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MAWSON GEOPHYSICAL OBSERVATORY, ANNUAL REPORT 1970

by

M.J.M. Robertson

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SUMMARY

Two three-component La Cour Magnetographs and a three-component Benioff seismograph are operated by BMR at Mawson. During 1970 a newly designed switchboard controlling the observatory power and timing from a digital clock was wired up; new Helmholtz coils were installed on the magnetograph, and a new magnetograph control panel was connected in the magnetic hut. Field observations of H, D, and Z were made in the Prince Charles Mountains during early 1971.

1. INTRODUCTION

Mawson Geophysical Observatory was established in 1955 with the installation of a three-component La Cour magnetograph. It has been enlarged subsequently until in 1970 there were two magnetographs (a normal and a sensitive), a three-component Benioff seismograph, and a visual magnetic recorder operated from an Elsec proton precession magnetometer.

The writer arrived at Mawson on the M.V. Nella Dan in early January 1970 after brief stops at Davis and the Amery Ice Shelf, where magnetic observations of H, D, and F were made. John Major, the 1969 geophysicist, completed the indoctrination and intercomparisons before leaving Mawson for the Prince Charles Mountains in February. The writer operated the observatory until the end of the year, when Josko Petkovic arrived to take over, and then spent about five weeks in the Prince Charles Mountains as a surveyor's assistant as well as making H, D, and Z magnetic observations; he returned to Australia in March 1971.

The construction of the observatory and the normal operation have been well documented in many of the previous reports (e.g. Oldham, 1957; Pinn, 1961; Cooke, 1967; Haigh, 1967).

This Record describes the geophysical work carried out by the Bureau of Mineral Resources (BMR) at Mawson during 1970. The work was part of the program of the Australian National Antarctic Research Expeditions, and was logistically supported by the Antarctic Division, Department of Supply.

2. CONTROL EQUIPMENT

The geophysics office contains the power and the timing equipment for the seismic and magnetic huts.

At the beginning of 1970 the standard 50-Hz 240-V power supply for drum motors was provided by amplifying the crystal-controlled low-voltage output from the Auroral Physics building. The time marks were generated from the BMR Observatory Timer Type TMU 1 activated by minute pulses from a Mercer chronometer. John Major had had no success with a prototype digital clock, the malfunctioning of which had prevented him from incorporating it in the system.

The new stores included a new production EMI digital clock, a switchboard for the office and the magnetic hut, and new magnetograph equipment. The switchboard, Type PPT 1, was designed in Canberra to act as a changeover between primary and secondary power and timing in the event of failures in any of the office components.

The first job then was to install the new clock and switchboard. This was done carefully in conjunction with operating the old system, so that record loss was kept to a minimum. The only loss was a few minutes during the actual shift of the power line from one system to the other. The EMI clock output dropped to 210 volts when all loads were on it, but this did not adversely affect the quality of the records. The voltage remained steady when the clock was switched to 24-volt operation.

When the EMI clock was first tested in the office it lost time drastically; this was ultimately attributed to use of the one standby battery to run both the clock and the TMU, the latter having a positive earth and the former a negative earth. The final system therefore employed 24 volts in two 12-V batteries to run the clock standby, and one 12-V battery separately operating the TMU and other 12-V components. Once connected thus there were no timing problems. The three batteries and an inverter were mounted on a sliding shelf, which could be rolled out from under the equipment rack whenever battery checking was required.

The new switchboard was bolted directly onto a modified version of the old one so that some of the components could be kept in use (for example, the ammeters to indicate the time-mark currents to both huts and the neon bulbs across the two output power lines). Also retained was the 12-V battery-charging circuit made from a diode bridge rectifier and 12-V a.c. transformer, to trickle-charge the extra battery. A new Boss 24-V battery charger was used to charge the clock batteries, and the current drawn from these was shown by mounting an old ammeter altered to read from 0 to 5A. When operating from the mains the clock also drew about 1A d.c. from the batteries and, in the event of mains failure, this value increased to about 3.5A; about 0.5 A seemed to be used by the thermostatically controlled crystal oven, which switched on and off at about 30-second intervals.

In order to prevent a growth of double-adaptors springing from the 500-watt Stabilac, a bank of four power points was built into the equipment rack to provide outlets to the two radio receivers and the EMI clock; because of its position, the inverter was plugged directly into the Stabilac output (see Plate 2).

The new system operated faultlessly from 19 March. The EMI clock was corrected nearly every day and the rate was adjusted occasionally. The TMU gained extra pulses whenever the accumulators were accidentally sparked and its indicator light bulb was replaced once. The standby Mercer chronometer was kept to within 10 seconds of Universal Time and a daily check was kept of its rate on a graph. Time signals from VNG or WWV were normally received on the Labtronics receiver, though with the rate of the clock approximately 30 ms/day and steady it was possible to estimate the correction for some time without having to correct the records, an asset during blizzards and radio blackouts. Occasionally the radio aerial connexion at the outside wall broke during blizzards, and later in the year a new aerial, joined to one of the main station aerials, was erected by the radio technicians to supplement the existing 12 MHz dipole. A new Smith's wall clock was connected through the switchboard to the EMI output and mounted where it could be seen from the desk. 'Geophysics Time' was much in demand from those in the camp with inferior timing equipment.

During a wet blizzard in December the power to the Geophysics Office went off when water entered the cable at some point, so for three days while repairs were being effected power was supplied through an extension cord from the clothing store. A new cable was laid above the road between the office and the vehicle workshop over the waste-heat pipe, and was attached to the side of the hut to avoid as much as possible being buried in the snow or damaged by traffic.

Plate 1 shows a block diagram of the new office system and Plate 2 shows a photograph of the completed rack.

Schematic and circuit diagrams for the new switchboard are shown in the handbook 'Antarctic Observatory Power & Timing PPT1, MC03'.

3. SEISMOLOGICAL OBSERVATORY

The Benioff three-component seismograph operated all year with no serious breakdowns. In April the recorder was serviced according to the instructions set out in the handbook; the focusing of the spots was improved slightly and the cracked long mirror in the N-S section was replaced. The new mirror was larger than the old one and was difficult to fit to the holder. Luminous identification numbers were affixed to the drums (Table 6). Later in the year a weight was suspended over the central drum shaft to eliminate chattering of the drums when that became sufficiently severe to affect the measurement of P arrivals.

Calibration

Weight lift tests to determine the free period and damping ratio of the seismometers were performed in June. The results of these tests (Table 7) indicated that there had been no change since John Major's calibration of the seismograph in 1969.

At the end of September two short-period Geotech galvanometers were installed, via impedance matching circuits, on the horizontal components, replacing two semi-long-period galvanometers. It had been decided that the infrequent S arrivals recorded by the latter were not sufficient reason for keeping them in use, whereas a three-component short-period system could be used to investigate local events (if any) and provide more information on the distant ones. The new system was operating by 1 October, but small adjustments of the seismometer damping resistance to give a damping ratio of 17:1 were not completed until a little later. Final ratios were 20, 17.8, 16.4:1 for the Z, N, E, respectively. For some reason the NS calibration pulse gave a small opposite deflection before the main pulse. This had not been evident on the long-period records, but it is assumed that because the calibrating system was not touched, the fault is inherent in it.

