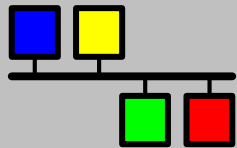


# EPICS



## EPICS Device Support For SL1000 Digitizers

QUALITY ■ INNOVATION ■ FORESIGHT

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# YOKOGAWA

**Hajime Nakamura**

and

**Takashi Asakawa**

Yokogawa Electric Corporation, Japan

**Joseph Ting**

Yokogawa Corporation of America, the USA

# Introduction

- The SL1000 is a data acquisition unit featuring fast data acquisition and transfer, and data storage capabilities.
- The SL1000 series has a wide and varied module lineup.
- EPICS device support for waveform digitizers including 100MS/s, 10MS/s, 1MS/s, and 100kS/s has been recently developed by Yokogawa.



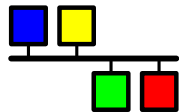
SL1000 Data Acquisition Unit



720210 100MS/s Digitizer Module

# Support Modules

## EPICS



Model	Sampling Rate	Resolution	Comments
720210	100MS/s	12bits	Isolation
701250	10MS/s	12bits	Isolation
701251	1MS/s	16bits	Isolation
701255	10MS/s	12bits	non-Isolation
701260	100kS/s	16bits	Isolation

These modules are supported by exactly the same (single) device support.

# Device Support

- The SL1000 is equipped with the 1000BASE-T Ethernet interface.
- The SL1000 employs the VXI-11 protocol; the device support requires the Asyn driver.
- The device support can read data during the measurement (no need to stop the acquisition).
- The following basic features of the SL1000 digitizers are supported:
  - **Data Compression**
  - **Storage of Historical Waveforms**
  - **SRQ Function (Asyn4.11 or later required)**

