TELEDYNE LECROY
Everywhereyoulook™

ActiveDSO
Developer's Guide

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ActiveDSO Developer's Guide

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Contents

About ActiveDSO

ActiveDSO™ is an **ActiveX®** control that enables Teledyne LeCroy oscilloscopes to be controlled by and exchange data with a variety of Windows® applications or programming languages that support the ActiveX standard: MS Office programs, Internet Explorer®, Visual Basic®, Visual C++®, Visual Java, Python, and much more.

For easy integration of your scope data with your Windows Application, ActiveDSO helps you:

- Generate a report by importing scope data right into Excel®, PowerPoint®, or Word®.
- Archive measurement results on the fly in a Microsoft Access® Database.
- Automate tests using Visual Basic, Java, C++, Excel (VBA).

Examples
Methods
Properties

Interfacing to the Oscilloscope

You can interface to most Teledyne LeCroy instruments using standard TCP/IP over Ethernet. GPIB, LSIB, and USBTMC may also be used if the oscilloscope is supplied with the optional interface card or connector.

NOTE: Legacy LeCroy instruments (prior to LSA-1000 series) support only GPIB and RS-232.

The ActiveDSO control hides the intricacies of programming for each of these interfaces and provides a simple and consistent interface to the controlling application. With less than 10 lines of VBA (Visual Basic for Applications) code in an Excel macro, the spreadsheet can recover pre-scaled waveform data from a remote instrument.

Embedded Control

The ActiveDSO control can also be embedded visually in any OLE automation compatible client and used manually without the need for any programming. It will run on any PC running Windows 95 or later, with the exception of Windows 8.

There are two fundamental ways to use the control.

1. As a visible object embedded in an OLE Automation compatible Client (PowerPoint for example), showing a captured display image. See Embedded Control Example.
2. As an invisible object accessed via a scripting language (Visual Basic for Applications for example) to remotely control an instrument. See Accessing from VBA.

The control's external name is: **`LeCroy.ActiveDSOCtrl.1`**

The control's CLSID is **`450A9897-D9C9-11D1-9966-0000F840FC5E`**

System Requirements

- Any Teledyne LeCroy oscilloscope that supports TCP/IP, GPIB, LSIB, or USBTMC

  NOTE: Only basic support is provided for members of the older 94xx family of instruments. A firmware upgrade is recommended for 93xx and LCxxx scopes. Please contact your Teledyne LeCroy service center. See the Appendix: Wiring for RS-232 Interfaces.

- Personal Computer running Windows 95, Windows 98, Windows NT (Intel, v3.51 or later), Windows 2000, Windows XP, Windows Vista, Windows 7, Windows 10

Examples

Embedded Control Example

The ActiveDSO control may be embedded in any OLE Automation compatible client and used manually without the need for any programming or scripting.

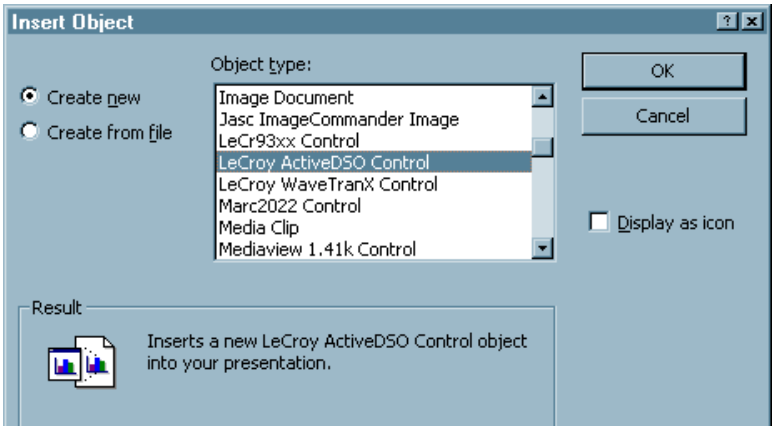
The following simple example shows the control being embedded into a Microsoft PowerPoint slide.

NOTE: This example uses PowerPoint 97. Other versions may not behave the same.

Embedded Control Example: Step 1

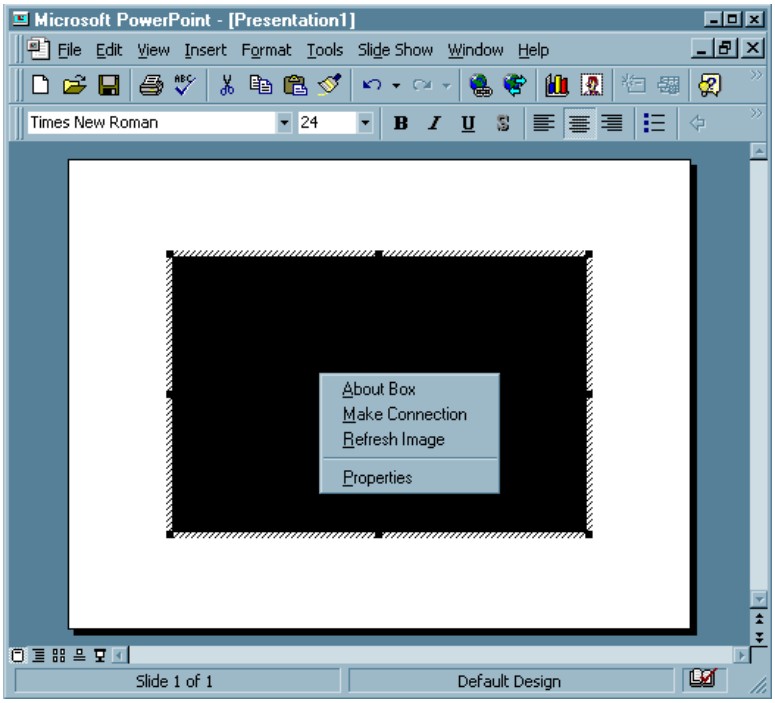
Open PowerPoint with a new blank presentation.

From the **Insert** Menu, select the **Object** menu item, then select the 'LeCroy ActiveDSO' object.



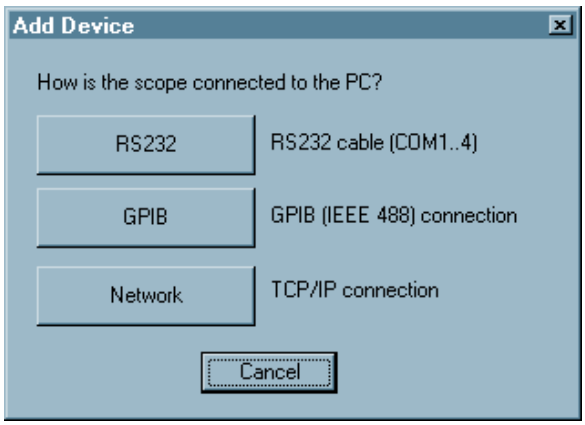
Embedded Control Example: Step 2

Right-click on the object and select the **Make Connection** menu item.