Plate 2 shows the disposition of the galvanometers and the recorder (the Z galvanometer is mounted in the recorder).

Improvements

Other tasks performed to improve the seismograph were the replacement, when they failed, of the 150-watt heating bulbs installed to prevent ice formation on the seismometer masses in the seismometer room; the rerouting, as for the office power line, of the seismic time and power line above the main road between the vehicle workshop and the geophysics hut; the setting in concrete of the same cable where the road to the rubbish-heap crosses it near the helipads. The rerouting of the cable became necessary when it was accidentally broken near the office. While it was disconnected the standby chronometer 21171 was used to provide minute marks in the seismic hut, and the recorder was driven by the station power. The new generators provide plenty of power at a steady frequency, so the records for those few hours were not badly affected; there was no record loss.

Recorder Lamps

A common fault in the seismograph was the sudden alteration in the brilliance of the recording lamps, causing the records to appear patchy. This was attributed to either deterioration of the potentiometers in the lamp circuits or a poor contact at the lamp base. Servisol applied to the potentiometers often solved the problem for a while and so new potentiometers were reordered, but there were occasions when poor contacts seemed a more plausible cause. These occurred in November when it was noticed that after replacing a blown bulb the fluctuations became worse, and that reseating the bulb steadied the brilliance.

Record loss

Record loss during 1970 was very slight. The largest total loss, i.e. loss on all three components simultaneously, was about three hours during the servicing of the recorder. A total of 35 hours caused by a blown bulb was the greatest single cause, i.e. on only one component, but this occurred only twice and never on the vertical seismogram, so the effective loss was nil. Other causes were open circuits in the attenuators (giving infinite attenuation), recorder adjustments, and obliteration of the record during high winds.

Data

Seismic bulletins were sent two or three times a week to Head Office and every fortnight to all Antarctic stations. On return to Australia a final analysis of the results was made and the results were punched on cards for ISC in Scotland. The final Bulletin contains about 1240 events. About 230 of these were not located by the U.S. ERL (formerly CGS) but were either confirmed by other stations or were in the opinion of the writer definite events. One hundred and twenty preliminary reported events were not included in the bulletin; the majority of these were small and occurred early in the year while the writer was not so seismically experienced; they were probably due to ice falls or artificial causes. Reports from other Antarctic stations were checked as they came in to confirm the larger events recorded at Mawson. As has been noted in early reports the sensitivity of the station was greatest during the period of maximum fast ice. The monthly distribution of events was as follows:

January	39 events	July	123 events
February	26 "	August	174 "
March	39 "	September	125 "
April	61 "	October	184 "
May	99 "	November	113 "
June	148 "	December	104 "

Sixteen out of 28 US nuclear tests, and two suspected nuclear tests from USSR, were recorded, as listed in Table 8.

4. MAGNETIC OBSERVATORY

Instruments

The magnetometers used at Mawson during 1970 were:

QHM 300	with preliminary correction	-7 gammas
QHM 301	" " "	-32 "
BMZ 62	" " "	22 "
DEC 332	" " "	-0.55'
PPM 340	no correction	

Magnetograph calibrator MC01A was used to determine scale values.

In January 1971, HTM 704 and DEC 333 were left at Mawson for intercomparisons. They were returned to Melbourne in March 1971.

The two three-component La Cour magnetographs (the normal and the sensitive) operated continuously with only six hours' simultaneous record loss. Absolute measurements for baseline control were made, and scale values determined, about seven times a month. QHM 300 was read on all occasions and QHM 301 and 174 were read about four times a month. A continuous monitor of the total field was maintained, using the PPM reading out onto a Hewlett-Packard Moseley 680 recorder via a digital-to-analogue converter. Baseline and scale value adoptions are shown in Tables 1 and 2. The adopted H baseline value is the weighted mean of the values determined with the three QHMs; the adopted D baseline value is determined directly from DEC 332 measurements, and the adopted Z baseline value is determined from PPM 340 measurements. The BMZ baseline value was used to check the PPM value.

Scale-value coils

In May the Helmholtz coils on both magnetographs were reconnected so that those on the H and Z variometers were in series, thereby reducing the time spent doing scale value measurements. The normal variometers are spread out over about 2 metres, so there was no interaction between the coils and the magnets of separate variometers. The sensitive magnetograph, having the variometers side by side, showed some interaction between H and D, but none between H and Z; confirmation of this came when the scale values remained constant after the rewiring.

On 3 August the Askania coils were taken off the normal and sensitive D variometers, the new BMR combined orientation and scale-value Helmholtz coils (Plates 3 and 5) were installed on the normal H and D variometers, and an original Andersson-Sorensen coil was fitted to the sensitive D variometer. This produced a 3-percent increase in both D scale values, which was anticipated in a telegram from Head Office received in July, explaining that the Askania coil constants were suspect.

All the normal variometers now had scale-value coils of approximately the same coil constant and so were joined in series. Because of the H and D interaction referred to above, there was no alteration in the arrangement of the sensitive scale-value coils. The new coils were not at this stage fixed in the orientation direction of 64°W as was the plan, because there was still a lot of magnetograph work to be done before orientation tests would be performed. The normal Z variometer had to be moved to the north about 5 cm so that the reserve traces and the temperature trace would not be blocked by the new coils on the H variometer. The thermometer in the H variometer had to be raised about 2 cm so that it could be read and this appeared to change the difference between the H and the Z thermometers from 0.9°C to 1.1°C, although no effect was noticed on the final thermograph baseline and scale-value adoptions. Apart from the 3-percent change in D scale values, no other scale-value changes were caused by the interchange of the coils.

Heaters

At the end of October the heater control failed to switch off, and the hut temperature was raised to about 28°C. The fault was in the 6-V micro-switch, but it was not properly corrected until a PMG relay was adjusted to suit the circuit cycling time and inserted in its place. During the repairs the thermostat circuit was rebuilt to the same plan and mounted in a different position. It is important with this type of circuit that the cycling time, i.e. the temperature change (essentially a voltage change) required to operate the relay, is minimum. After the final adjustment of the PMG relay a change of only 2 volts was required, and this gave a temperature range of less than two degrees Celsius.

New switchboard

Between 5 and 9 November the new switchboard MCO 3 (Plate 5) was wired into the sensitive magnetograph, while the normal magnetograph was kept operating from the old board. The new lampholders (Plate 4), slightly taller than the old ones, were installed, and all the prisms and some variometer mirrors had to be altered accordingly. By 10 November the record showed that the system was back to normal and work commenced on the changeover of the normal magnetograph; this took until 15 November. Part of the adjustments to the normal magnetograph included reversing the prism-lens in the D variometer to remove a spurious trace from the record - this altered the scale value by one percent. The old switchboard was taken out and extra equipment, not on the new MCO 3 panel, was transferred, viz.: two indicator lights, one for the heaters and one for the red lights, a heater temperature set knob, the Normal/Absolute switch and a 6-V terminal pair for aligning the lamps to vertical before placing them in a magnetograph. The relay-holding circuit designed for Haigh in 1965 to give even absolute time marks could not be easily included in the MCO 3 relays and was omitted. This means that the observer has to hold the foot-switch in the absolute hut for the required time. The 240-V a.c. for driving the drum motors, which previously was wired directly to the motors, was changed over, to pass through the MCO 3 panel. This allowed two indicator lights to burn, one red and one green.

