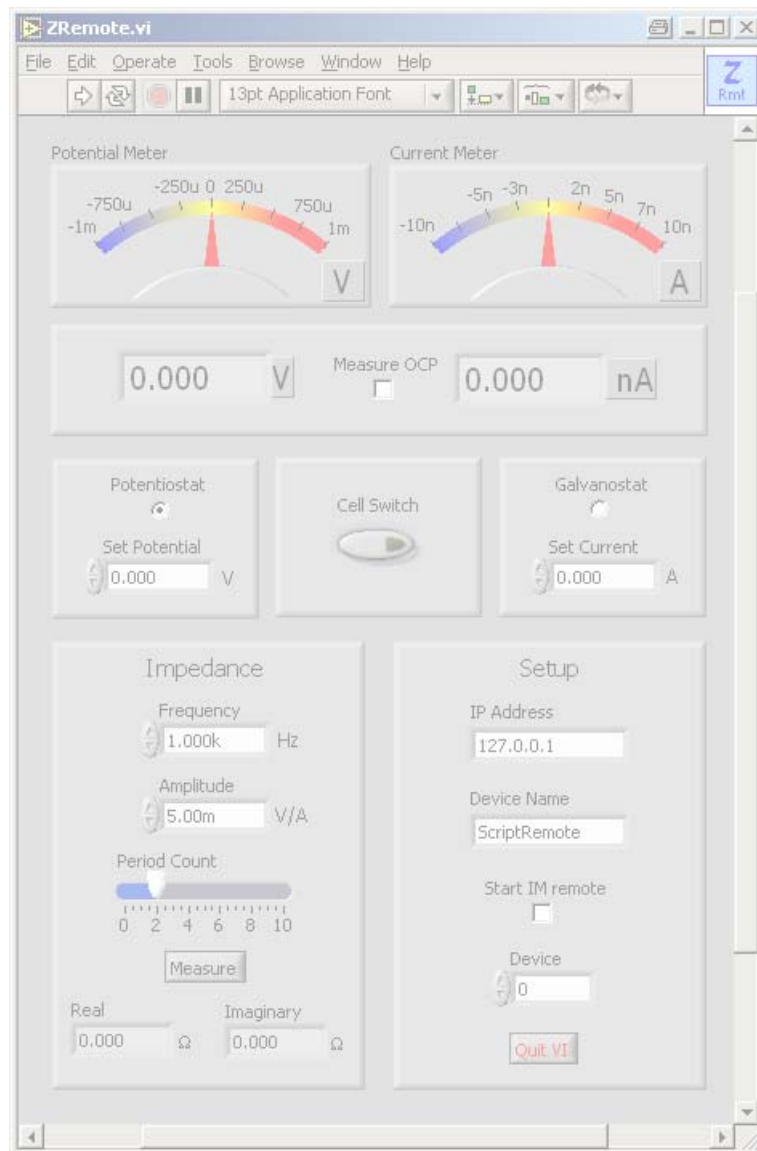


Remote

Remote Control of an Zennium by LabVIEW



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1. Introduction

Normally, the *Zennium* systems are controlled by the Thales software package which is optimised for measuring and analysing electrochemical data. In addition, the IM-systems are prepared to be controlled by external software using the TCP/IP protocol. This is not limited to the local IM-PC but is also possible over network.

For that purpose, a network card running the TCP/IP protocol has to be installed in the IM-PC. A dll-file is used to interface between external software (e.g. LabVIEW) and the IM interface. A SCRIPT procedure running on the IM will call the specific procedures for each of the commands and parameters.

A LabVIEW VI controlling the basic functions of the IM is supplied by Zahner. This LabVIEW VI can also be used as a basis for user applications.

2. Setup of a Remote System

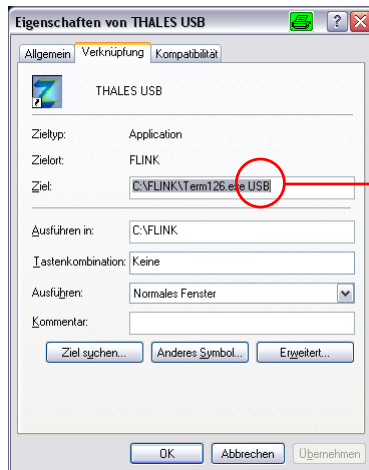
2.1 General Setup

In order to set up a remote system with LabVIEW under Windows XP, proceed as follows:

Make sure that the TCP/IP protocol is installed and active on your PC.

