NATHANIEL B. PALMER CRUISE NPB93-1 WEEKLY REPORT

We left Punta Arenas, Chile on the 4th of February at 0200. We sailed out the Straits of Magellan, turned right, passed through the Straits of LeMaire and headed for Antarctica. After the first day out, the weather smiled on us and it was hot and sunny. We decided to take the opportunity to deploy the SSI gas-injector guns and the 24 channel MCS streamer. We had deployed the gradiometer previously. It took a while to get the guns deployed. The streamer was a major disappointment since it floated and the data was intolerably noisy. We tried numerous fixes, all of which seemed to make minor but only minor improvements. We are now in the process of adding a 400 foot, non-bouyant leader to the 72-phone, 24-channel streamer. We will then add chain links every meter to the streamer itself to overcome its bouyancy. Mark has been able to make the EG&G 2420 record 24 channel data with the proper headers. The Cypher tapedrive will read the tapes and write them to Exabyte.

We crossed the Scotia Sea on a track east of but parallel to the Shackleton fracture zone. We then did a minor survey of the Geosat anomaly that may be the new plate boundary between the Shackleton and Antarctic plates. We found one crossing of a 150 m, very prominent fault scarp that shows vertical offset of all the flat lying beds from the surface down. We hope that we will have an opportunity to further survey this feature at the end of the cruise. We then turned southward on our way into Powell Basin. We started our first long crossing of Powell Basin towing the gradiometer, a single-channel oil filled streamer, a 24 phone ITI streamer wired as a single-channel streamer and two SSI guns. We started to collect extremely nice high resolution single channel data on the ITI streamer. We had to weight this streamer with 72 pieces of two link chain in order to keep it from floating. I have gotten to be quite good at cutting up chain with a portable band saw. The effort worked. We then decided to deploy a second set of two SSI guns. Unfortunately one of the second set had an air leak and was misfiring. With the three guns on our return run across Powell Basin we collected beautiful data with over two seconds of penetration. We were able to see basement under the 0.8 seconds of flat lying high reflectivity, turbiditic sediments that seem to uniformly blanket Powell Basin.

Last night, the first set of guns had been operating flawlessly for almost five days so we decided to bring them in for preventive maintenance. We used the time to do a core, the first

core ever taken on RVIB Palmer. While we did recover a good core and the Powell Basin looks to present an ideal place to core and take heat flow measurements, our operation needs a great deal of improvement. We are now on our way to Bransfield Strait in order to do some dredging and to be at Maxwell Bay when the SAAM flight arrives.

The ship is a true luxury liner. It has dynamic positioning which will be a great help on the heat flow stations. Mark [aka Dr. Wizard] and Keith have been an amazing pair in helping ASA sort out lots of the teething problems on the ship as far as computers and electronics. Keith may even get the 3.5 kHz system working. The chef was most recently the executive chef on Choest's yacht. Needless the say, the results are spectacular. I have already had trouble with the dryer shrinking all my pants. The scientific party is a good group, hard working, and should be commended.

Weekly Cruise Report #2
RVIB N.B. PALMER NBP93-1

The first week ended with the return crossing of Powell Basin with 3 of 4 SSI gas-injector guns firing. We were able to pick up the basement reflector which we had missed on the eastward crossing. We stopped to do the first piston core. Contrary to what was reported in the last cruise report, we did not get a good core. We cored 130 cm in the trigger core and retrieved a minor amount in the main core. We think that the seas were too rough and as the piston core hit the bottom the ship rolled pulling the piston through the liner, filling the liner with water and then just stabbing the bottom at the end. We have completely rethought the coring setup and hope that the next try will be far more successful.

