Interface to Temperature Chamber Software

June 20, 2003, Brilliance Qian

The Goal

The goal of the project is to create a number of functions within Dactron shaker control software to integrate the Dactron controller with Temperature/Humidity chamber. When this software is installed, the user will be able to send commands to chamber system or get the status from the chamber system.

When the chamber software is used concurrently with Dactron VCS (Vibration Control System) software, the design philosophy is that the VCS will be in the active mode while chamber is being controlled per schedule defined in VCS. The VCS run schedule controls the temperature settings. The VCS software also responds to temperature chamber and take certain actions.

The software is built originally based on WEISS temperature chamber software. The intention is to add interfaces to more and more chamber software while the user interface is kept the same.

How to interfere with Chamber TCP/IP server

WEISS Chamber server offers a **socket** interface that allows other application software to query status, setup parameter and send command. Dactron VCS can get chamber status, set parameter and send commands through TCP/IP network if necessary.

When does Dactron VCS interact with chamber server

- At the time when VCS starts (user presses the "Start" button)
- At the time when VCS stops (both schedule stops or user presses "Stop")
- At the time when VCS aborts
- While running, VCS access the chamber system periodically
- At the time when DSP requests

How does VCS interact with chamber server

At any time listed above, VCS checks given conditions. If any specified condition is satisfied, VCS will take actions that are specified in Chamber Interface Setup.

Now we list a couple of conditions and actions.

- ✓ **Conditions:**
- Unconditional. That means it will take at any condition
- Get Actual Value is less than/equal to/greater than a specified value
- Get Error Status is equal or not equal to a specified value, which can check whether Weiss is running normally.

- Get Error number is equal or not equal to a specified value. Same as above.
- Get Digital Output is ON or OFF.
- Get Digital Input is ON or OFF.

✓ **Actions:**

Actions includes two sides: to notify VCS System and to set parameter/send commands to chamber. Actions can be any one or reasonable combo of followings.

To notify VCS:

- Write to runlog
- Alarm
- Beep
- Send Email
- Send “Continue” message once
- Send “Stop” message once

To take action on chamber

- Set Setpoint to a specified value.
- Turn Chamber ON/OFF
- Set Digital Output ON/OFF

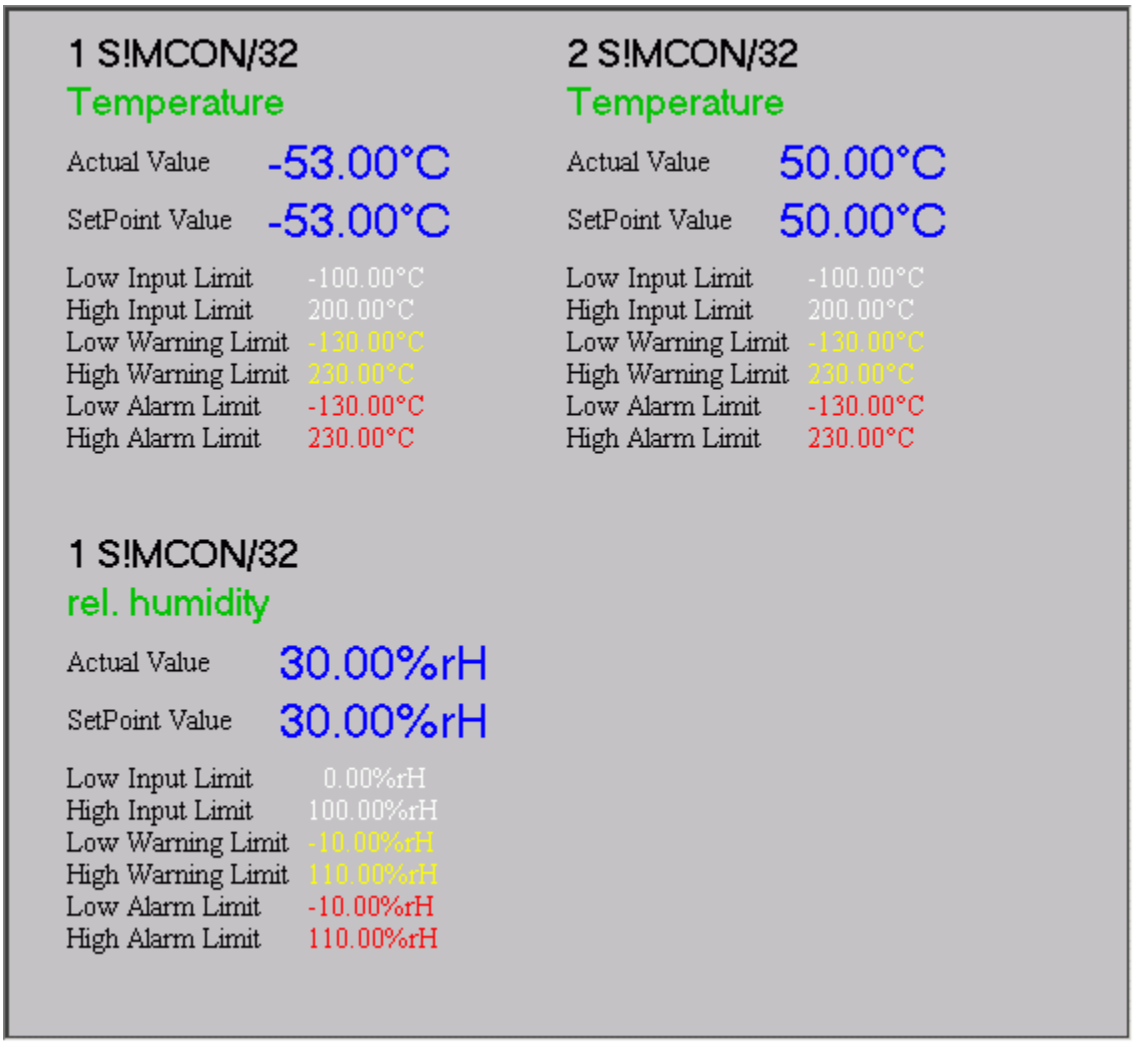
(For chamber vendor confirmation, we can add more actions if required)

✓ **Object:**

If selected actions are for chamber, a chamber index must be given. That means, parameters or commands are sent to a specified chamber, so user must select one from a chamber list.

