



FIXHDR HELP

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1. Description

fixhdr is a PASSCAL software tool distributed with PASSOFT, used to modify miniSEED header fields, address timing issues, and change header endianness. It can be used either as a graphical user interface or from the command line (batch mode). This document describes usage and functionality of **fixhdr**. Note that **fixhdr** searches the specified directory and all its subdirectories for miniSEED files. **Unix commands (bold print)** and any **command line arguments are highlighted in yellow**. GUI options and menus are highlighted gray. Input files are denoted by <filename>.

Warning: Fixhdr is designed to modify miniSEED files that contain a single station (i.e. a single network, station, location, channel identifier). Modifying headers of multiplexed miniSEED files (i.e. files containing several stations) will result in the loss of header information.

2. Starting fixhdr & building trace database

Activate your PASSOFT conda environment and ensure that your version of PASSOFT is up-to-date. Instructions for installing, activating, and updating the PASSOFT package can be found on the EPIC website here: <https://www.passcal.nmt.edu/content/software-resources>

Once you have activated your PASSOFT conda environment, type **fixhdr** on the command line to start the GUI version of the program. By default, **fixhdr** opens with your current working directory populated in the Data Directories field, as shown in Figure 1.

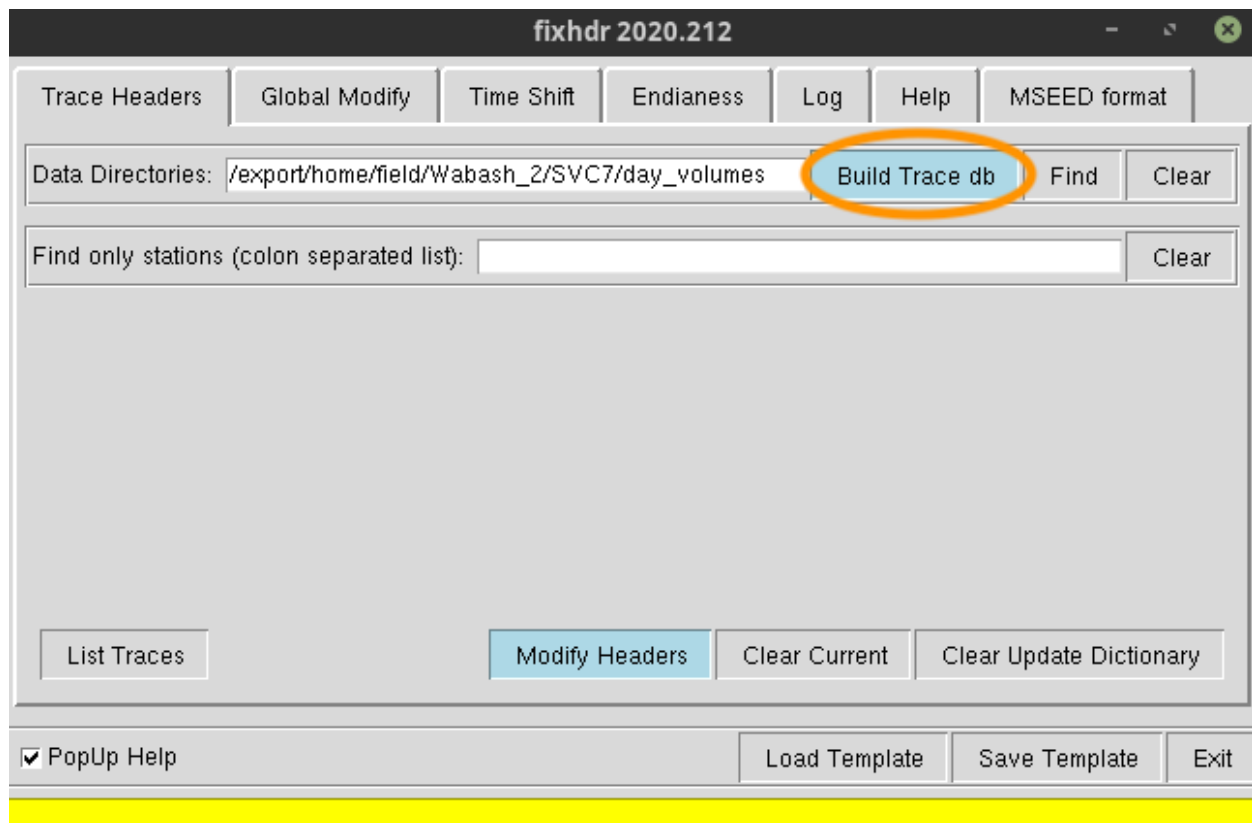


Figure 1 – Fixhdr main GUI window

If you need to change your data directories path, press the **Clear** button, then the **Find** button. If you do not clear the **Data Directories** field, **fixhdr** will add whatever directory or directories you choose in a colon-separated list and will search all of them to build the trace database (Trace db), as shown in Figure 2:

