Test&Measurement

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ScopeCorder Introduction Workbook

Version 1.2 – August 2016

DL850E series

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Introduction

This is the 'ScopeCorder Introduction Workbook' for the DL850E series ScopeCorders. This workbook is created to help ScopeCorder users understand the basic principles of working with their instrument.

In a series of exercises we will walk through the most commonly used functionality, but also address some unique ScopeCorder features.

To get familiar with the ScopeCorder's knobs & keys and their functions, please consider starting with Appendix A.

In case you have questions, remarks or suggestions related to this document or the ScopeCorder instrument, please contact your local representative, myself or go to the Additional resources for support.

Enjoy the exercises!

Regards,

Peter Schutte

Product Marketing – ScopeCorder

Phone   +31 (0)88 – 464 1817
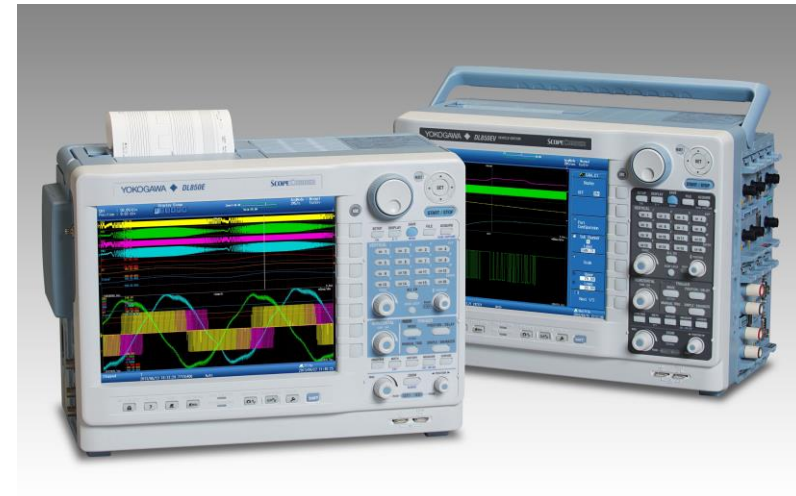Email   peter.schutte@nl.yokogawa.com

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1. Factory reset

A Factory RESET may be performed if the set-up status of the ScopeCorder is unknown.
It may be useful before performing these exercises, or before beginning a new test procedure.

Follow these steps:

1. Turn OFF the ScopeCorder

2. Hold the RESET button while turning ON the ScopeCorder

3. Continue to hold the RESET button

4. Wait for the confirmation message (you will hear a BEEP):
    'Turned on pressing the RESET key. Will initialize'

5. Release the RESET button

6. Press the ESC button

DONE! Factory reset has been completed.

Initialize vs. Factory Reset
A factory reset will initialize ALL settings, including those of the communication interfaces. To maintain communication interface settings, use _SETUP_ » _INITIALIZE_.

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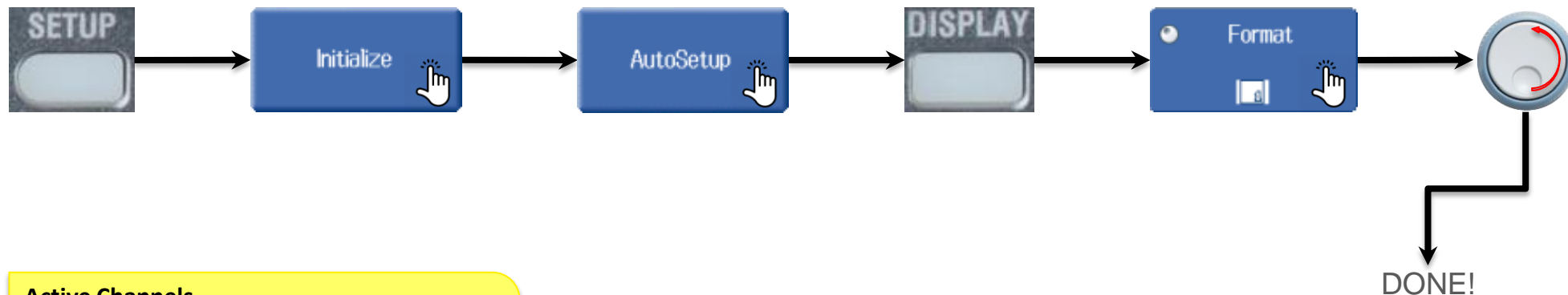
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2. A simple acquisition

Setup

Prerequisite: You may wish to perform a factory reset (Exercise 1) before this exercise to ensure your ScopeCorder matches the setup of the ScopeCorder used in these exercises.

In this exercise you will make a simple waveform acquisition. Please connect CH1 to the PROBE COMP pins on the front of the ScopeCorder using a suitable 10:1 or 1:1 probe / test lead. Leave all other channel inputs disconnected. Press CH1 and adjust PROBE to either 10:1 / 1:1 as appropriate for the input lead-set being used.

PROBE COMP connection

Follow these keystrokes:

SETUP → Initialize → AutoSetup → DISPLAY → Format →

DONE!

Active Channels
If other channels are still enabled, please turn them OFF by double-pressing each one of the corresponding channel buttons, such as *CH 2*, etc.

Results are displayed on the next page.

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2. A simple acquisition
Results

Show the signal over a longer time period
Use the Tim/DIV knob to change the length of your acquisition.

Longer memory, higher sample rate
Increase the record length (memory size) to increase the sample rate. To do so, press: *ACQUIRE* » Use the Jog Shuttle to adjust the Record Length.

