Instructions

Tektronix

DAS® 9200 Series & TLA 500 Series Certification Procedures

070-9470-98

Warning
The servicing instructions are for use by qualified personnel only. To avoid personal injury, do not perform any servicing unless you are qualified to do so. Refer to all safety summaries prior to performing service.

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Tektronix, Inc., P.O. Box 1000, Wilsonville, OR 97070–1000

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General Safety Summary

Review the following safety precautions to avoid injury and prevent damage to this product or any products connected to it.

Only qualified personnel should perform service procedures.

Injury Precautions

Use Proper Power Cord To avoid fire hazard, use only the power cord specified for this product.

Ground the Product This product is grounded through the grounding conductor of the power cord. To avoid electric shock, the grounding conductor must be connected to earth ground. Before making connections to the input or output terminals of the product, ensure that the product is properly grounded.

Do Not Operate Without Covers To avoid electric shock or fire hazard, do not operate this product with covers or panels removed.

Use Proper Fuse To avoid fire hazard, use only the fuse type and rating specified for this product.

Do Not Operate in Wet/Damp Conditions To avoid electric shock, do not operate this product in wet or damp conditions.

Do Not Operate in an Explosive Atmosphere To avoid injury or fire hazard, do not operate this product in an explosive atmosphere.

Avoid Exposed Circuitry To avoid injury, remove jewelry such as rings, watches, and other metallic objects. Do not touch exposed connections and components when power is present.

Product Damage Precautions

Use Proper Power Source Do not operate this product from a power source that applies more than the voltage specified.

Use Proper Voltage Setting

Before applying power, ensure that the line selector is in the proper position for the power source being used.

Provide Proper Ventilation

To prevent product overheating, provide proper ventilation.

Do Not Operate With Suspected Failures

If you suspect there is damage to this product, have it inspected by qualified service personnel.

Safety Terms and Symbols

Terms in This Manual

These terms may appear in this manual:

WARNING. *Warning statements identify conditions or practices that could result in injury or loss of life.*

CAUTION. *Caution statements identify conditions or practices that could result in damage to this product or other property.*

Terms on the Product

These terms may appear on the product:

DANGER indicates an injury hazard immediately accessible as you read the marking.

WARNING indicates an injury hazard not immediately accessible as you read the marking.

CAUTION indicates a hazard to property including the product.

Symbols on the Product

The following symbols may appear on the product:

DANGER
High Voltage

Protective Ground
(Earth) Terminal

ATTENTION
Refer to Manual

Double
Insulated

Certifications and Compliances

CSA Certified Power Cords

CSA Certification includes the products and power cords appropriate for use in the North America power network. All other power cords supplied are approved for the country of use.

Compliances

Consult the product specifications for Overvoltage Category and Safety Class.

Overvoltage Category

Overvoltage categories are defined as follows:

CAT III: Distribution level mains, fixed installation

CAT II: Local level mains, appliances, portable equipment

CAT I: Signal level, special equipment or parts of equipment, telecommunication, electronics

Service Safety Summary

Only qualified personnel should perform service procedures. Read this *Service Safety Summary* and the *General Safety Summary* before performing any service procedures.

Do Not Service Alone

Do not perform internal service or adjustments of this product unless another person capable of rendering first aid and resuscitation is present.

Disconnect Power

To avoid electric shock, disconnect the main power by means of the power cord or, if provided, the power switch.

Use Caution When Servicing the CRT

To avoid electric shock or injury, use extreme caution when handling the CRT. Only qualified personnel familiar with CRT servicing procedures and precautions should remove or install the CRT.

CRTs retain hazardous voltages for long periods of time after power is turned off. Before attempting any servicing, discharge the CRT by shorting the anode to chassis ground. When discharging the CRT, connect the discharge path to ground and then the anode. Rough handling may cause the CRT to implode. Do not nick or scratch the glass or subject it to undue pressure when removing or installing it. When handling the CRT, wear safety goggles and heavy gloves for protection.

Use Care When Servicing With Power On

Dangerous voltages or currents may exist in this product. Disconnect power, remove battery (if applicable), and disconnect test leads before removing protective panels, soldering, or replacing components.

To avoid electric shock, do not touch exposed connections.

X-Radiation

To avoid x-radiation exposure, do not modify or otherwise alter the high-voltage circuitry or the CRT enclosure. X-ray emissions generated within this product have been sufficiently shielded.

Preface

This document describes the procedures required to certify the DAS 9200 Series and TLA 500 Series logic analyzers and their associated modules.

This document is intended for Tektronix service personnel only. It assumes that the reader is a trained technician, familiar with DAS 9200 Series and TLA 500 Series logic analyzers.

For additional information, refer to the following documents:

- The *DAS Technician's Reference Manual* 070-5959-XX
- The *DAS Verification and Adjustment Procedures Manual* 070-5961-XX
- The *TLA 510/520 Service Manual* 070-8976-XX
- The *92A96XX Service Manual* 070-8247-XX
- The *92HS8 User Manual* 070-5951-XX
- The *DAS 9200 Systems/TLA 500 Systems Functional Verification Procedure* DAS9200-AA

Introduction

The purpose of these certification procedures is to enable the Tektronix Field Service organization to satisfy customer requests for traceable certification of the DAS 9200 and TLA 500 systems. (Often, the customer requires equipment certification to achieve or maintain ISO compliance.)

NOTE. *These procedures are not intended for customer availability.*

These procedures provide Tektronix Field Service Technicians with a standardized and documented procedure for traceable certification of DAS 9200 and TLA 500 Systems to national standards. After performing this procedure, the technician can generate and provide the customer with a Certificate of Traceable Calibration and, if required, a Certification Test Record. The technician can then apply appropriate calibration stickers to the mainframe and modules which make up the system. This provides the customer with documentation and confidence in the measurement accuracy of their system.

This procedure does not verify the system to published specifications. It should generally be used in conjunction with the *DAS 9200/TLA 500 Functional Verification Procedure*. These Certification Procedures certify the accuracy of the primary references or adjustments; the *Functional Verification Procedure* verifies the functionality of the mainframe, module, and probes. Although not required for traceable certification, if full verification of published specifications is specially requested by the customer, refer to the *Performance Verification Procedures* in the appropriate DAS 9200/TLA 500 Service Manuals.

This procedure is intended for use by Tektronix Field Service Technicians who have completed DAS9200 Service Training. Others with less training may need access to other reference documents, such as mainframe and module user manuals, for detailed information. (Refer to page xi for a partial list of related documents.)

Please check the Required Test Equipment table on page 6 to ensure you have the proper traceable test equipment, fixtures, tools, and materials, before beginning the procedures.

CAUTION. *Check with the customer before disconnecting probes or cables from the system under test. It is desirable to use the customer's probes and cables when called for, but in some cases this may not be possible.*

Products Certified

Table 1 lists the modules which can be certified, and the order in which they must be tested. Table 2 lists the modules which have no certifiable references.

These procedures support Tektronix-recommended product configurations only.

The recommended recertification interval for DAS 9200 and TLA 500 products is one year.

Table 1: Products Certified

Product		Parameter	Comments
1	DAS 9219/9220 Mainframe	Time Base Accuracy: 100 MHz (Main)	Measured on Controller board
2	DAS 9221/TLA 5XX Mainframe	Time Base Accuracy: 100 MHz (Main)	Measured on Controller board
3	92E9 Expansion Mainframe	Time Delay Accuracy	Measured on Expansion Slave board
4	92A16/92A16E board	Threshold Accuracy Time Base Accuracy (92A16 only): 200 MHz Clock	
5	92A96/C96 board	Threshold Accuracy	
6	92HS8 Master Interface board and Probe Cabinets	Time Base Accuracy: 500 MHz Clock 200 MHz Clock Threshold Accuracy Calibrator Accuracy	Time base accuracy measured on Memory board inside Probe Cabinet. Threshold Accuracy procedures consist of checking one setting for each DAC on one channel only.
7	92S16/92SX109 board	Pod Clock Outputs Threshold Accuracy (External Control Probe Input)	92SX109 same as 92S16 without multiplexer.
8	92S32/92SX118 board	Pod Clock Outputs	92SX118 same as 92S32 without multiplexer.

Table 2: Products Not Certified

Product	Comments
92A60 Controller board	No certifiable references or adjustments
92A60 Memory board	″
92A60D Memory board	″
92A90 Controller board	″
92A90 Memory board	″
92A90D Memory board	″
92A60/90 Buffer probe	″
92HS8E Expansion board	″
Acquisition probes	″
Pattern Generator probes	″
92LAN board	″
92LANSE board	″
92C01/2/3 board	″

Procedure Overview

Figure 1 shows the general order of tasks that you will need to perform for certification.

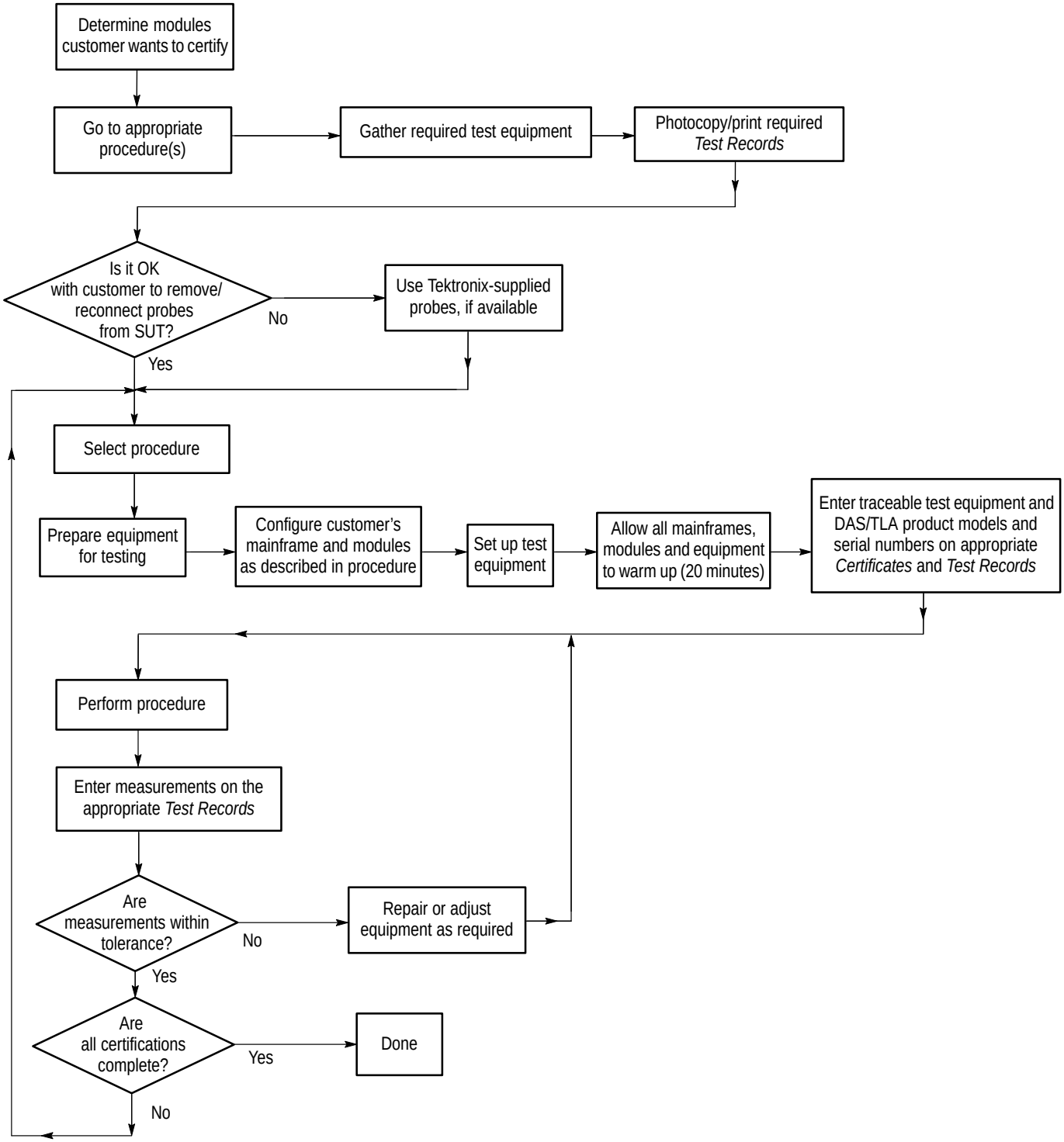

Figure 1: Certification Procedure Tasks

General Information and Conventions

The following general information and conventions apply throughout this section:

- Each test procedure begins with a table, similar to the one below, that provides information you need to know before starting the test.

