COMMONWEALTH OF AUSTRALIA

DEPARTMENT OF NATIONAL DEVELOPMENT

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

Record No. 1971/10

Mawson Geophysical Observatory, Annual Report, 1968

by

R. S. Smith

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ILLUSTRATIONS

SUMMARY

The author was resident geophysicist at Mawson responsible for the operation of magnetic and seismic observatories from February 1968 until January 1969. During this time continuous recording and control observations were maintained according to standard procedures.

An automatic magnetograph calibrator was installed and orientation tests were carried out on all recording magnets. The insensitive magnetograph was converted to normal sensitivity and the magnetograph previously referred to as 'normal' was renamed 'sensitive'.

Cables were laid from the office to the two recording huts, synchronous motor drives were fitted to the magnetograph recorders, and the power distribution system was reorganized with emphasis on the provision of standby supplies.

All time-marks are now provided by a time-mark programming unit, and radio time-marks can be recorded on the seismograms.

Field observations were carried out in January 1968 en route to Mawson in the vicinity of the Amery Ice Shelf, but none were possible on the return voyage.

1. INTRODUCTION

The geophysical observatory at Mawson, Antarctica, was opened in 1955, with the installation of a three-component normal-run La Cour magnetograph (Oldham, 1957). A Leet-Blumberg seismograph was installed in 1956 and replaced by a Benioff system in 1960 (Merrick, 1961). A bar fluxmeter was added in 1957 (Pinn, 1961) and withdrawn in 1967 (Dent, 1971). An insensitive La Cour magnetograph was installed in 1960 (Merrick, 1961). Thus during the author's term of duty from February 1968 to January 1969 the instruments in operation were the two magnetographs and the Benioff seismograph.

This Record outlines the main activities during this period. The work was part of the Australian National Antarctic Research Expeditions (ANARE) programme; the Antarctic Division, Department of Supply provided logistic support and accommodation while the Bureau of Mineral Resources, Geology & Geophysics (BMR) provided the observer and equipment.

2. MAGNETIC OBSERVATORY

Since 1960 two normal-run (15mm/hr) magnetographs have been in operation, one (the "normal", with scale values about 10 gammas/mm) for derivation of mean hourly values and other data, and the second (the "insensitive" with H and Z scale values about 50 gammas/mm) for complete recording during highly disturbed intervals. However, neither was ideal and it was decided to improve the situation by reducing the H and Z scale values of the "insensitive" instrument. The converted magnetograph was intended to be used as the "normal" instrument when it was fully controlled, and the original "normal" to be operated as a "sensitive" instrument.

The conversion was carried out between September and November but full control was not achieved until later. All data for 1968 have been derived from the original "normal" magnetograph. Preliminary monthly mean values for the observed elements H, D and Z and the derived element F are given in Table 1.

An automatic magnetograph calibrator, BMR type MCO-1, was installed in February. This considerably eased the labour involved in scale value measurement and improved the accuracy of current settings. The meter previously in use was retained as a monitor and found to be reading 0.86% low compared with MCO-1. However in March 1969 the MCO-1 was returned to Canberra and re-calibrated, revealing that it was giving currents 0.86% low on all ranges, i.e. the meter readings were correct and measurements taken on it in the past were correct. All scale-values measured during 1968 were corrected by -0.86%. Table 2 shows the scale values of the different systems.

<u>Normal magnetograph</u>

<u>Adjustments</u>. Several minor adjustments were made in order to improve the quality of traces. A summary of the adjustments is included in Table 3. In June adjustments were made to the recorder lens and the D and H reserve prisms to prevent the D1 reserve trace interfering with the main H trace. Considerable difficulty was found in trying to achieve good quality recording of all elements throughout the wide range of values recorded at Mawson.

In July the normal recorder slit was knocked repeatedly by an expeditioner who fitted the lid reversed while being trained for duties as a relief operator. It was found that with the slit level, the D and Z spots were prevented from reaching the paper; this caused several days' record loss. It is apparent that the recorder lenses have been adjusted with the slit elevated at one end. This caused the traces to fade when the spots approached the extremities of their recording space and reserve traces were superimposed on adjacent elements. The slit was left out of level and major adjustments were deferred until the new normal variometer was operating satisfactorily.

On 31 December and during early January adjustments were made on the D and H traces to make all magnitude increases record as ordinate increases. Adjustments to the Z variometer, although desirable, were deferred because it was believed that the magnet would have to be reground in the near future to restore it to a level position.

<u>H variometer base change</u>. On 22 November the H variometer was bumped causing a large change in H ordinate but only a small one in H temperature ordinate. The variometer functioned satisfactorily for the following month, but it was found that the thermograph scale value had changed from 1.05°C/mm to 1.23°C/mm. This suggested that the strip mounting had loosened and allowed the prism to fall fractionally, which may have been the reason for instability noticed in the H thermograph in previous years and reported by Haigh (1967). On 2 January 1969, the variometer was opened and the strip support was tightened prior to other adjustments to the variometer. From the change in thermograph scale value noted above, and increase in variometer temperature co-efficient of +1.3 gammas/°C would be expected. Using the baseline value data, the co-efficient before November was found to be less than 0.5 gammas/°C (and zero was adopted).

