MULTI-CHANNEL CONCURRENT ACQUISITION

The three plug-in compartments of the DSA 600 Series Digitizing Signal Anlayzers provide waveform acquisition for up to 12 input channels. The conditions under which Main and Window Records can be acquired concurrently, with real time sampling (single-shot acquisitions), depends on several interacting factors: the location and number of active plug-in channels (Figure 1), the record length, the sweep speed (Table 1), and the pretrigger conditions (Table 2).

The actual real time sample intervals for each channel are internally determined based on the above factors, but will always be an integer multiple of 1 ns in the DSA 601, or 500 ps in the DSA 602. [Equivalent time sampling (see the Sampling Brief) allows effective sample intervals as short as 1 ps in the DSA 601 and the DSA 602.]

Concurrent Plug-In Channel Combinations

The DSA 601 has two 8-bit digitizers capable of simultaneous 500 MS/s acquisition from any two channels in the LEFT compartment, or any combination of two channels not in the same compartment (Figure 1).

The DSA 602 has four 8-bit digitizers capable of simultaneous 500 MS/s acquisition from four channels (Figure 1). Two channels must be in the LEFT compartment, one in the CENTER, and one in the RIGHT. Simultaneous 1 GS/s acquisitions can be obtained from any two channels in the LEFT compartment, or any combination of two channels not in the same compartment. 2 GS/s acquisitions can be made from one channel in the LEFT compartment.

Real-Time Acquisition Bandwidth

Although the analog bandwidth may be as high as 1 GHz (depending on plug-in), iIn most practical applications, signal frequencies up to approximately one-fourth the sample rate can be acquired single-shot. This allows four points per cycle of the highest frequency component of the signal.

Record Length Considerations

For real-time acquisition, the maximum record length for the DSA 601 is:

1 channel	20464 pts*
2 channels (concurrent)	10240 pts

For real-time acquisition, the maximum record length for the DSA 602 is:

1 channel	32768 pts*
2 channels (concurrent)	20464 pts*
3-4 channels (concurrent)	10240 pts

*Available at the Maximum Sample Rate only.

NOTE: The record length for the main and the two window traces must be less than the maximum record length. For example, if the maximum record length is 10240 points, the main record can be set at 1024 points and each of the two windows at 4096 points.

The sum of the record lengths of all possible traces and stored waveforms is limited to 258,560 points (without Option 4C — Non-Volatile Storage; with Option 4C, stored waveforms are not included in the 258,560 point limitation).

Non-Concurrent Acquisition

If the channels cannot be acquired concurrently because the setup does not fall within the conditions stated above, they will be acquired alternately at up to a 500 MS/s sample rate.

