jSeisCal v0.4

USER MANUAL

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1 Introduction

This tool has been designed to conduct field operations regarding STS1 and STS2 installation. This first version is strongly oriented towards the way Geoscope installs those seismometers

This manual assumes that the user has a good knowledge of the use of a Q330 and a E300/PTM1 system, and that he has some basic networking skills.

2 Requirements

2.1 Platform

jSeisCal should work on any OS running a Java Virtual Machine. It is used and has been tested under the following OS:

- Windows XP
- Mac OS

2.2 Java heap space

Depending on the settings of the Java Virtual Machine, it might be required to use the option –Xmx256 or –Xmx512 to allocate enough memory to the software.

2.3 Q330

2.3.1 Version

The use of this version of jSeisCal is restricted to the Q330 (and Q330HR) digitizers. It has been used only with Q330HR. So for the moment, some hard coded scale issues might appear if used with a Q330 (24 vs 26 bits).

2.3.2 Wiring

For STS1 and STS2, velocity outputs should be connected to the A input, that is to say Z on channel 1, N on channel 2, E on channel 3.

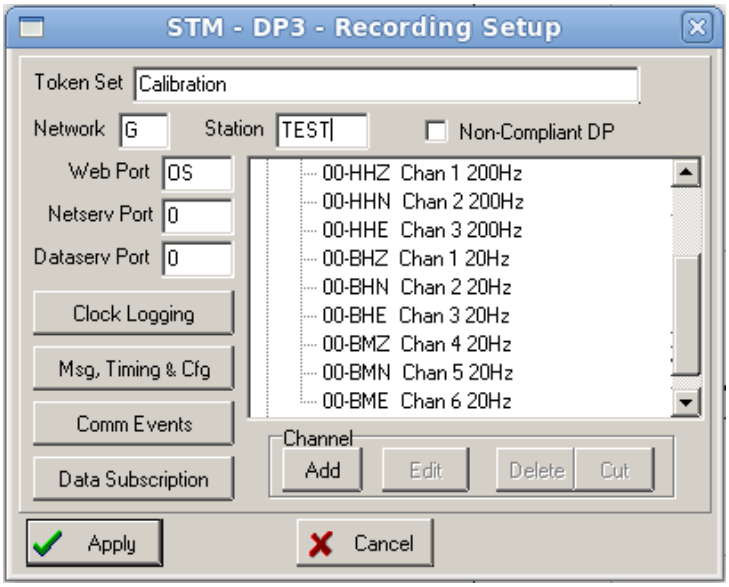
For STS1, POS outputs should be connected to the B output, that is to say LP Z on channel 4, LP N on channel 5, LP on channel 6

2.3.3 Data Port

The Data Port of the Q330 used for the installation/calibrations requires a special configuration.

For STS1 and STS2 :
BHZ, 20 Hz, Channel 1
BHN, 20 Hz, Channel 2
BHE, 20 Hz, Channel 3
HHZ, 200 Hz, Channel 1
HHN, 200 Hz, Channel 2
HHE, 200 Hz, Channel 3

For STS1 :
BMZ, 20 Hz, Channel 4
BMN, 20 Hz, Channel 5
BME, 20 Hz, Channel 6



2.3.4 Metrozet electronics

For STS1 installation/calibration, jSeisCal assumes that the sensors are connected in the standard order : Z N E. It requires the PTM1 module for Ethernet remote control of the E300 electronics.

2.3.5 Network

PC, Q330, PTM1 (E300) must be in the same sub-net to allow Ethernet links between them.
The IP of the PTM1 module and the IP of the Q330 should be set and known before running the software.

3 Getting Started – Step by Step procedure to receive data

3.1 Check the wiring of the whole setup

Sensors + network.

3.2 Set PTM1 IP address

See PTM1 user manual.

3.3 Set Q330 IP address

See Q330 user manual.

