P.O.L.

RRS 'James Clark Ross'
Voyage 1

20 December 1991 - 10 January 1992

ACCLAIM: Sea level measurements in the Scotia Sea and Drake Passage

Cruise Report No. 14

1992

NATURAL ENVIRONMENT RESEARCH COUNCIL
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ABSTRACT

ACCLAIM Bottom Pressure Recorders have been in place in the Scotia Sea since December 1988 and recovered/redeployed in 1989 and 1990. On this cruise the BPR's were complemented by two combined BPR/INVERTED ECHO SOUNDER rigs deployed in the Drake Passage. The principal aim of the exercise is to study the variations in flow of the Antarctic Circumpolar current on large time and space scales.

In addition remote island Sea Level Recording stations at Port Stanley - Falklands Islands, Signy Island - South Orkneys, and Faraday were upgraded.

No problems were encountered during the cruise operations, weather conditions were excellent for this area and data return from the recovered instruments was 100%.

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PROUDMAN OCEANOGRAPHIC LABORATORY

CRUISE REPORT NO.14

RRS JAMES CLARK ROSS

VOYAGE 1

20 DECEMBER 1991 - 10 JANUARY 1992

ACCLAIM: sea level measurements in the Scotia Sea and Drake Passage

Principal Scientist

P.R. Foden

1992

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Note: BPR - Bottom pressure recorder
IES - Inverted echo sounder
SLR - Sea level recorder

CRUISE PERSONNEL

The cruise participants were as follows:

POL personnel

Higher Scientific Officer	Peter Foden
Scientific Officer	Clare McGarry

RRS James Clark Ross personnel

Captain	Chris Elliott
Chief Officer	Robin Plumley
2nd Officer	John Pearn
3rd Officer	Graham Chapman
Chief Engineer	Dave Cutting
2nd Engineer	Bill Kerswell
Radio Officer	Charlie Waddicor
Electrician	Norman Thomas
Bosun	Bill Stoddard

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Thanks are also due to Bob Spencer for all his behind the scenes planning and preparation work and Clare McGarry for all her assistance on board the ship. Thanks too goes to Ian Vassie and Tony Banaszek for their support with communications between POL base and the ship.

Finally thanks are also due to Miguel Maccio of Lamont Doherty Geological Observatory for his patient and detailed explanation of the operating procedures for the IES instruments and to Marcella Stern for constructing them.

OVERVIEW

Part of the ACCLAIM (Antarctic Circumpolar Current Levels from Altimetry and Island Measurements) is to provide real time data from a 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 U.K. 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 (Antarctic Circumpolar Current) on large time and space scales, but the ACCLAIM network is also a component of GLOSS, providing sea level data which has improved knowledge of tidal behaviour in this remote area.

ACCLAIM BPRs have been in place east of the Drake Passage between Port Stanley and Signy island since 1988 and these were recovered and redeployed in 1989 and 1990.

POL CRUISE OBJECTIVES:

1) To deploy two combined BPR/IES in between Port Stanley and Faraday.

2) To put new SLR equipment ashore at Faraday base and get the electronic instrumentation operational. Install a Data Collection Platform (DCP) and antenna to test a satellite data telemetry link and give installation instructions to the base personnel responsible for the SLR.

3) To install DORIS (Doppler Orbitography and Radio-positioning Integrated by Satellite) satellite beacon at Rothera and to make this operational. Level in the antenna to a local bench mark and photograph the installation. Survey the Rothera base for the possible installation of a POL SLR and telemetry link.

4) To service the SLR at Signy base and recover the data logger tape. Install new software in the Tidata logger and fit new a DCP transmitter battery to try and improve power output to the satellite. Check barometric and temperature readings against a standard instrument and make sea level measurements as time allows.

5) To recover and redeploy the two BPRs en route from Signy to Port Stanley. Tapes need to be recovered from the instruments and all batteries changed for new ones. Attach radio beacons prior to re-deployment.

6) To service the Tidata SLR at Port Stanley and take barometric and temperature readings. Measure sea level directly with a tide staff and inspect and repair the mechanical installation as necessary.

BPR/IES DEPLOYMENTS AND SLR INSTALLATIONS

Ship Preparation

Two personnel from POL, Peter Foden and Clare McGarry, joined the R.R.S. James Clark Ross in Port Stanley on December 17th 1991. The equipment shipped out from the U.K. was unpacked and the wooden cases containing the ballast weights broken open and the ballast weights assembled. SLR loggers 4 and 5 were prepared and started off prior to sailing. The IESs were not started until just before deployment. The acoustic release units were prepared for wire testing.

Acoustic Wire Testing 21/12/91 - 22/12/91

The hydrographic winch was used to carry out wire tests to 3000 metres. The 6mm wire was led from the Traction Winch Room to the midship gantry and the eye attached to the acoustic releases.

Acoustic units tested:

2483 322/342/1.12
2326 320/418/1.10
2476 321/301/1.06
2163 321/438/1.14
227 320/341/0.94 (REJECTED)
2479 319/341/1.06 (REJECTED)

A large clump of chain links was used to provide adequate weight for the initial part of the descent.

The ship departed Stanley on December 20th 1991 at 08:34 and proceeded to Mare Harbour for fuel and to embark more BAS personnel. The ship departed at 18:58.

PORT STANLEY SLR 17/12/91

The SLR at FIPASS (Falkland Islands Passenger and Sea Services) was serviced and the software in the Tidata computer replaced with a new EPROM (Eraseable Programmable Read Only Memory). On 19/12/91 the tape on the Seadata logger was replaced and the logger restarted. The new software version installed was

STA91.C, C.S.=0D7AD4, DATE=28/11/91.

