ASA Application Note 09-03

Connecting M1™ to your Scope: You Have Choices

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Amherst Systems Associates, Inc.
www.amherst-systems.com

Clock & Timing Engineering   M1 Waveform Tools™

The purpose of this Application Note is to outline the various configurations by which M1 Waveform Tools™ can communicate with your oscilloscope and provide detailed instructions on how to set up and configure your system for each of those choices. If you are using a digitizer system rather than an oscilloscope, please see ASA 11-01, "How to set up and use your digitizer system with M1 Waveform Tools", instead.

1   <u>System Requirements</u>

Before beginning the process of setting up your system and installing M1, please make sure that the PC you intend to install M1 on meets these minimum system requirements:

- **Processor**: Pentium 4 or equivalent

- **RAM**: 1 GB

- **Hard drive space**: 100 MB for M1, with additional storage as required for saved waveforms

2   <u>Available Interface Choices</u>

There are four different interfaces by which the user can choose to connect M1 to an oscilloscope, each of which has particular advantages and disadvantages in terms of M1's performance and responsive-

ness, as listed below. In the detailed descriptions that follow, it is assumed that the user has confirmed that their oscilloscope is capable of supported the desired type of connection.

The primary decision the user must make is whether to connect internally, by running M1 inside of a Windows-based oscilloscope, or to connect to the scope from an external PC. Note however that this decision is not permanent – if you later decide to change how you connect to your scope, you can easily do so by following the instructions for the new interface type.

Connecting Internally

- Advantages: fastest data transfer; no additional PC required, saving money and bench space

- Disadvantages: Only available for Windows 2000/XP/Vista/7-based scopes; CPU and RAM must be shared between M1 and the scope application which slows analysis; scope internal screen may be too small for effective M1 use

Connecting Externally (general)

- Advantages: M1 PC can have a fast CPU and a large amount of RAM for fastest analysis

- Disadvantages: requires installation of VISA drivers; requires additional bench space for PC

Connecting Externally via Ethernet

- Advantages: fast data transfer (up to 1 Gbps); allows the PC to be located physically away from the scope

- Disadvantages: requires the scope either be connected to the company network (which some companies do not allow) or setting up a direct Ethernet connection using a crossover cable (a one-time action)
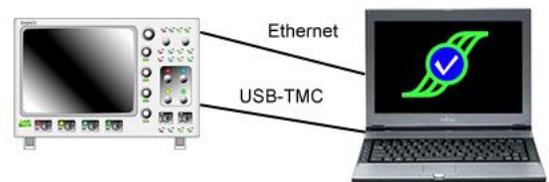
Connecting Externally via USB-TMC

- Advantages: fast data transfer (up to 480 Mbps for USB 2.0)

- Disadvantages: currently only available on certain scope models, usually mid-range or lower. (Important note: the scope must have a USB Type B/Device/square connector such as that found on a USB-connected inkjet printer to support USB-TMC; a Type A/Host/flat connector does not support USB-TMC.)
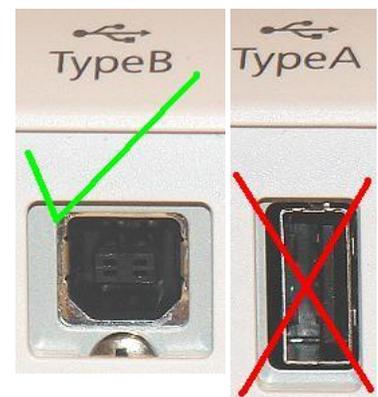
Connecting Externally via GPIB

- Advantages: only solution for some (particularly older) scopes

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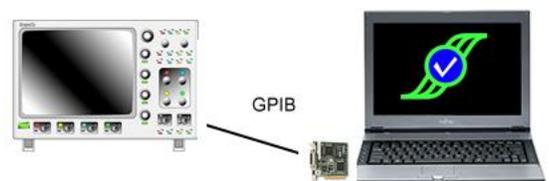
- Disadvantages: slowest data transfer from the scope; requires GPIB hardware on both the computer and the scope

3   Connecting Internally

1. Exit the oscilloscope application by choosing File/Exit from the scope's menu structure. This will decrease the chance that you will be required to reboot the scope after installation. Note that exiting the scope application is not available for all scope types; if this option is not available, it is recommended that the scope be set to Stop mode to prevent the scope application from slowing down the installation process.

2. Install and run the M1 Waveform Tools application according to the "Installing and Running the M1 Waveform Tools Software" process in Section 7 of this document. Note that where 'computer' is used in the installation process description, this is referring to the Windows-based computer inside of the scope.