# Device Support (cont.)

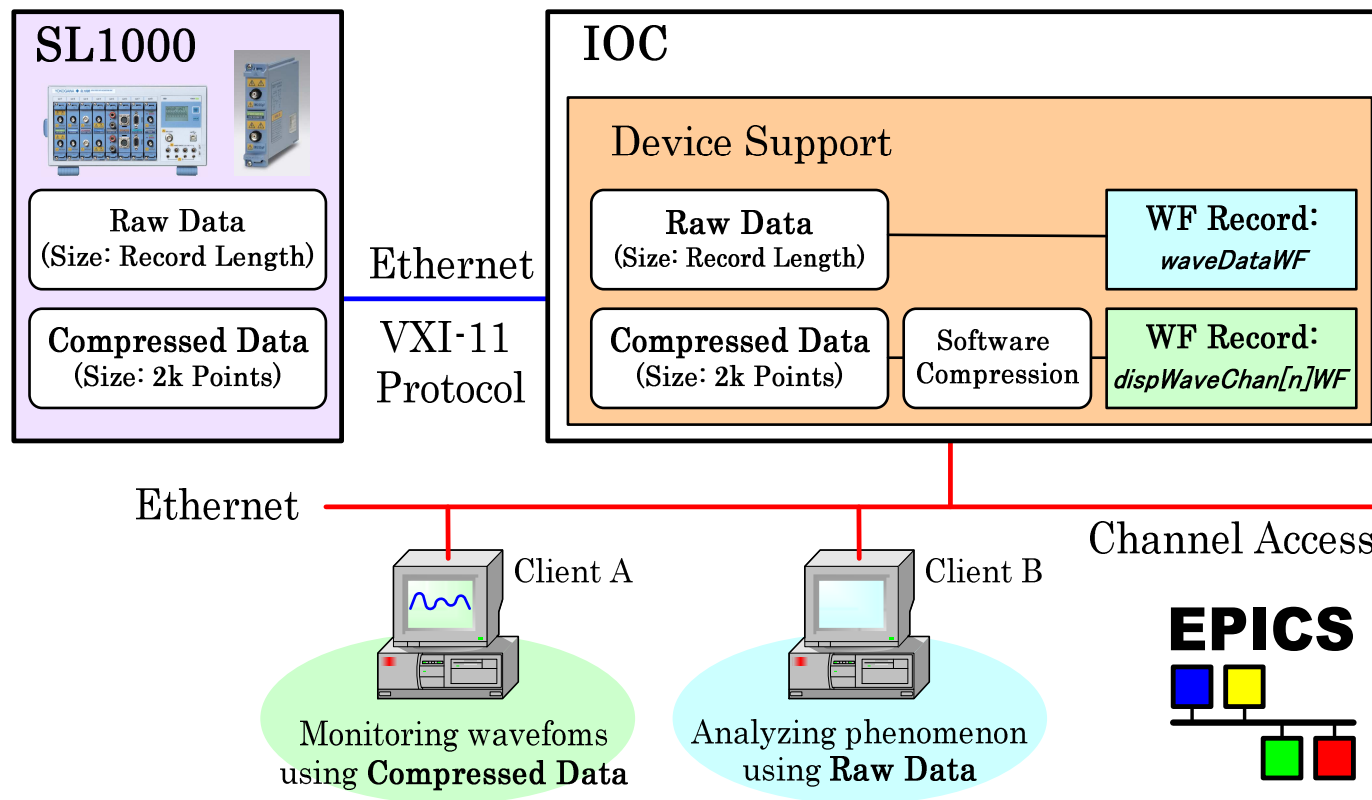
## ◆ Key Features

### ➤ Data Compression

- SL1000 performs the peak-to-peak data compression.
- The device stores both raw data and compressed data (2k points fixed) in the device memory.
- The device support can access either type of data.
- The device support further compresses the transferred 2k point data to a pre-determined number of points (default is 1k points) for display use.
- It is very beneficial to use the compressed data in displaying waveforms; 1k points would be enough for display use, while we can highly reduce the network traffic load by using compressed data.

# Device Support (cont.)

## Raw Data and Compressed Data stored in SL1000



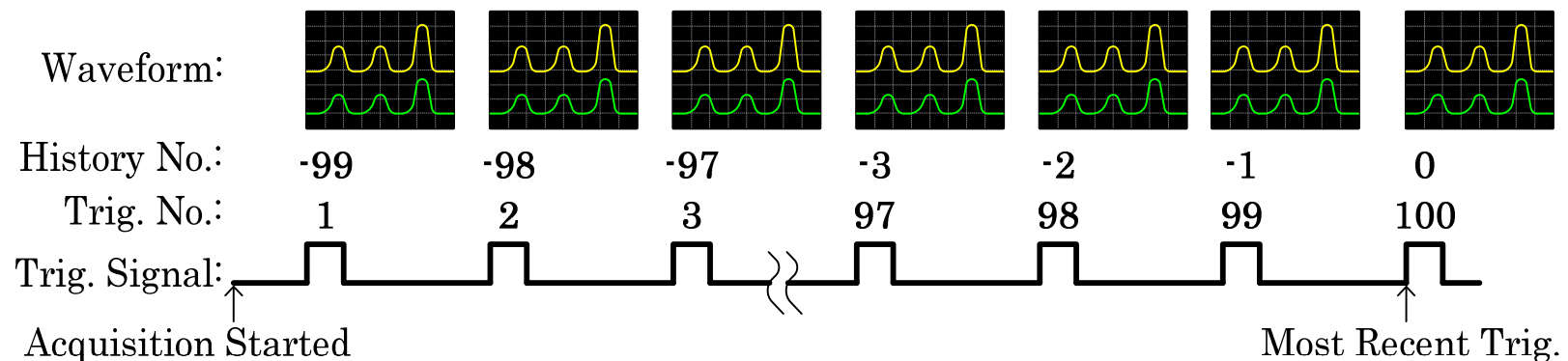
- When anomaly in a signal is detected, raw data can be used for a precise analysis of the phenomenon.

# Device Support (cont.)

## ➤ Storage of Historical Waveforms

- Since SL1000 is equipped with a large acquisition memory of 128MP, multiple waveforms can be stored.
- The device support can access historical waveform data stored in the device memory (by specifying a trigger number of the waveform).