After November a value of approximately 1.8 gammas/^{o}C was observed (and +1.5 gammas/^{o}C was adopted); this may have been altered by the adjustments on 2 January.

Parallax correction. The time-mark parallax correction was measured by turning off all lamps between the 59 and 01 minute marks at 10 hours on 24 June and again at 05 hours on 22 November. The corrections in minutes which must be applied to the time of an event as scaled from various time-mark lines were measured as follows:

Element	Time trace	24 June	22 November
H	Base	+1.0	+1.5
	Magnet	+0.3	+0.4
D	Base	-0.5	-0.2
	Magnet	-1.0	+0.7
Z	Temp	0.0	-0.5

Orientation. For the purpose of checking the orientation of all recording magnets a meridian of 61^{o} 47'W was adopted and indicated on the east-west walls of the hut by marks AA'. The standard reference taken was the marks PP' given by McGregor in literature at Mawson as bearing 57^{o} 49'W.

(a) H variometer. An optical radius of 187.0 cm was adopted and all readings were corrected to give the orientation at the mean ordinate for the month. Observations were made on 20 July 24, 27 and 28 August; 29 December (prior to adjustment), and 9 January (after adjustment). The last two sets in August were performed under the least active conditions, and Table 4 includes the results of these observations.

(b) D variometer. An optical radius of 197.0 cm was adopted and all readings were corrected to the monthly mean meridian. Observations were made on 29, 30 and 31 December and 9 January (following adjustments); Table 4 gives the result of those made under the most favourable conditions.

(c) Z variometer. A platform was constructed to allow the mounting of a BMZ supplementary magnet on a BMZ tripod; screw legs permitted fine adjustment for height and level. This equipment was set up 68.5 cm from the Z variometer magnet on the east prime vertical and on the same level. BMZ supplementary magnet

121:3 was used for these tests. Its moment was determined by using the same equipment set up 100 cm north of the H variometer; it was 874 c.g.s. units. Orientation tests were made on 22 and 23 November, giving the result shown in Table 4.

It will be noticed that the H magnet was shown to be south of its correct orientation, which would be expected as the declination is increasing westerly by about 1° every 4 years. Although the magnet was left in this condition, it should not require reorienting until about 1974. The D magnet was found to be oriented in advance of the change in declination and left in this sense after adjustment, so it should not require attention for some 10 years if undisturbed. Since 1955 when the Z variometer was installed, the vertical field has decreased in strength by approximately 1000 gammas, which would cause the magnet to be out of level some 1.5 degrees in the sense observed, so the result measured is as expected. The magnet requires levelling as soon as practicable.

Insensitive magnetograph

Parallax correction. The time-mark parallax error was measured by turning off all lamps between the 59 and 01 minute marks at 10 hours on 24 June. The corrections in minutes which must be applied to the time of an event as scaled from various time-mark lines were measured as follows:

Element	Time Trace	Correction, 24 June
H	Base (upper)	+1.5
	Magnet	+0.2
	Base (lower)	-1.0
D	Base	+0.5 (approx.)
Z	Base	+1.0
	Magnet	+0.8

Orientation. The orientation of all recording magnets was determined prior to conversion to medium sensitivity.

(a) H variometer. An optical radius of 121.0 cm was adopted, and all readings were corrected to give the orientation at the mean ordinate for the month. The azimuth of a prime-vertical line, given by the position of two movable sliders on the walls of the huts, was recorded at the hut by a previous observer, so this was used for a series of measurements during late July. These measurements gave an ex-orientation angle of some 3°, so the azimuth of this prime vertical was checked against the adopted reference line by triangulation within the hut and found to be in error by 3.6°. A final measurement on 28 August gave the result 0.3°N and S of EPV (Table 4).

(b) D variometer. An optical radius of 78.0 was adopted and all readings were corrected to give the orientation at the mean ordinate for the month. The first measurement was performed under disturbed conditions on 1 September, so another was made on 7 September under magnetically quiet conditions; the result of this is given in Table 4.

(c) Z variometer. The platform described above was set up 56.0 cm south of the Z variometer magnet in the adopted meridian. A measurement using BMZ supplementary magnet 121:3 was made on 1 September, and another on 7 September, this time using magnet 62:4. The moment of 62:4 calculated from published data was 690 c.g.s. The second test result differed significantly from the first, but it was found that the deflecting magnet was positioned approximately 0.5 cm high, so the reference level was high by 0.5°. Allowing for this the two results were in close agreement; the adopted value is included in Table 4.

As with the normal variometers, the ex-orientation observed for the H and Z insensitive variometers is as would be expected from the change of the magnetic field in recent years.

Conversion of insensitive variometers

The object was to increase the sensitivities of the H and Z variometers to give scale values near 20 gammas/mm; the D scale value of about 2.5 minutes/mm (13 gammas/mm) was considered satisfactory. This would ease the scaling of mean values without significantly decreasing their accuracy. A new H fibre and Z magnet were provided to accomplish this objective. Recording under the original systems ceased on 8 September.

