Omron CIP Ethernet/IP Communication Server

for Microsoft Windows
and Wonderware Applications

**User Manual
Ver 1.x Rev 1.1
DR 600 10
DR 600 11**

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Omron CIP Ethernet/IP Communication Server

Overview

The **Omron CIP Ethernet/IP Communication Server** (hereafter referred to as the "Omron CIP Server" or "OmronCIP" or "Server") is a Microsoft Windows 32-bit application program that acts as a communication protocol server and allows other Windows programs to access to data from Omron SYSMAC NJ-series Controllers using the Ethernet/IP CIP (Common Industrial Protocol) Message Communications (Ethernet/IP explicit messaging).

Omron CIP Server uses *Connection based Explicit Messages* to read and write NJ-series Controller *Global Variables*, without adding any special programming to the Controller program. Message type - CIP class 3 connection messages (Large_Forward_Open Service). The *Global Variables definition file* exported from Omron Sysmac Studio programming software is used by Omron CIP Server to validate the item names and their properties.

Any Microsoft Windows program that is capable of acting as a **DDE**, **FastDDE**, **SuiteLink** or **OPC** *Client* may use the OmronCIP Server.

There are two different OmronCIP Server versions described in this manual:
- Server version (ordering number DR 600 10), supporting SuiteLink, FastDDE and DDE protocols; this version hereafter is referred to as the "***Suite Link & DDE***" version.
- Server version (ordering number DR 600 11), supporting OPC and DDE protocols; this version hereafter is referred to as the "***OPC & DDE***" version;

The separate installation package is supplied for each version of the Server. In both cases, the name of Server executable file is **OmronCIP.EXE**. All further information in this manual is same for all versions of the Server, with the exception of few points where communication protocol specific features are explained.

Communication Protocols

Dynamic Data Exchange (DDE) is a communication protocol developed by Microsoft to allow applications in the Windows environment to send/receive data and instructions to/from each other. It implements a client-server relationship between two concurrently running applications. The server application provides the data and accepts requests from any other application interested in its data. Requesting applications are called clients. Some applications such as Wonderware InTouch and Microsoft Excel can simultaneously be both a client and a server.

FastDDE provides a means of packing many proprietary Wonderware DDE messages into a single Microsoft DDE message. This packing improves efficiency and performance by reducing the total number of DDE transactions required between a client and a server. Although Wonderware's FastDDE has extended the usefulness of DDE for the industry, this extension is being pushed to its performance constraints in distributed environments. The OmronCIP Server "Suite Link & DDE version" supports the <u>FastDDE Version 3</u> - an extension to Wonderware's proprietary FastDDE Version 2. This extension supports the transfer of Value Time Quality (VTQ) information. The original DDE and FastDDE Version 2 formats are still supported, providing full backward compatibility with older DDE clients. FastDDE Version 3 works on Windows 9x systems as well as Windows NT systems.

NetDDE extends the standard Windows DDE functionality to include communication over local area networks and through serial ports. Network extensions are available to allow DDE links between applications running on different computers connected via networks or modems. For example, NetDDE supports DDE between applications running on IBM compatible computers connected via LAN or modem and DDE-aware applications running on non-PC based platforms under operating environments such as VMS and UNIX.

SuiteLink uses a TCP/IP based protocol and is designed by Wonderware specifically to meet industrial needs such as data integrity, high-throughput, and easier diagnostics. This protocol standard is only supported on Microsoft Windows NT 4.0 or higher. SuiteLink is not a replacement for DDE, FastDDE, or NetDDE. The protocol used between a client and a server depends on your network connections and configurations. SuiteLink was designed to be the industrial data network distribution standard and provides the following features:

· Value Time Quality (VTQ) places a time stamp and quality indicator on all data values delivered to VTQ-aware clients.
· Extensive diagnostics of the data throughput, server loading, computer resource consumption, and network transport are made accessible through the Microsoft Windows NT operating system Performance Monitor. This feature is critical for the scheme and maintenance of distributed industrial networks.
· Consistent high data volumes can be maintained between applications regardless if the applications are on a single node or distributed over a large node count.
· The network transport protocol is TCP/IP using Microsoft's standard WinSock interface.

OPC (OLE for Process Control) is an open interface standard to provide data from a data source and communicate the data to any client application in a common standard way.

The OPC is based on Microsoft OLE, COM and DCOM technologies and enables simple and standardised data interchange between the industrial or office sector and the production sector. From general point of view many aspects of OPC are similar to DDE, but main difference is in the implementation by using Microsoft's COM (Component Object Model) technology. It enables fast exchange with process automation data and OPC open interface allows access to data from OPC Server in same standard way from OPC client applications supplied by different developers.

For more information on the basics of OPC, please refer to the ***OPC Specification***. The OPC Data Access Custom Interface Specification is maintained by ***OPC Foundation***.

The OPC support for OmronCIP Server "OPC & DDE" version is implemented based on ***FactorySoft OPC Server Development Toolkit*** and it conforms to OPC Data Access Custom Interface Specification 2.05.

The Suite Link, FastDDE (Version 3) and DDE support for OmronCIP Server "Suite Link & DDE" version is implemented by ***Wonderware I/O Server Toolkit*** ver. 7.2.1.6.

The FastDDE (Version 2) and DDE support for OmronCIP Server "OPC & DDE" version is implemented by ***Wonderware I/O Server Toolkit*** ver. 5.0 (008).

The OmronCIP Server connects to Omron SYSMAC NJ-series Controllers across an **Ethernet/IP** network using the **Common Industrial Protocol** (CIP). The EtherNet/IP is an industrial networking standard, maintained and distributed by ODVA (http://www.odva.org), and it is an Ethernet adaptation of CIP. The Common Industrial Protocol (CIP) is a media-independent common application-layer industrial protocol for industrial automation applications, providing a unified communication architecture throughout the manufacturing enterprise.

Accessing Remote Items via the Server

The communication protocol addresses an element of data in a conversation that uses a three-part naming convention that includes the ***application name***, ***topic name*** and ***item name***. The following briefly describes each portion of this naming convention:

application name
The name of the Windows program (Server) that will be accessing the data element. In the case of data coming from or going to Omron SYSMAC NJ-series Controller via this Server, the application portion of the address is **OmronCIP**.

topic name
Meaningful names are configured in the Server to identify specific devices. These names are then used as the topic name in all conversations to that device. For example, **PLC1**. **Note!** You can define multiple topic names for the same device (PLC) to poll different items at different rates.

item name
A specific data element within the specified topic. For example, when using this Server, items can be Global Variables (Booleans, Integers, Reals (floating point), Strings, members of Arrays and Structures, etc.) in the Omron NJ-series Controller. The term

"point" is used interchangeably with the term "item" in this User Manual. For more information on item names, see the *Item Names* section later in this manual. The Global Variables definition file exported from Omron Sysmac Studio programming software is used by Omron CIP Server to validate the item names and their properties.

Installing the OmronCIP Server

Installing the Server
The OmronCIP Server installation package is supplied as a Microsoft Installer file DR60010_xxx.msi (for "Suite Link & DDE" version) or DR60011_xxx.msi (for "OPC & DDE" version), where xxx is the current (latest) version of OmronCIP Server.

To install the OmronCIP Server, run the DR60010_xxx.msi ("Suite Link & DDE" version) or DR60011_xxx.msi ("OPC & DDE" version) and proceed as directed by the OmronCIP Server Setup Wizard. The installation is simple and straightforward, only it is important to select the correct protection (**HASP key** or **software license**) in "Custom Setup" dialog:

The HASP key or Software license key is needed for full time running of OmronCIP Server. The **HASP key** is an USB key (dongle) to be installed into PC USB port and needs the SafeNet Sentinel LDK Run-time Environment (HASP HL Runtime Package) to be installed and running – see details in "Licensing by using HASP HL key" section below. The **software license key** is a 16-character alphanumeric "computer-dependent" string, provided after purchasing the OmronCIP Server (for more information, see "Software license key" section below. Without HASP key installed or software license key entered, the OmronCIP Server will run one hour in demo mode. After purchasing the OmronCIP Server, the appropriate HASP key or software license key is provided and no re-installation of OmronCIP Server is needed.
In case "HASP Device driver" and "HASP Files" **are not selected** then HASP USB key will not be supported and only the **software license** will be available (files needed for HASP USB key will not be installed):
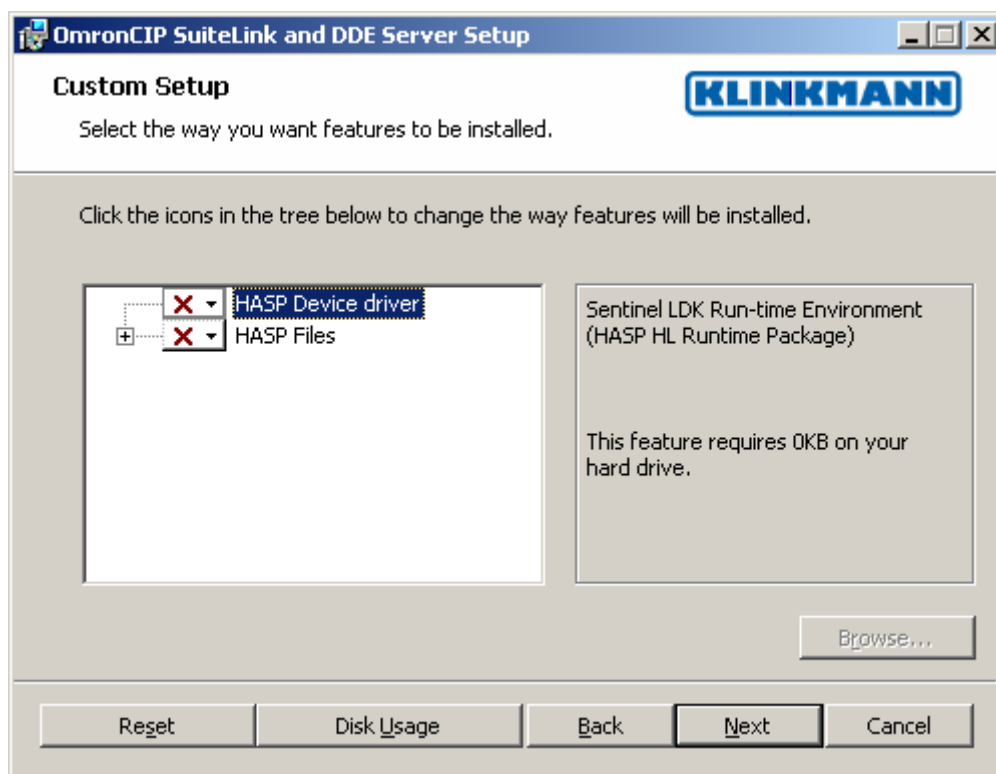
In case "HASP Device driver" and "HASP Files" **are selected** then HASP USB key will be supported and both HASP-key and software license will be available (files needed for HASP USB key will be installed):
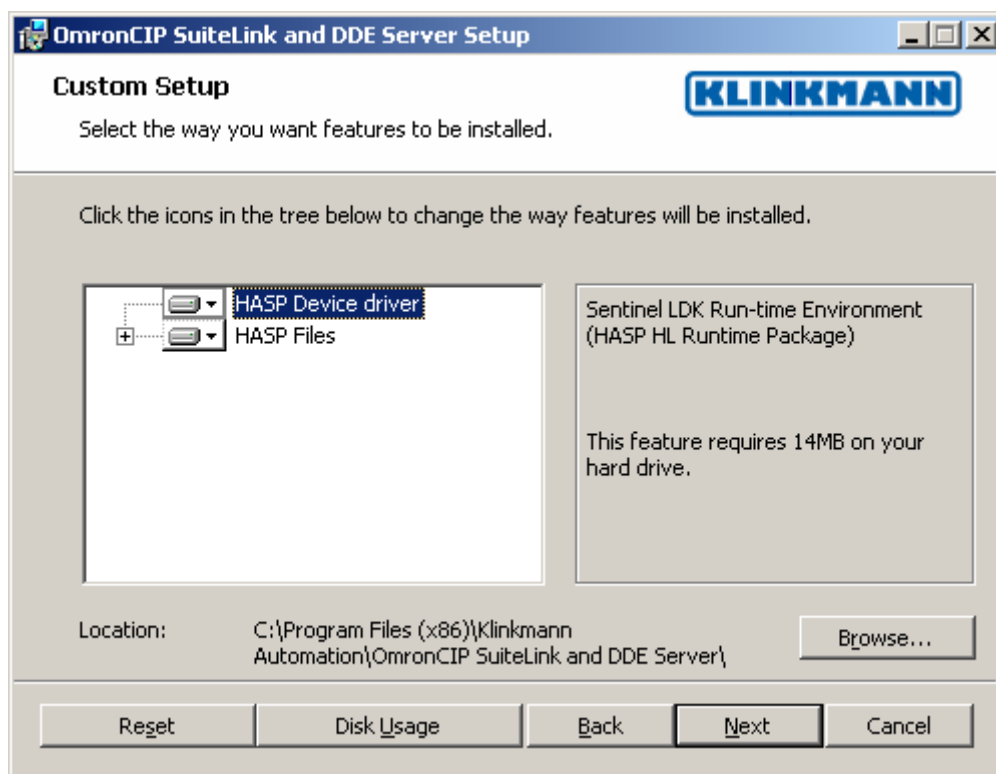
Note: In case the SafeNet Sentinel LDK Run-time Environment (HASP HL Runtime Package) is already installed on your computer (separately or by some other software) then it can be disabled:
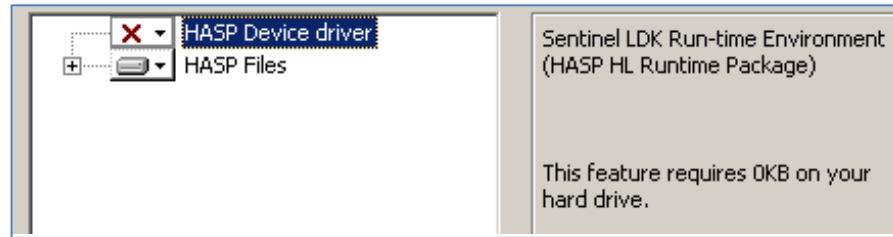
When installation is finished, the subdirectory specified as a folder where to install the OmronCIP Server files will contain the following files:

OmronCIP.EXE   The OmronCIP Server Program. This is a Microsoft Windows 32-bit application program.

OmronCIP.CHM   The OmronCIP Server Help file.

OmronCIP.CFG   An example configuration file.

OneVariable.txt   Example Global Variables definition file, conating only one Global variable.

Variables.txt   Example Global Variables definition file, conating several Global variables.

hasp_windows_44 42.dll   Dynamic Link Library installed only if "HASP Files" is selected during the installation in "Custom Setup" dialog.

haspdinst.exe   Sentinel LDK Run-time Environment Installer (HASP HL Runtime Package), copied to OmronCIP Server folder only if "HASP Device driver" is selected during the installation in "Custom Setup" dialog.

LICENSE.RTF   Klinkmann Automation software license file.

KLSERVER.DLL   Dynamic Link Library necessary for "OPC & DDE" version of the Server.

WWDLG32.DLL   Dynamic Link Library necessary only for "OPC & DDE" version Of the Server.

In case the "HASP Device driver" is selected during the installation in "Custom Setup" dialog, the Sentinel LDK Run-time Environment (HASP HL Runtime Package) is installed during the OmronCIP Server installation (and will be uninstalled during the OmronCIP Server uninstallation). The presence of Sentinel LDK Run-time Environment can be checked after the OmronCIP Server installation by looking-up in Control Panel / Administrative Tools Services – the Service "Sentinel Local License Manager" must be started.

Note:

The OmronCIP Server "Suite Link & DDE" version requires some Wonderware software (e.g. Wonderware InTouch) is installed on same computer. For "non-Wonderware" systems use the OmronCIP Server "OPC & DDE" version.

To **uninstall** the OmronCIP Server, start Control Panel, select "Uninstall a program" and select the "OmronCIP SuiteLink and DDE Server" or "OmronCIP OPC and DDE Server" from the list of available software products. Click on "Uninstall" and proceed as directed by the Uninstall Wizard.

Licensing by using HASP HL key

The following should be done to enable the licensing by HASP HL key:

- The "HASP Device driver" and "HASP Files" are selected during the OmronCIP Server installation in "Custom Setup" dialog – that causes correspondingly haspdinst.exe and hasp_windows_4442.dll files are copied to OmronCIP Server folder and Sentinel LDK Run-time Environment (HASP HL Runtime Package) is installed and started, enabling the OmronCIP Server can detect the HASP HL USB dongle;
- insert the received HASP key into USB port, and **wait** until "Installing device driver software" message disappears and "Device driver software installed successfully" message appears;
- start OmronCIP Server and check - if "Sofware key or HASP HL key not found!" message does not appear then it means everything is done correctly and OmronCIP Server runs in full mode with licensing by HASP HL key enabled.
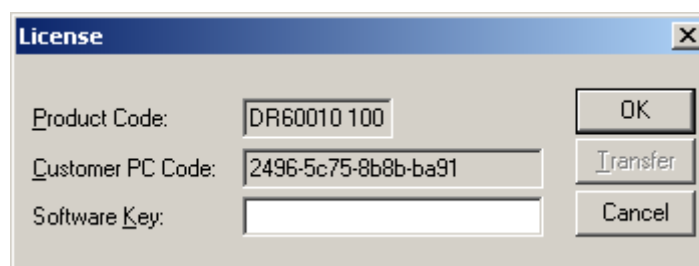
Software license key

OmronCIP Server supports the "computer dependent" **software licensing**. The following steps are required to enable it:

1) Start OmronCIP Server, click on "Help" menu item (also short-cut Alt+H can be used) and pop-up menu with "Help" menu commands will appear:
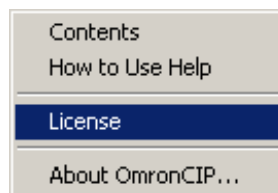

Select "License" and "License" dialog will appear:

2) Here the "Customer PC Code" is "computer-dependent" string generated by OmronCIP Server and it is unique for this computer. Write it down or Copy/Paste to e-mail when ordering the OmronCIP Server.

3) After purchasing the OmronCIP Server, you will get the software license key - 16-character alphanumeric string. Open the "License" dialog again and Copy/Paste it to "Software Key" field:
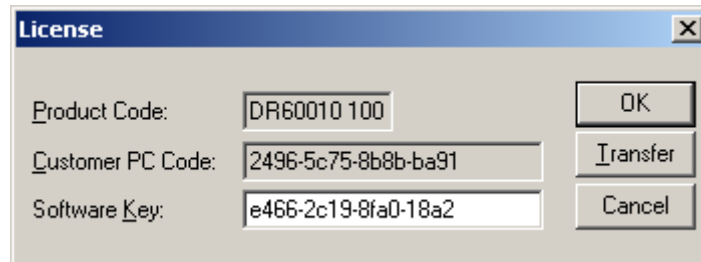
4) Click OK and restart OmronCIP Server. OmronCIP Server software license now is enabled.

Note – the "Software Key" string is saved to MS Windows system directory (e.g. C:\Windows) WIN.INI file [OmronCIP] section to enable it is automatically detected at OmronCIP Server next start-up.

Transferring the software license to other computer

The transfer of Software License Key might be needed in very rare situations when it is necessary to move Klinkmann software to other computer (or operation system change is planned for same computer). Such transfer PERMANENTLY removes the Software License Key, so be very careful when deciding to use this option.

The following steps are required to transfer the Software License Key:

1) Start the OmronCIP Server. For OmronCIP Server "Suite Link & DDE" version, the ArchestrA SMC Log Viewer (or Wonderware Logger) must be started. For OmronCIP Server "OPC & DDE" version, the OmronCIP Internal Logger and "Log to File" should be enabled (see "Troubleshooting menu" and "Internal Logger"sections at the end of this manual). Select Help/License from main menu and click the "Transfer" button on "License" dialog:
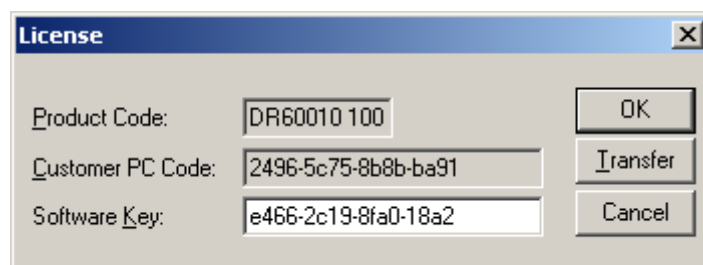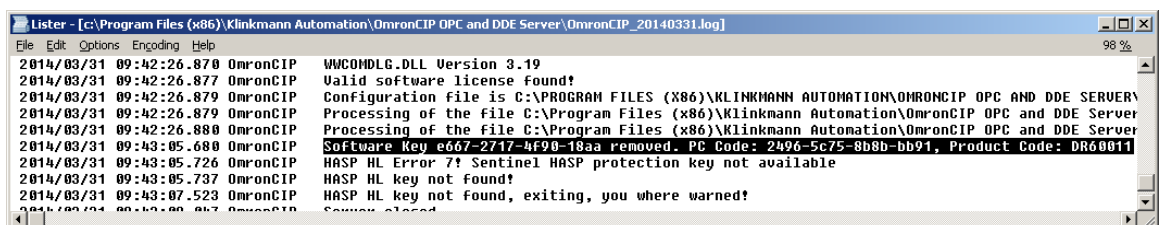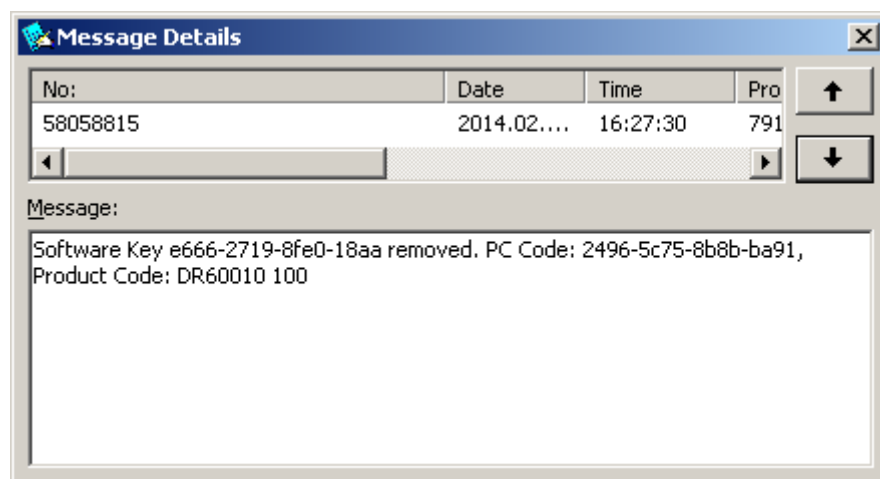

2) Confirm the transfer of Software License Key by clicking on Yes button:
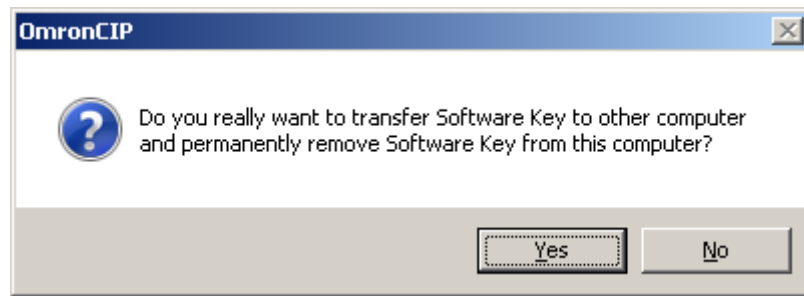
The "License" dialog now will contain the empty "Customer PC Code" and "Software Key" fields:
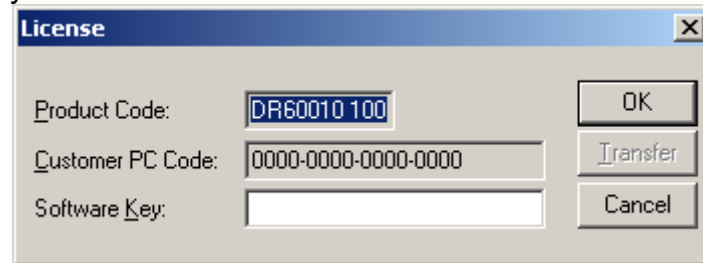
3) Take the screenshot from ArchestrA SMC Logger or OmronCIP Internal Log file window containing the "Software License Key removal message", like below:

or take the string with "Software License Key removal message" directly from ArchestrA SMC Logger or OmronCIP Internal Log file, like following:

Software Key e666-2719-8fe0-18aa removed. PC Code: 2496-5c75-8b8b-ba91, Product Code: DR60010 100

4) Provide the obtained "Software License Key removal message" screenshot or string together with new "Customer PC Code" when applying for new Software License Key without purchasing the new license (in situations when it is necessary to move Klinkmann software to other computer or operation system change is planned).

