



ARIAN
Industrial Control & Instrumentation

Arian Opc Server V4.0
Modbus RTU server software for OPC.

Users Guide

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1. Introduction

1.1 General Description

The Arian instruments send data (e.g. temperatures, counts, positions of valves) to a PC by means of a single wire pair across the plant.

Having in the PC a continuous historical data registry makes possible to generate automatically production reports.

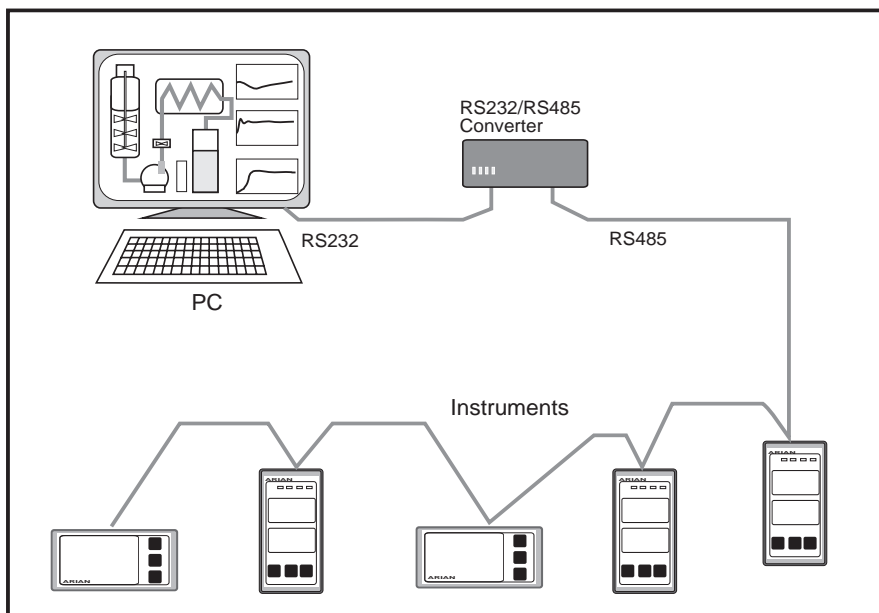
Derived benefits will be improvements in the productivity, cost reduction and a superior quality control.

1.2 How it works

Each instrument must have the optional RS485 isolated output card installed.

The RS485 bus is a low cost twisted single wire pair that connects the instruments thru the plant and ends in the ISO485 interface module that converts RS485 in to galvanically isolated RS232.

Finally the RS232 connects to a PC serial communications port.



By other side, from the software point of view:

The instruments use the Modbus RTU protocol for exchanging data with the PC thru the RS485 bus.

On the PC must be running the Arian Opc V4 server software making it the Modbus arbiter that collects data from the instruments (slaves).

The screenshot shows a window titled "Arian V4.0, modbus RTU, OPC server., V04a, Diciembre 2005". The window contains a menu bar (File, Edit, Tools, Run, About), a status bar (Running), and a file path (D:\dsgn\rs485\ari_v04\server V4\files\demo.ars). Below this is a table with the following data:

Instrum...	Variable	Value	Time	Date	Quality	Units
MainPipe	FlowRate	45.26186	07:42:32	08-05-2003	Verdadero	
MainPipe	Te_input	263.15	07:42:32	08-05-2003	Verdadero	
MainPipe	P1_input	101325	07:42:32	08-05-2003	Verdadero	
MainPipe	dP_input	0.9155273	07:42:32	08-05-2003	Verdadero	
MainPipe	Total	512693	07:42:32	08-05-2003	Verdadero	
MainPipe	sp1a	20	07:42:33	08-05-2003	Verdadero	

Data is displayed on the software console, stored as text files (for later processing) and presented in OPC format to other applications executed on the same PC or in the Net.

Such applications are typically HMI/MMI (Human Machine Interfaces / Man Machine Interfaces) software packages for displaying information in a friendly way.

