

TECHNICAL MANUAL
INSTRUMENT CALIBRATION PROCEDURE

DIGITAL STORAGE OSCILLOSCOPE

TEKTRONIX
2232

THIS PUBLICATION SUPERSEDES NAVAIR 17-20AW-396
DATED 1 FEBRUARY 2006

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PUBLISHED BY DIRECTION OF COMMANDER NAVAL AIR SYSTEMS COMMAND

1 JUNE 2007

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SECTION 1

INTRODUCTION AND DESCRIPTION

1.1 This procedure describes the calibration of Tektronix 2232 Digital Storage Oscilloscope. The instrument being calibrated is referred to herein as the TI (Test Instrument).

1.2 All comments concerning this procedure should be directed to the Measurement Science Department, Corona Division, Naval Surface Warfare Center, P.O. Box 5000, Corona, CA 92878-5000.

1.3 This procedure includes tests of essential performance parameters only. Any malfunction noticed during calibration, whether specifically tested for or not, should be corrected.

Table 1. Calibration Description

TI Characteristics	Performance Specifications	Test Method
Vertical alignment	As indicated	Compared with an oscilloscope calibrator.
Vertical amplitude	Range: 2 mV to 5 V/div Cursor tolerance: $\pm 3\%$ iv	Cursors measure output from an oscilloscope calibrator, beginning at 100 mV.
Time base	Range: 0.05 μ s to 0.5 s/div Tolerance: $\pm(2\% \text{ iv} + 500 \text{ ps})$ for 0.05 μ s/div; $\pm 2\%$ iv otherwise X10 Tolerance: $\pm 3\%$ iv	Compared with an oscilloscope calibrator.
Trigger	Range: 0.35 div deflection at 10 MHz and 1.5 div at 100 MHz External (A input only): 40 mV min input at 10 MHz; 150 mV at 100 MHz	The TI displays a known input signal.
Bandwidth	≥ 80 MHz at 2 mV/div; ≥ 100 MHz otherwise	The 3 dB frequency is noted.
Channel isolation	$\geq 100:1$ at 50 MHz	A known signal is applied to one channel, and the signal on the other channel is observed.
X/Y tests	As indicated	Visual check.

SECTION 2

EQUIPMENT REQUIREMENTS

NOTES

Minimum use specifications are the principal parameters required for performance of the calibration, and are included to assist in the selection of alternate equipment, which may be used at the discretion of the using laboratory. Satisfactory performance of alternate items shall be verified prior to use. All applicable equipment must bear evidence of current calibration.

The instruments utilized in this procedure were selected from those known to be available at Navy calibration facilities and the listing by make or model number carries no implication of preference, recommendation, or approval for use by other agencies. It is recognized that equivalent equipment produced by other manufacturers may be capable of equally satisfactory performance in this procedure.

Table 2. Equipment Requirements

Item	Minimum Use Specifications	Calibration Equipment
2.1 Oscilloscope calibration system		Tektronix F7532A1 or F7533A1
Required Components:		
2.1.1 Calibration generator	Range: 0 to 30 V p-p Uncertainty: $\pm 0.75\%$ iv Frequency: 10 kHz Markers from 0.05 μ s to 0.5 s Uncertainty: $\pm 0.5\%$ iv	Tektronix CG5011
2.1.2 Pulse head	Compatible with item 2.1.1	Tektronix 015-0311-01
2.1.3 Power module mainframe	Provide power for item 2.1.1	Tektronix TM5006AOPT015
2.2 Oscilloscope calibration system		Tektronix F7532A1
Required Components:		
2.2.1 Signal generator	Frequency range: 50 kHz to 100 MHz Amplitude: 80 mV Flatness uncertainty: ± 0.75 dB	Tektronix SG5030
2.2.2 Output leveling head	Compatible with item 2.2.1	Tektronix 015-2350-01
2.2.3 Power module mainframe	Provide power for item 2.2.1	Tektronix TM5006AOPT015
2.3 Feedthrough termination	Value: 50 Ω	Tektronix 011-0049-01; or Hewlett-Packard 10100A
2.4 Dual-input coupler	Short cables of equal length connected together through a tee; connects to both TI inputs simultaneously	Tektronix 067-0525-00 or Local supply

SECTION 3

PRELIMINARY OPERATIONS

3.1 Ensure that all power switches are set to off, and set all auxiliary equipment controls as necessary to avoid damage to the equipment and so that dangerous voltages will not be present on output terminals when the power switches are turned on.

