T.O. 2.2256

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MAGNETIC SURVEY OF THE ALLERSTON CLAIM GROUP

Whitney Twp. Ontario
Porcupine Mining Division
District of Cochrane

by

R. S. Middleton
Alamo Petroleum Ltd. - Rosario Resources Corp.
Suite 310 - 55 Yonge St.
TORONTO, Ontario

November, 1976

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INTRODUCTION

Purpose of Survey:

A magnetic survey was carried out to map the various volcanic and intrusive units on the property, especially on the eastern part of the property where extensive overburden exists. In addition, the survey was done to outline areas of low magnetite content within an ultramafic sill which would be suggestive of areas of talc magnesite with low iron oxide content.

LOCATION AND ACCESS

The property is shown on the attached sketch (plate 2) with the shaded areas showing the parts covered by the survey for which assessment work credits

The area covered is in Con. I, lot 6 N½, lot 7; lot 8; lot 9, N½; Con. II, lot 6; lot 7; lot 8; lot 9, S½; lot 10, S½, SE¼ and Con. III, lot 7, S½; lot 8, S½, NW¼, SW¼ of Whitney Township.

Access to the grid is by road from Porcupine (down lot 8 - 9 boundary) and by road from Hwy. 101 via the City of Timmins dump (lot 6 and 7, Con. III area).

PROPERTY

All but two claims are held under option from Ralph Allerston by Alamo Petroleum Ltd., Suite 310 - 55 Yonge Street, Toronto, Ontario, M5E 1J4. Claims 452637 and 451063 are held by Alamo through an option with D. Meunier. The 39 claims which would be credited with assessment work are covered in this survey within the overall group of 63 claims.

PREVIOUS WORK

The area has been flown with EM and magnetometer by Canadian Aero for Oro Mines Ltd. in 1970 (file 63.2730). Ground EM and magnetometer surveys by Noranda Mines Ltd. covered both areas surveyed in 1968 (file 63.2466).

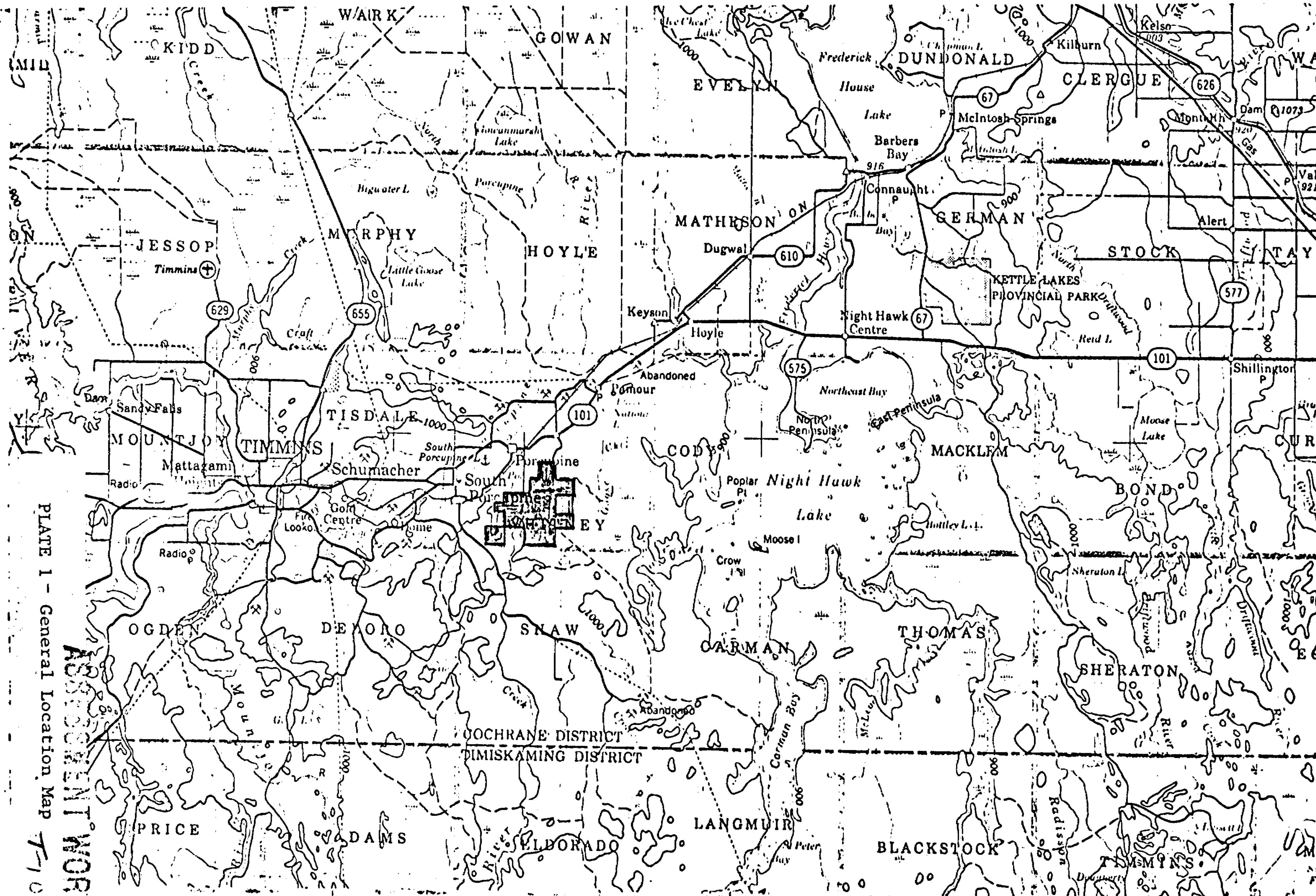

PLATE 1 - General Location Map

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[illegible] LIMITED - WHITNEY TWP CLAIMS

P. 420074	
420075	20 Days Magnetics
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444084	"
427444	"
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451040	"
451041	"
451042	"
451043	"
420330	"
420331	"
420332	"
420333	"
452637	"
451063	40 Days mag & lines
482879	"
482880	"
479905	"
479906	"
	"

TOTAL: 39 claims

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Oro Mines Ltd. covered part of the area in Figure 2 in 1970 with magnetometer and vertical loop (file 63.2675).

Canadian Lencourt Mines carried out I.P. and drilling on part of the area covered in Figure 2 in 1967 (file 63.2218).

Geological mapping completed in 1976 by Alamo Petroleum Ltd. on the claims will be submitted as a separate report.

GEOLOGY

The property is underlain by Archean mafic and felsic volcanics with associated sulphide and oxide iron formations. An ultramafic sill composed by peridotite with talc magnesite phases is situated on the west central part of the property. This sill lies stratigraphically at the base of the felsic (quartz sericite schists) rhyolitic tuff sequence. A sulphide iron formation marks the lower 100 feet of this felsic sequence. Felsic intrusives of fine-grained equigranular granodiorite (aplite) occurs in the west central part of the property.

A thin sill of gabbro and serpentine occurs in Con. III, lot 7 cutting the quartz sericite schists.

Numerous diabase dikes trending N20^{o}W cutting all other rock types are found on the property.

A complete geological survey has been submitted as a separate report for this property (Middleton, 1976).

INSTRUMENTATION AND SURVEY PROCEDURE

The survey was carried out using a McPhar M700 fluxgate magnetometer which measures the relative vertical magnetic field. Two main base stations were established on the grid which are tied to the Bristol Ogden Magnetic Base Station. The relative difference between the Whitney survey and Bristol-Ogden is 920 gammas (ie) 920 gammas have to be added to the survey values if Bristol-Ogden has a reading of 1000 gammas relative to the survey.

Base line 53N and 0 were read at 100 foot intervals and tied to the main base stations. All cross lines were tied to the base lines with checks every 2 hours or less and diurnal changes were distributed on the basis of time.

Readings were taken at 100 foot intervals along lines with 200 and 400 foot spacings. In areas of extreme gradient the station spacings were closed to 50 and 25 feet.

Contours were drawn at 100 gamma intervals.

For the area being submitted for assessment credit, there are 37.61 line miles of line including base lines, and 2140 stations were established.

A detailed description of the M700 magnetometer is given in the Appendix.

INTERPRETATION

The low magnetic relief areas on the central part of the property indicate felsic meta volcanics (quartz sericite schist) which dip northward 10^{o}- 40^{o}. Underlying these felsic volcanics are two iron formations (sulphide and oxide) as well as an ultramafic sill (peridotite). On the eastern part of the property the oxide iron formation forms a large magnetic high between lines 64E and 104E, north of base line 0. Drilling by INCO (on claim 420081) and notations on Ontario Department of Mines Map 47a (Hurst) suggest a serpentine body with mafic volcanics occurs on the central part of the property and is now interpreted to lie on the southern margin of the oxide iron formation. Other drilling on the property has suggested the ultramafic mass should overlie the oxide iron formation and for this reason a second magnetic high between 80E and 96E near 46N is interpreted to be ultramafic.

The magnetic high areas on the western part of the property are associated with magnetite rich phases of an ultramafic sill.

An oxide-sulphide (pyrrhotite) iron formation also extends across the south part of the property having 1500 gamma relief. This unit joins a band of peridotite on claim 420085 and extends eastward beyond line 104E.

Felsic intrusives (granodiorite) occur on claim P.451063 and create a magnetic anomaly at the contact. This phenomenon differs from a case on claim P.236225 - P.420082 where granodiorite intrude intermediate - felsic volcanics and a magnetic anomaly does not occur.

Diabase dikes which cut all rock types, trending N20^{o}W create narrow elongate anomalies.

The attached interpretation map illustrates the geological interpretation of the magnetics.

RECOMMENDATIONS AND CONCLUSIONS

Iron formations and ultramafic rocks suggested by magnetics on the eastern part of the property should be investigated for base metals. The broad extensive areas of rhyolitic tuff should be explored for base metals and precious metals. Portions of the areas interpreted to be ultramafic rocks hold potential for talc-magnesite mineralization.

Respectfully submitted,

REGISTERED PROFESSIONAL ENGINEER
R. S. MIDDLETON
PROVINCE OF ONTARIO

R. S. Middleton, Chief Geophysicist
ROSARIO RESOURCES CORPORATION

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PERSONNEL AND SURVEY DATES

The magnetometer survey was carried out between August 20 and August 31, 1976, by J. Winters (operator). Further survey work was completed by R. P. Bowen between November 1 - 18, 1976.

The overall project was supervised by R. S. Middleton

CERTIFICATE

I, Robert S. Middleton, of 7 Fiesta Lane, Toronto, Province of Ontario, hereby certify that:

1. I am a geophysicist employed by Rosario Resources Corporation, with offices at Suite 310, 55 Yonge Street, Toronto, Ontario.

2. I am a graduate of the Provincial Institute of Mining (Haileybury School of Mines) 1965, and Michigan Technological University B.S. (Applied Geophysics) 1968; M.S. (Geophysics) 1969.

3. I am a member of the Association of Professional Engineers of Ontario, the Society of Exploration Geophysicists, the European Association of Exploration Geophysicists, the Canadian Institute of Mining and Metallurgy, the Canadian Geophysical Union and a Fellow of the Geological Association of Canada.

4. This report is based on work directly supervised and in part personally carried out in Whitney Township, Ontario.

REGISTERED PROFESSIONAL ENGINEER R. S. MIDDLETON PROVINCE OF ONTARIO

R. S. Middleton, P. Eng.

Dated at Toronto, Ontario, this 24th day of November, 1976.

