### Can I create my own functions inside ISaGRAF ?

ISaGRAF supoorts functions written in ST, FBD, IL and QLD languages. User-defined functions are normally for some algorithm which been used again and again.

A function always has an return value (output parameter) and its name should be the same name as the function, and may have up to 31 input parameters. The code written inside functions can not call any **function block**, however can call other ISaGRAF standard **functions** and **c functions** provided by ICP DAS.

We are going to creating a function to save an integer value to the EEPROM. Its format is as the below.

Function name : W_EE Description:	EP Save an integer to the EEPROM when its valu	e changed
Input parameters:	-	2
ADDR_ (integer) :	the address of the EEPROM to write	W EEP
V1_ (integer):	New value	
V2_ (integer) :	Old value	ADDR_
Return parameter:		<sup>−</sup>  ∨1_
W_EEP (integer):	return the new value	

Note: The parameter names been used will become reserved names. That's why we use ADDR\_, V1\_, V2\_ rather than ADDR, V1 & V2.

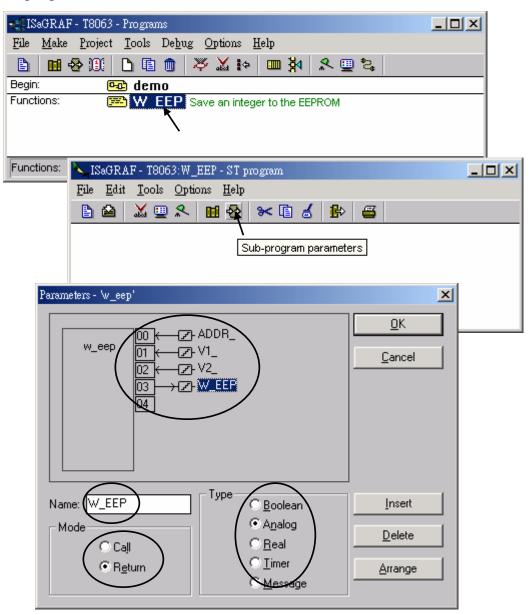
## **15.1:** Creating functions inside one project

Functions created inside one project can be only called by other programs written in the same project.

A. Click on "Create new program" inside the project. Given Name as "W\_EEP", Language as "ST:...", Style as "Function".

📲 ISaGRAF - T8063 - Pr	ograms	
<u>File Make Project To</u>	ools De <u>b</u> ug <u>O</u> ptions <u>H</u> elp	
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Begin: 🕰	Create new program	
	New Program 🚬	<li></li>
	Name: W_EEP	
Begin: demo (Function	Comment: Save an integer to the EEPROM	] ———— ]
	Language: ST : Structured Text	
	Style: Function	
	<u>OK</u> ancel	

**B.** Double click on the function to get into it. Then click on "Sub-program parameters" to define input and output parameters.



C. Declare local variables. We need a local **boolean internal** variable "TMP" in this example.

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Boolean Variable       Name:     TMP       Comment:	N Values	etwork Address:
© Internal © Input © Output © Const <u>ant</u>	False: True: Set to true at init Retain	<u>Store</u> <u>Cancel</u> <u>Next</u> <u>Extended</u>

**D.** Enter function codes.

ISaGRAF - T8063:W_EEP - SIF $V1 < V2$ THEN (* if value changed TMP := EEP_N_W(ADDR_, V1_); (* save if W_EEP := V1_; (* return the new value * END_IF;	t to the EEPROM *)
<pre>IF U1_ &lt;&gt; U2_ THEN (* if value changed *) TMP := EEP_N_W(ADDR_, U1_); (* save it to the EEPROM *) W_EEP := U1_; (* return the new value *) END_IF;</pre>	

**E.** Verify the function.

🛰 ISaGRAF - T8063:W_EEP - SI	l program		
<u>File Edit T</u> ools <u>Options H</u> e	lp		
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TMP := EEP_N_W <ad< th=""><th>N (* if value cha DR_, U1_); (* save (* return the neg</th><th>e it to the EEPR</th><th>0<b>M *</b>&gt;</th></ad<>	N (* if value cha DR_, U1_); (* save (* return the neg	e it to the EEPR	0 <b>M *</b> >
END_IF			
	Code Generator	×	1
	Code Generator No error de	×	
		×1	

**F.** Call it in other programs in the same project.

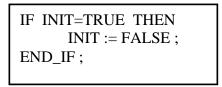
Name	Туре	Attribute	Description
INIT	Boolean	Internal	initial value at "TRUE". TRUE means 1 <sup>st</sup> scan cycle
K1	Boolean	Input	Connect to 1 <sup>st</sup> ch. Of "push4key", press it to get "Val"
New_Val	Integer	Internal	New value wish to save to the EEPROM
Old_Val	Integer	Internal	Old value
Val	Integer	Internal	Read back value of the EEPROM