Embedded Control Example: Step 3

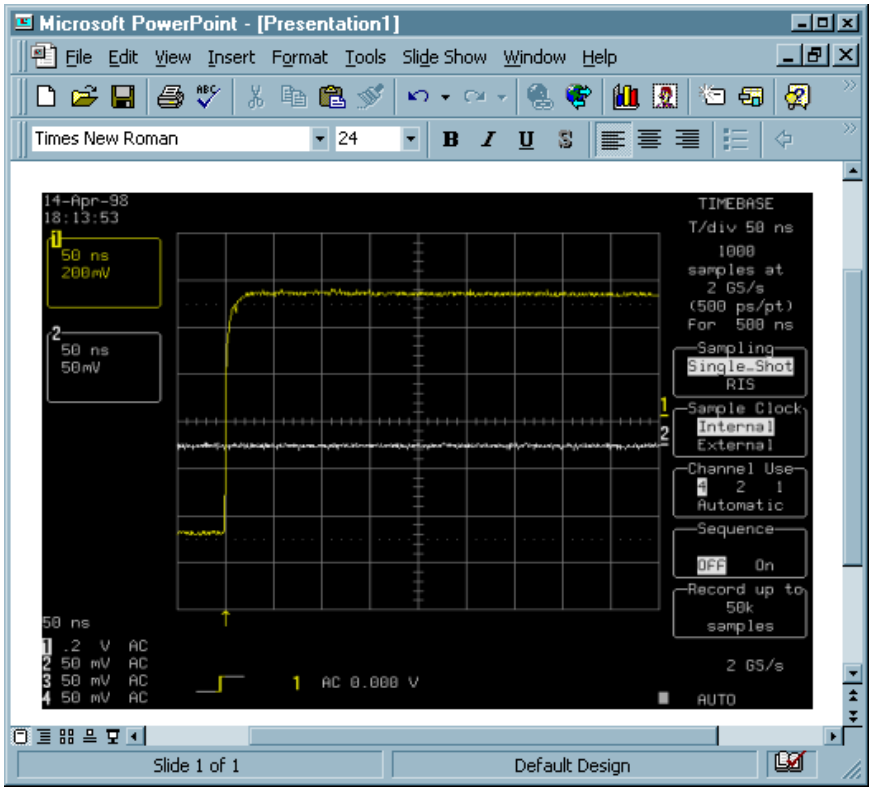
Select the type of connection that is required to communicate with your instrument. *GPIB will be used in this example.*



Enter the GPIB address of the device and click on OK.

Embedded Control Example: Step 4

Right-click on the object again and select the Refresh Image menu item. If everything is functioning correctly then the scope's current display image should appear in the control.



Accessing from VBA

VBA (Visual Basic for Applications) is the programming language built in to many of the more recent Windows applications. It is a subset of Visual Basic that makes it very simple to utilize the services of OLE Automation Servers and ActiveX Controls.

The following VBA subroutine demonstrates how easy it is to connect to a remote device (DSO/Signalyst) and send remote commands to it.

```
Sub LeCroyDSOTest()
    Dim o As Object

    Set o = CreateObject("LeCroy.ActiveDSOCtrl.1")
    Call o.AboutBox                    ' Present the control's About box
    Call o.MakeConnection("GPIB: 5")    ' Connect to the GPIB device at address 5
    Call o.WriteString("BUZZ BEEP", True)  ' Make the instrument beep
End Sub
```

To enter the VBA editor in members of the Microsoft Office suite use the **Tools -> Macro -> Visual Basic Editor** menu item.

When the Visual Basic application appears select the **Insert -> Module** menu item and type (or copy) the above example into the editor window that appears.

To execute the example position the text cursor within the subroutine either select the **Run -> Run Sub/UserForm** or press function key **F5**.

For more examples of control use from VBA refer to the description of each of the Methods and Properties.

Accessing from Visual C++ 5.0

Accessing the ActiveDSO control from within a Visual C++ application is a little more involved than under VBA. The following example shows how to create a 'wrapper' class for the control and then use the control to communicate with the instrument.

The example assumes a Visual C++ application based on the MFC libraries.

Accessing an ActiveX control from within a C++ application requires the creation of a 'wrapper class'. This is an automatically created file that contains a C++ interface to the ActiveDSO class.

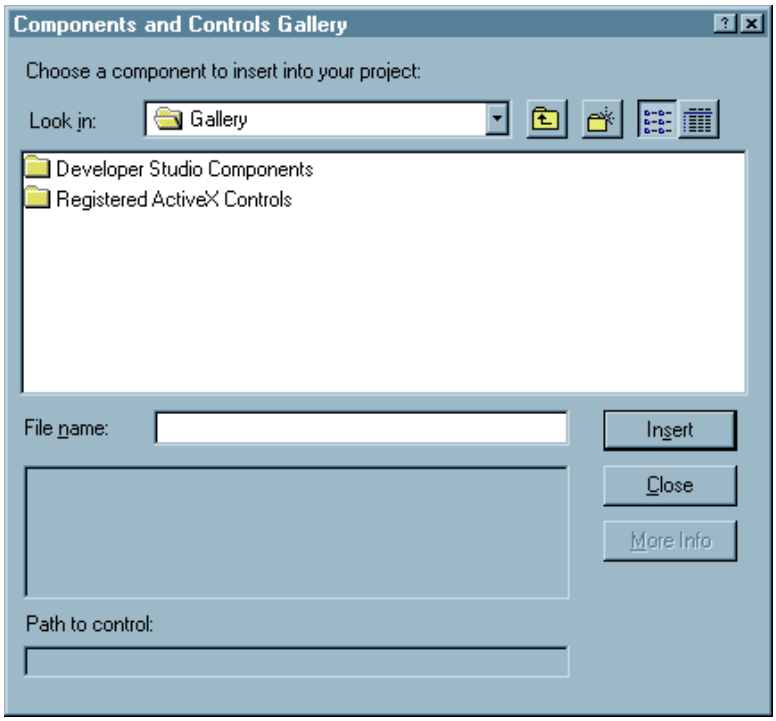
Once the wrapper class has been created the object must be instantiated and 'created' before it may be accessed.

Once communication with the device has been established and an acquisition has been taken the next major step is to read waveform data.