Z variometer. The upper and lower chambers were welded together by dried grease and a puller had to be used to separate them. The replacement magnet (ex Wilkes), moment 92 c.g.s., was fitted N pole north on the existing supports (the one supplied with the magnet was returned to Canberra).

The thermal strip length was approximately doubled but the compensator was not adjusted to record the temperature trace. A mask was fitted to the base mirror, which had been glued to the front of its support, below the normal level (Merrick, 1961).

Orientation tests are described below.

H variometer. The fibre was replaced by No. 1308, which had a torsion constant T = 16.8 (CGS.29). The torsion head was adjusted to give the correct orientation, then adjustments to the variometer prisms were made to position the traces. The temperature compensating strip was approximately doubled in length but was still too short, having a sinsitivity of 5.0°C/mm. The conversion was completed during October and final optical adjustments were made during November.

D variometer. As the sensitivity was already satisfactory for this variometer, it was left unchanged. However, during November the variometer was rotated and the prism adjusted to reposition the baseline above the magnet trace so that ordinate increases downwards correspond to magnitude increases westerly.

Parallax. The time-mark parallax correction was measured at 05 hours on 22 November. The corrections in minutes which must be applied to the time of an event as scaled from various time-mark lines were measured as follows:

Elements	Time Trace	Correction 22 November
H	Base	+1.1
	Magnet	+0.5
D	Base	-1.0
Z	No trace at time of test	

Orientation tests. When the conversion was complete a set of orientation tests was performed.

(a) Z variometer. To facilitate this work a bench was erected on the wall immediately to the north and on the same level as the variometer. Used with the platform described earlier, this allowed BMZ supplementary magnet 121:3 to be accurately levelled and oriented, and set up 55 cm from the variometer magnet. Using this equipment, measurements were performed on 18, 20 and 22 October, all showing the ex-level angle to be zero.

(b) H variometer. Following all adjustments, a satisfactory test on 25 November showed the magnet to be less than 0.1°N end N of EPV.

(c) D variometer. Following all adjustments, two satisfactory tests on 9 and 10 December showed the magnet ex-orientation to be approximately 0.2° N end W of N.

If undisturbed, all recording magnets should remain sufficiently well oriented for several years as the small ex-orientation shown is in advance of the predicted change in local magnetic field.

Recorder drives and cables

BMR synchronous motor drives were fitted to both magnetograph recorders, and it was decided to lay a cable from the office to the variometer hut to provide frequency-stabilised power. Accordingly, a four-conductor pyrotenax cable was carefully laid, well protected where necessary, to provide one pair for the power, and one pair for time-marks. It was found necessary to connect circuits on opposite cores to minimise fifty-cycle pickup on the time-mark lines. As no cable had been supplied by BMR and there was insufficient four-core cable available on the station, the last fifty yards of the run had to be completed with two cables of two cores each. The improvised joint gave trouble in early 1969 owing to moisture which entered the junction when surrounding snow melted. This would have been avoided had sufficient four-core cable been available.

Several days' record were lost owing to stoppages of the clockwork escapements prior to installation of the synchronous motors in May. After the new motors had been in use some time it was found that the drums were 'jumping' occasionally owing to severely worn bearings, so replacements were ordered.

Variometer hut

Floor and pier plans were prepared (Plate 1), minor modifications were made to the hut wiring, obsolete wiring was removed, black curtains were fitted to separate the two recording areas of the hut, and a light-proof drawer was fitted in the porch for photographic paper.

Absolute observations

These were carried out twice weekly if weather and magnetic conditions permitted; they averaged seven per month. The instruments used were as follows:

H:	QHM 300, with thermometer		N152
	301	" "	1416
	302	" "	1080

D: Askania Declinometer 332
Z: BMZ 62 with supplementary magnet 2 Down and thermometers 11132, 11126, 1168, 1160
F: Proton precession magnetometer ELSEC 340

H: The thermometer N152 bears only this marking but is presumed to be 633 which was originally fitted to QHM 300. This thermometer is particularly difficult to read as the mercury column is very fine and the glass envelope is scratched. Further, the corrections are in doubt so it should be replaced. Thermometer 1080 was fitted in February to replace 1082 broken during 1967.

D: It was noticed that two azimuth marks were in use, one being a post for use during daylight and the other a lamp for use during darkness. However, only one azimuth was recorded, 274° 14.4', that for the post. The lamp was strapped to the post with an offset of about two inches. A difference between the two azimuths of 1.2' was obtained with a theodolite. This result gave the azimuth for the lamp as 274° 15.6'.

Z: From 20 February to 13 March, BMZ readings were very poor and the neutral divisions observed during this period were inconsistent. The final value adopted was 0.9 different from that used by the previous observer. On 21 August the BMZ was opened to reseat the magnet. At some stage the prism must have been moved; however, the neutral division was not redetermined at this time so readings for the next 18 days are erroneous. On 8 September, the BMZ was again opened, the prism (which was found to be loose) was reseated, and the neutral division was adjusted to near its old level. A slight change in instrument correction has apparently been caused by this 'mishap', but the instrument behaved well for the rest of the year.

