



COMPASS - Overview

Interactive Weak and Strong Motion Data Processing Software

Rev Nov2008 Document Rev C

2011.02.22

This REF TEK manual provides the operator of a seismic station in making an initial analysis of the station's waveform data quickly and to create a report of phase picks which can be forwarded to national and international data centers.



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COMPASS - Overview

Revision History:

Revision	Date	Reason for change	Pages
C	2008.11.11	Update for Compass Nov2008	All
B	2008.07.08	Updated for COMPASS	All
A	2007.05.05	Update for REF TEK SM	All
0.1	2007.02.23	Initial Draft	All

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Printed in USA.

Software Version:

Current software and documentation is available on our web site. Some early units may require hardware modifications to use the latest software. Contact REF TEK if you have any queries on the compatibility of your unit(s) and the current software release.

Notation Conventions

The following notation conventions are used throughout REF TEK documentation:

Notation	Description
ASCII	Indicates the entry conforms to the American Standard Code for Information Interchange definition of character (text) information.
Binary	Indicates the entry is a raw, numeric value.
Hex	Indicates hexadecimal notation. This is used with both ASCII characters (0 – 9, A – F) and numeric values.
BCD	Indicates the entry is a numeric value where each four bits represents a decimal digit.
FPn	Indicates the entry is the ASCII representation of a floating-point number with n places following the decimal point.
<n>	Indicates a single 8-bit byte. When the contents are numeric, it indicates a hexadecimal numeric value; i.e. <84> represents hexadecimal 84 (132 decimal). When the contents are capital letters, it represents a named ASCII control character; i.e. <SP> represents a space character, <CR> represents a carriage return character and <LF> represents a line feed character.
MSB	Most Significant Byte of a multi-byte value.
MSbit	Most Significant Bit of a binary number.
LSB	Least Significant Byte of a multi-byte value.
LSbit	Least Significant Bit (bit 0) of a binary number.
YYYY	Year as a 4-digit number
DDD	Day of year
HH	Hour of day in 24-hour format
MM	Minutes of hour
SS	Seconds of minute
TTT	Thousandths of a second (milliseconds)
IIII	Unit ID number

n, nS	nano, nanoSecond; $10^{-9} = 0.000000001$
u, uS	micro, microSecond; $10^{-6} = 0.000001$
m, mS	milli, milliSecond; $10^{-3} = 0.001$
K, KHz	Kilo, KiloHertz; $10^3 = 1,000$
M, MHz	Mega, MegaHertz; $10^6 = 1,000,000$
G, GHz	Giga, GigaHertz; $10^9 = 1,000,000,000$
Kb, KB	Kilobit, KiloByte; $2^{10} = 1,024$
Mb, MB	Megabit, MegaByte; $2^{20} = 1,048,576$
Gb, GB	Gigabit, GigaByte; $2^{30} = 1,073,741,824$

Related Manuals:

130-SMA System Documents	Number	PDF file
130-SMA Startup (Command Line)	Doc-SMA-Ops	130SMA_startup.pdf
Data Utilities Users Guide	Doc-Datautils	130_utilities.pdf
130-SMA Command Interface	Number	PDF file
130 Cmd Line - Theory of Operations	Doc-CmdL-Theory	130_CLtheory.pdf
130 Cmd Line - Release Notes	Doc-CmdL-Release	130_CLRN.pdf
130 Cmd Line - Reference	Doc-CmdL-Ref	130_CLcmd.pdf
130 Cmd Line - Recording Format	Doc-CmdL-Record	130_CLrecord.pdf
130-SM GUI Users Guide	Doc-130-SMGui	RT130SM.pdf
Optional Manuals	Number	PDF file
SNDP Installation and Users Guide	SNDP-OP-003	SNDPUser.pdf
SNDP Reference Guide	SNDP-S-002	SNDPRef.pdf
RTCC Command / Control Users Guide	RTCC-S-006	RTCC.pdf
RT_Display Users Guide	RTD-S-007	RTDisplay.pdf
RT_View Users Guide	RTV-S-005	RTView.pdf
RTPMonitor Installation and Users Guide	RTPM-S-008	RTPM.pdf
RTPD Installation and Users Guide	RTPD-OP-005	RTPD.pdf
(part of RTPD manual) RTP Protocol		
Accelerometers		
131A-02/3 3G Triaxial Accelerometer	Doc-131A-03/2	131A023.pdf
131A-02/2 3G Triaxial Accelerometer	Doc-131A-02/2	131A022.pdf
131A-01/3 4G Triaxial Accelerometer	Doc-131B-01/3	131B013.pdf
131B-01/1 4G Unixial Accelerometer	Doc-131B-01/1	131B011.pdf

REF TEK Support and update notifications

As a valued user of REF TEK equipment we would like to provide the best support possible by keeping you up to date with our product updates.

If you would like to be notified of any REF TEK product updates please spend a couple of minutes to register with the REF TEK customer support team.

To register, enter your company information through the [Register](http://support.reftek.com) link on our website fill at <http://support.reftek.com>.

Our support team will send you a unique Username and Password allowing secured access to all product documentation and software sold to you company.

Once we register your contact we will only send necessary notifications via email. The same notifications will be shown on our website <http://support.reftek.com> notifications page .

Thanks,

Your REF TEK support team

Contents

1	Compass Overview.....	1
1.1	About the Compass Program	1
1.2	Contact for questions and suggestions.....	2
	Supported Platforms	2
	Windows 2000	2
	Windows XP.....	2
1.3	Installation Guidelines	3
1.4	Pre-Requisites	3
1.5	Loading RAW REF TEK data	4
1.5.1	Using the New Trace and Add Trace menus	4
1.6	To Process REF TEK Data	5
1.6.1	Create a DAS *.rtu file in the Response folder	5
1.6.2	Process data when loading an acceleration record	6
1.6.3	To go from Acceleration to Velocity:	9
1.6.4	To go from Velocity to Displacement:	13
1.6.5	To select channels and compare what is in memory	17
1.7	How to get SEED data	19
1.7.1	First Method.....	19
1.7.2	Second Method.....	19
1.7.3	Third Method.....	21
1.7.4	Create batch file request.bat with the text inside (cx.).....	21
1.7.5	MINISEED	21
2	Using the File Menu.....	23
2.1	File Menu menu	23
2.2	New Trace Command	24
2.2.1	Add Trace	26
2.2.2	Print a hard copy	27
2.2.3	Save Data.....	28
2.2.4	To load previously saved ASCII files into the program:	29
2.2.5	Exit.....	32

List of Figures:

Figure 1-1 About COMPASS	1
Figure 1-2 Bring in data	4
Figure 1-3 Open dialog box	4
Figure 1-4 Example .rtu file	5
Figure 1-5 Load New Trace	6
Figure 1-6 Load the RAW RT files	6
Figure 1-7 New Traces	7
Figure 1-8 Remove DC Offset	7
Figure 1-9 DC-Offset Degree	8
Figure 1-10 DC-Offset.....	8
Figure 1-11 Taper	9
Figure 1-12 Taper completed	9
Figure 1-13 BandPass	10
Figure 1-14 Bidirectional	11
Figure 1-15 Trapezoidal	11
Figure 1-16 Velocity results	12
Figure 1-17 Remove DC Offset.....	13
Figure 1-18 DC Offset dialog.....	13
Figure 1-19 DC Offset applied	14
Figure 1-20 Integrate	14
Figure 1-21 Displacement.....	15
Figure 1-22 Remove Offset.....	15
Figure 1-23 Displacement Results	16
Figure 1-24 Select Channels	17
Figure 1-25 Select Previous Channels	17
Figure 1-26 Display Selected Channels.....	18
Figure 2-1 File Menu.....	23
Figure 2-2 New Trace	24
Figure 2-3 Select Channels	25
Figure 2-4 Display Trace	25
Figure 2-5 Add Trace	26
Figure 2-6 Select Additional Trace	26
Figure 2-7 Print Menu	27
Figure 2-8 Printer Setup.....	27
Figure 2-9 Save Data.....	28
Figure 2-10 Save as	28
Figure 2-11 Load Previous.....	29
Figure 2-12 ASCII File.....	30

Figure 2-13 Select Channels	31
Figure 2-14 Exit Program	32



1 Compass Overview

1.1 About the Compass Program

This program was designed to assist the operator of a seismic station to make an initial analysis of the station's waveform data quickly and to create a report of phase picks which can be forwarded to national and international data centers.



Figure 1-1 About COMPASS

1.2 Contact for questions and suggestions

Refraction Technology, Inc.
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Voice: 214-440-1265
Fax: 972-578-0045
EMAIL: support@reftek.com
FTP: <ftp.reftek.com>
WWW: <http://reftek.com>

Supported Platforms

Windows 2000

Windows XP

1.3 Installation Guidelines

1. Copy the **COMPASS** CD folder to the **c:\reftek** folder on the Hard Disk.
2. Create a desktop shortcut for **Compass** and place on the desktop.

1.4 Pre-Requisites

Acquisition systems usually store waveforms in some specific formats. Usually they are in raw digital counts.

To get full performance with **COMPASS** software it is strongly recommended to have each station-channel's information:

- Location of Sensor (Latitude, Longitude, Altitude, and Depth in the Vault)
- Sensor orientation (Azimuth and Dip)
- The azimuth of the instrument in degrees from north (clockwise).
- The dip of the instrument (down from horizontal).
- The traditional orientation :
 - Z -----Dip = -90,Azimuth = 0
 - 0 N ----- Dip = 0,Azimuth = 0
 - 0 E -----Dip = 0,Azimuth 90
- Channel Transfer Function: Look Up Units (Meter,Meter/Second,Meters/(Second^2))
- Complex Poles, Zero of Transfer Function and Channel Sensitivities
- Optional information about FIR filters & decimating stages

The program is usually trying to locate a Dataless. Network_Station.seed file in the Response folder and then read this info in memory.

Note: If you are familiar with fields in the http://www.iris.edu/manuals/SEEDManual_V2.4.pdf there are some extra hints to load such info from general ASCII files.

1.5 Loading RAW REF TEK data

To prevent program problems while loading raw data, it is recommended to use of the **arcfetch** program on the RAW reftek data.

WARNING: This program uses Volt per Unit, Bit Weight and Station Location from the EH packet. If this information is missing there may be limited results.

