The 1996-2009 Borehole Dilatometer Installations, Operation, and Maintenance at Sites in Long Valley Caldera, California

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1. INTRODUCTION:

High seismicity levels with accelerating uplift (under the resurgent dome) in Long Valley caldera in the eastern Sierra Nevada from 1989 to 1997, triggered upgrades to dilational strainmeters and other instrumentation installed in the early 1980's following a series of magnitude 6 earthquakes. This included two additional high-resolution borehole strainmeters and replacement of the failed strainmeter at Devil's Postpile. The purpose of the borehole-monitoring network is to monitor crustal deformation and other geophysical parameters associated with volcanic intrusions and earthquakes in the Long Valley Caldera. Additional instrumentation was added at these sites to improve the capability of providing continuous monitoring of the magma source under the resurgent dome. Sites were selected in regions of hard crystalline rock, where the expected signals from magmatic activity were calculated to be a maximum and the probability of an earthquake of magnitude 4 or greater is large. For the most part, the dilatometers were installed near existing arrays of surface tiltmeters, seismometers, level line, and GPS arrays. At each site, attempts are made to separate tectonic and volcanic signals from known noise sources in each instrument type.

Each of these sites was planned to be a multi-parameter monitoring site, which included measurements of 3-component seismic velocity and acceleration, borehole strain, tilt, pore pressure and magnetic field. Using seismicity, geophysical knowledge, geologic and topographic maps, and geologists recommendations, lists of preliminary sites were chosen. Additional requirements were access, and telemetry constraints. When the final site choice was made, a permit was obtained from the U. S. Forest Service.

Following this selection process, two new borehole sites were installed on the north and south side of the Long Valley Caldera in June of 1999. One site was located near Big Spring Campground to the east of Crestview. The second site was located at the Motocross Track (near Old Mammoth) in the South Moat. This report describes the methods used to install these strainmeters and various other types of borehole instruments at these sites together with the site at Devil's Postpile and telemeter the data obtained to the USGS base in Menlo Park, CA.

General locations of the instrument sites are shown in Figure 1 with detailed locations in Figures 2, 3 and 4. Latitude and longitudes are seen in Table1.

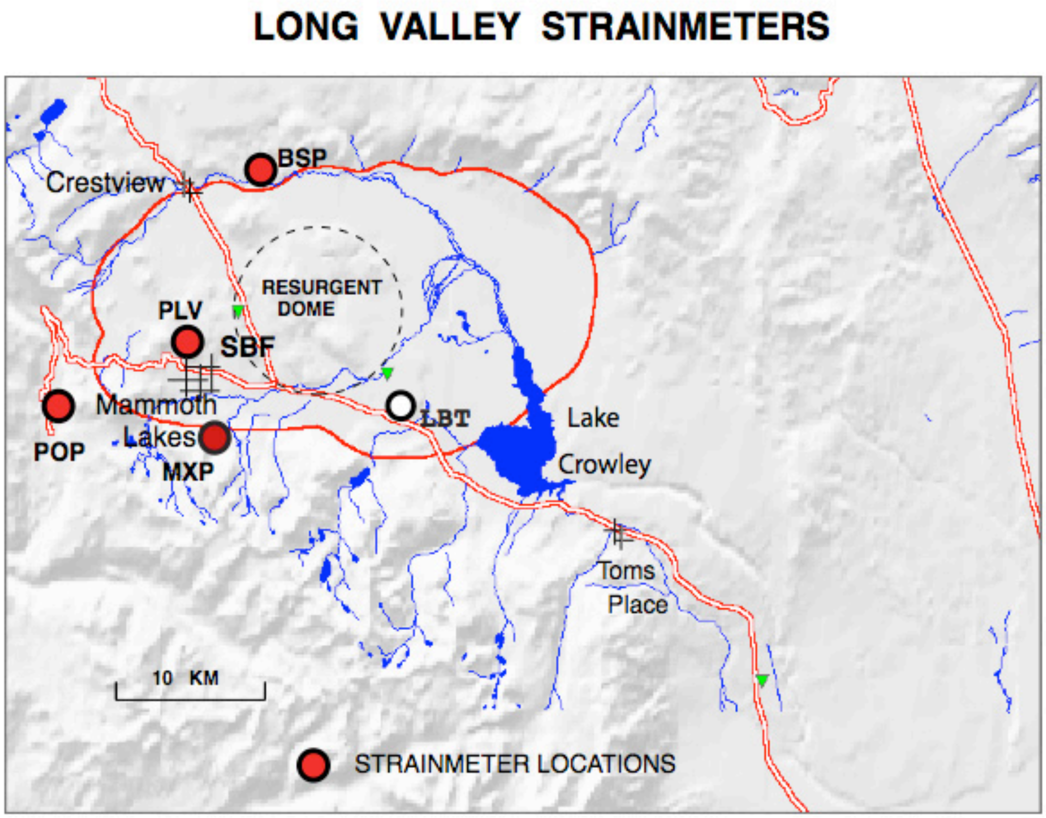
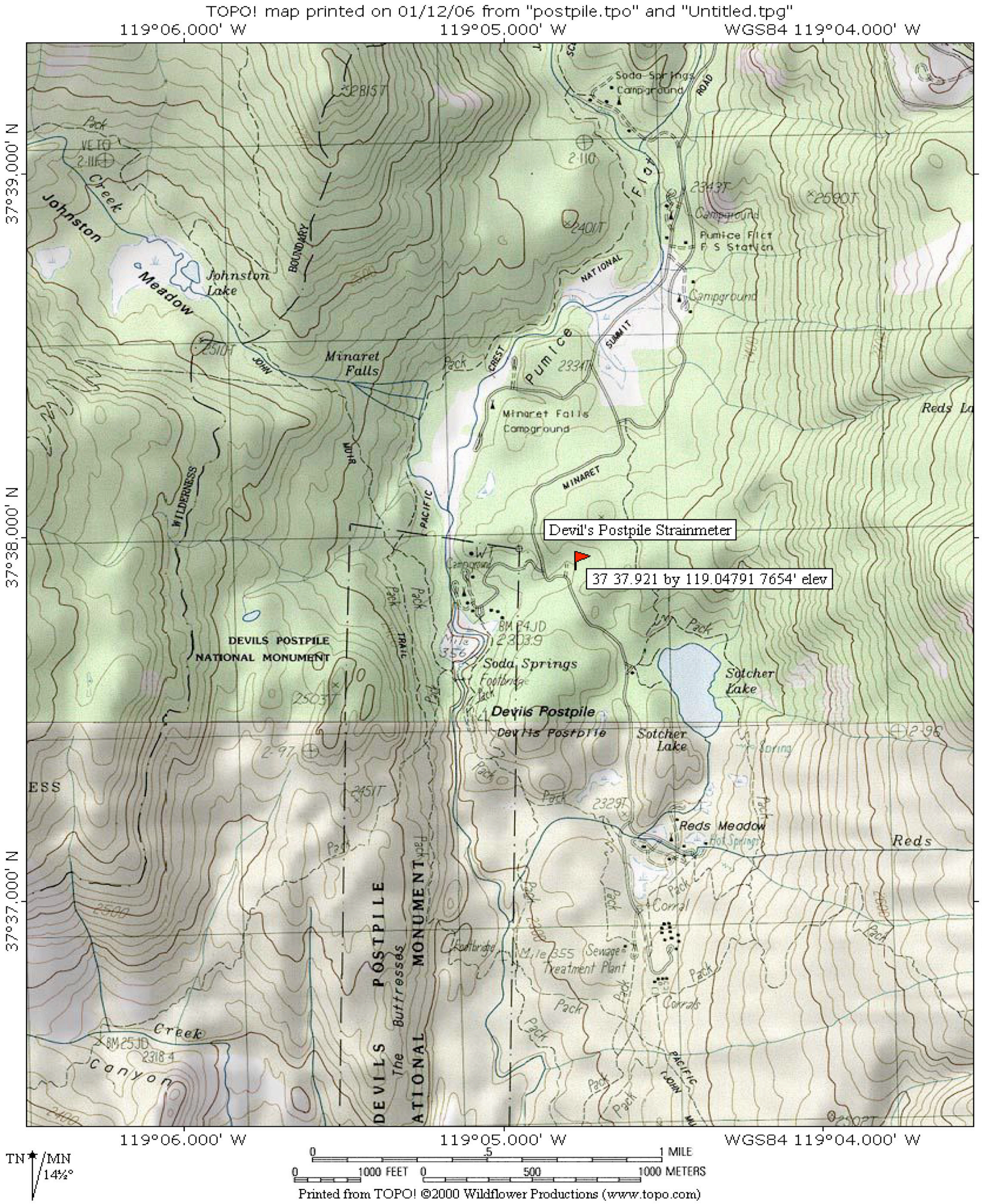


Figure 1

TABLE 1 , SITE LOCATIONS: Latitudes and longitudes

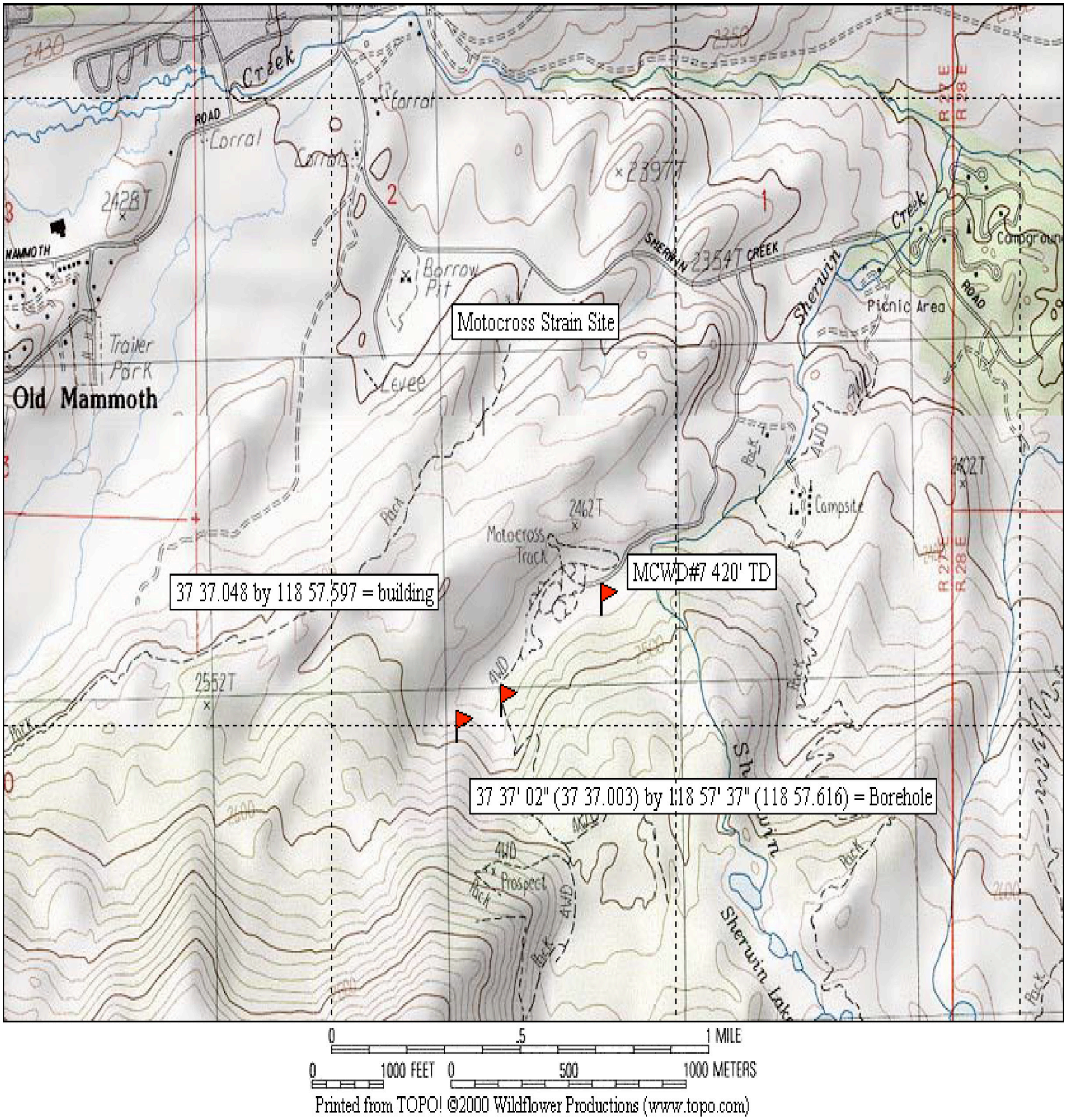
Site	Abbreviation (**01-09 are Zeno, s1 –s9 are 9210)	Latitude	Longitude	Elevation
Motocross	mx01 – 09, mxs1,3,5, 6,7,8,9	37.61687	118 .95267	7418’
Big Spring	bg01 – 09, bgs1 ,3,5, 6,7,8,9, p	37 .76115	118 94445	8049’
Devil's Postpile	popa,popb,popc,popt,pobp,pob2,popv,pops, pope, pos1,2,5,6,7,8,9,p	37 .63573	119.08303	7654’
Phillips	Plv1-plv8,pls1,2,5,6,7,8,9	37.67216	118.97496	8522’

Site Notes: Motocross and Big Spring have two transducers installed, #1 is the sensing volume, #2 is the reservoir recovery volume / thermistor down hole.
Devils Postpile is a single transducer instrument manufactured in 1991. The Phillips instrument has a single transducer and was manufactured and installed in 1989.



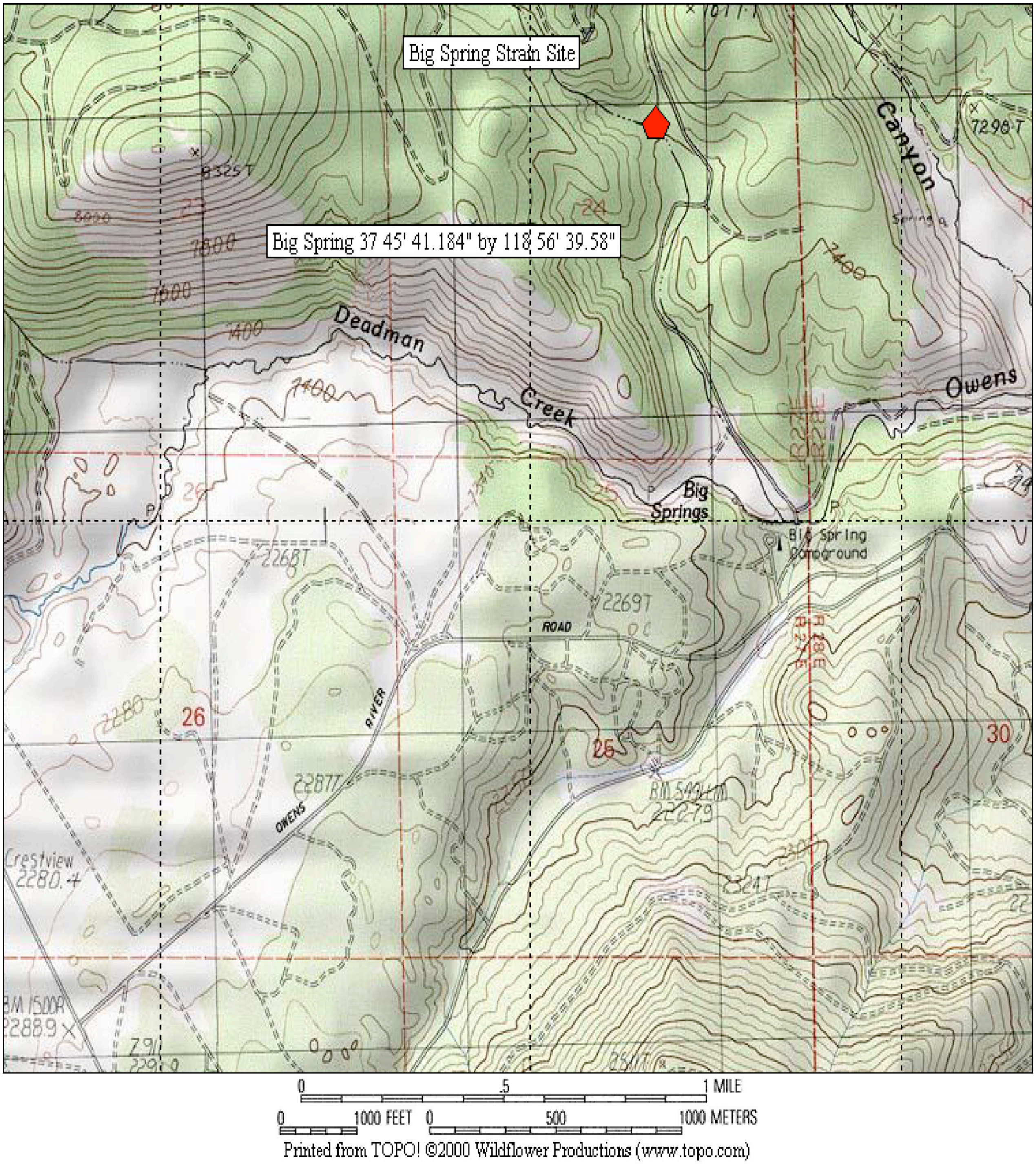
Map of Devil's Postpile Strain Site

Figure 2



Map of Motocross Strain Site

Figure 3



Map of Big Spring Site

Figure 4

2. INSTALLATION

2.1 DRILLING:

The primary design involved drilling an 8-inch hole for 6 inch casing to a depth of at least 400 feet. From the bottom of this hole, a 4-6 inch core hole is drilled to provide a series of choices for the final instrument location. During drilling, the locations of major aquifers anywhere in the hole are identified. If 10 feet of competent unfractured rock is identified in the recovered core below 400 feet, that location is recorded as a possible installation site. After an installation site is selected, the hole is cased, cemented to the surface and cleaned out with fresh water. If the core hole is 4 inch, it is reamed to 6 inch and the hole cleaned. For pore pressure monitoring, the casing is perforated to access the most active aquifer within about 100 feet of the strainmeter installation site.

An alternative drilling technique involves drilling a hole from the surface to a target depth of approximately 400 feet. At that depth, casing is set and cemented to the surface. A six inch rotary bit is then used to drill with water to at least 500 feet. When the drilling rate slows enough to indicate a large section of intact rock, this section is noted as a potential instrument site. Drilling is continued for 10 more feet to allow for suspended cuttings to settle, and then stopped. The hole is then circulated with clear water to remove cuttings and logged with a commercially available borehole inspection camera. This survey of the open section of the borehole helps to select the best installation sites. This method is more economical than coring although it affords only a method for identifying sites and not core for analysis.

To avoid hole contamination that might compromise the cementing of the instrument to the surrounding rock, the drilling technique requires the use of drilling mud containing no polymers or other aberrant compounds. After sites selection is complete, a 9 7/8” hammer bit is used to ream the hole to the target depth for setting and cementing the casing. The casing is then perforated as discussed previously. After the casing is perforated, set and cemented to the surface, a 6” hammer bit is run in the hole to clear the cement to the bottom. The borehole is then 6” hammer drilled to the bottom. An inclinometer (measures the angle of hole from vertical) and a cement dump, were then run in the hole to check for angle, clearance, and depth. When these are determined and the drilling fluids are displaced with clear water to the surface, the hole is ready for installation.

2.2 DILATOMETER INSTALLATION:

The Sacks-Evertsen dilational strainmeters used in this experiment (Sacks *et al*., 1971) are installed at depths between 367’ and 1192’ below the surface at borehole sites in Long Valley, as done elsewere in California (see instrument schematic on **P95**). The sensors, installed as part of a cooperative program between the U.S.G.S. and the Carnegie Institution of Washington, are cemented in a borehole with expansive grout having density characteristics approximating those of the host material. The borehole is then filled to the surface with cement to reduce long-term strains from hole relaxation effects and re-equilibration of the aquifer system.

The sensor consists of a 10 ft 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. The two new strainmeters installed in Long Valley, CA have two LVDT’s. The first measures the rock strain, and the second acts as reservoir volume monitor/low gain transducer/thermistor. The mechanical gain at the first LVDT is about 200,000. The frequency response is flat from about 20 Hz to less than 10^{-9} Hz. The 20 Hz high frequency cut-off results from hydraulics filter effects as oil flows from the large reservoir into the bellows chamber through a small orifice.

Installation is accomplished with the use of a truck mounted hydraulic winch and derrick. A 28 foot (8.534 meters) long grout dump is lowered to the bottom of the hole. If this dummy instrument reaches the bottom, it is clear that the hole will accept the instrument and installation proceeds. The instrument is prepared for installation and tested for proper operation. It is checked for proper resistances between pin outs, voltage is applied and readings of the signal out and transducer displacement after the valve is closed and opened. The dilatometer is manufactured with additional weight in the center section to act as ballast to help sink the instrument in the grout. The cable test, and recheck of the instrument are recorded with the date and time.

Prior to installation, the hydraulic winch and derrick is setup, its wire cable reeled out, measured and color coded every 50 feet for 1200 feet. 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. (See USGS Open File 89-349 for details on Borehole Dilatometer Installation Maintenance). The hydraulic derrick and winch are moved over the hole and the 27-foot grout dump is lowered to the bottom. When this clears, the bottom trip opens, and the hole depth is checked that it agrees with the depth determined by the drilling, final preparation can begin.

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. 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 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.

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. The grout has a slump of 12, or zero cone. Not watery but like a thick malt Approximately 6 hours is allowed between each dump for proper hardening of the grout.

The grout dump is then run down the hole empty to check the bottom hardness and depth. The cement dump has a capacity of 2.36 cu.ft., which fills approximately 12.02 linear feet of 6.0" hole with expansive grout (See specifications for "SET-GROUT" used on Page **93**). Each bag of expansive grout (Corps of Engineer 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. of grout. It takes 5.13 bags to fill the cement dump for one trip in the hole to cover the instrument. Six bags of grout and 7.35 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.

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 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 potentially causing 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. Its cable is raised and guided and taped to the wire rope bearing the instrument weight to the bottom of the hole. As the instrument is lowered, the 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, 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. **If**, **before one hour has elapsed, any resistances are bad or the instrument is working improperly, then it should be pulled out of the grout slowly.** (Please refer to Open File 89-349 Borehole Dilatometer Installation Maintenance, for photos and additional details.)

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 then another attempt can be made to install, if not the hole is made available for other instrumentation.

If the instrument passes its operational test, 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.

The final hole plan that was achieved for the installation at the Postpile strainmeter site is shown on **p96** (10.3 in Drawings, Schematic and Photo's) with a photo of the site on **p97**. The hole plan for Motocross is shown on **p99** with photo's of the site is shown on **p100** (10.6 and 10.7 in Drawings, Schematic and Photo's) while the plan and photo for Big Spring is shown on **p102 and p103** (10.8 and 10.9 in Drawings, Schematic and Photo's)

2.3 SEISMOMETER, PORE PRESSURE AND TILTMETER INSTALLATION:

In order to optimize the science from these boreholes, additional cement was run in to cover the instrument so other instruments could be installed. At the Big Spring borehole seismometer/acceleration packages, pore pressure transducers and tiltmeter instruments were installed. At the Motocross site, seismic/acceleration, and tiltmeter sondes were installed. The seismometer/acceleration sonde consisted of 3-component HS1 velocity transducers manufactured by Oyo-Geospace (see specs and frequency response on **p104-106**) and a 3-component 731-4A Wilcoxin accelerometer (see specs on **p108**). The tiltmeter was a Pinnacle Model #5000 self-leveling tiltmeter. Pore pressure was measured with Paroscientific Model 8WD020-I pressure transducer (see Pore Pressure Transducer and tiltmeter specifications on **p110** and **P109**, respectively, in Drawings, Schematics & Photos.).

2.3.1 Devils Postpile Pore pressure site:

In the summer of 1999, a 200 foot deep borehole was drilled though the pumice and basalt in order to monitor the aquifer at Devil's Postpile strain site. A 2-inch PVC pipe was lowered into the well and a Paroscientific pressure transducer was installed inside. This instrument was installed and the hole sealed (in the same manner as for the pore pressure transducer at Big Spring) in order to measure pore fluid variation over time. (see Postpile Pore Pressure Transducer on **p98** in Drawings, Schematics & Photos.)
Measurements from this transducer are recorded on the satellite data collection platform and telemetered to the GOES satellite for relay to Menlo Park, CA.

2.3.2 Seismic, and Tiltmeter Installation, Motocross site:

At this site, the hole bottom was brought up to a point 100' above the top of the strainmeter by running neat cement into the borehole. One-inch flush joint tremmie was lowered into the borehole in 20' sections using the hydraulic derrick. Once this tremmie gently contacted the top of the strainmeter cement and the depth and volume to a seismic package site determined, a new bottom depth was determined. The tremmie was pulled back 20' and a neat cement mix was prepared and delivered by gravity through the tremmie to the new target depth. After the tremmie was pulled from the hole and washed, this mix was allowed to set overnight. The seismic/acceleration package was placed in the hole the next day using the same tremmie pipe. It was cemented in place, and the hole bottom was brought up again (using the same method of volume calculation and tremmie and cement placement) to 180 feet from the surface.

The self-leveling tiltmeter (Pinnacle Model # 5000, see **p109**) was then installed. The tiltmeter was attached to 1" flush joint PVC tremmie pipe by a PVC press fit joint with wire rope bearing the load. Once it contacts the bottom it can be oriented using the PVC as the orientation tool. The tiltmeter was then cemented in place and the hole bottom brought up again (using the same method of volume calculation and tremmie and cement placement) to 50 feet from the surface.

2.3.3 Seismic, Pore pressure and Tiltmeter Installation, Big Spring site:

At this site, a 2-inch pvc pipe with the seismic package at the bottom (with perforation at 220 to 240 feet) was lowered to within 10 feet of the strainmeter. The hole bottom was brought up to 250 feet with gravity fed neat cement. A 60 mesh sand pack was set over the 250 to 210 foot aquifer interval. Five gallons of bentonite pellets were than dropped into the hole to act as a boundary between the sand and new cement. To deliver the cement, a one-inch flush joint tremmie was lowered into the borehole in 20' sections by using the hydraulic derrick. Once this tremmie gently contacts the top of the bentonite, the tremmie was pulled back 20' and a neat cement mix was prepared and delivered by concrete pumper through the tremmie to a new target depth (181 feet). It is immediately pulled out bringing the hole bottom up to 180 feet.

The self-leveling tiltmeter (Pinnacle Model # 5000) was then installed. It was attached to 1" flush joint PVC tremmie pipe by a PVC press fit joint with wire rope bearing the load. Once it contacted the bottom, it was oriented using the PVC to provide orientation information. The tiltmeter was then cemented in place and the hole bottom brought up again (using the same method of volume calculation & tremmie and cement placement) to 50 feet from the surface.

3. ELECTRONICS ENCLOSURES:

After the borehole was cemented to the surface and site was cleaned up, the electronic surface enclosures were installed. These enclosures consist of a 5 ft. wide by 5 ft. long, by 8 ½ Foot high, above grade steel structures with a steel door, for the electronics, and the batteries (see photos of Big Spring and Motocross sites on **p103** and **p100**, respectively).

4. SURFACE ELECTRONICS AND OPERATION:

The electronics consists of signal amplifiers, a barometric pressure transducer (Setra model 270, see specifications on **p113)**, and two data collection systems housed in the electronics enclosure. These electronics plus those for data collection and transmission are temperature tested in the lab and installed in metal enclosures. The electronics are powered by solar charged batteries located in the metal building with solar panels installed on the roof. The layout of this enclosure is shown on **p113**. All data from down hole (strain, pore pressure, seismic, tilt, etc) and at the surface (pressure, temperature, state of health, etc) flow through this electronics enclosure and all power is generated within the enclosure. Connectors and pin assignments to this box are shown on **p119.** The detailed pinouts from the downhole strainmeter cable connector to the electronics box and for a second connector on the strainmeter SOC box (**S**trainmeter **O**peration & **C**ontrol Box) are shown on **p121**. Analog and digital inputs to the Sutron 9210/SL2 satellite data collection platform with their color codes are shown on **p122**.

At these sites the seismic portion of the signal generated by the dilatometer is also collected by a Nanometrics High Resolution Digitizer and telemetered by spread spectrum radio relay, phone line, or satellite radio relay to Menlo Park. Outputs to this telemetry system are shown on **p124**. These digitizers are located in water-resistant below-grade temperature compensated enclosures. Power comes from solar charged batteries at Motocross and a thermal electric generator at Big Spring.

A water resistant box houses the electronics for the strainmeter. 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 than 10^{-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 (Sutron Model 9210 SL2, see description, specifications and inputs on **p114.** Previously these data were collected on Zeno 3200 Dataloggers: see **p85 & p116**) and transmited to Menlo Park, Cal. 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 have recorded 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^{-10} to 10^{-11} level if they occur quickly, and about 10^{-10} to 10^{-8} level if they occur days to weeks before the event.

The strainmeter electronics contains a dc/dc converter powering 2 operational amplifiers for 2 different DC (strain) signals, and a automatic valve opener driven by microprocessor control. The operation of the strainmeter electronics is as follows. As the strainmeter in the borehole is squeezed from pressures exerted on the surrounding rock, silicon oil in the instrument is forced through an orifice, displacing a bellows, which moves the attached core of a transducer. The movement of this core is approximately .318V/.01in. (.318V/.254mm), when powered by a 6.8V voltage regulator. The movement of this transducer is measured as a voltage at the surface in the SOC Box. This voltage is monitored by a microprocessor to control pressure relief of the transducer in the strainmeter. As discussed in the Dilatometer Instrumentation section, the dilatometer strain output is derived from two LVDT's, one measures volume changes that can be related to strain in the rock while the second monitors total reservoir volume together with instrument temperature. The operation of the SOC Box is designed so that if LVDT #1 exceeds a predetermined threshold voltage of 0.4 volts, a valve will open/close and pressure will drop as fluid flows to the resevoir monitored by LVDT #2. After 2 hours, a valve will open on this second resevoir and pressure will drop as fluid flows to a storage reservoir in the strainmeter. 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 +/- .3 volts. During the night a blocking diode acts to prevent discharge of the battery through the panel.

5. DETAILED DESCRIPTION OF DILATOMETER ELECTRONICS OPERATION

Summary

The strainmeter control box contains electronics that control and monitor the strainmeter. These electronics also filters the analog signals from the strainmeter and provide output to an external device. The external device is usually an Analog-to-Digital converter that provides digital data to either a local storage device 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 is not taken when power is marginal, 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 supplies a regulated 6.8VDC potential to the DT power input. The valves in the strainmeters are designed and manufactured at the Carnegie Institution of Washington with an open or close state that depends on the polarity of the potential voltage applied to the valves. Most of the older borehole strainmeters switch with a valve operating potential of 24VDC. The newer 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

5.1. VALVE OPENING ALGORITHM / SOC Box

June 7, 2000 (as described by Carnegie Institute of Washington / DTM)

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 l opens.
Valve l closes 1 minute after 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, Valve 2 opening is rescheduled for 11 minutes following next Valve 1 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 Valve 2 is open. If Valve 2 is open, we close Valve 2 before opening Valve l.

If Valve 2 needs to open we check if Valve l is open. If Valve1 is open, we close Valve l before opening Valve2

New firmware algorithm. Note that the High Level l 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 there won't be any need of this feature. So, make sure to 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, the SOC box is opening the valves as this 1VDC power display occurs, be concerned. If this is happening let CIW/DTM 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 Voltage Threshold = 0.4V
LVT=Low Voltage Threshold
HVT=High Voltage Threshold=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

.

* The SOC Box is used at the Big Spring and Motocross sites. A 1987 design strainmeter electronics box is used at Devils Postpile and Philips strainmeter sites. These electronics are described in Open File 89-349 Borehole Dilatometer Installation Maintenance.

5.2 CABLE AND 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 (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
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 pin outs.

* 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 on **p121** for a description of connector pin assignments

6. SURFACE PRESSURE TRANSDUCER & DATA COLLECTION INSTRUMENTS:

The barometric pressure is monitored with a pressure transducer manufactured by Setra Systems (Model 207). This on-site transducer aids in the reduction of the strain data as it is affected by barometric pressure. (see specifications on the Setra barometric pressure transducer on **p113** in Drawings, Schematics & Photos.) The transducer has an operating range of 300 millibar and is powered by a 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.

Coastal Environmental Systems ZENO Model 3200 was initially selected as the Data Collection Platform. This system draws 84ma at 12 volts DC during collection and 3 amps during transmission of data to the GOES satellite. Data is collected once every 10 minutes with 17 bit accuracy and transmitted at 10 minute intervals. See satellite data configurations in appendix **p19**.
(See specifications of the ZENO Satellite Data Collection Platform on **p116** in Drawings, Schematics & Photos). The ZENO 3200's were replaced in 2008 by Sutron 9210/SL2's to meet current NESDIS satellite transmission requirements. These operate at 22-bit accuracy. The 9210SL2's draw 75 ma at 12 V DC in quiescence and 3 amps during transmission.

7. 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.

As a routine, the data from each instrument is looked at daily for correct operation. It is inspected for tidal response (data quality), data dropouts (satellite problems, computer problems, missing transmissions), time of transmission, transmission power levels, and battery voltages. Information obtained from this helps with efficient field maintenance.

