MuSR Graphical User Interface: deltat Reference Manual

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Contents

Chapter 1

deltat Manual

This short manual describes the basic use of the `deltat` GUI interface used for time-differential bulk MuSR experiments at the Paul Scherrer Institute.

It contains the following sections:

(new sections will be added at a later point)

The manual is also available at the URL: http://lmu.web.psi.ch/facilities/software/deltat

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Chapter 2

MuSR Graphical User Interface: deltat Page Documentation

2.1 Using deltat

This section describes how to use the `deltat` GUI application to control your experiment.

The application is started on the MuSR Linux Console systems (see table below) by typing `deltat` on the command prompt, or by double-cliking the corresponding icon. The `deltat` application can be used either interactively (so-called "Manual Mode") or can be utilized to setup and start automatic run-sequences (so called "Autorun Mode").

The following subsections provide a detailed information how to use the `deltat` application in both modes

- Manual mode
- Autorun Mode

In addition the following subsection provides some information about the possibility to monitor different parameters of the experiment:

- Monitoring Parameters

The following table gives the names of the respective consoles and back-end computers used by some MuSR instruments:

Instrument	**Linux Console**	**MIDAS Linux Back-end**
GPD	pc6011	psw404
GPS	pc6012	psw405
DOLLY	pc6169	psw403

The account used by normal MuSR users on the Linux Console is `l_musr_tst`. Ask the instrument scientist for the present password.

Inside the PSI network, and also from ouside when using the VPN procedure, the Linux Console can be accessed via a VNC viewer by using the same password as for the `l_musr_tst` account.

2.2 Manual mode

In this section we will review the basic commands necessary to:

- Start_a_Run
- Control the Run Statistic
- Stop a Run
- Zero a Run
- Kill a Run
- Select and Modify Devices
  - Modifying the Values of the Experiment Magnets
  - Modifying Parameters and Setup of the Temperature Controller LTC20/LTC21
  - Modifying Parameters and Setup of the Temperature Controller LakeShore 340
  - Variox/Heliox Cryostat
  - Modifying other Devices
- Modify pTA Settings
- Resetting the Run State
- Modifying the Midas Setup

2.2.1 Start a Run

If a run is not already active, and if no autorun sequence is running, a run can be started from the tab `Run Control`.

Figure 2.1: `deltat` main window with the `Run Control` tab selected. Note that a run is not active and that the mode is manual. Note also that the `Start Run` button is clickable.

By pressing the button `Start Run` a dialog box giving the possibility to modify the titles appears. The last values set for the field and the temperature are normally automatically taken over for the run titles. Note that to date the titles have the same length limitations as previously. An extension is foressen when switching to the NEXUS file format.

Figure 2.2: Dialog to change the run titles at the beginning of a run

At the end of this dialog, the run is actually started.

At this point the status displayed by the `deltat` should be as follows:

Figure 2.3: `deltat` main window with the `Run Control` tab selected. Note that now a run is active and that the mode is still manual. Note also that the `Start Run` button has been replaced by `Pause Run` and that the buttons `Stop Run`, `Zero Run` and `Kill Run` are now clickable.

2.2.2 Control the Run Statistic

The statistic accumulated into the histograms as well as in the scalers can be checked when the tab `pTA Status` selected.

The first table shows the Histograms ("H"), with the current values ("C") and the saved values ("S"). Also the actual rate of the histograms is shown ("rH").

The second table shows the Scalers ("S"), with the current values ("C") and the saved values ("S"). Also the actual rate of the scalers is shown ("rS").

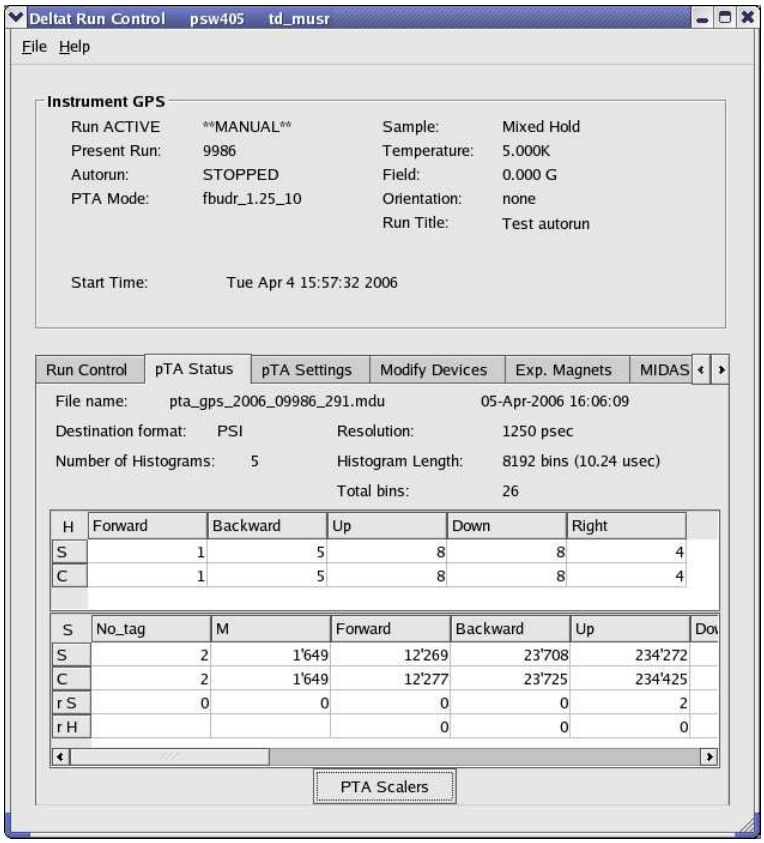

Figure 2.4: `deltat` main window with the `pTA Status` tab selected.

On the same tab `pTA Status` the button `pTA Scalers` gives acces to a graphical representation of the present scalers rates.

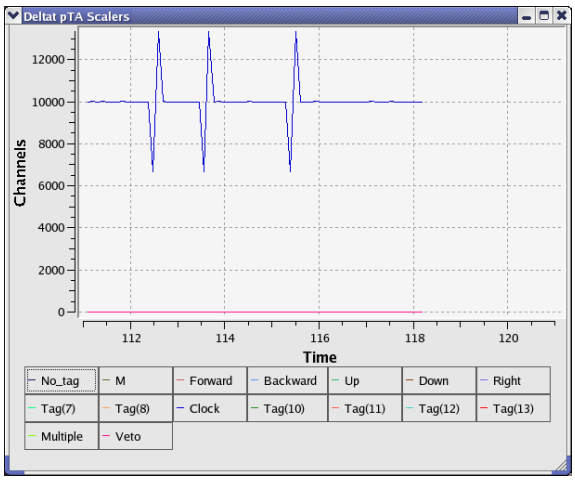

Figure 2.5: Graphical representation of the present scalers rates. The time axis corresponds to the time in minutes from the beginning of the run. The peaks reflect the fact that acquisition time and scalers are not updated synchronously.

2.2.3 Stop a Run

When the desired statistic has been reached, the run can be stopped by selecting the tab `Run Control` and by hitting the button `Stop Run`. At this point the user can modify the titles of the stopping run a last time.

2.2.4 Zero a Run

When a run is active, the user has the possibility to "zero" a run. This action will clear all the content of the scalers and histograms.

