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Record 1973/149

MAWSON GEOPHYSICAL OBSERVATORY ANNUAL REPORT 1971

by

J.J. Petkovic

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SUMMARY

During 1971, the operation of Mawson geophysical observatory was based on a three-component Benioff seismograph and two (NORMAL and SENSITIVE) three-component La Cour magnetographs. Continuous seismological and magnetic recordings were maintained throughout the year. Seismograms were analysed and the results were transmitted to the U.S. Department of Commerce. Magnetic control observations were carried out regularly. There was little loss of data and only minor changes were made on the existing system. Third-order magnetic observations of H, D and Z were taken at Mount Ruker, Mount Cresswell, and Mawson Escarpment South.

1. INTRODUCTION

Mawson Observatory is one of the observatories operated by the Bureau of Mineral Resources (BMR). Because of its geographical position the work there is carried out as part of the Australian National Antarctic Research Expeditions (ANARE), which derive its logistic support from the Antarctic Division, Department of Science.

The observatory commenced operation in 1955 with the installation of a three-component La Cour magnetograph. During 1971 the recording equipment consisted of: a three-component Benioff seismograph; two three-component La Cour magnetographs; and a Moseley chart recorder which monitored the magnetic total intensity from an Elsec Proton Precession Magnetometer (PPM).

The author arrived at Mawson on the M.V. Nella Dan in December 1970, as a member of the 18th ANARE (1971-72). He took over the duties of Observer-in-Charge from Malcolm Robertson after a short familiarization course (1 January 1971). The outgoing geophysicist completed intercomparisons of the declinometer and the QHMs, and carried out some regional magnetic work before his return to Australia (March 1971). The author continued observatory work until his departure for the Prince Charles Mountains in January 1972. During his absence, observatory operations were carried out by members of the expedition who had been trained for this purpose. In the Prince Charles Mountains he assisted the surveyors, and made regional magnetic observations which are described in this Record.

The author was replaced by the incoming geophysicist John Silich in February 1972. Familiarization and intercomparisons were completed before the author's return to Australia in March 1972.

2. CONTROL EQUIPMENT

In 1971 no additions were made to the office equipment described by Robertson (1972), and there were no major failures. Difficulties encountered were of an incidental nature rather than chronic recurrences of the same faults.

Stabilac voltage regulator

Most of the office equipment derived its power (Pl. 1) from a 500 W Stabilac constant voltage supply. During a test carried out in April 1971 on the EMI clock, it was found that the input voltage fluctuated in a manner similar to the fluctuations which occurred with the station mains power.

Further tests on the Stabilac showed that its regulator was bypassed and effectively out of the circuit. Apparently its input power terminals were reversed so that in fact there was no regulation of station power. This fault was corrected.

T.M.U. (Time Marker Unit)

Occasionally during the year spurious pulses triggered the T.M.U. which is a BMR-designed programmer. The cause of these pulses was not due to more obvious factors such as electro-static discharge or power/time line interference. The pulses occurred randomly, and all attempts to locate the source proved unsuccessful. The problem was not frequent, and since time calibration was not affected, no further action was taken.

Time signal receivers

There were two time signal receivers at Mawson in 1971 - a Labtronics receiver and a standby Eddystone receiver.

In general, the best signals were received on 12 MHz from VNG. The Labtronics operated satisfactorily throughout the year, although the reception was sometimes poor. Occasionally the signal was not strong enough to activate the EMI comparator although elsewhere on the station there were no other indications of poor reception. The signal received using the existing dipole was compared with that received using a V-antenna used by the local amateur radio stations. The V-antenna showed a marked improvement in reception. Meanwhile the original antenna became troublesome, particularly during blizzards, and required frequent repairs. When the amateur stations ceased operation late in 1971, the V-antenna was modified and made available to the incoming geophysicist.

EMI clock

In April 1971 there was a drop in the 210V clock output. This drop in an already low-output voltage was associated with a slowing of the usually uniform drum rotation. Extensive tests were performed but did not reveal any serious failure within the clock. The system slowly recovered when the output potentiometer was boosted to maximum voltage. At this level the steady clock rate of approximately 50 ms per day became erratic, and adjustments to the rate potentiometer were necessary. Five such changes were made during the year, and in this way the clock rate was kept at a tolerable level of less than 50 ms per day.

In mid-1971, change in clock power output was accompanied by excessive heating of the clock. The cover was removed and all intake filters were replaced. The presence of dust in the building, mainly from the oil heaters, caused ventilation problems and, with them, changes in output from the clock. In ordinary circumstances, the dust was of minor significance, but it became particularly bad during blizzards when it was shaken from the office walls.

Mercer chronometer

This was a standby timing system to be used when the EMI clock failed. At Mawson Observatory, this usually occurred when the pyrotenax cable carrying the time pulses broke. In these situations, the existing standby system was ineffective as it was necessary to transport the chronometer across the break and connect the Mercer directly to the relays in the vault. This resulted in a change in the working temperature of the chronometer which in turn effected a change in an other wise steady rate of approximately 0.2 s/day. When the chronometer was in use as a timing system, frequent additional checks on the rate were made.

Power and power lines

Breakages in the pyrotenax cables distributing power from the geophysical office to the seismic and variometer buildings was the chief source of system failures in 1971. These ground-level lines were very susceptible to careless tractor drivers, but the most common cause of failure was water entering the cables through previously repaired breaks. Both causes were common in the summer period when there was plenty of running water and no protective snow layer.

Considerable time was spent covering the vulnerable points with piping or steel grids. Rock or snow cover was effective, but when breaks did occur it made their location difficult and time-consuming.

