# Hardware Tracking Schema v1.1

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# Contents

# Chapter 1

# Inventory

## 1.1 Response information

### 1.1.1 Response information

$Response(seqresp\_id, resp\_number)$

| | | |
|---|---|---|
| seqresp_id | int | Sequence of responses identifier |
| resp_number | int | Response number |
| resp_type | char(1) | Response type (H, L, P, Z, F) |
| resp_id | int | Response identifier |

### 1.1.2 High-pass filter

$Response\_HP(hp\_id, order)$

| | | |
|---|---|---|
| hp_id | int | Filter identifier |
| filter_type | char(2) | Filter type (BW, DG, ND) |
| nb_pole | int | Number of poles |
| corner_freq | float | Corner frequency of filter |
| damping_value | float | Fraction of critical damping |

### 1.1.3 Low-pass filter

$Response\_LP(lp\_id, order)$

| | | |
|---|---|---|
| lp_id | int | Filter identifier |
| filter_type | char(2) | Filter type (BW, DG, ND) |
| nb_pole | int | Number of poles |
| corner_freq | float | Corner frequency of filter |
| damping_value | float | Fraction of critical damping |

### 1.1.4 Poles and Zeros

$$Response\_PZ(pz\_id, pz\_number, type)$$

| | | |
|---|---|---|
| pz_id | int | Poles and Zeros identifier |
| pz_number | int | Pole/Zero number |
| type | char(1) | Pole or Zero |
| r_value | float | Real zero/pole |
| r_error | float | Real zero/pole error |
| i_value | float | Imaginary zero/pole |
| i_error | float | Imaginary zero/pole error |

### 1.1.5 Polynomial

$$Response\_PN(pn\_id)$$

| | | |
|---|---|---|
| pn_id | int | Polynom identifier |
| poly_type | char(1) | Type of polynomial approximation (C, L, M) |
| lower_bound | float | Polynomial lower bound |
| upper_bound | float | Polynomial upper bound |
| max_error | float | Maximum error of polynomial approximation |
| nb_coeff | int | Number of polynomial coefficients |

$$Response\_PN\_Data(pn\_id, pn\_number)$$

| | | |
|---|---|---|
| pn_id | int | Polynom identifier |
| pn_number | int | Coefficient number |
| pn_value | float | Coefficient value |

## 1.2 Sensor information

### 1.2.1 Sensor information

$$Sensor(sensor\_id, start\_date)$$

| | | |
|---|---|---|
| sensor_id | int | Sensor identifier |
| name | char(80) | Sensor name |
| serial_nb | char(80) | Sensor serial number |
| start_date | date | Start date |
| end_date | date | End date |
| nb_component | int | Number of components |

### 1.2.2 Component information

$$Sensor\_Component(sensor\_id, comp\_nb)$$

| | | |
|---|---|---|
| sensor_id | int | Sensor identifier |
| comp_nb | int | Component number |
| channel | char(1) | Channel |
| type | char(1) | Type |
| sensitivity | float | Sensitivity |
| frequency | float | Frequency |
| seqresp_id | int | Sequence of responses identifier |

## 1.3 Filter-amplifier information

### 1.3.1 Filter-amplifier information

$$Filamp(filamp\_id, start\_date)$$

| | | |
|---|---|---|
| filamp_id | int | Filter-amplifier identifier |
| name | char(80) | Filter-amplifier name |
| serial_nb | char(80) | Filter-amplifier serial number |
| start_date | date | Start date |
| end_date | date | End date |
| nb_pchannel | int | Number of physical channels |

### 1.3.2 Physical channel information

$$Filamp\_PChannel(filamp\_id, pchannel\_nb)$$

| | | |
|---|---|---|
| filamp_id | int | Filter-amplifier identifier |
| pchannel_nb | int | Physical channel number |
| gain | float | Gain |
| seqresp_id | int | Sequence of responses identifier |

## 1.4 Datalogger information

### 1.4.1 Datalogger information

$$Datalogger(data\_id, start\_date)$$

| | | |
|---|---|---|
| data_id | int | Datalogger identifier |
| data_type | char(80) | Datalogger type |
| serial_nb | char(80) | Datalogger serial number |
| firmware_nb | char(80) | Datalogger firmware number |
| start_date | date | Start date |
| end_date | date | End date |
| nb_board | int | Number of boards |