Viewing the Chamber Status

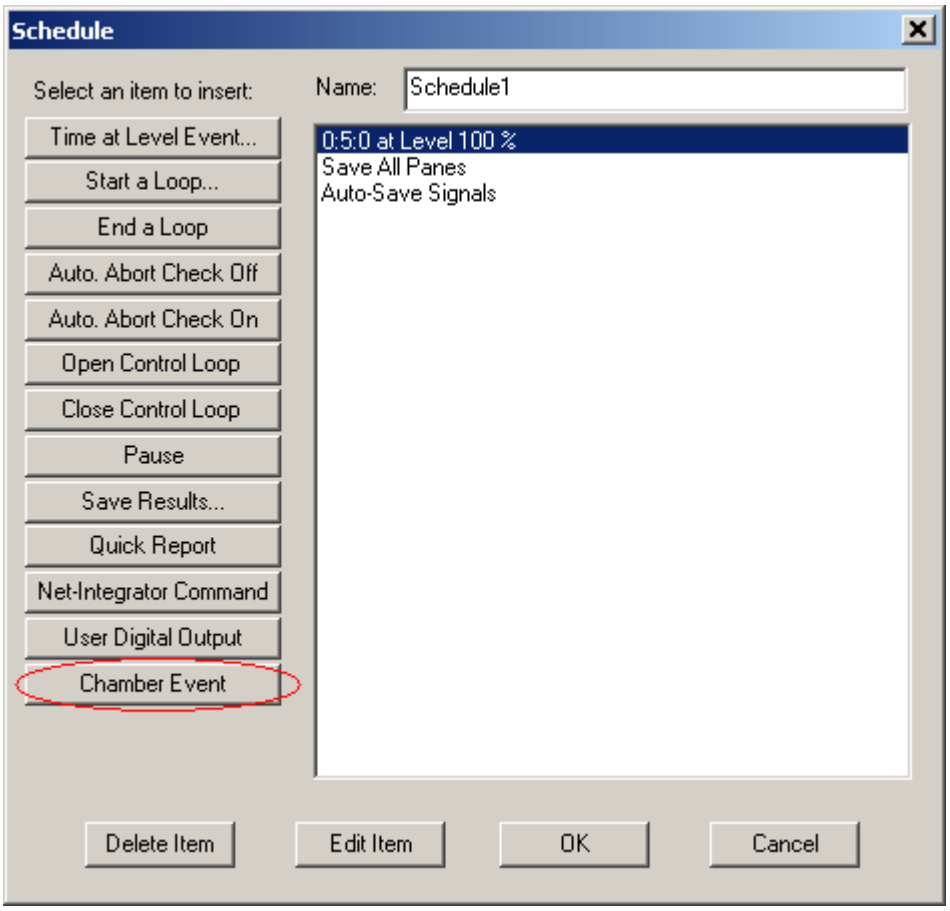
A Chamber status view can be created to watch chamber values like this:

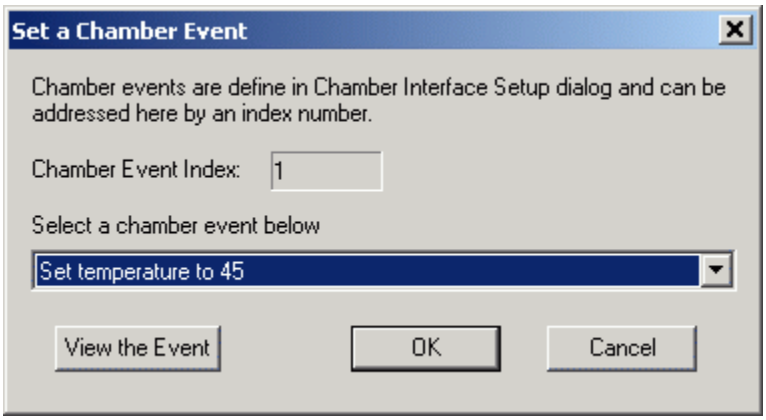


Because the temperature or humidity changes slowly, VCS reads chamber values at a period of 30 seconds or more (user adjustable).

