

Seismometer type = CMG3T Enter correct sensor name
Data sample rate = 100 s/s
Selected IIR frequency = 0 mHz corner frequency

ulRespKey unique response ID : 1
szFilename[51] - name of this file : seed.rsp
szDescription description : 100s/s, 0mHz, CMG3T
rtmStartDate effective date (start) : 2003-01-10_17:07:52.0000
rtmEndDate effective date (= start for current) : 2003-01-10_17:07:52.0000
rtmLoadDate date loaded into database : 2003-01-10_17:07:52.0000
pszDBComment database comment :
usNumStages number of stages in File : 8

usStageNumber response list stage number : 1
ulStageKey unique database stage key : 1
usSeedBlockette 43/4.1 SEED blockette equivalent : 43
szName 43/4.4 Unique identifying name : CMG3T Enter correct sensor name
chSeedType 43/4.5 type of stage A,B,C or D : A
szInputUnits 43/4.6 input units description : M/S Enter M/S/S for accelerometer
szOutputUnits 43/4.7 output units description : V
rNormFactor 43.8 seed optional to normalize : 1.000000
rNormFreq 43.9 seed optional. With 43.8 : 1
rInSamSec 47.5 input sampling rate : 0.000000
usDecimation 47.6 Sampling decimation factor : 1
usDecimationOffset 47.7 decimation offset : 0
rDelayEstimate 47.8 stage delay time (nominal) : 0.0
rDelayApplied 47.9 applied stage delay : 0.0
rGainOrSensitivity 48.5 stage sensitivity or gain : 2000.00 Enter sensor sensitivity
rGainFreq 48.6 frequency of stage gain : 10
rFrequency meaning depends on NMX type : 0.0
usType NMX response type 0 through 8 : 1
szDesign how filter was designed :
usNumTerms number of zeros or numerators : 2
usDenTerms number of poles or denominators : 2
rtmLoadDate date loaded into the database : Jan 10 2003 05:07PM
pszDBComment database comment :

Enter complex zeros then complex poles mentioned above (real, imaginary) in the following field:

Coefficients - as specified above : 0.000000,0.000000,
0.000000,0.000000,
-0.044422,0.012334,
-0.044422,-0.012334

usStageNumber response list stage number : 2
ulStageKey unique database stage key : 2
usSeedBlockette 43/4.1 SEED blockette equivalent : 43
szName 43/4.4 Unique identifying name : 1500Hz Bessel 3P-LP
chSeedType 43/4.5 type of stage A,B,C or D : A
szInputUnits 43/4.6 input units description : V
szOutputUnits 43/4.7 output units description : V
rNormFactor 43.8 seed optional to normalize : 1.405680e+012

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rNormFreq      43.9 seed optional. With 43.8      : 1
rInSamSec      47.5 input sampling rate           : 30000.000000
usDecimation   47.6 Sampling decimation factor    : 1
usDecimationOffset 47.7 decimation offset           : 0
rDelayEstimate 47.8 stage delay time (nominal)    : 0.0
rDelayApplied  47.9 applied stage delay          : 0.0
rGainOrSensitivity 48.5 stage sensitivity or gain  : 0.538000 Enter HRD front-end gain
rGainFreq      48.6 frequency of stage gain      : 10
rFrequency     meaning depends on NMX type      : 0.0
usType         NMX response type 0 through 8    : 1
szDesign       how filter was designed         :
usNumTerms     number of zeros or numerators    : 0
usDenTerms     number of poles or denominators  : 3
rtmLoadDate    date loaded into the database    : Jan 10 2003 05:07PM
pszDBComment   database comment                :
Coefficients   - as specified above            : -9904.800000,3786.000000,
-9904.800000,-3786.000000,
-12507.000000,0.000000

