



PRECISION CONTROL

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MICRO-JUMP AND LONG TERM AGING TEST STATION FOR HIGH PRECISION CRYSTALS

PC100 OPTION 31 PRECISION QUARTZ CRYSTAL STABILITY TEST INSTRUMENT

The micro-jump and aging station is designed to test quartz crystals in individually temperature-controlled cavities. Micro-jumps and long-term frequency aging is independently measured on each crystal. The test instrument is used in a laboratory or in a production environment. Using model number TRL10-A1-SC thru TRL10-A3-SC crystal test board, crystals with micro jumps of greater than 2.5×10^{-10} and aging rates of 1×10^{-11} per day can be accurately measured.



Note: The system shown consists of two cavity racks of 10 cavities each, one control and power supply rack, frequency counter, computer and printer (not shown). Additional cavity racks and power supply racks can be added to the standard system of 20 cavities.

FEATURES

- * The Standard Instrument is plug-in expandable, without modification, up to 100 test cavities.
- * Crystals or crystal test boards can be loaded independently into any cavity, at any time, without affecting any other cavity temperature or crystal frequency.

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- * Each cavity temperature is operator selected to set the test cavity to the individual crystal's known turnover point temperature or any temperature between +45°C and +95°C.
- * Each crystal can be replaced, turnover point temperature set, and the information entered into the computer within 20 seconds. Any crystal test board can be replaced within 30 seconds.
- * Each test cavity has a LED to indicate the presence of cavity heater power.
- * Individual test cavity power is interrupted if the cavity temperature exceeds +128°C.
- * Frequency measurements can be made by remote computer control or by a local operator control.

SPECIFICATIONS

NUMBER OF CAVITIES:	10 per Test Cavity Rack (systems can be ordered or upgraded with up to 100 cavities); 20 cavities is standard.
CAVITY TEMP. RANGE:	Fixed operator selected temperatures between +45°C and +95°C.
ACCURACY OF CAVITY TEMP:	Temperature can be selected to within: 2.5°C above 45°C, 1.0°C above 50°C, 0.5°C above 55°C, 0.2°C from 60°C to 90°C, 0.5°C above 90°C. Absolute cavity temperature accuracy is +/-0.5°C.
CAVITY TEMPERATURE STABILITY:	< +/- 0.02°C for a +20°C to +30°C room ambient temperature change. < +/- 0.005°C is typical with normal room temperature variations.
TEMPERATURE AGING OF CAVITIES:	< 0.05°C per year
MINIMUM MICRO-JUMPS MEASURED:	2.5 X 10 ⁻¹⁰ in a laboratory environment (+/-5 °C)
SIZE OF EACH TEST CAVITY:	1.70" x 1.20" x 2.30" (Length x Width x Height)
ACCEPTABLE CRYSTAL HOLDERS:	Space and pins for one of either a HC-35/U, HC-47/U, HC-37/U, HC-40/U, HC-43/U, all popular SMD sizes with optional adapters.
VARIABLE CRYSTAL DRIVE LEVEL:	Operator adjustable from <10 microwatts to >500 microwatts. For each crystal under test, a D.C. voltage proportional to crystal drive can be measured on front panel terminals.
ACCEPTABLE CRYSTAL CUTS:	AT cut is standard. Optional FC, IT, or SC cuts are acceptable when optional crystal test boards are used.

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MODE OF OPERATION: Fundamental, 3rd, 5th, and 7th overtone, see limitations below for each crystal test board frequency range.

FREQUENCY RANGE: 10 kHz to 400 MHz

NUMBER OF R.F. OUTPUTS: Two front panel outputs, one for the frequency counter and one to monitor the output or take additional measurements. Monitor level: -10dB below counter output.

STANDARD AT CUT CRYSTAL TEST BOARDS (SC, IT AND FC CUT BOARDS ARE OPTIONAL, FREQUENCY MUST BE SPECIFIED AT TIME OF ORDER):

MODEL NUMBER	CRYSTAL FREQUENCY RANGE (MHz)	BEST PER DAY AGING RATE	STANDARD CRYSTAL MODES
TRL10-A12	1.0 to 2.0	1×10^{-10}	Fund
TRL10-A11	2.0 to 4.0	1×10^{-10}	Fund
TRL10-A1	4.0 to 6.0	1×10^{-11}	Fund, 3rd
TRL10-A2	5.6 to 8.4	1×10^{-11}	Fund, 3rd
TRL10-A3	8.0 to 12.0	5×10^{-11}	Fund, 3rd
TRL10-A4	12.0 to 18.0	5×10^{-11}	Fund, 3rd
TRL10-A5	17.6 to 26.4	1×10^{-10}	Fund, 3rd
TRL10-A6	25.4 to 38.4	1×10^{-10}	Fund, 3rd
TRL10-A7	38.4 to 56.0	5×10^{-10}	Fund, 3rd, 5th
TRL10-A8	56.0 to 84.0	5×10^{-10}	Fund, 3rd, 5th
TRL10-A9	80.0 to 120.0	1×10^{-9}	Fund, 3rd, 5th, 7th
TRL10-A10	120.0 to 215.0	1×10^{-9}	Fund, 3rd, 5th, 7th

CAVITY ELECTRICAL INTERFACE: Two 6 pin connectors, 7 pins are available for optional use.

