sat-nms Software User Manual

Legacy Java-UI User Manual

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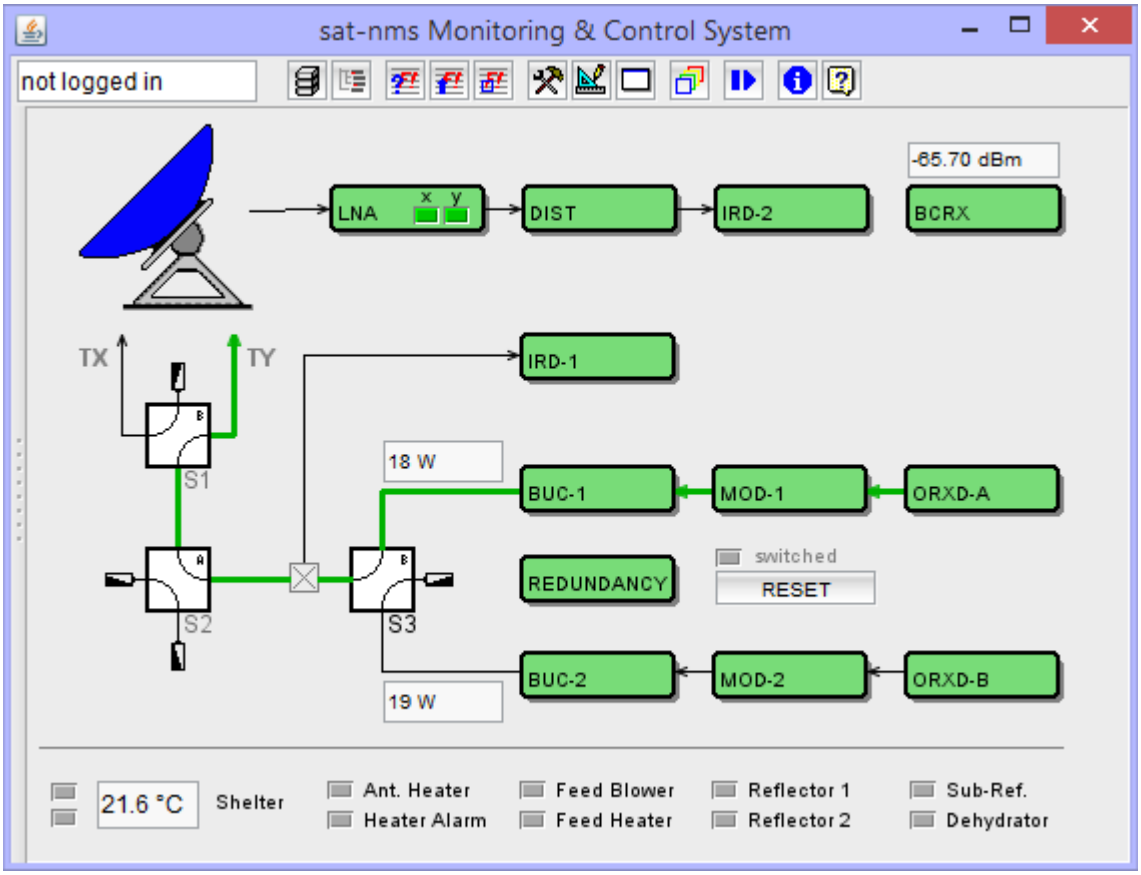
1 Legacy Java Client Operation

This section describes the functionality and the usage of the sat-nms M&C software when operated with the legacy Java client. The following chapters of the manual describe each function and each user interface screen in detail.

The satnms Java client is a legacy user interface to the software, it has been replaced by the newer Web based client. The documentation for the Java client is still provided for older M&C installations of if an installation explicitly uses the legacy client for some reason.

1.1 The M&C Main Window

The M&C main window forms the main entry point to the M&C user interface. As most of the subsidiary M&C windows, it is widely user configurable. In many cases the M&C main window will contain a block diagram showing the state of the devices operated by the M&C like shown in the example below.



In this block diagram each piece of equipment controlled by the M&C is represented by an icon in the window. The color (and/or shape) of the icons signals the state of each device. A double click to a icon opens the Device window for this device, a unified M&C user interface to it.

Tool-bar Functions

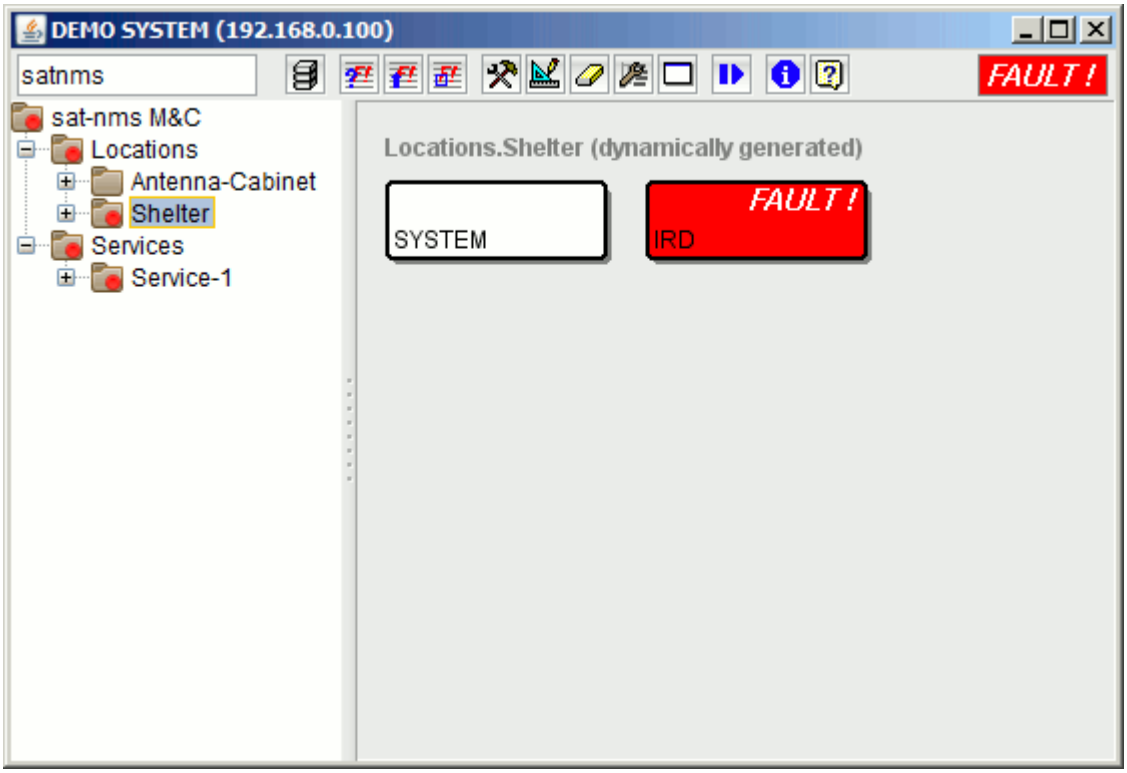
- --- The left field at the window's tool-bar shows the login-name of the user who is actually logged in. You may click with the mouse to this field, the program pops up the login/logout dialog.
- --- Shows a drop down list with all devices installed in the M&C system. Selecting a device from this list opens it's Device window .
- --- Opens the M&C Tree View Window .
- --- Opens the Event Report window .
- --- Opens the Live Event Log window .
- --- Opens a list of currently active faults.
- --- Opens the Device Setup window to configure the device setup of the M&C system.
- --- Opens the Screen Editor window to modify the layout of this M&C window.
- --- Opens a terminal window which connects to the debug / test port of the M&C server.
- --- Opens the User Management Window . You must be logged in with privilege level 150 or higher in order to open this window.
- --- Opens a file select dialog which loads or saves the window layout of the application.
- --- Opens the Macro Management window which controls recording and replay of equipment setting macros.

Remarks

- Touching a device icon with the right mouse button opens a context menu offering frequently used functions.
- As this window is widely user configurable, a particular M&C main window need not to look like the example shows here.
- Devices may be symbolized by other icons than shown here.

1.2 The M&C Tree View Window

The M&C Tree View Window is much like the M&C Main Window. It provides the same functions as the latter and adds a tree navigation bar at the left side of the window. M&C Tree View Window may used as a stand alone client window or launched from the M&C Main Window.



By default, the right side of the window shows the default user screen. The left part of the window shows the tree of subsystems and the devices attached to them. Each device node is marked with its fault state (no mark=OK, yellow mark=WARNING, red mark=FAULT). Subsystem nodes also show fault marks, summed up from the devices and subsystems contained in it.

Clicking on a node of the tree in the left part of the window changes the contents of the right part:

- If the node stands for a device, the device screen for this particular device is opened and embedded into the right part of the window.
- If the node stands for a subsystem, the right part of the window becomes a user screen, individually defined for this subsystem. This screen may be edited in the sat-nms GUI editor. If no such screen exists, the software dynamically creates screen containing all devices attached to this node in a grid.

The Tree View Editor may be used to edit the subsystem tree and the devices attached to each node.

Tool-bar Functions

- --- The left field at the window's tool-bar shows the login-name of the user who is actually logged in. You may click with the mouse to this field, the program pops up the login/logout dialog.
- --- Shows a drop down list with all devices installed in the M&C system. Selecting a device from this list opens it's Device window .

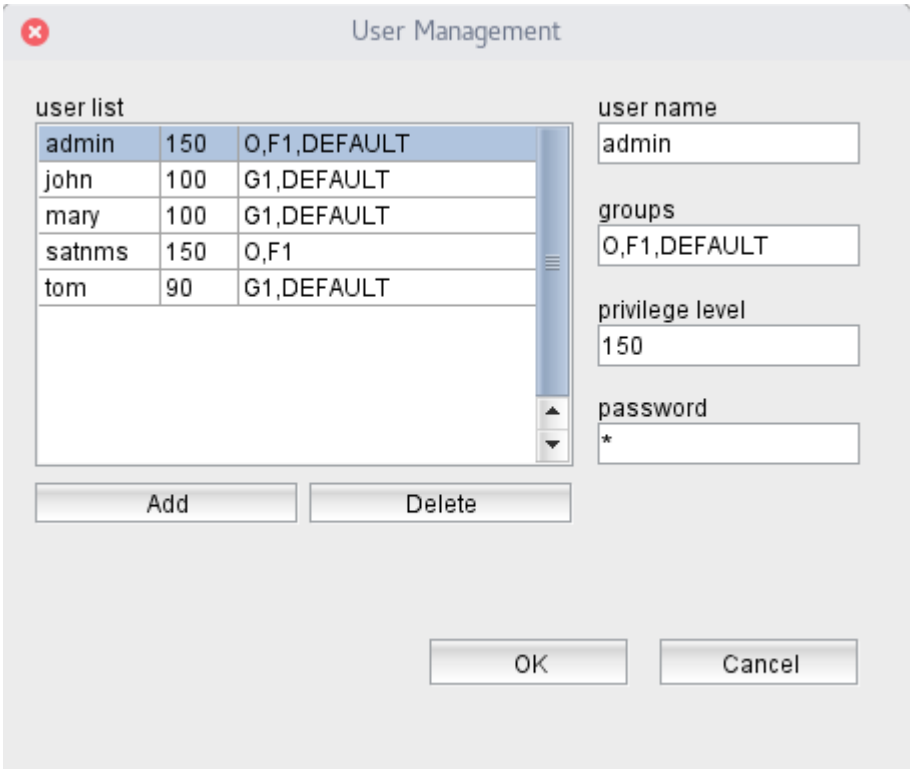
- --- Opens the Event Report window .
- --- Opens the Live Event Log window .
- --- Opens the Device Setup window to configure the device setup of the M&C system.
- --- Opens the Screen Editor window to modify the layout of the actually displayed user screen. If the screen is dynamically generated, it will be stored at the server's disc and will no longer be updated automatically.
- --- Deletes the user screen actually shown. This reverts the screen to the dynamically generated version provided by the software.
- --- Opens the Tree View Editor .
- --- Opens a terminal window which connects to the debug / test port of the M&C server.
- --- Opens the User Management Window . You must be logged in with privilege level 150 or higher in order to open this window.
- --- Opens the Macro Management window which controls recording and replay of equipment setting macros.

Remarks

Tree nodes may be expanded or collapsed either by clicking to the '+' marks in between the nodes or by double-clicking the node to expand/collapse.

1.3 The User Management Window

The user management window lets you manage the list of users which are allowed to operate the software. You need to be a "super user" with privilege level 150 or higher to open the user management window.



The user management window shows a list of all users known to the software. You may click to a user in the list to show the properties of this user in the entry fields right of the list.

- *user name:* The login name of the user. You cannot change the name of an existing user because this name identifies the user in the sat-nms software. You can however change the name in this field and press the button "Add" below the user list to create a new user definition.
- *groups:* This field takes a comma separated list of group identifiers. With the normal M&C software groups are meaningless, with the NMS software or the VioIP software however groups control which VLCs or which equipment a particular user may access. To change the group membership of the selected user simply edit/overwrite the group list and press enter.
- *privilege level:* The privilege level controls if a user may only control some basic aspects of the M&C system or if the operator may change everything. Higher numbers mean higher privileges or more comprehensive control. The privilege level numbers are often unique to the particular installation. Many installations of the sat-nms software however use the following standard levels:
  - 150 = super user, may control everything including all configuration tasks.
  - 100 = general user, may control all aspects of all devices, but may not change the sat-nms software configuration.
  - 90 = user with limited access to some devices or parameters only. Makes sense only together with a default screen wich gives no general access to all devices.To change the privilege level of a user, enter the new level value and then press enter.
- *password:* This field always displays a single asterisk, even as a super user you cannot see a user's password. You can however set a new password for the user simply by typing in into tge entry field and pressing enter.

To add a new user to the list, type the name of the user in the "user name" field and click the "Add" button. This takes the actually selected user as a template and creates a new user with the group memberships and privilege level of the template. The new user has no valid password set, you have to set an initial password for the new user explicitly by typing it into the "password" field. The user may change this password later.

To delete a user from the list, select the user to delete and click the "Delete" button below the user list.

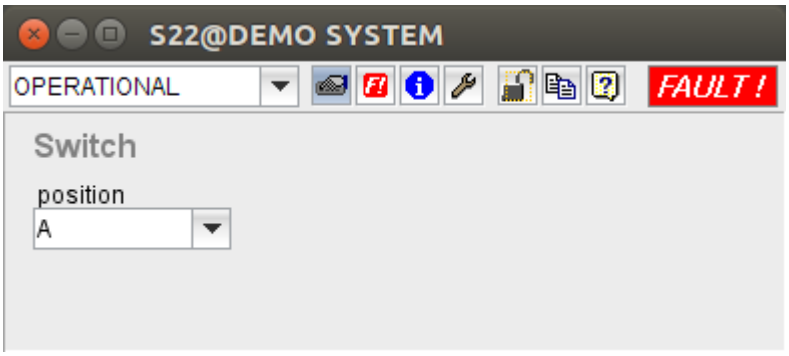
The software does not change the user database until you leave the user management window with the OK button. By pressing "Cancel" you can abort the edit process at any time.

Changed user permissions and credentials are valid with the next login of the user. Users currently remain with their privilege level and group assignments they had at the time they logged into the sat-nms software.

1.4 The Device Windows

The software offers a Device window for each type of equipment it supports. Device windows are launched by double clicking to the device icons in a M&C user interface window . It shows all parameters read from the device and permits to alter each writable parameter. For

clearance, the parameters are grouped to pages, you can switch between the pages using the tool-bar.



Writable parameters are shown with a light gray background, read only parameters appear with the standard gray background of the window. Choice parameters are changed immediately when you alter the selection. If you edit a text parameter, the field is shown with a yellow background. Once you press ENTER or you leave the field, the changed value gets transferred to the device. To cancel a parameter setting press ESC. The old value gets restored in the field and the background color returns to light gray. No parameter value is sent to the device in this case.

Tool-bar Functions

- --- The operation mode selector displays and sets the device operation mode. Device operation modes are:
  - **OPERATIONAL** --- This is the normal operation mode.
  - **FAULT-SUPPRESSED** --- The M&C server normally polls and controls the device, but does not generate a device summary fault if the is a fault condition with this unit.
  - **OUT-OF-SERVICE** --- The M&C server does not try to communicate with the device at all. If you alter parameters of a device in this mode, this has no effect.
- --- Opens a Load Device Preset dialog which lets you select a formerly stored device preset and apply the stored setting to the device. The chapter ' Managing Device Presets ' gives more information about device presets and how to handle them.
- --- Opens a Store Device Preset dialog which lets you store the actual device settings at the server for later retrieval.
- --- Switches the window to the 'faults' page. This page displays all fault flags the software knows about this device. Moreover, you can view and change the event priority for each particular fault flag:
  - Click to a fault flag and hold the mouse button down to see the event priority actually set.
  - Use the context menu (right mouse button) to change the event priority.

Valid selections for the event priority are:

- **OFF** --- This flag is completely suppressed.
- **INFO** --- This flag is signaled as an 'informational' event.
- **WARNING** --- This flag is signaled as a 'warning' event.
- **FAULT** --- This flag is signaled as a 'fault' event.
- **ALARM** --- This flag is signaled as an 'alarm' event.
- --- Switches the window to the 'info' page. This page gives some information about the type of equipment controlled.
- --- Switches the window to the 'maintenance' page. This page lets you set some configuration parameters and gives access to the 'low level interface' of the device.
- --- Locks the operation of the device that no other user can change device settings. See paragraph device locking below for details. If locked, the button shows a closed red lock:
- --- Duplicates / clones this window. This is useful if you want to have more than one instance of a device window open at a time.
- --- Launches the web browser with the help page for this individual device type. For a list of device types supported by the software see the 'Device Driver Reference' .

Device locking

Clicking the button once locks the operation of the device. The button icon changes to . If the device is locked, no other user may change devices settings. Locking is done along the user name, hence if you are logged in a second time an another place, you can operate the device from there as well.

A second click to the lock button releases the lock. Only the operator who set the lock may release it. This need not to be done at the same place where the lock was set bot you must be logged in with the same user name.

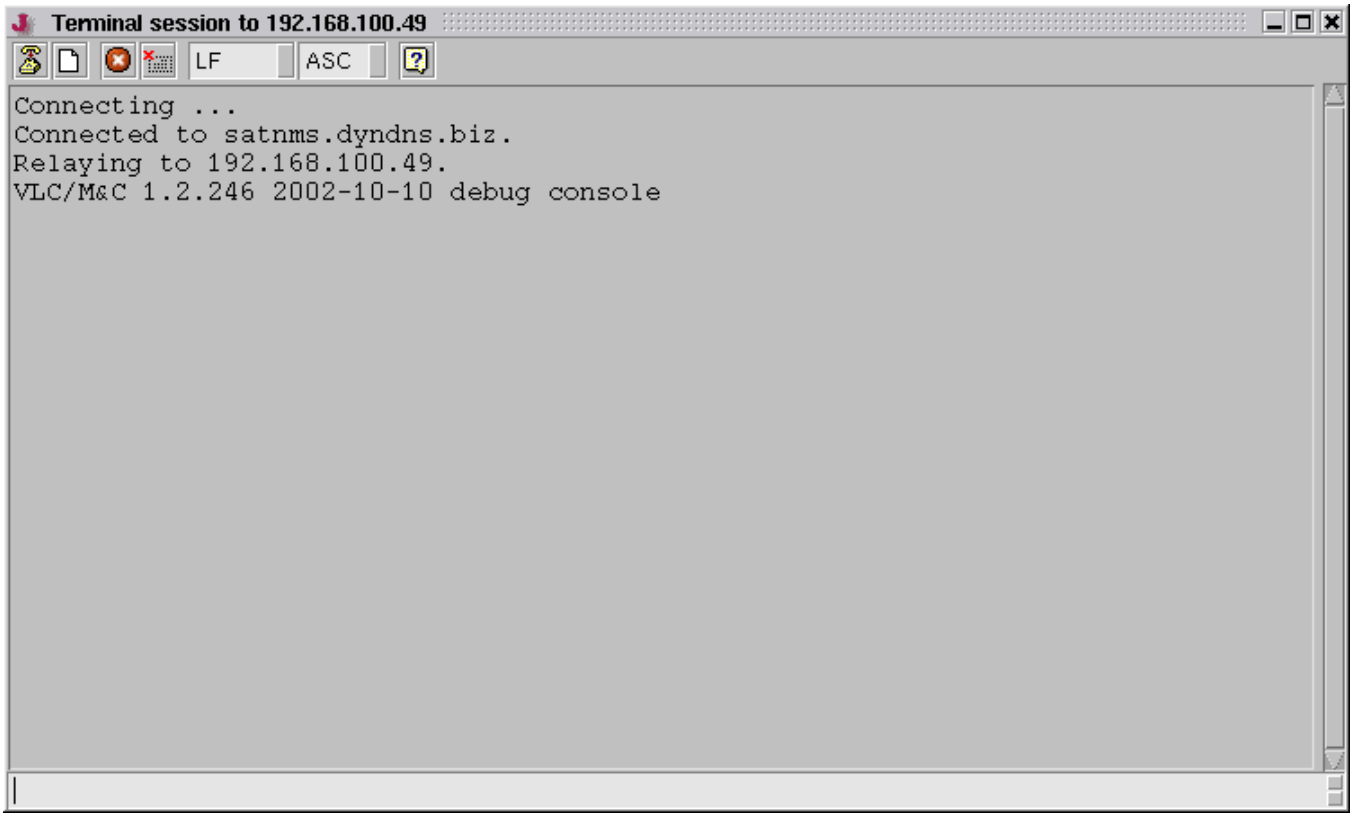
Administrators (with a privilege level of 150 or above) may release the lock in any case, also a restart of the sat-nms M&C server releases all pending device locks.

Remarks

- Units and unit factors displayed with a parameter are for information only. They are ignored when you enter a new value. Hence you cannot enter a value expecting 'MHz' in GHz by changing the unit multiplier.

1.5 The Terminal Window

The terminal window gives you access to the debug console of a VLC or M&C system. This is a valuable tool to inspect the low level communication to devices which are controlled by the M&C.



The terminal window consists of a display area which shows the debug output of the VLC and a command entry field at the bottom of the window. The tool bar at the top gives you access to the following functions:

- --- Disconnects from the VLC / M&C and closes the window (same as the 'q' command).
- --- Clears the window.
- --- Temporarily inhibits the output of data sent by the VLC / M&C.
- --- closes a 'term' connection to a certain serial interface.
- LF --- Selects the 'end of line' terminator appended to each commands entered to the command field at the bottom of the window. Possible selections are LF, CR, CR/LF, and ---.te .ts ASC Selects ASC or HEX mode. ASC is the normal terminal mode displaying printable characters as they are. HEX is the HEX-dump mode displaying each character as a 2-digit hexadecimal number. The mode affects the command entry, too.

Debug commands

At the entry line at the bottom of the window you can enter a number of debugging commands which may help to test e.g. new device drivers. The following commands may be entered:

- get <msg-id> --- Get the current value of an parameter with the ID <msg-id>
- set <msg-id> <v> --- Set parameter with the ID <msg-id> to a value as it would entered

by the user
- loop <msg-id> <v> --- Set parameter with the ID <msg-id> to a value as it would read from the device
- touch <msg-id> --- Force the parameter with <msg-id> to be read from the device with the next driver cycle
- threads --- Show a comprehensive list of device threads
- thread <n> --- Show details of thread number <n>
- peers --- Show peers / list of connected clients
- peer <n> (view|verbose|silent|kill) --- Details and functions of peer number <n>
- restart --- Restart MNC service (same as restart button in client)
- shutdown --- Stops MNC service. Attention: service has to be restarted on the command line
- limit / nolimit --- make the 'debug.log' file unlimited or limited in size. The MNC always starts with the 'debug.log' file limited in size.
- csm-debug --- toggles the debug output of**all** CSM spectrum analyzers ON/OFF. The debug output appears in the `.panic.log` file. Remarks:
  - Be careful to switch csm-debug off again after using it. It remains on when the debug terminal window is closed unless it has been switched off before. This may cause a large amount data in the `.panic.log` file.
  - Using csm-debug only gives meaningful information if there is only one spectrum analyzer running in the system. If you have multiple spectrum analyzers configured, be sure to set all but the one you want to debug to OUT-OF-SERVICE.

1.6 The History File Viewer

The sat-nms M&C software provides a facility (a logical device) calledFile-Recorder which is capable to record arbitrary data like levels, antenna pointing etc. into a disc file. The *History File Viewer* is the user interface to inspect such files. The window can be accessed either from the File-Recorder's device window or can be used as a stand alone application as well (see below for details).

The window shows a diagram of the recorded data, the fields and buttons in the tool bar permit to modify the appearance of the diagram as needed. Clicking into the diagram shows a marker which displays a readout of the value at the selected screen position.

Top Toolbar

- --- Loads a file from a local disc. Opens a standard file select dialog. You may use this to display files you have archived on you local PC.
- --- Gets a file directly from a remote sat-nms M&C. When you started the*History File Viewer* from within the sat-nms GUI, it usually will already display the data you want to see on startup. If you started the file viewer as a stand alone application, you use this function to connect to a M&C system and get the data from there.
- --- Saves / archives the recorded data as a disc file to the local computer. A file select dialog is shown where you can select or enter the name of the file to save. The file format is text based, saved files can be re-opened with the open icon in the tool bar. The textual format of the file also permits to process the saved data with a spreadsheet program or with gnuplot.
- --- Moves the plot two divisions to the left, lets you see older data.
- --- Moves the plot two divisions to the right, lets you see younger data.
- --- Shows/edits the start time. The displayed time corresponds to the leftmost grid line in the diagram. You set the start time by changing the value with the keyboard and then pressing ENTER or you may double-click to the field which displays a small calendar window which lets you select a another date in a comfortable way. When you change the start time, you should consider, that the software always aligns the value that in fits into the grid of the time scale. This means if e.g. the time scale is 1 hour/div, a start time

entered gets always aligned to a full hour.

- --- Zooms in the time scale, shows a smaller section of the data more detailed.
- --- Zooms out the time scale, shows a larger section of the data.
- --- Zooms out to show the entire plot. Please note, that the largest available scale shows 720 days (30d/div). If the data you are displaying covers a larger time span, you will not see the complete data even after zooming out fully.
- --- toggles live view / normal mode (see paragraph "Live view mode" below for details).
- --- Opens the trace properties dialog window (see below for details).
- --- Prints the diagram as actually shown.
- --- Shows this manual page.

Bottom Toolbars

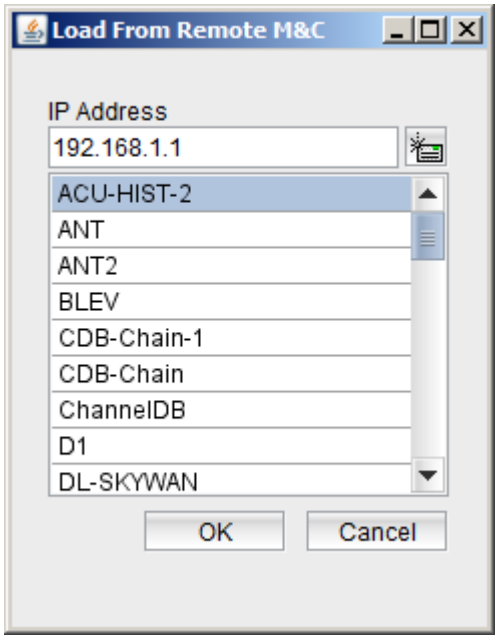
Below the diagram, the History File Viewer provides four toolbars to modify the scaling of the up to four traces shown in the diagram.

- --- The first control in each toolbar selects if the trace shall be drawn.
- --- Shows the color if this trace, clicking to the color fields opens a dialog which lets you change the color of the trace.
- --- Shows the name / description of the trace. When called directly from the File-Recorder device screen, the History File Viewer shows the IDs of the recorded parameters here, "Trace n" if the trace name is not known. Trace names may be set by the operator and saved on the M&C server, see the paragraph about adapting the diagram properties below.
- --- Moves the trace upwards one division.
- --- Moves the trace down one division
- --- Shows the y-scale reference level and the actual scaling. The y-reference level is the value corresponding to middle grid line.
- --- Zooms in the y-scale for this trace.
- --- Zooms out the y-scale for this trace.
- --- Zooms to show the min/max values (autoscale). This refers to the entire data, not only to the part actually shown.

Getting data directly from a M&C system

The history file viewer is capable to get the data to tisplay directly from a remote sat-nms M&C system. This feature can be used also if the viewer has been started as a stand alone application.

Clicking to the button in the tool bar opens the remote load dialog window. In this window, enter the IP address of the M&C computer you want to read from and click to the button right beside the entry field.



- --- The selection list field now shows 'connecting ...' and after a couple of the seconds, the files which look like File-Recorder data files are displayed in the the selection box. Select the file (the name of the File-Recorder logical device) you want to load an click to 'OK'.The histoy file viewer in this case loads *both* files belonging to the File-Recorder device if they are available. If you load the data from a File-Recorder named FREC1, the file viewer tries to get the files FREC.old.txt and FREC.txt and concatenates them in memory.

If the file recorder is not able to read from the remote M&C system, the 'connecting ...' notice remains visible permanently. In this case verify the IP address you entered, close the window and try again.

Live view mode

Beside for viewing stored log files, the *History File Viewer* can be used to display the logged data as it is acquired with an automated display update. By pressing the "live view" toggle button in the toolbar, the viewer changes to live view mode. In this mode the viewer shows up to 400 recent data points, automatically updated with an interval that is configurable separately from the standard interval at the File-Recorder device setup page.

Due to the automatic display update, the viewer and its autoscale functions behave slightly different in live view mode:

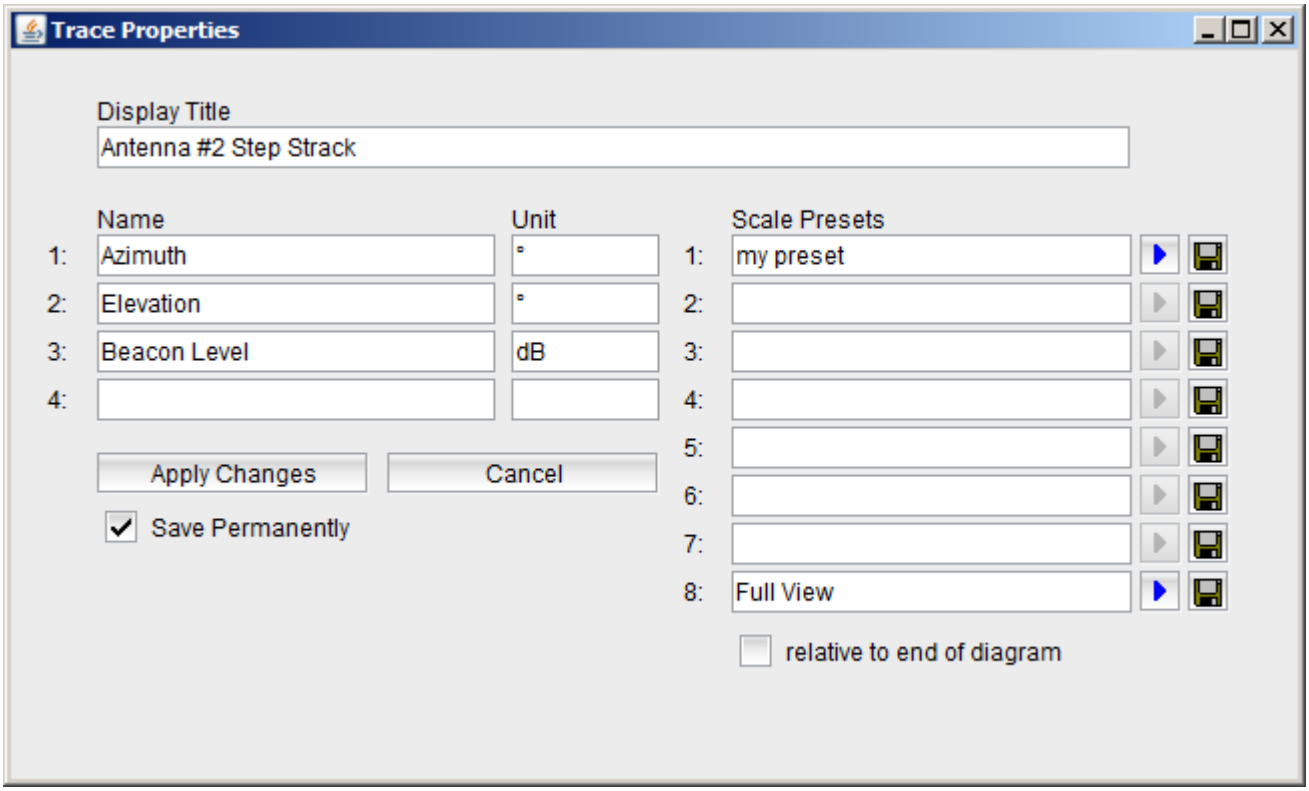
- The diagram gets aligned with the right edge of the frame with time axis autoscale and every time the display gets updated with new data points.
- When switching to live view mode, the time scale is adjusted once to show the entire (up to 400) live view data points.
- You may change the time axis scaling to your need with the zoom in/out buttons in the upper toolbar, the viewer won't overwrite this when the display gets updated.
- You also may change the time axis start value with the blue arrow buttons in the upper toolbar, but the viewer will revert this when the display gets updated.
- You cannot zoom or scroll outside the limited range of data points used for live view

mode. To view older data, switch back to normal mode.
- Loading or saving disc files is not possible in live view mode. If you try, a message is displayed and the viewer remains in live view mode.
- On the other hand, live view mode is not possible if the viewer shows the contents of a local file instead of the data from a File-Recorder device on a M&C.

To leave live view mode, click the "live view" toolbar button again. The viewer re-reads the full history data and performs an autoscale.

Adapting the diagram properties

The  in the tool bar opens the trace properties dialog window. This dialog lets you set the name of each trace, the unit which shall be displayed with the scaling information fo each trace and a diagram title. The latter is shown in the diagram window title bar and also above the plot in the printout.



If you select the 'save' option, the trace properties are written to file named like the data file, but with the suffix '.frv'. The file is written to the same place where the data file was loaded from. When you load this data file the next time, the saved trace properties are used automatically.

The Trace Properties dialog also lets you save and recall up to 8 scaling presets. These presets may help you recall certain settings of y/t scaling.

-  --- Stores the name of the preset, the color of each trace, if the trace shall be drawn or not and the actual scale settings to the given preset memory. The presets are stored together with the trace names in the '.frv' file on the M&C server.

-  --- Recalls this preset, restores the trace color, the trace enable state and the scale settings from the stored values. If the preset wasn't set before, the preset recall button is inactive.

If you check the mark below the preset list before recalling a preset, the start time of the diagram is set relative to diagram end. This means, the start time stored in the preset is ignored, the start time is set to show the recent data in the diagram.

Zooming to the cursor position

When you zoom the time axis of the diagram using the ool bar buttons, the viewer tries to keep the start time of the diagram constant. If you want to have a more detailled look on a certain event, the event you want to zoom to will probably move out tof the visible part of the display. To zoom to certain position on the time axis, hold down the SHIFT key and click to the position you want to zoom to. Holding the CTRL key while clicking works the other way round, the plot gets zoomed out.

Starting the viewer as a stand alone application

Assuming your sat-nms client software is installed at 'c:\satnms', the command line to start the history viewer is for a windows based computer:

java -cp client.jar satnms3.gui.FiledRecordFrame

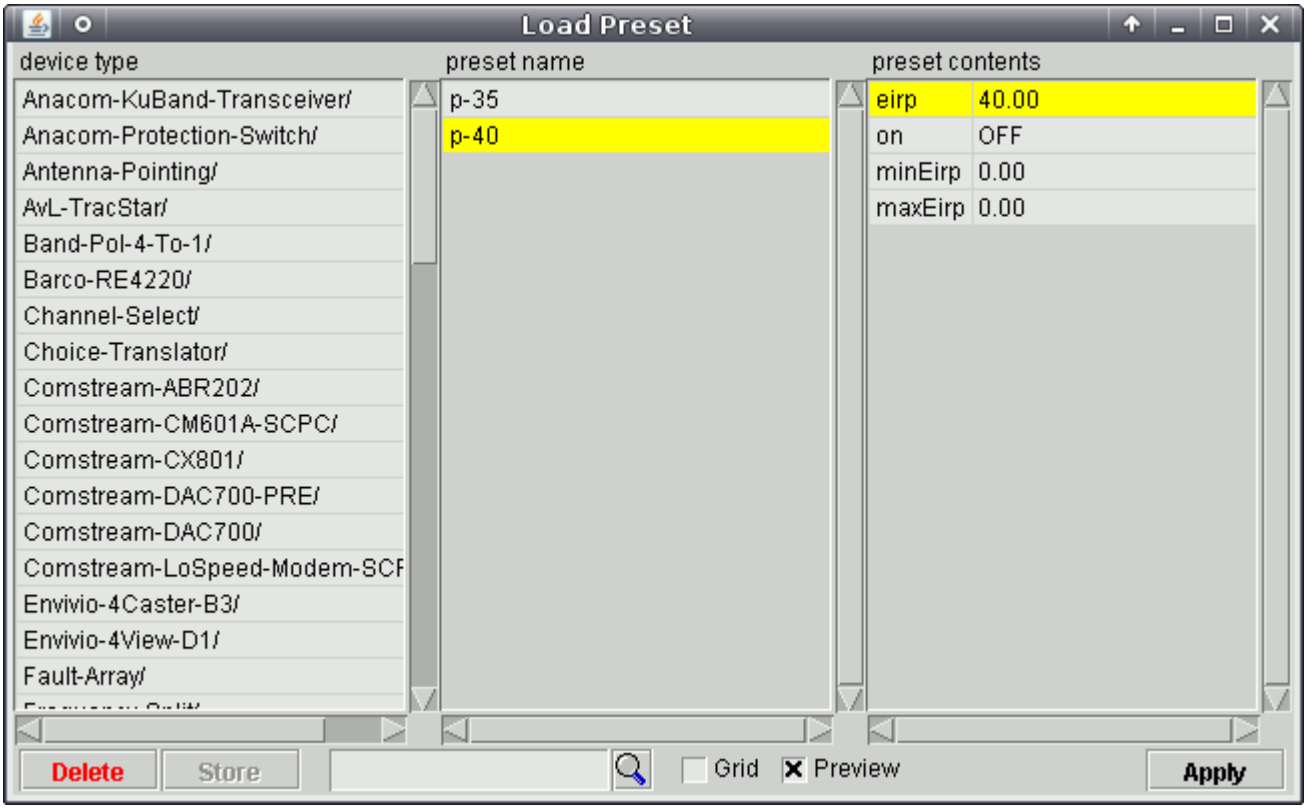
You may add this command as a start menu entry or as a desktop icon to your working environment.

1.7 Managing Device Presets

Most of the sat-nms device drivers allow to store a snapshot of the device's settings in 'device preset' files and let the operator restore these settings at a later time. The load / store preset feature is accessible though the tool bar of the device's ' Device Window '.

Presets are stored at the server your client program connects to. In a M&C environment this is the M&C server, with a NMS environment this is the central NMS server. This means in the latter case a preset may be stored while operating one VLC and later may be applied to a device on another VLC.

Presets always are dedicated to the device (driver) type they were recorded with. This is because is makes no sense to apply the settings of a beacon receiver to a DVB encoder. The target device will not 'know' what to do with the receiver settings. Even with similar devices (e.g. two IRDs from different vendors) there may be differences between the number and type of settings the devices understand. Hence, the software stores the preset files in a "by device driver" structure.



To load a stored preset, click the 'load preset' icon in the device window tool bar and select the preset in the middle list of the displayed dialog. If the *Preview* mark at the bottom of the dialog is checked, the right column shows the selected preset's contents. You may want to uncheck the *Preview* mark if your your connection to the M&C/NMS Server has a very poor bandwidth. Press *Apply* to apply the settings stored in the preset and close the dialog.

If there is a huge number of presets defined for the actual device type, the search function helps to find the proper preset file: Enter a search key into the field at the dialog's bottom line and press the search button to display only presets which contain the key in their name (the search is not case sensitive). You may specify multiple keys, separated by space characters. Only presets which contain *all* of the keys in their name will appear in the list.

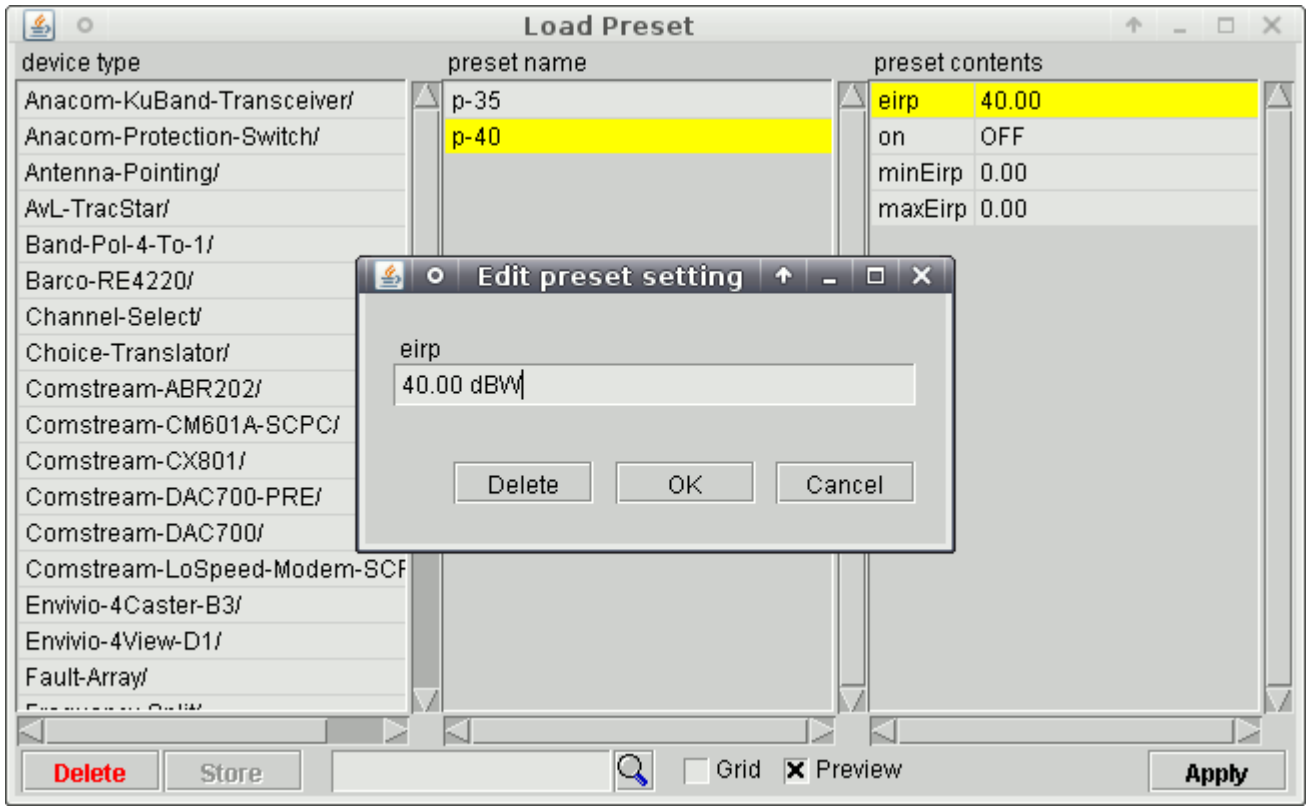
You may align the list of preset names to columns along the dashes in the names by checking the *Grid* mark. This specially is useful, if you strictly follow a certain naming scheme for your presets (e.g. something like 'satellite-channel-variant').

As mentioned above, presets are dedicated to the device type used to record them. However, for special applications the preset load dialog allows to apply a preset from another device type. For this, select the device type in the left column and then the preset file in the middle column. The program displays a prompt you have to quit, to prevent you from accidentally applying a preset from a wrong device type.

Editing Presets

If your system administrator gave you the permission for this, you are able to modify stored presets. The software supports both, permanently modifying a preset definition but also

changing some parameter temporarely before applying the preset:



Be sure to have the *Preview* mark checked and select the preset to modify. Double-clicking a parameter in the right column opens a small *Edit preset setting* dialog showing the value stored for this parameter. You may change the value to your needs and quit the dialog with the *OK* button to accept the modification. Clicking *Delete* removes the selected parameter from the preset which means that this parameter remains unchanged when the preset gets applied. *Cancel* leaves the dialog without changing the parameter.

Changes made to the preset file this way are temporary, they are made in a local copy of the preset. If click to *Apply* , the modified preset gets applied to the device. To store the edited preset permanently at the server, click the *Store* button which is now activated since the preset has been modified.

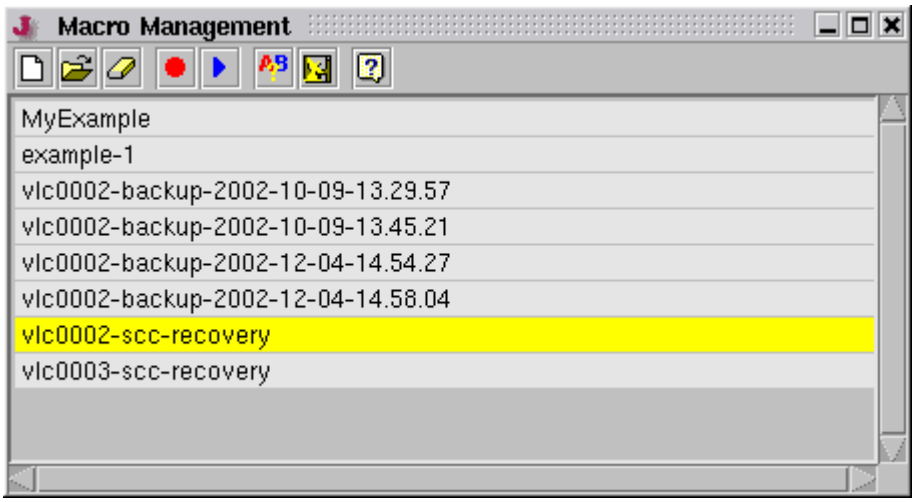
1.8 Recording and Playing Macros

The sat-nms software includes a powerful macro recording and playback feature which lets you automate complex equipment settings to one mouse click. The following chapters describe the user interface windows which give access to this feature.

1.8.1 The Macro Management window

The Macro Management window is the starting point for all operations like recording, playing, editing or deleting parameter setting macros. The window is shown if you click to the ▶ button in the tool bar of the M&C / VLC main window. To get an introduction to parameter setting

macros, see the chapter ' Concepts ' above.



The window shows a list of all macro definitions stored at the server, double clicking a list item opens the macro in the Macro Edit window . Other functions may be called using the tool bar buttons as explained below.

- --- Opens the Macro Edit window with a new, empty macro definition.
- --- Opens the selected macro in the Macro Edit window .
- --- Deletes the selected macro.
- --- Starts recording a new macro definition.
- --- Plays the selected macro.
- --- Compares the selected macro to another one. Please note the macro comparison function ignores all macro directives and does no parameter substitution. This function primary is meant to compare macros which have been recorded with the backup function contained in the SYSTEM device.
- --- Saves the selected macro as the SCC recovery macro to the actual VLC. This icon only is active if the Macro Management window has been called in the context of an SCC enabled NMS application.