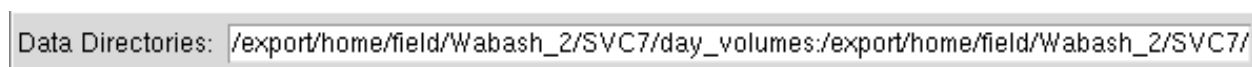


Figure 2 – Data Directories field

To load only one or a few stations, enter the station names in the **Find only stations** field (Figure 3)

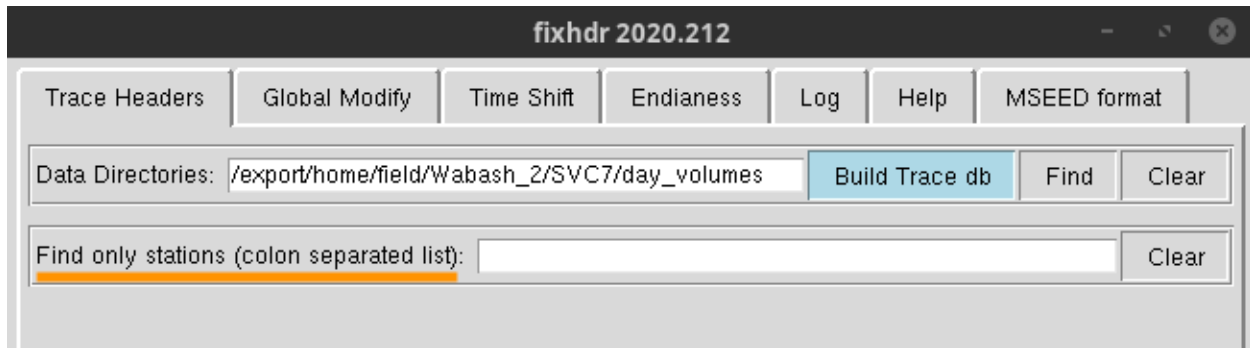


Figure 3 – Find only stations field

Once you are satisfied with data and directory selection, click the **Build Trace db** button. A pop-up message will appear with the status of reading trace header files:

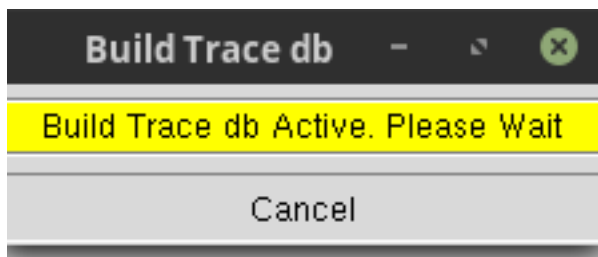


Figure 4 – Build Trace db pop-up message

- Note: Trace db build times vary: when searching 24 directories, it may take 3-5 minutes to build a trace db of ~12,000 files for the first time. However, when searching across >100 directories, it can take >30 minutes to build a trace db of ~6,500 files.

3. Changing file headers

3.1 Single header value

When Build Trace db is done, the main **fixhdr** GUI will update and populate with all the station, channel, location, network and sample rate values found within the examined trace headers. Continue to use this section if you have one or a few changes to

make (for example, changing one channel name on one station). If you have changes to make across your entire trace db, please go to section 3.1. The Stat:Chan:Loc:Net:Sps drop down shows all the combinations found in the trace db (Figure 5):

The screenshot shows the 'fixhdr 2020.212' application window. At the top is a menu bar with 'Trace Headers', 'Global Modify', 'Time Shift', 'Endianess', 'Log', 'Help', and 'MSEED format'. Below the menu bar is a 'Data Directories' section with a text field containing '/export/home/field/Wabash_2/SVC7/day_volumes', a 'Build Trace db' button, and 'Find' and 'Clear' buttons. Below that is a 'Find only stations (colon separated list):' text field with a 'Clear' button. The main section is a table with columns 'Stat:Chan:Loc:Net:Sps', 'New Values', and 'Applied'. The table has five rows: 'Station_Name', 'Channel', 'Location_Code', 'Network_Code', and 'Sample_Rate'. A dropdown arrow is highlighted in the 'Stat:Chan:Loc:Net:Sps' column. Below the table are buttons for 'List Traces', 'Modify Headers', 'Clear Current', and 'Clear Update Dictionary'. At the bottom is a status bar with a checkbox for 'PopUp Help', and buttons for 'Load Template', 'Save Template', and 'Exit'. A green status bar at the very bottom displays the text: '12120 unique mseed files found. *** 0 files with errors. See Log.'