Chamber Event

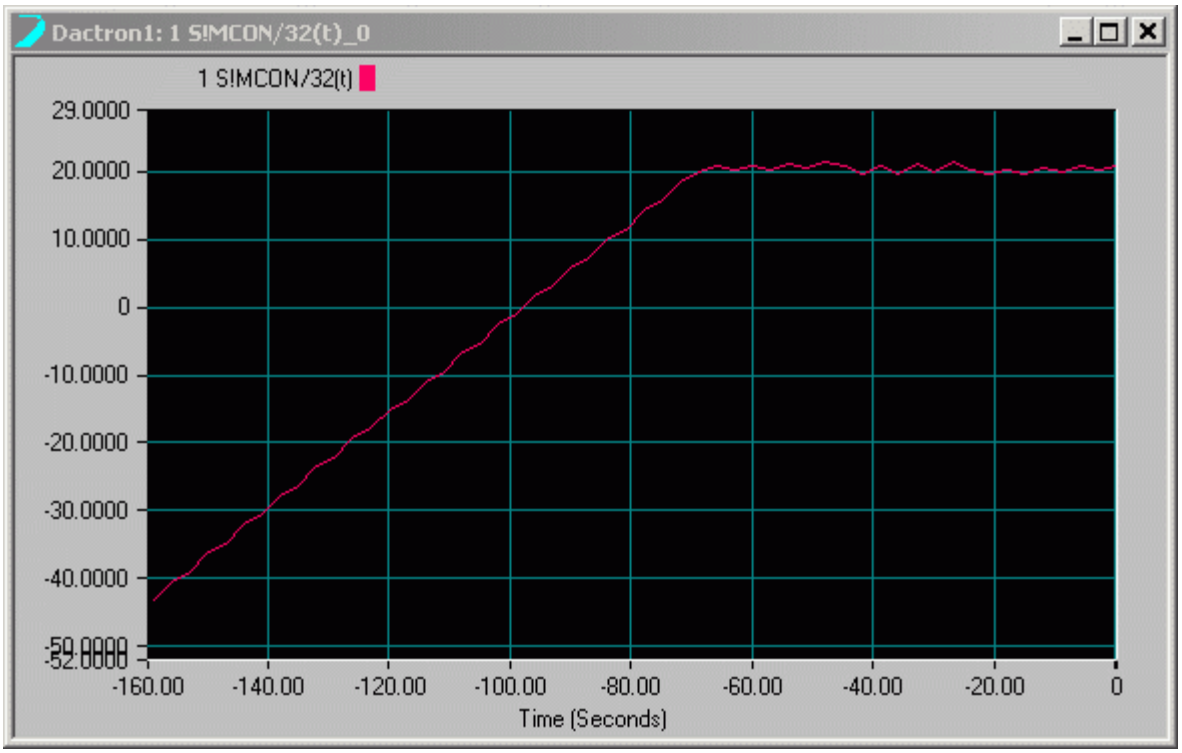
User can define a list of chamber actions that can be indexed by DSP on “Chamber Setup Interface” dialog. On schedule, user can define a “Chamber Event” with a parameter of index number. When DSP is executing the schedule and encounters a “Chamber Event” item, it posts a message to PC with a parameter of “Chamber Event” index. Once PC gets the message, it looks for the “Event” in the “Chamber Event” list and run the “Event” which sets chamber temperature, humidity or digital-output, etc.





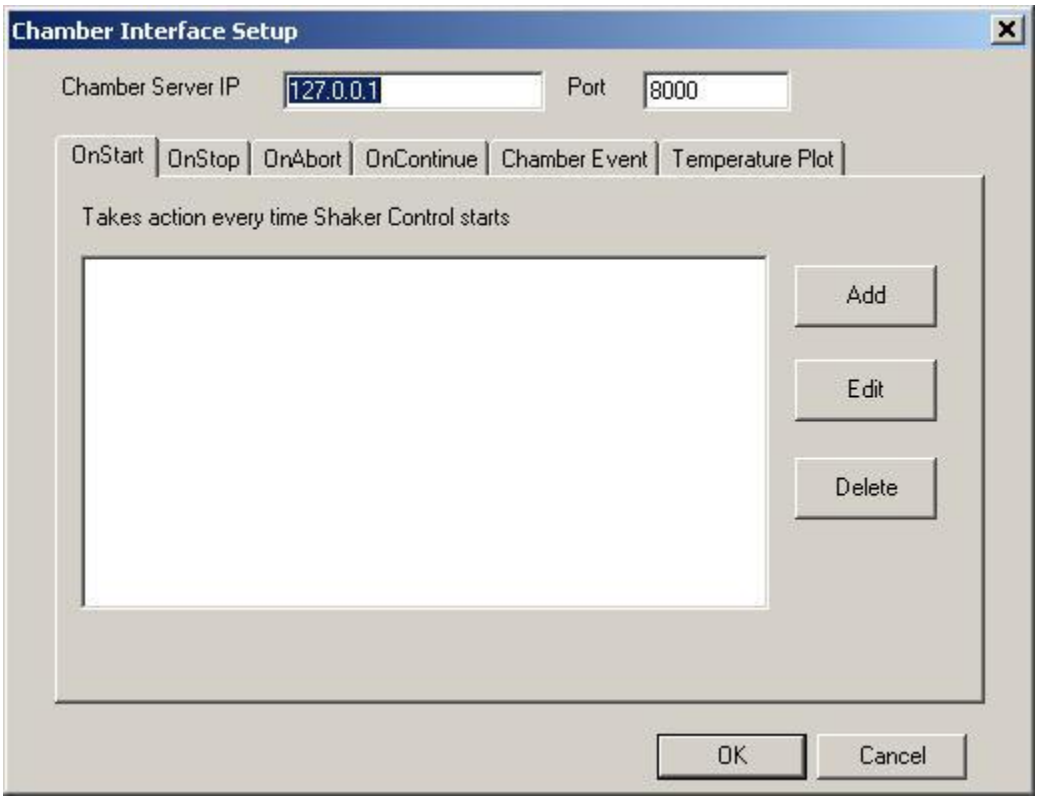
Temperature Trace View

If temperature plot is enabled on tab “Temperature Plot” on the “Chamber Setup Interface”, user can view a temperature trace on a normal pane.

