27 Radioactive Tracer Survey

27.1 Setup Procedure

Bring up Radioactive Tracer service.
Click Acquisition Box - Edit - Tool String
Edit the tool string as necessary to reflect the tool string being run. This is important to insure proper offsets, filters, and tool diameters.
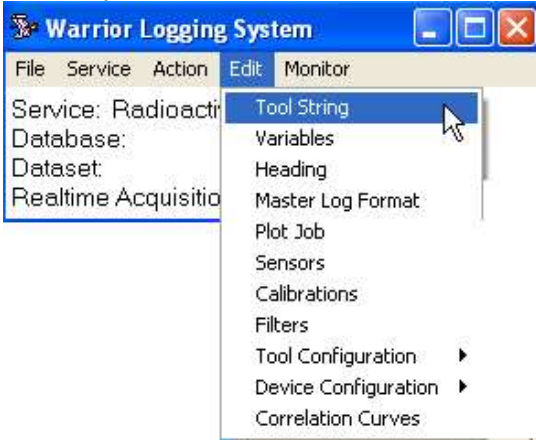Click Acquisition Box - Edit - Variables

FIG: 27.1 Tool String

Edit the variables to reflect the correct casing ID and tubing ID sizes for proper flow rate calculation (Tubing OD is also important if running in annulus). Add multiple zones if needed. (Note: a size of 0 indicates no casing, tubing, etc).

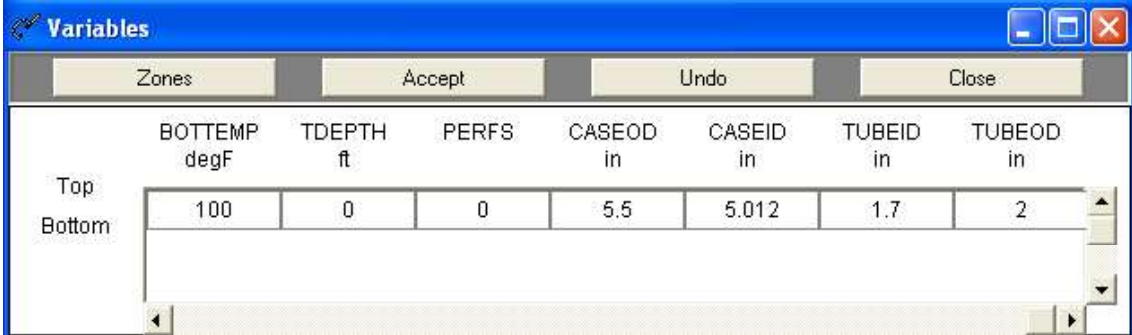|	BOTTEMP degF	TDEPTH ft	PERFS	CASEOD in	CASEID in	TUBEID in	TUBEOD in
Top Bottom	100	0	0	5.5	5.012	1.7	2

FIG: 24.2 Edit Variables

Click **Acquisition Edit Tool Configuration TREJCT** to bring up tracer configuration dialog box.
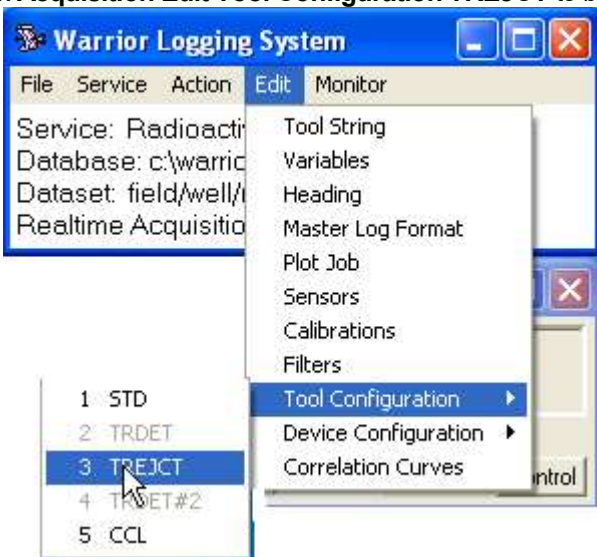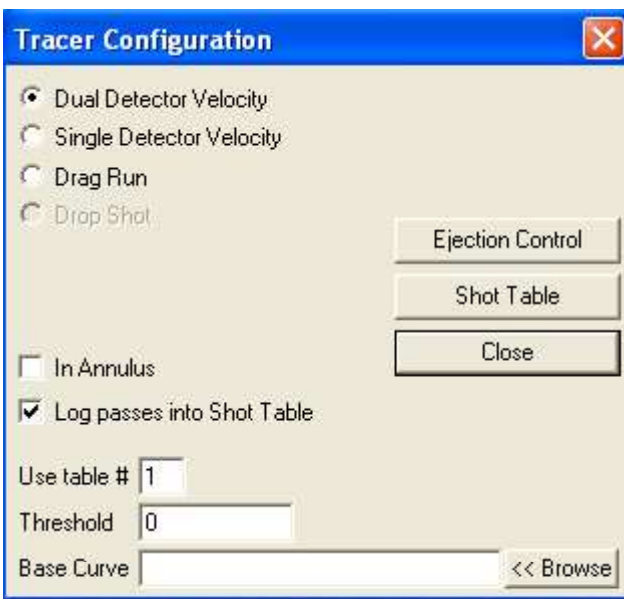