1.3 Technical specifications

GENERAL

- Galvanic isolation of instruments from the bus and from the bus to the PC by means of the insulating interface.
- RS485 Half duplex (1 pair).
- Modbus RTU software protocol.
- Maximum bus length is 1200 meters. Using a twisted pair AWG # 24.
- Digital communications by means of RS485 serial bus were conceived specially for industrial environments where noise and interference immunity is required.
- The scheme of distributed control and centralized supervision universally is accepted as the most reliable, because when failing a device in the bus, the rest continue operating in independent way.

Arian OPC V4 Software

- Run s on a x86 PC compatible computer with windows W95, W98, W2000, XP operating system.
- Modbus RTU bus arbiter on serial ports comm1 to comm4
- OPC server under DA2 specification.

2. Arian ModBus RTU, OPC server software.

This software packages is intended to use with Arian manufactured instruments but can be used as well with any other modbus RTU communicating device.

On the physical layer is the RS485 protocol, half duplex and not RS422 (sometimes called RS485 full duplex!).

So the software need to hear back (eco) what is witting on the comm. port.

This only depends on the type of RS232/RS485 interface you are using.

Collected data from the RS485 bus is displayed in the main form and comes available to other windows applications in OPC format. The software may also store received data in text files (*.csv)

OPC is a client-server based architecture for enabling communication between two applications running on distributed computers. The OPC Data Access Specification utilizes DCOM for communication between the OPC Client (eg. An HMI application) and the OPC server.

You will need a PC computer with at least.

- Windows 95, 98, 2000, NT operating systems.

- Svga 800x600 color monitor.

- Dcom installed on W95 or W98 systems

2.1 Start up.

Execute application Arian_Opc_V4.exe

Within the program go to [File / Open] in the upper context menu.

Open one of the example files on files*.ars folder

The file menu has the following options:

[File / Open]	Opens a new project file with extension .ars
[File / Save]	Saves the project file.
[File / Save as]	Saves with different name.
[File / Exit]	Quits

On this main form are presented the results of scanned tag values.

The other forms in the context menu are the following

[Edit]	Edit, tags, devices and communication settings.
[Tools]	Tools
[Run]	Start and stop scanning.
[About]	About

From now on the term “Device” will be used to refer a connected instrument in the serial bus. (e.g. a cl20 temperature controller).

To each device is assigned a slave number to be recognized.

Associated with a Device are one or more “tags” (temperature, set point, control output). They are device internal parameters that are informed to the bus master.

2.2 Edit.

On the edit menu you will have the following form:

Communications

Port: Comm2, Baud: 2400, Parity: M, Max Error count: 100, Refresh time (sec.): 4

Devices

Instrument	Slave Number	Comments
MainPipe	31	sample

Buttons: Edit, Add, Delete

Tags

Device	Name	Address	Data Type	Log	Access
MainPipe	FlowRate	H400160	Real4	Off	Read
MainPipe	Te_input	H400168	real4	Off	Read
MainPipe	P1_input	H400170	real4	Off	Read
MainPipe	dP_input	H400178	real4	Off	Read
MainPipe	Total	H400150	UnSignIntg4	Off	Read
MainPipe	sp1a	H400010	Integer2	Off	Read

Buttons: Edit, Add, Delete, Copy Tag From File

Accept

Communications/Port

Select the serial communications port of the PC connected to the rs485/rs232 interface

Communications/Baud

The baud rate used on the rs485 bus. Each device must be set with this same communicating baud rate

Communications/Parity

Use M on Arian instruments. For other instruments set according parity check set on instruments.