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usStageNumber  response list stage number        : 3
ulStageKey     unique database stage key        : 3
usSeedBlockette 43/4.1 SEED blockette equivalent : 43
szName         43/4.4 Unique identifying name    : A/D converter
chSeedType     43/4.5 type of stage A,B,C or D  : A
szInputUnits   43/4.6 input units description   : V
szOutputUnits  43/4.7 output units description  : COUNTS
rNormFactor    43.8 seed optional to normalize  : 1.000000
rNormFreq      43.9 seed optional. With 43.8    : 1
rInSamSec      47.5 input sampling rate         : 30000.000000
usDecimation   47.6 Sampling decimation factor  : 1
usDecimationOffset 47.7 decimation offset       : 0
rDelayEstimate 47.8 stage delay time (nominal)  : 0.0
rDelayApplied  47.9 applied stage delay        : 0.0
rGainOrSensitivity 48.5 stage sensitivity or gain : 7.88033e+005 Enter HRD ADC sensitivity
rGainFreq      48.6 frequency of stage gain    : 10
rFrequency     meaning depends on NMX type     : 0.0
usType         NMX response type 0 through 8   : 1
szDesign       how filter was designed        :
usNumTerms     number of zeros or numerators   : 0
usDenTerms     number of poles or denominators : 0
rtmLoadDate    date loaded into the database   : Jan 10 2003 05:07PM
pszDBComment   database comment               :
Coefficients   - as specified above           : 0.000000

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usStageNumber  response list stage number        : 4
ulStageKey     unique database stage key        : 4
usSeedBlockette 43/4.1 SEED blockette equivalent : 44
szName         43/4.4 Unique identifying name    : Fir 1 Filter
chSeedType     43/4.5 type of stage A,B,C or D  : D
szInputUnits   43/4.6 input units description   : COUNTS

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szOutputUnits      43/4.7 output units description      : COUNTS
rNormFactor        43.8 seed optional to normalize      : 1.000000
rNormFreq          43.9 seed optional. With 43.8       : 1
rInSamSec          47.5 input sampling rate             : 30000.000000
usDecimation       47.6 Sampling decimation factor     : 5
usDecimationOffset 47.7 decimation offset              : 0
rDelayEstimate     47.8 stage delay time (nominal)     : 0.0
rDelayApplied      47.9 applied stage delay           : 0.0
rGainOrSensitivity 48.5 stage sensitivity or gain       : 1.000000
rGainFreq          48.6 frequency of stage gain       : 10
rFrequency         meaning depends on NMX type        : 0.0
usType             NMX response type 0 through 8      : 4
szDesign           how filter was designed           :
usNumTerms         number of zeros or numerators      : 34
usDenTerms         number of poles or denominators    : 0
rtmLoadDate       date loaded into the database       : Jan 10 2003 05:07PM
pszDBComment      database comment                  :
Coefficients      - as specified above                : 3.788775e-005,
1.997269e-004,5.912768e-004,1.198337e-003,1.677196e-003,
1.234444e-003,-1.158774e-003,-6.071729e-003,-1.261023e-002,
-1.766685e-002,-1.615370e-002,-2.631810e-003,2.601663e-002,
6.805387e-002,1.159861e-001,1.582344e-001,1.830499e-001