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SECTION 1

INTRODUCTION

The M700 Magnetometer is a vertical field magnetometer employing the flux gate principle. The instrument is self-levelling, and a self-cancelling circuit permits rapid, accurate measurement of the earth's magnetic field from a meter, without adjustments or calculations.

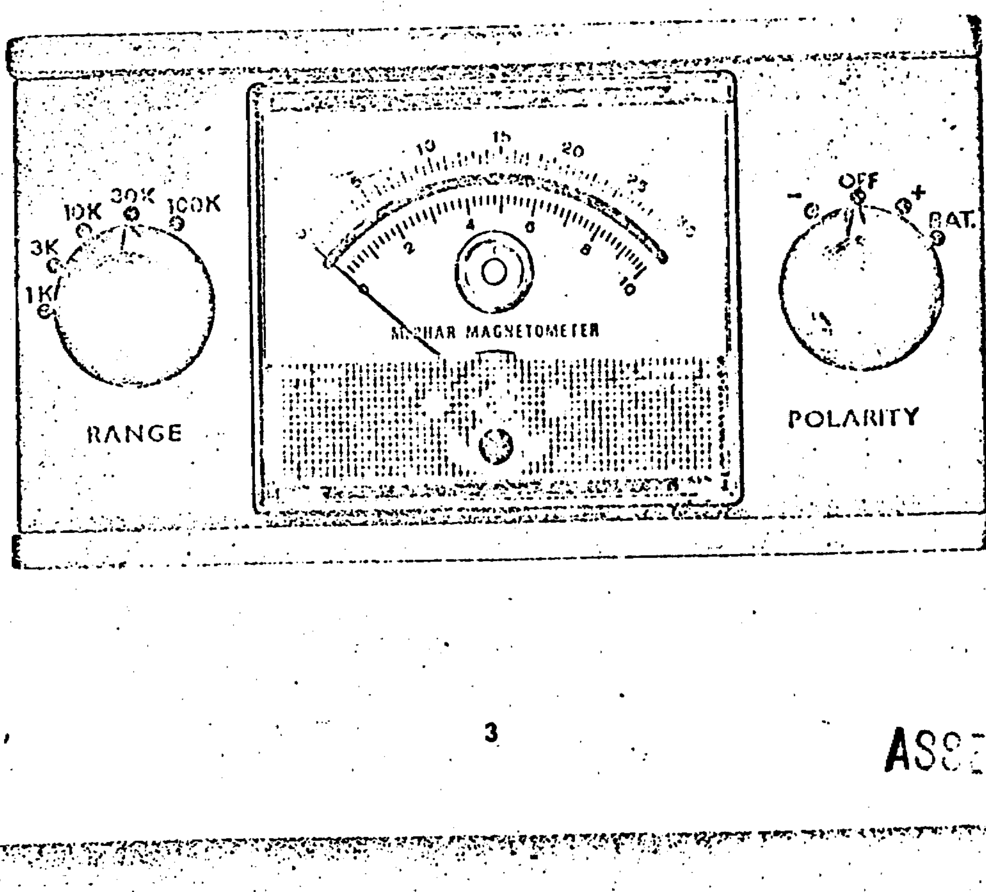
The self-levelling feature of this electronic magnetometer eliminates the need for bulky tripods and time consuming fine levelling procedures. Further, the instrument is practically insensitive to orientation. Errors are as low as 25 gammas for 180 degree rotation in a 15,000 gamma horizontal field.

Since the instrument can be adjusted electronically to measure vertical fields from plus 100,000 gammas to minus 100,000 gammas, there is no need for auxiliary magnets or complicated latitude adjustments.

The operation of the M700 is very simple. The reading on the meter is set to zero at a chosen base station by operating the latitude adjustment control. This can be done to an accuracy of 5 gammas. Next, as successive stations are occupied, the instrument is held roughly level, and the increase or decrease in the vertical component of the earth's magnetic field is read directly from the meter. Five scale ranges are available and on the most sensitive range the accuracy is 5 gammas.

The M700 Magnetometer is the result of extensive engineering based on rugged field requirements. It incorporates the latest advances in solid state components and has built in temperature stability. The instrument provides rapid, accurate, repeatable measurements.

An accessory socket broadens the applications of the M700. Optional accessories available from McPhar permit the same console to be used, for example, as a base station monitor or an airborne recording magnetometer.



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SECTION 2

SPECIFICATIONS

2–1 MAXIMUM SENSITIVITY

20 gammas per scale division on 1,000 gamma range.
Readability is 1/4 scale division or 5 gammas.

2–2 MAXIMUM MEASUREMENT

Zero to ± 100,000 gammas in five ranges.

Range Switch Position	Full Scale In Gammas	Gammas Per Scale Division
1K	1,000	20 black scale
3K	3,000	50 red scale
10K	10,000	200 black scale
30K	30,000	500 red scale
100K	100,000	2,000 black scale

2–3 MEASUREMENT POLARITY

The above ranges can be reversed in polarity as a simple function of the Polarity switch.

2–4 LATITUDE ADJUSTMENT

The latitude adjustment permits cancelling the earth's field up to a magnitude of ± 100,000 gammas. The adjustment control is a ten revolution precision potentiometer located under the sliding side panel. A positive type locking lever on the control removes the hazard of accidentally dislodging the setting.

2–5 SELF-LEVELLING SENSING HEAD

The unique self-levelling sensing head of this magnetometer is inserted as a plug-in unit. It is easily detached so that the same magnetometer can be used with other types of sensing heads such as the airborne gyro stabilized head etc.

2–6 ORIENTATION ERROR

The orientation error is set at the factory to 25 gammas or less in the presence of a 15,000 gamma horizontal field. It is possible to adjust the orientation error and the procedure is explained in the section 9–2 under Maintenance.

2–7 TEMPERATURE STABILITY

Over the temperature range of –35 to +55 degrees centigrade the temperature drift is limited to less than 50 gammas. See section 4–6 on Minimizing Temperature Drift.

2–8 BATTERY SUPPLY

The M700 Magnetometer is powered by two internally mounted 9 volt batteries. Any pair of the following batteries may be used.

Eveready No. 276
Mallory No. M1603
Burgess No. D6
R. C. A. No. VS306

For sub-zero operation the batteries may be transferred to an external battery case and carried under clothing to keep them from freezing. See section 6, Operation with External Batteries.

Two types of external battery cases are available see accessory list, section 11. One type is for the above batteries. Another type of case will accommodate the equivalent in flashlight cells for use in countries where the normal batteries are difficult to obtain.

2–9 ACCESSORY RECEPTACLE

A Cannon receptacle is located on the side of the instrument under the sliding panel. This increases the versatility of the instrument so it can be used in a number of ways in addition to its normal vertical field ground magnetometer function. See section 8, under Extended Applications and section 11, under Accessories.

2–10 ACCESSORY & LATITUDE SWITCH

This is a double function switch. The first function is to permit operation north or south of the equator by simply changing one step on the switch. By switching an additional step, the accessory socket is brought into connection and accessories can be applied to the instrument.

2-11 WEIGHT

The weight of the magnetometer is distributed as follows:-

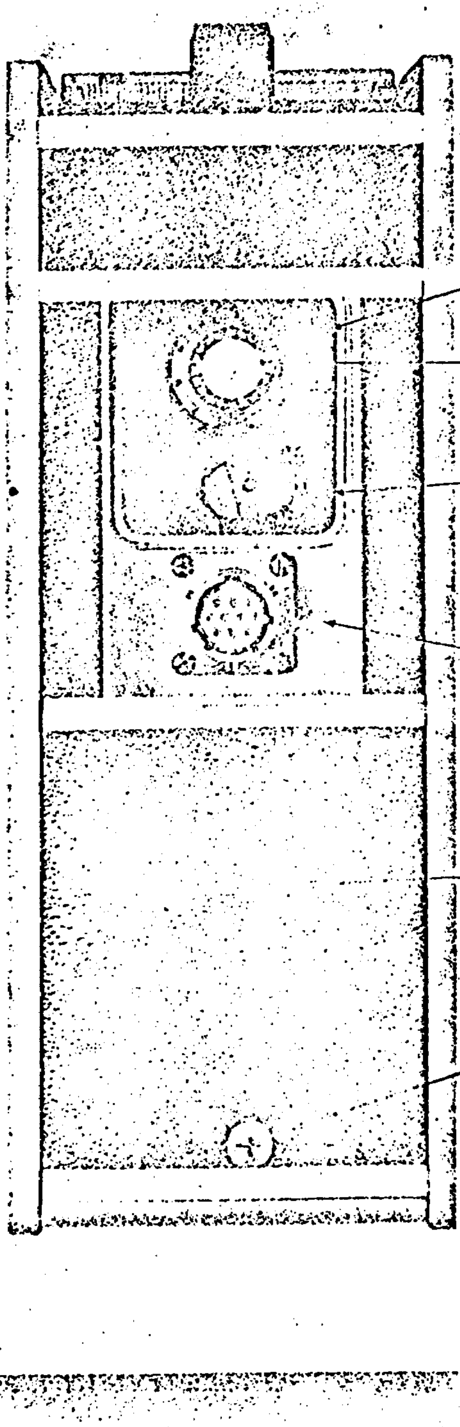
Console:	6 pounds
Batteries:	1-1/4 pounds 2 type Eveready 276
Carrying Case:	2 pounds

2-12 MAGNETOMETER DIMENSIONS

Width:	6-7/8 inches
Depth:	3-3/4 inches
Height:	9-5/8 inches

2-13 TRANSIT CASE

The magnetometer is shipped in a foam fitted transit case. The case is designed to accommodate the magnetometer in its leather case, spare batteries, external battery cable and battery case and instruction manual.



SECTION 3

GENERAL DESCRIPTION AND APPLICATIONS

The field sensitivity of the M700 magnetometer originates in a flux gate element mounted so that its axis of maximum sensitivity is maintained in the vertical plane. The flux gate element contains an excitation winding and a detector winding. In addition there are auxiliary windings around the element which carry D.C. currents. With the auxiliary windings, a D.C. flux is created to cancel the earth's field. Latitude adjust control and automatic cancelling.

The flux gate element is continuously excited between saturation levels by an A.C. current. A detector winding consisting of differentially wound coils, picks up zero voltage when the resultant D.C. flux through the elements is zero.

When the external D.C. field changes in magnitude, a corresponding phase-reversible second harmonic output voltage is produced across the detector winding. The second harmonic output voltage is fed to a phase sensitive rectifier system and used to provide a cancelling D.C. current to oppose the external field attempting to unbalance the flux gate element.

The system therefore is a self-cancelling one and at all times approximates a condition of zero flux about the flux gate element.

The D.C. current fed back to maintain the zero flux condition is measured on the display meter and is directly proportional to the change in the earth's field. The meter, then, can be calibrated directly in gammas.

Five meter ranges are provided to permit the measurement of a change of field of up to 100,000 gammas. Because the field at any new measurement station may increase or decrease, a polarity reversal on the on-off switch is provided.

The main application of the instrument is for general ground surveying. Because of the lack of any set-up requirements and the rapid direct meter read out, it provides the fastest and most economical geophysical surveying available compared to any other type of instrument or technique.

With the accessory receptacle the M700 lends itself to many other applications. These are covered in Section 8, under Extended Applications.

SECTION 4
OPERATING INSTRUCTIONS

4-1 INSPECTION

After the instrument is unpacked, it should be carefully inspected for damage received during transit.