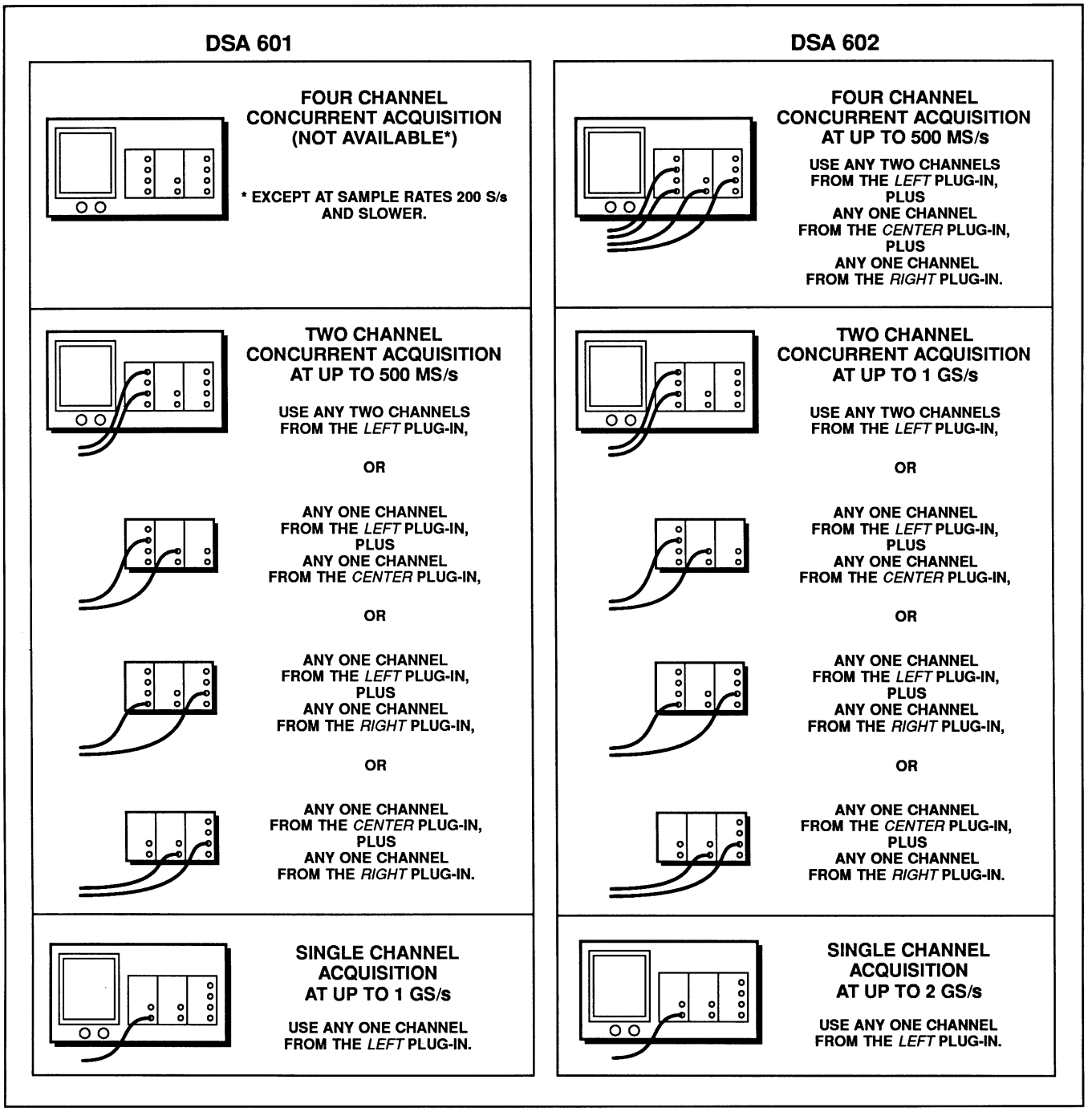

Figure 1. Plug-in channel combinations for Concurrent Acquisition.

Resultant Sampling Rates Based on Record Length and Sweep Speed.

