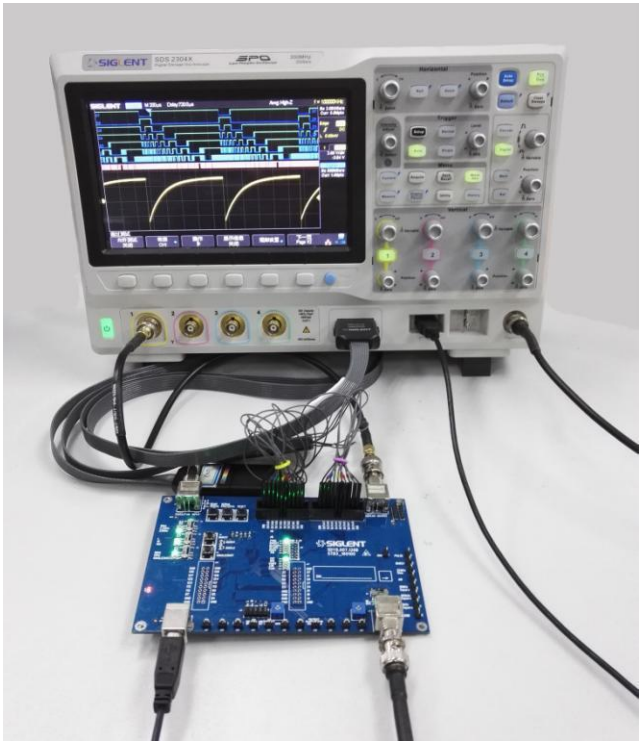
User Manual

STB3 Demo Board



This page intentionally left blank

Index

Features

The STB3 is a multi-signal generator board which was designed to aid in demonstrating SIGLENT oscilloscopes advanced features. Functions and operations such as advanced triggering, serial decoding, digital-phosphor display, and more can be demonstrated.

Common Waveforms

Sine Wave

1. Sine Wave #1
   - Frequency: 25 MHz
   - Amplitude: Approximately 1.3 Vpp
   - Output from jumper
2. Sine Wave #2
   - Frequency: 1.25 MH
   - Amplitude: Approximately 750 mVpp
   - Output from BNC connector

Figure 1 Sine Wave #1

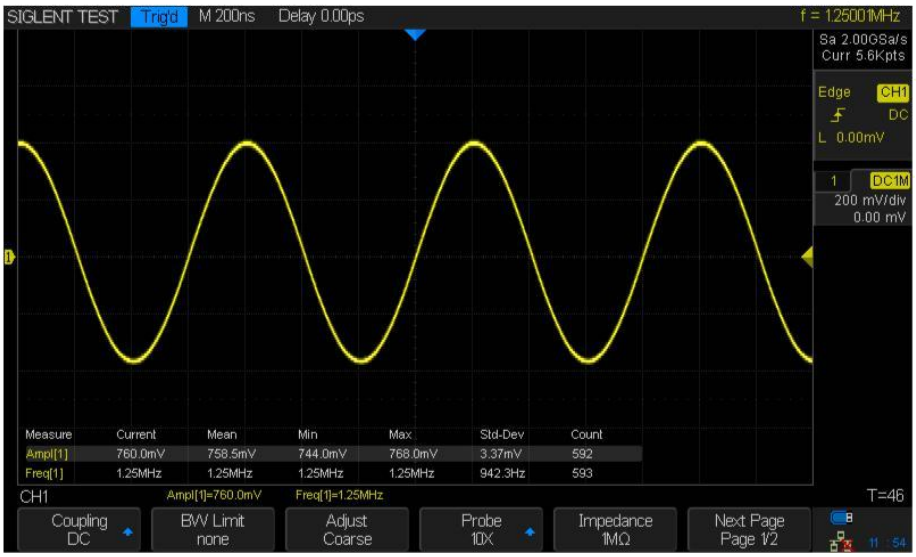


Figure 2 Sine Wave #2

Square Wave

1. Square Wave #1
   - Frequency: 1 kHz
   - Amplitude: Approximately 3 Vpp
   - DC offset: 3.3 V
2. Square Wave #2
   - Frequency: 100 kHz
   - Amplitude: Approximately 3.3 Vpp
   - DC offset: 1.7 V
3. Square Wave #3
   - Frequency: 10 MHz
   - Amplitude: Approximately 3.3 Vpp
   - DC offset: 1.7 V

Attention

Use ground spring when probing square wave #3 to get the optimum signal fidelity as shown below.

Figure 3 Square Wave #1

Figure 4 Square Wave #2

Figure 5 Square Wave #3

AM Signal

- Modulation Signal Frequency: 2.5 MHz
- Carrier Frequency: 25 MHz
- Adjustable modulation depth

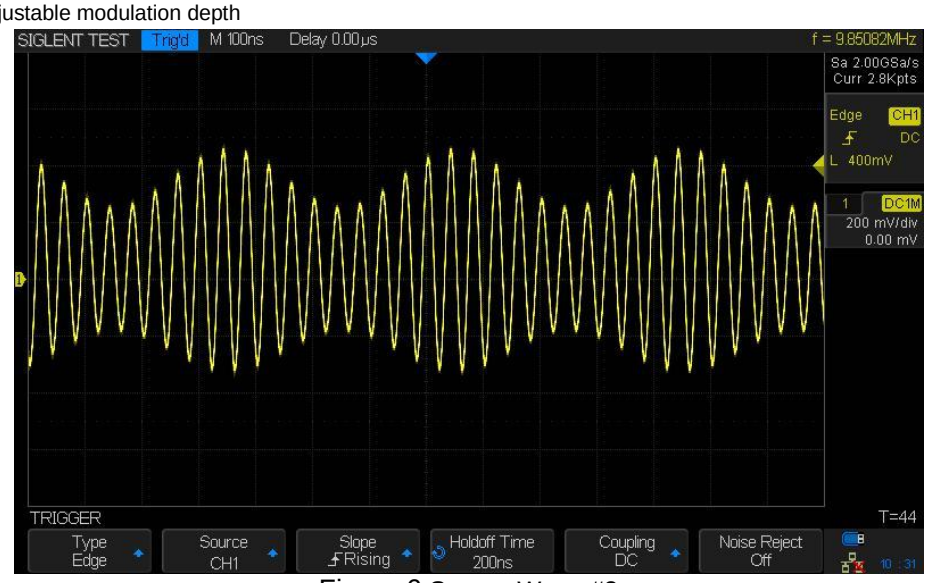


Figure 6 Square Wave #3

Fast Edge Square Wave

- Frequency: 1 MHz, 10 Hz, manually triggered
- LVPECL output (Low Voltage Positive Emitter Coupled Logic)

