ARTISAN®
TECHNOLOGY GROUP

Your **definitive** source for quality pre-owned equipment.

Artisan Technology Group
(217) 352-9330 | sales@artisantg.com | artisantg.com

Full-service, independent repair center
with experienced engineers and technicians on staff.

We buy your excess, underutilized, and idle equipment
along with credit for buybacks and trade-ins.

Custom engineering
so your equipment works exactly as you specify.

- Critical and expedited services
- In stock / Ready-to-ship
- Leasing / Rentals / Demos
- ITAR-certified secure asset solutions

Expert team | Trust guarantee | 100% satisfaction

All trademarks, brand names, and brands appearing herein are the property of their respective owners.

Find the *Keysight / Agilent 16557D* at our website: *Click HERE*

7

The Waveform Menu

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

The Waveform Menu

Use the Waveform menu to view state or timing data in a format similar to an oscilloscope display. Data is displayed with the horizontal axis representing either states (if operating in state mode) or time (if in timing mode), and the vertical axis representing logic highs and lows. In state mode, the analyzer displays state data in reference to the trigger point, with the horizontal resolution being states per division. In timing mode, the analyzer displays timing data in reference to the trigger point with the horizontal resolution being time per division. The Waveform Menu includes the following controls and markers:

- Basic Controls
- Pattern Markers
- Time Markers
- Waveform Display

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

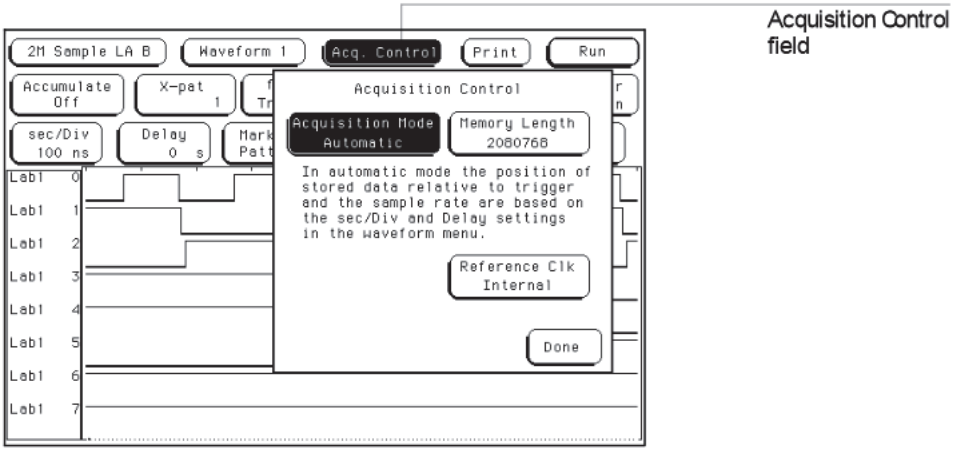
The basic controls on the initial Waveform screen let you configure this display using the following controls:

- Acquisition Control Field
- Accumulate Field
- States Per Division Field (State only)
- Seconds Per Division Field (Timing only)
- Delay Field
- Sample Period Display (Timing only)
- Markers Field

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Acquisition Control Field

The function of the Acquisition Control field in the Waveform menu is the same as in the Trigger menu. Refer to the "Acquisition Control Field" in chapter 5, "The Trigger Menu" for complete details.



Acquisition Control Field

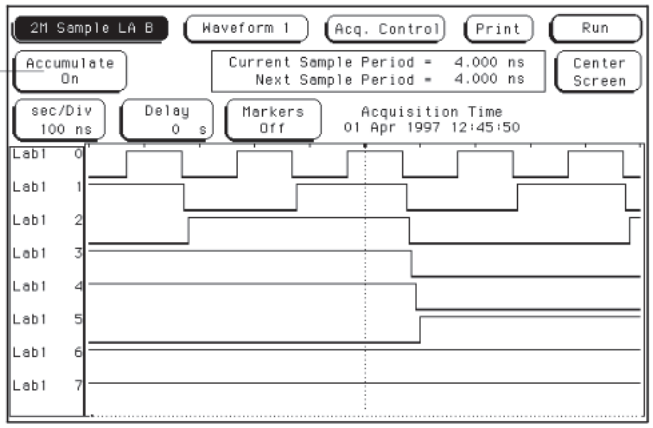
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Accumulate Field

The Accumulate field controls whether old data is cleared or displayed with new data. The Accumulate field will toggle On/Off. When Accumulate is on, the analyzer displays the data from a current acquisition on top of the previously acquired data.

The time at which the old data is cleared depends on whether the analyzer is run in Single or Repetitive mode. In Single mode, new data will be displayed on top of the old data each time the Run field is selected. In Repetitive mode, data is cleared from the screen only when you start a run after stopping an acquisition with the Stop field.

If you leave the Waveform menu or pop up a menu over the waveform display, any accumulated display data is lost and the accumulation process starts over.



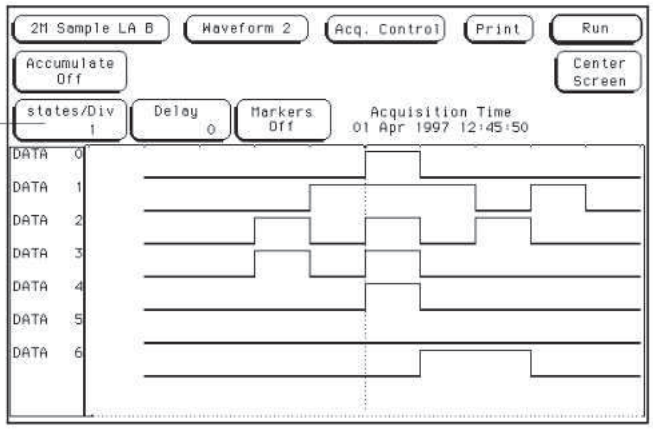
Accumulate Field

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

States Per Division Field (State and State Compare only)

When you set the analyzer Type field in the Configuration menu to State or State Compare, the analyzer uses external clocks from the system under test. In this mode, the X-axis of the waveform display is measured in states per division.

Use the states/Div field to select the states per division resolution of the X-axis. You can specify between 1 and (memory length/8) states per division by touching the states/Div field and rotating the knob or by touching the states/Div field twice and using the pop-up keypad. By adjusting the states/Div, you can zoom in to view a desired part of the display.



States Per Division Field

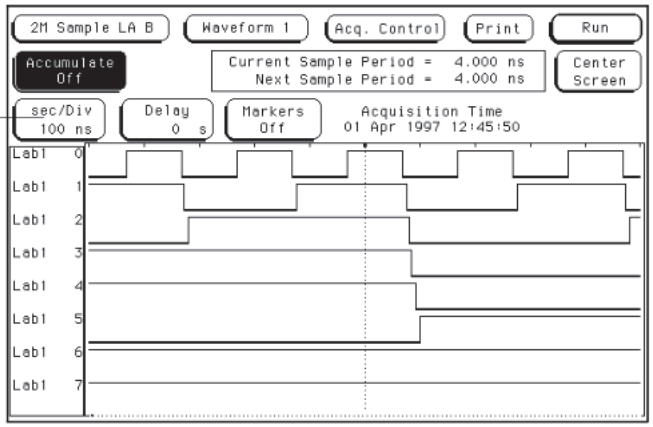
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Seconds Per Division Field (Timing only)

When you set the analyzer Type field in the Configuration menu to Timing, the analyzer uses its own internal clock. In this mode, the X-axis of the waveform display is measured in seconds per division (sec/Div).

Use the sec/Div field to select the seconds per division resolution of the X-axis. The range of the sec/Div field is 1 ns/Div to 2.2 s/Div. In half-channel mode, the maximum sec/Div setting is reduced by half. You set the sec/Div field either by touching the sec/Div field and rotating the knob, or by touching the sec/Div field twice and then using the pop-up keypad.

When using the knob to set the sec/Div, the value will change in a 1-2-5 sequence. By adjusting the sec/Div, you can zoom in to view a desired part of the display.



Seconds Per Division Field

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

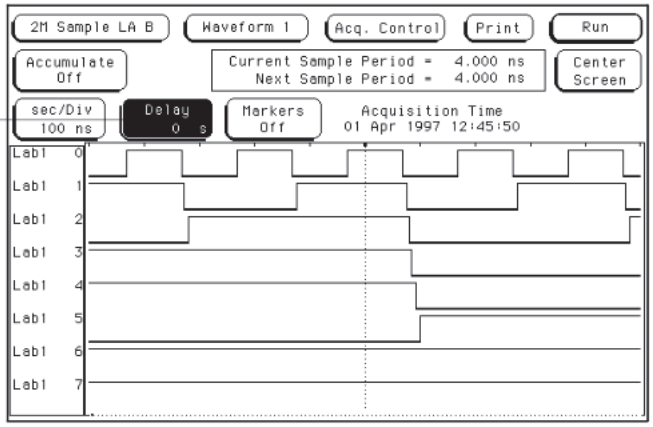
Delay Field

Depending on the analyzer configuration, you can set a positive or negative delay measured in either states or time. The Delay field allows you to scroll the data and place the display window desired at center screen. Changing the delay will not affect the next data acquisition unless it is a timing analyzer and the acquisition mode is automatic.

The delay range of a timing analyzer is from –2500 seconds to + 2500 seconds. The delay range of a state analyzer is from –[memory length] to +[memory length].

If you want to move the display window to view data located offscreen to the right, enter a positive delay. If you want to move the display window to view data located offscreen to the left, enter a negative delay.

You can enter a delay using the knob by selecting the Delay field once, which turns it light blue, and then turning the knob. If you select the Delay field a second time, when it is light blue, a pop-up keypad appears which enables you to enter an exact number.



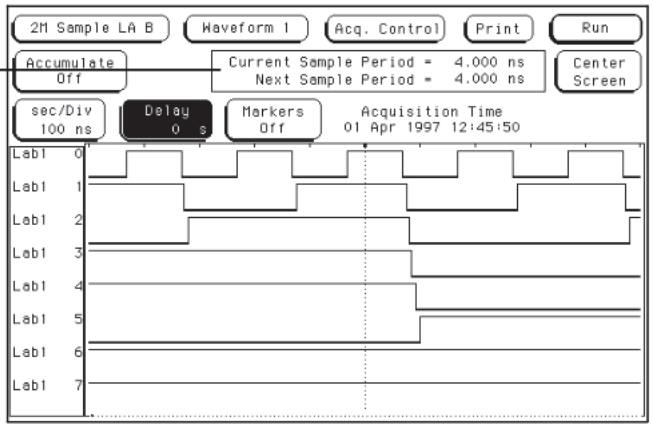
Delay Field

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Sample Period Display (Timing only)

The Sample period display only appears in a timing analyzer. A sample period is the interval of time between new data samples. Every time a new sample is taken, the analyzer updates the measurement.

The Current Sample period display is the sample period used for the last acquisition. The Next Sample period is the new sample period to be used at the next acquisition. If the acquisition mode is set to automatic, changing the sec/Div or delay will affect the sample period for the next acquisition.

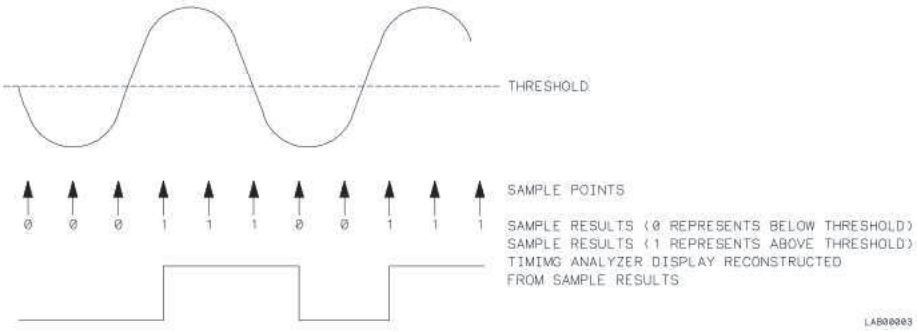


Sample Period Display

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Timing waveforms are reconstructed with respect to the sample period. A shorter sample period puts more sample points on the waveform for a more accurate reconstruction, but also fills memory quicker.

If the sec/Div is changed, resulting in a change in the next sample period, you must run the analyzer again before the current sample period display is updated.



Sample Points

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Markers Field

The Markers field is used to access the markers selection menu. When the Markers field is selected, a marker selection menu appears with the marker choices available under the present analyzer configuration.

State Analyzer Markers

In a state analyzer with time and state count turned off in the Trigger menu, only Pattern markers are available. With time count turned on, choices of Pattern, Time, and Statistics markers become available.

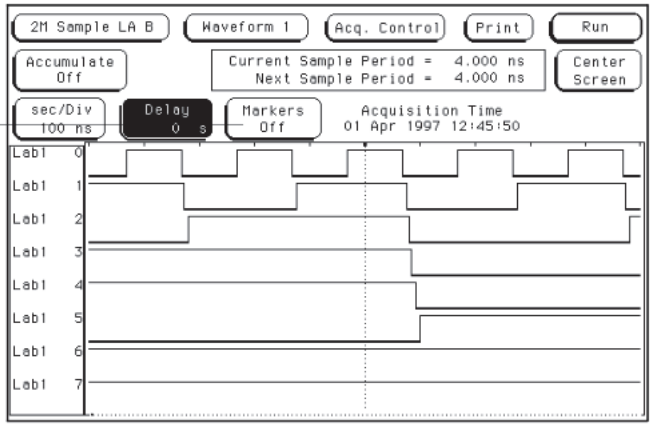
With states count turned on, Pattern and State markers are available.

Timing Analyzer Markers

In a timing analyzer you have marker choices of Pattern, Time, or Statistics.

Off

The Off selection turns marker operations off. If a Stop measurement was previously specified and the Stop measurement criteria are met, the measurement will stop even though the markers are off.



Markers Field

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

When Pattern markers are selected, two markers labeled X and O become available. You can use these markers to identify and mark unique bit patterns in the waveform display. Once the unique bit patterns are marked, you can use them as reference points or as criteria for a stop measurement.

The markers are color-coded for easy recognition in the waveform display. The X marker is a vertical green line, and the O marker is a vertical yellow line. In addition, each marker is labeled at the bottom of the display. When a marker is positioned in the waveform display, it is also positioned in the data listing display. You control pattern markers with the following fields:

- X-pat / O-pat Occurrence Fields
- From Trigger / Start / X Marker Field
- X to O Display Field (Timing only)
- Center Screen Field
- Specify Patterns Field
- X and O entering / leaving Fields (Timing only)
- Pattern Display Fields
- Label and Base Fields
- Label / Base Roll Field
- Stop Measurement Field
- Clear Pattern Field

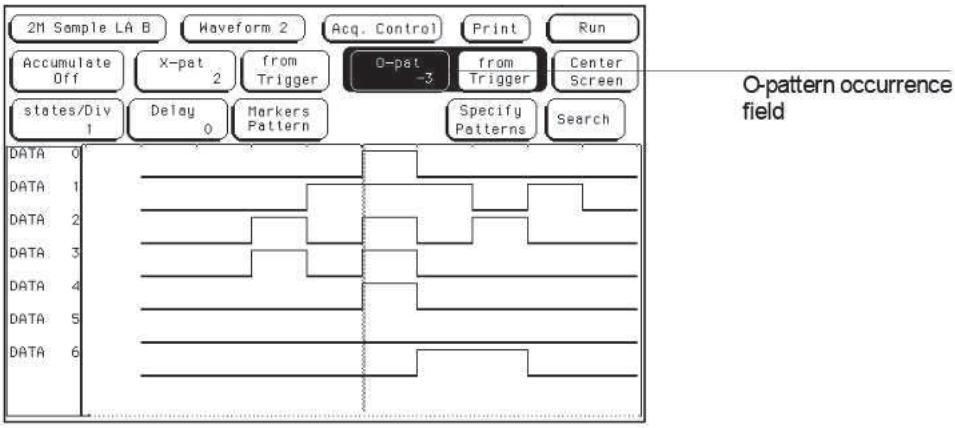
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

X-pat / O-pat Occurrence Fields

The X-pattern and O-pattern occurrence fields designate which pattern occurrence the marker is placed on. The range for the occurrence counter depends on the logic analyzer model and the memory depth selected. If you enter a number outside the range, the closest valid number will be substituted.

The occurrence field can be set in two ways. When the field is selected one time, it turns light blue and the knob becomes the entry method. If the field is selected a second time, a pop-up keypad appears and becomes the entry method.

The reference point from which the occurrence counter starts is either the trigger point, the start of the trace, or in the case of the O marker, the X marker. If a negative number is set, the analyzer will search for pre-trigger occurrences.



X-pattern and O-pattern Occurrence Fields

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

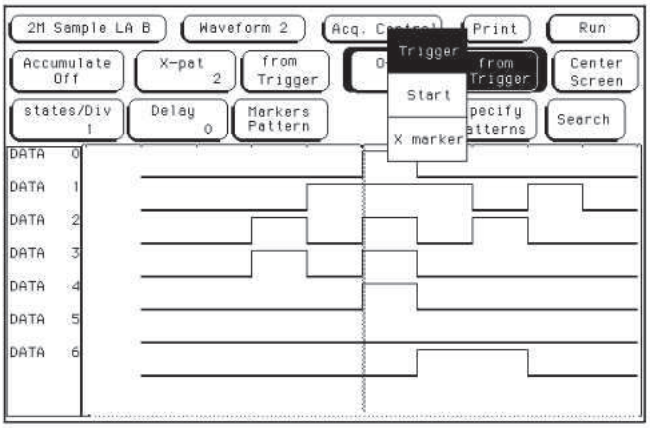
From Trigger / Start / X Marker Field

The From Trigger/Start/X Marker field is used to access the selection pop-up menu for the start point of the X and O marker occurrence counters.

The start points available for the green X marker are either the trace start point or the trigger point.

The start points available for the yellow O marker are the trace start point, the trigger point, or the X marker.

If the marker pattern cannot be found, a message appears at the top of the display indicating the search failed. If the O marker is referenced from the X marker, and the X marker is not found, the search for both markers will fail.



Trigger / Start / X Marker Field

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Center Screen Field

The Center Screen field accesses a menu which allows you to position the marked points of the waveform display relative to the center of the waveform display.

About Trigger The About Trigger selection is the default position. This choice will position the trigger at center screen.

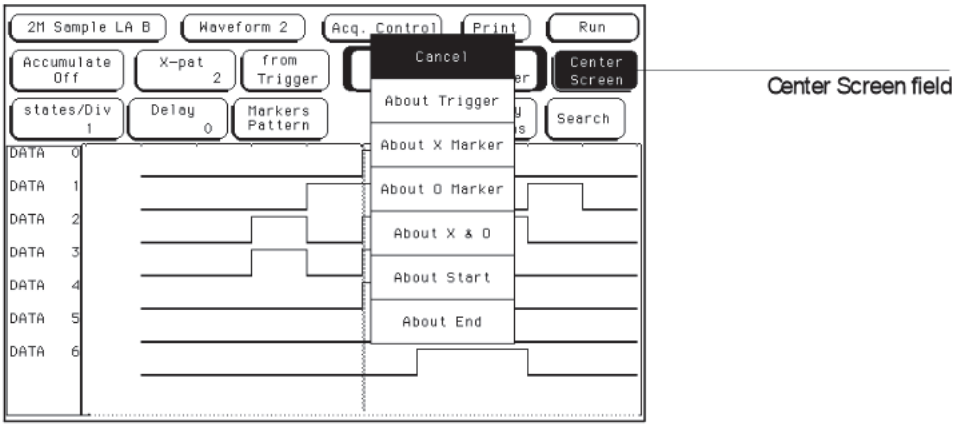
About X Marker This choice adjusts the delay to position the X marker at center screen.

About O Marker This choice adjusts the delay to position O marker at center screen.

About X & O This choice adjusts the sec/Div to allow both X and O markers to be displayed simultaneously.

About Start This choice adjusts the delay to position the start of the data record at the center of the screen.

About End This choice adjusts the delay to position the end of the data record at the center of the screen.



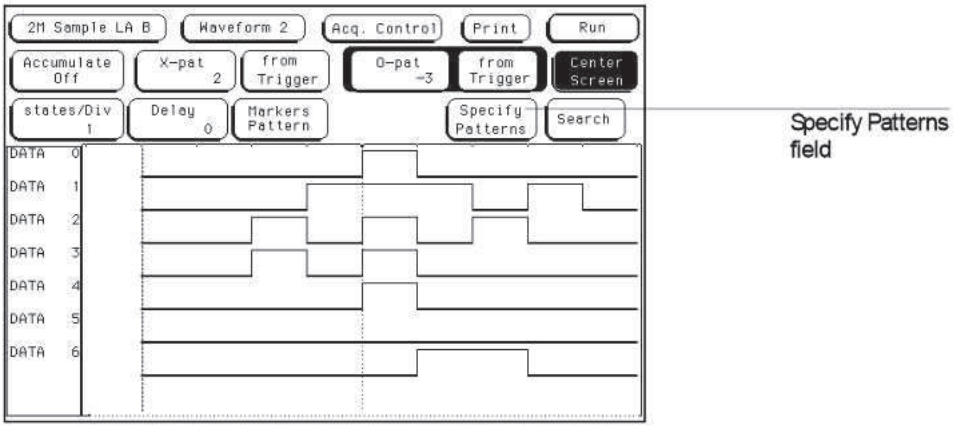
Center Screen Field

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Specify Patterns Field

The Specify Patterns field only appears when the markers are set to Pattern. When the Specify Patterns field is selected, a pop-up menu appears in which you can assign the bit patterns for the X and O markers, the X and O entering/leaving, and the Stop measurement criteria.

The Specify Patterns field functions exactly like the Specify Patterns field in the Listing menu. For more information on the fields in the pop-up menu attached to the Specify Patterns field, see "Specify Patterns Field" in chapter 6, "The Listing Menu."



Specify Patterns Field

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Time Markers

Time markers are indicators located in the waveform display that are used as reference marks to obtain time values between markers, or between each marker and the trigger point.

In a state analyzer, Time markers only become available when the Count field is set to Time in the Trigger menu.

The markers are color-coded for easy recognition in the waveform display. The X marker is represented by a vertical green line and the O marker is represented by a vertical yellow line. In addition, both markers are labeled at the bottom of the display.

If Pattern markers are assigned, the Time markers are initially placed at the same locations in the data listing.

Time markers have two fields for control and display:

- Trig to X/Trig to O Fields
- Marker Label/Base and Display

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Trig to X / Trig to O Fields

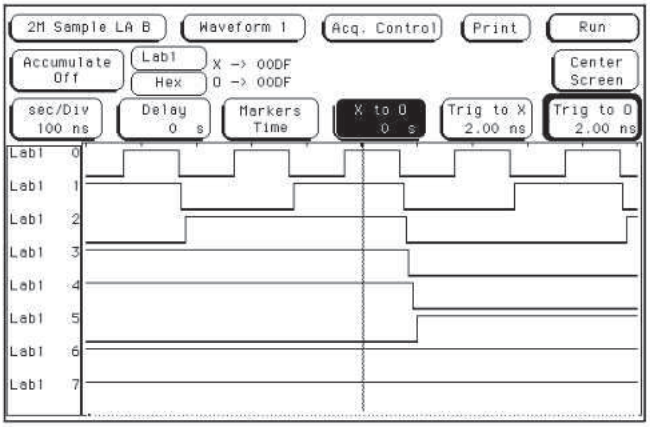
The Trig to X and Trig to O fields display the time between the trigger point and the marker. They are also used to position the markers with reference to the vertical red trigger line.