Sweep Speed	Record Length									
	512	1024	2048	4096	5120	8192	10240	16384	20480	32768
100.0 s/div	500.0 mS	1.0 S	2.0 S	5.0 S	5.0 S	10.0 S	10.0 S	20.0 S	20.0 S	50.0 S
50.0 s/div	1.0 S	2.0 S	4.0 S	10.0 S	10.0 S	20.0 S	20.0 S	40.0 S	40.0 S	100.0 S
20.0 s/div	2.5 S	5.0 S	10.0 S	25.0 S	25.0 S	50.0 S	50.0 S	100.0 S	100.0 S	250.0 S
10.0 s/div	5.0 S	10.0 S	20.0 S	50.0 S	50.0 S	100.0 S	100.0 S	200.0 S	200.0 S	500.0 S
5.0 s/div	10.0 S	20.0 S	40.0 S	100.0 S	100.0 S	200.0 S	200.0 S	400.0 S	400.0 S	1.0 kS
2.0 s/div	25.0 S	50.0 S	100.0 S	250.0 S	250.0 S	500.0 S	500.0 S	1.0 kS	1.0 kS	2.5 kS
1.0 s/div	50.0 S	100.0 S	200.0 S	500.0 S	500.0 S	1.0 kS	1.0 kS	2.0 kS	2.0 kS	5.0 kS
500.0 ms/div	100.0 S	200.0 S	400.0 S	1.0 kS	1.0 kS	2.0 kS	2.0 kS	4.0 kS	4.0 kS	10.0 kS
200.0 ms/div	250.0 S	500.0 S	1.0 kS	2.5 kS	2.5 kS	5.0 kS	5.0 kS	10.0 kS	10.0 kS	25.0 kS
100.0 ms/div	500.0 S	1.0 kS	2.0 kS	5.0 kS	5.0 kS	10.0 kS	10.0 kS	20.0 kS	20.0 kS	50.0 kS
50.0 ms/div	1.0 kS	2.0 kS	4.0 kS	10.0 kS	10.0 kS	20.0 kS	20.0 kS	40.0 kS	40.0 kS	100.0 kS
20.0 ms/div	2.5 kS	5.0 kS	10.0 kS	25.0 kS	25.0 kS	50.0 kS	50.0 kS	100.0 kS	100.0 kS	250.0 kS
10.0 ms/div	5.0 kS	10.0 kS	20.0 kS	50.0 kS	50.0 kS	100.0 kS	100.0 kS	200.0 kS	200.0 kS	500.0 kS
5.0 ms/div	10.0 kS	20.0 kS	40.0 kS	100.0 kS	100.0 kS	200.0 kS	200.0 kS	400.0 kS	400.0 kS	1.0 MS
2.0 ms/div	25.0 kS	50.0 kS	100.0 kS	250.0 kS	250.0 kS	500.0 kS	500.0 kS	1.0 MS	1.0 MS	2.5 MS
1.0 ms/div	50.0 kS	100.0 kS	200.0 kS	500.0 kS	500.0 kS	1.0 MS	1.0 MS	2.0 MS	2.0 MS	5.0 MS
500.0 µs/div	100.0 kS	200.0 kS	400.0 kS	1.0 MS	1.0 MS	2.0 MS	2.0 MS	4.0 MS	4.0 MS	10.0 MS
200.0 µs/div	250.0 kS	500.0 kS	1.0 MS	2.5 MS	2.5 MS	5.0 MS	5.0 MS	10.0 MS	10.0 MS	25.0 MS
100.0 µs/div	500.0 kS	1.0 MS	2.0 MS	5.0 MS	5.0 MS	10.0 MS	10.0 MS	20.0 MS	20.0 MS	50.0 MS
50.0 µs/div	1.0 MS	2.0 MS	4.0 MS	10.0 MS	10.0 MS	20.0 MS	20.0 MS	—	—	100.0 MS
40.0 µs/div	—	—	—	—	—	—	—	50.0 MS	50.0 MS	—
20.0 µs/div	2.5 MS	5.0 MS	10.0 MS	25.0 MS	25.0 MS	50.0 MS	50.0 MS	100.0 MS	100.0 MS	250.0 MS
10.0 µs/div	5.0 MS	10.0 MS	20.0 MS	50.0 MS	50.0 MS	100.0 MS	100.0 MS	—	—	500.0 MS
8.0 µs/div	—	—	—	—	—	—	—	250.0 MS	250.0 MS	—
5.0 µs/div	10.0 MS	20.0 MS	—	100.0 MS	100.0 MS	—	—	—	—	1.0 GS
4.0 µs/div	—	—	50.0 MS	—	—	250.0 MS	250.0 MS	500.0 MS	500.0 MS	—
2.5 µs/div	—	—	—	—	—	—	—	—	—	2.0 GS
2.0 µs/div	25.0 MS	50.0 MS	100.0 MS	250.0 MS	250.0 MS	500.0 MS	500.0 MS	1.0 GS	1.0 GS	—
1.0 µs/div	50.0 MS	100.0 MS	—	500.0 MS	500.0 MS	1.0 GS	1.0 GS	2.0 GS	2.0 GS	5.0 GS
800.0 ns/div	—	—	250.0 MS	—	—	—	—	—	—	—
500.0 ns/div	100.0 MS	—	—	1.0 GS	1.0 GS	2.0 GS	2.0 GS	4.0 GS	4.0 GS	10.0 GS
400.0 ns/div	—	250.0 MS	500.0 MS	—	—	—	—	—	—	—
250.0 ns/div	—	—	—	2.0 GS	2.0 GS	—	—	—	—	—
200.0 ns/div	250.0 MS	500.0 MS	1.0 GS	—	—	5.0 GS	5.0 GS	10.0 GS	10.0 GS	25.0 GS
100.0 ns/div	500.0 MS	1.0 GS	2.0 GS	5.0 GS	5.0 GS	10.0 GS	10.0 GS	20.0 GS	20.0 GS	50.0 GS
50.0 ns/div	1.0 GS	2.0 GS	4.0 GS	10.0 GS	10.0 GS	20.0 GS	20.0 GS	40.0 GS	40.0 GS	100.0 GS
25.0 ns/div	2.0 GS	—	—	—	—	—	—	—	—	—
20.0 ns/div	—	5.0 GS	10.0 GS	25.0 GS	25.0 GS	50.0 GS	50.0 GS	100.0 GS	100.0 GS	250.0 GS
10.0 ns/div	5.0 GS	10.0 GS	20.0 GS	50.0 GS	50.0 GS	100.0 GS	100.0 GS	200.0 GS	200.0 GS	500.0 GS
5.0 ns/div	10.0 GS	20.0 GS	40.0 GS	100.0 GS	100.0 GS	200.0 GS	200.0 GS	—	—	1.0 TS
4.0 ns/div	—	—	—	—	—	—	—	500.0 GS	500.0 GS	—
2.0 ns/div	25.0 GS	50.0 GS	100.0 GS	250.0 GS	250.0 GS	500.0 GS	500.0 GS	1.0 TS	1.0 TS	—
1.0 ns/div	50.0 GS	100.0 GS	200.0 GS	500.0 GS	500.0 GS	1.0 TS	1.0 TS	—	—	—
500.0 ps/div	100.0 GS	200.0 GS	—	1.0 TS	1.0 TS	—	—	—	—	—
400.0 ps/div	—	—	500.0 GS	—	—	—	—	—	—	—
200.0 ps/div	250.0 GS	500.0 GS	1.0 TS	—	—	—	—	—	—	—

