P.O.L.

RRS 'James Clark Ross'

20 November - 18 December
1993

ACCLAIM: Sea level measurements in the Drake Passage

Cruise Report No. 23

Natural
Environment
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PROUDMAN
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Bidston Observatory
Birkenhead, Merseyside, L43 7RA, UK
Tel: 051 653 8633
Telex: 628591 Ocean B
Fax: 051 653 6269

Director: Dr. B.S. McCartney

Natural Environment Research Council

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P.R. Foden and D. Smith

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ABSTRACT

ACCLAIM Bottom Pressure Recorders have been in place in the Scotia Sea since December 1988 and then in December 1992 they were transferred to the Drake Passage, each year they have been recovered and redeployed. The combined BPR/Inverted Echo Sounder instruments are deployed under the ground track of the TOPEX satellite across the Drake Passage.

A further Releasable Data Capsule was successfully recovered from MYRTLE, POL's long term development project BPR deployed in 1992 for four years.

In addition, a new remote island Sea Level Recording station was installed at Rothera and the stations at Port Stanley - Falkland Islands and Faraday were upgraded and serviced.

All objectives were successfully carried out, and the new SLR at Rothera is providing useful sea level information for POL and BAS scientists.

ISSUING ORGANISATION	*TELEPHONE*: **(0151) 653 8633**
Proudman Oceanographic Laboratory **Bidston Observatory** **Birkenhead** **Merseyside** **L43 7RA** **UK** **Director: Dr B S McCartney**	*FAX:* **(0151) 653 6269** *TELEX:* **628591 OCEAN BG**

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CRUISE PERSONNEL

The cruise participants were as follows:

POL personnel

Senior Scientific Officer	Peter Foden
Scientific Officer	Duncan Smith

JRC personnel

Senior Scientific Officer	Brian King
Senior Scientific Officer	Steve Alderson

RRS James Clark Ross personnel

Captain	Chris Elliott
Chief Officer	John Marshall
2nd Officer	Rory Jackson
3rd Officer	Tony Gatti
Chief Engineer	Dave Cutting
2nd Engineer	Bill Kerswell
Radio Officer	Mike Gloistein
Electrician	Norman Thomas
Deck Officer	John Summers

ACKNOWLEDGEMENTS

On behalf of POL we would like to thank the Captain, Officers and crew of the RRS James Clark Ross for their help in the recovery, deployment and installation of the sea level recorder equipment and the British Antarctic Survey for the opportunity and encouragement to perform the work.

We would also like to thank the BAS base staff at Faraday and Rothera for their considerable efforts on POL's behalf.

Thanks also to Bob Spencer, Ian Vassie and Geoff Hargreaves for their support and with communications between POL base and the ship.

INTRODUCTION

ACCLAIM - Antarctic Circumpolar Current Levels from Altimetry and Island Measurements -is providing real time data from it's network of sea level stations in the Southern Ocean as a

contribution to the World Ocean Circulation Experiment (WOCE). The associated research work at POL is an integral part of the many other UK. contributions to Core 2, the Southern Ocean component of WOCE, and interacts with international work from the United States, South Africa, Australia, France and Germany. The principal objective is to study variations in the flow of the ACC on large time and space scales but the ACCLAIM network is also a component of GLOSS and has supplied sea level data which has provided a knowledge of tidal behaviour in this remote area.

ACCLAIM Bottom Pressure Recorders (BPR) have been in place east of the Drake Passage between Port Stanley and Signy island since 1988 and recovered/re-deployed in 1989 and 1990 In 1991 two BPRs were deployed in the western part of the Drake Passage at shallower than previous depths to correspond with their US. counterparts deployed in the choke points off Africa and Australia. In 1992 a long term BPR called MYRTLE was additionally deployed in the area north of Elephant Island, a RDC was successfully released three weeks later to test the system.

POL CRUISE OBJECTIVES:

1) Recover and redeploy two combined Bottom Pressure Recorders (BPR) and Inverted Echo Sounders (IES) in between Port Stanley and Faraday.

2) Recover a Releasable Data Capsule (RDC) from the long term BPR, MYRTLE (Multi-year Return Tide Level Equipment), retrieve the stored data and process it.

3) Service the Sea Level Recorder (SLR) at Faraday base and retrieve the data set from the Toshiba computer. Remove the redundant Meteosat satellite transmitter.

3) Install a new SLR and sensors in the deep well at Rothera base.