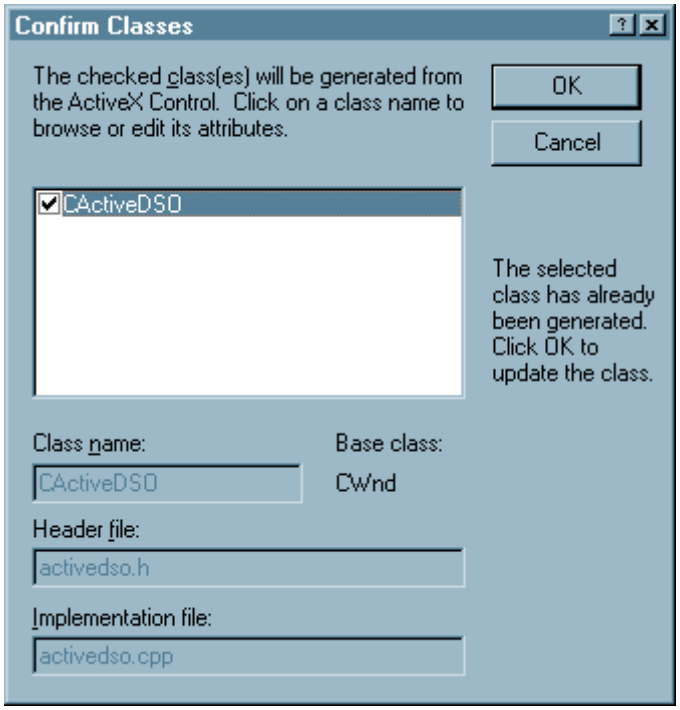
Accessing from Visual C++ 5.0: Creating the wrapper class

To create the wrapper class the following procedure may be used:

1. Enter the Project -> Add to project -> Components and controls... menu.



2. Select the Registered ActiveX Controls item.
3. Select the **LeCroy ActiveDSO Control** from the (long) list that appears. The following dialog should appear:



This dialog allows the class & file names of the 'wrapper' class to be changed, although the default is usually acceptable.

4. When the names are acceptable, click the OK button. Visual C++ will now create the two wrapper files.

Accessing from Visual C++ 5.0: Using the ActiveDSO control

1. Include the 'wrapper' header file created in Accessing from Visual C++ 5.0: Creating the wrapper class.
2. Create an instance of the control using the following code snippet (the call to **dso.Create** creates the control in a hidden window since it will be used purely as an automation server):

```
CActiveDSO dso;

RECT dummyRect;
dso.Create("LeCroy.ActiveDSOCtrl.1", "HiddenWindowForDSOControl", 0, dummyRect, this, 0);
```

3. Make a connection to the instrument using the MakeConnection method:

```
Call dso.MakeConnection("GPIB: 5");
```

4. As a quick test of the control call the **WriteString** method to cause the instrument to beep:

```
Call dso.WriteString("BUZZ BEEP", True);
```

Accessing from Visual C++ 5.0: Reading Waveform Data

Reading waveform data under Visual C++ is more complex than under Visual Basic since C++ does not natively support the VARIANT data type.

The following code snippet shows one way to access waveform data using the SafeArray support included in MFC (SafeArrayGetElement, SafeArrayGetLBound, and SafeArrayGetUBound).

The SafeArrayGetElement call is not terribly efficient. If performance is critical then the SafeArrayAccessData function should be used instead. See the Microsoft Visual C++ documentation for more information on these functions.

```
void CTestDialog::OnReadWaveform()
{
       // create the control
       CActiveDSO dso;

              RECT dummyRect;
       dso.Create("LeCroy.ActiveDSOCtrl.1", "Hello", 0, dummyRect, this, 0);

       Call dso.MakeConnection("GPIB: 5");
       Call dso.WriteString("BUZZ BEEP", True);

       // read up to 500 scaled data values from channel 1
       COleVariant  waveform;
       waveform.Attach(dso.GetScaledWaveform("C1",  // trace name
                            500,   // numPoints
                                   0);    // transfer first array

       // report any error that occurred above, if none occurred
// then loop through each data value
       if(dso.GetErrorFlag())
                  AfxMessageBox(dso.GetErrorString());
       else
       {
           long index = 0;
           long lowerBounds = 0;
           long upperBounds = 0;
           float data;

           // get the upper and lower bounds of the waveform
           SafeArrayGetLBound(waveform.parray, 1, &lowerBounds);
           SafeArrayGetUBound(waveform.parray, 1, &upperBounds);

           // loop through each element in the array
           for(index = lowerBounds; index <= upperBounds; ++index)
           {
               SafeArrayGetElement(waveform.parray, &index, &data);

…
           }
}
 }
```

Methods

The majority of the ActiveDSO methods return TRUE (non-zero) to indicate success, and FALSE (zero) to indicate failure. Upon a failure the ErrorFlag and ErrorString properties may be interrogated to learn more information about the failure. However, some of the methods return a VARIANT. To check for failure in this case, use the ErrorFlag and ErrorString properties.

AboutBox Method

The **AboutBox** method displays a dialog showing the ActiveDSO version number.

Syntax

controlName.AboutBox

Argument	Description
controlname	The name of the ActiveDSO control object.

DeviceClear Method

The **DeviceClear** method clears the connection to the device.

Syntax

Boolean controlName.DeviceClear

Argument	Description
controlname	The name of the ActiveDSO control object.
reboot	Boolean, normally FALSE, if TRUE the device will be rebooted

Returns

True on success, False on failure.

Remarks

This method will send a device clear signal to the instrument. Any unread response currently in the device's output buffer will be cleared.

If the reboot argument is true then this method will reboot the instrument. This operation may take up to 20 seconds to complete depending upon the type of device.

VBA Example

```
Sub example
       Dim o as Object
       set o = CreateObject("LeCroy.ActiveDSOCtrl.1")
       Call o.MakeConnection("GPIB: 5")  ‘ Connect to GPIB device at address 5
       Call o.DeviceClear(True)          ‘ Reboot the device
End sub
```

Disconnect Method

The **Disconnect** method disconnects the control from the device.

Syntax

Boolean controlName.Disconnect

Argument	Description
controlname	The name of the ActiveDSO control object.

Returns

True on success, False on failure.

Remarks

This method performs the necessary termination functions, which will cleanup and disconnect the interface connection.

GetByteWaveform Method

The **GetByteWaveform** method reads raw 8-bit waveform data from the instrument into a Byte array.

Syntax

Variant *controlName*. GetByteWaveform

Argument	Description
controlname	The name of the ActiveDSO control object.
traceName	String, Source trace name
maxBytes	Long, maximum number of bytes to read
whichArray	Integer, 0 = first array, 1 = second array (for dual-array waveform)

traceName := { C1 | C2 | C3 | C4 | M1 | M2 | M3 | M4 | TA | TB | TC | TD TD | F1 | Z1 | … } Some scopes/options support many more trace names, refer to the documentation for each scope/option.

