# WINDMILL Streamer Manual

**Windmill Software Limited** 

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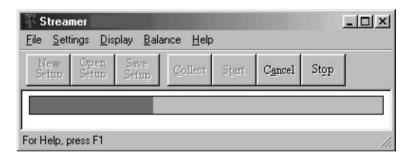
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# **Using Streamer**

#### 1.1 Introduction

Streamer collects data from instruments and devices at speeds of up to 100 kHz. It can stream data from analogue inputs directly to the computer's hard disk. Alternatively, for transient capture, Streamer saves data in memory and copies it to disk when collection has finished.



During collection Streamer can display charts and tables of data. If you need more sophisticated presentation then data can be shared with other Windows applications like Excel, using dynamic data exchange (DDE).

This Manual comprises two chapters. Chapter 1 describes installing Streamer and using it to collect data. Chapter 2 covers presenting data: charts, tables and dynamic data exchange.

# 1.2 Installing Streamer

Install Streamer along with the other Windmill programs. See Chapter 1 of the *Windmill User Manual* for details.

At the end of installation the Windmill Configuration program, ConfIML, runs. Here you need to press the Add button and select your hardware. A list of questions about device settings will be displayed. You must provide answers to all the questions. If in doubt press the Help button to bring up suitable answers to the questions, or refer to the *Streamer with Microlink Hardware Manual*. The Default button will reset all the answers to correspond with the hardware manufacturer's default settings.

After using ConfIML run the SetupIML program, as detailed in the Windmill User Manual. To maximise data logging speed make sure you

- Disable unused channels.
- 2. Turn off auto-ranging.
- 3. Turn off the low-pass filter.

For more on using SetupIML with Streamer see the Streamer with Microlink Hardware Manual.

# 1.3 Getting Started

To collect data you need to:

- 1. Configure Streamer by creating a new setup (Section 1.4).
- 2. Press the Collect button and create a data file (Section 1.5).
- 3. Press the Start button (Section 1.7).

You can save your choices and restore them the next time you use Streamer.

# 1.4 Configuring Streamer by Creating a New Setup

The first time you run Streamer, start by pressing the New Setup button. This takes you through the steps needed to configure Streamer, namely:

- 1. Configure the hardware (Section 1.4.1).
- 2. Set the format of the data file (Section 1.4.2).
- 3. Set how to trigger data collection (Section 1.4.3).
- 4. Set the speed of data collection, maximum number of scans and inter-channel interval (Sections 1.4.4, 1.4.5 and 1.4.6).

You can save your choices and restore them the next time you use Streamer.

You're now ready to create a data file, as detailed in Section.1.5.

#### 1.4.1 Configuring the Hardware

The data acquisition hardware is configured by sending it the hardware setup file (\*.ims), which you created with the SetupIML program. When you press the New Setup button the first thing to do is select the hardware setup file to send.

When you load the setup a message box might appear, telling you that either a low-pass filter or auto-ranging was specified in the setup file. For auto-ranging you'll have to return to SetupIML and pick an actual range (auto-ranging is too slow for Streamer). For a low-pass filter you will only be able to run Streamer slowly, otherwise the filter will introduce interference between channels

When you have loaded the setup file you can choose the format of the data file.

#### 1.4.2 Choosing the Format of the Data File

You are asked to choose the data file format during the New Setup process. To later change the format select Output file format from the

Settings menu. (If you don't want to save data then remove the tick from the Record Data to Disk box.)

Streamer can save data in three kinds of file: IMX, Famos or ASCII text. Which you pick depends on how you plan to analyse your data.

#### **IMX - Native binary format**

Data is written to disk directly from the hardware in a multiplexed binary format. This is the most efficient format.

#### Famos - Linearised 4 byte reals

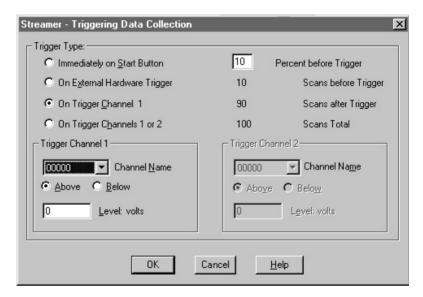
Data is saved to disk in a format that is optimised for the Famos data analysis package. Data is not written directly to disk, however. Streamer stores data in memory in the computer until the collection is complete. It then converts the data to engineering units and writes it to disk. Because the data is temporarily stored in the computer memory, Streamer is limited in the amount of data it can collect. This limit is variable and depends on the amount of free virtual memory.