### Data Storage of Historical Waveforms



# Device Support (cont.)

- The maximum number of waveforms which can be stored in the device depends on the number of channels and the record length:

Record Length	Number of Channels				
	1	2	3, 4	5 to 8	9 to 16
10k	5000	5000	3275	1637	818
100k	1309	654	326	162	80
1M	127	63	31	15	7

The maximum number of waveforms which can be stored in the device.



# Device Support (cont.)

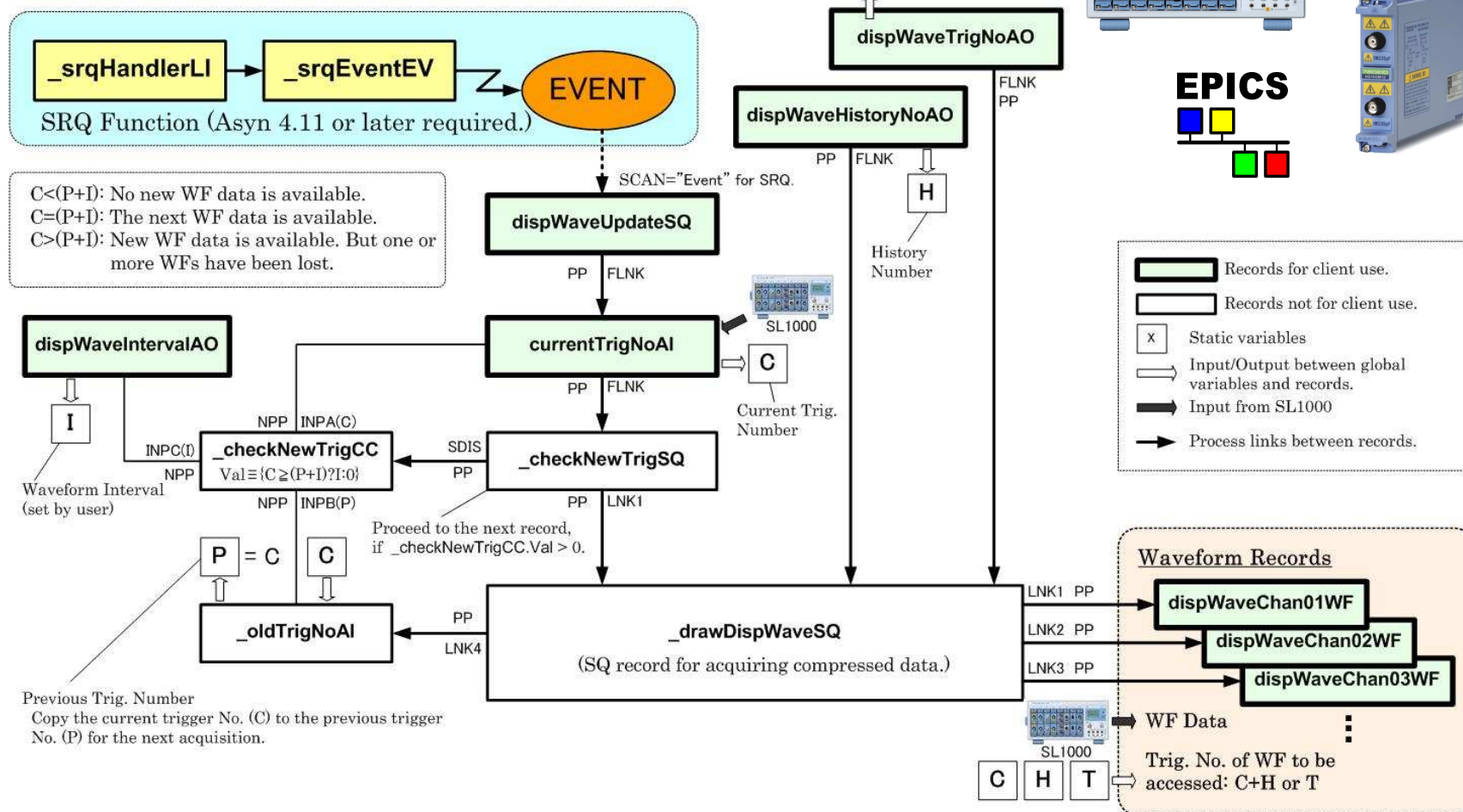
## ➤ **SRQ Function**

- The function is supported. At present (May/2009), the Asyn driver in the CVS repository at ANL is required.
- Hopefully, the next version (Asyn4.11) or later will officially support this function.

# Device Support (cont.)

## ◆ Data Acquisition Sequence

Block Diagram of Data Acquisition Sequence



# Device Support (cont.)

## ◆ Performance

The system works properly in the following conditions:

### Evaluation Environment

SL1000 w/ digitizer modules



Ethernet  
1000BASE-T  
Hub

Linux PC



IOC w/ device support and MEDM are running on the same PC.

#### Modules

Slot 1 to Slot 4 (8 channels):  
720210, 100MS/s, 12bits  
Slot 5 to Slot 8 (8 channels):  
701250, 10MS/s, 12bits

#### PC Specifications

OS: Linux (CentOS 5)  
CPU: Intel Core 2 Duo  
E7200 (2.53GHz)  
Memory: 2GB  
Network: 1000BASE-T

Transferred Data: Compressed Data (2k points/wave fixed.)

	Sampling Rate	Record Length (points)	Trigger Rate	No. of Channels	Data Size (points)	
