CERTIFICATE OF CALIBRATION

Issued by

Trescal

Date of Issue : 22 May 2010 **Certificate Number :** C3084619L

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Reg No FM32697
BS EN ISO9001:2008

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APPROVED SIGNATORY

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Mr M Hooper

Customer Good Reason trading Limited, 2 The Copse, Exhall, Coventry, CV7 9JW.

Equipment Details

Description : Transient Digitiser
Manufacturer : Tektronix
Type No : SDC5000 - Option 01
Serial No : B040201

Our Reference : 258829
Customer Ref. : DRAE034625
Date of Receipt : 21 April 2010
Re-calibration Date : 22 May 2011

Test Conditions

Ambient Temperature : [23 ± 3]°C
Relative Humidity : [40 ± 20]%
Calibrated By : M.Hooper **Date :** 22 May 2010
Checked By : G.Davies **Date :** 22 May 2010

Equipment complied with the specification

Certificate records the on receipt status

SPECIFICATION

The performance of the instrument was tested against the following specification :
Manufacturer's Catalogue : Dated 1993.

SUMMARY

The parameters on which measurements were performed and the procedures used to perform the measurements are detailed on page 2.

This item has been safety tested in accordance with safety procedure WP3/7/606.

The equipment complies with the stated specification at the points measured, due allowance having been made for the uncertainty of the measurement.

MEASURED PARAMETERS

Measurements were made on the parameters listed below and the results obtained compared to the specification given on page 1.

Parameter	Procedure
Calibrator Output - Amplitude (DC)	WP3/7/043
Calibrator Output - Frequency	WP3/7/043
Amplitude Measurement Accuracy	WP3/7/043
Vertical Offset Accuracy	WP3/7/043
Input Resistance	WP3/7/043
Rise Time	WP3/7/043
Trigger Accuracy	WP3/7/043
Timebase Accuracy	WP3/7/043

CALIBRATOR OUTPUT AMPLITUDE

Measurement Conditions : Measurements were made into a termination of 50 Ω. The Cal Out was set to Ampl.

Indicated Output (V)	Measured Output (DC)
4.0	4.0024 V
3.0	3.0019 V
2.0	2.0011 V
1.0	1.0017 V
0.800	0.8020 V
0.400	0.3999 V
0.200	0.1999 V
0.100	0.1001 V
0	0.039 mV
-0.100	-0.1000 V
-0.200	-0.1997 V
-0.400	-0.4003 V
-0.800	-0.7987 V
-1.0	-0.9987 V
-2.0	-1.9981 V
-3.0	-2.9981 V
-4.0	-3.9992 V

CALIBRATOR OUTPUT TIME

Measurement Conditions : Measurements were made into a termination of 50 Ω.
The Cal Out was set to Time.
The Cal Ampl was setting makes no difference to the Vpk-pk output level.

Output Parameter	Indicated Output	Measured Output
Time	80 µs	12.4998 kHz
	40 µs	24.9996 kHz
	16 µs	62.4989 kHz
	8.0 µs	124.998 kHz
	4.0 µs	249.996 kHz
	1.6 µs	624.989 kHz
	800 ns	1.24998 MHz
	400 ns	2.49996 MHz
	160 ns	6.24989 MHz
	80 ns	12.4998 MHz
	40 ns	24.9996 MHz
	16 ns	62.4989 MHz
	8 ns	124.9979 MHz
	4 ns	249.9957 MHz

Calibrated By : M.Hooper **Date** : 22 May 2010

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AMPLITUDE MEASUREMENT ACCURACY

Measurement Conditions : Measurements were made using the Mean measurement parameter.
The timebase was set to 10 µs.
The Acquire mode was set to Average and the number of averages to 16.

Select the Mean measurement and set the measurement zone to Full Mfm.
The Display to W1 VExp was set to x1 and the W1 HExp was set to x1.

Applied Voltage (DC)	Mean Measurement Indication
4.50 V 4.00 V 3.00 V 2.00 V 1.00 V	4.52 V 4.00 V 2.96 V 1.95 V 0.90 V
-1.00 V -2.00 V -3.00 V -4.00 V -4.50 V	-1.08 V -2.10 V -3.11 V -4.13 V -4.63 V

VERTICAL OFFSET ACCURACY

Measurement Conditions : Measurements were made using the Mean measurement parameter.
The timebase was set to 10 µs.
The Acquire mode was set to Average and the number of averages to 16.

