

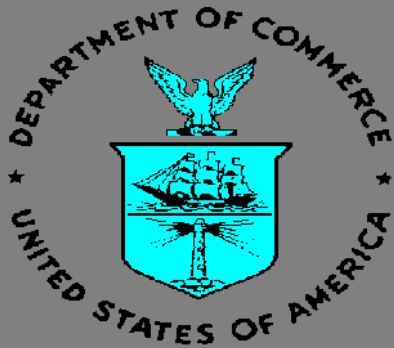
# NIST

## Frequency Measurement & Analysis Service



**NIST**

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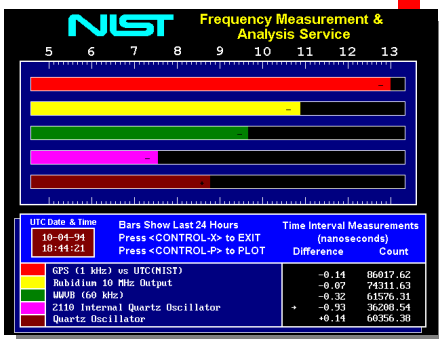
For Technical Support, please call:  
(303) 497-3212 or (303) 497-3378

To Begin, Press Any Key.

# NIST

## A Complete Solution To All Frequency Measurement & Calibration Problems

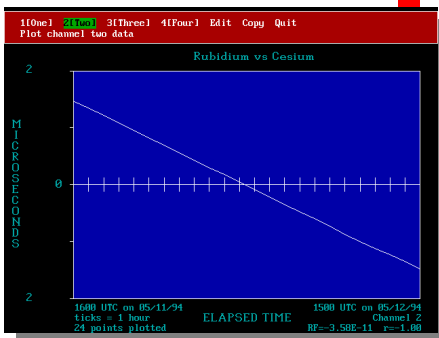
The NIST Frequency Measurement and Analysis Service makes it easy to measure and calibrate any quartz, rubidium, or cesium frequency standard. All measurements are made automatically, and are traceable to NIST at an uncertainty of  $2.5 \times 10^{-13}$  per day.



Subscribers to the NIST service receive a complete frequency measurement system which they install in their lab. The system is housed in an attractive metal equipment rack, and includes everything needed to make state-of-the-art frequency measurements. An easy-to-read instruction manual makes installation a snap. Plus, all subscribers are invited to attend a free 2-day training seminar at NIST to get hands-on experience with the system.

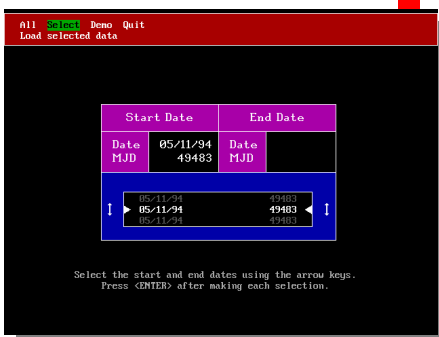
The GPS receiver is software controlled and requires no operator attention. Your only requirement is to mount a small antenna in a location which has a clear view of the sky.

The measurement system blends commercially-available equipment with hardware and software developed at NIST. Measurements are made using a time interval counter with a single shot resolution of less than 30 picoseconds. The software completely automates the measurement process. It presents the measurement data in a clear, easy-to-understand format. When enhancements to the software are developed, NIST installs them for you by modem. If any hardware component fails, NIST replaces it immediately using an overnight delivery service.



Once the system is installed, it's easy to get started. Simply plug in the frequency standards you want to measure, and connect the system to a dedicated phone line. Up to five frequency standards can be measured and calibrated at once. The phone line allows NIST personnel to call your system, verify and analyze your data, and quickly troubleshoot any problems that may occur.

