Shake Box Project

Connecting Shake Box to a Linux Computer

Presentation

ShakeBox in Action

Presented from:

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Glen Hockett

Bin Tang

Dated: 7-2-2014

Project Description:

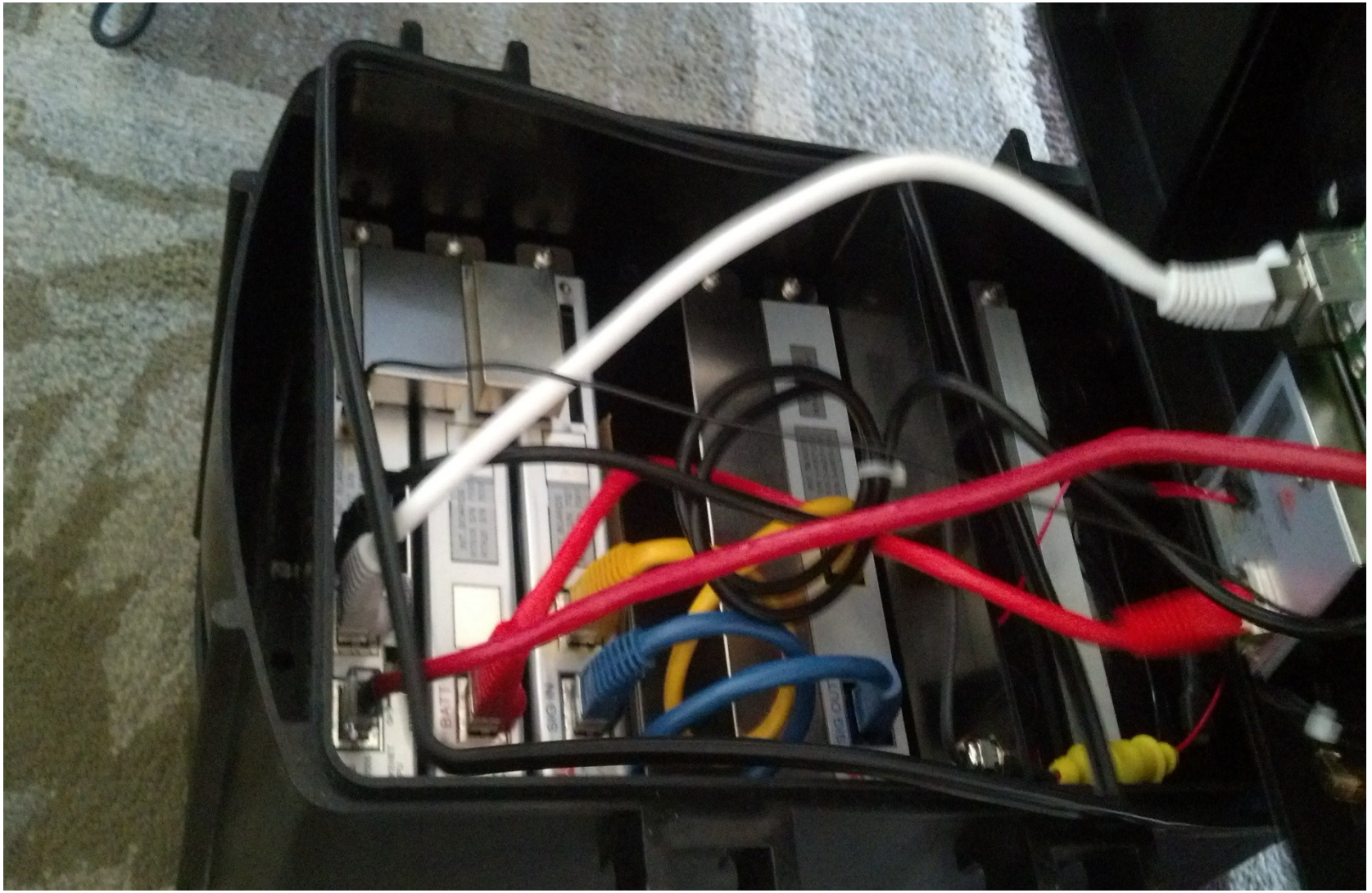
Currently Shake Box is working with Windows XP and Windows 7 professional

Project: Writing Device Drivers for shake Box to Work with Linux

Collecting Sample data with a Shake Box

REF-TEK 155-01

An external view of Shake Box, showing GPS,POWER, Radio Com Port etc.



An Interior View of Shake Box showing the wires and the internals like Interconnect Board, ADC Boards, and Sensor Control boards

Sample data to compare data with and without an earthquake
Creating An Artificial Earthquake

1. Sample data without an earthquake!
This data has been converted from hexadecimal to decimal with a java application called Data Processing

1284.3515908203126 3.671001032683003 0.637544760717 0.55223784912
1284.3565908203125 3.670844955512004 0.637504531691999 0.552229804399999
1284.3615908203126 3.670758067190004 0.637416027837 0.552199234464
1284.3665908203125 3.67082886508 2 0.637370971329 0.552175100304
1284.3715908203126 3.670867482114 0.637375798812 0.552171882416
1284.3765908203125 3.670614862363 0.637435337769 0.552200843408
1284.3815908203126 3.670542455428 0004 0.6375495882 0.552247502783999

2. Sample data collected during an artificial earthquake!

This data has been converted from hexadecimal to decimal with a java application called Data Processing

1742.2965908203125 3.675406592417 0.638415316818 0.5464102539519999

1742.3015908203124 3.6681610717880004 0.637837628019 0.551825959456

1742.3065908203125 3.676545794861 0.645889869663 0.5531098967679999

1742.3115908203124 3.690480107241 0.632397054678 0.548450394943999

1742.3165908203125 3.6509250031720004 0.634286209692 0.551557265808

1742.3215908203124 3.6661722946400004 0.646620428757 0.552992443856

1742.3265908203125 3.6964223030400003 0.63355886892 0.54904409528

1742.3315908203126 3.6583201648 0.643408543401 0.5488236699519999

1742.3365908203125 3.662569647363 0.645925271205 0.555872453616

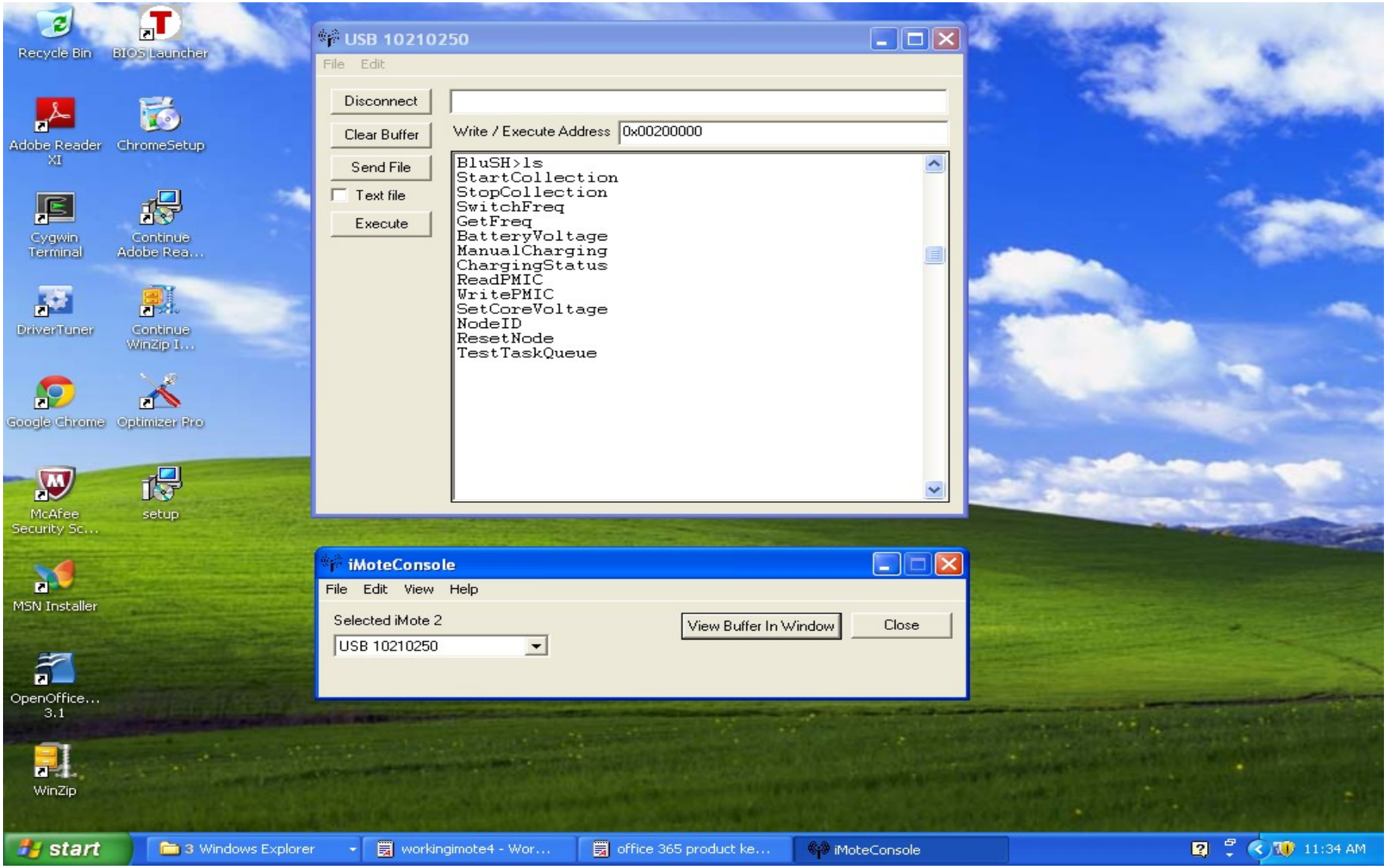
1742.3415908203126 3.690100373093 0.632562798261 0.547037742112