FIG: 27.3 Tool Configuration

FIG: 27.4 Tracer Configuration

Pick the method of tracer log you wish to run Dual Detector, Single Detector, or Drop Run.
For Single Detector Velocity logs, the detection level can be determined from a base log pass if one has been run, (use browse to select it, it must be in your current database). Or enter a threshold value for the level of when a shot should be detected. More on this later.
If the log is being run in the annulus between the tubing and casing, check this box for proper flow rate determinations.
Other than base runs, make sure the Log Passes into Shot Table Box is checked.
While normally all shot passes are logged into a single table, more than one table can be used and would need to be selected.

27.1.1 Tracer Ejection Control

Click **Ejection Control** box to set up ejector control. The ejection duration that you choose is dependent upon your tool type and strength of the tracer material being used. (This should be tested with water prior to the job to determine the approximate number of shots that will be available during the job.)

FIG: 27.5 Tracer Ejection Control

The Additional Squelch time is set to allow settling of the gamma detectors after the ejection to avoid noise being detected on the log.

27.2 Logging Procedures

The depths where a tool is positioned in the well can be critical to the final log interpretation. Normally the Warrior system uses the bottom of the tool string as its zero point; this may put the detectors several feet above the depth shown. (It is possible to change the zero point to a sensor if desired.)

If drag runs or velocity shots with a single detector are going to be done, it is recommended that a base run be logged first to record a background gamma. Use this to determine the threshold detection level or as a base curve that the threshold level is added to before detection occurs. Be aware detection occurs when the detector value crosses this threshold or base curve value plus threshold level, statistical deviations may cause premature detection. (Pick a high threshold level high enough to not cause premature detection.)

27.2.1 Velocity Shots

Position the tool in the well at the depth that you wish to make a shot. Shot passes can be Recorded on Time or by using the encoder simulator. The true depth of the encoder is used as the shot depth.

Start a log pass. Allow sufficient time for the detectors to obtain a "background reading". Then click the **Start Ejection** control. Continue recording until the detectors have drop back to the previous background reading. Stop the log pass.

Log as many passes in this manner as desired.

The Shot Table will now reflect the information just recorded. If a single detector method was used, the times and the flow rates will be complete. If a dual detector method was used the pass will have to be correlated to calculate the proper time, and thus the flow rates, as described below.

27.2.2 Drag Runs

Normal procedure is to eject a tracer slug, then to drop down and Record Up until the slug passes, then stop the pass. Then drop back down and start another pass. Each pass is recorded as a separate entry into the shot table.

The normal calculations integrate the area between the detection level and the curve, so it is important to record the complete passing of the tracer material.
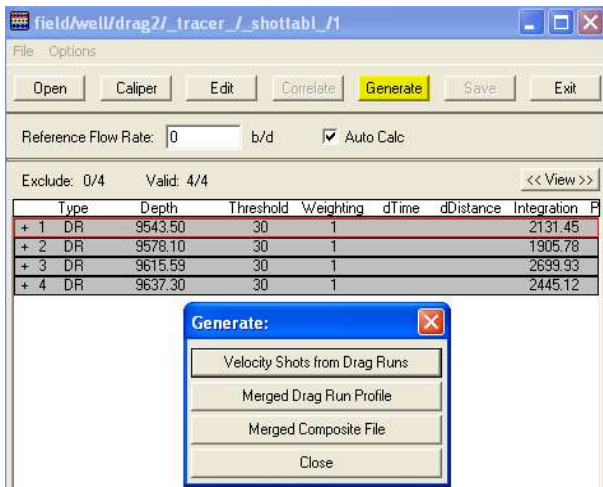

FIG: 27.6 Generate

FIG: 27.7 Generate Drag Run Profile

By clicking on the Generate button of the Shot table, all drag runs with a plus sign will automatically be merged into a single presentation. Selected annotations can be added for each pass. By using auto merge, curves from other passes, such as collars, temperature, or gamma, can automatically be added to the presentation.

