SCAMP QUESTIONS

FAQs (USB SCAMP)

Q: Should I leave SCAMP connected to USB when it is not uploading data or having its parameters changed?

No. SCAMP will not return to its sleep state if it is connected to the USB port of the host computer.

Q. I would like to mention that, when installing the Scamp software , we cannot get the "Found new hardware wizard". As the first execution of the Control.exe program indicated that it could not find the WINRTUSB.dll file, we tried to copy it in the right directory. Then, running Control.exe gave the "No USB connection " message.

Control.exe will absolutely not operate until the USB driver for SCAMP has been installed.

What Microsoft operating system are you using?

We have tested your SCAMP with Windows 2000 and also Windows 98SE. If you are using any other operating system, try a different computer that has Windows 2000 on it. You don't have to install the SCAMP driver, just look to see if the "Found new hardware" screen appears. You can select Cancel on the Found New Hardware Wizard screen. If Windows 2000 recognizes SCAMP you'll have to give up using whatever operating system you have that doesn't recognize SCAMP.

Instructions for installing the driver are contained within the operator's manual at the Software Installation section. These instructions depend upon the operating system recognizing SCAMP at the USB port. When you connect the SCAMP for the first time to your computer's USB port, Windows 2000 should recognize it as a un-installed device and display "Found new hardware" as shown in the manual. If this does not happen, try a different computer that has Windows 2000 on it. You don't have to install the SCAMP driver, just look to see if the "Found new hardware" screen appears. You can select Cancel on the Found New Hardware Wizard screen. If a different computer will recognize SCAMP then you have some problem with the original computer.

If no computer recognizes SCAMP, then replace SCAMP's batteries as described in Maintenance \ Replacing the Batteries section of the manual. Might as well get good at this since you'll do it often when operating SCAMP. Try computers again.

If you continue to fail to see the Found New Hardware screens when you connect SCAMP via USB, then go to Device Manager within your Windows 2000. Connect SCAMP via USB port and observe the Universal Serial Bus controllers part of the device tree. It will take something less than 10 seconds for Windows 2000 to recognize a USB device and post this info to Device Manager.

Q. I noted that in s_filter.c (C code) the suggested values for FP07 are: BW = 25.0 (Hz)

This is also the value that my (bad) memory remembers from the good old SCAMP days. Now, I noted that in s_process.m: BW = 40.0; %overall multiple filtering (Hz).

What gives? (I see that sharp and smooth retain the old values, i.e. 12.5 and 40.0 Hz, respectively).

Yes, 40 is the number used in the actual processing, while 25 is the number recommended at the start of the processing routine. Sorry, I don't know how these have come to be. There is a Fozdar reference cited in s_filter. I think that the actual numbers were established in this reference. There are two other parameters, the 'sharpening' and 'smoothing' and smoothing is 40. The overall brick wall must be higher than the smoothing, so the question is really why 40 was chosen for smoothing FP07.

These parameters are an important weak-spot in SCAMP processing. FP07s are visibly different from each other. I take this as evidence that the response of each is different. So there isn't a single set of parameters that cover all SCAMP sensors. But customers presently use only one set. I've tried to encourage someone to develop a measurement technique to establish parameters for an individual sensor. My idea is to place a grid over SCAMP's sensor guard, then obtain a profile. Ideally the grid would generate a known turbulence which is higher than the natural turbulence in the profile. This known turbulence could be used as the 'answer' and parameters could be selected so that the processed data gives a matching result. These parameters could then be used in subsequent profiles. It isn't difficult to obtain the data and it shouldn't be difficult to do the math to establish what turbulence the grid should generate. But no one has thus far.

You can find Fozdar in the SCAMP USB manual. I scanned Fozdar's paper and put it there in pdf format.

Q. We have been trying to get data in the downwards profiling mode, testing the Scamp functioning in the 5 gallon bucket full of water. We have defined all the conditions in the Mission Tab as indicated in the manual, we have awakened the Scamp with the Start magnet (but release motor

operates once instead of twice as mentioned in the manual ?) . But we cannot get any data file. What could be wrong?

The magnet causes SCAMP to wake up. It triggers its release motor once immediately to indicate it has awakened.

During the next 2 or 3 seconds SCAMP checks internal resources (batteries and memory) to be sure that it can perform a profile. If there are sufficient resources, then it triggers its release motor twice in quick succession. It then begins to evaluate the profile start conditions you defined.

When SCAMP determines that a profile start condition is true, it begins acquiring profile data and triggers its release motor continuously for 2 seconds (to drop any weight if in upwards mode).

After starting a profile, SCAMP acquires profile data and evaluates stop conditions to determine when to stop acquiring the profile.

Profile data acquisition is halted if a stop condition becomes true or if you connect to SCAMP via USB.

Since your release motor only runs one time, SCAMP is determining that there are insufficient resources for obtaining a profile.

Q. Another question is about the Scamp Control Dialog, in the System Tab. We get nothing in the battery status (no progress bar display on the right, voltage = 0), despite the fact that they are new and that main other features are operating (connection, channel testing, rotation of the release motor, ...)

The batteries should display a reasonable value, something like 7 to 9 Volts. Since they do not, then I suspect that there is a battery problem. This would explain you problem in question 1 above.

Q. In the Test tab, when we test the Fast T0 channel for instance, it seems that the display does not give the right temperature values. The water we are using is about 18°C and the display shows us 13°C. What does this test mean exactly? Other channels are also giving dubious results.