#### **ASCII - Suitable for import into Excel or Replay**

Most programs, including Microsoft Excel, accept data in ASCII format. As with Famos format, Streamer stores data in memory until collection is complete. It then converts the data to engineering units and writes it to disk. Because the data is temporarily stored in the computer memory, Streamer is limited in the amount of data it can collect. This limit is variable and depends on the amount of free virtual memory.

#### 1.4.3 Triggering Data Collection

The third step in the New Setup process is to choose how data collection is triggered. (To later change the trigger select Starting and Stopping from the Settings menu.)



Data collection will start after you press the Start button when your chosen trigger conditions are met. The trigger may be from an external trigger input on the hardware device, or generated in Streamer itself.

The trigger defaults to that specified in the hardware setup file (\*.ims). However, your selections here override that setting.

Choose to begin streaming data:

- 1. Immediately on pressing the Start button in Streamer.
- When your data acquisition hardware receives a signal at its external trigger input. (See the Hardware Manual for details of connecting an external trigger.)
- 3. When the voltage level at a designated input channel crosses your chosen threshold.

4. When the voltage levels at two designated input channels cross your chosen threshold.

For level triggering in points three and four:

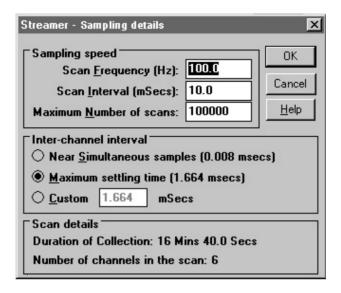
- Select "On Trigger Channel" then choose the input(s) to act as the trigger channel.
- Select an input channel from the Channel Name list.
- · Type in a voltage level
- Select whether post-trigger collection should start when the channel goes above or below this level.

Level triggering also lets you capture **pre-trigger data**. This is useful when you want to see what happened before and after an event. To do this just enter the proportion of data to collect before the trigger occurs, into the Percent before Trigger box. The number of pre- and post-trigger scans are shown. (To set the total number of scans collected select Sampling details from the Settings menu.)

Selecting to collect pre-trigger data enables **transient capture**, where data is saved in memory and copied to disk only after collection is complete.

### 1.4.4 Setting the Speed of Data Collection

The default speed is specified in the hardware setup file (\*.ims). You can change this during the New Setup process, or later by selecting Sampling details from the Settings menu.



The sampling speed can be expressed as the *scan frequency* or the *scan interval*. A scan consists of 1 reading from each enabled channel. The scan frequency is the number of scans taken each second. The scan interval is the time between the start of one scan and the start of the next. Changing either value causes the other to be recalculated.

Note that if you specified an external clock in SetupIML, the scan frequency and interval are greyed out and the external clock pulses used to time the scan.

In this dialogue you can also choose the maximum number of scans and inter-channel interval.

# 1.4.5 Setting the Maximum Amount of Data to Collect

You can choose how much data to collect, specifying it as a number of scans. (A scan consists of 1 reading from each enabled channel.) Do this either during the New Setup process, or by selecting Sampling details from the Settings menu. Erase the current number and type in a new one.

#### 1.4.6 Setting the Inter-Channel Interval

You can choose the time between sampling one channel and the next. This is called the *inter-channel interval* or *settling time*. Do this either during the New Setup process, or by selecting Sampling details from the Settings menu.

To set the lowest possible inter-channel interval choose Near Simultaneous samples. If you have signals of very different sizes, or signals from high impedance sources, you will need a longer channel interval as the hardware requires time to settle between readings. In these cases choose Maximum settling time.

If you want to specify your own inter-channel interval, make sure it's small enough to allow all enabled channels to be read within the time allowed for each scan (the scan interval). If you enter a channel interval that is too long, Streamer will not respond to the OK button.