By clicking on Velocity Shots from Drag Runs, records in the shot table will be generated with distances between runs. To get the times, each record will then have to be correlated.

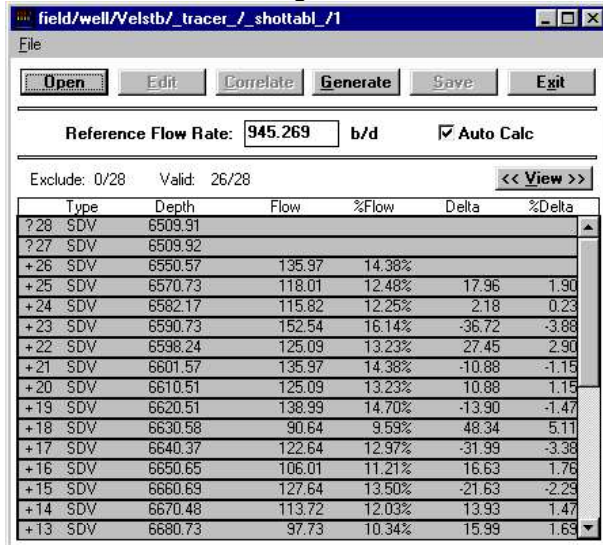### 27.2.3   Shot Table Editing, Correlation, and Flow Rate Log Generation

FIG: 27.8 Table flow rate

FIG: 27.9 Table Flow rate

Access to the shot table can be obtained through the Acquisition box and Editing Tool Configuration and choosing TREJCT and then clicking the Shot Table Button. It can also be accessed from the Utilities menu through the Tracer Interpretation selection.

The Shot Table shows the information taken each time a log pass was started. The first column contains a +, -, or ?. A + indicates a valid calculation. A – indicates that the record has been excluded from calculations. A ? indicates that correlation has not been done to determine time.The second column indicates the type of record. DR is drag run. DRV is velocity determined from drag runs. SDV is single detector velocity. DDV is dual detector velocity.

Other columns indicate depth of pass, flow rate, percentage of flow rate, change of flow rate, percent change of flow rate. By clicking on the view button, casing and tool dimensions can be viewed. Also available are detection times, integration, and dataset information.

