

NEMATRON

DDE Server

for Microsoft Windows
and InTouch Applications

**User Manual
Ver 1.x Rev 1.4
DR130 05**

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NEMATRON DDE Server

The NEMATRON DDE Server (hereafter referred to as the **NEM_DDE** Server) is a Microsoft Windows 16-bit application program that acts as a DDE (Dynamic Data Exchange) *Server* and allows other Windows application programs to communicate with Nematron Series 30/110/120 PLC Workstations through the RS-232 or RS-422 serial interface. The run-time system consists of one IBM PC or compatible connected to one or several Nematron Workstations. The **Nematron Driver Firmware** must be downloaded and run on each connected Nematron Workstation.

If only one Workstation is connected to the computer serial port (point-to-point connection) then RS-232 or RS-232/RS-422 (through converter, e.g. ENTRELEC model ILPH RS232/RS422-RS485 or OPTO22 AC7B) interface can be used for data exchange between Workstation and NEM_DDE Server.

If multiple Workstations must be connected to the computer serial port (multi-drop connection) then serial Line Sharer (e.g. Black Box Electronics RS-232 Line Sharer) can be used to share a single RS-232 line. If connection is longer than 15 m then the RS-232/RS-422 converter can be added between Line Sharer and Workstation.

The Serial Communication Board (e.g. DigiBoard PC/8e) also can be used to establish multiple point-to-point connections between Workstations and the computer. In this case both RS-232 and RS-422 interfaces can be used depending on installed Serial Communication Board type.

The *Server* is primarily intended for use with **Wonderware InTouch**), but it may be used by any Microsoft Windows program that is capable of acting as a DDE *Client*.

What is DDE?

DDE is a complete communication protocol designed 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 **InTouch** and Excel can simultaneously be both a *client* and *server*.

To obtain data from another application the *client* program opens a channel to the *server* application by specifying three things: the *server* **application name**, the **topic name** and the specific **item name**. For example, in the case of Excel, the application name is "Excel", the topic name is the name of the specific spreadsheet that contains the data and the item name is the specific cell on the spreadsheet. With **InTouch** the application name is "View", the topic name is the word "Tag name" when reading/writing to an **InTouch** tag name and the item name is a specific tag name in the **InTouch** Data Dictionary.

When a client application sets up a link to another DDE program, it requests the *server* application to *advise* the client whenever a specific item's value changes. These data links will remain active until either the *client* or *server* program terminates the link or the conversation. They are a very efficient means of exchanging data because when the link has been established no communication occurs until the specified data value changes. **InTouch** uses DDE to communicate with I/O device drivers and other DDE application programs.

Accessing a Remote DDE Item from NEM_DDE

The DDE protocol identifies an element of data by using a three-part address, including: **Application Topic** and **Item**.

Application refers to the name of the Windows program (server) that knows how to access the data element. For the NEM_DDE Server the application portion of the DDE address is **NEM_DDE**.

Topic is an application-specific sub-group of data elements. The NEM_DDE Server considers each Nematron Series 30/110/120 PLC Workstation to be a separate topic. The user creates a meaningful name for each Workstation and uses this name as the topic name for DDE references.

Note: In some cases, the term "node" is used interchangeably with the term "topic".

Item indicates a specific data element within the specified topic. For the NEM_DDE Server, an item is an individual point in the Nematron Series 30/110/120 PLC Workstation. (The item/point names are described in the **Item (Point) Naming** section.)

Note: In some cases, the term "point" is used interchangeably with the term "item".

Installing the NEM_DDE Server

The NEM_DDE Server installation package can be supplied:

1. As a self-extracting archive 13005xxx.EXE if downloaded from Klinkmann's web site (the xxx is the current (latest) version of the Server).
2. From installation on CD.
3. On two or three distribution disks (floppies).

To **install** the NEM_DDE Server from the self-extracting archive, run the 13005xxx.EXE and proceed as directed by the NEM_DDE Server Setup program.