Set the marker position by selecting the Trig to X and Trig to O fields, then, after the fields turn light blue, rotate the knob. In addition, values can be entered by selecting the light blue field a second time, then using the pop-up keypad that appears.

X to O Field

In a state analyzer configuration, the X to O field is a "read only" field that displays the difference between the X and O markers. As the X and O markers are changed, the display changes accordingly.

In a timing analyzer configuration, you can select and set the X to O field. If this field is changed, both X and O markers will move simultaneously with the relative difference remaining unchanged.



Trig to X / Trig to O Fields

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Marker Label / Base and Display

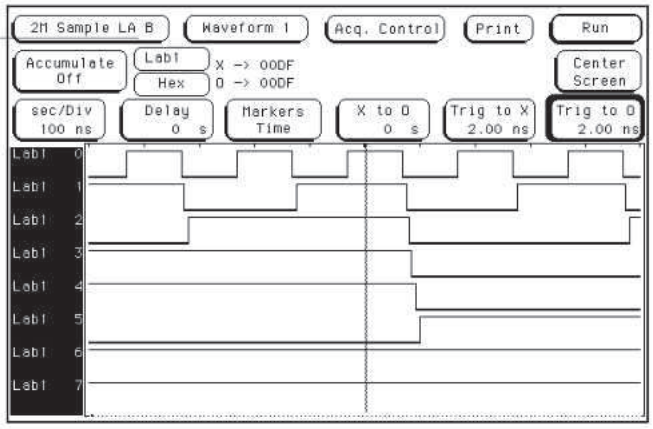
The label field displays the label name for which the X and O marker values are assigned. To display other labels, select the label field and choose the new label from the selection menu that appears. Only pre-assigned labels are available in the label selection menu.

The base field underneath the label field displays the numeric base of the marker values. To change the numeric base, select the base field, then choose the desired base from the selection menu. Bit patterns where the markers are currently placed, appear next to the appropriate marker.

See also

"Labels Assignment" in the "Common Module Operations" part of the Agilent Technologies 16500C User's Reference for complete information on assigning labels.

Marker Label/ Base



Marker Label / Base and Display

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

After patterns are assigned to the X and O markers, statistical information is available when you set the markers to Statistics. The logic analyzer displays the following information:

- Number of valid runs (runs where Pattern markers were placed on specified patterns).
- Minimum time between the X and O Pattern markers.
- Maximum time between the X and O Pattern markers.
- Average time between the X and O Pattern markers.

In a state analyzer, Statistics markers only become available when the Count field is set to Time in the Trigger menu.

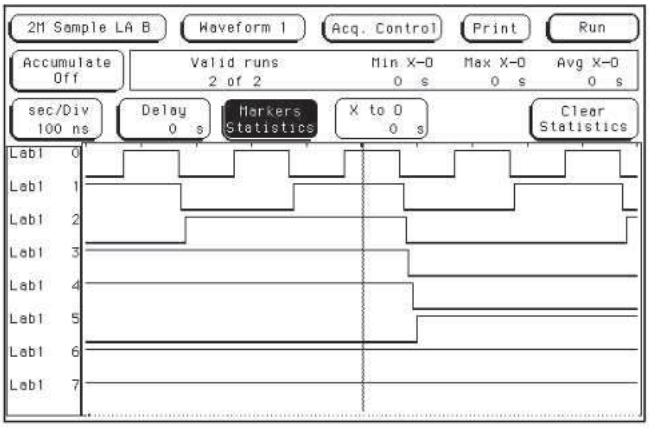
The markers are color-coded for easy recognition. The X marker is represented by a vertical green line and the O marker is represented by a vertical yellow line. In addition, both markers are labeled at the bottom of the display.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

The statistics generated are based on the time between the X and O markers. Both markers must be found before valid statistical information is displayed.

In repetitive run mode, the display is updated each time a valid run occurs until you press Stop. If you press Run after pressing Stop, the statistics continue to update without loss of information. All statistical information can be cleared at any time by selecting the Reset Statistics field.

In single run mode, each time you press Run an additional valid run will be added to the data and the statistics will be updated. This process continues unless you change the placement of the X and O Pattern markers between runs.



Statistics Display

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

The waveform display area of the Waveform menu displays state and timing waveforms for labels assigned in the Format menu. If the Waveform menu is from a state analyzer, the display is state waveforms. If the Waveform menu is from a timing analyzer, the display is timing waveforms.

Selecting waveforms for display, and modifying or deleting waveforms is identical for both state and timing waveforms. This area also accesses the following fields used to select, delete, or modify waveforms:

- Display Location Reference Line
- Blue Bar Field
- Channel Mode Field
- Module and Label Fields
- Action Insert/Replace Field
- Delete and Delete All Fields
- Waveform Size Field

Only waveforms with their bits assigned in the Format menu can be displayed. Each waveform is a member of a set of waveforms grouped under a label. The label name you assign in the Format menu is the label name that appears in the Labels selection list.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Display Location Reference Line

At the bottom of the Waveform menu is a reference line that displays the relative location of the display window, the markers, and the trigger point with reference to the total memory.

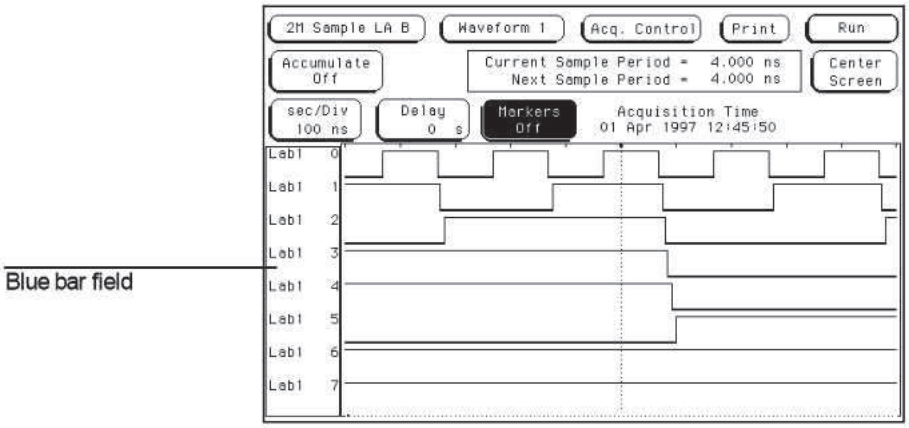
Total memory is represented by a horizontal dotted line. The display window is represented by an overlaid solid line. The markers and trigger point are represented by colored dots on top of the line representing total memory.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Blue Bar Field

The blue bar on the left side of the waveform display is both a display and configuration field. After all desired waveforms are configured for display, they are listed in the blue bar. If there are more waveforms than can be displayed, you can scroll through the list by selecting the dark blue bar, and, after it turns light blue, by turning the knob.

If the blue bar is already light blue, just turn the knob. If the blue bar is selected when it is light blue, the Waveform Selection menu appears. Use the Waveform Selection menu to configure the waveform display.

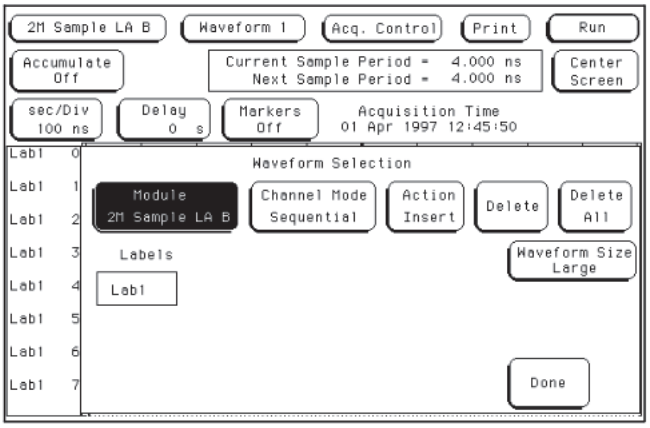


Blue Bar Field

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

When the Waveform Selection pop-up menu appears, you can select which waveforms are displayed, replaced, or modified. You can display a maximum of 24 waveforms onscreen at one time.

Single waveforms or all waveforms under a label can be displayed or turned off. How the waveform bits are assigned for display depends on what Channel Mode is currently selected.



Waveform Selection Menu

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Channel Mode Field

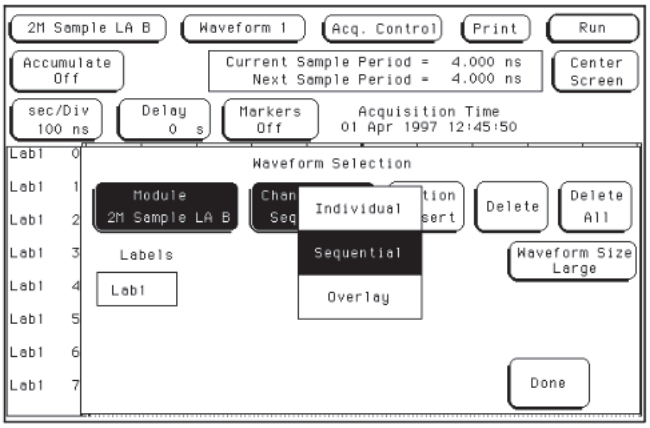
The Channel Mode field selects the method by which waveform labels are inserted into the display. All inserted labels are placed below the cursor in the blue bar field. When the Channel Mode field is selected, a selection menu appears with the choices described in the following paragraphs.

Individual

The Individual mode inserts selected channels from a label's channel selection list. The channel selection list appears when a label name is selected. Channels are inserted starting below the white cursor.

Sequential

The Sequential mode inserts all channels from the selected label in order starting below the white cursor.



Channel Mode Selection Menu

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Overlay

The Overlay mode inserts all bits of a label in a single waveform to form a composite waveform label. The onscreen indication for the Overlay mode is "All" following the label name.

Viewing State Data in Overlay Mode

When all assigned waveforms in a label are overlaid, the value of the data is displayed to the right of each new transition in the waveform display.

If the sec/Div is set to view a large increment of time, or the waveform scaling is set to small or medium, the state data readout will not fit between transitions. To display the state data readouts within the waveform, expand the sec/Div and use the large waveform setting. If symbols are assigned to represent data values, the symbol is displayed.

Module and Label Fields

If there are multiple timing analyzer or oscilloscope modules installed in the mainframe, this field will appear in the menu, and waveforms from the other modules can be displayed in the waveform menu. The Module field accesses a selection list. This list contains the modules installed in the mainframe that are configured in a Group Run, and that have timing or oscilloscope waveforms.

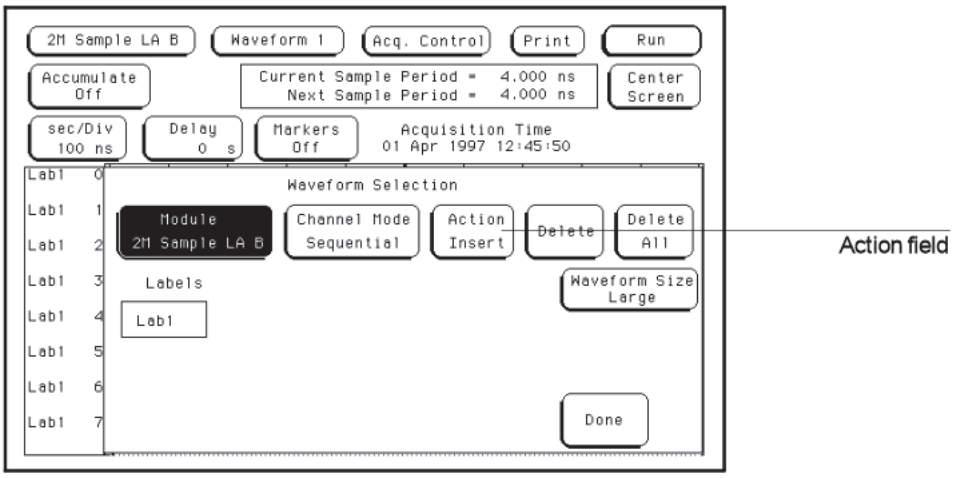
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Action Insert/Replace Field

Use the Action field to insert a label or channel into the display or to replace a label or channel.

Insert will append the selected label or channel to the end of the list of displayed labels.

To replace one waveform with another, use the knob to position the cursor on the waveform you want to replace. Touch the Action Insert field to toggle it to Action Replace. Then select the label that will replace the old label.



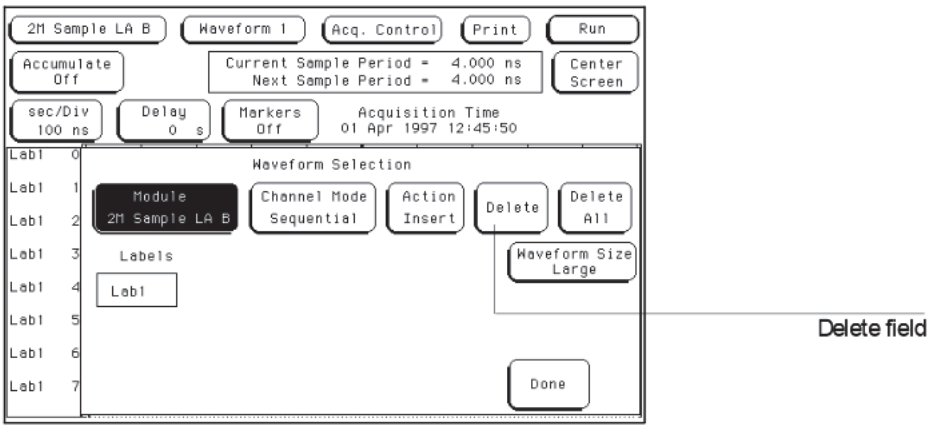
Action Insert/Replace Field

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Delete and Delete All Fields

Use the Delete field to delete single channels within the group of displayed waveforms. To delete a single channel, first highlight the desired channel by placing the cursor on the channel, then select the Delete field.

You can delete all currently displayed waveforms by selecting Delete All, then selecting Continue.



Delete Field

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Waveform Size Field

The Waveform Size field accesses a selection menu which contains choices that scale the displayed waveforms to different sizes. Use this feature to increase the number of waveforms in the display or to make viewing better for just a few.

Best Fit

When Best Fit is used, the analyzer picks the largest font, either small, medium, or large, that allows all waveforms to be displayed.

Small

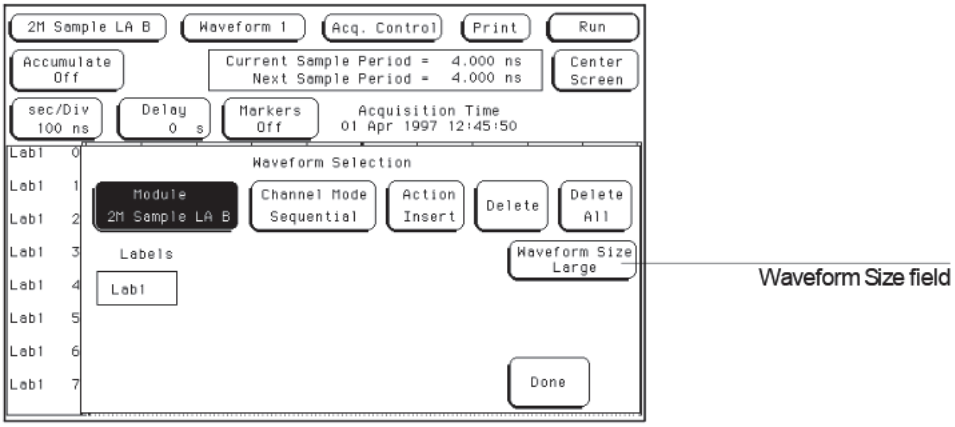
The small font will allow 24 waveforms to be displayed.

Medium

The medium font will allow 16 waveforms to be displayed.

Large

The large font will allow 8 waveforms to be displayed.



Waveform Size Selection Menu

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

8

The Chart Menu

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

The Chart Menu

Chart is a software post-processing feature that provides the ability to build XY graphs of label activity using state data. The Chart menu is only available when an analyzer is set to State or State Compare type.

The Y axis of the Chart mode always represents data values for a specified label. You can select whether the X axis represents states (rows in the Listing menu) or the data values for another label.

Chart Post-Processing Features

- When the X axis is set to State, X and O markers are available which can be used to search for specific data patterns or document time intervals of interest in timing mode. X and O markers can also gather statistics on the time between specific patterns in timing mode.
- Marker placement is synchronized with the Listing and Waveform menus.
- An accumulate mode is available that allows the chart display to build up over several runs.
- You can set a range of data to plot which scales both the axes to selectively view only data of interest.
- You can generate XY plots of Label versus Label or Label versus State.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Label Value Versus Label Value Charts

When labels are assigned to both axes, the chart shows how one label varies in relation to the other for a particular trace record. Label values are always plotted in ascending order from the bottom to the top of the chart and in ascending order from left to right across the chart. Plotting a label against itself will result in a diagonal line from the lower-left to upper-right corner. X and O pattern markers are disabled when operating in the label versus label mode.

Label Value Versus State Charts

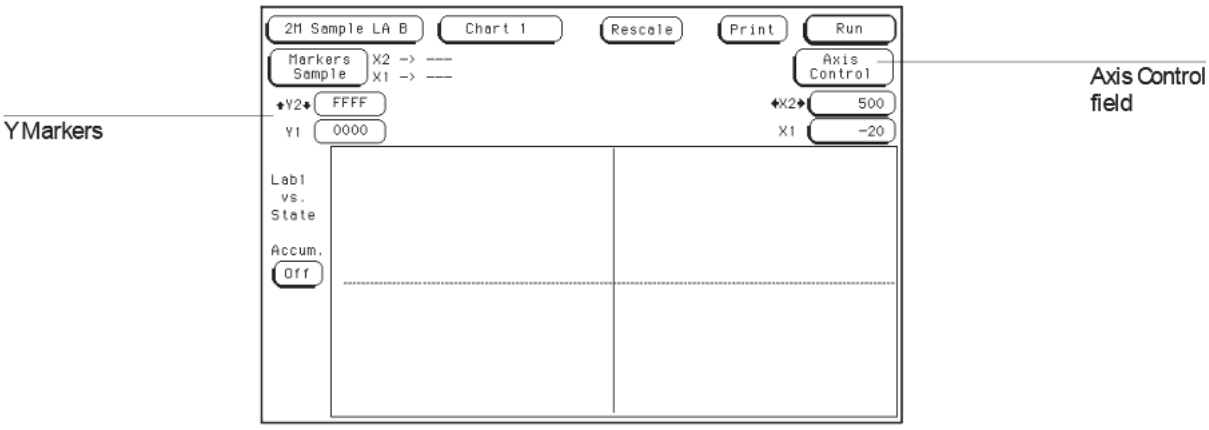
The Label value versus State chart is a graph of label activity versus the memory location in which the label data is stored. The label value is plotted against successive analyzer memory locations.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

The Y Markers

Y1 and Y2 Fields

The Y1 and Y2 markers are used for rescaling data on the vertical axis. Assigning values to these fields can be accomplished in either of two ways. When the field is selected the first time, it turns light blue and operating the knob will change the Y marker value. If the field is selected a second time, a pop-up keypad appears and becomes the entry method for the Y-marker value. The Y1 and Y2 markers may be used to zoom in on data of interest in the vertical range. To do this, touch the Rescale field, then select "between Y axis markers." For more information on rescaling data, refer to the "Rescale Field" section later in this chapter.

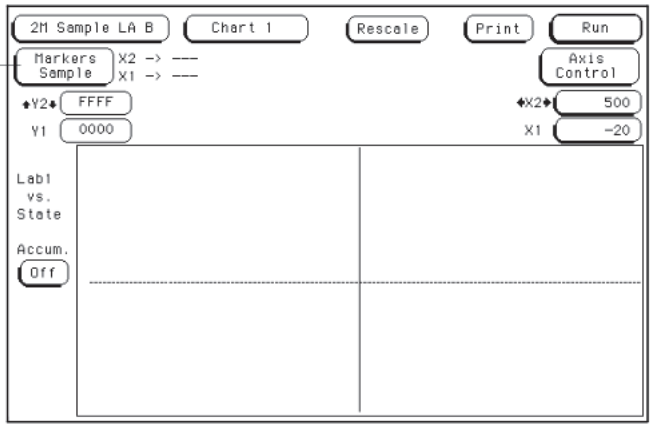


Y Markers for Rescaling the Vertical Axis

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

The X Markers and the Markers Field

The Markers field is used to access the markers selection pop-up menu. The choices available depend on the Count field in the Trigger menu. With Count Off, only Sample and Pattern are available. With Count Time, Sample, Pattern, Time, and Statistics are available. With Count States, Sample, Pattern, and States are available.



Markers Field

Sample

The Sample selection turns X and O marker operations off, and enables the X1 and X2 markers. The data values at the X1 and X2 markers are automatically displayed to the right of the Marker field when charting label versus state. Data between the X1 and X2 markers may be rescaled. For more information on rescaling, refer to "Rescale" later in this chapter.

If a Compare Stop measurement is specified in the Stop measurement field, and the Stop measurement criteria are met, the measurement will stop even though the Markers are set to Sample. However, an X-O Stop measurement will not complete if Markers are set to Sample.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

X1 and X2 Fields (Markers Sample mode only)

The X1 and X2 markers are used for displaying and rescaling specific data values. Assigning values to these fields can be accomplished in either of two ways. When the field is selected the first time, it turns light blue and operating the knob changes the value. If the field is selected a second time, a pop-up keypad appears and becomes the entry method. The X1 field positions the green X-axis marker and the X2 field positions the yellow X-axis marker. You can zoom in on the data between the X1 and X2 markers by selecting the Rescale Field and selecting "between X axis markers." For more information on rescaling data, refer to "Rescale" later in this chapter.

Pattern

When Pattern is selected, two markers labeled X and O become available. Pattern markers identify and mark unique bit patterns in the data. Once the unique bit patterns are marked, they can be used as reference points or, in timing mode, as criteria for a stop measurement.

Find X-pattern / Find O-pattern Field

The Find X-pattern / Find O-pattern field is a toggle field which is used to select the X or O marker for setup. The marker criteria set will be assigned to the pattern marker that is designated in this field. To assign marker criteria to the other marker, the other pattern marker must be designated in this field.

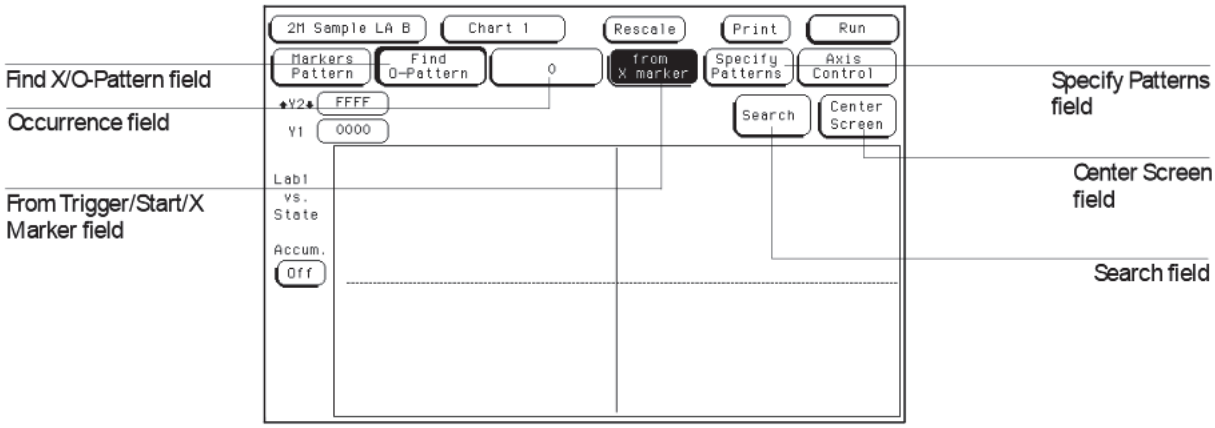
Occurrence Field

The occurrence field for both the X and O markers designates which pattern occurrence the marker is placed on. The maximum numeric value in the occurrence field is limited only by the total number of samples allowed by the memory configuration.