4   Connecting Externally via Ethernet

1. *(Recommended)* This option requires that VISA be installed on the computer that M1 will be installed on. Please install VISA according the the "Installing the VISA Drivers" process in this document, then return here.

2. Configure the oscilloscope to use Ethernet or TCP/IP as its remote connection method. How to do this will vary from scope to scope. Please consult the User's Manual for your scope or contact the vendor for assistance with this step.

   a. **Special Note for Tektronix scope users**: In order for an external program such as M1 to be able to locate the scope on the network, the LXI LAN Server must be enabled in the scope. This option can be found in the scope's Utilities menu. Unfortunately, this option appears to be reset every time the scope is rebooted, so you will need to turn the Server back on every time you reboot the scope and wish to connect to it via Ethernet.

   b. **Special Note for LeCroy scope users**: If you have a newer version of the scope firmware that offers the option of VXI remote connection under Utilities/Remote, you must select that option instead of TCPIP.

3. The next steps will be different depending on the type of Ethernet network connection you wish to make. Follow only one of the two sets of lettered procedures below, then continue with Step #4.

4.1   Connecting over a Network

   a. You will need a way to connect both the computer and the scope to the network. For the scope, this will be via a standard cable; for the computer this may be via a standard cable or wirelessly. For each standard cable, you will need an available Ethernet port either in a wall socket or a local hub/switch.

   b. Attach one end of a standard cable to the network port on the back of the scope and the other end of the cable to an available Ethernet port

c. Attach one end of a standard cable to the network port on the back of the computer and the other end of the cable to an available Ethernet port -or- connect to the network using the computer's wireless connection

d. You should contact your company's IT department for assistance in connecting both machines to the company network. Ensure the person setting up the networking understands that both the computer and oscilloscope must have their IP Addresses and Subnet Masks set such that they will be able to 'see' one another across the network, and must both belong to the same network Workgroup.

4.2 Connecting via a Crossover Cable

a. You will need an Ethernet crossover cable[*] to directly connect the computer to the scope

b. Attach one end of the crossover cable to the network port on the back of the scope and the other end of the cable to the network port on the computer

c. Since no network DHCP server will be available to assign IP addresses, both machines must be manually configured to use hard-coded IP addresses. Both must also be assigned the same Workgroup name. The following steps will explain the procedure for setting up the connection only once, but this procedure must actually be followed twice – once for the computer and once for the scope. The specific procedure will depend on what version of Windows the computer is running, as outlined below

4.2.1 Windows 98/ME/NT (Note that this can be inside a scope only – M1 does not support these OSs)

d. Open the network device by going to Start/Settings/Control Panel and double-clicking on 'Network'

e. In the Components section of the dialog that comes up, select 'TCP/IP' and click Properties

f. Follow these steps to fill out the TCP/IP Properties dialog
   i. On the 'IP Address' tab, select 'Use the following IP address'
   ii. Enter a valid IP address. **Important**: the PC and scope must have the same values for the first 3 segments of the IP address and different values for the last segment.
   iii. Enter 255.255.255.0 for 'Subnet mask'
   iv. On the 'Gateway' tab, for 'Default gateway', enter the same value as in 'IP address'
   v. On the 'DNS Configuration' tab, select 'Disable DNS'
   vi. Click OK once to close the TCP/IP Properties dialog

g. Select the 'Identification' tab from the Network dialog and enter a Workgroup name. **Important**: both computer and scope must have the same Workgroup name or the direct cable connection will not work.

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[*] **Important**: a crossover cable is different than a standard cable and will need to be specially obtained; they generally can be purchased for US$15-20. In some cases, a crossover cable may not be required if the computer's Ethernet port is labeled as 'Auto-MDX' or 'Auto-MDIX', as most Gigabit Ethernet ports are. In this case, a standard cable can be used and the Ethernet port will automatically detect and perform the crossover function itself.

h. If 'Local Area Connection' is disabled (computer screens in the icon are grey rather than light blue), right-click on the icon and select Enable to turn on the connection. **Important**: if your computer also has a wireless network connection, you should disable that by right-clicking on the 'Wireless Network Connection' icon and selecting Disable. This will ensure that the wireless connection does not interfere in any way with the direct cable connection.

