

## TECHNICAL INFORMATION SHEET – NUMBER 212, Issue 1

TITLE: Series 2000 and LabVIEW using iTools EuroMBus OPC Server

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**This** Technical Information Sheet (TIS) describes how to interface the Eurotherm Series 2000 instrumentation with Modbus RTU serial communications to National Instruments™ LabVIEW™ software using OPC (OLE for Process Control). For more information on OPC, please visit <http://www.opcfoundation.org>.

### Hardware/Software Requirements:

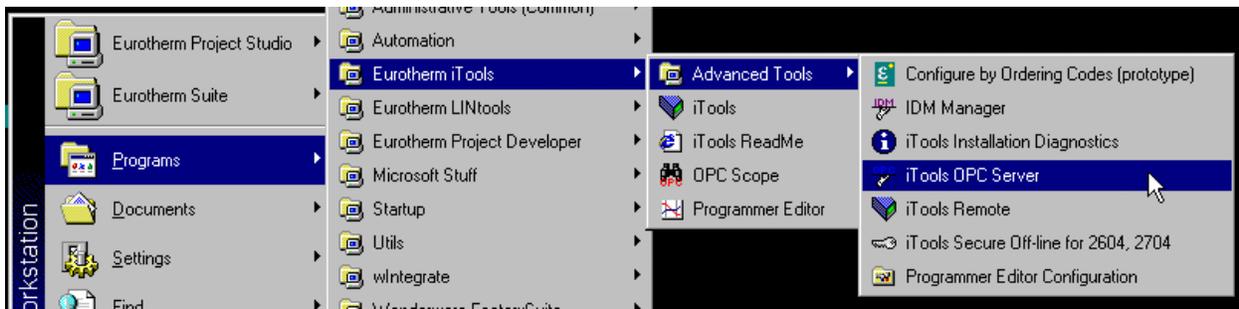
- Eurotherm Series 2000 controller or indicator with Modbus RTU serial communications. The communications interface may be RS-232, RS-422 or RS-485. If not RS-232 a converter may be required to connect the Series 2000 to the PC. For TIS-212, a 2604, Version 3 was used. Communication parameters used were; address 1, 9600 baud, 8 data bits, 1 stop bit and no parity.
- Eurotherm iTools – OPEN edition. iTools OPEN as shipped, includes a Modbus RTU OPC Server - EuroMBus. Version 4 or greater is recommended, though versions back to 2.51 are applicable.
- National Instruments LabVIEW. Version 6.0 was used. LabVIEW Version 5 or greater is also applicable. The DataSocket VI's used in this example are compatible with LabVIEW versions prior to V6.

**Begin** by wiring the Series 2000 controller or indicator to the PC that has LabVIEW installed. The diagram below details RS-232 wiring. For additional wiring examples, please go to <http://www.eurotherm.com/eiawire.htm>. Only one instrument at a time may connect using RS-232. Should the application require more than 1 instrument, RS-422 or RS-485 is required.