When a clean break occurred, both power and timing were lost. This necessitated the use of station power (which was distributed by a separate grid of pyrotenax cables) because, as mentioned earlier, office standby was of no use and was accompanied by almost violent chattering of the PPI switchboard relays. Possibly a fuse system should be incorporated in the future equivalent of a PPI switchboard since damage could have eventuated if the breaks were not discovered shortly after they occurred.

When water entered the cable, the symptoms varied according to the degree of interference between the time and power lines. When this interference was large, the fault was equivalent to a clean break. Otherwise the consequences would be completely inconspicuous, with pseudo time pulses only appearing now and then. The liklehood of failure and difficulty in location increases with every repair made on the cables. It is therefore suggested that new cables be laid at Mawson as the existing ones may cause a major interruption to the operation of the observatory. It would be advisable, when laying cables, to have them above the ground along the heater pipe ducts, with protective covering, and within easy access for inspection. Separate power and time lines would also decrease the probability of failure.

There were numerous generator failures, in the order of one per week at Mawson's power station. In each case standby power worked perfectly, resulting in no data loss.

3. SEISMIC OBSERVATORY

Equipment

Continuous recording was maintained throughout the year using a three-component Benioff seismograph.

In mid-1971 a BMR Observatory Rectifier (Pl. 2) was incorporated into the system as shown in Plate 1. The new output was not sufficient to give a good lamp intensity range, and the operation of the time marker assembly became unreliable. A diode was inserted into the rectifier circuit and this increased the output from 6V to 7V.

Trace 'spots' were checked regularly and optical adjustments made whenever required.

Lamp intensity changes persisted (see Major 1971; Robertson 1972), although these were not so noticeable after the receifier was installed. The residual changes were attributed to a loose contact somewhere in the lamp circuit. On several occasions, the intensity faded completely, indicating a clear break in the circuit. Four of these 'weak points' were isolated and resoldered. However several intensity changes still occurred.

Occasionally during the year, when the heaters failed and the inside temperature dropped to less than -10°C, the drum rotation became irregular, indicating a lower limit of working temperature for Benioff recorders.

Calibration and attenuation

6mA calibration pulses were applied at least twice a day - at the beginning and end of a record, and also at any other time when there was an attenuation change. These changes are listed in Table 1. High attenuation/ low gain was characteristic of Mawson's summer period when the coast was ice-free, and the sea waves generated large microseisms. When the sea ice set in, the 'base attenuation' dropped drastically. Individual peaks in attenuation persisted for the duration of blizzards which became stronger and more frequent with the progression of autumn and winter. It is hoped that the new seismic site, which is situated ten metres underground in a solid rock hill, will escape the vibrations of the building which are the main cause of high'blizzard' microseisms.

Three weight tests were performed on all three seismometers. The first two were of little value because of poor photographic reproduction. The tests were performed with a number of weights at different attenuation settings, and the results are listed in Table 2.

Data

During the year the combined loss of data amounted to only 30 hours.

When possible, arrival times were sent to Melbourne daily. There were also frequent exchanges of preliminary earthquake data between Mawson and the other Antarctic stations. The final analysis of the results contained 1438 events and phases. The higher-than-normal number of events recorded can be attributed to the large number of earthquakes which occurred in the New Guinea region during July 1971 (Table 6).

Excavation blasts from the Seismic - Cosray fault were recorded. These blasts jarred the optical system and were of no value for local travel-time studies.

A large number of other local events were recorded in 1971; most were probably ice breaks, but some were thought to be too large and too far away to be interpreted in this way. Mirny and Syowa seismograms for these particular days were examined, but there was no trace of any seismic disturbance at these times. An example of an event recorded on 19 April 1971 is shown on Plate 3.

4. MAGNETIC OBSERVATORY

Continuous recordings of H, D, and Z were carried out throughout the year using two three-component La Cour magnetographs named NORMAL and SENSITIVE. Details of variometers are documented in previous reports (Oldham, 1957; Merrick, 1961; Smith, 1971).

Recorders

There was a La Cour recorder with a synchronous drive for each of the above magnetographs. A four-core pyrotenax cable from the geophysical office provided regulated 240V motor power and the 6V closure pulses for the time relays. Station power was used for recorder lamps and variometer room heaters. The load on the station power was particularly heavy in 1971 and the above system proved inadequate since the lamp intensity would vary whenever the heaters were switched on or off. These variations in lamp intensity became noticeable early in the year and gradually increased as more heaters were needed with the coming of the winter. The problem was solved when the Observatory Rectifier was connected to the station power to provide current for the recorder lamps. Initially the voltage output was too low to give good intensities of the time mark traces but the rectifier's circuit was modified in order to increase this output and so improve the traces.

The semicircular contacts between the lamps and the lamp holders were prone to corrosion and caused irregular fluctuations of the lamp intensity. Gentle pressure applied to the lamps often solved the problem. When this failed, the lamps were removed, and the contacts cleaned. All four lamps were cleaned once during 1971.

The gears on the recorder motors occasionally disengaged with consequent loss of records for the remainder of the day. This happened somewhat more frequently on the SENSITIVE recorder than on the NORMAL recorder. However, the loss was small enough to tolerate.

Throughout the year the traces were of reasonable quality. There was a tendency for them to drift, making it necessary to adjust the optics from time to time. Explosions on a nearby excavation site aggravated this problem, but cylindrical lens adjustments were always sufficient to return the traces to normal. These adjustments are listed in Table 5.

MCO3 circuit board

This board contained timing, scale value, and trace intensity controls. In March 1971, as a consequence of a break in the pyrotenax cable, one of the two transistors AY6102 forming part of the time mark circuit failed. The fault was due to a short circuit between the 240V power lines and the 6V time mark lines within the four-core cable. The transistor was replaced with a similar type (BC177).