Since the weather in Powell Basin had turned nasty, we pulled in the seismic gear and headed at 10+ kts to Bransfield Straits. By the time we got there the guns had been overhauled and we redeployed them. We then ran a series of lines suggested by Dan Barker across the eastern end of the King George Basin. We may have found another Great Wall or at least a very narrow 300+ m spire. We will dredge it when we return to the KGB. We also found another volcanic mound in the eastern KGB. On the seismic lines on the Antarctic Peninsula side of the basin, we found the same faulting that Dan had seen on the Ewing data but with our high resolution setup we were able to trace these faults to the surface or at least as close to the surface as is resolvable with any seismic set-up. We then crossed the central KGB to finally get some high resolution seismic lines that I can use to analyze the heat flow results. We then turned southwest and crossed the submarine volcano that rises from 1900 m to 600 m on the western end of KGB. The caldera is 2.8 km in diameter at the rim and 0.5 km diameter at the floor. We continued to the southwest and crossed the Great Wall along the same track as Ewing crossed it. It was 450 m high and about 0.5 km wide. We then pulled in the seismic gear. We recrossed the Great Wall and dredged it to the northwest. We got a number of good bits up to 8000 lbs. The bag was about half full with about 200 kg of fresh vesicular basalts. Many have glassy rinds with some palagonite. Since I have not done any dredging in over 15 years, it was a real thrill to bring up a bag full of rocks on the first try. We then ran over to the volcano and dredged the inner wall of the caldera. Again we got about 150 to 200 kg of fresh, glassy, vesicular basalt.

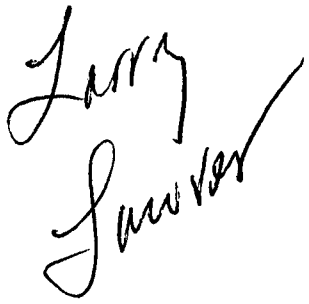
We then gave up work and the ship headed into Marsh Base

with a rendevous with RV Polar Duke and a contingent of dignitaries. Amongst the DVs were Al Sutherland, Peninsula Ops, DPP, Ron Koger, president of ASA, Carol Roberts, Dep. Dir., DPP, various Embassy types, Senate Foreign Affairs Committee types, etc. They stayed through brunch and then headed for the beach and a SAAM flight back to Punta Arenas. They at least expressed an appreciation for the problems connected with this operation. With luck, some of the flaws may be rectified. Unfortunately, by the time the DVs headed for the beach, the weather was really starting to kick up. Consequently, the only person from the Scientific Party that got ashore at Marsh was Brad Wolaver.

After we left Marsh, we returned to dredging the volcano, and dredged the rubble pile at the base of the volcano. We collected a light load (50 kg) of mostly weathered basalts and some very large drop stones. We did get one very nice tubular basalt with large vesicles on the interior and some glassy rind on the exterior. We then dredged the steep outer slope of the volcano. We got another 200 kg bag of rocks and lots of biological type stuff. The rocks were more of the vesicular basalt with some palagonite. We then headed east and tried to dredge the small volcanic mound (~200 m high) on the western edge of KGB [NE of the volcano]. Unfortunately, the 3.5 kHz system was working so poorly, that even when we slowed to 2 knots, we still could not see the bottom. It is fairly hard to dredge something that you can not see. We have since discovered that the holding tank for the 3.5 kHz transducer was empty again which may explain part of the problem. An additional problem was that we were on a course of 183 with a strong eastwind producing a marked starboard list. The 3.5 is on the portside and was probably shooting what little energy it got beyond the 1.25 inch steel plate into the watery void. Someday that system may be sorted out. Needless to say, when the wire jumped the shive we finally gave up dredging and got underway through Antarctic Sound to shoot down the east side of the Peninsula.

We shot our way south with only one false lead off to the southeast. Last night we got to 66°44' South and finally turned north. We are running 5 mile line spacing with east-west lines. On the southward run we were able to trace one horizon for over 75 miles. On our first westward run we just got to within 200 meters of the iceshelf. We were chased by a pack of mad seals, the leader of which got over the airgun. They really looked like a pack of dogs chasing a car. They finally gave up and turned back. We have passed numerous iceflows laden with penguins and seals. The seismic records are superb. After we zigzag our way north, we will

run back south and then pull in the gear and core our way back north. The weather is superb, the food is great and the scenery is awesome.