Remark

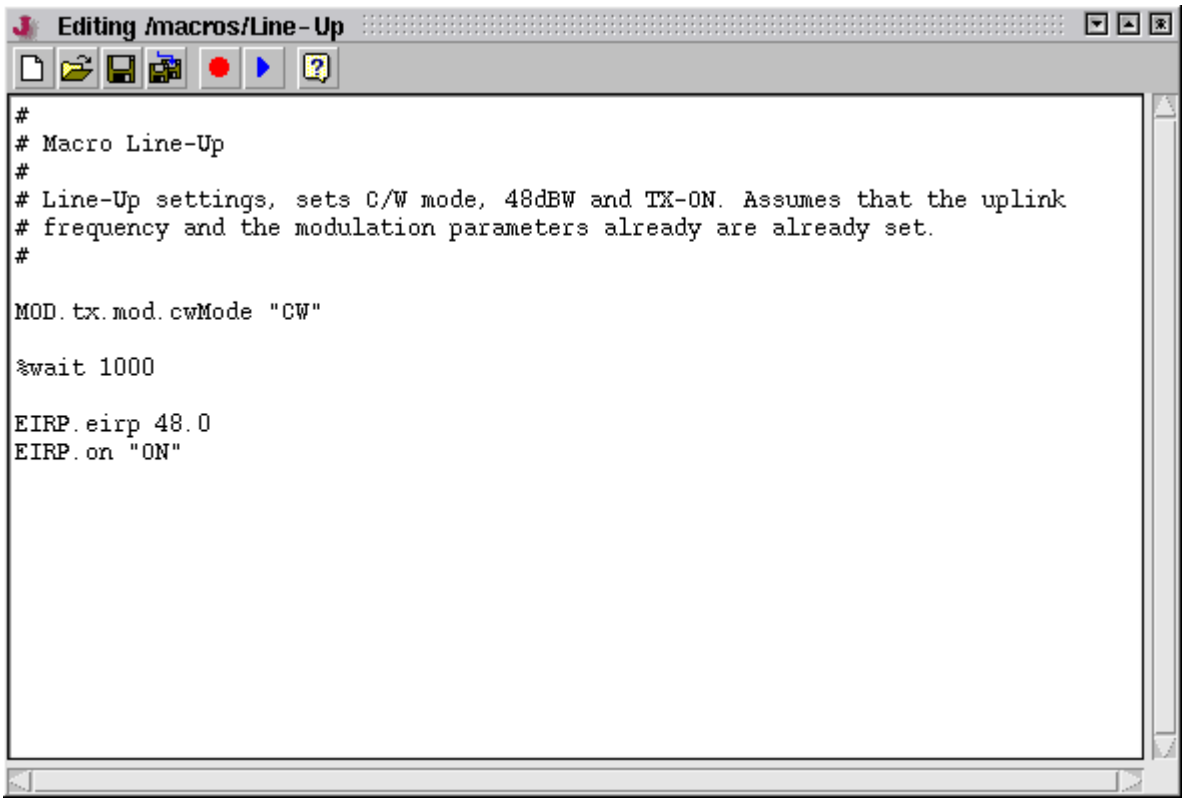
In an NMS, macros normally only can be played while the VLC this Macro Management window refers to is 'online'. An exception from this is a NMS controlling it's VLCs via SCC. Here macros also may be played for 'offline' VLCs, the commands get streamed to the SCC outbound communication channel in this case.

Macros played through the SCC outbound channel may be used to reinitialize a VLC's SCC transmit equipment if any attempts to setup a point to point connection to this VLC fail.

1.8.2 The Macro Edit window

The Macro Edit window lets you edit a macro definition (it's just a plain text file), play the edited macro or append additional steps using the record function. Before you start to edit your first macro, you might want to read the chapter ' Concepts ' at the beginning of this section

which explains the theory, file syntax and usage of these macros.



Handling the editor window (specially using cut & paste) slightly differs for Windows and Linux based computers. The window uses the cup & paste scheme of the operating system, so CTRL-C/CTRL-V works only on Windows based computers while pasting with the middle mouse button only is supported by Linux based machines. Below the tool bar functions are explained:

- --- Clears the edit buffer, lets you edit a new macro definition.
- --- Loads an existing macro definition into the editor.
- --- Saves the edited macro.
- --- Saves the macro using a different name.
- --- Starts a recording session which appends steps to the macro you're actually editing.
- --- Plays the macro in the edit buffer. The macro is played directly from memory, not saved.

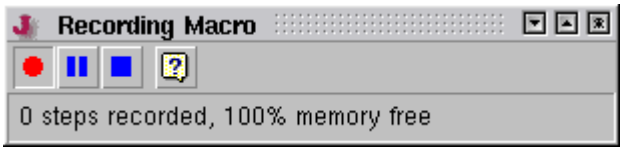
Remark

In an NMS, macros normally only can be played while the VLC this Macro Management window refers to is 'online'. An exception from this is a NMS controlling it's VLCs via SCC. Here macros also may be played for 'offline' VLCs, the commands get streamed to the SCC outbound communication channel in this case.

Macros played through the SCC outbound channel may be used to reinitialize a VLC's SCC transmit equipment if any attempts to setup a point to point connection to this VLC fail.

1.8.3 The Macro Record window

The Macro Record window lets you control the recording of a parameter setting macro. It is shown whenever a macro is recorded. Closing this window in the title bar of the window abandons the recording session, any recorded steps are lost.



The window shows the number of steps which have been recorded in the actual session and the percentage of available memory the macro actually occupies. The recording process is controlled by the tool bar buttons:

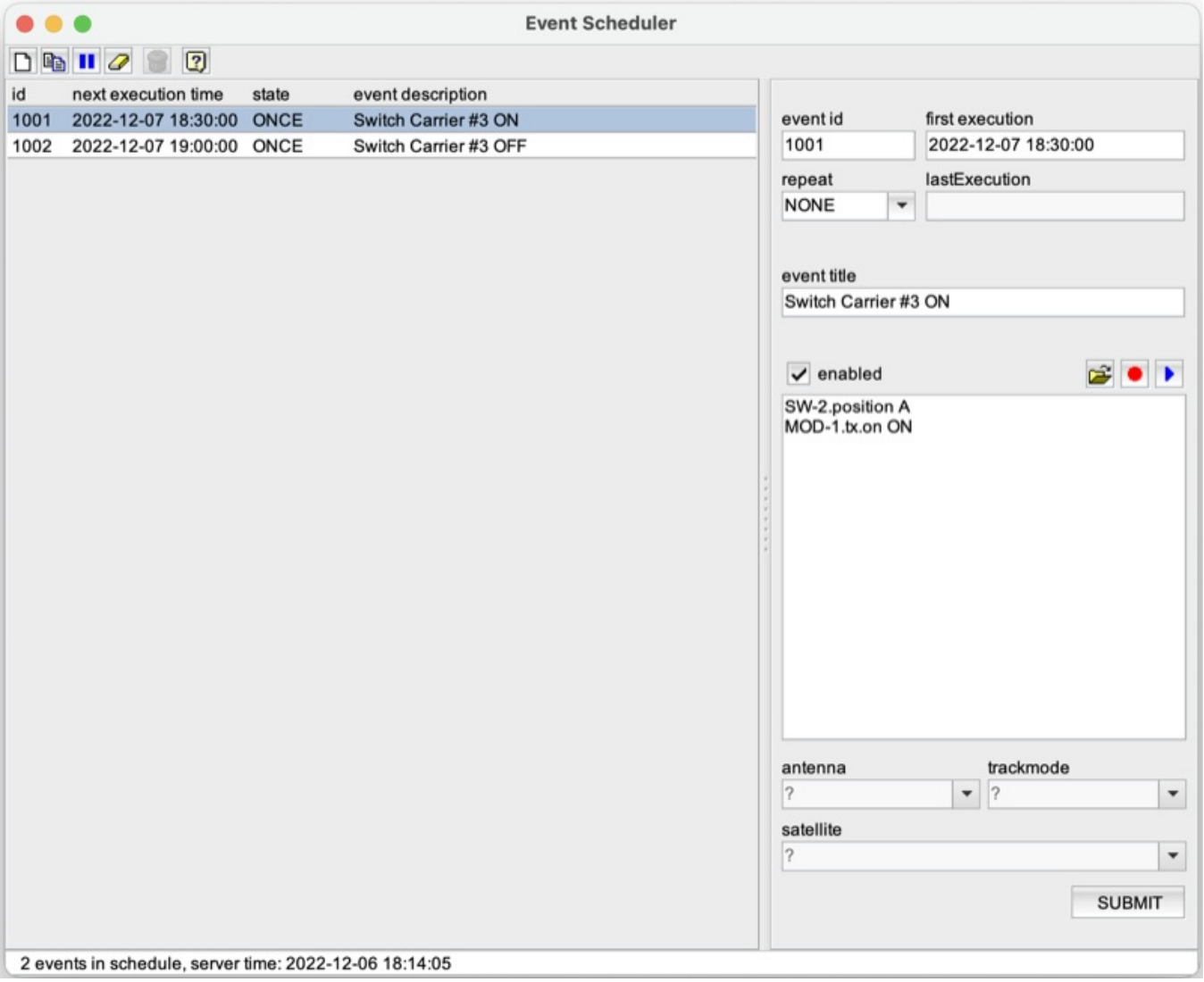
- ● --- If pressed down, recording is active. This is the default after the window appears. You may pause recording by pressing the pause button described below. To resume recording, click to the record button.
- ▮▮ --- Pauses recording. If, e.g., you find during a recording session that some device settings are not set as you expect, pause recording, set these settings and then resume recording the macro.
- ■ --- Stops the macro recording session and loads the macro into the Macro Edit window. You may modify the macro there, add a comment and store it with an arbitrary name.

1.9 The Macro Scheduler

The macro scheduler included in the sat-nms M&C software lets you execute macros at planned times. You access the macro scheduler from the M&C main window by clicking to the toolbar icon which shows a clock icon.

The scheduler supports events which are executed once at a given time as well as repeated events on a daily, weekly or monthly base. Repeated events are executed in the planned was up to a given end date. Monthly repeated events are executed every month at the programmed day of month. If you program a monthly event for 29.-31. of a month, it will be executed at the last day of a month which is shorter.

The macro scheduler window shows a scrollable list of planned events and provides controls to add, edit or delete events. Like with the macro management window, you may either record the macro you want to be played at the event's time or enter the commands manually. It is also possible to load a stored macro into the event.



The left side of the window shows the list of scheduled events, the right side shows the properties of the actually selected event (or the properties of the new event if you are about to create a new event). Events are sorted by the time of their next execution, the event to be executed next appears on top of the list.

By default the scheduler deletes events once the last execution of this event has been done, however, the scheduler may be configured to keep these events. In the latter case, outdated events appear at the bottom of the list, grayed out with the state DONE.

The toolbar at the top of the window contains all functions to manage the schedule, to add or remove event or to toggle their enabled state:

- Clears the properties section on the right, lets you enter the properties of a new event.
- Makes a copy of the actually selected event into the properties section on the right. You may edit this copy to your needs, the edited event will be added to the schedule when you click "Submit".

- Toggles the enabled state of the actually selected event. Disabled events appear grayed out in the event list, the macro execution is suppressed for a disabled event.
- Deletes the actually selected event from the schedule.
- If the scheduler is configured to keep outdated events in the schedule and if there are such events in the schedule, this toobar button becomes active. Clicking it cleans up the schedule an deletes all outdated events.
- Shows this help page.

The section of the right side of the window contains the properties of the actually selected event of a new event you are about to create. Below a short description of all entry fields and buttons on this section:

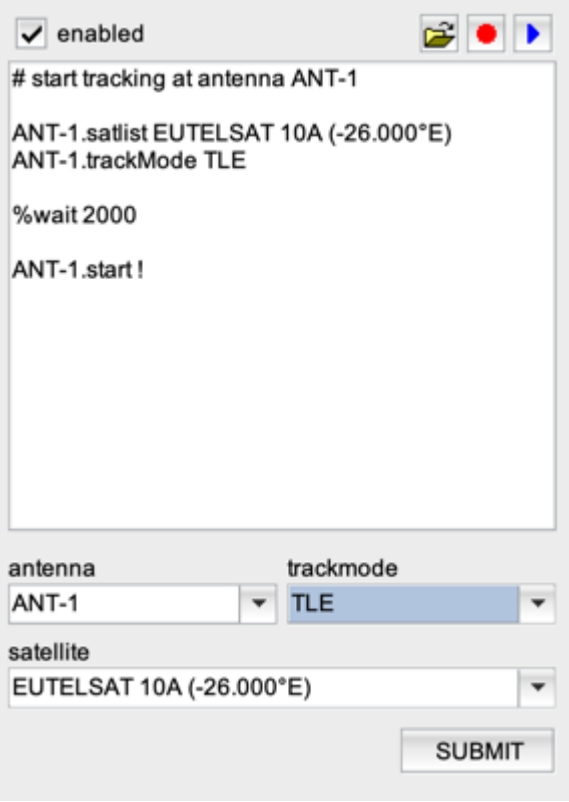
- **event id:** The event id is a unique identifier issued by he scheduler for each event. The event id cannot be changed by the operator.
- **first execution:** The date and time of the first execution of the event (for repeated events) or simply the time of execution for an event executed only once. Be sure to enter the date/time exactly in ISO format: YY-mm-dd HH:MM:SS, the program will reject entries formatted in another way. Double click into the entry field to open a pop up calendar widget which assists you entering the date.
- **repeat:** The repeat mode for the event. This may be one of:
  - **NONE:** The event is executed once at the date and time specified in "first execution".
  - **DAILY:** The event is executed first at the date and time specified in "first execution", then at all following days at the same time but not beyond the day given in "last execution" below.
  - **WEEKLY:** The event is executed first at the date and time specified in "first execution", then every seven days at the same time but not beyond the day given in "last execution" below.
  - **MONTHLY:** The event is executed first at the date and time specified in "first execution", then every month at the same day of month and time but not beyond the day given in "last execution" below. If you program a monthly event for 29.-31. of a month, it will be executed at the very last day of any month which is shorter.
- **last execution:** The day of the last execution of the event.
- **event title:** A descriptive title for the event which will appear in the event list at the left side.
- **enabled:** If checked, the event is enabled. An enabled event will execute its macro at due time, a disabled event will skip this.
- **macro text:** The large field below the "enabled" check mark contains the macro text to be executed. The format and syntax of the macro text follows exactly the definition given in section Automating Procedures With Macros . Unlike the standard macro facility of the software which stores macros as text files in a separate directory, macros of the scheduler are store with the schedule itself, they are not accessible from the software's macro player.
  - Lets you load an existing macro file into the macro for this event. The loaded file will replace the previous content of the entry field.
  - Lets you record the macro. While recording is active, all parameter settings you make at the GUI are recorded an added to the macro.

- ▶ By clicking this button, you can immediately execute the edited or recorded macro for testing.

- **SUBMIT:** Clicking SUBMIT actually adds the new / updates the edited event at the schedule. The program issues a query before executing this.

Antenna Scheduler

The Macro Scheduler provies a function to create easily a macro to start tracking at avertain antenna. For this function there are a number of selection fields at the lower right corner of the window, just above the SUBMIT button.



If you change any of the selections *antenna*, *trackmode* or *satellite*, the software replaces the the macro text with a fragment which sets up the antenna for the selected satellite and tracking mode and starts tracking on it. Additional commands / parameter settings may be aded to the macro before the schedule event gets saved by a click do SUBMIT.

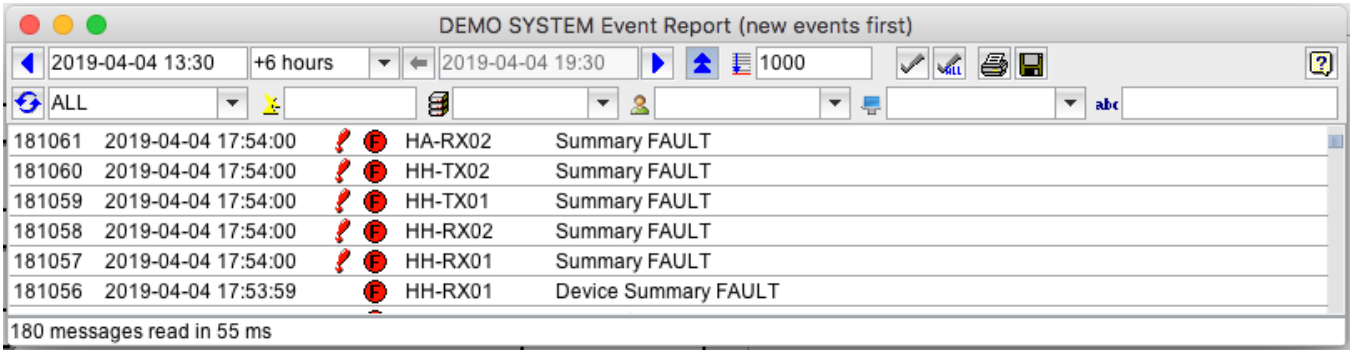
The antenna scheduler function is only available for antennas which are managed by Antenna-Management devices. If there are no such devices configured in the M&C, the fields assigned to the antenna scheduler function apear disabled.

1.10 The Event Report Window

The Event Report window lets you generate filtered reports from the event database maintained by the NMS. This database contains all event (fault) messages issued by the VLCs during the last months (the exact depth of event storage is configurable during system

installation).

The event report shown in the window gets automatically updated when you change the time range to display or the sort order. Changing the filter options in the second line of the toolbar does not automatically update the report, you have to click the reload button or press ENTER in one of the filter fields for this. This lets you combine various filter specifications without being interrupted by the generation of intermediate reports.



Data shown in the list columns

- *column --- description*
- 1 --- The event ID. This is a unique number the software assigns to each event which arrives at the NMS.
- 2 --- The time stamp when the event was originated. The originating VLC sets this, so the time relies on the accuracy of the VLC's clock.
- 3 --- The 'need acknowledgment' mark. Messages showing a red exclamation mark in this column are fault messages which need to be acknowledged by the operator.
- 4 --- The message priority. The message priority decides on the urgency, the message gets delivered from the VLC to the NMS. It also is a search criteria in the Event Report window. The following priority symbols may appear:
  - --- This is an informational message (lowest priority)
  - --- This is a fault message (medium priority)
  - --- This is an alarm message (highest priority, the VLC tries to deliver this immediately, regardless of the dial timing settings)
- 5 --- The primary message source. This usually is the ID of the VLC which issued the message. Messages marked with 'USER' or 'NMS' in this column have been generated locally in the NMS.
- 6 --- The secondary message source. This gives a more detailed information about the source of the message. It may be the name of the device in a VLC which caused the event.
- 7 --- The message text.

Tool-bar Functions

On top of the event report window, there is a 2-line toolbar which lets you control all aspects of what the event report shall contain.

The controls in the upper line between the two blue arrows define the time range to be displayed in the report. For this, the event report windows knows two different modes. One lets you define the time range as start time plus a duration picked from a list of commonly used values. The second mode lets you specify start and end time explicitly. The small button with the horizontal gray arrow symbol lets you switch between the modes. The gray arrow always points to the parameter which is actually active.

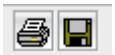
The blue arrow buttons enclosing this section of the tool bar let you increase or decrease the start point in increments of the selected duration.

A double click to the start or end time fields opens a calendar dialog window.

The button with the double blue vertical arrows on it toggles the order in which the events are shown. With the arrows down, the newest event is at the bottom of the list, when pointing up the list is ordered from newest to oldest. The default sort order is determined from a parameter set in the "client.properties" file located at the NMS or M&C server. Setting the key "gui.eventSortOrder" to "true" or "false" defines the default behavior of the event report window.

The entry field right of the sort order button defines the maximum number of events one report may contain. There is a default value for this (1000 in most cases), which is a good trade off between performance and the number of events displayed at a time. You may change this limit to your needs, but be aware: reports with millions of events may take some time to be collected.

These buttons lets acknowledge either the selected fault message only or all pending fault messages contained in the event log. Acknowledging a message is always logged as an additional event.



The 'print' and 'save' buttons are quite self-explanatory. 'print' sends the actual report to the printer using the system print dialog of your client computer. Depending on the operating system you are using, you probably have the possibility to preview the print and to select the pages of the report you actually want to be printed.

The 'save' button lets you save the actual report as a CSV file on your client computer. A file

select dialog box pops up, you have to enter or select a file name and click 'save' in order to have the file actually stored. The columns of the CSV file are separated by semicolons, you may import this file for example into a spread sheet program of your choice.

The reload button forces a report to be generated once more, for example to include some new events which may have ocurred since the time when the report was created. During a long lasting query, the button turns into a red 'stop' button, you may click to this to abort a pending query.

The priority selector defines the priority (or type) an event must have to be listed in the report. The selection *ALL* displays all events. *FAULT* includes events which at least have fault priority. *ALARM* displays alarm messages only (see the description of alarm priorities above). The selection *NOT ACK* shows all messages which (still) need to be acknowledged.

This filter lets you filter messages along their primary source. The primary source of a message is the VLC in an NMS environment. For stand alone M&C systems this filter is actually not applicable.

Any non blank value in this field filters those events which have their primary source field (usually the originating VLC) set to this value. If you enter multiple words in this field, all messages are shown which contain *all* words in their primary source at an arbitrary position. The filter is not case sensitive.

If the first character in this field is '-', the filter gets inverted. Example: '-vlc0003' lists all events which do *not* come from vlc0003.

This filter lets you filter messages along their secondary source. The secondary source is usually the name of the device which caused the message. With M&C systems, the entry field for the filter is a combo-box suggesting all device names used in the system in a drop down list. You may enter free text anyhow.

Any non blank value in this field filters those events which have their secondary source field set to this value. If you enter multiple words in this field, all messages are shown which contain *all* words in their secondary source at an arbitrary position. The filter is not case sensitive.

If the first character in this field is '-', the filter gets inverted.

The user name filter lets you restrict the report to messages originated by a certain user. Login messages and messages logging the active change of a parameter are stored with the name of the user who is responsible for this event.

The user name filter is a combo box which lets you either type the name of the user or selected from a drop down list with all known user names at this system. The filter is not case sensitive. You may type only a part of the user name, the filter shows all messages containing this character sequence in their user name field.

Please note, that this filter - if not blank - suppresses all messages which have no user name stored. No faults, no warnings are displayed with this filter.

The client host name filter lets you restrict the report to messages originated from a certain client PC. Login messages and messages logging the active change of a parameter are stored with the origin (hostname or IP4 address) of the event.

The client host name filter is a combo box which lets you either type the name of the client computer or select it from a drop down list with all known client names at this system. The filter is not case sensitive. You may type only a part of the client host name, the filter shows all messages containing this character sequence in their host name field.

Please note, that this filter - if not blank - suppresses all messages which have no client host name stored. No faults, no warnings are displayed with this filter.

The last filter is applied to the message text. Any non blank value in this field filters those events which contain this value in their message text (partial match). If you enter multiple words in this field, all messages are shown which contain *all* words in their message text at an arbitrary position. "one two" as a message filter will match for example the message text "received two ones". The filter is not case sensitive.

If the first character in this field is '-', the filter gets inverted. Example: '-OK' lists all events which do *not* contain OK in the message text.

Remarks

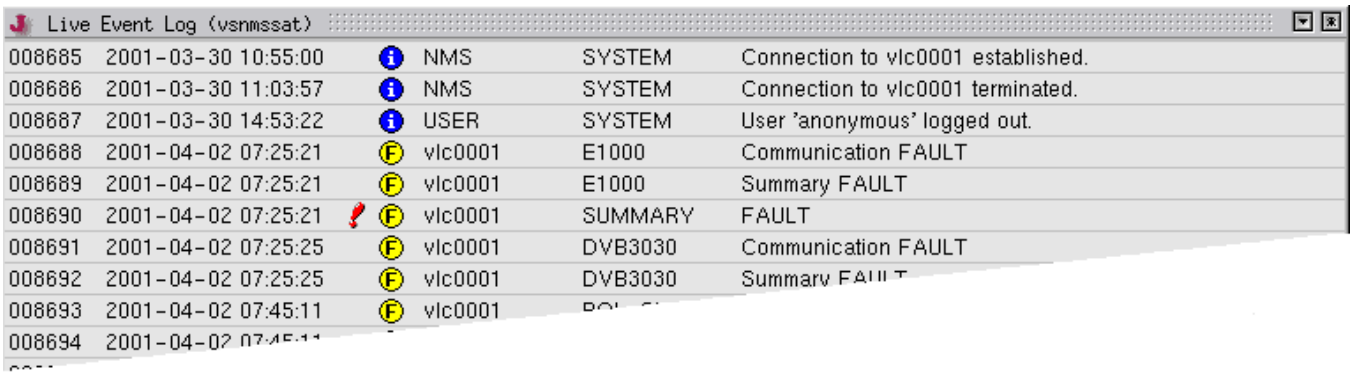
- The messages appear sorted by the time when they were originated.
- If you click to a message in the report, the time when the message was received at the NMS is displayed in the status line at the bottom of the window.
- With the right mouse button you get a context menu on each event, providing additional functions depending on the event's contents.
- The filter functions are combined using a logical AND. The report contains those events of the selected time range which match all of the filters.
- A new report is generated with the actual filter settings if you press ENTER in one of the entry fields or if you click to the reload button.

1.11 The Live Event Log Window

The Live Event Log window shows the recent event messages as they are received from one of

the VLCs. Unlike the Event Report window , which sorts the events by the when they were originated, the Live Event Log window shows the messages in the order of their arrival at the NMS. The window has a fixed size and always shows the last 25 messages.

The sort order of the event list (newest first / oldest first) may be toggled using the context menu shown with a right mouse button click on any line of the list. The default sort order is determined from a parameter set in the "client.properties" file located at the NMS or M&C server. Setting the key "gui.eventSortOrder" to "true" or "false" defines the default behavior of the live event log window.



Data shown in the list columns

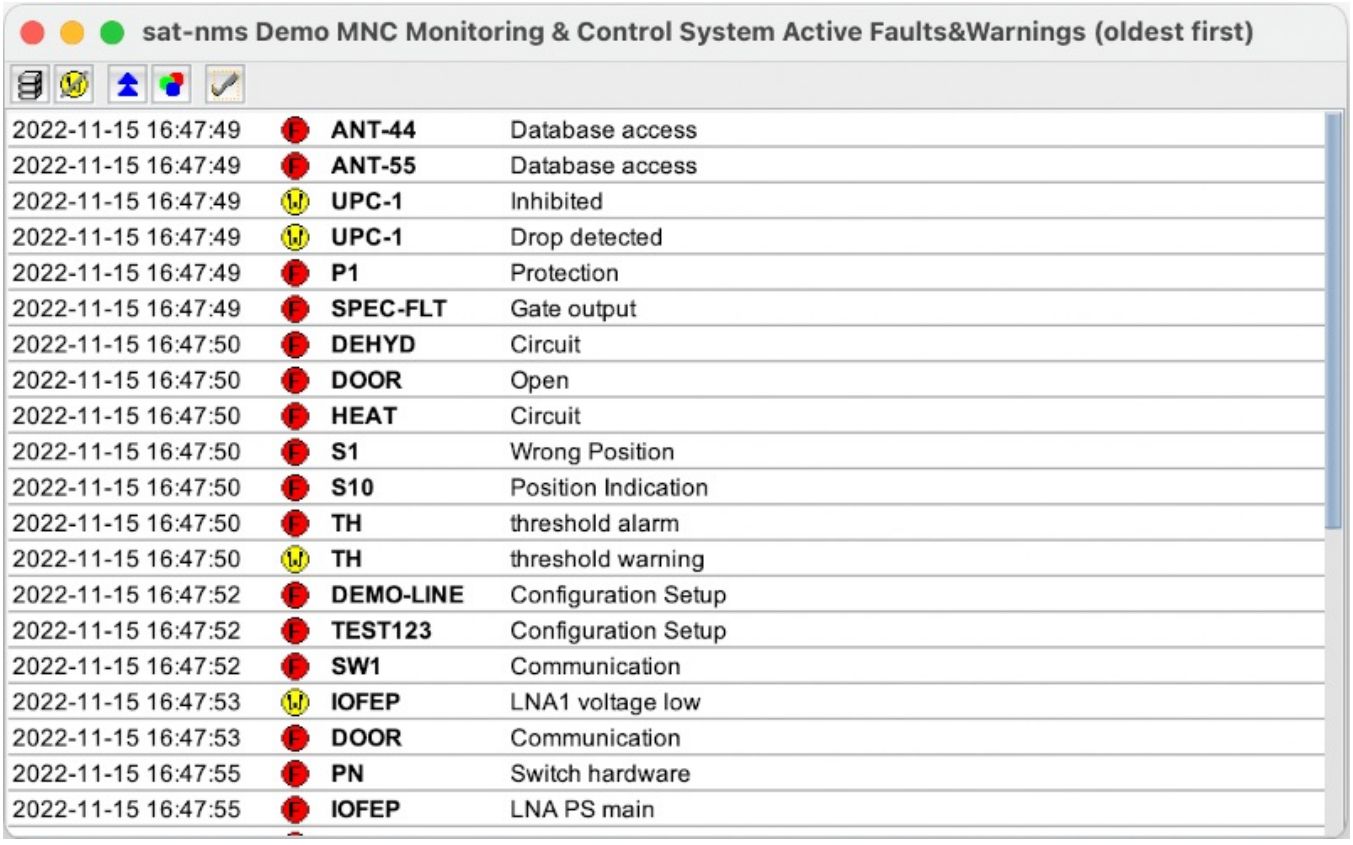
- Column 1 --- The event ID. This is a unique number the software assigns to each event which arrives at the NMS.
- Column 2 --- The time stamp when the event was originated. The originating VLC sets this, so the time relies on the accuracy of the VLC's clock.
- Column 3 --- The 'need acknowledgment' mark. Messages showing a red exclamation mark in this column are fault messages which need to be acknowledged by the operator.
- Column 4 --- The message priority. The message priority decides on the urgency, the message gets delivered from the VLC to the NMS. It also is a search criteria in the Event Report window. The following priority symbols may appear:
  - --- This is an informational message (lowest priority)
  - --- This is a fault message (medium priority)
  - --- This is an alarm message (highest priority, the VLC tries to deliver this immediately, regardless of the dial timing settings)
- Column 5 --- The primary message source. This usually is the ID of the VLC which issued the message. Messages marked with 'USER' or 'NMS' in this column have been generated locally in the NMS.
- Column 6 --- The secondary message source. This gives a more detailed information about the source of the message. It may be the name of the device in a VLC which caused the event.
- Column 7 --- The message text.

You may acknowledge messages marked with the red exclamation mark by double-clicking to the message line. This makes the exclamation mark disappear, an acknowledgment message gets added to the end of the log.

Please note, that if you close the Live Event Log window and open it again, any acknowledged message will appear with the exclamation mark set again. This is because the recognition of acknowledged messages depends on message sorting which does not happen in this window.

1.12 The Active Faults Window

The Active Fault Windows lists all actually pending faults and warnings in the VLC / M&C. The window automatically updates its content as the faults appear or disappear.



The toolbar buttons of the window let you select how the window displays the list of active faults:

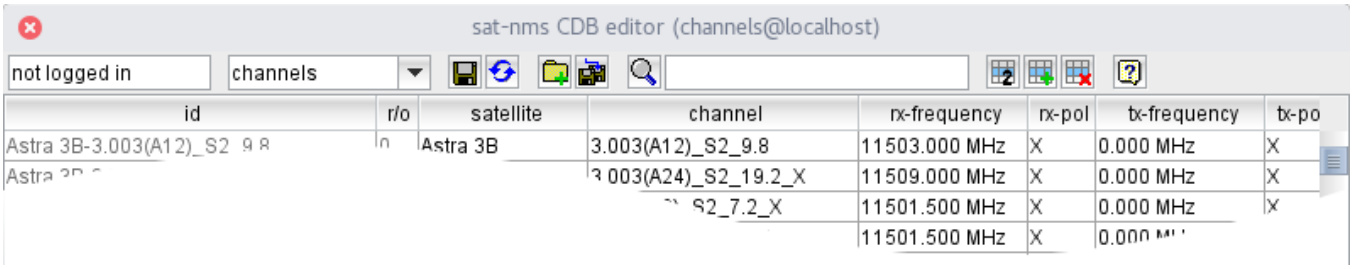
	If pressed, the faults are grouped by device name, if not they appear sorted by date.
	If pressed, the window suppresses al warnings, shows faults only. If not, faults and warnings are displayed.
	If pressed, newest events are shown on top. If not, oldest events are shown first.
	If pressed, the background of each line gets colored red for faults, yellow for warnings.

✔	Makes the "new fault" mark in the main window disappear and silences the beeper.

1.13 CDB Central Database Table Editor

The text based channel database (CDB) is a legacy tool to mangage satellite channel rx-/tx-parameter in a conveient way. It has been replaced with a SQL based database solution which entirely is operated through the sat-nms Web client. The description below is contained in the manual for reference only, it may apply to older M&C installations using the sat-nms Java client.

The sat-nms CDB table editor is a versatile tool to manage satellite channel lists in an easy and clear way. The table editor displays the contents of the CDB in spreadsheed like layout, lets you edit, add or delete channel definitions. Beside this, the table editor may be used to export or import the CDB table or parts of it on your client PC.



The picture above shows the table editor's toolbar. Below you find a short reference for all functions which are accessible here. A more elaborate description of the table editor's capabilities you find at the paragraphs forther down at this page.

- --- The login field. To log in, click into the field and enter your user name / password in the dialog popping up. You need to be logged in to save the edited table back to the server, all other functions work without login als well.
- --- The database selection. The M&C server may maintain other database tables beside the satellite channel list. Using this drop down selection you may switch between these databases. With your sat-nms installation, the field may be missing or limited to the 'channels' selection only.
- --- Saves the edited table back to the server. You need to be logged in for this.
- --- Reloads the table from the server. This abadons all changes since you opened the editor (or since the last save).
- --- Opens the import dialog. Lets you read a CSV file with channel definitions from you local PC and import these definitions into the CDB.
- --- Opens the export dialog. Lets you export all channels (or only the selected ones) to a CSV file on you client PC.
- --- Toggles the search function. Requires a search pattern to be entered in the field at its right.
- --- The search pattern field. Enter a search pattern here to select all channels matching this pattern. See 'Searching channels' below for a more detailed description how seaching works.

-  --- Duplicate row. Makes a duplicate of the (topmost) selected channel.
-  --- Add row. Inserts new channel definition above the (topmost) selected channel. The new channel gets initialized with default settings.
-  --- Delete row(s). Deletes the selected channel or all selected channels if more than one is selected.
-  --- Shows this help page.

Document style workflow

The table editor handles the CDB table like a document. When you start up the editor, it requests the complete database contents from the server and presents it in the editor window. It does not change the database until you click the save button to write back the changed channel list to the server. At this point all devices using the channel table will be informed about the changed database.

This workflow implies two things:

1. You can safely play around with the editor, change, delete or add channel definitions without disturbing the normal operation of the station. At any point you can abadon the editing process without changing the original data.
2. If two persons edit the database using two instances of the table editor at the same time, only the changes saved lastly will be taken by the CDB. This is the same as two persons edit the same document on a shared drive: The one wins who saves the changed document al last.

Logging in

A login as a user with a privilege level 100 or higher is required to write a modified table back to the server. All other functions, viewing channels, exporting them etc. are possible without login.

Login is done quite similar to the sat-nms M&C software, simply click to the login field in the upper left corner of the window and enter your user name and password at the dialog popping up.

Selecting the database

Some software installations may use multiple CDB databases, e.g. one for satellite channels and another for BISS keys. These installations show a selection field for the database to edit beside the login field. This field may be missing with your software installation.

Sorting the channels

The table editor normally presents the channels sorted alphabetically by the channel ID. By clicking to a column header of the table, you may sort the table by this column, e.g. by receive frequency. Clicking again to the table header reverts the sort order. Clicking to the header of the first column (channel ID) restores the original sort order.

Searching channels

When entering a text in the search field of the tool bar, the editor highlights all channels which contain this text in their channel ID. Beside this more complex searches are possible:

- Multiple words separated by space characters are searched and combined with a logical AND: "astra S2" for example marks all channel containing "astra" AND "S2" in their channel ID.
- Search words may be prepended by the name of a table column (as shown on the table header) followed by a colon. This makes the program search this word in this column. Example "EUT07 fec:7/8" marks all channels which contain "EUT07" in their channel ID and have a fec "7/8" set.
- The search is not case sensitive. The 'Search' button beside the search field toggles the selection

Selecting channels

A single channel is selected by clicking somewhere into the table row representing this channel. Holding down the SHIFT key while clicking to another table row selects a range of channels between these rows. Holding down the CTRL key while clicking to some channels adds these channels to the selection (or removes them if they are already selected).

Editing channels

You may change any channel parameter 'in place' in the table. For selection parameters simply click to the parameter field and select the new value from the drop down list. For numeric or textual parameter you need to double click the table field to switch it to edit mode. As soon as one value has been changed, the "MODIFIED" indicator shows up at the upper right corner of the window.

When you change the satellite name or the channel name, the program makes a new channel identifier from this and checks if this identifier is unique in the channel list. If not, a suffix is added to the channel name to make the identifier unique and a warning ist displayed.

If you are using the 'Import EBU channels' at the RX-Channel device, the channels imported from the EBU channel list are marked read-only anf cannot be edited in the table editor.

Adding new channels

There are two options to add a new channel to the database. 'Add a channel' means to add a new channel named 'NEW' and filled with defaults for all parameters. The second way to add a new channel is 'Duplicate channel'. As the name suggests, this duplicates the selected channel. All parameters are copied from the source channel and a suffix is added to the channel name to make the channel ID of the new channel unique. The new channel gets added above the actually selected row. If multiple rows are selected, the new channel is added above the topmost selected channel, this also acts as the template for the 'duplicate' function

Deleting channels

To delete one or more channels from the table, select the channels to delete and then click the 'delete row' button in the tool bar.

Importing channels

The table editor permits to import a set of channels from a CSV file which is located at your client PC. To import a file, click the 'import' button in the tool bar, select the file in the dialog box popping up and finally click 'Open' in this dialog box.

The table editor imports the file and adds the database records defined in this file to the table. It does this in an intelligent way:

- If an imported record has a duplicate in the table which matches the imported one for all parameters exactly, the imported channel definition is discarded. No duplicate is created in this case.
- If the imported channel has a duplicate in the table with the same channel ID but with different parameters, the channel gets imported and the channel name gets a '_DUP' suffix added.
- All other records in the imported file are simply added to the table.

The file format the import function expects, depends on your software installation and software version. It is always safe to import files which have been created using the export function on a sat-nms M&C with the same version number.

Exporting channels

You may export either all channels in the table or a subset of them to a local CSV file. Select the files to export and click the 'export' button in the tool bar. Then select or enter the file name you want to save to an click 'Save'.

If no channels are selected, the software exports all channels. You may use the search button (the magnifier glass) to remove an existing selection. If only one record is selected, the software will export this record only.

Saving the changed table

The 'save' button writes the changes you made back to the CDB server. You need to be logged in with a privilege level of at least 100 to do this operation. Once you click 'save', all RX-Channel and TX-Channel devices in the M&C get informed about the changed channel list.

If you made changes to the table and close the editor without saving the table, the program shows a warning about this.

Reverting all changes

The table editor offers the 'reload' button in the tool bar to discard all changes ant to load the table again from the CDB server. You may want to use this if you accidentally messed up the channel table.

1.14 The sat-nms ACU Indoor Unit

The ACU indoor unit is a PC system based on the sat-nms M&C technology. Together with an antenna controller and a beacon receiver it builds the sat-nms antenna control system. Main

features of this are:

- Monitoring and control of the concerned equipment.
- Satellite tracking using step track and orbit prediction tracking methods.
- Analysis and graphical presentation of the satellite tracking performance.

Using the sat-nms M&C platform as the basis, the ACU indoor unit also includes a lot of the benefits of the basic software:

- The software is highly modularized. The subsystems interfacing the tracking engine to the outside world may be configured to control third party products instead of the sat-nms outdoor unit or the beacon receiver.
- The user interface is very clear and contains data analysis tools to display in which way the antenna tracked the satellite.
- As with other implementations of the sat-nms M&C Software, the user interface is an platform independent Java program which may by run on any other computer in the LAN than the indoor unit itself.
- The indoor unit provides a event log database with a HTTP based interface to third party software.

The following chapters explain the concepts behind the sat-nms antenna control system and the architecture of specific configurations of the ACU. This is supplemented by a detailed description of all user screens and the meaning of all adjustable parameters.

1.14.1 Concepts

SatService GmbH offers sat-nms ACU Indoor Unit in two general configurations:

- The first configuration is optimized to work together with the sat-nms ACU/ODM. It utilizes all features of this device and adds a comfortable user interface with some handy utilities to it. The basic tracking functions are handled by the ODM in this case.The chapter 'sat-nms ACU Indoor Unit & Outdoor Module Configuration' describes the functionality and architecture of this configuration, chapter 'The ACU Main Window (with sat-nms ODM)' the appendant user interface. Furthermore you find a full description of the sat-nms ACU / ODM in the document 'sat-nms ACU Outdoor Module / User Manual'.
- The second configuration is directed to applications where the antenna pointing controller is a third party product. In this configuration the ODM / pointing controller is solely used to position the the antenna. All tracking algorithms are performed by ACU indoor unit software.Chapter 'sat-nms ACU Indoor Unit & 3rd Party Controller Configuration' describes the functionality and architecture of this second configuration, chapter 'The ACU Main Window (with 3rd Party Controller)' the appendant user interface. This modularity and flexibility makes the sat-nms ACU Indoor Unit to a universal antenna controller with sophisticated tracking capabilities which can be used with a multitude of antennas. Due to it's configurability it can be deployed together with new antenna installations and as an upgrade for existing antenna systems as well.

1.14.1.1 Tracking Modes

The sat-nms antenna control system -- regardless of the configuration used -- provides the basic types of satellite tracking:

Step Track

In plain step track mode, the ACU performs small test steps with the antenna in regular intervals to see if the receive level becomes better or worse for another antenna position. With the knowledge of the antenna pattern's shape, the tracking engine computes an optimized position from measurements taken at the old position and at the new one. Many parameters such as the step size, averaging times and the overall repetition interval are configurable by the operator.

Adaptive Track

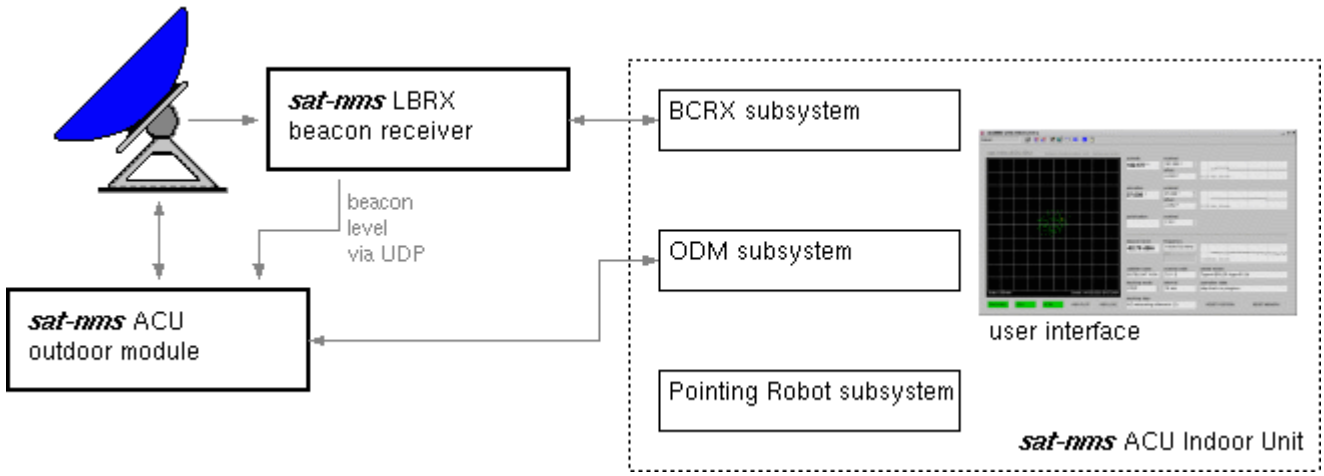
The adaptive tracking mode works much like the plain step track, however the tracking engine in background computes a mathematical model of the antenna motions from the step track results. A great advantage of this mode is that the antenna follows the computed model even if the beacon reception fails. With the plain step track mode, the antenna would freeze in this case until the satellite beacon appears again.

Program Track

With the third tracking mode called program track, the antenna follows a position computed from the satellite's ephemeris data. The tracking engine accepts Keplerian elements in NASA 2-line format or the proprietary Intelsat ephemeris data format for this. For this tracking mode, no beacon reception is required, however the ephemeris data sets must be updated every few days.

1.14.1.2 sat-nms ACU Indoor Unit & Outdoor Module Configuration

The diagram below shows the architecture of a antenna control system entirely built of sat-nms components. The 'sat-nms ACU Outdoor Module' controls the antenna pointing and performs the steptrack and adaptive tracking modes. The 'sat-nms LBRX Beacon Receiver' measures the satellite beacon level and supplies this level value on the Ethernet vie UDP Packets to the ODM. Both devices are controlled by the IDU through an Ethernet network (strictly spoken, the ODM also communicates with the beacon receiver directly, but this is for synchronization purposes only).



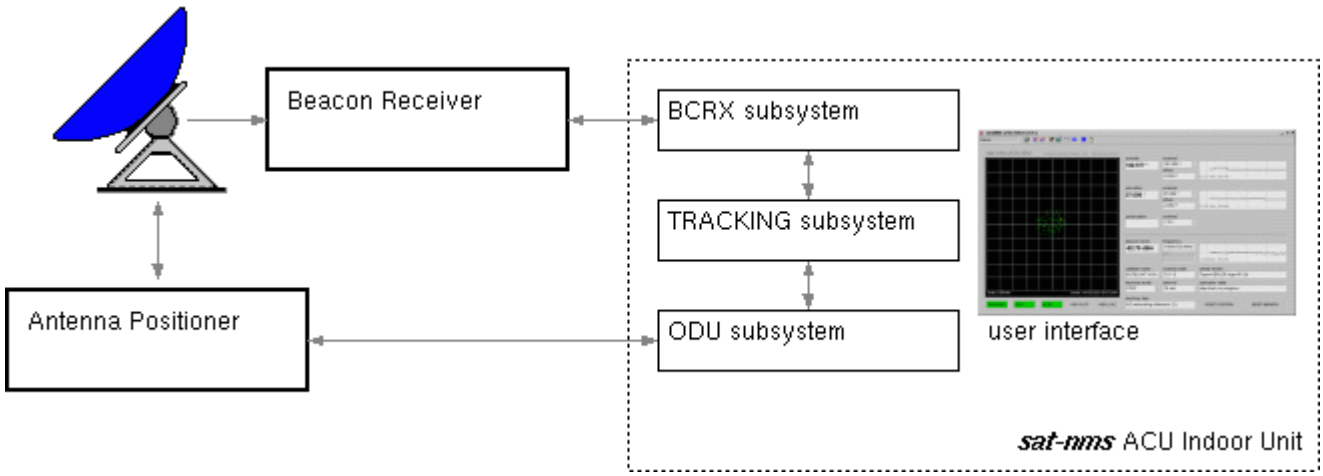
The indoor unit provides a comfortable graphical user interface which permits to monitor and control the whole antenna system. Beside this, it contains the so called 'Pointing Robot' , a software module which controls the antenna pointing according to the data evaluated from satellite ephemeris data sets or read from tables. This versatile tool superseeds the PROGRAM-Track function built into the ODM, which is not used in this configuration.

Configuring the antenna control system in this way is the favored solution. It achieves the best tracking results. More benefits are:

- The components of the antenna control system are optimally coordinated.
- Doing the step track locally in the ODM allows a very close timing of the operations during a steptrack cycle, this makes the tracking less susceptible to atmospheric variations of the beacon level.
- The tracking is completely independent from the indoor unit. If the IDU fails, the ODM still tracks the satellite.

1.14.1.3 sat-nms ACU Indoor Unit & 3rd Party Controller Configuration

The diagram below shows the architecture of a antenna control system using third party components. The 'Antenna Positioner' device solely controls the antenna pointing, it does not perform any satellite tracking. The 'Beacon Receiver' measures the satellite beacon level. Both devices are controlled by the IDU using arbitrary M&C interfaces (serial, TCP/IP). Any tracking functions are performed by a software module in the sat-nms ACU IDU.