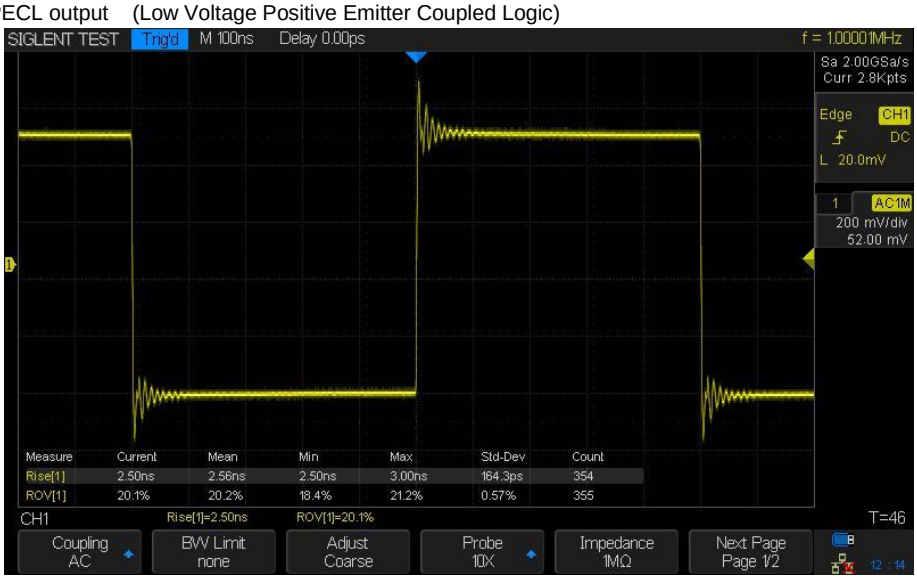


Figure 7 Fast Edge Square Wave - Using Ground Lead

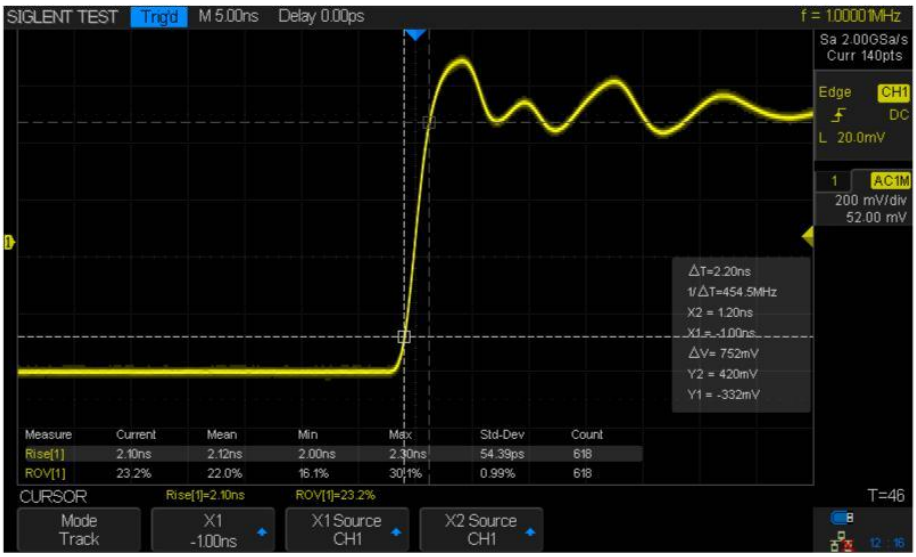


Figure 8 Fast Edge Square Wave - Using Ground Lead

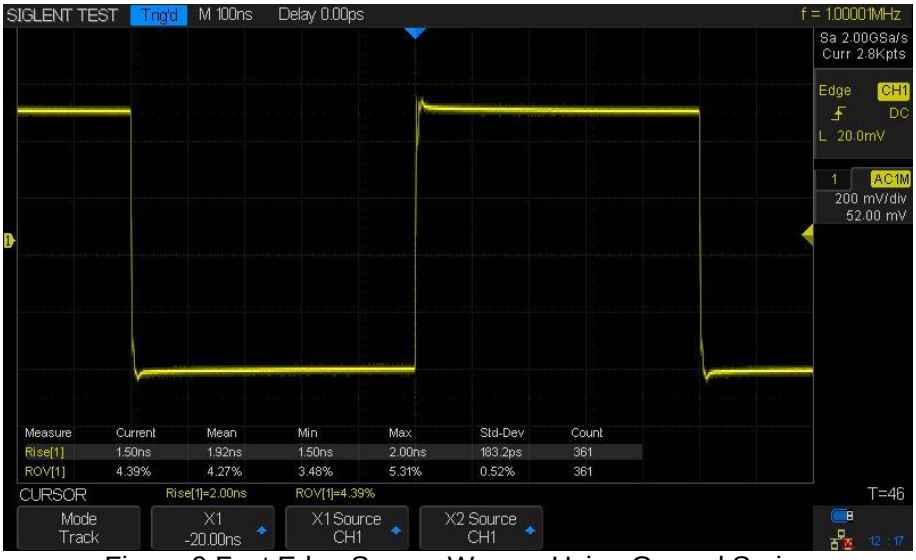


Figure 9 Fast Edge Square Wave – Using Ground Spring

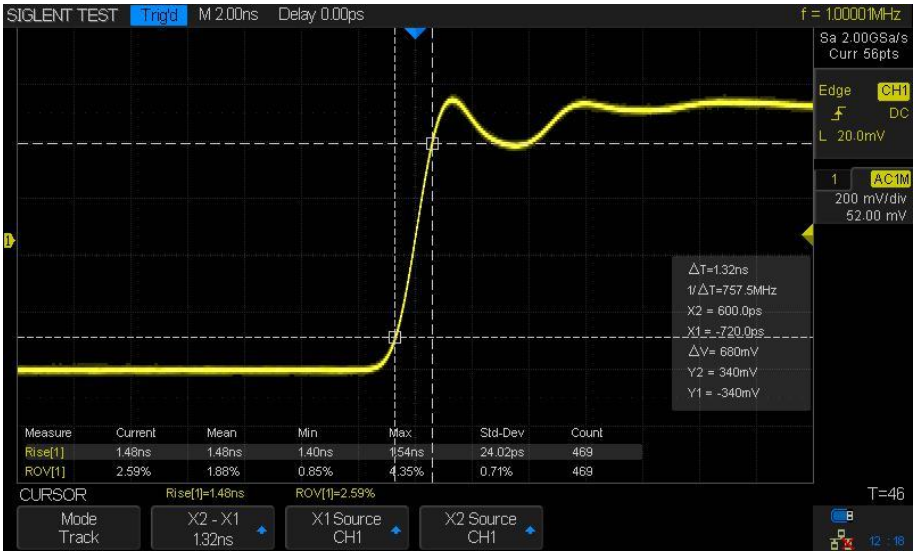


Figure 10 Fast Edge Square Wave – Using Ground Spring

Burst Signal

- Pulse Width: 500 ns
- NO. of Pulses: 1, 10, 100
- Manually Triggered

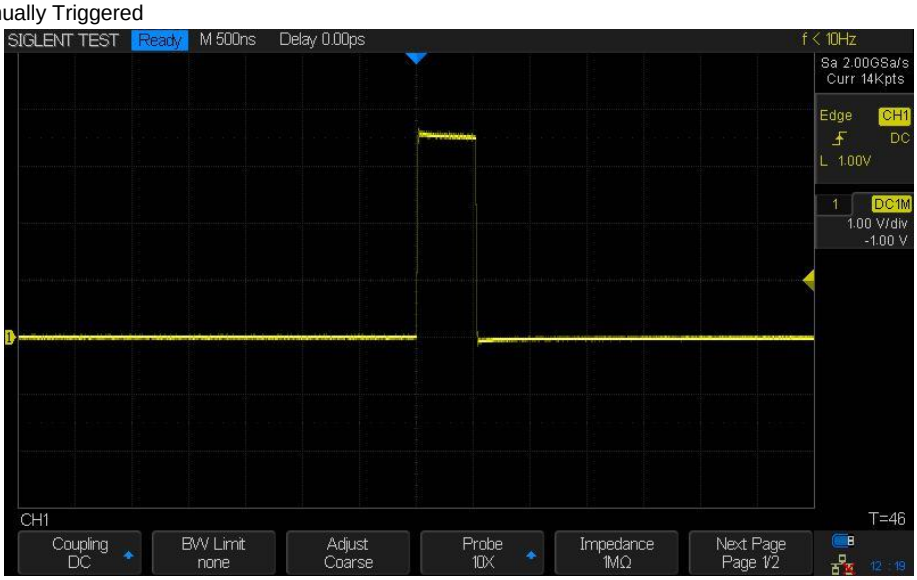


Figure 11 Burst Signal – 1 Pulse

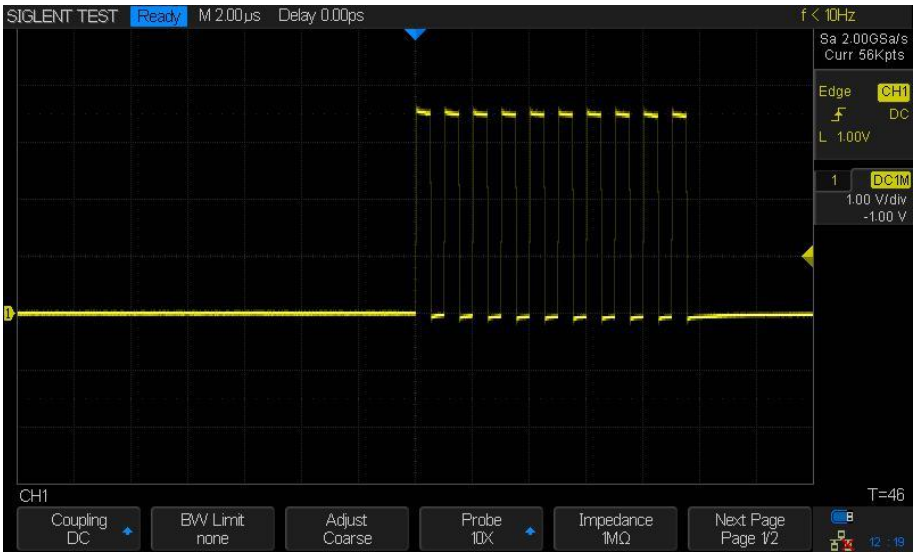


Figure 12 Burst Signal - 10 Pulses

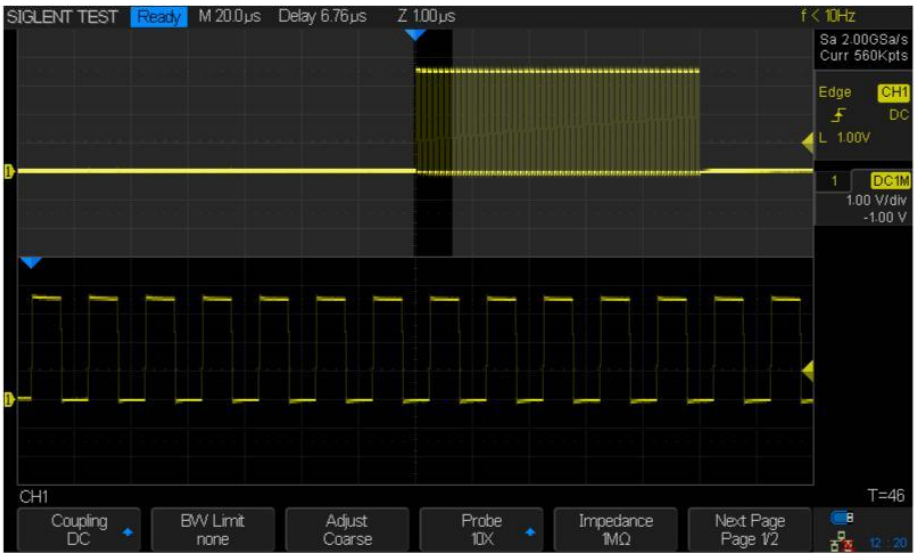


Figure 13 Burst Signal - 100 Pulses

Special Signals

PWM

- Carrier Frequency: 24.4 kHz
- Duty Cycle Variation: 25% to 50%

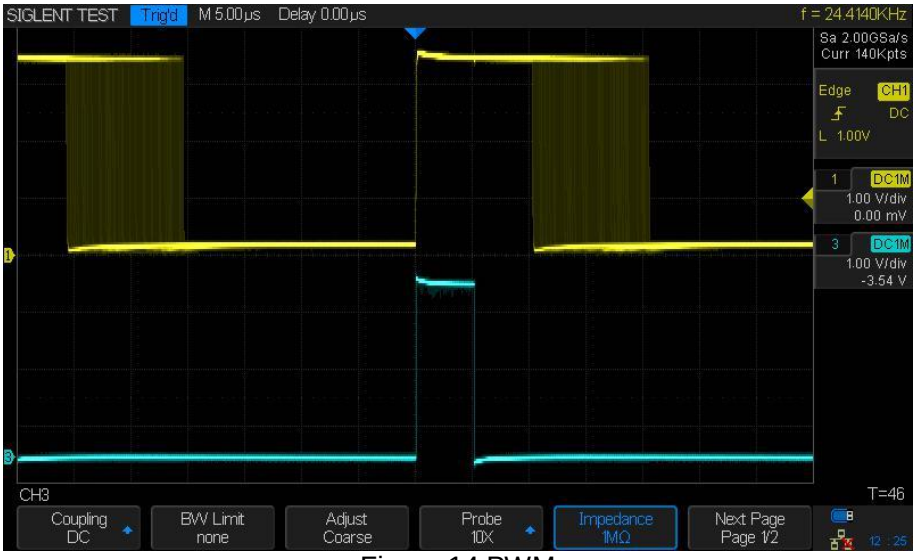


Figure 14 PWM

BURST

- Period: Approximately 65 ms
- Pulse Width: 500 ns
- Interval between Pluses: 500ns