F: For the first time a proton magnetometer was used at Mawson throughout the year. It was found possible to obtain readings on all days if the electronic console was operated in the absolute hut, which could be heated to near 0°C; but the signal level dropped rapidly if the electronics were allowed to operate at temperatures as low as -12°C. At -20°C the signal dropped to zero, and at -30°C the instrument ceased to cycle. The station difference from the external pier to the standard pier was measured on quiet days when the temperature was high enough, and was found to be +3 gammas. Preliminary Z base values calculated from F and H values were reliable throughout the year and were used for baseline value adoptions, with some reference to the BMZ values to determine the time and magnitude of variometer changes.

It appears that either the BMZ read consistently high during the winter months (as was assumed for adoptions), or, possibly, the proton precession magnemeter (PPM) read consistently low. Signal levels, and temperatures for some of these observations, are tabulated on the F programme output sheets, but there are insufficient data for firm conclusions to be made at this stage.

Pairs of readings from the PPM appear to be slightly more consistent than those from the BMZ on any one observation day, and the scatter from the mean is marginally less for the PPM. In several cases the deviations of the two sets of readings from their mean shows a marked similarity, suggesting that the scatter in base values is a real short-term fluctuation in variometer base value.

The standard deviations of observed from adopted baseline values were: D - 0.2 min; H - 2 gammas; Z (BMZ) - 3 gammas, Z (PPM) - 2 gammas.

Intercomparisons

The change-over in January 1969 was accomplished in four hours, so no attempt was made to perform intercomparisons during that time. It is strongly suggested that in such circumstances the comparison instruments should be sent on the first relief voyage, and the returning geophysicist should be secured a berth on the last return trip if at all possible, so making available the maximum time for these observations.

QHM 300 and field QHM 492 were compared with QHN 174, and declinometer 332 was compared with declinometer 333 during January by the incoming geophysicist, and the results and magnetograms were returned in March so no serious difficulty was encountered. A correction for the BMZ has been derived by comparing baseline values with those found using the PPM.

3. SEISMIC OBSERVATORY

The three-component Benioff seismograph was maintained in continuous operation throughout the year. It was found necessary late in February to tilt the short-period galvanometer recording Z motion, to restore full trace intensity.

The principal causes of record loss were power supply voltage fluctuations and occasional failures of short duration. Voltage surges were observed to oover a range of 180 to 300 volts in a few seconds. These had a detrimental effect on change-over relay circuits, the 'Transtronics' oscillator rate, and the seismic recorder lamps. The lamps were affected particularly by the failure of the 'Stabilac' voltage stabiliser to operate correctly. This was not diagnosed until December, when it was overhauled and adjusted.

Some instability in the long-period recording system was noted. This took two forms, the more prevalent being a drift in trace position which correlated strongly with gross variations in station supply voltage. A suggested mechanism for this is that a movement of air in the seismometer is caused when the output from the heating lamp is suddenly varied. The second effect took the form of a sudden impulse and decay to the normal position over a period of about 10 seconds. This may have been a direct magnetic coupling to the recording galvanometers, perhaps caused by the instantaneous collapse of the field around a d.c. - operated relay formerly located in the cold porch. This relay tended to drop out of circuit and then return almost instantaneously when the supply voltage to the recorder motor was momentarily interrupted.

Seismometer tests

Lift tests to determine the sensitivity and damping ratio of the Z seismometer failed because the maximum lamp intensity gave a trace too weak to record the very rapid spot movements encountered. However, after the conversion to direct current (see later), more voltage was available for short periods, and it was possible for tests to be carried out successfully. In the course of this work, it was discovered that an additional resistance had been connected in series with all three control rheostats. This was short circuited to permit greater maximum current.

A series of tests on 26 November showed that the settings previously in use caused the system to be heavily over-damped so the controls were reset. The tests were repeated on, 12, 16, and 20 December and on 1 January, and the damping settings were adjusted to give a damping ratio of 17:1. The seismometer free-period was checked several times on these dates and found to be 1.0 seconds.

Seismic data

Numbers of earthquakes reported to ISC per month were as follows, the total for 11 months being 1062: February 26, March 63, April 86, Map 146, June 134, July 118, August 173, September 94, October 90, November 66, December 66. The large annual increase in the recording capability of the station during the quiet winter months is very evident.

Frequent loss of time-marks had been caused by breakages in the lines running from the office to the recording hut. Portion of the run was completed with steel cored field telephone cable laid on the bare rock. These crossed a camp road frequently used by tracked vehicles. Even minor damage to the cable sheathing allowed moisture to enter and rusting of the core to take place.

No alternative power supply was available to restore operation of the recorder during periods of failure of the station power supply.

These two deficiencies were rectified after a four-core pyrotenax cable had been laid between the seismic hut and the office. One cable pair carried time-marks, and the other power for the recorder drive motor; standby power was provided by equipment in the office. A switch was provided so that the motor supply could be drawn from the station supply at the seismic hut if it was found necessary to work on the cable.

Finally, an accumulator on continuous floating charge was wired into a new distribution board for the lamps and time-mark relays. This board was located in the entrance porch for ease of maintenance, and it provided facilities for individual monitoring of each lamp current, the time-mark current, and supply voltages (Plate 3).

