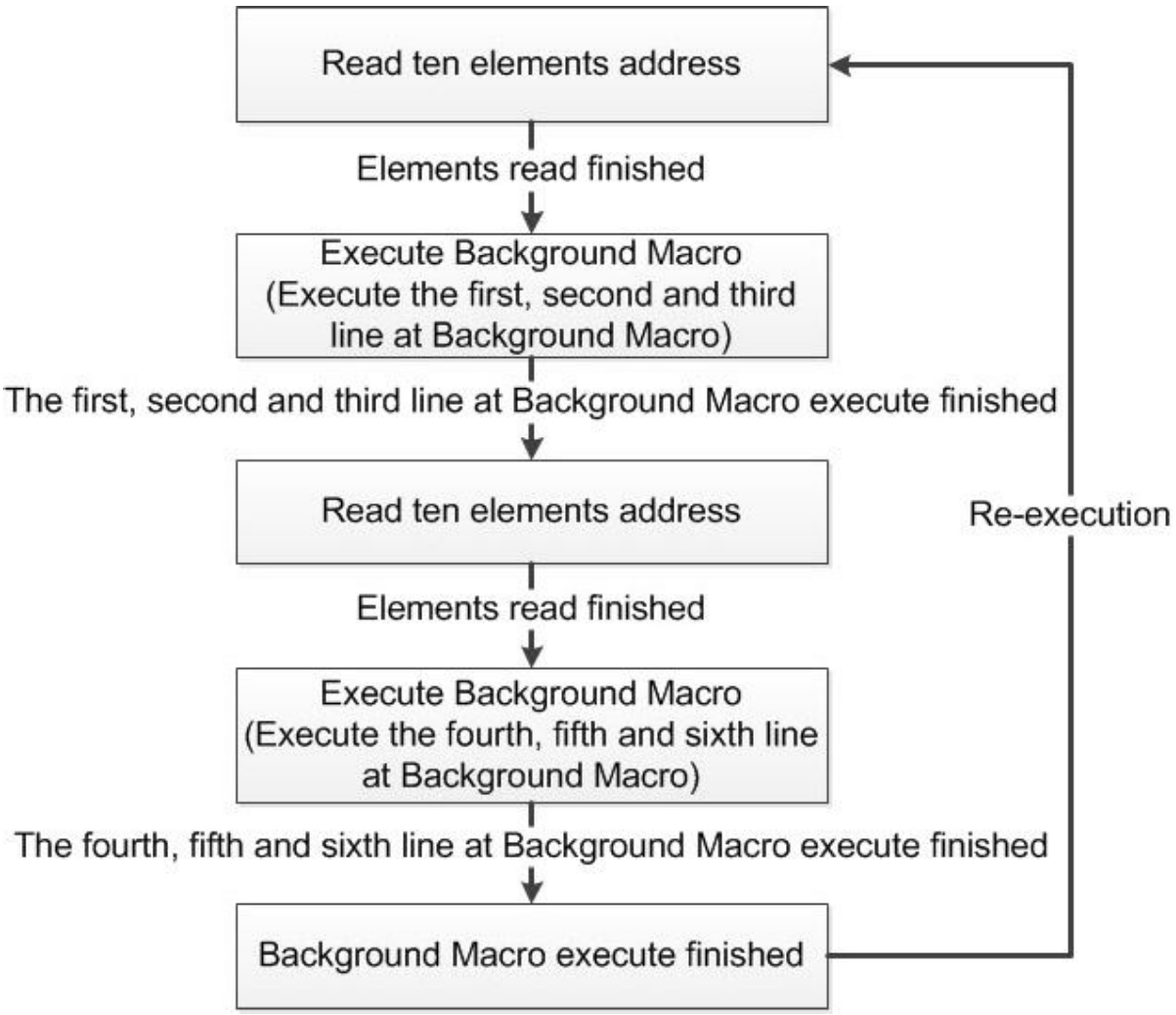


Figure 24-1-9-3 Background Macro Flowchart

24-1-10 Clock Macro

The Clock Macro can be edited by going into [Options] → [Clock Macro].

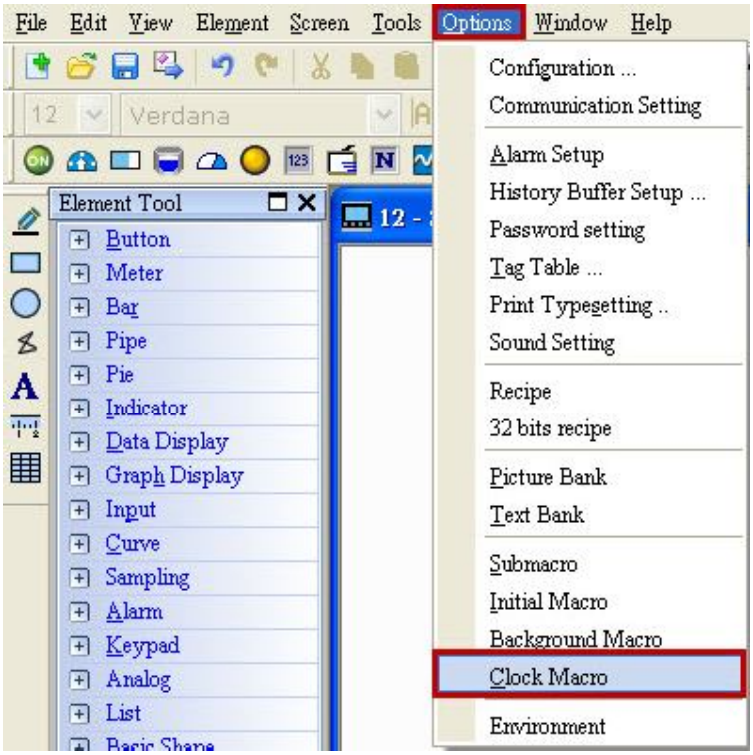


Figure 24-1-10-1 Clock Macro

The Clock Macro will be continuously executed during HMI operations. Unlike the Background Macro, the Clock Macro will finish executing all commands within the macro rather than one line or several lines at once. Similar to the Screen Cycle Macro, the Clock Macro also repeats its executions based on the Clock Macro Delay Time. Users can configure the delay time by going to [Options] → [Configuration…] to set the [Clock Macro Delay Time]. So that each time the Clock Macro is executed, it will wait until the macro delay time is completely elapsed. The default Clock Macro Delay Time is 100ms and the maximum time length is 65535ms.

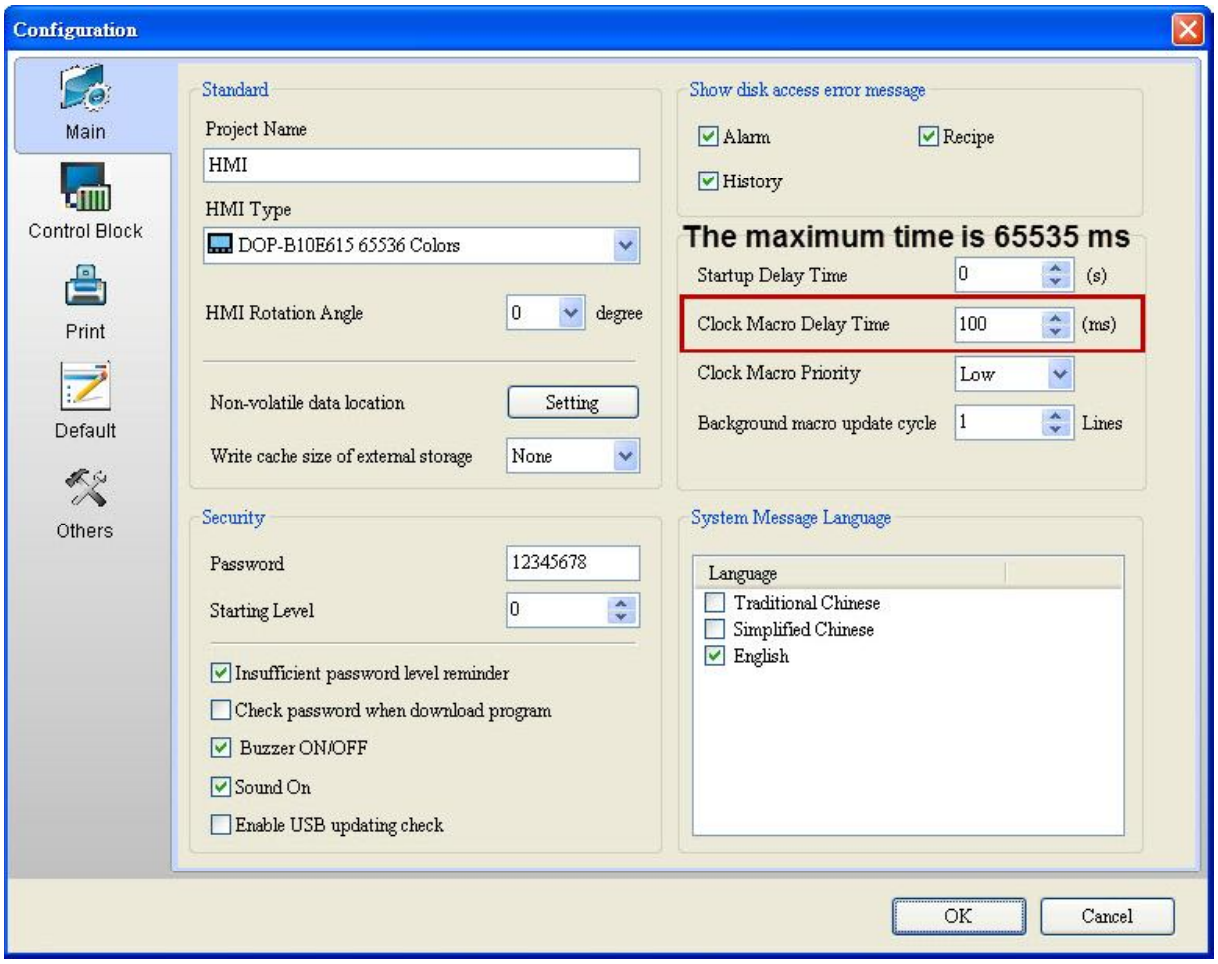


Figure 24-1-10-2 Clock Macro Delay Time

Three levels of priority (high, medium, and low) are also available for users to configure the priority of the Clock Macro. The order of priority can ensure the accurate delay time of Clock Macro.

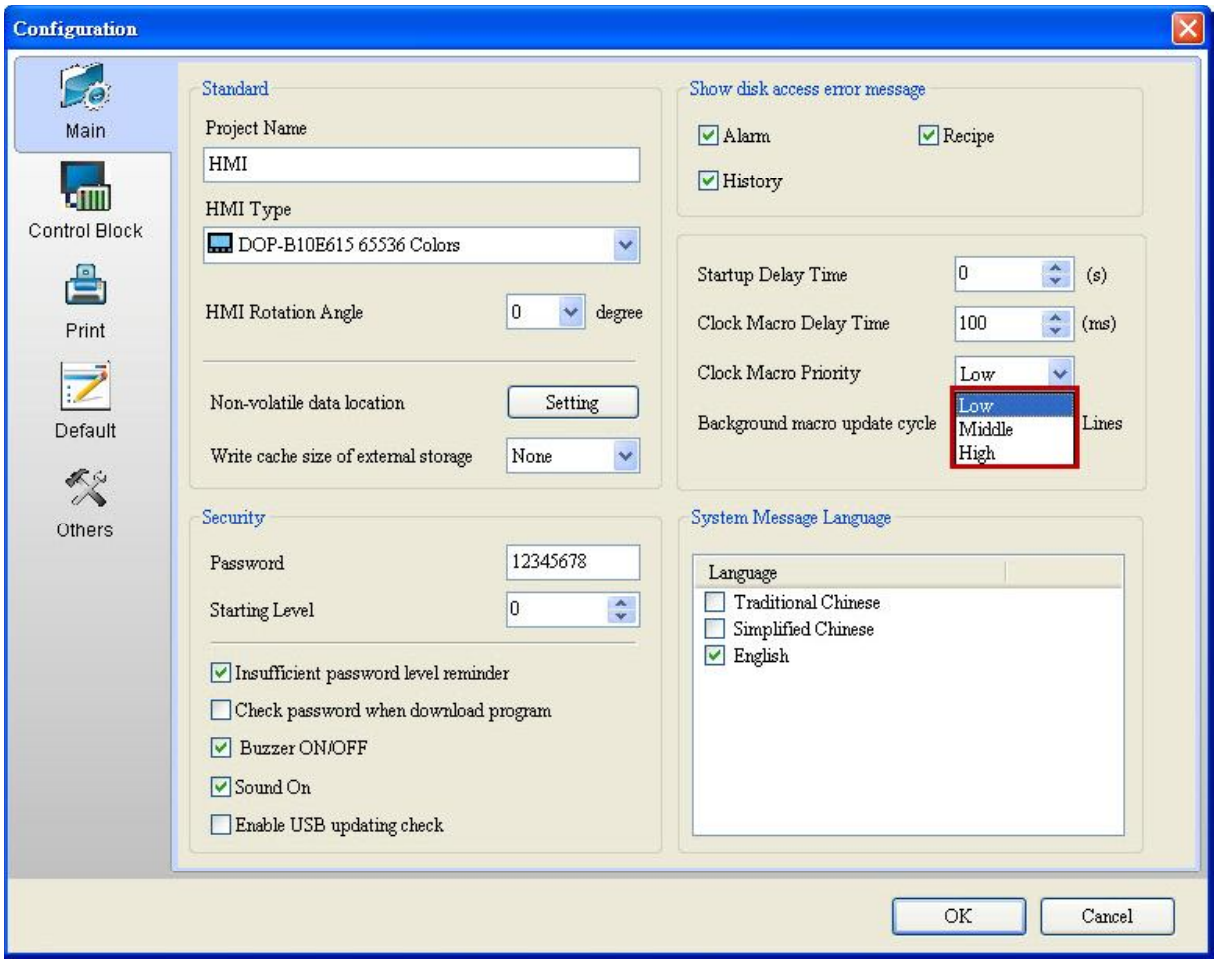


Figure 24-1-10-3 Clock Macro Priority

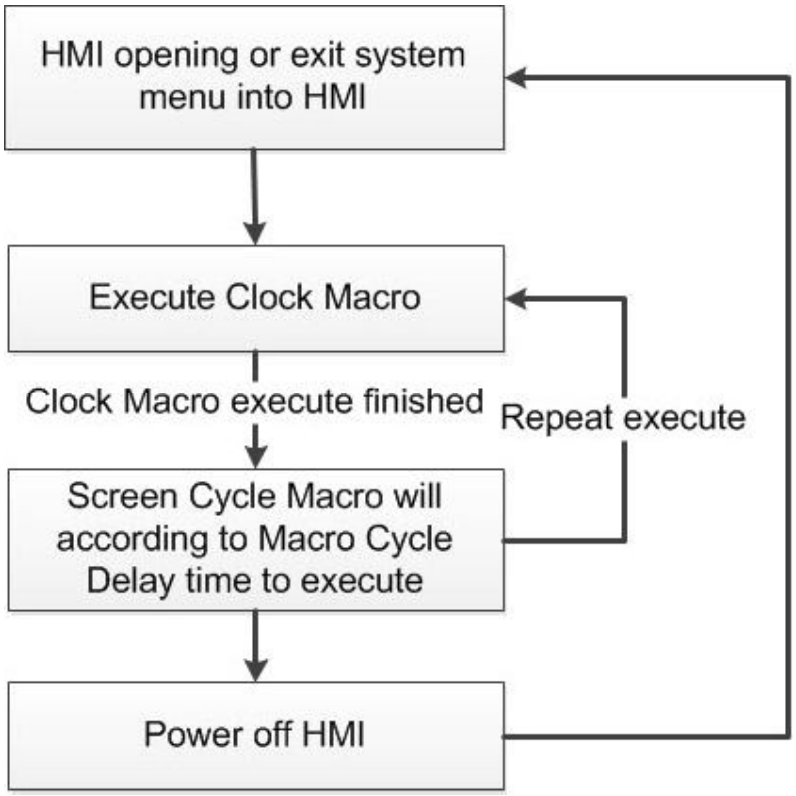


Figure 24-1-10-4 Clock Macro Flowchart

24-2 Macro Editing Window

After choosing a desired Macro, users can start to edit a Macro. Please note that each macro is capable of handling 512 lines of commands and only 640 bytes of characters are allowed on each line. Only 10 most recently edited macros will be displayed in the box on the top right side of the editing area. If there are more than 10 macros opened recently, then the first macro will be closed and the new Macro will be listed instead. Suppose the first Macro has been modified before it is closed, then a dialog box will pop up to ask the user to save the update of the macro before adding in the new macro.

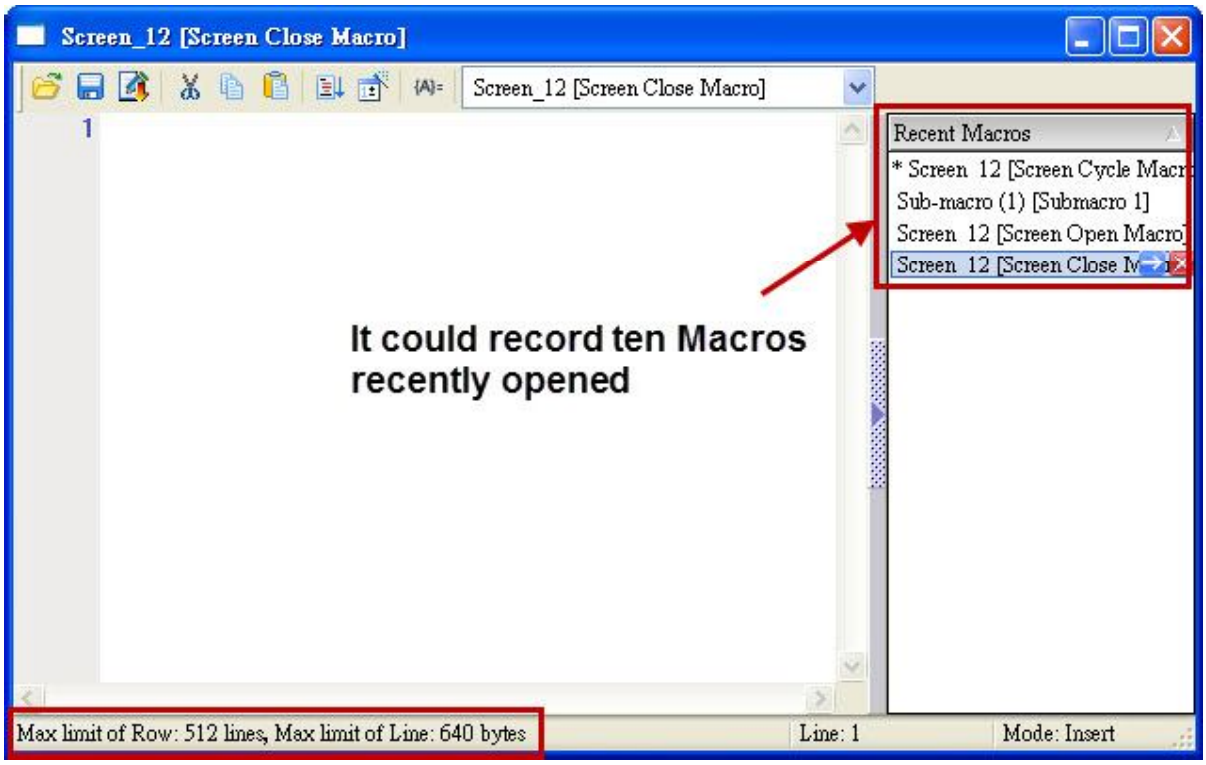


Figure 24-2-1 Macro Editing Window

The toolbar within the editing window is also available for users to design and edit macro commands.

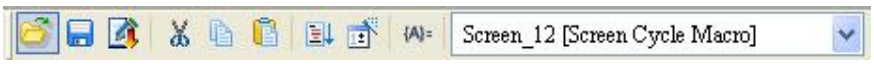


Figure 24-2-2 Macro Toolbar

Functions of each icon on the Macro Toolbar are explained in the following table.

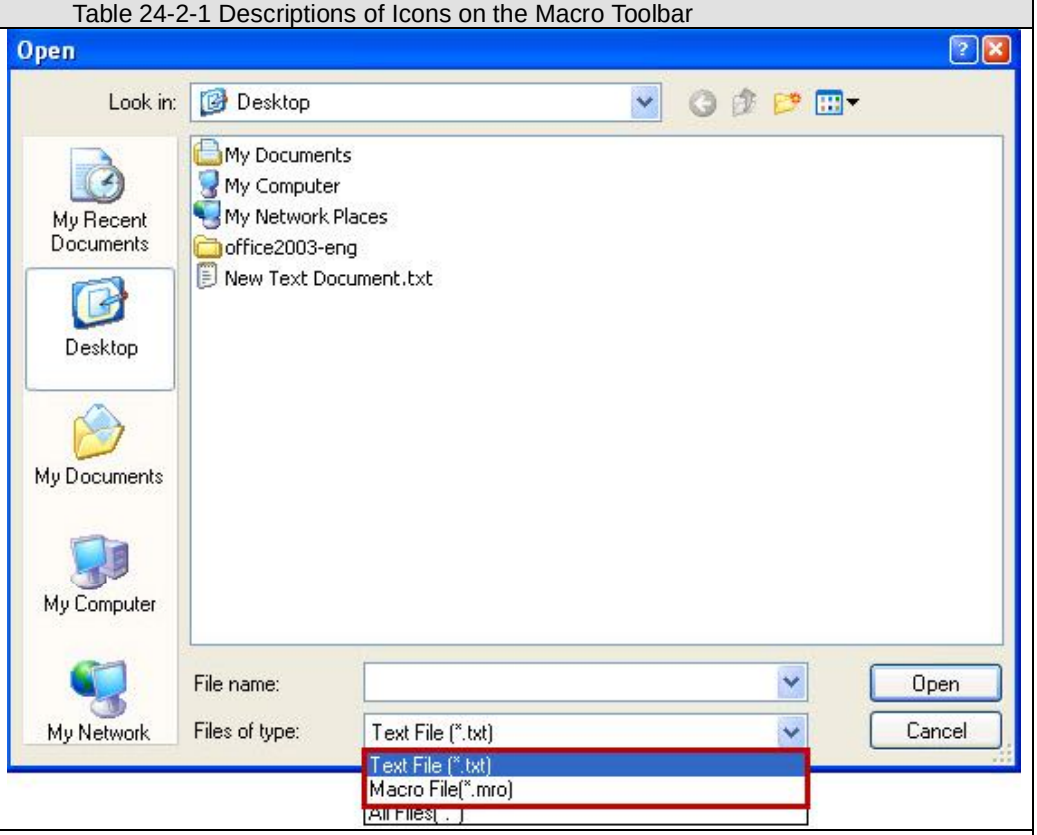
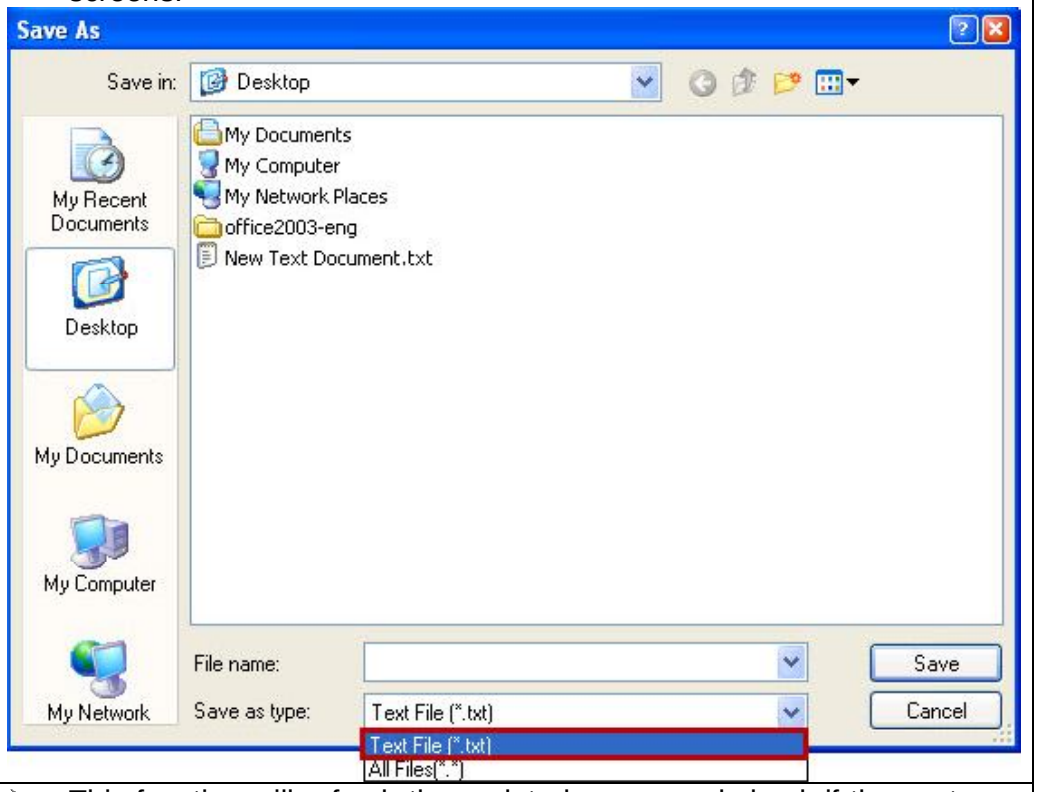
Functions of Macro Toolbar Icons

Table 24-2-1 Descriptions of Icons on the Macro Toolbar

Icon	Function	Content Description
	Open	➢ Open is equivalent to import. Two file formats are available: txt and mro. Users can choose to directly import previously edited macros to save time.

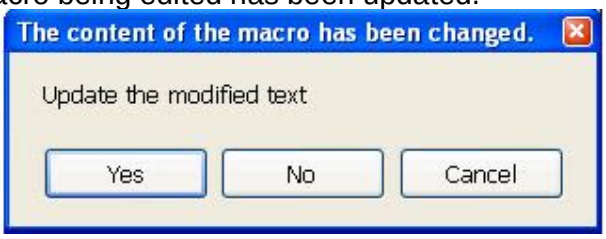
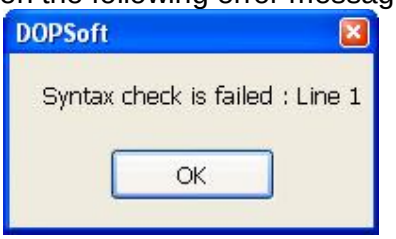
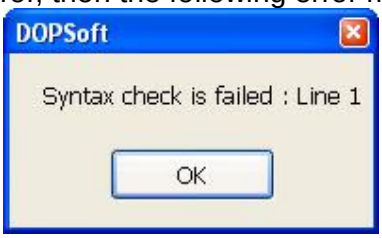
Functions of Macro Toolbar Icons

Table 24-2-1 Descriptions of Icons on the Macro Toolbar

		
	Save	➢ Save is equivalent to Export, but only the txt file format is supported. Users can save the edited macro as a backup or for use of other screens. 
	Update	➢ This function will refresh the updated macro and check if the syntaxes

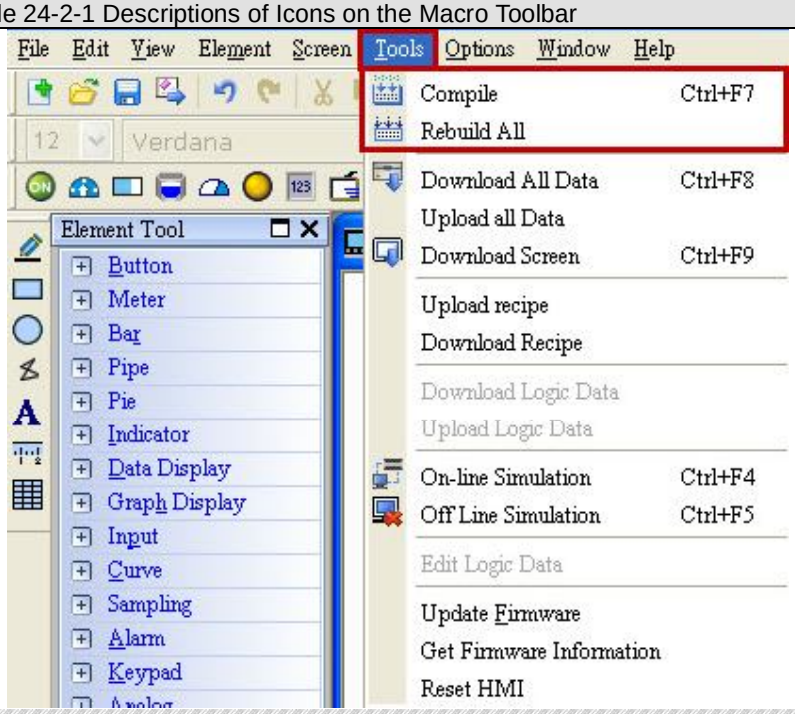
Functions of Macro Toolbar Icons

Table 24-2-1 Descriptions of Icons on the Macro Toolbar

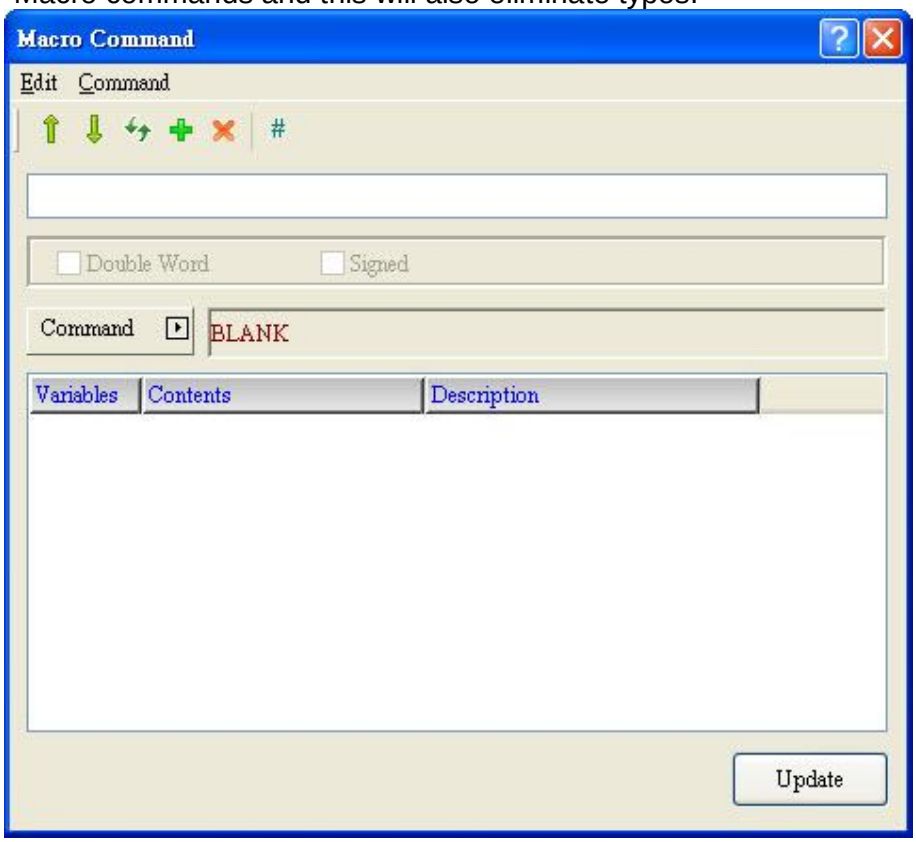
		are correct. If this button is not executed before exiting the current Macro editing window (click the exit button), the users will be prompted that the macro being edited has been updated.  ➢ Syntax check will be performed after clicking the update button. If there is a syntax error, then the following error message will pop up. 
	Cut	➢ Cut, Copy and Paste are used the same way as Microsoft Office and users can also choose to perform these operations through hotkeys (Cut: Ctrl + X; Copy: Ctrl + C; Paste: Ctrl + V).
	Copy	
	Paste	
	Syntax Check	➢ Syntax Check will check if macro commands are written correctly. If there is a syntax error, then the following error message will pop up.  NOTE: Syntax Check is not equivalent to compiling macros. Please consider the compile function to compile.

Functions of Macro Toolbar Icons

Table 24-2-1 Descriptions of Icons on the Macro Toolbar



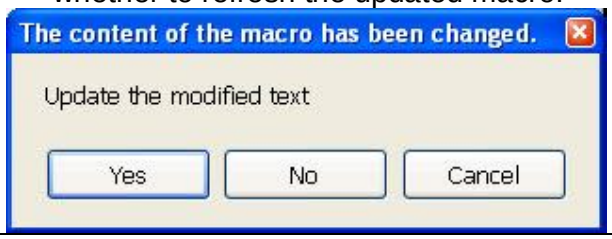
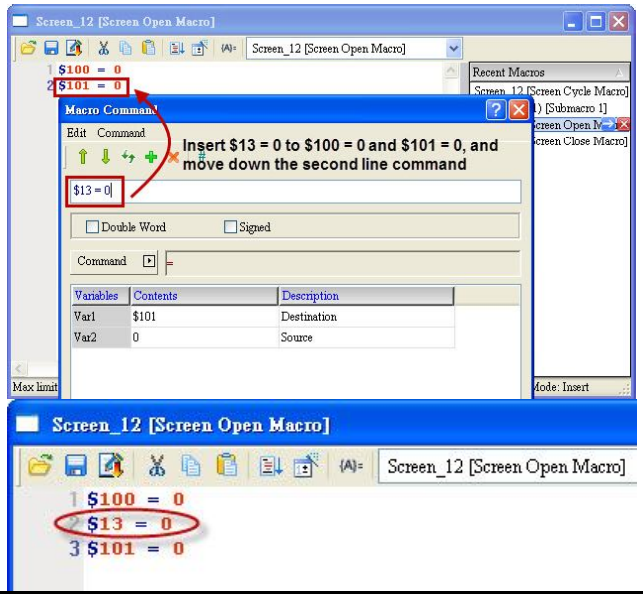
	Macro Wizard	➢ The purpose of the wizard is for users to more easily edit and type in Macro commands and this will also eliminate typos.



Edit	Previous 	➢ The previous icon will move the mouse cursor to the last line and the next icon will

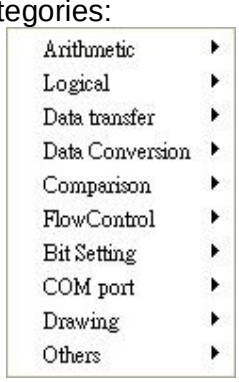
Functions of Macro Toolbar Icons

Table 24-2-1 Descriptions of Icons on the Macro Toolbar

Next 	move the mouse cursor to the next line. ➢ Via these two icons, users can choose which line within the macro to move to.
Update 	➢ This function will refresh the updated macro and check if the syntaxes are correct. If syntax errors are detected, then the error messages shown below will pop up for user notification.  ➢ If this icon is not executed before exiting the current Macro editing window (click the exit icon), the users will be prompted whether to refresh the updated macro. 
Insert 	➢ Insert a new macro command. This icon will replace the macro command where the cursor is located with the newly inserted command and move the current macro command to the next line. 

Functions of Macro Toolbar Icons

Table 24-2-1 Descriptions of Icons on the Macro Toolbar

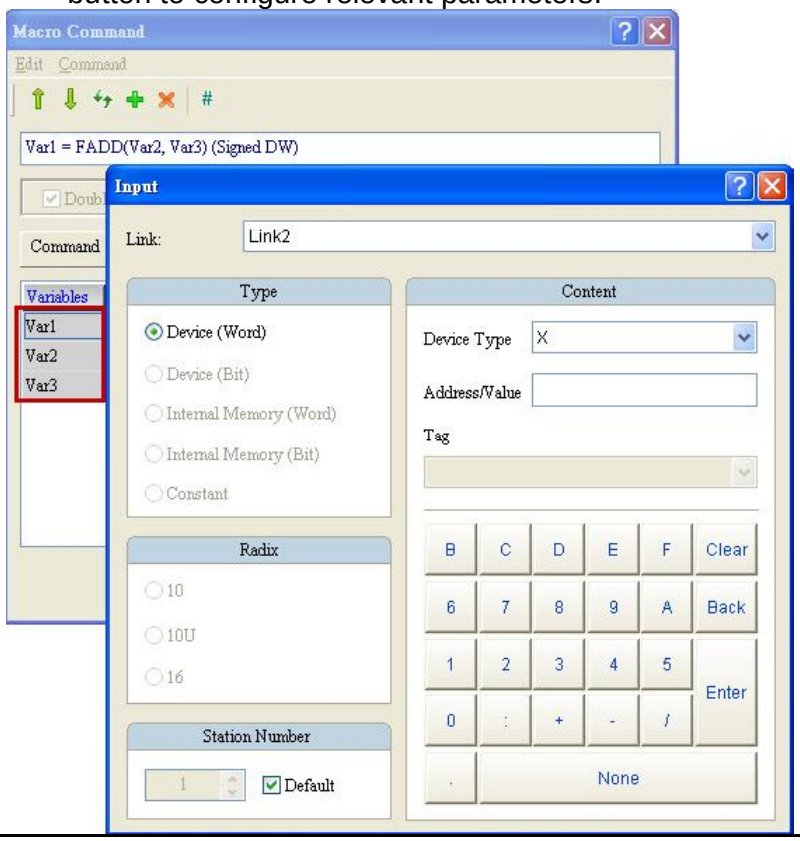
Delete 	➢ Delete the macro command where the mouse cursor is located. If the deleted command is not on the last line within the macro, then the lines below the deleted commands will move up.	
	NOTE : If no macro command exists where the mouse cursor is located, then nothing will happen.	
Comment 	➢ Comment helps users to manage macros, improve program readability and simplify code maintenance tasks. Users only need to insert the symbol # or click # button within the macro wizard ([Edit] → [Comment]) to comment on the program.	
	NOTE: Comments within the macro will not be executed.	
Commands	➢ These are macro functions and they are grouped into the following categories:  ➢ For detailed introductions on the commands, please refer to 24-3 Macro Commands.	
Double Word	➢ 32 bit or signed number operations are supported by macro commands. If Signed is checked, then the command will be executed as a signed number, or else the command will be executed as an unsigned number. If Double Word is check, then the command will be executed as a 32 bit command, or else the command will be executed as a Double Word command, or 16 bit command.	
Signed		

Unsigned	Unsigned number
Signed	Signed number
WORD	16 bit data
DW（DOUBLE WORD, DWORD）	32 bit data

NOTE:

Functions of Macro Toolbar Icons

Table 24-2-1 Descriptions of Icons on the Macro Toolbar

			For the Double Word data type, then each memory address will take two registers.
		Command	➢ Command is equivalent to the [Command] icon in the Macro Wizard dialog window and they both are used for users to choose their desired macro command. ➢ For detailed explanations please refer to 24-3 Macro Commands.
		Variable	➢ This function provide variables used in macro commands and users can directly click the variable button to configure relevant parameters. 
{A}=	Input Address		➢ Users can enter memory addresses used in the macro via this function to prevent address typos. 

24-3 Macro Commands

Based on the nature of macro commands, they are divided into the following ten categories: Arithmetic, Logical, Data transfer, Data conversion, Comparison, Flow control, Bit setting, Communication and Drawing and Other. If select HMC and PS models, users can choose the macro command of industrial application (E-Cam) which is shown as below.

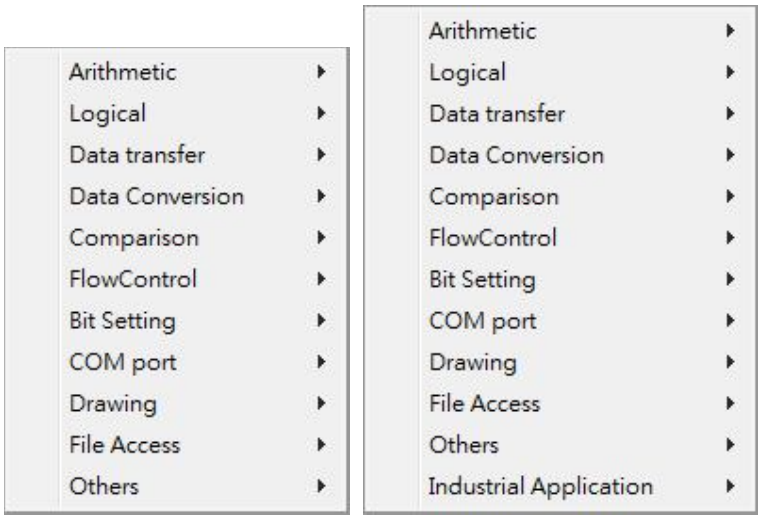


Figure 24-3-1 Type of Macro Commands

All supported macro commands are listed below:

Category	Function	Expression	Description
Arithmetic	+	Var1 = Var2 + Var3	Addition
	-	Var1 = Var2 - Var3	Subtraction
	*	Var1 = Var2 * Var3	Multiplication
	/	Var1 = Var2 / Var3	Division
	%	Var1 = Var2 % Var3	Get Reminder
	MUL64	Var1 = MUL64(Var2, Var3) (Signed DW)	64 bit Multiplication
	ADDSUMW	Var1 = ADDSUMW(Var2, Var3)	Repeated Addition
	FADD	Var1 = FADD(Var2, Var3) (Signed DW)	Floating Point Addition
	FSUB	Var1 = FSUB(Var2, Var3) (Signed DW)	Floating Poiont Subtraction
	FMUL	Var1 = FMUL(Var2, Var3) (Signed DW)	Floating Point Multiplication
	FDIV	Var1 = FDIV(Var2, Var3) (Signed DW)	Floating Point Division
	FMOD	Var1 = FMOD(Var2, Var3) (Signed DW)	Floating Point Reminder
	SIN	Var1 = SIN(Var2) (Signed DW)	Sine Function
	COS	Var1 = COS(Var2) (Signed DW)	Cosine Function
	TAN	Var1 = TAN(Var2) (Signed DW)	Tangent Function
	COT	Var1 = COT(Var2) (Signed DW)	Cotangent Function
	SEC	Var1 = SEC(Var2) (Signed DW)	Secant Function
	CSC	Var1 = CSC(Var2) (Signed DW)	Cosecant Function

Category	Function	Expression	Description
Logical	|	Var1 = Var2 | Var3	Bitwise OR Operation
	&&	Var1 = Var2 && Var3	Bitwise AND Operation
	^	Var1 = Var2 ^ Var3	Bitwise XOR Operation
	NOT	Var1 = NOT Var2	Bitwise NOT Operation
	<<	Var1 = Var2 << Var3	SHL(Bitwise Left-shift Operation)
	>>	Var1 = Var2 >> Var3	SHR(Bitwise Right-shift Operation)
Data transfer	MOV	Var1 = Var2	Data Moving Operand
	BMOV	BMOV(Var1, Var2, Var3)	Move in Block
	ArrayCopy	Var1 = ArrayCopy(Var2, Var3, Var4, Var5, Var6)	Copy Array
	FILL	FILL(Var1, Var2, Var3)	Fill in the Block
	FILLASC	FILLASC(Var1, " ")	String to ASCII Conversion
	FMOV	Var1 = FMOV(Var2) (Signed DW)	Move floating point data
Data conversion	BCD	Var1 = BCD(Var2)	Decimal to BCD Conversion
	BIN	Var1 = BIN(Var2)	BCD to Decimal Conversion
	TODWORD	Var1 = TODWORD(Var2)	WORD to Double WORD Conversion
	TOWORD	Var1 = TOWORD(Var2, Var3)	BYTE to Word Conversion
	TOBYTE	Var1 = TOBYTE(Var2, Var3)	Word to Byte Conversion
	SWAP	SWAP(Var1, Var2, Var3)	Swap between highbit and lowbit of WORD
	XCHG	XCHG(Var1, Var2, Var3)	Data Exchange
	MAX	Var1 = MAX(Var2, Var3)	Get Maximum value
	MIN	Var1 = MIN(Var2, Var3)	Get Minimum value
	TOHEX	Var1 = TOHEX(Var2)	Convert 4 ASCII characters to a four digit integer in hexadecimal format
	TOASC	Var1 = TOASC(Var2)	Convert hexadecimal integers into 4 Words ASCII characters
	FCNV	Var1 = FCNV(Var2) (Signed DW)	Conversion of

Category	Function	Expression		Description
				integer into floating point value
	ICNV	Var1 = ICNV(Var2) (Signed DW)		Conversion from integer to floating point value
	SPRINTF	Var1 = SPRINTF(Var2, "%u", Var4)		Format String
Comparison	IF…THEN GOTO	IF ==	IF Var1 == Var2 THEN GOTO LABEL Var3	If …. Goto a certain label identifier and continue subsequent executions
		IF !=	IF Var1 != Var2 THEN GOTO LABEL Var3	
		IF >	IF Var1 > Var2 THEN GOTO LABEL Var3	
		IF >=	IF Var1 >= Var2 THEN GOTO LABEL Var3	
		IF <	IF Var1 < Var2 THEN GOTO LABEL Var3	
		IF <=	IF Var1 <= Var2 THEN GOTO LABEL Var3	
		IF AND == 0	IF (Var1 && Var2) == 0 THEN GOTO LABEL Var3	
		IF AND != 0	IF (Var1 && Var2) != 0 THEN GOTO LABEL Var3	
		IF == ON	IF Var1 == ON THEN GOTO LABEL Var2	
		IF == OFF	IF Var1 == OFF THEN GOTO LABEL Var2	
		IFB == ON	IFB Var1 == ON THEN GOTO LABEL Var2	
		IFB == OFF	IFB Var1 == OFF THEN GOTO LABEL Var2	
	IF…THEN CALL	IF == CALL	IF Var1 == Var2 THEN CALL Var3	Macro If… Then Call a Submacro
		IF != CALL	IF Var1 != Var2 THEN CALL Var3	
		IF > CALL	IF Var1 > Var2 THEN CALL Var3	

Category	Function	Expression		Description
		IF >= CALL	IF Var1 >= Var2 THEN CALL Var3	
		IF < CALL	IF Var1 < Var2 THEN CALL Var3	
		IF <= CALL	IF Var1 <= Var2 THEN CALL Var3	
		IF AND == 0 CALL	IF (Var1 && Var2) == 0 THEN CALL Var3	
		IF AND != 0 CALL	IF (Var1 && Var2) != 0 THEN CALL Var3	
		IF == ON CALL	IF Var1 == ON THEN CALL Var2	
		IF == OFF CALL	IF Var1 == OFF THEN CALL Var2	
	IF…	IF ==	IF Var1 == Var2	Logical Comparison
		IF !=	IF Var1 != Var2	
		IF >	IF Var1 > Var2	
		IF >=	IF Var1 >= Var2	
		IF <	IF Var1 < Var2	
		IF <=	IF Var1 <= Var2	
		IF AND == 0	IF (Var1 && Var2) == 0	
		IF AND != 0	IF (Var1 && Var2) != 0	
		IF == ON	IF Var1 == ON	
		IF == OFF	IF Var1 == OFF	
	ELSEIF…	ELSEIF ==	ELSEIF Var1 == Var2	Logical Comparison
		ELSEIF !=	ELSEIF Var1 != Var2	
		ELSEIF >	ELSEIF Var1 > Var2	
		ELSEIF >=	ELSEIF Var1 >= Var2	
		ELSEIF <	ELSEIF Var1 < Var2	
		ELSEIF <=	ELSEIF Var1 <= Var2	
		ELSEIF AND == 0	ELSEIF (Var1 && Var2) == 0	
		ELSEIF AND != 0	ELSEIF (Var1 && Var2) != 0	
		ELSEIF == ON	ELSEIF Var1 == ON	
		ELSEIF == OFF	ELSEIF Var1 == OFF	
	ELSE	ELSE		Logical Comparison

Category	Function	Expression	Description
	ENDIF	ENDIF	Logical Comparison
	FCMP	Var1 = FCMP(Var2, Var3) (Signed DW)	Comparison of Floating Point Data
Flow control	GOTO	GOTO LABEL Var1	Label Identifier for the current process to unconditionally jump to
	LABEL	LABEL Var1	Label Identifier
	CALL	CALL Var1	Call Submacro
	RET	RET	Exit Submacro
	FOR	FOR Var1	Loop
	NEXT	NEXT	
	END	END	End Macro
Bit setting	BITON	BITON Var1	Set Bits to On
	BITOFF	BITOFF Var1	Set Bits Off
	BITNOT	BITNOT Var1	Set Bits to Inverse State (ON→OFF; OFF→ON)
	GETB	Var1 = GETB Var2	Acquire Bit State
Communication	INITCOM	Var1 = INITCOM(Var2, Var3, Var4, Var5, Var6, Var7, Var8)	COM Port Initialization
	ADDSUM	Var1 = ADDSUM(Var2, Var3)	Checksum Calculation through Addition
	XORSUM	Var1 = XORSUM(Var2, Var3)	Checksum Calculation through XOR Operation
	PUTCHARS	Var1 = PUTCHARS(Var2, Var3, Var4)	Output Character by Com Port
	GETCHARS	Var1 = GETCHARS(Var2, Var3, Var4)	Character Acquisition through Com Port
	SELECTCOM	SELECTCOM(Var1)	Com Port Selection
	CLEARCOMBUFFER	CLEARCOMBUFFER(Var1, Var2)	Com Port Buffer Clearance
	CHRCHKSUM	Var1 = CHRCHKSUM("Var2", Var3, Var4)	Calculation of String Length and Checksum
	LOCKCOM	Var1 = LOCKCOM(Var2, Var3)	Lock Com Port
	UNLOCKCOM	UNLOCKCOM(Var1)	Unlock Com Port
	STATIONON	STATIONON(Var1, Var2)	Set Station On
	STATIONOFF	STATIONOFF(Var1, Var2)	Set Station Off
	IPON	Var1 = IPON(Var2, Var3, Var4, Var5, Var6)	Enable IP Address
	IPOFF	Var1 = IPOFF(Var2, Var3, Var4, Var5, Var6)	Disable IP Address
Drawing	RECTANGLE	RECTANGLE(Var1)	Draw Rectangle
	LINE	LINE(Var1)	Draw Line

Category	Function	Expression	Description
	POINT	POINT(Var1)	Draw Point
	CIRCLE	CIRCLE(Var1)	Draw Ellipse
File Access	FileSlotRead	Var1 = FileSlotRead(Var2, Var3, Var4, Var5)	Read Files
	FileSlotWrite	Var1 = FileSlotWrite(Var2, Var3, Var4, Var5)	Write Files
	FileSlotRemove	Var1 = FileSlotRemove(Var2)	Remove Files
	FileSlotGetLength	Var1 = FileSlotGetLength(Var2, Var3)	Accessing File Length
	FileSlotExport	Var1 = FileSlotEXPORT(Var2, Var3, Var4, Var5)	Export Files
	FileSlotImport	Var1 = FileSlotIMPORT(Var2, Var3, Var4, Var5)	Import Files
Other	Time Tick	Var1 = TIMETICK	Acquire System up duration from System Startup to Present
	GETLASTERROR	Var1 = GETLASTERROR	Get Last Error Value
	Comment	#	Make Comment
	Delay	Delay(Var1)	System Delay
	GETSYSTEMTIME	Var1 = GETSYSTEMTIME	Acquire System Time
	SETSYSTEMTIME	SETSYSTEMTIME(Var1)	Set System Time
	GETHISTORY	Var1 = GETHISTORY（Var2, Var3, Var4, Var5, Var6）	Acquire Historical Log
	EXPORT	EXPORT(Var1)	Export Report to an External Device
	EXRCP16	Var1 = EXRCP16(Var2, Var3)	Export 16 bit Equation
	IMRCP16	Var1 = IMRCP16(Var2, Var3)	Import 16 bit Equation
	EXRCP32	Var1 = EXRCP32(Var2, Var3)	Export 32 bit Equation
	IMRCP32	Var1 = IMRCP32(Var2, Var3)	Import 32 bit Equation
	EXENRCP	Var1 = EXENRCP(Var2, Var3)	Export Enhance Recipe Equation
	IMENRCP	Var1 = IMENRCP(Var2, Var3)	Import Enhance Recipe Equation
	EXHISTORY	Var1 = EXHISTORY(Var2, Var3, Var4)	Export History Data
	EXALARM	Var1 = EXALARM(Var2, Var3)	Export Alarm Information
	DISKFORMAT	Var1 = DISKFORMAT(Var2)	Format Disk
	BMPCAPTURE	Var1 = BMPCAPTURE(Var2)	Screen Capture
	PLCDOWNLOAD	Var1 = PLCDOWNLOAD(Var2,	Via HMI to

Category	Function	Expression	Description
		Var3, Var4, Var5, Var6)	download DVP or ISP file to PLC
	GetCircleCenter	Var1 = GetCircleCenter(Var2, Var3)	Calculate the Coordinate of Circle Center
Industrial Application	ECAM	Var1 = ECAM(Var2, Var3, Var4, Var5) (DW)	E-Cam Table

24-3-1 Arithmetic Operation

Arithmetic operations are divided into integer operations and floating point operations and relevant macro usages are detailed below.

Figure 24-3-1-1 Arithmetic Operation

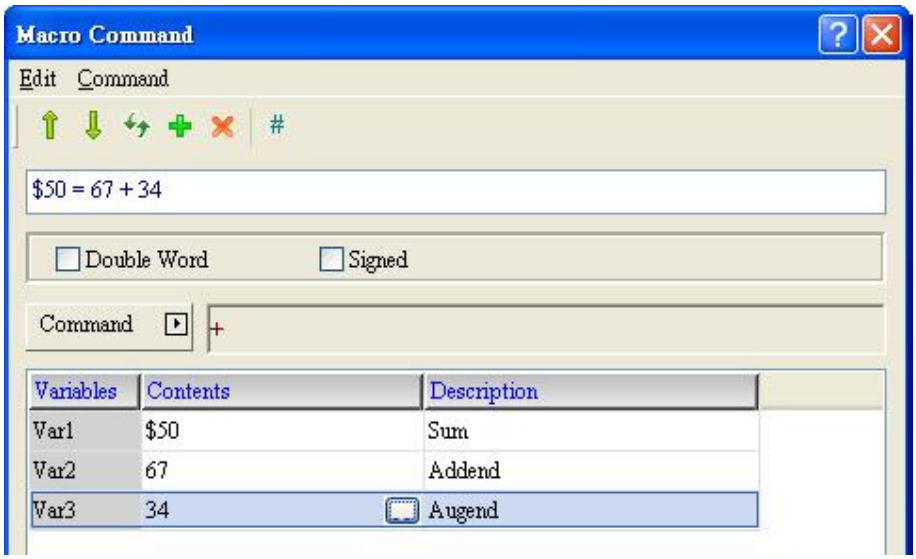
■ + (Addition)

Expression	What Variables Represent		NOTE
Var 1 = Var 2 + Var 3 (W) Var 1 = Var 2 + Var 3 (DW) Var 1 = Var 2 + Var 3 (Signed W) Var 1 = Var 2 + Var 3 (Signed DW)	Var 1	Sum	W: Word DW: Double Word Signed: Signed Number
	Var 2	Addend	
	Var 3	Augend	
	Expression Explanation		
	Add Var 2 to Var 3 and save the result in in Var 1.		

Variable	Memory Usage		
	Internal Memory	PLC Register	Constant
Var 1	◎	◎	
Var 2	◎	◎	◎
Var 3	◎	◎	◎

Example

- Var 1 is an internal memory address and Var 2 and Var 3 are both constants.



- Use addition command for $50 = 67 + 34, it will perform 67 + 34 and put results to $50. Therefore $50 will display 101.

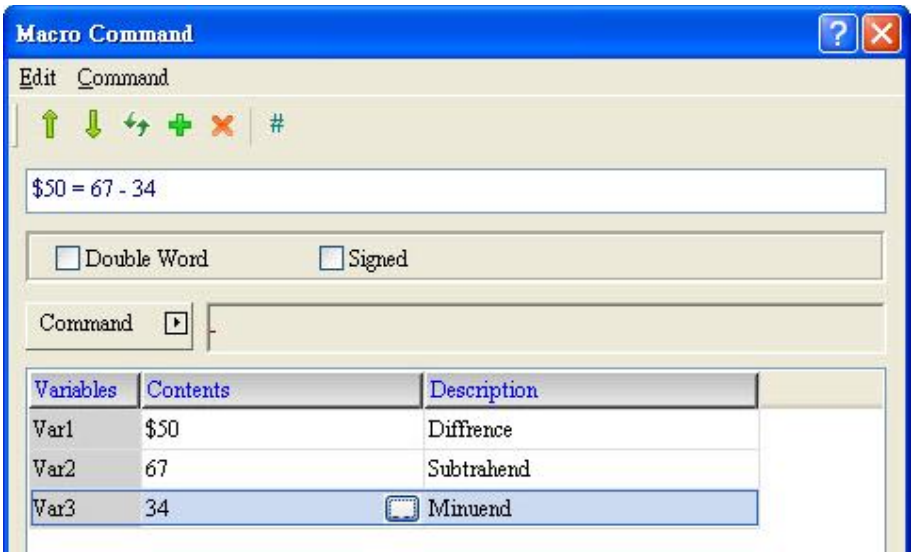
■ - (Subtraction)

Expression	What Variables Represent		NOTE
Var 1 = Var 2 - Var 3 (W) Var 1 = Var 2 - Var 3 (DW) Var 1 = Var 2 - Var 3 (Signed W) Var 1 = Var 2 - Var 3 (Signed DW)	Var 1	Difference	W: Word DW: Double Word Signed: Signed number
	Var 2	Subtrahend	
	Var 3	Minuend	
	Expression Explanation		
	Substract Var 2 from Var 3 and save the result in Var 1.		

Variable	Memory Usage		
	Internal Memory	**PLC Register**	**Constant**
Var 1	◎	◎	
Var 2	◎	◎	◎
Var 3	◎	◎	◎

Example

➢ Var 1 is an internal memory address and Var 2 and Var 3 are both constants.



➢ Use subtraction command for $50 = 67 - 34, it will perform 67 - 34 and put results to $50. Therefore $50 will display 33.

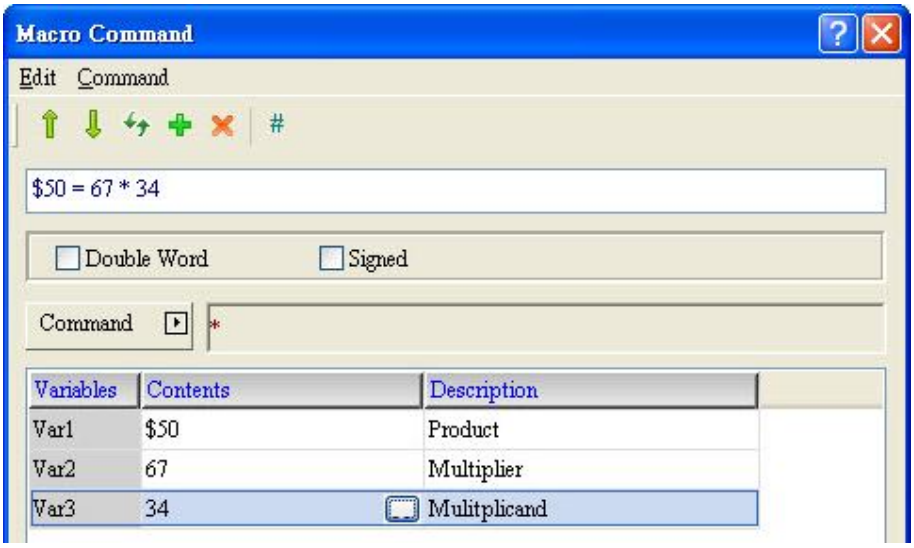
■ * (Multiplication)

Expression	What Variables Represent		NOTE
Var 1 = Var 2 * Var 3 (W) Var 1 = Var 2 * Var 3 (DW) Var 1 = Var 2 * Var 3 (Signed W) Var 1 = Var 2 * Var 3 (Signed DW)	Var 1	Product	W : Word DW : Double Word Signed : Signed number
	Var 2	Multiplier	
	Var 3	Multiplicand	
	Expression Explation		
	Multiply Var 2 and Var 3 and save the result in Var 1.		

Variable	Memory Usage		
	Internal Memory	**PLC Register**	**Constant**
Var 1	◎	◎	
Var 2	◎	◎	◎
Var 3	◎	◎	◎

Example

➢ Var 1 is an internal memory address and Var 2 and Var 3 are both constants.



➢ Use multiplication command for $50 = 67 * 34, it will perform 67 * 34 and put results to $50. Therefore $50 will display 2278.

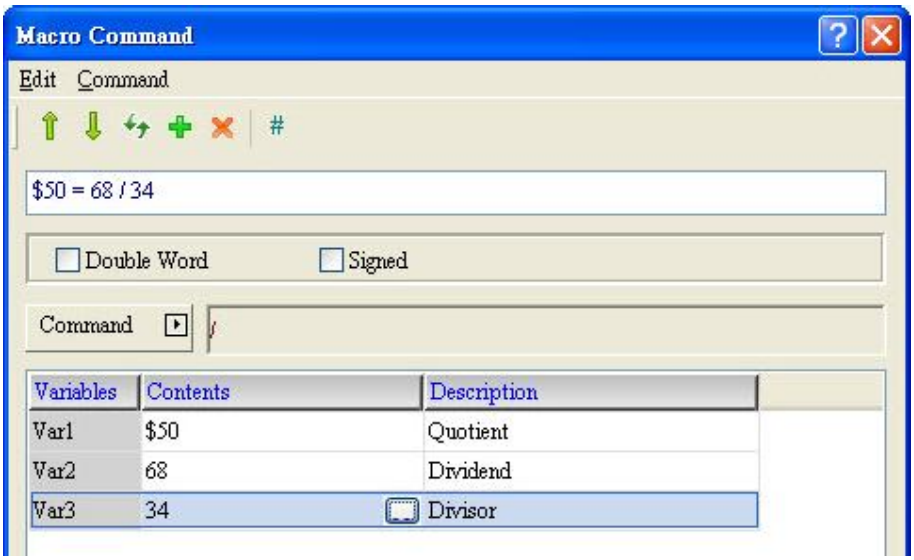
■ / (Division)

Expression	What Variables Represent		NOTE
Var 1 = Var 2 / Var 3 (W) Var 1 = Var 2 / Var 3 (DW) Var 1 = Var 2 / Var 3 (Signed W) Var 1 = Var 2 / Var 3 (Signed DW)	Var 1	Quotient	W: Word DW: Double Word Signed: Signed number
	Var 2	Dividend	
	Var 3	Divisor	
	Expression Explanation		
	Divide Var 2 by Var 3, and save the result (Quotient) in Var 1.		

Variable	Memory Usage		
	Internal Memory	**PLC Register**	**Constant**
Var 1	◎	◎	
Var 2	◎	◎	◎
Var 3	◎	◎	◎
Note: Var 3 can not be 0			

Example

- Var 1 is an internal memory address, and Var 2 and Var 3 are both constants.



- Use division command for $50 = 68 / 34, it will perform 68 / 34 and put results to $50. Therefore $50 will display 2.

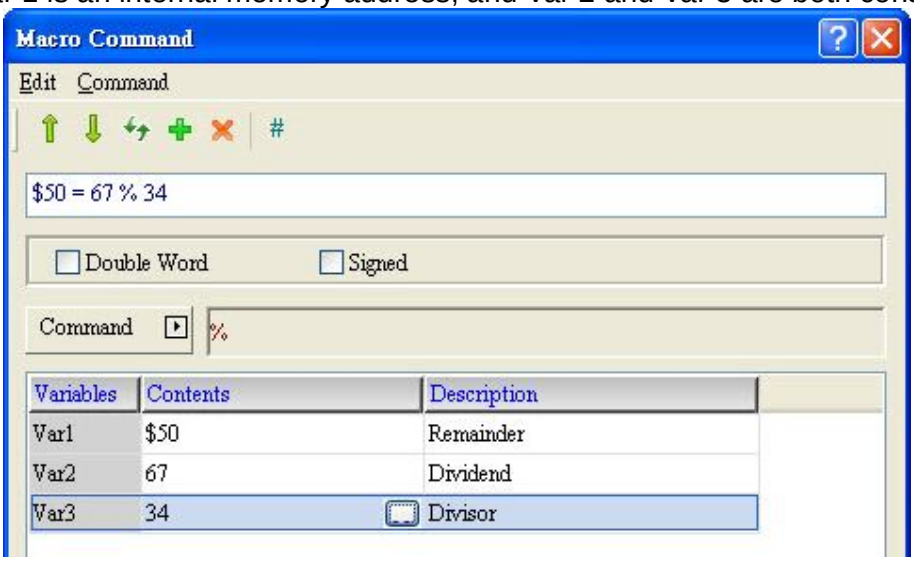
■ % (Get Reminder)

Expression	What Variables Represent		NOTE
Var 1 = Var 2 % Var 3 (W) Var 1 = Var 2 % Var 3 (DW) Var 1 = Var 2 % Var 3 (Signed W) Var 1 = Var 2 % Var 3 (Signed DW)	Var 1	Reminder	W: Word DW: Double Word Signed: Signed number
	Var 2	Dividend	
	Var 3	Divisor	
	Expression Explanation		
	Divide Var 2 by Var 3, and save the result (reminder) in Var 1.		

Variable	Memory Usage		
	Internal Memory	**PLC Register**	**Constant**
Var 1	◎	◎	
Var 2	◎	◎	◎
Var 3	◎	◎	◎
Note: Var 3 can not be 0			

Example

➢ Var 1 is an internal memory address, and Var 2 and Var 3 are both constants.



➢ Use get reminder command for $50 = 67 % 34, it will perform 67 % 34 and put results to $50. Therefore $50 will display 33.

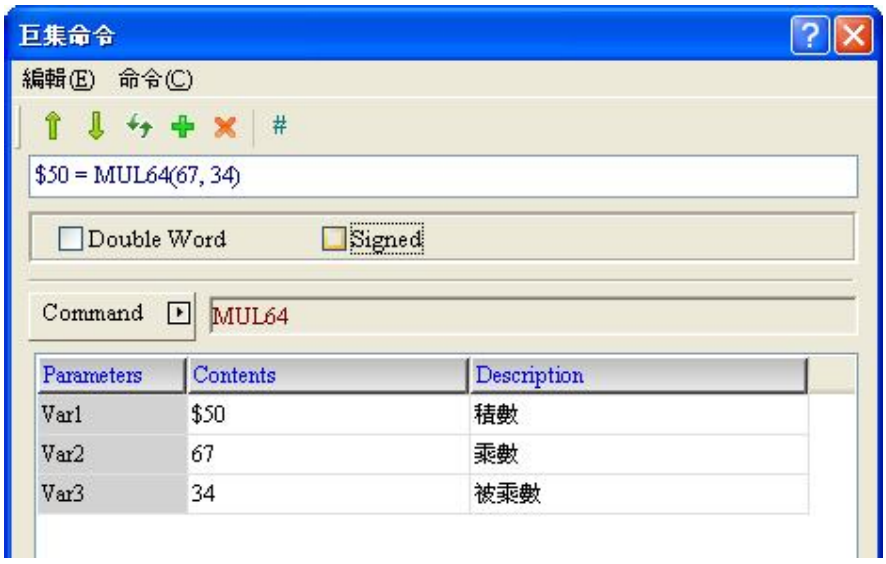
■ MUL64 (64 bit Multiplication)

Expression	What Variables Represent		NOTE
Var1 = MUL64(Var2, Var3) (W) Var1 = MUL64(Var2, Var3) (DW) Var1 = MUL64(Var2, Var3) (Signed W) Var1 = MUL64(Var2, Var3) (Signed DW)	Var 1	Product	W : Word DW : Double Word Signed : Signed number
	Var 2	Multiplier	
	Var 3	Multiplicand	
	Expression Explanation		
	Multiply Var 2 and Var 3, and save the result in Var 1.		