Cruise Report Number 3 RVIB Nathaniel B. Palmer

Our exciting story ended last week with our heading through Antarctic Sound to transit to the east side of the Peninsula. Our passage through Antarctic Sound was uneventful with only minor ice, some fog and generally low overcast. We then put out the 24 phone single channel streamer, four airguns and the magnetometer and headed on a course of 135 until we hit the ice edge at 64°30'S and 54°20'W. We then followed the ice edge on a southwest course and eventually got to 66°45'S, 58°45'W. We commenced an east-west grid with an intial 5 mile spacing to 66° where we switched to a 10 mile spacing. We got next to the iceshelf on three separate times. Twice at sunset and once in the early morning. The weather was clear, warm and there was little or no wind. I have never seen it so good for so long. The U1 reflector can be seen in almost all of our lines and we were easily able to trace John Anderson's S1, S2, and S3 subdivisions south from where he described them around Seymour Island. The high resolution seismic setup is perfect for this work. We then stopped the seismic work when we had completely run out of time and started coring. We collected 11 successful cores. We initially started with gravity cores. The bottom sampled by many of the cores close to the iceshelf and in the southern part of the area was very compact and almost dry. Some of the samples had to be dug out of the core catcher with a knife. When it became obvious that the core catchers on the ODP coring setup that we had, could not work with the stiff, gritty sediments that we were collecting, we switched to piston coring. We recovered two longer cores, one 2.5 m and one 3.5 m. On the third try, the core liner shattered, probably upon impact and we recovered less than a meter.

We spent eight days on seismic and two days coring. We are now underway on a course to the east along 64°30' S. We will turn north at 48° W and head into Powell Basin. I would say that with the dredging from last week and the seismic data from this past week, the cruise has been successful already. I hope that we can duplicate our success in Powell Basin and collect at least some heat flow data. I doubt that we will have weather nearly as perfect as we have had so far. The 3.5 kHz still gives lousy results and we have yet to try the 12 kHz system.

Cruise Report #4 RVIB N.B. Palmer 93-1

We finally tore ourselves away from the shelf off the east side of the Peninsula. We headed north to 64°30'S and turned east to cross the large negative Geosat gravity anomaly. We crossed the outer shelf and then crossed a steep continental slope. The upper part was steeper than the other part of the slope that we had crossed further to the south. As we went down the slope, we noticed a lot of beds being cut off at the surface. There was one particular set of wavy beds that started at about 0.4 seconds depth, eventually emerged at the surface, and then disappeared. As we headed east the slope gradually decreased until it ended at a 150-m scarp which I at first took to be an erosional feature or possibly some sort of fault scarp. Just after we had crossed the feature, the compressors had a problem so we circled around and crossed the feature a couple of miles north to get its orientation. After the compressor was fixed then the guns had a problem and we continued north in order to get another good crossing of the scarp. The second crossing of the scarp was west of the first but then the third crossing was quite a ways east of the first crossing. It finally dawned on me that what we were seeing was a huge landslide. In fact the size of the landslide coincides with the prominent negative gravity anomaly seen on the Geosat data. The seismic profile when viewed in that light looks exactly like one of the many landslides that I grew up with. The top of the slope was the headwall and the mysterious scarp at the bottom was the footwall. When viewed as a monstrous slide then all the disappearing beds make sense.

After we crossed the toe of the slide we continued east across what is called Trettin Bank on the DMA chart. We are happy to report that Trettin Bank does not exist, at least not where it is purported to be. We then continued on to Powell Basin. There are a series of ridges (?) that divide the westernmost part of Jane Basin from Powell Basin. In fact there are three which makes one wonder what we were crossing and where exactly Powell Basin starts. We got into Powell Basin and the weather was marginal to do station work so we continued with a seismic survey. The weather got progressively worse until we had 'the storm' on the 4th. We went from 20-30 kt winds to steady 60 kt winds within one hour. The fantail was completely buried in water on each set of waves. There was no question of trying to bring the guns or any other equipment in. All we could really do was stand in the aft control room and watch the water go by. I did not really expect to see all the equipment the next morning but lo and behold we got everything

back. The storm really only lasted about four hours and then went back down to 25 to 30 knots. The next night the moon was out. Unfortunately the storm has left confused seas with at least three sets of waves. We finally tried our first heat flow station today. It was blowing about 5 to 12 kts when we started but had gusted to 25 to 30 knots when we aborted the station. The equipment appeared to be working well until it stopped transmitting. We are now changing out one of the endcaps since we found a connector with a chip out of it. We hope that that was the problem that produced a small leak and plan our next heat flow station tomorrow, if the weather cooperates. We are all thinking of wildflowers and spring. There are only two more weeks to go.