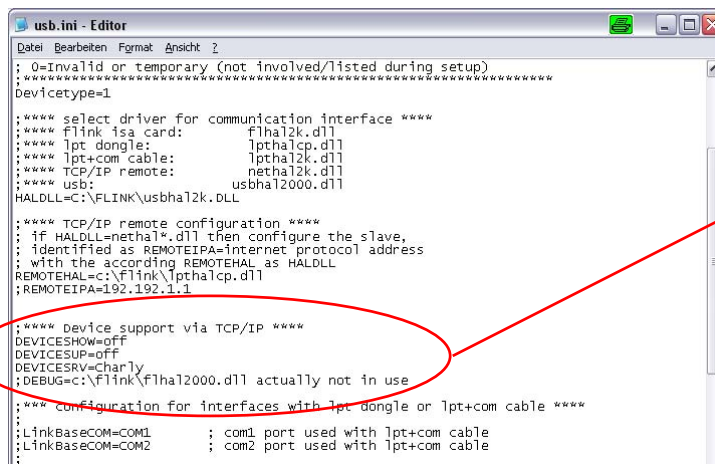
Make sure that LabVIEW is installed properly on your PC.

Right-click on the *Thales* icon on your desktop and select *Properties*. Check which .ini file is in use. This entry you will find in the *Target* line after the entry "c:\flink\termXXX.exe" with XXX as version number. For example: "c:\flink\term126.exe USB" means that the "usb.ini" file is in use.



This is the name of the .ini file used by the Thales driver (in this example usb.ini)

Open this .ini file which is located in the c:\flink folder of your computer hard drive. Set the parameter “DEVICESUP=on” (section “Device support via TCP/IP”). Save and close the editor window.



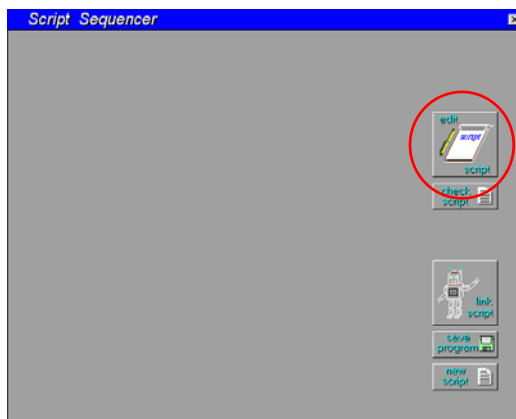
TCP/IP settings in the usb.ini file. Set the parameters as follows:

DEVICESUP=on
DEVICESRV=Charly
(Instead of Charly put in the server name or IP-address, e.g. 127.0.0.1 here)

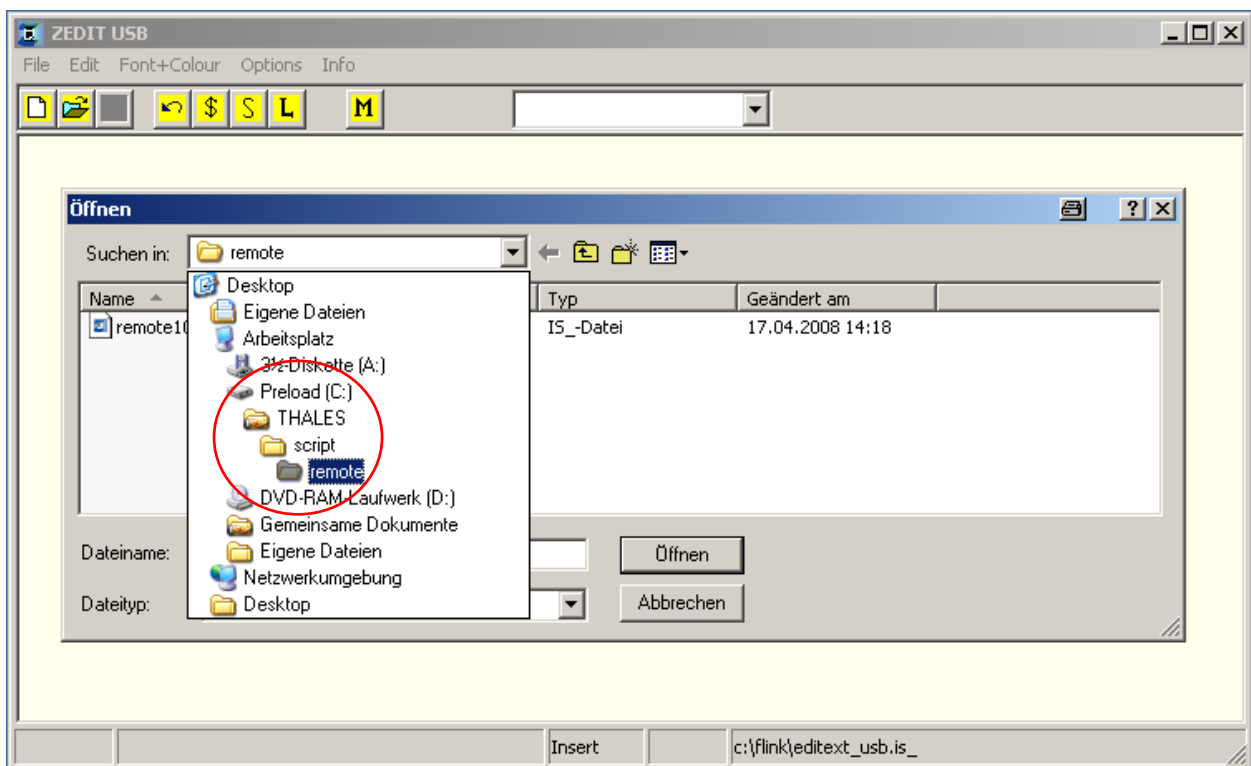
Leave all other settings as they are!
Save the edited .ini file and close the *Notepad*.