Note that if you enabled a low pass filter in SetupIML you need an inter-channel interval of at least 3 milliseconds, otherwise there may be interference between channels.

# 1.5 Creating a Data File

Before you can collect any data you have to press the Collect button. When saving to disk this lets you create a data file or directory. The type of dialogue that appears depends on the type of file format you've specified (Section 1.4.2).

#### **ASCII and IMX (Binary) Files**

Data from all channels are stored in one file. Enter a name and Streamer will automatically give the file the appropriate extension, .txt for ASCII or .imx for binary.

#### **Famos Files**

Data from each channel is stored in its own file. The files are named according to the channel names. You need to specify a directory (folder) in which to save the files. It is often convenient to organise your data in a series of sub-directories. If the

sub-directory you choose already exists then any data that is already stored there will be overwritten and lost.

Choose OK to create the file or directory. The Start and Cancel buttons are enabled and the Collect button disabled. (To re-enable the Collect button, and discard your data file settings, press Streamer's Cancel button.)

If no dialogue appears when you press the Collect button then saving to disk has been disabled (Section 1.5).

# 1.6 Viewing Data without Saving to Disk

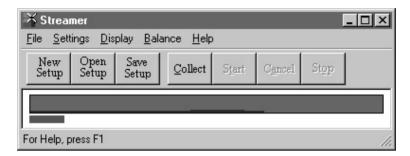
You can stream data without saving it to disk, giving just a visual display. Select Output File Format from the Settings menu. Do this before pressing the Collect button.

Clear the check box and choose OK. Data logging will be turned off. You'll probably want to see either a graphical or numerical display of the data, or indeed both.

Note that if you choose to view data without logging, you must still press the Collect button in order to enable the Start button. However, the Collect dialogue will not appear.

# 1.7 Starting to Collect Data

Press the Start button to begin streaming data. Collection will start when the next trigger is received (immediately if you haven't enabled triggering). The main Streamer window shows the progress of collection.



If you have selected to take readings before a trigger occurs, the red line shows the pre-trigger data captured. When you start sampling the blue progress bar advances to the end of the red trigger line and waits there until a trigger is received.

The Start button is not available until you have either created a new Streamer setup or restored an existing setup, and pressed the Collect button.

# 1.8 Stopping Data Collection

You can stop data capture by:

- 1. Pressing the Stop button.
- 2. Waiting until the requested number of samples have been collected (Section 1.4.5).

# 1.9 Balancing Strain Gauge Bridges

The output from unstrained bridges can be large in comparison to the changes that would be caused by strain. This requires a wide voltage range, the changes consequently being measured with poor resolution. The balancing facility solves this problem.

When you select Balance from Streamer's menu bar, a suitable voltage is subtracted from the input signal to make the bridge output read approximately zero. This subtraction will remain in force until you

re-select Balance, so all future readings are as changes relative to the new zero level.

The voltage subtracted is actually a fraction of the bridge excitation voltage, so changes in the excitation do not affect the balance.

# 1.10 Saving Streamer's Settings

You can save the details you've specified in Streamer, including any display window settings. You can later reload these settings, quickly restoring Streamer to where you left it.

Select Save Streamer Setup from the File menu, or press the Save Setup button. The details are saved in a \*.wst file.

# 1.11 Restoring Streamer's Settings

To restore previously saved setting to Streamer either select Restore Streamer Setup from the File menu, or press the Open Setup button.

Select a \*.wst file. All the previously saved settings, including the hardware setup file, will be restored, and any open windows re-opened.

# 1.12 Resizing, Moving and Minimising

You can resize, move and minimise Streamer in the normal Windows way. When you minimise Streamer, all its display windows will also be minimised.

Moving windows may lead to buffer overflow (where data is entering the hardware buffer faster than Streamer is taking it out), which causes streaming to stop.

# 1.13 Closing Streamer

If necessary stop streaming by pressing the Stop button. Select Exit from the File menu. Streamer, and all its display windows, will close.