Temperature

A thermistor suspended from the variometer roof operated 6V and 240V relays. These switched on the four 5A heaters which kept the temperature at 0°C. This arrangement proved to be most troublesome.

The first malfunction occurred when the contacts on the 240V relay fused owing to arcing before the contacts closed. These contacts were cleaned, and the box containing the relays was sealed as a few failures occurred when drift snow was forced inside the box by strong winds. When the contacts fused again, one of the relays was replaced.

The replacement worked well for about a month before it, too, failed. The next replacement worked for a few days before another failure took place. All these failures caused the temperature to soar in the variometer hut.

The new relays were of a microswitch type, so it was difficult to determine the reason for the failures. The puzzling part was that once the relays were working, all attempts to determine the cause of failure were unsuccessful.

Next, a progression of repairs followed until the whole system was overhauled. This commenced with the replacement of the 6V relay; then the thermistor circuit which amplified the signal was modified. When this met with no success, the circuit board was redesigned so that the signal operating the relays through the linear amplifier now did so through the Schmidt trigger. It was only when the thermistor itself was replaced that the system returned to normal. Thermostatic control has always been a problem at Mawson. It is suggested that an alternative system, which makes no use of mechanical relays, be introduced.

Elsec proton magnetometer

Continuous monotoring of the total intensity (F) commenced in 1969 (Major, 1971). This was carried out so that control observations could be performed when the geomagnetic field was undisturbed. The magnetometer was also used to calculate the absolute value of Z from the readings of F, and H from the QHMs.

Because it was necessary to leave the detection head outside, exposed to the elements, it deteriorated as the year progressed. In September a break occurred in the cable at the junction with the sensor, making it very difficult to repair. A thin copper strip was wound on to the severed coaxial braces, enabling it to function again. Field monitoring was discontinued in October and November, and the instrument was only used for absolute observations. When the weather improved sufficiently, continuous monitoring re-commenced.

Weather was also a factor in the deterioration of the cable plugs (Plessey), and when these became unserviceable they were replaced with CANON equivalents.

There was only one failure with the actual instrument - the D.C. relay stage. The faulty part was replaced with a spare.

Twice the batteries discharged without any apparent cause. After recharging they worked well. There were numerous cable breaks, but apart from being annoying these difficulties were minor.

Absolute observations

These were usually carried out seven times per month. As already mentioned the PPM was used for absolute Z measurements, and in addition BMZ (62) readings were made to keep up the comparisons.

There were three QHMs in Mawson in 1971 - 301, 300, and 174. Two were used to give a set of QHM readings for the first half of the year. Headquarters then gave instructions that all three were to be used in making up the set. Two sets of declination readings, using Askania declinometer 332, were made for each set of absolutes.

Difficulties with the PPM have already been described; there were only minor optical difficulties with the BMZ; the QHMs performed well. Only the declinometer data may contain an amount of error, but this would still be within tolerable limits.

Standard practice with D observations was to rotate the declinometer magnet 180° about its longitudinal axis. On several occasions it was noticed that the level of the scale image reflected from the magnet's mirror changed by a large amount with each rotation of the magnet. This resulted in larger than normal scatter of D values. When the author became aware of this, D readings were made only when this difference was small.

From the absolute observations and the thermograph plot the following were obtained: normal and sensitive Z temperature baseline values; normal and sensitive Z baseline values; normal and sensitive H baseline values; normal and sensitive D baseline values. These values are listed in Table 5.

Inter-comparisons were completed at Mawson in February 1972. Results indicated no large change in any of the absolute instruments used in 1971.

Scale values

On the average, scale values were determined seven times per month. These are listed in Table 4. Two new Helmholtz scale value/orientation coils were installed on SENSITIVE H and D variometers (Pl. 5). Attempts were made to connect the two coils and the Askanian coil on the Z variometer, in series with each other. This was unsuccessful, either because of a fault in the MCO3 or in the actual coil wiring. It was possible to get scale values only when the coils were wired in parallel, and orientation coils were disconnected.

Early in the year, the coil current source MCO1A was replaced with MCO1B. Both had specified current outputs which were used in determining scale values. There was some doubt about the current value of MCO1B. The output was monitored by an ammeter with a given instrument correction. The observed value of the current did not equal the manufacturer's specification. The same measurement was made with and AVO meter (more as an indication as the error introduced is large enough to make questionable the measurement obtained). The two meters gave identical results. It was assumed this was not coincidental since the first meter should have given an accurate readout, so the preliminary scale values were determined using the observed current value. Subsequent tests performed by the 1972 geophysicist indicated that this decision may have been erroneous, so the final scale values were calculated using the specified current. Table 3 lists both values.

Data

Preliminary data were compiled and transmitted monthly to Australia and to other Antarctic stations. These data consisted of: normal baseline values; normal scale values, preliminary monthly mean values; and K indices.

On return to Australia, mean hourly values were scaled. Final analyses was carried out on all the preliminary work from both normal and sensitive magnetographs. These final values were then used to determine temperature coefficients and preliminary instrument differences. Results are listed in Table 4.

During the year the total simultaneous record loss from the two magnetographs was 55 hours. The reasons for these losses, namely breaks in the pyrotenax cable, and the disengagement of the recorder gears, have already been discussed. Other causes accounted for only a minor part of lost data.

5. REGIONAL MAGNETIC OBSERVATIONS

Multiple sets of H, D, and Z third-order observations were made at three sites in the Prince Charles Mountains: Mount Creswell, Mount Ruker, and Mawson Escarpment South. Since the final azimuth computations by the surveyor had not been completed at the time of writing, these values are not yet available.