Variable	Memory Usage		
	Internal Memory	**PLC Register**	**Constant**
Var 1	◎	◎	
Var 2	◎	◎	◎
Var 3	◎	◎	◎

Example

- Var 1 is an internal memory address, and Var 2 and Var 3 are both constants.
- If checked Double Word, please also set data type of element for Double Word.



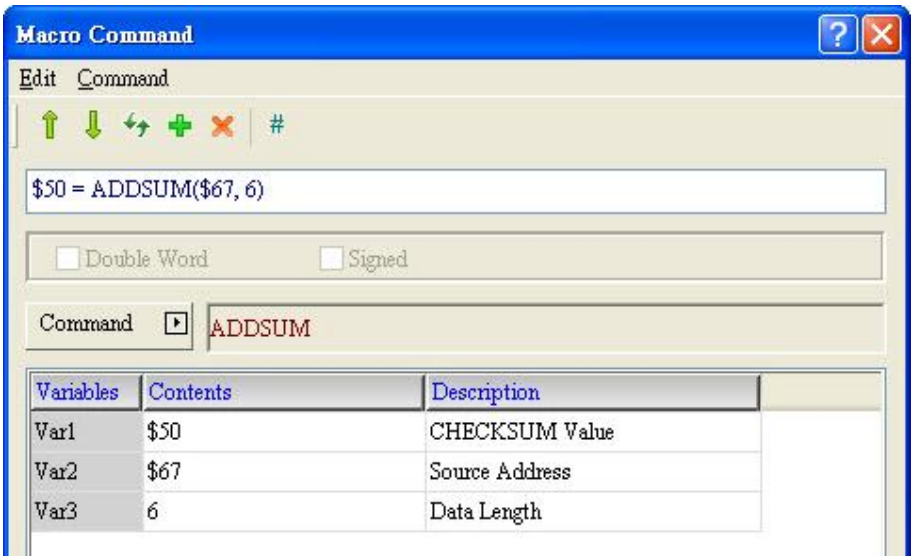
- Use MUL64 command for $50 =MUL64(67 , 34), it will perform MUL64(67 , 34) and put results to $50. Therefore $50 will display 2278.

■ ADDSUMW (Repeated Addition)

<table>
<tr><th colspan="2">Expression</th><th colspan="2">What Variables Represent</th><th>NOTE</th></tr>
<tr><td colspan="2" rowspan="5">Var1 = ADDSUMW(Var2, Var3) (W)
Var1 = ADDSUMW(Var2, Var3) (DW)</td><td>Var 1</td><td>Result of repeated addition</td><td rowspan="5">W : Word
DW : Double Word</td></tr>
<tr><td>Var 2</td><td>Starting address</td></tr>
<tr><td>Var 3</td><td>Length of repeated addition to be performed since the first item</td></tr>
<tr><td colspan="2">Expression Explanation</td></tr>
<tr><td colspan="2">Repeatedly add from Var 2 to later variables (until length specified in Var3), and save the result in Var 1.</td></tr>
<tr><td colspan="5">Note: Repeated addition is performed with a rate of 2 bits from the starting address if selecting Double World; repeated addition is performed with a rate of 1 bit from the starting address if selecting Word.</td></tr>
</table>

Variable	Memory Usage		
	Internal Memory	PLC Register	Constant
Var 1	◎	◎	
Var 2	◎	◎	◎
Var 3	◎	◎	◎

Example
➢ Var 1 and Var 2 are both internal memory addresses, and Var 3 is a constant. Please tick the Double Word box. ➢ Add up the values contained within the memory address of $0 forward for a length of 5 with an interval of 2 in between, and variables added: $0, $2, $4, $6 and $8.



- Input value for $0 = 1, $2 = 2, $4 = 3, $6 = 4 and $8 = 5, and then perform accumulation to $50. Therefore $50 will display 15.

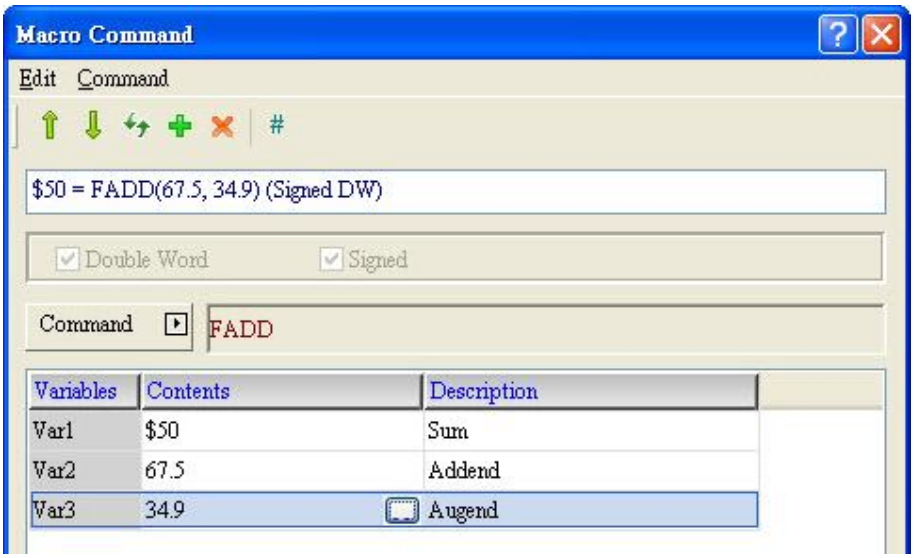
■ FADD (Floating Point Addition)

Expression	What Variables Represent		NOTE
Var1 = FADD(Var2, Var3) (Signed DW)	Var 1	Sum	DW : Double Word Signed : Signed number
	Var 2	Addend	
	Var 3	Augend	
	Expression Explanation		
	Multiply Var 2 and Var 3, and save and the result in Var 1.		

Variable	Memory Usage		
	Internal Memory	**PLC Register**	**Constant**
Var 1	◎	◎	
Var 2	◎	◎	◎
Var 3	◎	◎	◎

Example

➢ Var 1 is an internal memory address, and Var 2 and Var 3 are both constants.



➢ Use FADD command for $50 = FADD(67.5 , 34.9), it will perform FADD(67.5 , 34.9) and put results to $50. Therefore $50 will display 102.4.

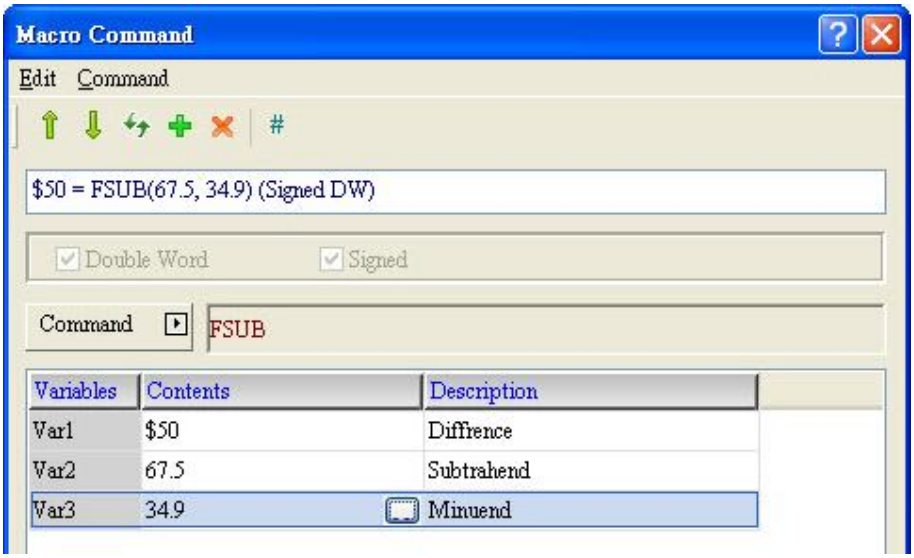
■ FSUB (Floating Point Subtraction)

Expression	What Variables Represent		NOTE
Var1 = FSUB(Var2, Var3) (Signed DW)	Var 1	Difference	DW : Double Word Signed : Signed number
	Var 2	Subtrahend	
	Var 3	Minuend	
	Expression Explanation		
	Subtract Var 2 from Var 3 and save the result in Var 1.		

Variable	Memory Usage		
	Internal Memory	**PLC Register**	**Constant**
Var 1	◎	◎	
Var 2	◎	◎	◎
Var 3	◎	◎	◎

Example

➢ Var 1 is an internal memory address, and Var 2 and Var 3 are constants.



➢ Use FSUB command for $50 = FSUB(67.5 , 34.9), it will perform FSUB(67.5 , 34.9) and put results to $50. Therefore $50 will display 32.6.

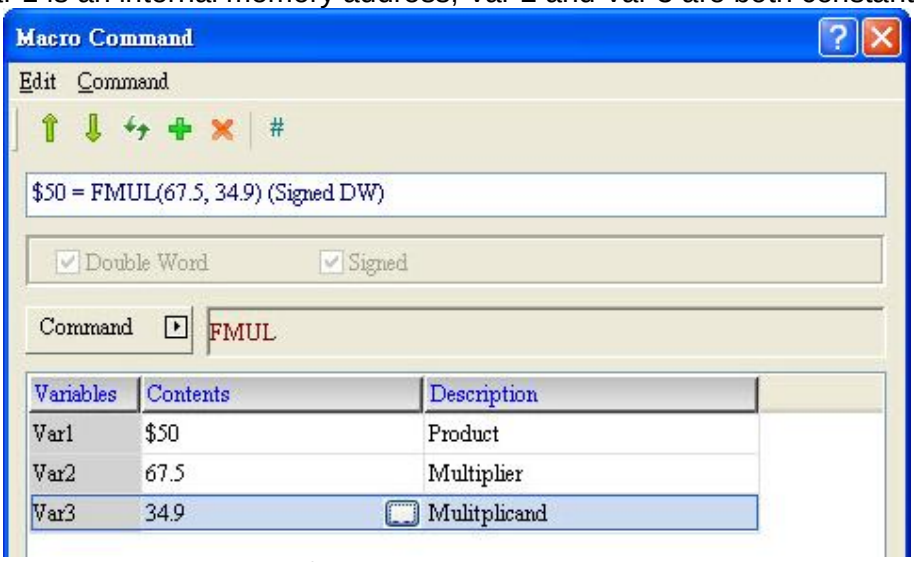
■ FMUL (Floating Point Multiplication)

Expression	What Variables Represent		NOTE
Var1 = FMUL(Var2, Var3) (Signed DW)	Var 1	Product	DW : Double Word Signed : Signed number
	Var 2	Multiplier	
	Var 3	Multiplicand	
	Expression Explanation		
	Multiply Var 2 and Var 3 and save the result in Var 1.		

Variable	Memory Usage		
	Internal Memory	**PLC Register**	**Constant**
Var 1	◎	◎	
Var 2	◎	◎	◎
Var 3	◎	◎	◎

Example

➢ Var 1 is an internal memory address, Var 2 and Var 3 are both constants.



➢ Use FMUL command for $50 = FMUL(67.5 , 34.9), it will perform FMUL(67.5 , 34.9) and put results to $50. Therefore $50 will display 2455.75.

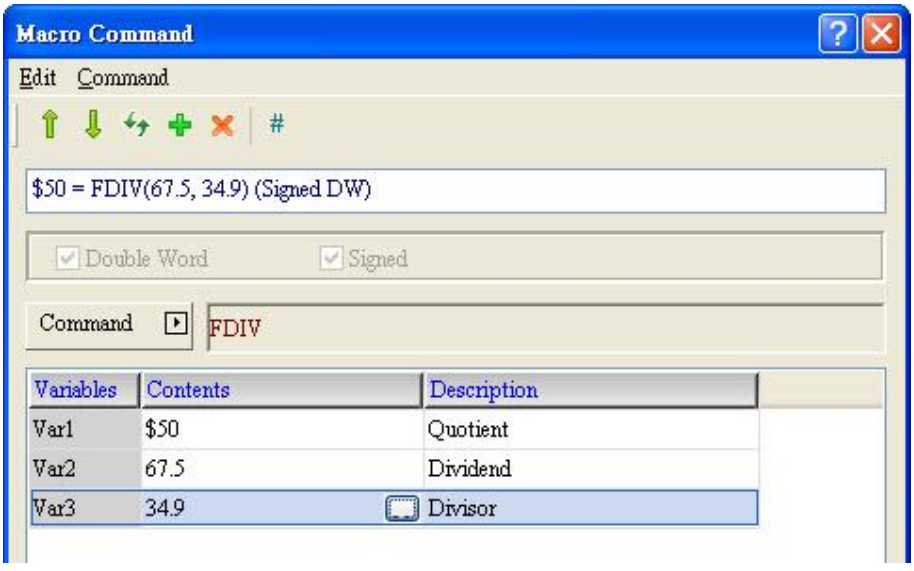
■ FDIV (Floating Point Division)

Expression	What Variables Represent		NOTE
Var1 = FDIV(Var2, Var3) (Signed DW)	Var 1	Quotient	DW : Double Word Signed : Signed number
	Var 2	Dividend	
	Var 3	Divisor	
	Expression Explanation		
	Divide Var 2 by Var 3, and save the result (Quotient) in Var 1.		

Variable	Memory Usage		
	Internal Memory	**PLC Register**	**Constant**
Var 1	◎	◎	
Var 2	◎	◎	◎
Var 3	◎	◎	◎

Example

➢ Var 1 is the internal memory address, and Var 2 and Var 3 are both constants.



➢ Use FDIV command for $50 = FDIV(67.5 , 34.9), it will perform FDIV(67.5 , 34.9) and put results to $50. Therefore $50 will display 1.934.

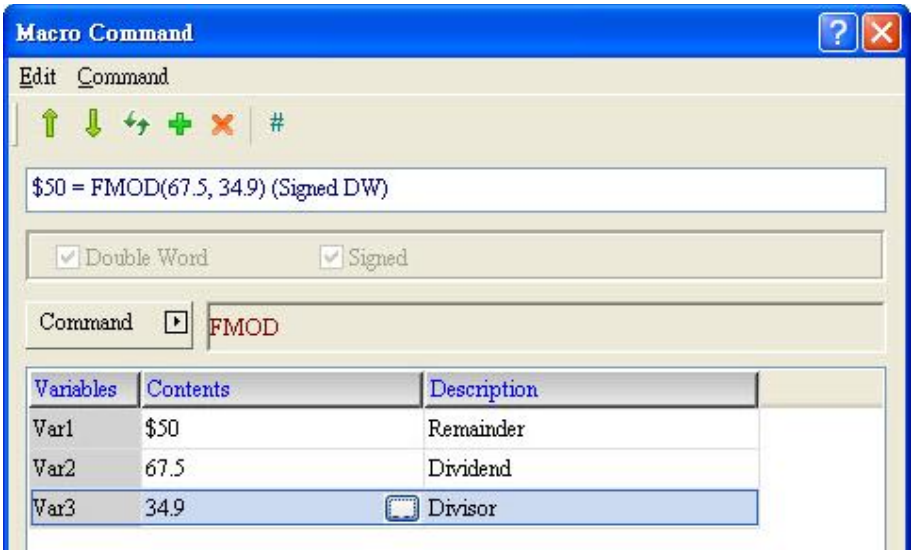
■ FMOD (Floating Point Reminder)

Expression	What Variables Represent		NOTE
Var1 = FMOD(Var2, Var3) (Signed DW)	Var 1	Reminder	DW : Double Word Signed : Signed number
	Var 2	Dividend	
	Var 3	Divisor	
	Expression Explanation		
	Divide Var 2 by Var 3, and save the result (reminder) in Var 1.		

Variable	Memory Usage		
	Internal Memory	**PLC Register**	**Constant**
Var 1	◎	◎	
Var 2	◎	◎	◎
Var 3	◎	◎	◎

Example

➢ Var 1 is an internal memory address, and Var 2 and Var 3 are constants.



➢ Use FMOD command for $50 = FMOD(67.5 , 34.9), it will perform FMOD(67.5 , 34.9) and put results to $50. Therefore $50 will display 32.6.

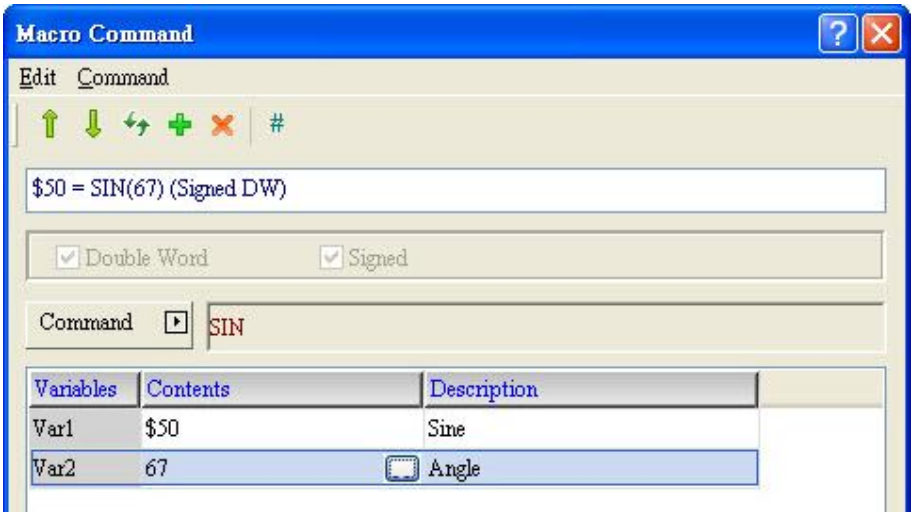
■ SIN (Sine Function)

Expression	What Variables Represent		NOTE
Var1 = SIN(Var2) (Signed DW)	Var 1	Sine	DW : Double Word Signed : Signed number
	Var 2	angle (in radians)	
	Expression Explanation		
	Perform the sine function operation on V2, and store the remainder in V1.		
*Data type of Var 1 must be Floating Point. *Data type of Var 2 must be Signed Decimal and can not have decimal places.			

Variable	Memory Usage		
	Internal Memory	PLC Register	Constant
Var 1	◎		
Var 2	◎		◎

Example

➢ Var 1 is an internal memory address and Var 2 is a constant.



➢ Use SIN command for $50 = SIN(67), it will perform SIN(67) and put results to $50. Therefore $50 will display 0.921. ◦

■ COS (Cosine Function)

Expression	What Variables Represent		NOTE
Var1 = COS(Var2) (Signed DW)	Var 1	Cosine	DW : Double Word Signed : Signed number
	Var 2	Angle (in radians)	
	Expression Explanation		
	Perform the cosine function operation on V2, and store the remainder in V1.		
*Data type of Var 1 must be Floating Point. *Data type of Var 2 must be Signed Decimal and can not have decimal places.			

Variable	Memory Usage		
	Internal Memory	**PLC Register**	**Constant**
Var 1	◎		
Var 2	◎		◎

Example

➢ Var 1 is an internal memory address, and Var 2 is a constant.

➢ Use COS command for $50 = COS(67), it will perform COS(67) and put results to $50. Therefore $50 will display 0.391.

■ TAN (Tangent Function)

Expression	What Variables Represent		NOTE
Var1 = TAN(Var2) (Signed DW)	Var 1	Tangent	DW : Double Word Signed : Signed number
	Var 2	angle (in radians)	
	Expression Explanation		
	Perform the tangent function operation on V2, and store the remainder in V1.		
*Data type of Var 1 must be Floating Point. *Data type of Var 2 must be Signed Decimal and can not have decimal places.			

Variable	Memory Usage		
	Internal Memory	**PLC Register**	**Constant**
Var 1	◎		
Var 2	◎		◎

Example

➢ Var 1 is an internal memory address, and Var 2 is a constant.

➢ Use TAN command for $50 = TAN(67), it will perform TAN(67) and put results to $50. Therefore $50 will display 2.356.

■ COT (Cotangent Function)

Expression	What Variables Represent		NOTE
Var1 = COT(Var2) (Signed DW)	Var 1	Cotangent	DW : Double Word Signed : Signed number
	Var 2	angle (in radians)	
	Expression Explanation		
	Perform the cotangent function operation on V2, and store the remainder in V1.		
*Data type of Var 1 must be Floating Point. *Data type of Var 2 must be Signed Decimal and can not have decimal places.			

Variable	Memory Usage		
	Internal Memory	PLC Register	Constant
Var 1	◎		
Var 2	◎		◎

Example

➢ Var 1 is an internal memory address, and Var 2 is a constant.

➢ Use COT command for $50 = COT(67), it will perform COT(67) and put results to $50. Therefore $50 will display 0.424.

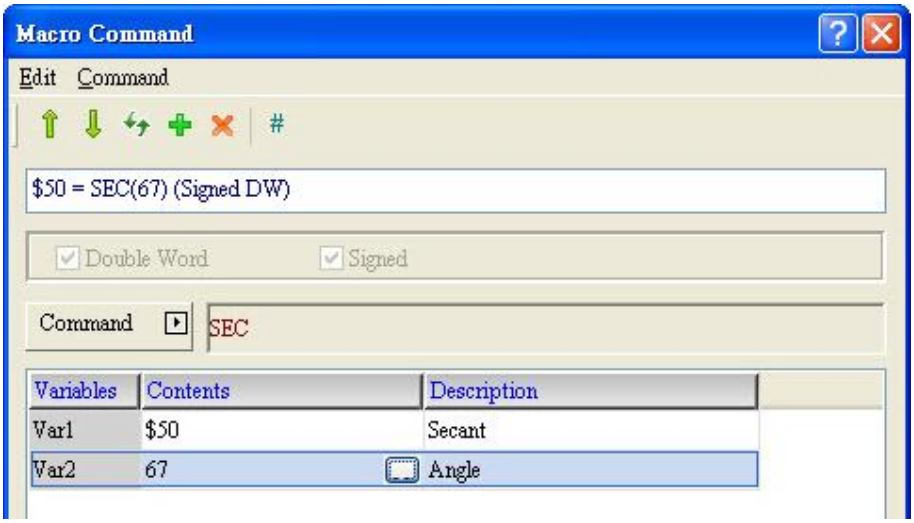
■ SEC (Secant Function)

Expression	What Variables Represent		NOTE
Var1 = SEC(Var2) (Signed DW)	Var 1	Secant	DW : Double Word Signed : Signed number
	Var 2	angle (in radians)	
	Expression Explanation		
	Perform the secant function operation on V2, and store the remainder in V1.		
*Data type of Var 1 must be Floating Point. *Data type of Var 2 must be Signed Decimal and can not have decimal places.			

Variable	Memory Usage		
	Internal Memory	PLC Register	Constant
Var 1	◎		
Var 2	◎		◎

Example

➢ Var 1 is an internal memory address, and Var 2 is a constant.



➢ Use SEC command for $50 = SEC(67), it will perform SEC(67) and put results to $50. Therefore $50 will display 2.559.

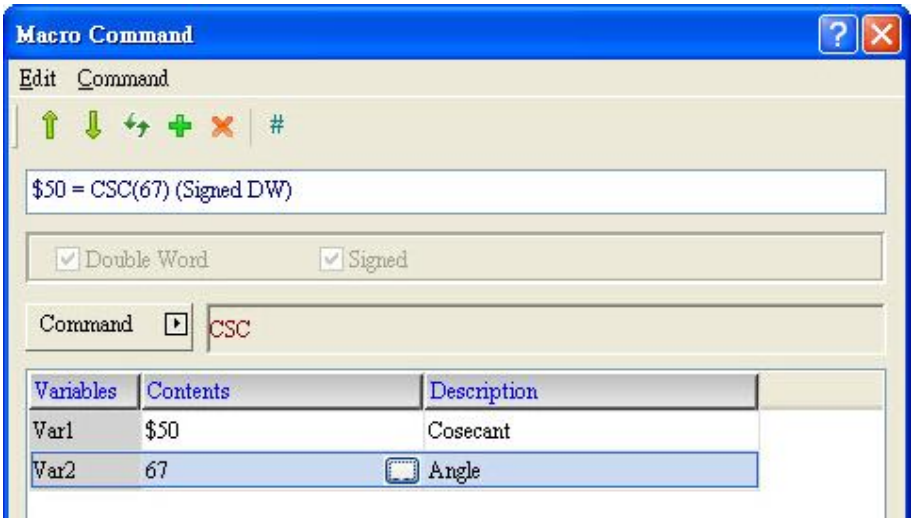
■ CSC (Cosecant Function)

Expression	What Variables Represent		NOTE
Var1 = CSC(Var2) (Signed DW)	Var 1	Cosecant	DW : Double Word Signed : Signed number
	Var 2	angle (in radians)	
	Expression Explanation		
	Perform the cosecant function operation on V2, and store the remainder in V1.		
*Data type of Var 1 must be Floating Point. *Data type of Var 2 must be Signed Decimal and can not have decimal places.			

Variable	Memory Usage		
	Internal Memory	PLC Register	Constant
Var 1	◎		
Var 2	◎		◎

Example

➢ Var 1 is an internal memory address, and Var 2 is a constant.



➢ Use CSC command for $50 = CSC(67), it will perform CSC(67) and put results to $50. Therefore $50 will display 1.086.

24-3-2 Logical Operation

Logical operations include six operators and relevant macro usages are detailed below.

Figure 24-3-2-1 Logical Operations

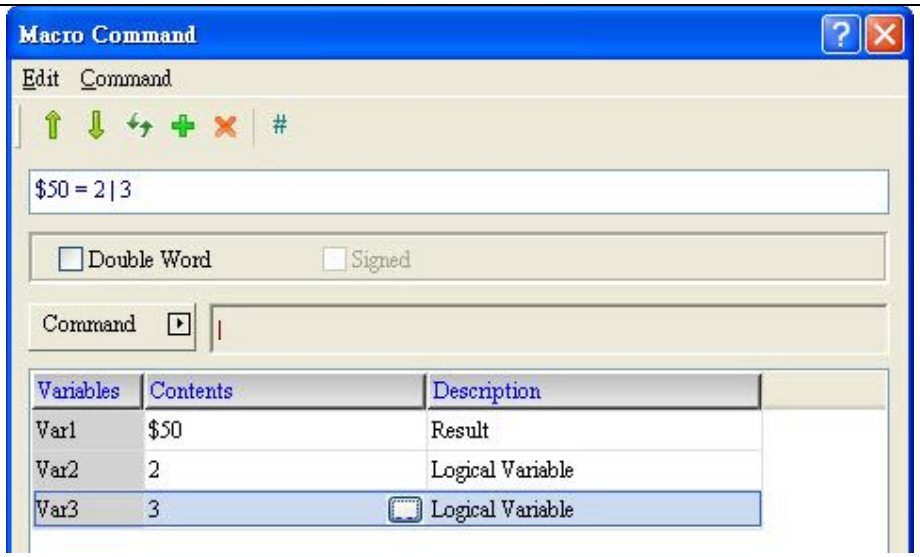
■ | (Bitwise OR Operation)

Bitwise OR Operation characteristic	
Operator	**Result**
0 OR 0	0
0 OR 1	1
1 OR 0	1
1 OR 1	1

Expression	What Variables Represent		NOTE
Var 1 = Var 2 | Var 3 (W) Var 1 = Var 2 | Var 3 (DW)	Var 1	Result of OR operation	W : Word DW : Double Word
	Var 2	Logical operand	
	Var 3	Logical operand	
	Expression Explanation		
	Perform the Bitwise OR operation on Var 2 and Var 3 and save the result Var 1.		

Variable	Memory Usage		
	Internal Memory	**PLC Register**	**Constant**
Var 1	◎	◎	
Var 2	◎	◎	◎
Var 3	◎	◎	◎

Example
➢ Var 1 is an internal memory address, and Var 2 and Var 3 are both constants.



- This command will transfer values for Var 2 and Var 3 to binary like 2 = 0010, 3 = 0011, and then bitwise OR operator with 0010 and 0011. After bitwise OR operator to get the result is 0011 and equals to 3.

	Binary	Value
	0010	2
| (OR Operator)	0011	3
	0011	3

■ && (Bitwise AND Operation)

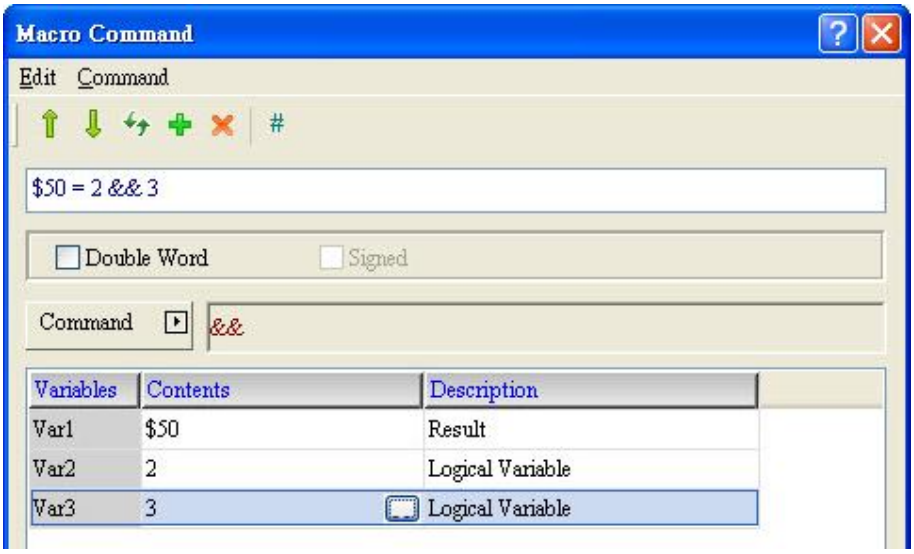
Bitwise AND Operation characteristic	
Operator	**Result**
0 OR 0	0
0 OR 1	0
1 OR 0	0
1 OR 1	1

Expression	What Variables Represent		NOTE
Var 1 = Var 2 && Var 3 (W) Var 1 = Var 2 && Var 3 (DW)	Var 1	Result of Bitwise AND operation	W : Word DW : Double Word
	Var 2	Logical Operand	
	Var 3	Logical Operand	
	Expression Explanation		
	Perform the Bitwise AND operation on Var 2 and Var 3 and save the result Var 1.		

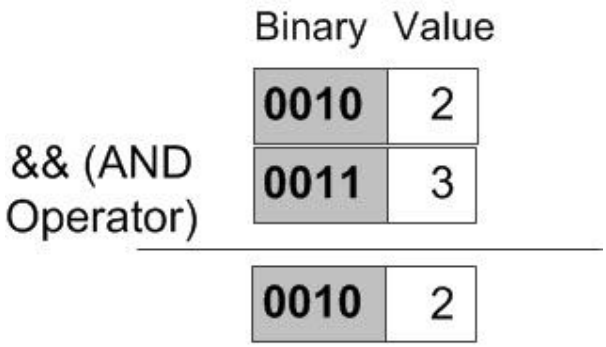
Variable	Memory Usage		
	Internal Memory	**PLC Register**	**Constant**
Var 1	◎	◎	
Var 2	◎	◎	◎
Var 3	◎	◎	◎

Example

➢ Var 1 is an internal memory address, and Var 2 and Var 3 are both constants.



- This command will transfer values for Var 2 and Var 3 to binary like 2 = 0010, 3 = 0011, and then bitwise AND operator with 0010 and 0011. After bitwise AND operator to get the result is 0010 and equals to 2.



■ ^ (Bitwise XOR Operation)

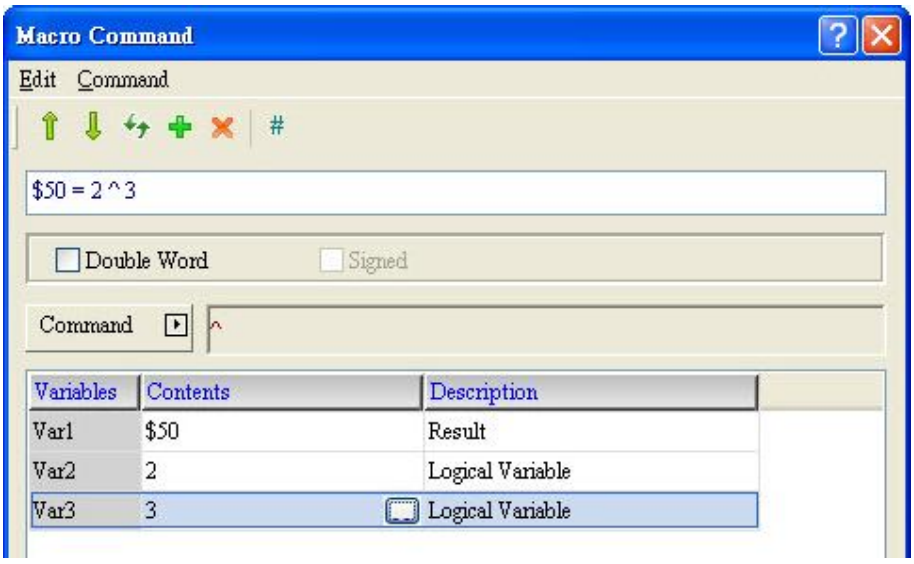
Bitwise XOR Operation characteristic	
Operator	**Result**
0 OR 0	0
0 OR 1	1
1 OR 0	1
1 OR 1	0

Expression	What Variables Represent		NOTE
Var 1 = Var 2 ^ Var 3 (W) Var 1 = Var 2 ^ Var 3 (DW)	Var 1	Result of Bitwise XOR operation	W : Word DW : Double Word
	Var 2	Logical Operand	
	Var 3	Logical Operand	
	Expression Explanation		
	Perform the Bitwise XOR operation on Var 2 and Var 3 and save the result Var 1.		

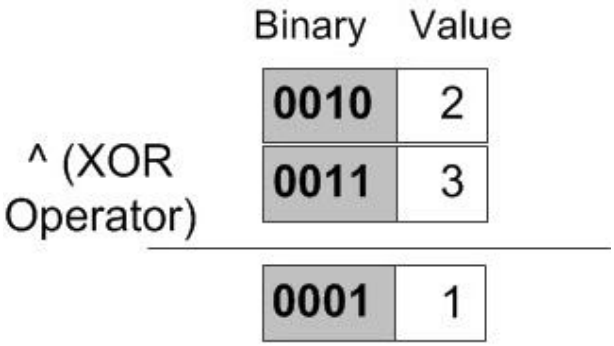
Variable	Memory Usage		
	Internal Memory	**PLC Register**	**Constant**
Var 1	◎	◎	
Var 2	◎	◎	◎
Var 3	◎	◎	◎

Example

➢ Var 1 is an internal memory address, and Var 2 and Var 3 are both constants.



- This command will transfer values for Var 2 and Var 3 to binary like 2 = 0010, 3 = 0011, and then bitwise XOR operator with 0010 and 0011. After bitwise XOR operator to get the result is 0001 and equals to 1.



■ NOT (Bitwise NOT Operation)

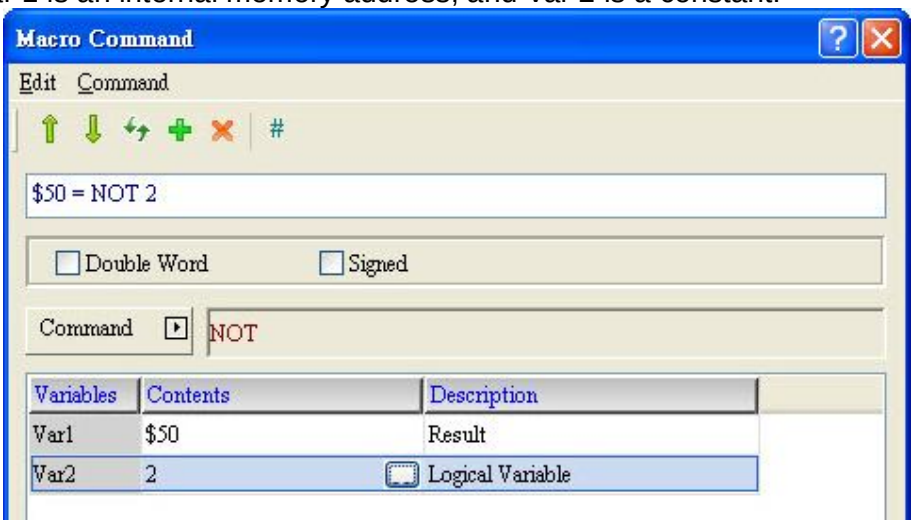
Bitwise NOT Operation characteristic	
Operator	**Result**
NOT 0	1
NOT 1	0

Expression	What Variables Represent		NOTE
Var 1 = NOT Var 2 (W) Var 1 = NOT Var 2 (DW) Var 1 = NOT Var 2 (Signed W) Var 1 = NOT Var 2 (Signed DW)	Var 1	Result of Bitwise NOT Operation	W : Word DW : Double Word Signed : Signed number
	Var 2	Logical Operand	
	Expression Explanation		
	Perform the Bitwise NOT operation on Var 2 and save the result in Var 1.		

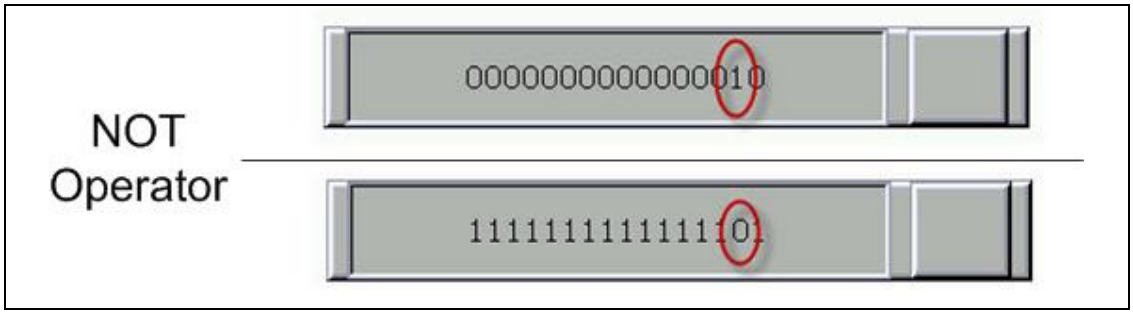
Variable	Memory Usage		
	Internal Memory	**PLC Register**	**Constant**
Var 1	◎	◎	
Var 2	◎	◎	◎

Example

➢ Var 1 is an internal memory address, and Var 2 is a constant.



➢ This command will transfer values for Var 2 to binary like 2 = 0000000000000010, and then bitwise NOT operator with 0000000000000010. After bitwise NOT operator to get the result is 1111111111111101.


NOT
Operator
0000000000000010
1111111111111101

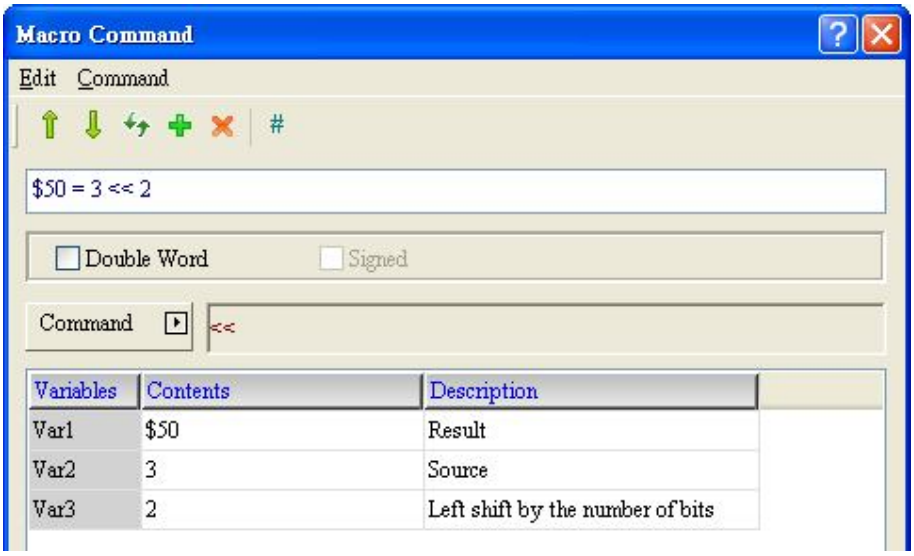
■ << (SHL Bitwise Left-shift Operation)

Expression	What Variables Represent		NOTE
Var1 = Var2 << Var3 (W) Var1 = Var2 << Var3 (DW)	Var 1	Result of left-shifted value	W : Word DW : Double Word
	Var 2	Source Address for the left-shift operation	
	Var 3	Numbers of bits to shift	
	Expression Explanation		
	Left-shift Var 2 by Var 3 bits and save the result in Var 1.		

Variable	Memory Usage		
	Internal Memory	PLC Register	Constant
Var 1	◎	◎	
Var 2	◎	◎	◎
Var 3	◎	◎	◎

Example

➢ Var 1 and Var 2 are both internal memory addresses, and Var 3 is a constant.



➢ This command will transfer values for Var 2 to binary like 3 = 0000000000000011, and then bitwise left-shift two bits with 0000000000000011. After bitwise left-shift operator to get the result is 0000000000001100.


<< (SHL
Operator)
0000000000000011
0000000000001100

■ >> (SHR Bitwise Right-shift Operation)

Expression	What Variables Represent		NOTE
Var1 = Var2 >> Var3 (W) Var1 = Var2 >> Var3 (DW)	Var 1	Result of right-shifted value	W : Word DW : Double Word
	Var 2	Source Address for the right-shift operation	
	Var 3	Number of bits to shift	
	Expression Explanation		
	Right-shift Var 2 by Var 3 bits and save the result in Var 1.		

Variable	Memory Usage		
	Internal Memory	PLC Register	Constant
Var 1	◎	◎	
Var 2	◎	◎	◎
Var 3	◎	◎	◎

Example

➢ Var 1 and Var 2 are both internal memory addresses, and Var 3 is a constant.

➢ This command will transfer values for Var 2 to binary like 8 = 0000000000001000, and then bitwise right-shift two bits with 0000000000001000. After bitwise right-shift operator to get the result is 0000000000000010.


>> (SHR Operator)
0000000000001000
0000000000000010

24-3-3 Data Transfer

There are six commands for data transfer and they are detailed below:

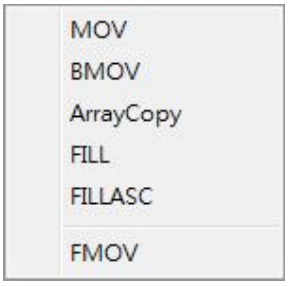


Figure 24-3-3-1 Data Transfer

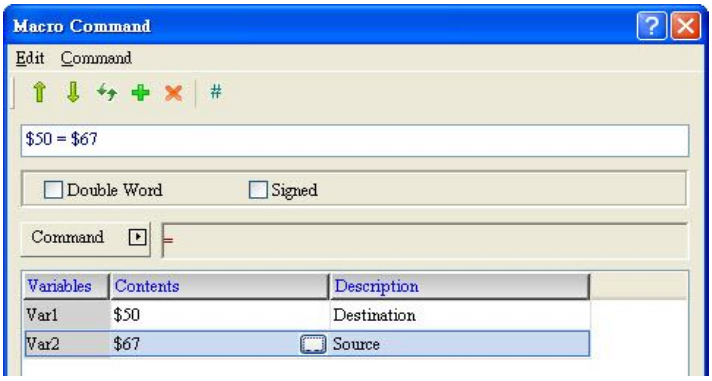
■ MOV (Data Moving Operand)

Expression	Context		NOTE
Var 1 = Var 2 (W) Var 1 = Var 2 (DW) Var 1 = Var 2 (Signed W) Var 1 = Var 2 (Signed DW)	Var 1	Destination Address	W : Word DW : Double Word Signed : Signed number
	Var 2	Source Data	
	Expression Explanation		
	Copy source data contained in Var 2 to Var 1, and data contained in Var 2 will not change.		

Variable	Memory Usage		
	Internal Memory	PLC Register	Constant
Var 1	◎	◎	
Var 2	◎	◎	◎

Example

➢ Var 1 is an internal memory address, and Var 2 is a constant.



➢ Use MOV command for $50 = $67, it will perform move with input value at $67 to $50. If input value is 34 at $67, therefore $50 will display 34.

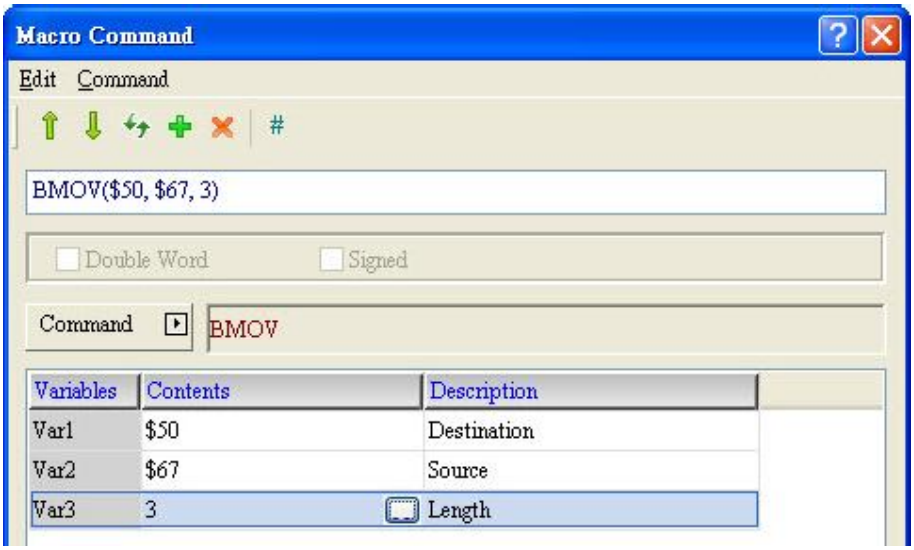
■ BMOV (Move in Block)

Expression	What Variables Represent		NOTE
BMOV(Var1, Var2, Var3) (W)	Var 1	Destination Address	W : Word
	Var 2	Source Data Address	
	Var 3	Word Data Length	
	Expression Explanation		
	Bulk-copy the entire block with the range specified in Var 3 from Var 2 to Var 1.		

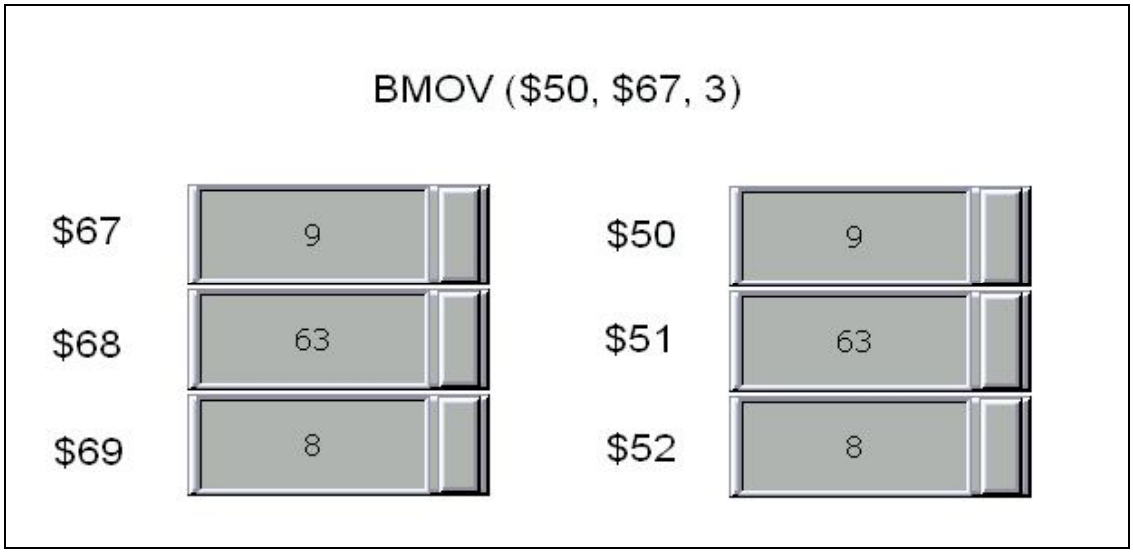
Variable	Memory Usage		
	Internal Memory	**PLC Register**	**Constant**
Var 1	◎	◎	
Var 2	◎	◎	
Var 3	◎		◎

Example

➢ Var 1 and Var 2 are both internal memory addresses, and Var 3 is a constant.



➢ It will perform move 3 data length from $67 to $50. Therefore when input value at $67, $68, $69 will move data to $50, $51, $52.


BMOV ($50, $67, 3)
$67
9
$68
63
$69
8
$50
9
$51
63
$52
8

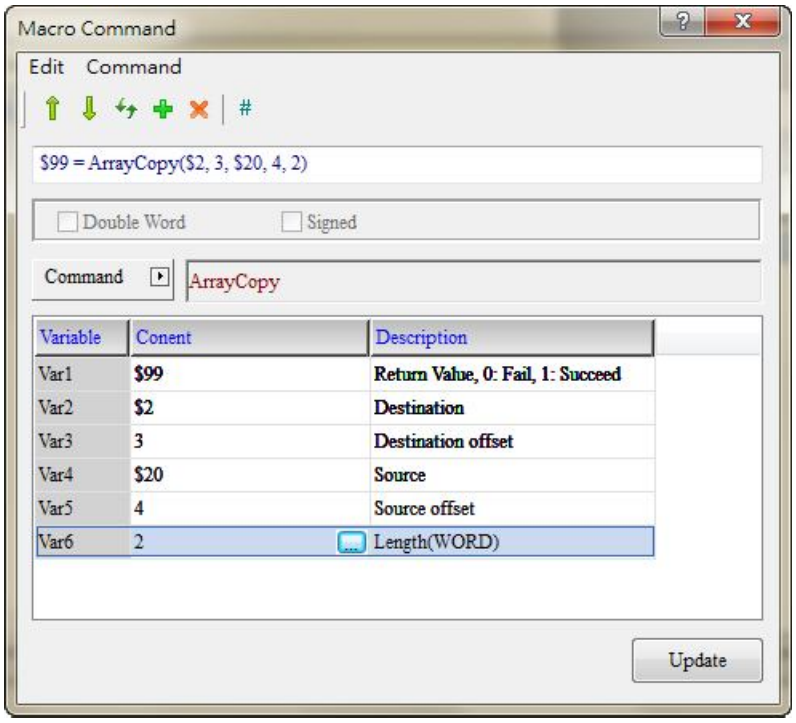
■ ArrayCopy (Copy Array)

<table>
<tr><th>Expression</th><th colspan="3">What Variables Represent</th><th>NOTE</th></tr>
<tr><td rowspan="9">Var1 = ArrayCopy(Var2, Var3, Var4, Var5, Var6)</td><td rowspan="3">Var 1</td><td colspan="2">Returned Value</td><td rowspan="9"></td></tr>
<tr><td>Failure</td><td>0</td></tr>
<tr><td>Success</td><td>1</td></tr>
<tr><td>Var 2</td><td colspan="2">Target Address</td></tr>
<tr><td>Var 3</td><td colspan="2">Target Offset Amount</td></tr>
<tr><td>Var 4</td><td colspan="2">Source Address</td></tr>
<tr><td>Var 5</td><td colspan="2">Source Offset Amount</td></tr>
<tr><td>Var 6</td><td colspan="2">Moving Length
(unit: WORD)</td></tr>
<tr><td colspan="3">Expression Explanation</td></tr>
<tr><td colspan="4">Copy one section of consecutive address to another section.</td></tr>
</table>

Variable	Memory Usage			
	Internal Memory	**PLC Register**	**String**	**Constant**
Var 1	◎			
Var 2	◎	◎		
Var 3	◎	◎		◎
Var 4	◎	◎		
Var 5	◎	◎		◎
Var 6	◎	◎		◎

Example

- $99 = ArrayCopy($2, 3, $20, 4, 2)



Address	$0	$1	$2	$3	$4	$5	$6	$7	…	$19	$20	$21	$22	$24	$24	$25	$26	…
Offset			+0	+1	+2	+3					+0	+1	+2	+3	+4			…

Copy the offset amount (4, the representative address is $24) specified by source address ($20) to the offset amount (3, the representative address is $5) specified by target address $2. See the figure below:

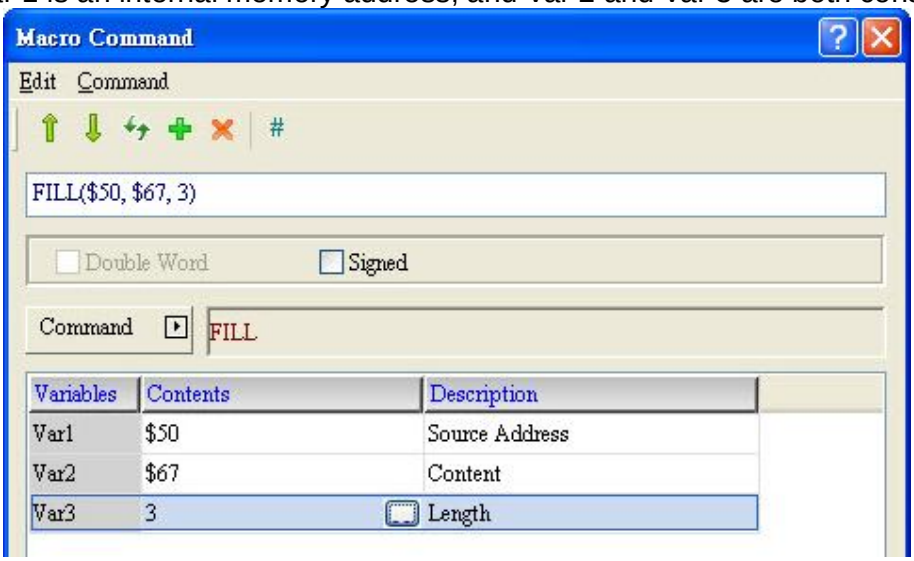
■ FILL (Fill in the Block)

Expression	What Variables Represent		NOTE
FILL(Var1, Var2, Var3) (W) FILL(Var1, Var2, Var3) (Signed W)	Var 1	Destination Address of the Source Data	W : Word
	Var 2	Source value	
	Var 3	Length	
	Expression Explanation		
	Copy the value contained in Var 2 to a number of variables starting from Var 1. (the number of variable is specified in Var 3)		

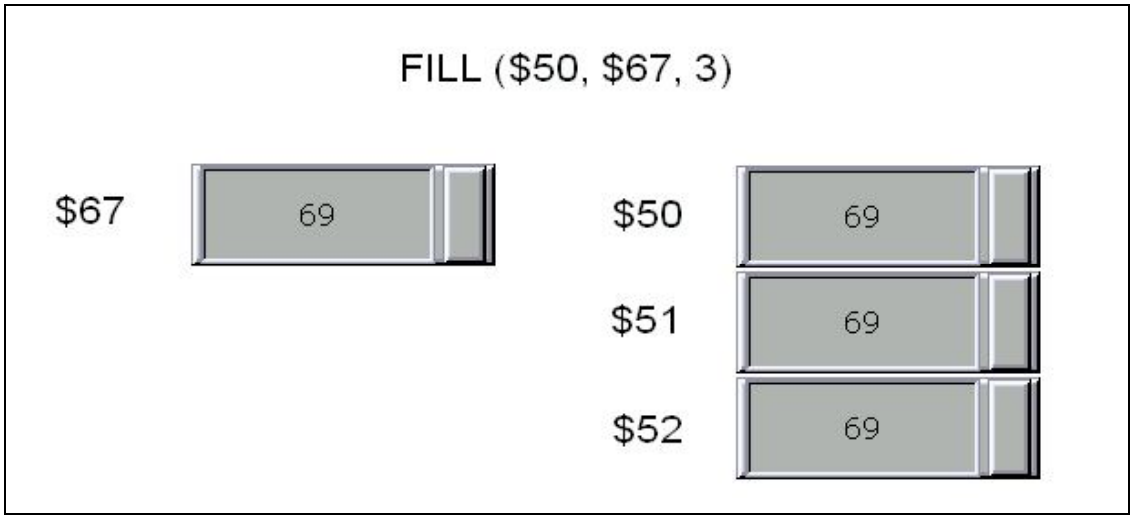
Variable	Memory Usage		
	Internal Memory	PLC Register	Constant
Var 1	◎	◎	
Var 2	◎	◎	◎
Var 3	◎	◎	◎

Example

➢ Var 1 is an internal memory address, and Var 2 and Var 3 are both constants.



➢ Input value at $67 and will fill the value for 3 data length from $50, $51 and $52.


FILL ($50, $67, 3)
$67
69
$50
69
$51
69
$52
69

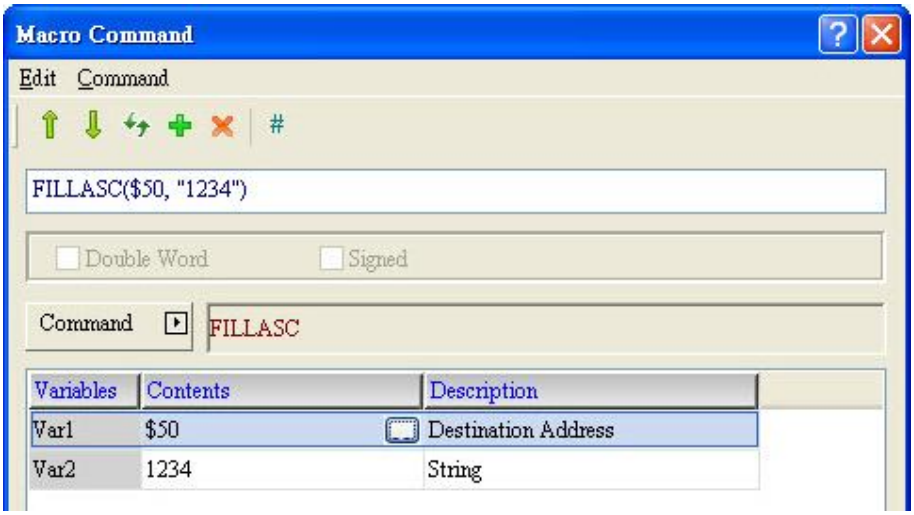
■ FILLASC (String to ASCII Conversion)

Expression	What Variables Represent		NOTE
FILLASC(Var1, "Var2") (W)	Var 1	Destination address for the string	W : Word
	Var 2	String	
	Expression Explanation		
	Convert the Var2 text string into corresponding ASCII values and save them in Var1.		

Variable	Memory Usage			
	Internal Memory	**PLC Register**	**Constant**	**String**
Var 1	◎	◎		
Var 2				◎

Example

➢ Var 1 is an internal memory address, and Var 2 is a text string.



➢ The result after conversion: $50 = 3241H, $51 = 3433H.

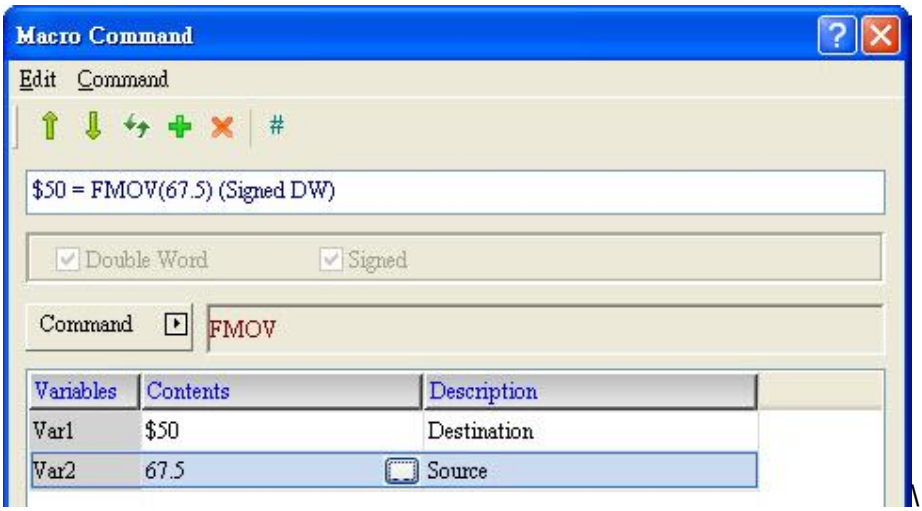
■ FMOV (Move floating point data)

Expression	What Variables Represent		NOTE
Var1 = FMOV(Var2) (Signed DW)	Var 1	Destination Address	DW : Double Word Signed : Signed number
	Var 2	Source data address	
	Expression Explanation		
	Copy floating point source data contained in Var 2 to Var 1, and the floating point contained in Var 2 will not change.		

Variable	Memory Usage		
	Internal Memory	PLC Register	Constant
Var 1	◎	◎	
Var 2	◎	◎	◎

Example

➢ Var 1 is an internal memory address and Var 2 is a constant.



➢ Put 67.5 floating data to $50, therefore $50 will display 67.5.

24-3-4 Data Conversion

Data conversion operations are performed with commands for data type conversion, maximum and minimal values and data swap, and their usages are detailed below:

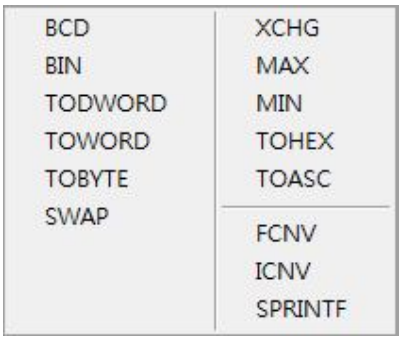


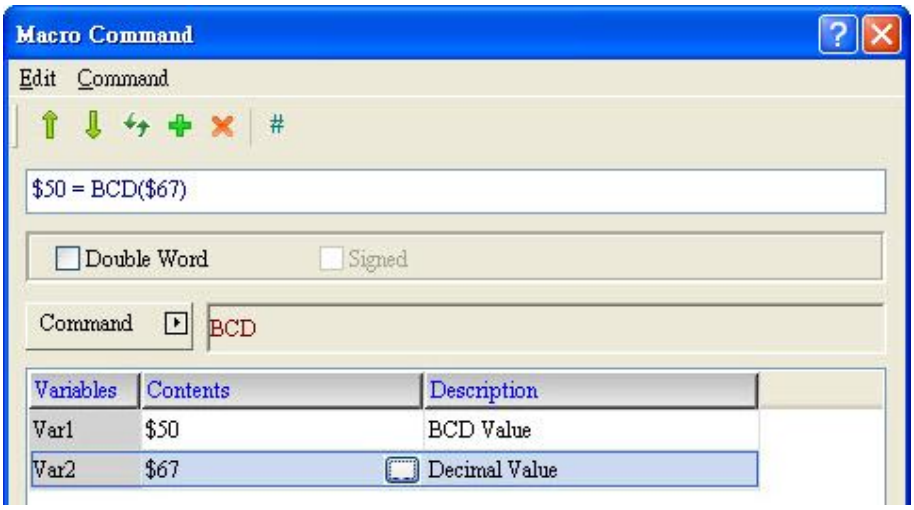
Figure 24-3-4-1 Data Conversion

■ BCD (Decimal to BCD Conversion)

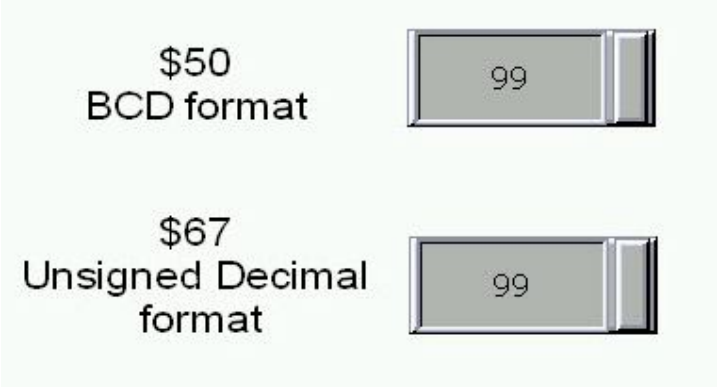
Expression	What Variables Represent		NOTE
Var1 = BCD(Var2) (W) Var1 = BCD(Var2) (DW)	Var 1	BCD type data	W : Word DW : Double Word
	Var 2	Decimal type data	
	Expression Explanation		
	Convert decimal data stored in Var2 into BCD data and save the converted data in Var1.		

Variable	Memory Usage		
	Internal Memory	PLC Register	Constant
Var 1	◎		
Var 2	◎		

Example
➢ Var 1 and Var 2 are internal memory addresses.



- Transfer Unsigned Decimal format with $67 to BCD format with $50.



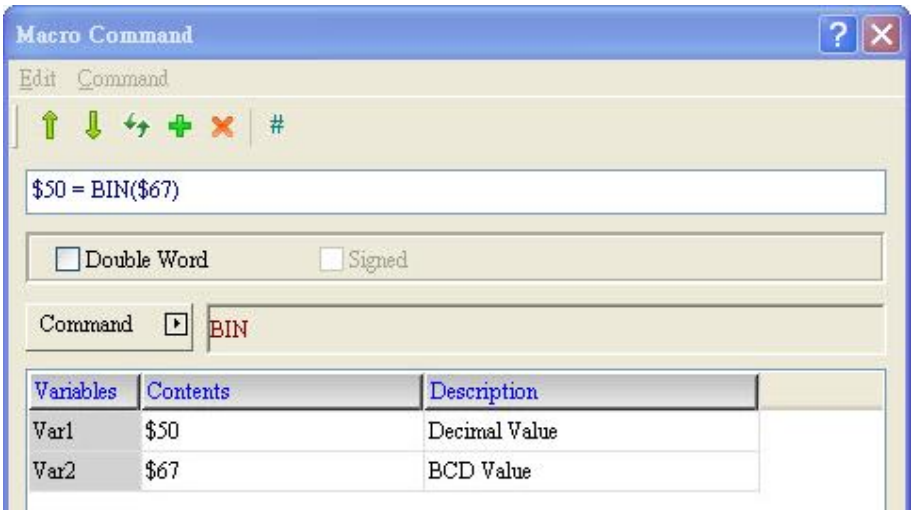
■ BIN (BCD to Decimal Conversion)

Expression	What Variables Represent		NOTE
Var1 = BIN(Var2) (W) Var1 = BIN(Var2) (DW)	Var 1	Decimal type data	W : Word DW : Double Word
	Var 2	BCD type data	
	Expression Explanation		
	Convert BCD data stored in Var2 into decimal data and save the converted data in Var1.		

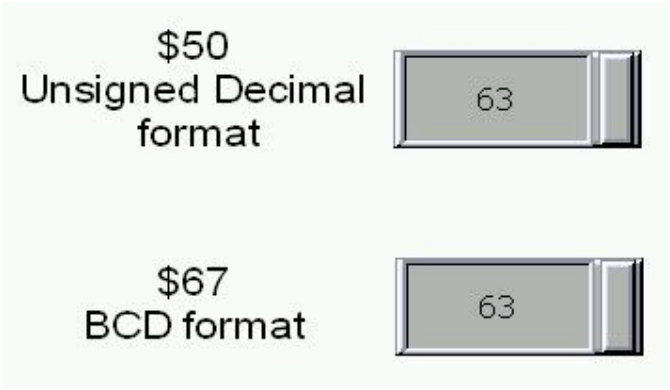
Variable	Memory Usage		
	Internal Memory	PLC Register	Constant
Var 1	◎		
Var 2	◎		

Example

➢ Var 1 and Var 2 are internal memory addresses.



➢ Transfer BCD format with $67 to Unsigned Decimal format with $50.