Certain information for a given record can be edited by selecting the record and clicking the edit button or by double clicking on a record. Casing and tool dimensions can be changed. Weighting other than 1.0, adjusts the calculated output. . An unsatisfactory station can be removed from the flow rate calculations by removing the check mark beside **Include in calcs.** A record marked as reference will be considered to be maximum or 100% flow rate.
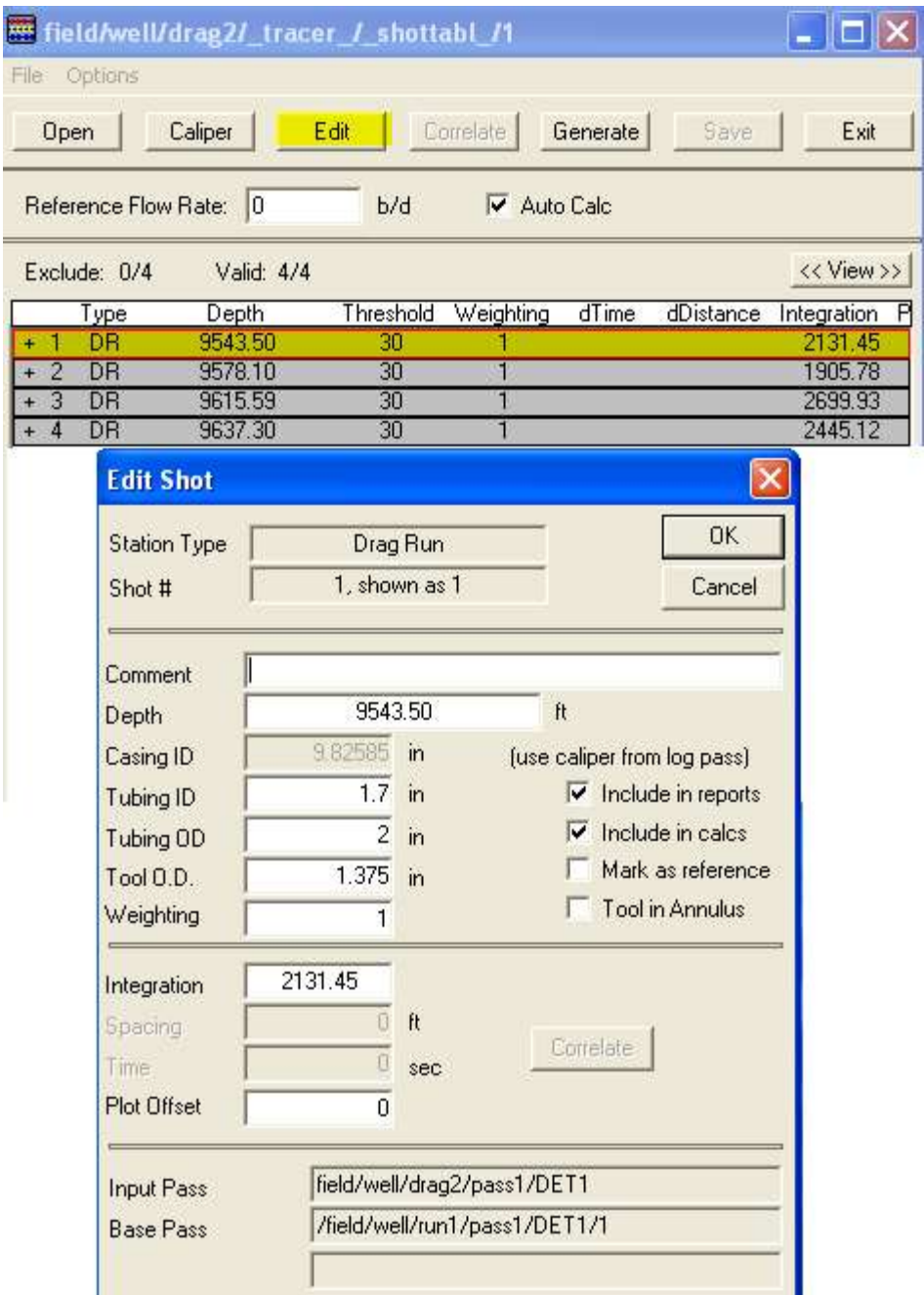