Particularly check for meter pointer damage and sensing head damage. The meter pointer can be inspected visually. To check the orientation error properly, requires an accurate turntable and controlled conditions. However, to quickly check for shipping damage, place the magnetometer on a flat surface away from any ferromagnetic material. Rotate it 180 degrees. If the self levelling arrangement in the sensing head has been damaged by severe shock, the orientation error will be several hundred gammas. If performing this check in a building, allow for the possibility of large field gradients. That is, after rotation, the magnetometer may end up in a different position and give a different reading.

It may be worthwhile mentioning at this point that, sometimes, when an instrument has been shipped some distance lying on its side, a hysteresis effect occurs on the self-levelling arrangement. The orientation error will consequently be somewhat larger than that set at the factory. This error will disappear if the instrument is allowed to stand vertical overnight.

If any shipping damage is found, immediately file a claim for damage in shipment with the carrier.

4-2 CONTROLS AND THEIR FUNCTION

There are four controls on the magnetometer and only two of these are operating controls used during the survey. For this reason, only these two controls are located on the top panel. The other two controls are located on the side of the instrument and protected by a sliding panel.

4-2-1 TOP PANEL CONTROLS

Polarity
This is a four position switch marked –, OFF, + and BAT. When the instrument is turned to + and a meter reading is indicated, then the earth's field intensity can be read on one of the scale ranges. If, on the other hand, the meter pointer deflects to the left of zero, the switch position is moved to – to obtain a scale reading.

The fourth position is a battery test position. The battery voltage is indicated directly on the black, 0 to 10, scale of the meter.

Range
This is a five position switch that selects the read-out scale of the magnetometer. If the Range switch is in the 3K position, then full scale on the meter represents 3,000 gammas and the red, 0 to 30, meter scale is used. If the Range switch is in the 10K position, then full scale on the meter represents 10,000 gammas and the black, 0 to 10, scale is used. See section 2-2 for the complete range to meter scale relationship.

4-2-2 SIDE PANEL CONTROLS

Latitude Adjust
This is a ten revolution precision potentiometer with a positive type locking lever. Operation of this control varies the magnitude of a D.C. current passing through one of the auxiliary coils wound around the flux gate element. This current sets up a magnetic field in opposition to the earth's field.

It is possible then, to cancel the earth's field at any given location so that the magnetometer meter reads zero. This allows the use of the most sensitive scale ranges for highest reading accuracy. Vertical fields of up to ± 100,000 gammas may be cancelled in conjunction with the reversing feature of the Latitude and Accessory switch.

When the Polarity switch is in the – position, turning the latitude control clockwise will cause the meter pointer to move clockwise or to the right of zero.

When the + position is used the clockwise rotation of the latitude control will

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cause the meter pointer to be displaced to the left.

Note that when the latitude control is fully clockwise, no cancelling current is applied to the sensing head. The resulting reading obtained with the magnetometer under these conditions represents the absolute magnitude of the earth's field.

Latitude and Accessory Switch
This control is the one least used. It is marked ± Latitude and + Accessory and –Accessory, using the abreviations of Lat. and Acc. respectively.

The markings simply indicate that north of the equator, only the two positions marked + are used. South of the equator only the two positions marked – are used. The + Acc or –Acc positions are only employed when an accessory such as a recorder and, or, external batteries are connected to the magnetometer.

4–3 CANCELLING THE EARTH'S MAGNETIC FIELD

Prior to the start of a magnetic survey it is desirable to cancel out the earth's field at some chosen location which will be designated as the base station. All future measurements in the area will then remain relative to this key point.

By cancelling out the earth's background field, the more sensitive scales of the magnetometer can be used along with the greater reading accuracy available with the more sensitive ranges.

By referring back to the base station from time to time, a check on the accuracy of the survey and diurnal variations is obtained. The process of magnetic closures is also an effective control procedure. Cancelling the earth's magnetic field is a simple procedure. Rest the Magnetometer on a stump or other convenient location which is to serve as the base station site. Turn the instrument on and select a range switch position that gives an on-scale reading.

Open the leather side flap and drop the slide panel to expose the Latitude Adjust control and the Latitude and Accessory switch. Check to see that the Latitude switch is in the appropriate position, + for northern hemisphere and – for southern hemisphere.

Release the locking lever on the Latitude Adjust dial and operate the control so the meter reading decreases to zero. As zero is approached progressively select more sensitive ranges and finally adjust for zero on the 1000 gamma range. It is not essential to be exactly on zero. Simply record the residual reading after locking the control. Make sure the instrument is held approximately level during this adjustment or while taking the residual reading.

The instrument is now ready for the survey and all future readings will be relative to this point.

4–4 TAKING A READING

Hold the instrument in both hands, slightly away from the body and both elbows pressed to the side of the body. Brace the feet slightly apart. Switch the instrument to the appropriate ON position and adjust the range switch to the most sensitive range that gives an on scale reading. Center the level bubble and while holding the instrument approximately level and steady, note the reading on the meter.

4–5 MINIMIZING FLUCTUATION DURING A READING

No ferrous objects such as steel belt buckles, pant zippers, pocket knives, lighters, etc., can be allowed in the vicinity of the sensing head. Such items will cause random meter fluctuations as the magnetometer moves relative to the body during a reading. Check all metal objects for magnetic effect beforehand using the magnetometer as an indicator.

There is a preferred body stance with respect to the horizontal direction of the earth's field. If the operator stands so his shoulders are roughly parallel to the direction of the earth's field, then back and forth motion of the body during a reading least affects the magnetometer. As the body moves, the sensing head, in its self-levelling suspension, is continually in motion.

The resulting angular rotation is at right angles to the horizontal field vector and results in minimum variation from this source. The use of the preferred direction is particularly effective on windy days.

The general direction of the earth's field in a given area may be found using the magnetometer. One way is to hold the magnetometer roughly level, then deliberately induce slight back and forth motion and note the meter fluctuations. Rotate the body to a new position and repeat. Do this until a point is found where the meter fluctuations are a minimum as the magnetometer is deliberately moved. This is the point where the shoulders are approximately parallel to the horizontal field vector.

Another way is to set the latitude adjust control fully clockwise. The magnetometer is now reading the absolute magnitude of the earth's field. Raise the bottom of the magnetometer so the case is parallel to the ground. Raise the bottom an additional five degrees to take up the angle of play in the sensing head and bring the sensing head approximately horizontal. The magnetometer can now be used to find the direction of the horizontal field vector by rotating the body and stopping where the meter gives a maximum reading. This is not necessarily the absolute magnitude because there is no guarantee the sensing head was horizontal but it does adequately indicate the direction. In this way the magnetometer can be used as a compass for emergency reckoning.

4-6 MINIMIZING TEMPERATURE DRIFT

The temperature stability of the M700 is very good and can be of the order of ½ gamma per degree centigrade. However, where sudden large temperature changes are experienced, allow half an hour for the magnetometer to stabilize before proceeding with a survey. Failure to do this will result in all of the temperature drift occurring during the early readings.

When operating in sub-zero temperatures it is sometimes more desirable to leave the magnetometer outdoors overnight, taking only the batteries indoors. This eliminates any requirement for stabilization and the resulting temperature drift will be small.

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EM-16 SURVEY OF PORTIONS OF THE ALLERSTON CLAIM GROUP WHITNEY TWP. ONTARIO

Porcupine Mining Division
District of Cochrane

by

R.S. Middleton
Alamo Petroleum Ltd - Rosario Resources Corp.
Suite 310 - 55 Yonge St.
TORONTO, Ontario

September, 1976

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INTRODUCTION

Purpose of Survey:

An EM-16 Survey was run in the area near claims P.443578 - P.443579 in order to define the location and direction of sulphide iron formations, metasediments and shear zones. A survey was run on claims P.451039 - P.451042 inclusive to trace the contact between mafic intrusive rocks and felsic volcanics as well as sheared felsic volcanics containing disseminated sulphides.

LOCATION AND ACCESS

The property is shown on the attached sketch with the shaded areas showing the parts covered by the survey.

The areas covered are in Con. II, lot 8, S½ and Con. III, lot 7, S½ of Whitney Township.

Access to the grid is by road from Porcupine (down lot 8 - 9 boundary) and by road from Hwy. 101 via the City of Timmins dump (lot 6 and 7, Con. III area).

PROPERTY

The claims are held under option from Ralph Allerston by Alamo Petroleum Ltd., Suite 310 - 55 Yonge Street, Toronto, Ontario, M5E 1J4. The seven claims covered in this survey which would be credited with assessment work are:

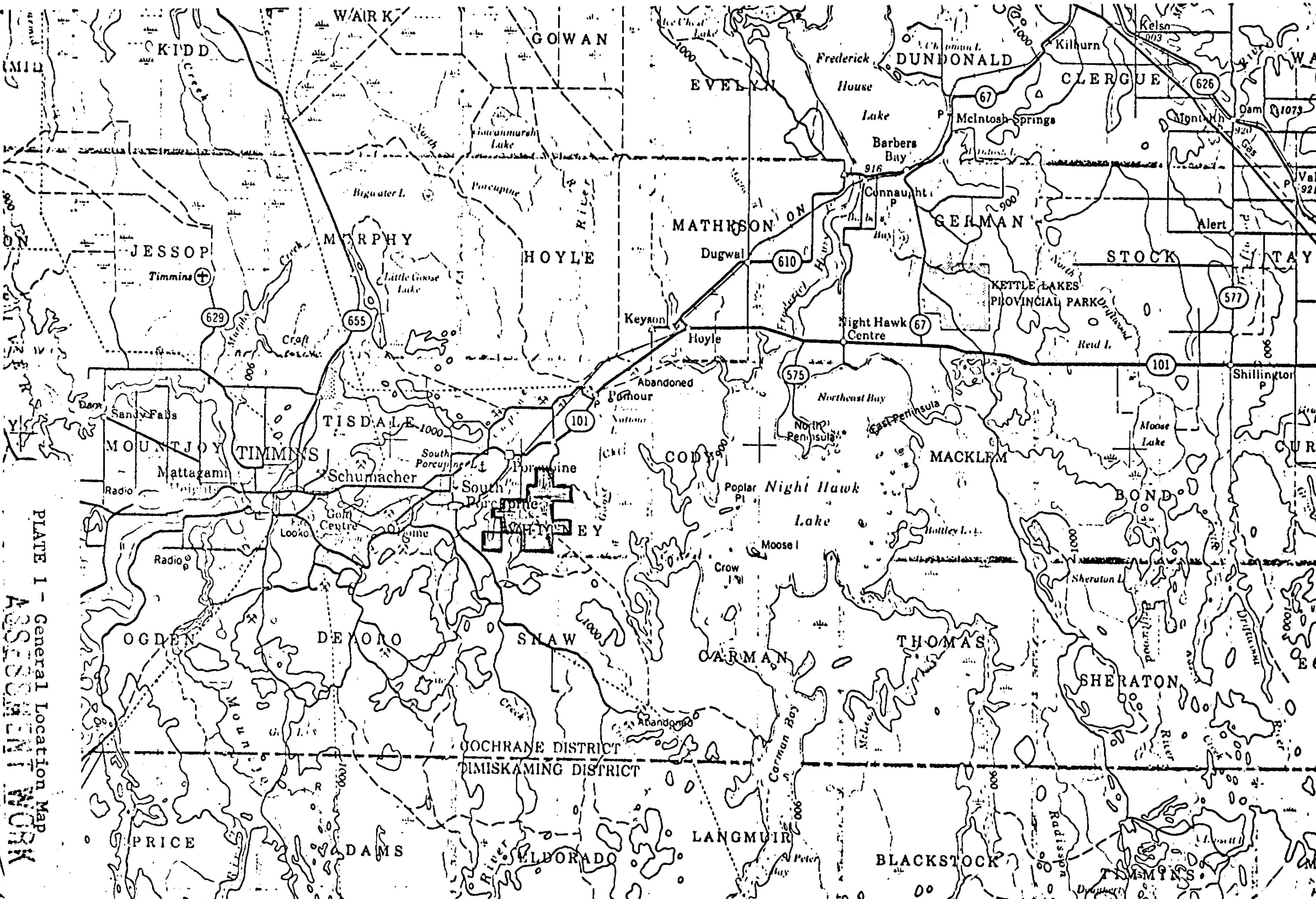

PLATE I - General Location Map

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2.

