ROBERTSON RESEARCH (AUSTRALIA) PTY. LIMITED

REPORT NO. 509

PROJECT NO. 789/1039

NORTHERN TERRITORY EXPLORATION LICENCE 1484

ANNUAL REPORT UP TO 6.III.79

AND FINAL REPORT

by

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SUMMARY

Northern Territory Exploration Licence 1484 was taken up by the Sutton Group of Companies in 1978 as one of a group of tenements approximately coincident with Tipperary Pastoral Holding, which is also held by the Group. The relatively small tenement is on the northeastern flank of the Daly River Basin, in which early Palaeozoic sediments accumulated over Lower Proterozoic metasediments and Middle Proterozoic granites in the Pine Creek Geosyncline.

The tenement has been covered by an airborne spectrometer and magnetometer survey, flown by Aero Exploration Pty. Limited over the entire area of the Suttons group of tenements. All of the tenements were included also in a photogeological interpretation commissioned from R.F. Loxton, Hunting and Associates.

Because EL 1484 is on the periphery of the area of principal interest to the Group, and because of the generally negative results from the airborne survey over this tenement, EL 1484 was relinquished in March 1979 after twelve months' tenure.

1. INTRODUCTION

Northern Territory Exploration Licence (EL) 1484 is one of eight tenements (Table I) which were taken up in 1977 and 1978 by the Suttons Group of Companies over an area substantially coincident with the Pastoral Lease area of Tipperary Station (Figure 1). Tipperary Pastoral Lease is also owned by the Group. The generalised solid geology of the region is shown in Figure 2.

All of the Suttons tenements have been covered by an airborne magnetic and radiometric survey. A new photogeological map of the tenements was also commissioned from Loxton, Hunting and Associates. The northeastern of four photogeological maps produced by Loxton, Hunting contains EL 1484 and it is presented, with flightlines from the airborne survey, as Figure 3.

The eight tenements cover ground in the western parts of Australian National Grid map sheets SD/52-8 ("Pine Creek"; Malone, 1962) and SD/52-12 ("Fergusson River"; Pontifex and Mendum, 1972), with the greater part falling within the northern, Pine Creek, sheet. One tenement (EL 1597) extends west to overlap onto map sheet SD/52-11 ("Port Keats"; Morgan, 1972).

Primary access to the tenements is gained via the supply track serving Tipperary Station ($13^{\circ}44'$S., $131^{\circ}02'$E) from the all-weather Stuart Highway near Mount Shoobridge. From Tipperary itself, well-maintained station tracks offer ready access to most parts of the Licence areas.

There are relatively few impediments to off-road travel by four-wheel-drive vehicles within the tenements. Much of the area consists of undulating plains covered by open forest or scrub; sparse rocky hills are rarely higher than about 15 m above the soil flats, and occasional mesas have scarp faces up to about 6 m high. In the north of EL 1359, at the northern end of the group of tenements, a more rugged uplands topography has a relief of up to 60 m, with steep-sided hills and long ridges separated by narrow valleys. A partially-dissected tableland, in which deep erosion has created rough rocky hills, falls within some of the most westerly tenements, but in general this tableland is excluded from the licence areas. Scarp faces are not generally present on the eastern side of the tablelands adjacent to the tenements.

TABLE I

NORTHERN TERRITORY EXPLORATION-LICENCE AREAS
HELD BY THE SUTTON GROUP OF COMPANIES

EL NO.	NAME	AREA (km^2)	LICENCE	DATE GRANTED
1355	Tipperary	1226.2	Suttons Motors (Darwin) Pty. Ltd.	8.VII.77
1357	Daly River	865.9	Sydney Motor Auctions Pty. Ltd.	8.VII.77
1358	Fish River	494.0	Autopool Pty. Ltd.	8.VII.77
1359	Noltenius	946.1	Gilbert and Roach Pty. Ltd.	8.VII.77
1484	-	113.0	Suttons Motors (Chullora) Pty. Ltd.	6.III.78
1597	Chilling Creek	248.7	Autopool Pty. Ltd.	8.VII.77
1598	Allia Creek	132.6	Autopool Pty. Ltd.	8.VII.77
1724	-	39.9	Suttons Motors (Chullora) Pty. Ltd.	6.III.78
		4066.4		

2. GEOLOGY OF TIPPERARY STATION AREA

Stratigraphic units cropping out within and near the tenement areas are summarized in Table II. The following brief descriptions include the distribution of each unit within the group of eight tenements.

2.1 ARCHAEAN BASEMENT: HERMIT CREEK METAMORPHIC ROCKS

The Hermit Creek Metamorphic Complex includes migmatites, granulites, gneisses and schists which, although formerly metamorphosed to amphibolite grade, have suffered retrograde metamorphism to greenschist facies. The age of the retrogression is likely to be that of the 1800 m.y. prograde metamorphism of of the sediments of the Pine Creek Geosyncline. Archaean granites have intruded the metamorphic rocks, but they are not easily distinguished in the field from the later granites of the Litchfield Complex, within which the Archaean rocks are now enclosed as rafts, inliers or pendants. For clarity, the entire Litchfield Complex outcrop area is identified as Archaean in the geological map accompanying this appraisal (Figure 2).

Neither the Archaean rocks nor the main massifs of the Litchfield Intrusive Complex crop out extensively within the Suttons EL areas, but they are close to them on their western side and the westernmost EL (1597) extends onto the Litchfield Complex. To the north of the tenements, Archaean rocks are seen in the Rum Jungle and Waterhouse Complexes, which are mantled gneiss domes forming inliers within the Pine Creek Geosyncline. Rocks of the Rum Jungle Complex have been dated at 2550 m.y. (Walpole *et al.*, 1968). On the eastern side of the Geosyncline, analogous inliers of Archaean rocks crop out, indicating that the Geosyncline is shallow, and probably underlain everywhere by a continuous Archaean Shield with an irregular palaeorelief surface.

2.2 LOWER PROTEROZOIC: PINE CREEK GEOSYNCLINE

In their comprehensive review of the sediments of the Pine Creek Geosyncline, Walpole *et al.* (1968) defined four time-rock groups which reflect conditions of sedimentation in different parts of the geosyncline. Sedimentation, in turn, reflected the structure and palaeorelief within the composite trough.

TABLE II

STRATIGRAPHY OF THE TIPPERARY STATION REGION, NORTHERN TERRITORY

AGE		UNIT	SYMBOL	LITHOLOGY
CAINOZOIC			Cz	Mud, silt, colluvium; thin sand; etc.
		(Three post-Cretaceous erosion cycles)	Czl	Detrital and late laterite
CRETACEOUS		Mullaman Beds	Klm	Sandstone; shale, conglomerate, porcellanite; much lateritization
unconformity				
ORDOVICIAN-CAMBRIAN	Daly River Group	Oolloo Limestone	Olo	Silicified limestone; chert bands
		Jinduckin Formation	C/olj	Ferruginous sandstone, siltstone with halite pseudomorphs; silicified and dolomitic limestone; marl
		Tindall Limestone	Cmt	Black crystalline limestone; chert bands and nodules; some clastic interbeds
unconformity				
LOWER CAMBRIAN		Antrim Plateau Volcanics	Cla	Basalt, dolerite, tuffaceous sandstone; basal arkosic quartzite
		Witch Wai, Jarong Conglomerates	Clw	Conglomerate, sandstone
unconformity				
ADELAIDEAN	Tolmer Group	Waterbag Creek Formation	Rug	Ferruginous sandstone; siltstone; silicified limestone, marl; halite pseudomorphs
		Hinde Dolomite	Ruh	Dolomite, dolomitic limestone; locally silicifie
	Buldiva Sandstone	Stray Creek Sandstone Member	Ruy	Quartz-sandstone; minor siltstone, shale
		Depot Creek Sandstone Member	Ruo	Quartz sandstone, locally silicified

(TABLE II (Continued)

AGE		UNIT	SYMBOL	LITHOLOGY
EARLY CARPTENTARIAN INTRUSIVE ROCKS		Reynolds River Granite	Pge	Granodiorite to granite
		Soldiers Creek Granite	Pgs	
		Titree Granophyre	Pgi	
		Litchfield Complex	Pgl	
LOWER PROTEROZOIC	intrusive contact	Zamu Complex	Pdo	Dolerite
		Chilling Sandstone	Plh	Quartz-sandstone
		*Berinka Volcanics	Pli	Intermediate to acid lavas and tuffs
	Finiss River Group	Burrell Creek Formation	Plb	Greywacke, siltstone, greywacke-siltstone
		Noltenius Formation	Pln	Quartz-greywacke, siltstone, conglomerate
	unconformity			
ARCHAEAN		Hermit Creek Metamorphics	Ah	Migmatite, quartzite, granulite, schist.

*Not known within Exploration Licence areas described in this report. Acid volcanic rocks, not shown on published maps, are present in the vicinity of the Daly River copper mine.

On and near Tipperary Station, the exposed sediments of the Pine Creek Geosyncline belong to the Finniss River Group. They are the Noltenius and Burrell Creek Formations, which are believed to represent the second phase of sedimentation into the geosyncline; to be derived from source areas west of the trough; and to be restricted to the geosyncline's western side. Initial sedimentation in the western part of the trough near the tenements resulted in deposition of the Batchelor Group (derived from the west) and of the Goodparla Group (derived from the east). Following uplift on the western side of the fault zone (Giants Reef Fault) believed to form the western margin of the geosyncline, the rocks of these two earlier depositional facies were then overlain, partially disconformably and partially gradationally, by the sediments of the Finniss River Group.

The rocks of the Finniss River Group are tightly folded, and faulting is common within them. They were regionally metamorphosed to greenschist facies at approximately 1800 m.y.; within EL 1359, locally higher grade metamorphism produced mica-schist and andalusite-mica-schist.

Walpole et al. regarded the Noltenius Formation as the near-shore facies of Finniss River Group sedimentation. It contains cobble and pebble conglomerates, greywacke and quartz greywacke, and siltstone and claystone. It appears to grade laterally eastwards into the relatively distal sediments of the Burrell Creek Formation, which is composed of generally fine-grained greywacke and siltstone, with neither conglomerate horizons nor conspicuously graded bedding. However, more recent investigations in the Rum Jungle area have shown that the Burrell Creek and Noltenius Formations are not simple divisions of the Finniss River Group, but they are complexly interbedded and grade imperceptibly into each other (Ingram et al, 1974). This situation is probably found also in the northern part of EL 1359 and the eastern part of EL 1598, the only parts of the tenements in which the Finniss River Group is exposed.

Near the Suttons tenements, the Noltenius Formation grades upwards into the Chilling Sandstone, which in this area, is regarded as part of the Pine Creek Geosynclinal sequence. (Farther west, there is a sharp facies change between the Noltenius Formation and the Chilling Sandstone on the Chilling Platform, outside the geosynclinal limits). The Chilling Sandstone is a typically medium-grained, ripplemarked quartz sandstone containing rare pebble conglomerate horizons, and like the Finniss River Group its provenance was west of the Pine Creek Geosyncline.

The Berinka Volcanics, which crop out near but not within EL 1597, are believed to be intercalated within the Noltenius Formation although the relationship has not been conclusively demonstrated. The volcanic rocks include intermediate to acid flows and pyroclastic horizons.

The sediments within the Pine Creek Geosyncline have been intruded by Lower Proterozoic basic sills and other minor intrusions, most of which are now seen as amphibolite following low-grade regional metamorphism. Part of only one restricted exposure of these Zamu Complex rocks is inferred within the tenements from photointerpretation; it is at the eastern edge of EL 1598.

As noted above, the Finniss River Group is exposed within the northern part of EL 1359, where both the Burrell Creek Formation and the Noltenius Formation, as mapped in the 1960's, are present. Chilling Sandstone, in association with relatively subordinate exposures of rocks of the Noltenius Formation, crops out in EL 1597; Noltenius Formation is also exposed in the eastern part of EL 1598 in association with the photointerpreted exposure of basic intrusive rocks of the Zamu Complex.

2.3 EARLY CARPENTARIAN GRANITES

Rather small plutons of granitic rocks of early Carpentarian age are present within EL 1359, and others are partially within EL's 1358, 1597 and 1598. These rocks are generally massive and coarse-grained or porphyritic, the main local exception being the Titree Granophyre of southern EL 1597. The intrusions which were intruded discordantly or partially concordantly into the rocks of the Pine Creek Geosyncline, have been isotopically dated at 1760 m.y. by Compston (Walpole et al., 1968, p. 286).

The relatively extensive granite mass of the Litchfield Complex, flanking the tenement areas to the west, is regarded as partly an early Carpentarian intrusion like the smaller bodies. However, it contains rafted Archaean migmatites, and this massif contains Archaean granites as well as the Carpentarian material. In Figure 1, the Litchfield Complex is identified wholly as Archaean, to simplify the presentation of surface geology.

2.4 DALY RIVER BASIN

The Daly River Basin contains Adelaidean (upper Proterozoic) to Ordovician sediments, the former resting with marked unconformity on the sediments of the Pine Creek Geosyncline and the Carpentarian granites intruding them. Within the relatively undeformed and unmetamorphosed Daly River sediments, unconformities are present above the Adelaidean sequence and above the Lower Cambrian Antrim Plateau Volcanics.

The Adelaidean rocks constitute an arenite-carbonate-lutite assemblage known as the Tolmer Group. The basal Buldiva Sandstone is a shallow marine deposit, subdivided into the underlying Depot Creek Sandstone Member and the overlying Stray Creek Sandstone Member; the latter contains interbedded lenses of siltstone which are not present in the lower unit. Both members are up to about 300 m thick. In spite of the large time-break inferred at the unconformity below these rocks, there are only rare conglomeratic lenses in the Depot Creek Sandstone Member, and those that are known are all at the base of the sequence and contain only pebbles of local origin. The Buldiva Sandstone is overlain by the Hinde Dolomite, a generally massive dolomite noted for its content of algal structures (Collenia); the dolomite is up to 60 m thick. It is succeeded by the Waterbag Creek Formation, the highest in the Tolmer Group. It consists of up to possibly 150 m of ferruginous sandstone and variegated siltstone with lenses of silicified limestone and marl. The sandstone and siltstone contain halite pseudomorphs.

The Tolmer Group crops out very extensively in EL's 1357 and 1358, and also in the western part of EL 1359.