The occurrence field can be set in two ways. When the field is selected one time, it turns light blue and knob operation becomes the entry method. If the field is selected a second time, a pop-up keypad appears and becomes the entry method.

The reference point from which the counting of occurrences starts is either the trigger point, the start of the trace, or in the case of the O marker, the X marker.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com



Fields Associated with Pattern Markers

From Trigger / Start / X Marker Field

The from Trigger/Start/X marker field is used to define the search start point of the X and O markers.

The start points for the green X marker are either the trace start point or the trigger point.

The start points available for the yellow O marker are either the trace start point, trigger point, or the X marker.

Search Field

The Search field initiates a search through the acquisition data for the specified occurrence of the user-defined X and O bit patterns. During the search, the Rescale field is overlaid with the red Cancel field until the search is finished. For more information on specifying bit patterns, refer to "Specify Patterns Field" section later in this chapter.

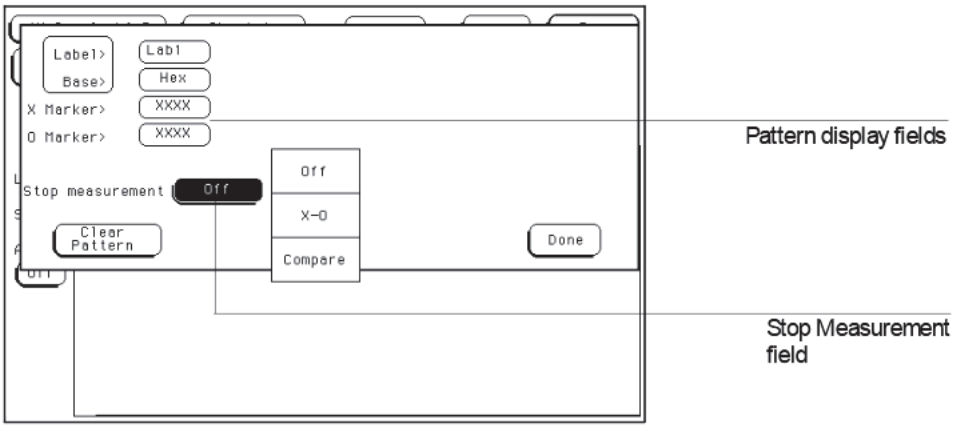
Center Screen Field

The Center Screen field is used to reposition the center of your display around the trigger, the X marker, the O marker or the X and O markers. This allows you to quickly move through the chart display to the events of interest.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Specify Patterns Field

When the Specify Patterns field is selected, a pop-up menu appears that is used to assign the bit patterns for the X and O markers and the Stop measurement criteria.



Specify Patterns Pop-up Menu with Stop Measurement Selections

Pattern Display Fields

The pattern display fields display the alphanumeric bit pattern specified for each X and O marker for all designated labels. The bit pattern is displayed in the same numeric base as in the Trigger menu. When the pattern display field is selected, a pop-up keypad appears which is used to set the bit pattern.

When there are more labels assigned than can be displayed on a single screen, the pattern display fields not shown can be rolled back onscreen by using the Label / Base roll field.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

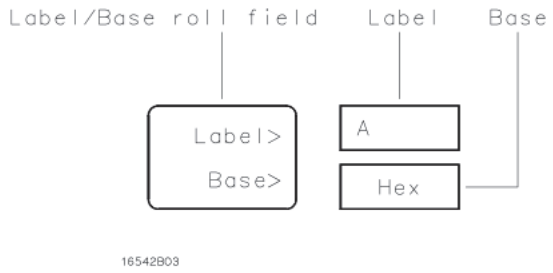
Label and Base Fields

The Label and Base fields show up together in all menus except the Format menu. When a new label is assigned, a base field is automatically assigned to that label.

Label Field Labels in the Listing menu are the same labels assigned in the Format menu. These labels will be displayed throughout the analyzer as they were assigned in the Format menu. For a complete definition of label assignment and modification, go to "Label Assignment Fields" in the Format menu chapter.

Base Field The function of the Base field is the same in most menus.

Label / Base Roll Field The function of the Label and Base roll field is the same in all menus.



Label / Base Roll Field

Clear Pattern

The Clear Pattern field gives you access to quickly clearing the X pattern, the O pattern, both X and O at once, or canceling your Clear Pattern request.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Stop Measurement Field

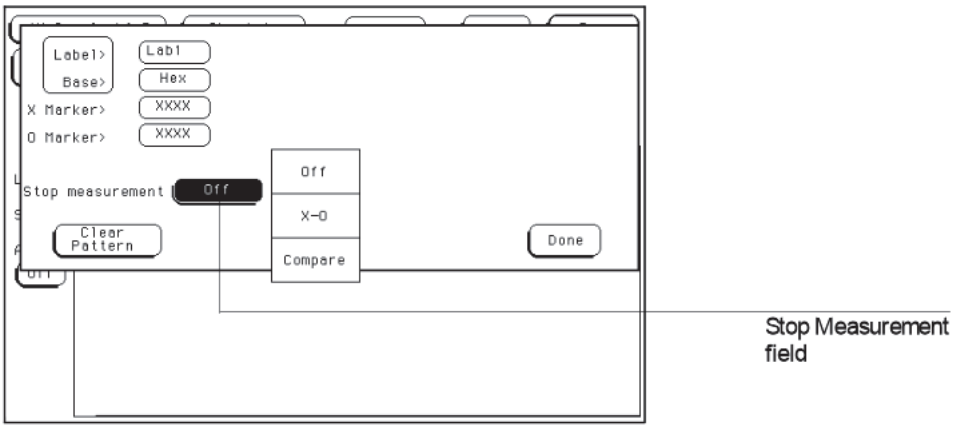
The Stop measurement function allows you to specify a condition which stops the analyzer measurement during a repetitive run.

When the Stop measurement field is selected, a Stop measurement type selection pop-up menu appears with the choices of Off, X-O, or Compare. Compare is only available if the analyzer type is State Compare. X-O is only available if Count Time is turned on in the Trigger menu.

Off

The Off selection turns off all Stop measurement operations.

If a Compare Stop measurement is specified in this field, and Stop measurement criteria are met, the measurement will stop even though the Markers are set to Sample. An X-O Stop measurement will not complete if Markers are set to Sample.



Stop Measurement Field and Pop-up Menu

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

X-O

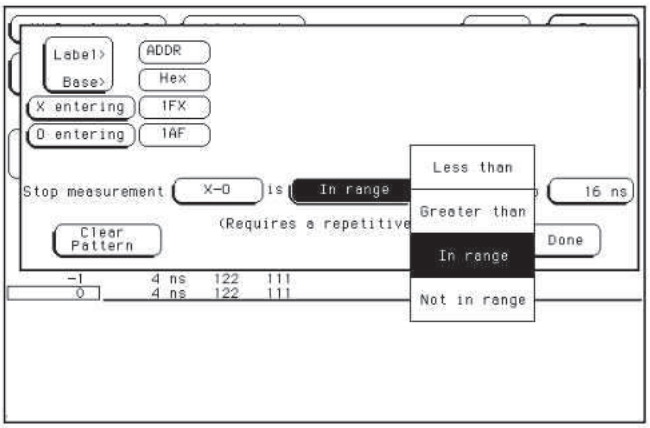
X-O is only available if Count Time is set in the Trigger menu. X-O is the time between the X and O markers. During a repetitive run, X-O is compared to a selectable time value which uses one of the following four options. If a match is found, the repetitive run is terminated.

Less Than X-O time must be less than the time value that you specify in the Time field.

Greater Than X-O time must be Greater than the time value that you specify in the Time field.

In Range X-O pattern must be within the time range value that you specify in the two Time fields.

Not in Range X-O pattern must not be within the time range value that you specify in the two Time fields.



X-O Field and Pop-up Menu

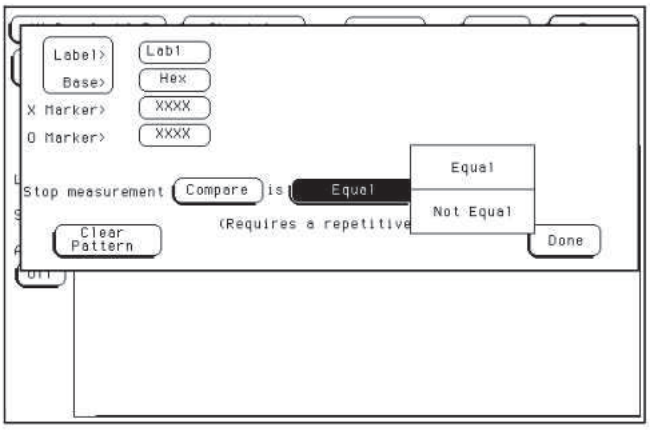
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Compare

Compare is only available when the analyzer type is set to State Compare in the Configuration menu. When Compare is selected, a repetitive run will be terminated when a comparison of data in the Listing menu and the data and criteria in the Reference listing matches an equality selection. The equality selection is set from the Equal/Not Equal selection pop-up menu.

Equal The data and compare criteria in the Compare menu must be equal to the data in the Listing menu.

Not Equal The data and compare criteria in the Compare menu must not be equal to the data in the Listing menu.



Compare Field and Pop-up Menu

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

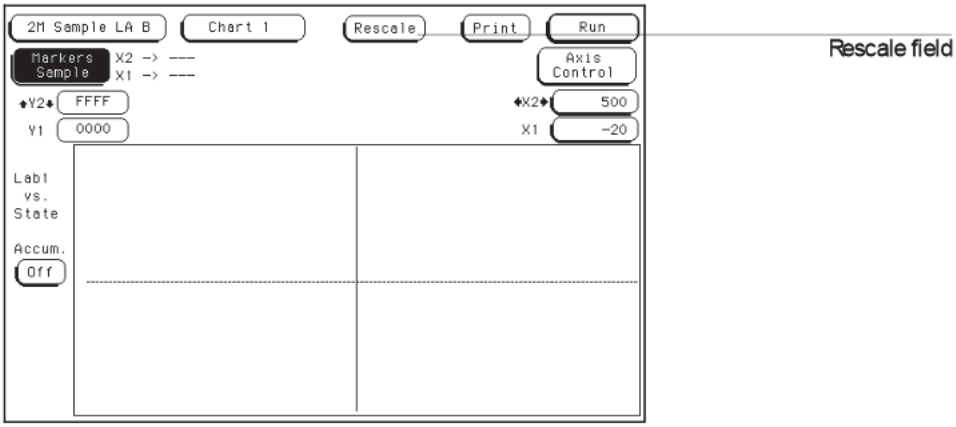
Rescale Field

The Rescale field is used to scale the sampled states based on the position of the Y1, Y2, X1, and X2 axis markers. To zoom in on a section of the displayed chart data, position the markers around the area of interest. When the Rescale field is selected, the pop-up menu allows you to choose rescaling between the X-axis markers, the Y-axis markers, between X- and Y-axis markers, Full Scale, or Cancel.

Between X axis markers This selection will rescale data on the horizontal X axis based on the positions or settings of X1 and X2. At the end of the rescaling operation, the X1 marker will reside at the far left side of the display screen and the X2 marker will reside at the far right side of the display.

Between Y axis markers This selection will rescale data on the vertical Y axis based on Y1 and Y2 settings. At the end of the rescaling operation, the Y1 marker will be positioned at the far top of the display screen and the Y2 marker will be positioned at the far bottom of the display.

Between X&Y axis markers This selection will execute both X and Y markers operations as discussed above, resulting in the rescaling of both the horizontal and vertical axes.



Rescale Field

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Full Scale This selection will rescale the horizontal and vertical axes so that all data samples are charted in the XY chart window. Selecting Full Scale will overwrite Y1, Y2, X1, and X2 settings, in addition to the Axis Control Ranges specified in the Axis Control pop-up menu.

To Cancel Plotting

Replotting Full Scale can take minutes to complete. To cancel plotting, touch the red Cancel field at the bottom right of the display screen.

Cancel The Cancel selection allows you to exit this pop-up menu without changing the current scaling.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

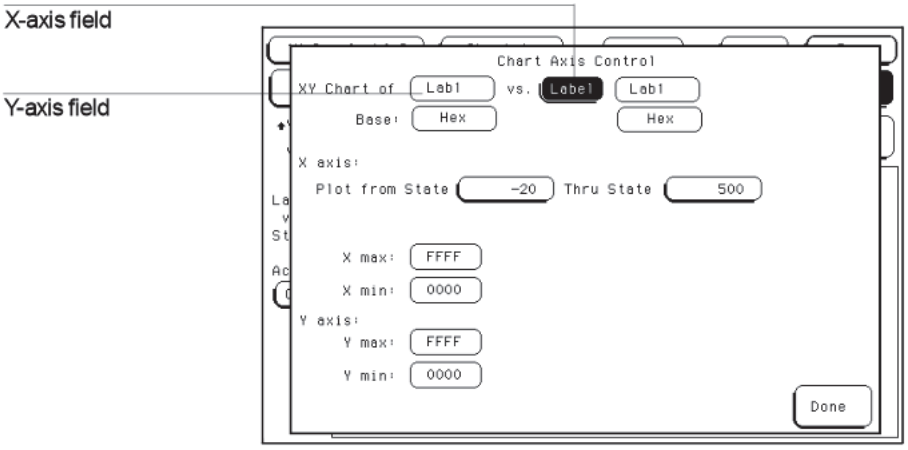
Axis Control Field

Touching the Axis Control field causes the Chart Axis Control pop-up menu to appear. In this menu, you specify the relation to be charted and the boundaries for the chart. The vertical Y axis will always be a label. The available labels are those which you defined in the Format menu. The horizontal X axis can be one of the same labels available for the Y axis, or it can be sample memory locations.

"XY Chart of" Field (Y-axis Label)

The Y-axis label field is just to the right of "XY Chart of" text. To specify a vertical axis label, touch the Y-axis Label field, then select the desired label from the label list pop-up menu. The label choices are the labels that were defined in the state Format menu.

The values charted are the acquired data values represented by that label, in the number base selected in the Axis Control menu. The placement of the label data on the chart is determined by the scaling of the two axes. You select values for the axes scaling in the X axis and Y axis fields found in the Axis Control menu.



The Axes Fields

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

"vs." State/Label Field (X axis)

The X axis can represent a label's value or sample location. The X-axis assignment field is just to the right of "vs." text, and toggles between State and Label. To assign a sample location to the horizontal axis, set this field to State. To assign a label's value to the X axis, set this field to Label. Another field appears to the right of the Label field. Touch this field, and a pop-up menu appears showing all the labels that are defined in the Format menu. Select one of these labels to assign its value to the X axis.

An XY chart, with Y-axis data values for Lab1 of: state 0=15, state 1=16, state 2=17,...state 99=114, and X-axis data values for Lab2 of: state 0=6, state 1=7, state 2=8,...,state 99=105, would result in the chart coordinates: (6,15), (7,16), (8,17),..., (105,114). The placement of the label data on the X and Y axes is determined by the values of the Xmin, Xmax, Ymin, and Ymax fields.

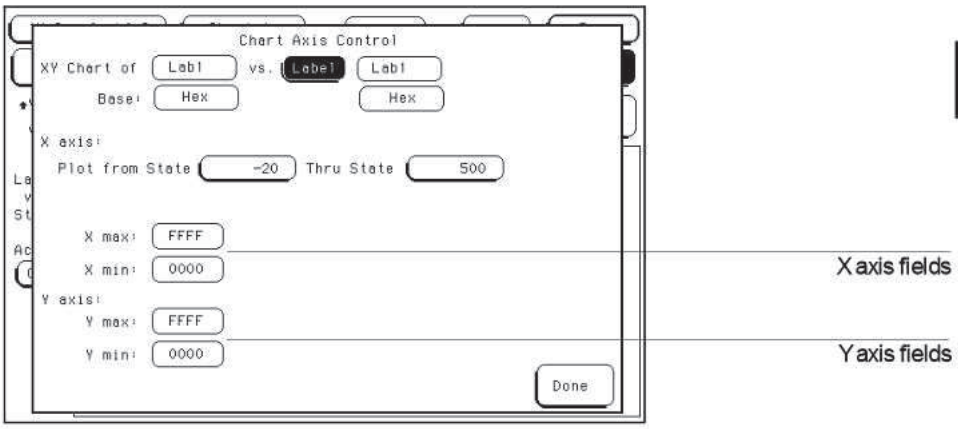
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

X axis and Y axis Fields

Either axis of the XY chart can be scaled by using the associated vertical or horizontal min (minimum) or max (maximum) value fields. When selected, a pop-up keypad appears in which you specify the minimum and maximum values that will be displayed.

When State is selected for the X axis, sample locations are plotted on the X axis. The min and max state locations are specified in the "X axis: Plot from State" field. For State, the minimum and maximum values that are selectable depend upon the memory depth you specified in the Configuration menu. For labels, the minimum and maximum values can range from 00000000H to FFFFFFFFH regardless of axis, because labels are restricted to 32 bits.

When plotting Label versus Label, both the Y axis and the X axis can be scaled. Charted memory locations are selectable in the "Plot from State" field for the X axis.



Axes Scaling Fields

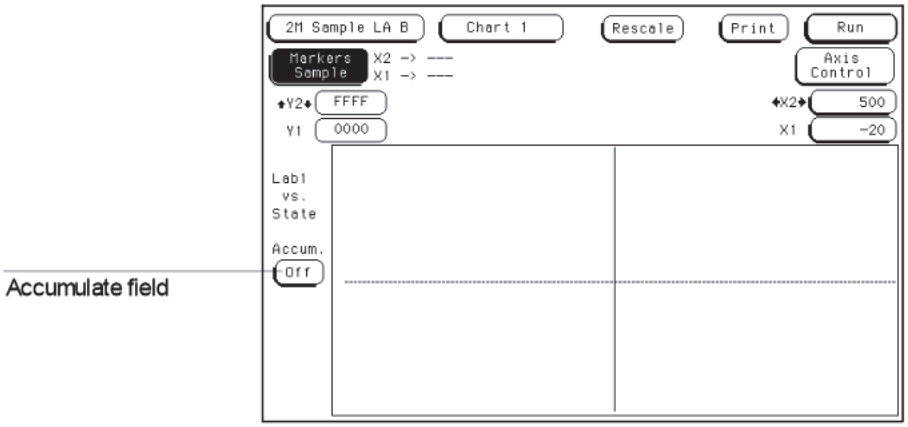
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Accumulate Field

The Accumulate field may be toggled between on and off. When Accumulate On is selected, data from multiple acquisitions are charted on top of one another. When Accumulate Off is selected, only the current acquisition is displayed.

Cancel Field

The red Cancel field appears while the specified chart is being plotted. It is located where the Rescale field is normally displayed. When Cancel is selected, the plotting halts, and the Cancel field disappears.



Accumulate Field

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

9

The Compare Menu

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

The Compare Menu

State Compare is a software post-processing feature that provides the ability to do a bit-by-bit comparison between the acquired state data listing and a reference listing.

The comparison between the acquired state listing data and the data in the reference listing is done relative to the trigger points. This means that the two data records are aligned at the trigger points and then compared bit by bit.

Any bits in the acquired data that do not match the bits in the compare image are treated as unequal.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Compare Post-Processing Features

You can view in separate listings the acquired data, your reference listing, and a listing that highlights the bits in the acquired data that do not match the corresponding bits in the reference listing.

You can edit the reference listing for unique comparisons.

You can mask specific bits that you do not want to compare. These "Don't compare" bits can be specified individually for a given label and state row, or specified by channel across all state rows.

You can select a range of states to compare. When a range is selected, only the bits that are in states on or between the specified boundaries are compared. Also, you can save the reference listing along with the analyzer configuration to disk.

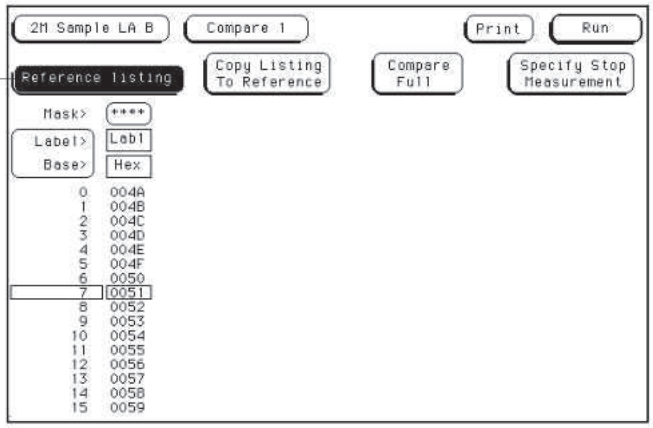
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Reference Listing Field

The Reference listing and Difference listing field is a toggle field that switches the listing type between the Reference image listing and the Difference listing.

The Reference listing is a display of the image (or template) that acquired data is compared to during a comparison measurement. The boundaries of the image are controlled by using the channel masking and compare range functions. Any bits in the reference listing displayed as "X" have been set to don't care bits during bit editing.

When the data listing is rolled, the difference data listing and the data listing in the Listing menu are also rolled.



Reference listing field

Reference Listing Field

See Also

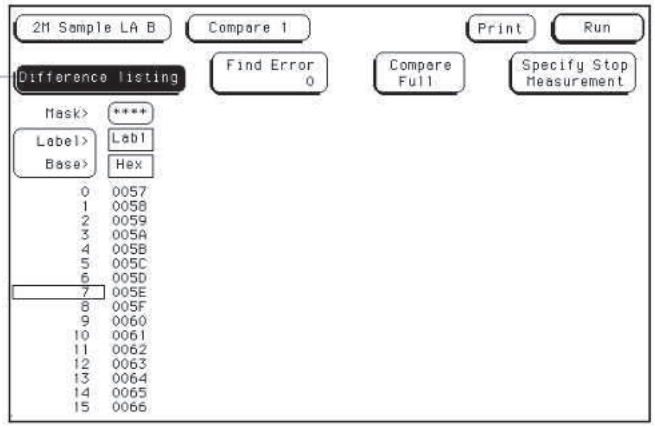
"Bit Editing Field" in this chapter for more information about editing bits.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Difference Listing Field

The Reference listing and Difference listing field is a toggle field that switches the listing type between the Reference image listing and the Difference listing.

The Difference listing is a display of the acquired data listing with the data that differs, if any, from the Reference listing, highlighted with inverse video. If the base is inverse assembled symbols, the entire line is highlighted with inverse video.



Difference Listing Field

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

The controls that roll the listing in all three menus, the normal State listing, the Reference listing, and the Difference listing are synchronized unless the number of pre-trigger states differ between the Reference listing and the acquired data.

This means that when you change the current row position in the Difference listing, the analyzer automatically updates the current row in the acquired State listing, Reference listing and vice-versa.

If the three listings are synchronized and you re-acquire data, the Reference listing may have a different number of pre-trigger states depending on the state trace trigger criteria. The Reference listing can be resynchronized to the State and Difference listings by entering the desired state (acquisition memory) location from the pop-up keypad.

This allows you to view corresponding areas of all lists, to cross-check the alignment, and to analyze the bits that do not match.