P.443578	20 Days
P.443579	20 Days
P.451039	20 Days
P.451040	20 Days
P.451041	20 Days
P.451042	20 Days
P.380506	10.5 Days

PREVIOUS WORK

The area has been flown with EM and magnetometer by Canadian Aero for Oro Mines Ltd. in 1970 (file 63.2730). Ground EM and magnetometer surveys by Noranda Mines Ltd. covered both areas surveyed in 1968 (file 63.2466).

Oro Mines Ltd. covered part of the area in Figure 2 in 1970 with magnetometer and vertical loop (file 63.2675).

Canadian Lencourt Mines carried out I.P. and drilling on part of the area covered in Figure 2 in 1967 (file 63.2218).

Geological mapping completed in 1976 by Alamo Petroleum Ltd. ~~and~~ on the claims will be submitted as a separate report.

GEOLOGY

The portion of the property covered in Figure 2 is underlain by Early Precambrian felsic volcanics and sulphide iron formation (with associated graphitic sediments). Diabase dikes of Early to Middle Precambrian age trending north-northwest cut the volcanics and iron formations.

The four claims covered by Figure 2 are underlain by felsic tuffs which have been altered to quartz-sericite schists. The schistosity strikes N50°E - N70°E and dips 25° -50°NW. A sill of gabbro - serpentine occurs on claim P.451039 and strikes northeastward.

Instrumentation and Survey Procedure:

The survey was carried out with an EM-16 manufactured by Geonics Ltd. Specifications and case histories are given in the Appendix. The inphase and out of phase response was measured at each station using station NAA (Cutler, Maine) as transmitter. Conductors, as indicated in the case histories, are outlined by a cross over of the inphase component from + to -. A good conductor would have a corresponding out of phase cross over from - to + and poor conductors show very little change in quadrature (out of phase) values.

Difficulty was encountered during the survey because of irratic shut off of the transmitting station. The operator was required to wait for the station to resume transmission on a number of occassions.

Stations established (on areas eligible for assessment credits)

Figure 1:	104	
Figure 2:	224	
TOTAL ...	328	Stations

ASSESSMENT WORK
T-1052

INTERPRETATION

Figure 1

Anomaly A

This is a weak conductor associated with a sulphide iron formation. A shear zone may be associated with it since the conductor continues northwestward into an area throughout.

Anomaly B

A weak to moderate conductor that coincides with an outcorp of sulphide iron formation. The eastward extension of this iron formation is questionable due to lack of conductors to the east on line 24E.

Anomaly C

This conductor is weak, dips northward at a low angle and occurs in felsic volcanics. This zone may be due to a shear containing disseminated sulphides.

Anomaly D

This is a strong northeast trending conductor associated with a graphitic shear which may represent an extension of a graphitie bearing iron formation. A major anticlinal axis parallels this conductor approximately 300' south, hence the portion of the conductor outlines on figure 1 is part of the north limits of an anticline.

Anomaly E

This weak conductor is associated with an occurrence of sulphide iron formation.

Anomaly F

This is a very weak "one-line" anomaly which occurs in an area of intermediate volcanics and may reflect localized shearing (parallel to anticlinal axis which passes through the area).

Anomaly G

This moderate conductor outlines a band of metasediments - sulphide iron formation which trends north - northeastward. This same unit joins the iron formation - graphite band represented by conductor D.

Anomaly H

A conductor south of the grid surveyed by the EM-16 is suggested by the inphase response. This conductor would probably be an oxide iron formation which trends southeast into Shaw Township.

Figure 2

Anomaly I

A weak conductor possibly a shear in felsic volcanics. This zone would dip northward.

Anomaly J

This anomaly is an extension of K, L and M and is a moderate conductor in terms of inphase values, however, the quadrature response does not support the inphase. An ultramafic body is interpreted to occur in the vicinity of the conductor (based on aeromagentic indications).

Anomaly K, L and M

Three parallel conductors occur in the area between lines 60E and 72E which are moderate in conductivity as shown by the strong inphase response, however, the out of phase (quadrature) values suggest low conductivity. The conductive zone dips north and is interpreted to be caused by disseminated sulphide mineralization within sheared felsic volcanics.

RECOMMENDATIONS AND CONCLUSIONS

Follow-up work with induced polarization on anomalies C and I, J, K, L, M is required to better define possible zones of sulphide (pyrite). These anomalies represent possible drill targets for precious-base metal mineralization.

Respectfully Submitted,

R. Middleton

R. S. Middleton
Chief Geophysicist

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T-1052

CERTIFICATE

I, Robert S. Middleton, of 7 Fiesta Lane, Toronto, Province of Ontario, hereby certify that:

1. I am a geophysicist employed by Rosario Resources Corporation, with offices at Suite 310, 55 Yonge Street, Toronto, Ontario.

2. I am a graduate of the Provincial Institute of Mining (Haileybury School of Mines) 1965, and Michigan Technological University B.S. (Applied Geophysics) 1968; M.S. (Geophysics) 1969.

3. I am a member of the Association of Professional Engineers of Ontario, the Society of Exploration Geophysicists, the European Association of Exploration Geophysicists, the Canadian Institute of Mining and Metallurgy, the Canadian Geophysical Union and a Fellow of the Geological Association of Canada.

4. This report is based on work directly supervised and in part personally carried out in Whitney Township, Ontario.

REGISTERED PROFESSIONAL ENG.
R. S. MIDDLETON
PROVINCE OF ONTARIO

R. Middleton

R. S. Middleton, P. Eng.

Dated at Toronto, Ontario, this 4th day of October, 1976.

ASSESSMENT WORK
T-1057

EM16

VLF Electromagnetic Unit

Pioneered and patented exclusively by Geonics Limited, the VLF method of electromagnetic surveying has been proven to be a major advance in exploration geophysical instrumentation.

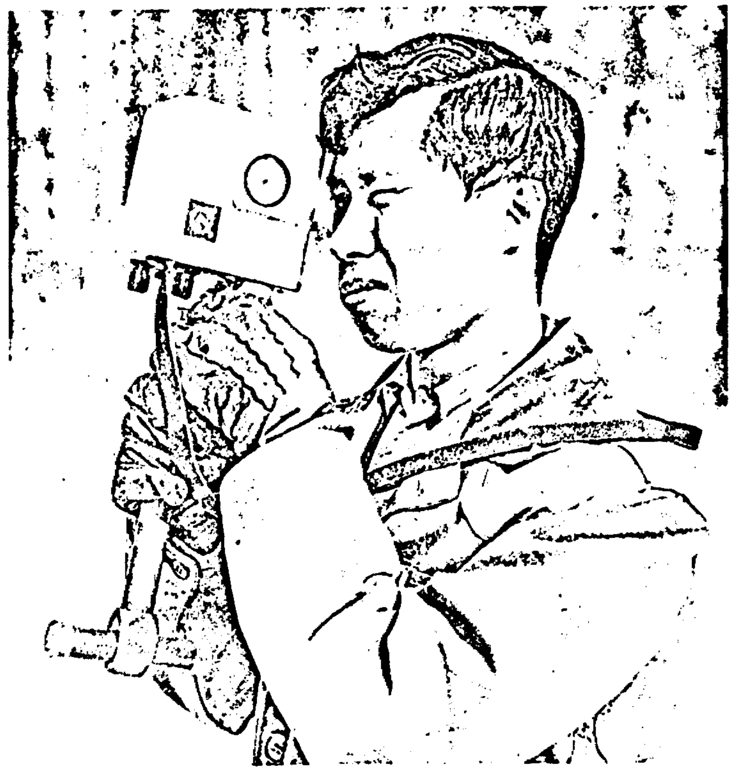
Since the beginning of 1965 a large number of mining companies have found the EM16 system to meet the need for a simple, light and effective exploration tool for mining geophysics.

The VLF method uses the military and time standard VLF transmissions as primary field. Only a receiver is then used to measure the secondary fields radiating from the local conductive targets. This allows a very light, one-man instrument to do the job. Because of the almost uniform primary field, good response from deeper targets is obtained.

The EM16 system provides the *in-phase* and *quadrature* components of the secondary field *with the polarities indicated.*

Interpretation technique has been highly developed particularly to differentiate deeper targets from the many surface indications.

Principle of Operation
The VLF transmitters have vertical antennas. The magnetic signal component is then horizontal and concentric around the transmitter location.

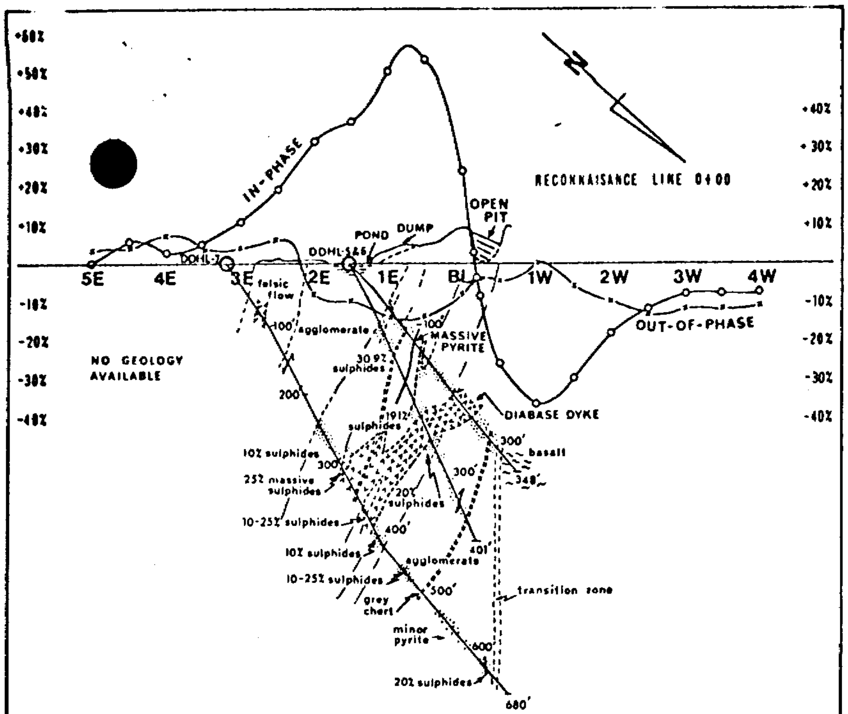


Specifications

Source of primary field	VLF transmitting stations.
Transmitting stations used	Any desired station frequency can be supplied with the instrument in the form of plug-in tuning units. Two tuning units can be plugged in at one time. A switch selects either station.
Operating frequency range	About 15-25 kHz.
Parameters measured	(1) The vertical in-phase component (tangent of the tilt angle of the polarization ellipsoid). (2) The vertical out-of-phase (quadrature) component (the short axis of the polarization ellipsoid compared to the long axis).
Method of reading	In-phase from a mechanical inclinometer and quadrature from a calibrated dial. Nulling by audio tone.
Scale range	In-phase ± 150%; quadrature ± 40%.
Readability	± 1%.
Reading time	10-40 seconds depending on signal strength.
Operating temperature range	−40 to 50° C.
Operating controls	ON-OFF switch, battery testing push button, station selector, switch, volume control, quadrature, dial ± 40%, inclinometer dial ± 150%.
Power Supply	6 size AA (penlight) alkaline cells. Life about 200 hours.
Dimensions	42 x 14 x 9 cm (16 x 5.5 x 3.5 in.)
Weight	1.6 kg (3.5 lbs.)
Instrument supplied with	Monotonic speaker, carrying case, manual of operation, 3 station selector plug-in tuning units (additional frequencies are optional), set of batteries.
Shipping weight	4.5 kg (10 lbs.)

