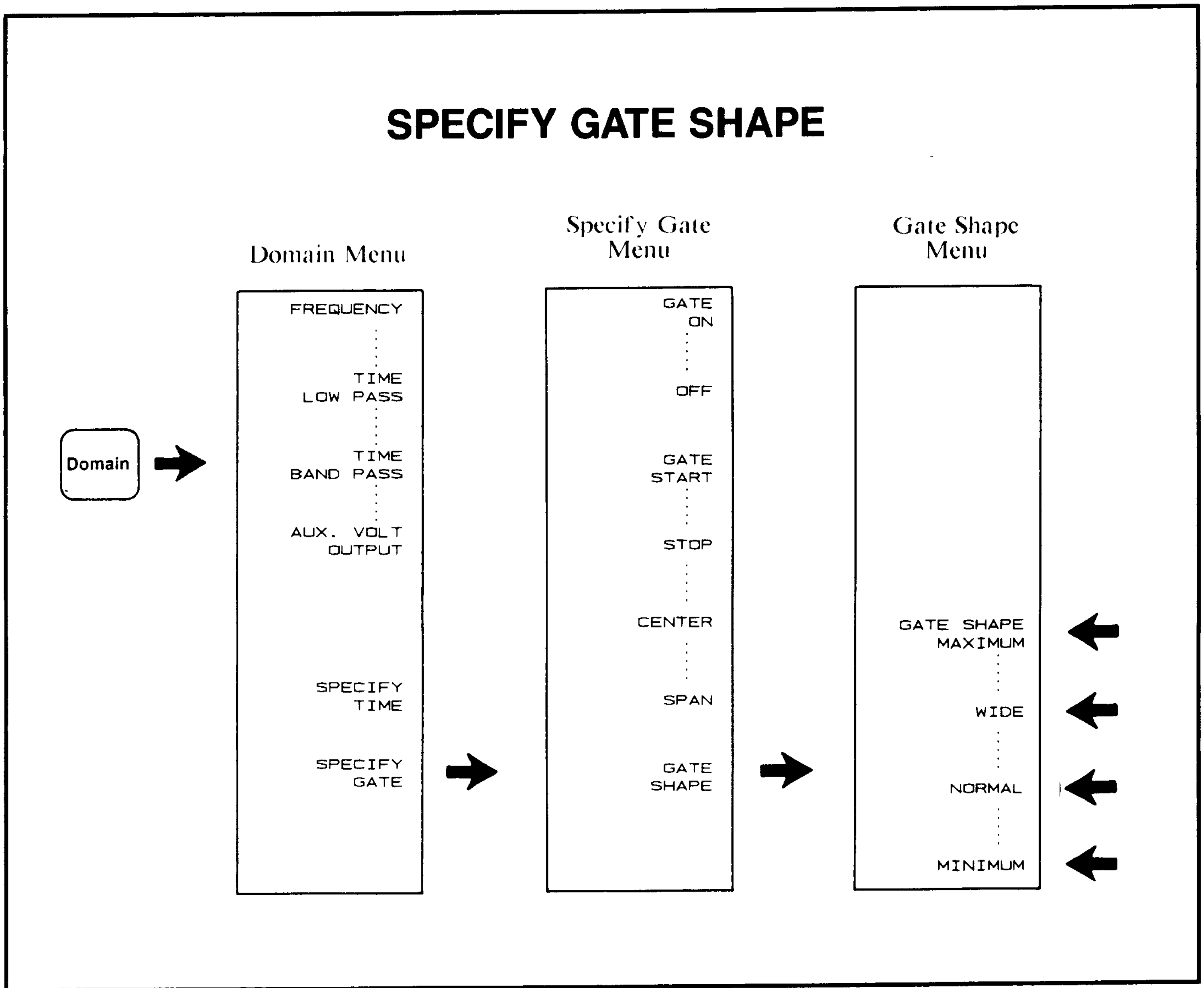
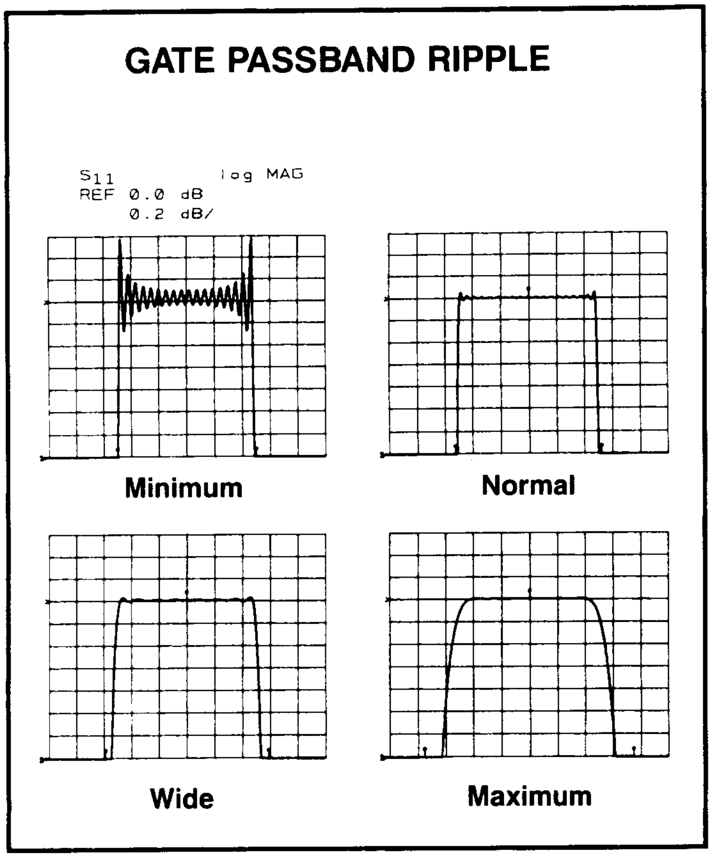