i. Click OK to close out all dialogs and save the changes you have made

j. Skip down to Step 4 on page 8 (marked with **CONTINUE HERE**)
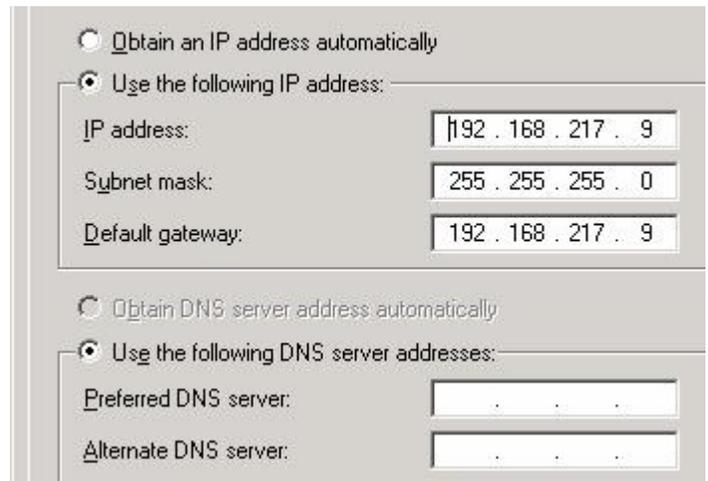
4.2.2   Windows 2000 or XP

d. Open the network device by going to Start/Settings/Control Panel and double-clicking on 'Network Connections', then right-clicking on 'Local Area Connection' and selecting Properties from the dropdown menu
  i. *(LeCroy oscilloscope only)* You can also get to the Network and Dial-up Connections window by clicking on the 'Net connections' button on the Remote tab under Utilities/ Utilities Setup…

e. In the Components section of the dialog that comes up, select 'Internet Protocol (TCP/IP)' and click Properties

f. Follow these steps to fill out the TCP/IP Properties dialog
  i. Select 'Use the following IP address'
  ii. Enter a valid IP address. **Important**: the computer and scope must have the same values for the first 3 segments of the IP address and different values for the last segment.
  iii. Enter 255.255.255.0 for 'Subnet mask'
  iv. For 'Default gateway', enter the same value as in 'IP address'
  v. Leave both DNS server entries empty
  vi. Click OK and then OK again to close both Networking dialogs

g. If 'Local Area Connection' is disabled (computer screens in the icon are grey rather than light blue), right-click on the icon and select Enable to turn on the connection. **Important**: if your computer also has a wireless network connection, you should disable that by right-clicking on the 'Wireless Network Connection' icon and selecting Disable. This will ensure that the wireless connection does not interfere in any way with the direct cable connection.

h. From the Windows Desktop, right-click on My Computer and select Properties from the dropdown menu. (If your PC does not have a My Computer icon on the desktop, go to Start/Settings/Control Panel and double-click on System.) Then select the 'Network Identification' (Windows 2000) or 'Computer Name' (Windows XP) tab on the System Properties dialog. Click on Properties (Windows 2000) or Change… (Windows XP) and create a Workgroup name in the 'Member of' section at the bottom of the resulting dialog.

Important: both computer and scope <u>must</u> have the same Workgroup name or the direct cable connection will not work.
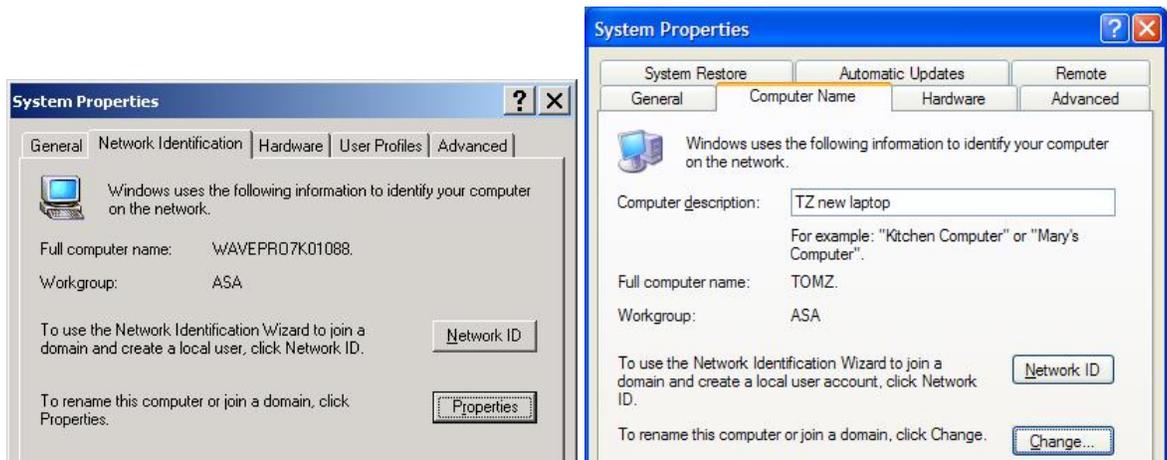
i. Click OK to close out all dialogs and save the changes you have made.