To **install** the NEM_DDE Server from CD or distribution disks (floppies), on MS Windows (95 (98), NT, 2000, XP):

1. Insert the CD with Klinkmann Software into CD drive or insert the NEM_DDE Server disk into a floppy drive A: or B:.
2. Select the **Run** command under the **File** menu.
3. Run STARTUP.EXE if installing from CD or SETUP.EXE if installing from distribution disks (floppies).
4. If installing from CD: select "Protocol Servers (DDE, SuiteLink, OPC)", find "NEMATRON DDE Server" and click on "Setup...".
5. Proceed as directed by the INSTALL program.

When installation is finished, the subdirectory specified as a folder where to install the NEM_DDE Server will contain the following files:

NEM_DDE.EXE The NEM_DDE Server Program. This is a Microsoft Windows 16-bit application program.

NEM_DDE.HELP The NEM_DDE Server Help file.

NEM_DDE.CFG	An example configuration file.
HPC_DDE.ROM	The Nematron Driver Firmware file for Nematron Series 30 PLC Workstation.
GPC_DDE.ROM	The Nematron Driver Firmware file for Nematron Series 110/120 PLC Workstation.
TEST30.IWS	The sample Screen file for Nematron Series 30 PLC Workstation.
TEST120.IWS	The sample Screen file for Nematron Series 110/120 PLC Workstation.
LICENSE.TXT	Klinkmann Automation software license file.
WWCOMDLG.DLL	Dynamic Link Library necessary for NEM_DDE Server.

To **uninstall** the NEM_DDE Server, start Control Panel, select “Add/Remove Programs” and select the “NEMATRON DDE Server” from the list of available software products. Click on “Add/Remove...” and proceed as directed by the UnInstallShield program.

Before the NEM_DDE Server is started, the Nematron Series 30/110/120 PLC Workstation must be initialized for the communication by loading **Nematron Driver Firmware** and **Screen** file into the Workstation. **Nematron Driver Firmware** and **screen** files can be loaded with Configuration Program (CP). For Nematron Series 30 PLC Workstation **Firmware** file **HPC_DDE.ROM** must be loaded, for Nematron Series 110/120 PLC Workstation - file **GPC_DDE.ROM**. There are also sample **Screen** files on distribution diskette: **TEST30.IWS** - for Nematron Series 30 PLC Workstation and **TEST120.IWS** for Nematron Series 110/120 PLC Workstation.

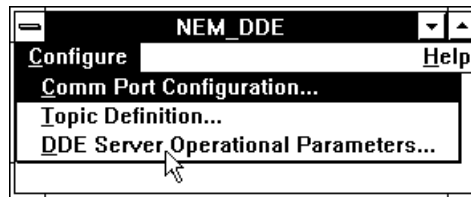
Note:

The HASP key is needed for full time running of NEM_DDE Server. The HASP Driver setup is performed during the Server setup. Without HASP Driver installed, the NEM_DDE Server will run only 1 hour (with all features enabled).

Configuring the NEM_DDE Server

After the NEM_DDE Server is initially installed, a configuration is required. Configuring the Server automatically creates a **NEM_DDE.CFG** file which holds all the topic definitions entered, as well as the communication port configurations. This file will be placed automatically in the same directory in which **NEM_DDE** executable is located unless the path where the configuration file will be placed is a specified via the */Configure/DDE Server Operational Parameters* command.

