MAGMA

Seismic Data Recovery

Troika International Limited

Magma User Guide

Version 6.0

TROIKA INTERNATIONAL

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About Troika

Troika is a Global Seismic Software Company supplying Data Management utilities and transcription software to Oil and Gas Companies and Service providers worldwide. The company was founded in 1994 as a software house specialising in the development of software relating to Seismic formats, data on legacy tapes and encapsulation formats on disk. Troika has always had a close relationship with the SEG Technical Committee and the Standards Leadership Council (SLC) to ensure that the data is format compliant and has developed tools to address issues and problems encountered in the industry when dealing with legacy data.

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CHAPTER 1

Introduction

Magma is a highly flexible seismic data transcription, reformatting and manipulation application capable of handling a wide range of legacy and modern recording formats and media types. It has established itself as the recommended front-end for several industry standard data analysis packages including being the chosen plug-in for “Foreign Tape Input” to Halliburton’s SeisSpace® ProMAX® seismic processing software family.

Magma is a data manipulation application that handles all seismic data formats from a variety of media types. Magma can provide fast transfer of information to and from High Capacity Media, hard disk and across networks, but is also able to handle data recorded on historic 21 and 9 track drives. It is a flexible seismic QC tool and efficiently handles seismic input/output and is designed to transcribe, copy, read and reformat data.

The Magma program is modular with input modules for the standard SEG seismic formats - other formats are added as the need arises.

There are also modules for output to SEGY & SEGD and for producing plots of seismic traces.

Our clients use Magma for many purposes including:

- Tape Copying
- Demultiplex
- Reformatting Tape data
- Quality Control procedures.
- Format compliance checks.

What's New

Magma 6.0 includes the following changes....

Magma 6.0.0

- New build environment - improving stability and modernising code

5.6.0 - New Functionality:

- Added support for branches in a Magma job.
- Improvements to Magma listing: Verbose mode added, and additional options to display details such as line number
- This version of Magma is compatible with Marlin 4.1 (subsequently to be released), which contains tabs for using Magma functionality.
- Ability to get the magma version from command line using -v qualifiers
- Directory paths can now be entered in manually or copy / pasted.
- In utilities changed EOF count for End-Of-Data to 10.
- Added a -v option to the magma executable, which will print the version of Magma to stdout and exit immediately.
- Added new option to SEGD input module to ignore the line sequence number in headers from SEGD 2.1 and later. If this option is set, the whole job will output a single seismic line, regardless of the value of line sequence.
- In the gui for dataout (ddout), added the option to paste an EBCDIC header from the clip-board in the same way as loading it from a template file.
- In plotfile, added a new substitution in the file name template. %T will substitute the name of the current input tape or file (without the file name extension).
- In dataoit (ddout)and rodeout, the output tape/file names can contain substitutions in a similar way to the file name template in plotfile.

Enhancements to existing functionality:

- Added support for Vanguard directories containing SEGD data (in addition to SEGA/B/C).
- Extended support for SEGY REV 2
- Further support for SIPMAP
- Naming of 'dd' functionality changed to 'data...'

  ddin => datain

  ddout => dataout

  ddcopy => datacopy

  ddlog => datalog

  dd21 => data21
- Fixed bug in resamp module which caused it to crash on Windows

Supported Operating Systems

Magma is supported on the following operating systems

Operating System	Architecture	Installer Name
Centos 7	64-bit	Magma-6.0-rhel5-x86_64-linux-installer-.run
Microsoft® Windows 7&10 / Microsoft Server 2016/2019+	64-bit	Magma-6.0-win64.exe

*CentOS 7 may require certain packages to be install beforehand. The way to check if a library needs to be installed is to do the following:

```
If you do not have permissions, sudo may be required.
go to: .../Magma.6.0.0-.r0h.e0l7-x86_64/bin
type: ldd magma
```

A list of the libraries needed will be displayed and any that are marked as being **"not found"** will need to be installed.

At the moment I have one example of this which is libodbc.so.2.

It can be installed using the following command:

```
yum install unixODBC
```

We recommend IBMtape drivers are installed for any IBM tape drive (not OS specific), and that sometimes an update to the system will mean the IBM drivers will need to be reinstalled.

Pre-Requisites

If you are using Centos 6+ you will require **libexpat.so.?**in order to run Magma. If you find that the job window and the log file are empty whilst running a job then this is likely the issue. Please run Magma from the command line in order to view any error messages that Magma is reporting.

To run Magma from the command line you must enter the follow:

```
/usr/local/Magma/bin/magma
```

If the following message show up then you will need to install libexpat in order for Magma to work correctly:

```
error while loading shared libraries: libexpat.so.0: cannot open shared object file:
No such file or directory
```

In order to install **libexpat** you will need to install the libexpat.so.? library. This can be done by typing "yum install expat" into the command line.

Magma is licensed via the FlexLM licensing software. You will be supplied with a flex license file which needs to be served from a flex license manager. If your site already uses FlexLM license servers the troika license can be served from those servers. Alternatively, Troika can supply the installers for the flex license manager on Windows or Linux. Please refer to “Troika_FlexNetPublisher_Guide.pdf”.

CHAPTER 2

Getting Started

This chapter describes the formats and encapsulations that Magma supports.

Launching the Magma GUI

In Windows, Magma can be started from the start/menu screen or by double-clicking the Magma icon (created as a short-cut during installation). On Linux a desktop launcher can be set and the Magma startup line put in the Command field, or run using the MagmaGUI file.

After launching, using either Linux or Windows, the main Magma screen is opened with the menu options displayed along the top bar. tdevs is automatically run within Magma and will detect any drives attached to the host system. These drives will be shown on the main GUI window.

Magma can be operated by using the Utility function or by creating modular jobs within the Job Editor. Both parts can be accessed when Magma is open and can be used to perform similar operations.

Note: The functions read data differently - the Utility function is more robust reading each byte and is useful for fault finding, whereas the Job Editor is usually used to create modular work flows which can be used to perform a variety of tasks. The Job Editor also allows for multiple inputs & outputs.

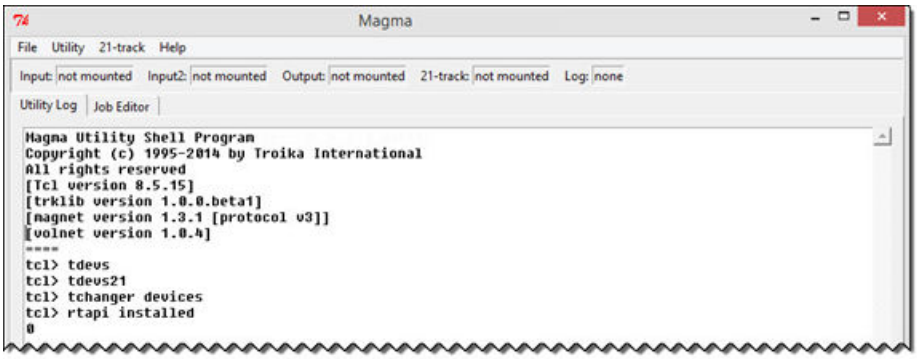


Figure 2-1 *Magma opening screen*

Supported Formats

Magmasupports the following formats:

Input	SEG A, B, C , D, Y, SIPMAP
Output	SEGY & SEGD

Supported Encapsulations

Encapsulation	Input	Output
tif	Y	Y
tif8	Y	Y (Default)
segd	Y	Y
segy	Y	Y
rode	Y	Y (Disk Only, No Ancillary Data)
uniseis	Y	
bytestream	Y	
promaxtod	Y	
lacey	Y	

Encapsulation Methods

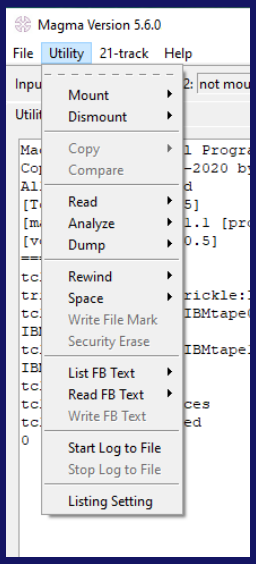
This page intentionally left blank to ensure new chapters start on right (odd number) pages.

CHAPTER 3

Utility

The Utility section in Magma allows you to easily analyse and examine the underlying content of files even if they are record encapsulated

- **Format recognition**
- **Reading and Displaying the structure of seismic files**
- **Viewing data in hexadecimal and identifying Metadata and Trace Header content and byte position**
- **Stripping encapsulations to see underlying format**
- **Reading navigation that isn't in text format**
- **Changing listing parameters**



Overview

The Utility menu has several useful functions:

- Fault finding
- Format recognition
- Locating byte positions
- Viewing data in hexadecimal
- Stripping encapsulations to see underlying format
- Reading navigation that isn't in text format

The following functions can be performed within the Utility menu:

- Copy of data bit-for-bit from magnetic media to disk, or vice versa
- Copy data and encapsulate as a .tap fie from magnetic media to disc
- Read and verifies data via tape dumps, format analyses and data comparison
- Erase data from magnetic media (Security erase magnetic media)
- Read/dump/write encapsulated data
- Read navigation files that are not in a text format

Click on the Utility tab, a drop-down menu will open giving several options Figure 3-1 below).

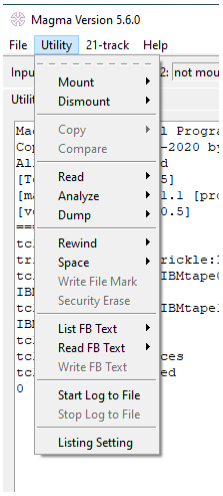


Figure 3-1 *Available options seen on opening the Utility function*

After any command has been performed it is necessary to use Rewind before issuing another command. E.g. an Analyse can only be performed from the beginning of a tape/file; an error will occur if a rewind is not done, for example, after Read and before Analyse.

Mount->Input (and Input2)

Click on the **Utility** button. A drop-down list will appear giving the option to select **Input**. A **Mount** Input box will open Figure 3-2 below

- Tape
- Changer
- Disk File
- Disk Directory (available for SEG-D)
- FTP

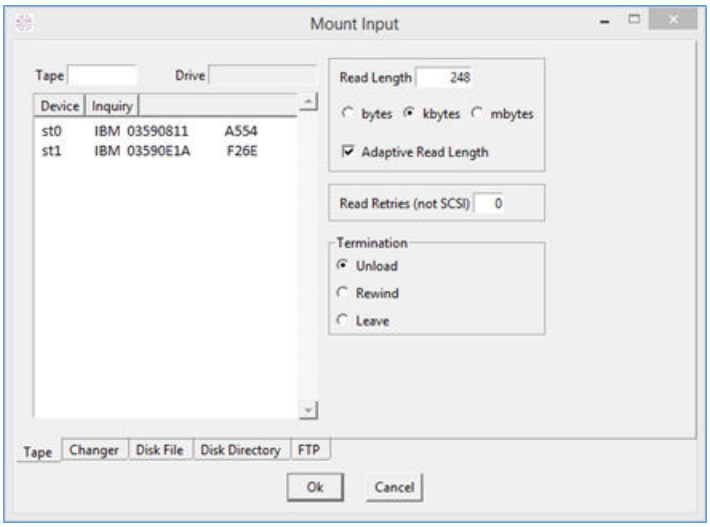


Figure 3-2 *Mount Input box*

To input from Tape ....

Select from the available devices shown and enter a tape volume name in the Tape box (top left). The selected drive will be shown in the "Drive" box. Press **OK**. The main Magma window will show information on the parameters used to mount the device as seen in Figure 3-3 below

```
tcl> tdevs21
tcl> tchanger devices
tcl> rtapi installed
0
tcl> tmount tape Tape0 Tape-Name -name input -access read -term unload
-readlength 248k -adaptive
input
```

Figure 3-3 *Highlighted area showing details of the mounted tape drive*

To input from disk files..

Click on the **Disk File** tab and select the required encapsulation from the available options. If the encapsulation/format is unknown, then use automatic (Magma has the ability to automatically detect a wide variety of formats and encapsulations).

- Click on **Browse**. An input box will open. Browse to the required directory and select the required file for input.

Encapsulation	Description
Automatic	The encapsulation method is determined automatically by examining the data in each file. This works in the vast majority of cases, and is the default.
Tape Image File (TAP)	
Extended TIF (TIF8)	TIF8 or Extended TIF is an alternative version of Tape Image File defined by Landmark to address limitations in the original TIF.
SEGY	This encapsulation method allows the reading and writing of SEGY data to a disk file. Such a file can only contain a single SEGY file, and will not work for any other type of data. The data is written directly into the file without any additional encapsulation information, and values in the SEGY headers are used to resolve the data into a tape record stream.
SEGD	This encapsulation method allows the reading and writing of SEGD data to a disk file, without any additional encapsulation information. Values in the SEGD headers are used to resolve the data into a tape record stream.
RODE	This encapsulation method allows the reading and writing of disk files using SEG RODE encapsulation. Note that using this method it is only possible to access the encapsulated tape record data itself and not any associated metadata contained in the RODE encapsulation, and it is only possible to access the first RODE tape image in an RP66 disk file.
RP66 Visible Envelope	This encapsulation method allows the reading and writing of disk files written according to RP66 Versions 1 and 2, as defined by the American Petroleum Institute. This encapsulation uses the RP66 Visible Envelope information to make an RP66 disk file appear the same as a tape. Note that the RP66 data inside the Visible Records is defined by the appropriate schema, e.g. RODE, which is conceptually a layer above this encapsulation method.
LIS	This encapsulation method allows the reading and writing of Schlumberger LIS data to a disk file. It will not work for any other type of data. Since the LIS format already includes record length information, no further encapsulation is necessary
ProMAX Tape On Disk	This encapsulation method allows the reading and writing of disk files using ProMAX "Tape On Disk" encapsulation.

Encapsulation	Description
Lacey	This encapsulation method allows the reading and writing of disk files using Lacey encapsulation.
SIPMAP	This encapsulation method allows the reading of data created using the Shell SIPMAP format. Note that the reading of such data only is supported.
DPTS ARC	This encapsulation method allows the reading and writing of data using the DPTS internal ARC encapsulation format.
Byte Stream	This encapsulation method allows the reading and writing of disk files without any encapsulation information. On read, the file appears as a stream of tape records of length specified by the -blocksize parameter. On write, tape records are streamed out to the file without any encapsulation information.

To input from files located on an FTP server ...

Click on the **FTP** tab. Enter the required information and press **OK**.

Note: this is not secure, but works well with anonymous FTP servers.

The selected input will be displayed in the main Magma window (See).

Mount -> Output

1. **Click** on the **Utility** button. A drop-down list will appear giving the option to select **Output**. A **Mount Output** box will open ().
2. Select the required output type from the available option tabs and click **OK**.
3. For **Tape** select the required tape density format (shown inFigure 3-4 on the next page).

   *Note: details of the different tape density options are provided in the **MAGMA REFERENCE MANUAL** which can be accessed from the **Help** menu*
4. For **Disk File** select from the encapsulation options (shown in "Disk File output encapsulation options" on the next page), and then click **Browse**. An output box will open. Browse to the required directory and enter a filename for the output file.
5. The selected output will be shown in the main Magma window (see Figure 3-4 on the next page).

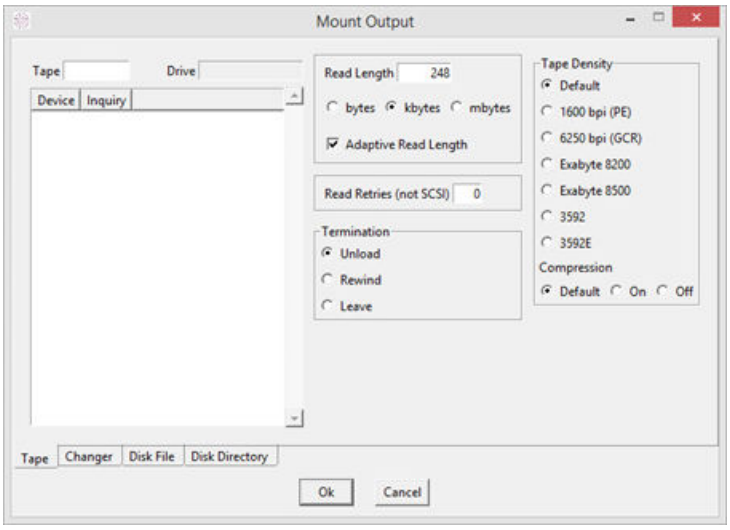


Figure 3-4 *Tape Output density options*

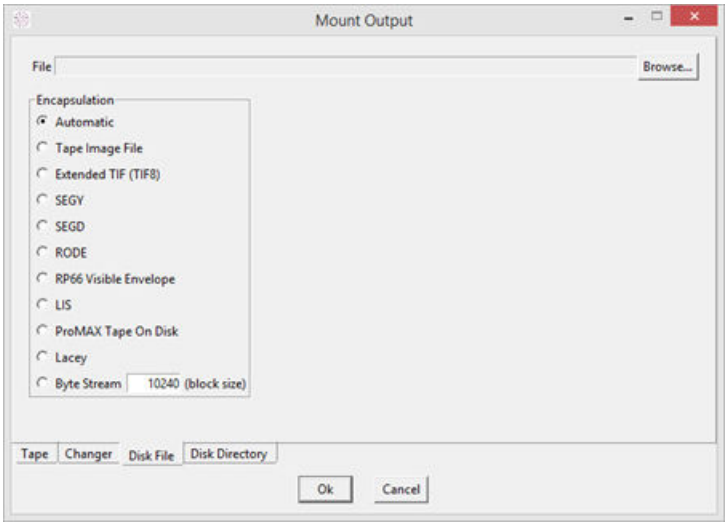


Figure 3-5 *Disk File output encapsulation options*

Note: For copying data using the SEGD encapsulation to be successful, it requires that the information in the General Headers, Channel Sets, and Trace Headers be correct for the specifications of Trace Length, Sample Rate, and Bytes Per Sample. If this is found not to be the case, the copy will fail. This is particularly pertinent when dealing with data that has been previously transcribed, especially when the original input media was old 9-track media, which could have been subject to degradation, causing data copied, especially Trace Length, not to match exactly the value specified in the header.

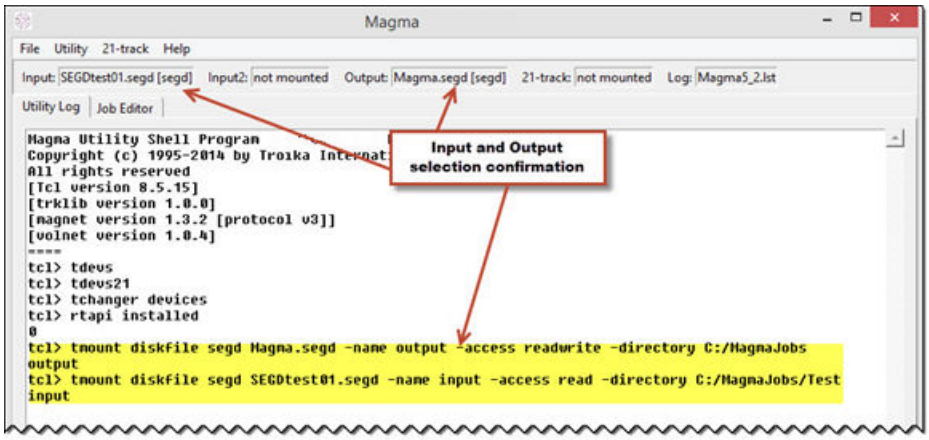


Figure 3-6 *Selected Input and Output options displayed in the main Magma window.*

Read

The **Read** command can be used to read and list a specified amount of data from the **Input/Input2** or **Output** source.

1. Click on the **Read** button. Select **Input**. A **Read Input** box will open (above).

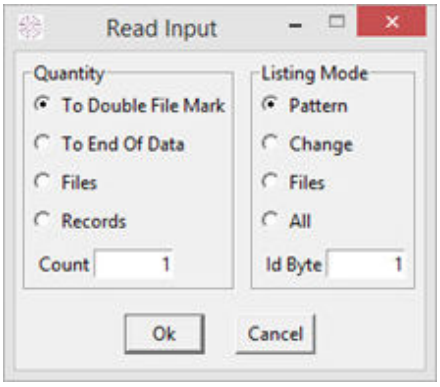


Figure 3-7 *Read Input Options*

2. Select the required Quantity:
    i. **To Double File Mark** specifies that the input will be read until two consecutive file marks have been found.
    ii. **To End of Data** specifies that the input will be read until either the physical end of data is encountered or three consecutive file marks have been found.
    iii. The **Files** option specifies that the input is to be read until a given number of file marks have been found. The number of files to be read should be specified in the “Count” box.
    iv. The **Records** option specifies that the input is to be read until a given number of records have been found. The number of records to be read should be specified in the “Count” box.
3. Select the required **Listing Mode**. The Listing Mode parameters specify the type of listing required for the stream of records read from the input.
    i. **Pattern** looks for patterns in the input record length. The first and last records in a file will always be listed and the sequence of records before and after a change in the pattern of record lengths.
    ii. **Change** will list the first and last records in a file, plus the records before and after a change in record length.
    iii. **Files** will list the first and last tape records in each file.
    iv. **All** will list all records.
    v. The “**idbyte**” box specifies the byte number of the first byte to be dumped. The listing produces a hex dump of 16 bytes from each record. The default is “1” and the first 16 bytes of each record will be dumped.
4. Click **OK**.
5. The progress of the read will be shown in the main Magma window. The process is complete when the text “Normal {Normal completion}” is displayed. Details will also be displayed in the Utility Log.

Note: The default is **Pattern** which provides a useful, but not too verbose listing for most data types. Input records with errors will always be listed.

