

Using Flow Control with the HEAD Recorder

The HEAD Recorder, which is included with ArtemiS as of version 8.0, is a data acquisition software program that features an editable Flow Control function. This function allows complex program sequences to be predefined, which can then be performed automatically. Fully automated procedures are possible as well as user interactions via dialogs and buttons. The program sequence is configured in an editor. This Application Note will help you get started using the editor. The descriptions refer to the HEAD Recorder version 2.0. The general proceeding is also applicable to older or newer versions. However, the number of available control blocks may vary in this case.

Introduction

A measurement sequence in the HEAD Recorder is defined in the Flow Control module. The default sequence includes the following elements: recording, insertion of the recording into an ArtemiS project, incrementing the file name, and next recording. This default sequence (standard program) normally runs automatically after each program start with no need for manual settings to be configured by the user.

In order to adapt the workflow to specific measurement tasks, it is possible to edit the standard program. To do so, launch the Flow Control editor via the "Tools" menu. Upon opening, the editor window shows the default sequence "Standard prog. 1" (see figure 1).

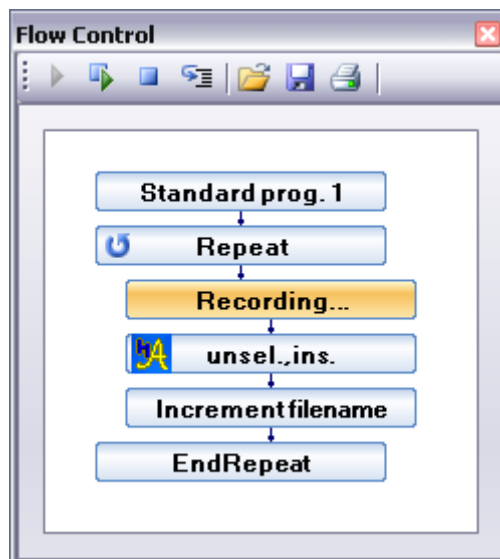



Figure 1: Flow Control editor with example program

This standard program contains the elements listed above in the form of blocks: "Recording", insertion into an ArtemiS project ("unsel., insert"), "Increment filename". In order to start a new

recording after these steps, the blocks are enclosed by a loop defined by the “Repeat” and “EndRepeat” blocks.

Clicking on the Pause icon  stops the program and allows it to be modified (edit mode). For this purpose, the left side of the window shows a list of all possible control blocks available for programming (see figure2).