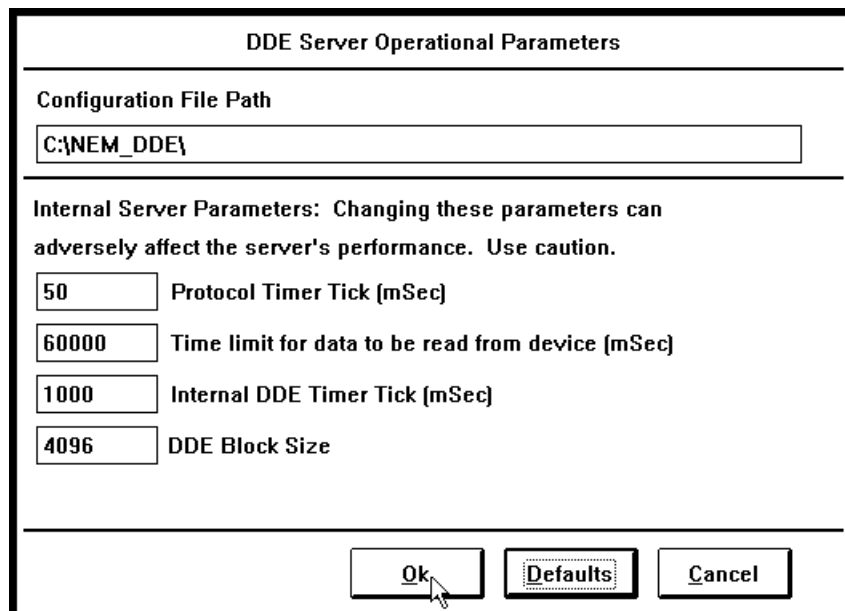
To perform the required configurations, start up the NEM_DDE program. If the Server starts up as an icon, double-click on the icon to open the server's window. To access the commands used for various configurations, open the */Configure* menu:



Configure Server Operational Parameters 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 **DDE Server Operational Parameters** command. The "DDE Server Operational Parameters" dialogue box will appear:



The following describes each field in this dialogue box:

Configuration File Path

The first field is used to specify the path (disk drive and directory) in which NEM_DDE will save its current configuration file. NEM_DDE 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 **NEM_DDE.CFG**.

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

Protocol Timer Tick

This field is used to change the frequency at which the Server checks for work to do. This should be approximately 2 to 4 times the faster rate desired to update data from Nematron Series 30/110/120 PLC Workstation.

Time Limit for Data to be Read From Device

This field is used to specify the maximum time that the Server will wait while trying to read values from the Controller before it reports a failure to the Client program. This parameter does not affect the performance of the Server in normal operation.

Internal DDE Timer Tick

The data entered in this field controls how often the Server performs various internal timing functions. It affects only error reporting, not normal performance.

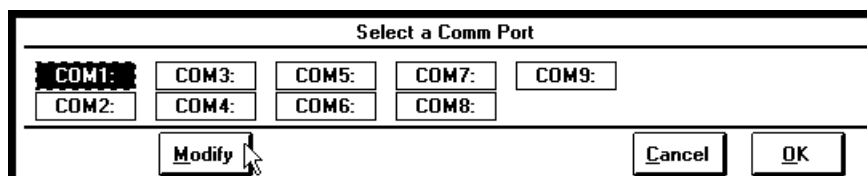
DDE Block Size

When the NEM_DDE Server is working with Wonderware **InTouch**, it packs DDE Advise and Data Messages into blocks to improve throughput. This field is used to adjust the block size. The entry in this field has no effect on the operation of the Server with normal DDE aware applications.

When all entries have been made, click on **OK**. To reset the default values, click on **Defaults**.

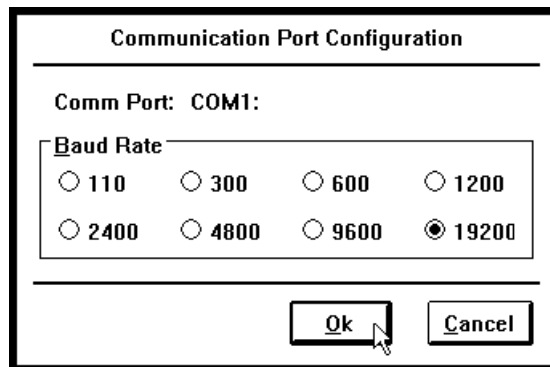
Configure Comm Port Command

This command is used to configure the communication port that will be used to communicate with the Nematron Series 30/110/120 PLC Workstations. Invoke the **Comm Port Configure** command. The "Select a Communication Port" dialogue box will appear:



Select a communication port and click on **Modify** to examine the characteristics of the selected port.