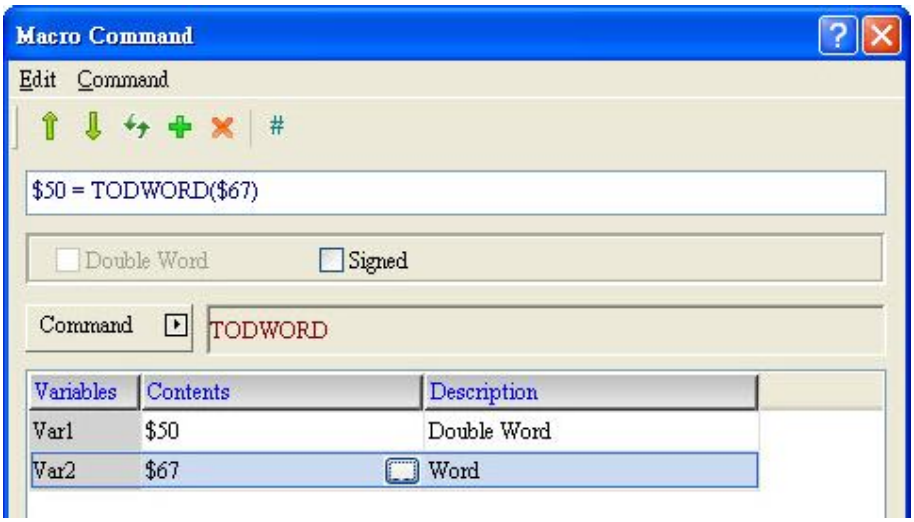
■ TODWORD (WORD to Double WORD Conversion)

Expression	What Variables Represent		NOTE
Var1 = TODWORD(Var2) (W) Var1 = TODWORD(Var2) (Signed W)	Var 1	Double Word type data	W : Word
	Var 2	Word type data	
	Expression Explanation		
	Convert Word data stored in Var2 into Double Word data and save the converted data in Var1.		

Variable	Memory Usage		
	Internal Memory	PLC Register	Constant
Var 1	◎		
Var 2	◎		

Example

➢ Var 1 and Var 2 are internal memory addresses.



➢ Convert the Word data originally stored in $67 into Double Word data and store it in $50. Since the converted data is a Double Word data, it actually takes up two addresses from $50 to $51.

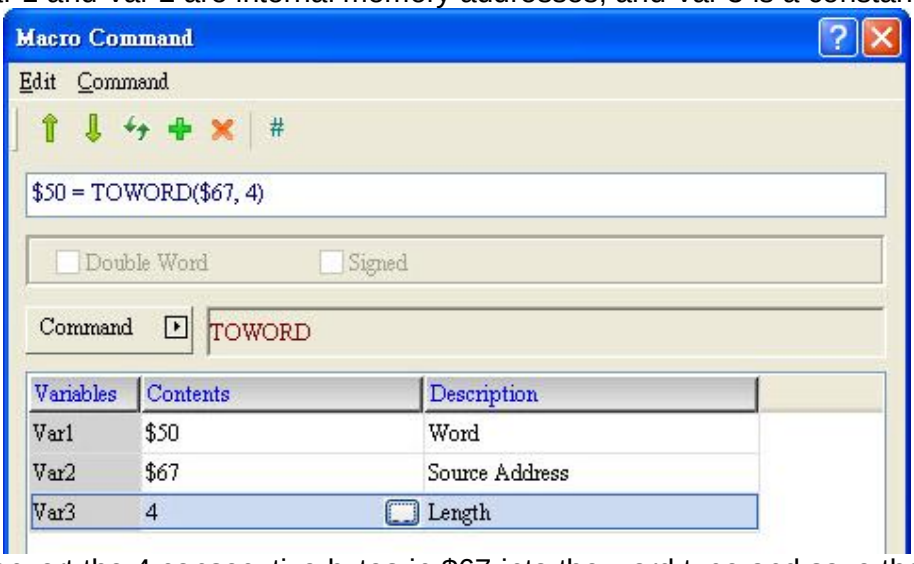
■ TOWORD (BYTE to Word Conversion)

<table>
<tr><th>Expression</th><th colspan="2">What Variables Represent</th><th>NOTE</th></tr>
<tr><td rowspan="5">Var1 = TOWORD(Var2, Var3) (W)</td><td>Var 1</td><td>Word type data</td><td rowspan="5">W : Word</td></tr>
<tr><td>Var 2</td><td>Starting Address of the Source Data</td></tr>
<tr><td>Var 3</td><td>Length</td></tr>
<tr><td colspan="2">Expression Explanation</td></tr>
<tr><td colspan="2">Convert BYTE data (number of byte is Var3) from Var2 to WORD value and store the result in Var1. The high byte will be filled with 0.</td></tr>
<tr><td colspan="4">* As V2 is in word data type, each word stored in Var 2 can be converted in to two words.
* Please note that the first and last byte of the converted WORD will be exchanged.</td></tr>
</table>

Variable	Memory Usage		
	Internal Memory	PLC Register	Constant
Var 1	◎		
Var 2	◎		
Var 3	◎		◎

Example

- Var 1 and Var 2 are internal memory addresses, and Var 3 is a constant.



- Convert the 4 consecutive bytes in $67 into the word type and save them into $50.
- Both $50 and $67 are set to the Hex data type.
- If $67 = AB67H and $68 = 9A62H, then after conversion using the TOWORD command, then the result is: $50 = 67H, $51 = ABH, $52 = 62H and $53 = 9AH.

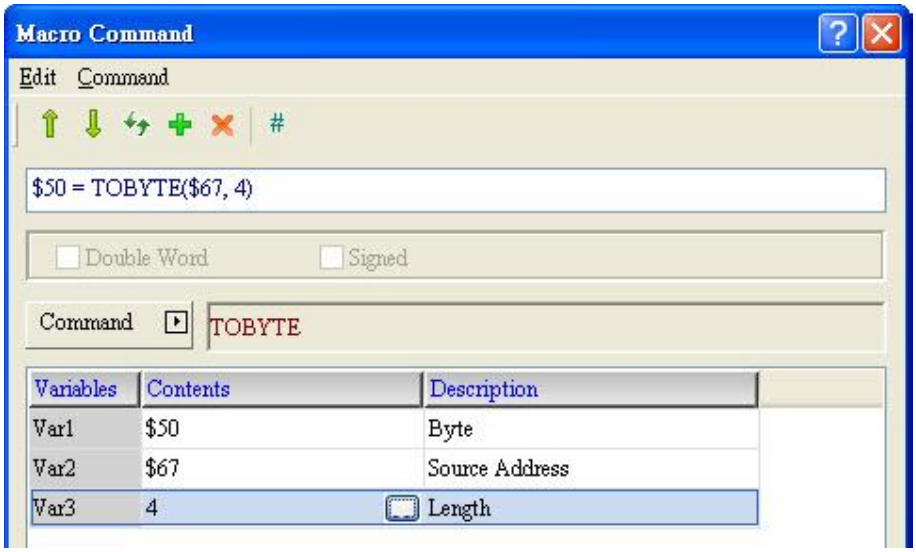
■ TOBYTE (Word to Byte Conversion)

<table>
<tr><th>Expression</th><th colspan="2">What Variables Represent</th><th>NOTE</th></tr>
<tr><td rowspan="5">Var1 = TOBYTE(Var2, Var3) (W)</td><td>Var 1</td><td>BYTE type data</td><td rowspan="5">W : Word</td></tr>
<tr><td>Var 2</td><td>Starting Address of the Source Data</td></tr>
<tr><td>Var 3</td><td>Length</td></tr>
<tr><td colspan="2">Expression Explanation</td></tr>
<tr><td colspan="2">Convert Word data (number of word is Var3) from low-byte of Var2 to Byte data (discard high-byte of Var2) and store the result in Var1.</td></tr>
<tr><td colspan="4">* Please note that the first and last byte of the converted WORD will be exchanged.</td></tr>
</table>

Variable	Memory Usage		
	Internal Memory	PLC Register	Constant
Var 1	◎		
Var 2	◎		
Var 3	◎		◎

Example

- Var 1 and Var 2 are internal memory addresses, and Var 3 is a constant.



- Convert the 4 consecutive words in $67 into the byte type and save them into $50.
- Both $50 and $67 are set to the Hex data type.
- If $67 = 12H, $68 = 76H, $69 = 24H and $70 = ABH, then after conversion using the TOBYTE command, the result is: $50 = 7612H、$51 = AB24H.

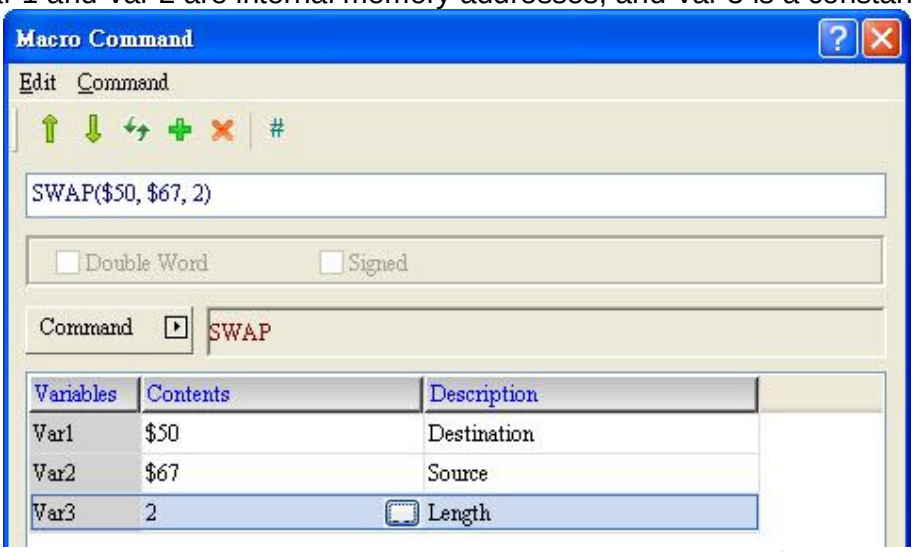
■ SWAP (Swap between highbit and lowbit of WORD)

Expression	What Variables Represent		NOTE
SWAP(Var1, Var2, Var3) (W)	Var 1	Starting Address of the Destination Data	W : Word
	Var 2	Starting Address of the Source Data	
	Var 3	Length	
	Expression Explanation		
	Swap between the high-byte and low-byte of Var 2 until the Var2+Var3 item, and store the result in the starting position of Var1 forward.		

Variable	Memory Usage		
	Internal Memory	PLC Register	Constant
Var 1	◎		
Var 2	◎		
Var 3	◎		◎

Example

- Var 1 and Var 2 are internal memory addresses, and Var 3 is a constant.



- Swap between the high-byte and low-byte of value stored in $67 and save the swapped result in $50.
- Both $50 and $67 are set to the Hex data type.
- If 67 = 5612H and $68 = B724H, then after executing the SWAP command to swap the high-byte and low-byte of values stored within $67 and save them into $50 and $51, the result will be $50=1256H, $51 = 24B7H.

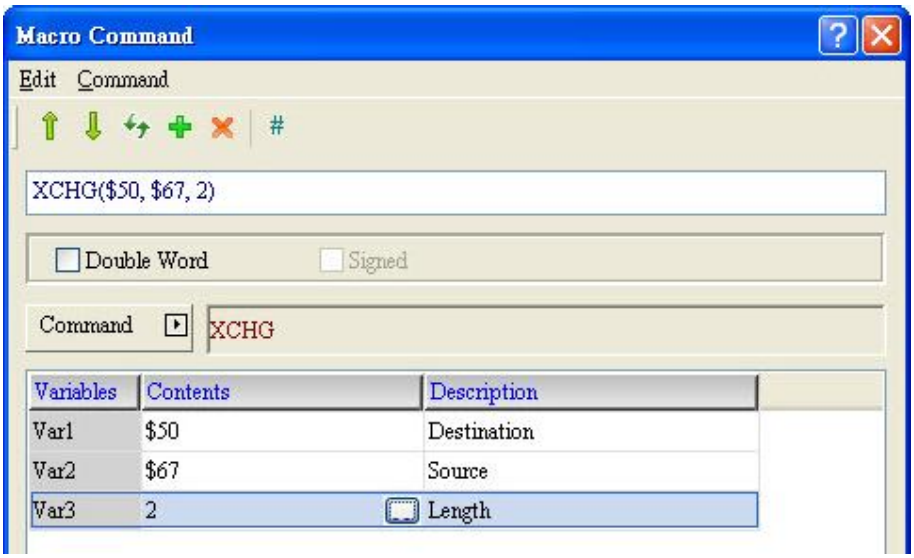
■ XCHG (Data Exchange)

Expression	What Variables Represent		NOTE
XCHG(Var1, Var2, Var3) (W) XCHG(Var1, Var2, Var3) (DW)	Var 1	Starting Address of the Destination Data	W : Word DW : Double Word
	Var 2	Starting Address of the Source Data	
	Var 3	Length	
	Expression Explanation		
	Exchange between values stored in Var 2 and Var 1 based on the length specified in Var 3.		

Variable	Memory Usage		
	Internal Memory	PLC Register	Constant
Var 1	◎		
Var 2	◎		
Var 3	◎		◎

Example

- Var 1 and Var 2 are internal memory addresses, and Var 3 is a constant.



- Exchange between 2 bytes of data stored in $67 and $50.
- Both $50 and $67 are Hex data type.
- If $67 = 1244H, $68 = 5678H, $50 = ABCDH and $51 = EFDCH, then after executing SCHG to exchange between values stored in $67 and $68, and $50 and $51, then the result will be $67 = ABCDH, $68 = EFDCH, $50 = 1244H and $51 = 5678H.

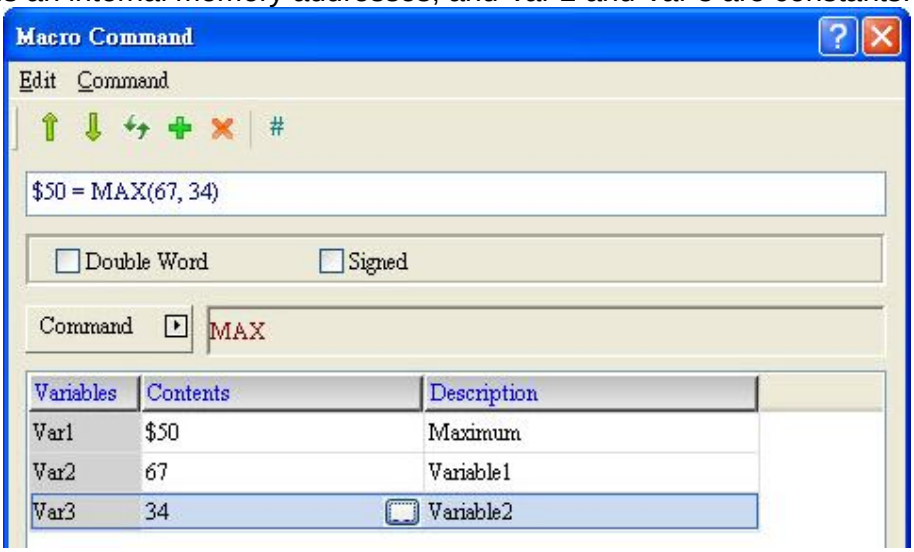
■ MAX (Get Maximum Value)

Expression	What Variables Represent		NOTE
Var1 = MAX(Var2, Var3) (W) Var1 = MAX(Var2, Var3) (DW) Var1 = MAX(Var2, Var3) (Signed W) Var1 = MAX(Var2, Var3) (Signed DW)	Var 1	Maximum value	W : Word DW : Double Word
	Var 2	Variable 1	
	Var 3	Variable 2	
	Expression Explanation		
	Get the maximum value between Var2 and Var3 and store the result in Var1.		

Variable	Memory Usage		
	Internal Memory	**PLC Register**	**Constant**
Var 1	◎		
Var 2	◎		◎
Var 3	◎		◎

Example

➢ Var 1 is an internal memory addresses, and Var 2 and Var 3 are constants.



➢ Maximize (67, 34) and put the maximum value to $50. Therefore $50 will display 67.

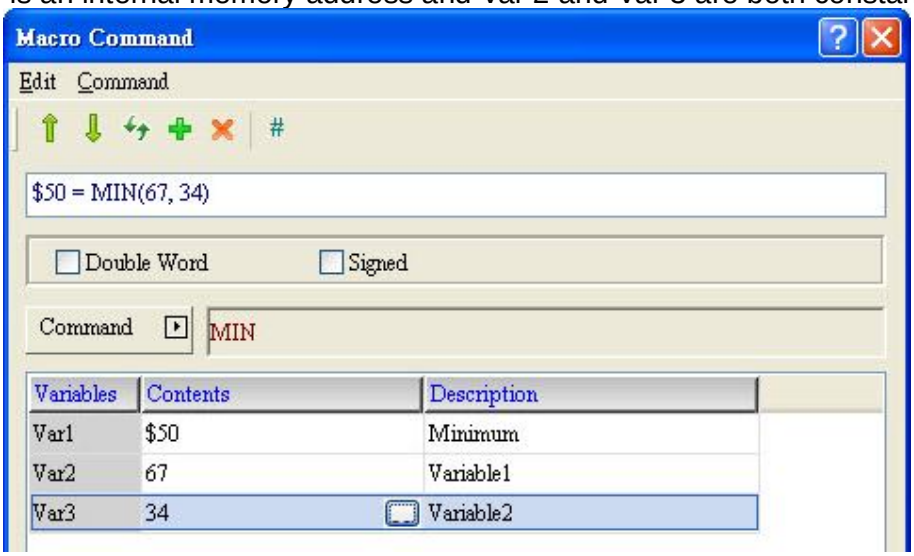
■ MIN (Get Minimum Value)

Expression	What Variables Represent		NOTE
Var1 = MIN(Var2, Var3) (W) Var1 = MIN(Var2, Var3) (DW) Var1 = MIN(Var2, Var3) (Signed W) Var1 = MIN(Var2, Var3) (Signed DW)	Var 1	Minimum Value	W : Word DW : Double Word
	Var 2	Variable1	
	Var 3	Variable2	
	Expression Explanation		
	Get the minimum value between Var2 and Var3 and store the result in Var1.		

Variable	Memory Usage		
	Internal Memory	PLC Register	Constant
Var 1	◎		
Var 2	◎		◎
Var 3	◎		◎

Example

➢ Var 1 is an internal memory address and Var 2 and Var 3 are both constants.



➢ Minimize (67, 34) and put the minimum value to $50. Therefore $50 will display 34.

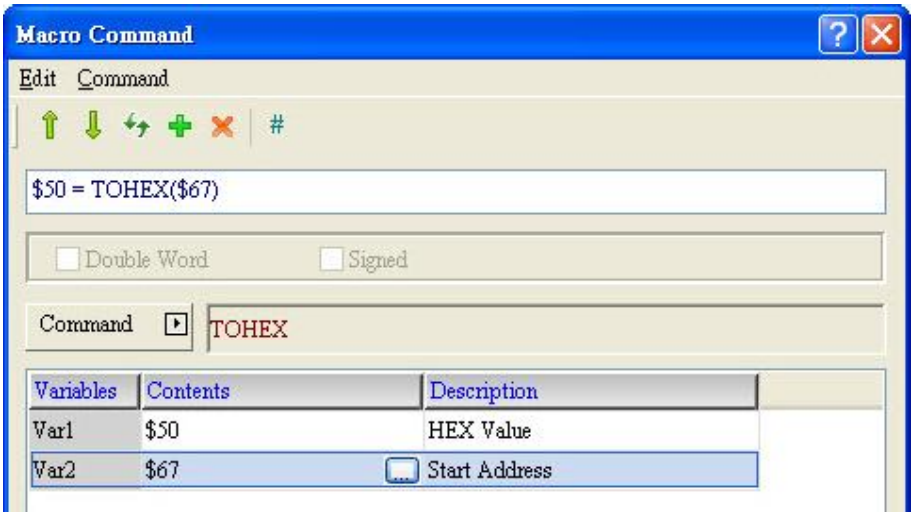
■ TOHEX (**Conversion of 4 ASCII characters to four digit HEX integer**)

Expression	What Variables Represent		NOTE
Var1 = TOHEX(Var2) (W)	Var 1	Hexadecimal value	W : Word
	Var 2	Starting ASCII Address	
	Expression Explanation		
	Convert the ASCII characters of V2 (4 WORDS) to the HEX value and store the result in V1.		

Variable	Memory Usage		
	Internal Memory	PLC Register	Constant
Var 1	◎		
Var 2	◎		

Example

- Var 1 and Var 2 are all internal memory addresses.



- Convert the ASCII characters of $67 (4 WORDS) to the HEX value and store the result in $50.
- Both $50 and $67 are set to the Hex data type.
- If $67 = 31H, $68 = 32H, $69 = 33H and $70 = 34H, then after using the TOHEX command to convert the ASCII characters stored in these four variables into HEX data type and store them in $50, then the result is: $50 = 1244H.

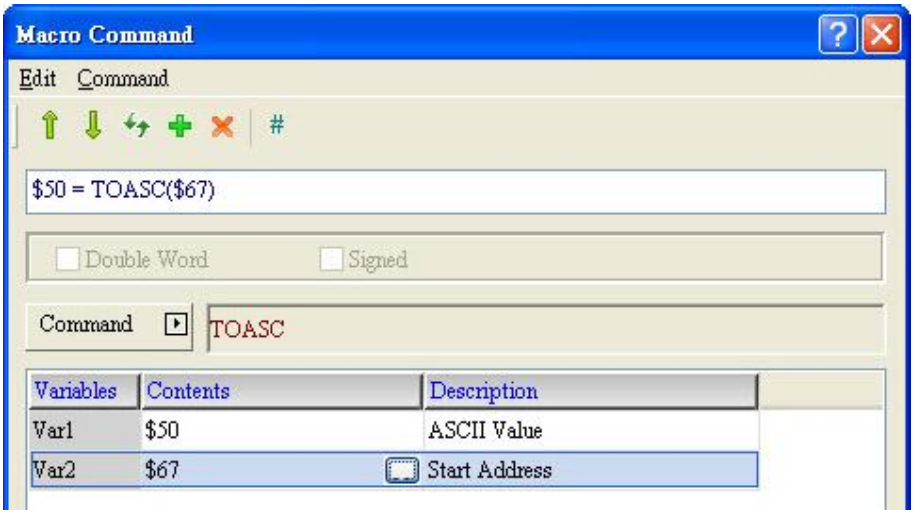
■ TOASC (Conversion of HEX integers into ASCII characters)

Expression	What Variables Represent		NOTE
Var1 = TOASC(Var2) (W)	Var 1	ASCII Value	W : Word
	Var 2	Starting hexadecimal address	
	Expression Explanation		
	Convert Var2 in HEX format to the ASCII (4 WORDS) characters and store the result in Var1.		

Variable	Memory Usage		
	Internal Memory	PLC Register	Constant
Var 1	◎		
Var 2	◎		

Example

- Var 1 and Var 2 are internal memory addresses



- Convert the HEX values of $67 into ASCII characters (4 WORDS) and store the result in $50.
- Both $50 and $67 are set to the Hex data type.
- If $67 = 1244H, then after using the TOASC command to convert the HEX value stored in $67 into ASCII characters and stored in these four variables into $50, $51, $52 and $53, then the result is: $50 = 31H, $51 = 32H, $52 = 33H, $53 = 34H.

■ FCNV (Conversion of integer into floating point value)

Expression	What Variables Represent		NOTE
Var1 = FCNV(Var2) (Signed DW)	Var 1	Floating point value	DW : Double Word Signed : Signed number
	Var 2	Integer value	
	Expression Explanation		
	Convert the value in Var2 (integer) to floating point value and store in Var1.		

Variable	Memory Usage		
	Internal Memory	PLC Register	Constant
Var 1	◎		
Var 2	◎		◎

Example

- Var 1 and Var 2 are internal memory addresses.

- Convert $67 (integer value) into the floating point value and save it in $50.
- $50 is set to floating point data type and the integer to Double Word data type.
- The result is $50 = 67.0.

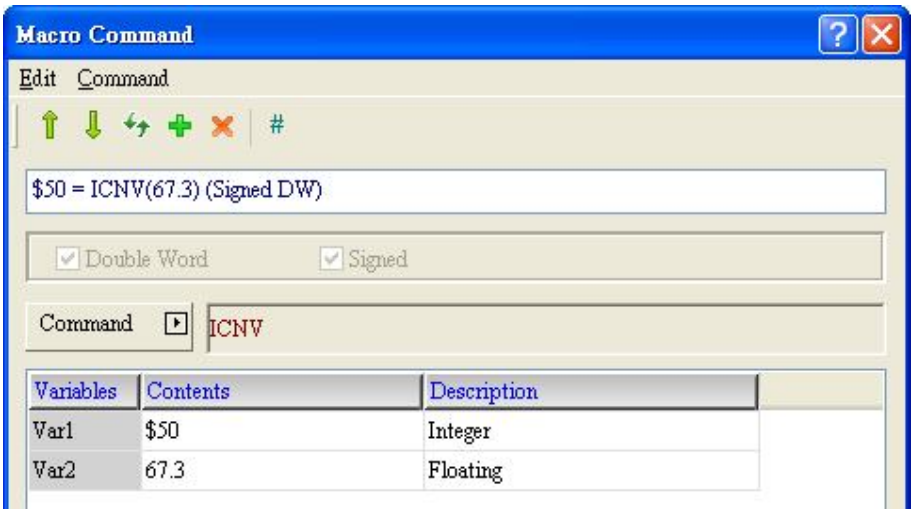
■ ICNV (Conversion from integer to floating point value)

Expression	What Variables Represent		NOTE
Var1 = ICNV(Var2) (Signed DW)	Var 1	Integer value	DW : Double Word Signed : Signed number
	Var 2	Floating point value	
	Expression Explanation		
	Convert the value in Var2 (floating point value) into an integer and store it in Var1.		

Variable	Memory Usage		
	Internal Memory	**PLC Register**	**Constant**
Var 1	◎		
Var 2	◎		◎

Example

➢ Var 1 and Var 2 are internal memory addresses.



➢ Convert 67.3 (floating point value) into the an integer and save it in $50.

➢ $50 is set to Unsigned Decimal and the integer to Word data type.

➢ The result is $50 = 67.

■ SPRINTF (Format String)

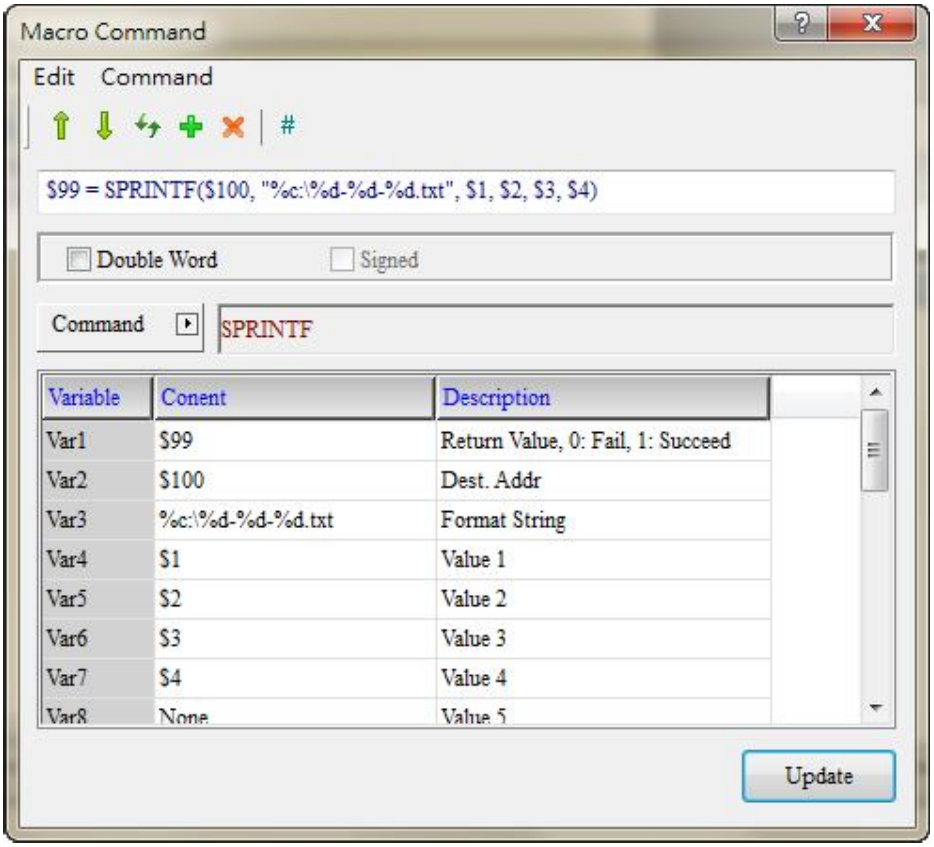
<table>
<tr><th>Expression</th><th colspan="3">What Variables Represent</th><th>NOTE</th></tr>
<tr><td rowspan="10">Var1 = SPRINTF (Var2, "%u", Var4) (DW)

Var1 = SPRINTF (Var2, "%u", Var4, …, Var24) (DW) (Note 2)</td><td rowspan="3">Var 1</td><td colspan="2">Returned Value</td><td rowspan="10">DW = Double Word</td></tr>
<tr><td>Failure</td><td>0</td></tr>
<tr><td>Success</td><td>1</td></tr>
<tr><td>Var 2</td><td colspan="2">Fill in the target address of string</td></tr>
<tr><td>Var 3</td><td colspan="2">String Content (Note 1)</td></tr>
<tr><td>Var 4</td><td colspan="2">Value 1</td></tr>
<tr><td>…</td><td colspan="2">…</td></tr>
<tr><td>Var 24</td><td colspan="2">Value 20</td></tr>
<tr><td colspan="3">Expression Explanation</td></tr>
<tr><td colspan="3">Fill in the string content then the target address according to Var 2</td></tr>
<tr><td colspan="5">Note 1: The supported string formats are shown as below:
%d：signed integer
%u：unsigned integer
%c：ASCII character
%x：value in hexadecimal
Note 2: It supports up to 20 variables
Note 3: The fill in number should be identical with the value number.</td></tr>
</table>

Variable	Memory Usage			
	Internal Memory	PLC Register	String	Constant
Var 1	◎			
Var 2	◎	◎		
Var 3			◎	
Var 4	◎	◎		◎
…	…	…		…
Var 24	◎	◎		◎

Example

- $99 = SPRINTF($100, "%c:\%d-%d-%d.txt", $1, $2, $3, $4)



Create numeric entry element: $1, $2, $3, $4. Then, enter the value which shown as below:

$1 = 68 (represents D in ASCII code)

$2 = 2012

$3 = 12

$4 = 21

Create character entry element and set its address to $100. After execution, the screen will show as below:

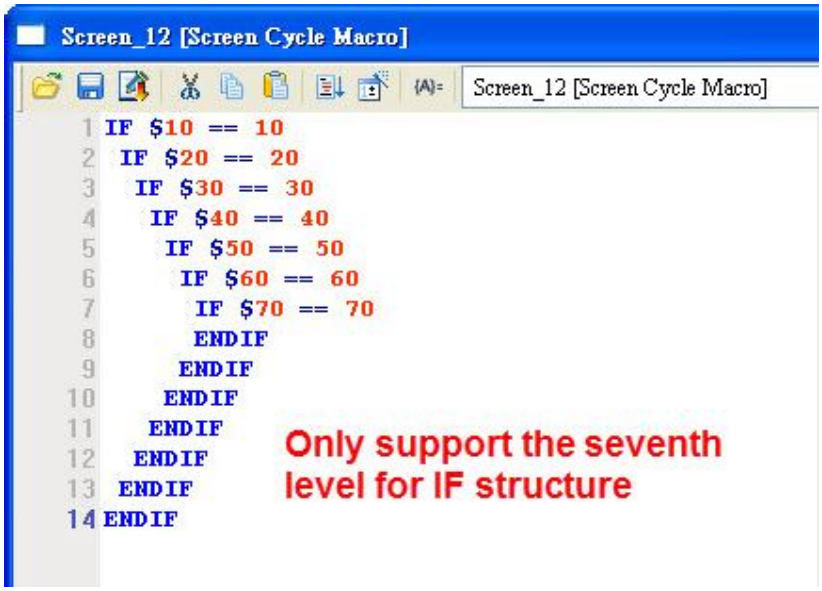
24-3-5 Comparison

Comparison is performed with such commands as If…Then Goto, If…Then Call, If and Elseif and they are detailed below.

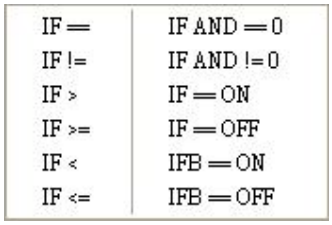
Figure 24-3-5-1 Comparison

NOTE：

✓ IF…structures only support 7 levels.



- IF…THEN GOTO (If …. Goto a certain label identifier and continue subsequent executions)



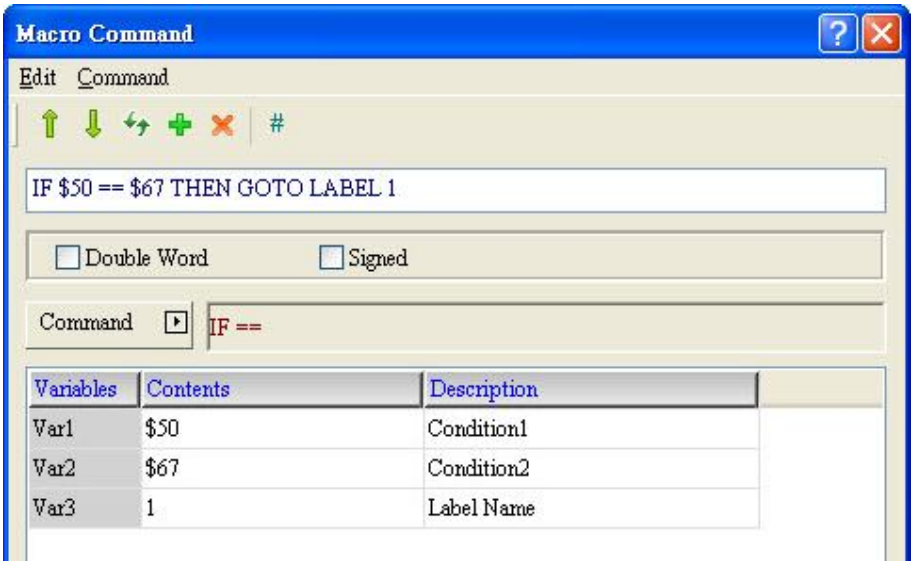
➢ There are twelve commands in the category of If…Then Goto Macro, and they are introduced below.

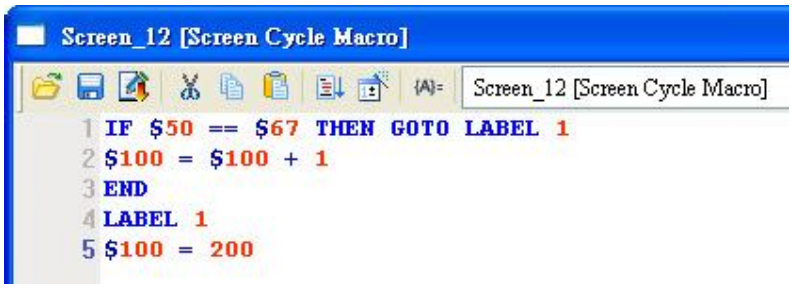
<table>
<tr><th colspan="4">(1) IF ==</th></tr>
<tr><th>Expression</th><th colspan="2">What Variables Represent</th><th>NOTE</th></tr>
<tr><td rowspan="5">IF Var1 == Var2 THEN GOTO LABEL Var3 (W)
IF Var1 == Var2 THEN GOTO LABEL Var3 (DW)
IF Var1 == Var2 THEN GOTO LABEL Var3 (Signed W)
IF Var1 == Var2 THEN GOTO LABEL Var3 (Signed DW)</td><td>Var 1</td><td>condition1</td><td rowspan="5">W : Word
DW : Double Word
Signed : Signed number</td></tr>
<tr><td>Var 2</td><td>condition2</td></tr>
<tr><td>Var 3</td><td>Label identifier</td></tr>
<tr><td colspan="2">Expression Explanation</td></tr>
<tr><td colspan="2">If condition1 equals condition2 then GOTO and execute Label Var 3.</td></tr>
</table>

Variable	Memory Usage		
	Internal Memory	PLC Register	Constant
Var 1	◎		◎
Var 2	◎		◎
Var 3			◎

Example

- Var 1 and Var 2 are both internal memory addresses, and Var 3 is a constant.





- If $50 equals $67 (value comparison), then execute LABEL1 ($100 = 200); otherwise, execute $100 = $100 + 1.

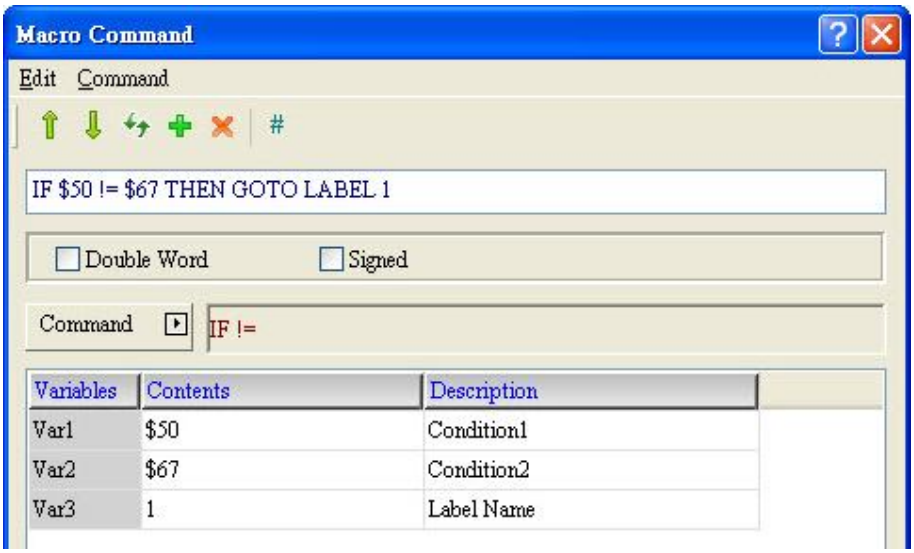
(2) IF !=

Expression	What Variables Represent		NOTE
IF Var1 != Var2 THEN GOTO LABEL Var3 (W) IF Var1 != Var2 THEN GOTO LABEL Var3 (DW) IF Var1 != Var2 THEN GOTO LABEL Var3 (Signed W) IF Var1 != Var2 THEN GOTO LABEL Var3 (Signed DW)	Var 1	condition1	W : Word DW : Double Word Signed : Signed number
	Var 2	condition2	
	Var 3	Label identifier	
	Expression Explanation		
	If condition1 does not equal to condition2 then GOTO and execute Label Var 3.		

Variable	Memory Usage		
	Internal Memory	PLC Register	Constant
Var 1	◎		◎
Var 2	◎		◎
Var 3			◎

Example

- Var 1 and Var 2 are both internal memory addresses, and Var 3 is a constant.



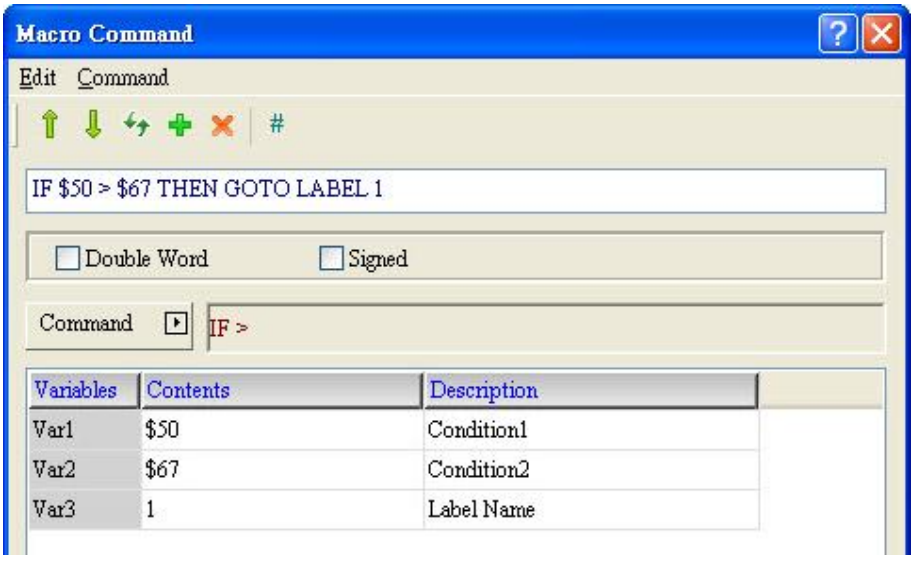
- If $50 does not equal to $67 (value comparison), then execute LABEL1 ($100 = 200); otherwise, execute $100 = $100 + 1.

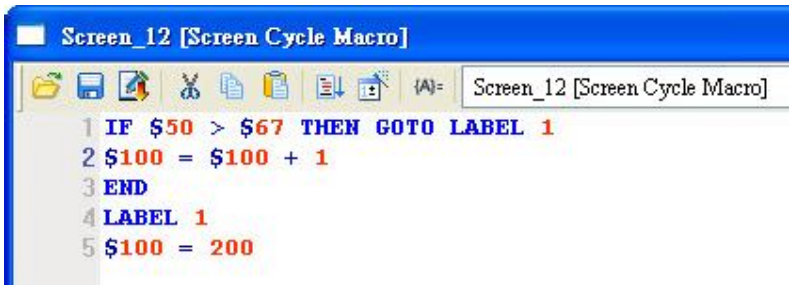
(3) IF >			
Expression	**What Variables Represent**		**NOTE**
IF Var1 > Var2 THEN GOTO LABEL Var3 (W) IF Var1 > Var2 THEN GOTO LABEL Var3 (DW) IF Var1 > Var2 THEN GOTO LABEL Var3 (Signed W) IF Var1 > Var2 THEN GOTO LABEL Var3 (Signed DW)	Var 1	condition1	W : Word DW : Double Word Signed : Signed number
	Var 2	condition2	
	Var 3	Label identifier	
	Expression Explanation		
	If condition1 is larger than condition2 then GOTO and execute Label Var 3.		

Variable	Memory Usage		
	Internal Memory	**PLC Register**	**Constant**
Var 1	◎		◎
Var 2	◎		◎
Var 3			◎

Example

➢ Var 1 and Var 2 are both internal memory addresses, and Var 3 is a constant.





- If $50 is larger than $67 (value comparison), then execute LABEL1 ($100 = 200); otherwise, execute $100 = $100 + 1.

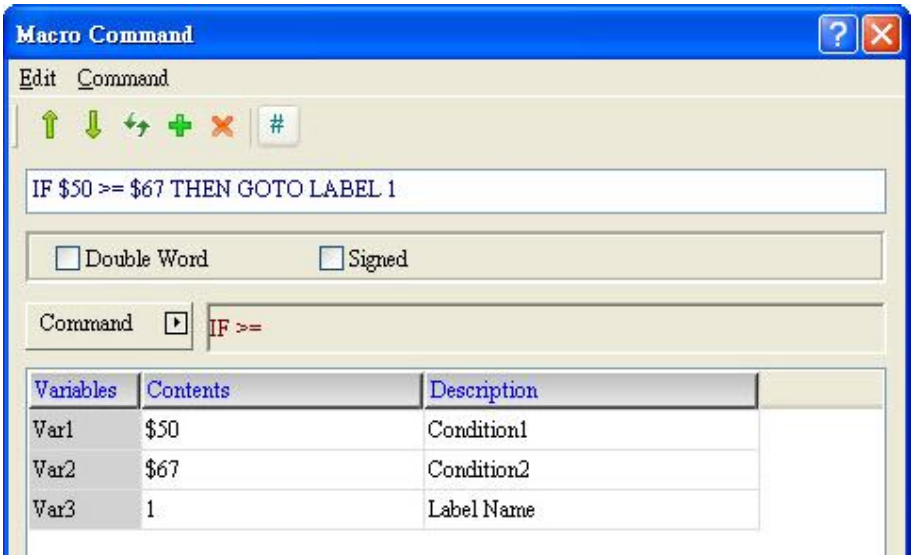
(4) IF >=

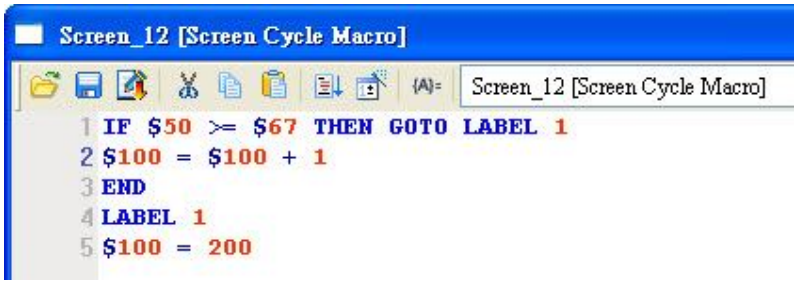
Expression	What Variables Represent		NOTE
IF Var1 >= Var2 THEN GOTO LABEL Var3 (W) IF Var1 >= Var2 THEN GOTO LABEL Var3 (DW) IF Var1 >= Var2 THEN GOTO LABEL Var3 (Signed W) IF Var1 >= Var2 THEN GOTO LABEL Var3 (Signed DW)	Var 1	condition1	W : Word DW : Double Word Signed : Signed number
	Var 2	condition2	
	Var 3	Label identifier	
	Expression Explanation		
	If condition1 is larger than or equals to condition2 then GOTO and execute Label Var 3.		

Variable	Memory Usage		
	Internal Memory	PLC Register	Constant
Var 1	◎		◎
Var 2	◎		◎
Var 3			◎

Example

- Var 1 and Var 2 are both internal memory addresses, and Var 3 is a constant.





- If $50 is larger than or equals to $67 (value comparison), then execute LABEL1 ($100 = 200); otherwise, execute $100 = $100 + 1.

(5) IF <

Expression	What Variables Represent		NOTE
IF Var1 < Var2 THEN GOTO LABEL Var3 (W) IF Var1 < Var2 THEN GOTO LABEL Var3 (DW) IF Var1 < Var2 THEN GOTO LABEL Var3 (Signed W) IF Var1 < Var2 THEN GOTO LABEL Var3 (Signed DW)	Var 1	condition1	W : Word DW : Double Word Signed : Signed number
	Var 2	condition2	
	Var 3	Label identifier	
	Expression Explanation		
	If condition1 is smaller than condition2 then GOTO and execute Label Var 3.		

Variable	Memory Usage		
	Internal Memory	PLC Register	Constant
Var 1	◎		◎
Var 2	◎		◎
Var 3			◎

Example

- Var 1 and Var 2 are both internal memory addresses, and Var 3 is a constant.

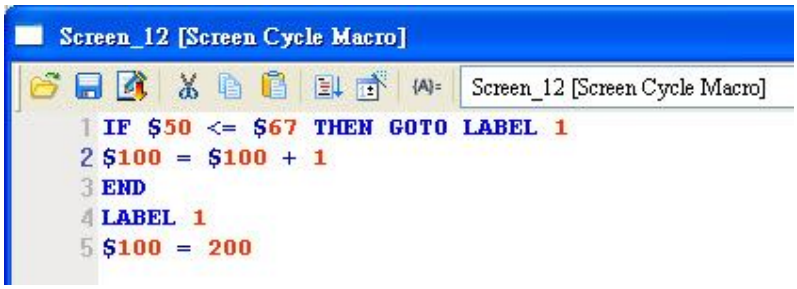
- If $50 is smaller than $67 (value comparison), then execute LABEL1 ($100 = 200); otherwise, execute $100 = $100 + 1.

(6) IF <=			
Expression	**What Variables Represent**		**NOTE**
IF Var1 <= Var2 THEN GOTO LABEL Var3 (W) IF Var1 <= Var2 THEN GOTO LABEL Var3 (DW) IF Var1 <= Var2 THEN GOTO LABEL Var3 (Signed W) IF Var1 <= Var2 THEN GOTO LABEL Var3 (Signed DW)	Var 1	condition1	W : Word DW : Double Word Signed : Signed number
	Var 2	condition2	
	Var 3	Label identifier	
	Expression Explanation		
	If condition1 is smaller than or equals to condition2 then GOTO and execute Label Var 3.		

Variable	Memory Usage		
	Internal Memory	**PLC Register**	**Constant**
Var 1	◎		◎
Var 2	◎		◎
Var 3			◎

Example

- Var 1 and Var 2 are both internal memory addresses, and Var 3 is a constant.

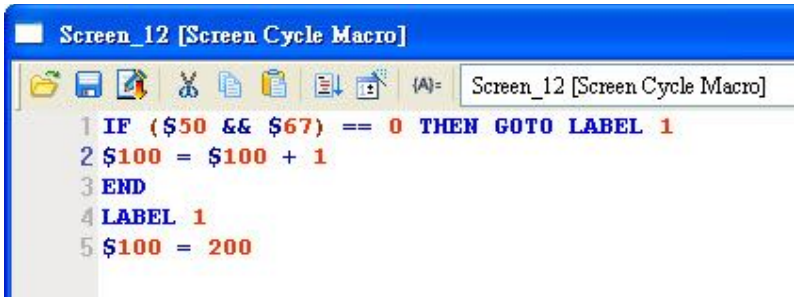


- If $50 is smaller or equals to $67 (value comparison), then execute LABEL1 ($100 = 200); otherwise, execute $100 = $100 + 1.

(7) IF AND == 0			
Expression	**What Variables Represent**		**NOTE**
IF (Var1 && Var2) == 0 THEN GOTO LABEL Var3 (W) IF (Var1 && Var2) == 0 THEN GOTO LABEL Var3 (DW)	Var 1	condition1	W : Word DW : Double Word
	Var 2	condition2	
	Var 3	Label identifier	
	Expression Explanation		
	If the result of Bitwise AND Operation between condition1 equals condition2 is 0, then GOTO and execute Label Var 3.		

Variable	**Memory Usage**		
	Internal Memory	**PLC Register**	**Constant**
Var 1	◎		◎
Var 2	◎		◎
Var 3			◎

Example
- Var 1 and Var 2 are both internal memory addresses, and Var 3 is a constant.



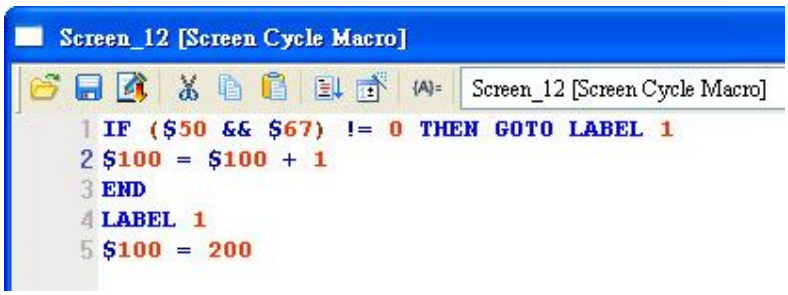
➢ If the result of Bitwise AND operation between $50 and $67 is 0, then execute LABEL1 ($100 = 200); otherwise, execute $100 = $100 + 1.

(8) IF AND != 0			
Expression	**What Variables Represent**		**NOTE**
IF (Var1 && Var2) != 0 THEN GOTO LABEL Var3 (W) IF (Var1 && Var2) != 0 THEN GOTO LABEL Var3 (DW)	Var 1	condition1	W : Word DW : Double Word
	Var 2	condition2	
	Var 3	Label identifier	
	Expression Explanation		
	If the result of Bitwise AND Operation between condition1 equals condition2 does not equal to 0, then GOTO and execute Label Var 3.		

Variable	**Memory Usage**		
	Internal Memory	**PLC Register**	**Constant**
Var 1	◎		◎
Var 2	◎		◎
Var 3			◎

Example

➢ Var 1 and Var 2 are both internal memory addresses, and Var 3 is a constant.



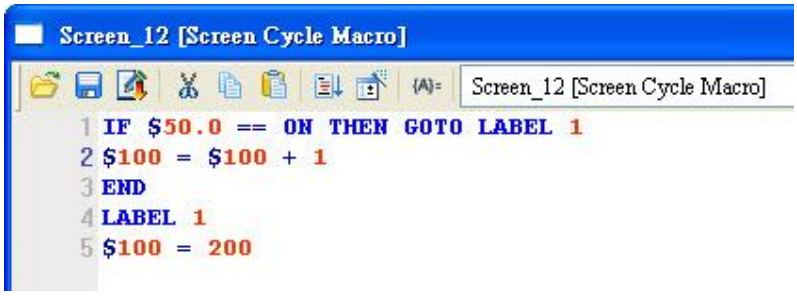
➢ If the result of Bitwise AND operation between $50 and $67 does not equal to 0, then execute LABEL1 ($100 = 200); otherwise, execute $100 = $100 + 1.

(9) IF == ON			
Expression	**What Variables Represent**		**NOTE**
IF Var1 == ON THEN GOTO LABEL Var2 (W)	Var 1	condition1	W : Word
	Var 2	Label identifier	
	Expression Explanation		
	If condition 1 is ON, then GOTO and execute LABEL Var 2.		

Variable	Memory Usage		
	Internal Memory	PLC Register	Constant
Var 1	◎ (Can only be Bit)		
Var 2			◎

Example

- Var 1 is an internal memory address, and Var 2 is a constant.



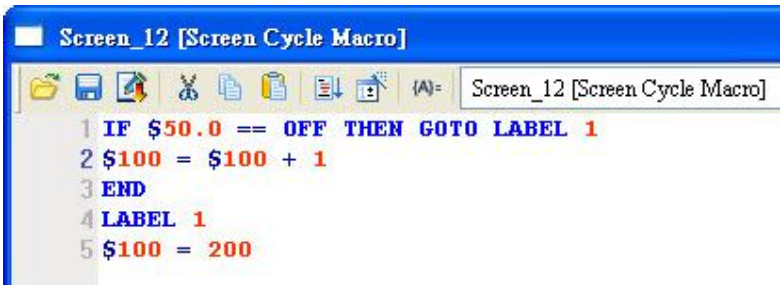
- If $50.0 is ON, then execute LABEL1 ($100 = 200); otherwise, execute $100 = $100 + 1.

(10) IF == OFF			
Expression	**What Variables Represent**		**NOTE**
IF Var1 == OFF THEN GOTO LABEL Var2 (W)	Var 1	Condition1	W : Word
	Var 2	Label identifier	
	Expression Explanation		
	If condition 1 is OFF, then GOTO and execute LABEL Var 2.		

Variable	Memory Usage		
	Internal Memory	PLC Register	Constant
Var 1	◎ (Can only be Bit)		
Var 2			◎

Example

➢ Var 1 is an internal memory address, and Var 2 is a constant.



➢ If $50.0 is OFF, then execute LABEL1 ($100 = 200); otherwise, execute $100 = $100 + 1.

(11) IFB == ON

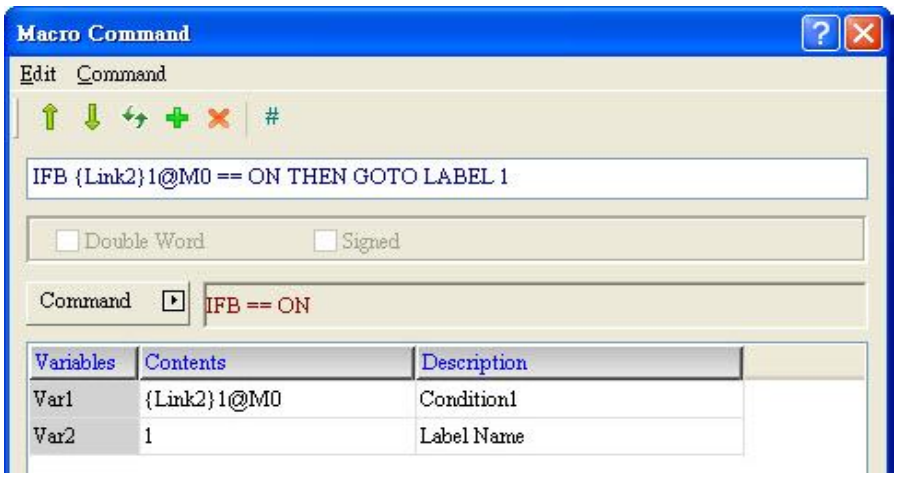
Expression	What Variables Represent		NOTE
IFB Var1 == ON THEN GOTO LABEL Var2 (W)	Var 1	condition1	W : Word
	Var 2	Label identifier	
	Expression Explanation		
	If condition 1 is ON, then GOTO and execute LABEL Var 2.		

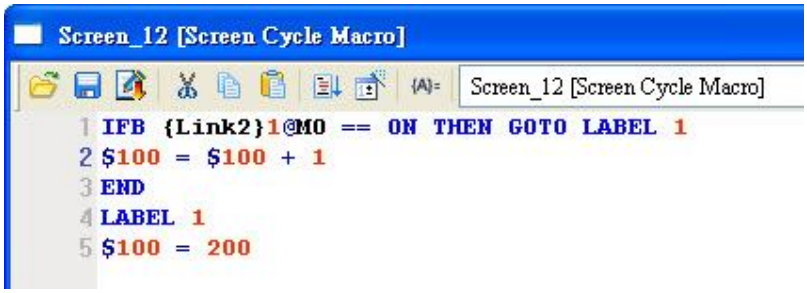
* in the command IFB == ON, the Bit address of Var 1 can support the external PLC Register.

Variable	Memory Usage		
	Internal Memory	PLC Register	Constant
Var 1	◎ (Can only be Bit)	◎ (Can only be Bit)	
Var 2			◎

Example

➢ Var 1 is a PLC Register address, and Var 2 is a constant.





➢ If M0 is ON, then execute LABEL1 ($100 = 200); otherwise, execute $100 = $100 + 1.

(12) IFB == OFF

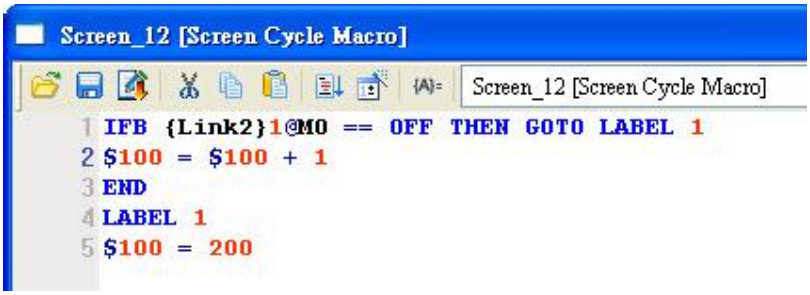
Expression	What Variables Represent		NOTE
IFB Var1 == OFF THEN GOTO LABEL Var2 (W)	Var 1	Condition1	W : Word
	Var 2	Label identifier	
	Expression Explanation		
	If condition 1 is OFF, then GOTO and execute LABEL Var 2.		

* in the command IFB == ON, the Bit address of Var 1 can support the external PLC Register.

Variable	Memory Usage		
	Internal Memory	**PLC Register**	**Constant**
Var 1	◎ (Can only be Bit)	◎ (Can only be Bit)	
Var 2			◎

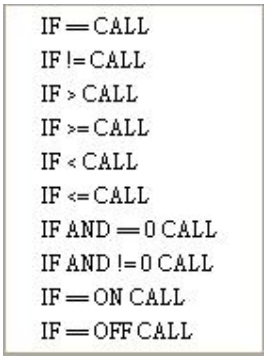
Example

➢ Var 1 is a PLC Register address, and Var 2 is a constant.



➢ If M0 is OFF, then execute LABEL1 ($100 = 200); otherwise, execute $100 = $100 + 1.

■ IF…THEN CALL (If… Then Call a Submacro)



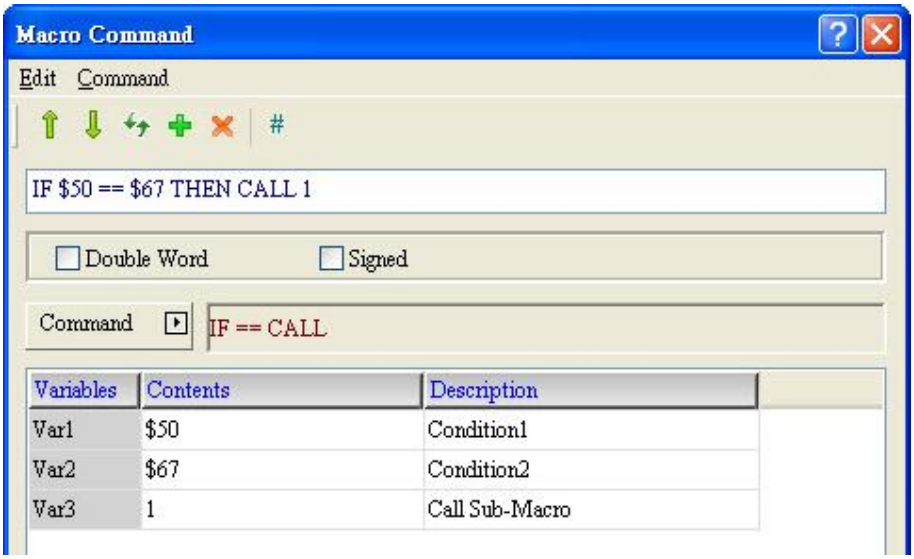
➢ There are 10 commands in the category of If…Then Call Macro, and they are introduced below.

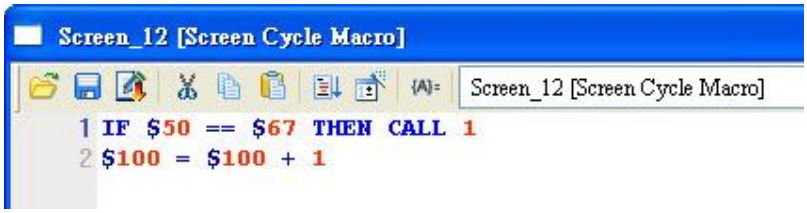
<table>
<tr><th colspan="4">(1) IF ==</th></tr>
<tr><th>Expression</th><th colspan="2">What Variables Represent</th><th>NOTE</th></tr>
<tr><td rowspan="5">IF Var1 == Var2 THEN CALL Var3 (W)
IF Var1 == Var2 THEN CALL Var3 (DW)
IF Var1 == Var2 THEN CALL Var3 (Signed W)
IF Var1 == Var2 THEN CALL Var3 (Signed DW)</td><td>Var 1</td><td>condition1</td><td rowspan="5">W : Word
DW : Double Word
Signed : Signed number</td></tr>
<tr><td>Var 2</td><td>condition2</td></tr>
<tr><td>Var 3</td><td>Label identifier</td></tr>
<tr><td colspan="2">Expression Explanation</td></tr>
<tr><td colspan="2">If condition 1 equals to condition 2, then call Var 3 (a submacro label).</td></tr>
</table>

Variable	Memory Usage		
	Internal Memory	PLC Register	Constant
Var 1	◎		◎
Var 2	◎		◎
Var 3			◎

Example

- Var 1 and Var 2 are internal memory addresses, and Var 3 is a constant.





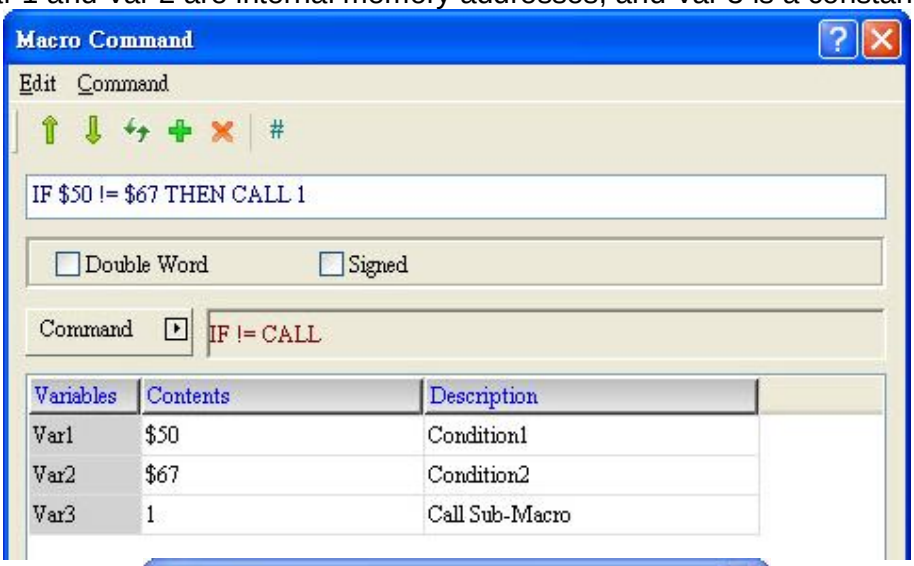
- If $50.0 equals to $67 (value comparison), then call the submacro labeled 1 ($100 = 200); otherwise, execute $100 = $100 + 1.

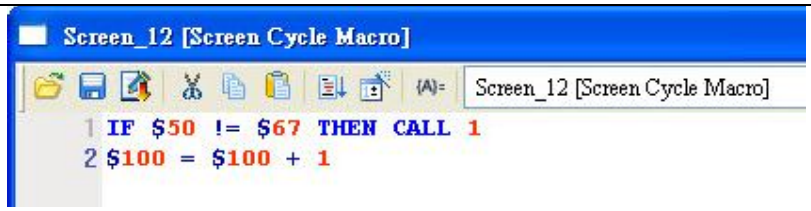
(2) IF !=			
Expression	**What Variables Represent**		**NOTE**
IF Var1 != Var2 THEN CALL Var3 (W) IF Var1 != Var2 THEN CALL Var3 (DW) IF Var1 != Var2 THEN CALL Var3 (Signed W) IF Var1 != Var2 THEN CALL Var3 (Signed DW)	Var 1	condition1	W : Word DW : Double Word Signed : Signed number
	Var 2	condition2	
	Var 3	Label identifier	
	Expression Explanation		
	If condition 1 does not equal to condition 2, then call Var 3 (a submacro label).		

Variable	Memory Usage		
	Internal Memory	**PLC Register**	**Constant**
Var 1	◎		◎
Var 2	◎		◎
Var 3			◎

Example

- Var 1 and Var 2 are internal memory addresses, and Var 3 is a constant.





➢ If $50.0 does not equal to $67 (value comparison), then call the submacro labeled 1 ($100 = 200); otherwise, execute $100 = $100 + 1.

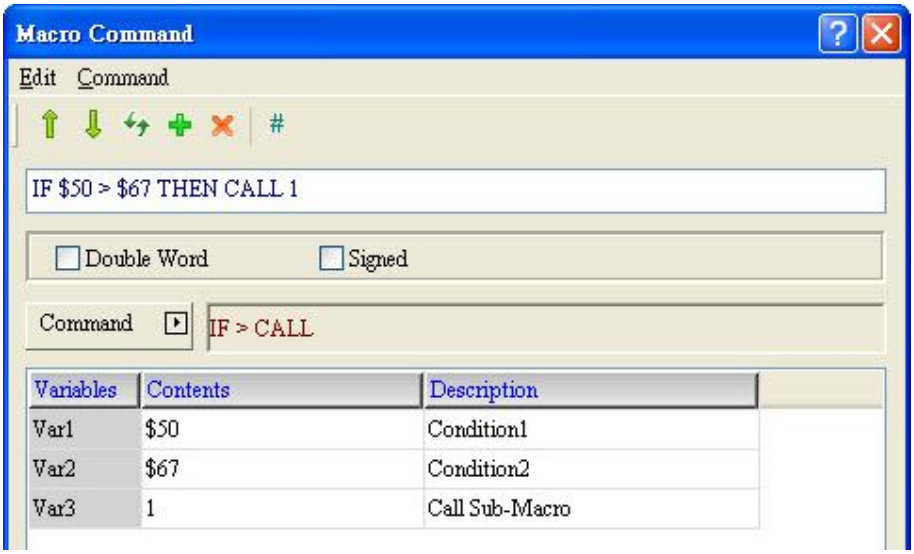
(3) IF >

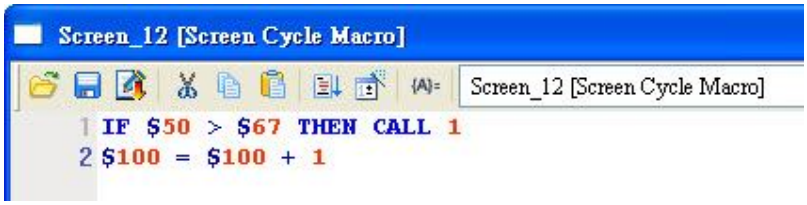
Expression	What Variables Represent		NOTE
IF Var1 > Var2 THEN CALL Var3 (W) IF Var1 > Var2 THEN CALL Var3 (DW) IF Var1 > Var2 THEN CALL Var3 (Signed W) IF Var1 > Var2 THEN CALL Var3 (Signed DW)	Var 1	condition1	W : Word DW : Double Word Signed : Signed number
	Var 2	condition2	
	Var 3	Label identifier	
	Expression Explanation		
	If condition 1 is larger than condition 2, then call Var 3 (a submacro label).		

