4.2 Test Equipment

To test the 7200 scopes you will need the following equipment:

Two 50 ohm terminators. These may be purchased from Coline Ltd.

Precision D.C. Voltage source capable of 15mV to 1.5 Volts into a 50 ohm load. For this part of the test I use a DAC on the GPIB bus and an HP 34401A meter (also on GPIB) for feedback. The DAC has a buffer amplifier that has less than 10uV of noise. I did this arrangement because you will need to set the voltage to +/-15mV, +/-30mV, +/-60mV, +/- 150mV, +/- 300mV, +/- 600mV, +/-1.50V. The 1.5V has to be switched several times during checkout. Multiply this by two channels and you have 40 points you need to set, or in my case 80 points for a 4 channel scope. I am far to lazy.

Sine wave generator with a frequency 10KHz and 550mV RMS

Sine wave generator with a 10MHz, 225mV RMS output and an accuracy of less than 1 PPM

Square wave generator with a 10KHz, 700mV p-p output. The rise time must be less than 1nS.

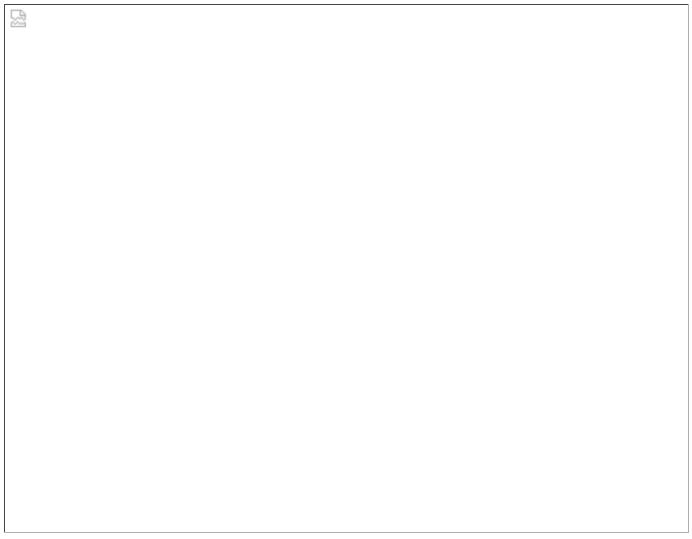
Sine wave generator with a frequency range of 1 MHz to 501MHz . Used for testing bandwidth.

Ohm meter. Used to measure input impedance of each channel.

In my case I did not have a way to generate a square wave with a < 1nS rise/fall time. So, I built a small amplifier using an LVDS receiver from Pericom. These parts will take a 350mV signal and drive 3.3V logic level outputs with times around 350pS. I just run this circuit from my HP generator.

This is the final unit without the battery. The two SMA connectors are for the input and output. The switch is for the on/off.

Here is a plot from the LVDS drivers output. The battery close to dead and the voltage is way below the 3.3 Volts needed by the part, but it's still close to the required rise time.



4.3 7200A final Testing

This is the scope today. The unit now has two 7242Bs installed, SCSI, nice color display and running rock solid after a 10 hour burn-in test.

I played around a bit trying to show you what the display looks like, but this was the best I could do.

So far I have only found one company that can actually calibrate the 7200's plug-ins correctly, LeCroy. I was quoted $600, verbal, per 7242.

I ended up just testing the units on my own using a known calibrated equipment.

7200/A - Download the 7200 / 7200A Performance verification software for free. (200KB).

On-line calibration manual in Adobe PDF format

The following report was created from my 7200A using the LeCroy software.