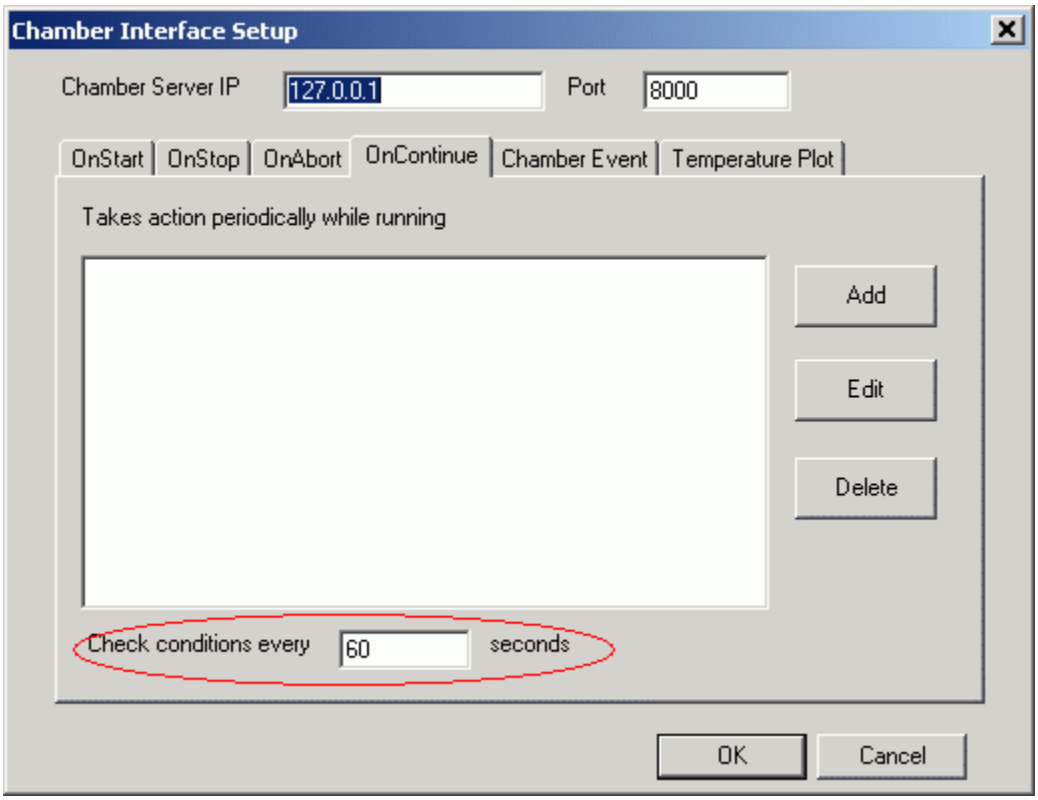


User Interface

The Chamber Interface Setup is like this:

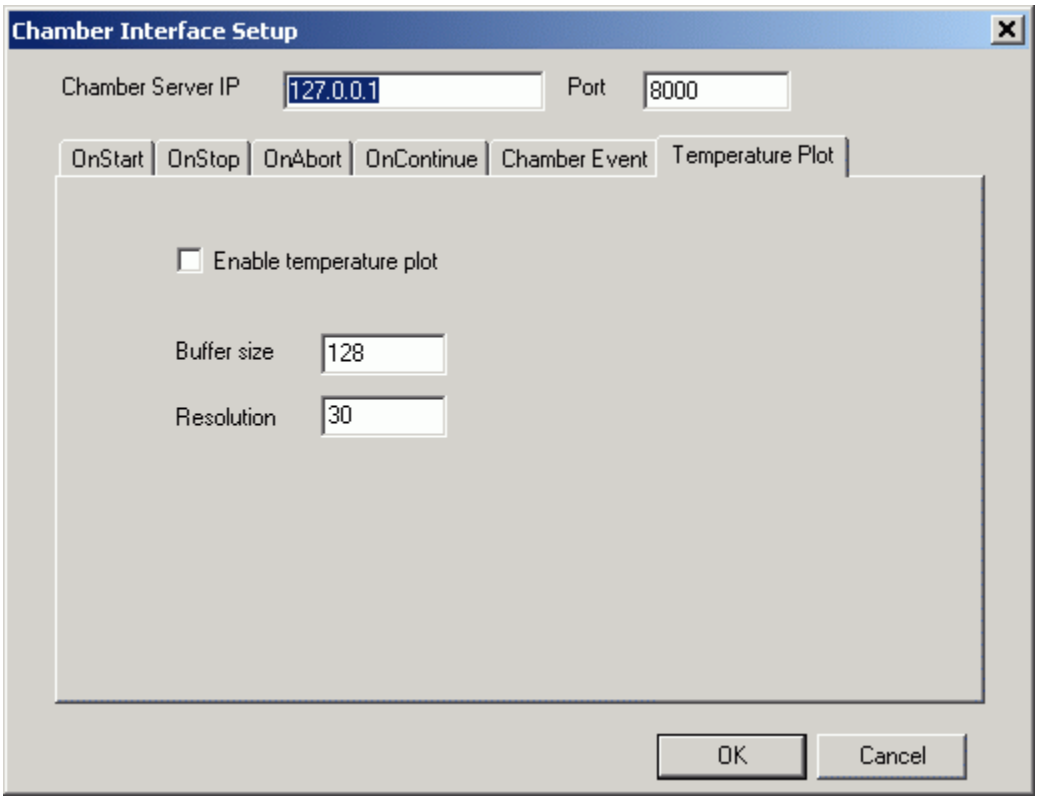


On the left-top, there are tabs for user to select: OnStart, OnStop, OnAbort, OnRunning, Chamber Event, Temperature Plot. The OnStart defines a list of actions to chamber for when VCSler is started, the OnStop defines a list for when VCSler is stopped and the OnAbort defines a list for when VCSler is aborted. The OnRunning defines a list for when VCSler is running and is slight different with the previous three ones. It is shown as following.