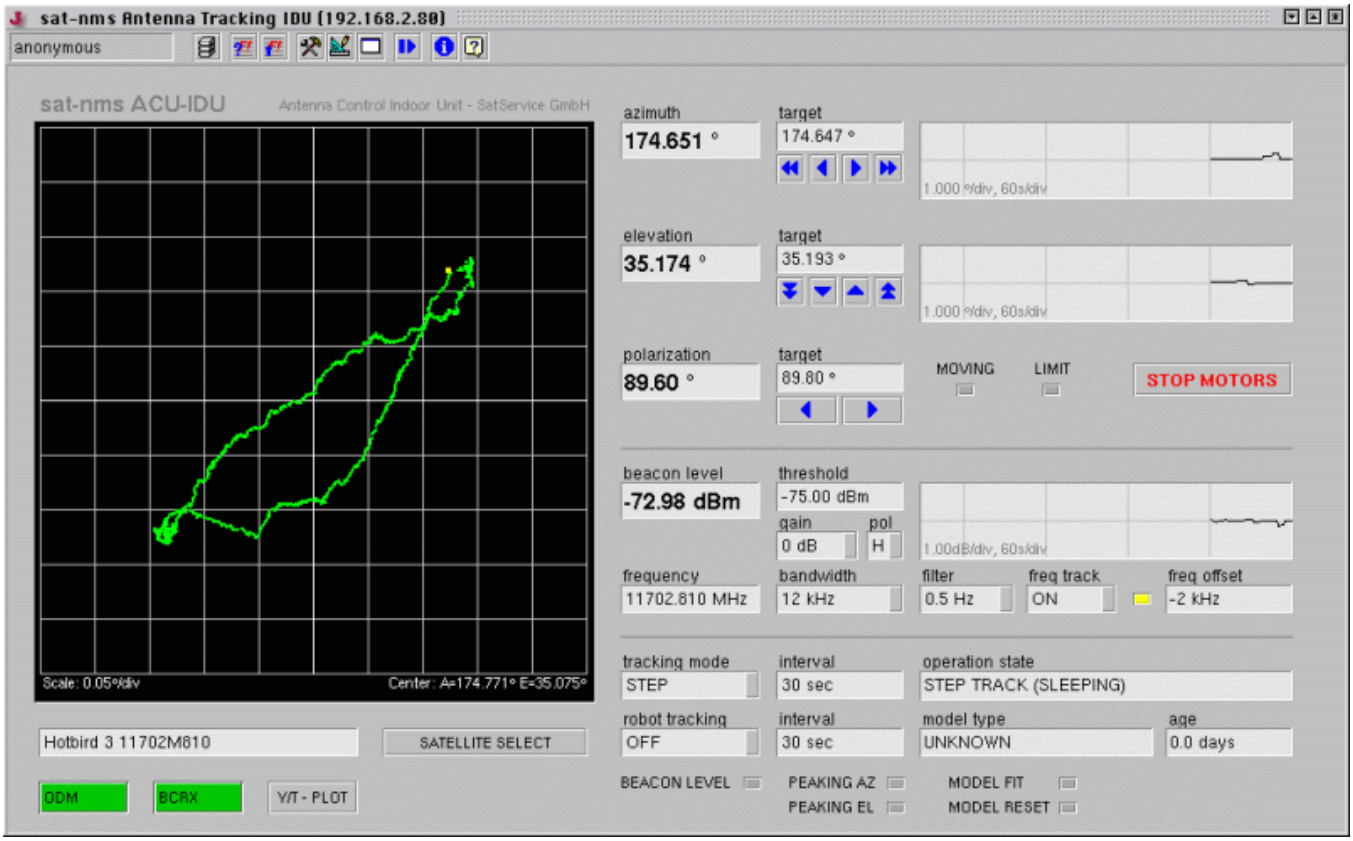


The indoor unit's main task is to perform the satellite tracking in this configuration. The IDU reads the beacon level thru the receiver's M&C interface and directs the antenna to to tracking steps. The tracking algorithms used by the IDU are similar to those used by the ODM, but not exactly the same. This is mainly because there is a longer time between moving the antenna for a test step anf reading out the beacon level.

The main advantage of this configuration is it's flexibility. The IDU is capable to do all tracking modes with any antenna controller which can be remote controlled by the sat-nms M&C system, the same applies for the beacon receiver. The sat-nms ACU indoor unit is a cost effective solution to upgrade existing antenna systems with a modern, network based user interface and a powerful satellite tracing engine.

1.14.2 The ACU Main Window (with sat-nms ODM)

The main screen of the sat-nms ACU Indoor Unit shows the main parameters of the antenna tracking control similar to the front panel of a oscilloscope. The left part of the window contains a diagram which shows the antenna movements of the past 48 hours. The most important settings and status displays are located at the right.

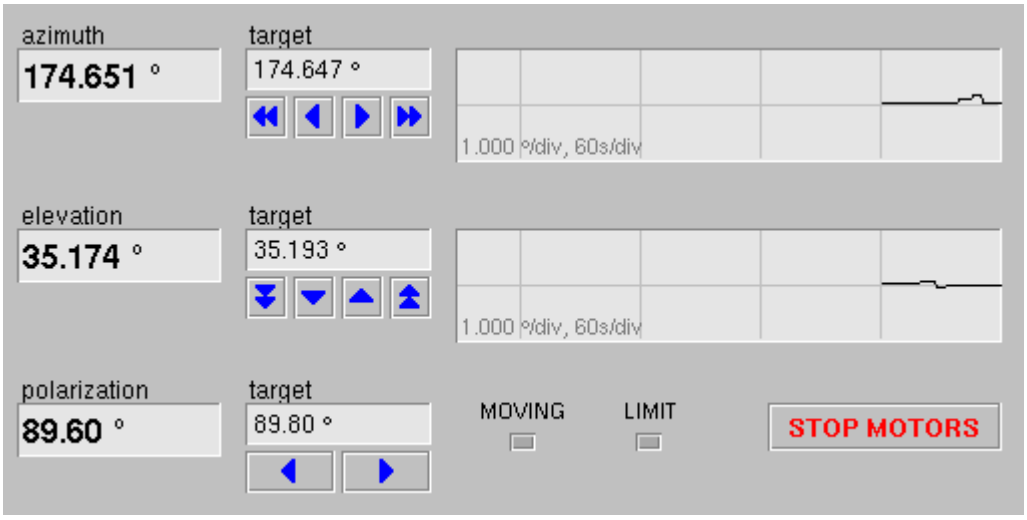


The toolbar on top of the window gives access to user login/logout, the event log and some other functions. As the ACU indoor unit inside principally is a M&C system, the toolbar is exactly the same as for the M&C Main Window .

At the top of the right part of the window thepointing display is located. It shows the actual antenna pointing and a strip chart of the recent history of antenna movements. Below the pointing display you find the beacon level display It reports the actual beacon level in a similar way. At the bottom of the right side the window contains an area with the tracking status display . Finally, below the tracking diagram on the left side, the ACU main screen contains the ACU subsystem menu . These buttons give you access to subsystem screens with all detail parameters of the ACU / tracking.

1.14.2.1 The Pointing Display

The area in the upper right part of the window shows the actual antenna pointing and provides entry fields to move the antenna to a given position. The example below is taken from an antenna which is not equipped with a polarization motor, the polarization angle display is empty therefore.

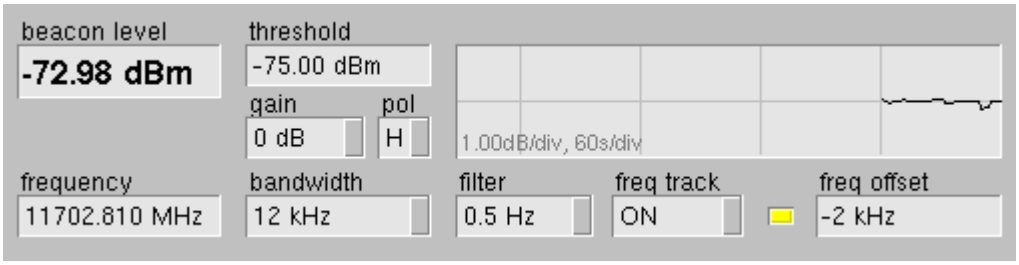


The fields labeled 'azimuth', 'elevation' and 'polarization' show the actual antenna pointing as read out from the angle encoders. For azimuth and elevation there is also a strip chart display of the angle. If you choose a high resolution scale for the chart, you can watch the antenna doing the tracking steps in the chart. Click with the right mouse button into the chart to get a pop-up menu for scales and other display options.

The 'target' fields show the actual target values. The arrow buttons below these fields permit to adjust the antenna position in small or larger steps. This only should be done with any tracking switched off to avoid interferences with motions initiated by the tracking engine.

1.14.2.2 The Beacon Level Display

Below the antenna pointing, the ACU shows the actual beacon level. The level value shown is that one read by the ODM from the analog input. This value may differ from the level reported by the beacon receiver directly. There is also a strip chart display of the level. The chart moves with the same speed as the angle charts above, so you directly can watch the influence of tracking steps to the beacon level. A click with the right mouse button into the chart shows a pop-up menu for scales and other display options.



The screen also provides fields to set common parameters of the beacon receiver like the receive frequency and polarization, bandwidth parameters and the frequency tracking option. Changing the values in these fields changes the beacon receiver setting immediately.

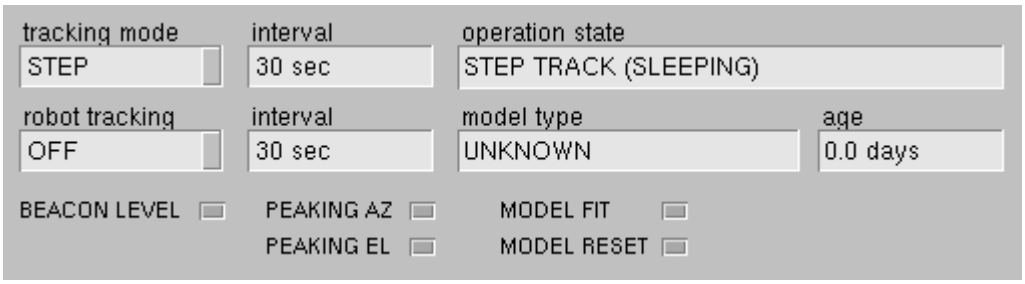
The threshold value contained in this parameter group is the ACU/ODM level threshold rather than the threshold parameter of the beacon receiver itself. The latter is recommended to be

set to a very low value in order to avoid level fault messages from the beacon receiver. The beacon level threshold is to be monitored by the ACU/ODM, hence the level fault can be synchronized with the tracking activities.

The frequency offset display in this group reports the activity of the beacon receiver's frequency track facility, the small yellow lamp is lit while a frequency track cycle is in progress

1.14.2.3 The Tracking Status Display

The lower right area of the ACU main window shows the tracking status display and the basic tracking mode parameters.



The table below gives a short description of each parameter in this area.

- **tracking mode** --- With this parameter you set the basic tracking mode. Available modes are OFF, STEP and ADAPTIVE. This parameter is passed to the ODM.
- **interval** --- With this parameter (upper row) you define in which intervals the ACU shall perform tracking steps. This parameter is passed to the ODM as well.
- **operation state** --- This field shows the general operation state of the tracking engine.
- **robot tracking** --- This switches the pointing robot ON or OFF. If the pointing robot is activated, the tracking mode is forced to OFF anf the antenna of moved on a path evaluated by the robot.
- **interval** --- The interval parameter in the lower row controls the update rate of the pointing robot.
- **model type** --- This status field displays the type of algorithm the pointing robot actually uses. Possible data sources may be Keplerian elements (NASA 2-line format), Intelsat ephemeris data or list of positions defined in a text file.
- **model age** --- Displays the age of the data used by the robot. With ephemeris data sets this is the time since the epoch of the data set. For file tracking the time stamp of the last record in the table is used as the epoch.

Below these parameter fields a couple of fault indicators (red lamps) are located on the screen. They report any faults of the tracking engine. The meaning of the individual faults are:

- BEACON LEVEL --- The beacon level is below the threshold and one of the tracking modes STEP or ADAPTIVE is selected. In STEP track mode the antenna freezes in this situation, in ADAPTIVE mode the antenna is moved along the model which has been calculated before the beacon disappeared.
- PEAKING AZ/EL --- The step track peaking failed for one of the axes. The tracking engine reports this fault if the position / beacon level pairs measured during the tracking cycle

does not match the antenna pattern curve sufficiently. This may happen if the beacon values are too noisy or if there is no beacon reception at all and the threshold is adjusted too low.

- MODEL FIT --- If the variance of the measured peaks to the calculated model exceeds the 'jitter threshold' value, this fault is raised. This is an indication that either the measurement values are noisy or the model type is not appropriate for the satellite's motion.
- MODEL RESET --- If the ODM recognizes a 'MODEL FIT' fault at three consecutive tracking cycles, it presumes the model to be invalid and resets the model. This voids all recorded step track positions (they remain visible in the diagrams) and resets the tracking to the learning phase where no model is available.

1.14.2.4 The ACU Subsystem Menu

The icons below the tracking diagram are the ACU subsystem menu. They give access to some less frequently used parameters of the antenna control system.

Clicking to the ODM icon opens a window which permits access to all parameters of the ODM directly. Also the the color of the icon signals the fault state of the ODM device. With the ODM device window there are a couple of parameters which control the behavior of the tracking subsystem. Chapter 'The ODM Detailed Parameter Screens' gives a detailed description of them.

The BCRX icon opens a window directly to operate / configure the beacon receiver attached to the ACU. This window is required to set some beacon receiver parameters which are not accessible thru the application main screen.

The 'VIEW PLOT' button opens a separate graphical Y/T display window which gives more detailed information about what the tracking engine did during the recorded hours. It provides variable scales, and permits to display additional information. The display shows either the azimuth or the elevation pointing found at the beginning of each tracking step together with the beacon level measured at this time. The following additional information may be included to the diagram:

- --- This button has no function in this configuration.
- --- The main pointing graph (light green) always shows the pointing the antenna was really moved to. This is the smoothed position if smoothing is activated. If this toolbar button is pressed, the diagram includes the evaluated peak positions as a faded, dark green graph.

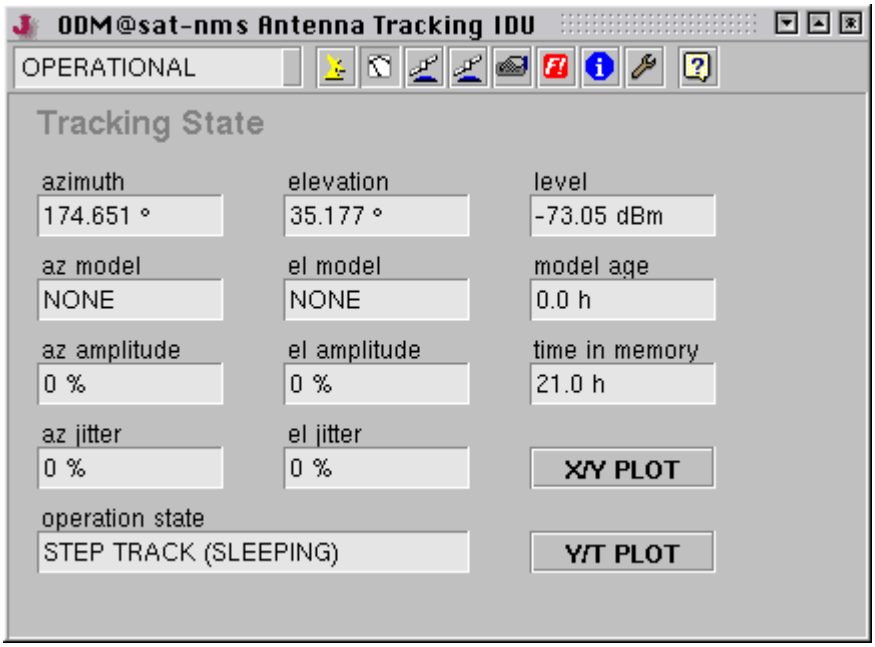
Clicking to the 'SATELLITE SELECT' button opens a window which lets you store and recall the position and the tracking parameters of several satellites. Also the ephemeris data for the pointing robot are entered here. Chapter 'The Satellite Select Screen' explains the functions of

this screen.

1.14.2.5 The ODM Detailed Parameter Screens

The ODM detailed parameter screens are part of the M&C device window for the SatService ACU/ODM. This window integrates all status and control parameters which are available for the ODM. To monitor and control the tracking functions of the ACU, the following two screens are important:

Clicking to the meter symbol in the toolbar shows the tracking state page. It displays a number of state parameters which report what the tracking engine actually does.

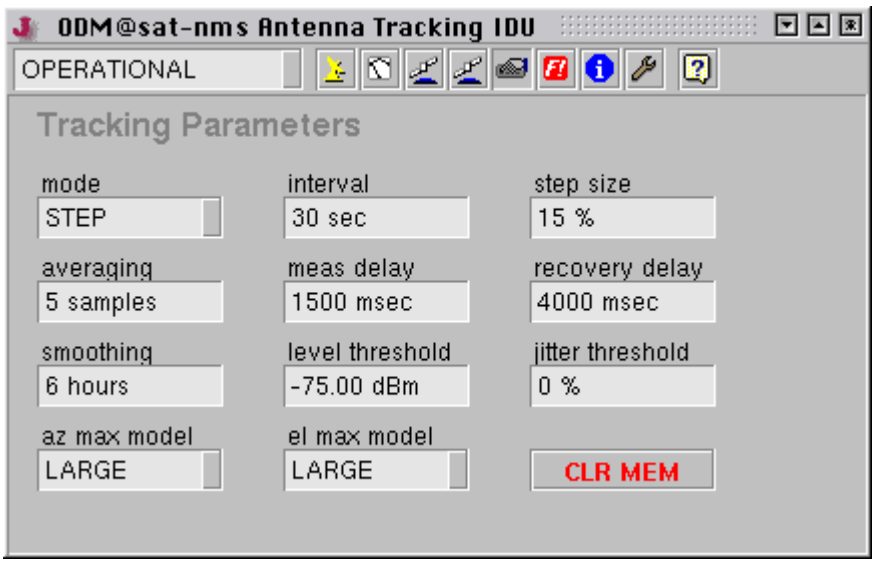


- **azimuth** --- The actual azimuth pointing.
- **elevation** --- The actual elevation pointing.
- **level** --- The actual beacon level (read from the ODM's analog input).
- **az model** --- The model type the ODM uses for the azimuth axis in ADAPTIVE mode if the beacon is lost. The value is displayed all the time, even if the beacon level is OK.
- **el model** --- The same for the elevation axis.
- **model age** --- This displays the time since the adaptive models have been updated the last time. The value normally is zero, if the beacon disappears it counts the time the antenna is tracked using the model.
- **az amplitude** --- The amplitude of the azimuth motion as a percentage of the antenna's 3 dB beamwidth. The ODM approximates the motion by a simple sine function to determine the amplitude.
- **el amplitude** --- The amplitude value for the elevation axis.
- **time in memory** --- The time span covered by the tracking data the ACU has in it's memory.
- **az jitter** --- The variance of all steptrack positions in memory with respect to the modeled values (azimuth). This is a measure how good the model fits. The jitter value is in percent if the antenna's 3 dB beamwidth. The 'jitter threshold' setting refers to the 'az/el jitter

values.

- **el jitter** --- The same for the elevation axis.
- **X/Y PLOT** --- Clicking to this button opens a separate window showing the same X/Y diagram as displayed in the main window.
- **operation state** --- Shows what the tracking engine actually is doing.
- **Y/T PLOT** --- Clicking to this button opens separate window showing the same X/T diagram as can be accessed from the main window.

Clicking to the device control symbol in the toolbar shows the tracking parameter page. Beside the tracking parameters shown in the application main window this page displays all adjustable parameters of the tracking subsystem.



- **mode** --- The tracking mode parameter selects the tracking method, the ACU actually uses. Possible selection are:
  - **OFF** --- No tracking is performed.
  - **STEP** --- Step track mode. In regular intervals, the antenna performs small search steps to optimize the pointing.
  - **ADAPTIVE** --- The adaptive tracking mode works the same way as step track, but it additionally is capable to predict the satellite's position when the beacon reception fails. It computes mathematical models of the satellites motion from the step track results recorded over a certain time.
  - **PROGRAM** --- The program tracking mode is offered here only for compatibility purposes only. In conjunction with the IDU the pointing robot should be used rather than the program track mode of the ODM.

A full description of the tracking functions used in the sat-nms ACU is given in chapter '5.0 Theory Of Operation' of the ACU/ODM manual.

- **interval** --- The interval time specifies how often the ACU shall perform a step track cycle. The value is to be entered in seconds. In fact, the parameter does not specify a cycle time but the sleep time between two tracking cycles. This means, the true cycle time is the time the ACU needs to perform one step track cycle plus the time entered

here. 300 seconds (5 minutes) is a good starting value for this parameter. Inclined orbit satellites probably will require a shorter cycle time, very stable satellites can be perfectly tracked with one step track cycle every 15 minutes (900 seconds).

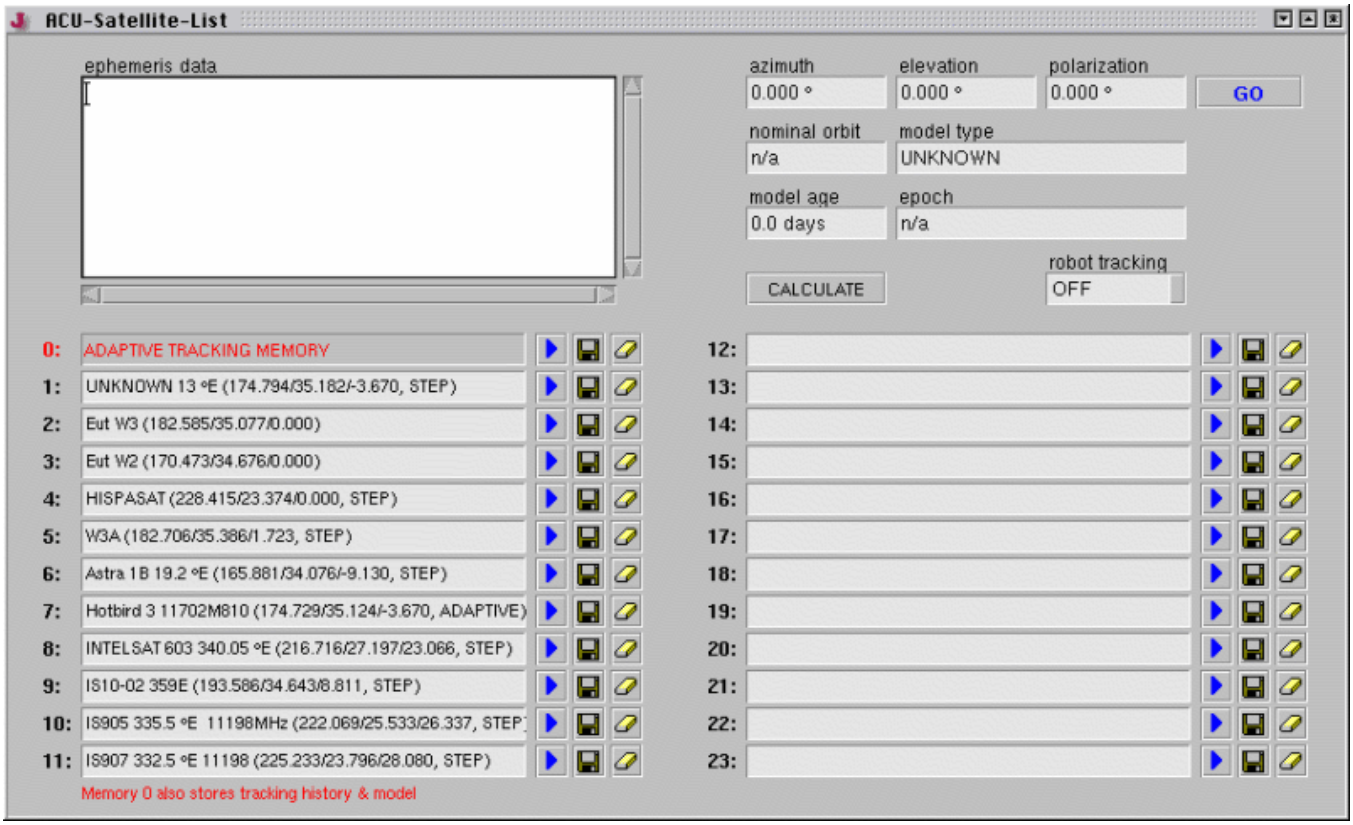
- **stepsize** --- The tracking step size is a very important parameter for the performance of the tracking. It defines the size of every de-pointing step, the ACU makes in order to find out where the optimal antenna pointing is. Setting too high values will cause significant signal degradations during the step track cycle because the antenna moves a too large amount away from the satellite. Setting the value too small will let the beacon level jitter mask the level differences caused by the test steps, the antenna will not track the satellite properly.The step size is specified as a percentage of the antenna's half 3dB beamwidth. The ACU calculates the beamwidth from the antenna diameter and the beacon frequency. Expressing the step size in this relative way keeps the value in the same range, regardless of th type of antenna. The recommended value for this parameter is 15-20%. You may want to start with 20% and try to reduce down to 15% if the signal degradation during tracking becomes too high.The tracking step size is a common parameter for both axes. If both axes behave differently, you can tweak the antenna diameter settings in the setup. Specifying a larger diameter makes the ACU using a smaller step size for this axis.If the tracking step seem to be completely out of range, you should check if the beacon frequency is set properly. The frequency must be the true receive frequency at the antenna, entered in MHz, not an L-band frequency or other IF.
- **averaging** --- When measuring the beacon level, the ACU takes a number of samples and averages them. The standard value of 5 samples normally should not be changed. Larger values will slow down the ACU execution cycle.
- **measdelay** --- During a steptrack cycle, the ACU positions the antenna to a certain offset and then measures the level. Between the moment when the antenna reached commanded position and the beacon level measurement the ACU waits some time to let the beacon level settle. The optimal delay value depends on the beacon receiver's averaging / post detector filter setting and is a quite critical for the steptrack performance.If the delay is too short, the beacon voltage does not reach its final value, the steptrack does not properly recognize if the signal gor better or worse after a test step. If the delay is too long, the impact of fluctuation to the measures level grows and may cover the small level difference caused by the test step. With the sat-nms LBRX beacon receiver, best results are achieved if the receiver is set to 0.5 Hz post detector filter bandwidth and a measurement delay of 1500 msecs
- **recoverydelay** --- After the the ACU has done the tracking steps for the elevation axis, it waits some time before it starts tracking the azimuth axis. This is to let the beacon level settle after the final position has been found. A typical value for this parameter is 4000 msecs
- **smoothing** --- This parameter controls the smoothing function. Setting it to zero disables smoothing. Smoothing lets the ACU point the antenna to positions evaluated from a simple model calculated from the step track peaks of the recent few hours. To understand the functionality of the smoothing function you may want to read chapter '5.3.3 Smoothing' in the ACU/ODM manual.
- **levelthreshold** --- If the beacon level falls below this threshold value, the ACU does not perform a step track cycle. If the level falls below the threshold during the steptrack cycle, the cycle gets aborted.If the ADAPTIVE tracking ist enabled and there is enough

data in the tracking memory, the ACU computes a mathematical model from the stored data and predicts the antenna pointing position from the extrapolation of the model. If the tracking mode is set to 'STEP', the ACU leaves the antenna where it is if the beacon level drops below the limit.Adjusting the threshold level that adaptive tracking is switched as expected must be done carefully and may require some iterations, specially if the beacon is received with a low C/N. A good starting value for the threshold is 10 dB below the nominal receive level or or 2 dB above the noise floor the beacon receiver sees with a de-pointed antenna, whatever value is higher.To turn off the monitoring of the beacon level (this in fact inhibits the adaptive tracking), simply set the threshold the a very low value (e.g. -99 dBm)

- **jitterthreshold** --- If the jitter value of at least one axis exceeds this threshold, the ACU raises an 'model fault'. If this happens three consecutive times, the ACU resets the models of both axes. Adaptive tracking will be possible not until 6 hours after this happens.A typical threshold value is 20%, this will detect very early that a model does not fit to describe the satellite's motion. If this value causes false alarms too often, you may want to raise the threshold to 50%. Setting it to 0 switches the threshold monitoring completely off.
- **azmaxmodel elmaxmodel** --- These settings let you limit the adaptive model to a simpler one, the ACU would choose by itself. The maximum model type can be set individually for each axis. Normally you will set both axes to 'LARGE', which leaves the model selection fully to the the ACU's internal selection algorithms.In cases where the ACU seems to be too 'optimistic' about the quality of the step track results, the maximum model on one or both axes may be limited to a more simple and more noise-resistant model. Specially inclined orbit satellites which are located close to the longitude of the antenna's geodetic location may require this limitation for the azimuth axis. With such a satellite, the elevation may move several degrees while the azimuth shows almost no motion.
- **CLRMEM** --- Clicking to this button clears the tracking memory. You should do this when you start to track a new satellite. Clearing the tracking memory about half an hour after tracking started significantly improves the quality of the first adaptive tracking model which will be evaluated after 6 hours of tracking. This is because the model does not get disturbed by the first search steps the antenna does until the optimal pointing to the satellite is found.

1.14.2.6 The Satellite Select Screen

The satellite select screen combines two functions for pointing the antenna to a satellite's position: The entry of ephemeris data to the pointing robot and the administration of the ACU's target memory locations.



The upper part of the screen is used to feed the pointing robot with the ephemeris data this requires to point the antenna to the satellite's position.

The usage is very simple: Copy the ephemeris data from e.g. your web browser window into the 'ephemeris data' field and click to the 'CALCULATE' button. The software tries to identify and parse the data and sets the informational fields on this right site to the values computed from the data. The 'azimuth' / 'elevation' / 'polarization' files show the antenna pointing which actually lets the antenna look to the satellite. The values below describe the type and the age of the ephemeris data set.

The pointing robot is capable interpret several types of ephemeris data including Keplerian elements in NASA 2-line format, Intelsat data, plain orbit positions and tables of az/el/pol value triples. The description of the Pointing-Robot logical devices describes the recognized data formats in detail.

The button 'GO' lets you make the pointing robot assist you in finding a satellite: Enter the satellite's nominal orbit position (or it's ephemeris data, if known), then click to 'CALCULATE', verify the calculated antenna pointing anf finally click the 'GO' to let the antenna move to this position.

The lower part of the screen manages the permanent storage of satellite parameters. Up to 24 satellites may be stored. The target memories store the antenna pointing and all tracking parameters. They are physically stored at the ODM's flash memory. If the ODM gets replaced, the stored positions are lost.

The ACU also stores the beacon receiver settings together with a target. These are stored at

the beacon receiver itself. The ODM, when receiving a command to store or recall a target memory, sends a command to beacon receiver to do the same.

-  --- Recalls this preset. The antenna is moved to the stored position, all tracking parameter are set as stored and the beacon receiver's parameters are set from the values stored with the preset. The tracking memory is cleared if a target memory is recalled. Only if the target number 0 is recalled, the tracking memory is restored to the state when this target was saved.
-  --- Stores the actual settings in this preset. The satellite name, the actual pointing and all tracking parameter are stored in the preset. The beacon receiver parameters are stored as well.
-  --- The preset memory with this number is deleted.

The target memory location 0 is a special one. Unless the other memory locations, this first one stores the contents of the tracking memory and all temporary tracking data like models etc. together with the position and parameters.

This makes the first memory location dedicated to the short time storage of a satellites tracking state, when another satellite shall be tracked for a couple of hours. Example:

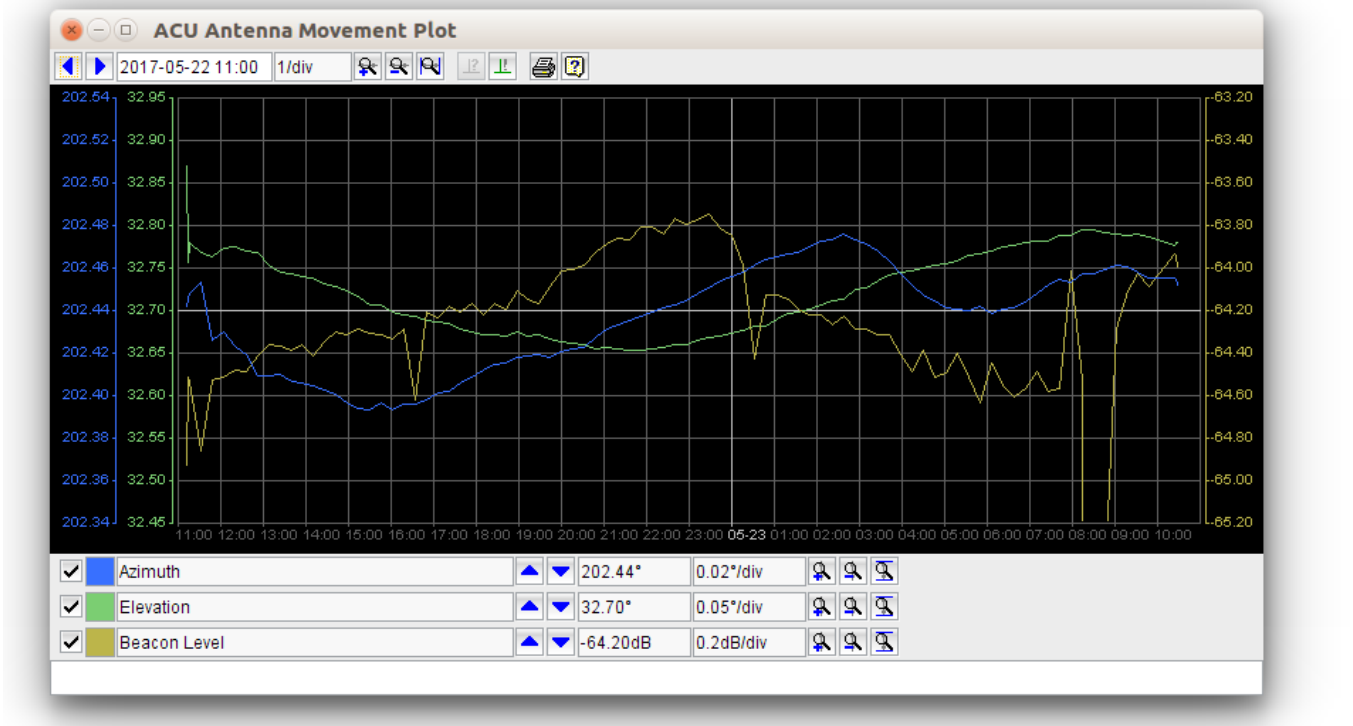
The antenna is tracking satellite A for a long time, the tracking memory is filled with 70 hours of step track data for this satellite. During a maintenance phase, the antenna shall temporarily track satellite B. With the target 0 memory you would handle this situation as follows:

1. Store the actual state as target 0 *before* the antenna is moved to point to satellite B.
2. Move the antenna to point to satellite B, either by recalling the target memory for this satellite or by pointing the antenna and clearing the tracking memory manually.
3. Let the antenna track satellite B for a couple of hours as needed.
4. No return to satellite A by recalling the target memory 0. This points the antenna back to satellite A and restores the tracking memory data for this satellite.

You should consider that it only makes sense to reuse the stored tracking data if there is less than twelve hours of discontinuity in tracking the satellite. If too much data is missing, clearing the tracking memory wil give the more reliable results.

1.14.2.7 The Y/T Tracking History Viewer

The sat-nms ACU IDU software provides a facility that permits to display the recorded tracking data in a versatile Y/T diagram viewer. This viewer may be launched by clicking to the "Y/T Plot" button either in the *ACU Main Screen* or in the device screen of the Satservice ACU-ODM.



The window shows a diagram of the recorded tracking data, the fields and buttons in the tool bar permit to modify the appearance of the diagram as needed. Clicking into the diagram shows a marker which displays a readout of the value at the selected screen position in the status bar at the bottom of the screen.

Top Toolbar

- --- Moves the plot two divisions to the left, lets you see older data.
- --- Moves the plot two divisions to the right, lets you see younger data.
- --- Shows/edits the start time. The displayed time corresponds to the leftmost grid line in the diagram.
- --- Zooms in the time scale, shows a smaller section of the data more detailed.
- --- Zooms out the time scale, shows a larger section of the data.
- --- Zooms out to show the recent 24 hours of recorded data.
- --- If pressed (it's a latching button), the search step beacon degradation is shown together with the beacon level. This function is not available with the SatService ACU-ODM.
- --- If pressed, the AZ/EL pointing determined by the peaking algorithm are shown as a second curve. The main curve shows the pointing angles where the antenna was moved to, including and optimization or smoothing applied.
- --- Prints the diagram as actually shown.

-  --- Shows this manual page.

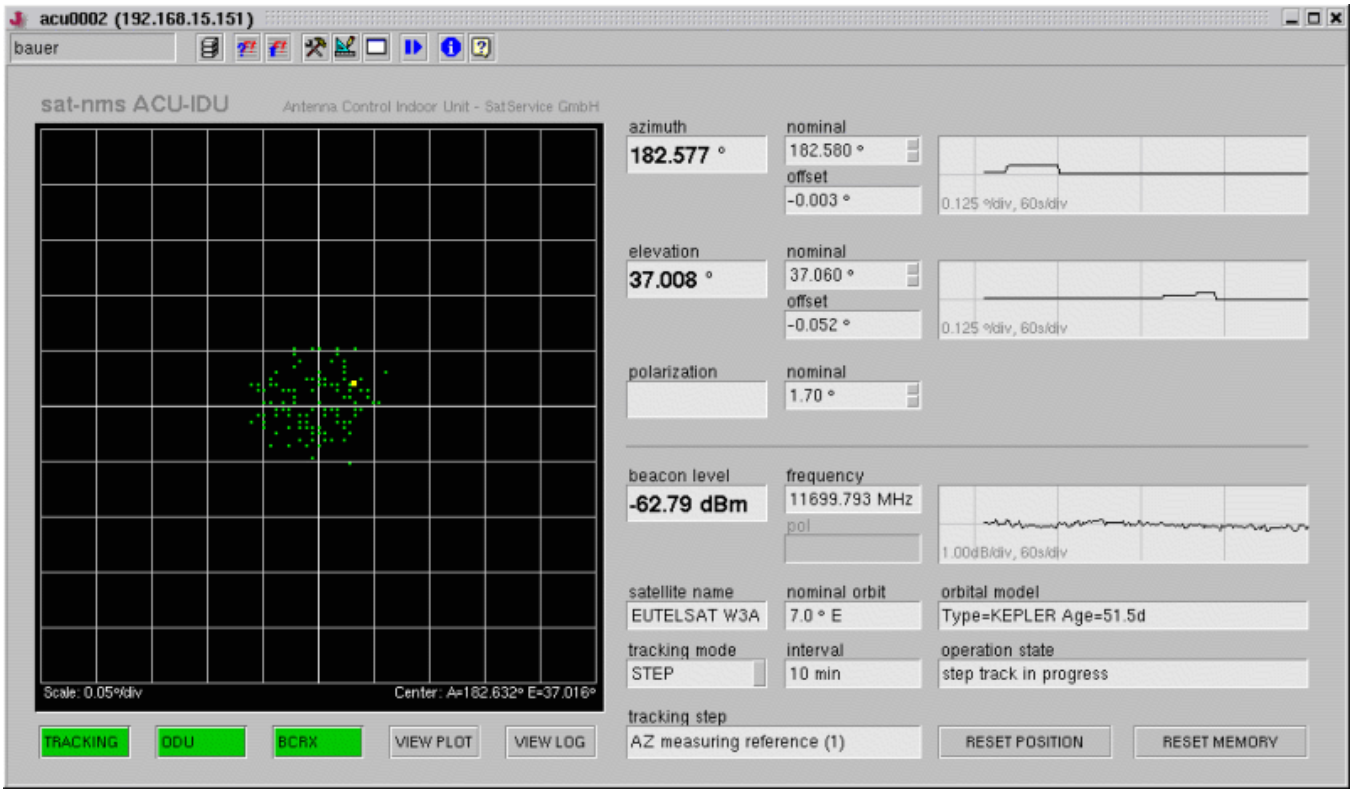
Bottom Toolbars

Below the diagram, the History File Viewer provides three toolbars to modify the scaling of the traces "Azimuth", "Elevation" and "Beacon Level" shown in the diagram.

-  --- The first control in each toolbar selects if the trace shall be drawn.
-  --- Shows the color if this trace, clicking to the color fields opens a dialog which lets you change the color of the trace.
-  --- Shows the name / description of the trace.
-  --- Moves the trace upwards one division.
-  --- Moves the trace down one division
-  --- Shows the y-scale reference level and the actual scaling. The y-reference level is the value corresponding to middle grid line.
-  --- Zooms in the y-scale for this trace.
-  --- Zooms out the y-scale for this trace.
-  --- Zooms to show the min/max values (autoscale). This refers to the entire data, not only to the part actually shown.

1.14.3 The ACU Main Window (with 3rd party controller)

The main screen of the sat-nms ACU Indoor Unit shows the main parameters of the antenna tracking control similar to the front panel of a oscilloscope. The left part of the window contains a diagram which shows the antenna movements of the past 48 hours. The most important settings and status displays are located at the right.

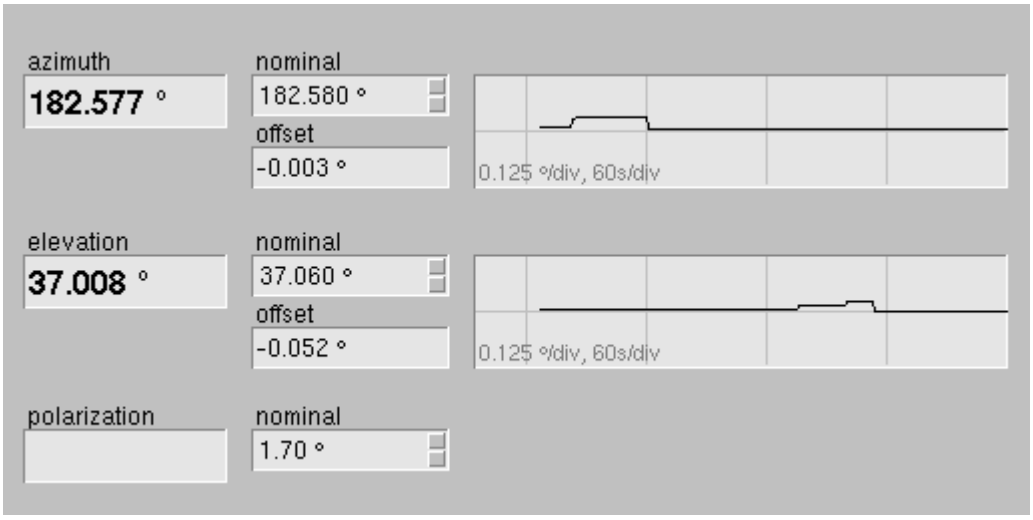


The toolbar on top of the window gives access to user login/logout, the event log and some other functions. As the ACU indoor unit inside principally is a M&C system, the toolbar is exactly the same as for the M&C Main Window .

At the top of the right part of the window thepointing display is located. It shows the actual antenna pointing and a strip chart of the recent history of antenna movements. Below the pointing display you find the beacon level display It reports the actual beacon level in a similar way. At the bottom of the right side the window contains an area with the tracking status display . Finally, below the tracking diagram on the left side, the ACU main screen contains the ACU subsystem menu . These five buttons give you access to subsystem screens with all detail parameters of the ACU / tracking.

1.14.3.1 The Pointing Display

The area in the upper right part of the window shows the actual antenna pointing and provides entry fields to move the antenna to a given position. The example below is taken from an antenna which is not equipped with a polarization motor, the polarization angle display is empty therefore.



The fields labeled 'azimuth', 'elevation' and 'polarization' show the actual antenna pointing as read out from the angle encoders. For azimuth and elevation there is also a strip chart display of the angle. If you choose a high resolution scale for the chart, you can watch the antenna doing the tracking steps in the chart. Click with the right mouse button into the chart to get a pop-up menu for scales and other display options.

The 'nominal' fields define the nominal antenna pointing for the actual satellite. The nominal pointing describes the center of the satellite's path over 24 hours.

- If you store the antenna pointing and the tracking parameters as a ACU preset, the software stores the nominal pointing. If you recall the preset, the software moves the antenna to the stored pointing and starts tracking there in the operation mode stored with the preset.
- The antenna moves to the nominal position, if you click to the 'RESET POSITION' button.
- The absolute tracking limits configured in the TRACKING subsystem refer to the nominal antenna pointing.

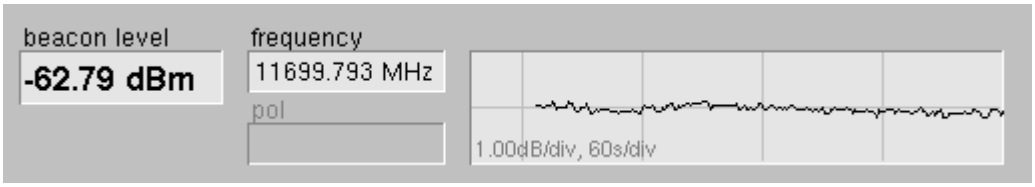
If you change a nominal pointing value while the antenna has tracking switched on, this only moves the reference point for the tracking limits. The antenna is under control of the tracking engine and does not move due to this change.

If the ACU tracking mode is set OFF, the antenna behaves differently. In this case changes of the nominal value let the antenna move immediately to the selected position.

Finally, the 'offset' fields indicate the actual difference between the real antenna pointing and the nominal position.

1.14.3.2 The Beacon Level Display

Below the antenna pointing, the ACU shows the actual beacon level. There is also a strip chart display of the level. The chart moves with the same speed as the angle charts above, so you directly can watch the influence of tracking steps to the beacon level. A click with the right mouse button into the chart shows a pop-up menu for scales and other display options.

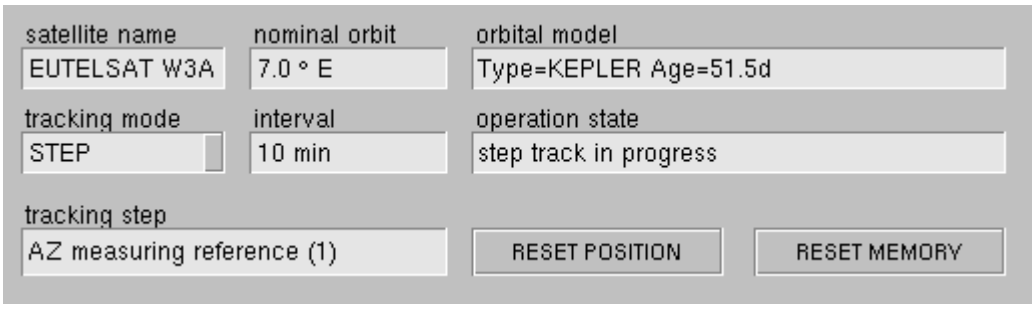


The screen also provides fields to set the beacon frequency and the receive polarization (the latter is not supported by antenna where the example picture has been taken from). Changing the values in these fields changes the beacon receiver setting immediately.

If you are using a third party beacon receiver which is not controlled by the ACU indoor unit, you nevertheless have to set the beacon frequency here. This is because the tracking software takes the frequency into account when estimating the antenna receive pattern and from this the tracing step sizes.

1.14.3.3 The Tracking Status Display

The lower right area of the ACU main window shows the tracking status display and the basic tracking mode parameters.



The table below gives a short description of each parameter in this area. The all refer to the TRACKING subsystem , this chapter gives a more detailed description of the tracking.

- **satellite name** --- The name of the satellite you are tracking.
- **nominal orbit** --- The nominal orbit position of the satellite.
- **orbital model** --- The type and age of the orbital model the ACU uses for the PROGRAM track mode. During ADAPTIVE tracking, the the number of hours in memory are displayed here.
- **tracking mode** --- With this parameter you set the basic tracking mode. Available modes are OFF, STEP, ADAPTIVE and PROGRAM..te .ts **interval**With this parameter you define in which intervals the ACU shall perform tracking steps.
- **operation state** --- This field shows the general operation state of the tracking engine.
- **tracking step** --- This field tells what the tracking engine is doing actually in this moment.
- **RESET POSITION** --- Moves the antenna back to the nominal pointing values. If you do this in ADAPTIVE or in PROGRAM track mode, the antenna will return to the estimated pointing with the next tracking step. With STEP track mode, the antenna starts tracking at the nominal pointing if you click to this button
- **RESET MEMORY** --- Clicking to this button clears the tracking memory, the ACU

remembers to estimate the antenna pointing in ADAPTIVE mode. You should do this if you change tracking to another satellite or if you recognize a significant repositioning of the satellite.

1.14.3.4 The ACU Subsystem Menu

The five icons below the tracking diagram are the ACU subsystem menu. Although looking unimposing, this menu is very important as it gives you access to all parameters of the ACU's subsystems.

Clicking to the TRACKING icon launches a window which shows all parameters of the tracking subsystem. The color of the icon tells about the fault state of the tracking engine (green = OK, red = FAULT). You open the TRACKING subsystem window in order to

- save and recall satellite presets.
- adapt low level tracking parameters like step sizes, averaging times etc.
- enter ephemeris data for antenna positioning or PROGRAM track mode.

The ODU icon opens a window to operate / configure the antenna positioner device. Normally it will not be necessary to access the positioner directly in this ACU configuration, moreover, it might mess up the tracking process if you command the antenna directly. There are however a few situations where you want to see all antenna parameters:

- The positioner shows a fault (red icon) and you want to know what the reason for the fault is.
- You want to move the antenna manually in small steps, e.g for the pointing calibration or for measurements. The SatService ACU ODM device window provides step movement buttons which help you to do this efficiently.

The BCRX icon opens a window directly to operate / configure the beacon receiver attached to the ACU. This window is required to set other beacon receiver parameter than the frequency or receive polarization.

