

SMART CHART

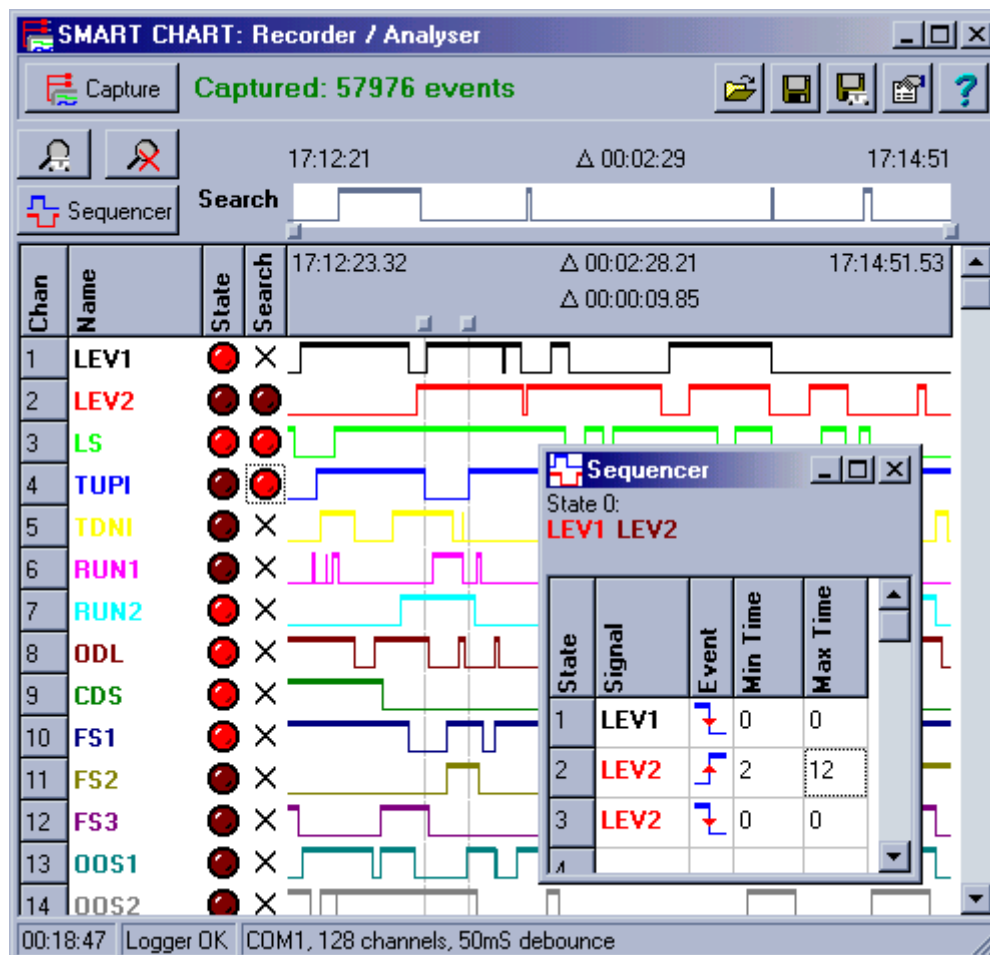
Signal Capture & Analysis

Rev 1.2

Smart Chart is a Windows programme which works in conjunction with your Data Logger* creating an interactive, graphic chart recorder ideal for solving intermittent and complex faults.

Functions include:

- Capture and Display ALL Input signals
- Holds over 1,000,000 events
- All isolated pulses are visible regardless of scale
- Search for specific signal patterns
- Search for specific signal sequences or violations, with time constraints
- Infinitely Zoom into relevant areas
- Give meaningful names to signals
- Reorder signals to suit
- Save everything to disk for later use



* Works with Applied Micros & Alphasoft 96 channel Loggers AND KONE 128 channel Loggers

Parts of the Display:

Tool bar:



- Capture: Start and stop capturing data. The number of events captured is also show.
- 📂 Open: Reload a previously saved Capture.
- 💾 Save: Save this Capture (with signal names etc.).
- 💾 Save Selection: Saves the Window (displayed) section of this Capture (with signal names etc.).
- 📄 Properties: Sets up the Data Logger and Smart Chart. (described later)
- ❓ Help: Pops up a menu to select Online Help and the About box. The About box is needed for Registration (described later).