7200A Mainframe SN: B21678

Plug-in A
Model: 7242B-F2 Option L1 SN: 29157

Plug-in B
Model: 7242B SN: 18117

7242B serial number B18117
7200A serial number B21678
Software version 3.3.1
DATE : 24 APR 2001 12:02:32

****

7242B NOISE LIMIT TEST rev 2.0
S/N B18117

Spec: baseline noise limit <=1 mv at 5 mv/div

T/div		CH1		CH2	
5.0	ms	100	uv	100	uv
2.0	ms	90	uv	100	uv
1.0	ms	90	uv	100	uv
0.5	ms	90	uv	100	uv
0.2	ms	90	uv	100	uv
0.1	ms	90	uv	100	uv
50.0	us	100	uv	100	uv
20.0	us	100	uv	100	uv
10.0	us	90	uv	100	uv
5.0	us	110	uv	110	uv
2.0	us	130	uv	140	uv
1.0	us	120	uv	140	uv
0.5	us	120	uv	140	uv
0.2	us	120	uv	130	uv
0.1	us	120	uv	140	uv
50.0	ns	110	uv	140	uv
20.0	ns	160	uv	340	uv

7242B NOISE TEST PASSED

****

7242B ADC NOISE TEST rev 2.1
S/N B18117

Spec: noise limit < lmv on 5mv/div range

	5 ns/pt	2.5 ns/pt	1 ns/pt
CH1	180 uv	120 uv	130 uv
CH2	150 uv	130 uv	150 uv

7242B ADC TEST PASSED

****

7242B DC LINEARITY AND GAIN TEST rev 2.0
S/N B18117

Spec: DC gain error limit < 2%

V/DIV	CH1	CH2
5 mv	1.6%	0.6%
10 mv	0.5%	1.7%
20 mv	1.3%	1.4%
50 mv	0.9%	1.2%
100 mv	1.0%	1.1%
200 mv	1.0%	1.0%
500 mv	0.6%	0.5%
1000 mv	0.5%	0.3%
2500 mv	0.3%	0.5%

7242B DC GAIN AND LINEARITY TEST PASSED

****

7242B TRIGGER LEVEL ACCURACY TEST rev 2.0
S/N B18117

Spec: max error < error limit (5% CH1 - 3, 10% Ext)

CH	Max Error	Error Limit
1	4.7 %	5 %
2	3.9 %	5 %
Ext	8.7 %	10 %

7242B Trigger Level Test PASSED

****

7242B TIMEBASE ACCURACY TEST rev 2.1
S/N B18117

Spec: difference to ref <= 100 Hz

Reference frequency = 10.00 MHz

Difference to reference frequency = 28.054 Hz

7242B TIMEBASE ACCURACY TEST PASSED

****

7242B TRIGGER DELAY ACCURACY TEST rev 2.1
S/N B18117

Spec: time at rise (TARS) limit <= 1ns
Spec: time at fall (TAFL) limit <= 1ns
Spec: overshoot limit <= 10%

CH	TARS	TAFL	OVSP	OVSN
1	-0.143 ns	-0.148ns	1.0%	0.0%
2	0.131 ns	0.154 ns	1.9%	0.0%

7242B TRIGGER DELAY ACCURACY AND PULSE RESPONSE TEST PASSED

****

7242B BANDWIDTH TEST rev 2.0
S/N B18117

Spec: 7242 BW 400MHz, 7242A, 7242B, 7234 BW 500 MHz

Freq (MHZ)	CH 1 (mv)	CH 2 (mv)
1	115.3	114.9
2	113.5	114.2
11	110.7	110.1
21	110.7	111.4
51	107.9	109.6
101	103.6	106.4
201	99.4	102.2
301	91.6	98.3
401	82.7	93.4
501	71.4	84.5

7242B BANDWIDTH TEST PASSED

****

7242B INPUT IMPEDANCE TEST RESULTS
S/N B18117

RANGE	50 ohms		1Mohm	
CH1	CH2	CH1	CH2	
5mv	50.101	50.192	.99720	.99762
10mv	50.096	50.188	.99720	.99762
20mv	50.431	50.456	.99720	.99762
50mv	50.589	50.645	.99720	.99762
.1v	50.277	50.270	.99720	.99762
.2v	50.281	50.271	.99720	.99762
.5v	50.282	50.271	.99720	.99762
1v	50.282	50.192	.99720	.99762
	limits (49-51 ohms)		(980,000 - 1,020,000 ohms)	