The 'VIEW PLOT' button opens a separate graphical Y/T display window which gives more detailed information about what the tracking engine did during the recorded 48 hours. It provides variable scales, and permits to display additional information. The display shows either the azimuth or the elevation pointing found at the beginning of each tracking step together with the beacon level measured at this time. The following additional information may be included to the diagram:

- --- If this toolbar button is pressed, the diagram shows the search step and the beacon level change resulting from this as a dimmed peak at the left edge of each data point. You can easily monitor the signal degradation which is caused temporarily by the tracking search steps with this function enabled.
- --- If this toolbar button is pressed, the diagram includes the evaluated peak positions.

In STEP track mode, this actually is the location where the antenna gets moved to. In ADAPTIVE tracking mode, the antenna moves to the location resulting from the mathematical model which is computed from the step track peaks. In the latter case, the peak positions may be interpreted as the actual difference between the modeled pointing and the peak position.

Clicking to the 'VIEW LOG' button opens a window where the program shows a live report what the tracking engine actually is doing. The log in this window is cleared with each new tracking step. If 'Y/T PLOT' diagram shows many unsuccessful tracking steps, watching the log reports may give an explanation why the tracking engine discards so many steps.

1.15 Specialized Client Applications

In addition to the standard Java client, the sat-nms software provides a number of client applications specialized to certain tasks. This chapter describes the operation of these (legacy) appliacations. Thy are:

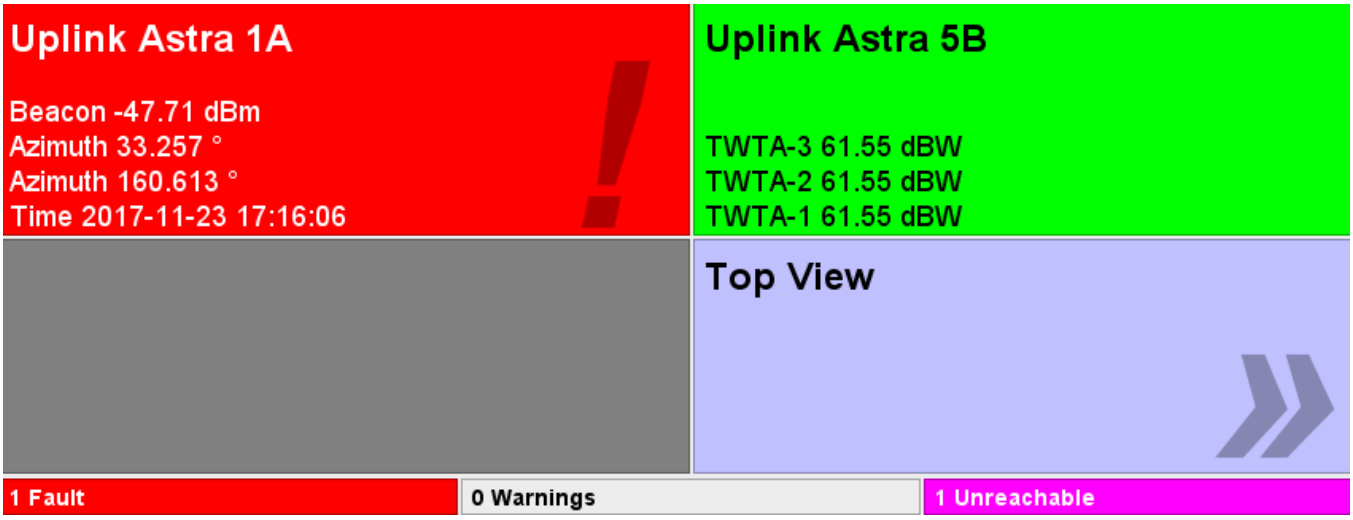
- The MasterClient Application The sat-nms MasterClient-2 is a client program for multiple sat-nms M&C servers. It can be used in parallel to the standard M&C client program in order to organise certain M&C system under a common main GUI.
- The ServiceClient Application The sat-nms Service-Client is a client program for the sat-nms M&C server. It can be used in parallel to the standard M&C client program in order to organise certain devices and device parameters in "services".
- The ViOIPClient Application The sat-nms VioIP (video over IP) Software is an extension to the sat-nms M&C software which permits to manage video over IP transmissions in a given IP network. The software manages resources like the bandwidth of connections between two nodes of the network or the usage of endpoint devices.
- The VioIP Network Configuration Application This program permits to add or delete locations, endpoint devices or data lines between the locations.

1.15.1 Master Client 2

The sat-nms MasterClient-2 is a client program for multiple sat-nms M&C servers. It can be used in parallel to the standard M&C client program in order to organise certain M&C system under a common main GUI.

You can invoke the MasterClient 2 with the following instructions (e.g. in a shortcut):

javaw -cp client.jar satnms3.mc2.MasterClient [config-file-name].xml



1.15.1.1 MasterClient 2 XML Configuration File

The version 2 MasterClient program reads it's configuration an XML file. Structure and the meaning of the XML elements are described in the following chapters.

When the MasteClient program is started without a command line argument, it reads a file **MasterClient.xml** in the actual working directory to read its configuration Alternatively a file or path name may be given as the only command line argument, the program then will read this file instead.

XML Element Hierarchy

The diagram below shows the overall tree structure of the XML elements making up the MasterClient's configuration. Most elements may appear multiple times except the <masterclient> element.

```
<masterclient>         The root element
|
+-<global>            Definition of a global parameter
|
+-<peerlist>          List of all peers to M&C systems
| |
| +-<peer>            Definition of one peer to a M&C system
|   |
|   +-<parameter>       Definition of an optional parameter to be
|                   watched at the M&C
|
+-<grouplist>          List of all groups
| |
| +-<group>           Definition of one group
|   |
|   +-<member>         Definition of one member in the group
|
+-<screenlist>         List of all screens
  |
  +-<screen>           Definition of one screen
    |
    +-<row>           Definition of one row of buttons in this screen
      |
      +-<button>       Definition of one button
```

1.15.1.2 XML Element Description

The following paragraphs describe each element which may occur in the configuration file with its possible children and attributes.

- <masterclient> --- The **<masterclient>** element is the root element of the XML tree. It contains all elements which make up the the master client's configuration. Elements outside the **<masterclient>** element are ignored.
- <global> --- The **<masterclient>** element may contain zero or more **<global>** elements. These elements define global settings of the master client program. They don't have child elements but they each have two attributes which both are mandatory: *key* and *value* .The following keys are defined:
  - fontSize --- The size (pixels) of the font used for the button labels.
  - fontSizeParam --- The size (pixels) of the font used for parameters in M&C buttons.
  - title --- The text to shown in the window title bar
  - okColor --- The color of a button standing for a M&C or group which is in state *OK* .
  - faultColor --- The color of a button standing for a M&C or group which is in state *FAULT* .
  - warningColor --- The color of a button standing for a M&C or group which is in state *WARNING* .
  - linkColor --- The color of a button which simply changes to another screen without

showing a fault state
- unreachableColor --- The color of a button standing for a M&C or group which is in state *UNREACHABLE* .
- disabledColor --- The color of a button standing for a M&C or group which is actually disabled.
- autoTextColor --- One of *true* or *false* . With *true* the button text is drawn black bright background colors, white for dark background colors for better contrast. With *false* the text is always drawn black.
- showSymbols --- One of *true* or *false* . If set *true* , the state of a M&C or group button is not only symbolized by its color but also by an exclamation mark for *FAULT/WARNING* or a question mark for *UNREACHABLE* . These symbols are drawn large in a faded color as part of the button background.
- priorityScheme --- One of *FAULT* or *UNREACHABLE* . Defines the priority of states a group uses to combine the states of its children. When set to *FAULT* , the priority is FAULT (highest) - WARNING - UNREACHABLE - OK (lowest).When set to *UNREACHABLE* the priority is UNREACHABLE (highest) - FAULT - WARNING - OK (lowest).A group always shows the highest priorized state one of its children shows.

Examples and default values for all keys:

```
<global key="fontSize" value="14" />
<global key="title" value="sat-nms Master Client 2" />
<global key="okColor" value="#00FF00" />
<global key="faultColor" value="#FF0000" />
<global key="warningColor" value="#FFFF00" />
<global key="linkColor" value="#8080FF" />
<global key="unreachableColor" value="#808080" />
<global key="disabledColor" value="#808080" />
<global key="autoTextColor" value="true" />
<global key="showSymbols" value="true" />
<global key="priorityScheme" value="FAULT" />
```

- <peerlist> --- The <peerlist> element contains the definition of all peers, each connecting to one M&C system and watching its state.
- <peer> --- The **<peer>** element defines one peer connecting to a M&C system and watching its state. The **<peer>** element may contain zero or more **<parameter>** elements which define parameters to watch additionally to the M&C summary fault state.Each **<peer>** element has a number of attributes which identify the element and define how to connect to the M&C system:
  - id --- A unique name identifying this peer. Groups and screen buttons use this identifier to refer to this peer / M&C. This attribute is mandatory.
  - ip --- The IP address of the M&C in dotted quad notation. This attribute is mandatory.
  - mode --- One of *enabled* or *disabled* This defines the the initial mode of this peer after program start. Enables peers operate normally and reflect their fault state as reported by the M&C. Disabled peers show a state *disabled* regardless of the fault state of the M&C. The mode attribute is optional, the program assumes *enabled* if

the attribute is missing.
    - clientpars --- Optional parameters added to the command line which launches the client program when the operator clicks to a button referring to this M&C. Typical contents for the clientpars attribute are user/password settings.

Examples:

```
<peer id="MNC1" ip="192.168.0.100" clientpars="-u satnms -p satnms -s default -q" />
<peer id="MNC2" ip="192.168.0.101" clientpars="-u satnms -p satnms -s default -q">
   <parameter id="EIRP-2.on" label="TX" />
</peer>
```

- <parameter> --- The **<parameter>** element defines one parameter the peer shall watch at its M&C additionally to the summary fault. A **<peer>** element may contain an arbitrary number of **<parameter>** elements as children.A screen button referring to the peer shows the actual values of the defined parameters, starting with the first parameter near the bottom of the button rectangle, the second one above this and so on.Parameters are shown with a fixed font size, depending on the button size they may be covered by the button label or completely ourside the button area, invisible for this reason.A **<parameter>** element contains these two attributes:
    - id --- The message ID of the parameter to watch.
    - label --- A label drawn on the screen button left of the parameter value

Example:

```
<parameter id="SYSTEM.time" label="Time" />
```

- <grouplist> --- The **<grouplist>** element contains the definition of all groups.
- <group> --- The **<group>** element defines one group within the **<grouplist>** . The group is named by a identifier, the group members are defined by **<member>** child elements within the **<group>** . The **<group>** element knows one (mandatory) attribute:
    - id --- A unique name identifying this group. Other groups and screen buttons use this identifier to refer to this group. Identifiers must be unique across **<peers>** and **<groups>** because both may appear as group members and state sources for screen buttons in the same way.

Example

```
<group id="GRP1">
  <member id="MNC1" />
 <member id="MNC2" />
</group>
```

- <member> --- The **<member>** element defines one group member within a **<group>** definition. The **<member>** element has one mandatory attribute selecting the **<peer>** or **<group>** as the group member:
    - id --- The existing name / identifier of the peer or group which shall be a member of

this group.

Example:

```
<member id="MNC1" />
```

When defining group members, care should be taken not to create circular references between groups: if e.g. a group defines itself als member or group A has group B as member and at the same time group B defines group A as member, this creates a race condition in the software, the master client won't work.

- <screenlist> --- The **<screenlist>** element contains the definition of all screens. The **<screenlist>** element may contain one attribute:
  - default --- The ID of the screen which shall be loaded when the program

Example:

```
<screenlist default="HOME">  ...  </screenlist>
```

- <screen> --- The **<screen>** element defines one screen of the MasterClient program. The MasterClient always shows one grid of N x M buttons. A screen is one set of such buttons shown at a time. Buttons referring to groups or simple link buttons may be clicked to switch to another screen, another set of buttons.A screen is defines as a sequence of **<row>** elements each containing a sequence or **<button>** elements. Buttons appear from left to right in a row, rows appear from top to bottom in the screen. The program scans the screen definitions at startup and evaluates the maximum number of rows and columns defined. The MasterClient always shows a grid of this size, filling it up with empty buttons if a particular screen or row is smaller than the evaluated size.The **<screen>** element contain one mandatory attribute:
  - id --- A unique name identifying this screen. The default attribute of the **<screenlist>** element and the **<target>** attribute of the **<button>** element refer to this identifiers to select this screen.

Example:

```
<screen id="HOME">  ...  </screen>
```

- <row> --- The **<row>** element defines one row of buttons in the screen. It has no attributes, contains zero or more **<button>** elements.
- <button> --- The **<button>** element defines one button within the row / screen. It contains up to three attributes:
  - src
  - label
  - target

Depending on the presence of attributes a button behaves differently

- A button without any attributes behaves as a dummy button or spacer

- A button containing a *target* attribute but no *src* attribute behaves as a link button, it simply switches to the target screen when clicked
- A button containing a *src* attribute referring to a **<peer>** element is a M&C button. It shows the fault state of the M&C and launches the client program for this M&C when clicked. It should not contain a *target* attribute.
- A button containing a *src* attribute referring to a **<group>** element is a group button. It shows the fault state combined by this group It must contain a *target* attribute which denotes the screen to be shown when the button is clicked.

1.15.1.3 Example showing a complete screenlist

```
<screenlist default="HOME">
 <screen id="HOME">
  <row>
   <button src="GRP1" label="Group 1" target="G1SCREEN" />
   <button src="GRP2" label="Group 2" target="G2SCREEN" />
  </row>
 </screen>
 <screen id="G1SCREEN">
  <row>
   <button src="MNC1" label="Station A" />
   <button src="MNC2" label="Station B" />
  </row>
  <row>
   <button />
   <button target="HOME" label="Top View" />
  </row>
 </screen>
 <screen id="G2SCREEN">
  <row>
   <button src="MNC3" label="Station C" />
   <button src="MNC4" label="Station D" />
  </row>
  <row>
   <button />
   <button target="HOME" label="Top View"/>
  </row>
 </screen>
</screenlist>
```

1.15.2 Service Client Application

The sat-nms Service-Client is a client program for the sat-nms M&C server. It can be used in parallel to the standard M&C client program in order to organise certain devices and device parameters in "services".

There may be multiple instances of the Service-Client running at the the same time. Operating

the software is fully multi-user capable, but adding/removing services should be done only from one computer at a time.

Service Definition A service is a combination of an arbitrary number of properties which each may be a up- or down converter, a splitter output, a combiner input, a fibre output or a test port. For each type of property there is a number of parameters which are monitored and - if applicable - controlled.

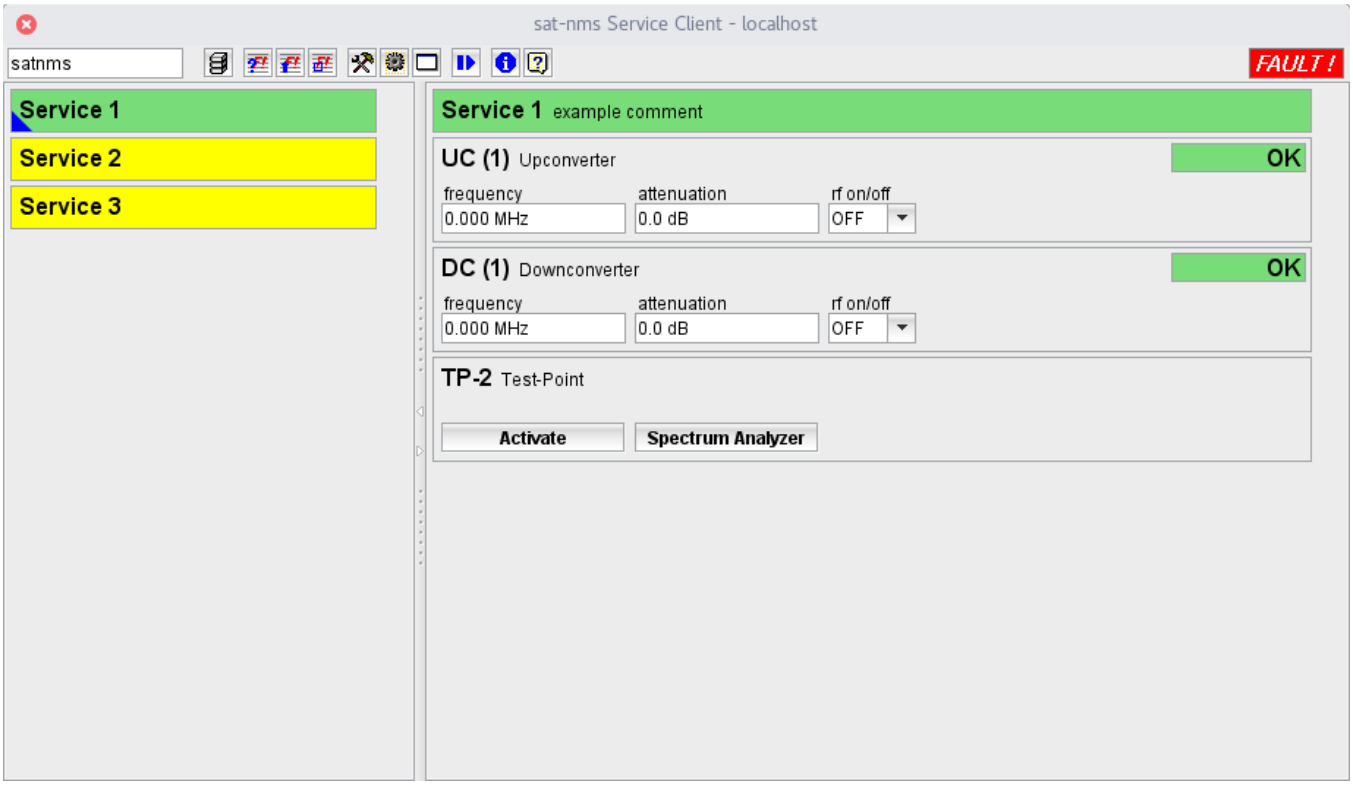
- property type --- monitoring only parameters, m&c parameters
- up-/downconverter --- fault flagfrequency attenuation signal on/off
- splitter output --- fault flag measured level (may be the common level at the splitter input)port on/off
- combiner input --- fault flag measured levelport on/off
- fibre output --- fault flag
- test output --- button/command to set all switch positions required to route the service output signal to this test point

There is a summary fault state for each service which is the "worst condition" of the properties contained in this service. This service summary fault states does not appear in the server's event log as it is evaluated in the client program and known only there.

Operation

The Service-Client window mainly consists of a list of available services at the left and the actual settings / readings of the selected service at the right. By clicking to a service name the service gets selected and its parameters are shown at the right. Both, service list and parameter panel automatically add vertical scrollbars if required.

The program inherits a lot of functions from the sat-nms standard M&C client. It uses the same login scheme as the standard M&C GUI, toolbar buttons for event report query, live event log and list of active faults work in the same way here.



At the left side the window shows a list of all defined services. The background color shows the actual fault state of the particular service (one of DISABLED/OK/WARNING/FAULT). The colors used for this are configurable. Clicking with the right mouse button on a service name opens a context menu at the mouse pointer containing some convenience functions like enabling/disabling the service summary fault or opening the configuration editor for this service. The service fault status is updated in near real time for all defined service which are not "disabled".

The right side of the window shows the parameters and state of the actually selected service. For each property belonging to the service, a field containing the property's name, parameters and fault state. The layout of these fields is defined by a XML configuration file supplied by SarService. The displayed name of a property consists of a label for the property type, the sat-nms device name referenced and - if applicable - an index identifying the unit within the device used for this service.

Status values and control parameters of the properties of the selected service are updated in near real time like with the standard M&C GUI. Control parameters can be changed in place without the need to open another window.

Tool Bar

The Service Client provides a toolbar at the top of the window which gives access to a number of global functions in the software. Below there is a short description for each of the toolbar buttons.

-  --- The left field at the window's tool-bar shows the login-name of the user who is

actually logged in. You may click with the mouse to this field, the program pops up the login/logout dialog.

- --- Shows a drop down list with all devices installed in the M&C system. Selecting a device from this list opens it's Device window .
- --- Opens the Event Report window .
- --- Opens the Live Event Log window .
- --- Opens a list of currently active faults.
- --- Opens the Device Setup window to configure the device setup of the M&C system.
- --- Switches the service client window to "edit" mode, lets you add or delete services or change service definitions (see "Configuration" below)
- --- Opens a terminal window which connects to the debug / test port of the M&C server.
- --- Opens the Macro Management window which controls recording and replay of equipment setting macros.
- --- Shows the program version info.
- --- Shows this help page.

Configuration

Configuring the Service-Client means to add or remove equipment (properties) from an existing service definition or to add or remove complete service definitions. For this purpose the Service-Client provides a configuration mode which can be switched on from the main window's tool bar. The configuration mode permits to:

- Add a new service
- Delete an existing service
- Change the order in which the services appear in the GUI
- Change the name of an existing service
- Add a property to an existing service
- Remove a property from an existing service
- Change the order in which the properties appear in the GUI

Changes made in configuration mode are reflected immediately, e.g. an added property shows up as soon as it is added. There is no "save" button in the configuration mode, all changes which are made are permanent.

When the configuration of services is changed, all other opened service clients are informed to re-read the configuration from the server to get updated. This happens within 15 seconds after a configuration change has been made.

When adding a new property to a service, the software knows which sat-nms devices or units within devices are suitable for the selected purpose. The software also knows which properties may be used only once and cannot configured a second time.

The operator gets a list of actually possible devices which may be configured as the new property for the service and selects the hardware representation of the property from this list.

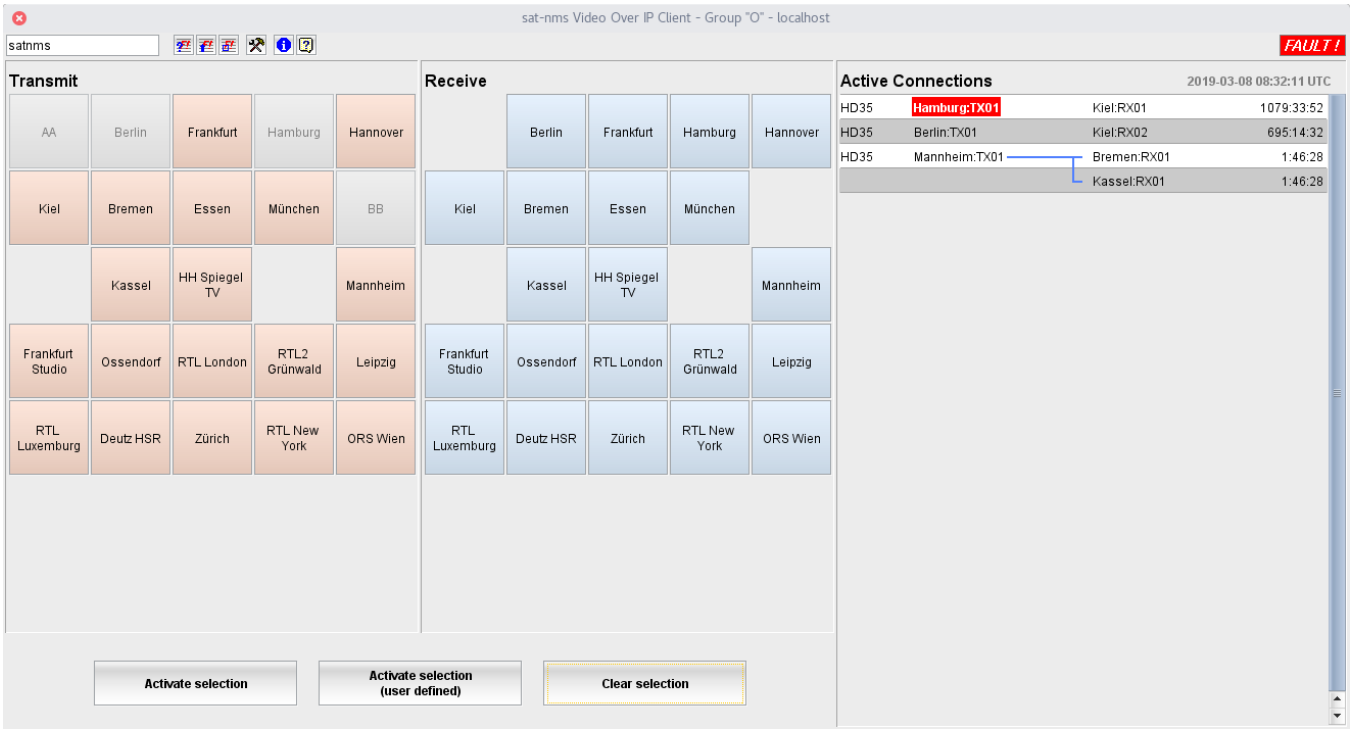
The knowledge, which types of devices are suitable e.g. as a combiner input, how many identical units of this a sat-nms device manages and through which parameter identifiers the

desired combiner port is addressed is defined in an XML configuration file which is supplied by SatService. By editing this file, more / new device types may be added to the list of known device drivers for the software.

1.15.3 VioIP Client Application

The sat-nms VioIP (video over IP) Software is an extension to the sat-nms M&C software which permits to manage video over IP transmissions in a given IP network. The software manages resources like the bandwidth of connections between two nodes of the network or the usage of endpoint devices.

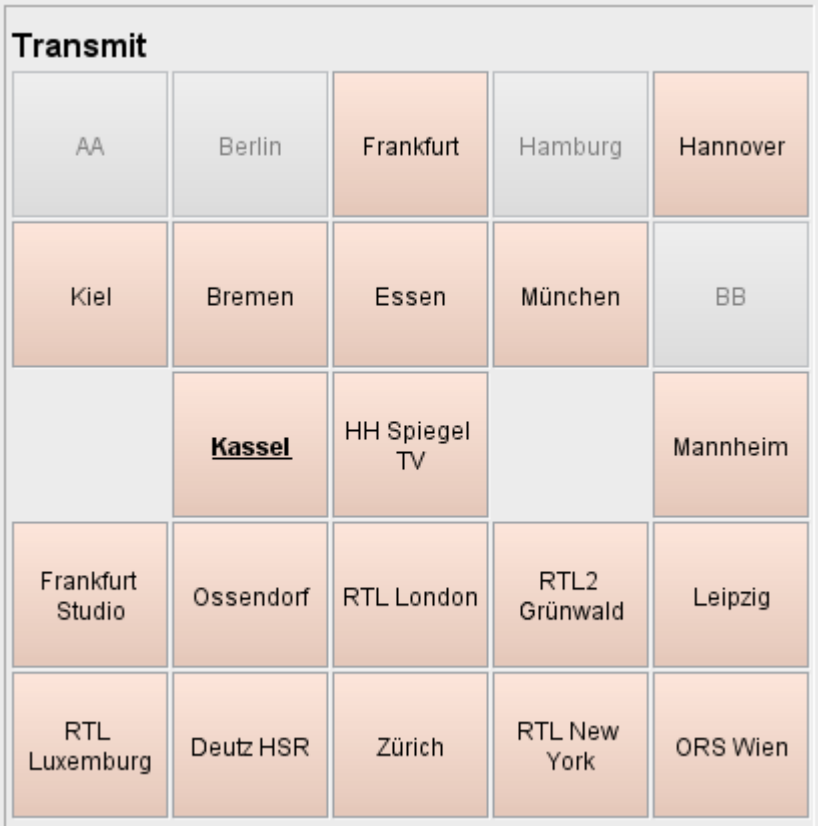
The sat-nms VioIP Software consists of an extension to the sat-nms M&C server with the resource database, the VioIP Client Application which is used to start or stop transmissions and finally the VioIP Network Configuration Application which permits to add or delete locations, endpoint devices or data lines between the locations. The following paragraphs describe the VioIP Client Application.



The VioIP Client Application window consists of three major parts: The TX location button array, the RX location button array and the list of active connections. At the top of the window there is a tool bar giving access to some global functions of the sat-nms software.

TX location button array

The array of TX locations shows one button for each location defined in the software which has at least one TX end point device configured. The button array is used to select the source of a connection to be started.



If there are no devices available to start a new connection from a particular location (because all devices are either in use, temporarily disabled or in communication fault state), the button is grayed out and cannot be pressed.

To select a location simply click the button. The name of the selected location prints bold/underlined to signal that this location is selected as the source for the connection to be started next. Only one TX location may be selected at a time, to change the selected TX location simply click another one. The selection mark then moves to this location. To unselect a location, click the selected location again or click the "Cancel selection" button below the button arrays.

RX location button array

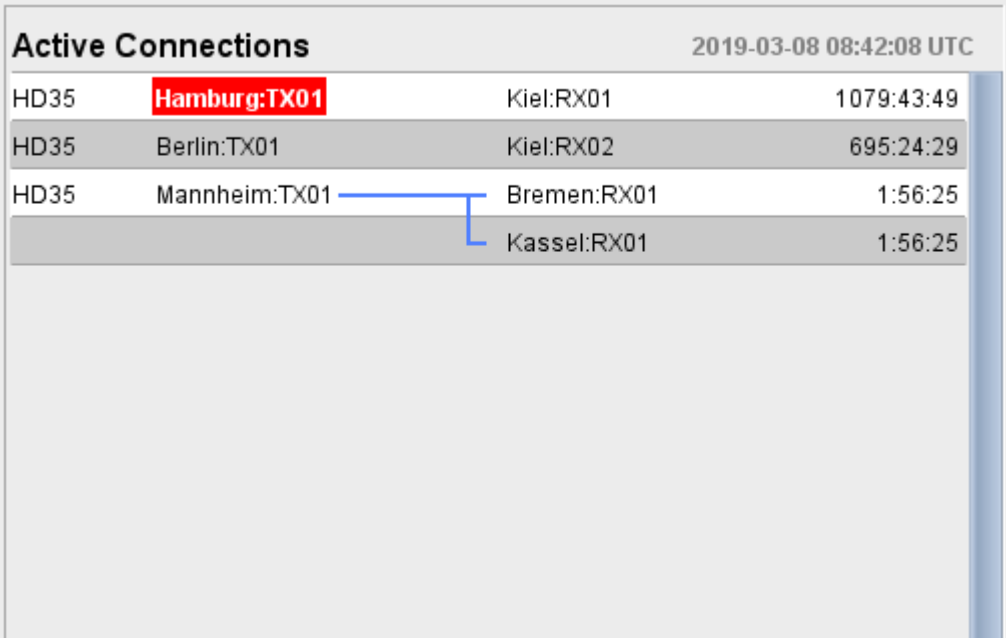
The array of RX locations shows one button for each location defined in the software which has at least one RX end point device configured. The button array is used to select the destination(s) of a connection to be started.

If there are no devices available to start a new connection to a particular location (because all devices are either in use, temporarily disabled or in communication fault state), the button is grayed out and cannot be pressed.

Using the RX location buttons is much like for the TX side, however the RX button array lets you multiple destination. Selecting more than one destination for an upcoming connection switches the operating mode to "multicast" which will send the program from the source location to all selected destinations.

Active connection list

The active connection list shows all active connection as a scrollable list, one connection per line. For each connection the video profile, the source (location and device) and the destination of the connection are shown. The last column shows the time how long this connection already is active.



Multicast groups are symbolized with blue lines, connecting one source to one or more destinations. If an end point device shows a fault while the connection is active, the name of the end point is drawn as white text on red background. Please note, that not all faults of the device are signalled in this way. In the logical VioIP-End-Point Device the faults are defined which are to be monitored while the connection is running.

Beside as a status display, the Active Connections list is used to protect, to un-protect and to stop running connections. Clicking with the right mouse button on a connection in the list shows a context menu which gives you several options, depending on the actual state of the connection. Below on this page you find paragraphs which describe elaborately how to terminate, protect or un-protect connections.

Tool bar buttons

The VioIP Client provides a toolbar at the top of the window which gives access to a number of global functions in the software. Below there is a short description for each of the toolbar buttons.

- --- The left field at the window's tool-bar shows the login-name of the user who is actually logged in. You may click with the mouse to this field, the program pops up the login/logout dialog.
- --- Opens the Event Report window .
- --- Opens the Live Event Log window .
- --- Opens a list of currently active faults.
- --- Opens the VioIP Network Configuration Application . This application lets you add or remove locations, end points, data lines an more. You must be logged as a user with privilege level 150 to use this function.
- --- Shows the program version info.
- --- Shows this help page.

Starting a connection

Starting a connection is straight forward, using the "Location Buttons" of the GUI. Click to a TX location and then to a RX location, finally click the "Activate selection" button below and the software starts a unicast connection between these locations. It uses the first available end point device at either location and the default video profile (bandwidth) for this.

You may select multiple RX locations by clicking the buttons in the RX location button array. In this case the software automatically uses multicast to transmit the program from the TX location simultaneously to all selected destinations.

If you accidentally selected an RX location, click it again to deselect it. This must be done before you activate the selection.

Terminating a connection

To terminate a connection click to the connection in the list with the right mouse button and select "Stop this connection" from the context menu popping up. With multicast connections there is also an option "Stop all connections of this multicast group".

Stopping a unicast connection means to turn off the transmission, switching all devices to stand-by and finally freeing the resources occupied by this connection (endpoint devices and used bandwidth). The same applies when stopping all connections of a multicast group or when stopping the very last connection of a multicast group.

Stopping a single connection from a multicast group means - unless this is the very last connection of this group which is still running - to switch of the receiver, freeing this as a resource and freeing the bandwidth which was used to send the signal to particularly this receiver.

Protecting a connection

Running connections may be protected from accidentally being terminated. Protected connections cannot be terminated directly, the protection must be removed before the connection can be terminated. Protected connections appear with a yellow colored background in the connection list.

To protect a connection, click to the connection in the list with the right mouse button and select "Protect this connection" from the context menu popping up. With multicast connections there is also an option "Protect all connections of this multicast group"

To remove the protection from a connection, click to the protected connection in the list with the right mouse button and select "Unprotect this connection" from the context menu popping up. With multicast connections there is also an option "Unprotect all connections of this multicast group"

Specifying end point devices explicitly

When starting a connection as described above, the software automatically selects the first available end point device at the selected location. You can explicitly specify the end point

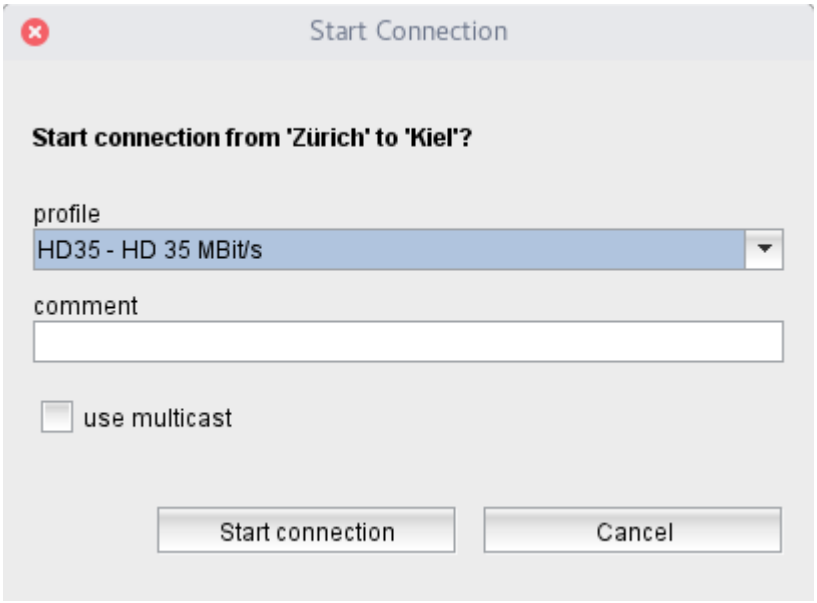
device to be used for a connection.

For this instead of left-clicking the location button use the right mouse button to show the context menu of the location button. Select the end point device of your choice from this menu.

Using a non-standard video profile / data rate

Connection which are established with the button "Activate selection" all use the default video profile and the bandwidth associated with this profile. The default profile is the first profile in the list of video profiles.

Using the button "Activate selection (user defined)" instead opens a dialog which lets you select a video profile from a list. This dialog also permits to set the "comment" property of a connection directly when the connection gets started.



Starting a multicast connection to a single destination

Using the "Activate selection (user defined)" button and the dialog window appearing with a click to this button, you may also start a connection to a single destination in multicast mode. To do this, set the check mark "use multicast" before clicking "Start connection".

Other functions

You may check the route, the software calculates for connections between two locations: Select a source location in the TX button array and then right-click the destination in the RX button array and select "Show route to here". The program displays a pop up window with the route.

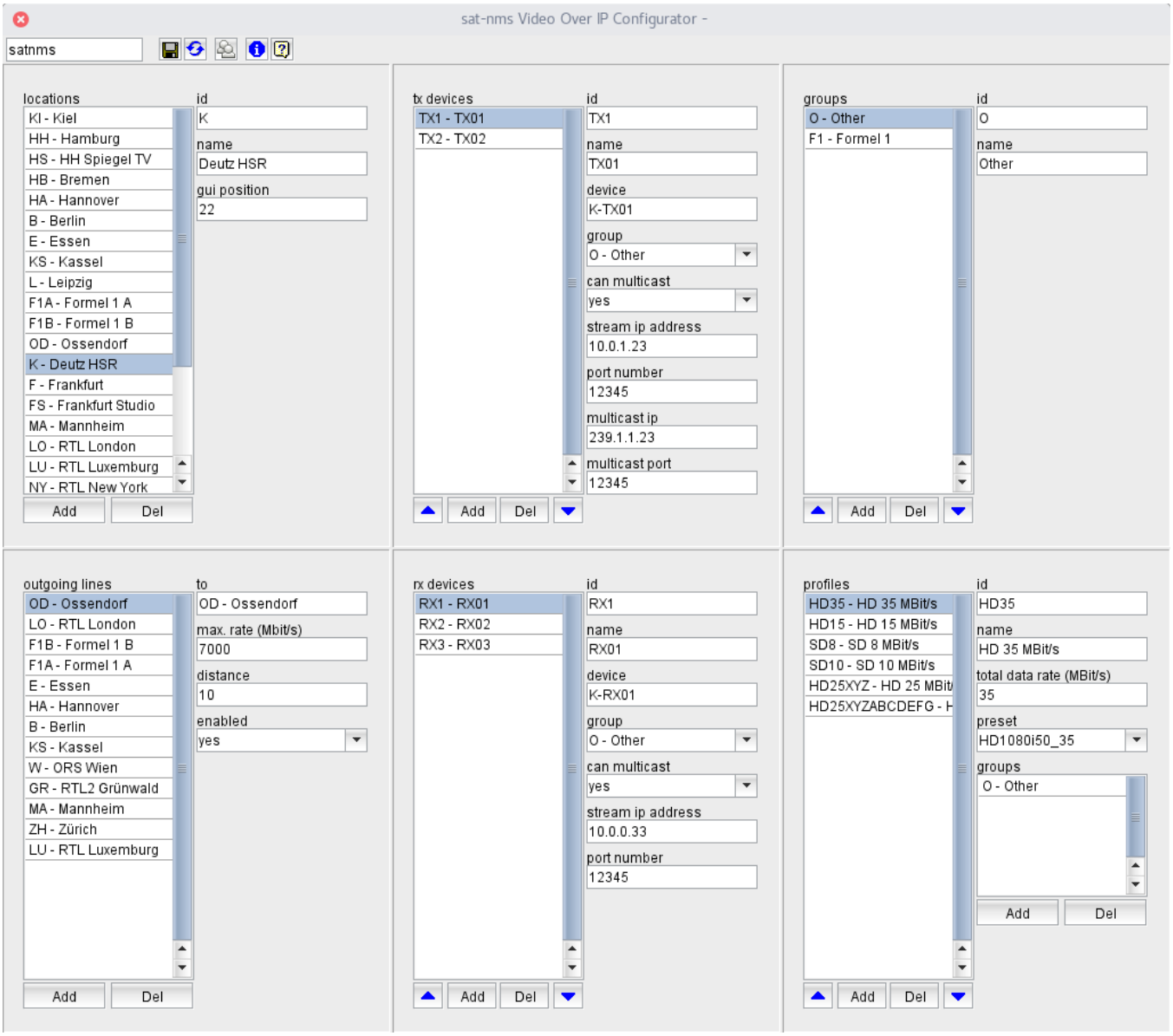
You may check the devices and outgoing lines for a location: Right-click the location button and select "Show location properties". The program displays a pop up window with requested information.

1.15.4 VioIP Network Configuration Application

The VioIP Network Configuration Application lets you configure many aspects of the VioIP Network. You can add or delete locations, endpoint devices or data lines between the locations.

The application works as a document editor: when started, it reads the actual VioIP network configuration and shows the settings. Edited settings are applied when the configuration is saved by clicking the "save" button in the tool bar. At any time you can revert the configuration to the settings which are actually running, e.g. if you deleted accidentally a location which shall not be deleted.

When you save an edited configuration, the program informs all running instances of the VioIP Client Application to reload the configuration in order to reflect the changes immediately. This is done unless you added or removed devices, in this case a restart of the M&C server is necessary to make the changes effective.



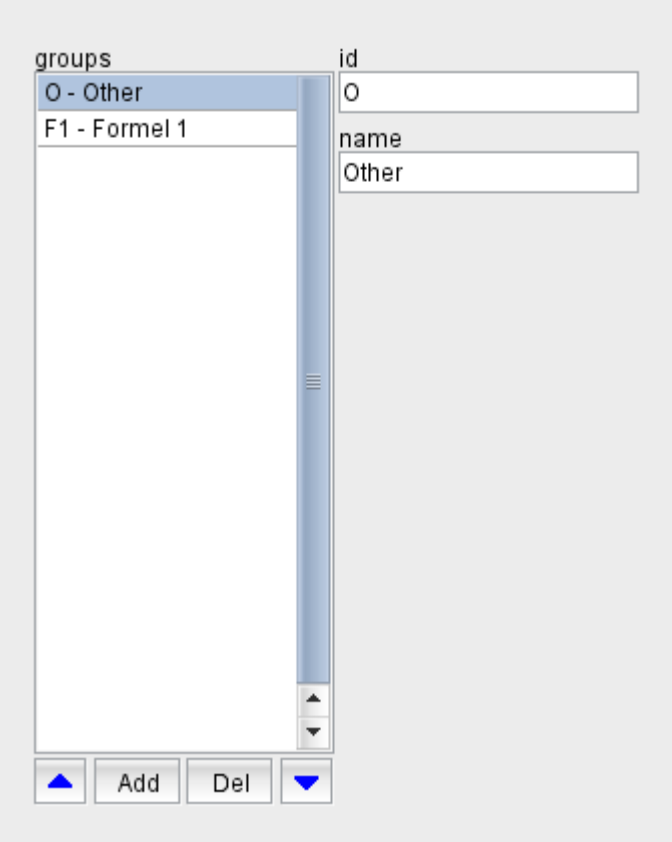
The configuration editor window is divided into 6 sections:Locations , Outgoing Lines , TX Devices , RX Devices , Groups and Profiles . While the last two sections work independently from the others, the sections Outgoing Lines , TX Devices and RX Devices always refer to the location actually selected in the Locations section.

The tool bar at the top of the window gives access to a number of global functions in the software. Below there is a short description for each of the toolbar buttons.

-  --- The left field at the window's tool-bar shows the login-name of the user who is actually logged in. You may click with the mouse to this field, the program pops up the login/logout dialog. Please note, that you need a privilege level of 150 or higher to change the configuration of the software
-  --- Writes the edited configuration back to the server. If you added or removed end points / devices this also changes the M&C device setup. In such a case a restart of the M&C server is necessary to make the changes effective. The software gives you the option to restart immediately or to postpone the restart.
-  --- Reverts all changes.te .ts  Opens the User Management Window .
-  --- Shows the program version info.
-  --- Shows this help page.

1.15.4.1 Groups

The sat-nms VioIP software lets you define groups of operators which only have access to a well defined part of the equipment. The VioIP Client Application is always started for one particular group and shows only the resources assigned to this group.



The group definition section is located in the top right corner of the application window. It shows the list of defined groups, selecting a group in the list shows the properties of this group right beside the list. You may edit the name of the selected group to your needs, the group name acts as a comment only. The group is uniquely identified by its ID, this cannot be changed once a group has been defined.

With the blue arrow buttons below the list, the selected group can be moved up and down in the list. The position of a group in the list is important inasmuch as the topmost group in the list is considered to be the default group.

The button "Add" lets you add a new group. The program shows a dialog window where you can enter the ID for the new group. An ID entirely consists of upper case letters and digits, the "-" character is allowed as separator. The ID must be unique, you cannot define two groups with the same ID. The ID also is unalterable, once you defined a new group you cannot change the ID of the group later.

The button "Del" lets you delete the selected group. The program shows a query dialog before the group actually gets deleted. The group you want to delete will probably be referenced by other resources, with these the following will happen:

- End point devices which belong to the deleted group will be moved to the default group. If you are going to delete the default (the topmost) group, the devices are moved to the group which will be the default group after the deletion. The very last group cannot be deleted. The software shows a second query dialog stating something like "9 devices will be moved from group 'A' to group 'B'" before the group deletion actually is done to inform

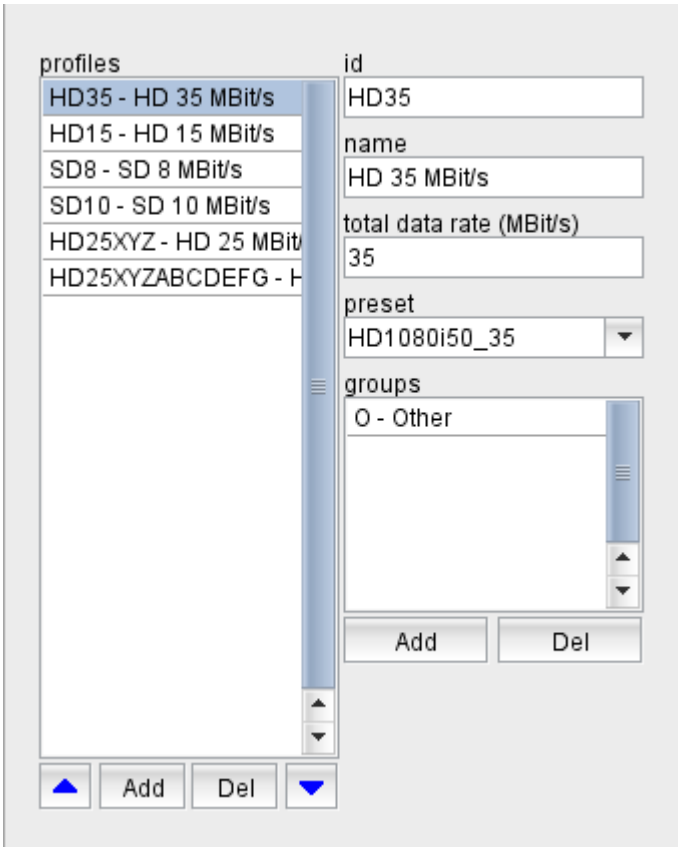
you what will happen if you delete this group.
- The group is removed from all profiles which had this group attached.

1.15.4.2 Profiles

Profiles define the data rate of the encoded stream, the video and audio encoding of the signal and many more parameters. The software uses a profile by applying a preset to the devices representing the end points of the upcoming connection.

To make a profile universally usable, presets with the name defined in the profile must be present for all types of encoder/decoder equipment used by the software. The software checks this when a new profile is defined.

There are device types which contain multiple encoders or decoders in one device frame. The software knows about these device types and expects a preset "NAME" to be present as "NAME-1", "NAME-2" ... "NAME-n" for all encoder or decoder instances this device may contain.



The profile definition section is located in the bottom right corner of the window. It shows the list of defined profiles, selecting a profile in the list shows the properties of this profile right beside the list. You may edit the properties of the selected profile to your needs. The profile is uniquely identified by its ID, this cannot be changed once a profile has been defined.

- *id:* The profile ID internally identifies the profile. It cannot be changed once the profile has been created.
- *name:* The profile name is shown in the VioIP Client Application in the list of active

connection and it is used to select a profile when the operator starts a connection with the "Activate selection (user defined)" button.