3.2 Connect the TI and auxiliary equipment to appropriate power sources. Ensure that the calibration generator (item 2.1.1) and signal generator (item 2.2.1) are installed in the power module mainframe (items 2.1.3 or 2.2.3), if applicable.

3.3 Turn the TI and auxiliary equipment on and allow sufficient time for warm-up (the TI requires 20 minutes warm-up time).

3.4 Set the TI controls as follows:

VAR HOLDOFF knob	Centered
INTENSITY knob	Centered
Both VERTICAL POSITION knobs	Centered
HORIZONTAL POSITION knob	Centered
B TRIGGER SLOPE button	Out
A TRIGGER NORM button	In
A and B TRIGGER LEVEL knobs	Centered
VERTICAL MODE switch to	CH 1
HORIZONTAL MODE switch to	A
CH 1 and CH 2 VOLTS/DIV knob to	0.2 V
A AND B SEC/DIV knob to	0.5 ms
All CAL knobs	Fully CW
A & B SOURCE switch to	CH 1
A COUPL switch to	NORM
All other buttons	Out

CAUTION

DO NOT ALLOW A SHARPLY FOCUSED SPOT TO REMAIN STATIONARY ON THE CRT, AS THIS MAY CAUSE THE SCREEN MATERIAL TO BURN.

SECTION 4

CALIBRATION PROCESS

NOTE

Unless otherwise specified, verify the results of each test and take corrective action whenever the test requirement is not met, before proceeding.

4.1 VERTICAL ALIGNMENT TESTS

4.1.1 Push the TI STORE and SETUP ACQ buttons. Then press the display panel keys, as necessary, to indicate the following:

ACQ MODE to	AVERAGE
> = 0.1 S.DIV to	ROLL
EXT CLOCK to	SLOW
CURSOR KNOB FUNC to	SWP LIM: NO LIMIT

4.1.2 Press the TI SETUP ACQ button again. Set the calibration generator for 0.5 ms markers. Connect the calibration generator TRIGGER OUTPUT to the TI CH 1 input, using the feedthrough termination (item 2.3).

4.1.3 Set the calibration generator TRIGGER OUTPUT to on. Adjust the TI A TRIGGER LEVEL knob, as necessary, to obtain a stable display. Adjust the TI HORIZONTAL POSITION knob so that the first marker coincides with the first vertical graticule line.

4.1.4 Verify that the displayed markers are parallel to and coincide with the TI vertical graticule lines.

4.1.5 Set the calibration generator TRIGGER OUTPUT to off and disconnect the test setup.

4.2 VERTICAL AMPLITUDE TESTS

4.2.1 Using the pulse head (item 2.1.2) connect the calibration generator OUTPUT to the TI CH 1 input. Set the TI baseline to the bottom line of the display. Set the calibration generator to output a 10 kHz signal in the voltage mode.

4.2.2 Set the calibration generator and TI CH 1 VOLTS/DIV to the first values listed in the following table.

4.2.3 Set the calibration generator OUTPUT to on. Adjust the TI A TRIGGER LEVEL knob, as necessary, to obtain a stable display.

4.2.4 Press the TI CURSORS knob twice and then adjust the knob, as necessary, to display two cursors on the screen. The cursor being moved is highlighted with a rectangular box around it.

4.2.5 Using the TI CURSORS knob, adjust the cursors so that one is at the peak of the waveform and the other at the bottom. Verify that the TI $\Delta V1$ value is within the first given tolerance limits listed in the following table.

4.2.6 Set the calibration generator and TI CH 1 VOLTS/DIV switches to each of the values listed in the following table. Adjust the TI A TRIGGER LEVEL knob, as necessary, to obtain a stable display. At each value, adjust the cursors so that one is at the peak of the waveform and the other at the bottom. Verify that the TI $\Delta V1$ value is within the given tolerance limits.

WARNING

DANGEROUS VOLTAGE VALUES ARE PRESENT. USE EXTREME CAUTION.

Calibration Generator (V/Div)	Calibration Generator (# of div)	CH 1 VOLTS/DIV	$\Delta V1$ Tolerance Limits (V)
0.1	1	20 mV	0.0970 to 0.1030
”	”	50 mV	”
”	6	0.1 V	0.582 to 0.618
1	1	0.2 V	0.970 to 1.030
”	3	0.5 V	2.910 to 3.090
”	2	1 V	1.94 to 2.06
”	4	” V	3.88 to 4.12
”	6	” V	5.82 to 6.18
2	6	2 V	11.64 to 12.36
5	”	5 V	29.10 to 30.90

4.2.7 Set the calibration generator OUTPUT to off and move it to the TI CH 2 input. Switch the TI VERTICAL MODE switch to CH 2 and A & B SOURCE switch to CH 2.