					Device->IOC	IOC->MEDM
1	100MS/s	1M	50Hz	16	2k fixed	1k
2	100MS/s	100k	50Hz	4	2k fixed	1k
3	10Ms	100k	50Hz	16	2k fixed	1k
4	1MS/s	10k	50Hz	14	2k fixed	1k
5	100kS/s	2k	25Hz	16	2k fixed	1k

Note 1: The SRQ function is enabled.

Note 2: The performance limit is affected by the record length and the number of channels. Since the SL1000 is optimized for transferring long data (e.g. 500k and 1M), the dependency of the performance on the record length might be complicated. See the documentation on the device support for more details.

Note that these results do not warrant the performance.

# Sample MEDM Viewer

## Main Display (Controller/Viewer)

The screenshot shows the YOKOGAWA SL1000 MEDM Viewer interface. The main display area is divided into two sections: "Waveform Display" on the left and "Channel Settings" on the right. The "Waveform Display" section shows two waveforms: a square wave on the left and a sine wave on the right. The "Channel Settings" section shows a grid of 16 channels (4 rows by 4 columns) with green dots indicating active channels. Below the main display area, there are several control panels: "Trigger Parameters", "Timing Parameters", "Sampling Parameters", "Module number and trigger number of waveforms to be displayed", "Current Value Measurement", and "DAQ Menu".

Channel Settings

Trigger Parameters

Timing Parameters

Sampling Parameters

Module number and trigger number of waveforms to be displayed.