Figure 5 – Stat:Chan:Loc:Net:Sps drop down

By selecting a combination to modify, the Station_Name and other fields will be populated on the left column. Enter the New Values in the right column and press Modify Headers to apply changes (Figure 6).

Stat:Chan:Loc:Net:Sps	SH03:EHE::6E:100.0	▼ New Values	Applied
Station_Name	SH03		<input type="checkbox"/>
Channel	EHE		<input type="checkbox"/>
Location_Code			<input type="checkbox"/>
Network_Code	6E		<input type="checkbox"/>
Sample_Rate	100.0		

☒ PopUp Help

109 traces selected for key: SH03:EHE::6E:100.0

Figure 6 – Modify Headers button

Example: to change channel name from EHE to EH2 for station SH03, enter EH2 in the **Channel** row under the **New Values** (Figure 7):

Stat:Chan:Loc:Net:Sps	SH03:EHE::6E:100.0	▼ New Values	Applied
Station_Name	SH03		<input type="checkbox"/>
Channel	EHE	EH2	<input type="checkbox"/>
Location_Code			<input type="checkbox"/>
Network_Code	6E		<input type="checkbox"/>
Sample_Rate	100.0		

Figure 7 – Changing single header value: channel name from EHE to EH2

Then, click the **Modify Headers** button. A pop-up and a progress message at the bottom of the main GUI show the modification process (Figure 8):

Modify Headers
-
↗
✕

Modify Headers Active. Please Wait

Cancel

Figure 8 – Pop-up message indicating modification process

After all headers are modified, selecting the same station:channel:location:network:sample rate again (without rebuilding the trace db), will show the modified values while the box in the **Applied** column will now be green (Figure 9):

Stat:Chan:Loc:Net:Sps	SH03:EHE::6E:100.0	New Values	Applied
Station_Name	SH03		<input type="checkbox"/>
Channel	EHE	EH2	<input checked="" type="checkbox"/>
Location_Code			<input type="checkbox"/>
Network_Code	6E		<input type="checkbox"/>
Sample_Rate	100.0		<input type="checkbox"/>

Figure 9 – Green box next to newly modified header value indicating applied change

To apply other changes and modification to the header values you would need to rebuild the trace db, otherwise you will get a **Warning** message (Figure 10):

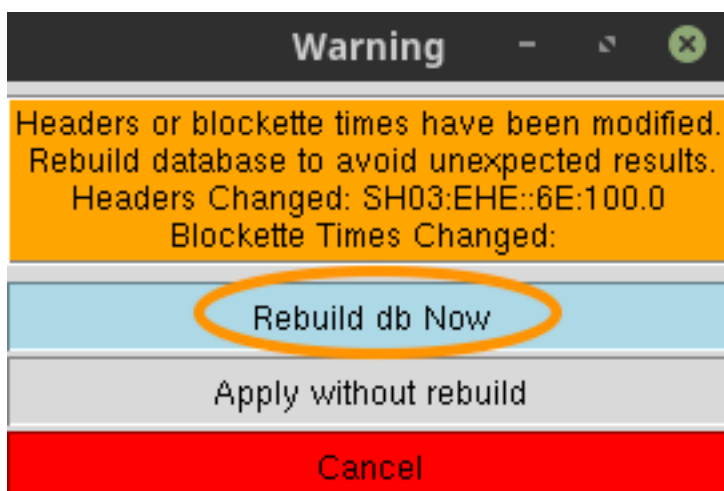


Figure 10 – Warning message

3.2 Using Global Modify

If you need to apply widespread changes to all or large portions of your data, such as renaming a network code, or converting all channels named EHE to EH2, you can use the **Global Modify** tab. Once you have built your trace db, go to the **Global Modify** tab and assign global modifications for station name, channel, location code, and network code as necessary (Figure 11):