The unconformity above the Waterbag Creek Formation is marked by occasional pockets of boulder-conglomerate up to 10 m thick, below the Lower Cambrian Antrim Plateau Volcanics. One such pocket of Witch Wai Conglomerate is partially within EL 1357, and another (Jarong Conglomerate) is adjacent to EL 1598. The Antrim Plateau Volcanics are composed of massive and vesicular tholeiitic basalts; there are some intercalated sandstones, and volcanic conglomerate, conglomerate or arkose have been noted from place to place at the bottom of the volcanic succession.

Up to 60 m of volcanics appear to be present near the Suttons Group tenements, although thicknesses elsewhere may be much greater (about 1000 m); the basalts crop out very extensively south of the EL's. Their eruptive centres are not known but they may be localized along the Halls Creek Mobile Zone, where the greatest thicknesses of lava are present.

The Antrim Plateau Volcanics are extensively exposed in EL's 1357, 1358, and western EL 1359.

Sedimentation in the Daly River Basin was completed after the eruption of the Volcanics by the subsequent deposition of the Cambrian to Ordovician Daly River Group. The basal member of the Group, the Middle Cambrian Tindall Limestone, is a fine-grained to coarsely crystalline limestone up to 150 m thick, containing lenses of sandstone and siltstone and also bands and lenses of chert. It is succeeded by the siltstones, ferruginous sandstones, and carbonates of the 200-m-thick Jinduckin Formation, and these in turn are overlain by flaggy silicified limestone (Oolloo Limestone) which has a similar thickness.

The Daly River Group forms large exposure-areas within EL's 1355, 1357, and 1358, and it extends north into EL 1359 and east into EL's 1484 and 1724.

2.5 MESOZOIC TO RECENT ROCKS

Throughout the Suttons Group tenements, generally horizontally stratified sandstones, siltstones and shales of Cretaceous age remain as mesas. It is believed that there is a passage upwards from freshwater to marine sediments in these strata, which unconformably overlie the older rocks. From place to place, there is a considerable variation in the levels of the surfaces covered by these Mullaman Beds. Since the Mesozoic, the area has been subjected to at least three erosional cycles, with consequent deep weathering of the near-surface rocks (weathering may be expected to have affected most exposures not subjected to active erosion, to depths of up to 100 m). Laterite and soil profiles, and alluvium, colluvium, talus and sand accumulations have developed, probably mostly during the Quaternary.

3. MINERALISATION IN TIPPERARY STATION AREA

Three instances of minor surface mineralisation are known within the Suttons tenement areas.

3.1 BARITE-FLUORITE-LEAD-ZINC

The Northern Territory Geological Survey reports (Lau, 1977) four separate occurrences of barite and fluorite, with minor sphalerite and galena, within an area of about 2.5 km x 1 km, about 15 km south of Tipperary Homestead within EL 1355. These occurrences are within the Middle Cambrian to Lower Ordovician Daly River Group. Although outcrop in the general vicinity is generally poor, it is believed that the occurrences are in the middle to upper part of the Middle Cambrian Tindall Limestone.

3.2 COPPER

Minor copper mineralisation is known near the bottom of the Antrim Plateau Volcanics, 21 km west-north-west of Tipperary Homestead (Walpole et al., 1968, p. 99). Malachite and azurite occur in basalt near the contact with underlying ferruginous sandstone, probably belonging to the Waterbag Creek Formation. Similar small copper shows are not uncommon outside the tenements, in places where the bottom of the volcanics is exposed; also Traves (1955), describing an area well to the west of the Suttons tenements, records minor copper mineralisation within the main mass of the lava pile.

3.3 MANGANESE

EL 1724, in the north-east of the group of tenements, probably covers some of the small manganese prospects recorded by Walpole et al. (1968, p. 232) in the Green Ant Creek area. These occurrences are irregular bodies of low-grade manganese ore at the unconformity below the Cretaceous Mullaman Beds, where they overlie steeply-dipping siltstones and greywackes of the Burrell Creek Formation. Walpole et al. indicate that the mineralisation probably formed by replacement of siltstone horizons in the Burrell Creek Formation, suggesting that it is pre-Cretaceous in age.

A total of 540 tons of ore was taken from this field for use at the Rum Jungle treatment plant, but the occurrence is believed to lack any present or future economic potential.

4. EXPLORATION BY SUTTONS GROUP OF COMPANIES

Suttons initiated its exploration of the tenements by commissioning the following investigations, which covered also ground between and adjacent to the EL's:

(i) Geological photointerpretation (J.B. Jeppe, R. F. Loxton, Hunting and Associates);

(ii) Airborne magnetic and gamma-radiation survey (Aero Exploration Pty. Ltd.);

(iii) Consultant's general assessment (Barrie, 1978)

4.1 GEOLOGICAL PHOTOINTERPRETATION

J. B. Jeppe of R. F. Loxton, Hunting and Associates, was commissioned to prepare a photogeological study of the area of Tipperary Pastoral Holding. The exercise was carried out in order to provide a detailed information base for the planning of mineral exploration in the area, and also for the planning of agricultural and pastoral development. The study, covering 5,600 km^2, used Division of National Mapping RC9 black-and-white photography (1962; 1:80,000). The study covers four map-sheets, of which the northeastern one forms Figure 3 of this report. The work was principally directed towards differentiation of the Cambro-Ordovician strata, rather than the relatively minor outcrop areas of Middle and Upper Proterozoic rocks.

4.2 AIRBORNE MAGNETIC AND GAMMA-RADIATION SURVEY

This survey was flown by Aero Exploration Pty. Ltd. (partly owned by the Suttons Motors Group) under the general direction of John Barrie, then consultant to the Group. Equipment specifications were as follows:

AIRCRAFT	Twin Pioneer
MAGNETOMETER	Varian V85, resolution 0.1 gamma
SPECTROMETER	Hamner (Harshaw Chemical Company, U.S.A.) 18,533 cm^3 crystal; differential analysis by windows; Lancer data acquisition system; Brush 6-channel and Hewlett-Packard 2-channel recorders

NAVIGATION, FLIGHTLINE RECOVERY	Bendix DR 12a Doppler; Kearfott master gyro; continuous 35 mm strip-film camera; Honeywell radar altimeter

The survey was flown in September and October 1977. Information was produced along a total of about 14,500 line-km, on about 150 flightlines. Nominal altitude over ground surface was 300 ft. (90 m). Flightlines were spaced at a nominal half-mile (800 m) with 25 percent allowance for quarter-mile (400 m) fill-in flightlines, which were subsequently flown along the edge of the Daly River Basin, over the Upper Proterozoic exposure areas, and along the Giants Reef Fault.

The information collected in 1977 comprises:

Complete magnetic-tape records
Complete print-out of magnetic tape
Analog profiles for magnetometer, altitude, and gamma-radiation channels total count, thorium, uranium, potassium (TC, Th, U, K) (Appendix I)
Detailed magnetic profiles of most lines (Appendix I)
Flightline plots on 1:88,000 black-and-white aerial photographs

Some data have been affected by equipment malfunction. During only the early part of the survey, test runs showed that the Th channel responded to a U source, and that the U channel responded to a K source (responses were also obtained in the correct channels). The Doppler navigation equipment failed on several occasions, at which times sampling occurred at 1-second intervals instead of intervals (ranging from 0.7 to 1 second) depending on aircraft speed.

4.3 GAMMA-RADIOMETRIC SURVEY RESULTS

The data on profiles and magnetic tapes are "raw". Background correction was applied to the gamma-radiation channels by zeroing them at 2000 ft (600 m) altitude relative to ground level, but compton-scatter and altitude corrections have not been applied to the collected information.

The airborne-radiometric information has not been computer-processed. Preliminary subjective analysis of the data resulted in definition of a number of uranium and thorium anomalies, of which very few were near the eastern side of the block of tenements. In particular, no clearly-defined uranium anomalies are present in EL 1484 and in southeastern EL 1355; in EL 1724, one uranium anomaly was noted in the eastern central part of the tenement, but it was not among those selected for ground follow up.

The following observations are of interest:

(i) Different rock-types generally have different characteristic radiometric-background signatures. These background levels agree with those shown on the B.M.R. reconnaissance radiometric maps.

(ii) Some Carpentarian granites are characterized by high background U, Th and K.

(iii) Very small, but persistent, U anomalies are present along the unconformity between Upper and Lower Proterozoic successions.

4.4 MAGNETIC SURVEY RESULTS

Magnetic data were collected on all flightlines. (The magnetic information collected on early flightlines is shown on charts separate from those on which radiometric and altitude data are presented.) The magnetic data have been subjected to preliminary examination, with observation of background levels, changes in background levels and zones of magnetic noise. The available information correlates well with magnetic-profile data published by the Bureau of Mineral Resources.

CONCLUSIONS

EL 1484 is on the eastern periphery of the area selected by the Suttons Group for investigation. The airborne and photogeological surveys have produced no information which indicates that farther work on the tenement is justified, and application has been made to relinquish the tenement in March 1979.

REFERENCES

BARRIE, J., 1978. An appraisal of the mineral potential of Tipperary Station, N.T. Consultant's Rep. to Suttons Motors Management, 37 p. (unpubl.).

INGRAM, J.A., JOHNSON, K., and CRICK, I.H., 1974. Rum Jungle and Western Pine Creek Geosyncline, Bur. Miner. Resour. Aust. Rep., 74/189, 68-74.

LAU, G.C., 1977. Barite-fluorite-zinc-lead mineralisation in the Tipperary area, Daly River Basin. Dep. N.T., Mines Branch, geol. Surv. Rec., 1977/4, 6 p.

MALONE, E.J., 1962. Pine Creek, N.T. - 1:250,000 Geological Series. Bur. Miner. Resour. Aust. explan. Notes, SD/52-8.

MORGAN, C.M., 1972. Port Keats, N.T. - 1:250,000 Geological Series. Bur. Miner. Resour. Aust. explan. Notes, SD/52-11.

PONTIFEX, I.R. and MENDUM, J.R., 1972. Fergusson River, N.T. - 1:250,000 Geological Series. Bur. Miner. Resour. Aust. explan. Notes, SD/52-12.

TRAVES, D.M., 1955. The geology of the Ord-Victoria region, Northern Australia. Bur. Miner. Resour. Aust. Bull., 27.

WALPOLE, B.P., CROHN, P.W., DUNN, P.R., and RANDAL, M.A. 1968. Geology of the Katherine-Darwin Region, Northern Territory. Bur. Miner. Resour. Aust. Bull., 82, 304 p. (2 vols.)

APPENDIX I

ANALOGUE PROFILES, AIRBORNE SURVEY OVER EL 1484

Seven traces on the charts represent, from top to bottom:

Magnetometer

Flight Altitude

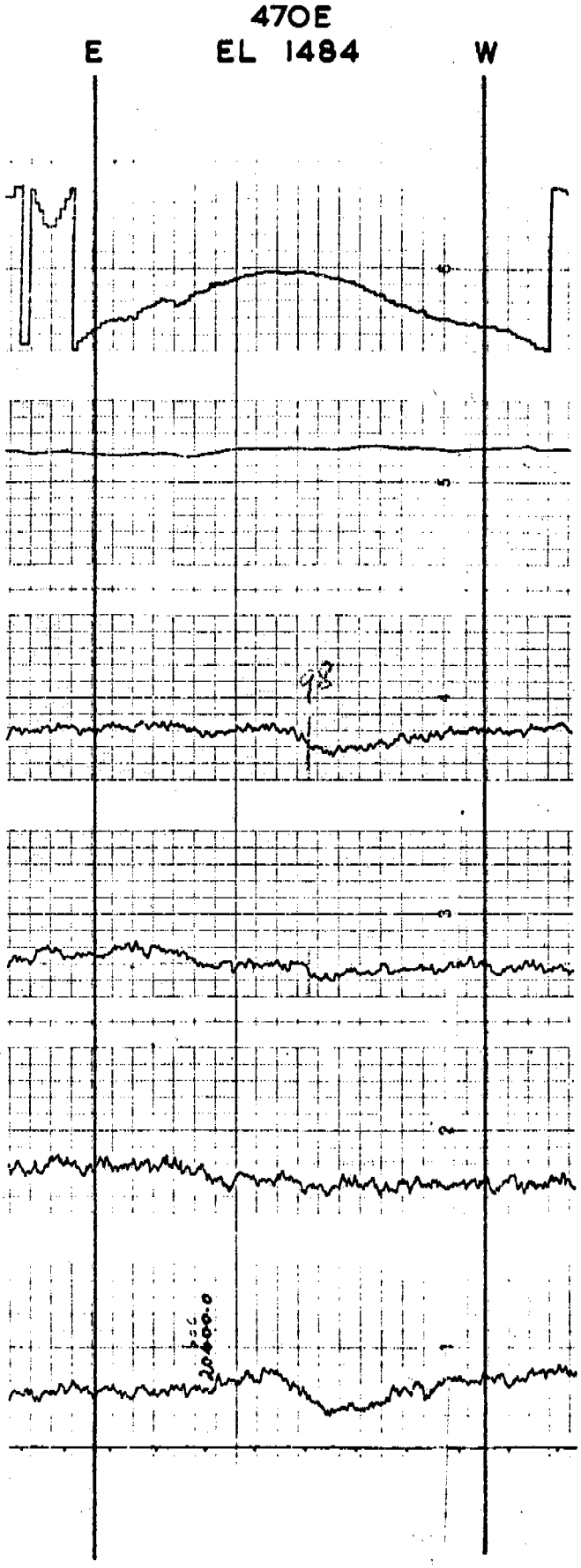
Gamma-radiation, total count

Gamma-radiation, uranium channel

Gamma-radiation, thorium channel

Gamma-radiation, potassium channel

Ground-location camera trip interval; selected frames identified by number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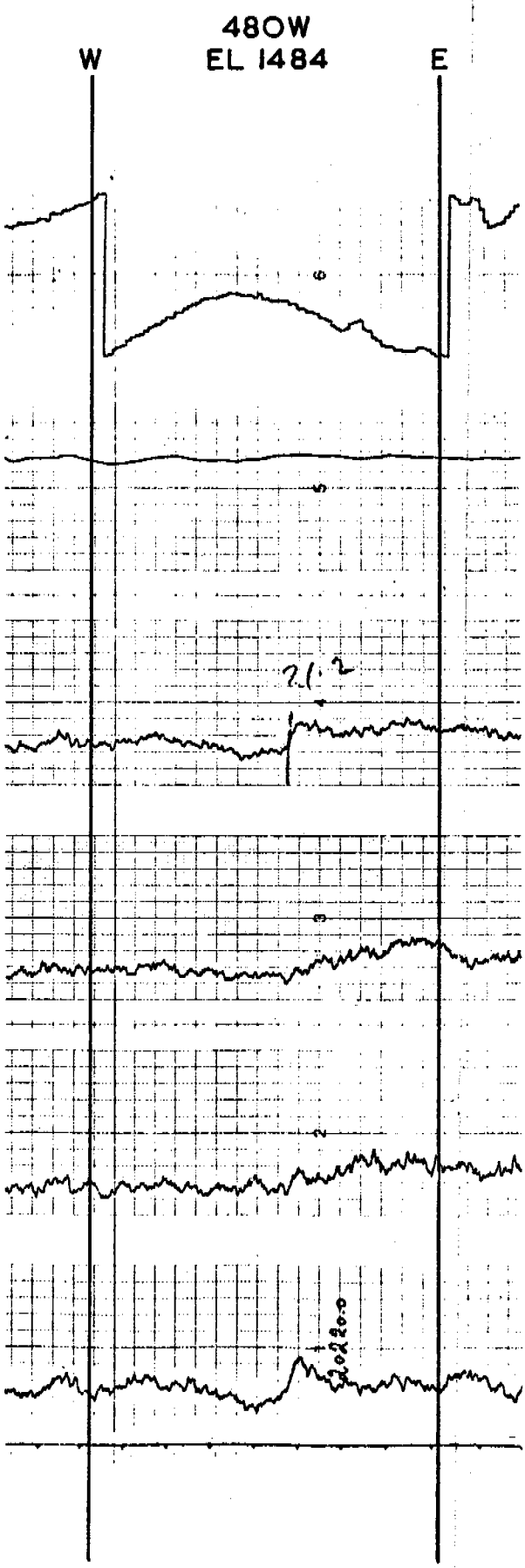
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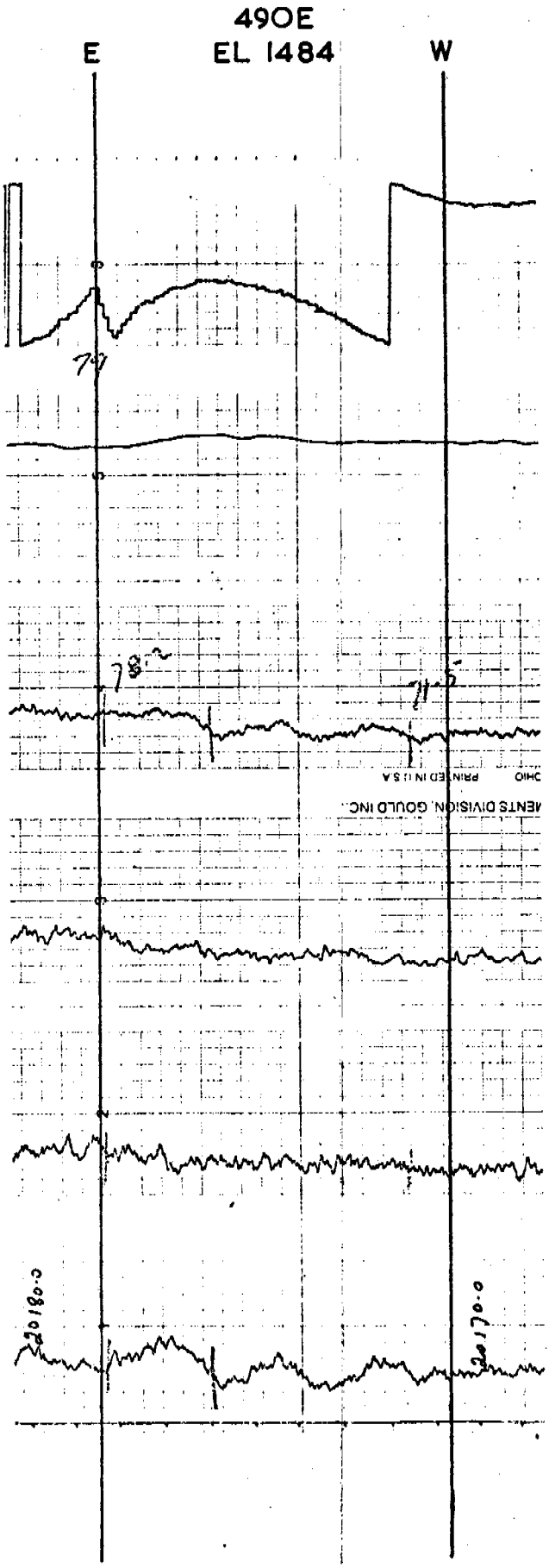
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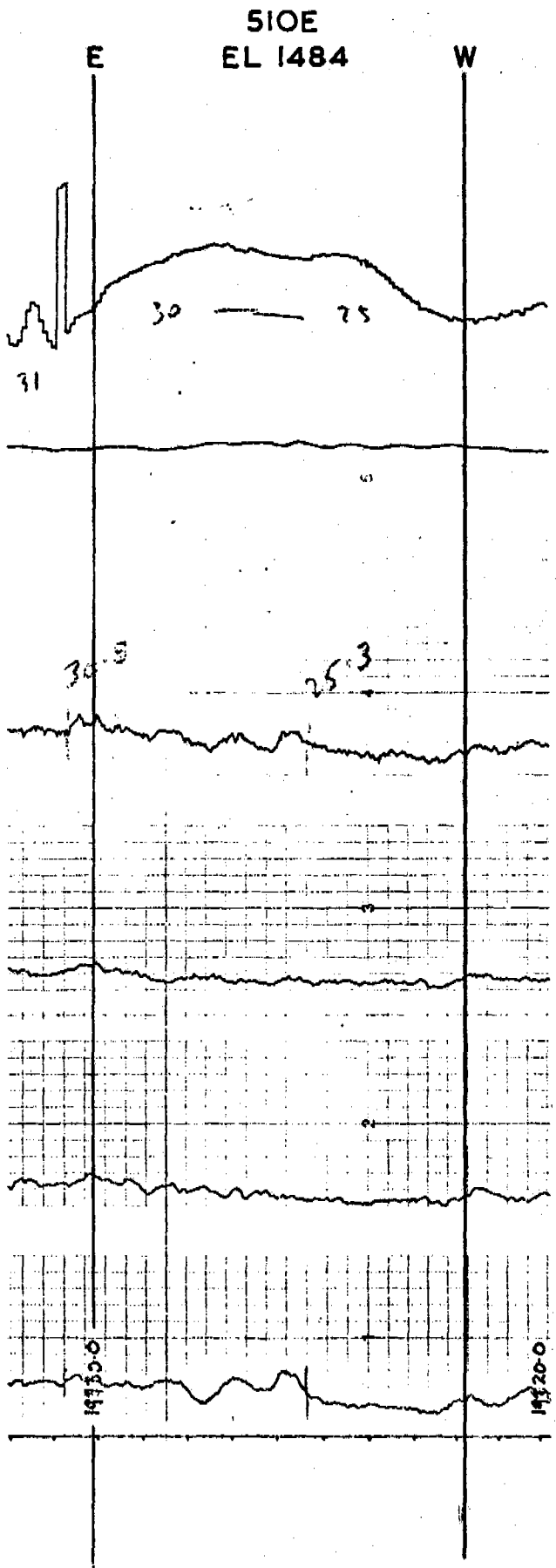