Select the Mean measurement and set the measurement zone to Full Mfm.
The Display to W1 VExp was set to x1 and the W1 HExp was set to x1.

Indicated Offset Setting	Applied Voltage (DC)	Mean Measurement Indication
2.50 V 5.00 V	2.50 V 5.00 V	2.49 V 5.06 V
-2.50 V -5.00 V	-2.50 V -5.00 V	-2.55 V -5.11 V

INPUT RESISTANCE

Channel	Measured Input Resistance
1	50.240 Ω

RISE TIME

Measurement Conditions : Measurements were made using the Rise Time measurement parameter.
The applied signal was a 250 mV pk-pk pulse.
The timebase was set to 5 ns.
The Acquire mode was set to Average and the number of averages to 16.
The Display to W1 VExp was set to x16 and the W1 HExp was set to x2.

Use every long BNC lead possible on the trigger output of the S52 pulse head to enable the pulse to be displayed on the screen otherwise the internal delay of the digitiser is not great enough to allow the rising edge to be displayed.
Select the Rise Time measurement and set the measurement zone to Cursors.
Turn on the cursors and set as required on the waveform, cursor 1 to 8 divisions across the screen and cursor 2 to a 2 divisions across the screen, this helps to eliminate false readings due to a slight curve at the start of the trace, etc.

Applied Rise Time	Manufacturers Specification	Measured Rise Time
25 ps	≤ 120 ps	0.11 ns

TRIGGER ACCURACY

Measurement Conditions : Measurements were made with the Trigger Mode set to Norm.

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The applied level was increased until the instrument triggered.

Level	Manufacturers Specification	Measured Trigger level
4.0 V	3.1 V to 4.9 V	4.05 V
2.0 V	1.3 V to 2.7 V	2.02 V
0.0 V	-0.5 V to +0.5 V	0.20 V
-2.0 V	-2.7 V to -1.3 V	-2.24 V
-4.0 V	-4.9 V to -3.1 V	-4.27 V

TIMEBASE ACCURACY

Measurement Conditions : Measurements were made using the Mean measurement parameter.
The timebase was set to 10 µs.
The Acquire mode was set to Average and the number of averages to 16.
The Period measurements were made with the applied timebase error set to 0.0 %.

Select the Mean measurement and set the measurement zone to Full Mfm.
The Display to W1 VExp was set to x1 and the W1 HExp was set to x1.

Indicated Range (/Div)	Applied Period	Period Measurement Indication	Timebase Measured Error (%)
5 ns	2 ns	1.95 ns	-2.5
10 ns	5 ns	4.88 ns	-2.4
20 ns	10 ns	10.05 ns	+0.5
50 ns	20 ns	20.1 ns	+0.5
100 ns	50 ns	50.7 ns	+1.4
200 ns	100 ns	100.6 ns	+0.6
500 ns	200 ns	198 ns	-1.0
1 µs	500 ns	495 ns	-1.0
2 µs	1 µs	989 ns	-1.1
5 µs	2 µs	1.98 µs	-1.0
10 µs	5 µs	4.95 µs	-1.0
20 µs	10 µs	9.92 µs	-0.8
50 µs	20 µs	19.8 µs	-1.0
100 µs	50 µs	49.6 µs	-0.8

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MEASUREMENT UNCERTAINTIES

Parameter	Uncertainties
Calibrator Output - Amplitude (DC)	± 0.2 %
Calibrator Output - Frequency	± 0.01 %
Amplitude Measurement Accuracy (Applied Level : 50 mV To 200 V)	± 0.5 %
Vertical Offset Accuracy (Applied Level : 50 mV To 200 V)	± 0.5 %
Input Resistance (Measured Value : 10 Ω To 40 Ω)	± 0.6 %
Input Resistance (Measured Value : 40 Ω To 90 Ω)	± 0.2 %
Input Resistance (Measured Value : 90 Ω To 150 Ω)	± 0.6 %
Rise Time	± 2.0 %
Trigger Accuracy (Applied Level : 5 mV To < 50 mV)	± 1.0 %
Trigger Accuracy (Applied Level : 50 mV To 200 V)	± 0.5 %
Timebase Accuracy (Applied Value : 1 ns/Div To 50 s/Div)	± 0.25 %