It is hoped that the large accumulator will isolate the lamp circuit from supply voltage fluctuations. All the old wiring from the fluxmeter installation was removed and the earth wire to the sea was rerun on a lower, much shorter path through the hut and bonded to the cable sheath earthing system. A screen and black curtains were installed to isolate the recorders from the rest of the hut.

4. POWER AND TIMING SUPPLIES

To support the equipment modifications at the two observatory huts, much new equipment was installed in the office. The equipment was installed gradually as time permitted, but was finally incorporated into a new rack and monitor board.

Details of the final power and timing system are shown in Plate 2. A summary of its main features follows.

(a) Drive motor supplies

Magnetograph - 'Transtronics' 50-Hz, 300-W amplifier actuated by the mains supply or an AWA inverter on mains failure.

Seismograph - a 50-Hz, 115-V valve amplifier triggered by stable 50 Hz from the auroral crystal chronometer. A change-over relay allowed the 'Transtronics' to be connected if the amplifier output failed. The 'Transtronics' frequency varied with supply voltage by 0.3% so it was not ideal for regular seismograph drum drive.

(b) Timing

A BMR programmer type TMU-1 provided the magnetic and seismic time-mark sequences from 1 minute input closures; the closures were provided by a Mercer chronometer or a relay operated by the auroral chronometer. A 'Labtronics' receiver allowed time-piece comparisons to be made, by recording the radio pulses on the seismograms.

(c) Standby power

All systems were kept in operation during power failures by two sets of batteries normally on floating charge.

(d) Monitors

Monitoring meters and indicator lamps were provided in all output circuits and in the battery line.

Problems were encountered with the 'Transtronics' oscillator and the TMU. The frequency instability of the first was assumed initially to be a temperature effect, and a lot of effort was expended in stabilizing the office temperature. This involved overhauling the oil heater, adding an electric turbofan heater and fitting thermostatic control to them, but these steps did not improve the performance of the oscillator. The cause was eventually traced to supply voltage variations.

The TMU was prone to triggering by stray pulses (e.g. drift static and transients on the d.c. supply line). Despite the use of shielded cables, this source of time-mark inaccuracy could not be completely overcome; it may be necessary to install an accessible gain control to limit the sensitivity of the input stage.

5. REGIONAL MAGNETIC OBSERVATIONS

En route to Mawson, magnetic observations were made at seven sites, all in the east Amery Ice Shelf area. The occupations are summarized below.

	Date	Locality	Components
1.	19/1/68	Bowman Island	H approx., D
2.	23/1/68	Mount Caroline Mikkelson (69°44'S, 75° 45'E)	H, D, F
3.	30/1/68	Near Strovers Peak	D, F
4.	30/1/68	Ice Shelf, Sandefjord Bay	F
5.	01/2/68	Camp G.1, Amery Ice Shelf	H, D, F
6.	06/2/68	Landing Bluff (Nat. Mapping R68/4)	H, D, F
7.	09/12/69	Gillock Island (Nat. Mapping R68/8)	H, D, F

6. OTHER DUTIES

Work of a less essential nature was undertaken to improve the facilities of the geophysics office. Fluorescent lighting was installed, tools were placed on a shadow board, cupboards were re-arranged, shelving was erected, and the hut walls were painted inside and out. The carpenter installed a 1000-gallon tank, piping, pump and wall radiator as part of a proposed hot water heating system for the station. Normal rostered kitchen duty and night-watch duty were completed and in addition the author was made responsible for the maintenance and issue of field equipment and, for a portion of the year, the care and training of the dogs. While these duties were considered a pleasure and a recreation they did consume at least one day a week and at times much more. On a few occasions assistance was given to the doctor in the operating theatre and in the nursing of patients. This duty was infrequent but at times very demanding, requiring at one stage some six hours' duty each day for several weeks. The shifting of fuel drums, and removal of rubbish, were voluntary camp duties performed by most expedition members when their schedules permitted, as was the final camp cleanup and painting programme.

In December a stocktake was carried out of the semi-consumable items held in the huts and office.

7. ACKNOWLEDGEMENTS

All members of the 1968 Mawson Expedition are thanked for their assistance, advice, and friendship, and in particular the following: Stan Murcutt, electrician, who not only carried out the daily routine during the author's field absences, but also carried out wiring and cable laying and was always willing to 'lend a hand' whenever any assistance was needed; Vic Kitney, supervising radio technician, who traced cable faults, supervised the erection of an antenna and helped service electronic equipment; Max Rubeli, surveyor, who carried out the daily routine during some of the author's absences in the field; and Riccy Springolo, carpenter, who constructed shelving and carried out maintenance on request.

Finally, thanks are due to staff of the Observatories Group at Head Office for their assistance and advice during the preparation of data obtained, and the writing of this report.