Remarks

This method should be used when unscaled 8-bit waveform data is required. It is especially useful for transferring huge waveforms due to its efficient use of memory (1 byte per sample as opposed to 4 for the GetScaledWaveform).

Note that waveforms read using this function cannot be sent back into the instrument.

An important point to note when using this function is that in order to store the signed data that the scope emits (-128 to 127) into Visual-Basic's unsigned 'Byte' data type it has been shifted by 128 (0 to 255). This should be remembered when scaling the data.

Use the SetupWaveformTransfer method to define the sparsing factor (to reduce large waveforms), first point to transfer, and segment number to transfer (for sequence waveforms).

Processed waveforms are usually 16 bit waveforms and should be transmitted in 16 bit form to avoid losing precision. Call the GetIntegerWaveform method to do this.

Use the GetScaledWaveformfunction to retrieve waveform data that has already been scaled.

The whichArray parameter should normally be zero, it is used only to specify that the second array of a dual-array waveform is required. Examples of dual-array waveforms are envelope waveforms which have a min and a max value at each sample, or a complex FFT which creates a real,imaginary pair.

See Also

SetupWaveformTransfer, GetNativeWaveform, SetNativeWaveform, GetIntegerWaveform, GetScaledWaveform, GetScaledWaveformWithTimes

VBA Example

```
Sub example
       Dim o as Object
       set o = CreateObject("LeCroy.ActiveDSOCtrl.1")

       Call o.MakeConnection("GPIB: 5")        ‘ Connect to GPIB device at address 5

       ‘ Read the contents of C1 into an array
       Dim waveform() as Byte
       waveform = o.GetByteWaveform("C1", 5000, 0)

       ' Determine the number of samples read
       NumSamples = UBound(waveform)

       ' Loop through all ampl values
For i = 0 To NumSamples
amplitude = waveform(i)
Next i
End sub
```

GetCommaDelimitedString Method

The **GetCommaDelimitedString** method extracts strings from a comma-delimited list.

Syntax

String controlName. GetCommaDelimitedString

Argument	Description
controlname	The name of the ActiveDSO control object.
inputString	String, Source String
index	Long, zero-based index of string to extract

Returns

A string extracted from a comma-delimited list.

Remarks

The remote control language used by LeCroy Instruments can sometimes require a fair amount of string parsing in the remote control application. This method provides a language-independent parsing tool to simplify this.

For example, the parameter query PAVA? returns a string that may look like this:

AMPL,1.02 V,OK

The GetCommaDelimitedString method may be used to extract just the parameter value:

Value = activeDSO.GetCommaDelimitedString(pavaResponse, 1)

VBA Example

```
Sub example
       Dim o as Object
       set o = CreateObject("LeCroy.ActiveDSOCtrl.1")

       Call o.MakeConnection("GPIB: 5") ‘ Connect to GPIB device at address 5

       Call o.WriteString("C1:PAVA?", True)    ‘ Request a parameter value
       replyString = o.ReadString(80)    ‘ Ask for the instrument's reply

' Extract just the parameter value
amplitudeValue = o.GetCommaDelimitedString (replyString, 1)
End sub
```

GetIntegerWaveform Method

The **GetIntegerWaveform** method reads raw 16-bit waveform data from the instrument into an Integer array.

Syntax

Variant *controlName*. GetIntegerWaveform

Argument	Description
controlname	The name of the ActiveDSO control object.
traceName	String, Source trace name
maxBytes	Long, maximum number of bytes to read
whichArray	Integer, 0 = first array, 1 = second array (for dual-array waveform)

traceName := { C1 | C2 | C3 | C4 | M1 | M2 | M3 | M4 | TA | TB | TC | TD TD | F1 | Z1 | … } Some scopes/options support many more trace names, refer to the documentation for each scope/option.

Remarks

This method should be used when unscaled 16-bit waveform data is required.

NOTE: Waveforms read using this function cannot be sent back into the instrument.

Use the SetupWaveformTransfer method to define the sparsing factor (to reduce large waveforms), first point to transfer, and segment number to transfer (for sequence waveforms).

Processed waveforms are usually 16 bit waveforms and should be transmitted in 16-bit form to avoid losing precision. Channel waveforms are usually 8 bit waveforms and may be transferred using the GetByteWaveform method to reduce transfer time and storage requirements.

Use the GetScaledWaveform function to retrieve waveform data that has already been scaled.

The whichArray parameter should normally be zero, it is used only to specify that the second array of a dual-array waveform is required. Examples of dual-array waveforms are envelope waveforms which have a min and a max value at each sample, or a complex FFT which creates a real,imaginary pair.

See Also

SetupWaveformTransfer, GetNativeWaveform, SetNativeWaveform, GetByteWaveform, GetScaledWaveform, GetScaledWaveformWithTimes

VBA Example

```
Sub example
       Dim o as Object
       set o = CreateObject("LeCroy.ActiveDSOCtrl.1")

       Call o.MakeConnection("GPIB: 5") ‘ Connect to GPIB device at address 5

       ‘ Read the contents of C1 into an array
       Dim waveform
       waveform = o.GetIntegerWaveform("C1", 5000, 0)

       ' Determine the number of samples read
       NumSamples = UBound(waveform)

       ' Loop through all ampl values
For i = 0 To NumSamples
amplitude = waveform(i)
Next i
End sub
```

GetNativeWaveform Method

The **GetNativeWaveform** method reads a waveform from the instrument in its native binary form.

Syntax

Variant controlName. GetNativeWaveform

Argument	Description
controlname	The name of the ActiveDSO control object.
traceName	String, Source trace name
maxBytes	Long, maximum number of bytes to read
wordData	Boolean, if TRUE transmit data as 16 bit words, FALSE for 8 bit words.
blockName	String, Waveform block name

traceName := { C1 | C2 | C3 | C4 | M1 | M2 | M3 | M4 | TA | TB | TC | TD TD | F1 | Z1 | … } Some scopes/options support many more trace names, refer to the documentation for each scope/option.

blockName := { DESC | TEXT | TIME | DAT1 | DAT2 | ALL }

Remarks

Channel waveforms (C1..C4) should be transmitted in 8-bit form by setting wordData FALSE.

Processed waveforms are usually 16 bit waveforms and should be transmitted in 16-bit form to avoid loosing precision. Set wordData TRUE to do this.

Use the GetScaledWaveform function to retrieve waveform data that has already been scaled.

blockName should be used to transfer the descriptor (DESC), the user text (TEXT), the time descriptor (TIME), the data (DAT1) block and optionally a second block of data (DAT2) or all entities (ALL).

Only complete waveforms transferred with (ALL) can be sent back into the instrument using the SetNativeWaveformSetNativeWaveform_Method Method.