### 1.4.2 Board information

$$Datalogger\_Board(data\_id, board\_nb, start\_date)$$

| | | |
|---|---|---|
| data_id | int | Datalogger identifier |
| board_nb | int | Board number |
| serial_nb | char(80) | Board serial number |
| start_date | date | Start date |
| end_date | date | End date |
| nb_module | int | Number of modules |

### 1.4.3 Module information

$$Datalogger\_Module(data\_id, board\_nb, module\_nb, start\_date)$$

| | | |
|---|---|---|
| data_id | int | Datalogger identifier |
| board_nb | int | Board number |
| module_nb | int | Module number |
| serial_nb | char(80) | Module serial number |
| sensitivity | float | Sensitivity (counts/volt) |
| start_date | date | Start date |
| end_date | date | End date |

## 1.5 Filter information

### 1.5.1 FIR Filter information

$Filter\_FIR(fir\_id)$

| | | |
|---|---|---|
| fir_id | int | FIR filter identifier |
| name | char(80) | Filter name |
| symmetry | char(1) | Filter symmetry (Even/None/Odd) |

$Filter\_FIR\_Data(fir\_id, coeff\_number)$

| | | |
|---|---|---|
| fir_id | int | FIR filter identifier |
| coeff_number | int | Numerator/Denominator number |
| type | char(1) | Numerator or Denominator |
| coeff | float | Numerator/Denominator coefficient |
| error | float | Numerator/Denominator error |

### 1.5.2 Filter information

$Filter(filter\_id)$

| | | |
|---|---|---|
| filter_id | int | Filter identifier |
| gain | float | Filter gain |
| freq | float | Frequency for filter gain |
| in_sp_rate | float | Input sample rate |
| out_sp_rate | float | Output sample rate |
| sample | int | Sample selected during decimation |
| delay | float | Filter delay |
| timetag | float | Delay applied to timetag |
| seqresp_id | int | Sequence of responses identifier |

### 1.5.3 Filters sequence

$Filter\_Sequence(seqfil\_id)$

| | | |
|---|---|---|
| seqfil_id | int | Sequence identifier |
| nb_filter | int | Number of filters |
| overall_gain | float | Overall gain |
| freq | float | Frequency |

$Filter\_Sequence\_Data(seqfil\_id, filter\_nb)$

| | | |
|---|---|---|
| seqfil_id | int | Sequence identifier |
| filter_nb | int | Filter number |
| filter_id | int | Filter identifier |

# Chapter 2

# Tracking

## 2.1 Station information

$Station(sta, net, start\_date)$

| | | |
|---|---|---|
| sta | char(6) | Station call letters |
| net | char(8) | Network code |
| lat | float | Latitude |
| lon | float | Longitude |
| elevation | float | Elevation |
| name | char(80) | Station name |
| nb_sensor | int | Number of sensors |
| nb_filamp | int | Number of filter-amplifiers |
| nb_digi | int | Number of digitizers |
| nb_data | int | Number of dataloggers |
| start_date | date | Start date |
| end_date | date | End date |

## 2.2 Sensor information

### 2.2.1 Sensor information

$Station\_Sensor(sta, net, sensor\_nb, start\_date)$

| | | |
|---|---|---|
| sta | char(6) | Station call letters |
| net | char(8) | Network code |
| sensor_nb | int | Sensor number |
| sensor_id | int | Sensor identifier |
| lat | float | Latitude |
| lon | float | Longitude |
| elevation | float | Elevation |
| depth | float | Local depth |
| nb_component | int | Number of components |
| start_date | date | Start date |
| end_date | date | End date |

### 2.2.2 Sensor/Component information

$Station\_Sensor\_Component(sta, net, sensor\_nb, component\_nb, start\_date)$

| | | |
|---|---|---|
| sta | char(6) | Station call letters |
| net | char(8) | Network code |
| sensor_nb | int | Sensor number |
| component_nb | int | Component number |
| hardware_type | char(1) | Hardware type (Filter-amplifier, Digitizer) |
| hardware_nb | int | Hardware number |
| hardware_pchannel | int | Hardware physical channel |
| azimuth | float | Azimuth |
| dip | float | Dip |
| start_date | date | Start date |
| end_date | date | End date |

## 2.3 Filter-amplifier information

### 2.3.1 Filter-amplifier information

$Station\_Filamp(sta, net, filamp\_nb, start\_date)$

| | | |
|---|---|---|
| sta | char(6) | Station call letters |
| net | char(8) | Network code |
| filamp_nb | int | Filter-amplifier number |
| filamp_id | int | Filter-amplifier identifier |
| nb_pchannel | int | Number of physical channels |
| start_date | date | Start date |
| end_date | date | End date |