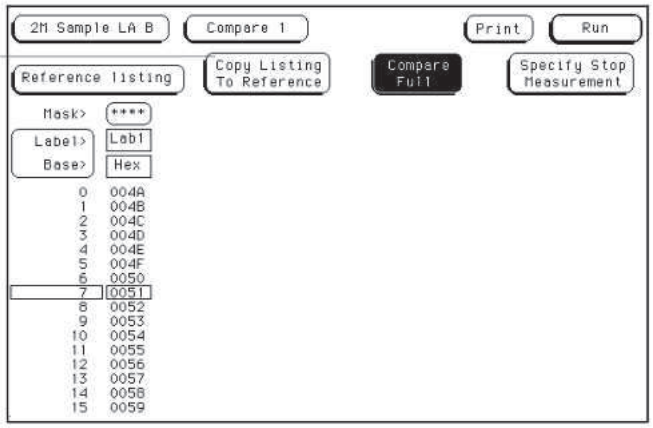
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Copy Listing to Reference Field

The initial Reference image is generated by either copying the data listing from the listing menu or by loading an analyzer configuration file which contains a Reference listing. You should be aware that if you load an analyzer configuration to get a Reference image, the other menu setups will change.

When the Copy Listing to Reference field is selected, the contents of the acquisition data structure (Listing menu display) are copied to the Reference image buffer. The previous Reference image is lost if it has not been saved to a disk.

Copy Listing To Reference field



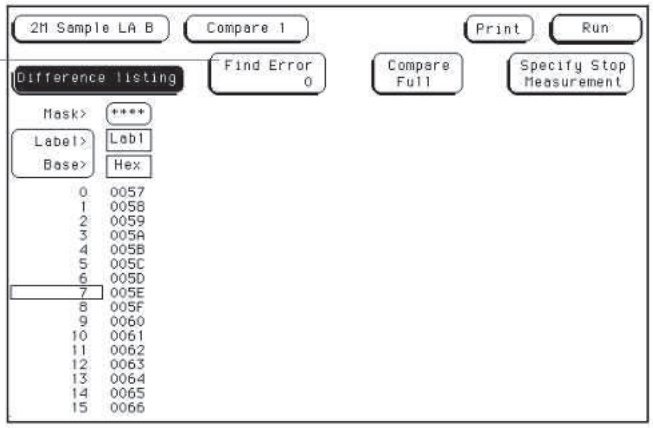
Copy Listing to Reference Field

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Find Error Field

The Find Error field allows you to easily locate any patterns that did not match in the last comparison. Occurrences of differences, or errors, are found in numerical ascending order from the start of the listing. The first occurrence of an error has the numerical value of one.

When you select the Find Error field, the field turns light blue and the knob can be used to select a number. If the field is touched a second time, a pop-up keypad appears in which you enter a number. The number you enter indicates which error you want to find. The listing is then scanned sequentially until the specified occurrence is found and rolled into view.



Find Error Field

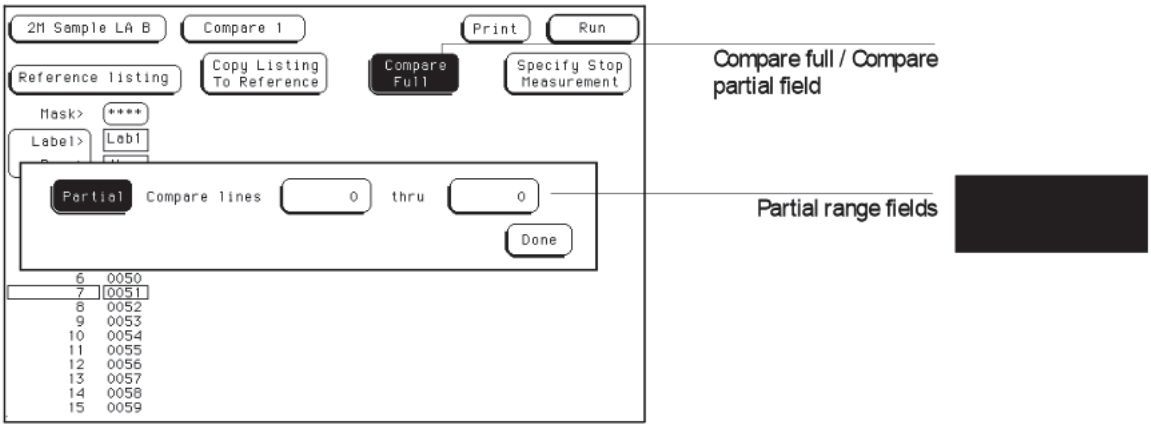
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Compare Full / Compare Partial Field

The Compare Full/Compare Partial field is a toggle field which allows you to compare either the full range of states or define a subset of the total number of states in the Reference image to be used in the comparison.

The Compare mode is accessed by touching the Compare Full/Compare Partial field in either the Compare or Difference listing menus. When selected, a pop-up menu appears in which you select either the Full or Partial option.

When you select the Partial option, fields appear for setting the start state and stop state values. Only bits in states (lines) on or between the boundaries are compared against the acquired data.



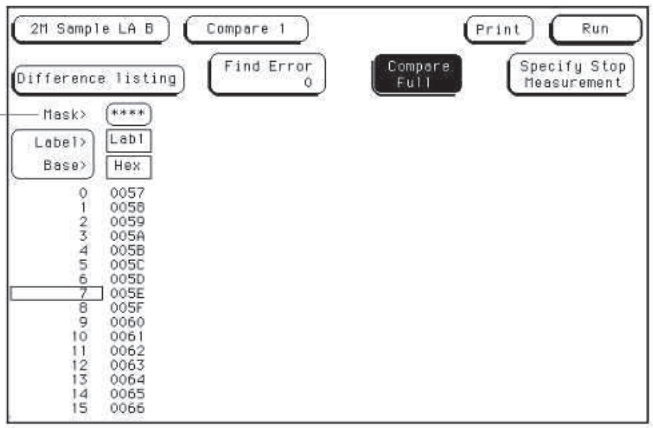
Compare Full / Compare Partial Field

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Mask Field

The channel masking field is used to specify a bit or bits in each label that you do not want compared. This causes the corresponding bits in all states to be ignored in the comparison. The Reference data image itself remains unchanged on the display.

When you select the Mask field an assignment pop-up menu appears in which you specify the channels to be compared and the channels to be masked. A period (.) indicates a don't compare mask for that channel and an asterisk (*) indicates that channel is to be compared.



Mask Field

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Specify Stop Measurement Field

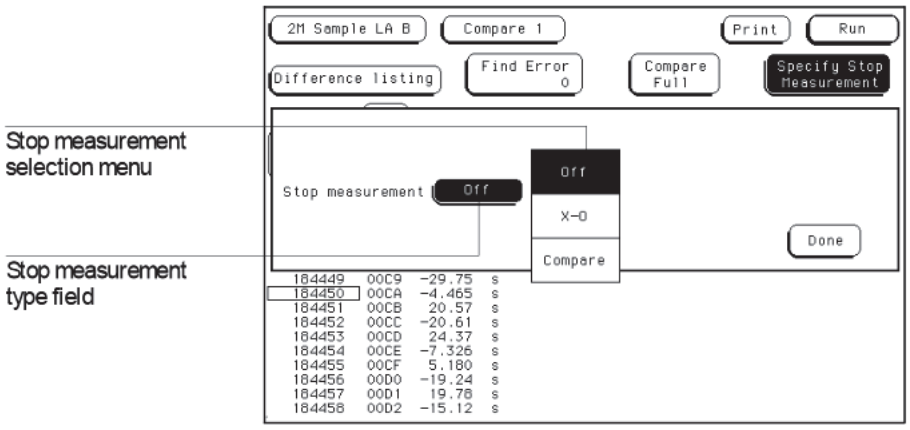
The Stop measurement function allows you to specify a condition which stops the analyzer measurement during a repetitive run. When the Specify Stop Measurement field is selected, a Stop measurement menu appears which is used to set the stop criteria.

When the Stop measurement type field is selected, a selection menu appears. Depending on the analyzer configuration, you will have the choices of Off, Compare, and X-O.

Off

The Off selection turns all Stop measurement operations off.

If the stop measurement operation is not turned off and the stop measurement criteria are met, the measurement will stop even though the markers are turned off.



Stop Measurement Fields

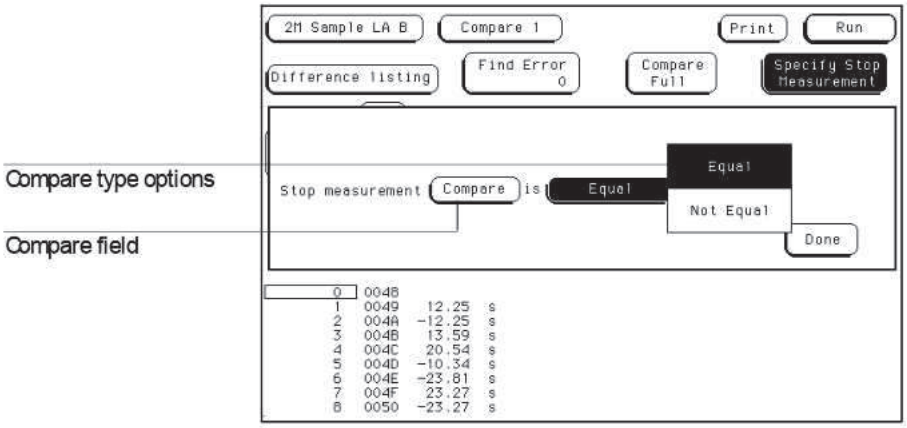
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Compare

When Compare is selected, a repetitive run is stopped when a comparison of data in the Listing menu and data and criteria in a Reference image matches an equality selection. The equality selection is set from the Equal/Not Equal selection pop-up menu.

Equal The data and compare criteria in the Compare menu must be equal to the data in the Listing menu.

Not Equal The data and compare criteria in the Compare menu must not be equal to the data in the Listing menu.



Compare Stop Measurement Type Fields

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

X-O

The X-O option is available in the State analyzer with its count set to Time.

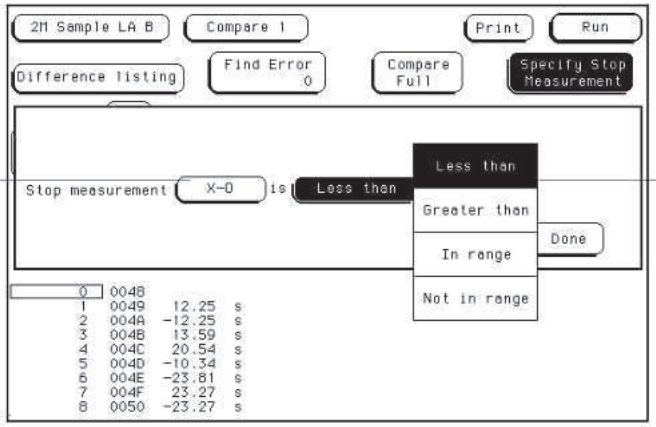
When X-O is selected, a repetitive run is stopped when a comparison of the time period between the X and O markers and one of the following time period options is true.

Less Than X-O time must be less than the time value that you specify in the Time field.

Greater Than X-O time must be greater than the time value that you specify in the Time field.

In Range X-O pattern must be within the time range value that you specify in the two Time fields.

Not in Range X-O pattern must not be within the time range value that you specify in the two Time fields.



X-O field

X-O options menu

X-O Stop Measurement Type Fields

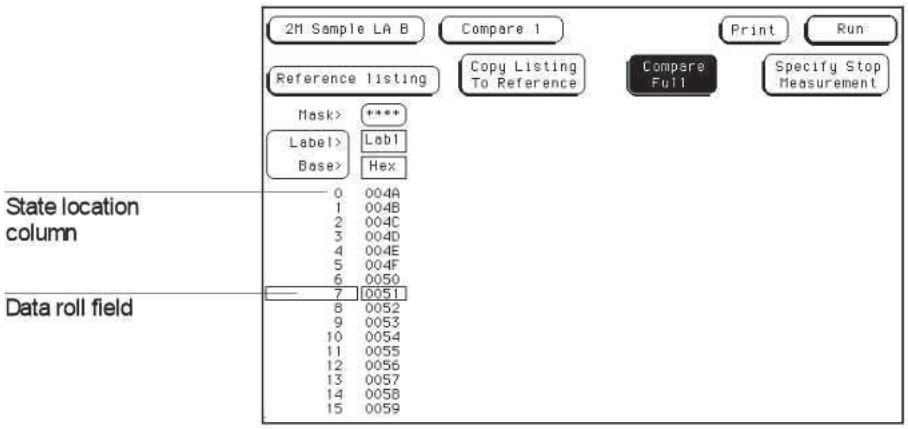
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Data Roll Field

The column of numbers at the far left represents the location of the acquired data in the state analyzer's memory. The numbered positions are also known as the state locations and are relative to the trigger state location, which is always represented by 0.

The state location column, along with its data, can be rolled to display offscreen data by using the data roll field. The data roll field is the small rectangular box located in the middle of the state location column.

The data roll field is used to either roll the data listing or to select an exact state for display. When the data roll field is light blue, the knob is active and can roll data in either direction. If you touch the data roll field when it is light blue, a pop-up keypad appears for the number of an exact state. When the pop-up keypad is used, the data listing shifts, leaving the selected state in the light blue data roll box.



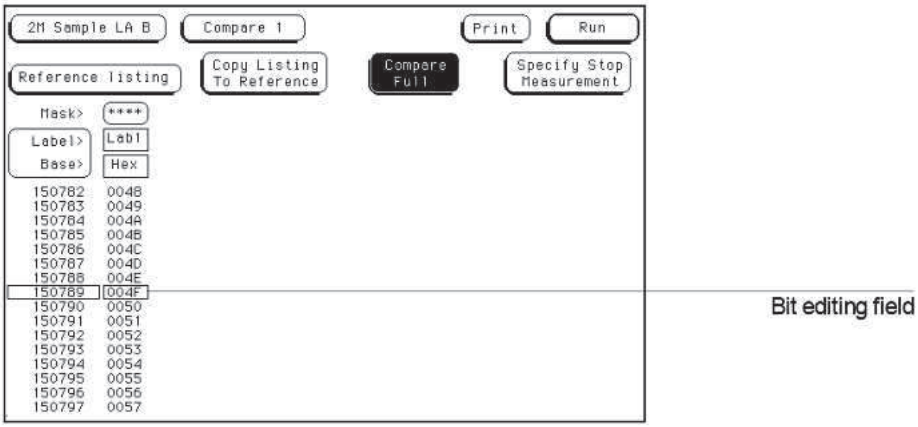
Data Roll Field

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Bit Editing Field

The bit editing fields are located in the center of the Reference listing display. A bit editing field exists for every label in the display unless the label's base is ASCII or inverse assembled symbols. Bit editing field allows you to modify the values of individual bits in the Reference image or specify them as don't compare bits.

You access data in the Reference listing by rolling the data listing using the knob until the data is located in the bit editing field. To enter a desired pattern or don't compare (X) for a bit, select the field and use the pop-up keypad which appears.



Bit Editing Field

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Label and Base Fields

The Label and Base fields show up together in all menus except the Format and Configuration menus. When a new label is assigned, a base field is automatically assigned to that label.

Label Field

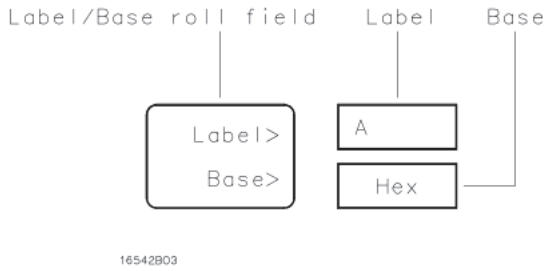
Labels in the Compare menu are the same labels assigned in the Format menu. These labels will be displayed throughout the analyzer as they were assigned in the Format menu.

Base Field

The function of the Base field is the same in all menus. To change the numeric base, select the base field, then choose the desired base from the selection menu.

Label / Base Roll Field

The function of the Label and Base roll field is the same in all menus. The rolling function is the same for all items that are stored offscreen. For more information on rolling labels, base, and pods, refer to Labels Assignment in the "Common Module Operations" part of the Agilent Technologies 16500C User's Reference Guide.



Label / Base Roll Field

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

10

The Mixed Display Menu

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

The Mixed Display Menu

The Mixed Display menu allows you to view state listings at the top of the display and waveforms at the bottom.

The state listing display shows data from the state analyzer currently accessed and interleaved state listings from other modules. If the analyzer is configured with two state analyzers, both state listing displays can be interleaved as well as shown separately.

The waveform display shows timing analyzer waveforms and oscilloscope waveforms. The waveforms can be from other modules within the Agilent Technologies 16500C Logic Analysis System.

The Mixed Display menu is only available when the analyzer is configured as a state analyzer with the Count field set to Time in the Trigger menu. In addition, before waveforms or state listings from other modules are displayed, they must be configured in a Group Run in the Intermodule menu.

For the most part, the operation of the menu fields in the listing and waveform portions of the Mixed Display menu are identical to their operation in their respective menus. The unique functions and features of the mixed display are:

- Intermodule Configuration
- Inserting Waveforms
- Interleaving State Listings
- Time-Correlated Displays
- Markers

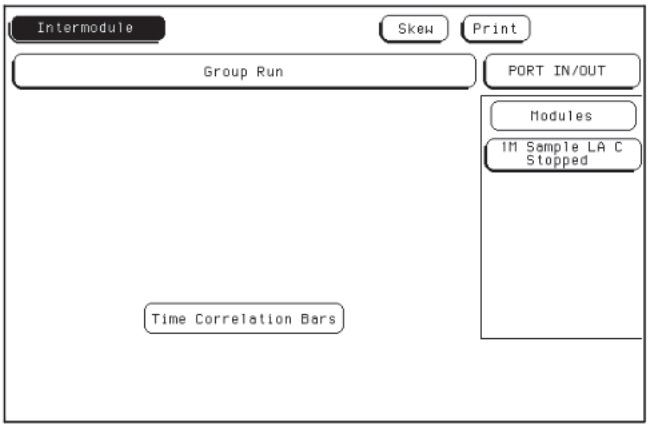
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Intermodule Configuration

Before waveforms or state listings from one module are displayed in the Mixed Display menus of other modules, all modules involved in the measurement must be configured in a Group Run. The Group Run configuration takes place in the mainframe's Intermodule menu. In addition, all state analyzers must have their Count fields set to Time in their Trigger menus.

See Also

"Correlating Measurements" in the Agilent Technologies 16500C User's Reference for complete information on intermodule operation.



16500 Intermodule Menu

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Inserting Waveforms

To insert waveforms from other modules, use the same procedure for selecting waveforms as you would in the Waveform menu.

See Also

"Waveform Display" in chapter 7, "The Waveform Menu," for information on the field definitions and the waveform selection functions.

Interleaving State Listings

Interleaved state listings allows you to view two labels and their data from different analyzers in the same column. The process of interleaving state listings can be performed in either the Listing menu or the Mixed Display menu. For example, if data is interleaved in the Listing menu, it will be automatically interleaved in the Mixed Display menu.

Before a state listing from a second analyzer can be interleaved into the listing, both analyzers must be configured in a Group Run in the Intermodule menu and the Count fields set to Time in both Trigger menus.

The interleaved label is placed directly above the selected label, and all interleaved data is displayed in yellow. In addition, the state numbers of the interleaved data are indented to the right. Because of the lack of room in the listing portion of the Mixed Display menu, the label identifying the interleaved data is not displayed.

State listings from all other analyzers can be interleaved into the state listing of an 16557D. With one exception, the process to interleave a label is the same as inserting labels. After the Interleave option is selected, an analyzer selection is made from a list containing the analyzers configured in the Group Run. Labels for each analyzer become available when the desired analyzer is selected.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Time-Correlated Displays

Once the Time markers are set in the Waveform display area of the Mixed Display menu, time-correlated X and O Pattern markers will be displayed in both the listing and the waveform display areas.

The analyzer uses a counter to track time between the triggering of one display and the triggering of the other display. It uses this count to reconstruct time-correlated data.

Markers

The markers in the Mixed Display menu are not the same as in the Listing and Waveform menus. Only Time markers are available in the Mixed Display menu. Even though you have placed time markers in the listing and waveform displays, you must place new ones on your points of interest in the Mixed Display. You set the time markers in the waveform display area of the menu.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

The SPA Menu

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

The System Performance Analysis (SPA) software is included as standard software in the Agilent Technologies 16550 family of logic analyzers.

SPA provides you with a set of functions for performing statistical analysis on your target system. Its functions include State Overview, State Histogram, and Time Interval modes.

To be successful with this software, you should be familiar with the operation of the logic analyzer.

This chapter is organized as follows:

- "What is System Performance Analysis?" outlines typical SPA applications, and describes the operating characteristics for each SPA mode.
- "Getting Started" describes how to access the SPA menus and how to select the SPA modes and set the specifications.
- "SPA Measurement Processes" is a detailed description of the measurement processes used by the SPA package. This theory of operation explains how the SPA software samples and sorts the data from the target system, and how the onscreen measurement values are computed for the State Overview, State Histogram, and Time Interval modes.
- "Using State Overview, State Histogram, and Time Interval" leads you through the three modes. It also tells how to set up SPA for the three modes, how to interpret the acquired data, and how to make measurements on specific areas of interest.
- "Using SPA with Other Features" tells you how to use SPA with other features.

Error messages and warnings used by SPA are the same as those used by the logic analyzer. Refer to "Error Messages," Chapter 12, for descriptions of these messages.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

If you are just getting started, the first two sections are recommended reading. The third section is optional. If you are an experienced user, the last sections will help you with your SPA measurements. Use the first three sections for review when necessary. If you need programming information, refer to the appropriate Programmer's Guide, available from your Agilent Technologies Sales Office.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

What is System Performance Analysis?

The logic analyzer's state or timing analyzer is used to make quantitative measurements on specific events in the target system. For example, a state or timing analyzer can measure a specific time interval on a microprocessor's control lines, or can find out how a particular subroutine was called.

System Performance Analysis, on the other hand, is used for qualitative measurements on the target system. SPA provides statistical analysis functions so you can determine how efficiently your target system is operating.

SPA repeatedly samples signals of interest, such as an address bus or the output of a counter. The multiple data sets from the repeated sampling are then used to build histograms and to compile statistics that describe your target system's performance over time.

Some typical examples of SPA applications include

- Obtaining an overview of system activity.
- Identifying software problems that lock up the microprocessor.
- Determining the best-case and worst-case execution times for a software module or a state machine.
- Establishing standards for software modules or state machines.
- Identifying inefficient use of mass storage and other peripherals.
- Evaluating memory utilization, such as illegal access in protected portions of memory, and locality of execution.

Operating characteristics

The following describes the operating characteristics of the System Performance Analysis software for the three SPA measurement modes.

State Overview The State Overview mode displays a bar chart of a label's state value versus the relative number of occurrences of each value in the defined range of the label. State Overview is available on any label defined in the Format Specification.

- The X axis is the defined range for the specified label divided into 256 buckets.
- The range of the specified label is user-definable.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

- The Y axis is the relative number of occurrences in each bucket.
- Maximum value of the Y axis is constantly updated to reflect the number of occurrences in the bucket that has the most occurrences, and is displayed as "Max count."
- The total number of states sampled for the selected label is presented as Total count. This includes states that may be outside the user-specified X axis range.
- Two markers are available on the X axis to determine the range of a bucket and number of occurrences in any bucket.
- Choice of base for a specified label is user-definable.