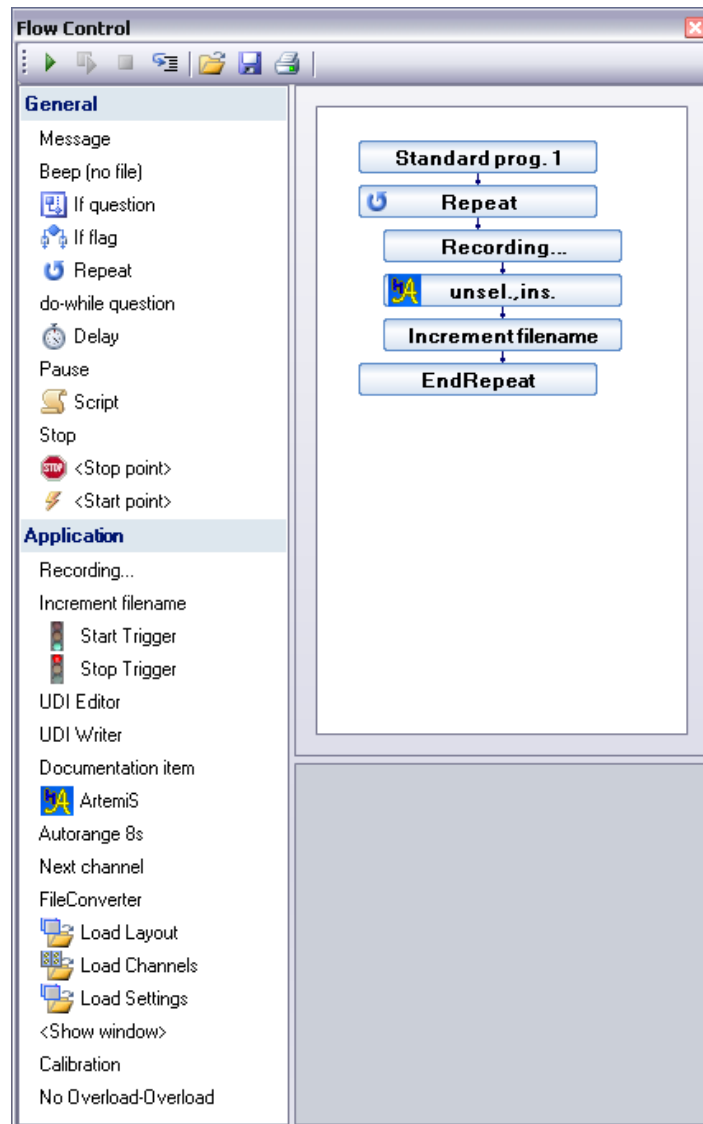





Figure 2: Flow Control in edit mode


These control blocks can be dragged with the mouse and dropped into the program sequence shown on the right side. Once a control block has been integrated into the program sequence, its properties can be edited in a properties dialog, which can be opened via the context menu of the respective block. The properties are displayed in the lower right area of the Flow Control window as soon as a block is clicked on with the left mouse button. A “Repeat” block, for example, allows the number of repetitions to be specified.

If you notice after starting that your program sequence contains an error, you can restore the standard program (default sequence) at any time with the “Reset Flow Control” command in the “Tools” menu. This can become necessary, for example, if you have programmed a faulty loop

function. However, note that resetting the Flow Control deletes the entire program you created. Therefore it is advisable to save intermediate versions of your work while you are programming. To do so, click on the Save icon . You can reload a saved program with the Open icon . The Start icon  starts the program sequence you created. Besides the possibility to save your Flow Control program with the Save icon, the current settings are also saved along with the current workspace. As soon as the workspace is reloaded when the software is started the next time, the edited Flow Control sequence is started as well.¹

Example of How to Create a Custom Flow Control Program

In the following, we will create an example program that controls the measurement workflow as follows: A measurement is performed, which is then inserted into an ArtemiS project. After the third measurement, the calculation is started in ArtemiS, which, in addition to the normal analysis, also determines the average of the three recordings. Furthermore, after each measurement the user is asked whether he accepts the measurement.

First, we should change the name of the program sequence and save the program. After clicking on the Save icon , a new name for the sequence can be entered. For consistency, it makes sense to also change the label "Standard prog. 1" on the top block of the program. This can be done in the properties dialog of this block, which can be opened via the context menu (see figure 3). Click on the text field "Standard prog. 1" to edit the name. After closing the properties dialog, the new name is displayed on the top block.

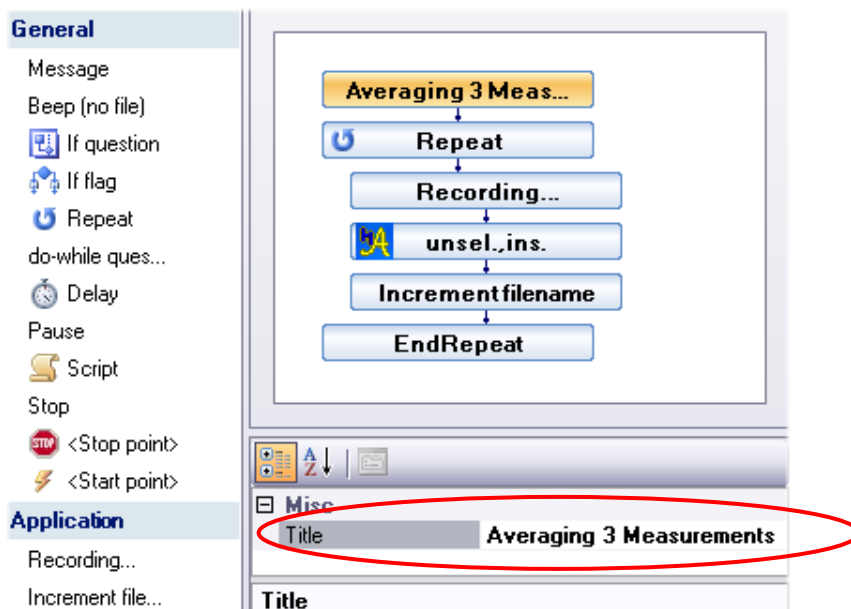


Figure 3: Changing the program title from "Standard prog. 1" to "Averaging 3 Measurements"

In the next step, the properties of the Repeat block are modified. In the default case, the "Infinitely" option is active in the properties of the block, which causes the loop to be repeated indef-

¹ For this functionality „Automatic Save&Load“ in the „File“ menu must be selected.

initely. To achieve a limited number of repetitions, disable the “Infinitely” option and enter the desired number of repetitions (“3” in the example) in the corresponding field. Figure 4 shows the modified properties dialog.