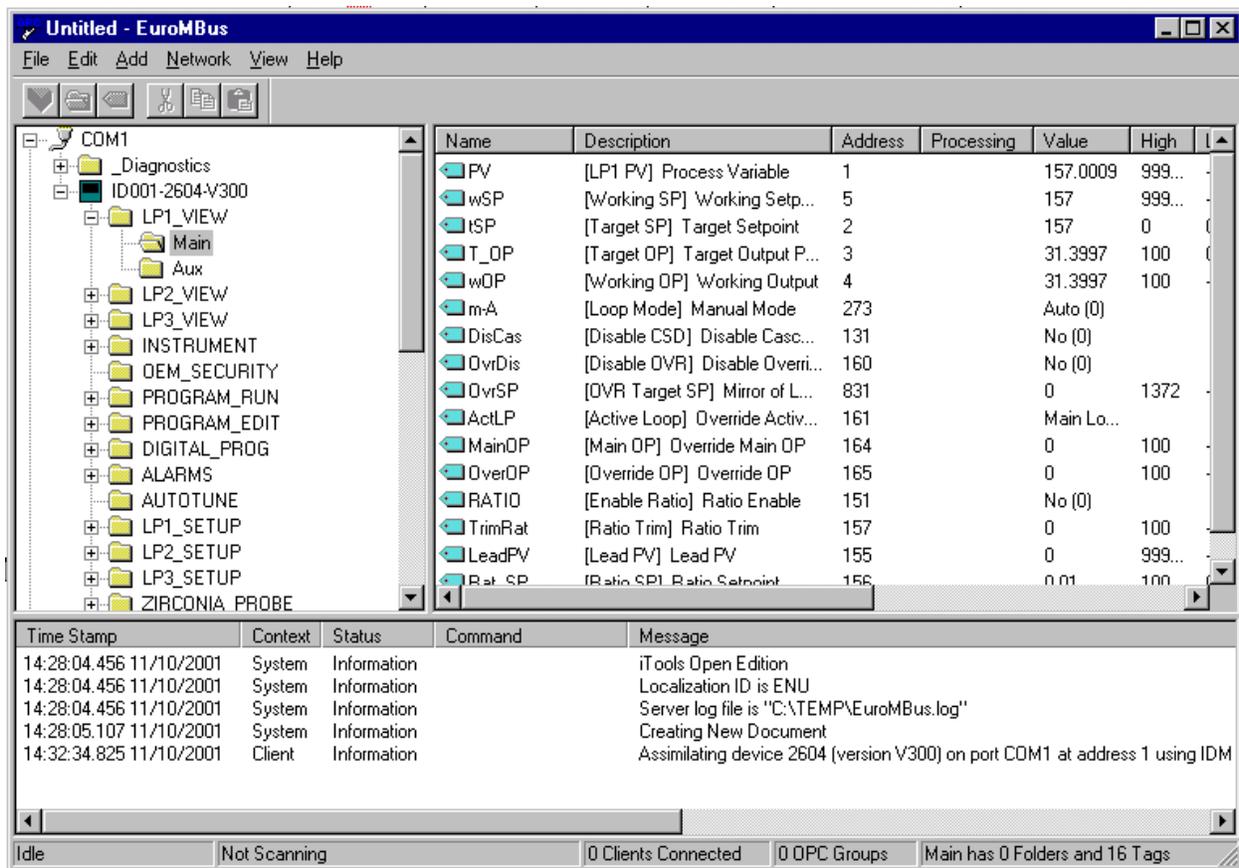
RS-232 Port			Connect To	Series 2000
Signal Name	9-Pin	25-Pin		2200e, 2400, 2604, 2704
Rx	2	3		HF
Tx	3	2		HE
Com	5	7		HD

**OPC** is the industry standard software interface used between LabVIEW and the Series 2000 instrumentation. Eurotherm iTools includes a standalone Modbus OPC Server named EuroMBus. *In V4 of iTools, EuroMBus may be used as a general purpose OPC Data Access server, supporting all required features of the OPC Data Access Custom Interface Specifications 1.0 and 2.0. This OPC server name is identified by the ProgID 'Eurotherm.ModbusServer.1'. iTools also includes an OPC Automation server, supporting all required features of the OPC Data Access Automation Interface Specification 2.0. This server would typically be used with Microsoft Visual Basic 5.0 or later, and is identified by the ProgID 'Eurotherm.OPCAutomation.1'.*

To start EuroMBus, go to Start/Programs/Eurotherm iTools/Advanced and select "iTools OPC Server" as shown in the picture below. EuroMBus is capable of auto-detecting any Series 2000 instrument with Modbus communications. By default, the parity in the instrument must be None, while the baud rate may be 4800, 9600 or 19200. The address may be from 1 to 255.



To auto-detect a connected instrument, from the EuroMBus menu bar, select Network/Start One Shot Scan – or press shortcut key F5. EuroMBus detects the instrument and automatically builds the database for the recognized Series 2000 instrument as shown in the picture below.