If the batteries aren't working, then sensor values will not be correct.

Your objective is to get the battery indication on the System Tab to give reasonable values. Sensors and missions won't work until reasonable values are displayed.

SCAMP has three battery packs: two 9 V transistor batteries, and a 6 X 1.5 V AA battery group. The CPU operates from the 6 X 1.5 AA battery group. The sensors and A/D system operate from the two 9 V transistor batteries. Since SCAMP will communicate via USB I suspect that the 6 X 1.5 AA batteries are not dead. However if either 9 V battery is dead then the A/D will not work and SCAMP will not have a way to determine the voltage for any battery including the 6 X 1.5 AA. This is how it will communicate even though the battery levels it displays are not reasonable.

I suspect that you have problems with one or both of the 9 V transistor batteries or with the fuses connecting them to SCAMP.

Open SCAMP, then remove all batteries. Measure their voltage. If either battery gives an unreasonable value, then replace it. If you get reasonable results, then the 9 V battery fuses may be blown. This can happen if you momentarily touch the 9 V battery backwards onto the connector or from some other unknown cause.

See the Maintenance|Replacing the Fuses in the SCAMP manual. Prior to doing anything, remove the 9 V battery harness (red,black, white wires and battery snaps). You will probably need to take off one electronics cover (Maintenance|Electronics Covers). Note how the connector is plugged on before you remove it. You MUST plug the connector back on in exactly the same way. It is not polarized and can be plugged on in two rotations.

Measure the resistance of each fuse. You can see the fuse on the red and white wires. Red goes to a 9 V battery (+) and White goes to the other 9 V battery (-) so you can guess which terminal in the battery snap to touch the Ohm meter to. You should measure about 6 Ohms resistance in each fuse. If you measure greater than 10 Ohms, the fuse is blown. If either fuse is blown then find the replacement 9 V battery harness we shipped with SCAMP. Measure its fuses. This is new and should give the correct 6 Ohm reading. If not then you've done the measurement wrong and must re-check things until you get the proper reading.

If you determine that the 9 V battery harness that you removed from SCAMP has a blown fuse and that the replacement harness is OK, install the replacement harness. Be sure you plug the connector on properly. Re-install the batteries, 9 V first, then 6 X AA. Be sure you don't touch the 9 V batteries the wrong way to the connectors.

You don't have to put the electronics cover on or close SCAMP.

Connect SCAMP via USB and run the control dialog. Batteries should indicate reasonable voltages. If so, put cover back on, close SCAMP, continue with testing.

If the fuses in the battery harness you remove are ok, or if after you replace them SCAMP still doesn't give a good battery reading then there are other problems.

Please tell me what resistance you measure and whether you get SCAMP going as I've described here.

Q. Why won't the MSDOS Host program, or the new Windows 2000 Matlab software load profiles produced by the MSDOS Host program?

You sent two profiles, both recorded in August 2003. Each profile consists of three files: *.txt, *.raw, and *.cfg. Both cfg files seem to be corrupted.

The problem is not with the new Matlab software only; the profiles do not load properly into the old Host program either. *.CFG files are very mechanical things and should have all information in exact positions within the file. I looked at historical *.cfg files from and also at *.cfg files from other SCAMP units. All historical files from all units that I reviewed have 6127 bytes. However the two *.cfg files that you sent have 6148 bytes.

As for the two files from Aug 2003 having 6148 bytes - either they were written wrong at the time they were collected or they have been corrupted during storage or handling since they were written. Since files prior and after 2003 seem correct, then I suspect storage or transport, especially if they have been transported through or stored on a Unix or Linux system.

Customer reply: Thanks for the reply. I figured out that all .cfg files are 6127 bytes in size on our MSDOS platform. It was the same even in Linux (which we prefer to use) and when I transferred the files from Linux to my Windows laptop to use your software, it jumped up to 6148. This is really funny to me, never realized this could happen. Anyway, now I changed all my files with the correct file sizes and it seems to work pretty well.

Q. I have question about the .dll called in Matlab m files. How can a .dll file be edited (to see what it is exactly doing)?

*.dll files cannot be edited by you. You must have the source *.c file, which you edit and then compile to create the *.dll. I do not distribute the source files with SCAMP, but will provide individual files in response to a specific need. I've attached the source file for s_segmen.c so you can see what it does. Now that you have this file, you could edit it and then compile it. Type 'help mex' into the Matlab command space. I think this brings back some information about mex files. In addition to Matlab you'll need a C compiler. I use Microsoft Visual C++ 6.0.

You'll also find that the *.dll are complied specifically for use on a Windows operating system. They cannot be used with Linux or Unix or any other OS. However others have compiled them for Linux and maybe even Unix.

Q: What are SCAMP's internal power modes?

SCAMP has three principal power modes:

Awake and idle - SCAMP enters this mode when connected to USB

Awake and acquiring data - SCAMP enters this mode after activation with the start magnet

Sleep - SCAMP enters this mode when not connected to USB and when data collection is completed

In the Awake modes SCAMP consumes substantial battery power. Batteries will last only a few hours in this mode. In Sleep mode SCAMP consumes very little battery power. Batteries will last weeks to months in this mode.

Q: My SCAMP doesn't respond to warm temperatures. I think these temperatures are above the calibrated range.

The best way to correct this problem is to return SCAMP to PME for calibration.