Note!
Without providing the "Software License Key removal message" screenshot or string, the new Software License Key will not be assigned.

Configuring the OmronCIP Server

After the OmronCIP Server is initially installed, a small amount of configuration is required. Configuring the Server automatically creates a **OmronCIP.CFG** file that holds all of the topic definitions entered, as well as the communication port configurations. This file will automatically be placed in the same directory in which **OmronCIP.EXE** is located unless the path where the configuration file will be placed is specified via the */Configure/Server Settings...* command.
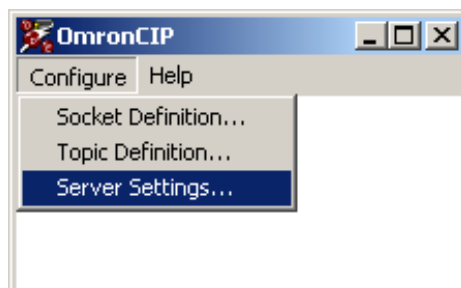
Server Settings Command

A number of parameters that control the internal operation of the Server can be set. In most cases, the default settings for these parameters provide a good performance and do not require changing. However, they can be changed to fine-tune the Server for a specific environment.

To change the Server's internal parameters, invoke the *Configure/Server Settings...* command. The "Server Settings" dialog box will appear:
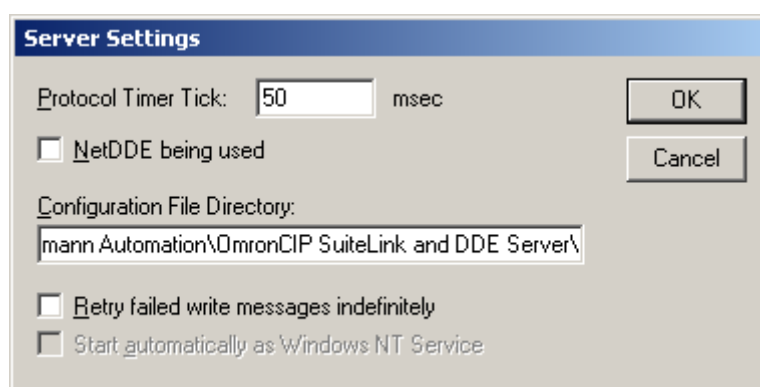
The following describes each field in this dialog box:

Protocol Timer Tick
This field is used to change the frequency at which the Server checks for work to do (at this frequency the Server tries to send one data request to Controller and receive one reply from Controller. If the send/response cycle is too long then more than one activation of Server is necessary to process it. If computer is very busy or some other MS Windows application is taking over the computer then the Server is activated rarely than setting in the **Protocol Timer Tick**.
Note: The default value is 50 milliseconds. The minimum value is 10 milliseconds.

NetDDE being used

This option is disabled and not supported by OmronCIP Server.

Retry failed write messages indefinitely
This field is used to disable the deleting of pending write messages when *slow poll mode* on some topic is started. As default all write messages for this topic are deleted when topic enters the slow poll mode.
Note. *Be careful when using this setting if Controller is switched off or disconncted, but client application continues to generate new values to be written to this Controller - that can cause the computer memory overload with memory allocated for write messages.*

Configuration File Directory
This field is used to specify the path (disk drive and directory) in which OmronCIP will save its current configuration file. The OmronCIP Server will use this path to load the configuration file the next time it is started.

Note: *Only the "path" may be modified with this field. The configuration file is always named* ***OmronCIP.CFG.***

Note: *There is no limit to the number of configuration files created, although each must be in a separate directory. When using the OmronCIP Server with* ***InTouch****, it is good practice to place the configuration file in the InTouch application directory.*

Start automatically as Windows NT Service
This option is disabled and not supported by OmronCIP Server.

Once all entries have been made, click on **OK**.

Socket Definition Command
To configure the Socket used for communication with Omron SYSMAC NJ-Servies Controller, invoke the */Configure/Socket Definition...* command. The "OmronCIP Socket Settings" first dialog box will appear:
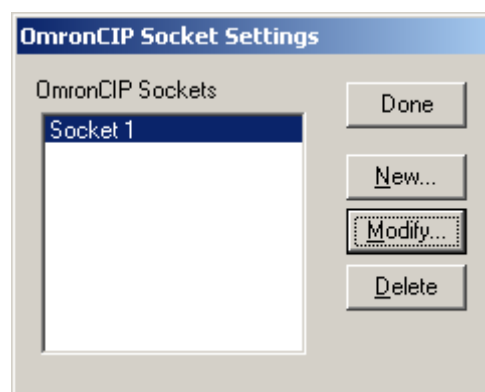
To modify or examine an existing Socket, select the topic name and click on **Modify**. To define a new Socket, click on **New**. The " OmronCIP Socket Settings" second dialog box will appear:
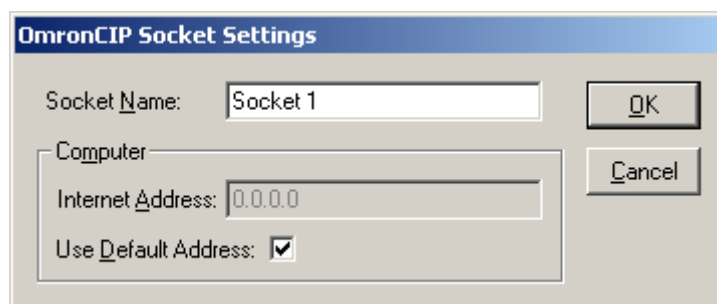
The following describes each dialog field in this dialog box:

Socket Name
Enter the Socket name and later use it in *Topic Definition*. Only one Socket with same **IP address** can be defined.

IP address
Enter the Computer Internet Address (IP address) if it has more than one. If there is only one Internet Address for computer then **Use Default Address** can be checked to use this IP Address. If Computer is multi-homed (more than one Internet Address used) and **Use Default Address** is checked then it is impossible to know which IP Address must be used.

Note: OmronCIP Sockets use the reserved for Ethernet/IP messaging port number 44818.

Once all entries have been made, click on **OK** to process the configuration for the Socket. The "OMRONETH Socket Settings" dialog box will appear again.

Click on **Done** when configuration for all Sockets has been performed.

Note: If this is the first time the Sockets have been configured, the user will be prompted to save configuration to an existing directory.

Saving OmronCIP Configuration File
If the configuration file does not currently exist, or a new configuration path has been specified, the Server will display the "Save Configuration" dialog box:
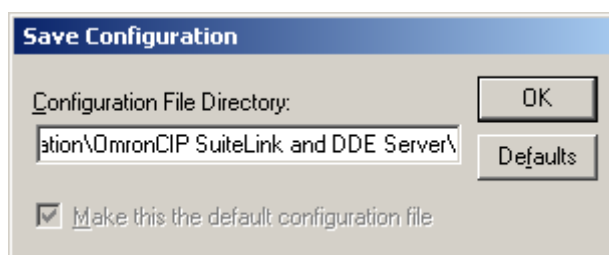
This dialog box displays the path where the Server is going to save the current configuration file. The path may be changed if necessary. Also, the path can optionally be recorded in the **WIN.INI** file by selecting the **"Make this the default configuration file"**

option. Doing so it will allow the OmronCIP Server to find the configuration file automatically each time it is started.

Configuration File Location

When the OmronCIP Server starts up, it first attempts to locate it's configuration file by first checking the **WIN.INI** file for a path that was previously specified. If the path is not present in the **WIN.INI** file, the Server will assume that the current working directory is to be used.

To start the Server from an application directory configuration file other than the default configuration file a special switch **(/d:)** is used. For example, invoke the **Start/Run** command and enter the following:
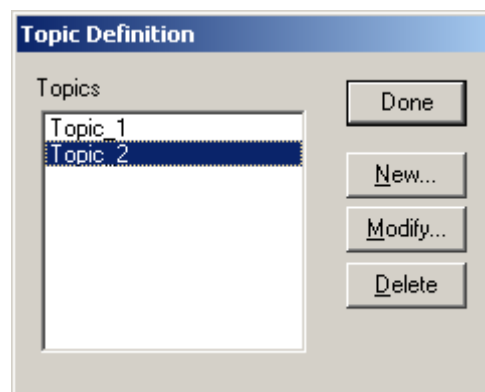
OmronCIP/d:c:\directoryname

Note: There is no limit to the number of configuration files that may be created, although each must be in a separate directory.

Topic Definition Command
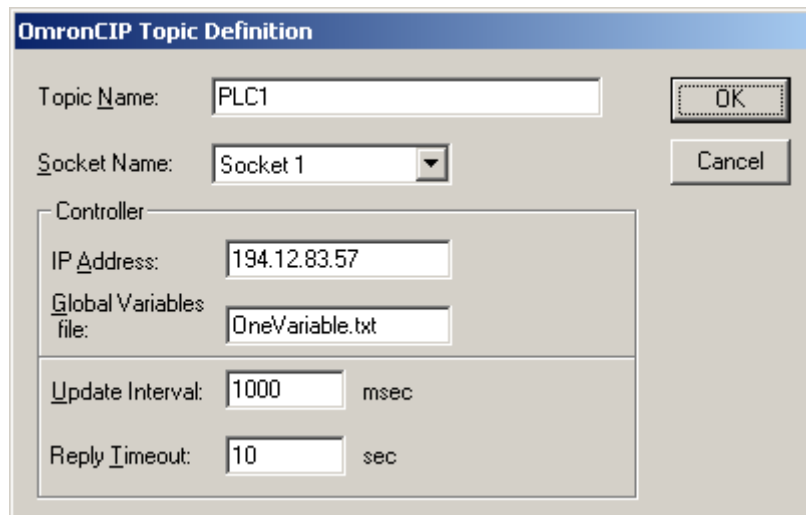
The user provides each connected Omron SYSMAC NJ-Servies Controller with an arbitrary name that is used as the Topic Name for all references to this Controller.

The following steps are taken to define the Topic attached to the Controller:

Invoke the *Configure/Topic Definition…* The "Topic Definition" dialog box will appear:

To define a new topic, click on **New**. To modify an existing topic, select the topic name and click on **Modify**. The "OmronCIP Topic Definition" dialog box will appear:

Enter the **Topic Name**.
Note: *If using **InTouch**, the same Topic Name is to be entered in the "Add Access Name" dialog box – see description in **Using the OmronCIP Server with InTouch** section.*

Socket Name
Select the Socket to associate it with the topic. Additional topics (Omron NJ-series Controllers) may be associated with the same Socket at a later time.

