ScopeCorder evolves to meet new measurement challenges

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ScopeCorders are a class of test & measuring instruments that combine features of both oscilloscopes and data-acquisition recorders. They are typically used in electromechanical and power applications in power utilities and the transportation industry, including automotive and rail applications.

Within these application sectors, ScopeCorders are often used as transient recorders in the service and maintenance areas: for fault finding or transient analyses in power generation and distribution (including renewable energy such as wind power) and the testing of power electronics in railway applications. On the research & development side, ScopeCorders are particularly suited to the development testing of power inverters for renewable energy applications, and for automotive testing including serial bus development.

When used in oscilloscope mode, the ScopeCorder will capture high-speed transient events or monitor repetitive signals, using familiar oscilloscope-type controls such as auto-setup to find signals automatically or manual adjustment of vertical scale, time per division, and trigger settings.

As a diagnostic tool, the ScopeCorder offers all the analysis tools of a modern digital oscilloscope including cursors, waveform parameter calculations, mathematical and DSP channels and FFT analyses. The ScopeCorder was, however, originally conceived as a measuring tool primarily for electromechanical applications, and as a result delivers higher vertical resolution, channel count, isolation, filtering, and abundant acquisition memory compared to a general-purpose oscilloscope. As a result, ScopeCorders are ideally suited to observing small changes, even across large dynamic ranges, and monitoring large numbers of signals simultaneously.

The instrument is typically used as a recorder for events lasting for more than one second - although the ScopeCorder can easily trend for minutes, hours or days. The user can go back and review live data, even while acquisition is in progress, and, unlike most data-acquisition systems, the instrument can make measurements and analyse data without taking the data offline. As a recorder, the ScopeCorder can automatically send an email, print captured data, sound an alarm, and save data when it detects a fault condition.

The ScopeCorder was initially conceived primarily as a portable tool for measurements on electromechanical systems, for which sampling rates of up to 10 million samples per second were sufficient. It was also designed around a modular basis, with a large number of plug-in modules available to interface with different types of electrical and mechanical sensors and transducers. In this context, it has achieved considerable success in areas such as the automotive and aerospace industries.

Application challenges

User experience with ScopeCorders has pointed to some interesting trends in the marketplace: notably an increased emphasis on electric vehicle development in the automotive industry, greater use of sensors and their associated electronics across the board, and a booming interest in alternative energy and energy-efficient systems using power electronics and in particular high-frequency inverters.

The implications of these developments for test & measurement instruments like the ScopeCorder are a requirement for increased channel count and higher speeds - linked with higher isolation for electrical power applications. A further requirement is for testing the latest generation of serial buses now becoming commonplace in the automotive sector.

Next generation

As a result of these challenges, the 'next generation' ScopeCorder (Fig.1) represents a major step forward both in performance and in the facilities available to users. The new DL850 ScopeCorder offers up to 128 input channels (an eightfold improvement on the first-generation units) and high-speed data acquisition with sampling rates up to 100 MS/s: ten times faster than the earlier models. These improvements are linked with up to 2 gigapoints of acquisition memory and the ability to record in real time to an internal 160 Gbyte hard disk or an external disk via an e-SATA interface.

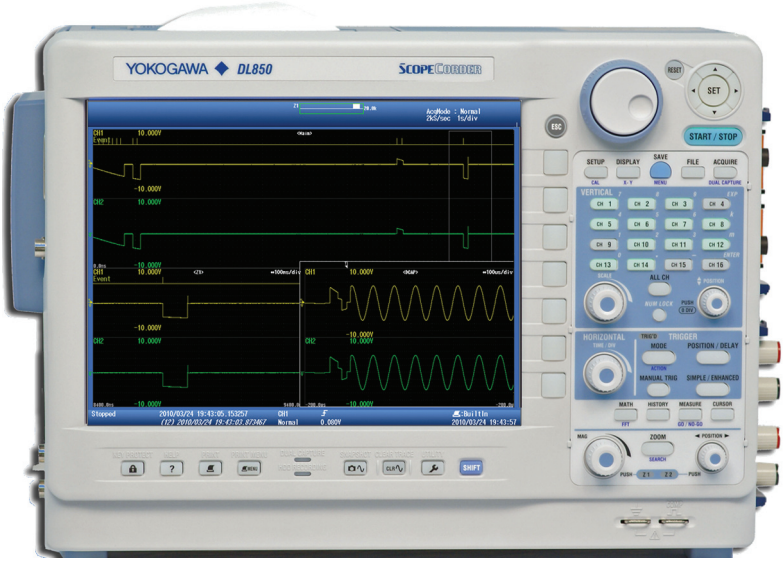

Figura 1. New high-speed & long memory modular oscilloscope (ScopeCorder = Oscilloscope + Recorder) DL850 from Yokogawa.