j. Skip down to Step 4 on page 8 (marked with **CONTINUE HERE**)

4.2.3   Windows Vista/7

d. Go to Start/Control Panel, select 'Network and Internet' and then 'Network and Sharing Center', then click on 'Manage Network Connections' from the choices in the left hand column

e. Right-click on 'Local Area Network' and select Properties from the dropdown menu

f. Select 'Internet Protocol Version 4 (TCP/IPv4)' in the Components section of the dialog and then click Properties

g. Follow these steps to fill out the TCP/IP Properties dialog
   i. Select 'Use the following IP address'
   ii. Enter a valid IP address. **Important**: the computer and scope must have the <u>same</u> values for the first 3 segments of the IP address and <u>different</u> values for the last segment.
   iii. Enter 255.255.255.0 for 'Subnet mask'
   iv. For 'Default gateway', enter the same value as in 'IP address'
   v. Leave both DNS server entries empty
   vi. Click OK and then OK again to close both Networking dialogs

h. If 'Local Area Connection' is disabled (computer screens in the icon are grey rather than light blue), right-click on the icon and select Enable to turn on the connection. **Important**: if your computer also has a wireless network connection, you should disable that by right-clicking on the 'Wireless Network Connection' icon and selecting Disable. This will ensure that the wireless connection does not interfere in any way with the direct cable connection.

i. In the Search bar at the top right of the Control Panel window, type 'Workgroup' and then click on 'Change workgroup name'
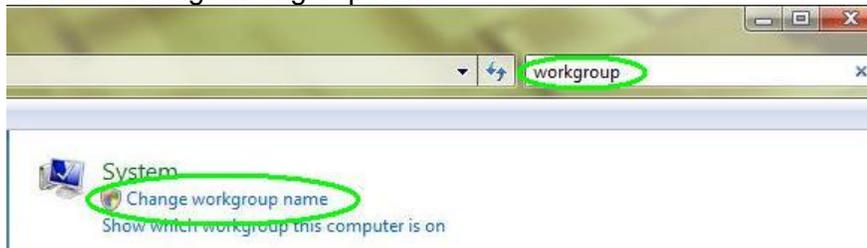
j. This will bring up the System Properties dialog, where you should click on Change to bring up the 'Computer Name Changes' dialog. Edit the Workgroup name as required, then click OK to close out of all open dialogs. Note that Windows may require you to reboot at this point.

4. **CONTINUE HERE**
   Install VISA on the external PC and confirm that the computer is able to connect to the oscilloscope by following the procedure in Section 6 (Installing and Testing the VISA Drivers) of this document.

5. Install and run the M1 Waveform Tools application according to the "Installing and Running the M1 Waveform Tools Software" process in Section 7 of this document.

5 Connecting Externally via USB-TMC

1. This option requires that VISA be installed on the computer that M1 will be installed on. Please install VISA according the the "Installing the VISA Drivers" process in this document, then return here.

2. Connect a USB A/B cable between the oscilloscope and the computer. The Type A/Host/flat end of the cable should be connected to the computer and the Type B/Device/square end of the cable should be connected to the scope.

3. Configure the oscilloscope to use USB as its remote connection method. How to do this will vary from scope to scope. Please consult the User's Manual for your scope or contact the vendor for assistance with this step.

4. Install VISA on the external PC and confirm that the computer is able to connect to the oscilloscope by following the procedure in Section 6 (Installing and Testing the VISA Drivers) of this document

5. Install and run the M1 Waveform Tools application according to the "Installing and Running the M1 Waveform Tools Software" process in Section 7 of this document.

6   Connecting Externally via GPIB

1. This option requires that VISA be installed on the computer that M1 will be installed on. Please install VISA according the the "Installing the VISA Drivers" process in this document, then return here.