The latter fogged the photographic paper while the record was being changed; therefore it was covered with tape and a new red one was reordered.

The only alteration to the circuitry of the MCO 3, as shown in the Antarctic Observatory Power and Timing Handbook, was to connect the clock contacts between the points A and C instead of A and D. This can be observed in Plate 6, which shows the wiring and the switching arrangement between the variometer hut and the absolute hut.

By 20 November both magnetographs were operating normally. Soon afterwards, however, the traces started to fade, which was first thought to be due to the variometer mirrors or recorder lens 'settling' but was soon discovered to be due to loss of charge of the 6-V battery. This was caused by the new system drawing about five times as much current as the old one. The extra drain had somehow lowered the battery charger output from 6½ to 5 volts, so extra turns were wound onto the transformer to restore the output.

A new cable was made to connect the MCO 3 with the calibrator MCO 1; connexions for the input from the MCO 1 to the female Cannon plug on the MCO 3 are as follows:

A	common	E	H 2
B	H 1	F	D 2
C	D 1	G	Z 2
D	Z 1		

where 1 refers to the sensitive coils and 2 the normal.

On 4 December the new wiring harnesses, made in the office, for the two magnetographs were installed. The colour code used is as follows:

Normal:	lamps	blue
	D SV	brown
	H SV	red
	Z SV	white
	common SV	black
	D orientation	green
	H "	violet
	common "	black

Sensitive: The same as above except the lamp wires are grey.

Orientation

The orientation reference line, 64°W, was established over the variometers by geometrically altering the 1969 62°W position marked on wooden slides on the walls of the hut. The value 64°W has been adopted as the orientation of the SV-O coils so that within the error limits of ±1 percent the scale values are not affected and the coils will not need to be realigned for ten years. (During this task the ANARE photographer took movie film of the variometer arrangements for a new film being made of the scientific work). Orientation tests were performed on 23 December. No tests were made on the Z variometers because extensive tests and regrinding of the magnets were done by John Major in the previous year (see Table 5).

The wiring in the variometer control room was altered so that the red light was directly over the switchboard, and the switches in the magnetograph room were changed so that only one operated both lights, as well as the indicator light on the switchboard; but the light over the sensitive recorder could be turned off if necessary. Identification numbers were affixed to both drums (Table 6).

Thermographs

On the normal magnetograph the two bimetallic strips were lengthened at different times during the year following instructions from Head Office. The final thermograph adoption uses the Z temperature trace, as it is the most sensitive, except on one occasion when it disappeared and the H temperature trace was used. The sensitive thermograph required no adjustments and the Z was the most accurate (Tables 3 and 4).

Temperature coefficient adoptions

Normal H. The 1969 adopted value was 7.5 gammas/°C. From 11 November 1970 onwards, after altering the bimetallic strip length, the value became -1.0 gammas/°C. This value gave good baseline values and indicated that the previous value should be altered. A value of 3.3 gammas/°C was theoretically calculated but the value 5.0 gammas/°C was finally adopted after perusal of the resultant baseline values.

Normal Z. No value was determined for the Z temperature coefficient during 1969 because of difficulties with the bimetallic strip, so the 1970 adopted value was that giving the best baseline values for both the PPM and the BMZ. This value was 5.0 gammas/°C until 3 August, when the length of the bimetallic strip was changed and a value of 2.0 gammas/°C was used from that date.

Sensitive. No analysis was made of the sensitive magnetograph temperature coefficients, but the 1969 values are available if needed.

Data

K-indices were scaled monthly and with preliminary baseline values, scale values, and monthly mean values were sent to Melbourne for distribution. Final mean hourly values will be published separately.

5. GENERAL MAINTENANCE

During the year the interior of the office and some items of furniture were painted; new linoleum was laid to replace torn and broken sections but there was not enough available to cover the entire floor; carpet sections were laid under the desk and near the equipment rack. The interiors of the absolute hut, control room, and cold porch of the variometer hut and the cold porch of the seismic hut were painted; the La Cour pendulum clock case was revarnished. A brace was constructed to support the interior face of the windward wall of the variometer hut when drift snow collecting between it and the outer face forced it against the sensitive magnetograph pier. The carpenter suggested that the whole wall be taken down one summer and rebuilt, but this would be difficult, dangerous to the instruments, and inconvenient.

Bitumen silver paint was used on the exterior of the geophysics hut, but the supply ran out before the other huts could be started. The fuel piping to the Coleman heater was replaced to improve its appearance and to stop a leak at one of the joins. The heater itself operated well all the year. A rack was built on the floor joints projecting from the end of the hut for storing boxes etc. but snowdrifts form over it in winter, so items required during the winter should be kept elsewhere. Owing to the close proximity of the clothing store the writer was designated to take charge of it, a task not unenjoyable once it was understood. As the Store is unheated the most taxing time was doing the stocktake and reordering in midwinter.

The writer did two weeks 'slushie' duty and numerous nightwatches as well as helping in the general camp duties, particularly on Saturday afternoons. A ten-day dog trip in mid July to Taylor glacier and Cape Bruce, and occasional day trips to nearby points of interest, helped break the routine of the year.

6. FIELD WORK

Field observations (H, D, and F) were taken at Davis station in January, using the QHM at the base and the PPM for comparisons at Mawson, and a further set of PPM readings only were taken on the Amery Ice Shelf a few days later as there was no tripod available for H and D readings.

During the summer months of January and February 1971 the writer spent five weeks in the Prince Charles Mountains assisting the surveyor and at the same time, using QHM 492 and BMZ 121, taking magnetic observations. Readings were taken at Moore Pyramid, where a semi-permanent station was marked with a cairn, Fisher Massif, Mount Stinear, and Mount Woinarski. While on Fisher Massif the writer and the surveyor filmed sequences of their work for the new 16-mm ANARE film on the Prince Charles Mountains operations. On Mount Forecast the writer was hit on the head by a helicopter rotor blade and forthwith returned to Mawson; this curtailed any further field observations. There were no other chances to take measurements as the trip back to Melbourne was direct. The field results will be used to help update the isomagnetic charts of Antarctica.

Intercomparisons: both field instruments were compared at Mawson before and after the survey. QHM 300 and PPM 340 were used as the standard instruments, and these in turn were compared with Melbourne observatory instruments in January 1970 and 1971, along with declinometer 332.