Earthquake Staistics

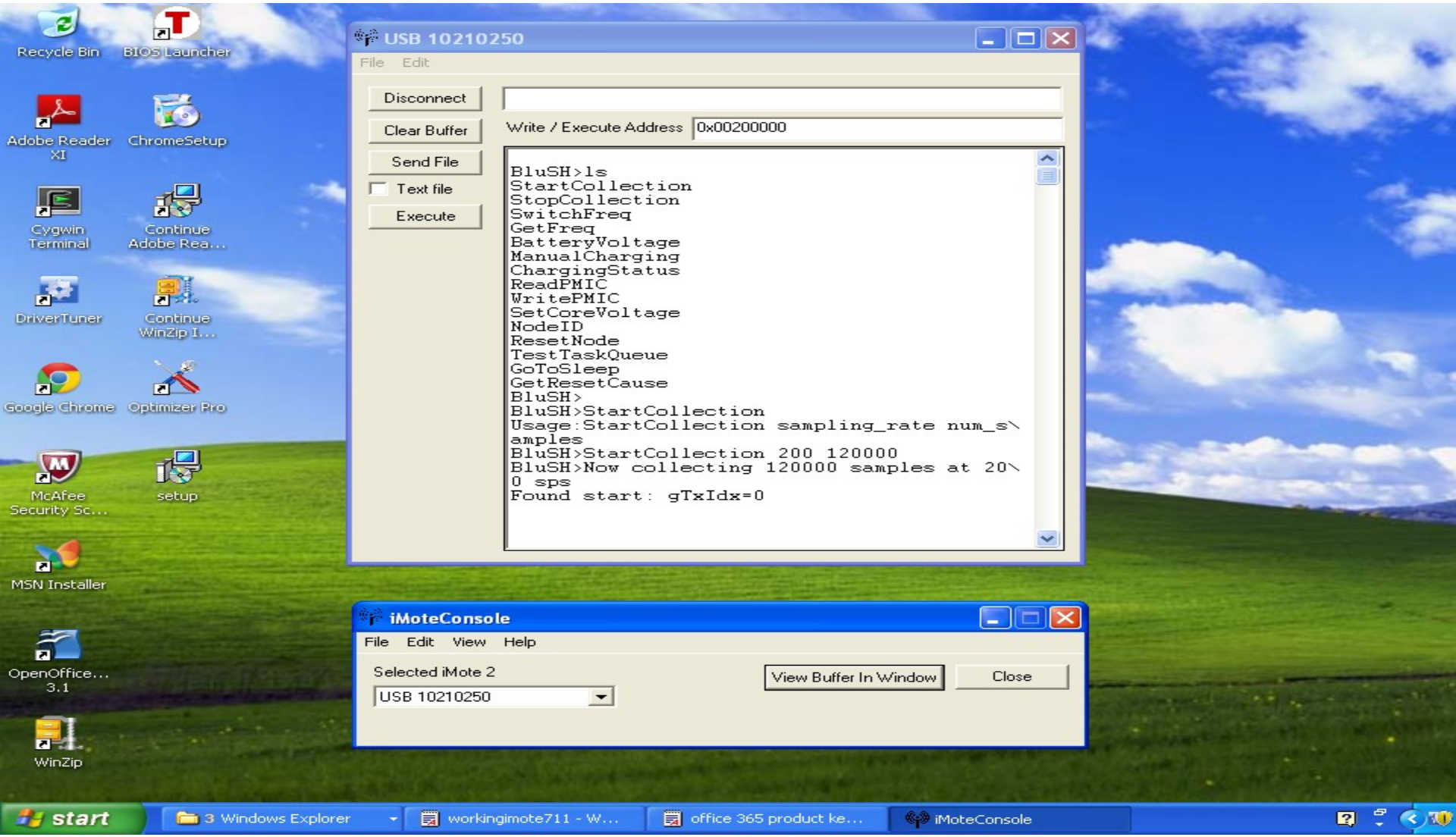
DBG: statistics: totCnt = 213960, discardCnt = 835, blockCnt = 42625

The Slides in the forthcoming pages:
Show the Steps Taken
to Connect a Shake Box to
Windows XP and Windows 7 Professional

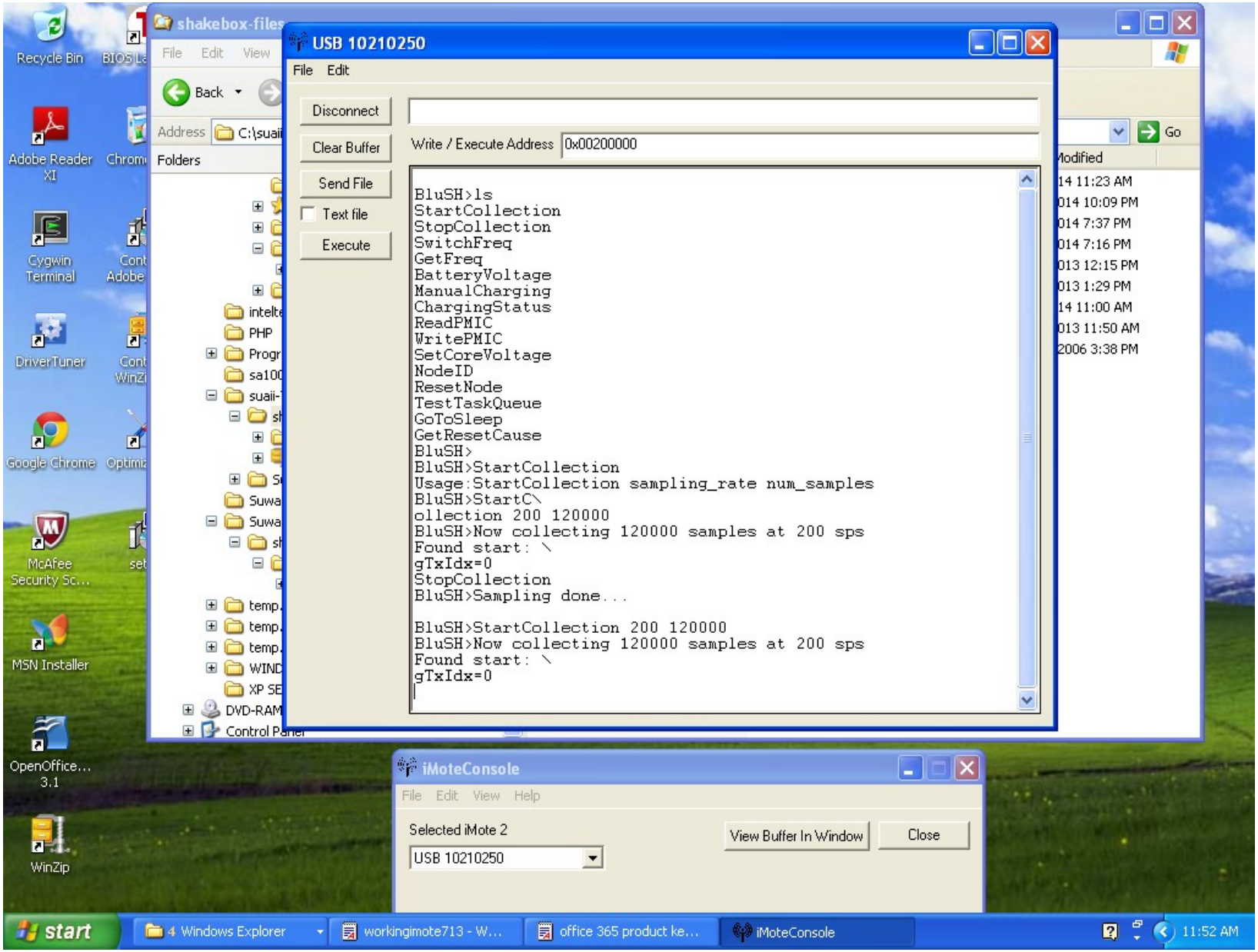
Collecting data using Windows XP professional
ls shows the list of Commands available