- NO. of Pulses: 20
- Random Glitch

Figure 15 BURST – Long Record Length

Figure 16 BURST – Long Recording Length, zoom in to see glitch detail

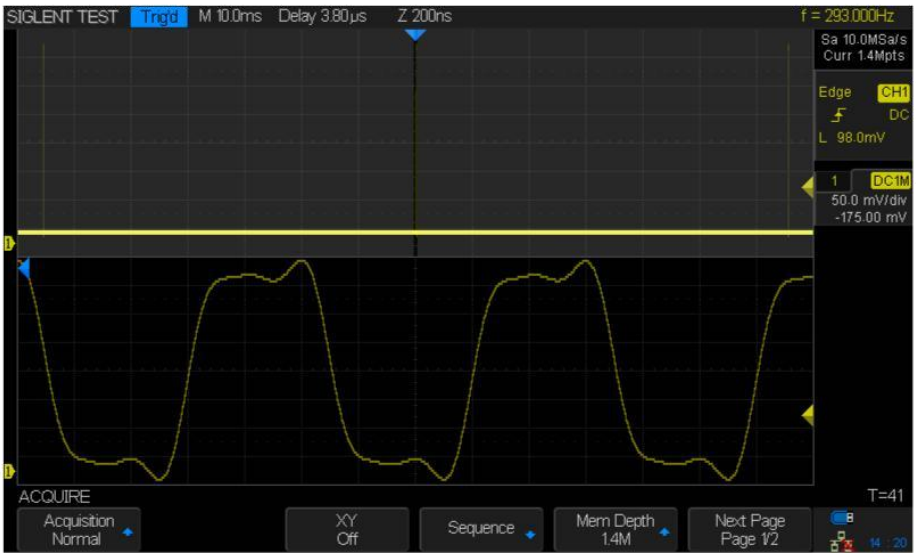


Figure 17 BURST- Middle Recording Length, loses glitch detail

Figure 18 BURST - Short Recording Length, aliasing

GLITCH

In this 1 Mbps pseudo-noise sequence there are glitches which typically have a pulse width of 60 ns and amplitude of 1.6 V, appearing every 15 ms.

Please note that probe loading can affect the glitch parameters because of the high source impedance. The resulting waveform could appear different from that shown below.

Figure 19 GLITCH – Positive Polarity

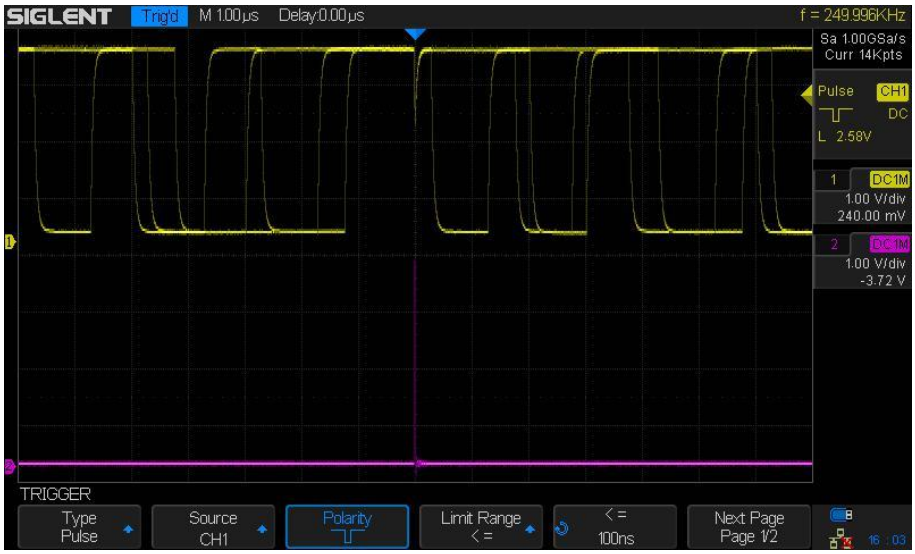


Figure 20 GLITCH – Negative Polarity

SLOPE

On the negative edge of a 156 kHz square wave, a step having 200ns width adds to the overall fall time of the edge. The resulting effective negative slope is approximately 200 ns.

