

Interfacing of Any PLC to Lab VIEW Using Modbus Protocol

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Abstract - Lab VIEW is frameworks designing programming for applications that require test, estimation, and control with fast access to equipment and information experiences. Lab VIEW By National Instruments is very good graphical programming tool for Engineers.

Lab VIEW can be interface may peripheral devices for getting data from surrounding, different type of sensors and other hardware. In this Paper we are showing interfacing of PLC to Lab VIEW software for our application.

1. INTRODUCTION

The Modbus modern convention was produced in 1979 to make correspondence conceivable between robotization gadgets. Initially executed as an application-level convention planned to exchange information over a serial layer, the convention has extended to incorporate usage over serial, TCP/IP, and the client datagram convention (UDP). Today, it is a typical convention utilized by innumerable gadgets for straightforward, solid, and proficient correspondence over an assortment of present day systems.

2. STUDY

We have studied about labview and an additional software VI package Manger. JKI Software's VI Package Manager (VIPM) makes utilizing and dispersing a NI LabVIEW add-on straightforward. With VIPM, it is anything but difficult to oversee and share reusable VIs over numerous undertakings, PCs, and groups of designers. The extra rearranges the way toward packaging your VIs and setting them up for conveyance.

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% ⊗ ⊗ ®	<u> </u>	13 2016 V DA		API
lame /\	Version	Repository	Company	
10dof	1.1.0.35	NE LabVIEW Tools Network	Nairi-Tech	
30 Express	1.0.0.16	NE LabVIEW Tools Network	Synergy	
6DOF Stewart platform control library	1.0.0.5	NI LabVIEW Tools Network	Ovak Technologies	
A/D Converters Test Tookit	1.2.0.24	NE LabVIEW Tools Network	Project Integration	
Advanced Calculations on Curves	1.0.0.2	NI LabVIEW Tools Network	RAFA Solutions	
Advanced Encryption Standard (AES)	1.0.0.5	NI LabVIEW Tools Network	National Instruments	
Advanced Plotting Toolkit	1.1.0.135	NI LabVIEW Tools Network	Helosphere Research LLC	
AES Crypto	1.0.0.7	NE LabVIEW Tools Network	Alab Technologies	
Algorithms after Dijkstra and Kruskal f	1.0.0.27	NI LabVIEW Tools Network	Ovak Technologies	
ALOHA	2.0.0.22	NI LabVIEW Tools Network	55 Solutions, Inc	
AM-9898 HART Interface Toolkit	1.0.0.19	NE LabVIEW Tools Network	Ambec	
Amulet Display API	1.0.0.30	NI LabVIEW Tools Network	Amulet Technologies	
ANT + Tookit	1.4.5.42	NE LabVIEW Tools Network	INU Solutions	
AR Drone Tookit	0.1.0.34	NE LabVIEW Tools Network		
Arduino Compatible Compiler for LabV	1.0.0.21	NI LabVIEW Tools Network	Aledyne-TSXperts	
Arduino Compatible Compiler for LabV	1.0.0.21	NE LabV2EW Tools Network	Aledyne-TSXperts	
Asynchronous TDMS Logger	1.5.1.15	NI LabVIEW Tools Network	National Instruments	
AutoSerial	1.0.0.12	NI LabVIEW Tools Network	Alab Technologies	
Averna Balcon Tip	1.0.0.23	NI LabVIEW Tools Network	Averna Technologies Inc	
Averna Notify Icon	1.0.0.17	NI LabVIEW Tools Network	Averna Technologies Inc	
B+W AS-I	1.0.0.93	NI LabVIEW Tools Network	National Instruments	
BACnet Protocol for LabVIEW	1.0.0.3	NE LabVIEW Tools Network	Ovak Technologies	
BACnet_IP Protocol for LabitEW	1.0.0.16	NE LabVIEW Tools Network	Ovak Technologies	
BeeDD5 Tookit 2.0	2.0.2.18	NI LabVIEW Tools Network	RobotroniX-Sistemi Software Integrati	
Biometric Login Tookit	1.0.1.25	NE LabVIEW Tools Network	Blue Ridge Test	
Biometric Login Toolkit API	1.1.0.18	NI LabVIEW Tools Network	Blue Ridge Test	
Biometric Login Tookit Base Componer	1.1.0.22	NI LabVIEW Tools Network	Blue Ridge Test	
Biometric Login Tookit Documentation	1.1.0.28	NE LabV2EW Tools Network	Blue Ridge Test	
Biometric Login Toolkit Server	1.1.0.23	NE LabVEEW Tools Network	Blue Ridge Test	
BitMan - Bitmap Manipulation Library	1.0.1.0	NE LabVIEW Tools Network	Wajciech Galebiowski (vugie)	
CalcExpress	2.7.2.36	NE LabVEEW Tools Network	Konstantin Shifershteyn	
Calculator Toolkit	1.0.0.2	NE LabVEEW Tools Network	RAFA Solutions	
Caraya	0.4.1.22	3KI Package Network	DK.	
Cassandra-driver	0.2.0.4	NI LabVIEW Tools Network	Lawrence Berkeley National Laboratory	
Class Creator Utility	1.0.2.16	NE LabVIEW Tools Network	Bloomy Controls, Inc	
Classic Flat UI Controls Kit	1.0.0.1	NI LabVIEW Tools Network	RAFA Solutions	
CLAUDIE_xisx	1.3.0.1	NE LabVIEW Tools Network	ATEsystem	

Fig.1 VI package manger

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3. WORKING

Adding Modbus API to lab VIEW using VIPM this procedure can be followed:

1. First of all download the VIPM from the internet using the URL https://vipm.jki.net/get. Here you get free as well as paired software. Just download the free version of the VIPM.