State Histogram The State Histogram mode displays states that occur within user-defined ranges of a label. State Histogram is available on any label defined in the Format Specification.

- Maximum number of ranges is 11.
- Other States included/excluded is available and displays a histogram of all states not covered by the user-defined ranges.
- You can trace All States or patterned Qualified States.
- Total samples displays the total number of occurrences in all displayed ranges.
- Choice of base for specified label is user-definable.

Time Interval The Time Interval mode displays time intervals between user-defined start and end events.

- Start and end events can be defined over all labels defined in the Format Specification.
- 10 ns is the minimum sample period and time interval resolution.
- The maximum number of time interval ranges is 8.
- Time interval range size is 10 ns to 9,999,999 seconds.
- Calculated statistics provides Maximum time, Minimum time, Average time, and Total number of time intervals sampled (one time interval defined to be a paired start/end event).
- Auto-range feature automatically scales the eight time intervals over maximum and minimum times using a logarithmic scale or linear scale.
- Choice of base for labels is user-definable.

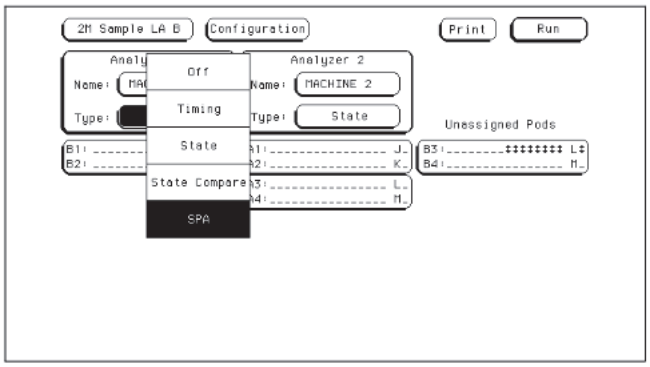
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Getting Started

This section describes how to access the System Performance Analysis (SPA) menus. Also, it describes selecting the SPA modes and setting the specifications.

Accessing the menus

The SPA menus are accessed through the Configuration menu. When the configuration menu is displayed, select the Type field and choose SPA from the pop-up menu.



Configuring an Analyzer for SPA

Selecting State Overview, State Histogram, or Time Interval modes

To access one of the three SPA modes, select the analyzer menu field after configuring one of the analyzers as SPA and select SPA.

Once in the SPA menu, you can move from State Overview, State Histogram, or Time Interval Modes by selecting the Trace Mode field as shown in the SPA menu on the next page. A pop-up menu appears, and you can select one of the three SPA modes in the pop-up menu.

> If you change modes while the logic analyzer is acquiring data, it will stop the acquisition.

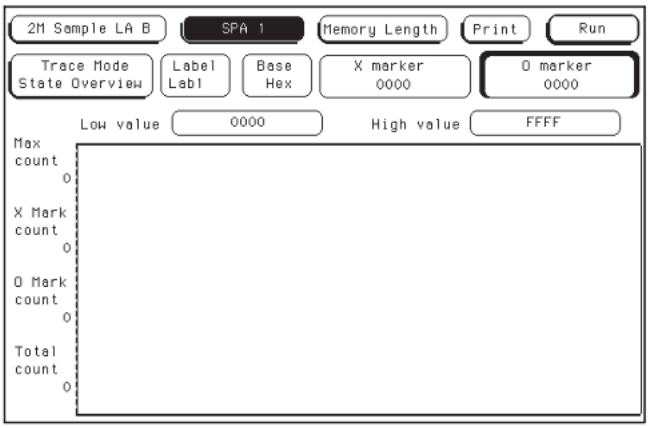
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Setting up the State Format specification

When a state or timing analyzer is changed to SPA, SPA will retain the state or timing format specification. For complete details on changing from a state or timing analyzer to SPA, see "Using SPA with Other Features" later in this chapter.

The State and Timing format specification menus provide symbol tables. You can use any defined symbols to specify the Low and High values in State Overview, to define the ranges and the qualified states in State Histogram, or to specify the Start and End conditions in Time Interval.

Your ability to use existing state or timing configurations with SPA depends on your application and target system. If your SPA measurement uses the same physical signals from the target system as an existing state or timing configuration, it may be easier to load the state or timing configuration from the disk instead of entering a new one.



Default SPA Menu

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

SPA Measurement Processes

This section introduces you to the measurement processes of the System Performance Analysis (SPA) software. It tells you how to select the appropriate trace mode and labels. It also explains how SPA samples and sorts data.

Selecting and changing trace modes

SPA has three trace modes: State Overview, State Histogram, and Time Interval. These are selected by the Trace Mode field in the SPA data display.

Only the currently displayed trace mode is affected during an acquisition. While acquiring and viewing data in one trace mode, the other two trace modes are not updated. If the trace mode or any other critical variable is changed during an acquisition, the logic analyzer stops the acquisition and displays "Warning: Run HALTED due to variable change."

Each trace mode only performs statistics on its own database. Therefore, if acquisitions are completed in two different trace modes, the two modes will not contain the same data.

For example, you select the State Overview mode and press the Run key. After the data accumulates for a period, press Stop. You then select the Time Interval mode and the screen is blank since no data has been acquired in this mode. You again press Run and let data accumulate and press Stop. In this example, two separate data sets are acquired, the first for State Overview mode, the second for Time Interval. You can now move between the modes and see the correct data for the associated measurement.

This separate acquisition data applies to all three trace modes. In this way, three separate views of the target system can be acquired and stored in SPA.

Sampling methods and data sorting

SPA provides a statistical summary of target system behavior over time. The greater the number of samples, the more accurate the statistics. Therefore, SPA should always be run in the Repetitive mode. By doing this, the analyzer will continue to sample the data and update the display until Stop is pressed, or until a sampling variable is changed on the display.

After SPA completes an acquisition, each sample in the current acquisition is compared to the ranges or buckets for the current trace mode. If the sample matches a range or bucket, it is sorted into that range or bucket. This process is repeated for every sample in the acquisition. After the entire acquisition

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

has been sorted, the histograms and displayed statistics are updated, and the analyzer is re-armed for the next acquisition.

Refer to the following sections on the three trace modes for details on sorting criteria and statistical computation.

Between each successive acquisition, there is blind time during which the captured data is unloaded and sorted, the display is updated, and the analyzer is restarted. The length of the blind time is a function of the complexity of the SPA measurement.

Selecting and changing labels

A label in Agilent Technologies logic analyzers is defined in the Format menu. A label is any named group of 32 or fewer data channels.

The State Overview and State Histogram modes monitor one label at a time. Any labels that are defined in the Format menu are available. A typical example is the ADDR (address) label used in many of the Agilent Technologies inverse assembler configurations. Often, SPA measurements will use the ADDR label to monitor memory activity.

Qualified State Histogram and Time Interval modes use all of the labels in the Format menu to define either the qualified state or the start and stop events, respectively. State Overview and State Histogram deal with recorded states, and Time Interval deals with time.

> Changing from one label to another in State Overview or State Histogram mode or changing the Start or End pattern in Time Interval erases any configuration and data for the original label. When returning to the original label, the display returns to its default mode. Loss of configurations and data when changing between labels can be prevented by saving configurations of interest to the disk before making the change, or by printing the results.

State Overview mode

State Overview mode is an X-versus-Y chart of the activity on a specified label. It provides a global view of the distribution of activity of the target system signals grouped under the specified label.

X axis scaling The X axis represents the defined range of the specified label and is divided into a series of buckets, or smaller ranges. The range of the X axis is defined by the Low value and High value fields, and is

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

divided equally among 256 buckets. For example, if the range defined by the low and high values is 1100, then 1100 divided by 256 equals 4.29. This value will be rounded up to 5, each bucket will have a range of 5, and only 220 buckets will be used (1100/5 = 220). The display grid will be truncated on the right because only 220 buckets are displayed.

If the full range of the label or the portion of the label defined by the Low value and High value is less than 255, then the number of buckets will be the difference between the Low and High values.

The Low and High values can be specified as discrete values in binary, octal, decimal, or hexadecimal. If Symbols have been defined in the Format menu, they can also be used for the low and high values.

Data sampling and sorting When Run is pressed, all input channels defined in the Format menu are sampled. Once acquired, the sampled data is sorted into the buckets of the specified label, and the State Overview display is updated. The acquisition is repeated until Stop is pressed or until a display variable is changed.

Y axis scaling The display builds a vertical histogram where the Y axis represents the relative number of occurrences in each of the buckets. As successive acquisitions are acquired and sorted, the display is constantly re-scaled vertically so that the upper limit of the Y axis represents the largest number of occurrences in any bucket.

The Y axis maximum limit is displayed in Max count.

Total count The Total count field is the total number of states sampled over the entire label range since the measurement was started.

X and O markers Markers can be placed on any bucket to determine the number of occurrences in that bucket. The X Mark count and O Mark count fields display the number of occurrences at the markers. The markers move only on the bucket boundaries.

The range of each bucket can be determined by selecting the X marker or O marker fields and noting the change in the marker value in the pop-up as the marker is moved slowly across the display.

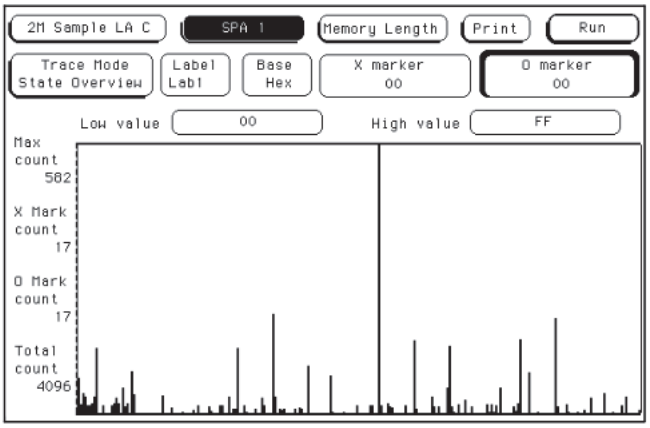
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Example

An example of a State Overview measurement is testing for access to a reserved area of memory. In this case, the channels of the address bus of the target system would need to be grouped under a single label, such as ADDR. By selecting the ADDR label in State Overview mode, and by defining the full range of the label (Low value = 0000, High value = FFFF with a 16-bit ADDR label), activity over the entire address range can be monitored. Access into reserved memory is easily identified.

By selecting only the range of the reserved area of memory with the Low and High values, the number of address values per bucket is decreased and a more detailed analysis can be performed.

The figure below shows a State Overview display.



SPA State Overview Menu

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

State Histogram mode

State Histogram mode displays relative activity of ranges of a specified label. The ranges can also be compared to activity on the rest of the label not defined in the ranges. Data qualification is possible with State Histogram, so data can be filtered during acquisition.

Data sampling and sorting When Run is pressed, all input channels defined in the Format menu are sampled. Once acquired, each sample in the acquisition is compared to each defined range. If the sample value is inclusively within the range and if the range is on, the count for that range is incremented, then the State Histogram display is updated. The acquisition is repeated until Stop is pressed or until a display variable is changed.

The histogram is displayed on a percentage scale, and each bar represents the fraction of all samples in that range. For example, if a bar reaches the 40% value on the display, then the range for that bar contains 40% of all the samples displayed. If the total of all bars equals greater than 100%, then ranges have been overlapped and data has been counted twice.

State Histogram vs. State Overview State Histogram is similar to State Overview, but there are key differences between the two modes. State Overview shows relative distribution of activity over a single contiguous range of a label. State Histogram also allows several non-contiguous ranges of a label to be defined.

State Overview requires minimal setup, and provides a quick overview of system activity. State Histogram requires more setup, but provides greater resolution and measurement flexibility.

State Overview mode does not display data that falls out of the range of its Low and High values. State Histogram, on the other hand, has an "Other States included/excluded" feature that will present a histogram of any activity that does not fall into the defined ranges (see "Other States included/ excluded," later in this section).

State Overview samples and displays all activity on the specified label. But State Histogram allows data qualification so that only activity of interest is sampled and displayed (see "Trace Type: All States vs. Qualified States," later in this section).

Range specifiers Up to 11 ranges are available. The ranges are defined by specifying a low and high value on the specified label and by a name you define. The ranges need not be contiguous. If two ranges overlap in any manner, acquired data will be counted in both ranges.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

If a range has a low and high value and a name defined, and the range is turned off, it will retain the low and high value and name when turned back on.

User-defined ranges vs. symbols When defining low and high values for the State Histogram ranges, you may use symbols instead of entering discrete values. Symbols can only be used for labels selected in the State Histogram mode if they are defined in the Format menu, and only if the base in the State Histogram menu is set to Symbol.

Pattern or range symbols defined in the Format menu can be used to set the low or high value of a range.

Total samples The total samples field displays the total number of samples in all the displayed ranges. If Other States included is selected, then total samples is the total of all displayed samples plus the other states. If any ranges are overlapped and samples fall in multiple buckets, these samples are only counted once in total samples.

Number of samples per range Displayed next to each bar is a value representing the number of samples for that range. The ratio of these values to total samples determines the relative size of the histograms. These values are updated as the repeated acquisitions are sorted and displayed.

Other States included/excluded Usually the defined ranges will not cover the entire range of the specified label. The Other States included/ excluded field provides an optional histogram showing all activity on the specified label that does not fall within any of the defined ranges. By selecting excluded, the relative activity of only the defined ranges is displayed. If included is selected, the "other" histogram appears under the ranges.

If a range is turned off, any activity in that range is included in Other States. The activity of a turned off range is included in the other range whether included or excluded other states is displayed or not.

Trace Type: All States vs. Qualified States State Histogram mode can qualify data as it is sampled. Qualifying data while sampling allows only data of interest to be stored, while the rest is thrown away.

When Trace Type is set to Qualified States, a new field appears in the upper row of the display. The new field, Specify States, is where the data qualification is defined. The data qualification is not limited only to the label selected in the State Histogram menu. It is defined over all labels defined in

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

the Format menu as a combination of values, in the current base, and don't cares.

For example, a microprocessor target system memory may contain two arrays. In State Histogram, the address ranges of the arrays can be defined and the relative activity in the arrays monitored. But, what if you only want to monitor writes to the array? In this case, you can define the data qualification as "Memory Write" on the STATUS label.

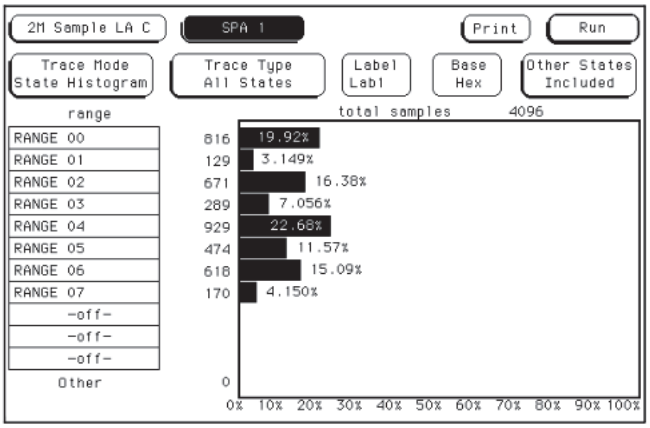
States that do not meet the qualification criteria are not stored by the analyzer, so they are not included in Other States.

Example

A computer system has several I/O devices, such as a data terminal, disk drive, tape drive, and printer. Each device has its own service routines stored in memory. The problem is that one or more of the devices is tying up the CPU.

The system address bus is monitored using State Histogram to define the memory blocks where the service routines are stored. The histograms quickly show that the print spooler is not working because the printer is constantly interrupting the CPU and is consuming 80% of address bus activity.

The figure below shows a sample State Histogram display.



SPA State Histogram Menu

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Time Interval mode

Time Interval mode shows distribution of execution time of a single event. The event is defined by specifying Start and End conditions as patterns across all labels defined in the Format menu.

Data sampling and sorting When you press Run, the analyzer samples the target system using the definitions entered in the Format menu. During acquisition, the state analyzer searches the data for the start and end conditions, and uses the analyzer's time tag feature to time the event. The time durations for each Start/End pair are then sorted into user-definable time interval ranges on the display. The acquisition is repeated until Stop is pressed or until a display variable is changed.

After the data is sampled, timed, and sorted, the histogram for each time interval range is updated.

If two time intervals are adjacent and have a common boundary (the upper limit of one equals the lower limit of the next), and a sampled time interval falls on the common boundary, the sample will be sorted into the higher time interval.

Start/End conditions Start and end conditions for Time Interval are specified on all labels defined in the Format menu as a combination of values in the current base and don't cares.

If a start or end condition is not found during an acquisition, the histogram will not change. The analyzer will only update when a start and stop event are both found.

Start and end conditions need not be adjacent in the data stream. For example, when the state analyzer sees the specified start condition, it starts the timer. If the start condition occurs again before the end condition occurs, the timer will not be reset.

For measurement purposes, the analyzer measures the time between the first occurrence of the start condition and the first occurrence of the stop condition.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Time Interval ranges Up to 8 time interval ranges are available. Each range has a lower and upper limit which can be entered manually. The Auto-range feature will automatically scale the eight ranges. The minimum allowable limit is 0 ns, the maximum 9,999,999 seconds.

Ranges do not have to be contiguous. However, gaps between ranges increase the risk of missed data. If two ranges overlap, data will be counted in both ranges. This applies to any number of overlapping ranges, or any portions of overlapping ranges. Common boundaries of adjacent ranges are not considered to be overlapped.

A range can be turned off by setting the lower and upper values to zero.

Auto-range The Time Interval ranges can be scaled quickly by selecting "Auto-range." This option requires a global Minimum time and Maximum time for the eight time interval ranges. The eight ranges are then scaled using either a log scale or linear scale.

All the ranges may be quickly initialized to off by selecting Auto-range, setting Minimum time and Maximum time to zero, and performing a linear scale.

The smallest increment allowable using Auto-scale is 10 ns. If the time interval defined by the minimum and maximum times is too small to allow all 8 ranges to be scaled, Auto-range will scale as many as possible and exclude some upper time interval ranges. The maximum resolution of each time interval is 10 ns.

Min, Max, and Avg Time Statistics The Time Interval mode display shows three statistics: Maximum (Max) time, Minimum (Min) time, and Average (Avg) time. These values are displayed whether or not they fall into any of the time interval ranges. Therefore, they are helpful in determining if the appropriate time intervals have been chosen.

The maximum resolution of the statistics is 8 ns.

Total samples Total samples is displayed above the histogram. A sample is defined as one Start/End pair. The Total samples field is not updated until the analyzer's memory is full or until Stop is pressed.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

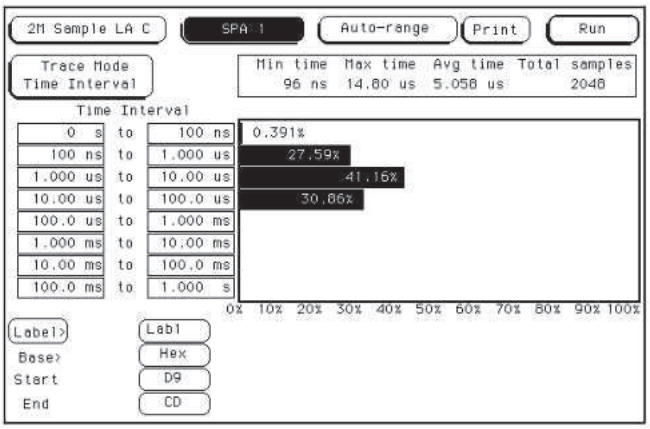
Example

A team of applications programmers is writing a math package for a spreadsheet. They need to develop standards for the various math functions. Using time interval mode, they can test the execution time of each of the math functions.

For each math function, they enter the starting and ending addresses in the Time Interval menu. They run the math function while monitoring its execution time with their logic analyzer in the Time Interval mode. Using Auto-range, they can quickly vary the time interval ranges for either greater time coverage or greater time resolution.

If the programmers wanted to see the details of the time intervals, they could set up a state analyzer measurement (not using SPA) and capture the activity between the start and stop events. The details could then be viewed in the state listing menu.

The figure below shows a sample Time Interval menu and its display.



SPA Time Interval Menu

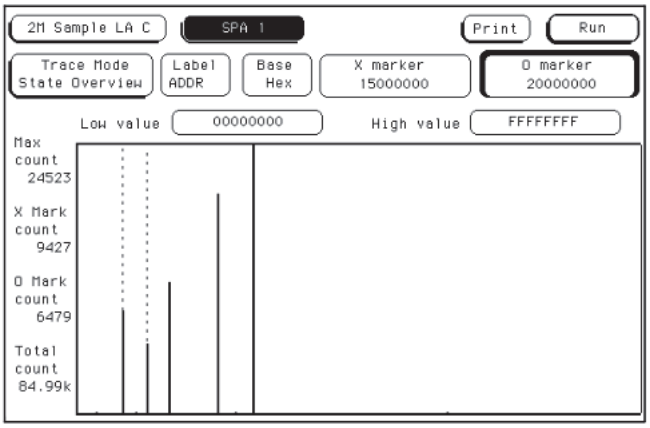
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Measurement example using all three trace modes

In a 32-bit microprocessor system, you want to determine how efficiently the CPU is being utilized. Critical questions might be: are any processes consuming excessive processing time, are any processes getting stuck in wait loops, and is the system handling service calls and interrupts efficiently?

You connect the Agilent Technologies logic analyzer to the address bus of your system. In the Format menu, you define a 32-bit label called ADDR and the state clocking. In many cases, Agilent provides preprocessors, inverse assemblers and standard configurations for popular microprocessors, and you need not enter the configuration manually or worry about probing issues.

In the State Overview mode, you select the ADDR label and start the acquisition to monitor the entire memory space. After several acquisitions, five areas of relatively high activity begin to build on the histogram. Using the X and O markers to determine the address boundaries of these five regions, you quickly recognize two programs, a delay routine in the operating system kernel, and a keyboard interrupt routine. The figure below shows the State Overview display.



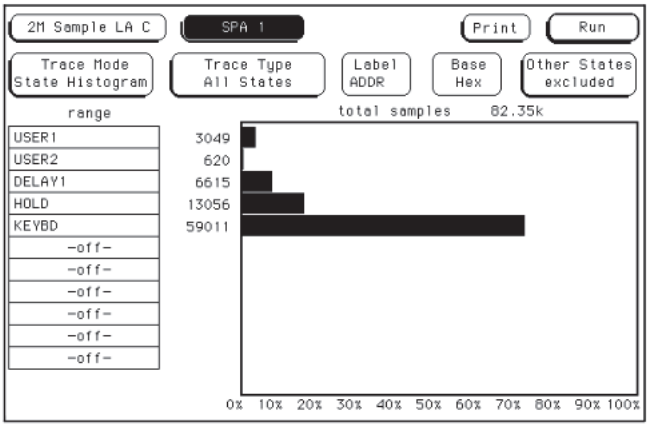
SPA State Overview

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Next, you go to the State Histogram menu and enter the names and boundaries of the five routines in the state histogram ranges.

State Histogram then displays the relative activity of the five routines. After several acquisitions, it is apparent that the interrupt routine is being accessed more often than expected.

The figure below shows the State Histogram display for this example.