4) Install a new SLR at Port Stanley, reprogramme the satellite transmitter and inspect the mechanical installation.

PORT STANLEY SLR - 18/11/93

A new TIDATA SLR was installed at Port Stanley and the earlier TIDATA removed although the cassette tape logger was left in place. The EPROM in the DCP satellite transmitter needed to be reprogrammed for four transmissions per day. This was done during the voyage and the EPROM replaced on our return to Port Stanley. All was successfully accomplished and the new recorder was left running. The cassette tape from the old logger was removed and brought home for translation. The mechanical installation was carefully inspected and found to be in good condition.

SHIP PREPARATION

Two POL personnel, Peter Foden and Duncan Smith, joined the R.R.S. James Clark Ross at Port Stanley in the Falkland Islands on the 17th of November 1993. The equipment and aluminium

boxes were located and unpacked. The aft laboratory was used for preparation of the equipment.

The first IES was prepared and got running together with the first, replacement BPR. The acoustic deck units were set-up and tested. The ship sailed at 08:30 on Saturday 20th November 1993.

ACOUSTIC RELEASE WIRE TESTING 20/11/93

The CTD frame was used to attach the acoustic releases to be tested. The first unit to be tested (2482) was bolted onto the CTD frame and tested satisfactorily on the first cast. The acoustic unit was taken off the CTD ready for the re-deployment of the BPR site POL 7.

Acoustic Information

Serial No.	2482
Beacon frequency	319 Hz
Release frequency	299 Hz

Fuse fired after 1 minute transmission at 299 Hz.

RECOVERY OF BPR/IES AT POL 7 SITE (off Burdwood Bank) - 21/11/93

Position	54 56.54 S, 58 23.59 W
Depth	1010 metres
Conditions	good, slight swell

EVENTS

12:38 GMT	Vessel on station, depth 950 metres, transducer into the water.
12:41 GMT	First transmission on 320 Hz, acoustic unit on immediately.
12:46 GMT	BPR/IES released, depth 990 metres, good acoustic contact.
13:05 GMT	Sighted on the port bow 100 metres, radio beacon heard immediately.
13:23 GMT	Instrument grappled, and brought inboard.

Total time on station: 45 minutes

The recovery went very well and the instrument was brought onboard with no damage. The acoustics had worked well and communications during recovery were good. The vessel went off station to carry out a CTD cast and returned later to redeploy the refurbished BPR/IES.

The acoustic unit (2476), used to fire the release was removed from the frame and refurbished with new batteries. Similarly the data logger was removed and replaced with the previously prepared logger No. 6.

RE-DEPLOYMENT OF BPR/IES (POL 7)

The ship returned to the POL 7 site at 21:00 after completing the CTD cast and the BPR/IES had been prepared for deployment. The previously tested acoustic unit was put on the frame together with the acoustic used to release the instrument. The BPR/IES was re-deployed very close to the original position and the depth matched within 3 metres. The IES was heard to transmit it's lockout time whilst on the sea bed and was seen to modify the lockout from it's default value. The acoustic reception was good and could be heard even when the ship's thrusters were in operation.

EVENTS

21st November 1993

Position	54 56.58 S, 58 23.51 W
Depth	1007 Uncorrected

21:00 GMT	Vessel on station.
21:18 GMT	Instrument into the water.
21:23 GMT	Acoustics switched on.
21:34 GMT	Instrument on the bottom.
21:42 GMT	Acoustics timed out.
22:00 GMT	IES ping and lockout modification heard.
22:30 GMT	Ship underway again.

Total time on station: 1 hour.

ACOUSTIC RELEASE WIRE TESTING 24/11/93

The CTD frame was again used to attach the acoustic release to be tested. The acoustic unit 2326 from the last recovery was refurbished.

Acoustic Information

Serial No.	2326
Beacon frequency	321 Hz
Release frequency	418 Hz

Fuse fired after 1 minute 50 seconds transmission at 418 Hz.

RECOVERY OF MYRTLE RELEASABLE DATA CAPSULE 25/11/93

This was the second capsule to be released from the MYRTLE BPR and was recovered in thick fog, which quickly arrived during the capsule ascent. The ship was held on position during the ascent but the capsule was recovered a mile and a half from it's nominal deployment position. When the capsule was on the surface the radio beacon was readily heard and was used to steer the ship directly to it. The capsule data logger had worked well and contained a one year data record.