2. Configure the oscilloscope to use GPIB as its remote connection method. How to do this will vary from scope to scope. Please consult the User's Manual for your scope or contact the vendor for assistance with this step

3. Connect one end of a GPIB cable to the GPIB connector on the back of the scope and the other end to the GPIB hardware on the computer. This may be:
   a. A standard GPIB connector if you are using an internal GPIB adapter
   b. A proprietary connector if you are using e.g. the NI PCMCIA-GPIB adapter
   c. A USB connector if you are using a USB-GPIB adapter

4. Install VISA on the external PC and confirm that the computer is able to connect to the oscilloscope by following the procedure in Section 6 (Installing and Testing the VISA Drivers) of this document

5. Install and run the M1 Waveform Tools application according to the "Installing and Running the M1 Waveform Tools Software" process in Section 7 of this document.

7   Installing and Testing the VISA Drivers

1. **Critical**: follow this procedure only if you are connecting M1 to your scope externally; installing VISA drivers on the scope may cause the scope to stop working properly

2. **Important**: the oscilloscope should not be attached to the computer during the VISA driver installation process

3. **Important**: the VISA drivers must be installed before the M1 software is installed

4. ASA officially supports only National Instruments (NI-VISA) and Keysight/Agilent Technologies' (Agilent IO Libraries) VISA implementations
   a. This does not mean that other VISA implementations (e.g. TekVISA) will not work with M1, only that they have not been tested by ASA and therefore are not officially supported because they may not work properly
   b. *(Agilent IO Libraries only)* Note that Keysight/Agilent Technologies (AT) VISA is not required to connect to an AT oscilloscope (i.e. NI-VISA may be used instead), nor will AT VISA only allow connections to an AT scope. For making an Ethernet connection, you must have IO Libraries version 14.0 or higher.
      i. *(LeCroy scopes only)* ASA has experienced difficulty in connecting M1 to a LeCroy scope via Ethernet using AT VISA. Given that NI-VISA does not give problems and that M1 does not know what type of VISA it is using, this is

believed to be an issue with AT VISA. At this time, ASA does not support the use of AT VISA for Ethernet connection to a LeCroy scope.

    ii. *(Windows 7 only)* ASA has experienced difficulty in connecting M1 to a scope using Agilent IO Libraries. Given that NI-VISA does not give problems and that M1 does not know what type of VISA it is using, this is believed to be an issue with AT VISA. At this time, ASA does not support the use of AT VISA under Windows 7 for an Ethernet connection.

  c. *(NI-VISA only)* Note that installation of National Instruments NI-488.2 package is a prerequisite for installation of NI-VISA. In ASA's experience the NI-488.2 installation package will provide the option to install NI-VISA at the same time.

5. **Important**: a software license for VISA is <u>not</u> included with M1 and must be obtained separately. A license can be obtained in one of several ways:

    a. If you are connecting externally via GPIB, your GPIB hardware will most likely have included a license for VISA; read the GPIB hardware installation documentation or ask the vendor if you are unsure

    b. If you own a Keysight/Agilent Technologies oscilloscope, it is ASA's understanding that such purchase entitles you to one license of Agilent IO Libraries[†].

    c. You may purchase a license from your preferred vendor

6. The chosen VISA package (and any necessary prerequisites) should be installed according to the vendor's instructions. In many cases, this will be a simple matter of running the installation program and selecting Next at all prompts. In other cases, specific decisions or choices may be required to create a proper installation. ASA can provide assistance if you are unsure of how to proceed.

7. Installation of the VISA drivers may require a reboot of your computer before proceeding. If you are installing GPIB hardware, you should shut off the computer and install the new hardware before rebooting in accordance with the manufacturer's instructions.

8. Before installing M1, it is recommended that you verify that the computer is able to see and communicate with the oscilloscope directly. If the computer cannot see and properly communicate with the scope directly, M1 will not be able to do so either. There are two variants of this procedure depending on which vendor's VISA you have selected. In either case, both the computer and the oscilloscope must be fully powered up, and the scope application must be running.

(LeCroy scopes only) From the scope menu, select Utilities/Utilities Setup. Select the Remote Control tab and ensure that 'Control From' on the left side has TCPIP selected, **unless** there is a VXI option available <u>and</u> you are connecting externally. In that case you should select VXI as the control option.

(Tektronix scopes only) From the scope menu, select Utilities/LAN Server Status and ensure that the LXI Server Status is On. Please note that the Server is reset every time you reboot the scope, and so you will need to turn it on again after rebooting and prior to running M1.

7.1 <u>NI-VISA</u>
(for Agilent IO Libraries, see page 11)

[†] **Important**: ASA does not warrant in any way that this understanding is correct, either at the time this document was written or any time thereafter. It is the sole responsibility of the user to ensure that they are in compliance with the licensing terms of their VISA software and any other necessary prerequisite software packages.