The next best way is to simply tell SCAMP that your water is warmer. Connect SCAMP to your computer. Run the SCAMP Control Dialog. Select the Channels tab. Select Fast T0 as the channel. Look at boxes on right. There is a Span Max and Span Min. What's the max temperature of your water? Add 1 degree, round up, put the result in the appropriate span box. Select Fast T1, do the same. If there is an Accurate T on this SCAMP then repeat for this channel. Select the OK button and you should see the SCAMP Control Dialog disappear from your screen. When you select OK your selections are sent to the SCAMP and implemented thereafter.

After this procedure your T calibrations will be slightly inaccurate, maybe you'll see errors of 0.1 deg C.

FAQs (General)

Q: Can SCAMP be used in a moored situation?

SCAMP's main objective is to determine the turbulent rate of energy dissipation. This is done by matching observed temperature gradient spectra to theoretical Batchelor spectra for a passively transported scalar. Where matches can be found the dissipation is computed from kB.

This method works well where the water is non-thermally uniform, but depends upon knowledge of the spatial distribution of temperature since the Batchelor spectral form is a function of wave number. Unfortunately, SCAMP can only measure temperature at fixed time intervals. The time-spaced interval is transformed to the distance-spaced interval required for Batchelor fitting by using SCAMP's velocity through the water. Since SCAMP is a vertically profiling device, this velocity can be determined from the rate of change of hydrostatic pressure.

In a moored situation some other method of determining velocity must be provided. Yes, you can moor SCAMP but it will not, of its own measurements, be able to determine dissipation. You must provide some other way to measure water velocity past SCAMP's temperature sensor.

Assuming that you provide some independent velocity measurement there are yet more subtle problems. SCAMP's temperature sensor cannot respond to temperature variations that occur too rapidly. This limits SCAMP's use to roughly 10 cm/sec. This velocity is established when profiling by adjusting SCAMP's buoyancy. In a moored situation you'll have to take what you get. If you expect 5 - 12 cm/sec SCAMP may work.

Q. The short I/O cable is communicating intermittently. What could be wrong?

This can occur during SCAMP use by setting the SCAMP upon the release end. The problem is within the cable just as it connects to the small metal I/O connector at SCAMP's release end cap. Two circuits are not connecting, with intermittent connection when the cable is flexed. The evident cause of the breakage is bending of the cable at the point where it connects to the connector.

Q. I would like to use SCAMP deeper than 100m. Is this possible?

SCAMP is designed for 100 meters maximum depth. We have no experience with its use at deeper points. SCAMP's pressure transducer is a 10 Bar device (145 PSI). At 200 meters it will be 2X range and may be permanently damaged. This can be swapped for a higher pressure sensor, but PME can only calibrate to 70 meters so the higher range would have to be extrapolated unless the customer does the depth cal.

Also , I can't promise that the system will be free of leaks or will resist implosion. My gut feeling (about 80% confidence) is that it will survive. I wouldn't use a Fast C sensor, but the other sensors (Acc CT and Fast T) should be OK at 200 meters. F-meter shouldn't have any problems either.

So I think SCAMP will work but you should plan to install a pressure sensor with the appropriate range.

I strongly suggest that if you intend to use SCAMP deeper than 100m, make the necessary modifications, and then thoroughly test it at 200 meters. Better to have it implode in a test chamber then at the end of a retrieval line.>

SCAMPs built with serial numbers ranging from SN0001 to SN0030 hold data internally, but have space for only 100 meters of 8 channel data. We are re-designing the SCAMP to contain up to 8000 meters of 8 channel data in multiple files. These SCAMPs can be retro-fitted with this new feature.

Q. In two of the data files there appear to be very large 'spikes' in the data recorded from all the channels. Can you suggest a cause for this and have you heard of it happening before?

Spikes certainly result from error in data transmission from SCAMP to host computer. You are probably using your new computer by now. SCAMP sends data in 500 scan blocks, then there is a handshaking operation, then more data. In both _1230 and _1308 the spike starts at different scans, about 5599 and 5547, but ends beginning with 6000 for both. What has happened is that the receiving compute has missed a byte thus blowing the alignment of the following bytes until the next 500 scan boundary.

We've seen this problem before, although it has been mostly at the once in a while level. You've seen it twice on the same day which is more frequent than is acceptable. The data in the spike isn't necessarily lost completely. Odds are that only 1 byte is scrambled and that the ARTS managed bit alignment for the following bytes, although not scan alignment. I haven't written an editor, but one can be written, that allows the artificial insertion of missed data. You can see nearly where the dropout is by looking at where each channel crashes in the scan, 5547 for example seems that channel 0 (Fast T0) is ok but the next channel is scrambled.

By the way I fixed the files by inserting one byte at the proper location. This brought the remaining bytes into alignment and fixed all the measurements save the one at the point where I inserted the byte. At this point I simply copied the measurement from the previous scan. The bottom line is that the new data files contain only 1 bogus measurement of one channel. The remaining data is exactly what you recorded.

For future profiles, please carefully check your computer for anything that might be generating interrupts. These are sometimes called TSR routines. You might try booting your computer from a floppy disk directly into MSDOS without starting '95 or anything else. Byte loss could be random but you've seen two on the same day. If an interrupt goes off it the CPU isn't able to service UART IRQ and can miss bytes. This is why I've fixed the program to stop upload on any

keypress: the keyboard IRQ routine took too much time and bytes were missed when a key was pressed.