Analyse

The **Analyse** command can be used to gather information from the input source and will give information on the input format. These values may provide useful information which can be used in other Magma input modules. All the automatically identified encapsulations/formats are supported in this function. Magma will strip off any encapsulation and give an analysis of the underlying format.

1. Click on the **Analyse** button. Select Input (Input2/Output).
2. The progress of the Analyse will be shown in the main Magma window. The process is complete when the text "Normal {Normal completion}" is dis played. Details will also be displayed in the Utility Log.

Dump

The **Dump** command can be used to read a specified amount of data from the input source. This will provide a more detailed analysis than the Read function. The dump function produces a hexadecimal dump of the data which gives a view of the data at a close level and will show information that **Analyse** does not pick up.

1. **Click** on the **Dump** button. Select Input **(Input2/Output)**. A Dump Input box will open Figure 3-8 below.

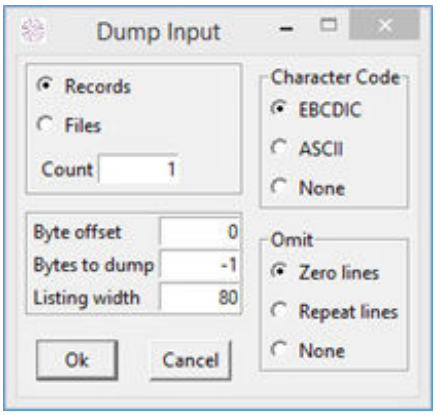


Figure 3-8 *Read Input*

2. Select to dump information for either **Files** or **Records**. Specify the number in the "Count" box.
3. Select to use **EBCDIC** or **ASCII** character code.

Note:

EBCDIC (Extended Binary Coded Decimal Interchange Code) is a character encoding set. The character encoding is based on Binary Coded Decimal (BCD) with the contiguous characters in the alphanumeric range formed in blocks of up to 10 from 0000 binary to 1001 binary.

ASCII is the American Standard Code for Information Interchange (also known as ANSI X3.4). ASCII is a 7-bit code with the 8th most significant bit (MSB) used for error checking. Most com-

puter systems use ASCII values of 128 and above for extended character sets.

The SEGY 3200 Byte Textual (Reel) Header is normally EBCDIC encoded.

4. Enter values to start the dump from a specified byte offset if required. The default parameters will start the dump at the first byte position.
5. Zero and repeated lines can be omitted from the dump. To dump all values, select “None”
6. Click **OK**.
7. The progress of the dump will be shown in the main Magma window. The process is complete when the text “Normal {Normal completion}” is displayed. Details will also be displayed in the Utility Log.

Copy

The copy command can be used to copy a specified amount of data from an input source to another selected disk or tape.

Note: This option will be greyed out if both Input and Output haven’t been selected.

1. **Click** on the **Copy** button. Select **Input**. A **Copy Input Output** box will open above.

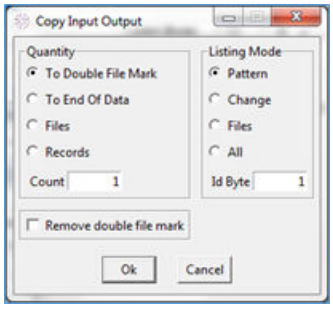


Figure 3-9 *Copy Input Output box*

2. Select the required Quantity and Listing Mode options (see "Read" on page 24). Click **OK**.
3. Double end of file marks (DEOF) can be removed by selecting the “Remove double file mark”. Any DEOF will then be replaced on the output by a single EOF mark.
4. The progress of the copy will be shown in the main Magma window. The process is complete when the text “Normal {Normal completion}” is displayed. Details will also be displayed in the Utility Log.

Compare

The **Compare** command will make a comparison between mounted **Input** and **Input2** and performs a bit to bit compare.

1. **Click** on the **Compare** button. Select **Input**. A **Compare Input Input2** box will open.
2. Select the required Quantity and Listing Mode options (see "Read" on page 24). Click **OK**.
3. The progress of the compare will be shown in the main Magma window. Details will also be displayed in the **Utility Log**.

Space

Use the Space command to skip over a specified number of file marks, records or to position the tape at the end of data. This is performed as a space forward to two consecutive file marks, followed by a space reverse to leave the tape positioned between the two file marks.

1. Click on the **Space** button. Select **Input**. A **Space Input** box will open above.

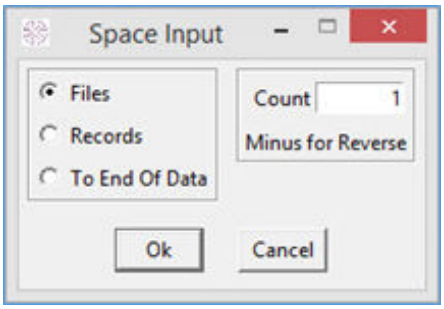


Figure 3-10 *Space Input Options*

2. Select the information to space:
    i. Enter a value in the "Count" parameter box to specify the number of **Files** (file marks) or **Records** which are to be spaced over. A positive value will space in a forward direction, and a negative value will space in the reverse direction.

    Note: If a count is not supplied, a value of one is assumed and the tape will be spaced forward over a single file mark or record.

    ii. To position the tape at the end of the data, select **To End of Data**. This will space forward to two consecutive file marks, followed by a space reverse and leave the tape positioned between the two file marks
3. Click **OK**.
4. The progress of the Space will be shown in the main Magma window. The process is complete when the text "Normal {Normal completion}" is displayed.

Write File Mark

The **Write File Mark** command can be used to write one or more file marks to a tape.

Note: This option will be greyed out if an Output hasn't been selected.

1. **Click** on the **Write File Mark** button. A Write File Mark box will open Figure 3-11 below.

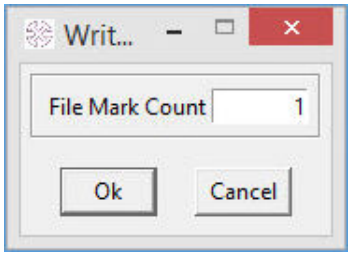


Figure 3-11 *Write File Mark Option*

2. Enter the number of file marks to write. If a value is not entered a single file mark will be written. Click **OK**.
3. The progress of the copy will be shown in the main Magma window. The process is complete when the text "Normal {Normal completion}" is displayed.

WARNING: It is easy to double up file marks. If there are multiple files the data will be unreadable after the first file.

Security Erase

The **Security Erase** command will erase the entire contents of the tape.

Note: This option will be greyed out if an Output hasn't been selected.

1. **Click** on the **Security Erase** button. A warning box will open (Figure 3-12 below).

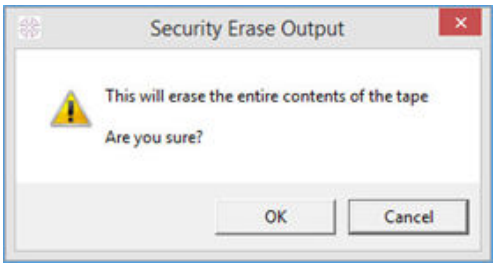


Figure 3-12 *Security Erase Output warning*

2. If you are sure the contents can be erased, click **OK**.
3. The progress of the copy will be shown in the main Magma window. The process is complete when the text "Normal {Normal completion}" is displayed.

WARNING: This will completely erase all data on the tape.

Rewind

The **Rewind** command will cause the input to rewind to the beginning.

1. **Click** on the **Rewind** button. The input will rewind to the beginning.

> After any command has been performed it is may be necessary to use Rewind before issuing another command. For example, an Analyse can only be performed from the beginning of a tape/file, if the user selects the Read command, and does not select Rewind before attempting to Analyse, an error will occur.

Fixed Block (FB) Text Utilities

FB is short for "Fixed Block" and refers to how certain types of data are written to magnetic tape. The type of data involved here is typically navigation and velocity text data. Historically, this data would be in written as 80 byte lines of text (card image) in EBCDIC format.

When written to tape these 80 byte lines would be combined into larger blocks, e.g. 50 records combined into 4000 bytes, to allow them to be written efficiently. If the 80 byte blocks were to be written to tape individually there would be excessive amounts of tape "start/stop" motion which would lead to drive and tape wear. The drive could also write such data as combined larger blocks much more quickly.

The Magma FB utilities can be used to

- List the contents of a Fixed Block Tape
- Read the contents into a disk file and optionally convert from EBCDIC to ASCII or vice-versa.
- Write the contents of a disk file to a Fixed block tape

List FB Text

This is used read the contents of a fixed block tape and output the contents to the Utility Log window.

1. Mount the Input Tape
2. Select **Utility → List FB Text**

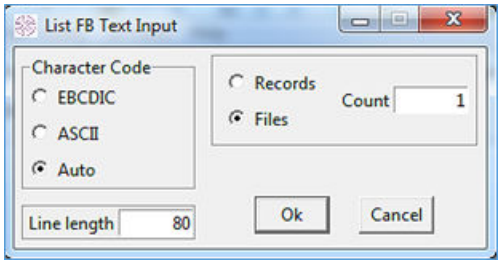


Figure 3-13 *List FB Text Input*

3. Modify settings as required:
   i. If you know the character encoding of the tape then you can choose the appropriate option (EBCDIC/ASCII), however, if you set the Character Code=Auto, Magma will attempt to detect the encoding.

ii. Unless the Line length is known, it is a fair assumption to use 80. The results may show that another Line length has been used and you can rewind and adjust.

iii. Use Records to list a restricted number of Blocks (for testing?). It is possible that a Tape contains multiple files in which case you use Files > 1 to list more than one file. Alternatively, you may want to List one file at a time doing multiple reads with Files=1.

The text will be output to the Utility Log window. In theory, it is possible to copy this output to a file or the clipboard BUT his could take a long time so it might be more appropriate to use List FB Text just for testing and use Read FB text to output to file.

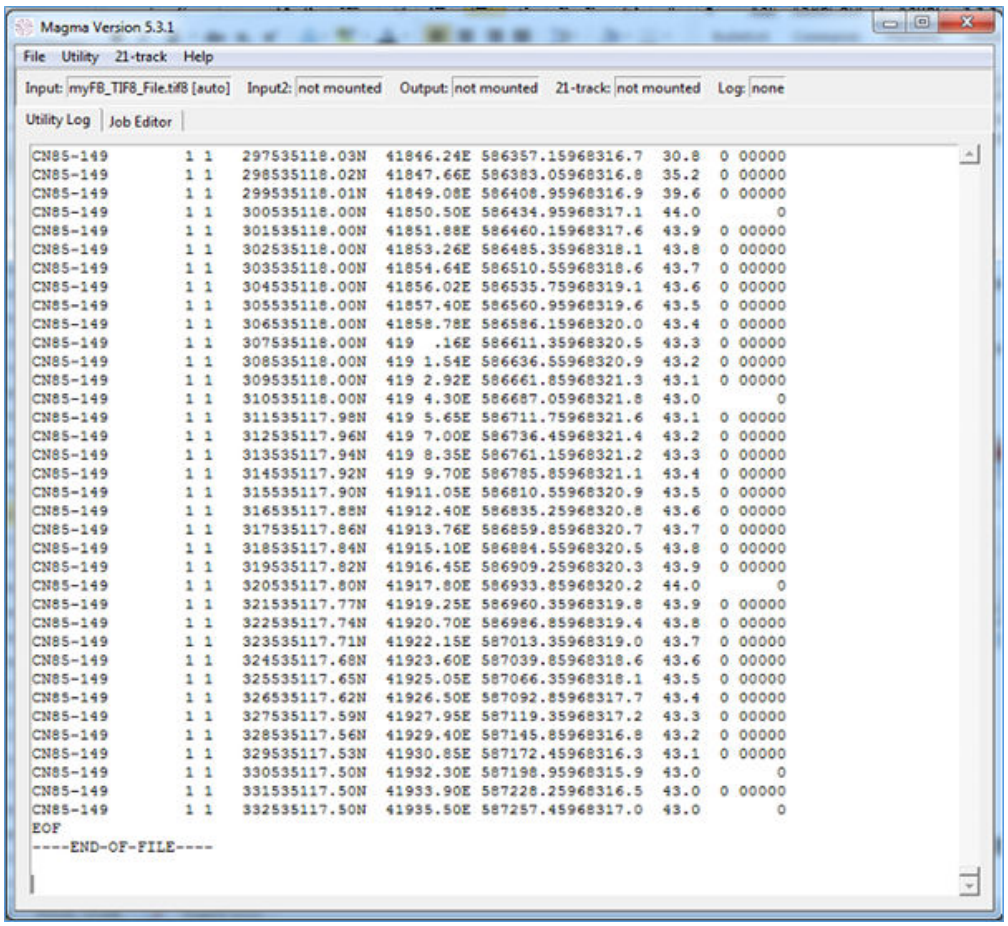


Figure 3-14 *Utility Log window*

Read FB Text

This is used to read the contents of a fixed block tape and output the contents to a disk file.

1. Mount the Input Tape
2. Select Utility → Read FB Text
3. Browse to a suitable output directory and enter a filename for the output.
4. Modify settings as required (Line Length & File count)

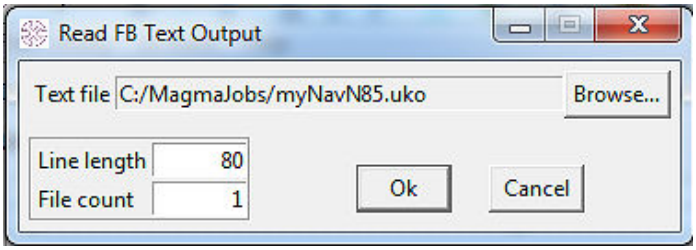


Figure 3-15 *Read FB Text Output*

5. Select **OK**
6. Utility Log window will display completion message showing number of lines copied.

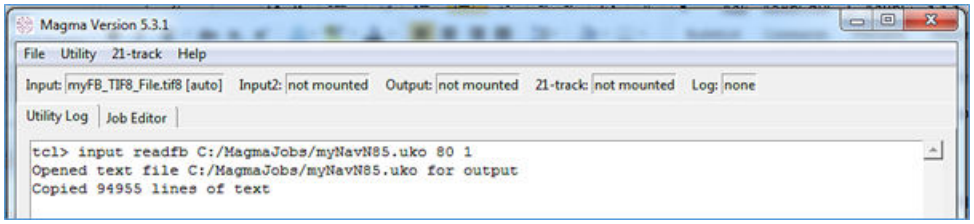


Figure 3-16 *Utility Log message*

Write FB Text

This is used to write a disk file to a fixed block output tape.

1. Mount the Output Tape
2. Select Utility → Write FB Text
3. Browse and select the disk file.
4. Modify settings as required (Line Length, Blocking Factor & encoding)

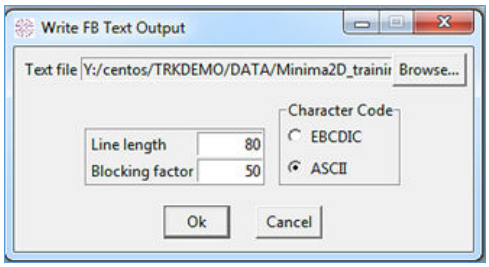


Figure 3-17 *Write FB text*

5. Select **OK**
6. Utility Log window will display completion message showing number of lines written.

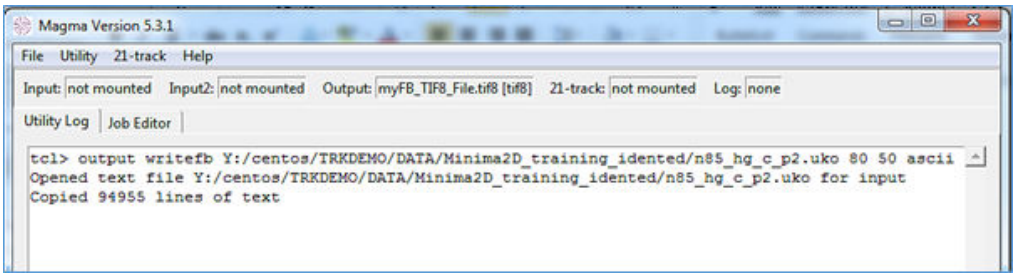


Figure 3-18 *Utility log completion message*

If you rewind and read the output, it will show the record structure of the output tape (here showing 4000 (i.e. 80*50) byte records + remainder records in last block.

```
tcl> output read -listmode pattern -idbyte 1 -todeof
Read Input tape: myFB_TIF8_File.tif8
Record Parity Error Super
Id bytes 1 to 16 Length Count Status File Record File
4830 3130 3020 5355 5256 4559 2041 5245 4000 n/a - 1 1 1
---- 1897 records of same length omitted from listing ----
434e 3835 2d31 3439 2020 2020 2020 2020 4000 n/a - 1 1899 1
434e 3835 2d31 3439 2020 2020 2020 2020 400 n/a - 1 1900 1
/\/\ End-of-file (File 1, 1900 records)
/\/\ End-of-file (File 2, 0 records)
```

Listing Settings

The listing command causes the format of the listing to be modified.

listing [-lv Normal/Verbose] [-dd] [-dt] [-dl] [-dln] [-lsp Space/Comma/Semicolon/<->]

-lv=Normal or Verbose

The -lv option specifies the level of listing detail. This option is neither Normal or Verbose. The default listing detail is Normal.

-dd

The -dd option is used to display the date on individual listing lines. The date is shown with this format: 25-SEP-2020

-dt

The -dt option is used to display the time on individual listing lines. The date is shown with this format: 09:44:53

-dl

The -dl option is used to display the listing level on individual listing lines. The level is shown as either Normal or Verbose

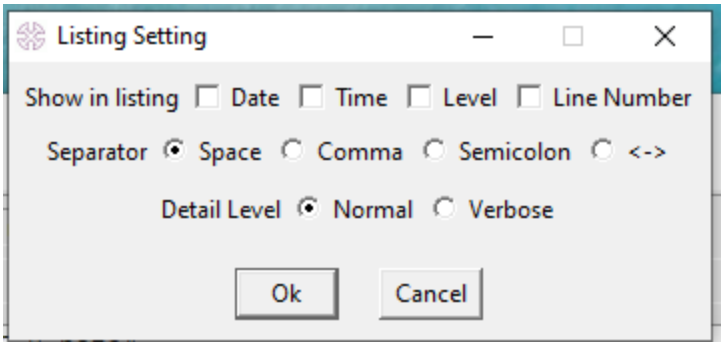
-dln

The -dln option is used to display line number into a listing. This option is only used when writing to a file, it is not used when writing to a scrolling feedback window.

-lsp

The -lsp option specifies the separator used between the date, time, level and line number, if these are displayed within the listing. The separator can either be either -Space, -Comma, semicolon or <-> (for arrow brackets).

An example with comma separation is 25-SEP-2020,10:06:11,Normal, and an example with arrow brackets separation is <25-SEP-2020><10:01:43><Normal>.



Changing options on this menu will invoke the *listing* command Utility log tab. All the options for the *listing* command are explained in the Magma reference guide.

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CHAPTER 4

Magma Jobs & Workflows

The Job Editor can be used to setup customised workflows. Workflows and parameters can be saved for application to similar projects.

New Job

1. Click on the **Job Editor** tab (located at the top left-hand side of the main Magma page).
2. Click on **File** and select **New Job** from the drop-down menu. A **New Job** parameter input box will open Figure 4-1 below

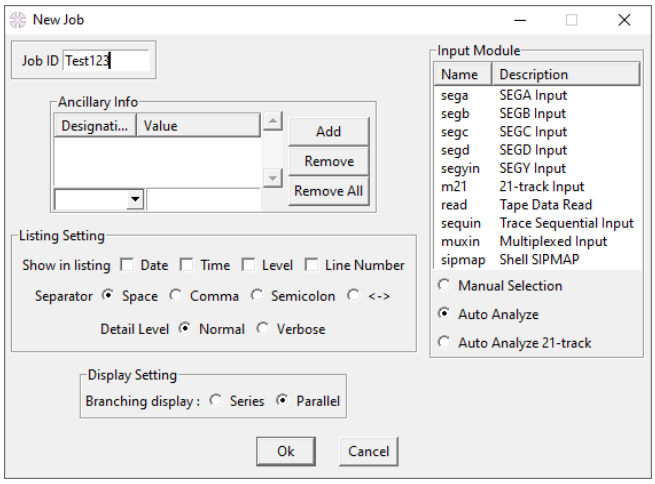

Figure 4-1 *New Job window*

3. Enter a **Job ID**. This could be a job number or the base name of the parameter file. When the job parameter file is saved, the initial file name offered will be based on the current job id.
4. Choose from one of the Input Module options (described in sections "Input Module - Auto Analyse option" below to"Input Module - Manual Selection" on page 39) Click **OK**. In most cases, **Auto Analyse** should be selected for automatic format recognition.
5. The Ancillary Info window is optional and is used to define Job Metadata as keyword/value pairs. This ancillary information can be used by various other modules in the job. For instance…
    a. The RODEOUT module can write this information as RODE-ANCILLARY-INFORMATION records.
    b. The SEGYOUT module can write this information as stanzas into Extended Textual file headers. (See section on"SEGYOUT" on page 62).
6. Choose from the Listing Setting options - These options will give the user the ability to chose extra information that will be included within the listing when a job is complete. More information about these settings can be founds within

Input Module - Auto Analyse option

This option is used in most cases and will attempt automatic format recognition.

1. A Mount Analyse box opens. Select the Input from Tape, Changer, Disk File, Disk Directory or FTP.
    - For Tape select from the available devices shown and enter a name in the Tape box (top left). The selected drive will be shown in the “Drive” box. Enter the required Read Length, Retries

and Termination options. Press **OK**.

a. Read Length specifies the byte count that will be used to read the input – all records must have a byte count less than or equal to this value. Selecting

Adaptive Read Length will use the read length parameter at the beginning of each input until two consecutive records with the same length are encountered; the read length will be then be set to these records and used for the rest of the file.

