

# EQ Simulator Input Station File Format

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Version 0.6

## **1. Overview**

The station file contains a list of station locations. These are locations where it is desired to calculate displacements or stresses. Stations are typically located on the earth's surface, but they are also allowed to be underground.

For each station, the file contains:

- An integer index number.
- If spherical coordinates are in use, the station location in latitude, longitude, and depth.
- If rectangular coordinates are in use, the station location in  $x$ ,  $y$ , and  $z$ .

## 1.1. Version History

### Version 0.6

Release date: 04/05/2013.

For version 0.6, the signature for an input station file is “EQSim\_Input\_Station\_2” and the specification level is 2. So, the first line of the file contains the following signature record:

```
101 EQSim_Input_Station_2 2
```

The following changes were made in version 0.6:

- For the rectangular  $(x, y, z)$  coordinate system, the placement of  $x$  and  $y$  in the file are reversed from the positions they occupied in version 0.5. Specifically, in version 0.6 the  $x$  coordinate is identified with longitude, and the  $y$  coordinate is identified with latitude. This change was made so that the  $(x, y, z)$  coordinate system is a right-handed coordinate system.

### Version 0.5

Release date: 03/25/2011.

For version 0.5, the signature for an input station file is “EQSim\_Input\_Station\_2” and the specification level is 1. So, the first line of the file contains the following signature record:

```
101 EQSim_Input_Station_2 1
```

Version 0.5 is the first version of the input station file.

## **2. Station Information**

### **2.1. Coordinates**

A station file can contain either spherical coordinates or rectangular coordinates. Models of natural fault systems typically use spherical coordinates (latitude, longitude, depth). Models of non-natural fault systems typically use rectangular coordinates ( $x, y, z$ ). There is a flag in the file that specifies whether spherical or rectangular coordinates are in use.

A station is described by three coordinates. If spherical coordinates are in use, then the three coordinates are *latitude*, *longitude*, and *depth*. Latitude and longitude are measured in decimal degrees (positive in the northern and eastern hemispheres respectively), and depth is measured in meters (negative underground).

If rectangular coordinates are in use, then the three coordinates are  $x$ ,  $y$ , and  $z$ , which are all measured in meters. Coordinate  $z$  is the same thing as depth, and is negative underground. The earth's surface is the plane  $z = 0$ .

### 3. File Format

The input station file is a container, as described in the EQ Simulator Container Format. The container format lets us store different kinds of records in a single file.

#### 3.1. Overall File Structure

The following table shows the overall structure of an input station file. Specific kinds of records are described later.

	Part	Description
1	Header	File header that contains the file signature, metadata, and record descriptors, as described in the container file specification.
2	Summary	One line that contains the station summary record. This record gives the total number of stations in the entire file.
3	Station list	Multiple lines that list the stations, and give coordinates for each.
4	End-of-file	One line that marks the end of the file, as described in the container file specification.

The signature for an input geometry file is “EQSim\_Input\_Station\_2”. The specification level of this document is 2. So, the first line of the file contains the following signature record:

```
101 EQSim_Input_Station_2 2
```

Refer to the container file specification for an explanation of signature and specification level.

#### 3.2. Indexing

Each station is assigned an index number. Indexes start at 1, and increase consecutively throughout the entire file. These are Fortran-style indexes.

## 4. Record Formats

The following table shows the standard kinds of data records for the input geometry file.

Kind	Name	Description
200	summary	Station summary record
201	station	Station record

These are all data records, which means that each record contains a series of data fields. Each kind of record is explained below.

The names “summary” and so forth must be listed in the descriptor part of the file header.

### 4.1. Station Summary Record

```
200  n_station lat_lo lat_hi lon_lo lon_hi  
      depth_lo depth_hi coord_sys comment_text
```

This must be the first data record in the file. It gives the total number of stations in the file. It is provided for the benefit of readers that need to allocate, in advance, all memory needed to store the station list.

The record contains 8 data fields, described in the following table.

	Name	Type	Description
1	n_station	integer	The total number of stations in the file.
5	lat_lo	real	If spherical coordinates are in use, the lowest value of latitude for any station in the entire file, in decimal degrees.  If rectangular coordinates are in use, the lowest value of <i>y</i> for any station in the entire file, in meters.
6	lat_hi	real	If spherical coordinates are in use, the highest value of latitude for any station in the entire file, in decimal degrees.  If rectangular coordinates are in use, the highest value of <i>y</i> for any station in the entire file, in meters.

7	lon_lo	real	If spherical coordinates are in use, the lowest value of longitude for any station in the entire file, in decimal degrees.  If rectangular coordinates are in use, the lowest value of $x$ for any station in the entire file, in meters.
8	lon_hi	real	If spherical coordinates are in use, the highest value of longitude for any station in the entire file, in decimal degrees.  If rectangular coordinates are in use, the highest value of $x$ for any station in the entire file, in meters.
9	depth_lo	real	The lowest value of depth or $z$ for any station in the entire file, in meters.
10	depth_hi	real	The highest value of depth or $z$ for any station in the entire file, in meters. Usually this value is 0.0.
11	coord_sys	integer	Coordinate system flag. Values: 0 – Spherical coordinates are in use. 1 – Rectangular coordinates are in use.

The names “n\_station” and so forth must be listed in the descriptor part of the file header.

As in any data record, the fields must be separated by one or more blank spaces. The *comment\_text* is optional, but if included it must be separated from the last field by one or more blank spaces.

## 4.2. Station Record

*201 index lat lon depth comment\_text*

There is one station record for each station. It specifies location of the station.

The record contains 4 data fields, described in the following table.

	Name	Type	Description
1	index	integer	Index number for this station. The first station in the file must have index number 1, and each subsequent station increments this value.

2	lat	real	<p>If spherical coordinates are in use, the latitude of this station, in decimal degrees. Positive in the northern hemisphere.</p> <p>If rectangular coordinates are in use, the <math>y</math> coordinate of this station, in meters.</p>
3	lon	real	<p>If spherical coordinates are in use, the longitude of this station, in decimal degrees. Positive in the eastern hemisphere.</p> <p>If rectangular coordinates are in use, the <math>x</math> coordinate of this station, in meters.</p>
4	depth	real	The depth or $z$ coordinate of this station, in meters. Negative underground.

The names “index” and so forth must be listed in the descriptor part of the file header.

As in any data record, the fields must be separated by one or more blank spaces. The *comment\_text* is optional, but if included it must be separated from the last field by one or more blank spaces.