# 1.14 Maximising the Data Collection Rate: Preventing Buffer Overflow

Buffer overflow occurs when data is entering the hardware buffer faster than it is being taken out and written to disk. This may be because the data flow into the buffer is too fast and the collection rate is not sustainable, or because of a temporary reduction in the rate at which data is taken out of the buffer; for example when another application accesses the disk.

A buffer overflow means that collection will stop. One way of dealing with this is to reduce the data acquisition rate, but in many cases this is unacceptable because the required sampling rate is determined by the nature of the signals you are monitoring. To maintain your chosen sampling rate, reduce the workload by taking one or more of these steps.

- Use SetupIML to disable any channels that do not need to be recorded.
- 2. Do not display the Chart, Data View or Info windows.
- 3. Run Streamer on its own with no other Windows applications running.
- 4. Defragment the disk to which you're streaming, using the program supplied by your operating system (for example Disk Defragmenter in the Windows System tools).

If you need to display the data graphically or numerically

- 1. Display only the channels you need to see.
- 2. Keep the display window as small as possible.
- 3. Don't update the display window too often.
- 4. Turn off the chart grid.

# **Displaying Data**

#### 2.1 Introduction

Streamer has several options for displaying data in real-time.

- 1. It can chart data.
- 2. It can show data numerically.
- It can use dynamic data exchange (DDE) to transfer data to other programs like Excel.
- 4. It can show information about its settings

Be aware, though, that displaying data will slow down Streamer.

# 2.2 Charting Data

You can chart the data as it is being collected by Streamer. Select New Chart from the Display menu to open Streamer's Chart window. Here you can display data from up to 8 channels. You can show two charts, each with its own channels, speed and display settings. This means that you can compare long and short term trends.

In the Chart window you can

- · Select channels to chart
- · Select superimposed or separate traces
- Select colours
- Turn a grid on
- Select the Y axis range
- Select the X axis labels
- Select the charting speed
- · Select the update rate

Open the Chart window, and configure it to you liking, before pressing the Collect button in the Streamer window. You cannot change any of the settings once data streaming has begun.

Charting automatically starts and stops as streaming starts and stops.

#### 2.2.1 Selecting Channels to Chart

You can chart up to 8 channels in one window. To choose which select the Chart window's Channels menu.

#### **Connecting channels**

The dialogue box shows all the channels available in the loaded hardware setup. Initially they are unconnected and listed in the left hand list box. To connect a channel either select it and press the Connect button, or double-click the channel. It will now be displayed in the right hand Connected Channels list box.

#### **Disconnecting channels**

To disconnect a channel either select it from the right hand box and press the Disconnect button, or double-click the channel. It will swap back to the Unconnected Channels box.

### Connecting all channels

When 8 or fewer channels are included in the setup you can connect them all at once by selecting the Connect All button. This button is greyed out if there are more than 8 channels.

Choose OK. The channels in the Connected Channels box are linked to Chart and will be graphed when you start streaming data. The channels will be in the same order as they are in the Connected Channels list.

After connecting or disconnecting channels the paper advances to a new page and the Chart is cleared of any previous graph.

You should connect channels before trying to set the other chart details.

#### 2.2.2 Selecting Superimposed or Separate Traces

The chart can be drawn either with traces from all channels superimposed on 1 Y axis or each trace completely separate.

Select Display from the Chart's menu bar. Choose either Separate or Superimposed traces.

#### 2.2.3 Selecting the Colours of the Traces

Select Display from the Chart's menu bar. To change the colour of a trace click on the arrow at the right of the colour box and select a new colour from the list

Press the Default button to reset the trace colours to their default values, namely:

Separate traces—All trace colours the same as the first one Superimposed traces—All trace colours different

Note that you should connect channels to the Chart window before trying to select colours.

#### 2.2.4 Turning the Grid On and Off

You can choose whether or not a grid is displayed on the chart.

Select Display from the Chart's menu bar then click on Grid On or Grid Off

# 2.2.5 Selecting the Y Axis Range of the Chart

Select Ranges from the Chart's menu bar. One of two Range dialogue boxes appears depending on whether you chose separate or superimposed traces (Section 2.2.2).

The range of input values covered by each trace is defined by a maximum and a minimum value.

#### Separate Traces

To set the chart range to the same as the channel range, check the "Auto" box (a tick is displayed).