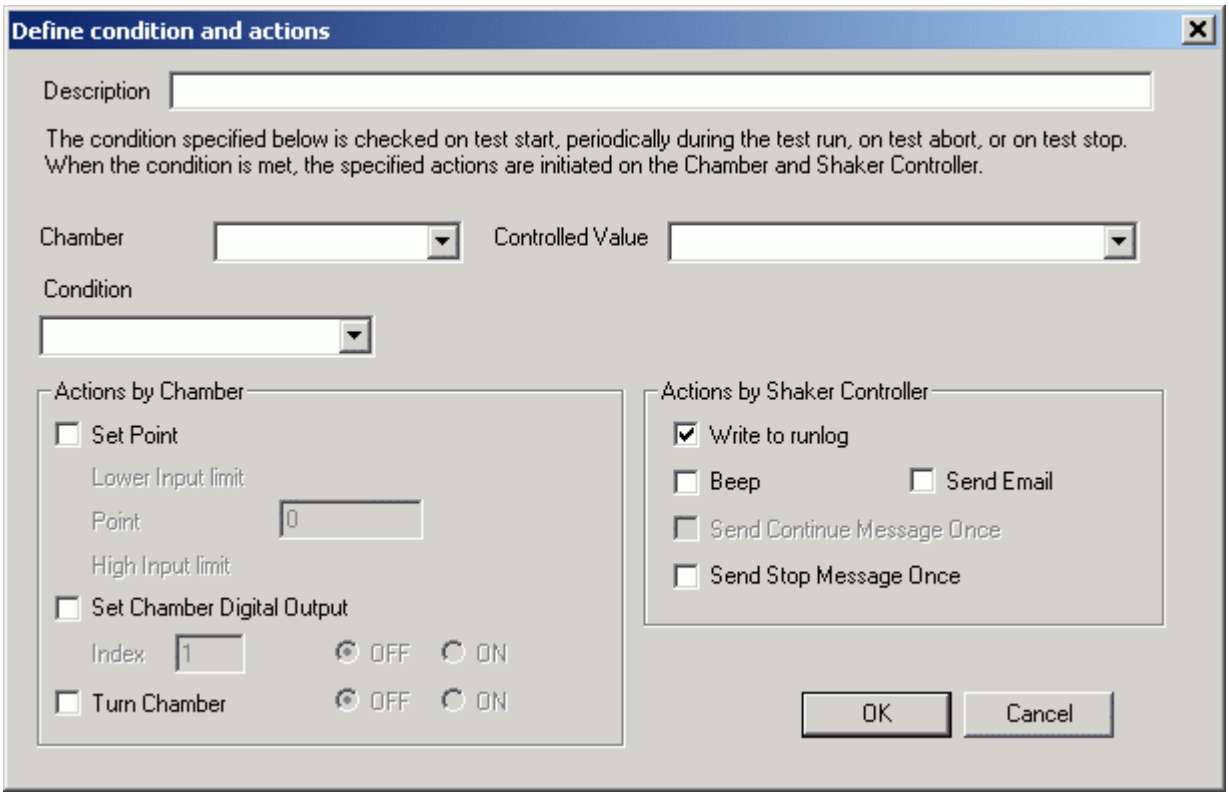


The tab “Chamber Event” defines a list of chamber actions that can be indexed by DSP. On schedule, user can define a “Chamber Event” with a parameter of index number. When DSP is executing the schedule and encounters a “Chamber Event” item, it posts a message to PC with a parameter of “Chamber Event” index. Once PC gets the message, it looks for the “Event” in the “Chamber Event” list and run the “Event” which sets chamber temperature, humidity or digital-output.

The tab “Temperature Plot” defines parameters for a trace signal of chamber temperature. VCSler watches the change of chamber temperature and can plot it on a pane as user demands. The parameters include buffer size of signals, time interval of two points.

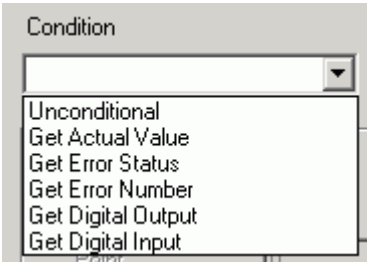


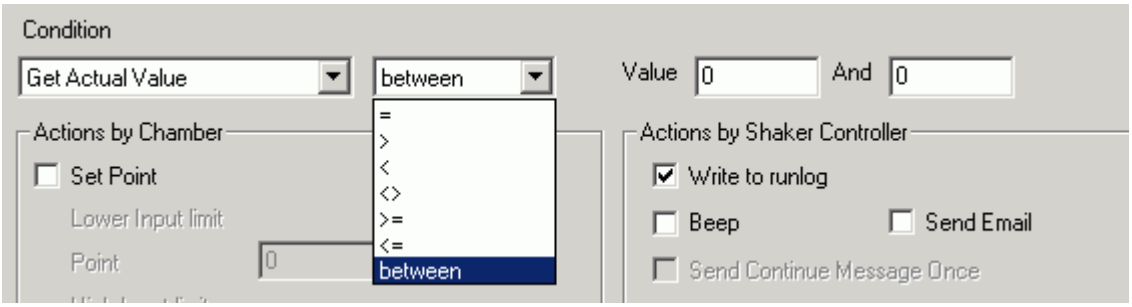
On first five tabs, when Add button is pressed, a dialog appears for user to input conditions and actions on a chamber.



