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Author	Janice Hong	Version	1.0.0	Date	Dec. 2015	Page	1 / 12

How to Allow the SCADA/HMI to Access Win-GRAF Variables?

This FAQ-008 provides a Win-GRAF project called "faq008" which includes two LD programs. One is used to get/set the PAC system time (i.e., the "PAC_Time" program) and the other is used to create a blinking function (i.e., the "LD1" program). The user can refer <u>Win-GRAF Getting Started</u> – Chapter 2 (Demo01) to know more details.

Moreover, this paper describes how to set up Win-GRAF variables as public data by enabling the Win-GRAF PAC as the Modbus TCP slave or the Modbus RTU slave so that the SCADA/HMI software (e.g., "InduSoft") can access Win-GRAF PAC's data. Follow the instructions below to set up.

<u>Note:</u> The following setting has been completed in the "faq008" project. The user can run the Win-GRAF and then click File > Add Existing Project > From Zip in the menu bar to restore this project (or refer the FAQ-003).

1.1. To Enable the Win-GRAF PAC as a Modbus TCP Slave

1. Click the "Open Fieldbus Configuration" tool button to open the "IO Drivers" window.

Win-GRAF - Demo01 File Edit View Insert Pro	l roject <u>T</u> ools <u>W</u> indow <u>H</u> elp	
😂 🔒 🖹 🎒 🐰 🗈	월 🕄 🗙 🔁 🕑 연 🛗 🏢 🏭 👭 😨 🙆 트 🗿 🕒 🎽 🖉	
Workspace	IO Drivers *	
Demo01 Exception prog Programs PAC_Time Pie PAC_Time Watch (for de Watch (for de Soft Scope Initial values Minding Config Sinding Config Sig Global defines Variables Types	Name Value Value Value <td>Name Type Global variables PAC_Year DINT PAC_Month DINT PAC_Day DINT DAC_Weak DINT Name Value</td>	Name Type Global variables PAC_Year DINT PAC_Month DINT PAC_Day DINT DAC_Weak DINT Name Value
	Build Cross references Runtime Call stack Breakpoints Digital sampling tra	ace Prompt HMI
Ready	OffLine 192.168.255.1:502	0,0 0×0 0,0 🛒
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2. Click the "Insert Configuration" button on the left side of the "IO Drivers" window and then select the "MOSBUS Slave" and click "OK" to enable a Modbus TCP Slave.

IO Drivers *		
E	Name Value	
Add Configuration	n n	×
Choose a configu	uration OK	
	Cance	5
MODB	US Master	
MODB السلم الم	US Slave	
<u>I</u>		
PAC Time Variables	LD1 IO Drivers	

3. Click the "Insert Master/Port" button on the left side to set the "Slave number" (In this case, the value is "1"), and click the "OK" button.

IO Drivers *	Name Value
品	
MODBUS Slave Prot	ocol 🛛
Slave number: 1	
Slave number Server ID	
PAC Time Variables LD1 10 D	rivers

4. Click the "Insert Slave/Data Block" button on the left side to open the "MODBUS Slave Request" window.

10 Drivers *				
	MODBUS Slave	Name	Value	
	器 Server - Slave number = 1	Slave number	1	
*		Server ID		
	Tips: 1. Press the "F1" key to 2. If you add two or mor "Server ID" for easier	open the Help e "Server' use (a string,	o on this subje " settings, typ e.g., `SVR1')	ect. e a
∎+				
— Request	t Address Nb	ltem [Description	
< > PAC	Time Variables LD1 10 Driver	s		
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5. Enter a simple note in the "Description" field and then click the "Input Registers" option.

ODBUS Slave Request	
Description: Read_Value Cancel	For Modbus I
Data read by the master Enter a simple note.	Options
O Input Bits	Input Bits
Input Registers	Input Regist
	For Modbus I
Data block "Base address" to "1"	Options
Base address: 1 and set the value of	Coil Bits
Nb items: 2000 "Nb items" is greater than "200".	Holding Registers

For Modbus Master to <u>Read</u> data:

Options	Data types
Input Bits	BOOL
Input Registers	BYTE, INT, DINT, REAL, etc.