Zoom / Search / Sequencer bar:



Three time periods exist to control the displays: The Capture period, the Zoom period and the Display period. The Capture is the entire capture period. The Zoom period is a subset of the Capture and is displayed in this bar. The Display period is a subset of the Zoom period and is displayed in the Waveform table (described below).

The Zoom bar contains the Search or Sequencer results over the current Zoom period along with the Zoom start and stop times (and the duration). In the lower region are displayed 2 movable handles which control the Display period and hence the Waveform table (described below). The Search results take the form of a waveform which is HIGH when the Search pattern is matched. TIP: A double click on the Zoom bar will reset the Display period to the Zoom period.

- 🔍 Zoom Selection: This shortens the current Zoom period to the Display period. This is required when more detail is required in the Zoom bar. This can be used repeatedly.
- 🔍 Zoom Capture: This resets the Zoom period to the Capture period.
- 🔍 Sequencer: This brings up the Sequencer window (described later).

Waveform table:

Chan	Name	State	Search	16:18:10.04	Δ 00:02:08.47	16:20:18.52
1	LEV1	●	●	Δ 00:00:03.88		
2	LEV2	●	●			

This displays the captured data over the Display period. Every Data Logger input uses a single row:

Chan: This contains the Data Logger input number. Drag up or down to rearrange the inputs into any required order.

Name: Signal Name. Double click (or select and type **Enter**) to change.

State: Input State. Lights up RED when the signal is asserted. This is continually updated.

Search: Search state for this signal. X = don't care. RED = must be asserted. BLACK = must NOT be asserted. To change this double click (or select and press **Enter**).

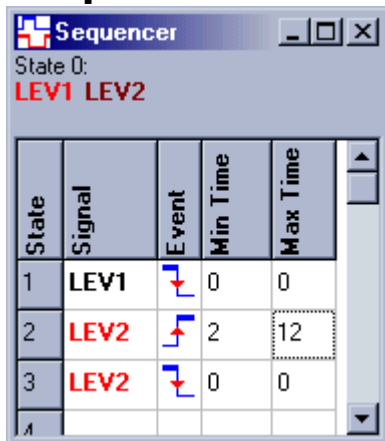
waveform: The timing diagram for this signal over the Display period. The Display start time, stop time and duration are displayed in the title. Also in the title are 2 movable handles with corresponding guide lines through the waveforms to allow alignment checking and time measurement. The time difference between these is displayed in the center of the title

area. TIP: A double click on the waveform will set all Search states to don't care (X) and this one to asserted (RED), this makes the Search bar equal to this signal.

Status bar:

This displays the current time, the Data Logger status and the current Properties. The Data Logger status shows *Logger OK* when a Data Logger is detected on the COM port.

Sequence window:



The screenshot shows a window titled 'Sequencer' with a table containing the following data:

State	Signal	Event	Min Time	Max Time
1	LEV1	[Symbol]	0	0
2	LEV2	[Symbol]	2	12
3	LEV2	[Symbol]	0	0

This window is brought up with the Sequencer button on the Zoom bar and provides for the searching of a sequence of events with time constraints. This can be used for finding faulty short or long pulses, invalid sequences, wrongly delayed signals, etc.

The Sequencer consists of a state machine which starts at State 0 and progresses through the higher States following user defined signal Events. Only signals referred to in the Events are significant in this process and all Events must occur in order AND each state must only remain active between Min Time and Max Time (if specified) OR a sequence Violation will be displayed.

The above example describes a sequence starting with LEV1 ON and LEV2 OFF. State 1 is entered when LEV1 goes OFF. State 2 is entered from State 1 when LEV2 goes ON. This state can only exist for between 2 and 12 seconds or a Violation is displayed. State 3 is entered from State2 when LEV2 goes OFF.

Columns: To change any values, double click (or select and type **Enter**)

State: The State column contains the State number. These can be dragged up or down to rearrange the order of events.

Signal: Specify the input Signal required for this State.

Event: Specify the sense of the Event, either turning ON or turning OFF.

Min Time: Specify the minimum time (seconds) that this State must remain active to prevent a violation. A value of 0 implies no minimum time.

Max Time: Specify the maximum time (seconds) that this State can remain active before a violation occurs. A value of 0 implies no maximum time.