IP address
Enter the Omron Controller IP address (Internet Address).

Global Variables file
Select or enter the name of *Global Variables definition file* exported from Omron Sysmac Studio programming software and used by Omron CIP Server to validate this Controller item names and their properties (see *Item Names* section later in this manual). To export the Global Variables, at first copy Global Variables to the clipboard by selecting "Tools / Export Global Variables / CX-Designer" from Omron Sysmac Studio Main menu and then save the contents of clipboard to the text file with appropriate filename and location.

Update Interval
Set the **Update Interval** field to indicate the frequency the items/points on this topic (Omron Controller) should be read (polled). This is requested update rate - at this frequency the values of all this topic active items must be updated. In real conditions (when large amount of data is requested from Controller) the real update rate can be longer - the OmronCIP Server will automatically adjust it to have the maximum possible performance.

Reply Timeout
Enter the amount of time (in seconds) the Controller will be given to reply to commands from the Server.
***Note:*** *The default value of 3 seconds should be sufficient for most configurations.*

When all entries in "OmronCIP Topic Definition" dialog box have been made, click on **OK** to process the configuration for this topic.

Select **Done** in "Topic definition" dialog box when configuration for all Topics has been performed.

Item Names

The Omron CIP Ethernet/IP Communication Server supports item names corresponding with names of Global Variables used in Omron SYSMAC NJ-series Controller program and published to the network as inputs, outputs, or publish only variables:
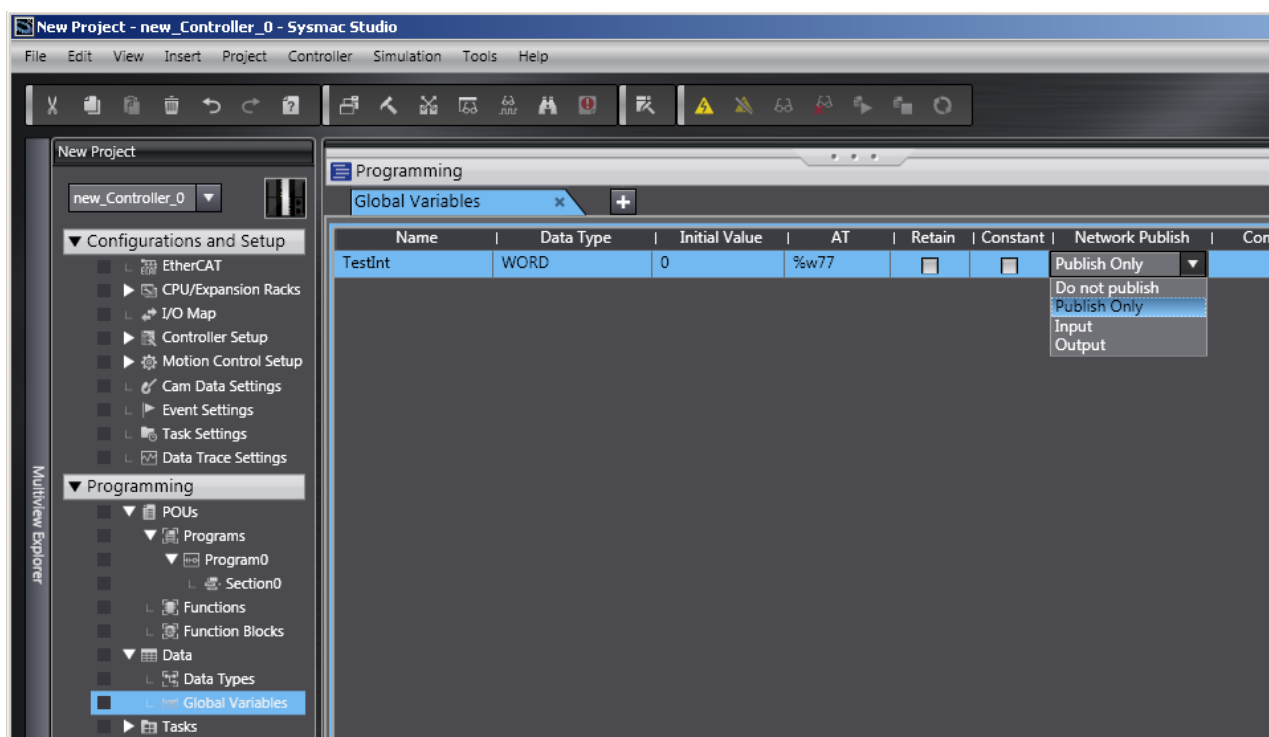
OmronCIP Server uses *Global Variables definition file* exported from Omron Sysmac Studio programming software to validate the corresponding Topic (Controller) item names and their properties.

To export the Global Variables, at first copy Global Variables to the clipboard by selecting "Tools / Export Global Variables / CX-Designer" from Omron Sysmac Studio Main menu and then save the contents of clipboard to the text file with appropriate filename and location.

The item names supported by OmronCIP Server is exactly same as names of Global Variables used in Omron SYSMAC NJ-series Controller program, except for elements of arrays the following format is used:

arrayname[x]

where **arrayname** is the name of Global Variable (array) and **x** is the index of array element (**x** starts from 0); for example, **TstArray2[5]** is array's **TstArray2** element with index **5**.

There is a <u>1994 bytes maximum length limitation</u> for CIP class 3 connection (Large_Forward_Open) messages, so the maximum number of items which can be read by one message depends on read message type. The OmronCIP Server currently supports two types of read messages:

1) **Multiple Services Packet** (Service Code 0A) messages, used for reading of <u>single</u> Global Variables, except array elements. The maximum number of items which can be read by one Multiple Services Packet message is limited to 32 items (it is limited by length of request command sent to Controller).

2) **Read Service for Variables** (Service Code 4C) messages, used for reading of <u>arrays</u> – in case item name indicates this item is array element, the whole array (starting from beginning) is read from Controller. Therefore it is important to use the array elements with small indexes, as the maximum number of items which can be read by one Read Service for Variables is limited by Controller response message. For example, the maximum number of DWORD (double word) type array elements which can be read from Controller is 495 double words.

***Note:** If possible, it is highly recommended to use arrays – that can greatly increase the OmronCIP Server performance in case it is necessary to read large amount of data.*

For more detailed information about format of Global Variables definition files, please refer to OneVariable.txt and Variables.txt example Global Variables definition files installed during the the OmronCIP Server installation.

Monitoring and Controlling Communication with a PLC

For each topic, there are following additional items offered by OmronCIP Server to monitor and control the communication with PLC.

STATUS

For each topic, there is a built-in discrete item that indicates the state of communication with PLC. The discrete item (**STATUS**) is set to **0** when communication fails and set to **1** when communication is successful. The **STATUS** value is set to 0 after 3 consecutive unsuccessful retries to communicate with this PLC.

From **InTouch** the state of communication may be read by defining an I/O Discrete tagname and associating it with the topic configured for the PLC and using **STATUS** as the item name.

From **Excel**, the status of the communication may be read by entering the following formula in a cell:

=OmronCIP|topic!STATUS

where **topic** is the name of topic (e.g. plc01) configured for PLC.

UPDATEINTERVAL

The **UPDATEINTERVAL** item is an Integer type Read/Write item used to access the currently set Update Interval (see *Topic Definition Command* section). It indicates the current requested update interval (in milliseconds). The value of this item can be read through DDE, Suite Link or OPC. Client can poke new values to this item. The range of

valid values is from 10 to 2147483647 milliseconds. The value of zero indicates that no items on this topic are updated. The write commands are still executed (new values written to PLC) if **UPDATEINTERVAL** value is 0.

Note: *By poking a value of zero to the* **UPDATEINTERVAL** *item, a client can stop all update activities on the corresponding topic without having to deactivate the items.*

POLL_NOW
The **POLL_NOW** item is an Integer type Write Only item used for immediate one time polling of all active items; this one time polling is performed when POLL_NOW value switches from 0 to 1; no effect when switches from 1 to 0.

MAXINTERVAL
The **MAXINTERVAL** item is an Integer type Read Only item used to access the measured maximum update interval (in milliseconds) of all items for the corresponding topic for the last completed poll cycle. The range of valid values is from 0 to 2147483647 milliseconds.

The **UPDATEINTERVAL** and **MAXINTERVAL** items can be used to tune the performance of communication.

ITEMCOUNT
The **ITEMCOUNT** item is an Integer type Read Only item used to access the number of active items in the corresponding topic. The range of valid values is from 0 to 2147483647.

ERRORCOUNT
The **ERRORCOUNT** item is an Integer type Read Only item used to access the number of active items with errors in the corresponding topic. The range of valid values is from 0 to 2147483647.

ERRORITEMS
The **ERRORITEMS** item is an Integer type Read/Write Only (unique for each topic) used to access the total number of items with invalid item names (these items are rejected by Server). The **ERRORITEMS** value can be reseted by writing 0 to this item. The range of valid values is from 0 to 2147483647.

WRITECOUNT
The WRITECOUNT item is an Integer type Read Only item used to access the number of write commands (messages) waiting for execution. The range of valid values is from 0 to 2147483647.

For example, in following way the **WRITECOUNT** item can be used to avoid the increasing of memory occupied by not executed write commands:
- activate the hot link with **WRITECOUNT** item and start to monitor it;
- activate new write command (by poking new value) only if value of **WRITECOUNT** becomes equal to 0, e.g. all previous write commands are executed and memory occupied by them is freed.

SUSPEND
Special Read/Write Discrete Item **SUSPEND** may be used to control the communication with a separate topic. If application changes **SUSPEND** value from 0 to 1 then communication with topic is suspended. If **SUSPEND** value is changed back to 0 then communication with this topic is resumed.
*Note: If topic is suspended by setting **SUSPEND** value to 1, then Server rejects all new write values to this topic, i.e. no new write messages are created after **SUSPEND** value has changed from 0 to 1.*

Using the OmronCIP Server with Suite Link and DDE Clients

The **"Suite Link & DDE"** version of OmronCIP Server is accessible from Suite Link clients (e.g. InTouch) and DDE clients (e.g. Excel). The **"OPC & DDE"** version of OmronCIP Server is accessible from DDE clients.

Using the OmronCIP Server with InTouch

To access to Omron NJ-series Controller Global Variables from **InTouch**, the Access Names and Tagnames should be defined in **WindowMaker.**

Defining the Access Names

InTouch uses **Access Names** to reference real-time I/O data. Each Access Name equates to an I/O address, which can contain a **Node**, **Application**, and **Topic**. In a distributed application, I/O references can be set up as global addresses to a network I/O Server or local addresses to a local I/O Server.

To define the Access Names in WindowMaker node invoke the */Special/Access Names...* command. The "Access Names" dialog box will appear ("Galaxy" and "OPC" are default already existing Access Names when creating a new InTouch application):
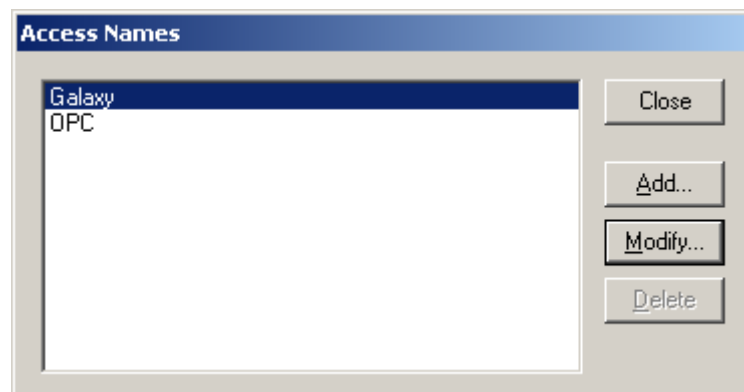
Click on **Add…**. The "Add Access Name" Dialog Box will appear:

*Note: If **Add** is selected, this dialog box will be blank when it initially appears. Data has been entered here to illustrate the entries that are made.*

The following fields are required entries when entering an Access Name Definition:

Access Name
In the Access Name box type the name you want InTouch to use to this Access Name. (For simplicity, use the same name that you will use for the **Topic Name** here.)