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3. Sample rate calculation

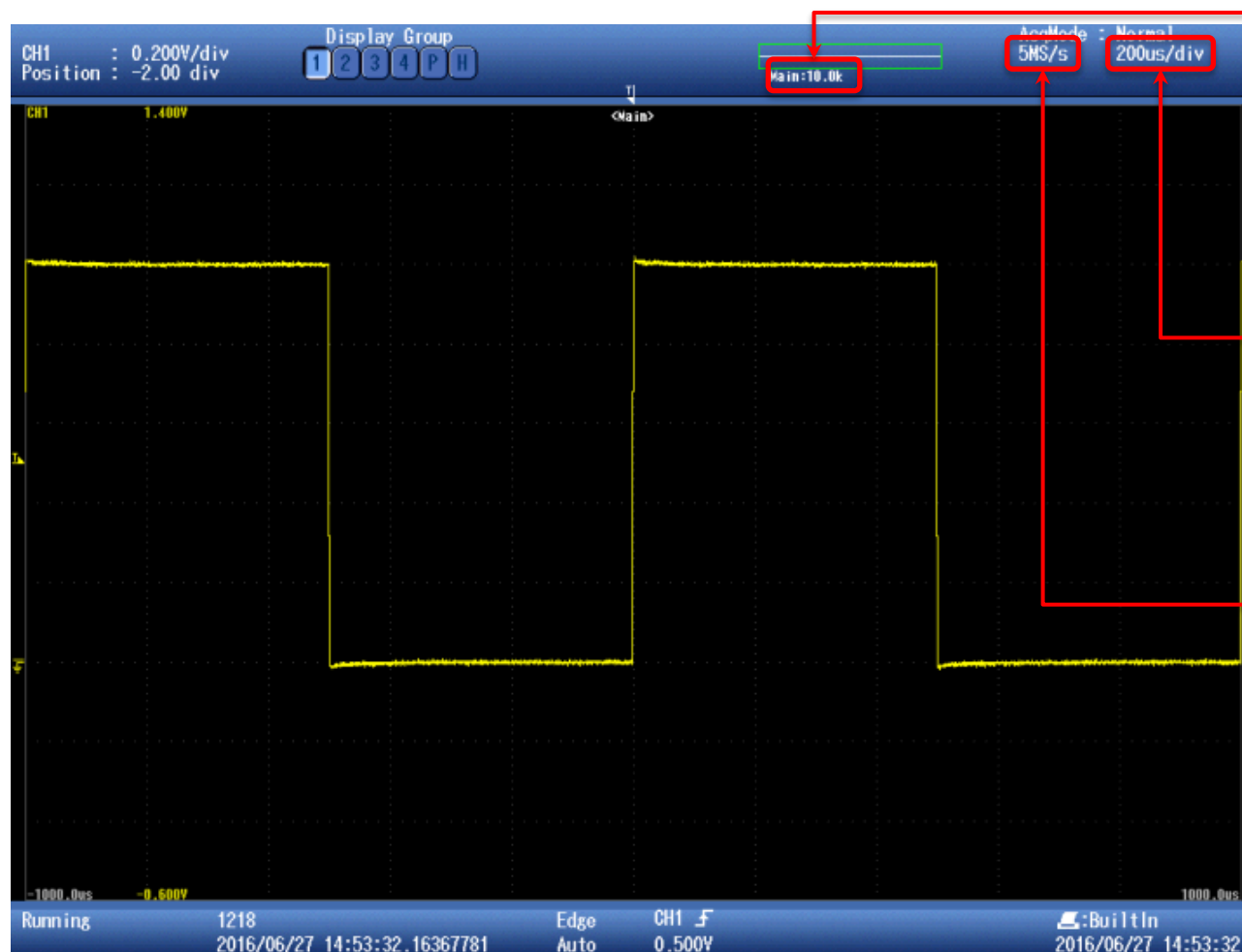$$\text{Sample Rate} = \frac{\text{Main (Record Length)}}{\text{Total Time}}$$

$$= \frac{10.000 \text{ points}}{200\mu s/\text{DIV} \times 10 \text{ DIV}}$$

$$= \frac{10.000}{2000\mu s} = \frac{10.000}{0,002s}$$

$$= 5\text{MS/s}$$

What sample rate & measurement time settings are possible?
Dependent on channel count, available memory and other parameters different sample rates & measurement times are available. Review Appendix C for more information.

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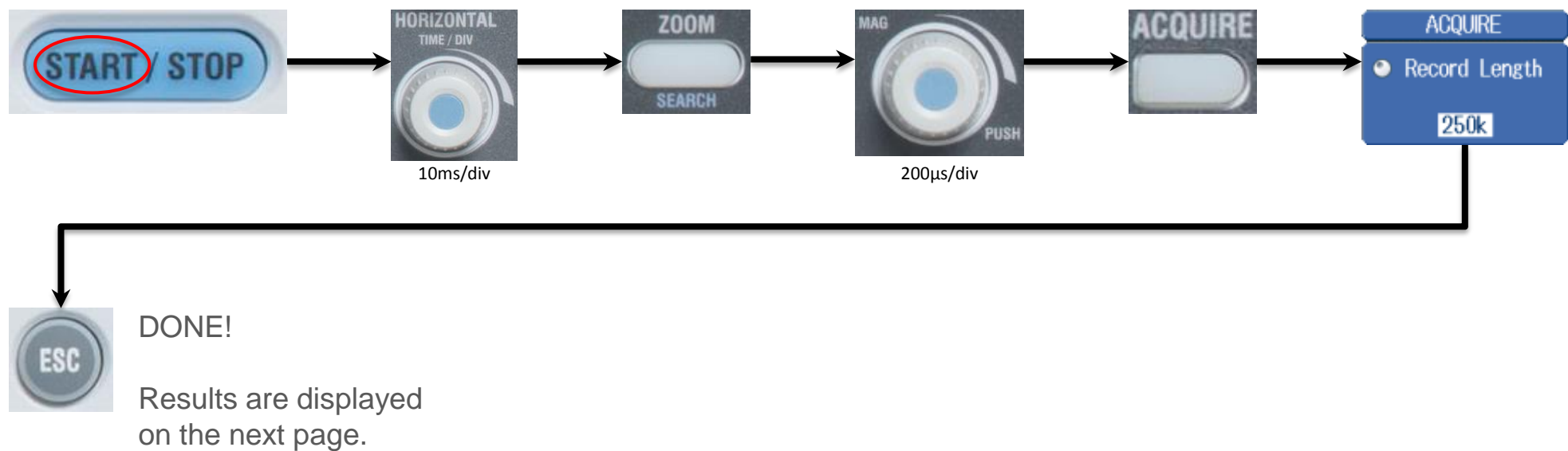# 4. Zoom to get more detail
Setup

Prerequisite: Perform Exercise 2 first, or acquire a waveform.