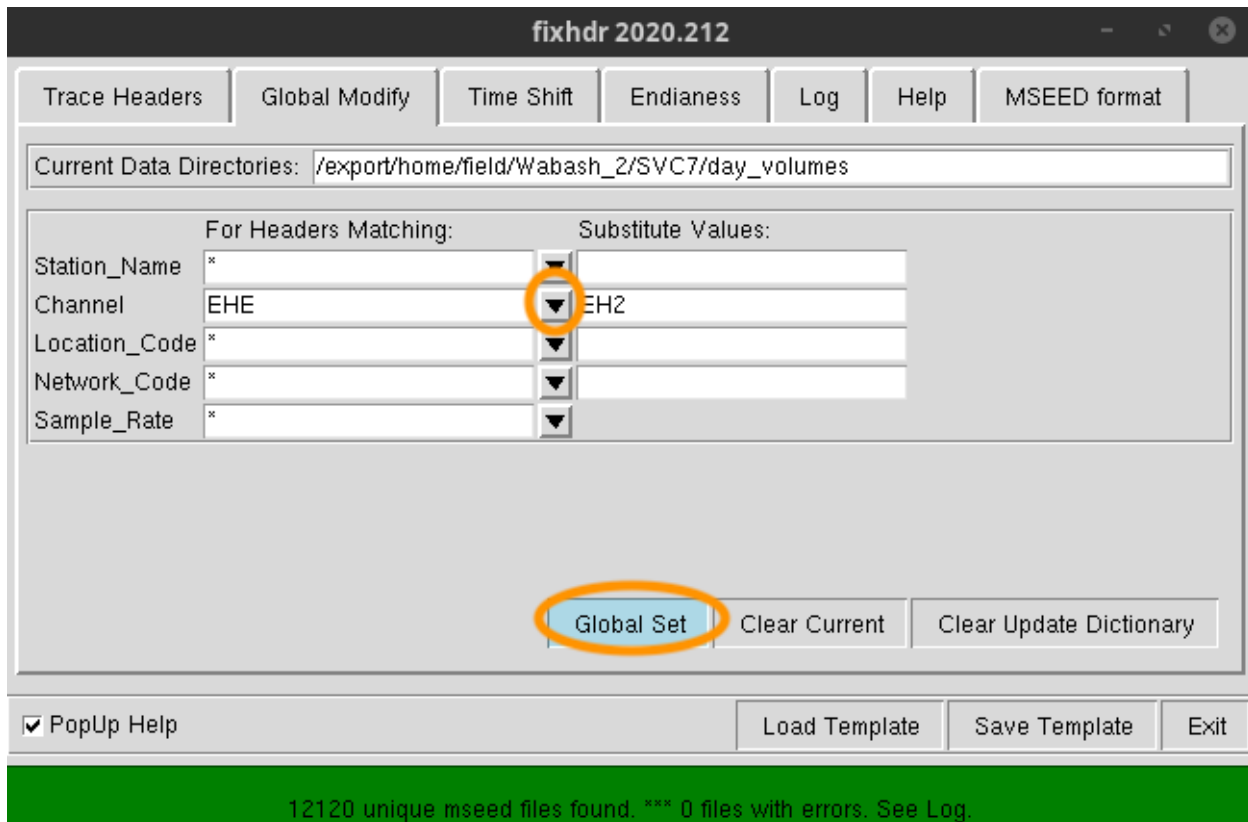


Figure 11 – Global modification of all channel names

From the main GUI select Global Modify, under **For Headers Matching** select the value to be changed, and on the opposite row under **Substitute Values** type in the new value. Click the **Global Set** button.

Note that the row(s) for the header(s) you want to modify will go blank, the color of the **Global Set** button will change, and a message: “Global Set Done. Use ‘Trace Headers’ to apply” will appear at the bottom of the GUI.

- Note: To clear all the Global Sets and start over, click **Clear Update Dictionary**.

You can apply multiple header changes at a time in one **Global Set** run. We recommend that you save the **Global Set** via **Save Template** and review the template before proceeding with changes. When all of the desired header changes are set, go to the **Trace Headers** tab and press **Modify Headers** to implement the changes, as described in section 3. After the changes are complete, build the trace db again and click the drop down for **Stat:Chan:Loc:Net:Sps** to verify the headers were properly fixed. It is also recommended that you save the log file in the **Log** tab, via the **Save Log File** button, for later reference.

Alternatively, you can save the Global Set modifications in a template file for later use in batch mode (see section 6). The saved template file can also be imported to the GUI

with the **Load Template** button and used to operate on the trace db. After loading the template, go to the **Trace Headers** tab and press **Modify Headers** to implement the changes. Then, rebuild the trace db to verify the corrections were correctly applied.

4. Time changes and questionable timing

fixhdr has the capability to apply bulk shift timing corrections. The **Time Shift** function in **fixhdr** is primarily used to mark data as timing questionable in cases where the timing of the data is potentially inaccurate due to issues with the GPS locks.

- Note: Be aware that **fixhdr** applies a fixed time correction for each time range and cannot scale the correction to account for drift.