1. Run the National Instruments Measurement and Automation Explorer (NI-MAX) utility by double-clicking on its icon on the desktop (or selecting it from Start/Programs/National Instruments)

2. Under Configuration, click on the + to open Devices and Interfaces

3. Depending on how you will interface to your scope, the instrument will appear in one of three different places
   a. If you are connecting via GPIB, your GPIB hardware device will show up as GPIB0 and your scope will appear as an entry under GPIB0 when you expand it by clicking the +
   b. If you are connecting via USB-TMC, your scope will show up as an entry under USB0 when you expand it by clicking the +
   c. If you are connecting via Ethernet, your scope will show up as an entry under VISA TCP/IP Resources when you expand it by clicking the +. **Note that Ethernet-connected scopes will not always show up automatically in NI-MAX and may need to be added manually**. If your scope is not shown, right-click on Devices and Interfaces and select Create New… From the dialog that comes up, select "VISA TCP/IP Resource" and click Next. On the next dialog, select "Manual Entry of LAN Instrument" and click Next. Finally, enter the IP address you have assigned to the scope and 'inst0' for LAN Device Name and click Validate. You should see a success message, after which you can click Finish and your scope will now be available under VISA TCP/IP Resources in the Configuration pane.

4. After locating your scope in the Configuration pane, select it and click on "Open VISA Test Panel" just to the right of Configuration

5. Uncheck "Show All VISA Operations" at the top right if it is checked.

6. From the viWrite tab, ensure that the Buffer is set to "*IDN?\n" and click Execute at the bottom right.

7. Switch to the viRead tab and click Execute at the bottom right. The scope's identifier string should appear in the Buffer box, and the Return Status should be zero.

8. If you can see the IDN string and have a zero return code, then the computer is able to see the scope. You should now return to the section for your chosen connection type to proceed.
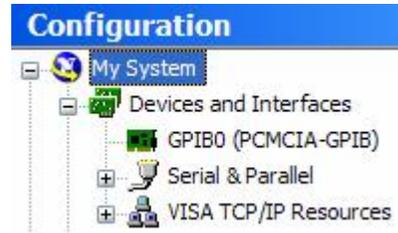
7.2 <u>Agilent IO Libraries</u>
(for NI VISA, see page 10)

1. Open the Connection Expert utility by right clicking on the 'IO' icon in the system tray and selecting Agilent Connection Expert.

2. Depending on how you will interface to your scope, the instrument will appear in one of three different places under "Instrument I/O on this PC" in the center pane
   a. If you are connecting via GPIB, your GPIB hardware device will show up as GPIB0 and your scope will appear as an entry under GPIB0 when you expand it by clicking the +
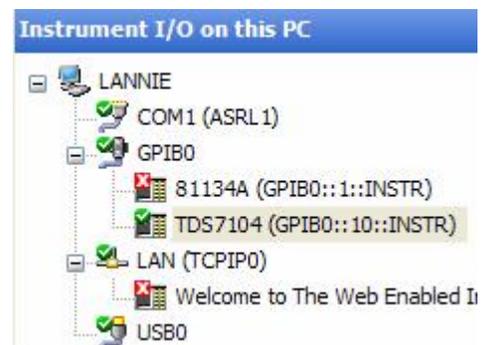
b. If you are connecting via USB-TMC, your scope will show up as an entry under USB0 when you expand it by clicking the +

c. If you are connecting via Ethernet, your scope will show up as an entry under LAN (TCPIP0) when you expand it by clicking the +. If it doesn't show up automatically, click on Add Instrument from the toolbar and select Add Address. Click on 'Use IP Address' and enter the scope IP address. Ensure that 'Use socket connection' is not checked, and click on Test Connection. Select '*IDN query' under 'Instrument Identification' and then click OK to exit.