Use the BytesRead property to determine how many bytes were placed in the destination buffer. This value will be required to know how many bytes to send back into the instrument with the SetNativeWaveform Method.

See Also

SetupWaveformTransfer, SetNativeWaveform, GetByteWaveform, GetIntegerWaveform, GetScaledWaveform, GetScaledWaveformWithTimes

VBA Example

```
Sub example
       Dim o as Object
       set o = CreateObject("LeCroy.ActiveDSOCtrl.1")

       Call o.MakeConnection("GPIB: 5")  ‘ Connect to GPIB device at address 5

       ‘ Read the contents of C1 into an array
       Dim waveform() as Byte
       waveform = o.GetNativeWaveform("C1", 5000, False, "ALL")
End sub
```

GetParameterValue Method

The **GetParameterValue** method reads a parameter value from the instrument.

Syntax

Double *controlName*. GetParameterValue

Argument	Description
controlname	The name of the ActiveDSO control object.
sourceTrace	String, Source trace name
paramName	String, Parameter Name
retUnits	String, storage for returned Units string
retState	String, storage for returned State string

traceName := { C1 | C2 | C3 | C4 | M1 | M2 | M3 | M4 | TA | TB | TC | TD TD | F1 | Z1 | … } Some scopes/options support many more trace names, refer to the documentation for each scope/option.

paramName := { see PAVA? In remote control manual }

retState := { see PAVA? In remote control manual }

Returns

A double-precision floating-point value containing the parameter value.

Remarks

This method provides a simple way to read parameter values from the Instrument. Internally the method uses the PAVA? query to read a string containing the parameter value. This string is parsed and the value, units, and state extracted and returned.

NOTE: If the units are required ensure that the instrument is in 'COMM_HEADER SHORT' or 'COMM_HEADER LONG' mode before calling this method. If the COMM_HEADER is 'OFF' then the parameter value will be returned correctly, but the units string will be empty.

VBA Example

```
Sub example
       Dim o as Object
       set o = CreateObject("LeCroy.ActiveDSOCtrl.1")

       Call o.MakeConnection("GPIB: 5")  ‘ Connect to GPIB device at address 5

' Read the amplitude parameter measurement
Dim units As String
Dim state As String

amplitudeValue = o.GetParameterValue("C1", "AMPL", units, state)
End sub
```

GetPanel Method

The **GetPanel** method reads the instrument's control state into a String, allowing a future call to **SetPanel** to reproduce the state.

Syntax

String controlName. GetPanel

Argument	Description
controlname	The name of the ActiveDSO control object.

Returns

A string containing the hex-ascii Panel.

Remarks

Use the SetPanel Method to send the panel back into the instrument.

The size of the panel will be approximately 5000 bytes, depending upon the instrument's firmware revision.

VBA Example

```
Sub example
       Dim o as Object
       set o = CreateObject("LeCroy.ActiveDSOCtrl.1")

       Call o.MakeConnection("GPIB: 5")  ‘ Connect to GPIB device at address 5

       ‘ Read the panel from the instrument and send it back in
       Dim panelString as String
       PanelString = o.GetPanel()
       Call o.SetPanel(panelString)
End sub
```

GetScaledWaveform

The **GetScaledWaveform** method reads a scaled waveform from the instrument.

Syntax

Variant controlName. GetScaledWaveform

Argument	Description
controlname	The name of the ActiveDSO control object.
traceName	String, Source trace name
maxBytes	Long, maximum number of bytes to read
whichArray	Integer, 0 = first array, 1 = second array (for dual-array waveform)

traceName := { C1 | C2 | C3 | C4 | M1 | M2 | M3 | M4 | TA | TB | TC | TD TD | F1 | Z1 | … } Some scopes/options support many more trace names, refer to the documentation for each scope/option.

Returns

A variant containing the scaled waveform, stored as an array of single-precision floating point values.

Remarks

Use the GetByteWaveform or GetIntegerWaveform method to retrieve a waveform in its raw binary form. This may be preferable in a time-critical application.

If the time value corresponding to each sample amplitude is required use the GetScaledWaveformWithTimes method.

The whichArray parameter should normally be zero, it is used only to specify that the second array of a dual-array waveform is required. Examples of dual-array waveforms are envelope waveforms which have a min and a max value at each sample, or a complex FFT which creates a real,imaginary pair.

See Also

SetupWaveformTransfer, GetNativeWaveform, SetNativeWaveform, GetByteWaveform, GetIntegerWaveform, GetScaledWaveformWithTimes

VBA Example

```
Sub example
       Dim o as Object
       set o = CreateObject("LeCroy.ActiveDSOCtrl.1")

       Call o.MakeConnection("GPIB: 5")  ‘ Connect to GPIB device at address 5

       ‘ Read the contents of C1 (up to max. of 5000 points) into an array
       Dim waveform
       Waveform = o.GetScaledWaveform("C1", 5000, 0)

       ' Determine the number of samples read
       NumSamples = UBound(waveform)

       ' Loop through all ampl values
For i = 0 To NumSamples
amplitude = waveform(i)
Next i
End sub
```

GetScaledWaveformWithTimes Method

The **GetScaledWaveformWithTimes** method reads a scaled waveform from the instrument and stores the time and amplitude at each sample point.

Syntax

Variant *controlName*. GetScaledWaveformWithTimes

Argument	Description
controlname	The name of the ActiveDSO control object.
traceName	String, Source trace name
maxBytes	Long, maximum number of bytes to read
whichArray	Integer, 0 = first array, 1 = second array (for dual-array waveform)

traceName := { C1 | C2 | C3 | C4 | M1 | M2 | M3 | M4 | TA | TB | TC | TD TD | F1 | Z1 | … } Some scopes/options support many more trace names, refer to the documentation for each scope/option.

Returns

A variant containing the scaled waveform, stored as a two-dimensional array of single-precision floating point values. Time values are stored in the first column of the array, amplitude values are stored in the second column.

Remarks

Use the GetByteWaveform or GetIntegerWaveform method to retrieve a waveform in its raw binary form. This may be preferable in a time-critical application.

If the time value corresponding to each sample amplitude is not required use the GetScaledWaveform method.

The whichArray parameter should normally be zero, it is used only to specify that the second array of a dual-array waveform is required. Examples of dual-array waveforms are envelope waveforms which have a min and a max value at each sample, or a complex FFT which creates a real,imaginary pair.