#### Superimposed Traces

To set the chart range to encompass all the channels' ranges, check the "Select best fit values" box.

The maximum and minimum values of the range will be displayed in the edit boxes. To set your own customised range type your chosen maximum and minimum values into the edit boxes.

The "auto" and "best fit" ranges are rounded to sensible values, -10.24 to +10.24 is rounded to -11 to +11 for example, so a full scale input may not appear right at the edge of the chart.

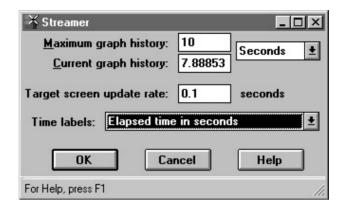
The range limits are used as Y axis labels on the graph, unless the window is too small to display them.

Changing the range causes the paper to advance to a new page.

Note that you should connect channels to the Chart window before trying to set ranges.

#### 2.2.6 Setting the Speed of Charting

Select Speed from the Chart's menu bar.



The speed of charting is specified as "graph history". The maximum graph history is the amount of data that can be displayed if the Chart window is maximised to fill the whole screen. The current graph history is the amount of data that can be displayed in the current window. You may specify a time in either of these boxes and the speed of charting will adjust accordingly. Changing a value in either box will automatically update the other.

If you are using an internal clock (as opposed to an external clock, defined in SetupIML) you can specify the chart history in hours, minutes or seconds. If you are using an external clock the software cannot determine the exact sampling times, so the history is specified as a number of samples.

#### 2.2.7 Setting How Often to Update the Chart

You can choose how often the chart is updated. Select Speed from the Chart's menu bar.

The smaller the value of the target update rate the smoother the scrolling.

#### 2.2.8 Selecting the X Axis Labels

To set the format of the time labels on the X axis select Speed from the Chart's menu bar. From the Time labels box choose elapsed time in seconds, minutes or hours.

#### 2.2.9 Opening a Second Chart Window

You can open a second Chart window, showing data from the same or different channels, and charting at the same or different speeds. You can therefore open two windows on a particular channel, one giving a detailed short term view and the other tracking a long term trend.

# 2.3 Displaying Data Numerically

You can display data values from selected channels whilst Streamer is collecting data.

- 1. Select Data View Window from the Display menu.
- 2. Select the Channels menu.
- Select channels and choose the Connect button, or double-click a channel to toggle between connected and unconnected.
- Type in a refresh rate. This specifies how often the Data View window is updated. For maximum streaming speeds don't update the display too often.
- Choose OK.

All the connected channels will be linked to the Data View window and their values shown either when Streamer is waiting for an input level to be crossed, or is streaming data.

Open a Data View window before pressing the Collect button.

# 2.4 Displaying the Setup Information

To display Streamer's settings select Info Window from the Display menu. The hardware setup file name, scan frequency, maximum number of scans, scans so far, scans post trigger, trigger mode, number of channels in the scan and Streamer's status will be displayed.

Open an Info window before pressing the Collect button.

# 2.5 Closing the Display Windows

To close the Chart, Data View or Info window, move to the window and press the Alt and F4 keys on the keyboard. If you close the main Streamer window then all its associated display windows will also close.

# 2.6 Displaying Data in Other Windows Programs in Real-Time: DDE

DDE (dynamic data exchange) is a protocol that allows co-operating Windows applications to send commands and data to one another.

You should read the manuals for your chosen Windows application to find how to create DDE links there.

Both Streamer and your target Windows application must be loaded before a conversation can begin.

Windows programs cannot make DDE conversations unless they have a unique DDE Service Name. Streamer's service name is always "STREAMER".

Streamer supports these DDE transactions

INITIATE starts a DDE conversation REQUEST provides one set of information

ADVISE provides updates every time a value changes (Hotlink)

**EXECUTE** sends commands to Streamer

TERMINATE ends the conversation

#### 2.6.1 Enabling Channels for DDE

To enable a channel for DDE display it in Streamer's Data View window. (Select Data View from Streamer's menu bar and choose the Channels menu to enable channels.)