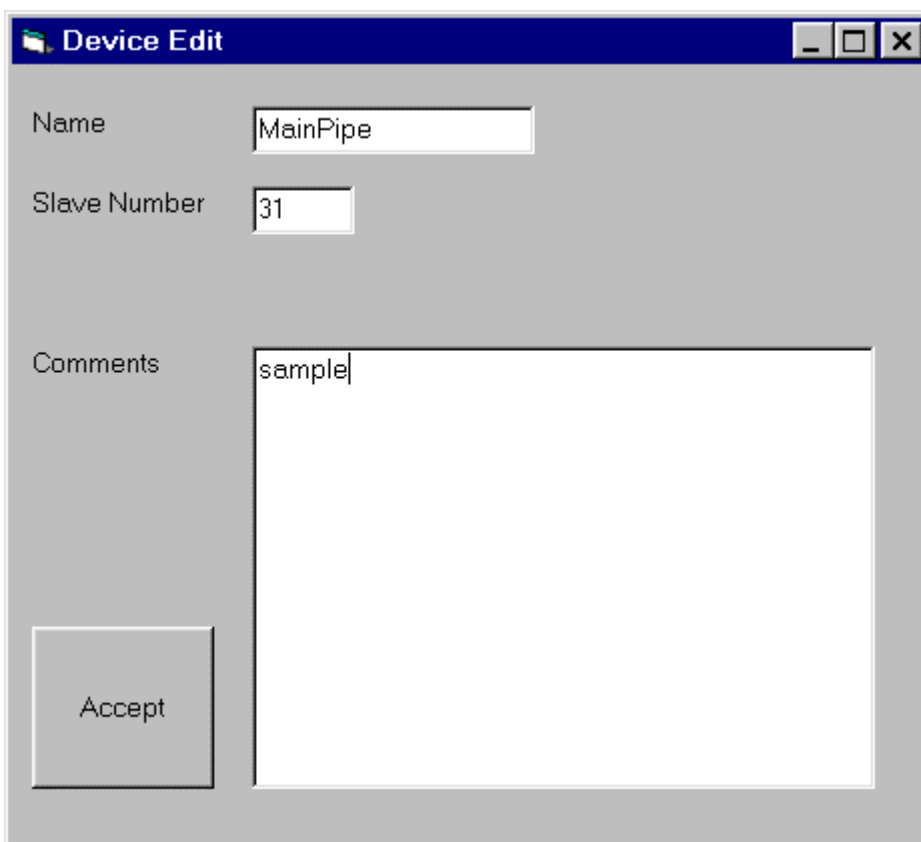
Communications/Max error count

The maximum number of communication errors that are stored for debugging check.

Devices/Edit

On the Devices frame use Add and Delete bottoms for adding or eliminating a selected device.

Edit button is for editing the selected device name and slave number on the form:



The image shows a screenshot of a software dialog box titled "Device Edit". The dialog box has a blue title bar with standard window controls (minimize, maximize, close). Inside the dialog, there are three input fields: "Name" containing "MainPipe", "Slave Number" containing "31", and "Comments" containing "sample". At the bottom left of the dialog is an "Accept" button.

The device name will be the name used from now on to identify the specified slave. The driver field and comments are optional.