****
* CALIBRATION CERTIFICATE *
* *

```
*          The  module  and  mainframe  listed  below  has  been     *
*          checked and calibrated  against our working  standards    *
*          listed  below and  following  the procedure documented    *
*          in the "7200  Series  Precision  Digital  Oscilloscope    *
*          7234  &  7242  Series  Module  Calibration  Procedure"    *
*          Operators  Manual.  It  meets or exceeds all published    *
*          specifications. The standards used in this calibration    *
*          traceable  to  the  US National Institute of Standards    *
*          and  Technology  (NIST).  They  are in compliance with    *
*          MIL-STD 45662A.                                           *
*                                                                    *
*    Mainframe model:   7200A SN B21678                              *
*    Plugin model:      7242B  SN B18117                             *
*    Software version:  3.3.1                                        *
*                                                                    *
*    Temperature:  28C   Humidity:  20%   Technician:  M. Wheeler    *
*    Date of cal: 24 APR 2001                                        *
*                                                                    *
*                                                                    *
*  Sinewave generator                    Cal Due Date: April 28,2001 *
*   Mfg.  Marconi         Model #:  2024         S/N:                *
*                                                                    *
*  Square Wave generator                 Cal Due Date: April 28,2001 *
*   Mfg.  HP              Model #:  33120A       S/N: US36001722     *
*                                                                    *
*  Precision DC Supply                   Cal Due Date: April 28,2001 *
*   Mfg.  Custom          Model #:  Custom       S/N:                *
*                                                                    *
*  Volt / Ohm Meter                      Cal Due Date: April 28,2001 *
*   Mfg.  HP              Model #:  34401A       S/N: US36033069     *
*                                                                    *
*  Power Meter                           Cal Due Date: April 28,2001 *
*   Mfg.  HP              Model #:  437B         S/N: 3123U18605     *
*                                                                    *
*  Power Sensor                          Cal Due Date: April 28,2001 *
*   Mfg.  HP              Model #:  8482A        S/N: 3318A27495     *
*                                                                    *
**********************************************************************



7242B   serial number 29157
7200A   serial number B21678
Software version 3.3.1
DATE : 24 APR 2001      14:31:12

**********************************************************************

7242B NOISE LIMIT TEST  rev 2.0
S/N 29157

Spec:  baseline noise limit <=1 mv at 5 mv/div

T/div           CH1             CH2
*********************************
5.0     ms      140     uv      140     uv
2.0     ms      140     uv      140     uv
1.0     ms      140     uv      150     uv
0.5     ms      140     uv      150     uv
0.2     ms      140     uv      140     uv
0.1     ms      140     uv      150     uv
50.0    us      140     uv      140     uv
20.0    us      140     uv      150     uv
10.0    us      150     uv      150     uv
5.0     us      160     uv      150     uv
2.0     us      160     uv      250     uv
1.0     us      160     uv      250     uv
0.5     us      170     uv      240     uv
0.2     us      160     uv      240     uv
0.1     us      160     uv      220     uv
50.0    ns      150     uv      230     uv
20.0    ns      150     uv      220     uv

7242B NOISE TEST PASSED


**********************************************************************

7242B ADC NOISE TEST  rev 2.1
S/N 29157

Spec:   noise limit < lmv on 5mv/div range

5 ns/pt 2.5 ns/pt       1 ns/pt
*******************************

CH1     350 uv  170 uv  160 uv
CH2     190 uv  160 uv  210 uv

7242B ADC TEST PASSED


**********************************************************************

7242B DC LINEARITY AND GAIN TEST  rev 2.0
S/N 29157

Spec:   DC gain error limit < 2%

V/DIV           CH1     CH2
10 mv           1.9%    1.7%
20 mv           1.0%    1.2%
50 mv           0.7%    0.7%
100 mv  0.4%    0.6%
200 mv  0.4%    0.7%
500 mv  1.0%    0.5%
1000 mv 0.5%    0.3%
2500 mv 0.1%    0.3%
```

7242B DC GAIN AND LINEARITY TEST PASSED

****

7242B TRIGGER LEVEL ACCURACY TEST rev 2.0
S/N 29157

Spec: max error < error limit (5% CH1 - 3, 10% Ext)

