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Borehole Dilatometer Installation, Operation, and Maintenance at sites in Hawaii

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Contents

1 Introduction:

In response to concerns about the potential hazard of Mauna Loa volcano in Hawaii, the USGS began efforts in 1998 to add four high-resolution borehole sites. Located at these sites are; strainmeters, tiltmeters, seismometers, accelerometers and other instrumentation. These instruments are capable of providing continuous monitoring of the magma movement under Mauna Loa. Each site was planned to provide multi-parameter monitoring of volcanic activity.

In June of 2000, a contract was let for the core drilling of three of these four sites. They are located at Hokukano (west side of Mauna Loa) above Captain Cook, HI; at Mauna Loa Observatory (11,737' near the summit), and at Mauna Loa Strip Road (east side of Mauna Loa). Another site was chosen near Halema'uma u' and Kilauea's summit, in the Keller deep well. (See maps). The locations of these instruments are shown in Figure 1 with their latitude and longitude in Table 1.

The purpose of this network is to monitor crustal deformation associated with volcanic intrusions and earthquakes on Mauna Loa and Kilauea volcanoes. This report describes the methods used to locate sites, install dilatometers, other instrumentation, and telemetry. We also provide a detailed description of the electronics used for signal amplification and telemetry, plus techniques used for instrument maintenance. Instrument sites were selected in regions of hard volcanic rock where the expected signals from magmatic activity were calculated to be a maximum and the probability of earthquakes with magnitude 4 or greater is large. At each location, an attempt was made to separate tectonic and volcanic signals from known noise sources for each instrument type.

2 Siting:

Using seismicity, geologic and topographic maps together with geophysical knowledge and geologists recommendations, a list of preliminary sites were selected. Available access, and telemetry issues were checked out in detail during field visits. When the final site choice was made, permits were obtained from landowners and a drilling contract was drawn up to begin exploratory drilling.

3 Drilling:

The primary drilling method used, involved core drilling with a PQ (4.80"/12.192 cm old.) drill to deal with the typical volcano geology in Hawaii. This geology consists of layered basaltic flows separated by ash deposits. Each hole was core drilled to about 350 to 400 feet, allowing retrieval of 3.265" o.d. core. This continuous core provided scientist with an unprecedented look into the eruption history of Mauna Loa over the past 10,000 years.

When 3 m of competent unfractured rock was identified in the recovered core below 350 feet, that location was recorded as a possible installation site. After the best possibilities for installation sites were selected, the hole was cased with drill steel. Cementing of the casing was not successful due to the voids between flows. All holes were located well above the water table so all holes had to be drilled with air. Some holes were logged with a televiewer borehole inspection camera to help in selection of the best installation sites. Overall, this drilling method was the least expensive for drilling in volcano geology. An inclinometer (measured the verticality of the holes) and a cement bailer were run in each hole to check for clearance, and depth. When these parameters were all determined, the hole was deemed ready for installation.

4 DILATOMETER INSTRUMENTATION :

The Sacks-Evertson dilational strainmeter used in this experiment (Sacks \fIet al\fR., 1971) are installed at

depths between 367' and 1192' below the surface on Mauna Loa and Kilauea. The sensors, installed as part of a cooperative program between the U.S. Geological Survey and the Carnegie Institution of Washington, are cemented in the borehole with expansive grout having density characteristics approximating those of the host material. The borehole is then filled to the surface with cement to avoid long-term strains from hole relaxation effects. (Re-equilibration of the aquifer system was not an issue at these dry volcanic boreholes.)

The sensor consists of a 3 m long stainless steel oil filled reservoir that is filled with 100 cs silicon oil. Small compressions on the side of this reservoir force oil into a small bellows. Displacement of the end of the bellows is monitored by an LVDT (linear voltage displacement transducer) which produces an output that is proportional to the imposed dilational strain. There are two LVDT's in the strainmeters installed in Hawaii. The first transducer measures the rock strain, and the second transducer acts as reservoir volume monitor / lo gain transducer / thermistor. The mechanical gain of the first LVDT is about 67,000. The frequency response is flat from about 20 Hz to less than 0.000000001 Hz. The 20 Hz high frequency cut-off is caused by the hydraulic filter effect as the oil flows from the large reservoir into the bellows chamber through a small orifice.

5 DILATOMETER INSTALLATION

Introduction

Installation was accomplished with the use of a truck mounted hydraulic winch and derrick. Before installation a 28 foot (8.534 meters) long grout dump was lowered to the bottom of the hole to check that the instrument would not get hung up during installation. Electronics for signal conditioning, amplification, data collection and transmission are temperature tested in the lab and installed in closed bottom concrete block surface enclosures. The electronics are powered by solar charged batteries. They are located in similar concrete block surface enclosures within 15 feet (4.57 meters) of the electronics.

At these sites additional effort has been made to record the seismic portion of the signal generated by the dilatometer. This has been done using 24 bit recorders with Spread Spectrum radio telemetry to HVO. They are installed with solar charged batteries in a separate enclosure.

Installation Procedure

After a instrumentation site has been selected, the core hole has been drilled and competent rock has been located below the casing, installation can begin.

A day before installation, the instrument is checked for correct operation and correct resistances between pin outs. Voltage is applied and readings of the signal out and signal change after the valve is closed and opened are taken and recorded. (see Installation Notes in Figures, Tables and Schematics). The dilatometer is manufactured with additional ballast weight in the center section to help sink the instrument in the installation grout.

Prior to installation, a small hydraulic crane and winch is setup, its wire cable reeled out, measured and color coded every 50 feet(15m.) for 1200 feet(365 m.). The grout dump, which is transported in three sections, is assembled. Its bottom opening trip mechanism is put together, greased, threaded to the bottom of the grout dump, and checked for operation.. The hydraulic derrick and winch are moved over the hole and the 27 foot (8.23 m.) grout dump is lowered to the bottom. When this clears, the bottom trip opens, and the hole depth agrees with the depth determined by the drilling, the drill rig is allowed to leave the site.

The instrument cable (mounted on a cable reel stand in the back of a pick-up) is unreeled, measured and marked with colored tape every 50 feet (15 m.). Twenty feet from the determined instrument depth a warning mark is attached. At the bottom depth mark for the instrument a bright colored tape is attached over a 2 foot (600 mm.)

section of the cable with the beginning of the tape nearest the instrument. The cable is reeled back in and positioned next to the hole. The instrument is removed from its crate, a wire rope is attached for lifting, and the instrument is secured vertically next to the hydraulic derrick, it is tested again for proper operation and this information is recorded (see Installation Notes).

The grout dump is raised over the hole with bottom trip attached, and run in the hole twice to recheck the depth. If a site in the hole has been found above the bottom, the bottom is raised to reach the site. This is done by mixing in a mortar mixer the right amount of grout to reach that depth and then lowering it to the bottom of the hole in the grout dump. Approximately 6 hours is allowed between each dump for proper hardening of the grout. (see photo 18). The grout dump is then run down the hole empty to check the hardness and the depth. (See attached copy on "SET-GROUT" in ATTACHMENTS). The cement dump has a capacity of 0.925 cu.ft. which fills approximately 10.59 linear feet of 3.76" hole. Each bag of non-shrink grout (Corps of Engineers Spec. for non-shrink grout CRD-C 621), 50-lb., is mixed with 9.8 lb. water (1.225 gal.) to get about .46 cu.ft. It takes 2.01 bags to fill the cement dump for one trip in the hole to cover the instrument. Three bags of grout and 3.675 gallons of water are usually mixed in a mortar mixer for each instrument emplacement. This leaves approximately 5.5 feet of grout above the instrument if the instrument settles to the bottom.

Now that the instrument is ready, the expansive non-shrink grout can be mixed for instrument installation. Mixing takes at least 15 minutes. The grout should have a slump of 12, or zero cone, rather like a thick malt. The cable test, and recheck of the instrument are recorded with the date and time. (see Installation Field Notes, attached in Figures, Tables and Schematics, under Resistance Check). A cup of water is poured in the grout dump (to act as a cushion when the grout is poured in), then the grout is poured in using 5 gal. plastic pails and a funnel. Because the grout begins to harden in 1 hour, time should be noted. Using the hydraulic derrick, the grout dump is lowered to 15 feet (4.572 meters) of the bottom, the tension of the cable is checked, and the dump is allowed to free fall. This trips the bottom device, the dump is slowly raised and the tension is checked for the weight of the grout. As the dump is raised the strain on the hydraulic motor is noticed to help determine if the grout has been released. This slow raise allows time for the grout to flow out evenly (with no turbulence which can potentially cause uneven mixing). When the dump is about 30 feet (9.15 m.) off the bottom it is raised quickly to the surface.

The dump is set aside and the instrument is positioned over the hole using the derrick and winch. As the instrument is lowered to the bottom of the hole, the instrument cable is taped to the weight bearing wire rope. The instrument cable depth marks are called off as they go in the hole. When the target depth, as marked on the cable, approaches the top of the casing, it's descent is slowed by the contact with the grout. The instrument will begin to enter the grout and sink to within 1-2 feet of the bottom.

At this time instrument and cable resistances are read, and power is applied to read its strain response as the cement sets. These values are recorded along with the date and time. (see installation notes in appendix). If, before one hour has elapsed, any resistances are bad or the **instrument is working improperly, than it should be pulled out of the grout slowly.** Once the instrument is on the surface, the top of the cement becomes the hole bottom. If there is another place above the original site, than another attempt can be made to install, if not the hole is made available for other instrumentation.

If the instrument **passes operation checks,** the installation can proceed.(the strainmeter should have approx 5.0 ft of grout over the top of it). The instrument cable is tied off using 1/2 inch rope with 3 or 4 half hitches tied to the surface casing. One to two days are allowed before the tension is relieved and the wire rope and cable are cable clamped to the casing.

6 Additional Instrumentation

In order to optimize the science from these boreholes, additional cement is placed over the instrument and other instruments are installed. At Strip Rd, Hokukano, and Mauna Loa Observatory sites, borehole seismometer/acceleration packages and tiltmeter instruments were installed.

At these sites the hole bottom was brought up to a point 100' above the top of the strainmeter by placing neat cement in the borehole. One inch flush joint tremmie pipe is lowered into the borehole in 20' sections by using the hydraulic derrick. Once this tremmie gently contacts the top of the strainmeter cement and the depth and volume to a seismic package site is determined, a new bottom can be set. The tremmie is pulled back 20' and a neat cement mix is prepared and delivered by gravity through the tremmie to the new target depth. After the tremmie is pulled from the hole and washed, this mix is allowed to set overnight. The seismic/acceleration package is placed in the hole the next day using the same tremmie pipe It is cemented in place, and the hole bottom is brought up again (using the same method of volume calculation & tremmie and cement placement) to 50 feet from the surface. The tiltmeter can now be installed. It is attached to 1" flush joint PVC tremmie pipe by a pvc press fit joint with wire rope bearing the load.

7 ELECTRONICS ENCLOSURES

After the instruments are all installed and the hole is cemented to the surface, electronic surface enclosures are installed. These enclosures consist of a 3 ft. (0.9144 m.) wide, 4 ft. (1.2192 m.) long, by 1 ½ ft (0.4572 m.) high closed bottom concrete block structures with a steel lid for the electronics, and the same for the batteries. The battery enclosure is a short distance from the electronics with solar panels for battery charging near by. All enclosures are connected by pvc conduit for power and signal routing.

8 SURFACE ELECTRONICS

The electronics consists of signal amplifiers, a barometric pressure transducer, and two data collection systems housed in the electronics enclosure. Electronics for signal conditioning, amplification, data collection and transmission are temperature tested in the lab and installed in closed bottom concrete block surface enclosures. The electronics are powered by solar charged batteries. They are located in a closed bottom concrete block surface enclosures within 15 feet (4.57 meters) of the electronics. A water resistant box houses the electronics for the strainmeter.

The strainmeter electronics consists of a dc/dc converter powering 2 op amps for 2 different DC (strain) signals, and a automatic valve opener driven by microprocessor control. The operation of the strainmeter electronics is a follows. As the strainmeter in the borehole is squeezed by the surrounding rock, silicon oil in the instrument is forced through an orifice, displaces a bellows, which moves the attached core of a transducer. The movement of this core is approximately .318V/.01 in.(.318V/.254mm), as powered by a 6.8V voltage regulator. The movement of this transducer is measured as a voltage at the surface in the **SOC** Box (**S**trainmeter **O**peration & **C**ontrol Box). This voltage is monitored by a micro processor to control pressure relief of the transducer in the strainmeter. As stated in the Dilatometer Instrumentation section, there are two LVDT's, one measures the strain on the rock, the second acts as a reservoir monitor/thermistor/lo gain transducer. The operation of the SOC Box is designed so that if LVDT #1 exceeds a predetermined threshold voltage of 0.4 volts it's valve will open/close and pass this pressure to LVDT #2. After 2 hours LVDT #2's valve will open and pass this pressure in the form of fluid to the reservoir volume space of the strainmeter. (see appendix). If during the daily cycle of the instrument operation, the battery powering the strainmeter should drop below 10 volts, the electronics will automatically shut down. It will open both valves at this time preventing pressure from exceeding the physical limits of the LVDT's in the instrument.

This electronics package draws approximately 380 milliamps. The electronics is powered by a 12 volt deep-cycle maintenance free gelled electrolyte trickle charged battery. This battery is kept charged by two 50 watt solar panels using a automatic sequencing charger. This charger stops charging at 14.3 volts +/-.2 volts and resumes at 13.2 +/-0.3 volts. During the night a blocking diode acts to prevent discharge of the battery through the panel.

High frequency data from the dilatometer in the 0.005 Hz to 100 Hz can be recorded on 24 bit telemetry systems with a least count noise of less than10 -11. Low frequency data, from 0 Hz to 0.002 Hz are transmitted via a 17-bit digital telemetry system through the GOES satellite system to Menlo Park, Cal. A separate polled spread spectrum telemetry to USGS Hawaii Volcano Observatory provides 1 minute data. The least count noise on the high gain satellite telemetry system for the dilatometer is about 2 * 10 -11. For the low gain channel the least count noise is about 1.2 * 10 -8. These instruments all record earth strain tides, strain transients related to volcanic deformation and numerous strain seismograms from local and tele-seismic earthquakes with magnitudes between 1 and 9. These strain seismograms are used to calculate the dynamic earthquake moments.

Static moments and total earthquake moments are determined from the co-seismic strains and total strain changes observed with larger events. Should pre-seismic strains occur before an expected volcanic eruption, they can be resolved at about the 10 to -11 level if they occur quickly, and about 10 to -8 level if they occur days to weeks before the event.

9. Basic Principle of Operation:

Summary:

SOC Box Operation (as described by Carnegie Institute of Washington / DTM) is as follows:

The strainmeter control box contains the electronics, which control and monitor the strainmeter. It also filters and passes the analog signals from the strainmeter to an external device. The external device is usually an Analog-to-Digital converter passing digital data to either local storage or a telemetry system or both.

Detailed Description:

Supply power to the strainmeter control box is monitored internally by the electronics to determine if sufficient voltage is present at the input to the strainmeter control box. If the voltage dips below the preset trip voltage (should be about 10Vdc), the controller will disconnect power until the voltage rises to an acceptable level. There is some hysteresis designed into the power monitoring circuitry to avoid the unwanted condition of power-off, power-on, power-off, etc... This on-off-on-off-on is something that could be quite common with a solar-cell charged battery system if the hysteresis was not implemented. To avoid any problems that could arise from sustained power cycling, hysteresis is used in the power monitoring circuit. Additionally supply power is monitored by the microcontroller by way of analog input to the 16-bit multiplexing A/D. If the voltage measured by the A/D drops to an unacceptable level the microcontroller wiI1 immediately open the strainmeter valves in an effort to protect the strainmeter. If this precaution was not taken when power is sagging, the strainmeter control box might shut down with valves closed during a seismic event. This could easily rupture the bellows in the strainmeter, leaving it unusable.

The strainmeter control box supplies power to the Differential Transformers contained in the strainmeter. The control box will supply a regulated 6.8VDC potential to the DT power input

The Valves in the strainmeters (designed and manufactured at the Carnegie Institution of Washington) open or close depending on the polarity of the potential voltage applied to the valves. Most of the older land-based strainmeters operate with a valve operating potential of 24VDC. The newer land- and water-based strainmeters

have valves that operate at 48VDC'. The serial connection is optically isolated using the RS-232 standard. It uses the following parameters.
BAUD: 9600, DATA BITS: 8, STOP BITS: 1, PARITY: None
As of the writing of this manual the Dept. of Terrestrial Magnetism has adopted a policy to use only 48VDC valves on all future water- and land-based strainmeters.

10. VALVE OPENING ALGORITHM

June 7, 2000

Low Threshold Voltage:
0.4Volts

Low Threshold Period:
Valve 1 = 900 seconds (15 minutes)
Valve 2 = 660 seconds (11 minutes)

High Threshold Voltage:
3.0Volts (60% of A/D's maximum voltage level)

Valve behavior if DT1 voltage exceeds low threshold for 15 consecutive minutes:
Valve 1 opens
Valve 2 is scheduled to open 2 hours later.
Valve 1 closes 15 seconds after opening.
Valve 2 closes 15 seconds after opening.

Valve2 behavior if DT2 voltage exceeds low threshold for 11 consecutive minutes:
Valve 2 opens.
Valve 2 closes 15 seconds after opening.

Valve1 behavior if DT1 voltage exceeds high threshold:
Valve l opens.
Valve l closes 1 minute afer opening
Valve 2 is scheduled to open **11 minutes** after Valve 1 closes.
Valve 2 remains open for 5 seconds.

If Valve l opens again in less than 11 minutes, Valve2 opening is rescheduled for 11 minutes following next Valve1 closing.

Valve2 behavior if DT2 voltage exceeds high threshold:
Valve 2 opens.
Valve 2 closes ***5* SEC** after opening.
Interlock:
If Valve l needs to open we check if Valve2 is open. If Valv e2 is open, we close Valve 2 before opening Valve 1.

If Valve 2 needs to open we check if Valve l is open. If Valve 1 is open, we close Valve l before opening Valv e2

Here is a chart describing the new firmware algorithm.
You should note that the High Level threshold does not change, it is static at 3.0VDC. The interlock disables the operation that opens valve 2, 2 hours after valve 1 has been opened over the low threshold. This is intended to keep DT2 close to zero so that the spring associated with DT2 does not deform such that its zero point would move slightly due to long term extension. Again, this interlock disable is only to be used to troubleshoot very specific problems. Most probably you won't have any need of this feature. So, make sure you do not select the interlock disable feature.

The 12VDC power occasionally displaying 12VDC is most probably a Windows 'feature'. Don't worry about it too much this is Windows interrupting its own RS232 stream. However, if you see that the SOC box is opening the valves as this 1 VDC power display occurs, you should be concerned. If this is happening you need to let DTM/CIW* know because that would be very serious.

Valve Close after
low threshold
opening
15 seconds since
valve closed?
Average next 128
samples. Represents
zero offset level.
Difference =
LVT -ABS(Average)
Difference
.LT.
10% of LVT?
LVT =
LVT + 0.1*LVT
ABS(Difference)
.GT.
(LVT+0.1*LVT) ?
LVT = LVT +LVT0
ABS(Zero offset)
.LT.
LVT?
LVT!=LVT0?
LVT=LVT-LVT0
LVT+LVT0
.LT.
HVT?
LVT0=Default Low VoltageThreshold = 0.4V
LVT=Low Voltage Threshold
HVT=High VoltageThreshold=3V

Algorithm for Low Voltage Threshold Adjustment
Applies to DT1 and DT2

DT1 and DT2 can have different Low Voltage Thresholds
NO
NO
Return leaving LVT
unchanged
NO
Return
NO
LVT = LVT0?
Return
NO
NO

*DTM/CIW = Department of Terrrestrial Magnetism / Carnegie Institute of Technology
5241 Broadbranch Road, N.W.
Washington, DC 20015
Call 202-478-8843, 8829, or 8835

11. Cable & Connector Summary (as described by Carnegie Institute of Washington / DTM)

Power
The Five (5) pin power connector provides input power to the 'Strainmeter Control Box'. The input power is a nominal +12Vdc (Strainmeter Operation and Control Box (SOC Box))
(11-24Vdc allowable range).

Strainmeter
The eighteen (18) pin connector interfaces the control box to the strainmeter. This connector provides power to the Differential Transformers, DT's, and valves in the strainmeter. It also feeds the DT outputs from the strainmeter into the control box.

Ground Post Post
This post is used to make a connection with the common ground. In an effort to reduce ground loops, which can induce noise into the system, this is by design the sole connection to common ground.

RS232
This connector provides serial communication to a PC for the purpose of monitoring the status of the strainmeter and manual control of the valves.

Output A
Output B
These two connectors are analog outputs from the strainmeter control box. These are the buffered DT signals from the strainmeter. OUTPUT A and B have identical pinouts.

* Note:
There is a hole in one of the faceplates. This hole feeds to a water tight tube used to feed outside air pressure to the pressure sensor inside the box.

** Note: Refer (to connector pin-out map for a description of connector pin assignments.

12. Barometer:

There is a barometric pressure transducer operating over a 300 millibar range. This on site transducer aids in the reduction of the strain data as it is effected by barometric pressure. (see barometric pressure transducer in Additional Electronics Section.) Setra Model #270

The barometric pressure transducer is powered by 1 12 volt deep-cycle maintenance free gelled electrolyte trickle charged batteries. This is kept charged by a similar automatic sequencing charger hooked to a 20 watt solar panel.

13 Telemetry:

Coastal Environmental Systems ZENO Model 3200 was selected as a Data Collection Platform. This system draws 84ma at 12 volts DC during collection and 3 amps at transmission of data to the GOES satellite. Data is collected once every 10 minutes to 17 bit accuracy and transmitted at 10 minute intervals. A second ZENO is also installed for transmission of 1 minute data via Spread Spectrum radio to the Hawaii Volcano Observatory. It also uses a auto sequencing charger and a 50 watt solar panel to keep the battery charged.

14. PROCEDURE FOR DILATOMETER MAINTENANCE:

In general the maintenance of a dilatometer installation is fairly straightforward. There may be the specific instance when a visit may be made for unexpected problems, but for the most part it is a routine procedure. In summary, the data from each instrument is looked at daily for proper operation. It is inspected for tidal response (data quality), data dropouts (satellite problems, computer problems, missing transmisions), time of transmission, transmission power levels, and battery voltages. Information obtained from this helps in the proper field maintenance.

15. Latitude and Longitude Locations

Site	Abbreviation	Latitude	Longitude	Elevation
Mauna Loa Strip Road	ST01 - 09	19.46117	155.34940	5,071 ft
Hokukano	HK01 - 09	19.53884	155.80814	4,764 ft
Mauna Loa Observatory	ML01 - 09	19.53651	155.57478	11,131 ft
Keller Well	KW01 - 09	19.39262	155.34940	3,622 ft

These are all strainmeter sites. Installed with 2.75" o.d. by 10' long Volumetric Strainmeters. they have two transducers installed, #1 is the sensing volume, #2 is the reservoir recovery volume / thermister downhole.

16. Satellite Data Configuration

Strip Road Strainmeter
lat 19 28.298 **long** 155 21.398
Data Logger = Coastal Environmental Systems ZENO 3200 sn #?
01 - 08 are +/-17 bit, 09 +/-12 bit
st01 = transducer #1 hi gain +/-.512 volt range 3.91x10-6
st02 = " " lo " +/-5.12 volt range 3.91x10-5
st03 = " #2 lo " +/-5.12 volt range 3.91x10-5
st04 = input to A/D as a short to ground +/-5.12 volt range 3.91x10-5
st05 = Setra #270 600-900mbar at 0 - 5vdc +/-5.12 volt range 3.91x10-5
st06 = tiltmeter x axis +/-5.12 volt range 3.91x10-5
at 17meter depth gain 3 in tiltmeter = 95.60mv/microradian
or 0.0004581574 microradians/ct
st07 = tiltmeter y axis +/-5.12 volt range 3.91x10-5
at 17meter depth gain 3 in tiltmeter = 98.10/microradian
or 0.00039819062 microradians/ct
st08 = YSI4401 thermister +/-5.12 volt range 3.91x10-5
C x .001 (ie, 15666 x .001 = +15.666)
st09 = +/- 12 bit range = .007816291 volts/ct (.007816291 by 1720 = 13.44 volts dc)
st10 == tipping bucket raingage, 1 count = 1millimeter
Number of assigned DCP bits 01 - 08 are +/-17 bit; 09 is +/-12 bit, 10 = rain gage

Hokukano Strainmeter
lat 19 32.330 **long** 155 48.489
Data Logger = Coastal Environmental Systems ZENO 3200 sn #?

Component description,sensor/digitizer gain,voltage range input to DCP
hk01 = transducer #1 hi gain +/-.512 volt range 3.91x10-6
hk02 = " " lo " +/-5.12 volt range 3.91x10-5
hk03 = " #2 lo " +/-5.12 volt range 3.91x10-5
hk04 = input to A/D as a short to ground +/-5.12 volt range 3.91x10-5

hk05 = Setra #270 600-900mbar at 0 - 5vdc +/-5.12 volt range 3.91x10-5
hk06 = tiltmeter x axis Pinnacle 5000 +/-5.12 volt range 3.91x10-5
at 14meter depth gain 3 in tiltmeter = 85.26mv/microradian
or 0.0004581574 microradians/ct
hk07 =tiltmeter y axis Pinnacle 5000 +/-5.12 volt range 3.91x10-5
hk08 = YSI4401 thermister C x .001 (ie, 15666 x .001 = +15.666)
hk09 = +/- 12 bit range = .007816291 volts/ct .007816291 by 1720 = 13.44 volts dc
hk10 = tipping bucket raingage, 1 count = 1millimeter
Number of assigned DCP bits 01 - 08 are +/-17 bit; 09 is +/-12 bit, 10 = rain gage

Mauna Loa Strainmeter
lat 19 32.227 **long** 155 35.347
Data Logger = Coastal Environmental Systems ZENO 3200 sn #?
01 - 08 are +/-17 bit; 09 +/-12 bit
ml01 = transducer #1 hi gain +/-.512 volt range 3.91x10-6
ml02 = " " lo " +/-5.12 volt range 3.91x10-5
ml03 = " #2 lo " +/-5.12 volt range 3.91x10-5
ml04 = inputto A/D as a short to ground +/-5.12 volt range 3.91x10-5
ml05 = Setra #270 600-900mbar at 0-5vdc +/-5.12 volt range 3.91x10-5
ml06 = tiltmeter x axis Pinnacle 5000 +/-5.12 volt range 3.91x10-5
at 14meter depth gain 3 in tiltmeter = 85.26mv/microradian
or 0.0004581574 microradians/ct
ml07 = tiltmeter y axis Pinnacle 5000 +/-5.12 volt range 3.91x10-5
at 14meter depth gain 3 in tiltmeter = 119.38mv/microradian
or 0.00032721143 microradians/ct
ml08 = YSI4401 thermister C x .001 (ie, 15666 x .001 = +15.666)
ml09 = +/- 12 bit range = .007816291 volts/ct .007816291 by 1720 = 13.44 volts dc
ml10 == tipping bucket raingage, 1 count = 1millimeter
Number of assigned DCP bits 01 - 08 are +/-17 bit; 09 is +/-12 bit, 10 = rain gage
-
Keller Strainmeter
lat 19 23.557 **long** 155 17.154
Data Logger = Coastal Environmental Systems ZENO 3200 sn #?
01 - 08 are +/-17 bit; 09 is +/-12 bit, 10 & 11 are +/-17bit
kw01 = transducer #1 hi gain +/-.512 volt range 3.91x10-6
kw02 = " " lo " +/-5.12 volt range 3.91x10-5
kw03 = " #2 lo " +/-.512 volt range 3.91x10-6
kw04 = inputto A/D as a short to ground +/-5.12 volt range 3.91x10-5
kw05 = Setra #270 800-11mbar at 0-5vdc +/-5.12 volt range 3.91x10-5
kw06 = tiltmeter x axis Pinnacle 5000 +/-5.12 volt range 3.91x10-5
at 14meter depth gain 3 in tiltmeter = 85.26mv/microradian
or 0.0004581574 microradians/ct
kw07 = tiltmeter y axis Pinnacle 5000 +/-5.12 volt range 3.91x10-5
kw08 = YSI4401 thermister C x .001 (ie, 15666 x .001 = +15.666)
kw09 = +/- 12 bit range = .007816291 volts/ct
.007816291 by 1720 = 13.44 volts dc
kw10 = tipping bucket raingage, 1 count = 1millimeter
kw11 = grounded input +/-5.12 volt range 3.91x10-5

Number of assigned DCP bits 01 - 08 are +/-17 bit; 09 is +/-12 bit,
10 = rain gage, 11 is +/-17 bit spare

Programming ZENO

Accessing the Coastal Environmental ZENO 3200 for programming is done through a manufacturer supplied rs232 cable and customer supplied PC or MAC with a terminal emulation program. (Crosstalk, Mirror, Windows Terminal, Hyperterminal, or ProComm).

Access the ZENO via the rs232 cable with the Hyperterminal program on. Then power the ZENO.
The program will display the following:

Strip Road Program:

"apply power to ZENO"

```
Watchdog Reset
ZENO-3200  using ZENOSOFT V1.813 Dec  1 1998 14:56:07 CS EEBE
(C)opyright 1995-1998, Coastal Environmental Systems, Seattle, WA, USA.
System Time = 05/12/02 23:47:05
Initializing Zeno 3200 .../
Verifying GOES Transmitter Initialization ...
WARNING: GOES Transmitter not initialized since system restart.
     Use the 'Initialize GOES' command inside the GOES menu.


Zeno 3200 is Data Sampling. Type 'U'<enter> to access the User Interface.
```

("U" <enter> entering this command will not appear on screen. However the response follows)

```
USER MENU
(C) Communications Menu          (T) Test Menu
(F) System Functions Menu        (Z) Zeno Program Menu
(S) Sample Period Menu           (Q) Quit
(D) Data Retrieval Menu          (H) Help

> c

COMMUNICATIONS MENU
(Cn/m) Change Item n To Value m      (Tn) Terminal Mode On COM Port n
(M)   Modem Menu                      (E)  Save Parameters To EEPROM
(P)   Power Control Menu              (U)  User Menu
(G)   GOES Menu                       (Q)  Quit
(D)   Digital Control Menu            (H)  Help

Item  1:  9600      (COM1 Baud Rate)
Item  2:  9600      (COM2 Baud Rate)
Item  3:  9600      (COM3 Baud Rate)
Item  4:  RS232     (COM1 Port Type)
Item  5:  GOES      (COM2 Port Type)
Item  6:  RS232     (COM3 Port Type)
Item  7:  NO        (COM3 User Interface Exclusive)
Item  8:  NO        (Enable Exclusive CCSAIL Access)

> g
```

```
GOES MENU
(Cn/m) Change Item n To Value m      (E) Save Parameters To EEPROM
(D)   Run GOES Diagnostics           (U) User Menu
(R)   Reset GOES Errors              (Q) Quit
(I)   Initialize GOES                (H) Help

Item 1:  2637e3e0     (Data Collection Platform Address)
Item 2:  104          (Self-Timed Transmit Channel Number)
Item 3:  00:00:10:00  (Self-Timed Transmission Interval)
Item 4:  00:06:00     (Self-Timed Transmission Offset)
Item 5:  1            (Transmission Window Length)
Item 6:  SHORT        (Satellite Link Parameter: Preamble)
Item 7:  151          (Random Transmit Channel Number)
Item 8:  00:00:00     (Random Transmission Interval)
Item 9:  00:05:00     (Random Disable Time)

> i

Current Date and Time:   05/12/01 22:51:46
Enter new Date and Time: 05/12/02 22:53:00
GOES Transmitter Initialization ... successful
Note: Next sample interval begins in 6 minutes and 59 seconds.

GOES MENU
(Cn/m) Change Item n To Value m      (E) Save Parameters To EEPROM
(D)   Run GOES Diagnostics           (U) User Menu
(R)   Reset GOES Errors              (Q) Quit
(I)   Initialize GOES                (H) Help

Item 1:  2637e3e0     (Data Collection Platform Address)
Item 2:  104          (Self-Timed Transmit Channel Number)
Item 3:  00:00:10:00  (Self-Timed Transmission Interval)
Item 4:  00:06:00     (Self-Timed Transmission Offset)
Item 5:  1            (Transmission Window Length)
Item 6:  SHORT        (Satellite Link Parameter: Preamble)
Item 7:  151          (Random Transmit Channel Number)
Item 8:  00:00:00     (Random Transmission Interval)
Item 9:  00:05:00     (Random Disable Time)

> u

USER MENU
(C) Communications Menu      (T) Test Menu
(F) System Functions Menu    (Z) Zeno Program Menu
(S) Sample Period Menu       (Q) Quit
(D) Data Retrieval Menu      (H) Help

> s

SAMPLE PERIOD MENU
(Cn/m) Change Item n To Value m      (Q) Quit
(E)   Save Parameters To EEPROM      (H) Help
(U)   User Menu

Item 1:  600    (Sample Interval Time)
Item 2:  14     (Sample Duration Time)
Item 3:  0      (Sample Time Offset)
```

```
> u
Checking Scan List records ...

USER MENU
(C) Communications Menu          (T) Test Menu
(F) System Functions Menu        (Z) Zeno Program Menu
(S) Sample Period Menu           (Q) Quit
(D) Data Retrieval Menu          (H) Help

> z

Enter Administrator Password: ****

Waiting for all data acquisition tasks to finish . . .


ZENO PROGRAM MENU
(S) Sensor Menu                  (W) Password Menu
(P) Process Menu                 (R) Reset System
(D) Data Output Menu             (E) Save Parameters To EEPROM
(T) Sensor Timing Loop Menu      (U) User Menu
(O) Output Message Timing Menu   (Q) Quit
(L) System Load Menu             (H) Help

S

SENSOR MENU
(Cn/m) Change Item n To Value m  (N) Go To Next Record
(A)  Insert After This Record    (P) Go To Previous Record
(B)  Insert Before This Record   (X) Delete All Records
(D)  Delete This Record          (Z) Zeno Program Menu
(Jn) Jump To Record n            (H) Help

Sensor Items for Record 1 of 9:
Item  1: Sensor Type Code              2 (18-bit Single-Ended A to D)
Item  2: Sensor Name                   dt01
Item  3: Sensor Input Channel          1-
Item  4: Analog Channel Gain           1
Item  5: Analog Channel Attenuation    1
Item  6: Switched Power Code           0 (NO SWITCHED POWER)
Item  7: Sensor Excitation Voltage Code  0 (NO EXCITATION VOLTAGE)
Item  8: Switched Excitation Return    0
Item  9: Switched Power Warmup Time    0
Item 10: Sensor Sample Count           8
Item 11: Maximum Sensor Readings       0
Item 12: Sensor Timing Loop            2 (1.0 seconds)
Item 13: Conversion Coefficient A      0
Item 14: Conversion Coefficient B      0.5
Item 15: Conversion Coefficient C      0

N
SENSOR MENU
(Cn/m) Change Item n To Value m  (N) Go To Next Record
(A)  Insert After This Record    (P) Go To Previous Record
(B)  Insert Before This Record   (X) Delete All Records
(D)  Delete This Record          (Z) Zeno Program Menu
(Jn) Jump To Record n            (H) Help
```

```
Sensor Items for Record 2 of 9:
Item  1: Sensor Type Code             2 (18-bit Single-Ended A to D)
Item  2: Sensor Name                  dt01
Item  3: Sensor Input Channel          1-
Item  4: Analog Channel Gain           1
Item  5: Analog Channel Attenuation   10
Item  6: Switched Power Code           0 (NO SWITCHED POWER)
Item  7: Sensor Excitation Voltage Code  0 (NO EXCITATION VOLTAGE)
Item  8: Switched Excitation Return    0
Item  9: Switched Power Warmup Time    0
Item 10: Sensor Sample Count           8
Item 11: Maximum Sensor Readings       0
Item 12: Sensor Timing Loop            2 (1.0 seconds)
Item 13: Conversion Coefficient A      0
Item 14: Conversion Coefficient B      0.5
Item 15: Conversion Coefficient C      0

N
SENSOR MENU
(Cn/m) Change Item n To Value m     (N) Go To Next Record
(A)  Insert After This Record       (P) Go To Previous Record
(B)  Insert Before This Record      (X) Delete All Records
(D)  Delete This Record             (Z) Zeno Program Menu
(Jn) Jump To Record n               (H) Help

Sensor Items for Record 3 of 9:
Item  1: Sensor Type Code              2 (18-bit Single-Ended A to D)
Item  2: Sensor Name                   dt02
Item  3: Sensor Input Channel          1+
Item  4: Analog Channel Gain           1
Item  5: Analog Channel Attenuation   10
Item  6: Switched Power Code           0 (NO SWITCHED POWER)
Item  7: Sensor Excitation Voltage Code  0 (NO EXCITATION VOLTAGE)
Item  8: Switched Excitation Return    0
Item  9: Switched Power Warmup Time    0
Item 10: Sensor Sample Count           8
Item 11: Maximum Sensor Readings       0
Item 12: Sensor Timing Loop            2 (1.0 seconds)
Item 13: Conversion Coefficient A      0
Item 14: Conversion Coefficient B      0.5
Item 15: Conversion Coefficient C      0

N
SENSOR MENU
(Cn/m) Change Item n To Value m     (N) Go To Next Record
(A)  Insert After This Record       (P) Go To Previous Record
(B)  Insert Before This Record      (X) Delete All Records
(D)  Delete This Record             (Z) Zeno Program Menu
(Jn) Jump To Record n               (H) Help

Sensor Items for Record 4 of 9:
Item  1: Sensor Type Code              2 (18-bit Single-Ended A to D)
Item  2: Sensor Name                   short
Item  3: Sensor Input Channel          2-
Item  4: Analog Channel Gain           1
Item  5: Analog Channel Attenuation    1
Item  6: Switched Power Code           0 (NO SWITCHED POWER)
Item  7: Sensor Excitation Voltage Code  0 (NO EXCITATION VOLTAGE)
```