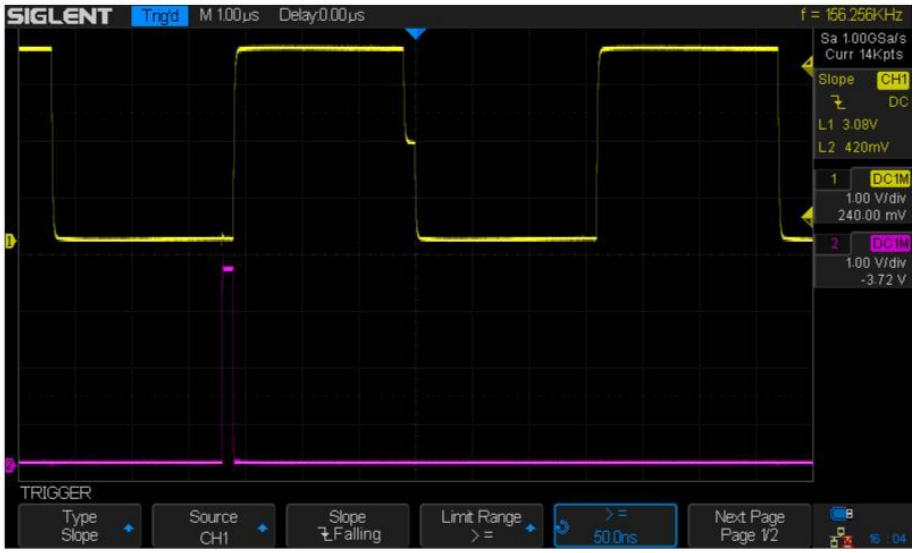


Figure 21 SLOPE

RUNT

In this 1 Mbps pseudo-noise sequence there is a runt signal with a 300 ns width appearing every 6.3 ms (max). Some voltage steps may also be present.