8.0 APPENDIX:

8.1.1 SATELLITE DATA COLLECTION CONFIGURATION:

Motocross Strainmeter May 1999 to august 2007
Data Logger *= Coastal Environmental Systems* **ZENO** *3200 sn #?*

Component description, sensor/digitizer gain, voltage range input to DCP
mx01 = transducer #1 hi gain +/-.512 volt range 3.91x10^{-6} mV/cnt
mx02 = " " lo " +/-5.12 volt range 3.91x10^{-5} mV/cnt
mx03 = " #2 lo " +/-5.12 volt range "
mx04 = input to A/D as a short to ground +/-5.12 " " "
mx05 = Setra #270 600-900 mbar at 0 - 5vdc +/-5.12 volt range 3.91x10^{-5} mV/cnt
mx06 = tiltmeter x axis same as mx06 " " " " "
mx07 = " y " same as mx07 " " " "
mx08 = YSI4401 thermister C x .001 (i.e., 15666 x .001 = +15.666)
mx09 = no connection
mx10 = +/- 12 bit range = .007816291 volts/ct
.007816291 by 1720 = 13.44 volts dc
Number of assigned DCP bits *01 - 08 are +/-17 bit; 09 is +/-12 bit,*

Motocross Strainmeter August 2007 to present

Data Logger = **Sutron** *9210/SL2*
Component description, sensor/digitizer gain, voltage range input to DCP
mxs1 = transducer #1 hi gain +/-5.00 volt range 1.192x10^{-6} mV/cnt
mxs3 = " #2 lo " +/-5.00 volt range " "
mxs5 = Setra #270 600-900 mbar at 0 - 5vdc +5.00 " " "
mxs6 = tiltmeter x axis +/-5.00 volt range 1.192x10^{-6}
at 17meter depth gain 3 in tiltmeter = 95.60mv/microradian
mxs7 = tiltmeter y axis +/-5.00 volt range 1.192x10^{-6}
at 17meter depth gain 3 in tiltmeter = 98.10/microradian
mxs8 = YSI4406 thermister = -887 = -8.87 C
mxs9 = direct readout = 1288 =12.88 Vdc
Number of assigned DCP bits *s1,s3,s5,s6,s7 +/-22 bit,*

Big Spring Strainmeter May 1999 to august 2007
Data Logger *= Coastal Environmental Systems* **ZENO** *3200 sn #?*

Component description, sensor/digitizer gain, voltage range input to DCP
bg01 = transducer #1 hi gain +/-.512 volt range $3.91x10^{-6}$ *mV/cnt*
bg02 = " " lo " +/-5.12 volt range $3.91x10^{-5}$ *mV/cnt*
bg03 = " #2 lo " +/-5.12 volt range "
bg04 = input to A/D as a short to ground +/-5.12 " " "
bg05 = Setra #270 600-900 mbar at 0 - 5vdc +/-5.12 volt range $3.91x10^{-5}$ *mV/cnt*
bg06 = tiltmeter x axis same as mx06 " " " " "
bg07 = " y " same as mx07 " " " "
bg08 = YSI4401 thermister C x .001 (ie, 15666 x .001 = +15.666)
bg09 = Paroscientific Pressure Transducer 8WD020S (SDI-12), value = 93233
= 932.33 millibars
bg10 = +/- 12 bit range = .007816291 volts/ct
.007816291 by 1720 = 13.44 volts dc
Number of assigned DCP bits *01 - 08 are +/-17 bit; 09 is +/-12 bit,*

Big Spring Strainmeter August 2007 to present

Data Logger *=* **Sutron** *9210/SL2*
Component description, sensor/digitizer gain, voltage range input to DCP
bgs1 = transducer #1 hi gain +/-5.00 volt range +/- $1.192x10^{-6}$ *mv/ct*
bgs3 = " #2 lo " +/-5.00 volt range "
bgs5 = Setra #270 600-900 mbar at 0 - 5vdc +5.00 " " "
bgs6 = tiltmeter x axis +/-5.00 volt range +/- $1.192x10^{-6}$ *mV/cnt*
at 17meter depth gain 3 in tiltmeter = 95.60mv/microradian
bgs7 = tiltmeter y axis +/-5.00 volt range +/- $1.192x10^{-6}$ *mV/cnt*
at 17meter depth gain 3 in tiltmeter = 98.10/microradian
bgs8 = YSI4406 thermister = -887 = -8.87 C
bgs9 = direct readout = 1288 =12.88 Vdc
bgsp= direct readout = 22561 is + 1000.00 millibars = 1225.61 millibars

Number of assigned DCP bits *s1,s3,s5,s6,s7 +/-22 bit,*

Devils Postpile Strainmeter ***May 1999 to August 2007***
Data Logger *= Coastal Environmental Systems* **ZENO** *3200 sn #?*

Component description, sensor/digitizer gain, voltage range input to DCP

popa = transducer x 10 gain +/-.512 volt range $3.91x10^{-6}$ mV/cnt
popb = " x 1 " +/-5.12 volt range $3.91x10^{-5}$ mV/cnt
popc = " x 50 " +/-5.12 volt range "
popt = inputto A/D as a short to ground +/-.512 " " "
pobp = Setra #270 600-900 mbar at 0 - 5vdc +/-5.12 volt range $3.91x10^{-5}$ mV/cnt
pob2 = Setra #230 0-25 psi at 0 - 5vdc +/-5.12 volt range $3.91x10^{-5}$ mV/cnt
popp = Paroscientific Pressure Transducer 8WD020S (SDI-12) value = 93233
= 932.33 millibars
pope = YSI4401 thermister C x .001 (ie, 15666 x .001 = +15.666)
popv = +/- 12 bit range = .007816291 volts/ct (.007816291 by 1720 = 13.44 volts dc
Number of assigned DCP bits *A,b,c,t,bo,b2,pp & pe are 17 bit A/D, pv is 12 bit A/D*

Devils Postpile Strainmeter ***August 2007 to present***
Data Logger *=* **Sutron** *9210/SL2*

Component description, sensor/digitizer gain, voltage range input to DCP

pos1 = transducer x 10 gain +/-5.00 volt range +/- $1.192x10^{-6}$ mv/ct
pos2 = " x 1 " +/-5.00 volt range "
pos5 = Setra #270 600-900 mbar at 0 - 5vdc + 5.00 volt range "
pos6 = strainmeter battery voltage divide by 3, i.e. = 42862 = 4.2862 x 3 = 12.8586 Vdc
pos7 = DCP battery direct readout = 1361 = 13.61 Vdc
pos8 = downhole thermistor +/- 5.00 volt range +/- 1.192x10-6mv/ct
posp = Paroscientific Pressure Transducer 8WD020S (SDI-12) value = 20252
= 20252+ 1000 millibars = 1202.52 millibars
pos9 = YSI4406 thermister direct readout = -124 = -1.24 C
Number of assigned DCP bits *s1,s2,s5,s8 are 22 bit A/D*

***Phillips Strainmeter** October 1989 to August 2007*
Data Logger = Sutron 8004

Component description, sensor/digitizer gain, voltage range input to DCP

plv1 = transducer x 10 gain +/- 10 volt range 3.05 x 10-4 mv/ct
plv2 = " x 1 " "
plv3 = " x 50 " "
plv4 = downhole thermistor "
plv5 = Setra #270 600-900 mbar at 0 - 5vdc "
plv6 = voltage divider strain battery "
plv7 = voltage divider DCP battery "
Number of assigned DCP bits +/- 15 bits over =/-10 volts DC

***Phillips Strainmeter** August 2007 to present*
Data Logger = **Sutron** *9210/SL2*

Component description, sensor/digitizer gain, voltage range input to DCP

pls1 = transducer x 10 gain +/-5.00 volt range +/- 1.192x10^{-6} mv/ct
pls2 = " x 1 " +/-5.00 volt range "
pls5 = Setra #270 600-900 mbar at 0 - 5vdc + 5.00 volt range "
pls6 = strainmeter battery voltage divide by 3, i.e. = 42862 = 4.2862 x 3 = 12.8586 Vdc
pls7 = DCP battery direct readout = 1361 = 13.61 Vdc
pls8 = downhole thermistor +/- 5.00 volt range +/- 1.192x10-6mv/ct
pls9 = YSI4406 thermister direct readout = -124 = -1.24 C
***Number of assigned DCP bits** s1,s2,s5,s6,s8 are 22 bit A/D*

8.1.2 SUTRON 9210 CONFIGURATION:

To check that programming is correct at an operating site, install sfformatter.bas and the particular configuration file for the site (e.g. bigspring.ssf) and follow the steps below:

1. Plug in Com 1 RS232 cable to com1 location of 9210.

2. Plug in I 2 C rs232 cable to I 2 C location (upper left) of 9210.

3. Plug in I 2 c RS232 cable to 8080-0003, insure both ends of RS232 cable is tightened using thumbscrews.

4. Plug in SMA GPS Time connector to Satlink 2. Ensure it's tightly seated.

5. Plug in RG 8 RF connector to Satlink 2.

6. Attach +12 GND (PWR IN) from 9210 to barrier strip with Satlink 2 power cable.

7. Ensure laptop is turned on and XTERM program is brought up to Laptop Display.

8. Plug in INLINE fuse.

9. After 30 seconds, the display should come on the 9210 XLITE. There should be Rx and Tx display on the XTERM windows upper right corner.

10. The XTERM will ask if you want to go directly to SETUP or it will power up and turn on the program on it's own. This will cause it to start collecting and transmitting at the correct times if it has been programmed correctly.

11. The MAIN menu will tell you the STATION INFO, time of day, station name,; STATION STATUS Recording, ON + TX, or not, Alarm and battery voltage.

12. If you go to the SETUP menu, and scroll to SATLINK. you can; Highlight SATLINK and EDIT. You will be able to see the ID and initialization icons.

13. Highlight Self-Timed and Edit, You will be able to see the Channel, format, type, Transmit time,

14. If you go to SENSORS, you can see the current data measurement. You can also request a collection of data for all inputs or specific inputs. These values are not he same as the values which will be sent...

15. If you go to LOG, you can see the data that has been collected at the previous 10-minute window. In order to view all the data value decimal digits, put your cursor on the right vertical line to the left of the Q, and drag your cursor to the right. You will see the right digits displayed to their most significant digit.

16. Highlight Self-Timed Test and Edit, You will be able to see the current message, which will be sent. Highlight Status , You will be able to scroll down through some of the information in the Satlink. Current time, when the unit was booted, time of next transmission, when the unit last sync to GPS Time.
    Click close, then close again will bring you back to the Main Menu.

17. If you haven't already determined that the Station Status shows recording ON + TXT, click START. By viewing the Satlink Status window, you know when the unit will transmit, so you should be able to check the battery on transmission.

18. If you do not get confirmation that there was a transmission and the values you saw and recorded in your notebook do not agree with what was received in Menlo Park, CA, you may need to reload the program.

19. Go To SETUP, Hightlight + next to Setup File, highlight Open, The 9210 will ask you to STOP the Recording, say YES. Highlight Xpertjack.ssf next to NAME. Say OK.You'll go back to SETUP automatically. Go up to the top of the SETUP Menu. Highlight Basic, highlight EDIT, Ensure STFORMATTER is there. (If it's not there, you need to go to File Transfer*) Say OK. This returns you to SETUP, Highlight Basic again, hit Compile.
The XTERM will tell you that the program has been compiled.
In the MAIN menu, you will have to ensure the name of the station matches the program in the SETUP FILE (These both should be xpertjack (i.e.))

    If there are no programs in the 9210, you will need to load one.

20. * To LOAD the Program. Go to FILE TRANSFER. Hightlight it. A new window will appear on your desktop. Find the Folder where you have saved your Sutron 9210-SL2 programs. Find the program. Highlight it, in the lower section of the window, you'll see a right arrow, highlight it. The file transfer program will ask if you want to transfer programs. If this is the one you want say YES. Once you have the program you want, plus STFORMATTER. You can get out of File Transfer by hitting the X in the upper right corner.

    Now you will have to go back to the SETUP window and go to line 19,

    Once you have the program installed, go back to MAIN menu and click START the recording and TXT.

Program files for each Long Valley site:

bigspring.ssf motocross.ssf Phillips.ssf Postpile.ssf stformatter.bas

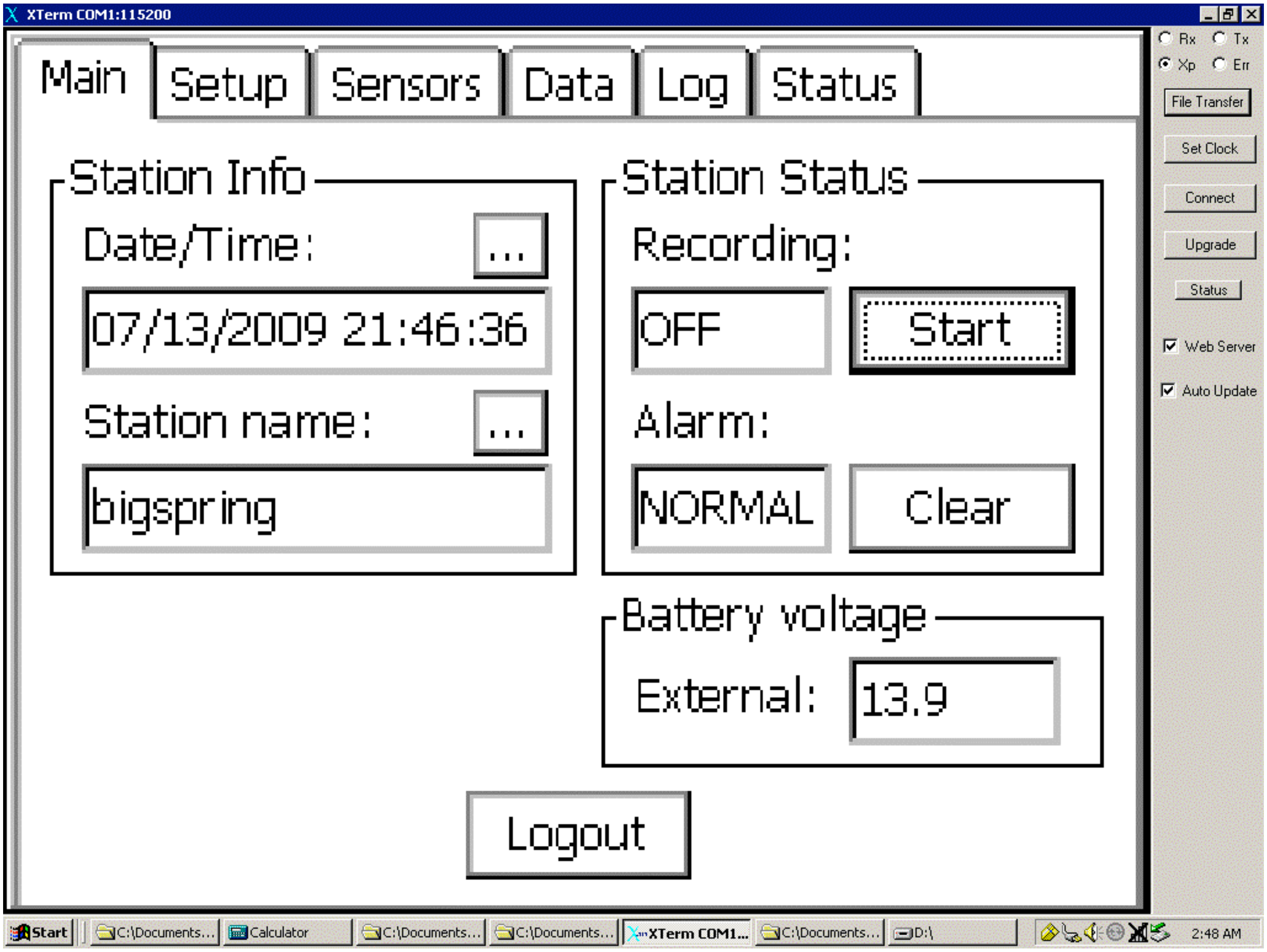
These .ssf files for each site are used with the 9210 operating program on a PC and ascii versions of each site file are included in order on pages ***126, 134, 142, 148*** *and* ***156****. The stformatter.bas is used at all of these Long Valley sites.*

Also required is the Xterm excutable program which can be obtained from the Sutron web site listed below.

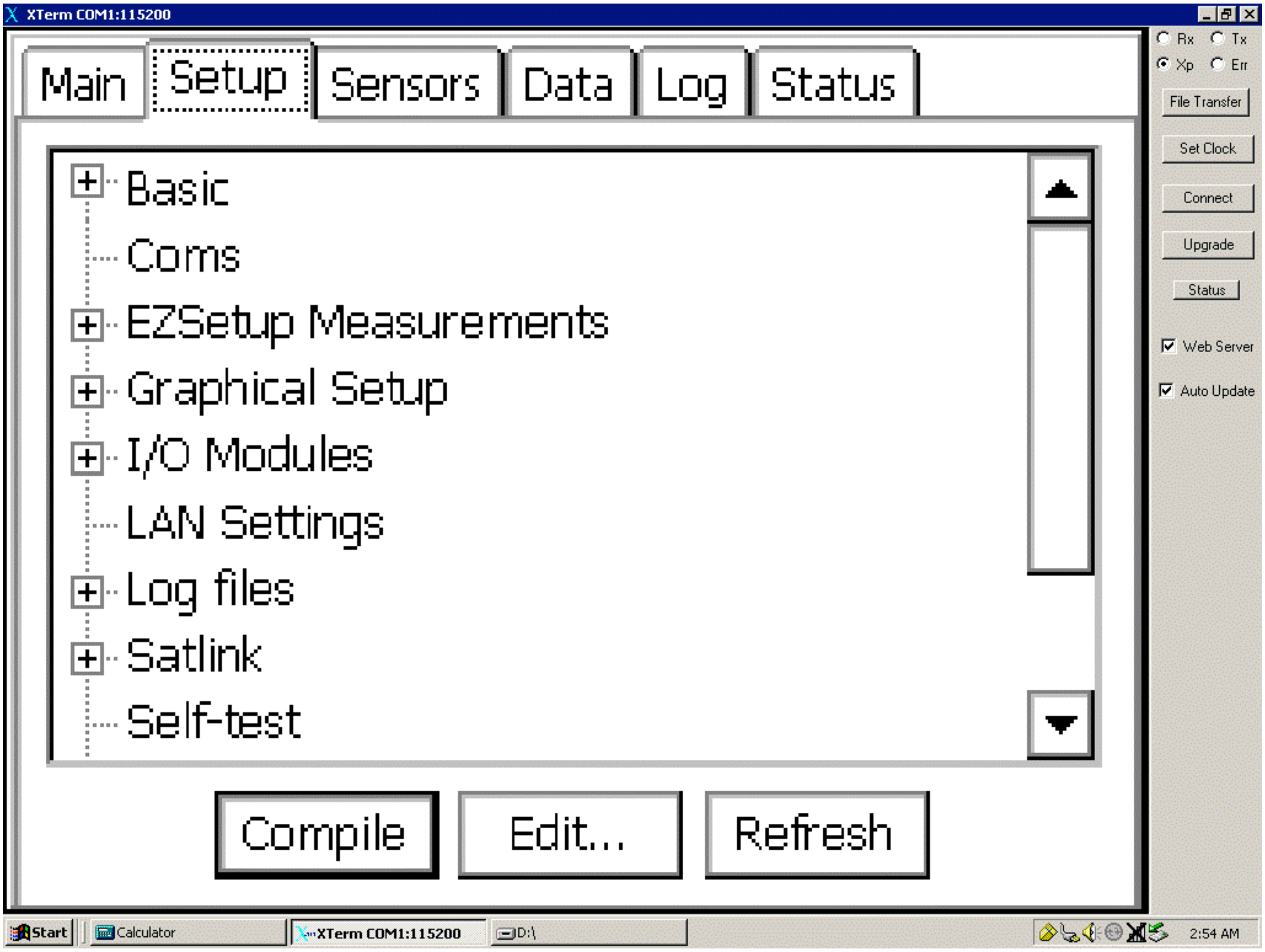
Xterm.exe

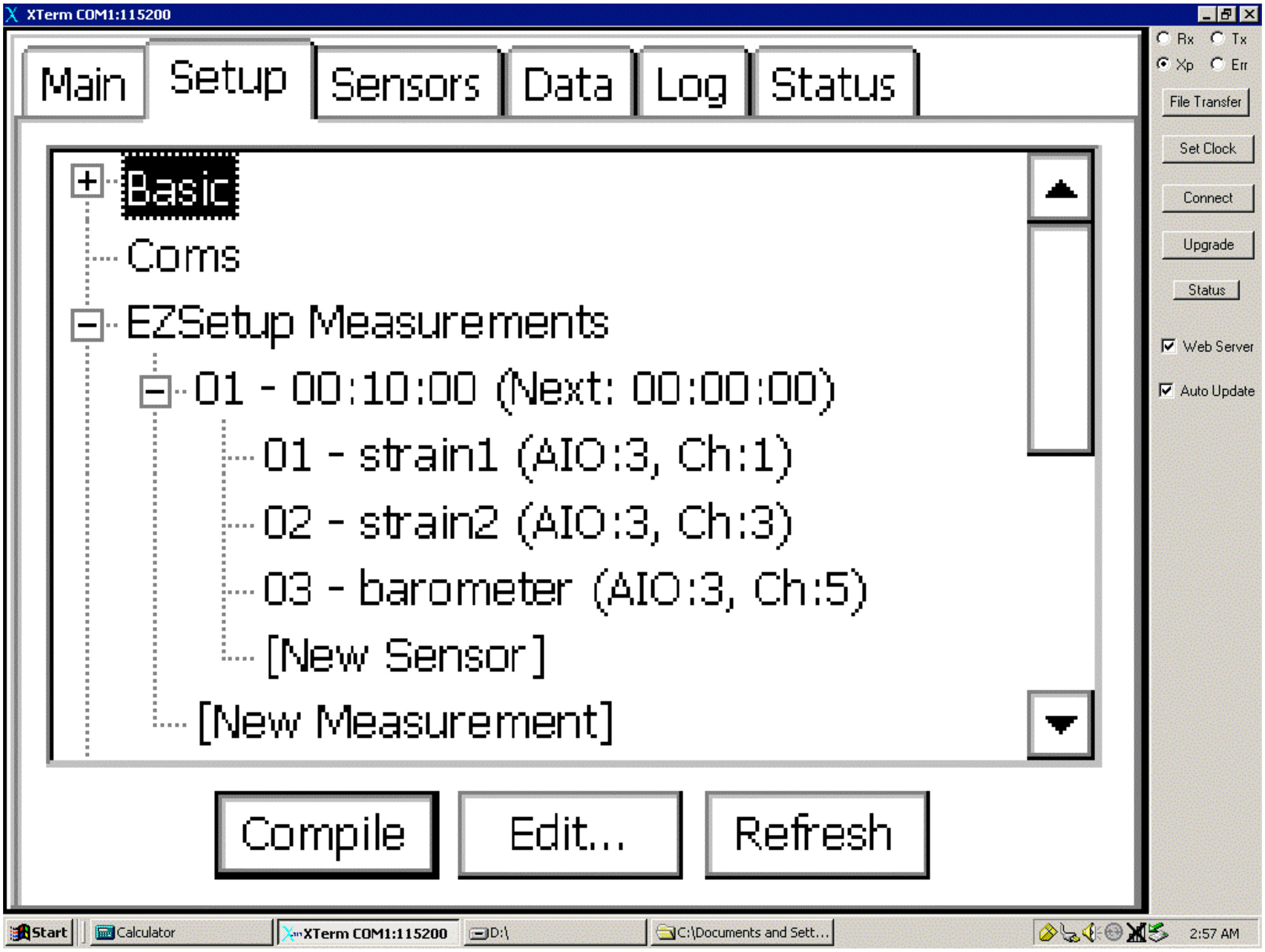
The Sutron Manual should also be loaded to your laptop from the http://www.sutron.com/ web site.

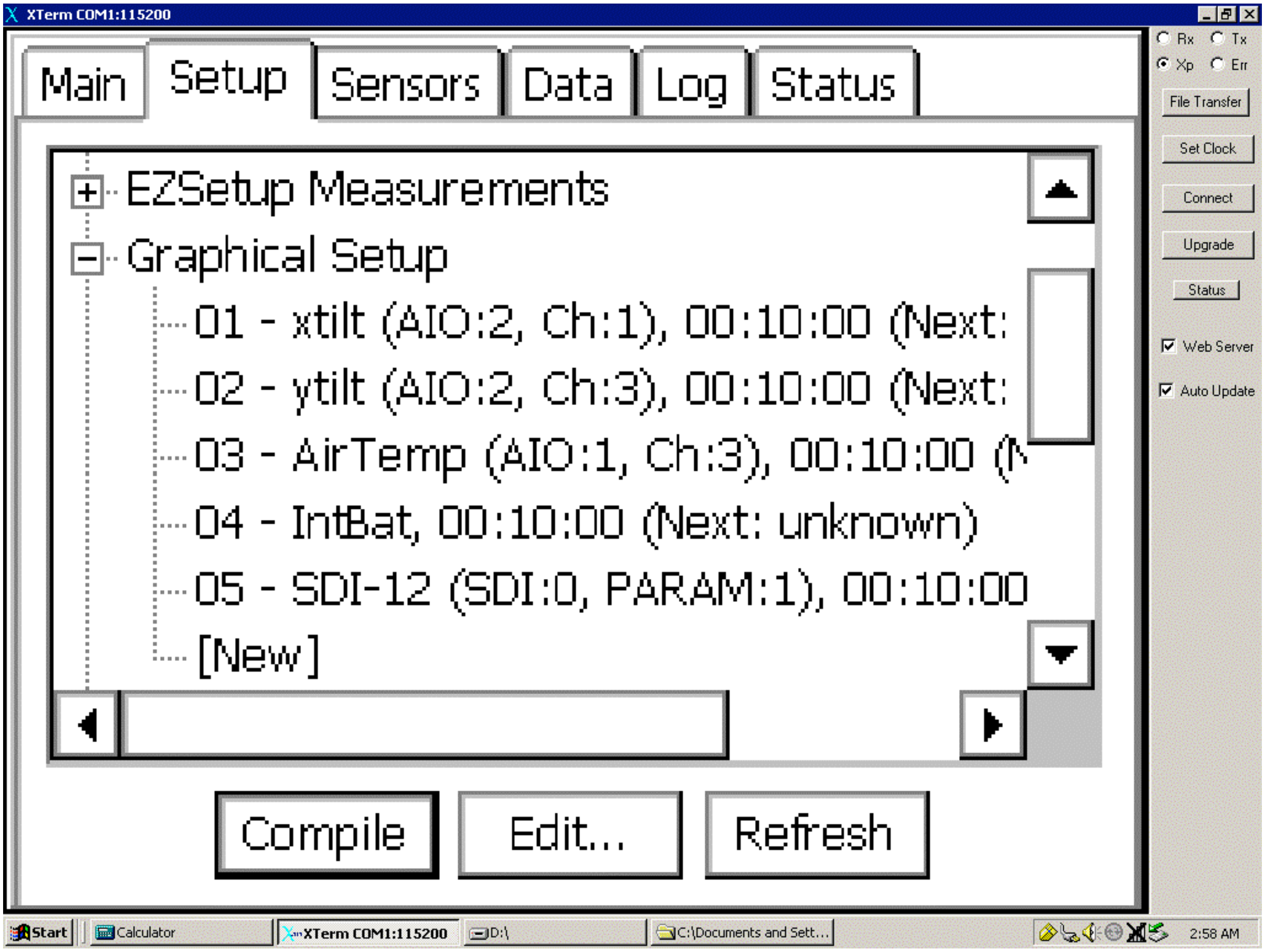
8.1.3 EXAMPLE MENU FOR THE 9210/ SL2 PROGRAM

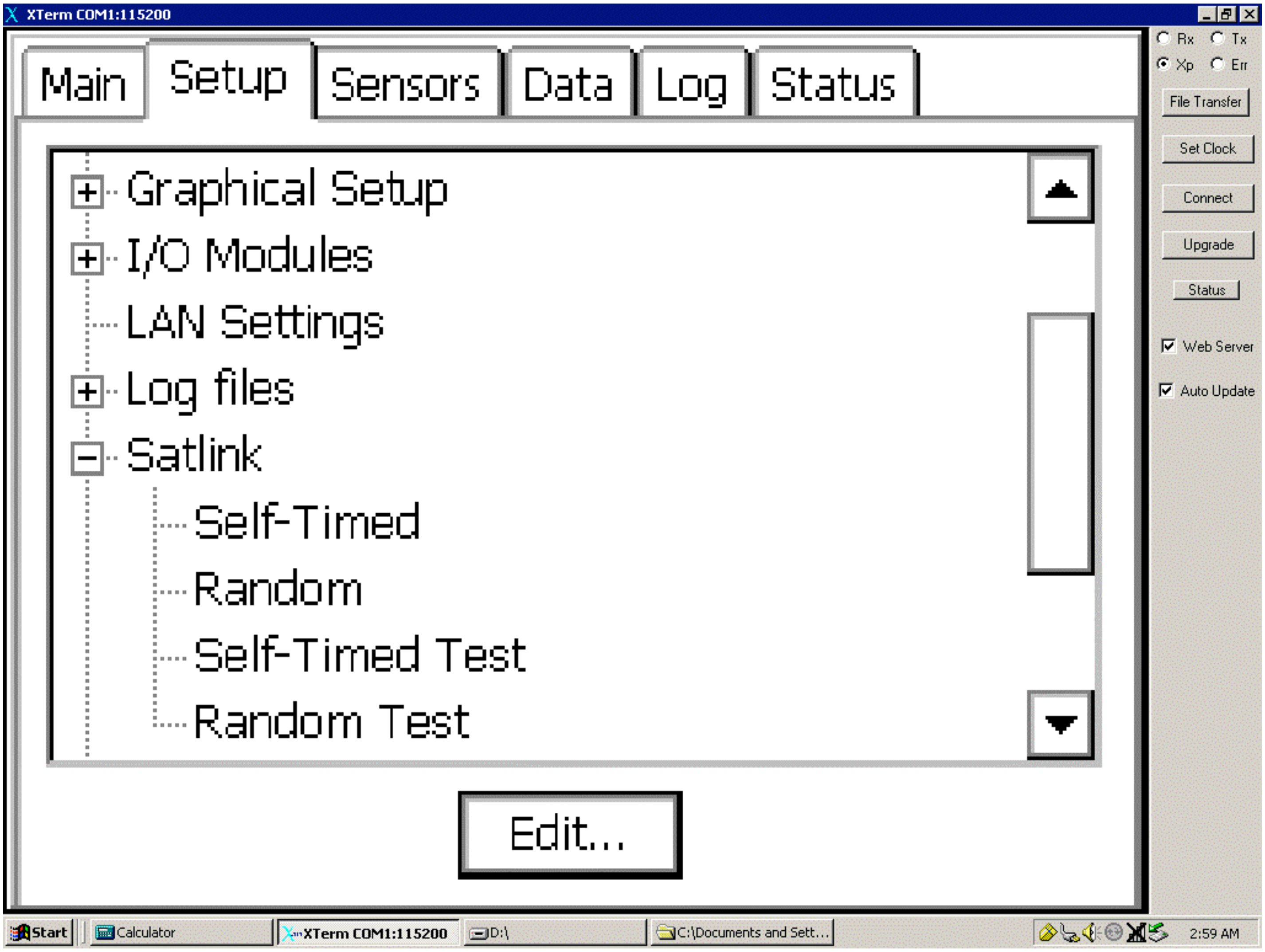


The MAIN menu provides the STATION INFO, time of day, station name,;
STATION STATUS Recording, ON + TX, or not, Alarm and battery voltage.

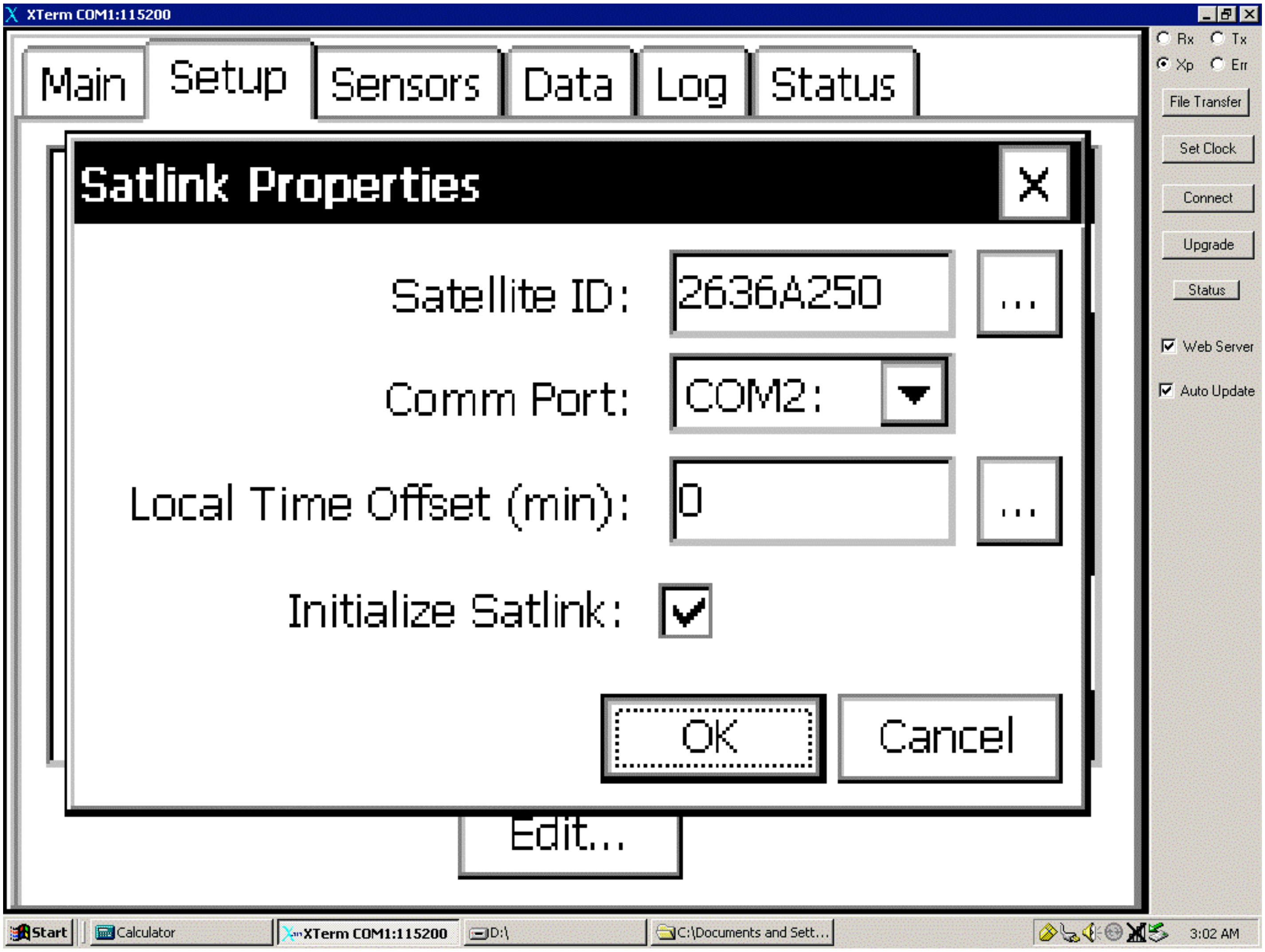

XTerm COM1:115200
Main
Setup
Sensors
Data
Log
Status
Basic
Coms
EZSetup Measurements
Graphical Setup
I/O Modules
LAN Settings
Log files
Satlink
Self-test
Compile
Edit...
Refresh
Rx
Tx
Xp
Err
File Transfer
Set Clock
Connect
Upgrade
Status
Web Server
Auto Update
Start
Calculator
XTerm COM1:115200
D:\
2:54 AM


XTerm COM1:115200
Main
Setup
Sensors
Data
Log
Status
Basic
Coms
EZSetup Measurements
01 - 00:10:00 (Next: 00:00:00)
01 - strain1 (AIO:3, Ch:1)
02 - strain2 (AIO:3, Ch:3)
03 - barometer (AIO:3, Ch:5)
[New Sensor]
[New Measurement]
Compile
Edit...
Refresh
Rx
Tx
Xp
Err
File Transfer
Set Clock
Connect
Upgrade
Status
Web Server
Auto Update
Start
Calculator
XTerm COM1:115200
D:\
C:\Documents and Sett...
2:57 AM

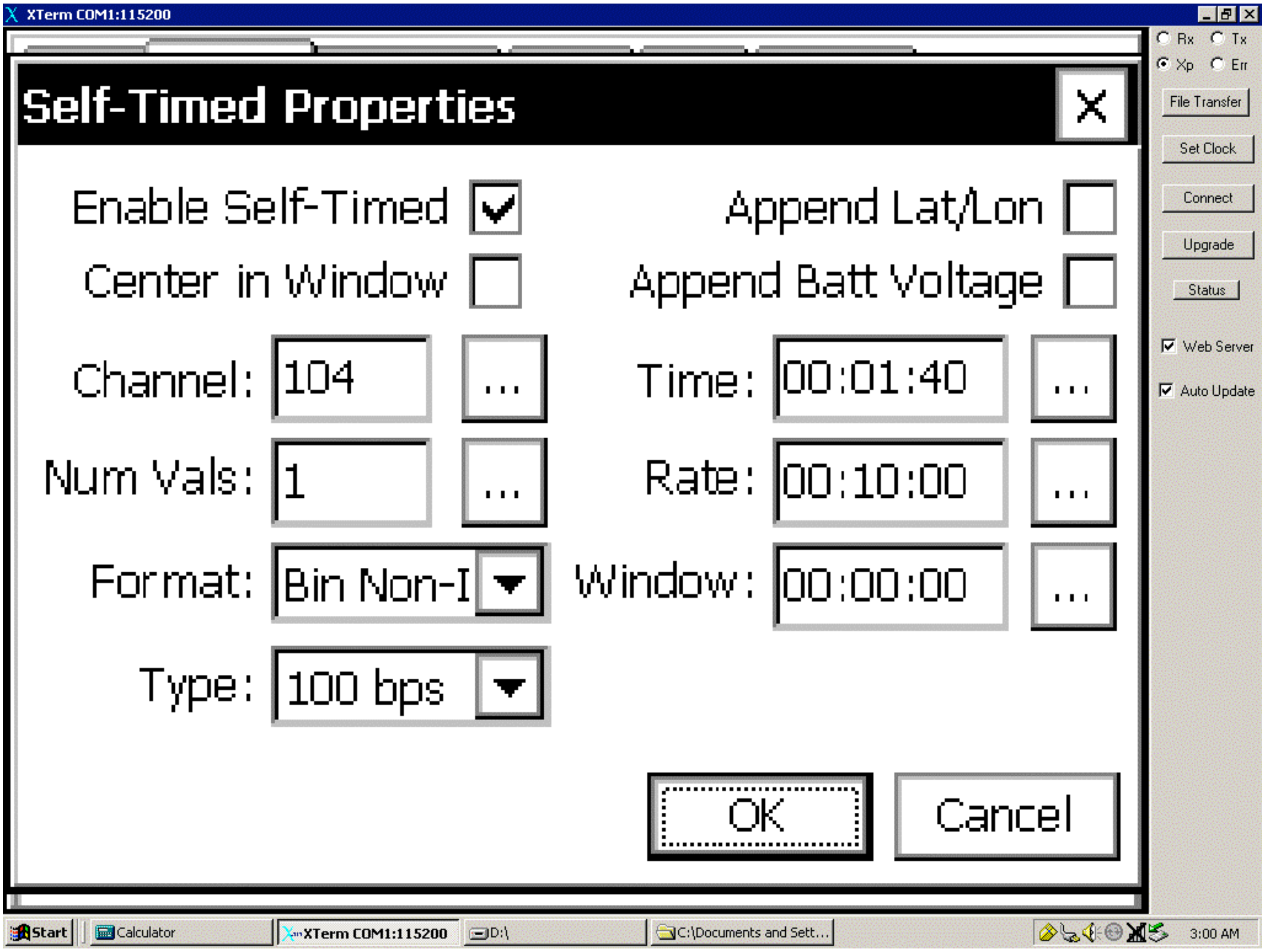

XTerm COM1:115200
Main
Setup
Sensors
Data
Log
Status
EZSetup Measurements
Graphical Setup
01 - xtilt (AIO:2, Ch:1), 00:10:00 (Next:
02 - ytilt (AIO:2, Ch:3), 00:10:00 (Next:
03 - AirTemp (AIO:1, Ch:3), 00:10:00 (N
04 - IntBat, 00:10:00 (Next: unknown)
05 - SDI-12 (SDI:0, PARAM:1), 00:10:00
[New]
Compile
Edit...
Refresh
Rx
Tx
Xp
Err
File Transfer
Set Clock
Connect
Upgrade
Status
Web Server
Auto Update
Start
Calculator
XTerm COM1:115200
D:\
C:\Documents and Sett...
2:58 AM



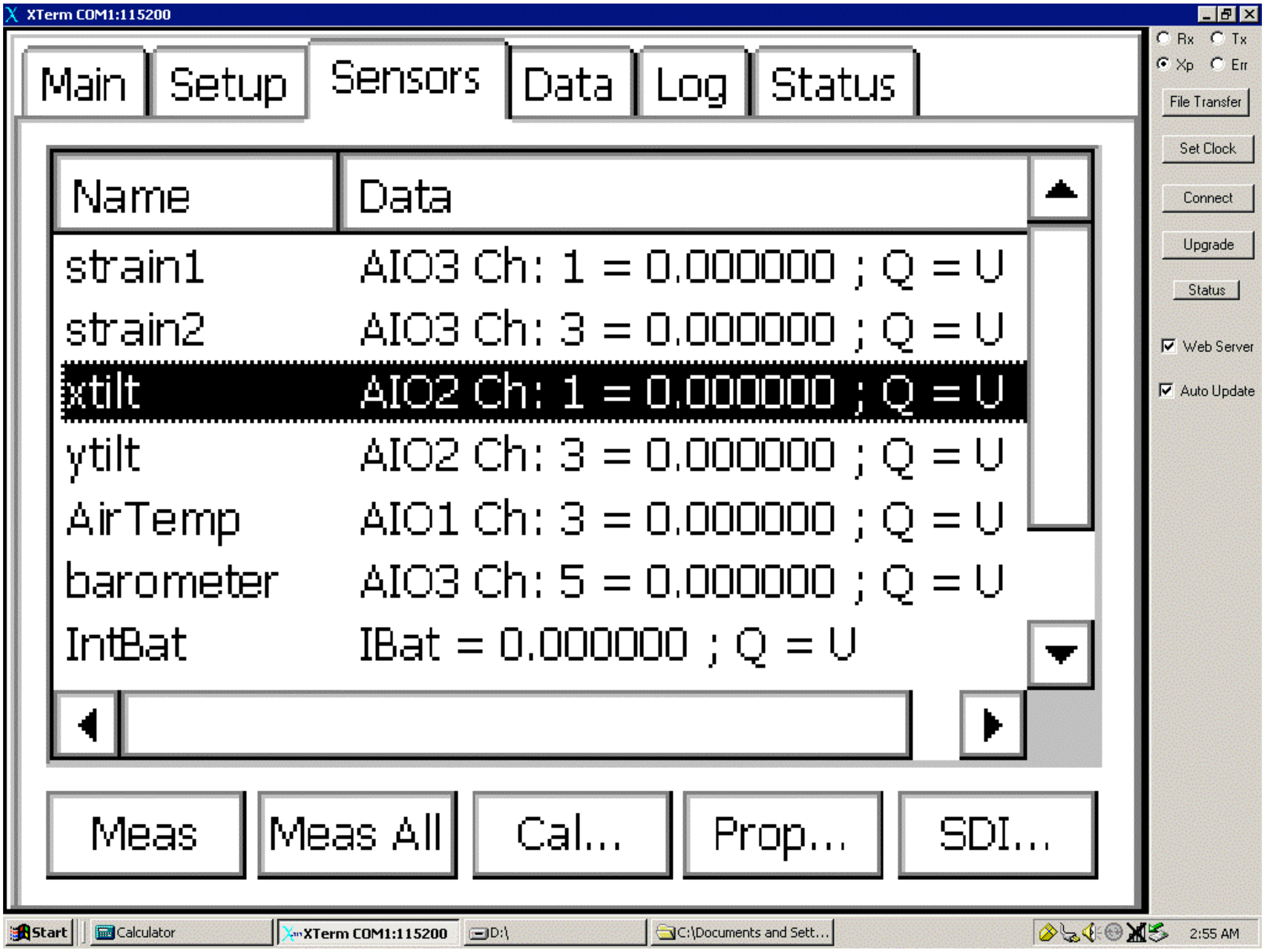
If you go to the SETUP menu, and scroll to SATLINK. you can;
Highlight SATLINK and EDIT. You will be able to see the id and initialization icons.