1.5.1 Using the New Trace and Add Trace menus

1. To bring data into the program for analysis, select the New Trace menu item
-OR-
2. Use the hot key **n**.

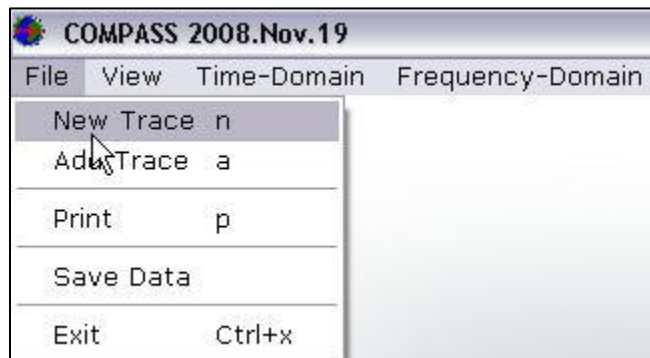


Figure 1-2 Bring in data

3. The **Open** files dialog box opens.

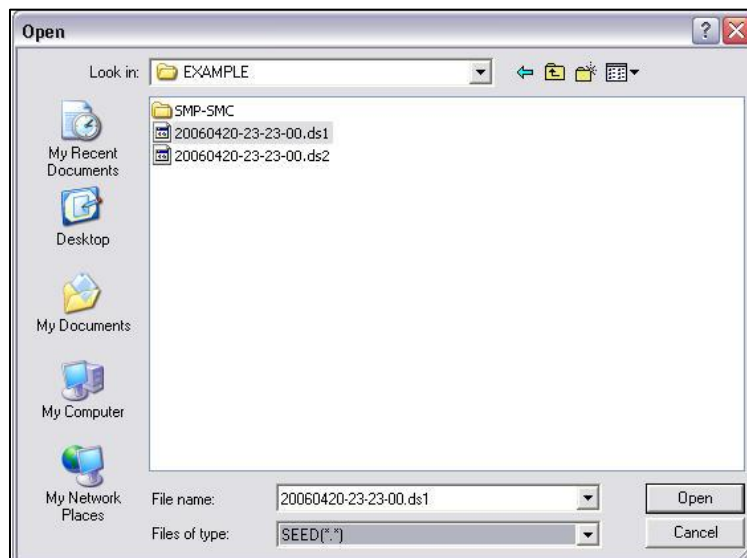


Figure 1-3 Open dialog box

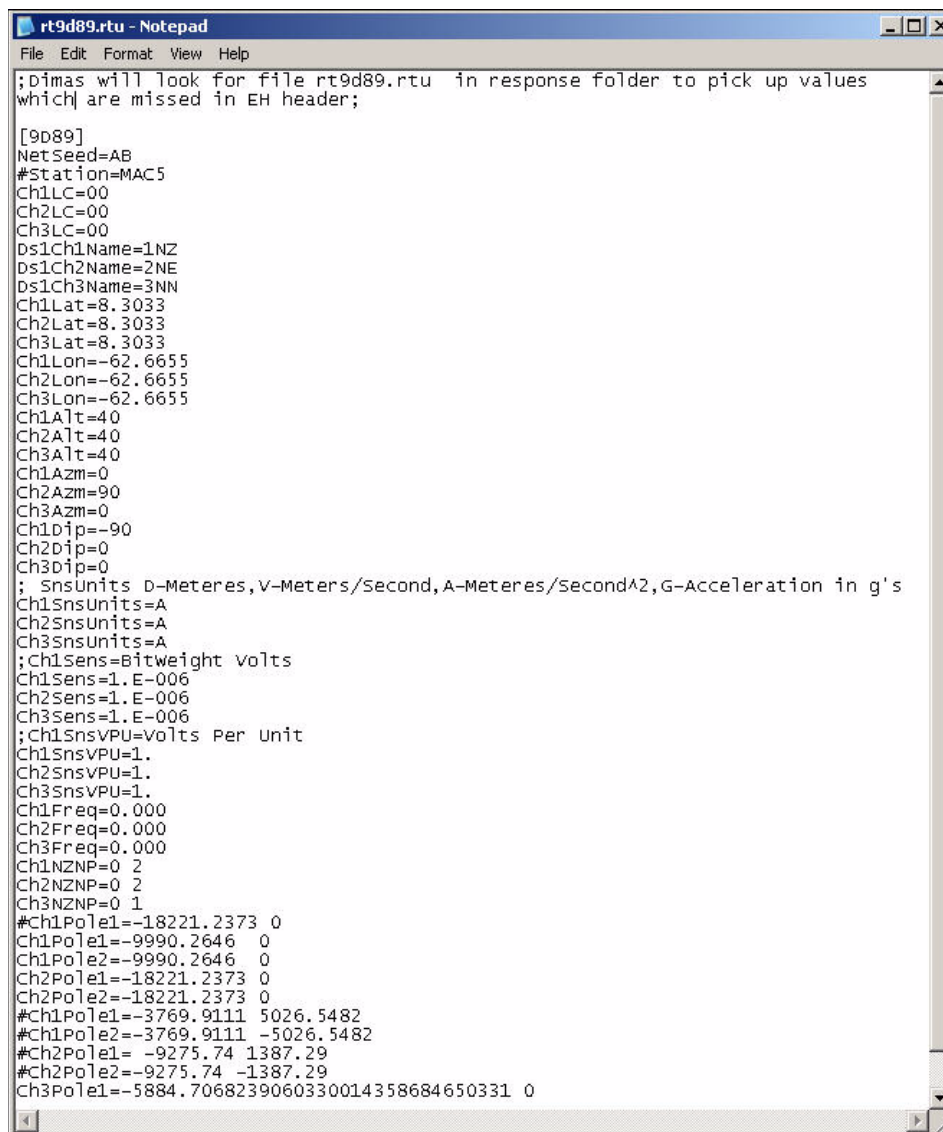
4. Set the Open dialog option **Files of Type** set to REFTEK (*.*) .

1.6 To Process REF TEK Data

1.6.1 Create a DAS *.rtu file in the Response folder

Compass looks in this file which will contain values missed from the EH header and are read by the Compass program (DAS = DAS unit ID).

1. Open the example.rtu file found in the Response folder with an editor.
2. Update desired settings.
3. Save the file in the **rtDAS.rtu** format.



```

rt9d89.rtu - Notepad
File Edit Format View Help
;Dimas will look for file rt9d89.rtu in response folder to pick up values
which are missed in EH header;

[9d89]
NetSeed=AB
#Station=MAC5
Ch1LC=00
Ch2LC=00
Ch3LC=00
Ds1Ch1Name=1NZ
Ds1Ch2Name=2NE
Ds1Ch3Name=3NN
Ch1Lat=8.3033
Ch2Lat=8.3033
Ch3Lat=8.3033
Ch1Lon=-62.6655
Ch2Lon=-62.6655
Ch3Lon=-62.6655
Ch1Alt=40
Ch2Alt=40
Ch3Alt=40
Ch1Azm=0
Ch2Azm=90
Ch3Azm=0
Ch1Dip=-90
Ch2Dip=0
Ch3Dip=0
; SnsUnits D-Meteres,V-Meters/Second,A-Meteres/Second^2,G-Acceleration in g's
Ch1SnsUnits=A
Ch2SnsUnits=A
Ch3SnsUnits=A
;Ch1Sens=Bitweight volts
Ch1Sens=1.E-006
Ch2Sens=1.E-006
Ch3Sens=1.E-006
;Ch1SnsVPU=Volts Per Unit
Ch1SnsVPU=1.
Ch2SnsVPU=1.
Ch3SnsVPU=1.
Ch1Freq=0.000
Ch2Freq=0.000
Ch3Freq=0.000
Ch1NZNP=0 2
Ch2NZNP=0 2
Ch3NZNP=0 1
#Ch1Pole1=-18221.2373 0
Ch1Pole1=-9990.2646 0
Ch1Pole2=-9990.2646 0
Ch2Pole1=-18221.2373 0
Ch2Pole2=-18221.2373 0
#Ch1Pole1=-3769.9111 5026.5482
#Ch1Pole2=-3769.9111 -5026.5482
#Ch2Pole1=-9275.74 1387.29
#Ch2Pole2=-9275.74 -1387.29
Ch3Pole1=-5884.7068239060330014358684650331 0

```

Figure 1-4 Example .rtu file

1.6.2 Process data when loading an acceleration record

Example steps used to process are:

1. Create the rtDAS.rtu file for each DAS and save in the **Response** folder (Created in Section 1.6.1).
2. Load the RAW RT files that have the Acceleration included.

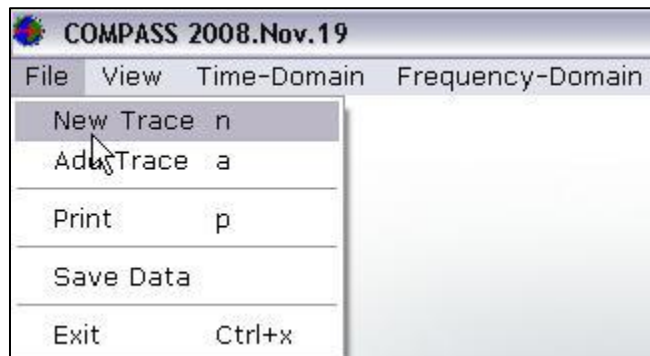
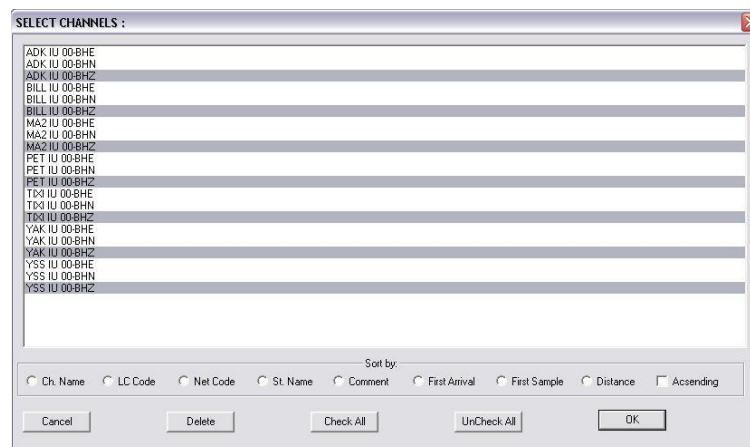