#### 2.6.2 Creating a DDE Conversation

When creating a DDE conversation, you must specify the service name (STREAMER) and the topic.

You can request data from Streamer on 4 topics: System, Data, Units and Status. Data is returned in CF-TEXT format, which is ordinary, readable ASCII text format. If several values are transferred then the values are separated by tab characters.

#### **System Topic**

DDE conversations with Streamer on the System topic can access eight items:

ItemList Lists supported StatusDDEStatus topic items.

Topics Lists supported topicsTopicsPop.

Formats Lists formats which may be used to transfer data.

Streamer only supports CF-TEXT format.

SysItems Lists the items supported by the System topic.

Channels These are the names of the channels enabled for DDE.

At the end of the list is a special channel called

AllChannels. This special channel name can be used

as

the item with the Units and Data topics to obtain a list of

data for all the active channels, accessing all

channels simultaneously.

Help Details supported topics and items.

Status Gives server status.

ExecuteList Lists supported DDE Execute commands.

#### **DDE Data Topic**

DDE conversations with Streamer on the Data topic can request items under the names of each channel shown in the Data View window. The answer returned is the most recently displayed data value read from this channel

The special item AllChannels will return a list of latest values for all the connected channels.

#### **DDE Units Topic**

DDE conversations with Streamer on the Units topic can request items under the names of each channel shown in the Data View window. The values supplied are the engineering units of values on this channel (Volts, Celsius or Hertz for example) as chosen in SetupIML and recorded in the \*.ims file.

The special item AllChannels will return a list of unit names for all the connected channels.

#### **Status Topic**

The Status topic is useful when controlling Streamer with DDE executes. It lets the controlling application know the current state of Streamer, so ensuring Streamer is ready for the next command. The Status topic has 2 items.

Text - Returns the current status of Streamer as text Number - Returns the current status of Streamer as a number.

No setup, 0: No hardware setupConfiguring has been loaded Busy, 1: Streamer is busy

Ready, 2: Streamer is ready for the CollectCollect button

Running, 3: Streamer is collecting data

Ready to start, 4: Streamer is ready for the StartStart button

Waiting for start level, 5: Streamer is waiting for the start level to be crossed

Error, 6: An error has occurred

#### 2.6.3 Sending Commands to Streamer with DDE

You can send Streamer simple instructions over DDE links, using the DDE Execute facility. This allows the applications to be controlled remotely from DDE client applications such as Famos or Excel.

You should send commands in the order that you'd press buttons or select menu items in Streamer. Check the status of Streamer before sending a command; to make sure it's ready to accept the instruction. To do this send a DDE request on the Status topicDDEStatus.

Commands are shown in upper case and their parameters in angled brackets. Parameters should be separated by a single space.

#### **BALANCE**

Balances strain gauge bridges. Equivalent to the Balance menu.

#### COLLECT <data file path and name>

Creates a file in which to save data. Equivalent to the Collect button. The <data file path and name> is optional. If present it should be the full file specification for the data file or directory (folder). If absent Streamer uses the Streamer directory + dataxxx

as the file specification, where xxx is a number between 000 and 999 inclusive. Streamer automatically picks the next free number and adds either .imx for binary files or .txt for ASCII files. For Famos there is no extension, dataxxx is a sub-directory.

#### **DESTROY**

Closes Streamer. Equivalent to Exit on the File menu.

#### LOAD <filename>

Loads a Streamer setup file. Equivalent to RestoreRestore on the File menu. The filename should be the full path to the \*.wst file.

#### MINIMIZE

Minimises Streamer and all its display windows. Equivalent of the Minimize command on the Control-menu box.

#### **RESTORE**

Restores Streamer, and all its display windows, to the sizes they were before they were minimised. Equivalent to the Restore command on the Control-menu box.

#### START

Starts streaming, either immediately or when the next trigger condition is fulfilled. Equivalent to the Start button. Only send this command after sending a COLLECT command.

#### **STOP**

Stops streaming. Equivalent to the Stop button. Only send this command after sending a START command.

When Streamer is being remotely driven by DDE execute commands it does not display any warnings. If data files already exist, for example, they will be overwritten without question. It is up to the controlling application to first check.