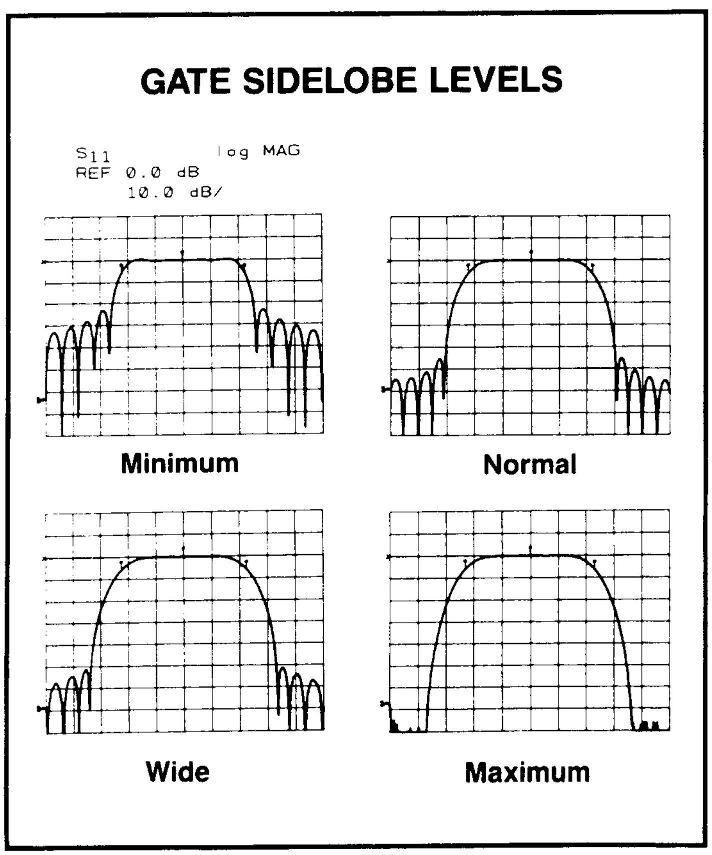
15150

To specify the characteristics of the gate, press **DOMAIN**, **SPECIFY GATE**, then **GATE SHAPE**. There are four gate shape softkeys, **GATE SHAPE MAXIMUM**, **WIDE**, **NORMAL**, and **MINIMUM**. Complete characteristics of each of these gate shapes are tabulated at the end of this section.