In this exercise you will use the Zoom functionality to get more detailed insight in the acquired signal, while still having the ability to make long acquisitions.

Follow these keystrokes:

10ms/div   200µs/div

DONE!

Results are displayed
on the next page.

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4. Zoom to get more detail
Results

Use the 2nd Zoom channel
In the given example, the second Zoom channel has been activated to get even more detail by zooming in on Zoom channel 1. To do this press:
Zoom1/Zoom2 » *Display* (set to: *On*) » *Zoom2 Source* (set to: *Zoom1*)
Now use the Magnitude and Position knobs to fine tune the Zoom windows.

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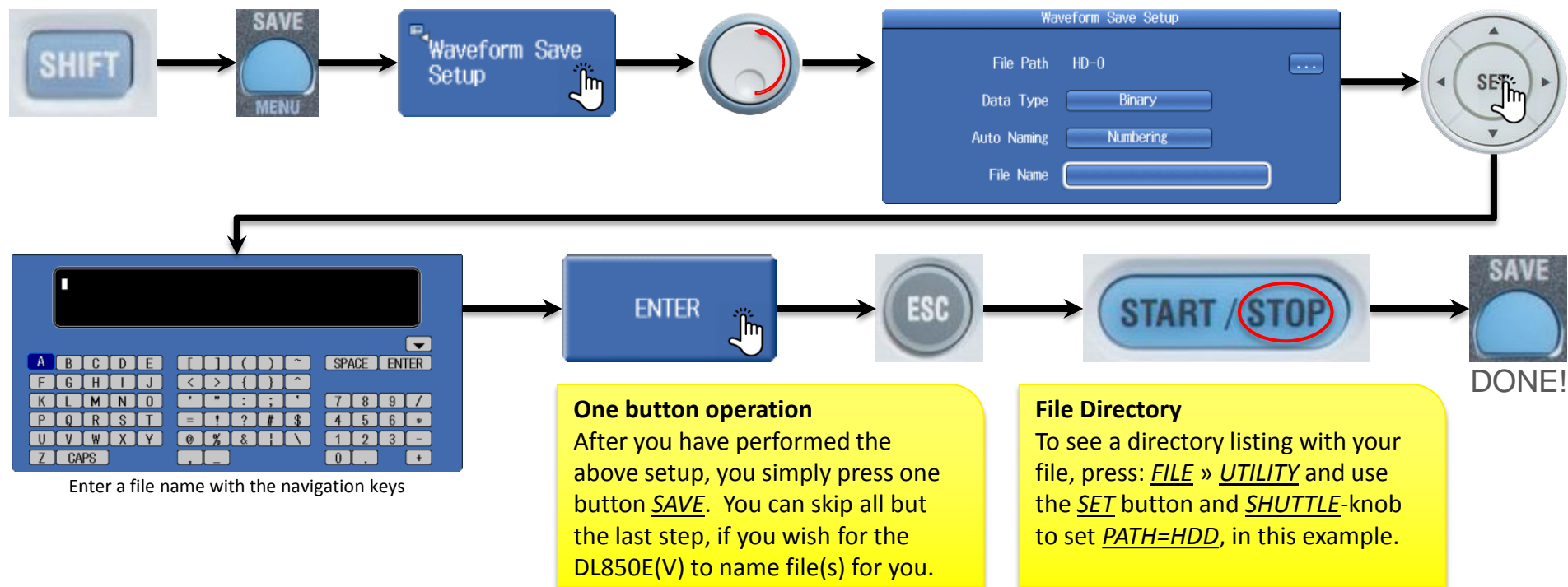
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5. Save a waveform

Setup

Prerequisite: Perform [Exercise 2](#) first, or acquire a waveform.

In this exercise you will save a waveform to a binary file.

Follow these keystrokes:

Enter a file name with the navigation keys

One button operation
After you have performed the above setup, you simply press one button *SAVE*. You can skip all but the last step, if you wish for the DL850E(V) to name file(s) for you.

File Directory
To see a directory listing with your file, press: *FILE* » *UTILITY* and use the *SET* button and *SHUTTLE*-knob to set *PATH=HDD*, in this example.

DONE!

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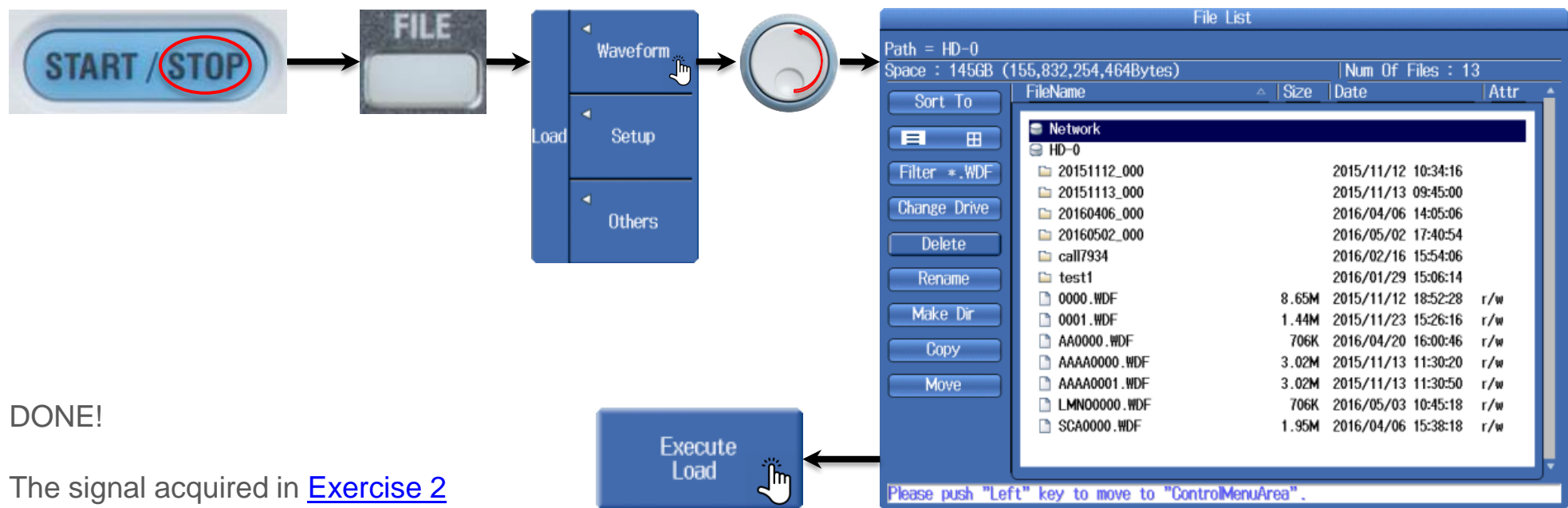
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6. Load & view a waveform
Setup

Prerequisite: Perform Exercise 5 first, or use another saved waveform.