3. After locating your scope, right click on it and select "Send Commands to this Instrument" from the popup menu

4. A dialog will come up, with "*IDN?" already filled in as the default command. Click on the Send & Read button.

5. Under "Instrument Session History", the scope's identifier string should appear.

6. If you can see the IDN string, then the computer is able to see the scope. You should now return to the section for your chosen connection type to proceed.
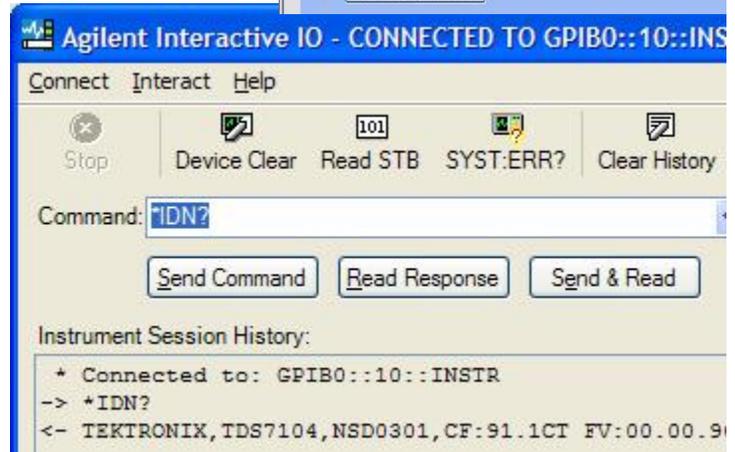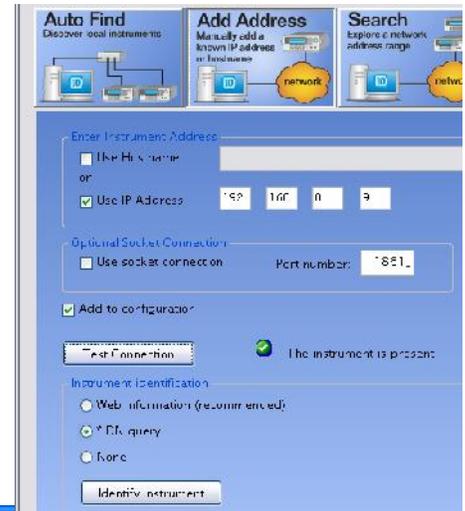
8   Installing and Running the M1 Waveform Tools Software

1. **Important**: if you have a USB hardware security key such as that pictured to the right, be sure it is not attached to the computer during the installation process.

2. *(Windows Vista only)* Installation of the security drivers for M1 requires that Vista's User Account Control (UAC) be turned off. To turn off UAC, open the Control Panel and type 'uac' in the Search bar at the top right of the Control Panel window, select 'Turn User Account Control (UAC) on or off', then clear the 'Use User Account Control (UAC) to help protect your computer' checkbox. When you click OK to confirm, Vista may require you to reboot.

3. Do one of the following, depending on where the M1 installation package resides:
   a. Insert the M1 installation CD into the computer CD drive, navigate to the CD drive in Windows Explorer, and run M1OT_Setup.exe
   b. Attach a USB flash drive containing the M1 installation package to the computer, navigate to the USB drive in Windows Explorer, and run M1OT_demo.exe (M1 Ultimate Edition or Reader) or M1OT_Std.exe(M1 Standard Edition)
   c. Navigate in Windows Explorer to the network location where the M1 installation package resides and run M1OT_demo.exe (M1 Ultimate Edition or Reader) or M1OT_Std.exe(M1 Standard Edition)

4. It is recommended that you install M1 under an Administrator account to prevent any possible issues with the Security Key drivers. In Windows 2000/XP, this means logging into Windows using an account with Administrator priviledges. In Windows Vista/7, this means right-clicking on the installer and choosing 'Run as Administrator' from the context menu.

5. Follow the instructions in the installer application to install M1. Unless you have good reason to select otherwise, it is recommended that you simply click Next or Yes at each step. Note that you will be prompted to install the Microsoft .NET Framework (required by M1) as well if it is not already installed on your system.

6. Security driver and .NET Framework installation may require you to reboot. If the installer informs you that a reboot is needed, please reboot the computer now before proceeding.

7. If you have a USB hardware security key such as that pictured above, please attach it to an available USB port on the computer at this time.

8. **Note**: Depending on your anti-virus/anti-malware software, HASPLMS.EXE and possibly related DLLs may be flagged as 'suspicious'. This is a common false-positive for security drivers. Please be assured that ASA has fully tested the installation package and its contents for viruses and malware.

9. **Important**: it is <u>strongly recommended</u> that you spend a few minutes to watch the M1 Mini Flight School videos prior to starting to use M1. The M1 interface has been specifically designed for ease-of-use and to allow you to be as productive as possible, and is different from other oscilloscope application interfaces you may be familiar with. To use an analogy, a modern fighter jet cockpit achieves similar goals, but without an introduction to how everything is designed to work together you might find the jet's interface confusing.