Field observations were greatly handicapped by weather conditions. The wind particularly produced pronounced 'quivering' in the quartz fibres. In many cases, it was impossible to make a reliable reading, even in mild Antarctic conditions. A vast improvement would be effected by using detachable 'surveyors' tents. These remain serviceable with winds up to 30 knots.

As the field work was carried out on an opportunity basis in conjunction with the 1971 surveying programme, there was little choice in selecting sites for observations, and the stations organized may not be representative of the regional magnetic field in the Prince Charles Mountains. In particular observations at the site on Mount Rukar indicated a steep gradient in the magnetic field, indicative of a major magnetic anomaly.

6. MAINTENANCE WORK AND STATION DUTIES

On arrival, the author found the Observatory in good order. It was evident, however, that the buildings were beginning to deteriorate from continuous battering by high winds and drifting snow. This was particularly bad in the variometer hut where the 'creep' of the windward wall was beginning to interfere with the piers. It was not possible to construct adequate internal building reinforcement as this would have required blocking parts of the sensitive variometer optics. Nevertheless a major repair will have to be done on this wall and it is hard to see how interruption in recording can be avoided in the future.

Excavation of the combined cosmic-ray/seismic value commenced in 1971. Everybody on the station contributed towards this project.

In December, the exterior of the Geophysical Office and the Seismic Vault were painted.

In addition to Observatory work the following station duties were performed: nightwatch; kitchen assistant; snow 'running'; Saturday station chores and other incidental tasks. The author was also in charge of the clothing store.

7. ACKNOWLEDGEMENTS

Helpful advice and assistance given by all members of the 1971 expedition is gratefully acknowledged. In particular, the author wishes to thank: Keith Gooley and Neil Smith, who operated the Observatory when he was away in the Prince Charles Mountains, and who readily gave their help throughout the year; Ken Hansen, Kit Scally, and Horst Rosler for assistance with numerous minor problems, with relays, cables, and other technical matters; Eddy Burk, for his help with regional observations and his good sense of humour whilst in the Prince Charles Mountains.

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TABLE 1. SEISMOMETER ATTENUATOR SETTINGS 1971

MONTH	DAY	TIME uT	ATTENUATOR VERT	ATTENUATOR HOR
JAN	1	0300	20	9
	22	0330	18	9
	23	0310	16	9
	28	1700	20	9
	30	0320	16	9
FEB	3	0315	10	6
	4	0310	16	8
	10	0231	24	10
	11	0331	18	9
	13	0308	24	10
	16	0326	18	9
	21	0330	22	9
	23	0314	30	10
	24	0235	20	9
MAR	3	0345	24	9
	4	0322	20	9
	5	0341	24	9
	10	0344	20	9
	12	0320	24	9
	17	0356	28	9
	18	0316	24	9
	19	0453	26	9
	22	0319	18	8
	25	0315	16	7
	27	0335	28	10
	29	0323	26	10
	30	0324	16	7
	31	0338	10	7
APR	1	0326	6	5
	2	1403	20	8
	4	0322	16	8
	5	0322	8	7
	7	0319	16	8
	8	0355	10	8
	9	0323	6	6
	11	0321	10	8

MONTH	DAY	TIME uT	ATTENUATOR VER	ATTENUATOR HOR
APR Cont	12	0314	6	6
	22	0320	20	9
	23	0317	8	9
	24	0315	6	6
	27	0330	8	7
MAY	2	0355	18	10
	5	0330	10	8
	6	0351	4	4
	8	0319	6	6
	13	0319	8	7
	16	0455	6	6
	22	0320	4	4
	23	0322	8	7
	25	0318	4	4
	26	0448	6	7
	27	0322	8	8
	28	0332	10	8
	29	0334	14	9
	30	0324	12	8
	31	0329	4	4
JUNE	1	0322	2	2
	2	0320	6	5
	6	0316	10	7
	8	0316	6	5
	11	0331	20	9
	12	0316	10	7
	13	0445	16	8
	15	0248	6	5
	18	0338	8	6
	21	0315	12	7
	22	0532	10	6
	24	0325	10	7
	25	0245	6	5
	27	0331	24	9½
	29	0313	8	5
JULY	1	0325	10	6
	3	0329	6	5

MONTH	DAY	TIME uT	ATTENUATOR VERT	HOR
JULY Cont	4	0329	12	9
	5	0336	8	7
	5	0339	8	8
	6	0331	10	9
	8	0345	6	6
	9	0411	6	7
	11	0349	4	5
	13	0321	6	7
	14	0350	4	6
	15	1708	8	8
	16	0247	6	7
	17	0357	4	5
	20	0325	0	2
	20	0558	4	4
	21	0324	6	6
	21	1031	0	1
	22	0322	2	2
	23	0358	10	9
	24	0338	6	7
	26	0333	12	9½
	27	0327	4	5
	29	0400	2	4
	30	0359	6	8
	30	0850	2	3
	30	0851	4	5
	31	0824	2	3
AUG	1	0408	0	1
	2	0331	4	5
	2	0338	6	7
	3	0323	4	5
	4	0417	2	3
	5	0331	8	9
	6	0332	4	5
	7	1912	0	1
	8	0326	6	8
	11	0324	4	7
	12	0343	0	1
	12	1500	6	8
	13	1323		
	14	0243	0	1