Global variables used in the project:

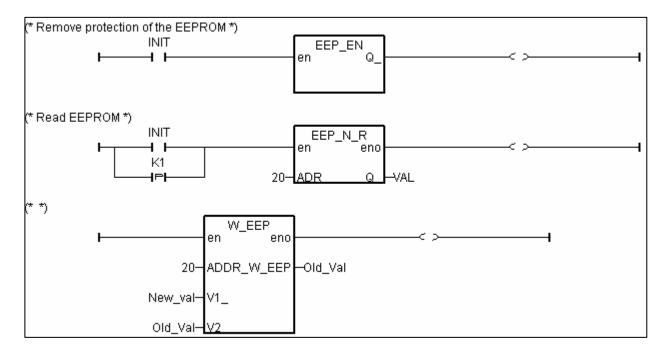
Project architecture:

- ISaGRAF - T8063 - Programs	
<u>File Make Project Tools Debug Options H</u> elp	
▙ ▥��?!! ▙ ▣ ☆ ▓ ▷ ▣ ♪ 옷 ▣ ≿	
Begin: 🗰 demo	
End: 🗰 end_init	
Functions: W_EEP Save an integer to the EEPROM	
Begin: demo (Ladder Diagram)	

ST program – "end\_init" in the "End" area :



LD program – "demo" :



ICP DAS

G. Set Compiler Options and compile the project.

- IS	SaGRAF - T8063 - Programs	
File	<u>Make</u> Project Tools Debug Options Help	
	Make application 📈 🌬 💷 🎘	
Begir		
End:		
Funct	Application run time Options an integer to the EEPROM	
	Compiler options	
Begir	Resources	
	Resources Compiler options Targets:	
	> SIMULATE: Workbench Simulator ISA68M: TIC code for Motorola	<u>S</u> elect
	> ISA86M: TIC code for Intel	
	CC86M: C source code (V3.04)	
	✓ Use embedded SFC engine	Upload
	Optimizer:	
	Run two optimizer passes	
	Evaluate constant expressions	Default
	Suppress unused labels	
	Optimize variable copying	
	Optimize expressions	
	Suppress unused code Optimize arithmetic operations	01
	L I Esterna de la companya de la company	<u> </u>
	- ISaGRAF - T8063 - Programs	<u>_     ×</u>
	File Make Project Tools Debug Options Help	
		r 🛄 🐉
	Begin: end demo	1
	End: End_init Make application code Functions: End EEP Save an integer to the EEPB	
	Functions: <b>W_EEP</b> Save an integer to the EEPR	COM
	Begin: demo (Ladder Diagram)	1
	Code Generator	×
	No error detected.	
	Do you want to exit the Code Generator	r now ?
	<u>Exit</u> <u>Continu</u>	e

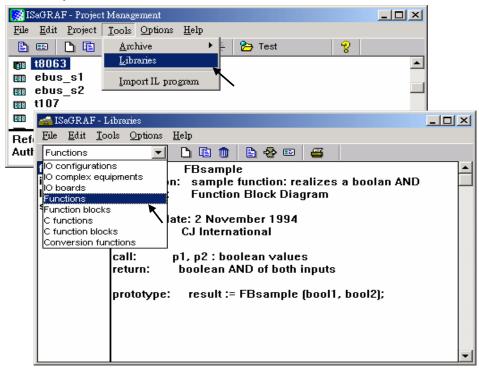
After download to the controller, you may change the "New\_Val", and then press "K1" to see what it happens.

# **15.2:** Creating functions in the library

Functions created in the library can be called by programs in any project.

The steps is similar to the former section 15.1. Please refer to it in advance.

A. Get into the library. Then click on "Functions"



B. Create an new function and given Name as "W\_EEP\_N", Language as "Structured Text".

🚵 ISaGRAF - L	ibraries		
<u>File E</u> dit <u>T</u> oo	ols <u>O</u> ptions	Help	
Functions	-	] 🗋 🛍 🕒 😔 💷 🧉 🖉	
fbsample ilsample Idsample stsample	name: descripti language	•	
		date: 2 November 1994	
	author:	Create new element	X
	call: return:	Name: W_EEP_N	<u>0</u> K
		Comment Save an integer to the EEPROM	<u>C</u> ancel
		Language: Structured Text	