Tags/Add

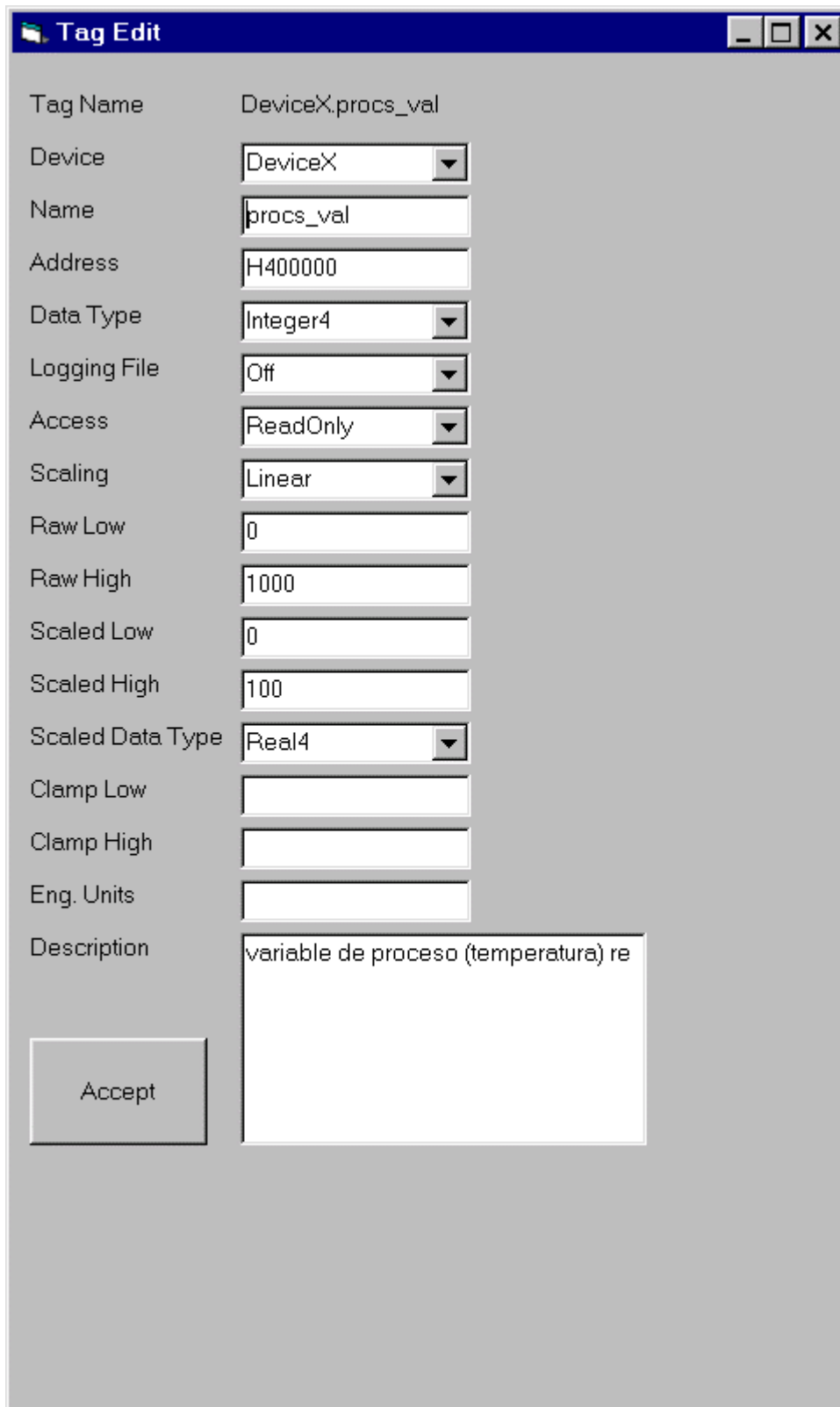
You may add a new tag with the Add button. The new tag will be based on the currently selected tag.

Tags/Delete

Eliminates the selected tag.

Tags/Edit

The tag edition form is the following:



The screenshot shows a 'Tag Edit' dialog box with the following fields and values:

Tag Name	DeviceX.procs_val
Device	DeviceX
Name	procs_val
Address	H400000
Data Type	Integer4
Logging File	Off
Access	ReadOnly
Scaling	Linear
Raw Low	0
Raw High	1000
Scaled Low	0
Scaled High	100
Scaled Data Type	Real4
Clamp Low	
Clamp High	
Eng. Units	
Description	variable de proceso (temperatura) re

An 'Accept' button is located at the bottom left of the dialog box.

Device

Is the device to which corresponds the tag.

Name

You define the name you want to give to the parameter.

Address and Data Type

This are specifications for the parameter address and data format as specified by the manufacturer.

Logging file.

By activating this option a coma separated variables format *.csv file is updated with the time and value of the parameter. The files are always on the logs\ subfolder. There are 2 of this files generated, one with the same tag name and also a general file (ALL_DATA_DATE.csv) with time and values off all tags with enabled option.

Access

Specified by the instrument manufacturer. Depend on whether the parameter is read only or may be written.