Cruise Report #5 RVIB Nathaniel B. Palmer 93-1

Well our weather luck has improved immensely. The Powell Basin is finally workable. We got the heat flow equipment working. It turns out that the problem was a leaking pressure sensor. We took a piston core and recovered 4.4m of hemipelagic muck. We have now been doing heat flow for the last three days. The equipment is working perfectly. Keith Najmulski has done a superb job getting the heat flow electronics to work and he understands the equipment better than anyone, including probably the people that built it. We are recording the data on an EPC 9800 which is a real dream machine, no odors. Beautiful separation of the data, the heater pulse has fired every time, and we can see the bottom bounce with the heat flow pinger. We did use an additional 12 kHz pinger on the wire for the first two and a half stations. Unfortunately it fell off the wire on the third station. The clamps, safety line, and frame returned to the ship minus the cylindrical pinger. There is no explanation for why or even how it was able to detach itself. Fortunately Powell Basin is flat, the winch works great and the ship's officiers are able to do heat flow station work without using the bow thrusters as long as the weather stays good. The last few days we have had 5 to 15 kt winds and 5 foot seas. We were able to get a beautiful 12 hour crossing of the extinct spreading center using four SSI guns and the 72 phone 24 channel streamer. We got excellent basement definition and could see layering in the sediments all the way to basement at about 2 sec or so. So far we have thrown 10 sonobouys. The first one we used on deck to test the homemade antenna. When we threw it overboard, it immediately sunk because all the CO2 had leaked out. Of the remaining ones, six have been successful for over two hours or more, and one worked for almost an hour. Our success rate is 80% or better. It looks like we may be getting some deep refractions.

We are now in the midst of a heat flow marathon. We only have 27 hours left in Powell Basin. So far we have gotten 11 successful penetrations without any problems. We just plotted out the pressure sensor results from the second station and they tracked the probe movement exactly. We plan three more stations tomorrow. We then leave for Bransfield Strait and a final two days of dredging. If there is any time left, we may try the camera or do some last heat flow work. We will then deploy the seismic gear again, do a quick survey in the southwest Scotia Sea and then on home.

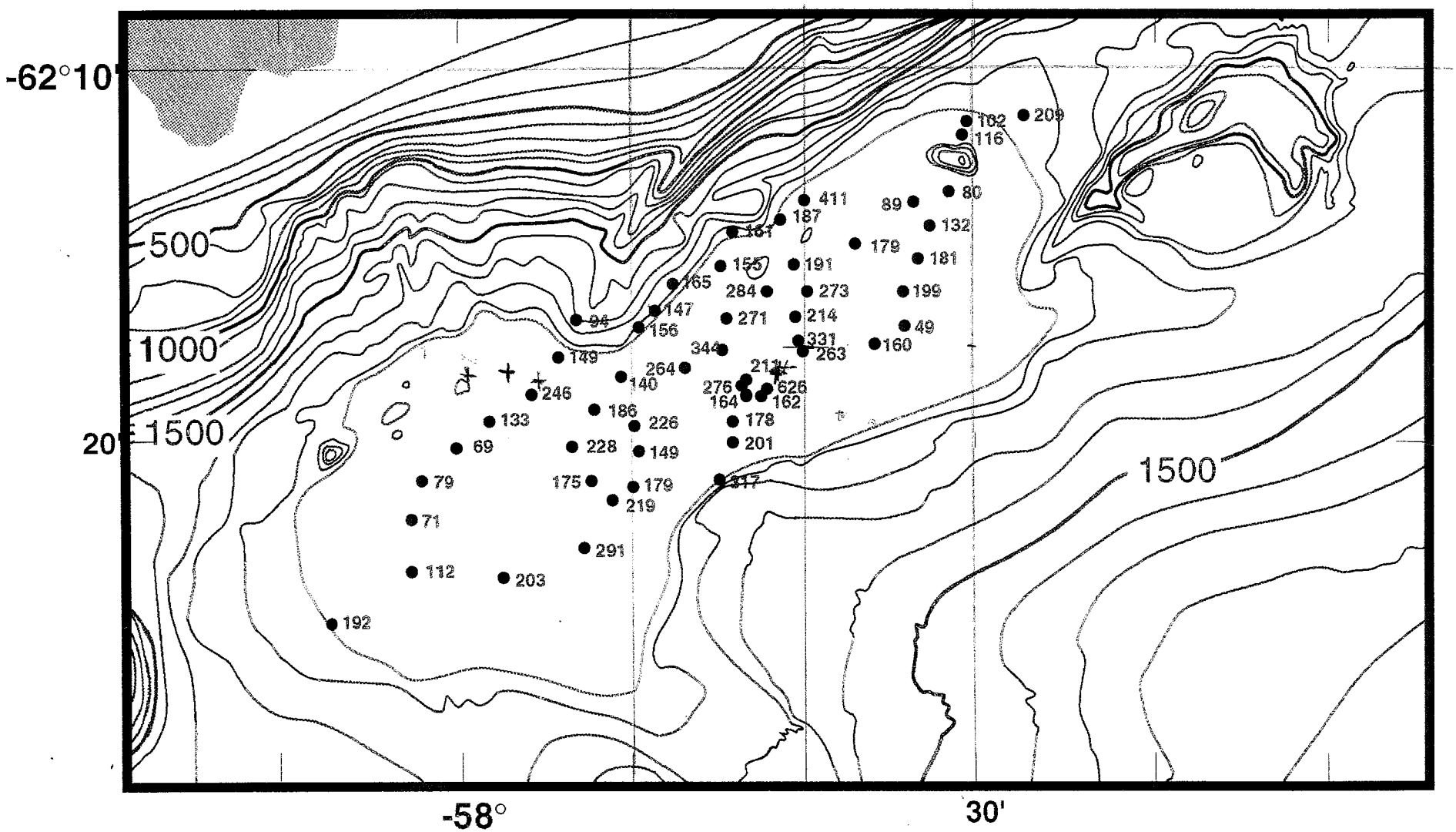
Cruise Report #6 RVIB Nathaniel B. Palmer 93-1