This action is possible by selecting the tab `Run Control` and by hitting the button `Zero Run`. A confirmation dialog will appear at this point.

2.2.5 Kill a Run

Although this action should be limited to the strict minimum, the user has the possibility to "kill" an active run. This action will stop the current run and reset the run number. When the next run is started, the data files of the killed run will be overwritten.

This action is possible by selecting the tab `Run Control` and by hitting the button `Kill Run`. A confirmation dialog will appear at this point.

Through the `deltat` user interface, the user can have access to almost all the devices used during the experiment. The experimental parameters can be modified, as a rule, when a run is not active.

2.2.6 Selecting Devices

The devices to be modified can be selected from the tab `Modify Devices` and, for the experiment magnets, from the tab `Exp. Magnets`.

If the tab `Modify Devices` is selected a list of the available devices will appear. A device can be selected and, if a modification is indeed allowed, a button `Modify` will appear.

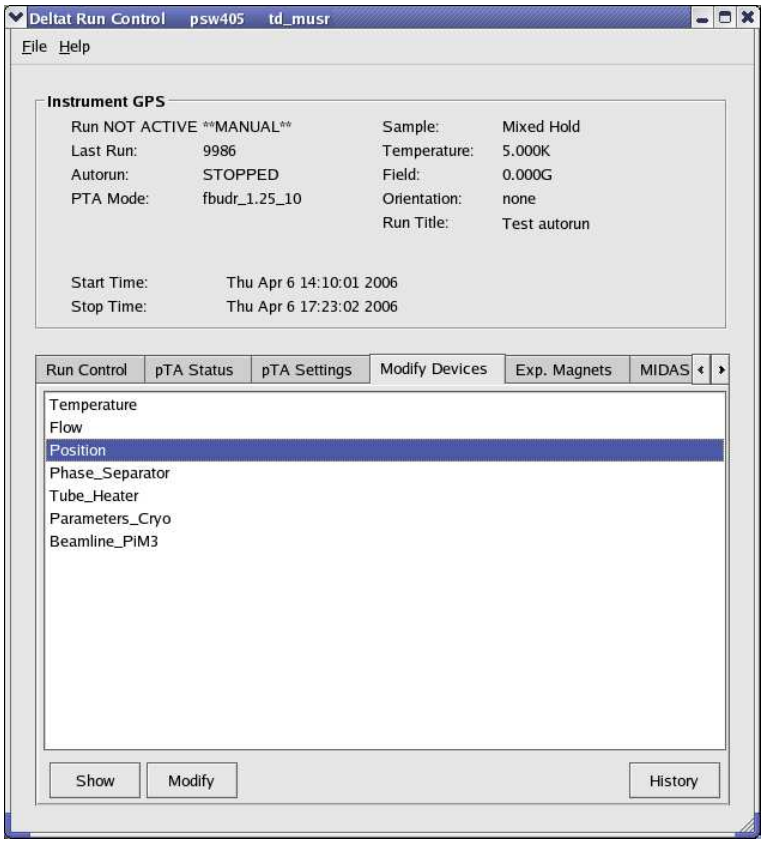

Figure 2.6: Example of a device for which a modification is allowed.

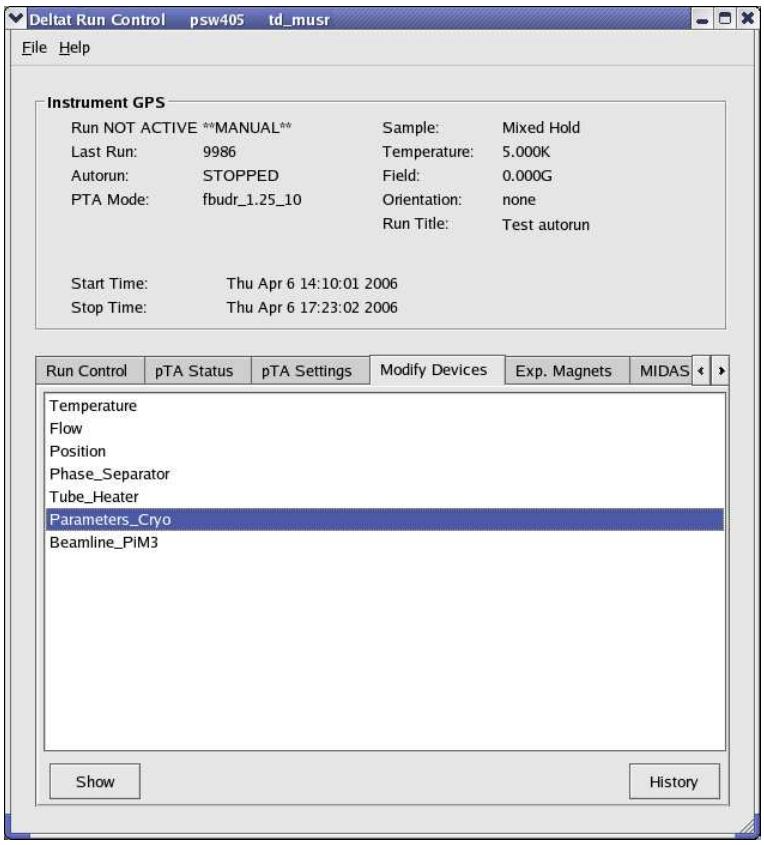

Figure 2.7: Example of a device for which no modification is allowed. Note that the `Modify` button is not available.

Each device is controlled and read out by a background process ("frontend" process) If this process is not running, when the user tries to access a device (through the buttons `Show` or `Modify`), it will be prompt whether he wants to start (or not) the frontend process.

In the following sections we will review the necessary commands to modify devices.

- Experiment Magnets
- Temp. Controller LTC20/LTC21
- Temp. Controller LS340
- Variox/Heliox Cryostat
- Other Devices

Note that before to turn the power of a device off, the frontend process should be stopped from the `deltat` user interface. This is very important, in particular for the GPIB communication as other devices on the same GPIB server may also be blocked.

2.2.7 Modifying the Values of the Experiment Magnets

If the tab `Exp. Magnets` is selected a list of the available magnets will appear on a table. By clicking one of the magnets, its "demand" value can be changed in the text-editing field. Depending on the reaction speed of the magnet power supply, the measured value will eventually reflect the new "demanded" value.