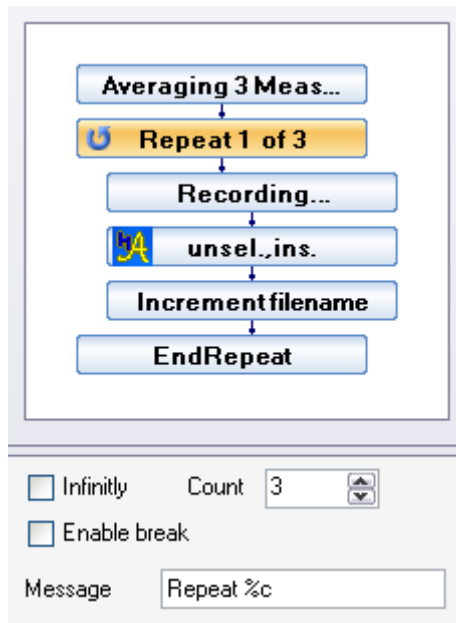


Figure 4: Modified properties dialog of the Repeat block

To implement a pop-up question window that asks the user whether he accepts the measurement, we need to include the block “do-while question” into the program sequence. To do so, drag and drop this block from the selection list on the left side into the program sequence on the right side. For a correct placement, you can drag the block onto the “Recording” block. Once you release the left mouse button, two blocks appear in the program sequence: “do” and “repeat”. Together, these two blocks form a loop, which is repeated until a certain condition is fulfilled; for example a click on a button by the user. In our example, we want the recording to be repeated until the user accepts it. Therefore, we must move the recording block to a position enclosed by the “do-repeat” loop. Rearranging the order of the blocks in the program is possible via drag and drop, too. Note that a block is always placed *after* the block you drag it onto. In the properties dialog of the “OK” block we can now modify the text of the pop-up window. For our example, a suitable text would be “Measurement OK?” with the possible answers “Yes” and “No”. Figure 5 shows the properties dialog.

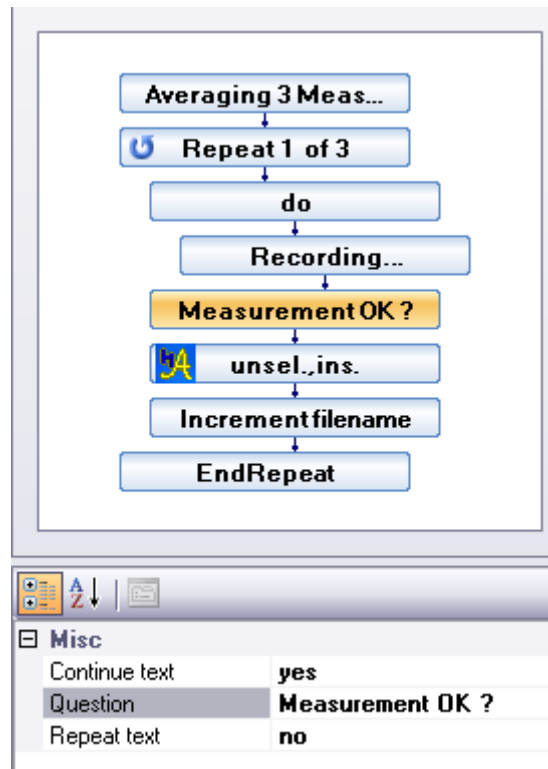


Figure 5: Question text of the “do-repeat” block

Once a recording has been accepted by the user, it should be inserted into an ArtemiS project automatically. This function is performed by an ArtemiS block. The default program already contains such a block, which can be reconfigured accordingly in the properties area. To have the recordings inserted into the current ArtemiS project, set all functions except “Insert new record” to “False” (see figure 6). After this modification, the ArtemiS block will insert all new recordings accepted by the user into an ArtemiS project.