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-----
usStageNumber      response list stage number      : 5
ulStageKey         unique database stage key         : 5
usSeedBlockette   43/4.1 SEED blockette equivalent    : 44
szName            43/4.4 Unique identifying name     : Fir 2 Filter
chSeedType        43/4.5 type of stage A,B,C or D    : D
szInputUnits      43/4.6 input units description     : COUNTS
szOutputUnits     43/4.7 output units description   : COUNTS
rNormFactor        43.8 seed optional to normalize   : 1.000000
rNormFreq          43.9 seed optional. With 43.8     : 1
rInSamSec          47.5 input sampling rate          : 6000.000000
usDecimation       47.6 Sampling decimation factor   : 3
usDecimationOffset 47.7 decimation offset           : 0
rDelayEstimate     47.8 stage delay time (nominal)   : 0.0
rDelayApplied      47.9 applied stage delay         : 0.0
rGainOrSensitivity 48.5 stage sensitivity or gain     : 1.000000
rGainFreq          48.6 frequency of stage gain     : 10
rFrequency         meaning depends on NMX type       : 0.0
usType            NMX response type 0 through 8     : 4
szDesign           how filter was designed           :
usNumTerms         number of zeros or numerators     : 30
usDenTerms         number of poles or denominators   : 0
rtmLoadDate       date loaded into the database     : Jan 10 2003 05:07PM
pszDBComment      database comment                  :
Coefficients      - as specified above                : 6.587914e-005,
1.899969e-004,-4.827186e-005,-1.216777e-003,-2.457607e-003,
-5.687041e-004,6.495283e-003,1.294971e-002,5.449010e-003,
-2.159296e-002,-4.696462e-002,-2.711075e-002,6.566507e-002,
2.029431e-001,3.061833e-001
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usStageNumber      response list stage number      : 6
ulStageKey         unique database stage key       : 6
usSeedBlockette   43/4.1 SEED blockette equivalent : 44
szName            43/4.4 Unique identifying name   : Fir 3 Filter
chSeedType        43/4.5 type of stage A,B,C or D  : D
szInputUnits      43/4.6 input units description  : COUNTS
szOutputUnits     43/4.7 output units description  : COUNTS
rNormFactor       43.8 seed optional to normalize  : 1.000000
rNormFreq         43.9 seed optional. With 43.8   : 1
rInSamSec         47.5 input sampling rate         : 2000.000000
usDecimation      47.6 Sampling decimation factor  : 2
usDecimationOffset 47.7 decimation offset          : 0
rDelayEstimate    47.8 stage delay time (nominal)  : 0.0
rDelayApplied     47.9 applied stage delay         : 0.0
rGainOrSensitivity 48.5 stage sensitivity or gain   : 1.000000
rGainFreq         48.6 frequency of stage gain     : 10
rFrequency        meaning depends on NMX type     : 0.0
usType           NMX response type 0 through 8    : 4
szDesign          how filter was designed         :
usNumTerms        number of zeros or numerators   : 118
usDenTerms        number of poles or denominators  : 0
rtmLoadDate       date loaded into the database   : Jan 10 2003 05:07PM
pszDBComment      database comment                :
Coefficients      - as specified above           : -1.046905e-005,
-2.377585e-005,-5.718979e-006,3.423591e-005,3.051089e-005,
-4.393138e-005,-7.445012e-005,3.356967e-005,1.362692e-004,
1.277561e-005,-2.025092e-004,-1.122147e-004,2.488128e-004,
2.730092e-004,-2.378789e-004,-4.882986e-004,1.257253e-004,
7.273434e-004,1.293681e-004,-9.317625e-004,-5.524018e-004,
1.016527e-003,1.135685e-003,-8.796328e-004,-1.823778e-003,
4.200994e-004,2.504274e-003,4.363557e-004,-3.008321e-003,
-1.707706e-003,3.124313e-003,3.327176e-003,-2.625743e-003,
-5.122464e-003,1.311452e-003,6.808534e-003,9.463453e-004,
-7.998371e-003,-4.153490e-003,8.232391e-003,8.152581e-003,
-7.023114e-003,-1.259593e-002,3.905999e-003,1.693529e-002,
1.518937e-003,-2.042215e-002,-9.579908e-003,2.209426e-002,
2.060824e-002,-2.067742e-002,-3.521951e-002,1.417054e-002,
5.525585e-002,1.904586e-003,-8.790202e-002,-4.504146e-002,
1.822970e-001,4.105864e-001

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usStageNumber      response list stage number      : 7
ulStageKey         unique database stage key       : 7
usSeedBlockette   43/4.1 SEED blockette equivalent : 44
szName            43/4.4 Unique identifying name   : Fir 5 Filter
chSeedType        43/4.5 type of stage A,B,C or D  : D
szInputUnits      43/4.6 input units description  : COUNTS
szOutputUnits     43/4.7 output units description  : COUNTS
rNormFactor       43.8 seed optional to normalize  : 1.000000
rNormFreq         43.9 seed optional. With 43.8   : 1
rInSamSec         47.5 input sampling rate         : 1000.000000
usDecimation      47.6 Sampling decimation factor  : 5
usDecimationOffset 47.7 decimation offset          : 0
rDelayEstimate    47.8 stage delay time (nominal)  : 0.0

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rDelayApplied      47.9 applied stage delay      : 0.0
rGainOrSensitivity 48.5 stage sensitivity or gain      : 1.000000
rGainFreq         48.6 frequency of stage gain : 10
rFrequency        meaning depends on NMX type : 0.0
usType           NMX response type 0 through 8 : 4
szDesign         how filter was designed      :
usNumTerms       number of zeros or numerators : 56
usDenTerms       number of poles or denominators : 0
rtmLoadDate      date loaded into the database : Jan 10 2003 05:07PM
pszDBComment     database comment            :
Coefficients     - as specified above        : 1.278289e-005,
4.864359e-005,1.144121e-004,1.910125e-004,2.191873e-004,
1.043084e-004,-2.426295e-004,-8.288109e-004,-1.497339e-003,
-1.894279e-003,-1.544016e-003,-5.733420e-005,2.574218e-003,
5.724076e-003,8.086910e-003,7.981330e-003,4.009124e-003,
-4.101318e-003,-1.480032e-002,-2.455139e-002,-2.845132e-002,
-2.161206e-002,-9.396188e-004,3.330763e-002,7.683237e-002,
1.218946e-001,1.591557e-001,1.802514e-001