Before beginning, you need to know: 1) sta:loc:net code of the station, 2) time shift to apply, and 3) time range for which the time shift is necessary. If needed, build the trace db as described in section 2.

To apply any timing changes, go to the **Time Shift** tab and use the dropdown to select the traces to which you want to apply timing correction. After you select the station:location:network traces you want to assign timing changes to, **fixhdr** will scan the traces and populate the **Start_Time** and **End_Time** fields based on the entire time span of the selected station:location:network traces (Figure 12):

Trace Headers Global Modify **Time Shift** Endianness Log Help MSEED format

Current Data Directories: /export/home/field/Wabash_2/SVC7/day_volumes

How to Treat Existing Corrections: ☒ Add To ☐ Replace **Undo Time Corrections**

For Traces Matching:

Stat:Loc:Net **SB01::6E** ▼

☐ Wildcard Location Code

Time Shift:

Start_Time 2015:240:21:56:20

End_Time 2015:315:19:00:01

Time_Shift_sec

Time Tag is questionable: ▼

Applied

☐ ☐

List Time Corrections **Apply Time Correction** Time Set Recalc Start/End Clear All

☒ PopUp Help Load Template Save Template Exit

760 traces selected for key: SB01::6E

Figure 12 – Applying time shift

Tag questionable timing:

In a case where you have questionable timing, for example if the GPS clock did not lock for a long period of time or had a large phase error (determined after reviewing state of health channels) for part of the deployment, edit the **Start Time** and/or **End Time** fields as needed to define the period of time for which timing was questionable, then choose **set** from the **Time Tag is questionable** dropdown, and enter a shift of 0.0 into the **Time Shift_sec** field (required) (Figure 13).

For Traces Matching:

Stat:Loc:Net ▼

☐ Wildcard Location Code

Time Shift:

Start_Time

End_Time

Time_Shift_sec

Time Tag is questionable: ▼

Apply

Figure 13 – Tagging questionable timing

Then, click on the **Apply Time Correction** button, and a pop-up window will appear:

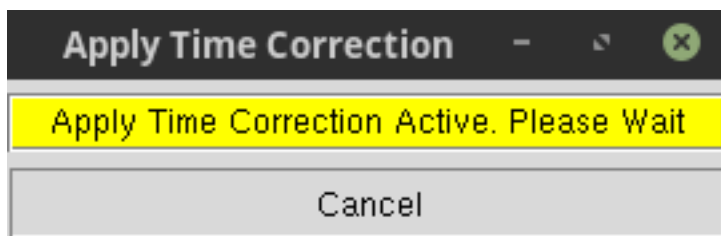


Figure 14 – Pop-up window indicating time correction is being applied

You can view the tagged headers by selecting the station:location:network traces you modified from the dropdown, and clicking on the **List Time Corrections** button on the **Time Shift** tab. This produces a pop-up window listing all of the blocks that were modified for each file (Figure 15). (It may take a couple of minutes depending on how many file blocks were changed)