Figure 1-5 Load New Trace



Figure 1-6 Load the RAW RT files

3. Select the channels of interest.
4. Approve the picked traces with the **OK** button.



5. The new traces display on the screen.

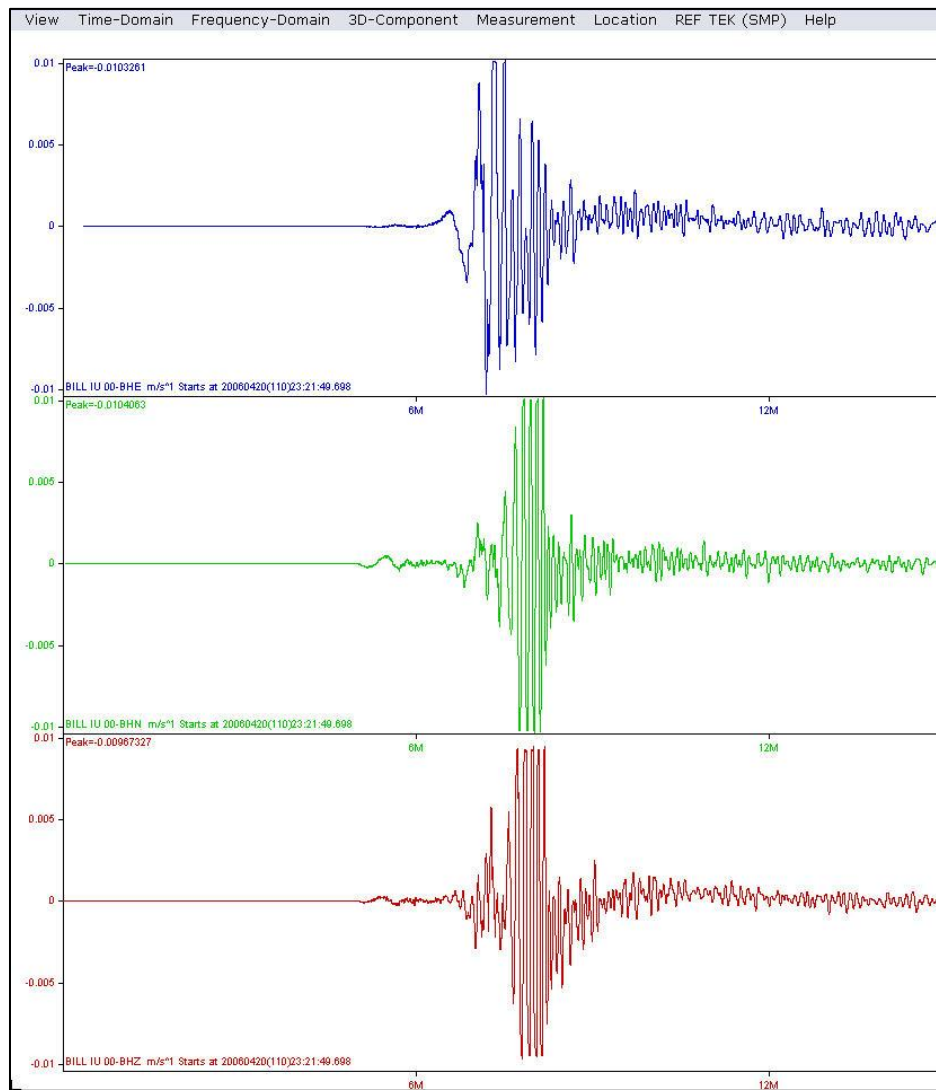


Figure 1-7 New Traces

6. Remove the DC-Offset (if the Linear drift polinom = 1) by selecting the **Remove Offset > Polinom Removal** men.

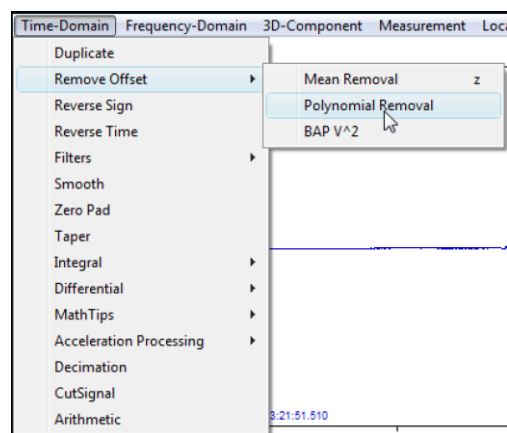


Figure 1-8 Remove DC Offset

7. The option dialog box opens for DC-Offset.
8. Set the **Polynomial Degree** to 1.
9. Approve the setting with the **OK** button.

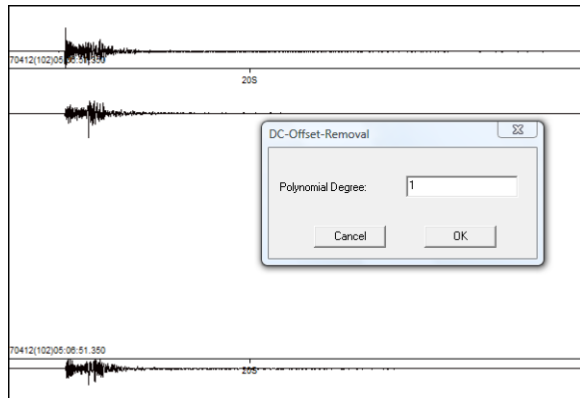


Figure 1-9 DC-Offset Degree

10. The screen redraws to show the completed offset operation.

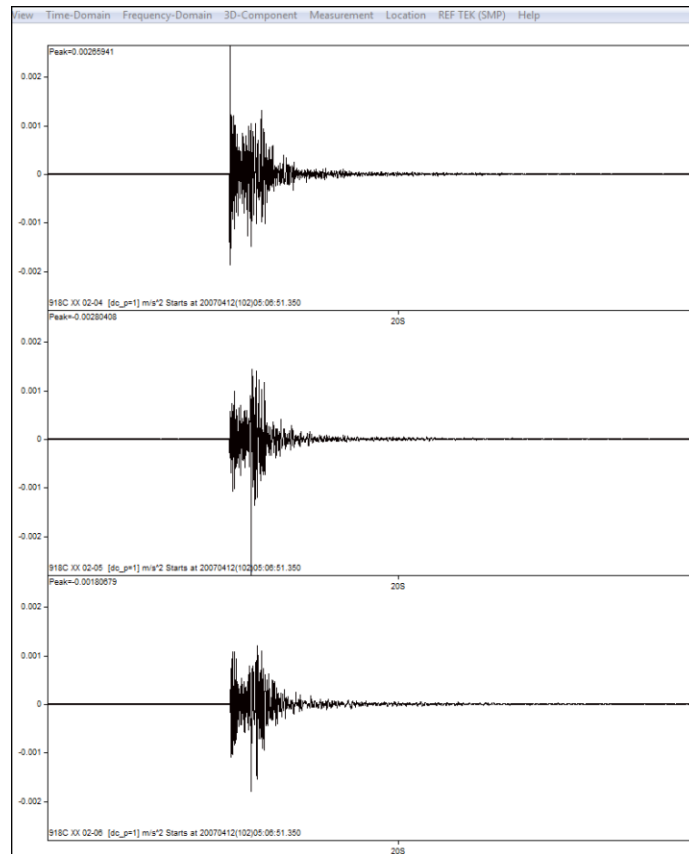


Figure 1-10 DC-Offset

Note: To see the units in a display in Gs go to the View menu and select the Acceleration processing option to show labels in Gs.

Note: To calculate max path and period from an acceleration record refer to the Auto A/T command "Pick A/T".

1.6.3 To go from Acceleration to Velocity:

1. Apply the Taper menu command to decrease the side effects of the filters.

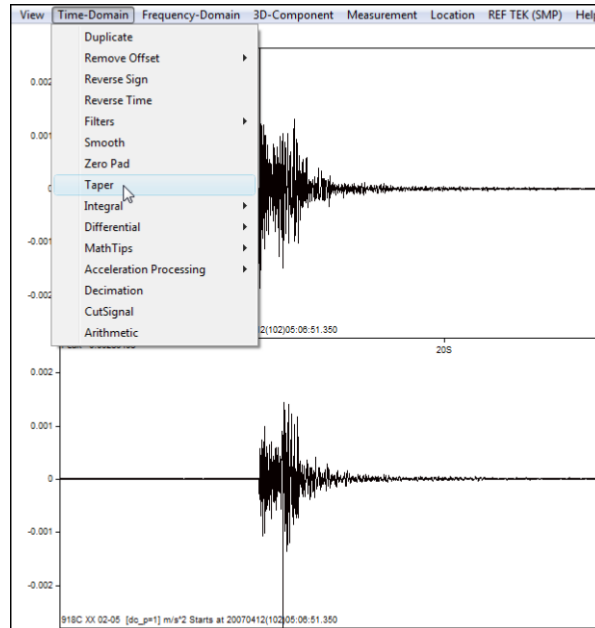


Figure 1-11 Taper

2. To use the Taper command pick points to taper at each end
3. The results of the taper operation are shown below:

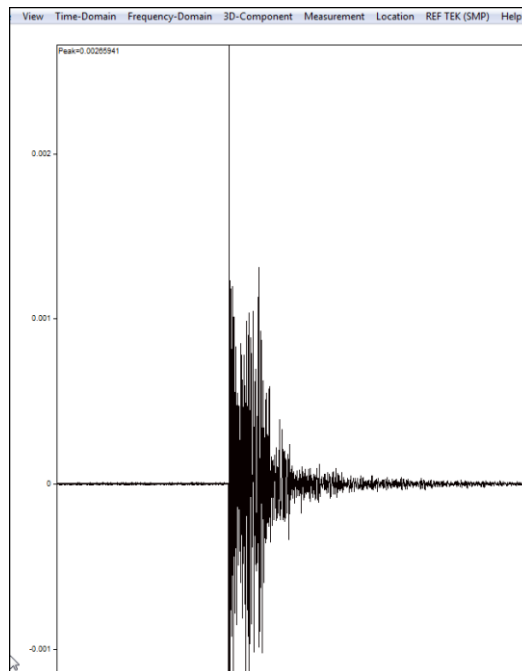
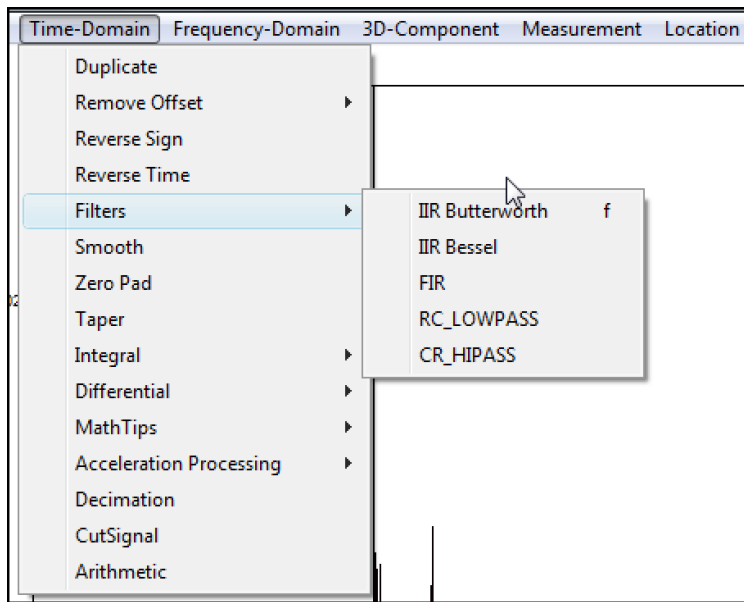
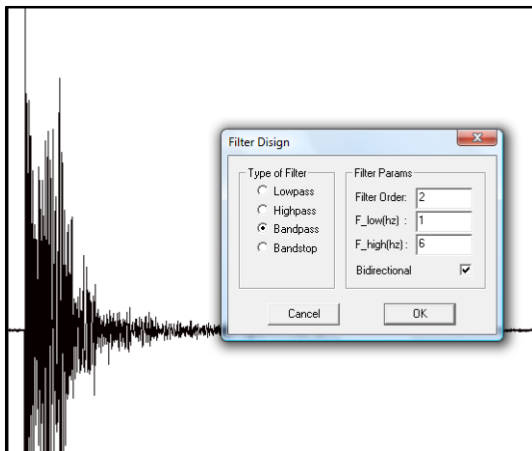
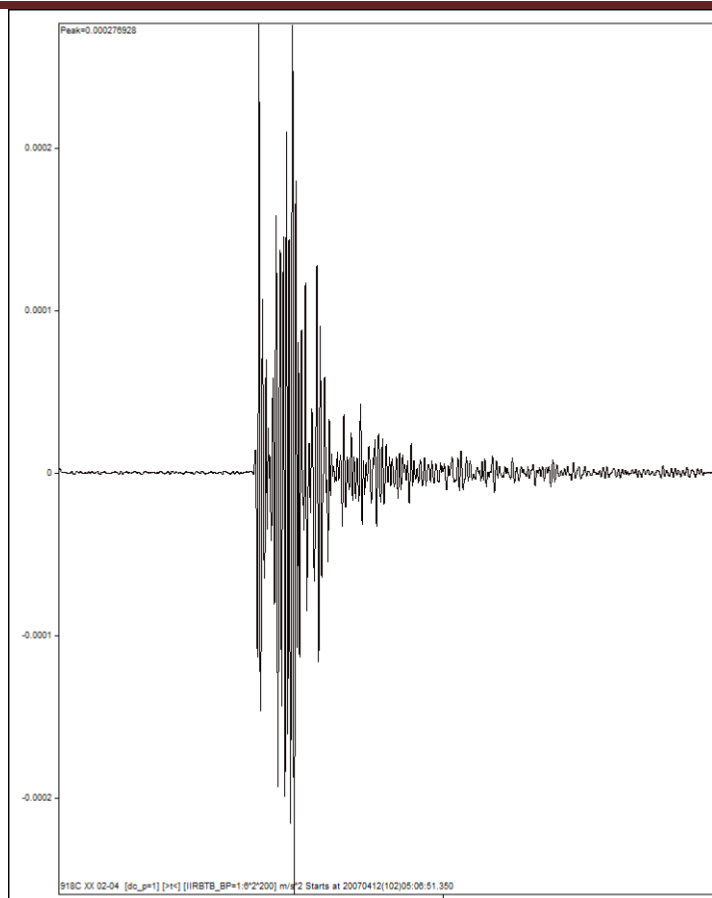
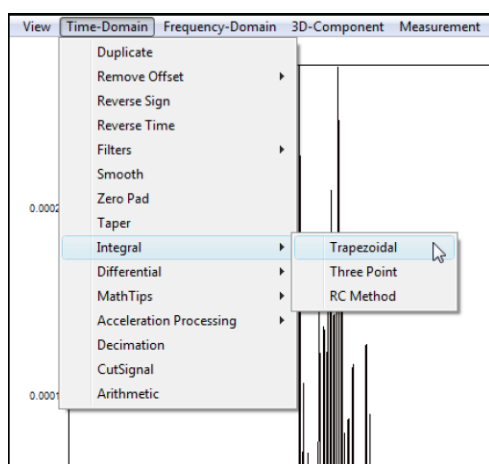