Q. This experiment I am doing in Australia will be in a fairly benign, calm, sheltered piece of water. Would reducing the free-fall rate (sy to 5 cm/s) be a useful thing for me to try? Could I get better vertical resolution in the dissipation?

Sorry, I don't have a yes or no answer for you. Yes, you'll increase the wave number that you can resolve with FP07. Maybe not as much as you think since there are boundary layers around the thermistor that grow thicker as velocity decreases. There is the "frozen turbulence" Taylor hypothesis which offers less guidance as velocity decreases. SCAMP's travel rate for slower speeds may become less steady... No quantitative information however. I don't know of anyone who has experience or comparisons at 5 cm/sec so no help there. Suggest you simply try both, then look at the data. I wouldn't just take 5 cm/sec data only however. A careful investigation of fall rate with comparisons to other instruments would make a nice paper!

Q. I am still working on getting a better understanding of the SCAMP, and I have a question about the o-ring grease. I read on forums on the internet that the type of o-ring grease one is supposed to use depends on the type of o-rings one has. The use of inappropriate grease could damage the o-ring (it could swell or dissolve). Do you have a special type or brand to recommend?

We've always used DOW Corning 200 CS silicone oil. SCAMPs sometime come back with customer-installed silicone stopcock grease. I think any silicone-based o-ring grease will be ok. Apply it, then keep checking the o-rings for a few days.

Q. Just a quick question about the fluorometer range. I noticed that on a couple of casts the fluorometer pegged at the top of the range (not too surprising, there's a lot of chlorophyll here). Is there something in the calibration constants that I can alter to reduce the sensitivity and increase the range if necessary. I'm not sure what to expect in the estuary I'll be working in, so want to be able to cope with anything.

Yes, there are two ways to change the fluorometer scale. Some background:

Fluorometer signal begins as light pulses received by a photodiode within SCAMP's end cap. Photo diode converts these to small current pulses. These are converted to voltage pulses by the first stage amp on the fluorometer circuit, then AC amplified by a second stage. Third stage is an adjustable gain (potentiometer on the 5500 board - only one inside SCAMP!) DC amplifier. After this the signal is rectified, filtered, and passed to SCAMP's A/D card by two more

stages. A/D card has digitally controllable offset and gain circuits that add another point where overall sensitivity can be changed. Ok, so there are two points where the signal can be adjusted: potentiometer and A/D card.

Changing the A/D card is easy. Just go to SETUP\CHANNELS\FLUOROMETER and increase the max/min range shown there. This simple change could solve the problem, but maybe not. It turns out that the actual voltages of the pulses within circuits on the 5500 board must not exceed processing ranges on the board. This can only be determined by looking at the pulses on an oscilloscope under the condition of max C. If your high C range causes the circuit voltage to exceed limits, nothing permanently bad happens but you'll see a slope in the otherwise straight calibration curve in the high C regions. Your max/min change will only expand the range before the A/D clips.

It is safe, however, to DECREASE the circuit gain from the present setting. This is done by turning the pot (a 20 turn device) screw a few turns as required CCW. Remember how many turns in case you want to turn it back up again later. If you decrease the circuit gain then you'll maintain linearity and at the same time expand the effective A/D clipping range.

Q. What is the recipe for Copro?

Mix 1000 micro-grams of copro powder in 100 ml of 6N HCl. Then add distilled water to make 2 liters.

I purchased my copro from Sigma Chemical Co 1-800-325-3010. Their part number is C-7157 for 1 mg of the substance. The proper name is Coproporphyrin III Tetramethyl Ester. 1 mg isn't much, so I simply put the entire bottle in 100 ml and shook until the powder dissolved, then removed the bottle. I doubt that the resulting 2 liter concentration of 500 ug per liter is very accurate, but you can tell if the f-meter changes its sensitivity if you use the same solution. Wrap aluminum foil around the storage bottle and store in a dark place. They say it lasts for a while.

As I remember I mixed 500 ug/l concentrations. I had to trust the supplier to weigh the sample correctly. I think I received 1000 ug in a little bottle. I measured two liters of water, then completely rinsed the bottle in them. I stirred then poured the solution into two 1-liter bottles which I sealed and wrapped with aluminum foil. I've had my solutions for several years now.

Q. On one day we had the rather bizarre problem of the Host upload from SCAMP locking the computer. After selecting "upload" Host would display the full memory, then when we selected "OK" the initial blank screen that appears before the upload plots just stayed there. The solution was to unplug SCAMP from the back of the PC, then reboot (leaving SCAMP

plugged in resulted in losing the data). The only vague idea I have about why this happened is that it may have been something to do with a noisy ship's power supply and charging the PC battery. Next day we got flawless operation (PC on ship supply, but battery always fully charged).

My guess is that there was an I/O connection problem. You probably tried upload immediately after plugging SCAMP without SETUP\COMMUNICATIONS first. SETUP\COMMUNICATIONS is error trapped and will respond correctly to a non-existent SCAMP. Other communication activities within HOST aren't so forgiving.

If you are using a communication cable beware of ground loops involving the ship and SCAMP's conductivity circuits. Ground flows down the communication cable, out the sensor shafts, into the water, into the ships hull, into the laptop ground (if its power supply doesn't "float"), and back down the communication cable. Conductivity is ground-dependent and really doesn't like this arrangement. No problems in autonomous mode however.