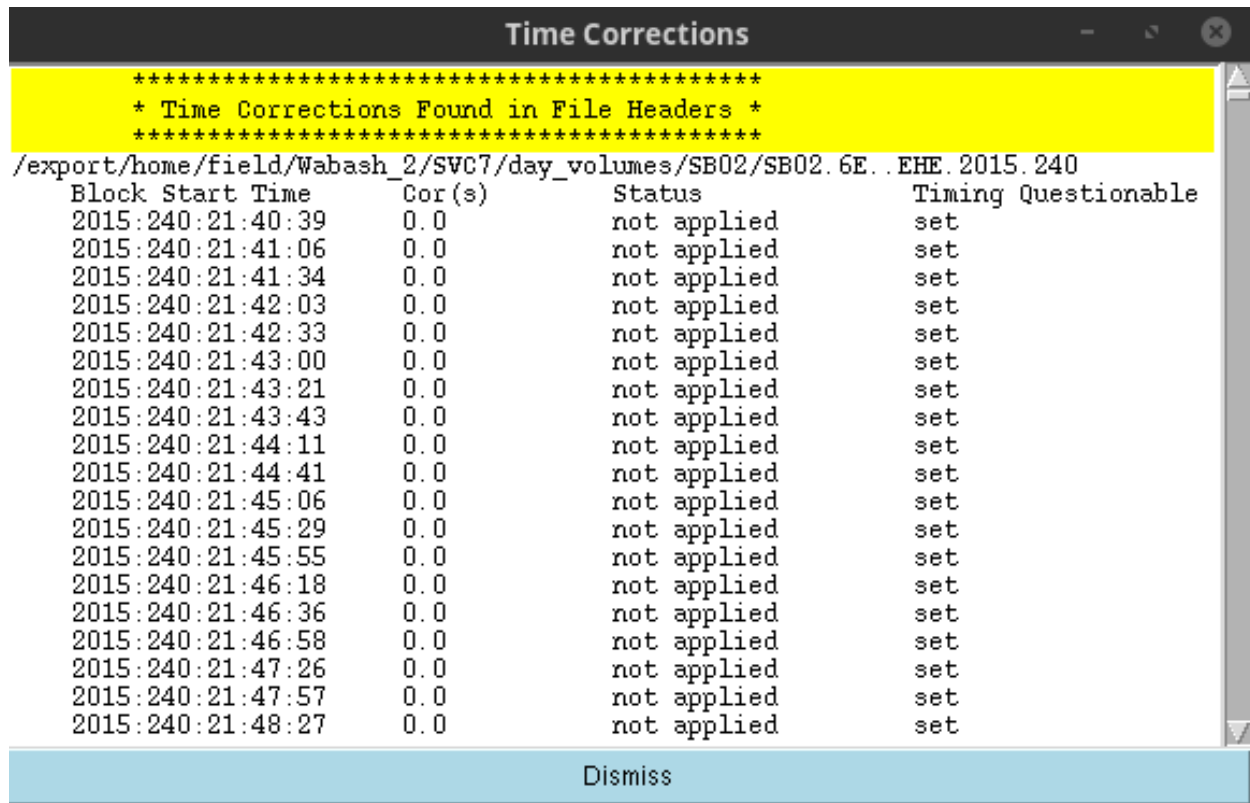


Figure 15 - Pop-up window listing questionable time blocks

Shift timing:

In the event that you need to apply a timing change to some of your files, select the affected station:location:network from the dropdown as mentioned above, then enter the change in seconds in the Time Shift sec field. If there was drift, you will need to adjust the start and end times for each fixed time correction to simulate the timing drift. Click on Apply Time Correction and wait for it to finish (Figure 16).

fixhdr 2020.212

Trace Headers | Global Modify | **Time Shift** | Endianness | Log | Help | MSEED format

Current Data Directories: /export/home/field/Wabash_2/SVC7/day_volumes

How to Treat Existing Corrections: ☒ Add To ☐ Replace Undo Time Corrections

For Traces Matching:		Time Shift:	Applied
Stat:Loc:Net	SB05::6E ▼	Start_Time	2015:240:19:31:18
<input type="checkbox"/> Wildcard Location Code		End_Time	2015:315:18:22:16
		Time_Shift_sec	0.625
	Time Tag is questionable: ▼		<input type="checkbox"/>

List Time Corrections
Apply Time Correction
Time Set
Recalc Start/End
Clear All

☒ PopUp Help Load Template Save Template Exit

751 traces selected for key: SB05::6E

Figure 16 - Time shifting

Click on **List Time Corrections** to view the corrections in the **Time Corrections** pop-up (Figure 17) (allow a couple of minutes for it to load):