In this exercise you will load and view a binary file containing a waveform.

Follow these keystrokes:

DONE!

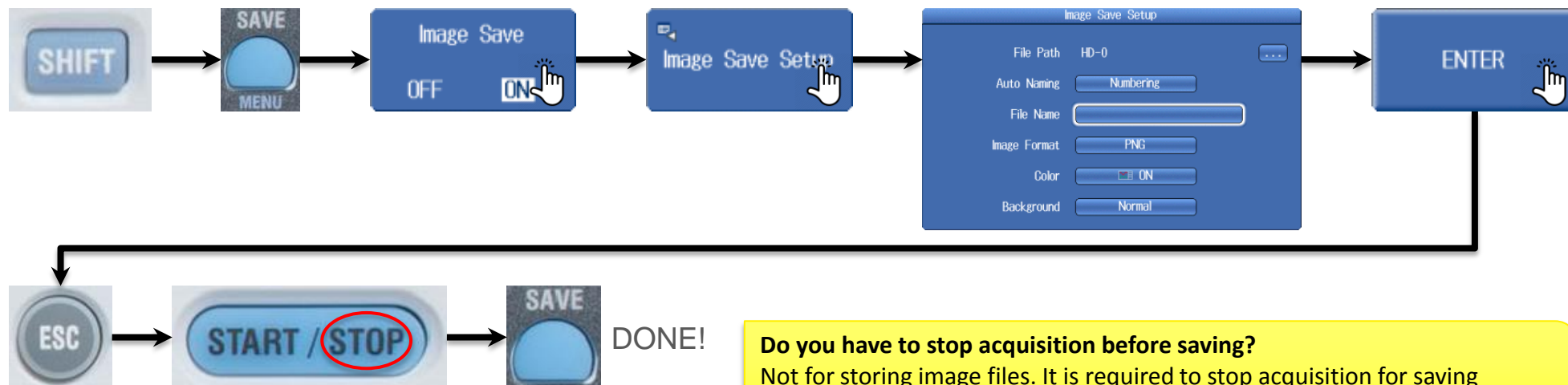The signal acquired in Exercise 2
Will now be displayed on the screen.

Note that the 'PATH = HD-0'. Highlight the file created in the previous exercise.

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7. Save a screen image

Prerequisite: Perform [Exercise 2](#) first, or acquire a waveform.

In this exercise you will save a screen image as JPEG, BMP or PNG file. Some steps may be abbreviated.

Follow these keystrokes:

DONE!

Do you have to stop acquisition before saving?
Not for storing image files. It is required to stop acquisition for saving waveform files (which is still enabled due to [Exercise 5](#)).
To only save image files: press *SHIFT* + *SAVE* » disable *Waveform Save*.

One key, two actions
As you just have experienced, the SAVE key can be used for saving a waveform file, a screen image or a combination of both.

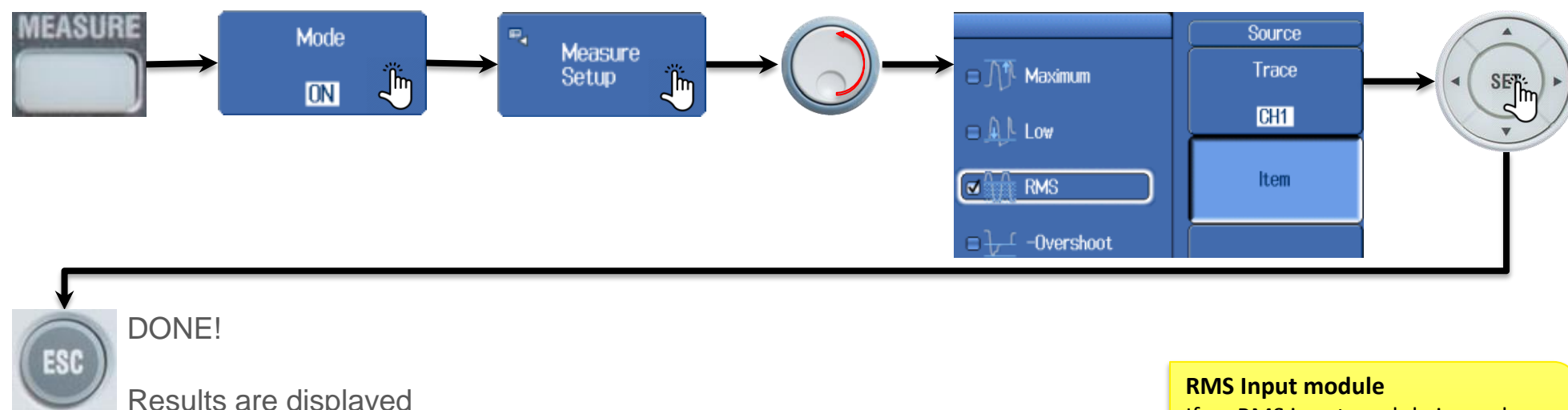**Test&Measurement**

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8. RMS measurement
Setup

Prerequisite: Perform Exercise 2 first, or acquire a waveform.