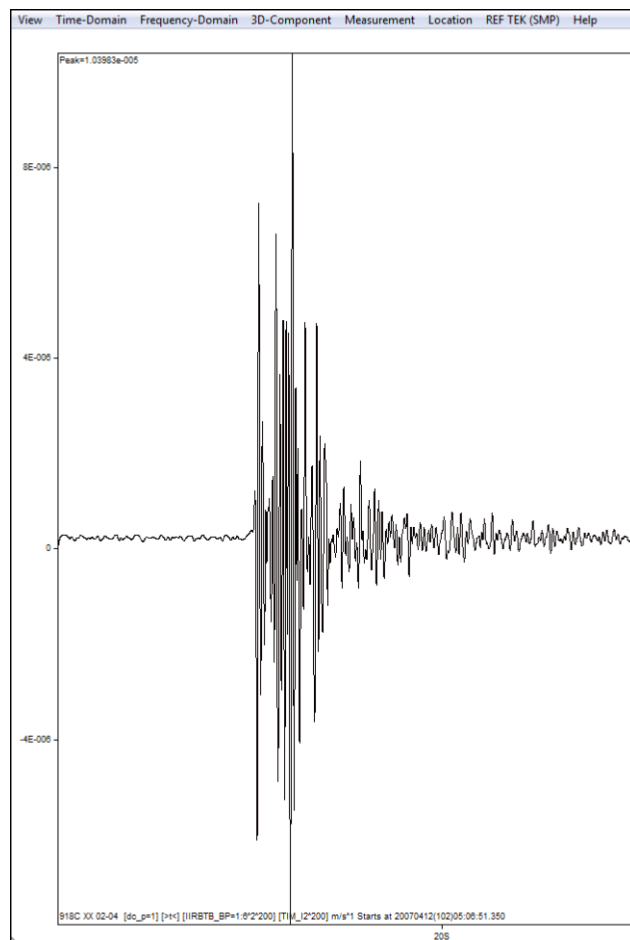
Figure 1-12 Taper completed

4. Use a BandPass filter IIR Butterworth (Bidirectional for no phase error)**Figure 1-13 BandPass****5. The option dialog opens to set the filter options.****6. Select the **Bidirectional** check box.****7. Approve the settings with the **OK** button.**

**Figure 1-14 Bidirectional**

8. Integrate by selecting the **Trapezoidal** command to get the Velocity.
(Trapezoidal is a common integration formula in BAP processing).

**Figure 1-15 Trapezoidal**

9. The result displays on the screen.**Figure 1-16 Velocity results**

1.6.4 To go from Velocity to Displacement:

1. To remove DC-Offset from the Velocity select the **Time-Domain -> Remove Offset -> Polinom Removal** command.

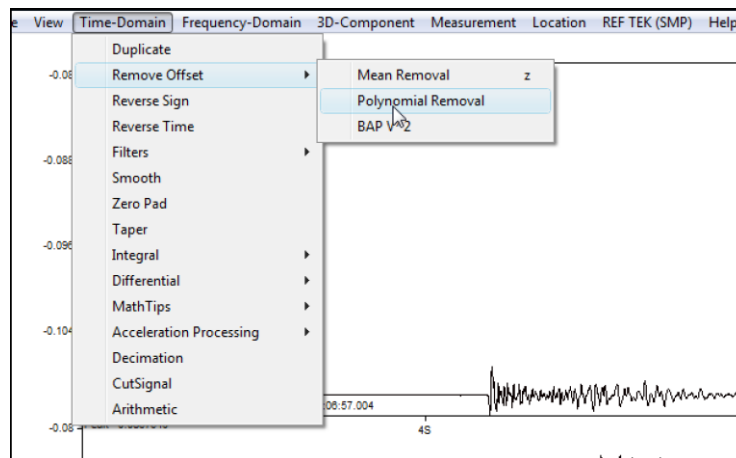


Figure 1-17 Remove DC Offset

2. The option dialog box opens for DC-Offset
3. Enter "1" in the DC-Offset-Removal dialog box.
4. Select the **OK** button to approve the DC Offset.