Equipment Required	Universal Counter/Timer with Probe (item 1) Dual Lead Adapter (item 7) Gold Square Pin (item 9)
Configuration	Mainframe, configured as follows: Top cover removed Memory board removed; other boards may be installed
Prerequisites	Warm-up time: 20 minutes, DAS and test equipment Power-up diagnostics pass. No previous tests required.

  The item numbers after each piece of equipment refer to line numbers in Table 3, *Required Test Equipment*, which begins on page 6.

- The *Test Record* starts with header information that must always be filled out completely. The *Certificate Number* is the number of the actual *Certificate of Traceable Calibration* that you'll complete.
- Always fill out the *Incoming Data* entry on the *Test Record*. The *Outgoing Data* entry is required only if you perform a repair or adjustment to the module such that the certification tests must be performed again.

Equipment Required

These procedures require the use of traceable signal sources and measurement instruments to ensure accuracy. Table 3 lists the equipment required for the procedures.

You can obtain an accuracy ratio of 4:1 or better by using the recommended equipment listed in the *Examples* column of Table 3. If your test equipment does not meet the minimum requirements listed in the table, your test results may be invalid.

Table 3: Required Test Equipment

Item Number and Description		Minimum Requirements	Examples	Where Used
1	Universal Counter/Timer with Probe[1]	200 MHz frequency measurement capability; 20 ppm time base accuracy @25 MHz to 200 MHz; 10 Hz resolution	Tektronix DC 5010 Digital Counter/Timer with P6125 5X Probe or P6137 10X Probe[1,2] (with TM 5000 mainframe) or Tektronix CMC251	Procedure 1, 2, 4, 6
2	Oscilloscope with two Probes[1,3]	350 MHz bandwidth; 2 ns/div; delta time = 14.2 ns ±0.9% (±125 ps)	Tektronix 2465B with P6137 probes or Tektronix TDS 520A with P6139A probes	Procedure 3, 7, 8
3	Digital Multimeter (DMM)	4.5 digit; 0 V ± 0.5 mV; ±1.6 V ± 3 mV (0.19%)	Tektronix DMM 252[4], DMM 254[4], DM2510, DM2510G or Fluke 884X or 850X series	Procedure 4, 5, 7
4	DC Voltage Calibrator	0 V ± 5 mV, 0 V ± 30 mV with <5 mV adjustment resolution	Fluke 34X series, Fluke 5100 series, Fluke 5500A or Wavetek 9100	Procedure 6
5	92A96 Acquisition Fixture	N/A	Refer to Appendix A on page 71 for parts list and build procedure.	Procedure 6
6	Threshold Fixture	N/A	Refer to Appendix B, on page 73 for parts list and build procedure.	Procedure 7
7	Dual-Lead Adapter	Two required	Tektronix PN 015-0325-00	Procedure 1, 2, 3, 6, 7, 8
8	Subminiature-to-Miniature Probe Adapter	Two required	Tektronix PN 013-0202-02	Procedure 3, 7, 8 Adapts the oscilloscope probe to the dual-lead adapter
9	Gold Square Pin	Single gold square pin	Part of 131-1634-00, or equivalent	Procedure 2, 6
10	Spring-Tip Ground Connector	Spring-tip ground for probe	Tektronix PN 214-4125-00	Procedure 4
11	DIP Clip	16 pin		Procedure 1
12	DIP Clip	20 pin, narrow, modified for two oscilloscope connections on pin 18[5]		Procedure 3
13	BNC Cable	36 in; two required	Tektronix PN 012-1341-00	Procedure 6
14	Dual Banana-to-BNC Connector	Two required	Tektronix PN 103-0090-00	Procedure 6

Table 3: Required Test Equipment (Cont.)

Item Number and Description		Minimum Requirements	Examples	Where Used
15	Ground Strap		Tektronix PN 196-3353-XX (standard with the 92A96/92C96 Module)	Procedure 6

1 **Probes must be compensated. Refer to the oscilloscope or counter/timer manual for the correct probe compensation procedure.**

2 **The P6125 probe is a 5X probe. If you use a 10X probe, you must adjust threshold voltages accordingly.**

3 **For procedures requiring delta time measurements, you must compensate for oscilloscope channel-to-channel skew.**

4 **The handheld DMMs (DMM 252 and DMM 254) provide a 3:1 test accuracy ratio at ±1.6 V (4 V full-scale range).**

5 **Modify the DIP clip by soldering a second pin in parallel with pin 18.**

Test Conditions

The certification procedures must be performed in an environment that is within the instrument's normal electrical and environmental operating parameters, following a minimum 20-minute warm-up period.

These procedures support Tektronix-recommended product configurations only.

Procedure 1: DAS 9219/9220 Mainframes

This procedure verifies the accuracy of the 100 MHz Time Base Clock on the Controller board.

Time Base Accuracy

Equipment Required	Universal counter/timer with probe (item 1) Dual lead adapter (item 7) 16-pin DIP clip (item 11)
Configuration	Mainframe, configured as follows: Top cover and card cage door removed Memory board removed[6]; all instrument modules removed
Prerequisites	All power-up diagnostics pass (before removing Memory board) Warm-up time: 20 minutes (test equipment and DAS/TLA mainframe) Counter/timer probe compensated No previous procedures required

[6] **Before removing the Memory board, verify that the power-up diagnostics pass.**

Test Equipment Setup

Set up the test equipment as follows:

Counter/Timer with 5X Probe	**Channel A:** MODE FREQ A TERM 1 MΩ SLOPE + ATTN X1 COUPL DC CH A LEVEL +0.740 V[7] AVGS –1

[7] **Value shown is for a 5X probe. For a 10X probe, value should be 0.372 V.**

100 MHz Time Base Clock Procedure

1. Connect the counter/timer probe GND to U121 pin 8 on the Controller board. (See Figure 2.)
2. Connect the counter/timer probe input to U121 pin 14 and record the measured frequency on the *Test Record*. Verify that the value is within the allowable range.

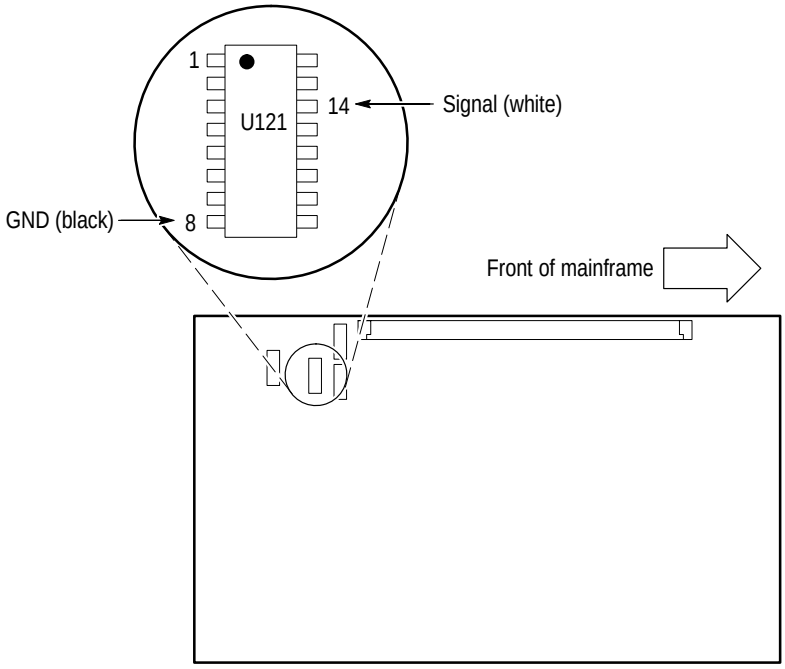

Figure 2: Controller Board 100 MHz Time Base Clock Test Point Locations (DAS 9219/9220 Mainframes)

Certification Test Record

DAS 9219/9220 Mainframe

Instrument Model: _____

Serial Number: _____ Certificate Number: _____

Verification Performed by: _____ Verification Date: _____

Time Base Accuracy Test Data

Characteristic	Specification	Tolerance	Procedure Reference	Incoming Data	Outgoing Data
100 MHz Main Clock	100 MHz ± 0.01%	99.99 MHz to 100.01 MHz	Page 10, Step 2		

Procedure 2: DAS 9221 and TLA 510/TLA 520 Mainframes

This procedure verifies the accuracy of the 100 MHz Time Base Clock on the Controller board.

Time Base Accuracy

Equipment Required	Universal counter/timer with probe (item 1) Dual lead adapter (item 7) Gold square pin (item 9)
Configuration	Mainframe, configured as follows: Top cover and card cage door removed All instrument modules removed
Prerequisites	Warm-up time: 20 minutes (test equipment and DAS/TLA mainframe) Counter/timer probe compensated No previous procedures required All power-up diagnostics pass

Test Equipment Setup

Set up the test equipment as follows:

Counter/Timer with 5X Probe	**Channel A:** MODE FREQ A TERM 1 MΩ SLOPE + ATTN X1 COUPL DC CH A LEVEL +0.740 V [8] AVGS –1

[8] **Value shown is for a 5X probe. For a 10X probe, value should be 0.372 V.**

100 MHz Time Base Clock Procedure

1. Connect the counter/timer probe ground to TP4800 (GND).
2. Connect the counter/timer probe input to U1800 pin 12 and record the measured frequency on the *Test Record*. (See Figure 3.) Verify that the value is within the allowable range.