Note: Adaptive Read Length will only work with formats that consist of a file header followed by fixed length records, for example, SEG-D and SEG-Y. It will not work with formats that have varying record lengths, such as LIS.

b. Read Retries specifies the number of times a 9-track tape with parity errors will be tried before the record is accepted. This option is not required for SCSI tape drives since retries are handled internally.

c. Termination specifies the action to be taken when each tape in the dataset is dismounted:

- **Unload** – the tape is unloaded ready to be removed from the drive
- **Rewind** – the tape will be rewound to the beginning
- **Leave** - the tape will be left positioned where it was when it is dismounted

- To input files from disk, click on the Disk File tab and select the required encapsulation from the available options. Automatic can be used for automatic format recognition.

Click on Browse. An Input File Tape box will open. Browse to the required directory and select the required file for input. Click OK.

- To access disk files located on an FTP server click on the FTP tab. Enter the required information and press OK. Note: this is not secure, but works well with anonymous FTP server
- To access multiple disk files located in a directory click on the Disk Directory Tab. Supply the directory path and optionally enter a (wildcard) filename pattern (e.g. 123*.segd). The files in a directory are read sequentially so that each directory appears as a logical tape. Probably the most common case is a directory containing multiple SEGD files, each SEGD file containing the data from a single shot. The type of directory is specified in the Directory Type parameter.
- To access cartridges that are loaded in an online Tape Library or Media Changer click on Changer. From the Changer panel, it is possible to see which libraries are accessible and what cartridges they contain. Choose the set of cartridges that you wish to read in to the job.

2. After selecting the desired Encapsulation an appropriate format window (Figure 4-2 on the next page) will open. Parameters will be automatically entered following the auto analyse. SEG-D is used in this example - please refer to Appendix A: Formats and Parameter – sega,b,c,d,y for all formats and parameter description. Click OK.

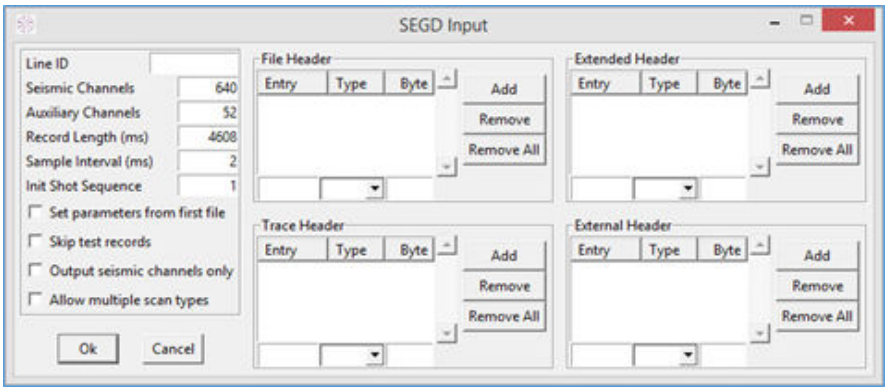

Figure 4-2 *SEG-D Input Parameter window*

3. The main Magma job screen will display the Job Parameter and Input modules (Figure 4-4 on the facing page). These can now be linked to form a workflow for manipulating or analysing the input data.

Input Module – sega/segb

The **sega & segb** modules read and demultiplex a SEGA & B dataset, and feed the resulting seismic trace stream to the next module in the job.

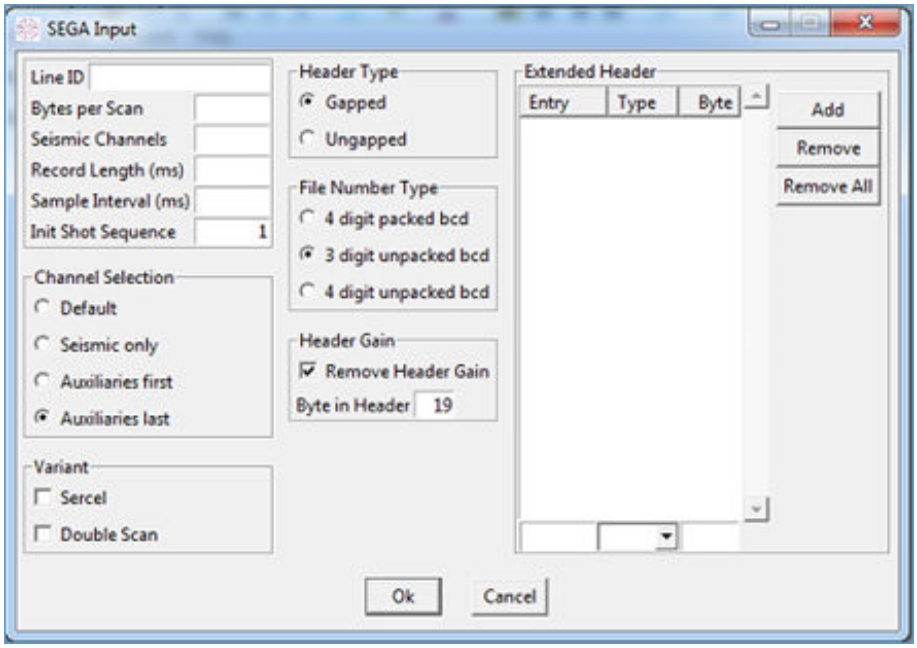

Figure 4-3 *sega and segb manual input parameters*

The following trace header entries are defined by sega & segb modules:

shotseq	Shot sequence number
ffid	Field file number
chan	Field channel number

Table 4-1 *Trace header entries defined by segc and segb modules*

Additional trace headers can be extracted by adding definitions in the Extended Header panel.

Check **Sercel** if the data was recorded on a Sercel field system (there are slight variations in the format sercel produced and Magma must take these into account).

Check **doublescan** if each data scan is recorded as two physical scans, e.g. a 96-trace scan is recorded as two 48-trace scans.

Input Module - Manual Selection

In the unlikely event that the Auto Analyse does not recognise a format then you can manually select the input modules from a list of formats.

The parameters required for each module can be determined by dumping representative records from the input media and referring to the relevant format standards document. Be aware that test records often occur at the beginning of Field tape sets and the analysis is best performed on the actual seismic records. The following sections do not attempt to provide detailed descriptions of the parameter fields; it is assumed that, if a user is employing manual input modules, the parameter fields should be, to a considerable extent, self-explanatory.

1. Select **Manual Selection** and choose the required encapsulation from the list of options.

2. A window with parameter options for the chosen encapsulation will open. Enter values as necessary for the input. See Appendix A: Formats and Parameter – sega,b,c,d,y for formats and parameter description. Click **OK**.

3. The main Magma job screen will display the Job Parameter and Input modules (Figure 22). These can now be linked to form a workflow for manipulating or analysing the input data.

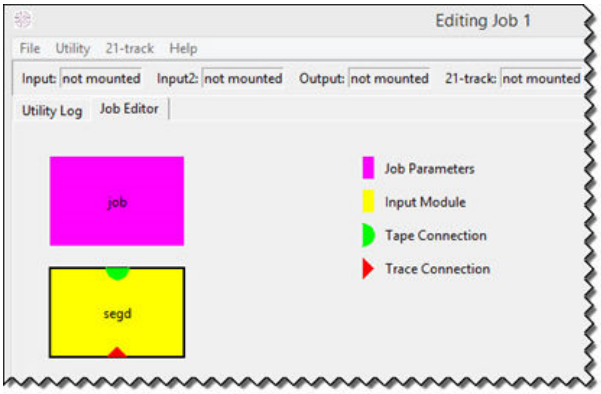

Figure 4-4 *Magma module boxes display in main Magma window.*

Manual Input Module – segyin

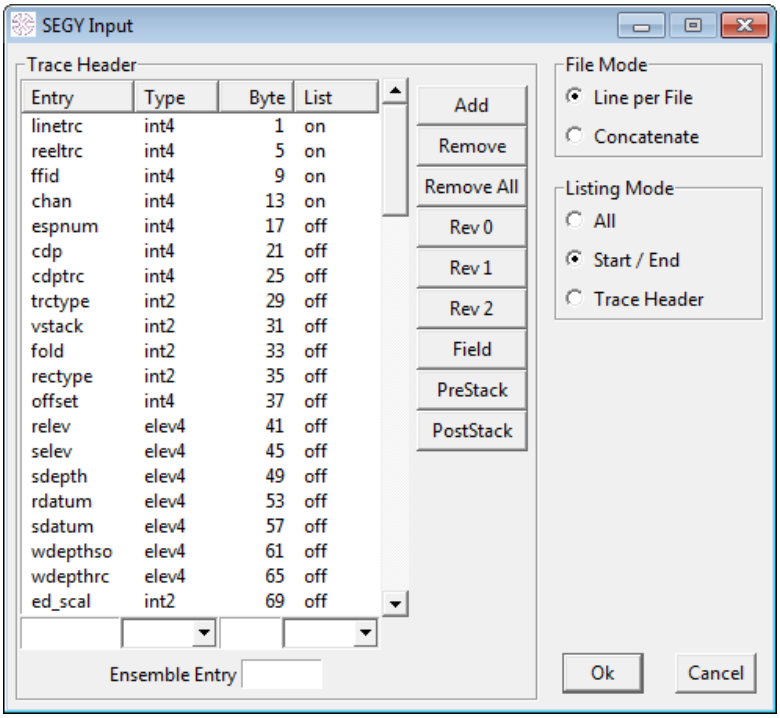

Figure 4-5 *Trace Header Panel*

The **Trace Header** panel (Figure 4-5 above) specifies which trace headers will be extracted. Each entry contains the name of the header, the byte position from which it will be extracted and the data representation that should be used and the way in which trace header values are presented in the job listing.

There are some pre-sets available that will load the most appropriate settings for dataset types (i.e. **Field, Pre-Stack & Post-Stack**).

The SEGY Rev 1 standard defines additional trace header entries beyond the Rev 0 standard, if dealing with Rev 1 data then you could select the **Rev** 1 button to bring these additional trace headers into play.

The SEGY Rev 2 button seen above in Figure 4-5 will rename the Trace Headers so that they comply to the standard.

Additional trace header entries can be defined by entering the relevant data in the field at the bottom of the panel and clicking **Add**.

Magma now supports Digicon field SEGY in the segyin module. Digicon has a 2048 byte pseudo-trace at the start of each field record.

The possible values for **Type** are:

int1	1-byte integer
int2	2-byte integer
int3	3-byte integer
int4	4-byte integer
int8	8-bye integer
ibmfp	4-byte IBM floating-point
ieee32	4-byte IEEE floating-point
coor4	4-byte integer representing a coordinate using the scale value in bytes 71-72
elev4	4-byte integer representing an elevation or depth using the scale value in bytes 69-70
time2	2-byte integer representing a time using the scale value in bytes 215-216
spnum4	4-byte integer representing a shotpoint number using the scale value in bytes 201-202
sm4	4-byte integer representing a source measurement entry in byes 225-228 (This value is scaled by a desperate exponent seen below as sm_exp)
sm_exp	2-byte integer located in a header called sm_exp (int2 - bytes 229-230).
Note: the last 4 special types will apply the appropriate scalars	

Table 4-2 *Trace Header Type*

The ***List*** selection defines how a trace header value will be used in the listing of the SEGY input traces.

Possible values are:

off	The entry will not appear in the listing
on	A column for the entry will appear in the listing, but the value will not affect which traces are listed
change	When the value of the entry changes the traces before and after the change will appear in the listing
ascend	The value of the entry is expected to be in an ascending sequence, and the traces before and after a break in sequence will appear in the listing
descend	The value of the entry is expected to be in a descending sequence, and the traces before and after a break in sequence will appear in the listing

Table 4-3 *List Values*

The **File Mode** parameter specifies how multiple SEGY files in a job should be treated. Possible values are:

Line per File	Each SEGY file is treated as a separate seismic line, with a line id extracted from the SEGY file header.
Concatenate	All SEGY files are assumed to belong to the same seismic line, and are concatenated into a single trace stream.

Table 4-4 *File Mode parameters*

The **Listing Mode** radio buttons determine the type of listing that will be produced when the SEGY data is being read. Possible values are:

All	All traces read will be listed. This will produce a very verbose listing file, but can be useful sometimes.
Start/End	The first and last 20 traces of each file are listed. This is a useful summary and is sufficient in most cases.
Trace Header	The listing is controlled by the List values for each Trace Header entry.

Table 4-5 *List Mode options*

The default value is **Start/End.**

Input Module - segc

The **segc** module reads and demultiplexes a SEGC dataset, and feeds the resulting seismic trace stream to the next module in the job.

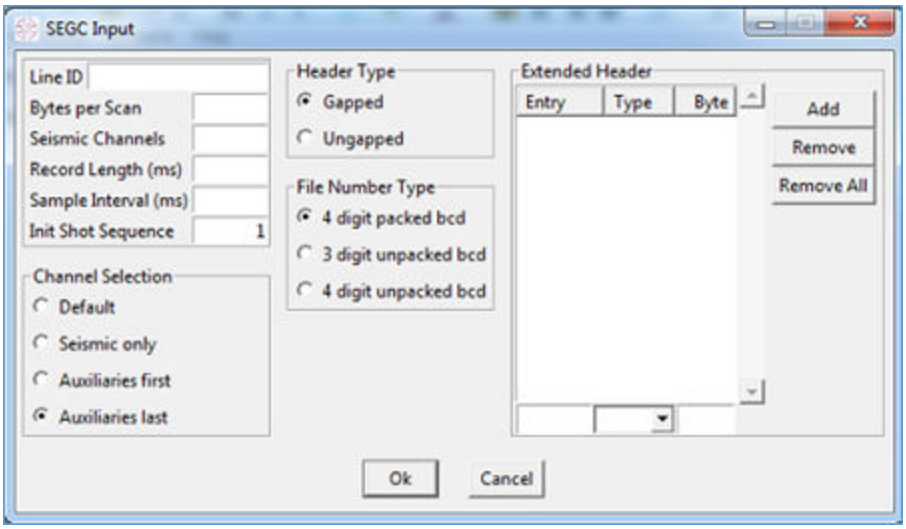

Figure 4-6 *segc manual input parameters*

The following trace header entries are defined by segc module:

shotseq	Shot sequence number
ffid	Field file number
chan	Field channel number

Table 4-6 *Trace header entries denied by segc module*

Additional trace headers can be extracted by adding definitions in the Extended Header panel.

Input Module – segd

The **segd** module reads a SEGD dataset, and feeds the resulting seismic trace stream to the next module in the job.

Note that SEGD is a self-defining format, allowing attributes such as sample interval and record length to vary from trace to trace. However, it is necessary to define nominal values for certain attributes which apply to the dataset. . These attributes are specified by the parameters ***Seismic Channels, Auxiliary Channels, Record Length, Sample Interval***. The values of these parameters are passed to subsequent modules in the job as the nominal values for the dataset. For instance, if the dataset is output to SEGY, the values of these parameters will be put into the SEGY 400-byte binary file header.

If **Set parameters from first file** is checked on, the values of these nominal parameters will be set from the first SEGD file encountered in the dataset.

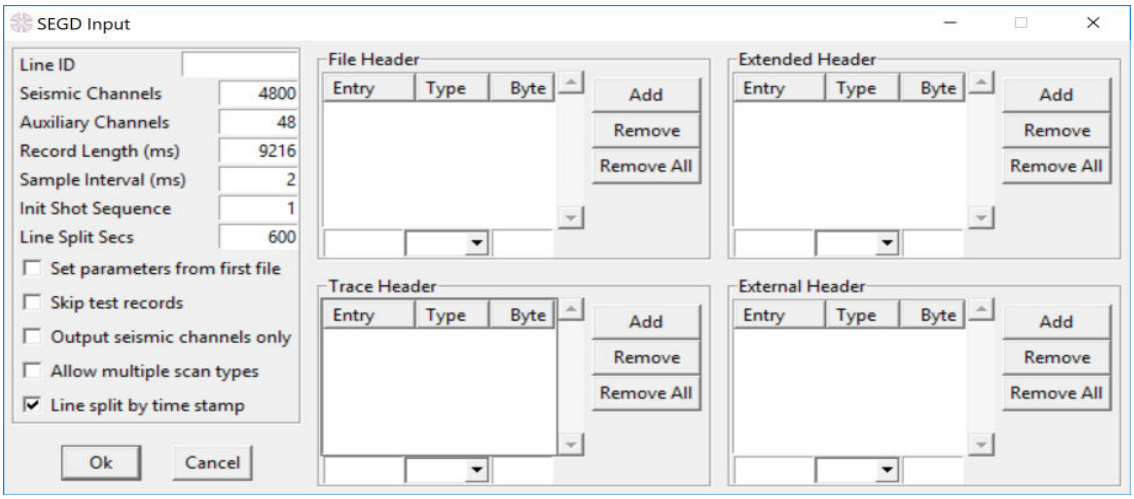

Figure 4-7 segd manual input parameters

The following trace header entries are defined by segd module:

shotseq	Shot sequence within line	**minute**	Minute in hour
shoseqtape	Shot sequence within tape	**second**	Second in minute
lineseq	Line sequence from SEGD file header	**time_shot**	Time of shot as HHMMSS
ffid	Field file number	**chan_set**	Channel set number
chan	Field channel number	**cable_no**	Marine streamer cable number
rectype	Record type (1=Normal, 2=Test)	**segdgain**	Descale multiplier
delay	Delay to start of trace, in milliseconds	**sht_x**	Source X coordinate
sampskew	Sample skew, in units of 1/256 of sample interval for channel	**sht_y**	Source Y coordinate
aliasfil	Anti-alias filter frequency	**ree_x**	Receiver X coordinate
aliaslop	Anti-alias filter slope	**ree_y**	Receiver Y coordinate
lowcut	Low-cut filter frequency	**s_line**	Sail line number
lowcslop	Low-cut filter slope	**r_line**	Receiver line number
notchfil	Notch filter frequency	**sou_sloc**	Source location number

year	Year data recorded	**srf_sloc**	Receiver location number
day	Day in year (Julian day)	**sdepth**	Source depth
hour	Hour data recorded		

Table 4-7 *Trace header entries defined by segd module*

Additional trace headers can be extracted by adding definitions in the **File Header, Extended Header, External Header and Trace Header** parameters.

In the SEGD reader, if the "Output seismic channels only" flag is set it will ignore any channels that are not flagged as seismic, and will not pass them on to later modules in the job. This includes SEGDOUT, which will not output any auxiliary channels in this case because the SEGD reader won't pass them. However, SEGDOUT will not modify the channel set descriptors in the SEGD file header to indicate that there are zero auxiliaries (in fact it can't because it doesn't know that it is not going to receive any auxiliaries from the reader).

With the relase of 5.6.0, Magma supports SEG-D 3.1 whichs adds support for little endian samples to remove the need to convert samples on the CPU before writing/reading data into SEG-D format. This will help the performance of large systems accessing large amounts of data (100s of MB per second).

SEGD Line Split

By selecting the "Line Split Secs" option and specifying a time in seconds the segd module allows you to split high density SEGD data into separate lines if there is more than one per tape/disk.

When outputing your SEGD for the line split to work you must select the "Output Per Input Line" option in the segdout module, this can be seen in "Segdout module" on page 83.

Input Module – read

The **read** module is a dummy module which reads a dataset defined by a **datain** module, but discards the data read. It can be used to pull a tape record stream through one or more **datacopy** or **log** modules, in order to make use of the side effects of those modules without doing anything else with the data. This provides a batch method of processing tapes regardless of their underlying formats.

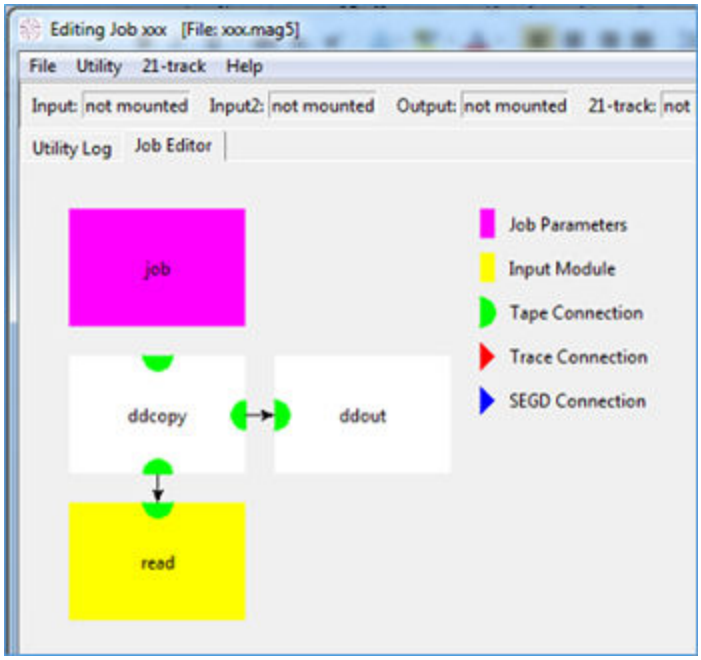

Figure 4-8 *Read module example for copy*

Input Module - Auto Analyze 21-track

A Mount Analyse box opens.

For 21-Track tapes, use the Tape tab (default) and enter (or choose) the appropriate settings for Tape, Drive, Density, Read Threshold, Read Length and Unload Behaviour before clicking **OK**.

If the 21-track tape has been pre-staged to disk from 21 track tape drive (e.g. using an MP 21 track drive) then use the Disk File tab, browse for the pre-staged 21-track disk file, select/deselect MP tape Encapsulation (as appropriate) and click **OK**.

Parameters within the selected modules can be edited at any time by double-clicking on the module box (Figure 4-9 below).