DEPLOYMENT OF BPR5/IES4 (POL1) 21/12/91

IES 4 was finally prepared 4 hours before deployment. Trouble had been experienced with the serial interface link and that meant that the Tattletale computer had to be started manually with the sphere open. The set-up procedure was captured using Mirror II on the Toshiba portable. An old battery pack was used for testing and a new one fitted prior to deployment. The unit was sealed up with silica gel tablets inside and a hot air gun used to provide the vacuum. The IES was transferred to the deck and fastened into the frame with stainless steel bolts taken from the acoustics brackets. These were used in preference to the nylon bolts provided. Note only two stainless bolts were used to secure the sphere into the frame. The transducer was secured into place with corrodible links to stop it moving too much whilst being deployed. A rope was tied to the transducer and to the frame but left long enough not to interfere with normal operation. The BPR was secured into the frame with rope and tie wraps.

EVENTS

07:00 GMT	Vessel on station
08:00 GMT	Preparations complete
08:07 GMT	BPR/IES released into water
08:17 GMT	Overside transducer into water
08:22 GMT	Both acoustics switched on
08:50 GMT	Ship's echo sounder switched off
09:08 GMT	Approx time on sea bed (landing missed, listening to the IES)
09:30 GMT	Both pingers timed out
09:34 GMT	Overside transducer brought inboard

Total time on station: 2 hours 30 minutes.

The IES was heard to ping whilst still travelling to the sea bed and the lockout time was monitored using a chronograph at 4.66 seconds.

DEPLOYMENT OF BPR4/IES3 (POL2) 23/12/91

IES 3 was set up exactly as IES 4. The unit was transferred to the frame and the third sample heard at 15:00:13 GMT on the deck. At 15:20 GMT the combined BPR2/IES3 was ready to deploy. The water depth was too great and a course alteration to North West found the optimum depth of 4000 metres.

EVENTS

14:00 GMT	On station but depth not suitable. Commence search
15:54 GMT	Vessel stopped final preparations commenced
16:05 GMT	BPR/IES released into water
16:10 GMT	Transducer into the water. Both acoustics on straight away
16:30 GMT	Pingers timed out, both turned back on again

16:58 GMT — Listening for IES. Nothing heard at first, this is because there is quite a lot of acoustic noise and we have drifted a distance away. Also the pinging was in the margin of the Nagrafax chart. By turning Down the Nagrafax gain the lockout transmission could be seen and was still 4.66 seconds.

17:15 GMT (approx) — BPR/IES on the sea-bed not seen to land. Whilst monitoring the IES transmissions the frame had landed on the sea-bed and the trace could clearly be seen.

17:20 GMT — The pingers timed out and the Nagrafax was switched to 1 second sweep to see if any transmissions from the IES. Nothing heard so the transducer was brought inboard and the ship proceeded to Faraday.

Total time on station: 3 hours 17 minutes.

POL1/POL2 Deployment Summary

Both deployments went smoothly and although there were only two strops holding the BPR frame, the lifting angle was not too severe. The wooden toggle from John Biscoe was used to release the frame and a loop spliced into the top of the lifting strop eye. The frame was positioned under the stern gantry and a 28 mm polypropylene rope passed through a wide throated block from the main frame hanger. A reinforced soft eye was connected to the rope on the frame using the wooden toggle. The rope came down from the gantry block and to a lead block secured to the deck and onto the drum end of the starboard mooring winch. Two steadying lines were used as the frame was lifted outboard. They were removed prior to the toggle being released. After deployment the over side transducer was put over the side by the midship gantry, the propulsion and bow thrust were stopped to reduce acoustic noise.

SEA LEVEL RECORDER INSTALLATION AT FARADAY BASE

The ship arrived at Faraday base on Christmas Eve, 24 December 1991. A little essential cargo handling was done and then no more until Boxing Day. The aluminium boxes containing the SLR equipment were taken ashore and unpacked. The back-up battery supply for the SLR was built up and tested.

Thermostat

A tamper-proof thermostat was fitted to the top of the logger cabinet and wired in series with a small heater element in the bottom of the cabinet. The temperature was set to 15 degrees Celsius but will need to be set according to conditions after installation.

Sea Sensor Unit

The pressure sensor was unpacked and transferred to the electronics laboratory. The unit was tested and found to be faulty. The sensor was almost certainly damaged in transit, the sensor block had been bolted directly to the wooden crate transferring any shock received. In the future, sensors will be packed in bubble wrap and clearly denoted as 'fragile' on the BAS

packing list. This will ensure that the crate is stowed in the fragile stow area of the ship and not in the hold. POL were informed of the sensor failure and another sensor was dispatched via BAS and the Polar Circle to Faraday. The old sensor was packed in bubble wrap and sent back to the ship ready for transporting back to POL.

DCP Installation

The aerial was mounted on the North East end of the main building close to the existing meteorological DCP aerial. It is bolted using 1/2" screwed rod through the aluminium cladding and structaboard of the building. A wooden backing plate is placed between the aluminium support bracket and the aluminium cladding. Mastic putty was placed behind the wooden plate to ensure a water tight seal. The two aerial cables come directly into the Ozone loft and are sealed with silicone rubber. The cables were made as short as possible and the socket on the end of the cable junction box changed to a plug, so that it can be directly connected to the DCP without an extension cable. This was done to ensure that the maximum amount of power was generated in the aerial. Also a larger than normal sized battery was fitted in an effort to increase transmission power. A wooden shelf supports the DCP, battery and charger unit. The aerial was orientated to point at the satellite, the settings for Faraday are as follows:

AZIMUTH	66.5 degrees
ELEVATION	2.0 degrees

MAGNETIC VARIATION FOR FARADAY	17.0 degrees East
ACTUAL COMPASS BEARING	49.5 degrees

This unfortunately coincides with Mount Shackleton which will block off a lot of the signal. This coupled with the fact that Faraday is just on the fringe area of the Meteosat satellite coverage means that reception will be difficult if possible at all.