ASSESSMENT WORK
T-1152

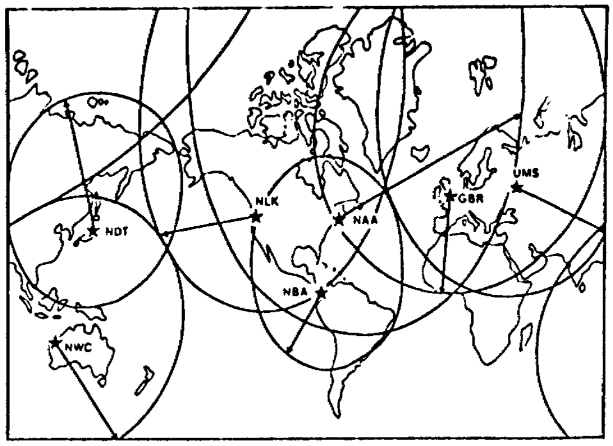
GEONICS LIMITED
Designers & manufacturers of geophysical instruments
subsidiary of Deering Milliken Inc.
2 Thorncliffe Park Drive
Toronto/Ontario/Canada
M4H 1H2
Tel: (416) 425-1821
Cables: Geonic's



Courtesy of Newfoundland & Labrador Corp. Ltd.

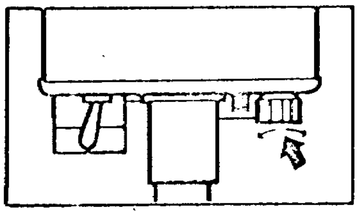
EM 16 Profile over Lockport Mine Property, Newfoundland

Additional case histories on request.



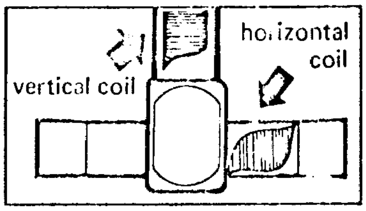
Areas of VLF Signals

Coverage shown only for well-known stations. Other reliable, fully operational stations exist. For full information regarding VLF signals in your area consult Geonics Limited. Extensive field experience has proved that the circles of coverage shown are very conservative and are actually much larger in extent.



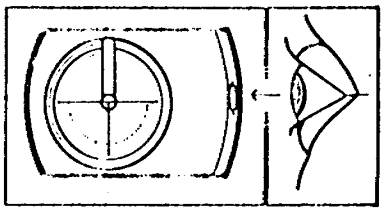
Station Selector

Two tuning units can be plugged in at one time. A switch selects either station.



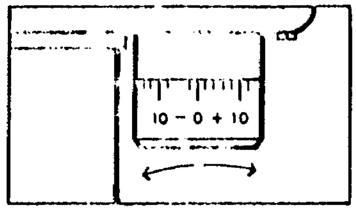
Receiving Coils

Vertical receiving coil circuit in instrument picks up any vertical signal present. Horizontal receiving coil circuit, after automatic 90° signal phase shift, feeds signal into quadrature dial in series with the receiving coil.



In-Phase Dial

shows the tilt-angle of the instrument for minimum signal. This angle is the measure of the vertical in-phase signal expressed in percentage when compared to the horizontal field.



Quadrature Dial

is calibrated in percentage markings and nulls the vertical quadrature signal in the vertical coil circuit.

By selecting a suitable transmitter station as a source, the EM 16 user can survey with the most suitable primary field azimuth.

The EM 16 has two receiving coils, one for the pick-up of the horizontal (primary) field and the other for detecting any anomalous vertical secondary field. The coils are thus orthogonal, and are mounted inside the instrument "handle".

The actual measurement is done by first tilting the coil assembly to minimize the signal in the vertical (signal) coil and then further sharpening the null by using the reference signal to buck out the remaining signal. This is done by a calibrated "quadrature" dial.

The tangent of the tilt angle is the measure of the vertical in-phase component and the quadrature reading is the signal at right angles to the total field. All readings are obtained in per centages and do not depend on the absolute amplitude of the primary signals present.

The "null" condition of the measurement is detected by the drop in the audio signal emitted from the patented resonance loudspeaker. A jack is provided for those preferring the use of an earphone instead.

The power for the instrument is from 6 penlight cells. A battery tester is provided.

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T-1052

GEONICS LIMITED
2 Thorncliffe Park Drive, Toronto 17, Ontario, Canada. Telephone: 425-1821 Area Code 416

EM16 CASE HISTORIES

The attached case histories are examples of the capability of the VLF electromagnetic system in various conditions.

The direction in which the readings have been taken are indicated by an arrow. All VLF survey maps should be so marked as an aid to interpretation.

Figure 1 - This profile shows two conductive zones. The anomaly at the left shows a reverse quadrature slope thus also indicating the presence of conductive overburden covering the bedrock conductor. The indicated depth to the conductor is calculated at one-half the distance between the positive and negative maximums. The anomaly at the right shows some positive quadrature slope, indicating a medium conductor.

Figure 2 - This profile shows a medium conductor. The right hand positive in-phase component has a long "tail" indicating the dip direction of the conductive zone.

Figure 3 - This anomaly is caused by a vertical zone of graphitic slate covered by approximately 85 feet of conductive clay. The in-phase anomaly is considerably reduced in amplitude. The quadrature shows a typically strong reverse slope.

Figure 4 - This anomaly is the result of a weak conductor. The location of the conductor is at the center of the slope, not at the actual zero-crossing.

Figure 5 - This shows a simplified example of EM16 used underground. By taking readings in two directions, using different primary field sources, one can locate ore pockets precisely. Only the in-phase profiles are shown in this figure.

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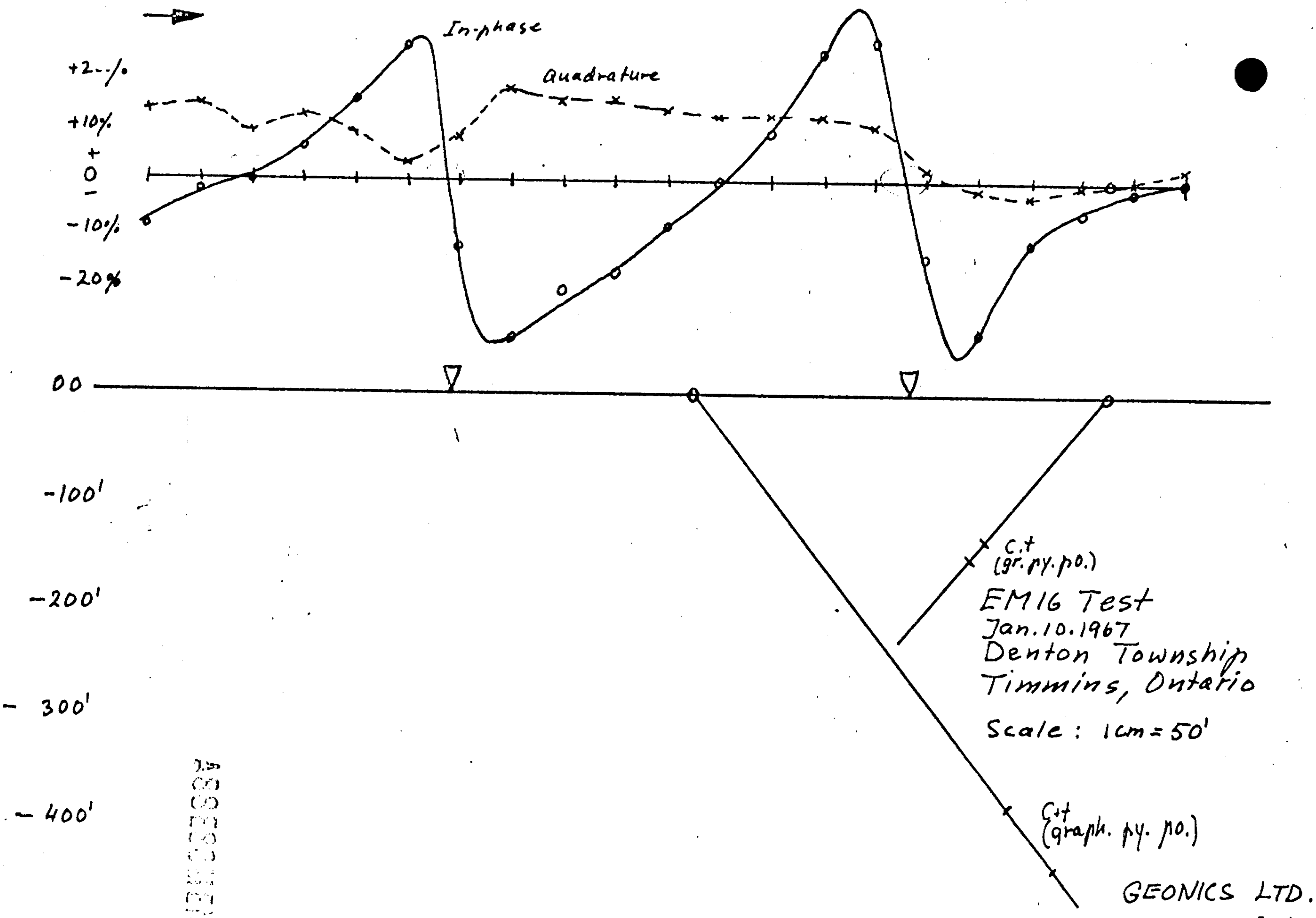
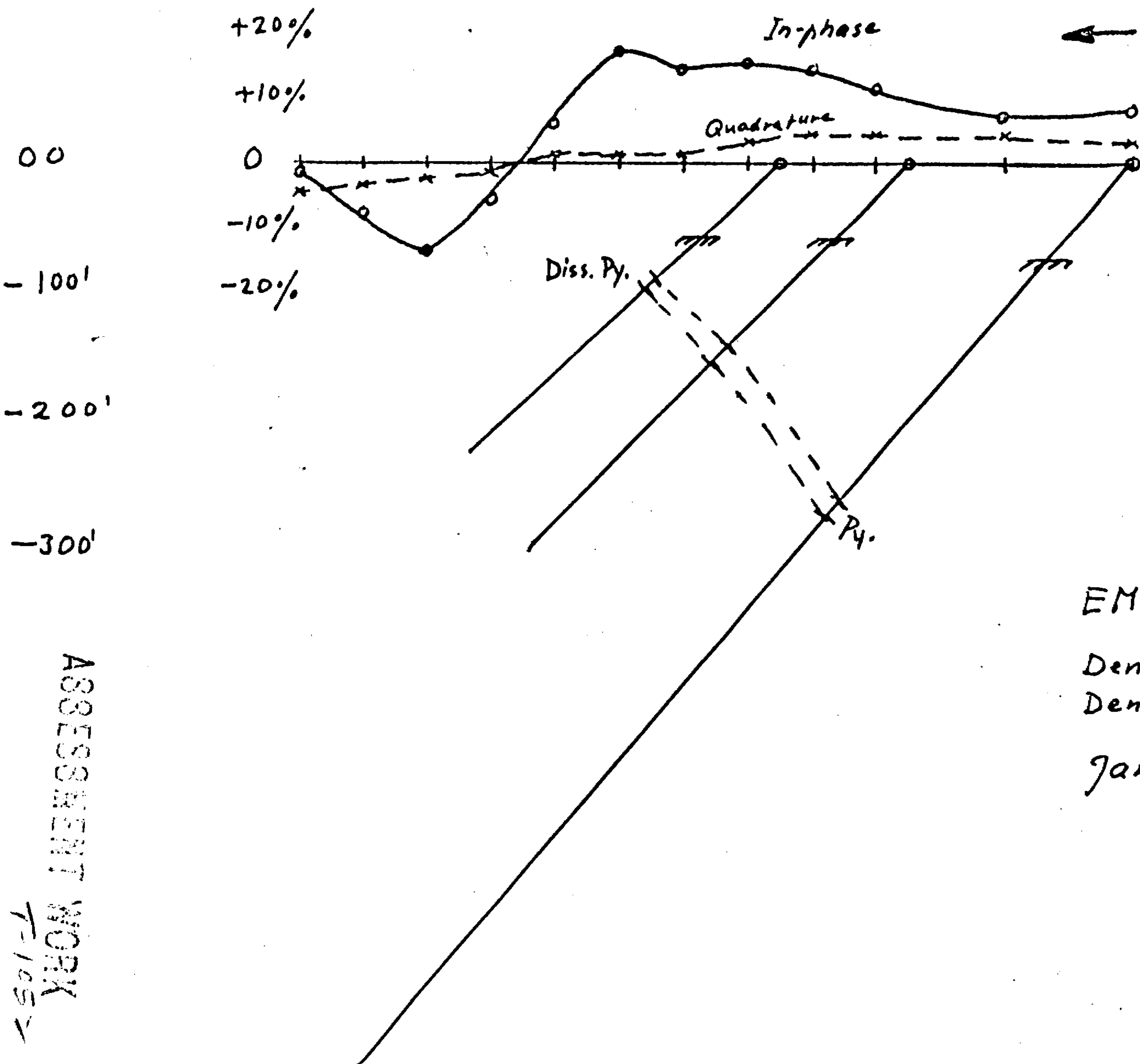