4.2.8 Repeat steps 4.2.1 through 4.2.6 for the TI CH 2 input.

4.2.9 Set the calibration generator OUTPUT to off. Set the TI VERTICAL MODE switch back to CH 1 and A & B SOURCE switch to CH 1.

4.2.10 Disconnect the test setup.

4.3 TIME BASE TESTS

4.3.1 Press the TI SETUP DISPLAY button. Then press the display panel keys as necessary to indicate the following:

ΔT DISPLAY to	ΔT
SMOOTH to	ON
VECTOR to	ON

4.3.2 Press the TI SETUP DISPLAY button to clear the DISPLAY menu.

4.3.3 Using the pulse head connect the calibration generator OUTPUT to the TI CH 1 input.

4.3.4 Set the TI HORIZONTAL MODE switch to A, CH 1 and CH 2 VOLTS/DIV knobs to 0.5 V and both channel switches to DC coupling.

4.3.5 Set the calibration generator to provide a 0.05 μ s marker. Set the TI A AND B SEC/DIV knob to 0.05 μ s. Set the calibration generator OUTPUT to on.

4.3.6 Ensure that the distance between each pair of markers is equal. Using the TI CURSORS knob, adjust the two cursors to coincide with the second and tenth marker. Verify that the TI ΔT value is within 391.5 and 408.5 ns.

4.3.7 Set the TI A AND B SEC/DIV and calibration generator marker to each of the values listed in the following table. For each value, ensure that the distance between each pair of markers is equal. Set the two cursors to coincide with the second and tenth markers and verify that the TI ΔT value is within the given tolerance limits.

TI SECONDS/DIV and Calibration Generator Marker (s)	ΔT Tolerance Limits
0.1 μ	0.784 to 0.816 μs
0.2 μ	1.568 to 1.632 μs
0.5 μ	3.920 to 4.080 μs
1 μ	7.840 to 8.160 μs
2 μ	15.68 to 16.32 μs
5 μ	39.20 to 40.80 μs
10 μ	78.4 to 81.6 μs
20 μ	156.8 to 163.2 μs
50 μ	392.0 to 408.0 μs
0.1 m	0.784 to 0.816 ms
0.2 m	1.568 to 1.632 ms
0.5 m	3.92 to 4.08 ms
1 m	7.84 to 8.16 ms
2 m	15.68 to 16.32 ms
5 m	39.2 to 40.8 ms
10 m	78.4 to 81.6 ms
20 m	156.8 to 163.2 ms
50 m	392.0 to 408.0 ms
Press the TI STORE and SETUP ACQ buttons. Press the display panel keys to set >=0.1 S.DIV to SCAN. Press the SETUP ACQ button to clear the ACQUISITION MENU.	
0.1*	0.784 to 0.816 s
0.2*	1.568 to 1.632 s
0.5*	3.920 to 4.080 s

*A Sec/Div only.

4.3.8 Press the TI SETUP ACQ button. Then press the display panel keys to set >=0.1 S.DIV to ROLL. Press the SETUP ACQ button to clear the ACQUISITION MENU.

4.3.9 Set the TI A AND B SEC/DIV (knob pulled for X10) knob to 1 μs and calibration generator marker switch to 0.1 μs. Adjust the TI for a stable display.

4.3.10 Verify that the distance between the 2nd and 10th marker is between 7.75 and 8.25 divisions.

4.3.11 Push the TI A AND B SEC/DIV knob (X10) in. Set the calibration generator OUTPUT to off.

4.3.12 Set the TI HORIZONTAL MODE switch to B, A SEC/DIV knob to 0.1 μs and B SEC/DIV knob to 0.05 μs (A SEC/DIV must be kept one step slower than the B SEC/DIV), and repeat steps 4.3.5 through 4.3.11 for B sweep (do not do the 0.1, 0.2, and 0.5 s test points).

4.3.13 Disconnect the test setup.

4.4 TRIGGER TESTS

4.4.1 Set the TI HORIZONTAL MODE switch to A. Set the signal generator to output a 350 mV signal at 10 MHz. Using the output leveling head (item 2.2.2) and the feedthrough termination, connect the signal generator OUTPUT HEAD to the TI CH 1 input.

