# TASP Essentials

Contents

## I. SICS

I.1. SICS (**S**INQ **I**nstrument **C**ontrol **S**ystem) is a client-server system that controls all the neutron spectrometers of SINQ. The server program runs all the time and the user simply manipulates a TASP dedicated client. The program was written by Mark Koennecke (Mark.Koennecke@psi.ch) and a detailed description is given in the SICS manual.

The TASP client may be started in different ways

a) Directly from the LINUX system, by typing.

> tas &amp;                        ( "&gt;" represents the terminal prompt)

b) Using a "Web JAVA" application.

c) Using the interface "six".

> six

I.2 SICS commands characteristics. They may be input interactively or by running a batch file

- Most commands are abbreviated to their first <u>two</u> relevant letters, like **pr** for "print", **se** for "set", **co** for "count", **dr** for "drive" or **sc** for "scan".

- Commands are separated from the accompanying variables by at least one space. The variables and their numerical values maybe separated by spaces "  ", commas "," or  "=".

-Input a single command per line but some commands may affect several devices and motors.

-An input line in SICS must begin with a command, but "printing" the positions of device controllers may be abbreviated by omitting "**pr**". That is, "> ki" is equivalent to "> **pr** ki"

## I.3 Some useful commands

\* Units of a1,…a6, za1,…,za6 and the goniometers settings, sgl and sgu, are in degrees, energies in meV, d-spacings and lattice constants in Å, q-values in Å$^{-1}$.

a) <u>Drive command</u>. Device controllers and motors like, a1, a2, …,a6, tt (temperature), mf (magnetic field) are changed with the command "drive".

> **dr** a3=40, a4 = 80                    (drive a3 to 40 deg and a4 to 80 deg).
> **dr** tt=0.2, mf=0.5                    (drive the temperature to 2 K and the magnetic field to 0.5 T)
> **dr** qh 4 0 0 0                    (drive (qh, qk, ql, en) to (4, 0, 0, 0) )

b) <u>Set Command</u>. Variables like, mn, ti, za3 are not driven but "set" to a value.

> **se** mn = 100                    (set monitor counts to 100)
> **se** za3 = 0.1                    (set zero of a3 to 0.1 deg.)
> **se** sa = 0                    (two-axis mode: a5 = a6 = 0.)
After changing sa a "drive" of kf must be performed for the changes to be implemented. Three axis mode are implemented with se sa = +1 or -1.  The zero of a5 changes to +90 or -90, respectively.
> **se** sa = -1                    (3-axis mode, negative scattering sense )
                              AVOID:     a) sa 1 ( it does not change zero of a5 !)
                                        b) error if "new sa" = "old sa"

c)  <u>Scan command</u>. Syntax: sc, motor, center position, step, step size, number of points np, monitor counts mn (or time ti). Note: any omitted variable uses its last assigned value. Maximum number of points per scan is 100. Examples:

> **sc** a3 -55 da3 1 np 11 mn 1000           (11 point scan of  a3, center=-55 deg, step= 1, 1000
                                        monitor cts per point. Initial a3=-60, final a3=-50).
> **sc** a3 -55 da3 1 np 11 ti 5           (As in the above command but count for 5 s per point).
> **sc** qh 2 0 0 0 dqh 0.5 0.5 0 0 np 4           (4-point scan in the direction **q**=(1, 1, 0), center (**q**, en)
                                        = (2 0 0 0). ql and en, remain constant. Initial **q**=(1, 1,
                                        0), final **q**=(2.5, 2.5, 0))
> **sc** qh 2 0 0 0 dqh 0 0 0 0.5 np 4           (4-point scan in energy, center (**q**, en) = (2 0 0 0). **q**
                                        remains constant.)

<u>Multiple scan.</u> Scan of two or more (up to 10) variables simultaneously. For instance, for a 11-point, theta-two-theta scan, in  a3 and a4, center: a3=20, a4=40, a3 step= -0.1, a4 step= -0.2, 1000 monitor cts per point, type:

> **sc** a3=20, a4=40, da3=-0.1, da4=-0.2 np 11 mn 1000

<u>Fast scan.</u> A single variable is driven from start to end without stopping and measurements are done on the fly. The "ti" value sets the time between measurements.

> **fs** a3=20, da3=1, np=21 ti= 2           (drive a3 from 10 to 30, reading every 2 s ).

The **dr** and **sc** commands perform "motions in reciprocal space" by keeping either ki or kf constant according to the value of the fx parameter. fx=1 keeps kf constant and fx=2 keeps ki constant.

d) <u>Count command</u>. "**co**" counts for a given time period or number of monitor counts. Example

> **co** mn 1000                                (count for 1000 cts in the monitor)
> **co** ti 2                                      (count for 2 s)

e)  <u>Stop command</u>. "stop". Any command can be interrupted at any time by typing

> **stop**

Note that "Ctrl+c" stops both the command and the "six" client. All the variables are stored. Resume the program by typing **six.**

- f) <u>List commands</u>.