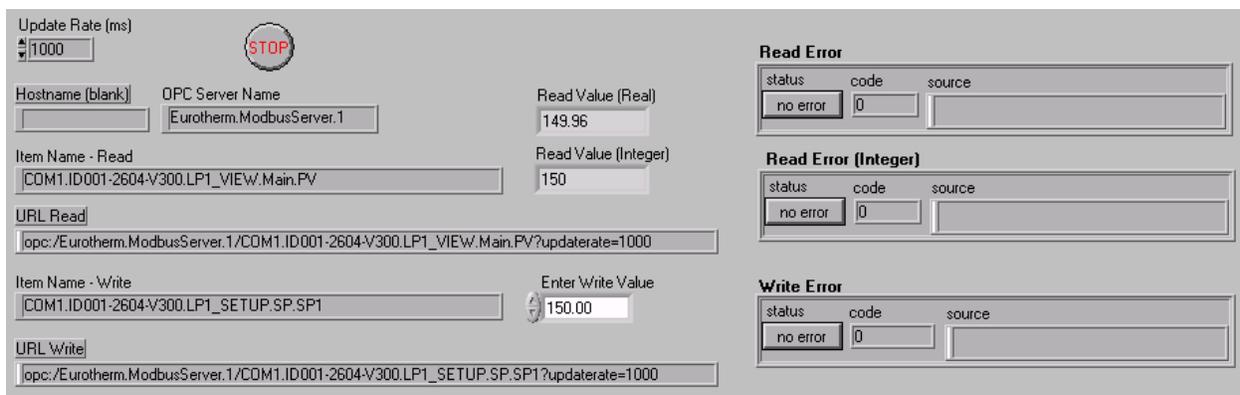
In this example note the hierarchy of the serial port, instrument, instrument parameter folders and the parameters themselves. This hierarchy is used to build the item name. Each branch in the hierarchy is delimited by a period. For example, to read the PV, start with COM1 – serial used to connect to the 2604, add the instrument ID – ID001-2604-V300, the parameter folders – LP1\_VIEW.Main, and lastly the parameter mnemonic - PV. The fully qualified item ID would thus be COM1.ID001-2604-V300.LP1\_VIEW.Main.PV. The instrument ID tells the address the instrument was found out – 001, the instrument model – 2604 and the version – V300. Item names are case sensitive.

The contents of the LP1\_VIEW.Main folder are displayed in the right hand pane. Because EuroMBus is a server, values are not automatically displayed in the Value column. However, values can be displayed in the Value column by selecting Network/Monitor – or shortcut key ALT-F5.

The EuroMBus configuration can be saved in order to automatically browse from an OPC client the address space of instrumentation connected to the PC. This has the advantage to OPC clients – LabVIEW in this case – in being automatically able to browse the address space of the instruments connected to iTools. It is not even necessary to start iTools manually in this case. Note that if iTools is shut down without saving the configuration, iTools will have to be manually started and a rescan performed. Please see TIS 208 for this feature.

**To configure LabVIEW** a sample application dsopc.vi may be downloaded from any of the Series 2000 product literature pages. For example see [http://www.eurotherm.com/products/controllers/2604\\_doc.htm](http://www.eurotherm.com/products/controllers/2604_doc.htm). This application is divided into 2 sections. The 1<sup>st</sup> section shows how to read and write single values whilst the 2<sup>nd</sup> section shows how to browse the instrument(s) address space by using the Data Socket Select URL.vi. The data sockets used in this application are found in the National Instruments/LabVIEW 6/vi.lib/platform subdirectory. These data sockets are compatible with LabVIEW versions 5 and 6. The library name is dataskt.lib.

In the picture below is the 1<sup>st</sup> section of the application dsopc.vi. It has been pre-configured to read the actual value (PV) of a 2604 V300 at address 1 as shown in the Item Name – Read text box. The Hostname is blank but the name of a remote PC running EuroMBus could be entered here for remote access of the instruments. The EuroMBus ProgID – Eurotherm.ModbusServer.1 has been entered into the OPC Server Name text box. The URL Read text box displays the result of the OPC to URL.vi that represents the fully qualified URL that has as it's input the Hostname, OPC Server Name and Item Name - Read. The OPC to URL.vi is found in the examples/comm/opc.lib library. The Data Socket Open Connection.vi function is then used to open the connection to the OPC Server.