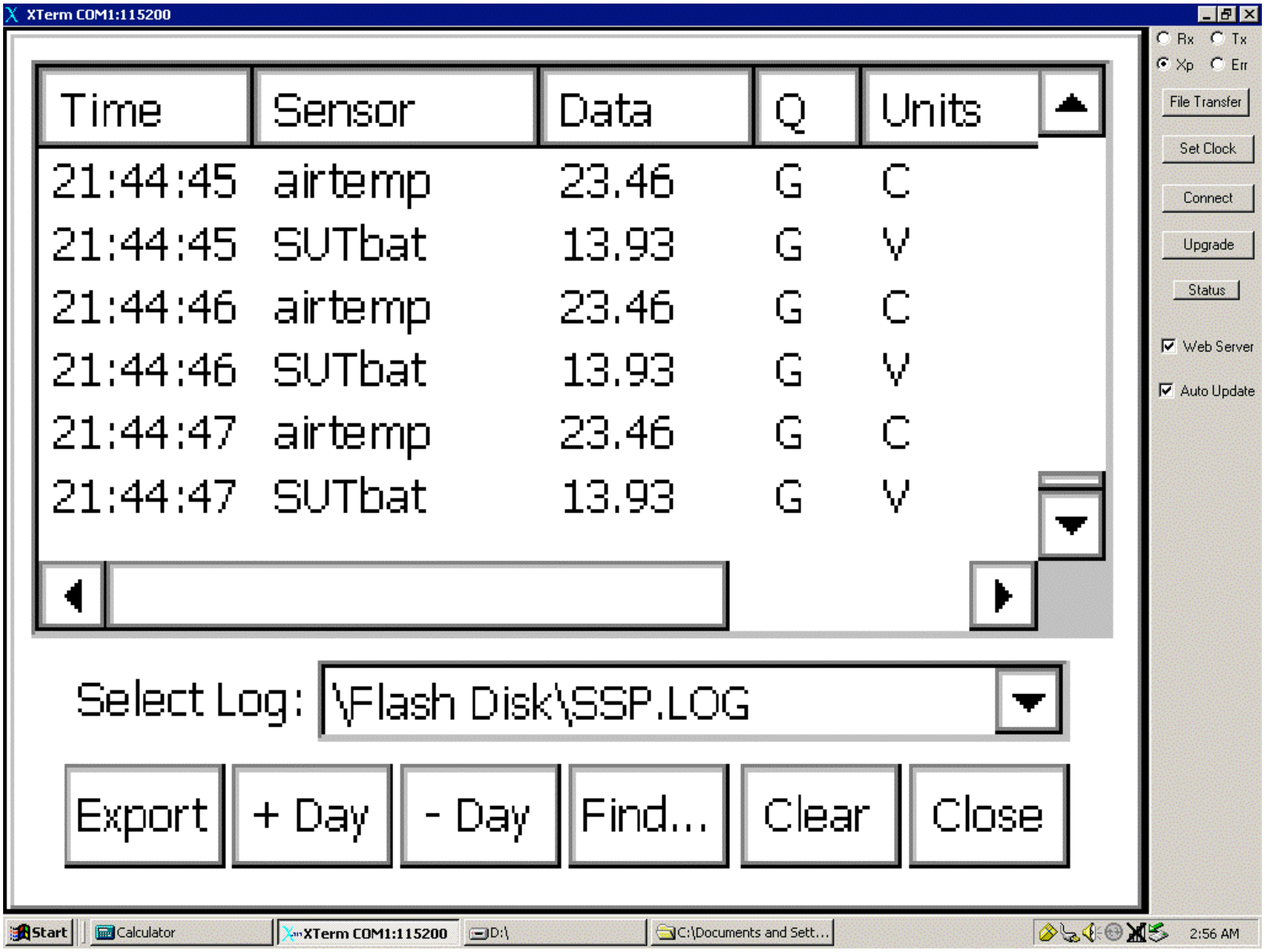
If you go to the SETUP menu, and scroll to SATLINK. you can;
Highlight SATLINK and EDIT. You will be able to see the id and initialization icons.



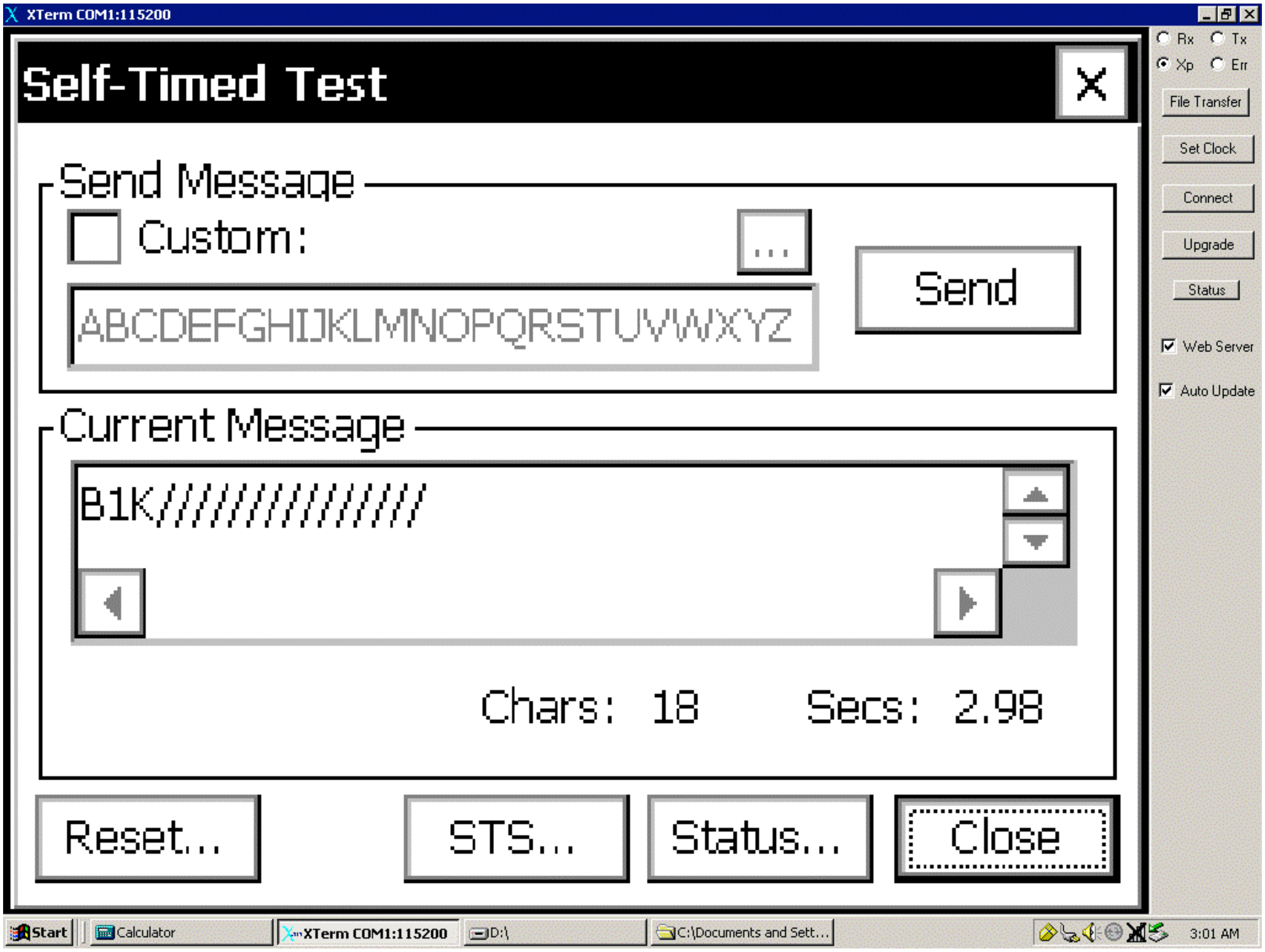
Highlight Self-Timed and Edit, You will be able to see the Channel, format, type, Transmit time,



If you go to SENSORS, you can see the current data measurement. You can also request a collection of data for all inputs or specific inputs. These values are not he same as the values which will be sent...

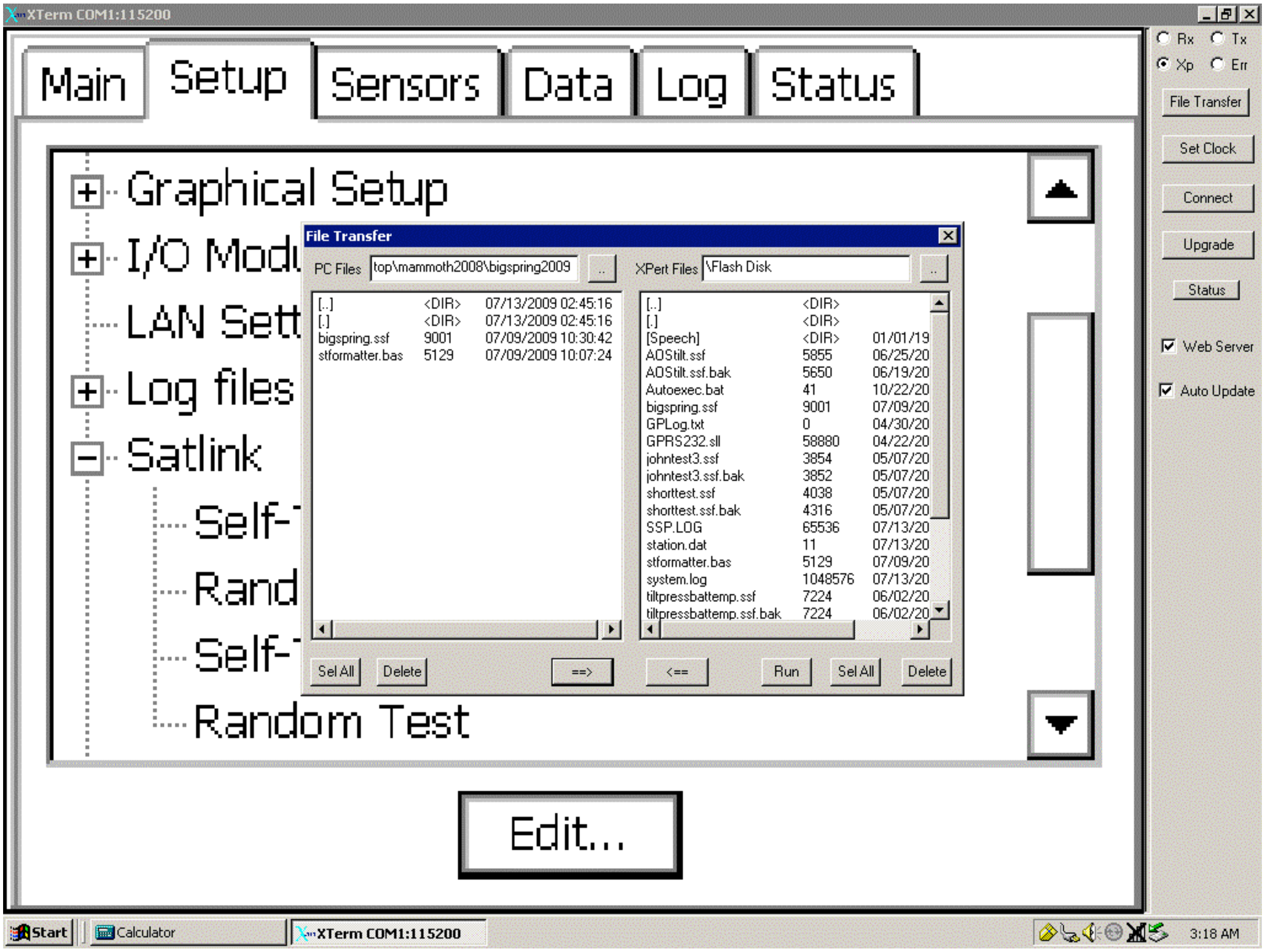


If you go to LOG, you can see the data that has been collected at the previous 10-minute window. In order to view all the data value decimal digits, put your cursor on the right verticle line to the left of the Q, and drag your cursor to the right. You will see the right digits displayed to their most significant digit.



Highlight Self-Timed Test and Edit, You will be able to see the current message which will be sent. Highlight Status , You will be able to scroll down through some of the information in the Satlink. Current time, when the unit was booted, time of next transmission, when the unit last sync to GPS Time.

Choose Close to return to the Main Menu.



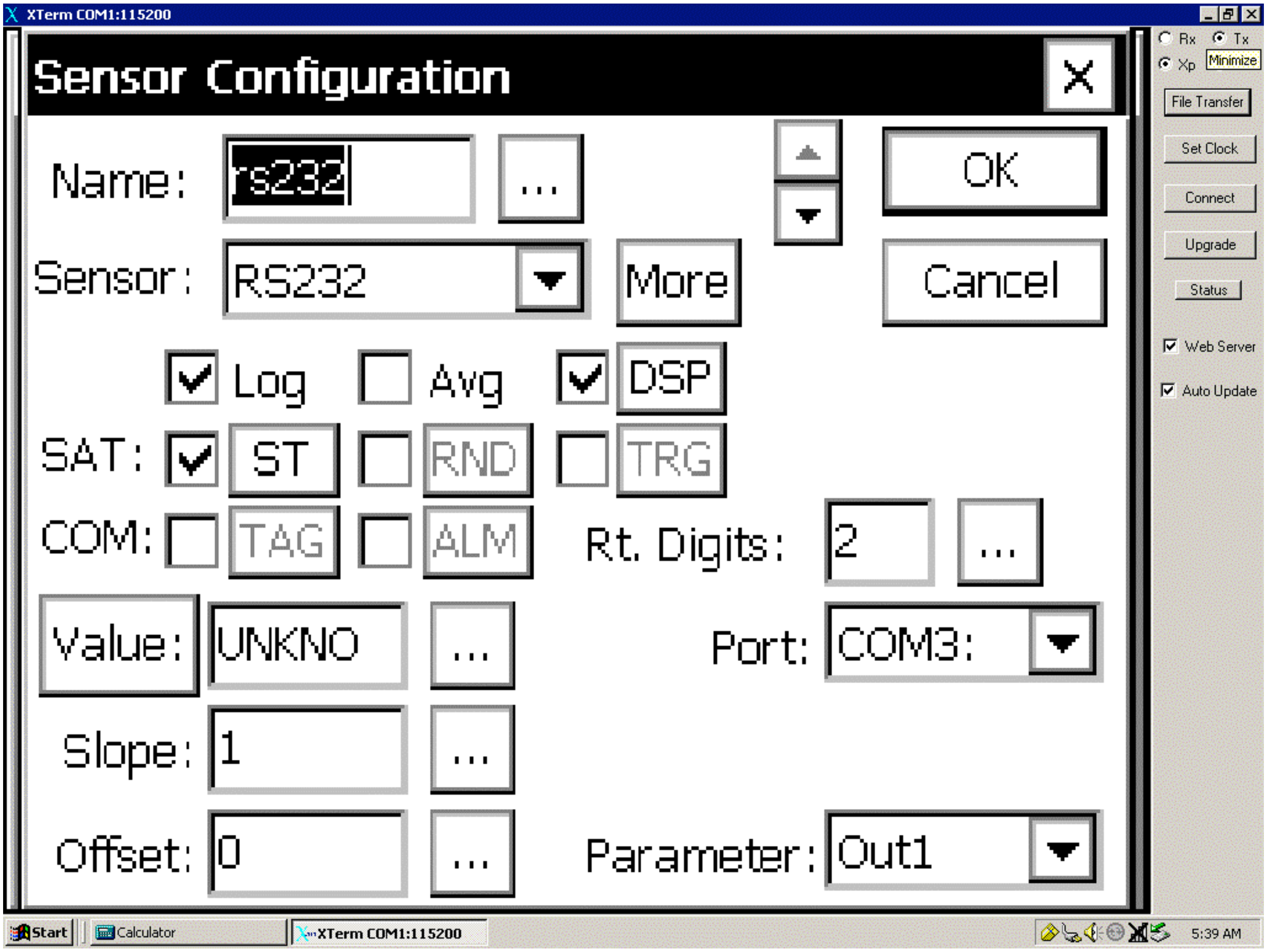
To LOAD the Program. Go to FILE TRANSFER. Hightlight it. A new window will appear on your desktop. Find the Folder where you have saved your Sutron 9210-SL2 programs. Find the program. Highlight it, in the lower section of the window, you'll see a right arrow, highlight it. The file transfer program will ask if you want to transfer programs. If this is the one you want say YES. Once you have the program you want, plus STFORMATTER. You can get out of File Transfer by hitting the X in the upper right corner.

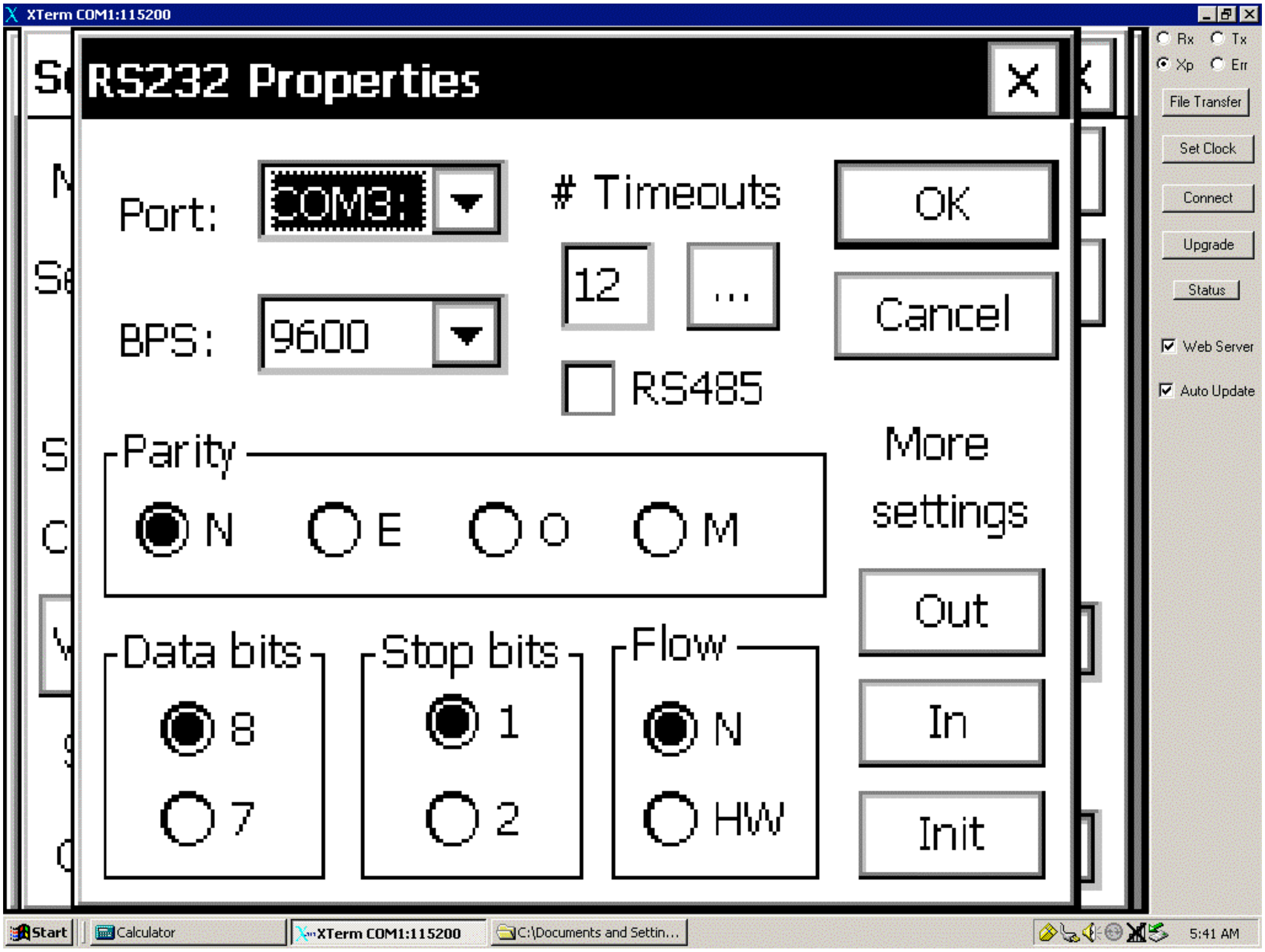
Now you will have to go back to the SETUP window and go to line 19,

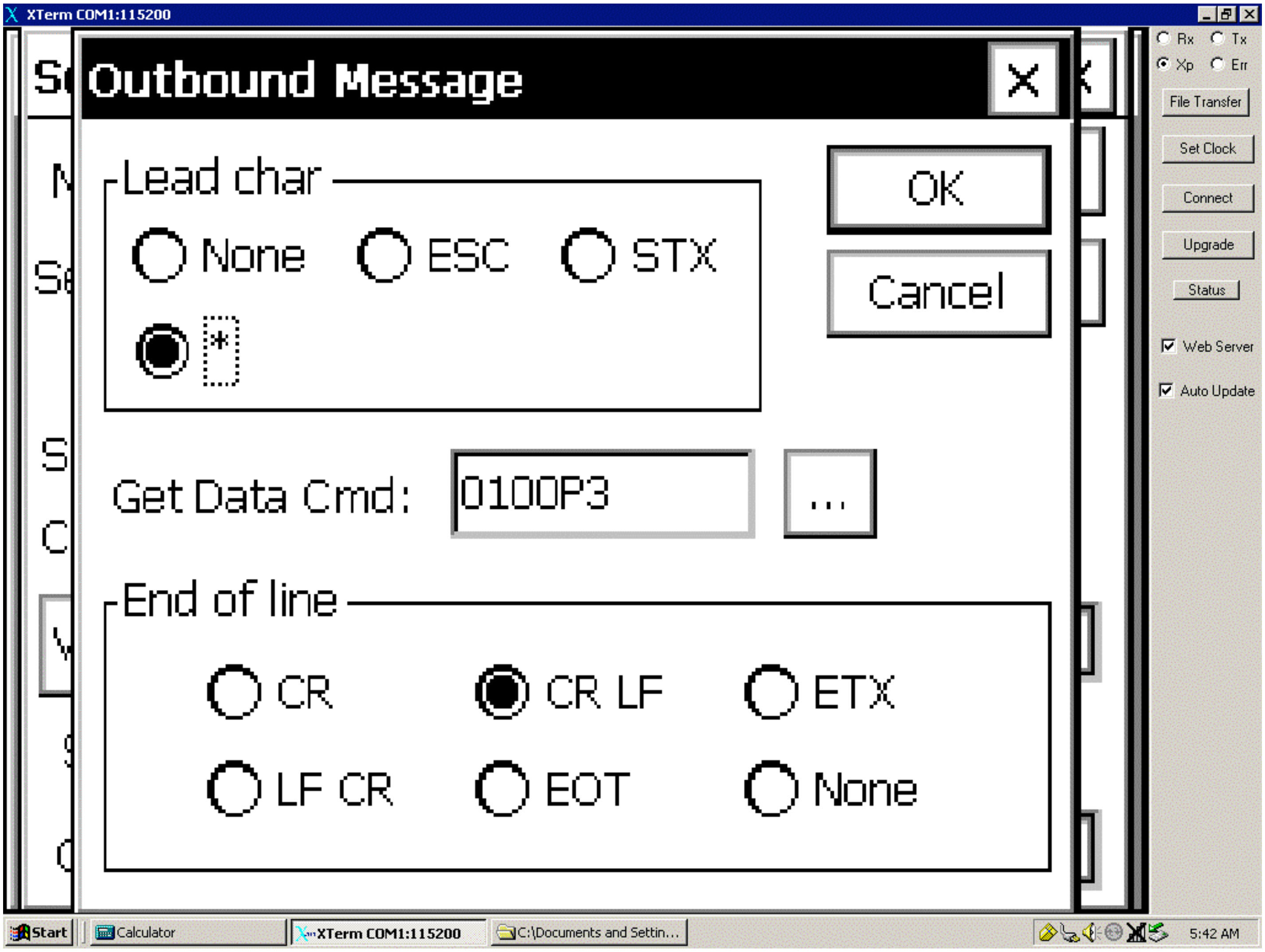
Once you have the program installed, go back to MAIN menu and hit START to start the recording and TXT.

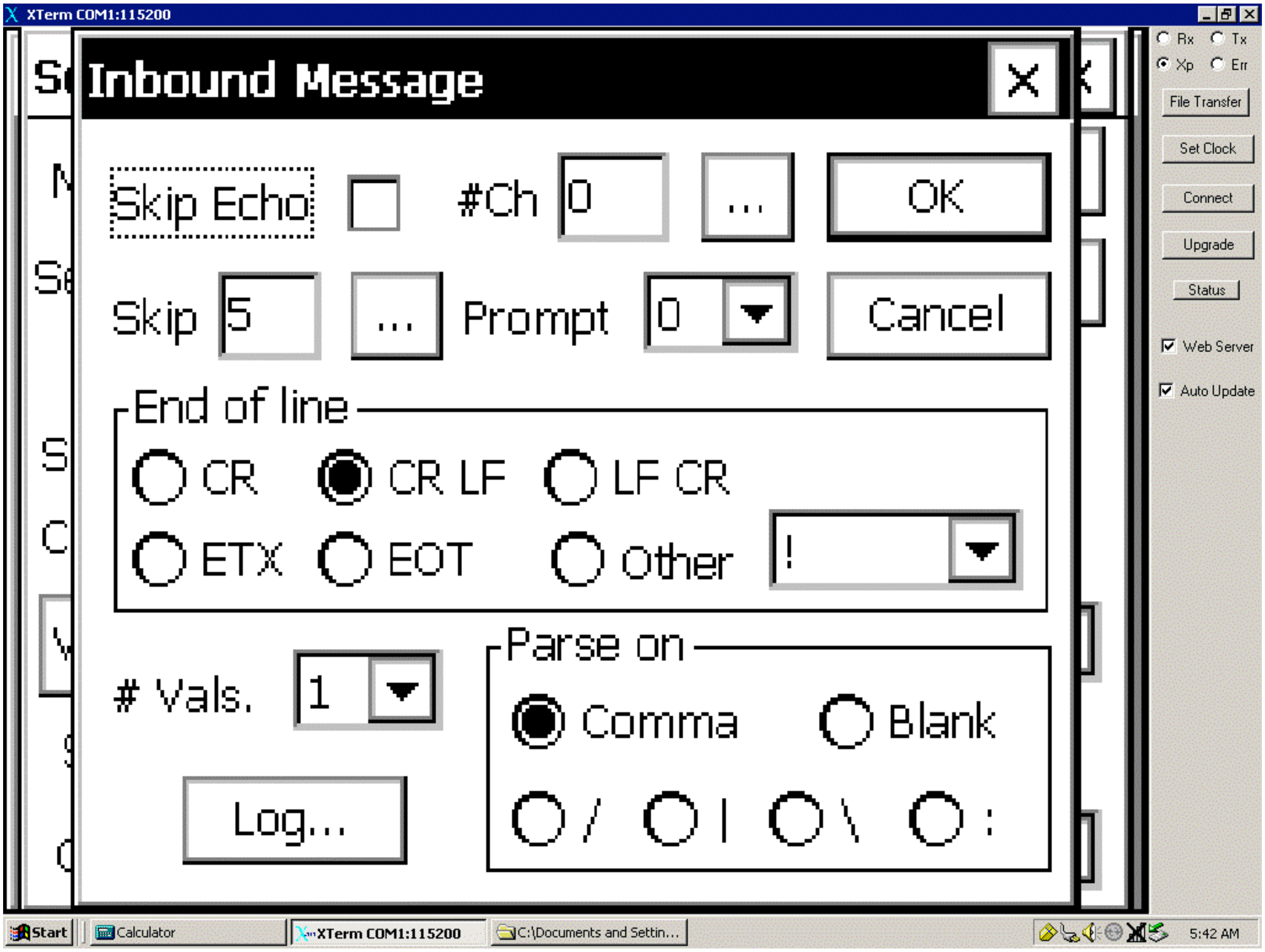
8.1.4 Programming for RS232 / Paroscientific / Pore Pressure at Postpile:

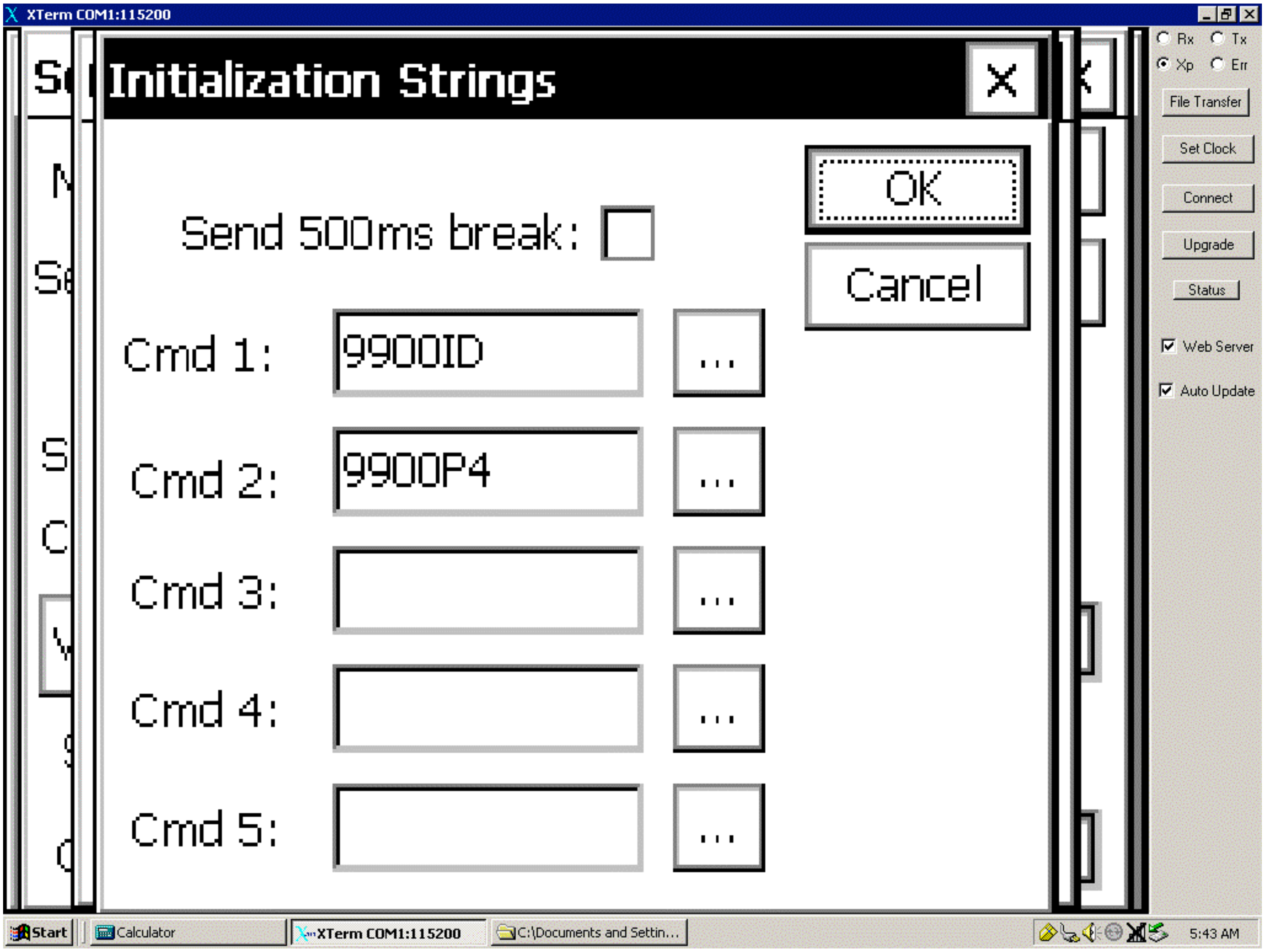
Go to Sensor Menu, go to EZ setup, scroll down to RS232, and select.