Table 1. Real-time acquisition depends on several factors — sweep speed, record length, and number of active channels. Shown here is the resultant sample rate based on sweep speed and record length and is color coded to indicate real-time or equivalent-time acquisition.

Real-time Sampling:

DSA 601 — 1 to 2 channels;
DSA 602 — 1 to 4 channels;
DSA 601, 3+ channels, and DSA 602, 5+ channels,
are acquired in real time by alternating between channels

DSA 601 — 1 channel;
DSA 602 — 1 to 2 channels.

DSA 602 — 1 channel.

Equivalent-time Sampling:

DSA 601 or DSA 602 — when 1 or more channels are in equivalent time.

Resultant Sampling Rates Based on Record Length and Sweep Speed.

Sweep Speed	Record Length									
	512	1024	2048	4096	5120	8192	10240	16384	20480	32768
100.0 s/div	500.0 mS	1.0 S	2.0 S	5.0 S	5.0 S	10.0 S	10.0 S	20.0 S	20.0 S	50.0 S
50.0 s/div	1.0 S	2.0 S	4.0 S	10.0 S	10.0 S	20.0 S	20.0 S	40.0 S	40.0 S	100.0 S
20.0 s/div	2.5 S	5.0 S	10.0 S	25.0 S	25.0 S	50.0 S	50.0 S	100.0 S	100.0 S	250.0 S
10.0 s/div	5.0 S	10.0 S	20.0 S	50.0 S	50.0 S	100.0 S	100.0 S	200.0 S	200.0 S	500.0 S
5.0 s/div	10.0 S	20.0 S	40.0 S	100.0 S	100.0 S	200.0 S	200.0 S	400.0 S	400.0 S	1.0 kS
2.0 s/div	25.0 S	50.0 S	100.0 S	250.0 S	250.0 S	500.0 S	500.0 S	1.0 kS	1.0 kS	2.5 kS
1.0 s/div	50.0 S	100.0 S	200.0 S	500.0 S	500.0 S	1.0 kS	1.0 kS	2.0 kS	2.0 kS	5.0 kS
500.0 ms/div	100.0 S	200.0 S	400.0 S	1.0 kS	1.0 kS	2.0 kS	2.0 kS	4.0 kS	4.0 kS	10.0 kS
200.0 ms/div	250.0 S	500.0 S	1.0 kS	2.5 kS	2.5 kS	5.0 kS	5.0 kS	10.0 kS	10.0 kS	25.0 kS
100.0 ms/div	500.0 S	1.0 kS	2.0 kS	5.0 kS	5.0 kS	10.0 kS	10.0 kS	20.0 kS	20.0 kS	50.0 kS
50.0 ms/div	1.0 kS	2.0 kS	4.0 kS	10.0 kS	10.0 kS	20.0 kS	20.0 kS	40.0 kS	40.0 kS	100.0 kS
20.0 ms/div	2.5 kS	5.0 kS	10.0 kS	25.0 kS	25.0 kS	50.0 kS	50.0 kS	100.0 kS	100.0 kS	250.0 kS
10.0 ms/div	5.0 kS	10.0 kS	20.0 kS	50.0 kS	50.0 kS	100.0 kS	100.0 kS	200.0 kS	200.0 kS	500.0 kS
5.0 ms/div	10.0 kS	20.0 kS	40.0 kS	100.0 kS	100.0 kS	200.0 kS	200.0 kS	400.0 kS	400.0 kS	1.0 MS
2.0 ms/div	25.0 kS	50.0 kS	100.0 kS	250.0 kS	250.0 kS	500.0 kS	500.0 kS	1.0 MS	1.0 MS	2.5 MS