The "Communication Port Configuration" dialogue box will appear:



For the NEM_DDE Server you must select only **Baud Rate**.

The selected Baud Rate must match the setting used in the Nematron Series 30/110/120 PLC Workstation.

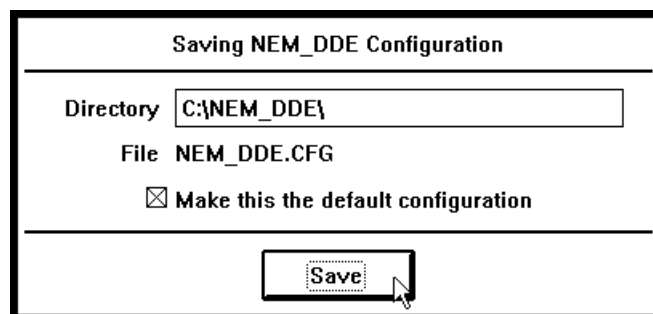
Note: The default Baud Rate is 19200.

When the Baud Rate is selected, select **OK** to process the configuration for the communication port.

Note: The first time a communication port is configured, the user will be prompted to verify the directory where the configuration file will be stored to specify the correct directory path.

Saving NEM_DDE Configuration File

If the configuration file does not currently exist, or a new configuration path has been specified, the Server will display the "Saving NEM_DDE Configuration" dialogue box:



This dialogue 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**" option. Doing so it will allow the NEM_DDE Server to find the configuration file automatically each time it is started.

Configuration File Location

When the NEM_DDE Server starts up, it first attempts to locate its 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 **File/Run** command in **File Manager** or **Program Manager** and enter the following:

NEM_DDE /d:c:\directoryname

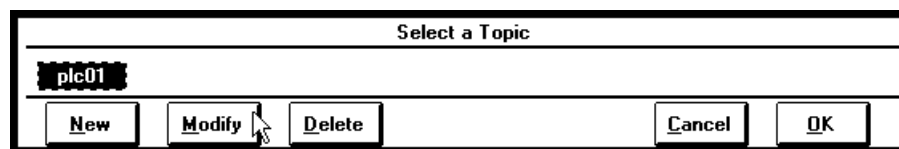
Note: There is no limit to the number of configuration files that may be created, although each must be in a separate directory.

Configure Topic Command

The user provides each Nematron Series 30/110/120 PLC Workstation with an arbitrary name that is used as the DDE topic for all references to this Workstation.

The following steps are taken to define the Topics attached to the Nematron Series 30/110/120 PLC Workstation:

1. Invoke the **Topic definition** command. The "Select a Topic" dialogue box will appear:



2. To modify an existing topic, select the topic name and click on **Modify**. To define a new topic, click on **New**. To remove an existing topic, click on **Delete**. The "NEM_DDE Topic Description" dialogue box will appear:

3. Enter the **Topic Name** which corresponds to the DDE Topic Name.

4. Click on the **Comm Port** button to associate a topic with the communication port.
Note: Additional topics may be associated with the same port later.
5. Enter the **Station number** for Nematron Series 30/110/120 PLC Workstation.
Note: Each Nematron Series 30/110/120 PLC Workstation must have a unique address from 0 to 255.
6. Set the **Maximum Configured Items/Points** for topic (PLC Workstation). (Set really used (polled) number of items/points, not maximum allowed). Default value is 64.
7. Click on the **Ok** button.
Note: The first time a topic is configured, the user will be prompted to verify the directory where the configuration file will be stored to specify the correct directory path.

Item (Point) Naming

The table below lists the item/point names supported by the NEM_DDE Server:

Item name	Description	DDE Tag Type	Value Range	Address Range
Dn	Bit	Discrete	0,1	D0...D65535
Bn	Unsigned byte	Integer	0...255	B0...B1023
Bns	Signed byte	Integer	-128...127	B0s...B1023s
Wn	Unsigned word	Integer	0...65535	W0...W1023
Wns	Signed word	Integer	-32768...32767	W0s...W1023s
Ln	Long	Integer	-2147483648... 2147483647	L0...L1023

Item/Point Naming Examples:

D0, D1, D8, D294, D65535, B0, B1, B3s, B638S, B1023
W0, W1, W183s, W1023, L0, L1, L419, L1023

For each Topic, there is also a built-in discrete item **STATUS** which indicates the state of communication with the Nematron Series 30/110/120 PLC Workstation. This discrete item is set to **0** when communication with the PLC Workstation fails and set to **1** when communication is successful.