Item 8: Switched Excitation Return 0
Item 9: Switched Power Warmup Time 0
Item 10: Sensor Sample Count 8
Item 11: Maximum Sensor Readings 0
Item 12: Sensor Timing Loop 2 (1.0 seconds)
Item 13: Conversion Coefficient A 0
Item 14: Conversion Coefficient B 0.5
Item 15: Conversion Coefficient C 0

N
SENSOR MENU
(Cn/m) Change Item n To Value m (N) Go To Next Record
(A) Insert After This Record (P) Go To Previous Record
(B) Insert Before This Record (X) Delete All Records
(D) Delete This Record (Z) Zeno Program Menu
(Jn) Jump To Record n (H) Help

Sensor Items for Record 5 of 9:
Item 1: Sensor Type Code 2 (18-bit Single-Ended A to D)
Item 2: Sensor Name baro
Item 3: Sensor Input Channel 2+
Item 4: Analog Channel Gain 1
Item 5: Analog Channel Attenuation 10
Item 6: Switched Power Code 0 (NO SWITCHED POWER)
Item 7: Sensor Excitation Voltage Code 0 (NO EXCITATION VOLTAGE)
Item 8: Switched Excitation Return 0
Item 9: Switched Power Warmup Time 0
Item 10: Sensor Sample Count 8
Item 11: Maximum Sensor Readings 0
Item 12: Sensor Timing Loop 2 (1.0 seconds)
Item 13: Conversion Coefficient A 0
Item 14: Conversion Coefficient B 0.5
Item 15: Conversion Coefficient C 0

N
SENSOR MENU
(Cn/m) Change Item n To Value m (N) Go To Next Record
(A) Insert After This Record (P) Go To Previous Record
(B) Insert Before This Record (X) Delete All Records
(D) Delete This Record (Z) Zeno Program Menu
(Jn) Jump To Record n (H) Help

Sensor Items for Record 6 of 9:
Item 1: Sensor Type Code 2 (18-bit Single-Ended A to D)
Item 2: Sensor Name x-axis
Item 3: Sensor Input Channel 3-
Item 4: Analog Channel Gain 1
Item 5: Analog Channel Attenuation 10
Item 6: Switched Power Code 0 (NO SWITCHED POWER)
Item 7: Sensor Excitation Voltage Code 0 (NO EXCITATION VOLTAGE)
Item 8: Switched Excitation Return 0
Item 9: Switched Power Warmup Time 0
Item 10: Sensor Sample Count 8
Item 11: Maximum Sensor Readings 0
Item 12: Sensor Timing Loop 2 (1.0 seconds)
Item 13: Conversion Coefficient A 0
Item 14: Conversion Coefficient B 0.5
Item 15: Conversion Coefficient C 0

N
SENSOR MENU
(Cn/m) Change Item n To Value m (N) Go To Next Record
(A) Insert After This Record (P) Go To Previous Record
(B) Insert Before This Record (X) Delete All Records
(D) Delete This Record (Z) Zeno Program Menu
(Jn) Jump To Record n (H) Help

Sensor Items for Record 7 of 9:

Item 1: Sensor Type Code	2 (18-bit Single-Ended A to D)
Item 2: Sensor Name	y-axis
Item 3: Sensor Input Channel	3+
Item 4: Analog Channel Gain	1
Item 5: Analog Channel Attenuation	10
Item 6: Switched Power Code	0 (NO SWITCHED POWER)
Item 7: Sensor Excitation Voltage Code	0 (NO EXCITATION VOLTAGE)
Item 8: Switched Excitation Return	0
Item 9: Switched Power Warmup Time	0
Item 10: Sensor Sample Count	8
Item 11: Maximum Sensor Readings	0
Item 12: Sensor Timing Loop	2 (1.0 seconds)
Item 13: Conversion Coefficient A	0
Item 14: Conversion Coefficient B	0.5
Item 15: Conversion Coefficient C	0

N
SENSOR MENU
(Cn/m) Change Item n To Value m (N) Go To Next Record
(A) Insert After This Record (P) Go To Previous Record
(B) Insert Before This Record (X) Delete All Records
(D) Delete This Record (Z) Zeno Program Menu
(Jn) Jump To Record n (H) Help

Sensor Items for Record 8 of 9:

Item 1: Sensor Type Code	2 (18-bit Single-Ended A to D)
Item 2: Sensor Name	temp
Item 3: Sensor Input Channel	4-
Item 4: Analog Channel Gain	1
Item 5: Analog Channel Attenuation	10
Item 6: Switched Power Code	0 (NO SWITCHED POWER)
Item 7: Sensor Excitation Voltage Code	2 (EXC = 2.50 VDC)
Item 8: Switched Excitation Return	A
Item 9: Switched Power Warmup Time	0
Item 10: Sensor Sample Count	8
Item 11: Maximum Sensor Readings	0
Item 12: Sensor Timing Loop	2 (1.0 seconds)
Item 13: Conversion Coefficient A	0
Item 14: Conversion Coefficient B	0.5
Item 15: Conversion Coefficient C	0

N

SENSOR MENU
(Cn/m) Change Item n To Value m (N) Go To Next Record
(A) Insert After This Record (P) Go To Previous Record
(B) Insert Before This Record (X) Delete All Records
(D) Delete This Record (Z) Zeno Program Menu

```
(Jn)  Jump To Record n                  (H) Help

Sensor Items for Record 9 of 9:
Item  1: Sensor Type Code                1 (12-bit Analog to Digital)
Item  2: Sensor Name                     Battery
Item  3: Sensor Input Channel            BATTERY VOLTAGE
Item  6: Switched Power Code             0 (NO SWITCHED POWER)
Item  7: Sensor Excitation Voltage Code  0 (NO EXCITATION VOLTAGE)
Item  8: Switched Excitation Return      0
Item  9: Switched Power Warmup Time      0
Item 10: Sensor Sample Count             1
Item 11: Maximum Sensor Readings         0
Item 12: Sensor Timing Loop              1 (0.5 seconds)
Item 13: Conversion Coefficient A        0
Item 14: Conversion Coefficient B        1
Item 15: Conversion Coefficient C        0

> z

ZENO PROGRAM MENU
(S) Sensor Menu                          (W) Password Menu
(P) Process Menu                         (R) Reset System
(D) Data Output Menu                     (E) Save Parameters To EEPROM
(T) Sensor Timing Loop Menu              (U) User Menu
(O) Output Message Timing Menu           (Q) Quit
(L) System Load Menu                     (H) Help

> p

PROCESS MENU
(Cn/m) Change Item n To Value m          (N) Go To Next Record
(A)  Insert After This Record            (P) Go To Previous Record
(B)  Insert Before This Record           (X) Delete All Records
(D)  Delete This Record                  (Z) Zeno Program Menu
(Jn)  Jump To Record n                   (H) Help

Process Items for Record 1 of 9:
Item  1: Process Category                1  : General
Item  2: Process Number                  2  : Averaging Process
Item  3: Input for Average Data          S1  : dt01

> n

PROCESS MENU
(Cn/m) Change Item n To Value m          (N) Go To Next Record
(A)  Insert After This Record            (P) Go To Previous Record
(B)  Insert Before This Record           (X) Delete All Records
(D)  Delete This Record                  (Z) Zeno Program Menu
(Jn)  Jump To Record n                   (H) Help

Process Items for Record 2 of 9:
Item  1: Process Category                1  : General
Item  2: Process Number                  2  : Averaging Process
Item  3: Input for Average Data          S2  : dt01

> n

PROCESS MENU
```

(Cn/m) Change Item n To Value m (N) Go To Next Record
(A) Insert After This Record (P) Go To Previous Record
(B) Insert Before This Record (X) Delete All Records
(D) Delete This Record (Z) Zeno Program Menu
(Jn) Jump To Record n (H) Help

Process Items for Record 3 of 9:
Item 1: Process Category 1 : General
Item 2: Process Number 2 : Averaging Process
Item 3: Input for Average Data S3 : dt02

> n

PROCESS MENU
(Cn/m) Change Item n To Value m (N) Go To Next Record
(A) Insert After This Record (P) Go To Previous Record
(B) Insert Before This Record (X) Delete All Records
(D) Delete This Record (Z) Zeno Program Menu
(Jn) Jump To Record n (H) Help

Process Items for Record 4 of 9:
Item 1: Process Category 1 : General
Item 2: Process Number 2 : Averaging Process
Item 3: Input for Average Data S4 : short

> n

PROCESS MENU
(Cn/m) Change Item n To Value m (N) Go To Next Record
(A) Insert After This Record (P) Go To Previous Record
(B) Insert Before This Record (X) Delete All Records
(D) Delete This Record (Z) Zeno Program Menu
(Jn) Jump To Record n (H) Help

Process Items for Record 5 of 9:
Item 1: Process Category 1 : General
Item 2: Process Number 2 : Averaging Process
Item 3: Input for Average Data S5 : baro

> n

PROCESS MENU
(Cn/m) Change Item n To Value m (N) Go To Next Record
(A) Insert After This Record (P) Go To Previous Record
(B) Insert Before This Record (X) Delete All Records
(D) Delete This Record (Z) Zeno Program Menu
(Jn) Jump To Record n (H) Help

Process Items for Record 6 of 9:
Item 1: Process Category 1 : General
Item 2: Process Number 2 : Averaging Process
Item 3: Input for Average Data S6 : x-axis

> n

PROCESS MENU
(Cn/m) Change Item n To Value m (N) Go To Next Record
(A) Insert After This Record (P) Go To Previous Record

```
(B)  Insert Before This Record          (X) Delete All Records
(D)  Delete This Record                 (Z) Zeno Program Menu
(Jn) Jump To Record n                   (H) Help

Process Items for Record 7 of 9:
Item 1: Process Category          1  : General
Item 2: Process Number            2  : Averaging Process
Item 3: Input for Average Data    S7 : y-axis

> n

PROCESS MENU
(Cn/m) Change Item n To Value m     (N) Go To Next Record
(A)  Insert After This Record       (P) Go To Previous Record
(B)  Insert Before This Record      (X) Delete All Records
(D)  Delete This Record             (Z) Zeno Program Menu
(Jn) Jump To Record n               (H) Help

Process Items for Record 8 of 9:
Item 1: Process Category          1  : General
Item 2: Process Number            2  : Averaging Process
Item 3: Input for Average Data    S8 : temp

> n

PROCESS MENU
(Cn/m) Change Item n To Value m     (N) Go To Next Record
(A)  Insert After This Record       (P) Go To Previous Record
(B)  Insert Before This Record      (X) Delete All Records
(D)  Delete This Record             (Z) Zeno Program Menu
(Jn) Jump To Record n               (H) Help

Process Items for Record 9 of 9:
Item 1: Process Category          1  : General
Item 2: Process Number            2  : Averaging Process
Item 3: Input for Average Data    S9 : Battery

> z

ZENO PROGRAM MENU
(S) Sensor Menu                     (W) Password Menu
(P) Process Menu                    (R) Reset System
(D) Data Output Menu                (E) Save Parameters To EEPROM
(T) Sensor Timing Loop Menu         (U) User Menu
(O) Output Message Timing Menu      (Q) Quit
(L) System Load Menu                (H) Help

> d

DATA OUTPUT MENU
(Cn/m) Change Item n To Value m     (N) Go To Next Record
(A)  Insert After This Record       (P) Go To Previous Record
(B)  Insert Before This Record      (X) Delete All Records
(D)  Delete This Record             (Z) Zeno Program Menu
(Jn) Jump To Record n               (H) Help

Data Items for Record 1 of 9:
Item 1: Field Type code           12 : GOES Binary Format Field
```

```
Item 2: Output Message(s)          1
Item 3: Field Name                 dt01
Item 4: Input Record and Element   P1.1
Item 5: Field Decimal Places       0
Item 6: Field Width                3

> n

DATA OUTPUT MENU
(Cn/m) Change Item n To Value m    (N) Go To Next Record
(A)    Insert After This Record    (P) Go To Previous Record
(B)    Insert Before This Record   (X) Delete All Records
(D)    Delete This Record          (Z) Zeno Program Menu
(Jn)   Jump To Record n            (H) Help

Data Items for Record 2 of 9:
Item 1: Field Type code            12 : GOES Binary Format Field
Item 2: Output Message(s)          1
Item 3: Field Name                 dt01
Item 4: Input Record and Element   P2.1
Item 5: Field Decimal Places       0
Item 6: Field Width                3

> n

DATA OUTPUT MENU
(Cn/m) Change Item n To Value m    (N) Go To Next Record
(A)    Insert After This Record    (P) Go To Previous Record
(B)    Insert Before This Record   (X) Delete All Records
(D)    Delete This Record          (Z) Zeno Program Menu
(Jn)   Jump To Record n            (H) Help

Data Items for Record 3 of 9:
Item 1: Field Type code            12 : GOES Binary Format Field
Item 2: Output Message(s)          1
Item 3: Field Name                 dt02
Item 4: Input Record and Element   P3.1
Item 5: Field Decimal Places       0
Item 6: Field Width                3

> n

DATA OUTPUT MENU
(Cn/m) Change Item n To Value m    (N) Go To Next Record
(A)    Insert After This Record    (P) Go To Previous Record
(B)    Insert Before This Record   (X) Delete All Records
(D)    Delete This Record          (Z) Zeno Program Menu
(Jn)   Jump To Record n            (H) Help

Data Items for Record 4 of 9:
Item 1: Field Type code            12 : GOES Binary Format Field
Item 2: Output Message(s)          1
Item 3: Field Name                 short
Item 4: Input Record and Element   P4.1
Item 5: Field Decimal Places       0
Item 6: Field Width                3

> n
```

DATA OUTPUT MENU

(Cn/m) Change Item n To Value m	(N) Go To Next Record
(A) Insert After This Record	(P) Go To Previous Record
(B) Insert Before This Record	(X) Delete All Records
(D) Delete This Record	(Z) Zeno Program Menu
(Jn) Jump To Record n	(H) Help

Data Items for Record 5 of 9:

Item 1: Field Type code	12 : GOES Binary Format Field
Item 2: Output Message(s)	1
Item 3: Field Name	baro
Item 4: Input Record and Element	P5.1
Item 5: Field Decimal Places	0
Item 6: Field Width	3

> n

DATA OUTPUT MENU

(Cn/m) Change Item n To Value m	(N) Go To Next Record
(A) Insert After This Record	(P) Go To Previous Record
(B) Insert Before This Record	(X) Delete All Records
(D) Delete This Record	(Z) Zeno Program Menu
(Jn) Jump To Record n	(H) Help

Data Items for Record 6 of 9:

Item 1: Field Type code	12 : GOES Binary Format Field
Item 2: Output Message(s)	1
Item 3: Field Name	x-axis
Item 4: Input Record and Element	P6.1
Item 5: Field Decimal Places	0
Item 6: Field Width	3

> n

DATA OUTPUT MENU

(Cn/m) Change Item n To Value m	(N) Go To Next Record
(A) Insert After This Record	(P) Go To Previous Record
(B) Insert Before This Record	(X) Delete All Records
(D) Delete This Record	(Z) Zeno Program Menu
(Jn) Jump To Record n	(H) Help

Data Items for Record 7 of 9:

Item 1: Field Type code	12 : GOES Binary Format Field
Item 2: Output Message(s)	1
Item 3: Field Name	y-axis
Item 4: Input Record and Element	P7.1
Item 5: Field Decimal Places	0
Item 6: Field Width	3

> n

DATA OUTPUT MENU

(Cn/m) Change Item n To Value m	(N) Go To Next Record
(A) Insert After This Record	(P) Go To Previous Record
(B) Insert Before This Record	(X) Delete All Records
(D) Delete This Record	(Z) Zeno Program Menu
(Jn) Jump To Record n	(H) Help

Data Items for Record 8 of 9:
Item 1: Field Type code 12 : GOES Binary Format Field
Item 2: Output Message(s) 1
Item 3: Field Name temp
Item 4: Input Record and Element P8.1
Item 5: Field Decimal Places 0
Item 6: Field Width 3

> n

DATA OUTPUT MENU
(Cn/m) Change Item n To Value m (N) Go To Next Record
(A) Insert After This Record (P) Go To Previous Record
(B) Insert Before This Record (X) Delete All Records
(D) Delete This Record (Z) Zeno Program Menu
(Jn) Jump To Record n (H) Help

Data Items for Record 9 of 9:
Item 1: Field Type code 12 : GOES Binary Format Field
Item 2: Output Message(s) 1
Item 3: Field Name BATTERY
Item 4: Input Record and Element P9.1
Item 5: Field Decimal Places 0
Item 6: Field Width 3

> z

ZENO PROGRAM MENU
(S) Sensor Menu (W) Password Menu
(P) Process Menu (R) Reset System
(D) Data Output Menu (E) Save Parameters To EEPROM
(T) Sensor Timing Loop Menu (U) User Menu
(O) Output Message Timing Menu (Q) Quit
(L) System Load Menu (H) Help

> t

SENSOR TIMING LOOP MENU
(Cn/m) Change Item n To Value m (H) Help
(Z) Zeno Program Menu

Item 1: 0.5 (Timing Loop #1 Period)
Item 2: 1.0 (Timing Loop #2 Period)
Item 3: 120.0 (Timing Loop #3 Period)
Item 4: 10.0 (Timing Loop #4 Period)

> o

OUTPUT MESSAGE TIMING MENU
(Cn/m) Change Item n To Value m (H) Help
(Z) Zeno Program Menu

Item 1: COM2 (Data Output Message #1 COM Port)
Item 2: COM3 (Data Output Message #2 COM Port)
Item 3: COM3 (Data Output Message #3 COM Port)
Item 4: COM3 (Data Output Message #4 COM Port)
Item 5: 0.0 (Data Output Message #1 Period)

```
Item  6:  0.0      (Data Output Message #2 Period)
Item  7:  0.0      (Data Output Message #3 Period)
Item  8:  0.0      (Data Output Message #4 Period)

> e
Verifying parameters can be stored in EEPROM . . .
Saving parameters to EEPROM . . .
Saving Scan List parameters to EEPROM . . .
475 out of 2048 bytes used in EEPROM.
Total EEPROM Writes: 43  Checksum: 238

ZENO PROGRAM MENU
(S) Sensor Menu                    (W) Password Menu
(P) Process Menu                   (R) Reset System
(D) Data Output Menu               (E) Save Parameters To EEPROM
(T) Sensor Timing Loop Menu        (U) User Menu
(O) Output Message Timing Menu     (Q) Quit
(L) System Load Menu               (H) Help

> b
Waiting for all data acquisition tasks to finish . . .

BACK DOOR MENU
(Cn/m) Change Item n To Value m    (X) Display Stack Usage
(F)  Calculate Free Heap Memory    (E) Save Parameters To EEPROM
(A)  Auto-Calibrate Compass        (U) User Menu
(I)  Initialize Compass            (H) Help
(R)  Reset Parameters To Defaults

Item  1:  16777      (Processor Clock Speed)
Item  2:  1          (RAM/ROM Wait States)
Item  3:  60         (50/60 Hz Rejection For 18-bit ADC)
Item  4:  18         (13/18 Bit Operation Of 18-bit ADC)
Item  5:  COUNTS     (A To D Conversion Results)
Item  6:  YES        (Expert Menu Mode)
Item  7:  32768.00   (Real-time Clock Crystal Frequency At 25 Degrees C)
Item  8:  0          (Speed vs. Noise Tradeoffs For 18-bit ADC, Factory Only)
Item  9:  1.0000     (12-bit ADC Correction Factor)

> s

SAMPLE PERIOD MENU
(Cn/m) Change Item n To Value m    (Q) Quit
(E)  Save Parameters To EEPROM     (H) Help
(U)  User Menu

Item  1:  600    (Sample Interval Time)
Item  2:  14     (Sample Duration Time)
Item  3:  0      (Sample Time Offset)

>u

USER MENU
(C) Communications Menu            (T) Test Menu
(F) System Functions Menu          (Z) Zeno Program Menu
(S) Sample Period Menu             (Q) Quit
(D) Data Retrieval Menu            (H) Help
```

> f

SYSTEM FUNCTIONS MENU
(Cn/m) Change Item n to Value m (E) Save Parameters To EEPROM
(S) System Date And Time (U) User Menu
(T) Calibrate Internal Temperature (Q) Quit
(V) Program Version (H) Help

Item 1: 1223 (Primary Unit/Experiment ID)
Item 2: 2 (Secondary Unit/Experiment ID)
Item 3: 1 (Data Dump Format)
Item 4: 1 (Real Time Output Format)
Item 5: 0 (Add Compass To Vane)
Item 6: 0 (Compass Offset)
Item 7: 0 (Barometer Elevation)

> v
ZENO-3200 using ZENOSOFT V1.813 Dec 1 1998 14:56:07 CS EEBE
(C)opyright 1995-1998, Coastal Environmental Systems, Seattle, WA, USA.

> u

USER MENU
(C) Communications Menu (T) Test Menu
(F) System Functions Menu (Z) Zeno Program Menu
(S) Sample Period Menu (Q) Quit
(D) Data Retrieval Menu (H) Help

> c g i
Current Date and Time: 05/12/02 23:39:26
Enter new Date and Time: 05/12/02 23:45:00
GOES Transmitter Initialization ... successful

Note: Next sample interval begins in 4 minutes and 59 seconds.

GOES MENU
(Cn/m) Change Item n To Value m (E) Save Parameters To EEPROM
(D) Run GOES Diagnostics (U) User Menu
(R) Reset GOES Errors (Q) Quit
(I) Initialize GOES (H) Help

Item 1: 2637e3e0 (Data Collection Platform Address)
Item 2: 104 (Self-Timed Transmit Channel Number)
Item 3: 00:00:10:00 (Self-Timed Transmission Interval)
Item 4: 00:05:15 (Self-Timed Transmission Offset)
Item 5: 1 (Transmission Window Length)
Item 6: SHORT (Satellite Link Parameter: Preamble)
Item 7: 151 (Random Transmit Channel Number)
Item 8: 00:00:00 (Random Transmission Interval)
Item 9: 00:05:00 (Random Disable Time)

> q

Verifying GOES Transmitter Initialization ...successful

Exiting user interface.

Hokukano Program

"apply power to ZENO"

Watchdog Reset
ZENO-3200 using ZENOSOFT V1.813 Dec 1 1998 14:56:07 CS EEBE
(C)opyright 1995-1998, Coastal Environmental Systems, Seattle, WA, USA.
System Time = 05/12/02 23:47:05
Initializing Zeno 3200 .../
Verifying GOES Transmitter Initialization ...
WARNING: GOES Transmitter not initialized since system restart.
Use the 'Initialize GOES' command inside the GOES menu.

Zeno 3200 is Data Sampling. Type 'U'<enter> to access the User Interface.

("U" <enter> entering this command will not appear on screen. However the response follows)

USER MENU

(C) Communications Menu	(T) Test Menu
(F) System Functions Menu	(Z) Zeno Program Menu
(S) Sample Period Menu	(Q) Quit
(D) Data Retrieval Menu	(H) Help

> c

COMMUNICATIONS MENU

(Cn/m) Change Item n To Value m	(Tn) Terminal Mode On COM Port n
(M) Modem Menu	(E) Save Parameters To EEPROM
(P) Power Control Menu	(U) User Menu
(G) GOES Menu	(Q) Quit
(D) Digital Control Menu	(H) Help

Item 1: 9600 (COM1 Baud Rate)
Item 2: 9600 (COM2 Baud Rate)
Item 3: 9600 (COM3 Baud Rate)
Item 4: RS232 (COM1 Port Type)
Item 5: GOES (COM2 Port Type)
Item 6: RS232 (COM3 Port Type)
Item 7: NO (COM3 User Interface Exclusive)
Item 8: NO (Enable Exclusive CCSAIL Access)

```
> g

GOES MENU
(Cn/m) Change Item n To Value m      (E) Save Parameters To EEPROM
(D)   Run GOES Diagnostics           (U) User Menu
(R)   Reset GOES Errors              (Q) Quit
(I)   Initialize GOES                (H) Help

Item 1:  263880d4      (Data Collection Platform Address)
Item 2:  104           (Self-Timed Transmit Channel Number)
Item 3:  00:00:10:00   (Self-Timed Transmission Interval)
Item 4:  00:05:15      (Self-Timed Transmission Offset)
Item 5:  1             (Transmission Window Length)
Item 6:  SHORT         (Satellite Link Parameter: Preamble)
Item 7:  151           (Random Transmit Channel Number)
Item 8:  00:00:00      (Random Transmission Interval)
Item 9:  00:05:00      (Random Disable Time)

> i

Current Date and Time:   05/12/01 22:51:46
Enter new Date and Time: 05/12/02 22:53:00
GOES Transmitter Initialization ... successful
Note: Next sample interval begins in 6 minutes and 59 seconds.

GOES MENU
(Cn/m) Change Item n To Value m      (E) Save Parameters To EEPROM
(D)   Run GOES Diagnostics           (U) User Menu
(R)   Reset GOES Errors              (Q) Quit
(I)   Initialize GOES                (H) Help

Item 1:  263880d4      (Data Collection Platform Address)
Item 2:  104           (Self-Timed Transmit Channel Number)
Item 3:  00:00:10:00   (Self-Timed Transmission Interval)
Item 4:  00:05:15      (Self-Timed Transmission Offset)
Item 5:  1             (Transmission Window Length)
Item 6:  SHORT         (Satellite Link Parameter: Preamble)
Item 7:  151           (Random Transmit Channel Number)
Item 8:  00:00:00      (Random Transmission Interval)
Item 9:  00:05:00      (Random Disable Time)

> u

USER MENU
(C) Communications Menu      ( T) Test Menu
(F) System Functions Menu    (Z) Zeno Program Menu
(S) Sample Period Menu       (Q) Quit
(D) Data Retrieval Menu      (H) Help

> s

SAMPLE PERIOD MENU
(Cn/m) Change Item n To Value m      (Q) Quit
(E)   Save Parameters To EEPROM      (H) Help
(U)   User Menu

Item 1:  600      (Sample Interval Time)
```

```
Item  2:  14        (Sample Duration Time)
Item  3:  0         (Sample Time Offset)

> u
Checking Scan List records ...

USER MENU
(C) Communications Menu          (T) Test Menu
(F) System Functions Menu        (Z) Zeno Program Menu
(S) Sample Period Menu           (Q) Quit
(D) Data Retrieval Menu          (H) Help

> zUSER MENU
(C) Communications Menu          (T) Test Menu
(F) System Functions Menu        (Z) Zeno Program Menu
(S) Sample Period Menu           (Q) Quit
(D) Data Retrieval Menu          (H) Help

> z

Enter Administrator Password: ****

Waiting for all data acquisition tasks to finish . . .

ZENO PROGRAM MENU
(S) Sensor Menu                  (W) Password Menu
(P) Process Menu                 (R) Reset System
(D) Data Output Menu             (E) Save Parameters To EEPROM
(T) Sensor Timing Loop Menu      (U) User Menu
(O) Output Message Timing Menu   (Q) Quit
(L) System Load Menu             (H) Help

S

SENSOR MENU
(Cn/m) Change Item n To Value m  (N) Go To Next Record
(A)  Insert After This Record    (P) Go To Previous Record
(B)  Insert Before This Record   (X) Delete All Records
(D)  Delete This Record          (Z) Zeno Program Menu
(Jn) Jump To Record n            (H) Help

Sensor Items for Record 1 of 9:
Item  1: Sensor Type Code              2 (18-bit Single-Ended A to D)
Item  2: Sensor Name                   dt01
Item  3: Sensor Input Channel          1-
Item  4: Analog Channel Gain           1
Item  5: Analog Channel Attenuation    1
Item  6: Switched Power Code           0 (NO SWITCHED POWER)
Item  7: Sensor Excitation Voltage Code  0 (NO EXCITATION VOLTAGE)
Item  8: Switched Excitation Return    0
Item  9: Switched Power Warmup Time    0
Item 10: Sensor Sample Count           8
Item 11: Maximum Sensor Readings       0
Item 12: Sensor Timing Loop            2 (1.0 seconds)
Item 13: Conversion Coefficient A      0
Item 14: Conversion Coefficient B      0.5
Item 15: Conversion Coefficient C      0
```

```
N
SENSOR MENU
(Cn/m) Change Item n To Value m      (N) Go To Next Record
(A)  Insert After This Record        (P) Go To Previous Record
(B)  Insert Before This Record       (X) Delete All Records
(D)  Delete This Record              (Z) Zeno Program Menu
(Jn) Jump To Record n                (H) Help

Sensor Items for Record 2 of 9:
Item  1: Sensor Type Code              2 (18-bit Single-Ended A to D)
Item  2: Sensor Name                   dt01
Item  3: Sensor Input Channel          1-
Item  4: Analog Channel Gain           1
Item  5: Analog Channel Attenuation    10
Item  6: Switched Power Code           0 (NO SWITCHED POWER)
Item  7: Sensor Excitation Voltage Code  0 (NO EXCITATION VOLTAGE)
Item  8: Switched Excitation Return    0
Item  9: Switched Power Warmup Time    0
Item 10: Sensor Sample Count           8
Item 11: Maximum Sensor Readings       0
Item 12: Sensor Timing Loop            2 (1.0 seconds)
Item 13: Conversion Coefficient A      0
Item 14: Conversion Coefficient B      0.5
Item 15: Conversion Coefficient C      0

N
SENSOR MENU
(Cn/m) Change Item n To Value m      (N) Go To Next Record
(A)  Insert After This Record        (P) Go To Previous Record
(B)  Insert Before This Record       (X) Delete All Records
(D)  Delete This Record              (Z) Zeno Program Menu
(Jn) Jump To Record n                (H) Help

Sensor Items for Record 3 of 9:
Item  1: Sensor Type Code              2 (18-bit Single-Ended A to D)
Item  2: Sensor Name                   dt02
Item  3: Sensor Input Channel          1+
Item  4: Analog Channel Gain           1
Item  5: Analog Channel Attenuation    10
Item  6: Switched Power Code           0 (NO SWITCHED POWER)
Item  7: Sensor Excitation Voltage Code  0 (NO EXCITATION VOLTAGE)
Item  8: Switched Excitation Return    0
Item  9: Switched Power Warmup Time    0
Item 10: Sensor Sample Count           8
Item 11: Maximum Sensor Readings       0
Item 12: Sensor Timing Loop            2 (1.0 seconds)
Item 13: Conversion Coefficient A      0
Item 14: Conversion Coefficient B      0.5
Item 15: Conversion Coefficient C      0

N
SENSOR MENU
(Cn/m) Change Item n To Value m      (N) Go To Next Record
(A)  Insert After This Record        (P) Go To Previous Record
(B)  Insert Before This Record       (X) Delete All Records
(D)  Delete This Record              (Z) Zeno Program Menu
(Jn) Jump To Record n                (H) Help
```

Sensor Items for Record 4 of 9:
Item 1: Sensor Type Code 2 (18-bit Single-Ended A to D)
Item 2: Sensor Name short
Item 3: Sensor Input Channel 2-
Item 4: Analog Channel Gain 1
Item 5: Analog Channel Attenuation 1
Item 6: Switched Power Code 0 (NO SWITCHED POWER)
Item 7: Sensor Excitation Voltage Code 0 (NO EXCITATION VOLTAGE)
Item 8: Switched Excitation Return 0
Item 9: Switched Power Warmup Time 0
Item 10: Sensor Sample Count 8
Item 11: Maximum Sensor Readings 0
Item 12: Sensor Timing Loop 2 (1.0 seconds)
Item 13: Conversion Coefficient A 0
Item 14: Conversion Coefficient B 0.5
Item 15: Conversion Coefficient C 0

N
SENSOR MENU
(Cn/m) Change Item n To Value m (N) Go To Next Record
(A) Insert After This Record (P) Go To Previous Record
(B) Insert Before This Record (X) Delete All Records
(D) Delete This Record (Z) Zeno Program Menu
(Jn) Jump To Record n (H) Help