METHOD OF SELECTING TEST CAVITIES: Local/Remote Mode Switch on front panel. Local Mode: 2 push button switches, one for Test Cavity Rack selected, and one for test cavity. Remote Mode: External computer control for test cavity rack and test cavity selection.

INPUT VOLTAGE: 105 to 132 V.A.C., 47-63 Hz. Inputs of 100, 220, 230, and 240 V.A.C. for international operation are available.

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REMOTE COMPUTER CONTROL HARDWARE AND SOFTWARE FEATURES:

- * Operates in Microsoft Windows environment, mouse driven, point and click software.
- * Serial number, customer, order information, and measurement time can be entered for each crystal.
- * Archive data includes day and time for all frequency readings. Archive data accumulated to date is displayed on screen along with the change in frequency in parts per billion (PPB) from the initial reading, daily aging rate, and a per day aging rate for the last 5 days.
- * Frequency measurement times of 1, 10, and 100 seconds can be selected for each crystal.
- * Data can be exported into popular spreadsheet programs and printed in tabulated form or frequency verses time plots.
- * Data can be copied to a floppy disk for a back-up file.
- * Any individual crystal frequency can be read manually.
- * All active test cavities can be swept and read manually.
- * When a new cavity is loaded, the computer waits for >2 hours before taking the reference reading to allow the crystal to stabilize.
- * Up to 12 operator programmable measurement cycles per day.
- * Frequency resolution of up to 12 digits/sec.
- * Software is customized to control customer's IEEE 488 compatible frequency counter.
- * Automatic system restart in case of power failure with Windows 98.

The PC100 System includes:

- 1 PC100 Cable Set
 - 1 PC100 Manual
 - 1 PC100 Control, Power Supply and Frequency Counter Rack
 - 1 PC100 20 Cavity Rack
 - 20 AT Cut Crystal Test Board (Specify Model No. at time of order)
 - 1 Computer/Monitor/Keyboard/Mouse
 - 1 Printer
 - 2 Control Boards for the computer
 - 1 Temperature Chamber
 - 1 * Frequency Standard
- *Quoted separately**

Equipment NOT included but required:

Adapters to age surface mounted crystals

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AVAILABLE OPTIONS

Crystal Test boards for other crystal cuts, i.e., FC, IT or SC.

Adapters to age surface mounted crystals

Spare Parts Kit and Repair Manual.

On-site training to install and operate the instrument.

Additional spare crystal test boards.

Crystal test boards to test crystals from 10 KHz to 4 MHz and 180 MHz to 300 MHz.

Additional plug-in Test Cavity Racks to expand the instrument up to 100 cavities.

Additional test equipment, i.e., D.C. Voltmeter, Oscilloscope.

Test cavities configured to measure long term aging of DIP oscillators, TCXO, VCXO and low powered OCXO units.

Precision OCXO Stability Option for measurement of long term stability of self contained ovenized oscillators.

Additional equipment to measure micro-jumps for time periods less than 2 hours.

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TYPICAL OUTPUT PRINTOUTS

* Software (included) generated test data form of the units tested as shown below with the readings automatically inserted in the form.