In this exercise you will perform a parametric measurement, such as RMS.
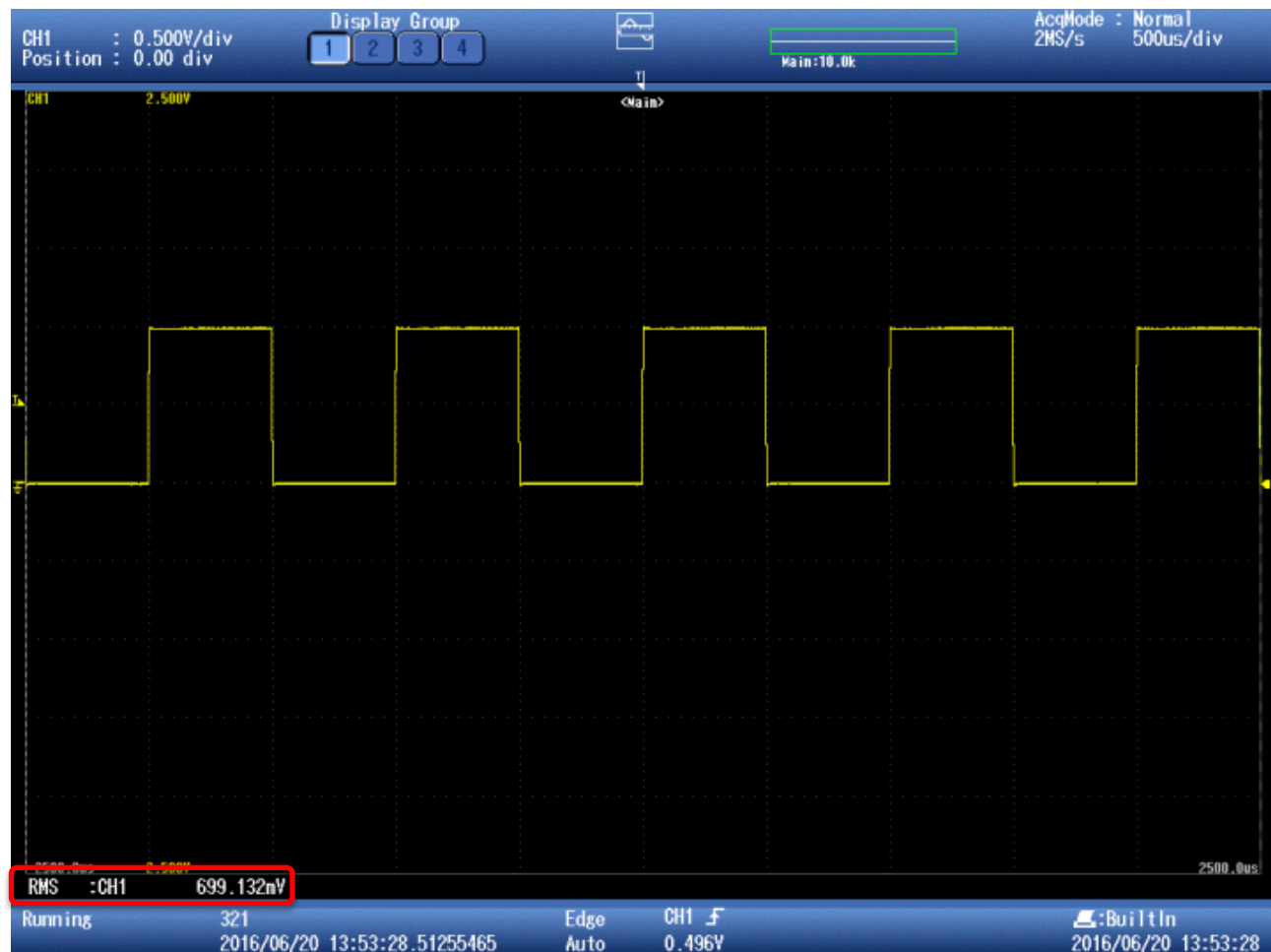
Follow these keystrokes:

DONE!

Results are displayed
on the next page.

RMS Input module
If an RMS input module is used
(e.g. 701267), RMS measurements
can also be done using a cursor.

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8. RMS measurement
Results

The RMS value is now displayed at the bottom of the screen; except when Time/DIV ≥ 100ms/DIV or 'roll mode' is used.
See screenshot, left-bottom.

Roll mode
In roll mode, waveforms scroll from right to left as new data is captured and the oldest values are deleted from the screen.

Extra Display
Measurement values are displayed on top of the waveform. To create blank space, press _Display_ » _Extra Window_, set the value to _1_.

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9. Cursor measurement
Setup

Prerequisite: Perform [Exercise 2](#) first, or acquire a waveform.

In this exercise you will perform a horizontal cursor measurement.

Follow these keystrokes:

Set cursor 1 to '2.00'

Set cursor 2 to '0.00'

DONE!

Results are displayed on the next page.

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9. Cursor measurement

Results

The cursor measurement is now displayed at the bottom of the screen.

Cursor adjustment
Don't forget to use the left and right arrow button to adjust the decimal position; this will allow for fine adjustment of each cursor.

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10. Hard disk recording – setup & create

Setup

Prerequisite: Perform Exercise 2 first, or acquire a waveform.

In this exercise you will make an acquisition using hard disk recording. Hard disk recording makes it possible to acquire and store data for up to 200 days.

Follow these keystrokes:

1 sec/DIV

DONE!

Results are displayed
on the next page.

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10. Hard disk recording – setup & create
Results

Verify files
To verify the recorded files, press *FILE* » *UTILITY*. Look in the current media PATH for a new folder.

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11. Hard disk recording – load & view
Setup

Prerequisite: Perform Exercise 10 first, or use another saved hard disk recording.

In this exercise you will load and view a hard disk recording from file.

Follow these keystrokes:

Highlight
FOLDER

Highlight
FILE

DONE!

Results are displayed
on the next page.

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11. Hard disk recording – load & view
Results

Zoom for detail
In order to take a closer look at the waveform data, use the *ZOOM* function. Go to Exercise 4 for additional explanation.

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12. Save a settings file

Prerequisite: none

In this exercise you will save the currently configured settings for your ScopeCorder to a .SET settings file.

Follow these keystrokes:

Use the soft keyboard or an USB keyboard to name the .SET file.

DONE!

File verification
To verify the .SET file was saved correctly:
press *FILE* » *UTILITY*
Browse to find the file.

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13. Load a settings file

Prerequisite: none

In this exercise you will load a .SET settings file to apply the saved settings to your ScopeCorder. Some steps may be abbreviated.

Follow these keystrokes:

Highlight
.SET file

DONE!

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14. Action on trigger

Prerequisite: Perform Exercise 2 first.