7. ACKNOWLEDGEMENTS

The writer wishes to thank all members of the 1970 expedition and the 1970-71 Prince Charles Mountains expedition for their assistance. In particular, special thanks go to:

Cosmic ray physicist Dave Parer who scaled and stamped the records while the writer was on his dog trip;

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Carpenter Bob Nicholson for his repairs to the huts;

Surveyor Norm Edwards for his help in determining azimuths for declination observations while in the Prince Charles Mountains.

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TABLE 1

NORMAL BASELINE VALUES

(Only preliminary instrument corrections have been applied)

Date	Time (Z)	From	To	Reason	
H BASELINES:	(Standard deviation ± 3.3 gammas)				
1. 1.70	0000		17193		
17. 5.70	0000	17193	17189	Unknown	
1. 9.70	0000	17189	17193	Unknown	
21.10.70	0000	17193	17181	Excessive Heat	
11.11.70	0740	17181	uncertain	System alterations	
12.11.70	0915	uncertain	17560	" "	
29.11.70	0300	17560	17584	Clock moved	
30.11.70	1300	17584	17565	Clock replaced	
8.12.70	1500	17565	17547	Adjustment	
22.12.70	1500	17547	17438	Filming of magnetograph	
D BASELINES:	(S.D. ± 0.33 min.)				
1. 1.70	0000		60° 28.2'		
5.11.70	1200	60° 28.2'	60° 26.3'	Unknown	
11.11.70	0740	60° 26.3'	60° 25.9'	System alterations	
14.11.70	0535	60° 25.9'	60° 32.0'	" "	
23.11.70	1351	60° 32.0'	60° 31.1'	Clock moved	
24.11.70	1243	60° 31.1'	60° 30.4'	" "	
29.11.70	0830	60° 30.4'	60° 28.0'	" "	
30.11.70	1300	60° 28.0'	60° 32.7'	" "	
Z BASELINES:	(S.D.: BMZ ± 3.2 gammas; PPM ± 4.0 gammas)				
1. 1.70	0000		47352		
31. 1.70	0000	47352	47347	Unknown	
17. 5.70	0000	47347	47342	Unknown	
3. 8.70	1100	47342	47274	New coils	
5. 8.70	0800	47274	47080	Change bimetal strip	
20. 8.70	0000	47080	47082	Adopt base change	Drift after bimetallic strip alteration
26. 8.70	0000	47082	47085	" " "	
15. 9.70	0000	47085	47089	" " "	
20. 9.70	0000	47089	47092	" " "	
13.11.70	0755	47092	uncertain	Install MC03	
16.11.70	0540	uncertain	47129	" "	
24.11.70	1243	47129	47188	move clock	
29.11.70	0830	47188	47119	" "	

TABLE 2

SCALE VALUES 1970

Var.	H gammas/mm	D min/mm	Z gammas/mm
Normal	21.2 ± 0.06	2.44 ± 0.005	22.4 ± 0.05
after 0740 11.11.70		2.42 ± 0.005	
Sensitive	9.56 ± 0.06	0.87 ± 0.005	10.3 ± 0.05

TABLE 3

NORMAL THERMOGRAPH 1970

From		To		St	b_t	Temperature trace to be used
d	h	d	h	°C/mm	°C	
Jan 1	0000	Aug 3	0735	2.9	-146.6	Z
Aug 3	1100	Aug 5	0725	1.7	- 86.2	Z
Aug 5	0845	Nov 11	0745	1.7	-100.8	Z
Nov 11	1100	Nov 16	0600	2.5	- 34.4	H
Nov 16	0745	Dec 31	2400	1.7	- 97.2	Z

TABLE 4

SENSITIVE THERMOGRAPH 1970

From		To		St	b_t	Temperature trace
d	h	d	h	°C/mm	°C	
Jan 1	0000	Mar 14	0300	1.09	- 20.7	Z
Mar 14	0300	Mar 20	0300	1.09	- 19.6	Z
Mar 20	0300	Mar 31	0300	1.09	- 11.6	H
Mar 31	0300	Nov 6	0900	1.09	- 37.6	Z
Nov 6	1130	Nov 8	0730	1.09	- 71.9	Z
Nov 8	0900	Nov 9	0940	1.09	- 56.4	Z
					- 14.3	H
Nov 9	1130	Dec 31	2400	1.09	- 47.7	Z

TABLE 5

ORIENTATION TESTS 23.12.70

VARIOMETER	MAGNET N POLE	1969
NORMAL H	E 1.5° S	E 0.7° S
NORMAL D	N 1.0° W	N 0.8° W
SENSITIVE H	E 0.02° S	E 0.7° S
SENSITIVE D	N 0.7° W	N 0.1° W

Annual mean meridian = 298°T (-62°T)

Assumed annual mean H value = 18358 gammas

TABLE 6

SEISMIC AND MAGNETIC DRUM IDENTIFICATION NUMBERS

No.	DRUM	
1	SENSITIVE	MAGNETOGRAM
2	NORMAL	"
3	VERTICAL	SEISMOGRAM
4	N - S	"
5	E - W	"

The number is seen in the top right hand corner of the record.