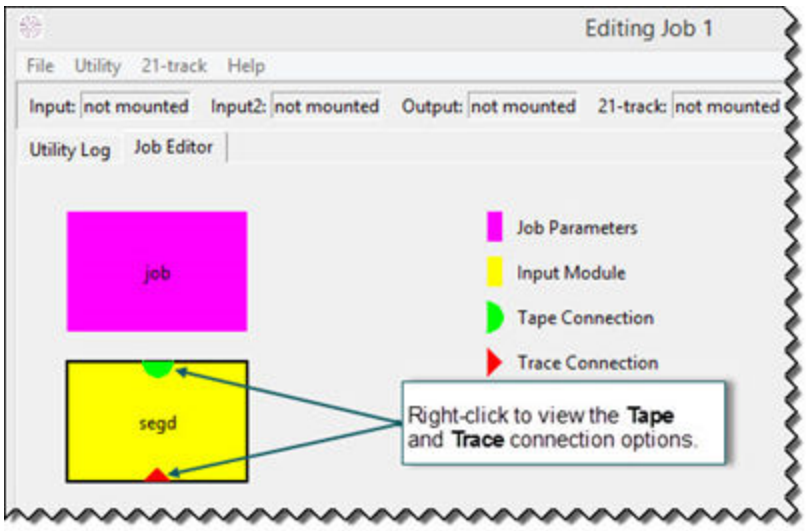

Figure 4-9 *Tape and Trace Connections*

Tape Connections

1. Right-click on the green semi-circle symbol on the input module. A list giving the available tape connection options will open .

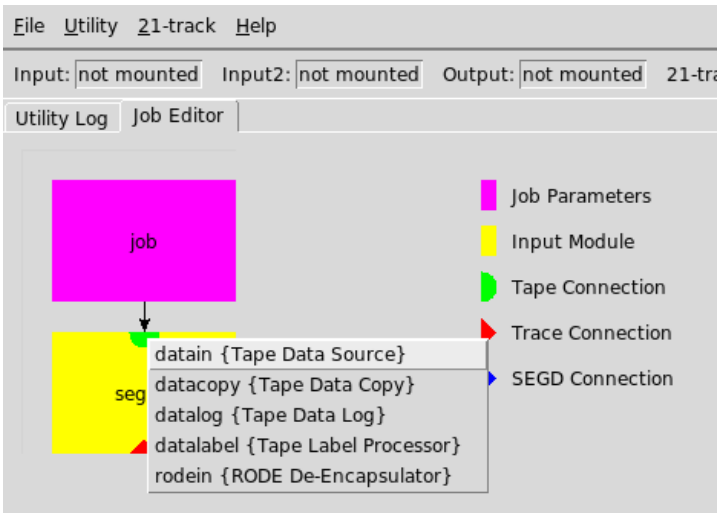

Figure 4-10 *Tape Connections*

i. **datain** – defines the source of the data which is to be imported. The dataset may be on one or more physical tapes or cartridge, or on one or more encapsulated disk files.

ii. **datacopy** - this module allows a bit-to-bit copy of an input tape record stream to be made surreptitiously while the data is being read. This module must be inserted in the workflow between the input module and the datain module, therefore, select this option prior to datain.

iii. **datalog** – this module allows a listing of an input tape record stream to be made while the data is being read. This module should be inserted between the input module and the datain module, therefore, select this option prior to datain. Note: The listing is similar to the one that would be produced if the input in the dataset were read using UTILITY.

iv. **data label** – this module performs tape label processing. Supported label types are SL (Standard Label), AL (ANSI Label) and RP66 (RP66 style label, e.g. RODE or SEGD Rev 2). Tapes which don't have any of these label types will be designated as NL (Non-Labelled). It should be inserted between the input module and the datain module, therefore, select this option prior to datain.

v. **rodein** - this module reads an RP66 storage set containing one or more RODE tape images, making each tape image appear as a separate tape to the input module.

Adding the datain module

1. Click **datain module**. A **Tape Data Source** window opens, to specify which data will be put into the Magma job
2. Select the input source from Tape, Changer, Volnet, Disk File, Disk Directory or FTP. The **Tape Data Source** window will change as necessary.
3. Select files to input. Files can be selected individually or as multiples.
    - To select non-consecutive files, press and hold down <**CTRL**> then click each required file in the list.
    - To select consecutive files, click the first file, press and hold down <**SHIFT**> then click the last file.
    - Enter a wildcard in the **Pattern** text box to limit the file selection to a particular type in the directory. For example, enter ***.segd** and click **Find**. Only files with a .segd extension will be listed.
4. Click **Transfer**. Files for input will be listed in the Tapes section of the **Tape Data Source** window (Figure 30)
5. If required, it is possible to change the order of the inputs by selecting a volume and using the **Move Up** or **Move Down** buttons.
6. The Sort button performs an alphanumeric sort of the volume list.

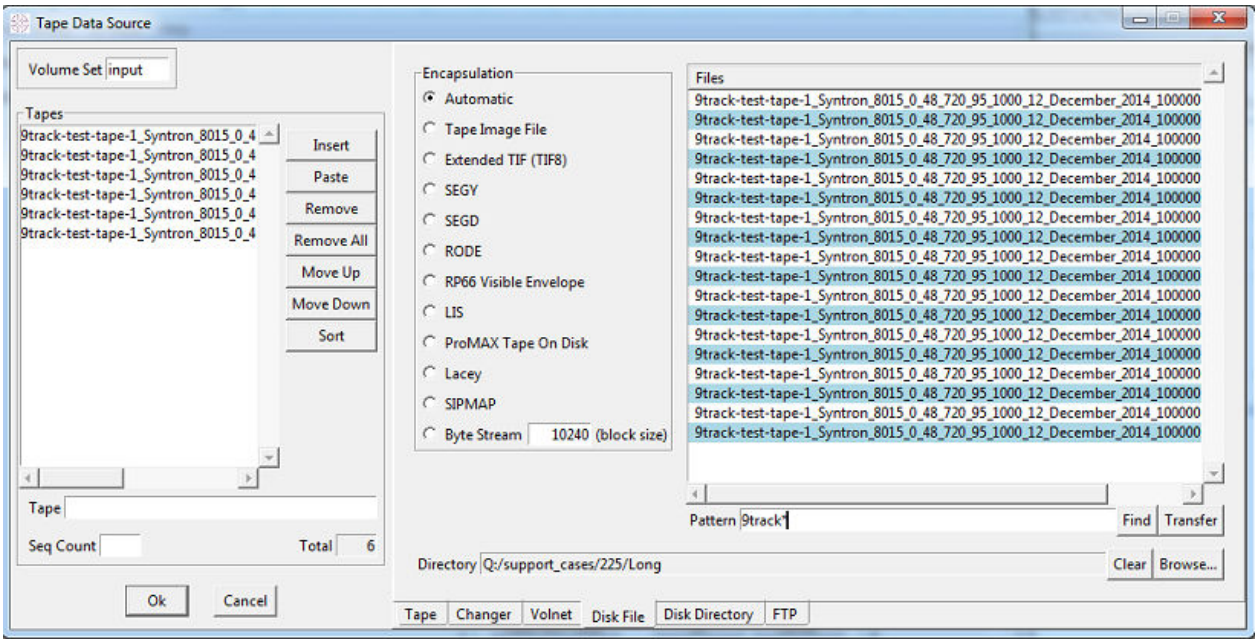

Figure 4-11 *Tape Data Source window showing transferred disk files selected using a wildcard*

7. Click **OK**. The **Tape Data Source** window will close and you will be returned to the main Magma job screen. The **datain** module will be added to the workflow (Figure 4-12 on the next page).

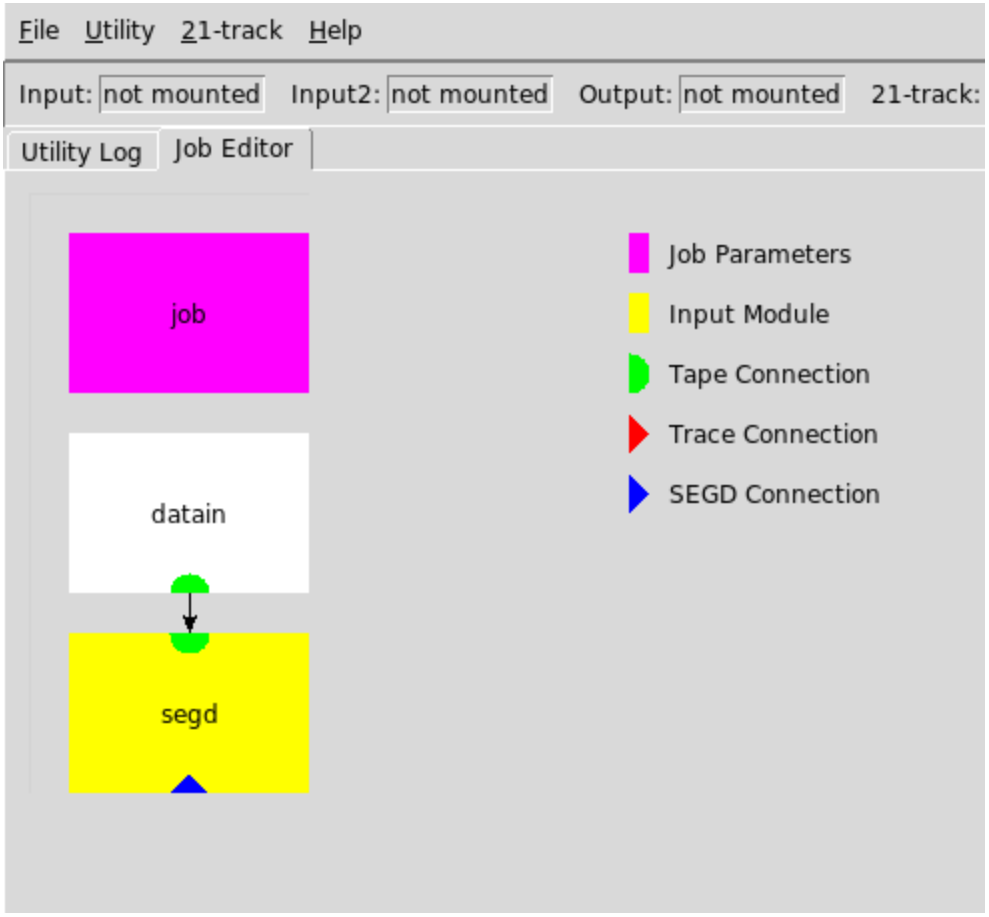

Figure 4-12 *Main Magma job window showing the datain module*

Adding the datacopy module

The **datacopy** module is used to do a bit-to-bit copy of an input tape. This is inserted between the input module and **datain** and therefore must be initiated before datain.

1. Click **datacopy**. A **Tape Data Copy** window opens.
2. Enter the number of input tapes that are to be concatenated onto each tape copy before a new output is started. Press **OK**.
   i. Use “1” for a one-to-one copy, i.e. each input tape will be copied to a separate output.
   ii. Use “0” to concatenate all the input tapes onto a single output

3. Select the data for using in the workflow. Right-click on the green semi-circle symbol at the top of the **datacopy** module and select **datain** ("Initiating datain and output from the datacopy module" below). Follow the instructions for **datain** given in "Adding the datain module" on page 49

4. Select the option for output. Right-click on the green semi-circle symbol on the right-hand of the **datacopy** module. Choose **from dataout**or **rodeout**. For **dataout** follow instructions given in section "Initiating dataout" on page 55. To copy to disk in RODE format follow instructions given in "Initiating rodeout" on page 56

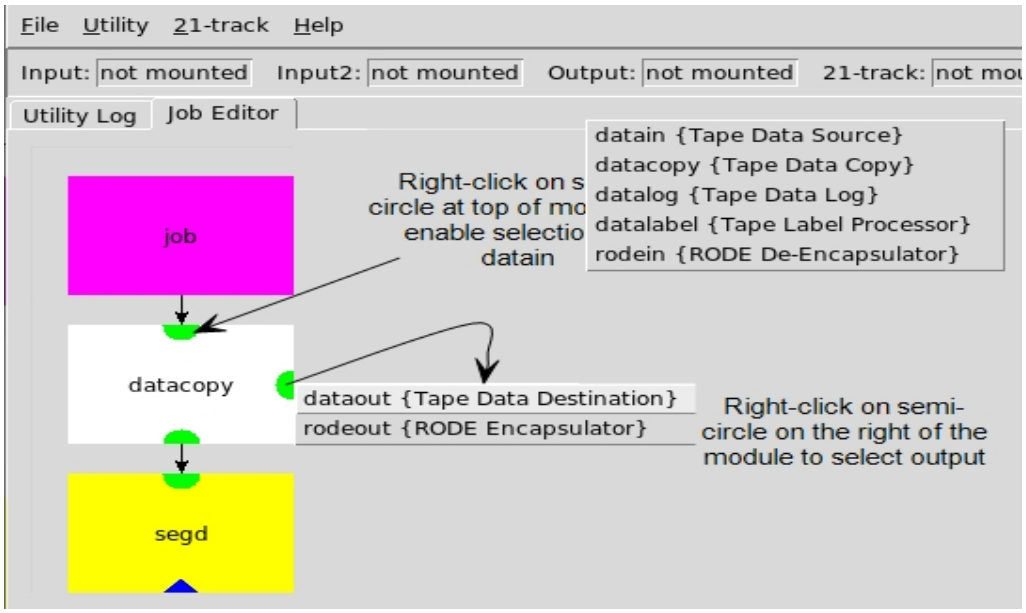

Figure 4-13 *Initiating datain and output from the datacopy module*

Adding the datalog module

The **datalog** function will read the input data (similar, but not the same as the Read function in Utility). This is inserted between the input module and **datain** and therefore must be initiated before **datain**.

1. Click **datalog**. A **Tape Data Log** window opens.

2. Select from **Pattern, Change, Files** or **All** and enter a value for **Idbyte**. (see "Read" on page 24) Press **OK**.

3. Results will be written to the .lst file specified at the launch of Magma (see section "Launching the Magma GUI" on page 14)

Adding the datalabel module

datalabell is a tape label processing function which will be performed on data specified within datain. The following label types are supported:

- Standard label (SL)
- ANSI Label (AL)
- RP66 Style (RP66) for example, RODE or SEGD Rev 2
- Non-designated (NL)

The **datalabel** module is inserted between the input module and datain and therefore must be initiated before **datain**.

1. Click **datalabel**. A **Tape Data Label** window opens.
2. Select from:
    i. Bypass Label processing – label records will be passed through unchanged
    ii. Verify Volume Serial Number – verifies the volume label against the tape name specified in datain.
3. Click **OK**.

Adding the rodein module

Copying SEGD data that's in the form of single disk files for each seismic line onto tape media can result in difficulties in retrieving such data from the tape on a line basis. All individual field files from all such line disk files will be output onto the tape as a continuous stream of field files making the determination of the field file ranges for each line disk file difficult to determine.

Modules **rodeout** (see "Initiating rodeout" on page 56) and rodein could be used to output and retrieve SEGD line disk files onto tape in a way that solves the above issue. Each file is defined and output using **rodeout** module. These files can be copied back onto disk in their input format using **rodein**. This enables files to be retrieved from tape on disk on a line basis. This also allows either the complete contents of the tape to be retrieved or user selected files only.

The **rodein** module reads RP66 storage set containing one or more RODE tape images, making each tape image appears as a separate tape to the input module.

When selected the **rodein** module is positioned between the tape input module and the format reader. "RODEIN module positioning" on the facing page shows a SEGY input example where the datain specifies the input media to read, the **rodein** module de-encapsulates the rode and supplies the underlying component tape/disk images to the segy input reader.

Note that it is not necessary to use rodein to read an RP66 disk file containing a single RODE tape image. In this case it is usually better to use datain with media set to diskfile and encaps set to rode.

*NOTE: It is not necessary to use rodein to read an RP66 disk file containing a single RODE tape image. In this case, it is usually better to use **datain** with media set to diskfile and encapsulation set to rode.*

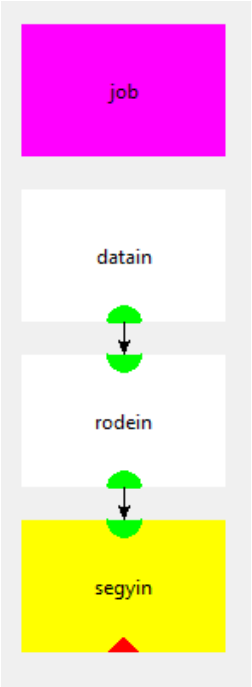

Figure 4-14 *RODEIN module positioning*

Magma has the ability to specify a list of logical tapes to be read from a RODE tape. A new mode parameter controls the behaviour.

If the **mode** radio button **sequential** (default) is selected then RODEIN will behave as before, i.e. all logical tapes will be read in sequence.

If the **mode** radio button **search** is selected, then RODEIN will search for and read the logical tapes specified in the tape list. It will search for RP66 files with File Id matching the tape names (hence you will need to know the fileIDs for each of the logical tapes).

"RODEIN module positioning" above shows an example where 2 specific logical tapes are being requested (i.e. fileIDs 987001 & 987003). The logical tapes do not have to be read in the order they appear on tape, Magma will read the logical tapes in the order they are requested.

> *Note that in search mode all requested tape images must be contained within a single RP66 Storage Unit. If a Storage Set spans multiple Storage Units it must be read using sequential mode.*

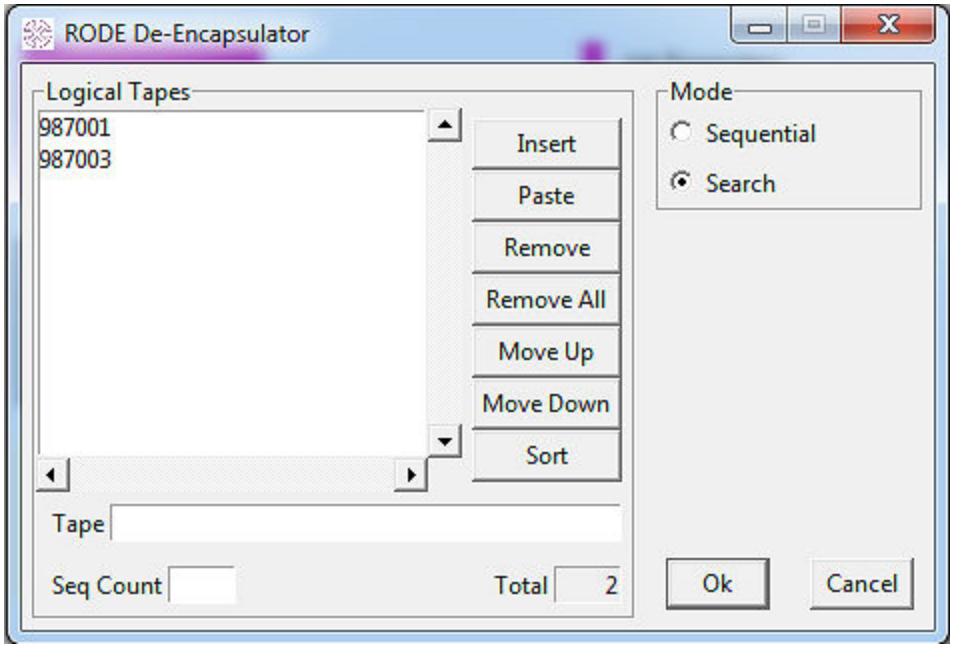

Figure 4-15 *RODEIN Parameters*

Output Options

Initiating dataout

The **dataout** module is available from **datacopy** or **segyout** and is used to define the destination of the dataset for output. A dataset may be written to one or more physical tapes or cartridges, or one or more encapsulated disk files. It is inserted between the input module and datain and **therefore must be initiated before datain.**

1. Click **dataout**. A Tape Data Destination window opens.
2. Select the output destination from Tape, Changer, Volnet, Disk File, Disk Directory or FTP. **The Tape Data Destination** parameter window will change as necessary.
    i. i. Selecting **Tape** will write the dataset to one or more manually mounted tape reels or cartridges.
    ii. ii. Selecting **Changer** will write the dataset to one or more cartridges located in a tape changer or library. The changer device is specified in the changer parameter.
    iii. iii. Selecting **Volnet** will write the dataset to one or more tape reels or cartridges which will be mounted by communicating with the operator via Volnet.
    iv. iv. Selecting **Disk File** will write the dataset to one or more encapsulated disk files. The encapsulation method is specified in the encaps parameter.
    v. v. Selecting **Disk Directory** will write the dataset to one or more disk directories. The data will be written as several files in a directory. The most common case is a SEGD directory containing multiple SEGD files, each file containing the data from a single shot.
    vi. vi. Selecting **FTP** will write the dataset to one or more encapsulated disk files located on an FTP server. Accessing files via FTP is generally far more efficient than remote file systems such as NFS or SMB. Note: this is not secure, but works well with anonymous FTP server.
3. Enter a single output name or multiple names (if required) in the comment box located at the bottom of the “Tapes” window. Use **Seq Count** to input sequential filenames. For example, to insert Out001, Out002 and Out003, type Out001 into the Tapes box then enter “3” in the **Seq Count** box and click **Insert**. Out002 and Out003 will be added to the tape list. It is good practice to specify the leading 0’s as this will give you a list of output tapes with the same number of characters. If you specify 11 tapes and start at OUT1 then you end up with OUT1, OUT2….OUT10, OUT11.
4. Click **Insert**.
5. Click **OK**. You will be returned to the main Magma window.

The tape parameter specifies the name of a single tape or logical tape in the dataset. A *dataout section must contain at least one tape parameter, but can contain more if required. If more tape names are supplied than are actually used when the dataset is generated, the extra names will be ignored. On the other hand, if generating the dataset runs out of tape names, the last name will be reused. This will normally contain one or more of the % substitutions described below.

A tape name can include the following special character sequences, which will be substituted at runtime to generate the actual tape/file name.