XTerm COM1:115200
RS232 Properties
Port:
COM3:
BPS:
9600
Timeouts
12
...
RS485
OK
Cancel
Parity
N
E
O
M
More settings
Data bits
8
7
Stop bits
1
2
Flow
N
HW
Out
In
Init
Rx
Tx
Xp
Err
File Transfer
Set Clock
Connect
Upgrade
Status
Web Server
Auto Update
Start
Calculator
XTerm COM1:115200
C:\Documents and Settin...
5:41 AM

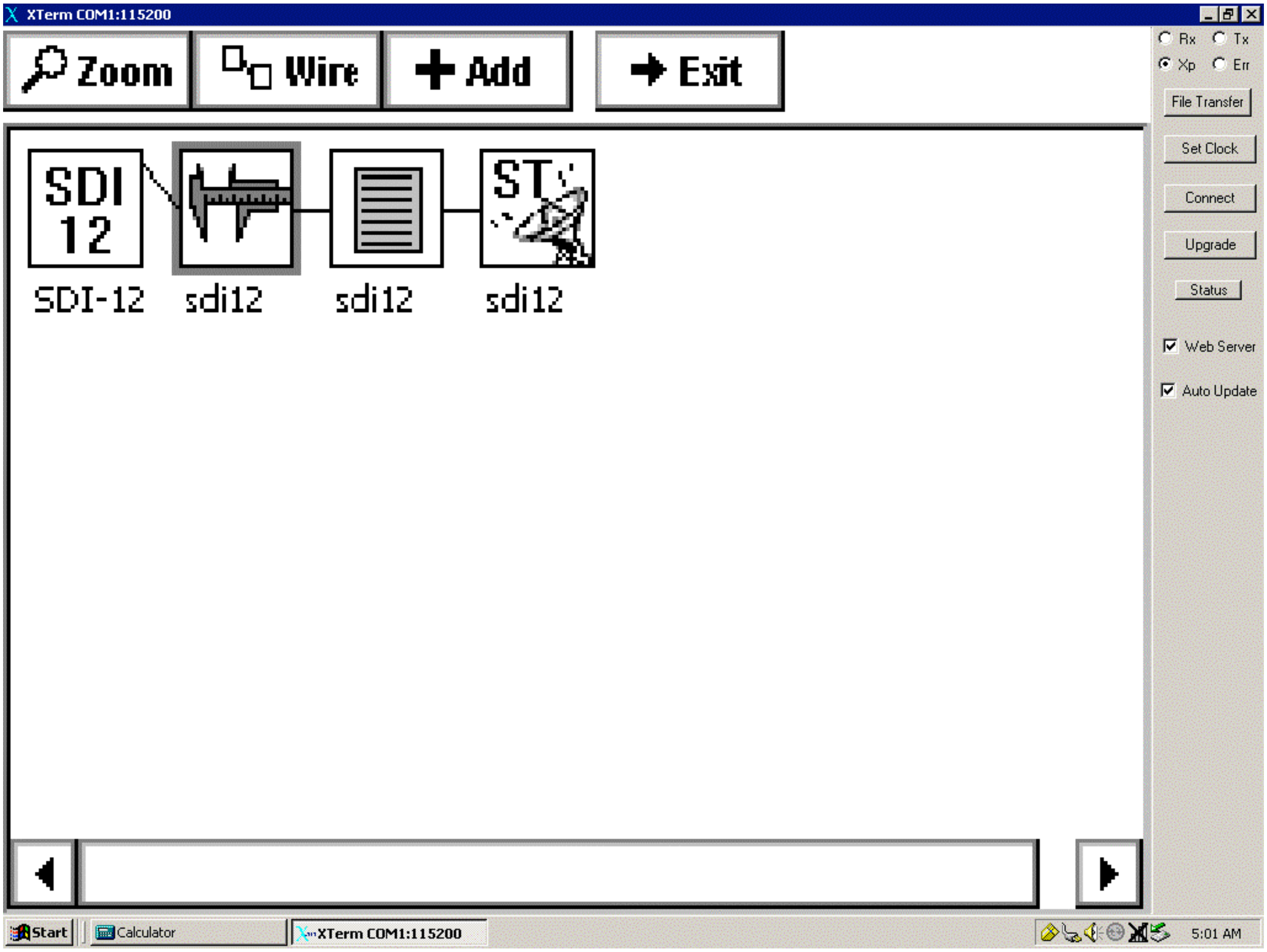

XTerm COM1:115200
Outbound Message
Lead char
None
ESC
STX
*
OK
Cancel
Get Data Cmd:
0100P3
...
End of line
CR
CR LF
ETX
LF CR
EOT
None
Rx
Tx
Xp
Err
File Transfer
Set Clock
Connect
Upgrade
Status
Web Server
Auto Update
Start
Calculator
XTerm COM1:115200
C:\Documents and Settin...
5:42 AM

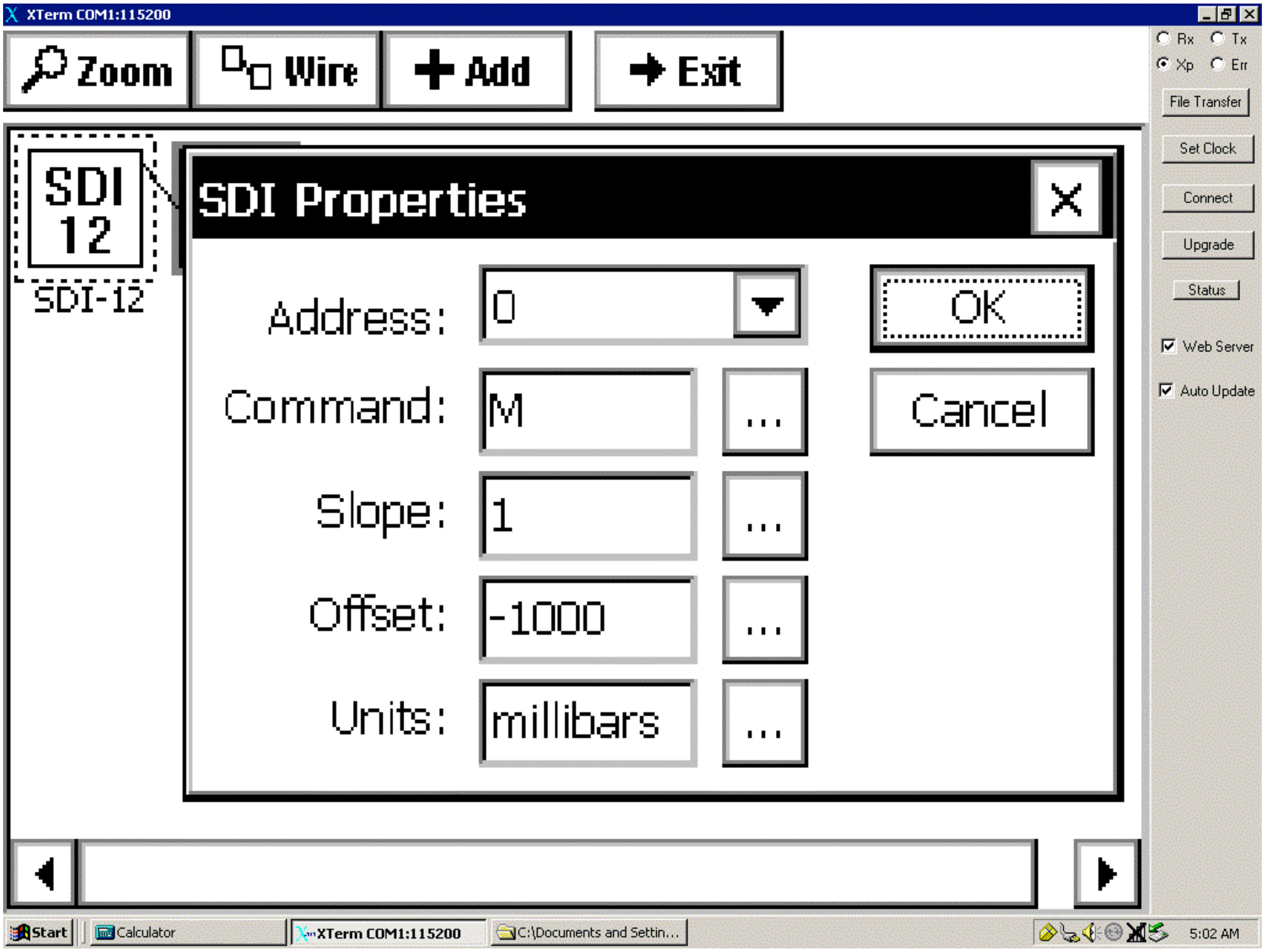

XTerm COM1:115200
Inbound Message
Skip Echo
#Ch
0
...
OK
Skip
5
...
Prompt
0
Cancel
End of line
CR
CR LF
LF CR
ETX
EOT
Other
!
Vals.
1
Log...
Parse on
Comma
Blank
/
|
\
:
Rx
Tx
Xp
Err
File Transfer
Set Clock
Connect
Upgrade
Status
Web Server
Auto Update
Start
Calculator
XTerm COM1:115200
C:\Documents and Settin...
5:42 AM

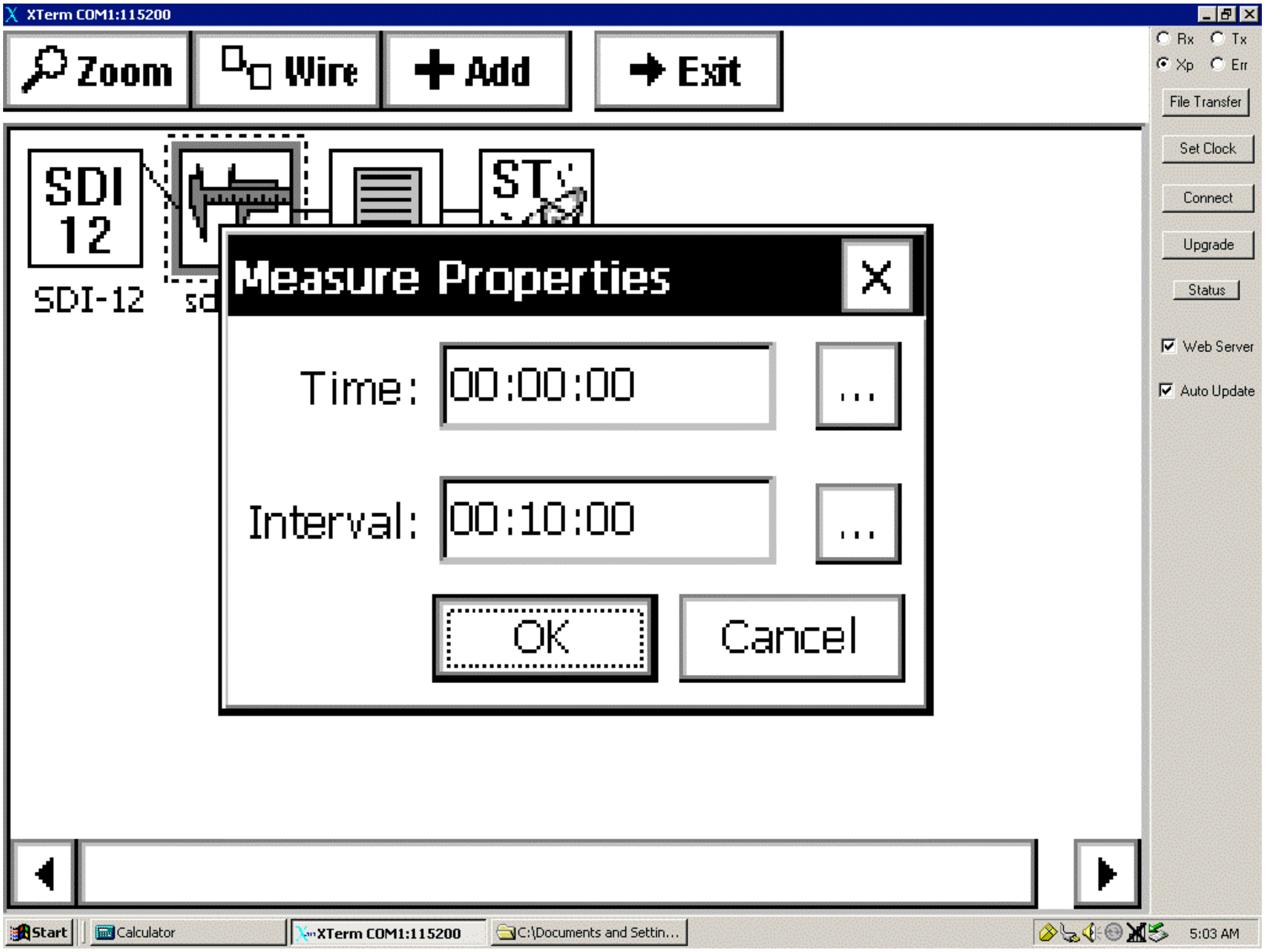

XTerm COM1:115200
Initialization Strings
Send 500ms break:
Cmd 1:
9900ID
Cmd 2:
9900P4
Cmd 3:
Cmd 4:
Cmd 5:
OK
Cancel
Rx
Tx
Xp
Err
File Transfer
Set Clock
Connect
Upgrade
Status
Web Server
Auto Update
Start
Calculator
XTerm COM1:115200
C:\Documents and Settin...
5:43 AM

8.1.5 Programming for SDI12 at Big Spring Pore Pressure:

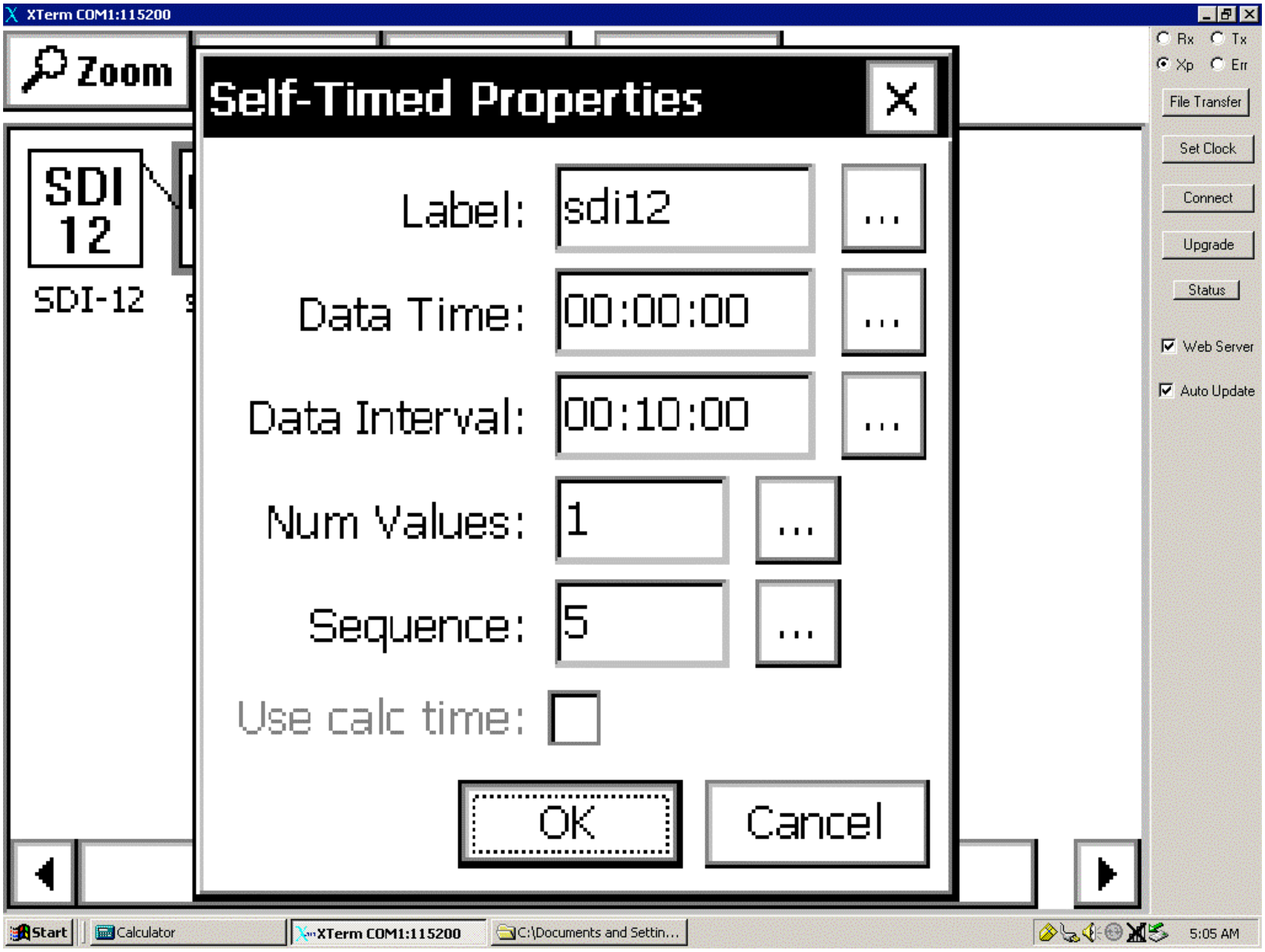
Go to Setup Menu, scroll down to Graphical Setup, open it, hightlight and open SDI12,




XTerm COM1:115200
Zoom
Wire
Add
Exit
Rx
Tx
Xp
Err
File Transfer
Set Clock
Connect
Upgrade
Status
Web Server
Auto Update
SDI 12
SDI-12
SDI Properties
Address:
0
Command:
M
Slope:
1
Offset:
-1000
Units:
millibars
OK
Cancel
Start
Calculator
XTerm COM1:115200
C:\Documents and Settin...
5:02 AM


XTerm COM1:115200
Zoom
Wire
Add
Exit
Rx
Tx
Xp
Err
File Transfer
Set Clock
Connect
Upgrade
Status
Web Server
Auto Update
SDI 12
SDI-12
Measure Properties
Time:
00:00:00
Interval:
00:10:00
OK
Cancel
Start
Calculator
XTerm COM1:115200
C:\Documents and Settin...
5:03 AM


XTerm COM1:115200
Log Properties
Log Name
\Flash Disk\SSP.LOG
Sensor Name
sdi12
...
Precision (right digits):
2
Log scheduled time:
OK
Cancel
Rx
Tx
Xp
Err
File Transfer
Set Clock
Connect
Upgrade
Status
Web Server
Auto Update
Start
Calculator
XTerm COM1:115200
C:\Documents and Settin...
5:04 AM


XTerm COM1:115200
Zoom
SDI 12
SDI-12
Self-Timed Properties
Label:
sdi12
Data Time:
00:00:00
Data Interval:
00:10:00
Num Values:
1
Sequence:
5
Use calc time:
OK
Cancel
Rx
Tx
Xp
Err
File Transfer
Set Clock
Connect
Upgrade
Status
Web Server
Auto Update
Start
Calculator
XTerm COM1:115200
C:\Documents and Settin...
5:05 AM

8.2 Programming the ZENO:

The following is the programming as installed at Motocross. Each site will have different parameter inputs as seen in the above definitions. These data recorders have been superceded by the Sutron 9210/SL2.
This is for reference purposes when viewing data older than august 2007.

HyperTerminal 1.0 -- HyperTerminal data file

8.2.1 MOTOCROSS

```
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 10:
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 10:
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
```

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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 10:
Item  1: Sensor Type Code                  2 (18-bit Single-Ended A to D)
Item  2: Sensor Name                       dt02
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 4 of 10:
Item  1: Sensor Type Code                  2 (18-bit Single-Ended A to D)
Item  2: Sensor Name                       shrt
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 5 of 10:

Item 1: Sensor Type Code	2 (18-bit Single-Ended A to D)
Item 2: Sensor Name	mxbp
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 6 of 10:

Item 1: Sensor Type Code	2 (18-bit Single-Ended A to D)
Item 2: Sensor Name	x-axis
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	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 10:

Item 1: Sensor Type Code	2 (18-bit Single-Ended A to D)

Item 2: Sensor Name y-axis
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 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 10:
Item 1: Sensor Type Code 2 (18-bit Single-Ended A to D)
Item 2: Sensor Name TEMP
Item 3: Sensor Input Channel 5-
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 10:
Item 1: Sensor Type Code 2 (18-bit Single-Ended A to D)
Item 2: Sensor Name short
Item 3: Sensor Input Channel 5+
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 10 of 10:
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



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 10:
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 10:
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 10:
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 10:
Item 1: Process Category 1 : General
Item 2: Process Number 2 : Averaging Process
Item 3: Input for Average Data S4 : shrt

> 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 10:
Item 1: Process Category 1 : General
Item 2: Process Number 2 : Averaging Process
Item 3: Input for Average Data S5 : mxbp

> 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 10:

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 10:
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 10:
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 10:
Item 1: Process Category 1 : General
Item 2: Process Number 2 : Averaging Process
Item 3: Input for Average Data S9 : 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 10 of 10:
Item 1: Process Category 1 : General
Item 2: Process Number 2 : Averaging Process
Item 3: Input for Average Data S10 : 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 10:
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 10:
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 10:
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 10:

Item 1: Field Type code	12 : GOES Binary Format Field
Item 2: Output Message(s)	1
Item 3: Field Name	shrt
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 10:

Item 1: Field Type code	12 : GOES Binary Format Field
Item 2: Output Message(s)	1
Item 3: Field Name	mxbp
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 10:

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 10:

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

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 10:

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 10:

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	P9.1
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 10 of 10:

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	P10.1
Item 5: Field Decimal Places	0
Item 6: Field Width	3

```
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)

> 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

> 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)


> 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

> 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

> 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:  263590c4      (Data Collection Platform Address)
Item  2:  104           (Self-Timed Transmit Channel Number)
Item  3:  00:00:10:00   (Self-Timed Transmission Interval)
Item  4:  00:04:50      (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

> 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)

HyperTerminal 1.0 -- HyperTerminal data file

8.2.2 BIG SPRING

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 10:
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 10:
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 10:
Item  1: Sensor Type Code                2 (18-bit Single-Ended A to D)
Item  2: Sensor Name                    dt02
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 4 of 10:
Item  1: Sensor Type Code                2 (18-bit Single-Ended A to D)
Item  2: Sensor Name                     shrt
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 5 of 10:

Item 1: Sensor Type Code	2 (18-bit Single-Ended A to D)
Item 2: Sensor Name	mxbp
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 6 of 10:

Item 1: Sensor Type Code	2 (18-bit Single-Ended A to D)
Item 2: Sensor Name	x-axis
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	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 10:

Item 1: Sensor Type Code	2 (18-bit Single-Ended A to D)
Item 2: Sensor Name	y-axis
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   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 10:
Item 1: Sensor Type Code   2 (18-bit Single-Ended A to D)
Item 2: Sensor Name   TEMP
Item 3: Sensor Input Channel   5-
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 10:
Item 1: Sensor Type Code   2 (18-bit Single-Ended A to D)
Item 2: Sensor Name   short
Item 3: Sensor Input Channel   5+
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 10 of 10:

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

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 10:

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 10:
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 10:
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 10:
Item  1: Process Category                1  : General
Item  2: Process Number                  2  : Averaging Process
Item  3: Input for Average Data         S4  : shrt

> 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 10:
Item  1: Process Category                1  : General
Item  2: Process Number                  2  : Averaging Process
Item  3: Input for Average Data         S5  : mxbp

> 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 10:
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 10:

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 10:

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 10:

Item 1: Process Category	1 : General
Item 2: Process Number	2 : Averaging Process
Item 3: Input for Average Data	S9 : 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 10 of 10:

Item 1: Process Category	1 : General
Item 2: Process Number	2 : Averaging Process
Item 3: Input for Average Data	10 : 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 10:
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 10:
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 10:
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 10:

Item 1: Field Type code	12 : GOES Binary Format Field
Item 2: Output Message(s)	1
Item 3: Field Name	shrt
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 10:

Item 1: Field Type code	12 : GOES Binary Format Field
Item 2: Output Message(s)	1
Item 3: Field Name	mxbp
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 10:

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 10:

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


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 10:
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 10:
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       P9.1
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 10 of 10:
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       P10.1
Item 5: Field Decimal Places           0
Item 6: Field Width                    3



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)

> 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

> 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)


> 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

> 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
```

```
> 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:  2636A250      (Data Collection Platform Address)
Item  2:  104           (Self-Timed Transmit Channel Number)
Item  3:  00:00:10:00   (Self-Timed Transmission Interval)
Item  4:  00:01:10      (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

> 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)

8.2.3 POSTPILE

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 = 05/12/16 00:49:47
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.

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

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 10:
Item 1: Sensor Type Code 3 (18-bit Differential A to D)
Item 2: Sensor Name popa
Item 3: Sensor Input Channel 1
Item 4: Analog Channel Gain 1
Item 5: Analog Channel Attenuation 4
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

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 10:

Item 1: Sensor Type Code	3 (18-bit Differential A to D)
Item 2: Sensor Name	popb
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

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 10:

Item 1: Sensor Type Code	3 (18-bit Differential A to D)
Item 2: Sensor Name	popc
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

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 10:

Item 1: Sensor Type Code	3 (18-bit Differential A to D)
Item 2: Sensor Name	popt
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	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

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 10:

Item 1: Sensor Type Code	2 (18-bit Single-Ended A to D)
Item 2: Sensor Name	pobp
Item 3: Sensor Input Channel	6+
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

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 10:

Item 1: Sensor Type Code	2 (18-bit Single-Ended A to D)
Item 2: Sensor Name	pob2
Item 3: Sensor Input Channel	5+
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

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 10:
Item  1: Sensor Type Code              13 (SDI-12 Serial Sensor)
Item  2: Sensor Name                   PARO
Item  3: Sensor Input Channel          COM2
Item 10: Sensor Sample Count           4
Item 11: Maximum Sensor Readings       1
Item 12: Sensor Timing Loop            4 (10.0 seconds)
Item 16: Retry Count                   3
Item 17: SDI-12 Address                0

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 10:
Item  1: Sensor Type Code                 2 (18-bit Single-Ended A to D)
Item  2: Sensor Name                      short
Item  3: Sensor Input Channel             6-
Item  4: Analog Channel Gain              1
Item  5: Analog Channel Attenuation       4
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

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 10:
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

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 10 of 10:
Item  1: Sensor Type Code                2 (18-bit Single-Ended A to D)
Item  2: Sensor Name                     temp
Item  3: Sensor Input Channel            7-
Item  4: Analog Channel Gain             1
Item  5: Analog Channel Attenuation      4
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      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              2 (1.0 seconds)
Item 13: Conversion Coefficient A        0
Item 14: Conversion Coefficient B        3.125e-06
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 11:
Item  1: Process Category                1  : General
Item  2: Process Number                  2  : Averaging Process
Item  3: Input for Average Data         S1  : popa

> 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 11:
Item 1: Process Category 1 : General
Item 2: Process Number 2 : Averaging Process
Item 3: Input for Average Data S2 : popb

> 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 11:
Item 1: Process Category 1 : General
Item 2: Process Number 2 : Averaging Process
Item 3: Input for Average Data S3 : popc

> 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 11:
Item 1: Process Category 1 : General
Item 2: Process Number 2 : Averaging Process
Item 3: Input for Average Data S4 : popt

> 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 11:
Item 1: Process Category 1 : General
Item 2: Process Number 2 : Averaging Process
Item 3: Input for Average Data S5 : pobp

> 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 11:
Item 1: Process Category 1 : General
Item 2: Process Number 2 : Averaging Process
Item 3: Input for Average Data S6 : pob2

```
> 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 11:
Item  1: Process Category              5  : Arithmetic
Item  2: Process Number                2  : Add Constant To Data Process
Item  3: Input for Data                S7.1 : PARO
Item  4: Constant Additive             -500

> 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 11:
Item  1: Process Category              5  : Arithmetic
Item  2: Process Number                5  : Multiply Data By Constant Process
Item  3: Input for Data                P7.1
Item  4: Constant Multiplier           100

> 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 11:
Item  1: Process Category              1  : General
Item  2: Process Number                2  : Averaging Process
Item  3: Input for Average Data       S8  : 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 10 of 11:
Item  1: Process Category              1  : General
Item  2: Process Number                2  : Averaging Process
Item  3: Input for Average Data       S9  : Battery

> 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 11 of 11:
Item  1: Process Category              4  : Special Sensor
Item  2: Process Number                1  : NTC Thermistor Process
Item  3: Input for Thermistor Voltage S10 : temp
Item  4: a-Coefficient                0.001288
Item  5: b-Coefficient                0.0002356
Item  6: c-Coefficient                9.557e-08
Item  7: R2 Resistance                 5020

> 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 10:
Item 1: Field Type code                12 : GOES Binary Format Field
Item 2: Output Message(s)                  1
Item 3: Field Name                        popa
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 10:
Item 1: Field Type code 12 : GOES Binary Format Field
Item 2: Output Message(s) 1
Item 3: Field Name popb
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 10:
Item 1: Field Type code 12 : GOES Binary Format Field
Item 2: Output Message(s) 1
Item 3: Field Name popc
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 10:
Item 1: Field Type code 12 : GOES Binary Format Field
Item 2: Output Message(s) 1
Item 3: Field Name popt
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 10:
Item 1: Field Type code 12 : GOES Binary Format Field
Item 2: Output Message(s) 1
Item 3: Field Name pobp
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 10:
Item 1: Field Type code 12 : GOES Binary Format Field
Item 2: Output Message(s) 1
Item 3: Field Name pob2
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 10:
Item 1: Field Type code 12 : GOES Binary Format Field
Item 2: Output Message(s) 1
Item 3: Field Name PARO
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 8 of 10:
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 P9.1
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 10:
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      P10.1
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 10 of 10:
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      P11.1
Item 5: Field Decimal Places           3
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)

> 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
```

```
> 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)

> 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

> e
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: 44  Checksum: 171

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

> 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



> 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)

> 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


> 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)> c

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:  26356040      (Data Collection Platform Address)
Item  2:  104           (Self-Timed Transmit Channel Number)
Item  3:  00:00:10:00   (Self-Timed Transmission Interval)
Item  4:  00:00:00      (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:     05/12/16 01:27:24
Enter new Date and Time: 05/12/16 01:30:00


> 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:  26356040      (Data Collection Platform Address)
Item  2:  104           (Self-Timed Transmit Channel Number)
Item  3:  00:00:10:00   (Self-Timed Transmission Interval)
Item  4:  00:00:00      (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)
> q

> i
Current Date and Time:           05/12/16 01:32:21
Enter new Date and Time:         05/12/16 01:33:00
GOES Transmitter Initialization ... Successful.

Note: Next sample interval begins in 6 minutes and 54 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:  26356040      (Data Collection Platform Address)
Item  2:  104           (Self-Timed Transmit Channel Number)
Item  3:  00:00:10:00   (Self-Timed Transmission Interval)
Item  4:  00:00:00      (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)

> q

Verifying GOES Transmitter Initialization ... Successful.
Exiting user interface.
```

8.3 ZENOSOFT CONFIGURATION:

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 complete initialization

Use the above information, and the instructions from the ZENO – 3200 User Manual to configure the ZENO Data Collection Platform in the following formats.

8.3.1 MOTOCROSS ZENO CONFIGURATION

```
* 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: 73/10/24 16:05:57
PARAM1 600 0 14 2 240 20 1043 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 641044676 104 2560 1079 1 0
PARAM7 151 0 1280 0 10000
PARAM8 "NONE" "NONE" "NONE" "NONE" "NONE" "NONE" "" "ZENO"
SENSOR 3 "dt01" 1 0 0 0 0 0 0 8 0 2 0 0.5 0 0
SENSOR 3 "dt01" 1 0 3 0 0 0 0 8 0 2 0 0.5 0 0
SENSOR 3 "dt02" 2 0 3 0 0 0 0 8 0 2 0 0.5 0 0
SENSOR 2 "shrt" 5 0 0 0 0 0 0 8 0 2 0 0.5 0 0
SENSOR 3 "bgbp" 3 0 3 0 0 0 0 8 0 2 0 0.5 0 0
SENSOR 2 "x-axis" 11 0 3 0 0 0 0 8 0 2 0 0.5 0 0
SENSOR 2 "y-axis" 4 0 3 0 0 0 0 8 0 2 0 0.5 0 0
```

```
SENSOR 2 "TEMP" 12 0 2 0 2 0 0 8 0 2 0 3.125e-06 0 0
SENSOR 2 "short" 5 0 3 0 0 0 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 4 1 S8.1 0.001288 0.0002356 9.557e-08 5000
PROCESS 1 2 S9.1
PROCESS 1 2 S10.1
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 "shrt" P4.1 0 3 1
DATA 12 1 "bgbp" 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 3 3 1
DATA 12 1 "short" P9.1 0 3 1
DATA 12 1 "BATTERY" P10.1 0 3 1
EOF
```

8.3.2 BIG SPRING ZENO CONFIGURATION

```
* 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: 73/10/24 15:55:35
PARAM1 600 0 14 2 240 20 1043 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 641114704 104 2560 266 1 0
PARAM7 151 0 1280 0 10000
PARAM8 "NONE" "NONE" "NONE" "NONE" "NONE" "NONE" "" "ZENO"
SENSOR 3 "dt01" 1 0 0 0 0 0 0 8 0 2 0 0.5 0 0
SENSOR 3 "dt01" 1 0 3 0 0 0 0 8 0 2 0 0.5 0 0
SENSOR 3 "dt02" 2 0 3 0 0 0 0 8 0 2 0 0.5 0 0
SENSOR 2 "short" 5 0 0 0 0 0 0 8 0 2 0 0.5 0 0
SENSOR 3 "bgbp" 3 0 3 0 0 0 0 8 0 2 0 0.5 0 0
SENSOR 2 "x-axis" 11 0 3 0 0 0 10 8 0 2 0 0.5 0 0
SENSOR 2 "y-axis" 4 0 3 0 0 0 10 8 0 2 0 0.5 0 0
SENSOR 2 "TEMP" 12 0 2 0 2 0 0 8 0 2 0 3.125e-06 0 0
SENSOR 13 "paro" 1 0 0 0 0 0 0 4 1 4 0 1 0 3 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 4 1 S8.1 0.001288 0.0002356 9.557e-08 5000
PROCESS 5 5 S9.1 100
PROCESS 1 2 S10.1
```

```
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 "bgbp" 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 3 3 1
DATA 12 1 "paro" P9.1 0 3 1
DATA 12 1 "BATTERY" P10.1 0 3 1
EOF
□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□
```

8.3.3 POSTPILE ZENO CONFIGURATION