Note: If PLC Workstation is inactive (nothing is sent from PLC Workstation to IBM PC) then the Server is continuously waiting for data from PLC Workstation and during this state the **STATUS** value is not updated.

Troubleshooting

WIN.INI entries

The first time you run the NEM_DDE Server configuration, most of the items in the following list will automatically appear in the WIN.INI file. It is usually in the C:\WINDOWS directory. 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 DOS text*). The following is a typical entry for the NEM_DDE Server:

```
[NEM_DDE]
ProtocolTimer=50
RequestTimer=1000
ValidDataTimeout=60000
DDEBlockSize=4096
WriteRetryIndefinitely=0
ConfigurationFile=C:\NEM_DDE\
WinIconic=0
WinFullScreen=0
WinTop=112
WinLeft=0
WinWidth=200
WinHeight=168
ShowSend=0
ShowReceive=0
ShowErrors=1
DumpScreen=1
```

Troubleshooting menu

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

- Suspend Protocol / Resume Protocol** - these choices permit you to turn protocol processing on and off, what means that you can suspend access to the Nematron Series 30/110/120 PLC Workstations.
- Show Send** - if checked then all outgoing data is displayed in hexadecimal format.
- Show Receive** - if checked then all incoming data is displayed in hexadecimal format.
- Show Errors** - if checked then information about errors is displayed.
- Verbose** - if checked then information about errors is displayed more verbose.
- Dump** - displays all information about opened ports, active topics and data items.
- Dump Screen** - if checked then information about active data is displayed in the NEM_DDE main window.

All debug output (except Dump Screen) is displayed via the Wonderware Logger, which must be active for these commands to work.

Warning: if you check **Show Send** and/or **Show Receive** debug output grows very fast and Nematron Series 30/110/120 PLC Workstations acts very slow.

Nematron Workstation Driver

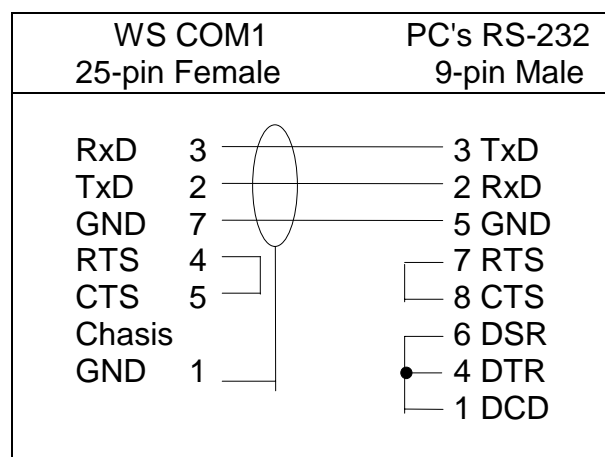
The Nematron Series 30/110/120 PLC Workstation must be initialized for the communication by loading **Nematron Driver Firmware** and **Screen** file into the Workstation. **Nematron Driver Firmware** and **screen** files can be loaded with Configuration Program(CP). For Nematron Series 30 PLC Workstation **Firmware** file **HPC_DDE.ROM** must be loaded, for Nematron Series 110/120 PLC Workstation - file **GPC_DDE.ROM**. There are also sample **Screen** files on the distribution diskette: **TEST30.IWS** - for Nematron Series 30 PLC Workstation and **TEST120.IWS** for Nematron Series 110/120 PLC Workstation.

Connecting Workstation to PC

RS-232 connections

Workstation can be connected directly to the serial interface RS-232 port on the PC. The communication parameters are not fixed but must be same as on PC. Defaults are 19200, 8 data bits, 1 stop bits and no parity.