For Modbus Master to <u>Write</u> data:

Options	Data types
Coil Bits	BOOL
Holding Registers	BYTE, INT, DINT, REAL, etc.

- 6. As the screenshot above, it is recommended to set the "Base address" to "1" and the "Nb items" refers to how much variable data can be provided by one "data block". If the data address requested from the Modbus Master (e.g., the SCADA software) is greater than this value (in this example, the value is "2000"), the Modbus Slave (i.e., Win-GRAF PAC) will not respond.
- 7. Mouse drags all the needed variables (e.g., "PAC_xxx", data type: "DINT") one-by-one from the Variables area and then drop it to the "Symbol" field.

10 D	rivers *								
E	⊡ M § MODBUS	Slave		Name	Value	7	Name	Туре	Dim.
묘	유 ····································		Request	Input Registers		PAC_Month	DINT	~	
*	🗄*🛢 Ir	iput Registers [1.	2000] - Read_Va	Address	1		PAC Day	DINT	(]
				Nb Item	2000		PAC_WeekDay	DINT	
Ð			Descript	Read_Value		PAC_Hour	DINT		
							PAC_Minute	DINT	
	Symbol	Offset	Mask		Storage	F	PAC_Second	DINT	~
	PAC_Year	0	FFFF		Default				>
¢þ	PAC_Month	0	FFFF		Default	N	amez Value		
	PAC_Day	0	FFFF	Default					
₿+	PAC_Hour	0	FFFF		Default	1			
-	PAC_Minute	0	FFFF		Default				
	PAC_Second	0	FFFF		Default				
		 -							
	<				>				
< >	PAC Time	/ariables LD1	10 Drivers						
			ICP DAS C	Co., Ltd.	Technical Docur	ner	it		

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8. Mouse double-click the "Offset" field and fill in a value, then press "Enter" key to finish the setting.

- Note: (1) The "Offset" value starts at "0" and the Modbus address of variable is equal to this value plus 1 (Base address).
 - (2) If using a 32-bits (or more than 32-bits) data type (e.g., "DINT"), it requires two Modbus addresses, as the table below, the "Offset" values are "0", "2", "4", "6", etc.

Symbol	Offset	Mask	Storage
PAC_Year	0	FFFF	Default
PAC_Month	2	FFFF	Default
PAC_Day	4	FFFF	Default
PAC_Hour	6	FFFF	Default
PAC_Minute	0 8 💌 🔮	FFFF	Default
PAC_Second		FFFF	Default
PAC_WeekDay	0 Enter	FFFF	Default
1			

Tips:

Mouse click the "Offset" field and press the keyboard "Ctrl+A" to select all items, and then click the "Iterate Property" button at the left side to open the settings window.

	Symbol	Offs	et 🔼	Mask	Storage
MZ	PAC_Year	0		FFFF	Default
ē,s	PAC_Month	0		FFFF	Default
₽↓	PAC_Day	0	-	FFFF	Default
	PAC_Hour	0		FFFF	Default
Ð	PAC_Minute	0	Ctrl+∆	FFFF	Default
	RAC_Second	0	CUITA	FFFF	Default
	PAC_WeekDay	0		FFFF	Default

Keep the "Name" setting, enter "0" into "From" field and enter "2" into "By" field, then click "OK".

Name From:	% 0 🗘	 (If the "Name" is set to "%%", it will show "00, 22, 44, 66, 88, 1010, 1212" in this example. The user can modify it depends on the needed settings and then check the value in the "Results" area.) 											
- Hesuits-			Symbol		Offset	Δ	Mask	Storage					
2			PAC_Ye	ear	0		FFFF	Default					
4			PAC_M	onth	2		FFFF	Default					
6			PAC_Da	зу	4		FFFF	Default					
10			PAC_H	our	6		FFFF	Default					
12			PAC_Mi	inute	8		FFFF	Default					
			PAC_Se	econd	10		FFFF	Default					
		ок 🔍 с	Ca PAC_W	'eekDay	12		FFFF	Default					
			< PAC	Time Va	riables LD1	10 D	rivers						
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 Click "Storage" to select entire columns and then press "Enter" key to display a drop-down menu. Then, select "DWORD (Low – High)" and press "Enter" key to complete the setting. (If using a 16-bits or below, it is no need to set the "Storage" item.)