Variable	Memory Usage		
	Internal Memory	PLC Register	Constant
Var 1	◎		◎
Var 2	◎		◎
Var 3			◎

Example

➢ Var 1 and Var 2 are internal memory addresses, and Var 3 is a constant.





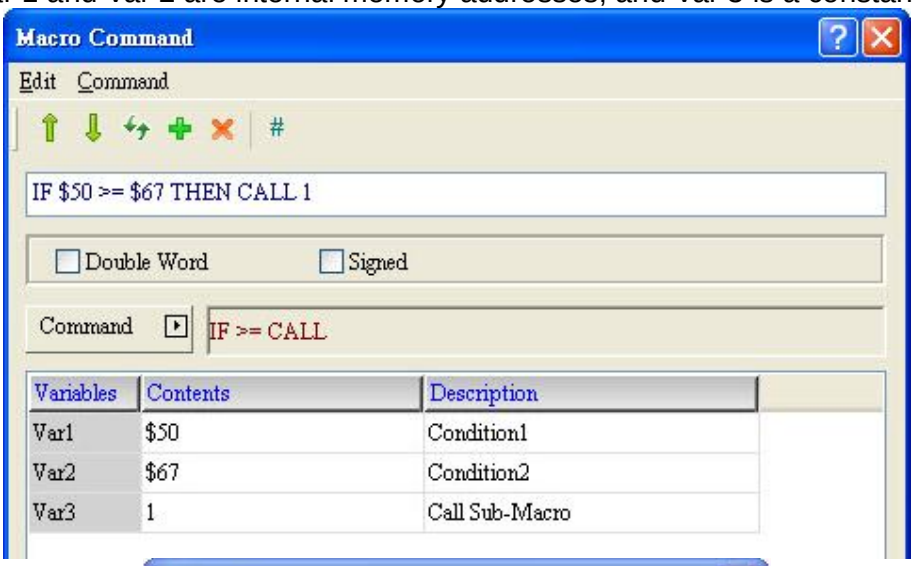
➢ If $50.0 is larger than $67 (value comparison), then call the submacro labeled 1 ($100 = 200); otherwise, execute $100 = $100 + 1.

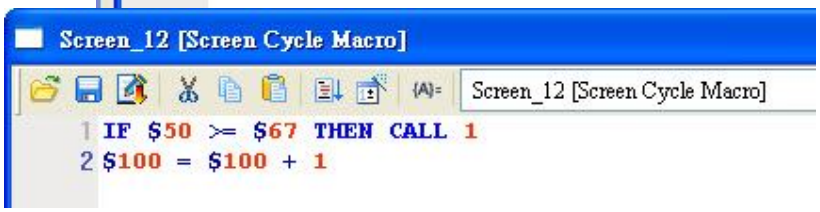
(4) IF >=			
Expression	**What Variables Represent**		**NOTE**
IF Var1 >= Var2 THEN CALL Var3 (W) IF Var1 >= Var2 THEN CALL Var3 (DW) IF Var1 >= Var2 THEN CALL Var3 (Signed W) IF Var1 >= Var2 THEN CALL Var3 (Signed DW)	Var 1	condition1	W : Word DW : Double Word Signed : Signed number
	Var 2	condition2	
	Var 3	Label identifier	
	Expression Explanation		
	If condition is larger or equals to condition 2, then call Var 3 (a submacro label).		

Variable	**Memory Usage**		
	Internal Memory	**PLC Register**	**Constant**
Var 1	◎		◎
Var 2	◎		◎
Var 3			◎

Example

- Var 1 and Var 2 are internal memory addresses, and Var 3 is a constant.





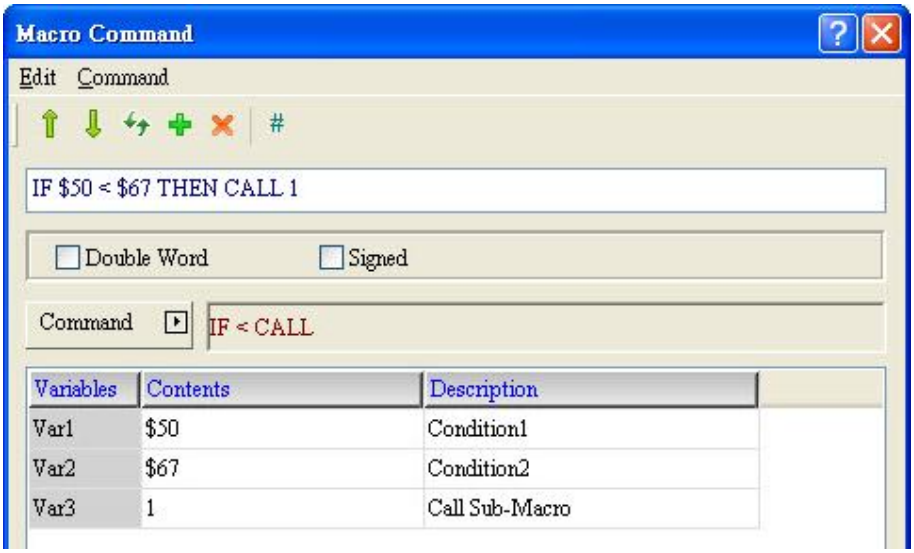
- If $50 is larger than or equals to $67 (value comparison), then call the submacro labeled 1 ($100 = 200); otherwise, execute $100 = $100 + 1.

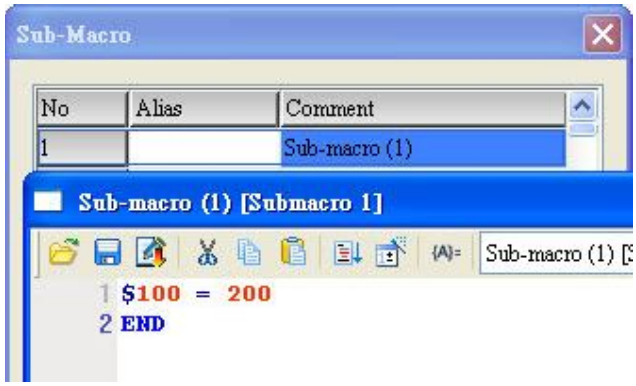
(5) IF <			
Expression	**What Variables Represent**		**NOTE**
IF Var1 < Var2 THEN CALL Var3 (W) IF Var1 < Var2 THEN CALL Var3 (DW) IF Var1 < Var2 THEN CALL Var3 (Signed W) IF Var1 < Var2 THEN CALL Var3 (Signed DW)	Var 1	condition1	W : Word DW : Double Word Signed : Signed number
	Var 2	condition2	
	Var 3	Label identifier	
	Expression Explanation		
	If condition 1 is smaller than condition 2, then call Var 3 (a submacro label).		

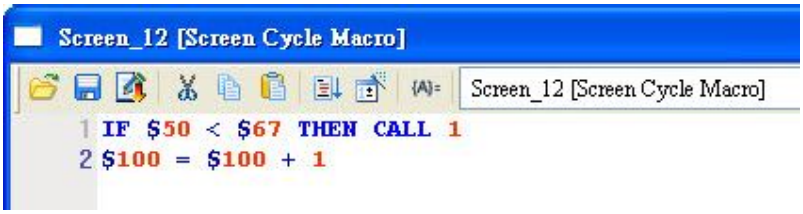
Variable	**Memory Usage**		
	Internal Memory	**PLC Register**	**Constant**
Var 1	◎		◎
Var 2	◎		◎
Var 3			◎

Example

➢ Var 1 and Var 2 are internal memory addresses, and Var 3 is a constant.







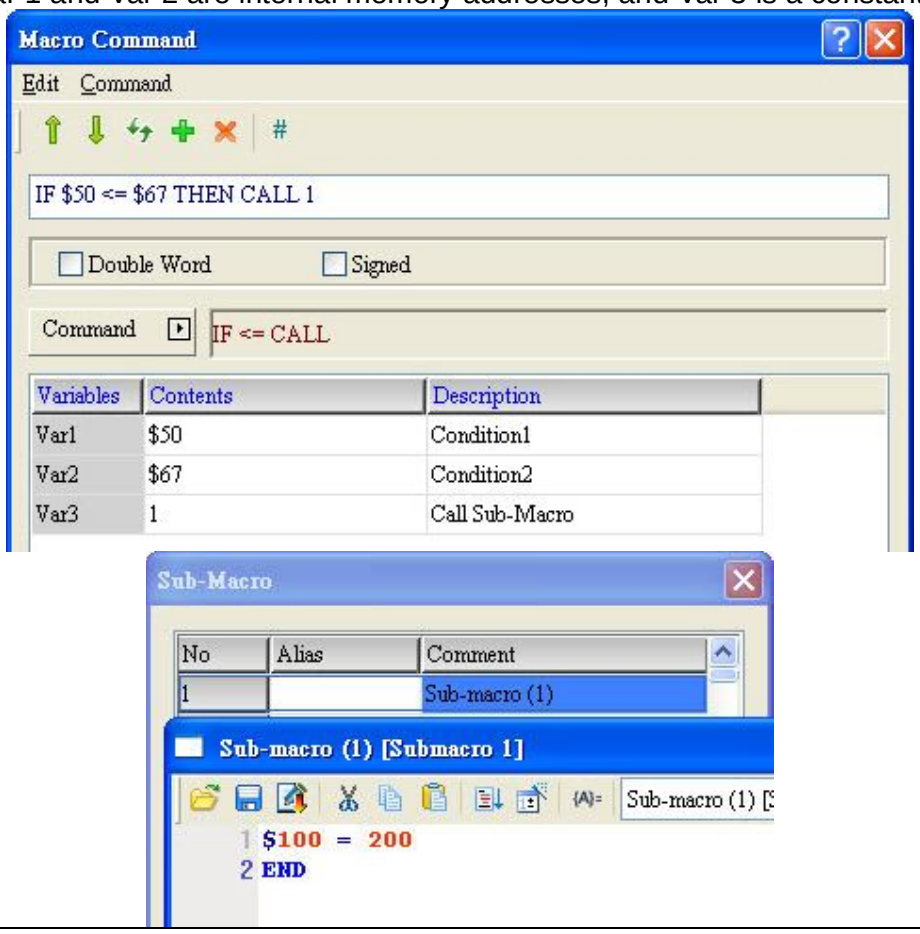
- If $50 is smaller than $67 (value comparison), then call the submacro labeled 1 ($100 = 200); otherwise, execute $100 = $100 + 1.

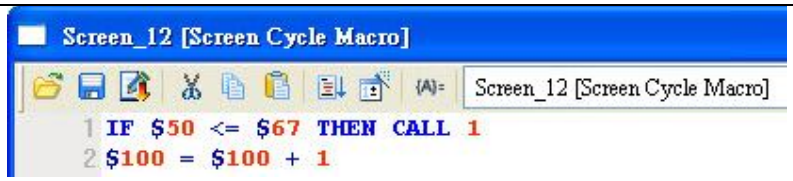
(6) IF <=			
Expression	**What Variables Represent**		**NOTE**
IF Var1 <= Var2 THEN CALL Var3 (W) IF Var1 <= Var2 THEN CALL Var3 (DW) IF Var1 <= Var2 THEN CALL Var3 (Signed W) IF Var1 <= Var2 THEN CALL Var3 (Signed DW)	Var 1	condition1	W : Word DW : Double Word Signed : Signed number
	Var 2	condition2	
	Var 3	Label identifier	
	Expression Explanation		
	If condition 1 is smaller than or equals to condition 2, then call Var 3 (a submacro label).		

Variable	Memory Usage		
	Internal Memory	PLC Register	Constant
Var 1	◎		◎
Var 2	◎		◎
Var 3			◎

Example

- Var 1 and Var 2 are internal memory addresses, and Var 3 is a constant.





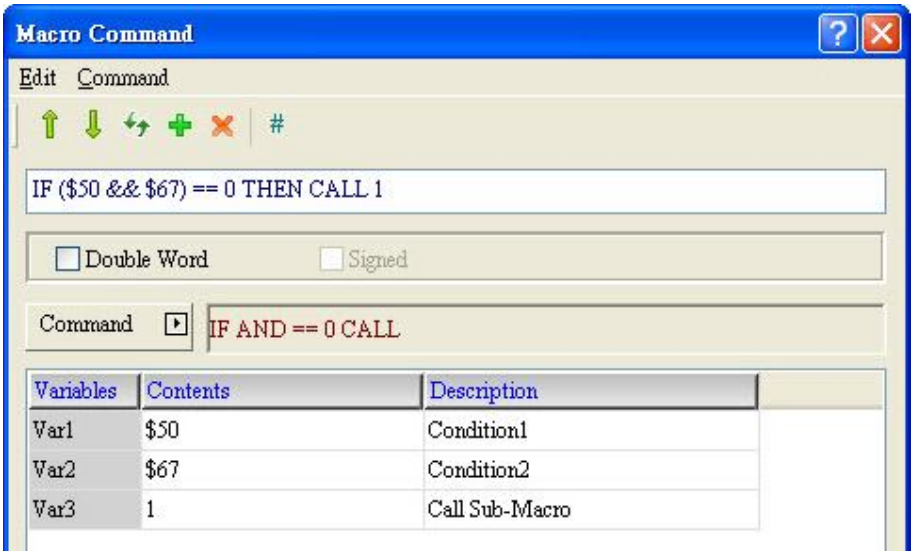
➢ If $50 is smaller than or equals to $67 (value comparison), then call the submacro labeled 1 ($100 = 200); otherwise, execute $100 = $100 + 1.

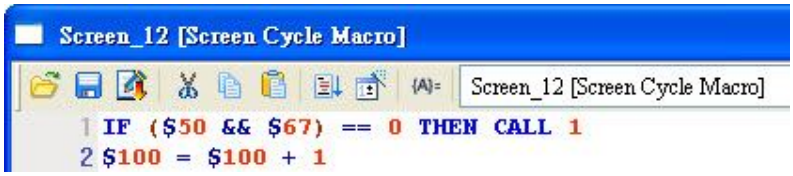
(7) IF AND == 0			
Expression	**What Variables Represent**		**NOTE**
IF (Var1 && Var2) == 0 THEN CALL Var3 (W) IF (Var1 && Var2) == 0 THEN CALL Var3 (DW)	Var 1	condition1	W : Word DW : Double Word
	Var 2	condition2	
	Var 3	Label identifier	
	Expression Explanation		
	If the result of Bitwise AND Operation between condition1 and condition2 is 0, then call the submacro labeled with Var 3.		

Variable	**Memory Usage**		
	Internal Memory	**PLC Register**	**Constant**
Var 1	◎		◎
Var 2	◎		◎
Var 3			◎

Example

➢ Var 1 and Var 2 are both internal memory addresses, and Var 3 is a constant.





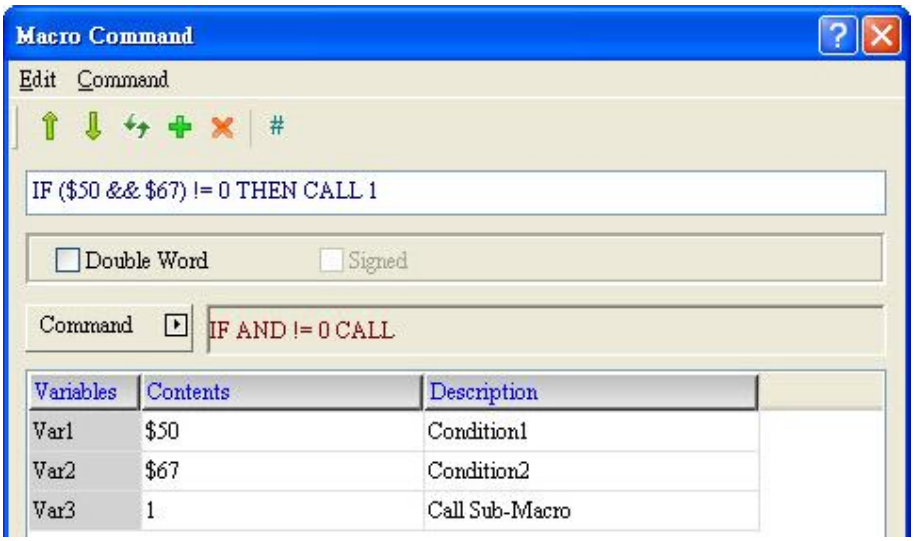
- If the result of Bitwise AND operation between $50 and $67 is 0, then call the submacro labeled 1 ($100 = 200); otherwise, execute $100 = $100 + 1.

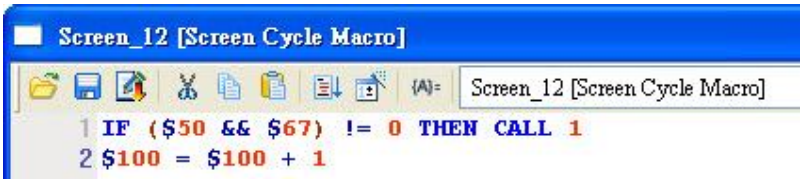
(8) IF AND != 0			
Expression	**What Variables Represent**		**NOTE**
IF (Var1 && Var2) != 0 THEN CALL Var3 (W) IF (Var1 && Var2) != 0 THEN CALL Var3 (DW)	Var 1	condition1	W : Word DW : Double Word
	Var 2	condition2	
	Var 3	Label identifier	
	Expression Explanation		
	If the result of Bitwise AND Operation between condition1 and condition2 is not 0, then call the submacro labeled with Var 3.		

Variable	**Memory Usage**		
	Internal Memory	**PLC Register**	**Constant**
Var 1	◎		◎
Var 2	◎		◎
Var 3			◎

Example

- Var 1 and Var 2 are both internal memory addresses, and Var 3 is a constant.





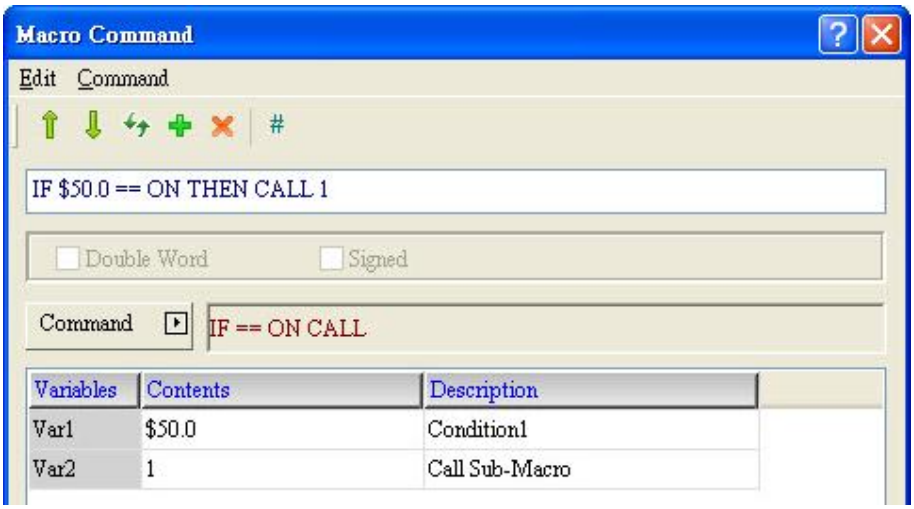
- If the result of Bitwise AND operation between $50 and $67 is not 0, then call the submacro labeled 1 ($100 = 200); otherwise, execute $100 = $100 + 1.

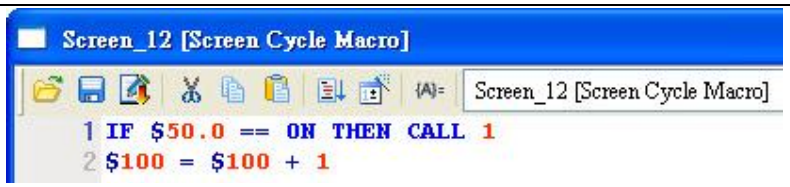
(9) IF == ON			
Expression	**What Variables Represent**		**NOTE**
IF Var1 == ON THEN CALL Var2 (W)	Var 1	condition1	W : Word
	Var 2	Label identifier	
	Expression Explanation		
	If condition1 is ON, then call the submacro labeled with Var 2.		

Variable	Memory Usage		
	Internal Memory	**PLC Register**	**Constant**
Var 1	◎ (Can only be Bit)		
Var 2			◎

Example

➢ Var 1 is the internal memory address, and Var 2 is a constant.





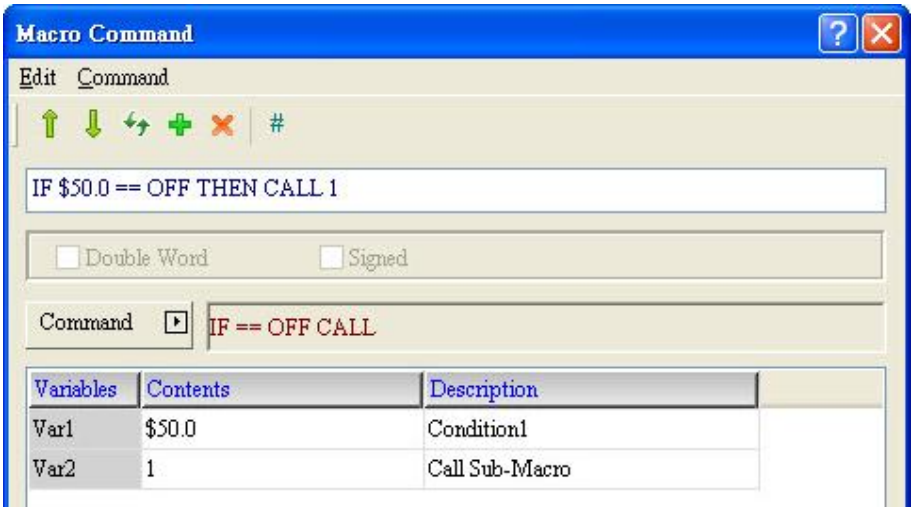
- If $50.0 is ON, then call the submacro labeled 1 ($100 = 200); otherwise, execute $100 = $100 + 1.

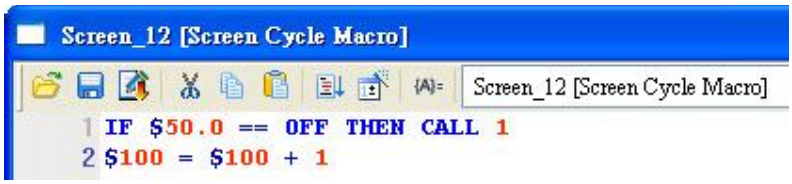
(10) IF == OFF			
Expression	**What Variables Represent**		**NOTE**
IF Var1 == OFF THEN CALL Var2 (W)	Var 1	condition1	W : Word
	Var 2	Label identifier	
	Expression Explanation		
	If condition1 is OFF, then call the submacro labeled with Var 2.		

Variable	**Memory Usage**		
	Internal Memory	**PLC Register**	**Constant**
Var 1	◎ (Can only be bit)		
Var 2			◎

Example

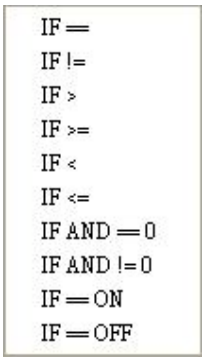
- Var 1 is the internal memory address, and Var 2 is a constant.





- If $50.0 is OFF, then call the submacro labeled 1 ($100 = 200); otherwise, execute $100 = $100 + 1.

■ IF…(If…)

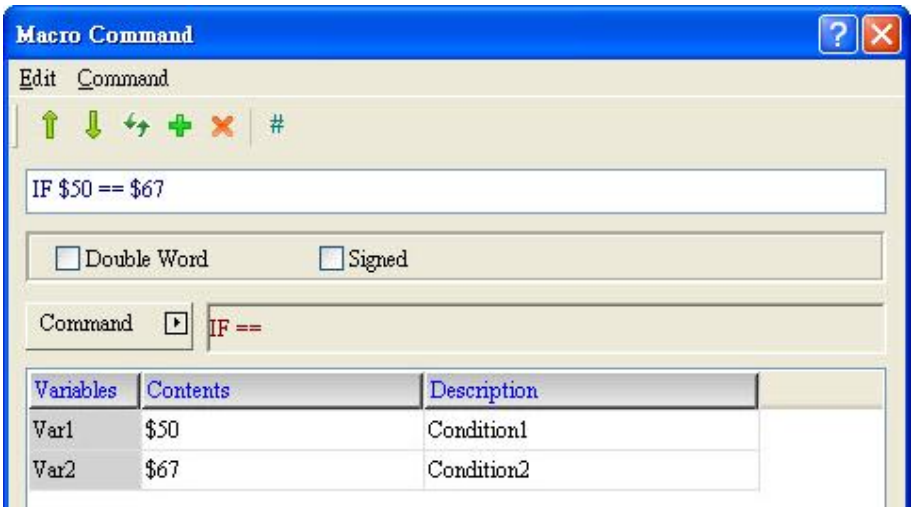


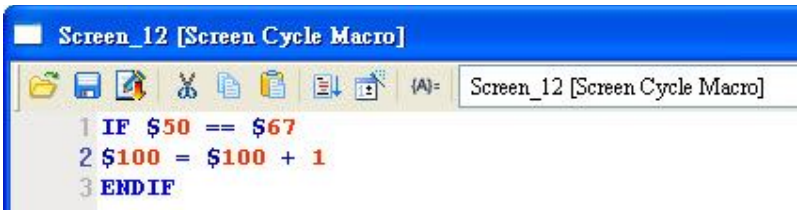
➢ There are 10 commands in the category of If… Macro, and they are introduced below.

(1) IF ==			
Expression	**What Variables Represent**		**NOTE**
IF Var1 == Var2 (W) IF Var1 == Var2 (DW) IF Var1 == Var2 (Signed W) IF Var1 == Var2 (Signed DW)	Var 1	condition1	W : Word DW : Double Word Signed : Signed number
	Var 2	condition2	
	Expression Explanation		
	If condition1 equals to condition2, then execute…		
*ENDIF is required at end of the IF Macro, or error messages will pop up during compile.			

Variable	**Memory Usage**		
	Internal Memory	**PLC Register**	**Constant**
Var 1	◎		◎
Var 2	◎		◎
Var 3			◎

Example
➢ Var 1 and Var 2 are both internal memory addresses, and Var 3 is a constant.





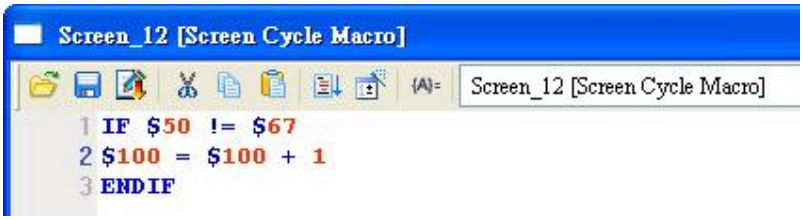
- If $50 equals to $67 (value comparison), then execute $100 = $100+1; if $50 is larger or smaller than $67, then do not execute $100 = $100 + 1.

(2) IF !=			
Expression	**What Variables Represent**		**NOTE**
IF Var1 != Var2 (W) IF Var1 != Var2 (DW) IF Var1 != Var2 (Signed W) IF Var1 != Var2 (Signed DW)	Var 1	condition1	W : Word DW : Double Word Signed : Signed number
	Var 2	condition2	
	Expression Explanation		
	If condition1 does not equal to condition2, then execute…		
*ENDIF is required at end of the IF Macro, or error messages will pop up during compile.			

Variable	Memory Usage		
	Internal Memory	**PLC Register**	**Constant**
Var 1	◎		◎
Var 2	◎		◎
Var 3			◎

Example

- Var 1 and Var 2 are both internal memory addresses, and Var 3 is a constant.



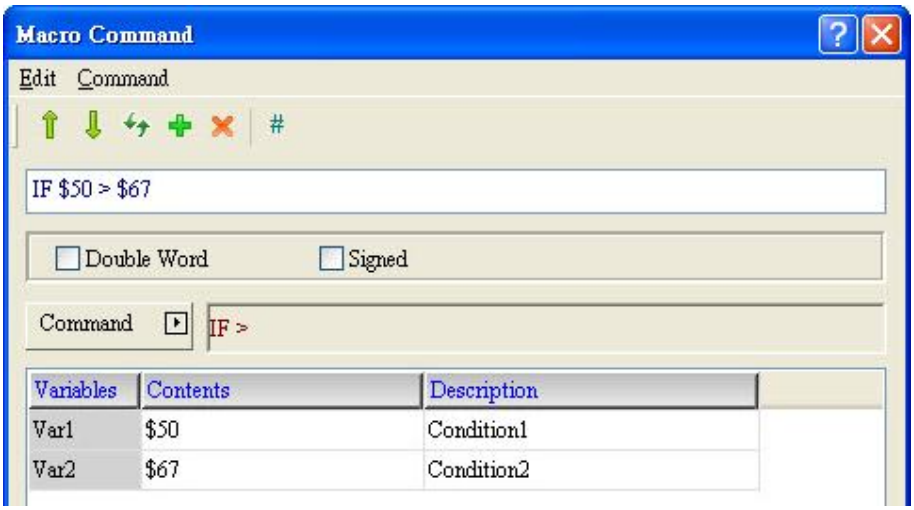
- If $50 does not equal to $67 (value comparison), then execute $100 = $100+1; otherwise, do not execute $100 = $100 + 1.

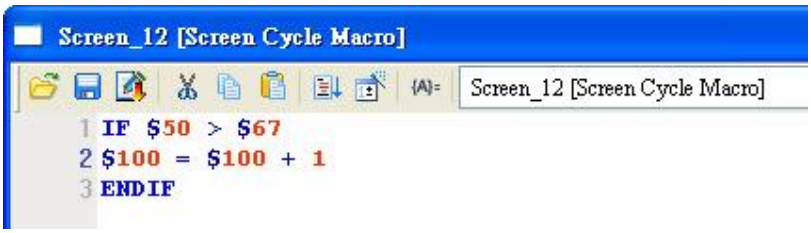
(3) IF >			
Expression	**What Variables Represent**		**NOTE**
IF Var1 > Var2 (W) IF Var1 > Var2 (DW) IF Var1 > Var2 (Signed W) IF Var1 > Var2 (Signed DW)	Var 1	condition1	W : Word DW : Double Word Signed : Signed number
	Var 2	condition2	
	Expression Explanation		
	If condition1 is larger than condition2, then execute…		
*ENDIF is required at end of the IF Macro, or error messages will pop up during compile.			

Variable	**Memory Usage**		
	Internal Memory	**PLC Register**	**Constant**
Var 1	◎		◎
Var 2	◎		◎
Var 3			◎

Example

- Var 1 and Var 2 are both internal memory addresses, and Var 3 is a constant.





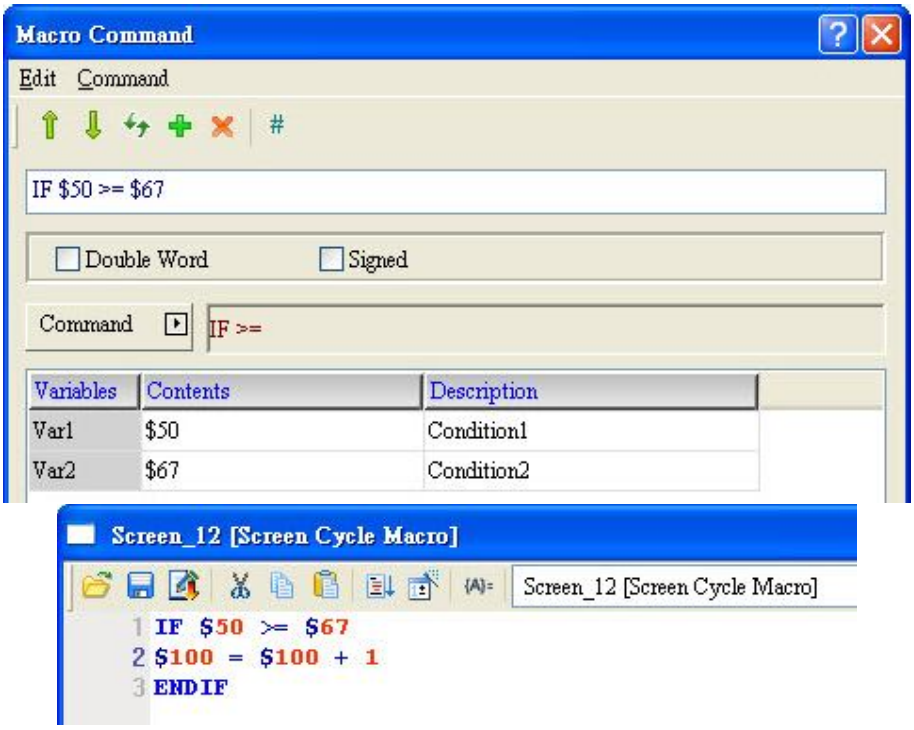
- If $50 is larger than $67 (value comparison), then execute $100 = $100+1; otherwise, do not execute $100 = $100 + 1.

(4) IF >=			
Expression	**What Variables Represent**		**NOTE**
IF Var1 >= Var2 (W) IF Var1 >= Var2 (DW) IF Var1 >= Var2 (Signed W) IF Var1 >= Var2 (Signed DW)	Var 1	condition1	W : Word DW : Double Word Signed : Signed number
	Var 2	condition2	
	Expression Explanation		
	If condition1 is larger than or equals to condition2, then execute…		
*ENDIF is required at end of the IF Macro, or error messages will pop up during compile.			

Variable	**Memory Usage**		
	Internal Memory	**PLC Register**	**Constant**
Var 1	◎		◎
Var 2	◎		◎
Var 3			◎

Example

- Var 1 and Var 2 are both internal memory addresses, and Var 3 is a constant.

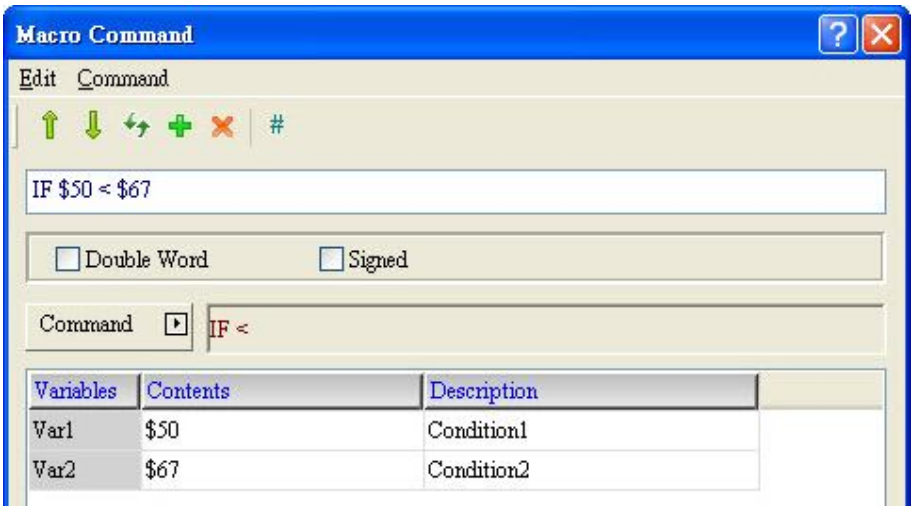


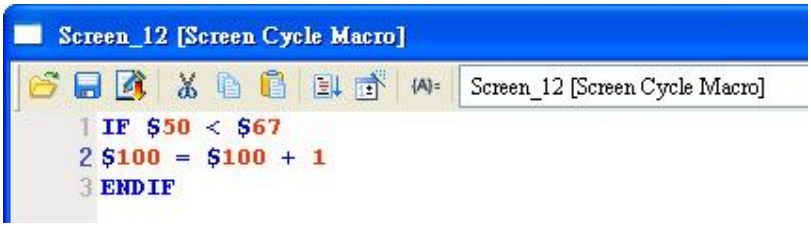
- If $50 is larger than or equal to $67 (value comparison), then execute $100 = $100+1; otherwise, do not execute $100 = $100 + 1.

(5) IF <			
Expression	**What Variables Represent**		**NOTE**
IF Var1 < Var2 (W) IF Var1 < Var2 (DW) IF Var1 < Var2 (Signed W) IF Var1 < Var2 (Signed DW)	Var 1	condition1	W : Word DW : Double Word Signed : Signed number
	Var 2	condition2	
	Expression Explanation		
	If condition1 is smaller than condition2, then execute…		
*ENDIF is required at end of the IF Macro, or error messages will pop up during compile.			

Variable	**Memory Usage**		
	Internal Memory	**PLC Register**	**Constant**
Var 1	◎		◎
Var 2	◎		◎
Var 3			◎

Example
➢ Var 1 and Var 2 are both internal memory addresses, and Var 3 is a constant.





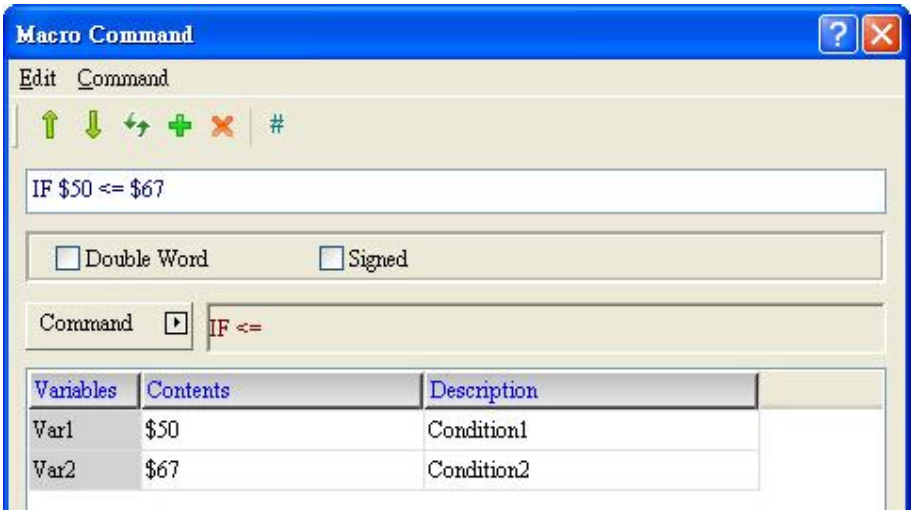
➢ If $50 is smaller than $67 (value comparison), then execute $100 = $100+1; otherwise, do not execute $100 = $100 + 1.

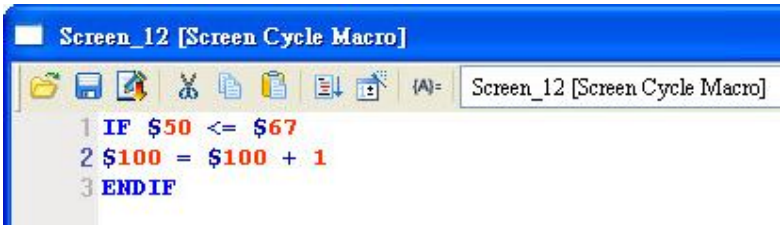
(6) IF <=			
Expression	**What Variables Represent**		**NOTE**
IF Var1 <= Var2 (W) IF Var1 <= Var2 (DW) IF Var1 <= Var2 (Signed W) IF Var1 <= Var2 (Signed DW)	Var 1	condition1	W : Word DW : Double Word Signed : Signed number
	Var 2	condition2	
	Expression Explanation		
	If condition1 is smaller than or equals to condition2, then execute…		
*ENDIF is required at end of the IF Macro, or error messages will pop up during compile.			

Variable	Memory Usage		
	Internal Memory	**PLC Register**	**Constant**
Var 1	◎		◎
Var 2	◎		◎
Var 3			◎

Example

- Var 1 and Var 2 are both internal memory addresses, and Var 3 is a constant.





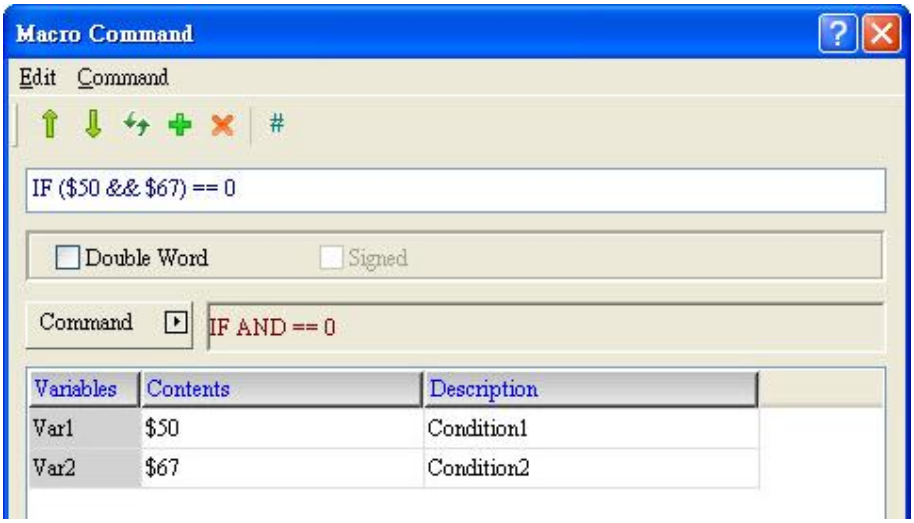
- If $50 is smaller than or equals to $67 (value comparison), then execute $100 = $100+1; otherwise, do not execute $100 = $100 + 1.

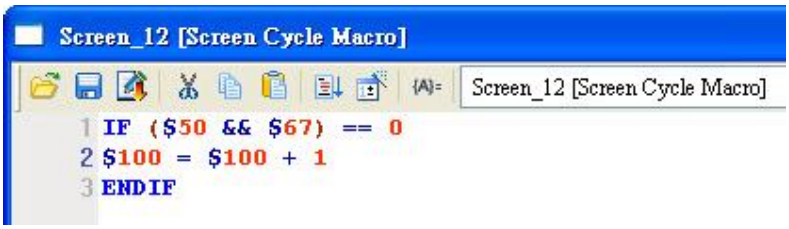
(7) IF AND == 0			
Expression	**What Variables Represent**		**NOTE**
IF (Var1 && Var2) == 0 (W) IF (Var1 && Var2) == 0 (DW)	Var 1	condition1	W : Word DW : Double Word
	Var 2	condition2	
	Expression Explanation		
	If the result of Bitwise AND Operation between condition1 and condition2 is 0, then execute ...		

Variable	**Memory Usage**		
	Internal Memory	**PLC Register**	**Constant**
Var 1	◎		◎
Var 2	◎		◎

Example

- Var 1 and Var 2 are both internal memory addresses.





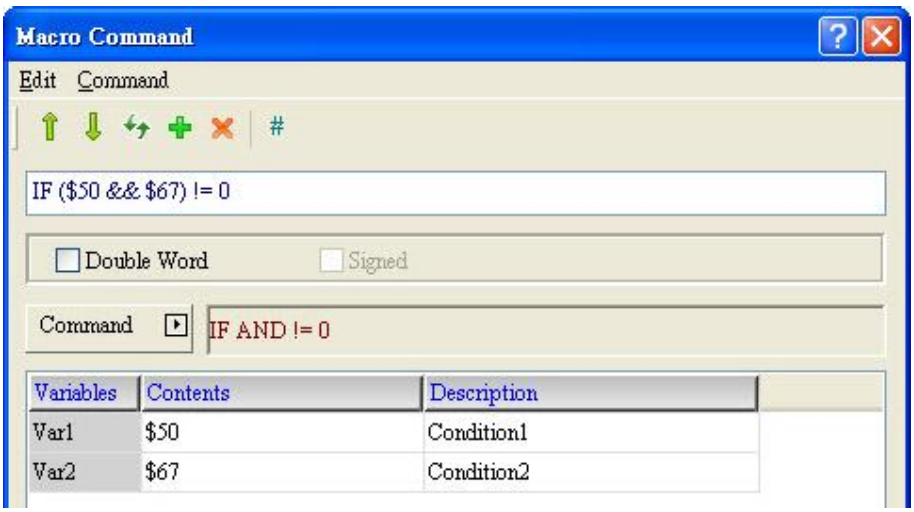
- If the result of Bitwise AND Operation between $50 and $67 is 0, then execute $100 = $100+1; otherwise, do not execute $100 = $100 + 1.

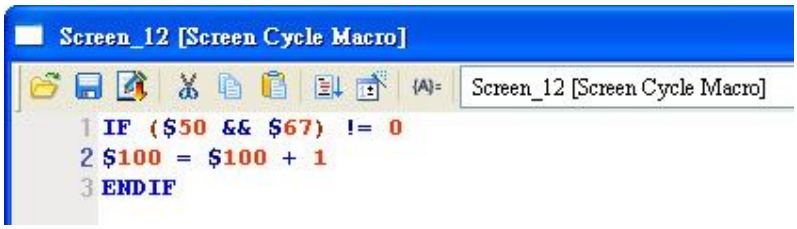
(8) IF AND != 0			
Expression	**What Variables Represent**		**NOTE**
IF (Var1 && Var2) != 0 (W) IF (Var1 && Var2) != 0 (DW)	Var 1	condition1	W : Word DW : Double Word
	Var 2	condition2	
	Expression Explanation		
	If the result of Bitwise AND Operation between condition1 and condition2 is not 0, then execute ...		

Variable	Memory Usage		
	Internal Memory	**PLC Register**	**Constant**
Var 1	◎		◎
Var 2	◎		◎

Example

- Var 1 and Var 2 are both internal memory addresses.





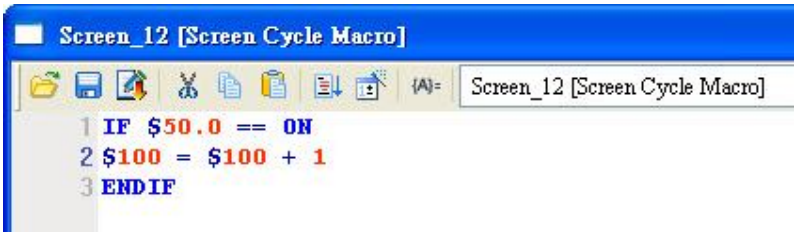
- If the result of Bitwise AND Operation between $50 and $67 is not 0, then execute $100 = $100+1; otherwise, do not execute $100 = $100 + 1.

(9) IF == ON			
Expression	**What Variables Represent**		**NOTE**
IF Var1 == ON (W)	Var 1	condition1	W : Word
	Expression Explanation		
	If condition1 is ON, then execute…		

Variable	**Memory Usage**		
	Internal Memory	**PLC Register**	**Constant**
Var 1	◎ (Can only be Bit)		

Example

- Var 1 is an internal memory address.



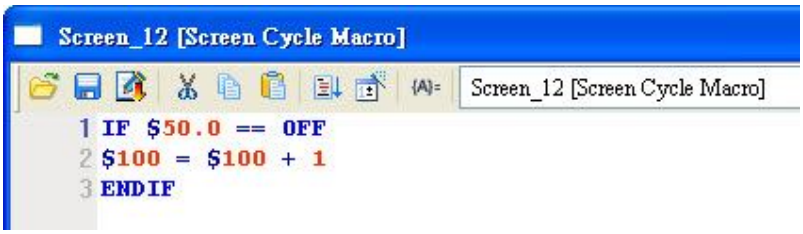
- If $50.0 is ON, then execute $100 = $100 + 1; otherwise, do not execute $100 = $100 + 1.

(10) IF == OFF			
Expression	**What Variables Represent**		**NOTE**
IF Var1 == OFF (W)	Var 1	condition1	W : Word
	Expression Explanation		
	If condition1 is OFF, then execute…		

Variable	**Memory Usage**		
	Internal Memory	**PLC Register**	**Constant**
Var 1	◎ (Can only be Bit)		

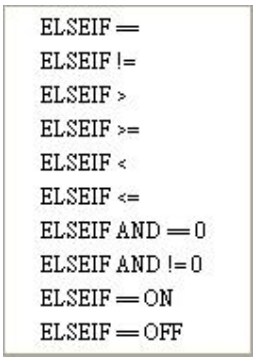
Example

- Var 1 is an internal memory address.



- If $50.0 is OFF, then execute $100 = $100 + 1; otherwise, do not execute $100 = $100 + 1.

■ ELSEIF… (Else…)

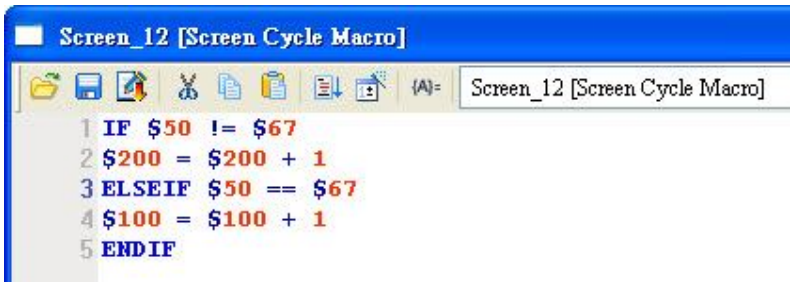


➢ There are 10 commands in the category of ELSEIF …Macro, and they are introduced below:

<table>
<tr><th colspan="4">(1) ELSEIF ==</th></tr>
<tr><th>Expression</th><th colspan="2">What Variables Represent</th><th>NOTE</th></tr>
<tr><td rowspan="4">ELSEIF Var1 == Var2 (W)
ELSEIF Var1 == Var2 (DW)
ELSEIF Var1 == Var2 (Signed W)
ELSEIF Var1 == Var2 (Signed DW)</td><td>Var 1</td><td>condition1</td><td rowspan="4">W : Word
DW : Double Word
Signed : Signed number</td></tr>
<tr><td>Var 2</td><td>condition2</td></tr>
<tr><th colspan="2">Expression Explanation</th></tr>
<tr><td colspan="2">Or else, if condition1 equals to condition2, then execute…</td></tr>
<tr><td colspan="4">*IF…ENDIF is required to pair up with ELSEIF Macro commands, or error messages will pop up during compile.</td></tr>
</table>

Variable	Memory Usage		
	Internal Memory	PLC Register	Constant
Var 1	◎		◎
Var 2	◎		◎

Example
➢ Var 1 and Var 2 are both internal memory addresses.



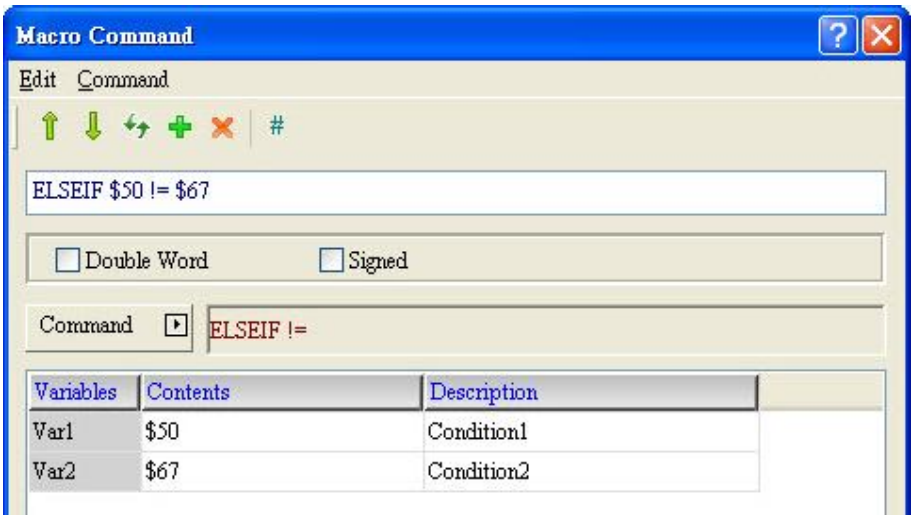
➢ If $50 does not equal to $67 (value comparison), then execute $200 = $200+1; otherwise, then execute $100 = $100 + 1.

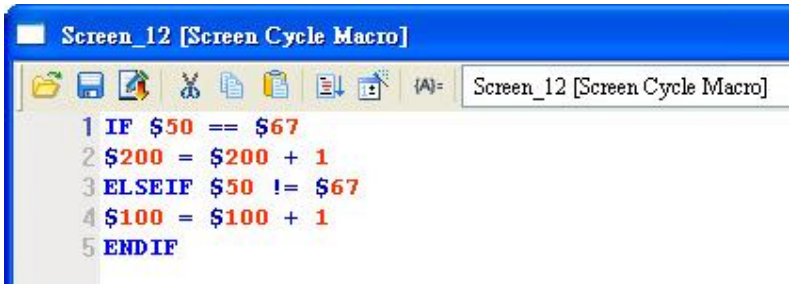
(2) ELSEIF !=			
Expression	**What Variables Represent**		**NOTE**
ELSEIF Var1 != Var2 (W) ELSEIF Var1 != Var2 (DW) ELSEIF Var1 != Var2 (Signed W) ELSEIF Var1 != Var2 (Signed DW)	Var 1	condition1	W : Word DW : Double Word Signed : Signed number
	Var 2	condition2	
	Expression Explanation		
	Or else, if condition1 does not equal to condition2, then execute…		
*IF…ENDIF is required to pair up with the ELSEIF Macro commands, or error messages will pop up during compile.			

Memory Usage			
Variable	**Internal Memory**	**PLC Register**	**Constant**
Var 1	◎		◎
Var 2	◎		◎

Example

- Var 1 and Var 2 are both internal memory addresses.





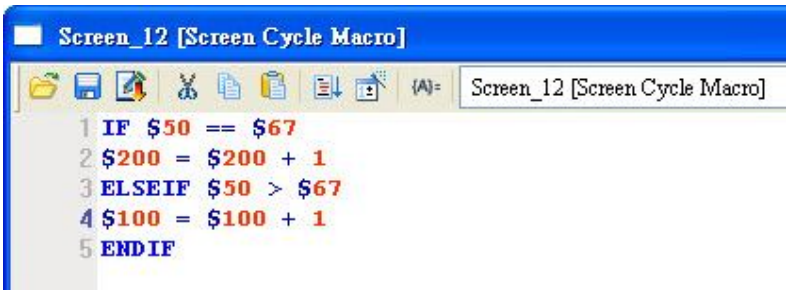
- If $50 equals to $67 (value comparison), then execute $200 = $200+1; otherwise, then execute $100 = $100 + 1.

(3) ELSEIF >			
Expression	**What Variables Represent**		**NOTE**
ELSEIF Var1 > Var2 (W) ELSEIF Var1 > Var2 (DW) ELSEIF Var1 > Var2 (Signed W) ELSEIF Var1 > Var2 (Signed DW)	Var 1	condition1	W : Word DW : Double Word Signed : Signed number
	Var 2	condition2	
	Expression Explanation		
	Or else, if condition1 is larger than condition2, then execute…		
*IF…ENDIF is required to pair up with the ELSEIF Macro commands, or error messages will pop up during compile.			

Variable	**Memory Usage**		
	Internal Memory	**PLC Register**	**Constant**
Var 1	◎		◎
Var 2	◎		◎

Example

- Var 1 and Var 2 are both internal memory addresses.



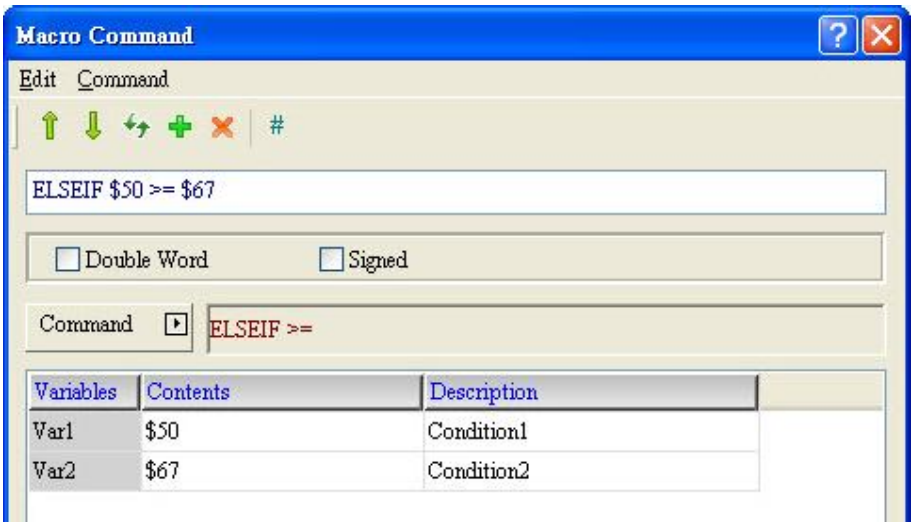
- If $50 equals to $67 (value comparison), then execute $200 = $200+1; or else if $50 is larger than $67, then execute $100 = $100 + 1.

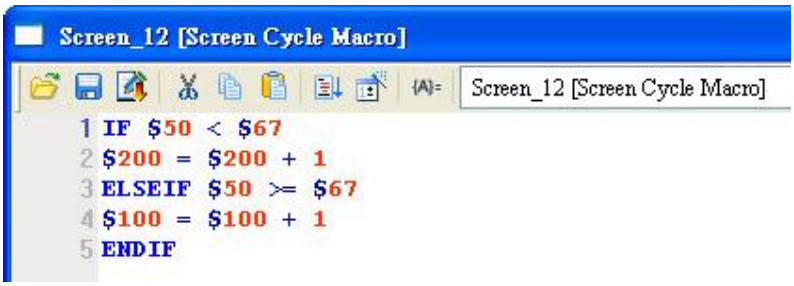
(4) ELSEIF >=			
Expression	**What Variables Represent**		**NOTE**
ELSEIF Var1 >= Var2 (W) ELSEIF Var1 >= Var2 (DW) ELSEIF Var1 >= Var2 (Signed W) ELSEIF Var1 >= Var2 (Signed DW)	Var 1	condition1	W : Word DW : Double Word Signed : Signed number
	Var 2	condition2	
	Expression Explanation		
	Or else, if condition1 is larger than or equals to condition2, then execute…		
*IF…ENDIF is required to pair up with the ELSEIF Macro commands, or error messages will pop up during compile.			

Variable	Memory Usage		
	Internal Memory	PLC Register	Constant
Var 1	◎		◎
Var 2	◎		◎

Example

➢ Var 1 and Var 2 are both internal memory addresses.





➢ If $50 is smaller than $67 (value comparison), then execute $200 = $200+1; otherwise, execute $100 = $100 + 1.

(5) ELSEIF <

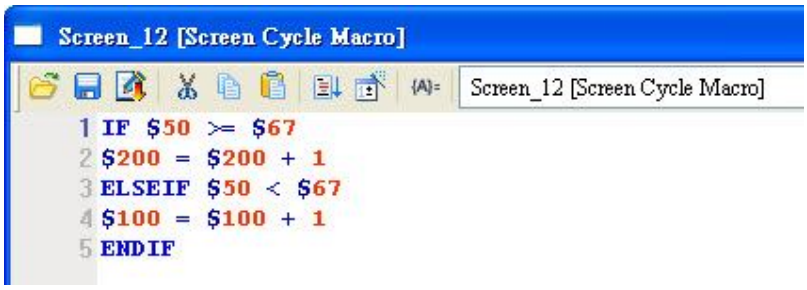
Expression	What Variables Represent		NOTE
ELSEIF Var1 < Var2 (W) ELSEIF Var1 < Var2 (DW) ELSEIF Var1 < Var2 (Signed W) ELSEIF Var1 < Var2 (Signed DW)	Var 1	condition1	W : Word DW : Double Word Signed : Signed number
	Var 2	condition2	
	Expression Explanation		
	Or else, if condition1 is smaller than condition2, then execute…		

*IF…ENDIF is required to pair up with the ELSEIF Macro commands, or error messages will pop up during compile.

Variable	Memory Usage		
	Internal Memory	PLC Register	Constant
Var 1	◎		◎
Var 2	◎		◎

Example

- Var 1 and Var 2 are both internal memory addresses.



- If $50 is larger than or equals to $67 (value comparison), then execute $200 = $200+1; or else if $50 is larger than $67, then execute $100 = $100 + 1.

(6) ELSEIF <=

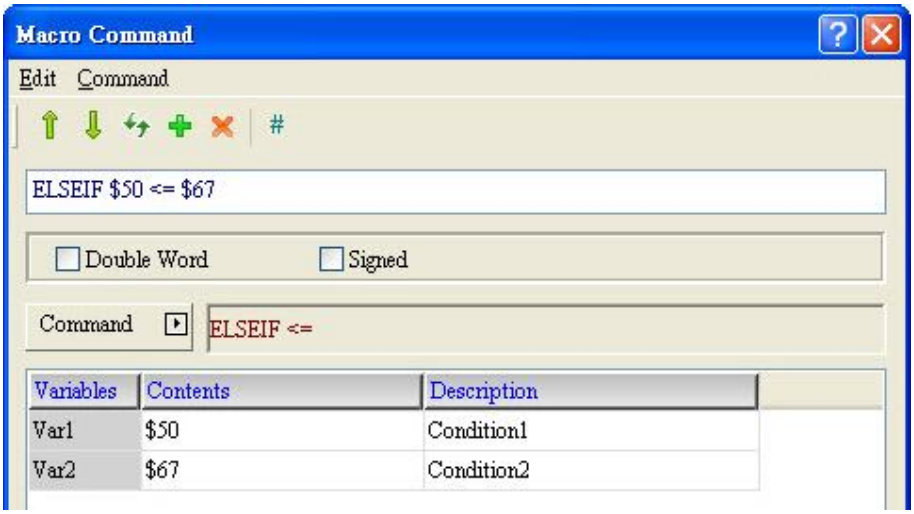
Expression	What Variables Represent		NOTE
ELSEIF Var1 <= Var2 (W) ELSEIF Var1 <= Var2 (DW) ELSEIF Var1 <= Var2 (Signed W) ELSEIF Var1 <= Var2 (Signed DW)	Var 1	condition1	W : Word DW : Double Word Signed : Signed number
	Var 2	condition2	
	Expression Explanation		
	Or else, if condition1 is smaller than or equals to condition2, then execute…		

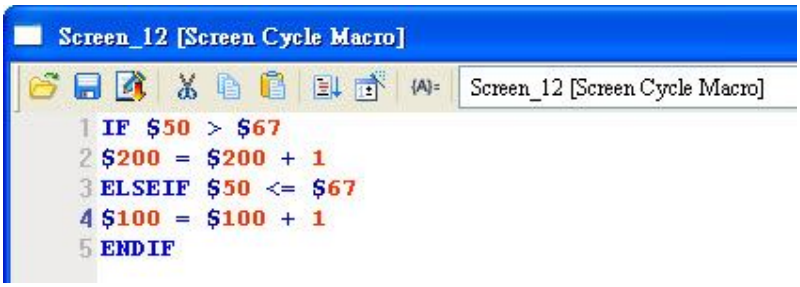
*IF…ENDIF is required to pair up with the ELSEIF Macro commands, or error messages will pop up during compile.

Variable	Memory Usage		
	Internal Memory	PLC Register	Constant
Var 1	◎		◎
Var 2	◎		◎

Example

- Var 1 and Var 2 are both internal memory addresses.





- If $50 is larger than $67 (value comparison), then execute $200 = $200+1; otherwise, execute $100 = $100 + 1.

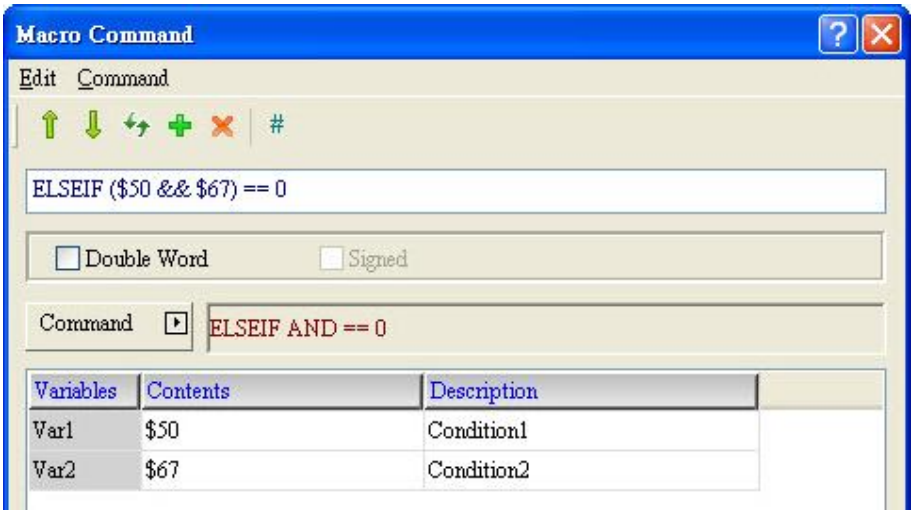
(7) ELSEIF AND == 0

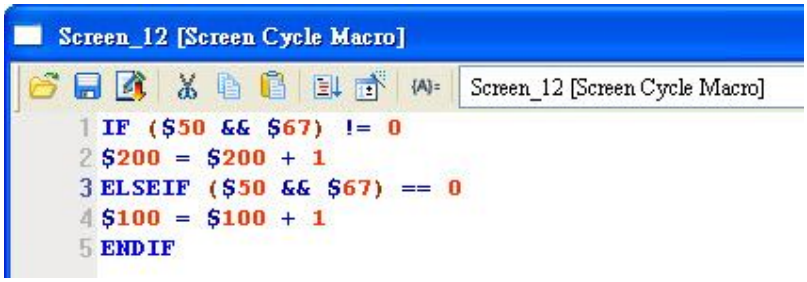
Expression	What Variables Represent		NOTE
ELSEIF (Var1 && Var2) == 0 (W) ELSEIF (Var1 && Var2) == 0 (DW)	Var 1	condition1	W : Word DW : Double Word
	Var 2	condition2	
	Expression Explanation		
	Or else, if the result of Bitwise AND Operation between condition 1 and condition 2 is 0, then execute…		

Variable	Memory Usage		
	Internal Memory	PLC Register	Constant
Var 1	◎		◎
Var 2	◎		◎

Example

➢ Var 1 and Var 2 are both internal memory addresses.





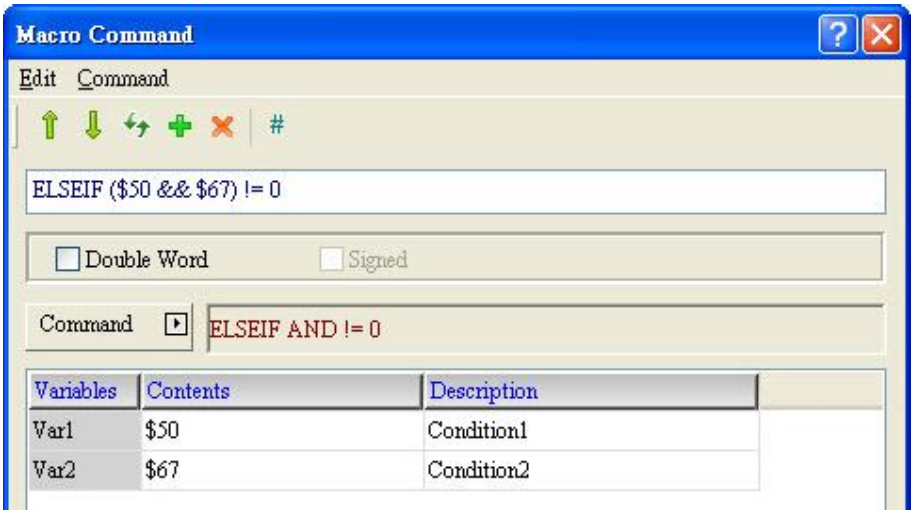
➢ If the result of Bitwise AND Operation between $50 and $67 is not 0, then execute $200 = $200+1; otherwise, execute $100 = $100 + 1.