> **li**                         (list all the TASP variables and parameters)
> **le**                         (list energy variables: ei, ki, ef, kf, qh, qk, ql, en, qm)
> **ls**                         (list sample variables)


## II. The first steps in TASP

1. Log in. Obtain a username and password from your local contact.

2. Start the TASP control software "SICS".

> **six**

3. Set various parameters

> **se** as 5.72 bs 2.85 cs 5.00          (set lattice parameters:  a = 5.72 Å,  b = 2.85 Å, c = 5.00 Å)
> **se**  aa 90 90 90                      (set alpha = 90 deg, beta=90 deg, gamma=90 deg )
> **se** title LiCu2O2 …                   (set title = "LiCu2O2…")
> **se** user MrX                          (set user = "MrX")
> **se** local Roessli                     (set local contact = "Roessli")

4. Check sample parameters

> **ls**                                    (list sample parameters)

5. Set and carefully **check the software limits** of all the relevant motors. They depend on the particular experimental arrangement of various auxiliary devices including pumps, pump lines, controllers and, of course, the position of the walls.

> **se** ua2 xxx                           (set upper limit of a2)
> **se** la2 yyy                           (set lower limit of a2)
….

6. Perform your scans either interactively or by running a "job file".

## III Simulation mode

Need to start and run the simulation SICS server as follows

 (i)  Open a new shell
 (ii)  > **six –s**  (start simulation SICS server)
 (iii)  > **sync**  (import current parameters of SICS)
 (iv)  >….  (perform your drives, scans or execute job files)

Everything is like in SICS, but no hardware is moved.

## IV Job files (macros)

IV.1 To create or edit a job file (assume filename = "*myjob.job*")
 (i)  Open a new shell
 (ii)  > **nedit** *filename* (or edit a file using any text editor)
 (iii)  Type your commands sequentially
 (iv)  Save and exit

All commands must be terminated by a carriage return (CR). End your job file with one or more CR's!

IV.2 Set Path. Assume  your file is in the TASP computer in a directory: "home/tasp/MrX"

> **exe batchpath** /home/tasp/MrX/

IV.3 To execute a job file within "SICS"

> **do** *myjob.job*

Note run command **ru** does not work.

## V How to…

### V.1 How to set the zero of a3  (variable: za3).

Assume TASP to be positioned at (qh,qk,ql,em) = (2,0 0 0) and the current value of a3 = XXX needs to be adjusted to target value YYY.

 (  i) > **fi** a3   (fix a3. That is, it cannot move)
 ( ii) > **dr** qh 2 0 0 0  (motor values are calculated, displayed and driven to their targets. But a3 does not move.)
     a1 = …
     a2 = …
     a3 = YYY
     a4 = …

 (iii) > **sp** a3 YYY  (set a3 to the calculated value by adjusting the zero of a3, za3)
 (iv) > **cl** a3   (clear or "unfix", i.e. release  a3)

The user should not change the zeros of any motor other than a3.

### V.2 How to perform polarization analysis.

Use the polarization analysis command "**pa**". This command allows for a polarization analysis loop to be carried out for each point in a scan. The allowed commands in the polarization analysis loop should be included in a file whose extension is ".pal".

> pa poll        (causes the commands in the file "poll.pal" to be executed for each subsequent scan)

In the ".pal" files the commands refer only to flippers (f1, f2), Helmholtz coils (hx, hy, hz) and counting, i.e, contain only commands: **se**, **co**, **dr**, **on** and **off**. The commands **on** and **off** refer to the spin flippers, f1 f2. For instance:

> **off** f1, f2                (turn both spin flippers, f1 and f2, off)
> **dr** hx = 5, 0, 5          (drive hx=5 A, hy = 0 A, hz = 5 A- currents in Amperes )
> **co** mn=200             (count for 200 monitor cts )
> **on** f1                  (turn on spin flipper 1)
> **co** mn=20               (count for 20 monitor counts)

See examples of Job files.

## V.3. How to set and control the temperature and magnetic field.

Open another shell and start the "SEA" application. Using SEA interactively, set the temperature and magnetic field. The SEA console prints the commands needed to perform the same actions directly from the "SICS" application.

Main variables: mf = magnetic field, tt = VTI temperature, ts = sample temperature. Convenient variable tem = ts for dilution fridges, and = tt for other cryostats. All the variables related to settings of the magnetic field and temperature regulation and control may be obtained from the SEA console.

> **dr** mf 1               (drive magnetic field to 1 Tesla)
> **ru** mf 1               (run magnetic field to 1 Tesla)
> **dr** tem 1             (drive temperature to 1 K)

 (**dr** waits until done before executing other commands, **ru** does NOT wait until done before executing other commands)

In case of errors in the connection between SEA and SICS, try
> **connect_sea**

In case of doubt of the functioning of the dilution unit 1GH check in the front panel of the dilution:

> **Temperature controller**
Mixing Chamber heater range 2 mW (adjusted to zero).

> **AC Lake Shore Resistance bridge**
heater range 31.6 mW (adjust/enter).
Excitation 200 uW
Voltage mode /on
Auto range /on

> **Flow control**

flow VTI = 5
tc tolerance 0.01
Voltage mode /on

## VI. To be avoided …

VI.1 Do not try to change the distance between the monochromator and detector and between the detector and analyzer.

### VI.1 List of variables that should NOT BE CHANGED

za1, za2, za4, za5, za6          (zero positions of motors: a1, a2, a4 a5 and a6)
dm, da                          (monochromator and analyzer d-space)

### VI.2 List of devices and motors that should NOT BE CHANGED

mtl, mtu, atl, atu              (lower and upper translation positions of the monochromator and analyzer)
mgl, agl                        (lower goniometer of the monochromator and analyzer)

**Not a good idea:**

> **cl**

because it would remove the "fix" of all the devices, including those that should not be changed However, it is fine to perform:

> **cl** za3