Node Name
If the data resides in a network I/O Server, in the Node Name box, type the remote node's name.

Application Name
In the Application Name box, type the actual program name for the I/O Server program from which the data values will be acquired. In case the values are coming from the OmronCIP Server the "OmronCIP" is used. Do not enter the .exe extension portion of the program name.

Topic Name
Enter the name defined for the topic in the OmronCIP Server to identify the topic the OmronCIP Server will be accessing.
The Topic Name is an application-specific sub-group of data elements. In the case of data coming from a OmronCIP Server program, the topic name is the exact same name configured for the topic in the OmronCIP Server.

*Note: This will usually be the same as the "Access Name", although, if desired, they may be different. However, it must be the same name used when the topics were configured in section **Configuring the OmronCIP Server**.*

Which protocol to use
Select the protocol (DDE or Suite Link) that you are using.

When to advise server
Select **Advise all items** if you want the Server program to poll for all data whether or not it is in visible windows, alarmed, logged, trended or used in a script. Selecting this option will impact performance, therefore its use <u>is not recommended</u>.

Select **Advise only active items** if you want the Server program to poll only points in visible windows and points that are alarmed, logged, trended or used in any script.

Click **OK** to accept the new Access Name and close the "Add Access Name" dialog box. The "Access Names" dialog box will reappear displaying the new Access Name selected in the list.

Click **Close** to close the "Access Names" dialog box.

Defining the Tagnames

To define the Tagnames associated with the new "Access Name", invoke the
/Special/Tagname Dictionary... command (in **WindowMaker**). The "Tagname Dictionary "
dialog box will appear:
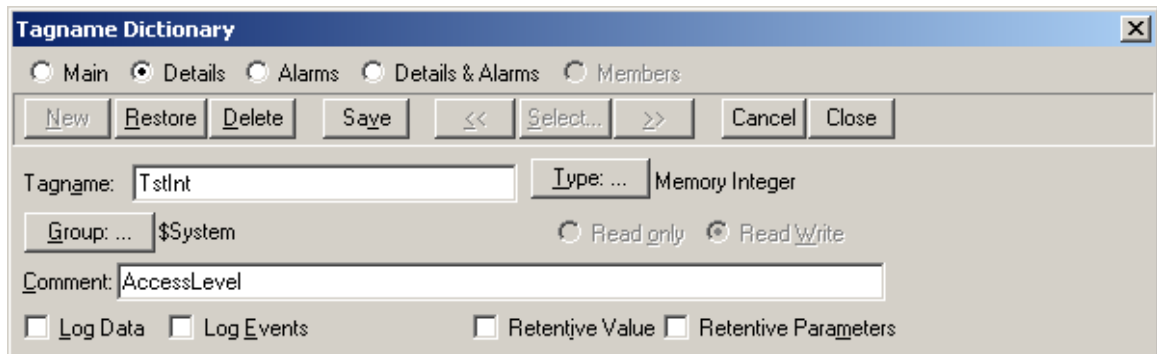
Click on **New** and enter the **Tagname**. (The tagname defined here is the name **InTouch**
will use. The OmronCIP Server does not see this name.)

Select the tag type by clicking on the **Type:…** button. The "Tag Types" dialog box will
appear:
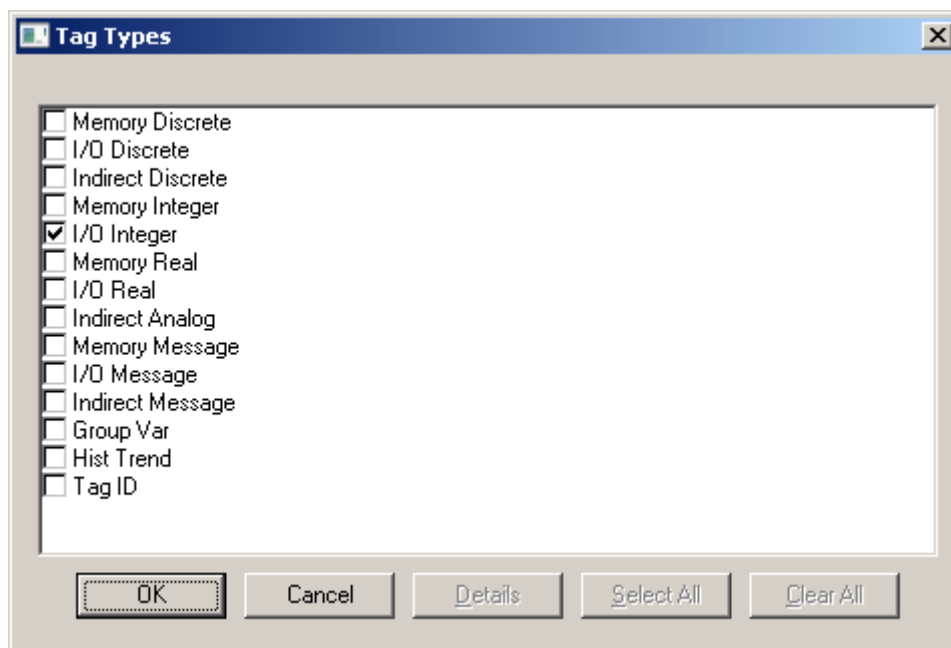
To access OmronCIP items, the type must be **I/O Discrete**, **I/O Integer**, **I/O real** or **I/O
Message**. Select the Tag type.

The "Details" dialog box for the tagname will appear:

Select the Access name for OmronCIP Server by clicking on the **Access Name:…** button. The "Access Names" dialog box will appear:

Select the appropriate Access Name and click on **Close**. (If the Access Name has not been defined as previously described, click on **Add** and define the Access Name now.)

The "Details" dialog box will appear displaying the selected Access Name:

For integers and reals fill in the **Min EU**, **Max EU**, **Min Raw** and **Max Raw** fields. These fields control the range of values that will be accepted from the Server and how the values are scaled. If no scaling is desired, **Min EU** should be equal to **Min Raw** and **Max EU** equal to **Max Raw**.

Enter the OmronCIP item name to be associated with this tagname in the **Item:** field in the "Details" box:

(Refer to the **Item Names** section below for complete details.)

Where applicable, the **Use Tagname as Item Name** option may be selected to automatically enter the tagname in this field. ***Note:*** *The tag name can only be used if it follows the conventions listed in the* **Item Names** *section.*

Once all entries have been made, click on the **Save** button (in the top dialog box) to accept the new tag name. To define additional tagnames click on the **New** button. To return to the **WindowMaker** main screen, select **Close**.

Monitoring the Status of Communication with InTouch

InTouch supports built-in topic names called **DDEStatus** and **IOStatus** that are used to monitor the status of communications between the Server and InTouch. For more information on the built-in topic names DDEStatus and IOStatus, see your InTouch documentation.

The status of communication between the Server and InTouch can be read into **Excel** by entering the following DDE reference formula in a cell on a spreadsheet (in following examples **PLC2** is the Topic Name configured for OmronCIP Server):

=view|DDEStatus!PLC2
or
=view|IOStatus! PLC2

Notes on Using Microsoft Excel

Data from the OmronCIP topic (Unitronics PLC) may be accessed from Excel spreadsheets. To do so, enter a formula like the following into a cell on the spreadsheet.

> **= OmronCIP|topic!item**

Note!
Sometimes, Excel requires the topic and/or item/points to be surrounded by apostrophes if it is required by Excel syntax.

In the formula, **topic** must be replaced with one of the valid topic names defined during the Server configuration process. Replace **item** with one of the valid item names described in the **Item Names** section.

Reading Values into Excel Spreadsheets

Values may be read directly into Excel spreadsheets by entering a DDE formatted formula into a cell, as shown in the following examples:

> **= OmronCIP|PLC2!TstInt**
> **= OmronCIP|NJ501!Real12**
> **= OmronCIP|'controller4'!'Struct1.MEMB2'**

Note: *Refer to the Microsoft Excel manual for complete details on entering Remote Reference formulas for cells.*

Writing Values to OmronCIP Points

Values may be written to the Server from Microsoft Excel by creating an Excel macro that uses the **POKE** command. The proper command is entered in Excel as follows:

channel=INITIATE("OmronCIP","topicname")
=POKE(channel,"itemname", Data_Reference)
=TERMINATE (channel)
=RETURN()

The following describes each of the above **POKE** macro statements:

channel=INITIATE("OmronCIP","topicname")
Opens a channel to a specific topic name (defined in the Server) in an application with name OmronCIP (the executable name less the .EXE) and assigns the number of that opened channel to **channel.**

*Note: By using the **channel=INITIATE** statement the word **channel** must be used in the **=POKE** statement instead of the actual cell reference. The **"applicationname"** and **"topicname"** portions of the formula must be enclosed in quotation marks.*

=POKE(channel,"itemname", Data_Reference)
POKEs the value contained in the **Data_Reference** to the specified item name (actual location in the Unitronics PLC) via the **channel** number returned by the previously executed **INITIATE** function. **Data_Reference** is the row/column ID of the cell containing the data value. For **"itemname"**, use some of the valid item names described in the **Item Names** section.

=TERMINATE(channel)
Closes the channel at the end of the macro. Some applications have a limited number of channels. Therefore they should be closed when finished. **Channel** is the channel number returned by the previously executed **INITIATE** function.

=RETURN()
Marks the end of the macro.

The following is an example of Excel macro used to poke value from cell B2 to topic **PLC2** item **TstInt**:

PokeMacro -Ctrl a
=INITIATE("OmronCIP","PLC2")
=POKE(A2,"TstInt",B2)
=ON.TIME(NOW()+0.01,"TerminateDDEChannel")
=RETURN()

TerminateDDEChannel
=TERMINATE(A2)
=RETURN()

Note: Refer to the Microsoft Excel manual for complete details on entering Remote Reference formulas for cells.

Using the OmronCIP Server with OPC Clients

The **"OPC & DDE"** version of OmronCIP Server is accessible from OPC Clients.

There are following general steps needed to access an OPC item from OmronCIP Server:

1. Run OPC Client application and select the "OmronCIP OPC and DDE Server" from the list of available OPC Servers. If OmronCIP Server currently is not running, it will start automatically.
2. Create a new group (or topic if Wonderware OPCLink application is used).
3. If OPC Client supports the validating of items, validate the item before adding it.
4. Add the item. Depending on OPC Client it can be done in several different ways, for example:

    a) By entering separately the access path to topic name (valid topic name configured in OmronCIP Topic definition) and separately the item name.
    b) By entering the full path to item name in the format **TopicName.ItemName** where **TopicName** is the valid topic name configured in OmronCIP Topic definition.
   c) By browsing the server address space.

By default the OmronCIP Server is installed and used as a local OPC Server - both OPC Server and OPC Client reside on same computer. The OmronCIP Server can run also as a remote OPC Server – in this case OPC Server and OPC Client are located on separate computers. Accessing the remote OPC Server is same as for local OPC Server, but some DCOM (Distributed COM) configuration is required before accessing the remote OPC Server. The DCOM configuration must be done both on OPC Server and OPC Client computers.

Configuring DCOM

To access OmronCIP Server as a remote OPC Server, it is necessary to do some changes in default security settings selected for the OPC Server's and Client's computers. The following Windows XP SP2 based explanation describes the necessary settings to be done for XP SP2 firewall, for OPC Server and for OPC Client computers.