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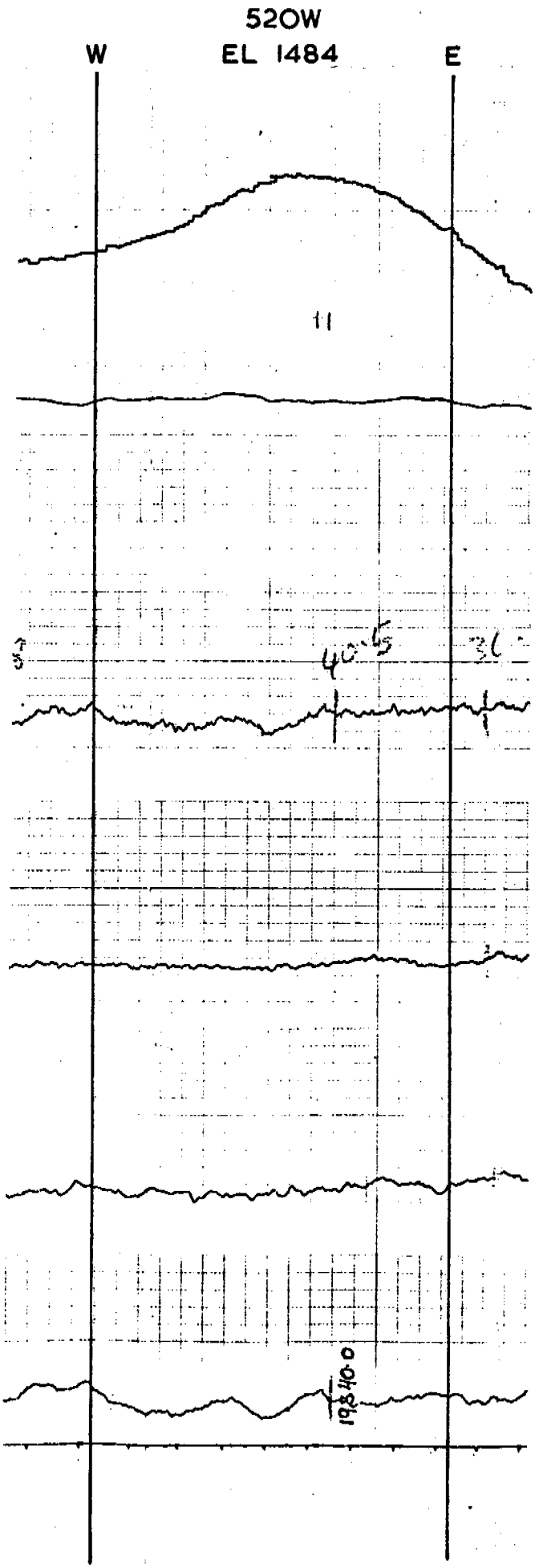
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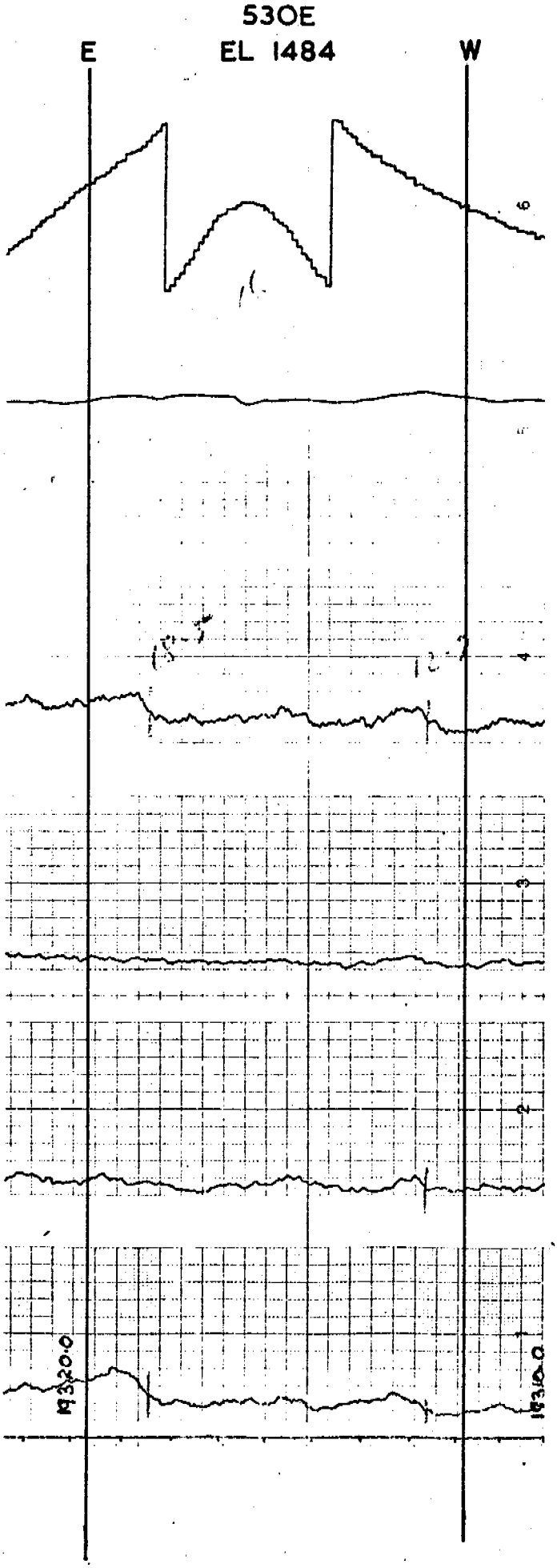
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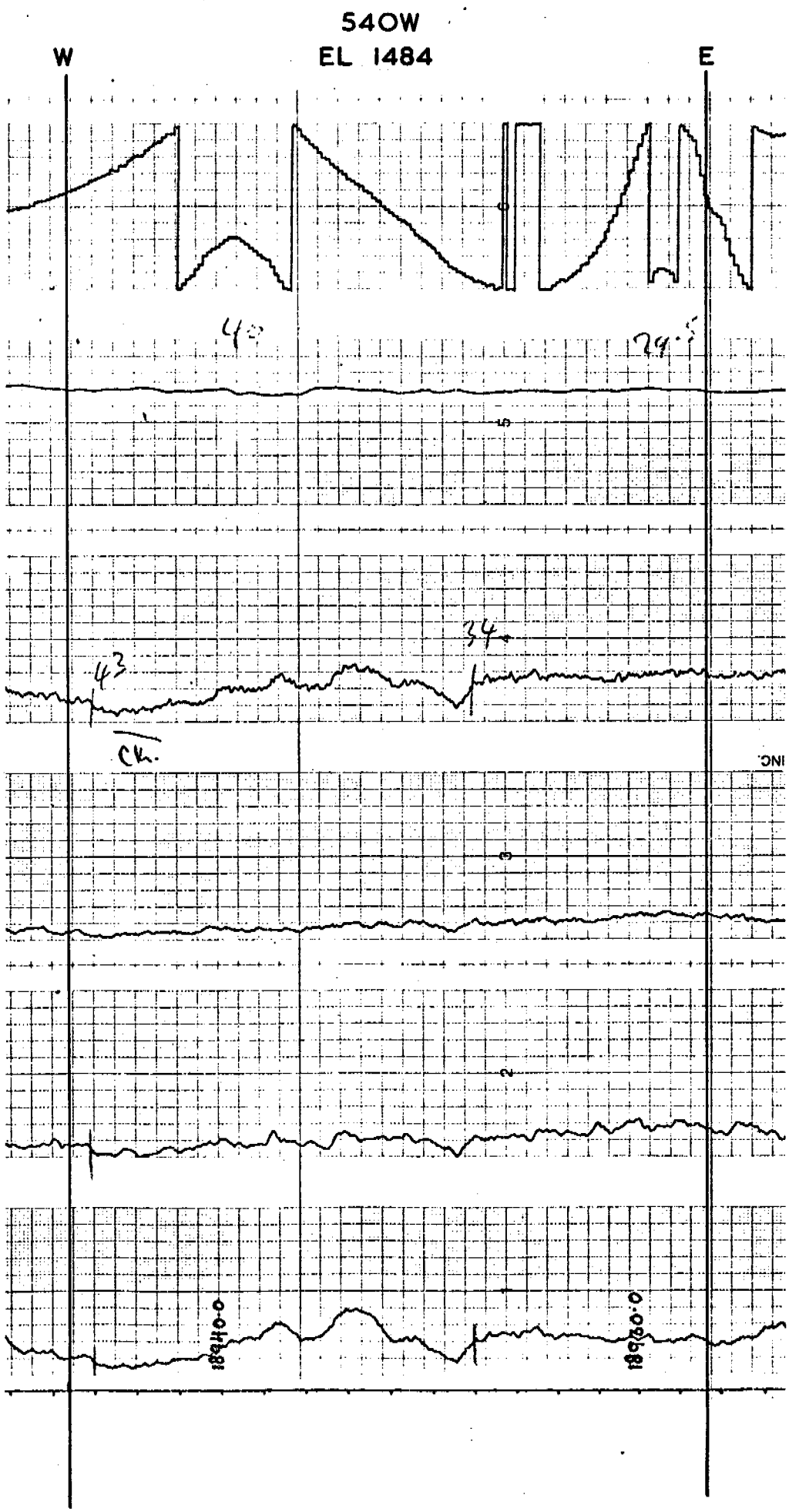
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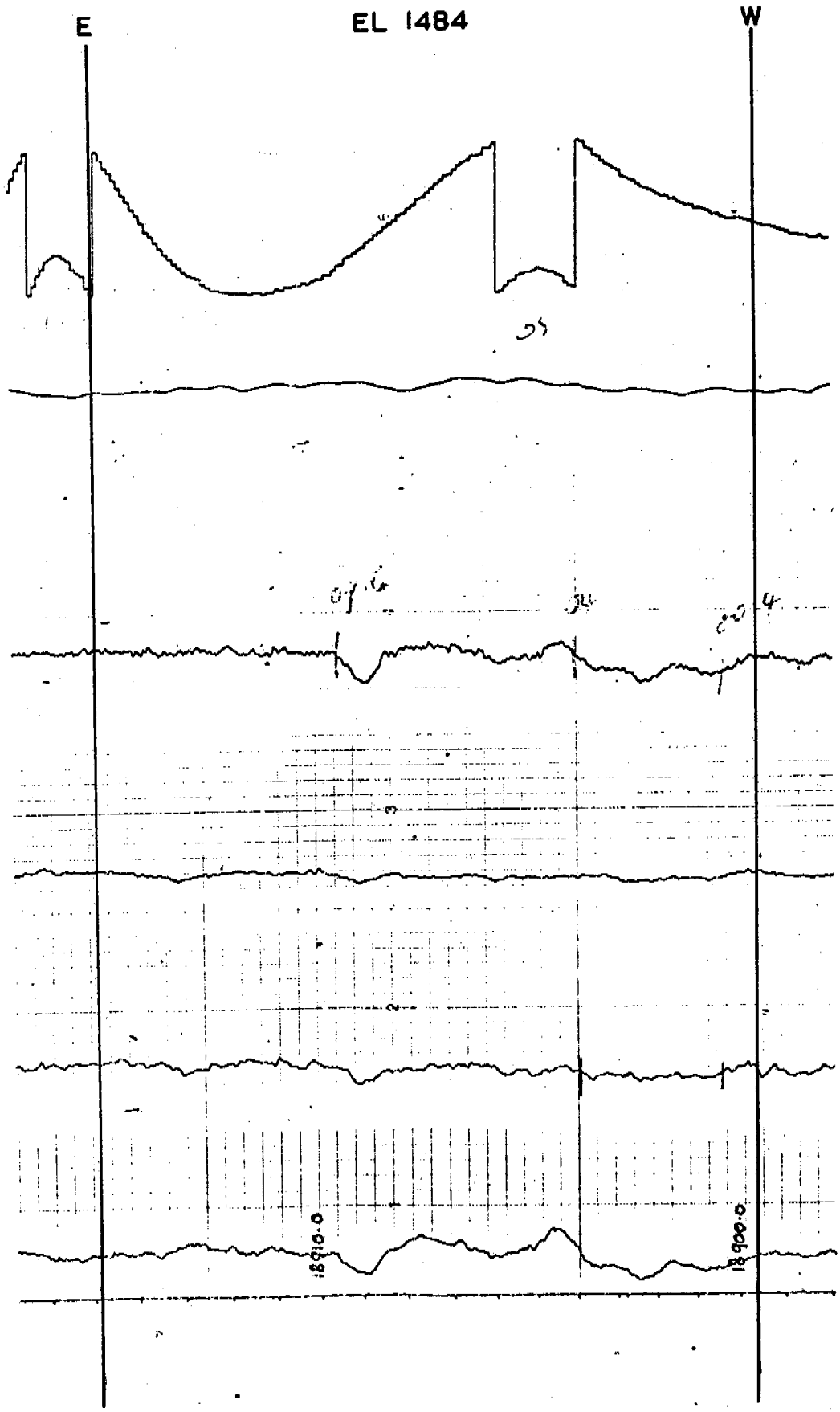
550E
EL 1484
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W
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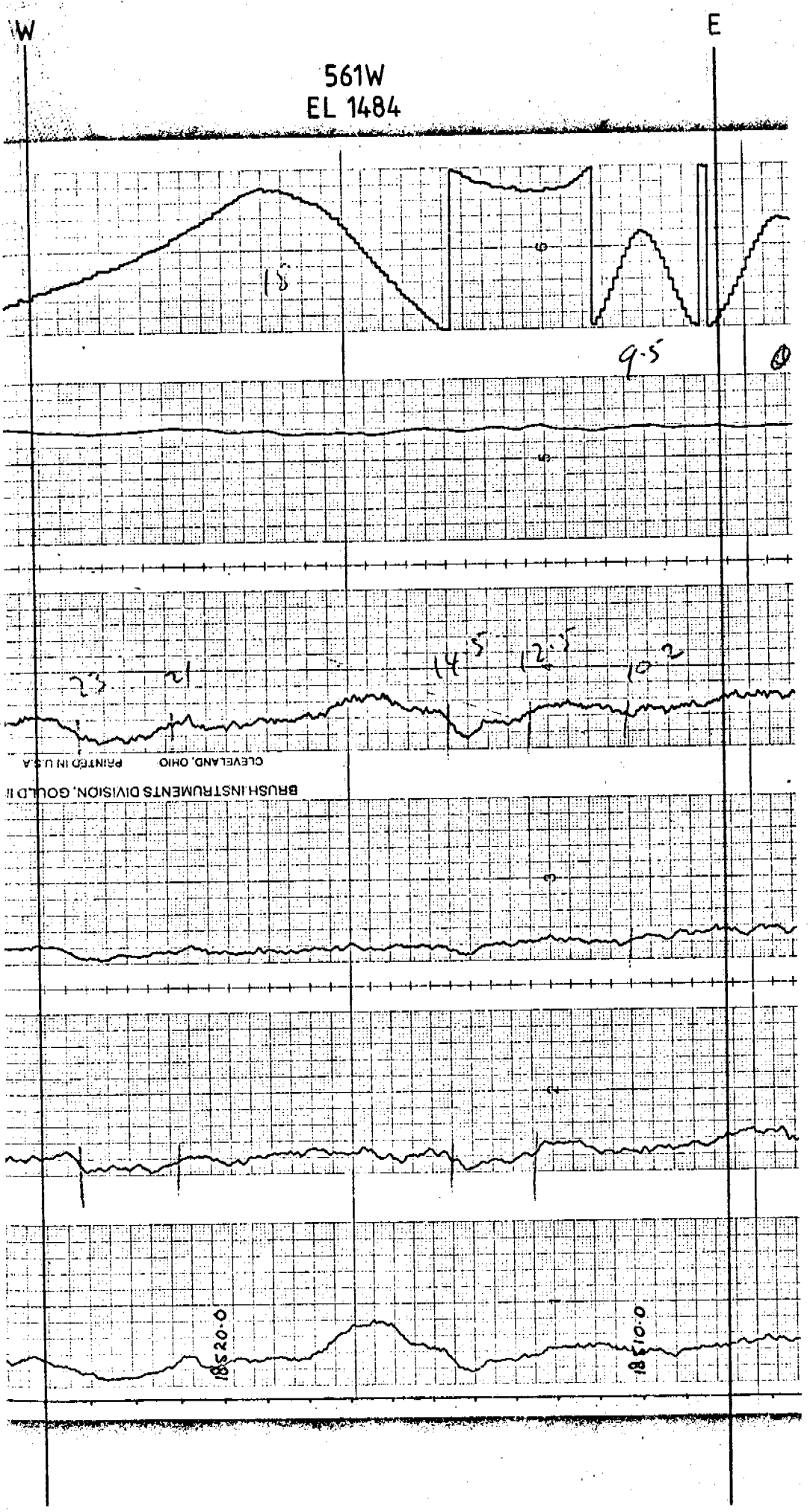
W
E
561W
EL 1484