25th November 1993

Position	59 43.69 S, 55 29.50 W
Depth	3690 metres uncorrected
Conditions	Good to start, then thick fog, calm

EVENTS

15:36 GMT	Vessel on station, depth 3690 metres, transducer into the water.
15:40 GMT	Transponding on 11 kHz to see back-up release - intermittent contact.
15:45 GMT	Transponds heard on 11 kHz and 14.5, nothing on 11.5, 10 or 14 kHz.
15:58 GMT	Release transmission sent at 14.5 kHz and command "A", 4 pings reply.
16:06 GMT	Range check - 3555.6 metres, capsule is ascending.
16:12 GMT	Range check - 3369.0 metres.
16:20 GMT	Transducer brought inboard, moving back to nominal position, foggy.
16:36 GMT	Back on station, transducer back in water, range check - 2456 metres.
17:40 GMT	Contact established with RF beacon, begin homing in.
18:08 GMT	Spotted ahead and brought inboard.
18:57 GMT	Returned to POL 6 position to check acoustic transponders.
19:00 GMT	Range check - 3763 metres on 11 kHz and 3761 metres on 11.5 kHz.
19:08 GMT	Capsule release disabled by transmission on 14.5 kHz and command "F".
19:13 GMT	Transponds only on 11 kHz range - 3765 metres.

Total time on station: 3 hours 15 minutes.

RECOVERY OF BPR/IES AT POL 5 SITE (Logger No.5) - 21/11/93

Position	60 50.95 S, 54 43.15 W
Depth	1020 metres
Conditions	good, slight swell

EVENTS

09:40 GMT	Vessel on station.
09:46 GMT	Both beacons switched immediately with one 320 Hz transmission.
09:49 GMT	BPR released using 438 Hz, release no. 2163.
09:57 GMT	Second release fired to dispose of backup pyro using release no. 2483.
10:00 GMT	Both pingers put into beacon mode.
10:10 GMT	BPR sighted 200 metres from starboard bow, RF beacon channel 'C' ok.
10:20 GMT	BPR brought inboard with no problems.

Total time on station: 40 minutes.

All went well with this recovery and the BPR was quickly brought on board to be refurbished prior to re-deployment. The ship went off to the CTD cast site whilst the BPR was being refurbished.

It had been hoped to transfer the Quartzdyne sensor (QD119016) from the recovered data logger

to the one that had previously been prepared. Unfortunately the sensor had suffered rather bad corrosion on the end cap and it would not last another year. Another Digiquartz sensor (DQ35126) was substituted. The other two Digiquartz DQ40375 and DQ43122 were transferred across to Logger No.2.

The acoustic unit 2483 was refurbished and fitted back on the frame together with the previously refurbished unit 2326. The IES No.10 had been set up and had been timed during it's pinging sequence and was fitted to the BPR frame.

RE-DEPLOYMENT OF BPR/IES AT POL 5 (Logger No.2) - 26/11/93

EVENTS

26st November 1993

Position	60 50.98 S, 54 42.84 W
Depth	1020 Uncorrected

22:00 GMT	Vessel on station.
22:16 GMT	Instrument into the water.
22:18 GMT	Acoustics switched on, vessel going upwind to drift over the site.
22:31 GMT	Instrument on the bottom, vessel staying on station to monitor next IES TX.
00:38 GMT	Problems with IES, intermittent 10 kHz pings heard as well as IES pings.
01:39 GMT	Ship underway again.

Total time on station: 3 hours 39 minutes.

The BPR/IES was delayed due to the CTD cast taking longer than was scheduled, this meant that we could not deploy the gauge before the IES was due to ping. When the cast was completed we were some 10 miles off the deployment site, the gauge was deployed at 22:16 GMT. The deployment went smoothly and the acoustics timed out correctly, we then waited for the next IES cycle. The ship's engines were shut down for silent conditions whilst we listened for the IES pings, unfortunately the IES did not modify it's lock out time. We waited for the next IES cycle and again the lock out time was not modified, in addition there were intermittent pings on 10 kHz

From the unexpected pings heard at the BPR/IES site it was probable that there was a fault with the IES transponder board. We did not have an spare IES to substitute for this one or an extra ballast frame, so the BPR/IES will have to remain on the sea bed, the sea level recorder should be fully operational.

It is hoped to be able to revisit the site on the northward leg of the voyage.