The following diagram shows how to make the cable to connect the Workstation to the PC using RS-232 interface:



Workstation's COM1 to PC's RS-232 port

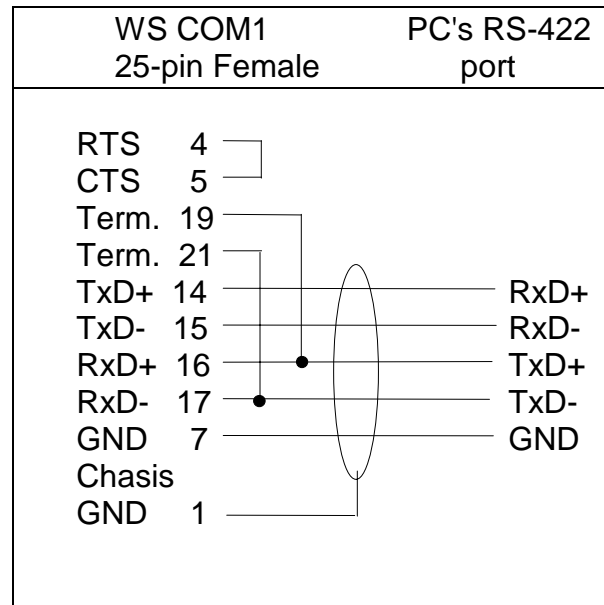
The same pin layout must be used if Line Sharer is inserted between Workstation's RS-232 interface and PC's RS-232 port.

RS-422 connections

If the RS-422 interface is used on the Workstation side then it can be connected directly to PC's RS-422 port (if Serial Communication Board is used on PC side) or through the RS-232/RS-422 Converter to the PC's RS-232 port.

The communication parameters are not fixed but must be same as on PC. Defaults are 19200, 8 data bits, 1 stop bits and no parity.

The following diagram shows how to connect the Workstation to the PC's RS-422 port:

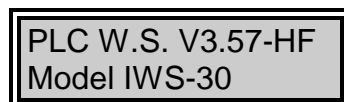


Workstation's COM1 to PC's RS-422 port

The same pin layout must be used on Workstation's side if Workstation's RS-422 interface is connected to RS-232/RS-422 Converter.

Configuring the Nematron Workstation

To configure Nematron Series 30 PLC Workstation you should have the Configuration Program (CP) version 3.57. The version of CP must be the same as the Nematron Driver version. To find the version of the Nematron Driver switch power on and watch the display during the power-up self-test. You should see the following:



The version of the Configuration Program (CP) is displayed during the startup of CP and also can be found by pressing "V" from the main menu.

STATION NUMBER

You must enter the Workstation's station number in the "PLC station number" field in the Configuration screen and Edit screens. It does not matter, what you enter in the "Workstations Station #" field in Configuration screen, however it must be different from value in "PLC station number" field.

ADDRESSING

When you set up a screen, using the Edit function of CP software, you must enter the Address of the location to be shown on the screen, in the "PLC Address" field. For example, if you want to display the value of the first Word, you should enter "W0" for the "PLC address". The "Data Format" of registers can be either *Signed* or *Unsigned Binary*, but not *BCD*.

The tables below show the format of every Register type and On/Off location the Workstation can access:

Register Type	Format	Range	Data Size
Byte	Bn	n=0 to 1023	byte
Word	Wn	n=0 to 1023	word
Lower word of Doubleword (Long)	LnL	n=0 to 1023	word
Higher word of Doubleword (Long)	LnH	n=0 to 1023	word

On/Off Type	Format	Range
Discrete	Dn	n=0 to 65535

Errors

When the Workstation encounters a problem in communicating with the PC, it displays an error message and an error code. The following is a list of messages with the meaning of each code.

NOT RDY ERR

This message always indicates that the CTS input on the serial port is not active, which typically indicates that the cable is not plugged into the Workstation.