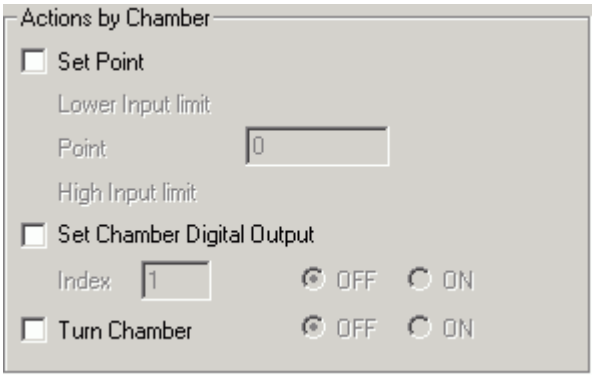
At the first, a chamber and its controlled value (Temperature or Rel. Humidity) must be selection.

Then, select a condition. Conditions dropdown list is as following:

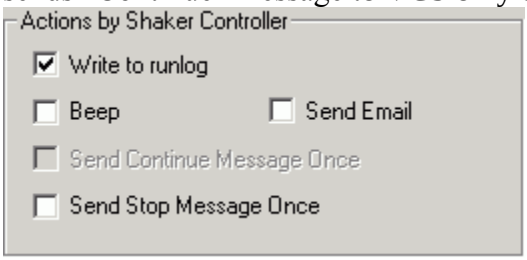




In actions, when “Set Setpoint”, “Turn Chamber” is checked, fields appear for values input



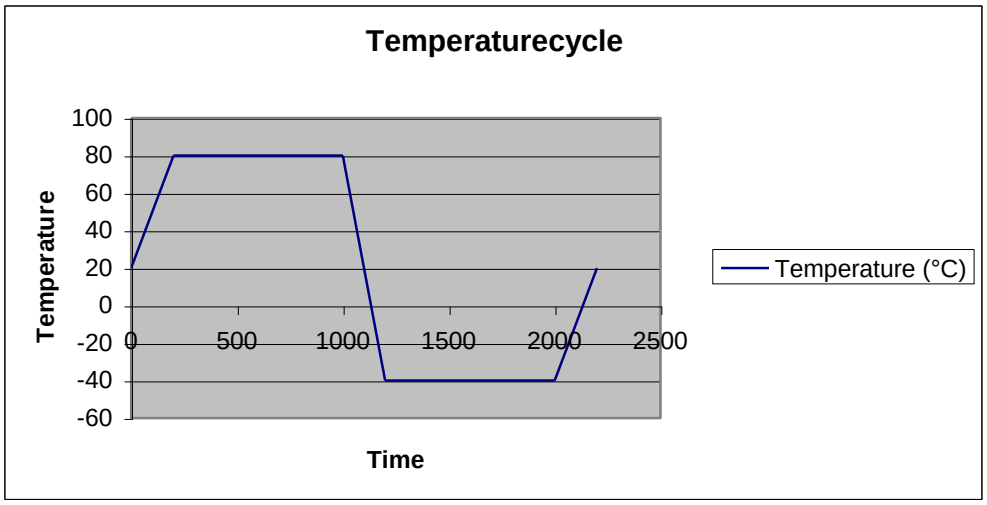
Actions to VCS is as following. “Send Continue Message Once” and “Send Stop Message Once” are only enabled on “OnContinue”. That means while VCS” running, it detects whether condition is satisfied. If so, it sends “Continue” message to VCS only once.



An Example

An example is give below:

	Time (s)	Temperature (°C)
	0	20
Start c:/.../random profile 5	200	80
Stop c:/.../random profile 5	1000	80
Start c:/.../sine profile 5	1200	-40
Stop c:/.../sine profile 5	2000	-40
	2200	20



In this example, two Dactron VCS projects are defined, one is random project and the other is sine project.

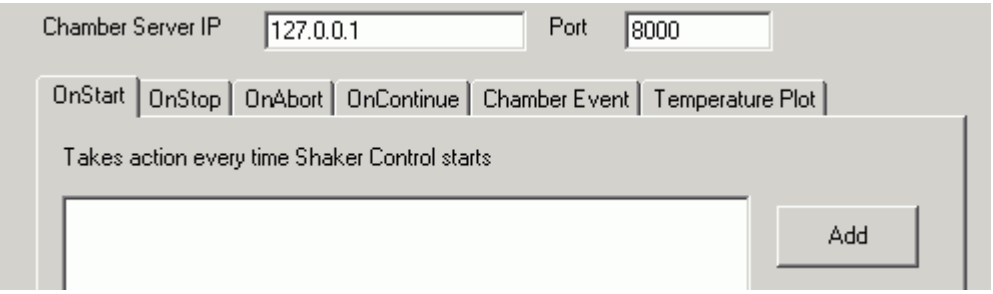
In the first project, on Weiss Interface Setup(WIS), we define an action “Set temperature to 80 °C” OnStart and define a conditional action “If GetValue() is between 79.5 and 80.5 then post ‘Continue’ message to VCS once” OnRunning. So, when random project is started, it sets temperature to 80 °C then it pauses. When Weiss’s temperature reaches 80 °C, it posts a “Continue” message to VCS then VCS continues random profile. On the time of 1000s, the project stops and quits.