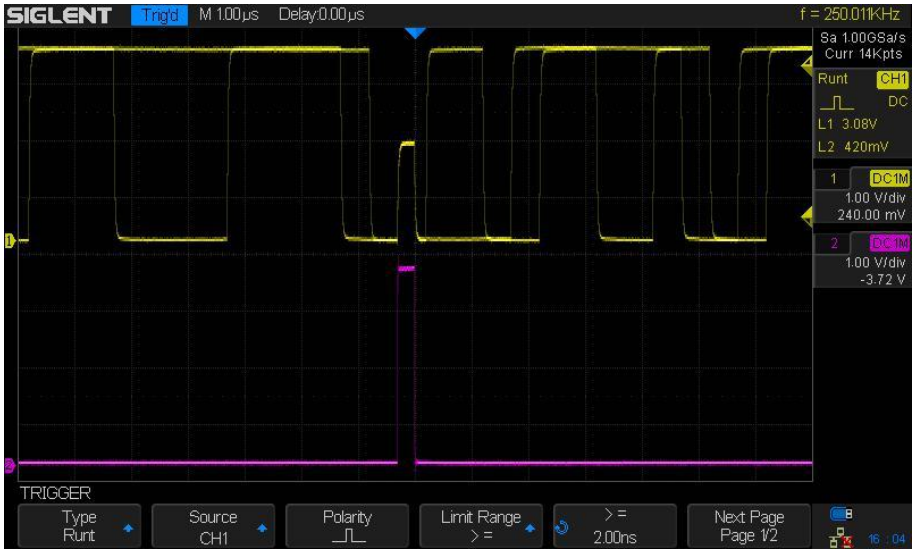


Figure 22 RUNT – Positive Polarity

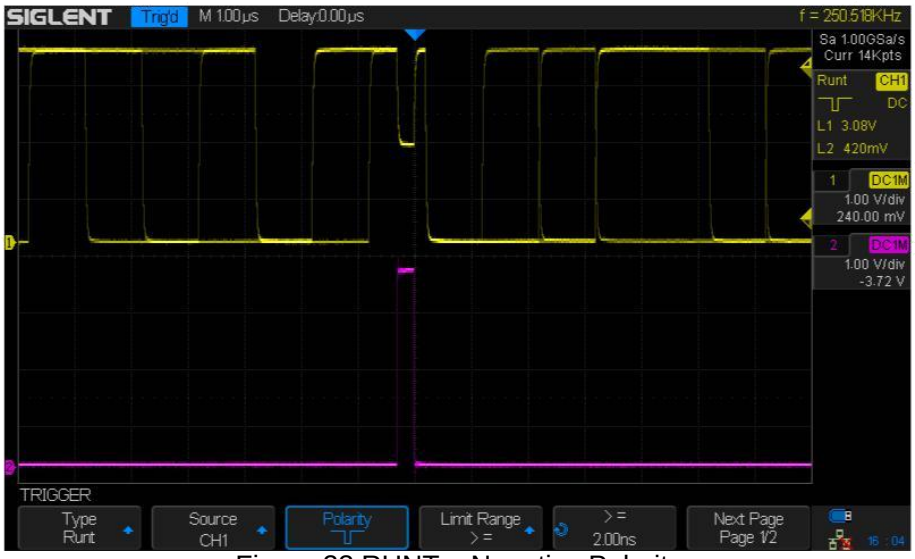


Figure 23 RUNT – Negative Polarity

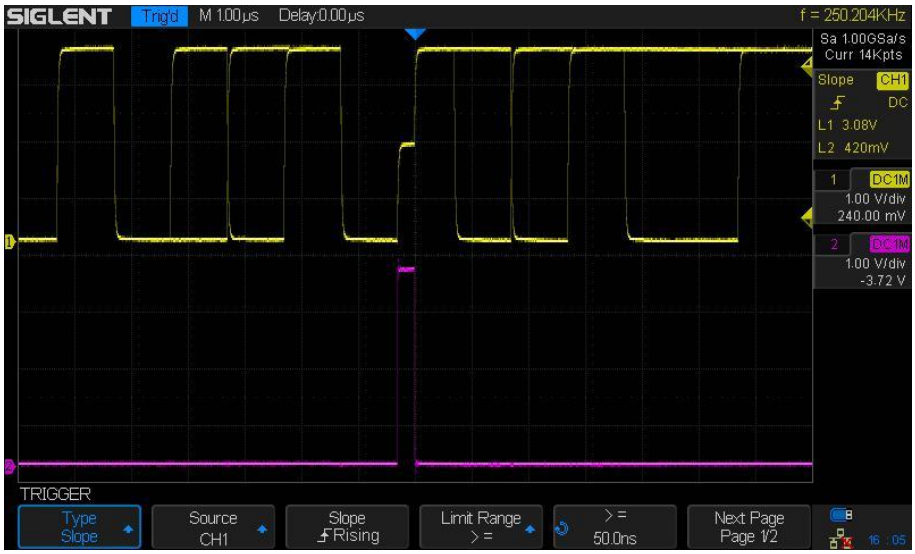


Figure 24 RUNT – Positive Edge Slope

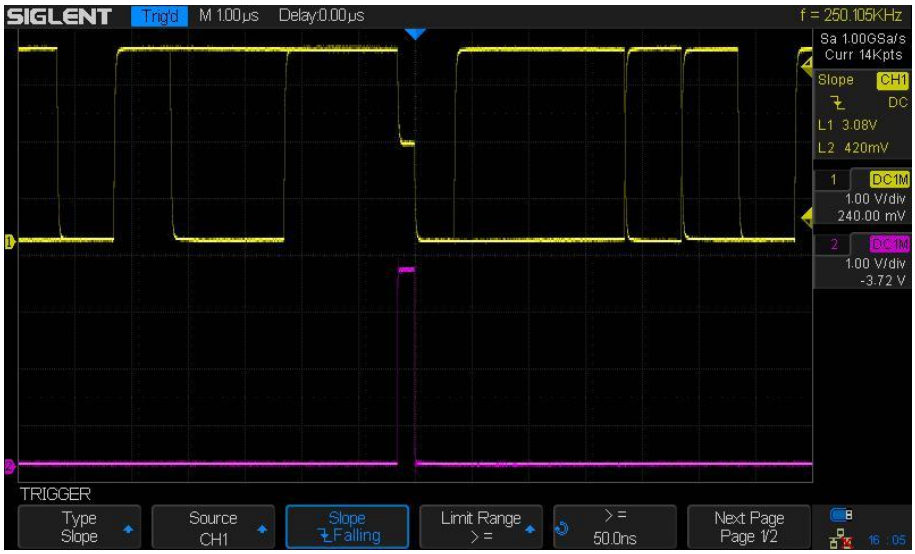


Figure 25 RUNT – Negative Edge Slope

Pseudo-Noise Sequence

- A 1 Mbps pseudo-noise sequence

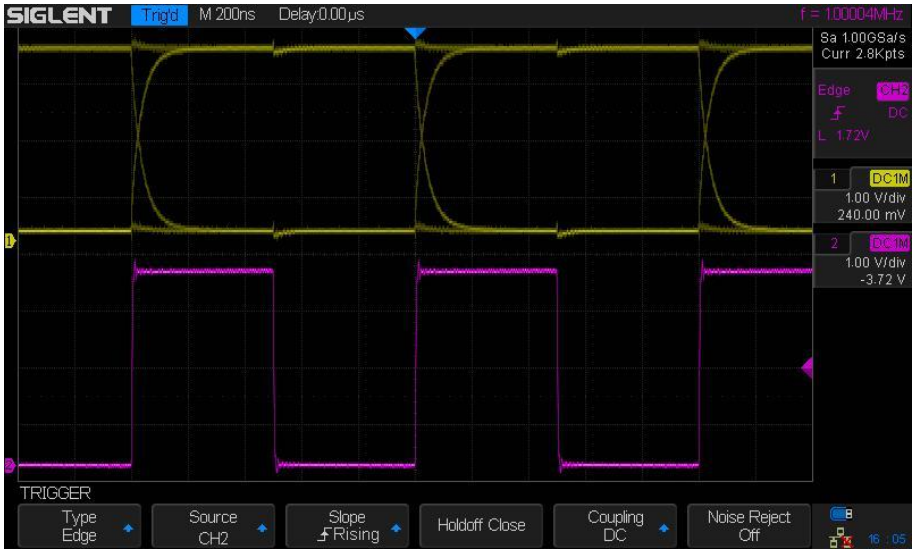


Figure 26 Pseudo-Noise Sequence

Noisy PWM

A noisy PWM with a carrier frequency of 1.5 KHz and a duty cycle variation from 25% to 50%, which is used for demonstrating the ERES acquisition mode. The noise amplitude is adjustable. (ERES: Enhanced Resolution)

Figure 27 Noisy PWM – NORMAL acquire mode

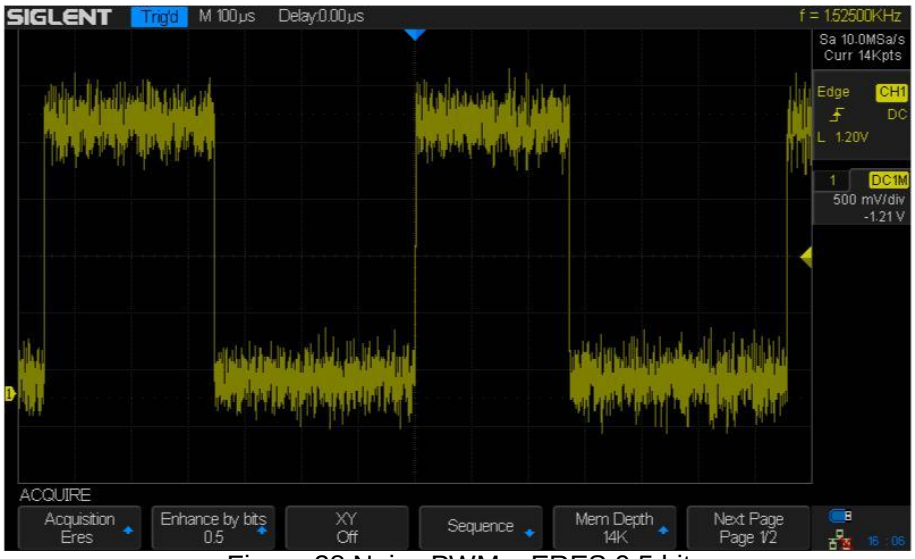


Figure 28 Noisy PWM – ERES 0.5 bit

Figure 29 Noisy PWM – ERES 3.0 bit

Signal for Demonstrating SPO

A specially designed signal for demonstrating Siglent's Super Phosphor Ocilloscope (SPO). Please note, proper trigger setup is required to obtain a stable display on this complex waveform, as shown below.

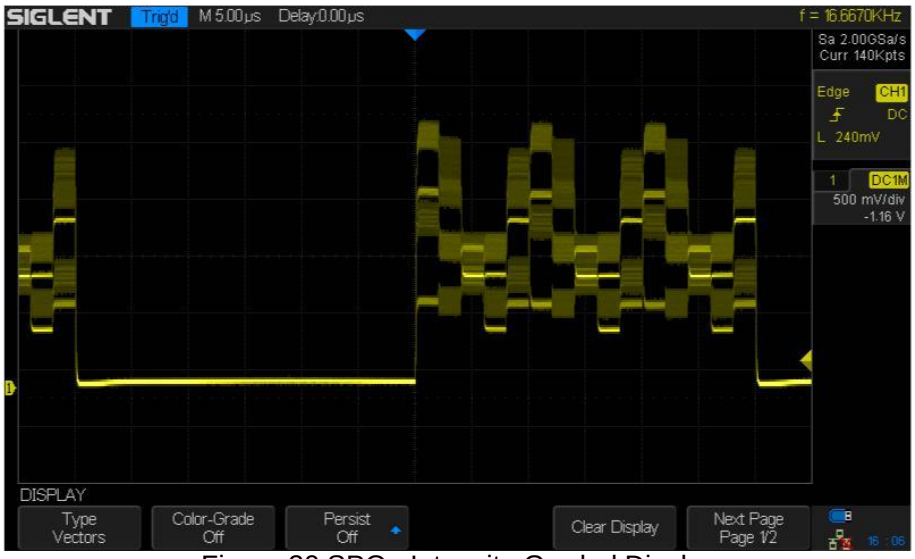


Figure 30 SPO –Intensity-Graded Display

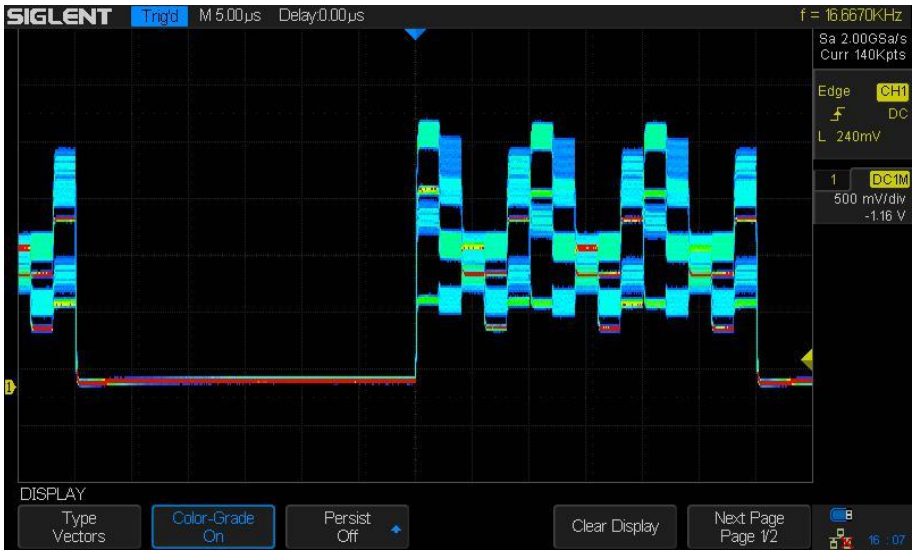


Figure 31 SPO – Display with Color Mode Enabled

Serial Protocol

I2C

- 100 kbps
- 7-bit and 10-bit addressing
- Read and write (R/W)

The I2C signal has 4 different kinds of frames (see table below). Every frame has 12 bytes of data which is 96'h53_49_47_4C_45_4E_54_5F_XX_XX_XX_XX（SIGLENT_XXXX in ASCII format, XXXXstands for 4 random characters）. If you have trouble in understanding the table below, please refer to NXP document UM10204.