```
* 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: 05/07/28 00:43:19
PARAM1 600 0 14 2 240 20 1043 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 641032256 104 2560 0 1 0
PARAM7 151 0 1280 0 10000
PARAM8 "NONE" "NONE" "NONE" "NONE" "NONE" "NONE" "" "ZENO"
SENSOR 3 "popa" 1 0 2 0 0 0 0 8 0 2 0 0.5 0 0
SENSOR 3 "popb" 2 0 3 0 0 0 0 8 0 2 0 0.5 0 0
SENSOR 3 "popc" 3 0 3 0 0 0 0 8 0 2 0 0.5 0 0
SENSOR 3 "popt" 4 0 3 0 0 0 0 8 0 2 0 0.5 0 0
SENSOR 2 "pobp" 6 0 3 0 0 0 0 8 0 2 0 0.5 0 0
SENSOR 2 "pob2" 5 0 3 0 0 0 0 8 0 2 0 0.5 0 0
SENSOR 13 "PARO" 1 0 0 0 0 0 0 4 1 4 0 1 0 3 0
SENSOR 2 "short" 13 0 2 0 0 0 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
SENSOR 2 "temp" 14 0 2 0 2 0 0 1 0 2 0 3.125e-06 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 5 2 S7.1 -500
PROCESS 5 5 P7.1 100
PROCESS 1 2 S8.1
PROCESS 1 2 S9.1
PROCESS 4 1 S10.1 0.001288 0.0002356 9.557e-08 5020
DATA 12 1 "popa" P1.1 0 3 1
DATA 12 1 "popb" P2.1 0 3 1
DATA 12 1 "popc" P3.1 0 3 1
DATA 12 1 "popt" P4.1 0 3 1
DATA 12 1 "pobp" P5.1 0 3 1
DATA 12 1 "pob2" P6.1 0 3 1
DATA 12 1 "PARO" P8.1 0 3 1
DATA 12 1 "short" P9.1 0 3 1
DATA 12 1 "BATTERY" P10.1 0 3 1
DATA 12 1 "temp" P11.1 3 3 1
EOF
□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□
```

8.4 INSTALLATION FIELD NOTES:

Installation DT1/2 Dilatometer MAMMOTH99

Site Name ________________________________ *time* __________________________ *date*

*Instrument #*___________________ *Depth of instrument*___________
Surface test

Wire Color	Pin number	component		ohm's	Voltage downhole	Voltage PC
Black	1	Valve 1 close +	60ohm	_________	________	__________
White	2	Valve 1 & 2 close -		_________	________	__________
Red	3	Valve 2 close +	60ohm	_________	________	__________
Green	4	Valve 1 & 2 close -		_________	________	__________
Orange	5	DT1 supply	IN+ .430ohm	________	________	__________
Blue	6	DT1& 2 supply com	IN – 5M	_________	________	__________
Wht/Blk trace	7	DT1sig out	OUT + 19K	_________	________	__________
Red/Blk trace	8	DT1com	OUT –	_________	________	__________
Grn/Blk trace	9	DT2 supply	IN + .430ohm	_________	________	__________
Org/Blk trace	10	DT1&2 supply com	IN – 5M	_________	________	__________
Blu/Blk trace	11	DT2 sig out	OUT + 19K	_________	________	__________
Blk/Wht trace	12	DT2 com	OUT –	_________	________	__________
Red/Wht trace	13	NC	NC	_________	________	__________
Grn/Wht trace	14	NC	NC	_________	________	__________
Blu/Wht trace	15	NC	NC	_________	________	__________
Blk/Red trace	16	NC	NC	_________	________	__________

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 B________ ___________

Valve 1 open___close___ Valve 2 open___close____ time________date______
PC DVM PC DVM
Comp A ________ __________ Comp B________ __________

Valve 1 open___close___ Valve 2 open___close____ time________date______
PC DVM PC DVM
Comp A ________ __________ Comp B________ __________

ELECTRONICS: POWER UP (valves closed?) ____________
SHUT DOWN (insure valves are open?)____________
Valve 1 open___close___ Valve 2 open___close____ time________date______
PC DVM PC DVM
Comp A________ __________ Comp B________ __________

9.0 ACKNOWLEDGEMENTS:

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10. DRAWINGS, SCHEMATICS AND PHOTOS

10.1 NONSHRINK SET GROUT FOR CEMENTING INSTRUMENT TO BOREHOLE

BASF
The Chemical Company

PRODUCT DATA

3 03 36 00 **Grouts**

SET® GROUT

General-construction mineral-aggregate nonshrink grout

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.

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

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^3 (0.012 m^3) 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.

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 BASF 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 80,000 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 BASF 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

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[1]				ASTM C230
Approximate water, gallons (L)	1.0 (3.8)			
Flow, 5 drops, %	126 – 145			
Compressive strength, psi (MPa)				ASTM C 942, according to ASTM C 1107
		Consistency		
	Flowable[2]	**Plastic**[3]	**Stiff**[4]	
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 BASF 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

Set® Grout contains.

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).

BASF Building Systems

889 Valley Park Drive
Shakopee, MN, 55379

www.BASFBuildingSystems.com

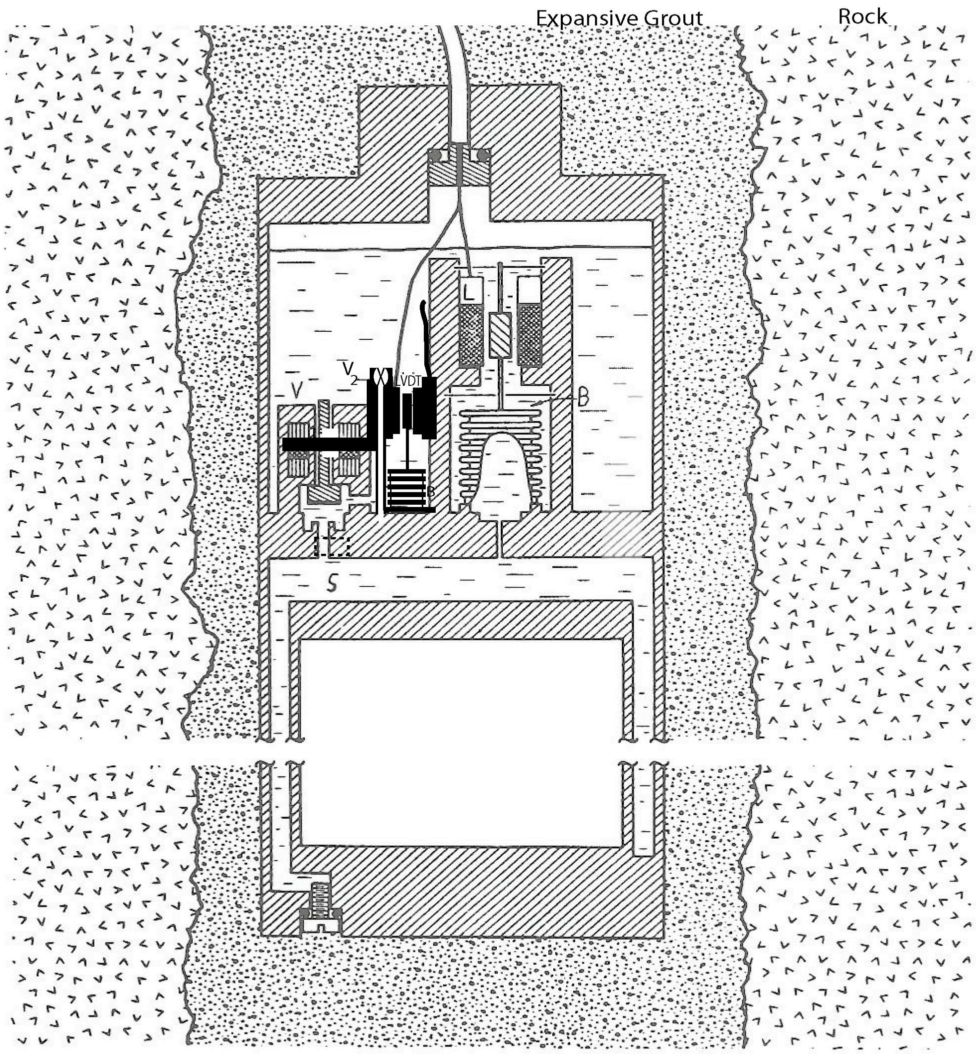
Customer Service 800-433-9517
Technical Service 800-243-6739

For professional use only. Not for sale to or use by the general public.

Form No. 1019304 7/06
Printed on recycled paper including 10% post-consumer fiber.

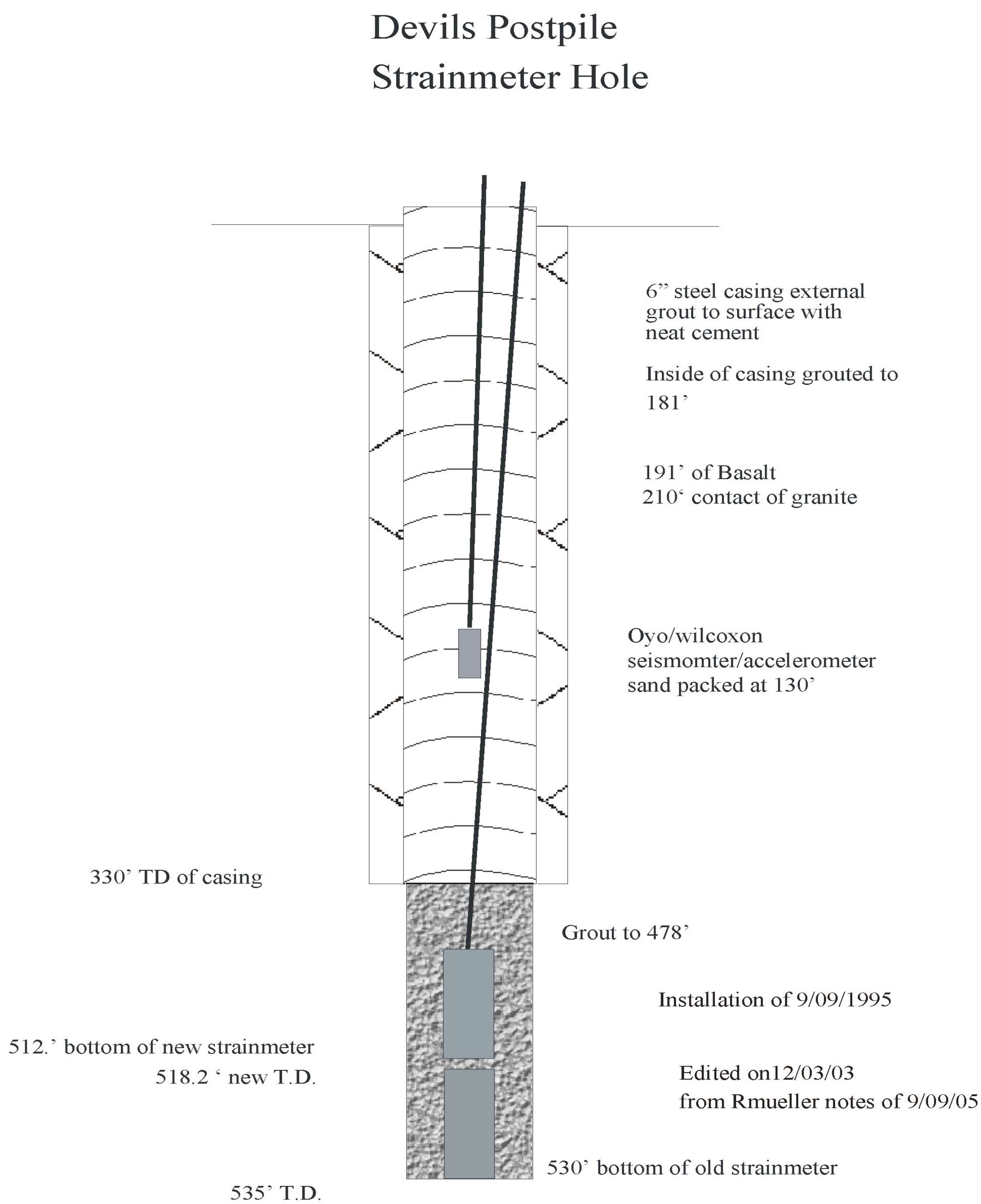
10.2 CIW Dilatometer Drawing

CIW Dilatometer

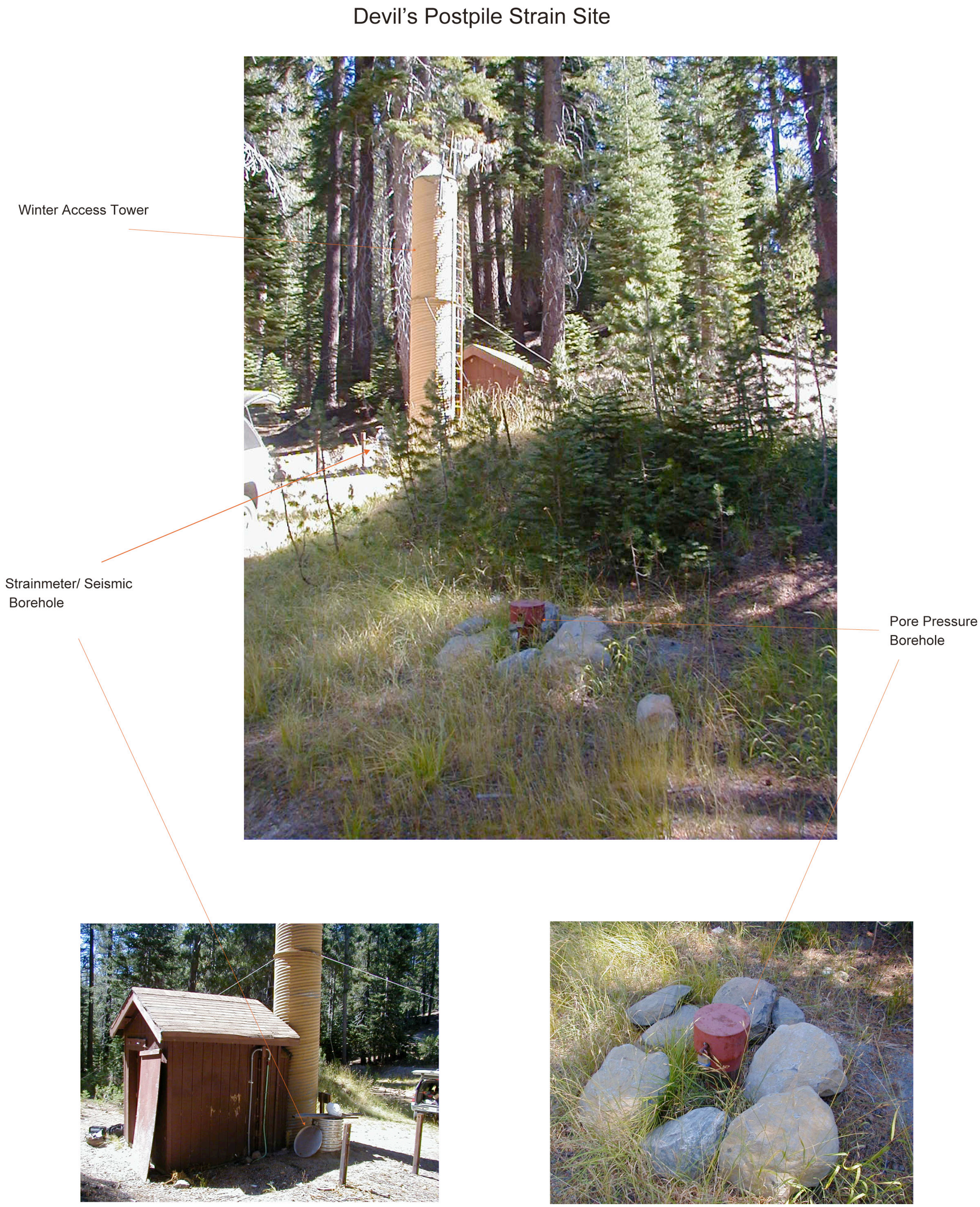


5.4. Simplified cross-section through a Sacks-Evertson dilatometer, shown cemented in a borehole. The sensing volume S is largely filled by a hollow insert and has a filling port at the bottom. The only openings between the sensing volume (lower) and backing volume (upper) are the rezero valve V (shown open) and the capillary to the bellows B. A DC-LVDT L (Section 3.3.3) above the bellows measures the bellows motion.

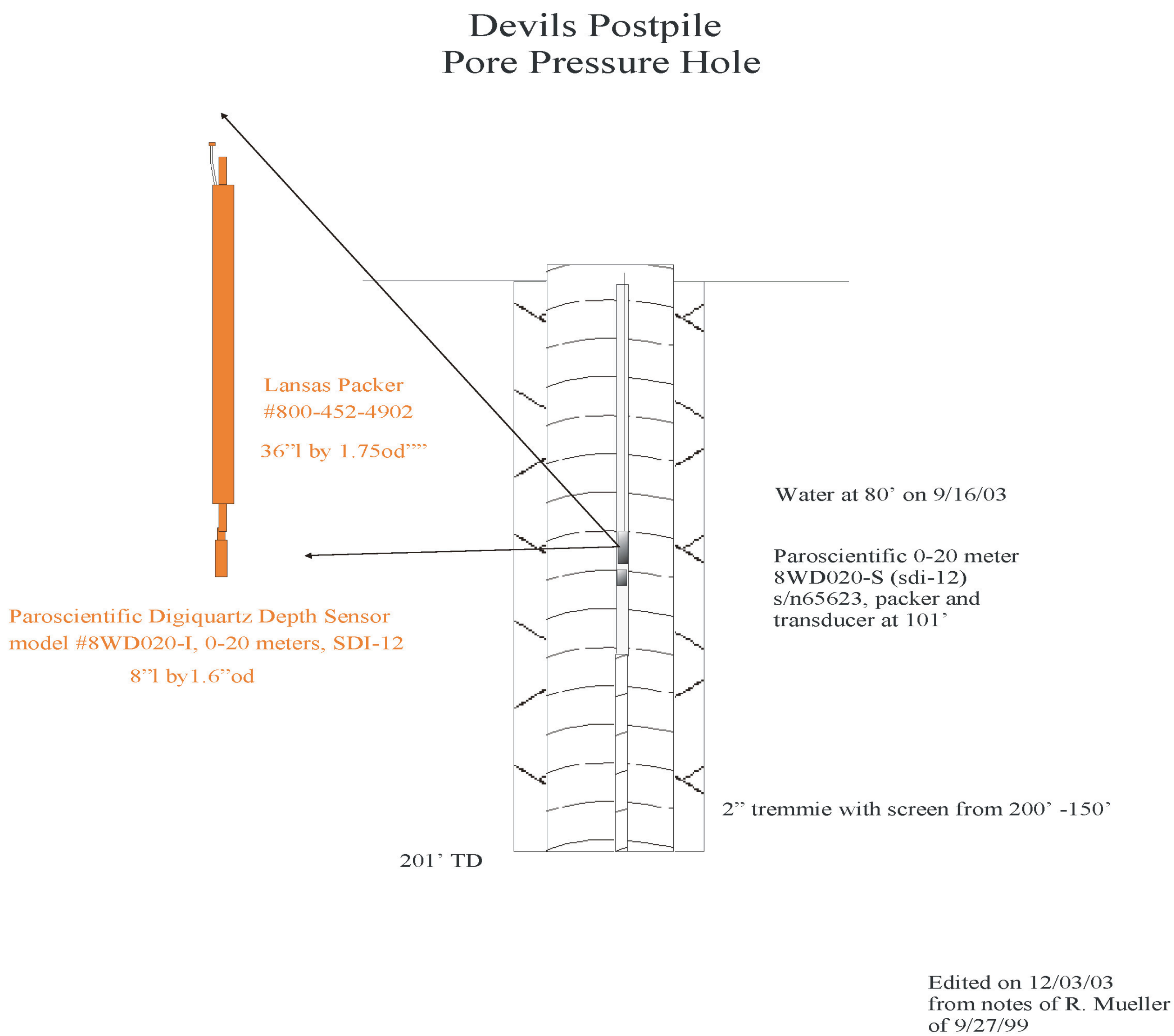
Response: Flat DC-100Hz
Sensitivity: <0.001 Nanostrain
Mechanical Amplifier (x250) avoids
Thermal Noise Limit
Calibration: Tidal
Atmos. Press
Seismic Wave



10.3 Devil's Postpile Borehole

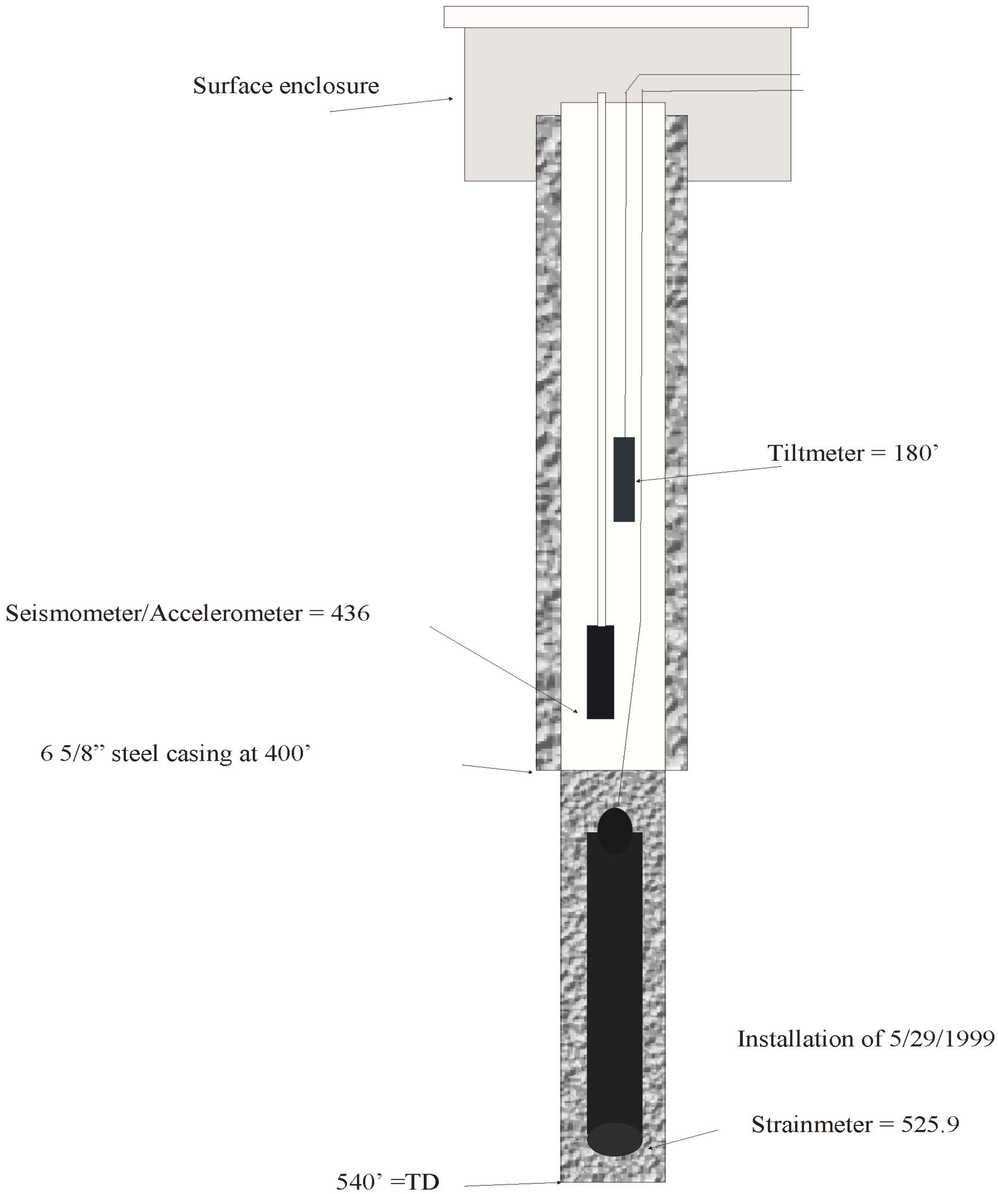


10.4 Photo of Devil's Postpile Strain Site



10.5 Devil's Postpile Pore Pressure Borehole

Motocross Strainmeter

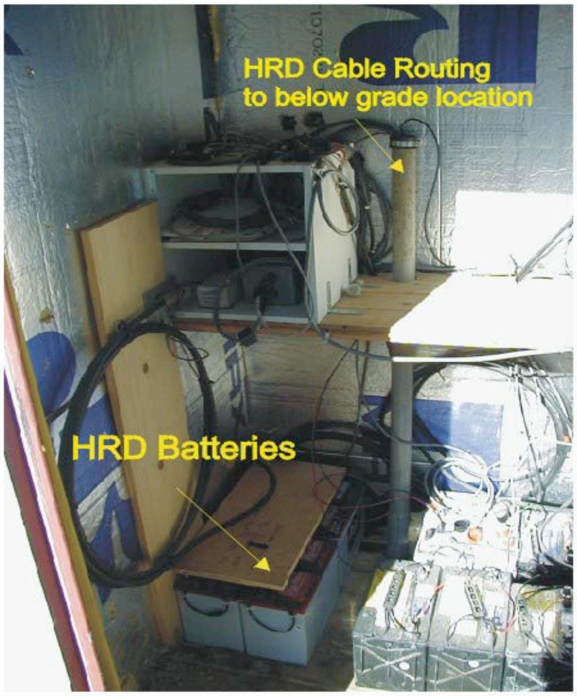


10.6 Motocross Borehole

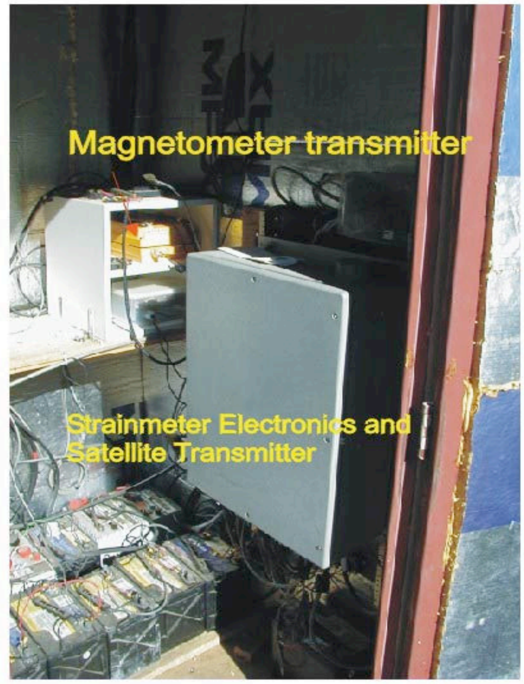
Motorcross Strain Site
Fall 2003

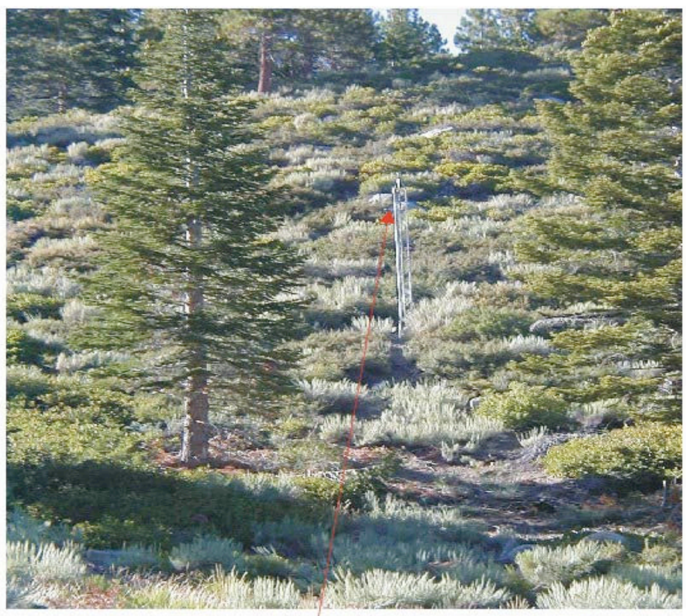
10.7 Photos of Motocross Strain Site

Nanometrics High Resolution Digitizer (HRD)



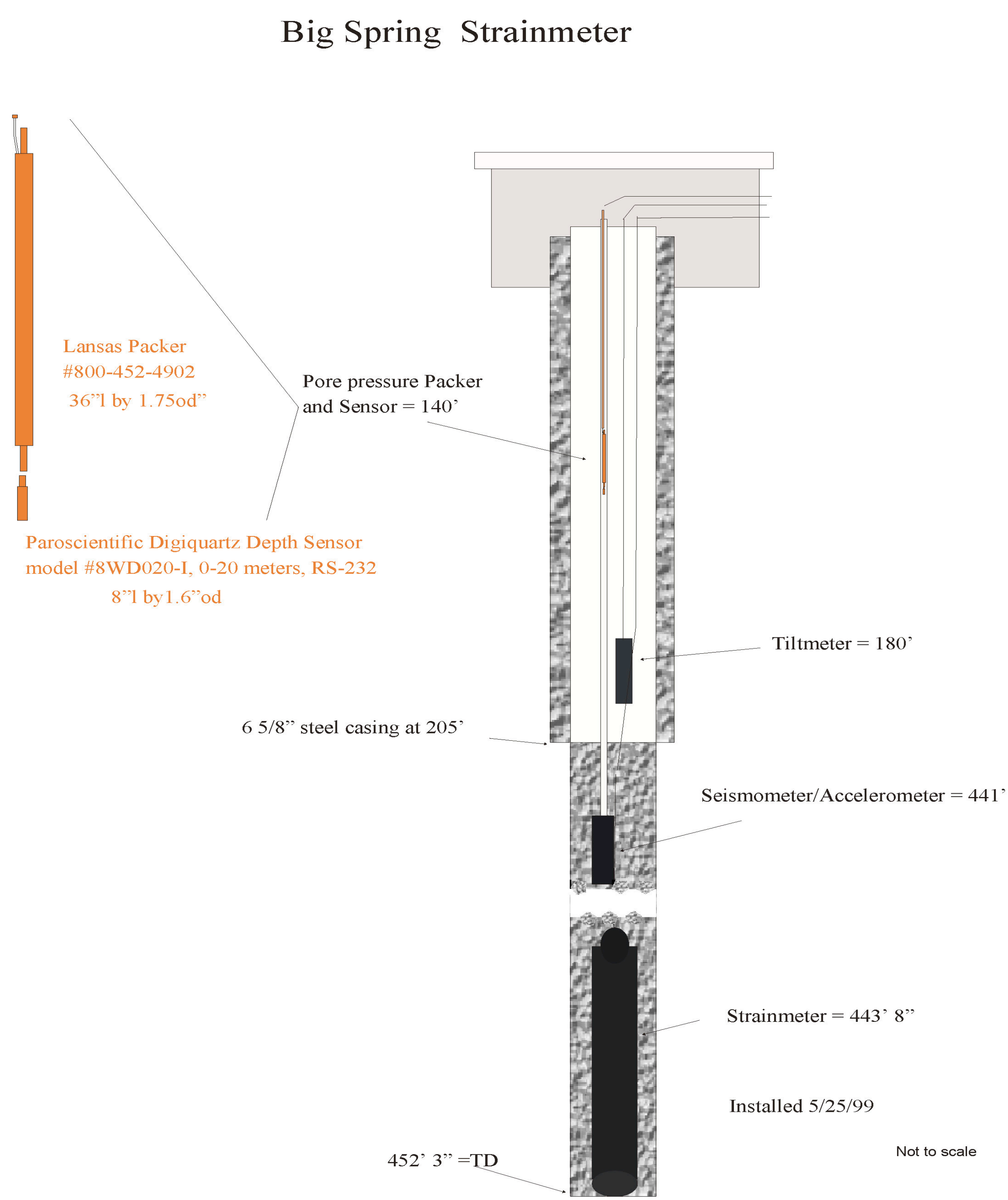
Deformation Instrumentation



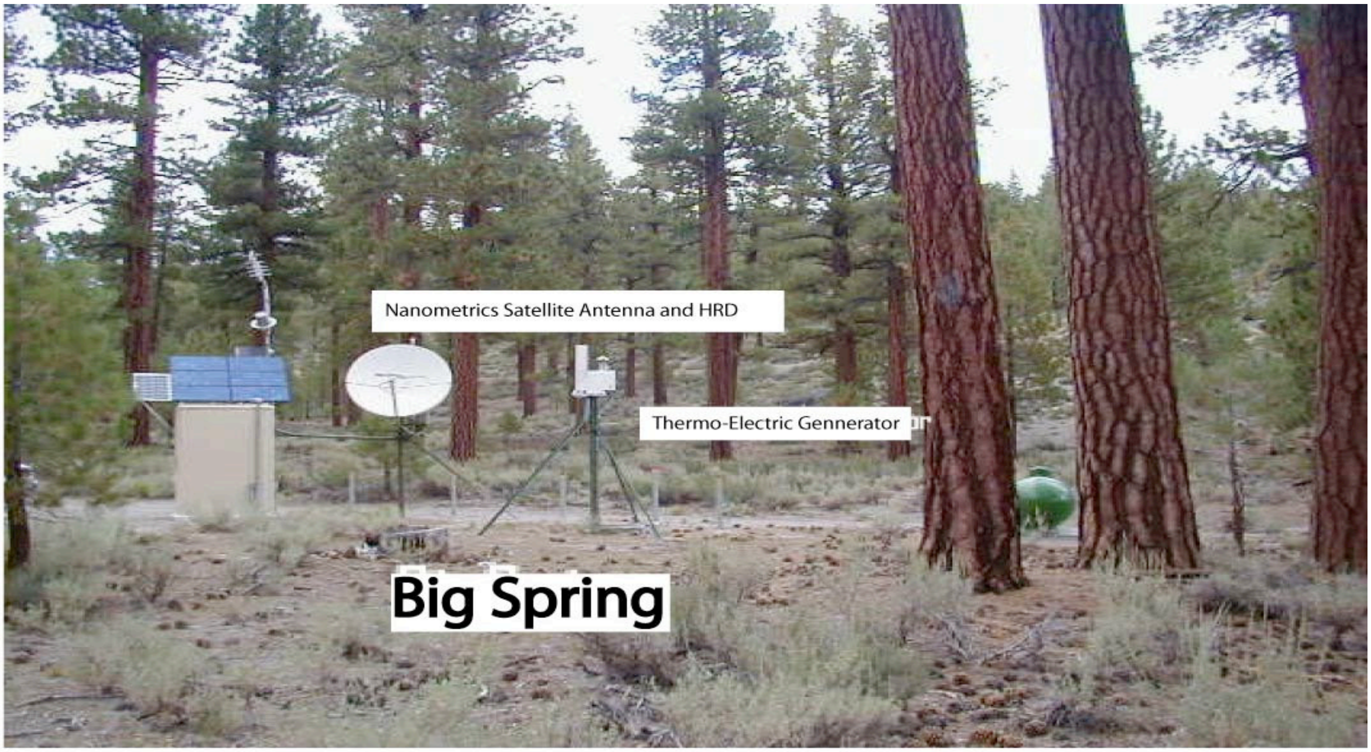


HRD Freewave Antenna

10.7 Photos of Motocross Strain Site



10.8 Big Spring Borehole



Big Spring Strain Site

10.9 Photos of Big Spring Strain Site

seismic exploration

GEOSPACE TECHNOLOGIES
An OYO Geospace Company

PRODUCTS | REQUEST INFO | SUPPORT | CONTACT INFORMATION | NEWS & EVENTS

- Geophysical
- Industrial/Geophones
- Seismology
  - GS-1
  - HS-1
  - SeisMonitor
  - MiniSeisMonitor
  - Standalone Data Logger
- Marine Seismic Solutions

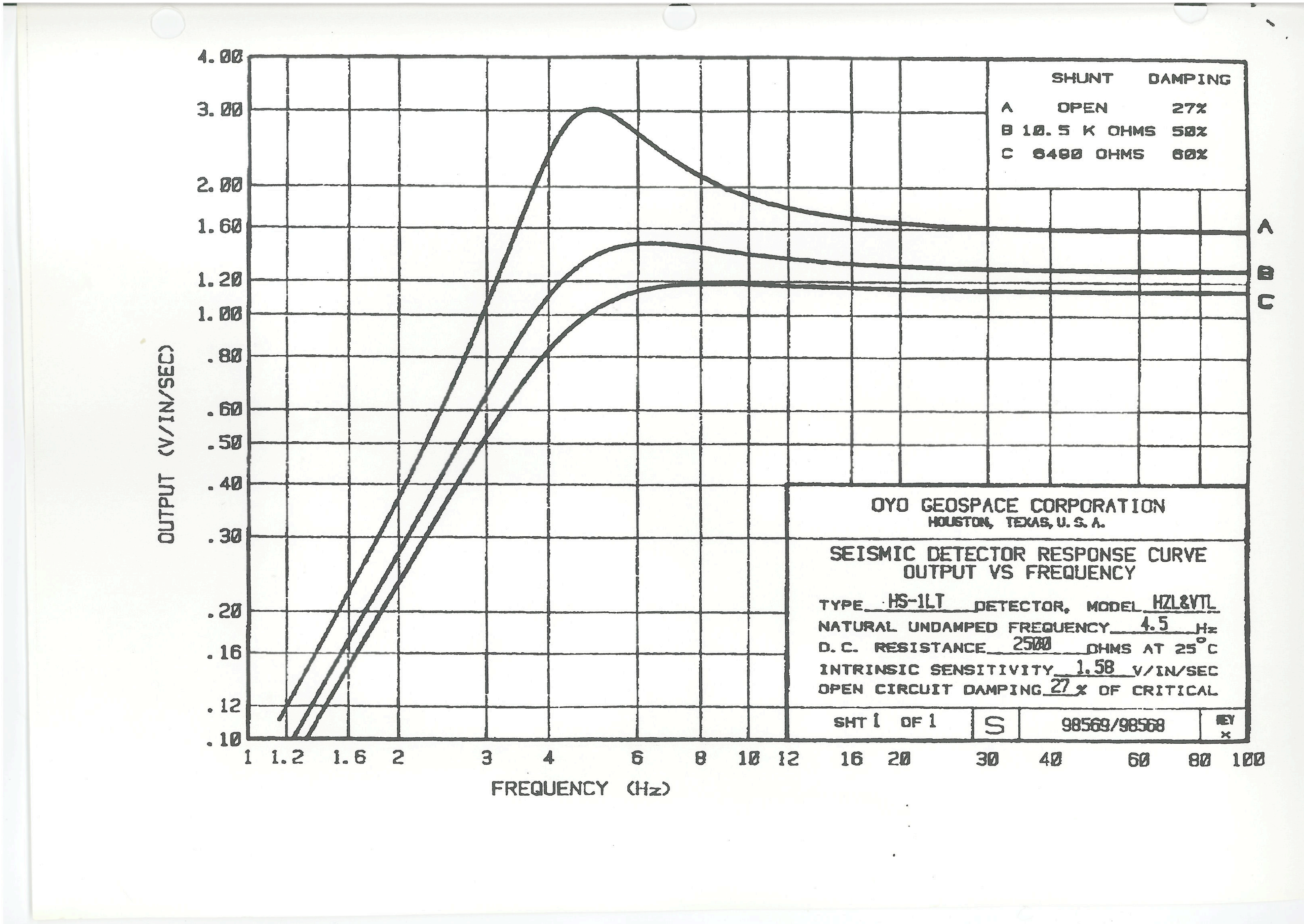
HS-1 Specifications

SPECIFICATION at 25°C, Geophone in designated operating position (Vertical or Horizontal)

Natural Frequency (Fn)	> 4.5 ± .75 Hz			7.5 ± .75 Hz			10 ± 1.0 Hz		
DC Coil Resistance (DCR), ohms	225 ± 13	510 ± 27	1250 ± 62	225 ± 13	510 ± 27	1250 ± 62	225 ± 13	510 ± 27	1250 ± 62
Sensitivity (G), ± 10% V/in/s	.510	.718	1.15	.510	.718	1.15	.510	.718	1.15
Sensitivity (G), ± 10% V/cm/s	.201	.283	.453	.201	.283	.453	.201	.283	.453
Open Circuit Damping (Bo), ± 20%	.27	.28	.28	.62	.67	.67	.46	.50	.50
Damping Constant (CD)	246	505	1295	334	718	1843	251	539	1382
Coil Mass (M), grams ± 5%	29	28	28	12.8	11.8	11.8	12.8	11.8	11.8

Maximum Tilt Angle			Vertical Models Horizontal Models	15° ± 2°	Vertical Models Horizontal Models	20° ± 3.5°	Vertical Models Horizontal Models	30° ± 7.5°	
Coil/Case Displacement in operating position, peak to peak			—Minimum .05 in (.13 cm), Maximum .10 in (.25 cm) —						
Natural Frequency (Fn)				15 ± 1.0 Hz		20 ± 1.0 Hz		28 ± 1.4 Hz	
DC Coil Resistance (DCR), ohms	225 ± 13	510 ± 27	1250 ± 62	225 ± 13	510 ± 27	1250 ± 62	225 ± 13	510 ± 27	1250 ± 62
Sensitivity (G), ± 10% V/in/s	.510	.718	1.15	.510	.718	1.15	.510	.718	1.15
Sensitivity (G), ± 10% V/cm/s	.201	.283	.453	.201	.283	.453	.201	.283	.453
Open Circuit Damping (Bo), ± 20%	.31	.33	.33	.23	.25	.25	.16	.18	.18
Damping Constant (CD)	167	359	922	125	269	691	89.5	192	494
Coil Mass (M), grams ± 5%	12.8	11.8	11.8	12.8	11.8	11.8	12.8	11.8	11.8
Maximum Tilt Angle				Vertical Models Horizontal Models	60° ± 30°	All Models	90° ± 3.5°	All Models	90° ± 3.5°
Coil/Case Displacement in operating position, peak to peak			—Minimum .07 in (.18 cm), Maximum .10 in (.25 cm) ——						

10.10.1 HS1 GEOPHONE Frequency Response



Model 731A
Ultra-quiet, ultra low frequency, seismic accelerometer

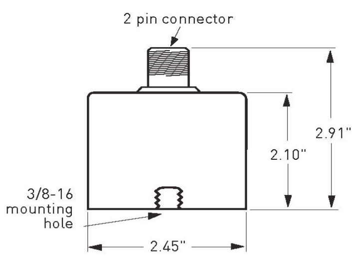
Dynamic
Sensitivity, ±10%, 25°C	10 V/g
Acceleration range	0.5 g peak
Amplitude nonlinearity	1%
Frequency response:	
±10%	0.10 - 300 Hz
±3 dB	0.05 - 500 Hz
Resonance frequency	815 Hz
Transverse sensitivity, max.	1% of axial
Temperature response:	
−10°C	−12%
+65°C	+5%

Electrical
Power requirement:	voltage source	18 - 30 VDC
	current regulating diode	2 - 10 mA
Electrical noise, equiv. g:		
Broadband	2.5 Hz to 25 kHz	0.5 µg
Spectral	2 Hz	0.03 µg/√Hz
	10 Hz	0.01 µg/√Hz
	100 Hz	0.004 µg/√Hz
Output impedance, max.		100Ω
Bias output voltage		9 VDC
Grounding		case isolated

Features
- Ultra high sensitivity
- Ultra low-noise electronics for clear signals at sub micro-g levels
- Low frequency capable
- Low pass filtered to eliminate high frequencies
- Reverse wiring protection

Environmental
Temperature range	−10 to 65°C
Vibration limit	10 g peak
Shock limit	fragile
Electromagnetic sensitivity @ 60 Hz	20 µg/gauss
Sealing	Hermetic
Base strain sensitivity	0.0001 g/µstrain

Physical
Sensing element design	PZT ceramic / flexure
Weight	670 grams
Case material	316L stainless steel
Mounting	3/8 - 16 tapped hole
Output connector	2 pin, MIL-C-5015 style
Mating connector	R6 type
Recommended cabling	J9 / J9T2A



Connector pin	Function
Shell	ground
A	power/ signal
B	common

Note: Special handling required due to sensitivity
Accessories supplied: SF7 mounting stud; calibration data (level 3)
Options: Power unit/amplifier P31

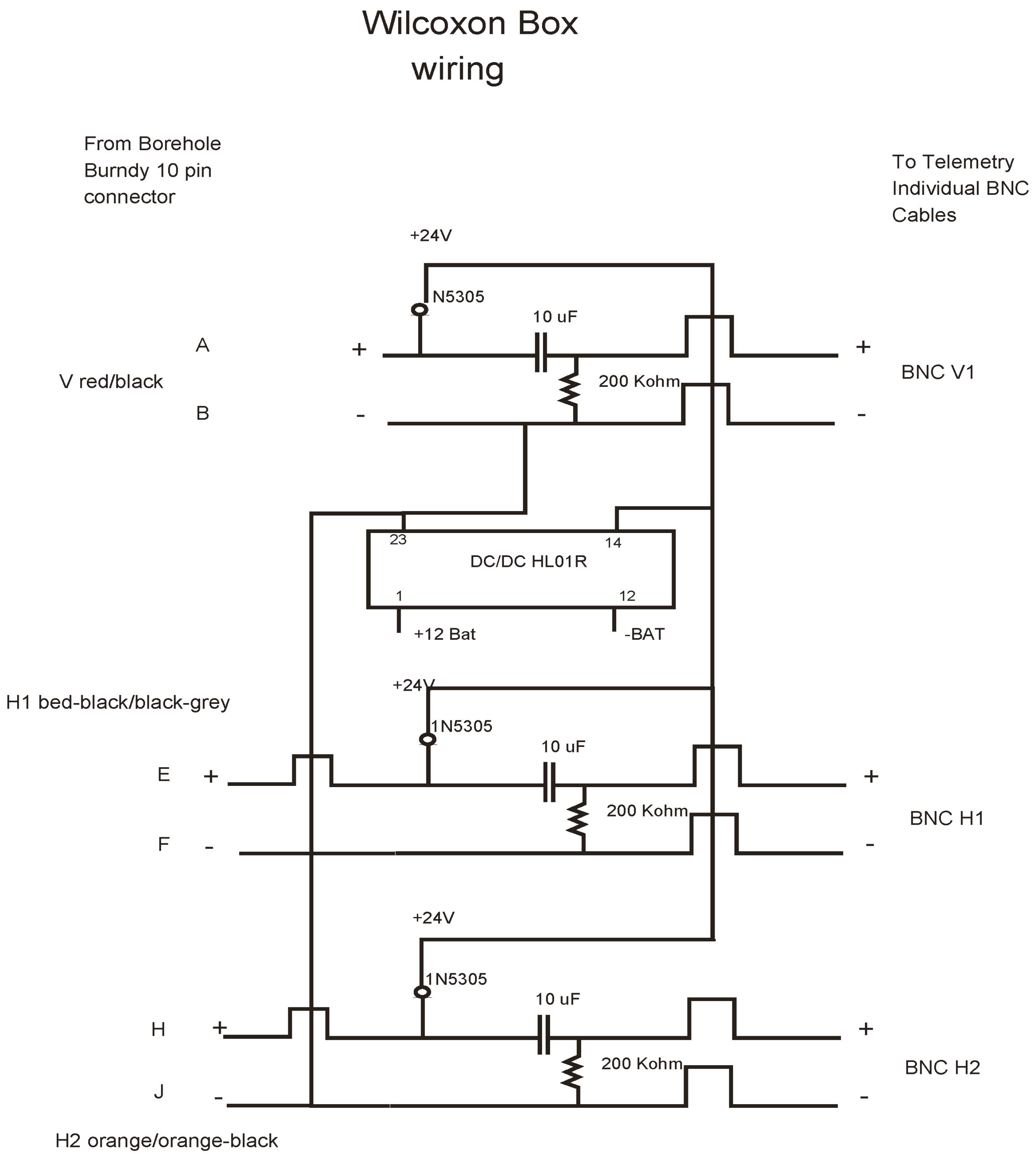
Wilcoxon Research Inc
21 Firstfield Rd
Gaithersburg, MD 20878
USA

Tel: 301 330 8811
Fax: 301 330 8873
Email: sensors@wilcoxon.com

www.meggitt.com

98078 Rev.C.2 5/04

10.11 Wilcoxon 731A Accelerometer Specifications



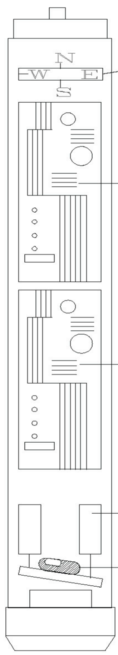
10.12 Wilcoxon Wiring Diagram

Series 5000 Tiltmeter

Pinnacle

GET RESULTS

- Accurate and robust measurements
- R&D 100 Award-winning design
- Simple installation and automatic leveling



Pinnacle Technologies Series 5000 Tiltmeter Schematic

Pinnacle's advanced series 5000 Tiltmeter is designed to provide high precision tilt data from an easy to use device in a rugged, field-ready package.

Pinnacle tiltmeters operate on the same principle as a carpenter's level. At the core of each tiltmeter is a pair of orthogonal bubble levels with a precise curvature. Electrodes detect minute movements of the air bubble within a conductive fluid as the fluid seeks the lowest spot in the sensor. The series 5000 tiltmeter can resolve tilt as little as one billionth of a radian (or 0.00000005 degrees).

Custom designed electronics measure and amplify the tilt from the two sensors. Pinnacle's unique analog electronics are specially designed to achieve very low noise levels and low power consumption. The analog electronics have 4 gain levels which can be changed remotely for mapping tilt signals of a wide range of magnitudes. The operating range of the tiltmeter electronics is from -40°C to 85°C (-40°F to 185°F). Optional electronics are available which extend the upper temperature limit to 125°C (260°F).

Pinnacle designed custom digital tiltmeter electronics in a cooperative project with Lawrence Livermore National Laboratories. Most sensing devices in use today send analog signals up a cable to the recording device, incurring signal losses and adding noise along the way. Pinnacle placed high precision 24 bit A/D converters adjacent to the analog amplifiers. Purely digital communication ensures no noise is added during transmission to the surface.

Conventional high gain tiltmeters can be difficult to install. Since any high gain sensor has a limited range, the sensor plate must be very close to perfectly horizontal to map an event. Getting the sensors level is normally accomplished by gently tapping the ground on one side of the tool, which gets awkward and requires a large diameter hole for sites deep below the surface. Since it is desirable to install tiltmeters at least 3 m and up to 12 m (10-40 ft) below the surface to achieve low background noise levels required for detecting small movements, the limited range of conventional tiltmeters paradoxically also limits their sensitivity. Pinnacle's series 5000 tiltmeters are equipped with an on-board digital processor and automatic leveling mechanism to allow simple installation in deep, narrow boreholes. Once in place, motors automatically bring the two sensors very close to level, and will continue to keep the sensors in their operating range even if large disturbances move the instrument.

Besides tilt, the tiltmeter internally records relevant information such as location, orientation, supply voltage, and sensor temperature. A solid state magnetic compass provides the tool orientation so tilt direction can be determined. On-board looped memory provides up to 8 months of data storage which is easily uploaded via a serial port connection at the surface, a direct cable connection to another computer (optional communication protocols are available to support communication through up to 8,000 m (25,000 ft) of cable), radio links, or a cell phone interface. The 5000 tiltmeter can be programmed to cycle

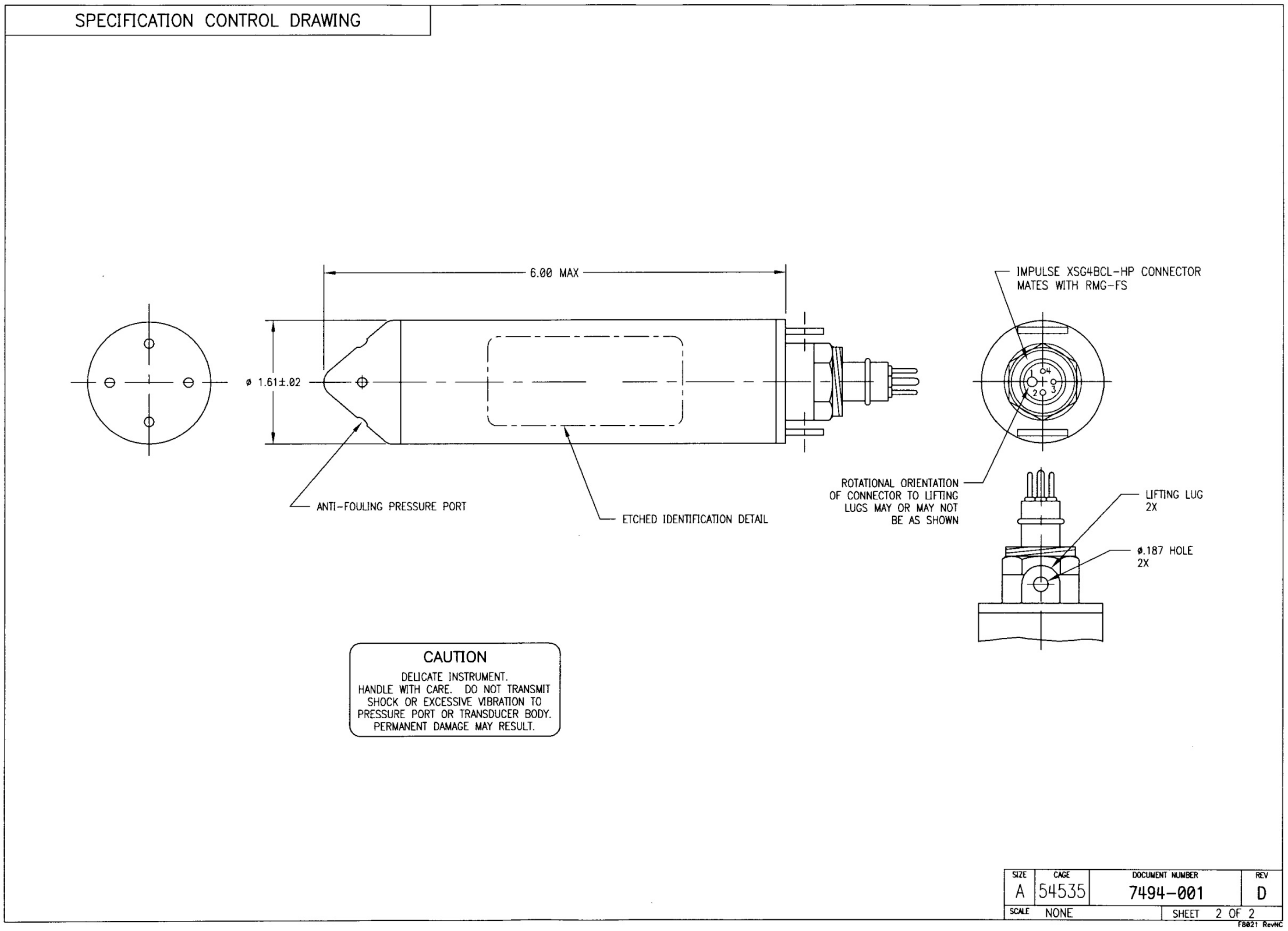
TECH UPDATE 05TM

10.13 Pinnacle Tiltmeter Specifications

Paroscientific Depth Sensor

Model # 8WD020-S = 0 to 20 meters or 0 - 45 psi, with a SDI-12 (serial data 1200 baud output)

10.14 Paroscientific Depth Sensor



10.15 Paroscientific Depth Sensor

SPECIFICATION CONTROL DRAWING

PERFORMANCE:

REPEATABILITY .... $\leq \pm 0.02\%$ FULL SCALE

HYSTERESIS .... $\leq \pm 0.02\%$ FULL SCALE

SUPPLY VOLTAGE SENSITIVITY .... LESS THAN 0.001% FULL SCALE/V (+6 TO +16 VDC)

CHARACTERISTICS:

WEIGHT .... 18 OZ MAX

RECOMMENDED INPUT VOLTAGE .... +6 VDC
OPERATES FROM +6 VDC MIN TO +16 VDC MAX

TYPICAL AVERAGE SUPPLY CURRENT: 7 mA IN SLEEP MODE
12 mA QUIESCENT
16 mA MAX

USERS SHOULD ALLOW FOR VOLTAGE DROP ON LONG CABLES TO ENSURE THAT AT LEAST +6 VDC ARRIVES AT THE DEPTH SENSOR.

OPERATING TEMPERATURE RANGE .... 0 °C TO +40 °C (32 °F TO 104 °F)

MODEL NO.	PART NO.	DEPTH RANGE (METERS)	PRESSURE RANGE
8WD020-I	1320-011-0	0 TO 20	0 TO 45 PSIA (0.31 MPA)
8WD060-I	1320-012-0	0 TO 60	0 TO 100 PSIA (0.69 MPA)
8WD130-I	1320-013-0	0 TO 130	0 TO 200 PSIA (1.38 MPA)
8WD200-I	1320-014-0	0 TO 200	0 TO 300 PSIA (2.07 MPA)
8WD270-I	1320-015-0	0 TO 270	0 TO 400 PSIA (2.76 MPA)

NOTES:

1. HOUSING MATERIAL: TYPE 316L STAINLESS STEEL, ACETAL PRESSURE PORT.
2. TRANSDUCER BELLOWS INTERNAL TUBING IS OIL FILLED.
3. DEPTH SENSOR IS PROTECTED FROM REVERSE VOLTAGE.
4. POWER AND SIGNAL LEADS ARE PROTECTED BY INDIVIDUAL BIDIRECTIONAL TRANSZORBS FOR SUPPRESSION OF LINE TRANSIENTS. A FUSE (1/4 AMP) IN SERIES WITH EACH OF THE LEADS TO THE DEPTH SENSOR IS RECOMMENDED FOR INSTALLATIONS WHERE A HIGH POTENTIAL MAY BE INADVERTENTLY APPLIED.
5. MAXIMUM TORQUE ON THE ELECTRICAL CONNECTOR IS18 INCH-POUNDS.
6. CONNECTOR PINOUT: PIN 1 = RS232 TX
   PIN 2 = RS232 RX
   PIN 3 = POWER/SIGNAL GROUND
   PIN 4 = POWER
7. REFER TO OPERATION MANUAL (DOC #8107-001) FOR COMMANDS AND CONFIGURATION INSTRUCTIONS.
8. RS-232 SIGNAL LEVELS ARE ±4VDC NOMINAL. MAXIMUM CABLE LENGTH DEPENDS ON CABLE TYPE, BAUD RATE AND ELECTRICAL NOISE LEVELS.
9. OIL FILLED UNITS GENERATE A PRESSURE HEAD WHICH VARIES WITH ORIENTATION.
10. THE FOLLOWING ARE CHARACTERISTICS OF FIRMWARE VERSION R3.00 OR LATER:
    A. ALL COMMANDS MUST BE TERMINATED WITH A CARRIAGE RETURN AND LINE FEED CHARACTER.
    B. SERIAL PROTOCOL IS FIXED AT 8/N/1. PT PARAMETER IS READ ONLY, AND ALWAYS RETURNS "N".
    C. MC AND CT DIAGNOSTIC COMMANDS ARE NOT SUPPORTED.
    D. SN AND TC PARAMETERS ARE READ-ONLY.
    E. MODEL 710 DISPLAY IS NOT SUPPORTED.

CURRENT APPROVALS				
	NAME	DATE	NAME	DATE
CAD ☒	R.M. Collado	2/05/07	MFG ☐ [illegible]	2/6/07
CHK ☐	[illegible]	2/6/07	QA ☐ [illegible]	2/6/07
ENG ☐	T. Luxon	2/5/07	MKTG ☐ [illegible]	2-7-07

EO NO/EFFECTIVE DATE: EO's 6963, 7060

Paroscientific, Inc.
4500 148th Avenue NE Redmond, WA 98052
Tel 425.883.8700 Fax 425.867.5407
website www.paroscientific.com

UNLESS OTHERWISE SPECIFIED
ALL DIMENSIONS ARE IN INCHES
DIMENSIONS IN BRACKETS ARE IN CENTIMETERS
DIMENSIONS ARE FOR REFERENCE ONLY

ACAD FILENAME: 7494-001_E

DESCRIPTION: DIGIQUARTZ® INTELLIGENT WELL DEPTH SENSOR, RS-232, ELECTRICALLY ISOLATED

SIZE	CAGE	DOCUMENT NUMBER	REV
A	54535	7494-001	D

SCALE NONE SHEET 1 OF 2

F8021 RevNC

10.15 Paroscientific Depth Sensor

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. 4093915, 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

800-257-3872

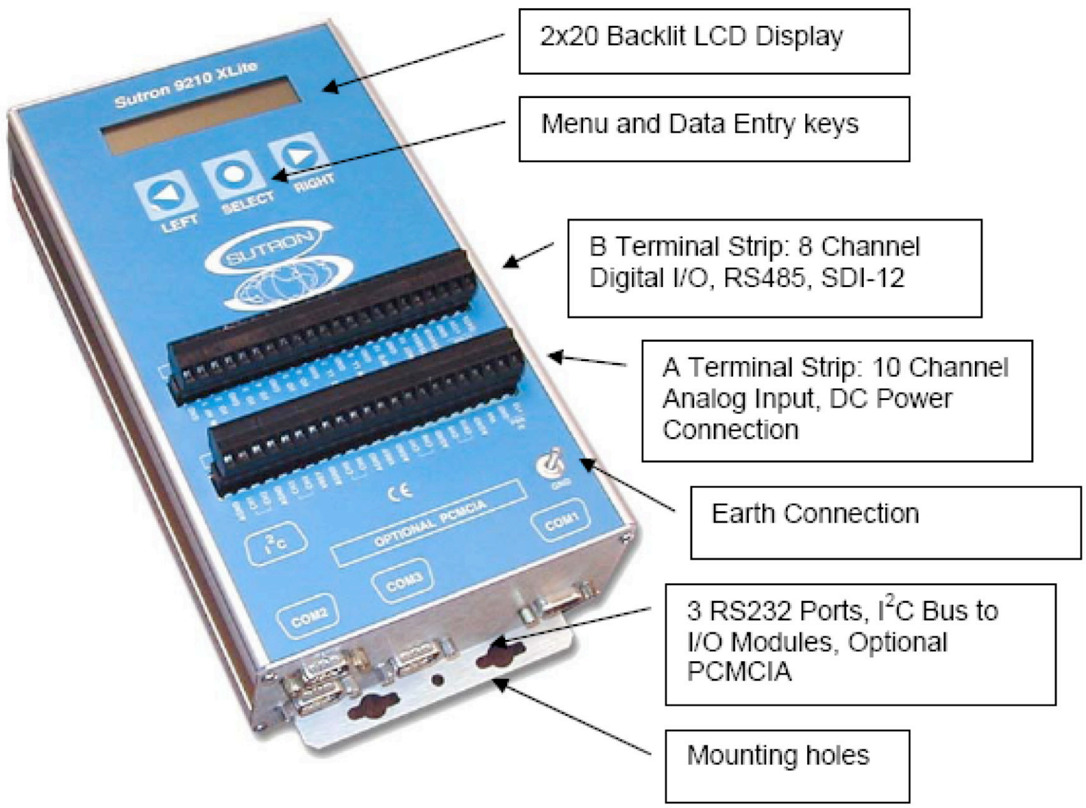
10.15 Setra Barometer

PRODUCT DESCRIPTION

The 9210 data acquisition platform is based on a 486 microprocessor, with the Windows CE operating system. Two models are available: one with and one without PCMCIA. All models have a built-in 10 channel 16 bit A/D, 8 channel digital, 3 RS232 ports, 1 RS485 port, SDI-12 port and an I^2C port. For data retrieval, simply connect a PC, modem, satellite transmitter and/or cell phone. In addition, every unit comes with a minimum of two megabytes of RAM for data storage. Power should be supplied from an external battery of 10-15 VDC.

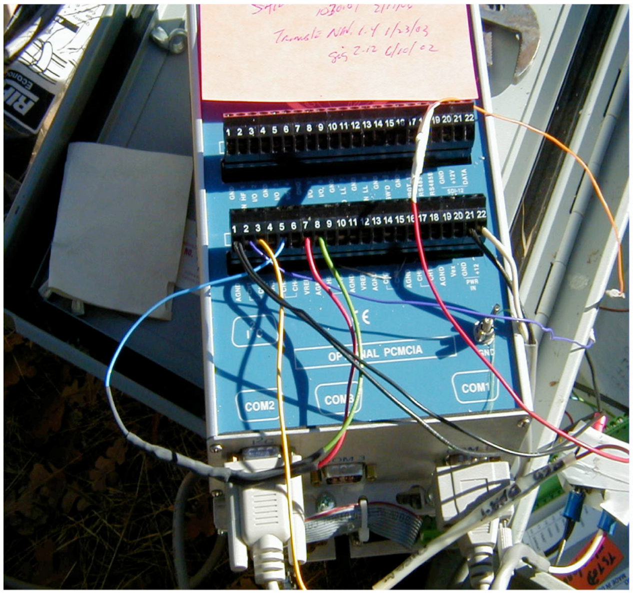
All the functionality can be accessed through a PC or Pocket PC. All the operations necessary to operate the unit can be done via the graphical interface on the PC/PocketPC. In addition, the built-in LCD allows for viewing data and simple calibration and adjustment.

9210 XLite with Integrated Display and I/O modules



Models

10.16 Sutron 9210/SL2



9210 inputs
aka AIO1

Location identifier

1= black analog ground
2 = purple strainmeter bh temp
input #1
3 = resistor divider input strain battery
input #2
4 = analog ground for resistor divider
of input #2
5 = air temp
input #3
7 = VREF voltage reference for air temp
8 = analog ground for air temp

21 =pwr ground
22 =+12 pwr

8080-0003 inputs
aka AIO2

Location identifier

2 = strain x 1, input #1 differential 1
4 = analog ground for input #1

6 = stain x 10, input #3 differential 2
8 = analog ground for input #3

10 = barometer, input #5 single ended
11 = analog ground for input #5

4 = jumper to 9210 analog ground
#1 analog input

10.17 Sutron 9210/SL2

Monitor Your World

Aviation Weather Stations	Military Weather Stations	Emergency Response Stations	Other Weather Stations

Weather Stations

General & Portable
Shipboard
PSD/Regulatory
High Tower/NRC
Industrial/Chemical
Forestry
Agricultural
Ice Stations
Radiosondes
Surface Monitoring
Water Resource
ZENO® Datalogger
INTERCEPT® Software

Contact Coastal

ZENO® 3200 Datalogger Technical Specifications

Inputs and Outputs

1. Sixteen Analog Inputs. Seven channels of differential or fourteen channels of single-ended inputs.

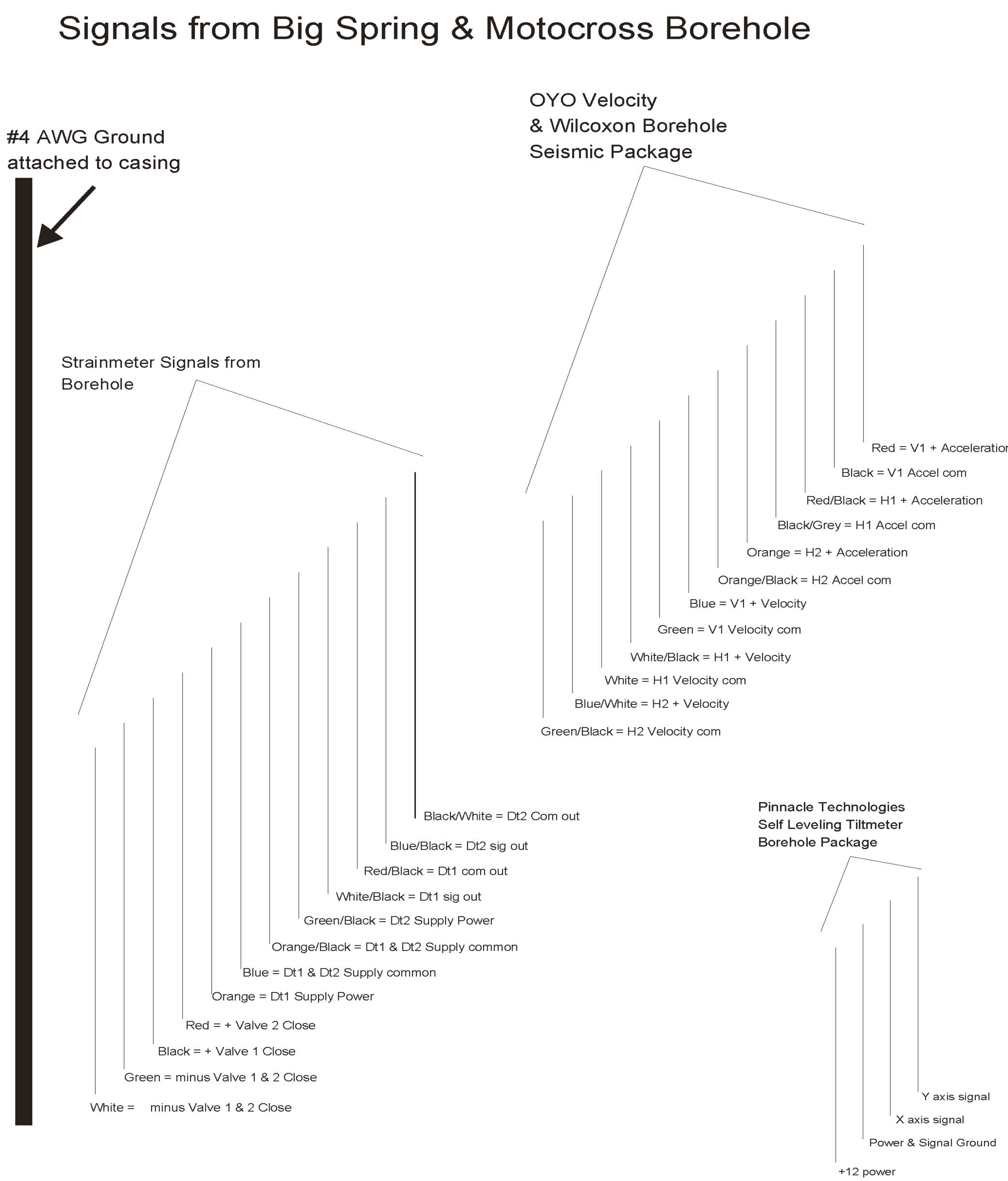
- Ultrahigh Resolution: ±18-bit with 50 or 60 Hz noise rejection (sample rate up to 2 channels per second).
- High Resolution: ±15-bit with 50 or 60 Hz noise rejection (sample rate up to 10 channels per second).
- Medium resolution: ±13-bit (sample rate up to 50 channels per second).
- Low Resolution: Two unipolar channels available at 12-bit A/D (on a separate fast A/D converter).
  - *Accuracy and linearity for high resolution A/D converter provided over a wide temperature range as follows:*
    - Linearity: ± 0.005% [-40° to +60°C].
    - Absolute Accuracy: 0.05% [-40° to +60° C].
    - Ratiometric Accuracy: ± 0.02% [+20° to +30°C] - Input range of each channel is software selectable for high resolution channels.
    - 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.*

Analog Expansion

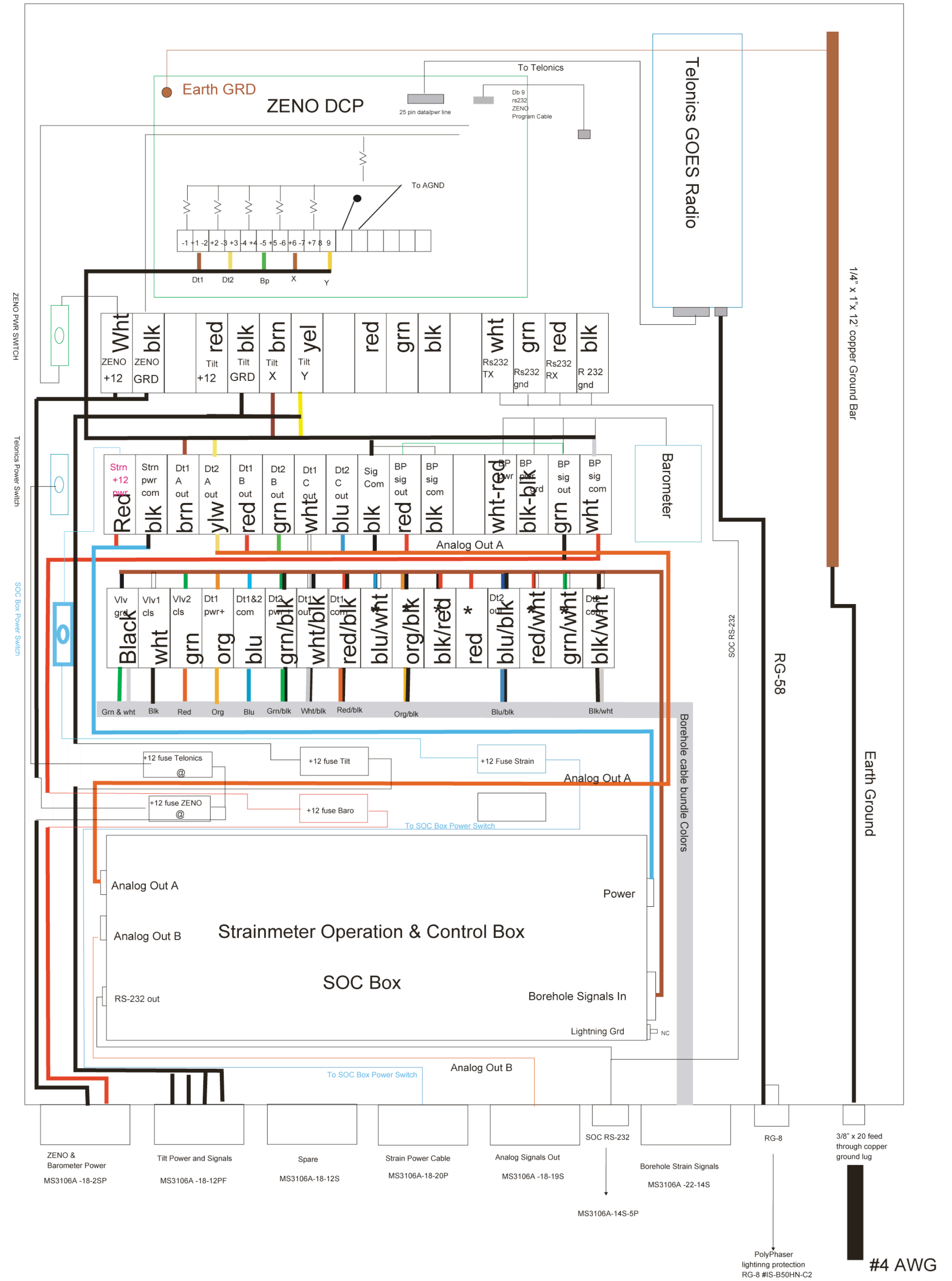
- Up to three multiplexer boards can be added, each allowing 32 additional single-ended or 16 differential inputs.
- Analog Outputs

2. Digital to Analog Expansion Board

- Up to three boards of 4 or 8 channels of individually programmable 12-bit analog output at 0 to 5 V (other output types optional).
- *Digital inputs can be configured for frequency, period, count, or event counting. Digital outputs can provide control or alarm signals.*



10.18 Big Spring & Motocross Borehole Wiring



#4 AWG
to borehole
casing

* 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.

DCPBOX

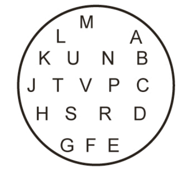
10.19 SOC BOX and DCP Electronics enclosure

Inputs2001dcpbox.cdr

Rev 09/29/01

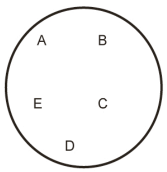
Solder side

Receptacles



Strainmeter cable
19 pin female

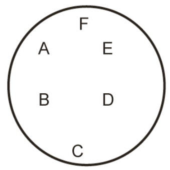
A Valve #1,2 open + Blk
B Valve #1 close + wht
C dt1 C out - sig red
D Valve #2 close + grn
E dt1 A,B,C IN + pwr org
F dt1&2 A,B,C IN - pwr blu
G dt1 A out + sig wht/blk
H dt 1 A out - sig red/blk
J dt2 A,B,C IN pwr + grn/blk
K dt1 B out - sig org/blk
L dt2 A out + sig blu/blk
M dt2 A,B,C out - sig blk/wht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



5 pin female

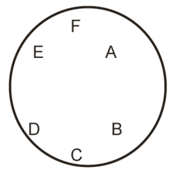
ZENO/BARO
power

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



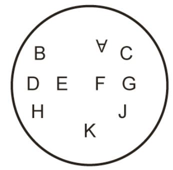
6 pin male
Tlitmeter

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

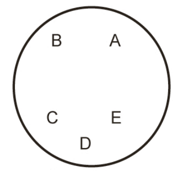


6 pin female
Pore Pressure

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

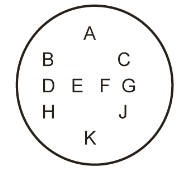


Spare
female



5 pin male
Strainmeter Power

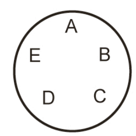
A + Bat Red
B - Bat Blk
C - Bat Blk
D NC
E + Bat Red



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

2001MAMbox



Female
RS-232
Strainmeter

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

10.21 Strainmeter Conncetions on Electronics Box

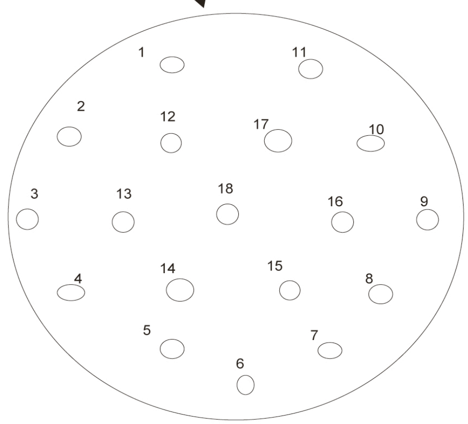
2001MAMbox

BoreholeDCPBox.cdr

REV 9/29/01

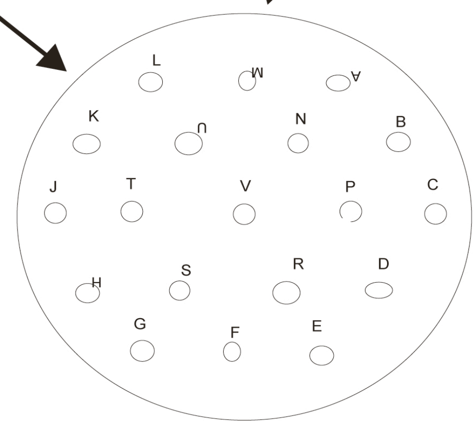
STRAINMETER ELECTRONICS BOX CONNECTOR		Borehole cable	strainmeter to	19 pin DCP BOX connector
12 & 17	- valve 1&2 close	black	1	A
1	+valve 1 close	white	2	B
9	DT1 C sig out -	red	3	C
11	valve #2 close	green	4	D
2	DT 1 A,B,C IN +	orange	5	E
13	DT 1&2 A,B,C IN -	blue	6	F
4	DT 1 A sig out +	wht/blk trace	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

Carol Cable#C0787 multi-conductor
foil shield



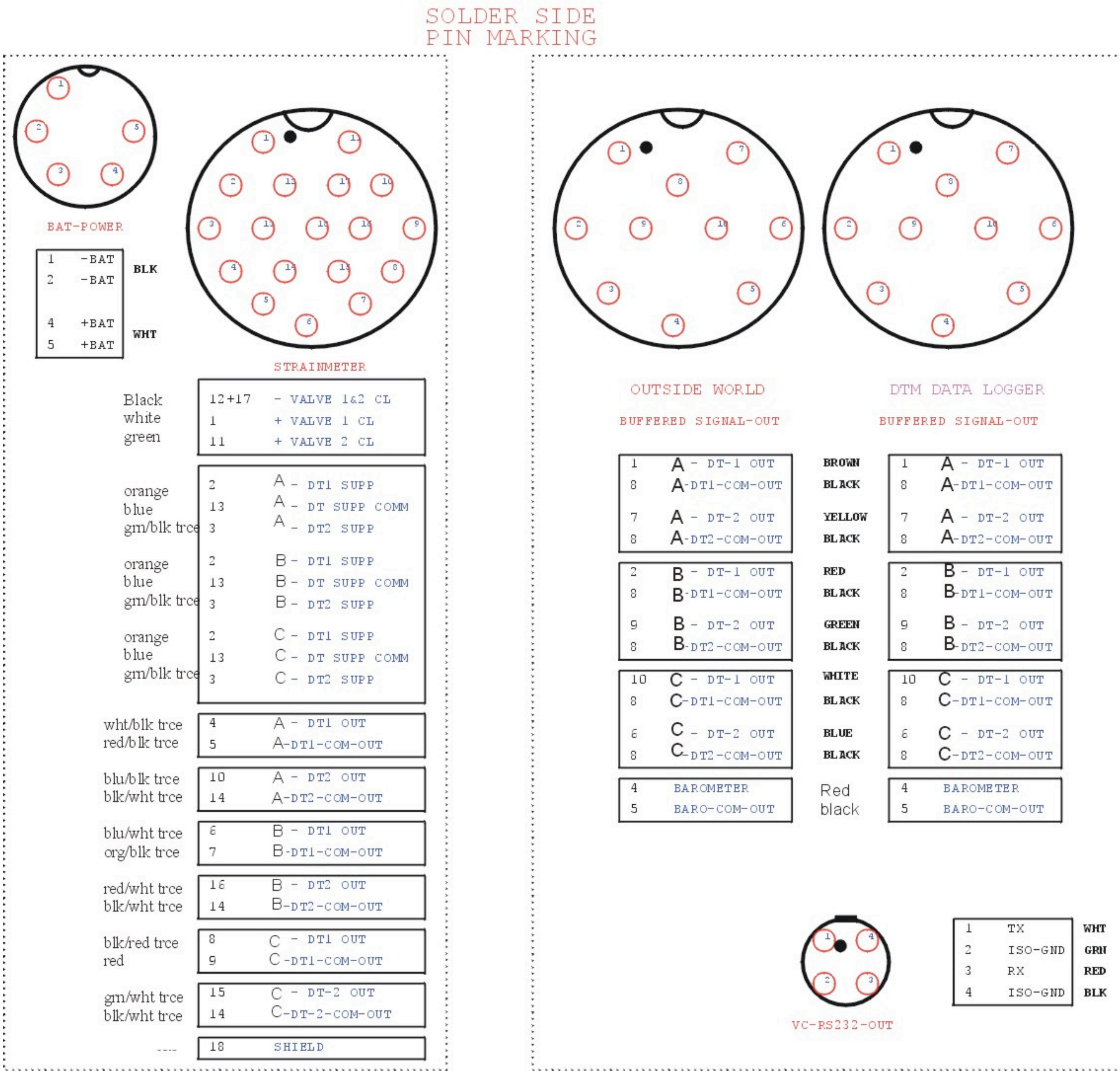
Strainmeter Electronics Box connector
solder side

Solder side



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

2001 DTM-CIW SOC BOX
Electronics Connectors



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

2001MAMbox

10.22 SOX BOX Electronic Connections

Analog and digital inputs to Sutron 9210/SL2 and 8080-0003

Devils Postpile & Phillips

Analog Inputs to AIO2 / 8080-0003

Strainmeter electronics 8080-0003

Amp 2 = green	gain 1	pin 2
Amp 2 = white	ground	pin 4
Amp1 = blue	gain 10	pin 6
Amp1 = white	ground	pin 8
Baro =	white braometer	pin 10
Baro =	barometer ground	pin 9

green jumper from 4 to 8 to 9 to pin 13 of 9210 AIO1

Analog Inputs to AIO1 / 9210 location A

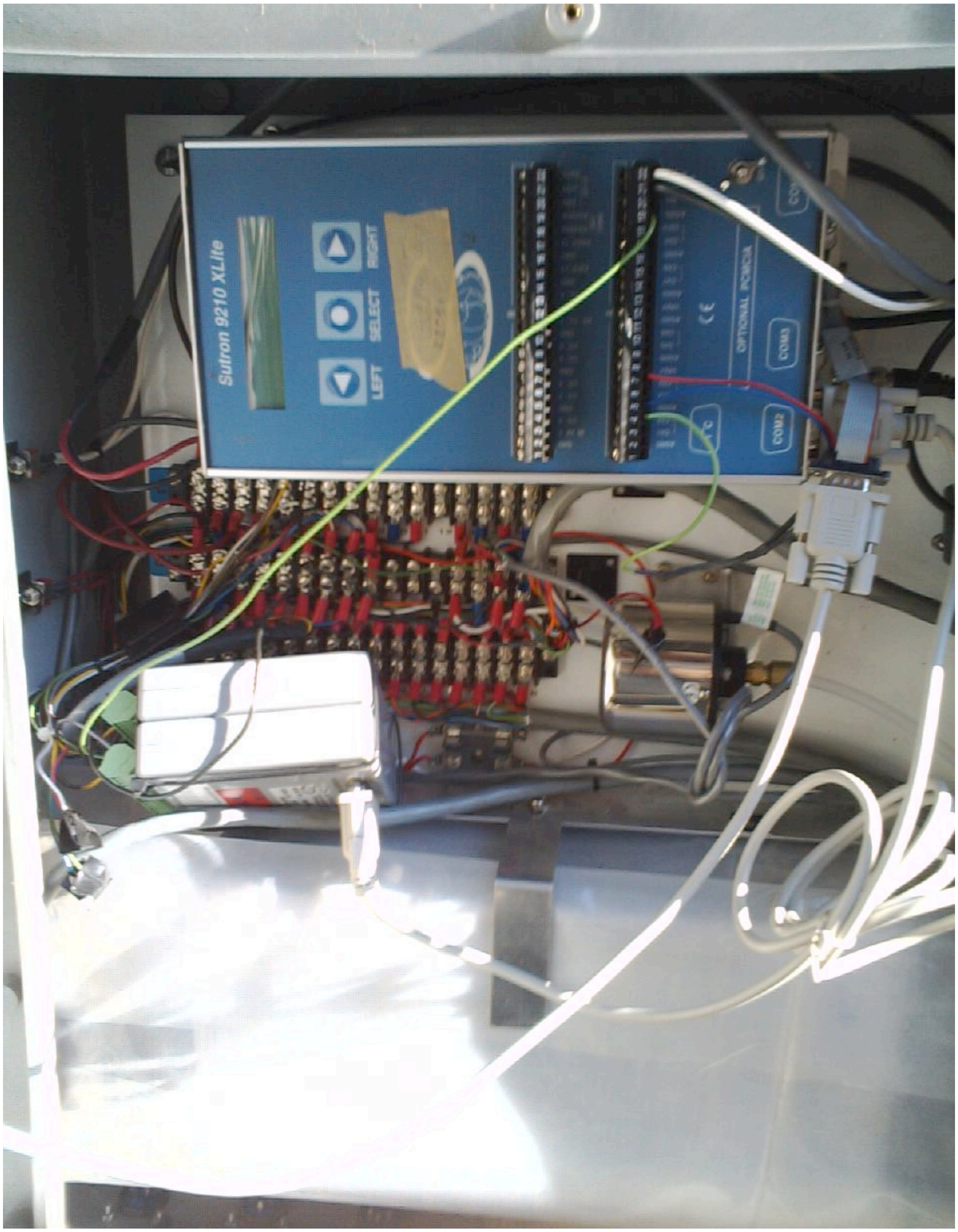
Borehole Thermistor	= purple bht ch1		pin 2
Strain Battery monitor	= white	ch2	pin 3
Battery analog ground	= green bat angd		pin 4
Air thermistor	= blue	ch3	pin 6
VRef thermisotor	= red	VREF	pin 7
Reference Thermistor	= green	agnd	pin 8

Digital Inputs location B (Devils Postpile)

Paroscientific SDI Data	= black	pin 22
Paroscientific SDI grd	= green	pin 20
Paroscientific SDI +12 V	= red	pin 21

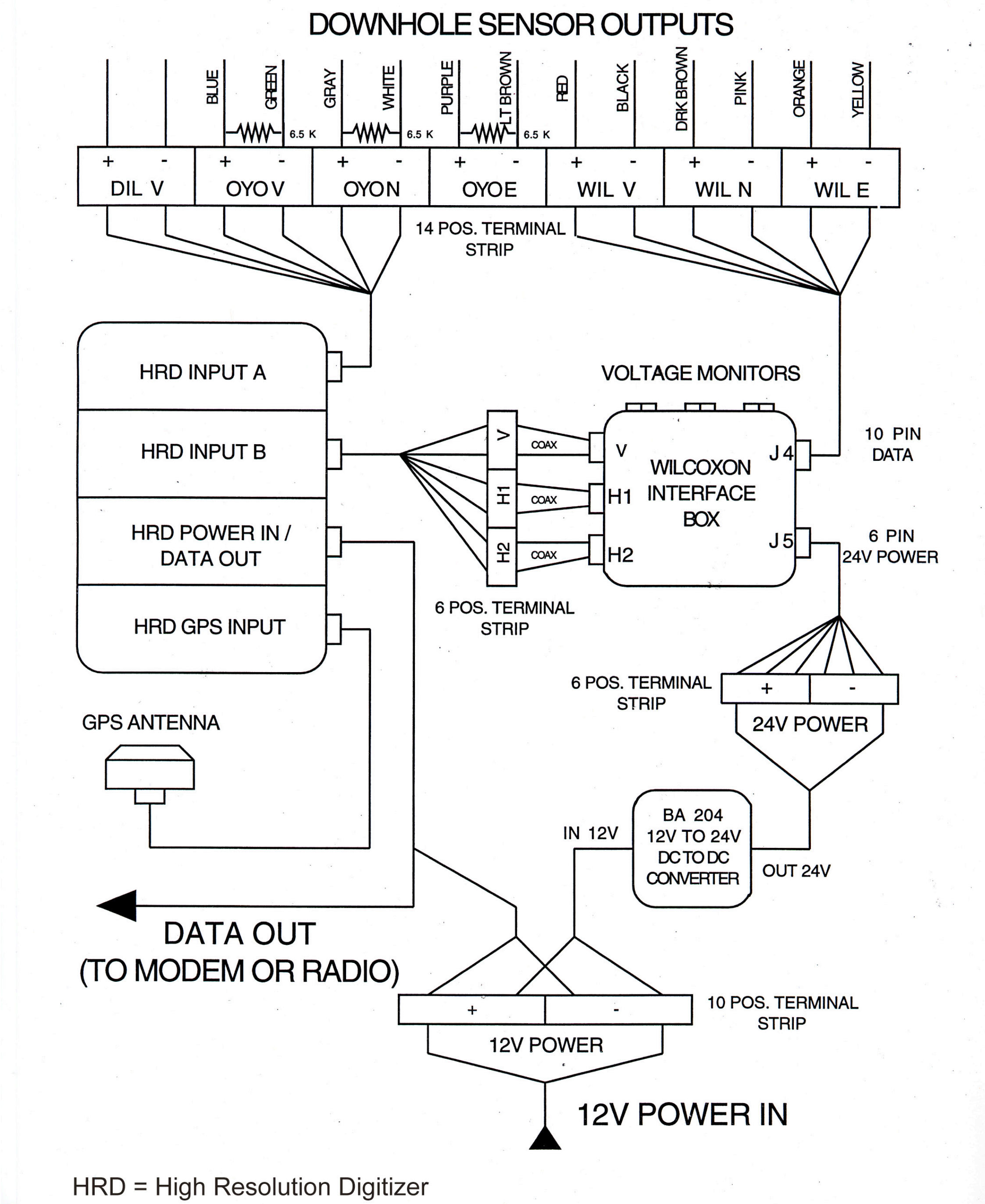
10.23 Sutron Color-Coded Inputs & Locations

DCP BOX



10.24 Photo of Sutron 9210 logger/SL2GOES Radio, DCP & 8080-0003

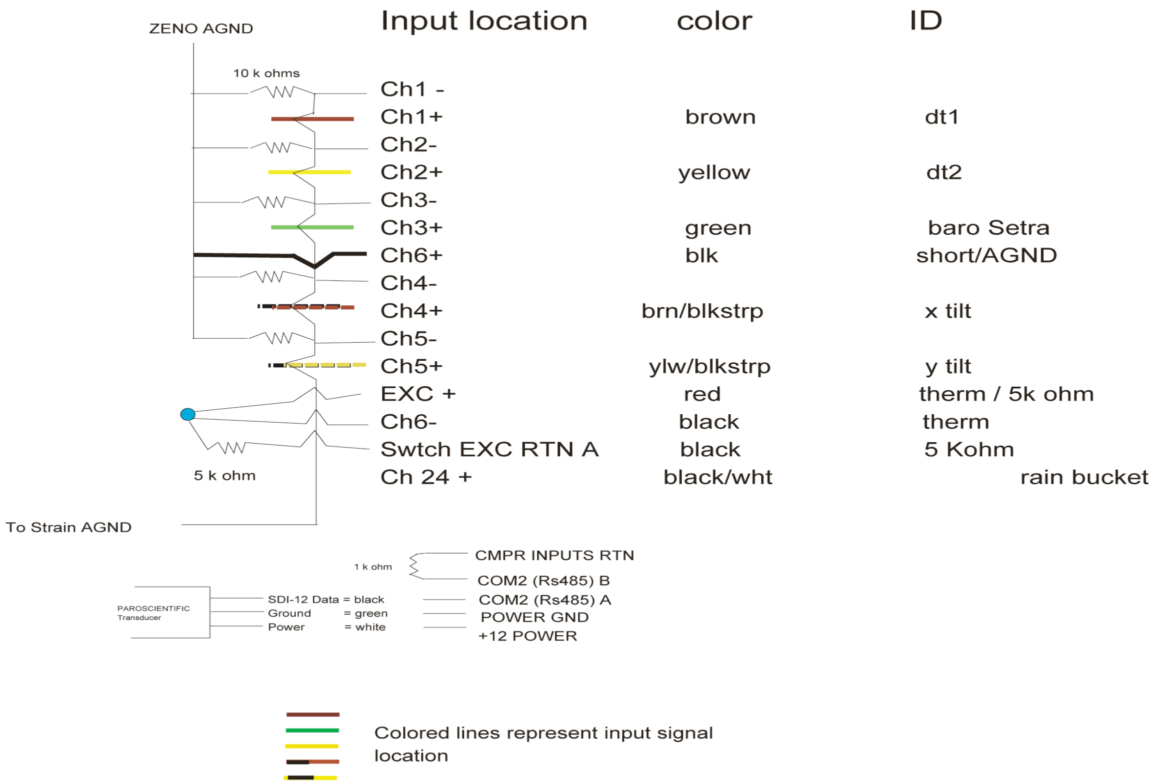
Downhole Sensor Ouputs
for seismic signals to HRD



10.25 Wilcoxon Accelerometer / OYO Downhole Inputs to USGS High Rate Digitizer

ZENO INPUTS.cdr

2001 analog inputs



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

10.26 ZENO Inputs

10.27 Sutron 9210 program site files

Sutron 9210/SL2 Program files for each Long Valley site are*:*

10.27.1 BIG SPRING SSF FILE

Copy this file and save it as *bigspring.ssf* file. Then you can load it into the 9210/SL2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<SetupFile>
	<Engine>
		<Settings
			Version = "2.7.0.7"
		/>
	</Engine>
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			SamplesToAverage = "0#41"
			IsGUI = "0#41"
			SamplingTime = "00:00:00#36"
			MeasurementsPerLog = "1#41"
			Function = "EzMeasure#36"
			MeasurementTime = "00:00:00#36"
			Enabled = "1#41"
			LogID = "#36"
			SamplingInterval = "00:00:01#36"
			MeasurementInterval = "00:10:00#36"
			Index = "0#9"
		/>
		<Module
			Name = "ADC"
			Offset = "0#50"
			XOn = "0#41"
			Warmup = "1#41"
			IsGUI = "0#41"
			ADCReadingType = "0#41"
			XChannel = "2#41"
			InputChannel = "1#41"
			FilterNotch = "10#41"
			Slope = "1#50"
			Function = "strain1#36"
			XVoltage = "3#41"
			Differential = "1#41"
			Units = "#36"
			IODeviceName = "2#41"
			Index = "1#9"
		/>
		<Module
			Name = "Display"
			IsGUI = "0#41"
			RightDigits = "7#41"
			Function = "Display#36"
			Input2 = "3,2#36"
			Units = "V#36"
			UseUnits = "0#41"
			Index = "2#9"
			Label = "strain1#36"
```

```
/>
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      IsGUI = "0#41"
      RightDigits = "7#41"
      Slope = "1#50"
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      Function = "strain1#36"
      Input2 = "1,2#36"
      Index = "3#9"
      Avg = "0#41"
/>
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      Offset = "0#50"
      XOn = "0#41"
      Warmup = "1#41"
      IsGUI = "0#41"
      ADCReadingType = "0#41"
      XChannel = "4#41"
      InputChannel = "3#41"
      FilterNotch = "10#41"
      Slope = "1#50"
      Function = "strain2#36"
      XVoltage = "3#41"
      Differential = "1#41"
      Units = "#36"
      IODeviceName = "2#41"
      Index = "4#9"
/>
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      IsGUI = "0#41"
      RightDigits = "6#41"
      Function = "Display#36"
      Input2 = "6,2#36"
      Units = "V#36"
      UseUnits = "0#41"
      Index = "5#9"
      Label = "strain2#36"
/>
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      Log = "1#41"
      Offset = "0#50"
      IsGUI = "0#41"
      RightDigits = "6#41"
      Slope = "1#50"
      Input0 = "0,2#36"
      Function = "strain2#36"
      Input2 = "4,2#36"
      Index = "6#9"
      Avg = "0#41"
/>
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      XChannel = "2#41"
```