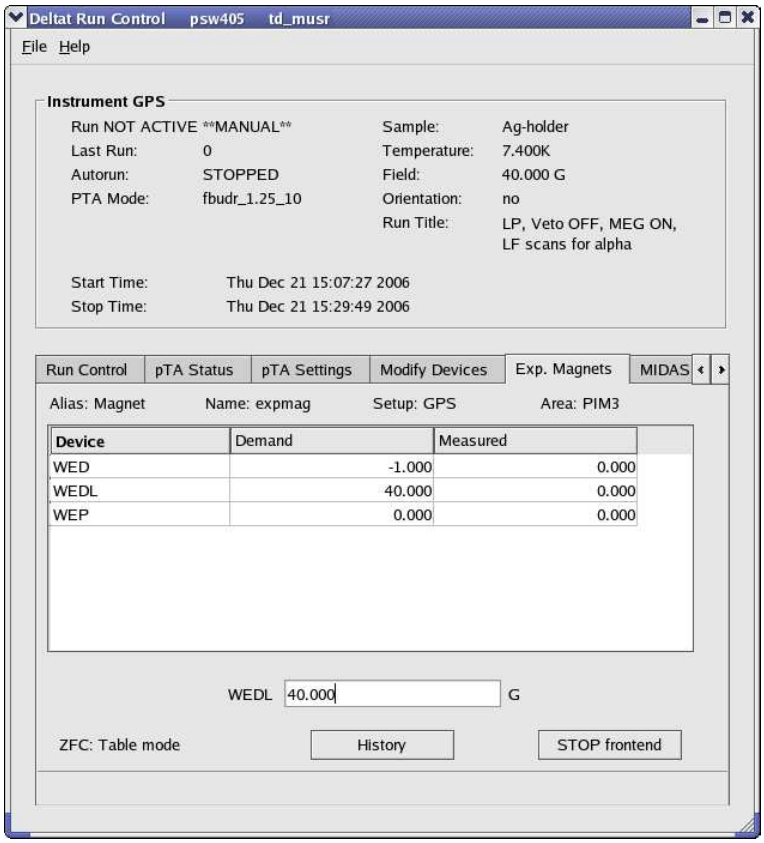

Figure 2.8: Example of the dialog window to modify the field of a device. By clicking on the desired magnet in the table, the new demand value can be entered in the text-editing field.

2.2.8 Modifying Parameters and Setup of the Temperature Controller LTC20/LTC21

If the tab `Modify Devices` is selected a list of the available devices will appear. The Temperature Controller device can be selected and a button `Modify` will be available.

By hitting the button `Modify`, a first dialog appears giving the possibility either to change the set-point(s) (`Modify Temperature`) or modify the setup (i.e. when changing holder or cryostat; `Modify Setup`). Also the user has the possibility to put the controller in the Control or Monitor mode.

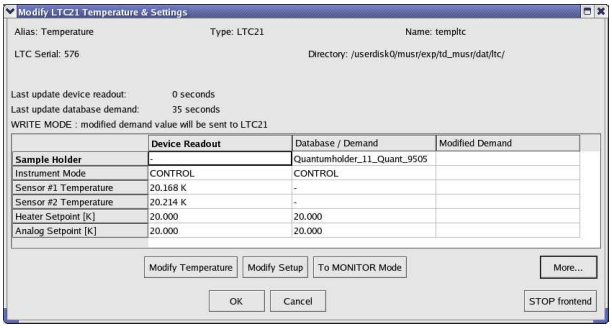

Figure 2.9: First dialog to modify the temperature setpoints(s) or setup of the LTC20/LTC21 temperature controller.

When modifying the temperature setpoint(s) a second dialog will appear with the currently set and the modified setpoint(s), the temperature range(s) and time(s) for the stability criterium. The values can be modified in the table and changes will be applied by pressing the button `OK`.

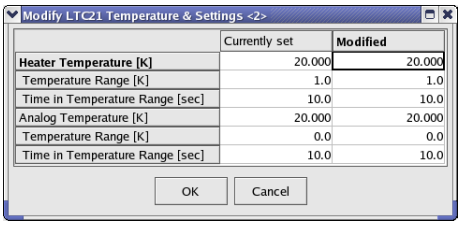

Figure 2.10: Second dialog to modify the temperature setpoints(s).

To modify the setup of the controller (for example when changing the sample stick) the button `Modify Setup` has to be pressed. A "wizard" dialog will appear with a drop-down list on the first page giving the possibility to choose the new sample stick.

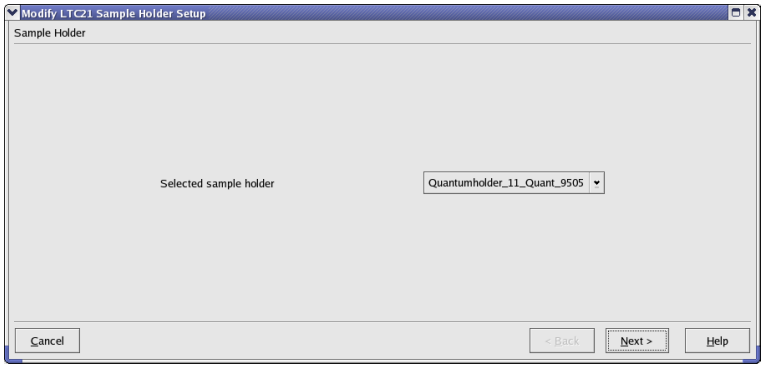

Figure 2.11: Dialog to choose the new sample stick.

By hitting the button `Next`, the second page will appear where the configuration can be choosen (1 or 2-loop mode, etc...). By choosing the corrected entry, the setup can be finished by hitting the button `Apply & Exit`.

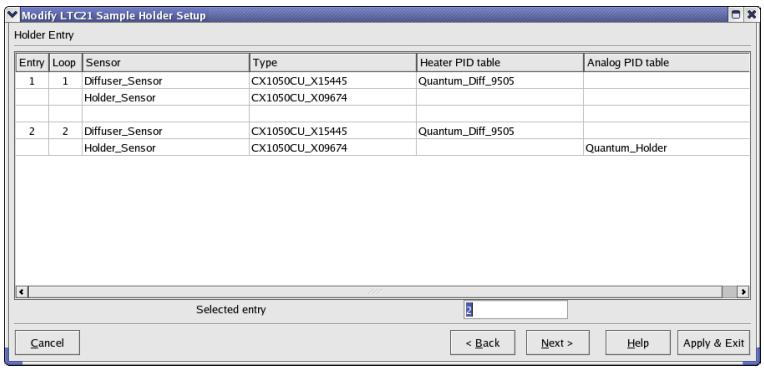

Figure 2.12: Dialog to choose the configuration for the new sample stick.

At this point the temperature controller should be configured with the corresponding parameters, and a new setpoint may be set.

2.2.9 Modifying Parameters and Setup of the Temperature Controller LakeShore 340

If the tab `Modify Devices` is selected a list of the available devices will appear. The Temperature Controller device can be selected and a button `Modify` will be available.

By hitting the button `Modify`, a first dialog appears giving the possibility either to change the setpoint(s) (`Modify Temperature`) or modify the setup (i.e. when changing cryostat; `Modify Setup`). Also the user has the possibility to put the controller in the Control or Monitor mode. This can be done either by switching ON or OFF the heater loops (Monitor/Control button) or by enabling/interrupting the heater loop wires using the HECTOR module (button `Switch Output Control ON/OFF`).

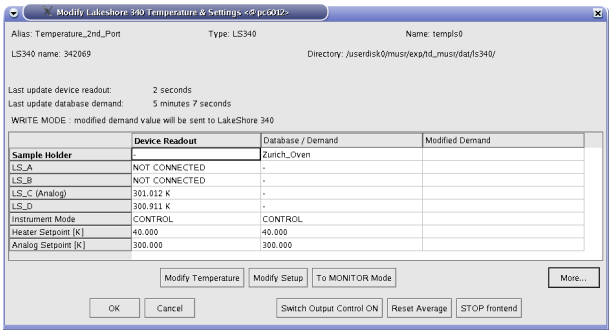

Figure 2.13: First dialog to modify the temperature setpoints(s) or setup of the LakeShore 340 temperature controller.

When modifying the temperature setpoint(s) a second dialog will appear with the currently set and the modified setpoint(s), the temperature range(s) and time(s) for the stability criterium. The values can be modified in the table and changes will be applied by pressing the button `OK`.