   The Mini Flight School videos (as well as a collection of other videos designed to quickly introduce you to various aspects of M1's functionality) are available from M1's Training menu as well as online at

   www.m1ot.com/training

10. **Important**: the scope application <u>must</u> be running in order for M1 to function, even if you are running M1 inside of the scope. M1 communicates with the scope application, not with the scope hardware itself. If you exited the scope application for any reason, please restart it now by clicking on the scope application icon on the scope desktop.

11. *(LeCroy oscilloscopes only)* You must set the scope's Remote mode to TCPIP. To do this, first select Utilities/Utilities Setup… from the scope's menu. Select the Remote tab, then under 'Control from' on the left side ensure that TCPIP is selected, **unless** there is a VXI option available <u>and</u> you are connecting externally. In that case you should select VXI as the control option.

12. Connect your signal to the scope and set the sample rate and memory depth as desired
    a. **Important**: There <u>must</u> be a live signal available on the scope before M1 is started. M1's AutoMeasure feature will trigger the scope several times during startup as it detects and sets up your signals.
    b. The scope's internal trigger must be set such that a Single acquisition from the front panel of the scope actually triggers and collects data. This is the trigger method that M1 uses, and M1 will therefore time out and fail to detect the your signals if the scope trigger is not set appropriately.
    c. When first starting M1, it is recommended that you use a moderate memory depth of 100-200Kpts per channel to confirm that everything is working properly prior to switching to deeper memory settings
    d. M1 requires a <u>minimum</u> memory depth of 10Kpts per channel; if a lower setting is found, M1 will automatically attempt to increase it
    e. For performance reasons, M1 by default limits acquisitions to a <u>maximum</u> memory depth of 2Mpts per channel. This can be changed in Preferences/Performance.
    f. For most oscilloscopes, M1 can only access the data that is currently being shown on the scope screen. This means that if you wish to capture 1000s of edges per acquisition, you must increase the timebase so that 1000s of edges are shown onscreen. The primary exceptions to this rule are Keysight/Agilent Technologies Windows-based scopes where the memory depth can be set independently of the timebase from the Setup/Acquisition dialog.
    g. For most oscilloscopes, Sample Rate, Timebase, and Memory Depth are linked. This means that changing one of these parameters will generally result in one of the others being

changed as well. This is an important fact to keep in mind as you set up the scope so that you do not inadvertently decrease the Sample Rate while attempting to increase the Memory Depth. The primary exceptions to this rule are Keysight/Agilent Technologies Windows-based scopes.

    h.   *(LeCroy scope specific)* To ensure proper setup of the scope for use with M1, please do the following from the scope application:
- i.   click on Timebase (lower right)
- ii.   select the SMART Memory tab
- iii.   make sure Sample Mode (right side) is set to Real Time
- iv.   select 'Fixed Sample Rate' on the left side
- v.   set the Sampling Rate to the maximum available unless you specific reasons to do otherwise

13. Start M1 by one of the following methods:
    a. *(Running inside of a Keysight/Agilent oscilloscope only)* Select Analyze/ASA M1 Waveform Tools from the scope's menu
    b. Double-click the M1 icon on the desktop
    c. Go to Start/Programs/M1/M1 Waveform Tools and select the M1 icon

14. Occasionally, M1 will initially not be able to properly recognize a network-attached scope and you will see a message indicating that no scope was found. In this case, select Measurement Setup from M1's Main Menu tab then click on Scope IP Address. Enter the scope's IP address in the box provided, then click OK. Click OK once more to rerun AutoMeasure.

15. M1's AutoMeasure feature will automatically detect the scope and the signals attached, and open an appropriate set of measurements.

16. The M1 Mini Flight School videos (and other videos) available at www.m1ot.com/training will give you a solid start on where to go next and how to move around the M1 interface, but a brief overview of the most important controls is as follows:

    a. The big green GO button will take an acquisition, or start a sequence of acquisitions, either Live or Saved, depending on the acquisition type you have selected under the GO mode button.

    b. The NEW button to the right of the GO button will start the New Measurement wizard to enable you to open additional measurements. There is no limit to the number of measurements you can have open simultaneously, although a maximum of 4 measurements can be shown in the main viewing area at any one time.

    c. TestScripts/compliance tests are accessed by selecting the Measurement Tools menu from the Main Menu tab and then clicking Compliance/TestScript

    d. When you're ready to leave, the Save button will allow you to save the waveform data, graphics, measurement results, and other items. You also have the option to create a PDF report showing the current state of every measurement.

9 <u>References</u>

"Preserving Performance and Responsiveness in M1 Waveform Tools™" – ASA White Paper, April 2009