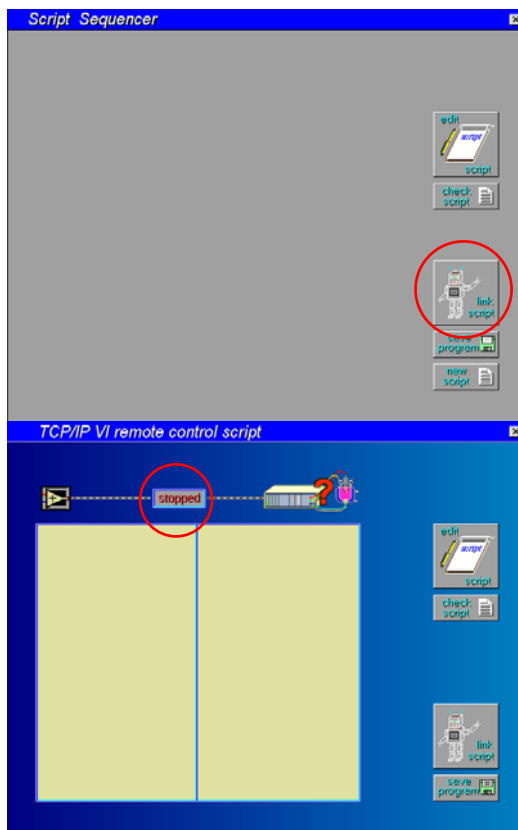
Start the Thales application and activate Script.



Load the SCRIPT into the Zahner editor using the edit script button.



Select the file *remotexx.is_* (xx = version number, e.g. *remote10.is_*) in the folder *c:\THALES\script\remote* and load it. Click the middle mouse button leave the editor and to return to the SCRIPT main page.



Now link the script with the button link script.

After linking the script is started automatically.
At this stage, the communication indicator reads stopped because the communication is not set up so far. It will start as soon as the other end of the “communication line”, the LabVIEW VI or another controller software is started.

During remote control the Thales software has to remain in this state. Leaving the script window will interrupt communication.

2.2 Remote Boot of an *Zennium*

When using the *Zennium* at distant places it can even boot without user interaction. No pressing of D or B at the startup screen is necessary. For this purpose a folder THALES\boot with the needed runtime files has to be created. The folder THALES\bootremote contains all necessary files and can be used by renaming. By triggering an NMI via TCP/IP the *Zennium* is started with the files in the boot folder remote-controlled. This can be done with the LabVIEW sample application by activating the “Start IM remote” option. By adding the Thales link to the autostart folder of your Thales-PC switching on the PC and the *Zennium* are the only actions necessary.

To enable remote boot do the following steps:

1. Thales-PC: Rename the folder c:\THALES\bootremote into c:\THALES\boot.
2. Start Thales or add the Thales shortcut to your autostart folder so it is started automatically.
3. Client-PC: Start LabVIEW and open ZRemote.vi.
4. Enter IP Address (and if changed in the script Device Name) of the Thales PC in ZRemote.vi.
5. Activate the “Start IM remote” option.



Please mind that the precompiled remote script in c:\THALES\bootremote can not be edited. To apply changes load the script source file remotexx.is_ from c:\THALES\script\remote as described before, link it and save the program to c:\THALES\boot.

3. LabVIEW sample application

The sample application ZRemote.vi is located in the folder c:\THALES\NIM. It uses the VIs Autoscale.vi, HandleUserErrors.vi, Sendcommand.vi, Startup.vi, and the library flclient.lib. This library integrates the function calls to DevCli.dll into LabVIEW.

All LabVIEW VIs are saved in the LabVIEW 6.1 file format so they can be used with older versions of LabVIEW. But they are also compatible with recent versions like 8.5.