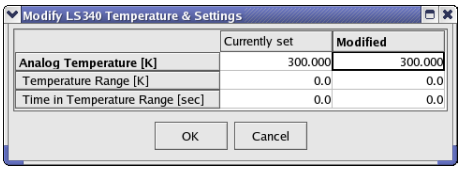

Figure 2.14: Second dialog to modify the temperature setpoints(s).

To modify the setup of the controller (for example when changing between CCR and Oven) the button `Modify Setup` has to be pressed. A "wizard" dialog will appear with a drop-down list on the first page giving the possibility to choose the new cryostat.

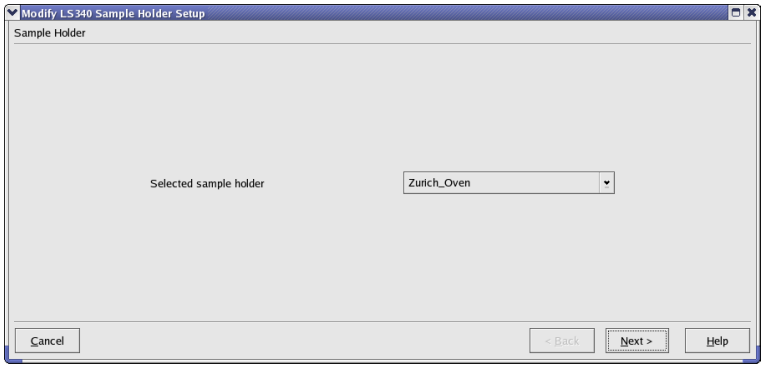

Figure 2.15: Dialog to choose the new cryostat.

By hitting the button `Next`, the second page will appear where the configuration can be choosen (1 or 2-loop mode, etc...). By choosing the corrected entry, the setup can be finished by hitting the button `Apply & Exit`.

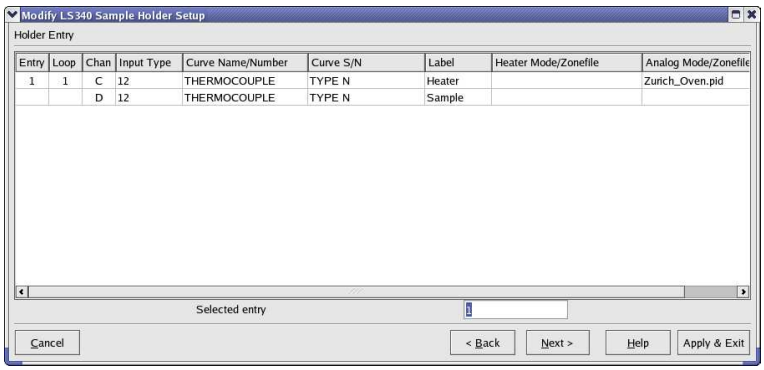

Figure 2.16: Dialog to choose the configuration for the new cryostat.

At this point the temperature controller should be configured with the corresponding parameters, and a new setpoint may be set.

Note that the setup procedure is relatively long for the LakeShore 340, as each time new PID tables are downloaded on-fly.

2.2.10 Modifying Parameters of the Variox Cryostat (and Heliox Insert)

The Oxford Instruments VARIOX cryostats are used on the GPD and DOLLY MuSR instruments. They can be used as usual so-called static helium-flow cryostat with a sample stick insert.

They can be also used in combination with the HELIOX insert, which is an ^{3} He sorbtion pump system.

The Variox cryostat and the Heliox insert are controlled by a LabView application running on a PC located near the instrument. this application controls the needed temperature controllers (ITC 503's) sand reads the level meter of the cryogenic fluids (ILM 211). During normal operation, the user controls the temperature of the cryostat and/or insert through a MIDAS fron-end process, which communicates with the LabView application. This MIDAS front-end is fully integrated into the `deltat` GUI application.

Prior to control the Varix/Heliox system, the LabView application should be setup correctly and ready to communicate with the MIDAS front-end.

Ask the instrument scientist for advices.

Notes for the instrument scientist:

- The MIDAS front-end should be first configured to reflect the hardware used (Variox and/or Heliox and/or ILM). This is done by changing the values of some variables in the ODB:
  - `/Equipment/tempvariox/Settings/Devices/OXFORDVARIOXout/DD/ITC Variox Used`
  - `/Equipment/tempvariox/Settings/Devices/OXFORDVARIOXout/DD/ITC Heliox Used`
  - `/Equipment/tempvariox/Settings/Devices/OXFORDVARIOXout/DD/ILM Used`

  This can be performed either with **odbedit** or through the WEB interface, by looking at the tree:
  - GPD: http://psw404:8081/Equipment/tempvariox/Settings/Devices/OXFORDVARIOXout/DD
  - DOLLY: http://psw403:8081/Equipment/tempvariox/Settings/Devices/OXFORDVARIOXout/DD
- The MIDAS front-end should then be configured to reflect the setpoints which can be changed by the MIDAS fron-end. This is done by changing the values of some variables in the ODB:
  - `/Equipment/tempvariox/Variables/Output[30]`
  - `/Equipment/tempvariox/Variables/Output[31]`

  This can be performed either with **odbedit** or through the WEB interface, by looking at the tree:
  - GPD: http://psw404:8081/Equipment/tempvariox/Variables
  - DOLLY: http://psw403:8081/Equipment/tempvariox/Variables

  Alternatively, one can change these values through the WEB interface, by looking at the tree:
  - GPD: http://psw404:8081/SC/tempvariox
  - DOLLY: http://psw403:8081/SC/tempvariox

  The `Output[30]` and `Output[30]` variables correspond to the variables `ITC_Variox_Setpoint_Used` and `ITC_Heliox_Setpoint_Used`, respectively

2.2.10.1 Using the Variox cryostat alone

When using the Variox cryostat alone, the MIDAS front-end and LabView application should be configured accordingly.

Usually, the user can set the temperature of the Variox and read the cryogenic levels.

If the tab `Modify Devices` is selected a list of the available devices will appear. The Variox/Heliox Cryostat can be selected and a button `Modify` will be available.

By hitting the button `Modify`, a first dialog appears giving the possibility either to change the setpoint (`Modify Temperature`).

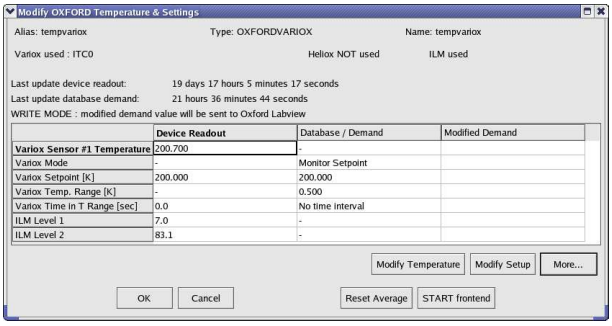

Figure 2.17: First dialog to modify the temperature setpoint of the Variox.

When modifying the temperature setpoint a second dialog will appear with the currently set and the modified setpoint, the temperature range(s) and time(s) for the stability criterium. The values can be modified in the table and changes will be applied by pressing the button `OK`.

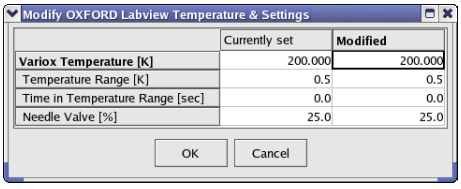

Figure 2.18: Second dialog to modify the temperature setpoints.