4.4.2 Set the TI CH 1 VOLTS/DIV knob to 1 V and the A AND B SEC/DIV knob to 0.5 μ s.

4.4.3 Set the signal generator OUTPUT HEAD to on.

NOTE

For the remainder of Section 4.4, the TI TRIGGER LEVEL knob may be adjusted, as necessary, to create a stable display.

4.4.4 Verify that a stable display can be maintained.

4.4.5 Set the TI CH 1 VOLTS/DIV knob to 0.2 V and the A AND B SEC/DIV knob to 0.1 μ s. Adjust the signal generator to 300 mV output at 100 MHz and verify that a stable display can be maintained.

4.4.6 Set the signal generator OUTPUT HEAD to off.

4.4.7 Set the TI HORIZONTAL MODE switch to B and repeat steps 4.4.1 through 4.4.5.

4.4.8 Set the signal generator OUTPUT HEAD to off.

4.4.9 Repeat steps 4.4.1 through 4.4.8 for the TI CH 2 input.

4.4.10 Reconnect the signal generator to the TI EXT INPUT connector and CH 1 input, using the dual-input coupler (item 2.4). Set the TI for external trigger and set the signal generator to output 40 mV at 10 MHz.

4.4.11 Set the TI VERTICAL MODE switch to CH 1 and HORIZONTAL MODE switch to A. Set the signal generator output to on.

4.4.12 Set the TI controls for a well-defined trace on the CRT and verify that a stable display can be maintained.

4.4.13 Set the signal generator to output 150 mV at 100 MHz. Set the TI controls for a well defined trace on the CRT and verify that a stable display can be maintained.

4.4.14 Set the signal generator OUTPUT HEAD to off. Move the TI CH 1 connection to CH 2.

4.4.15 Repeat steps 4.4.10 and 4.4.13 for the TI CH 2 input.

4.4.16 Set the signal generator OUTPUT HEAD to off.

4.4.17 Disconnect the test setup.

4.5 BANDWIDTH TESTS

4.5.1 Using the output leveling head and the feedthrough termination, connect the signal generator OUTPUT HEAD to the TI CH 1 input. Set the signal generator to output a 1 MHz signal at 16 mV.

4.5.2 Set the TI CH 1 VOLTS/DIV knob to 2 mV, VERTICAL MODE switch to CH 1, and A & B SOURCE switch to CH 1.

4.5.3 Set the signal generator OUTPUT HEAD to on.

4.5.4 Slowly increase the signal generator frequency until the CRT display is only 5.6 divisions high. Verify that the signal generator frequency is ≥ 80 MHz.

4.5.5 Set the signal generator OUTPUT HEAD to off. Set the signal generator to output a 1 MHz signal at 800 mV.

4.5.6 Set the TI CH 1 VOLTS/DIV knob to 0.1 V.

4.5.7 Set the signal generator OUTPUT HEAD to on. Adjust the TI horizontal and vertical scales, as necessary, for a stable display.

4.5.8 Slowly increase the signal generator frequency until the CRT display is only 5.6 divisions high. Verify that the signal generator frequency is ≥ 100 MHz.

4.5.9 Set the signal generator OUTPUT HEAD to off.

4.5.10 Repeat steps 4.5.1 through 4.5.9 for TI CH 2.

4.6 CHANNEL ISOLATION TESTS

4.6.1 Set the signal generator to output a 50 MHz signal at 200 mV.

4.6.2 Set the TI VERTICAL MODE switch to CH 2, A & B SOURCE switch to CH 2, and the CH 2 VOLTS/DIV knob to 0.1 V. Set the signal generator OUTPUT HEAD to on and adjust the signal generator for a 2 division display.

4.6.3 Set the TI VERTICAL MODE switch to CH 1 and the CH 1 VOLTS/DIV switch to 2 mV. Verify that the TI CH 1 waveform is ≤ 1 division.

4.6.4 Set the signal generator OUTPUT HEAD to off. Move the signal generator and feedthrough termination to the TI CH 1 input.

4.6.5 Set the signal generator OUTPUT HEAD to on. Set the TI CH 1 VOLTS/DIV knob to 0.1 V and A & B SOURCE switch to CH 1. Adjust the signal generator output voltage so that TI CH 1 has a 2 division display on the CRT.