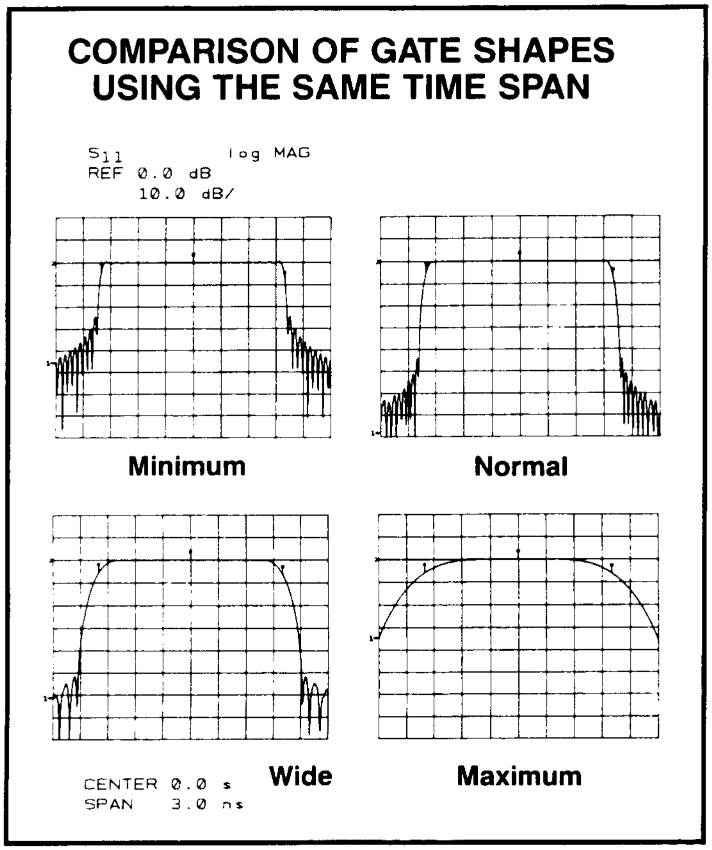
15160

The gate is a bandpass shaped time filter, and each of the four gate shapes have different filter characteristics. This slide shows, at 0.2 dB/division, the difference in passband ripple for each of the four gate shapes. The minimum gate has the least ripple. Note that these plots do not have the same time span.



15170

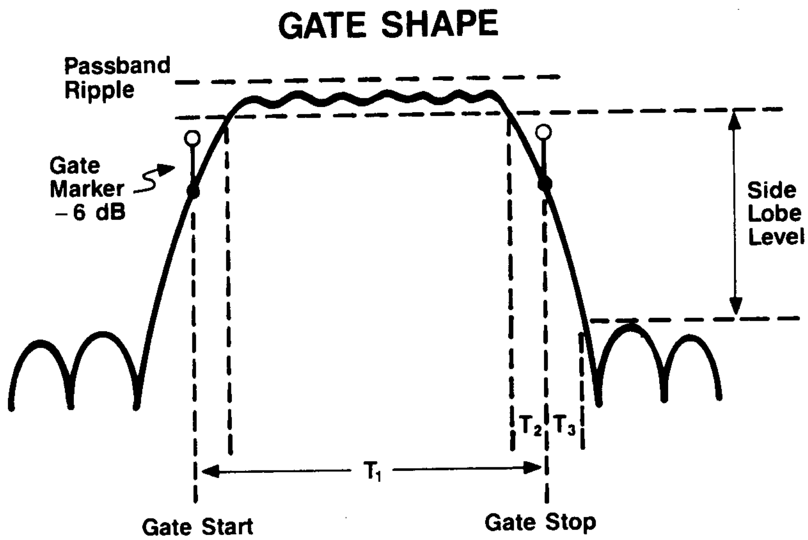
This slide compares the sidelobe levels of each of the four gate shapes. The minimum gate has the highest sidelobe levels, and the maximum gate has the lowest sidelobe levels. Therefore, the maximum gate gives the greatest attenuation of responses outside the gate span. Note that these plots do not have the same time span.



15180

The lower sidelobe levels are achieved at a tradeoff with an increase in the cutoff rate. These figures show the gate filter shapes using the same time span in order to see the difference in the cutoff rates.

Notice that the Minimum gate cuts off the fastest, and is therefore the most useful in gating out an undesired response that is closely spaced in time to a desired response. The Normal gate has a cutoff rate that is twice as slow, and the Wide and the Maximum gates have cutoff rates that are consecutively slower, giving a correspondingly wider gate shape.



Gate Shape	Passband Ripple	Sidelobe Levels	Cutoff Time $T_2 = T_3$	Minimum Gate Span T_1
Minimum	±0.40 dB	-24 dB	$0.6/f_{SPAN}$	$1.2/f_{SPAN}$
Normal	±0.04 dB	-45 dB	$1.4/f_{SPAN}$	$2.8/f_{SPAN}$
Wide	±0.02 dB	-52 dB	$4.0/f_{SPAN}$	$8.0/f_{SPAN}$
Maximum	±0.01 dB	-80 dB	$11.2/f_{SPAN}$	$22.4/f_{SPAN}$