As Events are defined, the meaning of State 0 will be displayed in the top part of the window. ie All relevant signals will be listed showing their State 0 state: Dull for OFF. Bright for ON. The Zoom bar will also change showing the Sequencer States as a pattern. At any point the height of the pattern represents the State (State 0 being the lowest). When no State is valid the pattern is blank. When a state violation occurs a vertical line is shown. Typically this will look like a set of stairways. On the

example above, State 0 is found, then States 1 & 2 before a violation occurs. Later State 0 is found again but another violation occurs. Later State 0 is found again then States 1, 2 & 3.

Connections:

Connect the Data Logger inputs to the required signals. For Applied Micros / Alphasoft Loggers, these need to provide at least 9 volts when active. EPL Loggers have a variable threshold (but lack isolation). Connect the Laptop PC serial port to the Data Logger as for a normal data logging. If all is well, the Status bar will show *Logger OK* and The State column in the Waveform table will continually show the states of all connected signals.

Common Tasks:

Capturing Waveforms:

Click the **Capture** button to start collecting input signal data. The green message nearby will display *Capturing [#### events]* where #### is the number of input changes recorded. To stop capturing data click the Capture button again. The waveforms will then appear in the window.



Moving and Naming Signals:

Each signal can be given a meaningful name as follows: Double click on the name (in the **Name** column), enter the new name and press **Enter**. Signals can be moved up or down for convenience by dragging the grey “buttons” that make up the **Chan** column on the far left. Column widths can be adjusted by dragging the lines between the columns in the top (title) row.



Performing a search:

To search for a particular pattern of signal values, change the values of the Search item in the required signals to the value required in the pattern. All other Search values should be set to don't care (X). Each change will immediately cause an update to the Search display. The results in the Search bar take the form of a waveform with a high corresponding to a pattern match.



Saving Everything to disk:

Click on the Save button in the Toolbar. This will save the entire Capture and all signal names, Search status and display order. A file name is requested then the file is produced with an extension of SC. The approximate file size is 23 bytes per event.



Saving the Zoom portion of the Capture to disk:

Click on the SaveSelected button in the Toolbar. This operates exactly the same as the Save command with the exception that only the Zoom portion of the events will be saved. When the resulting file is reloaded later, the portion saved becomes the entire Capture.



Loading a Saved Capture:

Click on the Open button in the Toolbar. Select a Smart Chart project file (extension SC) and click **OK**.

Finding a short positive pulse:

Open the Sequencer. Define State 1 as the relevant signal going high. Enter the shortest acceptable time in Min Time. Define State 2 as the same signal going low. Then look for violations on the Zoom bar. These are pulses shorter than Min Time. For a negative pulse, reverse both Events. To search for a long pulse, fill Max Time with the longest acceptable time. Both times can be used together to specify both minimum and maximum time.

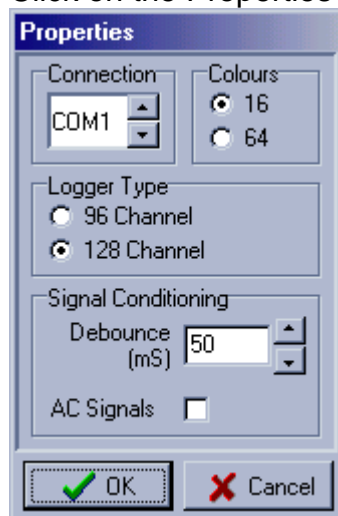
Fast Tricks:

Reset Zoom to the entire Capture by double clicking the Search bar waveform.

Place a single channel in the Search waveform by double clicking the waveform.

Setting up Smart Chart: Properties:

Click on the Properties button on the Toolbar. A Window will appear as follows:



Connection: Specify the COM port connected to the Data Logger.

Logger Type: Specify either the 96 channel Applied Micros / Alphasoftware Logger OR the 128 channel EPL Logger.

Debounce: Specify the time (in milliseconds) required for an input to be stable before being considered valid. A value of 20mS is mostly suitable, although a value up to 2000 mS may be needed for severe relay bounce.

AC Signals: Set if AC signals (50Hz) are expected on the inputs as a valid ON state. (Otherwise AC may be rejected as noise).

Click OK to accept the changes **OR** click **Cancel** to abort any changes.