MAINTENANCE OF THE SEA LEVEL RECORDER AT FARADAY BASE - 1/12/93 to 2/12/93

The ship arrived at Faraday on the evening of the 30th November, relief was started early on 1st December. We were able to get on the first trip ashore and started to inspect the Tidata recorder

in the tide gauge hut and the printer which is located in the Ozone loft.

All was in good condition and the staff at the base had looked after the equipment very well. The data from the Toshiba portable were downloaded and then erased from the hard disk so as not to cause confusion with next year's data. A new version of the data logging programme was installed on the Toshiba that corrected the problem with the day counter incrementing all the time. The redundant aerial and DCP transmitter were removed from the Main building and the holes through the wall made good.

The Psion terminal that had been left behind to restart the Tidata logger was found to have flat batteries. The terminal had lost all it's serial port settings, new batteries were fitted and the serial port was set-up correctly once more. The Seadata logger in the tide gauge hut was timed and the tape removed. A new tape was fitted and the logger left running. The Tidata CPU was checked out and timed and then reset. Because the DCP had been removed the midnight pulse from it had been disconnected, the wire was grounded at the Ozone loft end and left taped out of the way. Instructions were left for restarting the Psion terminal after the loss of power due to the battery going flat and for setting up the Tidata recorder.

INSTALLATION OF SEA LEVEL STATION AT ROTHERA 7/12/93

After a very early start the metalwork and the electronic equipment for the sea level recorder were unloaded at Rothera base. The steel support frame was modified to fit the well by cutting off unwanted sections with an acetylene torch. The steelwork was fastened to the concrete wall of the well with rawl bolts and spacers to make it level. A blockboard floor was put into the well to provide an operator platform so that the recorder electronic unit could be accessed. The steel box containing the recorder was fastened to the well wall and the copper tube containing the two pressure sensors lower into place with a mobile crane.

The Electrician provided a power socket for the recorder in the well and by midnight the electronics were wired up to the sensors and the recorder was put on test overnight.

Due to air still in the pressure sensor pipes and the slow movement of water in the well there was a difference of two metres between the two pressure sensors. It could be seen that the air was gradually coming out and that the two recorded pressures getting closer together.

The transmitting radio modem was located on the well wall and the aerial just below the wooden lid. This was thought best at the time to protect the aerial from traffic clearing the snow from over the well. The receiving modem was located in the main building on the top floor facing the well. The data logging Toshiba portable was located adjacent to the receiving modem on an unused bench. All seemed to be working correctly and the POL personnel left on the ship which was unexpectedly leaving to visit disused bases at Horseshoe Bay and Stonnington. Whilst onboard it was a good opportunity to finish off the operation manual for the sea level recorder at Rothera.

On return to Rothera it was found that although the gauge was working well the data transmissions through the modem were being corrupted sometimes. The receiver modem was

relocated to the pump house which is about 30 metres from the well. Only a few transmissions could be monitored but all seemed to be working well but local RF noise was causing the odd character to be corrupted. It was apparent from the data coming from the gauge that air was still inside the copper sensor tube but was coming out more and more on each tidal cycle. The ship departed Rothera base at 14:00 on 10th December 1993 en route for Port Stanley.

RETURN TO BPR/IES SITE AT POL 5 - 16/12/93

The BPR/IES site was revisited to see if the problem with the intermittent 10 kHz pings, could be resolved. The vessel stopped on the site at 05:00 GMT the overside transducer was put into the water and the Mk IV deck unit and Nagrafax chart recorder were used to monitor the IES. Acoustic conditions were good and the vessel was allowed to drift over the site. At 05:05 GMT the Benthos transducer was put into the water and a ping on 10 kHz transmitted. Immediately there was a series of rogue pings in the water It was found that transmission pings on 11 kHz stopped the rogue transponder pings and transmissions on 10 kHz started them off again.

At 06:50 GMT the first proper IES ping was heard followed by two sets of burst pings, In between the burst pings there were indiscriminate pings on 10 kHz which stopped as the second set of burst pings began. They could be stopped with a transmission ping from the deck unit on 11 kHz. Nothing further could be gained from monitoring the site and the vessel left at 07:00 GMT continuing passage to Port Stanley.

CTD CASTS

Throughout the voyage CTD casts were carried out by ship's personnel under the supervision of two staff from the James Rennell Centre, Southampton. This work was carried out as part of the WOCE effort in this area. For details the CTD results please contact the James Rennell Centre.