Serial #: TEST16 Start-DT: 04/09/03 - 11:20

Name: PRECISION
CONTROL

Description: STABILITY TEST

Xtal Freq-Mhz: 5.000000 GT: 100 Secs

Reference-DT: 04/09/03 - 15:15 Reference Freq-Mhz: 5.00000333290

Read#	Date-Time	Freq-Mhz	E- Time	Dev-ppb	1-Day_Aging- ppb	5-Day Daily Aging - ppb
1	04/09/03-16:15	5.000003334	0.2	0.23		
2	04/09/03-17:45	5.000003323	0.27	0.55		
3	04/09/03-19:45	5.000003336	0.35	0.65		
4	04/09/03-21:45	5.000003337	0.43	0.77		
5	04/09/03-23:45	5.000003337	0.52	0.87		
6	04/10/03-01:45	5.000003338	0.6	0.95		
7	04/10/03-03:45	5.000003338	0.68	1.02		
8	04/10/03-05:45	5.000003338	0.77	1.07		
9	04/10/03-07:45	5.000003338	0.85	1.12		
10	04/10/03-09:45	5.000003339	0.93	1.17		
11	04/10/03-11:45	5.000003339	1.02	1.2		
12	04/10/03-15:15	5.000003339	1.16	1.25		
13	04/10/03-16:15	5.000003339	1.2	1.26		
14	04/10/03-17:45	5.000003339	1.27	1.28		
15	04/10/03-19:45	5.000003334	1.35	1.33		
16	04/10/03-21:45	5.000003334	1.43	1.38		
17	04/10/03-23:45	5.000003334	1.52	1.43		
18	04/11/03-01:45	5.000003334	1.6	1.46		
19	04/11/03-03:45	5.000003334	1.68	1.47		
20	04/11/03-05:45	5.000003334	1.77	1.46		
21	04/11/03-07:45	5.000003334	1.85	1.47		
22	04/11/03-09:45	5.000003334	1.93	1.48		
23	04/11/03-11:45	5.000003341	2.02	1.71		
24	04/11/03-15:15	5.000003342	2.16	1.72	0.47	
25	04/11/03-16:15	5.000003342	2.2	1.72		
26	04/11/03-17:45	5.000003342	2.27	1.73		
27	04/11/03-19:45	5.000003342	2.35	1.73		
28	04/11/03-21:45	5.000003342	2.43	1.75		
29	04/11/03-23:45	5.000003342	2.52	1.75		
30	04/12/03-01:45	5.000003331	2.6	1.76		

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* The data shown above is change to an ASCII file within the software (included) and is manually copied by the operator into the Microsoft Excel program (sample Excel file included) or similar program to produce the following form:

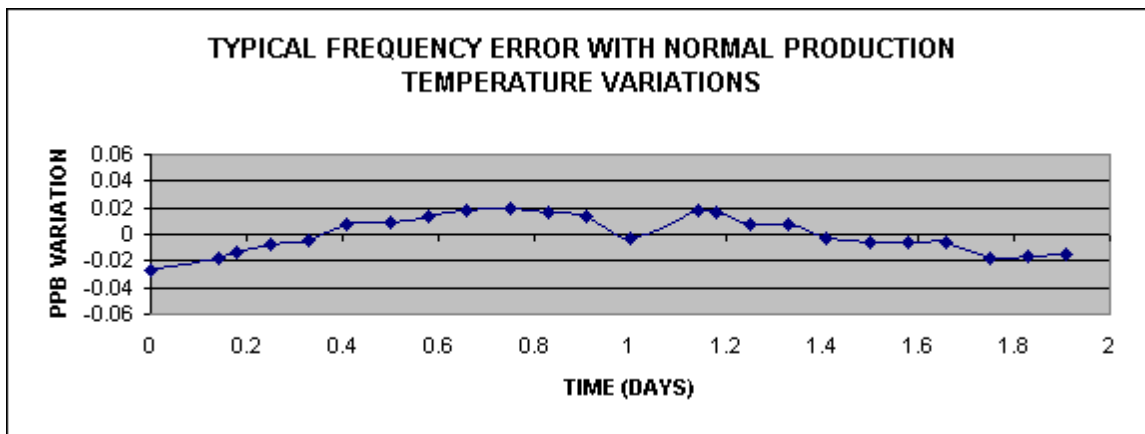
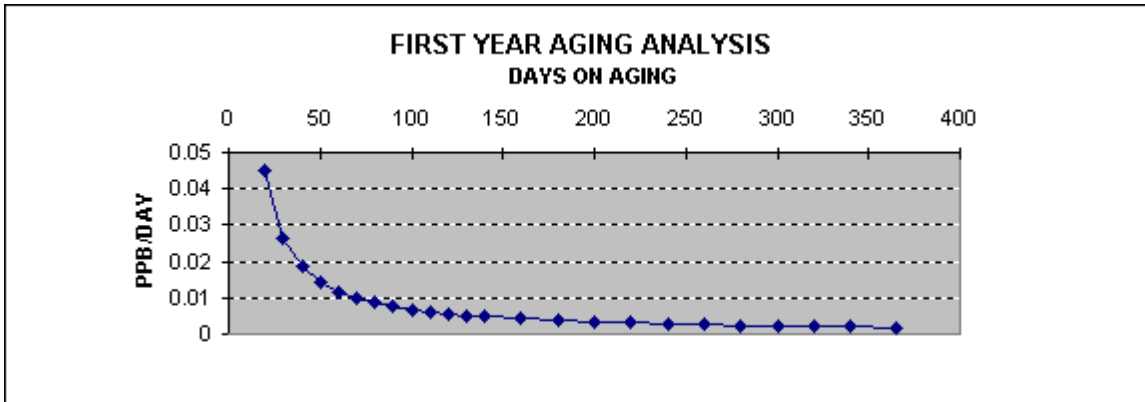
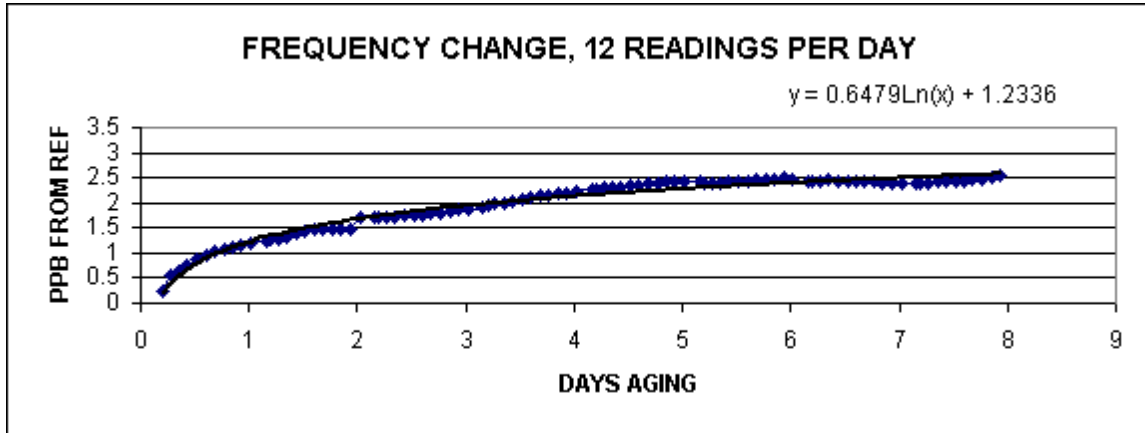
Serial #: TEST16 Start-DT: 04/09/03 - 11:20