TABLE 7

SEISMOGRAPH DAMPING RATIOS AND FREE PERIODS, 1970

Component	Z	N-S	E-W
Free period	0.87 sec	-	-
ratio	20:1	17.8:1	16.4:1

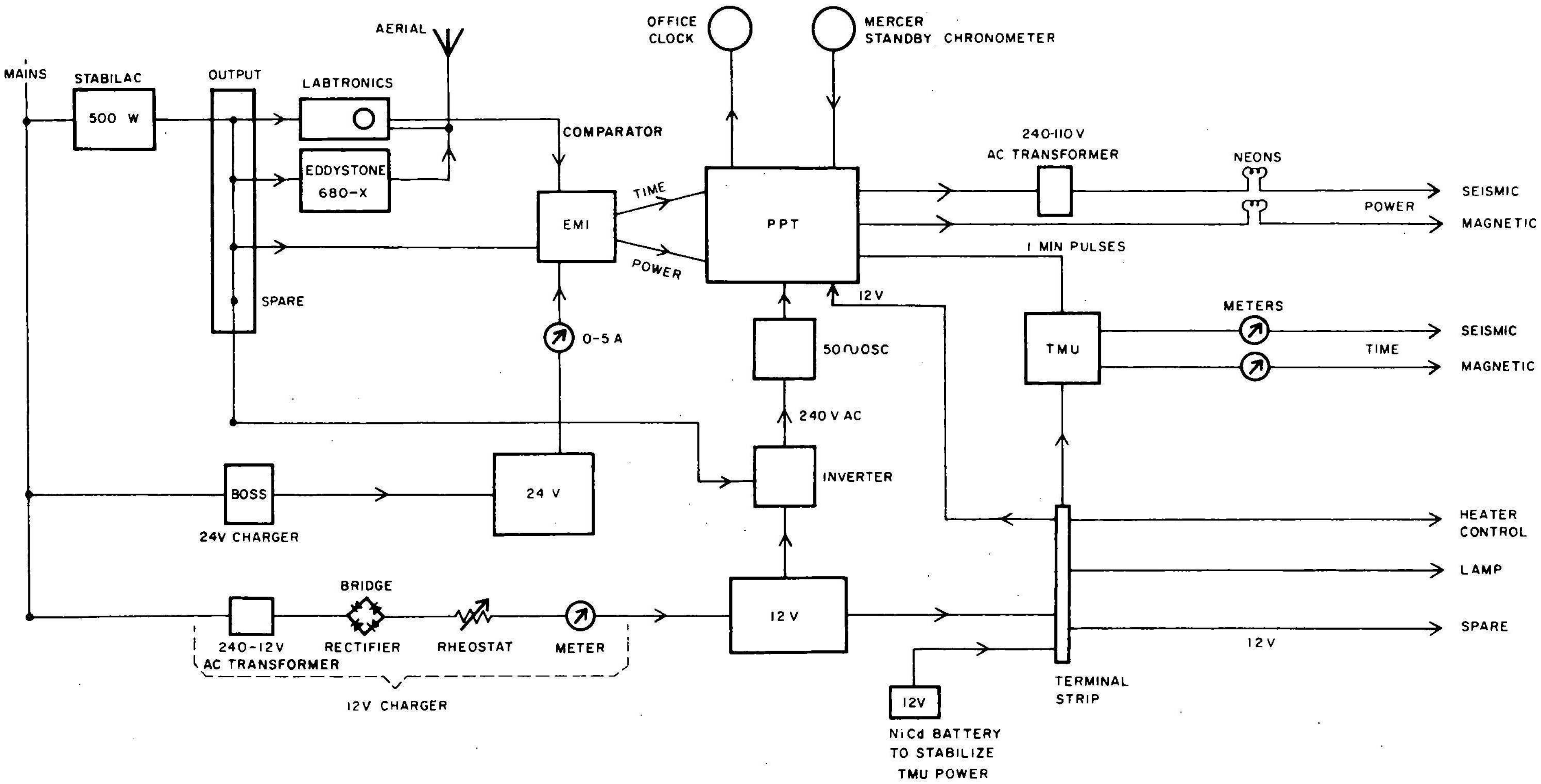
TABLE 8

NUCLEAR TESTS RECORDED AT MAWSON, 1970

Date 1970	PKP arrival time h	m	s	Origin time h	m	s	Place of origin	NOS Magnitude
Feb 04	17	19	50.3	17	00	00.0	Southern Nevada Test Site	5.6
Feb 26	15	49	50.8	15	30	00.0	" " " "	5.3
Mar 23	23	24	50.5	23	05	00.0	" " " "	4.2
Mar 26	19	19	50.5	19	00	00.2	" " " "	6.2
May 01	14	34	40.6	14	13	00.0	" " " "	4.2
May 05	15	49	50.6	15	30	00.2	" " " "	5.2
May 15	13	49	50.6	13	30	00.0	" " " "	5.3
May 21	14	34	51 E	14	15	00.0	" " " "	5.1
May 26	14	35	51 E	14	16	00.2	" " " "	5.0
May 26	15	19	46.5	15	00	00.0	" " " "	5.6
Jun 26	13	19	50.8	13	00	00.0	" " " "	4.3
Oct 12	06	19	20 E	05	59	57.1	Novaya Zemlya	6.7
Oct 14	14	49	45.9	14	30	00.0	Southern Nevada Test Site	5.5
Nov 05	15	19	50 E	15	00	00.0	" " " "	4.9
Dec 12	07	19	33 E	07	00	57.3	Western Kazakh SSR	6.1
Dec 16	16	19	50 E	16	00	00.1	Southern Nevada Test Site	5.1
Dec 17	16	24	45 E	16	05	00.2	" " " "	5.7
Dec 18	15	49	50 E	15	30	00.2	" " " "	5.2

To accompany Record No. 1972/44

OFFICE EQUIPMENT LAYOUT (MAWSON 1970)