Sea Level Recorder Electronics Unit

The complete electronic package was temporarily installed in the Ozone loft together with the DCP transmitter. After the mechanical installation has been completed the SLR electronics can be transferred to the outside SLR hut. The DCP was set up and the time and date set. The Tidata computer was initialized and the Seadata logger set running with a test tape. The printer was setup and running correctly. The synchroniser was left coupled to the DCP so that the transmissions could be monitored on the Tandy computer.

1st. DCP transmission	05:12:02 GMT 28/12/91
Power output	6.2 Watts
Battery voltage	13.0 volts, VCO supply 3.8 volts

At 05:30:00 GMT the last scan was recorded on the test tape (28 scans in total) and it was removed and the logger left running without a tape fitted.

Mechanical Installation

The steel work for the rebuilding of the Faraday SLR was placed on the concrete plinth adjacent to the SLR hut. Because the RRS James Clark Ross is equipped with a large tender craft, the steel work could be lifted with the hydraulic crane directly out of the craft and on to the shore. The reconstruction work on the SLR will take place later in the year, when the area around the SLR has thawed out and the immediate resupplying of the base is over. At the time of writing I have heard that reconstruction of the SLR has already commenced (late January 1992). A full set of blueprints have been left at the base together with a construction manual. (POL Internal document 29, Foden,Spencer and Casson November 1991)

Sea Sensor Unit Disassembly

The plastic block containing the sea pressure sensor was opened and the faulty unit removed (DQ 40069). The SLR was left running with the pressure sensor disconnected but the temperature sensor was still connected. Before disconnecting the sensor the voltage and frequency were checked again and were: 5.99 volts and 68650 Hz.

Faraday Sea Level Recorder Summary

The electronic SLR was set up ready for the base personnel to install later in the year after completion of the mechanical installation. On returning to the ship it was confirmed that a spare pressure sensor had already been sent out with John Hall from BAS, who had kindly agreed to take it as personal baggage onto the Polar Circle. Tony Banaszek was asked to send the calibration information for the new sensor via fax to the ship. This he promptly did and another EPROM was programmed for the Tidata computer. The new EPROM was tested with a spare Tidata board on the ship and it printed out the correct tidal heights for a given frequency.

A package was made up for Faraday consisting of the new EPROM, some silicone oil for the sensor pipe and some spare rechargeable batteries for the BAS DCP Synchroniser unit. This was left on the ship for the next call at Faraday in January 1992. A duplicate EPROM was also sent to the RRS Bransfield in case the RRS James Clark Ross was unable to call. It was also later found out that DCP transmissions were not being received at POL from Faraday. On a radio schedule with Faraday, Iain Goodfellow was asked to alter the azimuth setting to see if the orientation was incorrect. This was done in 5 degree steps with several days in between to verify transmissions. At the time of writing transmissions have been received and most recent reports confirm that the SLR has been successfully installed, outputting data to the DCP and HP printer.

DORIS INSTALLATION AT ROTHERA

The ship arrived at Rothera base on 29/12/91, the large wooden crate containing the DORIS equipment was unloaded from the ship onto the quayside and taken up to the base. Work commenced on the installation the next day. The large crate was unpacked and all the components identified. The equipment seemed to be in good order and the DORIS electronic package was taken inside the hut to warm up. The best place for the aerial seemed to be on the North end of the Joiner's workshop (Phase 1 building). With the help of the joiner Mike,

two wooden support plates were fastened near the apex of the building and then drilled through to take the threaded rods that hold the base of the aerial support. One section of the triangular tower was bolted onto the aerial support and then the aerial base plate was bolted on top. The fibre glass dome containing the aerial was bolted to the base plate and the two aerial cables led down the support and into the loft of the building. Below the aerial and adjacent to the aerial support, brackets were mounted for the meteorological instruments. The connecting cable was also led into the loft.

DORIS Electronic Unit

The electronic unit was set up in the loft against the wall that the aerial had been mounted on. The metal table supplied for DORIS was too high for the loft and was not adjustable. The joiner made a shorter stand and the DORIS electronic package was connected to the aerial the meteorological sensors and the battery pack.

The battery pack was 34.9 volts when taken out of the crate, this was just on the 35.0 limit for acceptance. The batteries were individually charged using a 12 volt battery charger. After charging, the voltage was 37.5 volts. A mains supply was put in specially and the DORIS lead wired directly to the outlet.

Switching the DORIS Beacon on

As soon as the mains supply to the beacon was switched on the 6.3 Amp fuse (F3) on the regulation card blew. Each time the fuse was replaced and the power re-applied the fuse blew each time. The unit would power up from just the batteries and the voltage Vr indicated on the LCD would read 0.00 volts. After a while the cut-out trips and the beacon switches off. When the power from the batteries was re-applied the beacon powered up again but the period that it stayed on for diminished as the batteries discharged.

Testing the DORIS Beacon

With the mains supply disconnected and all the batteries charged up again the unit was switched back on. After switching on the battery light came on and after 30 seconds all lights went out. The LCD read 00 00 00 TAI and BALISE EN VEILLE. The key was turned to PROGRAM and the TST key pressed. The LEDs flash three times and the SECTEUR LED comes on and the message DEFAUT SECTEUR Vr=00.0v appears on the LCD. On turning the key to operate mode the following appears on the LCD :

00 00 00 TAI ******* Io=247 mA Tb=17C (asterisks flashing)

Vr=00.0v Vb=34.9v Vo=21.8v P4=06W P2=09W

The regulation board was inspected to see if any faults could be found but it is is very difficult to access components on the beacon without major disassembly. No spares or circuit diagrams were supplied with the beacon so the beacon only was packed up and returned to the ship for returning to France. The battery box, aerial and meteorological sensors were left in place ready for connecting to a replacement beacon. The DORIS handbook and the unused mechanical parts were left with the Joiner.