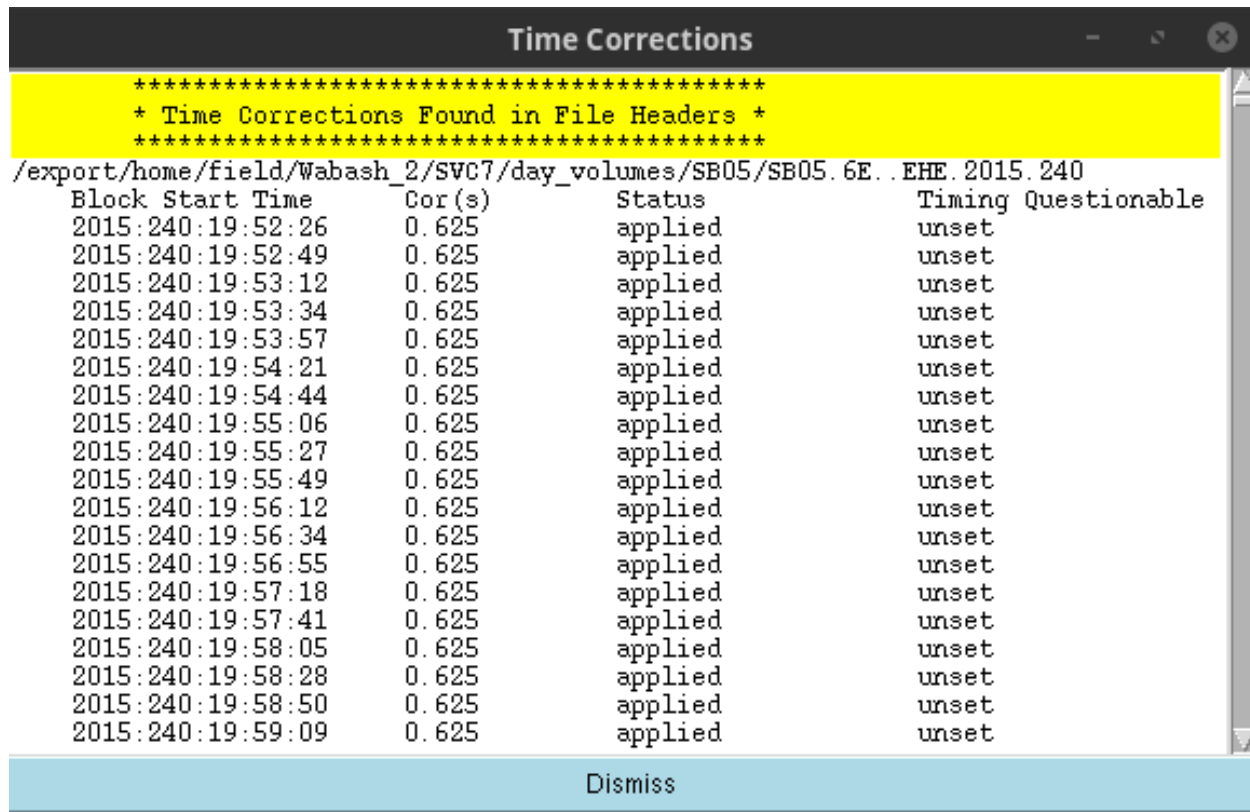


Figure 17 - Pop-up window listing time-shifted data blocks

- Note: Please be aware that **fixhdr** will not exactly apply a time shift that is a multiple of a tenth of a second (e.g. 0.7 s). For example, if it is instructed to apply a time shift of 0.7 s, the correction that appears when you list time corrections will be 0.6999 s instead of 0.7 s.
- Note: Time shift correction may not be completely and accurately reversible, make sure to keep a clean copy of the original data before shifting the times.

5. Changing header endianness

All miniSEED files submitted to PASSCAL for archiving should be in big endian byte order. They will likely be this way to start with. An exception might be if you are working on a Mac that was PowerPC compatible, or some Linux systems. A limited number of dataloggers also write miniSEED in little endian. You can use the **Endianness** tab to check if all of your file headers are big endian. Use the **Convert to Big** button if any of the headers are little endian (Figure 18). Use the same process to change miniSEED file headers from big to little endian.

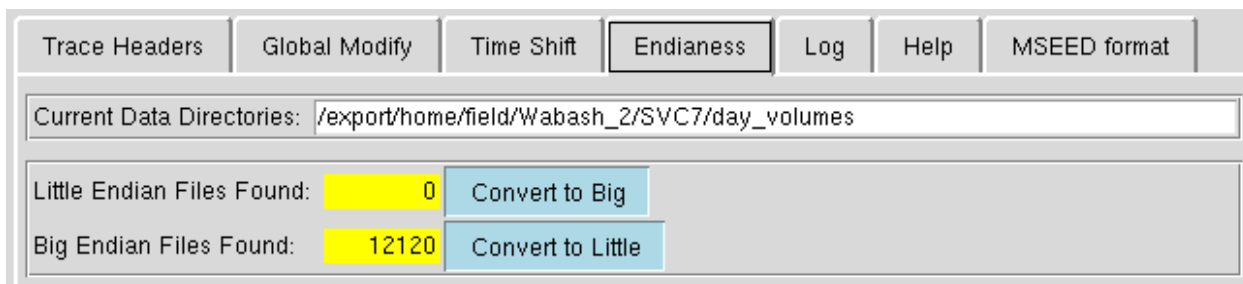


Figure 18 - Changing Endianness

- Note: **fixhdr** only changes endianness of the miniSEED headers; it cannot be used to modify endianness of the waveform data.