Q. Do you think SCAMP, or any of the individual sensors, will get upset about high concentrations of hydrogen sulfide?

uDO won't like this. H2S is known to give Clarke type oxygen sensors problems. I'm not really sure what happens to them however. No experience on this score.

Q. I changed the Acc CT sensor, and also put on a new DO sensor. I tried a communicate with SCAMP, and the serial connection worked. I then tested all the channels, and they all gave by total rubbish. Both C (Acc and fast) gave something like 40 (absolutely constant over the 100 samples), and temperatures were both large and negative. I asked for the battery voltage, and got a circuit temperature of 154 degrees (it's warmer in Australia, but not that warm) and all three battery voltages were -33 V. I took out the batteries and replaced them; same results. I then disconnected the two new sensors that I installed, again same results. I've had a careful look around and I am sure that I have not dislodged anything. Any ideas?

My bet is that you've blown a fuse in the 9v battery connection cable. It's really easy to do. It sometimes happens if you it the transistor cans when installing the A/D side shield. Here's how you can tell:

Method 1: Take off the A/d side cover. This reveals the 5026 board. Look in your manual in the back for pictures of the boards. You'll find the 5026 shown there if you don't know which one it is. This is the A/D board. Get SCAMP to awaken by communicating with it. Measure the voltage from each T0-5 transistor

can to the chassis. These should be almost exactly equal to the battery voltage, about 9.2 volts for fresh batteries.

Method 2: Take off the A/d side cover. Unplug the 9V battery connection wire. Measure resistance from battery terminals to corresponding pin on 3 pin board connector. Two of the battery connector terminals will go to the center pin (black wire) A (-) connector will go to the white wire pin and will have the fuse resistance of about 7 ohms. A (+) connector will go to the red wire pin, again with 7 ohms resistance. Blown fuses do not entirely open, they have blown resistances in the 1000 ohm range.

It is also possible to blow the fuses by contacting any of the many power supply pins on the boards so maybe there. My money is on a blow out due to the covers somehow. I favor this since it seems you described the problem as occurring right after sensor replacement, with no normal operation interval.

Q. When I tried to talk to SCAMP after changing the batteries, I was getting no reply. After trying just about everything else I could think of (rebooting Host, replacing batteries again etc.) I tried replacing the wire with the fuse in it which connects to the 9vs. After this, I could get SCAMP to wake up, but all the info it was giving back was nonsense(internal temp 136 degC, battery voltage -33v, depth 40m, analog test giving odd looking response,etc.). I then went back to the original 9v battery wire and everything was O.K., have you got any idea what may have been going on?

I thought that perhaps one of the com. chips in SCAMP might have been getting it's configuration confused due to the power being turned off, but I've never seen it do this before, have you?

There seems to be two problems: won't talk and analog doesn't work.

For won't talk, strongly suspect that there was some contact difficulty with the AA batteries. The status of the 9 volt batteries should not affect SCAMP's ability to print its banner. If no 9 volts then the analog things like batteries and TEST\ANALOG won't work right. One possibility is the velcro battery holder. It can hold the top AA's off the contact pad.

The other possibility is the I/O connector. Maybe something wasn't plugged in correctly. You might try talking to SCAMP while gently bending the various wires. Maybe there is a bad wire or contact.

As for the analog, most likely the 9V connector assembly was plugged wrong, or a battery accidentally touched backwards, blowing the fuse. Use an ohm meter to measure from the connector end to the battery snap terminals. You'll find that the black wire (at connector end) goes to one (+) and one (-) snap terminal with very nearly 0 ohms. The red wire should go to a (+) snap terminal with 6 to 7

ohms of resistance. White goes to the opposite (-) snap terminal, again with about 6 ohms. The 6 ohms result from the fuses. If these are blown the resistance increases to over 1000 ohms. Visually inspect the assembly for broken wires also. Should you find a bad fuse, you have two spares that can be soldered in place of the blown one.

Q. T1 was removed and I had switched off the channel and forgot to switch off the gradient channel for T1. What are the effects of this?

When no sensor is installed the + terminal of the op-amp that services Fast T1 is simply open - not connected to anything. The circuit output is undefined in this case but I've not seen any problems. It is not impossible however that Fast T1 oscillated badly and maybe swamped out both gradient channels. All gradient gains are implemented by the same IC, I use a dual DAC, one for each gradient channel so channel-channel cross talk at higher frequencies is not impossible.

Q. How do I test the gradient channels?

Disconnect a Fast T sensor and replace it with the circuit shown. Set the oscillator for 10 hz. Record a short profile. You should see a sinusoidal variation of temperature on the Fast T channel, and its gradient on the Grad Fast T. This should work for both T0 and T1 provided you connect to the proper sensor port. One thing to watch out for: It is possible to drive the gradient circuit into over-range internally and not see the clipping distortion in the recorded data. (The over-range point occurs before the anti-alias filter and the action of the filter removes over-range clipping features from the data.) Do the math on the Fast T channel and check that the peak values don't exceed the limits shown by HOST for the Grad Fast T channel at whatever gain you are using. You may have to turn the oscillator amplitude way down...

Another simple test might be to stratify a bucket of water, then profile SCAMP through it by hand, being careful not to crash the sensors. You could review the profile data, verify that the gradient is bad, then connect a dummy sensor and repeat. Maybe the gradient will clean up. I don't know for sure that the gradient problem is related to the lack of a Fast T1 sensor, but it seems most likely at this time.