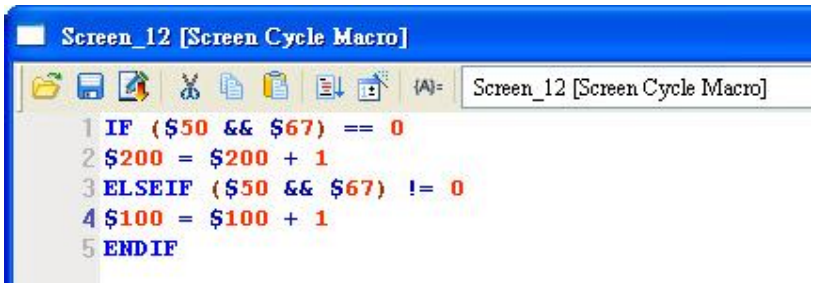
(8) ELSEIF AND != 0			
Expression	**What Variables Represent**		**NOTE**
ELSEIF (Var1 && Var2) != 0 (W) ELSEIF (Var1 && Var2) != 0 (DW)	Var 1	condition1	W : Word DW : Double Word
	Var 2	condition2	
	Expression Explanation		
	Or else, if the result of Bitwise AND Operation between condition 1 and condition 2 is not 0, then execute…		

Variable	Memory Usage		
	Internal Memory	PLC Register	Constant
Var 1	◎		◎
Var 2	◎		◎

Example

- Var 1 and Var 2 are both internal memory addresses.





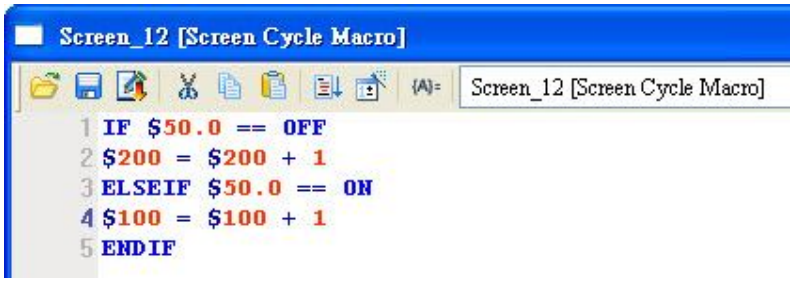
- If the result of Bitwise AND Operation between $50 and $67 is 0, then execute $200 = $200+1; otherwise, execute $100 = $100 +1.

(9) ELSEIF == ON			
Expression	**What Variables Represent**		**NOTE**
ELSEIF Var1 == ON (W)	Var 1	condition1	W : Word
	Expression Explanation		
	Or else, if condition1 is ON, then execute…		

Variable	Memory Usage		
	Internal Memory	PLC Register	Constant
Var 1	◎ (Can only be Bit)		

Example

➢ Var 1 is the internal memory address.



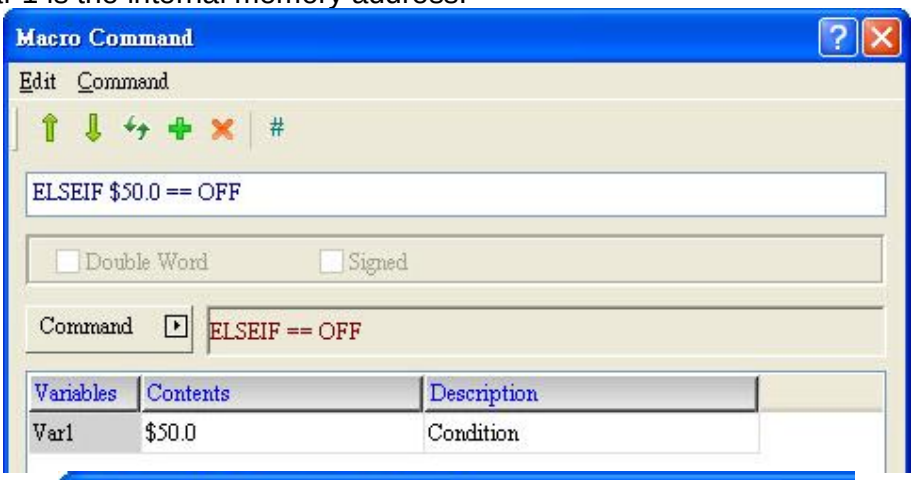
➢ If $50.0 is OFF, then execute $200 = $200 + 1; if $50.0 is ON, then execute $100 = $100 + 1.

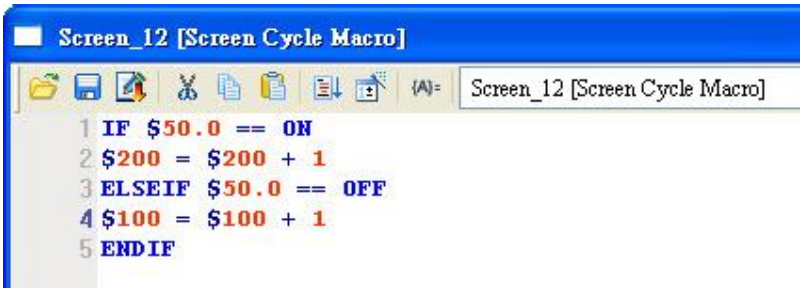
(10) ELSEIF == OFF			
Expression	**What Variables Represent**		**NOTE**
ELSEIF Var1 == OFF (W)	Var 1	condition1	W : Word
	Expression Explanation		
	Or else, if condition1 is OFF, then execute…		

Variable	Memory Usage		
	Internal Memory	PLC Register	Constant
Var 1	◎ (Can only be Bit)		

Example

- Var 1 is the internal memory address.

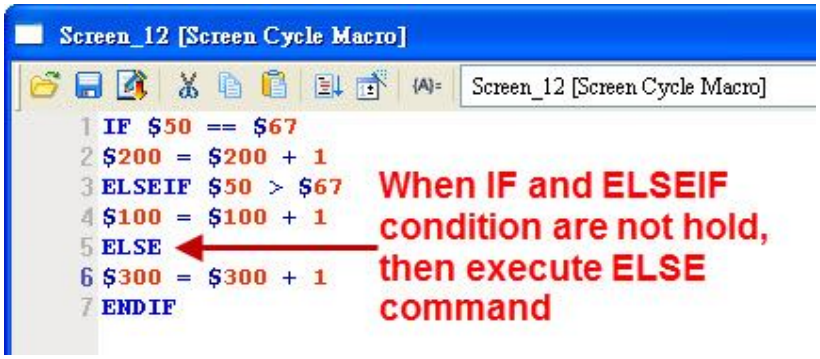




- If $50.0 is ON, then execute $200 = $200 + 1; if $50.0 is OFF, then execute $100 = $100 + 1.

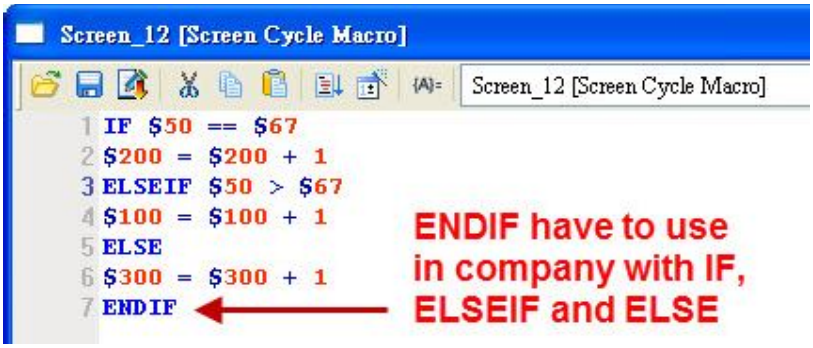
■ ELSE

The Else command is used to execute other procedures when either the If or Elseif statement is not true. Else needs to pair up with If and Endif, or error messages will pop up during compile.



■ ENDIF

ENDIF is primarily used to pair up with commands such as If…, Else, and Eseif…

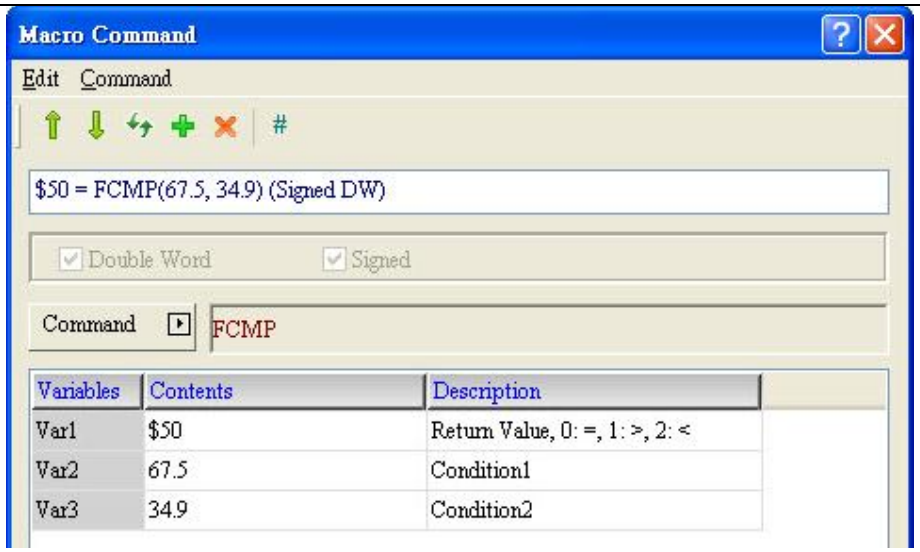


■ FCMP (Comparison of Floating Point Data)

Expression	What Variables Represent			NOTE
Var1 = FCMP(Var2, Var3) (Signed DW)	Var 1	Returned the compared result.		DW : Double Word Signed : Signed number
		=	0	
		>	1	
		<	2	
	Var 2	condition1		
	Var 3	condition2		
	Expression Explanation			
	Compare Var 2 and Var 3 and save the result in Var 1.			

Variable	Memory Usage		
	Internal Memory	PLC Register	Constant
Var 1	◎		
Var 2	◎		◎
Var 3	◎		◎

Example
➢ Var 1 is an internal memory address, and Var 2 and Var 3 are constants.



- Compare with Var 2 and Var 3 value, and return value of 0, 1, 2. Due to 67.5 is greater than 34.9, so return value for 1. The $50 will display value for 1.

24-3-6 Flow Control

There are seven commands for flow control: GOTO, LABEL, CALL, RET, FOR, NEXT and END and with them, users can control the sequence of a program being executed. Their usages are detailed below.

Figure 24-3-6-1 Flow Control

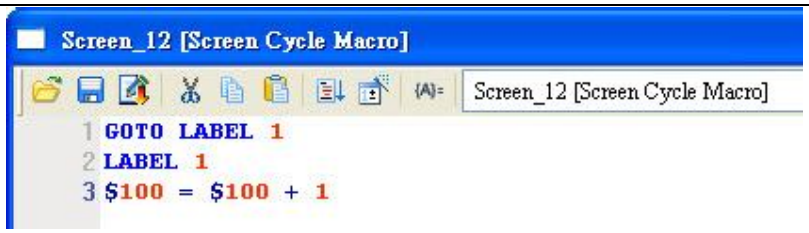
■ GOTO LABEL (label identifier for the current process to unconditionally jump to)

Expression	What Variables Represent		NOTE
GOTO LABEL Var1 (W)	Var 1	Label identifier for the current process to jump to	W : Word
	Expression Explanation		
	A designated identifier for the current process to directly jump to.		

Variable	Memory Usage		
	Internal Memory	PLC Register	Constant
Var 1			◎

Example

➢ Var 1 can only be Constant.



➢ Directly jump to Label 1 and the expression marked by Label 1 is $100 = $100 + 1.

■ LABEL (Label Identifier)

Expression	What Variables Represent		NOTE
LABEL Var1 (W)	Var 1	Label identifier for the current process to jump to	W : Word
	Expression Explanation		
	A designated identifier for the current process to directly jump to.		
* Each label has to have its unique label name and no identical label name is allowed for another label within the same macro.			

Variable	Memory Usage		
	Internal Memory	PLC Register	Constant
Var 1			◎

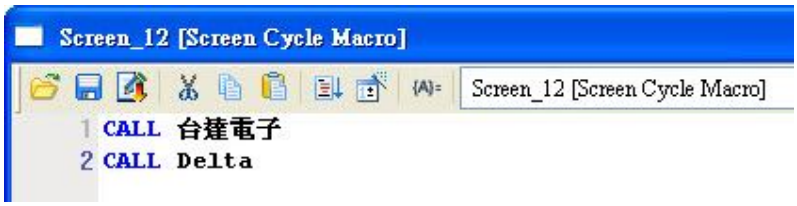
Example

➢ Var 1 can only be Constant.

■ CALL (Call Submacro)

Expression	What Variables Represent		NOTE
CALL Var1 (W)	Var 1	Submacro ID(1~512)	W : Word
	Expression Explanation		
	A designated identifier for the current process to directly jump to.		

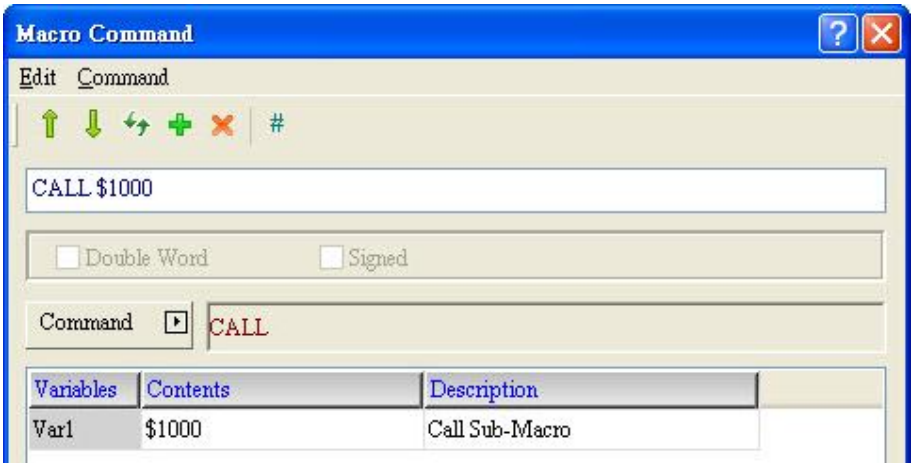
* Var 1 supports both Chinese and English names, but in such case, please manually enter the alias of the macro. The macro wizard only supports a submacro ID.



Variable	Memory Usage		
	Internal Memory	**PLC Register**	**Constant**
Var 1	◎		◎

Example

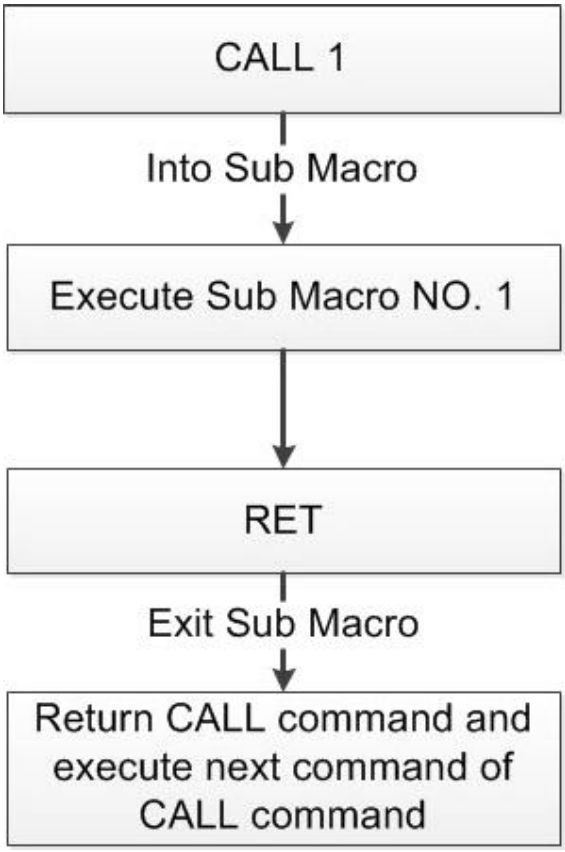
- Var 1 is an internal memory address.



- Users can enter submacro ID via $1000, or an internal memory address, to execute commands within a macro.

■ RET (Exit Submacro)

Expression	Expression Explanation	NOTE
RET	Exit a submacro and return back to the next line right after a submacro.	RET needs to be at the last line of a submacro and needs to pair up with the Call command.



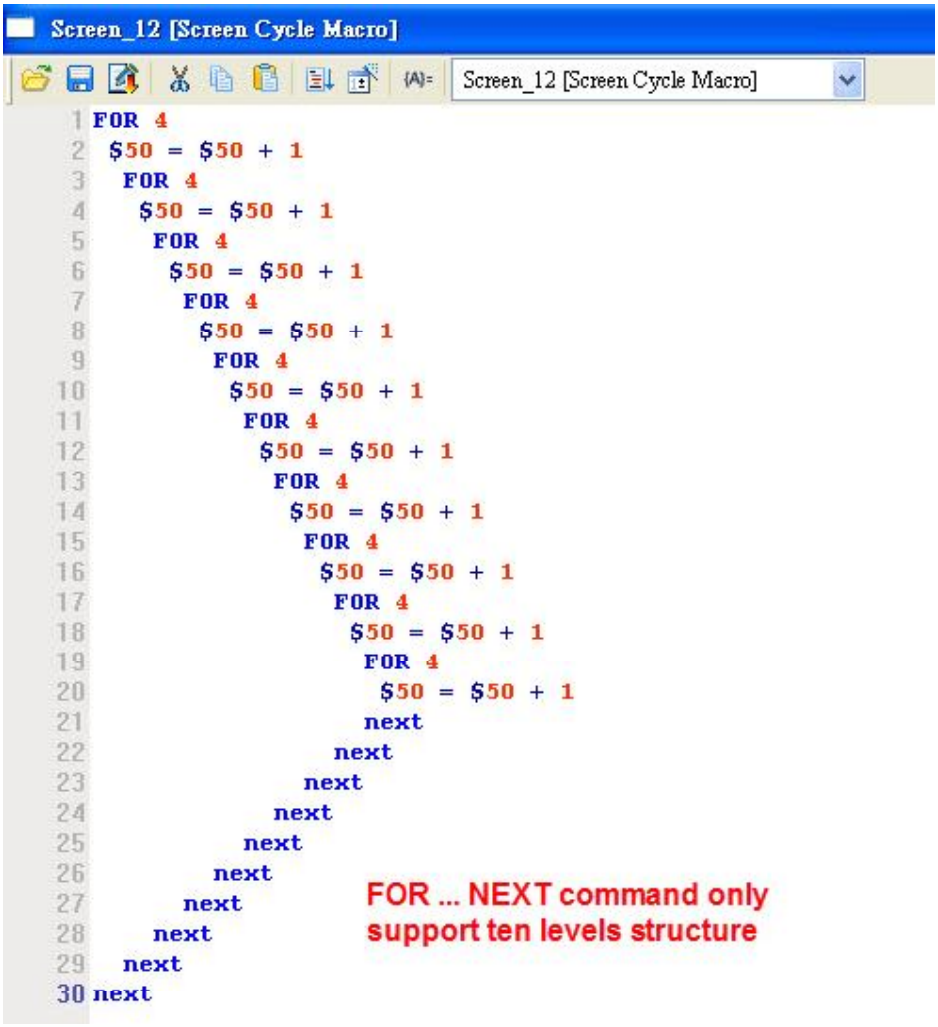
Example

➢ RET needs to be at end of a macro

■ FOR, NEXT (Loop)

Expression	What Variables Represent		NOTE
FOR Var1 (W)	Var 1	Number of loops	W : Word
	Expression Explanation		
	Statement to run the loop “Var 1” times		
Expression	**Expression Explanation**		**NOTE**
NEXT	Need to pair up with “For”		

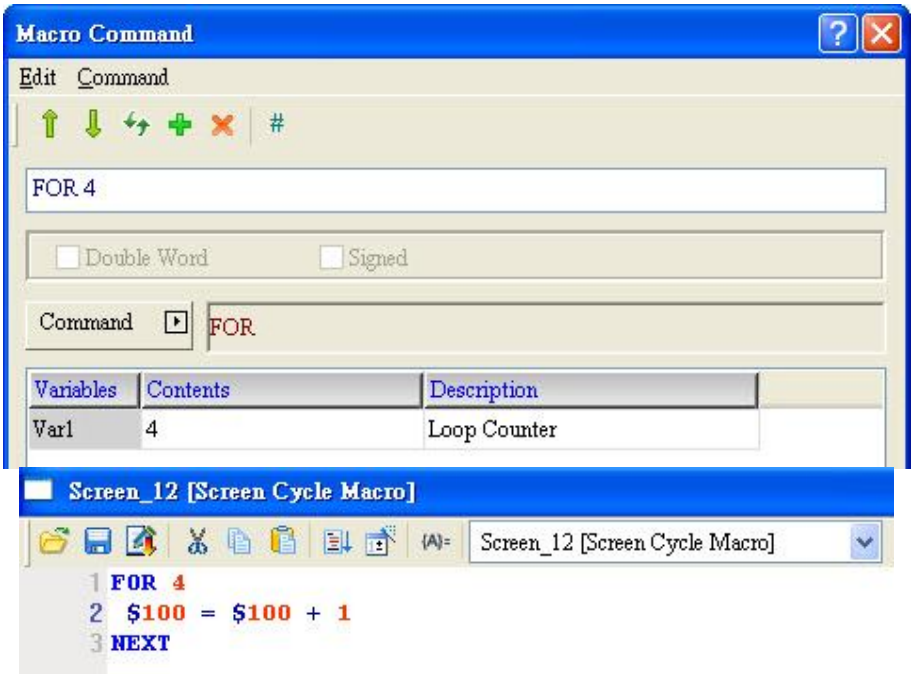
*multiple layers are possible (up to a maximum of three loops).



Variable	Memory Usage		
	Internal Memory	**PLC Register**	**Constant**
Var 1	◎		◎

Example

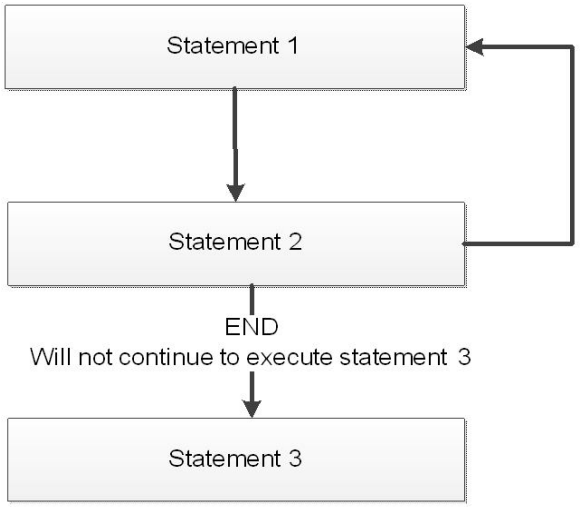
- Var 1 is a constant.



- For 4 means to execute the statement "$100 = $100 + 1" four times and hence, the result is 4.

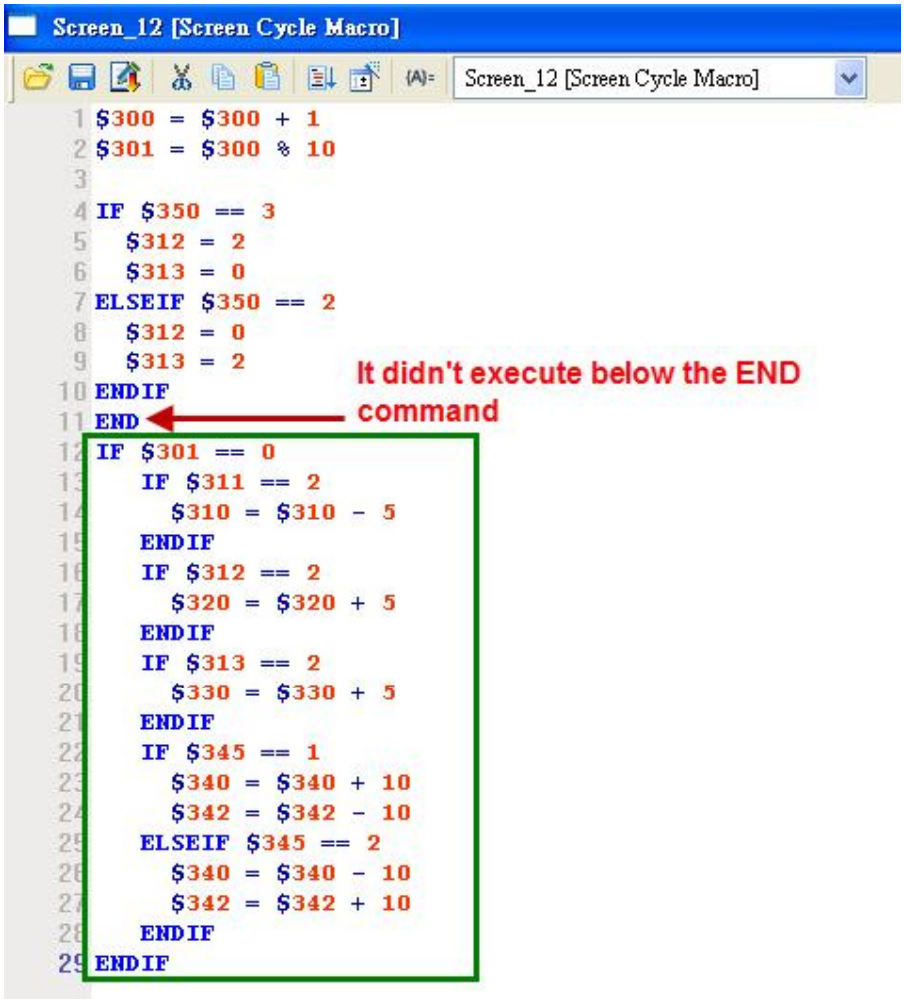
■ END (End Macro)

Expression	Expression Explanation	NOTE
END	End a macro.	If END command is used in a submacro, it indicates the program will not execute the next statement within the macro that the submacro belongs to.

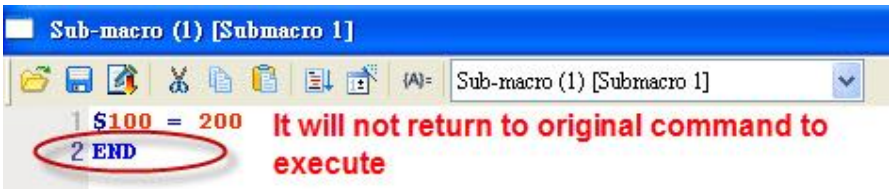


Example

- Below END command will not execute.



- If the END command is at the end of a submacro, it indicates the program will not execute the next statement within the macro the submacro belongs to.



24-3-7 Bit Settings

Four commands are available for Bit settings. With these commands, users can set the ON/OFF or inverse status of a bit, or display the value of a bit. These commands are detailed below.

Figure 24-3-7-1 Bit Settings

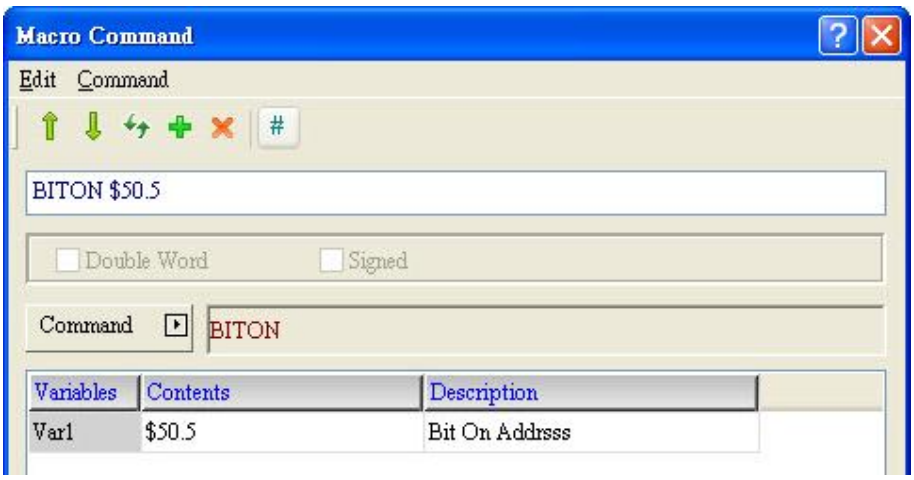
■ BITON (Set Bits to ON)

Expression	What Variables Represent		NOTE
BITON Var1 (W)	Var 1	Set the state of the bit	W : Word
	Expression Explanation		
	Set the n^{th} bit to ON (N as denoted by Var 1).		

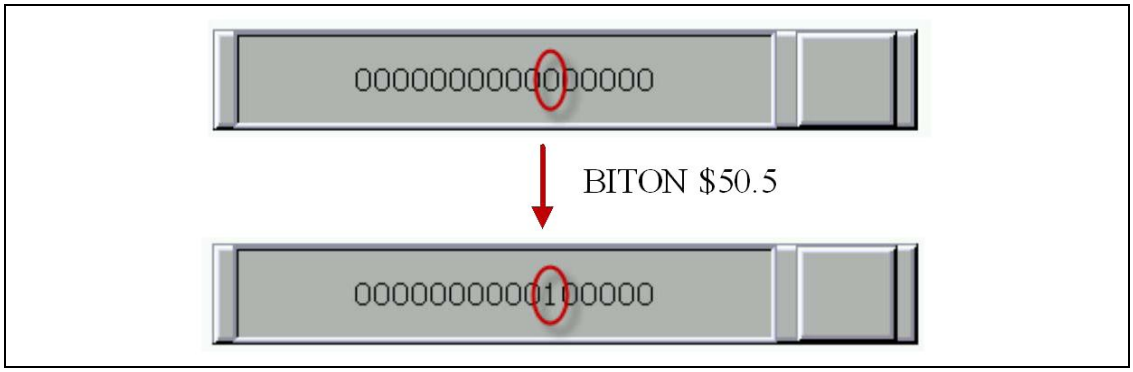
Variable	Memory Usage		
	Internal Memory	**PLC Register**	**Constant**
Var 1	◎ (Can only be Bit)	◎ (Can only be Bit)	

Example

- Var 1 is an internal memory address.



- Set $50 to be the variable to set the bit and data type to be binary. When executing BITON $50.5, then the fifth bit will be set to ON.



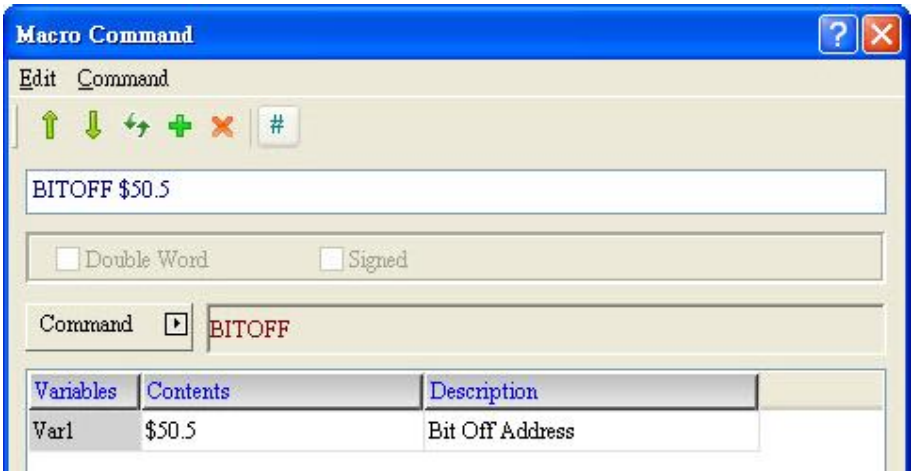
■ BITOFF (Set Bits to OFF)

Expression	What Variables Represent		NOTE
BITOFF Var1 (W)	Var 1	Set the state of the bit	W : Word
	Expression Explanation		
	Set the n^{th} bit to OFF (N as denoted by Var 1).		

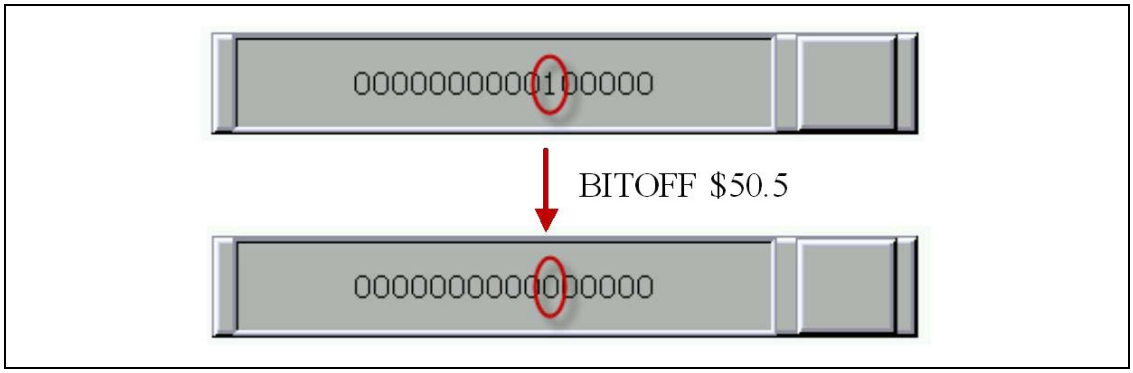
Variable	Memory Usage		
	Internal Memory	**PLC Register**	**Constant**
Var 1	◎ (Can only be Bit)	◎ (Can only be Bit)	

Example

➢ Var 1 is an internal memory address.



➢ Set $50 to be the variable to set the bit and data type to be binary. When executing BITOFF $50.5, then the fifth bit will be set to OFF.



■ BITNOT (Set the bit to inverse state, ON→OFF, OFF→ON)

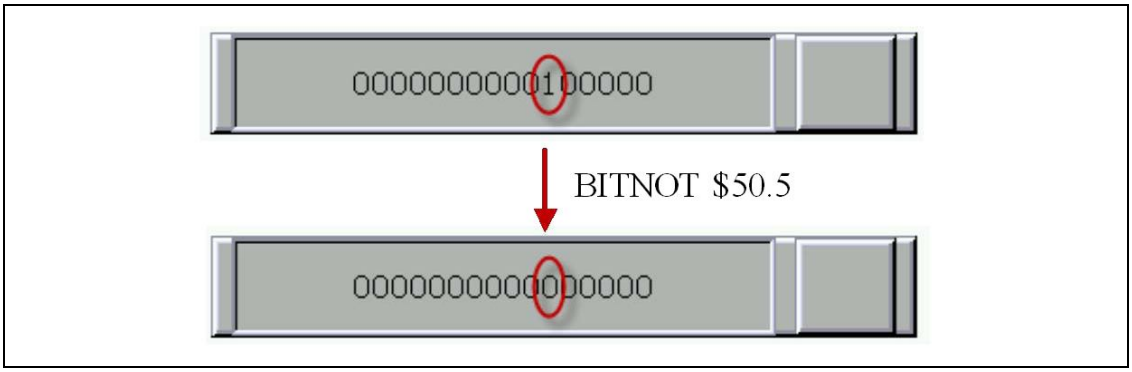
Expression	What Variables Represent		NOTE
BITNOT Var1 (W)	Var 1	Set the state of the bit	W : Word
	Expression Explanation		
	Set the n^{th} bit to its inverse state: ON→OFF or OFF→ON (N as denoted by Var 1).		

Variable	Memory Usage		
	Internal Memory	PLC Register	Constant
Var 1	◎ (Can only be bit)	◎ (Can only be bit)	

Example

➢ Var 1 is an internal memory address.

➢ Set $50 to be the variable to set the bit and data type to be binary. When executing BITNOT $50.5, then the fifth bit will be set from ON to OFF.



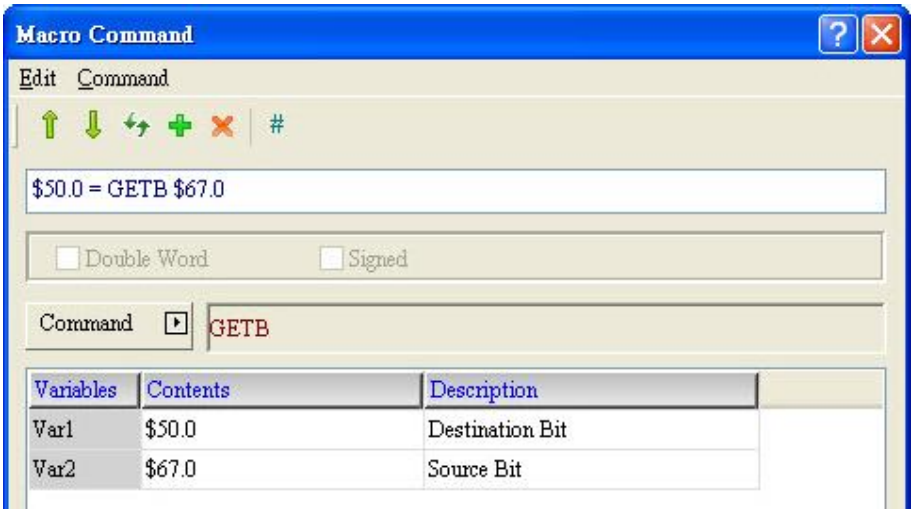
■ GETB (Acquire Bit State)

Expression	What Variables Represent		NOTE
(Var1) = GETB (Var2) (W)	Var 1	Set the state of the bit	W : Word
	Expression Explanation		
	Get n^{th} bit value and store it in Var 1(N as denoted by Var 2).		

Variable	Memory Usage		
	Internal Memory	PLC Register	Constant
Var 1	◎ (Can only be bit)	◎ (Can only be bit)	
Var 2	◎ (Can only be bit)	◎ (Can only be bit)	

Example

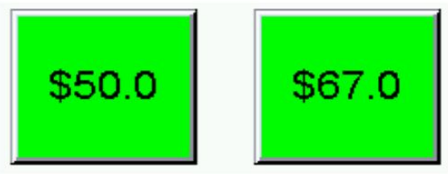
- Var 1 and Var 2 are both internal memory addresses.



- Set $50 to be the variable to set the bit and data type to be binary.
- Set $50.0 and $67.0 to be the ON button. When executing $50.0 = GETB

$67.0 and push the $67.0 button, then $50.0 will be triggered to be ON.

$$\$50.0 = \text{GETB}(\$67.0)$$



24-3-8 COM Port

COM Port macros are used to control com ports and they are detailed below.

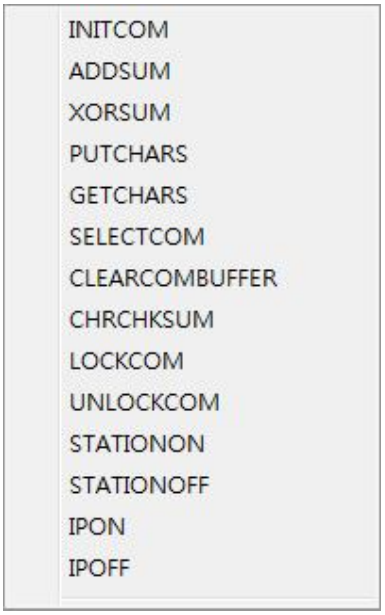


Figure 24-3-8-1 COM Port

■ INITCOM (COM Port Initialization)

<table>
<tr><th>Expression</th><th colspan="2">What Variables Represent</th><th>NOTE</th></tr>
<tr><td rowspan="11">Var1 = INITCOM(Var2, Var3, Var4, Var5, Var6, Var7, Var8) (W)</td><td rowspan="3">Var 1</td><td>Returned result</td><td rowspan="11">W : Word</td></tr>
<tr><td>0 : Failure</td></tr>
<tr><td>1 : Successful</td></tr>
<tr><td>Var 2</td><td>Com Port</td></tr>
<tr><td>Var 3</td><td>Interface</td></tr>
<tr><td>Var 4</td><td>Data Bit</td></tr>
<tr><td>Var 5</td><td>Parity</td></tr>
<tr><td>Var 6</td><td>Stop Bit</td></tr>
<tr><td>Var 7</td><td>Baud Rate</td></tr>
<tr><td>Var 8</td><td>Flow Control</td></tr>
<tr><td colspan="2">Expression Explanation</td></tr>
<tr><td colspan="2">Initialize com ports, open com ports, set the protocol (Var 2 ~ Var 8) and return the result of initialization back to Var 1.</td></tr>
</table>

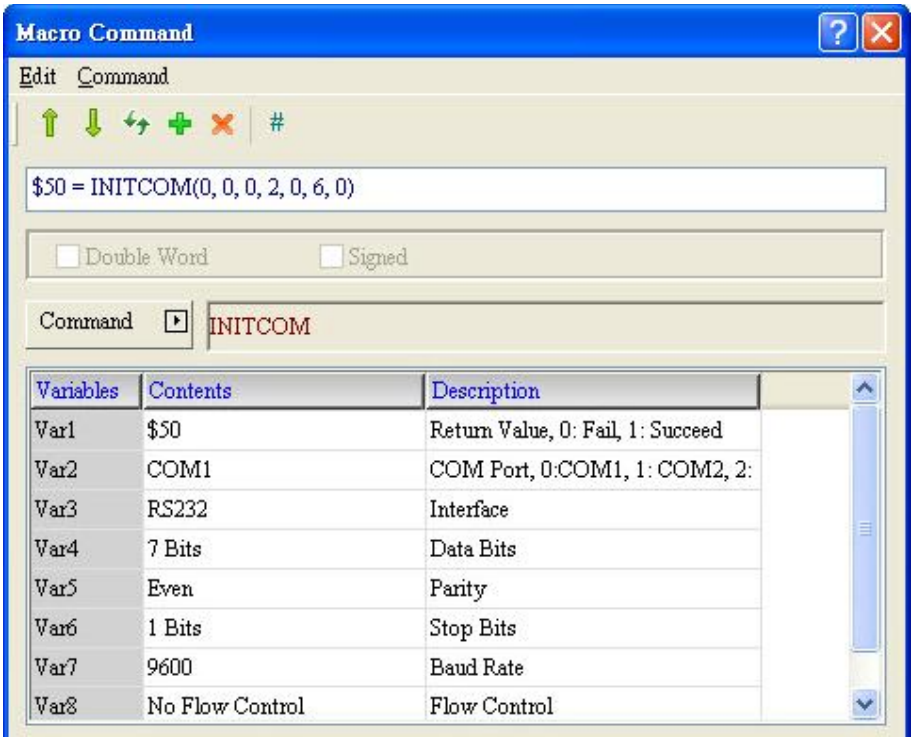
Variable	Memory Usage		
	Internal Memory	PLC Register	Constant
Var 1	◎		

Parameter Setup			
Variable	**Parameter**	**Parameter Details**	**Corresponding Codes**
Var 2	Com Port	COM 1	0
		COM 2	1
		COM 3	2
Var 3	Interface	RS242	0
		RS422	1
		RS485	2
Var 4	Data Bit	7 Bits	0
		8 Bits	1
Var 5	Parity	None	0
		Old	1
		Even	2
Var 6	Stop Bit	1 Bits	0
		2 Bits	1
Var 7	Baud Rate	300	0
		600	1
		900	2
		1200	3
		2400	4
		4800	5
		9600	6
		14400	7
		19200	8
		28800	9
		38400	10
		57600	11
		115200	12

Var 8	Flow Control	No Flow Control	0
		CTS RTS Flow Control	1
		DTR DSR Flow Control	2
		Xon Xoff Flow Control	3

Notes about Flow Control		
No Flow Control		Flow control function is disabled.
Flow Control		The transmission speed and communication validity are enhanced during communication due to new transmission technology, such as compress immediately, debug,…etc. But the new technology also makes the transmission speed between HMI and PC will be longer than the actual transmission speed. Therefore, ensure the data security and transmit complete data between computer and HMI, when transmitting data through serial communication port, the flow control is necessary.
Flow Control	**CTS / RTS Flow Control**	Flow control for hardware. It uses handshaking signal to control receiving and sending data. The control is achieved via internal modem or external modem that connects to HMI by connecting cable.
	DSR / DTR Flow Control	It is flow control for hardware also. It is used when PC and HMI is connected by cable directly.
	Xon / Xoff Flow Control	It is flow control for software. It is only used for 2400bps modem. The control method is to generate control code by software and add it in the transmission data.

Example
➢ Var 1 is an internal memory address



- After execute INITCOM command, it will return to 0 or 1 value to $50.

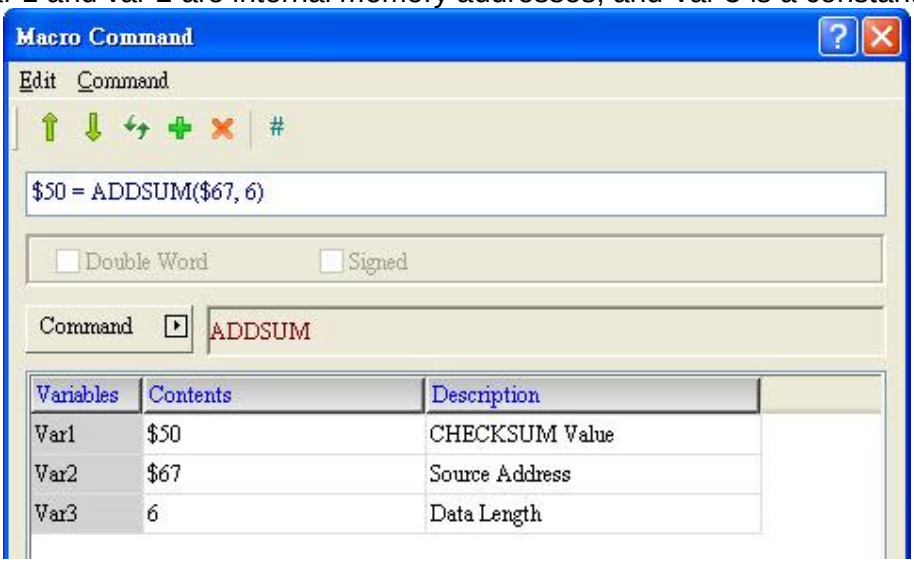
■ ADDSUM (Checksum Calculation through Addition)

Expression	What Variables Represent		NOTE
Var1 = ADDSUM(Var2, Var3) (W)	Var 1	Checksum	W : Word
	Var 2	Starting address of the source data	
	Var 3	Data length	
	Expression Explanation		
	Calculate the checksum using addition. Var1 stores the calculated checksum value, Var2 stores the starting address for data to be calculated and Var3 stores the length of data.		
*the checksum value calculated through ADDSUM is based on BYTE. If the data length is 6, it must be divided by 2 for the correct length is 3.			

Variable	Memory Usage		
	Internal Memory	PLC Register	Constant
Var 1	◎		
Var 2	◎		
Var 3	◎		◎

Example

- Var 1 and var 2 are internal memory addresses, and Var 3 is a constant.



- After addition, the three consecutive bytes (6 / 2 = 3), starting from the address stored in $67, will be stored in $50.
- The expression means $67 + $68 + $69 = $50.

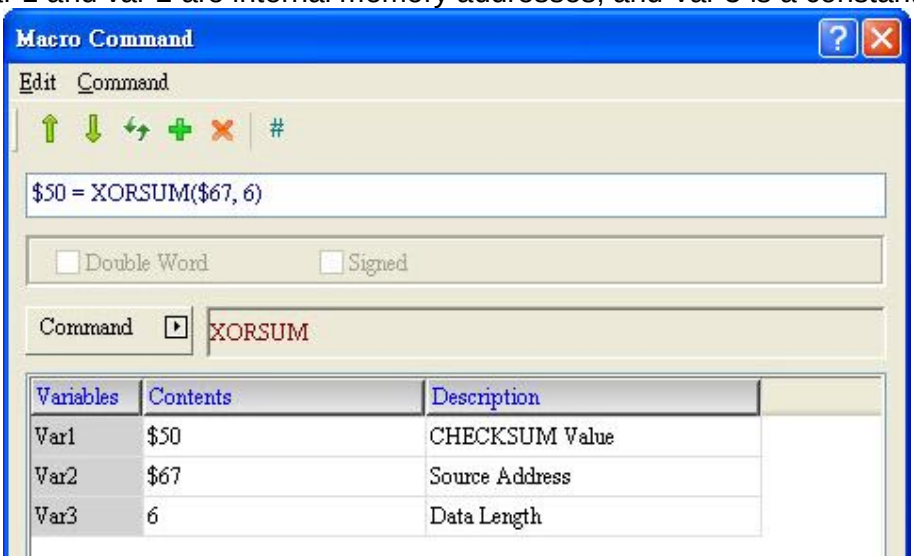
■ XORSUM (Checksum Calculation through XOR Operation)

<table>
<tr><th>Expression</th><th colspan="2">What Variables Represent</th><th>NOTE</th></tr>
<tr><td rowspan="5">Var1 = XORSUM(Var2, Var3)
(W)</td><td>Var 1</td><td>Checksum</td><td rowspan="5">W : Word</td></tr>
<tr><td>Var 2</td><td>Starting Address of the Source Data</td></tr>
<tr><td>Var 3</td><td>Data Length</td></tr>
<tr><td colspan="2">Expression Explanation</td></tr>
<tr><td colspan="2">Calculate the checksum using XOR operations. Var1 stores the calculated checksum, Var2 stores the starting address for data to be calculated and Var3 stores the length of the data.</td></tr>
<tr><td colspan="4">*the checksum value calculated through XORSUM is based on BYTE. If the data length is 6, it must be divided by 2 for the correct length is 3.</td></tr>
</table>

Variable	Memory Usage		
	Internal Memory	PLC Register	Constant
Var 1	◎		
Var 2	◎		
Var 3	◎		◎

Example

- Var 1 and var 2 are internal memory addresses, and Var 3 is a constant.



- After XOR operations, the three consecutive bytes (6 / 2 = 3), starting from the address stored in $67, will be stored in $50.
- The expression means $67 + $68 + $69 = $50.

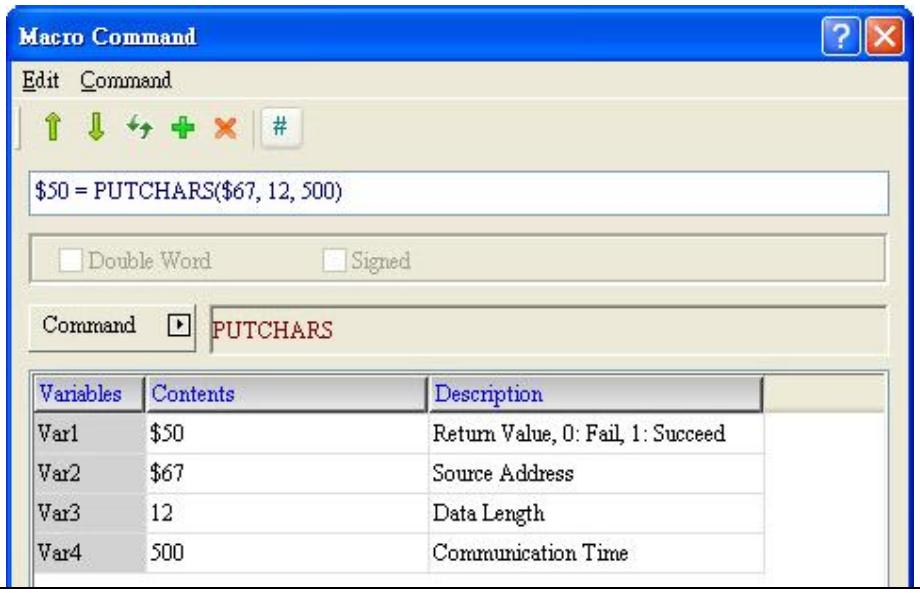
■ PUTCHARS (Output Character by Com Port)

<table>
<tr><th>Expression</th><th colspan="3">What Variables Represent</th><th>NOTE</th></tr>
<tr><td rowspan="6">Var1 = PUTCHARS(Var2, Var3, Var4) (W)</td><td rowspan="3">Var 1</td><td colspan="2">Returned result</td><td rowspan="6">W : Word</td></tr>
<tr><td>Failure</td><td>0</td></tr>
<tr><td>Successful</td><td>1</td></tr>
<tr><td>Var 2</td><td colspan="2">Starting address of the source data</td></tr>
<tr><td>Var 3</td><td colspan="2">Data length</td></tr>
<tr><td>Var 4</td><td colspan="2">Duration of data transmission</td></tr>
<tr><td colspan="4">Expression Explanation</td></tr>
<tr><td colspan="4">Send in data (including starting address stored in Var 2, data length specified in Var 3, and required transmission duration saved in Var 4) via selected communication ports and save the returned value in Var 1.</td></tr>
<tr><td colspan="5">*PUTCHARS much be paired up with INITCOM and SELECTCOM.
*Var 3 is Byte format.</td></tr>
</table>

Variable	Memory Usage		
	Internal Memory	PLC Register	Constant
Var 1	◎		
Var 2	◎		
Var 3	◎		◎
Var 4	◎		◎

Example

➢ Var 1 and var 2 are internal memory addresses, and Var 3 and Var 4 are constants.



➢ Save inputted characters from $67 to $50 along with relevant parameters (12 consecutive characters; transmission duration: 500; and returned value: 0 or 1).

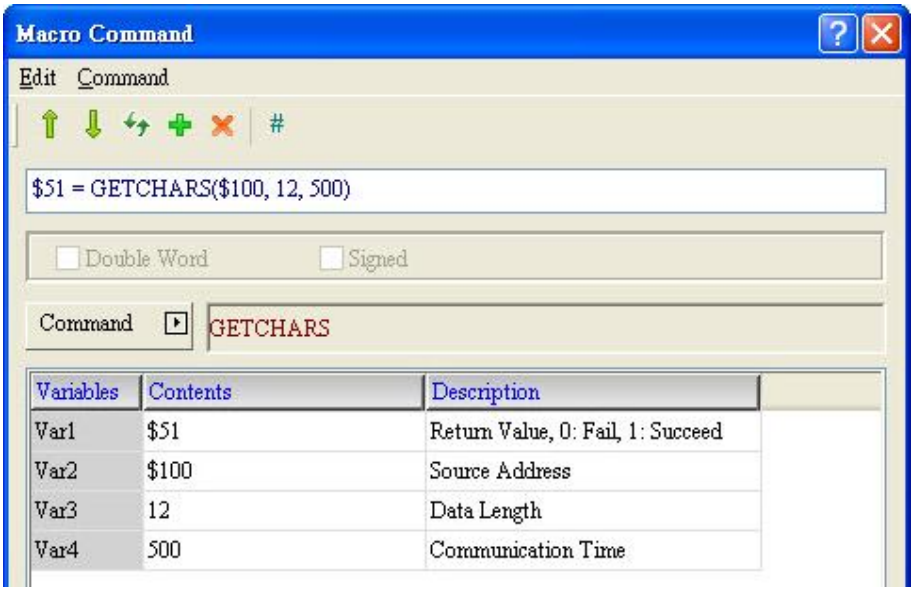
■ GETCHARS (Character Acquisition through Com Port)

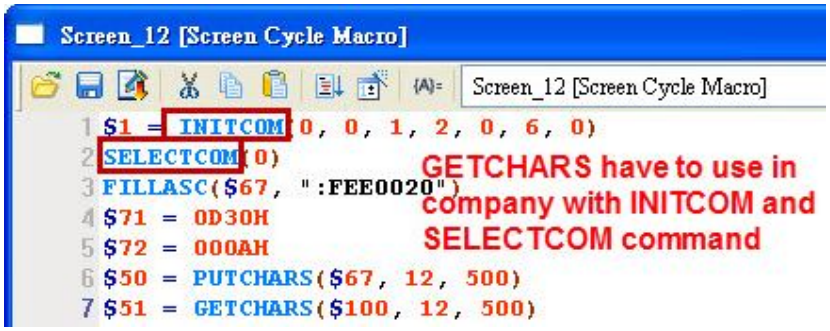
<table>
<tr><th>Expression</th><th colspan="3">What Variables Represent</th><th>NOTE</th></tr>
<tr><td rowspan="7">Var1 = GETCHARS(Var2, Var3, Var4) (W)</td><td rowspan="3">Var 1</td><td colspan="2">Returned result</td><td rowspan="7">W : Word</td></tr>
<tr><td>Failure</td><td>0</td></tr>
<tr><td>Successful</td><td>1</td></tr>
<tr><td>Var 2</td><td colspan="2">Starting address of the source data</td></tr>
<tr><td>Var 3</td><td colspan="2">Data length</td></tr>
<tr><td>Var 4</td><td colspan="2">Duration of data transmission</td></tr>
<tr><td colspan="3">Expression Explanation</td></tr>
<tr><td colspan="3">Send in data (including starting address stored in Var 2, data length specified in Var 3, and required transmission duration saved in Var 4) via selected communication ports and save the returned value in Var 1.</td></tr>
<tr><td colspan="5">*GETCHARS much be paired up with INITCOM and SELECTCOM.
*Var 3 is Byte format.</td></tr>
</table>

Variable	Memory Usage		
	Internal Memory	PLC Register	Constant
Var 1	◎		
Var 2	◎		
Var 3	◎		◎
Var 4	◎		◎

Example

- Var 1 and var 2 are internal memory addresses, and Var 3 and Var 4 are constants.





- Save received characters from $100 to $51 along with relevant parameters (12 consecutive characters; transmission duration: 500; and returned value: 0 or 1).

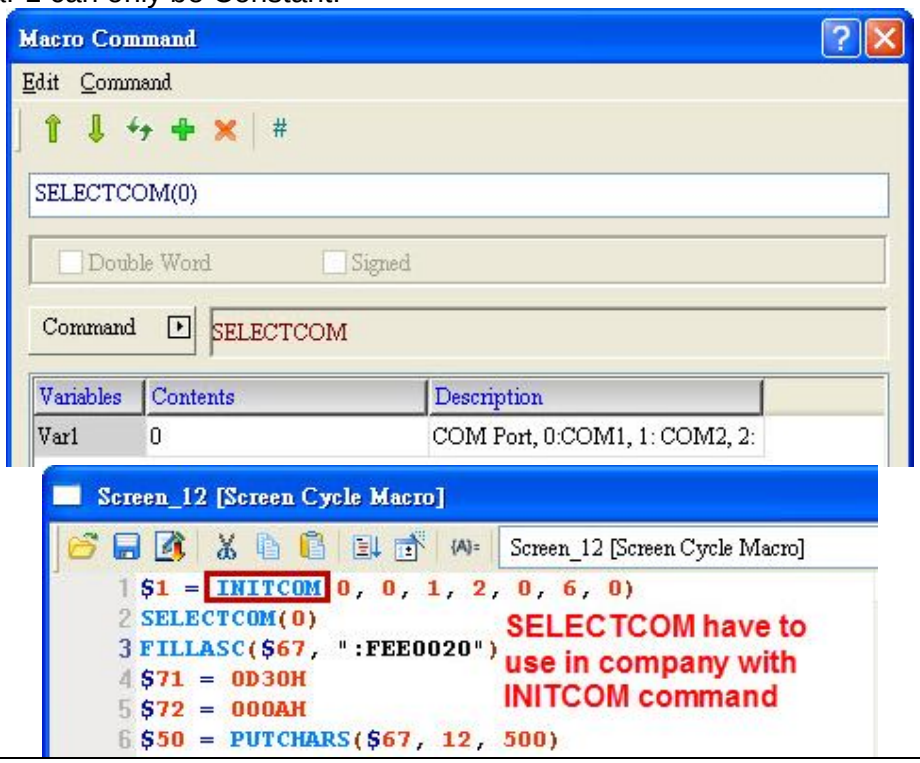
■ SELECTCOM (Com Port Selection)

<table>
<tr><th>Expression</th><th colspan="3">What Variables Represent</th><th>NOTE</th></tr>
<tr><td rowspan="5">SELECTCOM(Var1) (W)</td><td rowspan="3">Var 1</td><td>COM 1</td><td>0</td><td rowspan="5">W : Word</td></tr>
<tr><td>COM 2</td><td>1</td></tr>
<tr><td>COM 3</td><td>2</td></tr>
<tr><td colspan="3">Expression Explanation</td></tr>
<tr><td colspan="3">Send in acquired characters (including starting address stored in Var 2, data length specified in Var 3, and required transmission duration saved in Var 4) via selected communication ports and save the returned value in Var 1.</td></tr>
<tr><td colspan="5">*SELECTCOM much be paired up with INITCOM.
*The designated com port can not be the same as the com port used by the system. All communication commands will be processed via the COM port the user selects after executing this command. Therefore, the Selectcom command of a particular macro does not support other macros and there will be no interference between different macros.</td></tr>
</table>

Variable	Memory Usage		
	Internal Memory	PLC Register	Constant
Var 1			◎

Example

➢ Var 1 can only be Constant.



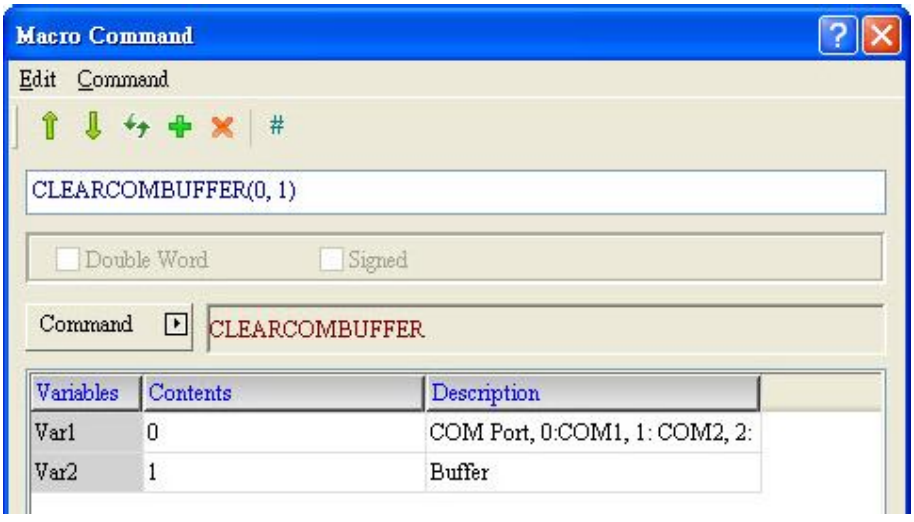
■ CLEARCOMBUFFER (Com Port Buffer Clearance)

<table>
<tr><th>Expression</th><th colspan="3">What Variables Represent</th><th>NOTE</th></tr>
<tr><td rowspan="6">CLEARCOMBUFFER(Var1, Var2)
(W)</td><td rowspan="3">Var 1</td><td>COM 1</td><td>0</td><td rowspan="6">W : Word</td></tr>
<tr><td>COM 2</td><td>1</td></tr>
<tr><td>COM 3</td><td>2</td></tr>
<tr><td rowspan="2">Var 2</td><td>Receiving buffer</td><td>0</td></tr>
<tr><td>Transmitting buffer</td><td>1</td></tr>
<tr><td colspan="3">Expression Explanation</td></tr>
<tr><td colspan="4">Clear the buffer for the Nth Com Port (N as denoted by Var 1).</td></tr>
</table>

Variable	Memory Usage		
	Internal Memory	PLC Register	Constant
Var 1			◎
Var 2			◎

Example

➢ Var 1 and var 2 can only be Constant.