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        FilterNotch = "60#41"
        Slope = "1#50"
        Function = "xtilt#36"
        XVoltage = "3#41"
        Differential = "1#41"
        Units = "v#36"
        IODeviceName = "3#41"
        Index = "7#9"
/>
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        Function = "xtilt#36"
        Interval = "00:10:00#36"
        Input2 = "7,2#36"
        Time = "00:00:00#36"
        Index = "8#9"
/>
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        EventDriven = "0#41"
        Index = "9#9"
/>
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        XOn = "0#41"
        Warmup = "1#41"
        ADCReadingType = "0#41"
        XChannel = "4#41"
        InputChannel = "2#41"
        FilterNotch = "10#41"
        Slope = "1#50"
        Function = "ytilt#36"
        XVoltage = "3#41"
        Differential = "1#41"
        Units = "#36"
        IODeviceName = "3#41"
        Index = "10#9"
/>
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        Function = "ytilt#36"
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        Input2 = "10,2#36"
        Time = "00:00:00#36"
        Index = "11#9"
/>
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        FixedInterval = "00:00:00#36"
        LogFile = "\Flash Disk\SSP.LOG#36"
        Precision = "4#41"
        Function = "ytilt#36"
        Input2 = "11,2#36"
        SensorName = "ytilt#36"
        EventDriven = "0#41"
```

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  />
  <Module
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        Offset = "00:00:00#36"
        Function = "ytilt#36"
        Interval = "00:10:00#36"
        Input2 = "12,2#36"
        Sequence = "2#41"
        UseCalcTime = "0#41"
        NumVals = "1#41"
        Index = "13#9"
        Label = "ytilt#36"
  />
  <Module
        Name = "AirTemp"
        Thermistor = "0#41"
        ComplResistor = "10000#41"
        Function = "AirTemp#36"
        TempUnits = "0#41"
        IODeviceName = "1#41"
        Channel = "3#41"
        Index = "14#9"
  />
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        Function = "Measure#36"
        Interval = "00:10:00#36"
        Input2 = "14,2#36"
        Time = "00:00:00#36"
        Index = "15#9"
  />
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        FixedInterval = "00:00:00#36"
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        Function = " airtemp#36"
        Input2 = "15,2#36"
        SensorName = "airtemp#36"
        EventDriven = "0#41"
        Index = "16#9"
  />
  <Module
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        XOn = "0#41"
        Warmup = "100#41"
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        ADCReadingType = "0#41"
        XChannel = "6#41"
        InputChannel = "5#41"
        FilterNotch = "60#41"
        Slope = "1#50"
        Function = "barometer#36"
        XVoltage = "3#41"
        Differential = "0#41"
        Units = "#36"
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        Index = "17#9"
  />
  <Module
        Name = "Display"
```

```
        IsGUI = "0#41"
        RightDigits = "6#41"
        Function = "Display#36"
        Input2 = "19,2#36"
        Units = "V#36"
        UseUnits = "0#41"
        Index = "18#9"
        Label = "barometer#36"
  />
  <Module
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        Log = "1#41"
        Offset = "0#50"
        IsGUI = "0#41"
        RightDigits = "6#41"
        Slope = "1#50"
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        Function = "barometer#36"
        Input2 = "17,2#36"
        Index = "19#9"
        Avg = "0#41"
  />
  <Module
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        Offset = "00:00:00#36"
        Function = "airtemp#36"
        Interval = "00:10:00#36"
        Input2 = "16,2#36"
        Sequence = "3#41"
        UseCalcTime = "0#41"
        NumVals = "1#41"
        Index = "20#9"
        Label = "airtemp#36"
  />
  <Module
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        Offset = "00:00:00#36"
        Function = "xtilt#36"
        Interval = "00:10:00#36"
        Input2 = "9,2#36"
        Sequence = "1#41"
        UseCalcTime = "0#41"
        NumVals = "1#41"
        Index = "21#9"
        Label = "bhtemp#36"
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        XOn = "0#41"
        Warmup = "100#41"
        ADCReadingType = "0#41"
        XChannel = "2#41"
        InputChannel = "1#41"
        FilterNotch = "60#41"
        Slope = "1#50"
        Function = "strainbat#36"
        XVoltage = "3#41"
        Differential = "0#41"
        Units = "#36"
        IODeviceName = "1#41"
        Index = "22#9"
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```

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      Function = "Measure#36"
      Interval = "00:10:00#36"
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      Time = "00:00:00#36"
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/>
<Module
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      FixedInterval = "00:00:00#36"
      LogFile = "\Flash Disk\System.log#36"
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      Function = "strainbat#36"
      Input2 = "23,2#36"
      SensorName = "strainbat#36"
      EventDriven = "0#41"
      Index = "24#9"
/>
<Module
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      Offset = "00:00:00#36"
      Function = "strainbat#36"
      Interval = "00:10:00#36"
      Input2 = "24,2#36"
      Sequence = "4#41"
      UseCalcTime = "0#41"
      NumVals = "1#41"
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      Label = "strainbat#36"
/>
<Module
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      Function = "IntBat#36"
      TempUnits = "0#41"
      Index = "26#9"
/>
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      Function = "Measure#36"
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/>
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      LogFile = "\Flash Disk\System.log#36"
      Precision = "2#41"
      Function = "strainbat#36"
      Input2 = "27,2#36"
      SensorName = "intbat#36"
      EventDriven = "0#41"
      Index = "28#9"
/>
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      Function = "SelfTimed#36"
      Interval = "00:10:00#36"
      Input2 = "28,2#36"
      Sequence = "5#41"
```