1.0 ms/div	50.0 kS	100.0 kS	200.0 kS	500.0 kS	500.0 kS	1.0 MS	1.0 MS	2.0 MS	2.0 MS	5.0 MS
500.0 µs/div	100.0 kS	200.0 kS	400.0 kS	1.0 MS	1.0 MS	2.0 MS	2.0 MS	4.0 MS	4.0 MS	10.0 MS
200.0 µs/div	250.0 kS	500.0 kS	1.0 MS	2.5 MS	2.5 MS	5.0 MS	5.0 MS	10.0 MS	10.0 MS	25.0 MS
100.0 µs/div	500.0 kS	1.0 MS	2.0 MS	5.0 MS	5.0 MS	10.0 MS	10.0 MS	20.0 MS	20.0 MS	50.0 MS
50.0 µs/div	1.0 MS	2.0 MS	4.0 MS	10.0 MS	10.0 MS	20.0 MS	20.0 MS	—	—	100.0 MS
40.0 µs/div	—	—	—	—	—	—	—	50.0 MS	50.0 MS	—
20.0 µs/div	2.5 MS	5.0 MS	10.0 MS	25.0 MS	25.0 MS	50.0 MS	50.0 MS	100.0 MS	100.0 MS	250.0 MS
10.0 µs/div	5.0 MS	10.0 MS	20.0 MS	50.0 MS	50.0 MS	100.0 MS	100.0 MS	—	—	500.0 MS
8.0 µs/div	—	—	—	—	—	—	—	250.0 MS	250.0 MS	—
5.0 µs/div	10.0 MS	20.0 MS	—	100.0 MS	100.0 MS	—	—	—	—	1.0 GS
4.0 µs/div	—	—	50.0 MS	—	—	250.0 MS	250.0 MS	500.0 MS	500.0 MS	—
2.5 µs/div	—	—	—	—	—	—	—	—	—	2.0 GS
2.0 µs/div	25.0 MS	50.0 MS	100.0 MS	250.0 MS	250.0 MS	500.0 MS	500.0 MS	1.0 GS	1.0 GS	—
1.0 µs/div	50.0 MS	100.0 MS	—	500.0 MS	500.0 MS	1.0 GS	1.0 GS	2.0 GS	2.0 GS	5.0 GS
800.0 ns/div	—	—	250.0 MS	—	—	—	—	—	—	—
500.0 ns/div	100.0 MS	—	—	1.0 GS	1.0 GS	2.0 GS	2.0 GS	4.0 GS	4.0 GS	10.0 GS
400.0 ns/div	—	250.0 MS	500.0 MS	—	—	—	—	—	—	—
250.0 ns/div	—	—	—	2.0 GS	2.0 GS	—	—	—	—	—
200.0 ns/div	250.0 MS	500.0 MS	1.0 GS	—	—	5.0 GS	5.0 GS	10.0 GS	10.0 GS	25.0 GS
100.0 ns/div	500.0 MS	1.0 GS	2.0 GS	5.0 GS	5.0 GS	10.0 GS	10.0 GS	20.0 GS	20.0 GS	50.0 GS
50.0 ns/div	1.0 GS	2.0 GS	4.0 GS	10.0 GS	10.0 GS	20.0 GS	20.0 GS	40.0 GS	40.0 GS	100.0 GS
25.0 ns/div	2.0 GS	—	—	—	—	—	—	—	—	—
20.0 ns/div	—	5.0 GS	10.0 GS	25.0 GS	25.0 GS	50.0 GS	50.0 GS	100.0 GS	100.0 GS	250.0 GS
10.0 ns/div	5.0 GS	10.0 GS	20.0 GS	50.0 GS	50.0 GS	100.0 GS	100.0 GS	200.0 GS	200.0 GS	500.0 GS
5.0 ns/div	10.0 GS	20.0 GS	40.0 GS	100.0 GS	100.0 GS	200.0 GS	200.0 GS	—	—	1.0 TS
4.0 ns/div	—	—	—	—	—	—	—	500.0 GS	500.0 GS	—
2.0 ns/div	25.0 GS	50.0 GS	100.0 GS	250.0 GS	250.0 GS	500.0 GS	500.0 GS	1.0 TS	1.0 TS	—
1.0 ns/div	50.0 GS	100.0 GS	200.0 GS	500.0 GS	500.0 GS	1.0 TS	1.0 TS	—	—	—
500.0 ps/div	100.0 GS	200.0 GS	—	1.0 TS	1.0 TS	—	—	—	—	—
400.0 ps/div	—	—	500.0 GS	—	—	—	—	—	—	—
200.0 ps/div	250.0 GS	500.0 GS	1.0 TS	—	—	—	—	—	—	—