4.6.6 Set the TI VERTICAL MODE switch to CH 2 and the CH 2 VOLTS/DIV knob to 2 mV. Verify that the TI CH 2 waveform is ≤ 1 division.

4.6.7 Set the signal generator OUTPUT HEAD to off. Disconnect all equipment from the TI.

4.7 X/Y TESTS

4.7.1 Set the TI VERTICAL MODE switch to BOTH and press the X-Y button so that the TI display is now in X/Y format. Connect the calibration generator through the dual-input coupler to the TI CH 1 and CH 2 inputs.

4.7.2 Set both TI VOLTS/DIV knob to 0.2 V and the A AND B SEC/DIV knob to 1 μ s. Set the calibrator generator to output 1.2 V at 100 kHz. Set the calibration generator OUTPUT to on. A straight line will appear on the TI display at a 45° angle.

4.7.3 Adjust both TI VERTICAL POSITION knobs (not the VOLTS/DIV scales) and/or HORIZONTAL POSITION knob separately so that the entire length of the line can be seen on the display. Verify that the length of the line (as measured horizontally) is between 5.8 and 6.2 divisions.

4.7.4 Set the calibration generator OUTPUT to off. Press the TI X-Y button so that the TI display returns to its normal format.

4.7.5 Set the TI VERTICAL MODE switch to CH 1. Unless other measurements are to be performed, set the TI front panel POWER switch to OFF and disconnect all equipment.

CALIBRATION CHECKLIST

TEST INST (S) Tektronix 2232 Digital Storage Oscilloscope

PROC. NO.	NA 17-20AW-396	MFR	MODEL		SER. NO.	
PROCEDURE STEP NO. (1)	FUNCTION TESTED (2)	NOMINAL (3)	MEASURED VALUES		OUT OF TOL (6)	CALIBRATION TOLERANCES (7)
			FIRST RUN (4)	SECOND RUN (5)		
4.1	Vertical Alignment Tests					
4.1.4	Displayed markers	--	ck ()			Coincide with TI vert lines
4.2	Vertical Amplitude Tests	(V)				(V)
4.2.5	CH 1 -20 mV/div	0.1000				0.0970 to 0.1030
4.2.6	50 mV/div	"				"
"	0.1 V/div	0.600				0.582 to 0.618
"	0.2 "	1.000				0.970 to 1.030
"	0.5 "	3.000				2.910 to 3.090
"	1 "	2.00				1.94 to 2.06
"	" "	4.00				3.88 to 4.12
"	" "	6.00				5.82 to 6.18
"	2 "	12.00				11.64 to 12.36
"	5 "	30.00				29.10 to 30.90
4.2.8	CH 2 -20 mV/div	0.1000				0.0970 to 0.1030
"	50 mV/div	"				"
"	0.1 V/div	0.600				0.582 to 0.618
"	0.2 "	1.000				0.970 to 1.030
"	0.5 "	3.000				2.910 to 3.090
"	1 "	2.00				1.94 to 2.06
"	" "	4.00				3.88 to 4.12
"	" "	6.00				5.82 to 6.18
"	2 "	12.00				11.64 to 12.36
"	5 "	30.00				29.10 to 30.90
4.3	Time Base Tests					
4.3.6	A sweep CH 1 - 0.05 μ s	400.0 ns				391.5 to 408.5 ns
4.3.7	" 0.1 μ s	0.800 μ s				0.784 to 0.816 μ s
"	" 0.2 μ s	1.600 μ s				1.568 to 1.632 μ s
"	" 0.5 μ s	4.000 μ s				3.920 to 4.080 μ s
"	" 1 μ s	8.000 μ s				7.840 to 8.160 μ s