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            Function = "SDI-12#36"
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      />
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            Function = "sdi12#36"
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            Time = "00:00:00#36"
            Index = "31#9"
      />
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            Function = "sdi12#36"
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      />
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            Sequence = "6#41"
            UseCalcTime = "0#41"
            NumVals = "1#41"
            Index = "33#9"
            Label = "sdi12#36"
      />
</ModuleList>
<LogList>
      <Log
            Name = "\Flash Disk\SSP.LOG"
            Size = "65536"
            Wrap = "true"
            IgnoreQuality = "false"
      />
      <Log
            Name = "\Flash Disk\System.log"
            Size = "65536"
            Wrap = "true"
            IgnoreQuality = "false"
      />
</LogList>
<SelfTest>
      <Common
```

```
            ExternalLoopback = "1"
            PCMCIA = "0"
            PowerConsumption = "1"
            XliteButton = "0"
            XliteIOHeader = "1"
      />
</SelfTest>
<ComsMgr>
      <Com1
            Disable = "1#41"
            Connection = "1#41"
      />
      <Com2
      />
      <Com3
      />
      <Com4
      />
      <Com6
      />
      <Com7
      />
      <Com8
      />
      <Com9
      />
</ComsMgr>
<Satlink>
      <Common
            Port = "0"
            SatID = "2633D300"
            InitSatlink = "1"
            LTO = "0"
      />
      <SelfTimed
            Enabled = "1"
            LatLon = "0"
            Quality = "0"
            Channel = "136"
            Type = "2"
            Format = "3"
            Time = "00:02:40"
            Rate = "00:10:00"
            CenterWin = "0"
            WinLen = "00:00:00"
            NumVals = "1"
            EnableSatID2 = "0"
            SatID2 = "00000000"
            SCDChannel = "1"
      />
      <Random
            Enabled = "0"
            LatLon = "0"
            Quality = "0"
            Channel = "151"
            NormRate = "12:00:00"
            AlarmRate = "01:00:00"
            Type = "0"
            BurstCount = "3"
            BurstRate = "00:01:00"
            Format = "0"
            NumVals = "1"
      />
```

```
	</Satlink>
	<BasicMgr>
		<Settings
			GoesSelfTimedFunction = "STFORMATTER#36"
		/>
		<Schedule
			Subroutine = "&lt;None&gt;#36"
			Interval = "00:10:00#36"
			Time = "00:00:00#36"
		/>
	</BasicMgr>
</SetupFile>
```

10.27.2 MOTOCROSS SSF FILE

Copy this file and save it as *motocross.ssf* file. Then you can load it into the 9210/SL2

```
<SetupFile>
	<Engine>
		<Settings
			Version = "2.7.0.7"
		/>
	</Engine>
	<ModuleList>
		<Module
			Name = "EzMeasure"
			SamplesToAverage = "0#41"
			IsGUI = "0#41"
			SamplingTime = "00:00:00#36"
			MeasurementsPerLog = "1#41"
			Function = "EzMeasure#36"
			MeasurementTime = "00:00:00#36"
			Enabled = "1#41"
			LogID = "#36"
			SamplingInterval = "00:00:01#36"
			MeasurementInterval = "00:10:00#36"
			Index = "0#9"
		/>
		<Module
			Name = "ADC"
			Offset = "0#50"
			XOn = "0#41"
			Warmup = "1#41"
			IsGUI = "0#41"
			ADCReadingType = "0#41"
			XChannel = "2#41"
			InputChannel = "1#41"
			FilterNotch = "10#41"
			Slope = "1#50"
			Function = "strain1#36"
			XVoltage = "3#41"
			Differential = "1#41"
			Units = "#36"
			IODeviceName = "2#41"
			Index = "1#9"
		/>
		<Module
			Name = "Display"
			IsGUI = "0#41"
			RightDigits = "7#41"
```

```
		Function = "Display#36"
		Input2 = "3,2#36"
		Units = "V#36"
		UseUnits = "0#41"
		Index = "2#9"
		Label = "strain1#36"
	/>
	<Module
		Name = "EzSensor"
		Log = "1#41"
		Offset = "0#50"
		IsGUI = "0#41"
		RightDigits = "7#41"
		Slope = "1#50"
		Input0 = "0,2#36"
		Function = "strain1#36"
		Input2 = "1,2#36"
		Index = "3#9"
		Avg = "0#41"
	/>
	<Module
		Name = "ADC"
		Offset = "0#50"
		XOn = "0#41"
		Warmup = "1#41"
		IsGUI = "0#41"
		ADCReadingType = "0#41"
		XChannel = "4#41"
		InputChannel = "3#41"
		FilterNotch = "10#41"
		Slope = "1#50"
		Function = "strain2#36"
		XVoltage = "3#41"
		Differential = "1#41"
		Units = "#36"
		IODeviceName = "2#41"
		Index = "4#9"
	/>
	<Module
		Name = "Display"
		IsGUI = "0#41"
		RightDigits = "6#41"
		Function = "Display#36"
		Input2 = "6,2#36"
		Units = "V#36"
		UseUnits = "0#41"
		Index = "5#9"
		Label = "strain2#36"
	/>
	<Module
		Name = "EzSensor"
		Log = "1#41"
		Offset = "0#50"
		IsGUI = "0#41"
		RightDigits = "6#41"
		Slope = "1#50"
		Input0 = "0,2#36"
		Function = "strain2#36"
		Input2 = "4,2#36"
		Index = "6#9"
		Avg = "0#41"
	/>
	<Module
```

```
        Name = "ADC"
        Offset = "0#50"
        XOn = "0#41"
        Warmup = "100#41"
        ADCReadingType = "0#41"
        XChannel = "2#41"
        InputChannel = "1#41"
        FilterNotch = "60#41"
        Slope = "1#50"
        Function = "xtilt#36"
        XVoltage = "3#41"
        Differential = "1#41"
        Units = "v#36"
        IODeviceName = "3#41"
        Index = "7#9"
/>
<Module
        Name = "Measure"
        Function = "xtilt#36"
        Interval = "00:10:00#36"
        Input2 = "7,2#36"
        Time = "00:00:00#36"
        Index = "8#9"
/>
<Module
        Name = "Log"
        FixedInterval = "00:00:00#36"
        LogFile = "\Flash Disk\SSP.LOG#36"
        Precision = "4#41"
        Function = "xtilt#36"
        Input2 = "8,2#36"
        SensorName = "xtilt#36"
        EventDriven = "0#41"
        Index = "9#9"
/>
<Module
        Name = "ADC"
        Offset = "0#50"
        XOn = "0#41"
        Warmup = "1#41"
        ADCReadingType = "0#41"
        XChannel = "4#41"
        InputChannel = "2#41"
        FilterNotch = "10#41"
        Slope = "1#50"
        Function = "ytilt#36"
        XVoltage = "3#41"
        Differential = "1#41"
        Units = "#36"
        IODeviceName = "3#41"
        Index = "10#9"
/>
<Module
        Name = "Measure"
        Function = "ytilt#36"
        Interval = "00:10:00#36"
        Input2 = "10,2#36"
        Time = "00:00:00#36"
        Index = "11#9"
/>
<Module
        Name = "Log"
        FixedInterval = "00:00:00#36"
```