31/12/91 Michel Lansman at IGN was contacted by fax to inform him of the situation and asking what action to take. It was recommended that they sent a replacement beacon as soon as possible. A message was also sent to POL to see if they could contact IGN by telephone. No reply came from France, probably due to the holiday period and the ship left Rothera on the 1/1/92 for Signy.

Levelling the DORIS Beacon

The hut in which the DORIS beacon was housed had a bench mark in the concrete support on the NW corner of the building. This level was transferred to directly below the aerial by means of a pipe filled with water. The height was then measured directly to the reference point on the aerial plate and to the centre point of the barometer unit.

Height of reference point from bench mark	= 4.419 metres
Height of barometer centre point from bench mark	= 3.870 metres

To get the height to the aerial reference point, the distance to the bottom plate was measured (4.414 metres) and the thickness of the plate measured (5mm) and the two added together.

NB Two in-line aerial filters were supplied but with no instructions as to where they were to be fitted. ie at the aerial end or the beacon end. The filters were placed at the aerial end and then the cables attached to the filters. The filters were covered with self-amalgamating tape and pvc tape to seal them.

It was heard later from POL that it was not possible to get a DORIS beacon to Stanley in time for the ship, It was suggested to remove the one from Signy Island and send it back to Rothera on the next trip.

SIGNY SEA LEVEL RECORDER

The ship arrived at the South Orkneys on the 5/1/92 after a slow trip due to thick fog and large icebergs. The SLR installation at Signy consists of a Digiquartz pressure sensor, Tidata computer and a Seadata backup logger. The data is sent back to the U.K. using a DCP satellite transmitter.

Tidata Computer Servicing

The main task at Signy was to install the new version of software for the Tidata computer. This latest version dumps the data at 00:45 GMT and 12:45 GMT thus avoiding the clash of the end of the integration period at 00:30 and 12:30. The DCP had already sent off it's data at 14:12 GMT so the data in the Tidata's buffer was saved to the Tandy computer. The time and date were checked and the Tidata clock was 1 sec slow against the GPS clock on the ship. At 20:35 GMT the barometric pressure was checked (997.6 millibars) and then the Tidata was switched off. The new EPROM was installed and it's details are as follows:

SIG91.C, C.S.=0D7A70, DATE=28/11/91.

The Tidata was powered up again and the time and date reset. The time is now fast by 1 second. The barometric pressure was checked again at 20:44 GMT and was 997.5 millibars.

Seadata Logger

The Seadata logger was opened up and found to be reset to 0000 on the LCD display. The logger did not scan at all. It was as if the reset button had been pressed and then left. The tape had moved on but not a lot, the logger had obviously been stopped for quite a long time. There had been some problems with the SLR in March 1991 and it appeared that the logger had been stopped since then. The old tape was removed and a new tape put on, the start time was:

Tape start: 22:00:00 GMT 5/1/92 Signy Island Seadata logger

After restarting the logger it was seen to scan at 00:45:00 GMT with scan number 11. So logger functioning normally.

DCP Maintenance

The DCP transmitter was next serviced and a new, larger battery fitted in an effort to increase the power output to the aerial. The voltage of the old battery was measured to be 12.7 volts when transmitting and the R.F. output 6.0 Watts. The time of the DCP was checked and found to be 8 seconds fast as against the ship's GPS clock. The old battery was disconnected and the new one put in. The new battery increased the power output and when measured the battery voltage was 12.9 volts whilst transmitting and an output power of 6.2 Watts into the aerial. The DCP clock was found to be 1 second slow now after resetting. The DCP aerial was checked out and found to be in good mechanical order.

Barometric Pressure Test

A comparison was made of the intelligent barometer output and the precision aneroid barometer kept on base. At 12:50 GMT the precision aneroid read 990.35 millibars and the intelligent at 13:00 GMT read 990.6 millibars. Directly interrogating the intelligent barometer gave 989.9 millibars against 990.25 millibars on the precision aneroid. The frequency fed to the Seadata logger by the intelligent barometer was also changed from 16.8 Hz to 134.4 Hz by altering the divider output inside the barometer from pin6 (Q3) to pin 12 (Q0). This now gives 17203.2 Hz going to the Seadata, where it is divided again by 128 to give 134.4 Hz.

Precision aneroid barometer type M2236, range 900-1050 millibars
Serial No. 512 (Same unit used when SLR installed in December 1988).

Sea Sensor Inspection

The SLR pressure head had recently been dived on and inspected and was found to be in good condition. but the galvanized pipes protecting the cable were found to be exposed. The base commander Neil Gilbert said that he would arrange for the pipes to be covered with rocks again with particular attention to the areas where the cable itself is exposed. A precision temperature logging system has been received at Signy and The person in charge of it (Luke)

said that he would install it next to the SLR pressure head so that POL could obtain a temperature calibration for the thermistor probe inside the pressure head.

HP Printer for the Sea Level Recorder

The HP printer gives a local print out of the DCP data has been working well and the print out is important this year due to the failure of the Seadata logger in March. The paper had been running askew and jamming, this was found to be caused by the bail roller not being put back in place after changing the paper. The inkjet cartridge was changed for a new one and spare cartridges left for the printer.

Summary - Signy Sea Level Recorder

The Signy SLR has been in operation since December 1988 and worked continuously since then. There have been problems with the power supply at Signy (noise from the refrigerators) but the new version of software should help the Tidata computer from 'hanging up'. By changing the battery to a larger capacity one the output voltage to the DCP has been increased and likewise the power to the aerial. This should help decrease the number of dropouts in the data due to the Southerly position of the site and the low elevation. The pressure sensor and temperature sensor are both still working after three years in a hostile environment and they and the cable appear to be in good condition. The galvanized pipe covering the cable will be covered in rocks again to help protect it from icebergs.