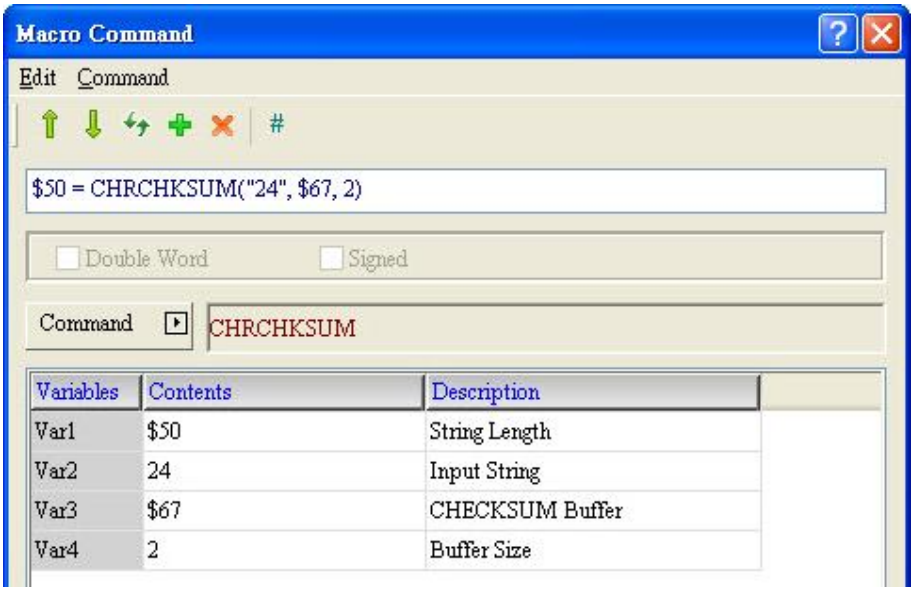
■ CHRCHKSUM (Calculation of String Length and Checksum)

<table>
<tr><th>Expression</th><th colspan="4">What Variables Represent</th><th>NOTE</th></tr>
<tr><td rowspan="7">Var1 = CHRCHKSUM("Var2", Var3, Var4) (W)</td><td>Var 1</td><td colspan="3">String length</td><td rowspan="7">W : Word</td></tr>
<tr><td>Var 2</td><td colspan="3">Inputted string</td></tr>
<tr><td>Var 3</td><td colspan="3">Memory address to store string</td></tr>
<tr><td rowspan="2">Var 4</td><td rowspan="2">Format to display the checksum</td><td>1 Byte</td><td>1</td></tr>
<tr><td>2 Bytes (Word)</td><td>2</td></tr>
<tr><td colspan="4">Expression Explanation</td></tr>
<tr><td colspan="4">Calculate the string length and checksum and save them in Var 1</td></tr>
<tr><td colspan="6">* the string length for string stored in Var 1 will be different based on the format set in Var 4.
* if the inputted string is “345” and Var 4 is set to 2, then the Var 1 string length will be 5; or else if Var 4 is set to 1, then the Var 1 string length will be 4. (based on BYTE)</td></tr>
</table>

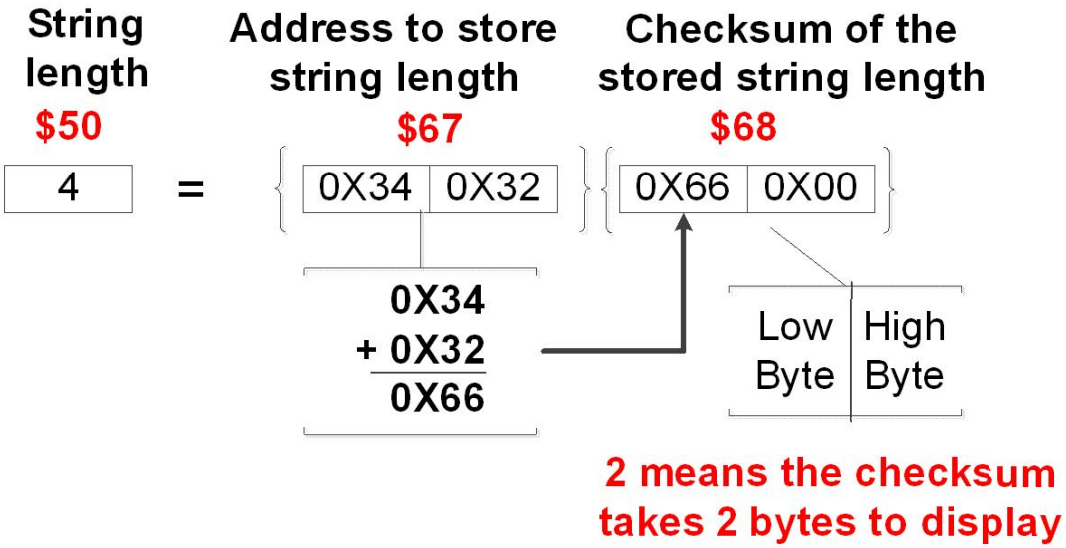
Variable	Memory Usage			
	Internal Memory	**PLC Register**	**String**	**Constant**
Var 1	◎			
Var 2			◎	
Var 3	◎			
Var 4				◎ (Can only be 1 and 2)

Example

➢ **Example 1:**

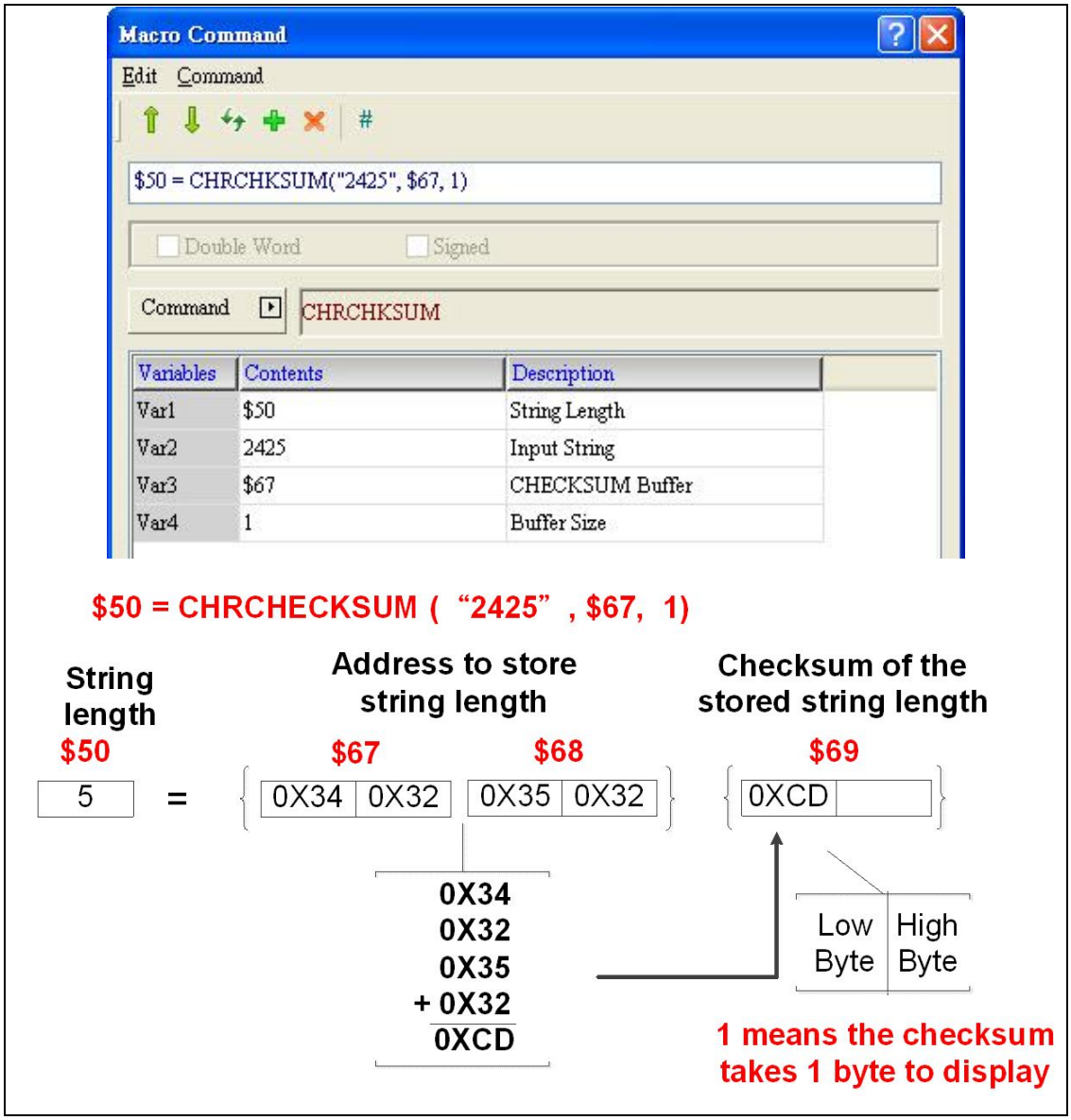


$50 = CHRCHECKSUM ("24" , $67, 2)



2 means the checksum takes 2 bytes to display

➢ **Example 2:**


Macro Command
Edit Command
$50 = CHRCHKSUM("2425", $67, 1)
Double Word
Signed
Command
CHRCHKSUM
Variables
Contents
Description
Var1
$50
String Length
Var2
2425
Input String
Var3
$67
CHECKSUM Buffer
Var4
1
Buffer Size
$50 = CHRCHECKSUM (“2425” , $67, 1)
String length
$50
5
=
Address to store string length
$67
$68
0X34
0X32
0X35
0X32
0X34
0X32
0X35
+ 0X32
0XCD
Checksum of the stored string length
$69
0XCD
Low Byte
High Byte
1 means the checksum takes 1 byte to display

■ LOCKCOM / UNLOCKCOM (Lock Com Port/Unlock Com Port)

<table>
<tr><th>Expression</th><th colspan="3">What Variables Represent</th><th>NOTE</th></tr>
<tr><td rowspan="9">Var1 = LOCKCOM(Var2, Var3) (W)</td><td rowspan="3">Var 1</td><td colspan="2">Returned result</td><td rowspan="13">W : Word</td></tr>
<tr><td>Failure</td><td>0</td></tr>
<tr><td>Successful</td><td>1</td></tr>
<tr><td rowspan="3">Var 2</td><td>COM 1</td><td>0</td></tr>
<tr><td>COM 2</td><td>1</td></tr>
<tr><td>COM 3</td><td>2</td></tr>
<tr><td>Var 3</td><td colspan="2">Time out value</td></tr>
<tr><td colspan="3">Expression Explanation</td></tr>
<tr><td colspan="3">Lock Com Port</td></tr>
<tr><td rowspan="5">UNLOCKCOM(Var1) (W)</td><td rowspan="3">Var 1</td><td>COM 1</td><td>0</td></tr>
<tr><td>COM 2</td><td>1</td></tr>
<tr><td>COM 3</td><td>2</td></tr>
<tr><td colspan="3">Expression Explanation</td></tr>
<tr><td colspan="3">Unlock Com Port</td></tr>
<tr><td colspan="5">* If Lockcom is set to continuously wait without limit (or Var 3 = 0), it indicates that the Lockcom will be executed twice within the same macro and this will cause the HMI to become unresponsive.
* When the communication commands are used in different macros, such as Screen Cycle Macro, Clock Macro, Background Macro, Run Pre-action/Post-action Macro (ON/OFF Macro) and Screen Open/Close Macro, the different macros may have interferences and cause error results. The solution to this issue is to add the LOCKCOM and UNLOCKCOM commands before and after communication commands, and this is to ensure that communication will not be interrupted for other purposes and preserve integrity of transmitted messages.</td></tr>
</table>

Memory Usage (LOCKCOM)			
Variable	**Internal Memory**	**PLC Register**	**Constant**
Var 1	◎		
Var 2			◎
Var 3			◎

Memory Usage (UNLOCKCOM)			
Variable	**Internal Memory**	**PLC Register**	**Constant**
Var 1			◎

Followings are the examples describe the situations when properly applying, improperly applying and misapplying LOCKCOM / UNLOCKCOM macro command.

Example of Applying LOCKCOM / UNLOCKCOM (correctly use)

Background Macro	On Macro	Screen Cycle Macro
$50 = LOCKCOM(0,500) $51 = PUTCHARS($67, 3, 300) UNLOCKCOM(0)	$50 = LOCKCOM(0,500) $51 = GETCHARS($67, 3, 300) UNLOCKCOM(0)	$50 = LOCKCOM(0,500) $51 = PUTCHARS($67, 3, 300) UNLOCKCOM(0)

Assuming that communication commands are executed in three macros, if LOCKCOM (0, 500) is executed in Background macro, it means COM 1 is locked at the moment. Since COM1 has been locked by Background macro, On Macro and Screen Cycle macro will stop when executing to LOCKCOM (0, 500). LOCKCOM (0, 500) in On Macro or Xcreen Cycle macro can be executed until COM 1 is released (when Background macro executes UNLOCKCOM(0)). This could avoid data transmission and receiving error.

Example of Applying LOCKCOM / UNLOCKCOM (improperly use)

On Macro	Screen Cycle Macro
$51 = GETCHARS($67, 3, 300)	$50 = LOCKCOM(0,500) $51 = PUTCHARS($67, 3, 300) UNLOCKCOM(0)

Assuming that communication commands are executed in two macros, if LOCKCOM (0, 500) is executed in Screen Cycle Macro, it means COM 1 is locked at the moment. However, On Macro is not locked by LOCKCOM, which means it still can execute GETCHARS command. It does not have to wait until UNLOCKCOM command is executed by Screen Cycle Macro. This would result in data transmission and receiving error. Please avoid the situation that mentioned above.

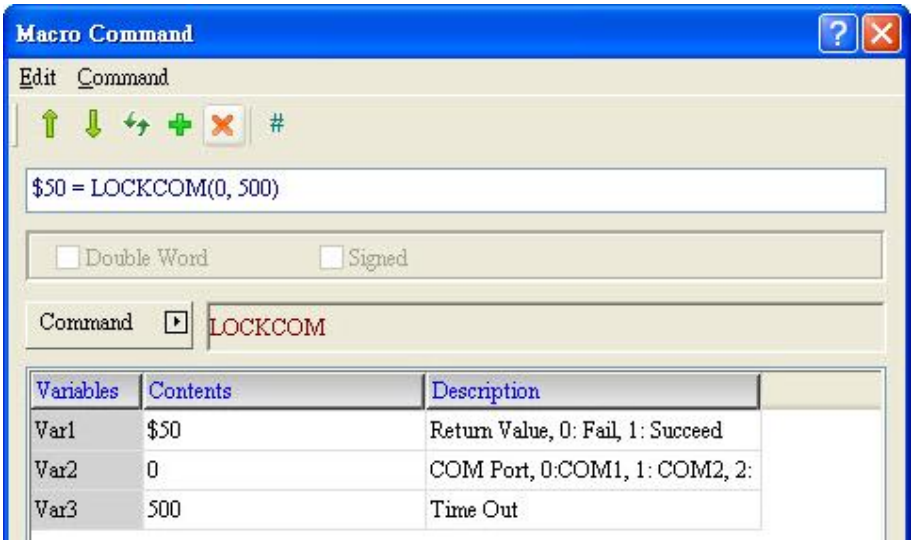
Example of Applying LOCKCOM / UNLOCKCOM (misapplying)

Background Macro	On Macro
$50 = LOCKCOM(0, 500) $51 = PUTCHARS($67, 3, 300)	UNLOCKCOM(0)

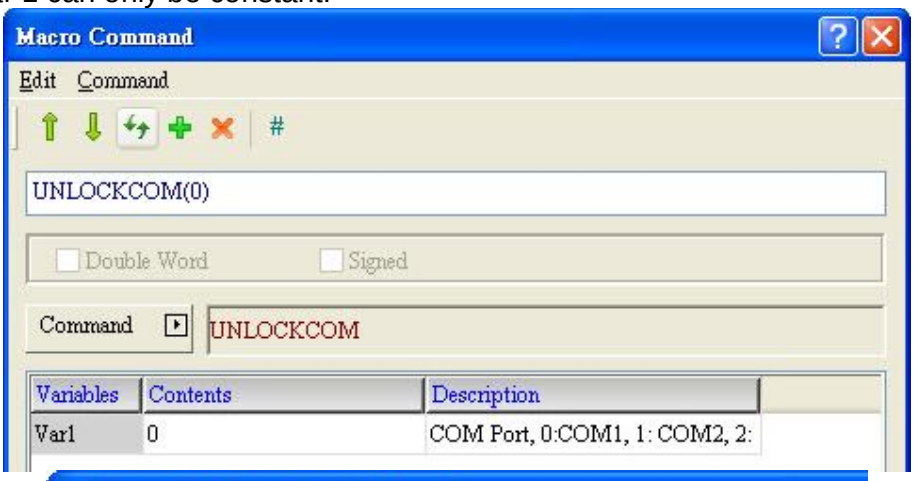
Assuming that COM port is locked in Background Macro and is used to transmit data, but COM Port cannot be unlocked in On Macro. This means commands to lock and unlock COM Port cannot be separated.

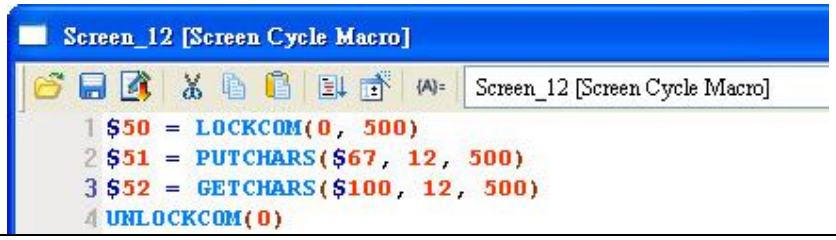
Example

- Var 1 is an internal memory address, and Var 2 and Var 3 can only be Constant



- Var 1 can only be constant.



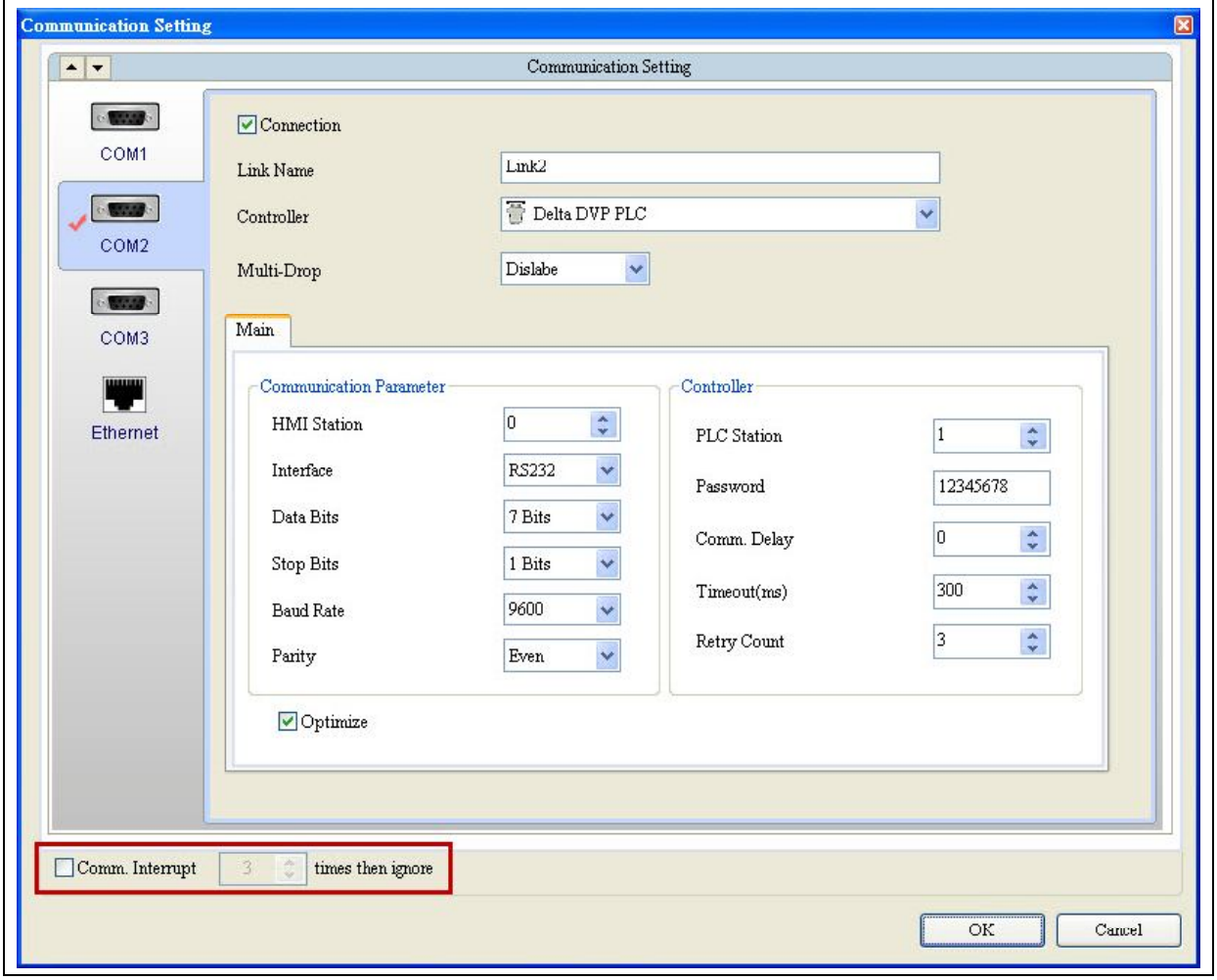


■ STATIONON (Set Station On)

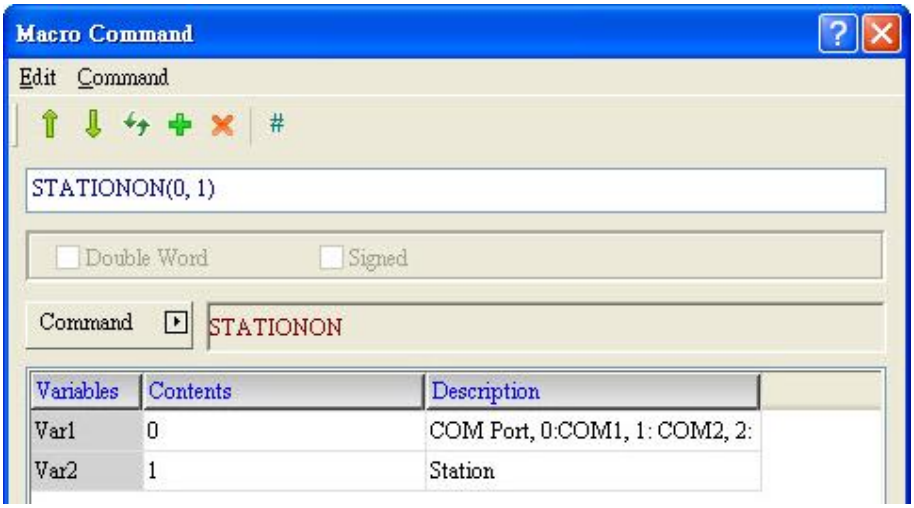
Expression	What Variables Represent			NOTE
STATIONON(Var1, Var2) (W)	Var 1	COM 1	0	W : Word
		COM 2	1	

		COM 3	2	
	Var 2	Station ID		
	Expression Explanation			
	Enable the N^{th} Com Port of K^{th} station and so that HMI can communicate with the controller of the K^{th} station (N^{th}: denoted in Var1; K^{th}: denoted in Var2)			

* The STATIONON macro command cannot be used when the “Comm. Interrupt XXX times then ignore” box is ticked [Options] → [Communication Setting].

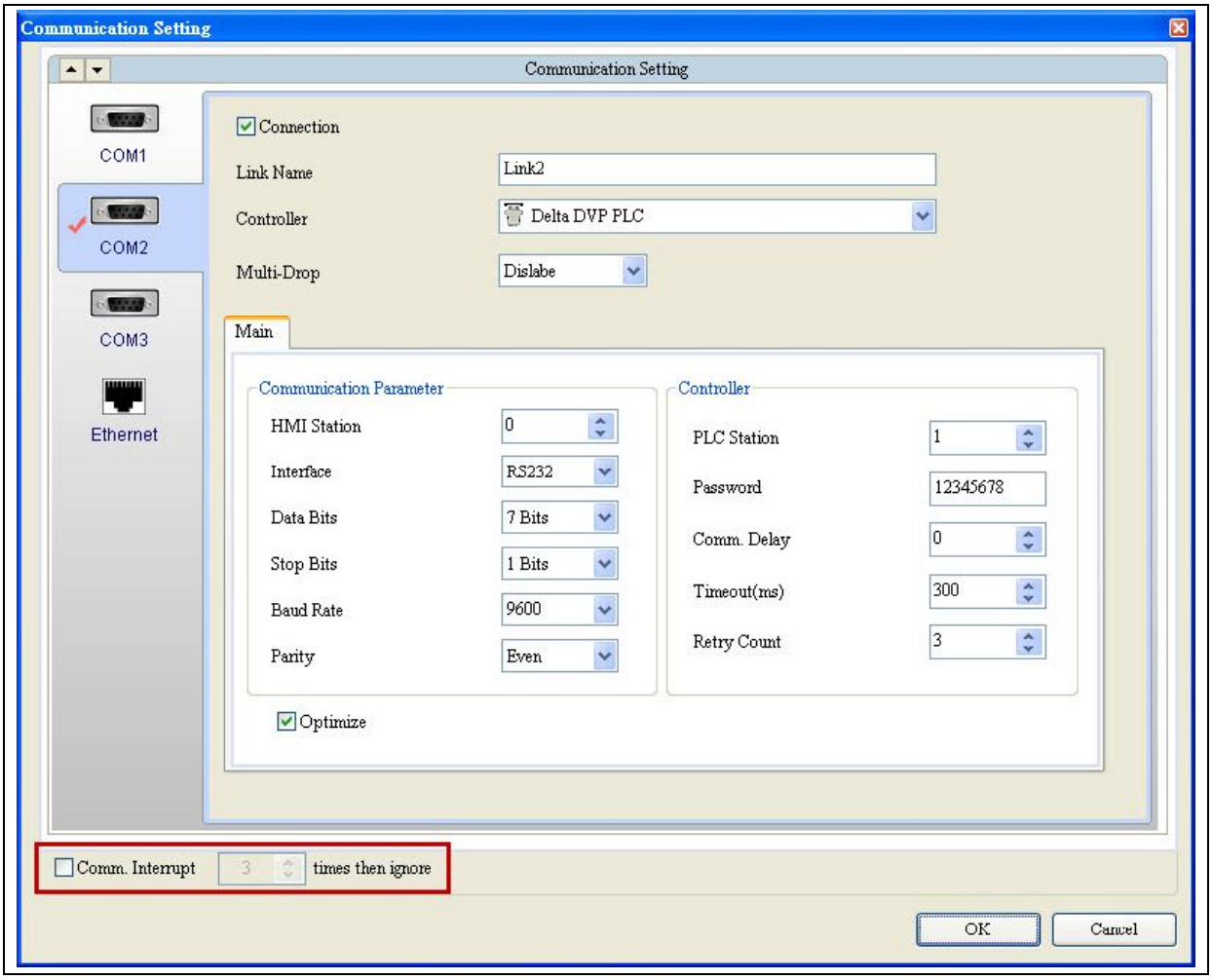


Variable	Memory Usage		
	Internal Memory	**PLC Register**	**Constant**
Var 1	◎		◎
Var 2	◎		◎

Example
➢ Var 1 and Var 2 are constants and open Com 1 of Station #1. 

■ STATIONOFF (Set Station Off)

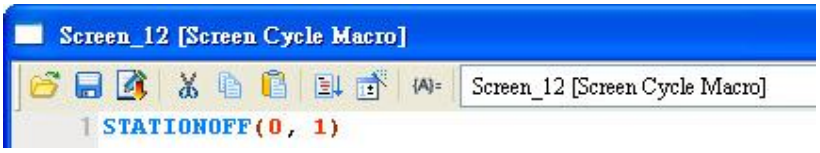
Expression	What Variables Represent			NOTE
STATIONOFF(Var1, Var2) (W)	Var 1	COM 1	0	W : Word
		COM 2	1	
		COM 3	2	
	Var 2	Station ID		
	Expression Explanation			
	Disable the N^{th} Com Port of K^{th} station and so that HMI cannot communicate with the controller of the K^{th} station (N^{th}: denoted in Var1; K^{th}: denoted in Var2).			
* The STATIONOFF macro command cannot be used when the “Comm. Interrupt XXX times then ignore” box is ticked [Options] → [Communication Setting].				



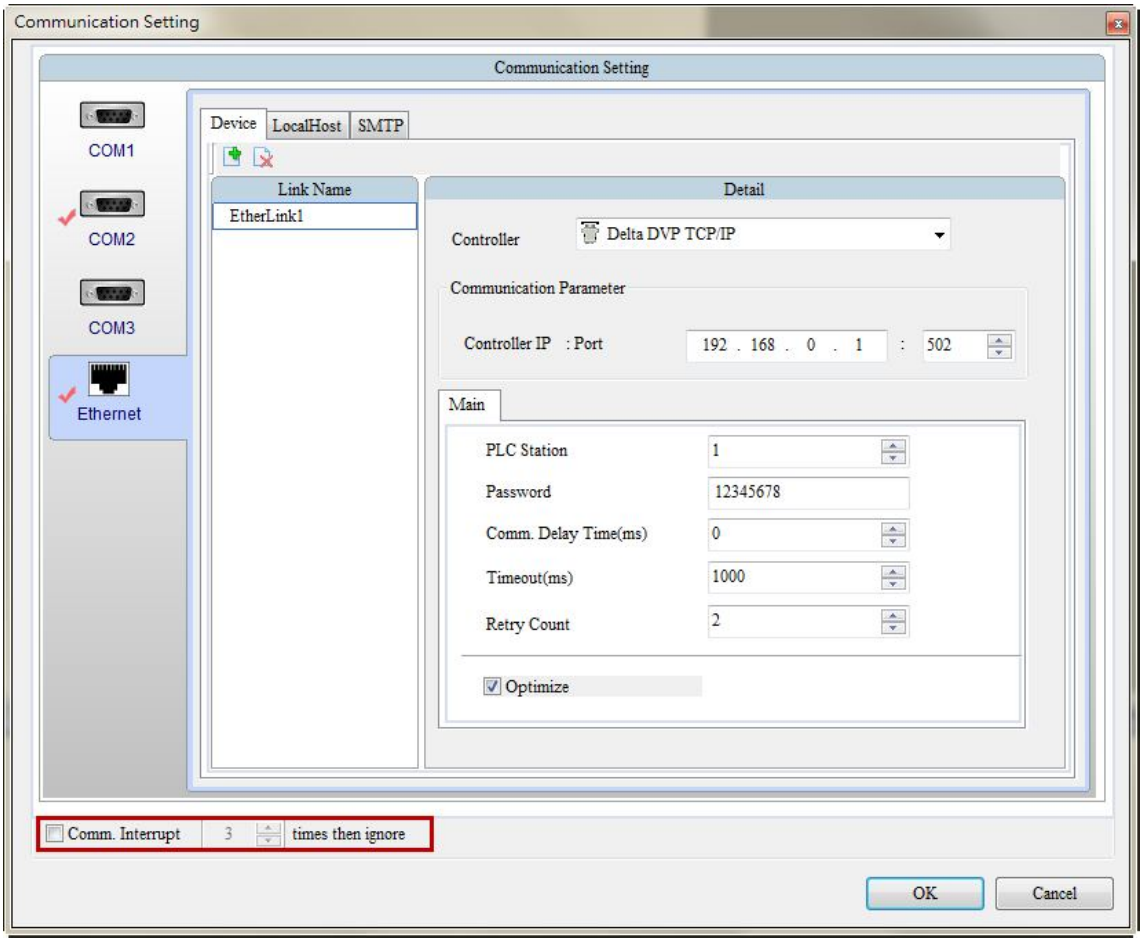
Variable	Memory Usage		
	Internal Memory	PLC Register	Constant
Var 1	◎		◎
Var 2	◎		◎

Example

➢ Var 1 and Var 2 are constants and open Com 1 of Station #1.



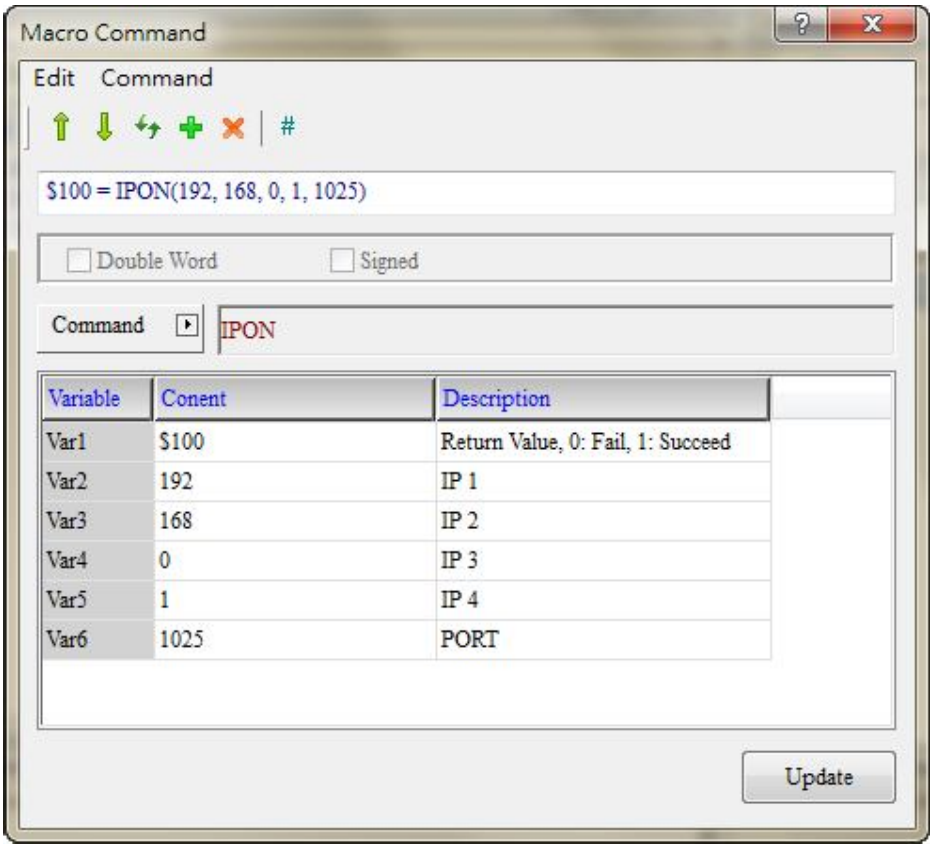
■ IPON (IP Address Activate)

<table>
<tr><th>Expression</th><th colspan="3">What Variables Represent</th><th>NOTE</th></tr>
<tr><td rowspan="9">Var1 = IPON(Var2,Var3,Var4, Var5,Var6) (W)</td><td rowspan="3">Var 1</td><td colspan="2">Returned Value</td><td rowspan="9">W：Word</td></tr>
<tr><td>Failure</td><td>0</td></tr>
<tr><td>Success</td><td>1</td></tr>
<tr><td>Var 2</td><td colspan="2">IP1</td></tr>
<tr><td>Var 3</td><td colspan="2">IP2</td></tr>
<tr><td>Var 4</td><td colspan="2">IP3</td></tr>
<tr><td>Var 5</td><td colspan="2">IP4</td></tr>
<tr><td>Var 6</td><td colspan="2">Port</td></tr>
<tr><td colspan="3">Expression Explanation</td></tr>
<tr><td colspan="3">Activate IP Var2.Var3.Var4.Var5 and Port Var6. Then, HMI can communicate with the controller.</td></tr>
<tr><td colspan="5">Note 1：Var6 cannot be used. When it is not using, all Port under this IP will be activated.
Note 2：IPON macro cannot be used with Communication Interrupt under 【Option】→ 【Communication Setting】.
 
</td></tr>
</table>

Variable	Memory Usage		
	Internal Memory	PLC Register	Constant
Var 1	◎		
Var 2	◎	◎	◎
Var 3	◎	◎	◎
Var 4	◎	◎	◎
Var 5	◎	◎	◎
Var 6	◎	◎	◎

Example

- Var 1 is internal register while Var 2 ~ Var 6 are constants. Activate IP 192.168.0.1 Port：1025.

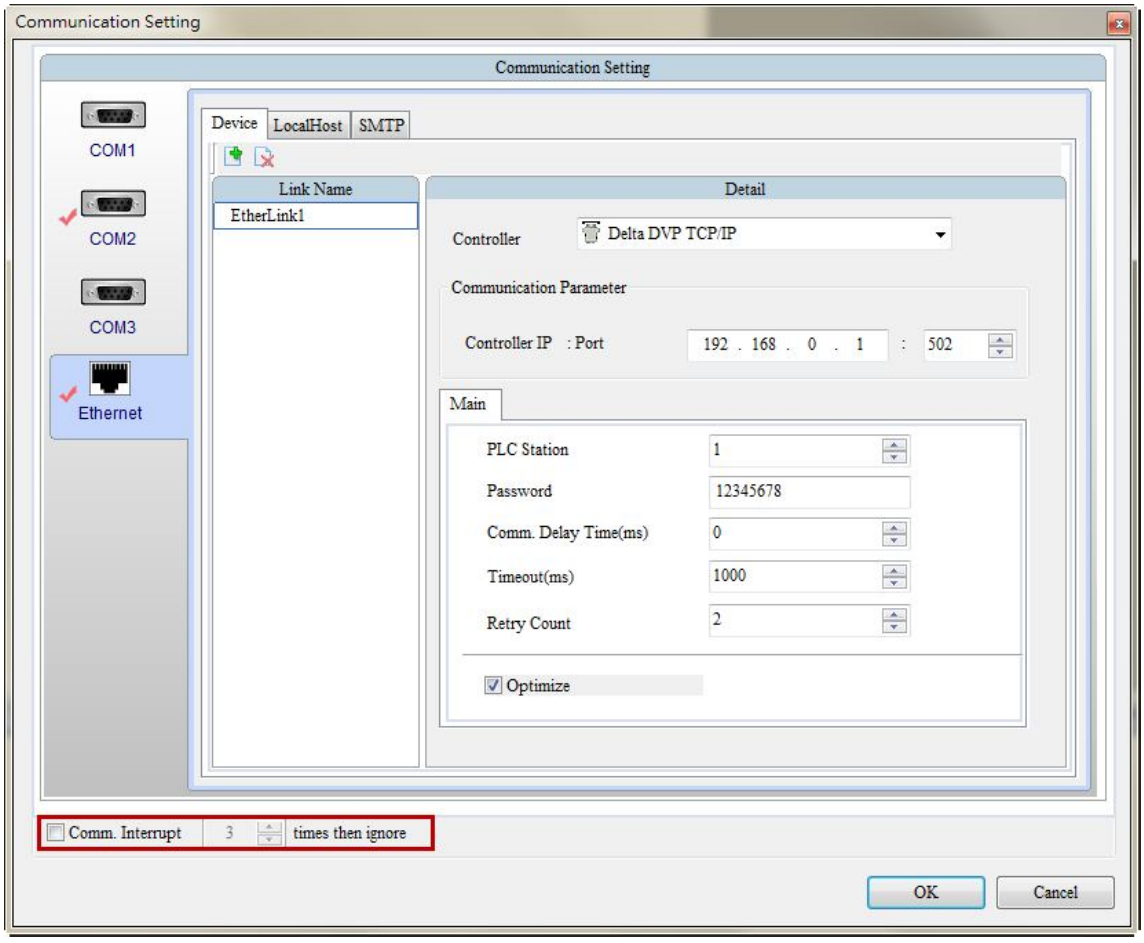


- If not using Var6, then **$100 = IPON (192, 168, 0, 1).** To enable all port in IP 192.168.0.1.

■ IPOFF (Disable IP address)

<table>
<tr><th>Expression</th><th colspan="3">What Variables Represent</th><th>NOTE</th></tr>
<tr><td rowspan="10">Var1 = IPOFF(Var2,Var3,Var4, Var5,Var6) (W)</td><td rowspan="3">Var 1</td><td colspan="2">Returned Value</td><td rowspan="10">W：Word</td></tr>
<tr><td>Failure</td><td>0</td></tr>
<tr><td>Success</td><td>1</td></tr>
<tr><td>Var 2</td><td colspan="2">IP1</td></tr>
<tr><td>Var 3</td><td colspan="2">IP2</td></tr>
<tr><td>Var 4</td><td colspan="2">IP3</td></tr>
<tr><td>Var 5</td><td colspan="2">IP4</td></tr>
<tr><td>Var 6</td><td colspan="2">Port</td></tr>
<tr><td colspan="3">Expression Explanation</td></tr>
<tr><td colspan="3">Close IP Var2.Var3.Var4.Var5 and Port Var6. Then, HMI will be unable to communicate with the controller of that station.</td></tr>
</table>

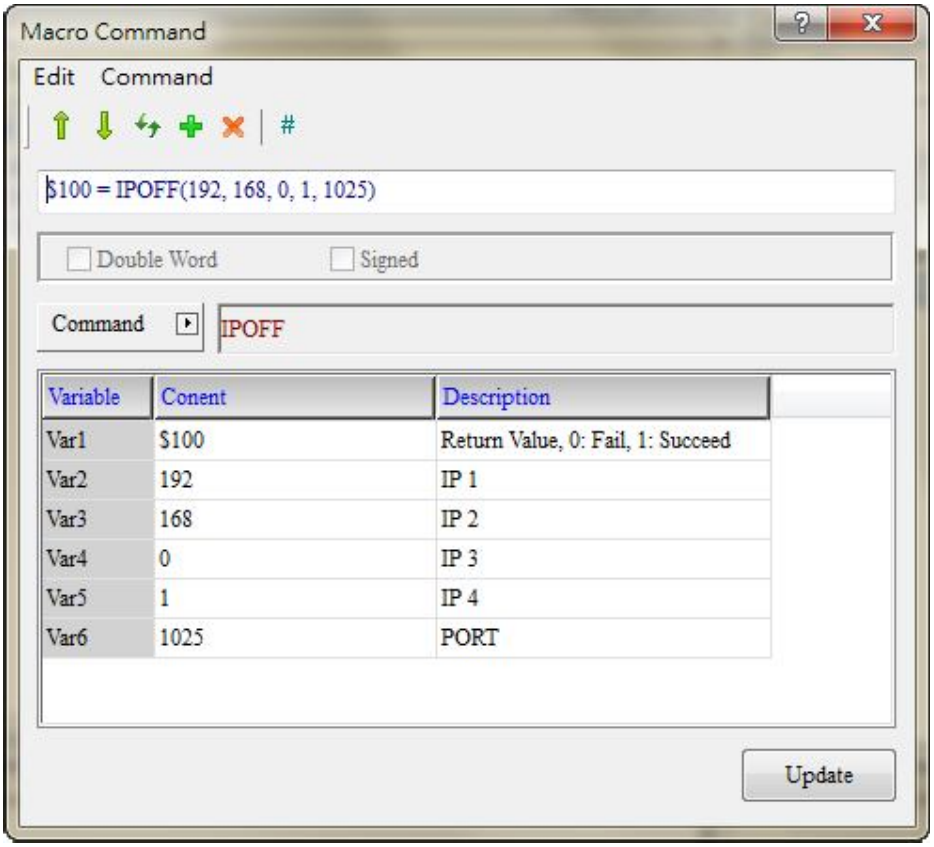
Note 1: Var6 is not necessary. When it is not using, all Ports under the IP will be closed.
Note 2: IPON macro cannot be used with Communication Interrupt under 【Option】→ 【Communication Setting】.



Variables	Memory Usage		
	Internal Memory	PLC Register	Constant
Var 1	◎		
Var 2	◎	◎	◎
Var 3	◎	◎	◎
Var 4	◎	◎	◎
Var 5	◎	◎	◎
Var 6	◎	◎	◎

Example Description

- Var 1 is internal register. Var 2 ~ Var6 are constants. Close IP 192.168.0.1 Port：1025.



- If not use Var6, **$100 = IPOFF(192, 168, 0, 1),** close all ports in IP 192.168.0.1.

24-3-9 Drawing

DMI supports a list of drawing commands, including Rectangle, Line, Point and Circle for users to draw different graphics. They are detailed below.

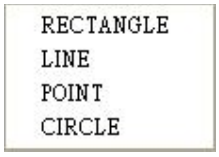


Figure 24-3-9-1 Drawing

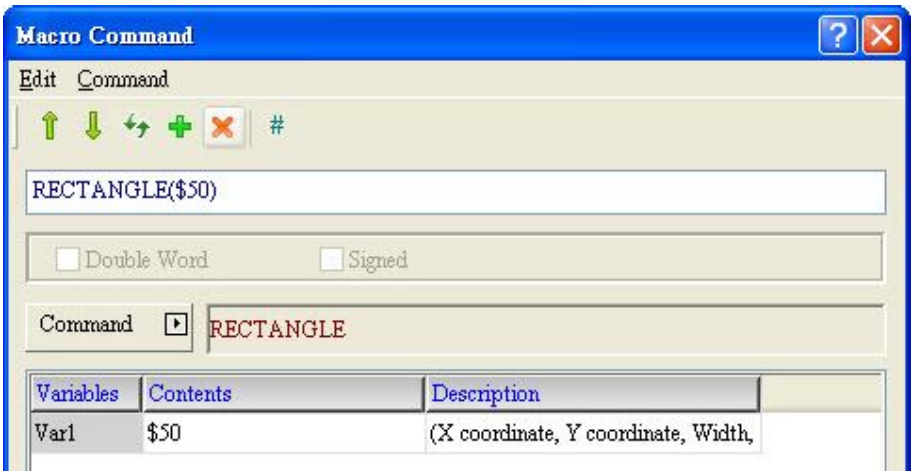
■ RECTANGLE (Draw Rectangle)

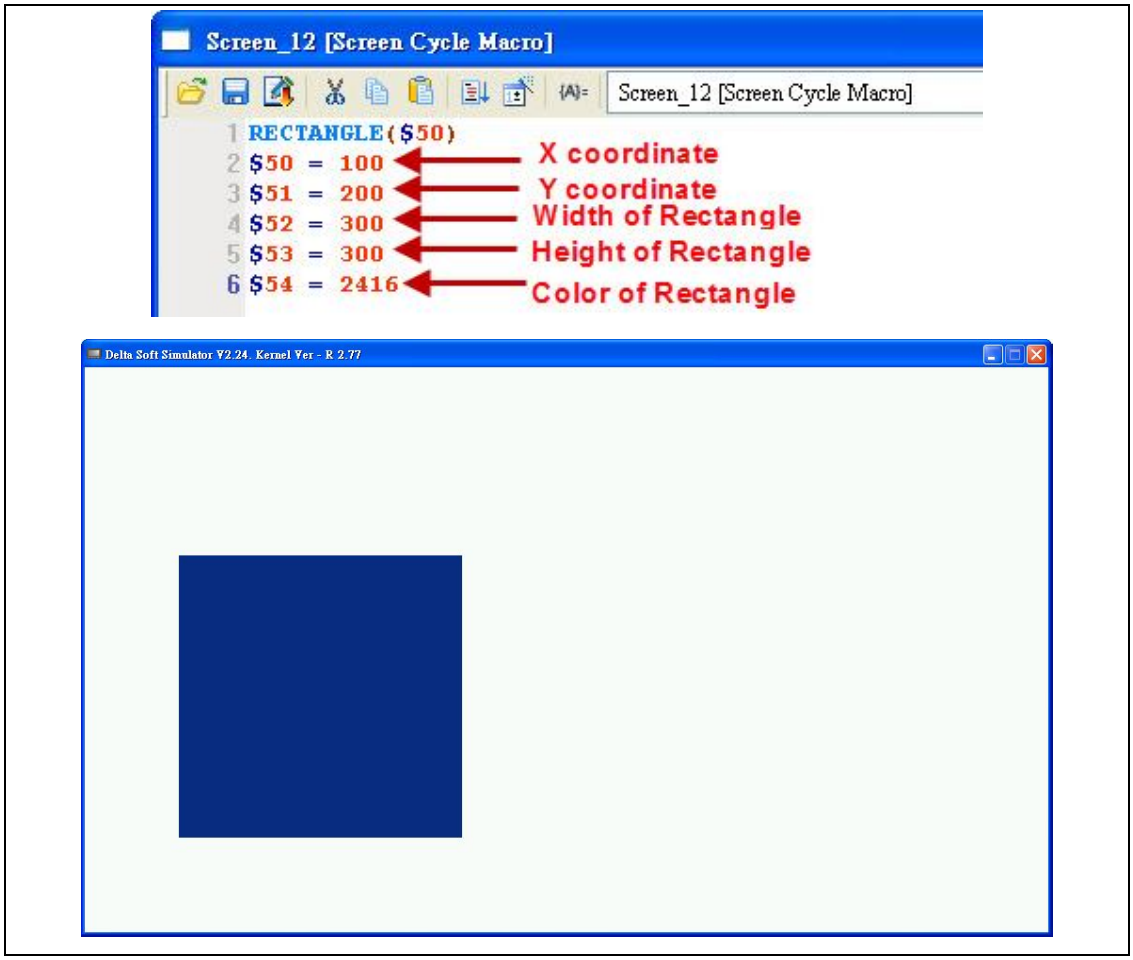
Expression	What Variables Represent		NOTE
RECTANGLE(Var1) (W)	Var 1	upper-left X-coordinate	W : Word
	Var 1 + 1	upper-left Y-coordinate	
	Var 1 + 2	width of the rectangle	
	Var 1 + 3	height of the rectangle	
	Var 1 + 4	color of the rectangle	
	Expression Explanation		
	Continuous addresses to draw a rectangle.		

Variable	Memory Usage		
	Internal Memory	PLC Register	Constant
Var 1	◎		

Example

➢ Var 1 is an internal memory address.





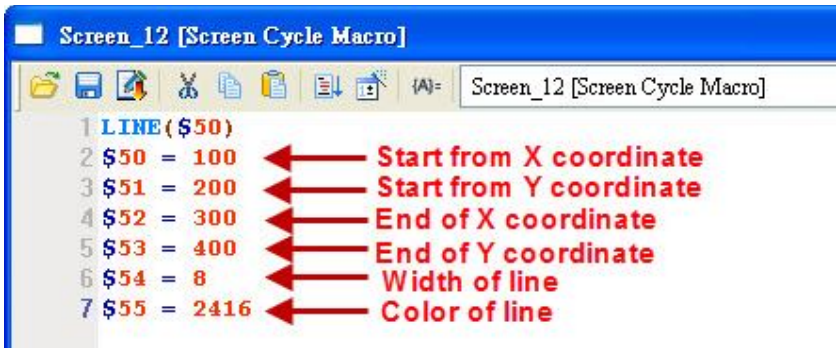
■ LINE (Draw Line)

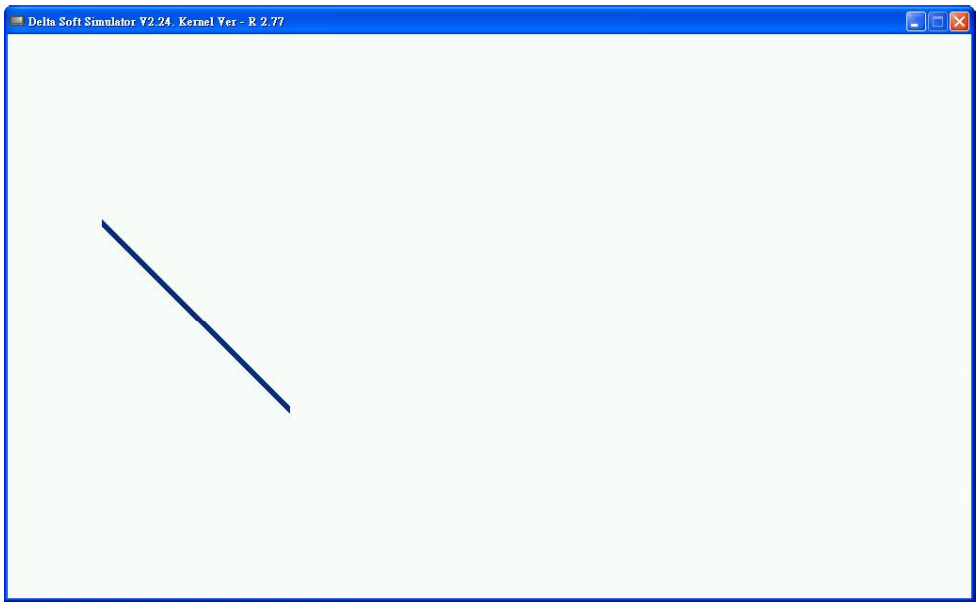
Expression	What Variables Represent		NOTE
LINE(Var1) (W)	Var 1	Starting X-coordinate	
	Var 1 + 1	Starting Y-coordinate	W : Word
	Var 1 + 2	Ending X-coordinate	
	Var 1 + 3	Ending Y-coordinate	
	Var 1 + 4	Width of the line	
	Var 1 + 5	Color of the line	
	Expression Explanation		
	Continuous addresses to draw a line.		

Variable	Memory Usage		
	Internal Memory	PLC Register	Constant
Var 1	◎		

Example

- Var 1 is an internal memory address.





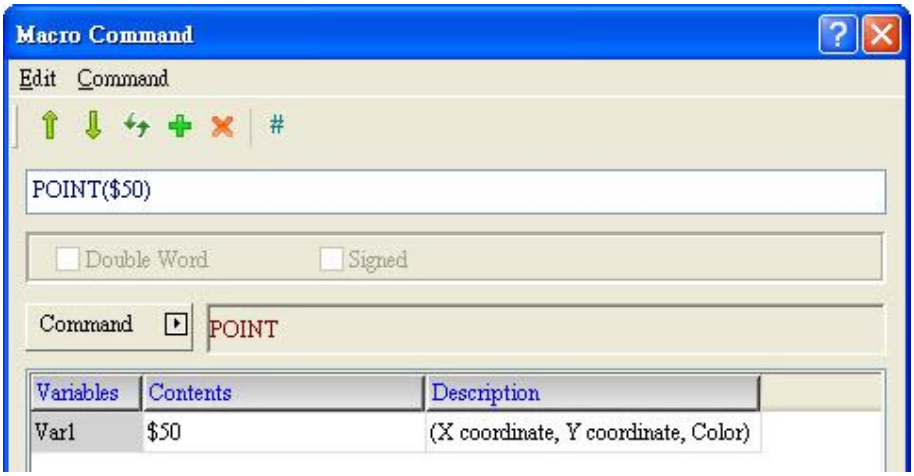
■ POINT (Draw Point)

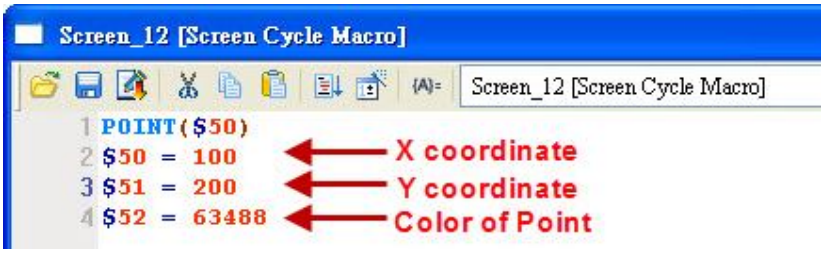
Expression	What Variables Represent		NOTE
POINT(Var1) (W)	Var 1	X-coordinate	
	Var 1 + 1	Y-coordinate	W : Word
	Var 1 + 2	Color of the point	
	Expression Explanation		
	Continuous addresses to draw a point.		

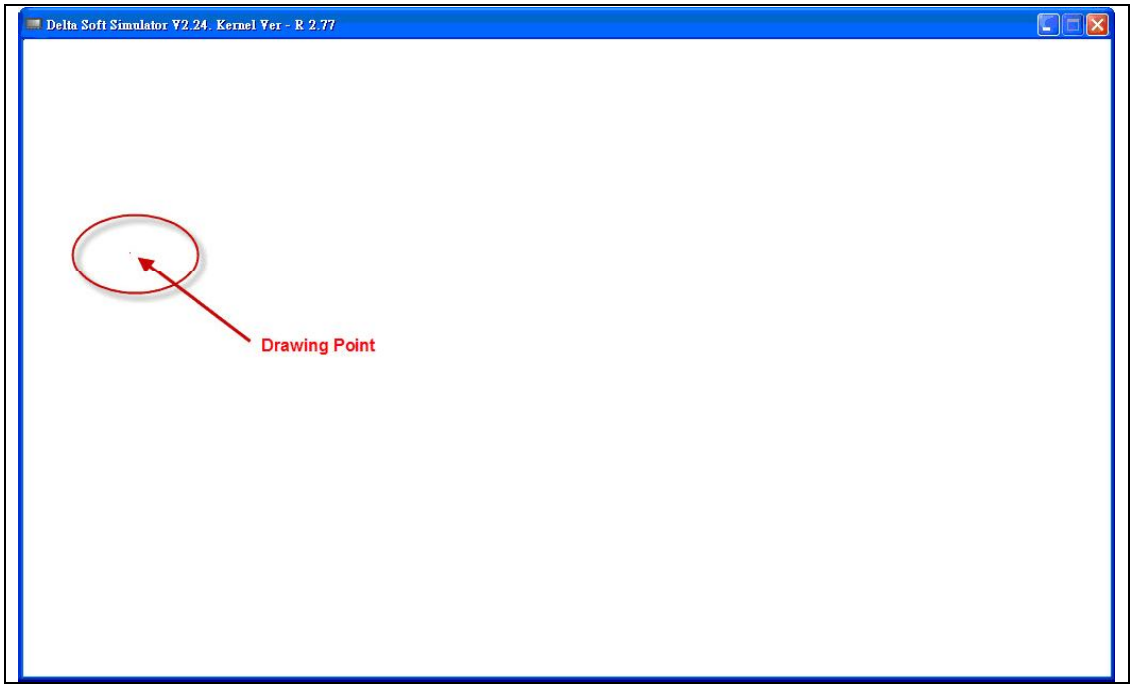
Variable	Memory Usage		
	Internal Memory	PLC Register	Constant
Var 1	◎		

Example

➢ Var 1 is an internal memory address.





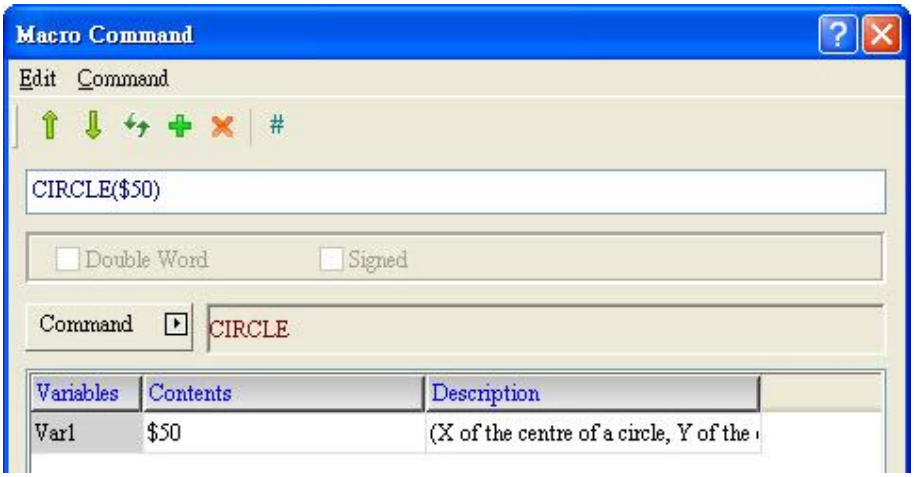


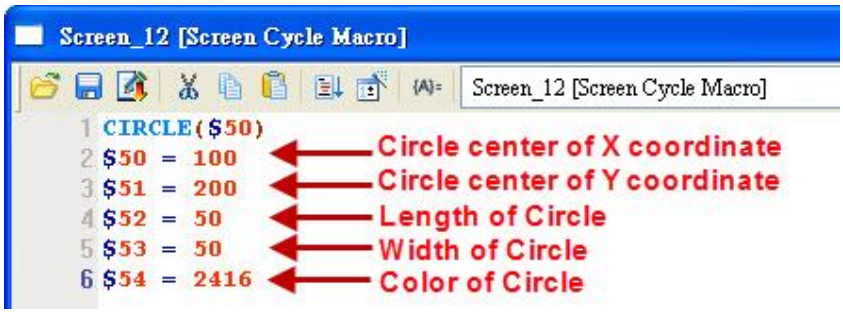
■ CIRCLE (Draw Ellipse)

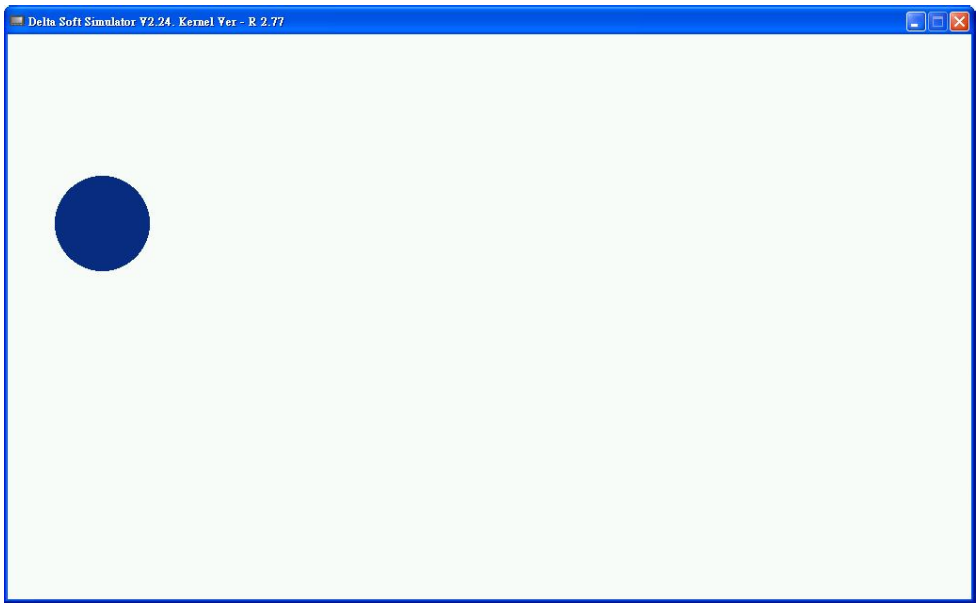
Expression	What Variables Represent		NOTE
CIRCLE(Var1) (W)	Var 1	X-coordinate of the center of the ellipse	W : Word
	Var 1 + 1	Y-coordinate of the center of the ellipse	
	Var 1 + 2	length of the ellipse	
	Var 1 + 3	width of the ellipse	
	Var 1 + 4	color of the ellipse	
	Expression Explanation		
	Continuous addresses to draw a point.		

Variable	Memory Usage		
	Internal Memory	PLC Register	Constant
Var 1	◎		

Example
➢ Var 1 is an internal memory address.

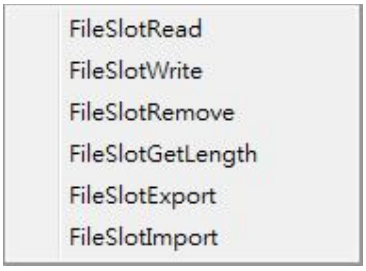

Macro Command
Edit Command
CIRCLE($50)
Double Word
Signed
Command
CIRCLE
Variables
Contents
Description
Var1
$50
(X of the centre of a circle, Y of the


Screen_12 [Screen Cycle Macro]
Screen_12 [Screen Cycle Macro]
1 CIRCLE($50)
2 $50 = 100
3 $51 = 200
4 $52 = 50
5 $53 = 50
6 $54 = 2416
Circle center of X coordinate
Circle center of Y coordinate
Length of Circle
Width of Circle
Color of Circle


Delta Soft Simulator V2.24. Kernel Ver - R 2.77

24-3-10 File Access

The related commands of File Access include FileSlotRead, FileSlotWrite, FileSlotRemove, FileSlotGetLength, FileSlotExport and FileSlotImport. Please refer to the followings for further descriptions.



■ FileSlotRead (Read the File)

<table>
<tr><th>Expression</th><th colspan="3">What Variables Represent</th><th>NOTE</th></tr>
<tr><td rowspan="8">Var1 = FileSlotRead (Var2, Var3, Var4, Var5) (W)</td><td rowspan="3">Var 1</td><td colspan="2">Returned Value</td><td rowspan="8">W：Word</td></tr>
<tr><td>Failure</td><td>0</td></tr>
<tr><td>Success</td><td>1</td></tr>
<tr><td>Var 2</td><td colspan="2">FileSlot ID</td></tr>
<tr><td>Var 3</td><td colspan="2">Target Address</td></tr>
<tr><td>Var 4</td><td colspan="2">Start address of FileSlot content (DW)</td></tr>
<tr><td>Var 5</td><td colspan="2">Word data length</td></tr>
<tr><td colspan="3">Expression Explanation</td></tr>
<tr><td colspan="4">Read FileSlot content of Var 2, whose starting address is specified by Var 4 and data length specified by Var 5 to the target address which is specified by Var 3. Then, return the value to Var 1.</td></tr>
<tr><td colspan="5">Note: If the specified FileSlot file does not exist, please use FileSlotWrite command to create the file first.</td></tr>
</table>

Variables	Memory Usage		
	Internal Memory	PLC Register	Constant
Var 1	◎		
Var 2	◎	◎	◎
Var 3	◎	◎	
Var 4	◎	◎	◎
Var 5	◎	◎	◎

■ FileSlotWrite (Write the File)

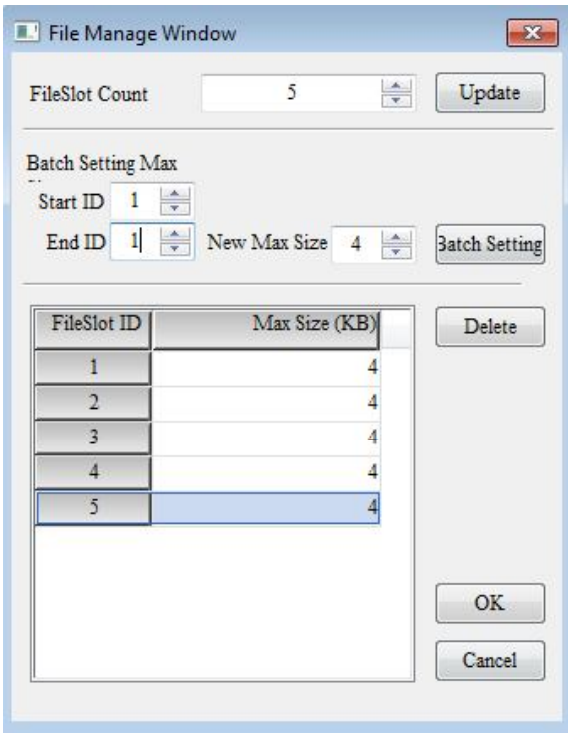
Expression	What Variables Represent			NOTE
Var1 = FileSlotWrite (Var2, Var3, Var4, Var5) (W)	Var 1	Returned Value		W：Word
		Failure	0	
		Success	1	
	Var 2	FileSlot ID		
	Var 3	Source Address		
	Var 4	Start position of FileSlot content (DW)		
	Var 5	Word data length		
	Expression Explanation			
	Read Var5 Word starting from Var3 and regard Var4 as start address to write FileSlot of Var2. Then, return the result to Var1.			

Variables	Memory Usage		
	Internal Memory	PLC Register	Constant
Var 1	◎		
Var 2	◎	◎	◎
Var 3	◎	◎	
Var 4	◎	◎	◎
Var 5	◎	◎	◎

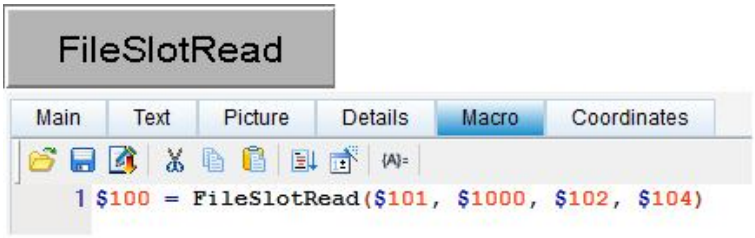
Example Description

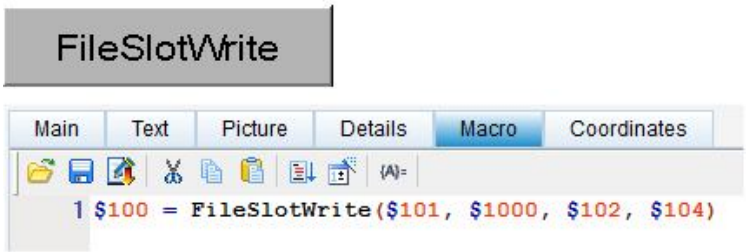
- Use FileSlotWrite to create the file. Then, use FileSlotRead to access the data. See the descriptions below:

Step 1: Enter 【Option】→【File Manage】 to setup FileSlot.

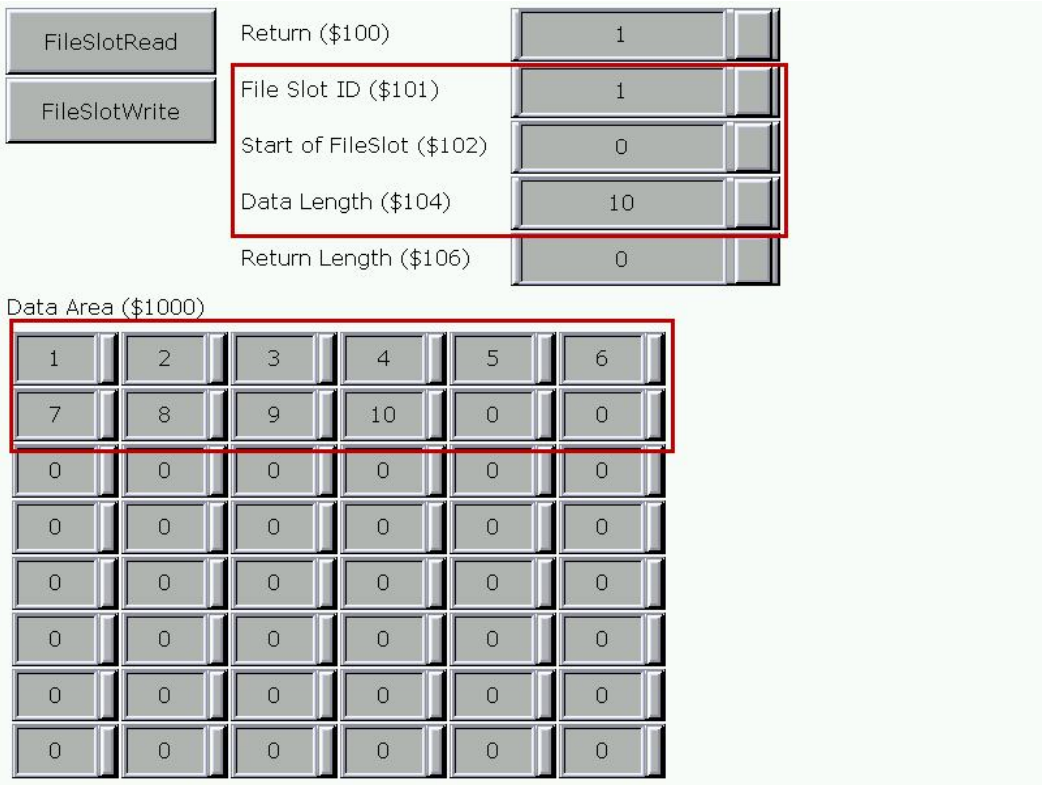


Step 2: Create two momentary buttons and compile ON macro.