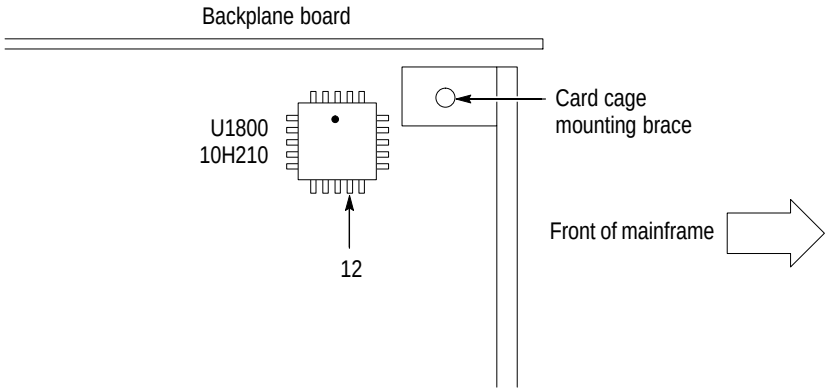

Figure 3: Controller Board 100 MHz Time Base Clock Test Point Location (DAS 9221/TLA Mainframes)

Certification Test Record

DAS 9221 and TLA 510/TLA 520 Mainframes

Instrument Model: _____

Serial Number: _____ Certificate Number: _____

Verification Performed by: _____ Verification Date: _____

Time Base Accuracy Test Data

Characteristic	Specification	Tolerance	Procedure Reference	Incoming Data	Outgoing Data
100 MHz Main Clock	100 MHz ± 0.01%	99.99 MHz to 100.01 MHz	Page 14, Step 2		

Procedure 3: 92E9 Expansion Mainframe

This procedure verifies that the 92E9 Expansion Mainframe is correctly synchronized with the master mainframe clock to ensure overall system timing accuracy.

Time Delay Accuracy

Equipment Required	Oscilloscope with probes (item 2) Dual-lead adapters (2) (item 7) Subminiature-to-miniature probe adapters (2) (item 8) 20-pin DIP clip, narrow, modified for two oscilloscope connections on pin 18 (item 12)
Configuration	Expansion Mainframe(s), configured as follows: Top cover and card cage door removed All instrument modules removed
Prerequisites	Warm-up time: 20 minutes (test equipment, DAS master mainframe, and expansion mainframe(s)) Oscilloscope probes compensated[9] Power-up diagnostics pass Must have passed either *Procedure 1: DAS 9219/9220 Mainframes* or *Procedure 2: DAS 9221 and TLA 510/520 Mainframes*

[9] **The following procedure calls for a delta time measurement. Before taking the measurement, you must compensate for the oscilloscope channel-to-channel skew (in addition to the normal probe compensation).**

Test Equipment Setup

Set up the test equipment as follows:

Oscilloscope	A Trigger	
	Source	Ch 1
	Coupling	AC
	Slope	+
	Mode	Auto
	Trigger Level	Mid-position
	A Time Base	5 ns/Div
	Ch 1 and Ch 2 Vertical	
	Coupling	AC
	Impedance	1MΩ
	Bandwidth	Full
	V/Div	500 mV/Div

Time Delay Procedure

The following procedure measures the delay between two different stages of the clock signal.

CAUTION. *Use extreme caution when connecting the DIP clip to U265. Shorting pins to ground or to other pins will destroy the device. Make all connections with the mainframe power off.*

1. Power off the mainframes before connecting the DIP clip or any test equipment.
2. Using the DIP clip, connect the Ch 1 scope probe input to U265 pin 10 on the Expansion Slave board. (See Figure 4.) Connect the ground lead to U265 pin 18.
3. Connect the Ch 2 scope probe to U265 pin 5 and the ground lead to U265 pin 18.

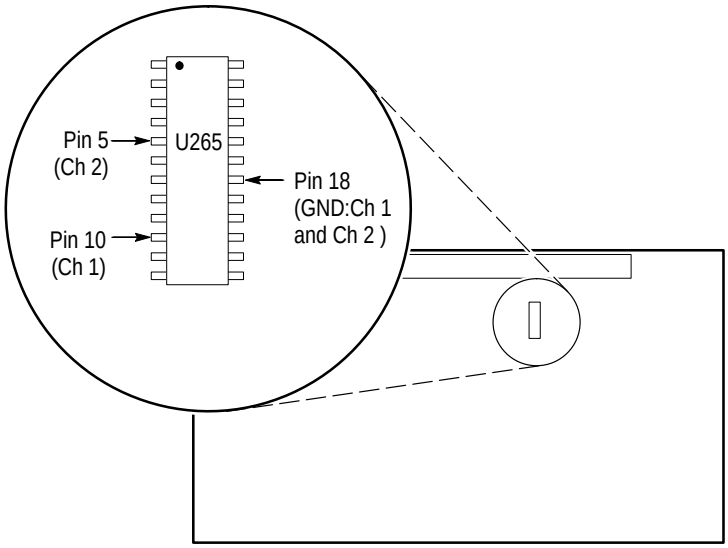

Figure 4: DAS 92E9 Expansion Slave Board Test Point Locations

4. Power on the master mainframe (which, in turn, powers on the expansion mainframe).
5. Adjust the scope trigger level for a stable waveform.
6. Position the rising edge of the Ch 1 waveform at the left-most vertical graticule line and center the waveform vertically.
7. Center the Ch 2 waveform vertically.
8. Change the Horizontal Scale to 2 ns. Reposition the waveforms horizontally, if necessary, to locate the rising edge of Ch 1 at the left-most vertical graticule line.
9. Use the oscilloscope cursors to measure the time (Δ delta time) from the 50% point of the rising edge of the Ch 1 waveform to the 50% point of the falling edge of the Ch 2 waveform. Record this value on the *Test Record*. Verify that the value is within the allowable range.

Certification Test Record

DAS 92E9 Expansion Mainframe

Instrument Model: _____

Serial Number: _____ Certificate Number: _____

Verification Performed by: _____ Verification Date: _____

Time Delay Accuracy Test Data

Characteristic	Specification	Tolerance	Procedure Reference	Incoming Data	Outgoing Data
Time Delay	14.2 ns ± 500 ps	13.7 ns to 14.7 ns	Page 19, Step 9		

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Procedure 4: 92A16 Acquisition Board and 92A16E Expansion Board

This procedure verifies the accuracy of the 200 MHz Time Base Clock on the 92A16 board. This procedure also verifies the accuracy of the acquisition probe thresholds on the 92A16 and 92A16E boards.

Time Base Accuracy

This procedure checks the 92A16 200 MHz Time Base Clock.

Equipment Required	Universal counter/timer with probe (item 1) Spring-tip ground connector (item 10)
Configuration	Mainframe, configured as follows: Top cover and card cage door removed 92A16 installed in the lowest allowable slot number (slot 2 of DAS mainframe); all other instrument modules removed
Prerequisites	Warm-up time: 20 minutes, DAS and test equipment Counter/timer probe compensated Power-up diagnostics pass No previous tests required

Test Equipment Setup

Set up the test equipment as follows:

Counter/Timer with 5X Probe	**Channel A:** MODE FREQ A TERM 1 MΩ SLOPE + ATTN X1 COUPL DC CH A LEVEL +0.740 V [10] AVGS –1

[10] **Value shown is for a 5X probe. For a 10X probe, value should be 0.372 V.**

200 MHz Time Base Clock Procedure

1. Move to the 92A16 Trigger menu.
2. Press F1: START.
3. Connect the counter/timer probe spring-tip ground to the Gnd test point (hole) on the back of the circuit board, near U716. (See Figure 5.)
4. Connect the counter/timer probe input to U716, pin 9 and record the measured frequency on the *Test Record*. Verify that the value is within the allowable range.

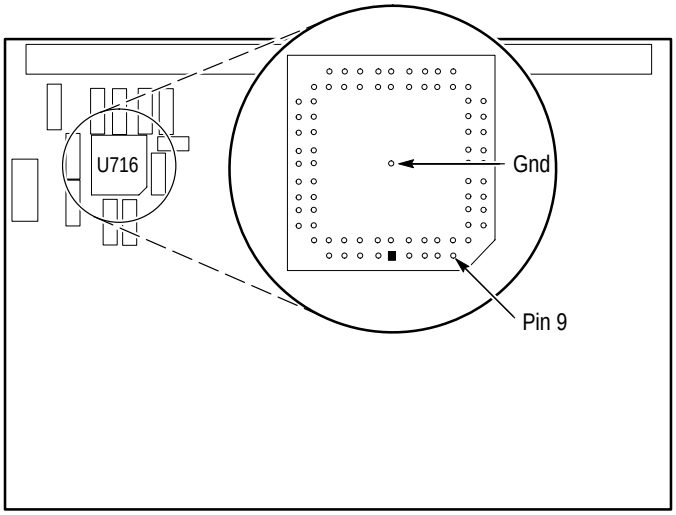


Figure 5: 92A16 Test Point Locations (back of board)

Threshold Accuracy

This procedure verifies the threshold accuracy at the external control probe connectors (J400 and J600).

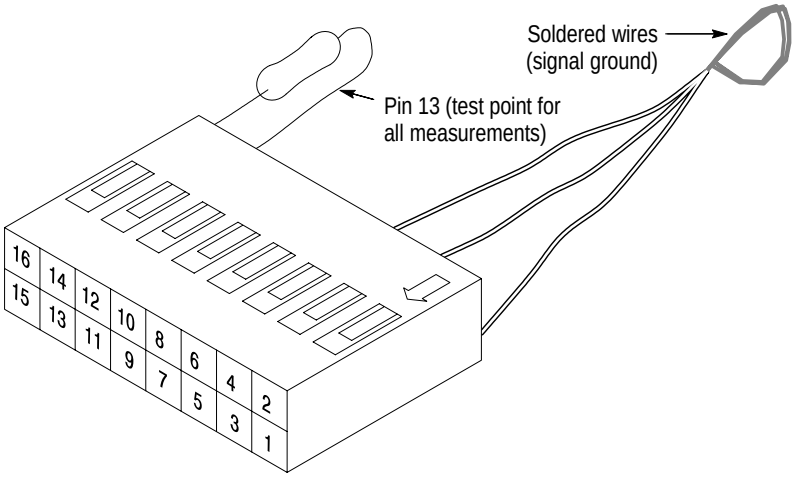
Equipment Required	DMM (item 3) Threshold fixture[11] (item 6)
Configuration	Mainframe, configured as follows: Top cover and card cage door removed 92A16 installed in the lowest allowable slot number (slot 2 of DAS mainframe); 92A16E modules installed in adjacent slots; all other instrument modules removed
Prerequisites	Warm-up time: 20 minutes (test equipment and DAS/TLA mainframe and modules) All power-up diagnostics pass

[11] **For information about building the threshold fixture, refer to Appendix B, on page 73.**

Test Equipment Setup

Set up the test equipment as follows:

Threshold Fixture	Connected to J400 (pod B connector) of the 92A16 module—pin 1 of threshold fixture connected to pin 1 of probe pod connector
DMM	Autorange Ground lead connected from DMM to pin 1 of threshold fixture (see following figure) Positive lead connected to pin 13 of threshold fixture



Pod B/Pod C Threshold Procedure

1. Make the following 92A16 Setup menu selections:

   - Channel menu:
     Threshold Level→VAR→ 0.00V
     (Repeat this setting for each pod, including all 92A16E pods, if present)
   - Trigger menu:

     ```
     State  One

        If     Word #1   =   XX...  (all don't cares)

        Then   Begin Again
     ```

2. Press F1: START.
3. Record the DMM voltage reading on the *Test Record*. Verify that the value is within the allowable range.
4. Move the threshold fixture to J600 (pod C connector).

CAUTION. *When inserting the threshold fixture into a connector, be sure that the fixture is correctly oriented, pin 1-to-pin 1. Incorrect insertion can damage the instrument module.*

5. Record the DMM voltage reading on the *Test Record*. Verify that the value is within the allowable range.

6. If any 92A16E modules are present, move the threshold fixture to the J400 and J600 connectors on those modules and record the DMM voltage reading for each connector on the *Test Record* for the 92A16E. (Each 92A16E module requires a separate *Test Record*.) Verify that the value is within the allowable range.