See Also

SetupWaveformTransfer, GetNativeWaveform, SetNativeWaveform, GetByteWaveform, GetIntegerWaveform, GetScaledWaveform

VBA Example

```
Sub example
       Dim o as Object
       set o = CreateObject("LeCroy.ActiveDSOCtrl.1")

       Call o.MakeConnection("GPIB: 5") ‘ Connect to GPIB device at address 5

       ' Read the contents of C1 (up to max. of 5000 points) into an array
       Dim waveform
       Waveform = o.GetScaledWaveformWithTimes("C1", 5000, 0)

       ' Determine the number of samples read
       NumSamples = UBound(waveform, 2)

       ' Loop through all time, ampl pairs
For i = 0 To NumSamples
time = waveform(0, i)
amplitude = waveform(1, i)
Next i

End sub
```

MakeConnection Method

The **MakeConnection** method creates the connection between the control and a device.

Syntax

Boolean controlName.MakeConnection

Argument	Description
controlname	The name of the ActiveDSO control object.
address	Device address string

Returns

True on success, False on failure.

Remarks

Once the ActiveDSO object is created by the container application, this method is first one that needs to be invoked to make the initial connection to the instrument. The address argument will take an address in the form of string.

Interface	Syntax	Example
GPIB	GPIBx: nn x := 0..3 (optional) nn := 1..30	GPIB: 5
Network	IP: a.b.c.d a,b,c,d := 0 to 255	IP:128.23.24.21
RS232	COMn: baud,bits,parity,stop n := 1..4 baud := { 300 | 1200 | 2400 | 4800 | 9600 | 19200 | 57600 | 115000 } bits := 7 | 8 parity := N | O | E stop := 1 | 1.5 | 2	COM1: 19200,8,N,1
USBTMC	USBTMC:<VISA-Resource Name>	USBTMC:USB0::0x05FF::0x1023::2807N59057::INSTR

VBA Example (GPIB)

```
Sub example
       Dim o as Object
       set o = CreateObject("LeCroy.ActiveDSOCtrl.1")
       Call o.MakeConnection("GPIB: 5")  ‘ Connect to GPIB device at address 5
       Call o.WriteString("VDIV 50mV", True)
End sub
```

ReadBinary Method

The **ReadBinary** method reads a binary response from the instrument.

Syntax

Variant controlName. ReadBinary

Argument	Description
controlname	The name of the ActiveDSO control object.
maxBytes	Long, Maximum number of bytes to read

Returns

This method returns the received data in a Variant containing an array of bytes.

Remarks

This method reads a binary response from the instrument. The *maxBytes* argument indicates the maximum number of bytes to read. If there is more to read than the indicated *maxBytes*, then the remaining bytes will be left unread in the instrument.

VBA Example

```
Sub example
       Dim o as Object
       set o = CreateObject("LeCroy.ActiveDSOCtrl.1")

       Call o.MakeConnection("GPIB: 5") ‘ Connect to GPIB device at address 5
       Call o.WriteString("C1:WF? DAT1", True) ‘ Request the waveform data for C1

       Dim waveform
       waveform = o.ReadBinary(10000)    ‘ Read the data
End sub
```

ReadString Method

The **ReadString** method reads a string response from the instrument.

Syntax

String controlName.ReadString

Argument	Description
controlname	The name of the ActiveDSO control object.
maxBytes	Long, Maximum number of bytes to read

Returns

The device response is returned in a String.

Remarks

This method reads a string response from the instrument. The *maxBytes* argument indicates the maximum number of characters to read. If there is more to read than the indicated *maxBytes*, then the remaining characters will be left unread in the instrument.

VBA Example

```
Sub example
       Dim o as Object
       set o = CreateObject("LeCroy.ActiveDSOCtrl.1")

       ' Read the *IDN? Response
       Call o.MakeConnection("GPIB: 5")  ‘ Connect to GPIB device at address 5
       Call o.WriteString("*IDN?", True) ‘ Request the Scope's ID string
       replyString = o.ReadString(80)    ‘ Read the DSO's reply
End sub
```

RefreshImage Method

The **RefreshImage** method updates the control's image with the current contents of the instrument's display.

Syntax

Boolean controlName. RefreshImage

Argument	Description
controlname	The name of the ActiveDSO control object.

Returns

True on success, False on failure.

Remarks

This method is only useful if the control is embedded into a form or document. When the control is being used as an Automation server without it being visible it is of no use.

SerialPoll Method

The **SerialPoll** method returns the device's serial poll response (GPIB Devices Only).

Syntax

Boolean controlName.SerialPoll

Argument	Description
controlname	The name of the ActiveDSO control object.
response	Integer, storage for serial poll response

Returns

True on success, False on failure.

Remarks

Serial polling usually takes place once an SRQ (service request) has been asserted and is advantageous when there are several instruments involved.

The serial poll returns the STB register of the instrument. This contains a bit (SRQ) which indicates whether the device is currently requesting service.

VBA Example

```
Sub example
       Dim o as Object
       set o = CreateObject("LeCroy.ActiveDSOCtrl.1")

       Call o.MakeConnection("GPIB: 5")  ‘ Connect to GPIB device at address 5

       ‘ Serially poll the device, returns STB register
Dim x As Integer
Call o.SerialPoll(x)
End sub
```

SetNativeWaveform Method

The **SetNativeWaveform** method writes a waveform in its native binary form into the instrument.

Syntax

Boolean controlName. SetNativeWaveform

Argument	Description
controlname	The name of the ActiveDSO control object.
destination	String, Destination trace name
buffer	Byte Array, Source buffer

destination := { M1 | M2 | M3 | M4 }

Returns

True on success, False on failure.

Remarks

This method sends a waveform captured using the GetNativeWaveform method back into the instrument. Note that waveforms captured using the other GetxxxWaveform functions cannot be sent back into the instrument in this way.

VBA Example

```
Sub example
       Dim o as Object
       set o = CreateObject("LeCroy.ActiveDSOCtrl.1")

       Call o.MakeConnection("GPIB: 5")  ‘ Connect to GPIB device at address 5

       ‘ Read the contents of C1 into an array and write it back into M1
       Dim waveform() as Byte
       waveform = o.GetNativeWaveform("C1", 5000, False, "ALL")
       Call o.SetNativeWaveform("M1", waveform)
End sub
```

SetPanel Method

The **SetPanel** method sets the instrument's control state using a panel string captured using the method **GetPanel**.

Syntax

Boolean controlName. SetPanel

Argument	Description
controlname	The name of the ActiveDSO control object.
buffer	String, panel string captured with **GetPanel**.

Returns

True on success, False on failure.

Remarks

Use the GetPanel method to read the panel string.

VBA Example

```
Sub example
       Dim o as Object
       set o = CreateObject("LeCroy.ActiveDSOCtrl.1")

       Call o.MakeConnection("GPIB: 5")  ‘ Connect to GPIB device at address 5

       ‘ Read the panel from the instrument and send it back in
       Dim panelString as String
       PanelString = o.GetPanel()
       Call o.SetPanel(panelString)
End sub
```

SetRemoteLocal Method

The **SetRemoteLocal** method controls the Remote/Local state of the device.