G82/3-151A

PLATE 1

PLATE 2

COMPLETED EQUIPMENT RACK

COMPONENTS

PPT SWITCHBOARD

DIGITAL CLOCK

MERCER CHRONOMETER

LABTRONICS TIME SIGNAL RECEIVER

EDDYSTONE RECEIVER

STABILAC OUTLETS

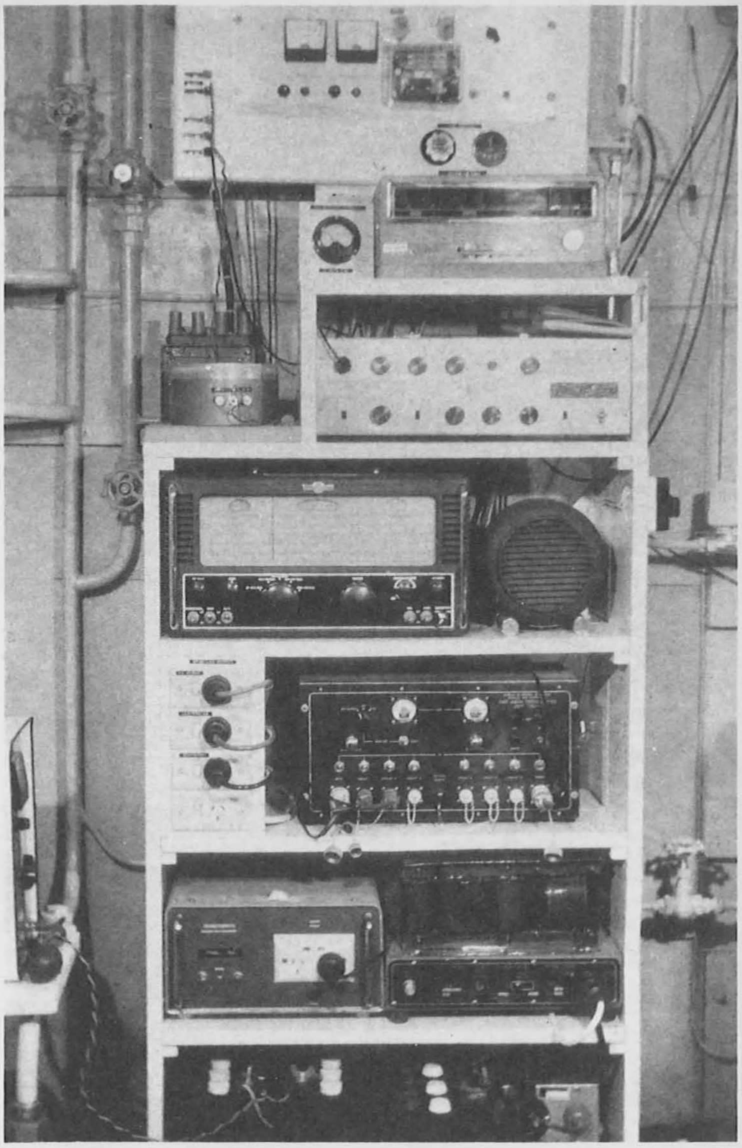
TMU I

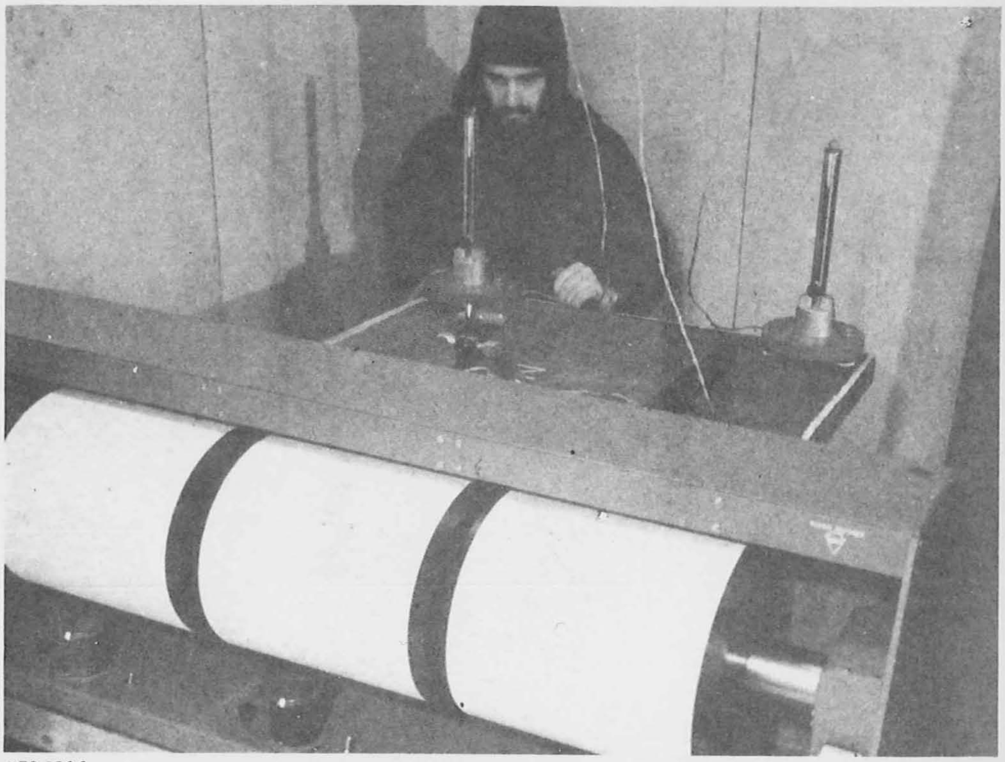
TRANSTRONICS 50 Hz OSC

STABILAC

BATTERIES

AWA INVERTER





NEG 350C

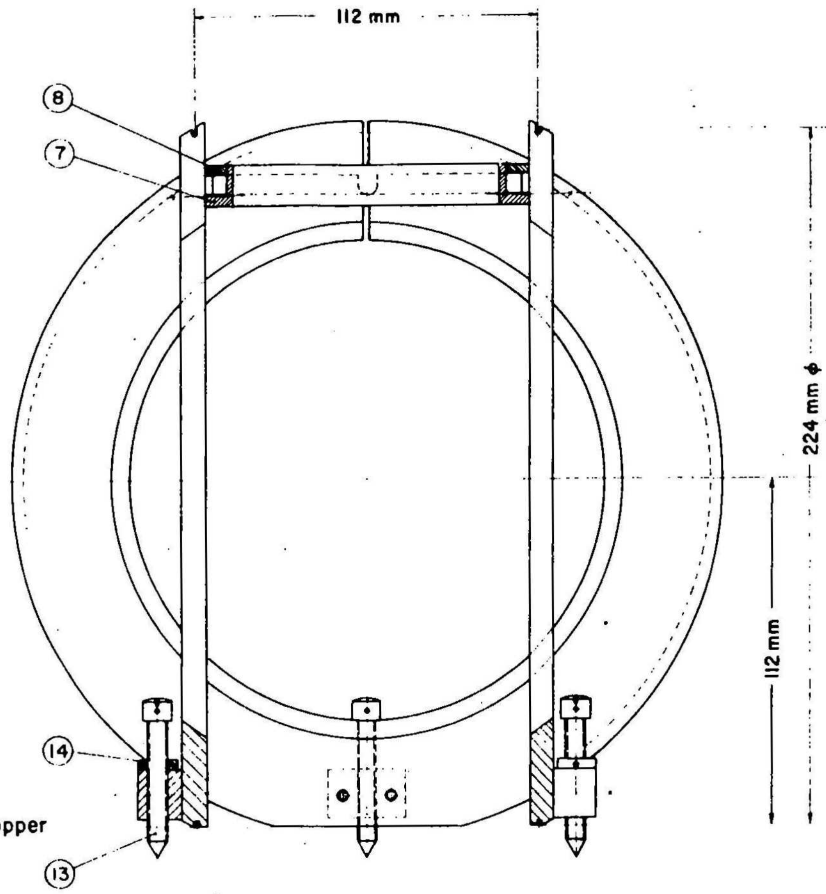
SEISMIC RECORDER

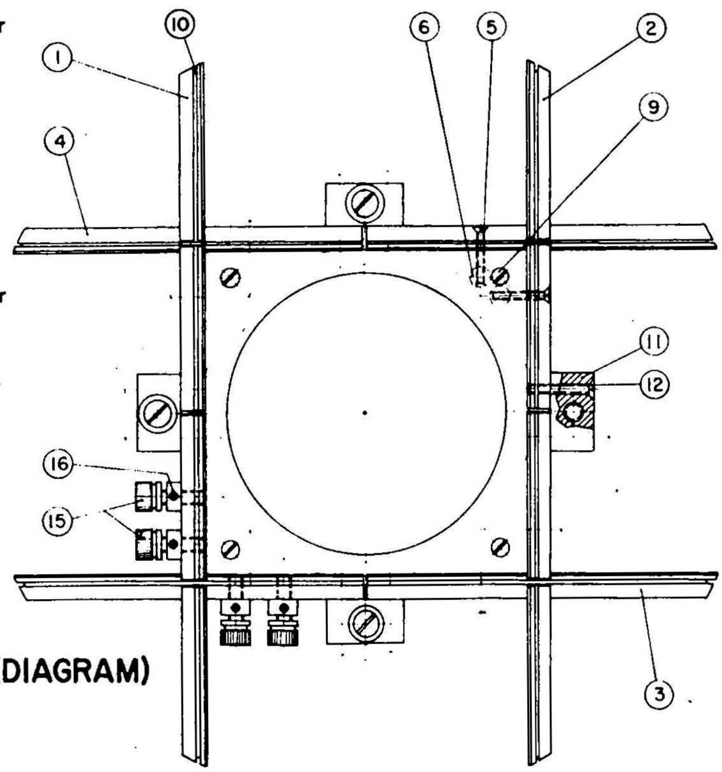
To accompany Record No. 1972/44

ANT/B9-25A

DETAILS

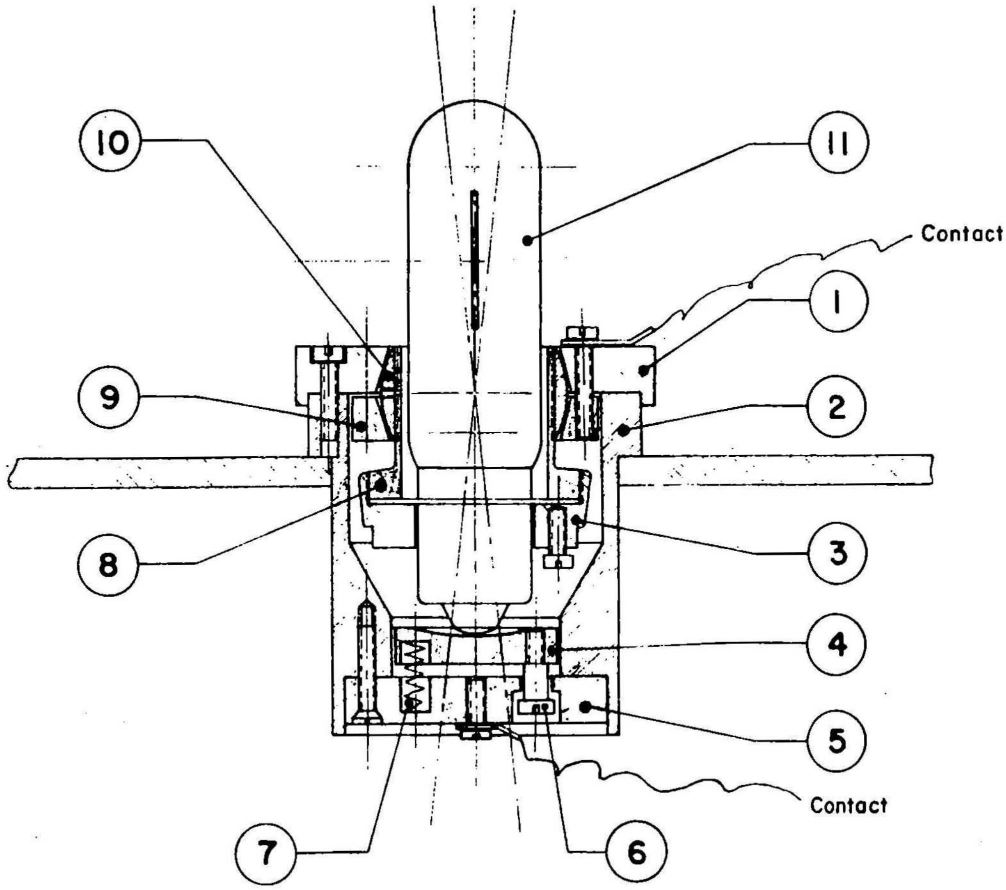
1. Coil ring, canvas bakelite
2. Coil ring, canvas bakelite
3. Coil ring, canvas bakelite
4. Coil ring, canvas bakelite
5. Countersunk screw
   4 B.A. x 3/4" long, nickel silver
6. Bush piece, brass
7. Square block, canvas bakelite
8. Cover plate, canvas bakelite
9. Countersunk screw,
   4 B.A. x 1/2" long, nickel silver
10. Wire 21 S.W.G. x 140" long, copper
11. Block, aluminium
12. Countersunk screw
    4 B.A. x 7/8" long, nickel silver
13. Leg, nickel silver
14. Nut, nickel silver
15. Terminal, nickel silver
16. Grub screw,
    6 B.A. x 3/16" long, nickel silver





HELMHOLTZ COILS (DIAGRAM)