### 2.3.2 Filter-amplifier/Physical channel information

$Station\_Filamp\_PChannel(sta, net, filamp\_nb, pchannel\_nb, start\_date)$

| | | |
|---|---|---|
| sta | char(6) | Station call letters |
| net | char(8) | Network code |
| filamp_nb | int | Filter-amplifier number |
| pchannel_nb | int | Physical channel number |
| hardware_type | char(1) | Hardware type (Filter-amplifier, Digitizer) |
| hardware_nb | int | Hardware number |
| hardware_pchannel | int | Hardware physical channel |
| start_date | date | Start date |
| end_date | date | End date |

## 2.4 Digitizer information

### 2.4.1 Digitizer information

$$Station\_Digitizer(sta, net, digi\_nb, start\_date)$$

| | | |
|---|---|---|
| sta | char(6) | Station call letters |
| net | char(8) | Network code |
| digi_nb | int | Digitizer number |
| serial_nb | char(80) | Digitizer serial number |
| nb_pri_pchannel | int | Number of primary physical channels |
| nb_aux_pchannel | int | Number of auxiliary physical channels |
| start_date | date | Start date |
| end_date | date | End date |

### 2.4.2 Digitizer/Physical channel information

$$Station\_Digitizer\_PChannel(sta, net, digi\_nb, pchannel\_nb, start\_date)$$

| | | |
|---|---|---|
| sta | char(6) | Station call letters |
| net | char(8) | Network code |
| digi_nb | int | Digitizer number |
| pchannel_nb | int | Physical channel number |
| data_nb | int | Datalogger number |
| data_pchannel | int | Datalogger physical channel |
| digi_type | char(3) | Digitizer type (DSP, AUX) |
| digi_polarity | char(1) | Digitizer polarity (N, ...) |
| start_date | date | Start date |
| end_date | date | End date |

## 2.5 Datalogger information

### 2.5.1 Datalogger information

$$Station\_Datalogger(sta, net, data\_nb, start\_date)$$

| | | |
|---|---|---|
| sta | char(6) | Station call letters |
| net | char(8) | Network code |
| data_nb | int | Datalogger number |
| data_id | int | Datalogger identifier |
| nb_pchannel | int | Number of physical channels |
| start_date | date | Start date |
| end_date | date | End date |

### 2.5.2 Datalogger/Physical channel information

$$Station\_Datalogger\_PChannel(sta, net, data\_nb, pchannel\_nb, start\_date)$$

| | | |
|---|---|---|
| sta | char(6) | Station call letters |
| net | char(8) | Network code |
| data_nb | int | Datalogger number |
| pchannel_nb | int | Physical channel number |
| seed_io | char(2) | SEED instrument and orientation |
| nb_lchannel | int | Number of logical channels |
| start_date | date | Start date |
| end_date | date | End date |

### 2.5.3 Datalogger/Logical channel information

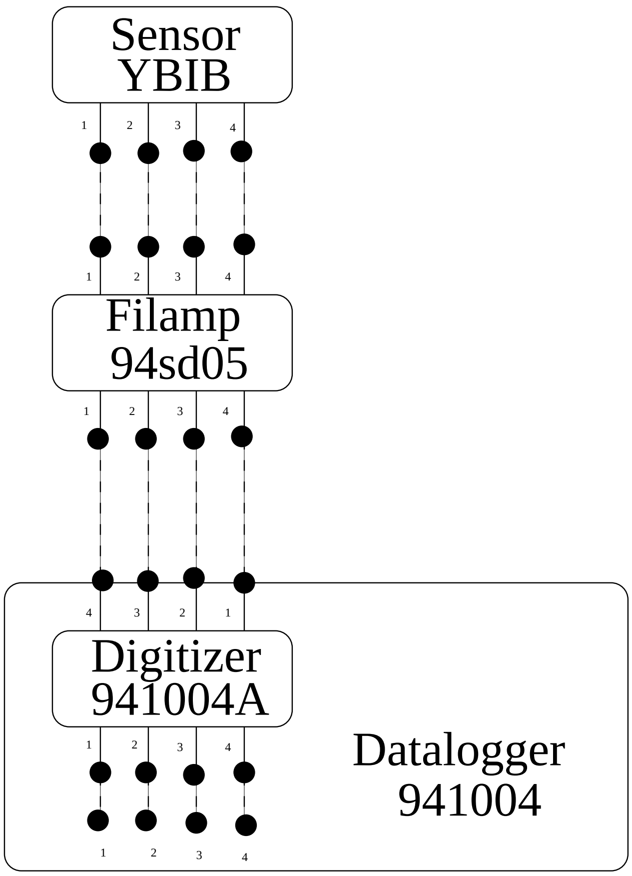
$Station\_Datalogger\_LChannel(sta, net, data\_nb, pchannel\_nb, lchannel\_nb, start\_date)$