Syntax

Boolean controlName.SetRemoteLocal

Argument	Description
controlname	The name of the ActiveDSO control object.
mode	Long, 1 = Remote mode, 0 = Local mode

Returns

True on success, False on failure.

Remarks

This method sets the instrument to Remote or Local mode, if the *mode* argument is set to 1 then the oscilloscope is set to Remote Mode, otherwise oscilloscope is set to Local Mode.

NOTE: All 94xx and 93xx/LCxxx oscilloscopes with firmware revisions prior to legacy firmware 7.2.0 require the oscilloscope to be in Remote mode before remote commands (not queries) would be accepted. All 93xx/LCxxx/LSAxxxx instruments running legacy 7.2.0 or later accept commands both in Local and Remote modes.

SetTimeout Method

The **SetTimeout** method sets the control's time-out time.

Syntax

Boolean controlName.SetTimeout

Argument	Description
controlname	The name of the ActiveDSO control object.
timeoutTime	Single, Time-out time in seconds

Returns

True on success, False on failure.

Remarks

This method sets the time that the control will wait for a response from the instrument. The methods to which this applies are:

ReadString, ReadBinary, WaitForOPC, GetByteWaveform, GetIntegerWaveform GetNativeWaveform, GetScaledWaveform, GetScaledWaveformWithTimes

SetupWaveformTransfer Method

The **SetupWaveformTransfer** configures various parameters that control the transfer of waveforms from the instrument to the PC.

Syntax

Boolean *controlName.* SetupWaveformTransfer

Argument	Description
firstPoint	Integer, The index of the first point to transfer (0 = first point).
sparsing	Integer, The sparsing factor (0 = all points, 2 = skip every other pt.)
segmentNo	Integer, Segment number to transfer (0 = all segments).

Returns

True on success, False on failure.

Remarks

This method affects how the various GetWaveform functions transfer a waveform.

For the majority of cases the default settings will be sufficient. These are:

Start Transfer at first point

Transfer all data points

Transfer all segments.

VBA Example

```
Sub example
	Dim o as Object
	set o = CreateObject("LeCroy.ActiveDSOCtrl.1")

	Call o.MakeConnection("GPIB: 5")  ‘ Connect to GPIB device at address 5

	‘ Setup waveform transfer to start sending at point 100, transfer every
' other point, and transfer data only from segment 5 of a sequence waveform.
	Call o.SetupWaveformTransfer(100, 2, 5)

End sub
```

StoreHardcopyToFile Method

The **StoreHardcopyToFile** method transfers a hardcopy image from the instrument and stores it in a file on the controlling PC.

Syntax

Boolean *controlName.* StoreHardcopyToFile

Argument	Description
controlname	The name of the ActiveDSO control object.
format	String, Hardcopy format. See list/explanation below
auxFormat	String, Auxiliary format, normally empty ("").
filename	Destination filename.

Returns

True on success, False on failure.

Remarks

This method uses the instrument's HARDCOPY_SETUP and SCREEN_DUMP remote commands to retrieve a hardcopy image and store it in a file on the controlling PC.

The *format* string may be any device shown in the remote control manual on the HARDCOPY_SETUP command page. Depending on the family (93xx, LCxxx, and LSAxxxx) and the software version, these could include:

BMP, BMPCOMP, CANONCOL, EPSON, EPSONCOL, HPDJ, HPDJBW, HPPJ, HPTJ, HPLJ, HP7470A, HP7550A, TIFF, TIFFCOL, TIFFCOMP, HPGL

The *auxFormat* string may be used to send extra information to the HARDCOPY_SETUP command. This could include the paper orientation ("FORMAT,PORTRAIT", or "FORMAT,LANDSCAPE"), page-feed ("PFEED,ON"or "PFEED,OFF"), etc. Again, see the HARDCOPY_SETUP page of the instrument remote control manual for more details.

VBA Example

```
Sub example
       Dim o as Object
       set o = CreateObject("LeCroy.ActiveDSOCtrl.1")

       Call o.MakeConnection("GPIB: 5")  ‘ Connect to GPIB device at address 5

       ‘ Read a BMP image from the instrument and store it in file 'C:\BMPImage.bmp'
Call o.StoreHardcopyToFile("BMP", "", "C:\BMPImage.bmp")

       ‘ Read a TIFF image from the instrument and store it in file 'C:\TIFFImage.tif'
Call o.StoreHardcopyToFile("TIFF", "", "C:\TIFFImage.tif")

       ‘ Read an HPGL image from the instrument and store it in file 'C:\HPGLImage.hpl'
Call o.StoreHardcopyToFile("HPGL", "", "C:\HPGLImage.hpl")

       ‘ Read an HP LaserJet formatted image from the instrument and store it in file
'C:\HPLJImage.img'
Call o.StoreHardcopyToFile("HPLJ", "PFEED,ON,FORMAT,PORTRAIT", "C:\HPLJImage.img")
End sub
```

TransferFileToDso Method

The **TransferFileToDso** method transfers a file from the PC to a mass storage device on the oscilloscope.

Syntax

Boolean *controlName*.**TransferFileToDso**

Argument	Description
remoteDevice	String, The device name for instrument end (CARD, HDD, FLPY).
remoteFileName	String, The name (and path) of the destination file on the instrument.
localFileName	String, The name (and path) of the source file on the PC.

Returns

True on success, False on failure.

Remarks

CARD applies only to legacy models.

VBA Example

```
Sub example
       Dim o as Object
       set o = CreateObject("LeCroy.ActiveDSOCtrl.1")

       o.MakeConnection("GPIB: 5")      ‘ Connect to GPIB device at address 5

    ‘ Copy localpath\localfile to remotepath\remotefile.
       o.TransferFileToDso("HDD", "D:\dso\dest.txt", "C:\pc\src.txt")

End sub
```

TransferFileToPc Method

The **TransferFileToPc** method transfers a file from a mass storage device on the instrument to the PC.

Syntax

Boolean *controlName*.**TransferFileToPc**

Argument	Description
remoteDevice	String, The device name for instrument end (CARD, HDD, FLPY).
remoteFileName	String, The name (and path) of the source file on the instrument.
localFileName	String, The name (and path) of the destination file on the PC.

Returns

True on success, False on failure.

Remarks

CARD applies only to legacy models.

VBA Example

```
Sub example
       Dim o as Object
       set o = CreateObject("LeCroy.ActiveDSOCtrl.1")

       o.MakeConnection("GPIB: 5")      ‘ Connect to GPIB device at address 5

    ‘ Copy remotepath\remotefile to localpath\localfile.
       o.TransferFileToPc("HDD", "D:\dso\src.txt", "C:\pc\dest.txt")

End sub
```

WaitForOPC Method

The **WaitForOPC** method may be used to wait for previous commands to be interpreted before continuing.