Name: APL

Description: STABILITY TEST

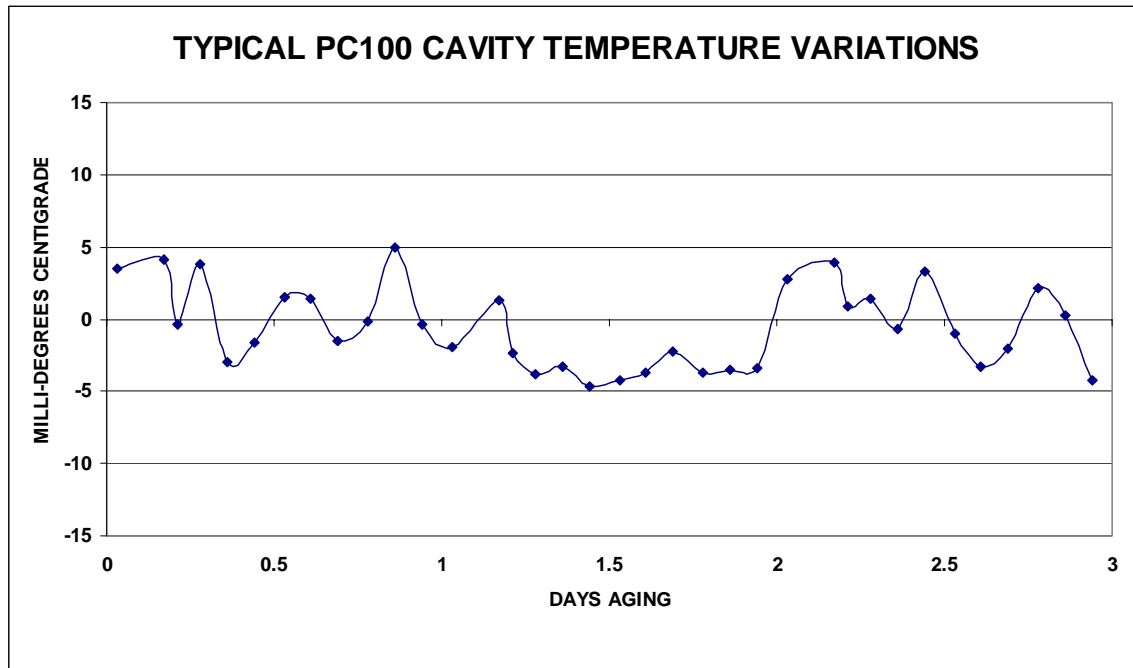
Xtal Freq-Mhz: 5.000000 GT: 100 Secs

Reference-DT: 04/09/03 - 15:15 Reference Freq-Mhz: 5.00000333290



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PRECISION CONTROL PC100 OPT 31 TYPICAL CAVITY TEMPERATURE STABILITY IN A NORMAL LABORATORY ENVIRONMENT



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Serial #: TEST16 Start-DT: 04/09/03 - 11:20

Name: PRECISION CONTROL

Description: STABILITY TEST

Xtal Freq-Mhz: 5.000000 GT: 100 Secs

Reference-DT: 04/09/03 - 15:15 Reference Freq-Mhz: 5.00000333290