CH	Max Error	Error Limit
1	3.4 %	5 %
2	3.3 %	5 %
Ext	7.4 %	10 %

7242B Trigger Level Test PASSED

****

7242B TIMEBASE ACCURACY TEST rev 2.1
S/N 29157

Spec: difference to ref <= 100 Hz

Reference frequency = 10.00 MHz

Difference to reference frequency = 12.005 Hz

7242B TIMEBASE ACCURACY TEST PASSED

****

7242B TRIGGER DELAY ACCURACY TEST rev 2.1
S/N 29157

Spec: time at rise (TARS) limit <= 1ns
Spec: time at fall (TAFL) limit <= 1ns
Spec: overshoot limit <= 10%

CH	TARS	TAFL	OVSP	OVSN
1	0.232 ns	0.246 ns	9.1%	4.1%
2	0.337 ns	0.364 ns	9.1%	6.0%

7242B TRIGGER DELAY ACCURACY AND PULSE RESPONSE TEST PASSED

****

7242B BANDWIDTH TEST rev 2.0
S/N 29157

Spec: 7242 BW 400MHz, 7242A, 7242B, 7234 BW 500 MHz

Freq (MHZ)	CH 1 (mv)	CH 2 (mv)
1	118.1	116.3
2	117.4	116.7
11	115.3	112.8
21	115.3	110.0
51	115.3	113.2
101	114.6	115.3
201	114.2	116.3
301	111.0	110.3
401	111.7	110.7
501	93.7	89.8

7242B BANDWIDTH TEST PASSED

****

7242B INPUT IMPEDANCE TEST RESULTS
S/N 29157

RANGE	50 ohms		1Mohm	
CH1	CH2		CH1	CH2
5mv	49.977	50.008	1.00157	1.00531
10mv	50.058	50.006	1.00157	1.00531
20mv	50.348	50.339	1.00157	1.00531
50mv	50.452	50.238	1.00157	1.00531
.1v	50.321	50.237	1.00157	1.00531
.2v	50.277	50.240	1.00157	1.00531
.5v	50.272	50.238	1.00157	1.00531
1v	50.272	50.238	1.00157	1.00531

limits (49-51 ohms) (980,000 - 1,020,000 ohms)

****

CALIBRATION CERTIFICATE

The module and mainframe listed below has been checked and calibrated against our working standards listed below and following the procedure documented in the "7200 Series Precision Digital Oscilloscope 7234 & 7242 Series Module Calibration Procedure" Operators Manual. It meets or exceeds all published specifications. The standards used in this calibration traceable to the US National Institute of Standards and Technology (NIST). They are in compliance with MIL-STD 45662A.

Mainframe model: 7200A SN B21678
Plugin model: 7242B SN 29157
Software version: 3.3.1

```
*    Temperature: 28C  Humidity: 20%  Technician: M. Wheeler    *
*                                                               *
*    Date of cal: 24 APR 2001                                   *
*                                                               *
*                                                               *
*                        Approved by: _____________________     *
*                                                               *
*  Sinewave generator                  Cal Due Date: April 28,2001  *
*   Mfg. Marconi        Model #: 2024        S/N:                  *
*                                                               *
*  Square Wave generator               Cal Due Date: April 28,2001  *
*   Mfg. HP             Model #: 33120A      S/N: US36001722       *
*                                                               *
*  Precision DC Supply                 Cal Due Date: April 28,2001  *
*   Mfg. Custom         Model #: Custom      S/N:                  *
*                                                               *
*  Volt / Ohm Meter                    Cal Due Date: April 28,2001  *
*   Mfg. HP             Model #: 34401A      S/N: US36033069       *
*                                                               *
*  Power Meter                         Cal Due Date: April 28,2001  *
*   Mfg. HP             Model #: 437B        S/N: 3123U18605       *
*                                                               *
*  Power Sensor                        Cal Due Date: April 28,2001  *
*   Mfg. HP             Model #: 8482A       S/N: 3318A27495       *
*                                                               *
*****************************************************************
```