15
9.5
14.5
12.5
10.2
CLEVELAND, OHIO
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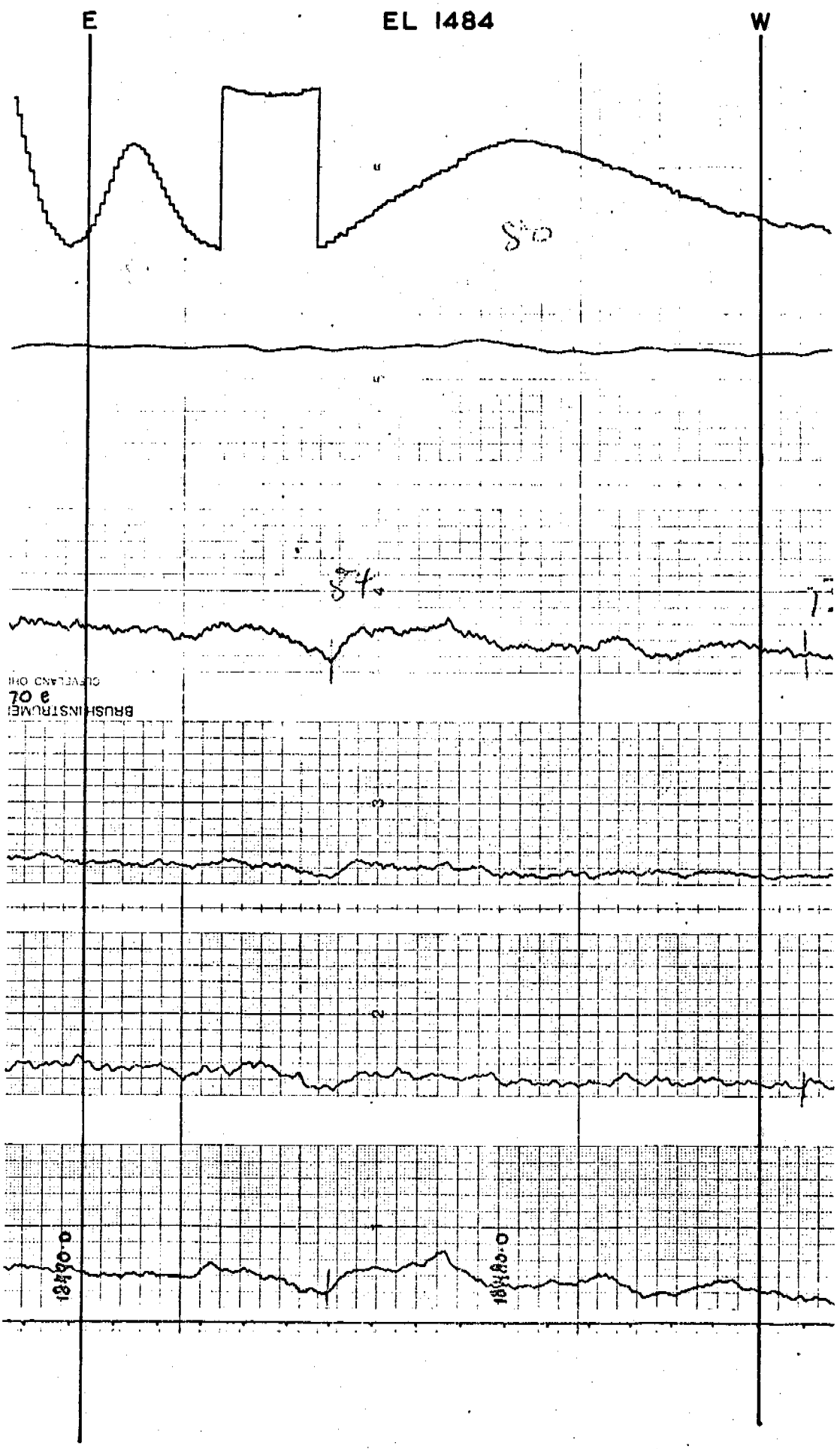
BRUSH INSTRUMENTS DIVISION, GOULD I
1820.0
1810.0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W
S°D
S°4
BRUSH INSTRUMENTS
CLEVELAND OHIO
3
2
1
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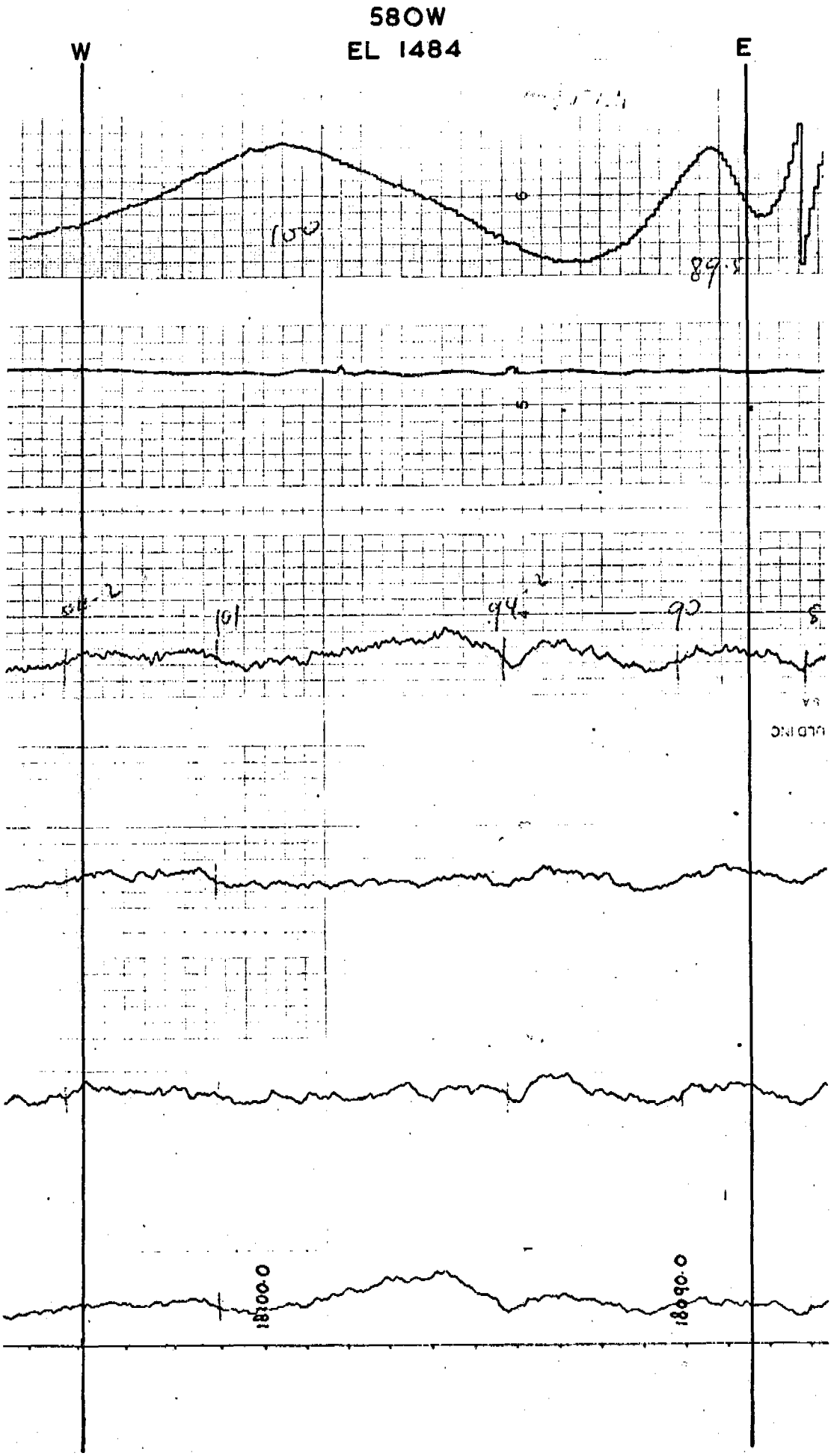
1800.0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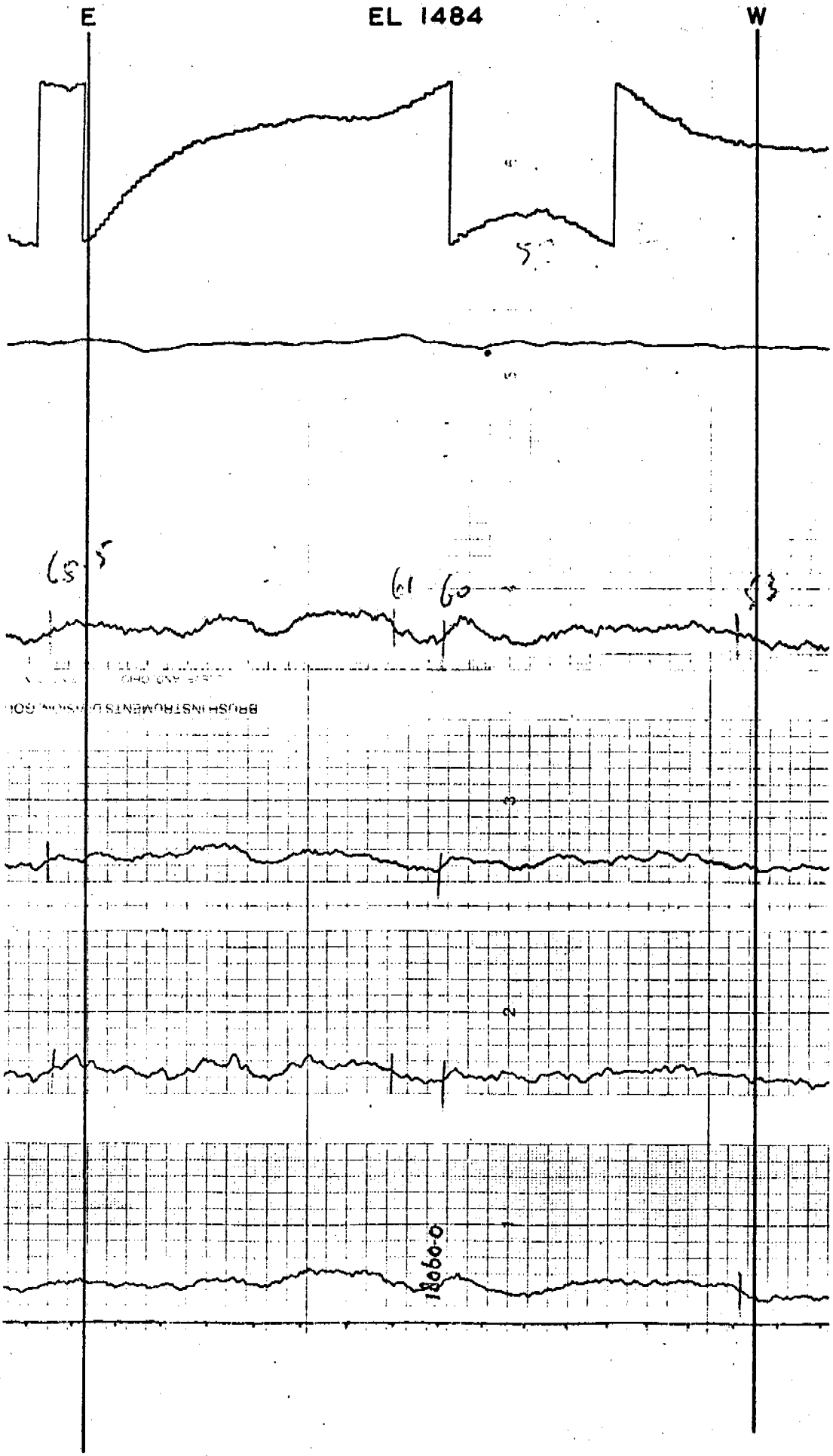
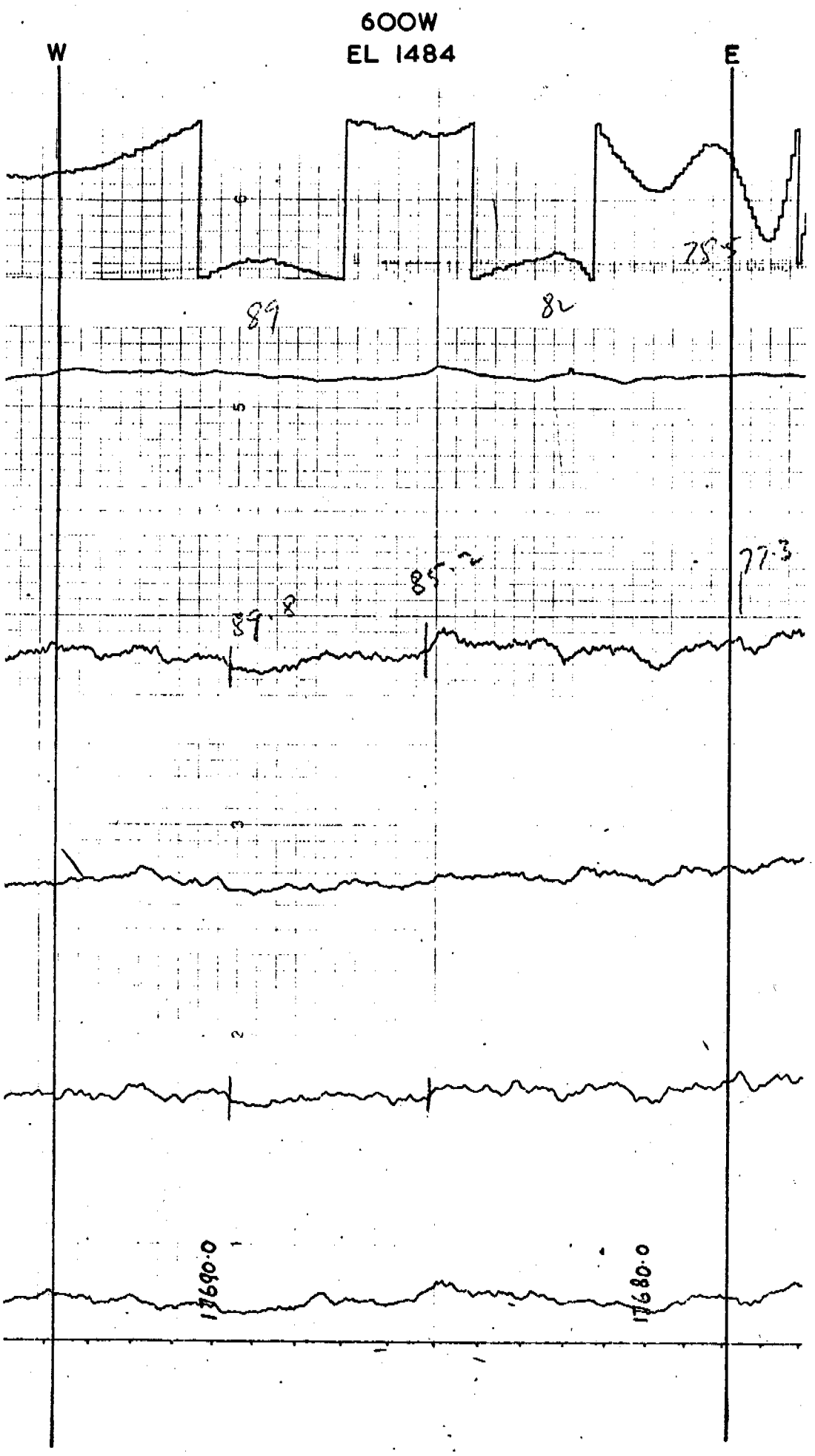
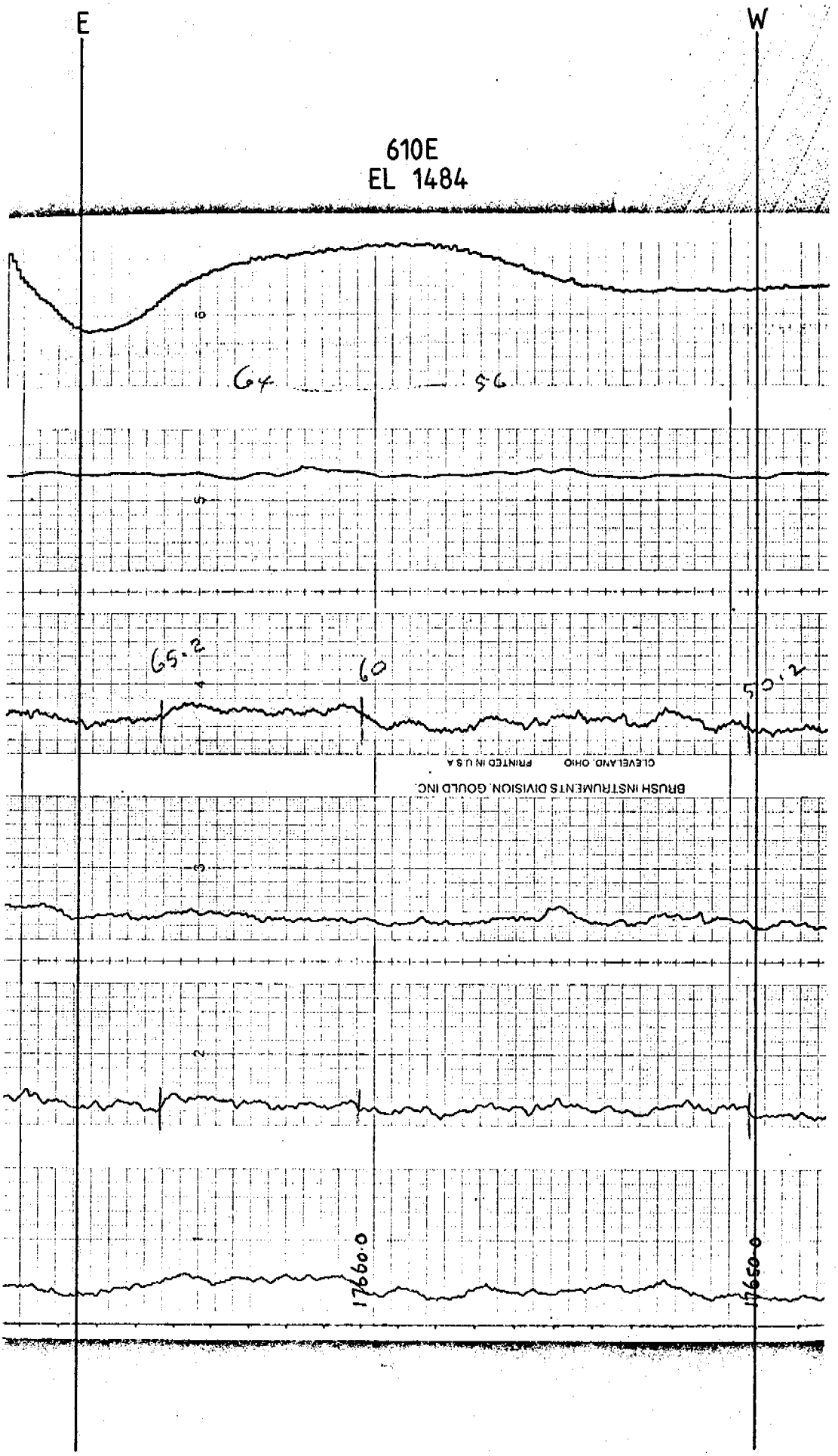