Q. We lost a couple of sets of casts the other day when the PC just locked up during upload. No idea why, though I suspect that we need to be more in the habit of hitting "communication" as a standard check prior to every deployment. Any ideas?

If the upload was in-process then SETUP\COMMUNICATION would make no difference. SETUP\COMMUNICATION only checks the I/O. If the upload began normally then the I/O was OK, at least at that time. Lockups during upload are most likely within the HOST program since if SCAMP stops sending HOST should recover. You can test this by unplugging SCAMP while doing a dummy upload.

Q. Would it be possible to record data internally as well during connected work, so that we have the fallback option of downloading what has been collected in case we have to reboot the PC? Also, I gather the memory gradually clears itself as data is downloaded. Would it be possible to keep the data there until SCAMP is told to collect again?

Presently in connected mode a ring buffer is implemented. This buffer can overwrite itself after data is removed so you effectively get about 1.5 times the buffer size since you withdraw data over the serial I/O somewhat more slowly than you add it via the A/D. It is not impossible to change SCAMP's software to remove the ring nature of the buffer and have it stop filling at the end instead of wrap around. Data could be sent up the cable during the filling process, just as it is now. This is actually more simple than the ring. The buffer could remain in memory for a chance at an autonomous upload if the connected one fails.

You've probably noticed that after an autonomous upload of SCAMP the opportunity to upload the same data again is not implemented: the memory block entry disappears in the upload data box. The data is still in SCAMP's memory, just SCAMP's software doesn't provide access twice. If an autonomous upload fails you don't get a second chance, although you could if the software were modified.

Probably the best thing to do for the connected upload problem is to try to figure out why it fails. Others have used connected mode with success.

Q. Testing the depth channel shows an offset (in air) of about 10.2 metres. I cleaned out the open end of the pressure sensor with DI water, and I also opened up the pressure case (thinking that the insides might be stuck at aircraft pressure), but no effect. Any ideas?

When we do a re-cal on SCAMP we restore the pressure calibration coefficients to the condition that existed just after we calibrated the pressure channel previously. This was done on SN0013 and supplied within the new SCAMP.CFG file that we returned to you. We then check the pressure channel. You can see this in the NOTES.TXT file as CHK0003 done on Tuesday Feb 15 (it has an offset of 4 cm now after a year and a half). You can load this check file using HOST's FILE\OPEN CHECK. SCAMP's pressure transducer measures absolute pressure. It is calibrated against PME's Paroscientific digiquartz

pressure transducer, also an absolute device. The pressure units used are meters of fresh water at 4 deg C. These absolute pressure devices measure presensitive to atmospheric pressure. In air, SCAMP reports atmospheric pressure in meters of fresh water units: about 10 meters representing the approximately 15 psi atmospheric pressure at sea level. It is important that SCAMP respond to absolute pressure since SCAMP is often used in alpine lakes where zero depth actually occurs at lower than sea-level atmospheric pressure. The SETUP\DEPTH ZERO process changes the pressure calibration coefficient C0 (the offset) such that 0 engineering units is produced by SCAMP at the current ambient pressure.

The bottom line is that nothing is wrong with SCAMP, it is simply measuring your local atmospheric pressure. Just perform the SETUP\DEPTH ZERO activity and SCAMP will begin reporting zero depth at whatever pressure is present when you do the SETUP\DEPTH ZERO. The manual on CD gives a description of how this is done.

Note that after zeroing the depth units reported will still be in meters of fresh water at 4 deg C. If you are in salt water or warm water you may want to adjust the pressure channel C0..C3 coefficients to give depth in meters of whatever water you are profiling. The CD operator's manual gives instructions for this activity.

Q. First, a quick question on the structure of the cfg files saved with each SCAMP profile. I recently had to replace the Acc CT sensor at very short notice (i.e. the rest of the gear, including the SCAMP PC, had left on the boat) so that I could not alter the calibration info for the sensor (I wasn't out on the fieldtrip). I know I can re-calibrate the salinity because we have lots of salinity samples ready to be analyzed from the trip. But, I was wondering if there is a short route via the cfg files. I've sorted out the new cal data now, but was wondering what the difference is between the scamp.cfg and the individual cfg files saved with each cast. For example, the new SCAMP.cfg is identical to the one used during the fieldwork, apart from the Acc CT cal data which I have now set correct for the new sensor. Is there any other vital info in the cfg file that I would irrevocably trash if I simply got each of the casts to use the scamp.cfg as their config files?

SCAMP.CFG is not at all equal to _xxxx.CFG. You can't simply copy SCAMP.CFG into xxxx.CFG and expect things to work. I'm not sure I understand the situation you describe. Except for multiple mode, SCAMP is always used with its host computer. Prior to a profile you can load the calibration file for the new sensor and accept the calibration. This will alter SCAMP.CFG and all xxxx.CFG files created subsequently. I'm also guessing you already knew this so I must still be off target. Perhaps you would like to apply a new calibration to data already collected? This is done by changes to the xxxx.CFG file. xxxx.CFG can be changed only by creating a program especially for this purpose. I have

not done this. You can modify an example I provided. Look in the SCODE folder under SCAMP for ENG_UNIT.C. This program shows how to compute engineering units from the xxxx.RAW and xxxx.CFG. As a by-product it also defines xxxx.CFG and xxxx.RAW. If you modify it to load xxxx.CFG, change data, and save xxxx.CFG,then you'll be able to retroactively apply new calibration constants.