```
        LogFile = "\Flash Disk\SSP.LOG#36"
        Precision = "4#41"
        Function = "ytilt#36"
        Input2 = "11,2#36"
        SensorName = "ytilt#36"
        EventDriven = "0#41"
        Index = "12#9"
  />
  <Module
        Name = "SelfTimed"
        Offset = "00:00:00#36"
        Function = "ytilt#36"
        Interval = "00:10:00#36"
        Input2 = "12,2#36"
        Sequence = "2#41"
        UseCalcTime = "0#41"
        NumVals = "1#41"
        Index = "13#9"
        Label = "ytilt#36"
  />
  <Module
        Name = "AirTemp"
        Thermistor = "0#41"
        ComplResistor = "10000#41"
        Function = "AirTemp#36"
        TempUnits = "0#41"
        IODeviceName = "1#41"
        Channel = "3#41"
        Index = "14#9"
  />
  <Module
        Name = "Measure"
        Function = "Measure#36"
        Interval = "00:10:00#36"
        Input2 = "14,2#36"
        Time = "00:00:00#36"
        Index = "15#9"
  />
  <Module
        Name = "Log"
        FixedInterval = "00:00:00#36"
        LogFile = "\Flash Disk\SSP.LOG#36"
        Precision = "2#41"
        Function = " airtemp#36"
        Input2 = "15,2#36"
        SensorName = "airtemp#36"
        EventDriven = "0#41"
        Index = "16#9"
  />
  <Module
        Name = "ADC"
        Offset = "0#50"
        XOn = "0#41"
        Warmup = "100#41"
        IsGUI = "0#41"
        ADCReadingType = "0#41"
        XChannel = "6#41"
        InputChannel = "5#41"
        FilterNotch = "60#41"
        Slope = "1#50"
        Function = "barometer#36"
        XVoltage = "3#41"
        Differential = "0#41"
```

```
        Units = "#36"
        IODeviceName = "2#41"
        Index = "17#9"
  />
  <Module
        Name = "Display"
        IsGUI = "0#41"
        RightDigits = "6#41"
        Function = "Display#36"
        Input2 = "19,2#36"
        Units = "V#36"
        UseUnits = "0#41"
        Index = "18#9"
        Label = "barometer#36"
  />
  <Module
        Name = "EzSensor"
        Log = "1#41"
        Offset = "0#50"
        IsGUI = "0#41"
        RightDigits = "6#41"
        Slope = "1#50"
        Input0 = "0,2#36"
        Function = "barometer#36"
        Input2 = "17,2#36"
        Index = "19#9"
        Avg = "0#41"
  />
  <Module
        Name = "SelfTimed"
        Offset = "00:00:00#36"
        Function = "airtemp#36"
        Interval = "00:10:00#36"
        Input2 = "16,2#36"
        Sequence = "3#41"
        UseCalcTime = "0#41"
        NumVals = "1#41"
        Index = "20#9"
        Label = "airtemp#36"
  />
  <Module
        Name = "SelfTimed"
        Offset = "00:00:00#36"
        Function = "xtilt#36"
        Interval = "00:10:00#36"
        Input2 = "9,2#36"
        Sequence = "1#41"
        UseCalcTime = "0#41"
        NumVals = "1#41"
        Index = "21#9"
        Label = "bhtemp#36"
  />
  <Module
        Name = "ADC"
        Offset = "0#50"
        XOn = "0#41"
        Warmup = "100#41"
        ADCReadingType = "0#41"
        XChannel = "2#41"
        InputChannel = "1#41"
        FilterNotch = "60#41"
        Slope = "1#50"
        Function = "strainbat#36"
```

```
        XVoltage = "3#41"
        Differential = "0#41"
        Units = "#36"
        IODeviceName = "1#41"
        Index = "22#9"
  />
  <Module
        Name = "Measure"
        Function = "Measure#36"
        Interval = "00:10:00#36"
        Input2 = "22,2#36"
        Time = "00:00:00#36"
        Index = "23#9"
  />
  <Module
        Name = "Log"
        FixedInterval = "00:00:00#36"
        LogFile = "\Flash Disk\System.log#36"
        Precision = "2#41"
        Function = "strainbat#36"
        Input2 = "23,2#36"
        SensorName = "strainbat#36"
        EventDriven = "0#41"
        Index = "24#9"
  />
  <Module
        Name = "SelfTimed"
        Offset = "00:00:00#36"
        Function = "strainbat#36"
        Interval = "00:10:00#36"
        Input2 = "24,2#36"
        Sequence = "4#41"
        UseCalcTime = "0#41"
        NumVals = "1#41"
        Index = "25#9"
        Label = "strainbat#36"
  />
  <Module
        Name = "IntBat"
        Function = "IntBat#36"
        TempUnits = "0#41"
        Index = "26#9"
  />
  <Module
        Name = "Measure"
        Function = "Measure#36"
        Interval = "00:10:00#36"
        Input2 = "26,1#36"
        Time = "00:00:00#36"
        Index = "27#9"
  />
  <Module
        Name = "Log"
        FixedInterval = "00:00:00#36"
        LogFile = "\Flash Disk\System.log#36"
        Precision = "2#41"
        Function = "strainbat#36"
        Input2 = "27,2#36"
        SensorName = "intbat#36"
        EventDriven = "0#41"
        Index = "28#9"
  />
  <Module
```

```
            Name = "SelfTimed"
            Offset = "00:00:00#36"
            Function = "SelfTimed#36"
            Interval = "00:10:00#36"
            Input2 = "28,2#36"
            Sequence = "5#41"
            UseCalcTime = "0#41"
            NumVals = "1#41"
            Index = "29#9"
            Label = "intbat#36"
      />
      <Module
            Name = "SDI-12"
            Offset = "0#18"
            Command = "M#36"
            Slope = "1#18"
            Function = "SDI-12#36"
            Units = "millibars#36"
            AddressIdx = "0#9"
            Index = "30#9"
      />
      <Module
            Name = "Measure"
            Function = "sdi12#36"
            Interval = "00:10:00#36"
            Input2 = "30,0#36"
            Time = "00:00:00#36"
            Index = "31#9"
      />
      <Module
            Name = "Log"
            FixedInterval = "00:00:00#36"
            LogFile = "\Flash Disk\System.log#36"
            Precision = "5#9"
            Function = "sdi12#36"
            Input2 = "31,2#36"
            SensorName = "sdi12#36"
            EventDriven = "0#9"
            Index = "32#9"
      />
      <Module
            Name = "SelfTimed"
            Offset = "00:00:00#36"
            Function = "sdi12#36"
            Interval = "00:10:00#36"
            Input2 = "32,2#36"
            Sequence = "6#9"
            UseCalcTime = "0#9"
            NumVals = "1#9"
            Index = "33#9"
            Label = "sdi12#36"
      />
</ModuleList>
<LogList>
      <Log
            Name = "\Flash Disk\SSP.LOG"
            Size = "65536"
            Wrap = "true"
            IgnoreQuality = "false"
      />
      <Log
            Name = "\Flash Disk\System.log"
            Size = "65536"
```

```
            Wrap = "true"
            IgnoreQuality = "false"
      />
</LogList>
<SelfTest>
      <Common
            ExternalLoopback = "1"
            PCMCIA = "0"
            PowerConsumption = "1"
            XliteButton = "0"
            XliteIOHeader = "1"
      />
</SelfTest>
<ComsMgr>
      <Com1
            Disable = "1#41"
            Connection = "1#41"
      />
      <Com2
      />
      <Com3
      />
      <Com4
      />
      <Com6
      />
      <Com7
      />
      <Com8
      />
      <Com9
      />
</ComsMgr>
<Satlink>
      <Common
            Port = "0"
            SatID = "2633D300"
            InitSatlink = "1"
            LTO = "0"
      />
      <SelfTimed
            Enabled = "1"
            LatLon = "0"
            Quality = "0"
            Channel = "136"
            Type = "2"
            Format = "3"
            Time = "00:02:40"
            Rate = "00:10:00"
            CenterWin = "0"
            WinLen = "00:00:00"
            NumVals = "1"
            EnableSatID2 = "0"
            SatID2 = "00000000"
            SCDChannel = "1"
      />
      <Random
            Enabled = "0"
            LatLon = "0"
            Quality = "0"
            Channel = "151"
            NormRate = "12:00:00"
            AlarmRate = "01:00:00"
```

```
                Type = "0"
                BurstCount = "3"
                BurstRate = "00:01:00"
                Format = "0"
                NumVals = "1"
            />
        </Satlink>
        <BasicMgr>
            <Settings
                GoesSelfTimedFunction = "STFORMATTER#36"
            />
            <Schedule
                Subroutine = "&lt;None&gt;#36"
                Interval = "00:10:00#36"
                Time = "00:00:00#36"
            />
        </BasicMgr>
</SetupFile>
```


10.27.3 PHILLIPS SSF FILE

Copy this file and save it as *phillips.ssf* file. Then you can load it into the 9210/SL2

PHILLIPS SSF FILE


```
<SetupFile>
        <ModuleList>
            <Module
                Name = "EzMeasure"
                SamplesToAverage = "0#41"
                IsGUI = "0#41"
                SamplingTime = "00:00:00#36"
                MeasurementsPerLog = "1#41"
                Function = "EzMeasure#36"
                MeasurementTime = "00:00:00#36"
                Enabled = "1#41"
                LogID = "#36"
                SamplingInterval = "00:00:01#36"
                MeasurementInterval = "00:10:00#36"
                Index = "0#9"
            />
            <Module
                Name = "ADC"
                Offset = "0#50"
                XOn = "0#41"
                Warmup = "1#41"
                IsGUI = "0#41"
                ADCReadingType = "0#41"
                XChannel = "2#41"
                InputChannel = "1#41"
                FilterNotch = "10#41"
                Slope = "1#50"
                Function = "strain1#36"
                XVoltage = "3#41"
                Differential = "1#41"
                Units = "#36"
                IODeviceName = "2#41"
                Index = "1#9"
            />
            <Module
```

```
        Name = "Display"
        IsGUI = "0#41"
        RightDigits = "7#41"
        Function = "Display#36"
        Input2 = "3,2#36"
        Units = "V#36"
        UseUnits = "0#41"
        Index = "2#9"
        Label = "strain1#36"
/>
<Module
        Name = "EzSensor"
        Log = "1#41"
        Offset = "0#50"
        IsGUI = "0#41"
        RightDigits = "7#41"
        Slope = "1#50"
        Input0 = "0,2#36"
        Function = "strain1#36"
        Input2 = "1,2#36"
        Index = "3#9"
        Avg = "0#41"
/>
<Module
        Name = "ADC"
        Offset = "0#50"
        XOn = "0#41"
        Warmup = "1#41"
        IsGUI = "0#41"
        ADCReadingType = "0#41"
        XChannel = "4#41"
        InputChannel = "3#41"
        FilterNotch = "10#41"
        Slope = "1#50"
        Function = "strain2#36"
        XVoltage = "3#41"
        Differential = "1#41"
        Units = "#36"
        IODeviceName = "2#41"
        Index = "4#9"
/>
<Module
        Name = "Display"
        IsGUI = "0#41"
        RightDigits = "6#41"
        Function = "Display#36"
        Input2 = "6,2#36"
        Units = "V#36"
        UseUnits = "0#41"
        Index = "5#9"
        Label = "strain2#36"
/>
<Module
        Name = "EzSensor"
        Log = "1#41"
        Offset = "0#50"
        IsGUI = "0#41"
        RightDigits = "6#41"
        Slope = "1#50"
        Input0 = "0,2#36"
        Function = "strain2#36"
        Input2 = "4,2#36"
        Index = "6#9"
```

```
        Avg = "0#41"
    />
    <Module
        Name = "ADC"
        Offset = "0#50"
        XOn = "0#41"
        Warmup = "100#41"
        IsGUI = "0#41"
        ADCReadingType = "0#41"
        XChannel = "6#41"
        InputChannel = "5#41"
        FilterNotch = "60#41"
        Slope = "1#50"
        Function = "barometer#36"
        XVoltage = "3#41"
        Differential = "0#41"
        Units = "#36"
        IODeviceName = "2#41"
        Index = "7#9"
    />
    <Module
        Name = "Display"
        IsGUI = "0#41"
        RightDigits = "6#41"
        Function = "Display#36"
        Input2 = "9,2#36"
        Units = "V#36"
        UseUnits = "0#41"
        Index = "8#9"
        Label = "barometer#36"
    />
    <Module
        Name = "EzSensor"
        Log = "1#41"
        Offset = "0#50"
        IsGUI = "0#41"
        RightDigits = "6#41"
        Slope = "1#50"
        Input0 = "0,2#36"
        Function = "barometer#36"
        Input2 = "7,2#36"
        Index = "9#9"
        Avg = "0#41"
    />
    <Module
        Name = "ADC"
        Offset = "0#50"
        XOn = "0#41"
        Warmup = "100#41"
        ADCReadingType = "0#41"
        XChannel = "2#41"
        InputChannel = "1#41"
        FilterNotch = "60#41"
        Slope = "1#50"
        Function = "bhtemp#36"
        XVoltage = "3#41"
        Differential = "0#41"
        Units = "#36"
        IODeviceName = "1#41"
        Index = "10#9"
    />
    <Module
        Name = "Measure"
```

```
        Function = "bhtemp#36"
        Interval = "00:10:00#36"
        Input2 = "10,2#36"
        Time = "00:00:00#36"
        Index = "11#9"
  />
  <Module
        Name = "Log"
        FixedInterval = "00:00:00#36"
        LogFile = "\Flash Disk\SSP.LOG#36"
        Precision = "4#41"
        Function = "Log#36"
        Input2 = "11,2#36"
        SensorName = "bhtemp#36"
        EventDriven = "0#41"
        Index = "12#9"
  />
  <Module
        Name = "SelfTimed"
        Offset = "00:00:00#36"
        Function = "SelfTimed#36"
        Interval = "00:10:00#36"
        Input2 = "12,2#36"
        Sequence = "1#41"
        NumVals = "1#41"
        Index = "13#9"
        Label = "bhtemp#36"
  />
  <Module
        Name = "AirTemp"
        Thermistor = "0#41"
        ComplResistor = "10000#41"
        Function = "AirTemp#36"
        TempUnits = "0#41"
        IODeviceName = "1#41"
        Channel = "3#41"
        Index = "14#9"
  />
  <Module
        Name = "Measure"
        Function = "airtemp#36"
        Interval = "00:10:00#36"
        Input2 = "14,2#36"
        Time = "00:00:00#36"
        Index = "15#9"
  />
  <Module
        Name = "Log"
        FixedInterval = "00:00:00#36"
        LogFile = "\Flash Disk\SSP.LOG#36"
        Precision = "2#41"
        Function = "airtemp#36"
        Input2 = "15,2#36"
        SensorName = "airtemp#36"
        EventDriven = "0#41"
        Index = "16#9"
  />
  <Module
        Name = "SelfTimed"
        Offset = "00:00:00#36"
        Function = "SelfTimed#36"
        Interval = "00:10:00#36"
        Input2 = "16,2#36"
```

```
        Sequence = "3#41"
        NumVals = "1#41"
        Index = "17#9"
        Label = "airtemp#36"
/>
<Module
        Name = "ADC"
        Offset = "0#50"
        XOn = "0#41"
        Warmup = "100#41"
        ADCReadingType = "0#41"
        XChannel = "5#41"
        InputChannel = "4#41"
        FilterNotch = "60#41"
        Slope = "1#50"
        Function = "strainbat#36"
        XVoltage = "3#41"
        Differential = "0#41"
        Units = "#36"
        IODeviceName = "1#41"
        Index = "18#9"
/>
<Module
        Name = "Measure"
        Function = "strainbat#36"
        Interval = "00:10:00#36"
        Input2 = "18,2#36"
        Time = "00:00:00#36"
        Index = "19#9"
/>
<Module
        Name = "Log"
        FixedInterval = "00:00:00#36"
        LogFile = "\Flash Disk\SSP.LOG#36"
        Precision = "4#41"
        Function = "strainbat#36"
        Input2 = "19,2#36"
        SensorName = "strainbat#36"
        EventDriven = "0#41"
        Index = "20#9"
/>
<Module
        Name = "SelfTimed"
        Offset = "00:00:00#36"
        Function = "strainbat#36"
        Interval = "00:10:00#36"
        Input2 = "20,2#36"
        Sequence = "4#41"
        NumVals = "1#41"
        Index = "21#9"
        Label = "strainbat#36"
/>
<Module
        Name = "IntBat"
        Function = "IntBat#36"
        TempUnits = "0#41"
        Index = "22#9"
/>
<Module
        Name = "Measure"
        Function = "intbat#36"
        Interval = "00:10:00#36"
        Input2 = "22,1#36"
```

```
            Time = "00:00:00#36"
            Index = "23#9"
      />
      <Module
            Name = "Log"
            FixedInterval = "00:00:00#36"
            LogFile = "\Flash Disk\SSP.LOG#36"
            Precision = "2#41"
            Function = "intbat#36"
            Input2 = "23,2#36"
            SensorName = "intbat#36"
            EventDriven = "0#41"
            Index = "24#9"
      />
      <Module
            Name = "SelfTimed"
            Offset = "00:00:00#36"
            Function = "SelfTimed#36"
            Interval = "00:10:00#36"
            Input2 = "24,2#36"
            Sequence = "5#41"
            NumVals = "1#41"
            Index = "25#9"
            Label = "intbat#36"
      />
</ModuleList>
<LogList>
      <Log
            Name = "\Flash Disk\SSP.LOG"
            Size = "65536"
            Wrap = "true"
            IgnoreQuality = "false"
      />
      <Log
            Name = "\Flash Disk\System.log"
            Size = "65536"
            Wrap = "true"
            IgnoreQuality = "false"
      />
</LogList>
<SelfTest>
      <Common
            ExternalLoopback = "1"
            PCMCIA = "0"
            PowerConsumption = "1"
            XliteButton = "0"
            XliteIOHeader = "1"
      />
</SelfTest>
<ComsMgr>
      <Com1
            Disable = "1#41"
            Connection = "1#41"
      />
      <Com2
      />
      <Com3
      />
      <Com4
      />
      <Com6
      />
      <Com7
```

```
            />
            <Com8
            />
            <Com9
            />
      </ComsMgr>
      <Satlink>
            <Common
                  Port = "0"
                  SatID = "2633D300"
                  InitSatlink = "1"
                  LTO = "0"
            />
            <SelfTimed
                  Enabled = "1"
                  LatLon = "0"
                  Quality = "0"
                  Channel = "136"
                  Type = "2"
                  Format = "3"
                  Time = "00:02:40"
                  Rate = "00:10:00"
                  CenterWin = "0"
                  WinLen = "00:00:00"
                  NumVals = "1"
                  EnableSatID2 = "0"
                  SatID2 = "00000000"
                  SCDChannel = "1"
            />
            <Random
                  Enabled = "0"
                  LatLon = "0"
                  Quality = "0"
                  Channel = "151"
                  NormRate = "12:00:00"
                  AlarmRate = "01:00:00"
                  Type = "0"
                  BurstCount = "3"
                  BurstRate = "00:01:00"
                  Format = "0"
                  NumVals = "1"
            />
      </Satlink>
      <BasicMgr>
            <Settings
                  GoesSelfTimedFunction = "STFORMATTER#36"
            />
            <Schedule
                  Subroutine = "&lt;None&gt;#36"
                  Interval = "00:10:00#36"
                  Time = "00:00:00#36"
            />
      </BasicMgr>
</SetupFile>
```


10.27.4 POSTPILE SSF FILE

Copy this file and save it as *postpile.ssf* file. Then you can load it into the 9210/SL2

POSTPILE SSF FILE


```
<SetupFile>
```

```
<Engine>
      <Settings
            Version = "2.7.0.7"
      />
</Engine>
<ModuleList>
      <Module
            Name = "EzMeasure"
            SamplesToAverage = "0#9"
            IsGUI = "0#9"
            SamplingTime = "00:00:00#36"
            MeasurementsPerLog = "1#9"
            Function = "EzMeasure#36"
            MeasurementTime = "00:00:00#36"
            Enabled = "1#9"
            LogID = "#36"
            SamplingInterval = "00:00:01#36"
            MeasurementInterval = "00:10:00#36"
            Index = "0#9"
      />
      <Module
            Name = "ADC"
            Offset = "0#18"
            XOn = "0#9"
            Warmup = "1#9"
            IsGUI = "0#9"
            ADCReadingType = "0#9"
            XChannel = "2#9"
            InputChannel = "1#9"
            FilterNotch = "10#9"
            Slope = "1#18"
            Function = "strain1#36"
            XVoltage = "3#9"
            Differential = "1#9"
            Units = "#36"
            IODeviceName = "2#9"
            Index = "1#9"
      />
      <Module
            Name = "Display"
            IsGUI = "0#9"
            RightDigits = "7#9"
            Function = "Display#36"
            Input2 = "3,2#36"
            Units = "V#36"
            UseUnits = "0#9"
            Index = "2#9"
            Label = "strain1#36"
      />
      <Module
            Name = "EzSensor"
            Log = "1#9"
            Offset = "0#18"
            IsGUI = "0#9"
            RightDigits = "7#9"
            Slope = "1#18"
            Input0 = "0,2#36"
            Function = "strain1#36"
            Input2 = "1,2#36"
            Index = "3#9"
            Avg = "0#9"
      />
      <Module
```

```
		Name = "ADC"
		Offset = "0#18"
		XOn = "0#9"
		Warmup = "1#9"
		IsGUI = "0#9"
		ADCReadingType = "0#9"
		XChannel = "4#9"
		InputChannel = "3#9"
		FilterNotch = "10#9"
		Slope = "1#18"
		Function = "strain2#36"
		XVoltage = "3#9"
		Differential = "1#9"
		Units = "#36"
		IODeviceName = "2#9"
		Index = "4#9"
	/>
	<Module
		Name = "Display"
		IsGUI = "0#9"
		RightDigits = "6#9"
		Function = "Display#36"
		Input2 = "6,2#36"
		Units = "V#36"
		UseUnits = "0#9"
		Index = "5#9"
		Label = "strain2#36"
	/>
	<Module
		Name = "EzSensor"
		Log = "1#9"
		Offset = "0#18"
		IsGUI = "0#9"
		RightDigits = "6#9"
		Slope = "1#18"
		Input0 = "0,2#36"
		Function = "strain2#36"
		Input2 = "4,2#36"
		Index = "6#9"
		Avg = "0#9"
	/>
	<Module
		Name = "ADC"
		Offset = "0#18"
		XOn = "0#9"
		Warmup = "100#9"
		IsGUI = "0#9"
		ADCReadingType = "0#9"
		XChannel = "6#9"
		InputChannel = "5#9"
		FilterNotch = "60#9"
		Slope = "1#18"
		Function = "barometer#36"
		XVoltage = "3#9"
		Differential = "0#9"
		Units = "#36"
		IODeviceName = "2#9"
		Index = "7#9"
	/>
	<Module
		Name = "Display"
		IsGUI = "0#9"
		RightDigits = "6#9"
```

```
        Function = "Display#36"
        Input2 = "9,2#36"
        Units = "V#36"
        UseUnits = "0#9"
        Index = "8#9"
        Label = "barometer#36"
  />
  <Module
        Name = "EzSensor"
        Log = "1#9"
        Offset = "0#18"
        IsGUI = "0#9"
        RightDigits = "6#9"
        Slope = "1#18"
        Input0 = "0,2#36"
        Function = "barometer#36"
        Input2 = "7,2#36"
        Index = "9#9"
        Avg = "0#9"
  />
  <Module
        Name = "ADC"
        Offset = "0#18"
        XOn = "0#9"
        Warmup = "100#9"
        ADCReadingType = "0#9"
        XChannel = "2#9"
        InputChannel = "1#9"
        FilterNotch = "60#9"
        Slope = "1#18"
        Function = "bhtemp#36"
        XVoltage = "3#9"
        Differential = "0#9"
        Units = "#36"
        IODeviceName = "1#9"
        Index = "10#9"
  />
  <Module
        Name = "Measure"
        Function = "bhtemp#36"
        Interval = "00:10:00#36"
        Input2 = "10,2#36"
        Time = "00:00:00#36"
        Index = "11#9"
  />
  <Module
        Name = "Log"
        FixedInterval = "00:00:00#36"
        LogFile = "\Flash Disk\SSP.LOG#36"
        Precision = "4#9"
        Function = "Log#36"
        Input2 = "11,2#36"
        SensorName = "bhtemp#36"
        EventDriven = "0#9"
        Index = "12#9"
  />
  <Module
        Name = "SelfTimed"
        Offset = "00:00:00#36"
        Function = "SelfTimed#36"
        Interval = "00:10:00#36"
        Input2 = "12,2#36"
        Sequence = "1#9"
```

```
        UseCalcTime = "0#9"
        NumVals = "1#9"
        Index = "13#9"
        Label = "bhtemp#36"
  />
  <Module
        Name = "SDI-12"
        Offset = "-500#18"
        Command = "M#36"
        Slope = "1#18"
        Function = "SDI-12#36"
        Units = "millibars#36"
        AddressIdx = "0#9"
        Index = "14#9"
  />
  <Module
        Name = "Measure"
        Function = "sdi12#36"
        Interval = "00:10:00#36"
        Input2 = "14,0#36"
        Time = "00:00:00#36"
        Index = "15#9"
  />
  <Module
        Name = "Log"
        FixedInterval = "00:00:00#36"
        LogFile = "\Flash Disk\SSP.LOG#36"
        Precision = "6#9"
        Function = "sdi12#36"
        Input2 = "15,2#36"
        SensorName = "sdi12#36"
        EventDriven = "0#9"
        Index = "16#9"
  />
  <Module
        Name = "SelfTimed"
        Offset = "00:00:00#36"
        Function = "SelfTimed#36"
        Interval = "00:10:00#36"
        Input2 = "16,2#36"
        Sequence = "2#9"
        UseCalcTime = "0#9"
        NumVals = "1#9"
        Index = "17#9"
        Label = "sdi12#36"
  />
  <Module
        Name = "AirTemp"
        Thermistor = "0#9"
        ComplResistor = "10000#9"
        Function = "AirTemp#36"
        TempUnits = "0#9"
        IODeviceName = "1#9"
        Channel = "3#9"
        Index = "18#9"
  />
  <Module
        Name = "Measure"
        Function = "airtemp#36"
        Interval = "00:10:00#36"
        Input2 = "18,2#36"
        Time = "00:00:00#36"
        Index = "19#9"
```

```
/>
<Module
      Name = "Log"
      FixedInterval = "00:00:00#36"
      LogFile = "\Flash Disk\SSP.LOG#36"
      Precision = "2#9"
      Function = "airtemp#36"
      Input2 = "19,2#36"
      SensorName = "airtemp#36"
      EventDriven = "0#9"
      Index = "20#9"
/>
<Module
      Name = "SelfTimed"
      Offset = "00:00:00#36"
      Function = "SelfTimed#36"
      Interval = "00:10:00#36"
      Input2 = "20,2#36"
      Sequence = "3#9"
      UseCalcTime = "0#9"
      NumVals = "1#9"
      Index = "21#9"
      Label = "airtemp#36"
/>
<Module
      Name = "ADC"
      Offset = "0#18"
      XOn = "0#9"
      Warmup = "100#9"
      ADCReadingType = "0#9"
      XChannel = "5#9"
      InputChannel = "4#9"
      FilterNotch = "60#9"
      Slope = "1#18"
      Function = "strainbat#36"
      XVoltage = "3#9"
      Differential = "0#9"
      Units = "#36"
      IODeviceName = "1#9"
      Index = "22#9"
/>
<Module
      Name = "Measure"
      Function = "strainbat#36"
      Interval = "00:10:00#36"
      Input2 = "22,2#36"
      Time = "00:00:00#36"
      Index = "23#9"
/>
<Module
      Name = "Log"
      FixedInterval = "00:00:00#36"
      LogFile = "\Flash Disk\SSP.LOG#36"
      Precision = "4#9"
      Function = "strainbat#36"
      Input2 = "23,2#36"
      SensorName = "strainbat#36"
      EventDriven = "0#9"
      Index = "24#9"
/>
<Module
      Name = "SelfTimed"
      Offset = "00:00:00#36"
```

```
            Function = "strainbat#36"
            Interval = "00:10:00#36"
            Input2 = "24,2#36"
            Sequence = "4#9"
            UseCalcTime = "0#9"
            NumVals = "1#9"
            Index = "25#9"
            Label = "strainbat#36"
        />
        <Module
            Name = "IntBat"
            Function = "IntBat#36"
            TempUnits = "0#9"
            Index = "26#9"
        />
        <Module
            Name = "Measure"
            Function = "intbat#36"
            Interval = "00:10:00#36"
            Input2 = "26,1#36"
            Time = "00:00:00#36"
            Index = "27#9"
        />
        <Module
            Name = "Log"
            FixedInterval = "00:00:00#36"
            LogFile = "\Flash Disk\SSP.LOG#36"
            Precision = "2#9"
            Function = "intbat#36"
            Input2 = "27,2#36"
            SensorName = "intbat#36"
            EventDriven = "0#9"
            Index = "28#9"
        />
        <Module
            Name = "SelfTimed"
            Offset = "00:00:00#36"
            Function = "SelfTimed#36"
            Interval = "00:10:00#36"
            Input2 = "28,2#36"
            Sequence = "5#9"
            UseCalcTime = "0#9"
            NumVals = "1#9"
            Index = "29#9"
            Label = "intbat#36"
        />
    </ModuleList>
    <LogList>
        <Log
            Name = "\Flash Disk\SSP.LOG"
            Size = "65536"
            Wrap = "true"
            IgnoreQuality = "false"
        />
        <Log
            Name = "\Flash Disk\System.log"
            Size = "65536"
            Wrap = "true"
            IgnoreQuality = "false"
        />
    </LogList>
    <SelfTest>
        <Common
```

```
            ExternalLoopback = "1"
            PCMCIA = "0"
            PowerConsumption = "1"
            XliteButton = "0"
            XliteIOHeader = "1"
        />
    </SelfTest>
    <ComsMgr>
        <Com1
            Disable = "1#9"
            Connection = "1#9"
        />
        <Com2
        />
        <Com3
        />
        <Com4
        />
        <Com6
        />
        <Com7
        />
        <Com8
        />
        <Com9
        />
    </ComsMgr>
    <Satlink>
        <Common
            Port = "0"
            SatID = "2633D300"
            InitSatlink = "1"
            LTO = "0"
        />
        <SelfTimed
            Enabled = "1"
            LatLon = "0"
            Quality = "0"
            Channel = "136"
            Type = "2"
            Format = "3"
            Time = "00:02:40"
            Rate = "00:10:00"
            CenterWin = "0"
            WinLen = "00:00:00"
            NumVals = "1"
            EnableSatID2 = "0"
            SatID2 = "00000000"
            SCDChannel = "1"
        />
        <Random
            Enabled = "0"
            LatLon = "0"
            Quality = "0"
            Channel = "151"
            NormRate = "12:00:00"
            AlarmRate = "01:00:00"
            Type = "0"
            BurstCount = "3"
            BurstRate = "00:01:00"
            Format = "0"
            NumVals = "1"
        />
```

```
	</Satlink>
	<BasicMgr>
		<Settings
			GoesSelfTimedFunction = "STFORMATTER#36"
		/>
		<Schedule
			Subroutine = "&lt;None&gt;#36"
			Interval = "00:10:00#36"
			Time = "00:00:00#36"
		/>
	</BasicMgr>
</SetupFile>
```

10.27.5 STFORMATTER FILE FOR ALL STRAIN SITES IN LONG VALLEY

The following .txt page tells the Sutron 9210 how to format the data collected from the program. This enables it to be telemetered at 22 bit resolution. Save this page from `Public Declare Function` to `End Function` ***as stformatter.bas. If it is saved as any other file name or format, it will not work. It shoud be***

```
Public Declare Function ReadLog(LogName, Sensor, TimeStamp, RLData,
RLQuality,RLUnits)
Public Declare Function BigBin(num, numbytes)

Public Function SELFTIMED_STFormatter

Open "System.log" For Log As #1
Log #1, Now, "START SELFTIMED FORMAT"
Close #1

' Variables used to store results of Readlog function
RLData = 0.0
RLQuality = "U"
RLUnits = ""

'Initialize local variables
LogName = "SSP.LOG"
MinTx = 2         '10 minute values to transmit
TimeNow = now           'What time are we starting
TxDataBuffer = "" 'Temp tx buffer
usym = 3445971          'Missing data value

'Set up sensors array
'Array at 3 holds data multiplier
'Array at 2 holds sensor interval in seconds
'Array at 1 holds sensor name
'Array at 0 holds data
DataToTx (0,1) = "strain1"
DataToTx (1,1) = "strain2"
DataToTx (2,1) = "barometer"

DataToTx (2,2) = 600
DataToTx (2,3) = 1000000

DataToTx (1,2) = 600
DataToTx (0,3) = 10000000
DataToTx (0,2) = 600
DataToTx (1,3) = 1000000

'Initialize array at 0 to hold data for transmission

NumSensors = Ubound(DataToTx)
for i = 0 to NumSensors
```

```
   DataToTx(i,0)  = Int(i+1)
next i

'Loop to get data from log
'Get all defined sensors and build their string
for i = 0 to NumSensors
   'Get recent timestamp based on sensor interval and add time offset
   'and interval to sensor message
''060731   Tsens = TimeNow - (TimeNow Mod (DataToTx(i,2) * 2)) - 60
'' Change current time to minutes, subtract 1 minute and mod to neareast 10 minutes

''            Tsens = TimeNow - (((TimeNow Mod 60) - 60) Mod 600)
''            Tsens = TimeNow - ((Timenow - 120) Mod
          Tsens = TimeNow - (TimeNow Mod 60) - 60
          Tsens = Tsens - ((Minute(Tsens) Mod 10) * 60)

if i = 0 then
'Put logging time into transmission buffer
          dateval = ((int(Year(Tsens)) - 2000) * 10000) + (int(Month(Tsens)) * 100) +
int(Day(Tsens))
          DataToTx(i,0) = DataToTx(i,0) + bigbin(dateval,4)
          timeval = int(Hour(Tsens)) * 100  + int(Minute(Tsens))
          DataToTx(i,0) = DataToTx(i,0) + bigbin(timeval,4)
end if

'How many values will be transmitted
   if(DataToTx(i,2)) = 600 then SensLoop = MinTx

   'Get the number of values specified (recent data first)
   'Add good data to sensor tx string, place an M in bad or missing data
   for t = 1 to SensLoop
      if ReadLog(LogName, DataToTx(i,1), Tsens, RLData, RLQuality, RLunits) = 1
      then

         dataval = int(RLData * DataToTx(i,3) + .5)
         DataToTX(i,0) = DataToTx(i,0) + bigbin(dataval,4)

      else
         DataToTX(i,0) = DataToTx(i,0) + bigbin(usym,4)

      end if
      Tsens = Tsens - DataToTx(i,2)
   next t
next i
'
'Loop to build entire tx buffer from each sensor message
for i = 0 to (NumSensors)
   TxDataBuffer = TxDataBuffer + DataToTx(i,0)
next i

'''for i = 0 to (NumSensors-1)
'''   TxDataBuffer = TxDataBuffer + DataToTx(i,0) + " "
'''next i
'''TxDataBuffer = TxDataBuffer + DataToTx(i,0)

Open "System.log" For Log As #1
Log #1, Now, "END SELFTIMED FORMAT"
Close #1


'Selftimed_STFormatter = TxDataBuffer + Selftimed_STFormatter & Time
Selftimed_STFormatter = TxDataBuffer + Selftimed_STFormatter
End Function
```

```
''''''''''''''''''''''''''''
'
' Function bigbin to convert data to 4 byte pseudo-binary
'
''''''''''''''''''''''''''''
Public Function BigBin(num, numbytes)
' this function formats unsigned integers into 6 bit binary format.
' it is needed because the builtin bin6 function only works on two's complement
' numbers up to 18 bits
i = int(num)
outstr = ""
while numbytes >0
   numbytes = numbytes-1
   byteval = i And 63
   i = i >> 6
   if byteval = 63 then
      outstr = chr(63) & outstr
   else
      outstr = chr(byteval+64) & outstr
   end if
wend
BigBin = outstr
end function

'Function to read a specific sensor from log
'
Public Function ReadLog(LogName, Sensor, TimeStamp, RLData, RLQuality, RLUnits)
     ' LogName, Sensor, and TimeStampe are inputs
     ' RLData, RLQuality, and RLUnits are global variables that receive this
     ' function's outputs
     ' If Sensor at TimeStamp is found, 1 is returned - Otherwise, 0

RLData = 0.0
RLQuality = "U"
RLUnits = ""
ReadLog = 0
Type = 0
TimeFound = 0
SensorFound = ""
FileNum = FreeFile

Open LogName for Log as FileNum
Seek FileNum, TimeStamp

If Not Eof(FileNum) Then
   Input FileNum, Type, TimeFound, SensorFound, RLData, RLQuality, RLUnits
   Do While TimeFound = TimeStamp and Not Eof(FileNum)
      If SensorFound = Sensor Then
         If RLQuality = "G" Then
            ReadLog = 1
         End If
         Exit Do
      Else
          ' Log may contain multiple entries for this time-slot so keep looking
          ' Original Seek finds last entry for specified time, so move to
'           previous
          Seek FileNum, Next
          Input FileNum, Type, TimeFound, SensorFound, RLData, RLQuality, RLUnits
      End If
   End Loop
End If
```

```
Close FileNum
End Function
```