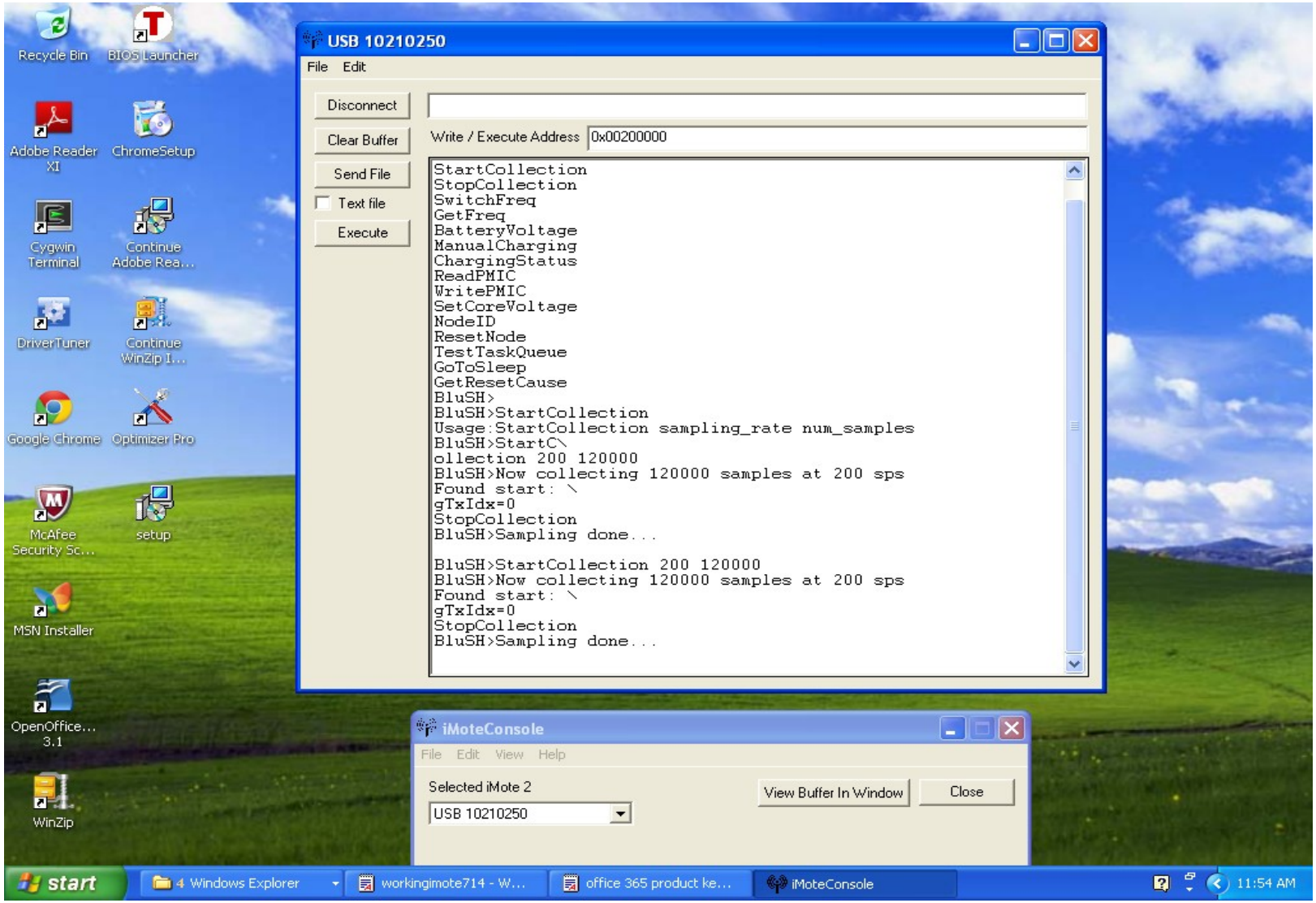


The USB device number is not encrypted in windows XP:
USB 10210250



Shake box is collecting data




USB 10210250
File Edit
Disconnect
Clear Buffer
Send File
Text file
Execute
Write / Execute Address 0x00200000
StartCollection
StopCollection
SwitchFreq
GetFreq
BatteryVoltage
ManualCharging
ChargingStatus
ReadPMIC
WritePMIC
SetCoreVoltage
NodeID
ResetNode
TestTaskQueue
GoToSleep
GetResetCause
BluSH>
BluSH>StartCollection
Usage:StartCollection sampling_rate num_samples
BluSH>StartC\
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BluSH>Now collecting 120000 samples at 200 sps
Found start: \
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BluSH>Sampling done...
BluSH>StartCollection 200 120000
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Found start: \
gTxIdx=0
StopCollection
BluSH>Sampling done...
iMoteConsole
File Edit View Help
Selected iMote 2
USB 10210250
View Buffer In Window
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Recycle Bin
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Adobe Reader XI
ChromeSetup
Cygwin Terminal
Continue Adobe Rea...
DriverTuner
Continue WinZip I...
Google Chrome
Optimizer Pro
McAfee Security Sc...
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OpenOffice... 3.1
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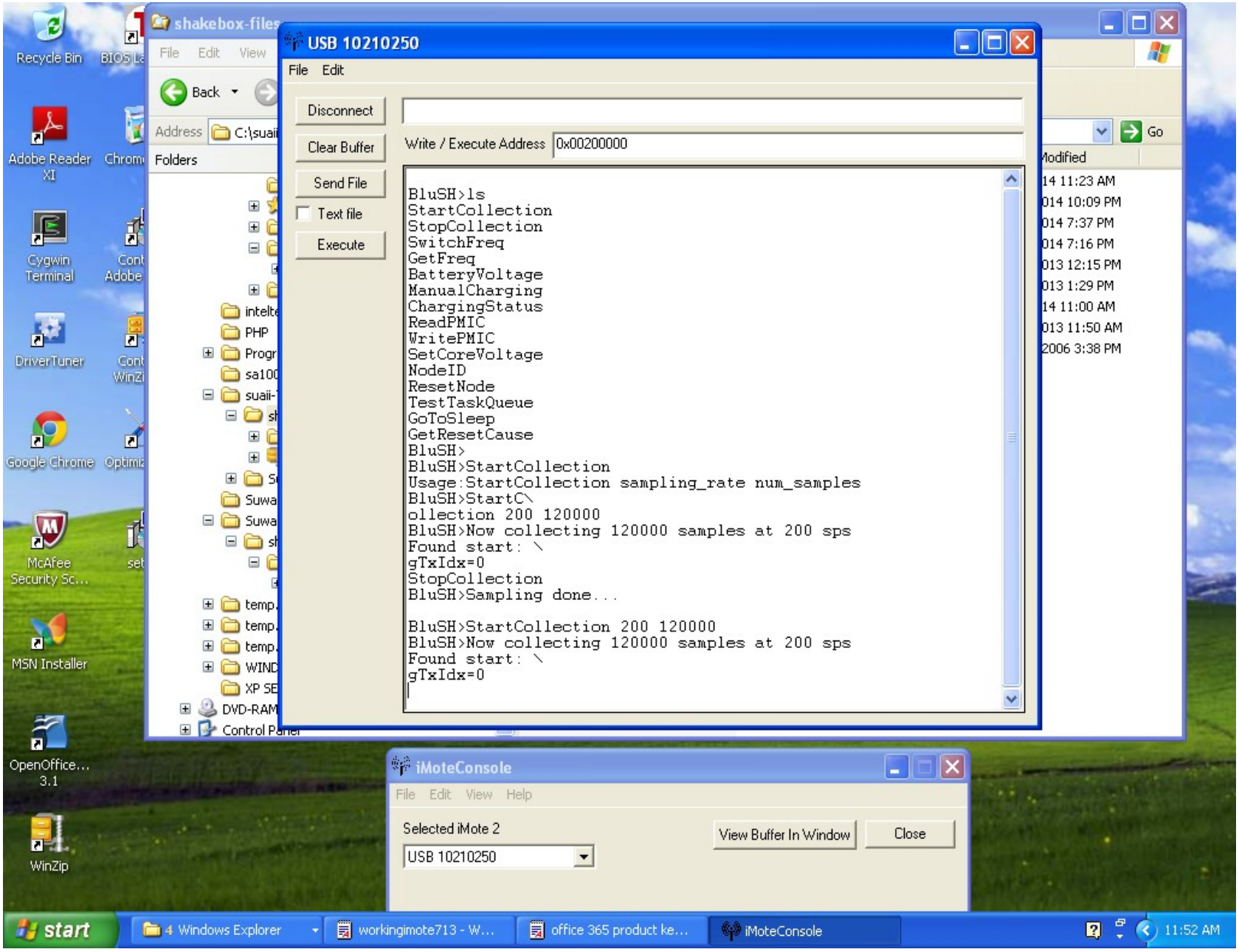
iMoteConsole
11:54 AM


shakebox-files
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Address C:\suaii
Folders
USB 10210250
File Edit
Disconnect
Clear Buffer
Send File
Text file
Execute
Write / Execute Address 0x00200000
BluSH>ls
StartCollection
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SwitchFreq
GetFreq
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ManualCharging
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StopCollection
BluSH>Sampling done...
BluSH>StartCollection 200 120000
BluSH>Now collecting 120000 samples at 200 sps
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gTxIdx=0
iMoteConsole
File Edit View Help
Selected iMote 2
USB 10210250
View Buffer In Window
Close
Recycle Bin
Adobe Reader XI
Cygwin Terminal
DriverTuner
Google Chrome
McAfee Security Sc...
MSN Installer
OpenOffice... 3.1
WinZip
start
4 Windows Explorer
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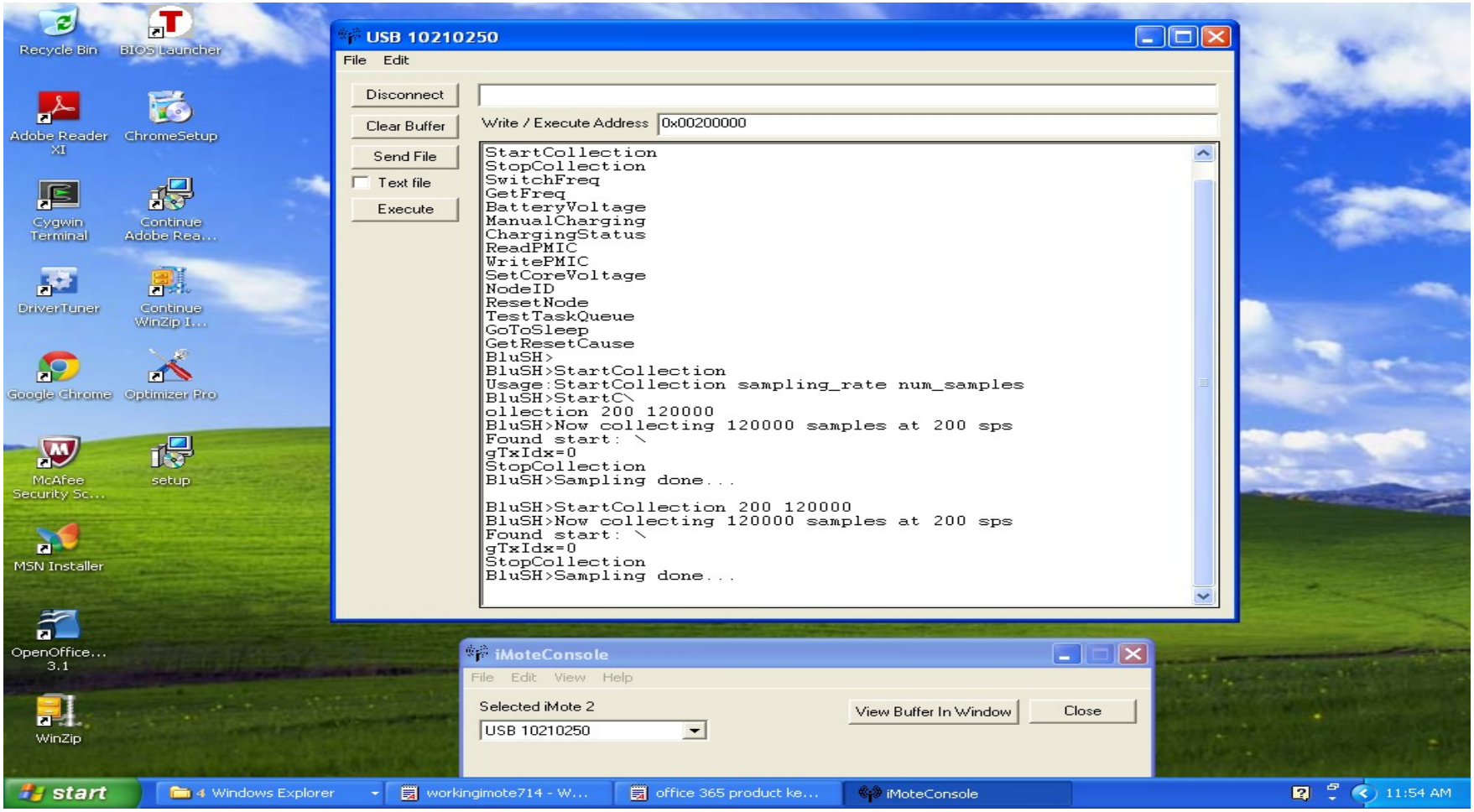
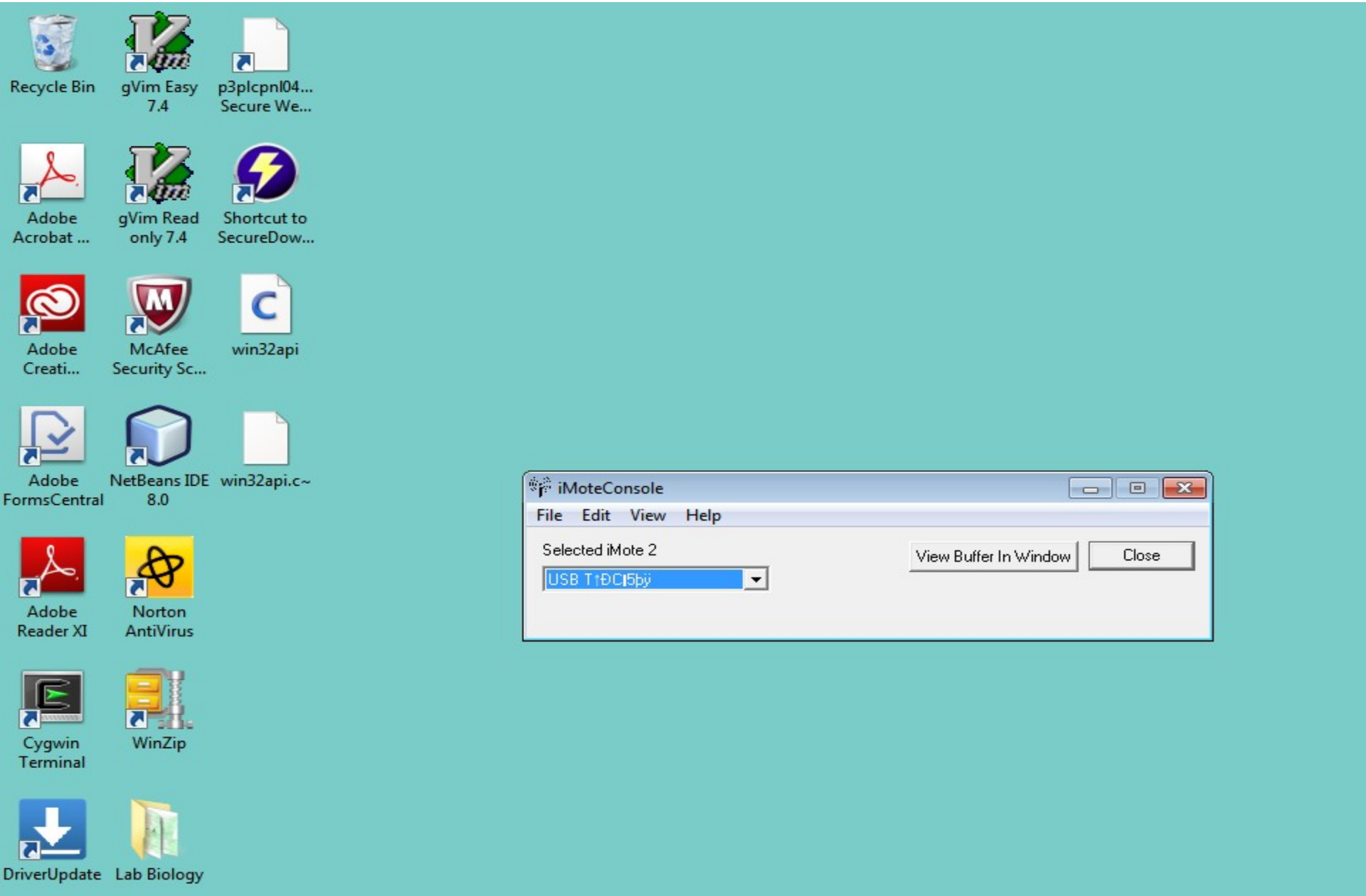
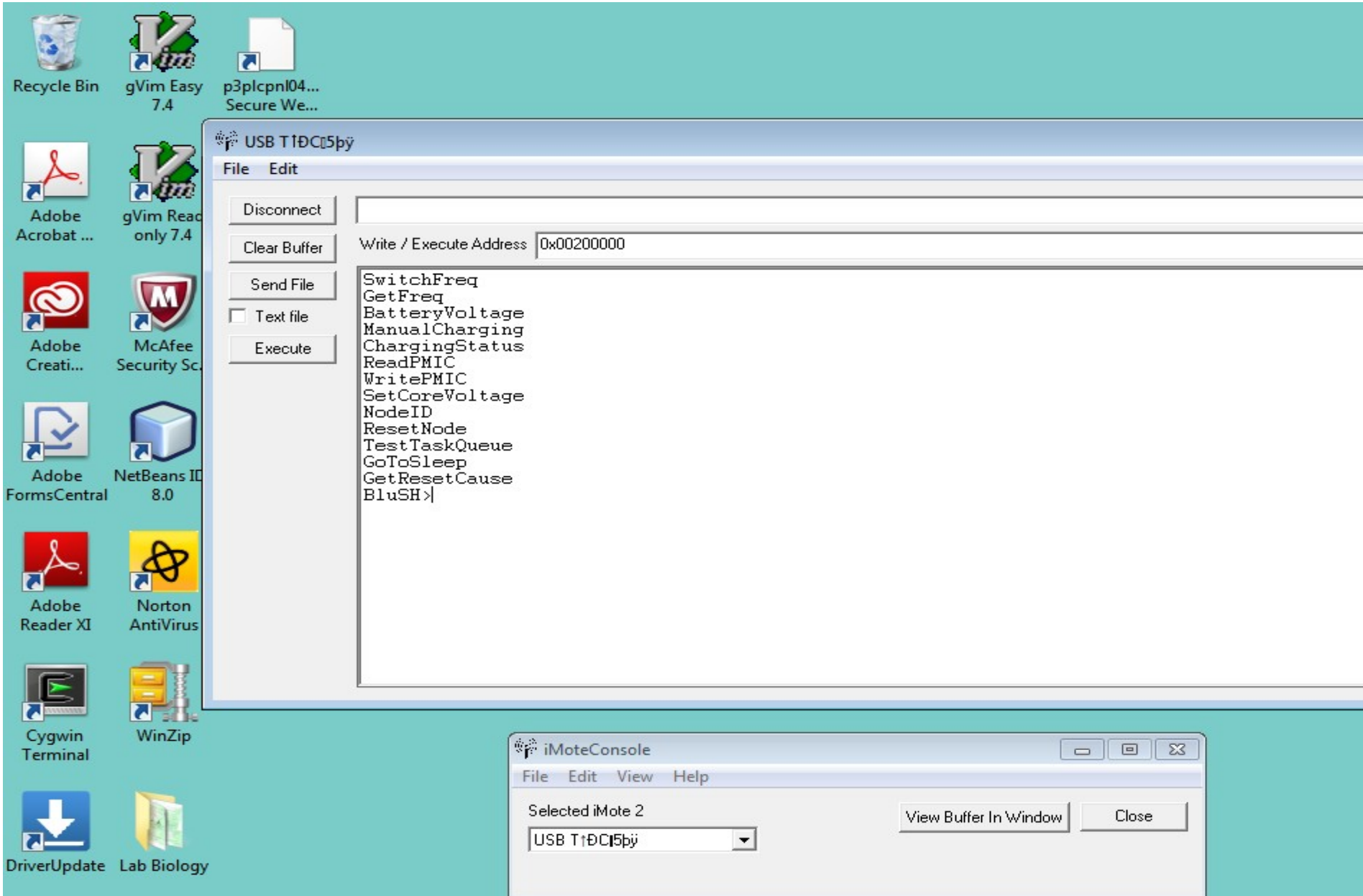
office 365 product ke...
iMoteConsole
11:52 AM