RECOVERY AND REDEPLOYMENT OF BPR (POL3) BETWEEN SIGNY AND STANLEY 7/1/92

The ship left Signy on the early evening of January 6th 1992 by 07:00 GMT the next day the ship was on station to recover the BPR from the Signy end of the BPR line.

Position	60 03.10 S 47 04.90 W
Uncorrected depth	2010 metres (from last year)
Acoustic units	2477 320/241/1.16 2478 321/361/1.16

EVENTS 7/1/92

07:00 GMT	Ship on station. Depth 1888 metres corrected
07:17 GMT	Transducer into the water
07:20 GMT	Both pingers on in beacon mode
07:23 GMT	Into release mode using acoustic unit 2477
07:32 GMT	Still trying to release using 2477
07:34 GMT	Changing over to acoustic unit 2478

07:36 GMT	BPR released and on it's way to surface
07:43 GMT	Fired other pyro after 4 minutes release transmission
08:00 GMT	Transducer brought inboard and ship moved to original position
08:05 GMT	Redeploying transducer again
08:08 GMT	Acoustic contact regained, still coming up
08:25 GMT	BPR sited
09:05 GMT	BPR recovered on deck

The BPR frame was in good condition and so were the pressure cases on the Seadata logger and the acoustic units. The logger was immediately removed from the frame and heated using a hot water spray from a hosepipe. The acoustic units were warmed up the same way and opened to replace the receiver and transmitter batteries with new ones. The release batteries were in good condition and were left in both units. Both releases were bench tested to fire a test bulb and then replaced on the BPR frame. The radio beacon was tested with the hand held radio receiver prior to deployment.

Deployment of BPR (POL3) 7/1/92

Into the water	16:24 GMT 7/1/92
Position	60 03.08 S
	47 09.95 W
Barometric press.	995.7 millibars
Wind	16 kts NW'ly
Air temperature	3.5 C
Sea temperature	0.6 C
Corrected depth	2267 metres

Acoustic units fitted:

2477	320/241/1.16 seconds
2478	321/361/1.16 seconds

EVENTS

16:15 GMT	Vessel on station, BPR preparation complete
16:24 GMT	Into the water, slight/mod sea, moderate swell
17:08 GMT	On the sea bed
17:30 GMT	Acoustic pingers timed-out

17:35 GMT Transducer brought inboard, tests on ship joystick control

19:00 GMT Ship proceeds to next station

Total time on station: 10 hours 25 minutes

POL 3 Summary

The recovery and deployment both went smoothly. The majority of the time was spent replacing the Seadata logger and acoustic batteries. The frame was in good condition and required nothing more than checking the security of all the nuts and bolts. The ballast weight was a difficult fit and had to have one of the points ground off and the most of one of the others cut off. There was continuing good weather which made the BPR servicing easier to carry out. Acoustic unit 2477 was slow to fire but did fire on the way to the surface.

ATTEMPTED RECOVERY OF BPR DEPLOYED IN 1989/1990 SEASON 9/1/92

It was not possible to recover one of the BPRs last year and it was tried again this year to locate it. The weather was particularly bad last year and this made acoustic reception in the sea difficult.

Position	54 52.80 S 54 38.80 W
Uncorrected depth	4098 metres
Acoustics	2328 322/460/1.14 2420 319/379/0.92

EVENTS

07:14 GMT	Vessel on station
07:15 GMT	Overside transducer into the water. Transmit on 320
07:34 GMT	Nothing heard. Transmit on 460 to release
07:38 GMT	1 km from nominal position. Getting foggy
07:45 GMT	Transducer brought inboard. Vessel returning to nominal position
08:03 GMT	Vessel back on site. Transmitting on 379 to release
08:30 GMT	Still no response. Changing back to release on 460
08:35 GMT	Returning to nominal position again
08:56 GMT	Going to 500 metres SW of position
09:00 GMT	Vessel back on station. Transmitting on 320

09:13 GMT	No contact made, so trying again on 460
09:25 GMT	Transducer brought inboard. Making a search of the area
10:00 GMT	Search abandoned resume passage to next station

Total time on station: 2 hours 31 minutes

Summary

There was no sign of the BPR at all, and it is almost certain that the frame had popped itself up last season. A considerable amount of acoustic energy was put into the water and if the acoustics had been within a mile of the ship they would have switched on. The sea conditions were excellent and the pingers would have been heard over a considerable distance if they had been in the water.

RECOVERY AND REDEPLOYMENT OF BPR (POL4) 9/1/92 - 10/1/92

The last BPR to be recovered and redeployed was just before arriving back at Port Stanley.

Position	53 30.59 S 56 58.97 W	
Uncorrected depth	2800 metres	
Acoustics fitted	2517	320/259/1.18
	2518	320/278/1.16

EVENTS 9/1/92

18:45 GMT	On station. Overside transducer in water, both releases on
18:47 GMT	2518 put into release mode
18:49 GMT	Release fired but not lifted from the bottom
18:54 GMT	BPR released after a delay. There is a strong signal from 2518 and a weak signal from 2517
19:08 GMT	Second pyro fired using 2517, still a weak signal
19:29 GMT	BPR still coming to the surface, signal stronger
19:45 GMT	On the surface, sited on the port beam. Transducer inboard
20:45 GMT	BPR recovered and on deck

The BPR frame was badly corroded with large clumps of encrustation on the edges of the frame. The corrosion was up to 3/4" in parts. The aluminium frame must have been touching

the steel ballast frame and causing electrolytic corrosion. The frame was cleaned up with hot water and the clumps of corrosion removed, the BPR and acoustic units were in good condition and had not corroded. The areas of the frame that had corroded were covered up with pvc tape and since the strop anchorage points were quite corroded ropes were spliced into the strops and fastened directly to the BPR frame, in case the corrosion got worse over the next year. The logger unit and acoustics were removed as before and warmed up with a hot water spray. The acoustic receiver and transmitter batteries were replaced. The release batteries were in good condition and were left in both units. Both releases were bench tested to fire a test bulb and then replaced on the BPR frame.