%J	The jobid specified on the *job line.
%L	The line id for the seismic line. This will be set by the input module in the job.
%T	The name of the current input tape or file (without the file name extension).
%S	The sequence number of the output tape/file in this ddout. The first tape/file will have sequence 1, the second sequence 2, and so on.

The special character sequences listed previously can be used in the dataout module in the tape name box as seen below in the image.

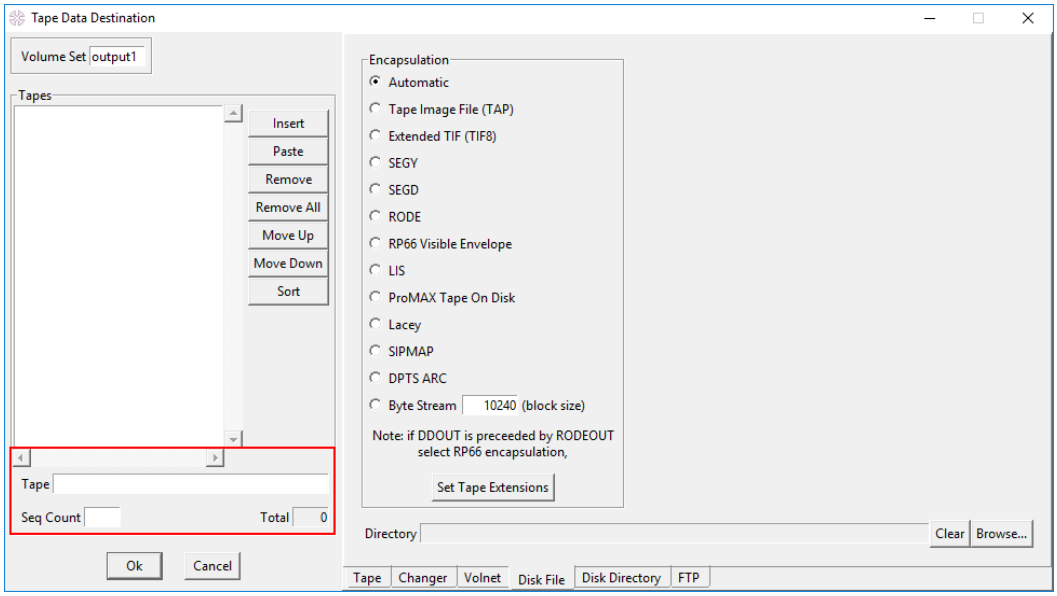

Figure 4-16 *Dataout Tape Data Destination*

Initiating rodeout

The **rodeout** module is available from **datacopy** or **segyout** and is used to write separate RODE tape images for each output module. It is inserted between the output module and **ddout** and therefore must be initiated before **ddout**.

1. Click **rodeout**. A **Rode Encapsulator** window opens ().

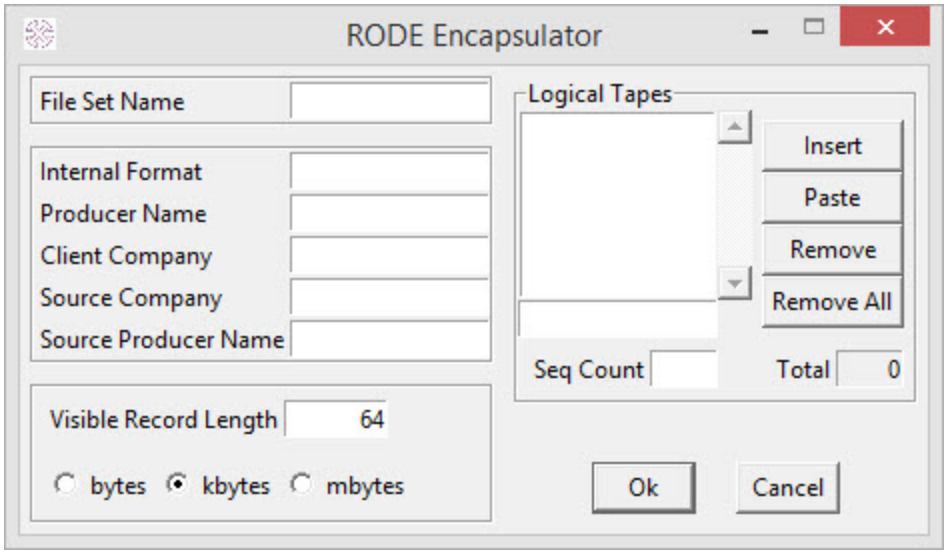

Figure 4-17 *RODEOUT encapsulator parameter window*

2. Enter a single output name or multiple names (if required) in the comment box located at the bottom of the "Logical Tapes" window. Use **Seq Count** to input sequential filenames. For example, to insert Out1, Out2 and Out3, type Out1 into the Tapes box then enter "3" in the **Seq Count** box and click **Insert**. Out2 and Out3 will be added to the tape list.

   Note: If more tape names are supplied than used the extra names will be ignored. If not enough names are given and the number of files in the **datain** is more than the number of logical tape entries specified the following error will be given: "unable to open file or device. Unable to mount next copy output"

3. Enter a file name for the storage set in the **File Set Name** box.
4. Enter information for:
   - Internal Format
   - Producer name
   - Client Company
   - Source Company
   - Source Producer Name
5. Specify the Visible Record Length.
6. Click **OK**. You will be returned to the main Magma window.

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CHAPTER 5

Magma modules

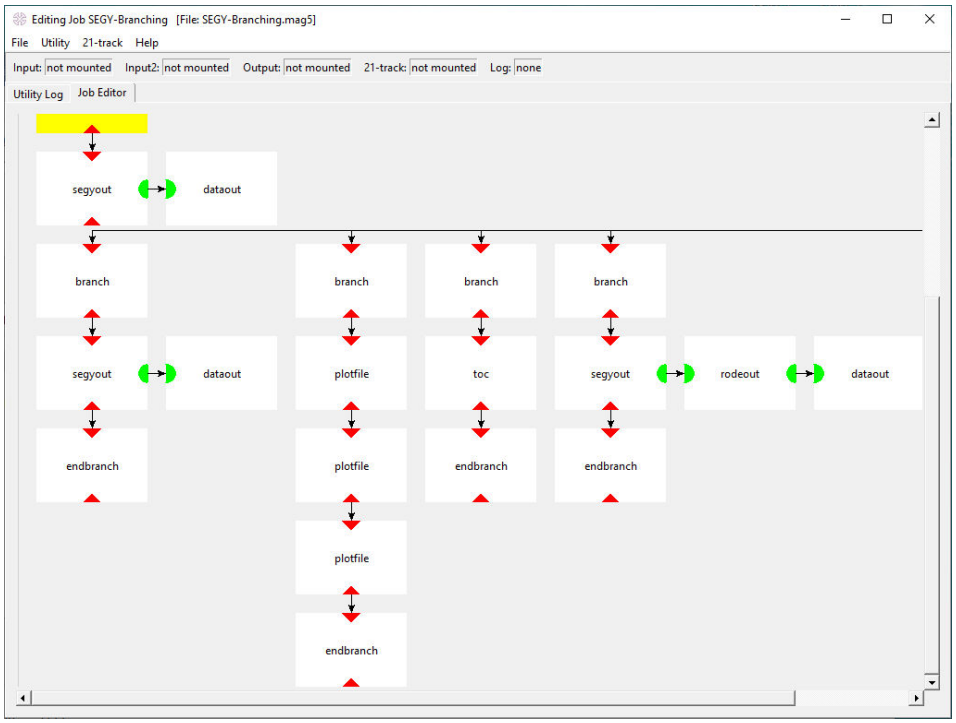
Several trace connection options are available and can be used to perform a variety of operations to the input seismic data. One or more functions can be built into a job which can be saved. Trace connections are put into operation by right-clicking the red triangle on the module box.

Branching

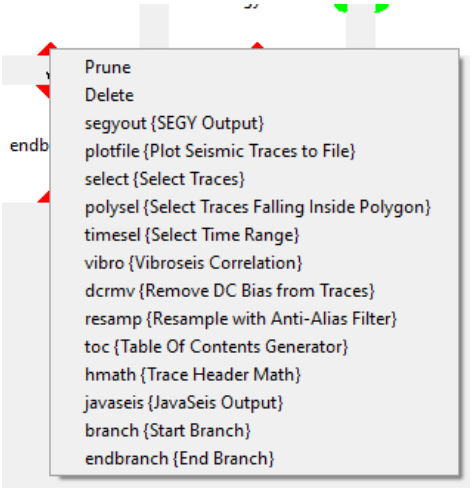
With the release of Magma 5.6 the option to add branching to your job flow is available. Branching allows the user to create multiple branches in order to have more than one output type within the flow.

The dialog also contains an option to control the display of the branching, note this option is entirely a display option and does not affect the processing on the job in any way.

When the branching is set to 'Parallel' you get a display as below:



When you click on an upward pointing red arrow (at the bottom on a module) you get the following options.



Prune

This option removes all modules in the sequence below the current module in the sequence, if displaying in parallel view it will also delete all modules in columns to the right of the module.

Delete

This option deletes the current module, when deleted all the other modules are moved up in the sequence. If in a parallel display, when a 'branch' module is deleted, a column from the display will be removed.

Insert

Below the delete options are options to insert additional modules into the sequence. Inserting a branch module when in parallel display, will add a column into the display.

The Prune and delete options are not available on the final module in the sequence.

The Prune and delete options are not available if a module has a side branch, the side branch needs to be pruned before these options are available.

The user needs to maintain a valid sequence of modules, i.e. when using branching, both a branch and an end branch are required.

SEGYOUT

The **SEGYOUT** module writes a SEGY dataset to the output defined in **ddout**. On selecting this option, the SEGYOUT parameter window will open seen in below.

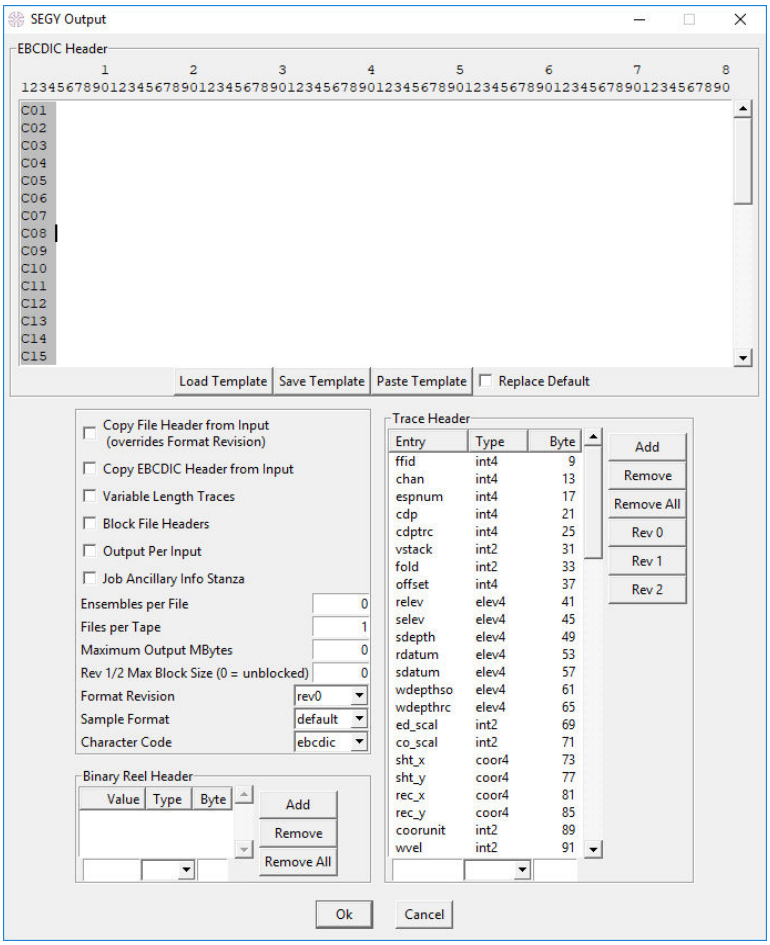


Figure 5-1 *SEGYout parameter window*

int1	1-byte integer
int2	2-byte integer
int3	3-byte integer
int4	4-byte integer
int8	8-bye integer
ibmfp	4-byte IBM floating-point
ieee32	4-byte IEEE floating-point
coor4	4-byte integer representing a coordinate using the scale value in bytes 71-72
elev4	4-byte integer representing an elevation or depth using the scale value in bytes 69-70
time2	2-byte integer representing a time using the scale value in bytes 215-216
spnum4	4-byte integer representing a shotpoint number using the scale value in bytes 201-202
sm4	4-byte integer representing a source measurement entry in byes 225-228 (This value is scaled by a separate exponent seen below as sm_exp)
sm_exp	2-byte integer located in a header called sm_exp (int2 - bytes 229-230).
Note: the last 4 special types will apply the appropriate scalars	

Table 5-1 *Trace Headers*

Load/Save/Paste Template

Load Template

This feature allows .fmt files to be loaded into the EBCDIC header. Magma only allows files saved as .fmt to be loaded; this can be done in notepad or other text edit application by simply changing the extension. Magma will only be able to recognise and load a .fmt file as long as the card numbers are correctly formatted down the left side up to C40.

Save Template

This saves the template as a .fmt file so that it can be loaded into the SEGY Output module in future.

Paste Template

This feature pastes an EBCDIC header from the clipboard in the same way as loading it from a template file.

Copy File Header from Input

Check this box to use the file header from the SEGY input for the file header of the SEGY output.

Note: If this option is selected any extended text headers and the SEGY rev1 binary header flag are dropped, even when they are selected. The copy file header option overwrites these.

Copy EBCDIC Header from Input

Check this box to use information provided in the input SEG-Y text (EBCDIC) header. Individual lines can be changed by manually entering information in the EBCDIC header window.

Variable Length Traces

Check this box if files in the input SEGY dataset have variable trace lengths. If not checked all traces in the SEGY dataset will be written to the length given as the number of samples recorded in bytes 3221-3222 of the file header – traces will be padded or truncated as necessary.

Block File Headers

The Text and Binary Headers can be inside or outside of the blocks. Check this box if the File Header should be included within the block.

Output Per Input

Selecting this option will cause a new SEGY output file to be started when the first trace from a new input tape/file is encountered.

Job Ancillary Info Stanza

Check this box if ancillary information has been given in the job module (see "New Job" on page 36) and SEGY Rev 1 checkbox is checked. Supplied information will be written as “Troika:JobInfo” in Extended Textual File Headers of the output SEGY. There will be as many Extended Textual File Headers as required to contain the ancillary information. Each keyword/value pairs is written to

```
((Troika:JobInfo))
Job ID = 123456
```

```
country = GB
region = North Sea
```

There will also be an Extended Textual File Headers containing the EndText stanza

```
((SEG:EndText))
```

Ensembles per File

Enter a value to specify the maximum number of ensembles that will be written to the SEGY dataset.

- a new SEGY file will always be started for a new line
- use the default value “0” for no maximum value.

Files per Tape

Enter a value to specify the maximum number of SEGY files that will be written to each output tape.

Maximum Output Mbytes

Enter a value to specify the maximum number of megabytes that will be written to each output. When this value is reached a new SEGY file will be started on a new tape.

- a new SEGY file will always start at the beginning of an ensemble
- use the default value “0” for no limit to output size

Rev 1/2 Max Block Size (0 = unblocked)

This is the maximum blocksize (in Bytes) that will be used. Magma will create blocks containing as many trace records that fit the blocksize. Traces cannot be split between blocks.

Format Revision

This option allows you to select which Revision of SEGY you want for your output.

Sample Format

Specifies the format of the sample values in the SEGY output

- Select **default**for the sample data format from the input. This means that the sample format used is taken from the input file analyzed so long as it is either IEEE32 and IBMFP32.
- Select **ibmfp** for 4-byte IBM floating-point
- Select **ieee** for 4-byte IEEE floating-point

Character Code

Specifies the character code to be used in the Textural File Header of the SEGY output

- select **ebcdic** for an EBCDIC character code (the default)
- select **ascii** for an ASCII character code

Binary Reel Header

This enables edits on the any part of the binary header. Enter the value to be used, select the data type (e.g.int4, int2) and specify the start byte position (bytes start at 1).

- This should be used with great caution as a number of fields contain structural descriptors of the data records (e.g. Num of Samples, Sample Rate etc.).
- Editing these values has the potential to invalidate the data structures.
- Only use this when you are convinced that a binary header value is wrong

or

- use it to place values in the optional portion of the Binary header (bytes 61-300 & 307-400 According to SEGY rev 1 format) but beware that the original file producer might also have used the optional portion. Dump the binary header and check first.

To use the **segyout** module:

1. Select parameters as necessary and input values as required:
2. If required, edit or replace the Textural File Header (EBCIDIC) for the output SEGY:use copy from the input when the datain file is SEGY. Check the box next to **Copy EBCDIC Header from Input** on the SEGY Output option panel (Figure 5-2 below).

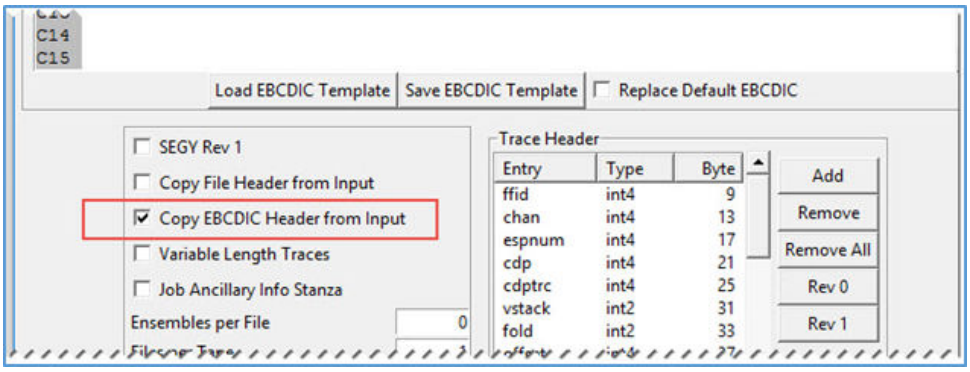


Figure 5-2 *Copy EBCDIC Header from input*

i. If an EBCDIC template is to be used, click on the **Load from an EBCDIC template** button. A search window will open; navigate to the desired template filename and click Open. The text header information will be displayed in the EBCDIC Header window. Each line in the template file should start with CNN where NN is the line number (between 01 & 40). The following three lines would create a 40 line Text Header with specified text in lines 01,02 & 40

```
C01 Example Textual Header
C02 Troika International
C40 End Textual
```

Additional text can be added by typing into the window after loading the template.

ii. Text can be manually typed into the 40 lines in the EBCDIC Header window. Supplied text will be added to the EBCDIC header for each line that is entered.

Text header information can be saved as a template for future use. Select the **Save EBCDIC Template** button, browse to the required directory and enter a filename for the template. The file will be given a .fmt extension.

3. Select trace header parameters to define a single entry in the SEGY trace header. Default settings are set from the SEG standards.
4. When all entries are defined, click **OK** to return to the **Job Editor** main window.

Plotfile

The plotfile module will produce a plot of some or all of the seismic traces as an output TIFF (Tagged Image File Format) graphics file.

1. Right-click the trace connection red triangle and select **plotfille** from the dropdown list. **A Plot Seismic Traces to File** parameter window will open Figure 5-3 below.

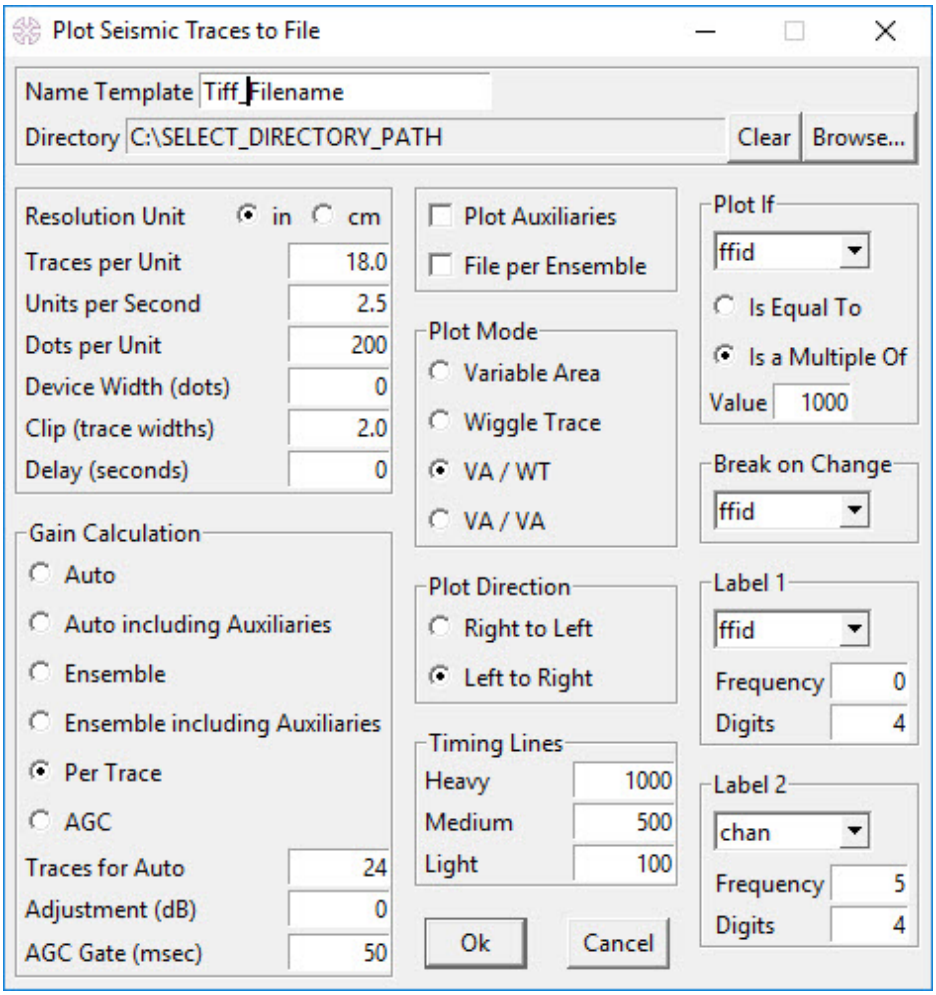


Figure 5-3 *Plot parameter window*

2. Enter a name to be used for the TIFF that will be produced in the name **template** text field.

   The Name template parameter can include the following special character sequences, which will be substituted when the TIFF file is opened. For example, entering %L_01 will generate a filename using the seismic line name specified in the input module.