6. Using fixhdr in batch mode

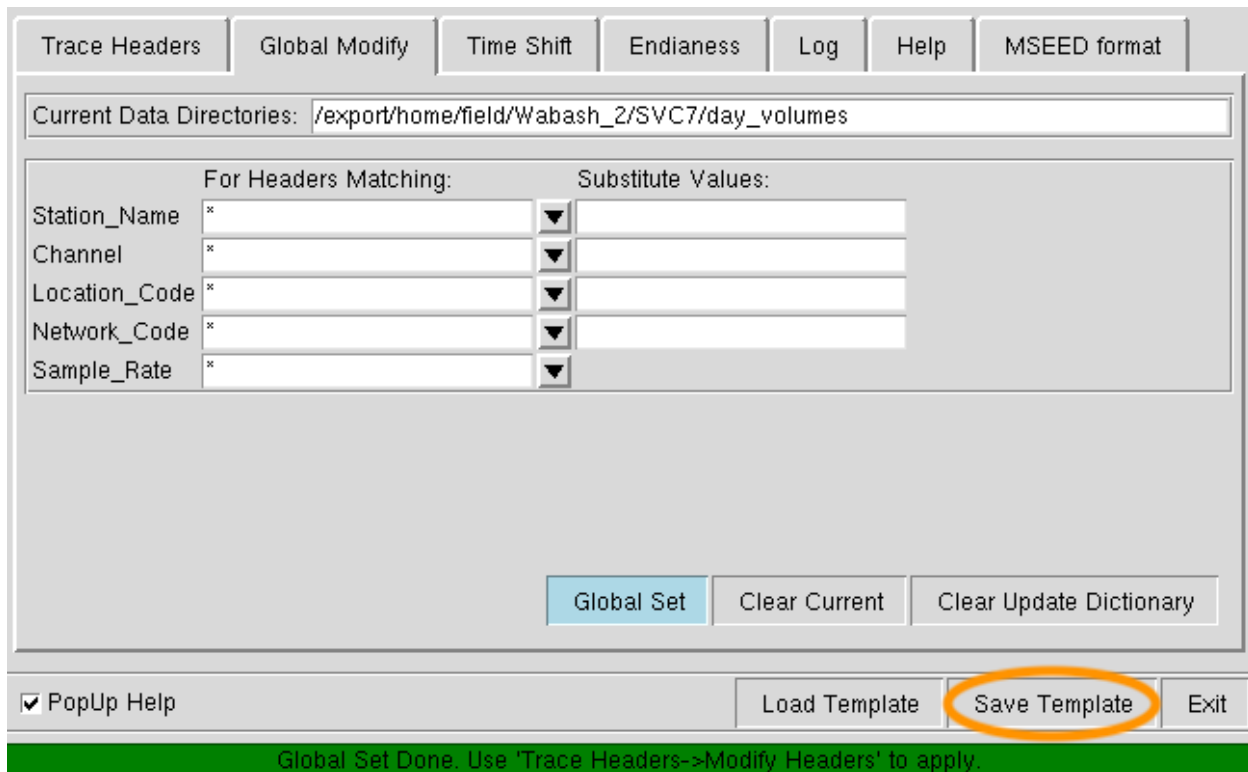
It is also possible to run **fixhdr** without the GUI, using a batch file as an input with the original and new headers. Type `fixhdr -h` in the terminal to see all options.

A **fixhdr** batch file is a text file formatted like this:

```
# Header Changes
# stat:chan:loc:net:sps  stat:chan:loc:net
hdrlist{
SB01:EHE::6E:100.0      :EH2::
SB01:EHN::6E:100.0      :EH1::
SB02:EHE::6E:100.0      :EH2::
SB02:EHN::6E:100.0      :EH1::
}
```

You can create your **fixhdr** batch file via command line scripting tools, hand editing or using the GUI.

To create a batch file in the **fixhdr** GUI, build the trace db in the **Trace Headers** tab and then go to the **Global Modify** tab. Enter your substitute values and apply **Global Set** as discussed in section 3.1. and click on **Save Template** (Figure 19).



Trace Headers Global Modify Time Shift Endianess Log Help MSEED format

Current Data Directories: /export/home/field/Wabash_2/SVC7/day_volumes

	For Headers Matching:	Substitute Values:
Station_Name	*	
Channel	*	
Location_Code	*	
Network_Code	*	
Sample_Rate	*	

Global Set Clear Current Clear Update Dictionary

☒ PopUp Help Load Template **Save Template** Exit

Global Set Done. Use 'Trace Headers->Modify Headers' to apply.

Figure 19 - Save Template to be used in batch mode

This will write a ready-to-use batch file in your current working directory. To run **fixhdr** in batch mode, and make changes to header values, run the following command:

```
fixhdr -d <data directory> -m <batch file>
```

If your files are in multiple directories, you must list the directories (no wildcards) in a colon-separated list. **fixhdr** will print out to the screen what it is working on, as well as the change applied status for all headers in the batch file.

Once completed, you may open the **fixhdr** GUI and rebuild the trace db to verify that all the changes have been applied.