SUMMARY

The recovery and re-deployment of the BPR/IES instruments went well and with no problems. Although the transponder on the IES at POL 5 does appear to be faulty, this will not affect the sea level record from this site. The Releasable Data Capsule from the MYRTLE BPR was in good condition and recovered in foggy conditions. The provision of a radio beacon on the RDC enabled the ship to be accurately and quickly directed toward the capsule on the sea surface.

The installation of the sea level recorder at Rothera is a major step forward and will provide useful data for the future and provide an overlap with the recorder on Faraday. The installation at Port Stanley is still working well and providing a useful service to the local community as well as providing information for POL.

APPENDIX 1 - TECHNICAL INFORMATION ON INSTRUMENTATION

SLR INSTALLATION AT PORT STANLEY 18/11/93 - 19/11/93

There had been problems with the synchronisation of the two separate Tidata loggers and so the twin CPU sea level recorders were taken out and replaced with a single TDS data logger fitted with a 2 Megabyte SRAM card memory. The Seadata logger was left in place just recording the two sea pressure channels and sea temperature.

New Tidata logger started	02:00 GMT 19/11/93, Day 323
1st scan was seen at	02:15 GMT 19/11/93

In the evening the raw data was downloaded to PC file "STANRAW.DAT" and the calibrated data to PC file "STANCAL.DAT".

After the vessel returned to Stanley the SLR was checked again and all seemed well, a new EPROM was fitted to the DCP to enable four transmissions a day.

TXs at	03:12 GMT,
	06:14 GMT,
	15:12 GMT,
	18:14 GMT.
Data dumps at	22:00 GMT,
	04:00 GMT,
	10:00 GMT,
	16:00 GMT.

On 21/12/93 at 17:50 GMT the data was downloaded again to PC file "PETSTAN.DAT" containing both the calibrated and raw data.

SLR INSTALLATION AT FARADAY BASE 1/12/93

The DCP and the HP Jet Printer were working properly, there was plenty of paper and two Ink Jet cartridges were left behind. The data from the Toshiba 1200 hard disk drive was downloaded to the Toshiba 1800 via a serial lead and the original files erased. The contents of the DCP buffer were transferred to the Tandy laptop, file "FDCP.DO".

DCP aerial disconnected and replaced with dummy load whilst the aerial was removed.

Last DCP transmission was at 17:11:55 GMT before switching off.

Tidata dump to file	"FTID.DO"
Tidata time check:	19:09:09 Real time 19:10:00 GMT
Tidata clock reset:	19:39:25 GMT

Sensor frequencies: Digiquartz = 35,531 Hz
Temperature = 145.8 Hz

Seadata logger restarted with a new tape: 19:45:00 GMT, 1/12/93
Logger checked, scan 3 at: 20:07:30 GMT.
Checked again, scan 155 seen at: 15:07:30 GMT, 2/12/93.

Midnight pulse line shorted out at the Ozone loft end, to stop RF pickup. NB there is now no handshaking used anymore and the data just goes directly to the printer and the Toshiba computer.

SLR INSTALLATION AT ROTHERA BASE 7/12/93

Cable connections from the pressure sensor cable:

Green = Half-tide
Black = Temperature
White = Full-tide
Red = +6 volts
Common = Screens

Rothera Tidata started off at: 01:45:00 GMT 8/12/93
Scan checked at 02:15:00 GMT, day 342, Barometric reading = 978.535, Air temp = 14.231 C
Data downloaded from the Tidata to PC file "ROT1ST.DAT".

10/12/96
Problems with the transmission of data from the well to the Main building, the data was being corrupted sometimes. The Toshiba and receiving modem relocated to the Pump house which is about 30 metres from the well. Transmissions tried again with much improvement. Measurements of the sensor positions were taken.

Measurements taken at Rothera Sea Level Recorder Well.
Height from half-tide point to top of wooden cover = 3.900 metres
Distance from the bottom of the well to the top = 9.54 metres
Distance from bottom of well to first joint = 7.2 metres

As far as can be estimated Mean Sea Level is within 15 cm of the half-tide point.