%J	The jobid specified in the job module.
%L	The line id for the seismic line. This will be set by the input module in the job.
%E	The ensemble number for the first trace plotted to the file. **(This functionality is best used when using the file per ensemble option)**
%F	The field file id (FFID) for the first trace plotted to the file. **(This functionality is best used when using the file per ensemble option)**
%V	Version number of the TIFF file, which will be substituted by a value one greater than the last version of the file produced with the name generated by the template (the first file will be version 1).
%T	Input tape or disk file name. (note the filename suffix will be excluded)

Figure 5-4 *Template text fields*

Each seismic line will be plotted to a separate file. The file extension .tif will be appended automatically. If a path is not supplied, then the plot file will be produced in the directory to which the job is saved. **In windows the path separator should be specified with / (forward slash).**

3. Browse to the directory to which the TIFF files will be written. Note. The current working directory is the default directory.
4. Select what is to be plotted:
    i. Check the **File Per Ensemble** checkbox to create a new TIFF file for each new PrimaryEnsemble.
    ii. Chech the **Plot Auxiliaries** checkbox to plot auxiliary traces. Only seismic data traces will be plotted by default.
5. Select:
    i. **Plot Mode** to specify the type of plot that will be produced.
    ii. **Plot Direction** to specify the horizontal direction of the plot.
    iii. **Timing Lines** to specify the time and thickness of lines that will be generated on the plot.
6. Enter values for:
    i. **Resolution Unit** - select inches (in) or centimetres (cm)
        - **Traces per unit** – specifies the horizontal scale in traces per inch. Default is 18.0
        - **Units per second** – specifies the vertical scale of the plot in inches per second. Default is 2.5
        - **Dots per unit** – specifies the resolution of the plot resolution in dots per inch. Default is 200
        - **Device width** – specifies the plot width in dots. If the plot width is greater than this value the traces at the highest time are truncated. The width will not be limited if a value is not supplied.

- **Clip** – specifies how far the plot for each trace is allowed to swing from the centre line before clipping occurs. Expressed in trace widths with a default value of 2.0
- **Delay** – allows the start of the plot to be delayed (not plotted) by the number of seconds specified. The default value is 0.

ii. **Gain Calculation** - specifies the method used to calculate the plot gain.

- **Auto**– calculated from the first ntrgain seismic data traces encountered. Auxiliary traces will be plotted, but are not included in the gain calculation.
- **Auto including Auxiliaries** – calculated from the first ntrgain traces encountered including auxiliary traces.

  Note: ntrgain is the parameter which specifies the number of traces used to calculate the plot gain. The default value is 24.
- **Ensemble** – individually calculated from the seismic traces in each ensemble with a new calculation starting with each new ensemble. Auxiliary traces will be plotted, but are not included in the gain calculation.
- **Ensemble including Auxiliaries** - individually calculated from the seismic traces in each ensemble with a new calculation starting with each new ensemble. Auxiliary traces will be plotted and included in the gain calculation.
- **Per trace** – gain is calculated for each individual trace.
- **AGC** – applies Automatic Gain Control before they are plotted.
- **Traces for Auto** - specifies how many traces will be used to calculate the plot gain using Auto or Auto including Auxiliaries. The default value is 24.
- **Adjustment** – allows automatically calculated plot gain to be adjusted by a specified number of dBs. A single value will adjust dB for both seismic and auxiliary traces. 2 values separated by a comma will apply individual dB adjustments - the first value is used for the seismic trace and the second value is applied to the auxiliary trace.
- **AGC gate** – specifies the length of the gate (msec) if AGC is applied.

7. Select:

   i. **Plot If** to specify the type of trace and trace increment that is to be plotted. **Note: If is not supplied, all traces will be plotted.**

   ii. **Break on Change** to plot a space between the specified ensemble. This would typically be used to separate Shot (FFID) or Gather (CDP) Records.

8. Specify **Label 1** and **Label 2** trace headers that will be used to annotate the plot. The selected trace header entry will be used as the label.
9. When all entries are defined, click **OK** to return to the **Job Editor** main window.

Note: more detailed explanations for all available options in the plotfile parameter sections are provided in the MAGMA REFERENCE MANUAL which can be accessed from the Help menu.

By default, Magma will produce a single plot for each line that it processes.

- If a separate plot is required per line then the %L macro should be specified in the Name template so that the detected line name is used in the filename.

  The following behaviour will be seen when using the segyin module:

#Inputs	File Mode	Filename	Result
1	Line per File	ABC	ABC.tif
1	Concatenate	ABC	ABC.tif
>1	Line per Fike	ABC	ABC.tif is written per input (i.e. plotfile is over-written for each new line {input file/tape}) **THIS COMBINATION SHOULD NOT BE USED**
>1	Concatenate	ABC	ABC.tif
>1	Line per File	ABC~L	ABClineA.tif, ABClineB, ABCline3.tif etc. (i.e. 1 plot file per input file)
>1	Concatenate	ABC%L	ABCLineA.tif (containing all data)

- SEG A/B/C data is treated as 1 line regardless of the number of inputs. Hence only 1 plot file will be produced by each **plotfile** module
- SEGD data will, generally, be treated as 1 line. However, the SEGD Rev 2.1 introduced a Line Sequence Number, if this has been used then Magma will produce multiple lines (even from a single input). **Hence you should specify the %L macro in the plot file name template field.**

Magma 5.3.1 introduced the ability to produce individual plots per ensemble (e.g. 1 plot per Shot/FFID). In version 5.3.1 and later the name of the file is generated using the template specified in the **name** parameter.

Old parameter files will not run with Magma 5.3.1 or later (but they can be loaded into the Magma GUI).

Example – Plotting FFID in Multiples of 1000

Using **Plot If** select **FFID** from the drop down selection box and check **is a multiple of 1000**. Enter %J_%F_%V in the Name template box to generate plot names with Job_FFID_Version. For example, given a Job name of "TPD" and an input FFID range of 1561-1868 the following plots will be produced:

```
/media/psf/centos/TRKDEMO/PROJECTS/TPD/TPD_1600_1.tif
/media/psf/centos/TRKDEMO/PROJECTS/TPD/TPD_1700_1.tif
/media/psf/centos/TRKDEMO/PROJECTS/TPD/TPD_1800_1.tif
```

Each containing a plot of the relevant FFID. If the job is run again the plots will have a version of _2.

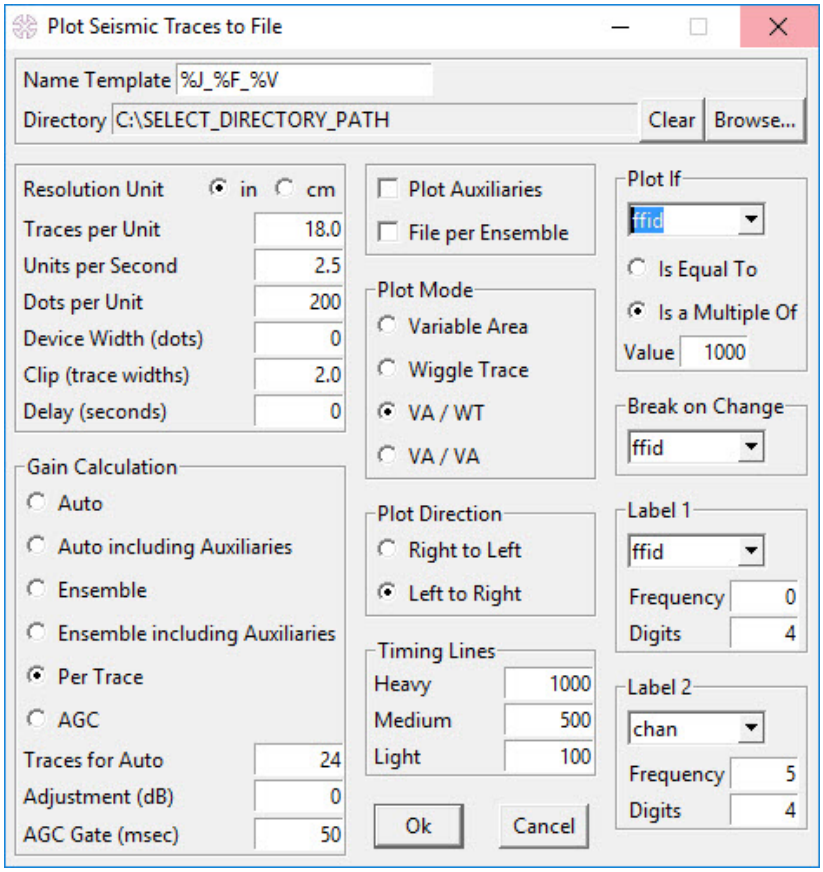


Figure 5-5 *Plot File per Ensemble settings*

Select

The **Select** module allows the selection of individual trace ranges depending on the value of the trace header entry.

1. Right-click the trace connection red triangle and choose **select** from the dropdown list. A **Select Traces** parameter window will open (see examples below).

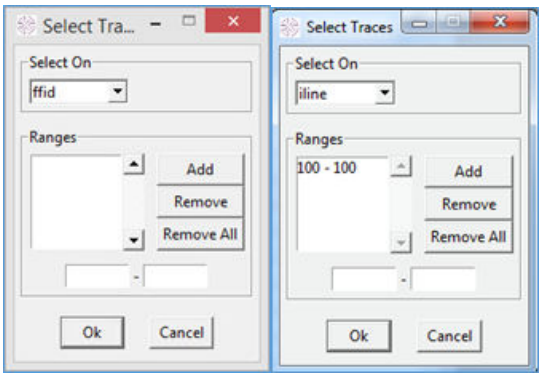


Figure 5-6 *Select traces parameter window*

2. Select shotseq, ffid, chan, espnum or cdp from dropdown OR type in another (valid) header name "Trace header entries defined by segd module" on page 45 provides examples of other valid header names).
3. Specify the range of values to keep then click **Add**. Repeat to specify multiple ranges.
4. When all entries are defined, click **OK** to return to the **Job Editor** main window.

Polysel

The **Polysel** module allows the selection of traces depending on whether the coordinates for each trace contained in a pair of trace header entries fall inside a specified polygon.

1. Right-click the trace connection red triangle and choose **polysel** from the dropdown list. A **Select Traces Falling Inside Polygon** parameter window will open.

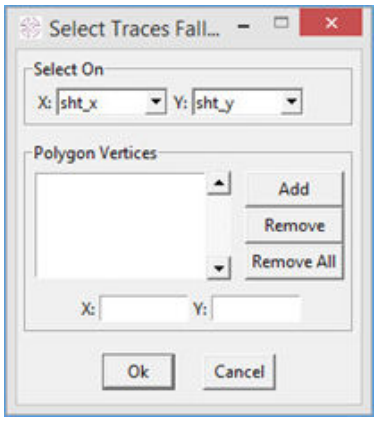


Figure 5-7 *Polygon selection parameter window*

1. Select the trace header entry that contains the X and Y coordinates for each trace. Choose from **sht_x** and **sht_y**, **rec_x** and **rec_y** or **cdp_x** and **cdp_y.**
2. Specify the X and Y vertex coordinates to define the polygon. Enter the values and click **Add**. Note: the order in which the values are supplied is significant – the last vertex joins to the first to close the polygon.
3. Click **OK**.

Timesel

The **Timesel** module selects a time range for all or the selected traces. The output of this module will be full length traces, samples outside the selection will be zeroed.

1. Right-click the trace connection red triangle and choose **timesel** from the dropdown list. A **Select Time Range** window will open (see below).

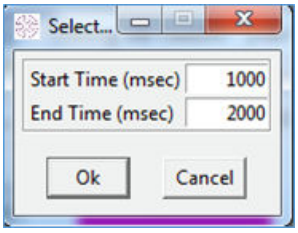


Figure 5-8 *Select Time parameter window*

2. Enter the start and end times in milliseconds (msec) for the desired time range. Note: Samples outside of the selected range will be zeroed.
3. Click **OK** to return to the Job Editor main window.
4. The Figures below show the effect of Time Selection. (Data Courtesy of RMOTC http://www.rmotc.doe.gov)

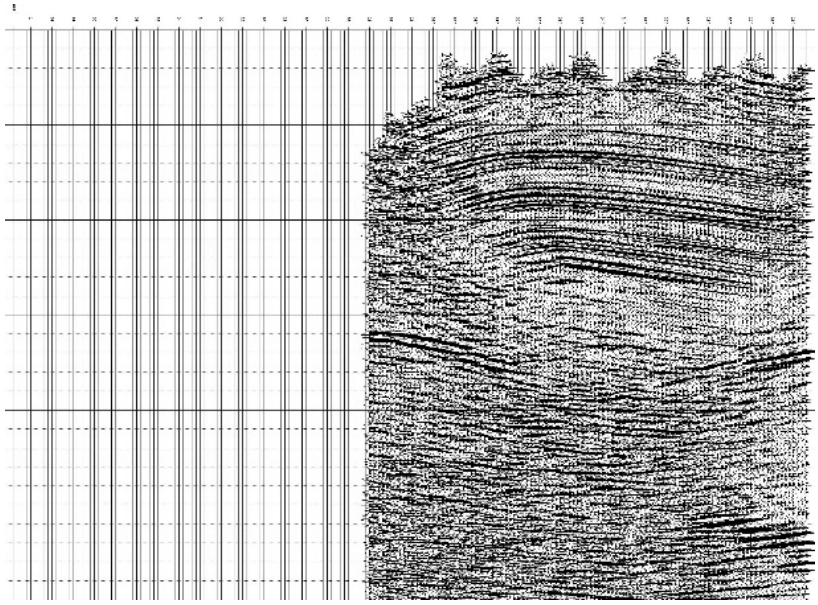


Figure 5-9 *Original Data*

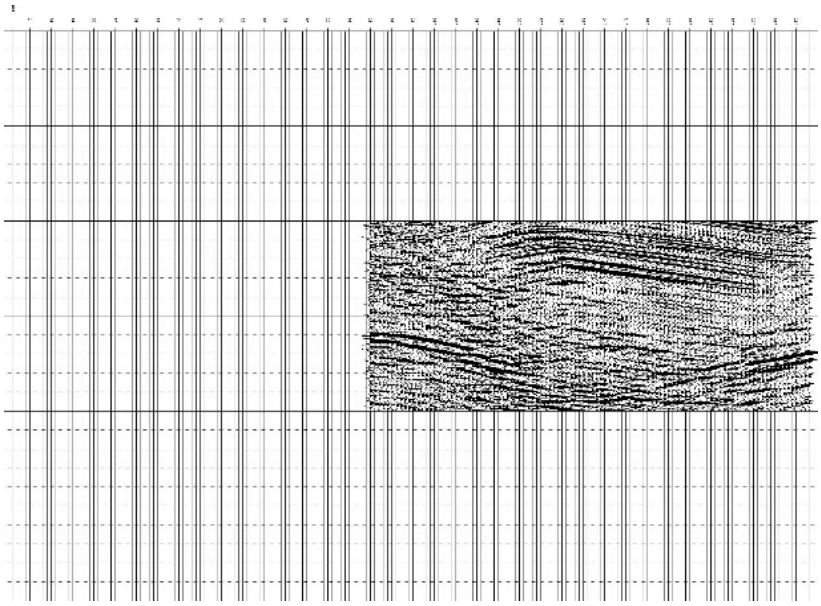


Figure 5-10 *Time Selected Data*

Vibro

The **vibro** module performs correlation on raw VibroSeis data.

1. Right-click the trace connection red triangle and choose vibro from the dropdown list. The Vibroseis Correlation window will open.

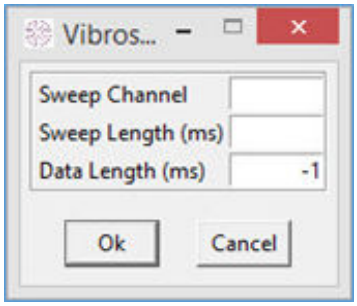


Figure 5-11 *Vibroseis Correlation parameter window*

2. Enter parameters for:
    - **Sweep Channel** – the channel number of the sweep channel in each field record
    - **Sweep Length** – the length of the VibroSeis in milliseconds
    - **Data Length** – the length of the seismic data in milliseconds.
3. Click **OK** to return to the **Job Editor** main window.

Dcrmv

The **dcrmv** module removes DC bias from traces. The mean value of all samples in each trace is calculated and the mean value subtracted from all samples. There are no input parameters.

Resamp

The resamp module resamples traces to twice the sample interval, e.g. 2 msec to 4 msec. An anti-alias filter is applied before the resampling takes place. The anti-alias filter applied is a Minimum Phase filter with a roll-off of 72 dB/octave and a cut-off of 0.18 times the sampling frequency, e.g. resampling from 2 msec to 4 msec the cut-off will be at 90 Hz. This module does not take any parameters.

Hmath

The `hmath` module performs mathematical operations on values in the trace headers of traces passing through it. A text panel is supplied to enter the header maths directives (see above).

In this example:

1. $numtraces is an internal variable.
2. It is implicitly initialised to 0 (Zero)
3. For every trace processed $numtraces increased by one
4. The internal trace header tracecount is set to the current value of $numtraces
5. tracecount is not a standard internal troika header but it is created on-the-fly
6. tracecount header is set to the current value of numtraces

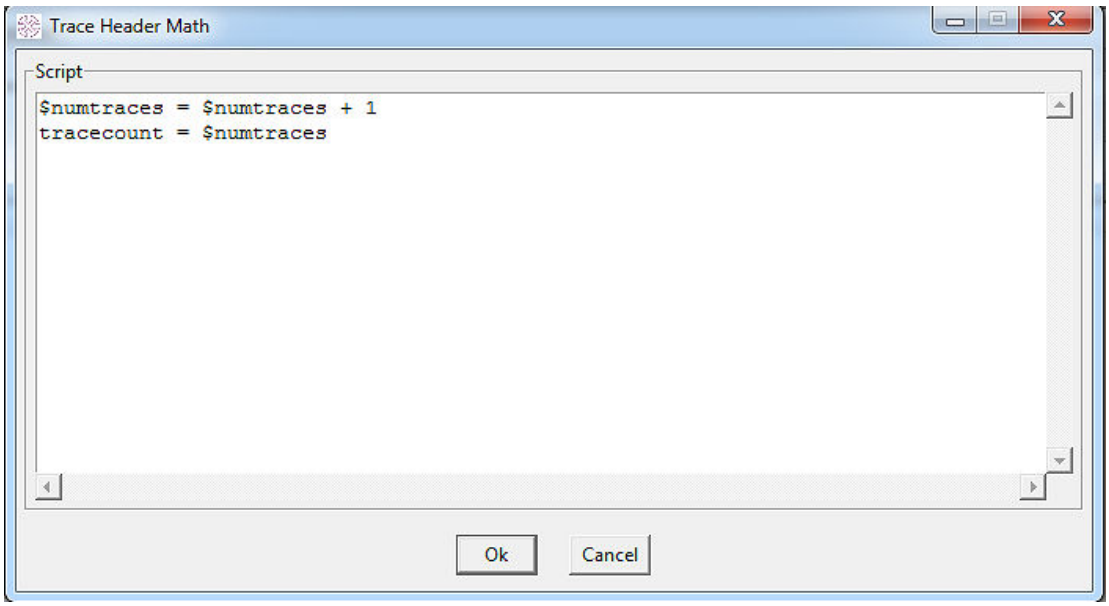


Figure 5-12 *hmath script panel*

Each line in the script defines an operation.

Basic Syntax:

```
e = a + b [where a = c]
```

Note: The "where" clause is optional. If omitted, it evaluates to all traces.

The commands are positionally significant and form a pipeline of commands.

Operators

Available operators are:

Operator	Precedence	Description
+	4	Add
-	4	Subtract
*	3	Multiply
/	3	Divide
%	3	Modula's (Remainder after division)
=	2	Is equal to
!	2	Is Not equal to
&	1	And
|	1	Or
(	0	Open Bracket
)	0	Close Bracket

Table 5-2 *Header Maths - Operations and precedence*

Note: Low value of precedence is evaluated first (e.g. Brackets first)

Trace Headers:

Two types of trace header item are available. Predefined and dependant on the SEG-Y version specified, and user defined. Both Predefined and User defined header items are readwrite. It should be noted that User defined header items are made available to TOC but are NOT written to any seismic output file.

Variables

Two types of variable are available. Built-in and User Defined.

User Defined Variables

User defined variable are identified using a $ prefix, are initialized to 0 are creation time and are readwrite. User defined variable values persist across traces.