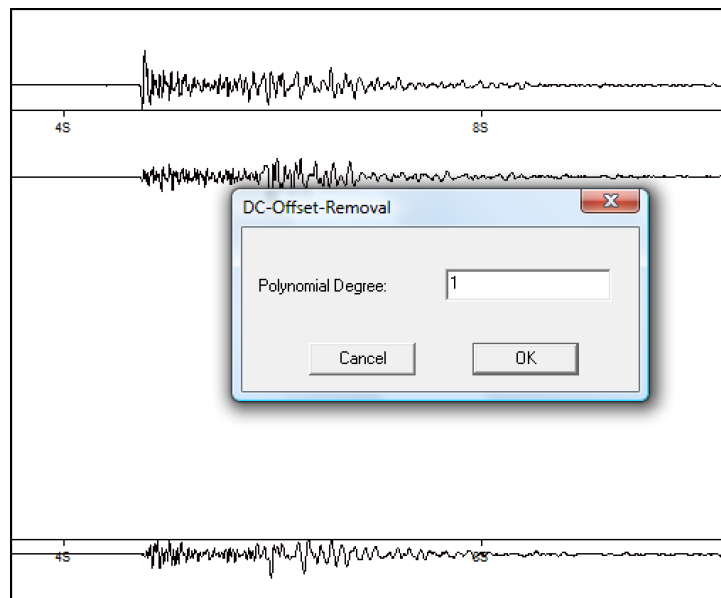


Figure 1-18 DC Offset dialog

5. The results display on the screen.

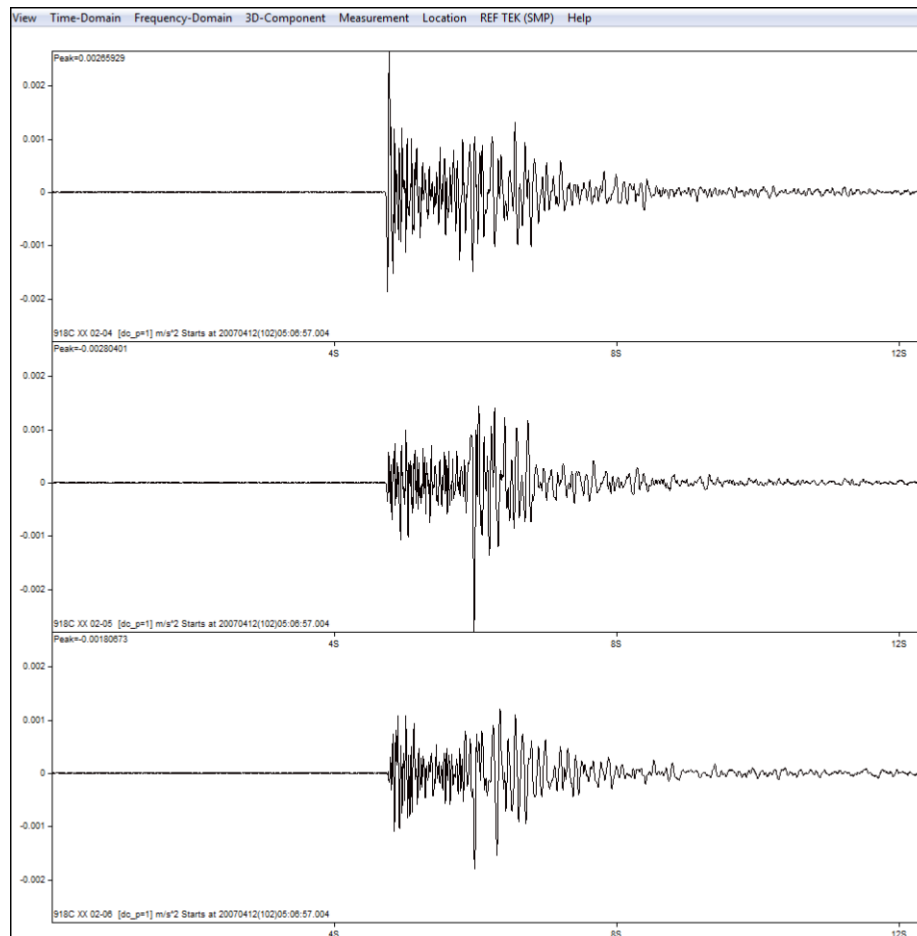


Figure 1-19 DC Offset applied

6. Integrate to get displacement by using the Trapezoidal menu.

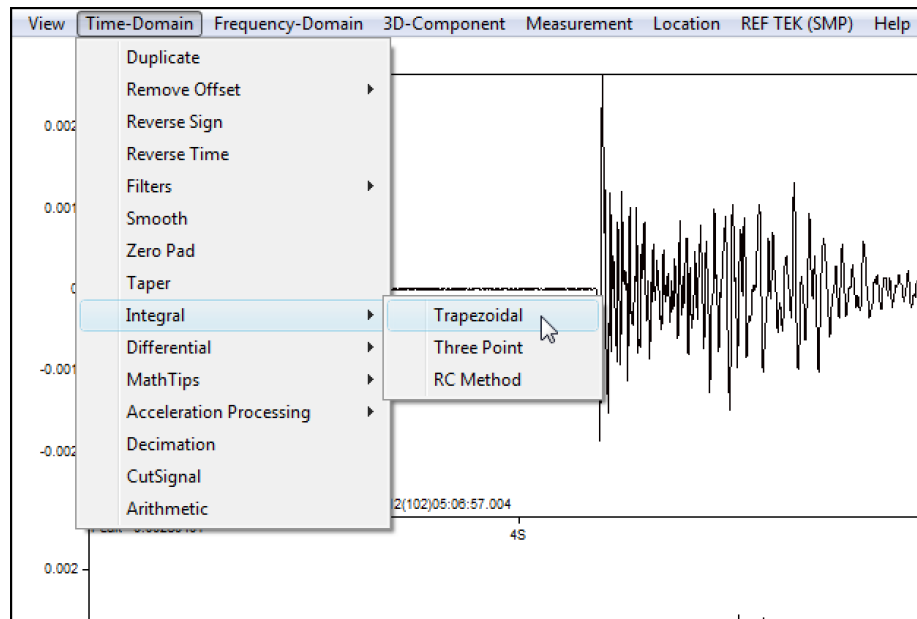


Figure 1-20 Integrate

7. The results display on the screen.

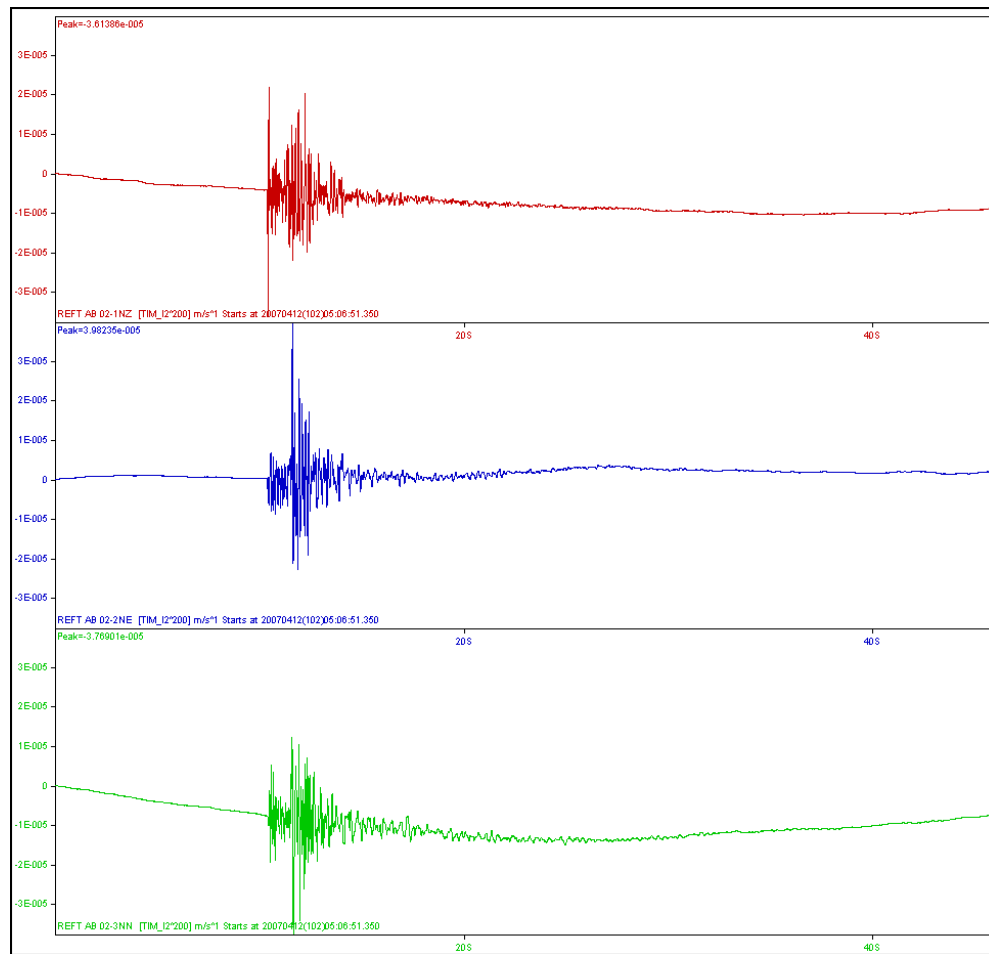


Figure 1-21 Displacement

8. To remove DC-Offset from the Displacement select the **Time-Domain > Remove Offset > Polinom Removal** command.

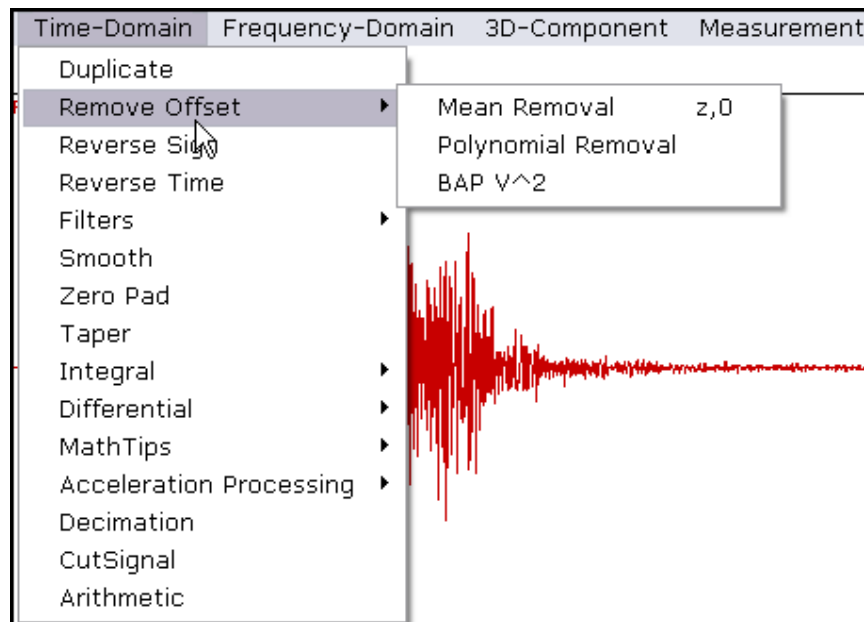
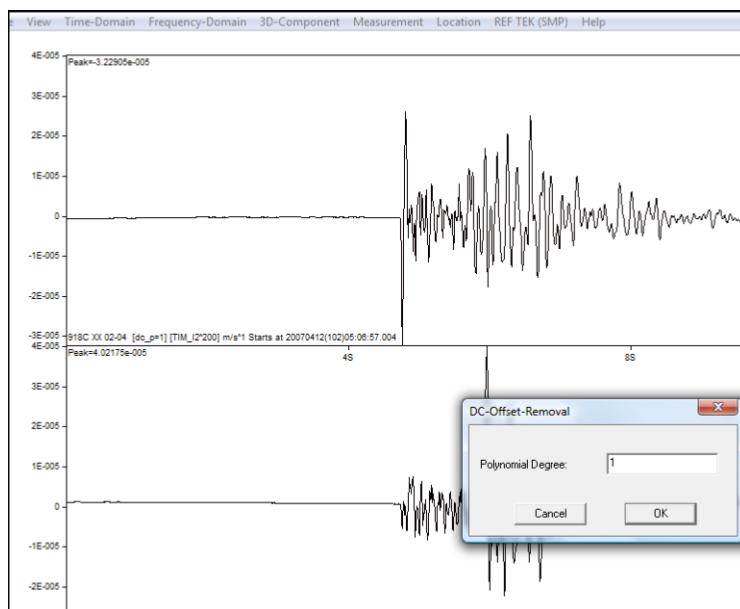


Figure 1-22 Remove Offset

9. The option dialog box opens for DC-Offset.
10. Enter "1" in the DC-Offset-Removal dialog box.
11. Select the OK button to approve the DC Offset.