Note:

When using the Variox cryostat alone, the Variox setpoint changes the temperature of the Variox IVC. In addition, the sample stick is equipped with a temperature control loop (sensor and heater) which can be controlled by a LTC20/21 controller or a LakeShore controller. Therefore to change the sample temperature, the Variox setpoint should be changed as well as the setpoint of the sample stick through the corresponding device controlling the stick. Of course the same temperature should be set for both setpoints.

2.2.10.2 Using the Variox cryostat with Heliox insert

When using the Variox cryostat with the Heliox, the MIDAS front-end and LabView application should be configured accordingly.

Usually, and after the condensation of the ^{3}He liquid, the Variox is kept at the lowest temperature (directly through the LabView application) and solely the temperature of the Heliox is changed from the `deltat` GUI application (the possibility to change the Variox setpoint from `deltat` beeing disabled).

If the tab `Modify Devices` is selected a list of the available devices will appear. The Variox/Heliox Cryostat can be selected and a button `Modify` will be available.

By hitting the button `Modify`, a first dialog appears giving the possibility either to change the setpoint (`Modify Temperature`).

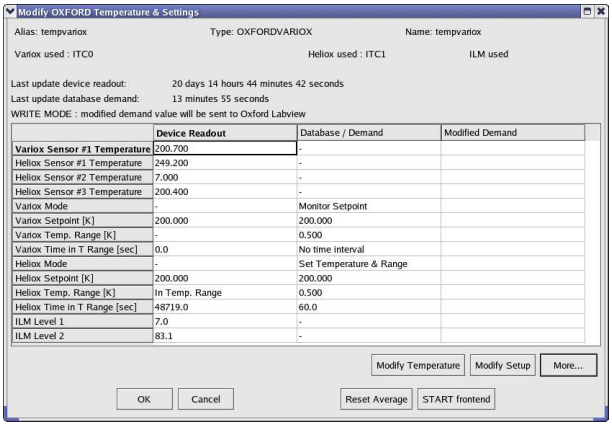

Figure 2.19: First dialog to modify the temperature setpoint of the Variox.

When modifying the temperature setpoint a second dialog will appear with the currently set and the modified setpoint, the temperature range and time for the stability criterium. The values can be modified in the table and changes will be applied by pressing the button `OK`.

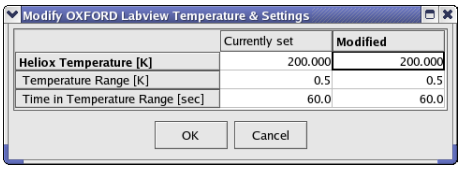

Figure 2.20: Second dialog to modify the temperature setpoints.

2.2.11 Modifying other Devices

On the `Modify Devices`, when selecting another device, by hitting the button `Modify`, a dialog appears containing a table with the different parameters available for the choosen device. By clicking one of the parameters, its "demand" value can be changed in the text-editing field. Depending on the reaction speed of the device and the reading of the related front-end, the measured value will eventually reflect the new "demanded" value.

Note that if really necessary, a modification of a device is possible in the middle of a run, but the user will have to clear some warning dialogs.

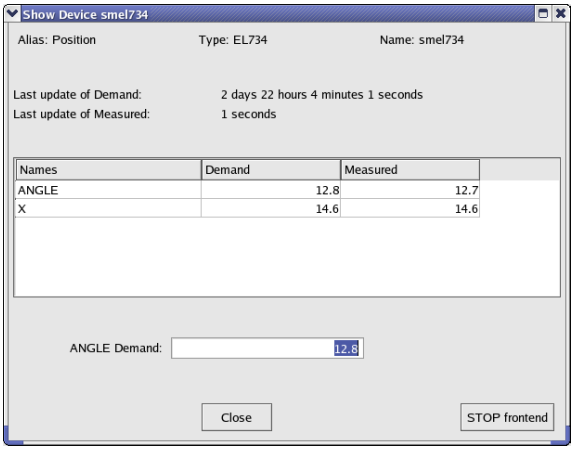

Figure 2.21: Example of the dialog window to modify parameters of a device. By clicking on the desired parameter in the table, the new demand value can be entered in the text-editing field.

2.2.12 Modify the pTA Settings

With the tab `pTA Settings` active you have the following buttons available:

`Select Mode`**:**

shows a list of defined modes and prompts for the name of the mode to be in use;

`Modify this Mode's Settings`**:**

modifies the set-up of the currently selected mode;

`Show this Mode's Settings`**:**

shows the set-up of the currently used mode;

`Show Settings of Mode`**...:**

shows a list of defined modes and prompts for the name of the mode to be shown.

`Create Mode`**:**

creates a new pTA mode.
If an instrument specific template file is available (`mode_template_WSNAME.odb` in `/userdisk0/musr/exp/td_musr/midas` on the Linux backend computer) mode set-up will be read from the template file. Currently the maximum number of modes is limited to 6;

`Copy Mode`**:**

does what it says;

`Rename Mode`**:**

does what it says;

`Delete Mode`**:**

does what it says;

`Save Mode`**:**

saves mode into an ASCII file (`*.odb`) in directory `/userdisk0/musr/exp/td_musr/midas` on the Linux backend computer;

`Restore Mode`**:**

reads mode information from an ASCII file (`*.odb`) located in `/userdisk0/musr/exp/td_musr/midas` on the Linux backend computer.

Note:

A mode must be selected before it may be modified or used for data-acquisition. The last selected mode will be used when data acquisition is started.

2.2.13 Modify the Midas Setup

Note:

This section is exclusively dedicated for Intrument Scientists to perform/alter the initial setup of the database.. Go ahead only if you know what you are doing.

With the tab `MIDAS Setup` you have to modify the Midas Setup by clicking the button `Start Midas Setup`.

This will start the MIDASSET program to configure, select and modify pTA mode settings and view the Midas ODB database.

WARNING:

It is not possible to perform a Midas run transition (e.g. starting data acquisition of the pTA) while MIDASSET is in editing mode!

2.2.14 Resetting the Run State (being stuck with Run CHANGING)

If one of the **pTA Settings** or **MIDAS Setup** command is invoked to edit the ODB database the variable `/Runinfo/Transition in process` is set to the value 1. The run status changes to `CHANGING`.

The run state may then not be changed before the variable `/Runinfo/Transition in process` is reset to zero! As a consequence, no run may be started until the respective command in progress is correctly terminated typing exit or quit.

If you are absolutely sure that the run state is stuck to `CHANGING`, you may reset the variable `/Runinfo/Transition in process` to 0 following one the possibilities shown below:

- go in the **MIDAS Setup** tab. If the run status is still on `CHANGING` a button `Reset Changing` will be active. By pressing it the status of the run will be reset.

  or

- on the data acquisition console, when logged in as user l_musr_tst, open a terminal window and invoke the command:

  ```
  reset_changing
  ```

  or

- open a terminal window on the data acquisition console and invoke the command:

  ```
  /usr/local/midas/midasset -h pswXXX -e td_musr -r reset -b -1 dir group
  ```

  where `pswXXX` is the name of the backend computer.

Note:

Before resetting "Transition in progress" to 0, make sure that the ODB database is not being edited from another window or terminal.

2.3 Autorun Mode

This page described how to set an autorun sequence.