Deployment of BPR (POL4)

Into the water	02:45 GMT
Position	53 29.00 S
	56 51.73 W
Barometric press.	1000.3 millibars
Wind	18 kts NNW'ly
Air temperature	8.2 C
Sea temperature	8.0 C
Corrected depth	2708 metres

Acoustic units fitted:

2517	320/259/1.18 seconds
2518	320/278/1.16 seconds

EVENTS 10/1/92

02:40 GMT	BPR preparation complete, transducer overside
02:45 GMT	Into the water, moderate sea, moderate swell
03:39 GMT	On the sea bed
03:52 GMT	Acoustic pingers timed-out
03:54 GMT	Transducer brought inboard
04:00 GMT	Station completed, proceeding to Port Stanley

Total time on station: 9 hours 20 minutes

POL 4 Summary

Again the recovery and deployment went smoothly with continuing good weather. Both acoustic units fired their pyros and the delay in lifting off the bottom was probably due to corrosion between the BPR frame and the ballast weight. Extra thick PVC tape was used between the the frame and ballast weight to prevent corrosion.

APPENDIX I - SLR, BPR AND IES TECHNICAL INFORMATION

STANLEY SLR DETAILED INFORMATION

Battery pack voltages:
Charging voltage = 19.8 volts
After diode = 19.1 volts
Logger supply = 14.25 volts
Motor supply = 19.1 volts

DCP battery = 13.94 volts

At 23:30:00 GMT the Tidata time was 23:28:13, (1 min. 47 secs. slow)

New EPROM version STA91.C/C.S.0D7AD4/28/11/91 fitted and new 74HC374.

19/11/91 The DCP was resynchronised at 02:20:00 GMT after being found to be 7 seconds fast.

Channel 1 = 38036 Hz
Channel 2 = 104.8 Hz
Channel 3 = 129.8 Hz

Last scan : 2734 at 11:18:57 GMT (3 mins. 57 secs. slow) 19/12/91
Tape start: 11:45:00 GMT 19/12/91.

POL1 BPR5/IES4 DETAILED INFORMATION

Logger No.5

Channel 1 = QD119016	21,561 Hz
Channel 2 = DQ40190	35,324 Hz
Channel 3 = DQ43122	33,215 Hz
Channel 4 = QT1	32,760 Hz
Channel 5 = Temperature sensor No.3	8,190 Hz

n.b. Channel 1 converted to 9 volts output to suit the Quartztronic sensor.

Seadata Card Numbers:

DB1 = 9
XP35 = 130
XP35 = 633
XP35 = 578
DC40 = 345
XC19 = 432
MB1 = ?
CR30 = 291

CR21 = 309
CR12 = 208

LOGGER No.5	Tape started	00:00:00 GMT 19/12/91
	1st scan	00:15:00 GMT 19/12/91
	2nd scan	00:30:00 GMT 19/12/91

Time from the ship's synchronised radiocode clock system.

IES No.4

Software version: IESH4_10 NOV1,91

SIGN ON TIME	02:59:07 GMT 22/12/91
LOCK-OUT MOD. TIME	10 hours
FIRST CYCLE	05:00:43 GMT (PEEP ON TOSHIBA)
FIRST PING	05:00:46 GMT
FIRST BURST	05:02:51 GMT
SECOND BURST	05:04:59 GMT
LOCK-OUT TX	05:07:07 GMT

Deployment of BPR5/IES4 (POL1)

Into the water	08:07 GMT 22 December 1991
Position	56 29.45 S
	62 59.16 W
Barometric press.	1001.7 millibars
Wind	NE 16 kts
Air temperature	5.2 C
Sea temperature	6.1 C
Corrected depth	3924 metres

Acoustic units fitted:

2326	320/418/1.10 seconds
2476	321/301/1.06 seconds

POL2 BPR2/IES3 DETAILED INFORMATION

Logger No.4

Sensors fitted:

Channel 1 = DQ18173	33,360 Hz
Channel 2 = DQ41086	32,254 Hz
Channel 3 = DQ43126	33,142 Hz
Channel 4 = QT4	32,760 Hz
Channel 5 = Temperature sensor ?	8,190 Hz

Seadata card numbers:

DB1 = 4
XP35 = 83
XP35 = 62
XP35 = 114
DC40 = 86
XC19 = 6
MB1 = 4
CR30 = 173
CR21 = 775
CR12 = 166

LOGGER No.4	Tape started 00:45:00 GMT 19/12/91
	First scan 01:00:00 GMT 19/12/91
	Sec. scan 01:15:00 GMT 19/12/91

IES No.3

Wake-up time was checked at 11:14:01 GMT. The IES time was one second fast at 11:14:02.

FIRST CYCLE	11:01:14 GMT 23/12/91 (PEEP ON TOSHIBA)
FIRST PING	11:01:16 GMT
FIRST BURST	11:03:26 GMT
SECOND CYCLE PING	13:00:45 GMT
FIRST BURST	13:02:52 GMT

Lock-out transmission occured but Toshiba battery ran flat, lock-out time 4.66 seconds.