12. The results display on the screen.

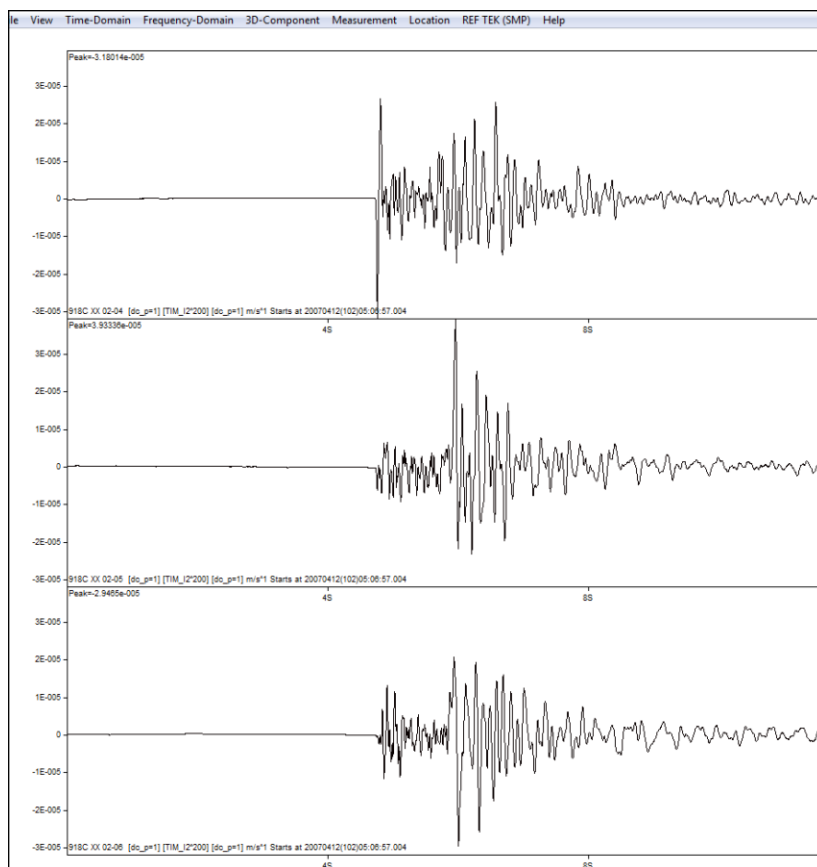


Figure 1-23 Displacement Results

13. Use the **Auto F/T** menu command for automatic period and amplitude. To see all plots a window will open.

1.6.5 To select channels and compare what is in memory

1. Use the Select Channels menu.

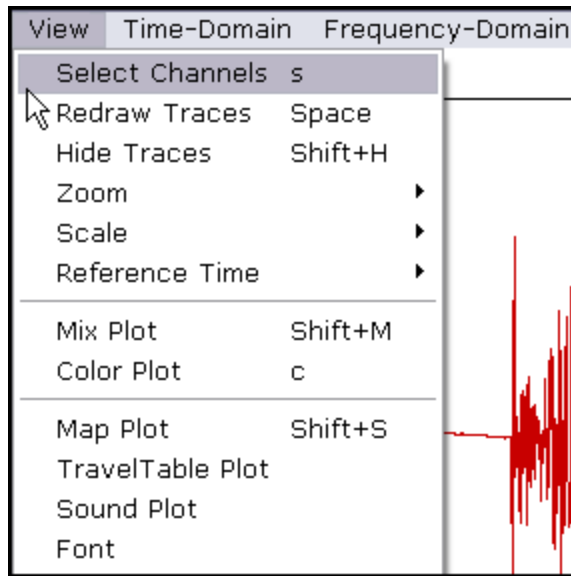


Figure 1-24 Select Channels

2. The display opens to select the channels.
3. Approve the selection with the **OK** button.

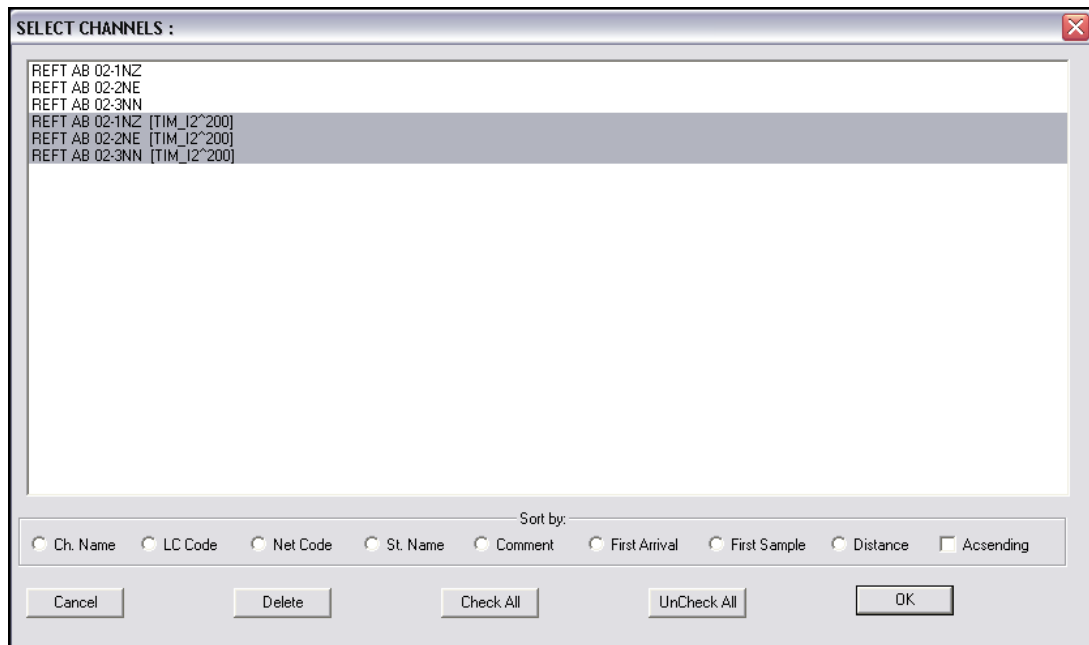
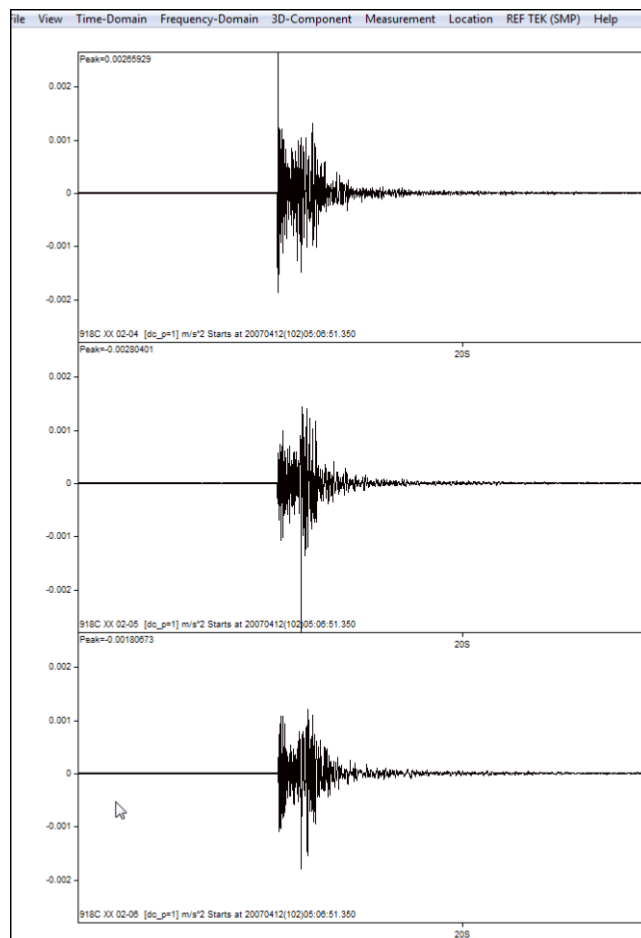


Figure 1-25 Select Previous Channels

4. The display updates to show the selected channels.**Figure 1-26 Display Selected Channels**

1.7 How to get SEED data

1.7.1 First Method

1. Follow instructions on www.iris.washington.edu WILBER

1.7.2 Second Method

2. Internet login to gsn station

Example:

1. Run telnet dp.emsd.iks.ru
2. Follow the screen instructions.

Here is Example:

```

** ** ** ** ** ** ** ** ** ** ** ** *First Stage** * *** * *** * *** * ***
05-9/68K V2.4 Motorola VME147 -68030 101/12/13 01:54:47

```

User name?: seed

Password: data

Process #30 logged on 101/12/13 01:55:00

Welcome!

• .please wait

PET - MultiShear ~***LOCATION CODES REQUIREDH*** (Use R command)

Please type your name and organization - up to 50 characters:

```

** ** ** ** ** 

```

User

PET - MultiShear ~***LOCATION CODES REQUIREDU*** (Use R command)

Copyright 1986-1998 by Joseph M. Steirn & Quanterra, Inc.

Retrieve (C) 1986-1998 - MSHEAR Release 36/08-0131- 68020- FPU

type ? for help

Command? V 00-Bil?

UTC starting date for PET.00-BH? data:

yy/mm/dd hh:mm:ss

? 2001/12/01 00:00:00

UTC ending date for PET.00-BH? data:

yy/mm/dd hh:mm: ss

? 2001/12/01 00:05:00

...search interval 2001/12/01 00:00:00 - 2001/12/01 00:05:00

9 total records selected.

```
...creating local file
writing local file
•..creating archive file "CH01 1201.A00"
BHN-1 1/30 23:58* , BHZ-1 1/30 23:58* , BHE-1 1/3023:59*, BFIN-12/01 00:00*
BHZ-12/01 00:00*, BHE-12/01 00:01* , BHN-12/01 00:03*, BHZ-12/01 00:03*
BHE-12/01 00:04*
•...closing local file
Command? q
•      . .normal termination
•..vbb data retrieval system logged out
** ** ** ** ** ** ** ** ** ** ** ** ** ** ** ** ** ** *Second Stage* *** * *** * *** * *** *
Run ftp dp.emsd.iks.ru & follow screen instructions
Connected to dp.emsd.iks.ru.
220 05-9 ftp server ready
User (dp.emsd.iks.ru:(none)): ftp
331 password required for fip
Password:  user
230 user fip logged in
~      binary
200 Type set to I.
fip> get cb011201.a00
200 PORT command ok
150 Opening data connection for cb011201.a00 ( 194.84.170.1 15,25 13) (36864
bytes)

226 Transfer complete
36864 bytes received in 25.11 seconds (1.47 Kbytes/sec)
ftp> del CB011201.A00
200 DELE command ok
ftp> by e
```

1.7.3 Third Method

Connection to netreg process on DP

Run reqd.exe

Input Password :DATREQ

Input PortName(ex. operator) :4003

Input HostName(ex. rts2) :dp.emsd.iks.ru

Input Packet Size(ex. 4096) :4096

Input Channel Maska (cx. 00-BHZ):00-BHZ

Input StartDate(ex. YYYY/MMJDD) :2001/12/01

Input StartTime (cx. HH:MM:SS):00:00:00

Input Duration in Sec (cx. 360):600

This will generate a file with data on Your local disk named:

2001 1201-00-00-00.dp.emsd.iks.ru

1.7.4 Create batch file request.bat with the text inside (cx.)

```
reqd.exe DATREQ 4003 dp.emsd.iks.ru 4096 00-BHZ %1 %2 %3
```

```
reqd.exe DATREQ 4003 dp.emsd.iks.ru 4096 00-BHN %1 %2 %3
```

```
reqd.exe DATREQ 4003 dp.emsd.iks.ru 4096 00-BHE %1 %2 %3
```

1. At the command line:

Run "request.bat 2001/12/01 00:00:00 600"

2. This will generate a file with data on your local disk named:

2001 1201-00-00-00.dp.emsd.iks.ru with three components inside.

1.7.5 MINISEED

If you are getting MINISEED data files You need to get dataless SEED files with response information inside:

1. Goto ftp://aslftp.cr.us~s.gov/pub/dataless
2. Download file (cx.) DATALESS.IU_PET.seed to the RESPONSE directory.



2 Using the File Menu

2.1 File Menu menu

A new analysis session begins by reading waveform data into program memory. Waveform data can be obtained from several sources in different formats.

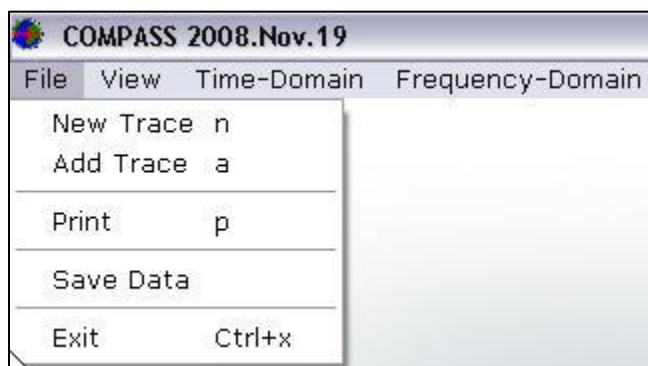


Figure 2-1 File Menu

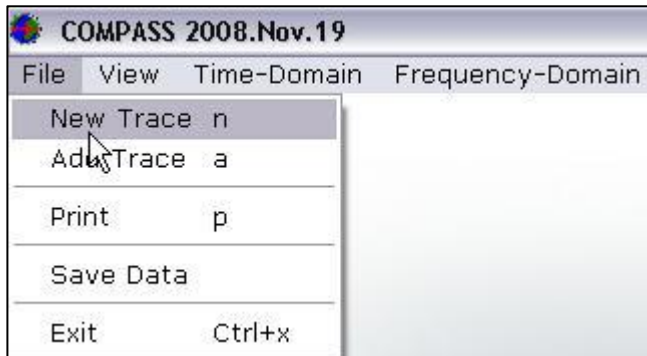
2.2 New Trace Command

Waveform data may be obtained from several sources, but must be in the FULL-SEED or MINI-SEED format.

Every time a trace is altered by filtering or component rotation or the corresponding comment is added to the channel name the original trace is saved in memory. It can be recovered using this command.

1. To bring data into the program for analysis, select the **New Trace** menu item
-OR-

Use the hot key n.



2. The OPEN files dialog box opens.

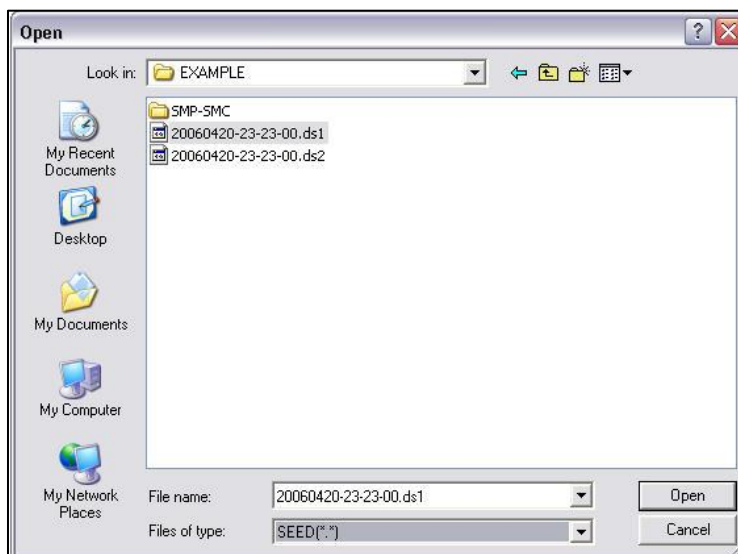


Figure 2-2 New Trace

3. Select the desired channel components.

-OR-

Use Shift, Ctrl & mouse keys to highlight the components

4. Select the **Open** button.

5. To arrange the traces in the display by different criteria, click the corresponding check box.
6. To delete unnecessary channels from program memory highlight the channels and click the **Delete** button.