590E
EL 1484
E
W
65
61
60
53
18060-0


600W
EL 1484
W
E
89
82
78.5
77.3
89.8
85.2
17690.0
17680.0


E
W
610E
EL 1484
64
56
65.2
60
50.2
BRUSH INSTRUMENTS DIVISION, GOULD INC.
CLEVELAND, OHIO
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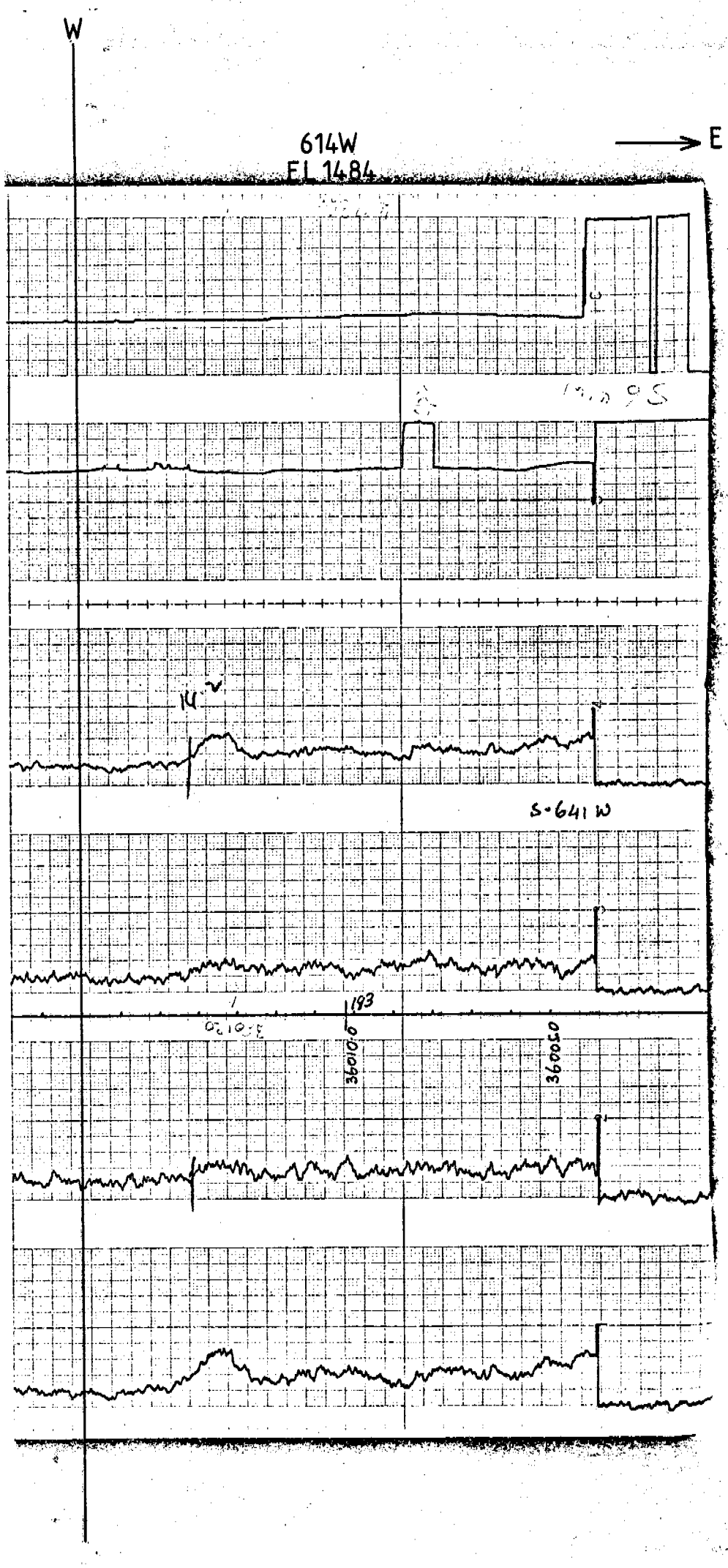
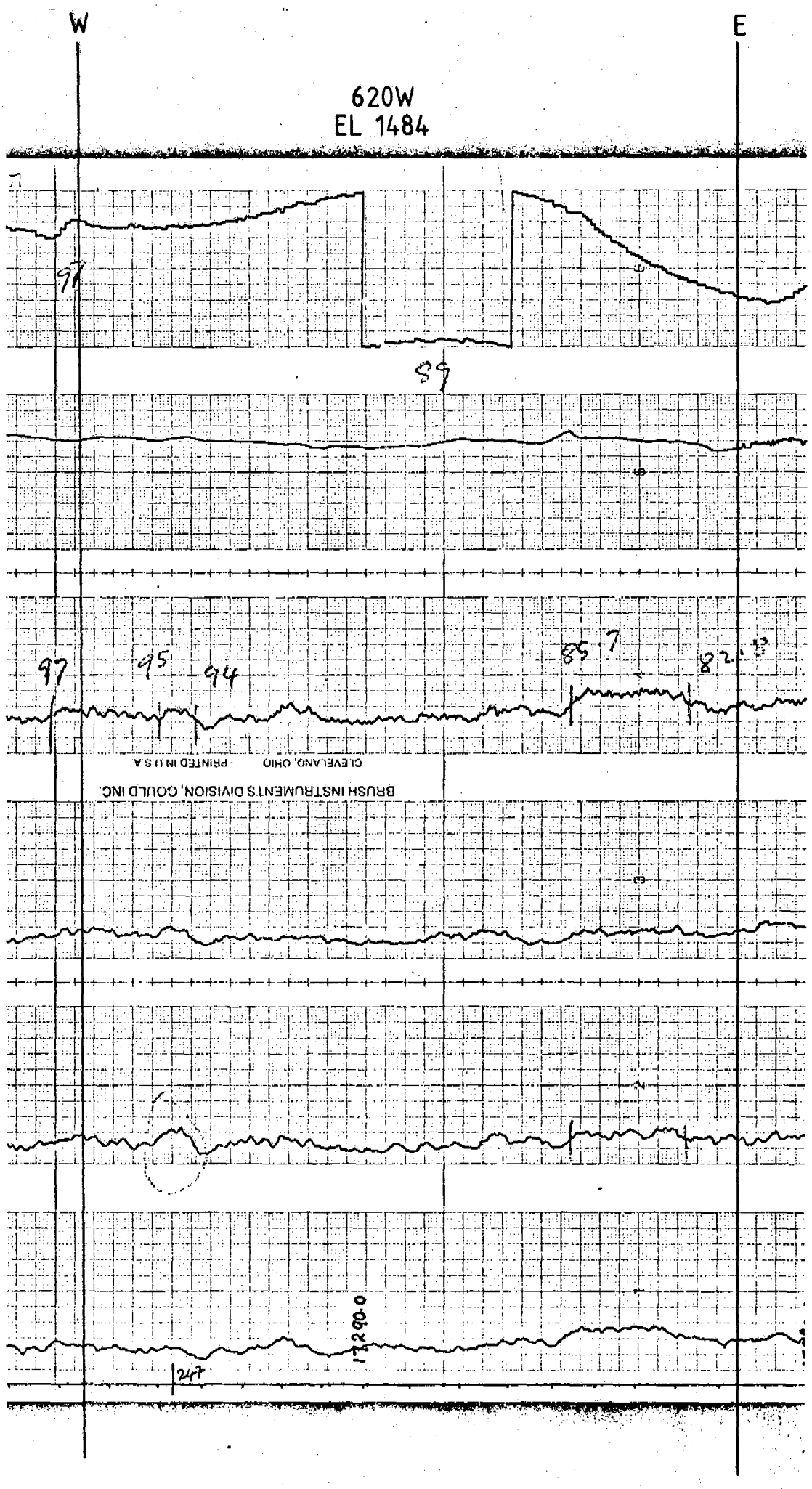
17660.0
17650.0