MONTH	DAY	TIME uT	ATTENUATOR VERT	HOR
AUG Cont	17	0338	2	3
	18	0405	4	5
	20	0537	2	3
	21	0251	6	6
	22	0321	6	7
	24	0331	12	10
	25	0425	8	9
	26	0325	0	1
	26	1332	6	6
	27	0351	6	8
	27		8	9
	28	0320	6	7
	31	0250	4	5
SEPT	1	0312	16	9
	4	0325	2	2
	6	0328	18	10
	7	0338	6	8
	7	1034	4	5
	8	0322	4	5
	10	0324	1	2
	11	0442	8	9
	12	0325	2	3
	13	1246	6	7
	14	0346	8	8
	15	0346	2	3
	17	0355	18	10
	18	0450	8	9
	18	0452	18	10
	20	0243	4	5
	21	0326	6	7
	21	0430	4	5
	21	1019	2	3
	26	0345	6	7
	26	1515	0	1
	27	0317	4	5
	28	0242	2	3
	28	0900	8	9
	29	0243	2	3
	30	0316	4	5
		0243		

MONTH	DAY	TIME uT	ATTENUATOR VERT	HOR
OCT	1	0243	4	5
	4	0312	8	9
	5	0322	2	3
	6	0321	6	8
	8	0317	4	6
	9	0316	4	5
	11	0350	6	7
	12	0342	2	3
	14	0543	0	2
	15	0323	6	7
	16	0314	8	9
	17	0424	6	7
	19	0314	8	9
	21	0315	2	3
	23	0310	4	5
	28	0322	6	7
	29	0454	2	3
	30	0633	4	5
	31	08	8	9
NOV	3	0313	6	7
	6	0314	2	3
	7	0312	6	7
	8	0538	10	9½
	9	0749	24	10
	10	0947	4	5
	11	1205	10	9½
	15	0425	8	7
	17	0938	4	5
	21	1757	2	3
	22	1820	6	7
DEC	8	1137	8	7
	9	1714	10	8
	10	1743	16	9
	11	1732	18	9½
	13	1845	6	5
	18	0739	24	10
	21	0941	18	9
	22	1055	6	6
	24	0329	16	8
	26	0311	10	7
	28	0320	12	8

TABLE 2. SEISMOMETER WEIGHT LIFT TESTS 1971

Z SEISMOMETER			N-S SEISMOMETER			E-W SEISMOMETER		
WT (gms)	ATTEN (db)	DAMP RATIO (A_1/A_2)	WT (gms)	ATTEN (db)	DAMP RATIO (A_1/A_2)	WT (gms)	ATTEN (db)	DAMP RATIO (A_1/A_2)
1 gm.	12	10.7:1	1 gm.	0	13.0:1	1 gm.	4	10.5:1
5 gm.	24	9.7:1	2 gm.	0	15.3:1	2 gm.	6	10.0:1
10 gm.	32	10.6:1	5 gm.	MAX	15.6:1	10 gm.	10	7.6:1
20 gm.	36	10.0:1				20 gm.	MAX	9:1
20 gm.	38	10.0:1						

TABLE 3. MAGNETOMETER DIFFERENCES

INST. (NOS)	DIFF	ADOP. DIFF
QHM 301 - QHM 300	+ 3±3 nT	3 nT
QHM 301 - QHM 174	-24±3 nT	-24 nT
DEC 333 - DEC 332	0.2±0.2 min	0.0 min
PPM 340 - BMZ 62		22 nT

TABLE 4. SCALE VALUES AND TEMPERATURE COEFFICIENTS 1971

COMP	SVo	SVs	Temperature Coefficient
H Normal	21.13 ± 0. 05 nT/mm	21.35 ± 0.09 nT/mm	2.0 nT/°C
D Normal	2.37 ± 0.01 min/mm	2.40 ± 0.01 min/mm	
Z Normal	22.38 ± 0.05 nT/mm	22.63 ± 0.05 nT/mm	0.5 nT/°C
H Sensitive	9.50 ± 0.05 nT/mm	9.60 ± 0.05 nT/mm	2.0 nT/°C
D Sensitive	0.860 ± 0.005 min/mm	0.870 ± 0.005 min/mm	
Z Sensitive	10.2 ± 0.05 nT/mm	10.37 ± 0.05 nT/mm	0.5 nT/°C
T_Z Normal	1.76 ± 0.03 °C/mm		
T_Z Sensitive	1.09 ± 0.02 °C/mm		

* SVo - Scale values determined using observed current

* SVs - Scale values determined using specified current

TABLE 5. MAGNETOGRAPH BASELINE VALUES 1971

Time (GMT)	Date	Baseline Value Before	After	Remarks
NORMAL H (nT)				
00^h	1. 1.71	17438	17438	
13^h	6. 1.71	17438	17410	Optical adj. on baseline
03^h	17. 1.71	17410	17419	Thickening of baseline
03^h	19. 1.71	17419	17408	Accidental change
11^h	30. 1.71	17408	17420	Optical adj.
08^h	8. 4.71	17420	17416	Optical adj.
05^h	21. 6.71	17416	17412	Optical adj.
11^h	29. 6.71	17412	17410	Optical adj.
03^h	7. 8.71	17410	17400	Wind pier vibration
14^h	2. 9.71	17400	17384	Trace lamp exchange
08^h	14. 9.71	17384	17376	Time lamp exchange
15^h	28.11.71	17376	17366	Explosion
SENSITIVE H (nT)				
00^h	1. 1.71		17990	
12^h	4. 2.71	17990	17995	Cylindr. lense adjust.
08^h	8. 4.71	17995	17985	Temp change and opt. adj.
11^h	11. 5.71	17985	17989	Record adj. - gears
05^h	22. 9.71	17989	17980	Lamp exchange
15^h	29.11.71	17980	17987	Explosion
NORMAL D				
00^h	1. 1.71	60° 32.7	60° 32.7	
03^h	11. 1.71	60° 32.7	60° 31.2	Double image baseline
03^h	12. 1.71	60° 31.2	60° 33.4	Optical adj.