| | | |
|---|---|---|
| sta | char(6) | Station call letters |
| net | char(8) | Network code |
| data_nb | int | Datalogger number |
| pchannel_nb | int | Physical channel number |
| lchannel_nb | int | Logical channel number |
| seqfil_id | int | Sequence of filters identifier |
| seed | char(3) | SEED channel name |
| location | char(2) | SEED location |
| rgain | float | Gain at the response frequency |
| rfreq | float | Frequency for response |
| sample_rate | float | Sample rate |
| clock_tolerance | float | Clock tolerance |
| data_type | char(2) | Data type (TG/CG) |
| data_format | char(80) | Data format (SEED, ...) |
| comp_type | char(80) | Compression type (STEIM1, ...) |
| block_size | int | Block size (512, 4096, ...) |
| start_date | date | Start date |
| end_date | date | End date |

# Chapter 3

# Example: YBIB

## 3.1 Overview



## 3.2 Inventory

### 3.2.1 Response

| seqresp_id | resp_number | resp_type | resp_id |
|---|---|---|---|
| 1 | 1 | H | 1 |
| 2 | 1 | H | 2 |
| 3 | 1 | L | 1 |
| 4 | 1 | F | 1 |
| 5 | 1 | F | 2 |

### 3.2.2 Response_HP

| hp_id | filter_type | nb_pole | corner_freq | damping_value |
|---|---|---|---|---|
| 1 | DG | 2 | 4.5 | 0.62 |
| 2 | DG | 1 | 0.0796 | 1. |

### 3.2.3 Response_LP

| lp_id | filter_type | nb_pole | corner_freq | damping_value |
|---|---|---|---|---|
| 1 | DG | 2 | 600. | 0.7071 |

### 3.2.4 Sensor

| sensor_id | name | serial_nb | start_date | end_date | nb_component |
|---|---|---|---|---|---|
| 1 | WIL 13 | YBIB1 | 1996/06/28 23:25 | NULL | 4 |

### 3.2.5 Sensor_Component

| sensor_id | comp_nb | channel | type | sensitivity | frequency | seqresp_id |
|---|---|---|---|---|---|---|
| 1 | 1 | 1 | A | 1.0204 | 10. | 3 |
| 1 | 2 | 2 | A | 1.0204 | 10. | 3 |
| 1 | 3 | 3 | A | 1.0204 | 10. | 3 |
| 1 | 4 | 4 | V | 50. | 30. | 1 |

### 3.2.6 Filamp

| filamp_id | name | serial_nb | start_date | end_date | nb_pchannel |
|---|---|---|---|---|---|
| 1 | Qpreamp | 94sd05 | 1996/06/28 23:25 | NULL | 4 |

### 3.2.7 Filamp_PChannel

| filamp_id | pchannel_nb | gain | seqresp_id |
|---|---|---|---|
| 1 | 1 | 10. | 2 |
| 1 | 2 | 10. | 2 |
| 1 | 3 | 10. | 2 |
| 1 | 4 | 100. | NULL |

### 3.2.8 Datalogger

| data_id | data_type | serial_nb | firmware_nb | start_date | end_date | nb_board |
|---|---|---|---|---|---|---|
| 1 | Q4120 | 941004 | 0 | 1996/06/06 00:00 | NULL | 1 |

### 3.2.9 Datalogger_Board

| data_id | board_nb | serial_nb | start_date | end_date | nb_module |
|---|---|---|---|---|---|
| 1 | 1 | 941004A | 1996/06/06 00:00 | NULL | 4 |

### 3.2.10 Datalogger_Module

| data_id | board_nb | module_nb | serial_nb | sensitivity | start_date | end_date |
|---|---|---|---|---|---|---|
| 1 | 1 | 1 | NULL | 428638. | NULL | NULL |
| 1 | 1 | 2 | NULL | 431261. | NULL | NULL |
| 1 | 1 | 3 | NULL | 425793. | NULL | NULL |
| 1 | 1 | 4 | NULL | 413133. | NULL | NULL |