Scaling

Use linear option for numbers and bit option for extracting bit information from a 16 bit integer.

Raw low, Raw high

This are the expected parameter value range as received from the instrument. If Scaling option is Bit, then the Raw low parameter must be the bit position from to take.

Scaled low, Scaled high

This are the low scale and up scale given by the server, corresponding linearly to Raw low and Raw high values.

Scaled Type

The OPC data type used for presenting the scaled value.

Clamp low, Clamp high

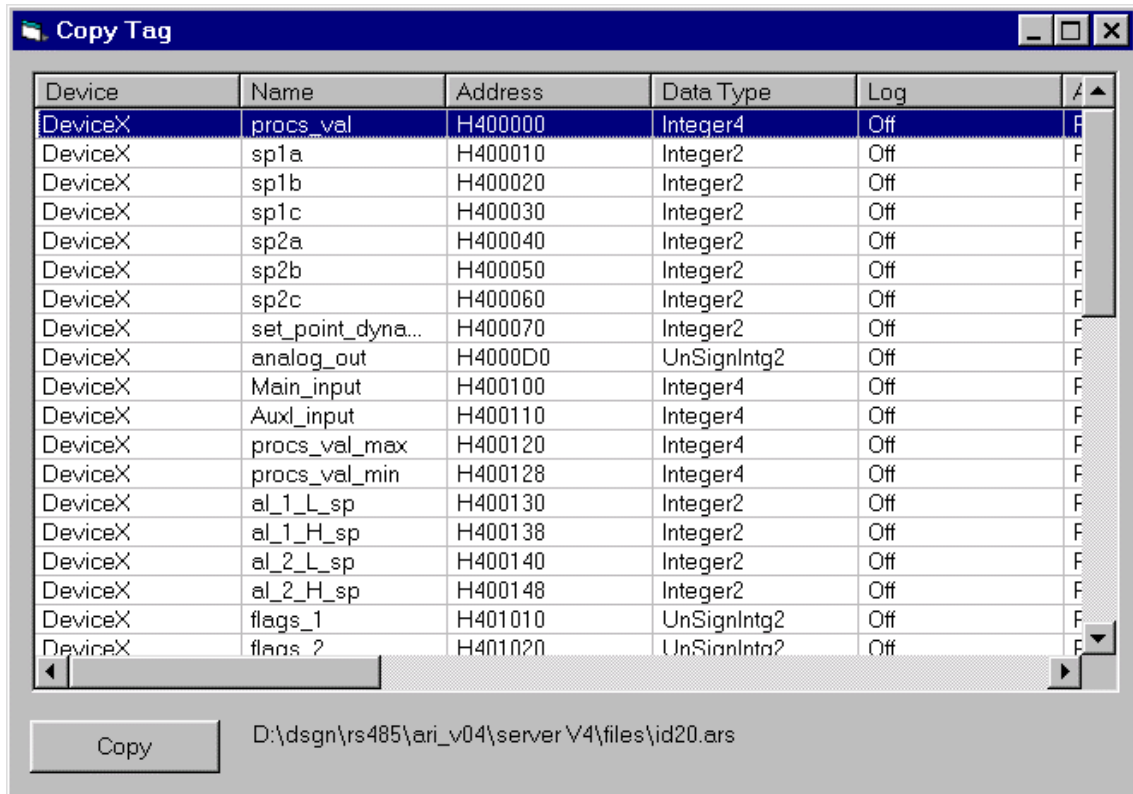
Are optional parameters used to clamp the scaled value to a minimum and maximum values. (e.g. if value is greater than [Clamp high], then is set to Clamp high value)

Units and Description

Used only for having the engineering units and some description of the parameter.

You may also copy tags from other files and then edit them. This way you reduce the time for composing configuration files.

Use the “Copy Tag From File” command on the main edit frame. It will ask you for a file to be open and then it will show a form similar to this one:



Select the tag you want to copy and use the “copy” command.