Recycle Bin
BIOS Launcher
Adobe Reader XI
ChromeSetup
Cygwin Terminal
Continue Adobe Rea...
DriverTuner
Continue WinZip I...
Google Chrome
Optimizer Pro
McAfee Security Sc...
setup
MSN Installer
OpenOffice... 3.1
WinZip
USB 10210250
File Edit
Disconnect
Clear Buffer
Send File
Text file
Execute
Write / Execute Address 0x00200000
StartCollection
StopCollection
SwitchFreq
GetFreq
BatteryVoltage
ManualCharging
ChargingStatus
ReadPMIC
WritePMIC
SetCoreVoltage
NodeID
ResetNode
TestTaskQueue
GoToSleep
GetResetCause
BluSH>
BluSH>StartCollection
Usage:StartCollection sampling_rate num_samples
BluSH>StartC\
ollection 200 120000
BluSH>Now collecting 120000 samples at 200 sps
Found start: \
gTxIdx=0
StopCollection
BluSH>Sampling done...
BluSH>StartCollection 200 120000
BluSH>Now collecting 120000 samples at 200 sps
Found start: \
gTxIdx=0
StopCollection
BluSH>Sampling done...
iMoteConsole
File Edit View Help
Selected iMote 2
USB 10210250
View Buffer In Window
Close
start
4 Windows Explorer
workingimote714 - W...
office 365 product ke...
iMoteConsole
11:54 AM

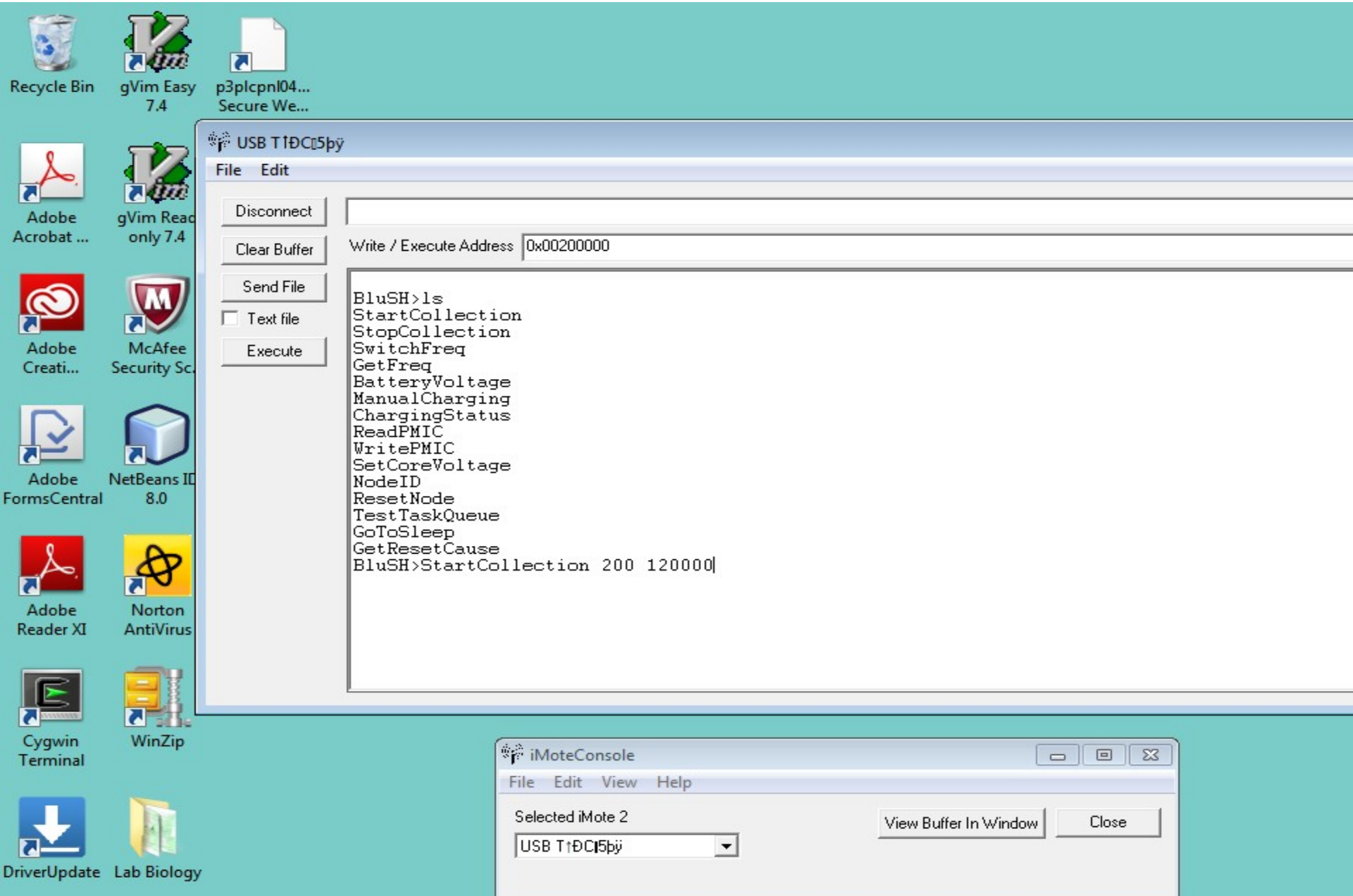
USB device number is encrypted in windows 7