### 3.2.11 Filter_Sequence

| seqfil_id | nb_filter | overall_gain | freq |
|---|---|---|---|
| 1 | 3 | 0. | 0. |
| 2 | 4 | 0. | 0. |
| 3 | 5 | 0. | 0. |
| 4 | 7 | 0. | 0. |

### 3.2.12 Filter_Sequence_Data

Only the first sequence of filters is described.

| seqfil_id | order | filter_id |
|---|---|---|
| 1 | 1 | 1 |
| 1 | 2 | 2 |
| 1 | 3 | 3 |

### 3.2.13 Filter

| filter_id | gain | freq | in_sp_rate | out_sp_rate |
|---|---|---|---|---|
| 1 | 1. | 0. | 32000. | 2000. |
| 2 | 1. | 0. | 2000. | 1000. |
| 3 | 1. | 0. | 1000. | 500. |

| sample | delay | timetag | seqresp_id |
|---|---|---|---|
| 0 | 0. | 0. | 4 |
| 0 | 0. | 0. | 5 |
| 0 | 0. | 0. | 5 |

### 3.2.14 Filter_FIR

| fir_id | name | symmetry | gain |
|---|---|---|---|
| 1 | FIR.AD32M | N | 0.999904 |
| 2 | FIR.F96CM | N | 0.999188 |

### 3.2.15 Filter_FIR_Data

This table is not described, due to the high amount of rows.

## 3.3 Tracking

### 3.3.1 Station

| sta | net | lat | lon | elevation | name |
|---|---|---|---|---|---|
| YBIB | BK | 37.81472 | -122.35815 | 4. | Yerba Buena Island |

| nb_sensor | nb_filamp | nb_digi | nb_data | start_date | end_date |
|---|---|---|---|---|---|
| 1 | 1 | 1 | 1 | 1996/06/28 23:25 | NULL |

### 3.3.2 Station_Sensor

| sta | net | sensor_nb | sensor_id | lat | lon |
|---|---|---|---|---|---|
| YBIB | BK | 1 | 1 | 37.81472 | -122.35815 |

| elevation | depth | nb_component | start_date | end_date |
|---|---|---|---|---|
| 4. | 61. | 4 | 1996/06/28 23:25 | NULL |

### 3.3.3 Station_Sensor_Component

| sta | net | sensor_nb | component_nb | hardware_type | hardware_nb |
|---|---|---|---|---|---|
| YBIB | BK | 1 | 1 | F | 1 |
| YBIB | BK | 1 | 2 | F | 1 |
| YBIB | BK | 1 | 3 | F | 1 |
| YBIB | BK | 1 | 4 | F | 1 |

| hardware_pchannel | azimuth | dip | start_date | end_date |
|---|---|---|---|---|
| 1 | 0. | -90. | 1996/06/28 23:25 | NULL |
| 2 | 257. | 0. | 1996/06/28 23:25 | NULL |
| 3 | 347. | 0. | 1996/06/28 23:25 | NULL |
| 4 | 0. | -90. | 1996/06/28 23:25 | NULL |

### 3.3.4 Station_Filamp

| sta | net | filamp_nb | filamp_id | nb_pchannel | start_date | end_date |
|---|---|---|---|---|---|---|
| YBIB | BK | 1 | 1 | 4 | 1996/06/28 23:25 | NULL |

### 3.3.5 Station_Filamp_PChannel

| sta | net | filamp_nb | pchannel_nb | hardware_type |
|---|---|---|---|---|
| YBIB | BK | 1 | 1 | D |
| YBIB | BK | 1 | 2 | D |
| YBIB | BK | 1 | 3 | D |
| YBIB | BK | 1 | 4 | D |

| hardware_nb | hardware_pchannel | start_date | end_date |
|---|---|---|---|
| 1 | 4 | 1996/06/28 23:25 | NULL |
| 1 | 3 | 1996/06/28 23:25 | NULL |
| 1 | 2 | 1996/06/28 23:25 | NULL |
| 1 | 1 | 1996/06/28 23:25 | NULL |

### 3.3.6 Station_Digitizer

| sta | net | digi_nb | serial_nb |
|---|---|---|---|
| YBIB | BK | 1 | 941004A |

| nb_pri_pchannel | nb_aux_pchannel | start_date | end_date |
|---|---|---|---|
| 4 | 0 | 1996/06/28 23:25 | NULL |