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usStageNumber     response list stage number      : 8
ulStageKey       unique database stage key      : 8
usSeedBlockette  43/4.1 SEED blockette equivalent    : 44
szName           43/4.4 Unique identifying name  : Fir 3 Filter
chSeedType       43/4.5 type of stage A,B,C or D : D
szInputUnits     43/4.6 input units description  : COUNTS
szOutputUnits    43/4.7 output units description : COUNTS
rNormFactor      43.8 seed optional to normalize : 1.000000
rNormFreq        43.9 seed optional. With 43.8   : 1
rInSamSec        47.5 input sampling rate        : 200.000000
usDecimation     47.6 Sampling decimation factor : 2
usDecimationOffset 47.7 decimation offset         : 0
rDelayEstimate   47.8 stage delay time (nominal) : 0.0
rDelayApplied    47.9 applied stage delay        : 0.0
rGainOrSensitivity 48.5 stage sensitivity or gain : 1.000000
rGainFreq        48.6 frequency of stage gain    : 10
rFrequency        meaning depends on NMX type    : 0.0
usType           NMX response type 0 through 8   : 4
szDesign         how filter was designed         :
usNumTerms       number of zeros or numerators   : 118
usDenTerms       number of poles or denominators : 0
rtmLoadDate      date loaded into the database    : Jan 10 2003 05:07PM
pszDBComment     database comment                :
Coefficients     - as specified above            : -1.046905e-005,
-2.377585e-005,-5.718979e-006,3.423591e-005,3.051089e-005,
-4.393138e-005,-7.445012e-005,3.356967e-005,1.362692e-004,
1.277561e-005,-2.025092e-004,-1.122147e-004,2.488128e-004,
2.730092e-004,-2.378789e-004,-4.882986e-004,1.257253e-004,
7.273434e-004,1.293681e-004,-9.317625e-004,-5.524018e-004,
1.016527e-003,1.135685e-003,-8.796328e-004,-1.823778e-003,
4.200994e-004,2.504274e-003,4.363557e-004,-3.008321e-003,
-1.707706e-003,3.124313e-003,3.327176e-003,-2.625743e-003,
-5.122464e-003,1.311452e-003,6.808534e-003,9.463453e-004,
-7.998371e-003,-4.153490e-003,8.232391e-003,8.152581e-003,
-7.023114e-003,-1.259593e-002,3.905999e-003,1.693529e-002,

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1.518937e-003,-2.042215e-002,-9.579908e-003,2.209426e-002,
2.060824e-002,-2.067742e-002,-3.521951e-002,1.417054e-002,
5.525585e-002,1.904586e-003,-8.790202e-002,-4.504146e-002,
1.822970e-001,4.105864e-001

usStageNumber	response list stage number	: 9
ulStageKey	unique database stage key	: 9
usSeedBlockette	43/4.1 SEED blockette equivalent	: 44
szName	43/4.4 Unique identifying name	: IIR filter
chSeedType	43/4.5 type of stage A,B,C or D	: D
szInputUnits	43/4.6 input units description	: COUNTS
szOutputUnits	43/4.7 output units description	: COUNTS
rNormFactor	43.8 seed optional to normalize	: 1.000000
rNormFreq	43.9 seed optional. With 43.8	: 1
rInSamSec	47.5 input sampling rate	: 100.000000
usDecimation	47.6 Sampling decimation factor	: 1
usDecimationOffset	47.7 decimation offset	: 0
rDelayEstimate	47.8 stage delay time (nominal)	: 0.0
rDelayApplied	47.9 applied stage delay	: 0.0
rGainOrSensitivity	48.5 stage sensitivity or gain	: 1.000000
rGainFreq	48.6 frequency of stage gain	: 10
rFrequency	meaning depends on NMX type	: 0.0
usType	NMX response type 0 through 8	: 2
szDesign	how filter was designed	:
usNumTerms	number of zeros or numerators	: 2
usDenTerms	number of poles or denominators	: 2
rTmLoadDate	date loaded into the database	: Jan 10 2003 05:07PM
pszDBComment	database comment	:
Coefficients	- as specified above	: 1.000000,-1.000000, 1.000000,-1.000000