IES battery voltages before diodes read from left to right:

15.45 volts
15.44 volts
15.44 volts
15.44 volts
15.45 volts

Transponder battery:

16.98 volts
16.97 volts

Deployment of BPR2/IES3 (POL2)

Into the water	16:05 GMT
Position	61 28.43 S
	61 17.43 W
Barometric press.	996.2 millibars

Wind	SE 5 kts
Air temperature	1.2 C
Sea temperature	1.0 C
Corrected depth	3946 metres

Acoustic units fitted:

2163	321/438/1.14 seconds
2483	322/342/1.12 seconds

FARADAY SEA LEVEL RECORDER

Battery voltages:

Power supply open circuit	19.74 volts
Power supply batteries charging	19.74 volts
Charging supply to batteries	18.99 volts
Tidata and Seadata supply	12.95 volts
Seadata motor supply	17.27 volts
Pressure sensor supply	5.99 volts

Sea Sensor Unit (DQ 40069)

The current consumption was 1.59 mA but the pressure frequency output was 68352 Hz instead of the expected 38308 Hz. The temperature sensor had a resistance reading of 80.8 kOhm.

Barometer Frequency Output

Frequency measured at sensor output 37228 Hz. The original total division factor was 16, this gave an output of 2326 Hz. The divider was altered to give a division factor of 256 so that the output from pin 4 of the 9 pin connector is now 145 Hz.

Digiquartz Intelligent barometer type 1015A-01. Serial No. 40423. 0-15 psi.

The cable connections for the sea sensor cable are as follows:

SCREEN	0 volts (GROUND)
GREEN	THERMISTOR
BLACK	THERMISTOR
TWISTED BLACK PAIR	PRESSURE FREQUENCY
TWISTED RED/WHITE	POSITIVE SUPPLY (6.00 volts)

Faraday Logger Start

Test Seadata logger tape started 02:00:00 GMT 28/12/91 (N.B. 7.5 min scans)

Pressure frequency	68696 Hz
Temperature frequency	13.5 Hz

Barometer frequency 145.5 Hz

Faraday Sensor Replacement

DQ 45624 sent out with John Hall on the Polar Circle.

SIGNY ISLAND SEA LEVEL RECORDER

The power supply voltages were checked and found to be:

Farnell power supply o/p	19.62 volts (before diode)
	18.93 volts (after diode)
Fuse no.1	14.13 volts
Fuse no.2	18.93 volts
Fuse no.3	14.13 volts
Tidata power supply	13.68 volts input. 4.98 volts output.

Frequencies measured on the Signy SLR

Tidata

17191 Hz	Barometer to Seadata logger
38076 Hz	Digiquartz output
86.7 Hz	Temperature oscillator output

Seadata

134.3 Hz	DC40 Baro. press channel
38077 Hz	XP35 Pressure channel
86.8 Hz	DC40 Temperature channel

POL3 SIGNY END BPR DETAILS

BPR REFURBISHMENT 7/1/92

NEW PYROS FITTED	2477 MC17.89 3/90
	2478 MC17.98 3/90

New radio beacon and light fitted to the mast:

NOVATECH model RF 700A-1	S/N 20222
CHANNEL A, FREQUENCY	154.585 MHz
FLASHING LIGHT model 204-SRS	S/N 176

It was not possible to remove the sensors from their plastic brackets so a frequency meter and a piece of wire were used to pickup the sensor frequencies.

Channel 1 = DQ38175	33330 Hz
Channel 2 = DQ36573	32842 Hz
Channel 3 = DQ18567	33581 Hz
Channel 4 = 3T1	988 Hz

All channels were working correctly and so the sensors were disconnected and the tube opened up at 12:29 GMT.

Scan number 9349 was seen at 12:31:52 GMT and scan 9351 at 13:01:52 GMT

The tape had transported half way and all looked alright. The old battery pack was removed and replaced with a new one.

Battery voltages:	old battery pack	new battery pack
Motor	17.55 volts	19.54 volts
Grn/Brn Wht/Brn	13.98 volts	14.56 volts
Wht/Grn Wht/Orn	13.87 volts	14.59 volts
Wht/Red Wht/Blu	14.04 volts	14.58 volts
Grn/Red Grn/Blk	14.37 volts	14.56 volts
Orn/Brn Orn/Blu	13.91 volts	14.60 volts

A new cassette tape was put on the logger and it was restarted at:

Tape start:	14:15:00 GMT 7/1/92
First scan seen at:	14:30:00 GMT and tape seen to transport.

The sensors were connected up again and the frequencies found to be:

Channel 1 = DQ38175	33331 Hz
Channel 2 = DQ36573	32842 Hz
Channel 3 = DQ18567	33582 Hz
Channel 4 = 3T1	1006 Hz

The logger was sealed up again with silica gel tablets inside and replaced on the BPR frame.

POL3 Deployment

Into the water	16:24 GMT 7/1/92
Position	60 03.08 S
	47 09.95 W
Barometric press.	995.7 millibars
Wind	16 kts NW'ly
Air temperature	3.5 C
Sea temperature	0.6 C
Corrected depth	2267 metres

Acoustic units fitted:

2477	320/241/1.16 seconds
2478	321/361/1.16 seconds

POL4 STANLEY END BPR DETAILS

NEW PYROS FITTED	2517 MC17.99 3/90
	2518 MC17.100 3/90

New radio beacon and light fitted to the mast:

NOVATECH model RF 700A-1	S/N 20223
CHANNEL B, FREQUENCY	159.480 MHz
FLASHING LIGHT model 204-SRS	S/N 174

The radio beacon was tested with the hand held radio receiver prior to deployment.

Bottom Pressure Recorder Refurbishment

The sensor frequencies were checked before opening the logger tube.

Channel 1 = DQ41079	32265 Hz
Channel 2 = DQ41083	32320 Hz
Channel 3 = DQ41097	32304 Hz
Channel 4 = 2T4	4692 Hz

All the channels were working correctly. The sensors were disconnected and the tube opened up at 2345 GMT. The scan count was 39777.

Last scan on the tape seen at 00:01:56 GMT, 10/1/92 Scan no. 39779

The tape had transported about half way. The bottom of the tube was removed and a new battery pack fitted.