Misc	
Calculate	False
InsertFolder	
InsertInMarkAnalyser	False
InsertNewRecord	True
ProjectPath	
StartAutomatically	False
UnselectMarks	False
WindowAction	Nothing

Figure 6: Properties dialog of the ArtemiS block

The ArtemiS block configured this way inserts the recordings the user has accepted into an ArtemiS project. So the program we created so far performs a series of three measurements, where the user can decide after each measurement whether it was OK or must be repeated. Once the user has accepted the measurement, it is automatically inserted into the active ArtemiS project. Before starting the measurement, the project must be configured so that the calculation includes averaging. For this purpose, a suitable element is inserted into the Statistics pool of the project. Figure 7 shows an example for such a project.

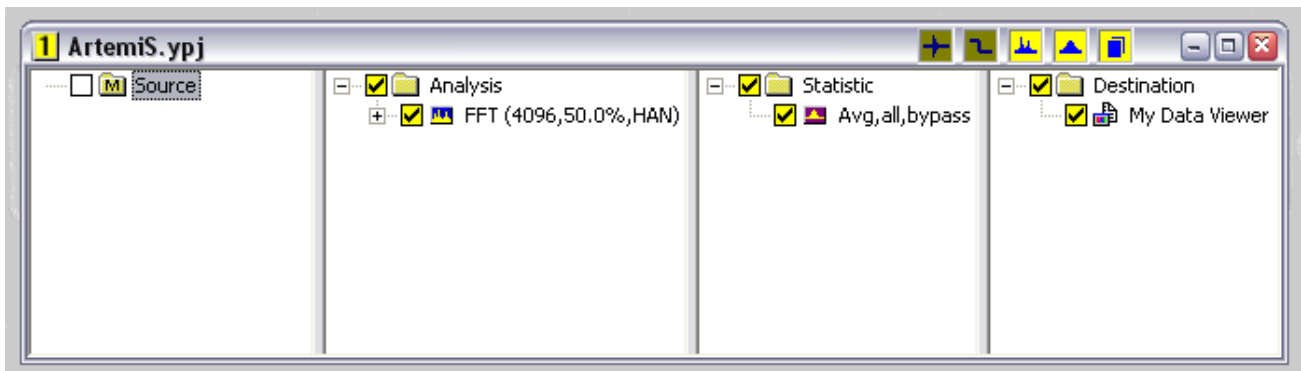


Figure 7: Example ArtemiS project for averaging an FFT analysis

In the ArtemiS project shown above, first an FFT analysis is performed, and then the results of the analysis are averaged and displayed in a Data Viewer. The Insertion and selection of the desired sound files is handled by the Flow Control system of the HEAD Recorder. In addition, the Flow Control program also starts the calculation. However, the desired analysis and the averaging function must first be configured in the corresponding ArtemiS project. The project shown in figure 7 is just an example. Of course, you can also use other analysis and averaging functions as well as filtering functions. This is defined by the user in the configuration of the active ArtemiS project.

Once a complete ArtemiS project exists, Flow Control editing can be continued. The default program, on which this example program is based, already contains the next required block. It is the "Increment filename" block. Once a measurement has been accepted by the user and inserted into the current ArtemiS project, the Flow Control program automatically increments a number in the file name, so a new measurement can be made and saved without overwriting the previous results. In the default settings for this block, the "Increment" option is active, which can be used for this example without modification.

The next block that follows is "Endrepeat", which is already included in the default program as well and can be used as it is. Together with the "Repeat 1 of 3" block, this block defines the loop to be repeated. As soon as the "Endrepeat" block is reached, the program flow returns to the position of the "Repeat 1 of 3" block.

When the three measurements have been recorded, ArtemiS should start the calculation defined in the preconfigured project. This is achieved with an additional ArtemiS block, where we activate the "Calculate" parameter by setting it to "True" (see figure 8).