The screenshot shows the ZRemote.vi interface with several key components and annotations:

- Potential Meter:** A semi-circular gauge showing potential in Volts (V) with a scale from -1m to 1m. A red needle points to 0.000. A red circle highlights the gauge and its digital display.
- Current Meter:** A semi-circular gauge showing current in Amperes (A) with a scale from -10n to 10n. A red needle points to 0.000. A red circle highlights the gauge and its digital display.
- Measure OCP:** A checkbox labeled "Measure OCP" is checked, indicating open circuit potential measurement.
- Operating Mode:** Radio buttons for "Potentiostat" (selected) and "Galvanostat".
- Set Potential:** A numeric input field set to 0.000 V.
- Set Current:** A numeric input field set to 0.000 A.
- Impedance Section:**
 - Frequency: 1.000k Hz
 - Amplitude: 5.00m V/A
 - Period Count: A slider set to 10.
 - A "Measure" button is highlighted with a red circle.
 - Real: 0.000 Ω
 - Imaginary: 0.000 Ω
- Setup Section:**
 - IP Address: 127.0.0.1
 - Device Name: ScriptRemote
 - Start IM remote: unchecked checkbox
 - Device: 0
 - Quit VI button

Annotations on the right side of the image provide further details:

- "Analog and digital auto-ranging meters display the measured potential."
- "Measure the **open circuit potential** i.e. potential when cell is switched off"
- "Set operating mode to potentiostatic or galvanostatic mode."
- "Enter set point potential (potentiostatic mode) and set point current (galvanostatic mode)."
- "Enter parameters for a impedance measurement"
- "Start impedance measurement with preset parameters."
- "Result of last impedance measurement"

The box on the lower right hand side deals with setup of communication and choice of the used device.



IP-Address of Thales-PC acting as server and device name coded in the remote script (default: ScriptRemote).

These inputs are disabled while execution of the LabVIEW VI. Preset these settings before starting the LabVIEW VI.

Boot IM remote at start of LabVIEW VI. This issues an NMI over TCP/IP and increases timeout of the initial communication test to approx. 60 s.

This checkbox is disabled during execution. Preset before starting the LabVIEW VI.

Active potentiostat: 0 internal potentiostat, 1, 2, 3, ... channels of EPC40, RMux

Please note the following hints:

The *Zennium* is set to the state of the front panel when starting the LabVIEW VI. Saving the front panel in a desired default state can shorten manual setup. In consequence this also means: if the Cell Switch is activated at start of the LabVIEW VI the cell is switched on.

Do not use the Stop-Button (red circle) of LabVIEW to quit the LabVIEW VI. The communication is not terminated correctly in this case. Always use the “Quit VI” button on the front panel.

If the Stop-Button was used inadvertently restart LabVIEW to reset communication.

The radio buttons for potentiostatic and galvanostatic control can be both activated when the LabVIEW VI is not running. At start of the VI the Potentiostat button is read out and the Galvanostat button set accordingly.

At startup the LabVIEW VI tries to establish communication for a maximum time of 5 s. If this fails an error message is displayed. Activating “Start IM remote” extends this timeout to 60 s.

The analog meters are autoranging. To avoid flickering of the range the last five values are taken into account when switching to a lower scale. If a new value exceeds the current scale rescaling takes place instantaneously.

4. Instruction Set of the Remote Script

The remote script supports the following variables for controlling the IM.

Assignment	Description	Range
Pset	Set potential [V]	-4 to +4
Cset	Set current [A]	IM6 : -3 to +3 <i>Zennium</i> : -2.5 to +2.5
Frq	Set frequency [Hz]	IM6 : 10^{-5} to $8 \cdot 10^6$ <i>Zennium</i> : 10^{-5} to $4 \cdot 10^6$
Ampl	Set AC amplitude [mV]	0 to 1000
Nw	Set number of AC periods	1 to 99
Pot	ECW on/off state	0 = off -1 = on
Gal	ECW galvanostatic/potentiostatic mode	see table below
GAL	ECW pseudogalvanostatic/galvanostatic mode	see table below
DEV%	logical potentiostat number	0 = main pot 1 – 16 = external pots (only if available)

Setup of ECW-mode.

	GAL = 1	GAL = 0	GAL = -1
Gal = 0	-	potentiostatic	pseudo-galvanostatic
Gal = -1	galvanostatic	-	-

Functions to acquire data from the *Zennium*.

Function	Description
POTENTIAL	Requests potential [V]
CURRENT	Requests current [A]
IMPEDANCE	Requests impedance (real, imaginary)

Examples

Pset=1.5	'sets potential to 1.5 V'
Frq=1000	'sets frequency to 1 kHz'
Pot=-1	'switches potentiostat on'
DEV%=5	'selects external channel #5'
IMPEDANCE	'returns e.g.: 10.001e2,4.54'