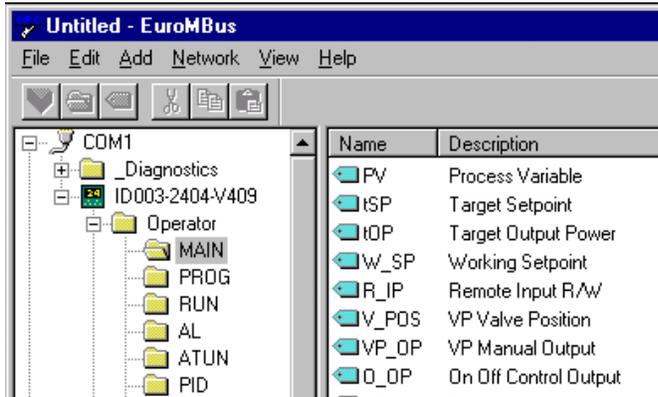


The screenshot shows the LabVIEW interface for the dsopc.vi application. It features several control panels:

- Update Rate (ms):** A numeric control set to 1000.
- STOP:** A red circular button.
- Hostnames:** A text box containing "blank".
- OPC Server Name:** A text box containing "Eurotherm.ModbusServer.1".
- Read Value (Real):** A numeric display showing "149.96".
- Item Name - Read:** A text box containing "COM1.ID001-2604-V300.LP1\_VIEW.Main.PV".
- Read Value (Integer):** A numeric display showing "150".
- URL Read:** A text box containing the URL "opc://Eurotherm.ModbusServer.1/COM1.ID001-2604-V300.LP1\_VIEW.Main.PV?updateRate=1000".
- Item Name - Write:** A text box containing "COM1.ID001-2604-V300.LP1\_SETUP.SP.SP1".
- Enter Write Value:** A numeric control set to "150.00".
- URL Write:** A text box containing the URL "opc://Eurotherm.ModbusServer.1/COM1.ID001-2604-V300.LP1\_SETUP.SP.SP1?updateRate=1000".
- Read Error:** A table with columns "status", "code", and "source". The status is "no error", code is "0", and source is empty.
- Read Error (Integer):** A table with columns "status", "code", and "source". The status is "no error", code is "0", and source is empty.
- Write Error:** A table with columns "status", "code", and "source". The status is "no error", code is "0", and source is empty.

Two (2) digital indicators display the PV as real and integer data types. These reads use the Data Socket Update Data.vi, Data Socket Read Integer.vi and Data Socket Read Double.vi functions. The chart – not shown here – displays the Item Name – Read real value. To read any other instrument or parameter, change the Item Name – Read text box. For example, if a 2404 V4.09 at address 3 was used instead, and the PV was the read parameter of interest, the Item Name – Read would be COM1.ID003-2404-V409.Operator.MAIN.PV. Use the hierarchical view of the instrument to follow the branches down to the parameter of

interest separating each branch by a period. See the picture below from EuroMbus for the 2404 example.



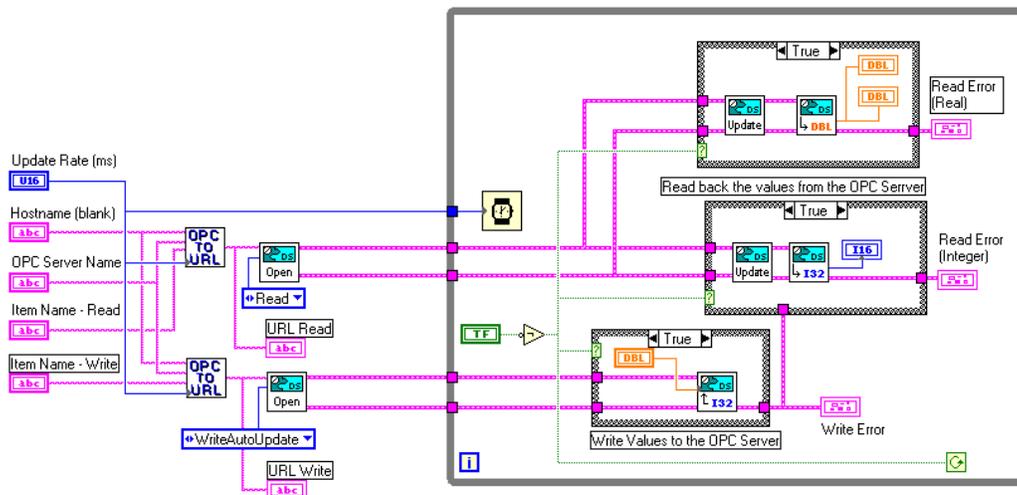
To write to a parameter in the sample application the Data Socket Write Integer.vi is used. As for reads, there is an Item Name – COM1.ID001-2604-V300.LP1\_SETUP.SP.SP1 in this example. Enter the desired parameter value then press enter.