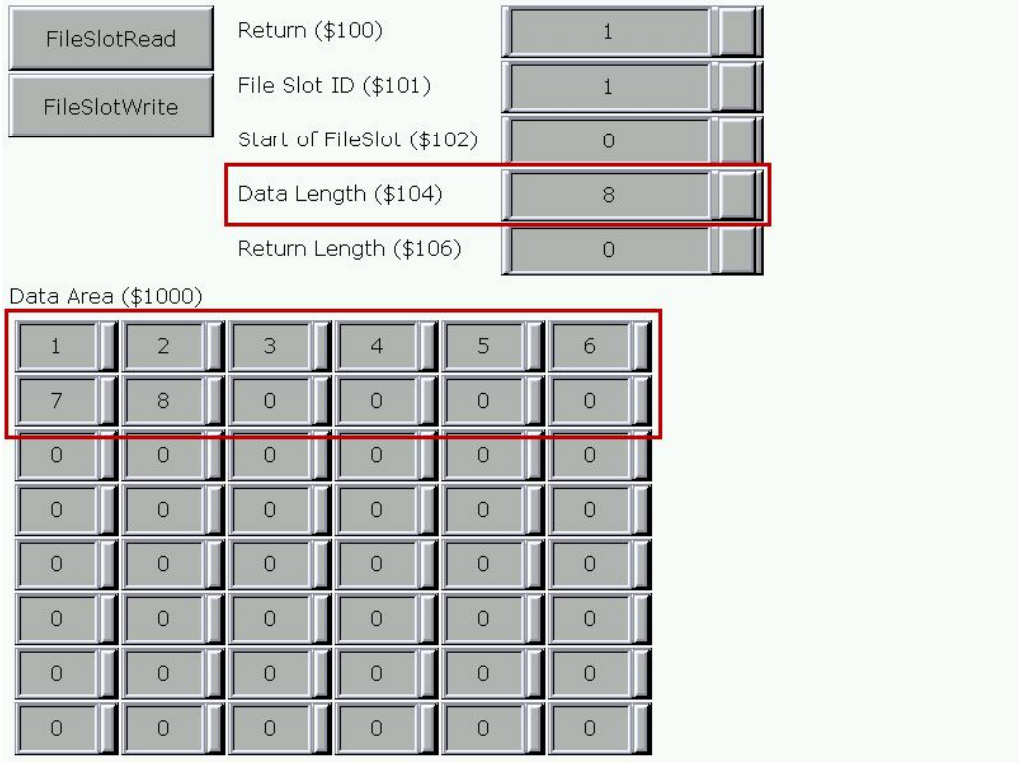




Step 3: Compile the screen and download it to HMI. Regard $1000 as start address to edit 10 Words. Set $101 to 1, $102 to 0 and $104 to 10. When FileSlotWrite is triggered, data of $1000 ~ $1009 will be written into the FileSlot whose ID is 1 and start to write from address 0.



Step 4: Reset the data of $1000 ~ $1009 to 0. Set $104 to 8. When FileSlotRead is triggered, the FileSlot whose ID is 1 will be written into $1000 ~ $1007 from the 8th Word starting with the 0th address.



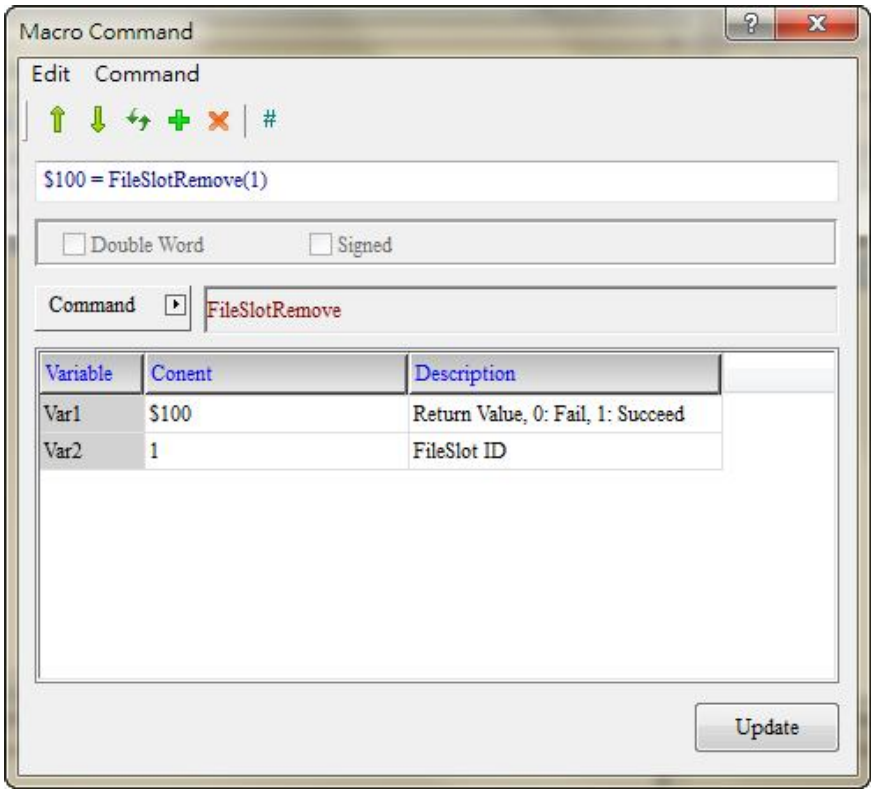
■ FileSlotRemove (Remove the File)

<table>
<tr><th>Expression</th><th colspan="3">What Variables Represent</th><th>NOTE</th></tr>
<tr><td rowspan="5">Var1 = FileSlotRemove (Var2) (W)</td><td rowspan="3">Var 1</td><td colspan="2">Returned Value</td><td rowspan="5">W：Word</td></tr>
<tr><td>Failure</td><td>0</td></tr>
<tr><td>Success</td><td>1</td></tr>
<tr><td>Var 2</td><td colspan="2">FileSlot ID</td></tr>
<tr><td colspan="3">Expression Explanation</td></tr>
<tr><td colspan="3">Remove FileSlot of VAr2 and return the result to Var1.</td></tr>
</table>

Variable	Memory Usage		
	Internal Memory	PLC Register	Constant
Var 1	◎		
Var 2	◎	◎	◎

Example Description

➢ Var 1 is internal memory and Var 2 is the constant. Remove FileSlot whose ID is 1 (Var2) and save the returned value in $100 (Var1).



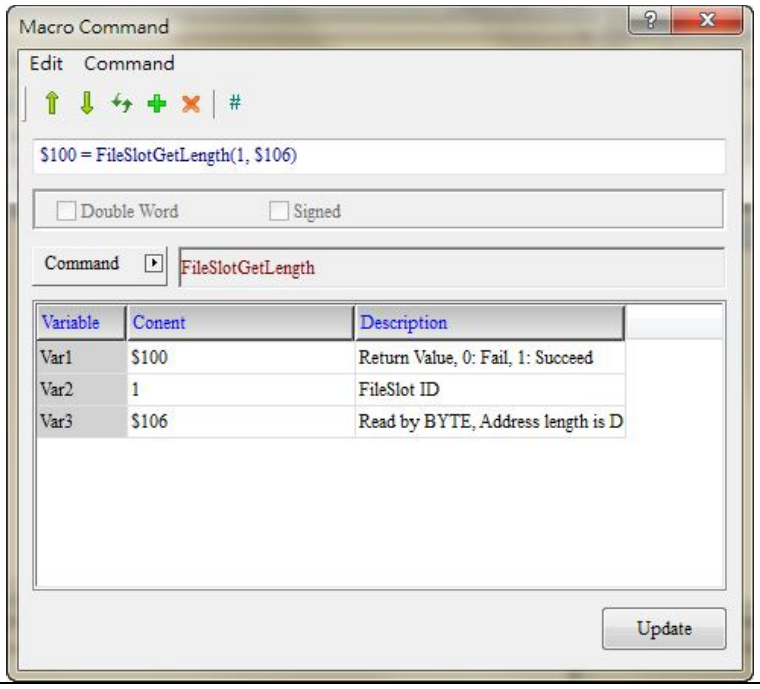
■ FileSlotGetLength (Read the file length)

<table>
<tr><th>Expression</th><th colspan="3">What Variables Represent</th><th>NOTE</th></tr>
<tr><td rowspan="6">Var1 = FileSlotGetLength (Var2, Var3) (W)</td><td rowspan="3">Var 1</td><td colspan="2">Returned Value</td><td rowspan="6">W：Word</td></tr>
<tr><td>Failure</td><td>0</td></tr>
<tr><td>Success</td><td>1</td></tr>
<tr><td>Var 2</td><td colspan="2">FileSlot ID</td></tr>
<tr><td>Var 3</td><td colspan="2">Returned Value of FileSlot Length (DW)</td></tr>
<tr><td colspan="3">Expression Explanation</td></tr>
<tr><td colspan="4">Save the FileSlot length of Var 2 in Var 3 and return the result to Var 1.</td></tr>
<tr><td colspan="5">Note: The unit of accessing length is BYTE.</td></tr>
</table>

Variable	Memory Usage		
	Internal Memory	PLC Register	Constant
Var 1	◎		
Var 2	◎	◎	◎
Var 3	◎	◎	

Example Description

➢ Var 1 and Var 3 are internal memory and Var 2 is constant. Acquire the length of FileSlot whose ID is 1 (Var2) and save it in $106. Then, save the returned value in $100 (Var 1). If the FileSlot length is 10 Words, the value returned to $106 is 20 (BYTE).



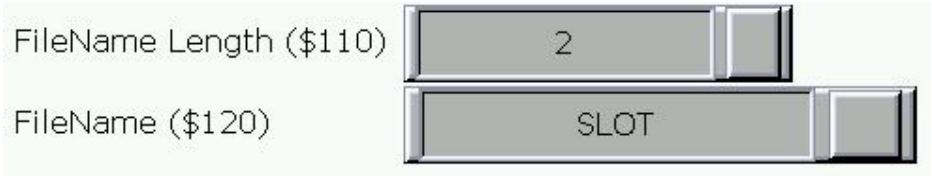
■ FileSlotExport (Export the File)

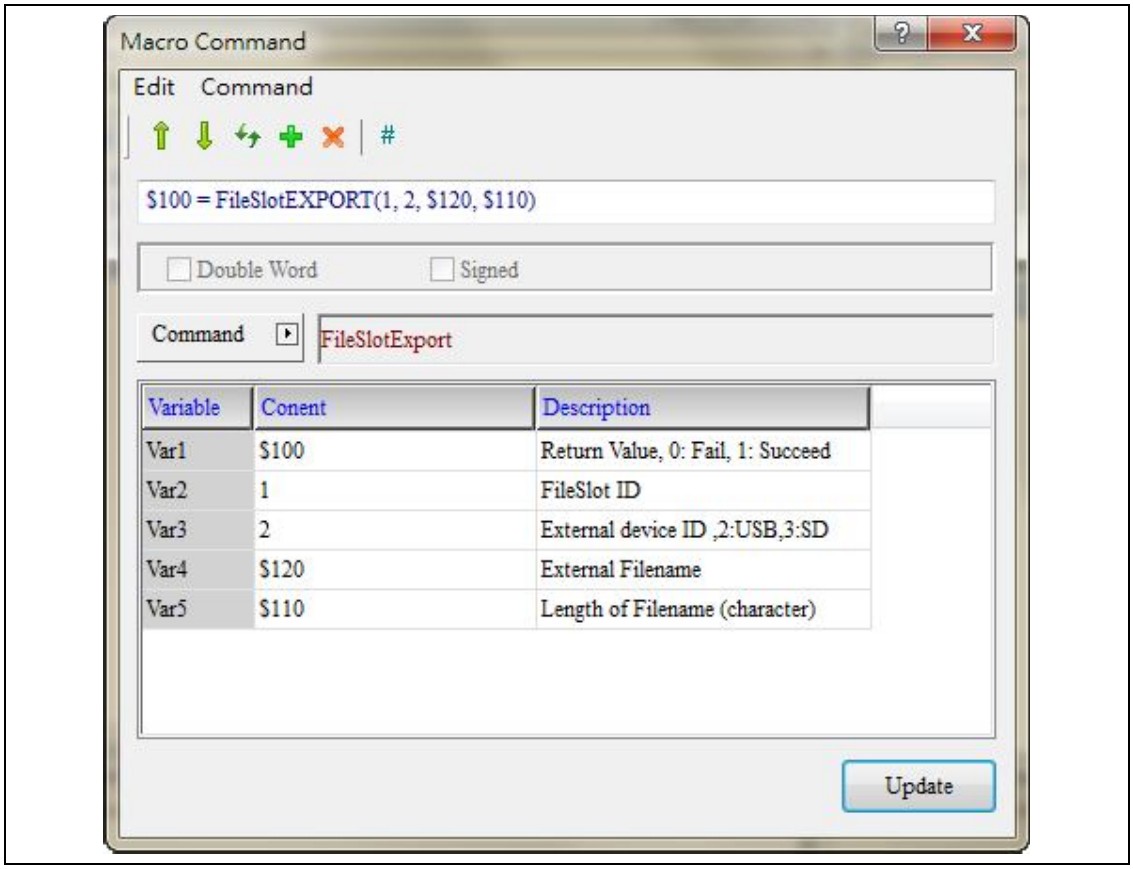
<table>
<tr><th>Expression</th><th colspan="4">What Variables Represent</th><th>NOTE</th></tr>
<tr><td rowspan="9">Var1 = FileSlotExport (Var2, Var3, Var4, Var5) (W)</td><td rowspan="3">Var 1</td><td colspan="3">Returned Value</td><td rowspan="9">W：Word</td></tr>
<tr><td>Failure</td><td colspan="2">0</td></tr>
<tr><td>Success</td><td colspan="2">1</td></tr>
<tr><td>Var 2</td><td colspan="3">FileSlot ID</td></tr>
<tr><td rowspan="2">Var 3</td><td rowspan="2">File Export Device</td><td>USB Disk</td><td>2</td></tr>
<tr><td>SD Card</td><td>3</td></tr>
<tr><td>Var 4</td><td colspan="3">Exported File Name</td></tr>
<tr><td>Var 5</td><td colspan="3">Length of Exported File Name</td></tr>
<tr><td colspan="4">Expression Explanation</td></tr>
<tr><td colspan="4">Export Var 2 FileSlot to external storage device, Var3 and its file name is Var 4. Then, return the result to Var1.</td></tr>
</table>

Variable	Memory Usage		
	Internal Memory	PLC Register	Constant
Var 1	◎		
Var 2	◎	◎	◎
Var 3	◎	◎	◎
Var 4	◎	◎	
Var 5	◎	◎	◎

Example Description

- Var 1, Var 4 and Var 5 are internal memory while Var 2 and Var3 are constants. Export FileSlot ID 1 (Var 2) to USB Disk (Var 3), the length of file name is 2 (Var 5) and its file name is Slot (Var 4). Then, save the returned value in $100 (Var 1).




Macro Command
Edit Command
$100 = FileSlotEXPORT(1, 2, $120, $110)
Double Word
Signed
Command
FileSlotExport
Variable
Conent
Description
Var1
$100
Return Value, 0: Fail, 1: Succeed
Var2
1
FileSlot ID
Var3
2
External device ID ,2:USB,3:SD
Var4
$120
External Filename
Var5
$110
Length of Filename (character)
Update

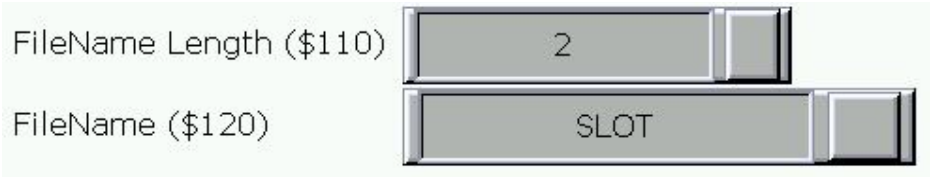
■ FileSlotImport (Import the File)

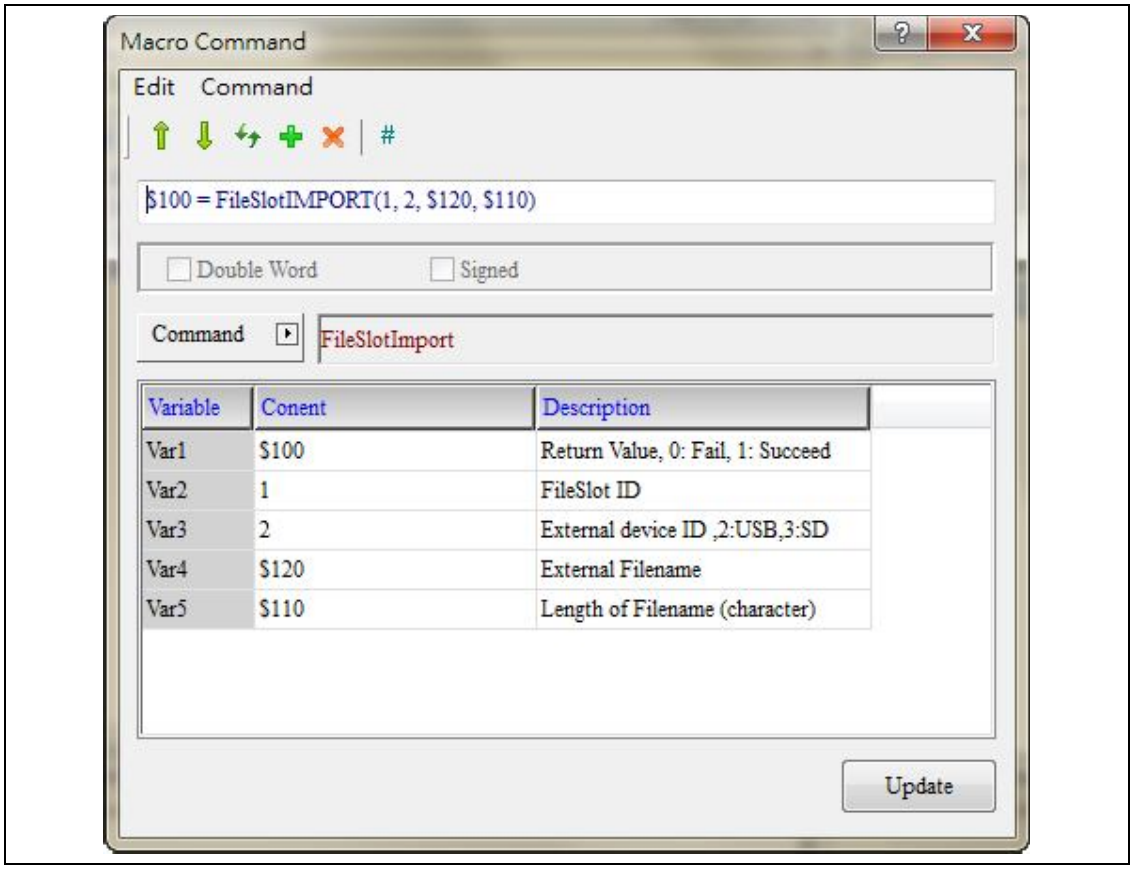
<table>
<tr><th>Expression</th><th colspan="5">What Variables Represent</th><th>NOTE</th></tr>
<tr><td rowspan="8">Var1 = FileSlotImport (Var2, Var3, Var4, Var5) (W)</td><td rowspan="3">Var 1</td><td colspan="4">Returned Value</td><td rowspan="8">W：Word</td></tr>
<tr><td colspan="2">Failure</td><td colspan="2">0</td></tr>
<tr><td colspan="2">Success</td><td colspan="2">1</td></tr>
<tr><td>Var 2</td><td colspan="4">FileSlot ID</td></tr>
<tr><td rowspan="2">Var 3</td><td rowspan="2">File Import Device</td><td>USB Disk</td><td>2</td></tr>
<tr><td>SD Card</td><td>3</td></tr>
<tr><td>Var 4</td><td colspan="4">Imported File Name</td></tr>
<tr><td>Var 5</td><td colspan="4">Length of Imported File Name</td></tr>
<tr><td colspan="6">Expression Explanation</td></tr>
<tr><td colspan="6">Import the file names Var4 from external storage device Var3 to FileSlot of Var2. Then, return the result to Var1.</td></tr>
</table>

Variables	Memory Usage		
	Internal Memory	PLC Register	Constant
Var 1	◎		
Var 2	◎	◎	◎
Var 3	◎	◎	◎
Var 4	◎	◎	
Var 5	◎	◎	◎

Example Description

- Var 1, Var 4 and Var 5 are internal memory while Var 2 and Var3 are constants. Import the file named Slot (Var4) with file name length as 2 (Var5) from USB Disks (Var 3) to FileSlot ID 1 (Var 2). Then, save the returned value in $100 (Var 1).




Macro Command
Edit Command
$100 = FileSlotIMPORT(1, 2, $120, $110)
Double Word
Signed
Command
FileSlotImport
Variable
Conent
Description
Var1
$100
Return Value, 0: Fail, 1: Succeed
Var2
1
FileSlot ID
Var3
2
External device ID ,2:USB,3:SD
Var4
$120
External Filename
Var5
$110
Length of Filename (character)
Update

24-3-11 Others

Others macro commands include TIME TICK, Comment, Delay, GETSYSTEMTIME、SETSYSTEMTIME, EXPORT, EXRCP, IMRCP, EXENRCP, IMENRCP. Users can acquire system setup time, import and export equations with these commands and they are detailed below.

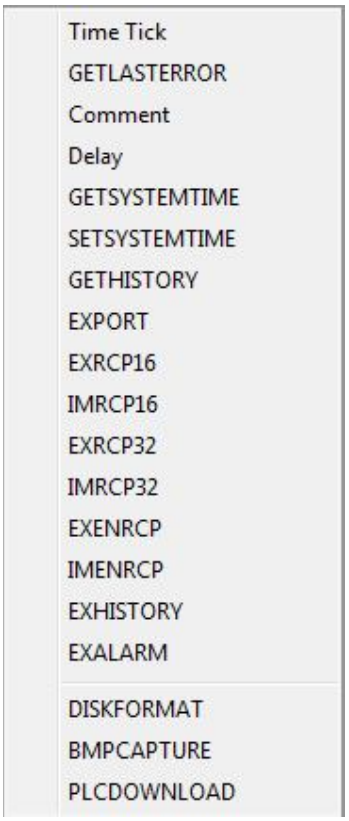


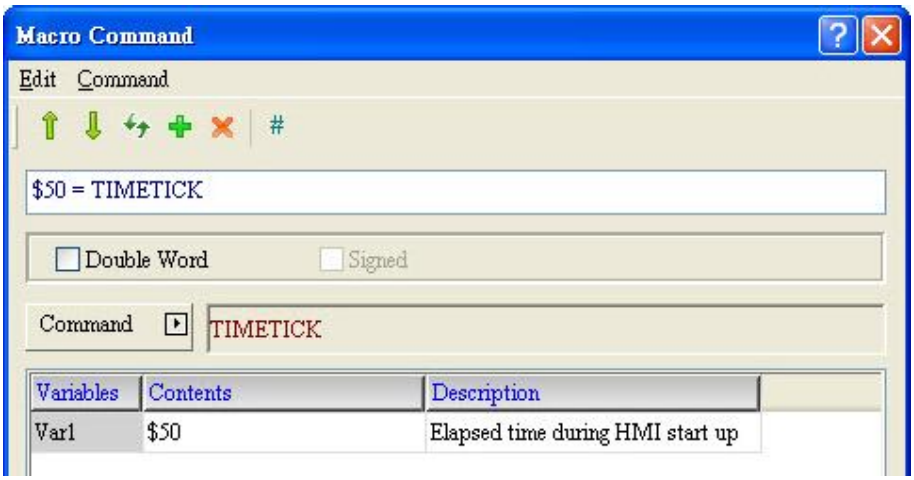
Figure 24-3-11-1 Others

■ Time Tick (Acquire System up duration from System Startup to Present)

Expression	What Variables Represent		NOTE
Var1 = TIMETICK (W) Var1 = TIMETICK (DW)	Var 1	TIMETICK from system startup to present	W : Word DW : Double Word
	Expression Explanation		
	Calculate system up duration from system startup time to present and save it in Var 1 (in ms).		

Variable	Memory Usage		
	Internal Memory	PLC Register	Constant
Var 1	◎		

Example
➢ Var 1 is an internal memory address and save the system up duration in $50.



■ GETLASTERROR (Get Last Error Value)

Expression	What Variables Represent		NOTE
Var1 = GETLASTERROR (W) Var1 = GETLASTERROR (DW) Var1 = GETLASTERROR (Signed W) Var1 = GETLASTERROR (Signed DW)	Var 1	Last error value 1 : Successful Negative value: error (for details on the negative value please refer to 24-4 Macro Error Codes)	W : Word DW : Double Word Signed : Signed number
	Expression Explanation		
	Acquire the last error value and save the result in Var1.		

Variable	Memory Usage		
	Internal Memory	PLC Register	Constant
Var 1	◎		

Example
➢ Var 1 is an internal memory address and save the last error value in $50.

■ COMMENT (Make Comment)

Expression	What Variables Represent		NOTE
#Var1 (W)	Var 1	Description of the macro	W : Word
	Expression Explanation		
	Mark Var 1 as a comment		

Variable	Memory Usage		
	Internal Memory	**PLC Register**	**Constant**
Var 1	◎		

Example
➢ Put # in front of a statement to make it a comment; or type in a description for a macro and put # in front of the macro description.

■ Delay (System Delay)

Expression	What Variables Represent		NOTE
Delay(Var1) (W)	Var 1	Delay time length	W : Word
	Expression Explanation		
	Set the system to delay for a duration(in ms) specified in Var1 before executing the next command		

* Since the HMI is a multiplexer system, a default system delay may occur. If this command is set, then the delay duration will become longer due to multiplexing operations, and the condition that setting the time forward will not happen.

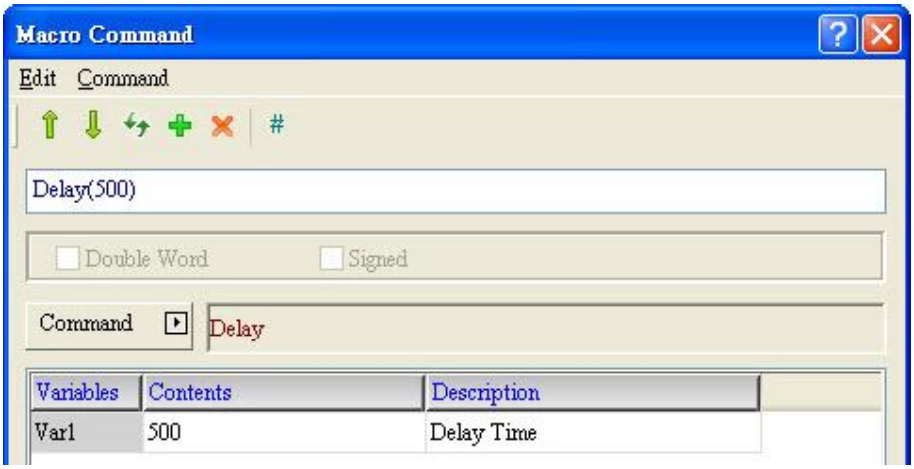
* Please note that a long delay duration may cause the HMI to respond slowly.

* When executing this command, the HMI will suspend all current operations and resume them after the delay duration is over.

Variable	Memory Usage		
	Internal Memory	PLC Register	Constant
Var 1	◎		◎

Example

➢ Var 1 is a constant and set the delay to 500 ms.



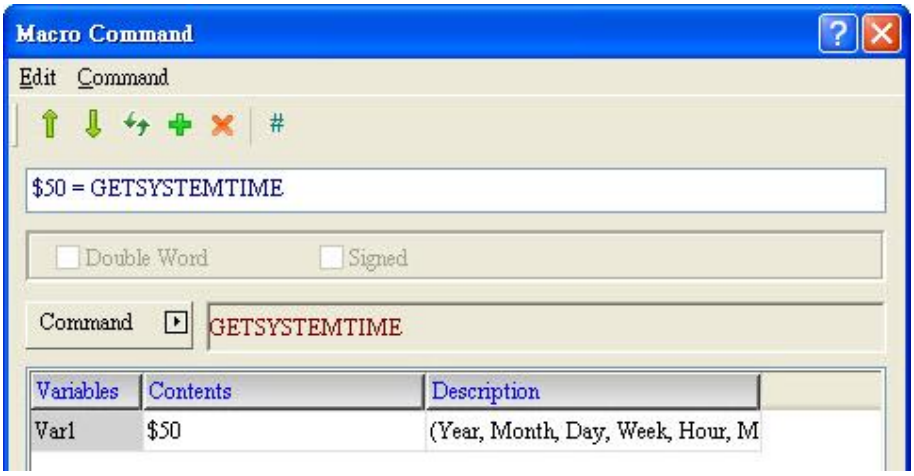
■ GETSYSTEMTIME (Acquire System Time)

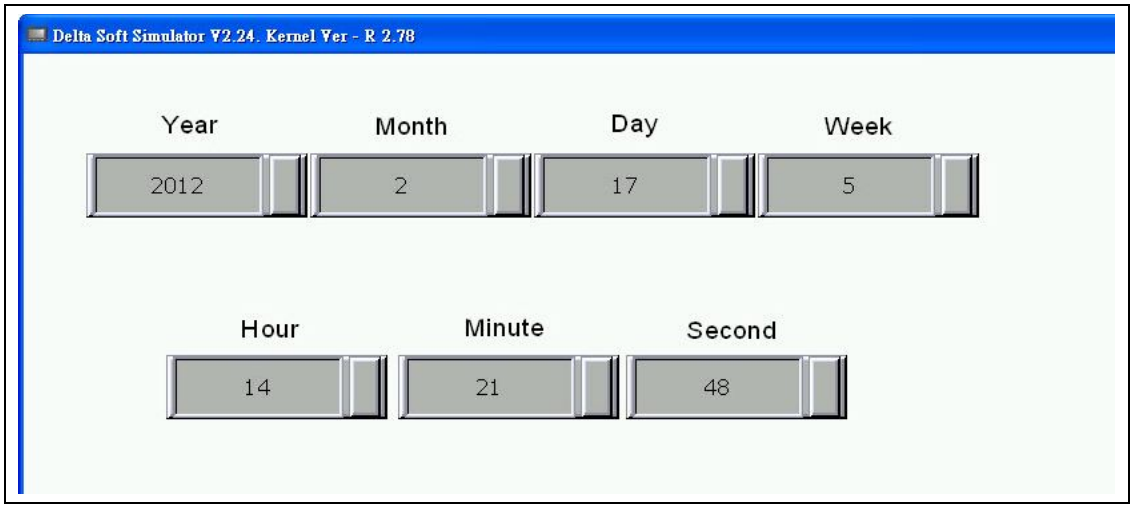
Expression	What Variables Represent		NOTE
Var1 = GETSYSTEMTIME (W)	Var 1	Year	W : Word
	Var 1 + 1	Month	
	Var 1 + 2	Day	
	Var 1 + 3	Week	
	Var 1 + 4	Hour	
	Var 1 + 5	Minute	
	Var 1 + 6	Second	
	Expression Explanation		
	Acquire system time with 7 address (in Words) from Var 1 to Var 7.		

Memory Usage			
Variable	**Internal Memory**	**PLC Register**	**Constant**
Var 1	◎		

Example

➢ Var 1 is an internal memory address and save the current system time to $50 ~ $57.



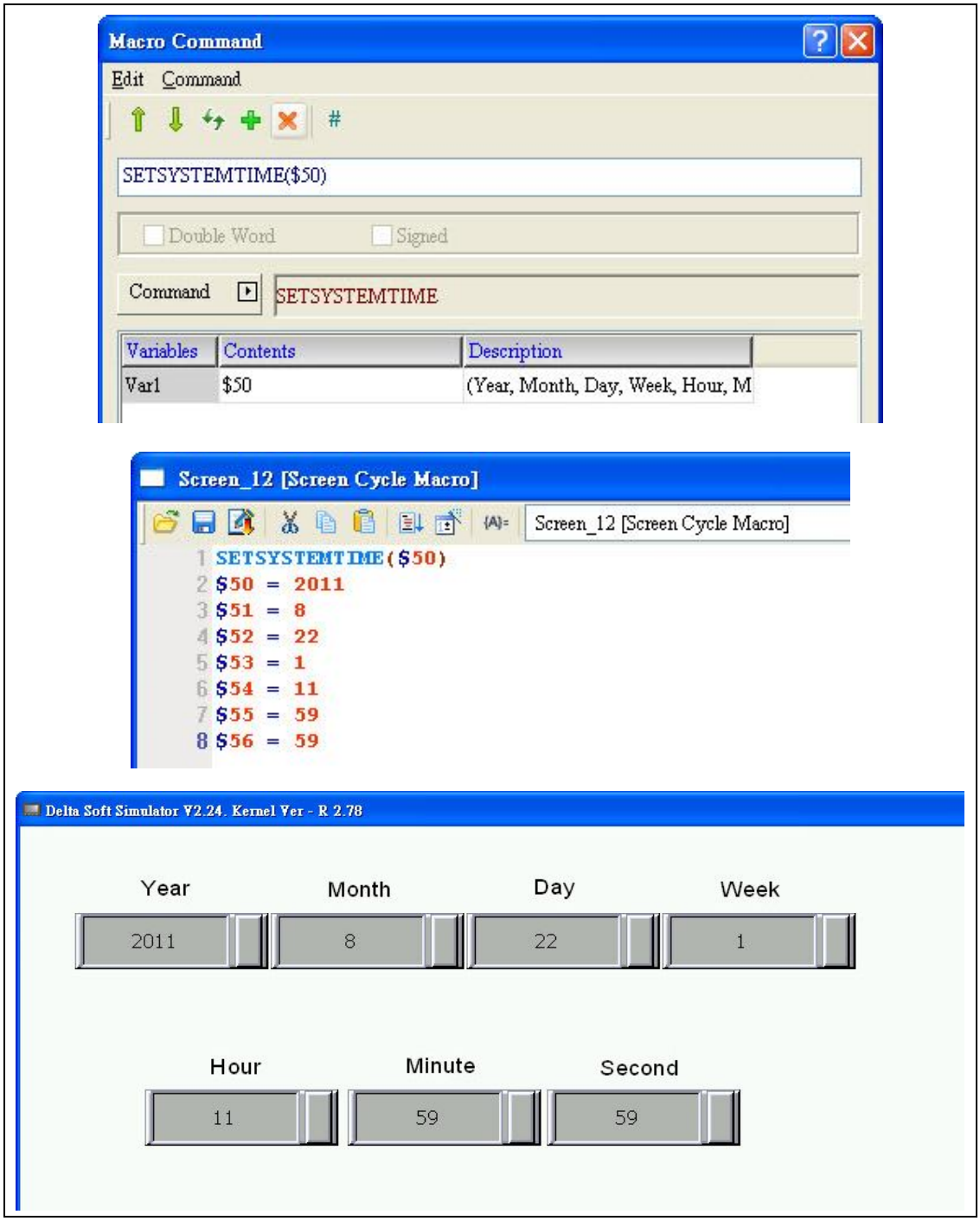


■ SETSYSTEMTIME (Set System Time)

Expression	What Variables Represent		NOTE
Var1 = SETSYSTEMTIME (W)	Var 1	Year	W : Word
	Var 1 + 1	Month	
	Var 1 + 2	Day	
	Var 1 + 3	Week	
	Var 1 + 4	Hour	
	Var 1 + 5	Minute	
	Var 1 + 6	Second	
	Expression Explanation		
	Set system time with 7 address (in Words) from Var 1 to Var 7.		

Variable	Memory Usage		
	Internal Memory	PLC Register	Constant
Var 1	◎		

Example
➢ Var 1 is an internal memory address. Set and save the current system time to $50 ~ $57.


Macro Command
Edit Command
SETSYSTEMTIME($50)
Double Word
Signed
Command
SETSYSTEMTIME
Variables
Contents
Description
Var1
$50
(Year, Month, Day, Week, Hour, M
Screen_12 [Screen Cycle Macro]
Screen_12 [Screen Cycle Macro]
1 SETSYSTEMTIME($50)
2 $50 = 2011
3 $51 = 8
4 $52 = 22
5 $53 = 1
6 $54 = 11
7 $55 = 59
8 $56 = 59
Delta Soft Simulator V2.24. Kernel Ver - R 2.78
Year
Month
Day
Week
2011
8
22
1
Hour
Minute
Second
11
59
59

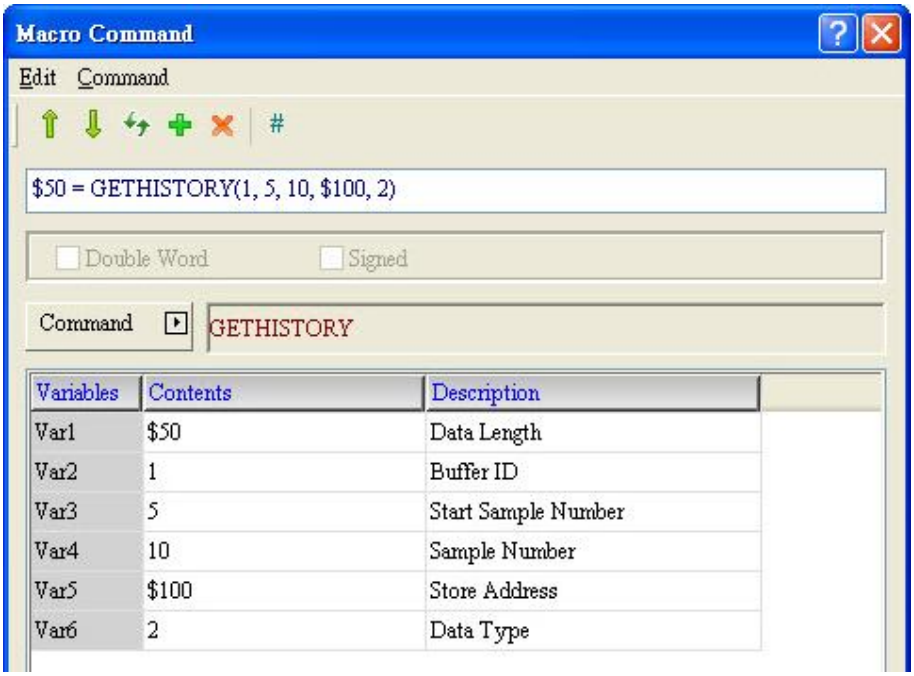
■ GETHISTORY (Acquire Historical Log)

<table>
<tr><th>Expression</th><th colspan="4">What Variables Represent</th><th>NOTE</th></tr>
<tr><td rowspan="8">Var1 = GETHISTORY(Var2, Var3, Var4, Var5, Var6) (W)</td><td>Var 1</td><td colspan="3">Store data length</td><td rowspan="8">W : Word</td></tr>
<tr><td>Var 2</td><td colspan="3">Store ID for history buffer</td></tr>
<tr><td>Var 3</td><td colspan="3">Store starting address for sampling</td></tr>
<tr><td>Var 4</td><td colspan="3">Store the number of record accessing point</td></tr>
<tr><td>Var 5</td><td colspan="3">Store the data storage address</td></tr>
<tr><td rowspan="3">Var 6</td><td rowspan="3">Data Type</td><td>Data</td><td>0</td></tr>
<tr><td>Time</td><td>1</td></tr>
<tr><td>Data and Time</td><td>2</td></tr>
<tr><td colspan="4">Expression Explanation</td></tr>
<tr><td colspan="4">Acquire historical log.</td></tr>
<tr><td colspan="6">* it is recommended to set Var 1, Var 3 and Var 4 as Double Word. If using consecutive addresses in Word, then data may be overwritten and result may be affected.</td></tr>
</table>

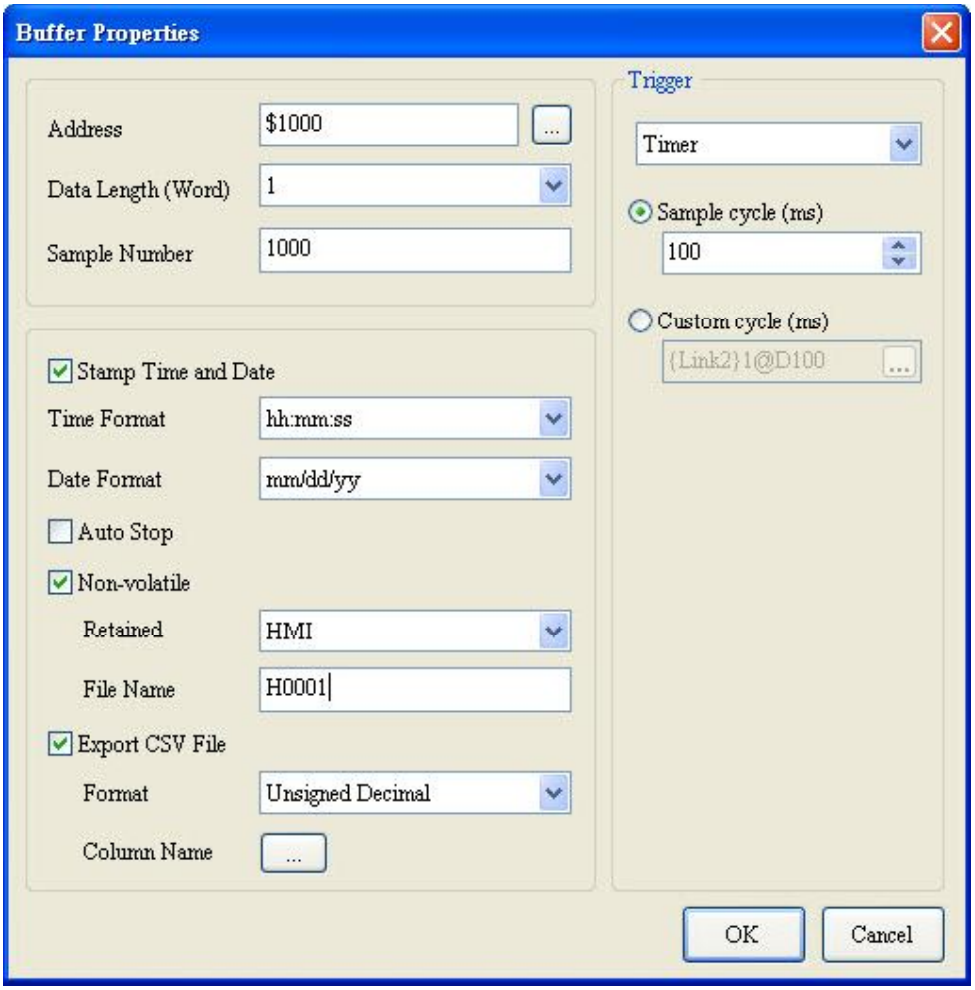
Variable	Memory Usage		
	Internal Memory	PLC Register	Constant
Var 1	◎		
Var 2	◎		◎
Var 3	◎		◎
Var 4	◎		◎
Var 5	◎	◎	
Var 6	◎		◎

Example

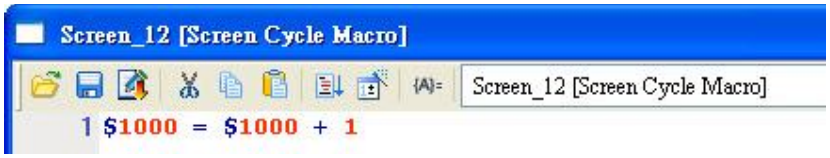
- Var 1 and Var 5 are an internal memory addresses, and Var 2, Var3, Var 4 and Var 6 are constants. Set the ID for the history buffer as 1(Var 2), sample 10 records (Var 3) starting from the 5th record (Var 2), Set the data type to 2 (Var 6), including time and data, and save it to consecutive addresses of $100 (var 5) and save the data length into $50 (Var 1).



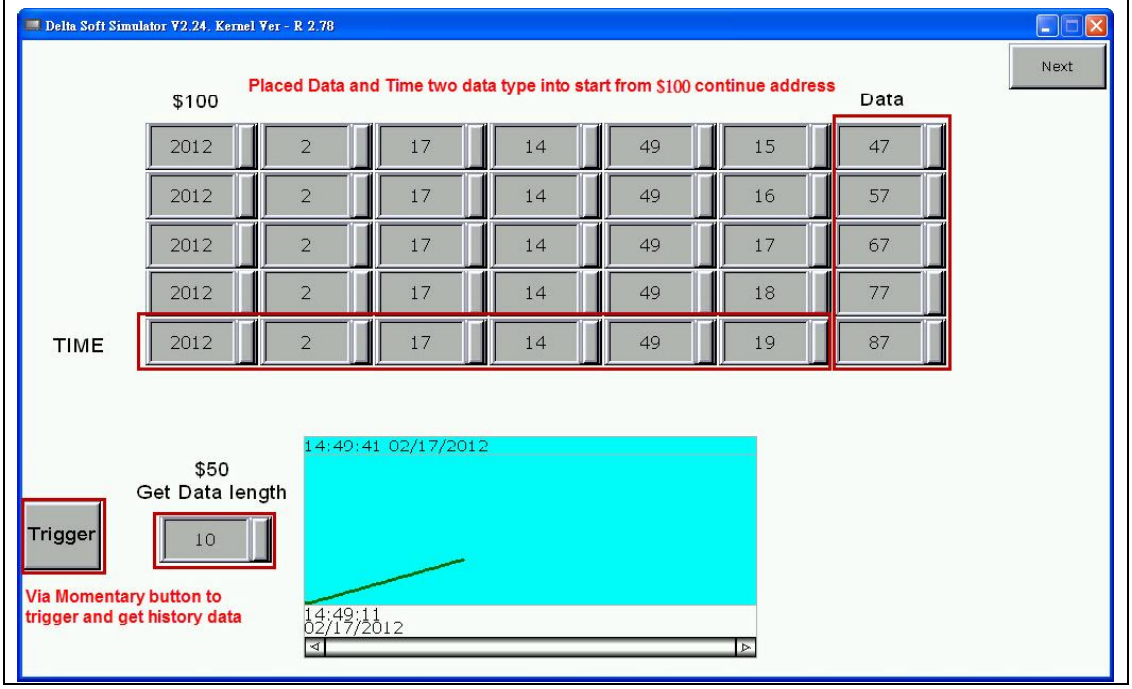
- Set $1000 as the record accessing address for sampling history buffers.



- Edit Screen Cycle Macro to repeatedly adding history records to $1000.



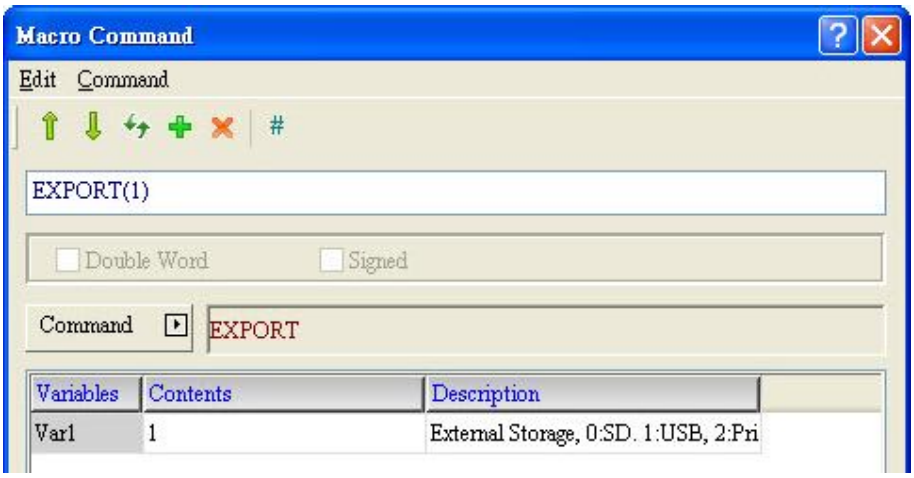
➢ Edit ON Macro and set GETHISTORY as shown below.



■ EXPORT (Export Report to an External Device)

Expression	What Variables Represent				NOTE
EXPORT(Var1) (W)	Var 1	Device to export a report	SD Card	0	W : Word
			USB Disk	1	
			Printer	2	
	Expression Explanation				
	Delay for a duration specified in Var 1 to resume the next command (in ms).				

Variable	Memory Usage		
	Internal Memory	PLC Register	Constant
Var 1	◎		◎

Example
➢ Var 1 is a constant. Export the report to a USB Disk. 

■ EXRCP16/EXRCP32 (Export 16 bit Equation/32 bit Equation)

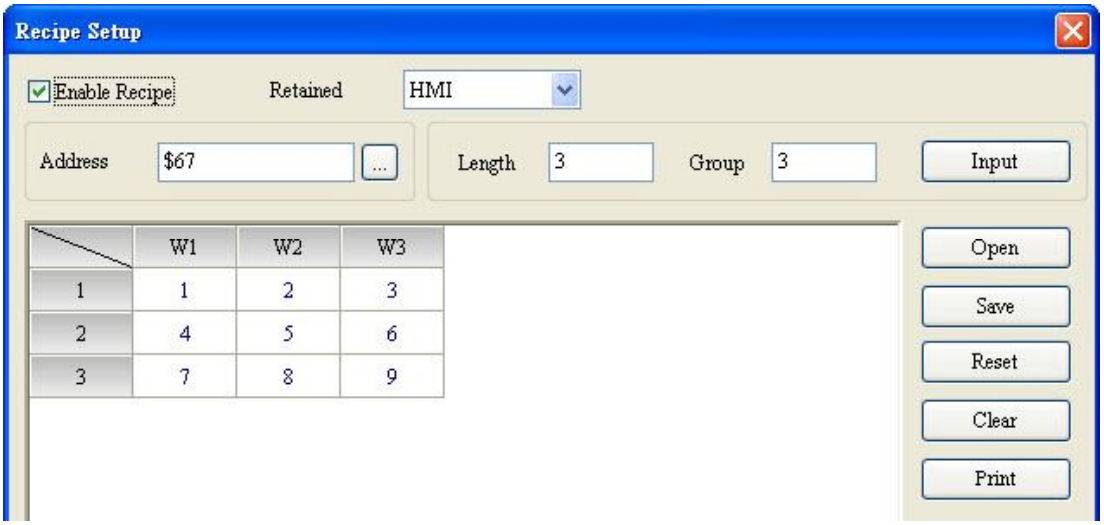
<table>
<tr><th>Expression</th><th colspan="4">What Variables Represent</th><th>NOTE</th></tr>
<tr><td rowspan="6">Var1 = EXRCP16(Var2, Var3) (W)
Var1 = EXRCP32(Var2, Var3) (W)</td><td rowspan="3">Var 1</td><td colspan="3">Returned Value</td><td rowspan="6">W : Word</td></tr>
<tr><td colspan="2">Failure</td><td>0</td></tr>
<tr><td colspan="2">Successful</td><td>1</td></tr>
<tr><td>Var 2</td><td colspan="3">File name of the exported 16 bit equation</td></tr>
<tr><td rowspan="2">Var 3</td><td rowspan="2">Storage device the equation is exported to</td><td>SD Card</td><td>2</td></tr>
<tr><td>USB Disk</td><td>3</td></tr>
<tr><td colspan="5">Expression Explanation</td></tr>
<tr><td colspan="5">Export and save 16 bit (or 32 bit) equations to Var 3 and save the returned result to Var 1.</td></tr>
<tr><td colspan="6">Note: The exported file is saving to root in the storage device.</td></tr>
</table>

Variable	Memory Usage		
	Internal Memory	PLC Register	Constant
Var 1	◎	◎	
Var 2	◎	◎	
Var 3	◎	◎	◎

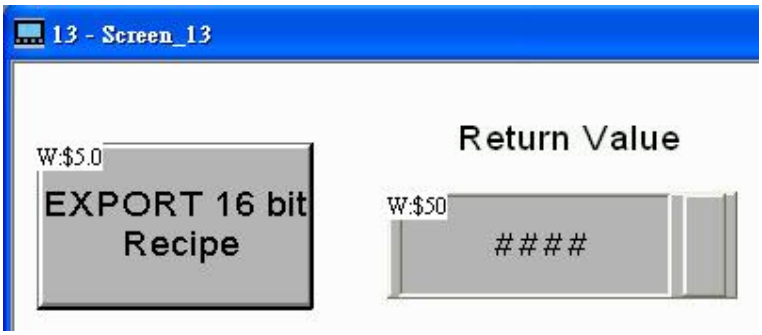
Example

- The below example illustrates how to export a 16 bit equation and for a 32 bit equation, the exporting steps are the same.
- Export a 16 bit equation to a USB Disk and file name is tina.

Step 1: go to equation setup dialog box to set up an equation [Options] → [Equation].



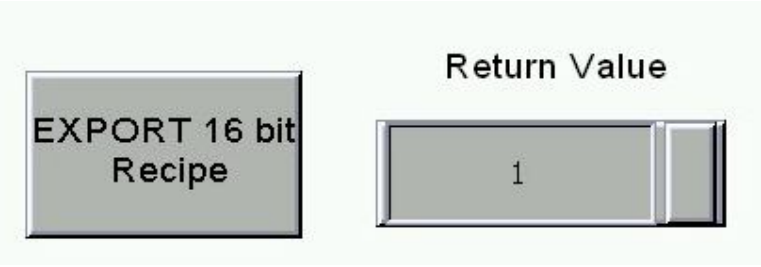
Step 2: create a maintained button ($5.0) and variable ($50).

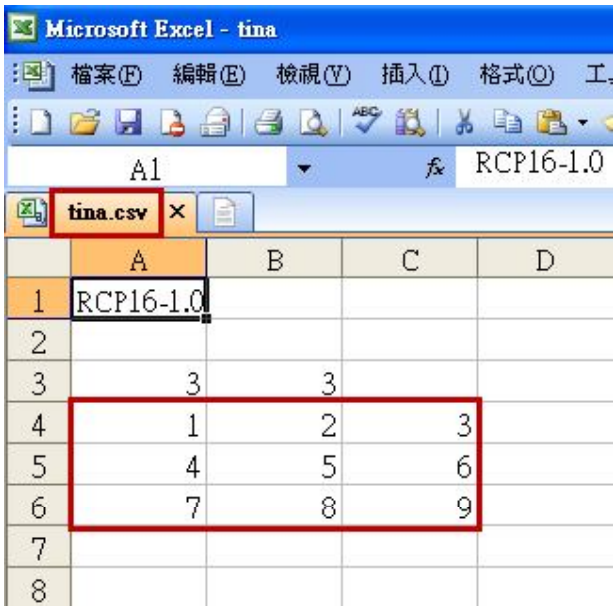


Step 3: enter into the button and create an ON Macro shown below. Put the tina string into $100 and export the data to a USB Disk, using the command EXRCP16, and name the file tina.

Step 4: edit the elements within the editing area and download the equation to the HMI. Trigger the $5.0 button and then $50 will display 1, indicating it is successful

and export the 16 bit equation to the designated USB Disk.





■ IMRCP16/IMRCP32 (Import 16 bit Equation/32 bit Equation)

Expression	What Variables Represent				NOTE
Var1 = IMRCP16(Var2, Var3) (W) Var1 = IMRCP32(Var2, Var3) (W)	Var 1	Returned Value			W : Word
		Failure	0		
		Successful	1		
	Var 2	File name of the imported 16 bit equation			
	Var 3	Storage device the equation is imported from	SD Card	2	
			USB Disk	3	
	Expression Explanation				
	From Var 3 to import 16 bit (or 32 bit) equations and returned result to Var 1.				

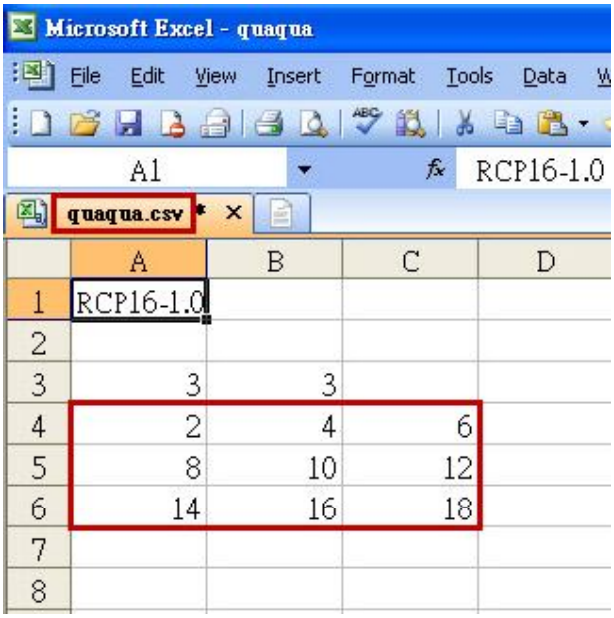
Variable	Memory Usage		
	Internal Memory	PLC Register	Constant
Var 1	◎	◎	

Var 2	◎	◎	
Var 3	◎	◎	◎

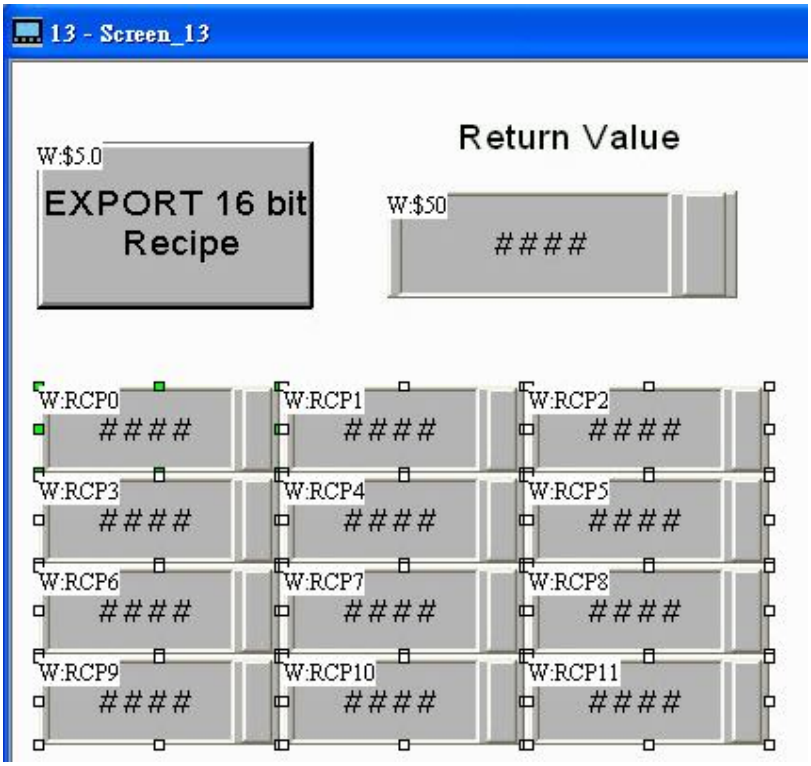
Example

- The below example illustrates how to import a 16 bit equation, and for a 32 bit equation, the importing steps are the same.
- Import a 16 bit equation to a USB Disk and file name is quaqua.

Step 1: Modify and save the equation to the USB Disk.

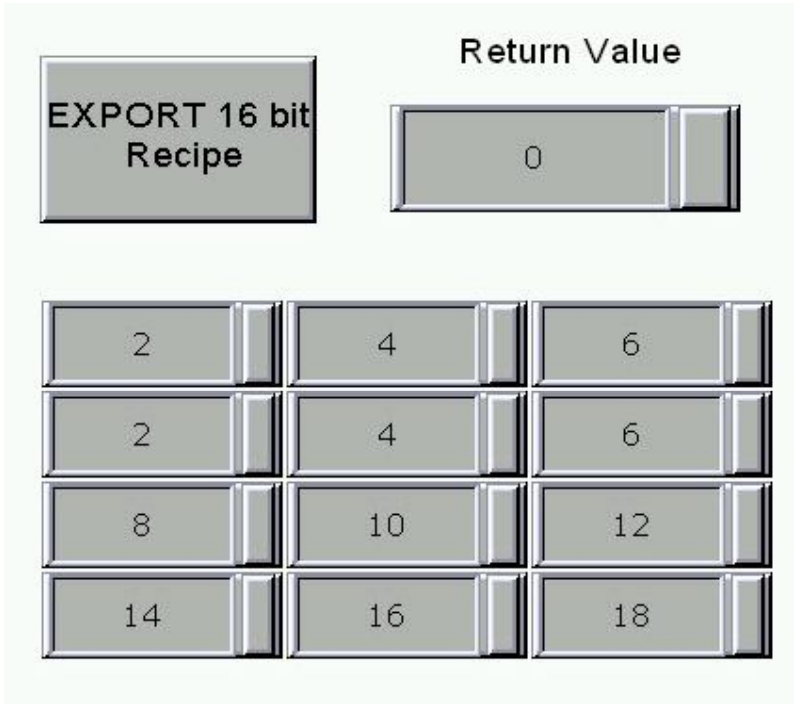


Step 2: create a maintained button ($5.0), variable ($50), and addresses for storing equations RCP0~RCP11.



Step 3: enter into the button and create an ON Macro shown below. Put the quaqua string into $100 and import the data to a USB Disk, using the command IMRCP16.

Step 4: edit the elements within the editing area and download the equation to the HMI. Trigger the $5.0 button and then $50 will display 1, indicating it is successful and import the 16 bit equation to the HMI. The equation data will replaced by the quaqua equation just imported.


EXPORT 16 bit Recipe
Return Value
0
2
4
6
2
4
6
8
10
12
14
16
18

■ EXENRCP (Export Enhance Recipe Equation)

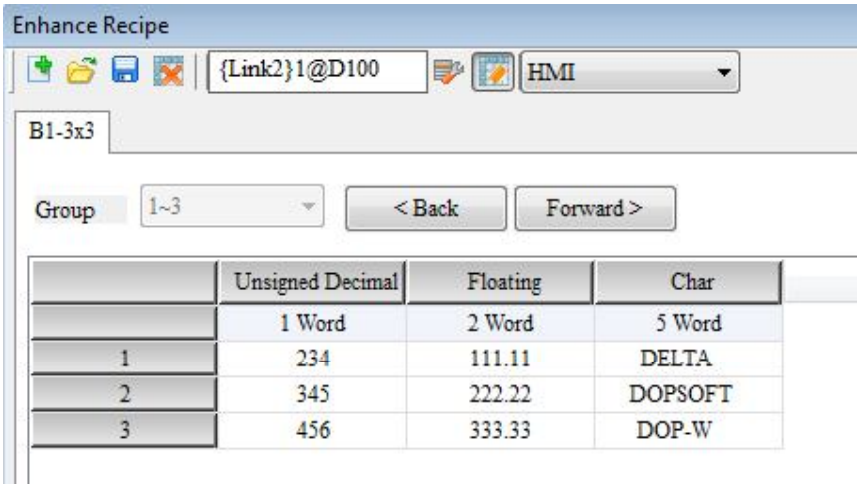
<table>
<tr><th>Expression</th><th colspan="5">What Variables Represent</th><th>NOTE</th></tr>
<tr><td rowspan="6">Var1 = EXENRCP(Var2, Var3) (W)</td><td rowspan="3">Var 1</td><td colspan="4">Returned Value</td><td rowspan="6">W : Word</td></tr>
<tr><td colspan="2">Failure</td><td colspan="2">0</td></tr>
<tr><td colspan="2">Successful</td><td colspan="2">1</td></tr>
<tr><td>Var 2</td><td colspan="4">File name of the exported enhance recipe equation</td></tr>
<tr><td>Var 3</td><td rowspan="2">Storage device the equation is exported to</td><td>USB Disk</td><td>2</td></tr>
<tr><td>SD Card</td><td>3</td></tr>
<tr><td colspan="6">Expression Explanation</td></tr>
<tr><td colspan="6">Export and save 16 bit (or 32 bit) equations to Var 3 and save the returned result to Var 1.</td></tr>
<tr><td colspan="7">Note: The exported file is saving to root in the storage device.</td></tr>
</table>

Variable	Memory Usage		
	Internal Memory	PLC Register	Constant
Var 1	◎	◎	
Var 2	◎	◎	
Var 3	◎	◎	◎

Example

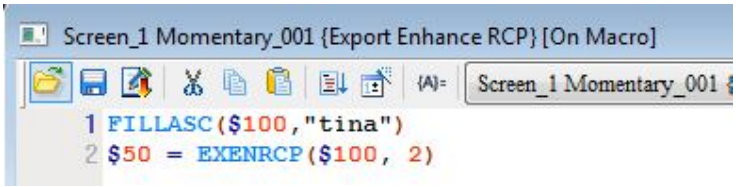
➢ Export the enhance recipe data to USB Disk and name it as tina.

Step 1: Enter【Option】→【Enhance Recipe】 to setup enhance recipe data.

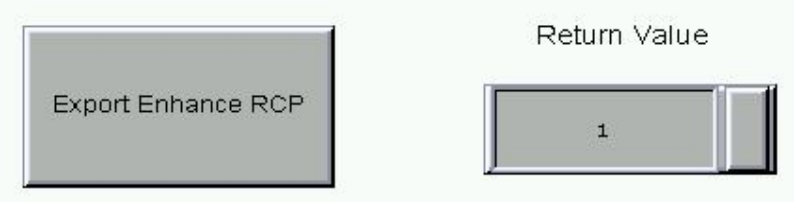


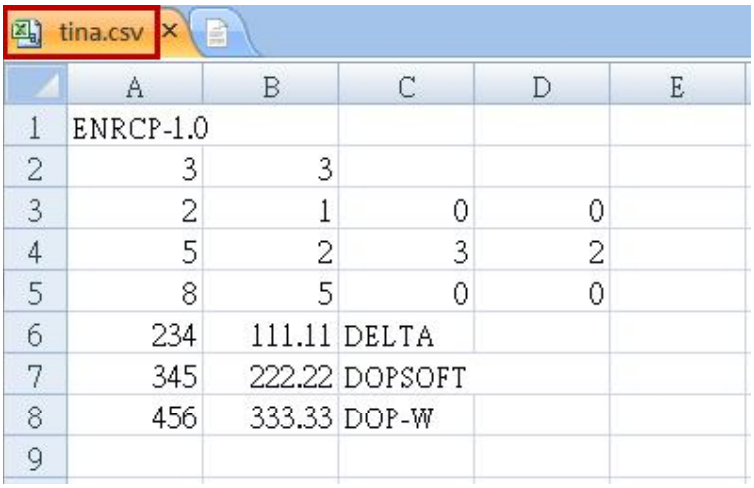
Step 2: Create momentary button ($5.0) and numeric entry element ($50).

Step 3: Go to Screen of Momentary Button to edit On macro. Please see as below. Place “tina” to $100. Then, export the enhance recipe to USB Disk whose file name is tina.



Step 4: Compile the screen and download the recipe data to HMI. When $5.0 button is triggered, $50 will display 1, which means the enhance recipe is exported successfully. Then, export the enhance recipe data to USB Disk.





tina.csv

	A	B	C	D	E
1	ENRCP-1.0				
2	3	3			
3	2	1	0	0	
4	5	2	3	2	
5	8	5	0	0	
6	234	111.11	DELTA		
7	345	222.22	DOPSOFT		
8	456	333.33	DOP-W		
9					

Note: Please refer to the followings for the definition of each field.