7. Press F1: STOP.

Certification Test Record

DAS 92A16 Acquisition Board

Instrument Model: _____

Serial Number: _____ Certificate Number: _____

Verification Performed by: _____ Verification Date: _____

Time Base Accuracy Test Data

Characteristic	Specification	Tolerance	Procedure Reference	Incoming Data	Outgoing Data
200 MHz Time Base Clock	200 MHz ± 0.5%	199 MHz to 201 MHz	Page 58, Step 8		

Threshold Accuracy Test Data

Characteristic	Specification	Tolerance	Procedure Reference	Incoming Data	Outgoing Data
Pod B Threshold	0.000 V ± 8 mV	–0.008 V to +0.008 V	Page 26, Step 3		
Pod C Threshold	0.000 V ± 8 mV	–0.008 V to +0.008 V	Page 26, Step 5		

Certification Test Record

DAS 92A16E Expansion Board

Instrument Model: _____

Serial Number: _____ Certificate Number: _____

Verification Performed by: _____ Verification Date: _____

Threshold Accuracy Test Data

Characteristic	Specification	Tolerance	Procedure Reference	Incoming Data	Outgoing Data
Pod B Threshold	0.000 V ± 8 mV	–0.008 V to +0.008 V	Page 27, Step 6		
Pod C Threshold	0.000 V ± 8 mV	–0.008 V to +0.008 V	Page 27, Step 6		

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Procedure 5: 92A96/92C96 Acquisition Board

This procedure verifies the accuracy of the 92A96/92C96 data and clock channel input thresholds.

Equipment Required	DMM (item 3)
Configuration	Mainframe, configured as follows: Top cover and card cage door removed Mainframe lying on its right side, with power supply down 92A96 or 92C96 installed in highest allowable slot (slot 7 for DAS, slot 3 for TLA), all other instrument modules removed
Prerequisites	Warm-up time: 20 minutes (test equipment and DAS/TLA mainframe and modules) No previous procedures required All power-up diagnostics pass

Threshold Accuracy

This procedure verifies the accuracy of the data and clock channel input threshold levels.

Test Equipment Setup

Set up the test equipment as follows:

DMM	Autorange

PRREF Procedure

1. Select the 92C96 Channel menu.
2. Press F5: DEFINE THRESHOLD, and set both the Clock and Data Thresholds to VAR –4.00V.
3. Press F8: EXIT & SAVE.
4. Select the 92C96 Clock menu.
5. Select External for the Module Clock selection.

6. Refer to Figure 6 and connect the DMM's ground and positive input leads as follows:

   Ground lead to +5 V (C342 +lead)

   Positive input lead to PRREF (TP324)

7. Record the DMM voltage reading on the *Test Record*. Verify that the value is within the allowable range.

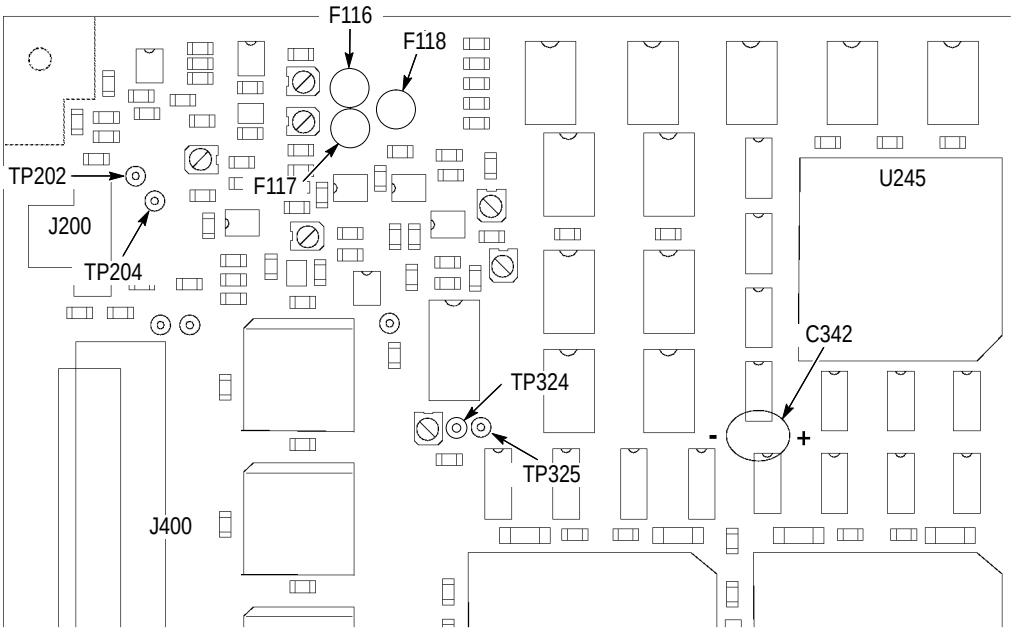


Figure 6: Data and Clock Threshold Test Point Locations

CREF/DREF Procedure

8. Move the DMM's ground lead to TP325 (ground).

9. Press F1: START, wait for the Slow Clock message to appear, and press F1: STOP.

10. Move the DMM's positive input lead to CREF (TP202).

11. Record the DMM voltage reading on the *Test Record* (the *CREF –4.00 V Threshold* entry). Verify that the value is within the allowable range.

12. Move the DMM's positive input lead to DREF (TP204).

13. Record the DMM voltage reading on the *Test Record* (the *DREF –4.00 V Threshold* entry). Verify that the value is within the allowable range.

14. Select the 92C96 Channel menu.

15. Press F5: DEFINE THRESHOLD, and set both the Clock and Data Thresholds to VAR +8.75 V.

16. Press F8: EXIT & SAVE.

17. Press F1: START, wait for the Slow Clock message to appear, and press F1: STOP.

18. Record the DMM voltage reading on the *Test Record* (the *DREF +8.75 V Threshold* entry). Verify that the value is within the allowable range.

19. Move the DMM's positive input lead to CREF (TP202).

20. Record the DMM voltage reading on the *Test Record* (the *CREF +8.75 V Threshold* entry). Verify that the value is within the allowable range.

21. Select the 92C96 Channel menu.

22. Press F5: DEFINE THRESHOLD, and set both the Clock and Data Thresholds to VAR +1.50 V.

23. Press F8: EXIT & SAVE.

24. Press F1: START, wait for the Slow Clock message to appear, and press F1: STOP.

25. Record the DMM voltage reading on the *Test Record* (the *CREF +1.50 V Threshold* entry). Verify that the value is within the allowable range.

26. Move the DMM's positive input lead to DREF (TP204).

27. Record the DMM voltage reading on the *Test Record* (the *DREF +1.50 V Threshold* entry). Verify that the value is within the allowable range.

Certification Test Record

DAS 92A96/92C96 Acquisition Board

Instrument Model: _____

Serial Number: _____ Certificate Number: _____

Verification Performed by: _____ Verification Date: _____

PRREF Accuracy Test Data

Characteristic	Specification	Tolerance	Procedure Reference	Incoming Data	Outgoing Data
PRREF Reference	–1.680 V ± 90 mV	–1.590 V to –1.770 V	Page 34, Step 7		

CREF/DREF Accuracy Test Data

Characteristic	Specification	Tolerance	Procedure Reference	Incoming Data	Outgoing Data
CREF –4.00 V Threshold	–4.00 V ± 75 mV	–3.925 V to –4.075 V	Page 34, Step 11		
DREF –4.00 V Threshold	–4.00 V ± 75 mV	–3.925 V to –4.075 V	Page 34, Step 13		
DREF +8.75 V Threshold	+8.75 V ± 75 mV	+8.675 V to +8.825 V	Page 35, Step 18		
CREF +8.75 V Threshold	+8.75 V ± 75 mV	+8.675 V to +8.825 V	Page 35, Step 20		
CREF +1.50 V Threshold	+1.50 V ± 75 mV	+1.425 V to +1.575 V	Page 35, Step 25		
DREF +1.50 V Threshold	+1.50 V ± 75 mV	+1.425 V to +1.575 V	Page 35, Step 27		

Procedure 6: 92HS8 Interface Board and Probe Cabinets

This procedure verifies the accuracy of the 92HS8 200 MHz and 500 MHz Time Base Clocks. This procedure also verifies the accuracy of the 92HS8 and 92HS8E Probe Cabinet data input thresholds.

The time bases used by the 92HS8/92HS8E module are configuration-dependent. When two Probe Cabinets are connected to the Master Interface board, the module uses the time bases on the Master Interface board. When only one Probe Cabinet is connected, the module uses the time bases within the Probe Cabinet.

For full certification, perform both time base accuracy procedures. This certifies time bases on both the Master Interface board and within the Probe Cabinet. If only one Probe Cabinet is available, you will be able to perform partial certification only, verifying only the time bases of the Probe Cabinet.

In either case you will be able to certify the Probe Cabinet threshold accuracy.

NOTE. *The 92HS8E Interface Board contains no certifiable references. However, the Probe Cabinets attached to the 92HS8E can be certified.*

Calibrator Accuracy: Probe Cabinet

This procedure verifies the accuracy of the 92HS8 Probe Cabinet calibrator output.

Equipment Required	Universal counter/timer with probe (item 1) Dual lead adapter (item 7)
Configuration	Mainframe, configured as follows: Top cover and card cage door removed 92HS8/92HS8E Interface board installed in DAS mainframe; all other instrument modules removed One Probe Cabinet connected to Pod D of the 92HS8 Master Interface board[12] (mainframe must have been powered up in this configuration) Probe Cabinet top cover removed. Probe Cabinet Acquisition board jumpered for 8-channel (single cabinet) operation. Refer to the *92HS8 User Manual*.
Prerequisites	Warm-up time: 20 minutes (test equipment and DAS/TLA mainframe and modules) Counter/timer probe compensated No previous procedures required All power-up diagnostics pass

[12] **Having two Probe Cabinets connected to the Master Interface board will invalidate the test results.**

Test Equipment Setup

Set up the test equipment as follows:

Counter/Timer with 5X Probe	**Channel A:** MODE FREQ A TERM 1 MΩ ATTN X1 COUPL DC CH A LEVEL +0.740 V [13] AVGS –1

[13] **Value shown is for a 5X probe. For a 10X probe, value should be 0.372 V.**

Calibrator Frequency Procedure

Perform this procedure for each Probe Cabinet to be certified.

1. Connect the counter/timer probe GND to one of the REF pins of the Probe Cal connector (on the front of the 92HS8 Probe Cabinet).
2. Connect the counter/timer probe input to one of the SIG pins of the Probe Cal connector.
3. Go the the 92HS8 Config menu and run the 92HS8 Deskew process for the connected Probe Cabinet.

NOTE. *The calibrator output signal occurs for only a few seconds.*

4. Record the measured frequency as Calibrator Frequency on the *Test Record* for the Probe Cabinet. Verify that the value is within the allowable range.

Time Base Accuracy: Probe Cabinet

This procedure verifies the accuracy of the 92HS8 Probe Cabinet 200 MHz and 500 MHz Time Base Clocks.