Q. What about using the SCAMP on an oceanographic ship?

(feedback from: Jonathan Sharples, University of Southampton) We used SCAMP from a small vessel (freeboard about 2.5 metres), deploying over the windward side. With 200m of cable we could profile down to about 40 to 50 metres before the wind drift of the ship made the line too taut (and it was not very windy, about 5 - 10 knots). SCAMP did not like swell too much either, and in swell 1 - 2 metres tended to somersault in the upper few metres (novel use of the PAR sensor....). Good data was not recorded until about 10 metres depth due to a combination of swell somersaults and the ship's wake.

We used a modified spinnaker boom to deploy SCAMP, which kept it away from the ship's side.

Paying out the line from the hand-held roll was ok (but have a good strong lanyard connecting the cable roll to the ship!) Pulling SCAMP back to the surface against the ship's drift was a little scary initially, as the line gets rather taut. But, we did not get close to the breaking strain; you just have to overcome your fear.

Recovery onto the boat was not so easy, but waiting for the boat to roll toward SCAMP and hauling inboard worked ok (we were not using the conducting cable: hauling SCAMP out of the water using that may not be a good idea).

Note also, profiling to 40 or 50 metres means you don't get many profiles to combine for statistically reliable dissipation estimates. We had to use the longer 200m non-conducting cable, so data downloads took a lot of time. Ultimately, we were able to estimate tidal averages of dissipation with confidence, but could not reliably resolve intra-tidal signals.

(feedback from Barry Ruddick, Dalhousie University) - I've actually been afraid to use SCAMP from a large ship. The two main factors are:

1. The 10 cm/s fall rate means that the ship drifts away from the instrument faster than it falls. Profiles are very limited in depth range because of that.

2. If it's windy, the drag plate could cause the instrument to swing and bang against the side of the ship, breaking sensors. I think it might be possible to use SCAMP from a relatively small ship, anchored in protected waters. I would try

using it from the forepeak, so the instrument can swing without hitting the ship, and to prevent the instrument from seeing the wake.

The certain way is to use SCAMP from a launch, so it can be set directly into the water. John Dower and I have done this without problems.

(feedback from John Dower, University of British Columbia) - Barry and Jonathon are right, deploying and recovering SCAMP from a ship is a nail-biting experience! I found that deploying from a launch or (better yet) an inflatable boat was much easier on my blood pressure. In any case, even if it were easy to deploy from a ship the amount of turbulent noise created by the ship makes it preferable to get away from the ship in a small boat.

Even from a small boat, however, the downwind drift of the boat can make it hard to get deep profiles. My best results came when I measured off 100m of the kevlar line, attached a small float to it and then tossed (well, lowered, actually) the whole thing (i.e. SCAMP, the kevlar line, and the float) over the side of the inflatable and then simply followed the float until SCAMP had reached the desired depth. Just make sure the float is sufficiently large!

The only other problem I encountered was condensation inside the housing when SCAMP was used in *really* cold waters. In coastal Newfoundland, where I've used SCAMP since 1997, the summer air temperature can be a muggy 25C, the surface temperature can be 12C, while at 50m depth the temperature falls to about -1C. When I opened the housing after a few such casts (to change batteries) I found a fine layer of condensation all over the inside of the housing. After that, I always taped a few of those small desiccant packs inside....that seemed to solve the problem.

Short of that, the only thing that I find to be a bit annoying is the long time taken to download a deep cast from SCAMP while siting in a tiny rubber boat in the wind, rain, and hail!

Q. Can you just confirm that the engineering units were calibrated as micro Einstein's per meter squared per sec?

No. Calibration units are shown in SETUP\CHANNEL under the PAR section. The PAR (photosynthetically active radiation) sensor comes to me with calibration units of (umol/(s*m**2))/uA, a calibration of intensity to sensor current output. I calculate the conversion factor from uA to SCAMP's CR based on a math model of the circuit performance. The engineering units you ultimately see expressed by the data are (umol/(s*m**2)). This seemed a weird intensity unit to me but I guess it is useful if you are a plant chemist. I guess it makes sense since the photodiode inside the PAR sensor doesn't see the full light spectrum but rather a shaped subset. Shaping is done by filters within the sensor.

PAR is usually measured (by aquatic biologists anyway) in units of u mol photons /(m**2 s) (i.e. a rate of supply of photons). An Einstein is simply a mol of photons, so the units are correct.

Q. I have a query about the circuit temperature. It seems to be reading too low. In the field today the air temp was about 16 C and the water 14 C, but the circuit T always said about 10 C.

CircT has hardware bugs and doesn't work very well. I wouldn't worry about CircT.

Q. Back in the lab I opened up SCAMP, and it sure did feel cold in there, but the room T was 18 C and metal at anything less than that will feel cold I guess. I've been checking SCAMP out for the past hour, and the circuit T is now at almost 15 C.

Any ideas on that lot? Is it something I should just ignore? I have left SCAMP out of the pressure tube with the plan to check again tomorrow morning before going out again.

Do the TEST\ANALOG TEST to see if you get the right result. Open SCAMP and remove the stainless steel covers. Inspect for water leakage.