In this exercise you will configure a simple 'Action on Trigger' acquisition. This function allows you to leave the ScopeCorder unattended and it will automatically perform actions if a trigger event takes place.

Follow these keystrokes:

Trigger Mode

Select 'Beep' with the Jog shuttle and press the 'Set' button.

DONE!

Save files on trigger
Combine this with Exercise 5 and use the *Save Waveform* option in the *Action Setup* to automatically save a waveform file upon a trigger.

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15. Window based OR trigger

Prerequisite: Perform Exercise 2 first.

In this exercise you will configure an OR trigger for a specified Window. This simple and effective function triggers when a waveform goes IN or OUT in a user-specified range of voltage

Follow these keystrokes:

DONE!

AND trigger
To perform a Window based AND trigger, simply choose *TYPE* = *AND* using otherwise these same keystrokes.

Edge detection condition (Edge)
Set the conditions for detecting each trigger source edge. When Edge is set to *IN*, An edge is detected when the trigger source enters the specified level range; in our example 450 – 550 mV.

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16. Dual Capture
Setup

Prerequisite: Perform Exercise 1 and Exercise 2 first.

In this exercise you will set up a 'Dual Capture'. 'Dual Capture' is a feature which will record data at a low rate until a trigger condition/event is detected after which data is recorded at high sample rate.
Disconnect the PROBE TIP from PROBE COMP; leave PROBE GROUND connected (important).

Follow these keystrokes:

1 sec/Div

DONE!

Touch finger on/off PROBE TIP at 1 second intervals for 12 seconds, then press STOP. See next page for results.

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16. Dual Capture
Results

The top window (Main) displays an acquisition with the sample rate of 100 S/s.

The bottom window (Dual Capture) displays one of the 'Dual Capture' events with a sample rate of 2 MS/s

Combine 'Dual Capture'
'Dual Capture' can also 'Auto Save' and is compatible with other 'Action' features.

Display Events
Not all events are clearly visible in the main window. To visualise all events in the main window, press: *SHIFT + ACQUIRE* » *Next* » *Event Display* This can also be done after acquisition has stopped.

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17. Channel labeling
Setup

Prerequisite: Perform **Exercise 2** first.

In this exercise you will add a new channel label to channel 1.

Follow these keystrokes:

Input name, scale & unit string

Control your instrument
Connect a **USB mouse & keyboard** to make input to the ScopeCorder easier.

DONE!

Results are displayed on the next page.

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17. Channel labeling

Results

Adjust multiple channels
Use the _ALL CH_ button menu to make adjustments to multiple channels at once.

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18. Scaling & Units
Setup

Prerequisite: Perform Exercise 2 first.

In this exercise you will add custom scaling and a unit to an existing channel in order to display the actual measured current, rather than the acquired voltage.

Follow these keystrokes:

Current clamp scaling example
The depicted current clamp (Yokogawa 96095) supplies 10mV per ampere. Using Y=A*X+B scaling we can visualise the acquired current instead of the "raw" voltage. The formula will be: 1A (Y) = 100 (A) *10mV (X) + 0 (B)

DONE!

Results are displayed on the next page.

Select 'AX+B', change A to '2.00', B to '0.00', add a unit string named 'A'.

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18. Scaling & Units

Results

CH1 – Scaled COMP signal
Y-scale min: -5.000A
Y-scale max: 5.000A
Resolution: 1A/div

CH2 – Regular COMP signal
Y-scale min: -2500mV
Y-scale max: 2500mV
Resolution: 500mV/div
* Used CH2 to visualise the regular COMP signal

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19. Phase measurement between 2 channels
Setup

Prerequisite: Acquire two 60^0 phase shifted waveforms on CH1 and CH2, at 5ms/DIV

In this advanced exercise you will setup a Phase Measurement between the two acquired waveforms. Steps are somewhat abbreviated.

Follow these keystrokes:

DONE!

Channel delay
In order to perform this exercise with a DL850E(V) only, you can also connect CH 2 to PROBE COMP and add a delay to the channel.
To do this: Press the _CH 2_ button » Select _Filter Delay Setup_ » set a delay of _166µs_

Results are displayed on the next page.

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19. Phase measurement between 2 channels

Results

60 degrees delay between 2nd rising edge of CH1 to the 2nd rising edge of CH2 (as counted at zero-crossing, from left to right).

Extra Display
Measurement values are displayed on top of the waveform. To create blank space, press *Display* » *Extra Window*, set the value to *1*.

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Appendix A – DL850E(V) knobs and keys

Soft keys
Use to select items on the setup menus that appear during configuration

ESC key
Use to clear setup menus and pop-up menus

Jog Shuttle
Use to change values and move cursors. Turn the shuttle ring to vary the rate at which values change. The rate is based on the shuttle ring angle.

Setup and execution keys and knobs

Probe compensation signal output terminal
1kHz, 1V$_{P-P}$. Transmits correction signals for probes.

Functional ground terminal
Connect a ground wire to this terminal when performing probe correction.

Setup and execution keys

KEY PROTECT key

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Appendix A – DL850E(V) knobs and keys

CH1 to CH16 keys

These keys display menus for turning the display of each channel on and off and configuring settings such as display label settings, input coupling settings, the probe attenuation or the current-to-voltage conversion ratio, the bandwidth limit, the vertical position, vertical zoom settings, the offset value and linear scaling. Also you can press a key to select the channel that the SCALE knob will control. Channel keys illuminate when their corresponding channel is on. After you press NUM LOCK, you can press a channel key to enter the number displayed to the upper right of the key in white.

ALL CH key

Press this key to display a window in which you can configure all the settings from the menus that appear when you press CH1 to CH16. The settings appear in a list.

POSITION knob (vertical POSITION knob)

Use this knob to adjust the vertical display position (vertical position) of an input waveform. Before you turn this knob, select the target waveform by pressing a key from CH1 to CH16. This knob has a push switch. You can press the knob to reset the position to 0.00 div.

NUM LOCK key

Press this key to use the CH1 to CH16 keys to enter numbers.

SCALE knob

Use this knob to set the vertical scale. Before you turn this knob, select the target waveform by pressing a key from CH1 to CH16. If you change the scale while waveform acquisition is stopped, the setting actually takes effect when you restart waveform acquisition.