Equipment Required	Universal counter/timer with probe (item 1) Dual lead adapter (item 7) Gold square pin (item 9)
Configuration	No change
Prerequisites	Counter/timer probe compensated Must have completed the *Calibrator Accuracy: Probe Cabinet* procedure (page 40)

Test Equipment Setup

No change from previous test.

Frequency A/Frequency B Procedure

Perform this procedure for each Probe Cabinet to be certified.

1. From the power-up defaults, make the following changes to the 92HS8 setup:

   - Trigger menu:

Sample Mode	Async	
Sample Rate	500 ps	
Trigger Location	—T————	
Arm Signal	Off	
Trigger On	A	
Word Recognizer	A=Word	10101010
True Level	Filter Off	

2. Connect the counter/timer probe GND to TP114 (see Figure 7) on the back of the Memory board. (Using the dual lead adapter can make probing easier.)

3. Connect the counter/timer probe input to U212 pin 8 on the back of the Memory board.

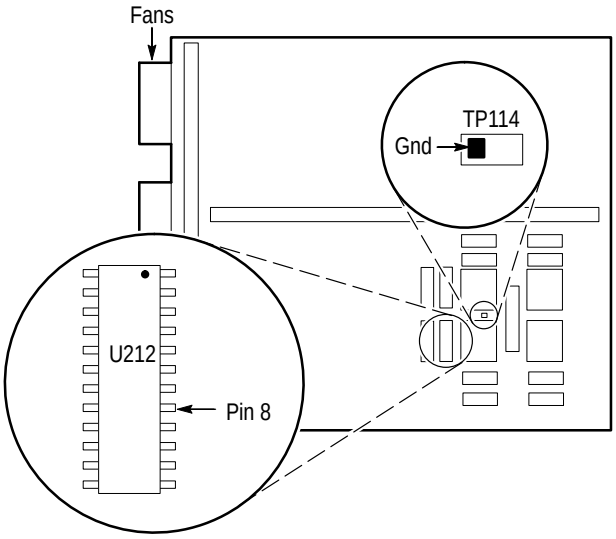


Figure 7: 92HS8 Memory Board Test Point Locations (back of board)

4. Press F1: START.

5. Record the measured frequency as Frequency A on the *Test Record* for the Probe Cabinet. Verify that the value is within the allowable range.

6. Press F1: STOP.

7. In the Trigger menu, change the Sample Rate to 5 ns.

8. Press F1: START.
9. With the same counter/timer probe connections used in steps 2 and 3, record the measured frequency as Frequency B on the *Test Record* for the Probe Cabinet. Verify that the value is within the allowable range.
10. Press F1: STOP.
11. If you do not have any more Probe Cabinets to certify, continue on to *Time Base Accuracy: Master Interface Board*, on page 43. If you have additional Probe Cabinets to certify, complete the following steps.
12. Power down the mainframe, remove the Probe Cabinet, and connect the next Probe Cabinet to be certified.
13. Power on the mainframe. Allow a 20-minute warm-up time.
14. From the power-up defaults, make the following changes to the 92HS8 setup (same as step 1):

    - Trigger menu:

Sample Mode	Async	
Sample Rate	500 ps	
Trigger Location	—T————	
Arm Signal	Off	
Trigger On	A	
Word Recognizer	A=Word	10101010
True Level	Filter Off	

15. Repeat the *Calibrator Accuracy: Probe Cabinet* procedure on page 40 and steps 2 through 11 of this procedure.

Time Base Accuracy: Master Interface Board

This procedure verifies the accuracy of the 92HS8 Master Interface board 200 MHz and 500 MHz Time Base Clocks.

***NOTE**. If the customer operates the 92HS8 module in 8-channel mode (only one Probe Cabinet connected) and does not need full certification (which requires a second Probe Cabinet), proceed to* Data Threshold Accuracy, *on page 46.*

Equipment Required	No change
Configuration	No change
Prerequisites	Warm-up time: 20 minutes (test equipment and DAS/TLA mainframe and modules) Counter/timer probe compensated All power-up diagnostics pass Must have completed the *Calibrator Accuracy:Probe Cabinet* and *Time Base Accuracy: Probe Cabinet* procedures (pages 40 and 41)

Test Equipment Setup

No change from previous test.

Frequency A/Frequency B Procedure

1. Power down the mainframe.
2. Connect two Probe Cabinets to the Master Interface board. The Probe Cabinet Acquisition board of each cabinet should be configured for 16–32 channel operation. Refer to the *92HS8 User Manual*.

***NOTE**. If only one Probe Cabinet is connected, the test results will be invalid.*

3. Connect a 92HS8 clock cable from each cabinet to the 92HS8 Master Interface board.

***NOTE**. For probing purposes, you need to remove the top cover from only one of the two Probe Cabinets.*

4. Power on the mainframe.

5. From the power-up defaults, make the following changes to the 92HS8 setup:

   - Trigger menu:

Sample Mode	Async	
Sample Rate	500 ps	
Trigger Location	—T————	
Arm Signal	Off	
Trigger On	A	
Word Recognizer	A=Word	10101010 10101010
True Level	Filter Off	

6. For the Probe Cabinet with the top cover removed, connect the counter/timer probe to the back of the Memory board as follows: GND to TP114, and the probe input to U212 pin 8. (See Figure 7 on page 42.)

7. Press F1: START.

8. Record the measured frequency as Frequency A on the *Test Record* for the Master Interface board. Verify that the value is within the allowable range.

9. Press F1: STOP.

10. In the Trigger menu, change the Sample Rate to 5 ns.

11. Press F1: START.

12. With the same counter/timer probe connections used in step 6, record the measured frequency as Frequency B on the *Test Record* for the Master Interface board. Verify that the value is within the allowable range.

13. Press F1: STOP.

Data Threshold Accuracy: Probe Cabinet

This procedure verifies the Probe Cabinet data channel input threshold level.

Equipment Required	DC Voltage Calibrator (item 4) 92A96 Acquisition Fixture[14] (item 5) BNC Cable (item 13) Dual Banana-to-BNC Connector (item 14) Ground Strap (item 15)
Configuration	Mainframe, configured as follows: 92HS8/92HS8E Interface board(s) and Probe Cabinet(s) installed, all other instrument modules removed
Prerequisites	Warm-up time: 20 minutes (test equipment and DAS/TLA mainframe and modules) 92HS8 cabinets deskewed[15] All power-up diagnostics pass

[14] **For information about building the 92A96 Acquisition Fixture, refer to Appendix A, on page 71.**

[15] **Refer to the *92HS8 User Manual* for information on running the deskew procedure.**

Test Equipment Setup

Set up the test equipment as follows (see Figure 8 for details):

Ground Strap	Connect the ground strap between the DAS/TLA mainframe and the DC voltage calibrator.
DC Voltage Calibrator	Connect to 92A96 Acquisition Fixture.
92A96 Acquisition Fixture	Connect the 92HS8 channels 0 through 7 (from one Probe Cabinet) to the 92A96 Acquisition Fixture. Ensure that you connect the reference side of the podlets to the ground side of the fixture.

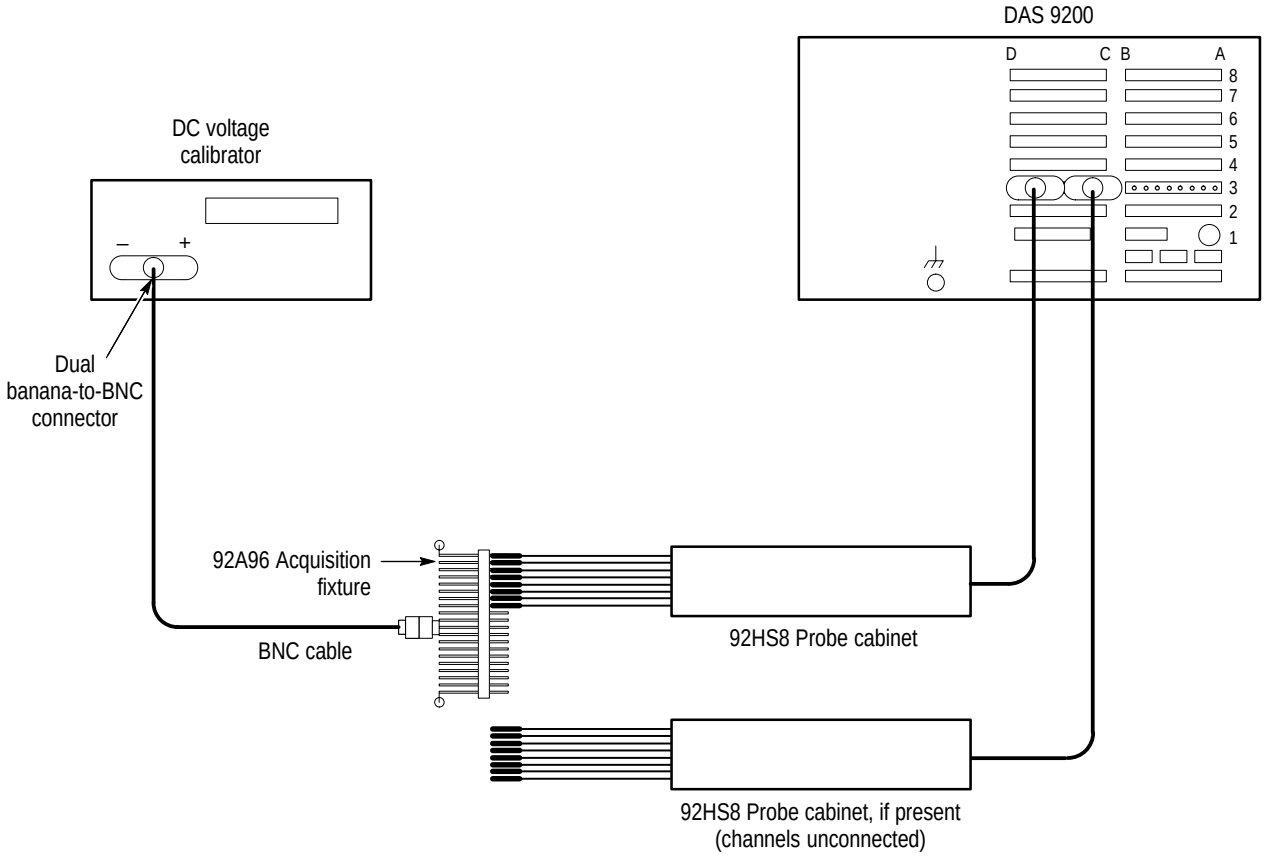


Figure 8: 92HS8 Probe Cabinet Data Threshold Accuracy Equipment Setup

***NOTE**. If additional Probe Cabinets are installed, it is permissible to leave them connected to their respective 92HS8E boards.*

Threshold High/ Threshold Low Procedure

***NOTE**. The 92HS8 cabinets must be deskewed before performing this procedure. Refer to the* 92HS8 User Manual *for information on running the deskew procedure.*

1. Make the following 92HS8 Setup menu changes:

- Trigger menu:

Sample Mode	Async		
Sample Rate	1 ms		
Trigger Location	————————T		
Arm Signal	Off		
Trigger On	A		
Word Recognizer	A=Word	11111111 XXXXXXXX...	False Level

  Set the word recognizer to 1's for the Probe Cabinet under test only. Channels from all other installed Probe Cabinets should be set to X (don't cares). For example, when setting the word recognizer for the second Probe Cabinet, the word recognizer should be set to XXXXXXXX 11111111.