- *total data rate (MBit/s):* In this field enter the total data rate the encoded signal occupies on the data lines between the locations. The rate must match the data rate produced by the encoder preset and must include the rate of all contained streams including the transport stream format overhead. This is **not** the video data rate!.
- *preset:* With this field the name of the preset to be used for this profile is defined. The software presents a drop down list with all presets it finds for the device types known to be used as encoders / decoders within the VioIP software. The entry field also permits to overwrite the name and set a preset name which is not yet present. When the preset name is changed - either by entering a new name or by selecting a name from the list - the software checks if this preset is available for all known encoder / decoder device types. If not the software displays a warning. This means, you can define a profile which has the referenced presets not or not completely defined, but you are warned: You will not be able to start a connection with this profile if the referenced preset is not available for either the source or the destination device.
- *groups:* A VioIP Client Application will only permit to use this profile if the group ID the client has been started with appears in this list. This way you may define different profile settings for each particular group, each group will only see the profile definitions it has been granted permission. You may use the "Add" / "Del" buttons below the groups list to add or delete groups for this profile. If the group list of a profile is empty, it cannot be used.

With the blue arrow buttons below the profile list the selected profile can be moved up and down in the list. The topmost profile in the list is considered to be the default which is used for connections the operator starts without the "user defined" option.

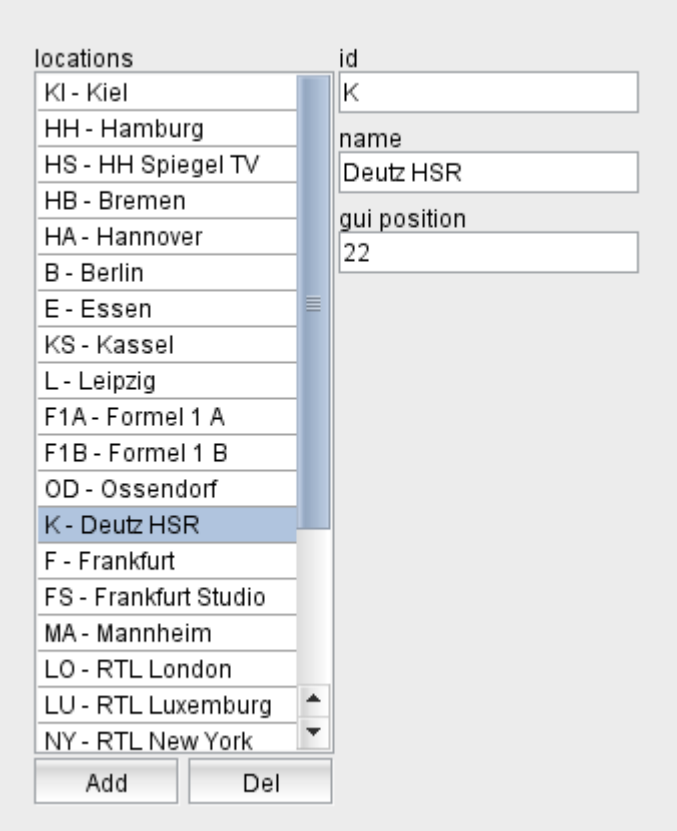
The button "Add" lets you add a new profile. The program shows a dialog window where you can enter the ID for the new profile. An ID entirely consists of upper case letters and digits, the "-" character is allowed as a separator. The ID must be unique, you cannot define two profiles with the same ID. The ID also is unalterable, once you defined a new profile you cannot change the ID of the profile later.

The button "Del" lets you delete the selected profile. The program shows a query dialog before the profile actually gets deleted. Deleting a profile does **not** delete the preset definitions referenced by this profile.

1.15.4.3 Locations

The section in the top left corner of the window shows the list of locations. Locations typically match rooms or cities, but strictly spoken 'locations' in the sense of this software are logically places which share a number of encoder/decoder devices which are connected in a network with virtually infinite bandwidth (i.e. the bandwidth of the network between the local devices is not managed by the software).

A location has a number of outgoing data lines and a number of TX and/or RX devices attached.



The 'locations' section shows the list of defined locations, selecting a location in the list shows the properties of this location right beside the list. Selecting a location also updates the data in the Outgoing Lines , TX Device and RX Devices sections to show these objects as they are available at the selected location.

You may edit the properties of the selected location to your needs. The location is uniquely identified by its ID, this cannot be changed once a location has been defined.

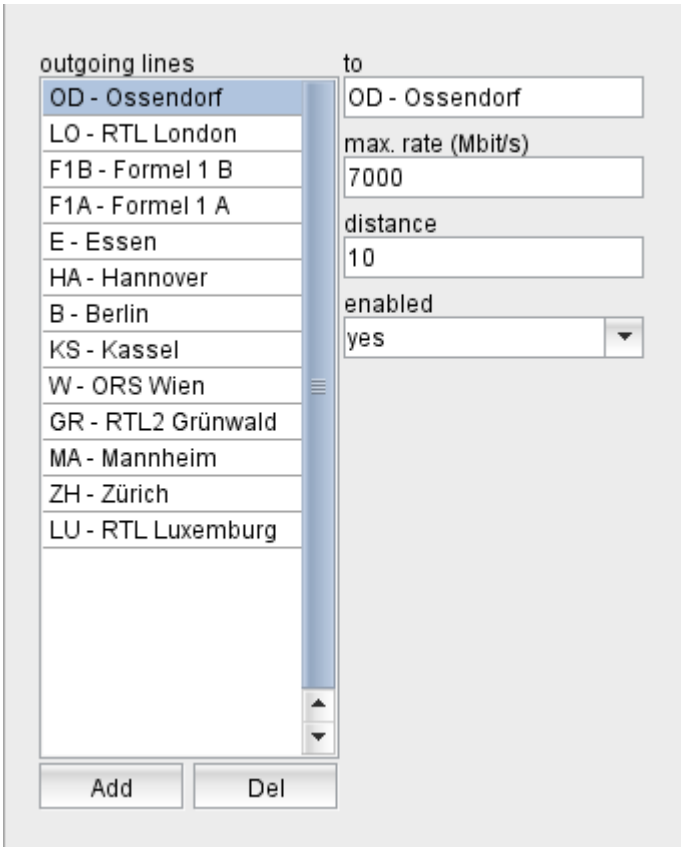
- *id:* The location ID internally identifies the location. It cannot be changed once the location has been created.
- *name:* The location name is shown in theVioIP Client Application as the label of the button representing the location in the TX/RX button arrays.
- *gui position:* The value in this field defines the position of the button representing this location in the button arrays. These arrays consist of 7 rows / 5 columns. A GUI position "1" addresses the button in the upper left corner, "5" in the upper right corner. "6" addresses the first button in the second row and so on. The special value "0" makes a location (temporarily) invisible. You cannot assign a GUI position twice, the program will decline this. If a new location is defined it automatically gets the first available GUI position assigned as a default.

The button "Add" lets you add a new location. The program shows a dialog window where you can enter the ID for the new location. An ID entirely consists of upper case letters and digits, the "-" character is allowed as a separator. The ID must be unique, you cannot define two locations with the same ID. The ID also is unalterable, once you defined a new location you cannot change the ID of the location later.

The button "Del" lets you delete the selected location. The program shows a query dialog before the location actually gets deleted. Deleting a location does **not** delete any sat-nms device definitions associated with this location.

1.15.4.4 Outgoing Lines

The section "outgoing lines" below the "locations" section defines the data lines which go from the selected location to other locations. The software manages data lines as unidirectional connections from location A to B. To define bidirectional lines, you have to define the line twice: once as a line from A to B and a second time as a line from B to A.



The section "outgoing lines" shows the list of data lines starting at the actually selected location. Selecting a line in the list shows the properties of this line right beside the list.You may edit the properties of the selected data line to your needs

- *to:* The ID and name of the destination location of this line. This field is read-only and cannot be changed.
- *max. rate (Mbit/s):* The maximum data rate which is available for the VioIP application on this line. The software uses this to examine if there is enough bandwidth available for a new connection.
- *distance:* The virtual distance between the two locations connected by this line. The software uses this number to calculate the data route between two locations using the Dijkstra algorithm. For details see the paragraph at the end of this page.
- *enabled:* This switch lets you temporarily disable a line without removing the line from

the configuration.

The button "Add" lets you add a new line. The program shows a dialog window where you can select the destination location for the line.

The button "Del" lets you delete the selected line. The program shows a query dialog before the line actually gets deleted.

Route Calculation

In the VioIP system the route from one location to another is determined by the settings of the IP routers in the system and by source/destination IP addresses. To calculate the available bandwidth between two locations, the software must know the way the IP packets take, specially when the route goes over several hops. The available bandwidth then is calulated as the minimum bandwidth available on any line on this route.

The software uses for this the "shortest path" algorithm by Dijkstra: Each line has assigned a "distance" value, the total distance of a route is the sum of distances of all hops of the route. From all possible routes the software chooses the one with the shortest total distance.

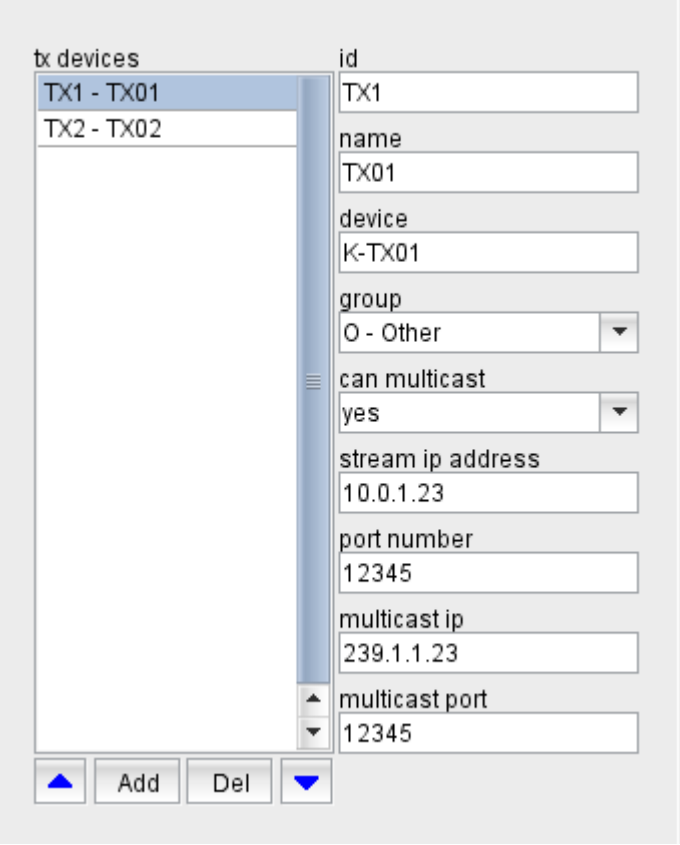
As the software cannot read the settings of the routers used in the network, it is important to set the "distance" parameters in a way that the routes calculated by the VioIP software match the routing programmed in the IP routers. You may check the routes actually used in the software in the VioIP Client Application : Select a source location in the TX button array and then right-click the destination in the RX button array and select "Show route to here". The program displays a pop up window with the route.

1.15.4.5 TX Devices

The section "tx devices" manages the transmit devices or more strictly spoken the transmit side connection end points available for the selected location. This usually comprises more than the plain encoder device.

A transmit side connection end point consists of the following components:

1. The data stored about this end point in the VioIP configuration database.
2. A logical end point (VioIP-End-Point) device representing the connection end point in the sat-nms M&C software. The logical end point device receives abstract commands to start or stop a connection and translates this abstract command into the particular settings expected by the physical end point device. There is always exactly one logical end point device for a connection end point.
3. A physical end point device in the sat-nms M&C software. This device - typically an encoder - gets the video signal at its input and creates an IP stream sent over the network. There are devices containing more than one encoder unit in one physical device frame. Hence it is possible that multiple logical endpoint devices share the same physical device. A so called "module index" is used to identify the encoder unit which shall be used.
4. Optionally there may be a file recorder device assigned to the connection end point. This file recorder logs quality parameters of the physical endpoint device like packet counters.



The section "tx devices" shows the list of tx devices available at the selected location. Selecting a device in the list shows the properties of this device right beside the list. You may edit the properties of the selected device to your needs

- *id:* The device ID internally identifies the device. It cannot be changed once the device has been created.
- *name:* The name of the device.
- *device:* The name of the VioIP-End-Point device representing this end point in the sat-nms M&C software.
- *group:* The group this device is assigned to. The device is only visible / accessible for a VioIP Client Application started for the ID of this group .
- *can multicast:* Set this to "yes" if the physical device representing this end point is capable to create a multicast stream.
- *stream ip address:* Enter the IP address of the stream port of the device here. This is the source address of unicast streams sent by this device. The address usually is not actively commanded at the device, however the value entered here must match the address configured in the device.
- *port number:* This is the port number of the source of a unicast stream. Usually this value doesn't matter as the device uses a random port number for this.
- *multicast ip:* The multicast address / group to be used in multicast mode.
- *multicast port:* The port number to be used in multicast mode.

With the blue arrow buttons below the device list the selected device can be moved up and down in the list. When the software searches for the first available deviceThe topmost device

which is used for connections the operator starts without specifying a device explicitly, it goes through this list from top to bottom.

The button "Add" lets you add a new device. The program shows a dialog window where you can enter the ID for the new device. An ID entirely consists of upper case letters and digits, the "-" character is allowed as a separator. The ID must be unique, you cannot define two devices with the same ID. The ID also is unalterable, once you defined a new device you cannot change the ID of the device later.

When you entered the ID for new device, the software shows in a next step a dialog which lets you select which aspects of the connection end point actually shall be created and how these aspects shall be initialized. Chapter Adding New Devices later in this document describes this dialog more elaborately.

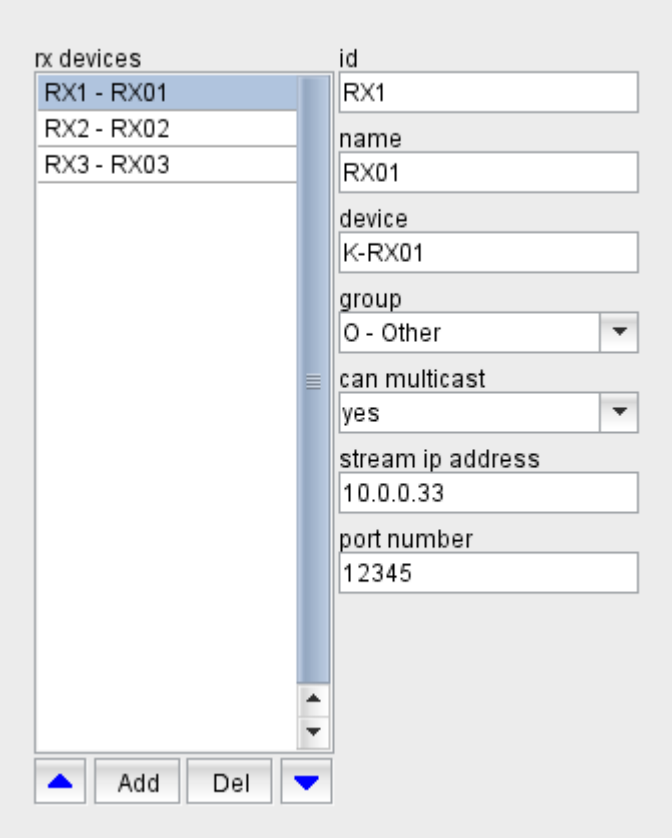
The button "Del" lets you delete the selected device. The program shows a query dialog before the device actually gets deleted. The dialog lets you select if the software shall remove the VioIP-End-Point device, the physical device and an optional file recorder device as well from the M&C system configuration.

1.15.4.6 RX Devices

The section "rx devices" manages the receive devices or more strictly spoken the receive side connection end points available for the selected location. This usually comprises more than the plain decoder device.

A receive side connection end point consists of the following components:

1. The data stored about this end point in the VioIP configuration database.
2. A logical end point (VioIP-End-Point) device representing the connection end point in the sat-nms M&C software. The logical end point device receives abstract commands to start or stop a connection and translates this abstract command into the particular settings expected by the physical end point device. There is always exactly one logical end point device for a connection end point.
3. A physical end point device in the sat-nms M&C software. This device - typically a decoder - receives the IP stream at its input and decodes it to the contained video / audio signals. There are devices containing more than one decoder unit in one physical device frame. Hence it is possible that multiple logical enpoint devices share the same physical device. A so called "module index" is used to identify the decoder unit which shall be used.
4. Optionally there may be a file recorder device assigned to the connection end point. This file recorder logs quality parameters of the physical endpoint device like packet counters.



The section "rx devices" shows the list of rx devices available at the selected location. Selecting a device in the list shows the properties of this device right beside the list. You may edit the properties of the selected device to your needs

- *id:* The device ID internally identifies the device. It cannot be changed once the device has been created.
- *name:* The name of the device.
- *device:* The name of the VioIP-End-Point device representing this device or end point in the sat-nms M&C software.
- *group:* The group this device is assigned to. The device is only visible / accessible for a VioIP Client Application started for the ID of this group .
- *can multicast:* Set this to "yes" if the physical device representing this end point is capable to receive a multicast stream.
- *stream ip address:* Enter the IP address of the stream port of the device here. This is used as the destination address of unicast streams sent to this device. The address usually is not actively commanded at the device, however the value entered here must match the address configured in the device.
- *port number:* This is the destination port number for the unicast stream.

With the blue arrow buttons below the device list the selected device can be moved up and down in the list. When the software searches for the first available deviceThe topmost device which is used for connections the operator starts without specifying a device explicitly, it goes through this list from top to bottom.

The button "Add" lets you add a new device. The program shows a dialog window where you can enter the ID for the new device. An ID entirely consists of upper case letters and digits, the "-" character is allowed as a separator. The ID must be unique, you cannot define two devices with the same ID. The ID also is unalterable, once you defined a new device you cannot change the ID of the device later.

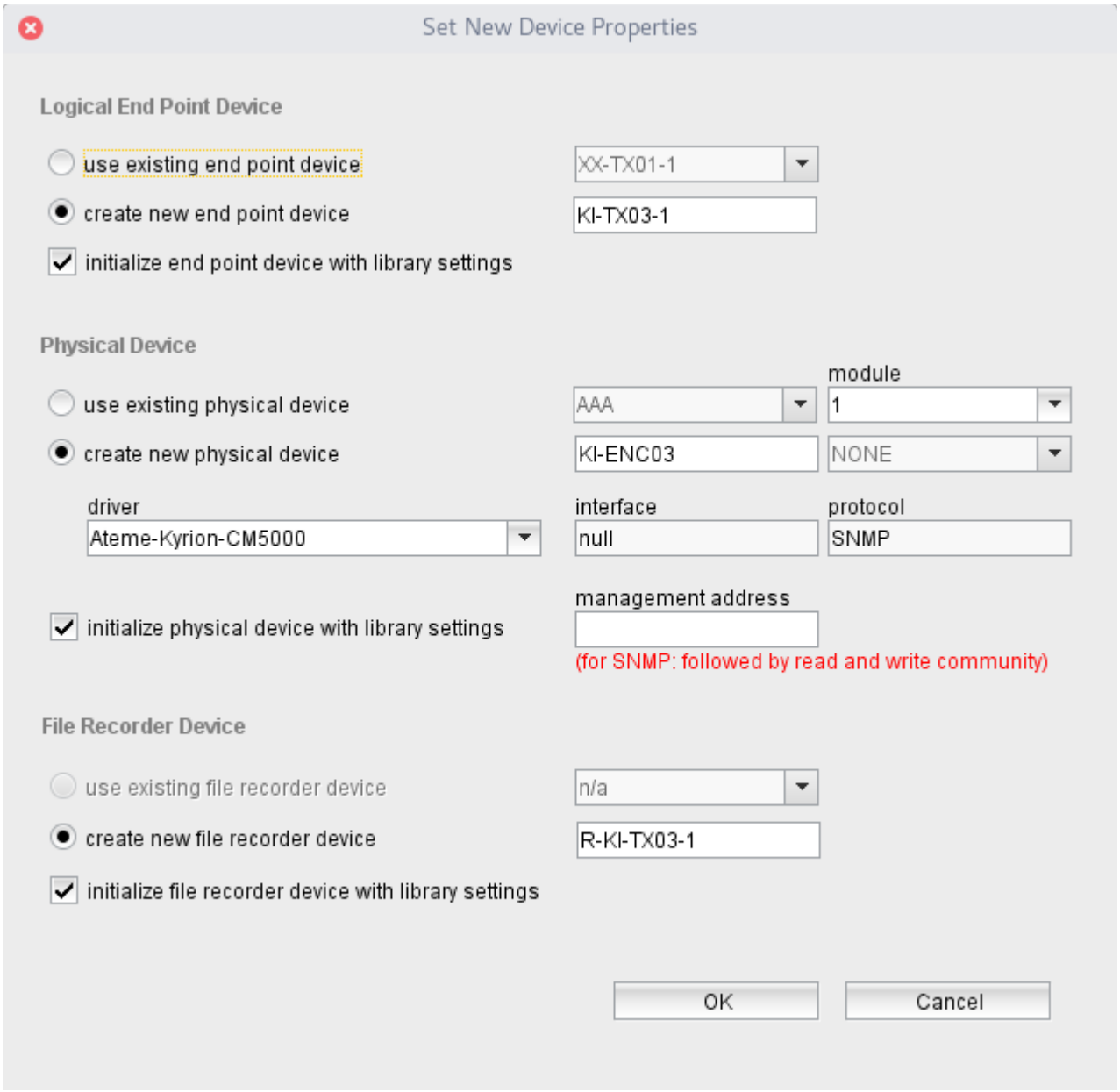
When you entered the ID for new device, the software shows in a next step a dialog which lets you select which aspects of the connection end point actually shall be created ans how these aspects shall be initialized. Chapter Adding New Devices later in this document describes this dialog more elaborately.

The button "Del" lets you delete the selected device. The program shows a query dialog before the device actually gets deleted. The dialog lets you select if the software shall remove the VioIP-End-Point device, the physical device and an optional file recorder device as well from the M&C system configuration.

1.15.4.7 Adding New Devices

The button "Add" below the list of TX or RX devices lets you add a new device. The program shows a dialog window where you can enter the ID for the new device. An ID entirely consists of upper case letters and digits, the "-" character is allowed as a separator. The ID must be unique, you cannot define two devices with the same ID. The ID also is unalterable, once you defined a new device you cannot change the ID of the device later.

When you entered the ID for new device, the software shows in a next step this dialog which lets you select which aspects of the connection end point actually shall be created and how these aspects shall be initialized.



The first section in this dialog refers to the logical end point device which represents the new connection end point to create. You have the choice either to use an existing VioIP-End-Point device in the M&C for this or to create a new one.

You can select the first choice only if there areVioIP-End-Point devices in the M&C which are not yet used for the VioIP software. The software offers a list of such devices in this case, you can select one from this drop down list.

If you select to create a new logical end point device, the software suggests a name for this device, made up from the location ID and the device ID you specified in the previous step.

Finally the checkmark "initialize end point with library settings" defines if the setup of the used or newly created device shall be initialized with settings derived from choices made in the next step concerning the physical device. This includes the faults to be monitored at the physical

device and the start/stop macros used by the logical end point device to perform the start and stop of a connection.

The next section is all about the physical device to be used for the end point. Again you have the choice either to use an existing device or to create a new one. Using an existing device is speically useful to use an unused module in a multi-encoder or multi-decoder device. Regardless of your choice you have to specify a module index beside the device name if the device containes multiple modules.

If you decide to create a new physical device you should select the device driver for the new device as the next step. Selecting the driver sets the communication interface and communication protocol defaults and suggests a name suitable for the new device.

The next step is to specify the management address for the new device. For devices controlled via SNMP the address should contain also the read and write community names (e.g. "10.0.0.1 public private").

The checkmark "initialize physical device with library settings" defines if the setup of the used or newly created device shall be initialized with settings derived from choices made in the next step concerning the physical device. This is important for multi-encoder or multi-decoder devices because this masks stream specific faults of the device in a way, that these faults do not interfere with the state of other streams on the same device.

The last section of the dialog defines the optional file recorder which may be used to log the values of packet counters of the physical device. Like the logical end point device, the file recorder is a logical device and the options given for this device are very similar to the options for the logical end point.

You may choose between using an existing device (if one is available) or to create a new one. Checking "initialize file recorder with library settings" lets you automatically initialize the file recorder to monitor the packet counter parameters of the physical device selected above.

1.16 M&C Configuration

This section of the manual describes how to configure the sat-nms M&C software for the device configuration of the ground station to control and how to create an application specific user interface consisting of one or more screens.

The following chapters refer to the legacy Java client user interface of the software, they only are applicable to software installation which still or explicitly use the Java client as user interface.

New M&C installation should preferably use the Web based user interface which provides equivalent funtions to configure the software for a specific task.

1.16.1 Configuring The Device Setup

With the sat-nms M&C or VLC software, the assignment which type of device is controlled by which serial interface is free configurable. The user interface of the software provides a

configuration window which enables the authorized operator to setup the software.

Chapter ' The Device Setup Editor Window ' describes the usage of this configuration tool and guides through setup of a M&C system or VLC. The now following chapter introduces the underlying concepts of the M&C / VLC device configuration.

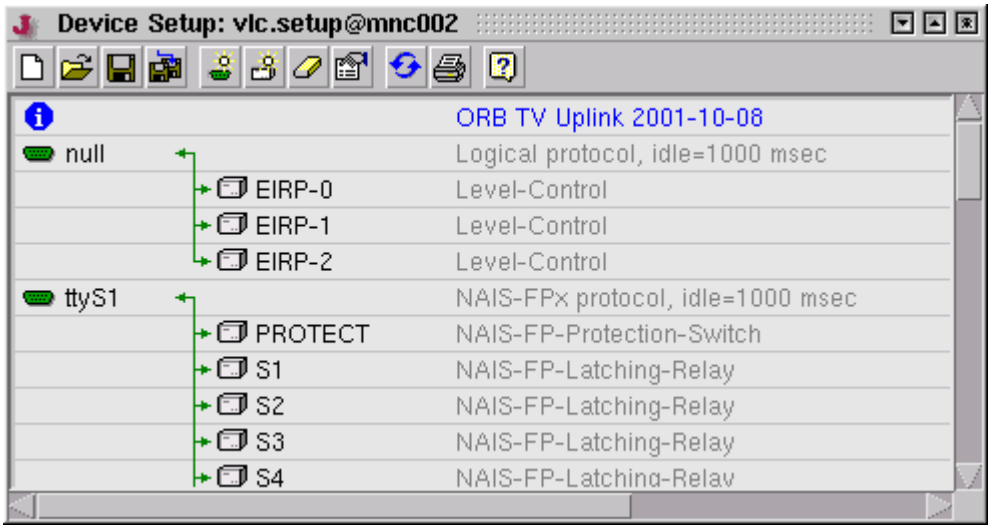
1.16.1.1 Concepts

When an operator is going to configure a VLC or M&C first it is important to understand, that with the sat-nms software each serial interface is bound to a communication protocol. The communication protocol used for a certain device is not unchangeably linked to the device driver. This is to support multiple devices being controlled via a single interface. Devices using a common 'multi drop' capable protocol may be connected to the VLC / M&C with a RS485 bus. This way one can for example operate a ND-SatCom upconverter and a CPI TWTA with a single RS485 interface. Both device types use the same communication protocol, they may share the same RS485 bus.

Once an interface (serial port) has been included into the setup and got a communication protocol assigned to it, within the setup devices can be attached to this interface. With the device definition, the device gets a name and a device driver assigned to it. The device's name acts as an address within the software where to send at commands (equipment settings) to, the device driver tells the software how to treat the device at a low communication level.

1.16.1.2 The Device Setup Editor Window

The 'Device Setup Editor' lets you define / modify the equipments setup, i.e. the assignment of monitored/controlled devices to the physical interfaces of a VLC or M&C computer. You need to be connected on-line and logged in as a fully authorized operator to edit the equipment setup.



As shown in the figure above, the editor presents the equipment setup as a list of interface and device definitions. Green arrows connect the devices with the interface they use to communicate with the computer.

In the VLC/M&C computer, the equipment setup is stored as a file 'vlc.setup'. This file is read by the M&C server software on startup. Changes you make in the editor window are temporary until save this file to the target system (the function). A changed equipment setup you stored on the target machine will become effective when the M&C server application gets restarted.

Tool-bar Functions

- --- Clears the setup, lets you define a new setup from scratch.
- --- Loads a equipment setup from disc. With a NMS system the file is loaded from the NMS server, not from the VLC.
- --- Saves the edited setup as 'vlc.setup' to the target computer. It will use this equipment setup with the next start.
- --- Saves the edited setup with a different file name. Setup definitions are stored in a folder 'setups' which is located at the NMS server computer with NMS systems, on the M&C server computer with M&C systems.
- --- Adds a new interface definition. The definition is inserted just below the actually highlighted one.
- --- Adds a new device definition to the setup. The new definition is inserted just below the actually highlighted one unless the latter describes an interface. In this case, the new definition gets appended at the end of the list of devices already connected to this interface
- --- Deletes the actually highlighted definition.
- --- Lets you edit/change the actually highlighted definition. You also may double click to the definition for this.
- --- Restarts the M&C server application on the target computer. You must do this, to make the target system use a modified equipment setup. With a M&C application, this will break the user interface's connection to the server. With a NMS/VLC application the VLC will go off-line with the restart. You should wait at least 2 minutes before you try to connect again.
- --- Prints the edited setup.

Multiple Devices At One Interface

With RS232 interfaces, you will connect one piece of equipment to one interface in most cases. However, there are a couple of situations where multiple devices at one interface make sense:

- The *null* interface is used by all logical devices. In every VLC/M&C system there is exactly one *null* interface running the *Logical* protocol. All logical devices are connected to this (physically not existent) interface.
- When using an RS422/485 interface, you may connect several devices to a bus and control them through one interface. The precondition for this is, that **all** devices at this interface use the **same** communication protocol supporting this kind of multi drop operation.
- Devices for switches, alarm circuits etc. which rely on the Matsushita FP0 PLD, are assigned to the same interface as long as they are implemented by the same FP0 device.

Storing Setups For Backup Or As Templates

With an NMS application you are encouraged to backup every equipment setup at the NMS site by means of the 'save as ()' function. This backs up the settings at a central place and builds a set of template setups.

Restarting The Target System

When modifying an equipment setup, be sure to store the changes setup using the  - function and then to restart the target with  . Without restart, the target continues using the old setup until a restart occurs for some other reason.

Stored Equipment Settings

Apart from the plain interface assignments done by this configuration window, the equipment setup comprises a large number of settings like interface line speeds, device addresses etc. When changing device names, be aware that these settings are lost.

1.16.2 Arranging The User Interface

The sat-nms software contains a powerful tool which enables the operator to customize or even create user interface screens which are nice looking and easy to operate. The tool, called the ' Screen Editor ', works much like a vector based drawing program. It lets the user place various kinds of objects (editing fields for settings, textual or graphical status displays and much more) into the screen to edit.

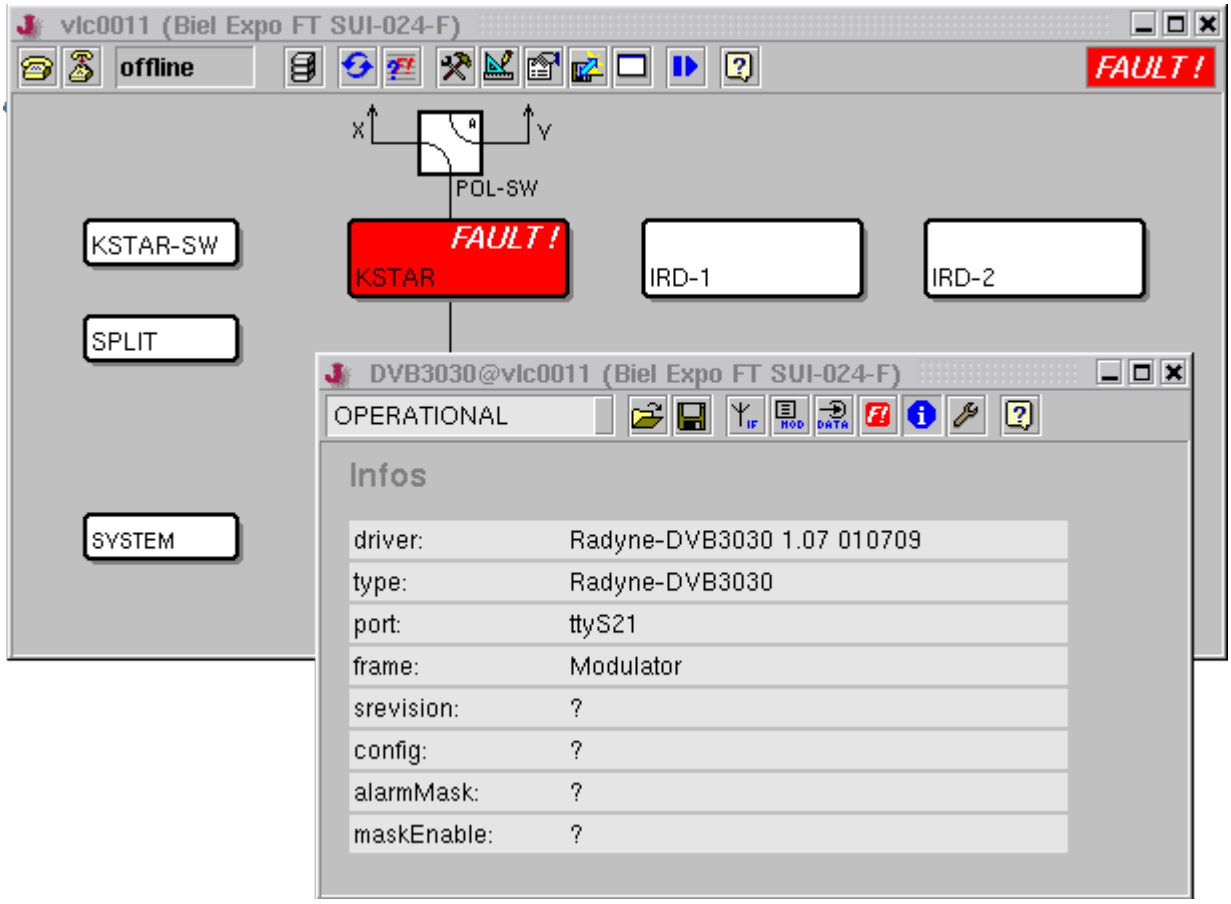
The software comes with predefined screens for each device type. These screens can be used to create a hierarchical structured user interface with a few mouse clicks. On the other hand, the configuration capabilities of the sat-nms user interface are powerful enough to create special user interface screens exactly matching the operator's needs.

1.16.2.1 Concepts

The software foresees one main screen for each M&C / VLC. With a M&C this main screen automatically is shown when the user interface program is started. With a VLC, the 'VLC Main Window' contains this screen. The user interface may be configured to use more than one screen which are switched on the operator's request, either shown in the same window or in separate windows.

Device oriented user interface

There are two major approaches to design and configure a user interface for the sat-nms software. The first one, called the 'device oriented user interface', results in a hierarchically structured user interface. It makes use of the predefined windows / screens coming with the software and can be created with only a few mouse clicks.



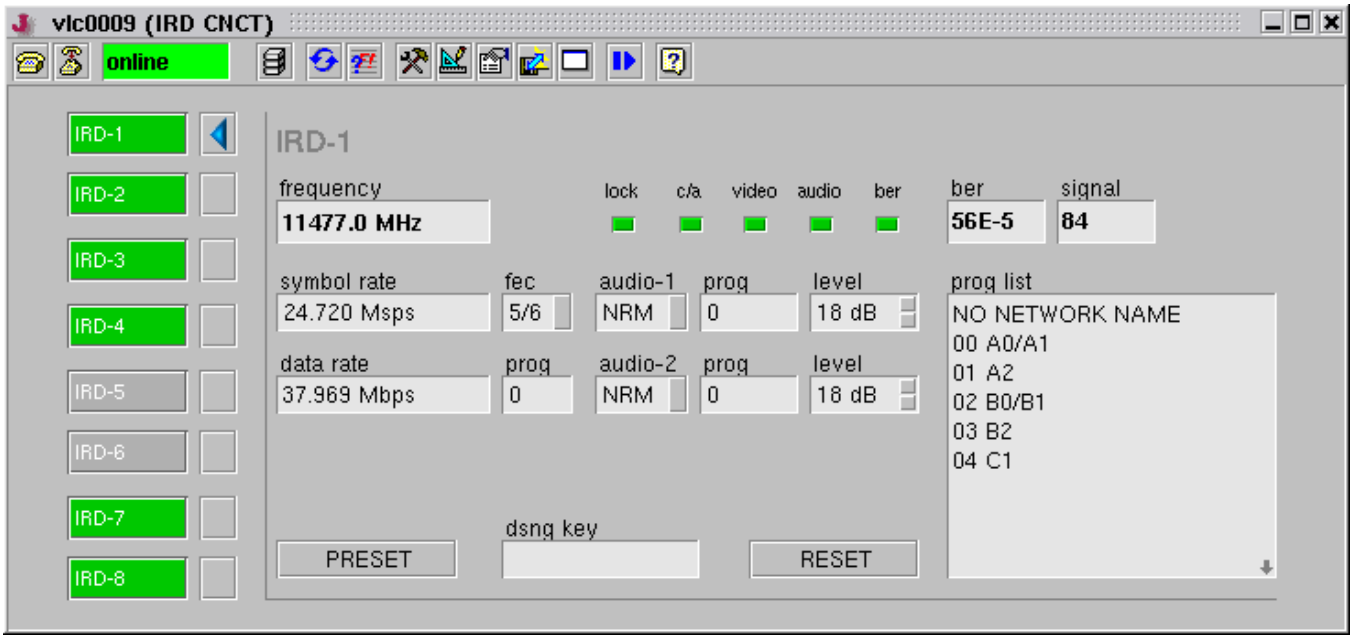
Example for a device oriented user interface.

With the device oriented user interface, the main window contains a so called device icon for each device which is controlled by the M&C/VLC. This icon is labeled with the device's name and shows the OK/FAULT state of the device with it's color. A double click to a device icon opens the ' Device Window ' for this device, containing the predefined screens for this device type. Using the ' Device Window ', all parameters of a device supported by the sat-nms software can be monitored or controlled.

To create a main screen for the device oriented user interface, thescreen editor provides a function adding a device icon for each device in the system on a single mouse click.

Task oriented user interface

While the device oriented user interface follows predetermined structures, the so called 'task oriented user interface' is entirely customer designed. Using the screen editor , the user places entry fields or status displays in the screen for each parameter he wants to include to the user interface.



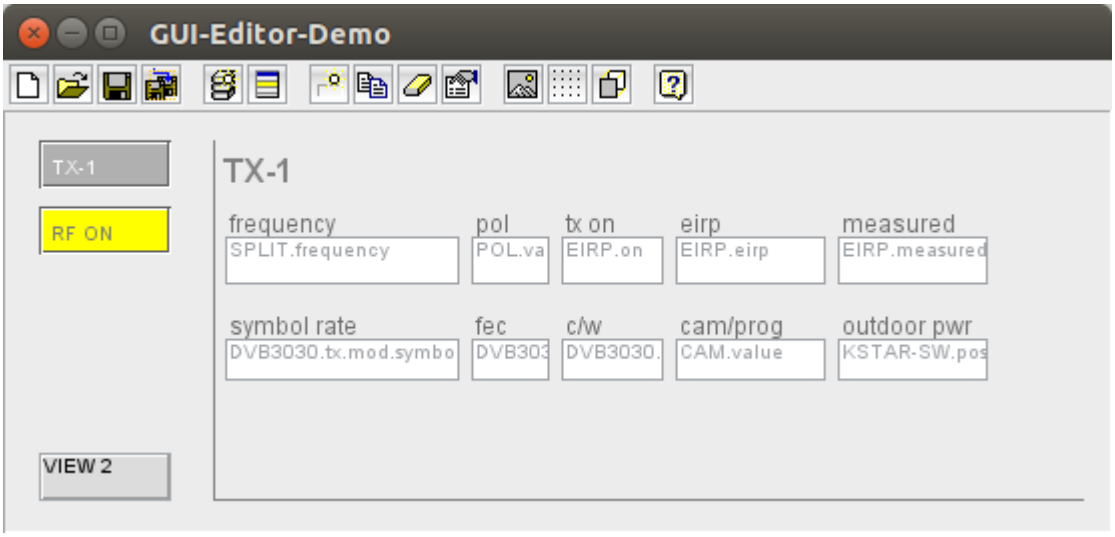
Example for a task oriented user interface.

A task oriented user interface not necessarily contains all available parameters. To keep the user interface clear, only those parameters are included, which the operator needs to fulfill the task the user interface is designed for. Moreover, there also is no need to group parameters by the device they belong to, like the device oriented user interface does. Parameters belonging to diverse devices freely may be mixed in one screen.

1.16.2.2 The Screen Editor Window

The Screen Editor window is used to layout the M&C windows used in the M&C/NMS user interface. Windows like the VLC Main window, the M&C Main window and additional user created windows are customized by means of this program.

The Screen Editor works like a simple drawing program. Each M&C window contains a number of objects (elements) which may be placed, sized and edited using the Screen Editor.



Object Placement

Objects contained in the window are placed by dragging them to the desired position (left mouse button). Dragging an object with the right mouse button changes it's size, or, more precisely changes the size of it's bounding rectangle (most objects are not scaled if they are resized). A double click to an object opens the Element Properties window for this object.

Tool-bar Functions

- --- Clears the window surface and starts to edit a new window.
- --- Loads a window description to edit.
- --- Saves the window actually edited.
- --- Saves the window actually edited with a different name. If you have selected a group of elements, only the selected elements are saved. This deletes all unselected elements and shrinks the panel just to fit around the selected elements! The saved screen always ist stored in the "/screens" directory. This applies even if you edited a VLC screen from within the NMS client application.
- --- Adds a new device icon for each device which has not yet an icon. This function is only available, if the program knows about the device list of the application which is edited.
- --- Adds a new object to the window. It appears in the upper left corner. You also may point with the mouse to the (empty) destination point at the drawing area and the right button context menu.
- --- Duplicates the selected object. The new object appears on top of existing one.
- --- Removes the selected object. If you have selected a group of elements, all elements in the group are removed.
- --- Opens a Element Properties window for the selected object.
- --- Defines a background image for the window. A file selection box appears, you may select any picture in GIF or JPG format as the window background. The window size automatically gets aligned to the size of the image you selected.
- --- Objects are placed along a invisible 3 x 3 pixel grid if they are moved while this

button is down.
-  --- Moves the selected object to the back so it does not cover any other object.

Inserting screens

You may insert complete screens into the actually edited one. Point the mouse to where you want the upper left corner of the inserted screen to be placed. Press the right mouse button and select "Insert screen" from the context menu. A file selection box appears which lets you select the screen to insert.

You also may select one of the predefined screens used by the device windows of the software for insertion. To insert such a file, change the directory to "dscreens" in the file selection box. Be aware, that the message identifiers of all parameters in these screens don't contain a device ID. The tx-on parameter of a transceiver e.g. refers to a message ID "tx.on" in a device screen, not to something like "KSTAR-1.tx.on". You have to edit all message identifiers if you insert a screen from this directory.

Group selections

The screen editor lets you select multiple elements to a set on which you can perform some useful actions. Selecting an element group works like you would expect: Spanning a rectangle by dragging the mouse with the left button held down selects all elements which are covered by this rectangle. Selecting single elements with the mouse while pressing down the CTRL key at the keyboard also adds these element to the group. Any other mouse click clears the selection.

Elements selected in this way are marked with a blue rectangle drawn around. The first element you selected is called the "reference element". It's marked with four small boxes in it's corners. If you select a group by spanning a rectangle around the elements, the element which was selected before becomes the "reference element". Below there is a list of operations you may apply to a selected group of elements:

- Moving a group of elements: --- Select the elements you want to move, then keep the CTRL key pressed and drag one of the elements in the group (left mouse button). The other elements follow.
- Resizing a group of elements: --- You can change a group of elements to the same width, height or size the reference element has. Select the elements you want to resize and select the reference element. Then -- while pressing the CTRL key -- open the context menu with the right mouse button on one of the elements in the group. Select "Same width", "Same height" or "Same size" as you need.
- Aligning a group of elements: --- Aligning a group of elements, i.e. moving them to make either the left, right, top or bottom edge of all elements in one line, is done analogous to the resizing functions. The context menu selections are "Align left" ... "Align bottom". "Align column" is a special function which aligns the selected elements horizontally to the reference element like "Align left". Vertically this function aligns the elements to fit into a fixed 42 pixel raster, relative to the reference element.
- Re-addressing a group of elements. --- With this function (context menu selection "Same device") you can address a group of elements to the same device name the reference element contains in it's message ID. The device name in the message ID of each element

in the group gets replaced by the device name in the reference element's message ID. This function recognizes if an element contains no device name defined and adds the reference element's device name in this case.

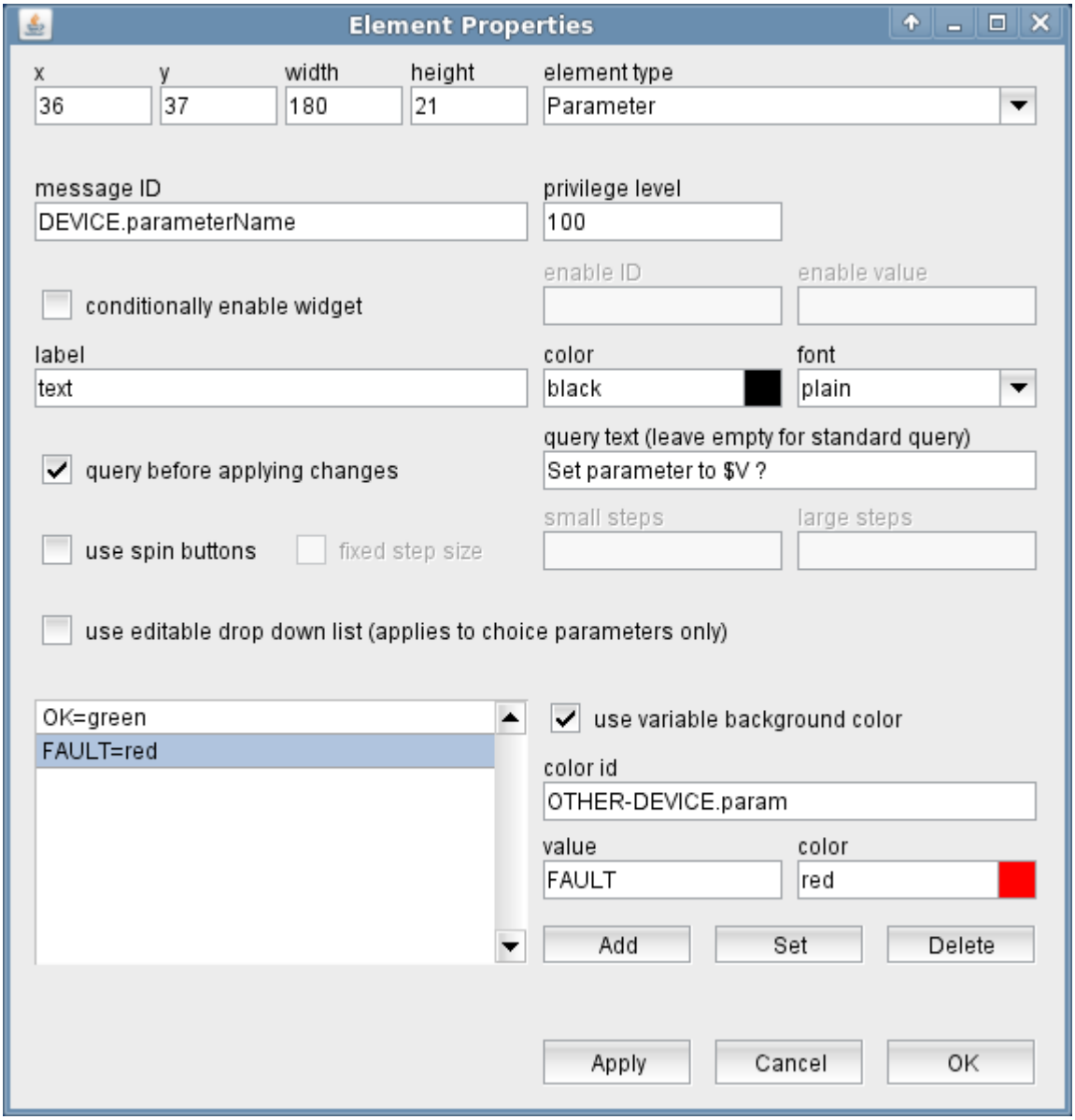
- Storing a group of elements: --- Select the elements you want to store and click to  in the tool bar. This deletes all unselected elements and shrinks the panel just to fit around the selected elements, so be careful! In most cases it will be better to make a backup of the edited screen before.
- Deleting a group of elements: --- Select the elements you want to delete and click to  in the tool bar.