After the first project quits, the second one, sine project, is started. It acts same as the first one. On WIS, define an action “Set temperature to –40 °C” OnStart, define a conditional action “If GetValue() is between -39.5 and -40.5 then post ‘Continue’ message to VCS once” OnRunning, and define an action “Set temperature to 20 °C” OnStop. After started, the project sets Weiss temperature to –40 °C, then pauses, waiting for a ‘Continue’ message to synchronize with Weiss. On the time of stop, it sets temperature back to 20°C

Chamber Interface Setup Guide

Parameters definition

In Dactron VCS, click menu “Test Setup/Chamber Interface Setup”. A dialog appears to setup Chamber Interface parameters.



In the field “Chamber Server IP” and “Port”, enter the IP address of Chamber TCP/IP server and its port. The IP address and port are also used by Chamber Watch View.

All items listed at OnStart will be checked one by one when Dactron VCS is started.

All items listed at OnStop will be checked one by one when Dactron VCS is stopped.

All items listed at OnAbort will be checked one by one when Dactron VCS aborts.

All items listed at OnContinue will be checked periodically one by one when Dactron VCS project is running. The interval is defined at a field under the list.

To add an item, press “Add” button, then a dialog appears to define condition and actions. To modify an item, select an item in the list then press “Edit”. To delete an item, select an item in the list then press “Delete” button. If you want to add or edit an item, make sure that Weiss TCP/IP server is running and IP address and port number is right.

On a “Define condition and actions” dialog, several fields are given.

- Description

Description field is to define string displayed in a list on “Weiss Interface Setup” dialog.

- Chamber and Controlled Value

Weiss Chamber lists available chamber number and name on the specified Weiss Server. If a chamber is selected, Controlled Value is updated to list all controllable value on this chamber such as temperature, humidity.

- Condition

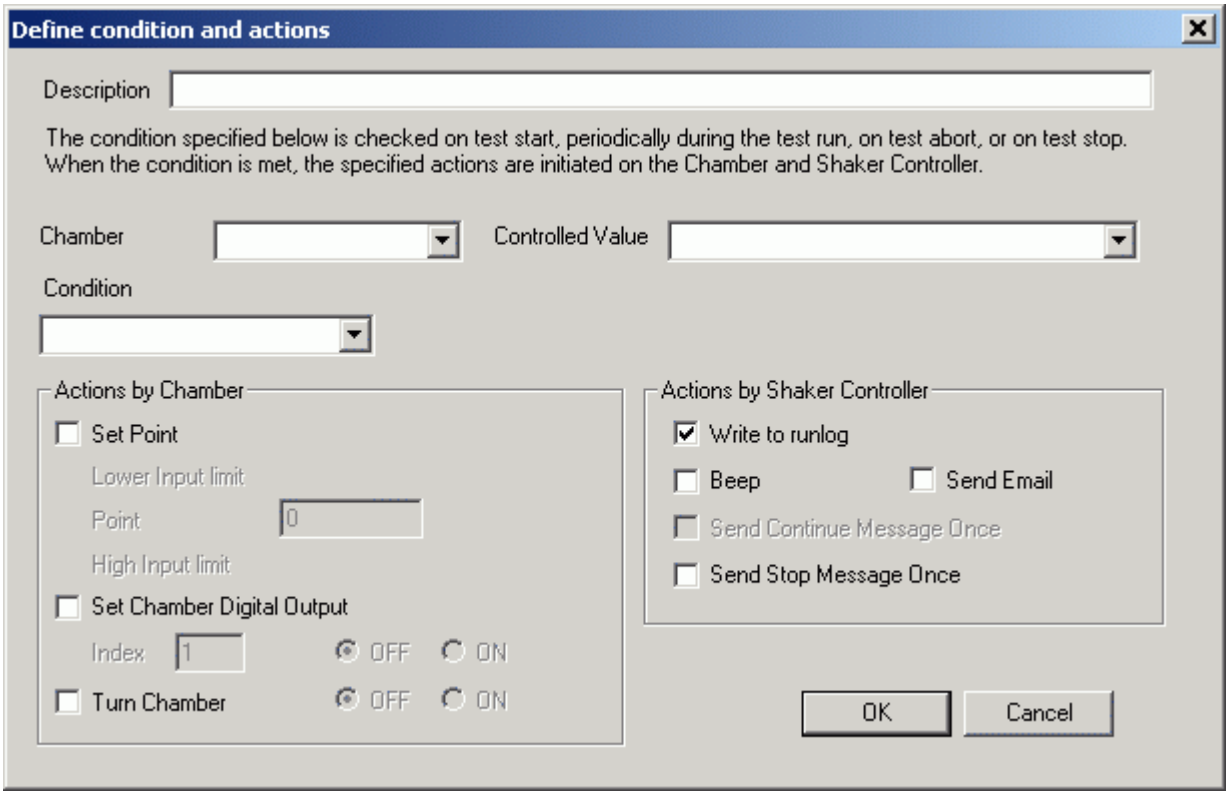
Condition field lists items to be checked, there are some options: Unconditional, Get Actual Value, Get Error Status, Get Error Number. Unconditional means no condition to be checked. If last three options are selected, some fields appears to enter supplemental information. Get Actual Value means to check actual value(temperature or humidity) is less/greater/equal to/between the specified value.