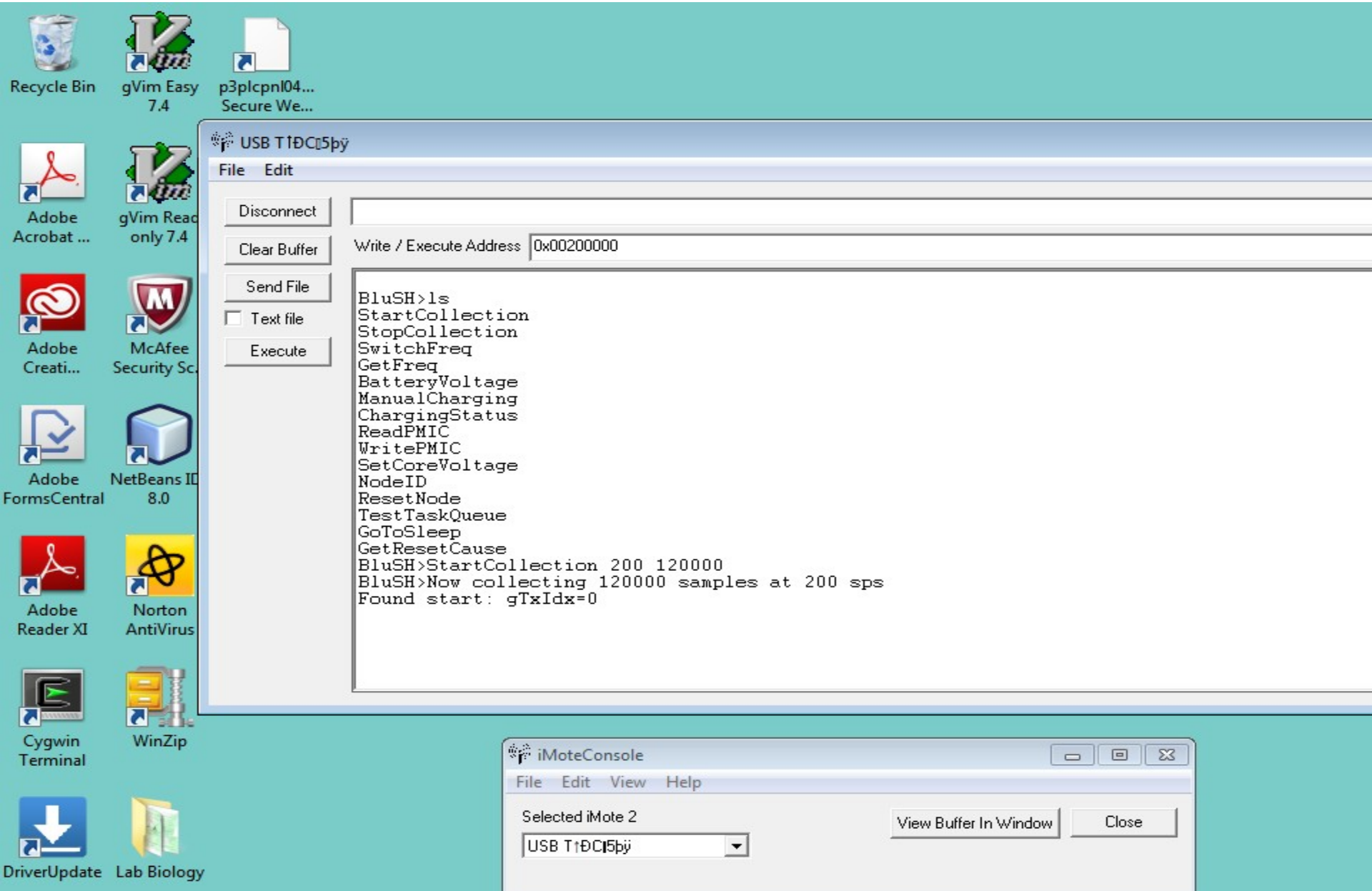
List of Commands at the Bluish Prompt



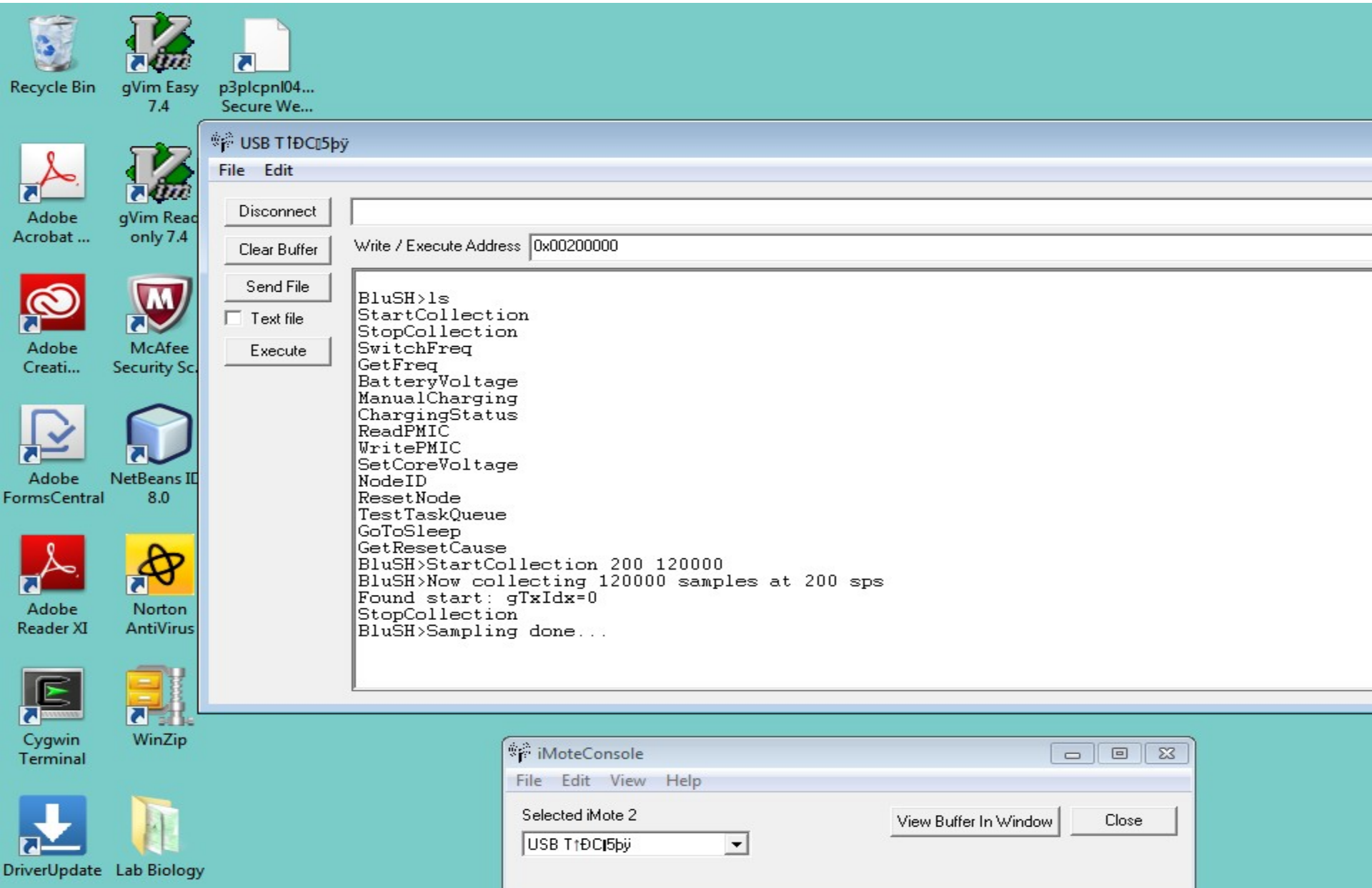
Starting of Data Collection with StartCollection 200 120000



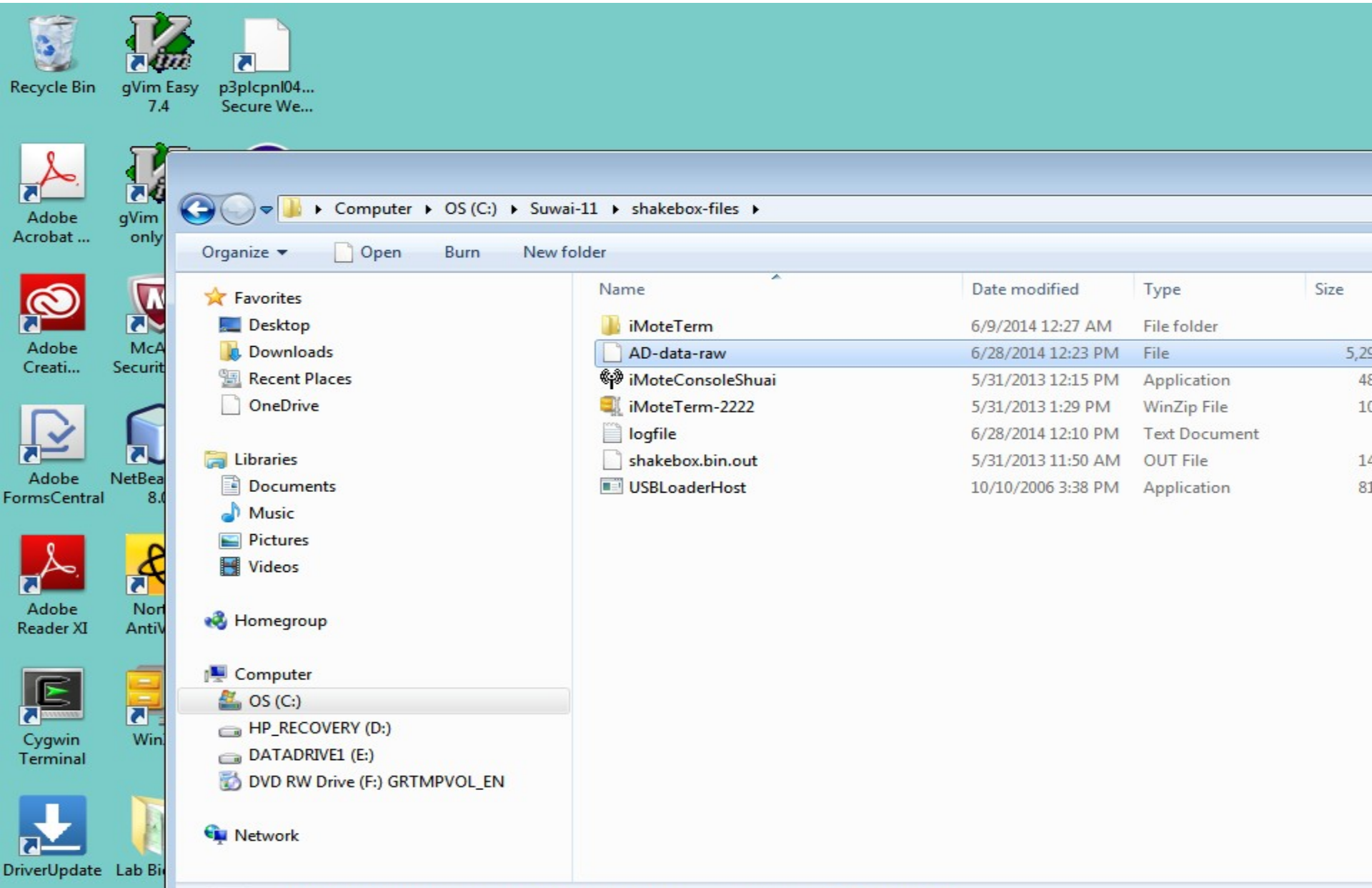
Starting of data Collection collecting 120000 samples at 200 sps