An autorun sequence can be edited from the `deltat` and will be saved on the back-end computer with the extension `".seq"`.

The following typographic convention is adapted in this manual.

- `<...>` represents an mandatory argument.
- `[<...>]` represents an optional argument.
- `<...>|<...>` represents a choice between different arguments.

In the following, we will describe how to:

- Edit an Autorun Sequence
- Syntax of an Autorun Sequence
- Control an Autorun Sequence

2.3.1 Edit an Autorun Sequence

To edit an autorun sequence, the tab `Run Control` should be active.

By pressing the button `Edit Sequence` in the `Autorun Sequence` box a dialog to choose a run sequence file (extension ".seq") will appear. It is possible to choose an existing file or give a new filename. Once choosen the file will appear in an editor window.

When the user is finished with the writing of the sequence, the sequence can be verified and saved. After verification, warnings will appear in green within the script and errors will appear in red.

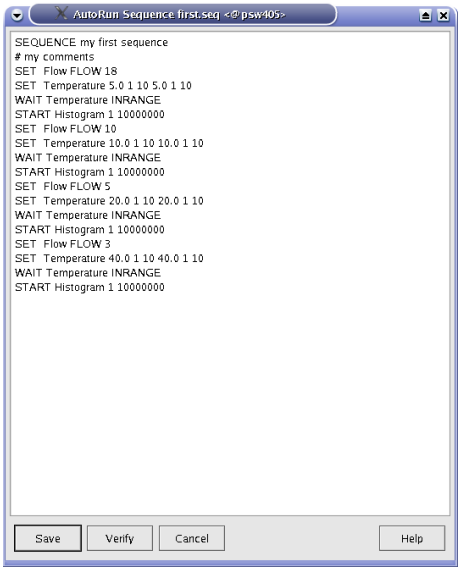

Figure 2.22: Editor window containing the file to be edited. Once the editing is finished, the user has the possibility to verify the autorun syntax, and save the file.

To write an autorun sequence, a set of standard commands are available and decribed in the following sections. These comands can be used to:

- Modify Devices
  - Use of the SET command for temperature controllers
    - Syntax for LTC20/21 and for LakeShore 340
    - Syntax for the Variox Cryostats
  - Use of the SET command for other devices
- Start a Run
- Wait Command
  - Wait a given Amount of Time
  - Wait for reaching Device Specific Condition
- Change Run Titles
- Document the Autorun Sequence

2.3.2 Modify the Parameters of a Device – SET command

To modify the parameters of a device, the command `SET` should be used. We will differentiate the use of the `SET` for two categories of devices:

- Use of the SET command for temperature controllers
  - Syntax for LTC20/21 and for LakeShore 340
  - Syntax for the Variox Cryostats
- Use of the SET command for other devices

2.3.2.1 Use of the SET command for temperature controllers

Syntax for LTC20/21 and for LakeShore 340 As these temperature controllers can control different heating loops, depending on the specific setup, the parameters for both loop may be needed. The parameters are the setpoint and tolerance in Kelvin, as well as the required stability time for the temperature to be within the tolerance.

```
SET  <alias>|<equipment name> <control-loop 1 parameters>|<control-loop 2 parameters>
```

where `<control-loop N parameters> = <setpoint><tolerance><stability-time>`

Examples:

- Setting the main Cryostat Temperature (2-loops mode):

  ```
  SET Temperature 100.0 1.0 60 100.0 1.5 30
  ```

  The same action for the 2nd-port Cryostat Temperature (2-loops mode):

  ```
  SET Temperature_2nd_Port 100.0 1.0 60 100.0 1.5 30
  ```

  where:

  - `Temperature` or `Temperature_2nd_Port` represent the aliases for the respective temperature controller frontends,
  - `100.0` represents the new setpoint in Kelvin for the first heating loop,
  - `1.0` represents the tolerance in Kelvin for the first heating loop,
  - `60` represents the time that the first temperature needs to stay within the tolerance to be considered "in range",
  - `100.0` represents the new setpoint in Kelvin for the second heating loop,
  - `1.5` represents the tolerance in Kelvin for the second heating loop,
  - `30` represents the time that the second temperature needs to stay within the tolerance to be considered "in range".

    Note that the autorun sequence does NOT wait for the "in range" conditions to be fulfilled prior to go to the next autorun sequence command. If the user wants to wait for the "in range" conditions, a WAIT command (see below) has to be included as next command (or where needed).

- Setting the main Cryostat Temperature (1-loop mode):

```
SET Temperature 100.0 1.0 60
```

where:

- `Temperature` represents the alias for the temperature controller frontend,
- `100.0` represents the new setpoint in Kelvin,
- `1.0` represents the tolerance in Kelvin,
- `60` represents the time that the temperature needs to stay within the tolerance to be considered "in range".

Note:

Note tha the `SET` does solely set the parameters, but does not actually wait for the temperature to be in the defined tolerance for the defined time. To be sure to have a temperature within the tolerance, the user should also specify the command `WAIT` (see section Wait for reaching Device Specific Condition) after the `SET` command.

Syntax for the Variox Cryostats The GUI `deltat` and the MIDAS data acquisition system allow the users to control the LabView application controlling the Oxford Instrument Variox Cryostats. As explained in section Variox the setup has to be performed on the LabView application prior to control it from the `deltat` application.

```
SET  <alias>|<equipment name> <Variox-par.><Heliox-par.>[<NV>]|<Variox-par.>[<NV>]|<Heliox-par.>
```

where:

- `<Variox-par.> = <setpoint><tolerance><stability-time>` are the parameters for the Variox Cryostat,
- `<Heliox-par.> = <setpoint><tolerance><stability-time>` are the parameters for the Heliox Insert,
- `<NV>` is the Variox needle valve value in %. This parameter can only be used if the Variox Cryostat is **not** is auto-needle-valve mode.

Note:

The number and type of parameters to be specified depends on the configuration of the front-end (is the Heliox or Variox setpoint requested? – See also Section Modifying Parameters of the Variox Cryostat (and Heliox Insert)).
Note that the `SET` does solely set the parameters, but does not actually wait for the temperature to be in the defined tolerance for the defined time. To be sure to have a temperature within the tolerance, the user should also specify the command `WAIT` (see section Wait for reaching Device Specific Condition) after the `SET` command.

2.3.2.2 Use of the SET command for other devices

Syntax:

```
SET  <alias>|<equipment name> [<device specific arguments>]
```

Note:

Any device not being shown in the `Modify Device` list (except pTA and Experimental Magnets) may not be set in the autorun sequence. Use `Show` or `Modify` in the `Modify Device` tab to find out about currently valid Aliases, Names and Parameter Names.

The examples given below refer to the GPS aliases.

Examples:

- Setting an helium flow:

```
SET Flow FLOW 2.5
```

  where:

  - `Flow` represents the alias for the flow controller frontend,
  - `FLOW` represents the parameter to be changed,
  - `2.5` represents the flow in l/min.

- Setting a magnet:

```
SET Magnet WED 1000 60
```

  where:

  - `Magnet` represents the alias for the magnet controller frontend,
  - `WED` represents the name of a specific magnet,
  - `1000` represents the new field in Gauss,
  - `60` represents the waiting time for the field stabilization. Note that this time is waited immediately after changing the field setpoint value. Therefore the user should choose a long enough waiting time to allow the field to stabilize.