- Channel menu:
  Channel Definition overlay
  Threshold VAR 0.000V*(for all pod thresholds)*

2. Set the DC voltage calibrator output to +0.030 V.

***NOTE**. To achieve negative polarity on some calibrators, it might be necessary to reverse the orientation of the dual banana-to-BNC connector on the calibrator output.*

3. Press the F1: START key. The logic analyzer should indicate a "Waiting for Trigger" condition.

4. Press F1:STOP.

5. Adjust the calibrator voltage in a negative direction, in 5 mV increments, until the logic analyzer triggers. (Each time you increment the voltage, press F1: START, then F1:STOP).

***NOTE**. If you change the calibrator voltage while the logic analyzer is "Waiting for Trigger," the logic analyzer might trigger. This is normal and is caused by noise created when changing the calibrator output voltage. If this situation occurs, simply restart the analyzer module.*

6. Record the calibrator voltage reading (where the logic analyzer triggered) as Threshold (High) on the *Test Record* for the appropriate Probe Cabinet. Verify that the value is within the allowable range.

7. Change the trigger condition to Word=00000000 XXXXXXXX. (For the second Probe Cabinet, the value would be XXXXXXXX 00000000.)

8. Set the DC voltage calibrator output to –0.030 V.

9. Press the F1: START key. The logic analyzer should indicate a "Waiting for Trigger" condition.

10. Adjust the DC voltage calibrator output in a positive direction, in 5 mV increments, until the logic analyzer triggers. (Each time you decrement the voltage, press F1: START, then F1:STOP).

11. Record the calibrator voltage reading (where the logic analyzer triggered) as Threshold (Low) on the *Test Record.* Verify that the value is within the allowable range.

12. Disconnect the probes from the 92A96 Threshold Fixture, and connect probes from the next Probe Cabinet to be certified.

13. Change the trigger condition to Word=11111111 XXXXXXXX. (For the second Probe Cabinet, the value would be XXXXXXXX 11111111.)

14. Repeat steps 2 through 12.

Certification Test Record

DAS 92HS8 Master Interface Board

Instrument Model: _____

Serial Number: _____ Certificate Number: _____

Verification Performed by: _____ Verification Date: _____

Time Base Accuracy Test Data

Characteristic	Specification	Tolerance	Procedure Reference	Incoming Data	Outgoing Data
Frequency A (derived from 500 MHz Time Base Clock)	62.500 MHz ±0.1%	62.4375 MHz to 62.5625 MHz	Page 45, Step 8		
Frequency B (derived from 200 MHz Time Base Clock	25.000 MHz ±0.1%	24.9750 MHz to 25.0250 MHz	Page 45, Step 12		

Certification Test Record

DAS 92HS8 Probe Cabinet

Instrument Model: _____

Probe Cabinet Serial Number: _____ Certificate Number: _____

Verification Performed by: _____ Verification Date: _____

Calibrator Accuracy Test Data

Characteristic	Specification	Tolerance	Procedure Reference	Incoming Data	Outgoing Data
Calibrator Frequency	50.065 MHz ± 0.01%	50.060 MHz to 50.070 MHz	Page 41, Step 4		

Time Base Accuracy Test Data

Characteristic	Specification	Tolerance	Procedure Reference	Incoming Data	Outgoing Data
Frequency A (derived from 500 MHz Time Base Clock)	62.500 MHz ± 0.1%	62.4375 MHz to 62.5625 MHz	Page 42, Step 5		
Frequency B (derived from 200 MHz Time Base Clock	25.000 MHz ± 0.1%	24.9750 MHz to 25.0250 MHz	Page 43, Step 9		

Threshold Accuracy Test Data

Characteristic	Specification	Tolerance	Procedure Reference	Incoming Data	Outgoing Data
Threshold (High)	0.000 V ± 25 mV	–0.025 V to +0.025 V	Page 49, Step 6		
Threshold (Low)	0.000 V ± 25 mV	–0.025 V to +0.025 V	Page 49, Step 11		

Procedure 7: 92S16/92SX109 Pattern Generator Board

This procedure verifies the timing accuracy of the 92S16 pod clocks and the external control probe threshold. The same procedure applies to the 92SX109 board; the multiplexer adapter is not certified.

Pod Clock Maximum Skew

These procedures verify the maximum skew values for the following areas: pod clock skew between pods (not edge positioned) and pod clock skew between pods (edge positioned).

Equipment Required	Oscilloscope with probes (item 2) Dual-lead adapter for probe (item 7) Subminiature-to-miniature probe adapter (item 8)
Configuration	Mainframe, configured as follows: Top cover and card cage door removed Mainframe lying on its right side, with power supply down 92S16 or 92SX109 installed in highest slot number; all other instrument modules removed Pattern Generator probes attached to 92S16/92SX109
Prerequisites	Warm-up time: 20 minutes (test equipment and DAS/TLA mainframe and modules) Oscilloscope probes compensated No previous tests required All power-up diagnostics pass

Test Equipment Setup

Set up the test equipment as follows:

Oscilloscope	Trigger Mode: Auto Source: Ch 2 Coupling: DC Slope: + Time/Div: 1 ns Vertical Mode: Ch 1 & Ch 2 Ch 1 and Ch 2 Vertical Coupling: DC Impedance: 1MΩ Bandwidth: Full Volts/Div: 500 mV/Div Dual-lead adapters connected to both scope probes

Logic Analyzer Setup

1. Set up the mainframe and 92S16 board as follows:

a. From the power-up default values, make the following 92S16 Setup menu changes:

- Config menu:
  Clock: Internal 200 ns
- Program menu:

Seq	Label	Inst		Pgx_1 (Hex)
0	Start			0000
1		Jump	Start	FFFF

b. Press F1: START to start the 92S16 module.

2. Connect the oscilloscope Ch 2 probe to TP108 on the 92S16 board. (See Figure 9.)

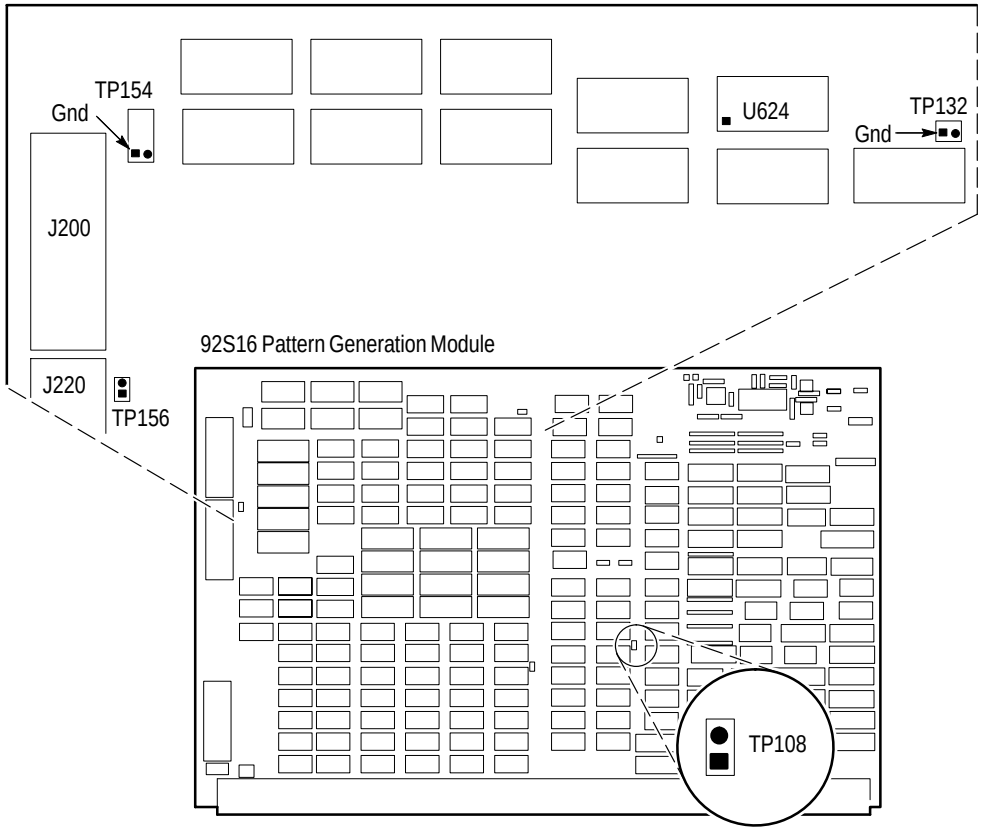


Figure 9: 92S16 Test Point Locations

3. Set up the oscilloscope as follows:

   a. Connect the Ch 1 probe GND to the GND pin of TP132. (The ground pin is indicated by a square pad.)

   b. Touch the Ch 1 input to U624 pin 16. This is a +5 V power supply connection.

   c. Position the +5 V DC signal on Ch 1 at 1.3 V above the center horizontal graticule line of the oscilloscope. The graticule center line is now set at VBB.

   d. Set the oscilloscope to trigger on the rising edge of Ch 2.

   e. Set the oscilloscope display mode to Ch 1 Only.

Pod Clock Skew (Not Edge Positioned) Procedure

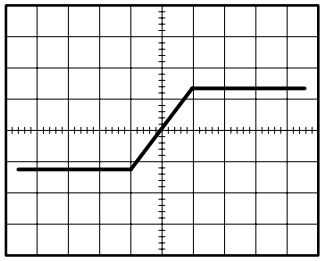
In the following test, you will measure several clock signals which, under ideal conditions, would occur at precisely the same time. In reality, variations in delay line adjustment between pods result in a timing difference between the signals. This time difference between signals is referred to as the skew.

In this procedure, you will first take a reference measurement, then compare the other signals to this measurement, to verify that the skew is within allowable limits.

4. Connect the Ch 1 probe to TP154. (The ground pin is indicated by a square pad. See Figure 9.)

5. Adjust the oscilloscope trigger level for a stable trace.

6. Adjust the horizontal position so that the rising edge crosses through the center of the graticule, as shown. This is the time reference (REF) for the next step.



7. Probe TP156 using the Ch 1 probe. (See Figure 9 on page 57.) Note how far the crossing point of the rising edge has shifted to the right (+) or left (–) of REF. This is the skew value.

8. Record the skew value on the *Test Record*. Verify that the value is within the allowable range.

9. Press F1: STOP.

Pod Clock Skew (Edge Positioned) Procedure

10. Make the following menu 92S16 Setup menu changes:

    - Channel Definition Overlay:
      For Pods 8A and 8B (DAS 9200) or Pods 3A and 3B (TLA 500)
      Output Level TTL
      Clock Polarity ⎍
      Clock Delay +5 ns

11. Press F1: START to start the 92S16 module.

12. Attach the Ch 1 probe to TP154 and adjust the triggering for a stable trace.

13. Adjust the horizontal position until the rising edge is displayed, and position the rising edge so that it crosses through the center of the graticule. This is the time reference (REF) for the next step.

14. Attach the Ch 1 probe to TP156 and record the skew value on the *Test Record*. Verify that the value is within the allowable range.

15. Press F1:STOP.

Threshold Accuracy

This procedure verifies the threshold accuracy at the P6460 external control probe connector (J240).