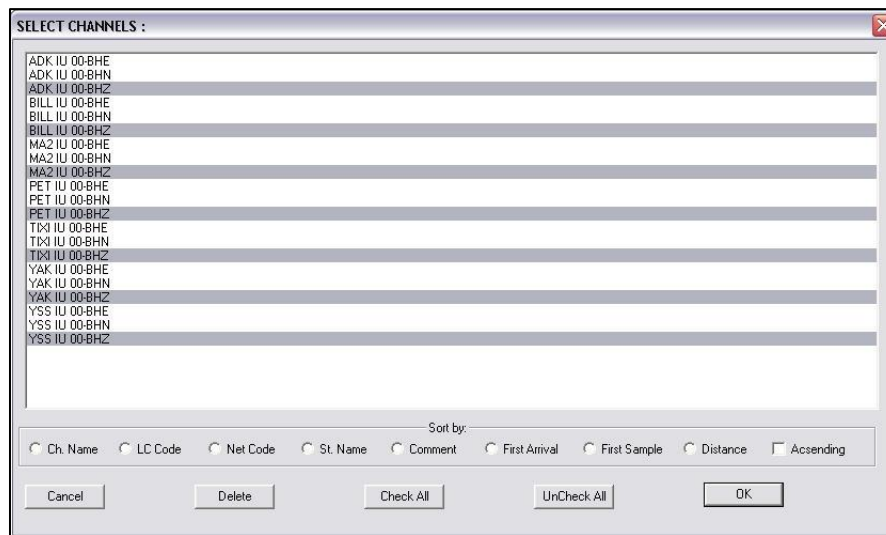


Figure 2-3 Select Channels

7. The desired trace(s) will display.

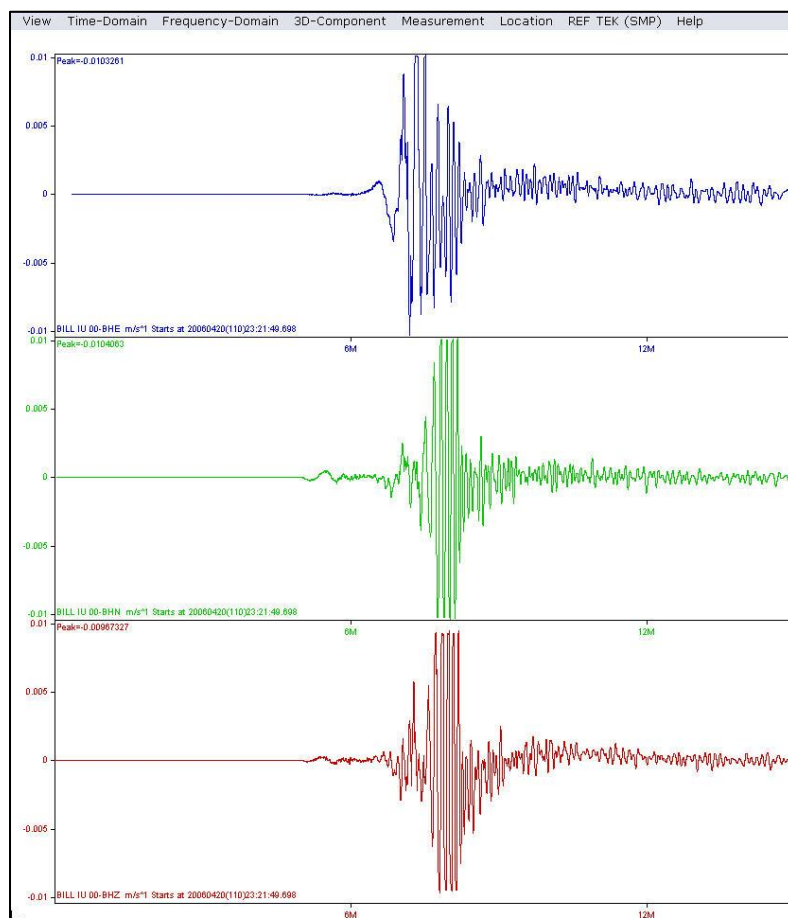


Figure 2-4 Display Trace

2.2.1 Add Trace

1. Additional data channels (which can be from different stations) can be read by selecting the **Add Trace** menu item

-OR-

Using the hot key a.

2. The dialog box shown below appears.

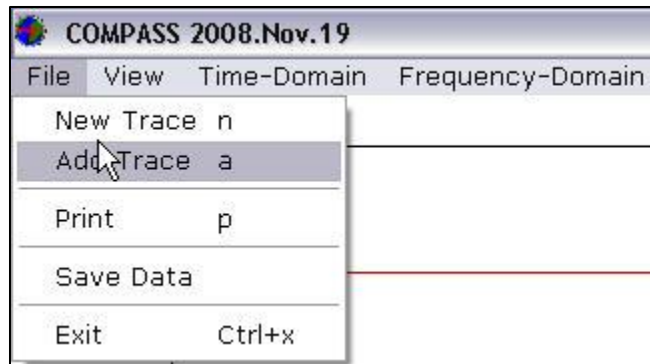


Figure 2-5 Add Trace

3. To select **MULTIPLE** files press the **Ctrl+Left** mouse button.
4. To select **NON-CONTIGUOUS** files select a single file and then press **Shift+Left** mouse button to select the last file of a contiguous selection.
5. Click the cursor on the **OPEN** button to open the files.

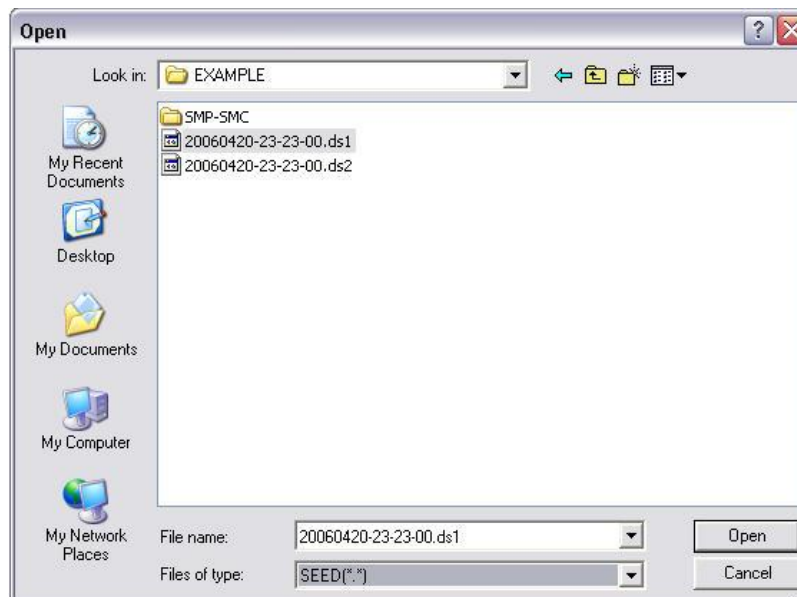
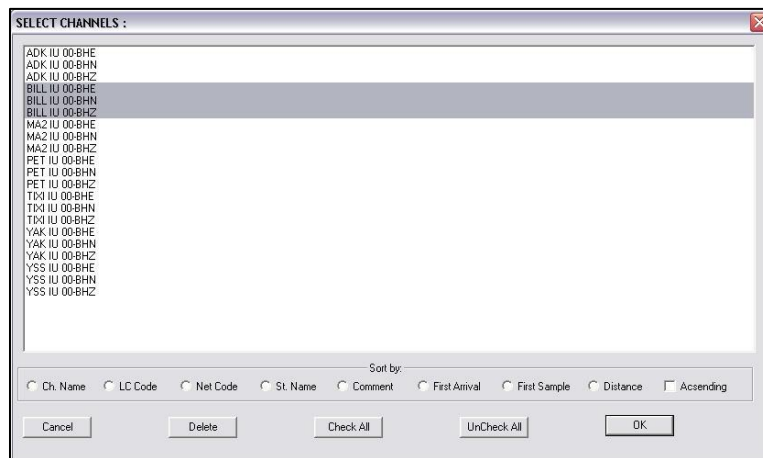


Figure 2-6 Select Additional Trace

6. Select the desired channels



7. Press the **OK** button.

2.2.2 Print a hard copy

1. To get a hard copy of current screen select the **Print** menu

-OR-

Use the hot key p.

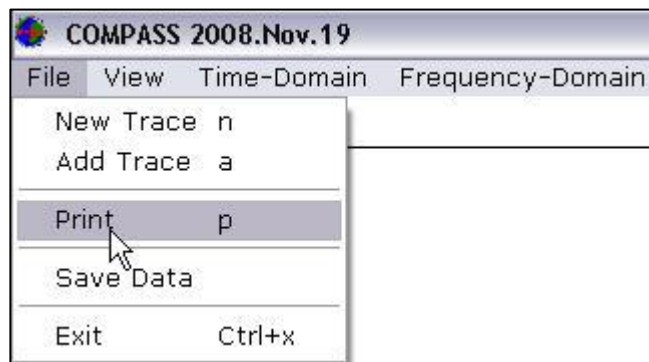


Figure 2-7 Print Menu

2. Fill in print dialog parameters and properties for the desired page layout.
3. Select the **OK** button to plot the trace.

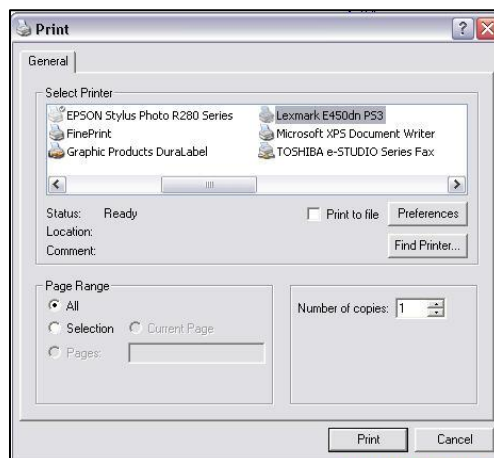


Figure 2-8 Printer Setup

2.2.3 Save Data

All active channels on the screen can be saved to one ASCII file within a (zoomed in) time interval for future use.

1. Select the **File** menu **Save Data** option.

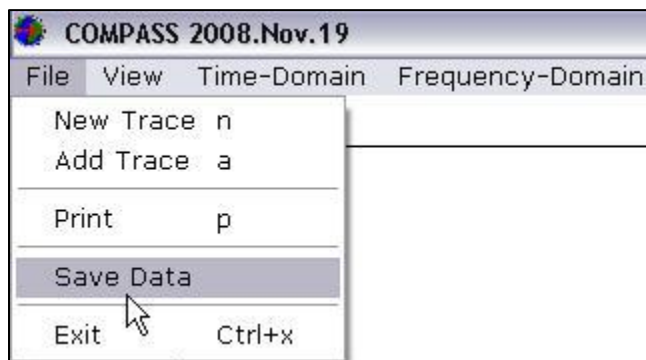


Figure 2-9 Save Data

2. Select the desired type of data to save (ascii - *.asc or SeismoSignal - .dat).

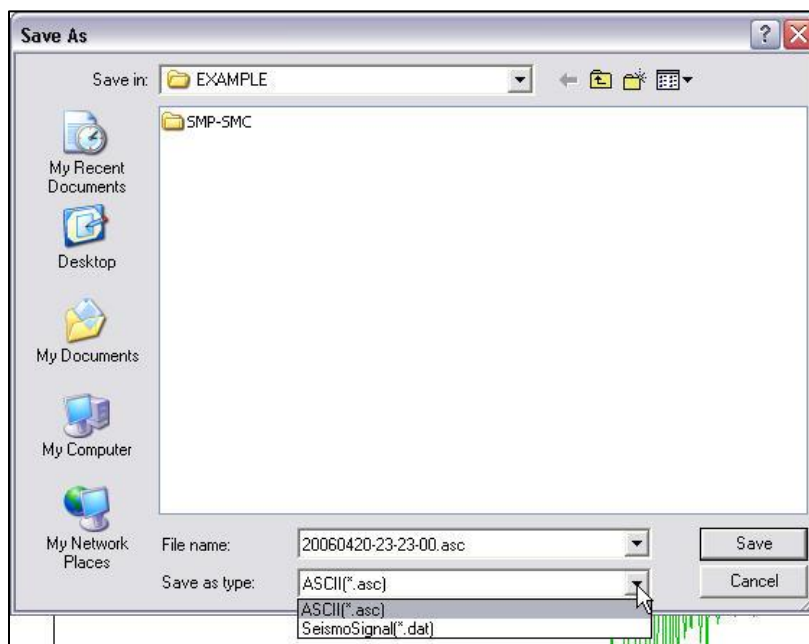
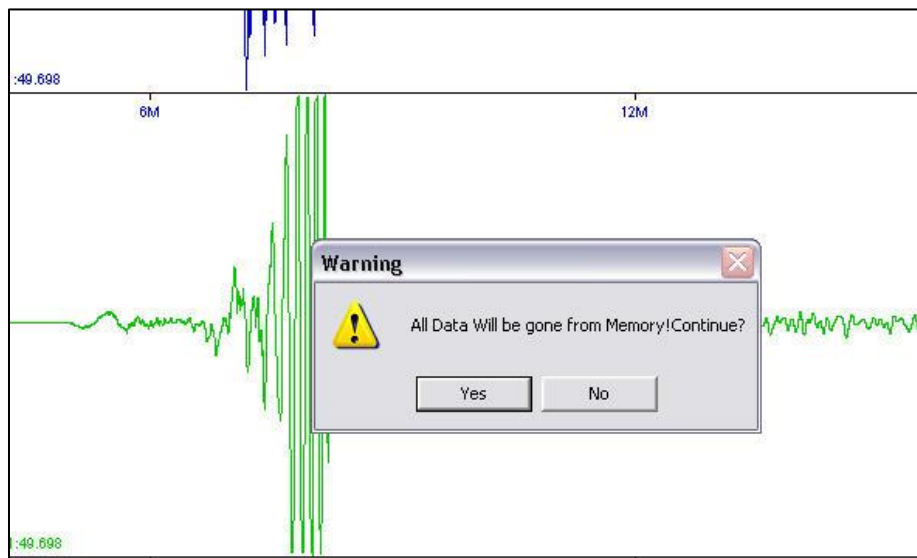


Figure 2-10 Save as

2.2.4 To load previously saved ASCII files into the program:

1. Using the **New Trace** or **Add Trace** commands when data has been loaded will result in a menu warning of erase of the data in memory.