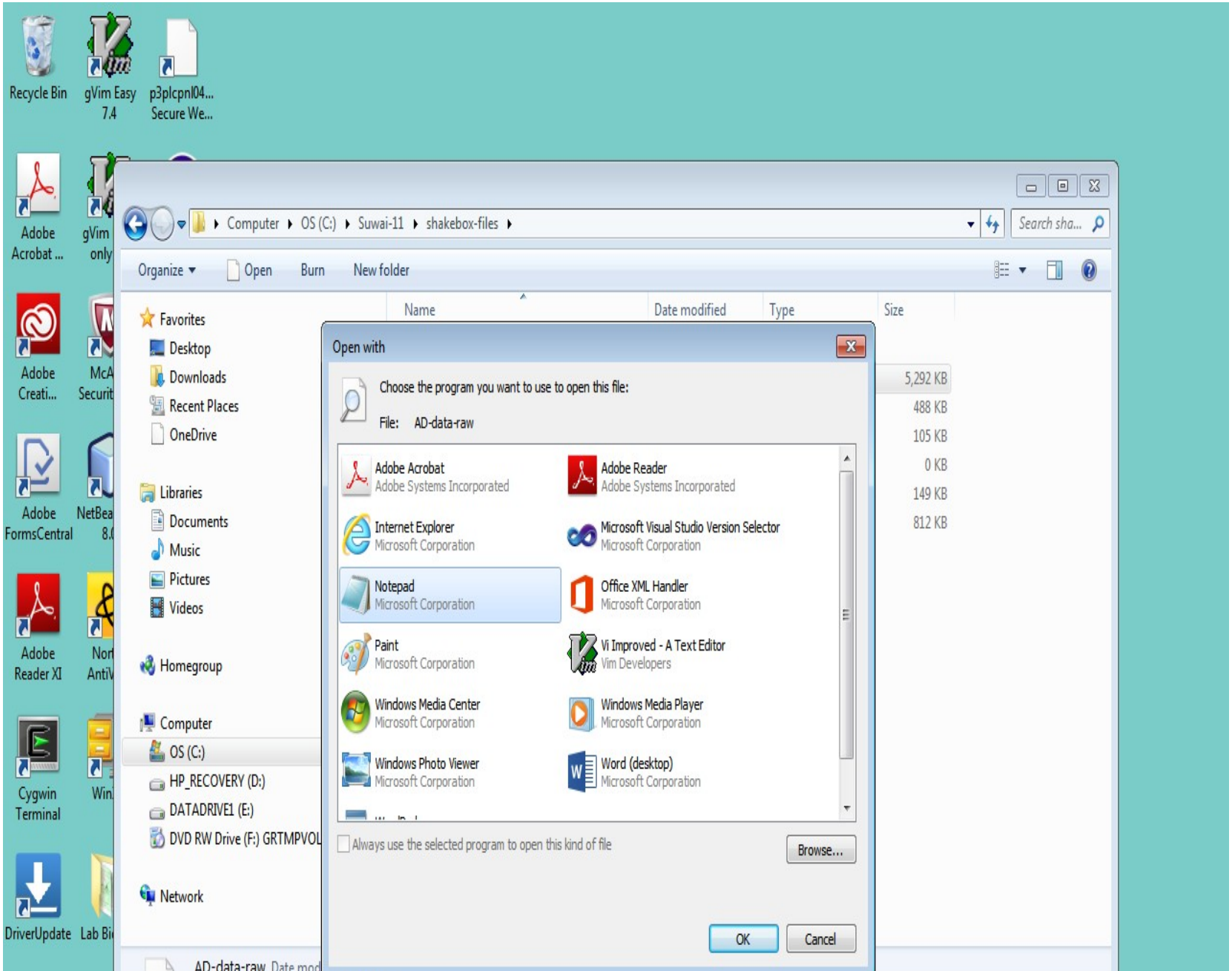
StopCollection is used to terminate the collection



Data has been collected into a file AD-data-raw in the Shakebox-files folder



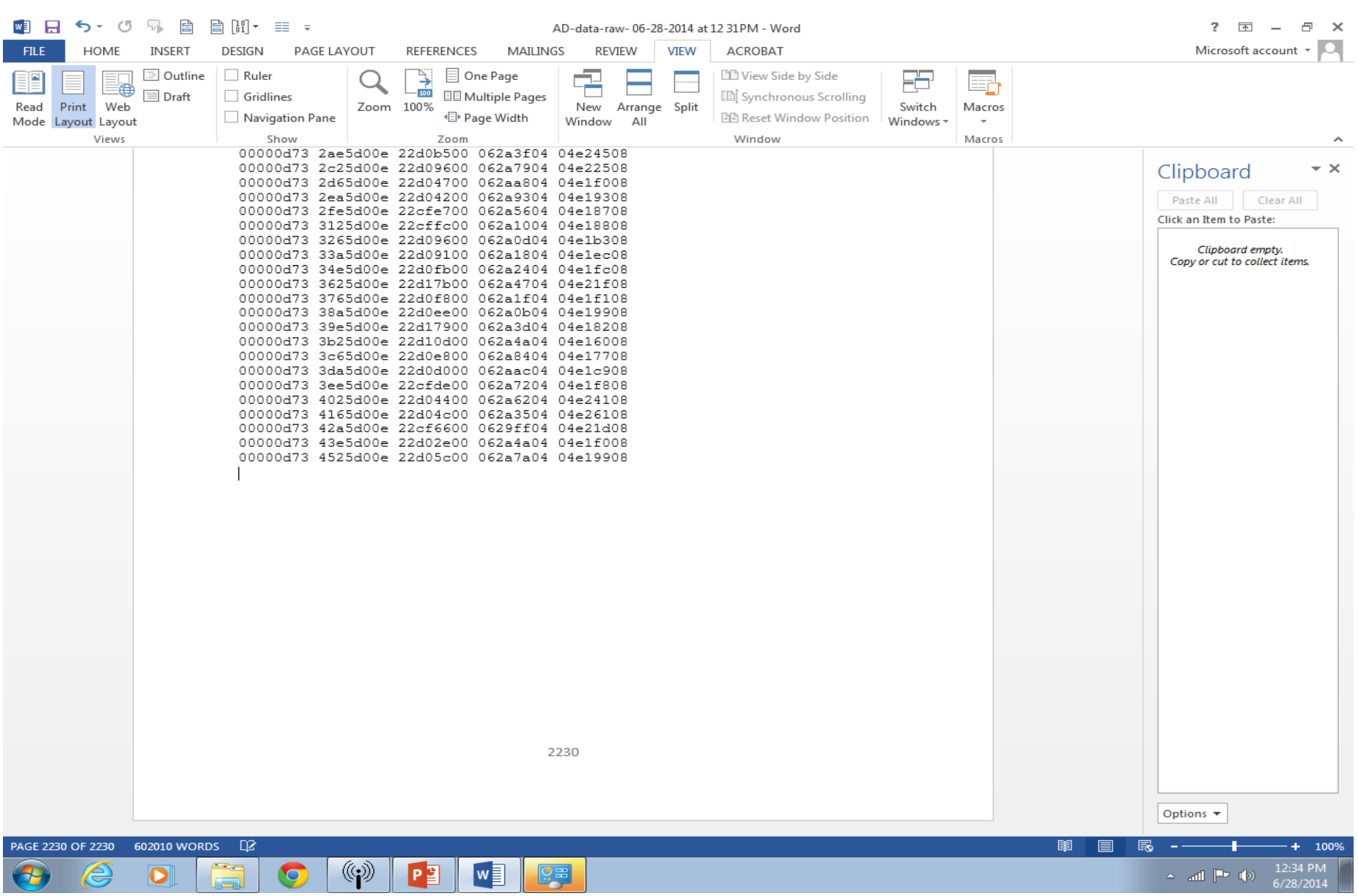
The file is opened with Notepad



ShakeBox Collected 2230

pages of sample data in

approximately 5 minutes hexadecimal format:



Hexadecimal data is converted into Decimal Format through a Java program Called Data-Processing

Page 1 of pages 2230 of Data Collected in 5 minutes

1

```
0000032f c865d00e 22b43900 0610db04 04d8b408
0000032f c9a5d00e 22b39f00 0610eb04 04d89a08
0000032f cae5d00e 22b29400 0610e104 04d8e808
0000032f cc25d00e 22b39200 0610f504 04d92308
0000032f cd65d00e 22b3e500 0610f004 04d94808
0000032f cea5d00e 22b2c600 0610ad04 04d98708
0000032f cfe5d00e 22b27b00 06109604 04d97008
0000032f d125d00e 22b35f00 0610bf04 04d94808
0000032f d265d00e 22b36f00 0610d104 04d8eb08
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0000032f d625d00e 22b44e00 0610e304 04d88708
0000032f d765d00e 22b36300 0610d004 04d8cb08
0000032f d8a5d00e 22b2de00 0610d504 04d91708
0000032f d9e5d00e 22b3df00 0610f104 04d93c08
0000032f db25d00e 22b36e00 06110104 04d96008
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0000032f dda5d00e 22b38d00 06110204 04d94b08
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0000032f e025d00e 22b22400 0610a304 04d8e408
0000032f e165d00e 22b2fd00 06109d04 04d8df08
0000032f e2a5d00e 22b47400 06109604 04d8ca08
0000032f e3e5d00e 22b2f400 0610af04 04d8de08
0000032f e525d00e 22b2a000 0610ec04 04d8fe08
0000032f e665d00e 22b3fc00 06110e04 04d91008
0000032f e7a5d00e 22b33a00 06112904 04d93708
0000032f e8e5d00e 22b21600 06111404 04d93d08
0000032f ea25d00e 22b37d00 0610e704 04d94b08
0000032f eb65d00e 22b3d300 0610bf04 04d93308
0000032f eca5d00e 22b28700 06109304 04d91008
0000032f ede5d00e 22b33900 0610aa04 04d91008
0000032f ef25d00e 22b3e800 0610d504 04d8c408
0000032f f065d00e 22b35200 0610f504 04d8c308
0000032f f1a5d00e 22b33c00 06110a04 04d8d708
0000032f f2e5d00e 22b39700 0610ef04 04d8d208
0000032f f425d00e 22b3b700 0610cd04 04d91508
0000032f f565d00e 22b34900 06108e04 04d93508
```