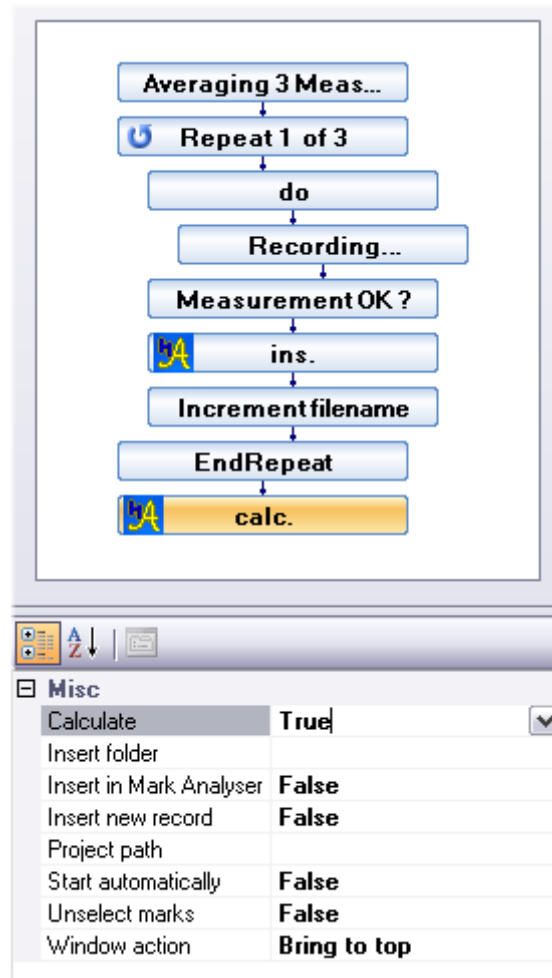




Figure 8: Properties dialog of an ArtemiS block that starts a calculation

In addition, we should set the “Window action” parameter to “Bring to top”, so the ArtemiS window is automatically displayed in the foreground and we can immediately see the calculation results.

Once the calculation is done and has been displayed, the Flow Control program should restart. To achieve this, we add another “do-while question” block at the end of the program. Furthermore, another ArtemiS block is required at the beginning of the program, which deactivates all sound files and hides the ArtemiS window in the background. This is necessary to prevent the already evaluated sound files from being included in the averaging again. In addition, the ArtemiS window is hidden, so the Recorder interface appears in the foreground again and can be operated during the recording.

The figures 9 and 10 show the properties dialogs of the additional blocks. Figure 11 shows the complete Flow Control program.

After the new Flow Control program has been completed, it should first be saved by clicking on the Save icon . To start the program and to use your custom Flow Control, click on the Start icon .

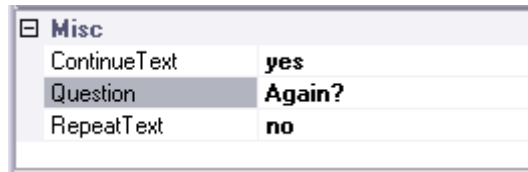


Figure 9: Properties dialog of the final "do-repeat" block

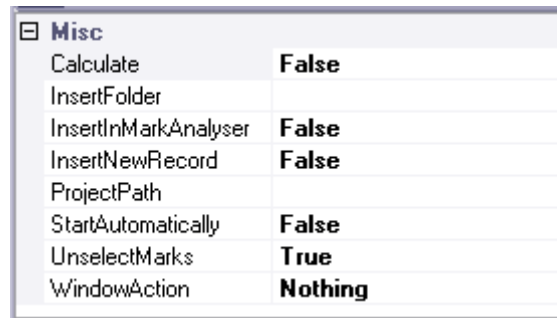


Figure 10: Properties dialog of the additional ArtemiS block



Figure 11: The complete Flow Control program example

Of course, the HEAD Recorder can also be used as a stand-alone software without ArtemiS. In that case, the ArtemiS blocks described in the above example cannot be used. All other blocks are available as described.

Automatic Triggering of Recordings

Of course, the Flow Control function can also be used to automate the recording of triggered measurements. For this purpose, the Flow Control system provides a block for the start trigger and another for the stop trigger. These blocks are labeled with green or red traffic light icons, respectively.

In the following example, we will create a Flow Control program that automatically records an engine run-up (1000 to 6000 rpm) and a run-down (6000 to 1000 rpm). For a better overview, we will include the triggering in the standard (default) program and not in the more complex Flow Control example we created above.