Seadata logger information

19/11/93
Logger No. 6
Channel 1 Quartzdyne 4 stacks
Channel 2,4 Digiquartz and QT3 2 stacks
Channel 3 Digiquartz 1 stack
Logger supply 2 stacks

Measured voltages

White/Red and White/Blue	= 14.70 volts
Orange/Brown and Orange/Blue	= 14.72 volts
White/Orange and White/Green	= 14.72 volts
and Green/Red and Green/Black	= 14.53 volts
Red/Blue and Blue	= 19.33 volts

Sensor voltages

Channel 1 = 6.00 volts
Channel 2 = 6.00 volts
Channel 3 = 6.00 volts
Channel 4 = 14.01 volts

Sensor frequencies

Channel 1, 293660QT	= 26277 Hz
Channel 2, DQ41083	= 32320 Hz
Channel 3, DQ35126	= 32131 Hz (Temporary sensor)
Channel 4, QT3	= 32757 Hz

Currents measured

Logger	Orange/Brown	= 1.60 mA
Channel 1	White/Red	= 6.34 mA
Channel 2 and 4	Green/Red and White/Orange	= 1.70 mA
Channel 3	White/Brown	= 1.40 mA
Motor Supply	Red/Blue	= 260 mA

Logger Started: 01:15:00 GMT, 20/11/93

First scan seen: 01:30:00 GMT, case then sealed with grease and silica gel tablets.

ACOUSTIC RELEASE UNITS

Acoustic unit 2478, when connected up there was no response on the beacon channel at all, batteries disconnected and put to one side.

Acoustic unit 2482 connected up and tested on the bench, bandwidths as follows:
317 - 323 = 6 Hz
297 - 302 = 5 Hz
Fired after 40 seconds on 300 Hz, at 20 °C.

20/11/93 the wire test gave the following bandwidths:
315 - 324 = 9 Hz
294 - 304 = 10 Hz
Fired after 1 minute on 299 Hz, checked that fuse fired - YES.

21/11/93
Acoustic unit 2476 was used to release the POL 7 BPR/IES and was refurbished with new batteries. Voltages were: Receiver = 5.75 volts
Transmitter = 14.75 volts
Relay = both 9.53 volts

Bandwidth test on the bench:
319 - 328 = 9 Hz
298 - 308 = 10 Hz
Fired after 70 seconds on 303 Hz.

Logger No. 6 re-deployed at POL 7 21/11/93

Position: 54° 56.58' South
58° 23.51' West

Depth: 1007 metres uncorrected

Into the water: 21:18 GMT
On the bottom: 21:33 GMT

Acoustics units 2476, 2482

Radio Beacon Channel "C", 160.725 MHz (Tested before deployment)
Flashing light fitted and tested

22/11/93
Logger No. 2 disassembly

Sensor frequencies measured externally
Channel 1, DQ38173 = 33357 Hz
Channel 2, DQ41086 = 32200 Hz (Transferred to POL 7 site)
Channel 3, DQ43126 = 33141 Hz
Channel 4, QT1 = 32758 Hz. (Note not QT1 as in last year's notes)

Scan No. 3609 seen at 18:31:40 GMT, 22/11/93
Scan No. 3610 seen at 18:46:40 GMT, 22/11/93

On opening tube:
Tape just over half transported.

Sensor frequencies measured internally:
Channel 1, DQ38173 = 33359 Hz
Channel 2, DQ41086 Already removed from logger
Channel 3, DQ43126 = 33141 Hz
Channel 4, QT1 = 32759 Hz. (Note not QT1 as in last year's notes)
Channel 5, Int. Temp 4 = 8189 Hz.

Last scan on the tape: No. 6310 at 18:46:40 GMT 22/11/93

Battery voltages of old battery pack:

Red/Blue and Blue	= 18.38 volts
White/Brown and White/Black	= 13.94 volts
White/Orange and White/Green	= 14.18 volts
White/Red and White/Blue	= 14.08 volts
Green/Red and Green/Black	= 14.16 volts
Orange/Brown and Orange/Blue	= 13.93 volts

22/11/93
Logger 2 re-assembly

The battery pack used has previously been used for the MYRTLE test at Stony Cove, just using the White/Brown and White/Black stack. Because this had partly been used it was put onto channel 3, - the backup Digiquartz.