**C.** Define input and return parameters

📥 ISaGRAF - Li	braries	
<u>File Edit T</u> ool	s <u>O</u> ptions <u>H</u> elp	
Functions	💽 🗅 🗈 💼 🗎 🚭 👘	
fbsample ilsample Idsample steample	name: - description: - language: -	
stsample W EEP N	Cre Parameters - 'W_EEP_N'	×
	au cal ret W_EEP_N 00 + Z ADDR_ 01 + Z V1_ 02 + Z V2 03 + Z W_EEP_N 04 + Z W_EEP_N	<u>O</u> K <u>C</u> ancel
	Name V2_ Mode Call C Return C Message	Insert Delete Arrange

#### **D.** Add codes.

📤 ISaGRAF - Li	ibraries
<u>File E</u> dit <u>T</u> oo	ls <u>O</u> ptions <u>H</u> elp
Functions	🔽 🗅 🗈 💼 📙 🕸 💷 🚘
fbsample ilsample Idsample stsample W EEP N	name: - Edit source code description: - language: -
<b>N</b> IS <u>F</u> ile	$\begin{array}{c} \text{IF V1}_{-} <> \text{V2}_{-} \text{ THEN}  (* \text{ if value changed } *) \\ \text{GGRAF-W_E} \\ \hline \text{Edit lools} \\ \hline \text{Edit lools} \\ \hline \text{M}  \text{EEP_N}_{-} W(\text{ADDR}_{-}, \text{V1}_{-});  (* \text{ save it to the EEPROM } *) \\ W_{-} \text{EEP}_{-} \text{N} := \text{V1}_{-};  (* \text{ return the new value } *) \\ \hline \text{END}_{-} \text{IF}; \end{array}$
l L	U1_ <> U2_ THEN (* if value changed *) IMP := EEP_N_W(ADDR_, U1_); (* save it to the EEPROM *) V_EEP_N := U1_ ; (* return the new value *) D_IF ;

E. Declare local variables. We need a boolean internal variable – "TMP"

📏 ISaGRAF	F - W_EEP_N - ST program	
<u>File E</u> dit	<u>T</u> ools <u>Options</u> <u>H</u> elp	
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TMP	_ <> Dictionary EN (* if value changed *) := EEP_N_W(ADDR_, V1_); (* save it to the EEPROM	*>
W_EE END IF	💊 ISaGRAF - W_EEP_N - Local booleans	
	<u>File Edit T</u> ools <u>Options H</u> elp	
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	Booleans, Integers/Reals   Timers   Messages   FB instances   Defined words	
	Name Attrib. Addr. Comment	
	TMP [internal] 0000	
	$\lambda$	
		<b>v</b>
	TMP @0000 [internal] (false,true)	

**F.** Save the function and set compiler options.

📐 ISaGRAF - W_EEP_N - ST program	n		
<u>File Edit T</u> ools <u>Options H</u> elp			
🖹 🚔 👗 🖽 😤 🔀 🗎	💰 😫 🖴		
IF Save <> U2_ THEN (* if value changed *) TMD ·= FEP N H(ADDR H1) · (* save it to the FEPROM *)			
N ISaGRAF - W_EEP_N - ST program			
<u>File E</u> dit <u>T</u> ools <u>Options</u> <u>H</u> elp			
🖹 🚵 👗 🔋 🗸 Show tool <u>b</u> ar	▶ 🖴		
✓ Show <u>K</u> eywords		—µ_	
IF U1_ <> <u>Font</u>	Compiler options	×	
TMP := EE Tab setting	Targets:		
W_EEP_N : Update diary	SIMULATE: Workbench Simulator	Select	
END_IF; <u>Opdate diary</u> <u>Compiler options</u>	ISA68M: TIC code for Motorola		
1	> ISA86M: TIC code for Intel CC86M: C source code (V3.04)	<u>U</u> nselect	
	✓ Use embedded SFC engine	Upload	
	Optimizer:		
	Run two optimizer passes		
	Evaluate constant expressions	<u>D</u> efault	
	Suppress unused labels     Optimize variable copying		
	Coptimize expressions		
	Suppress unused code     Optimize arithmetic operations		
	Optimize antimetic operations     Optimize boolean operations	<u></u> K	
	Euild binary decision diagrams (BDDs)	Cancel	

### **G.** Verify the function.

🔧 ISaGRAF - W_EEP_N - ST prog	ræn	- D ×
<u>File Edit T</u> ools <u>Options H</u> elp	1	
🖹 🛍 👗 🖬 😵 🛰 🛙	1 💰 🚯 🚝	
	(* if value changed *) R_, U1_); (* save it to the EEPROM Code Generator	*)
END_IF;	No error detected. Do you want to exit the Code Generator now ?	Þ
	<u>Exit</u> <u>Continue</u>	

Then you can call it in any project.