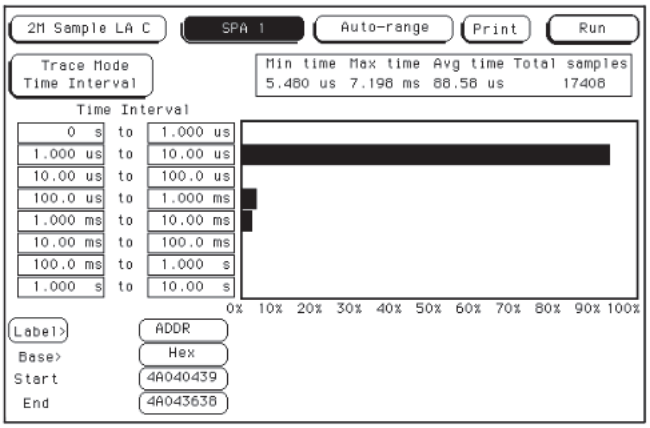
SPA State Histogram

You now go to the Time Interval menu and enter the Start and End conditions for the suspect interrupt routine. Before altering the default Time Interval ranges, you start the acquisition and observe the Maximum (Max), Minimum (Min), and Average (Avg) times. From these values, the typical execution times of the interrupt are apparent, and provide good starting values for the Time Interval ranges using Auto-range. From the Max time, it is apparent that the interrupt routine is having problems.

Running the acquisition again, you discover that the interrupt usually takes the expected 8 microseconds, but occasionally it takes as long as 8 milliseconds. After experimenting with the target system while monitoring the interrupt with Time Interval mode, a faulty key on the keyboard is discovered. The key is bouncing excessively, resulting in an extended interrupt routine call.

The figure on the next page shows the Time Interval display for this example.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com



SPA Time Interval

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Using State Overview, State Histogram, and Time Interval

This section explains how to select the display fields, set up the logic analyzer and use the State Overview, State Histogram and Time Interval modes of SPA.

Setting up the logic analyzer

This section assumes you have defined the format and have connected the logic analyzer probes to the target system. For complete details on these topics, refer to the appropriate reference section.

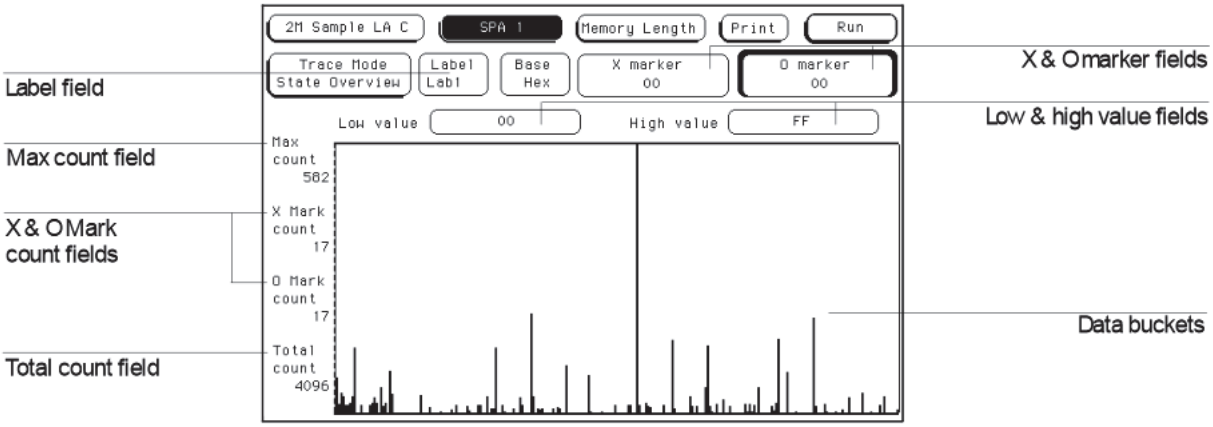
For a detailed description of State Overview, State Histogram, and Time Interval mode measurement processes, refer to the third section, "SPA Measurement Processes."

Using State Overview mode

Choosing a label to monitor To specify a label to monitor, select the "Label" field in the State Overview menu (figure on the next page). The pop-up shows a list of all the labels defined in the Format menu. From this list, choose the label you want to monitor.

> Changing from one label to another will erase the display setup for the first label. If you want to change to a different label, but don't want to lose the setup for the current one, first save the current one to disk or print it.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com



SPA State Overview menu with fields called out

Specifying Low and High values The range of the X axis is determined by the Low value and High value fields. To change the X axis range, select the Low value or High value fields and enter new limits. The range you specified will then be divided among the 256 available buckets along the X axis (unless the range is less than 256 or the histogram frame is truncated due to bucket range round-off).

For example, you might set the low and high values so that the range is 1100. 1100 divided by 256 is 4.29. This will be rounded up to 5, and each bucket will have a range of 5. Since 1100 divided by 5 is 220, the histogram frame will be truncated at the right because the X axis will have only 220 of the 256 buckets.

The default high and low values represent the full range of the label you chose. Before changing these values, you may want to run the acquisition and acquire some data to view activity over the entire range of the label. You can then zoom in on areas of interest.

You can enter low and high values in binary, octal, decimal, hexadecimal, ASCII, or symbol.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Interpreting the histogram display Select Run Repetitive to start the State Overview acquisition. As the data is sampled and sorted, the buckets along the X axis will accumulate. The relative size of the vertical bars show the distribution of activity on the label you chose. The analyzer will continue to sample, sort the data, and update the display until you press Stop or until you change a display variable.

Max count represents the current upper limit of the Y axis for the bucket with the greatest number of data samples. Max count for the limit of the Y axis will increase as the buckets fill with samples.

Read Total count to find the total number of samples taken over the specified range of the label. This is not affected by the low and high values.

Using the markers To find the number of data samples in any bucket, select the X marker or O marker field. Turn the knob to move the marker to the area of interest. Read the X Mark count or O Mark count values to determine the number of samples in the current bucket.

As you move either marker across the display, the value in the X Marker or O Marker pop-up will change. The amount of change of the marker's value represents the size of the bucket.

Zooming in on an area of interest When viewing the State Overview display, you may see areas of high activity and areas of little or no activity. To zoom in on one of these areas for more resolution, put the X and O markers on the boundaries of the area, then adjust the low and high values to match the X and O marker positions.

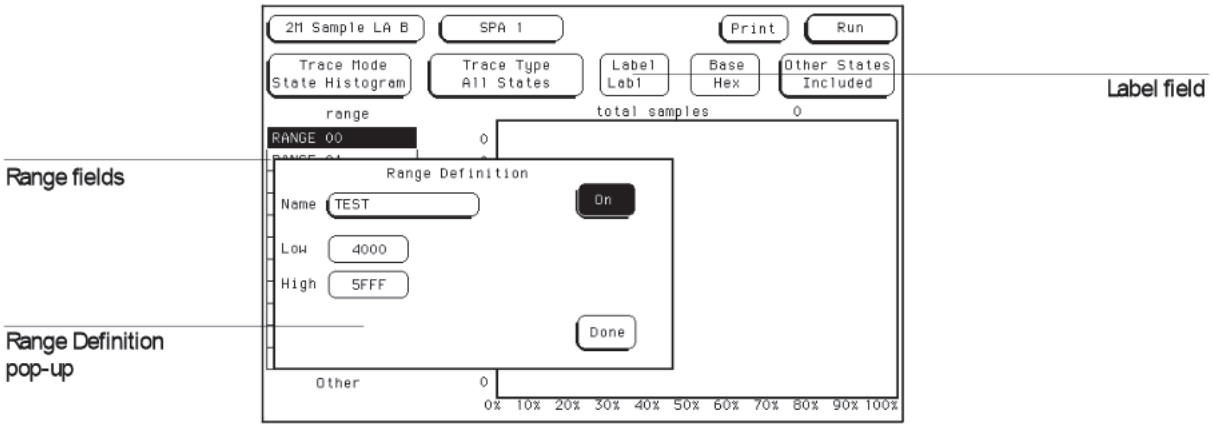
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Using State Histogram mode

Choosing a label to monitor To specify a label to monitor, select the Label field in the State Histogram display. In the pop-up, you will see a list of all the labels defined in the Format menu. From this list, choose the label you want to monitor.

> Changing from one label to another will erase the display setup for the first label. If you want to change to a different label, but do not want to lose the setup for the current one, save the current one to a disk.

Defining the ranges To define a range on the specified label, select one of the 11 range fields. When you select one of the 11 ranges, you will see the Range Definition pop-up. This pop-up has fields where you enter the low and high value, a name for the range, and whether the range is on or off.



SPA State Histogram Menu with Fields Called Out

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

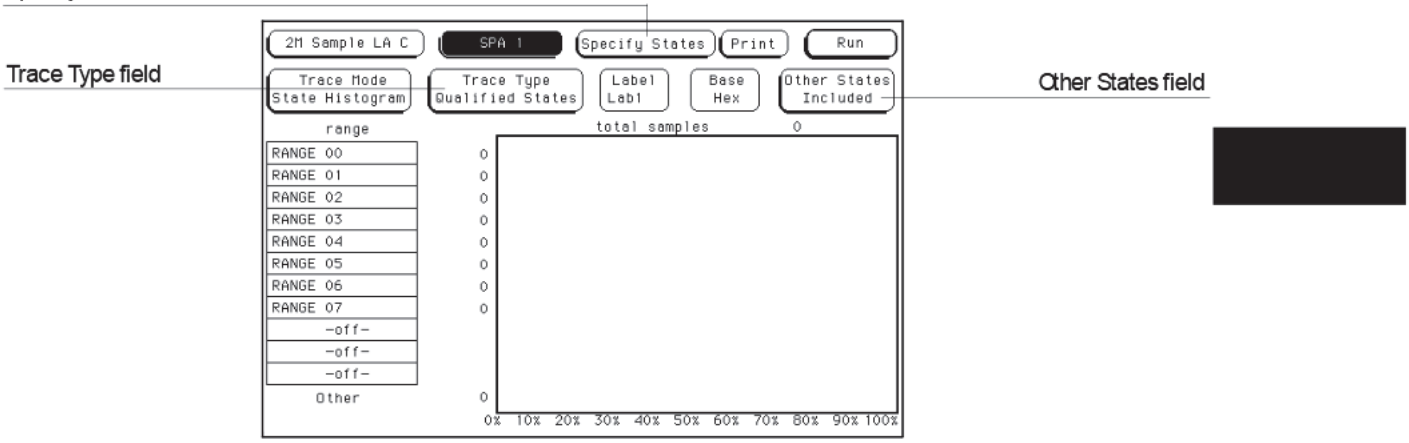
Using symbols for ranges In the Format menu, you can define symbols for any available label. The symbols can be defined as Pattern Symbols or as Range Symbols. For complete information on defining and using symbols, see "Symbols Assignment" in Agilent Technologies 16500C User's Reference.

If you set the base field in the State Histogram display to Symbol, you can use any defined range or pattern symbol to set the lower and upper values of the ranges.

Tracing All States vs. Qualified States You can qualify the data sampled and sorted in the State Histogram by selecting the Trace Type field and setting it to Qualified States. This creates a new field at the top of the display called "Specify States."

Select Specify States and you will see a pop-up that contains a pattern field for every label defined in the Format menu. Use the pattern fields to define the data qualification.

For example, in the State Histogram you may want to monitor the address bus of a microprocessor system to examine memory activity. But, you may want to monitor only writes to memory. In the Specify States pop-up, you can tell the analyzer to sample only memory writes by entering under the STATUS label the bit pattern or symbol that corresponds to memory writes.



SPA State Histogram menu with fields called out

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Interpreting the histogram display Select Run Repetitive to start the State Histogram acquisition. The relative activity over the ranges you defined is displayed as histograms. The total samples field shows the total number of data samples displayed in all of the ranges. The number of samples for each range is displayed to the left of each histogram.

The percentage amounts of the histograms total 100% (note the scale at the bottom of the display). If they add up to more than 100%, you have overlapped two or more ranges, and the data samples are being counted in multiple ranges.

The analyzer will continue to sample, sort the data, and update the display until you press Stop or until you change a display variable.

Other States included/excluded The histograms show the relative distribution of activity over the ranges you have defined. In most cases, the ranges will not cover the full range of the label you chose to monitor.

To view the activity over the entire range of the label, including activity not covered by the ranges, select the Other States field and change it to included. Another histogram bar called "other" will appear at the bottom of the display. This will show activity not covered by the ranges. You can toggle included/excluded if the analyzer is running since it only affects the display and not the accumulated data that has been acquired.

Note that changing between included and excluded changes the absolute sizes of the histograms. Unless you have defined overlapping ranges, the total percentage size of the all the range histograms plus the histogram for other should equal 100%.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

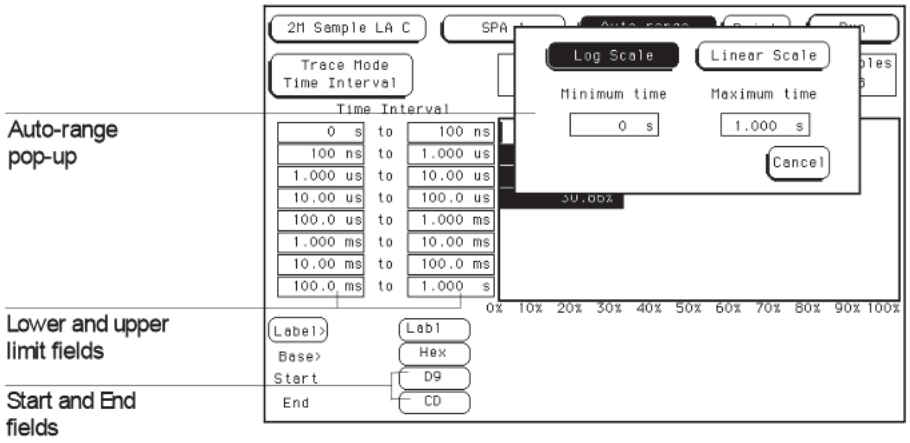
Using Time Interval mode

Use Time Interval mode to determine the distribution of time between two specific events. The state analyzer uses the time tag feature to time the event; thus, in Time Interval mode, the minimum state clock period is 10 ns.

Specifying an event To use Time Interval mode, you must define an event that you want timed. At the bottom of the display, note the Start and End fields. To define an event, select the appropriate labels in the Start and End fields to define the boundaries.

For example, start and end might be the beginning and ending addresses of a subroutine stored in memory. If you are timing a counter period, start and end might be the initial and final count values.

Note that in start and end, you are not limited to a single label. You define the event over all available labels as patterns including don't cares. Be sure that the start and end conditions actually occur in the target system or the analyzer will not find the timing reference points and will not make the time interval measurement. You may want to use the state analyzer (not SPA) to verify that the Start and Stop events actually occur.



SPA Time Interval Menu with Fields Called Out

For measurement purposes, the analyzer measures the time between the first occurrence of the Start condition and the first occurrence of the Stop condition.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Defining the Time Interval ranges Before changing the ranges from their default values, you may want to press Run and acquire some data. From this initial run, the Maximum (Max), Minimum (Min), and Average (Avg) statistics on the display will help you choose the appropriate set of Time Interval ranges.

To define the ranges, select the fields for the lower and upper limits and enter the limits of the range. The ranges do not need to be contiguous, but if you leave gaps between the ranges, critical data may be missed. Also, if you overlap ranges, data may be counted multiple times and present a misleading histogram.

Using Auto-range To quickly set up all 8 time interval ranges, select the Auto-range field. Enter the minimum time and maximum time for all 8 ranges combined. Then, when you select Log Scale or Linear Scale, all 8 ranges will be scaled accordingly between the Minimum and Maximum times. See the figure on the previous page for the Auto-range pop-up. Common boundaries of adjacent ranges are not considered overlapped. Values that fall on the common boundary will be included in the highest range.

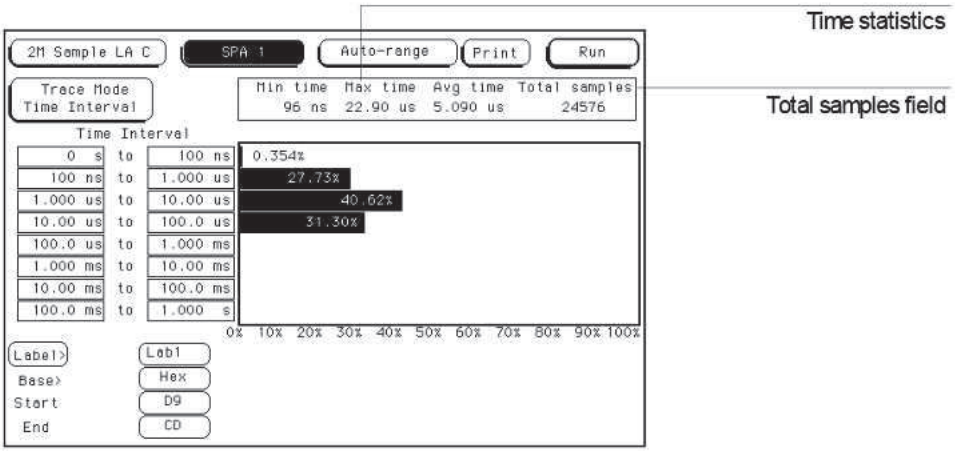
A fast way to set up the Time Interval display is to define your Start and End events and select Run using the default ranges. Select Repetitive Run mode. After accumulating data for a while, press Stop. Then select Auto-range and enter the Min time and Max time display statistics in the Auto-range Minimum time and Maximum time fields. When you select Log Scale or Linear Scale, the ranges will be defined automatically.

Interpreting the histogram display As the analyzer samples the data, it searches for Start/End event pairs. One event pair is considered one sample. The time value for each event pair is compared to each defined time interval range. The range's count is incremented if the time value falls within that range.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

The analyzer continues to search for Start/End event pairs until you press Stop or until you change a display variable. The distribution of the events' time duration is displayed as histograms (see figure below).

The Max time, Min time, and Avg time statistics give you useful statistics for the event you defined no matter what ranges you've set up.



SPA Time Interval Menu with Statistics Called Out

The Total samples field shows the number of Start/End event pairs found by the analyzer, whether they are covered by the ranges or not.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Using SPA with other features

Programming with SPA

SPA is programmable. Refer to the Agilent Technologies 16557D Programmer's Guide for SPA commands. The Programmer's Guide is available as an option with the logic analyzer. Contact your Agilent Technologies Sales Office for more information.

Changing between SPA and a State/Timing Analyzer

If you have configured a state or timing analyzer in the logic analyzer, you can quickly change to SPA, or from SPA to a state or timing analyzer. You can use the same Format menu in your SPA measurements as you did in your state or timing analysis measurements.

To change between a state analyzer and SPA, go to the Configuration menu, select the Type field, and select SPA from the list.

When SPA is selected, a separate trace specification definition is used. Even though the Qualified State Histogram and Time Interval modes use the same pattern recognizers as the state and timing analyzers, the SPA definitions are kept separate from those entered in the state or timing analyzer mode. As a result, switching between SPA and state or timing recovers the user's original pattern recognizers for the selected mode.

Any Symbols in the Format menu will also carry over to SPA.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

12

Error Messages

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

About Messages

This chapter lists the error, warning, and advisory messages that you may encounter during operation of the analyzer. Error messages have a red background, warning messages a yellow background, and advisory messages a green background.

For more information

If any messages are encountered while running Self-Tests, refer to the Service Guide for information on test descriptions and troubleshooting procedures. If an error is encountered during analyzer configuration or general operation, there could be more than one cause of the problem. In most cases, the analyzer is configured improperly.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Error Messages

Must have at least 1 edge specified. You must assign at least one clock edge to one of the available clocks in the Master clocking arrangement. In addition, if the Slave clock is being used, it must have at least one clock edge assigned. The analyzer will not let you close the clock assignment pop-up until an edge is specified.

Time correlation of data is not possible. Before time correlation of data is possible, time tags must be placed on the data. If you want time correlated data, set the Count field in the Trigger menu to Time.

Maximum of 32 channels per label. This message appears when you try to assign more than 32 channels to a single label

NO DISK. There are no disks in the disk drives. You must place a disk into the disk drive before configurations can be loaded or stored.

Timer is off in sequence level. At least one sequence level has specified a timer as part of the sequence instruction and that timer is not turned on. The timer must be set to either Start, Pause, or Continue.

Timer is specified in sequence, but never started. A timer is specified somewhere in the sequence, but was not started. The timer must be set to Start. The timer can be set to Start in any sequence level.

Problems reading file. The user is trying to translate a configuration file that can not be opened a second time.

Inverse assembler not loaded - bad object code. Corrupt inverse assembler file. Try getting another copy of the inverse assembler file and loading that.

Insufficient memory to load IAL - load aborted. There is not a block of free memory large enough to load inverse assembler.

ASCII entry not available. The ASCII base is not available. You must use another base selection.

Incompatible Vram Types. You have mixed card types in your logic analysis module. A module must be composed of cards of the same model (for example, 16557) and memory size (for example, 2M).

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Warning Messages

Waiting for Prestore. This message is displayed for a timing analyzer waiting for prestore.

Search failed - X pattern not found. The X pattern specified could not be found; therefore, the pattern marker could not be placed in the data.

Search failed - O pattern not found. The O pattern specified could not be found, therefore the pattern marker could not be placed in the data.

Warning: Run HALTED due to variable change. This message appears when certain analyzer settings are changed during a repetitive run. When this occurs, the analyzer stops.

Error not found. The Find Error number specified could not be found.

s/Div set to limit. The s/Div field is set to its limit. The s/Div limit is inversely proportional to maximum memory length.

Delay set to limit. The Delay field is set to its limit. This limit is the absolute value of the memory length.

Machine name: "filename" inverse assembler not found. This message appears when the inverse assembler file could not be found.

Slow or missing clock. This message indicates a slow or missing clock. This is displayed for a state analyzer only until the first clock occurs.

Data was acquired without time tags. Time tag values will not be displayed because data was stored without time tags. If you want time tags stamped on the data, set Count in the Trigger menu to Time.

Data was acquired without state tags. State tag values will not be displayed because data was stored without state tags. If you want state tags stamped on the data, set Count in the Trigger menu to State.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Two pod pairs are needed to use both timers. If both timers are being used in an analyzer, and there are no unassigned pods, this message is shown when Run is selected. Timer2 references in the trigger sequence will not be valid.

No active analyzer. This message is displayed if Run is selected with no analyzers turned on.

Cannot read unrecognized data. The user is trying to translate a SPA configuration from a foreign module.

Demultiplexed clocking cannot be translated. The user is trying to translate a configuration that has demultiplexed or mixed clocks.

User thresholds have been truncated. The user is trying to translate a configuration having thresholds greater than 6 Volts or less than -6 Volts.

Slave clocks may need manual adjustment. The user is trying to translate an Agilent Technologies 16540/41A,D configuration which has slave clocks specified. This message appears when the translation is not direct.

Clock Qualifiers not fully restored. The user is trying to translate a configuration that has more than two qualifiers.

No state machines for this module. The user is trying to load an inverse assembler into a module with no state machines.

Error loading DISPLAY1. User is loading a configuration with a corrupt DISPLAY1 section.

Pods have been truncated. User is loading a configuration with more pods than the current system's pods.

Clock pod and least significant pods have been preserved. User is loading a configuration with number of pods greater than the current system's number of pods.

Need to have two free sequence levels. For each sequence level with a "<" assigned, you must leave two sequence levels free. To free up two levels, simply delete two levels.

Mixed Mode not available. User is trying to show mixed mode incorrectly.

Incompatible data not loaded. User is loading data originally saved on another model of logic analyzer. Saved data from one model cannot be read by the other models.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Ymin is greater than Ymax. The value assigned to Y minimum is greater than the value assigned to Y maximum.

Xmin is greater than Xmax. The value assigned to X minimum is greater than the value assigned to X maximum.

Ymin is equal to Ymax. The value assigned to Y minimum is equal to the value assigned to Y maximum.