S	7'b1001110	W	A1	D1	A2	„	D12	A13	P

S	7'b1111010	W	A1	8'b11101011	A2	D1	A3	„	D12	A13	P

S	7'b1100100	R	A1	D1	A2	„	D12	A13	P

S	7'b1111010	W	A1	8'b10101011	A2	Sr	7'b1111010	R	A3	D1	A4	„	D12	A14	P

Table 1 I2C Frame

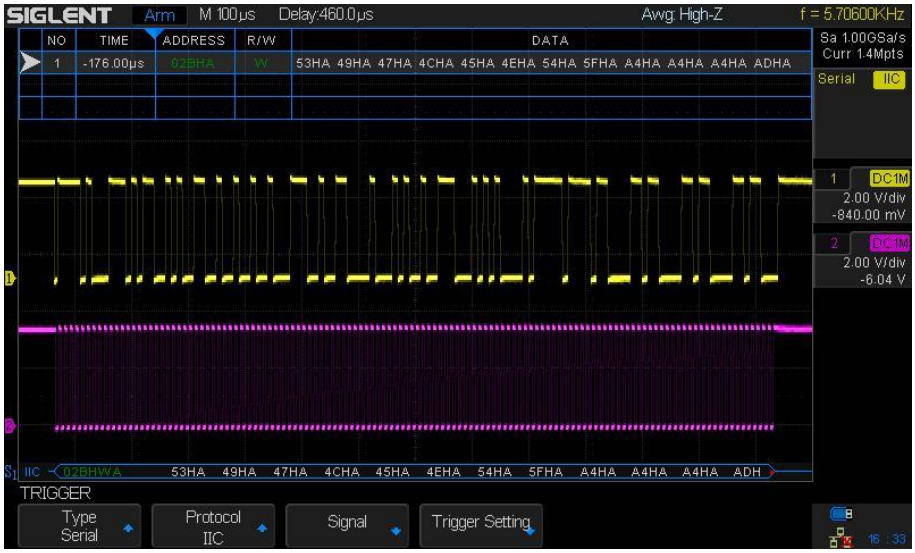


Figure 32 I2C Signal

SPI

- 1 Mbps
- CPOH=1, CPHA=1
- 8-bit data width
- MSB first
- Active low chip select

Like I2C signal, the SPI signal has 12bytes of data in each transfer, which is 96'h53_49_47_4C_45_4E_54_5F_XX_XX_XX_XX.

Figure 33 SPI Signal

UART

- 9.6 kbps baud rate
- Idle high
- 8-bit data width
- MSB first
- Odd parity bit
- 2-bit stop bit

As with the I2C signal, the UART signal has 12bytes data in each transfer, which is 96'h53_49_47_4C_45_4E_54_5F_XX_XX_XX_XX.

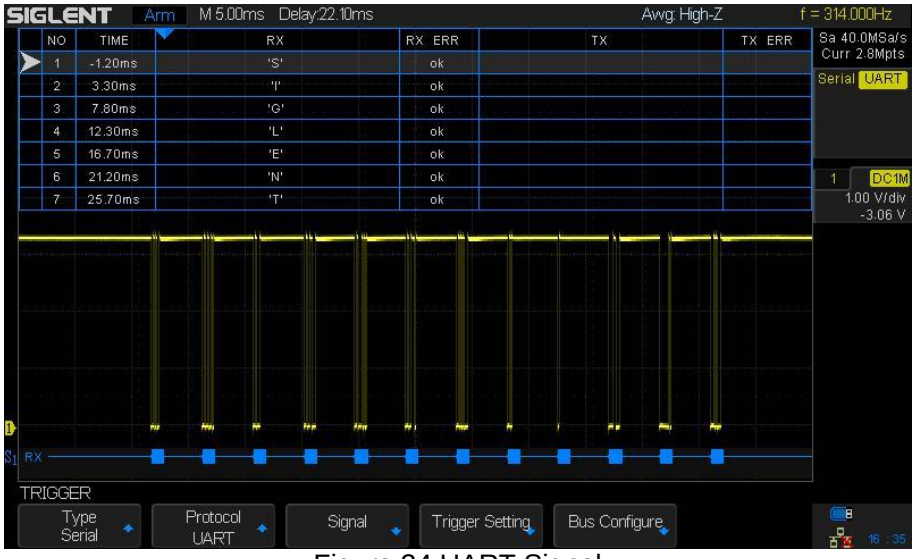


Figure 34 UART Signal

LIN

- 9.6 kbps
- LIN 2.0

NO.	Break	Sync	PID	Parity	Data	Checksum	Stop
1	≧13bit	8'h55	6'h06	2'b00	16'h54_5f	8'h46	T
2	≧13bit	8'h55	6'h14	2'b00	16'h54_5f	8'h38	T
3	≧13bit	8'h55	6'h25	2'b00	32'h45_4e_54_5f	8'h93	T
4	≧13bit	8'h55	6'h3b	2'b03	64'h53_49_47_4c_54_5f	8'h8c	T

Table 2 LIN Frame

Figure 35 LIN Signal

CAN

- 50 kbps
- Extended format
- ISO-11898-5 physical layer

NO.	SOF	ARB	RTR	r1	r0	DLC	Data	CRC	ACK	EOF
1	SOF	29'h7819 f51	1'b0	1'b1	1'b1	4'h8	64'h53_49_47_4C_ 45_4E_54_5F	15'h7541	D	EOF
2	SOF	29'h12f3 0dc	1'b1	1'b1	1'b1	4'h0	--------	15'h3d1c	D	EOF
3	SOF	29'h4495 71d	1'b0	1'b1	1'b1	4'h4	32'h45_4E_54_5F	15'h65c0	D	EOF
4	SOF	29'h56a7 e0c	1'b1	1'b1	1'b1	4'h3	--------	15'h05f7	D	EOF

Table 3 CAN Frame

Figure 36 CAN Signal

PASS/FAIL Demonstration

Compatible with SDS2000X PASS/FAIL output. When a “failure” occurs, the onboard LED flickers once.

MSO Demonstration

Compatible with SDS2000X and SPL2016, can be used with other SIGLENT MSO models.

- Selectable onboard 1.25 MHz sine wave or external input analog signal
- Buffered analog signal output through BNC connector
- Selectable onboard ADC sampling frequency: 1 MSPS, 2.5 MSPS, 25 MSPS