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TABLE 1

Preliminary monthly mean values, 1968

Month	H gammas	D(West) ° '		Z gammas	F gammas
January	18,372	61	39.0	-48104	51493
February	360		40.5	096	481
March	361		41.3	098	483
April	357		43.3	091	475
May	358		44.0	083	468
June	364		43.7	064	452
July	364		44.5	051	440
August	360		45.8	046	434
September	365		46.0	036	427
October	366		46.5	026	418
November	371		46.0	027	420
December	387		45.1	-47995	393
Annual mean	18,365	61°	43.8'W	-48060	51449

TABLE 2

Adopted Scale Values, 1968

Magnetograph	D min/mm	H gammas/mm	Z gammas/mm
Normal / sensitive	0.86 ± 0.01	9.50 ± 0.06	10.40 ± 0.07
Insensitive	2.44 ± 0.02	51.2 ± 0.2	51.1 ± 0.2
Normal *	2.44 ± 0.01	21.1 ± 0.1	22.0 ± 0.2

* after September

TABLE 3

Summary of baseline changes, 1968

H Variometer

27. 8.68	Working in hut repairing scale-value coil
18.10.68	Working in hut calibrating BMZ magnet
22.11.68	Bumped variometer while moving coil
28.12.68	Bumped variometer while aligning coil
31.12.68	Adjustments to variometer temperature compensating prism
1. 1.69 to 9. 1.69	Adjustments to variometer

D Variometer

13. 3.68	Disturbed variometer
25. 5.68	Bumped variometer moving coil
25. 6.68 31.12.68 1. 1.69 to 9. 1.69	Adjustments to variometer

Z Variometer

26. 2.68	Bumped variometer
24. 5.68	Adjustment to baseline mirror
11. 7.68	Adjustment to recorder slit
27. 8.68	Working in hut repairing O/C Z scale-value coil
25. 9.68	Working in hut repairing heater