Time (GMT)	Date	Baseline Value Before	Baseline Value After	Remarks
NORMAL D (continued)				
03^h	19. 1.71	60° 33.4	60° 31.6	Double image baseline
03^h	26. 1.71	60° 31.6	60° 33.4	Optical adj.
05^h	22. 6.71	60° 33.4	60° 32.4	T.M. recovery
10^h	29. 6.71	60° 32.4	60° 33.6	Optical adj.
13^h	2. 9.71	60° 33.6	60° 34.1	Lamp exchange
13^h	21. 9. 71	60° 34.1	60° 34.9	Lamp exchange
15^h	29.11.71	60° 34.9	60° 35.9	Explosion
SENSITIVE D				
00^h	1. 1.71		61° 29.8	
00^h	1. 1.72	61° 29.8	61° 29.8	
NORMAL Z (nT)				
00^h	1. 1.71	47123	47123	
03^h	17. 3.71	47123	47113	Unknown
03^h	7. 8.71	47113	47119	Wind vibration - pier
14^h	2. 9.71	47119	47124	Lamp exchange
03^h	3.11.71	47124	47133	Baseline thickening
SENSITIVE Z (NT)				
00^h	1. 1.71		47478	
08^h	8. 4.71	47478	47476	Optical adj.
19^h	9. 6.71	47476	47489	Excessive heat
NORMAL Z temperature (°C)				
00^h	1. 1.71	-97.2	-101 °C	Adopted
14^h	2. 9.71	-101 °C	-99.7 °C	Lamp exchange
SENSITIVE Z temperature (°C)				
00^h	1. 1.71	-47.7	-47.7 °C	
00^h	1. 1.72	-47.7 °C		

TABLE 6. NUMBER OF SEISMIC PHASES RECORDED IN 1971

MONTH	NO OF PHASES
JANUARY	82
FEBRUARY	25
MARCH	20
APRIL	74
MAY	68
JUNE	69
JULY	510
AUGUST	138
SEPTEMBER	142
OCTOBER	188
NOVEMBER	72
DECEMBER	50
TOTAL	1438

