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Returning Thermal Advantage Instrument's DSC 2920 and SDT 2960 to Functioning Order

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Returning Thermal Advantage Instrument's DSC 2920 and SDT 2960 to Functioning Order

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Abstract

Thermal Advantage (TA) Instruments DSC 2920 and SDT 2960 require a computer running Windows NT 2000 and an Industry Standard Architecture (ISA) expansion card to output and record data. Due to the lack of availability for this older software and hardware, a virtual machine running Windows NT 2000, using Oracle VM VirtualBox as the virtualization software, and a GPIB-USB-SH converter were used to allow a modern computer to interface with the DSC and SDT. The Windows NT virtual machine ran the necessary TA software to communicate with the DSC and SDT and USB pass-through was used to allow the virtual machine to see the instruments via the GPIB-USB-SH converter. Both the DSC and SDT successfully communicated and output data to the modern computer.

1. Setting Up the Virtual Machine and Instruments

This is an attempt to describe how to rebuild the virtual machine system from scratch that runs the DSC and SDT. This guide will include the procedure for setting up the virtual machine and software needed to run the DSC and SDT. However this guide could also be used to setup a virtual machine for other instruments.

All files described in this guide should be located at
C:\Users\chem\Documents\Ethan\DSCandSDTFiles on the computer running the SDT.

Host=the computer running the virtual machine

VM=the virtual machine

Setting up Virtual Machine

1. Download and install Oracle VM VirtualBox <https://www.virtualbox.org/>
 - The most recent version should be fine, but version Version 5.1.22 r115126 (Qt5.6.2) is known to work
2. Create a new virtual machine, click the blue sun icon that says new
3. Enter Desired name, Type-Microsoft Windows, Version-Windows 2000, hit next
4. Select desired amount of RAM to be passed to virtual machine, next
 - 256 MB is known to be enough, too much and break old OS
 - Windows 2000 has a 4 GB cap on anything
5. Create a virtual hard disk now, create
 - If you have a vdi backup of a machine you want to use, select use an existing virtual hard disk file, then select vdi file
6. Select VDI hard disk type, next
 - it's the easiest for just VirtualBox, but VHD is easiest to use between different virtual machine softwares
7. Select Dynamically allocated, next
 - Dynamically mean the vdi file
8. Enter a name for the vdi file, select max file size of 4 GB, create
 - Anymore will break Windows 2000
9. A new virtual machine, VM, should be created.
10. Right click the VM, settings, storage

11. Controller type should be IDE, Type PIIX4
 - Windows 2000 requires IDE, not SATA, but it should default to this
12. You should see your vdi file and empty disk drive
 - If no disk drive, select Controller:IDE, disk with green plus, leave empty
13. Select empty disk drive, click on cd on right of screen, chose virtual optical disk file
14. Navigate to EN_WIN2000_PRO_SP4.ISO, select it, press ok on windows
15. Start virtual machine with green arrow, it should boot into Windows 2000 setup iso
16. Follow installer until you get to portioning hard drive space
17. Install to entire unallocated space, partition using the NTFS file system
18. Allow installation to finish, reboot,
19. Should get prompt to boot form CD, DON'T boot form cd
 - If you go under storage and remove the CD this prompt will go away
20. Should get screen Windows 2000 professional Setup, allow to finish, screen will flash
21. When prompt appears, hit next, enter desired Test name
22. Enter CD key from Windows2000lisence.jpg
 - While this is technically a single computer key, it will install on as many computer as you want, proceed at own discretion
23. Enter computer name and admin password, set time and date
24. Select Typical Setting, No this computer is not on a network
25. Allow installer to finish, click finish, should reboot
26. Windows 2000 should boot, check Windows always assumes the following....
 - This is for convenience, means it will automatically login that user in
27. Enter password for that user, next, finish
28. You should now be in windows 2000, reboot and make sure everything still works

Setting up USB Pass Through

1. Download and install the Oracle VM VirtualBox Extension Pack
<https://www.virtualbox.org/wiki/Downloads>
 - This is required for USB pass through
2. Ensure that the GPIB-USB-HS adaptor is plugged into the host computer
3. Enter settings, orange gear, then USB

4. Ensure Enable USB Controller is checked and USB 2.0 (EHCI) is selected
5. Select the usb device with a green plus on the right, select National Instrument GPIB-USB-HS
6. Select OK
7. This allows the VM to see and interface with the GPIB-USB-HS

Setting up Share Folder

1. Enter settings, orange gear, then shared folder
2. Select folder with green plus on right
3. Select folder you want to share between bot the host and VM, check auto-mount
4. Press OK
5. Once in the VM, select devices from the toolbar, inset guest addition CD image
6. Then go to my computer, in the VM, and you should see the VBOXADDITION mounted as a cd
7. Run the cd and install the software
 - select yes to all the windows about unrecognized software license
8. Reboot VM, under my computer you should now see the shared folder as a network drive
9. Now any file placed in that folder or a sub folder will be seen by both the host and VM
 - This is how you transfer files to or from the VM