NO RESPONSE ERR

This message always indicates that the PC is not responding for the Workstation's requests. This typically indicates that the cable, plugged into the Workstation is not connected to the PC, or that the PC is turned off, or NEM_DDE Server is not started, e.t.c.

MSG ERROR

This message indicates that the PC's response to the Workstation contains an error or is garbled or data not present on PC.

Error Code	Description
1	Receiver buffer overflowed
2	Receiver overrun error
4	Parity error
8	Framing error
16	Workstation received "Break"
200	Workstation received an invalid response
211	DDE Server's symbol table does not exist
213	Data item not found in the DDE Server's symbol table

SCREEN ERROR

This message indicates that the screen file contains invalid data.

Error Code	Description
101	Chosen "BCD" in "Data format" field
102	Invalid operand identifier in "PLC address" field
103	Bad or missing address in "PLC address" field
104	Bad or missing lower/higher word identifier for doublewords
105	Extra characters at the end of "PLC address" field
106	Conflicting "PLC address" and "Data size" field

Test application

In order to understand how PLC Workstation displays the information that you want to receive from PC, use this test application.

At first you should download the file "TEST30.IWS", which is on the distribution diskette. But before downloading you should configure CP, by entering "HPC_DDE" in the "Firmware name" field.

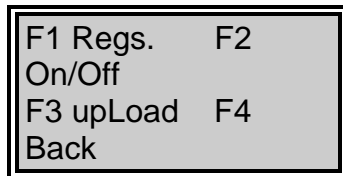
FIRST SCREEN

When you have downloaded the screen file to the Workstation, you will see the following screen :

PC DDE demo screens Press any key

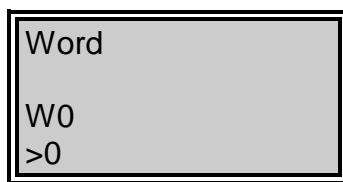
MENU

Press any key on Workstation's keyboard, to go to the main menu :



REGISTER SCREENS

Press "F1 Regs" in the main menu to go to the register screens. The first register screen displays "Word W0" and you will see the following :



In this screen you can increment and decrement displayed value by pressing "+" or "-". You can go to the next screen by pressing "↓", to the previous one by pressing "↑" or back to main menu by pressing "F4 Back".

When you go to the next screen, you will see the same Word but displayed in hex format, not in decimal.

Press "↓" key several times to see all register screens: Next screens displays following registers:

"Word(hex)	W0"
"Word	W1"
"Byte	B0"
"Byte	B1"
"LoWord of Long	L0L"
"HiWord of Long	L0H"
"Long	L0"

You can change value of any displayed Word or Byte (Wn, Bn) by pressing "+" and "-". You can not change L0, but changes as you change L0L and L0H.

On/Off SCREENS

Press "F2 On/Off" in the main menu to go to On/Off screens. The first On/Off screen displays "Discrete D0" and you will see the following :

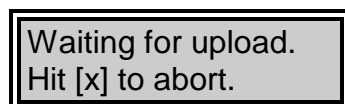


In this screen you can switch On and Off this bit by pressing "+" and "-". For this screen "Enter" key is defined as pushbutton that toggles displayed value. You can go to the next screen by pressing "↓" key, to the previous one by pressing "↑" or back to the main menu by pressing "F4 Back".

Next screen displays "Discrete D1". For this screen "Enter" key is defined as a momentary pushbutton.

UPLOAD SCREEN

Press "F3 upLoad" in the main menu to go to upload screen :



When the Workstation displays this screen, it is ready to accept a new screen file or firmware upload. If you do not want to upload you can leave this screen by pressing BackSpace.

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NEM_DDE Server
Revision History

Apr 95	Rev 1.0	First Release
May 95	Rev 1.1	Support to up to 9 communication ports and signed bytes and words added
Oct 95	Rev 1.2	Modification of manual contents Chapters: Files on the NEM_DDE Distribution Diskette Installing the NEM_DDE Server
Sep 97	Rev 1.3	Manual file name changed. Minor changes.
Mar 2002	Rev 1.4	Installation from CD information added.