To restore the default Flow Control program, you can use the "Reset Flow Control" command in the "Tools" menu. Before doing this, make sure to save the Flow Control program you created before. For editing the trigger conditions, the Trigger window must be open in addition to the main Recorder window. If the Trigger window is not shown in the current Recorder configuration, it can be brought up with the keyboard shortcut [Ctrl]+[T] (see figure 12).



Figure 12: HEAD Recorder main window and trigger window

The standard program now can be extended as follows: From the block list on the left first drag a *Stop Trigger* and then a *Start Trigger* to the Flow Control program on the right (see figure 13).

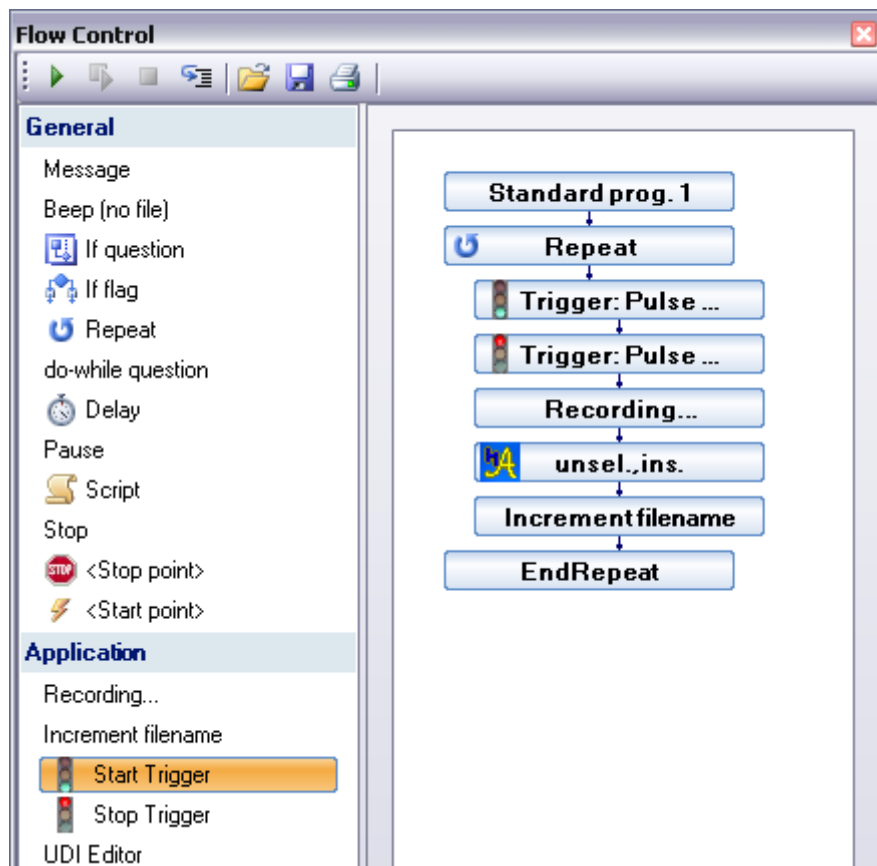


Figure 13: Standard Flow Control program with triggers added

In order for the triggers to be applied to the recording, the trigger blocks must be placed *before* the recording block. The order of the start and stop trigger doesn't matter. Both trigger blocks equally refer to the subsequent recording.

Now we will use the Trigger window to specify the desired trigger conditions. In our example, the recording is to be triggered by the pulse channel. The start trigger should be at 1000 rpm, the stop trigger should be at 6000 rpm.

For the run-up, triggering should occur on the rising edge. Once the trigger conditions are entered in the Trigger window, these settings must be transferred to the Flow Control program. To do so, use the command "Get values from trigger", which can be accessed by right-clicking on the respective trigger block. Figure 14 shows the trigger conditions and the Flow Control program.

Once the trigger conditions have been transferred, they can be verified in the tool tip of the respective trigger block.