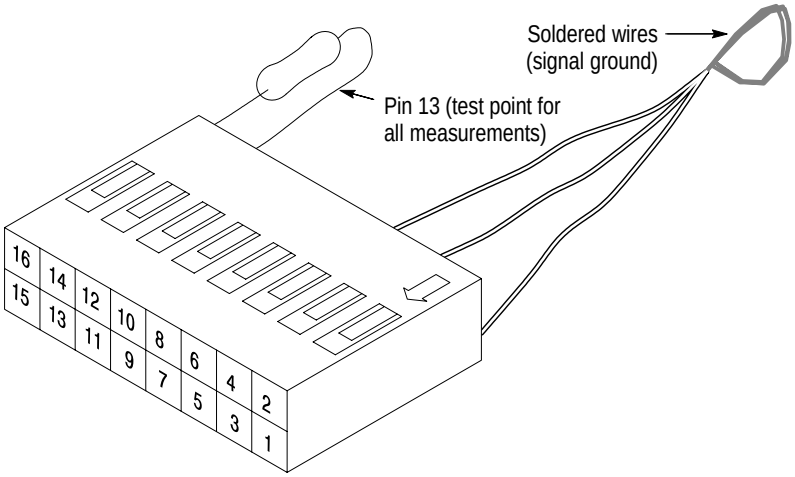
Equipment Required	DMM (item 3) Threshold fixture[16] (item 6)
Configuration	Mainframe, configured as follows: Top cover and card cage door removed 92S16 or 92SX109 installed in highest slot number, all other instrument cards removed
Prerequisites	Warm-up time: 20 minutes (test equipment and DAS/TLA mainframe and modules) Must have passed the *Pod Clock Maximum Skew* procedures (page 55) All power-up diagnostics pass

16 **For information about building the threshold fixture, refer to Appendix B, on page 73.**

Test Equipment Setup

Set up the test equipment as follows:

Threshold Fixture	Connected to J240 of the 92S16 module (align pin 1 of Threshold Fixture with pin 1 of J240 (at end closest to J260 SMB connector)
DMM	Autorange Ground lead connected from DMM to pin 1 of threshold fixture (see following figure) Positive lead connected to pin 13 of threshold fixture



Threshold Procedure

1. Make the following 92S16 Setup menu selections:
   - Config menu:
     P6460 Threshold Level→VAR→ 0.00V
2. Press F1: START.
3. Record the DMM voltage reading on the *Test Record*. Verify that the value is within the allowable range.
4. Make the following menu 92S16 Setup menu selections:
   - Config menu:
     P6460 Threshold Level→VAR→ –6.40V
5. Press F1: STOP, and then press F1: START.
6. Record the DMM voltage reading on the *Test Record*. Verify that the value is within the allowable range.
7. Make the following menu 92S16 Setup menu selections:
   - Config menu:
     P6460 Threshold Level→VAR→ +6.35V
8. Press F1: STOP, and then press F1: START.
9. Record the DMM voltage reading on the *Test Record*. Verify that the value is within the allowable range.
10. Press F1: STOP.

Certification Test Record

DAS 92S16/92SX109 Pattern Generator Board

Instrument Model: _____

Serial Number: _____ Certificate Number: _____

Verification Performed by: _____ Verification Date: _____

Maximum Relative Skew Test Data

Characteristic	Specification	Tolerance	Procedure Reference	Incoming Data	Outgoing Data
Pod Clock Output: Maximum Relative Skew Between Pods (Not Edge Positioned)	2 ns	See footnote[17]	Page 58, Step 8		
Pod Clock Output: Maximum Relative Skew Between Pods (Edge Positioned)	4 ns	See footnote[18]	Page 59, Step 14		

[17] **Edges of any two pod clocks from a single card must occur within 2 ns of each other (no edge delay programmed)**

[18] **Edges of any two pod clocks from a single card must occur within 4 ns of each other (edge delay programmed)**

Threshold Accuracy Test Data

Characteristic	Specification	Tolerance	Procedure Reference	Incoming Data	Outgoing Data
0.00 V Threshold	0.000 V ± 2 mV	–0.002 V to +0.002 V	Page 60, Step 3		
–6.40 V Threshold	1.600 V ± 12 mV	1.588 V to 1.612 V	Page 60, Step 6		
+6.35 V Threshold	–1.587 V ± 12 mV	–1.575 V to –1.599 V	Page 60, Step 9		

Procedure 8: 92S32/92SX118 Pattern Generator Board

This procedure verifies the timing accuracy of the 92S32 pod clocks. The same procedure applies to the 92SX118 module; the multiplexer adapter is not certified.

Pod Clock Maximum Skew

Equipment Required	Oscilloscope with probes (item 2) Dual-lead adapters for probes (item 7) Subminiature-to-miniature probe adapters (item 8)
Configuration	Mainframe, configured as follows: Top cover and card cage door removed Mainframe lying on its right side, with power supply down 92S32 or 92SX118 installed in highest slot number; all other instrument modules removed[19] Pattern Generator probes attached to 92S32/92SX118
Prerequisites	Warm-up time: 20 minutes (test equipment and DAS/TLA mainframe and modules) Oscilloscope probes compensated No previous tests required All power-up diagnostics pass

19 **If necessary, reconfigure the 92S32 bus jumpers for correct termination.**

Test Equipment Setup

Set up the test equipment as follows:

Oscilloscope	Trigger Mode: Auto Source: Ch 2 Coupling: DC Slope: + Time/Div: 1 ns Vertical Mode: Ch 1 & Ch 2 Ch 1 and Ch 2 Vertical Coupling: DC Impedance: 1MΩ Bandwidth: Full Volts/Div: 500 mV/Div Dual-lead adapters connected to both scope probes

Logic Analyzer Setup

1. Set up the mainframe and 92S32 board as follows:

a. From the power-up default values, make the following 92S32 Setup menu changes:

- Config menu:
  Clock Internal 200 ns
- Program menu:

Seq	Pgx_1 (Hex)
0	00000000
1	FFFFFFFF

- Run Control Overlay:
  92S32 Pattern Range Range 1

Pattern Range	Start Seq	End Seq	Run Mode
Range 1	0	1	Free Run

b. Press F1: START to start the 92S32 module.

2. Set up the oscilloscope as follows:

a. Connect the Ch 1 probe GND to the GND pin of TP42.

b. Touch the Ch 1 input to U508 pin 16. This is a +5 V power supply connection.

c. Position the +5 V DC signal on Ch 1 at 1.3 V above the center horizontal graticule line of the oscilloscope. The graticule center line is now set at VBB.

d. Set the oscilloscope to trigger on the rising edge of Ch 2.

e. Set the oscilloscope display mode to Ch 1 Only.

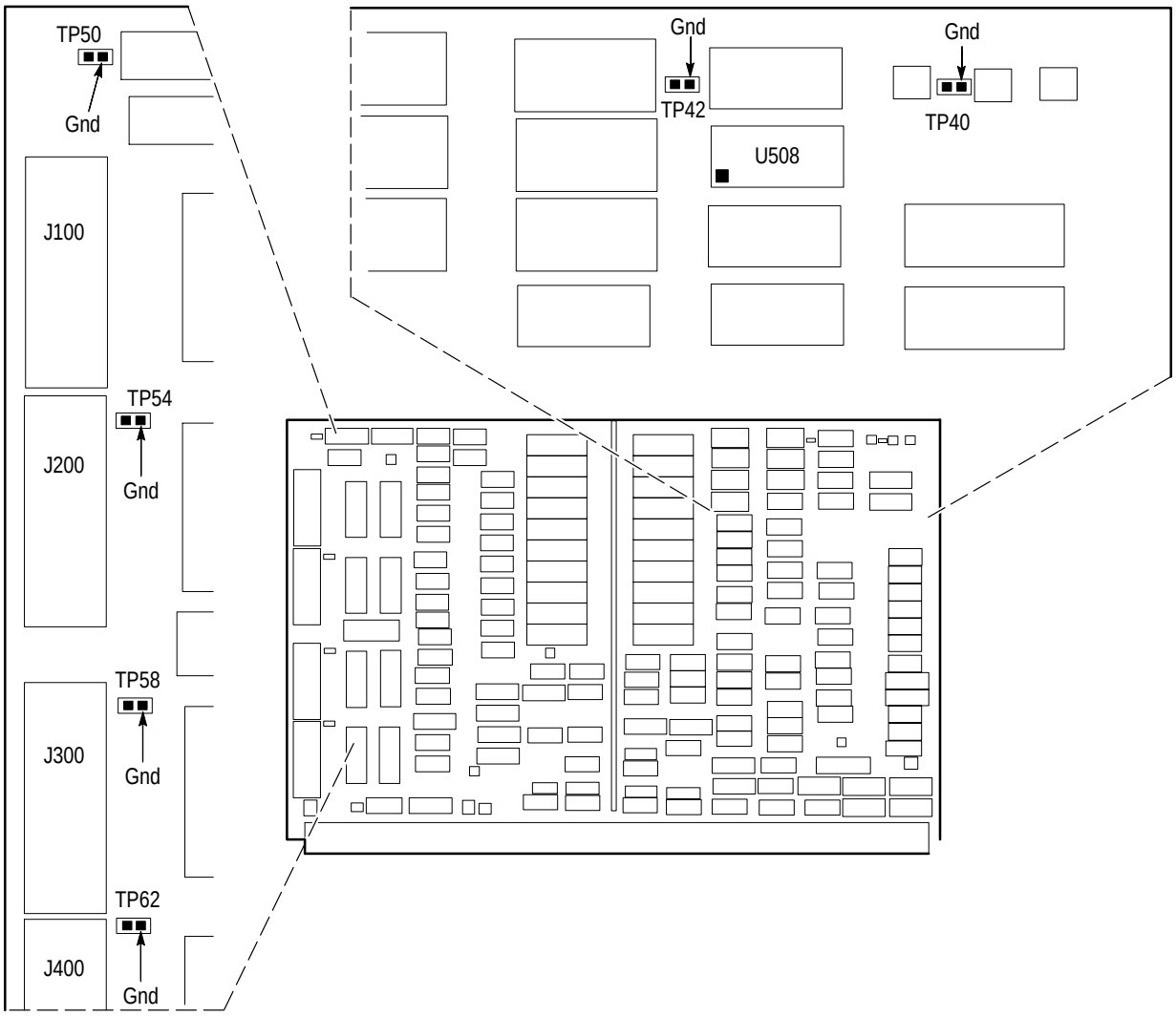


Figure 10: 92S32 Test Point Locations

Pod Clock Skew (Not Edge Positioned) Procedure

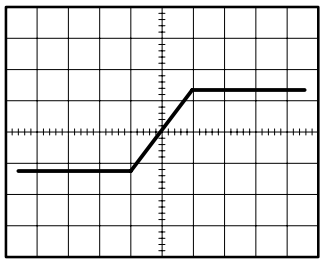
In the following test, you will measure several clock signals which, under ideal conditions, would occur at precisely the same time. In reality, variations in delay line adjustment between pods result in a timing difference between the signals. This time difference between signals is referred to as the skew.

In this procedure, you will first take a reference measurement, then compare the other signals to this measurement, to verify that the skew is within allowable limits.

3. Connect Ch 2 probe to TP40.

4. Connect Ch 1 probe to TP50.

5. Adjust the oscilloscope horizontal position so that rising edge of the signal is on the center vertical graticule line, as shown. This will act as a time reference (REF) for the following steps.



6. Using the Ch 1 probe, observe the signals at each test point listed in Table 4. Note how far the crossing points shift left (–) or right (+) of REF, and record the maximum value in each direction.