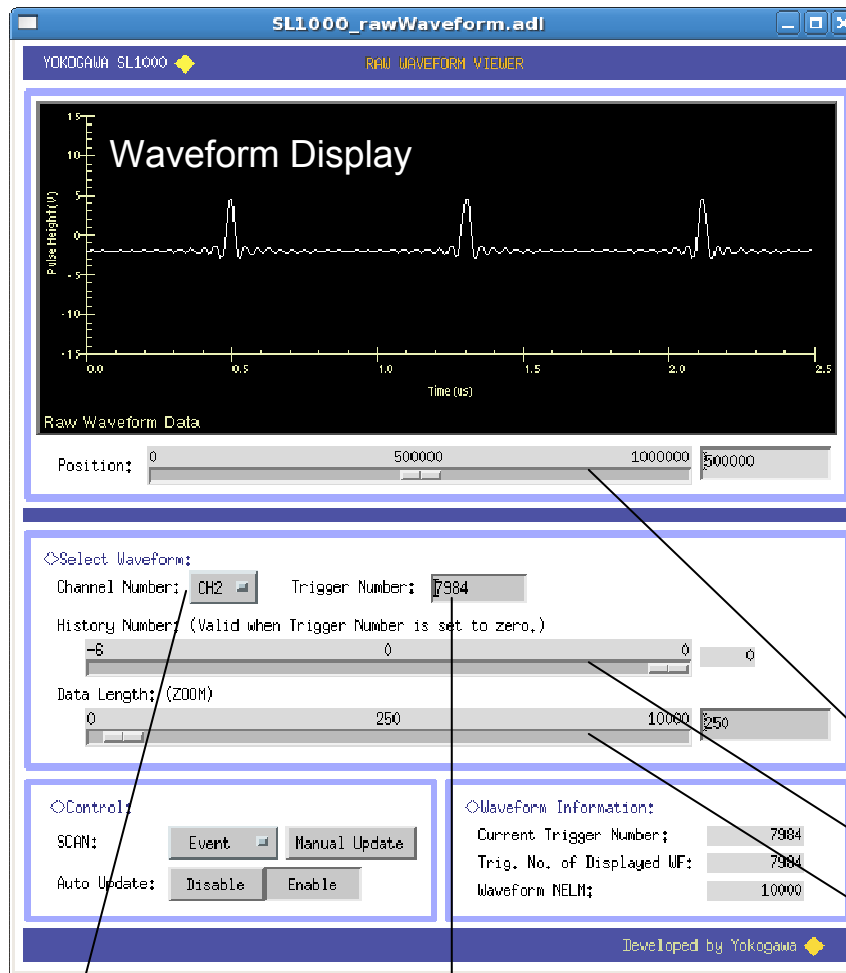
Current Value Measurement

DAQ Menu

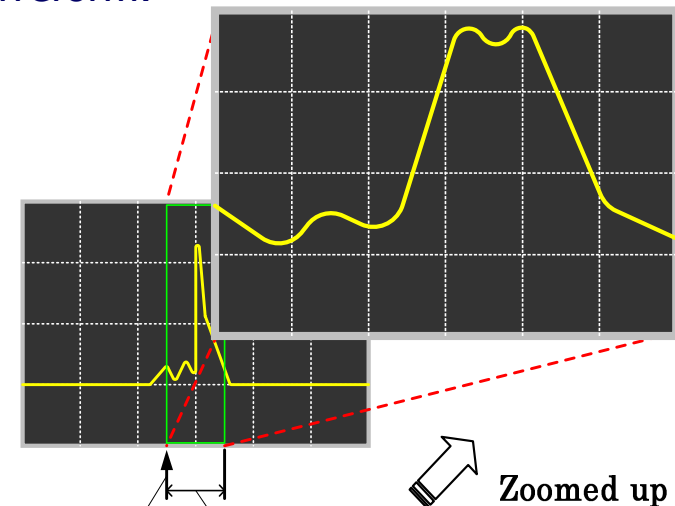
This is for controlling the device and displaying compressed waveforms. The number of modules equipped in the SL1000 unit is automatically detected. Waveforms of the selected module (2 channels) are displayed at a time.

# Sample MEDM Viewer (cont.)

## Raw Waveform Viewer



The region of interest can be zoomed up by specifying a start position and a data length (span) for the selected waveform.



Start Position Span

Start Position (point number)

History Number

Data Length (Span = No. of points)

Channel Number Trigger Number

# Summary

- Device support for SL1000 digitizer modules has been developed by Yokogawa.
- The digitizer modules including 100MS/s, 10MS/s, 1MS/s, 100kS/s work properly with exactly the same device support.
- Basic features of the SL1000 digitizers:
  - **Data Compression,**
  - **Storage of Historical Data, and**
  - **SRQ Function**are supported by this device support.

Note: Our device support is of a sample and is supplied "**AS IS**" without warranty of any kind.

**Thank you.**