

Abstract

This Application Note explains the process of establishing functional Dynamic Data Exchange (DDE) links that allow communication from National Instruments Corporation LabVIEW (Laboratory Virtual Instrument Engineering) software to Micromanipulator's pcProbe II prober control software. DDE "poke" and "request" commands will be discussed. Available LabVIEW Virtual Instruments (VI's) for establishing the DDE link, and the procedure for establishing the links will also be discussed.

By establishing a DDE link between LabVIEW and pcProbe II, the user can control the operation of Micromanipulator semi-automatic probe stations while operating in the LabVIEW graphical programming environment. This Application Note assumes the reader is familiar with the programming and general concepts of LabVIEW software. This Application Note also assumes that the reader has obtained a complete version of the LabVIEW software. A complete copy of Micromanipulator's pcRouter manual will be required as it will be referenced several times.

LabVIEW and pcProbe II, pcRouter must be running. At the operator's discretion, pcRouter may be in a minimized format. pcRouter (standard with Micromanipulator pcProbe II-core software) accepts DDE commands and distributes those DDE commands to pcProbe II internal functions. These internal functions include pcNav, pcWfr, pcLaunch, pcVideo, and pcIndie and are standard with PCP2-SUITE1.

DDE Communication Concepts

There are two basic types of DDE commands used to communicate with Micromanipulator probe stations. These commands are "poke" and "request" commands. A DDE command that initiates the execution of a specific task or function is a "poke" command. A command that asks for the return of information is a "request" command. A DDE poke may tell the prober stage to move to a specific X,Y location, while a DDE request would ask the prober stage for its current position. With poke and request commands, functional control of Micromanipulator probe stations can be obtained.

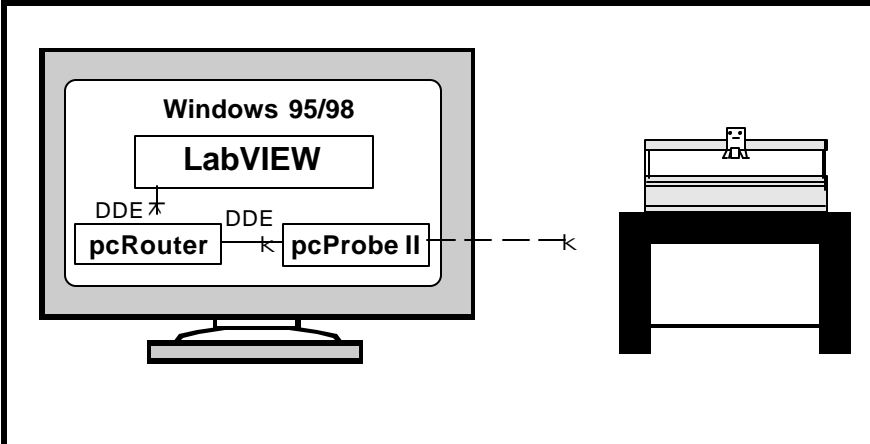


Figure 1 - The interface architecture

The Interface Architecture

The DDE interface architecture between LabVIEW and Micromanipulator's pcProbe II control software is illustrated in figure 1. As illustrated, LabVIEW software is the *client* of the DDE interface link. In such a situation, LabVIEW communicates prober control commands to pcProbe II, which in this case is the *server* of the DDE link. Once commands are sent

through the DDE link, pcProbe II software interprets the commands and assumes the responsibility of probe station control. Both LabVIEW and pcProbe II are running on Windows 95/98.

As illustrated by figure 1, DDE commands are sent from the LabVIEW software through pcRouter. In order to establish a functional DDE interface between



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The following communication actions take place when using DDE communications protocols within Windows:

- Step 1** Select the application *Service and Topic*
- Step 2** Select item for conversation
- Step 3** Transfer command or data
- Step 4** Terminate conversation

DDE links between LabVIEW and pcProbe II execute each of the four steps above.

Getting Started - How to write your custom VI's

The procedures that follow describe the process of writing custom LabVIEW VI's for establishing functional DDE control of Micromanipulator probe stations.

Poke DDE links

In order to establish a DDE poke link between LabVIEW and pcProbe II, the following procedure must be executed in LabVIEW.

STEP 1
Establish a new VI diagram window.

STEP 2
Under the main LabVIEW menu, select EDIT>>EDIT CONTROL AND FUNCTIONS PALETTES. This brings up the "functions" palette illustrated in figure 2.

STEP 3
In the functions palette, select the "communications" icon. The communications icon brings up the palette illustrated in figure 3.