2.3 Tools.

Errors

Open the errors listing form. This is useful for tracking communication errors to some device. Please note that a communication error means fail to communicate and not “wrong value” for a parameter.

Report File

Only useful on Arian instruments.

Generates a file with the internal settings of a device. The file is stored for later inspection with the remote programming and configuration software RPS.

Write parameter

Open a form where you may select a Tag (Read/Write) and write a new value for the parameter.

Simulate

If you set this option and then run the server, the values will be simulated, not scanned from devices. The main form will turn read as an advice that these are not real values.

2.5 Run

Start and stop server operation.

3. Converting RS232 to RS485

3.1 The Arian ISO485 Isolating Interface

The ISO485 is a RS485/RS232 physical protocol converter that additionally makes galvanical isolation of the RS232 communications port from the RS485 bus. Also protects equipment from surges and spikes.

The Arian Opc Server software is designed to be used with the ISO485 isolating interface. It may be used with any other RS232 to RS485 converter as long as this 2 compatibility points are satisfied.

- 1) Echo from transmit. When the master transmits data, he must receive the echo of his transmission (the same data) for verification purposes.
- 2) Since RS485 is half duplex, the bus arbiter (PC) indicate the converter to load the bus with transmit data or to receive. The Arian software does this activating the RTS (request to send data) of the comm port. In general most of the converters use this same line, but some not.

3.2 RS485 Functional description

The RS232 protocol is ground voltage referenced. In the connector is a ground pin on where voltages are compared (pin 7 in the DB25 connector). Any pin with a voltage between $-5V$ and $-12V$ is considered in the logic 1 state, and with $5V$ to $12V$ is logic 0 state. RS232 is full duplex, which means that can simultaneously transmit and receive because there are both different lines. (TX pin 2 and RX pin 3 on the DB25)

By the other side RS485 is a differential pair with no ground, there are 2 lines A and B, both carry voltages in the order of 3 to 5 volts referred to an internal ground.