3.4 Set computer IP address

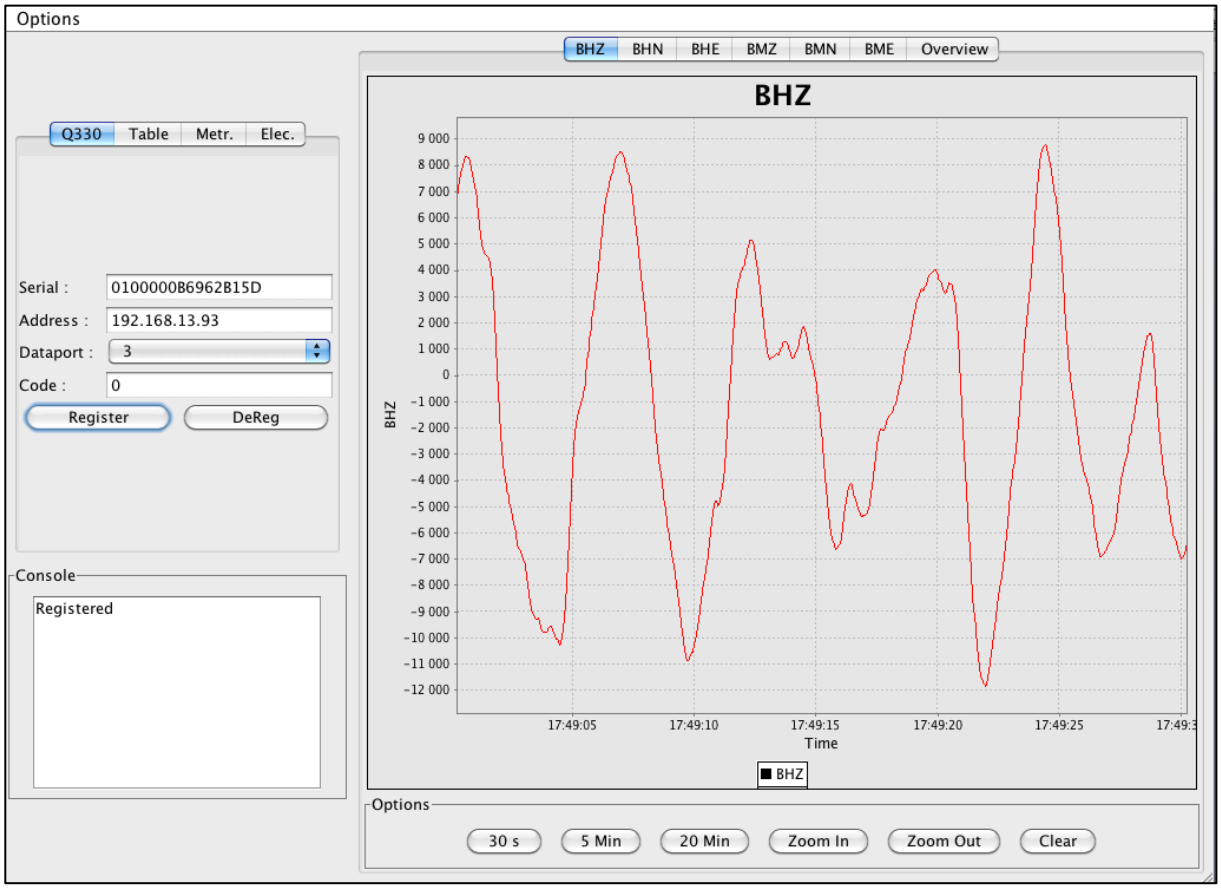
Depends on your OS.

3.5 Set Q330 Data Port

See 2.3.3

3.6 Run jSeisCal.run

You should see the main window appear on screen:



3.7 Register to the Q330

Enter the Q330 Serial number, IP address, Data port number and registration code.

!! CAUTION !! :

When you click on Register, the tool sends a flush command to the data port right after the registration. If the data port contains data, they will be erased and lost, so be sure to have no need of those data. If the data port is already registered to another client, the registration will fail and no data will be lost.

This feature has been implemented in order to have always real time data. If the flush was not sent, each time you would register to a data port, the Q330 would start sending old data first until its buffer is empty. For some data ports with 100% of the Q330 memory, this can be long and annoying, specially on the field !

If you have read this paragraph, then you can click on the Register button !