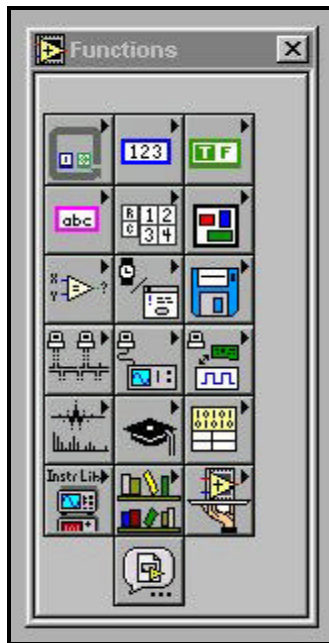
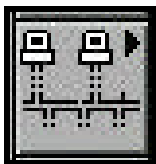


Figure 2 - "Functions" Palette



STEP 4
Select the "DDE" icon. Selecting the DDE icon brings up the DDE VI palette. These are the VI's that are available for establishing a functional DDE interface between LabVIEW and pcProbe II. The DDE VI palette is illustrated in figure 4.

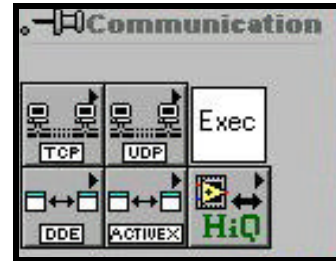


Figure 3 - Communications Palette

STEP 5
From the DDE VI Palette, select the DDE Open VI.

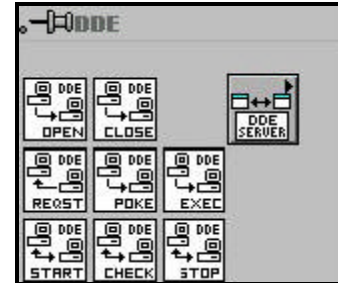
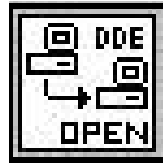
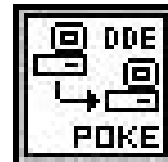


Figure 4 - DDE VI Palette

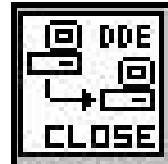
STEP 6
Place the DDE Open VI in the new diagram window. This is accomplished by using the mouse to drag the Open VI into the window and releasing the left mouse button when you have the VI in the desired location.

STEP 7
From the DDE VI palette, select the DDE Poke VI icon.



STEP 8
Repeat step number 6 with the DDE poke VI.

STEP 9
From the DDE VI palette, select the DDE Close VI and repeat step 6 again with the Close VI.



STEP 10
From the functions palette (figure 2), select the "Time and Dialog" icon. Selecting the "Time and Dialog" icon brings up the Time and Dialog palette illustrated in figure 5.

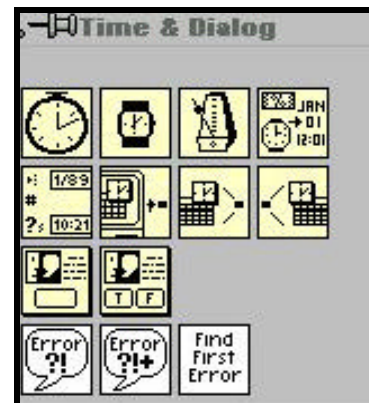
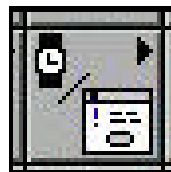


Figure 5 - Time and Dialog Palette

STEP 11

Select the “Error ?!” icon from the Time and Dialog Palette.

STEP 12

From the “Tools” palette (figure 6) select the “wire” tool. The “tools palette” can be found under “WINDOWS>>SHOW TOOLS PALETTE” from the main LabVIEW menu. Move the wire tool into the center of the DDE Open VI and notice that the connections for the VI will be highlighted. By moving the wire tool over the Open VI, you will see the connections for *Service*, *Topic*, *error in* (no error), *conversation refnum*, and *error out*.

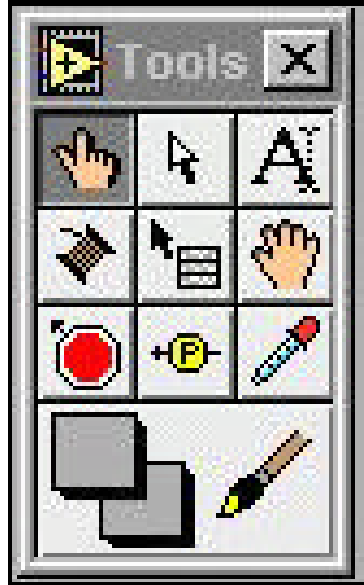


Figure 6 - Tools Palette



By moving the wire tool over each of the other VI in the diagram window, you will see the following connections:

DDE Poke VI:

- time-out (-1)
- conversation refnum (1 input and 1 output)
- item
- data
- error in (no error)
- error out

DDE Close VI:

- conversation refnum
- error in (no error)
- error out
- mode T (close immediately)

DDE Error ?! VI

- error out.
- message
- error in (no error)
- type of dialog (OK msg:)
- error source (“”)
- error code (no error: 0)
- error?
- code, source, and error out

STEP 13

Using the wire tool, connect all of the “conversation refnum” connections together as shown in figure 8. Figure 8 shows the overall VI structure with all four of the VI’s. No refnum connection is required for the Error?! VI.