Sensor Items for Record 5 of 9:
Item 1: Sensor Type Code 2 (18-bit Single-Ended A to D)
Item 2: Sensor Name baro
Item 3: Sensor Input Channel 2+
Item 4: Analog Channel Gain 1
Item 5: Analog Channel Attenuation 10
Item 6: Switched Power Code 0 (NO SWITCHED POWER)
Item 7: Sensor Excitation Voltage Code 0 (NO EXCITATION VOLTAGE)
Item 8: Switched Excitation Return 0
Item 9: Switched Power Warmup Time 0
Item 10: Sensor Sample Count 8
Item 11: Maximum Sensor Readings 0
Item 12: Sensor Timing Loop 2 (1.0 seconds)
Item 13: Conversion Coefficient A 0
Item 14: Conversion Coefficient B 0.5
Item 15: Conversion Coefficient C 0

N
SENSOR MENU
(Cn/m) Change Item n To Value m (N) Go To Next Record
(A) Insert After This Record (P) Go To Previous Record
(B) Insert Before This Record (X) Delete All Records
(D) Delete This Record (Z) Zeno Program Menu
(Jn) Jump To Record n (H) Help

Sensor Items for Record 6 of 9:
Item 1: Sensor Type Code 2 (18-bit Single-Ended A to D)
Item 2: Sensor Name x-axis
Item 3: Sensor Input Channel 3-
Item 4: Analog Channel Gain 1
Item 5: Analog Channel Attenuation 10
Item 6: Switched Power Code 0 (NO SWITCHED POWER)
Item 7: Sensor Excitation Voltage Code 0 (NO EXCITATION VOLTAGE)

Item 8: Switched Excitation Return 0
Item 9: Switched Power Warmup Time 0
Item 10: Sensor Sample Count 8
Item 11: Maximum Sensor Readings 0
Item 12: Sensor Timing Loop 2 (1.0 seconds)
Item 13: Conversion Coefficient A 0
Item 14: Conversion Coefficient B 0.5
Item 15: Conversion Coefficient C 0

N
SENSOR MENU
(Cn/m) Change Item n To Value m (N) Go To Next Record
(A) Insert After This Record (P) Go To Previous Record
(B) Insert Before This Record (X) Delete All Records
(D) Delete This Record (Z) Zeno Program Menu
(Jn) Jump To Record n (H) Help

Sensor Items for Record 7 of 9:
Item 1: Sensor Type Code 2 (18-bit Single-Ended A to D)
Item 2: Sensor Name y-axis
Item 3: Sensor Input Channel 3+
Item 4: Analog Channel Gain 1
Item 5: Analog Channel Attenuation 10
Item 6: Switched Power Code 0 (NO SWITCHED POWER)
Item 7: Sensor Excitation Voltage Code 0 (NO EXCITATION VOLTAGE)
Item 8: Switched Excitation Return 0
Item 9: Switched Power Warmup Time 0
Item 10: Sensor Sample Count 8
Item 11: Maximum Sensor Readings 0
Item 12: Sensor Timing Loop 2 (1.0 seconds)
Item 13: Conversion Coefficient A 0
Item 14: Conversion Coefficient B 0.5
Item 15: Conversion Coefficient C 0

N
SENSOR MENU
(Cn/m) Change Item n To Value m (N) Go To Next Record
(A) Insert After This Record (P) Go To Previous Record
(B) Insert Before This Record (X) Delete All Records
(D) Delete This Record (Z) Zeno Program Menu
(Jn) Jump To Record n (H) Help

Sensor Items for Record 8 of 9:
Item 1: Sensor Type Code 2 (18-bit Single-Ended A to D)
Item 2: Sensor Name temp
Item 3: Sensor Input Channel 4-
Item 4: Analog Channel Gain 1
Item 5: Analog Channel Attenuation 10
Item 6: Switched Power Code 0 (NO SWITCHED POWER)
Item 7: Sensor Excitation Voltage Code 2 (EXC = 2.50 VDC)
Item 8: Switched Excitation Return A
Item 9: Switched Power Warmup Time 0
Item 10: Sensor Sample Count 8
Item 11: Maximum Sensor Readings 0
Item 12: Sensor Timing Loop 2 (1.0 seconds)
Item 13: Conversion Coefficient A 0
Item 14: Conversion Coefficient B 0.5
Item 15: Conversion Coefficient C 0

```
N

SENSOR MENU
(Cn/m) Change Item n To Value m      (N) Go To Next Record
(A)   Insert After This Record       (P) Go To Previous Record
(B)   Insert Before This Record      (X) Delete All Records
(D)   Delete This Record             (Z) Zeno Program Menu
(Jn)  Jump To Record n               (H) Help

Sensor Items for Record 9 of 9:
Item  1: Sensor Type Code              1 (12-bit Analog to Digital)
Item  2: Sensor Name                   Battery
Item  3: Sensor Input Channel          BATTERY VOLTAGE
Item  6: Switched Power Code           0 (NO SWITCHED POWER)
Item  7: Sensor Excitation Voltage Code  0 (NO EXCITATION VOLTAGE)
Item  8: Switched Excitation Return    0
Item  9: Switched Power Warmup Time    0
Item 10: Sensor Sample Count           1
Item 11: Maximum Sensor Readings       0
Item 12: Sensor Timing Loop            1 (0.5 seconds)
Item 13: Conversion Coefficient A      0
Item 14: Conversion Coefficient B      1
Item 15: Conversion Coefficient C      0

> z

ZENO PROGRAM MENU
(S) Sensor Menu                      (W) Password Menu
(P) Process Menu                     (R) Reset System
(D) Data Output Menu                 (E) Save Parameters To EEPROM
(T) Sensor Timing Loop Menu          (U) User Menu
(O) Output Message Timing Menu       (Q) Quit
(L) System Load Menu                 (H) Help

> p

PROCESS MENU
(Cn/m) Change Item n To Value m      (N) Go To Next Record
(A)   Insert After This Record       (P) Go To Previous Record
(B)   Insert Before This Record      (X) Delete All Records
(D)   Delete This Record             (Z) Zeno Program Menu
(Jn)  Jump To Record n               (H) Help

Process Items for Record 1 of 9:
Item  1: Process Category              1  : General
Item  2: Process Number                2  : Averaging Process
Item  3: Input for Average Data        S1  : dt01

> n

PROCESS MENU
(Cn/m) Change Item n To Value m      (N) Go To Next Record
(A)   Insert After This Record       (P) Go To Previous Record
(B)   Insert Before This Record      (X) Delete All Records
(D)   Delete This Record             (Z) Zeno Program Menu
(Jn)  Jump To Record n               (H) Help
```

```
Process Items for Record 2 of 9:
Item  1: Process Category          1  : General
Item  2: Process Number            2  : Averaging Process
Item  3: Input for Average Data    S2  : dt01

> n

PROCESS MENU
(Cn/m) Change Item n To Value m     (N) Go To Next Record
(A)   Insert After This Record      (P) Go To Previous Record
(B)   Insert Before This Record     (X) Delete All Records
(D)   Delete This Record            (Z) Zeno Program Menu
(Jn)  Jump To Record n              (H) Help

Process Items for Record 3 of 9:
Item  1: Process Category          1  : General
Item  2: Process Number            2  : Averaging Process
Item  3: Input for Average Data    S3  : dt02

> n

PROCESS MENU
(Cn/m) Change Item n To Value m     (N) Go To Next Record
(A)   Insert After This Record      (P) Go To Previous Record
(B)   Insert Before This Record     (X) Delete All Records
(D)   Delete This Record            (Z) Zeno Program Menu
(Jn)  Jump To Record n              (H) Help

Process Items for Record 4 of 9:
Item  1: Process Category          1  : General
Item  2: Process Number            2  : Averaging Process
Item  3: Input for Average Data    S4  : short

> n

PROCESS MENU
(Cn/m) Change Item n To Value m     (N) Go To Next Record
(A)   Insert After This Record      (P) Go To Previous Record
(B)   Insert Before This Record     (X) Delete All Records
(D)   Delete This Record            (Z) Zeno Program Menu
(Jn)  Jump To Record n              (H) Help

Process Items for Record 5 of 9:
Item  1: Process Category          1  : General
Item  2: Process Number            2  : Averaging Process
Item  3: Input for Average Data    S5  : baro

> n

PROCESS MENU
(Cn/m) Change Item n To Value m     (N) Go To Next Record
(A)   Insert After This Record      (P) Go To Previous Record
(B)   Insert Before This Record     (X) Delete All Records
(D)   Delete This Record            (Z) Zeno Program Menu
(Jn)  Jump To Record n              (H) Help

Process Items for Record 6 of 9:
Item  1: Process Category          1  : General
```

```
Item  2: Process Number              2  : Averaging Process
Item  3: Input for Average Data      S6  : x-axis

> n

PROCESS MENU
(Cn/m) Change Item n To Value m      (N) Go To Next Record
(A)   Insert After This Record       (P) Go To Previous Record
(B)   Insert Before This Record      (X) Delete All Records
(D)   Delete This Record             (Z) Zeno Program Menu
(Jn)  Jump To Record n               (H) Help

Process Items for Record 7 of 9:
Item  1: Process Category            1  : General
Item  2: Process Number              2  : Averaging Process
Item  3: Input for Average Data      S7  : y-axis

> n

PROCESS MENU
(Cn/m) Change Item n To Value m      (N) Go To Next Record
(A)   Insert After This Record       (P) Go To Previous Record
(B)   Insert Before This Record      (X) Delete All Records
(D)   Delete This Record             (Z) Zeno Program Menu
(Jn)  Jump To Record n               (H) Help

Process Items for Record 8 of 9:
Item  1: Process Category            1  : General
Item  2: Process Number              2  : Averaging Process
Item  3: Input for Average Data      S8  : temp

> n

PROCESS MENU
(Cn/m) Change Item n To Value m      (N) Go To Next Record
(A)   Insert After This Record       (P) Go To Previous Record
(B)   Insert Before This Record      (X) Delete All Records
(D)   Delete This Record             (Z) Zeno Program Menu
(Jn)  Jump To Record n               (H) Help

Process Items for Record 9 of 9:
Item  1: Process Category            1  : General
Item  2: Process Number              2  : Averaging Process
Item  3: Input for Average Data      S9  : Battery

> z

ZENO PROGRAM MENU
(S) Sensor Menu                      (W) Password Menu
(P) Process Menu                     (R) Reset System
(D) Data Output Menu                 (E) Save Parameters To EEPROM
(T) Sensor Timing Loop Menu          (U) User Menu
(O) Output Message Timing Menu       (Q) Quit
(L) System Load Menu                 (H) Help

> d

DATA OUTPUT MENU
```

```
(Cn/m) Change Item n To Value m      (N) Go To Next Record
(A)   Insert After This Record       (P) Go To Previous Record
(B)   Insert Before This Record      (X) Delete All Records
(D)   Delete This Record             (Z) Zeno Program Menu
(Jn)  Jump To Record n               (H) Help

Data Items for Record 1 of 9:
Item 1: Field Type code              12 : GOES Binary Format Field
Item 2: Output Message(s)            1
Item 3: Field Name                   dt01
Item 4: Input Record and Element     P1.1
Item 5: Field Decimal Places         0
Item 6: Field Width                  3

> n

DATA OUTPUT MENU
(Cn/m) Change Item n To Value m      (N) Go To Next Record
(A)   Insert After This Record       (P) Go To Previous Record
(B)   Insert Before This Record      (X) Delete All Records
(D)   Delete This Record             (Z) Zeno Program Menu
(Jn)  Jump To Record n               (H) Help

Data Items for Record 2 of 9:
Item 1: Field Type code              12 : GOES Binary Format Field
Item 2: Output Message(s)            1
Item 3: Field Name                   dt01
Item 4: Input Record and Element     P2.1
Item 5: Field Decimal Places         0
Item 6: Field Width                  3

> n

DATA OUTPUT MENU
(Cn/m) Change Item n To Value m      (N) Go To Next Record
(A)   Insert After This Record       (P) Go To Previous Record
(B)   Insert Before This Record      (X) Delete All Records
(D)   Delete This Record             (Z) Zeno Program Menu
(Jn)  Jump To Record n               (H) Help

Data Items for Record 3 of 9:
Item 1: Field Type code              12 : GOES Binary Format Field
Item 2: Output Message(s)            1
Item 3: Field Name                   dt02
Item 4: Input Record and Element     P3.1
Item 5: Field Decimal Places         0
Item 6: Field Width                  3

> n

DATA OUTPUT MENU
(Cn/m) Change Item n To Value m      (N) Go To Next Record
(A)   Insert After This Record       (P) Go To Previous Record
(B)   Insert Before This Record      (X) Delete All Records
(D)   Delete This Record             (Z) Zeno Program Menu
(Jn)  Jump To Record n               (H) Help

Data Items for Record 4 of 9:
```

```
Item 1: Field Type code              12 : GOES Binary Format Field
Item 2: Output Message(s)            1
Item 3: Field Name                   short
Item 4: Input Record and Element     P4.1
Item 5: Field Decimal Places         0
Item 6: Field Width                  3

> n

DATA OUTPUT MENU
(Cn/m) Change Item n To Value m      (N) Go To Next Record
(A)    Insert After This Record      (P) Go To Previous Record
(B)    Insert Before This Record     (X) Delete All Records
(D)    Delete This Record            (Z) Zeno Program Menu
(Jn)   Jump To Record n              (H) Help

Data Items for Record 5 of 9:
Item 1: Field Type code              12 : GOES Binary Format Field
Item 2: Output Message(s)            1
Item 3: Field Name                   baro
Item 4: Input Record and Element     P5.1
Item 5: Field Decimal Places         0
Item 6: Field Width                  3

> n

DATA OUTPUT MENU
(Cn/m) Change Item n To Value m      (N) Go To Next Record
(A)    Insert After This Record      (P) Go To Previous Record
(B)    Insert Before This Record     (X) Delete All Records
(D)    Delete This Record            (Z) Zeno Program Menu
(Jn)   Jump To Record n              (H) Help

Data Items for Record 6 of 9:
Item 1: Field Type code              12 : GOES Binary Format Field
Item 2: Output Message(s)            1
Item 3: Field Name                   x-axis
Item 4: Input Record and Element     P6.1
Item 5: Field Decimal Places         0
Item 6: Field Width                  3

> n

DATA OUTPUT MENU
(Cn/m) Change Item n To Value m      (N) Go To Next Record
(A)    Insert After This Record      (P) Go To Previous Record
(B)    Insert Before This Record     (X) Delete All Records
(D)    Delete This Record            (Z) Zeno Program Menu
(Jn)   Jump To Record n              (H) Help

Data Items for Record 7 of 9:
Item 1: Field Type code              12 : GOES Binary Format Field
Item 2: Output Message(s)            1
Item 3: Field Name                   y-axis
Item 4: Input Record and Element     P7.1
Item 5: Field Decimal Places         0
Item 6: Field Width                  3
```

```
> n

DATA OUTPUT MENU
(Cn/m) Change Item n To Value m     (N) Go To Next Record
(A)  Insert After This Record       (P) Go To Previous Record
(B)  Insert Before This Record      (X) Delete All Records
(D)  Delete This Record             (Z) Zeno Program Menu
(Jn) Jump To Record n               (H) Help

Data Items for Record 8 of 9:
Item 1: Field Type code             12 : GOES Binary Format Field
Item 2: Output Message(s)           1
Item 3: Field Name                  temp
Item 4: Input Record and Element    P8.1
Item 5: Field Decimal Places        0
Item 6: Field Width                 3

> n

DATA OUTPUT MENU
(Cn/m) Change Item n To Value m     (N) Go To Next Record
(A)  Insert After This Record       (P) Go To Previous Record
(B)  Insert Before This Record      (X) Delete All Records
(D)  Delete This Record             (Z) Zeno Program Menu
(Jn) Jump To Record n               (H) Help

Data Items for Record 9 of 9:
Item 1: Field Type code             12 : GOES Binary Format Field
Item 2: Output Message(s)           1
Item 3: Field Name                  BATTERY
Item 4: Input Record and Element    P9.1
Item 5: Field Decimal Places        0
Item 6: Field Width                 3

> z

ZENO PROGRAM MENU
(S) Sensor Menu                     (W) Password Menu
(P) Process Menu                    (R) Reset System
(D) Data Output Menu                (E) Save Parameters To EEPROM
(T) Sensor Timing Loop Menu         (U) User Menu
(O) Output Message Timing Menu      (Q) Quit
(L) System Load Menu                (H) Help

> t

SENSOR TIMING LOOP MENU
(Cn/m) Change Item n To Value m     (H) Help
(Z)  Zeno Program Menu

Item 1:  0.5     (Timing Loop #1 Period)
Item 2:  1.0     (Timing Loop #2 Period)
Item 3:  120.0   (Timing Loop #3 Period)
Item 4:  10.0    (Timing Loop #4 Period)

> o

OUTPUT MESSAGE TIMING MENU
```

```
(Cn/m) Change Item n To Value m       (H) Help
(Z)   Zeno Program Menu

Item  1:  COM2      (Data Output Message #1 COM Port)
Item  2:  COM3      (Data Output Message #2 COM Port)
Item  3:  COM3      (Data Output Message #3 COM Port)
Item  4:  COM3      (Data Output Message #4 COM Port)
Item  5:  0.0       (Data Output Message #1 Period)
Item  6:  0.0       (Data Output Message #2 Period)
Item  7:  0.0       (Data Output Message #3 Period)
Item  8:  0.0       (Data Output Message #4 Period)

> e
Verifying parameters can be stored in EEPROM . . .
Saving parameters to EEPROM . . .
Saving Scan List parameters to EEPROM . . .
475 out of 2048 bytes used in EEPROM.
Total EEPROM Writes: 43  Checksum: 238

ZENO PROGRAM MENU
(S) Sensor Menu                       (W) Password Menu
(P) Process Menu                      (R) Reset System
(D) Data Output Menu                  (E) Save Parameters To EEPROM
(T) Sensor Timing Loop Menu           (U) User Menu
(O) Output Message Timing Menu        (Q) Quit
(L) System Load Menu                  (H) Help

> b
Waiting for all data acquisition tasks to finish . . .

BACK DOOR MENU
(Cn/m) Change Item n To Value m       (X) Display Stack Usage
(F)   Calculate Free Heap Memory      (E) Save Parameters To EEPROM
(A)   Auto-Calibrate Compass          (U) User Menu
(I)   Initialize Compass              (H) Help
(R)   Reset Parameters To Defaults

Item  1:  16777       (Processor Clock Speed)
Item  2:  1           (RAM/ROM Wait States)
Item  3:  60          (50/60 Hz Rejection For 18-bit ADC)
Item  4:  18          (13/18 Bit Operation Of 18-bit ADC)
Item  5:  COUNTS      (A To D Conversion Results)
Item  6:  YES         (Expert Menu Mode)
Item  7:  32768.00    (Real-time Clock Crystal Frequency At 25 Degrees C)
Item  8:  0           (Speed vs. Noise Tradeoffs For 18-bit ADC, Factory Only)
Item  9:  1.0000      (12-bit ADC Correction Factor)

> s

SAMPLE PERIOD MENU
(Cn/m) Change Item n To Value m       (Q) Quit
(E)   Save Parameters To EEPROM       (H) Help
(U)   User Menu

Item  1:  600     (Sample Interval Time)
Item  2:  14      (Sample Duration Time)
Item  3:  0       (Sample Time Offset)
```

```
>u

USER MENU
(C) Communications Menu          (T) Test Menu
(F) System Functions Menu        (Z) Zeno Program Menu
(S) Sample Period Menu           (Q) Quit
(D) Data Retrieval Menu          (H) Help

> f

SYSTEM FUNCTIONS MENU
(Cn/m) Change Item n to Value m  (E) Save Parameters To EEPROM
(S)  System Date And Time        (U) User Menu
(T)  Calibrate Internal Temperature (Q) Quit
(V)  Program Version             (H) Help

Item 1: 1223     (Primary Unit/Experiment ID)
Item 2: 2        (Secondary Unit/Experiment ID)
Item 3: 1        (Data Dump Format)
Item 4: 1        (Real Time Output Format)
Item 5: 0        (Add Compass To Vane)
Item 6: 0        (Compass Offset)
Item 7: 0        (Barometer Elevation)



> v
ZENO-3200 using ZENOSOFT V1.813 Dec 1 1998 14:56:07 CS EEBE
(C)opyright 1995-1998, Coastal Environmental Systems, Seattle, WA, USA.

> u

USER MENU
(C) Communications Menu          (T) Test Menu
(F) System Functions Menu        (Z) Zeno Program Menu
(S) Sample Period Menu           (Q) Quit
(D) Data Retrieval Menu          (H) Help

> c g i
Current Date and Time:    05/12/02 23:39:26
Enter new Date and Time: 05/12/02 23:45:00
GOES Transmitter Initialization ... successful

Note: Next sample interval begins in 4 minutes and 59 seconds.

GOES MENU
(Cn/m) Change Item n To Value m  (E) Save Parameters To EEPROM
(D)  Run GOES Diagnostics        (U) User Menu
(R)  Reset GOES Errors           (Q) Quit
(I)  Initialize GOES             (H) Help

Item 1: 263880d4     (Data Collection Platform Address)
Item 2: 104          (Self-Timed Transmit Channel Number)
Item 3: 00:00:10:00  (Self-Timed Transmission Interval)
Item 4: 00:05:15     (Self-Timed Transmission Offset)
Item 5: 1            (Transmission Window Length)
Item 6: SHORT        (Satellite Link Parameter: Preamble)
Item 7: 151          (Random Transmit Channel Number)
```

Item 8: 00:00:00 (Random Transmission Interval)
Item 9: 00:05:00 (Random Disable Time)

> q

Verifying GOES Transmitter Initialization ...successful

Exiting user interface.

Mauna Loa Program

"apply power to ZENO"

Watchdog Reset
ZENO-3200 using ZENOSOFT V1.813 Dec 1 1998 14:56:07 CS EEBE
(C)opyright 1995-1998, Coastal Environmental Systems, Seattle, WA, USA.
System Time = 05/12/02 23:47:05
Initializing Zeno 3200 .../
Verifying GOES Transmitter Initialization ...
WARNING: GOES Transmitter not initialized since system restart.
Use the 'Initialize GOES' command inside the GOES menu.

Zeno 3200 is Data Sampling. Type 'U'<enter> to access the User Interface.

("U" <enter> entering this command will not appear on screen. However the response follows)

USER MENU

(C) Communications Menu	(T) Test Menu
(F) System Functions Menu	(Z) Zeno Program Menu
(S) Sample Period Menu	(Q) Quit
(D) Data Retrieval Menu	(H) Help

> c

COMMUNICATIONS MENU

```
(Cn/m) Change Item n To Value m      (Tn) Terminal Mode On COM Port n
(M)   Modem Menu                     (E)  Save Parameters To EEPROM
(P)   Power Control Menu             (U)  User Menu
(G)   GOES Menu                      (Q)  Quit
(D)   Digital Control Menu           (H)  Help

Item 1:  9600       (COM1 Baud Rate)
Item 2:  9600       (COM2 Baud Rate)
Item 3:  9600       (COM3 Baud Rate)
Item 4:  RS232      (COM1 Port Type)
Item 5:  GOES       (COM2 Port Type)
Item 6:  RS232      (COM3 Port Type)
Item 7:  NO         (COM3 User Interface Exclusive)
Item 8:  NO         (Enable Exclusive CCSAIL Access)

> g

GOES MENU
(Cn/m) Change Item n To Value m      (E) Save Parameters To EEPROM
(D)   Run GOES Diagnostics           (U) User Menu
(R)   Reset GOES Errors              (Q) Quit
(I)   Initialize GOES                (H) Help

Item 1:  2638202c      (Data Collection Platform Address)
Item 2:  104           (Self-Timed Transmit Channel Number)
Item 3:  00:00:10:00   (Self-Timed Transmission Interval)
Item 4:  00:05:40      (Self-Timed Transmission Offset)
Item 5:  1             (Transmission Window Length)
Item 6:  SHORT         (Satellite Link Parameter: Preamble)
Item 7:  151           (Random Transmit Channel Number)
Item 8:  00:00:00      (Random Transmission Interval)
Item 9:  00:05:00      (Random Disable Time)

> i

Current Date and Time:    05/12/01 22:51:46
Enter new Date and Time: 05/12/02 22:53:00
GOES Transmitter Initialization ... successful
Note: Next sample interval begins in 6 minutes and 59 seconds.

GOES MENU
(Cn/m) Change Item n To Value m      (E) Save Parameters To EEPROM
(D)   Run GOES Diagnostics           (U) User Menu
(R)   Reset GOES Errors              (Q) Quit
(I)   Initialize GOES                (H) Help

Item 1:  2638202c      (Data Collection Platform Address)
Item 2:  104           (Self-Timed Transmit Channel Number)
Item 3:  00:00:10:00   (Self-Timed Transmission Interval)
Item 4:  00:05:40      (Self-Timed Transmission Offset)
Item 5:  1             (Transmission Window Length)
Item 6:  SHORT         (Satellite Link Parameter: Preamble)
Item 7:  151           (Random Transmit Channel Number)
Item 8:  00:00:00      (Random Transmission Interval)
Item 9:  00:05:00      (Random Disable Time)

> u
```

```
USER MENU
(C) Communications Menu          (T) Test Menu
(F) System Functions Menu        (Z) Zeno Program Menu
(S) Sample Period Menu           (Q) Quit
(D) Data Retrieval Menu          (H) Help

> s

SAMPLE PERIOD MENU
(Cn/m) Change Item n To Value m    (Q) Quit
(E)  Save Parameters To EEPROM     (H) Help
(U)  User Menu

Item  1:  600     (Sample Interval Time)
Item  2:  14      (Sample Duration Time)
Item  3:  0       (Sample Time Offset)

> u
Checking Scan List records ...

USER MENU
(C) Communications Menu          (T) Test Menu
(F) System Functions Menu        (Z) Zeno Program Menu
(S) Sample Period Menu           (Q) Quit
(D) Data Retrieval Menu          (H) Help

> z

Enter Administrator Password: ****

Waiting for all data acquisition tasks to finish . . .


ZENO PROGRAM MENU
(S) Sensor Menu                  (W) Password Menu
(P) Process Menu                 (R) Reset System
(D) Data Output Menu             (E) Save Parameters To EEPROM
(T) Sensor Timing Loop Menu      (U) User Menu
(O) Output Message Timing Menu   (Q) Quit
(L) System Load Menu             (H) Help

S

SENSOR MENU
(Cn/m) Change Item n To Value m    (N) Go To Next Record
(A)  Insert After This Record      (P) Go To Previous Record
(B)  Insert Before This Record     (X) Delete All Records
(D)  Delete This Record            (Z) Zeno Program Menu
(Jn)  Jump To Record n             (H) Help

Sensor Items for Record 1 of 9:
Item  1: Sensor Type Code              2 (18-bit Single-Ended A to D)
Item  2: Sensor Name                   dt01
Item  3: Sensor Input Channel          1-
Item  4: Analog Channel Gain           1
Item  5: Analog Channel Attenuation    1
Item  6: Switched Power Code           0 (NO SWITCHED POWER)
Item  7: Sensor Excitation Voltage Code  0 (NO EXCITATION VOLTAGE)
```

Item 8: Switched Excitation Return 0
Item 9: Switched Power Warmup Time 0
Item 10: Sensor Sample Count 8
Item 11: Maximum Sensor Readings 0
Item 12: Sensor Timing Loop 2 (1.0 seconds)
Item 13: Conversion Coefficient A 0
Item 14: Conversion Coefficient B 0.5
Item 15: Conversion Coefficient C 0

N
SENSOR MENU
(Cn/m) Change Item n To Value m (N) Go To Next Record
(A) Insert After This Record (P) Go To Previous Record
(B) Insert Before This Record (X) Delete All Records
(D) Delete This Record (Z) Zeno Program Menu
(Jn) Jump To Record n (H) Help

Sensor Items for Record 2 of 9:
Item 1: Sensor Type Code 2 (18-bit Single-Ended A to D)
Item 2: Sensor Name dt01
Item 3: Sensor Input Channel 1-
Item 4: Analog Channel Gain 1
Item 5: Analog Channel Attenuation 10
Item 6: Switched Power Code 0 (NO SWITCHED POWER)
Item 7: Sensor Excitation Voltage Code 0 (NO EXCITATION VOLTAGE)
Item 8: Switched Excitation Return 0
Item 9: Switched Power Warmup Time 0
Item 10: Sensor Sample Count 8
Item 11: Maximum Sensor Readings 0
Item 12: Sensor Timing Loop 2 (1.0 seconds)
Item 13: Conversion Coefficient A 0
Item 14: Conversion Coefficient B 0.5
Item 15: Conversion Coefficient C 0

N
SENSOR MENU
(Cn/m) Change Item n To Value m (N) Go To Next Record
(A) Insert After This Record (P) Go To Previous Record
(B) Insert Before This Record (X) Delete All Records
(D) Delete This Record (Z) Zeno Program Menu
(Jn) Jump To Record n (H) Help

Sensor Items for Record 3 of 9:
Item 1: Sensor Type Code 2 (18-bit Single-Ended A to D)
Item 2: Sensor Name dt02
Item 3: Sensor Input Channel 1+
Item 4: Analog Channel Gain 1
Item 5: Analog Channel Attenuation 10
Item 6: Switched Power Code 0 (NO SWITCHED POWER)
Item 7: Sensor Excitation Voltage Code 0 (NO EXCITATION VOLTAGE)
Item 8: Switched Excitation Return 0
Item 9: Switched Power Warmup Time 0
Item 10: Sensor Sample Count 8
Item 11: Maximum Sensor Readings 0
Item 12: Sensor Timing Loop 2 (1.0 seconds)
Item 13: Conversion Coefficient A 0
Item 14: Conversion Coefficient B 0.5
Item 15: Conversion Coefficient C 0

N
SENSOR MENU
(Cn/m) Change Item n To Value m (N) Go To Next Record
(A) Insert After This Record (P) Go To Previous Record
(B) Insert Before This Record (X) Delete All Records
(D) Delete This Record (Z) Zeno Program Menu
(Jn) Jump To Record n (H) Help

Sensor Items for Record 4 of 9:

Item 1: Sensor Type Code	2 (18-bit Single-Ended A to D)
Item 2: Sensor Name	short
Item 3: Sensor Input Channel	2-
Item 4: Analog Channel Gain	1
Item 5: Analog Channel Attenuation	1
Item 6: Switched Power Code	0 (NO SWITCHED POWER)
Item 7: Sensor Excitation Voltage Code	0 (NO EXCITATION VOLTAGE)
Item 8: Switched Excitation Return	0
Item 9: Switched Power Warmup Time	0
Item 10: Sensor Sample Count	8
Item 11: Maximum Sensor Readings	0
Item 12: Sensor Timing Loop	2 (1.0 seconds)
Item 13: Conversion Coefficient A	0
Item 14: Conversion Coefficient B	0.5
Item 15: Conversion Coefficient C	0

N
SENSOR MENU
(Cn/m) Change Item n To Value m (N) Go To Next Record
(A) Insert After This Record (P) Go To Previous Record
(B) Insert Before This Record (X) Delete All Records
(D) Delete This Record (Z) Zeno Program Menu
(Jn) Jump To Record n (H) Help

Sensor Items for Record 5 of 9:

Item 1: Sensor Type Code	2 (18-bit Single-Ended A to D)
Item 2: Sensor Name	baro
Item 3: Sensor Input Channel	2+
Item 4: Analog Channel Gain	1
Item 5: Analog Channel Attenuation	10
Item 6: Switched Power Code	0 (NO SWITCHED POWER)
Item 7: Sensor Excitation Voltage Code	0 (NO EXCITATION VOLTAGE)
Item 8: Switched Excitation Return	0
Item 9: Switched Power Warmup Time	0
Item 10: Sensor Sample Count	8
Item 11: Maximum Sensor Readings	0
Item 12: Sensor Timing Loop	2 (1.0 seconds)
Item 13: Conversion Coefficient A	0
Item 14: Conversion Coefficient B	0.5
Item 15: Conversion Coefficient C	0

N
SENSOR MENU
(Cn/m) Change Item n To Value m (N) Go To Next Record
(A) Insert After This Record (P) Go To Previous Record
(B) Insert Before This Record (X) Delete All Records
(D) Delete This Record (Z) Zeno Program Menu
(Jn) Jump To Record n (H) Help

Sensor Items for Record 6 of 9:

Item 1: Sensor Type Code	2 (18-bit Single-Ended A to D)
Item 2: Sensor Name	x-axis
Item 3: Sensor Input Channel	3-
Item 4: Analog Channel Gain	1
Item 5: Analog Channel Attenuation	10
Item 6: Switched Power Code	0 (NO SWITCHED POWER)
Item 7: Sensor Excitation Voltage Code	0 (NO EXCITATION VOLTAGE)
Item 8: Switched Excitation Return	0
Item 9: Switched Power Warmup Time	0
Item 10: Sensor Sample Count	8
Item 11: Maximum Sensor Readings	0
Item 12: Sensor Timing Loop	2 (1.0 seconds)
Item 13: Conversion Coefficient A	0
Item 14: Conversion Coefficient B	0.5
Item 15: Conversion Coefficient C	0

N

SENSOR MENU

(Cn/m) Change Item n To Value m	(N) Go To Next Record
(A) Insert After This Record	(P) Go To Previous Record
(B) Insert Before This Record	(X) Delete All Records
(D) Delete This Record	(Z) Zeno Program Menu
(Jn) Jump To Record n	(H) Help

Sensor Items for Record 7 of 9:

Item 1: Sensor Type Code	2 (18-bit Single-Ended A to D)
Item 2: Sensor Name	y-axis
Item 3: Sensor Input Channel	3+
Item 4: Analog Channel Gain	1
Item 5: Analog Channel Attenuation	10
Item 6: Switched Power Code	0 (NO SWITCHED POWER)
Item 7: Sensor Excitation Voltage Code	0 (NO EXCITATION VOLTAGE)
Item 8: Switched Excitation Return	0
Item 9: Switched Power Warmup Time	0
Item 10: Sensor Sample Count	8
Item 11: Maximum Sensor Readings	0
Item 12: Sensor Timing Loop	2 (1.0 seconds)
Item 13: Conversion Coefficient A	0
Item 14: Conversion Coefficient B	0.5
Item 15: Conversion Coefficient C	0

N

SENSOR MENU

(Cn/m) Change Item n To Value m	(N) Go To Next Record
(A) Insert After This Record	(P) Go To Previous Record
(B) Insert Before This Record	(X) Delete All Records
(D) Delete This Record	(Z) Zeno Program Menu
(Jn) Jump To Record n	(H) Help

Sensor Items for Record 8 of 9:

Item 1: Sensor Type Code	2 (18-bit Single-Ended A to D)
Item 2: Sensor Name	temp
Item 3: Sensor Input Channel	4-
Item 4: Analog Channel Gain	1
Item 5: Analog Channel Attenuation	10
Item 6: Switched Power Code	0 (NO SWITCHED POWER)

```
Item  7: Sensor Excitation Voltage Code    2 (EXC = 2.50 VDC)
Item  8: Switched Excitation Return        A
Item  9: Switched Power Warmup Time        0
Item 10: Sensor Sample Count               8
Item 11: Maximum Sensor Readings           0
Item 12: Sensor Timing Loop                2 (1.0 seconds)
Item 13: Conversion Coefficient A          0
Item 14: Conversion Coefficient B          0.5
Item 15: Conversion Coefficient C          0

N

SENSOR MENU
(Cn/m) Change Item n To Value m      (N) Go To Next Record
(A)    Insert After This Record      (P) Go To Previous Record
(B)    Insert Before This Record     (X) Delete All Records
(D)    Delete This Record            (Z) Zeno Program Menu
(Jn)   Jump To Record n              (H) Help

Sensor Items for Record 9 of 9:
Item  1: Sensor Type Code              1 (12-bit Analog to Digital)
Item  2: Sensor Name                   Battery
Item  3: Sensor Input Channel          BATTERY VOLTAGE
Item  6: Switched Power Code           0 (NO SWITCHED POWER)
Item  7: Sensor Excitation Voltage Code  0 (NO EXCITATION VOLTAGE)
Item  8: Switched Excitation Return    0
Item  9: Switched Power Warmup Time    0
Item 10: Sensor Sample Count           1
Item 11: Maximum Sensor Readings       0
Item 12: Sensor Timing Loop            1 (0.5 seconds)
Item 13: Conversion Coefficient A      0
Item 14: Conversion Coefficient B      1
Item 15: Conversion Coefficient C      0

> z

ZENO PROGRAM MENU
(S) Sensor Menu                    (W) Password Menu
(P) Process Menu                   (R) Reset System
(D) Data Output Menu               (E) Save Parameters To EEPROM
(T) Sensor Timing Loop Menu        (U) User Menu
(O) Output Message Timing Menu     (Q) Quit
(L) System Load Menu               (H) Help

> p

PROCESS MENU
(Cn/m) Change Item n To Value m      (N) Go To Next Record
(A)    Insert After This Record      (P) Go To Previous Record
(B)    Insert Before This Record     (X) Delete All Records
(D)    Delete This Record            (Z) Zeno Program Menu
(Jn)   Jump To Record n              (H) Help

Process Items for Record 1 of 9:
Item  1: Process Category          1  : General
Item  2: Process Number            2  : Averaging Process
Item  3: Input for Average Data    S1 : dt01
```

> n

PROCESS MENU
(Cn/m) Change Item n To Value m (N) Go To Next Record
(A) Insert After This Record (P) Go To Previous Record
(B) Insert Before This Record (X) Delete All Records
(D) Delete This Record (Z) Zeno Program Menu
(Jn) Jump To Record n (H) Help

Process Items for Record 2 of 9:
Item 1: Process Category 1 : General
Item 2: Process Number 2 : Averaging Process
Item 3: Input for Average Data S2 : dt01

> n

PROCESS MENU
(Cn/m) Change Item n To Value m (N) Go To Next Record
(A) Insert After This Record (P) Go To Previous Record
(B) Insert Before This Record (X) Delete All Records
(D) Delete This Record (Z) Zeno Program Menu
(Jn) Jump To Record n (H) Help

Process Items for Record 3 of 9:
Item 1: Process Category 1 : General
Item 2: Process Number 2 : Averaging Process
Item 3: Input for Average Data S3 : dt02

> n

PROCESS MENU
(Cn/m) Change Item n To Value m (N) Go To Next Record
(A) Insert After This Record (P) Go To Previous Record
(B) Insert Before This Record (X) Delete All Records
(D) Delete This Record (Z) Zeno Program Menu
(Jn) Jump To Record n (H) Help

Process Items for Record 4 of 9:
Item 1: Process Category 1 : General
Item 2: Process Number 2 : Averaging Process
Item 3: Input for Average Data S4 : short

> n

PROCESS MENU
(Cn/m) Change Item n To Value m (N) Go To Next Record
(A) Insert After This Record (P) Go To Previous Record
(B) Insert Before This Record (X) Delete All Records
(D) Delete This Record (Z) Zeno Program Menu
(Jn) Jump To Record n (H) Help

Process Items for Record 5 of 9:
Item 1: Process Category 1 : General
Item 2: Process Number 2 : Averaging Process
Item 3: Input for Average Data S5 : baro

> n

```
PROCESS MENU
(Cn/m) Change Item n To Value m      (N) Go To Next Record
(A)  Insert After This Record        (P) Go To Previous Record
(B)  Insert Before This Record       (X) Delete All Records
(D)  Delete This Record              (Z) Zeno Program Menu
(Jn) Jump To Record n                (H) Help

Process Items for Record 6 of 9:
Item 1: Process Category             1  : General
Item 2: Process Number               2  : Averaging Process
Item 3: Input for Average Data       S6 : x-axis

> n

PROCESS MENU
(Cn/m) Change Item n To Value m      (N) Go To Next Record
(A)  Insert After This Record        (P) Go To Previous Record
(B)  Insert Before This Record       (X) Delete All Records
(D)  Delete This Record              (Z) Zeno Program Menu
(Jn) Jump To Record n                (H) Help

Process Items for Record 7 of 9:
Item 1: Process Category             1  : General
Item 2: Process Number               2  : Averaging Process
Item 3: Input for Average Data       S7 : y-axis

> n

PROCESS MENU
(Cn/m) Change Item n To Value m      (N) Go To Next Record
(A)  Insert After This Record        (P) Go To Previous Record
(B)  Insert Before This Record       (X) Delete All Records
(D)  Delete This Record              (Z) Zeno Program Menu
(Jn) Jump To Record n                (H) Help

Process Items for Record 8 of 9:
Item 1: Process Category             1  : General
Item 2: Process Number               2  : Averaging Process
Item 3: Input for Average Data       S8 : temp

> n

PROCESS MENU
(Cn/m) Change Item n To Value m      (N) Go To Next Record
(A)  Insert After This Record        (P) Go To Previous Record
(B)  Insert Before This Record       (X) Delete All Records
(D)  Delete This Record              (Z) Zeno Program Menu
(Jn) Jump To Record n                (H) Help

Process Items for Record 9 of 9:
Item 1: Process Category             1  : General
Item 2: Process Number               2  : Averaging Process
Item 3: Input for Average Data       S9 : Battery

> z

ZENO PROGRAM MENU
(S) Sensor Menu                      (W) Password Menu
```

```
(P) Process Menu                    (R) Reset System
(D) Data Output Menu                (E) Save Parameters To EEPROM
(T) Sensor Timing Loop Menu         (U) User Menu
(O) Output Message Timing Menu      (Q) Quit
(L) System Load Menu                (H) Help

> d

DATA OUTPUT MENU
(Cn/m) Change Item n To Value m     (N) Go To Next Record
(A)  Insert After This Record       (P) Go To Previous Record
(B)  Insert Before This Record      (X) Delete All Records
(D)  Delete This Record             (Z) Zeno Program Menu
(Jn) Jump To Record n               (H) Help

Data Items for Record 1 of 9:
Item 1: Field Type code              12 : GOES Binary Format Field
Item 2: Output Message(s)             1
Item 3: Field Name                   dt01
Item 4: Input Record and Element     P1.1
Item 5: Field Decimal Places          0
Item 6: Field Width                   3

> n

DATA OUTPUT MENU
(Cn/m) Change Item n To Value m     (N) Go To Next Record
(A)  Insert After This Record       (P) Go To Previous Record
(B)  Insert Before This Record      (X) Delete All Records
(D)  Delete This Record             (Z) Zeno Program Menu
(Jn) Jump To Record n               (H) Help

Data Items for Record 2 of 9:
Item 1: Field Type code          12 : GOES Binary Format Field
Item 2: Output Message(s)         1
Item 3: Field Name               dt01
Item 4: Input Record and Element  P2.1
Item 5: Field Decimal Places       0
Item 6: Field Width                3

> n

DATA OUTPUT MENU
(Cn/m) Change Item n To Value m     (N) Go To Next Record
(A)  Insert After This Record       (P) Go To Previous Record
(B)  Insert Before This Record      (X) Delete All Records
(D)  Delete This Record             (Z) Zeno Program Menu
(Jn) Jump To Record n               (H) Help

Data Items for Record 3 of 9:
Item 1: Field Type code           12 : GOES Binary Format Field
Item 2: Output Message(s)         1
Item 3: Field Name                dt02
Item 4: Input Record and Element  P3.1
Item 5: Field Decimal Places       0
Item 6: Field Width                3

> n
```

DATA OUTPUT MENU

(Cn/m) Change Item n To Value m	(N) Go To Next Record
(A) Insert After This Record	(P) Go To Previous Record
(B) Insert Before This Record	(X) Delete All Records
(D) Delete This Record	(Z) Zeno Program Menu
(Jn) Jump To Record n	(H) Help

Data Items for Record 4 of 9:

Item 1: Field Type code	12 : GOES Binary Format Field
Item 2: Output Message(s)	1
Item 3: Field Name	short
Item 4: Input Record and Element	P4.1
Item 5: Field Decimal Places	0
Item 6: Field Width	3

> n

DATA OUTPUT MENU

(Cn/m) Change Item n To Value m	(N) Go To Next Record
(A) Insert After This Record	(P) Go To Previous Record
(B) Insert Before This Record	(X) Delete All Records
(D) Delete This Record	(Z) Zeno Program Menu
(Jn) Jump To Record n	(H) Help

Data Items for Record 5 of 9:

Item 1: Field Type code	12 : GOES Binary Format Field
Item 2: Output Message(s)	1
Item 3: Field Name	baro
Item 4: Input Record and Element	P5.1
Item 5: Field Decimal Places	0
Item 6: Field Width	3

> n

DATA OUTPUT MENU

(Cn/m) Change Item n To Value m	(N) Go To Next Record
(A) Insert After This Record	(P) Go To Previous Record
(B) Insert Before This Record	(X) Delete All Records
(D) Delete This Record	(Z) Zeno Program Menu
(Jn) Jump To Record n	(H) Help

Data Items for Record 6 of 9:

Item 1: Field Type code	12 : GOES Binary Format Field
Item 2: Output Message(s)	1
Item 3: Field Name	x-axis
Item 4: Input Record and Element	P6.1
Item 5: Field Decimal Places	0
Item 6: Field Width	3

> n

DATA OUTPUT MENU

(Cn/m) Change Item n To Value m	(N) Go To Next Record
(A) Insert After This Record	(P) Go To Previous Record
(B) Insert Before This Record	(X) Delete All Records
(D) Delete This Record	(Z) Zeno Program Menu
(Jn) Jump To Record n	(H) Help

```
Data Items for Record 7 of 9:
Item 1: Field Type code              12 : GOES Binary Format Field
Item 2: Output Message(s)            1
Item 3: Field Name                   y-axis
Item 4: Input Record and Element     P7.1
Item 5: Field Decimal Places         0
Item 6: Field Width                  3

> n

DATA OUTPUT MENU
(Cn/m) Change Item n To Value m      (N) Go To Next Record
(A)    Insert After This Record      (P) Go To Previous Record
(B)    Insert Before This Record     (X) Delete All Records
(D)    Delete This Record            (Z) Zeno Program Menu
(Jn)   Jump To Record n              (H) Help

Data Items for Record 8 of 9:
Item 1: Field Type code              12 : GOES Binary Format Field
Item 2: Output Message(s)            1
Item 3: Field Name                   temp
Item 4: Input Record and Element     P8.1
Item 5: Field Decimal Places         0
Item 6: Field Width                  3

> n

DATA OUTPUT MENU
(Cn/m) Change Item n To Value m      (N) Go To Next Record
(A)    Insert After This Record      (P) Go To Previous Record
(B)    Insert Before This Record     (X) Delete All Records
(D)    Delete This Record            (Z) Zeno Program Menu
(Jn)   Jump To Record n              (H) Help

Data Items for Record 9 of 9:
Item 1: Field Type code              12 : GOES Binary Format Field
Item 2: Output Message(s)            1
Item 3: Field Name                   BATTERY
Item 4: Input Record and Element     P9.1
Item 5: Field Decimal Places         0
Item 6: Field Width                  3

> z

ZENO PROGRAM MENU
(S) Sensor Menu                      (W) Password Menu
(P) Process Menu                     (R) Reset System
(D) Data Output Menu                 (E) Save Parameters To EEPROM
(T) Sensor Timing Loop Menu          (U) User Menu
(O) Output Message Timing Menu       (Q) Quit
(L) System Load Menu                 (H) Help

> t

SENSOR TIMING LOOP MENU
(Cn/m) Change Item n To Value m      (H) Help
(Z)    Zeno Program Menu
```

```
Item  1:  0.5        (Timing Loop #1 Period)
Item  2:  1.0        (Timing Loop #2 Period)
Item  3:  120.0      (Timing Loop #3 Period)
Item  4:  10.0       (Timing Loop #4 Period)

> o

OUTPUT MESSAGE TIMING MENU
(Cn/m) Change Item n To Value m       (H) Help
(Z)    Zeno Program Menu

Item  1:  COM2       (Data Output Message #1 COM Port)
Item  2:  COM3       (Data Output Message #2 COM Port)
Item  3:  COM3       (Data Output Message #3 COM Port)
Item  4:  COM3       (Data Output Message #4 COM Port)
Item  5:  0.0        (Data Output Message #1 Period)
Item  6:  0.0        (Data Output Message #2 Period)
Item  7:  0.0        (Data Output Message #3 Period)
Item  8:  0.0        (Data Output Message #4 Period)

> e
Verifying parameters can be stored in EEPROM . . .
Saving parameters to EEPROM . . .
Saving Scan List parameters to EEPROM . . .
475 out of 2048 bytes used in EEPROM.
Total EEPROM Writes: 43  Checksum: 238

ZENO PROGRAM MENU
(S) Sensor Menu                       (W) Password Menu
(P) Process Menu                      (R) Reset System
(D) Data Output Menu                  (E) Save Parameters To EEPROM
(T) Sensor Timing Loop Menu           (U) User Menu
(O) Output Message Timing Menu        (Q) Quit
(L) System Load Menu                  (H) Help

> b
Waiting for all data acquisition tasks to finish . . .

BACK DOOR MENU
(Cn/m) Change Item n To Value m       (X) Display Stack Usage
(F)    Calculate Free Heap Memory     (E) Save Parameters To EEPROM
(A)    Auto-Calibrate Compass         (U) User Menu
(I)    Initialize Compass             (H) Help
(R)    Reset Parameters To Defaults

Item  1:  16777      (Processor Clock Speed)
Item  2:  1          (RAM/ROM Wait States)
Item  3:  60         (50/60 Hz Rejection For 18-bit ADC)
Item  4:  18         (13/18 Bit Operation Of 18-bit ADC)
Item  5:  COUNTS     (A To D Conversion Results)
Item  6:  YES        (Expert Menu Mode)
Item  7:  32768.00   (Real-time Clock Crystal Frequency At 25 Degrees C)
Item  8:  0          (Speed vs. Noise Tradeoffs For 18-bit ADC, Factory Only)
Item  9:  1.0000     (12-bit ADC Correction Factor)

> s
```

SAMPLE PERIOD MENU
(Cn/m) Change Item n To Value m (Q) Quit
(E) Save Parameters To EEPROM (H) Help
(U) User Menu

Item 1: 600 (Sample Interval Time)
Item 2: 14 (Sample Duration Time)
Item 3: 0 (Sample Time Offset)

>u

USER MENU
(C) Communications Menu (T) Test Menu
(F) System Functions Menu (Z) Zeno Program Menu
(S) Sample Period Menu (Q) Quit
(D) Data Retrieval Menu (H) Help

> f

SYSTEM FUNCTIONS MENU
(Cn/m) Change Item n to Value m (E) Save Parameters To EEPROM
(S) System Date And Time (U) User Menu
(T) Calibrate Internal Temperature (Q) Quit
(V) Program Version (H) Help

Item 1: 1223 (Primary Unit/Experiment ID)
Item 2: 2 (Secondary Unit/Experiment ID)
Item 3: 1 (Data Dump Format)
Item 4: 1 (Real Time Output Format)
Item 5: 0 (Add Compass To Vane)
Item 6: 0 (Compass Offset)
Item 7: 0 (Barometer Elevation)

> v
ZENO-3200 using ZENOSOFT V1.813 Dec 1 1998 14:56:07 CS EEBE
(C)opyright 1995-1998, Coastal Environmental Systems, Seattle, WA, USA.

> u

USER MENU
(C) Communications Menu (T) Test Menu
(F) System Functions Menu (Z) Zeno Program Menu
(S) Sample Period Menu (Q) Quit
(D) Data Retrieval Menu (H) Help

> c g i
Current Date and Time: 05/12/02 23:39:26
Enter new Date and Time: 05/12/02 23:45:00
GOES Transmitter Initialization ... successful

Note: Next sample interval begins in 4 minutes and 59 seconds.

GOES MENU
(Cn/m) Change Item n To Value m (E) Save Parameters To EEPROM
(D) Run GOES Diagnostics (U) User Menu
(R) Reset GOES Errors (Q) Quit

(I) Initialize GOES (H) Help

Item 1: 2638202c (Data Collection Platform Address)
Item 2: 104 (Self-Timed Transmit Channel Number)
Item 3: 00:00:10:00 (Self-Timed Transmission Interval)
Item 4: 00:05:40 (Self-Timed Transmission Offset)
Item 5: 1 (Transmission Window Length)
Item 6: SHORT (Satellite Link Parameter: Preamble)
Item 7: 151 (Random Transmit Channel Number)
Item 8: 00:00:00 (Random Transmission Interval)
Item 9: 00:05:00 (Random Disable Time)

> q

Verifying GOES Transmitter Initialization ...successful

Exiting user interface.

KELLER WELL PROGRAM

"apply power to ZENO"

Watchdog Reset
ZENO-3200 using ZENOSOFT V1.813 Dec 1 1998 14:56:07 CS EEBE
(C)opyright 1995-1998, Coastal Environmental Systems, Seattle, WA, USA.
System Time = 05/12/02 23:47:05
Initializing Zeno 3200 .../
Verifying GOES Transmitter Initialization ...
WARNING: GOES Transmitter not initialized since system restart.
Use the 'Initialize GOES' command inside the GOES menu.

Zeno 3200 is Data Sampling. Type 'U'<enter> to access the User Interface.

("U" <enter> entering this command will not appear on screen. However the response follows)

USER MENU
(C) Communications Menu (T) Test Menu
(F) System Functions Menu (Z) Zeno Program Menu
(S) Sample Period Menu (Q) Quit
(D) Data Retrieval Menu (H) Help

> c

COMMUNICATIONS MENU
(Cn/m) Change Item n To Value m (Tn) Terminal Mode On COM Port n
(M) Modem Menu (E) Save Parameters To EEPROM
(P) Power Control Menu (U) User Menu
(G) GOES Menu (Q) Quit
(D) Digital Control Menu (H) Help

Item 1: 9600 (COM1 Baud Rate)
Item 2: 9600 (COM2 Baud Rate)
Item 3: 9600 (COM3 Baud Rate)
Item 4: RS232 (COM1 Port Type)
Item 5: GOES (COM2 Port Type)
Item 6: RS232 (COM3 Port Type)
Item 7: NO (COM3 User Interface Exclusive)
Item 8: NO (Enable Exclusive CCSAIL Access)

> g

GOES MENU
(Cn/m) Change Item n To Value m (E) Save Parameters To EEPROM
(D) Run GOES Diagnostics (U) User Menu
(R) Reset GOES Errors (Q) Quit
(I) Initialize GOES (H) Help

Item 1: 2637f0d6 (Data Collection Platform Address)
Item 2: 104 (Self-Timed Transmit Channel Number)
Item 3: 00:00:10:00 (Self-Timed Transmission Interval)
Item 4: 00:06:20 (Self-Timed Transmission Offset)
Item 5: 1 (Transmission Window Length)
Item 6: SHORT (Satellite Link Parameter: Preamble)
Item 7: 151 (Random Transmit Channel Number)
Item 8: 00:00:00 (Random Transmission Interval)
Item 9: 00:05:00 (Random Disable Time)

> i

Current Date and Time: 05/12/01 22:51:46
Enter new Date and Time: 05/12/02 22:53:00
GOES Transmitter Initialization ... successful
Note: Next sample interval begins in 6 minutes and 59 seconds.

GOES MENU
(Cn/m) Change Item n To Value m (E) Save Parameters To EEPROM
(D) Run GOES Diagnostics (U) User Menu
(R) Reset GOES Errors (Q) Quit

```
(I)  Initialize GOES                    (H) Help

Item  1:  2637f0d6      (Data Collection Platform Address)
Item  2:  104           (Self-Timed Transmit Channel Number)
Item  3:  00:00:10:00   (Self-Timed Transmission Interval)
Item  4:  00:06:20      (Self-Timed Transmission Offset)
Item  5:  1             (Transmission Window Length)
Item  6:  SHORT         (Satellite Link Parameter: Preamble)
Item  7:  151           (Random Transmit Channel Number)
Item  8:  00:00:00      (Random Transmission Interval)
Item  9:  00:05:00      (Random Disable Time)

> u

USER MENU
(C) Communications Menu          (T) Test Menu
(F) System Functions Menu        (Z) Zeno Program Menu
(S) Sample Period Menu           (Q) Quit
(D) Data Retrieval Menu          (H) Help

> s

SAMPLE PERIOD MENU
(Cn/m) Change Item n To Value m      (Q) Quit
(E)  Save Parameters To EEPROM       (H) Help
(U)  User Menu

Item  1:  600     (Sample Interval Time)
Item  2:  14      (Sample Duration Time)
Item  3:  0       (Sample Time Offset)

> u
Checking Scan List records ...

USER MENU
(C) Communications Menu          (T) Test Menu
(F) System Functions Menu        (Z) Zeno Program Menu
(S) Sample Period Menu           (Q) Quit
(D) Data Retrieval Menu          (H) Help

> zUSER MENU
(C) Communications Menu          (T) Test Menu
(F) System Functions Menu        (Z) Zeno Program Menu
(S) Sample Period Menu           (Q) Quit
(D) Data Retrieval Menu          (H) Help

> z

Enter Administrator Password: ****

Waiting for all data acquisition tasks to finish . . .

ZENO PROGRAM MENU
(S) Sensor Menu                  (W) Password Menu
(P) Process Menu                 (R) Reset System
(D) Data Output Menu             (E) Save Parameters To EEPROM
(T) Sensor Timing Loop Menu      (U) User Menu
(O) Output Message Timing Menu   (Q) Quit
```

(L) System Load Menu (H) Help

S

SENSOR MENU
(Cn/m) Change Item n To Value m (N) Go To Next Record
(A) Insert After This Record (P) Go To Previous Record
(B) Insert Before This Record (X) Delete All Records
(D) Delete This Record (Z) Zeno Program Menu
(Jn) Jump To Record n (H) Help

Sensor Items for Record 1 of 9:

Item 1: Sensor Type Code	2 (18-bit Single-Ended A to D)
Item 2: Sensor Name	dt01
Item 3: Sensor Input Channel	1-
Item 4: Analog Channel Gain	1
Item 5: Analog Channel Attenuation	1
Item 6: Switched Power Code	0 (NO SWITCHED POWER)
Item 7: Sensor Excitation Voltage Code	0 (NO EXCITATION VOLTAGE)
Item 8: Switched Excitation Return	0
Item 9: Switched Power Warmup Time	0
Item 10: Sensor Sample Count	8
Item 11: Maximum Sensor Readings	0
Item 12: Sensor Timing Loop	2 (1.0 seconds)
Item 13: Conversion Coefficient A	0
Item 14: Conversion Coefficient B	0.5
Item 15: Conversion Coefficient C	0

N
SENSOR MENU
(Cn/m) Change Item n To Value m (N) Go To Next Record
(A) Insert After This Record (P) Go To Previous Record
(B) Insert Before This Record (X) Delete All Records
(D) Delete This Record (Z) Zeno Program Menu
(Jn) Jump To Record n (H) Help

Sensor Items for Record 2 of 9:

Item 1: Sensor Type Code	2 (18-bit Single-Ended A to D)
Item 2: Sensor Name	dt01
Item 3: Sensor Input Channel	1-
Item 4: Analog Channel Gain	1
Item 5: Analog Channel Attenuation	10
Item 6: Switched Power Code	0 (NO SWITCHED POWER)
Item 7: Sensor Excitation Voltage Code	0 (NO EXCITATION VOLTAGE)
Item 8: Switched Excitation Return	0
Item 9: Switched Power Warmup Time	0
Item 10: Sensor Sample Count	8
Item 11: Maximum Sensor Readings	0
Item 12: Sensor Timing Loop	2 (1.0 seconds)
Item 13: Conversion Coefficient A	0
Item 14: Conversion Coefficient B	0.5
Item 15: Conversion Coefficient C	0

N
SENSOR MENU
(Cn/m) Change Item n To Value m (N) Go To Next Record
(A) Insert After This Record (P) Go To Previous Record
(B) Insert Before This Record (X) Delete All Records

(D) Delete This Record (Z) Zeno Program Menu
(Jn) Jump To Record n (H) Help

Sensor Items for Record 3 of 9:

Item 1: Sensor Type Code	2 (18-bit Single-Ended A to D)
Item 2: Sensor Name	dt02
Item 3: Sensor Input Channel	1+
Item 4: Analog Channel Gain	1
Item 5: Analog Channel Attenuation	10
Item 6: Switched Power Code	0 (NO SWITCHED POWER)
Item 7: Sensor Excitation Voltage Code	0 (NO EXCITATION VOLTAGE)
Item 8: Switched Excitation Return	0
Item 9: Switched Power Warmup Time	0
Item 10: Sensor Sample Count	8
Item 11: Maximum Sensor Readings	0
Item 12: Sensor Timing Loop	2 (1.0 seconds)
Item 13: Conversion Coefficient A	0
Item 14: Conversion Coefficient B	0.5
Item 15: Conversion Coefficient C	0

N
SENSOR MENU
(Cn/m) Change Item n To Value m (N) Go To Next Record
(A) Insert After This Record (P) Go To Previous Record
(B) Insert Before This Record (X) Delete All Records
(D) Delete This Record (Z) Zeno Program Menu
(Jn) Jump To Record n (H) Help

Sensor Items for Record 4 of 9:

Item 1: Sensor Type Code	2 (18-bit Single-Ended A to D)
Item 2: Sensor Name	short
Item 3: Sensor Input Channel	2-
Item 4: Analog Channel Gain	1
Item 5: Analog Channel Attenuation	1
Item 6: Switched Power Code	0 (NO SWITCHED POWER)
Item 7: Sensor Excitation Voltage Code	0 (NO EXCITATION VOLTAGE)
Item 8: Switched Excitation Return	0
Item 9: Switched Power Warmup Time	0
Item 10: Sensor Sample Count	8
Item 11: Maximum Sensor Readings	0
Item 12: Sensor Timing Loop	2 (1.0 seconds)
Item 13: Conversion Coefficient A	0
Item 14: Conversion Coefficient B	0.5
Item 15: Conversion Coefficient C	0

N
SENSOR MENU
(Cn/m) Change Item n To Value m (N) Go To Next Record
(A) Insert After This Record (P) Go To Previous Record
(B) Insert Before This Record (X) Delete All Records
(D) Delete This Record (Z) Zeno Program Menu
(Jn) Jump To Record n (H) Help

Sensor Items for Record 5 of 9:

Item 1: Sensor Type Code	2 (18-bit Single-Ended A to D)
Item 2: Sensor Name	baro
Item 3: Sensor Input Channel	2+
Item 4: Analog Channel Gain	1

Item 5: Analog Channel Attenuation 10
Item 6: Switched Power Code 0 (NO SWITCHED POWER)
Item 7: Sensor Excitation Voltage Code 0 (NO EXCITATION VOLTAGE)
Item 8: Switched Excitation Return 0
Item 9: Switched Power Warmup Time 0
Item 10: Sensor Sample Count 8
Item 11: Maximum Sensor Readings 0
Item 12: Sensor Timing Loop 2 (1.0 seconds)
Item 13: Conversion Coefficient A 0
Item 14: Conversion Coefficient B 0.5
Item 15: Conversion Coefficient C 0

N
SENSOR MENU
(Cn/m) Change Item n To Value m (N) Go To Next Record
(A) Insert After This Record (P) Go To Previous Record
(B) Insert Before This Record (X) Delete All Records
(D) Delete This Record (Z) Zeno Program Menu
(Jn) Jump To Record n (H) Help

Sensor Items for Record 6 of 9:
Item 1: Sensor Type Code 2 (18-bit Single-Ended A to D)
Item 2: Sensor Name x-axis
Item 3: Sensor Input Channel 3-
Item 4: Analog Channel Gain 1
Item 5: Analog Channel Attenuation 10
Item 6: Switched Power Code 0 (NO SWITCHED POWER)
Item 7: Sensor Excitation Voltage Code 0 (NO EXCITATION VOLTAGE)
Item 8: Switched Excitation Return 0
Item 9: Switched Power Warmup Time 0
Item 10: Sensor Sample Count 8
Item 11: Maximum Sensor Readings 0
Item 12: Sensor Timing Loop 2 (1.0 seconds)
Item 13: Conversion Coefficient A 0
Item 14: Conversion Coefficient B 0.5
Item 15: Conversion Coefficient C 0

N
SENSOR MENU
(Cn/m) Change Item n To Value m (N) Go To Next Record
(A) Insert After This Record (P) Go To Previous Record
(B) Insert Before This Record (X) Delete All Records
(D) Delete This Record (Z) Zeno Program Menu
(Jn) Jump To Record n (H) Help

Sensor Items for Record 7 of 9:
Item 1: Sensor Type Code 2 (18-bit Single-Ended A to D)
Item 2: Sensor Name y-axis
Item 3: Sensor Input Channel 3+
Item 4: Analog Channel Gain 1
Item 5: Analog Channel Attenuation 10
Item 6: Switched Power Code 0 (NO SWITCHED POWER)
Item 7: Sensor Excitation Voltage Code 0 (NO EXCITATION VOLTAGE)
Item 8: Switched Excitation Return 0
Item 9: Switched Power Warmup Time 0
Item 10: Sensor Sample Count 8
Item 11: Maximum Sensor Readings 0
Item 12: Sensor Timing Loop 2 (1.0 seconds)

```
Item 13: Conversion Coefficient A          0
Item 14: Conversion Coefficient B          0.5
Item 15: Conversion Coefficient C          0

N
SENSOR MENU
(Cn/m) Change Item n To Value m      (N) Go To Next Record
(A)  Insert After This Record        (P) Go To Previous Record
(B)  Insert Before This Record       (X) Delete All Records
(D)  Delete This Record              (Z) Zeno Program Menu
(Jn) Jump To Record n                (H) Help

Sensor Items for Record 8 of 9:
Item  1: Sensor Type Code            2 (18-bit Single-Ended A to D)
Item  2: Sensor Name                 temp
Item  3: Sensor Input Channel        4-
Item  4: Analog Channel Gain         1
Item  5: Analog Channel Attenuation  10
Item  6: Switched Power Code         0 (NO SWITCHED POWER)
Item  7: Sensor Excitation Voltage Code  2 (EXC = 2.50 VDC)
Item  8: Switched Excitation Return  A
Item  9: Switched Power Warmup Time  0
Item 10: Sensor Sample Count         8
Item 11: Maximum Sensor Readings     0
Item 12: Sensor Timing Loop          2 (1.0 seconds)
Item 13: Conversion Coefficient A    0
Item 14: Conversion Coefficient B    0.5
Item 15: Conversion Coefficient C    0

N

SENSOR MENU
(Cn/m) Change Item n To Value m      (N) Go To Next Record
(A)  Insert After This Record        (P) Go To Previous Record
(B)  Insert Before This Record       (X) Delete All Records
(D)  Delete This Record              (Z) Zeno Program Menu
(Jn) Jump To Record n                (H) Help

Sensor Items for Record 9 of 9:
Item  1: Sensor Type Code            1 (12-bit Analog to Digital)
Item  2: Sensor Name                 Battery
Item  3: Sensor Input Channel        BATTERY VOLTAGE
Item  6: Switched Power Code         0 (NO SWITCHED POWER)
Item  7: Sensor Excitation Voltage Code  0 (NO EXCITATION VOLTAGE)
Item  8: Switched Excitation Return  0
Item  9: Switched Power Warmup Time  0
Item 10: Sensor Sample Count         1
Item 11: Maximum Sensor Readings     0
Item 12: Sensor Timing Loop          1 (0.5 seconds)
Item 13: Conversion Coefficient A    0
Item 14: Conversion Coefficient B    1
Item 15: Conversion Coefficient C    0

> z

ZENO PROGRAM MENU
(S) Sensor Menu                      (W) Password Menu
(P) Process Menu                     (R) Reset System
```

```
(D) Data Output Menu                    (E) Save Parameters To EEPROM
(T) Sensor Timing Loop Menu             (U) User Menu
(O) Output Message Timing Menu          (Q) Quit
(L) System Load Menu                    (H) Help

> p

PROCESS MENU
(Cn/m) Change Item n To Value m     (N) Go To Next Record
(A)  Insert After This Record       (P) Go To Previous Record
(B)  Insert Before This Record      (X) Delete All Records
(D)  Delete This Record             (Z) Zeno Program Menu
(Jn) Jump To Record n               (H) Help

Process Items for Record 1 of 9:
Item  1: Process Category            1  : General
Item  2: Process Number              2  : Averaging Process
Item  3: Input for Average Data      S1  : dt01

> n

PROCESS MENU
(Cn/m) Change Item n To Value m     (N) Go To Next Record
(A)  Insert After This Record       (P) Go To Previous Record
(B)  Insert Before This Record      (X) Delete All Records
(D)  Delete This Record             (Z) Zeno Program Menu
(Jn) Jump To Record n               (H) Help

Process Items for Record 2 of 9:
Item  1: Process Category            1  : General
Item  2: Process Number              2  : Averaging Process
Item  3: Input for Average Data      S2  : dt01

> n

PROCESS MENU
(Cn/m) Change Item n To Value m     (N) Go To Next Record
(A)  Insert After This Record       (P) Go To Previous Record
(B)  Insert Before This Record      (X) Delete All Records
(D)  Delete This Record             (Z) Zeno Program Menu
(Jn) Jump To Record n               (H) Help

Process Items for Record 3 of 9:
Item  1: Process Category            1  : General
Item  2: Process Number              2  : Averaging Process
Item  3: Input for Average Data      S3  : dt02

> n

PROCESS MENU
(Cn/m) Change Item n To Value m     (N) Go To Next Record
(A)  Insert After This Record       (P) Go To Previous Record
(B)  Insert Before This Record      (X) Delete All Records
(D)  Delete This Record             (Z) Zeno Program Menu
(Jn) Jump To Record n               (H) Help

Process Items for Record 4 of 9:
Item  1: Process Category            1  : General
```

```
Item  2: Process Number                2  : Averaging Process
Item  3: Input for Average Data       S4  : short

> n

PROCESS MENU
(Cn/m) Change Item n To Value m      (N) Go To Next Record
(A)    Insert After This Record      (P) Go To Previous Record
(B)    Insert Before This Record     (X) Delete All Records
(D)    Delete This Record            (Z) Zeno Program Menu
(Jn)   Jump To Record n              (H) Help

Process Items for Record 5 of 9:
Item  1: Process Category             1  : General
Item  2: Process Number               2  : Averaging Process
Item  3: Input for Average Data       S5  : baro

> n

PROCESS MENU
(Cn/m) Change Item n To Value m      (N) Go To Next Record
(A)    Insert After This Record      (P) Go To Previous Record
(B)    Insert Before This Record     (X) Delete All Records
(D)    Delete This Record            (Z) Zeno Program Menu
(Jn)   Jump To Record n              (H) Help

Process Items for Record 6 of 9:
Item  1: Process Category             1  : General
Item  2: Process Number               2  : Averaging Process
Item  3: Input for Average Data       S6  : x-axis

> n

PROCESS MENU
(Cn/m) Change Item n To Value m      (N) Go To Next Record
(A)    Insert After This Record      (P) Go To Previous Record
(B)    Insert Before This Record     (X) Delete All Records
(D)    Delete This Record            (Z) Zeno Program Menu
(Jn)   Jump To Record n              (H) Help

Process Items for Record 7 of 9:
Item  1: Process Category             1  : General
Item  2: Process Number               2  : Averaging Process
Item  3: Input for Average Data       S7  : y-axis

> n

PROCESS MENU
(Cn/m) Change Item n To Value m      (N) Go To Next Record
(A)    Insert After This Record      (P) Go To Previous Record
(B)    Insert Before This Record     (X) Delete All Records
(D)    Delete This Record            (Z) Zeno Program Menu
(Jn)   Jump To Record n              (H) Help

Process Items for Record 8 of 9:
Item  1: Process Category             1  : General
Item  2: Process Number               2  : Averaging Process
Item  3: Input for Average Data       S8  : temp
```

```
> n

PROCESS MENU
(Cn/m) Change Item n To Value m      (N) Go To Next Record
(A)  Insert After This Record        (P) Go To Previous Record
(B)  Insert Before This Record       (X) Delete All Records
(D)  Delete This Record              (Z) Zeno Program Menu
(Jn) Jump To Record n                (H) Help

Process Items for Record 9 of 9:
Item 1: Process Category          1  : General
Item 2: Process Number            2  : Averaging Process
Item 3: Input for Average Data    S9 : Battery

> z

ZENO PROGRAM MENU
(S) Sensor Menu                      (W) Password Menu
(P) Process Menu                     (R) Reset System
(D) Data Output Menu                 (E) Save Parameters To EEPROM
(T) Sensor Timing Loop Menu          (U) User Menu
(O) Output Message Timing Menu       (Q) Quit
(L) System Load Menu                 (H) Help

> d

DATA OUTPUT MENU
(Cn/m) Change Item n To Value m      (N) Go To Next Record
(A)  Insert After This Record        (P) Go To Previous Record
(B)  Insert Before This Record       (X) Delete All Records
(D)  Delete This Record              (Z) Zeno Program Menu
(Jn) Jump To Record n                (H) Help

Data Items for Record 1 of 9:
Item 1: Field Type code              12 : GOES Binary Format Field
Item 2: Output Message(s)             1
Item 3: Field Name                   dt01
Item 4: Input Record and Element     P1.1
Item 5: Field Decimal Places          0
Item 6: Field Width                   3

> n

DATA OUTPUT MENU
(Cn/m) Change Item n To Value m      (N) Go To Next Record
(A)  Insert After This Record        (P) Go To Previous Record
(B)  Insert Before This Record       (X) Delete All Records
(D)  Delete This Record              (Z) Zeno Program Menu
(Jn) Jump To Record n                (H) Help

Data Items for Record 2 of 9:
Item 1: Field Type code              12 : GOES Binary Format Field
Item 2: Output Message(s)             1
Item 3: Field Name                   dt01
Item 4: Input Record and Element     P2.1
Item 5: Field Decimal Places          0
Item 6: Field Width                   3
```