While measurements are being made, a full-color bar graph displays the performance of each frequency standard over the last 24 hours. This bar graph is updated every hour. It



The system uses signals from the Global Positioning System (GPS) as a reference frequency.

lets you see at a glance how well each standard is performing. Every 24 hours (at a time that you select) the system prints a full-page graph of each standard's performance. The graph documents the calibration in case questions arise in the future. You can also print a statistical summary of the data, or a listing of the data in tabular form.

The software allows you to graph the performance of a frequency standard over periods ranging from 2 seconds to 150 days. An array of powerful graphing features let you display the data in a variety of fashions: you can increase or decrease the scale of the y-axis, or "zoom in" on sections of the graph to show as much detail as possible. Plus, a powerful FILTER feature is included that automatically removes outliers and phase steps if you choose to do so.

All of the data recorded by the system is stored on disk, and backed up on tape for redundancy. At any time, you can retrieve and graph past data

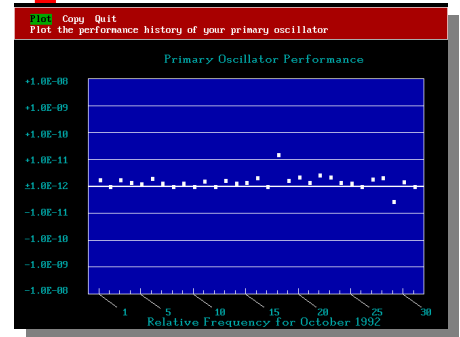
recorded by the system. This gives you a permanent history of all frequency calibrations made by your laboratory.

NIST regularly checks each system by modem to insure proper operation. NIST verifies the data from each system, and mails each subscriber a monthly report that certifies that their primary frequency standard is traceable to NIST.

The service complies with the requirements of NVLAP (National Voluntary Laboratory Accreditation Program). Subscribers to the service who seek accreditation in the frequency calibration field can reduce or eliminate the proficiency testing and on-site assessment fees charged by NVLAP.

If your laboratory calibrates frequency standards, the NIST Frequency Measurement & Analysis Service can be a welcome addition. The service provides a complete solution to all frequency measurement and calibration problems.

*The Frequency Measurement & Analysis Service provides NIST traceability, and meets NVLAP requirements for frequency calibrations.*