FIG: 27.10 Options

FIG: 27.11 edit shot

If a Dual Detector method or velocity shots from drag runs was used, the data recorded will have to be correlated before times will be computed. Shots that have not been computed will be tagged with a question mark (?). Click on a shot pass to select it, then click on correlate to open the correlation process box.
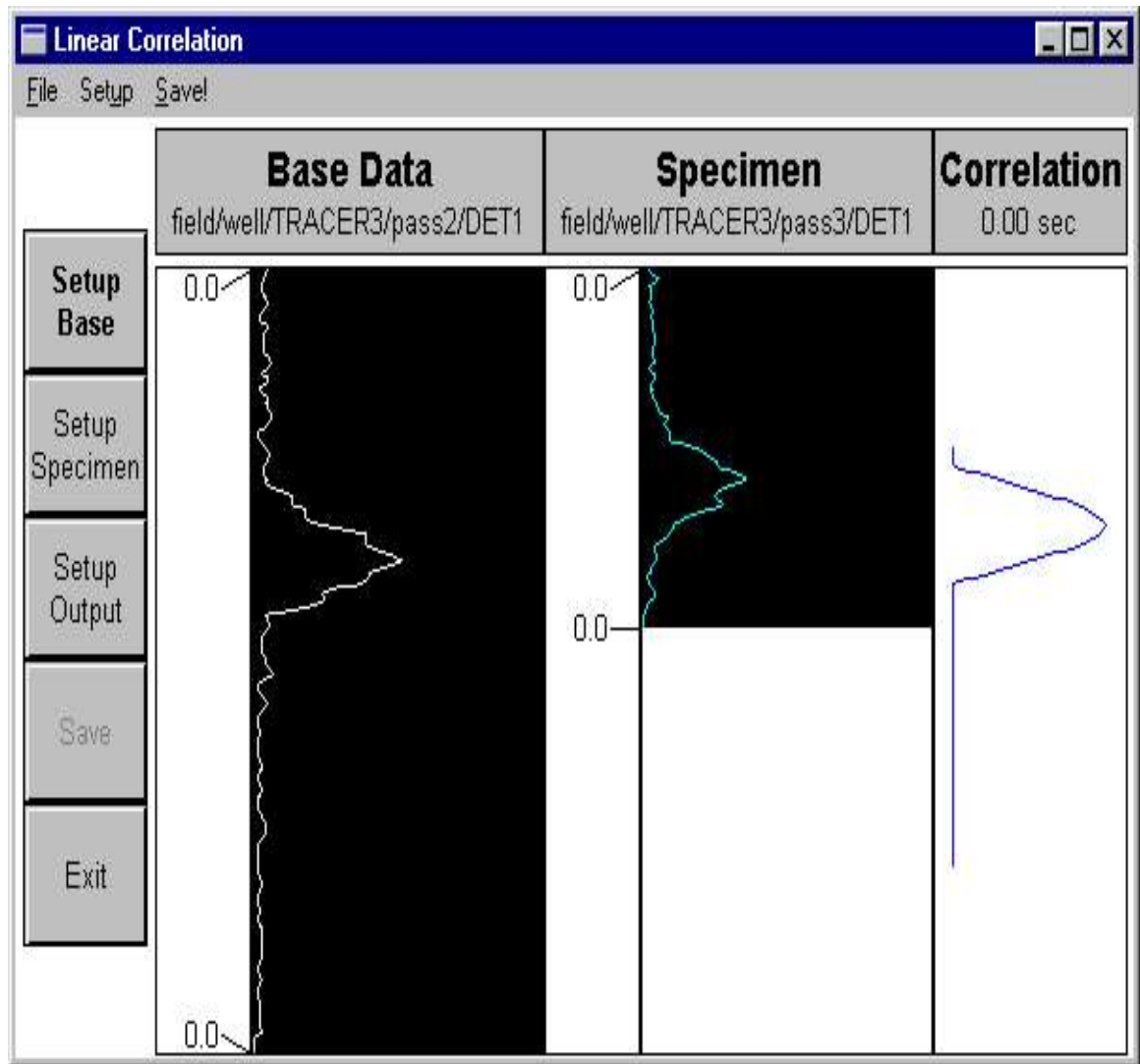
FIG: 27.12 Liner Correlation

Normally the selected base curve, specimen curve, and output curve will be setup. There are options to select different curves to be used if desired. On the base data, click and drag on the portion of the data that you think is valid, if the whole pass looks good, this step may be skipped. On the specimen data, click and drag on the portion of the data that is valid. The length of this data MUST be less than the length of the base data.

It is important that the whole response to the shot be selected since the calculations are done on the area under the curve and not on a given level.

Click Begin to compute the time. Click Save to retain the present calculations. Click Exit to return to the Shot table.

When all stations have been edited as desired, click on **Generate**. Choose Merged Composite File. Curves from a collar locator pass, a gamma ray pass, etc. may be added to the final presentation if desired. Finally when OK is clicked the flow rate presentation will be plotted out.

27.3 Service Specific - Tracer Survey

The Tracer service incorporates several special features that may require further explanation. The Warrior software attempts to calculate results from each pass of data as it is recorded or immediately afterwards.

27.3.1 Dual Detector Velocity

In **Dual Detector Velocity** mode the time displacement between the two curves is determined by a correlation technique. Any part or all of the data may be used to match the curves together. It is essential that complete event of the slug passing the detectors be recorded for this technique to be effective.

27.3.2 Single Detector Velocity

In Single Detector Velocity mode, the time from the ejector shot to a threshold crossing by the GR (or detector) curve is measured. If two detectors are in the tool string, the time measurement is made from the ejector shot to the first GR curve to cross the threshold.

27.3.3 Tracer

In **Tracer** the area between the designated GR (or detector) curve and either a baseline GR or a fixed level, is the primary measurement.

The results and other information are placed in a **Shot Table**. The contents of the shot table are used as a basis for the calculation of total and differential flow rates for display in tabular or log format.