> n

DATA OUTPUT MENU

(Cn/m) Change Item n To Value m	(N) Go To Next Record
(A) Insert After This Record	(P) Go To Previous Record
(B) Insert Before This Record	(X) Delete All Records
(D) Delete This Record	(Z) Zeno Program Menu
(Jn) Jump To Record n	(H) Help

Data Items for Record 3 of 9:

Item 1: Field Type code	12 : GOES Binary Format Field
Item 2: Output Message(s)	1
Item 3: Field Name	dt02
Item 4: Input Record and Element	P3.1
Item 5: Field Decimal Places	0
Item 6: Field Width	3

> n

DATA OUTPUT MENU

(Cn/m) Change Item n To Value m	(N) Go To Next Record
(A) Insert After This Record	(P) Go To Previous Record
(B) Insert Before This Record	(X) Delete All Records
(D) Delete This Record	(Z) Zeno Program Menu
(Jn) Jump To Record n	(H) Help

Data Items for Record 4 of 9:

Item 1: Field Type code	12 : GOES Binary Format Field
Item 2: Output Message(s)	1
Item 3: Field Name	short
Item 4: Input Record and Element	P4.1
Item 5: Field Decimal Places	0
Item 6: Field Width	3

> n

DATA OUTPUT MENU

(Cn/m) Change Item n To Value m	(N) Go To Next Record
(A) Insert After This Record	(P) Go To Previous Record
(B) Insert Before This Record	(X) Delete All Records
(D) Delete This Record	(Z) Zeno Program Menu
(Jn) Jump To Record n	(H) Help

Data Items for Record 5 of 9:

Item 1: Field Type code	12 : GOES Binary Format Field
Item 2: Output Message(s)	1
Item 3: Field Name	baro
Item 4: Input Record and Element	P5.1
Item 5: Field Decimal Places	0
Item 6: Field Width	3

> n

DATA OUTPUT MENU

(Cn/m) Change Item n To Value m	(N) Go To Next Record
(A) Insert After This Record	(P) Go To Previous Record
(B) Insert Before This Record	(X) Delete All Records

```
(D)  Delete This Record              (Z) Zeno Program Menu
(Jn) Jump To Record n                (H) Help

Data Items for Record 6 of 9:
Item 1: Field Type code               12 : GOES Binary Format Field
Item 2: Output Message(s)             1
Item 3: Field Name                    x-axis
Item 4: Input Record and Element      P6.1
Item 5: Field Decimal Places          0
Item 6: Field Width                   3

> n

DATA OUTPUT MENU
(Cn/m) Change Item n To Value m      (N) Go To Next Record
(A)  Insert After This Record        (P) Go To Previous Record
(B)  Insert Before This Record       (X) Delete All Records
(D)  Delete This Record              (Z) Zeno Program Menu
(Jn) Jump To Record n                (H) Help

Data Items for Record 7 of 9:
Item 1: Field Type code               12 : GOES Binary Format Field
Item 2: Output Message(s)             1
Item 3: Field Name                    y-axis
Item 4: Input Record and Element      P7.1
Item 5: Field Decimal Places          0
Item 6: Field Width                   3

> n

DATA OUTPUT MENU
(Cn/m) Change Item n To Value m      (N) Go To Next Record
(A)  Insert After This Record        (P) Go To Previous Record
(B)  Insert Before This Record       (X) Delete All Records
(D)  Delete This Record              (Z) Zeno Program Menu
(Jn) Jump To Record n                (H) Help

Data Items for Record 8 of 9:
Item 1: Field Type code               12 : GOES Binary Format Field
Item 2: Output Message(s)             1
Item 3: Field Name                    temp
Item 4: Input Record and Element      P8.1
Item 5: Field Decimal Places          0
Item 6: Field Width                   3

> n

DATA OUTPUT MENU
(Cn/m) Change Item n To Value m      (N) Go To Next Record
(A)  Insert After This Record        (P) Go To Previous Record
(B)  Insert Before This Record       (X) Delete All Records
(D)  Delete This Record              (Z) Zeno Program Menu
(Jn) Jump To Record n                (H) Help

Data Items for Record 9 of 9:
Item 1: Field Type code               12 : GOES Binary Format Field
Item 2: Output Message(s)             1
Item 3: Field Name                    BATTERY
```

```
Item 4: Input Record and Element        P9.1
Item 5: Field Decimal Places            0
Item 6: Field Width                     3

> z

ZENO PROGRAM MENU
(S) Sensor Menu                         (W) Password Menu
(P) Process Menu                        (R) Reset System
(D) Data Output Menu                    (E) Save Parameters To EEPROM
(T) Sensor Timing Loop Menu             (U) User Menu
(O) Output Message Timing Menu          (Q) Quit
(L) System Load Menu                    (H) Help

> t

SENSOR TIMING LOOP MENU
(Cn/m) Change Item n To Value m         (H) Help
(Z)    Zeno Program Menu

Item  1:  0.5        (Timing Loop #1 Period)
Item  2:  1.0        (Timing Loop #2 Period)
Item  3:  120.0      (Timing Loop #3 Period)
Item  4:  10.0       (Timing Loop #4 Period)

> o

OUTPUT MESSAGE TIMING MENU
(Cn/m) Change Item n To Value m         (H) Help
(Z)    Zeno Program Menu

Item  1:  COM2       (Data Output Message #1 COM Port)
Item  2:  COM3       (Data Output Message #2 COM Port)
Item  3:  COM3       (Data Output Message #3 COM Port)
Item  4:  COM3       (Data Output Message #4 COM Port)
Item  5:  0.0        (Data Output Message #1 Period)
Item  6:  0.0        (Data Output Message #2 Period)
Item  7:  0.0        (Data Output Message #3 Period)
Item  8:  0.0        (Data Output Message #4 Period)

> e
Verifying parameters can be stored in EEPROM . . .
Saving parameters to EEPROM . . .
Saving Scan List parameters to EEPROM . . .
475 out of 2048 bytes used in EEPROM.
Total EEPROM Writes: 43  Checksum: 238

ZENO PROGRAM MENU
(S) Sensor Menu                         (W) Password Menu
(P) Process Menu                        (R) Reset System
(D) Data Output Menu                    (E) Save Parameters To EEPROM
(T) Sensor Timing Loop Menu             (U) User Menu
(O) Output Message Timing Menu          (Q) Quit
(L) System Load Menu                    (H) Help

> b
Waiting for all data acquisition tasks to finish . . .
```

```
BACK DOOR MENU
(Cn/m) Change Item n To Value m      (X) Display Stack Usage
(F)  Calculate Free Heap Memory      (E) Save Parameters To EEPROM
(A)  Auto-Calibrate Compass          (U) User Menu
(I)  Initialize Compass              (H) Help
(R)  Reset Parameters To Defaults

Item 1: 16777      (Processor Clock Speed)
Item 2: 1          (RAM/ROM Wait States)
Item 3: 60         (50/60 Hz Rejection For 18-bit ADC)
Item 4: 18         (13/18 Bit Operation Of 18-bit ADC)
Item 5: COUNTS     (A To D Conversion Results)
Item 6: YES        (Expert Menu Mode)
Item 7: 32768.00   (Real-time Clock Crystal Frequency At 25 Degrees C)
Item 8: 0          (Speed vs. Noise Tradeoffs For 18-bit ADC, Factory Only)
Item 9: 1.0000     (12-bit ADC Correction Factor)

> s

SAMPLE PERIOD MENU
(Cn/m) Change Item n To Value m      (Q) Quit
(E)  Save Parameters To EEPROM       (H) Help
(U)  User Menu

Item 1: 600    (Sample Interval Time)
Item 2: 14     (Sample Duration Time)
Item 3: 0      (Sample Time Offset)

>u

USER MENU
(C) Communications Menu              (T) Test Menu
(F) System Functions Menu            (Z) Zeno Program Menu
(S) Sample Period Menu               (Q) Quit
(D) Data Retrieval Menu              (H) Help

> f

SYSTEM FUNCTIONS MENU
(Cn/m) Change Item n to Value m      (E) Save Parameters To EEPROM
(S)  System Date And Time            (U) User Menu
(T)  Calibrate Internal Temperature  (Q) Quit
(V)  Program Version                 (H) Help

Item 1: 1223   (Primary Unit/Experiment ID)
Item 2: 2      (Secondary Unit/Experiment ID)
Item 3: 1      (Data Dump Format)
Item 4: 1      (Real Time Output Format)
Item 5: 0      (Add Compass To Vane)
Item 6: 0      (Compass Offset)
Item 7: 0      (Barometer Elevation)


> v
ZENO-3200  using ZENOSOFT V1.813 Dec  1 1998 14:56:07 CS EEBE
(C)opyright 1995-1998, Coastal Environmental Systems, Seattle, WA, USA.
```

```
> u

USER MENU
(C) Communications Menu          (T) Test Menu
(F) System Functions Menu        (Z) Zeno Program Menu
(S) Sample Period Menu           (Q) Quit
(D) Data Retrieval Menu          (H) Help

> c g i
Current Date and Time:   05/12/02 23:39:26
Enter new Date and Time: 05/12/02 23:45:00
GOES Transmitter Initialization ... successful

Note: Next sample interval begins in 4 minutes and 59 seconds.

GOES MENU
(Cn/m) Change Item n To Value m      (E) Save Parameters To EEPROM
(D)    Run GOES Diagnostics          (U) User Menu
(R)    Reset GOES Errors             (Q) Quit
(I)    Initialize GOES               (H) Help

Item  1:  2637f0d6      (Data Collection Platform Address)
Item  2:  104           (Self-Timed Transmit Channel Number)
Item  3:  00:00:10:00   (Self-Timed Transmission Interval)
Item  4:  00:06:20      (Self-Timed Transmission Offset)
Item  5:  1             (Transmission Window Length)
Item  6:  SHORT         (Satellite Link Parameter: Preamble)
Item  7:  151           (Random Transmit Channel Number)
Item  8:  00:00:00      (Random Transmission Interval)
Item  9:  00:05:00      (Random Disable Time)

> q

Verifying GOES Transmitter Initialization ...successful

Exiting user interface.
```

ZENOSOFT

An alternate to entering the programming by hand would be to download the configuration:

To Configure a ZENO using a laptop and program from a Diskette

1 hook black ZENO db9 cable to ZENO and com port 1 (db9) on back of laptop.

2 open ZENO Hyperterm file (configured to 9600 baud, 8 data bits, 1 start bit, 1 stop bit, no parity, no flow control)

3 type U & enter (the U will not display)

4 Computer responds with :

USER MENU
(C) Communications Menu (T) Test Menu
(F) System Functions Menu (Z) Zeno Program Menu
(S) Sample Period Menu (Q) Quit
(D) Data Retrieval Menu (H) Help

5 type Z & enter

6 Enter Administrator Password: (ZENO is password)

7 Computer responds with :

ZENO PROGRAM MENU
(S) Sensor Menu (W) Password Menu
(P) Process Menu (R) Reset System
(D) Data Output Menu (E) Save Parameters To EEPROM
(T) Sensor Timing Loop Menu (U) User Menu
(O) Output Message Timing Menu (Q) Quit
(L) System Load Menu (H) Help

8 type L & enter

9 Computer responds with :

SYSTEM LOAD MENU
(R) Receive Configuration From Host (Z) Zeno Program Menu
(T) Transmit Configuration From Zeno (H) Help

type XR & enter

the computer says:

The Existing System Setup Will Be Lost. Continue? (Y/N) **Y & enter**

Ready To Receive X-Modem System Configuration File.
Enter CONTROL-X To Abort transfer.

At this point you have to go to the "Transfer" drop down of the menu bar at the top of the Hyperterm Window.
Hit "Send File"
Go to "Browse" and find the configuration you downloaded and saved in the laptop" in "Select File to Send"
And click "open".

(if you take too long you'll be kicked back to section 9)

Once you hit "send" in the "Send File" window, the program is downloaded (you'll see a window telling the download progress.)
You'll get a response similar to this:

CCCCCCCCC
73 Parameters Loaded
10 Sensor Command Sets Loaded
10 Process Command Sets Loaded
10 Data Command Sets Loaded

SYSTEM LOAD MENU
(R) Receive Configuration From Host (Z) Zeno Program Menu
(T) Transmit Configuration From Zeno (H) Help

Precede The R Or T Command With An 'X' For X-Modem Transfer
(e.g. Enter 'XR' To Receive A Configuration File Via X-Modem)

14 You can now go back to (Z)

Z & enter

ZENO PROGRAM MENU

(S) Sensor Menu	(W) Password Menu
(P) Process Menu	(R) Reset System
(D) Data Output Menu	(E) Save Parameters To EEPROM
(T) Sensor Timing Loop Menu	(U) User Menu
(O) Output Message Timing Menu	(Q) Quit
(L) System Load Menu	(H) Help

E & enter

Verifying parameters can be stored in EEPROM . . .
Saving parameters to EEPROM . . .
Saving Scan List parameters to EEPROM . . .
518 out of 2048 bytes used in EEPROM.
Total EEPROM Writes: 135 Checksum: 107

ZENO PROGRAM MENU

(S) Sensor Menu	(W) Password Menu
(P) Process Menu	(R) Reset System
(D) Data Output Menu	(E) Save Parameters To EEPROM
(T) Sensor Timing Loop Menu	(U) User Menu
(O) Output Message Timing Menu	(Q) Quit
(L) System Load Menu	(H) Help

Then:

U C G & enter

GOES MENU

(Cn/m) Change Item n To Value m	(E) Save Parameters To EEPROM
(D) Run GOES Diagnostics	(U) User Menu
(R) Reset GOES Errors	(Q) Quit
(I) Initialize GOES	(H) Help

Item 1:	2637E3AO	(Data Collection Platform Address)
Item 2:	104	(Self-Timed Transmit Channel Number)
Item 3:	00:00:10:00	(Self-Timed Transmission Interval)
Item 4:	00:06:20	(Self-Timed Transmission Offset)
Item 5:	1	(Transmission Window Length)
Item 6:	SHORT	(Satellite Link Parameter: Preamble)
Item 7:	151	(Random Transmit Channel Number)
Item 8:	00:00:00	(Random Transmission Interval)
Item 9:	00:05:00	(Random Disable Time)

Ensure the platform address and self-timed transmission offset are correct.

16

I & enter

Current Date and Time: 04/10/26 18:30:50
Enter new Date and Time: **??/??/?? ??:??:?? & enter**

This should initialize everything and you're done

The following are configuration for the Hawaii sites:

Strip Road:

```
* Zeno 3200 System Setup File
* Program Version And Date: ZENO-3200  using ZENOSOFT V1.813 Dec  1 1998 14:56:07 CS EEBE
* (C)opyright 1995-1998, Coastal Environmental Systems, Seattle, WA, USA.
* Setup File Date And Time: 00/09/14 22:28:46
PARAM1 600 0 14 2 240 20 1223 2 9600 9600
PARAM2 9600 0 4 0 0 1 1 0 0 0
PARAM3 16777 1 60 18 0 0 0 0 1 2
PARAM4 2 2 0 1 1 3276800 0 -1 5 0
PARAM5 0 0 0 0 300 0 0 0 0 0
PARAM6 0 0 0 852163200 641196960 104 2560 1536 1 0
PARAM7 151 0 1280 0 10000
PARAM8 "NONE" "NONE" "NONE" "NONE" "NONE" "NONE" "" "ZENO"
SENSOR 2 "dt01" 8 0 0 0 0 0 0 8 0 2 0 0.5 0 0
SENSOR 2 "dt01" 8 0 3 0 0 0 0 8 0 2 0 0.5 0 0
SENSOR 2 "dt02" 1 0 3 0 0 0 0 8 0 2 0 0.5 0 0
SENSOR 2 "short" 9 0 0 0 0 0 0 8 0 2 0 0.5 0 0
SENSOR 2 "baro" 2 0 3 0 0 0 0 8 0 2 0 0.5 0 0
SENSOR 2 "x-axis" 10 0 3 0 0 0 0 8 0 2 0 0.5 0 0
SENSOR 2 "y-axis" 3 0 3 0 0 0 0 8 0 2 0 0.5 0 0
SENSOR 2 "temp" 11 0 3 0 2 1 0 8 0 2 0 0.5 0 0
SENSOR 1 "Battery" 2 0 0 0 0 0 0 1 0 1 0 1 0 0
PROCESS 1 2 S1.1
PROCESS 1 2 S2.1
PROCESS 1 2 S3.1
PROCESS 1 2 S4.1
PROCESS 1 2 S5.1
PROCESS 1 2 S6.1
PROCESS 1 2 S7.1
PROCESS 1 2 S8.1
PROCESS 1 2 S9.1
DATA 12 1 "dt01" P1.1 0 3 1
DATA 12 1 "dt01" P2.1 0 3 1
DATA 12 1 "dt02" P3.1 0 3 1
DATA 12 1 "short" P4.1 0 3 1
DATA 12 1 "baro" P5.1 0 3 1
DATA 12 1 "x-axis" P6.1 0 3 1
DATA 12 1 "y-axis" P7.1 0 3 1
DATA 12 1 "temp" P8.1 0 3 1
DATA 12 1 "BATTERY" P9.1 0 3 1
EOF
□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□
□□□□□□□□□□
```

Hokukano

```
* Zeno 3200 System Setup File
* Program Version And Date: ZENO-3200  using ZENOSOFT V1.813 Dec  1 1998 14:56:07 CS EEBE
* (C)opyright 1995-1998, Coastal Environmental Systems, Seattle, WA, USA.
* Setup File Date And Time: 00/09/19 22:58:20
PARAM1 600 0 14 2 240 20 1223 2 9600 9600
PARAM2 9600 0 4 0 0 1 1 0 0 0
PARAM3 16777 1 60 18 0 0 0 0 1 2
PARAM4 2 2 0 1 1 3276800 0 -1 5 0
```

```
PARAM5 0 0 0 0 300 0 0 0 0 0
PARAM6 0 0 0 852163200 641237204 104 2560 1295 1 0
PARAM7 151 0 1280 0 10000
PARAM8 "NONE" "NONE" "NONE" "NONE" "NONE" "NONE" "" "ZENO"
SENSOR 2 "dt01" 8 0 0 0 0 0 0 8 0 2 0 0.5 0 0
SENSOR 2 "dt01" 8 0 3 0 0 0 0 8 0 2 0 0.5 0 0
SENSOR 2 "dt02" 1 0 3 0 0 0 0 8 0 2 0 0.5 0 0
SENSOR 2 "short" 9 0 0 0 0 0 0 8 0 2 0 0.5 0 0
SENSOR 2 "baro" 2 0 3 0 0 0 0 8 0 2 0 0.5 0 0
SENSOR 2 "x-axis" 10 0 3 0 0 0 0 8 0 2 0 0.5 0 0
SENSOR 2 "y-axis" 3 0 3 0 0 0 0 8 0 2 0 0.5 0 0
SENSOR 2 "temp" 11 0 3 0 2 1 0 8 0 2 0 0.5 0 0
SENSOR 1 "Battery" 2 0 0 0 0 0 0 1 0 1 0 1 0 0
PROCESS 1 2 S1.1
PROCESS 1 2 S2.1
PROCESS 1 2 S3.1
PROCESS 1 2 S4.1
PROCESS 1 2 S5.1
PROCESS 1 2 S6.1
PROCESS 1 2 S7.1
PROCESS 1 2 S8.1
PROCESS 1 2 S9.1
DATA 12 1 "dt01" P1.1 0 3 1
DATA 12 1 "dt01" P2.1 0 3 1
DATA 12 1 "dt02" P3.1 0 3 1
DATA 12 1 "short" P4.1 0 3 1
DATA 12 1 "baro" P5.1 0 3 1
DATA 12 1 "x-axis" P6.1 0 3 1
DATA 12 1 "y-axis" P7.1 0 3 1
DATA 12 1 "temp" P8.1 0 3 1
DATA 12 1 "BATTERY" P9.1 0 3 1
EOF
□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□
□□□□□□□□□□□
```

Mauna Loa

```
* Zeno 3200 System Setup File
* Program Version And Date: ZENO-3200  using ZENOSOFT V1.813 Dec  1 1998 14:56:07 CS EEBE
* (C)opyright 1995-1998, Coastal Environmental Systems, Seattle, WA, USA.
* Setup File Date And Time: 00/09/17 03:45:07
PARAM1 600 0 14 2 240 20 1223 2 9600 9600
PARAM2 9600 0 4 0 0 1 1 0 0 0
PARAM3 16777 1 60 18 0 0 0 0 1 2
PARAM4 2 2 0 1 1 3276800 0 -1 5 0
```

```
PARAM5 0 0 0 0 300 0 0 0 0 0
PARAM6 0 0 0 852163200 641196960 104 2560 1536 1 0
PARAM7 151 0 1280 0 10000
PARAM8 "NONE" "NONE" "NONE" "NONE" "NONE" "NONE" "" "ZENO"
SENSOR 2 "dt01" 8 0 0 0 0 0 0 8 0 2 0 0.5 0 0
SENSOR 2 "dt01" 8 0 3 0 0 0 0 8 0 2 0 0.5 0 0
SENSOR 2 "dt02" 1 0 3 0 0 0 0 8 0 2 0 0.5 0 0
SENSOR 2 "short" 9 0 0 0 0 0 0 8 0 2 0 0.5 0 0
SENSOR 2 "baro" 2 0 3 0 0 0 0 8 0 2 0 0.5 0 0
SENSOR 2 "x-axis" 10 0 3 0 0 0 0 8 0 2 0 0.5 0 0
SENSOR 2 "y-axis" 3 0 3 0 0 0 0 8 0 2 0 0.5 0 0
SENSOR 2 "temp" 11 0 3 0 2 1 0 8 0 2 0 0.5 0 0
SENSOR 1 "Battery" 2 0 0 0 0 0 0 1 0 1 0 1 0 0
PROCESS 1 2 S1.1
PROCESS 1 2 S2.1
PROCESS 1 2 S3.1
PROCESS 1 2 S4.1
PROCESS 1 2 S5.1
PROCESS 1 2 S6.1
PROCESS 1 2 S7.1
PROCESS 1 2 S8.1
PROCESS 1 2 S9.1
DATA 12 1 "dt01" P1.1 0 3 1
DATA 12 1 "dt01" P2.1 0 3 1
DATA 12 1 "dt02" P3.1 0 3 1
DATA 12 1 "short" P4.1 0 3 1
DATA 12 1 "baro" P5.1 0 3 1
DATA 12 1 "x-axis" P6.1 0 3 1
DATA 12 1 "y-axis" P7.1 0 3 1
DATA 12 1 "temp" P8.1 0 3 1
DATA 12 1 "BATTERY" P9.1 0 3 1
EOF
```

Keller Well

```
* Zeno 3200 System Setup File
* Program Version And Date: ZENO-3200  using ZENOSOFT V1.813 Dec  1 1998 14:56:07 CS EEBE
* (C)opyright 1995-1998, Coastal Environmental Systems, Seattle, WA, USA.
* Setup File Date And Time: 00/09/15 00:48:24
PARAM1 600 0 14 2 240 20 1223 2 9600 9600
PARAM2 9600 0 4 0 0 1 1 0 0 0
PARAM3 16777 1 60 18 0 0 0 0 1 2
PARAM4 2 2 0 1 1 3276800 0 -1 5 0
PARAM5 0 0 0 0 300 0 0 0 0 0
PARAM6 0 0 0 852163200 641200342 104 2560 1320 1 0
PARAM7 151 0 1280 0 10000
PARAM8 "NONE" "NONE" "NONE" "NONE" "NONE" "NONE" "" "ZENO"
SENSOR 2 "dt01" 8 0 0 0 0 0 0 0 8 0 2 0 0.5 0 0
SENSOR 2 "dt01" 8 0 3 0 0 0 0 0 8 0 2 0 0.5 0 0
SENSOR 2 "dt02" 1 0 3 0 0 0 0 0 8 0 2 0 0.5 0 0
SENSOR 2 "short" 9 0 0 0 0 0 0 0 8 0 2 0 0.5 0 0
SENSOR 2 "baro" 2 0 3 0 0 0 0 0 8 0 2 0 0.5 0 0
SENSOR 2 "x-axis" 10 0 3 0 0 0 0 0 8 0 2 0 0.5 0 0
SENSOR 2 "y-axis" 3 0 3 0 0 0 0 0 8 0 2 0 0.5 0 0
SENSOR 2 "temp" 11 0 3 0 2 1 0 8 0 2 0 0.5 0 0
SENSOR 1 "BATTERY" 2 0 0 0 0 0 0 0 1 0 1 0 1 0 0
SENSOR 2 "water" 4 0 0 0 0 0 0 0 8 0 2 0 0.5 0 0
SENSOR 2 "water" 12 0 0 0 0 0 0 0 8 0 2 0 0.5 0 0
PROCESS 1 2 S1.1
PROCESS 1 2 S2.1
PROCESS 1 2 S3.1
PROCESS 1 2 S4.1
PROCESS 1 2 S5.1
PROCESS 1 2 S6.1
PROCESS 1 2 S7.1
PROCESS 1 2 S8.1
PROCESS 1 2 S9.1
PROCESS 1 2 S10.1
PROCESS 1 1 S11.1
DATA 12 1 "dt01" P1.1 0 3 1
DATA 12 1 "dt01" P2.1 0 3 1
DATA 12 1 "dt02" P3.1 0 3 1
DATA 12 1 "short" P4.1 0 3 1
DATA 12 1 "baro" P5.1 0 3 1
DATA 12 1 "x-axis" P6.1 0 3 1
DATA 12 1 "y-axis" P7.1 0 3 1
DATA 12 1 "temp" P8.1 0 3 1
DATA 12 1 "BATTERY" P9.1 0 3 1
DATA 12 1 "water" P10.1 0 3 1
DATA 12 1 "water" P11.1 0 3 1
EOF
```

□□□

17.