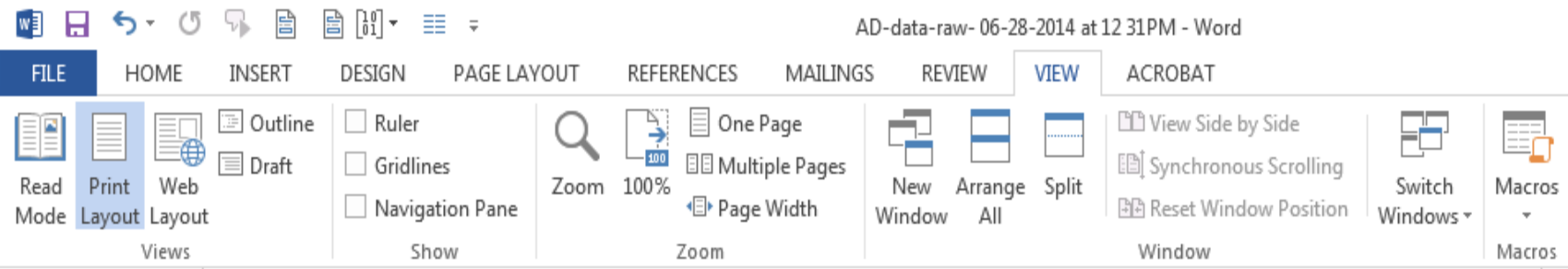


```
00000d73 1965d00e 22d09b00 062ad604 04e12f08
00000d73 1aa5d00e 22d03500 062ab104 04e18e08
00000d73 1be5d00e 22d08700 062a6504 04e1f208
00000d73 1d25d00e 22d06000 062a2304 04e23008
00000d73 1e65d00e 22d02500 0629ee04 04e21c08
00000d73 1fa5d00e 22d0af00 062a2204 04e1ff08
00000d73 20e5d00e 22d04700 062a4f04 04e1ba08
00000d73 2225d00e 22d06500 062a9204 04e15a08
00000d73 2365d00e 22d0cb00 062ae104 04e14808
00000d73 24a5d00e 22d0cb00 062ab104 04e15408
00000d73 25e5d00e 22d13400 062a8004 04e1a108
00000d73 2725d00e 22d10c00 062a3304 04e1fa08
00000d73 2865d00e 22d0d500 0629e004 04e24c08
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00000d73 2ae5d00e 22d0b500 062a3f04 04e24508
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00000d73 3125d00e 22cffc00 062a1004 04e18808
00000d73 3265d00e 22d09600 062a0d04 04e1b308
00000d73 33a5d00e 22d09100 062a1804 04e1ec08
```
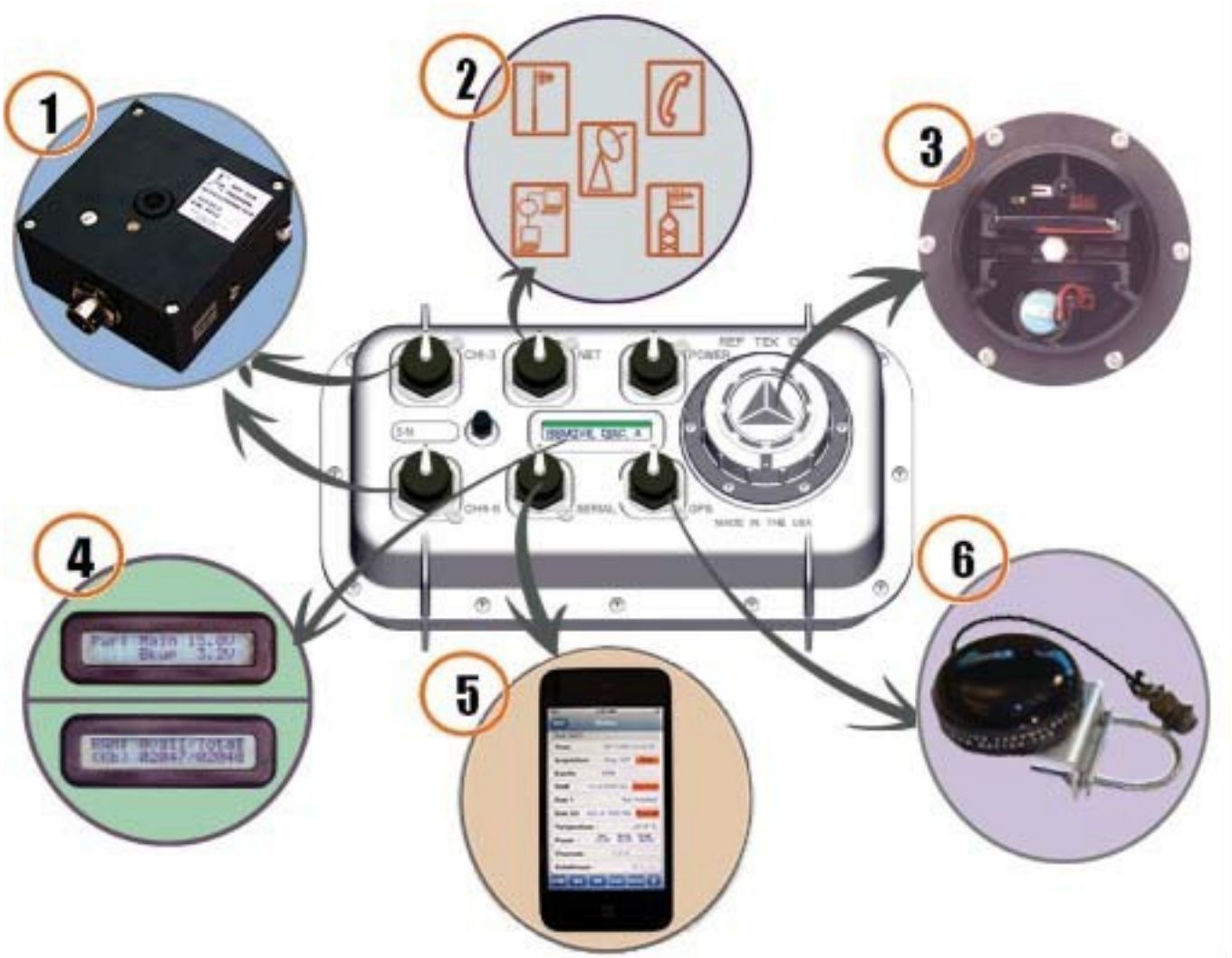

FEATURES of REF-TEK Model 130S-1

Similar to REF-TEK 155-01



The 130S Broadband Seismic Recorder

It has been designed to be easier to use more compact, lighter in weight, lower power, and requires less maintenance than other recorders.

Not only is the hardware optimized for field deployments, software tools have been specially developed to support both field and base station operation.

The 130S case is a clamshell design, inherently waterproof, with easy access to all user features on the top of the unit.

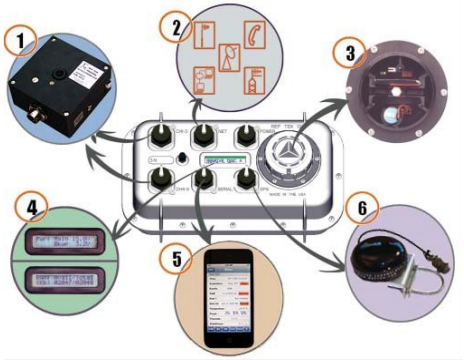
1. The 130S has 3 or 6 input channels for connection to any sensor available in the seismology market.
2. The network Command / Control and Data Telemetry is either Ethernet 10BaseT or serial PPP.
5. The disk compartment contains two CF-II slots, backup battery and status LEDs for easy servicing.
6. The LCD display allows the 130S Recorder to be serviced without connecting a set-up controller by displaying the 130S State-Of-Health.
7. User set-up, control, status, and data monitoring are carried out either with the iFSC Controller or with a PC or Workstation running RTI application software set.
8. The 130S uses a high-precision TCXO disciplined by an external GPS Receiver / Clock, which maintains time accuracy to better than 10 µsec.

Key Features

State-of-the-Art ADC

Small Size and lightweight Modular Hardware IP communications over Ethernet and Asynchronous Serial Embedded/Removable

Applications



1. Local and regional Broadband
2. After shock Active Source
3. Micro Zonation-Survey
4. Site Noise Survey
5. Earthquake Early Warning
6. Rapid Transportation

Communications: NET Connector

Connector: Ethernet: 10 Base T, TCP/IP, UDP/IP, FTP, RTP

Serial Asynchronous, RS 232, PPP, TCP/IP, UDP/IP, FTP, RTP

Serial Connector:

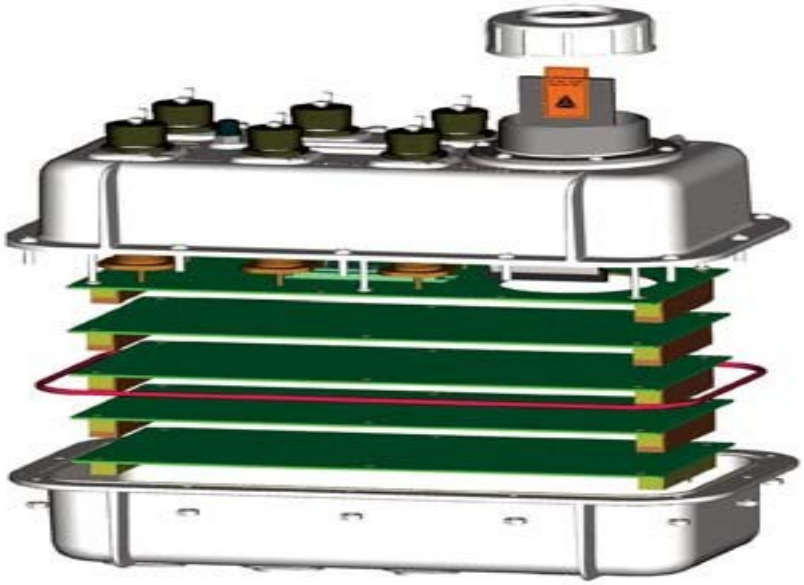
Terminal: Asynchronous, RS 232 130

Hardware Modularity

REF TEK 130S is constructed with up to five internal boards stacked together – an arrangement that is more reliable and less costly than a traditional backplane arrangement. The 130S comes with a Lid Interconnect Board, a Microcomputer Board, one or two ADC Boards and a Sensor Control Board .

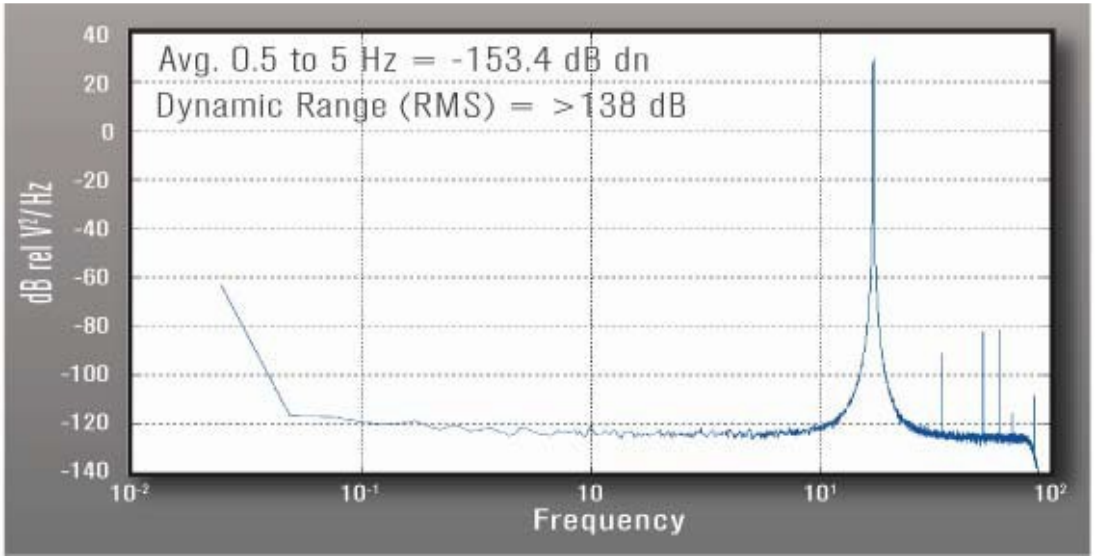
One or two removable disks reside in a sealed compartment that is accessed by opening a lid located on the top of the 130S case. The main electronics section is sealed with the lid open or closed.