The weather stayed good for our last week of work. We finally got six heat flow stations with a total of 21 penetrations. While I had originally planned more stations, the values are remarkably consistent so I doubt there was any need for more measurements. When we finally left Powell Basin we had planned to transit at full speed to Bransfield Strait to do the final two days of dredging. The weather only allowed 6 kts steaming so we took 12 more hours of 4-gun 24 channel seismic data. Great bottom definition and some peculiar wavy beds that Tom Williams calls contourites, whatever those are. The gravity map of Powell Basin looks remarkably similar if not exactly like the Geosat gravity map that Dave Sandwell produced. It kind of makes you wonder why people need aerogravity data at sea. We then pulled in the gear when the fog and weather lifted and headed for our first of six dredge targets in Bransfield Strait. Much to my amazement, we were able to come back with at least something from each site. A couple of times it was the wrong type of rocks, glacial erratics, but four of six returned the right stuff. The least successful dredge was one that I did. We watched three of the four rocks fall out of the bag as we were getting it aboard but they were all erratics anyway. One of my other dredges we got just the right amount of the right rocks (~50 kg). Randy Keller got another one of our mega-hauls, about 200 kg of the right stuff. It seems that the features closest to the South Shetland Islands are the older volcanics covered with more sediment and more erratics and the ones closer to the center are the freshest with glass and unaltered vesicular basalt. The large submarine volcano in between the two lines is about in between. We knocked off the dredge targets in about 30 hours so I was able to do two more heat flow stations. Keith got three penetrations on the first station while I slept and then I did six penetrations on the second station. The second station was done to verify the one very high heat flow value that we had gotten in 1989. The last three penetrations were done with the ship drifting back over the exact spot. The values are remarkable. They gradually increase from about 400 mW/m2 to 650 mW/m2. The total temperature variation from the top to the lower thermistor on the last site was 2.9 °C! When the heat flow probe came back on deck there was a fair quantity of mud in the heat flow weight. There are a lot of black particles in the mud. They are either ash or may be evidence of a black smoker in the vicinity.