T Variometer

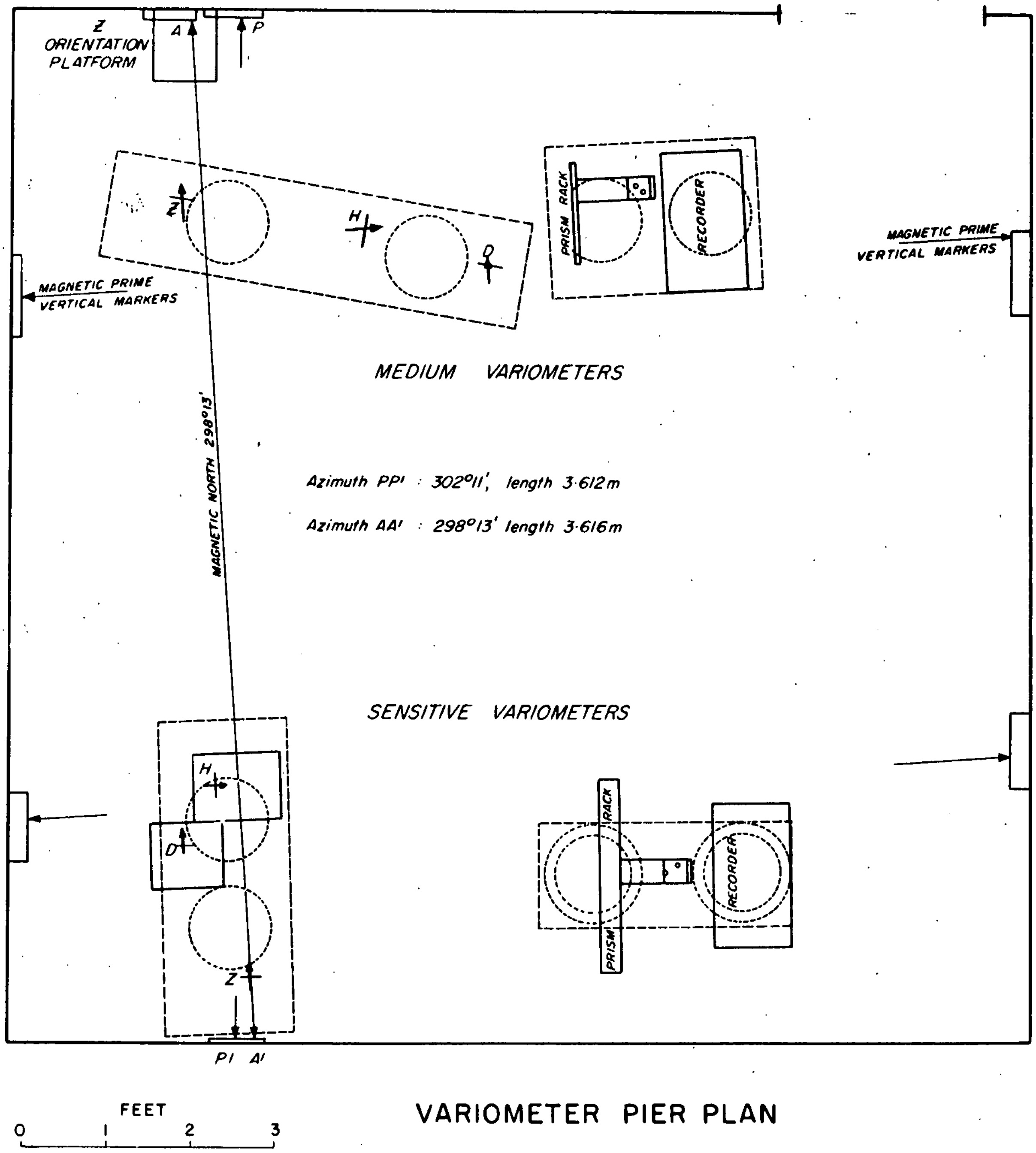
24. 5.68	Adjustment to baseline mirror

TABLE 4

Variometer magnet north pole ex-orientations

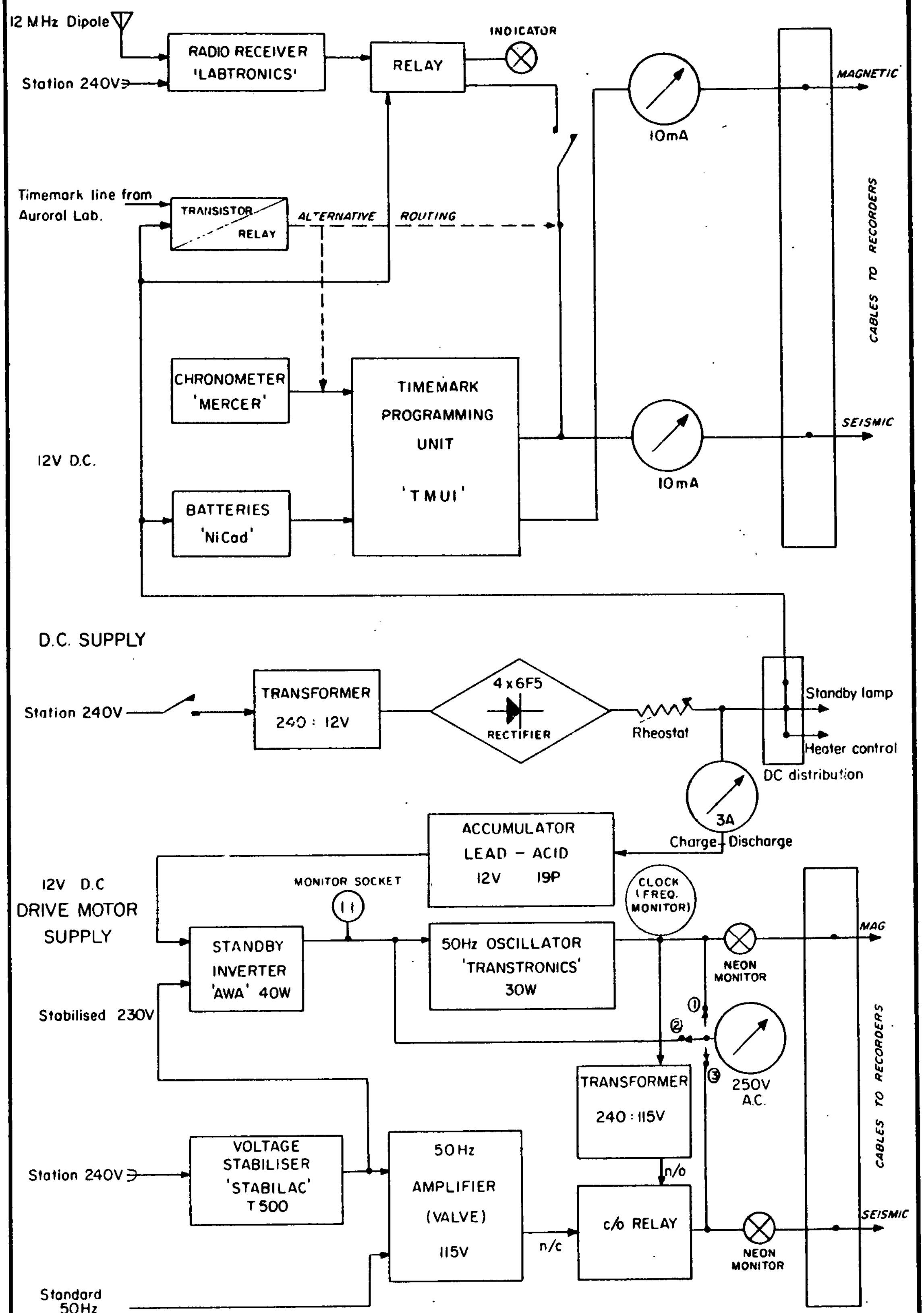
Variometer	Date	Reference fields	D	H	Z
Normal /	Aug 68	H: 18,360		E0.3°S	
Sensitive	Nov 68	Z: 48,027			N1.0°D
	Dec 68		N0.5°W		
	Jan 69	H: 18,355	N0.4°W	E0.3°S	
Insensitive /	Aug 68	H: 18,360		E0.3°S	
Normal	Sep 68	Z: 48,036	N0.8°W		N1.9°D
	Oct 68				0.0°
	Nov 68	H: 18,371		E0.1°N	
	Dec 68		N0.2°W		