- Setting a sample rotation angle:

```
SET Position ANGLE 130.0 30
```

  where:

  - `Position` represents the alias for the rotation controller frontend,
  - `ANGLE` represents the parameter to be changed,
  - `130.0` represents the new angle.
  - 30 represents the maximum optional waiting time for ANGLE (which should be longer than the time necessary to rotate the sample, especially if a run is started as next step).
    Note: if waiting time is not specified, the autorun sequence will wait until ANGLE is within tolerance.

- Setting a new value for the Tube Heater:

```
SET Tube_Heater I 0.230
```

  where:

  - `Tube_Heater` represents the alias for the Tube Heater frontend,
  - `I` represents the parameter to be changed (here the current),
  - `0.230` represents the new current in Ampere.

- Setting a new value for a beamline element:

```
SET Beamline_PiM3 FS302 400
```

  where:

  - `Beamline_PiM3` represents the alias for the Beamline Controller frontend,
  - `FS302` represents the element to be changed (here the slits in front of GPS),
  - `400` represents the new DAC value for this element.

2.3.3 Perform a Run in an Autorun Sequence – START or STOP command

To start a run in an autorun sequence, the command `START` should be used:

Syntax:

```
START S[CALER]    <number of scaler>|<label> <limit>
```

or

```
START H[ISTOGRAM] <number of histogram>|<label> <limit>
```

Examples:

- Starting a run to accumulate 10'000'000 events in the histogram 1:

  ```
  START Histogram 1 10000000
  ```

- Starting a run to accumulate 5'000'000 events in the histogram "Forw":

  ```
  START Histogram Forw 5000000
  ```

- Starting a run to accumulate 3'000'000 events in the scaler 5:

  ```
  START Scaler 5 3000000
  ```

As a rule, if a run was already active when an autorun sequence is started, it will be stopped. The users can nevertheless keep the running run and incoporate it in the autorun sequence by using the command `STOP` as the first command in the autorun sequence: :

Syntax:

```
STOP S[CALER]    <number of scaler>|<label> <limit>
```

or

```
STOP H[ISTOGRAM] <number of histogram>|<label> <limit>
```

Example:

- Stopping a run, already running before the autorun sequence is started, after an accumulation of 10'000'000 events in the histogram 1:

  ```
  STOP Histogram 1 10000000
  ```

2.3.4 Wait for Special Conditions – WAIT command

2.3.4.1 Wait a given Amount of Time

There is the possibility to make the autorun sequence process wait a given amount of time before proceeding with the next command:

Syntax:

```
WAIT <time in seconds>
```

Example:

- Waiting 15 minutes before proceeding:

  ```
  WAIT 900
  ```

2.3.4.2 Wait for reaching Device Specific Condition

The autorun sequence can wait until a device has reached specific conditions.

(Note: to date this command applies only to the Conductus/Neocera LTC21 Temperature Controller and to the LakeShore 340 Temperature Controller).

Syntax:

```
WAIT <alias>|<equipment name>|<interval [sec]>  [<device specific arg>] [<max interval>]
```

Example:

- Waiting that the temperature of the main Cryostat is in range

  ```
  WAIT Temperature INRANGE
  ```

- Waiting that the temperature of the Cryostat at the second port is in range

  ```
  WAIT Temperature_2nd_Port INRANGE
  ```

- Terminate waiting if temperature is still not in range after 1 hour

  ```
  WAIT Temperature INRANGE 3600
  ```

Notes:

- If the stability-time parameter for a temperature controller is set to 0, the `WAIT ... INRANGE` command wait until the temperature is within the tolerance and then immediately proceeds.
- If the tolerance parameter for a temperature controller is set to 0, the `WAIT ... INRANGE` command does not wait for the temperature to be within the tolerance.

2.3.5 Change the Titles of a Run

The titles for a run can be modified from the autorunsequence with the command `TITLE`:

Syntax:

```
TITLE    S[AMPLE]=<text> F[IELD]=<text> T[EMP]=<text> O[RIENT]=<text> C[OMMENT]=<text>
```

Note that normally the field, temperature and orientation entries are automatically changed when they have been modified by the command `SET` or if they have been changed interactively.

Example:

- Changing the comment entry

  ```
  TITLE C=This is just a test
  ```

2.3.6 Document the Autorun Sequence

Lines of the autorun sequence file beginning with "#" are considered as comments.

The command `SEQUENCE` is usually placed at the top of the script and define the title of the autorun sequence. This title is displayed for example in the status window of the autorun sequence (see section Status of the Autorun Sequence).

2.3.7 Controlling an Autorun Sequence

2.3.7.1 Starting an Autorun Sequence

When the tab `Run Control` is active, an autorun sequence can be started by pressing the button `Start Sequence` (in the **Autorun Sequence** box). A first dialog will appear giving the choice to select the appropriate autorun sequence file.

Once the autorun sequence is started, the run information on the main window will indicate that an autorun is running.

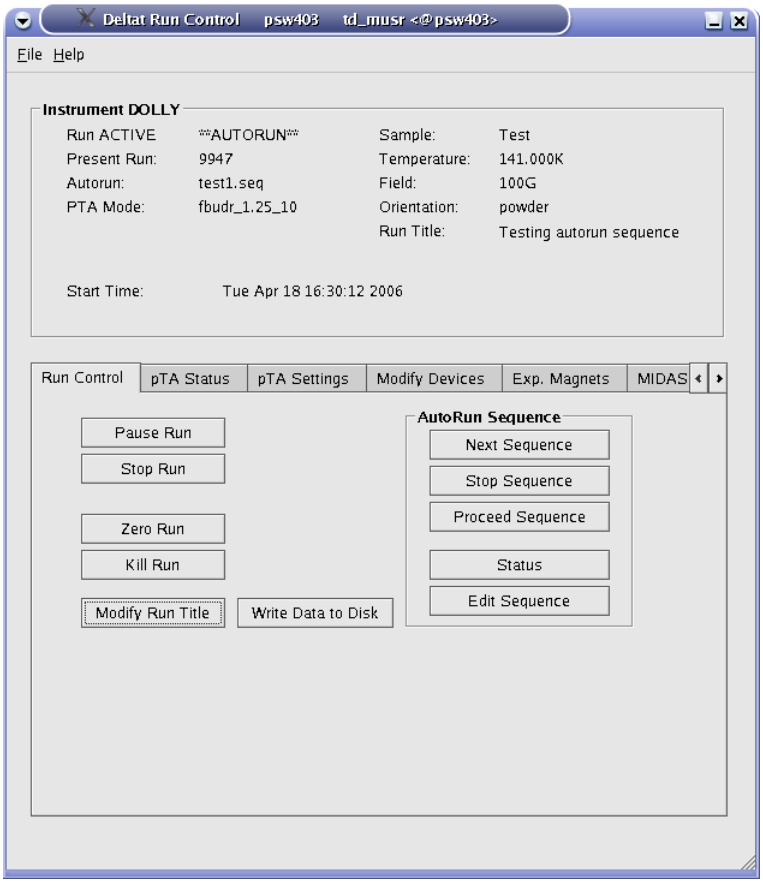

Figure 2.23: Main window indicating that an autorun sequence is active (note the `**AUTORUN**` indication at the top of the window). Note also that the interactive button (as `Stop Run`, etc...) are in the autorun mode only active when a run is active.