We had hoped to take bottom photos of one of the dredge sites and of the high heat flow site. We tested out the camera but with

the loss of the pinger from last week and a minor problem with the pinger in the heat flow instrument we had no way of knowing where the bottom was, so no way of taking pictures. We then got underway with all the engines going, ran to the north end of Bransfield Strait and did one seismic crossing of the North Bransfield Basin and exited the region between Clarence and Elephant Island with a good but overcast view of both islands as well as Cornwallis Island. We then went off the slope and out into the Scotia Sea with 4 guns banging, and the 24 channel streamer. We did a quick survey to look for the plate boundary and finally crossed an unusual feature at about 60S, 56W. We then hauled in the gear and headed at full speed across the Drake's Passage. We had a fairly uneventful but windy crossing until last night when we were reminded that we were in fact on a ship and we had a fair amount of rolling. We are now on the east side of Tierra del Fuego and headed north in almost balmy summer type weather. We should be in Punta Arenas by noon tomorrow.

62 J7-43


-62°10'
-500
1000
1500
20
1500
-58°
30'
102
209
116
411
89
80
187
132
161
179
181
155
191
165
284
273
199
147
271
214
94
156
49
331
344
263
160
149
264
211
140
276
626
246
164
162
186
133
226
178
69
228
149
201
79
175
179
317
219
71
291
112
203
192

SOME TIPS FOR UTIG HEAT FLOW PROBE USERS

Seiichi Nagihara (6/5/92)

Mechanical and electrical designs of the UTIG heat flow probe are described in detail by the two technical report: Nagihara et al. (1990a) and Nagihara et al. (1990b). Applied Microsystems Ltd. (AML) provides software and hardware manuals for the electronics: ARGUS II. The user of the probe first should go through these documents carefully.

PREPARATION FOR CRUISES

1. Battery for memory back up

The electronics carries a lithium battery for memory back-up. The battery usually lasts for six months, but I recommend to replace it before every cruise. There can be many occasions where the main battery for the data logger runs out when you are probing the sea floor. Your data would depend on this back-up battery.

The lithium battery is located on the memory expansion board of the data logger unit (see the hardware manual). The board is not facing outside. To replace the battery, you need to open one of the PVC lids and extract the memory and CPU boards from the chassis.

2. Main battery pack

The data logger needs total 14 V DC power. The battery package consists of 7 Gates X Cells (2 V each). The batteries lose capacities with time. It is recommended to check how long the battery would last before going on cruises.

3. Sensor tubes

BEFORE DEPLOYMENT

1. Turning the power on

Both pressure cases use a dummy plug for the power switch. Switch for the data logger is a 4-contact, male dummy plug whose Pins 1 and 2 are shorted. Plug this into the female bulkhead connector on the top end cap. Pin 1 goes to the positive end of the circuits, Pin 2 to the battery positive and Pin 3 to the common ground. Applying a volt meter to Pins 2 and 3 enables you to check the battery voltage.

Switch for the pinger/heater unit is a 6-contact, mail dummy plug, whose Pins 1 and 3 are shorted. Pins 4 and 6 are also shorted because I once used separate battery packs for the pinger and heater, but now these pins are not used. The bulkhead to mate with this 6-pin dummy is located on the bottom end cap. Pin 1 goes to the battery positive, Pin 2 to the common ground and Pin 3 to the positive end of the circuits.

2. Setting up communication between the probe and a personal computer (Macintosh)

You can talk to the instrument through the modem port of your Macintosh computer. Attach a regular modem cable to the computer. Connect the other end of the cable to another cable which has a female D25 connector at one end and a female 4-contact underwater connector at the other. The underwater connector goes to the terminal on the top end cap of the data logger unit.

Communication programs such as Kermit, Versa Term Pro, and Microphone are used to talk to the CPU of the probe. Default baud rate is set to 4800 (See Software Manual). If the computer is set to a different baud rate, the probe should send a brief message to the computer. It it happens, correct the baud rate and hit Cntl-Q.

The operation system (OS) of ARGUS II were originally developed by AML, but it had a serious error in firing the heat pulse. M. Wiederspahn and I corrected this error and made a new OS (V.1.30). Even if AML has an OS called v1.30, it would be different from ours and may still contain the heat pulse problem. They may recommend you an upgrade using their program, but I strongly suggest that you should not obtain any software from them. They are so incompetent.

3. Checking out the probe

When you turn on the probe, a series of short messages and questions will show up on your screen. Answer them by simply typing "y" or "n". Do not forget to hit CR after every command or answer.