2. Use of the **New Trace** and **Add Trace** menus with the open dialog option will allow the **Files of Type** to be set to the desired filetype *.asc.

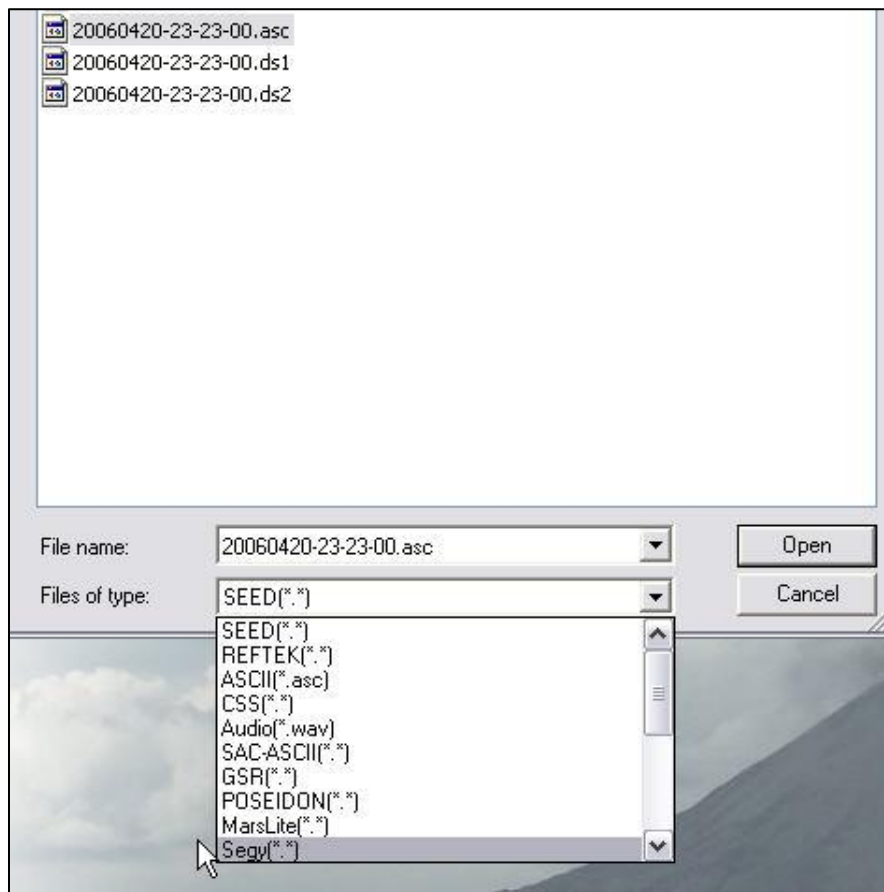


Figure 2-11 Load Previous

3. Select the desired ASCII file.

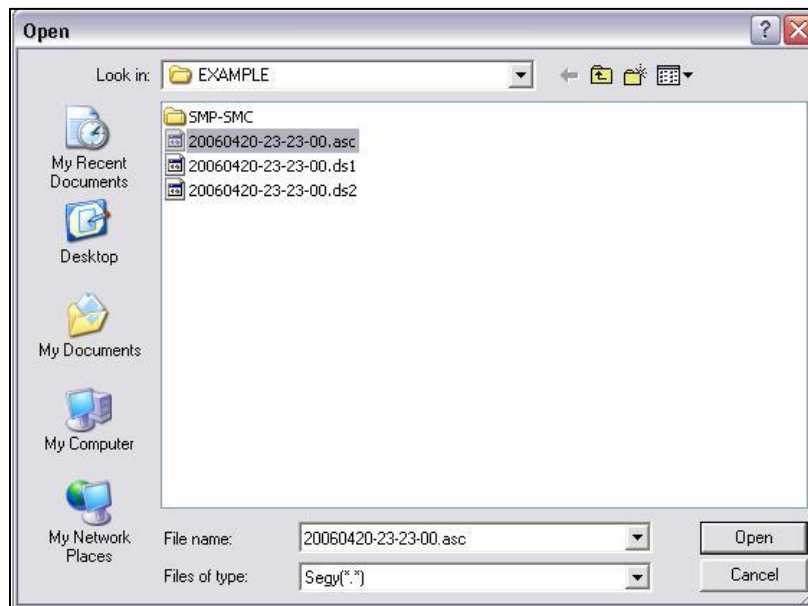
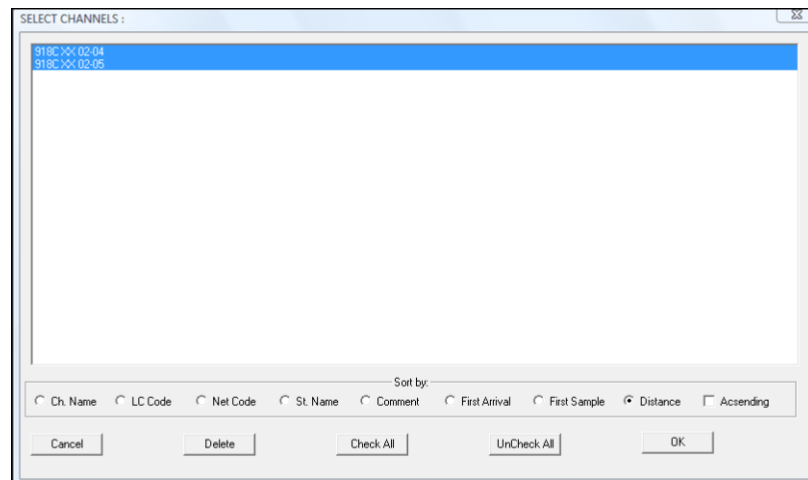


Figure 2-12 ASCII File

4. Select the channel options and the channels.

-OR-

5. Use **Shift**, **Ctrl** and mouse cursor to highlight the components.



6. Press **OK** then done.

If a trace is altered by filtering, component rotation, or the corresponding comment is added to the channel name the original trace is saved in memory. It can be recovered using this command.

1. To arrange the traces on the display by different criteria, click the corresponding check box.
2. To delete unnecessary channels from program memory highlight them and click Delete button.

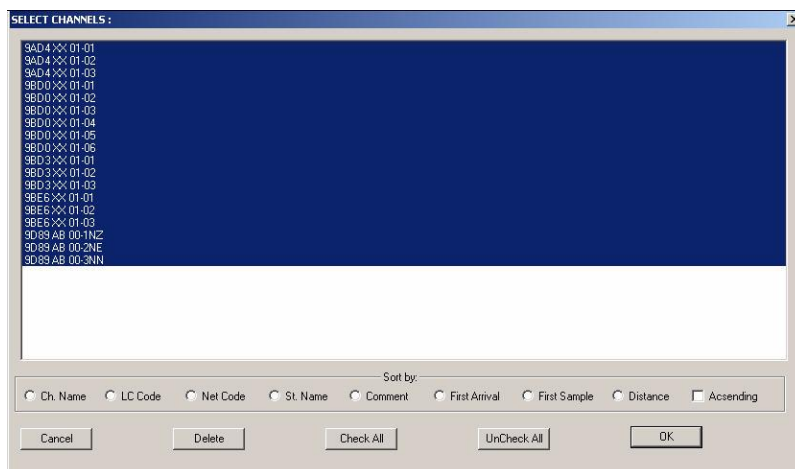
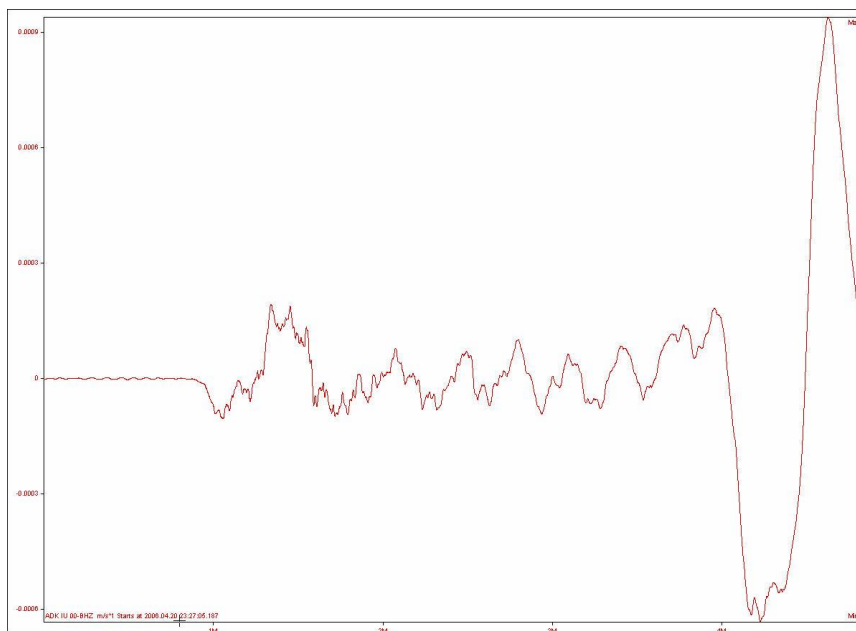


Figure 2-13 Select Channels

3. The desired trace opens in the display.



2.2.5 Exit

1. Click on the box in the upper right corner of the window,

-OR-

Use the hot key combination Ctrl-X.

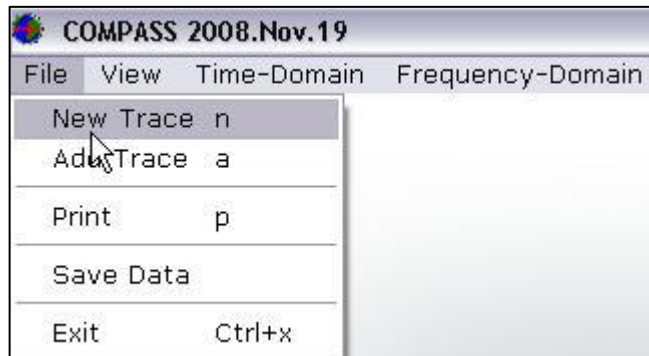


Figure 2-14 Exit Program

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