Format	Definition of DOPSoft
BCD	0
Signed Decimal	1
Unsign Decimal	2
Hexdecimal	3
Binary	4
Floating	5
Char	8

Descriptions of each cell in exported CSV file are shown as below:

A-1 : Version ENRCP-1.0
A-2 : File Number 3
B-2 : Group Number 3
A-3 : Numeric Format of the 1st Field 2 (Unsigned Decimal)
B-3 : Numeric Length of the 1st Field 1 (Word)
C-3 : Integer Digits of the 1st Field 0
D-3 : Fractional Digits of the 1st Field 0
A-4 : Numeric Format of the 2nd Field 5 (Floating)
B-4 : Numeric Length of the 2nd Field 2 (Word)
C-4 : Integer Digits of the 2nd Field 3
D-4 : Fractional Digits of the 2nd Field 2
A-5 : Numeric Format of the 3rd Field 8 (Char)
B-5 : Numeric Length of the 2nd Field 5 (Word)
C-5 : Integer Digits of the 3rd Field 0
D-5 : Fractional Digits of the 3rd Field 0

■ IMENRCP (Import Enhance Recipe Equation)

<table>
<tr><th>Expression</th><th colspan="5">What Variables Represent</th><th>NOTE</th></tr>
<tr><td rowspan="6">Var1 = IMENRCP(Var2, Var3) (W)</td><td rowspan="3">Var 1</td><td colspan="4">Returned Value</td><td rowspan="6">W : Word</td></tr>
<tr><td colspan="2">Failure</td><td colspan="2">0</td></tr>
<tr><td colspan="2">Successful</td><td colspan="2">1</td></tr>
<tr><td>Var 2</td><td colspan="4">File name of the imported enhance recipe equation</td></tr>
<tr><td>Var 3</td><td rowspan="2">Storage device the equation is imported from</td><td>USB Disk</td><td>2</td></tr>
<tr><td>SD Card</td><td>3</td></tr>
<tr><td colspan="6">Expression Explanation</td></tr>
<tr><td colspan="6">From Var 3 to import enhance recipe equations and returned result to Var 1.</td></tr>
</table>

Variable	Memory Usage		
	Internal Memory	PLC Register	Constant
Var 1	◎	◎	
Var 2	◎	◎	
Var 3	◎	◎	◎

Example

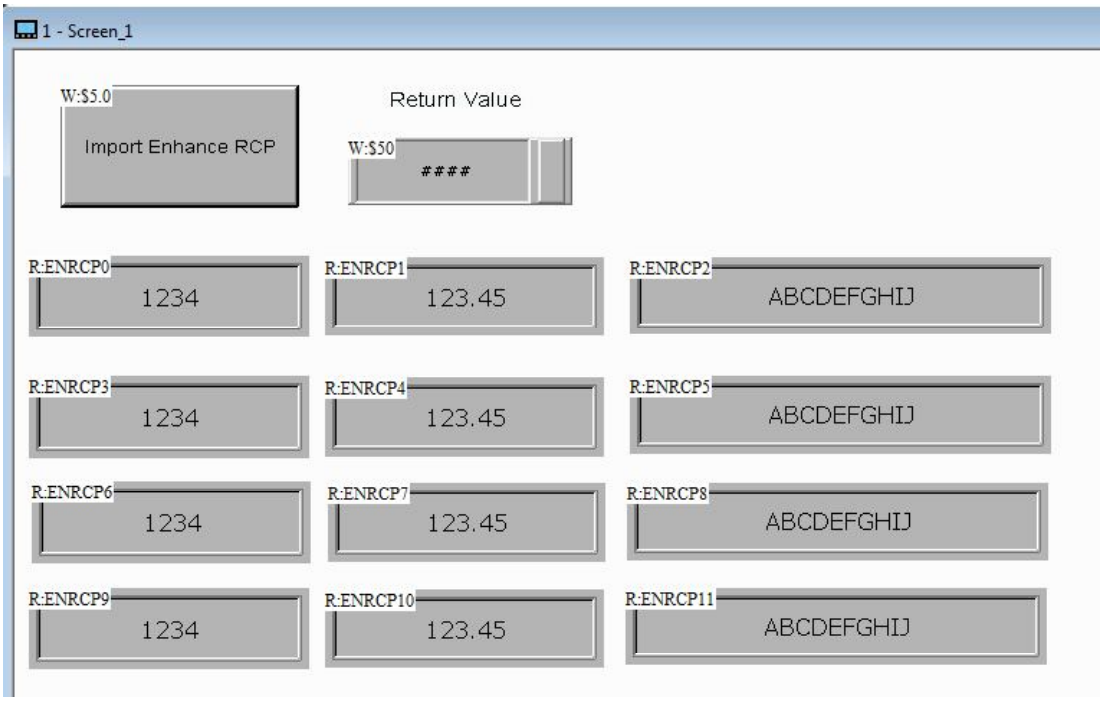
- Import the enhance recipe data from USB Disk to HMI and its file name is quaqua.

Step 1: Refer to the following figure that uses EXCEL to create recipe file. Its file name is quaqua.csv and is saved in USB Disk.

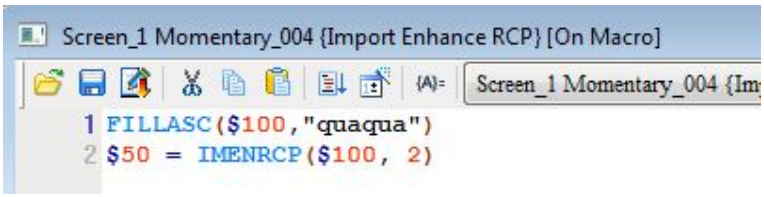
quaqua.csv

	A	B	C	D	E
1	ENRCP-1.0				
2	3	3			
3	2	1	0	0	
4	5	2	3	2	
5	8	5	0	0	
6	456	444.11	eServer		
7	789	555.22	eRemote		
8	999	666.33	DOP-B		

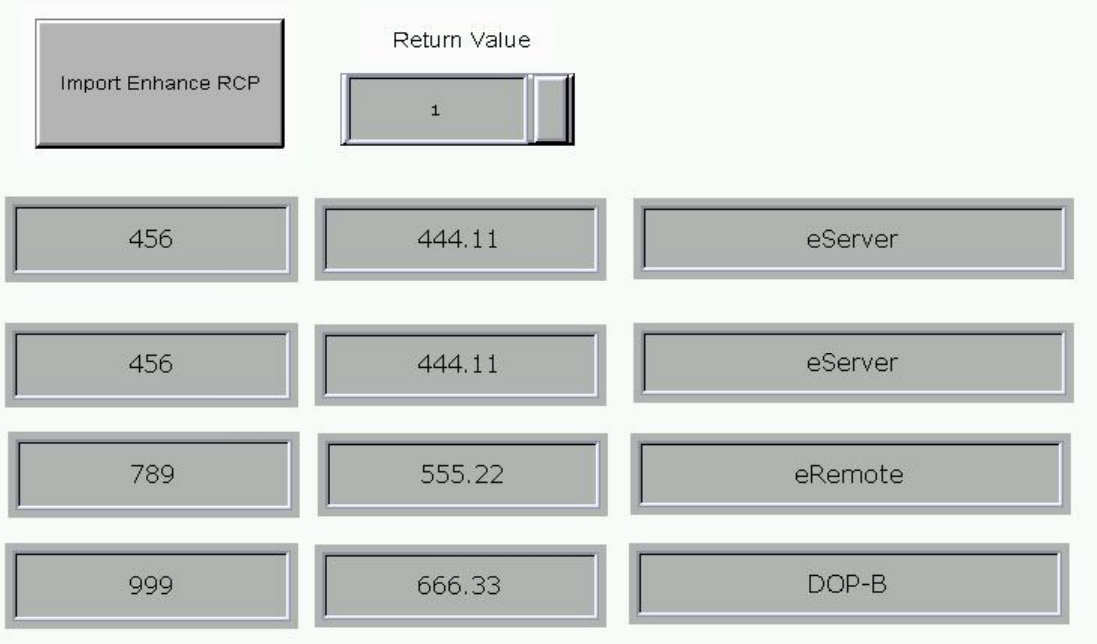
Step 2: Create momentary button ($5.0), numeric entry element ($50) and recipe address RCP0 ~ RCP11.



Step 3: Enter Screen of Momentary Button to edit On macro. Please see as below. Place quaqua to $100 and import the enhance recipe data from USB Disk.



Step 4: Compile the screen and download recipe data to HMI. When $5.0 button is triggered, $50 will display 1, which means the enhance recipe is imported successfully. Then, import the enhance recipe data to HMI. The data will be changed as the one of quaqua recipe data.



■ EXHISTORY (Export Historical Data)

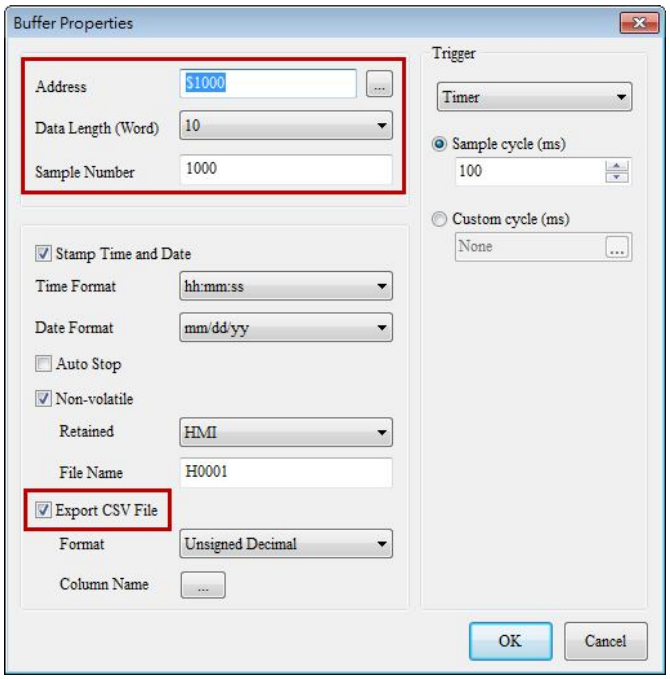
<table>
<tr><th>Expression</th><th colspan="5">What Variables Represent</th><th>NOTE</th></tr>
<tr><td rowspan="8">Var1 = EXHISTORY(Var2, Var3, Var4)</td><td rowspan="3">Var 1</td><td colspan="4">Returned Value</td><td rowspan="8"></td></tr>
<tr><td colspan="2">Failure</td><td colspan="2">0</td></tr>
<tr><td colspan="2">Success</td><td colspan="2">1</td></tr>
<tr><td>Var 2</td><td colspan="4">Historical Buffer Area ID</td></tr>
<tr><td>Var 3</td><td colspan="4">Exported File Name</td></tr>
<tr><td rowspan="2">Var 4</td><td rowspan="2">External Storage Device</td><td>USB Disk</td><td>2</td></tr>
<tr><td>SD Card</td><td>3</td></tr>
<tr><td colspan="5">Expression Explanation</td></tr>
<tr><td colspan="5">Export the historical data to external storage device.</td></tr>
<tr><td colspan="7">Note 1: In buffer area property setting,『output to CSV file』has to be checked.
Note 2: When the buffer area ID is 0, it means all historical buffer areas are exported. If 3 historical buffer areas are opened, 3 files will be exported and the file name will be『Exported File 1.csv』,『Exported File 2.csv』and『Exported File 3.csv』, repectively. If the area ID is not 0, it means the exported historical buffer area ID is specified. When it exports one file, the file name will be『Exported File.csv』.
Note 3: When the file is exported,『.csv』will be added as the filename extension automatically. Characters such as『\』,『/』,『:』,『*』,『?』,『”』,『<』,『>』and『|』cannot be included in file name.
If x00 is included in the string, the string will be judged as finish.</td></tr>
</table>

Variables	Memory Usage			
	Internal Memory	PLC Register	String	Constant
Var 1	◎	◎		
Var 2	◎	◎		◎
Var 3	◎	◎		
Var 4	◎	◎		◎

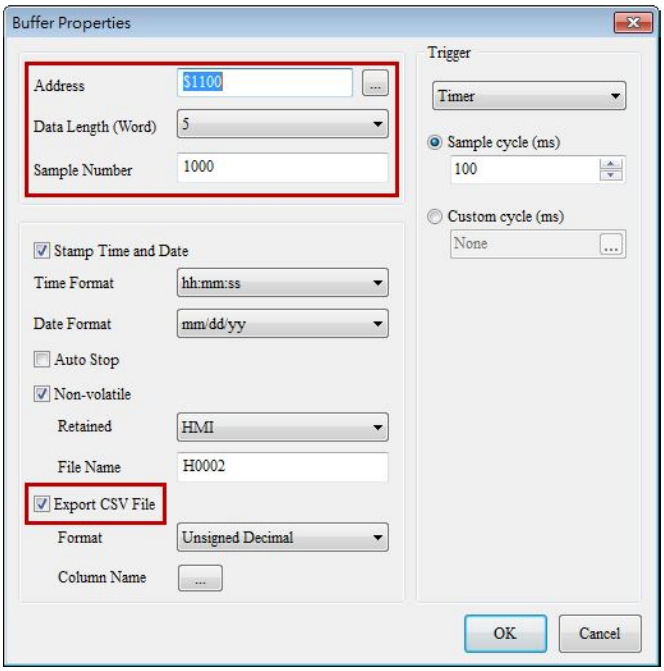
Example Description

➢ Step 1: Setup three historical buffer areas. See the setting below:

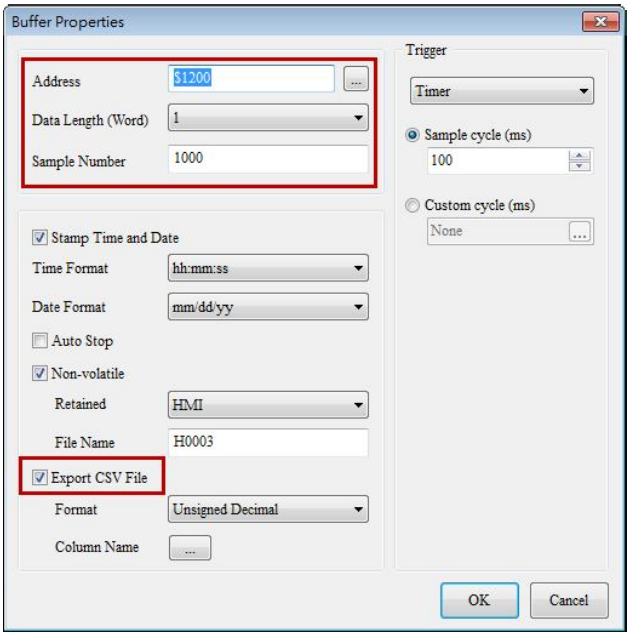
(1) Historical Buffer Area 1: Set Address to $ 1000, Data Length to 10 and check “Export CSV file”.



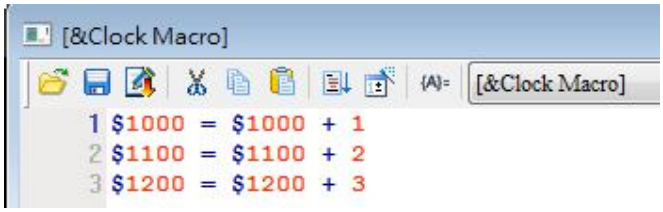
(2) Historical Buffer Area 2: Set Address to $ 1100, Data Length to 5 and check “Export CSV file”.



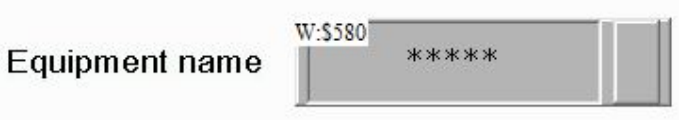
(3) Historical Buffer Area 3: Set Address to $ 1200, Data Length to 1 and check “Export CSV file”.



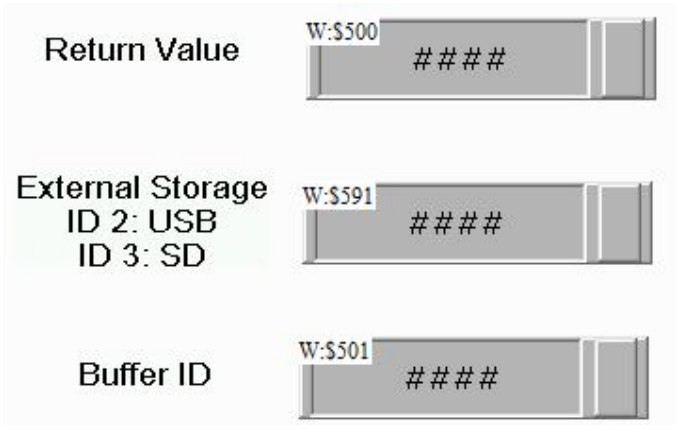
Step 2: Add historical data in Clock Macro.



Step 3: Create character entry element and set its address as $580, string length as 5.



Step 4: Create 3 numeric entry elements and set their address as $500, $591 and $501.



Step 5: Create maintained button element, set the address to $100.0 and add On Macro.

Screen_1 Maintained_009 {EXHISTORY} [On Macro]

```
1 FILL($510, 0, 30)
2 $570 = TOWORD($580, 5)
3 $200 = GETSYSTEMTIME
4 $50 = SPRINTF($510, "%c%c%c_%d%d%d_History", $570, $571, $572, $200, $201, $202)
5
6 $500 = EXHISTORY($501, $510, $591)
```

Description of macro command:

Line 1: Clear $510 ~ $539

Line 2: Convert $580 (String of Equipment Name) to word by the unit of byte.

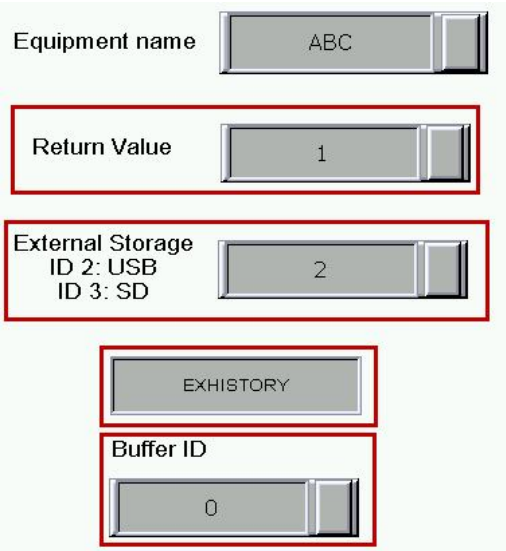
Line 3: Move the system time to $200 ~ $206 (year, month, day, week, hour, minute, second).

Line 4: Add『_year, month, day』 and 『_History』 to 『three words of equipment name』to form a serial string and specify $510 as start address.

Line 6: Export the historical data to the specified external device and file name.

Step 6: Download the editing screen to HMI and insert USB Disk to the port of HMI.

Step 7: Enter the Equipment name as『ABC』 and choose 2 for External Storage Device, which means USB is applied. Set buffer area ID to 0 (export all) then press『EXHISTORY』. When it is completed, the returned value becomes 1.



Step 8: Remove USB. And the exported files are shown as below:


ABC_20041214_History1.csv
Microsoft Office Excel 逗點分隔值...
85 KB
ABC_20041214_History2.csv
Microsoft Office Excel 逗點分隔值...
66 KB
ABC_20041214_History3.csv
Microsoft Office Excel 逗點分隔值...
51 KB

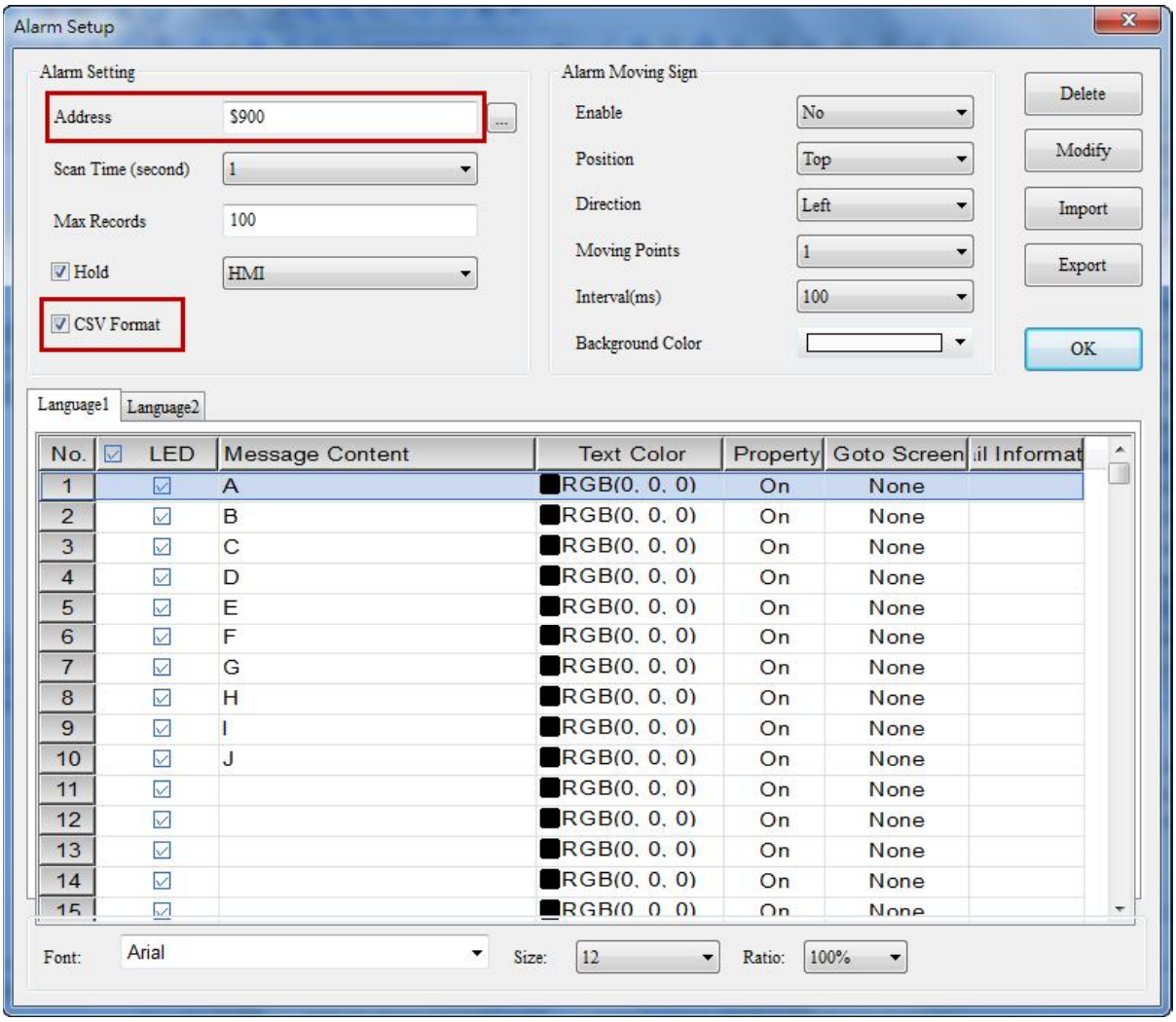
■ EXALARM (Export the Alarm)

<table>
<tr><th>Expression</th><th colspan="5">What Variable Represent</th><th>NOTE</th></tr>
<tr><td rowspan="6">Var1 = EXALARM(Var2, Var3)</td><td rowspan="3">Var 1</td><td colspan="4">Returned Value</td><td rowspan="6"></td></tr>
<tr><td colspan="3">Failure</td><td>0</td></tr>
<tr><td colspan="3">Success</td><td>1</td></tr>
<tr><td>Var 2</td><td colspan="4">Exported File Name</td></tr>
<tr><td rowspan="2">Var 3</td><td rowspan="2">External Storage Device</td><td>USB Disk</td><td>2</td></tr>
<tr><td>SD Card</td><td>3</td></tr>
<tr><td colspan="6">Expression Explanation</td></tr>
<tr><td colspan="6">Export the alarm information to external storage device.</td></tr>
<tr><td colspan="7">Note 1: In Alarm setting, please check『output to CSV file』.
Note 2: When the file is exported,『.csv』will be added as the filename extension automatically.
Characters such as『\』,『/』,『:』,『*』,『?』,『”』,『<』,『>』 and 『|』cannot be included in file name.
If x00 is included in the string, the string will be judged as finish.</td></tr>
</table>

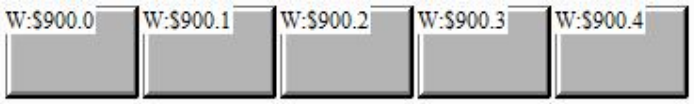
Variables	Memory Usage			
	Internal Memory	PLC Register	String	Constant
Var 1	◎	◎		
Var 2	◎	◎		
Var 3	◎	◎		◎

Example Description

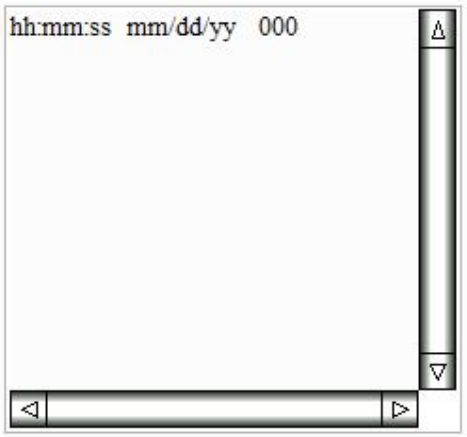
- Step 1: The setting of Alarm is shown as below. The Address is set as $900. Please check "CSV Format".



Step 2: Create maintained element for triggering alarms. The address is set as $900.0, $900.1, $900.2, $900.3 and $900.4 in sequence.



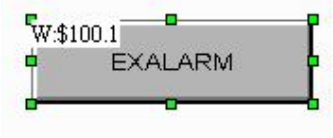
Step 3: Create Historical Alarm Table to show the current historical alarms.

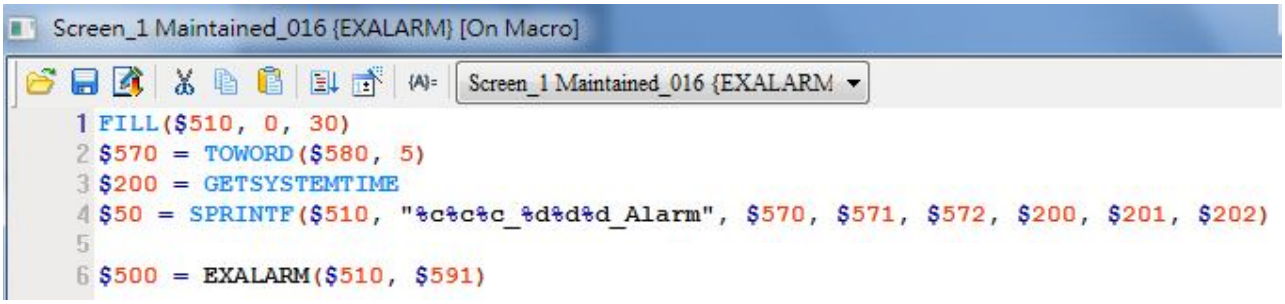


Step 4: Create character entry element and set its address as $580 and string length as 5.

Step 5: Create two numeric entry elements and set their address as $500 and $591, respectively.

Step 6: Create maintained button element and set its address as $100.1. Then, add On Macro.





See below for the descriptions of macro commands:

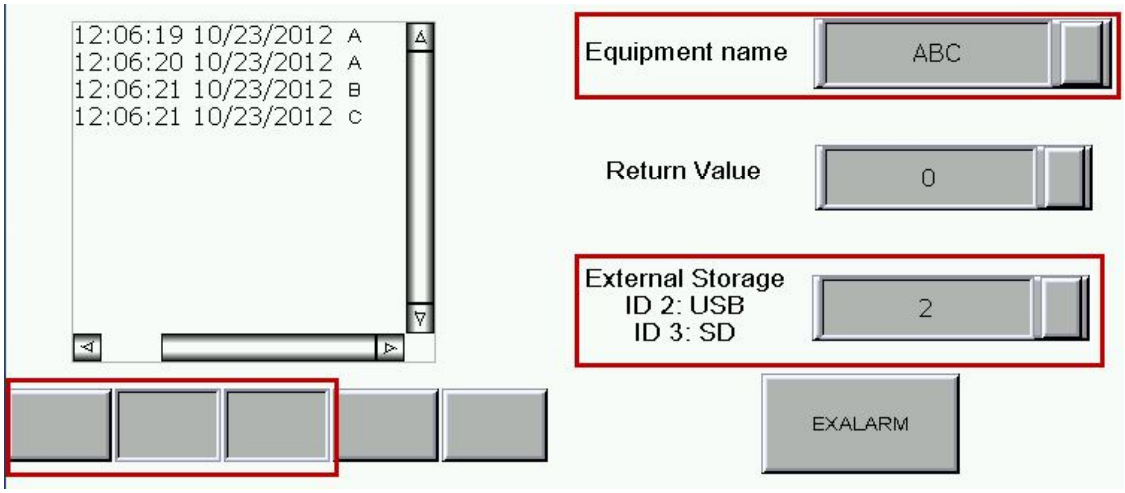
Line 1: Clear $510 ~ $539.

Line 2: Convert $580 (String of Equipment Name) to word by the unit of byte.

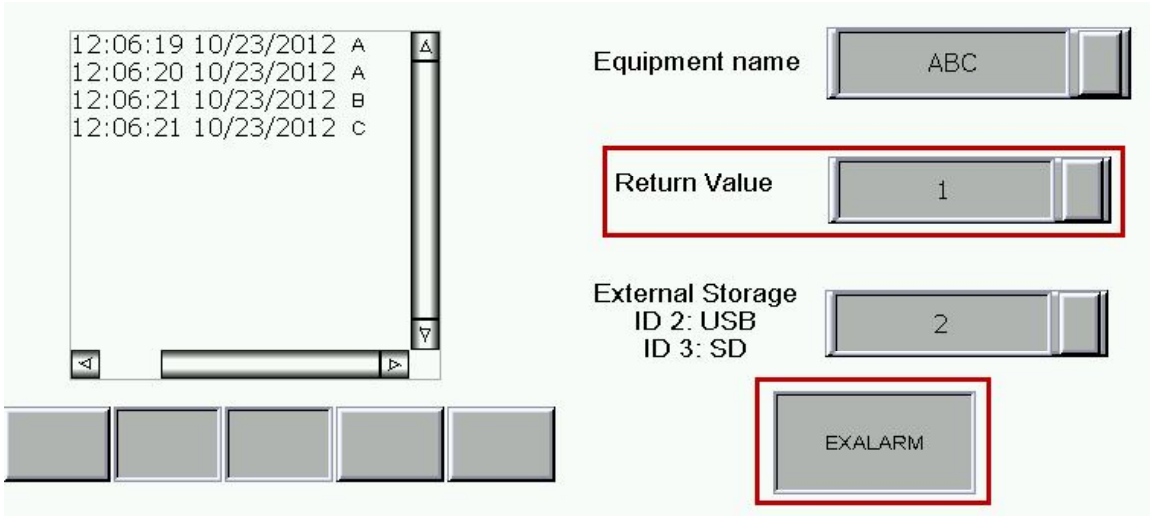
Line 3: Move the system time to $200 ~ $206 (year, month, day, week, hour, minute, second).
Line 4: Add『_year, month, day』 and 『_Alarm』 to 『three words of equipment name』to form a serial string and specify $510 as start address.
Line 6: Export the historical alarm to the specified external device and file name.

Step 7: Download the editing screen to HMI and insert USB Disk to the port of HMI.

Step 8: Trigger the alarm and enter 『ABC』 as the equipment name on the screen. Select 『2』 for external storage device, which means USB is applying.



Step 9: Press『EXALARM』button. When it is complete, the returned value will return to 1.



Step 10: Remove USB. And the file exported from USB will be shown as below:

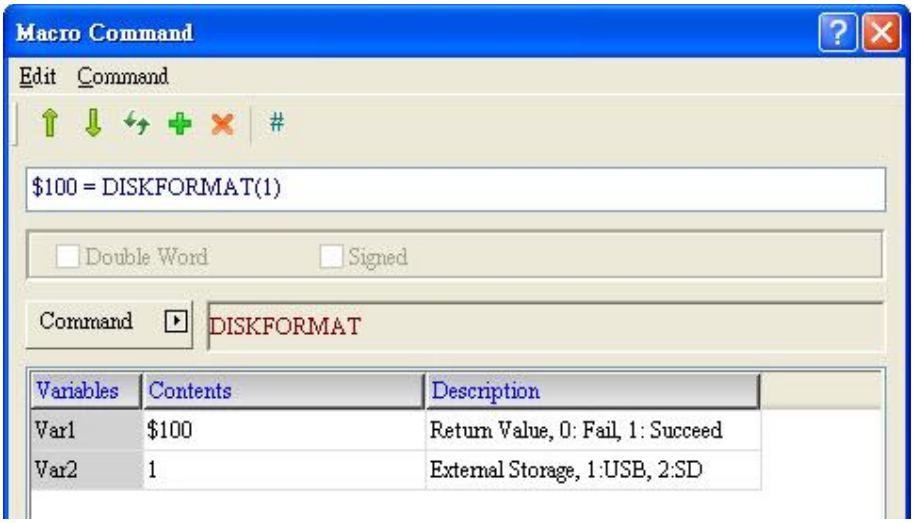
■ DISKFORMAT (Format Disk)

<table>
<tr><th>Expression</th><th colspan="4">What Variables Represent</th><th>NOTE</th></tr>
<tr><td rowspan="5">Var1 =DISKFORMAT(Var2) (W)</td><td rowspan="2">Var 1</td><td rowspan="2">Returned Value</td><td>Successful</td><td>0</td><td rowspan="5">W : Word</td></tr>
<tr><td>Failure</td><td>1</td></tr>
<tr><td rowspan="2">Var 2</td><td rowspan="2">External storage device</td><td>SD Card</td><td>1</td></tr>
<tr><td>USB Disk</td><td>2</td></tr>
<tr><td colspan="4">Expression Explanation</td></tr>
<tr><td colspan="5">Select the desired device to be formatted as specified in Var 2 and save the returned value in Var 1.</td></tr>
</table>

Variable	Memory Usage		
	Internal Memory	PLC Register	Constant
Var 1	◎	◎	
Var 2	◎	◎	◎

Example

➢ Var 1 is an internal memory address and Var 2 is a constant. Format the USB Disk and save the returned value in $100.



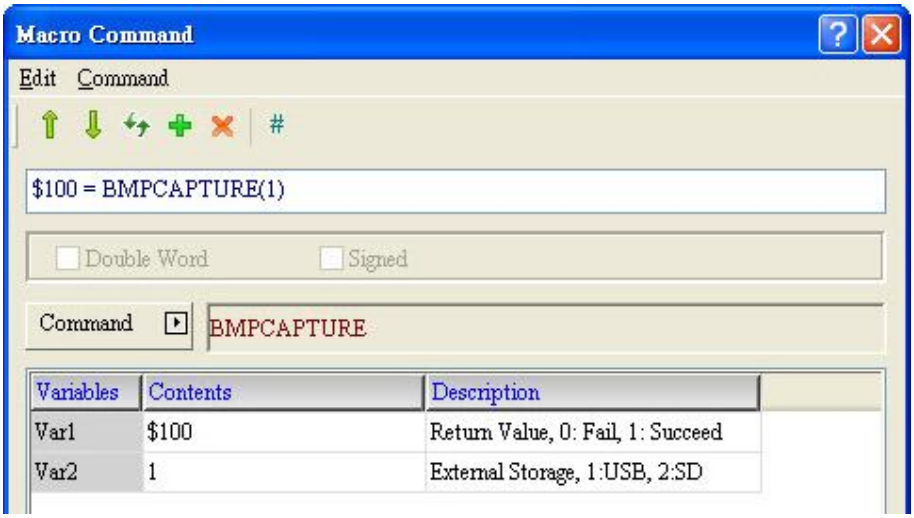
■ BMPCAPTURE (Screen Capture)

<table>
<tr><th>Expression</th><th colspan="4">What Variables Represent</th><th>NOTE</th></tr>
<tr><td rowspan="5">Var1 = BMPCAPTURE(Var2)
(W)</td><td rowspan="2">Var 1</td><td rowspan="2">Returned Value</td><td>Successful</td><td>0</td><td rowspan="5">W : Word</td></tr>
<tr><td>Failure</td><td>1</td></tr>
<tr><td rowspan="2">Var 2</td><td rowspan="2">External storage device</td><td>SD Card</td><td>1</td></tr>
<tr><td>USB Disk</td><td>2</td></tr>
<tr><td colspan="4">Expression Explanation</td></tr>
<tr><td colspan="5">Save the snapshot into the device specified in Var 2 and the returned value to Var 1.</td></tr>
<tr><td colspan="6">* Use BMPCAPTURE to export file is save as .bmp format.
* Export path is under the root and save folder as named for currently year, month and date, save file as named for Hour, minute and second.</td></tr>
</table>

Variable	Memory Usage		
	Internal Memory	PLC Register	Constant
Var 1	◎	◎	
Var 2	◎	◎	◎

Example

➢ Var 1 is an internal memory address and Var 2 is a constant. Save the snapshot to the USB Disk and the returned value in $100.



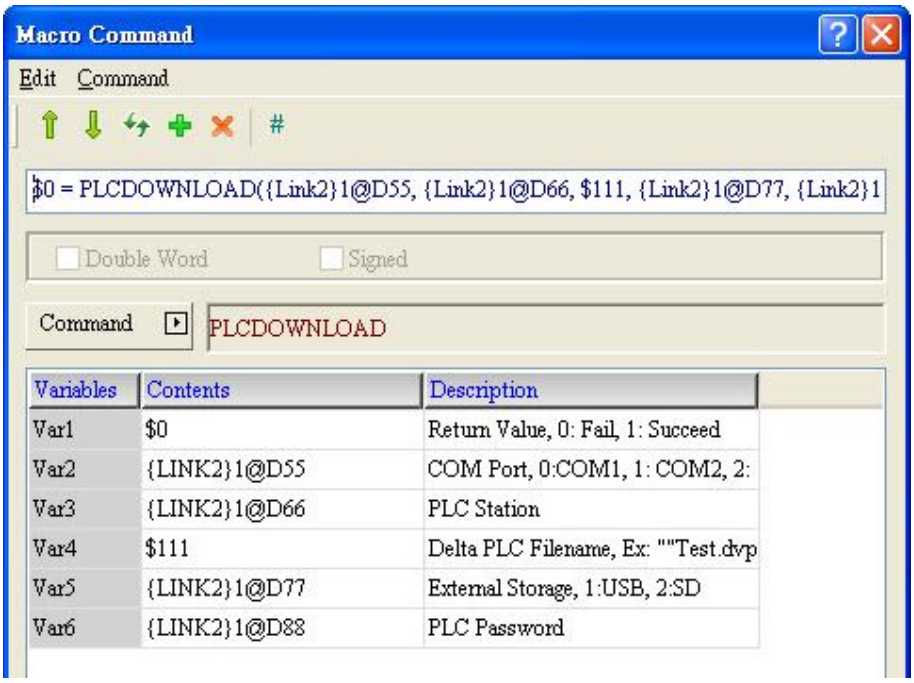
■ PLCDOWNLOAD

<table>
<tr><th>Command</th><th colspan="4">What Variables Represent</th><th>NOTE</th></tr>
<tr><td rowspan="11">Var1 = PLCDOWNLOAD(Var2, Var3, Var4, Var5, Var6) (W)</td><td rowspan="2">Var 1</td><td rowspan="2">Return Value</td><td>Failed</td><td>0</td><td rowspan="11">W：Word</td></tr>
<tr><td>Success</td><td>1</td></tr>
<tr><td rowspan="3">Var 2</td><td rowspan="3">COM Port</td><td>COM1</td><td>0</td></tr>
<tr><td>COM2</td><td>1</td></tr>
<tr><td>COM3</td><td>2</td></tr>
<tr><td>Var 3</td><td colspan="3">PLC Station number</td></tr>
<tr><td>Var 4</td><td colspan="3">DELTA PLC file name
For example like delta.dvp, delta.isp</td></tr>
<tr><td rowspan="2">Var 5</td><td rowspan="2">External Storage</td><td>SD Card</td><td>1</td></tr>
<tr><td>USB Disk</td><td>2</td></tr>
<tr><td>Var 6</td><td colspan="3">PLC Password</td></tr>
<tr><td colspan="4">Expression Explanation</td></tr>
<tr><td colspan="4">Download PLC file to PLC</td></tr>
<tr><td colspan="6">* Only support Delta PLC.
* File format support .dvp and .isp.
* Please use Character entry element for PLC Password with Var 6.</td></tr>
</table>

Variable	Memory Usage		
	Internal Memory	PLC Register	Constant
Var 1	◎	◎	
Var 2	◎	◎	◎
Var 3	◎	◎	◎
Var 4	◎	◎	
Var 5	◎	◎	◎
Var 6	◎	◎	

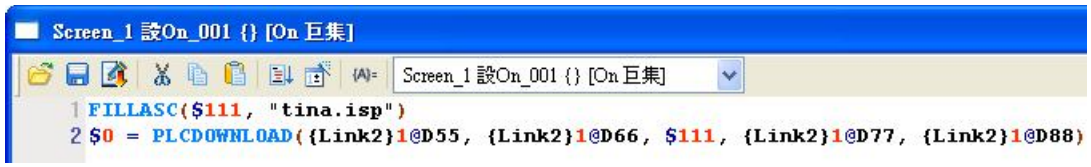
Example

- Please save downloaded ISP file to USB Disk or SD card then return value to $0.

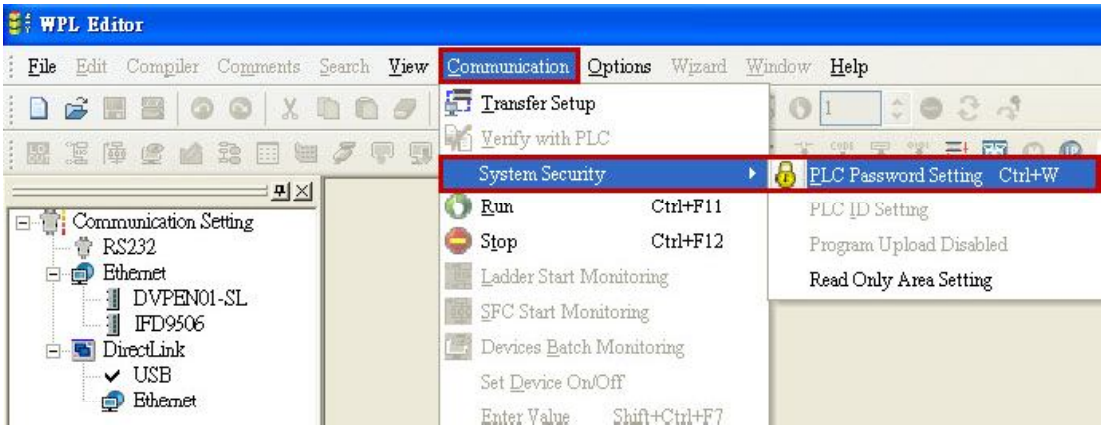


- Var 4 means PLC file name. So it has to use another command “FILLASC”and set file name string to some address.

- Then use the address $111 on Var 4 of PLCDOWNLOAD macro command.



- Var 6 means PLC Password, and it has to set password by WPL or ISP software. After setting, it could use Character Entry element to input password and download PLC file to PLC.
  - WPL Password setting



- ISP Password setting


Password Setting
Password (4 Characters)
OK
Cancel
Confirmation
Enable Limited Time:
UnLock

■ GetCircleCenter (Calculate the Coordinate of Circle Center)

<table>
<tr><th>Expression</th><th colspan="3">What Variable Represent</th><th>NOTE</th></tr>
<tr><td rowspan="6">Var1 = GetCircleCenter
(Var2, “Var3)</td><td rowspan="3">Var 1</td><td colspan="2">Returned Value</td><td rowspan="6">DW = Double Word</td></tr>
<tr><td>Failure</td><td>0</td></tr>
<tr><td>Success</td><td>1</td></tr>
<tr><td>Var 2</td><td colspan="2">Enter the calculated three coordinates (Note 1)</td></tr>
<tr><td>Var 3</td><td colspan="2">Circle center coordinate that is complete calculation (Note 2)</td></tr>
<tr><td colspan="3">Expression Explanation</td></tr>
<tr><td colspan="3">Enter the three coordinates to calculate circle center coordinate (Note 3)</td></tr>
</table>

Note 1: Enter the calculated three coordinates:
Set 3 points as P1(x1, y1), P2(x2, y2) and P3(x3, y3). Each point has the length of DW.
Assume that Var2 is $100, then:
x1: LOW WORD is saved in $100 and HIGH WORD is saved in $101.
y1: LOW WORD is saved in $102 and HIGH WORD is saved in $103
x2: LOW WORD is saved in $104 and HIGH WORD is saved in $105
y2: LOW WORD is saved in $106 and HIGH WORD is saved in $107
x3: LOW WORD is saved in $108 and HIGH WORD is saved in $109
y3: LOW WORD is saved in $110 and HIGH WORD is saved in $111

Note 2: Circle center coordinate that is complete calculation:
Assume the coordinate of circle center is P4 (x4, y4) and each point has the length of DW. If Var3 is $200, then:
x4: LOW WORD is saved in $200 and HIGH WORD is saved in $201
y4: LOW WORD is saved in $202 and HIGH WORD is saved in $203

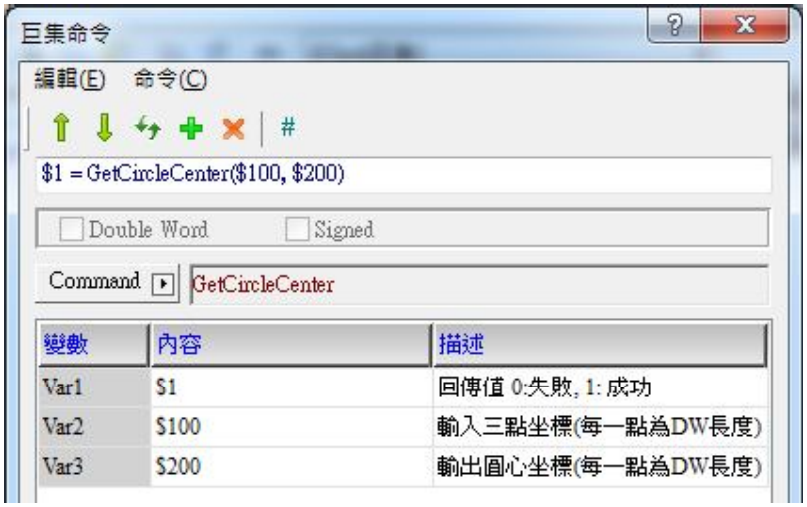
Note 3：Calculation formula:
$x = \triangle x / \triangle$
$y = \triangle y / \triangle$
Among them, $\triangle = 2(xa - xb) * (yc - yb) - 2(ya - yb) * (xc - xb)$
$\triangle x = (yc - yb) * (xa^2 + ya^2 - xb^2 - yb^2) - (ya - yb) * (xc^2 + yc^2 - xb^2 - yb^2)$
$\triangle y = (xa - xb) * (xc^2 + yc^2 - xb^2 - yb^2) - (xc - xb) * (xa^2 + ya^2 - xb^2 - yb^2)$

Variables	Memory Usage		
	Internal Memory	PLC Register	Constant
Var 1	◎		
Var 2	◎		
Var 3	◎		

Example Description

➢ **Example:**

$1 = GetCircleCenter ($100, $200)



Step 1: Create $1 numeric entry element and the unit is Word.

Step 2: Create $100, $102, $104, $106, $108, $110 numeric entry element and the unit is Double Word. Please enter the following value, respectively.

$100 = 0

$102 = 0

$104 = 100

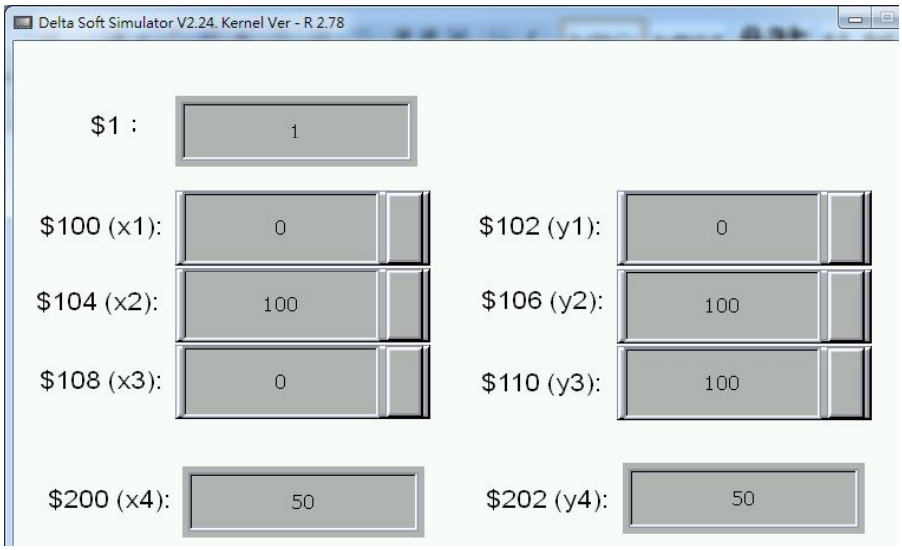
$106 = 100

$108 = 0

$110 = 100

Step 3: Create $200 and $202 numeric entry element. The unit is Double Word.

After Macro is executed, the screen will be shown as below:


Delta Soft Simulator V2.24. Kernel Ver - R 2.78
$1 :
1
$100 (x1):
0
$102 (y1):
0
$104 (x2):
100
$106 (y2):
100
$108 (x3):
0
$110 (y3):
100
$200 (x4):
50
$202 (y4):
50

24-3-12 Industrial Application

Industrial application provides ECAM macro to create E-Cam curve. Please refer to the followings for further description:

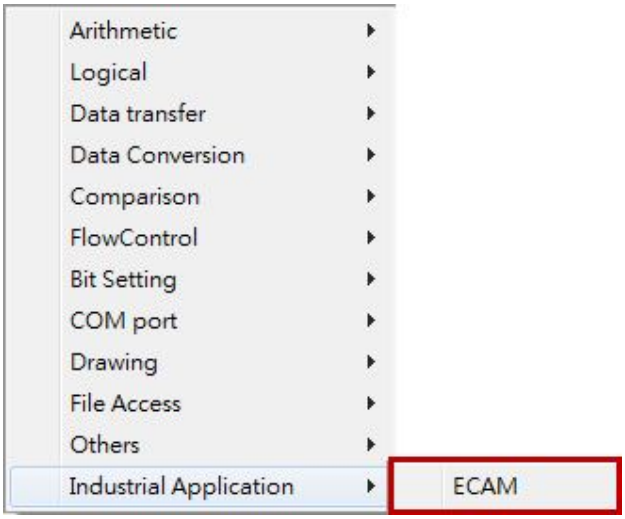


Figure 27-2-1 E-CAM Macro

■ ECAM

Expression	What Variable Represent		NOTE
Var1 = ECAM(Var2, Var3, Var4, Var5) (DW)	Var 1	Returned Value	DW：Double Word
	Var 2	Address of E-Cam curve algorithm mode	
	Var 3	Start address of E-Cam parameter input	
	Var 4	Start address of E-Cam curve output	
	Var 5	Address of E-Cam curve output	

Memory Usage			
Variables	**Internal Memory**	**PLC Register**	**Constant**
Var 1	◎		
Var 2			◎
Var 3	◎		
Var 4	◎		
Var 5	◎		
Detailed Command Description			
Var1: Returned value Everytime when curve calculation is complete, x1234000 will increase 1. In curve calculation, Var1 will be cleared to 0. If the curve cannot be calculated, it will return the error code. See the descriptions			

below:

Error Code	Causes
0	No error
1	E-Cam table type error
2	Command type error
3	Input parameter error
4	E-Cam area number exceeds the range
5	Space in data array is not enough (ASDA-A2 series provides 800DW)
6	Input degree exceeds the range, reduce the degree of synchronous area or S-curve area
7	Cutting length exceeds the suggested range. Please enter the recommended cutting length (L) or speed compensation rate.
8	Speed compensation exceeds the range
9	E-gear ratio exceeds the specified range
10	The printing range is larger than roller circumference
11	Initial speed is < 0
12	Time procedure is in error
13	The cutter diameter is too small
14	Operation of cutter may be in error

Var2: Address of E-Cam curve algorithm mode

Use this address to select E-Cam curve algorithm mode。

Input Value	E-Cam Curve Creation Method
1	Rotary shear - Adjustable sealing zone
2	Printer machine
3	Rotary shear – cos compensation

Var3: Start address of E-Cam parameter input

Different E-cam curve creation methods requires different number of parameters. Var3 is used to setup the start address of E-Cam parameter. Please refer to the following table for further information:

E-Cam curve creation method	Input address	Parameters
Rotary shear - Adjustable sealing zone	n	E-Cam area number, P5_82_MIN ~ P5_82_MAX
	n+2	Deceleration ratio: Numerator (nGA)
	n+4	Deceleration ratio: Denominator) (nGB)
	n+6	Knife number (nKnife)
	n+8	Knife diameter (d1) Unit: mm x 100

	n+10	Cutting length (L) Unit: mm x 100
	n+12	Speed compensation (dVcp) -50.00% ~ 50.00% x 100
	n+14	Angle in acceleration area (ns2) Unit: degree
	n+16	Angle in synchronous area (ns3) Unit: degree
	n+18	Angle in S-Curve area (nsS) Unit: degree
	n+20	E-gear ratio (numerator) (P1-44)
	n+22	E-gear ratio (denominator) (P1-45)
Printer Machine	n	E-Cam area number, P5_82_MIN ~ P5_82_MAX
	n+2	Deceleration ratio: Numerator (nGA)
	n+4	Deceleration ratio: Denominator) (nGB)
	n+6	Printing range (dPL) Unit: mm x 100
	n+8	Blank range (dBL) Unit: mm x 100
	n+10	Roller diameter (dd1) Unit: mm x 100
	n+12	Roller diameter of master (dd2) Unit: mm x 100
	n+14	Angle in waiting area (Deg1) Unit: degree
	n+16	Angle in S-Curve area (DegS) Unit: degree
	n+18	Angle in synchronous area (DegA) Unit: degree
	n+20	E-gear ratio (numerator) (P1-44)
	n+22	E-gear ratio (denominator) (P1-45)
Rotary shear – cos compensation	n	E-Cam area number, P5_82_MIN ~ P5_82_MAX
	n+2	Deceleration ratio: Numerator (nGA)
	n+4	Knife number
	n+6	Knife diameter (mm) x 100
	n+8	Product cut length (mm) x 100
	n+10	Speed compensation (master axis) Unit: %
	n+12	Lead constant speed area Unit: count number
	n+14	Cut thickness D(mm) x 100
	n+16	Cut height H(mm) x 100
	n+18	E-gear ratio (numerator) (P1-44)
	n+20	E-gear ratio (denominator) (P1-45)

	n+22	Speed ratio (conveyor 2: conveyor 1)
	n+24	S (curve level): 1 ~ 4 levels

Var4: Start address of E-cam curve output

After calculation, the E-cam curve outputs to the start address of Var4. Please refer to Var5 for its output length.

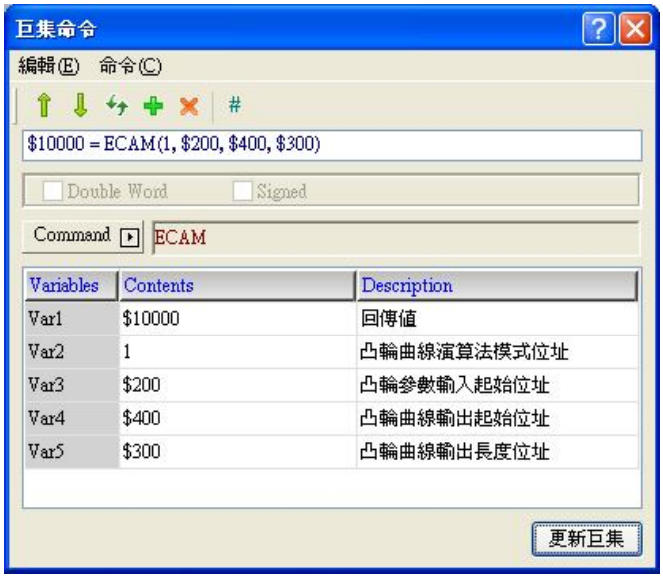
Var5: Address of E-cam curve output length

After calculation, if the E-cam output length is 100, it will take 200-word long address. (For E-cam funciton, the unit is Double Word.)

NOTE: Please be aware of address overlap when applying E-Cam funciton. E-Cam curve of ASDA-A2 can create up to 721 areas. Thus, the E-cam value will take 1422 words at most. If Var4 (start adress of E-Cam curve output) is set to $0, it is suggested to reserve $0~$1441 for E-cam use only.

Example Description

1. Create a momentary button and set its address as $0.0. Write **$10000 = ECAM(1, $200, $400, $300)** in On Macro.



Var2 = 1. It indicates that this macro command calculate the E-Cam curve for rotary shear-adjustable sealing zone.

Parameters that is required by macro algorithm starting from $200 use 12 Double Words (= 24 Words) and take $200-$223 as the memory address.

$200	E-Cam area number, P5_82_MIN ~ P5_82_MAX
$202	Reduction ratio (numerator) (nGA)
$204	Reduction ratio (denominator) (nGB)
$206	Knife number (nKnife)
$208	Knife diameter (d1) Unit: mm x 100
$210	Cutting length (L) Unit: mm x 100
$212	Speed compensation, (dVcp) -50.00% ~ 50.00% x 100
$214	Angle in acceleration area (ns2) Unit: degree
$216	Angle in synchronous area (ns3) Unit: degree
$218	Angle in S-Curve area (nsS) Unit: degree
$220	E-gear ratio (numerator) (P1-44)
$222	E-gear ratio (denominator) (P1-45)

After calculation, E-Cam parameters will be outputted to the address starting from $400 to $1841 at most.
(In A2 system, one E-cam curve can be divided up to 721 parts. One part takes

one double word. Thus, it will take 721*2 =1442 Words. And its memory address is from $400 to $1841.)

The actual curve will be outputted to $300.

2. Create one E-cam curve element on the screen. See below for its address setting:

E-CAM Curve Element	E-CAM Macro	Address
Read Buffer Address	Var4	$400
Read Size Address	Var5	$300
Read Start Address	Var1	$10000

3. Create one E-cam sketch element. See below for its address setting:

E-CAM Sketch Element	E-CAM Macro	Address
Read Buffer Address	Var4	$400
Read Size Address	Var5	$300
Read Start Address	Var1	$10000

4. Create 12 numeric entry elements on the screen. Unit is Double Word. See below for its address setting:

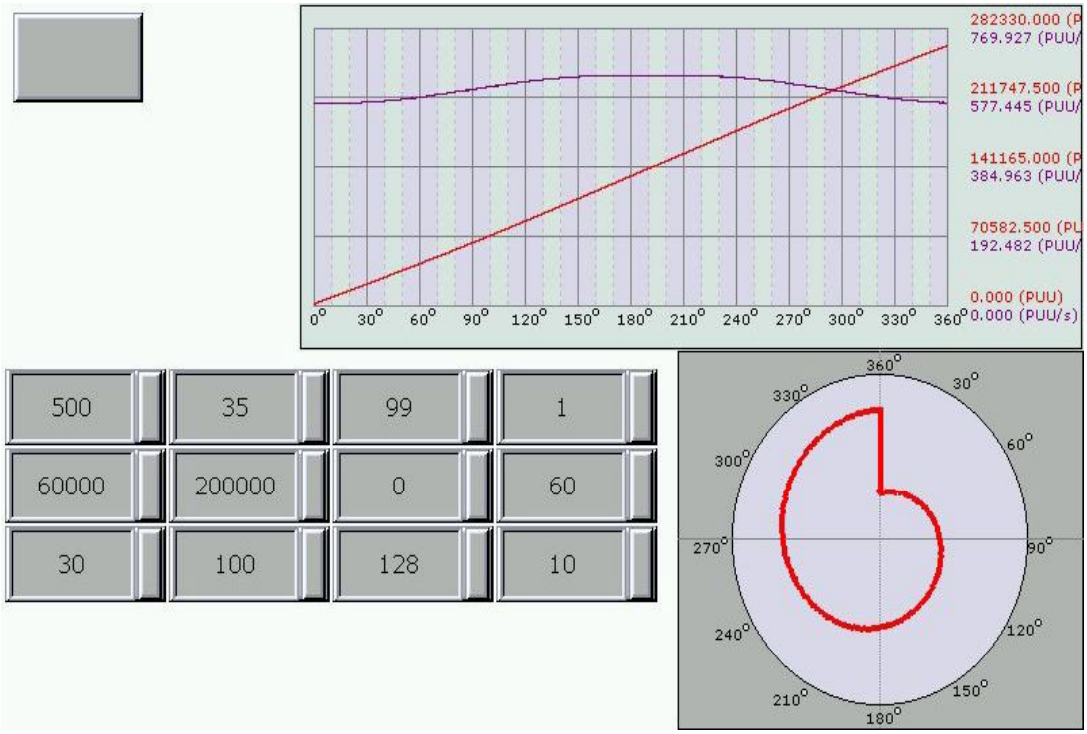
$200	E-Cam area number, P5_82_MIN ~ P5_82_MAX
$202	Reduction ratio (numerator) (nGA)
$204	Reduction ratio (denominator) (nGB)
$206	Knife number (nKnife)
$208	Knife diameter (d1) Unit: mm x 100
$210	Cutting length (L) Unit: mm x 100
$212	Speed compensation, (dVcp) -50.00% ~ 50.00% x 100
$214	Angle in acceleration area (ns2) Unit: degree
$216	Angle in synchronous area (ns3) Unit: degree
$218	Angle in S-Curve area (nsS) Unit: degree
$220	E-gear ratio (numerator) (P1-44)
$222	E-gear ratio (denominator) (P1-45)

5. When downloading to HMI, please fill in the following value in sequence:

$200	500
$202	35
$204	99
$206	1
$208	60000
$210	200000

$212	0
$214	60
$216	30
$218	100
$220	128
$222	10

6. Press momentary button $0.0. The E-cam curve will be generated as below:



24-4 Macro Error Messages

Users may accidently type in incorrect syntaxes or typos within macros. To help users quickly locate error Macro codes, the HMI system will display error codes in the output field during the coding process and also prompt error messages during complies to remind users about these errors.

➢ Error Message During Editing

Number	Number name	Trouble shooting
-100	LABEL cannot be found	There is no such LABEL required by the GOTO command
-101	Recursion occurred	This error message indicates that recursion has occurred, and errors of this sort mostly happen in submacros. The reason is that a submacro is called by itself within the same submacro, either directly or indirectly. Basically, the recursion technique can not be used within a submacro, but if this is unavoidable, please consider Goto or For (infinite loop) instead.
-102	More than 10 nested FOR used	This error message is to remind users not to use more than 10 nested FOR commands. The purpose is to prevent excessive uses of the FOR command and avoid memory insufficiency. If necessary, please consider GOTO or IF instead.
-103	Submacro does not exist	This error message indicates that the submacro called upon does not exist. As an example, the code “CALL 5” is intended to call a submacro 5, but the user somehow does not write submacro 5 in the program. To avoid unpredictable consequences due to this kind of mistakes (typos or forgot to add the corresponding sub-macro), this error message is hence displayed to remind the users.
-104	Number of NEXT is less than the number of FOR	Next and For are paired operands and must be used together. This error message indicates that the number of NEXT and FOR

		does not match. The program can not proceed to the next For if there is one NEXT missing.
-105	Number of FOR is less than the number of NEXT	Next and For are paired operands and must be used together. This error message indicates that the number of NEXT and FOR does not match. The program can not proceed to the next For if there is one extra NEXT.
-106	Repeated LABEL	This error message indicates that there is one duplicated LABEL within the same macro. This will generate unpredictable consequences since there are two sequences for the same GOTO. To avoid this kind of mistakes, this error message is hence displayed.
-107	There is RET in Macro	This error message indicates that is a RET command in the macro. The RET command is reserved for the submacro to return back to the macro. Should there be a need to end a macro, please consider END instead.

➢ HMI Macro Error Messages

Users can read error messages via macro commands. However, if a correct command is executed before the error message is read, then the previous error message will be overwritten (changed). Macro error messages will not be changed, however, while a different macro is being executed.

Number	Number name	Trouble shooting
-10	GOTO error	This message means that there is a GOTO error for the macro that is currently being executed.
-11	Stack overflow	This message indicates that the stack for the macro currently executed is full. This may be caused by using too many sub-macros or executing multiple macros at the same time. This message is a mechanism avoiding memory insufficiency.
-12	Empty Submacro	This message indicates that calling a sub-macro has failed. Since the Call

		command identifies a submacro through its ID stored in an internal memory address, if that address does contain the corresponding ID for the submacro, and then there will be no submacro to be upon.
-13	Data Read Error	This message indicates an error has occurred during the data reading process. Although there is a possibility the error is due to incorrect data stored in a specific internal memory address, most of the time it is the problem of an external controller that has caused this read error.
-14	Data Write Error	This message indicates an error has occurred during the data writing process. Although there is a possibility the error is due to incorrect data stored in a specific internal memory address, most of the time it is the problem of an external controller that has caused this write error.
-15	Divisor is 0	This error message indicates that the devisor is identified as 0 during the division or reminder operations.
-16	Data process error with BCD format	This error message indicates when execute BCD macro command have some error with data process.
-17	Data process error with convert ASCII to HEX format	This error message indicates when execute TOHEX macro command have some error with covert ASCII to HEX format.
-18	NEXT OFFSET error	This error message indicates when macro have data error will cause execute next command error.
-19	Character command error	This error message indicates when execute FILLASC will have error.
-20	Data process error with BIN format	This error message indicates when execute BIN macro command have some error with data process.
-21	Sub macro data error	This error message indicates when macro have data error will cause call sub macro error.

-22	FOR Loop have OFFSET error	This error message indicates when macro have data error will cause execute FOR macro error.
-24	INITIAL ERROR	This error message indicates when execute INITCOM command will have error.
-24	Memory allocation error	This error message indicates HMI memory is not enough to execute macro commands.
-25	COM Port error	This error message indicates COM Port has error and will cause execute related about COM Port macro failed.
-26	Print Port error	This error message indicates select incorrect Print Port when execute print action.
-27	Read value error	This error message indicates over range when read macro parameter.
-28	IF ELSE ENDIF error	This error message indicates when execute IF ELSE ENDIF macro command have error.
-29	Pen width setting error	This error message indicates set incorrect pen width of draw macro.
-30	History data error	This error message indicates when execute GETHISTORY macro command have error.
-31	Export error	This error message indicates when execute EXPORT macro command have error.
-32	Disk reading error	This error message indicates external or internal storage have error will cause execute related about EXPORT and DISKFORMAT macro command error.
-33	Print error	This error message indicates when execute macro command to print have error.
-34	IF ELSE ENDIF stack over flow	This error message indicates stack over flow when execute IF ELSE ENDIF macro command.
-35	Password error	This error message indicates input password error when execute related password confirm macro.
-36	Password lock error	This error message indicates password exceed input limitation when execute related password confirm macro.
-37	ID password identify error	This error message indicates ID password error when execute related ID password

		confirm macro.
-38	Syntax error	This error message indicates after download PLC program have syntax error.
-39	Connection failed or no response	This error message indicates when download PLC program and detect connection failed or no response.

Explanation about PLC file error includes DVP and ISP file format.		
-40	File name not support	This error message indicates not support file name when execute macro to open PLC file.
-41	Version not support	This error message indicates not support version when execute macro to open PLC file.
-42	Open file error	This error message indicates open file failed when execute macro to open PLC file.
-43	File Handle error	This error message indicates file point error when execute macro to open PLC file.
-44	File reading error	This error message indicates cannot reading when execute macro to open PLC file.
-45	File Seek error	This error message indicates cannot move file content when execute macro to open PLC file.
-46	File writing error	This error message indicates cannot writing when execute macro to open PLC file.
-47	File remove error	This error message indicates remove file failed when execute macro to remove file.
-48	File Rename error	This error message indicates file rename failed when execute macro to rename file.
-49	File length error	This error message indicates file length error when execute macro.
-50	File data error	This error message indicates file data error when execute macro.