For example:

```
$mycounter
$anotherthing
```

Maths Header Examples

Set the FFID trace header to a single value for each trace that contains the **inline** and **crossline** as stored in the espnum and chan header items.

```
ffid = chan + espnum * 10000
```

```
Note: In the above example, Due to the precedence rules espnum
will be multiplied by 10000 before the chan is added. The result
is stored in header item ffid
```

Extract the inline and cross line from the ffid, as stored in the above example.

```
chan = ffid%10000
```

```
espnum = ffid/10000
```

Set the header item cdp to an incrementing value starting at 1 and incrementing to 10000, then repeat the sequence to the end of the data.

```
$mycounter = $mycounter+1
```

```
cdp = $mycounter
```

```
$mycounter = 0 where $mycounter = 10000
```

```
Note: The user defined variable $mycounter is initialised to 0 on
creation. The first step it to increment the counter. Next set the
value of the current cdp item to the value of $mycounter. Then if
the counter has reached 10000, we reset it to 0.
```

Set the cdp number of all test records to 9999

```
cdp = 9999 where rectype = 8
```

Set the traceheader sampint and numsamps to the values found in the binary/line header

```
Sampint = @sampint
```

```
Numsamp = @numsamps
```

Here is a more complex example. Set header item chan to a number that indicates the line sequence within the data set. We assume that the header item espnum holds the current lineid, and my not be a simple sequence number.

```
$mylinesequence = $mylinesequence+1 when espnum!$mylinenum
```

```
$mylinenum =espnum
```

```
Chan = $mylinesequence
```

Note: On initialization, the variables $mylinenum and $mylinesequence will be set to 0. When processing the first trace, header item espnum will not equal $mylinenum, so $mylinesequence will be incremented by 1. We then set $mylinenum to the current espnum and set header item to the current `$mylinesequence`

Built-in Variables

Built-in variables are READ ONLY and are identified by a prefix of @, the value of the variables is calculated at runtime. For SEGY these are (pre) populated from the Binary Header. For SEGD these are (pre) populated from the Line Header.

Available built-in (read only) variables are:

@numsamps

@sampint

@numseis

@numaux

@tracesperensemb

@fold

More Complex arithmetic.

```
cdp=cdp*(1000+ffid)-chan%2 where chan>(100+100)*7 & chan < 201 | (rectype =
8)
```

Javaseis

The **javaseis** module writes the seismic traces to a JavaSeis dataset which can be input directly into **Halliburton's SeisSpace/ProMAX** application.

There is a separate User Guide that explains how this output module works. It can be accessed (as a PDF document) from the Magma Help menu.

CHAPTER 6

SEGD Handling

It is possible to both write SEGD outputs and produce Table of Contents from the SEGD Headers (as opposed to the troika internal headers).

Note that **segdout** and **segdtoc** modules are only relevant and valid in combination with the **segd** input module.

"SEGD Input/Output job example" below shows a typical job setup to read in SEGD, write out SEGD, Produce a Table of Contents and a Plot.

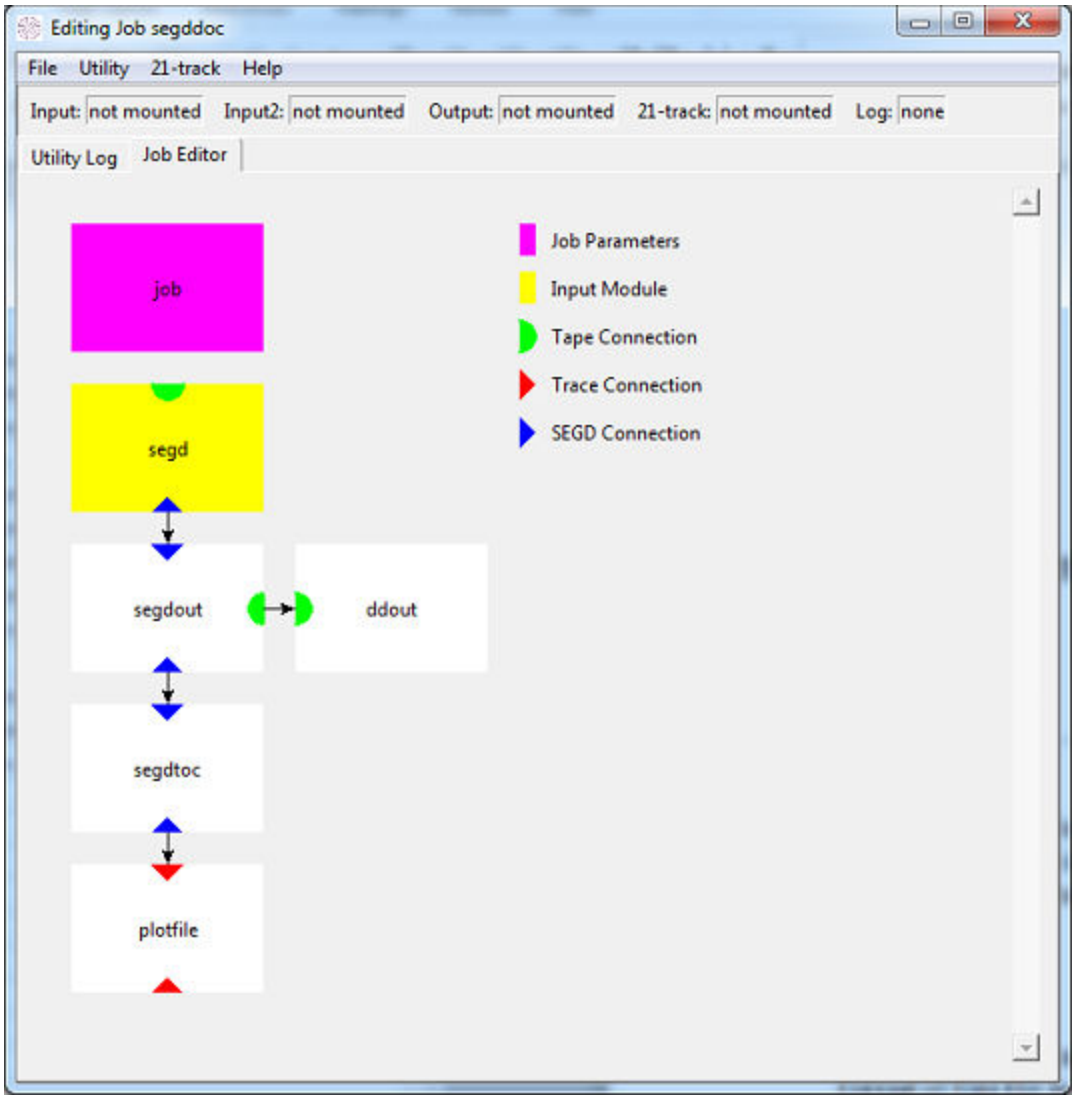


Figure 6-1 *SEGD Input/Output job example*

Segdout module

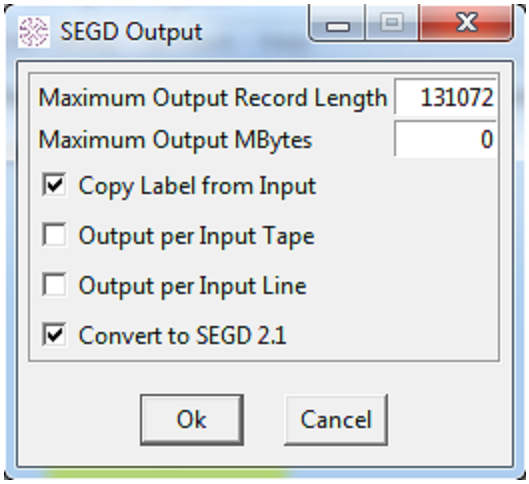


Figure 6-2 *Segdout Parameter Dialogue*

The options for the segdout module include:

Maximum Output Record Length	This can be used to buffer multiple records into a single tape block. This makes tape I/O much more efficient. When not buffering small data blocks (for each trace) are written to tape.
Maximum Output Mbytes	A new tape will be requested once the specified number of bytes has been written to the current output. 0 (Zero) means infinite i.e. output will continue until current output tape is full.
Copy Label from Input	For SEGD Rev 2.1 inputs. Copy the storage unit label from the input.
Output per Input Tape	A new Output tape will be requested for each new Input tape/File opened.
Output per Input Line	A new Output tape will be requested for each new Seismic Line encountered in the Input Stream. You need to select this if you are using the segd split functionality seen in "SEGD Line Split" on page 45.
Convert to SEGD 2.1	The data will be output in SEGD 2.1 format.

Table 6-1 *Segdout module options*

Segdtoc module

The **segdtoc** module produces a Table of Contents of the SEGD data passing through it. It performs an identical function to the TOC module, except that it can access values in SEGD headers. It must immediately follow the SEGD input module in a Magma job.

Under **Definition**: browse to the TOC definition file that will be used. Under **Output**: enter the name of the output file that will contain the resultant Table of Contents. This will be produced in the directory in which the magma job is saved.

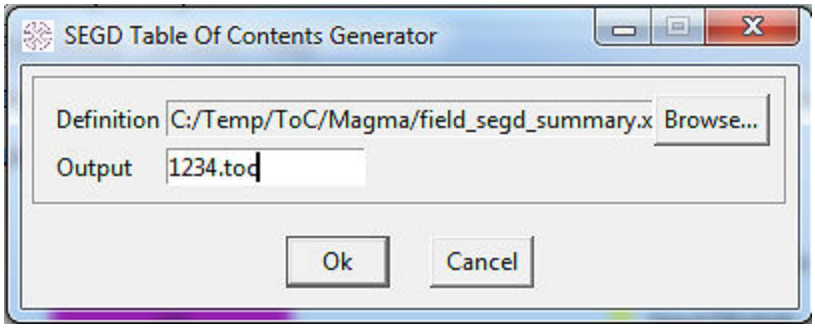


Figure 6-3 *segdtoc dialogue*

CHAPTER 7

General Sequential Trace input (sequin)

The sequin module is a general reader for trace sequential seismic data, with the format of the data defined by parameters. The dataset is contained in one or more "tapes", defined in the datain module.

When creating a new Magma job, select the **sequin Input Module**. Auto Analyse is not possible with sequin as it is up to the user to define the input format.

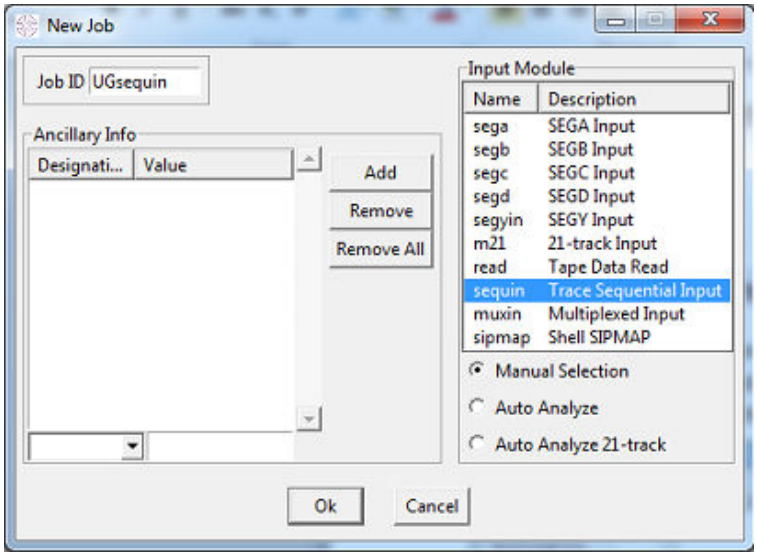


Figure 7-1 *seguin job parameters*

After clicking **OK** on the job screen the sequin parameter screen will appear (see "seguin parameter screen" below), this is where the input format is defined. **Note that there are some predefined formats (Phoenix, Western Code 4 etc), these may be useful as an illustration of how a format needs to be defined**.

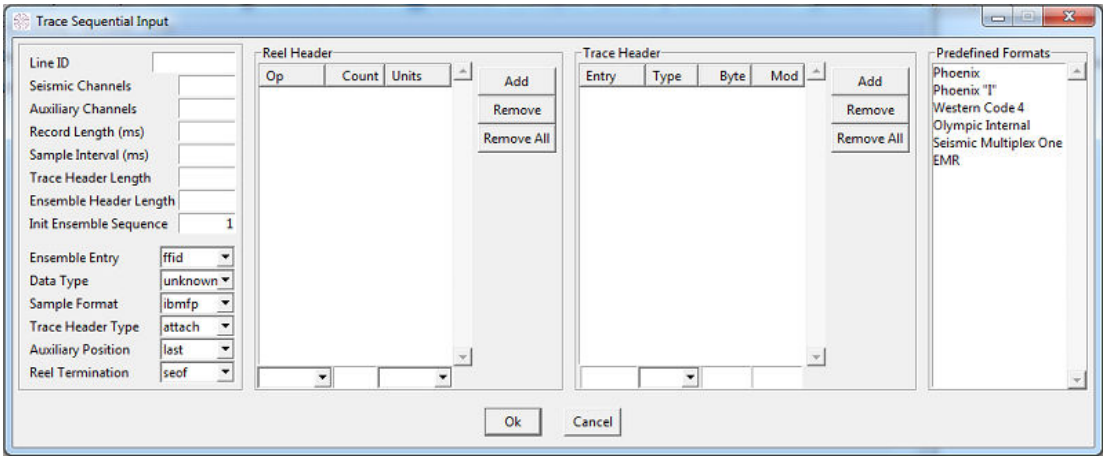


Figure 7-2 *seguin parameter screen*

General Parameters

Seismic Channels

The **Seismic Channels** parameter specifies the number of seismic data traces per ensemble. There is no default.

Auxiliary Channels

The **Auxiliary Channels** parameter specifies the number of auxiliary traces per ensemble. There is no default, if there are no auxiliaries then enter 0 (Zero)

Record Length

The **Record Length** parameter specifies the length of the seismic traces, in milliseconds. There is no default.

Sample Interval

The **Sample Interval** parameter specifies the sample interval, in milliseconds. There is no default.

Trace Header Length

The **Trace Header Length** parameter specifies the number of bytes in the trace header at the front of each trace record. There is no default.

Ensemble Header Length

The **Ensemble Header Length** parameter specifies the number of bytes in the header record at the start of each ensemble. A value of 0 indicates that there is no ensemble header. The default value is 0.

Init Ensemble Sequence

The **Init Ensemble Sequence** parameter specifies the initial value of the ensemble sequence number that is used in trace header entries of type specified as **Ensemble Entry**. The default value is 1.

Ensemble

The **Ensemble** parameter specifies the name of the trace header entry containing the ensemble number. This entry must be defined in a **Trace Header** entry

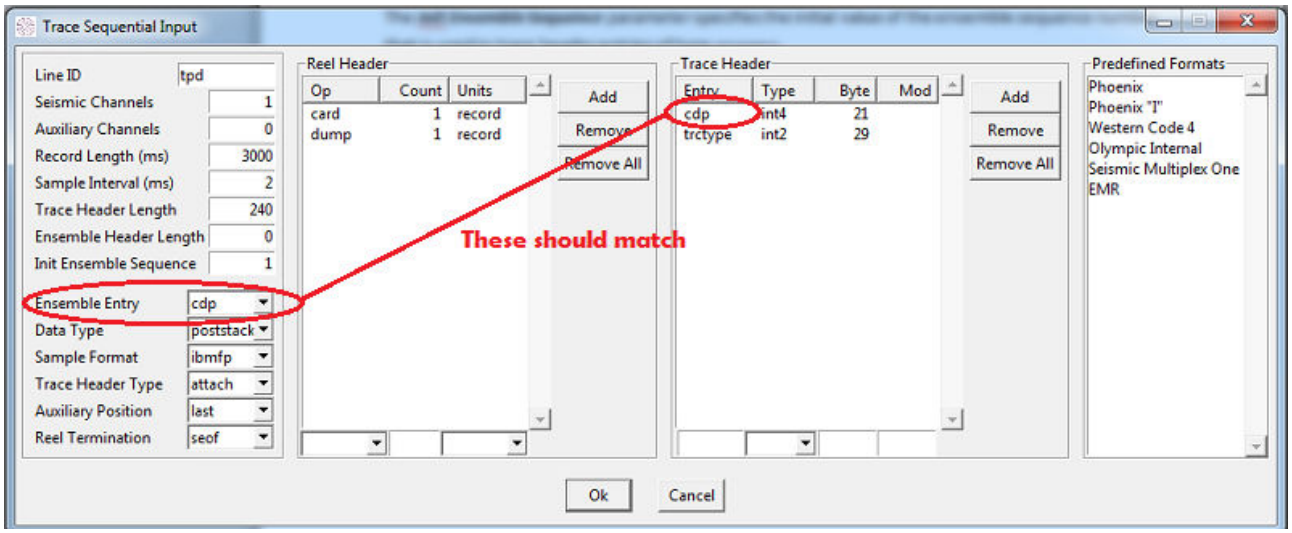


Figure 7-3 *Ensemble parameter*

Data Type

The Data Type parameter specifies the type of seismic data in the trace sequential dataset,

Possible values are:

unknown	Unknown data type
field	Field data
prestack	Prestack data (gathers)
poststack	Post stack data (horizontally stacked)

Table 7-1 *Data type parameters*

The default value is **unknown**.

Sample Format

The Sample Format parameter specifies the format of the data sample values.

Possible values are:

ibmfp	IBM 32-bit floating-point
ieee	IEEE 32-bit floating-point
int2	2-byte integer
int3	3-byte integer
int4	4-byte integer
int3g	3-byte integer plus 4-bit gain
i12	12-bit (1.5 byte) integer
sm2	2-byte sign and magnitude
cggfp	CGG floating-point

Table 7-2 *Sample Format parameters*

The default value is **ibmfp**.

Trace Header Type

The Trace Header Type parameter specifies the type of the trace header on each trace record.

Possible values are:

Attach	The trace header is attached to the front of each trace
Overlay	The trace header overlays the first few sample values in each trace

Table 7-3 *Trace Header type parameters*

The default value is **Attach**.

Auxiliary Position

The Auxiliary Position parameter specifies where the auxiliary traces are positioned in each ensemble.

Possible values are:

First	The auxiliaries are positioned at the front of each ensemble, before the seismic data traces
Last	The auxiliaries are positioned at the end of each ensemble, after the seismic data traces

Table 7-4 *Auxiliary Position parameters*

The default value is **last**.

Reel Termination

The **Reel Termination** parameter specifies how a reel is terminated.

Possible values are:

seof	Single file mark
deof	Double file mark

Table 7-5 *Reel Termination parameters*

The default value is **seof**.

Reel Header

The **Reel Header** parameter specifies an operation to be performed at the start of each input reel. If multiple **Reel Header** parameters are supplied, the operations will be performed in order at the start of each input reel.

Each **Reel Header** parameter is a list of three values, separated by commas.

type

This specifies the type of the operation to be performed on the reel header.

read	Read tape records and list block sizes
card	Read tape records and list them as card images
dump	Read tape records and produce hexadecimal dump
dumpasc	Read tape records and produce hex dump with ASCII characters
dumpebc	Read tape records and produce hex dump with EBCDIC characters

Table 7-6 *Reel header - type of operation*

count

This specifies the count associated with the operation. The meaning of this value depends on the **unit's** parameter.

units

Specifies the units associated with the operation.

file	Read count tape files
record	Read count tape records
reclen	Read tape records as long as the block size is count bytes

Table 7-7 *Operation Units*

Trace Header

Each **Trace Header** parameter defines a single entry in the input trace header. Multiple entries are defined by supplying **Trace Header** as many times as necessary.

Enter definitions for each trace header that needs to be captured by specifying values in the columns at the bottom of the panel (as highlighted red here) and clicking the **Add** button.

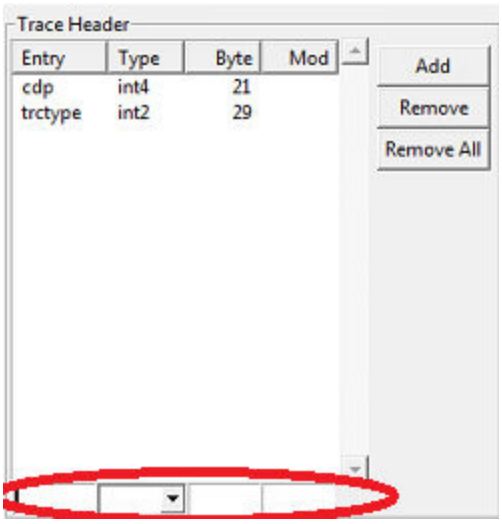


Figure 7-4 *Adding trace header definition*

The value of the **Trace Header** parameter is a list of four values, separated by commas.

Entry

This is the name to be given to the trace header entry. This can be any string of alphanumeric characters, although there are standard names for certain entries which should be used if appropriate.

Type

The type of the value in the input trace header.

int1	1-bye integer
int2	2-byte integer
int3	3-byte integer
int4	4-byte integer
int8	8-byte integer
bcdu	Unpacked bcd (binary coded decimal)
bcdp	Packed bcd (binary coded decimal)

Table 7-8 *Value Types*

Byte

The byte number of the first byte of the value in the input trace header. The first byte in the trace header is numbered byte 1.

Mod

For the binary coded decimal types (bcdu & bcdp), the **Mod** parameter specifies the number of decimal digits.

CHAPTER 8

Sequin Example

The following simple examples show how to specify the format for a SEGY rev0 file.

Note: This is purely an academic exercise as Magma would easily be able to recognize, read and decode this data and you would not need to use sequin for this purpose. It is offered as an example because SEGY is a well-known and understood format which should help to illustrate the mapping of the format in sequin.