CALIBRATION CHECKLIST

TEST INST (S) Tektronix 2232 Digital Storage Oscilloscope

PROC. NO.	NA 17-20AW-396		MFR	MODEL		SER. NO.	
PROCEDURE STEP NO. (1)	FUNCTION TESTED (2)	NOMINAL (3)	MEASURED VALUES		OUT OF TOL (6)	CALIBRATION TOLERANCES (7)	
			FIRST RUN (4)	SECOND RUN (5)			
4.3.7	A sweep CH 1 - 2 μs	16.00 μs				15.68	to 16.32 μs
"	" 5 μs	40.00 μs				39.20	to 40.80 μs
"	" 10 μs	80.0 μs				78.4	to 81.6 μs
"	" 20 μs	160.0 μs				156.8	to 163.2 μs
"	" 50 μs	400.0 μs				392.0	to 408.0 μs
"	" 0.1 ms	0.800 ms				0.784	to 0.816 ms
"	" 0.2 ms	1.600 ms				1.568	to 1.632 ms
"	" 0.5 ms	4.00 ms				3.92	to 4.08 ms
"	" 1 ms	8.00 ms				7.84	to 8.16 ms
"	" 2 ms	16.00 ms				15.68	to 16.32 ms
"	" 5 ms	40.0 ms				39.2	to 40.8 ms
"	" 10 ms	80.0 ms				78.4	to 81.6 ms
"	" 20 ms	160.0 ms				156.8	to 163.2 ms
"	" 50 ms	400.0 ms				392.0	to 408.0 ms
"	" 0.1 s	0.800 s				0.784	to 0.816 s
"	" 0.2 s	1.600 s				1.568	to 1.632 s
"	" 0.5 s	4.000 s				3.920	to 4.080 s
4.3.10	X10	8.00 div				7.75	to 8.25 div
4.3.12	B sweep CH 1 - 0.05 μs	400.0 ns				391.5	to 408.5 ns
"	" 0.1 μs	0.800 μs				0.784	to 0.816 μs
"	" 0.2 μs	1.600 μs				1.568	to 1.632 μs
"	" 0.5 μs	4.000 μs				3.920	to 4.080 μs
"	" 1 μs	8.000 μs				7.840	to 8.160 μs
"	" 2 μs	16.00 μs				15.68	to 16.32 μs
"	" 5 μs	40.00 μs				39.20	to 40.80 μs
"	" 10 μs	80.0 μs				78.4	to 81.6 μs
"	" 20 μs	160.0 μs				156.8	to 163.2 μs
"	" 50 μs	400.0 μs				392.0	to 408.0 μs
"	" 0.1 ms	0.800 ms				0.784	to 0.816 ms
"	" 0.2 ms	1.600 ms				1.568	to 1.632 ms
"	" 0.5 ms	4.000 ms				3.92	to 4.08 ms
"	" 1 ms	8.00 ms				7.84	to 8.16 ms

CALIBRATION CHECKLIST

TEST INST (S) Tektronix 2232 Digital Storage Oscilloscope

PROC. NO.	NA 17-20AW-396	MFR	MODEL	SER. NO.		
PROCEDURE STEP NO. (1)	FUNCTION TESTED (2)	NOMINAL (3)	MEASURED VALUES		OUT OF TOL (6)	CALIBRATION TOLERANCES (7)
			FIRST RUN (4)	SECOND RUN (5)		
4.3.12	B sweep CH 1 - 2 ms	16.00 ms				15.68 to 16.32 ms
"	5 ms	40.0 ms				39.2 to 40.8 ms
"	10 ms	80.0 ms				78.4 to 81.6 ms
"	20 ms	160.0 ms				156.8 to 163.2 ms
"	50 ms	400.0 ms				392.0 to 408.0 ms
"	X10	8.00 div				7.75 to 8.25 div
4.4	Trigger Tests					
4.4.4	CH 1 Horiz mode A 10 MHz	--	ck ()			Stable display
4.4.5	" " 100 MHz	--	ck ()			"
4.4.7	CH 1 Horiz mode B 10 MHz	--	ck ()			"
"	" " 100 MHz	--	ck ()			"
4.4.9	CH 2 Horiz mode A 10 MHz	--	ck ()			"
"	" " 100 MHz	--	ck ()			"
"	CH 2 Horiz mode B 10 MHz	--	ck ()			"
"	" " 100 MHz	--	ck ()			"
4.4.12	CH 1 EXT INPUT - 10 MHz	--	ck ()			"
4.4.13	100 MHz	--	ck ()			"
4.4.15	CH 2 EXT INPUT - 10 MHz	--	ck ()			"
"	100 MHz	--	ck ()			"
4.5	Bandwidth Tests					(MHz)
4.5.4	CH 1 - 2 mV/div	--	ck ()			≥80
4.5.8	Full	--	ck ()			≥100
4.5.10	CH 2 - 2 mV/div	--	ck ()			≥80
"	Full	--	ck ()			≥100
4.6	Channel Isolation Tests					
4.6.3	CH 1 vs CH 2	--	ck ()			≤1 div
4.6.6	CH 2 vs CH 1	--	ck ()			"
4.7	X/Y Tests					
4.7.3	Length of line	6.00 div				5.8 to 6.2 div