When a Tracer survey is selected, **Edit/Tool Configuration/Tracer** brings up the **Tracer Configuration** window as shown below.
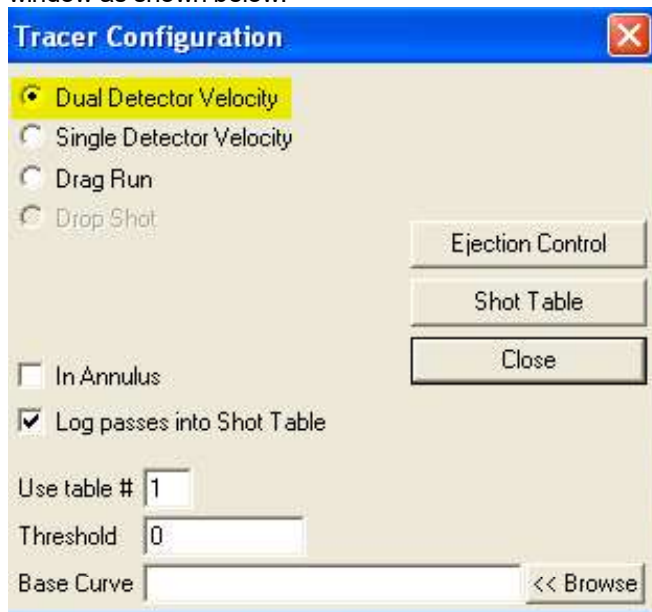

FIG: 27.13 Tracer Configuration

The user defines the type of survey to be run from a choice of Single or Dual Detector Velocity, or Tracer (Drop Run). This selection defines the type of on-line calculation that the software will attempt. If the survey is being run in the annulus the **In Annulus** box should be selected on order that the correct calculations be made.

If it is required that the passes be inserted into the current shot table the **Log passes into Shot Table** should be selected. This would be the normal case to actually record the results and is the default.

More than one Shot Table may be defined for each survey.

27.3.4 Drag Run

Drag Run option is selected the user is asked to define which detector is to be used.
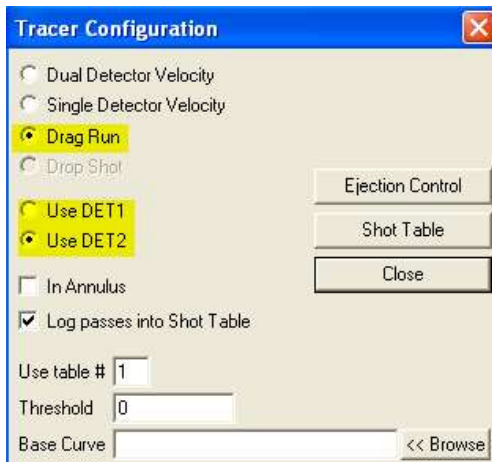
FIG: 27.14 Tracer Configuration

When two detectors are in the tool string and single detector velocity is selected the system will make calculations based on the first curve to cross the threshold.

When making calculations from the tracer passes (i.e. the area under the DET curve) it is necessary to define either a fixed threshold value or a baseline DET pass. The area under the DET curve and above the Threshold or

Base Curve is used to calculate the percentage of the original radioactive material passing the detector and the flow profile.

This information is defined in the **Threshold** or **Base Curve** fields.

To display the current **Shot Table** and/or **Tracer Ejection Control** window click on the appropriate button.

FIG: 27.15 Tracer Ejection Control

When running the service with the SDS interface panel the operator has the option to control the run time of the ejector motor from the Tracer Ejection Control window.

The length of time for each motor run is entered in the **Duration** dialog box. Clicking on the **Start Ejection** button changes the polarity of the line power for the time set in the Duration box.

27.3.5   Additional Squelch

The **Additional Squelch** field allows the user to set an additional dead time period in the DET curves after the ejector motor has run in order to avoid line noise appearing on the log. The time needed depends on various factors and is best set by trial and error.

The Tracer tool software module generates a curve called **EJECT** which shifts one unit to the right for the period of the ejection, thus indicating the occurrence and duration of the ejector motor run.

The survey is currently run by logging with the internal encoder simulator, however the actual depth is recorded as a curve named **ADEPTH**. This curve may be presented on the log in curve or tabular form, in order to indicate movement of the tool during the survey.

The elapsed time from the start of the survey is available via a curve named **ELTIM**.