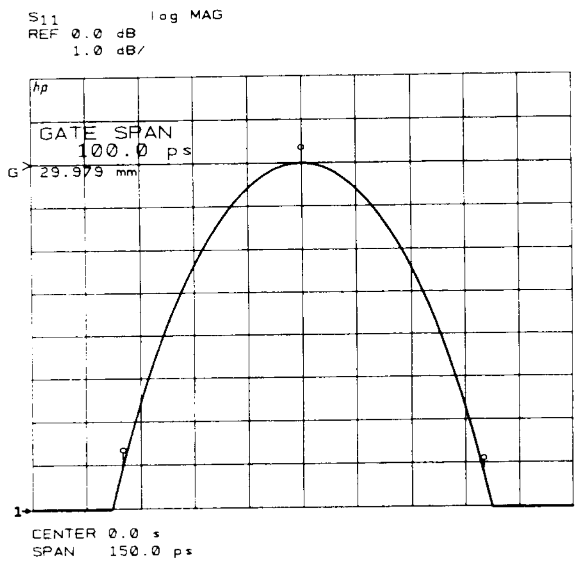
15185

This illustrates the overall gate shape and lists the important characteristics for each gate shape. T_1 is the gate span, which is equal to the stop time minus the start time. T_2 is the time between the edge of the passband and the −6 dB point, representing the the cutoff rate of the filter. T_3 is the time between the −6 dB point and the edge of the gate stopband. For all filter shapes T_2 is equal to T_3, and the filter is the same on both sides of the center time.

The table is useful in making comparisons to determine if a particular gate shape will work for a given measurement. The cutoff time and the minimum gate span are functions of the frequency span of the measurement and are computed from the formulas given.

MINIMUM GATE SPAN

$T_1 = 2 * T_2$



15190

Each gate shape has a minimum recommended gate span for proper operation. This is a consequence of the finite cutoff rate of the gate. The minimum recommended gate span is given by

$$T_{1MIN} = 2 * T_2$$

which makes the filter passband equal to 0 seconds.

Specifying a gate span that is smaller than this minimum span will produce a distorted gate shape that has no passband, has a distorted shape, has incorrect indications of start and stop times, and may have increased sidelobe levels.

MINIMUM GATE SPAN EXAMPLE

F_{SPAN} = 10 GHz
Gate Shape Normal

$$T_1 = \frac{2.8}{10E^9}$$

= 2 nanoseconds

15191

If the frequency span is 10 GHz with the Normal gate shape, then the minimum gate span without distorting the gate shape is 2 nanoseconds.

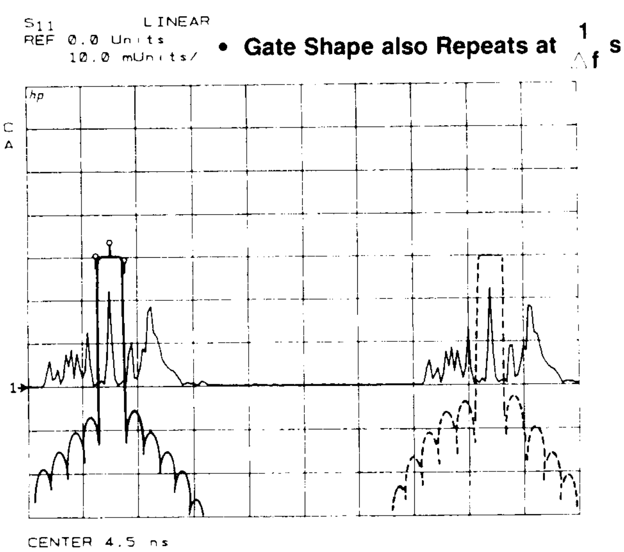
THE NOTCH GATE

15210

The different gates used by the network analyzer all have a bandpass filter shape to allow viewing individual responses or groups of responses by attenuating the effect of responses which are outside the gate. However, it is possible to construct a Notch Gate to remove an individual response or group of responses and retain the surrounding responses.