Table 1. Real-time acquisition depends on several factors — sweep speed, record length, and number of active channels. Shown here is the resultant sample rate based on sweep speed and record length and is color coded to indicate real-time or equivalent-time acquisition.

Real-time Sampling:

DSA 601 — 1 to 2 channels;
DSA 602 — 1 to 4 channels;
DSA 601, 3+ channels, and DSA 602, 5+ channels,
are acquired in real time by alternating between channels

DSA 601 — 1 channel;
DSA 602 — 1 to 2 channels.

DSA 602 — 1 channel.

Equivalent-time Sampling:

DSA 601 or DSA 602 — when 1 or more channels are in equivalent time.

Table 2. Pre-trigger Conditions for Real-Time Acquisition.

The following formulas may be used to estimate whether acquisitions will be made in real time or equivalent time. These conditions only apply if the conditions in Table 1 have been met. A window is considered to be post-trigger if any points of the window are acquired after the trigger point. Otherwise, a window is considered to be pre-trigger. When windows are being acquired, the main time base sample rate must be less than or equal to 250 MS/s.

Main and window acquisitions will be in real time if:

For one post-trigger window:

$$MRL+WRL<M_a$$

For two post-trigger windows:

$$MRL+2\times WRL<M_a$$

For one pre-trigger window:

$$MRL+WSR_1\times WPOS_1<M_a$$

For one pre-trigger window (1) and one post-trigger window (2):

$$MRL+WSR\times WPOS_1+WRL_2<M_a$$

For two pre-trigger windows:

$$MRL+WSR\times WPOS_1+WSR\times WPOS_2<M_a$$

Where:

MRL is the Main Record Length
WRL is the Window Record Length
WSR is the Window Sample Rate
WPOS is the Window Position (window 1 or window 2)
M_a is the available memory (see chart below)

	DSA 601		DSA 602	
Window Sample Rate	Total Available Memory	Number of Channels	Total Available Memory	Number of Channels
≤500 MS/s	10k points	1 or 2	10k points	1 to 4
1 GS/s	20k	1	20k	1 or 2
2 GS/s	—	—	40k	1

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