Firewall

When setting up the OPC Server/Client, it is recommended initially to switch the firewall off. After the necessary configuration is done, the firewall should be restarted and the DCOM port added to the exception list – by selecting "Add Port..." in firewall "Exceptions" pane and adding TCP port 135 as it is needed to initiate DCOM communications:
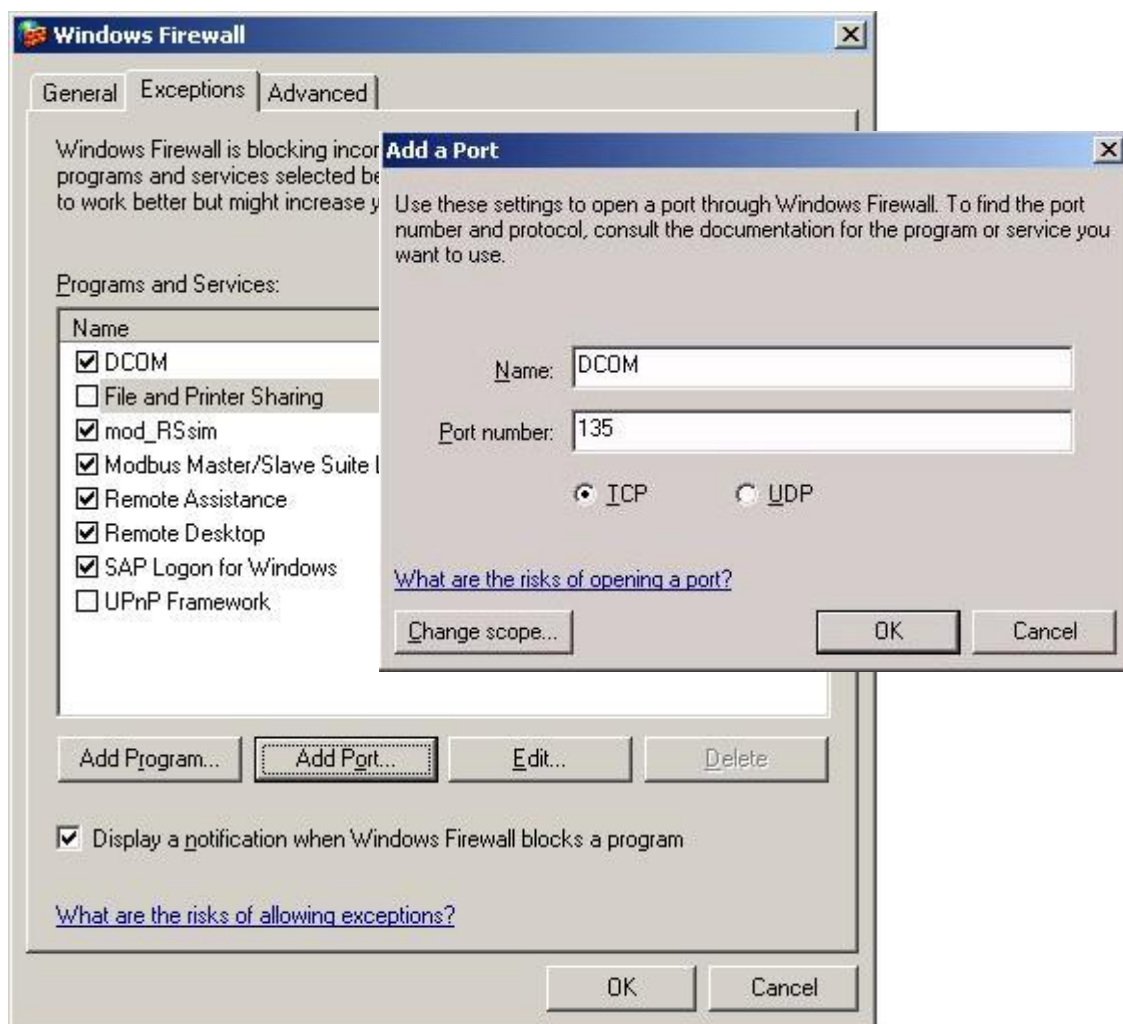
As well by selecting the "Add Program...", all necessary OPC Server and OPC Client programs should be added to the exception list.

OmronCIP OPC Server settings

After OmronCIP Server "OPC & DDE" version installation, the System Administrator must configure DCOM by using the **dcomcnfg.exe** system utility, the following steps:

1. At first, it is recommended to create a local group (i.e. OPCUSERS) that contains a list of all the users who will have permission to access the OmronCIP OPC server.

2. Start dcomcnfg.exe from Windows XP Start-Run line and select the "OmronCIP OPC & DDE Server" from the list of DCOM entries:
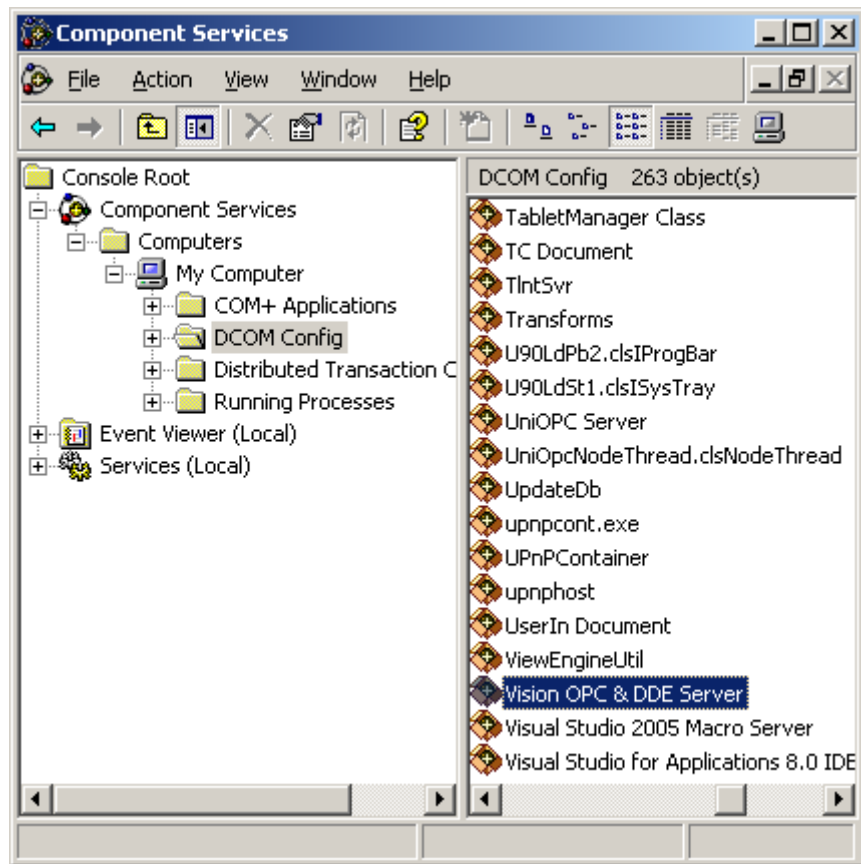
3. Right click on "OmronCIP OPC & DDE Server" and select the Poperties item from the pull down menu that appears. In the window that appears select the **General** tab and make sure the "Authentication Level" field is set to "Connect":
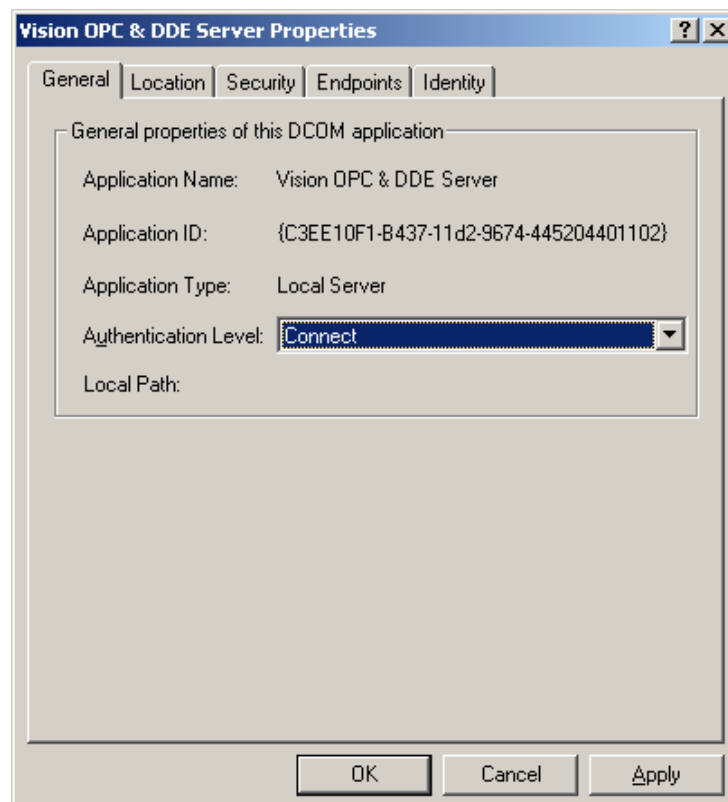
4. Select the **Security** tab and customize the **Launch and Activation** and **Access** permissions by adding the user group with user who will have permission to access the OmronCIP OPC server. Give <u>all</u> permissions to that group:
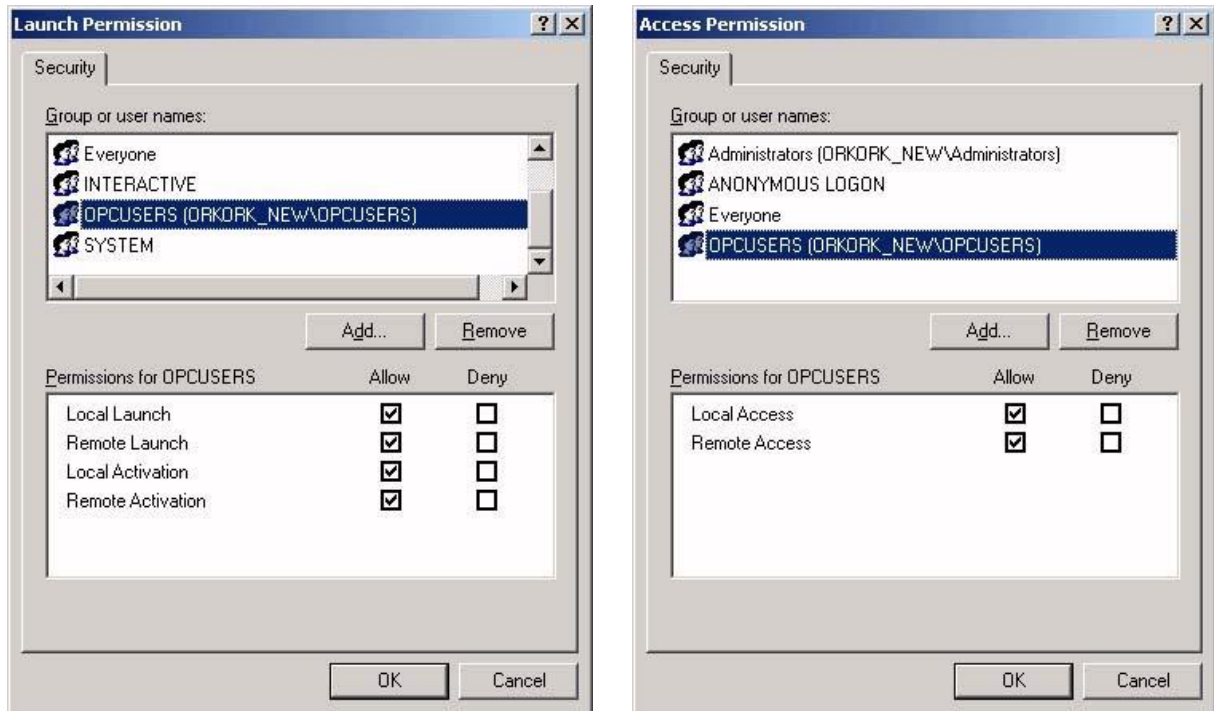
5. Now the configuration of OPC Server is completed – close the dcomcnfg program and restart the OmronCIP OPC Server to put new settings into effect.