Remarks

- Window descriptions, images and icons are stored on the NMS server computer. This means, any changes you make are stored at a central place and are automatically available to other users. If you wand to add your own icons or images, contact your system administrator to store these files on the server computer.
- A quick start for a new main screen is the  tool bar button. It creates a new device icon for each device defined in the VLC/M&C system.

1.16.2.3 The Element Properties Window

The Screen Object Properties window is used to set the properties of a display object within the Screen Editor . Depending on the type of screen element, the window may contain different fields / information, below the element properties window for the common parameter element is shown as an example:



Although the contents of the element properties window depends on the type of element shown, the first line of the window is always the same:

- x --- X location of the element in the window.
- y --- Y location of the element in the window.
- width --- Width of the element's bounding box.
- height --- Height of the element's bounding box.
- element type --- The object type of the element.

Remarks

- If you change an element's position by dragging it with the mouse, this will overwrite any position / size values values edited in the element properties window. Clicking "Apply" before the element is moved saves the edited values.
- Changing the element type also changes the shape of the element properties window. As

the element properties internally are stored in a way compatible to older software versions, the content of some fields may change in a way you might not expect.
- The screen editor uses the same Element Properties window for all elements. If you click to another element in the editor window, the properties of this element get loaded into the properties window.

1.16.2.4 Display Element Types

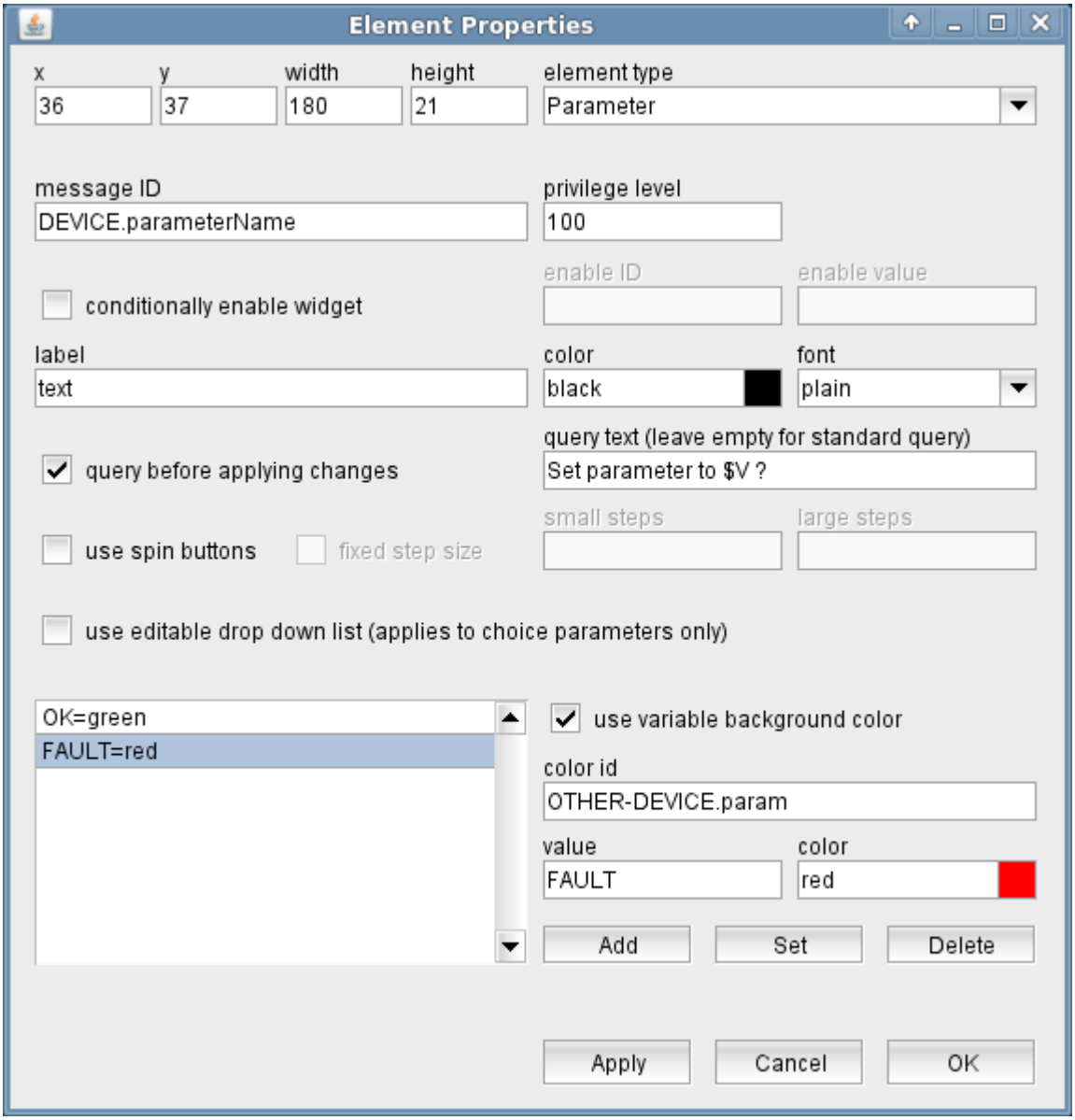
The table below shows the types of display elements the screen editor supports. A detailed description of the individual element types is given on the following pages.

Element Type	***Description***
Parameter	A parameter entry field.
Read-Only Parameter	A parameter display field which does not allow the parameter to be edited.
Radio Buttons	A parameter entry field specially for CHOICE parameters.
Fault	A special display element to display a fault flag. It shows the textual description of the fault and it's state in an entry field frame. The right mouse button shows a context menu to change the fault's priority.
Label	Displays a single line of text.
3D Frame	Draws a sunken 3D frame, may be used to group parameters.
Rectangle	Draws a rectangle.
Line / Arrow	Draws a horizontal/vertical line or arrow.
Icon	Places an icon (GIF or JPG image) into the screen. Optionally the icon can be programmed to change with a parameter value.
EDIT Button	Places an EDIT button into the screen, implicitly forcing the EDIT/TAKE operating method for this screen instead of changing each parameter independently.
TAKE Button	Places a TAKE button into the screen.
LOCK Button	A button to control the lock state for exclusive operation for a number of devices.
Device Icon	Places an icon into the screen which represents a device. This icon will display the device's operating/fault state by it's color / shape.

Element Type	***Description***
Switch Icon	Like the device icon. but additionally displays the actual position of a switch (Meant to be used for block diagrams showing the true signal path.
Frame Button	Defines a button which launches another screen, e.g. for detail views.
Parameter Button	A button which sends a certain parameter value when pressed.
Latching Button	A button which displays/controls a 2-state parameter using it's pressed state.
Gauge	A gauge element, displaying a numeric parameter as a horizontal bar.
Strip Chart	A strip chart element, displaying a numeric parameter as an y/t diagram that automatically advances with 1 pixel / second.
Spectrum Display	The spectrum display element integrates the spectrum display of a spectrum analyzer device in a user screen.
MCP Display	The MCP display element integrates the measurement display of a spectrum analyzer device in multi channel measurement mode in a user screen.
ODM Target List	The ODM Target List element shows the list of targets of aSatService-ACU-ODM antenna controller device. It permits to recall, save or delete target definitions of this type of antenna controller. It is specialized to this antenna controller, does not support other types.
XY Chart	This element shows the relation of two numeric variables in an X/Y diagram, featuring a trace which shows the recent history of the values with a configurable depth. The update rate, the diagram scaling and much more is configurable with this screen element.
JSON List	This is a special screen element required for some devices which distribute a state table/list in JSON format.
Thumbnail Icon	A screen element to show thumbnail images from the video processed by an encoder / decoder / gateway device which supports this feature.

1.16.2.4.1 Parameter

The *Parameter* display element is the common component to display and edit most types of M&C parameters. Depending on the data type of the parameter (the data type is detected automatically) the parameter elements appears as textual / numeric entry field, choice box or as display field for read only parameters. In the screen editor, the parameter element is shown as a sunken rectangle.



The attributes listed below may be configured to customize a display element of this type:

- message ID --- The message ID addresses the parameter the element shall display or edit. The message ID consists of the device name followed by a colon and the name of the parameter. *XMIT-1.tx.on* for example addresses the variable *tx.on* at a device named *XMIT-1* . With the ' Device Driver Index ' in the appendix of this document there is a list of variable names provided for each device driver the software supports.
- privilege level --- The privilege level necessary to change this parameter. The predefined screens of the software use 100. In your own screens you may set certain parameters to higher privilege levels, limiting the group of operators permitted to change the parameter.
- conditionally enable widget --- Parameter fields may be locked to read only state unless another parameter matches a given value. For instance, changing the position of a wave guide switch may be inhibited while the carrier is switched on. Check this mark to activate this feature.

- enable ID --- This field defines the ID for the enabling parameter.
- value --- The value belonging to the parameter above. The actual value of the parameter addressed by "enable ID" mut match this value in order to enable the entry field.
- label --- The label text is drawn above the element.
- color --- The color attribute of a parameter element sets the color of the label shown above the entry field. The text in the parameter field itself always is shown in the default text color of the selected look & feel. Colors may be specified by standard color names like red / green / blue or using a hexadecimal RGB notation. '#FFFF00' for example specifies yellow. You may click to the color example field in order to open a color chooser dialog and select the color from there.
- font --- The font attribute applies to the text shown in the parameter field itself. The label text is shown with the standard ("plain") font size for all font selections except the smallest one. In the latter case the label is drawn using this small font size, too.
- query before applying changes --- Check this mark to make the element show a query before a parameter gets actually commanded.
- query text --- The query text to be shown in the pop-up window. you may leave this field empty, the program uses a standard query text in this case.In the question text, placeholders may used for two values: Any occurrences of the pattern **$P** get replaced by the parameter name (message ID). Any occurrences of the pattern **$V** get replaced by the new value to set.
- use spin buttons --- Checking this mark enables "spin buttons" for numeric entry fields. Clicking these small arrow symbols at the right edge of the entry field increases/decreases the value by a certain amount. clicking them with the right mouse button increases/decreases by a larger amount.Enabling spin buttons with automatic step size automatically enables the "use editable drop down list" feature.
- fixed step size --- Checking this mark permits to set user defined increment values for the spin buttons. If not checked, the spin button increment is derived from the least significant digit shown in the field, the large (right mouse button) increment is ten time that.
- small steps --- The spin button increment value to be applied with left mouse button clicks.
- large steps --- The right mouse button spin button increment. The program assumes 10 times the small steps if the large steps field is left empty.
- use editable drop down list / force single click select --- Checking this mark changes the type of drop down list to be used with a choice parameter.Enumerated values normally are shown as a drop down list which pops up if you click into the field. This element type is not keyboard sensitive, you always have to select the value with the mouse which may be inconvenient if the list contains a large number of values.With the editable drop down list option checked you can type into the field and write some characters of the new value you want to set. The element pops up a list of applicable setting containing the typed characters. Clicking to the selected value in the list completes the selection, sets the value.If the widget is configured for a height of 40 pixels or more, it appears as a scrollable list rather than as a drop down box. Checking this mark forces the widget to select a value with a single mouse click, normally a double click is required to select a value.Selecting this option automatically enables "use spin buttons".
- use variable background color --- Checking this mark enables the variable background color feature for this screen element. Depending on the actual value of the variable

addressed by 'color id', the element's background is set using the translation table shown in the lower left corner of the dialog. If the actual value of the color id variable does not match any of the table entries or if no color id is specified, the first color in the list is used to draw the element's background.The buttons Add/Set/Delete along with the value and color fields are used to edit the color translation table.

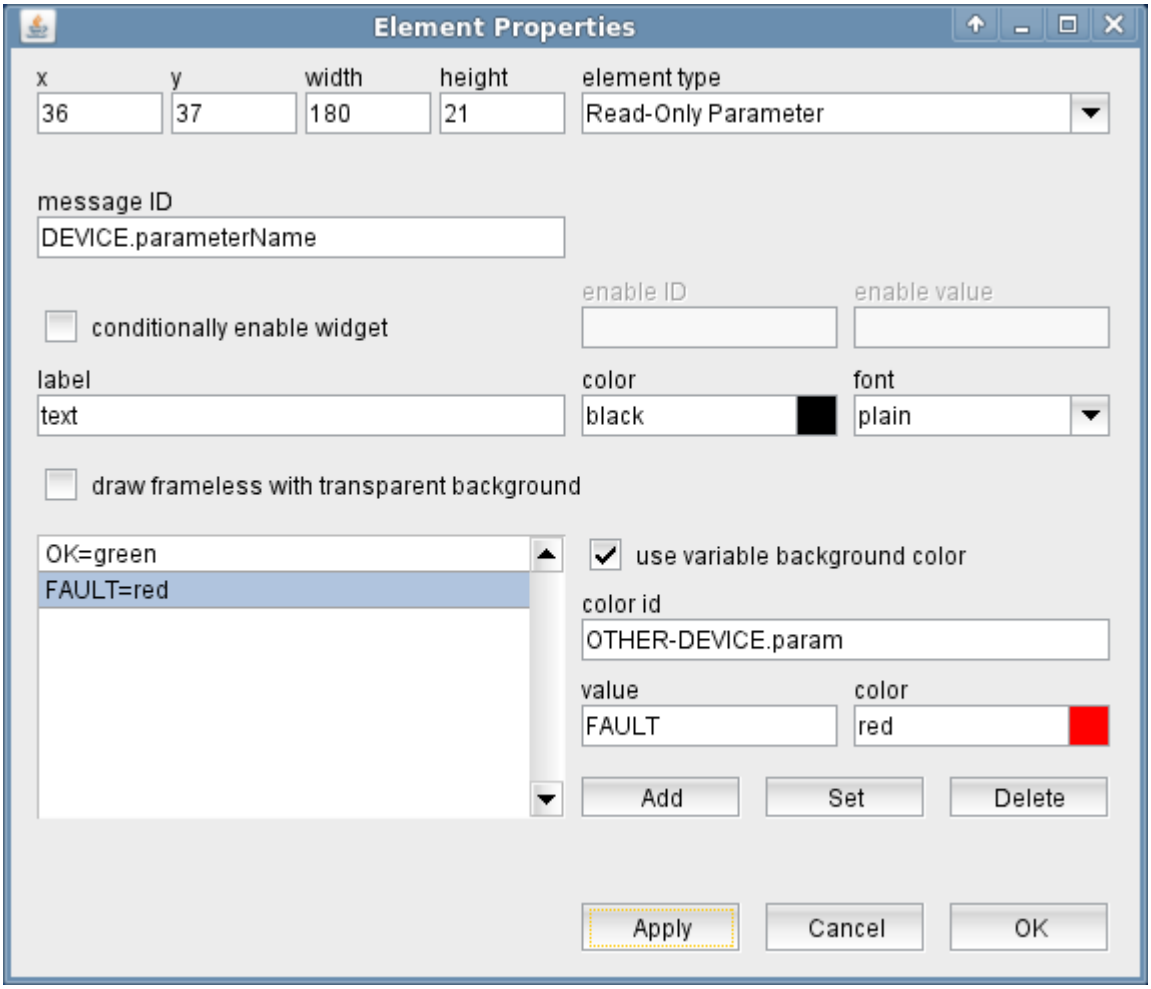
- color id --- The message ID of the parameter which controls the background color of this element.
- value --- The parameter value of the actually selected table entry
- color --- The color specification of the actually selected table entry. This may either be the name of a basic color (red, yellow etc.) or a hexadecimal RGB color specification like '#FF8000'. The latter defines some sort of orange, consisting of 0xFF red, 0x80 green and 0x00 blue. The actually selected color is shown in the right part of the entry field, clicking to this opens a color chooser dialog which lets you select / compose the the color to your needs.
- Add / Set / Delete --- These buttons control editing the color translation list.
  - To add a new value / color pair to the list, fill the value and color fields, then click to "Add".
  - To change the color assigned to a given parameter value, first select the table entry of interest, change the color value and finally click "Set".
  - To delete a value / color pair from the list, select the table entry and then click "Delete".

Remarks

- The options "use spin buttons" (automatic step size) and "use editable drop down list" internally use the same use the same property of the screen element. Hence, these options are linked in way that if you enable one of these options, the other one is selected as well. This is done to maintain compatibility to older versions of the software. This linkage means no limitation, as a parameter element never can be a numeric entry field and a choice list at the same time.
- The predefined screens of the software always use the "plain" font and a height of 21 pixels for parameter fields.
- If you enlarge the height for a choice parameter widget to more than 40 pixels, the software uses a list widget with scroll bars rather than a drop down selection box.
- If you enlarge the height for a entry field to more than 50 pixels, the software uses a multi line entry field widget. Multi line entry fields are useful only for very few types of parameters, they are not recommended for general use.

1.16.2.4.2 Read-Only Parameter

The *Read-Only Parameter* display element is used to display M&C parameters read-only. It looks much alike the Parameter element, but never allows to change the parameter it displays.



The attributes listed below may be configured to customize a display element of this type:

- message ID --- The message ID addresses the parameter the element shall display or edit. The message ID consists of the device name followed by a colon and the name of the parameter. *XMIT-1.tx.on* for example addresses the variable *tx.on* at a device named *XMIT-1* . With the ' Device Driver Index ' in the appendix of this document there is a list of variable names provided for each device driver the software supports.
- color --- The color attribute of a parameter element sets the color of the label shown above the entry field. The text in the parameter field itself always is shown in the default text color of the selected look & feel. Colors may be specified by standard color names like red / green / blue or using a hexadecimal RGB notation. '#FFFF00' for example specifies yellow. You may click to the color example field in order to open a color chooser dialog and select the color from there.
- font --- The font attribute applies to the text shown in the parameter field itself. The label text is shown with the standard ("plain") font size for all font selections except the smallest one. In the latter case the label is drawn using this small font size, too.
- draw frameless with transparent background --- Check this mark to let the software draw the element without a entry field frame and with transparent background. With this option the Read-Only-Parameter element can be used as a label which changes it's text with the value of a variable. Please note that you cannot use the 'variable background

color' option (described below) together with the frameless / transparent background option.
- use variable background color --- Checking this mark enables the variable background color feature for this screen element. Depending on the actual value of the variable addressed by 'color id', the element's background is set using the translation table shown in the lower left corner of the dialog. If the actual value of the color id variable does not match any of the table entries or if no color id is specified, the first color in the list is used to draw the element's background.The buttons Add/Set/Delete along with the value and color fields are used to edit the color translation table.
- color id --- The message ID of the parameter which controls the background color of this element.
- value --- The parameter value of the actually selected table entry
- color --- The color specification of the actually selected table entry. This may either be the name of a basic color (red, yellow etc.) or a hexadecimal RGB color specification like '#FF8000'. The latter defines some sort of orange, consisting of 0xFF red, 0x80 green and 0x00 blue. The actually selected color is shown in the right part of the entry field, clicking to this opens a color chooser dialog which lets you select / compose the the color to your needs.
- Add / Set / Delete --- These buttons control editing the color translation list.
    - To add a new value / color pair to the list, fill the value and color fields, then click to "Add".
    - To change the color assigned to a given parameter value, first select the table entry of interest, change the color value and finally click "Set".
    - To delete a value / color pair from the list, select the table entry and then click "Delete".

Remarks

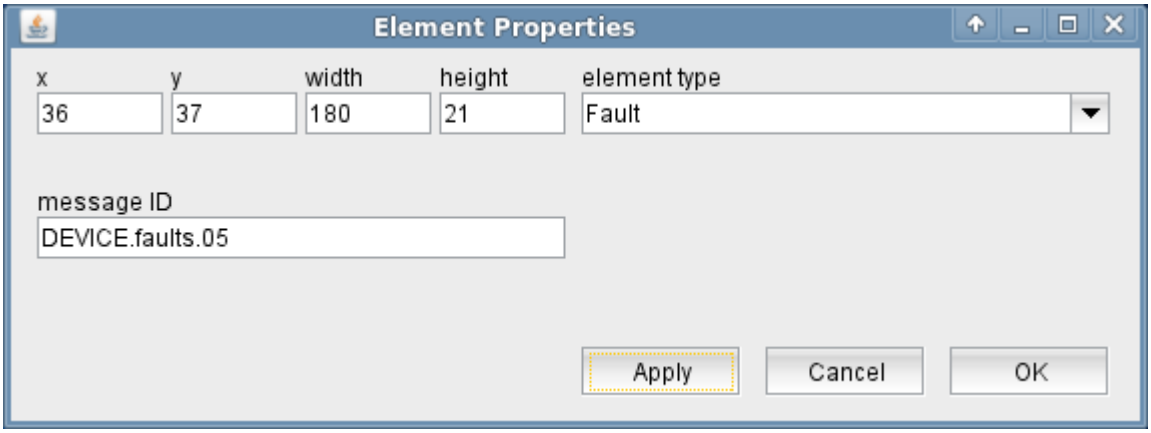
- The predefined screens of the software always use the "plain" font and a height of 21 pixels for parameter fields.

1.16.2.4.3 Fault

The *Fault* display element shows a fault flag. The faults page of the predefined device windows makes use of this display element.

The software treats device faults in a special way. In the variable list of a device driver the fault flags appear as variables called "faults.00" .. "faults.99". The software automatically produces a variable "config.faults.XX" for each fault flag "faults.XX" the driver defines. This configuration variable controls the priority of the fault. The Fault display element now:

- Displays the state if the fault flag (OK/FAULT)
- Displays the fault text (the description for the fault flag is distributed as a message at runtime).
- While the operator holds down the left mouse button on it, the Fault element shows the priority set for this fault.
- With the right mouse button the Fault element shows a context menu to change the fault's priority.

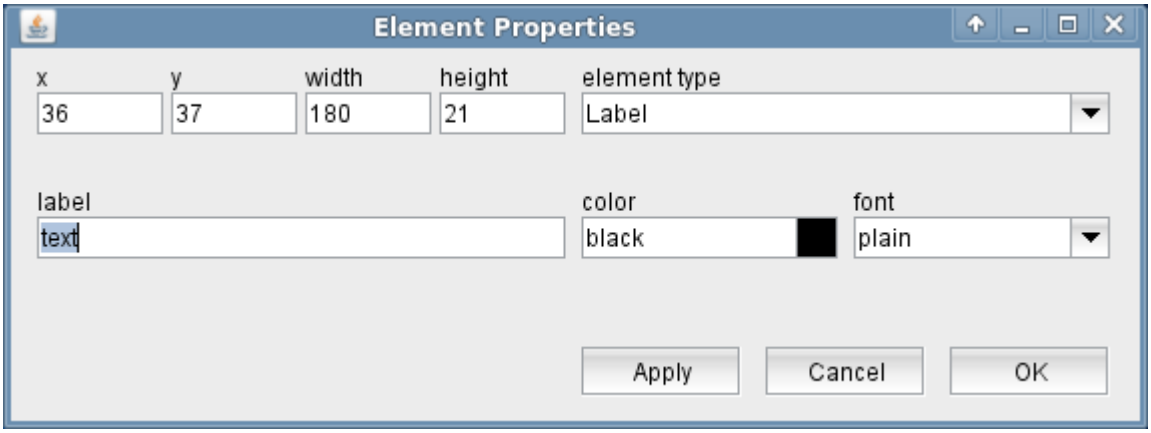


The attributes listed below may be configured to customize a display element of this type:

- Message ID --- The message ID addresses the parameter the element shall display or edit. The message ID consists of the device name followed by a colon and the name of the parameter. *XMIT-1.faults.22* for example addresses the variable *faults.22* at a device named *XMIT-1* . With the 'Device Driver Index ' in the appendix of this document there is a list of variable names provided for each device driver the software supports.

1.16.2.4.4 Label

The *Label* display element shows a label (a one line text string) with a selectable font / color.

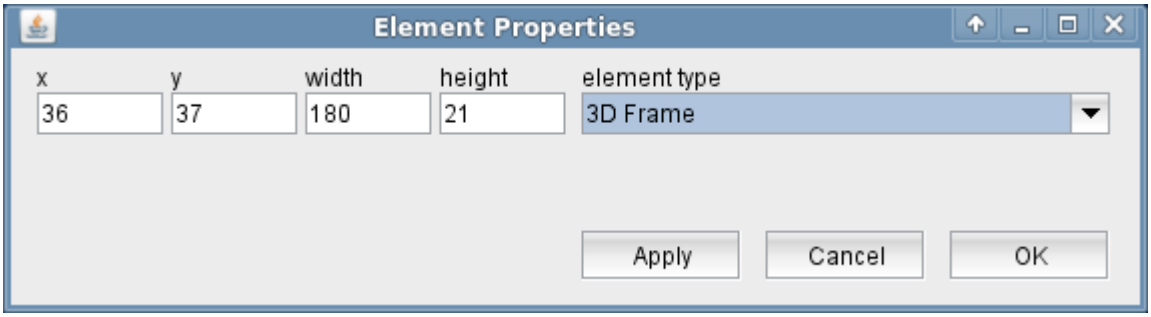


The attributes listed below may be configured to customize a display element of this type:

- text --- The text to be shown.
- color --- The color attribute of a parameter element sets the color of the label shown above the entry field. The text in the parameter field itself always is shown in the default text color of the selected look & feel. Colors may be specified by standard color names like red / green / blue or using a hexadecimal RGB notation. '#FFFF00' for example specifies yellow. You may click to the color example field in order to open a color chooser dialog and select the color from there.
- font --- The font to be used for the label.

1.16.2.4.5 3D Frame

The *3D Frame* display element draws a sunken 3D frame, which is intended to be used to group other elements.



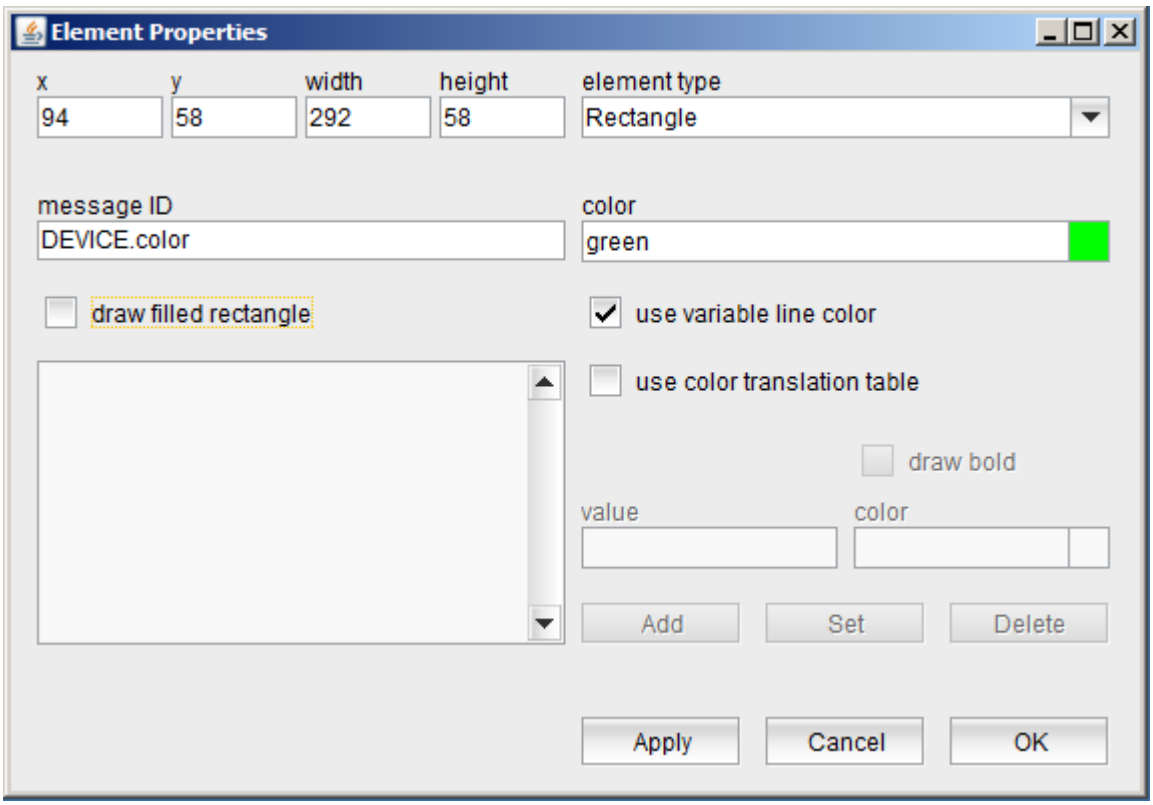
Beside the position in the window there are no user configurable attributes to set.

Remarks

The 3D frame's inside area is transparent, it does not conceal the screen elements it encloses. In the screen editor, however the 3D frame grabs all mouse clicks, so you might not be able to mode the elements which are inside the frame. In this case move the 3D frame to the back by pressing while the frame element is selected. The other elements are now "on top" of the frame element and may be addressed by the mouse independently.

1.16.2.4.6 Rectangle

The *Rectangle* display element draws a rectangle with a selectable color.



The attributes listed below may be configured to customize a display element of this type:

- message ID --- The message ID addresses a parameter which controls the color of the rectangle. No message ID is required if the rectangle shall be drawn with a fixed color.
- color --- The color to be used to draw the rectangle unless a variable line color is specified. Colors may be specified by standard color names like red / green / blue or using a hexadecimal RGB notation. '#FFFF00' for example specifies yellow. You may click to the color example field in order to open a color chooser dialog and select the color from there.
- draw filled rectangle --- If this mark is checked, a solid rectangle is drawn. The 'draw bold' property in the color translation table has no effect when the rectangle is drawn solid.
- use variable line color --- Check this mark to let the software draw the rectangle with a color specified by the value of the variable specified by 'message ID'. Unless you check the mark 'use color translation table', the software interprest the variable contents as described below in the paragraph 'Color / Line Width Codes'.
- use color translation table --- Checking this mark enables a color translation table which works much like the variable background color feature for entry elements. Depending on the actual value of the variable addressed by 'message ID', the element's line color and thickness is set using the translation table shown in the lower left corner of the dialog. If the actual value of the variable does not match any of the table entries or if no message ID is specified, the first color in the list is used to draw the element's background.The buttons Add/Set/Delete along with the value and color fields are used to edit the color translation table.
- draw bold --- The line thickness specification of the actually selected table entry. If the mark is checked, the line is drawn 3 pixels wide, with the mark unchecked the line width is 1 pixel.
- value --- The parameter value of the actually selected table entry
- color --- The color specification of the actually selected table entry. This may either be the name of a basic color (red, yellow etc.) or a hexadecimal RGB color specification like '#FF8000'. The latter defines some sort of orange, consisting of 0xFF red, 0x80 green and 0x00 blue. The actually selected color is shown in the right part of the entry field, clicking to this opens a color chooser dialog which lets you select / compose the the color to your needs.
- Add / Set / Delete --- These buttons control editing the color translation list.
    - To add a new value / color pair to the list, fill the value and color fields, then click to "Add".
    - To change the color assigned to a given parameter value, first select the table entry of interest, change the color value and finally click "Set".
    - To delete a value / color pair from the list, select the table entry and then click "Delete".

Color / Line Width Codes

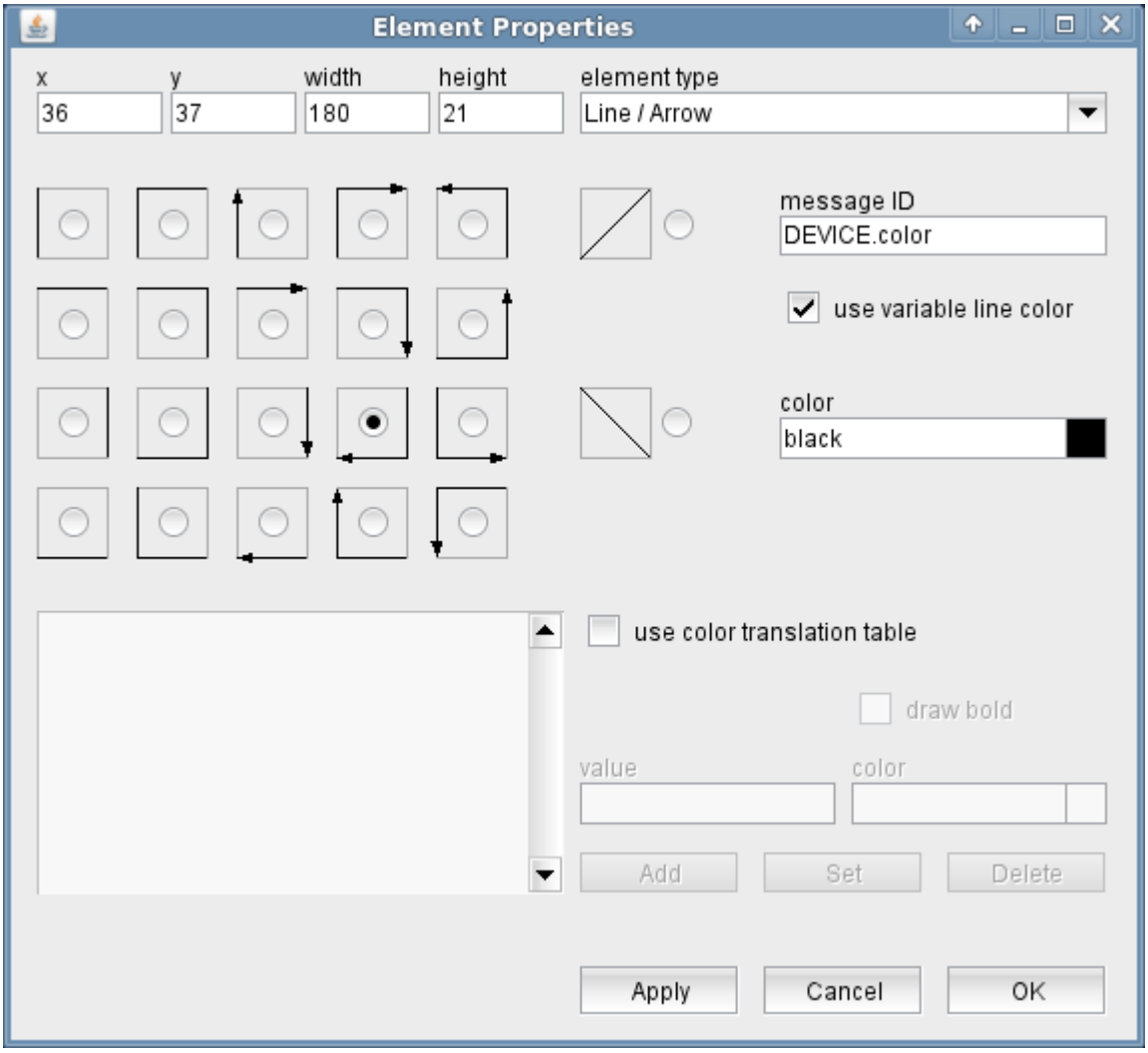
If you check the 'use variable line color' mark without using a color translation table, the software interprets the variable contents as a text value and parses it using the following rules (upper/lower case doesn't matter):

- If the variable value starts with one of the keywords BLACK, WHITE, RED, GREEN, BLUE, YELLOW or GRAY, this color is used.
- If the variable value ends with BOLD, the line is drawn 3 pixels wide (instead of 1 pixel default width).
- If the variable value is TRUE or it contains the text FAULT, the line is drawn red, 3 pixels wide if the variable denotes a fault flag.
- If the variable value is TRUE and the variable does not denote a fault flag, the line is drawn green, 3 pixels wide.
- If the variable value is ON, the line is drawn green, 3 pixels wide.
- If the variable value starts with a '#' character, the following six characters are interpreted as a hexadecimal number, specifying the RGB parts of an arbitrary color. Example: "#FF00FF-BOLD" defines a 3 pixels wide, magenta colored line.
- If none of the rules above matches, the line is drawn with the default color, 1 pixel wide.

The ' Gate-Array ' logical device may be used to combine several state variables in the M&C and generate the color codes expected by the line / arrow element.

1.16.2.4.7 Line / Arrow

The *Line / Arrow* display element draws a horizontal and/or a vertical line and optionally an arrowhead. The line's color is selectable. Strictly speaking the Line / Arrow element is a rectangle with only one or two sides drawn.



The attributes listed below may be configured to customize a display element of this type:

- shape --- To select which parts of the bounding rectangle of the element shall be drawn as a line, select one of the shape symbols.
- message ID --- The message ID addresses a parameter which controls the color of the rectangle. No message ID is required if the rectangle shall be drawn with a fixed color.
- use variable line color --- Check this mark to let the software draw the rectangle with a color specified by the value of the variable specified by 'message ID'. Unless you check the mark 'use color translation table', the software interprest the variable contents as described below in the paragraph 'Color / Line Width Codes'.
- color --- The color to be used to draw the rectangle unless a variable line color is specified. Colors may be specified by standard color names like red / green / blue or using a hexadecimal RGB notation. '#FFFF00' for example specifies yellow. You may click to the color example field in order to open a color chooser dialog and select the color from there.
- use color translation table --- Checking this mark enables a color translation table which works much like the variable background color feature for entry elements. Depending on the actual value of the variable addressed by 'message ID', the element's line color and

thickness is set using the translation table shown in the lower left corner of the dialog. If the actual value of the variable does not match any of the table entries or if no message ID is specified, the first color in the list is used to draw the element's background.The buttons Add/Set/Delete along with the value and color fields are used to edit the color translation table.

- draw bold --- The line thickness specification of the actually selected table entry. If the mark is checked, the line is drawn 3 pixels wide, with the mark unchecked the line width is 1 pixel.
- value --- The parameter value of the actually selected table entry
- color --- The color specification of the actually selected table entry. This may either be the name of a basic color (red, yellow etc.) or a hexadecimal RGB color specification like '#FF8000'. The latter defines some sort of orange, consisting of 0xFF red, 0x80 green and 0x00 blue. The actually selected color is shown in the right part of the entry field, clicking to this opens a color chooser dialog which lets you select / compose the the color to your needs.
- Add / Set / Delete --- These buttons control editing the color translation list.
  - To add a new value / color pair to the list, fill the value and color fields, then click to "Add".
  - To change the color assigned to a given parameter value, first select the table entry of interest, change the color value and finally click "Set".
  - To delete a value / color pair from the list, select the table entry and then click "Delete".

Color / Line Width Codes

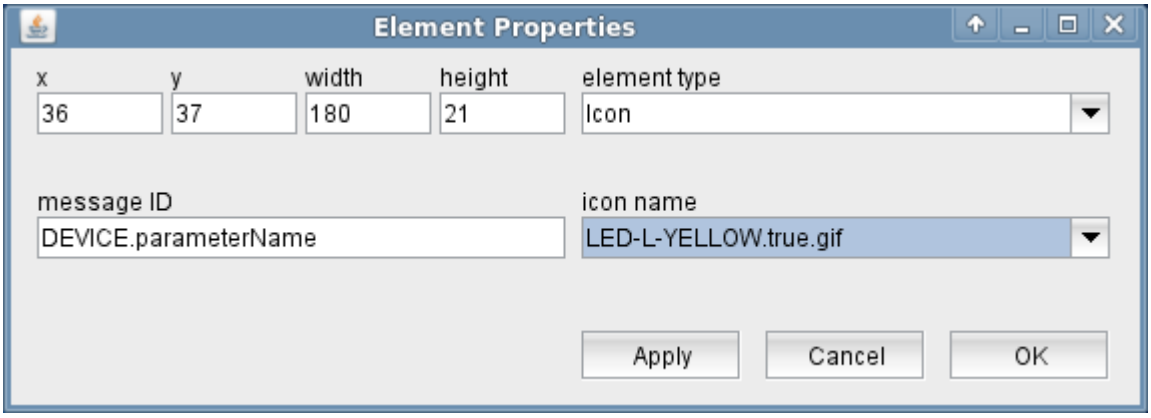
If you check the 'use variable line color' mark without using a color translation table, the software interprets the variable contents as a text value and parses it using the following rules (upper/lower case doesn't matter):

- If the variable value starts with one of the keywords BLACK, WHITE, RED, GREEN, BLUE, YELLOW or GRAY, this color is used.
- If the variable value ends with BOLD, the line is drawn 3 pixels wide (instead of 1 pixel default width).
- If the variable value is TRUE or it contains the text FAULT, the line is drawn red, 3 pixels wide if the variable denotes a fault flag.
- If the variable value is TRUE and the variable does not denote a fault flag, the line is drawn green, 3 pixels wide.
- If the variable value is ON, the line is drawn green, 3 pixels wide.
- If the variable value starts with a '#' character, the following six characters are interpreted as a hexadecimal number, specifying the RGB parts of an arbitrary color. Example: "#FF00FF-BOLD" defines a 3 pixels wide, magenta colored line.
- If none of the rules above matches, the line is drawn with the default color, 1 pixel wide.

The ' Gate-Array ' logical device may be used to combine several state variables in the M&C and generate the color codes expected by the line / arrow element.

1.16.2.4.8 Icon

The *Icon* display element shows an arbitrary GIF/JPEG picture. The image file must reside in the *./images* directory on the M&C/NMS server.



The attributes listed below may be configured to customize a display element of this type:

- message ID --- You can make the image change with a parameter value. The message ID addresses the parameter which selects the image to display (see below for details). The message ID consists of the device name followed by a colon and the name of the parameter. *XMIT-1.tx.on* for example addresses the variable *tx.on* at a device named *XMIT-1* . With the ' Device Driver Index ' in the appendix of this document there is a list of variable names provided for each device driver the software supports.
- icon name --- Selects the name of the image to display.

Using an icon to display a parameter

If you specify a message ID with the element properties of an *Icon* , the image displayed will change with the parameter value addressed by the message identifier.

You must supply one image file for each value the parameter may have. The parameter value must appear in the file name just in front of the gif/jpg suffix, enclosed in dots. All images used for one parameter should be of the same size. If the *Icon* element receives a parameter value it does not find an image file for, a black rectangle is displayed instead of an image.

Example: Let's assume you want to visualize a TX ON/OFF switch with an antenna symbol changing it's color with the position of the switch. Supply two images called "transmission.ON.gif" and "transmission.OFF.gif" which symbolize these states as you want. Notice that the ON/OFF keywords in the file names *exactly* reflect the possible values of this parameter and that the file names only differ in this point. Select one of image files for the icon element and enter the message Id of the TX-ON/OFF parameter into the appropriate field.

The mechanism used to select the image file to display mostly limits the usage of dynamically changing icons to CHOICE parameters. Merely numeric (integer) parameters with a very limited number of possible values come into question, too.

Using an icon to display a device summary fault

With device summary faults ("DEVNAME.fault"), and subsystem faults ("SUBSYSTEM. ... .fault")

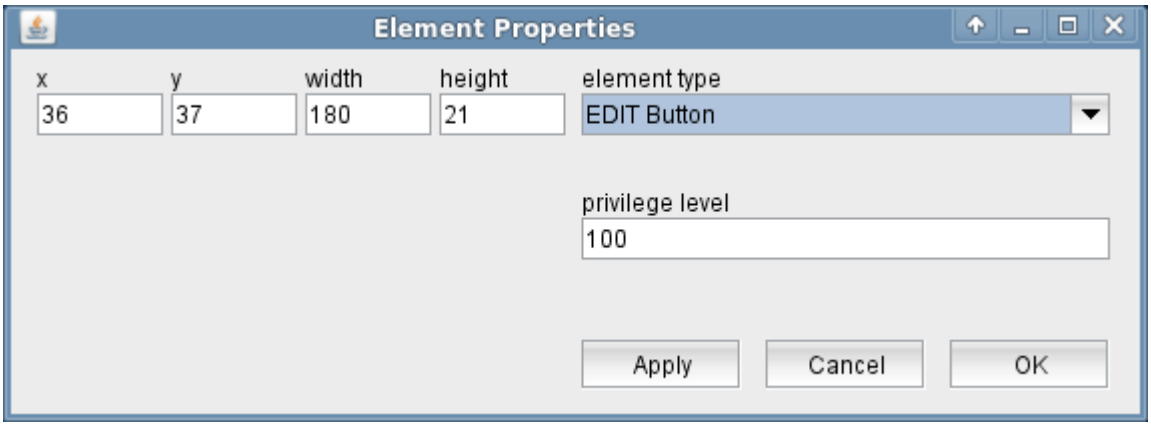
the *Icon* element translates the fault state to "true" for FAULT and "false" for "OK.". This is because the sat-nms software provides the individual fault flags in a device driver as boolean values, the summary fault however is represented by a text which can be one of "OK.", "WARNING" and "Summary FAULT". Translating the OK/FAULT values lets you use the same image files for individual and summary fault states.

To display a device summary fault as an color changing icon, you have to provide three image files, for example:

MyIcon.false.gif for the "OK" state **MyIcon.WARNING.gif** for the "WARNING" state **MyIcon.true.gif** for the "FAULT" state

1.16.2.4.9 EDIT Button

The *EDIT Button* display element places an EDIT button to the screen. It appears as a simple button with the label "EDIT" on it. You define one (and only one) EDIT button in a screen which shall be operated following the EDIT / TAKE operating method explained below. If you have an EDIT button in a screen you must have e TAKE button , too.



The attributes listed below may be configured to customize a display element of this type:

- privilege level --- With this attribute you specify the minimum privilege level an operator must own in order to be permitted to press this button.

The EDIT / TAKE operating method

The M&C software uses the same display elements to show the values read from a device (monitoring) and to change parameter settings on an operator's request (control). The operating situation determines whether a display element contains a monitored value or an edited one.

The software usually changes each parameter as you edit it. More precisely, if you edit a value in an entry field, the field's background becomes yellow to point out that the value is an edited one. If you leave the field or if you press RETURN, the edited value is sent to the device. CHOICE parameters behave slightly different, but in a similar sense.

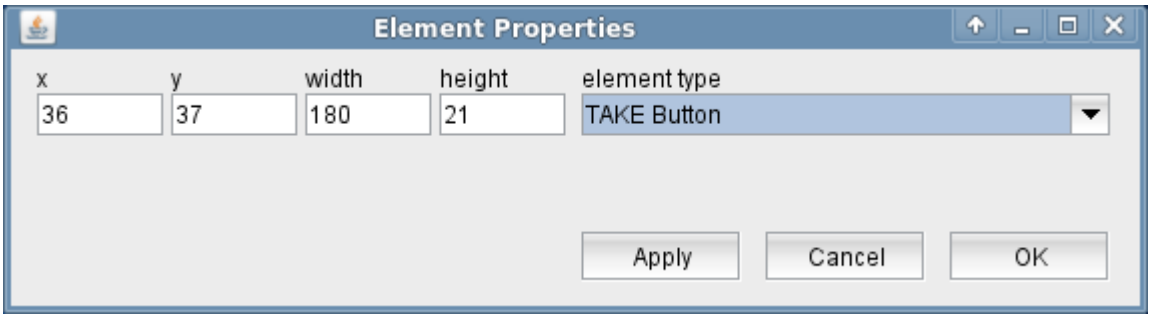
Now, if an EDIT button is defined in the screen, it behaves completely different. All display

elements in the screen show the values monitored at the device in the default state of the screen. You can't change any parameter in this state unless you press the EDIT button. With the EDIT button pressed (it's a latching one) the screen turns into "edit" state and stops updating the screen elements with the values monitored from the device. Now you can change the parameter values, however a changes value will not be sent to the device unless you press the TAKE button. When doing so, all parameter values from this screen are sent to the device at one time. The screen returns to the default state in order to show the values read back from the device.

Using the EDIT / TAKE operating method disables the "intelligent" change parameter ranges, some device drivers support. A modem device driver may dynamically change the valid range of the symbol rate depending of the FEC actually selected. With the EDIT / TAKE operating method, the device driver does not receive the FEC setting as you edit it and therefore cannot change the symbol rate range accordingly. For this reason you should use the EDIT / TAKE operating method only where this is a strong requirement for some reason, not as the default operating style for all screens.