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Appendix A – DL850E(V) knobs and keys

Horizontal

TIME/DIV knob

Use this knob to set the time-axis scale. If you change the scale while waveform acquisition is stopped, the scale actually takes effect when you restart waveform acquisition.

Triggering

(SHIFT +) MODE key

Displays a menu for selecting the trigger mode.
Press SHIFT and then MODE to display a menu for configuring action-on settings.

POSITION/DELAY key

Press this key to set the trigger position and the trigger delay.

SIMPLE/ENHANCED key

Displays a trigger setup menu

MANUAL TRIG key

Press this key to make the DL850E/DL850EV trigger regardless of the trigger settings.

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Appendix A – DL850E(V) knobs and keys

Other

ANALYSIS key
Displays a menu for performing power math. This key is valid on models with the /G5 option.

(SHIFT+) MATH key
Displays a menu for waveform computation. Press SHIFT and then MATH to display a menu for configuring FFT computation.

HISTORY key
Displays a menu for using the history feature to recall data.

(SHIFT+) MEASURE key
Display a menu for automated measurement of waveform parameters. Press SHIFT and then MEASURE to display a menu for GO/NO-GO determination.

CURSOR key
Displays a menu used when performing cursor measurements.

(SHIFT+) ZOOM key
Displays a waveform zoom display menu. Press SHIFT and then ZOOM to display a menu for data searching (the search & zoom function).

MAG knob
Use this knob to set the zoom factors for the Zoom1 and Zoom2 zoom boxes. This knob has a push switch. Press the MAG knob to switch the zoom box whose zoom factor is set by it.
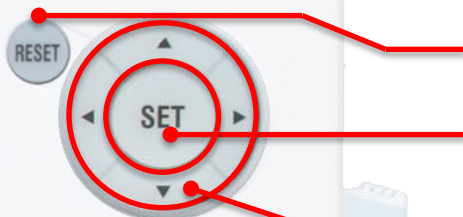
◄POSITION► knob (Zoom POSITION knob)
Use this knob to set the zoom position. This knob has a push switch. Press the POSITION knob to switch the zoom box whose zoom position is set by it.

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Appendix A – DL850E(V) knobs and keys

Other - continued

RESET key
Resets the value to it's default value

SET key
Press this key to select the menu item that you have moved the cursor to using the job shuttle. You can also press the SET key to start entering a value or characters.

Arrow keys (▲▼ ►◄ keys)
Use the ►◄ keys to move the cursor between numeric digits. Use the ▲▼ keys to increment or decrement the value of a digit. You can also use the ▲▼ keys to select setup items.

START/STOP key
Starts and stops waveform acquisition according to the trigger mode. The key is illuminated while the DL850E/DL850EV is acquiring waveforms.

(SHIFT+) ACQUIRE key
Displays a menu used to set the waveform acquisition mode. Press SHIFT and then ACQUIRE to display a menu for configuring the dual capture feature.

FILE key
Press this key to save or load data from a storage medium or to display a menu for file manipulation.

(SHIFT+) SAVE key
Pres this key to save waveform or screen capture data to a storage medium. Press SHIFT and then SAVE to display a menu for configuring the save operation.

(SHIFT+) DISPLAY key
Use this key to configure the display. Press SHIFT and then DISPLAY to display an X-Y display menu.

(SHIFT+) SETUP key
Displays a menu for initialising the settings to their factory defaults; performing auto setup, which automatically sets the DL85E/DL850EV according to the input signal; storing and recalling setup information; and so on. Press SHIFT and then SETUP to display a calibration menu.

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Appendix A – DL850E(V) knobs and keys

Other - continued

KEY PROTECT key

When you press this key, it illuminates, and the keys on the front panel are locked. Press the key again to unlock the keys.

HELP key

Turns on and off the help window, which explains various features

PRINT key

Use this key to save and print screen capture data.

PRINT MENU key

Displays a menu for printing screen captures to the built-in printer or a network printer or displays a menu for saving screen capture data to a storage medium.

SNAPSHOT key

Retains the currently displayed waveforms on the screen in white. Snapshot waveforms can be saved and loaded.

CLEAR TRACE key

Clears the waveform acquired using the snapshot function and accumulated waveforms.

UTILITY key

Displays a menu for configuring system, communication, network and environment settings; for performing self tests and for displaying system information (information about installed modules, installed options and the firmware version).

SHIFT key

Press this key once to access the features that are written in purple below each key. The shift key illuminates when the keys are shifted. Pressing the key again clears the shifted condition.
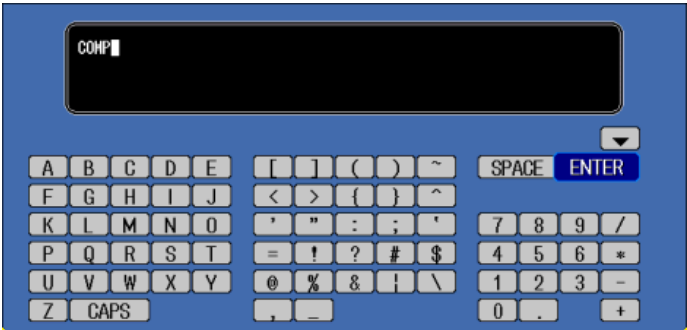
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Appendix B – Using a USB keyboard & mouse

If you find yourself altering the ScopeCorder's configuration often, you will appreciate the use of keyboard and mouse with it. Using the USB ports you can connect wired keyboards and mice.
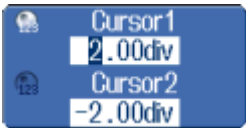
They keyboard will function as expected, it will allow you to easily enter characters for data entry fields:

The mouse introduces a new way of accessing all functionality. Using the right mouse button a context menu appears, allowing access to all menus and settings.
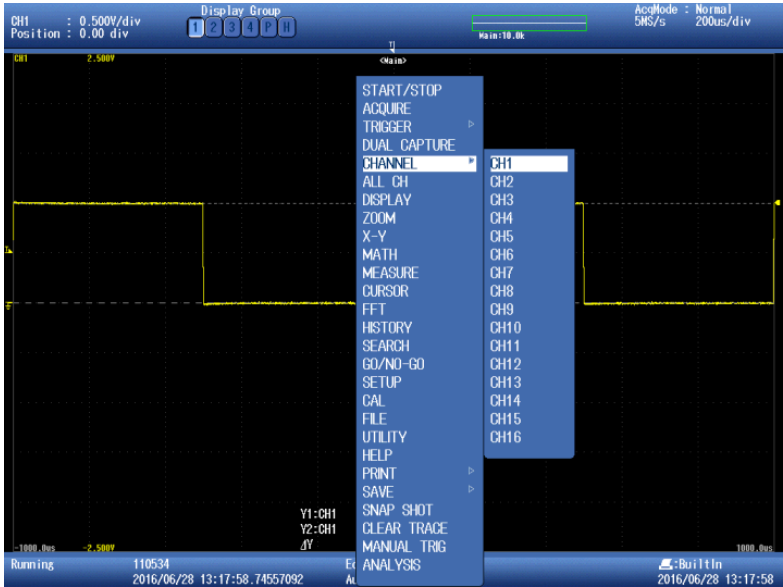
Example
Enter a channel label

Example
Adjust cursor settings

Mouse menu: channels

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Appendix C – Sample rate & measurement time
DL850E/DL850EV ScopeCorder getting started guide

In order to determine the possible sample rate & measurement time settings, a few parameters need to be defined. The 'DL850E/DL850EV ScopeCorder getting started guide' (download link) provides the necessary information.

From this manual we will be using Appendix 3 and 1.

User's Manual
DL850E/DL850EV
ScopeCorder
Getting Started Guide

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Yokogawa Meters & Instruments Corporation

IM DL850E-03EN
4th Edition

Example case
4 measurement channels; up to 10MS/s sample rate
/M1 memory option (1 GPoint)
Use DualCapture

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Appendix C – Sample rate & measurement time
Maximum record length

■ First thing to determine is the maximum record length. Go to Appendix 3 of the guide (page 'App-19'), where you will find 4 tables. Depending on the use of the features 'Dual Capture' and 'Hard disk recording', a different table applies:

	Dual Capture **OFF**	Dual Capture **ON**
Hard disk recording **OFF**	Table 1	Table 3
Hard disk recording **ON**	Table 2	Table 4

■ Select the row that represents your channel count.
■ Select the column that represents your memory option.

Example case
For our example case we use table 3, resulting in a maximum record length of 100M.

When Dual Capturing Is On and Hard Disk Recording Is Off

Number of Displayed Channels	Model Standard	/M1 (1 G)	/M2 (2 G)
9 to 16 channels	5 M	25 M	50 M
5 to 8 channels	10 M	50 M	100 M
3 to 4 channels	25 M	100 M	250 M
2 channels	50 M	250 M	500 M
1 channel	100 M	500 M	1 G

Unit of record length: Point

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Appendix C – Sample rate & measurement time
Time/div and sample rate

■ Now we can lookup what Time/div and sample rate options are available. To do this, go to appendix 1 of the guide (page 'App-1'). Here you find tables with all options for the different record lengths.

- If you have a 100 MS/s input module (720210 / 720211) installed, use the tables starting at page 'App-1'.
- If you don't have 100 MS/s input modules installed, use the tables starting at page 'App-8'.

■ Now search for the column with the appropriate record length. In the example case (100M) we find this at pages 'App-12' and 'App-13', with the following options:

Time/div & recording time
Please note that in our example case we can select from 1µs to 20 days per division, resulting in an acquisition time of 10µs to 200 days.

100 MPoint																	
Time /div	Sample Rate (S/s)	Display Record Length (Points)	Time /div	Sample Rate (S/s)	Display Record Length (Points)	Time /div	Sample Rate (S/s)	Display Record Length (Points)	Time /div	Sample Rate (S/s)	Display Record Length (Points)	Time /div	Sample Rate (S/s)	Display Record Length (Points)	Time /div	Sample Rate (S/s)	Display Record Length (Points)
1 µs	10 M	100	1 ms	10 M	100 k	1 s	10 M	100 M	1 min	100 k	60 M	1 h	2 k	72 M	1 day	100	86.4 M
2 µs	10 M	200	2 ms	10 M	200 k	2 s	5 M	100 M	2 min	50 k	60 M	2 h	1 k	72 M	2 days	50	86.4 M
5 µs	10 M	500	5 ms	10 M	500 k	3 s	2 M	60 M	3 min	50 k	90 M	3 h	500	54 M	3 days	20	51.84 M
10 µs	10 M	1 k	10 ms	10 M	1 M	4 s	2 M	80 M	4 min	20 k	48 M	4 h	500	72 M	4 days	20	69.12M
20 µs	10 M	2 k	20 ms	10 M	2 M	5 s	2 M	100 M	5 min	20 k	60 M	5 h	500	90 M	5 days	20	86.4M
50 µs	10 M	5 k	50 ms	10 M	5 M	6 s	1 M	60 M	6 min	20 k	72 M	6 h	200	43.2 M	6 days	10	51.84M
100 µs	10 M	10 k	100 ms	10 M	10 M	8 s	1 M	80 M	7 min	20 k	84 M	7 h	200	50.4 M	8 days	10	69.12M
200 µs	10 M	20 k	200 ms	10 M	20 M	10 s	1 M	100 M	8 min	20 k	96 M	8 h	200	57.6 M	10 days	10	86.4M
500 µs	10 M	50 k	500 ms	10 M	50 M	20 s	500 k	100 M	9 min	10 k	54 M	9 h	200	64.8 M	20 days	5	86.4M
						30 s	200 k	60 M	10 min	10 k	60 M	10 h	200	72 M			
									12 min	10 k	72 M	12 h	200	86.4 M			
									15 min	10 k	90 M						
									30 min	5 k	90 M						

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Additional Resources

For technical support on ScopeCorder products, please contact our Customer Service Centre:

Phone +31 (0)88 – 464 1429

Email CSC.TCE@nl.yokogawa.com

To find information on the ScopeCorder platform (main frames, modules & accessories) and also find application examples, please make use of the ScopeCorder product pages at our website:

DL850E(V) product page

To download the latest manuals, firmware versions, drivers and software, please register yourself and your product at our Y-Link page:

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