To Accompany Record No. 1973/149

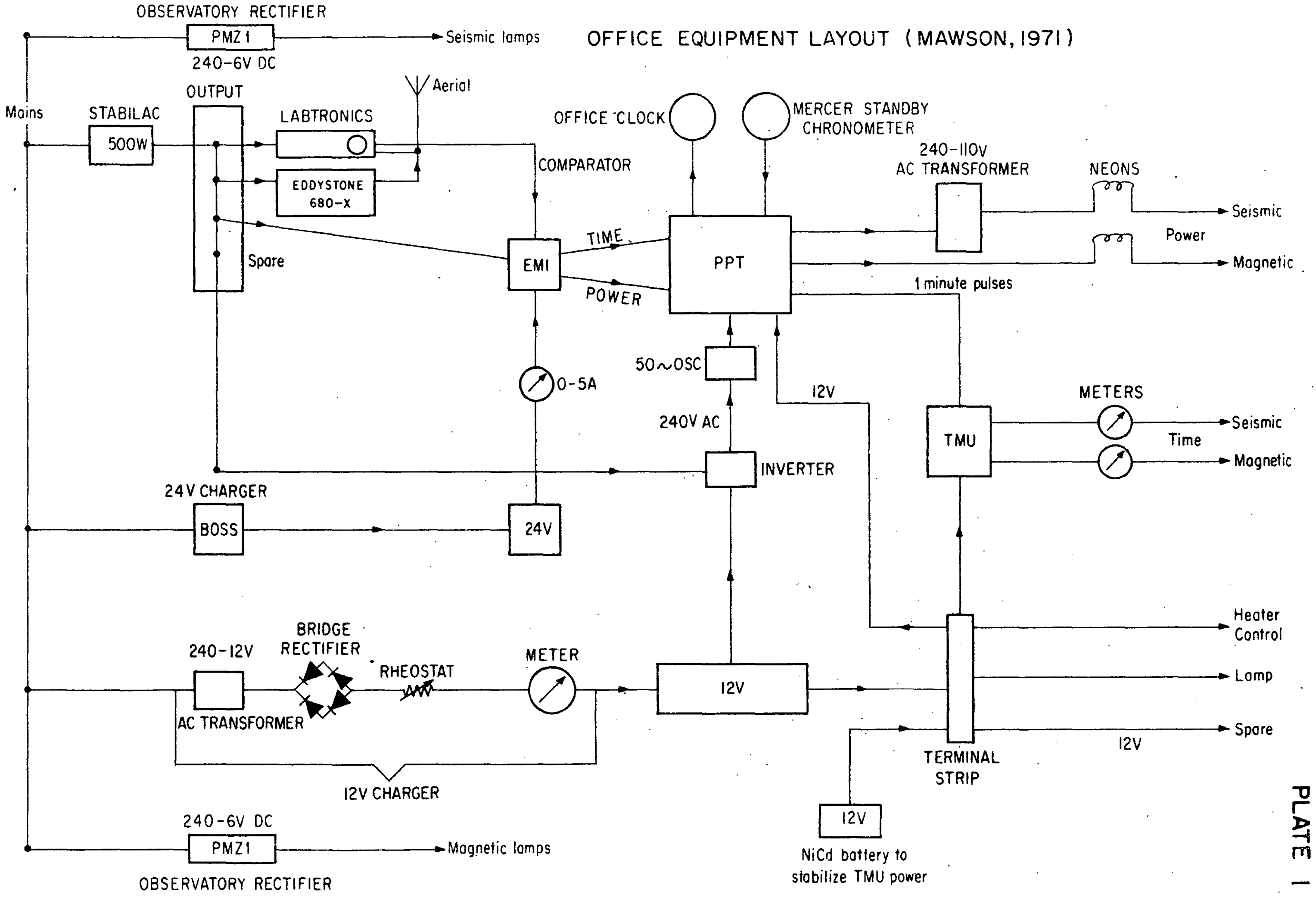
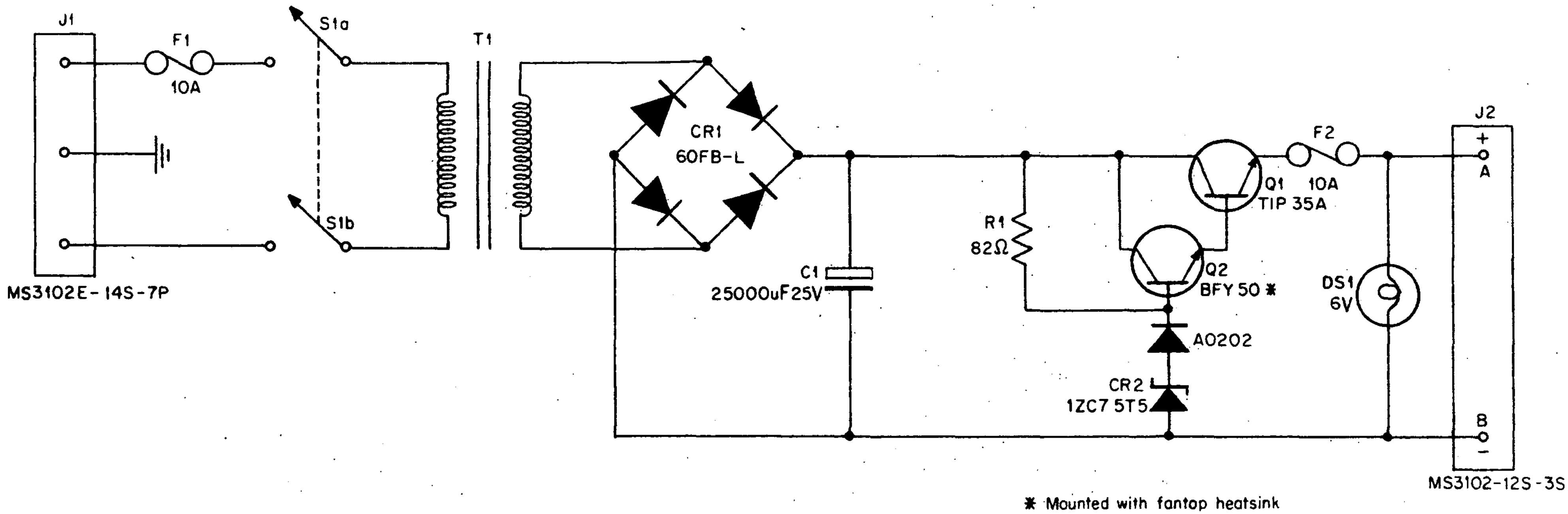