W
614W
EL 1484
E
S-641 W
193
360100
360050


W
E
620W
EL 1484
97
99
97
95
94
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82.
1290.0
247
BRUSH INSTRUMENTS DIVISION, GOULD INC.
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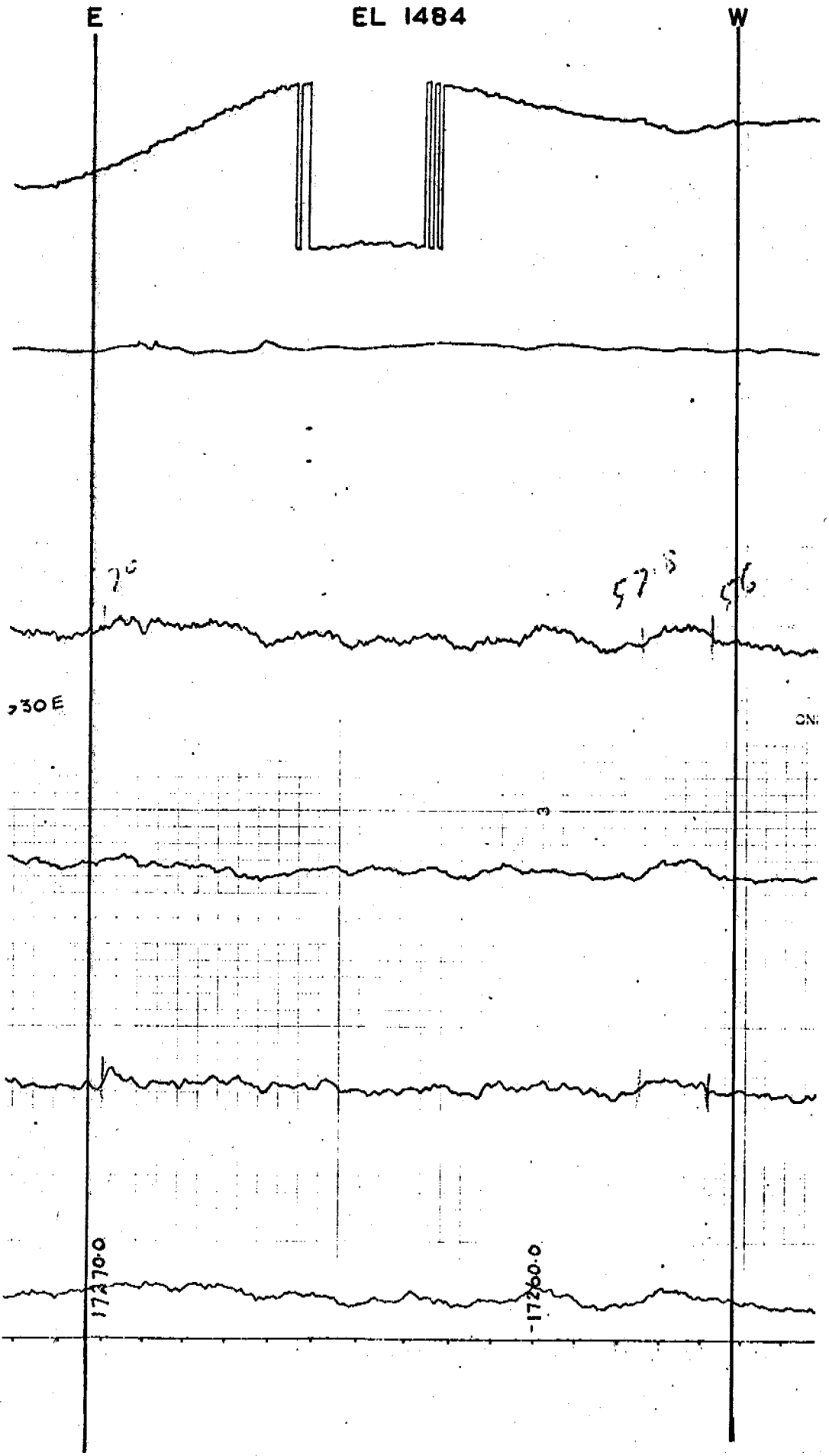
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EL 1484
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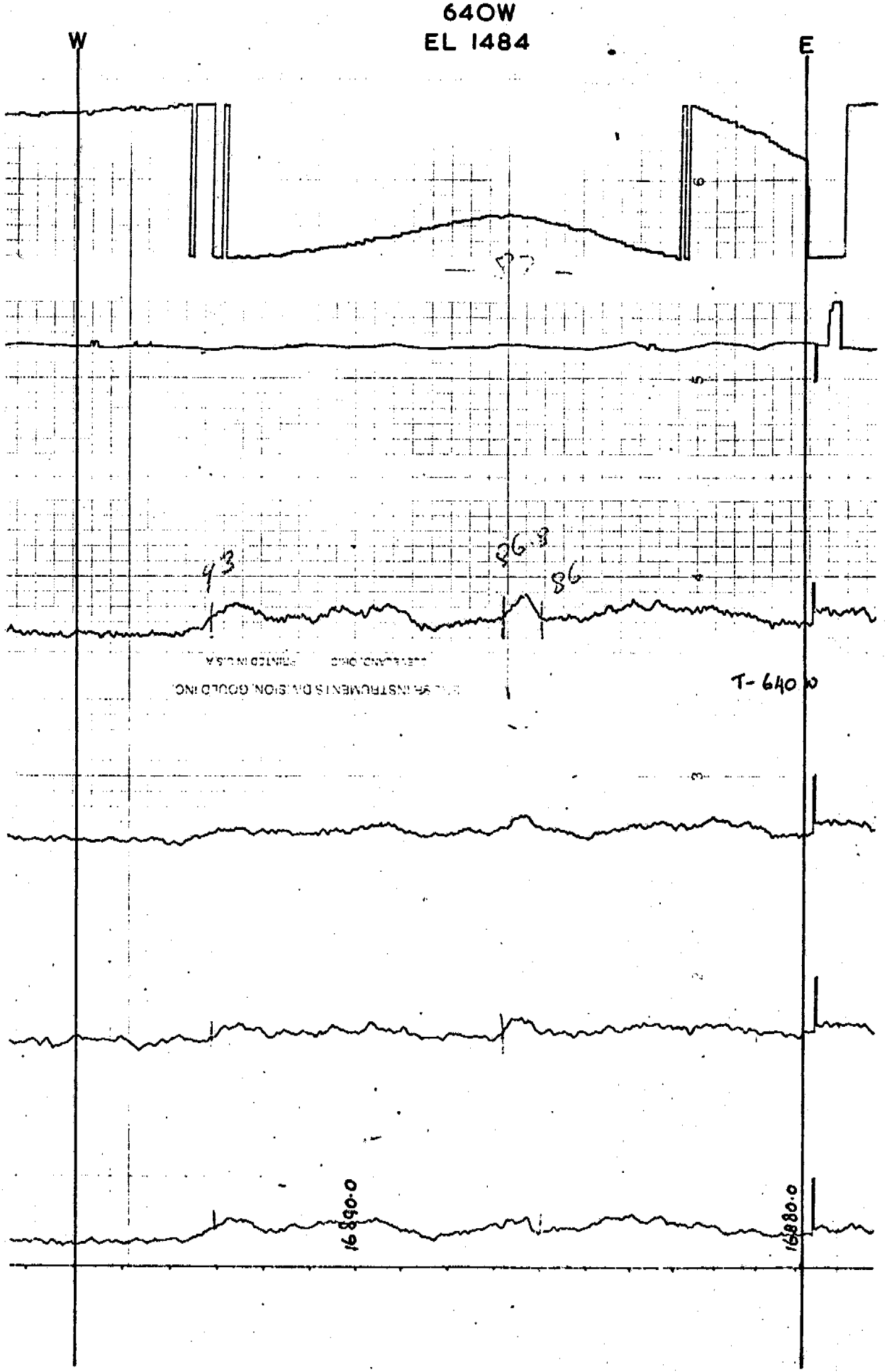
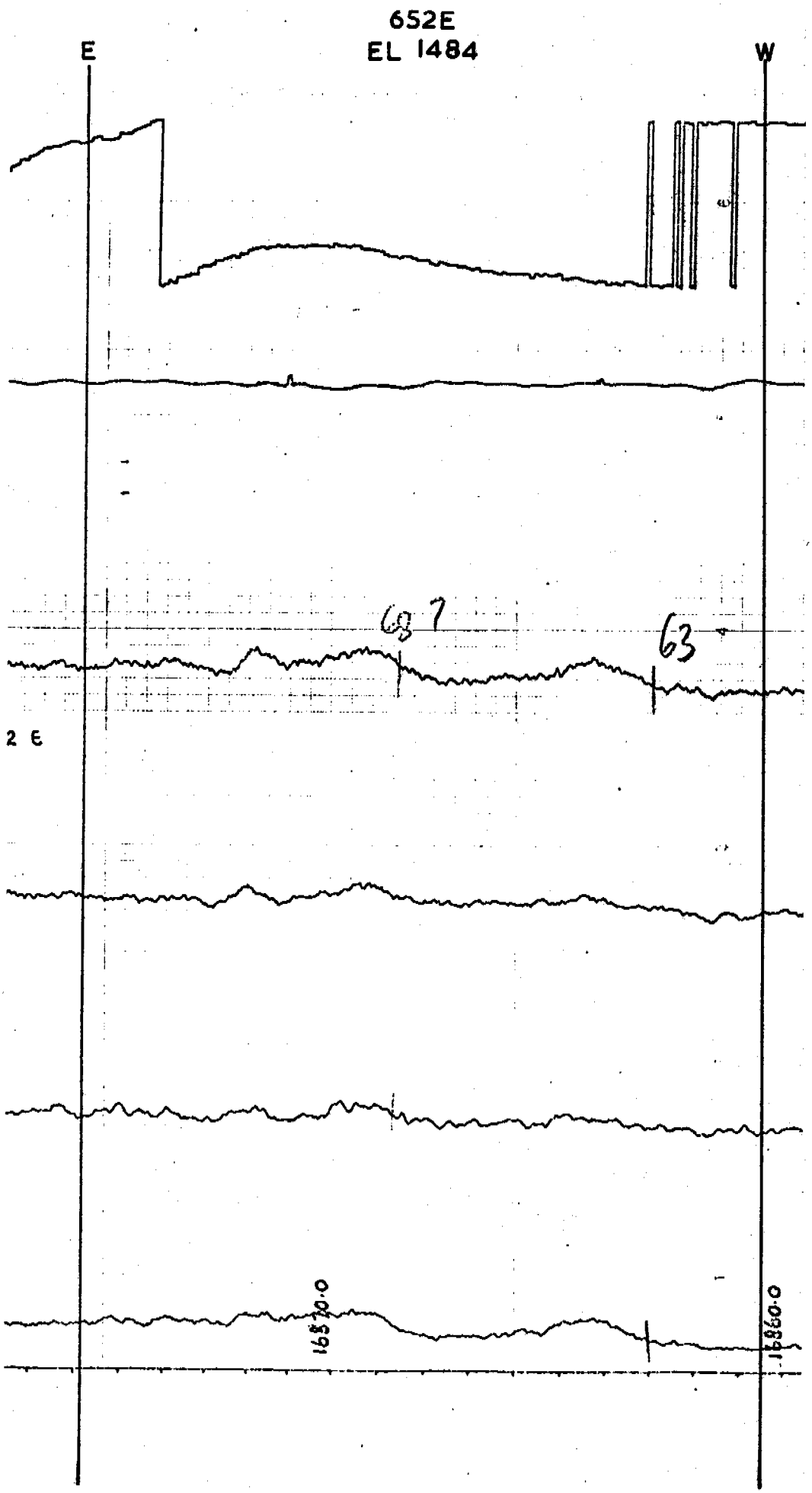
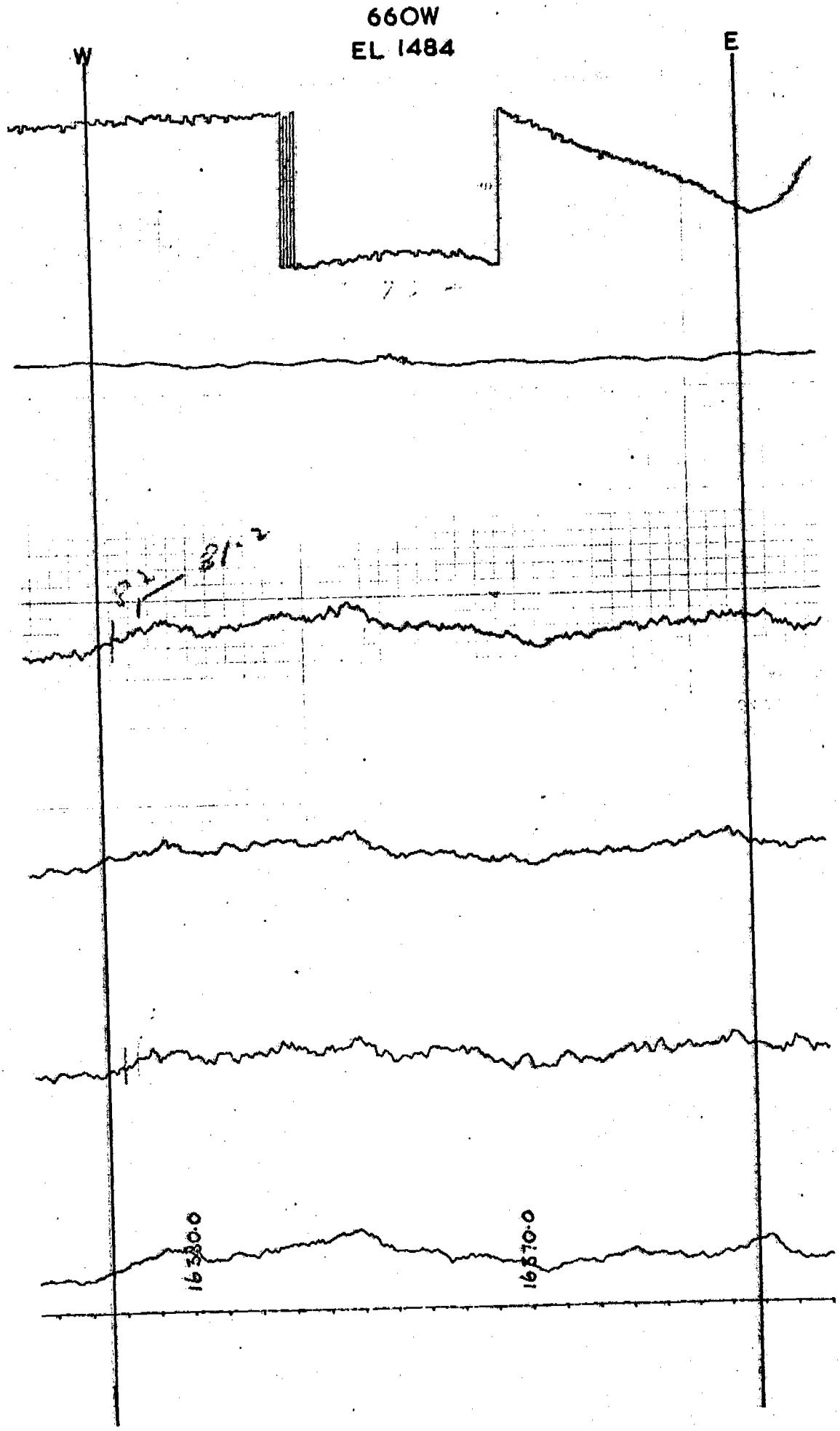
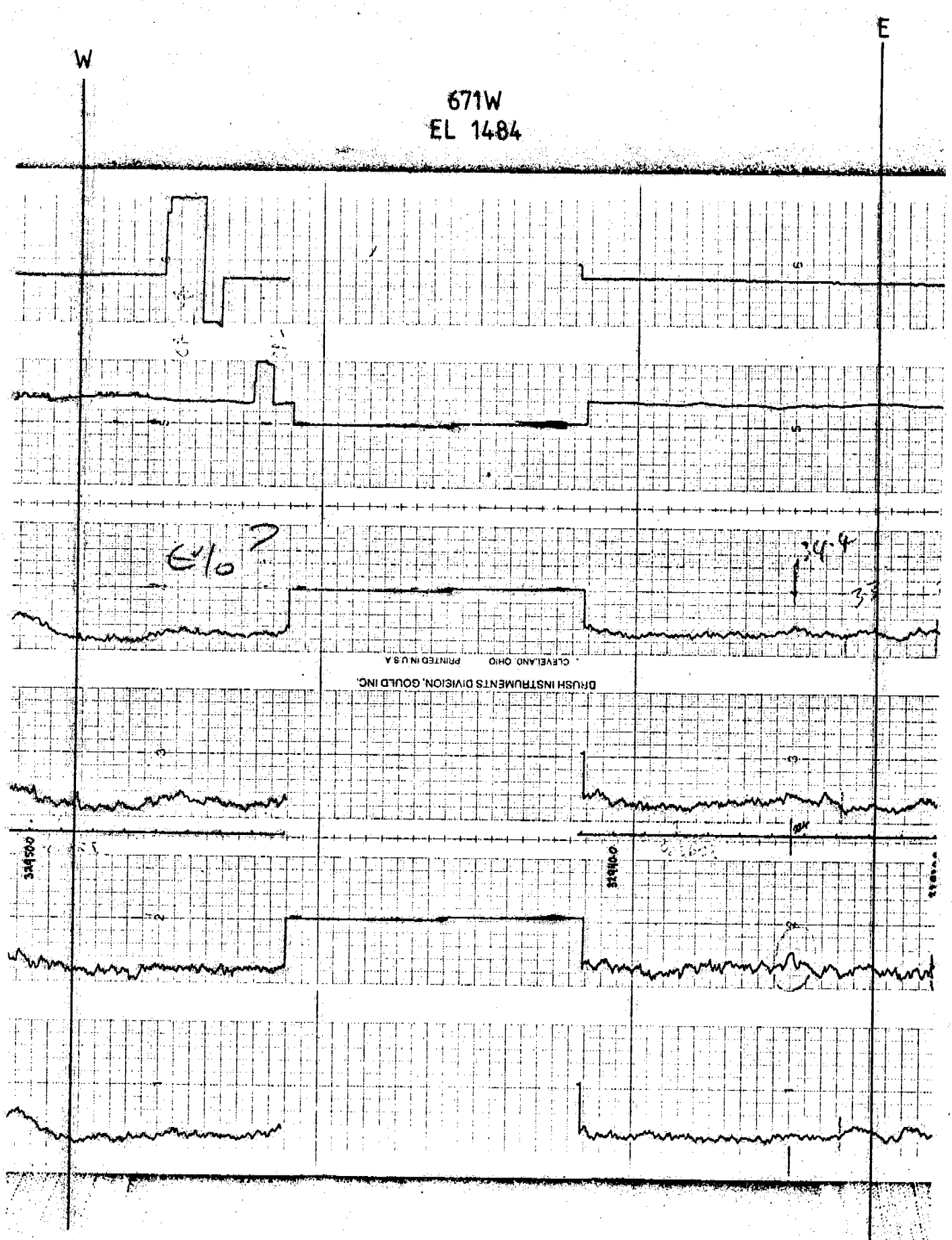
W
7°
57°
56
>30E
ON
-17200.0
-17600.0