2.3.7.2 Status of the Autorun Sequence

In addition to the indication on the main window, the status of an autorun sequence can be observed when pressing the button `Status` in the **Autorun Sequence** box. An additional window will appear showing the status of the Run Sequence.

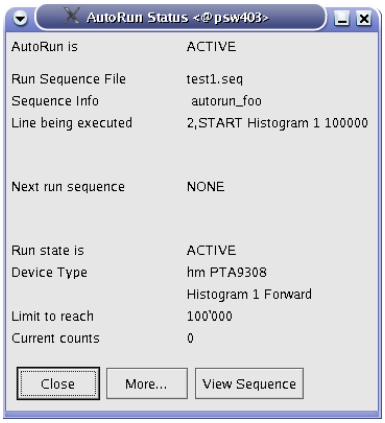

Figure 2.24: Autorun Sequence Status window showing the status of the autorun sequence.

In addition to the button **More...** giving access to more information, the button **View Sequence** opens a window where the present autorun sequence is displayed whit the line being executed highlighted in red.

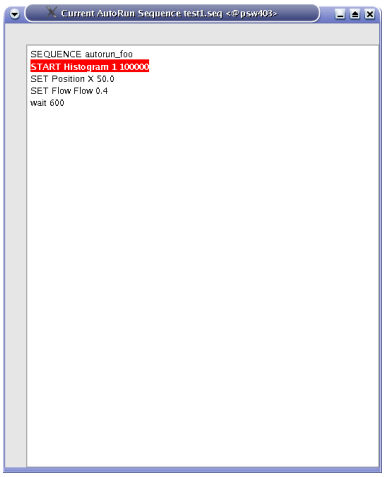

Figure 2.25: View Sequence window showing the present autorun sequence with the line being executed highlighted in red.

2.3.7.3 Altering the Autorun Sequence

Different actions can be taken when an autorun sequence is running.

The user can:

- **Stop the Autorun process:** With the tab `Run Control` active, by pressing the button `Stop Sequence`. The user will be prompted whether to stop immediately or at the end of the present action.
- **Proceed the Autorun process:** With the tab `Run Control` active, by pressing the button `Proceed Sequence`. If the autorun sequence is waiting for a Device Specific Condition, the user will be asked whether the waiting should be aborted. The autorun sequence will stop the present action and proceed to the next line.

- **Load the "Next" Sequence:** The user can choose the next autorun sequence by pressing the button `Next Sequence` (tab `Run Control` active). The user will be prompted whether to attach the "next" autorun sequence at the end of the present sequence or whether to stop the present sequence. If the second option is choosen, the user can choose whether to jump to the "next" sequence immediately or at the end of the present run.

Note:

After starting the autorun sequence, the autorun sequence will be copied into a special file. Unlike the old DAQ system, there is no direct possibility to alter just the remaining lines to be executed. To do so, the user should edit the autorun sequence file with the necessary modifications and load it, for example with the `Next Sequence` option.

2.4 Monitoring Parameters

The Midas slow control system monitors permanently a variety of parameters.

Some of them can be displayed as a function of time. The display option is available for some devices in the tab `Modify Devices`. By choosing a device and hitting the button `History` a browser window will appear with the corresponding history. In addition to the possibility to navigate in the "history", different time spans can be choosen. On a multi-parameter plot, a single parameter can be displayed by clicking its legend. The full plot can be recover by clicking on the title of the plot.

As much browser windows as necessary can be open.

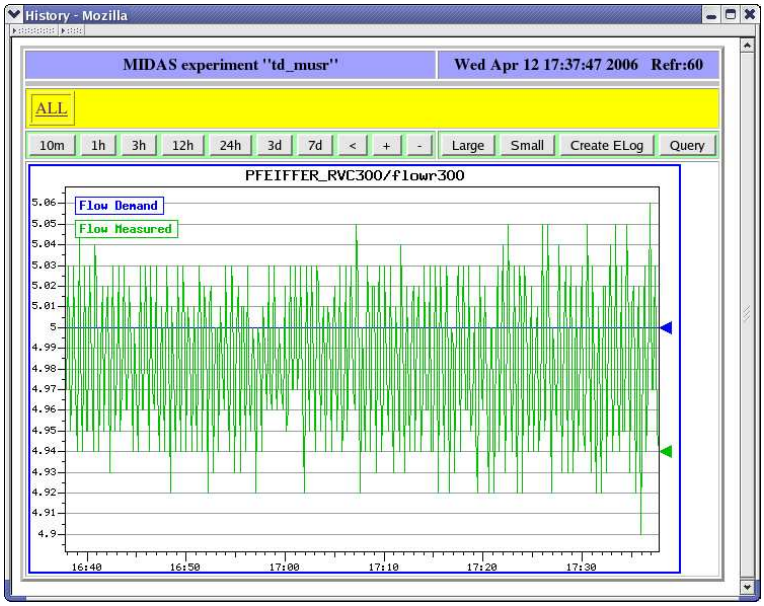

Figure 2.26: Example of history plot.

By clicking on the `All` link, all the available history display will be shown on a reduced format. A particular display can be choosen by clicking on it.

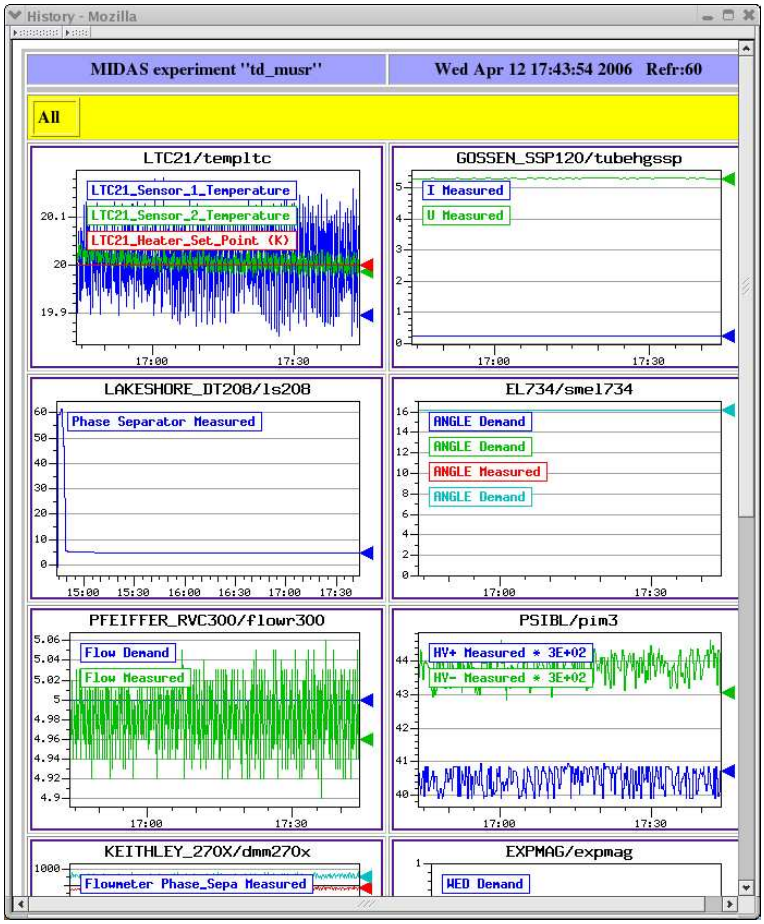

Figure 2.27: Partial vue of all the available history plots.