In-phase
Quadrature
+2--/.
+10%
+
0
-
-10%
-20%
00
-100'
-200'
- 300'
- 400'
C.+
(gr. py. po.)
C+t
(graph. py. po.)
EM16 Test
Jan. 10. 1967
Denton Township
Timmins, Ontario
Scale: 1cm = 50'
GEONICS LTD.

[Fig. 1]



EM16 Test

Denton Township, Timmins
Denton-Thorneloe Property

Jan. 10. 1967

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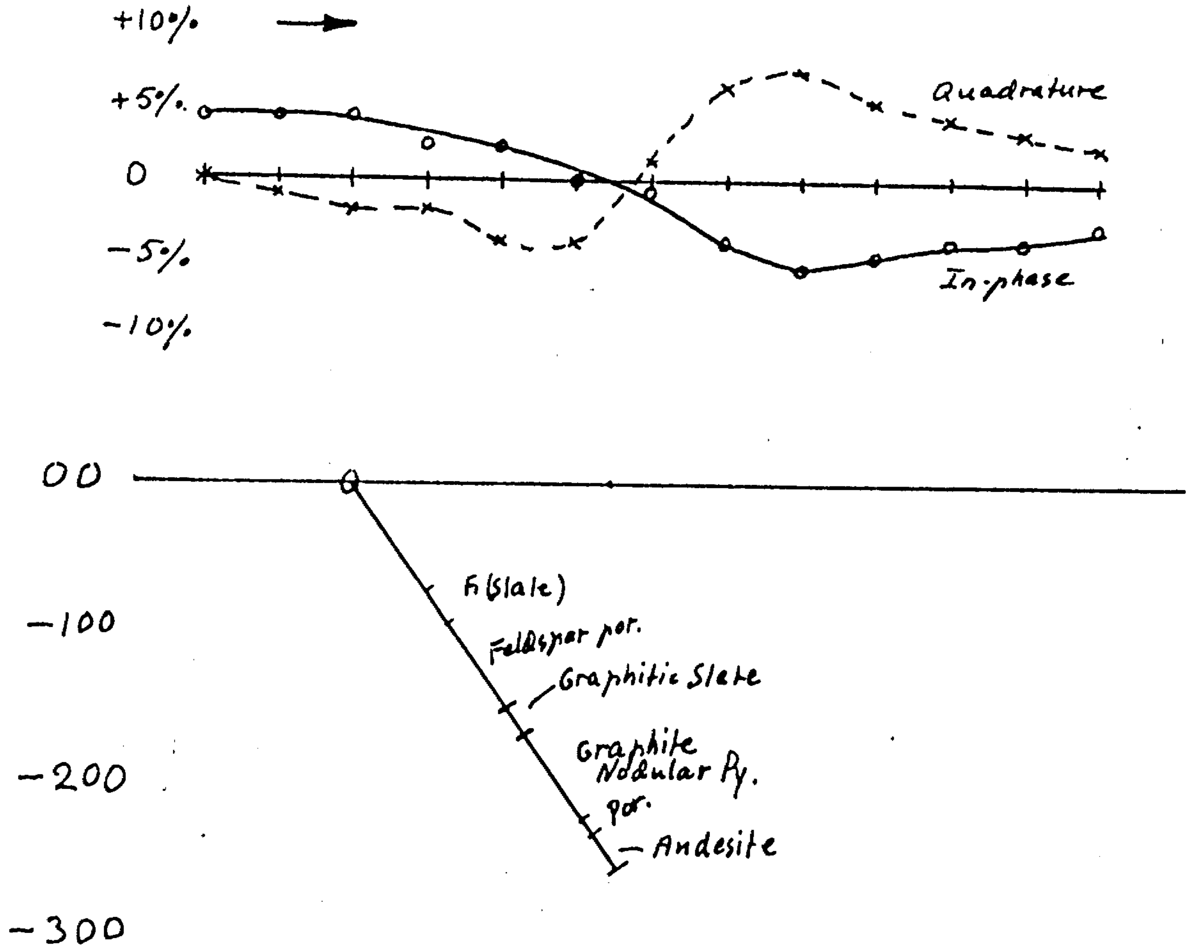
Fig. 2



EM16 Test

Timmins Area

Jan. 10. 1967

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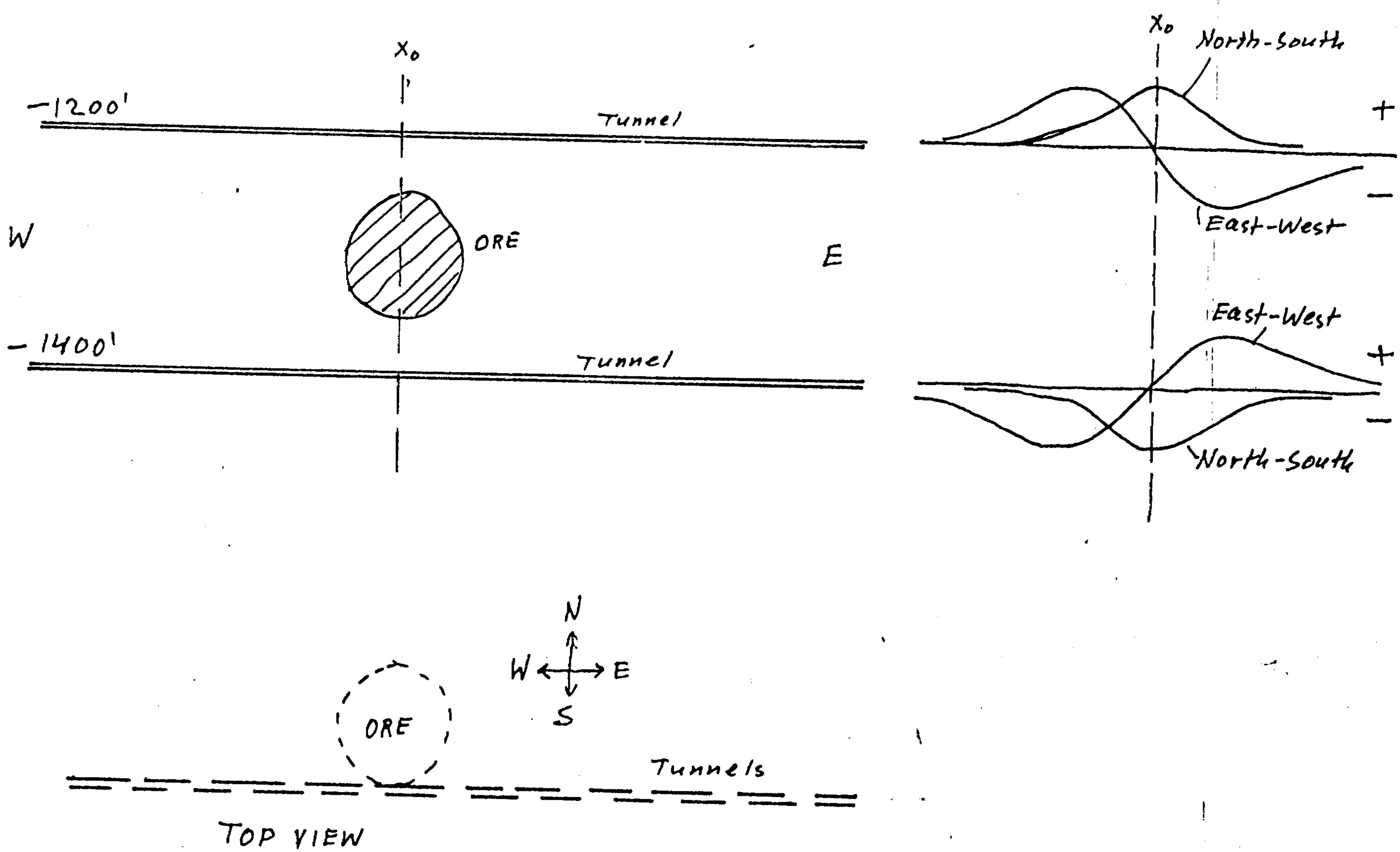
Fig. 3