Symbol	Offset	Mask	S	torage 🥿	Δ_{-}	Range (Low)
PAC_Year	0	FFFF	De	fault		
PAC_Month	2	FFFF	De	fault	Ť.	
PAC_Day	4	FFFF	De	fault		
PAC_Hour	6	FFFF	De	fault		
PAC_Minute	8	FFFF	De	fault		
PAC_Second	10	FFFF	De	if so de		
PAC_WeekDay	12	FFFF	D	Default DWORD (I DWORD (I	High - I Low - H	Low)
PAC Time V	l /ariables LD	1 IO Drivers		STRING(6) STRING(8) STRING(1))) 0)	

To expand this "Data Block" and you can see the Modbus addresses of all variables. It equals to the "Offset" value plus "1" (Base address).

10	Drivers *						
臣	📋 📋 🛙	out Registers [1.,2000]	- Read_Value	^	Name	Value	
무		+01: PAC_Year			Request	Input Reg	isters
4+	· · · · ·	+23: PAC_Month			Address	1	
=	····· 🖸	+45: PAC_Day			Nb Item	2000	
0	· 🖸	+67: PAC_Hour			Description	Read_Val	ue
	🗅	+89: PAC_Minute					
	····· 🖸	+1011: PAC_Secor	nd	-			
		+1213: PAC_Week	Day	~			
¢,s	Symbol	Offset	Mask		Storage		Range (Lo
	PAC_Year	0	FFFF		DWORD (Lo	w - High)	
Ē↑	PAC_Year PAC_Month	0 2	FFFF FFFF		DWORD (La DWORD (La	ow - High) ow - High)	
∎+	PAC_Year PAC_Month PAC_Day	0 2 4	FFFF FFFF FFFF		DWORD (La DWORD (La DWORD (La	ow - High) ow - High) ow - High)	
∎ +	PAC_Year PAC_Month PAC_Day PAC_Hour	0 2 4 6	FFFF FFFF FFFF FFFF		DWORD (La DWORD (La DWORD (La DWORD (La	ow - High) ow - High) ow - High) ow - High)	
∎+	PAC_Year PAC_Month PAC_Day PAC_Hour PAC_Minute	0 2 4 6 8	FFFF FFFF FFFF FFFF FFFF		DWORD (La DWORD (La DWORD (La DWORD (La DWORD (La	ow - High) ow - High) ow - High) ow - High) ow - High)	
€+	PAC_Year PAC_Month PAC_Day PAC_Hour PAC_Minute PAC_Second	0 2 4 6 8 10	FFFF FFFF FFFF FFFF FFFF		DWORD (La DWORD (La DWORD (La DWORD (La DWORD (La DWORD (La	ow - High) ow - High) ow - High) ow - High) ow - High) ow - High)	
€	PAC_Year PAC_Month PAC_Day PAC_Hour PAC_Minute PAC_Second PAC_WeekDay	0 2 4 6 8 10 12	FFFF FFFF FFFF FFFF FFFF FFFF		DWORD (La DWORD (La DWORD (La DWORD (La DWORD (La DWORD (La DWORD (La	ow - High) ow - High) ow - High) ow - High) ow - High) ow - High) ow - High)	

10. Then, we need to add the second "Data Block" for the Modbus Master to read the Boolean data. This configure way is similar to the step 4 to 8:

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 (1) Click the "Server" item and click the "Insert Slave/Data Block" button at the left side to open the settings window. (2) In the "MODBUS Slave Request" window, enter a simple note and select the "Input-bits" option, then set "Base address" to "1" and set "Nb items" to "2000". 												
Image: Server - Slave number = 1 Image: Server - Slave												
					read by the r Input <u>B</u> its	naste E	nter a s	imple note]			
For the Modb	us Master to <u>Re</u>	<mark>ad</mark> data:			read or force	d by the r	nactor					
Option	Data Type	2			Coil Bits	a by the f	nascer					
Input Bits	BOOL			0	Holding Regis	sters						
Input Registe	ers BYTE, INT REAL, LIN	, DWORD, T, etc.		-Data I Bas	block e <u>a</u> ddress:	1						
				<u>N</u> b i	items:	2000						

(3) Mouse drags the Boolean variables (i.e., "LED1", "LED2"; data type: BOOL) one-by-one and drop them to the "Symbol" area, and then set the "Offset" to "0" and to "1".

IO D	rivers *											í X
日	🗄 🖓 🏪 Server	- Slave number = 1	•	^ ^	Name	Value		Y	Name		Туре	
묘	🚊 🕂 🗄 🗠	ut Registers [12000]	-Read Valu	F	Request	Input Bits			LED1		BOOL	^
**	⊟… *⊟ Inp	ut Bits [1.,2000] - Rea	ad_Boolean	A	Address	1			LED2		BOOL	
		+0: LED1		N	Nb Item	2000			🛛 🖌 🔛 RE	TAIN vari	ables	~
Ð	····· 🗖	+1: LED2			Description	Read_Boolear	۱				3	2
				×						L) (alu		_
	Symbol	Offset	Mask		Storage		Rang	- No	ine	Valu		_
	LED1	0	FFFF		Default	-	-					
¢,	LED2 👞	1	FFFF		Default							
∃ ↓	<						>	<				
< >	PAC fime Va	riables LD1 IO D	rivers									

You have completed the settings for the Modbus Slave. Finally, follow the way below to re-compile the program and download it to the Win-GRAF PAC.

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Classification Win-GRAF English FA Author Janice Hong Versi 11. Click "Project" > "Build All Projects" below). If a message informs you, " Build On Line Change is disabled [MODBUS-S]: (4): PAC_Year: Warning: 32 b < CT Segment = 55 byte(s) > < 16 1/0s > Relocating code < Code CRC=323797fc - File CRC=eb3d0c1 No error detected Build Cross references Runtime 12. Mouse right-click the project name set the PAC IP (e.g., "192.168.71.19	AQ-008 on 1.0.0 from the men No error detect oit word ordering not 6 - Size=3672 > Call stack Bre (i.e., "Demo01	Date u bar to com ted" that me supported by run This version sakpoints Dic	Dec. 2015 pile this prog eans this proc time 7.4 and older n information qital sampling trace t the "Commu	Page ram again (ess is succes) can be igno	7 / 12 as the figure ssful. red. rameters" t
AuthorJanice HongVersi11. Click "Project" > "Build All Projects" below). If a message informs you, "BuildOn Line Change is disabled [MODBUS-S]: (4): PAC_Year: Warning: 32 b < CT Segment = 55 byte(s) > < 161/Ds > Relocating code < Code CRC=323797fc - File CRC=eb3d0c1 No error detectedNo error detectedImage: Set the PAC IP (e.g., "192.168.71.19)	on 1.0.0 ' from the men No error detect it word ordering not 6 - Size=3672 > Call stack Bre (i.e., "Demo01	Date u bar to com ted" that me supported by run This version akpoints Dic ") and select	Dec. 2015 npile this prog eans this proc time 7.4 and older n information	Page gram again (ess is succes can be igno can be igno	7 / 12 as the figure ssful. ored. rameters" t
11. Click "Project" > "Build All Projects" below). If a message informs you, " Build On Line Change is disabled [MODBUS-S]: (4): PAC_Year: Warning: 32 b < CT Segment = 55 byte(s) > < 161/0s > Relocating code < Code CRC=323797fc - File CRC=eb3d0c1 No error detected Build Cross references Runtime 12. Mouse right-click the project name set the PAC IP (e.g., "192.168.71.19	from the men No error detect it word ordering not 6 - Size=3672 > Call stack Bre (i.e., "Demo01	u bar to com ted" that me supported by run This version	npile this prog eans this proc atime 7.4 and older n information gital sampling trace	gram again (ess is succes) can be igno Prompt HM	as the figure ssful. pred. rameters" t
to establish a connection and down	:502") and the load this project WM Win-GR File Edit	n CIICK the m ct to the Wir AF - Demo0 <u>View</u> Insert F	nenu bar "Proj n-GRAF PAC. Il Project <u>I</u> ools <u>W</u> Build All Pro	ject" > "On I <u>J</u> indow <u>H</u> elp	ine" (or برایی) F7
File Edit Yiew Insert Project Tools Yee Workspace Paramete Demo01 Set as Startup Project Set as Startup Project Communication Paramete Jon Line	Workspace	Exception pro Programs	Clean All Pro Download Al Settings Con Line Simulate	jects 1 1 Projects	Ctrl+F5 F5
SCADA / HMI			Win-Gf	RAF PAC	
InduSoft IP: 192.168.71.xxx Mask: 255.255.255.0	IP: 192.16 Port: 502	8. 71 .19	-5xx8-CE7	WP-8xx8	
Modbus TCP Master	r		Modbus 1	CP Slave	