### 3.3.7 Station_Digitizer_PChannel

| sta | net | digi_nb | pchannel_nb | data_nb |
|---|---|---|---|---|
| YBIB | BK | 1 | 1 | 1 |
| YBIB | BK | 1 | 2 | 1 |
| YBIB | BK | 1 | 3 | 1 |
| YBIB | BK | 1 | 4 | 1 |

| data_pchannel | digi_type | digi_polarity | start_date | end_date |
|---|---|---|---|---|
| 1 | DSP | N | 1996/06/28 23:25 | NULL |
| 2 | DSP | N | 1996/06/28 23:25 | NULL |
| 3 | DSP | N | 1996/06/28 23:25 | NULL |
| 4 | DSP | N | 1996/06/28 23:25 | NULL |

### 3.3.8 Station_Datalogger

| sta | net | data_nb | data_id | nb_pchannel | start_date | end_date |
|---|---|---|---|---|---|---|
| YBIB | BK | 1 | 1 | 4 | 1996/06/28 23:25 | NULL |

### 3.3.9 Station_Datalogger_PChannel

| sta | net | data_nb | pchannel_nb |
|---|---|---|---|
| YBIB | BK | 1 | 1 |
| YBIB | BK | 1 | 2 |
| YBIB | BK | 1 | 3 |
| YBIB | BK | 1 | 4 |

| seed_io | nb_lchannel | start_date | end_date |
|---|---|---|---|
| L1 | 4 | 1996/06/28 23:25 | NULL |
| L2 | 4 | 1996/06/28 23:25 | NULL |
| L3 | 4 | 1996/06/28 23:25 | NULL |
| P1 | 4 | 1996/06/28 23:25 | NULL |

### 3.3.10 Station_Datalogger_LChannel

The start_date, end_date, location, rgain and rfreq fields are not described.

| sta | net | data_nb | pchannel_nb | lchannel_nb | seqfil_id | seed | sample_rate |
|---|---|---|---|---|---|---|---|
| YBIB | BK | 1 | 1 | 1 | 1 | CL1 | 500 |
| YBIB | BK | 1 | 1 | 2 | 2 | HL1 | 100 |
| YBIB | BK | 1 | 1 | 3 | 3 | BL1 | 20 |
| YBIB | BK | 1 | 1 | 4 | 4 | LL1 | 1 |
| YBIB | BK | 1 | 2 | 1 | 1 | CL2 | 500 |
| YBIB | BK | 1 | 2 | 2 | 2 | HL2 | 100 |
| YBIB | BK | 1 | 2 | 3 | 3 | BL2 | 20 |
| YBIB | BK | 1 | 2 | 4 | 4 | LL2 | 1 |
| YBIB | BK | 1 | 3 | 1 | 1 | CL3 | 500 |
| YBIB | BK | 1 | 3 | 2 | 2 | HL3 | 100 |
| YBIB | BK | 1 | 3 | 3 | 3 | BL3 | 20 |
| YBIB | BK | 1 | 3 | 4 | 4 | LL3 | 1 |
| YBIB | BK | 1 | 4 | 1 | 1 | DP1 | 500 |
| YBIB | BK | 1 | 4 | 2 | 2 | EP1 | 100 |
| YBIB | BK | 1 | 4 | 3 | 3 | BP1 | 20 |
| YBIB | BK | 1 | 4 | 4 | 4 | LP1 | 1 |

| clock_tolerance | data_type | data_format | comp_type | block_size |
|---|---|---|---|---|
| 5. d-2 | TG | SEED | STEIM2 | 4096 |
| 1. d-2 | TG | SEED | STEIM2 | 4096 |
| 2. d-3 | TG | SEED | STEIM2 | 4096 |
| 1. d-4 | TG | SEED | STEIM2 | 4096 |
| 5. d-2 | TG | SEED | STEIM2 | 4096 |
| 1. d-2 | TG | SEED | STEIM2 | 4096 |
| 2. d-3 | TG | SEED | STEIM2 | 4096 |
| 1. d-4 | TG | SEED | STEIM2 | 4096 |
| 5. d-2 | TG | SEED | STEIM2 | 4096 |
| 1. d-2 | TG | SEED | STEIM2 | 4096 |
| 2. d-3 | TG | SEED | STEIM2 | 4096 |
| 1. d-4 | TG | SEED | STEIM2 | 4096 |
| 5. d-2 | TG | SEED | STEIM2 | 4096 |
| 1. d-2 | TG | SEED | STEIM2 | 4096 |
| 2. d-3 | TG | SEED | STEIM2 | 4096 |
| 1. d-4 | TG | SEED | STEIM2 | 4096 |