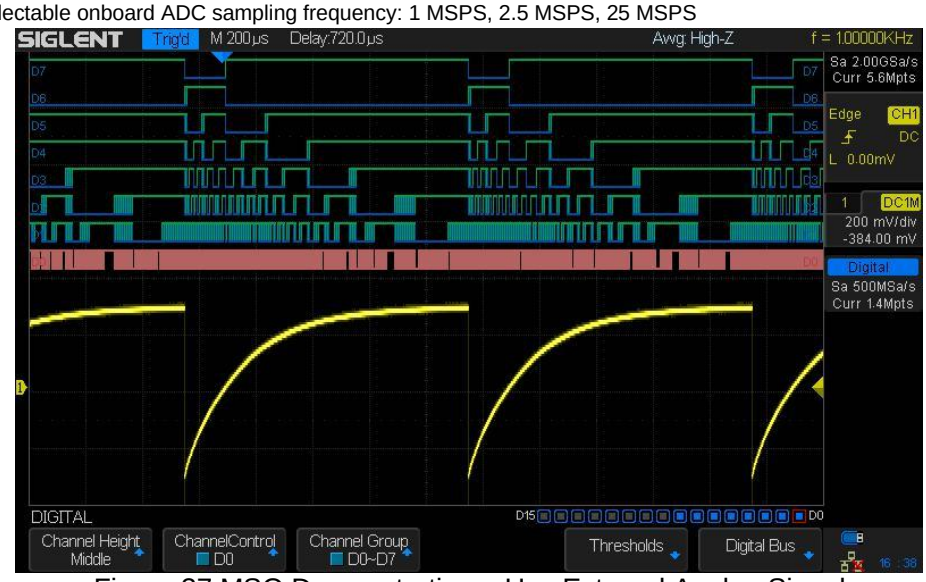


Figure 37 MSO Demonstration – Use External Analog Signal

Quick Start

Connection Example

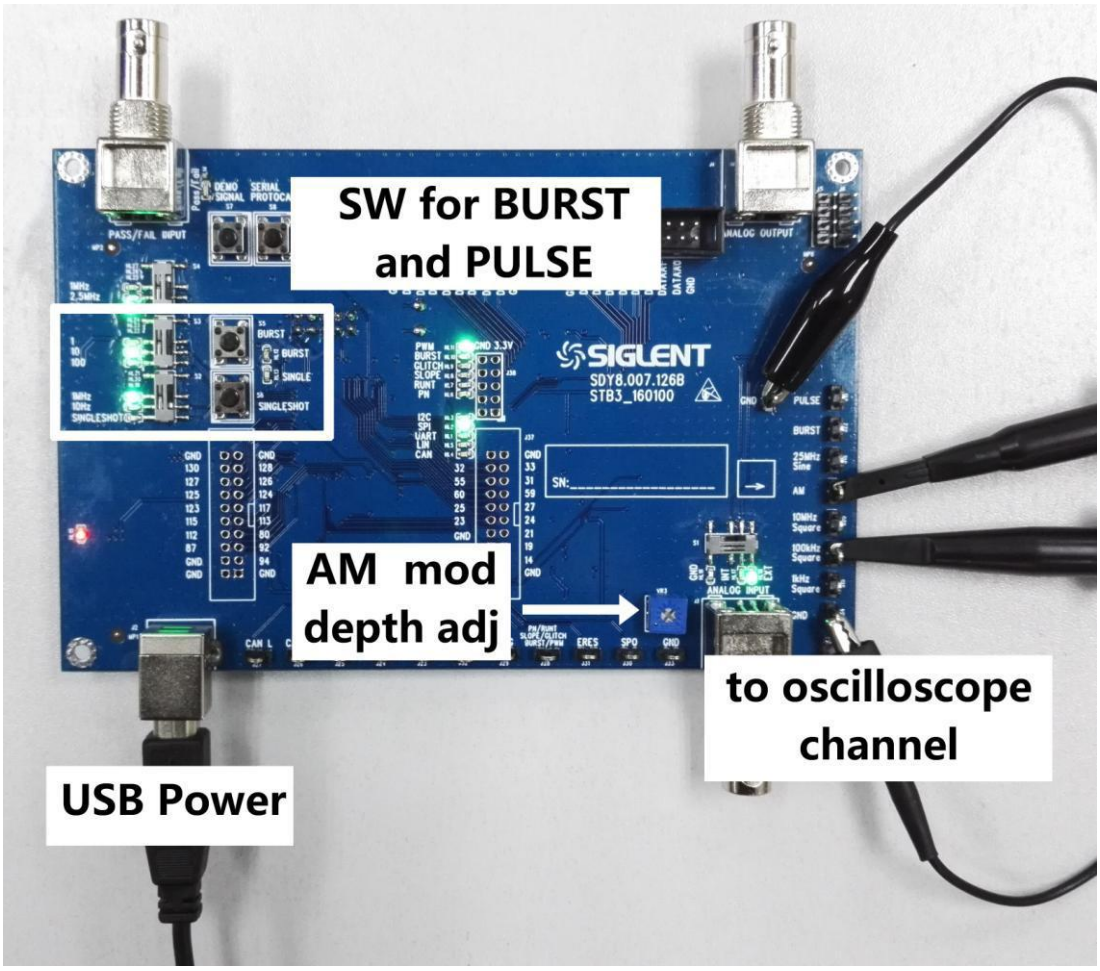


Figure 38 for Common Waveforms

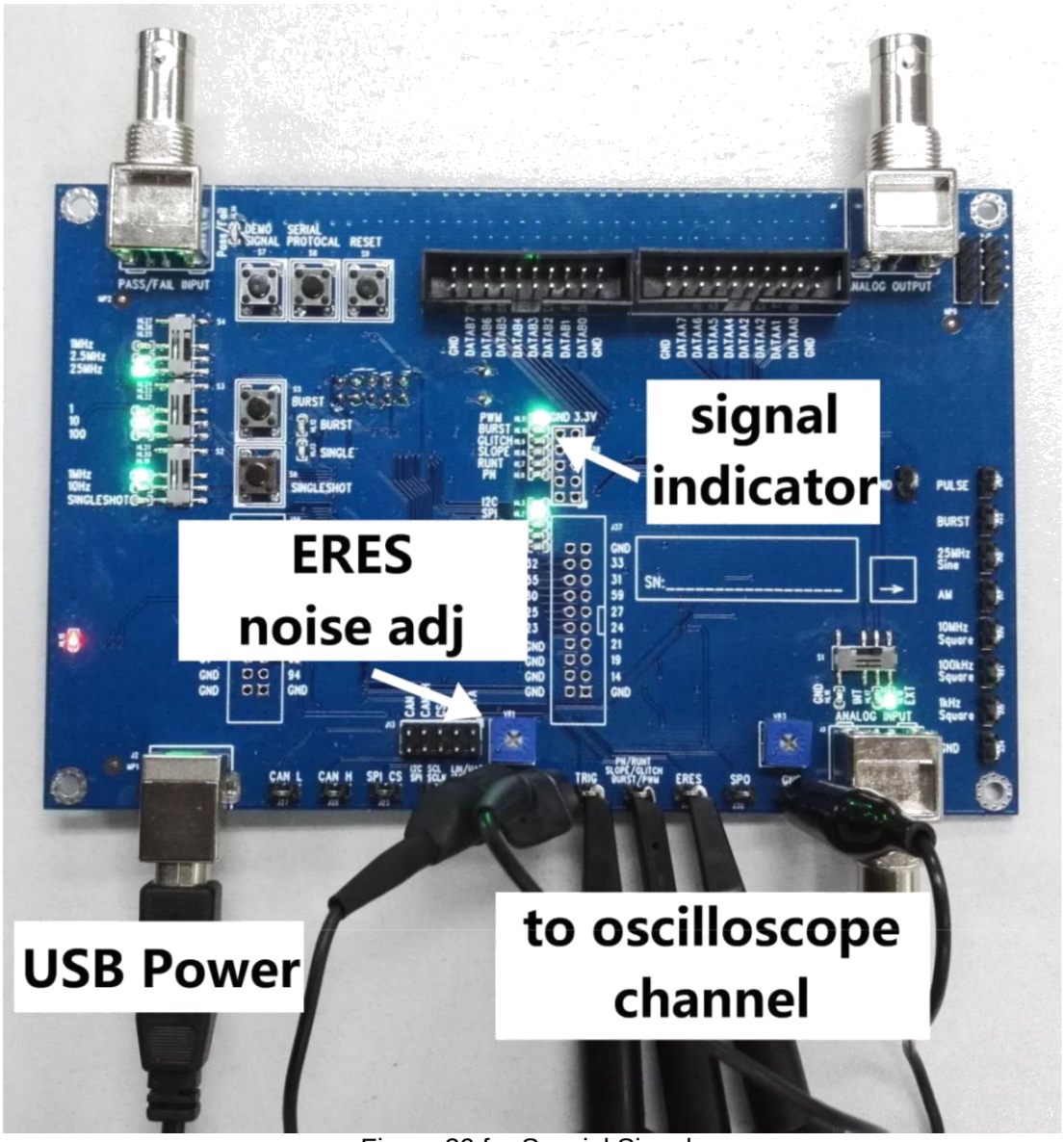


Figure 39 for Special Signals