PLATE 4

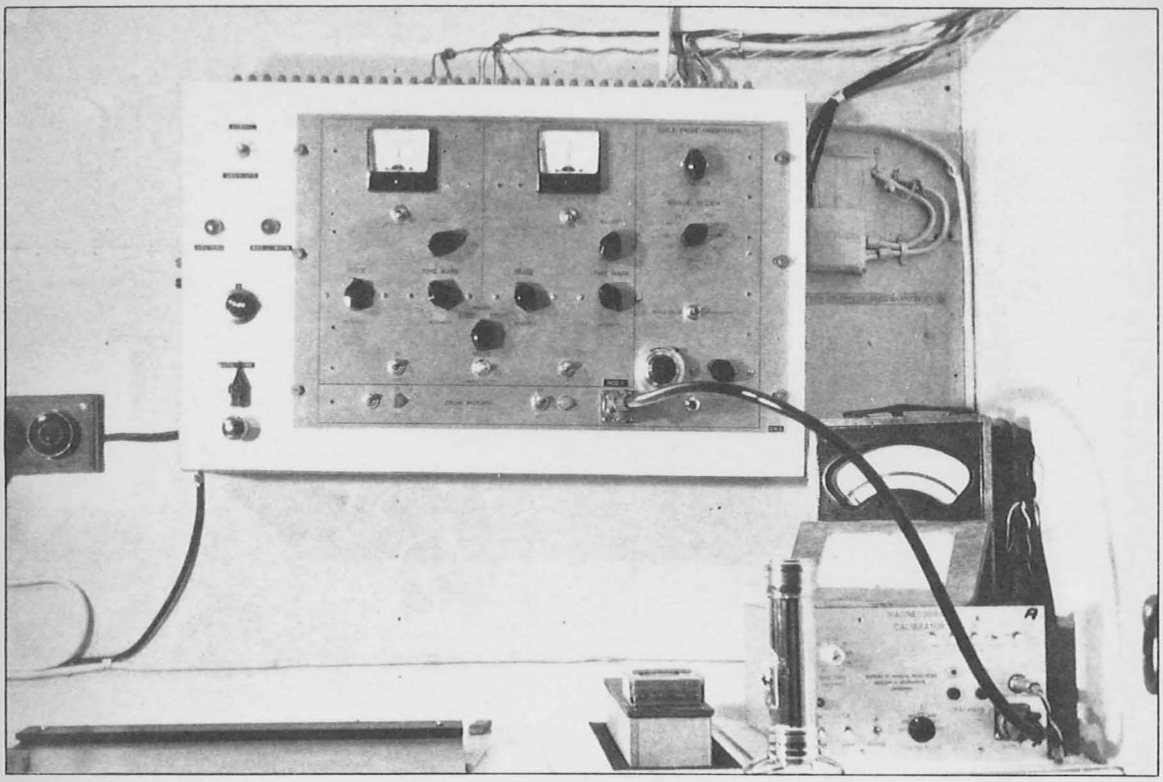


DETAILS

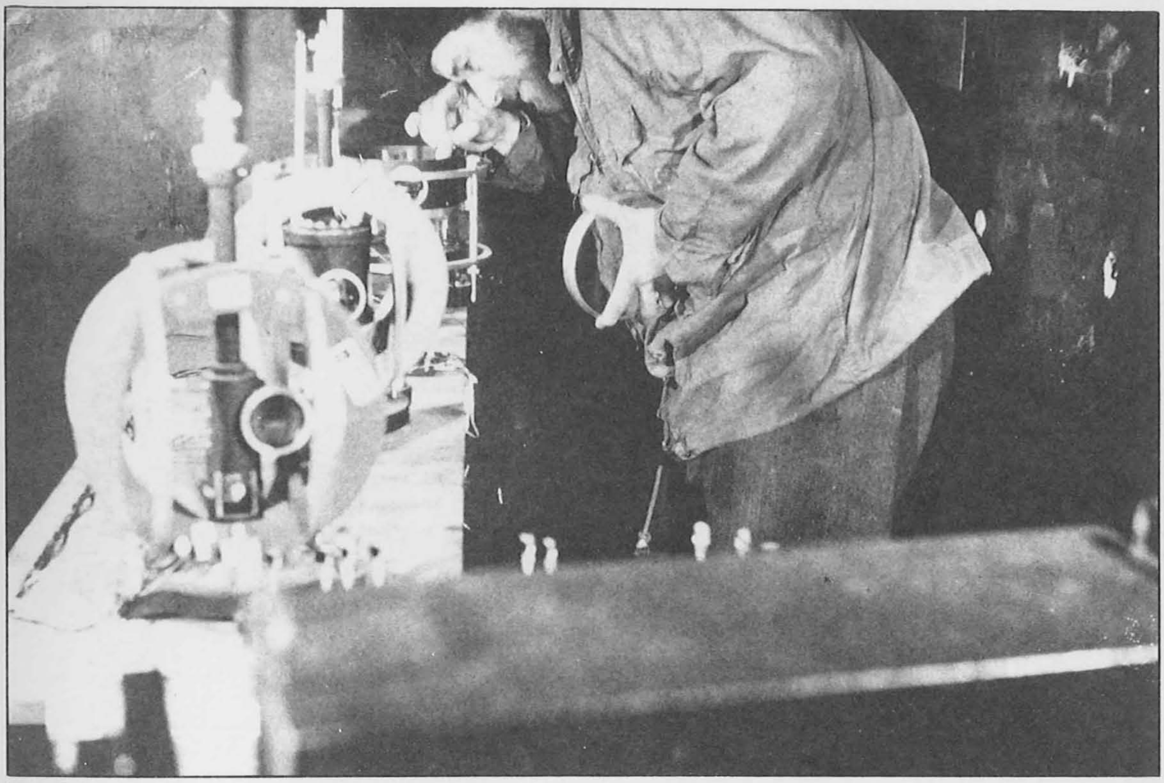
1. Cover, ebonite
2. Base holder, ebonite
3. Base ring, brass, silver plated
4. Contact plate, brass, silver plated
5. Bottom plate, brass, silver plated
6. Neck screw, brass
7. Spring, bronze
8. Lamp bush, brass, silver plated
9. Clamp ring, brass, silver plated
10. Ball, bronze, silver plated
11. Lamp, Philips, 6V. 0·8A. 3873C/23

NON-MAGNETIC LAMPHOLDERS

BASED ON M34, PAGE 1. *To accompany Record No. 1972/44* G82/3-153 A



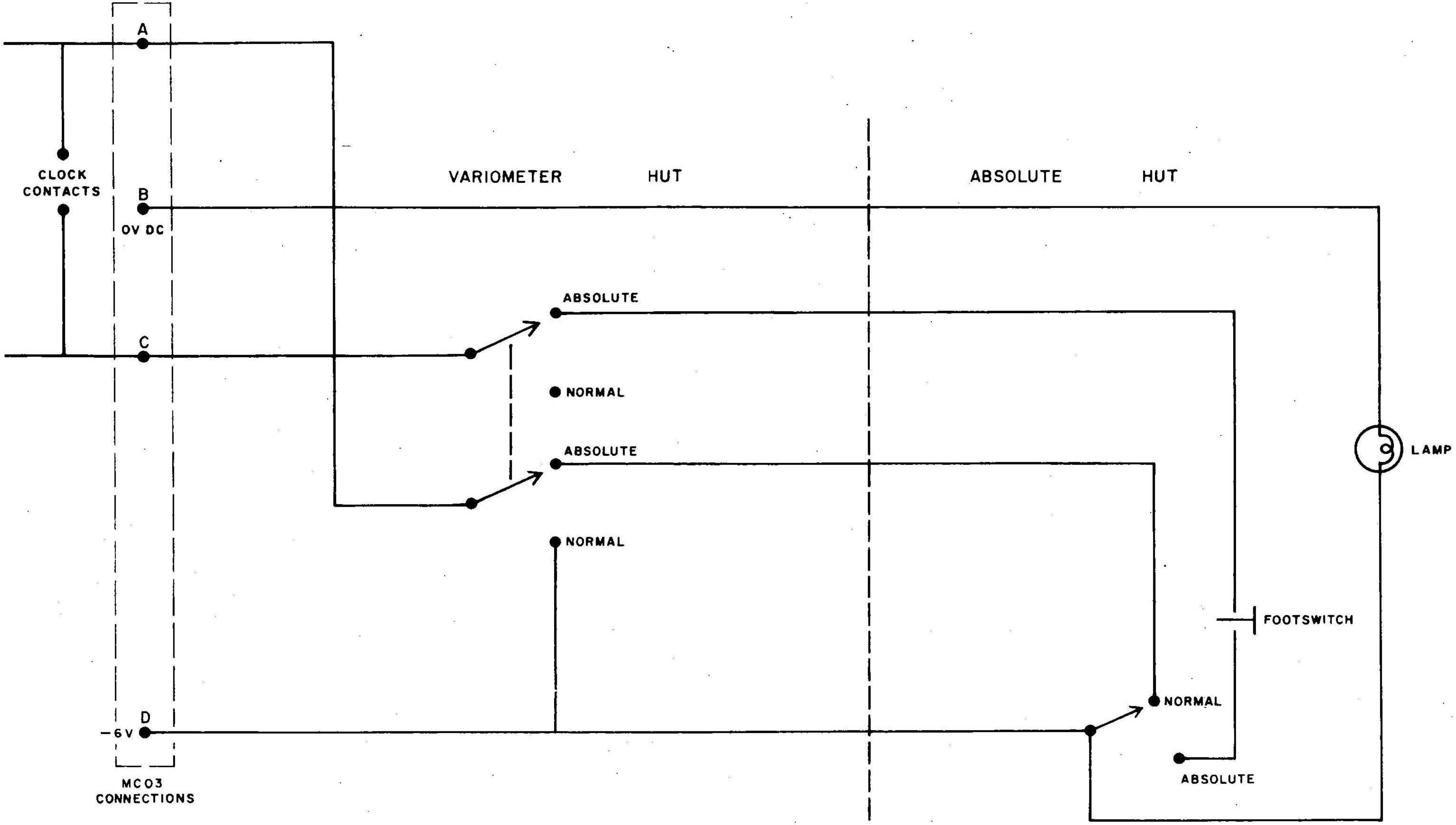
MCO3 Switchboard



NEG 350C

Normal magnetograph showing new coils

To accompany Record No. 1972/44



G82/3-150A

VARIOMETER—ABSOLUTE HUT WIRING DIAGRAM—MAWSON 1970

PLATE 6