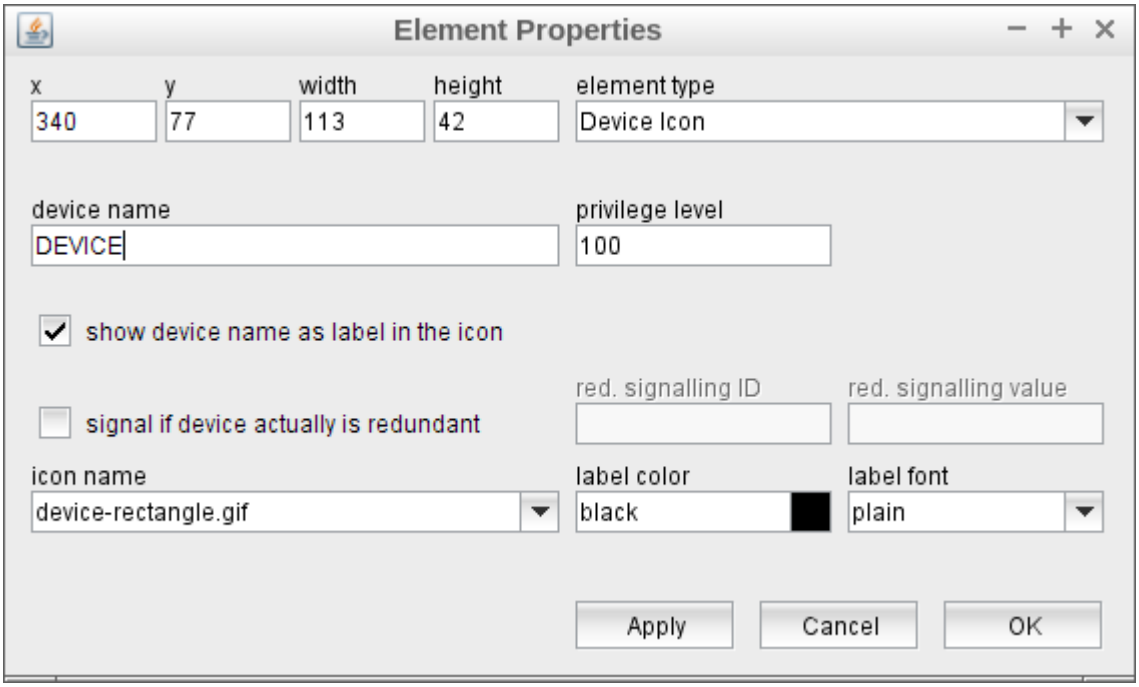
1.16.2.4.10 TAKE Button

The *TAKE Button* display element places an TAKE button to the screen. It appears as a simple button with the label "TAKE" on it. The TAKE button complements the EDIT button described above in this document. It sends the changed parameter values to their destination when pressed. A detailed description of the EDIT / TAKE operating method for M&C screens is given at the EDIT Button chapter.

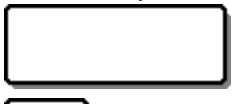


1.16.2.4.11 Device Icon

The *Device Icon* display element represents a device in the M&C user interface. It displays the status of the device by it's color/shape and gives access to the Device Window for this particular device by a double mouse click. The right mouse button launches a context menu with common operations for the device.



The attributes listed below may be configured to customize a display element of this type:

- device name --- The name of the device this element stands for.
- privilege level --- The privilege level necessary to use this device icon. The predefined screens of the software use 100. In your own screens you may set certain parameters to higher privilege levels, limiting the group of operators permitted to use this icon.
- show device name as label in the icon --- Check this mark to show name of the device as a label in the icon. Un checking may be useful when using very small icons where the label would not fit inside or when a label shall be used which differs from the name of the device.
- signal if device actually is redundant --- Check this mark to apply a special coloring for devices which are in the redundant signal path of a redundancy switching facility.
- red. signalling ID --- The message ID of a parameter which gives the information if the device actually operates as the redundant one or if it is operational. For a 1:1 TWTA redundancy this could be the position parameter of the waveguide switch which selects the signal from the two TWTAs
- red.singalling value --- If the value of the parameter addressed by above message ID matches the value given in this field, the device icon is shown as "redundant" (depends in the icon set used, the factory icon sets use a blue background color for this).
- icon name --- Selects the name of the image to display. The sat-nms software at least provides three predefined icons for this purpose:
  -  --- device-rectangle.gif
  -  --- device-square.gif
  -  --- device-minirect.gif

Your installation probably will contain some more device icons to select.

- label color --- The color attribute of a parameter element sets the color of the device name shown with the icon.
- label font --- The font attribute applies to the device name, too.

Using customized images

You may supply your own images for the device icon display element. To do so, place seven images into the *./images* directory named "xxxxx.gif", "xxxxx-F.gif" (fault), "xxxxx-C.gif" (communication fault), "xxxxx-S.gif (fault suppressed)", "xxxxx-R.gif" (redundant), "xxxxx-O.gif" (out of service) and "xxxxx-M.gif" (maintenance). You should consider the following:

- All images should be of the same size.
- The software places the device name at the lower left corner of the image using the selected font and color. All four images should use appropriate colors in this area to keep the device name visible.
- Beside GIF-images the software also accepts PNG images (file extension .png) and JPG images (file extension .jpg). All images of a set must be of the same type (GIF/PNG/JPG).

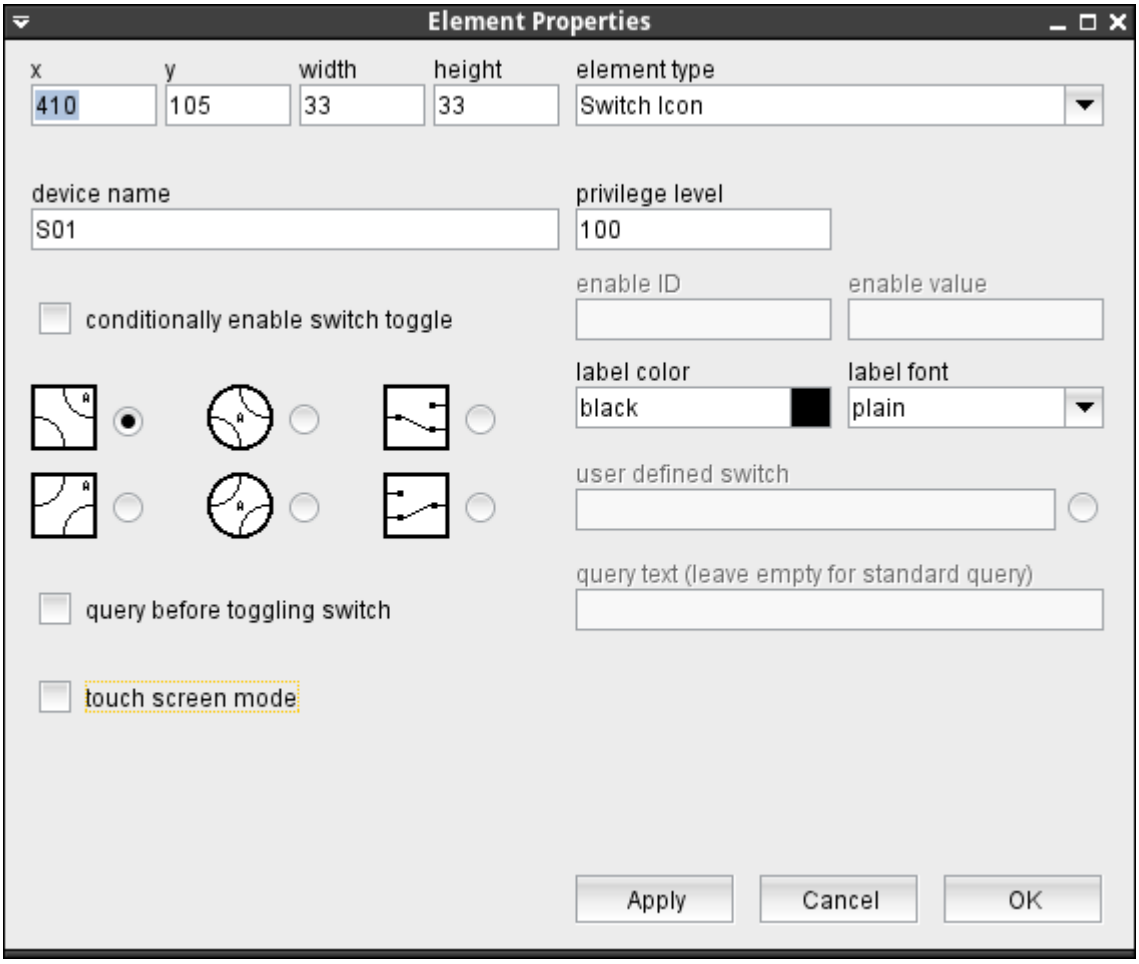
Using a customized 'transmitting' emblem

For devices which provide the 'info.signal.on' parameter to report that the device is actually transmitting or receiving, the device icon shows an emblem at it's upper right corner. The software uses the 'signal-on-emblem.png' image as a default for this.

You may define individual emblems for each image set by placing a "xxxxx-X.gif" (or .png/.jpg) image in the ./images folder with xxxxx being the base name of the device icon. The software will use this file for the transmitting emblem of this particular icon set. The file extension of the emblem must match the extension of the base icon image.

1.16.2.4.12 Switch Icon

The *Switch Icon* display element is a special version of the Device Icon element which may be used to visualize the position of a switch in a user interface screen designed as a block diagram. The switch icon has all capabilities of a plain device icon display element. The context menu shown with this right mouse button additionally contains an option to toggle the switch position. The switch icon element -- unlike the plain device icon element -- does *not* support user defined images.



The attributes listed below may be configured to customize a display element of this type:

- device name --- The name of the device this element stands for. You also may enter the complete ID of the parameter which controls the switch position for devices which manage more than one switch or use a non-standard switch position parameter name.
- privilege level --- The privilege level necessary to toggle the switch position. To change the device mode (OPERATIONAL, OUT-OF-SERVICE), at least a privilege of 100 is necessary, or the value set here if this is higher.
- conditionally enable switch toggle --- The toggle function of a switch icon may be locked unless another parameter matches a given value. For instance, changing the position of a wave guide switch may be inhibited while the carrier is switched on. Check this mark to activate this feature.
- enable ID --- This field defines the ID for the enabling parameter.
- value --- The value belonging to the parameter above. The actual value of the parameter addressed by "enable ID" must match this value in order to enable the toggle option of the switch icon.
- shape --- Select the shape of the icon from the given switch symbols or a user defined switch. .ts user defined switchThe (base-) name of a set of userdefined switch icons. See below how to use your own switch icons.
- label color --- The color attribute of a parameter element sets the color of the device name shown with the icon.

- label font --- The font attribute applies to the device name, too.
- query before toggling switch --- Check this mark to make the element show a query before a switch toggle gets executed.
- query text --- The query text to be shown in the pop-up window. you may leave this field empty, the program uses a standard query text in this case.In the question text, placeholders may used for two values: Any occurrences of the pattern **$P** get replaced by the parameter name (message ID). Any occurrences of the pattern **$V** get replaced by the new value to set.
- touch screen mode --- Selecting this option makes the switch icon behave differently, optimized for touch screen usage. You may toggle the switch position by touching the icon twice. This first time you touch it, the icon shows a turquoise ball in the upper left corner. This ball disappears after 2 seconds. If you touch the icon a second time before the turquoise ball disappears, the switch is actuated.There is no right mouse button context menu in this mode, no way to go into the device screen or set the device OUT-OF-SERVICE.

Remarks

Configuring a confirmation question as described above, only affects the 'Toggle position' function provided by the switch icon's right mouse context menu. Setting the switch position from the device dialog always works without a confirmation request.

User defined switch icons

The sat-nms software comes with 6 predefined switch icons. You may add your own icons if none of the predefined switches matches your needs.

For a user defined switch you have to create a set of ten PNG image files / icons. Each icon shows one combination of switch position and device state. All icons of a set must be of the same size, the files must be located in the *images* subdirectory of the sat-nms server installation and they must follow the naming scheme described below.

The file name of a switch icon consists of the user defined name, follwed by a dash and a 2-character status code. All switch icons must be PNG images and end with the file suffix ".png" (lower case). The first character of the status code reflects the switch position, the second one the device's fault/operation state. The following codes are defined:

pos.	***character***	***description***
1	A	switch is in position A (or OFF)
1	B	switch is in position B (or ON)
2	N	switch device is in normal operation, no fault is pending
2	W	switch device shows a warning
2	F	switch device shows a fault

pos.	*character*	*description*
2	S	switch device is set FAULT-SUPPRESSED
2	O	switch device is set OUT-OF-SERVICE

Combining the two switch positions with five device status codes results in totally 10 icons which show all possible states of a switch. If you create a switch named "myswitch", the files would be:

myswitch-AN.png myswitch-AW.png myswitch-AF.png myswitch-AS.png myswitch-AO.png myswitch-BN.png myswitch-BW.png myswitch-BF.png myswitch-BS.png myswitch-BO.png

Replacing the predefined icons

In in your sat-nms installation mostly user defined switch symbols are used, you may replace some or all of the predefined switch symbols offered by the Switch Icon dialog with your favorite icons. To configure this, edit the file "client.properties" in the base directory of the sat-nms server installation and add some or all lines of the following:

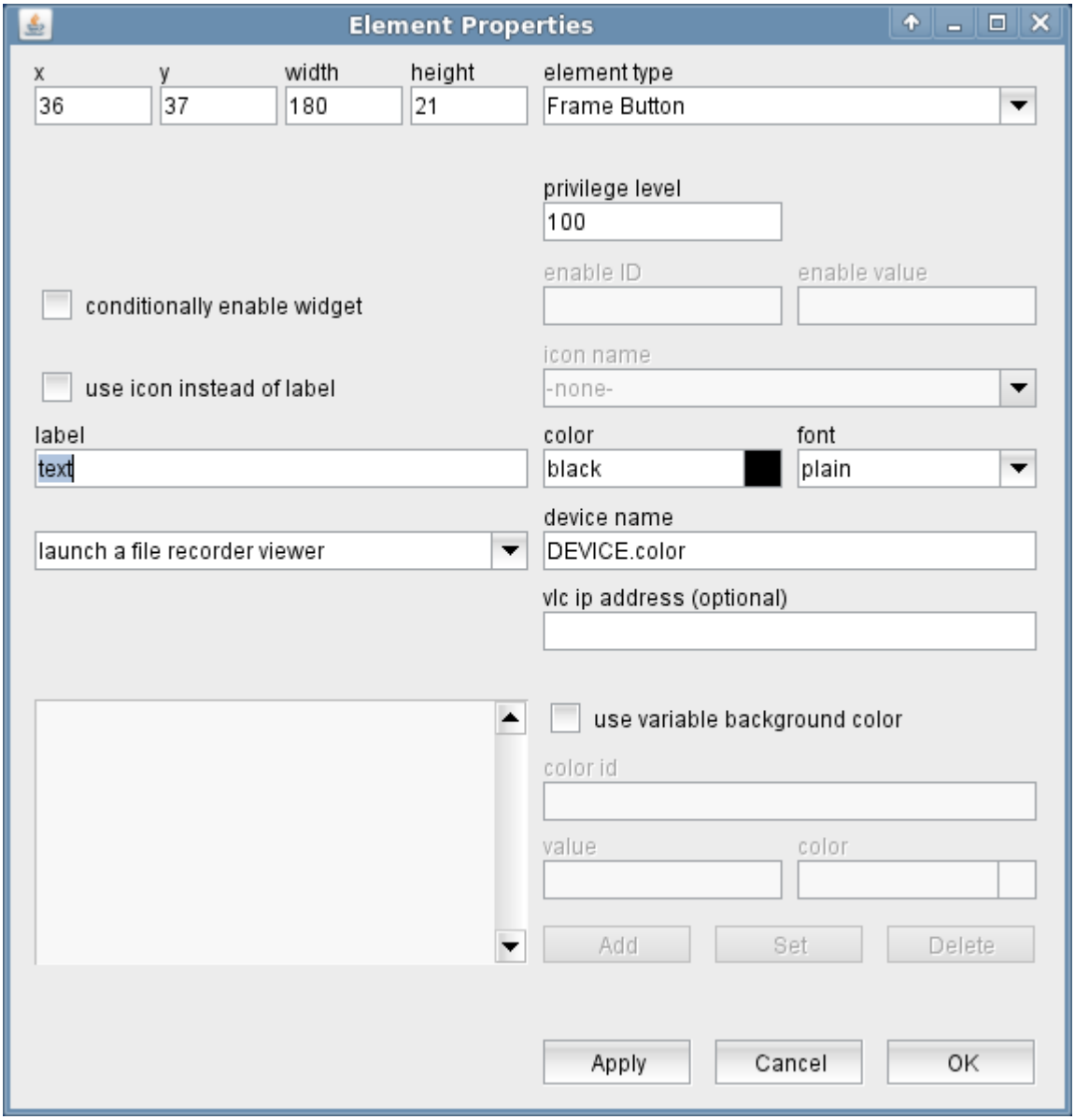
gui.editor.predefinedSwitch.1=myswitch1 (replace myswitch1 by the name of the icon set to use) **gui.editor.predefinedSwitch.2=myswitch2 gui.editor.predefinedSwitch.3=myswitch3 gui.editor.predefinedSwitch.4=myswitch4 gui.editor.predefinedSwitch.5=myswitch5 gui.editor.predefinedSwitch.6=myswitch6**

Please note, this does not replace / delete the factory icons. Screens which make use of the factory switches will still use them as before and you are still able to edit screens with factory switch icons by explicitly define their names in the *user defined switch* field. The names of the factory switch icons are *wgswitch* , *wgswitch-mirrored* , *cxswitch* , *cxswitch-mirrored* , *lswitch* and *rswitch* .

User defined switch icons may be of any size, even larger than the factory icons. When used as predefined switch icons, such large icons will show up in the dialog with their upper left corner only. In the screen the icons gets displayed with it's full size.

1.16.2.4.13 Frame Button

The *Frame Button* display element creates a button which launches another user interface screen if pressed. The screen to be launched may be another user defined screen or a predefined one.



The attributes listed below may be configured to customize a display element of this type:

- privilege level --- The privilege level necessary to activate this button. The predefined screens of the software use 100. In your own screens you may set certain parameters to higher privilege levels, limiting the group of operators permitted to change the parameter.
- conditionally enable widget --- FRame buttons may be locked to disabled state unless another parameter matches a given value. Check this mark to activate this feature.
- enable ID --- This field defines the ID for the enabling parameter.
- value --- The value belonging to the parameter above. The actual value of the parameter addressed by "enable ID" mut match this value in order to enable the entry field.
- use icon instead or label --- Check this mark in order to make the button show an icon instead of a label text.
- icon name --- Provides a list of all available icons / images on the sat-nms server.
- font --- The font to be used for the button label.

- label --- The label text is drawn on the button.
- color --- The color of the button label. Colors may be specified by standard color names like red / green / blue or using a hexadecimal RGB notation. '#FFFF00' for example specifies yellow. You may click to the color example field in order to open a color chooser dialog and select the color from there.
- font --- The font of the button label.
- button function --- with this field you select the function of the button. The available functions are listed below. The meaning of the parameters right beside the function selector changes with the function selected.
- *launch a child screen* --- Launches a new screen in a separate window. Parameter 1: screen name Parameter 2: n/a
- *replacescreenwithanotherone* --- Replaces the actual screen by another one, re-uses the same window. Parameter 1: screen name Parameter 2: n/a
- *launch a tty setup window* --- Launches a dialog to edit the line settings of a serial interface. Parameter 1: interface name, e.g. ttyS2 Parameter 2: n/a
- *launch a device setup window* --- Launches a dialog to edit the setup parameters of a given device. Parameter 1: name of the device Parameter 2: n/a
- *launch a load preset dialog* --- Launches a dialog to select and apply a preset to a given device. Parameter 1: must contain the name of the device, followed by a comma and the name of the device driver used by the device. Example: MODEM-1,Comstream-CM601A-SCPC Parameter 2: if this parameter is not empty, the preset load dialog initializes it's search pattern field with this value. Only presets containing the pattern string (character case doesn't matter) will appear in the list.
- *launch a text viewer window* --- Launches a multiline text view window which shows the actual contents of the given parameter. Parameter 1: The message ID of the parameter to show. Parameter 2: n/a
- *launch a tracking viewer* --- Launches a tracking report window for the Antenna-Tracking logical device. The tracking report window shows azimuth or elevation together with the beacon level over the recent 48 hours. Parameter 1: The message ID to show. Typically this is the "state.mode4" Parameter of an Antenna-Tracking or a SatService-ACU-ODM device. Parameter 2: n/a
- *launch a az/el viewer* --- This is much like the tracking viewer, but the window plots elevation versus azimuth in a quadratic diagram. Parameter 1: The message ID to show. Typically this is the "state.mode4" Parameter of an Antenna-Tracking or a SatService-ACU-ODM device. Parameter 2: n/a
- *launch a file recorder viewer* --- Launches a graphical presentation screen for data recorded with a File-Recorder logical device. Parameter 1: Name of the File-Recorder device and (optionally) a preset number 1..8 to be invoked after the data has been loaded. A ">" may be appended to the preset number in order to make the diagram show recent data instead of the data shown at the time when the preset was stored. Example: "FILEREC-12>" shows the dat a of the FILEREC-1 device, invokes the preset number 2 and shows the data recently recorded by the file recorder device. Parameter 2: In an NMS environment you must supply the VLC's IP address in this field. The VLC must be reachable directly and permanently from the client PC to make this feature work safely. In a M&C system leave the field empty
- *launch a spectrum viewer* --- Launches the device window of a spectrum analyzer and optionally sets an arbitrary number of parameters. Parameter 1: The name of the

spectrum analyzer device Parameter 2: An optional macro list. This may contain zero or more parameter ID - value pairs. These settings may be used to preset the spectrum analyzer certain settings but also to control switches or other devices in the signal path. Example: S03=B, SA1.center=12345.666 If the operator clicks to this button, the switch S03 is commanded to position B, the spectrum analyzer SA1 is set for a center frequency of 12345.666 MHz and the spectrum analyzer window gets opened.

- *launch an m&c client* --- Launches another M&C client program which connects to the given IP address. The M&C client runs in a separate JVM. It tries to login at the target machine with the same name and password the parent program uses. Parameter 1: The address to connect to Parameter 2: n/a
- *launch another java runtime* --- Runs an arbitrary Java program by starting another JRE process. Note, that all command line arguments including the classpath specification must be provided. These arguments probably will be platform specific, hence a user interface depending on this feature only will work on the platform it is configured for. Parameter 1: The command line parameter for the java program Parameter 2: n/a
- *launch a web browser window* --- Launches the platform's standard web browser and shows the given URL. Parameter 1: The URL to show. To show a certain page of the online manual, simply use the 4 digit topic number of the page as the URL parameter. To show an extern web page, e.g. the web based user interface of a sat-nms ACU ODM, enter a URL starting with "http://...". Example: " **http://192.168.2.81** ". Parameter 1 must be a valid URL string in this case, space characters must be escaped as "%20". The BROWSER button this way also can be used to operate a device which provides a web user interface. In device-oriented screens, the character '@' gets expanded to the device's IP address if contained in the URL string. Example: " **http:///** " lets the browser call the top page of the device's web user interface. Parameter 2: n/a
- *start a program on the client pc* --- Starts a program on the client computer. The program must be specified with the full path to the executable file. Parameters for the program may be added, separated space characters. If the path name itself contains space characters, in must be enclosed in double quotes.
- *launch a VideoLAN media player window* --- Starts the VLC media player in a new window to show live video from a certain device. This works with devices like webcams, if the device driver is prepared for this. See the paragraph "VideoLAN media player" below for more details. Parameter 1: The name of the device for which the VLC player shall show the video stream. When used in a device window, parameter 1 is ignored and the button uses the name of the device of this window. Parameter 2: n/a
- *launch a Pointing-Robot import screen* --- Launches a file import window which lets you import pointing table, TLE or Intelsat ephemeris data files from the client PC to the M&C server compunter into the directory where the Pointing-Robot expects these files. Parameter 1: n/a Parameter 2: n/a
- *navigate to a given treeview node* --- Makes the button a navigation button for the treeview application. Clicking the button changes the panel at the right side of the tree view window as if the tree node described by the path specification would have been clicked. Parameter 1: The tree node (path) specification for the button. The path consists of the display names of the tree nodes making up the path to the desired node, separated by '.' characters. If the button for example shall show the page for a subsystem called "Stream-1" contained in a subsystem called "Streams", then the path specification for the button is **Streams.Steam-1** Parameter 2: n/a

- use variable background color --- Checking this mark enables the variable background color feature for this screen element. Depending on the actual value of the variable addressed by 'color id', the element's background is set using the translation table shown in the lower left corner of the dialog. If the actual value of the color id variable does not match any of the table entries or if no color id is specified, the first color in the list is used to draw the element's background. The buttons Add/Set/Delete along with the value and color fields are used to edit the color translation table.
- color id --- The message ID of the parameter which controls the background color of this element.
- value --- The parameter value of the actually selected table entry
- color --- The color specification of the actually selected table entry. This may either be the name of a basic color (red, yellow etc.) or a hexadecimal RGB color specification like '#FF8000'. The latter defines some sort of orange, consisting of 0xFF red, 0x80 green and 0x00 blue. The actually selected color is shown in the right part of the entry field, clicking to this opens a color chooser dialog which lets you select / compose the the color to your needs.
- Add / Set / Delete --- These buttons control editing the color translation list.
    - To add a new value / color pair to the list, fill the value and color fields, then click to "Add".
    - To change the color assigned to a given parameter value, first select the table entry of interest, change the color value and finally click "Set".
    - To delete a value / color pair from the list, select the table entry and then click "Delete".

VideoLAN media player

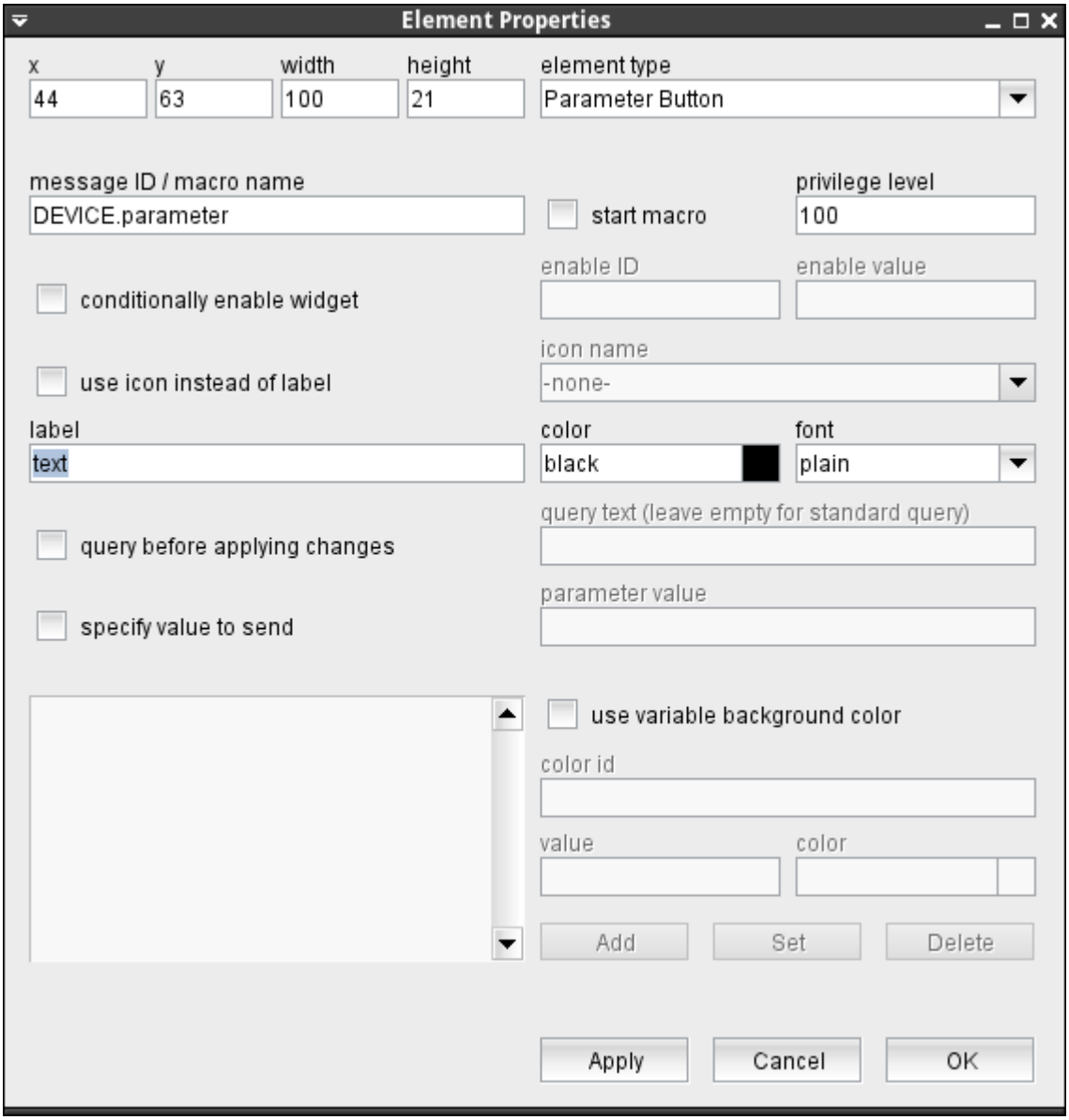
The Frame Button may be configured to launch a VideoLAN media player (VLC) in order to show a live video stream sent by any device capable for this. To use this feature, the VideoLAN media player must be installed on the client machine and the sat-nms driver of the device sending the video stream must be prepared for this.

The frame button expects the device driver to provide a variable called *videoLAN.cmds* which must contain all command line parameters the VLC media player requires to show the desired stream. In the simplest case this is an URL specifying the video stream, but other command line parameters for the VLC player may be used as well.

To launch the VLC media player on Microsoft Windows clients, the program must know the complete path to the executable "vlc.exe". In the M&C server's configuration file 'client.properties' you may set this path. If required, multiple variants may defined, one for each client PC. You find more details on this in the factory default 'client.properties' file.

1.16.2.4.14 Parameter Button

The *Parameter Button* display element is a button which sends a parameter value if pressed. A frequently used application for the parameter button is a RF-OFF button which sends a "tx.on=OFF" to a certain device. Beside this, a parameter button also may be programmed to play a parameter setting macro.



The attributes listed below may be configured to customize a display element of this type:

- message ID / macro name --- The message ID addresses the parameter the button shall control. The message ID consists of the device name followed by a colon and the name of the parameter. *XMIT-1.tx.on* for example addresses the variable*tx.on* at a device named *XMIT-1* . With the '[Device Driver Index](#) ' in the appendix of this document there is a list of variable names provided for each device driver the software supports.If the "start macro" mark ist checked, this button acts as a macro player button instead of sending a parameter. In this case the field contains the name of the macro to play. If used in an NMS, the macro with this name must be present in the "./macros" subdirectory of the NMS installation.
- start macro --- Selects if the button shall start a macro (checked) or send a certain parameter (unchecked).
- privilege level --- The privilege level necessary to access this button. The predefined screens of the software use 100. In your own screens you may set certain parameters to

higher privilege levels, limiting the group of operators permitted to change the parameter.
- conditionally enable widget --- Parameter buttons may be locked to disabled state unless another parameter matches a given value. For instance, changing the position of a wave guide switch may be inhibited while the carrier is switched on. Check this mark to activate this feature.
- enable ID --- This field defines the ID for the enabling parameter.
- value --- The value belonging to the parameter above. The actual value of the parameter addressed by "enable ID" mut match this value in order to enable the button.
- use icon instead or label --- Check this mark in order to make the button show an icon instead of a label text.
- icon name --- Provides a list of all available icons / images on the sat-nms server.
- label --- The label text is drawn on the button.
- color --- The color of the button label. Colors may be specified by standard color names like red / green / blue or using a hexadecimal RGB notation. '#FFFF00' for example specifies yellow. You may click to the color example field in order to open a color chooser dialog and select the color from there.
- font --- The font to be used for the button label.
- query before applying changes --- Check this mark to make the element show a query before a parameter gets actually commanded.
- query text --- The query text to be shown in the pop-up window. you may leave this field empty, the program uses a standard query text in this case.In the question text, placeholders may used for two values: Any occurrences of the pattern **$P** get replaced by the parameter name (message ID). Any occurrences of the pattern **$V** get replaced by the new value to set.
- specify values to send --- Checking this mark let you define the parameter value to be sent with a button click. Without this option the button sends the label text as a parameter value.
- parameter value --- The value to be sent when the button is clicked.
- use variable background color --- Checking this mark enables the variable background color feature for this screen element. Depending on the actual value of the variable addressed by 'color id', the element's background is set using the translation table shown in the lower left corner of the dialog. If the actual value of the color id variable does not match any of the table entries or if no color id is specified, the first color in the list is used to draw the element's background.The buttons Add/Set/Delete along with the value and color fields are used to edit the color translation table.
- color id --- The message ID of the parameter which controls the background color of this element.
- value --- The parameter value of the actually selected table entry
- color --- The color specification of the actually selected table entry. This may either be the name of a basic color (red, yellow etc.) or a hexadecimal RGB color specification like '#FF8000'. The latter defines some sort of orange, consisting of 0xFF red, 0x80 green and 0x00 blue. The actually selected color is shown in the right part of the entry field, clicking to this opens a color chooser dialog which lets you select / compose the the color to your needs.
- Add / Set / Delete --- These buttons control editing the color translation list.
    - To add a new value / color pair to the list, fill the value and color fields, then click to

"Add".
- To change the color assigned to a given parameter value, first select the table entry of interest, change the color value and finally click "Set".
- To delete a value / color pair from the list, select the table entry and then click "Delete".

Using the Parameter Button to control device presets

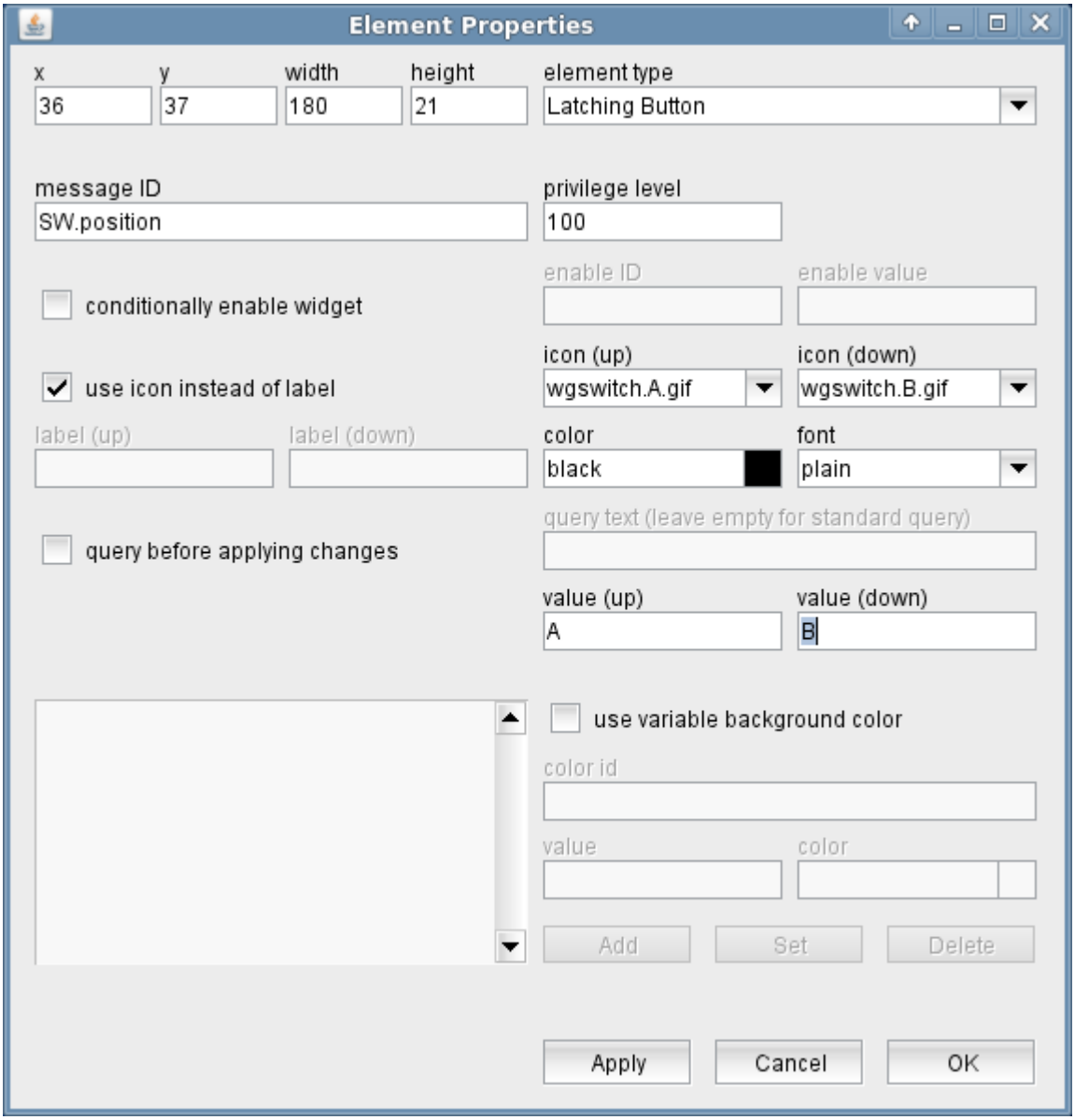
Each device in the sat-nms software knows two hidden variables which control storing and applying of device presets. The variables are called 'loadPreset' and 'savePreset'. Sending a string value to one of these variables will load or save a device preset with the name given as the variable value. Please note, that this feature uses preset files stored on the M&C/VLC itself. Hence, in a NMS environment these presets are only available for the particular VLC and these presets cannot be managed by the standard preset load/save functions in the device window toolbar in this case.

1.16.2.4.15 Latching Button

The *Latching Button* display element works much like the Parameter Button element described in the previous chapter, but specialized to show and control an enumeration parameter which knows exactly two states (e.g. on/off or true/false).

When the operator changes the state of the button by clicking it once, the latching button sends the 'other' parameter value to the device. On the other hand, if some other instance in the system changes the parameter state, the latching button recognizes this and changes the up/down state of the button accordingly.

Like the parameter button, the latching button may be labeled with text or an image. To reflect the actual state, the latching button always is configred with two text string or two image names which are shown according to the actual parameter value.



The attributes listed below may be configured to customize a display element of this type:

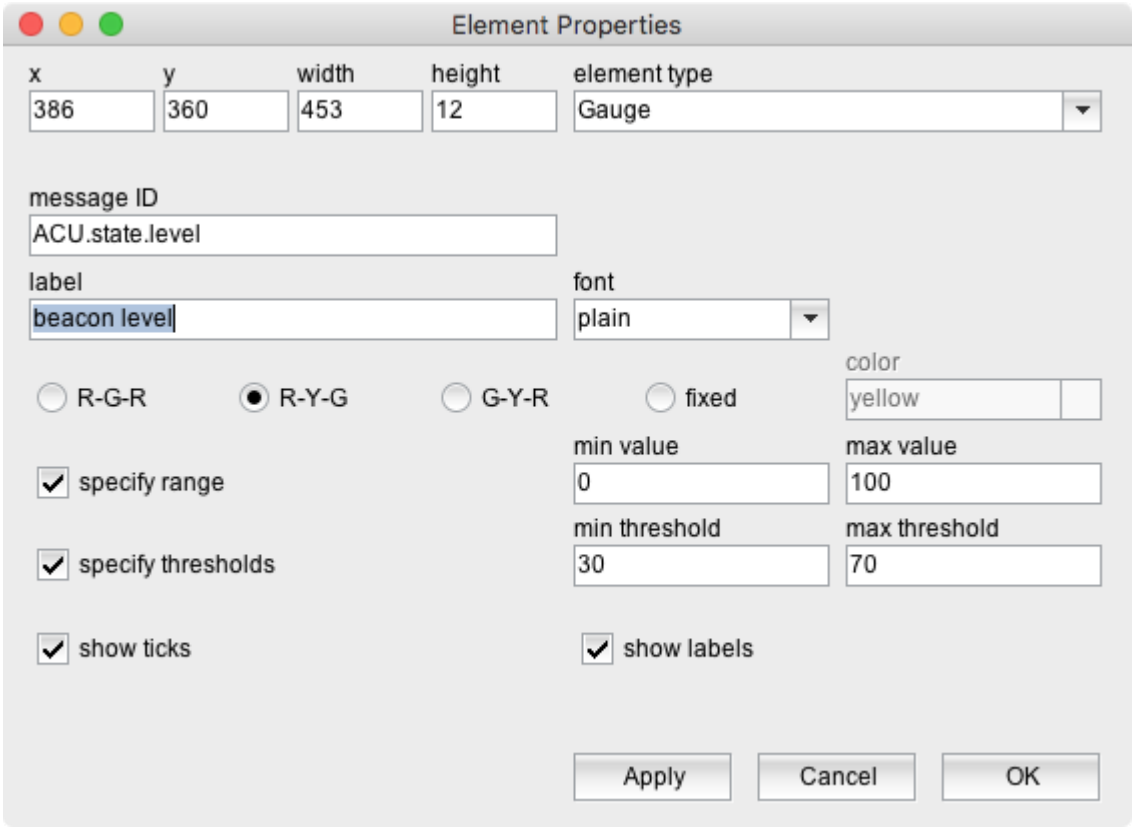
- message ID --- The message ID addresses the parameter the button shall control. The message ID consists of the device name followed by a colon and the name of the parameter. *XMIT-1.tx.on* for example addresses the variable *tx.on* at a device named *XMIT-1* . With the ' Device Driver Index ' in the appendix of this document there is a list of variable names provided for each device driver the software supports.
- privilege level --- The privilege level necessary to access this button. The predefined screens of the software use 100. In your own screens you may set certain parameters to higher privilege levels, limiting the group of operators permitted to change the parameter.
- conditionally enable widget --- Parameter buttons may be locked to disabled state unless another parameter matches a given value. For instance, changing the position of a wave guide switch may be inhibited while the carrier is switched on. Check this mark to activate this feature.

- enable ID --- This field defines the ID for the enabling parameter.
- value --- The value belonging to the parameter above. The actual value of the parameter addressed by "enable ID" mut match this value in order to enable the button.
- use icon instead or label --- Check this mark in order to make the button show an icon instead of a label text.
- icon (up) --- The name of the icon to be shown in "up" state of the button. The field provides a list of all available icons / images on the sat-nms server.
- icon (down) --- The name of the icon to be shown in "down" state of the button. The field provides a list of all available icons / images on the sat-nms server.
- label (up) --- This label text is drawn on the button in "up" state.
- label (down) --- This label text is drawn on the button in "down" state.
- color --- The color attribute of a parameter element sets the color of the label shown on the button. Colors may be specified by standard color names like red / green / blue or using a hexadecimal RGB notation. '#FFFF00' for example specifies yellow. You may click to the color example field in order to open a color chooser dialog and select the color from there.
- font --- The font to be used for the button label.
- query before applying changes --- Check this mark to make the element show a query before a parameter gets actually commanded.
- query text --- The query text to be shown in the pop-up window. you may leave this field empty, the program uses a standard query text in this case.In the question text, placeholders may used for two values: Any occurrences of the pattern **$P** get replaced by the parameter name (message ID). Any occurrences of the pattern **$V** get replaced by the new value to set.
- value (up) --- The value to be sent when the button is clicked an changes to "up" state.
- value (down) --- The value to be sent when the button is clicked an changes to "down" state.
- use variable background color --- Checking this mark enables the variable background color feature for this screen element. Depending on the actual value of the variable addressed by 'color id', the element's background is set using the translation table shown in the lower left corner of the dialog. If the actual value of the color id variable does not match any of the table entries or if no color id is specified, the first color in the list is used to draw the element's background.The buttons Add/Set/Delete along with the value and color fields are used to edit the color translation table.
- color id --- The message ID of the parameter which controls the background color of this element.
- value --- The parameter value of the actually selected table entry
- color --- The color specification of the actually selected table entry. This may either be the name of a basic color (red, yellow etc.) or a hexadecimal RGB color specification like '#FF8000'. The latter defines some sort of orange, consisting of 0xFF red, 0x80 green and 0x00 blue. The actually selected color is shown in the right part of the entry field, clicking to this opens a color chooser dialog which lets you select / compose the the color to your needs.
- Add / Set / Delete --- These buttons control editing the color translation list.
    - To add a new value / color pair to the list, fill the value and color fields, then click to "Add".
    - To change the color assigned to a given parameter value, first select the table entry

of interest, change the color value and finally click "Set".
- To delete a value / color pair from the list, select the table entry and then click "Delete".

1.16.2.4.16 Gauge (Bar Graph)

The *Gauge* display element shows a numeric parameter value as a horizontal bar in an entry field like frame. The gauge element is capable to adjust the scale factor for the gauge automatically from the parameter's range definition. Alternatively the scale parameters may set explicitly.



The attributes listed below may be configured to customize a display element of this type:

- message ID --- The message ID addresses the parameter the element shall display. The message ID consists of the device name followed by a colon and the name of the parameter. *XMIT-1.tx.on* for example addresses the variable *tx.on* at a device named *XMIT-1* . With the 'Device Driver Index ' in the appendix of this document there is a list of variable names provided for each device driver the software supports.
- label --- The label text drawn above the gauge / bar graph.
- font --- The font attribute applies to the label text shown above the gauge element.
- color scheme --- The gauge element knows three color schemes, allowing to change the bar color dynamically with the monitored value: | *color scheme* | *description* | | ---- | ---- | | R-G-R | RED/GREEN/RED The bar is displayed green while the value is between the minimum and maximum thresholds. If the value is outside the limits, the bar is displayed red. | | R-Y-G | RED/YELLOW/GREEN The bar is displayed red while the value is below the

minimum threshold value. It changes to yellow if the value is between the minimum and maximum thresholds. If the value exceeds the maximum threshold, the bar color changes to green. | | G-Y-R | GREEN/YELLOW/RED The bar is displayed green while the value is below the minimum threshold value. It changes to yellow if the value is between the minimum and maximum thresholds. If the value exceeds the maximum threshold, the bar color changes to red. | | fixed color | The bar is displayed with the color defined with the field 'color'. |

Please note, unless you specify min/max thresholds for the monitored value, only the fixed color mode is available.

- color --- The bar color used with the fixed color scheme. Colors may be specified by standard color names like red / green / blue or using a hexadecimal RGB notation. '#FFFF00' for example specifies yellow. You may click to the color example field in order to open a color chooser dialog and select the color from there.
- specify range --- Check this mark to define the range which is displayed by the gauge element.
- min value --- The minimum value of the displayed range.
- max value --- The maximum value of the displayed range.
- specify thresholds --- Check this mark to define the threshold values which are used for RGR and GYR color schemes.
- min threshold --- The minimum threshold value.
- max value --- The maximum threshold value.
- show ticks --- check this mark to make the element show scale ticks vor the min/max and threshold values below the gauge.
- show labels --- With this mark checked, below the gauge element labeled ticks are shown for the min/max and threshold values. (requires "show ticks"). Bar graph elements with this option enabled should be configured with a width that is sufficient to show the scale labels without overlap.