Xmin is equal to Xmax. The value assigned to X minimum is equal to the value assigned to X maximum.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Advisory Messages

Insert failed - Maximum of 60 entries. 60 listing columns is the maximum number allowed. This advisory appears when you try to configure more than 60 columns.

Occurrences Remaining in Level "n". The analyzer is waiting for the specified level to be satisfied. This advisory is used in analyzers that use the Occurs parameter.

Waiting in Level "n". The analyzer is waiting for the specified level to be satisfied. This advisory is used in analyzers that use the OR parameter.

n.nnn s remaining to delay. This advisory is displayed for a conventional/glitch timing analyzer that is doing a long hardware delay (after trigger and during the delay).

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

13

Specifications and Characteristics

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Specifications and Characteristics

This chapter lists specifications and characteristics for the Agilent Technologies 16557D logic analyzer. Specifications are the performance standards against which the product is tested.

Characteristics are not specifications, but are included as additional information.

For complete information on the test procedures to verify product performance, refer to the Agilent Technologies 16557D Service Guide. The Service Guide can be ordered from any Agilent Technologies Sales Office.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Specifications

The specifications are the performance standards against which the product is tested.

Minimum State Clock Pulse Width *	3.5 ns
Threshold Accuracy	± (100 mV + 3% of threshold setting)

Clock Scheme:

Single Clock, Single Edge:

Setup/Hold Time: *	-0.5/3.5 ns through 3.0/0.0 ns, adjustable in 500-ps increments
Maximum State Speed	135 MHz
Minimum Master-to-Master Clock Time *	7.40 ns

Single Clock, Multiple Edges:

Setup/Hold Time: *	-0.5/4.0 ns through 3.5/0.0 ns, adjustable in 500-ps increments
Maximum State Speed	135 MHz
Minimum Master-to-Master Clock Time *	7.40 ns

Multiple Clocks, Multiple Edges:

Setup/Hold Time: *	-0.5/4.5 ns through 4.0/0.0 ns, adjustable in 500-ps increments
Maximum State Speed	135 MHz
Minimum Master-to-Master Clock Time *	7.40 ns

* Specified for an input signal VH = −0.9 V, VL = −1.7 V, and threshold = −1.3 V.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Characteristics

The characteristics are not specifications, but are included as additional information.

	Full Channel	Half Channel *
Maximum State Clock Rate		
One, Two, Three-Cards	135 MHz	Not applicable
Maximum State Clock Rate		
Four, Five-Cards	100 MHz	Not applicable
Maximum Conventional Timing Rate	250 MHz	500 MHz
Channel Count per Card	68	34
Channel Count per Three-Card Module	204	102
Channel Count per Five-Card Module	340	170
Memory Depth	2032K	4177K

* Half channel mode is only available for timing analysis.

Supplemental Characteristics

These characteristics are not specifications, but are included as additional information.

Probes	
Input Resistance	100 KΩ, 2%
Input Capacitance	~ 8 pF
Minimum Voltage Swing	500 mV, peak-to-peak
Maximum Input Voltage	± 40 V, CAT I
Threshold Range	± 6.0 V, adjustable in 50 mV increments

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

State Analysis

Setup/Hold Time[1]	-0.5/3.5 ns through 3.0/0 ns, adjustable in 500 ps increments
Minimum State Clock Width	3.5 ns
State Clock/Qualifiers	4/4
Time Tag Resolution[2]	8 ns
Maximum Time Count Between States	34 seconds
Maximum State Tag Count[2]	4.29 x 109

[1]Minimum setup/hold time specified for single-edge, single-clock acquisition. Single-clock, multiedge setup/hold window is 3.5 ns. Multiclock, multiedge setup/hold window is 4.0 ns. All setup/hold windows are adjustable in 500-ps increments.

[2]When all pods are assigned to a state or timing machine, time or state tags halve the memory depth.

Timing Analysis

Sample Period Accuracy	0.01 % of sample period
Channel-to-Channel Skew	2 ns, typical
Time Interval Accuracy	±(sample period + channel-to-channel skew + 0.01% of time interval reading)
Minimum Detectable Glitch	3.5 ns

Triggering

Sequencer Speed	135 MHz, maximum
State Sequence Levels	12
Timing Sequence Levels	10
Max. Occurrence Counter Value	1,048,575
Pattern Recognizers	10
Range Recognizers	2
Range Width	32 bits each
Timers	2
Timer Value Range	400 ns to 500 seconds
Glitch/Edge Recognizers	2 (timing only)

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Measurement and Display Functions

Arming Each module can be armed by the RUN key, external PORT IN, or by another module via the Intermodule Bus (IMB).

Displayed Waveforms 24 lines maximum, with scrolling across 96 waveforms.

Measurement Functions

Run/Stop Functions

Run Starts acquisition of data in specified trace mode.

Stop In single trace mode or the first run of a repetitive acquisition, STOP halts acquisition and displays the current acquisition data. For subsequent runs in repetitive mode, STOP halts acquisition of data and updates the current display.

Trace Mode Single mode acquires data once per trace specification. Repetitive mode repeats single mode acquisitions until stop is pressed or until time interval between two specified patterns is less than or greater than a specified value, or within or not within a specified range.

Indicators

Activity Indicators Provided in the Configuration and Format menus for identifying high, low, or changing states on the inputs.

Markers Two markers (X and 0) are shown as dashed lines on the display.

Trigger Displayed as a vertical dashed line in the Timing Waveform display and a line 0 in the State Listing display.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Data Entry/Display

Labels Channels may be grouped together and given a 6-character name. Up to 126 labels in each analyzer may be assigned with up to 32 channels per label.

Display Modes State Listings, State Waveforms, Timing Waveforms, Timing Listings, Compare Listings, Chart, and System Performance Analysis. State Listing, Timing Waveforms, and Oscilloscope Waveforms can be time-correlated on the same displays.

Timing Waveform Pattern readout of timing waveforms at X or 0 marker.

Bases Binary, Octal, Decimal, Hexadecimal, ASCII (display only), Two's Complement, and User-defined symbols.

Symbols 500 maximum. Symbols can be downloaded over RS-232, GPIB, or Ethernet LAN.

Marker Functions

Time Interval The X and 0 markers measure the time interval between one point on a timing waveform and trigger, two points on the same timing waveform, two points on different waveforms, or two states (time tagging on).

Delta States (state analyzer only) The X and 0 markers measure the number of tagged states between one state and trigger or between two states.

Patterns The X and 0 markers can be used to locate the nth occurrence of a specified pattern from trigger, or from the beginning of data. The 0 marker can also find the nth occurrence of a pattern from the X marker.

Statistics X and 0 marker statistics are calculated for repetitive acquisitions. Patterns must be specified for both markers, and statistics are kept only when both patterns can be found in an acquisition. Statistics are minimum X to 0 time, maximum X to 0 time, average X to 0 time, and ratio of valid runs to total runs.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Auxiliary Power

Power Through Cables	1/3 amp at 5 V maximum per cable

Operating Environment

Indoor Use Only	
Temperature	Instrument, 0 C to 55 C (+32 F to 131 F) Probe lead sets and cables, 0 C to 65 C (+32 F to 149 F).
Humidity	Instrument, probe lead sets, and cables, up to 95% relative humidity at +40 C (+122 F)
Altitude	To 4600 m (15,000 ft)
Vibration	Operating: Random vibration 5-500 Hz, 10 minutes per axis, 0.3 g (rms)
	Non-operating: Random vibration 5 to 500 Hz, 10 minutes per axis, 2.41 g (rms); and swept sine resonant search, 5 to 500 Hz, 0.75 g (0-peak), 5 minute resonant dwell at 4 resonances per axis.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Installation and Service

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

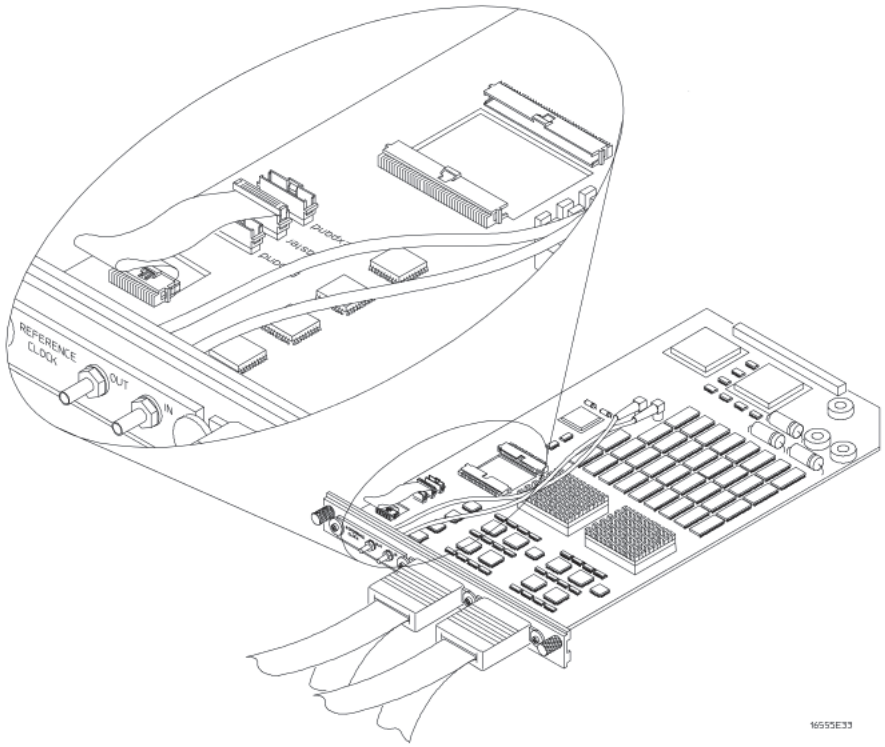
To configure a single-card module

- When shipped separately, the module is configured as a single-card module. The cables should be connected as shown in the figure.
- To configure a multi-card module into single-card modules, remove the cables connecting the cards. then connect the free end of the 2x10 cable on the connector labeled "Master" (J6) on each card (see figure below).

CAUTION

If you pull on the flexible ribbon part of the 2x10 cable, you might damage the cable assembly. Using your thumb and finger, grasp the ends of the cable connector. Apply pressure to the ends of the cable connector to disengage the metal locking tabs of the connector form the cable socket on the board. Then pull the connector from the cable socket.

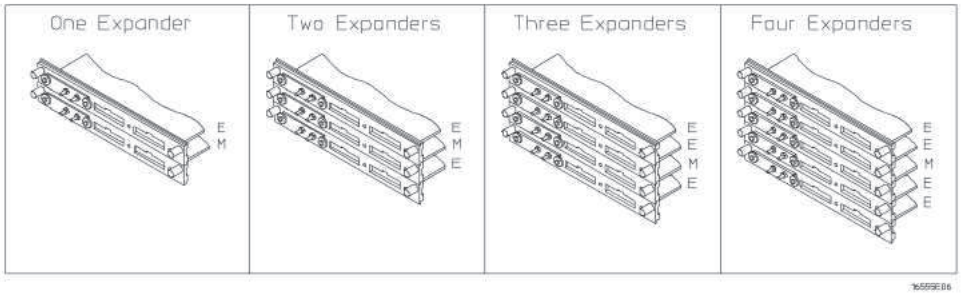
Save unused cables for future configurations.



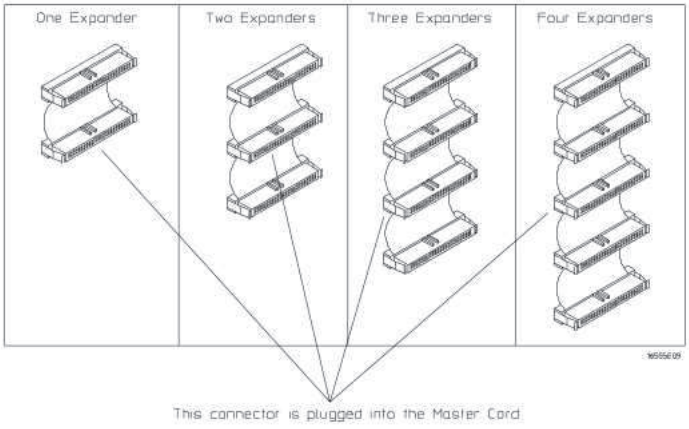
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

To configure a multi-card module

1 Plan the configuration. Multi-card modules can only be connected as shown in the illustration. Select the card that will be the master card, and set the remaining boards aside.

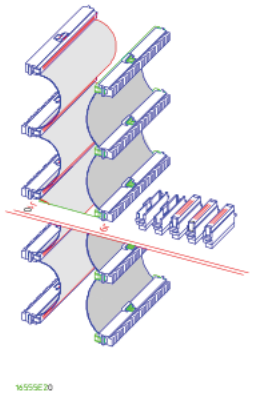


2 Obtain two 2x25 cables from the accessory pouch that match the number of expanders being configured. The illustration shows the cables that are available and which cable is used in each expander configuration.



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

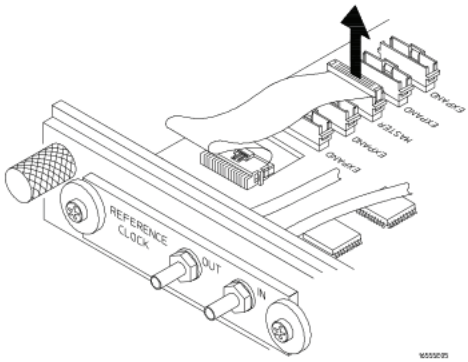
3 Look at the illustration in the previous step. The illustration shows which of the cable connectors is plugged into the master card. Plug one 2x25 cable into the master card J9. Observe which cable connector (as shown in the illustration) is plugged into J9. Follow the same procedure to connect the second 2x25 cable into the master card J10.



4 On the expander cards, disconnect the end of the 2x10 cable that is plugged into the connector labeled "Master."

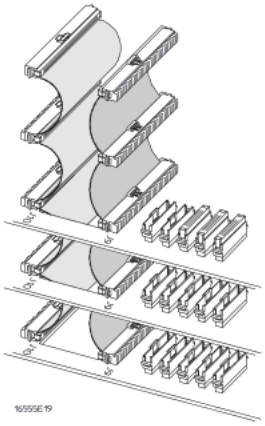
CAUTION

If you pull on the flexible ribbon part of the 2x10 cable, you might damage the cable assembly. Using your thumb and finger, grasp the ends of the cable connector. Apply pressure to the ends of the cable connector to disengage the metal locking tabs of the connector from the cable socket on the board. Then pull the connector from the cable socket.

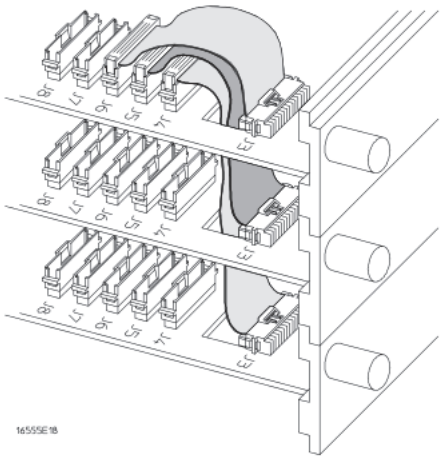


Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

5 Place the master card on top of any expander cards that are under the master card. Feed the 2x25 cables that are plugged into the master card through the cable access holes of the expander cards. Plug the 2x25 cables into J9 and J10 of the expander cards.

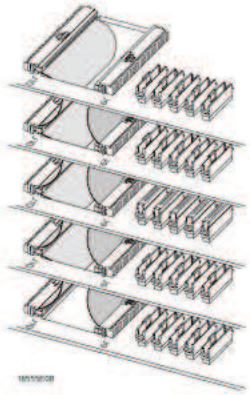


6 Feed the free end of the 2x10 cables of the expander cards through the access holes to the master card. Plug the 2x10 cables into J4 (bottom-most expander in a five-card configuration) and J5 (expander that is next to the master card) on the master card.

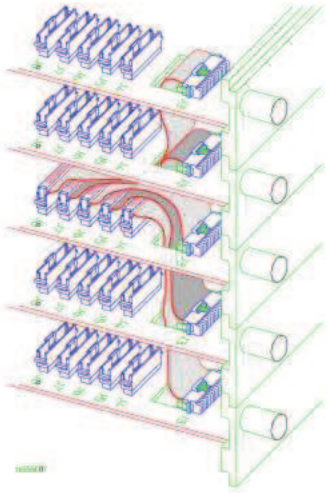


Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

7 Place the remaining expander boards on top of the master board. Feed the 2x25 cables that are plugged into the master card through the cable access holes of the expander cards. Plug the 2x25 cables into J9 and J10 of the expander cards.

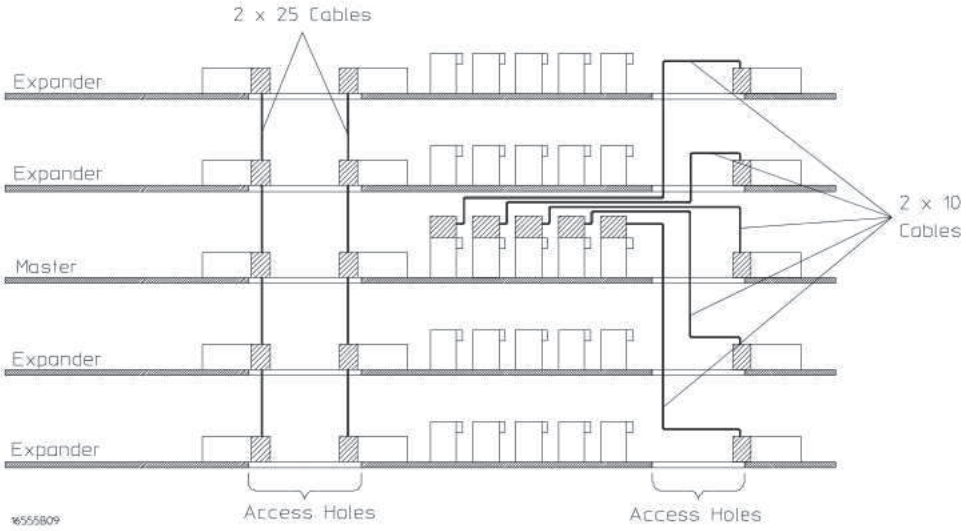


8 Feed the free end of the 2x10 cables of the expander cards through the access holes to the master card. Plug the 2x10 cables into J7 (expander that is next to the master card) and J8 (top-most expander in a four- or five-card configuration) on the master card.



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

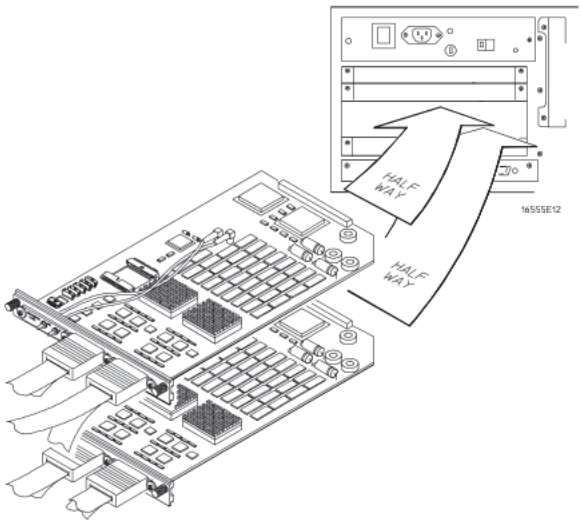
9 The following illustration shows the proper connection of the 2x25 cables and the 2x10 cables for a five-card module. If a two-, three-, or four-card module is configured, not all cables will be present; however, the existing cables will be routed in the same manner. Make sure ALL cables are firmly seated.



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

To install modules

1. Slide the cards which are above the slots into which you want to put modules about halfway out of the mainframe.
2. With the probe cables facing away from the instrument, slide the modules approximately halfway into the mainframe.



3. Slide the assembled modules into the mainframe, but not completely in.

   Each card in the instrument will be firmly seated and tightened in step 5.
4. Position all cards and filler panels so that the endplates overlap.
5. Seat the cards and tighten the thumbscrews.

   Starting with the bottom card, firmly seat the cards into the backplane connector of the mainframe. Keep applying pressure to the center of the card endplate while tightening the thumbscrews finger-tight. Repeat this for all cards and filler panels from the bottom up.

CAUTION

Correct air circulation keeps the instrument from overheating. For correct air circulation, filler panels must be installed in all unused card slots. Keep any extra filler panels for future use.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Preparing for Use

Power Requirements

All power supplies required for operating the logic analyzer are supplied through the backplane connector in the mainframe.

Operating System Requirements

The 16557D requires an Agilent Technologies 16500C Logic Analysis System mainframe. It is not compatible with the Agilent Technologies 16500A or Agilent Technologies 16500B. The 16500C mainframe must be running version 1.06 or later of the system software. If these requirements are not met, the 16557 module will not be recognized.

Operating Environment

The operating environment is listed in chapter 13. Note the non-condensing humidity limitation. Condensation within the instrument can cause poor operation or malfunction. Provide protection against internal condensation.

The logic analyzer module will operate at all specifications within the temperature and humidity range given in chapter 13. However, reliability is enhanced when operating the module within the following ranges:

- Temperature: +20 °C to +35 °C (+68 °F to +95 °F)
- Humidity: 20% to 80% non-condensing

Storage

Store or ship the logic analyzer in environments within the following limits:

- Temperature: -40 °C to +75 °C
- Humidity: Up to 90% at 65 °C
- Altitude: Up to 15,300 meters (50,000 feet)

Protect the module from temperature extremes which cause condensation on the instrument.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

To inspect the module

1. **Inspect the shipping container for damage.**

   If the shipping container or cushioning material is damaged, keep them until you have checked the contents of the shipment and checked the instrument mechanically and electrically.

2. **Check the supplied accessories.**

   Accessories supplied with the module are listed in chapter 1, "Accessories Supplied."

3. **Inspect the product for physical damage.**

   Check the module and the supplied accessories for obvious physical or mechanical defects. If you find any defects, contact your nearest Agilent Technologies Sales Office. Arrangements for repair or replacement are made, at Agilent Technologies' option, without waiting for a claim settlement.