EM16 in Underground Surveys

Readings facing East or North
Scale 1 cm = 25 ft.
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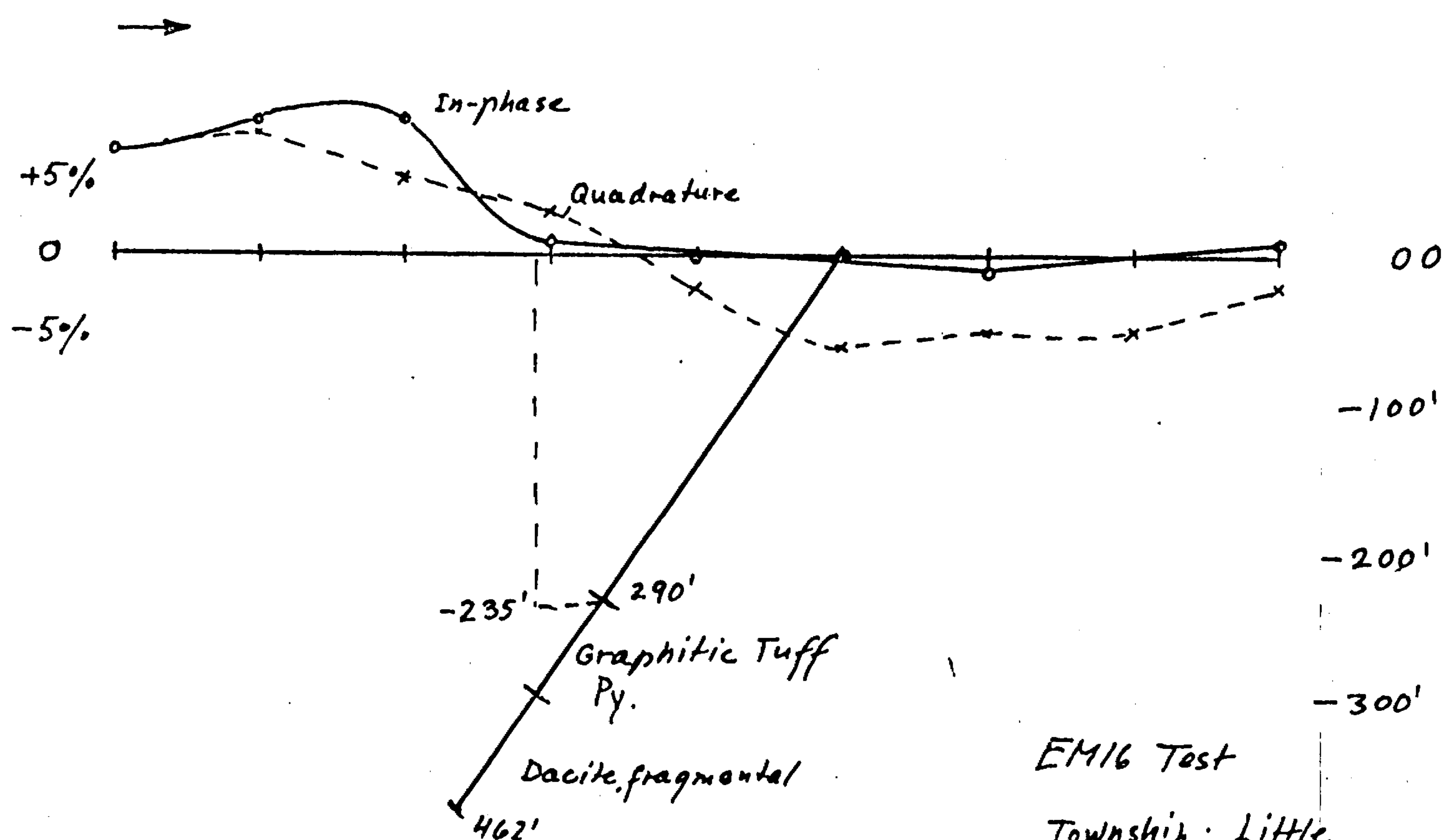
Fig. 5



EM16 Test

Township: Little
Timmins Area, Ontario
Date: Jan. 10, 1967

Scale: 1 cm = 50'

GEONICS LTD.

Fig. 4

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2 Thorncliffe Park Drive, Toronto 17, Ontario, Canada. Telephone: 425-1821 Area Cod

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MODEL EXPERIMENTS

Contributed by

T.P. Rogowsky and W. A. Bowes of Martin, Sykes and Associates, Steamboat Springs, Colorado. We wish to thank them for their permission to use the very illustrative results.

Target:

28 gage zinc plated roofing sheet, 6 x 48 feet, above ground.

Ground:

The area was covered by 2.5 ft. of conductive soil on top of gravel and clay. The area was found to be free of anomalies.

Readings:

The graphs show the view (cross section) to North. Readings towards right (East). Primary field is East-West. The instrument was moved along the zero-line except where shown as a separate sloping line (side of a hill). The quadrature component was negligibly small except where shown in the graphs.

Station:

WWVL, 20 kHz

Scale:

1 sq. = 2 feet
1 sq. = 10 %

ASSESSMENT WORK

T-1052

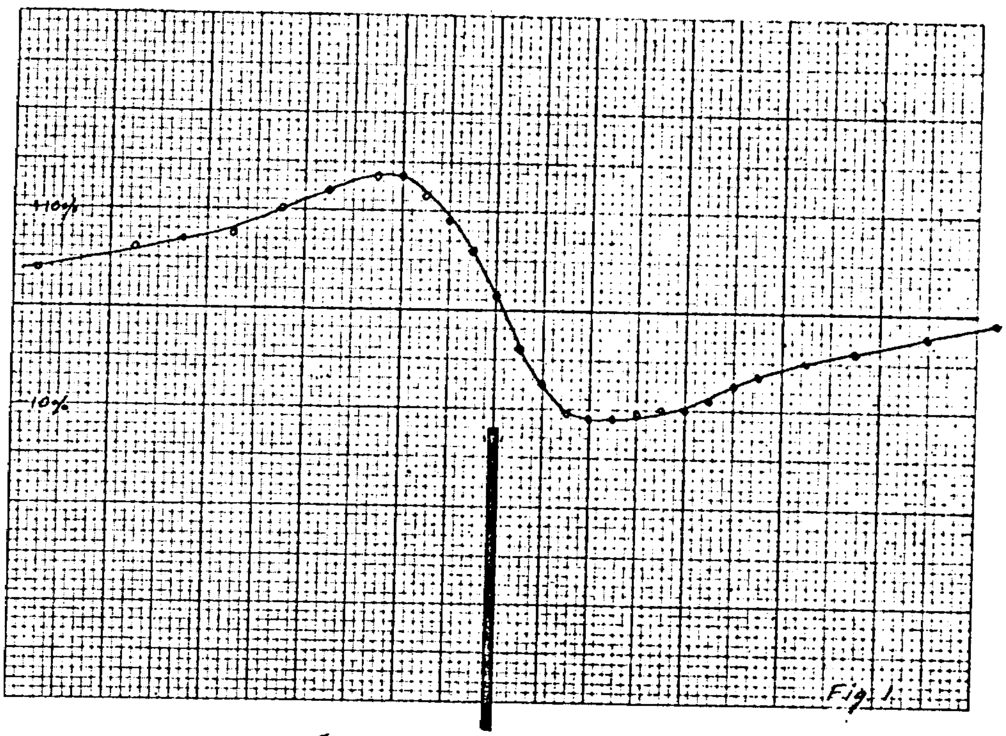

Fig. 1.