3.8 Check incoming data

You can check visually the data incoming by clicking on the tabs for each channels. Only the B?? channels are displayed. Displaying the HH? channels is too CPU hungry for Java (starts hanging after 1 hour of data ...). You can check that HH? Channels are coming in using the “Overview” tab which displays the status of each internal channel buffer.

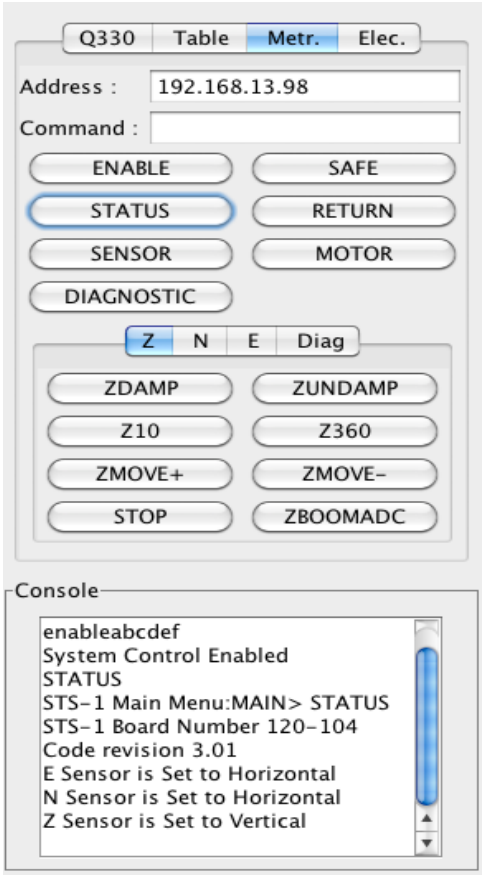
4 STS1 installation

4.1 Connect to Metrozet systems : E300 through PTM1

Enter PTM1 IP address and click on **ENABLE** button. This will connect to the module and enable the command mode.

You can then issue the commands by clicking on the corresponding button.

The commands that do not have a button can be issued using the command field: type the command and press **ENTER**.



4.2 BM? Channels view

Mean is the mean value on a 20s sliding window.

Max is the ratio between the current peak to peak amplitude and the last peak to peak amplitude when a new max (Max_n) is detected, see the formula :

$$Max_{\%} = \left(\frac{(Max_n - Min_n)}{(Max_{n-1} - Min_n)} - 1 \right) * 100$$

Min is the ratio between the current peak to peak amplitude and the last peak to peak amplitude when a new min (Min_n) is detected, see the formula :

$$Min_{\%} = \left(\frac{(Max_n - Min_n)}{(Max_n - Min_{n-1})} - 1 \right) * 100$$

4.3 Example of horizontal component setup using free oscillations method

- Level and unlock the sensor
- Try to center the mass with the sensor unplugged
- Plug the sensor.
- Plug the E300. Always remove the power on the E300 before plugging or unplugging any cable.
- Run jSeisCal, register to the Q330 and enable Metrozet remote control of E300 electronics (ENABLE button)
- Click on the corresponding channel tab (BME or BMN)
- Switch the sensor to 10s mode using the N10 or E10 button
- Try to get a value of the POS signal in the viewing range turning the feet
- Once you have a POS value in the range, try to center to 0 this value
- Remove the damping by clicking on NUNDAMP or EUNDAMP button
- The sensor will start to oscillate with a free period of 10s, the amplitude of the oscillations should increase each time you will touch it and decrease with time if it is not in a unstable position
- Try to reduce the damping, ie put the sensor in a horizontal position while keeping the mean value near 0
- If the oscillations become too big, click on NDAMP or EDAMP button to re-enable the damping for a few seconds and remove it again with NUNDAMP our EUNDAMP.
- The horizontal component setup is ok when:
    - Max% et Min % are between 0% and -1% .
    - Mean is near 0 V, between -0.2V and 0.2V
- Put back the damping (NDAMP or EDAMP) and the 360s mode (N360 or E360)
- Check that the POS value stays near 0V after a few minutes

- Settings can change after the addition of the glass bell and the vacuum.