Installation DT1/2 Dilatometer HAWAII/Mammoth

Site Name _____ time _____ date

Instrument #_____ Depth of instrument_____
Surface test

Wire Color	Pin number	component		ohm's	Voltage's downhole	PC
Black	1	Valve 1 close +		_____	_____	_____
White	2	Valve 1 & 2 close -		_____	_____	_____
Green	4	Valve 1 & 2 close -		_____	_____	_____
Orange	5	DT1 supply	IN +	_____	_____	_____
Grn/Blk trace	9	DT2 supply	IN +	_____	_____	_____
Blue	6	DT1&2 supply com	IN-	_____	_____	_____
Wht/Blk trace	7	DT1sig out	OUT +	_____	_____	_____
Red/Blk trace	8	DT1com	OUT –	_____	_____	_____
Blu/Wht trace	15	NC	NC	_____	_____	_____
Org/Blk trace	10	DT1&2 supply com	OUT –	_____	_____	_____
Blk/Red trace	16	NC	NC	_____	_____	_____
Red	3	Valve 2 close +		_____	_____	_____
Blu/Blk trace	11	DT2 sig out	OUT +	_____	_____	_____
Red/Wht trace	13	NC	NC	_____	_____	_____
Grn/Wht trace	14	NC	NC	_____	_____	_____
Blk/Wht trace	12	DT2 com	OUT –	_____	_____	_____

Strainmeter Status

DT1 status DT2 status
Power up

Valve 1 open___close___ Valve 2 open___close____ time_____date_____
PC DVM PC DVM
Comp A _____ _____ Comp A_____ _____

Valve 1 open___close___ Valve 2 open___close____ time_____date_____
PC DVM PC DVM
Comp A _____ _____ Comp A_____ _____

Valve 1 open___close___ Valve 2 open___close____ time_____date_____
PC DVM PC DVM
Comp A _____ _____ Comp A_____ _____

Shut Down (insure valves are open)_____ Electronics power up(valves closed)_____

Valve 1 open___close___ Valve 2 open___close____ time_____date_____
PC DVM PC DVM
Comp A_____ _____ Comp A_____ _____

18. Acknowledgements:

Michael Acierno CIW / DTM (SOC Box Operation)
Dale Evertsen (instrument design)
Vincent Keller USGS
Alan Linde CIW /DTM
Glen Poe CIW /DTM retired (electronics design)
Selwyn Sacks CIW /DTM (instrument design)
Brian Scheilgh CIW /DTM (SOC Box Operation)
Michael Seeman CIW /DTM retired (instrument manufacture)
Stanley Silverman USGS

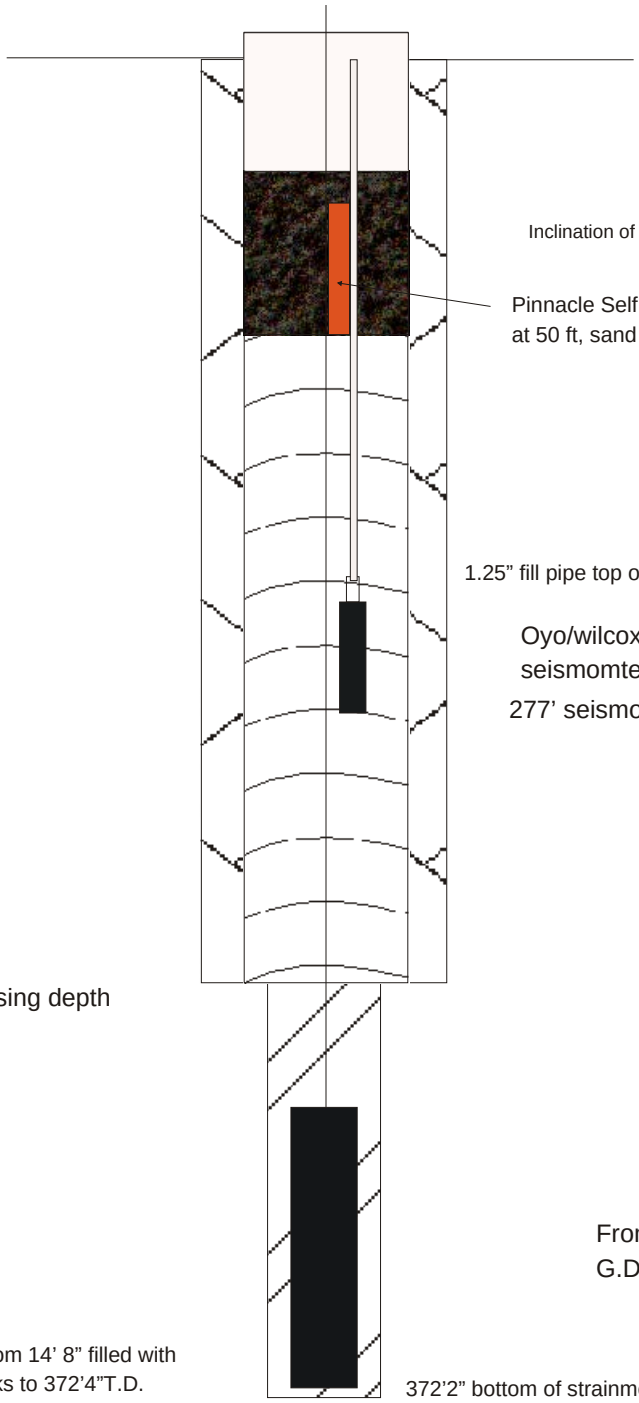
Please refer to: Open-File 89-340 Borehole Dilatometer Installation, Operation and Maintenance at Sites along the San Andreas Fault, California, G.D. Myren and M.J.S. Johnston

Drawings, Schematics, & Maps
Contents

Mauna Loa Strip Dilatometer

4.0” casing inside 4.5” borehole
with 4” cored section from 356’10”’ to 387’5’’

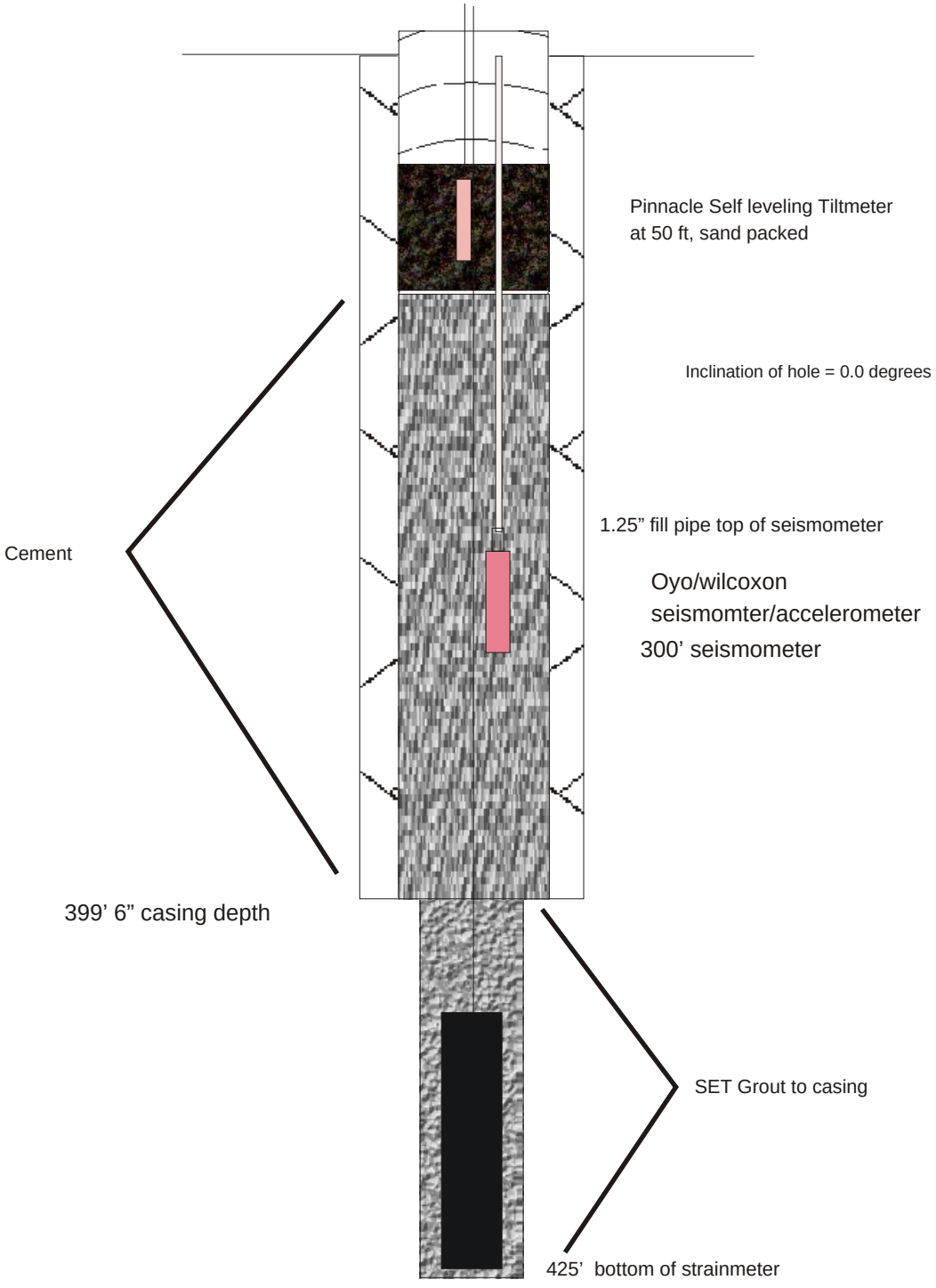
total length of borehole cemented back to 50’ of surface



Hokukano Dilatometer

4.0” casing inside 4.5” borehole
with 4” cored section from 399.5’ to 425’ 6”

total length of borehole cemented back to 50’ of surface



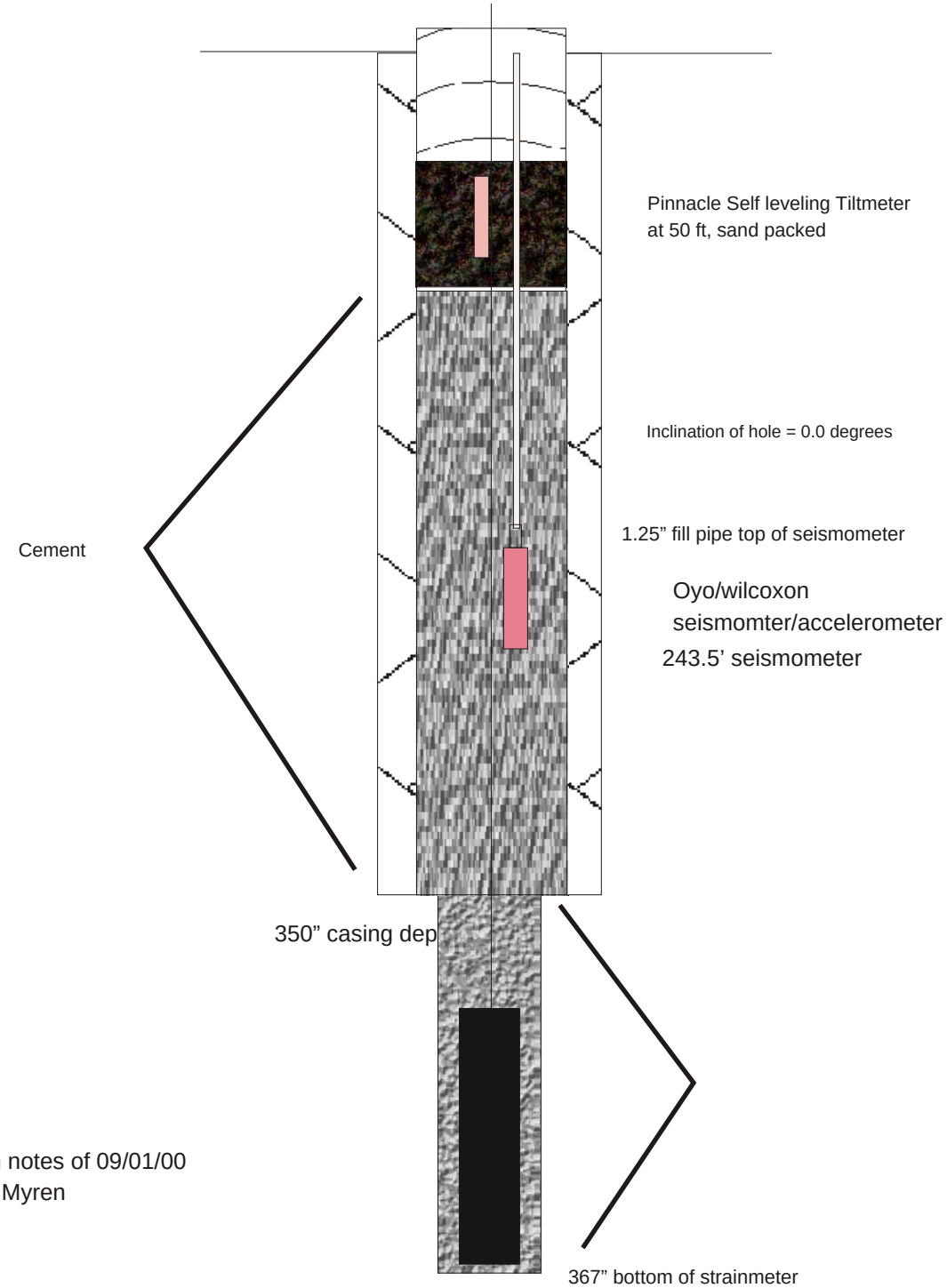
T.D. = 428’ 9”
bottom 3’ filled with rock

From notes of 09/01/00
G.D. Myren

Mauna Loa Observatory Dilatometer

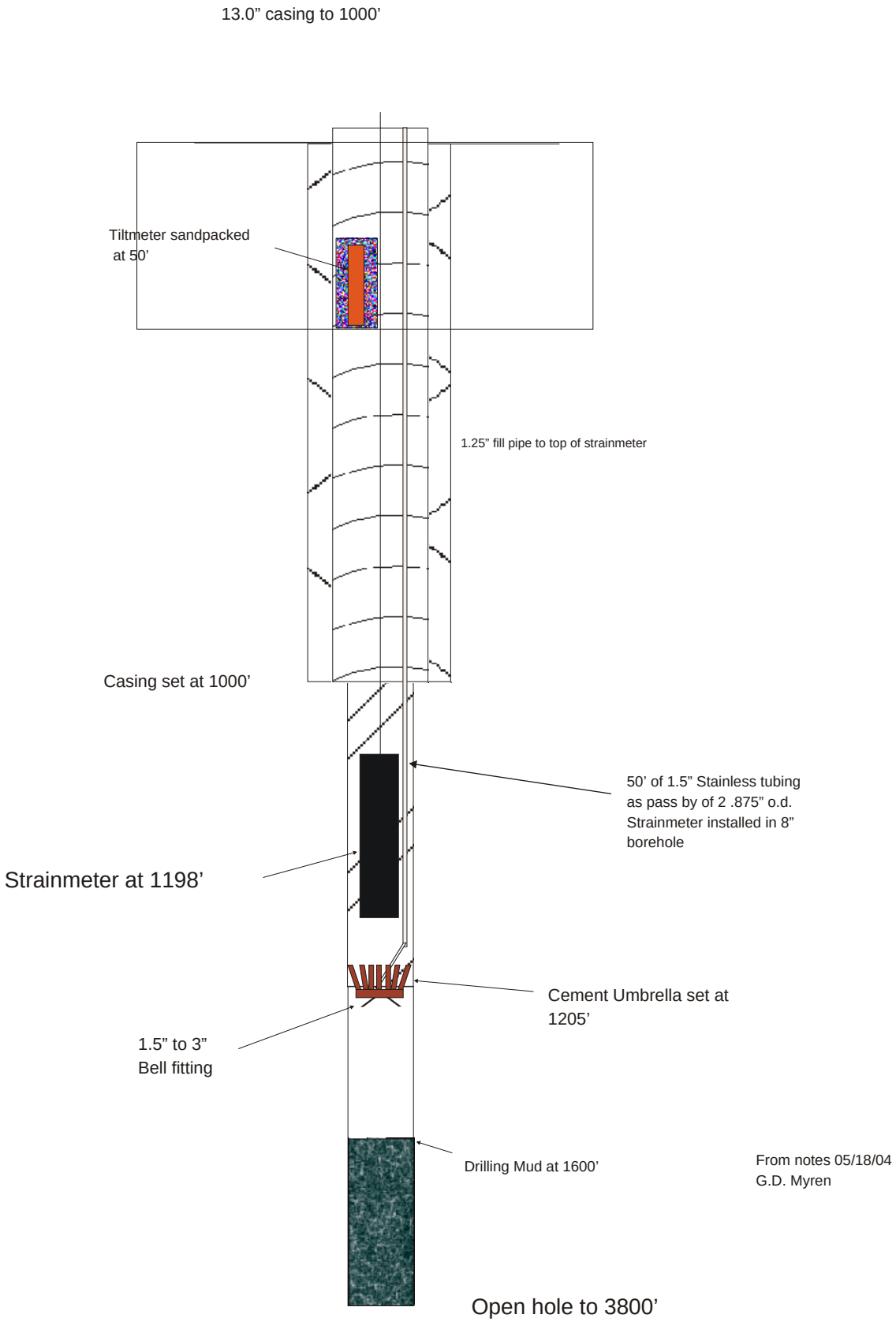
4.0” casing inside 4.5” borehole
with 4” cored section from 350’ to 367’3”

total length of borehole cemented back to 45’ of surface



From notes of 09/01/00
G.D. Myren

Keller Dilatometer



degussa.
Construction Chemicals

SET® GROUT

General-construction mineral-aggregate nonshrink grout

PRODUCT DATA

3 03600 Grouts

Description

Set® Grout is a Portland-cement-based construction grout containing mineral aggregate. It is designed to meet all of the performance requirements of the Corps of Engineers Specification CRD C 621 and ASTM C 1107, Grades B and C, at a consistency from flowable to damp pack.

Yield

One 50 lb (22.7 kg) bag of Set® Grout mixed with 1.0 gallon (3.8 L) of water, provides approximately 0.42 ft (0.012 m) of mixed grout (at a flowable mix).

Packaging

50 lb (22.7 kg) multi-wall paper bags

Shelf Life

1 year when properly stored

Storage

Store in unopened packaging in a clean, dry environment

Features	Benefits
▪ Natural gray color	Blends in with surrounding concrete
▪ Free of inorganic accelerators, including chlorides or other salts	Will not corrode reinforcing steel
▪ Can be extended with clean, well-graded coarse aggregate	Fills large voids without additional mix water
▪ Hardens free of bleeding at stiff, plastic, or flowable consistencies	Provides effective bearing area for load transfer

Where to Use

APPLICATION

- Normal loads for columns and baseplates
- Anchoring bolts and reinforcing bars
- Bedding grout for precast panels
- Repairing of cavities resulting from ineffective concrete consolidation
- Caulking concrete pipe
- Backfilling, underpinning foundations, and pressure grouting of slabs needing alignment
- General-construction applications

How to Apply

Application

Consult the Set® Grout product bag for installation details. For aggregate extension guidelines, refer to Appendix MB-10: Guide to Cementitious Grouting.

Curing

Cure all exposed grout shoulders by wet curing for 24 hours and then applying a recommended curing compound compliant with ASTM C 309 or preferably ASTM C 1315.

For Best Performance

- Contact your local representative for a pre-job conference to plan the installation.
- When grouting in temperatures below 50° F (10° C) or above 90° F (32° C), special procedures are required. Store and mix grout to produce the desired mixed-grout temperature. If bagged material is hot, use cold water; if bagged material is cold, use warm water to achieve a mixed-product temperature as close to 70° F (21° C) as possible. Consult with your Degussa representative for use of Set® Grout outside of the recommended temperature range.
- Do not use Set Grout where it will contact steel designed for stresses above 60,000 psi (552 MPa). Use Masterflow® 816, Masterflow® 1341, or Masterflow® 1205 post-tensioning cable grouts instead.
- Do not add plasticizers, accelerators, retarders, or other admixtures or additives without the specific written authorization of Degussa Technical Service.
- For best results, do not attempt to place Set® Grout under a baseplate with less than 1" (25 mm) of vertical clearance.
- Do not place Set® Grout in any lifts greater than 6" (15 cm) unless the product is extended with aggregate.

Protection and Repair

www.DegussaBuildingSystems.com

Technical Data

Composition

Set® Grout is a Portland-cement-based grout containing mineral aggregate.

Compliances

- CRD C 621, Grades B and C, and ASTM C 1107, Grades B and C, at a consistency from flowable to dry pack
- City of Los Angeles Research Report Number RR 23137

Test Data

PROPERTY	RESULTS			TEST METHODS
Flowable Mix				ASTM C230
Approximate water, gallons (L)	1.0 (3.8)			
Flow, 5 drops, %	125 – 145			
Compressive strength, psi (MPa)				ASTM C 942, according to ASTM C 1107
		Consistency		
	Flowable²	Plastic³	Stiff⁴	
3 day	3,000 (21)	5,000 (35)	6,000 (41)	
7 day	5,000 (35)	6,500 (45)	8,800 (61)	
28 day	7,000 (48)	9,000 (62)	10,000 (69)	

[1] At a constant percent of water, consistency will vary with temperature. Final set takes place in approximately 6 hours at a flowable consistency at 70° F (21° C).

[2] 140% flow on flow table, ASTM C 230, 5 drops in 3 seconds.

[3] 100% flow on flow table, ASTM C 230, 5 drops in 3 seconds.

[4] 40% flow on flow table, ASTM C 230, 5 drops in 3 seconds.

Expect reasonable variations from the results shown because of varying temperatures and atmospheric conditions at the jobsite. Control field and laboratory tests on the desired placing consistency rather than strictly on water content.

- Where precision alignment and severe service, such as heavy loading, rolling, or impact resistance, are required, use metallic-reinforced, non-catalyzed Embeco® 885 grout. If the amount of impact resistance needed is not great enough to require metallic reinforcement, use mineral-aggregate Masterflow® 928 grout.
- Make certain the most current versions of product data sheet and MSDS are being used; call Customer Service (1-800-433-9517) to verify the most current versions.
- Proper application is the responsibility of the user. Field visits by Degussa personnel are for the purpose of making technical recommendations only and not for supervising or providing quality control on the jobsite.

Health and Safety

SET® GROUT

Caution

Risks

Eye irritant. Skin irritant. Causes burns. Lung irritant. May cause delayed lung injury.

Precautions

KEEP OUT OF THE REACH OF CHILDREN. Avoid contact with eyes. Wear suitable protective eyewear. Avoid prolonged or repeated contact with skin. Wear suitable gloves. Wear suitable protective clothing. Do not breathe dust. In case of insufficient ventilation, wear suitable respiratory equipment. Wash soiled clothing before reuse.

First Aid

Wash exposed skin with soap and water. Flush eyes with large quantities of water. If breathing is difficult, move person to fresh air.

Waste Disposal Method

This product when discarded or disposed of is not listed as a hazardous waste in federal regulations. Dispose of in a landfill in accordance with local regulations.

For additional information on personal protective equipment, first aid, and emergency procedures, refer to the product Material Safety Data Sheet (MSDS) on the job site or contact the company at the address or phone numbers given below.

Proposition 65

This product contains materials listed by the state of California as known to cause cancer, birth defects, or reproductive harm.

VOC Content

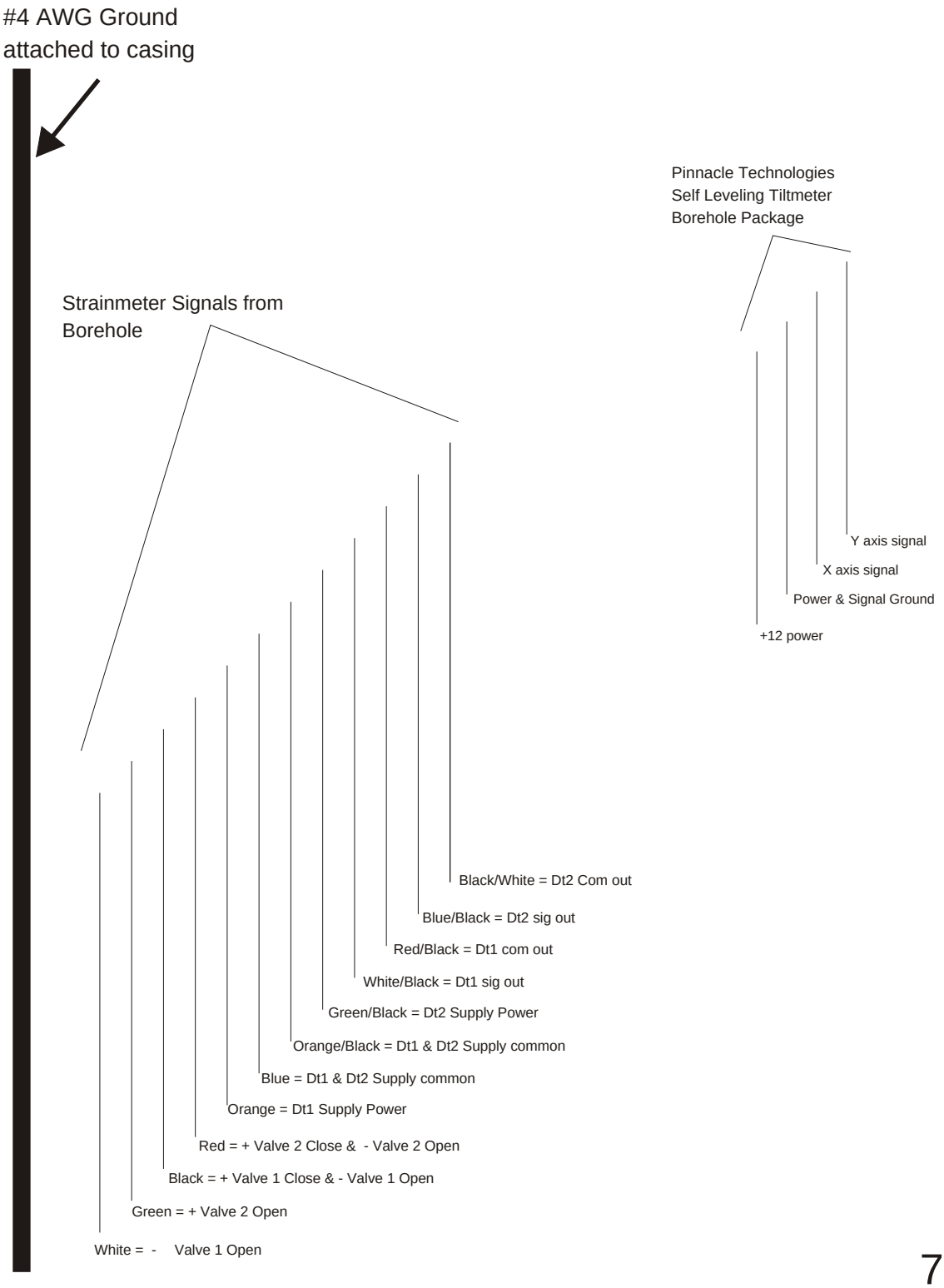
0 lbs/gal or 0 g/L.

For medical emergencies only, call ChemTrec (1-800-424-9300).

Degussa Building Systems
889 Valley Park Drive
Shakopee, MN, 55379
www.degussabuildingsystems.com
Customer Service 800-433-9517
Technical Service 800-243-6739

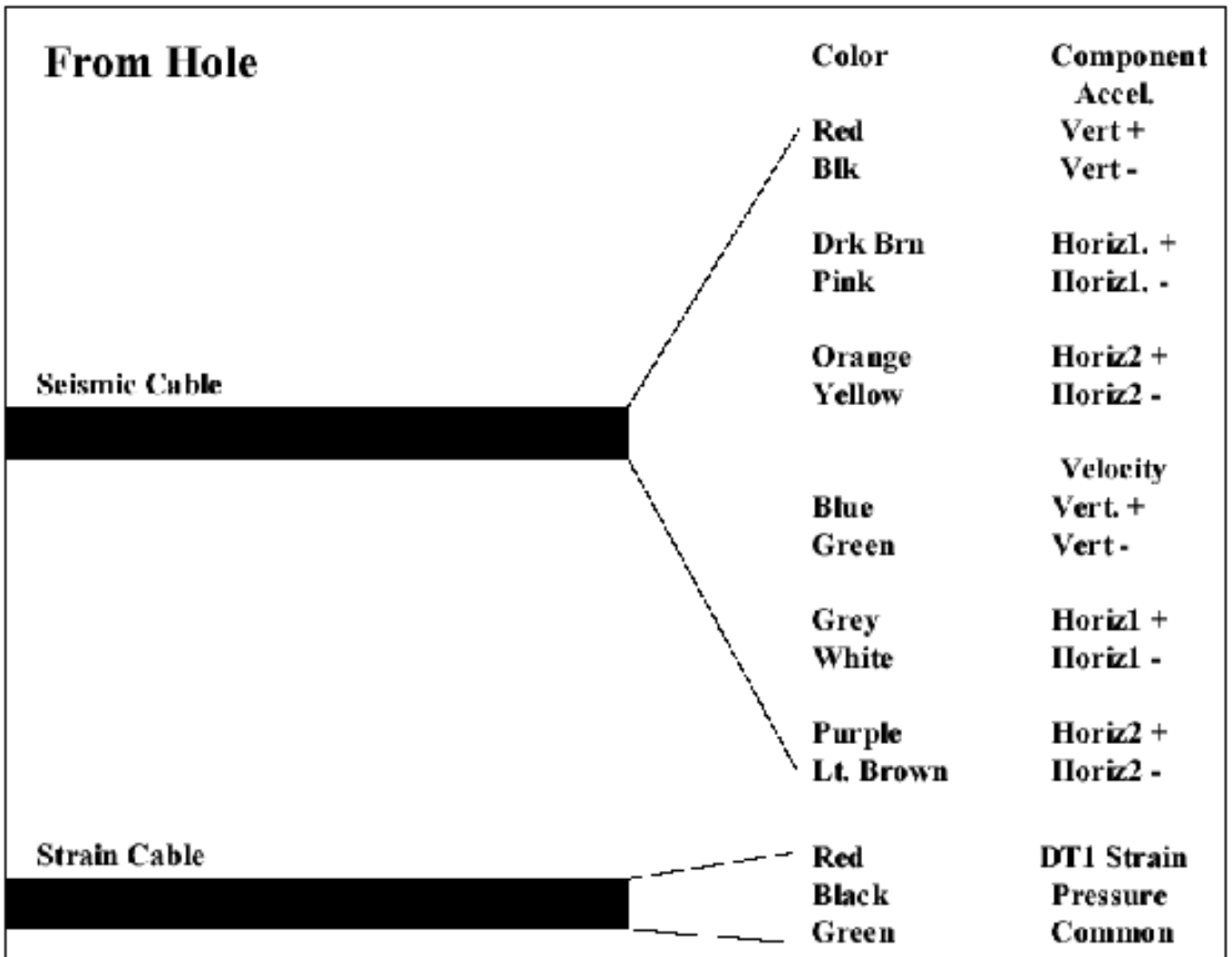
[illegible]

Borehole Signals Wires



Strip Road

Telemetry Wiring

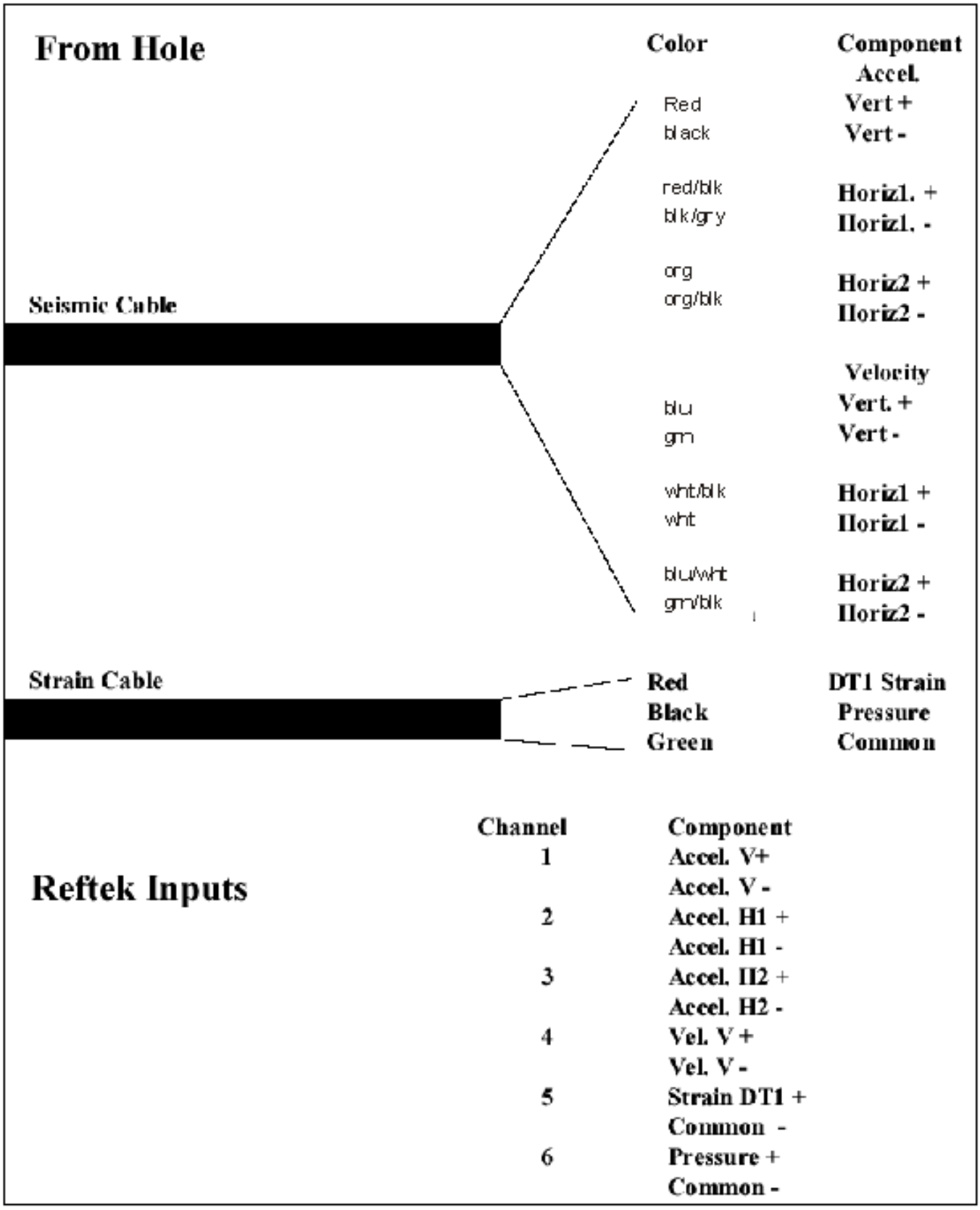


Reftek Inputs

Channel	Component
1	Accel. V+
	Accel. V -
2	Accel. H1 +
	Accel. H1 -
3	Accel. H2 +
	Accel. H2 -
4	Vel. V +
	Vel. V -
5	Strain DT1 +
	Common -
6	Pressure +
	Common -

Hokukano

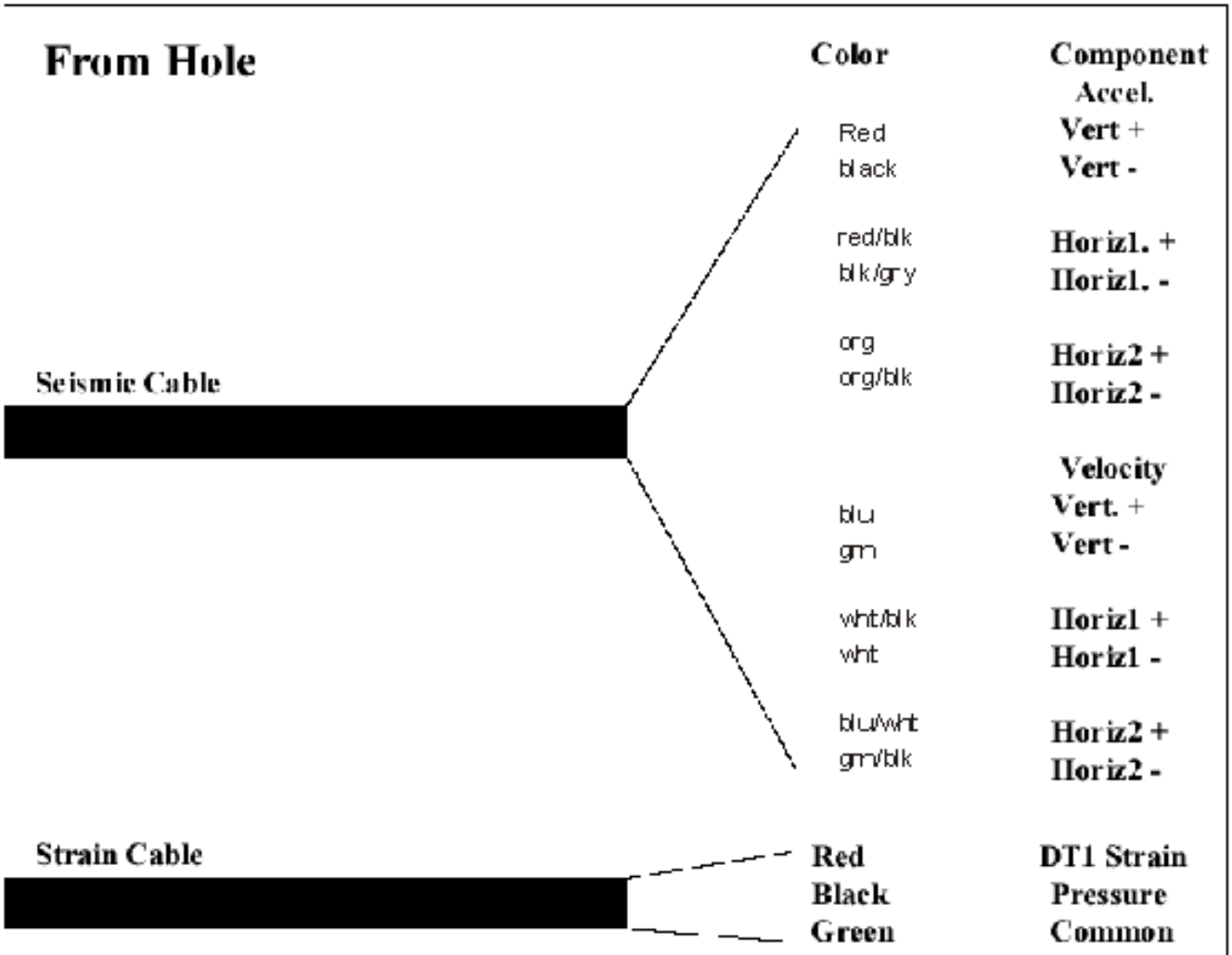
Seismic Telemetry Wiring



Reftek Inputs

Channel	Component
1	Accel. V+
	Accel. V -
2	Accel. H1 +
	Accel. H1 -
3	Accel. H2 +
	Accel. H2 -
4	Vel. V +
	Vel. V -
5	Strain DT1 +
	Common -
6	Pressure +
	Common -