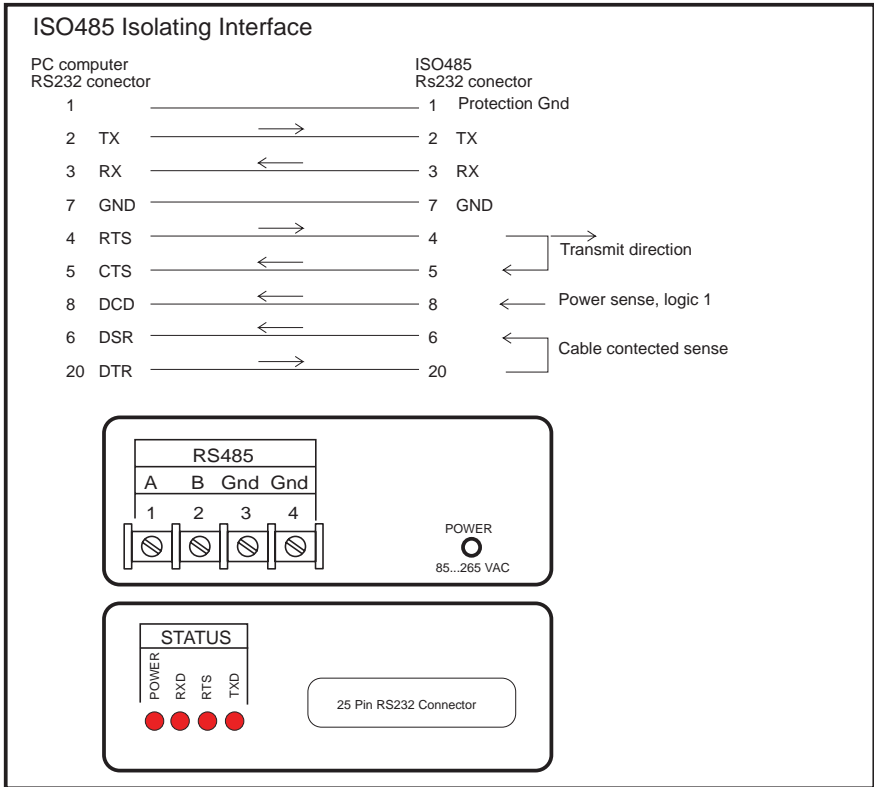
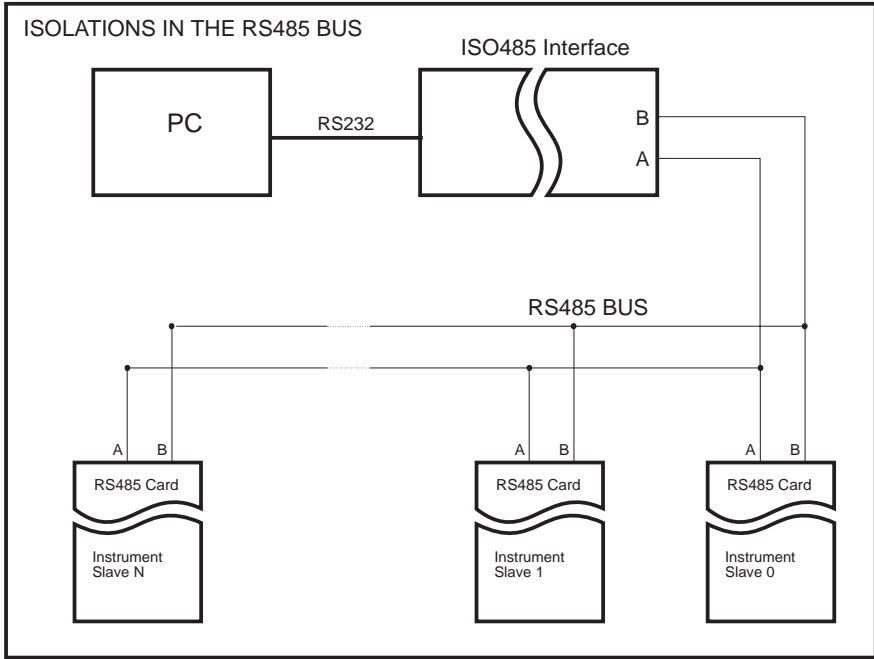
The RS485 is considered to be in the logic 1 state if voltages on line A is greater than on line B ($A > B$) and logic 0 if the opposite ($A < B$).

Since both lines are similar and have the same impedance any external interference will make both lines change the same way maintaining its differential voltage, making no change in its logic state. For this noise immunity is why RS485 is used for industrial environments.

RS485 is a half duplex (only one device can transmit at a time) multipoint protocol expected to be useful up to 4000 feet . There can be several instruments connected to the bus.

RS232 is only point-to-point and works only up to 45 feet.

The bus arbiter (PC) is the one who designates who will transmit. This is done by the RTS line (pin 4) of the RS232 port. When RTS is active indicates the ISO485 converter that the arbiter will transmit to some slave so it must load the RS485 bus with the data.



4. References

Modbus RTU Protocol:

www.modbus.org/specs.php
download file: PI_MBUS_300.pdf
MODBUS Over Serial Line FOR LEGACY APPLICATIONS ONLY
www.modicon.com/TECHPUBS/intr7.html

OPC documentation, examples and tools.

www.opcfoundation.org/	Main OPC site
www.mmioopc.com/download.htm	Free OPC explorer
www.opcconnect.com/freestuf.php	Links to a lot of free OPC software
www.ioserver.com/	Very good professional OPC server. Free trial.

www.ipi.ac.ru/lab43/lopc-en.html
Lab43's LightOPC is an open source OPC server toolkit, produced by Russian academics and released under the GNU LGPL license.
Excellent for OPC developers.

HMI / MMI software packages

Low Cost HMI software, US\$150 up to \$600 aprox.
www.mmioopc.com/download.htm
www.instanthmi.com/
www.plantview.it
www.azeotech.com
www.iconics.com/support/free_tools.asp
<http://linuxincontrol.org/>