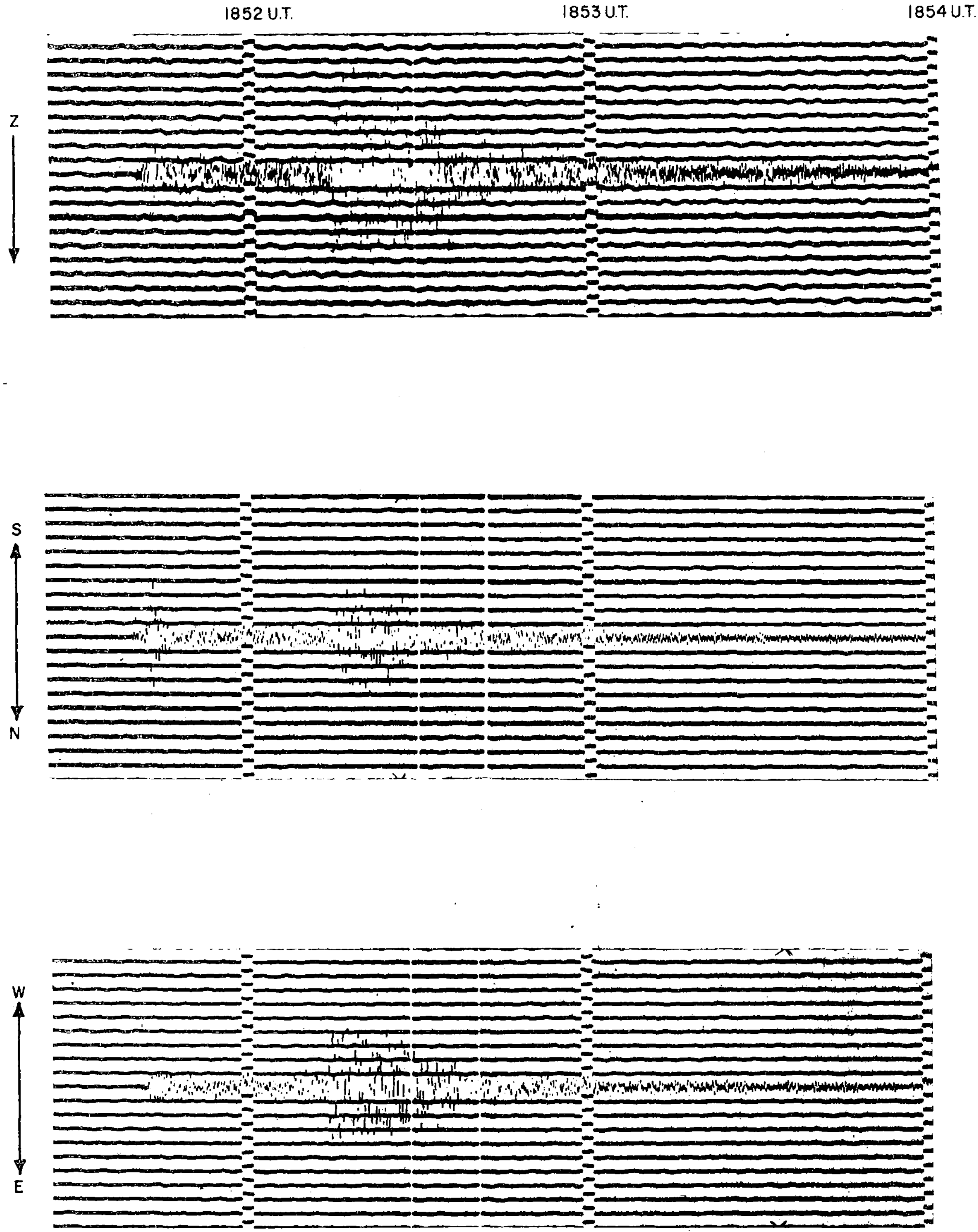
PLATE 1

ANT/B9-31A



OBSERVATORY RECTIFIER PMZ1 (MAWSON, 1971)

LOCAL EVENT — (19th APRIL 1971)



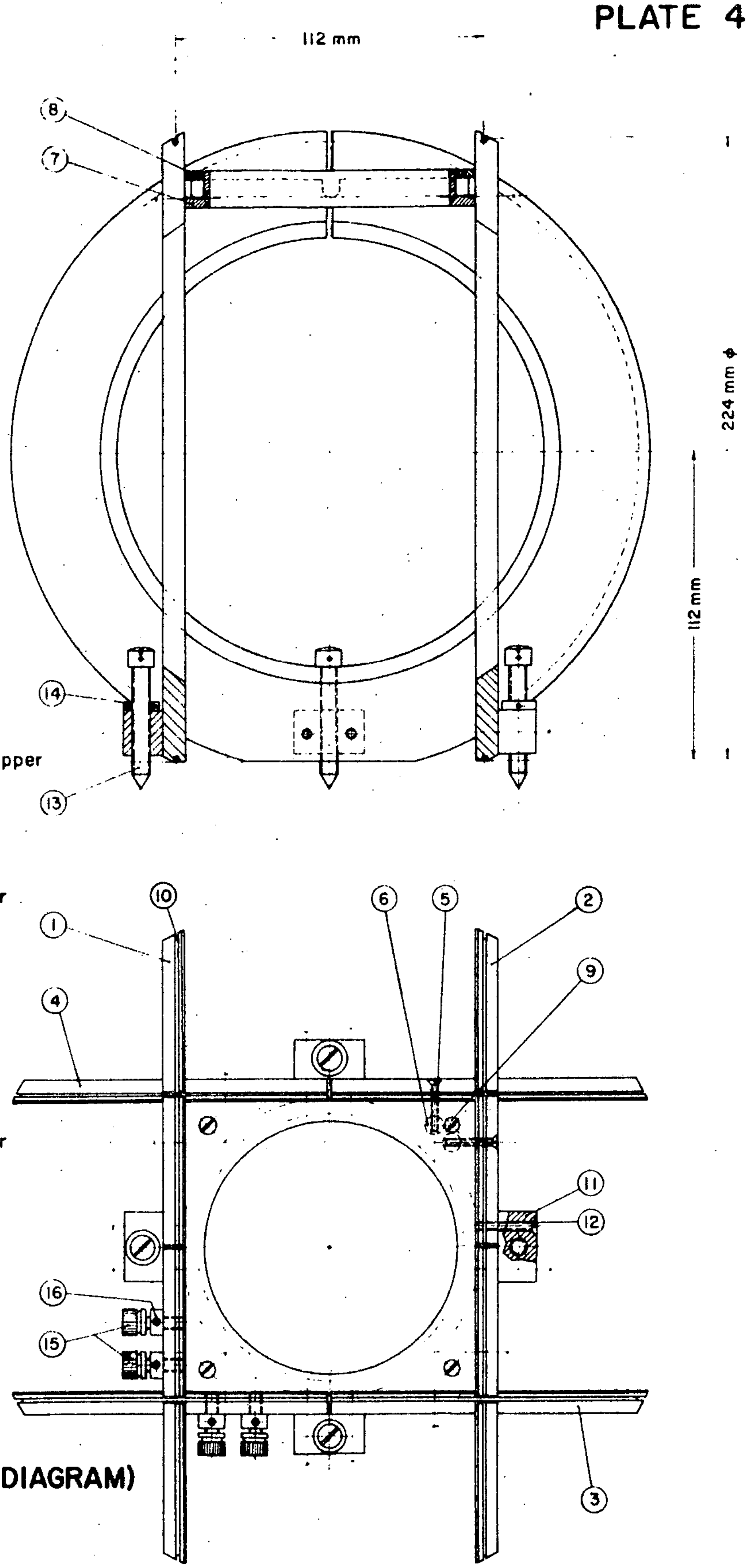
	Z	N-S	E-W
ATTENUATION	6	6	6

TIME CORRECTION IS ZERO

PLATE 4

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)