Notes

SEED Blockette 43 Response poles and zeroes
type

A Laplace transform analog response, in rad/sec
B Analog response in Hz
C Undefined
D Digital(Z - transform)

SEED Blockette 44 Response coefficients
type

A Laplace transform analog response, in rad/sec
B Analog response in Hz
C Undefined
D Digital(Z - transform)

NMX response types

- 0 S-plane numerator & denominator coefficients
- 1 S-plane poles and zeroes
- 2 Z-plane numerator and denominator coefficients
- 3 Z-plane numerator coeffs only (symmetric FIR, N taps,
(N+1)/2 coeffs, biggest first
- 4 Z-plane numerator coeffs only (symmetric FIR, N taps,
(N+1)/2 coeffs, smallest first
- 5 Frequency amplitude response list (not implemented)
- 6 Generic corner slope list (not implemented)
- 7 Decimation and delay (unit gain)
- 8 Gain @ frequency only (not implemented in PMResponse)

NMX to SEED mapping

SEED	NMX	Plane	
type	type		
43A	1	S	S-plane poles and zeroes
44A	0	S	S-plane numerator & denominator coefficients
44D	2	Z	Z-plane numerator and denominator coefficients

Not supported by MAKESEED

- 43D Z-plane poles and zeroes
- 44D 3 Z Numerator only, biggest first, half set
- 44D 4 Z Numerator only, smallest first, half set

Notes:

- 1. SEED pole position errors not supported

Response file

A response file is built from a number of stages listed as above. At the moment there is no response record, but there may be in the future. Stage is a sparse record since only the fields needed are used. The field usage changes in some fields according to the NMX stage type 0 thru 8. The mapping from NMX to SEED is as above.

Each stage consists of (nominally) 32 lines (0..31)
 Line[0] must start with (and is for comment
 Additional lines following line 0 and starting with (are also comment
 lines[1..30] are normal items (see example table)
 line[31] holds the first coefficient

During reading this file, all characters on each line between newline and colon are ignored. A conversion error results if the actual type does not match the expected type. The exception is the line with coefficients.

The first coefficient is on line 31, thereafter, numbers are read until the numerator and denominator coefficient counts are satisfied, with all the numerator coefficients first. Coefficients are separated by space, newline, comma or tab. Numbers are

characters from the set 0..9+-.Ee. There can be one or more coefficients on line 31, or for example, each coefficient could be separated from the next by newline.

After the last coefficient, the next line is expected to be the comment line starting with (of the next stage.

Notes on each field in NMX Stage record

ulRespKey

Response filename should be anystring.<numeric id>.res

szDescription

Typically type of overall response. Only needed in stage[0].

rtmStartDate;

rtmEndDate;

rtmLoadDate;

pszDBComment

Ignored, but may be used in the future

usNumStages

Read from stage[0]. Used to check that expect number of stages are present.

usStageNum

Ignored for now. Recommend to put good value.

ulStageKey

Assigned by MakeSEED

usSeedBlockette

Critical parameter. Tells MakeSEED kind of blockette to make.

szName (26)

Description of stage, e.g. seismometer type, filter type, etc

chSeedType

This field is used to tell MAKESEED which type of SEED primary blockette to make from this stage. MAKESEED may also make a second or secondary blockette from the stage information. See elsewhere for details.

szInputUnits (21)

szOutputUnits (21)

Used to build SEED Units Abbreviations Blockette 34

rNormFactor

rNormFreq

Used to set corresponding fields in blockette 43

rInSamSec

usDecimation

usDecimationOffset

rDelayEstimate

rDelayApplied

If rInSamSec is non-zero, causes blockette 48 to be built from this info.

rGainOrSensitivity

rFrequency

If rGainOrSensitivity is non-zero, causes blockette 47 to be built from this info.

rGainFreq

Not used

usType

This field is used by PMResponse to set type of response. Note that this field allows several types which are not supported by SEED.

szDesign (21)

A place to put how (for example) the FIR coefficients were derived. Ignored.

usNumTerms

usDenTerms

Number of each type of coefficients in coefficient field below.

rtmLoadDate

Ignored. Slot for date put in database.

pszDBComment

Ignored. Slot for comment to put in database.

Coefficients

All the numerators first.

BUGS

MakeSEED should check usType to make sure is a supported one. It does not.