- Actions taken to Chamber

There are two actions right now, Set Control Value and Turn Chamber On or Off. If “Set Control Value” checkbox is checked, a field is enabled for enter, the value must be between Lower Input Limit and High Input Limit. If “Turn Chamber” checkbox is checked, radio On and Off are enabled for selecting.

- Actions to VCS

There are several actions to VCS: Write to runlog, Beep, Send Email, Send “Continue” Message Once, Send “Stop” Message Once.



Chamber Watch View

Click menu “Window/Chamber Watch Window”, a chamber watch view will be created. It watches Actual Value, SetPoint Value, Input/Warning/Alarm Limitation on all Weiss chamber and controlled Value(temperature and humidity). If the Weiss TCP/IP Server is inactive, it just displays a message “Can't

connect to the Weiss TCP/IP server", but if the server is activated late, it will reconnect to it automatically and watches all above values.

SiMPAT! Technical Manual

Using our Server/Client modules S!MPATI* can be extended to a multi-user/multi-platform environment. In addition, the S!MPATI server module offers an interface to your own applications. In other words S!MPATI* Server* offers the possibility to realize an integration into almost any testing environment.

A simple but comprehensive set of commands establishes the communication with S!MPATI* Server*. The data exchange will be handled over TCP/IP sockets.

The following functionality is on your disposal:

- Set Values (e.g. temperature/humidity) - sending and receiving
- Actual Values - receiving
- Additional Sensor Readings - receiving
- Digital Outputs - setting
- Digital Inputs - reading
- Error Messages - reading
- Automatic Programs on Controller - starting and stopping
- Archiving/Data Logging - starting and stopping

Special functions can be implemented upon request.

S!MPATI* Server*

Command Syntax, Command List

1. Command Syntax

Command-ID	SR	Chamber-ID	SR	Parameter 1	SR	Parameter 2	SR	Parameter n (up to 4 parameters depending on command)	CR

SR = SeparatoR = "¶" (ASCII 182)
CR = CarriageReturn (\r) signaling the end of a command

EXAMPLE:
Command - set temperature control value
SET ControlValue

Command-ID	SR	Chamber-ID 1-32	SR	Set Value-ID 1 = Temperature	SR	Set Value	End of Command
11001	¶	2	¶	1	¶	25.0	CR

2. Response

Response from the server application on a GET command, e.g. GET ActValue

1	SR	23.90	CR

General syntax:

Error Code	SR	Return Value 1	SR	Return Value 2	SR	Return Value n (depending on command up to 4 return values)	CR

In the event of an error respectively:

Error Code	CR

Possible error codes:

1	Successful command execution
-1	Empty command string
-2	Missing Chamber-ID
-3	Invalid Chamber-ID
-4	Chamber not accessible
-5	Unknown Command-ID
-6	Insufficient number or wrong command parameters
-7	No server (in server service command mode)

3. Available Commands

Name of Command	Command-ID	Parameter 1	Parameter 2		Return Value 1
CHAMBER INFORMATION					
GET ChamberName	10006				ChamberName
GET ChamberType	10017	Index			VÖTSCH 10001 WEISS DMR 20001
GET ControlValueNum	11018				ControlValue
GET DigitalChannelNum	14007				DigitalChannel
GET ErrorNum	17002				Error

GET OperationStatus	10012				CONNECTED 0x1 RUN 0x2 WARNING 0x4 ERROR 0x8
GET OperationMode	10010				DATALOGGING 0x01 MANUAL 0x02 AUTOMATIC 0x04 PAUSE 0x08 BUSY 0x10
GET ScanRate	10034				ScanRate
CONTROL VALUE (e.g. temperature, humidity, ...)					
GET Name	11026	Index			Name
GET Unit	11023	Index			Unit
SET ControlValue	11001	Index	Value		
GET ControlValue	11002	Index			ControlValue
GET ActValue	11004	Index			ActValue
GET InputLimitMin	11007	Index			InputLimitMin
GET InputLimitMax	11009	Index			InputLimitMax
GET WarningLimitMin	11016	Index			WarningLimitMin
GET WarningLimitMax	11017	Index			WarningLimitMax
GET AlarmLimitMin	11014	Index			AlarmLimitMin
GET AlarmLimitMax	11015	Index			AlarmLimitMax
SET VALUE (e.g. fan speed)					
GET Name	13011	Index			Name
GET Unit	13010	Index			Unit
GET SetValue	13005	Index			SetValue
GET InputLimitMin	13002	Index			Min
GET InputLimitMax	13004	Index			Max
READINGS (e.g. additional sensors)					
GET Name	12019	Index			Name
GET Unit	12016	Index			Unit
GET ActValue	12002	Index			ActValue
GET WarningLimitMin	12010	Index			Min
GET WarningLimitMax	12011	Index			Max
GET AlarmLimitMin	12008	Index			Min
GET AlarmLimitMax	12009	Index			Max
DIGITAL CHANNELS					
SET DigitalOut	14001	Index	ON / OFF		
GET DigitalOut	14003	Index			DigitalOut, 0/1

GET DigitalIn	15002	Index			DigitalIn , 0/1
ERRORS					
GET ErrorMessage	17007	Index			ErrorMessage
GET ErrorStatus	17009	Index			ErrorStatus, 0/1
AUTOMATIC-MODE					
SET StartProgram	19014	Program Nr	Loops		
SET StopProgram	19015				
SET Download	19001	Program Name	Program Location		
GET ProgramStatus	19062	0			TRUE / FALSE (1/0)
ARCHIVING					
SET ArchiveName	18011	Archive name			
SET StartArchive	18009	ON = 1			
SET StopArchive	18009	OFF = 0			