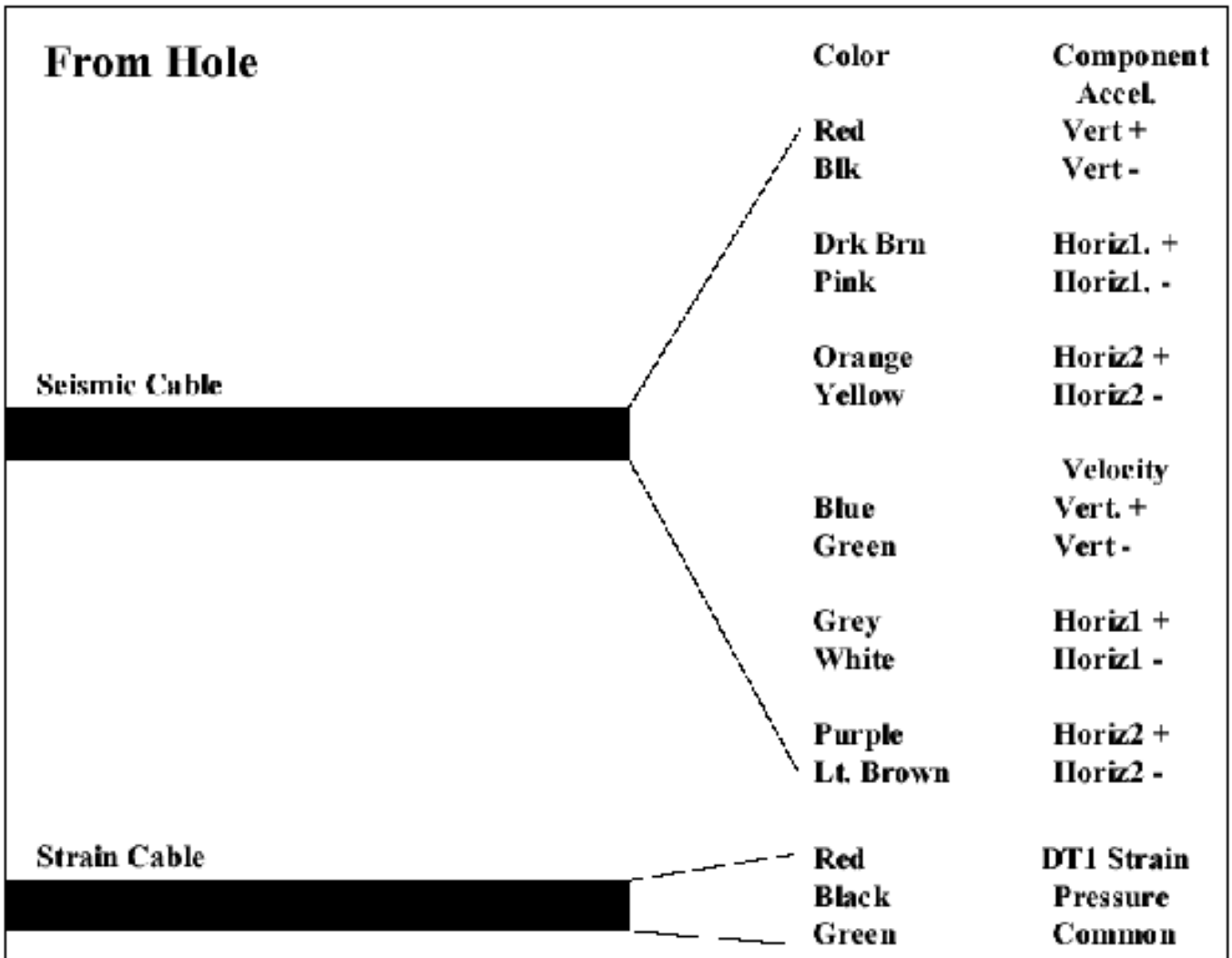
Mauna Loa Telemetry Wiring



Reftek Inputs

Channel	Component
1	Accel. V+
	Accel. V -
2	Accel. H1 +
	Accel. H1 -
3	Accel. H2 +
	Accel. H2 -
4	Vel. V +
	Vel. V -
5	Strain DT1 +
	Common -
6	Pressure +
	Common -

Keller Seismic Telemetry Wiring



Reftek Inputs

Channel	Component
1	Accel. V+
	Accel. V -
2	Accel. H1 +
	Accel. H1 -
3	Accel. H2 +
	Accel. H2 -
4	Vel. V +
	Vel. V -
5	Strain DT1 +
	Common -
6	Pressure +
	Common -

Wilcoxon Box Inputs

	Wilcoxon Box Inputs	Hokukano & Mauna Loa	Keller & Strip
V1	wht blk	red black	red blk
H1	red blk	red/blk blk/gry	dk brn pink
H2	grn blk	org org/blk	org ylw

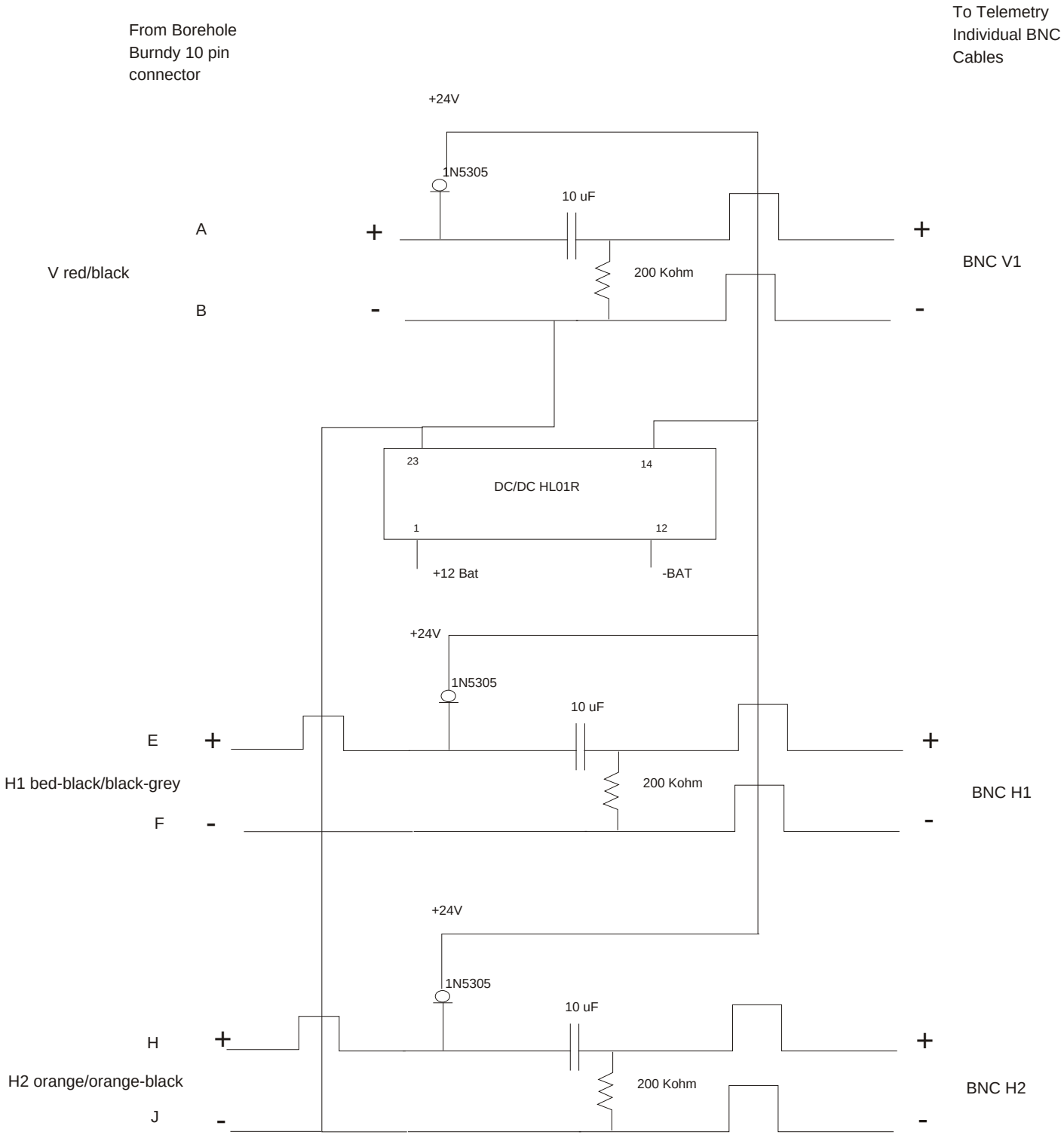
Wilcoxon Outputs

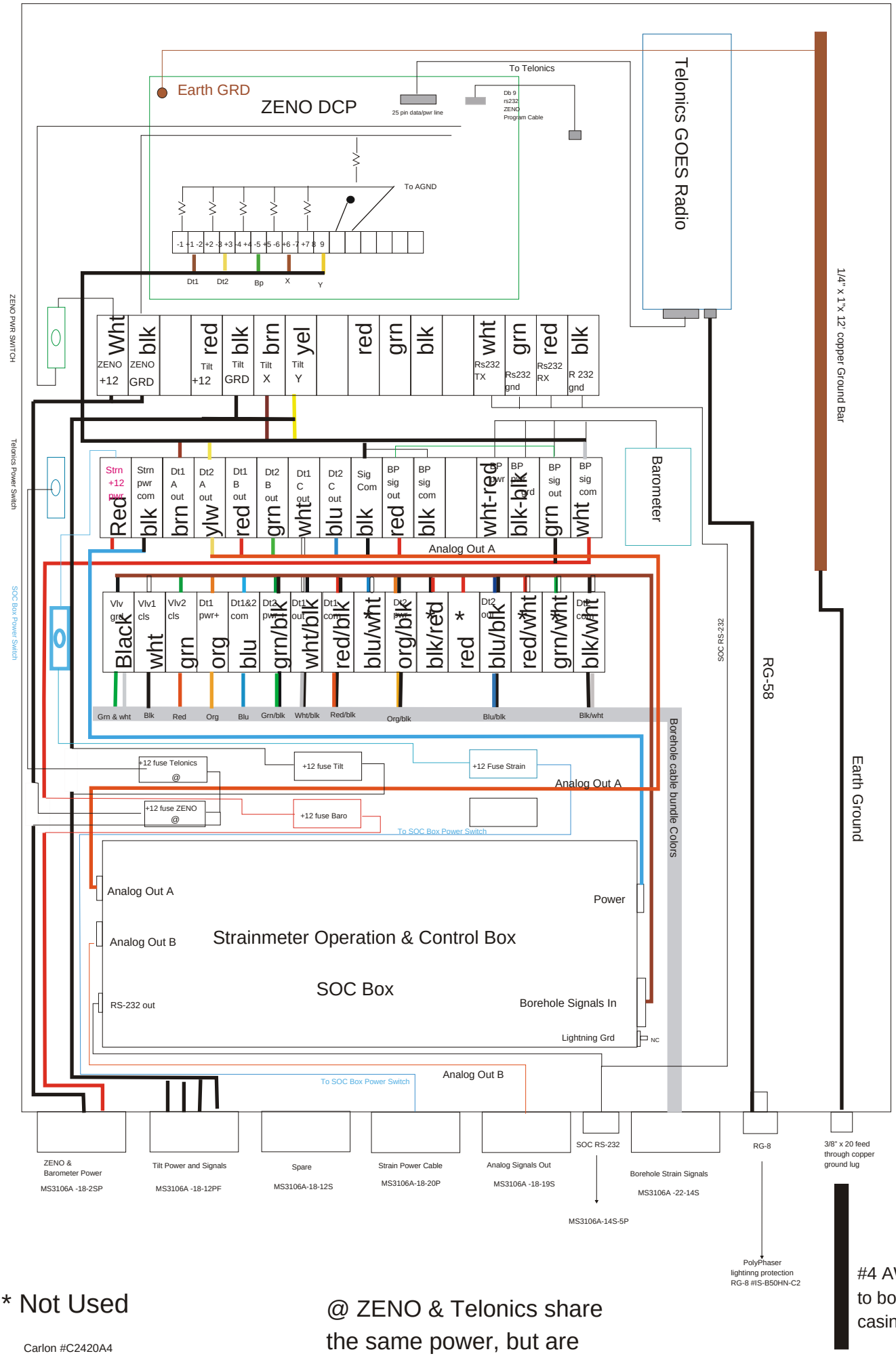
V1 BNC Cable

H1 BNC Cable

H2 BNC Cable

Wilcoxon Wireing





* Not Used

Carlon #C2420A4
24"x20"x7.5"
Hinged cover NEMA Circuit Safe
Cabinet Enclosure

@ ZENO & Telonics share the same power, but are switched sepately.

ZENO®-3200 Specifications

I. INPUTS AND OUTPUTS

A. Sixteen Analog Inputs. Seven channels of differential or fourteen channels of single-ended inputs.
- **Ultra-High Resolution:** ±18-bit with 50/60 Hz noise rejection (Sample rate up to 2 channels per second).
- **High Resolution:** ±15-bit with 50/60 Hz noise rejection (Sample rate up to 15 channels per second).
- **Medium Resolution:** ±13-bit (Sample rate up to 50 channels per second).
- **Low Resolution:** Two unipolar channels available at ±12-bit A/D. (On a separate fast A/D converter).

Accuracy and linearity are provided over a wide temperature range as follows:
- **Linearity:** ± 0.001% [-40° to +60°C].
- **Basic Absolute Accuracy:** ±0.05% [-40° to +6C°C].
- **Basic Ratiometric Accuracy:** ± 0.01% [+10° to +30°C] - Input range of each channel is software selectable.
- **Wide Dynamic Input Range:** ± 5mV to ± 5V in 10 ranges, with > 1G ohms input resistance.

All analog inputs are fault-protected against shorts, overvoltages, transients and ESD.

B. Analog Expansion
- **Up to four multiplexer boards** can be added, each allowing 32 additional single-ended or 16 differential inputs.

C. Analog Outputs
- **Optional Digital to Analog expansion board** gives 4 or 8 channels of individually programmable 12-bit analog output at 0 to 5 V (other voltage ranges optional).

D. 15 Digital I/O Channels
- **Six** Schmitt trigger conditioned inputs.
- **Two** comparator inputs.
- **Six** general purpose input or output channels (inputs TTL level with pull up resistor, outputs 0 - 5 VDC high impedance).
- **One** switch closure (event counter).

Digital inputs can be configured for frequency, period, count, or event counting. Digital outputs can provide control or alarm signals.
- **Count Inputs:** Up to 65536 counts.
- **Frequency Period Inputs:** Up to 100 KHz, 0.003% accuracy.

E. Sensor and Auxiliary Power Outputs
- **Sensor Excitation: Five switched** excitation outputs for software selectable voltages of 1.25, 2.50, 5.00 VDC, with accuracy of 0.01% at up to 100 mA.
- **Reference Outputs: One, fixed** for sensor signal offsets.
- **Power Outputs (Switched): (3 at 12 volt, 2 at 5 volt)**
  - +12 VDC
    - One 12 VDC at 700 mA.
    - Two 12 VDC at 150 mA.
  - +5 VDC
    - Two maximum of 600 mA total for both outputs.
  - Other Power Outputs: optional.

F. Three Serial Communication Channels
- **Dedicated RS232 / RS485 / TTL level** with modem control and terminal access.
- **Dedicated RS232** with optional RF modem.
- **RS232 / RS485; SDI-12 optional;** two additional multiplexed TTL optional.
- **RS422 available as option.**
- **Up to two additional** multiplexed channels.

II. CPU AND MEMORY

A. CPU: Motorola 68332 32-bit microcontroller. Clock speed 16 MHz.

B. Program Space: 256 kBytes of EPROM (512 kBytes optional); 2 kBytes EEPROM.

C. Data Storage Space: 64 kBytes standard, 256 kBytes and 1 MB optional (PCMCIA to 20 MB optional).

III. SYSTEM POWER REQUIREMENTS

A. Power Management: Advanced power management for very low power consumption includes sensor power switches and dynamic clock. DC-powered system operates from 10.7 to 16 VDC at 10 to 100 mA, depending on application.

B. Standby Current: System uses three (3) mA standby current to maximize battery life in low duty cycle applications.

C. AC Power Option: 120/240 Volts AC, 50/60Hz power supply/battery charger is optional.

IV. SPECIAL FEATURES

A. Hardware Watchdog and Power Monitor.
B. Software Watchdog Timer.
C. Real Time Clock, Battery Backed: Accurate to 30 seconds per month (5 seconds per month optional).
D. BIT - Self Test Diagnostics.
E. Battery-Backed Logging Memory.
F. Non-Volatile System Configuration Settings.
G. Individual Channel Programming of sensor type and sample rate.

V. OPTIONAL FEATURES

A. Extra Transient Protection.
B. PCMCIA slot.
C. Up to three Expansion boards.

VI. PHYSICAL/ENVIRONMENTAL

A. Dimensions: 10.25" X 6" X 3.75"
B. Weight: 2 lbs / 4 ozs
C. Wide Temperature Range: -40°C to +60°C with optional -55°C to +70°C.

COASTAL ENVIRONMENTAL SYSTEMS

820 First Avenue South, Seattle, Washington 98134-1202
Telephone: **206-682-6048 1-800-488-6291** Fax: **206-682-5658**
www.coastalenvironmental.com

ZENO-3200 INTERNAL SOFTWARE (FIRMWARE)
Built-in help-assisted menus in easy-to-read text, accessed by any computer, can be internally programmed:
- Type of sensor and specifications
- Data processing that will occur, requiring single or multiple sensor inputs for calculation
- Data outputs custom configured in real-time or for storage

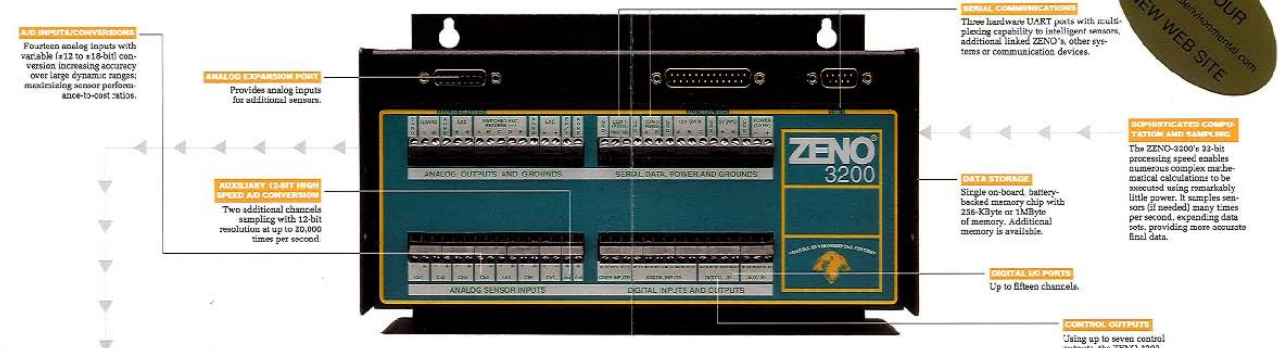
EEPROM STORAGE
An EEPROM chip remembers all sensor and program settings changeable only by using ZENO-3200 menus. If disrupted, ZENO-3200 will automatically reboot using the settings that were entered, allowing it to be set up in the office and shipped without programming the unit in the field.

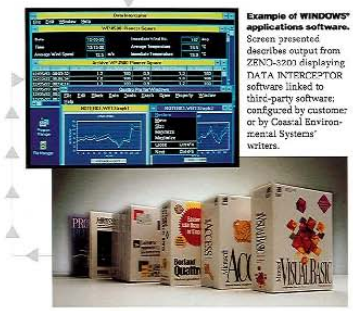
APPLICATION SOFTWARE
A WINDOWS program called DATA INTERCEPTOR is provided by Coastal Environmental Systems which collects, displays and forwards all data from the ZENO-3200. It sends data directly to WINDOWS application programs eliminating the need to decipher custom, proprietary software.

STAND-ALONE PRODUCT OR TURN KEY SYSTEMS
The ZENO-3200 is a stand-alone product or a turn key solution with housings, sensors, towers, communication devices and software applications all supplied by Coastal Environmental Systems.

QUALITY CONTROL
Stress testing of ZENO-3200 units from –40°C to +60°C or optionally at wider ranges assures that all electronic systems are working as specified. No better way exists to cull faulty components and more importantly, confirm work accomplished by engineers and technicians.

CUSTOMER SUPPORT
Customer support has been a hallmark of Coastal Environmental Systems since 1981. The ZENO-3200 is a product of understanding customer needs—proof that we listen. A customer support program, in place for all these years, is unparalleled. Ask for details and a list of satisfied customers—in the end, their comments are the only real measure of our effectiveness.





Example of WINDOWS® applications software. Screen presented describes output from ZENO-3200 displaying DATA INTERCEPTOR software linked to third-party software; configured by customer or by Coastal Environmental Systems' writers.

ZENO®-3200—ADVANCED MEASUREMENT, CONTROL, DATA STORAGE AND TELEMETRY

The ZENO-3200 reads sensors, processes data, checks alarms and control functions and stores and/or telemeters remotely collected data. A Motorola 68332, 32-bit microcontroller allows extremely fast and powerful computing of multiple routines and uses advanced power management for very low power consumption. A *true* real-time executive is used to achieve multi-tasking which samples and communicates simultaneously. Unmatched analog signal conversion, digital I/O, serial communication, programming and data memory *are all located in a single housing.*

Easy to follow, help-assisted menus guide you through minor changes or major projects involving sensors, processing and telemetry.

The primary component of ZENO-3200 is a four-layer, printed circuit board, including transient and RFI protection, in a housing designed to make the ZENO-3200 nearly impervious to noise or radio interference. Every operation is confirmed using both a hardware and software "watchdog."

www.coastal.org

Examine the detailed specifications and call (800) 488-8291 for more information about how the highly sophisticated and versatile ZENO-3200 elevates data gathering capabilities to a new level.

Model 270

SETRACERAM™ for Barometric, Gauge or Absolute Pressure

Barometric Pressure: 600-1100 hPa/mb, 800-1100 hPa/mb
Absolute: 0 to 10, 20, 50, 100 psia / Gauge Pressure: 0 to 5, 10, 20, 50, 100 psig
Non-condensing Air or Gas

For many years, high accuracy environmental and test & measurement applications around the world have relied on the consistent performance of the Setra Model 270 pressure transducer. Applications range from remote weather monitoring and avionics systems, endorsed by government agencies, to crucial compensation for barometric pressure variations in laser interferometers.

Long-term reliability and stability in such demanding application environments are achieved in the 270 with the combination of the SETRACERAM™ capacitive sensor and Setra's proprietary custom IC analog circuit.

The fundamentally simple design and thermally stable glass fused ceramic sensing capsule is coupled with the sophisticated capacitance charge-balance IC circuit where accurate signal conditioning and environmental compensation is performed. Standard accuracy is 0.05% Full Scale end point method. Higher accuracy and thermal specifications are also available.

Type of Pressure	Pressure Range	Maximum Pressure
Barometric	800 to 1100 hPa/mb 600 to 1100 hPa/mb	20 psia
Absolute	0 to 10, 20, 50, 100 psia	1.5 x rated
Gauge	0 to 5, 10, 20, 50, 100 psig	1.5 x rated

NOTE: Setra adheres to strict quality standards including ISO 9001 and ANSI Z540-1. The calibration of this product is NIST traceable.

U.S. Patent nos. 4469013, 4168518

159 Swanson Rd., Boxborough, MA / Telephone: 978-263-1400 / Fax: 978-264-0292

Applications

- High Accuracy Barometric Pressure Measurement
- Weather and Environmental Data
- Data Buoys and Remote Weather Stations
- Engine Test Cells
- High Accuracy Transfer Standard for Calibration
- CE Mark Compliance

Features

- SETRACERAM™ Sensor
- High Accuracy, ±0.05% FS
- ±0.03% FS Optional Accuracy
- Repeatability Within 0.01% FS
- Excellent Long-Term Stability
- Low Power Consumption
- Instant Warm-Up
- Fast Response

When it comes to a product to rely on - choose the Model 270. When it comes to a company to trust - choose Setra.

ISO 9001 Certified

Visit Setra Online:
http://www.setra.com

setra
800-257-3872

Model 270 Specifications

Performance Data

Accuracy*	<±0.05% FS
Non-Linearity	
End Point	±0.05% FS
Best Fit Straight Line	±0.05% FS
Hysteresis	0.01% FS
Non-Repeatability	0.01% FS
Resolution	Infinite, limited only by output noise level (0.005% FS)
Thermal Effects**	
Compensated Range °F(°C)	+30 to +120 (-1 to +49)
Thermal Zero Shift	
Barometric	<±0.2% FS/100°F (±0.18% FS/50°C)
Other Ranges	<±0.1% FS/100°F (±0.09% FS/50°C)
Thermal Coefficient Sensitivity	<±0.1% FS/100°F (±0.09% FS/50°C)
Long Term Stability	<± 0.1% FS over 6 months at 70°F
Static Acceleration Effect	<±0.01% FS/G
Warm-up	<±0.04% FS shift after 20 minutes at constant temperature and pressure
Time Constant	< 10 milliseconds to reach 90% final output with step function pressure input

*RSS of Non-Linearity, Hysteresis, and Non-Repeatability. Higher accuracy units available on special order.
**Units calibrated at nominal 70°F. Maximum thermal error computed from this datum.

Environmental Data

Temperature	
Operating °F (°C)	0 to +175 (-18 to +80)
Storage °F (°C)	-65 to +250 (-54 to +120)
Vibration	2g from 5Hz to 500Hz
Acceleration	10g
Shock	50g Operating 1/2 sine 10ms
Pressure fitting	1/8"-27 NPT Internal
Electrical connection	2-foot Multi-conductor Cable
Weight (approx.)	9 ounces (0.25 Kgm)

Electrical Data

Electrical Circuit*	4-Wire (+Exc, -Exc, +Out, -Out)
Excitation**	22 to 32 VDC Fully protected against miswiring
Output***	0 to 5 VDC****
Isolation	The insulation resistance between all signal leads tied together and case ground is 100 megohms minimum at 25 VDC.
Output Impedance	<5 ohms
Output Noise	<200 microvolts RMS (0 Hz to 100 Hz).
Current Consumption	8 mA (0.2 Watts)

*For best performance, either negative excitation or negative output should be connected to case (ground). Both leads cannot be connected to case (ground). Units calibrated at the factory with negative excitation connected to case.
**Internal regulation minimizes effect of excitation variation, with < ±0.005% FS output change. Will operate on 28 VDC aircraft power per MIL-STD-704A and not be damaged by emergency power conditions.
***Calibrated into a 20K ohm load, operable into a 5000 ohm load or greater.
****Zero output factory set to within ±5 mV.
Span (Full Scale) output factory set to within ±5 mV.

Options

Electrical Options

623	12 VDC excitation (11 to 16 VDC)

Performance Options

708	Compensated temperature, -13°F to +160°F (±0.13% FS/100°F zero and span effect). Cannot be ordered with option 707.
707	±0.08% FS (RSS) Accuracy with ±0.027% FS Linearity (End Point Method). Cannot be ordered with option 708.

Mechanical Options

803-825	Up to 25 ft. of cable can be supplied. Please specify cable length when ordering (i.e. 803 for 3 ft. cable).
865	NEMA 4 Weather Proof Enclosure
911	Etched Metal Stainless Steel Tag

Special Range

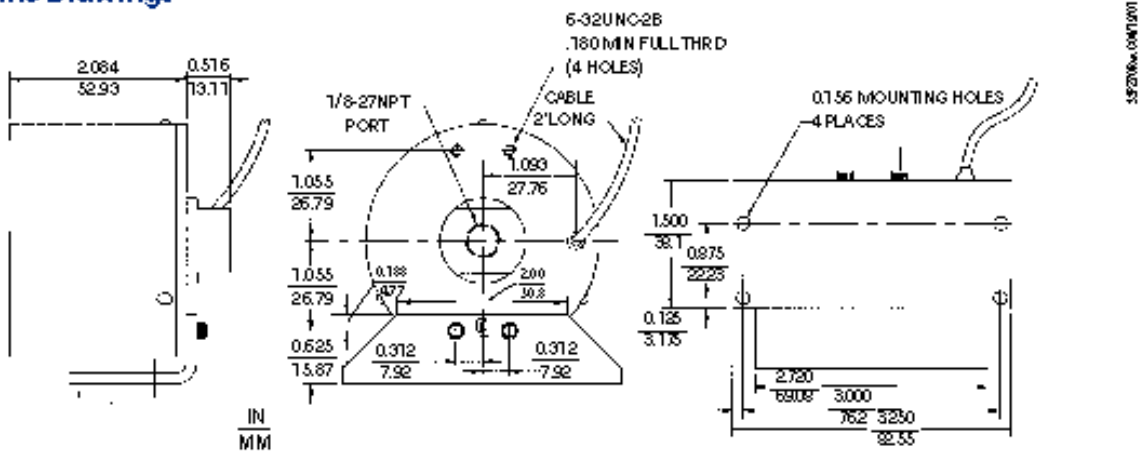
SR	Special Range (Specify Range Required).

Pressure Media

Non-condensing air or gas compatible with hard anodized aluminum, alumina ceramics, gold, fluorocarbon elastomer sealant & Buna-N O-Ring.

Specifications subject to change without notice.

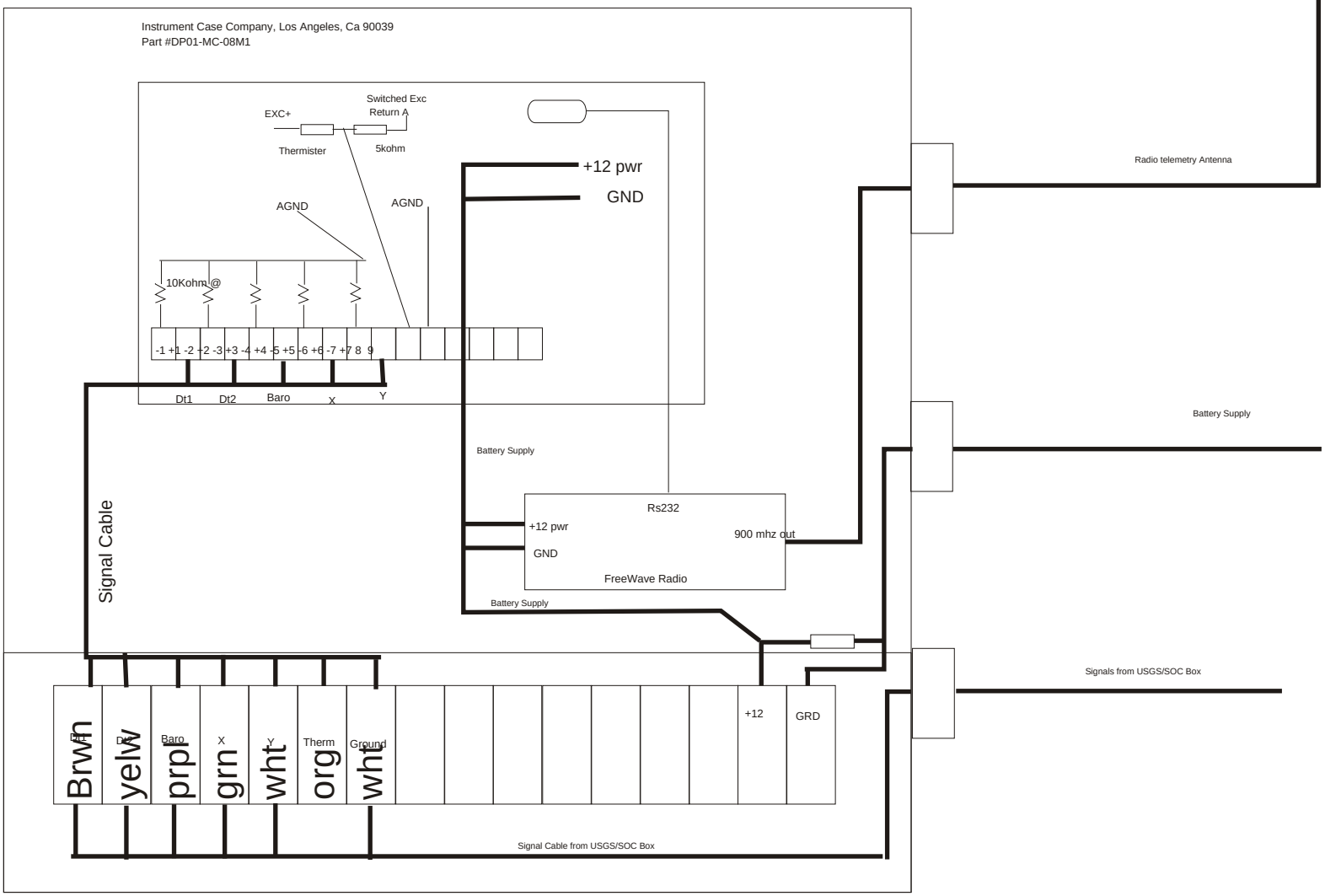
Outline Drawings



With no particular application awareness on all Setra products, both personally and through our literature, it is the customer's responsibility to determine the suitability of this product in the application.