The modular design of the instrument means that the 128 input channels can be of assorted types. The ScopeCorder can be fitted with isolated, simultaneously sampled modules at up to 100 megasamples per second with 12-bit resolution. Users who do not require the highest sample rates, on the other hand, can choose a 16-channel multiplexed module, or any of three universal voltage input modules which sacrifice speed in exchange for higher voltage, resolution up to 16 bits, accuracy, and input ranges. An RMS coupled mode makes it possible to monitor and trigger off changes in RMS levels.

With its modular architecture, the ScopeCorder will handle nearly every type of electrical or physical signal. Users can arbitrarily combine eight different modules out of a range of 15 unique module types, supporting direct input of popular sensors like thermocouples, accelerometers, strain gauges or tachometers.

The DL850 makes use of a large, 10.4 inch LCD display, an internal hard drive, and a thermal printer mounted on top of the case. Three

USB ports, an Ethernet port, an e-SATA port, a video port, a GPIB port, and a SD-card slot populate the unit's left side panel. On the right side, the DL850 has room for eight input modules.

Yokogawa pioneered - and has now perfected - the concept of deep memory in data-acquisition instruments, and the ScopeCorder has its full share: up to two billion points of data can be recorded continuously at 100 MS/s per channel. Regardless of memory size, ScopeCorder users can also make use of the proprietary GIGAZoom engine, which allows them to smoothly zoom in and out of a signal, with zoom factors up to 10 million times, even while acquisition is in progress.

The unique architecture of the ScopeCorder means that the instrument automatically allocates its memory to best accommodate the user's test strategy. Once the desired sample rate is set, the 'history' feature intelligently utilises the remainder of the available memory - allowing users to view and save previously captured acquisitions. Another unique function available in the ScopeCorder is the 'dual capture' feature, which makes it possible to configure both high-speed and low-speed capture. In this mode, the DL850 continuously logs data at the lower speed until a trigger condition is met. At the higher sample rate, the ScopeCorder acquires a transient waveform, with multiple waveforms for multiple triggers, all while continuously logging at the low speed rate.

In addition to its versatile trigger functions, the DL850 ScopeCorder offers a number of specialised waveform capture tools. One of these is the 'wave window' trigger, which is ideal for AC power line monitoring. It allows the user to define a 'golden reference waveform'. Any subsequent waveforms that do not match this reference waveform - such as surges, spikes or dropouts - will then cause the ScopeCorder to trigger.

New modules

As indicated above, the DL850 boasts improved performance over earlier ScopeCorder products in nearly every area. Major specifications like sample rate, memory, channel count, screen resolution and data transfer rates are all significantly improved. New features, like IRIG synchronisation and streaming to external disk, have been added, and the redesigned 'GIGAZoom2' engine allows for real-time zooming during acquisition. In fact, more than 100 specification details have been improved, including history time-stamp resolution, backlit channel buttons and many more.

To preserve users' investments, the DL850 is backwards compatible with all modules from the earlier DL750 ScopeCorder. Moreover, four new modules have been added to the line-up:

The world's only 100 MS/s, 12-bit module with 1 kV of optical isolation and a 1 kV input range, making it ideally suited for measurements on high-speed inverters in today's energy-saving architectures.

A 16-channel scanner module containing eight sub-channels per physical input connector, allowing a single instrument to be equipped with up to 128 channels per box.

A logic module for measuring TTL signals in conjunction with a high-speed logic probe. For measuring industrial high-voltage logic signals, isolated logic probes are available. Each module supports two sets of eight logic bits.

A CAN bus monitor module is designed to measure and trend CAN sensor data. This makes it possible to extract the contents of any CAN identifier and plot its decoded value to the screen, correlated with all waveforms on other channels.

Figura 2. Up to 128 different signals (and at sampling speed up to 100 MS/s) can be measured with the scalable DL850.

Conclusion

The enhanced performance, advanced features and user friendliness of the new generation of ScopeCorders will make them even more attractive for measurement applications in traditional markets like automotive and aerospace, as well as opening up new opportunities in expanding industries like electric vehicles, alternative energy and power electronics. Ω