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1.2. To Enable the Win-GRAF PAC as a Modbus RTU Slave

Before doing this, you must complete all the content that described in <u>Section 1.1</u> to open the Modbus Slave data. The way to enable the Win-GRAF PAC as the Modbus RTU Slave is to add the "MBSLAVERTU" or the "MBSLAVERTU**EX**" function block in the program. To begin, follow these steps:

1.2.1. Add the "MBSLAVERTU" function block

1. In the "LD1" window, mouse click the place where you want to add this function block and then click the "Insert FB.." button on the left side of the window.



2. Double-click on this function block and select the name "<u>MBSLAVERTU</u>", then click "OK".



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3. In the "MBSLA' string 'COM2:9 Modbus Maste	VERTU" function (CO (CO (CO (CO (CO (CO (CO (CO	*Natural logarith PSTRING ("Get TE ("Low part of (*Logarithm (ba dESSAGE ("sen DRD (*Low part DRD (*Pack (*Maximum*) ASTERTU (*M ASTERTU (*	Inst_MBSLAVERTU Inst_M	hat*) d*) vice Identifica a()*) serial(*) click the AF PAC's settings.	Tips: Press the ' the function tion") OK Cano left side of the COM2 to com Tips: Press the "Fi function blo the related H	MBSL" key to MBSL" key to mame quid e "PORT" and munication 1" key on thi ck to show u Help.	o find ckly. d enter a with the s p



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1.2.2. Add the "MBSLAVERTUEX" function block

When using several "Server - ..." settings (recommend to set one) in the "IO Drivers" window, the user needs to use the "MBSLAVERTU**EX**" function block.

IO Drivers *											
臣	⊡Ma MODBUS Slave			Name	Value						
문	🗄 👪 Server	- Slave number = 1		Slave number	1						
**	🗄 🗝 🗄 Input Registers (12000) - Read_Value			Server ID	'Svr1'						
5		ut Bits [1.,2000] - Re		-							
	Request	Address	Nb Item	Description							
₽Щ	Input Registers	1	2000	Read_Value							
Ì₿	Input Bits	1	2000	Read_Boolean							
212											
PAC Time Variables LD IO Drivers											

 Follow steps 1 to 4 above to add the "MBSLAVERTUEX" function block. If you want to change the usage for existing function block, mouse double-click the "MBSLAVERTU" and change it to the "MBSLAVERTUEX", and then click the "OK" button.



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2. The "MBSLAVERTU**EX**" has a "SrvID" setting. Double click the left side of the "SrvID" and enter a needed "Server ID" (using a string format, e.g., 'Svr1').

Note:

Using the "MBSLAVERTU" function block means the first Modbus Slave setting will be enabled. Using the "MBSLAVERTU**EX**" function block means to enable the Modbus Slave setting depends on the "Server ID".



Now, you have finished the settings for the "MBSLAVERTU**EX**" function block, and then re-compile the program and download it to the Win-GRAF PAC.