Battery volts on new battery pack:

Orange/Blue and Orange/Brown	= 14.52 volts
Green/Black and Green/Red	= 14.47 volts
White/Blue and White/Red	= 14.51 volts
White/Green and White/Orange	= 14.51 volts
White/Black and White/Brown	= 14.44 volts
Blue and Red/Blue	= 19.20 volts

Channel voltages:
Channel 1 = 6.00 volts
Channel 2 = 5.99 volts
Channel 3 = Stack not connected yet
Channel 4 = 14.46 volts

Sensors connected:
Channel 1 = To be put on from Drake South BPR
Channel 2 = To be put on from Drake South BPR
Channel 3 = DQ41077 (Low current sensor - 0.7 mA + 0.3 mA quiescent)
Channel 4 = QT4
Channel 5 = Internal - T4

Currents measured:

Orange/Brown	= 2.3 mA (Logger)
Green/Red	= 0.6 mA (External temperature sensor)
White/Red	= 0.0 mA but going up to 0.3 mA every few seconds
White/Orange	= 0.3 mA
White/Black	= 1.0 mA (Channel 3)
Red/Blue	= 280 mA

Logger started 15:00:00 GMT, 23/11/93

Frequencies measured:
Channel 1 = To be connected
Channel 2 = To be connected
Channel 3 = 32175 Hz - DQ41077
Channel 4 = 32757 Hz - QT4
Channel 5 = 8189 Hz - Internal T4

Logger seen to scan 16:30:00 GMT, Scan No. 6. Then greased, sealed up with silica gel. Awaiting the two pressure sensors from Drake South BPR.

23/11/93 IES No. 10 Preparation
The reed switch on this unit's sphere was damaged and so the IES sphere from the last recovery was substituted.

First ping at 14:50:05

wakeup 4,	IES time	15:00:40
	GMT time	15:00:42

24/11/93 Preparation of acoustic unit 2326
This release had been used to pop up the last BPR recovered and so just needed new batteries fitting.

Battery voltages:

RX battery	= 5.83 volts
TX battery	= 14 volts (old one left in)
Relay	= both 9.44 volts (old ones left in)

Tested on the bench at 20 °C, fired after 79 seconds at 420 Hz.

Tested on CTD cast:
Bandwidth 316 - 326 = 10 Hz and 414 - 423 Hz = 9 Hz
Fired fuse at 1000 metres wire out, 110 seconds at 418 Hz.

26/11/93 Logger 5 disassembly
After recovery of the BPR sensors QT119016 and DQ40375 were transferred to Logger 2, unfortunately the Quartzdyne sensor was badly corroded on the end cap and could not be re-deployed for another year. DQ35126 was substituted for the Quartzdyne.

29/11/93 Switching off Logger 5
Scan 7030 seen at 14:32:37 GMT
Scan 7031 seen at 14:47:37 GMT. Logger switched off at 14:50 GMT and tape removed.

Battery voltages:

Orange/Blue and Orange/Brown	= 13.85 volts
Green/Black and Green/Red	= 14.52 volts
White/Blue and White/Red	= 12.22 volts
White/Green and White/Orange	= 13.99 volts

White/Black and White/Brown = 13.82 volts
Blue and Red/Blue = 18.34 volts

26/11/93 Preparing Logger 2 for re-deployment

Sensor frequencies:
Channel 1 = 32131 Hz - DQ35126
Channel 2 = 31966 Hz - DQ40375
Channel 3 = 32171 Hz - DQ41077
Channel 4 = 32745 Hz - QT4

The logger was tie-wrapped to the frame and also secured with rope safety strop.

26/11/93 Preparation of acoustic unit 2483
This release had been used to pop up POL 5 and so just needed new batteries fitting.