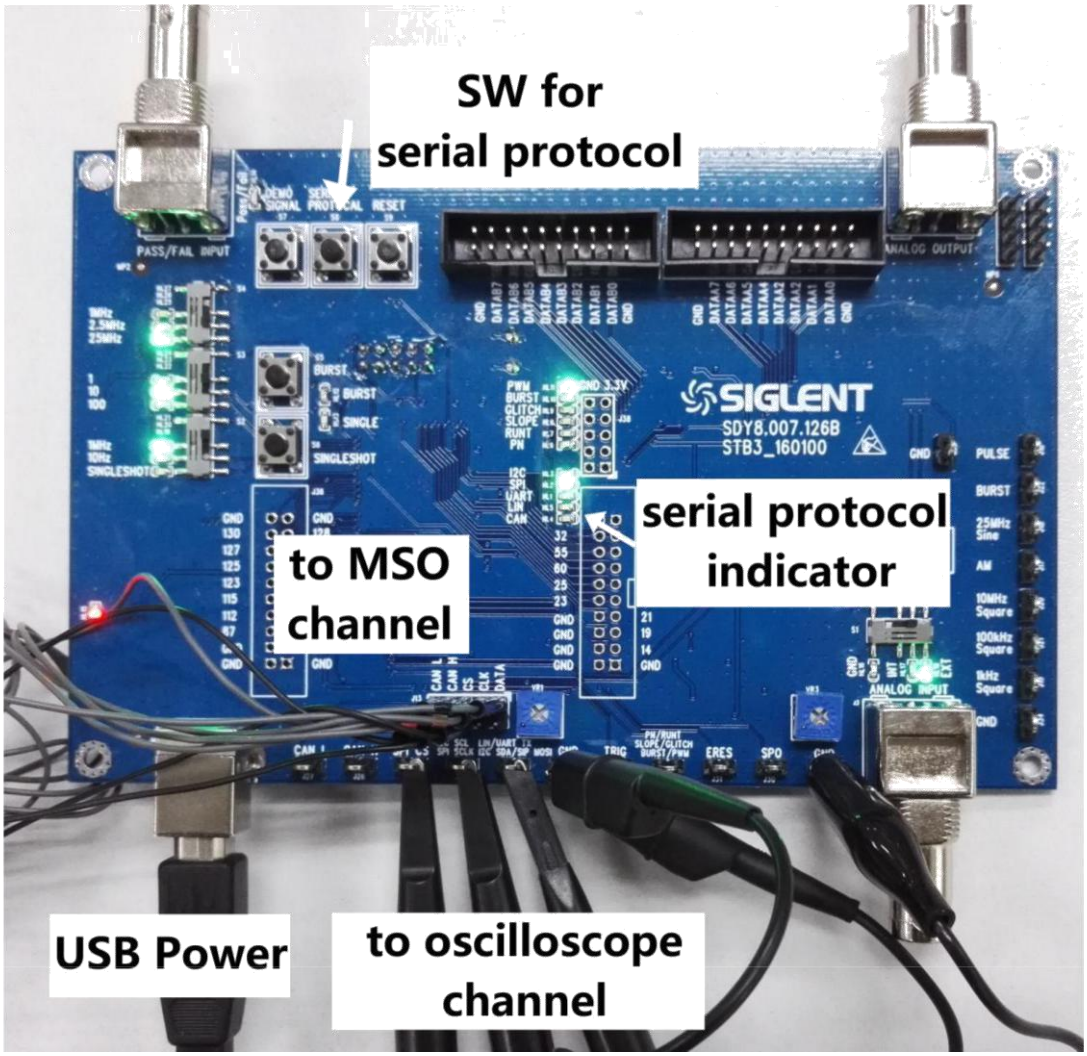


Figure 40 for Serial Protocol Signal

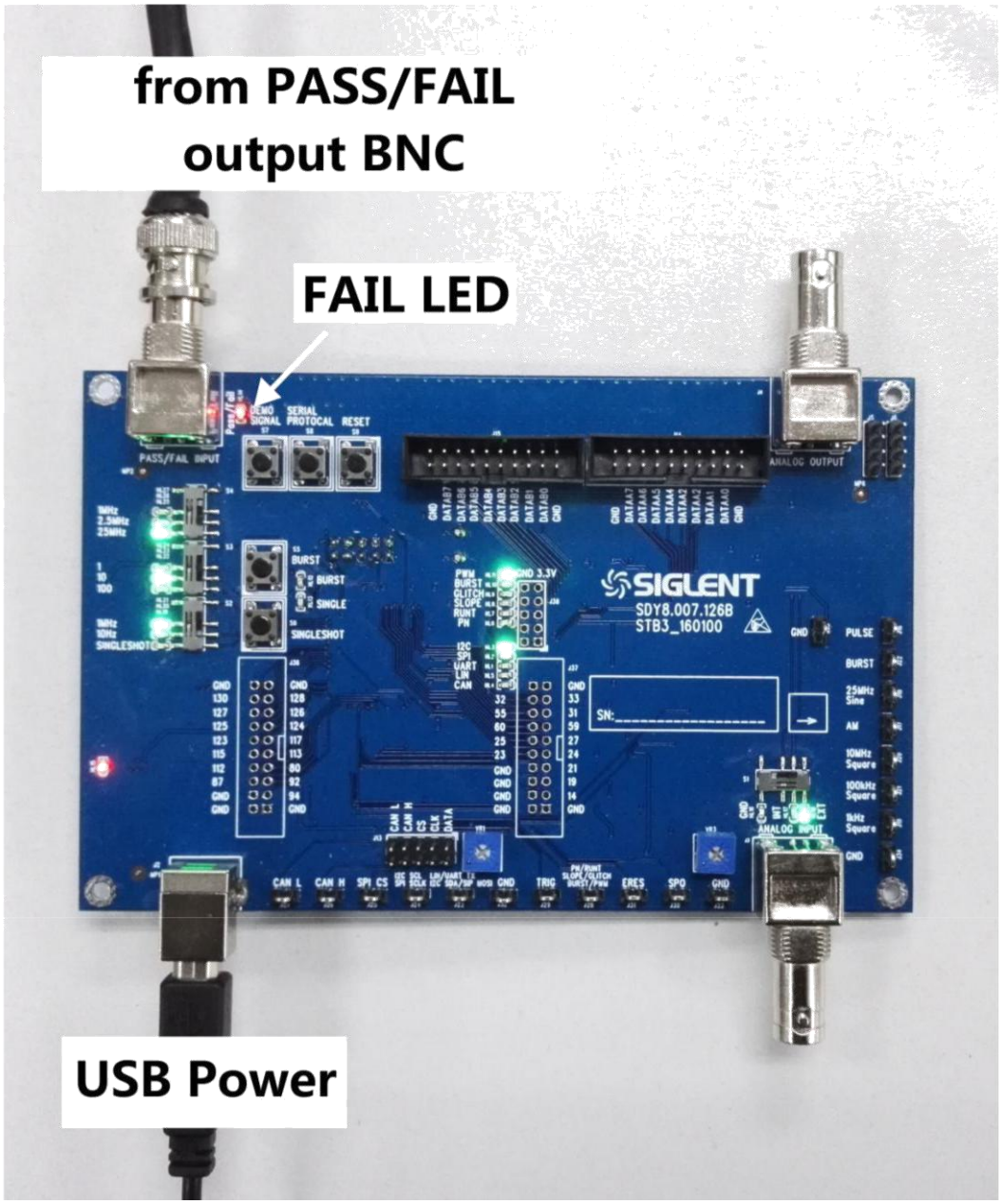


Figure 41 for PASS/FAIL Demonstration

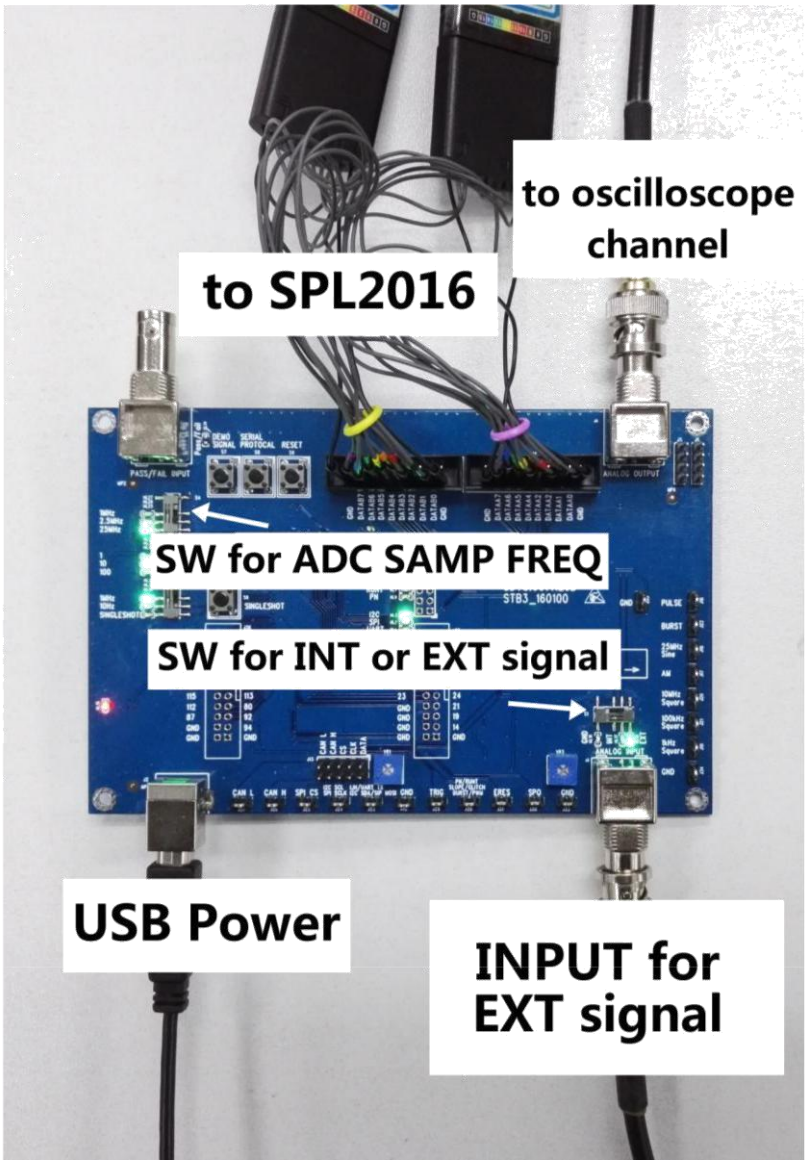


Figure 42 for MSO Demonstration

This page intentionally left blank