There are ways to measure the current consumption. Use TEST\CHAT to send POWERLOCK 1 This holds SCAMP's power always on. Take out 9 volt batteries from cavity but don't disconnect them. Measure voltage from SCAMP chassis (volt meter black lead) to each terminal of each battery. You can probe this from the side with the red volt meter lead. Each battery will have one terminal that has 0 volts. This is connected to ground. Each will have one terminal that measures the battery output. One will be about +9 volts the other about -9 volts depending on the battery charge. Next measure voltage from SCAMP's chassis to the metal can of each large transistor on the analog board where the batteries connect. These will be about +/- 9 volts (there are two transistors). It turns out that that battery lead has fuses in it that have about 6 ohms of internal resistance. If you subtract the appropriate (+ with +, - with -) transistor case voltage from the corresponding battery voltage you'll get the voltage drop across each fuse. SCAMP analog consumes about 32 mA so with 6 ohm fuses you'll see something like 0.190 volt difference.

The current consumption in the AA batteries is harder. Get a small piece of printed circuit board with copper on both sides. Solder a 1 ohm resistor from one side to the other. Insert the printed circuit board between the two top AA

batteries. You've inserted a 1 ohm resistor in series with the batteries in this way. SCAMP digital consumes about 80 to 100 mA so expect about 80 to 100 mV when you measure voltage across the resistor.

Remember to use TEST\CHAT to send POWERLOCK 0 to tell SCAMP it can sleep again.

Q. Is it possible for HOST to show the grad gain range for T1? There is only 1 display option for the range, which is T0 (?).

I'm a little confused about where in HOST you want to display the gradient gain. It is clearly displayed in SETUP\CHANNELS for example. Perhaps you mean in DISPLAY\GRADIENT RANGE? Please go to SETUP\PARAMETERS. On the second line there is a Fast T processing parameter. Change it from 0 to 1. In MAY happen that this causes the gradient range display to jump to Fast T1. I don't know since I've never tried this particular feature. Of course you can create your own display under Matlab, but this may not be very convenient in a field situation.

Q. What water density is used to convert pressure (in psi) to depth for the SCAMP calibrations?

The conversion factor that I use is Depth = 0.7030696 * pressure (PSI)

This factor is actually located within the ParoScientific pressure transducer ROM. When calibrating a SCAMP I simply read depth (meters) from the Paros. The Paros applies the above conversion from measured pressure to depth. Essentially the Paros is telling me depth in fresh water.

Q. Background: The deployment was on Lake Superior, Oct. 10, nice warm day,
calm, typical cold Lake Superior water. I was running SCAMP in real-time (i.e., near real-time) mode, using the conducting wire. Most casts I would start the data acquisition with SCAMP in the bucket on board. I would then lower SCAMP into the water and release to begin freefall. At the end of the wire (80 m depth), I would then pull SCAMP back in. During the time I was bringing SCAMP back up, I would stop the data acquisition when I saw the depth start to decrease on the screen (indicating that SCAMP had transmitted all of the downward data to the computer).

Problem: On a number of occasions (something like 50%!), the data acquisition program would quit when the instrument had been deployed only a short

distance down into the water column (10-20 m). The error screen displayed "Error Upload" and some other stuff that I did not really note at the time. I don't know what the problem was, whether it was software related, hardware related, or what. I cannot duplicate it in the lab with SCAMP in a bucket. I'm hoping you have some suggestions.

It appears from the files you attached that you are seeing the Error! No Upload message. This message is recorded in the log files for the two bad profiles. I checked through the source code and have determined that this message indicates that SCAMP and HOST were unable to negotiate a proper start of a block of data. HOST uploads SCAMP data in 500 scan blocks. At the start of each block SCAMP and HOST do a little handshake. If the handshake fails, then the Error! No Upload message appears and the upload halts.

It also appears from the data that there are communication problems prior to the time the upload ends. This can be seen in the wild variation of the data near the end. Wild variation happens when a byte or more is lost during the 500 scan block transmission. The loss of data effectively skews the following data even though it is properly transmitted up the cable. It simply arrives at the wrong location and is associated with the wrong channel. When this now-bogus data is presented for the channel it is wildly wrong, even though it would be correct if simply shifted to the proper channel.

So much for symptoms. Sorry, I don't know why there is data transmission problems on the cable. Since you can't repeat the symptoms in a bucket I'm guessing that the problem has something to do with the actual deployment of the cable. Maybe there is some loose contact somewhere, maybe at either end or maybe a break in the cable somewhere. My suggestion is to do your lab experiment once to prove things are working, then try again but wiggle the cable where ever you think a bad contact might be.

When we see transmission problems they are usually associated with some software problem in the HOST computer, usually some program that is running in the background behind the HOST program. I'm trusting nothing these days, not even the "exit to MS DOS" feature in Win98. Make a boot disk containing only an old copy of MS-DOS. Boot your computer from this disk and bypass all of the Windows things and virus checkers. I can make a bootable CD that automatically starts HOST if your computer can boot from CD. I don't know if I can make a plain bootable 3.5 floppy anymore or not... Anyway, since you are able to upload data in the lab reliably I don't blame the host computer. I just point out this problem since we've seen it in the past and since it could give the same symptoms as you see so far as data upload is concerned.

Reply from customer: Bingo! Removing a virus checker that was pre-installed has completely eliminated the problem. Since doing so, I have not been able to

duplicate the problem in the lab (thankfully). I was out on Lake Superior last week and did 35 profiles without any problems.