Installing GPIB-USB-HS Drivers

1. Run ni4882273.exe on the **host** computer.
2. Select OK, select desired unzip location, select Unzip
3. Once finished the installer should open up
 - If not navigate to unzip location, run autorun.exe
4. Select install software, allow installation to finish
 - the default components selected for install should be alright
5. Repeat this process on the **VM**
 - Use the shared folder to transfer ni4882273.exe to the VM
 - Windows 2000 default installation wizard may pop-up, just cancel that
6. If the installer fails, which it might, there is still hope. Navigate to unzip location, then Product folder.
7. You should now see lots of folders. Instead each one is an .msi files. You must install all of the drivers manually by ruining each msi file in each folder. Yes, there is a lot of them.
 - If there is more than one msi file in a folder, one is for 64-bit and one for 32-bit computers. If the host or VM you are installing on is 64-bit, use the msi with 64 in the name. If the host or VM is 32-bit, Windows 2000 is 32-bit, use the installer

with either 32, x86, or just not the 64 bit msi. If only one msi, use that for both 64 and 32 bit computers.

8. Try to install all the msi files. If one fails, just move onto the next one and hope that the failed msi file wasn't important

Installing TA Software on VM

1. Using Virtualbox mount the TS_NT_R26.iso to the VM
 - Toolbar Device, Optical Drive, Chose image
2. In VM, under my computer, run the CD
 - select Thermal Solutions for Windows NT
3. Enter anything under Name, Company, and Serial
 - Typical install should be good
4. Allow install to finish
5. If you try to run the software now it will complain about a missing key.
6. Copy the TAAAdv.exe to the TA Software install folder
 - Most likely C:\Program Files\TA Instruments\Thermal Solutions\
7. Create shortcut for the TAAAdv.exe
8. Right click shortcut, properties, edit target path so there is a -k after the last “
9. Run that shortcut and as long as that program is running no other TA program should complain about a missing key

2. General Operating Procedure for the DSC and SDT

NOTE: DON'T CLOSE THE VIRTUAL MACHINEN WINDOWS USIGN THE X IN THE TOP RIGTH CORNER.

Windows 2000 is especially susceptible to damage if power loss occurs during the boot and power-off sequences. Closing the virtual machine window using the X in the top-right hand corner is the same thing as a power loss, so that could damage the Windows 2000 install. Whenever possible shutdown the virtual machine properly from within Windows 2000. Only use the X in the top-right hand corner as a last resort.

Starting Data Collection

1. Turn on the SDT and DSC before starting the virtual machine.
2. Run the Windows 2000 shortcut located on the desktop.
3. Once in the Windows 2000 virtual machine, run the shortcut TAAAdv located on the desktop.
4. As long as the TAAAdv program is running, no other TA application should complain about a missing key.
5. TAAAdv should open two windows one which interfaces with the SDT and which interfaces with the DSC.
6. Use the windows for the respective instrument to collect data.

DSC Method Set-up

1. Once in the DSC Window

Shutting Down Virtual Machine

1. Close TAAAdv and any other TA applications
2. Go to Start Menu, inside virtual machine, select shutdown. A second window should appear. You can choose shutdown or restart.
3. When the virtual machine has shutdown it will close the windows itself. **Don't** attempt to close the virtual machine window early using the X in the top-right hand corner

Useful Information

With Standard DSC cell only:

Purge Gas:50 mL/min N₂ 25 mL/min He

Air Cool: 20 to 120 psi

Vacuum: Capped

More info page 3-29, TA Instruments Thermal Analysis & Rheology (physical)

Rheology Temperature Range: Room Temp-725 C, TA Instruments Thermal Analysis & (physical)

$1 \text{ cm}^3/\text{min} = 1 \text{ mL}/\text{min}$

ROTAMETER CALIBRATION DATA

<p>Model Number 270134.001 Tube Number N032-41ST Float Number Spherical Float Material 316 SS</p>	<p>Ref. Conditions 1 ATM & 70° F Range 5.00 - 142 (cm³)/min Metering Temp. 21.1°C (70°F) Metering Press. 14.7 PSIA</p>
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mm SCALE READING	ACTUAL FLOW in (cm ³)/min.			
	Air	N2	Ar	He
150.0	142	140	117	141
140.0	124	123	102	120
130.0	110	109	90	103
120.0	97	97	80	90
110.0	89	83	68	75
100.0	69	70	56	61
90.0	59	61	48	52
80.0	49	50	40	42
70.0	39	40	32	33
60.0	31	33	26	27
50.0	23	24	19	19
40.0	18	19	15	15
30.0	12	12	10	10
20.0	8	8	6	7
10.0	5	5	4	4

-Conversion table for TA manostat from MM to flow rate

In TAManual.pdf (digital)

3-12 Segment descriptions for Methods

6-7 Calibration of DSC device

Troubleshooting

If a machine isn't being detected, shutdown the virtual machine and check all connections. The connections are sensitive and if all the connections aren't tight this can lead to only partial detection of a machine.

- If a machine isn't being detected, from the menu bar in the virtual machine window, select Device, then USB. The next window should have a check next to National Instruments GPIB-USB-HS. If unchecked, check it. This tab controls what USB devices are passed to the virtual machine. In order for the virtual machine to see the instrument the usb converter, National Instruments GPIB-USB-HS, must be passed to it.

-If an instrument throws an error, go to the window inside TAAAdv for that machine. From the menu bar for that windows select view, then Error Log. This will provide information about the nature of the error.