2. Then install the VIPM to the computer.

3. After installing the VIPM you have to open the VIPM which is open like fig.1

4. Now search for NI Modbus library in the search box. Then select NI Modbus Library. And install it. When you install it automatically opens the labview. If your computer does not have labview developing system then it will not installed. For installing it you have to install labview first.

			JKI VI Package
Edit View Package Tools W	indow Help		
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		12 2016 V 🕅 AI	V 🔍 NI modbus
Name /\	Version	Repository	Company
DCAF Modbus Module	2.1.0.85	NI LabVIEW Tools Network	National Instruments
GModBus over Serial Line	3.0.0.54	NI LabVIEW Tools Network	SAPHIR
GModBus over TCP	3.0.0.65	NI LabVIEW Tools Network	SAPHIR
MT Modbus Library	1.1.5.39	NI LabVIEW Tools Network	National Instruments
Plasmionique Modbus Master	1.2.1.2	NI LabVIEW Tools Network	

Fig.2 Installing NI Modbus library



	Q				
Comparison	Timing	Dialog & User			
File I/O	Waveform	Application Control			
	* ,				
Synchronization	Graphics & Sound	Report Generation			
Measurement I/O			Þ		
Instrument I/O					
Mathematics					
Signal Processing					
Data Communication					
Connectivity					
Control & Simulation					
Express			١Ì.	Addons	
Addons				v	\sim
Select a VI					THE REAL PROPERTY AND INC.
DSC Module			•	2	
Arduino			•	Find Add-ons	Modbus Library
	*				

Fig3. Modbus library I function pallet

5. When it installed successfully the Modbus APIs are automatically comes in function pallet in addons

Now you are ready for controlling and monitoring the PLC data like Memory and registers.

Now every PLC have some standard communication protocols and communication address. All the memory coils and registers in the PLC have a unique address. By using this address labview and PLC can be easily interfaced.

These communication protocols can be obtained from the Manufacturer of PLC or it may be available on the Website of the Programmable logic control.

4. COMMUNICATION (Delta plc with Lab VIEW)

As demonstration we are going to communicate delta PLC with Lab view. First of all we have to download the communication protocols of the delta PLC from the website of delta. It will be a document file and contains the list of address of memories and data resisters. As we can see that all the given address are in the Hexadecimal. So in the programming we have to use them by changing in decimal form.

1. For this task the block diagram is shown in fig. Now there are some steps of programming to read and write data to the PLC.

- 2. Open the labview and create a new VI.
- 3. Now in functional block diagram window select create Modbus instance by using the address addon>Modbus library>Master API>create Modbus instance.

Now suppose that we want to turn ON M0 and want to monitor status of M1. And also want to read the data register D0 and want to write the register D1.



Fig.4: Main Block diagram for reading and writing data

Device	Range	Туре	Address
S	000~255	bit	0000~00FF
S	246~511	bit	0100~01FF
s	512~767	bit	0200~02FF
S	768~1023	bit	0300~03FF
х	000~377 (Octal)	bit	0400~04FF
Y	000~377 (Octal)	bit	0500~05FF
Т	000~255	bit/word	0600~06FF
М	000~255	bit	0800~08FF
М	256~511	bit	0900~09FF
М	512~767	bit	0A00~0AFF
D	000~256	word	1000~10FF
D	256~511	word	1100~11FF
D	512~767	word	1200~12FF
D	768~1023	word	1300~13FF

Table.1: Delta PLC communication Address

Explanation of block diagram:

- 1. First step is the initialization of the Modbus instance or can be called reference. While initializing the instance we have to choose one mode of communication such that new TCP master OR slave. The TCP is for communication by Ethernet and we have to provide IP address of the slave device Address.
- 2. If you are communicating by RS232 serial port then you have to select New serial Master or Slave. If you have select serial master then you have to provide VISA resource name as Slave device. While using the serial master make sure that you have install NI-VISA 16.0 driver to your computer. Otherwise it does not works and does

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not shows and virtual COM Ports while you add VISA resource to the VI.

- 3. Now after that in the second step the added VI is to write single coil. 2048 is the address of M0. It can be seen from the table where Address for the MO starts from 800 in HEX. If we convert it in decimal then we get 2048.
- 4. Similarly the third VI is for reading the coils. It reads multiple coils and we have to provide starting device address and number of devises. it gives Array of the Boolean.
- 5. The fourth VI is for Reading multiple data register. From the table we can see that the Address of the D0 is 1000 in HEX. When we convert it into decimal then we get 4096. So the address of D0 will be 4097 and address of D1 will be 4097 in decimal format.
- 6. Similarly the last VI id for writing the single register. It writes in data register D0 of the PLC and value to be write is 5.
- 7. The last VI is for closing Modbus instance.
- 8. For running continually and control and monitoring continually we put a while loop for reading and writing VI.

5. CONCLUSIONS

As we are trying to communicate our PLC to Lab VIEW is now working correctly. Now if run our Lab VIEW program by RUN button provided on Program. When we RUN the VI anyone can able to access the PLC data.

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