The Read Error (Real and Integer) and Write Error cluster controls display any errors that occur. Examples of errors that could occur are; wrong instrument or version, no address space for an instrument(s) in EuroMbus, wrong OPC server name, wrong item name or trying to write beyond limits set in the instrument. Should an error occur, the status display turns to ERROR with a red background, the error code number is displayed and a descriptive message is displayed in the source text box as shown below.



The Stop button control input causes the Data Socket Close Connection.vi to be called closing the connections to EuroMbus.

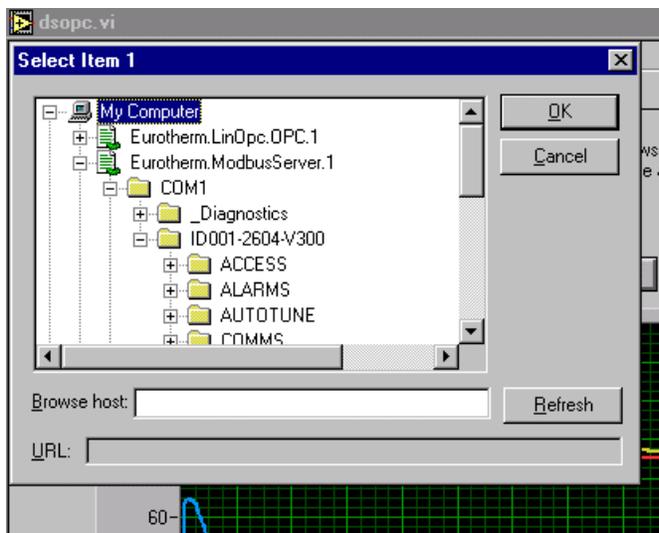
The picture below is the 1<sup>st</sup> section vi diagram for the single read and writes.



The 2<sup>nd</sup> section of the dsopc.vi application demonstrates automatic address space browsing of registered OPC servers and the use of arrays. For and While loops structures are used. Up to five read parameters (arbitrarily chosen) may be plotted and their digital value displayed as shown in the partial panel picture below. The URL Read Strings cluster control displays the fully qualified URL Read strings of the selected parameter items. Before running the application enter in the required Update Rate and the number of items to read from the OPC Server. Once the application is running the Data Socket Select URL.vi causes a Select Item 'n' dialog box to appear.



In the Select Item 1 My Computer hierarchical view shown below, all registered OPC Servers are listed. Eurotherm.ModbusServer.1 is the registered name of EuroMbus. Note that the hierarchical view shown under Eurotherm.ModbusServer.1 is exactly the same as that in EuroMbus.



To read the actual value (PV), scroll and expand the 2604 folder (ID001.2604-V300) to LP1\_VIEW/Main and select PV. The folder hierarchy shown differs depending on the Series 2000 instrument connected. Press Ok and continue selecting the items for the number selected. Once complete, the value of the selected items begins to scroll across the chart.

The Error Reading Items and Time Out from OPC Server boolean button controls indicate any errors generated by the Data Socket.vi functions. This error type

demonstrates a second way to display Data Socket error reporting. The Stop button control stops execution of the while loop causing the close connections for loop to be executed.

The following picture is the vi diagram for the 2<sup>nd</sup> section showing address space browsing of OPC servers and arrays of selected items.