Reel Header

Dumping the Reel header (and referring to the Standard) shows that this is 3200 bytes consisting of 40 80-byte card images in EBCDIC.

```
Length: 3200 bytes (File 1, record 1)
00000000 C3F0 F140 C3D3 C9C5 D5E3 407A 40C7 4BE2 <C01 CLIENT : G.S>
00000016 4BC9 4B40 D5D6 D560 C5E7 C3D3 E4E2 C9E5 <.I. NON-EXCLUSIV>
00000032 C540 E2E4 D9E5 C5E8 4040 40C1 D9C5 C140 <E SURVEY AREA >
00000048 7A40 D5D6 D9E3 C840 E2C5 C140 D5C5 E3C8 <: NORTH SEA NETH>
00000064 C5D9 D3C1 D5C4 E240 D7C8 C1E2 C540 C9C9 <ERLANDS PHASE II>
... Snip ...
00003120 C3F4 F040 C5D5 C440 C5C2 C3C4 C9C3 7A40 <C40 END EBCDIC: >
00003136 4040 4040 4040 4040 4040 4040 4040 4040 <    >
00003152 4040 4040 4040 4040 4040 4040 4040 4040 <                >
00003168 4040 4040 4040 4040 4040 4040 4040 4040 <                >
00003184 4040 4040 4040 4040 4040 4040 4040 4040 <               >
```

Binary Header

Dumping the Binary header and referring to the standards document ….

```
Length: 400 bytes (File 1, record 2)
00000000 0000 1FB7 0000 0069 0185 0001 0001 0000  <.........e......>
00000016 0FA0 0000 05EC 0000 0001 0001 0004 0001 <................>
00000032 0000 0000 0000 0000 0000 0000 0000 0000 <................>
00000048 0000 0001 0004 0001 0001 0000 0002 0000 <................>
---- 20 lines of all zeroes omitted ----
00000384 0000 0000 0000 0000 0000 0000 0000 0000 <................>
At Byte 13 (2 Byte Integer) 0x0001 = 1 == 1 data trace per ensemble
At Byte 15 (2 Byte Integer) 0x0000 = 0 == 0 auxiliary traces per ensemble
At Byte 17 (2 Byte Integer) 0x0FA0 = 4000 == Sample rate in uS
At Byte 21 (2 Byte Integer) 0x05EC = 1516 == Number of samples
Data length is 4 * 1516-1 = 6060 ms
At Byte 25 (2 Byte Integer) 0x0001 = 1 == Data sample format code is 4 byte IBM float-
ing point
At Byte 29 (2 Byte Integer) 0x0004 = 4 == Horizontally stacked data
```

Entering the parameters

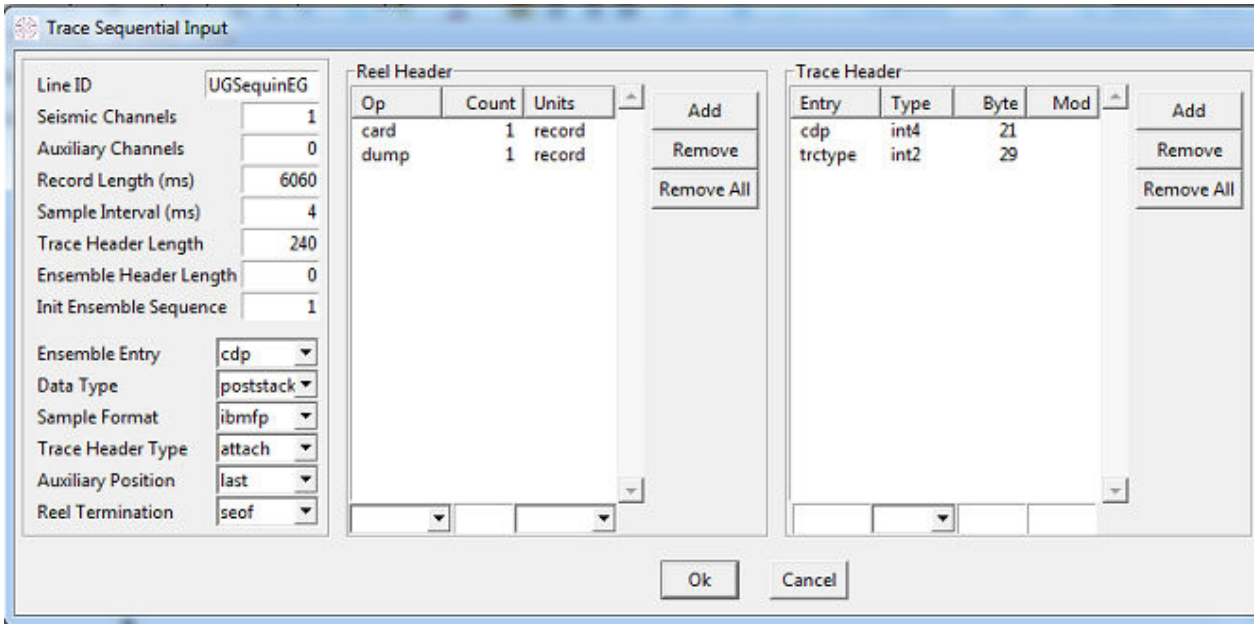


Figure 8-1 *Trace Sequential Input*

Seismic Channels	This is 1, taken from the binary header
Auxiliary Channels	This is 0, taken from the binary header
Record Length	This is 6060, taken from the binary header
Sample Interval	This is 4, taken from the binary header
Trace Header Length	The standard states that the trace header length is 240 bytes
Ensemble Header Length	Not applicable – leave as 0
Init Ensemble Sequence	We do not wish to renumber ensembles – leave as 1
Ensemble	Binary header identified data as horizontally stacked – hence select cdp
Data Type	Binary header identified data as horizontally stacked – hence selected post-stack (could be left as unknown)
Sample Format	Binary header identified data sample format code is 4 byte IBM floating point – hence select ibmfp

Trace Header Type	The standard states that the trace header is part of the data trace record – hence select attach
Auxiliary Position	There are no auxiliaries –leave as last - ignored
Reel Termination	This job is reading from a disk file – hence the default of seof is sufficient.

Table 8-1 *Sequential Input parameters*

Reel Header

This job is making 2 directives for the treatment of the Reel Header

CARD	**1**	**RECORD**	Read 1 record as cards i.e. the 3200-byte EBCDIC text header
DUMP	**1**	**RECORD**	Then read 1 record and dump the contents to the job listing in Hex i.e. the 400-byte binary header

Table 8-2 Reel header directives

Trace Header

After reading the Reel Header records (as directed), Magma will then process Trace data records according to the parameters given in General Parameters. The Trace Header entries in this example mean that only two trace headers are being extracted from the trace headers, in reality many more trace headers would normally be extracted.

The Trace Header entry for the stated Ensemble Entry must be defined (i.e. cdp)

cdp	**int4**	**21**	Extract the cdp value from Bytes 21-24 as a 4-byte integer
trctype	**int2**	**29**	Extract the Trace Type from Bytes 29-30 as a 2-byte integer

Table 8-3 Reel header directives

CHAPTER 9

General Multiplexed Record Input (muxin)

The MUXIN module is a general reader for multiplexed seismic data, with the format of the data defined by parameters. The dataset is contained in one or more "tapes", defined in the datain module.

Trace header entries

The following Trace header entries are defined by muxin module

shotseq	Shot sequence number
ffid	Field file number
chan	Field channel number

Table 9-1 *Trace header entries defined by muxin*

Setting up a job

When creating a new Magma job, select the sequin Input Module. Auto Analyse is not possible with sequin as it is up to the user to define the input format.

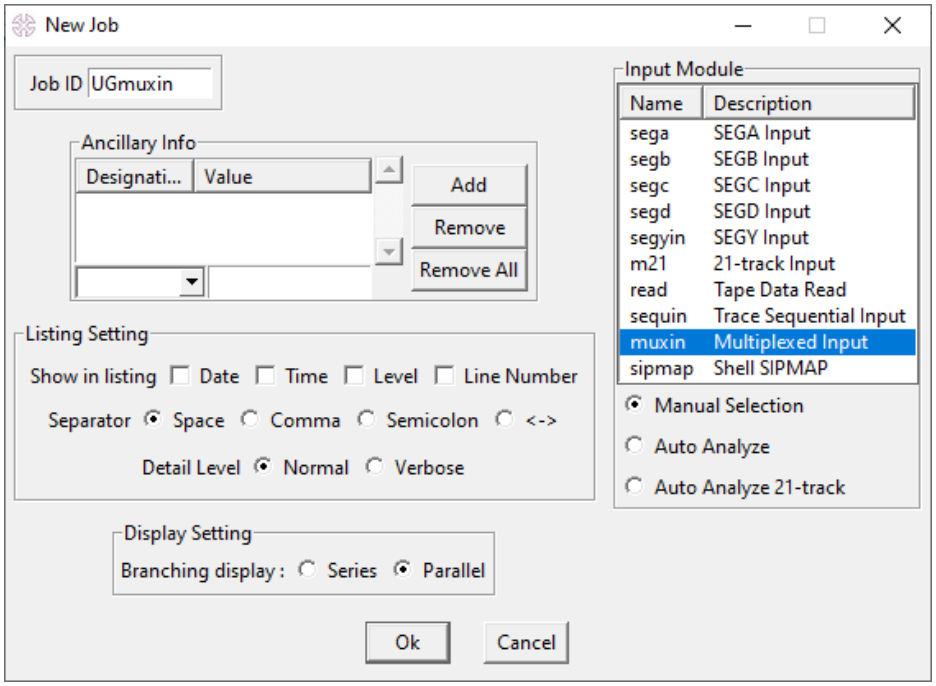


Figure 9-1 muxin job parameters

After clicking OK on the job screen the sequin parameter screen will appear (see "muxin job parameters" above), this is where the input format is defined. Note that there are some predefined formats which may be useful if you have data in these formats but can also be used as examples of how formats need to be defined.

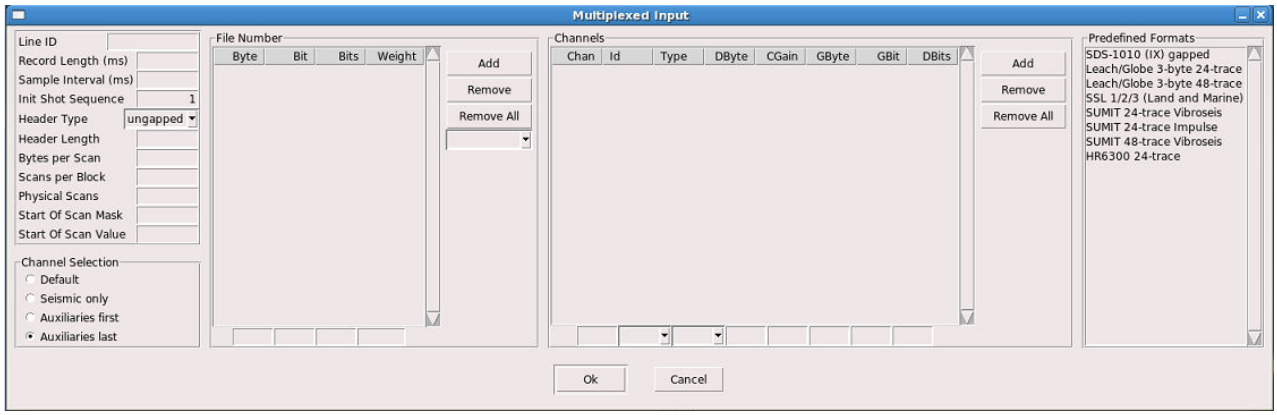


Figure 9-2 *muxin parameters*

Defining the input format

Record Length

Sample Interval

The **Sample Interval** parameter specifies the sample interval, in milliseconds. There is no default.

Init Shot Sequence

The **Init Shot Sequence** parameter specifies the initial value of the shot sequence number that is output in trace header entry **`shotseq`**. The default value is 1.

Header Type

The Header Type parameter specifies the type of the header used by the multiplexed records.

There is no default, possible values are:

Ungapped	The header is attached to the front of each multiplexed data record with no inter-record gap in between.
Gapped	The header is a separate tape record at the front of each multiplexed record.

Table 9-2 *Header type parameters used by multiplexed records*

Header Length

The **Header Length** parameter specifies the number of bytes in the header on each multiplexed record. There is no default.

Bytes per Scan

The Bytes per Scan parameter specifies the number of bytes per data scan in the multiplexed records. There is no default.

Scans per Block

The **Scans per Block** parameter specifies the number of data scans per tape block in the multiplexed data. A value 0 indicates that it is gapless. The default value is 0.

Physical Scans

The **Physical Scans** parameter specifies the number of physical scans per data scan in the multiplexed data.

This is typically used when the data looks like 24 trace but is actually 48 trace with channels 1-24 and 25-48 recorded in alternate scans, in which case **Physical Scans** should be specified as 2.

Note that if **Physical Scans** is specified with a value other than 1, the value supplied for the **Physical Scans** parameter should be the total number of bytes in the combined data scan. The default value is 1.

Start of Scan Mask

The **Start of Scan Mask** parameter should be specified as 8 hexadecimal digits defining a 32 bit start-of-scan mask. This is used in a bitwise "and" operation on the first four bytes of each data scan and the result is 8.3 Channels with the value supplied for the **Start of Scan Value** parameter to identify the start of a data scan. There is no default.

Start of Scan Value

The **Start of Scan Value** parameter should be specified as 8 hexadecimal digits defining a 32 bit start-of-scan value. This is compared with the value resulting from the application of the **Start of Scan Mask** parameter to identify the start of a data scan. There is no default.

Channel Selection

The **Channel Selection** parameter specifies which channels are required from the multiplexed records. Possible values are:

Seismic Only	Only the seismic channels will be output
Auxiliaries First	The auxiliary channels will be output before the seismic data channels
Auxiliaries Last	The auxiliary channels will be output after the seismic data channels

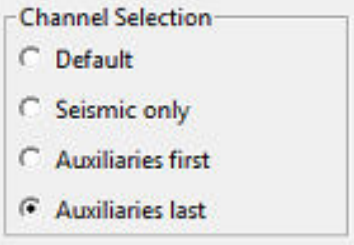


Table 9-3 *Channel selection parameters*

The default selection is **Auxiliaries Last.**

File Number

The **File Number** parameters define the format of the field file number in the header of each multiplexed record. Multiple **File Number** parameters will be supplied, each one defining a segment of the file number. The parameter specification is a list of four values. (Byte, Bit, Bits & Weight)

Byte

This is the byte number of the byte within the header containing the file number segment. The first **byte** in the header is numbered byte 1.

Bit

This is the bit number of the most significant bit of the file number segment within the byte specified by **Byte**. The most significant bit in the **byte** is numbered bit 0.

Bits

This is the number of bits in the file number segment. The whole segment must be contained within the byte, so that the value of **Bit** plus **Bits** must be less than or equal to 8.

Weight

This is the weight of the segment within the complete file number. Typically, this will be a power of 10 for binary coded decimal file numbers.

Example

Given the following Hex dump of the first 16 Bytes of a File Header record

```
Length: 7212 bytes (File 1, record 1)
9200 1024 8464 0C34 6C00 0000 0101 4440
8002 8002 8002 8002 8002 8002 8002 8002
```

…and a format diagram that says that the file number is in the top half of the first 3 bytes

The apparent file number for this record would be 901

```
9200 1024
```

…to specify this in muxin, keeping in mind that Bit 0 is treated as the first bit (or left most), use the following 3 entries.

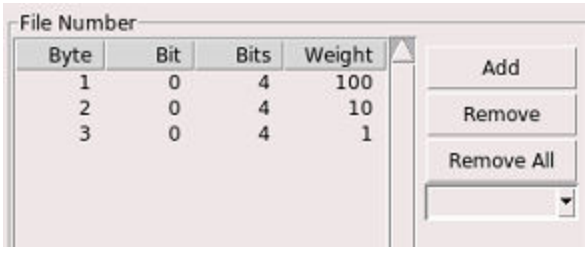


Figure 9-3 *Bits and bytes*

```
Use Bits 0 to 3 from byte 1 and multiply by 100 = 900
Use Bits 0 to 3 from byte 2 and multiply by 10 = 0
Use Bits 0 to 3 from byte 3 = 1
Giving 901
```

Channels

The ***Channels*** parameters define the location and type of the sample value for each channel within a data scan. Channel parameters should be supplied for each channel within the multiplexed record.

The parameter specification for each channel consists of eight values.

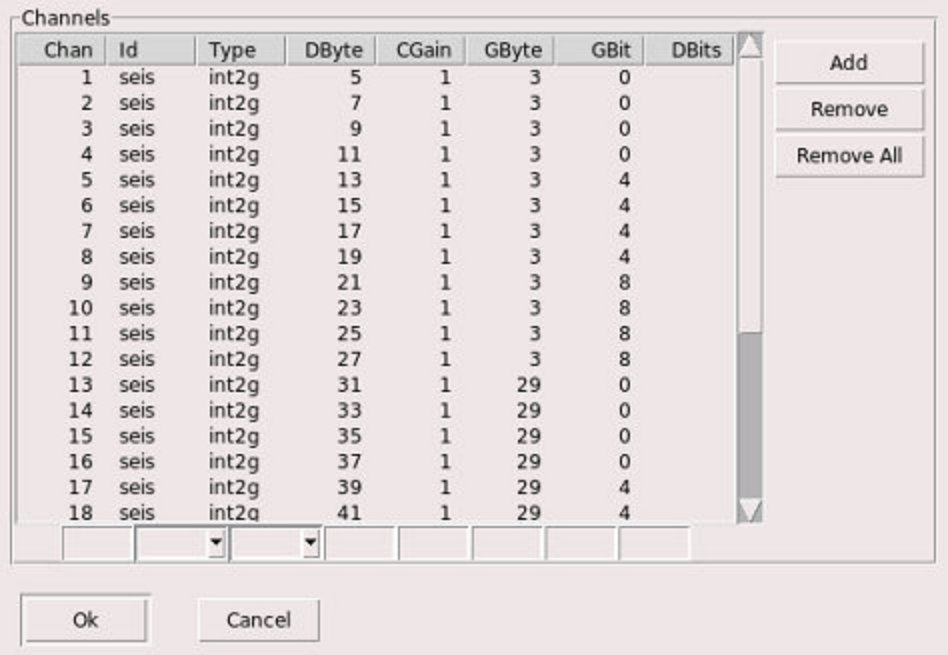


Figure 9-4 *Channels*

Chan

The Field channel number.

Id

Trace id for the channel. Choose one of the following values from the drop down:

seis	Seismic data
dead	Dead
dumy	Dummy
tbrk	Time break
uphl	Uphole
swep	Sweep
tmng	Timing
wbrk	Water break
othr	Other
unkn	Unknown

Table 9-4 *Trace ID for channel*

Type

This is the **Type** of sample value. Choose one of the following values from the drop down:

int2	16 bit integer
int2g	16 bit integer with 4 bit variable gain
int1	8 bit integer

Figure 9-5 *Trace ID for channel*

Dbyte

This is the byte number of the first byte of the value in the data scan. The first byte in the scan is numbered byte 1.

CGain

This is the Constant gain to be applied to (removed from, note negative exponent) values. Each sample value is scaled by: 2**-CGain

GByte

This is the byte number of the first byte of the 16 bit word containing the variable gain within the data scan when **GByte** is specified as i16g. The first byte in the scan is numbered byte 1.

GBit

This is the bit number of the first bit of the 4 bit field within the 16 bit word containing the variable gain when **Type** is specified as **int2g**. The first bit in the 16 bit word is numbered bit 0.

DBits

This is the number of bits within the data word that are actually used. Bits at the end of the data word beyond **DBits** bits will be masked off. If **DBits** is not supplied or is zero the whole data word will be used.

CHAPTER 10

Appendices

The following Appendices give additional information that you may find useful.

Appendix A: Formats and Parameter – sega,b,c,d,y

Please refer to the Technical Standards section of the SEG web site (http://www.seg.org) for detailed information of SEGD and SEGY format definitions.

At the date of writing this guide an index to the standards could be found at:

http://www.seg.org/resources/publications/misc/technical-standards

Appendix B: Table of Contents Example

Example TOC definition file

```
<?xml version="1.0"?>
<TOC>
<delimiter value="\t"/>
      <header><name string="Title:" /><name argument="toc-output-file" /></-
      header>
      <header><name string="Creator:" /><name string="Troika International"
      /></header>
      <header><name string="Subject:" /><name string="SEGD Contents" /></-
      header>
      <header><name string="Description" /><name string="SEGD contents" />
      </header>
      <header><name string="Contributor:" /><name environment="USERNAME" /></-
      header>
      <header><name string="Date:" /><name date="%a-%b-%Y" /></header>
      <header><name string="Type:" /><name string="CSV file" /></header>
      <header><name string="Rights:" /><name string="Company Confidential"
      /></header>
<header>
      <name string="cdp" />
      <name string="chan" />
      <name string="cdptrc" />
      <name string="numsamps" />
      <name string="espnum" />
      <name string="fold" />
      <name string="coorunit" />
</header>
<record>
      <name trace="cdp" trigger="always"/>
      <name trace="chan" trigger="always" />
      <name trace="cdptrc" display="value" />
      <name trace="numsamps" display="value" />
      <name trace="espnum" display="value"/>
      <name trace="fold" display="value"/>
      <name trace="coorunit" display="value"/>
</record>
</TOC>
```


TOC output file (Doc.toc)

This is the output tab delimited file that has been subsequently read and formatted in Excel.

Title	C:\MagmaJobs\Doc.toc
Creator	Troika International
Subject	SEGD Table of Contents
Description	SEGD File/Tape contents
Contributor	oper
Source System	tractor
Date	Wed-Apr-31-2015
Type	CSV file
Rights	Company Confidential

cdp	chan	cdptrc	numsamps	espnum	fold	coorunit
18613	1	1	1501	100	0	1
18614	2	2	1501	100	0	1
…lines omitted						
18709	97	97	1501	100	522	1
18710	98	98	1501	100	551	1
18711	99	99	1501	100	596	1
18712	100	100	1501	100	612	1
18713	101	101	1501	100	721	1
18714	102	102	1501	100	712	1
18715	103	103	1501	100	784	1
18716	104	104	1501	100	820	1
18717	105	105	1501	100	885	1
18718	106	106	1501	100	889	1
18719	107	107	1501	100	958	1
18720	108	108	1501	100	1012	1
…lines omitted						
18799	187	187	1501	100	139	1
18800	188	188	1501	100	35	1