640W
EL 1484
W
E
43
86.3
86
T-640 W
16890.0
16880.0


652E
EL 1484
E
W
63 7
63
2 E
16820.0
16860.0


660W
EL 1484
W
E
1650.0
1670.0


W
E
671W
EL 1484
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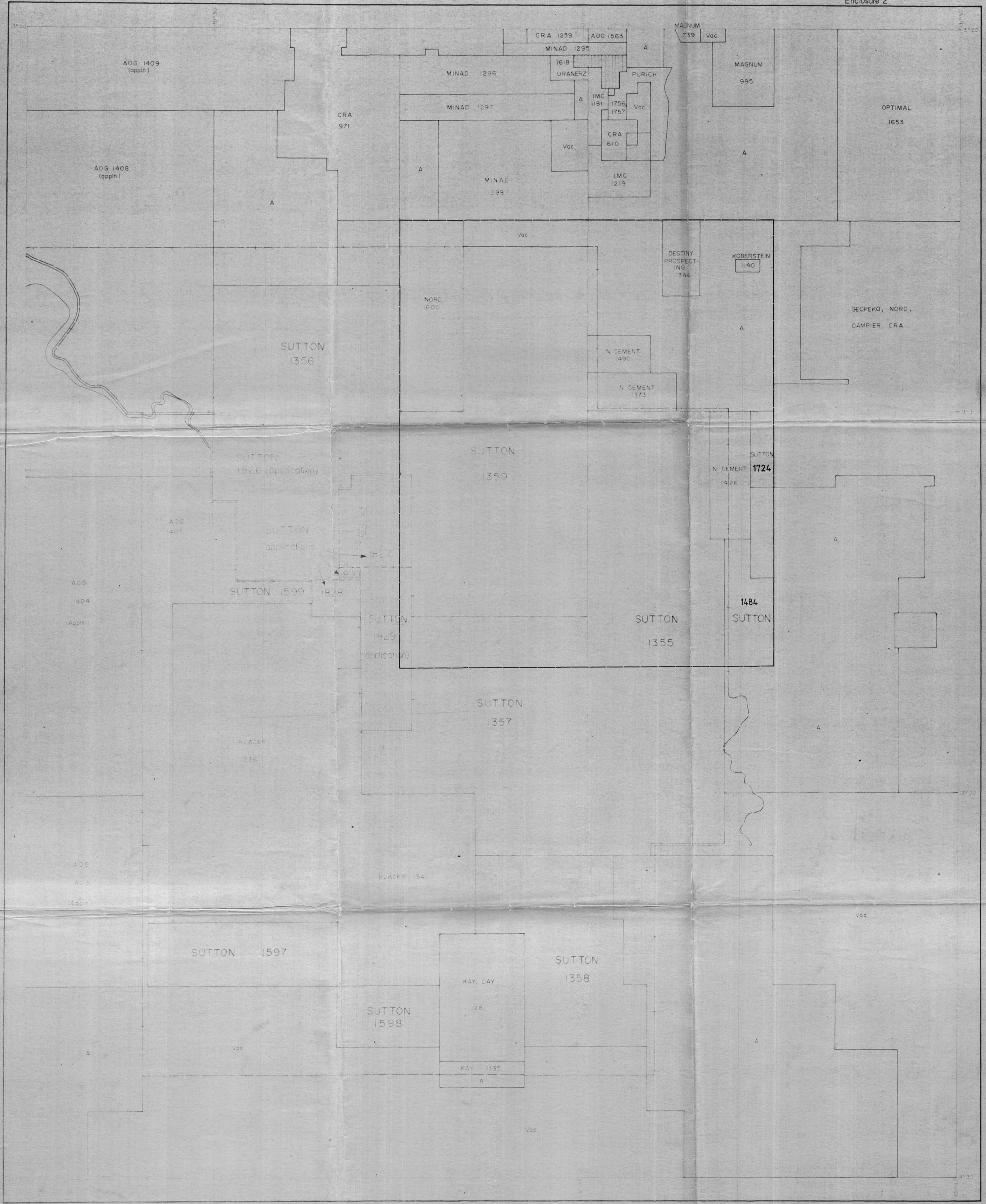
BRUSH INSTRUMENTS DIVISION, GOULD INC.

EXPLORATION LICENCE BOUNDARIES (JANUARY 1978)
Enclosure 2



EXPLORATION LICENCE AREAS (BOTH GRANTED AND UNDER APPLICATION)
AND SUTTONS GROUP PASTORAL LEASE BOUNDARY

FIGURE 1.

SCALE 1:250,000

LEGEND

SUTTON 539 — EXPLORATION LICENCE HOLDER (ABBREVIATED) & TITLE NUMBER

A — AREA APPLIED FOR — APPLICANT UNKNOWN

Vac — AREA VACANT

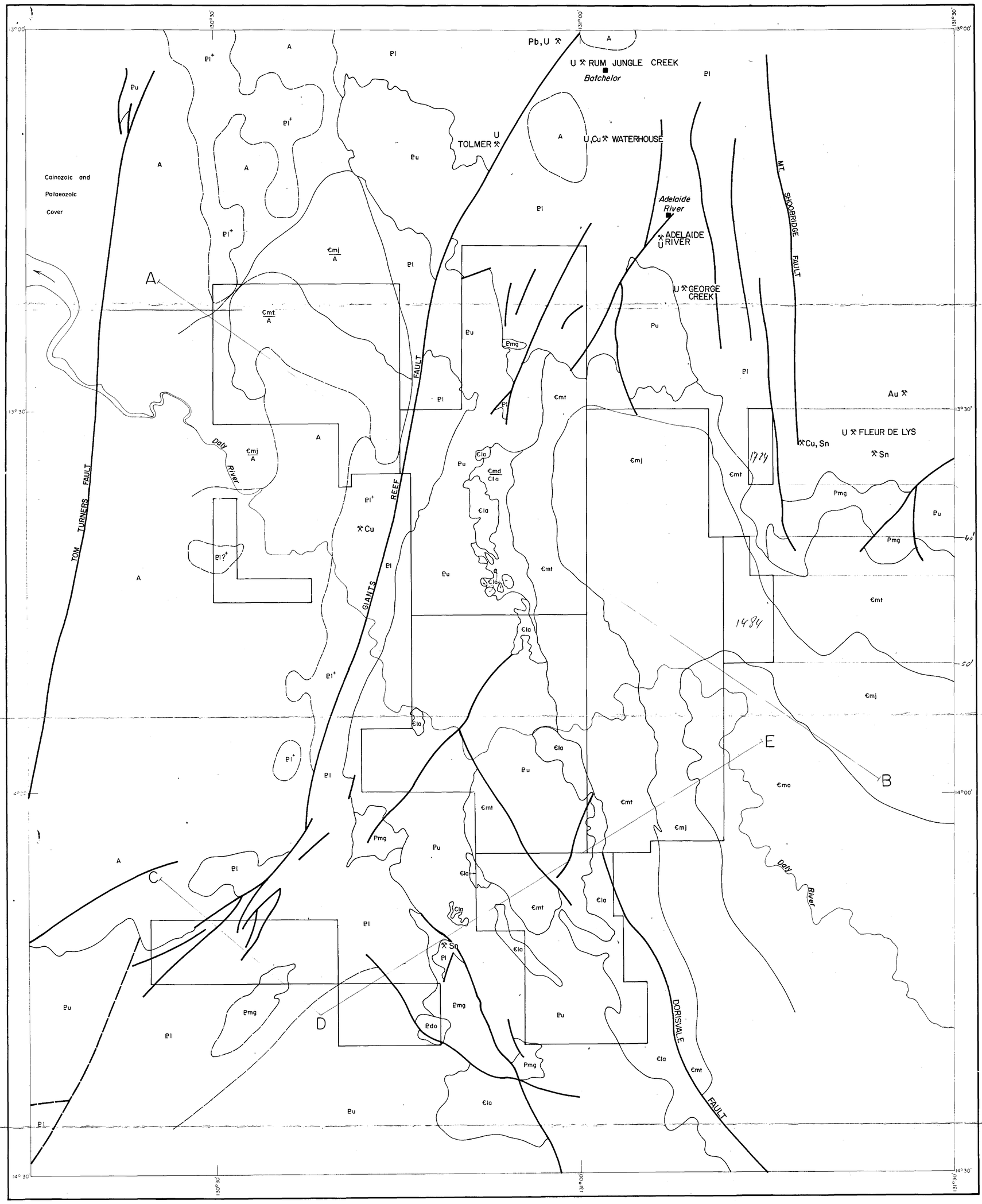
GOVERNMENT RESERVE

BOUNDARY OF FIG 3.

TIPPERARY PASTORAL LEASE BOUNDARY

CR 79/84

SOLID GEOLOGY
INTERPRETATION



LEGEND
(Rock types within Suttons Group areas)

CRETACEOUS — Omitted from map – small outcrops only

Unconformity

MIDDLE CAMBRIAN — €md — Undifferentiated

Ooloo Limestone — €mo — Silicified Limestone

Jinduckin Formation — €mj — Medium to fine sandstone

Tindall Limestone — €mt — Fossiliferous Limestone

Unconformity

LOWER CAMBRIAN OR UPPER PROTEROZOIC — €md — Undifferentiated

Antrim Plateau Volcanics — €la — Basalt, tuffaceous sandstone

Unconformity

UPPER PROTEROZOIC AND MIDDLE PROTEROZOIC — Pu — Undifferentiated: Includes: Waterbag Creek Formation – Ferruginous sandstone and siltstone, limestone lenses

Hinde Dolomite – dolomite with algal reefs

Buldiva Sandstone – quartz sandstone and siltstone with lenses of hematite rich, silicified calcarenite breccia and quartz pebble conglomerate

Unconformity

MIDDLE PROTEROZOIC — Pmg — Granite

LOWER PROTEROZOIC — Pl — Undifferentiated. Includes: Finniss River Group – (Burrell Creek Formation and Noltenius Formation) Siltstone, greywacke – siltstone, greywacke, quartz pebble conglomerate: Mica schist, andalusite-mica schist

Pl+ — Undifferentiated: Possible Batchelor Group inferred from magnetic data

Pdo — Dolerite

Unconformity

ARCHAEAN — A — Undifferentiated

Geological boundary

Fault

U ⚒ Mine or prospect

■ Town

Exploration licence boundary

Plan prepared by
ROBERTSON RESEARCH (AUST) PTY LTD
Moss Vale Rd
Ryde, 2075, NSW

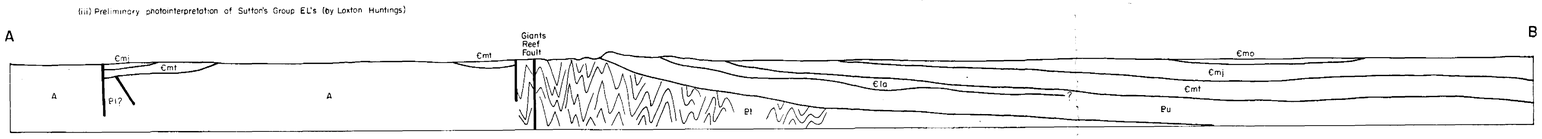
Date 12.3.78

Drawing No 662

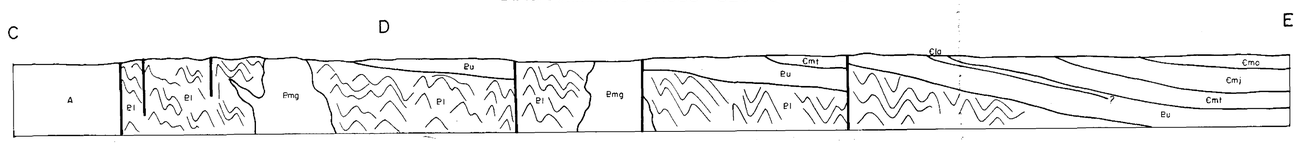
SOLID GEOLOGY: SIMPLIFIED AND INTERPRETED FROM:
(i) BMR 1:250,000 geological maps
(ii) BMR 1:250,000 magnetic contour maps
(iii) Preliminary photointerpretation of Sutton's Group EL's (by Loxton Huntings)

SOLID GEOLOGY — INTERPRETATION
FIGURE 2

SCALE 1:250,000
KILOMETRES 5 0 5 10 15 20 KILOMETRES



DIAGRAMMATIC CROSS SECTION A – B



DIAGRAMMATIC CROSS SECTION C-D-E

CR 79/89

SUTTONS PROJECT

1:84,000 N.W. SHEET GEOLOGY

1977 AIRBORNE SURVEY FLIGHTLINES

CR 79/84

Robertson Research Australia

P.O. Box 265,
Bowral, N.S.W. 2576
(048) 61 2388
Telex 22769

1484, 1724

17th July, 1980.

Attention: Mr. A.W. Newton

Northern Territory Department of Mines and Energy,
P.O. Box 2901,
DARWIN. N.T. 5794

Dear Sir,

Re: Your letter dated 8/7/80 Ref. MG/2/12 AWN/SW:190

In reply to your letter of 8th July, I must apologize for us having overlooked the commitment made in our previous correspondence to provide substitute maps for the final reports on E.L. 1484 and 1724. Unfortunately, the relevant originals are still in our Northern Territory field camp but we are making arrangements to have them sent to us so that substitute maps can be prepared for you to put on open file.

With regard to your request for advice on the scales for the analogue records, they are as follows:

PRODUCTION LINES 1230-1300 INCLUSIVE AND 1171, 1182

200 CPS Full Scale Deflection (CPSFSD) in 'K' Channel
100 CPS Full Scale Deflection in 'U' Channel
100 CPS Full Scale Deflection in 'TH' Channel
1000 CPS Full Scale Deflection in Broad Band (B/B) Channel

PRODUCTION LINES 10, 11, 32, 40, 41, 50, 60, 70

500 CPS Full Scale Deflection (CPSFSD) in 'K' Channel
500 CPS Full Scale Deflection in 'U' Channel
200 CPS Full Scale Deflection in 'TH' Channel
2000 CPS Full Scale Deflection in Broad Band (B/B) Channel

ALL OTHER LINES

500 CPS Full Scale Deflection (CPSFSD) in 'K' Channel
200 CPS Full Scale Deflection in 'U' Channel
200 CPS Full Scale Deflection in 'TH' Channel
2000 CPS Full Scale Deflection in Broad Band (B/B) Channel

with time constants (TC) of 2 sec, 2 sec, 2 sec and 0.5 sec respectively in all cases.

Yours faithfully,

Ronald Boutler

R.D. BUTLER.
General Manager.

RDB/ss