4.4 Example of vertical component setup using maximum of gravity method

The idea is to move the feet of the vertical sensor to reach a maximum on the POS signal for a certain setup of the balancing weight. The final POS value is reached by readjusting the balancing weight or by changing the pressure in the glass bell.

- Level and unlock the sensor
- Try to center the mass with the sensor unplugged by adjusting the balancing weight (see STS1 data sheet ...)
- Plug the sensor.
- Plug the E300. Always remove the power on the E300 before plugging or unplugging any cable.
- Run jSeisCal, register to the Q330 and enable Metrozet remote control of E300 electronics (ENABLE button)
- Click on the corresponding channel tab : BMZ
- Switch the sensor to 10s mode using the Z10 button
- Try to get a value of the POS signal in the viewing range
- Adjust one foot to reach a maximum (STS1 data sheet indicates a minimum which becomes a maximum with E300 electronics, see E300 data sheet)

- Adjust one other foot to increase the value reach a maximum
- Cycle the 3 feet until each adjustment decreases the value
- Remove power on the E300
- Lock the sensor
- Readjust the balancing weight to reach a POS value of ~ – 6 V (this value depends on the vacuum that you want to put in the glass bell ...)
- Repower the E300
- Re do the feet adjusting procedure as many times as needed
- Switch back the electronics to 360s mode with Z360
- Set the final POS value by adjusting the vacuum in the glass bell.

5 Absolute calibration

5.1 Principle

The tool assumes that the calibration is a CT-EW1 from Lennartz with the extension bridge for horizontal calibration. jSeisCal records the data and does the calculation. The algorithm is based on the calibration algorithms developed by E. Wielandt.

5.2 Setup

Put the table in the desired position (Vertical or Horizontal) using the Mode button. See the CT-EW1 manual for use with the remote control and for gear manipulations.

5.3 Parameters

Set the parameters according to the calibration that you want to run and to the displacement values of the table:

- *Disp* : vertical displacement of the table
- *Free p* : free period of the seismometer
- *Damping* : damping ...
- *Bits* : bits range of the digitizer
- *Volts* : input range of the digitizer in volts
- *Channel* : Data channel used for the calibration, best is HHZ for vertical and BHN and BHE for horizontal

5.4 Procedure

- Run jSeisCal, setup the Q330 and the table and its parameters ...
- Select the desired channel tab for data display
- Setup the seismometer, STS1 or STS2
- Wait to have a stabilized signal
- Click on start button to start the recording
- Run the calibration manually. See the CT-EW1 manual ...
- Click on stop (same button as start) to stop the calibration record.
- A new window should appear with the calculation results

- You can change the parameter and recalculate the sensitivity
- Save / Open is possible using E. Wielandt data format called here “Seife”

5.5 Calculation

The calculation is strongly inspired by E. Wielandt algorithms Dispcal and Tiltcal, but it is simplified for better results with STS2 and STS1. There are fewer corrections applied to the signal than in Professor Wielandt procedure (drift etc. …) . Therefore, this calculation will not work well with short period sensors. A comparison with Pr Wielandt dispcal and tiltcal programs is always suggested!

6 Electrical calibration

6.1 Principle

jSeisCal can control the E300 electronics to set it into calibration mode and to start the calibration signals. jSeisCal will not record the data and will not calculate the poles and zeros.

6.2 Procedure

- Once the seismometer is installed and running under its glass bell and in 360s mode, (re)enable the E300 remote control.
- Click on the “Electr.” tab
- Click on CALIBRATE to go to calibrate “directory”
- Set the calibration mode: click on INTCALVELOCITY
- Depending on the channels (2 at the same time) that you want to calibrate, click on EZSIGNALOUT (Z and E) or NZSIGNALOUT (Z and N), see E300 manual for details
- Click on SWEEP to launch sweep calibration or STEP for step calibration.
- After calibration, don’t forget to put back the E300 in SAFE mode

7 Know issues / bugs

7.1 Freeze after 1 or 2 hours of data display

Depending on the power of your system, the tool may start hanging after 1 or 2 hours of data display and record. To be optimized ...

7.2 Networking issues

After a while without anything sent to the E300, the socket looses connection and the tool has to be restarted …