The GPS Receiver is separate from the main unit in order to allow the GPS antenna to be located some distance away.



Noise Performance

The 130S series recorder incorporates the 3rd generation 24-bit delta sigma type analog-to-digital converter with state-of-the-art design. The combination produces the highest performance low power 24-bit seismic recorder. Below is the power spectral density of the ADC with the full scale sine wave input.



Data Retrieval

The 130S series recorder may be equipped with one or two Compact Flash Type I or Type II storage media (disks). CF flash storage is available up to 16 GB capacity. For example, 4 GB is enough storage to hold more than 100 days of three channel, 100 sps data recorded with Steim 2 compression.

Files are written in FAT32 format allowing high capacity disks to be used. To swap a disk during acquisition, simply open the cap that seals the disk compartment. A red LED indicates the disk is busy.

When inactive a green LED signals to remove the disk and insert another one in its place. Replace the cap resealing the compartment.

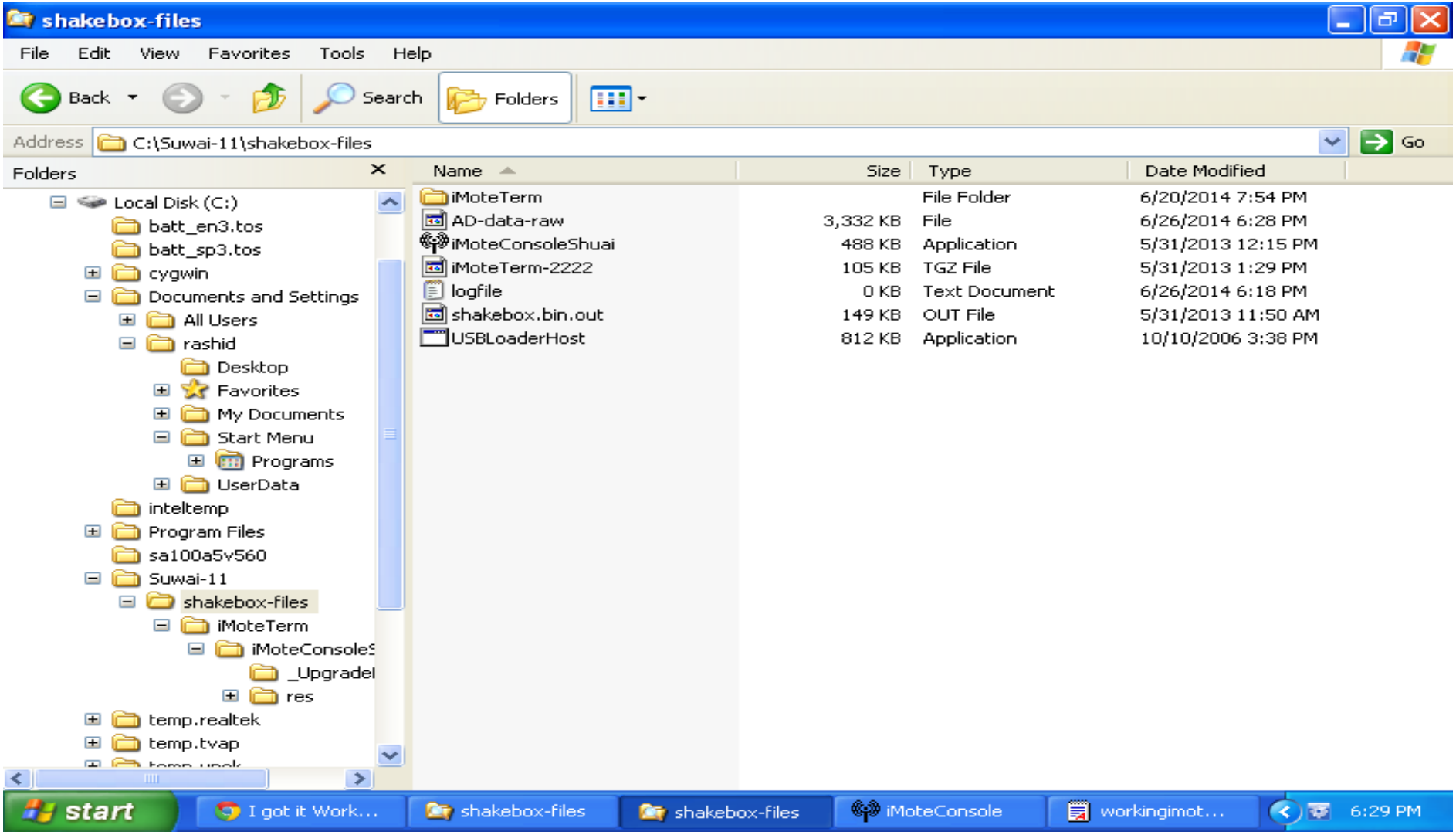
Data from the disk may be read on any PC / Workstation using a CF-II reader. Data can also be remotely downloaded from the 130S disk using FTP over LAN/WAN.

Module	Description	Contents
1	Lid Interconnect Board (RT520) ( )	Power Supply Lightning Protection Physical Interface DC-DC Converter
2	Microcomputer Board (RT506) ( )	CPU Battery Backed SRAM (up to 16 MBytes) Serial Ports Real-time Clock Ethernet Controller, full stack Enhanced Integrated Drive Electronics (EIDE)
3	ADC (RT649) ( )	24-Bit ADC Channels (3 each) Input Pre-Amplifi Digital Anti-Alias Filters 1M SRAM Direct Memory Access (DMA) Controller DC-DC Converter
4	Sensor Control Board (RT527) ( )	Monitoring of Mass Position Re-Centering Command; Mass Lock/Unlock Calibration Commands Calibration Signals DC-DC Converter

run:

Date and Time	AD_ch_1	AD_ch_2	AD_ch_3.
155.4515908203125	3.66909592577100003	0.6312577686899999	0.519545715984
155.4565908203125	3.66933567317800002	0.63112903581	0.51947974928
155.4615908203125	3.66932766279630003	0.631064669369999	0.519582721696
155.4665908203125	3.669176377921	0.6311129442	0.51976131448
155.4715908203125	3.66927774763000003	0.631172483157	0.51996243248
155.4765908203125	3.66955289398300004	0.631238458758	0.520113673216
155.4815908203125	3.66934210935	0.631190183928	0.520121717935999
155.4865908203125	3.66914097897500002	0.631074324336	0.519943125151999
155.4915908203125	3.66951910408000004	0.630997084608	0.519692129888
155.4965908203125	3.66960116527300003	0.6309520281	0.51951997288
155.5015908203125	3.669160287491	0.630998693769	0.519534453376
155.5065908203125	3.66938233542500004	0.631154782386	0.519627721279999
155.5115908203125	3.66958990197200004	0.63128995191	0.519737180319999

date, time, AD_ch_1, AD_ch_2, AD_ch_3.


shakebox-files
File Edit View Favorites Tools Help
Back Search Folders
Address C:\Suwai-11\shakebox-files
Go
Folders
Local Disk (C:)
batt_en3.tos
batt_sp3.tos
cygwin
Documents and Settings
All Users
rashid
Desktop
Favorites
My Documents
Start Menu
Programs
UserData
inteltemp
Program Files
sa100a5v560
Suwai-11
shakebox-files
iMoteTerm
iMoteConsoleS
_Upgradel
res
temp.realtek
temp.tvap
Name Size Type Date Modified
iMoteTerm File Folder 6/20/2014 7:54 PM
AD-data-raw 3,332 KB File 6/26/2014 6:28 PM
iMoteConsoleShuai 488 KB Application 5/31/2013 12:15 PM
iMoteTerm-2222 105 KB TGZ File 5/31/2013 1:29 PM
logfile 0 KB Text Document 6/26/2014 6:18 PM
shakebox.bin.out 149 KB OUT File 5/31/2013 11:50 AM
USBLoaderHost 812 KB Application 10/10/2006 3:38 PM
start
I got it Work...
shakebox-files
shakebox-files
iMoteConsole
workingimot...
6:29 PM

Source code written from Shuai Hao: iMoteConsole.cpp

```
// iMoteConsole.cpp : Defines the class behaviors for the application.
//
#include "stdafx.h"
#include "iMoteConsole.h"
#include "iMoteConsoleDlg.h"

#ifdef _DEBUG
#define new DEBUG_NEW
#undef THIS_FILE
static char THIS_FILE[] = __FILE__;
#endif

/////////////////////////////////////////////////////////////////////////////
// CIMoteConsoleApp

BEGIN_MESSAGE_MAP(CIMoteConsoleApp, CWinApp)
	//{{AFX_MSG_MAP(CIMoteConsoleApp)
		// NOTE - the ClassWizard will add and remove mapping macros here.
		//    DO NOT EDIT what you see in these blocks of generated code!
	//}}AFX_MSG
	ON_COMMAND(ID_HELP, CWinApp::OnHelp)
END_MESSAGE_MAP()

/////////////////////////////////////////////////////////////////////////////
// CIMoteConsoleApp construction
```

```
CIMoteConsoleApp::CIMoteConsoleApp()
{
	// TODO: add construction code here,
	// Place all significant initialization in InitInstance
}

/////////////////////////////////////////////////////////////////////////////
// The one and only CIMoteConsoleApp object

CIMoteConsoleApp theApp;
/////////////////////////////////////////////////////////////////////////////
// CIMoteConsoleApp initialization

BOOL CIMoteConsoleApp::InitInstance(){
	InitCommonControls();
	CWinApp::InitInstance();
	AfxEnableControlContainer();

	// Standard initialization
	// If you are not using these features and wish to reduce the size
	//  of your final executable, you should remove from the following
	//  the specific initialization routines you do not need.

	AfxInitRichEdit2();
	CIMoteConsoleDlg *dlg =new CIMoteConsoleDlg;
	m_pMainWnd = dlg;
	dlg->LoadProfileInfo();
	int nResponse = dlg->DoModal();
	if (nResponse == IDOK)		{
		// TODO: Place code here to handle when the dialog is
		//  dismissed with OK
	}
	else if (nResponse == IDCANCEL)
	{
		// TODO: Place code here to handle when the dialog is
		//  dismissed with Cancel
	}
	dlg->SaveProfileInfo();
	delete dlg;
	// Since the dialog has been closed, return FALSE so that we exit the
	//  application, rather than start the application's message pump.
	return FALSE;
}
```

```
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	CIMoteConsoleDlg *dlg =new CIMoteConsoleDlg;
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	}
	dlg->SaveProfileInfo();
	delete dlg;
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	//  application, rather than start the application's message pump.
	return FALSE;
}
```

Thanks!