OPCEnum settings

OPCEnum (OPC Enumeration Service) is OPC standard component that allows remote OPC Client to browse the local machine to identify OPC Servers that are installed on it.

To configure OPCEnum settings, start dcomcnfg.exe from Windows XP Start-Run line and select the "OPCEnum" from the list of DCOM entries. Right click on "OPCEnum" and select the Poperties item from the pull down menu that appears. In the window that appears select the **General** tab and make sure the "Authentication Level" field is set to "Connect":
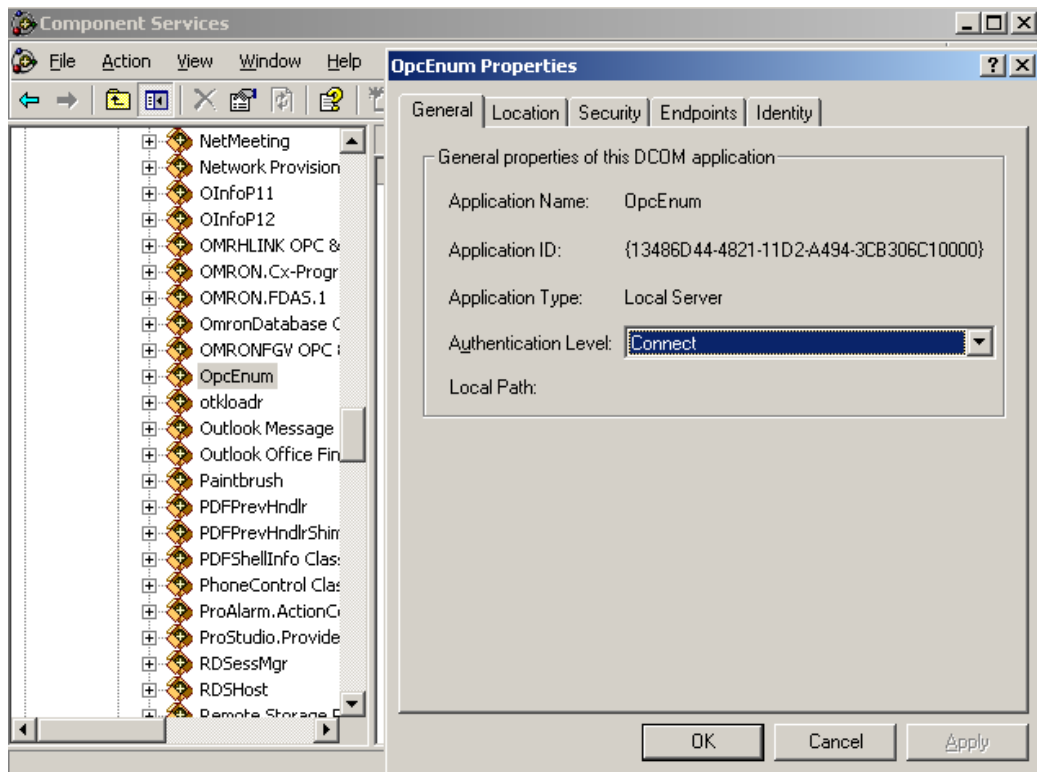
Select the **Security** tab and customize the **Launch and Activation** and **Access** permissions by adding the user group OPCUSERS same way like for "OmronCIP OPC & DDE Server". Give <u>all</u> permissions to that group.

OPC Client side settings
To configure necessary settings on OPC Client computer:

1. Start dcomcnfg.exe from Windows XP Start-Run line, navigate to and right click on "My Computer" and select Poperties item from the pull down menu that appears. In the window that appears select the **Default Properties** tab and make sure the settings there are filled like as shown below:
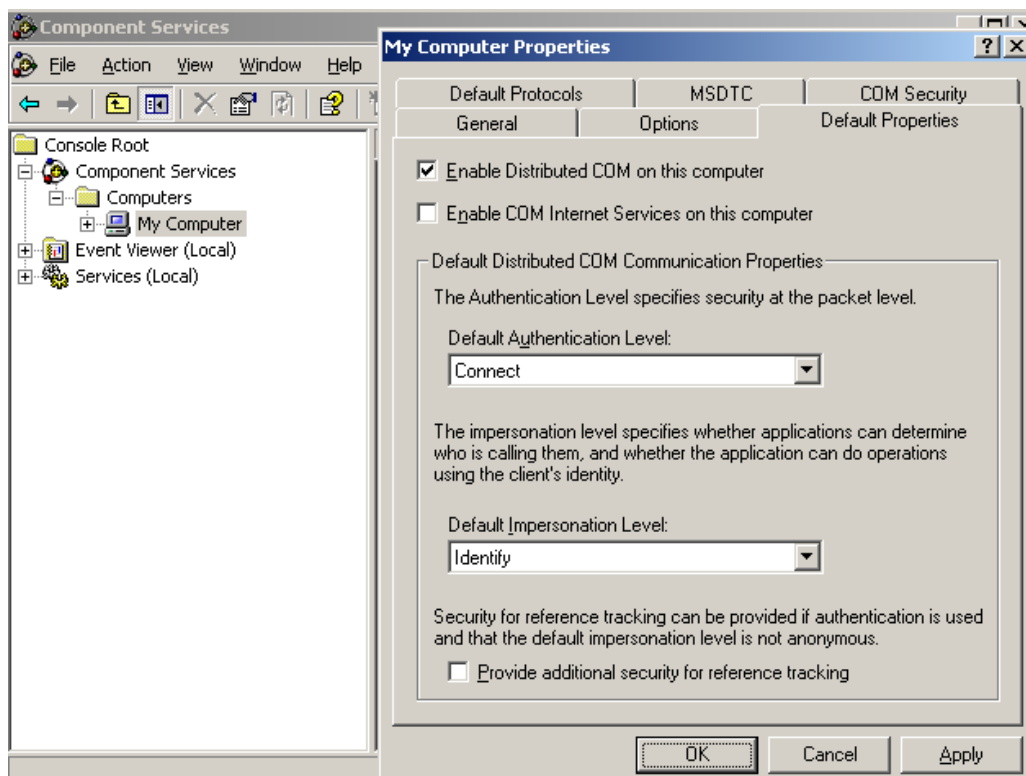
2. Select the **Com Security** tab and edit the Default settings for **Access Permissions** by adding (if not yet added) ANONYMOUS LOGON and giving it all access permissions. Do the same also for "Edit Limits":
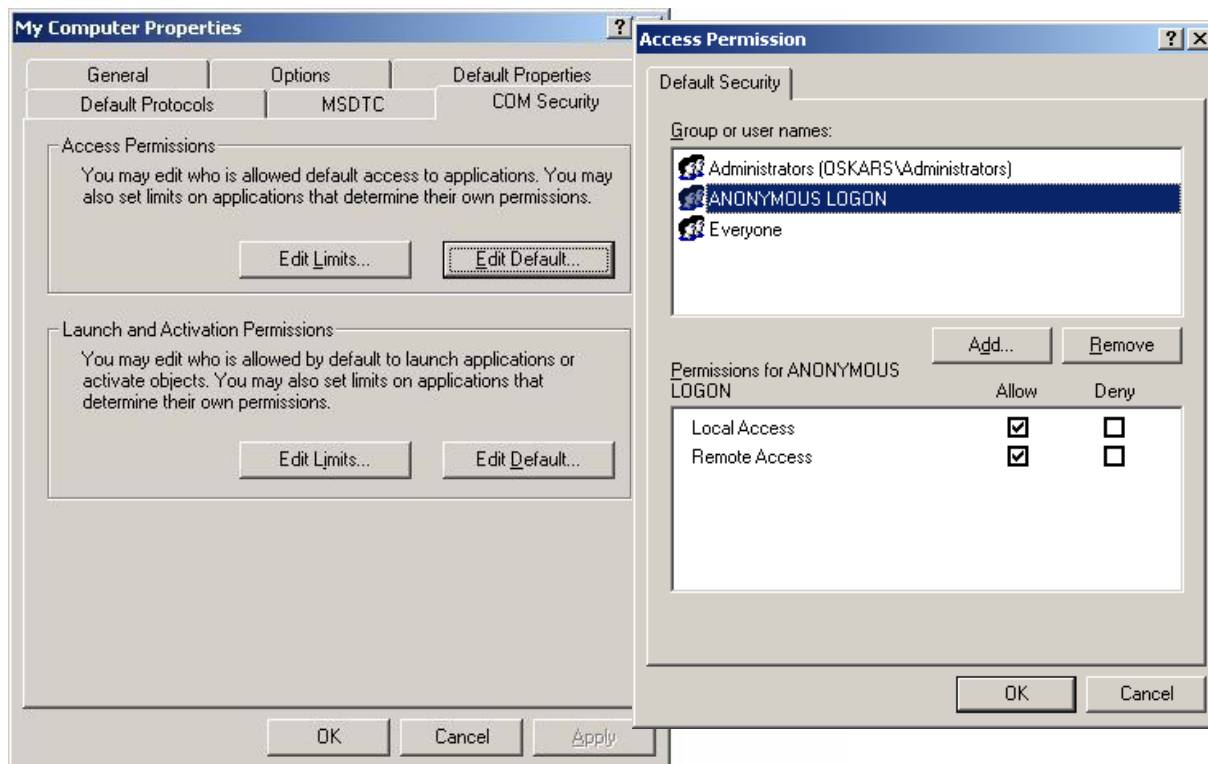
3. Edit the Default settings for **Launch and Activation Permissions** by adding (if not yet added) ANONYMOUS LOGON and giving it all all access permissions. Do the same also for "Edit Limits".

Note!
In case the "Edit Limits" selections are not available (grayed) that would mean the DCOM Security Options for some reason have Security Setting other than "Not defined". To correct that: select *Control Panel/ Administrative Tools/Local Security Policy* and select *Local Policies/Security Options* in "Local "Security Settings" dialog box; select, right click and invoke Properties for "DCOM: Machine Access Restrictions... " and "DCOM: Machine Launch Restrictions... " and change their "Security Setting" to "Not defined".

4. Now the configuration of OPC Client side is is completed – close the dcomcnfg program and restart the OPC Client.

Running OmronCIP "OPC & DDE" version as Windows Service

To <u>install</u> OmronCIP Server "OPC & DDE" version to run as **Windows Service**, the OmronCIP Server must be started with command line parameter "/Service":

OmronCIP /Service

After this the "OmronCIP OPC & DDE Server" Service will be installed with Startup type "Manual". The Service Startup configuration can be changed by MS Windows XP *Control Panel/Administrative Tools/Services* configuration. The **Allow service to interact with desktop** checkbox in "Log On" tab <u>must be checked</u> (the "Log On" tab can be invoked from Poperties item from the pull down menu that appears when right clicking on **OmronCIP OPC & DDE Server** Service). If **Allow service to interact with desktop** is not selected then OmronCIP Server full functionality is not ensured (e.g. the Server configuration can not be changed, no message boxes will be displayed, etc.).

To <u>uninstall</u> "OmronCIP OPC & DDE Server" Service, at first the Service must be stopped by *Control Panel/ Administrative Tools/Services/Stop* and then OmronCIP Server must be started manually with command line parameter "/DelService":

OmronCIP /DelService

After this the OmronCIP Server "OPC & DDE" version will be still registered and accessible to OPC Clients.