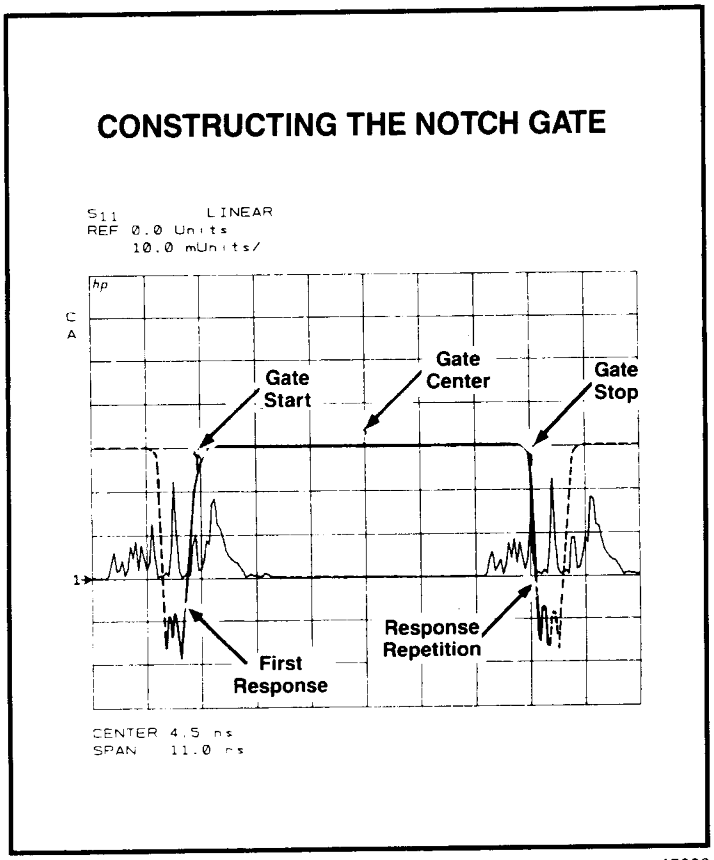
EFFECT OF GATING ON RESPONSE REPETITIONS

- Gate Shape also Repeats at $\frac{1}{\Delta f}$ s



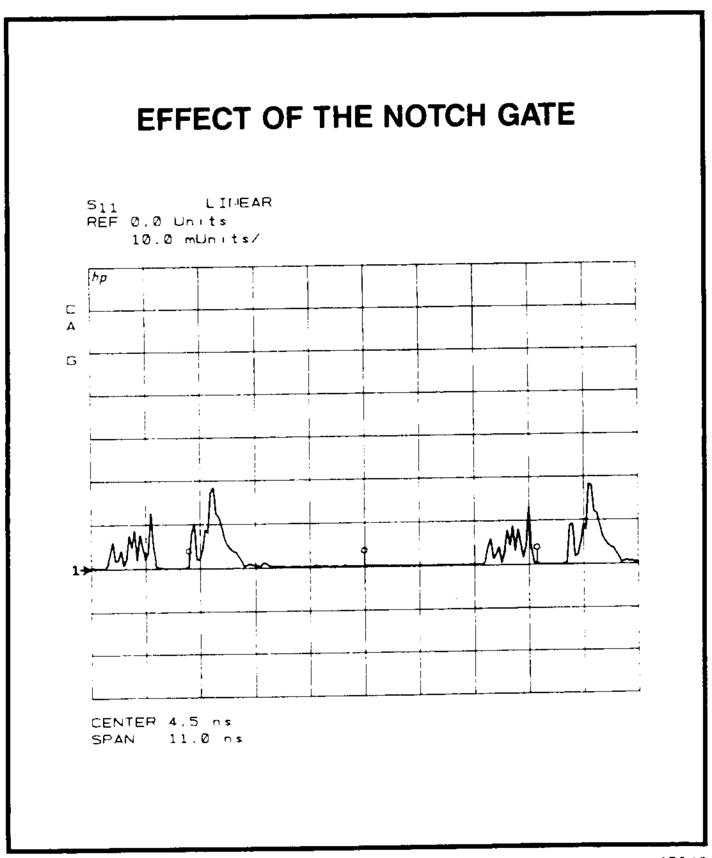
15220

As explained in the discussion of time domain range, every time domain response is repetitive in time due to the non-continuous frequency domain data. Therefore, the gate shape also repeats over the same interval, 1/Δf seconds.



15230

To construct the notch gate, first increase the time span so that one set of response repetitions is visible. Now set the **GATE START** at the right side of the response that is to be removed, and then set the **GATE STOP** to the left side of the first repetition of that response. As before, the gate shape will repeat over the same interval as the response. This places a notch at the location of the response to be removed.



15240

When the gate is turned on, the response will be removed. Only the responses outside the notch will be retained.

NOTCH - GATE PROCEDURE

- **Determine Where Notch Start and Stop Should Be**
- **Set Gate Start = Notch Stop**
- **Set Gate Stop = Notch Start + Range**

$$\text{Range(s)} = \frac{1}{\Delta f} = \frac{\text{Points}-1}{\text{Frequency Span}}$$

15250

This is the general procedure for setting up the notch gate.