Syntax

Boolean controlName.WaitForOPC

Argument	Description
controlname	The name of the ActiveDSO control object.

Returns

True on success, False on failure.

Remarks

This method sends the query '*OPC?' to the device and waits for its reply.

WaitForSRQ Method

The **WaitForSRQ** method may be used to wait for an SRQ (Service Request) from the device.

Syntax

Boolean controlName.WaitForSRQ

Argument	Description
controlname	The name of the ActiveDSO control object.
timeoutTime	Single, Time to wait (in seconds) for an SRQ

Returns

True on success, False on failure.

Remarks

If an SRQ is detected from the device within the specified time the method will return TRUE.

WriteBinary Method

The **WriteBinary** method sends a binary data block to the device with or without a terminating EOI (End or Identify).

Syntax

Boolean controlName.WriteBinary

Argument	Description
controlname	The name of the ActiveDSO control object.
srcArray	Byte Array, Data Array to send to the device.
numBytes	Long, Number of bytes to send
EOI	Boolean, True = terminate with EOI

Returns

True on success, False on failure.

Remarks

If EOI is set to TRUE then the device will start to interpret the command immediately. This is normally the desired behavior.

If EOI is set to FALSE then a command may be sent in several parts with the device starting to interpret the command only when it receives the final part which should have EOI set TRUE.

VBA Example

```
Sub example
       Dim o as Object
       set o = CreateObject("LeCroy.ActiveDSOCtrl.1")
       Call o.MakeConnection("GPIB: 5") ‘ Connect to GPIB device at address 5

'read waveform into ‘wf’ Variant array
       Call o.WriteString "VBS app.Memory.M2.ClearMem", True ' clear M2,

' Important ! turn header off
' Important ! ALL must be used as argument for WF?
' Request the waveform data for C1
       Call o.WriteString "CHDR OFF;MSIZ 500;C1:WF? ALL", True

       Dim wf
       wf = o.ReadBinary(2000)  ' Read C1 data
       o.WaitForOPC

       Call o.WriteString "M2:WF ", False  ' Prepare the DSO to receive a waveform in M2
       Call o.WriteBinary "wf, 2000, True"   ' Send the waveform, terminate with EOI
       o.WaitForOPC
End sub
```

WriteGpibCommand Method

The **WriteGpibCommand** method sends low-level GPIB commands to the device.

Syntax

Boolean controlName.WriteGpibCommand

Argument	Description
controlname	The name of the ActiveDSO control object.
cmdArray	Byte Array, GPIB commands to send to the device.
numBytes	Long, Number of bytes to send

Returns

True on success, False on failure.

Remarks

This method is useful only for devices connected using the GPIB bus and is not usually required when communicating with a LeCroy instrument. It is used to support older GPIB devices.

When invoked while the instrument is connected via other means than GPIB, this method does nothing and returns immediately without error.

WriteString Method

The **WriteString** method sends a string to the connected device with or without a terminating EOI (End or Identify).

Syntax

Boolean controlName.WriteString

Argument	Description
controlname	The name of the ActiveDSO control object.
textString	String, Text string to send to the device.
EOI	Boolean, TRUE = terminate with EOI

Returns

True on success, False on failure.

Remarks

This method sends a string command to the instrument.

If EOI is set to TRUE then the device will start to interpret the command immediately. This is normally the desired behavior.

If EOI is set to FALSE then a command may be sent in several parts with the device starting to interpret the command only when it receives the final part which should have EOI set TRUE.

VBA Example

```
Sub example
       Dim o as Object
       set o = CreateObject("LeCroy.ActiveDSOCtrl.1")
       Call o.MakeConnection("GPIB: 5") ‘ Connect to GPIB device at address 5
       Call o.WriteString("VDIV ", False)      ‘ First part of command, no EOI
       Call o.WriteString("10V ", True)‘ Second part of command, terminate with EOI
End sub
```

Properties

BinTransferSupport Property

The **BinTransferSupport** property is a read-only **Boolean** value that is set TRUE during a call to the MakeConnection method if it is determined that the connection can support binary data transfers.

NOTE: Binary data transfers are supported by the GPIB and Network interfaces but not by the RS232 interface. The GetBinaryWaveform and SetBinaryWaveform methods automatically compensate for an interface that does not support binary data transfers by transferring the waveform in hex-ascii form.

BytesRead Property

The **BytesRead** property is a read-only **Long** value that indicates the number of bytes read from the device by the last method used.

ConnectionType Property

The **ConnectionType** property is a read-only **String** value that is set to indicate the type of connection to the device when the MakeConnection is called.

Settings

GPIB Device

Network Device

RS232 Device

DeviceModel Property

The **DeviceModel** property is a read-only String value that is set to the device model string extracted from the *IDN? query when the MakeConnection method is called.

ErrorFlag Property

The **ErrorFlag** property is a read-only **Boolean** value that is set TRUE if an error occurred since either the MakeConnection call or the last time that it was read.

If the ErrorFlag is set TRUE the ErrorString property may be used to extract a verbose description of the error.

It is highly advisable to check the state of the ErrorFlag frequently during a remote control session.

ErrorString Property

The **ErrorString** property is a read-only **String** value that should be read if the ErrorFlag property is set TRUE to extract a verbose description of the error that occurred.

NOTE: The ErrorString property is cleared by a call to the MakeConnection method, or when the ErrorString property is read.

NumChannels Property

The **NumChannels** property is a read-only **Long** value that is set to the number of channels supported by the device when the MakeConnection method is called.

ScreenType Property

The **ScreenType** property is a read-only **String** value that is set to the type of display supported by the device when the MakeConnection method is called.

Settings

Color Screen

Monochome Screen

SerialNumber Property

The **SerialNumber** property is a read-only String value that is set to the device serial number string extracted from the *IDN? query when the MakeConnection method is called.

Appendix: Wiring for RS-232 Interfaces

DB-9 to DB-9 Null-Modem cable wiring is required.

NOTE: ScopeExplorer uses the oscilloscope in Hardware Handshake mode and therefore requires a full Null-Modem cable. A cable that just connects TxD/RxD and Gnd will not function correctly.

A cable constructed using the following wiring diagram may be used to control a 93xx/LCxxx DSO from a standard PC using the RS-232 port.

Description	DB-9 Male Pin #		DB-9 Male Pin #	Description
DCD+DSR	1 and 6	<->	4	DTR
RxD	2	<->	3	TxD
TxD	3	<->	2	RxD
DTR	4	<->	1 and 6	DCD+DSR
Gnd	5	<->	5	Gnd
RTS	7	<->	8	CTS
CTS	8	<->	7	RTS

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