The first command you might want to execute is "test". It will check each of the RAMs and ROMs. The ROM integrity of the current OS (v. 1.30) is 99. :"test" command also shows you the voltage and current (both positive and negative) which the data logger is drawing. If the voltages are below 14 V, you should recharge the battery before deployment. The typical values for the current are 75 to 90 mA for positive and 25 to 45 for negative. If the current reading exceeds these values, it is very likely that something unusual is taking place in the electronics.

The second step would be to check the parameter settings. Type "show all". Refer Software manual to change parameters.

The third step would be "data test" command. This command monitors all the thermistors, reference resistors, tilt and pressure. The probe will show you temperatures at each thermistor, but the R-T conversion it uses is not quite accurate. The temperature readings can be 2 or 3 °C off in absolute sense. The important point here is that the all the thermistors show similar temperature readings.

The measurements of the reference resistors are also converted to temperature. The typical values are ~ -1.77 °C for the low end and ~28.40 °C for the high end. These two readings should be stable all the time, but I have found out that the reading can change slightly (no more than 0.03 °C though) when the probe is just turned on. Seemingly it takes 20 to 30 minutes of warm up before these readings stabilize. "data test" command does not store the data into the memory. This is a simple diagnostic command.

Now you know that all the thermistors are safe and sound. The next step is to check out the pinger and heater. First, make sure that the pinger/heater power switch is on. Usually you would hear a ping when you turn on the pinger power. This alone could be a good indication that the pinger is working. More complete test would be "beep" command.

The heater can be test by "pulse command". This is a command to fire the heat pulse manually regardless of depth and tilt of the instrument. Do "data test" right before and after "pulse" command so that the temperature rise due to the heat is apparent. Successful execution of "beep" and "pulse" commands means that these units are physically alive.

Finally, you put the instrument in the logging mode by "start" or "resume" command. If you do not want to delete data which were collected previously, use "resume"

OPERATION UNDER WATER

When the probe is under water, it sends acoustic signals to your ship. The signal includes information on the tilt and four selected thermistors. One cycle of the signals consists of five pares of pinging. The first of the pair is the reference ping which comes every second. The second ping comes after a period (less than 1 sec), which is proportional to the amount of tilt or temperatures. The full scale is one second, which corresponds to about 30 degree in tilt and 2 °C in temperature.

When the battery of the data logger is about to die, you would see some indications in the acoustic signal. Fifteen to twenty minutes before the battery

dies, all the temperature readings become zero. All the temperature signal on the EPC record would line up parallel to the reference signals. You could still see the tilt signal though.

AT RECOVERY OF THE PROBE

First, set up the communication with your Macintosh. The instrument should still be logging the data unless its battery is dead. Set your computer for downloading of the data. Type Cntl-S to terminate logging. Type Cntl-S again to start the downloading.

Do not forget to charge the batteries.

TROUBLE SHOOTING

1. The battery died before recovery.

The battery for the data logger must be alive when you retrieve the data. If the battery is dead, you need to charge it before doing anything. As long as the memory back-up battery is alive your data are safe. However, the death of the main battery sometimes reset all the parameters you specified. Even though the temperature data are stored in the RAMs, the instrument CPU may not recognized them because the data address maker is reset to zero. If this happens, use "total memory dump". This command allows you to read all the information stored in the RAMs regardless of the address marker. See Software manual for the usage of this command.

2. The instrument does not boot up.

It is very likely that the baud rate setting of your computer does not match that of the instrument CPU's. If the instrument is set to its default baud rate (4800), it will send a short message saying "you are using a wrong baud rate". When you see this message, just change your baud rate to 4800 and Ctrl-Q. If the instrument is not set to its default baud rate, you may not get any message. If you think that's the case, turn off the power of the instrument, set your computer to a different baud rate and try to boot up the instrument. You may have to repeat this procedure a few times until you find the right baud rate.

If you have just replaced some parts or memory back-up battery of the instrument. It is more likely that the instrument does not boot-up because you screwed up the wiring or connectors. Turn off the power immediately and check the hardware manual on the wiring.

3. The instrument behaving oddly

When you turn on and off the power of the instrument, some parameter information stored in the RAM can be screwed up. When it happens the instrument may not read the thermistors in the right order, or may not dump the data properly etc. Check all the parameter by "show all". You could see some parameters such as "thermistor order" and "dump start" have unreasonable numbers. Execute "reset all" to set everything right.