STEP 14

Connect the error out connections of each VI together using the wire tool.

STEP 15

Place the wire tool over the service connection of the Open VI. Press the right mouse button and select “create control” from the pull down menu that appears. This will display an “ABC” item. Click the right mouse button on the “ABC” item and select “find control” from the pull down menu that appears. The data window illustrated in figure 7 will appear. Click on the “operate value” tool in the tool palette and in the “service” window, type in “PCPROBE”. Do not hit the ENTER key. PCPROBE will always be the service when establishing DDE links between LabVIEW and pcProbe II. This accomplishes step 1 in the “DDE Communications Concept” section of this Application Note.



Figure 7 - Data Window

STEP 16

Return to the new VI diagram window. Repeat step 15 for the “topic” connection. The topic for DDE link between LabVIEW and pcProbe II will always be “DATA”. This accomplishes the second part of step 1 in the “DDE Communications Concept” section of this Application Note.

STEP 17

Move to the DDE Poke VI and repeat step 15 for the “Item” and “Data” connections. This accomplishes steps 2 and 3 of the DDE communications concepts sections of this Application Note. For this simple example, we will turn the probe station microscope illuminator on. Therefore, the item will be “illum” and the data will be “1”. This data was taken from page 13 of the pcRouter manual, which has been rewritten below. Information about other commands can be found in the pcRouter manual.

illum

- Item:** illum
- Data:** 1 = ON 0 = OFF
- Type:** DDE Poke
- Application:** posutil
- Purpose:** Turn illuminator on or off

Notice that the poke VI shown in figure 8 accomplishes each of the four steps discussed in the “DDE Communications Concepts” section of this Application Note. The steps accomplished are:

Step 1 - Select the application Service and Topic

4 Accomplished in the DDE Open VI

- Service = pcProbe
- Topic = Data

Step 2 - Select item for conversation

4 Accomplished in the DDE Poke VI

- Item = any poke command listed in the pcRouter manual. (“Illum” was used for this example.)

Step 3 - Transfer command or data

4 Accomplished in the DDE Poke VI

- Data = the data required for the poke command being sent. This information can be found in the pcRouter manual. For this example, a “1” was sent to turn the illuminator on.

Step 4 - Terminate conversation.

4 Accomplished by the DDE Close VI.

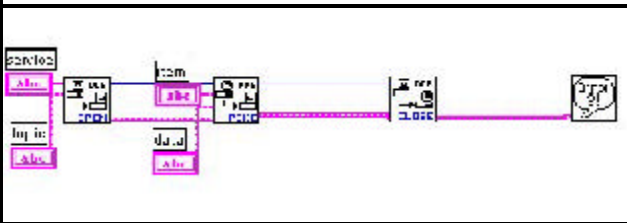


Figure 8 - DDE Poke VI structure.

Request DDE Links

The procedure for establishing DDE Request links between LabVIEW and pcProbe II is similar to the procedure for establishing DDE Poke links. The overall VI structure is illustrated in figure 9.

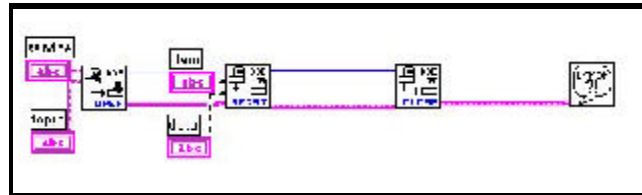


Figure 9 - DDE Request VI structure

Notice that the Request VI has been used in figure 9. The only procedure steps that vary from the Poke procedures are 7 and 17. The “item” stills need to be established, but no data will be transmitted for request commands. In this case, the data returned will be included in the “data” connection of the request VI. For example, if the illuminator state is needed, the “item” will be “GETILLUM”. The data returned will be the current status of the illuminator (i.e., 1= on, 0 = off). Additional information about the GETILLUM command, as well as other request commands, can be referenced in the pcRouter manual.

Summary

This Application Note has discussed the process of establishing functional Dynamic Data Exchange (DDE) links that allow communication from National Instruments Corporation LabVIEW software to Micromanipulator’s pcProbe II software. DDE poke and request commands have been discussed and the process for establishing the VI’s has also been discussed.

Further Reading

- *Interfacing to pcProbe II via DDE Links*. The Micromanipulator Company Inc. (part number A1011211).
- *pcProbe II Users Manual*, pages 1-31, pcRouter section. The Micromanipulator Company Inc.
- *LabVIEW Users Manual*, chapter 23 pages 23-1 to 23-11. National Instruments Corporation.
- *LabVIEW Communications VI Reference Manual*, Chapter 4 pages 4-1 to 4-16. National Instruments Corporation.

Acknowledgments

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