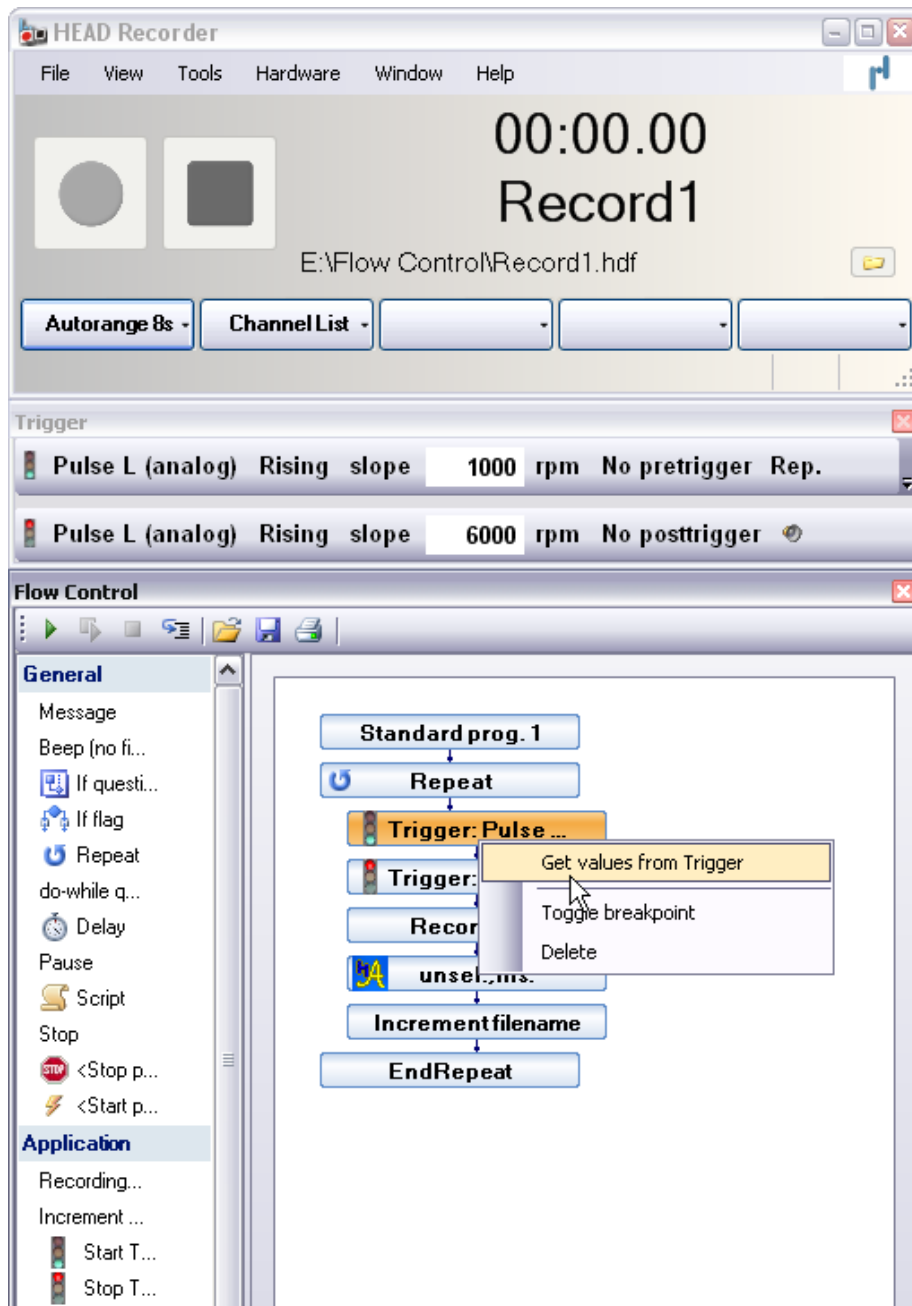


Figure 14: Trigger settings for the recording of a run-up

In order to record the run-down automatically as well, the following blocks must be copied: start trigger, stop trigger, recording block, ArtemiS block and the block for incrementing the file number. To copy the blocks, drag and drop them while keeping the [Ctrl] key pressed. The copied blocks must be inserted after the existing "Increment filename" block.

To modify the trigger conditions for the run-down, first enter the modified conditions in the Trigger window and then transfer them to your program with the "Get values from trigger" command. The complete program with the trigger conditions for the run-down is shown in figure 15.