Reference bearing PP 57.8°W: Reference meridian 61.8°W



VARIOMETER PIER PLAN

PLATE 2



POWER AND TIMING CIRCUITS

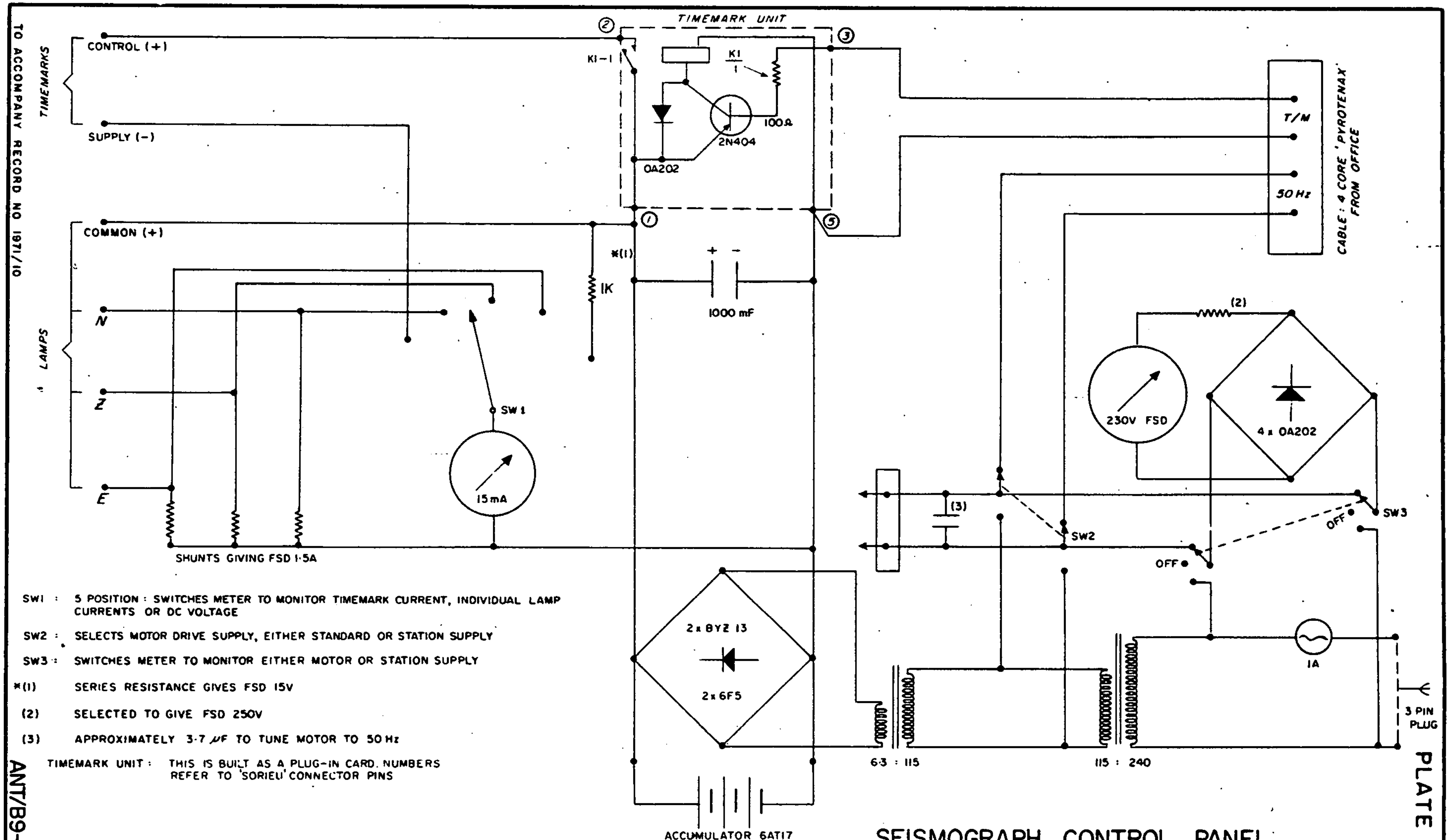
TO ACCOMPANY RECORD NO 1971/10

ANT/B9-3A

MAWSON 1968

MAWSON 1968

TO ACCOMPANY RECORD NO 1971/10



SW1 : 5 POSITION : SWITCHES METER TO MONITOR TIMEMARK CURRENT, INDIVIDUAL LAMP CURRENTS OR DC VOLTAGE

SW2 : SELECTS MOTOR DRIVE SUPPLY, EITHER STANDARD OR STATION SUPPLY

SW3 : SWITCHES METER TO MONITOR EITHER MOTOR OR STATION SUPPLY

*(1) SERIES RESISTANCE GIVES FSD 15V

(2) SELECTED TO GIVE FSD 250V

(3) APPROXIMATELY 3·7 μF TO TUNE MOTOR TO 50 Hz

TIMEMARK UNIT : THIS IS BUILT AS A PLUG-IN CARD. NUMBERS REFER TO 'SORIEU' CONNECTOR PINS

ANT/B9-2A

SEISMOGRAPH CONTROL PANEL

PLATE 3