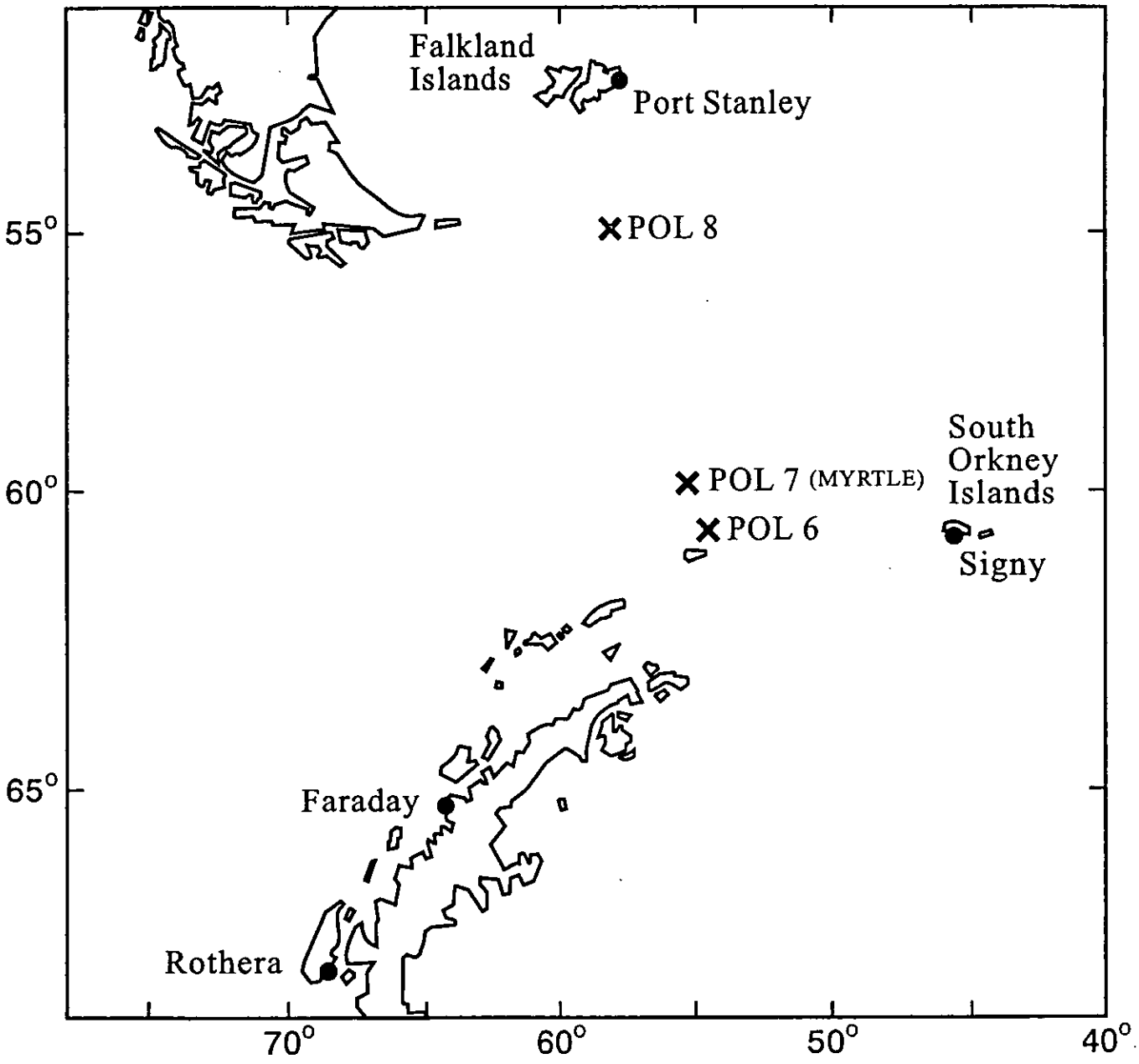
Battery voltages:
RX battery = 5.83 volts
TX battery = 14.83 volts (old one left in)
Relay = both 9.54 volts

Tested on the bench at 20 °C
Bandwidth:
320 - 325 = 5 Hz, 340 - 345 = 5 Hz
Fired after 49 seconds at 342 Hz.

Radio beacon fitted: Serial No. 20227, Channel "D", (160.785 MHz).
Flashing light : Serial No. 177 (New).

Appendix 2

Map of deployment positions of BPR's (✕) recovered and re-deployed on RRS James Clark Ross Nov/Dec 1993.



● Island sea level stations.

GLOSSARY

ACC	-	Antarctic Circumpolar Current
ACCLAIM	-	Antarctic Circumpolar Current levels from Altimetry and Island Measurements
BPR	-	Bottom Pressure Recorder
CTD	-	Conductivity, Temperature and Depth Profiler
CPU	-	Central Processing Unit
DCP	-	Data Collection Platform
FIPASS	-	Falkland Islands Passenger and Sea Service
GMT	-	Greenwich Mean Time
IES	-	Inverted Echo Sounder
MYRTLE	-	Multi Year Return Tidal Level Equipment
RDC	-	Recoverable Data Capsule
SLR	-	Sea Level Recorder
SRAM	-	Static Random Access Memory
TDS	-	Triangle Digital Services
WLR	-	Water Level Recorder
WOCE	-	World Ocean Circulation Experiment