To clean the logic analyzer module

With the instrument turned off and unplugged, use mild soap and water to clean the front of the module. Harsh soap might damage the water-based paint.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

A
accessories
  available 1-7
  supplied 1-6
accumulate field 7-5
acquisition control
  waveform menu 7-4
acquisition control field
  state analyzer 5-37
  timing analyzer 5-37
acquisition mode
  automatic 5-38
  manual 5-38
  state 5-9
action insert/replace field 7-28
activity indicators 3-8
advisory messages 12-2, 12-7
Agilent Technologies 10269C General Purpose Probe
  Interface 1-7
analyzer arming 5-33
analyzer name field 3-3
analyzer type
  state 3-4
  state compare 3-4
  timing 3-4
Arm-In signal 5-34
arming
  intermodule 5-34
arming between modules 5-34
arming configuration 5-33
arming control
  between analyzers 5-33
  field 5-32
  graphical representation 5-33
arming external instrument 5-34
assignment field indicators 5-28
asynchronous clock 3-4
auto-range 11-5, 11-16
auxiliary power characteristics 13-8
avg time statistic 11-16
axes scaling fields 8-17
axis control field 8-15 - 8-17

B
bar chart 11-4
base field 6-11, 7-19
basic controls 7-3
bit assignment field 4-18
bit editing field 9-15
bit pattern assignment 5-21
bit pattern terms 5-21
blind time 11-9
blue bar field 7-24
branches taken field 5-40
branching
  across trigger levels 5-13
  edge terms 5-27
  field 5-13
  secondary term 5-13
buckets 11-4
bus interfaces 2-4

C
cables 14-2
cancel 8-14
  field 8-18
center screen field 7-15
changing between
  SPA and a State/Timing Analyzer 11-30
channel depth
  maintain 4-3
channel masking 9-10
channel mode
  full 4-6
  half 4-6
  individual 7-26
  overlay 7-27
  sequential 7-26
channel mode field 7-26
channels
  clock 1-2
  data 1-2
characteristics 13-2
  auxiliary power 13-8
  data entry and display 13-7
  listed 13-4
  measurement 13-6
  measurement and display 13-6
  operating environment 13-8
  probe 13-4
  state analysis 13-5
  timing analysis 13-5
  triggering 13-5
Chart menu 8-2
  find o-pattern field 8-6
  find x-pattern field 8-6
  from trigger/start/x-marker field 8-7
  label and base fields 8-9
  label/base roll field 8-9
  markers field 8-5
  occurrence field 8-6
  post-processing features 8-2
  specify patterns field 8-8
  stop measurement field 8-10
  x-axis label/state value field 8-16
charts
  label value vs label value 8-3
  label value vs states 8-3
choosing a label to monitor 11-21
cleaning module 14-10
clear pattern field 6-14
clock
  asynchronous 3-4
  input channels 4-5
  master 4-2, 4-5, 4-7, 4-12
  qualifier 4-2
  reference 5-39
  slave 4-2, 4-7 - 4-8, 4-12
  synchronous 3-4
  threshold levels 4-2
clock combinations 4-13
clock input channel
  as data channel 4-5
clock inputs
  multicard 4-12
  single card 4-12
clock qualifiers 4-13
clock threshold level 4-13
clock/qualifier 4-12
clocking
  preprocessor 2-4
  select 3-2
clocking modes 1-2
combination assignment 5-29
combination terms 5-29
compare full/compare partial field 9-9
compare image 9-4
compare menu 9-2
  bit editing field 9-15
  compare full/compare partial field 9-9
  copy trace to compare field 9-7
  data roll field 9-14
  difference listing field 9-5 - 9-6
  find error field 9-8
  label and base fields 9-16
  label/base roll field 9-16

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

mask field 9-10
post-processing features 9-3
reference listing field 9-4
specify stop measurement 9-11 - 9-13
configuration 1-4
file 1-7
menu 3-2
configure
multicard module 14-3 - 14-7
one-card module 14-2
control field
arming 5-32
control fields 5-31
controls
basic 7-3
copy listing to reference field 9-7
copy trace to compare field 9-7
count field 5-35
count fields 10-3
counters 1-2
cross-domain measurements 5-32
current sample 7-9

D
data
acquired 6-2
entry and display characteristics 13-7
interleaved 6-2
scrolling 7-8
state 7-2
timing 7-2
Data on Clocks 4-5
data roll field 6-19, 9-14
data sorting 11-8
and sampling 11-10, 11-12, 11-15
deep-memory 2-25
default timer 5-16
delay 5-39
delay field 7-8
delay range 7-8
delete and delete all fields 7-29
demultiplex mode 4-7, 4-9
demultiplexing
preprocessor 2-4
difference listing field 9-5 - 9-6
display
zoom 7-6 - 7-7
display hidden data 6-19
displays
time-correlated 10-5
duration counter field 5-14

E
ECL 4-11
edge
assignment 5-27
choices 5-27
term symbols 5-28
terms 5-27
error messages 12-2 - 12-3
examples
Bit Assignment 4-19
State Histogram mode 11-14
State Overview mode 11-11
Time Interval mode 11-17
using all three trace modes 11-18
expander cards 14-3
cabling 14-4
external clock 5-39
external reference clock 2-25

F
features 1-5
file configuration
preprocessor 2-5
file translation
preprocessor 2-5
find error field 9-8
find x-pattern/o-pattern 6-5
field 8-6
format menu 4-2
from start X-marker field 6-7, 7-14
from trigger field 7-14
from trigger X-marker field 6-7
from trigger/start/x-marker field 8-7
full scale 8-13 - 8-14

G
grabbers
connecting to probes 2-24
connecting to test points 2-24
probe 2-19
green line 6-17
grounding
pod 2-18
probe 2-18
group run 10-2 - 10-4

H
histograms 11-4

I
indicators 13-6
individual channel mode 7-26
inserting waveforms 10-4
inspecting module 14-10
installation
multicard module 14-3 - 14-7
one-card module 14-2
installing modules 14-8
installing probe leads 2-23
interface
preprocessor 2-4
universal 2-4
interface kit
probing 2-3
interleaved state listings 10-4
intermodule configuration 10-3
intermodule menu 10-2
internal clock 5-39
inverse assembler 1-7
preprocessor 2-4

K
keyboard 1-3

L
label field 6-11, 7-19
label polarity 4-17
labels 11-9
changing 11-9
selecting 11-9
State Histogram Mode 11-9
State Overview Mode 11-9
Time Interval mode 11-9
leads
probe 2-19
listing menu 6-2
logical operation field 5-30
logical operators 5-30

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

M
macro library 5-3
macros
  break down 5-42
  delay 5-3
  how to use 5-4
  pattern/edge 5-3
  predefined 5-3
  predefined trigger 5-3
  restore 5-42
  sequence dependent 5-3
  state trigger 5-7
  time violation 5-3
  timing trigger 5-5
  trigger 5-3
  user defined 5-3
  violation 5-3
markers
  chart menu 8-4
  color 6-4
  field 6-3, 7-11, 8-5
  in mixed display 10-5
  in waveform display 7-12
  O 11-10
  pattern 7-12
  state analyzer 6-3, 7-11
  timing analyzer 6-3, 7-11
mask field 9-10
master card 14-3
  cabling 14-4
master clock 4-2, 4-12
max time statistics 11-16
measurement and display characteristics 13-6
measurement characteristics 13-6
measurements
  cross-domain 5-32
memory
  post-trigger data 5-38
  pre-trigger data 5-38
  reference line 7-23
memory depth 1-2, 4-4
  considerations 5-36
memory length field 5-39
menu
  configuration 3-2
  format 4-2
  listing 6-2
  resource term configuration 5-18
  sequence instruction 5-11
  trigger 5-2
  waveform 7-2
menus
  accessing SPA 11-6
messages
  advisory 12-2, 12-7
  error 12-2 - 12-3
  warning 12-2, 12-4 - 12-6
microprocessor mnemonics 2-4
min time statistics 11-16
mixed display markers 10-5
mixed display menu 10-2
mnemonics
  microprocessor 2-4
modify sequence level 5-42
modify trigger field 5-42 - 5-43
module
  cleaning 14-10
  inspecting 14-10
  installation 14-8
module and label fields 7-27
mouse 1-3
multicard
  reference clock 5-39
multicard module 4-5
  configure 14-3 - 14-7

N
name field 3-3
naming analyzers 3-3
next sample 7-9
number of samples per range 11-13

O
O marker field 6-9
O-pattern occurrence field 7-13
occurrence counter
  reference point 7-13
occurrence counter field 5-12
occurrence field 8-6
occurrences
  maximum number 5-12
  number of 5-35
one-card module
  configuration 14-2
operating environment characteristics 13-8, 14-9
operating system 14-9
ORed trigger 5-34
Other States included/excluded 11-5, 11-13
overlay channel mode 7-27

P
pattern display fields 6-10
pattern markers 6-4, 7-12
  color 7-12
pattern occurrence
  fields 6-6
  reference point 6-6
plot from State 8-17
pod
  clock field 4-7
  connections preprocessor 2-5
  field 4-6
  grounding 2-18
  threshold field 4-11
  voltage thresholds 2-20
pods
  assign 3-2
polarity
  default 4-17
  label 4-17
Port-Out signal 5-34
post-processing features
  Chart menu 8-2
  compare menu 9-3
post-trigger data 5-38
power requirements 14-9
pre-trigger data 5-38
predefined resource terms
  combination 5-29
  selection 5-29
preprocessor
  file configuration 2-5
  modules 1-7
  pod connections 2-5
probe
  characteristics 13-4
  connecting tip assembly 2-17
  disconnecting leads 2-23
  grabbers 2-19
  grounding 2-18
  input voltage maximum 2-20

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

installing leads 2-23
interface 2-3
leads 2-19
probe cable 2-20
power caution 2-20
probe cables
connecting 2-22
probes
connecting grabbers 2-24
probing
general purpose 2-2, 2-17
options 2-2
passive 2-17
system components 2-21
product performance
verify 13-2

R

range
assignment 5-23
specifiers 11-12
terms 1-2, 5-23
reference
clock 5-39
line 7-23
listing field 9-4
repetitive mode 7-5
replace sequence level 5-42
rescale field 8-13 - 8-14
resource terms 1-2, 5-9, 5-17
combine 5-12
field 5-18
menu 5-18
roll field 5-10, 6-11, 6-19, 8-9, 9-14
rolling 4-16

S

sample 8-5
sample mode 8-6
sample period
Time Interval mode, minimum 11-5
sample period display 7-9
sample period field 5-41
sampling methods
blind time 11-9
scrolling data 7-8
seconds per division field 7-7
select new macro field 5-11
selecting
SPA modes 11-6
State Histogram mode 11-6
State Overview mode 11-6
Time Interval mode 11-6
selecting fields
display 11-21
sequence
instruction menu 5-11
instructions stored data 5-40
level insert, delete 5-11
level number field 5-10
levels 1-2, 5-9, 5-42
of instructions 5-9
sequential channel mode 7-26
setting up
logic analyzer (SPA) 11-21
State Format specification 11-7
setup and hold
adjustments 4-14
default 4-15
signal amplitude
probing 2-20
single mode 7-5
single-card module 4-5
slave clock 4-2, 4-12
SPA 11-2
See System Performance Analysis
specifications 13-2
listed 13-3
specify patterns field 6-8, 7-16, 8-8
Specify States field 11-13
specify stop measurement 9-11 - 9-13
compare 9-12
x - o 9-13
specifying low and high values 11-22
start/end conditions 11-15
state
acquisition mode 4-3
analysis characteristics 13-5
analyzer 3-4
analyzer markers 7-11
analyzers vs SPA 11-4
compare 3-4, 9-2
State Format specification
setting up 11-7
State Histogram mode 11-5, 11-12
All States vs Qualified States 11-13
choosing a label to monitor 11-24
data sampling and sorting 11-12
defining the ranges 11-24
example 11-14
interpreting the histogram display 11-26
maximum number of ranges 11-5
number of samples per range 11-13
operating characteristics 11-5
Other States included/excluded 11-13, 11-26
range specifiers 11-12
selecting 11-6
State Histogram vs State Overview 11-12
total samples 11-13
tracing All States vs Qualified States 11-25
user-defined ranges vs symbols 11-13
using 11-24
using symbols for ranges 11-25
state listings
interleaved 10-4
viewing 10-2
state listings from other analyzers 10-4
State Overview mode 11-4, 11-9
choosing a label to monitor 11-21
data sampling and sorting 11-10
example 11-11
interpreting the histogram display 11-23
operating characteristics 11-4
selecting 11-6
specifying low and high values 11-22
total count 11-10
using 11-21
using the markers 11-23
X-axis scaling 11-9
Y-axis scaling 11-10
zooming in on an area of interest 11-23
state tags 4-3, 5-35
absolute 5-35
relative 5-35
states per division 7-2
states-per-division field 7-6
statistical information 7-20
statistics markers 6-17, 7-20
color 6-17
in a state analyzer 7-20
in repetitive run mode 6-18
in single run 7-21
in single run mode 6-18

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

repetitive run 7-21
state analyzer 6-17
status lines
preprocessor 2-4
stop measurement
field 6-12, 8-10
x - o 8-11
X-O option 6-13
storage 14-9
symbols 4-2
synchronous clock 3-4
System Performance Analysis 3-5
definition 11-4
operating characteristics 11-4
using with other features 11-30

T
tags
state 4-3
time 4-3
template 9-4
term assignment field 5-12
termination adapter 2-3
terms
resource 5-17
test points
connecting grabbers 2-24
Time Interval mode 11-5, 11-15
auto-range 11-16
data sampling and sorting 11-15
defining the time interval ranges 11-28
example 11-17
interpreting the histogram display 11-28
operating characteristics 11-5
resolution 11-5
selecting 11-6
specifying an event 11-27
start/end conditions 11-15
time statistics 11-16
total samples 11-16
using 11-27
using Auto-range 11-28
Time interval ranges 11-16
maximum time 11-16
minimum time 11-16
range of 11-5
time markers 7-17
color 6-15
in a state analyzer 7-17
state analyzer 6-15
timing analyzer 6-15
with pattern markers 7-17
time per division 7-2
time statistics 11-16
time tags 4-3
time-correlated displays 10-5
timer
assignment 5-25
control field 5-16
default 5-16
minimum value 5-26
status 5-10
terms 5-25
terms inverted 5-25
terms within sequence level 5-25
timers 1-2
timing
acquisition mode 4-4
analysis characteristics 13-5
analyzer 3-4
analyzer markers 7-11
analyzer vs SPA 11-4
waveforms reconstructed 7-10
total count
State Overview 11-5, 11-10
total samples
State Histogram mode 11-13
Time Interval mode 11-16
touchscreen 1-3
trace modes 11-8
selecting 11-8
State Histogram 11-8
State Overview 11-8
Time Interval 11-8
trace type
All States vs Qualified States 11-13
translation information
table 2-6
trig to O field 7-18
trig to X field 7-18
trig to X/trig to O fields 6-16
trigger menu 5-2
trigger point placement 5-38
trigger position
center 5-39
end 5-39
start 5-38
User Defined 5-39
trigger position field 5-38
triggering characteristics 13-5
TTL 4-11

U
Universal Interfaces 2-4
user-defined macros 5-3

V
viewing state listings 10-2
voltage level
user selected 4-11

W
warning messages 12-2, 12-4 - 12-6
waveform display 7-22
waveform menu 7-2
acquisition control 7-4
basic controls 7-3
waveform size field 7-30
waveforms
inserting 10-4

X
X and O entering/ leaving fields 6-9
X and O markers 11-10
O Mark count 11-10
X Mark count 11-10
X axis 11-4, 11-9
high value 11-9
low value 11-9
X marker field 6-9
X to O display field 6-16
X to O field 7-18
in state analyzer 7-18
in timing analyzer 7-18
X-axis label/state value field 8-16
X-pattern occurrence field 7-13
"XY chart of" field 8-15
XY chart window 8-14

Y
Y axis 11-5, 11-10
maximum value 11-5
yellow line 6-17

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Z
zoom 7-6 - 7-7

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

DECLARATION OF CONFORMITY

according to ISO/IEC Guide 22 and EN 45014

Manufacturer's Name: Agilent Technologies

Manufacturer's Address: Digital Design Product Generation Unit
1900 Garden of the Gods Road
Colorado Springs, CO 80907 USA

declares, that the product

Product Name: Logic Analyzer Module

Model Number(s): 16557D

Product Option(s): All

conforms to the following Product Specifications:

Safety:	IEC 1010-1:1990+A1 / EN 61010-1:1993	
	UL 3111	
	CSA-C22.2 No. 1010.1:1993	
EMC:	CISPR 11:1990 / EN 55011:1991	Group 1 Class A
	IEC 555-2:1982 + A1:1985 / EN 60555-2:1987	
	IEC 555-3:1982 + A1:1990 / EN 60555-3:1987 + A1:1991	
	IEC 801-2:1991 / EN 50082-1:1992	4 kV CD, 8 kV AD
	IEC 801-3:1984 / EN 50082-1:1992	3 V/m, {1kHz 80% AM, 27-1000 MHz}
	IEC 801-4:1988 / EN 50082-1:1992	0.5 kV Sig. Lines, 1 kV Power Lines

Supplementary Information:

The product herewith complies with the requirements of the Low Voltage Directive 73/23/EEC and the EMC Directive 89/336/EEC and is marked accordingly.

This product was tested in a typical configuration with Agilent Technologies test systems.

Colorado Springs, 07/02/97

Ken Wyatt

Ken Wyatt/Product Regulations Manager

European Contact: Your local Agilent Technologies Sales and Service Office or Agilent Technologies GmbH, Department ZQ/ Standards Europe, Herrenberger Strasse 130, D-71034 Böblingen Germany (FAX: +49-7031-14-3143)

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Product Regulations

Safety

IEC 1010-1:1990+A1 / EN 61010-1:1993
UL 3111
CSA-C22.2 No.1010.1:1993

EMC

CE
ISM 1-A

This Product meets the requirement of the European Communities (EC) EMC Directive 89/336/EEC.

Emissions

EN55011/CISPR 11 (ISM, Group 1, Class A equipment)
IEC 555-2
IEC 555-3

Immunity

EN50082-1	Code	Notes
IEC 801-2 (ESD) 8kV AD	1	
IEC 801-3 (Rad.) 3 V/m	1	
IEC 801-4 (EFT) 1kV	1	

Performance Codes:
1 PASS - Normal operation, no effect.
2 PASS - Temporary degradation, self recoverable.
3 PASS - Temporary degradation, operator intervention required.
4 FAIL - Not recoverable, component damage.

Notes: (None)

Sound Pressure Level

N/A

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

© Copyright Agilent Technologies 1998 - 2000
All Rights Reserved.

Reproduction, adaptation, or translation without prior written permission is prohibited, except as allowed under the copyright laws.

Restricted Rights Legend.

Use, duplication or disclosure by the U.S. Government is subject to restrictions as set forth in subparagraph (c) (1) (ii) of the Rights in Technical Data and Computer Software clause at DFARS 252.227-7013 for DOD agencies, and subparagraphs (c) (1) and (c) (2) of the Commercial Computer Software Restricted Rights clause at FAR 52.227-19 for other agencies.

Agilent Technologies
3000 Hanover Street
Palo Alto, California 94304
U.S.A.

Document Warranty

The information contained in this document is subject to change without notice.

Agilent Technologies makes no warranty of any kind with regard to this material, including, but not limited to, the implied warranties of merchantability or fitness for a particular purpose.

Agilent Technologies shall not be liable for errors contained herein or for damages in connection with the furnishing, performance, or use of this material.

Safety

This apparatus has been designed and tested in accordance with IEC Publication 1010, Safety Requirements for Measuring Apparatus, and has been supplied in a safe condition. This is a Safety Class I instrument (provided with terminal for protective earthing). Before applying power, verify that the correct safety precautions are taken (see the following warnings). In addition, note the external markings on the instrument that are described under "Safety Symbols."

Warning

- Before turning on the instrument, you must connect the protective earth terminal of the instrument to the protective conductor of the (mains) power cord. The mains plug shall only be inserted in a socket outlet provided with a protective earth contact. You must not negate the protective action by using an extension cord (power cable) without a protective conductor (grounding). Grounding one conductor of a two-conductor outlet is not sufficient protection.
- Only fuses with the required rated current, voltage, and specified type (normal blow, time delay, etc.) should be used. Do not use repaired fuses or short-circuited fuseholders. To do so could cause a shock or fire hazard.
- Service instructions are for trained service personnel. To avoid dangerous electric shock, do not perform any service unless qualified to do so. Do not attempt internal service or adjustment unless another person, capable of rendering first aid and resuscitation, is present.
- If you energize this instrument by an auto transformer (for voltage reduction), make sure the common terminal is connected to the earth terminal of the power source.
- Whenever it is likely that the ground protection is impaired, you must make the instrument inoperative and secure it against any unintended operation.
- Do not operate the instrument in the presence of flammable gasses or fumes. Operation of any electrical instrument in such an environment constitutes a definite safety hazard.
- Do not install substitute parts or perform any unauthorized modification to the instrument.
- Capacitors inside the instrument may retain a charge even if the instrument is disconnected from its source of supply.
- Use caution when exposing or handling the CRT. Handling or replacing the CRT shall be done only by qualified maintenance personnel.

Safety Symbols



Instruction manual symbol: the product is marked with this symbol when it is necessary for you to refer to the instruction manual in order to protect against damage to the product.



Hazardous voltage symbol.



Earth terminal symbol: Used to indicate a circuit common connected to grounded chassis.

WARNING

The Warning sign denotes a hazard. It calls attention to a procedure, practice, or the like, which, if not correctly performed or adhered to, could result in personal injury. Do not proceed beyond a Warning sign until the indicated conditions are fully understood and met.

CAUTION

The Caution sign denotes a hazard. It calls attention to an operating procedure, practice, or the like, which, if not correctly performed or adhered to, could result in damage to or destruction of part or all of the product. Do not proceed beyond a Caution symbol until the indicated conditions are fully understood or met.

Agilent Technologies
P.O. Box 2197
1900 Garden of the Gods Road
Colorado Springs, CO 80901

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Product Warranty

This Agilent Technologies product has a warranty against defects in material and workmanship for a period of one year from date of shipment. During the warranty period, Agilent Technologies will, at its option, either repair or replace products that prove to be defective.

For warranty service or repair, this product must be returned to a service facility designated by Agilent Technologies.

For products returned to Agilent Technologies for warranty service, the Buyer shall prepay shipping charges to Agilent Technologies and Agilent Technologies shall pay shipping charges to return the product to the Buyer. However, the Buyer shall pay all shipping charges, duties, and taxes for products returned to Agilent Technologies from another country.

Agilent Technologies warrants that its software and firmware designated by Agilent Technologies for use with an instrument will execute its programming instructions when properly installed on that instrument. Agilent Technologies does not warrant that the operation of the instrument software, or firmware will be uninterrupted or error free.

Limitation of Warranty

The foregoing warranty shall not apply to defects resulting from improper or inadequate maintenance by the Buyer, Buyer-supplied software or interfacing, unauthorized modification or misuse, operation outside of the environmental specifications for the product, or improper site preparation or maintenance.

No other warranty is expressed or implied. Agilent Technologies specifically disclaims the implied warranties of merchantability or fitness for a particular purpose.

Exclusive Remedies

The remedies provided herein are the buyer's sole and exclusive remedies. Agilent Technologies shall not be liable for any direct, indirect, special, incidental, or consequential damages, whether based on contract, tort, or any other legal theory.

Assistance

Product maintenance agreements and other customer assistance agreements are available for Agilent Technologies products.

For any assistance, contact your nearest Agilent Technologies Sales Office.

Certification

Agilent Technologies certifies that this product met its published specifications at the time of shipment from the factory. Agilent Technologies further certifies that its calibration measurements are traceable to the United States National Institute of Standards and Technology, to the extent allowed by the Institute's calibration facility, and to the calibration facilities of other International Standards Organization members.

About this edition

This is the Agilent Technologies 16557D State/Timing Logic Analyzer User's Reference.

Publication number 16557-97004, January 2000
Printed in USA.

Print history is as follows:

16557-97000, March 1998

16557-97004, January 2000

New editions are complete revisions of the manual. Many product updates do not require manual changes; and, conversely, manual corrections may be done without accompanying product changes. Therefore, do not expect a one-to-one correspondence between product updates and manual updates.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Artisan Technology Group is an independent supplier of quality pre-owned equipment

Gold-standard solutions

Extend the life of your critical industrial, commercial, and military systems with our superior service and support.

We buy equipment

Planning to upgrade your current equipment? Have surplus equipment taking up shelf space? We'll give it a new home.

Learn more!

Visit us at **artisantg.com** for more info on price quotes, drivers, technical specifications, manuals, and documentation.

Artisan Scientific Corporation dba Artisan Technology Group is not an affiliate, representative, or authorized distributor for any manufacturer listed herein.

We're here to make your life easier. How can we help you today?

(217) 352-9330 | sales@artisantg.com | artisantg.com

ARTISAN® TECHNOLOGY GROUP