7. Calculate a final skew value. The final skew value is the maximum possible skew that can occur relative to a specified reference (REF). To determine the final skew value, add the maximum left-of-REF (–) skew to the maximum right-of-REF (+) skew. (Use unsigned values.)

Table 4: Pod Clock Output Skew (Not Edge Positioned), Steps 6 and 7

Test Point	Maximum Skew Left-of-REF	Maximum Skew Right-of-REF
TP 50	REF	REF
TP54, TP58, TP62		
Final Skew Value[20]	*Transfer this value to the Test Record*	

[20] **To determine the final skew value, add the maximum left-of-REF (–) skew to the maximum right-of-REF (+) skew. (Use unsigned values.)**

For example, with test point measurements of TP54 = –300 ps, TP58 = +400 ps, TP62 = –100 ps, the final skew value is 300 ps + 400 ps = 700 ps.

8. Record the final skew value on the *Test Record*. Verify that the value is within the allowable range.

9. Press F1:STOP.

Pod Clock Skew (Edge Positioned) Procedure

10. Make the following menu 92S32 Setup menu changes:

- Channel Definition Overlay:
  Output Level TTL
  Clock Polarity ⎍
  Clock Delay +5 ns

  Repeat these settings for Pods 8A through 8D (DAS 9200) or Pods 3A through 3D (TLA 500)

11. Press F1:START.

12. Connect Ch 1 probe to TP50.

13. Adjust the oscilloscope horizontal position so that rising edge of the signal is on the center vertical graticule line. This will act as a time reference (REF) for the following steps.

14. Using the Ch 1 probe, observe the signals at each test point listed in Table 5. Note the most extreme skew value to the left (–) or right (+) of REF.

15. Calculate a final skew value, and record the final skew value on the *Test Record*. Verify that the value is within the allowable range.

Table 5: Pod Clock Output Skew (Edge Positioned), Steps 14 and 15

Test Point	Maximum Skew Left-of-REF	Maximum Skew Right-of-REF
TP 50	REF	REF
TP54, TP58, TP62		
Final Skew Value[21]	*Transfer this value to the Test Record*	

[21] **To determine the final skew value, add the maximum left-of-REF (–) skew to the maximum right-of-REF (+) skew. (Use unsigned values.)**

16. Press F1:STOP.

17. If you reconfigured the 92S32 bus jumpers, return the jumpers to their original configuration.

Certification Test Record

DAS 92S32/92S118 Pattern Generator Board

Instrument Model: _____

Serial Number: _____ Certificate Number: _____

Verification Performed by: _____ Verification Date: _____

Maximum Relative Skew Test Data

Characteristic	Specification	Tolerance	Procedure Reference	Incoming Data	Outgoing Data
Pod Clock Output: Maximum Relative Skew Between Pods (Not Edge Positioned)	2 ns	See footnote[22]	Page 67, Step 8		
Pod Clock Output: Maximum Relative Skew Between Pods (Edge Positioned)	4 ns	See footnote[23]	Page 67, Step 15		

[22] **Edges of any two pod clocks from a single card must occur within 2 ns of each other (no edge delay programmed)**

[23] **Edges of any two pod clocks from a single card must occur within 4 ns of each other (edge delay programmed)**

Appendix A: 92A96 Acquisition Fixture

This procedure lists the steps needed to build the 92A96 Acquisition Fixture. This fixture is designed to interconnect the 92A96 Module Sync Out signal to 92A96 Probe podlets. The ground side pins are ganged together. The signal side pins are also ganged together and are terminated to ground through two parallel 100 Ω resistors.

Material Required

The following material is required to build the fixture.

- 2 × 40 wide square-pin strip (Tektronix part number 131-2171-00)
- Two 4-inch long, 22 gauge bare wires
- Two 100 Ω resistors, 1/4 watt (Tektronix part number 315-0101-00)
- BNC RF connector (Tektronix part number 131-2010-00)
- Solder and soldering iron

Build Procedure

Refer to Figure 11 and use the following steps to build the acquisition fixture.

1. Use diagonal cutters to cut a block of 20 pairs of square pins from the 2 × 40 square-pin connector strip.
2. Solder one 4-inch bare wire to all the square pins on the side with the longer pins, keeping the bare wire as far from the insulator as possible.
3. Turn the strip over and solder the other 4-inch bare wire to all the square pins on the other side of the pin strip. Cut off any excess length.
4. Check all solder connections, making sure that each pin on the fixture is soldered to the bare wire. Check that none of the pins on the top of the pin strip are soldered to the pins on the bottom.
5. Solder one 100 Ω resistor between the top and bottom rows of pins at one end of the fixture. Then solder the other 100 Ω resistor between the top and bottom rows of pins at the other end of the fixture. Note: you might want to make 270° loops at each end of the resistors for easier probing.
6. Locate the BNC RF connector and clip off the two adjacent mounting posts from one side of the outer ground ring of the connector.

7. Solder the remaining two mounting posts to one side of the fixture. This side will be called the ground side of the fixture.

8. Solder the center conductor of the BNC RF connector to the center of the bare wire on the other side of the fixture. This side will be called the signal side of the fixture.

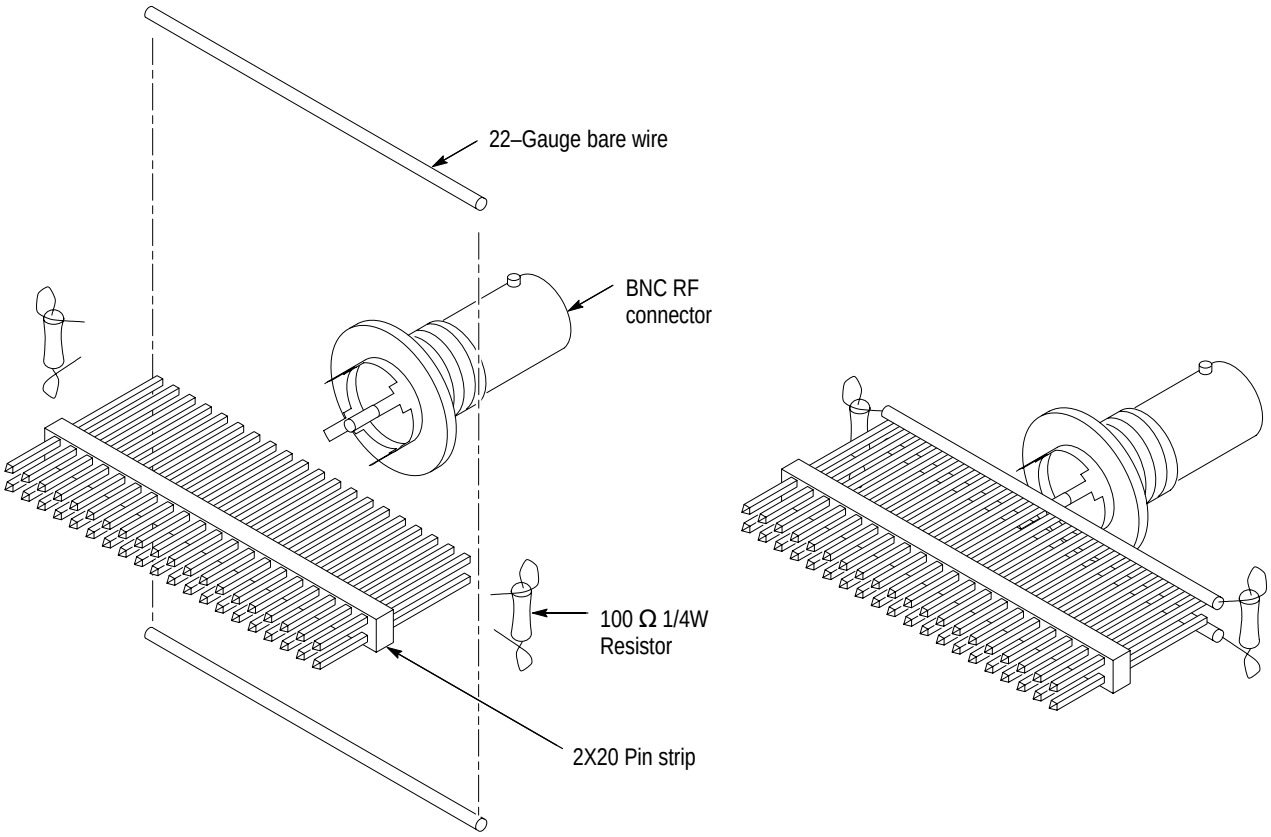


Figure 11: 92A96 Acquisition Fixture Construction

This completes the construction of the 92A96 Acquisition Fixture.

Appendix B: Threshold Fixture

The threshold fixture is used to verify the threshold setting on the 92A16 Acquisition Module and the 92S16 Pattern Generator Module. This procedure lists the steps needed to build the threshold fixture.

Material Required

The following material is required to build the fixture.

- Terminal connector holder, 2 holes × 8 holes, Tektronix part number 352-0484-00
- Five mini-PV female connectors, Tektronix part number 131-0707-00
- 10.5 kΩ resistor, 0.1%, Tektronix part number 321-0291-00
- 22-gauge wire
- Solder and soldering iron

Build Procedure

Refer to Figure 12 and use the following steps to build the acquisition fixture.

1. Cut three lengths of wire, each approximately one inch long.
2. Connect three of the mini-PV connectors to the three lengths of wire.
3. Connect the remaining two mini-PV connectors to the resistor, one at each end.
4. Insert the mini-PV connectors (attached to the wires) into holes 1, 4, and 7 of the terminal connector holder. See Figure 12.
5. Solder the three free ends of the wires together. This is the signal ground.
6. Insert the two mini-PV connectors (attached to the resistor) into holes 13 and 16 of the terminal connector holder. Pin 13 is the test point for all measurements.

CAUTION. *When connecting this fixture to the acquisition board or pattern generator board probe connector, be sure to mate pin 1 of the fixture to pin 1 of the probe connector.*

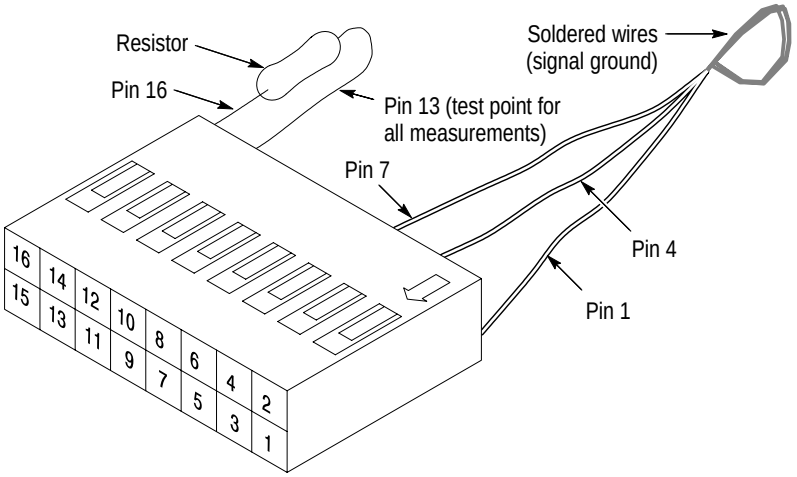


Figure 12: Threshold Fixture

This completes the construction of the threshold fixture.