Troubleshooting

WIN.INI entries

The first time you run the OmronCIP Server configuration, most of the items in the following list will automatically appear in the WIN.INI file, located in the MS Windows system directory (e.g. C:\WINNT). It is an ASCII file and can be altered manually if you wish with any text editor, e.g., MS Windows Notepad (*do not use a program that formats text, such as MS Word or Write unless the file is saved as a DOS text*). The following is a typical entry for the OmronCIP Server:

[OmronCIP]
ProtocolTimer=10
ConfigurationFile=C:\OmronCIP
WinIconic=0
WinFullScreen=0
WinTop=110
WinLeft=0
WinWidth=200
WinHeight=170
DumpScreen=1

The following additional entries can be used:

SlowPollRetries and **SlowPollInterval**
The **SlowPollRetries** entry is used to enter the number of consecutive error retries for one topic. If after **SlowPollRetries** there is still no successful response from unit (Unitronics PLC), then this topic is changed to *slow poll mode*. The WIN.INI file **SlowPollInterval** entry is used to enter the slow poll mode update interval (in seconds).

Entering into slow poll mode is reported to WWLogger and (or) to OmronCIP Internal Logger by following string:

"Node:<NODENAME> Topic:<TOPICNAME>. Set slow poll mode - poll after each %ld secs. Stop error logging to topic."

Leaving the slow poll mode is reported to WWLogger and (or) to OmronCIP Internal Logger by following string:

"Node:<NODENAME> Topic:<TOPICNAME>. Return to normal communication to topic. Error logging reestablished"

The default values (they are used if WIN.INI file does not contain these entries) are **SlowPollRetries** equal to 5 and **SlowPollInterval** equal to 60 seconds.

MultiWrite
If **MultiWrite=1** entry is added to WIN.INI file [OmronCIP] section then write commands are processed in the following way: if server receives some new value to be written to unit and other writing command to same UNIT address is still pending (waiting for execution)

then no new write command is created - the value in existing write command is replaced by new one. As default (no **MultiWrite** entry or **MultiWrite=0**) all write values are delivered to UNIT, i.e. always new write command is created.

If **MultiWrite=2** then Server tries to include the new write value into the some of previously created messages **ignoring the sequence** of data changing in the client application. Server can include into one message only the consecutive item values. Example: value of MI100 in message with values of items MI99 or MI101.
 Important! *If MultiWrite=2 then maximum writing speed is achieved, but this option **is not recommended** if data changing sequence is important for PLC program!*

WriteCapacity
The **WriteCapacity** entry can be used to specify how many values can be sent (written) by one write message. The **WriteCapacity** value becomes effective only starting with second pending write message, i.e. the first pending write message always will contain one value. The **WriteCapacity** entry is relevant only if parameter **MultiWrite=2**. The **WriteCapacity** default value is 1.

MessageRetries
The **MessageRetries=** entry can be used to specify how many times the OmronCIP server will try to send any command to PLC. After **MessageRetries** expires the next command will be tried. As default (no **MessageRetries** entry or **MessageRetries=2**) the **MessageRetries** equal to 2 will be used. Note - the topic STATUS item value will change to 0 when **MessageRetries** expires.

WriteRetries
The **WriteRetries=** entry can be used only for write commands to specify how many times write command will be tried to send. The **WriteRetries** entry is used together with **MessageRetries** in the following way: if after **WriteRetries * MessageRetries** there is still no response from PLC then this write command is removed from list of pending write commands and will be no more executed. As default (no **WriteRetries** entry or **WriteRetries=3** the **WriteRetries** equal to 3 will be used. So, if default settings (**MessageRetries=2** and **WriteRetries=3**) are used, the write command will be deleted after 6 unsuccessful retries.

Examples:
- by settings **MessageRetries=2** and **WriteRetries=1** the OmronCIP server will delete write command after 2 unsuccessful retries;
- by settings **MessageRetries=1** and **WriteRetries=1** the OmronCIP server will delete write command immediately after first unsuccessful retry.

FirstPollDelay
The **FirstPollDelay=** entry can be used to specify how long is pause (delay) between connection establishing and first poll request issue. As default (no **FirstPollDelay** entry or **FirstPollDelay=0**) the **FirstPollDelay** equal to 0 will be used.

FirstWDDelay
The **FirstWDDelay =** entry can be used to specify how long is pause (delay) between connection establishing and first watchdog write message issue. As default (no **FirstWDDelay** entry or **FirstWDDelay=0**) the **FirstWDDelay** equal to 0 will be used.

Troubleshooting menu

The following debugging choices are appended to the Server's System Menu (the menu that appears when you click on the Server icon in the upper left hand corner of the Server's window):

Suspend Protocol/Resume Protocol - these choices permit you to turn protocol processing on and off, what means that you can suspend access to Controller(s).

Show Send - if checked then all outgoing user data logged in hexadecimal format.

Show Receive - if checked then all incoming user data logged in hexadecimal format.

Show Errors - if checked then all information about errors is logged.

Show Rejected Writes - this option can be useful in situation when communication with some topic (topics) is suspended by using the SUSPEND item (see *Item Names* section) and the Server rejects all writes (pokes) to this topic (topics). If checked then information about each rejected write (poke) value is logged. If not checked (default) then Server rejects all writes (pokes) to suspended topic(s) without logging any information.

Verbose - if checked then additional debugging information is displayed.

Dump - all information about ports, topics, messages and data items logged. This can be use to find out how many messages are actually sent to the PLC(s).

Dump Screen - if checked then information about active messages are displayed on the OmronCIP main window. This also can be used to find out how many messages are actually sent to the PLC(s).

Show Logger - this selection is available only for OmronCIP "OPC & DDE" version. If checked then OmronCIP Internal Logger is activated and all debug information is going to OmronCIP Internal Logger. The OmronCIP Internal Logger file is named in the format:
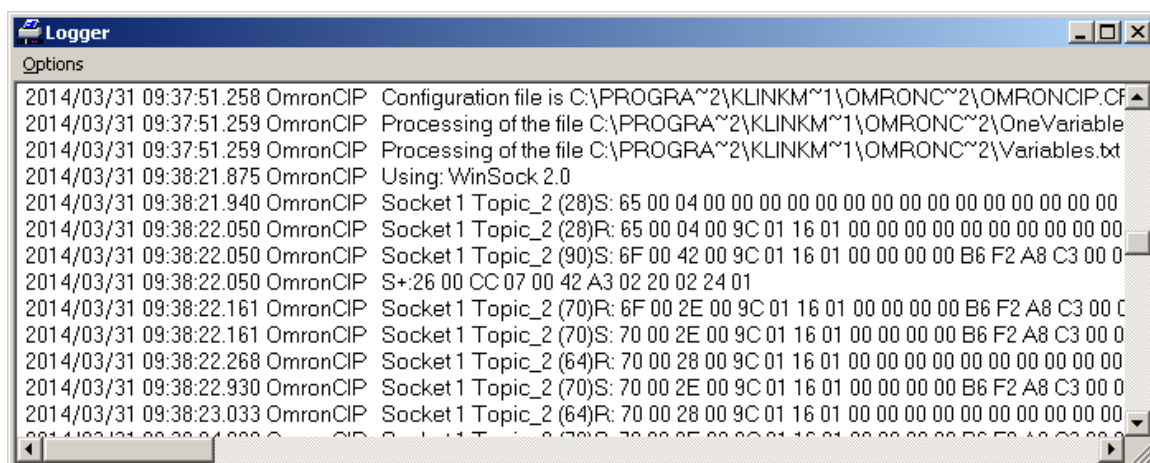
OmronCIP_YYYYMMDD.LOGn

where **YYYY** is a year, **MM** is a month, **DD** is a day and **n** is a order number of consecutive OmronCIP Internal Logger file, starting from 1 (the OmronCIP Internal Logger file maximum size is 16 MB; if there is more information logged then next consecutive file is created, e.g. there can be consecutive files OmronCIP_19990413.LOG1, OmronCIP_19990413.LOG2, etc.).

All OmronCIP debug information (except **Dump Screen**) is displayed through the ArchestrA SMC Log Viewer (Wonderware Logger) or OmronCIP Internal Logger (in case **Show Logger** is checked), which must be active for these commands to work.

*Note: If you check **Show Send** and/or **Show Receive** debug output grows very fast and it is possible that computer can become very slow.*

Internal Logger

The OmronCIP "OPC & DDE" version supports the Internal Logger. To enable the OmronCIP Internal Logger, check the **Show Logger** option at the OmronCIP Server System Menu (see *Troubleshooting menu* section above) - this command can be used to start/stop the Internal Logger. The Internal Logger window looks like following:

To save Internal Logger information to file, select *Options/Disk Options…* from Internal Logger main menu – the "Disk Options" dialog box will appear:
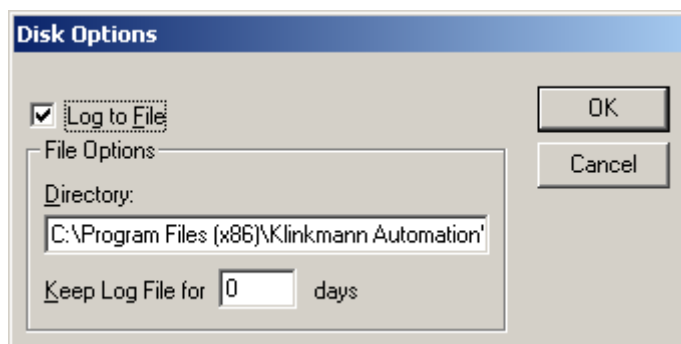
The following can be entered in this dialog box:

Log to File
If checked then Internal Logger information will be saved to Internal Logger File. The OmronCIP Internal Logger file name is created in the following format:

OmronCIP _YYYYMMDD.LOGn

where **YYYY** is a year, **MM** is a month, **DD** is a day and **n** is a order number of consecutive OmronCIP Internal Logger file, starting from 1. The OmronCIP Internal Logger file maximum size is 16 MB; if there is more information logged then next consecutive file is created, e.g. there can be consecutive files OmronCIP_20030228.LOG1, OmronCIP_20030228.LOG2, etc.

Directory
Enter the path where to keep the Internal Logger File.

Keep Log File for
Here the number of days how long to keep the Internal Logger File can be entered. After this number of days expires, the corresponding Internal Logger File will be automatically deleted. The default value **0** keeps Internal Logger Files forever - in this case they can be deleted manually.

Options/Font
To configure the font used by Internal Logger, select *Options/Font…* from Internal Logger main menu - the "Font" dialog box will appear:
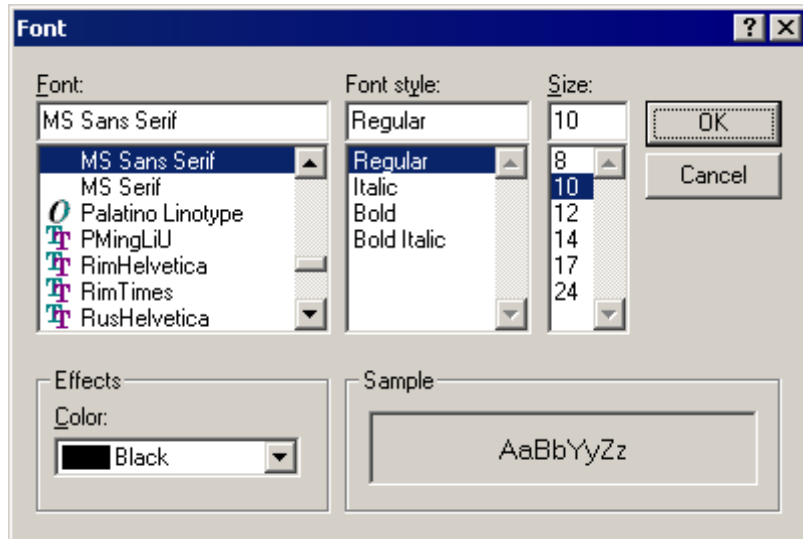
KLINKMANN AUTOMATION
Omron CIP Ethernet/IP Communication Server
Revision History

Date	Number	Notes
Mar 2014	Rev 1.0	First Release
Mar 2014	Rev 1.1	Item Names section modified, arrays added.