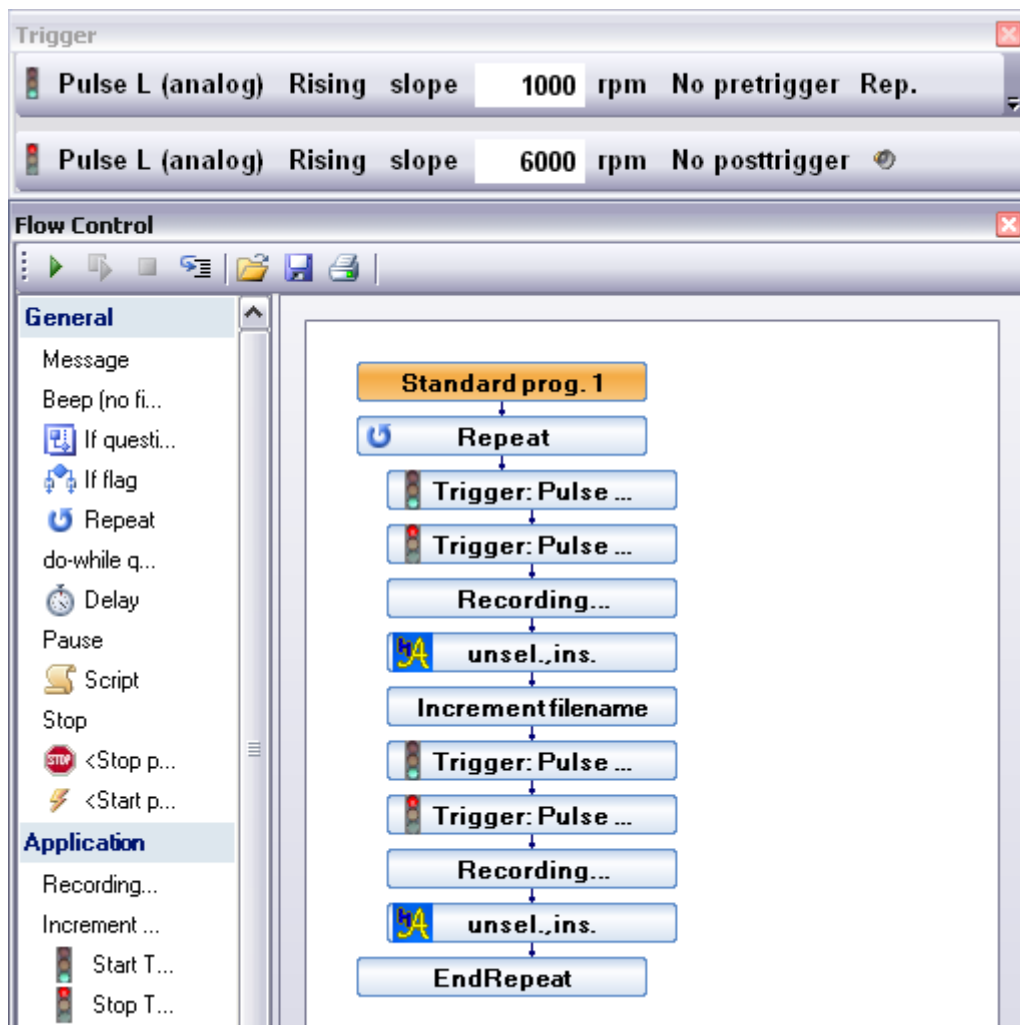


Figure 15: Flow Control program for the automatic recording of a run-up and a run-down

To record the run-down immediately after the run-up with no need to click the Record button again, you can set the parameter "Start immediately" in the properties dialog of the second recording block to "True".

Once the Flow Control program we configured this way is activated with the Start icon, the recording must be started once by the user by clicking on the Record button. Afterwards, the recording of a run-up and a run-down within the specified rpm limits is performed automatically. Each of the two recordings is inserted into the Source pool of the active ArtemiS project. Afterwards, the respective file name is incremented automatically.

Of course, the HEAD Recorder can also be used as a stand-alone application without ArtemiS. In this case, the ArtemiS blocks used in the example are not available. All other blocks can be used as described.

More possibilities for using the Flow Control function as well as a detailed description of the available blocks can be found in the online help of the HEAD Recorder, which can be opened with the function key [F1].

Do you have questions for the author? Please contact us at imke.hauswirth@head-acoustics.de. We look forward to your feedback!