Scaling and Threshold Display

Principally there are three ways to use a gauge element and to control the scaling of the display:

1. The default behavior of the gauge element is to examine the display scaling from the range definition of the displayed variable. The scaling is set that the complete range of the variable is displayed. This works fine if the displayed variable comes with a properly set range definition. Some drivers however define the range of read only parameters as 0..0 (means 'don't know the limits') or as a extraneous wide range to avoid overflows. Variables with such range definitions will not display in a meaningful way. The default scaling does not provide any threshold monitoring or tick display.
2. You may explicitly specify the display range with a range definition in the appropriate fields as described above. Such a definition overwrites the default scaling of the gauge element. You may include unit descriptions to the scale values, but you should consider, that long scale labels tend to overlap and become unreadable.
3. If you let the gauge element monitor the 'gauge' status variable of aLevel-Set logical device, this state variable will provide it's own display range and threshold definition. This

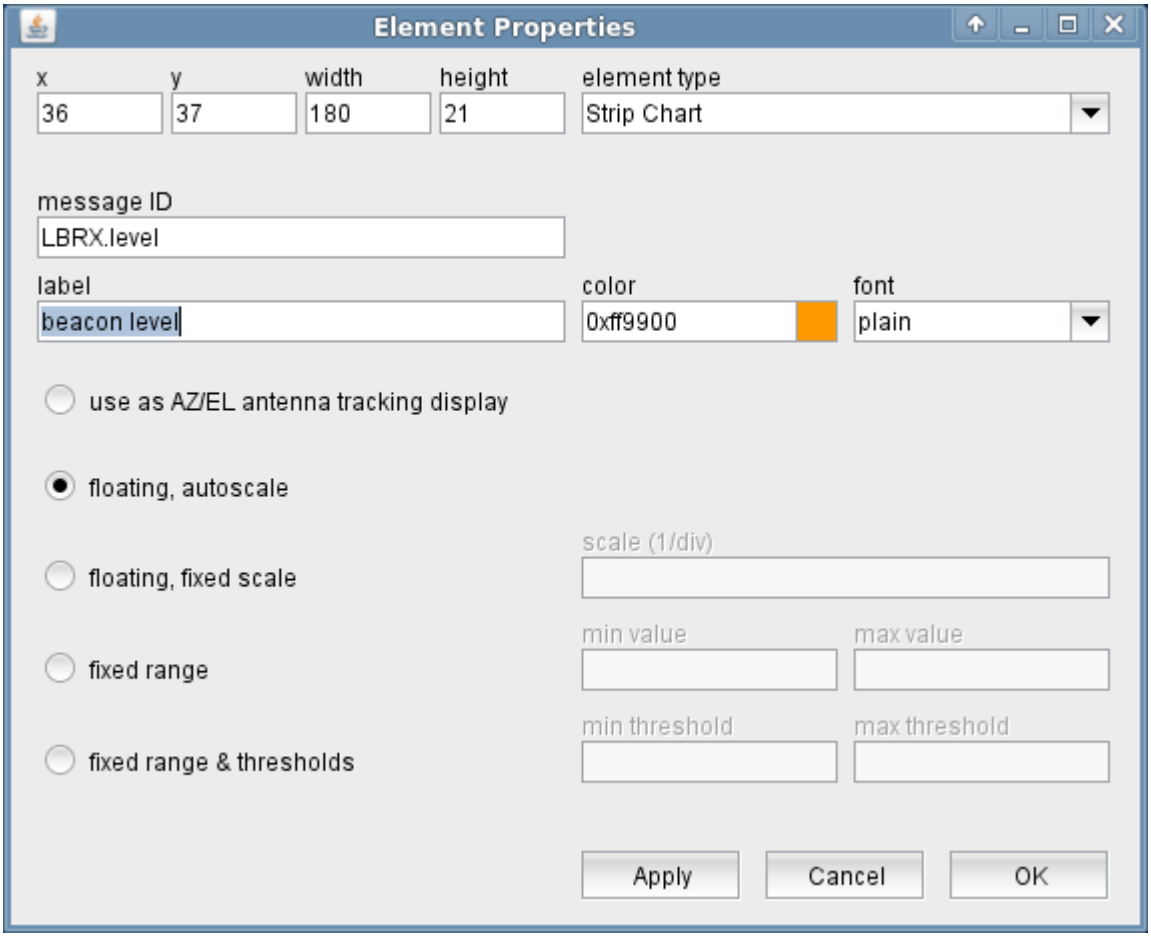
replaces the default scaling and also a scaling explicitly defined for this element. The display range provided by the Level-Set device always includes threshold definitions, but does not turn on the display of labeled ticks under the bar graph. If you want to enable this, you have to specify a dummy display range and thresholds in the fields described above.

1.16.2.4.17 Strip Chart

The *Strip Chart* display element shows a strip chart of a numeric parameter. The chart advances with a constant speed of 1 pixel / second. The default y-scale is 1/division but may be changed by clicking to the chart with the right mouse button.

By default, the strip chart element lets the y-scale offset follow the displayed value that the recent measurement samples are shown in the diagram. This behavior is optimized for applications where the strip chart shall indicate a 'trend' for the displayed value, using an element height of only 50 pixels or less.

Optionally you may disable this variable scaling by defining fixed scale values in the 'Text / Image Name' field. With this fixed y-axis scaling an additional threshold check may be added, turning the chart background to red if the actual value exceeds the defined limits. When used with limit checking, the height of the chart should be at least 100 pixels.



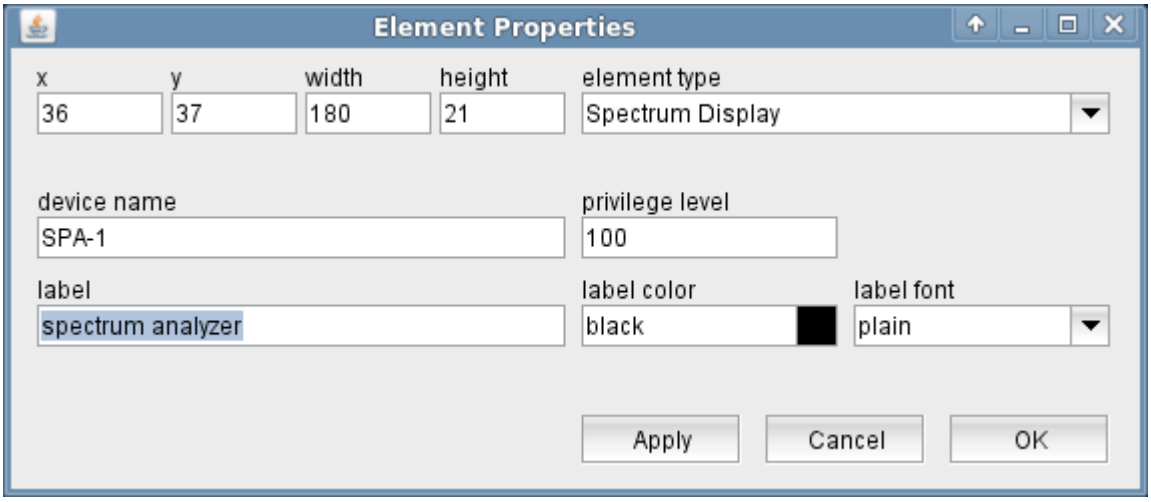
The attributes listed below may be configured to customize a display element of this type:

- message ID --- The message ID addresses the parameter the element shall display. The message ID consists of the device name followed by a colon and the name of the parameter. *XMIT-1.tx.on* for example addresses the variable *tx.on* at a device named *XMIT-1* . With the 'Device Driver Index ' in the appendix of this document there is a list of variable names provided for each device driver the software supports.
- label --- The label text drawn above the strip chart
- color --- Defines the pen color and the color of the label drawn above the chart. Colors may be specified by standard color names like red / green / blue or using a hexadecimal RGB notation. '#FFFF00' for example specifies yellow. You may click to the color example field in order to open a color chooser dialog and select the color from there.
- font --- The font attribute applies to the label text shown above the strip chart.
- display mode --- Selects the display mode of the strip chart element. Five modes are available:**use as AZ/EL antenna tracking display** The strip chart display element also may be used to place an Az/El diagram into a user interface for an Antenna-Tracking logical device. To do this, select this option and let the display element listen to the '.state.mode4' parameter of the Antenna-Tracking device. The Az/El diagram has a fixed size, you should align the display element size that the diagram is displayed properly.**floating, autoscale** This is the standard display mode. The strip chart aligns the reference value (the medium display line) in a way that every new display point is shown on this line. The initial scale is 1 unit/div.**floating, fixed scale** Works like the above mode, but the scale value gets initialized with a user defined value.**fixed range** The min/max values to display are defined explicitly, there is no automatic reference level alignment with this mode.**fixed range & thresholds** Like the above mode, but additionally there are min/max thresholds defined. If the actual value of the monitored parameter, the display background changes to red.
- scale --- The initial scale value used with the 'floating, fixed scale' mode.
- min value --- The minimum value to display for the fixed range display modes.
- max value --- The maximum value to display for the fixed range display modes.
- min threshold --- The lower threshold value for the "fixed range & thresholds" mode.
- max threshold --- The upper threshold value for the "fixed range & thresholds" mode.

1.16.2.4.18 Spectrum Display

The *Spectrum Display* element embeds the spectrum display of a spectrum analyzer device in the screen. The display may be scaled to an almost arbitrary size, however the following limitations apply:

- The annotation labels which reflect the actual spectrum analyzer settings are not scaled with the display element. If the element is very small, the labels may overlap and become unreadable.
- Resizing the spectrum display element is only possible in certain steps, the grid behind the spectrum curve is always made up of *10*n + 11* pixels in one dimension. The screen editor software knows about this, snaps the size of the element to the next (smaller) valid size after you release the mouse button.



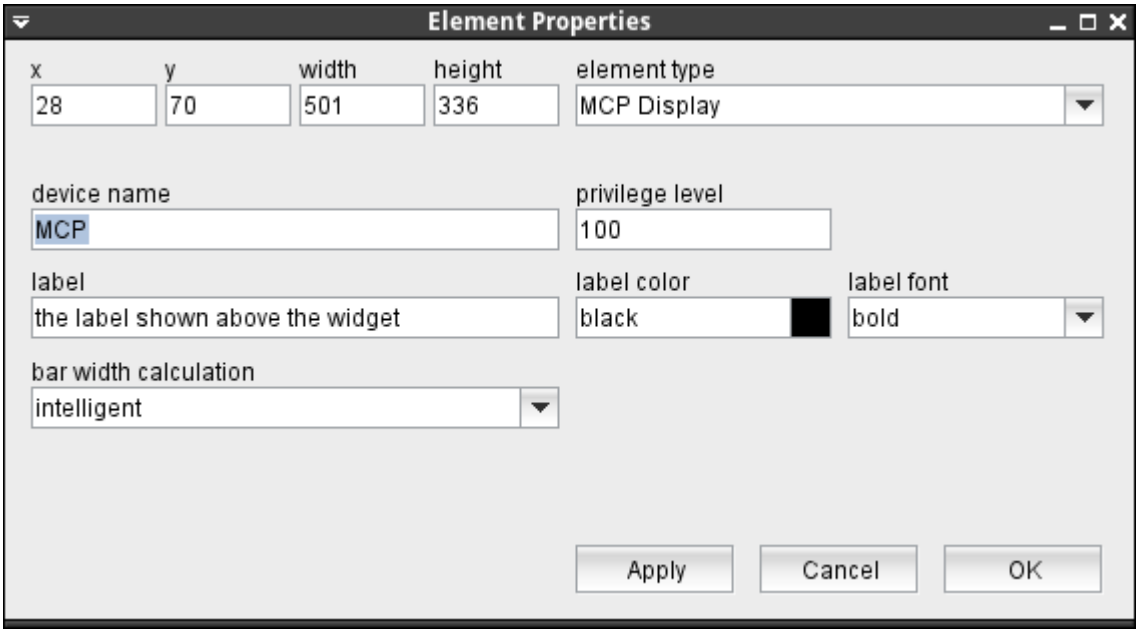
The attributes listed below may be configured to customize a display element of this type:

- device name --- The name of the spectrum analyzer device to operate.
- privilege level --- The privilege level necessary to operate the spectrum analyzer device.
- label --- The annotation label displayed above the spectrum display.
- label color --- The color of the label displayed above the spectrum display. Colors may be specified by standard color names like red / green / blue or using a hexadecimal RGB notation. '#FFFF00' for example specifies yellow. You may click to the color example field in order to open a color chooser dialog and select the color from there.
- label font --- The font attribute sets the font of the label shown above the element.

1.16.2.4.19 MCP Display

The *MCP Display* element embeds the measurement display of a spectrum analyzer device in multi channel power measurement mode into the screen. The display may be scaled to an almost arbitrary size, however the following limitations apply:

- The annotation labels which reflect the actual device settings are not scaled with the display element. If the element is very small, the labels may overlap and become unreadable.
- Channels may displayed very narrow if the display is too small, labels may become unreadable in this case.

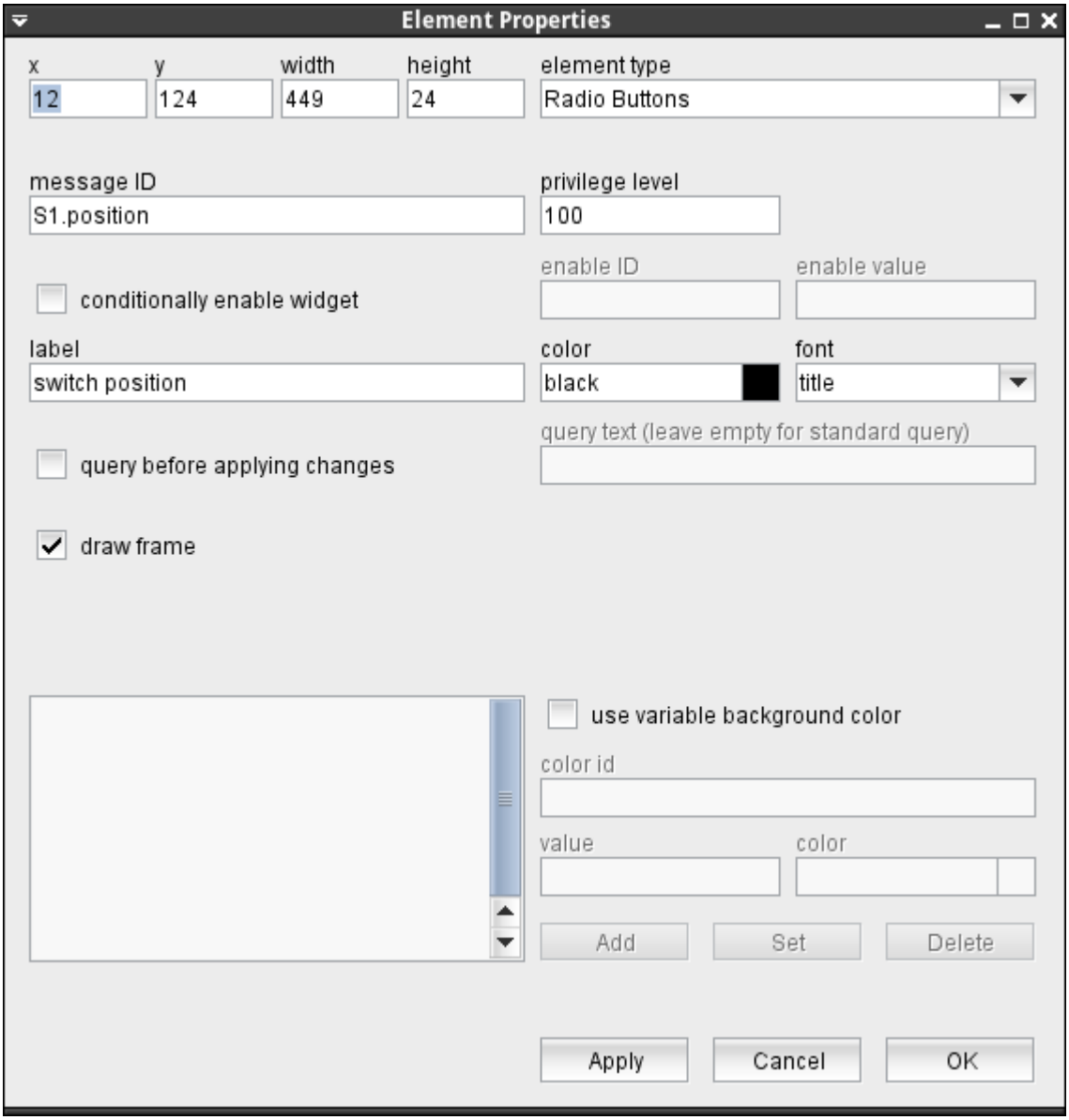


The attributes listed below may be configured to customize a display element of this type:

- device name --- The name of the spectrum analyzer device to operate.
- privilege level --- The privilege level necessary to operate the spectrum analyzer device.
- label --- The annotation label displayed above the spectrum display.
- label color --- The color of the label displayed above the spectrum display. Colors may be specified by standard color names like red / green / blue or using a hexadecimal RGB notation. '#FFFF00' for example specifies yellow. You may click to the color example field in order to open a color chooser dialog and select the color from there.
- label font --- The font attribute sets the font of the label shown above the element. This font also applies to the name labels shown below the channel bars.
- bar width calculation --- This parameter lets you select how the screen element calculates the width of the bars from the channels' bandwidth. 'all same width' draws all bars with the same width, regardless of the channels' bandwidth. 'strict proportional' calculates the width of the bars following the ratio of bandwidths - even if this leads to very narrow bars with unreadable figures. 'intelligent' which is the default, draws wide channels wider than narrow ones, but limits the ratio of bar widths to 1:3.

1.16.2.4.20 Radio Buttons

The *Radio Buttons* display element is a component to display and edit CHOICE type M&C parameters as a number of radio buttons. Depending on the height of the element, radio buttons are positioned in a row or in a column. In the screen editor, the parameter element is shown as a simple rectangle rectangle.



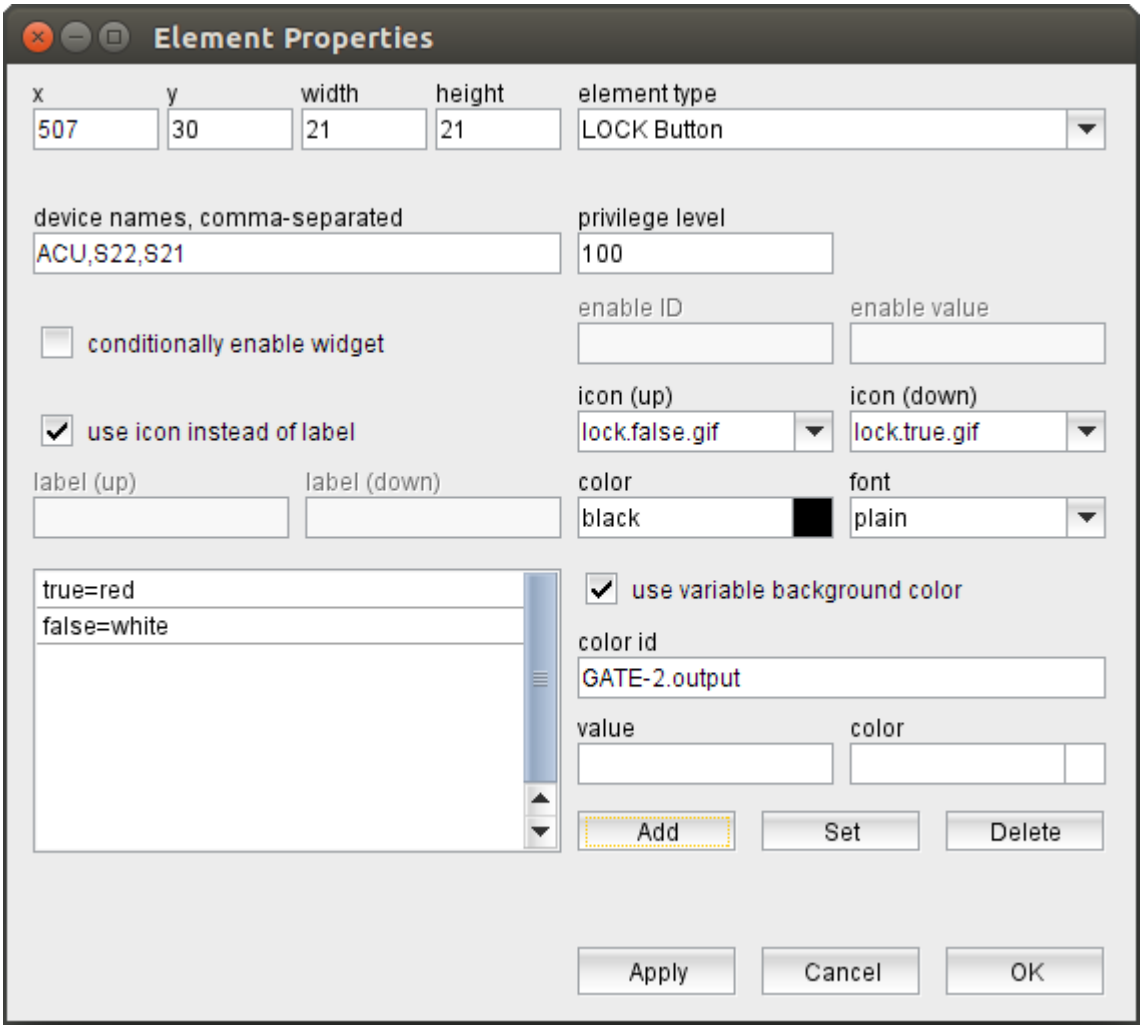
The attributes listed below may be configured to customize a display element of this type:

- message ID --- The message ID addresses the parameter the element shall display or edit. The message ID consists of the device name followed by a colon and the name of the parameter. *XMIT-1.tx.on* for example addresses the variable *tx.on* at a device named *XMIT-1* . With the ' Device Driver Index ' in the appendix of this document there is a list of variable names provided for each device driver the software supports.
- privilege level --- The privilege level necessary to change this parameter. The predefined screens of the software use 100. In your own screens you may set certain parameters to higher privilege levels, limiting the group of operators permitted to change the parameter.
- conditionally enable widget --- Parameter fields may be locked to read only state unless another parameter matches a given value. For instance, changing the position of a wave guide switch may be inhibited while the carrier is switched on. Check this mark to activate this feature.

- enable ID --- This field defines the ID for the enabling parameter.
- value --- The value belonging to the parameter above. The actual value of the parameter addressed by "enable ID" mut match this value in order to enable the entry field.
- label --- The label text is drawn above the element.
- color --- The color attribute of a parameter element sets the color of the label shown above the entry field. The text in the parameter field itself always is shown in the default text color of the selected look & feel. Colors may be specified by standard color names like red / green / blue or using a hexadecimal RGB notation. '#FFFF00' for example specifies yellow. You may click to the color example field in order to open a color chooser dialog and select the color from there.
- font --- The font attribute applies to the text shown in the parameter field itself. The label text is shown with the standard ("plain") font size for all font selections except the smallest one. In the latter case the label is drawn using this small font size, too.
- query before applying changes --- Check this mark to make the element show a query before a parameter gets actually commanded.
- query text --- The query text to be shown in the pop-up window. you may leave this field empty, the program uses a standard query text in this case.In the question text, placeholders may used for two values: Any occurrences of the pattern **$P** get replaced by the parameter name (message ID). Any occurrences of the pattern **$V** get replaced by the new value to set.
- draw frame --- Checking this mark makes the element show a rectangular frame around the radio buttons.
- use variable background color --- Checking this mark enables the variable background color feature for this screen element. Depending on the actual value of the variable addressed by 'color id', the element's background is set using the translation table shown in the lower left corner of the dialog. If the actual value of the color id variable does not match any of the table entries or if no color id is specified, the first color in the list is used to draw the element's background.The buttons Add/Set/Delete along with the value and color fields are used to edit the color translation table.
- color id --- The message ID of the parameter which controls the background color of this element.
- value --- The parameter value of the actually selected table entry
- color --- The color specification of the actually selected table entry. This may either be the name of a basic color (red, yellow etc.) or a hexadecimal RGB color specification like '#FF8000'. The latter defines some sort of orange, consisting of 0xFF red, 0x80 green and 0x00 blue. The actually selected color is shown in the right part of the entry field, clicking to this opens a color chooser dialog which lets you select / compose the the color to your needs.
- Add / Set / Delete --- These buttons control editing the color translation list.
  - To add a new value / color pair to the list, fill the value and color fields, then click to "Add".
  - To change the color assigned to a given parameter value, first select the table entry of interest, change the color value and finally click "Set".
  - To delete a value / color pair from the list, select the table entry and then click "Delete".

1.16.2.4.21 LOCK Button

The LOCK Button lets you lock the operation of a number of device devices that no other user can change device settings. The button is in pressed state if at least one of the devices it is assigned to is locked by some user. You only may realease the button if you set the lock by yourself of if you have a privilege level of 150 or more.



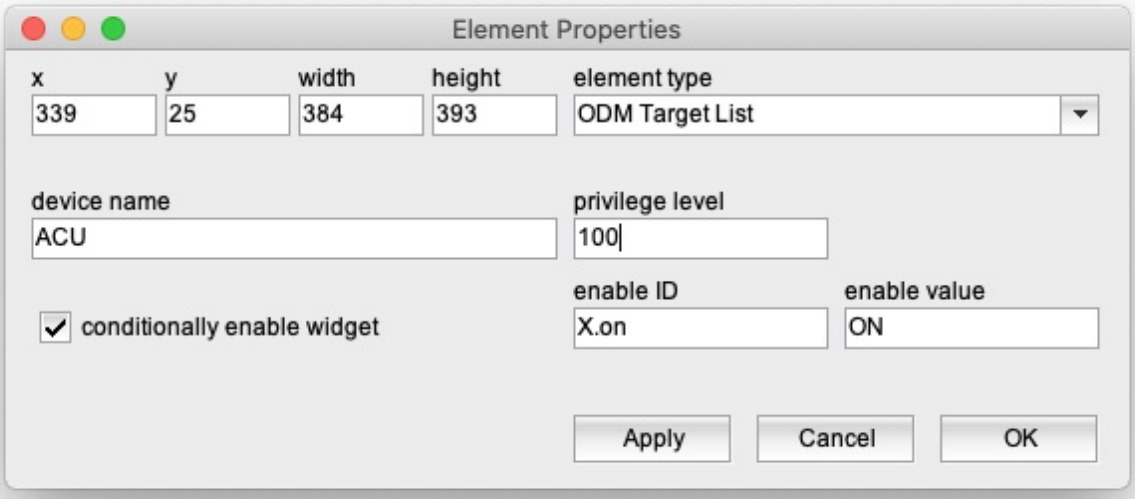
The attributes listed below may be configured to customize a display element of this type:

- device names, comma-separated --- As the field heading suggests, this field expects a comma-separated list of the devices, this button shall control.
- privilege level --- The privilege level necessary to access this button. The predefined screens of the software use 100. In your own screens you may set certain parameters to higher privilege levels, limiting the group of operators permitted to change the parameter.
- conditionally enable widget --- Parameter buttons may be locked to disabled state unless another parameter matches a given value. For instance, changing the position of a wave guide switch may be inhibited while the carrier is switched on. Check this mark to activate this feature.
- enable ID --- This field defines the ID for the enabling parameter.
- value --- The value belonging to the parameter above. The actual value of the parameter

addressed by "enable ID" mut match this value in order to enable the button.
- use icon instead or label --- Check this mark in order to make the button show an icon instead of a label text.
- icon (up) --- The name of the icon to be shown in "up" (unlocked) state of the button. The field provides a list of all available icons / images on the sat-nms server.
- icon (down) --- The name of the icon to be shown in "down" (locked) state of the button. The field provides a list of all available icons / images on the sat-nms server.
- label (up) --- This label text is drawn on the button in "up" (unlocked) state.
- label (down) --- This label text is drawn on the button in "down" (locked) state.
- color --- The color attribute of a parameter element sets the color of the label shown on the button. Colors may be specified by standard color names like red / green / blue or using a hexadecimal RGB notation. '#FFFF00' for example specifies yellow. You may click to the color example field in order to open a color chooser dialog and select the color from there.
- font --- The font to be used for the button label.
- use variable background color --- Checking this mark enables the variable background color feature for this screen element. Depending on the actual value of the variable addressed by 'color id', the element's background is set using the translation table shown in the lower left corner of the dialog. If the actual value of the color id variable does not match any of the table entries or if no color id is specified, the first color in the list is used to draw the element's background.The buttons Add/Set/Delete along with the value and color fields are used to edit the color translation table.
- color id --- The message ID of the parameter which controls the background color of this element.
- value --- The parameter value of the actually selected table entry
- color --- The color specification of the actually selected table entry. This may either be the name of a basic color (red, yellow etc.) or a hexadecimal RGB color specification like '#FF8000'. The latter defines some sort of orange, consisting of 0xFF red, 0x80 green and 0x00 blue. The actually selected color is shown in the right part of the entry field, clicking to this opens a color chooser dialog which lets you select / compose the the color to your needs.
- Add / Set / Delete --- These buttons control editing the color translation list.
    - To add a new value / color pair to the list, fill the value and color fields, then click to "Add".
    - To change the color assigned to a given parameter value, first select the table entry of interest, change the color value and finally click "Set".
    - To delete a value / color pair from the list, select the table entry and then click "Delete".

1.16.2.4.22 ODM Target List

The ODM Target List screen element lets you embed the list of targets of aSatService-ACU-ODM antenna controller in the screen. Targets may be recalled (which moves the antenna to the stored position and sets the tracking parameters associated with this target), saved or deleted.



The attributes listed below may be configured to customize a display element of this type:

- device name --- This parameter is interpreted differently depending on the context where the ODM Target List screen element resides:
  - When placed in a user defined screen or in the main screen of the application, 'device name' must be set to the name of the ODM device it shall refer to.
  - When placed in the device screen of another device which defines a configuration variable with the antenna controller device name, the name of this configuration variable must be entered as the 'device name'.
  - Finally, when used in the device screen of the ODM device itself, 'device name' must de set to '@'

Please note, that the ODM Target List screen element only works withSatService-ACU-ODM antenna controller device type, other antenna controllers are not supported.

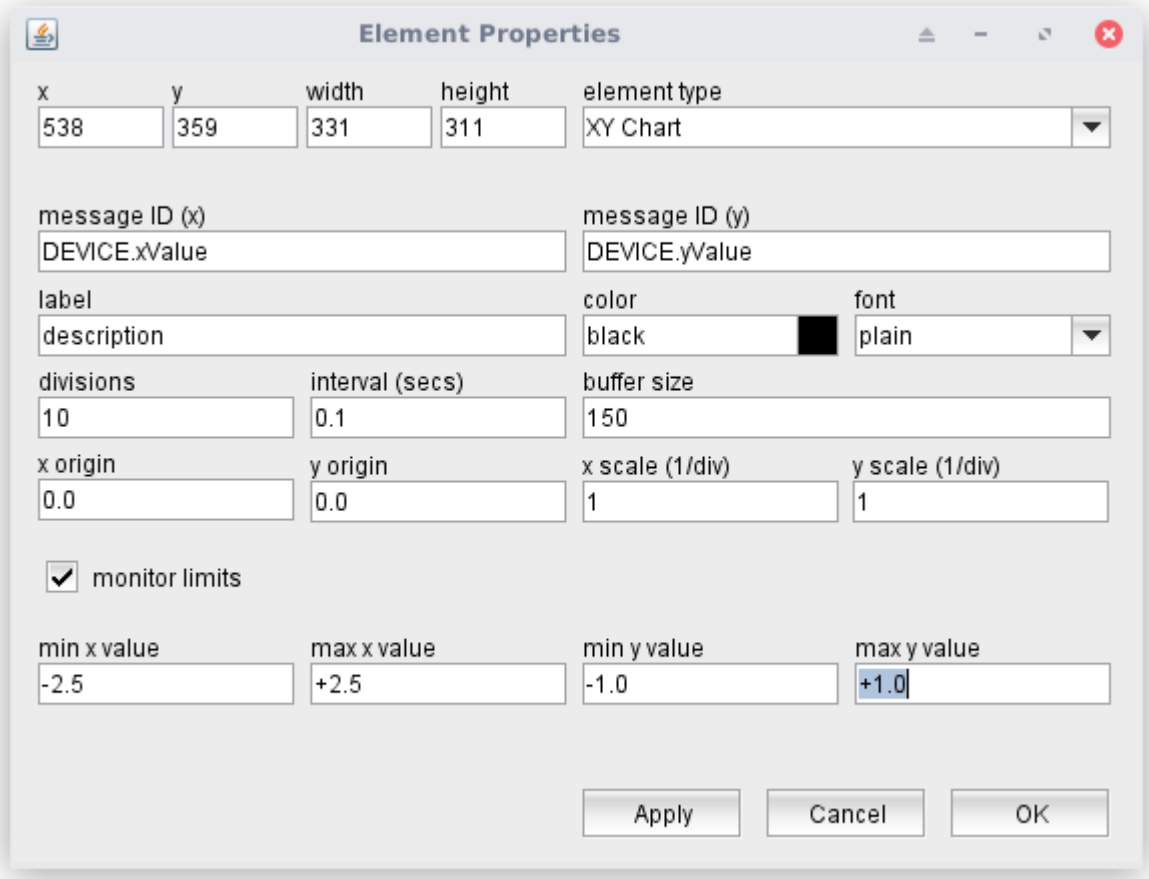
- privilege level --- The privilege level necessary to access this element. The predefined screens of the software use 100. In your own screens you may set certain parameters to higher privilege levels, limiting the group of operators permitted to change the parameter.
- conditionally enable widget --- The target list widget may be locked to disabled state unless another parameter matches a given value. For instance, a TX-ON state may disable the selection of another satellite by means of the target list widget.
- enable ID --- This field defines the ID for the enabling parameter. When used in a device screen, the ID is interpreted as a variable name of the device, this screen belongs to.
- value --- The value belonging to the parameter above. The actual value of the parameter addressed by "enable ID" mut match this value in order to enable the button.

1.16.2.4.23 XY Chart

This element shows the relation of two numeric variables in an X/Y diagram, featuring a 'track' which shows the recent history of the values with a configurable depth. The update rate, the diagram scaling and much more is configurable with this screen element.

The X/Y chart display may be scaled to an almost arbitrary size, however the following limitations apply:

- The annotation labels which reflect the actual display settings are not scaled with the display element. If the element is very small, the labels may overlap and become unreadable.
- Resizing the X/Y chart display element is only possible in certain steps, the grid behind the curve is always made up of a number pixels in one dimension which is divisible by the configured number of diagram divisions without remainder. The screen editor software knows about this, snaps the size of the element to the next (smaller) valid size after you release the mouse button.



The attributes listed below may be configured to customize a display element of this type:

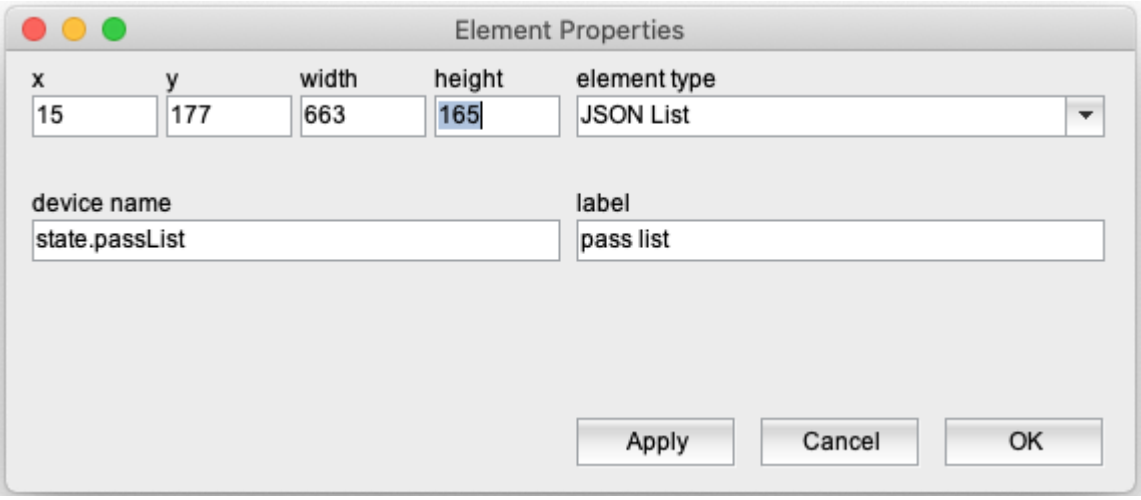
- messageID(x) message ID (y) --- The message IDs of the parameters to show.
- label --- The annotation label displayed above the X/Y chart
- color --- The color of the label displayed above the X/Y chart. Colors may be specified by standard color names like red / green / blue or using a hexadecimal RGB notation.

'#FFFF00' for example specifies yellow. You may click to the color example field in order to open a color chooser dialog and select the color from there.

- font --- The font attribute sets the font of the label shown above the element.
- divisions --- The number of divisions shown in the diagram for both directions. You may enter arbitrary values here, but to achieve some readability, you are encouraged to us common values like 2 ('hair cross'), 4 or 10.
- interval --- The update time interval for the display in seconds. 0.1 means to add every 100msec a new value to the display and remove the oldest value from the buffer at the same time.
- buffer size --- The display maintains a "first in first out" buffer of a size defined with this parameter. The buffer provides a short time memory the display shows as a trace of past values. Values in the range 100-300 are a good choice, larger values may slow down the client application. Please note, that the buffer gets cleared when the window is closed.
- x origin y origin --- The origin values refer to the*center* of the diagram. Using an even number of divisions helps to identify the diagram center as the crosspoint of the middle grid lines
- x scale y scale --- The scale values are per division. with xorigin = 0.0 and x scale = 1.0 an x value of 1.0 gets displayed one division right of the diagram center.
- monitor limits --- With this mark checked, the display monitors the*actual* X/Y values to be within the limits defined below. The limit values are shown as a dark red rectangle. When the while the actual X/Y values exceed the limits, the disgram background becomes red.
- min x value max x value min y value max y value --- The limit values for X and Y to be checked.

1.16.2.4.24 JSON List

The JSON List element is a special screen element required for some devices which distribute a state table/list in JSON format. It can only be used for this purpose.

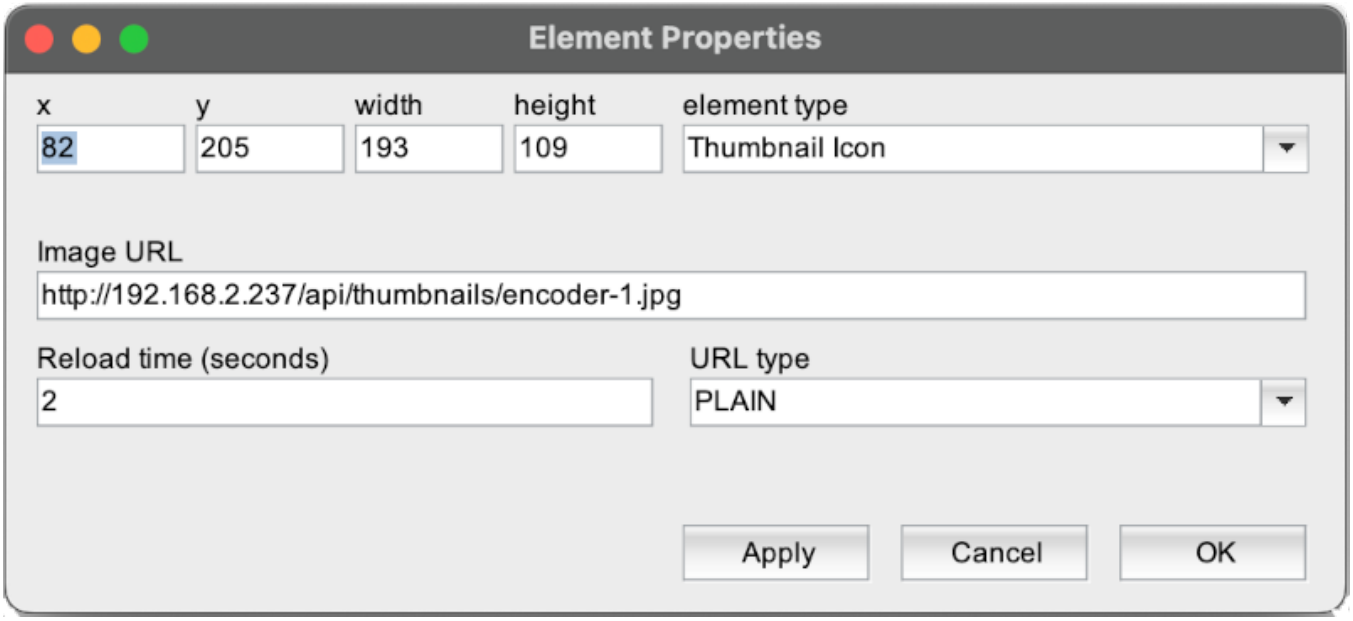


The attributes listed below may be configured to customize a display element of this type:

- message ID --- The message ID of the JSON list to show.
- label --- The annotation label displayed above the element

1.16.2.4.25 Thumbnail Icon

The Thumbnail Icon element lets you display a thumbnail of the video actually processed by a device lika an encoder, decoder or gateway. The displayed icon is a static image, updated every couple of seconds.



The attributes listed below may be configured to customize a display element of this type:

- Image URL --- The URL where to fetch the image.
- Reload Time --- The interval when the image shall be reloaded (seconds)
- URL Type --- One of PLAIN or ADVANCED. With PLAIN the URL is used as it is, with ADVANCED CGI parameters for the actual time and the image width and height are appended to the URL.

REMARKS

- The device to get the thumbnail images from must support this feature.
- The device to get the thumbnail images from must be accessible in the network from the client's point of view.
- Thumbnail Icons are - when resized by mouse drag in the GUI editor - forced to 16:9 ratio. If another image ratio is required, image width and height must be entered in the dialog shown above.
- in PLAIN mode, the image received from the device gets scaled to fit the screen element size, in ADVANCED mode no scaling is done as the software queries the image already in the correct size from the device.

1.16.2.5 Configuring a Tabbed View Client

Configuring a Tabbed View user interface is mainly a job of planning and organization. The layout of navigation bar buttons and VLC screens ist defined in a configuration file, but before editing this file some preparation have to be done:

1. Define, which views / tabs shall be present in the Tabbed View Client
2. For each tab define which VLC screens shall be contained. Edit the screens using the sat-nms Screen Editor Window .
3. Edit the Tabbed View configuration file to put things together.

The NMS directory tree provides an own subdirectory named "tviews", containing the configuration files for the Tabbed View Client. The file called "default" is used by the client, unless the client is forced to read another file (that's a command line option of the client program)

Configuration file format

The configuration file is a free form text file defining the tab layout with a couple of keywords. In the file, whitespace and C/C++ style comments are ignored. Syntax and keywords are best explained using this example:

```
// example tabbed view definition file
//

SHOW-FAULTICON NO
SUPPRESS-OFFLINE-FAULTS YES
SPACING 3

BUTTON "TAB 1"

   SCREEN vlc0001 vlc0001_rx_Tabscreen
   SCREEN vlc0002 vlc0002_rx_Tabscreen
   SCREEN vlc0003 vlc0003_rx_Tabscreen
   GROUP G1

GAP

BUTTON "TAB 2"

   SCREEN vlc0003 vlc0003_tx
   SCREEN vlc0002 vlc0002_tx
   SCREEN vlc0001 vlc0001_tx

DEFAULTS

   USER u1 "TAB 2"
```

The file starts with two global definitions:

- SHOW-FAULTICON --- Must be followed by YES or NO. Defines if the main toolbar shall include a system wide "new fault" indicator. Depending on the type of usage of the equipment managed by the NMS, the system wide fault indicator may be red all the time, irritating the operators. In this case you may want to suppress the indicator by specifying

"SHOW-FAULTICON NO". If you omit the SHOW-FAULTICON definition, the Tabbed View Client shows the fault indicator.

- SUPPRESS-OFFLINE-FAULTS --- Must be followed by YES or NO. Defines if faults of an off-line VLC are signalled with a red lamp in the Tabbed View's navigation bar:
  - With NO, an off-line VLC is shown with a red lamp if the VLC signalled a fault when it was on-line the last time.
  - With YES, of-line VLCs always are shown with s gray lamp.

Default is NO, without the SUPPRESS-OFFLINE-FAULTS definition the software shows off-line VLCs with a red lamp if there is a faul known for the VLC.

- SPACING --- Must be followed by a number in the range 1..100. The SPACING value defines the room in pixels, the program reserves above and below each button. Hence, the space between two buttons is two times this value. The default for SPACING is 10 pixels.

The sequence of these definitions doesn't matter, however they should appear before the first BUTTON definition.

The BUTTON keyword defines a button in the navigation bar. It must be followed by the button label, enclosed in double quotes. Buttons are identified by their label, hence button labels should be unique within a Tabbed View definition.

The BUTTON definition also starts the definition of the tab / view assigned to this button. Within the tab definition, the following definitions are expected:

- GROUP *group-name* --- The GROUP definition is optional and may appear only once. Specifying a group for a button restricts the access to this tab to users being part of the specified user group. Omitting the GROUP definition for a button lets all (loggen in) users access this tab.
- SCREEN *vlc-id screen-name* --- The SCREEN clause defines one VLC screen appearing in the tab. The keyword SCREEN must be followed by the ID of the VLC to connect to (using the notation vlc####) and the name of the screen definition to display. The screen definition file is expected in the 'screens' directory, the file name must not contain any whitespace.There may be multiple SCREEN definitions for one tab, the screens are layed out one below each other in the order they appear in the configuration file. The number of screens actually is not limited, but it makes no sense to define more screens than fitting into the fullscreen application window. There are no scrollbars provided to manage a virtual screen larger than the physical screen size.

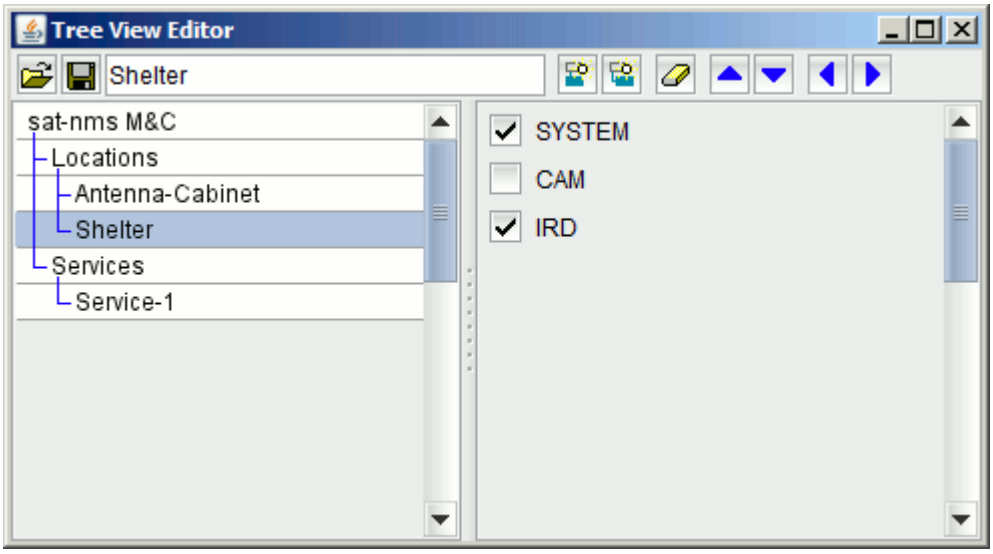
In the sequence of BUTTON definitions the keywords GAP and LINE may be used instead of a button clause. As GAP suggests, this tells the software to place a gap (10 pixels height) between two buttons in the navigation bar. LINE draws a horizontal line to separate buttons.

The BUTTON definitions optionally may be followed by a list of default screen assignments, preceded by the keyword DEFAULTS. Each default screen definition consists of the keyword USER, folled by a user name and the label of a button defined above. The button label must be enclosed in double quotes.

Defining a default tab for a certain user means to tell the software that this tab shall be opened automatically when the user logs on. For each user only one default tab may be defined. Together with the autologin feature available as command line option when the Tabbed View gets invoked, the program may configured to show one tab automatically when started.

1.16.2.6 Configuring the M&C Tree View

The Tree View Editor window lets you define or modify the tree / subsystem hierarchy used by the M&C Tree View. You open the Tree View Editor by clicking the appropriate tool bar button of the Tree View.



The left part of window shows the subsystem tree structure, the right part a list of all devices configured in the M&C system. Editing / modifying the tree structure is straight forward:

Selecting a tree node with the mouse shows the name of this node in the text field in the tool bar and at the right side places a checkmark in front of all devices which are attached to this node. Checking / unchecking devices attaches or detaches the to/from the actual tree node. Using the toolbar buttons you may add or remove tree nodes and move them up or down:

- --- Re-load the tree definition from its disc file, thus reverting all changes to the last saved state.
- --- Stores the changes made at the tree at the server and updates all Tree View windows actually open.
- --- Shows the name of the selected node. The name may be changed by editing the field and pressing RETURN. Please note, that changing a node's name will re-reference the node from its user screen and also will change the message IDs of the subsystem fault message of this node ans all its children.
- --- Adds a new node to the tree. The new node will be added as the last sibling of the selected node.
- --- Adds a new node to the tree. The new node will be added as the last child of the selected node.

-  --- Removes the selected not an all its children from the tree.
-  --- Moves the selected node one position up in the list of its siblings. Does nothing if the note is already at the topmost position.
-  --- Moves the selected node one position down in the list of its siblings. Does nothing if the note is already at the lowest position.
-  --- Moves the selected note on level up in the tree hierarchy. The highest level a node may be of is one below the root node.
-  --- Moves the selected node one level down in the tree hierarchy. The node must have at least one sibling for this.

The nodes of the tree view in the sat-nms software also can be seen as subsystems of the M&C. The M&C server creates a fault flag for wach tree view node / subsystem which is defined using the Tree View Editor.

Subsystem fault flags summarize the fault states of all devices and subsequent tree nodes which are children the particular node. Like the summary fault of a device, the subsystem fault is one of "OK.", "WARNING" of "Summary FAULT". It states the most severe fault state one of the summarized devices or subsystems reports.

The subsystem fault flags can be accessed for display at the GUI through their parameter ID, which is defined as "SUBSYSTEM. ... .fault", where the three dots are to be replaced by the fully qualified name of the tree node. If for example a tree node "/Locations/Shelter-B" exists, the fault ID for this node is "SUBSYSTEM.Locations.Shelter-B.fault".