159 Swanson Road, Boxborough, MA 01719/Tel 978-263-1400;
Toll Free 800-257-3872; Fax 978-264-0292; email sales@setra.com

Free Wave Box

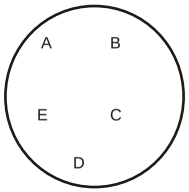


Inputs2001dcpbox.cdr

Rev 09/29/01

Solder side

Receptacles

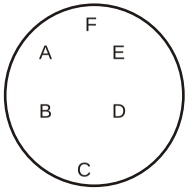


5 pin female

ZENO/BARO

power

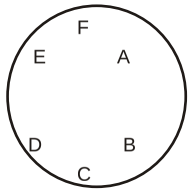
A - Bat DCP blk
B + Bat DCP wht
C + Bat Baro Setra wht
D NC
E - Bat Baro Setra blk



6 pin male

Tlitmeter

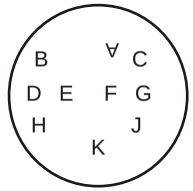
A -Bat tilt blk
B X out brn
C NC
D Y out ylw
E + Bat red
F NC



6 pin female

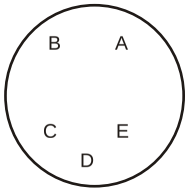
Pore Pressure

A NC
B Pore Pres sig out BLK
C Pore Press Com GRN
D Pore Press BAT RED
E NC
F NC



Spare

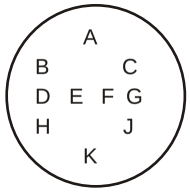
female



5 pin male

Strainmeter Power

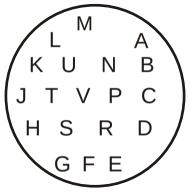
A + Bat Red
B - Bat Blk
C - Bat Blk
D NC
E + Bat Red



10 pin female

Signal to A/D

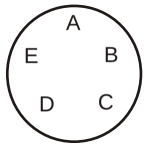
A dt1A out +	brn
B dt1B out +	red
C NC	
D Baro out +	red
E Baro out com	blk
F dt2C out +	blu
G dt2A out +	ylw
H dt1&2,A,B,C com	blk
J dt2B out +	grn
K dt1C out +	wht



Strainmeter cable

19 pin female

A Valve #1,2 open +	Blk
B Valve #1 close +	wht
C dt1 C out - sig	red
D Valve #2 close +	grn
E dt1 A,B,C IN + pwr	org
F dt1&2 A,B,C IN - pwr	blu
G dt1 A out + sig	wht/blk
H dt 1 A out - sig	red/blk
J dt2 A,B,C IN pwr +	grn/blk
K dt1 B out - sig	org/blk
L dt2 A out + sig	blu/blk
M dt2 A,B,C out - sig	blk/wht
N dt2 B out + sig	red/wht
P dt2 C out + sig	grn/wht
R dt1 B out + sig	blu/wht
S dt1 C out + sig	blk/red



Female

RS-232

Strainmeter

A tx wht
B iso-GND grn
C RX red
D iso - gnd blk
E NC

2001MAMbox

Strainmeter Inputs

Carol Cable#C0787 multi-conductor
foil shield

REV 9/29/01

BoreholeDCPBox.cdr

STRAINMETER ELECTRONICS BOX CONNECTOR		Borehole cable	strainmeter to	19 pin DCP BOX connector
12 & 17	- valve 1&2 close	black	1	A
1	+valve 1 close	white	2	B
9	DT1 C sig out -	red	3	C
11	valve #2 close	green	4	D
2	DT 1 A,B,C IN +	orange	5	E
13	DT 1&2 A,B,C IN -	blue	6	F
4	DT 1 A sig out +	wht/blk trace	7	G
5	DT 1 A sig out -	red/blk trace	8	H
3	DT 2 A,B,C IN +	grn/blk trace	9	J
7	DT 1 B out -	org/blk trace	10	K
10	DT 2 A out +	blu/blk trace	11	L
14	DT 2 A,B,C out -	blk/wht trace	12	M
16	DT 2 B out +	red/wht trace	13	N
15	DT 2 C out +	grn/wht trace	14	P
6	DT 1 B out +	blu/wht trace	15	R
8	DT 1 C out +	blk/red trace	16	S

Strainmeter Electronics Box connector
solder side

Solder side

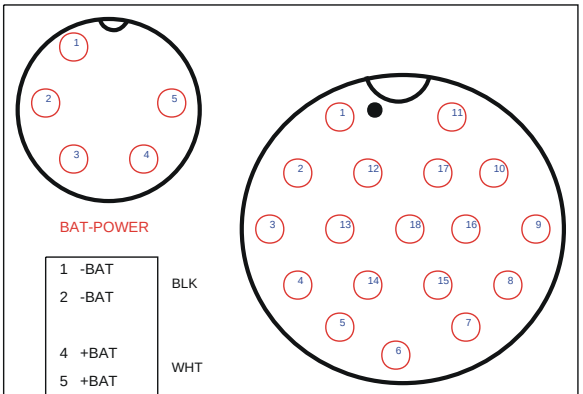
Strainmeter Cable to
Strainmeter/DCP BOX
plug connector, solder side

2001MAMbox

2001electConnctr.cdr

2001 DTM-CIW Strainmeter Electronics Connectors

SOLDER SIDE
PIN MARKING

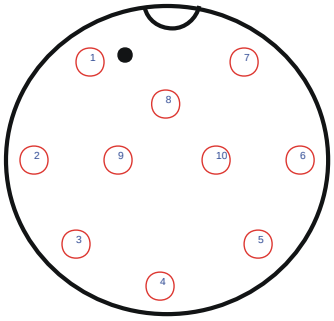


BAT-POWER

1	-BAT	BLK
2	-BAT	
4	+BAT	WHT
5	+BAT	

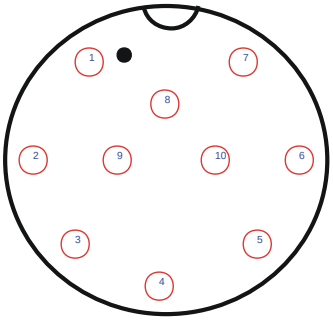
STRAINMETER

Black white green	12+17	- VALVE 1&2 CL
	1	+ VALVE 1 CL
	11	+ VALVE 2 CL
orange blue grn/blk trce	2	A - DT1 SUPP
	13	A - DT SUPP COMM
	3	A - DT2 SUPP
orange blue grn/blk trce	2	B - DT1 SUPP
	13	B - DT SUPP COMM
	3	B - DT2 SUPP
orange blue grn/blk trce	2	C - DT1 SUPP
	13	C - DT SUPP COMM
	3	C - DT2 SUPP
wht/blk trce red/blk trce	4	A - DT1 OUT
	5	A - DT1-COM-OUT
blu/blk trce blk/wht trce	10	A - DT2 OUT
	14	A - DT2-COM-OUT
blu/wht trce org/blk trce	6	B - DT1 OUT
	7	B - DT1-COM-OUT
red/wht trce blk/wht trce	16	B - DT2 OUT
	14	B - DT2-COM-OUT
blk/red trce red	8	C - DT1 OUT
	9	C - DT1-COM-OUT
grn/wht trce blk/wht trce	15	C - DT-2 OUT
	14	C - DT-2-COM-OUT
	18	SHIELD



OUTSIDE WORLD

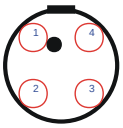
BUFFERED SIGNAL-OUT



DTM DATA LOGGER

BUFFERED SIGNAL-OUT

1	A - DT-1 OUT	BROWN	1	A - DT-1 OUT
8	A DT1-COM-OUT	BLACK	8	A DT1-COM-OUT
7	A - DT-2 OUT	YELLOW	7	A - DT-2 OUT
8	A DT2-COM-OUT	BLACK	8	A DT2-COM-OUT
2	B - DT-1 OUT	RED	2	B - DT-1 OUT
8	B DT1-COM-OUT	BLACK	8	B DT1-COM-OUT
9	B - DT-2 OUT	GREEN	9	B - DT-2 OUT
8	B DT2-COM-OUT	BLACK	8	B DT2-COM-OUT
10	C - DT-1 OUT	WHITE	10	C - DT-1 OUT
8	C DT1-COM-OUT	BLACK	8	C DT1-COM-OUT
6	C - DT-2 OUT	BLUE	6	C - DT-2 OUT
8	C DT2-COM-OUT	BLACK	8	C DT2-COM-OUT
4	BAROMETER	Red	4	BAROMETER
5	BARO-COM-OUT	black	5	BARO-COM-OUT



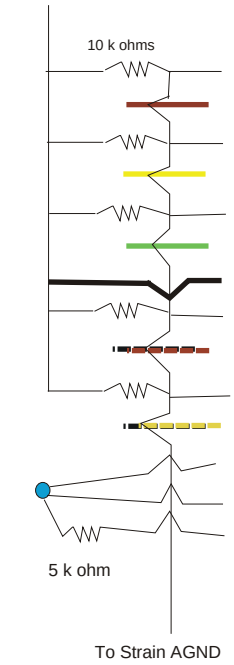
VC-RS232-OUT

1	TX	WHT
2	ISO-GND	GRN
3	RX	RED
4	ISO-GND	BLK

*Color scheme shown was used to construct cables for use with valve control boxes for use in Hawaii USGS summer 2000 installation.

ZENO INPUTS.cdr

2001 analog inputs



Input location	color	ID
Ch1 -		
Ch1+	brown	dt1
Ch2-		
Ch2+	yellow	dt2
Ch3-		
Ch3+	green	baro Setra
Ch6+	blk	short/AGND
Ch4-		
Ch4+	brn/blkstrp	x tilt
Ch5-		
Ch5+	ylw/blkstrp	y tilt
EXC +	red	therm / 5k ohm
Ch6-	black	therm
Swtch EXC RTN A	black	5 Kohm
Ch 24 +	black/wht	rain bucket

Colored lines represent input signal location

Coastal Environmental Systems
ZENO DCP #3200

Telonics TGT-1 Domestic GOES Transmitter

Setra Systems, INC. Pressure Transducers
#270 800-1100 millibar ranges
11-15VDC excitation
0-5vdc output

Carnegie Institute of Washington / Department of Terrestrial Magnetism SOC Box
(Strainmeter Operation & Control (electronics) Box
for 2 transducer strainmeter

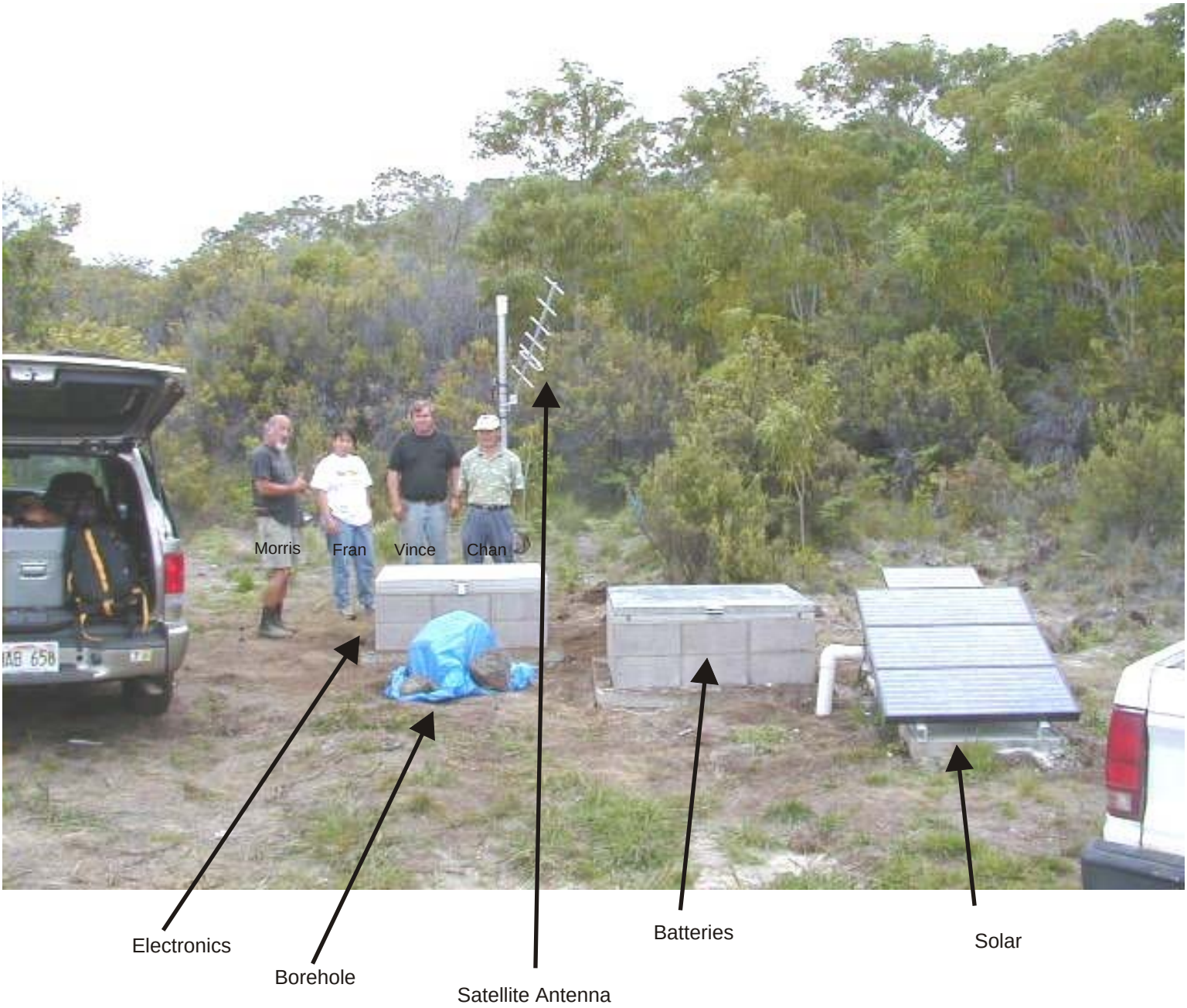


Photo taken September 2000

Strip Road Strain Site

Hokuna Strain site

Solar Panels

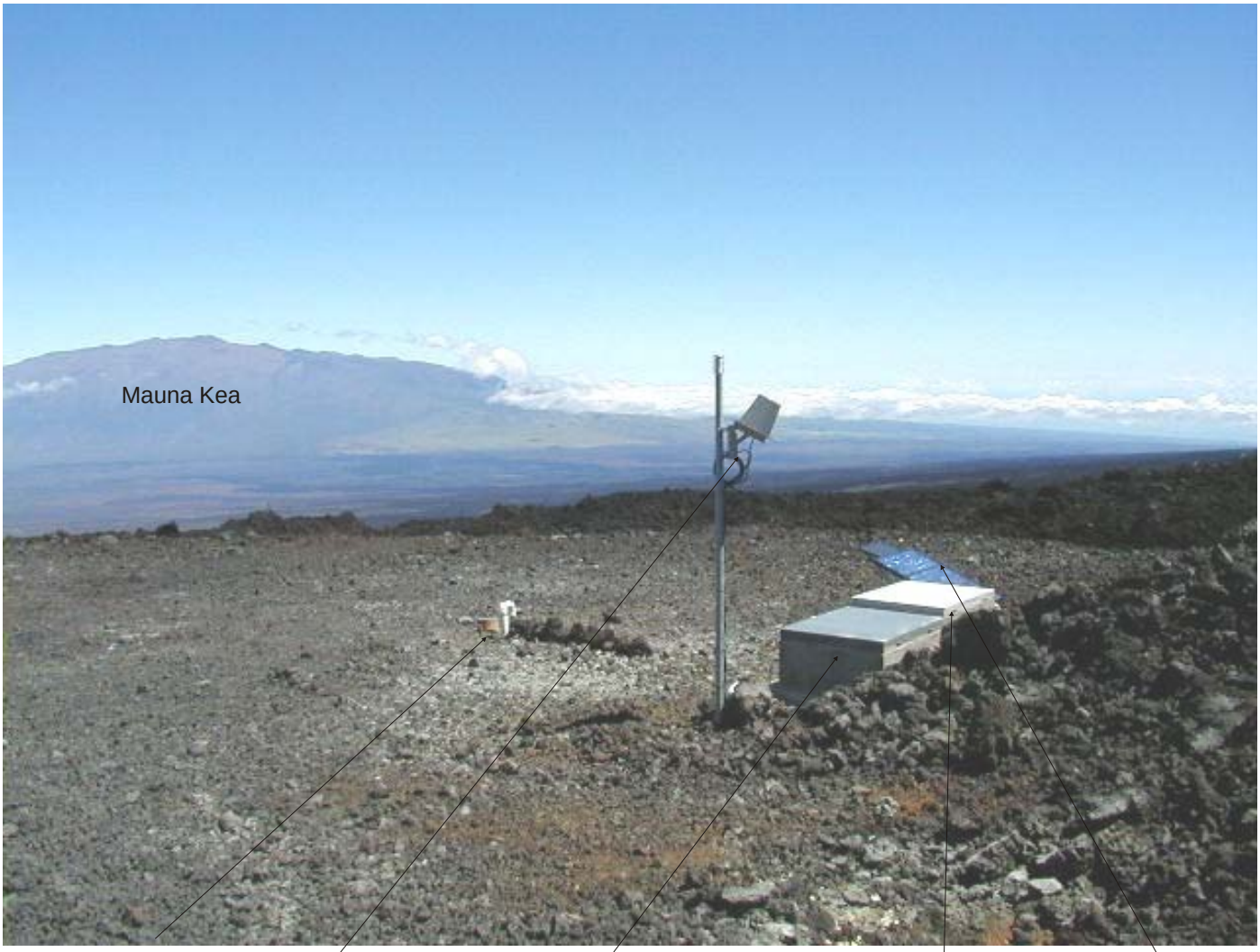
Satellite Antenna

Battery Box & FreeWave

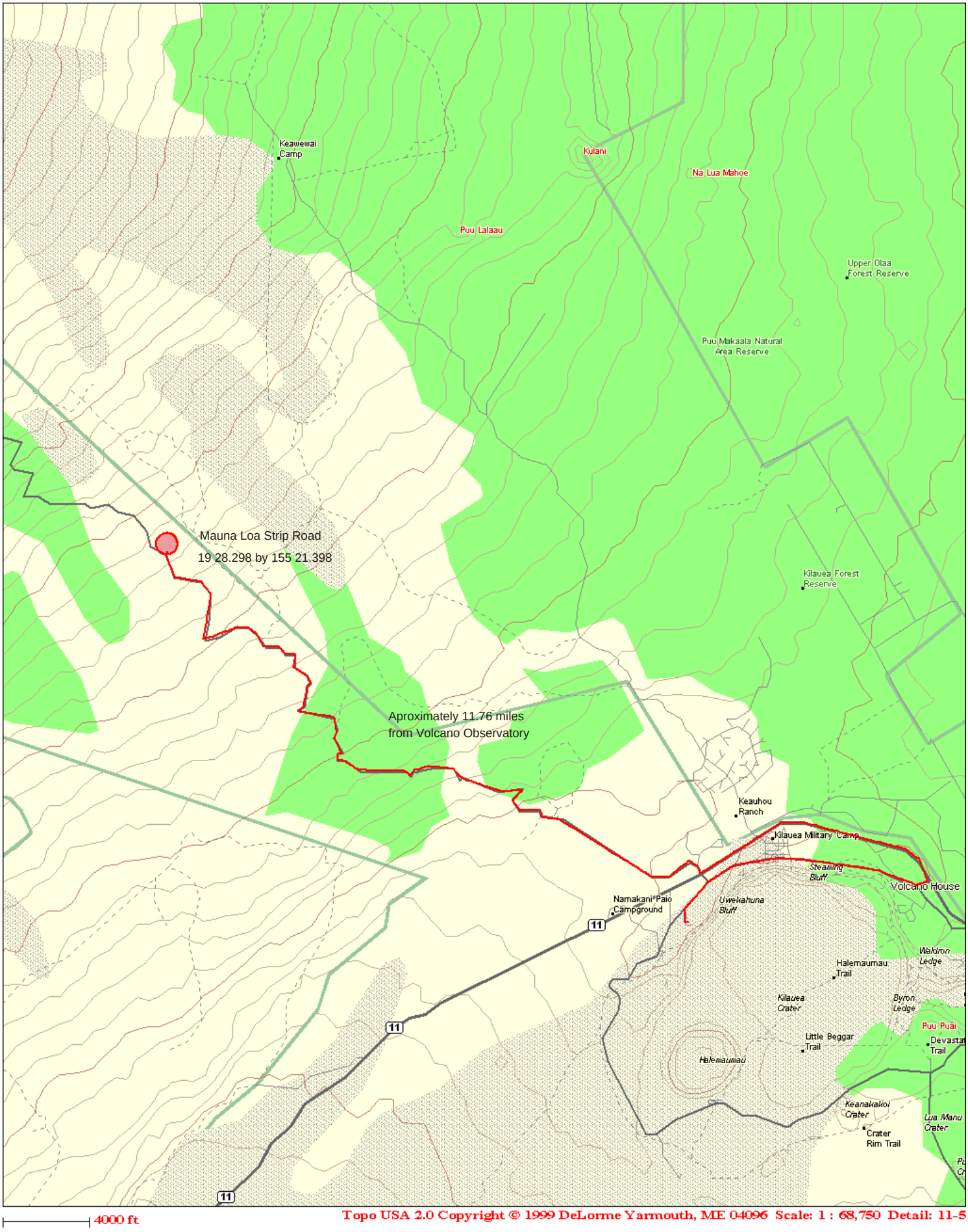
Fran Coloma

Electronics Box

Mauna Loa Strain Site

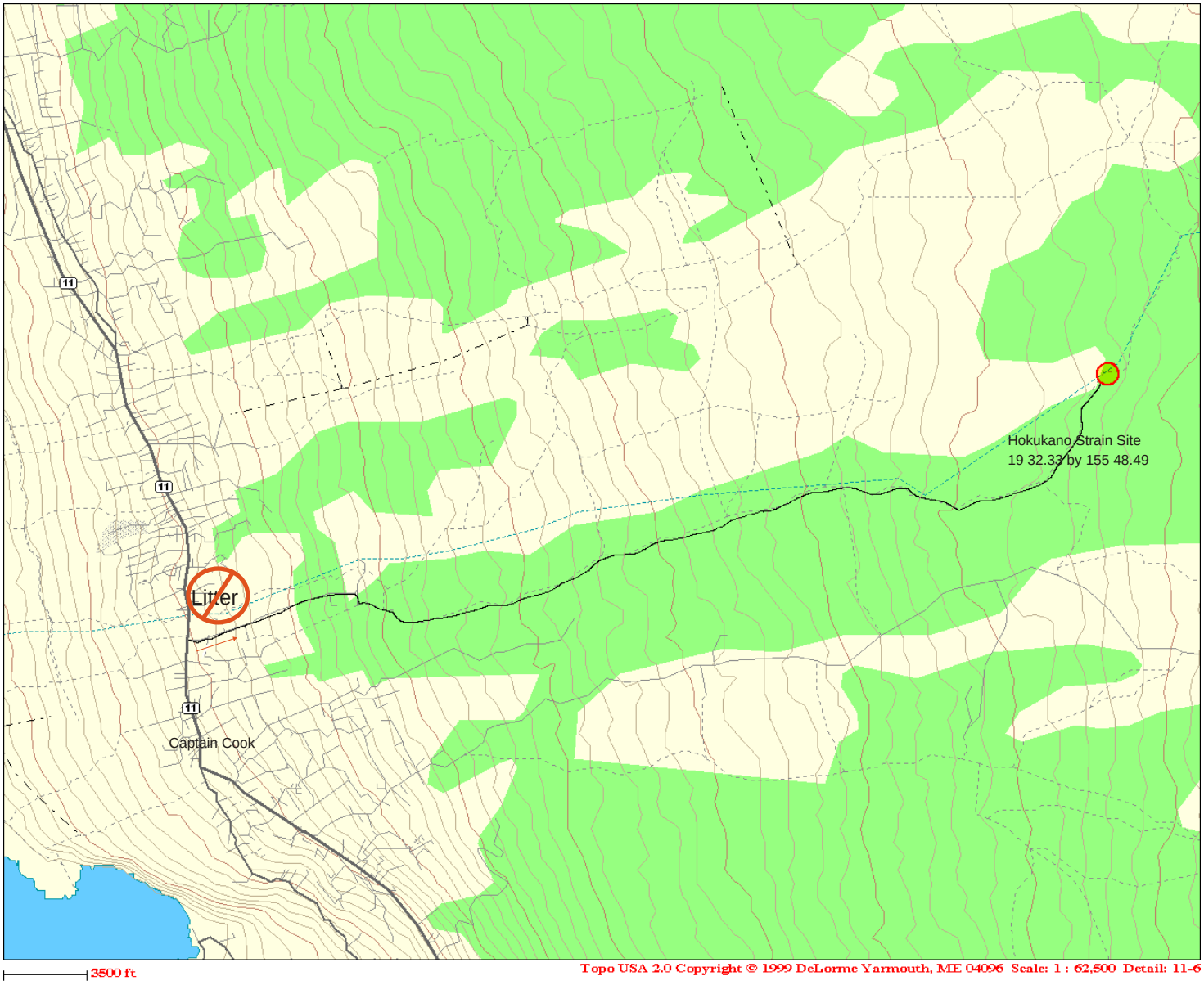


Keller Strain Site

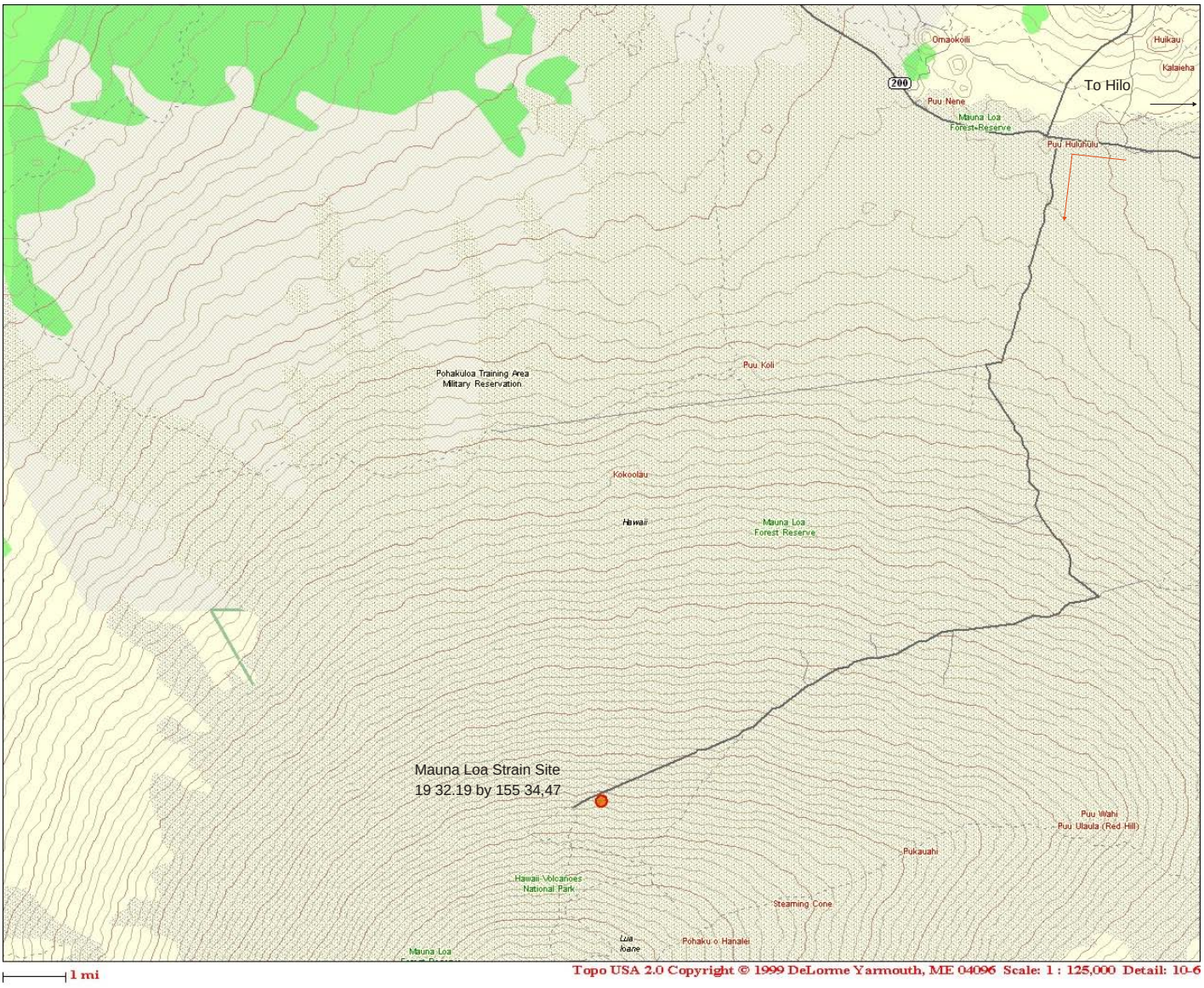


Mauna Loa Strip Rd Strain Site

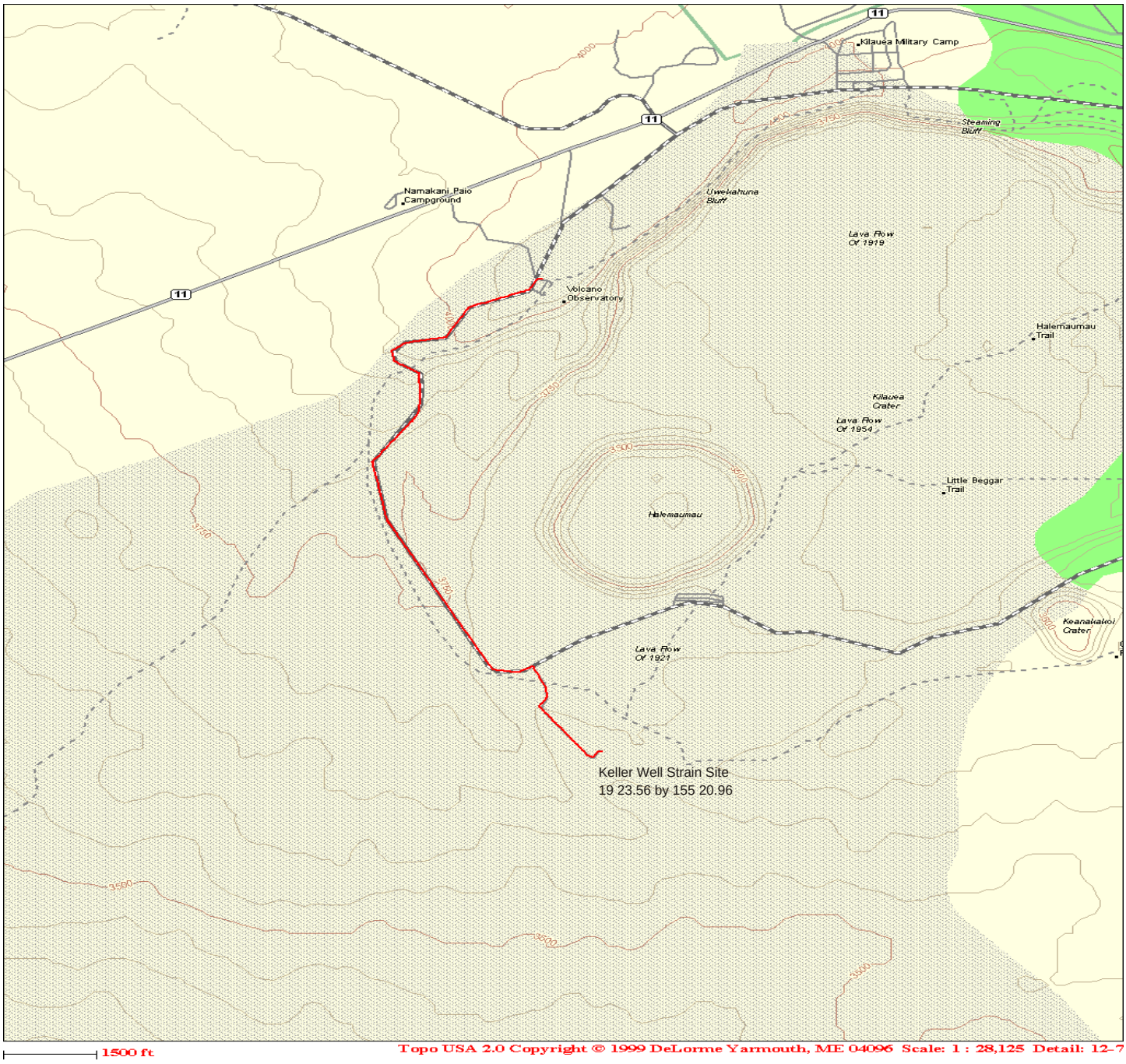
Hokukano Strain site

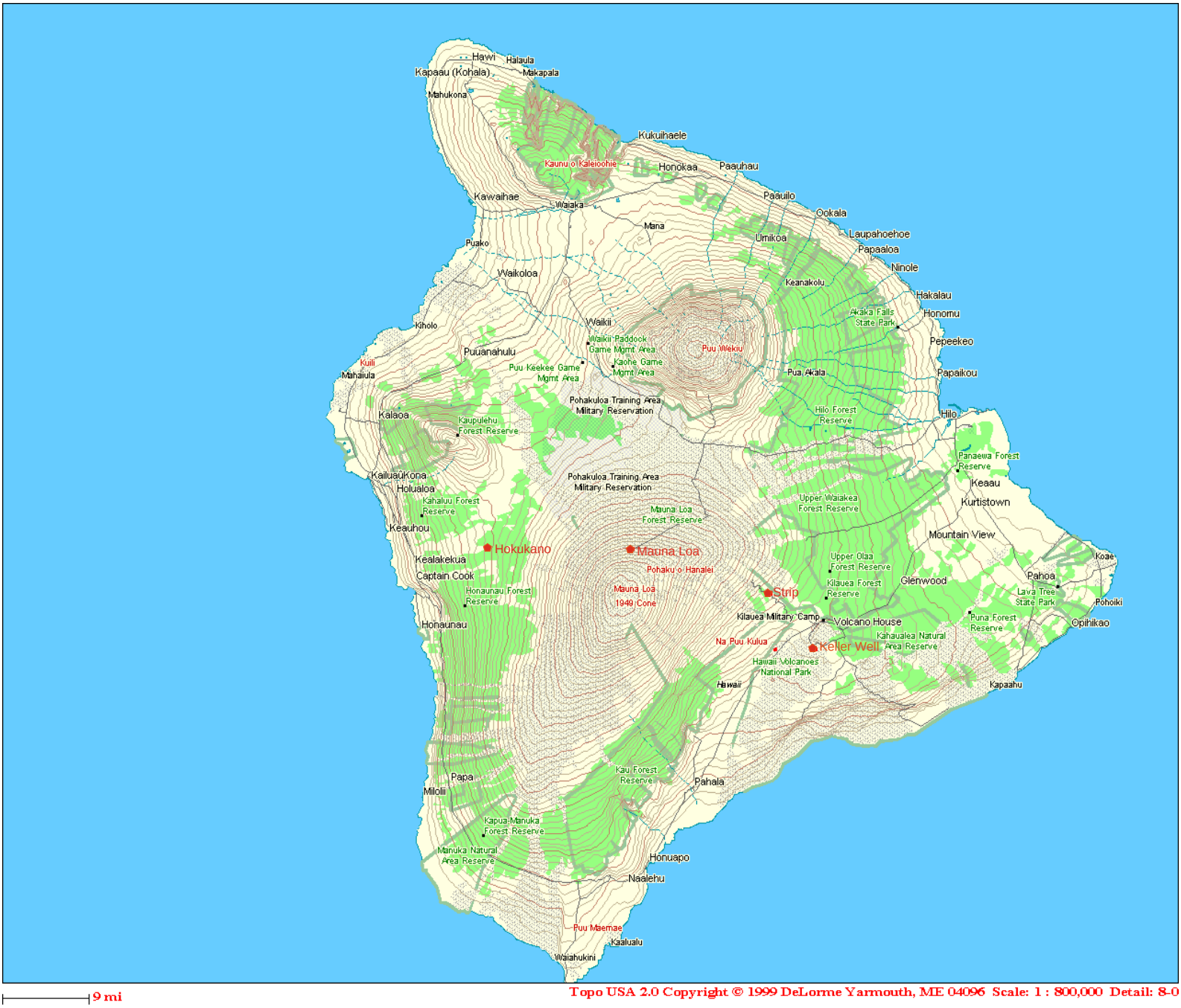


Mauna Loa Strain Site



Keller Well Strain Site





Island of Hawaii

Volumetric Strainmeter Sites