Battery voltages:	old battery pack	new battery pack
Motor	17.54 volts	19.49 volts
Grn/Brn Wht/Brn	14.07 volts	14.56 volts
Wht/Grn Wht/Orn	14.07 volts	14.60 volts
Wht/Red Wht/Blu	14.09 volts	14.60 volts
Grn/Red Grn/Blk	14.28 volts	14.57 volts
Orn/Brn Orn/Blu	13.89 volts	14.62 volts

A new cassette tape was put on the logger and it was restarted at:

Tape start:- 01:00:00 GMT 10/1/92

First scan seen at: 01:15:00 GMT and tape seen to transport

The sensors were connected up again and the frequencies found to be:

Channel 1 DQ41079	32265 Hz
Channel 2 DQ41083	32320 Hz
Channel 3 DQ41097	32304 Hz
Channel 4 2T4	3790 Hz

The logger was sealed up again with silica gel tablets inside and replaced on the BPR frame. The ballast weight was a bad fit on the BPR frame and one point was cut off and another ground down to make the frame fit. The contact points on the ballast weight were covered with heavy duty pvc tape in order to isolate the aluminium frame from the steel ballast weight.

RESULTS OF ACOUSTIC WIRE TESTS

2483 bandwidth: 338-343 fired after 90 seconds on 340
318-323 fuse fired

227 NO RESPONSE ON RELEASE CHANNEL

2326 bandwidth: 414-421 fired after 160 seconds on 418
316-325 fuse fired

2476 bandwidth: 294-308 fired after 120 seconds on 301
315-327 fuse fired

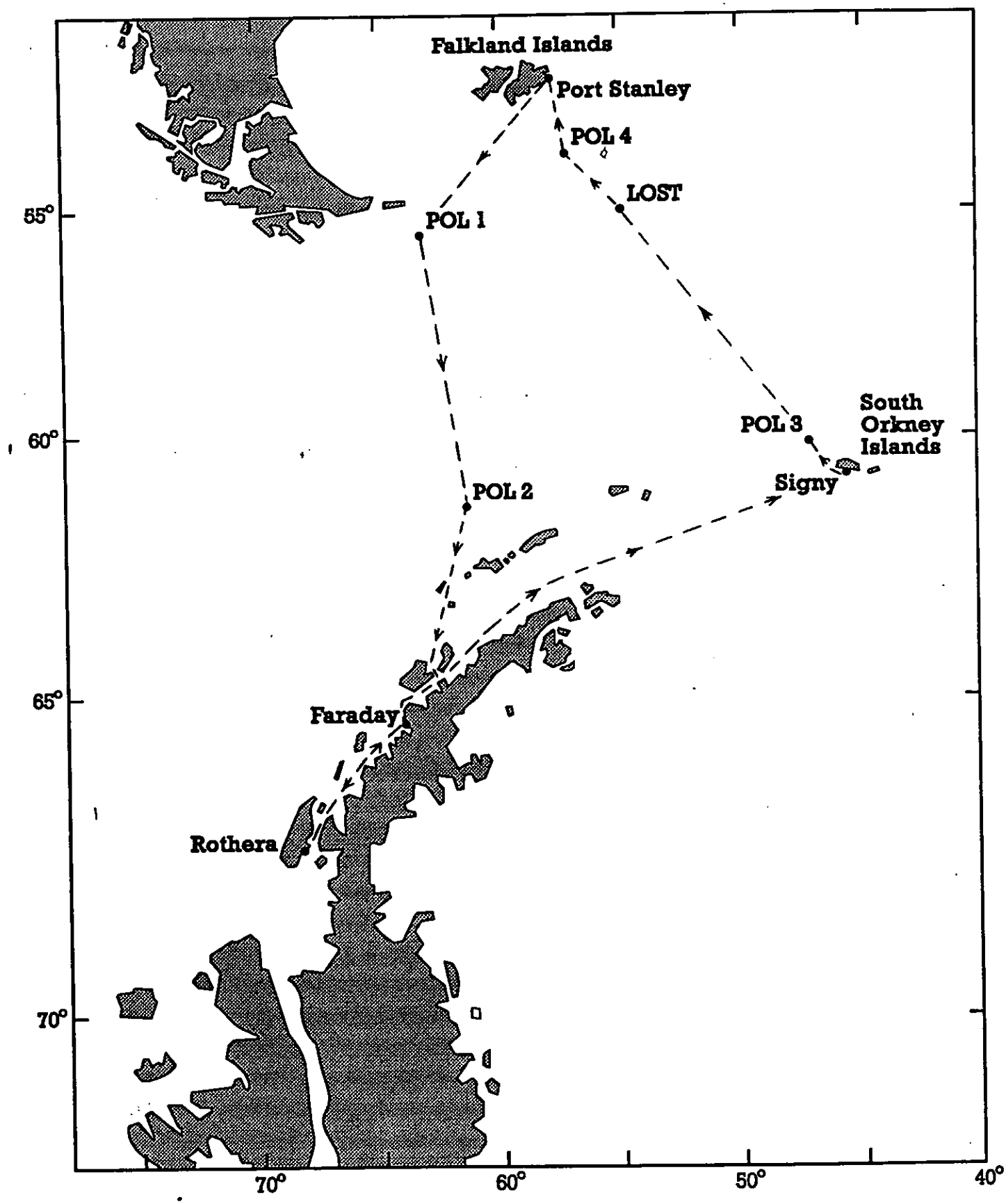
2163 bandwidth 318-325 fired after 60 seconds on 438
431-448 fuse fired

2479 NO RESPONSE ON BEACON CHANNEL

The acoustic tests revealed that 227 and 2479 were unserviceable and were rejected.

ILLUSTRATIONS

Figure 1: Cruise track BPR/IES deployments and SLR installations
Figure 2: Layout of SLR installation



BPR/IES/SLR Deployments 1991/92 Season

BLOCK DIAGRAM - REMOTE SLR INSTALLATION