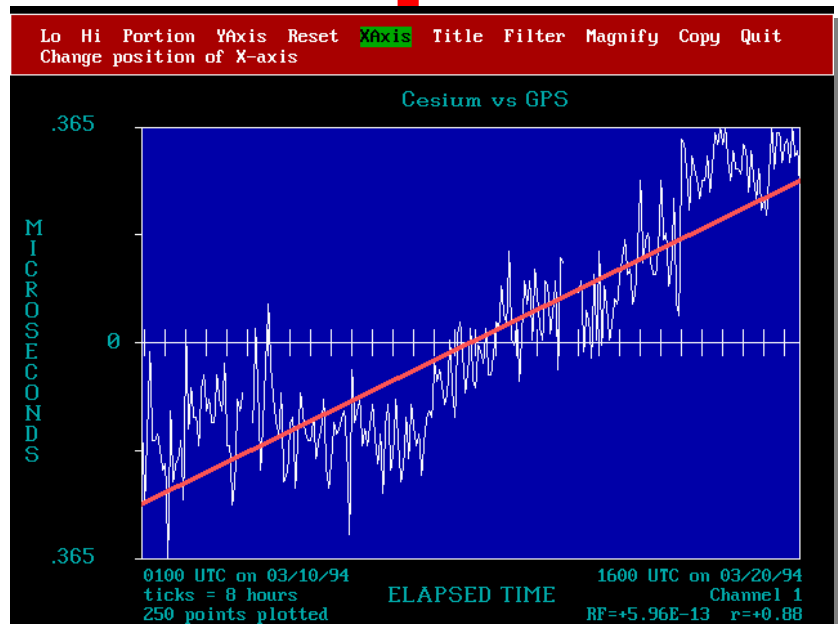
CHANNEL 1 - Cesium vs GPS

Number	MJD	Date	UTC	Drift (ppb)
1	49403	05/11/94	21:00	-0.03
2	49403	05/11/94	22:00	+0.11
3	49403	05/11/94	23:00	-0.06
4	49404	05/12/94	00:00	-0.10
5	49404	05/12/94	01:00	-0.01
6	49404	05/12/94	02:00	-0.04
7	49404	05/12/94	03:00	-0.04
8	49404	05/12/94	04:00	-0.01
9	49404	05/12/94	05:00	+0.15
10	49404	05/12/94	06:00	-0.09
11	49404	05/12/94	07:00	+0.01
12	49404	05/12/94	08:00	+0.07
13	49404	05/12/94	09:00	-0.06
14	49404	05/12/94	10:00	+0.03
15	49404	05/12/94	11:00	+0.04

ShortTerm History GPS Quit

Current Status of GPS Reception

Tracking Status (1 to 6)	6	UTC Date (MM-DD-YYYY)	05-13-1994	
Signal Quality (0 to 9)	7	UTC Time (HH:MM:SS)	17:08:15	
SATELLITES CURRENTLY BEING TRACKED				
PRN Number	Health (OK)	Azimuth	Elevation	Correlator to Noise
10	HH	177	033	51
02	HH	261	038	50
19	HH	061	077	50
20	HH	041	017	51



# NIST

## Frequency Measurement & Analysis Service

### Measurement System

Subscribers receive a measurement system consisting of the following items (the equipment remains NIST property):

- Metal equipment rack
- Rack-mount computer system
- Rack-mount color monitor
- Rack-mount keyboard
- Rack-mount GPS receiver
- Time Interval Counter
- Modem
- Printer
- Uninterruptible Power Supply
- NIST Measurement Software
- Illustrated Reference Manual
- All necessary cables & supplies

### Training

All subscribers may send as many staff members as they wish to a free 2-day training seminar at the NIST laboratories in Boulder, Colorado (travel and per diem not included). The seminar covers the operation of the service, and general information about frequency measurements and calibrations.

### NIST Support

NIST completely supports each subscriber. Questions about the service are answered by telephone on Monday through Friday, during normal working hours.

Parts that fail are replaced by NIST using an overnight delivery service. Subscribers are responsible for packing and shipping the defective part back to NIST in Boulder, Colorado.

NIST also routinely checks each measurement system by modem to insure proper operation. Through the modem link, NIST can troubleshoot all hardware, software, and measurement problems. The measurement results are validated by NIST personnel, and monthly calibration reports are mailed to each subscriber.

### Service Costs

The NIST Frequency Measurement and Analysis Service costs less than most alternative methods of obtaining high-accuracy, traceable calibrations. Costs are based on the development and operating expenses incurred by NIST.

Subscribers pay two fees: a one-time startup fee, and a monthly service fee. These are described below:

#### **One-Time Startup Fee: \$1500**

This fee includes the procurement, assembly and testing of the system. Each system is burned-in for at least two weeks prior to shipment. The fee also includes the cost of shipping the system to the subscriber's site.

#### **Monthly Service Fee: \$500**

This fee starts upon shipment of the system. It is a comprehensive fee and there are no hidden costs. It covers technical support, equipment replacement, data analysis, and all necessary supplies.

### Payment and Delivery

Subscribers issue a purchase order to NIST for the startup fee, and for at least 1 year of service. Invoices are sent quarterly and in arrears. For example, after subscribing to the service for 3 months, you'll receive an invoice for \$1500 (for the service already received).

Delivery usually takes place within 4 weeks of receipt of an order.

For more information or to place an order, contact NIST using the address and phone numbers on the right side of this page.

### NIST Calibration Number

The NIST Frequency Measurement and Analysis Service is listed in the *NIST Calibration Services Users Guide* as Service ID Number 76100S. You may reference this number when ordering.



# NIST

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