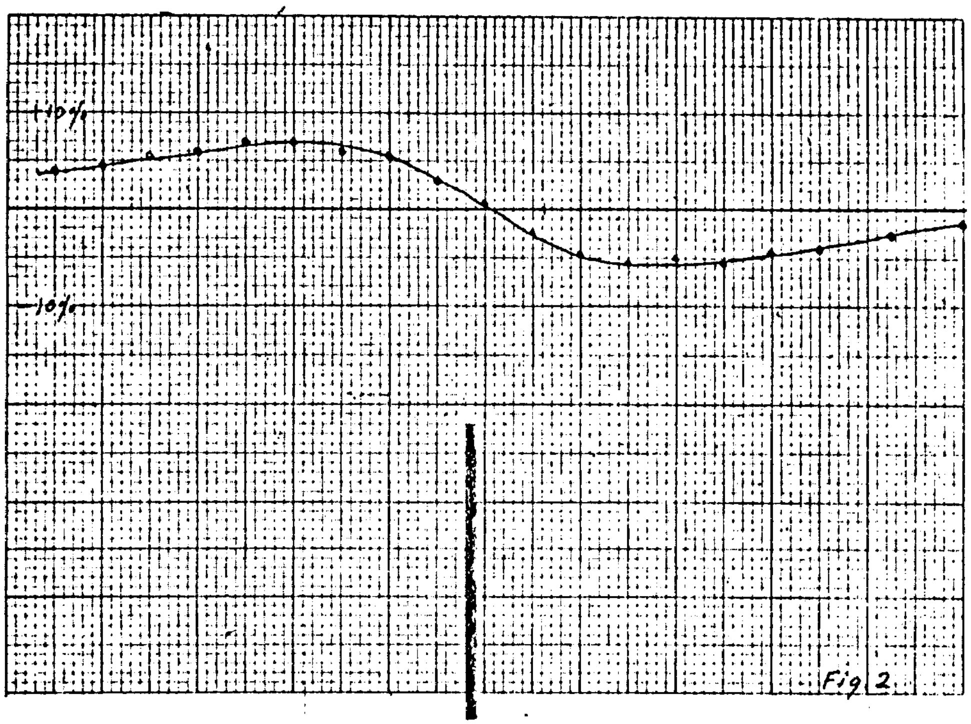

Fig 2

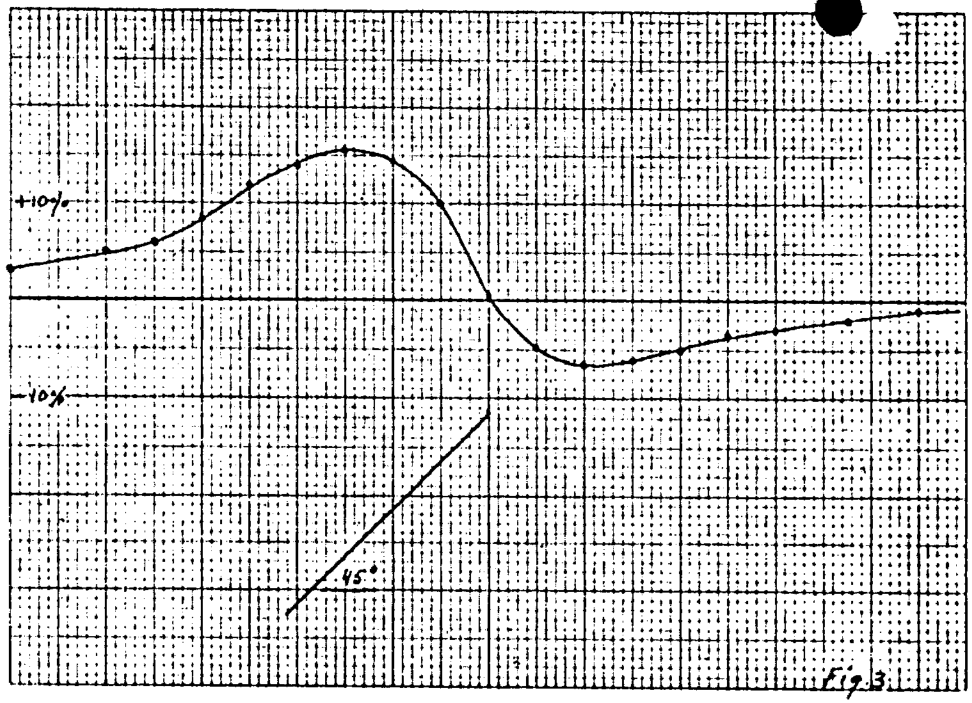

Fig 3

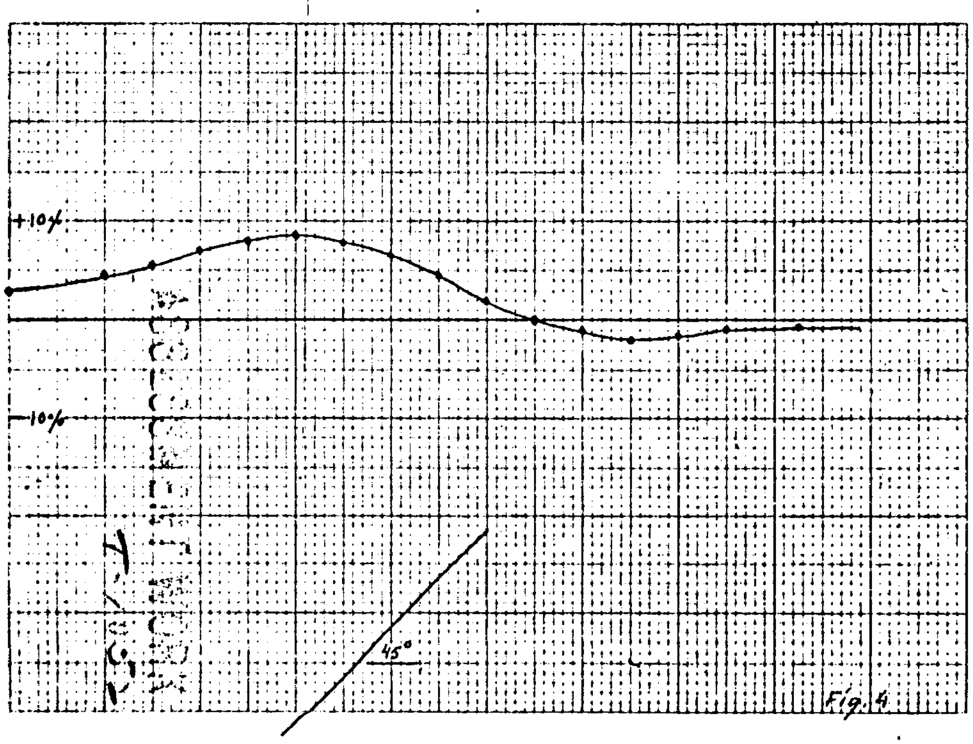

Fig 4

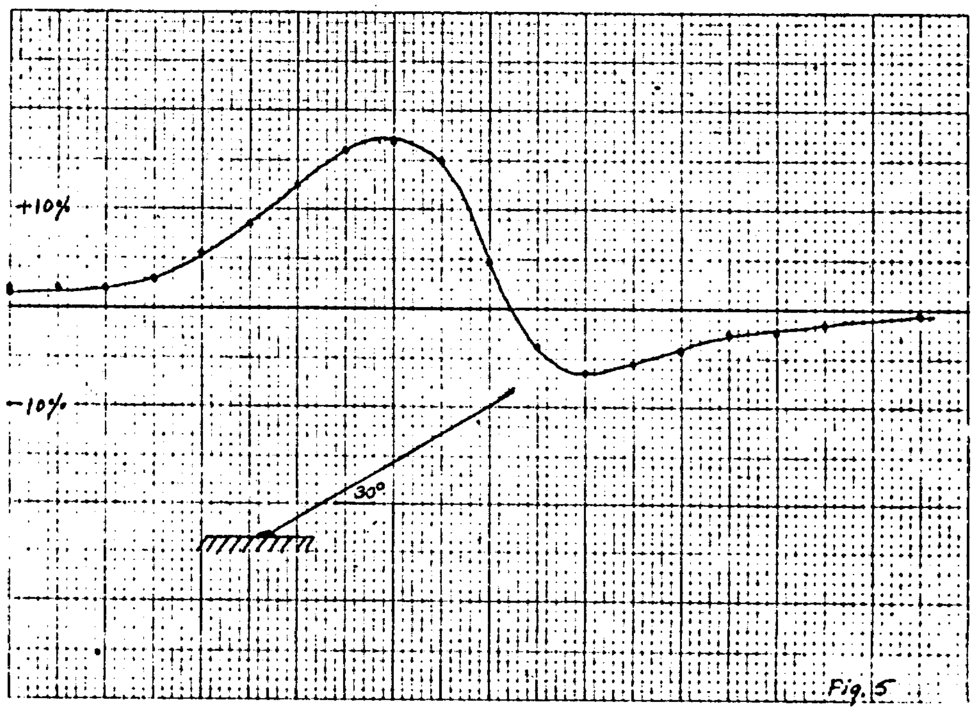

Fig 5

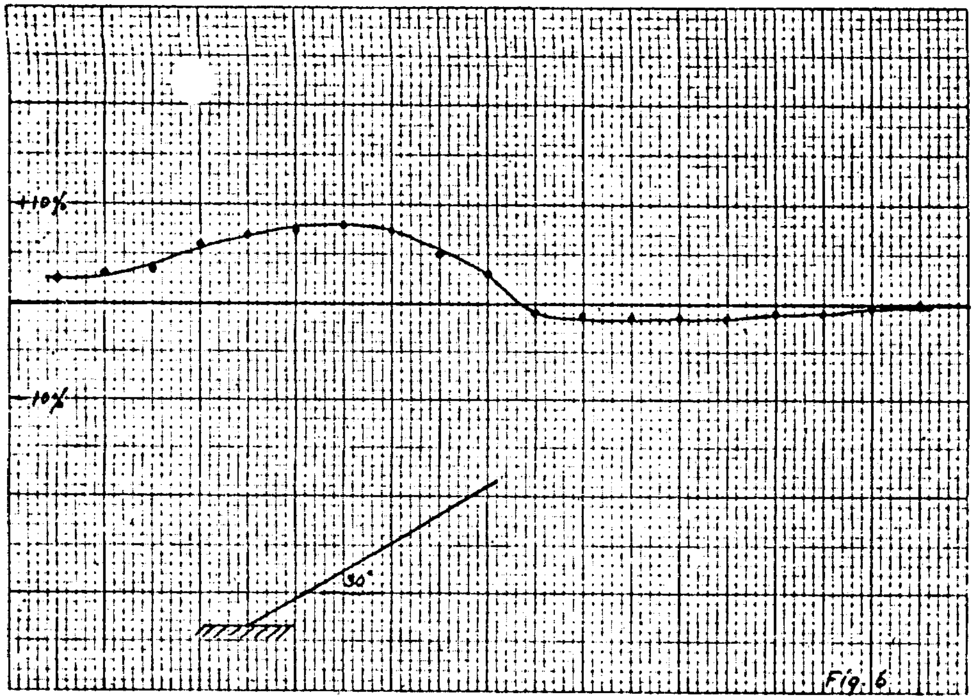

Fig. 6

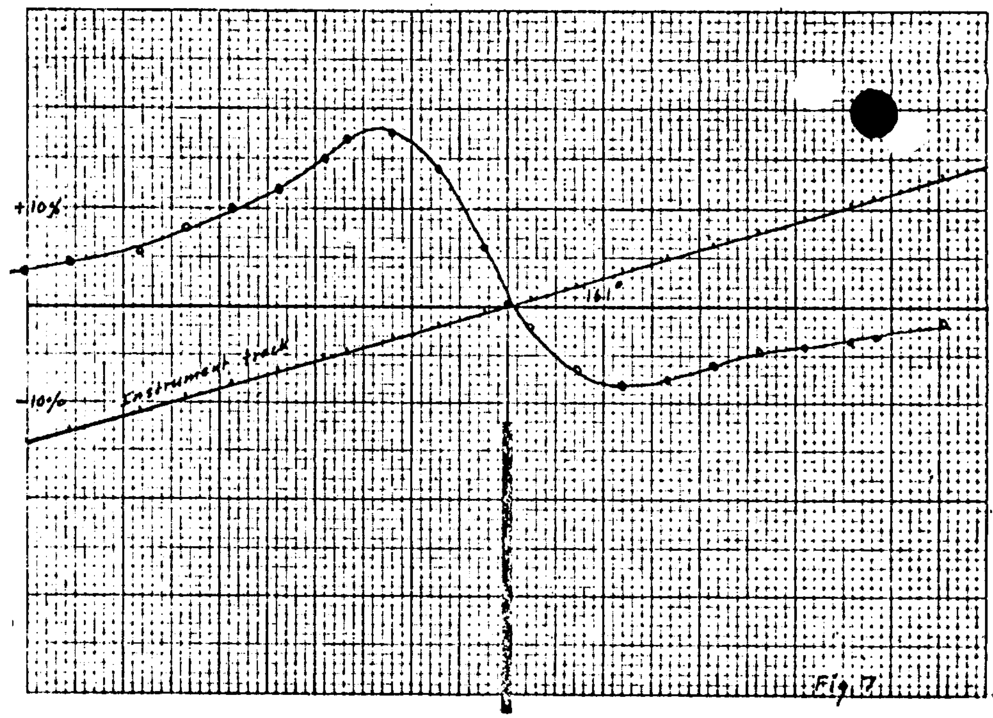

Fig. 7

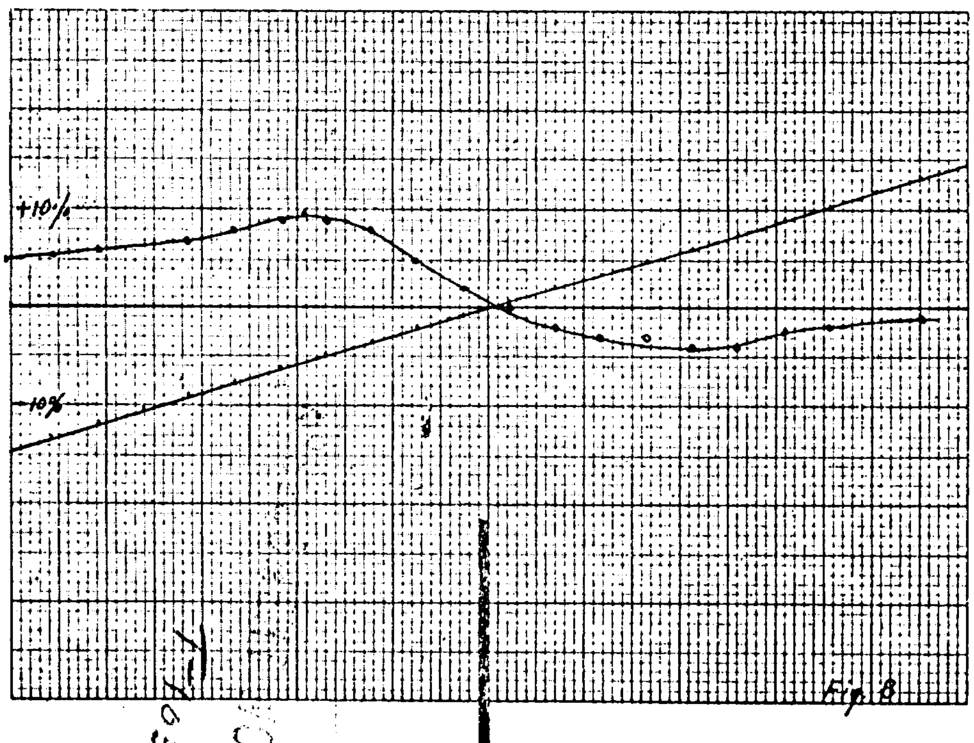

Fig. 8

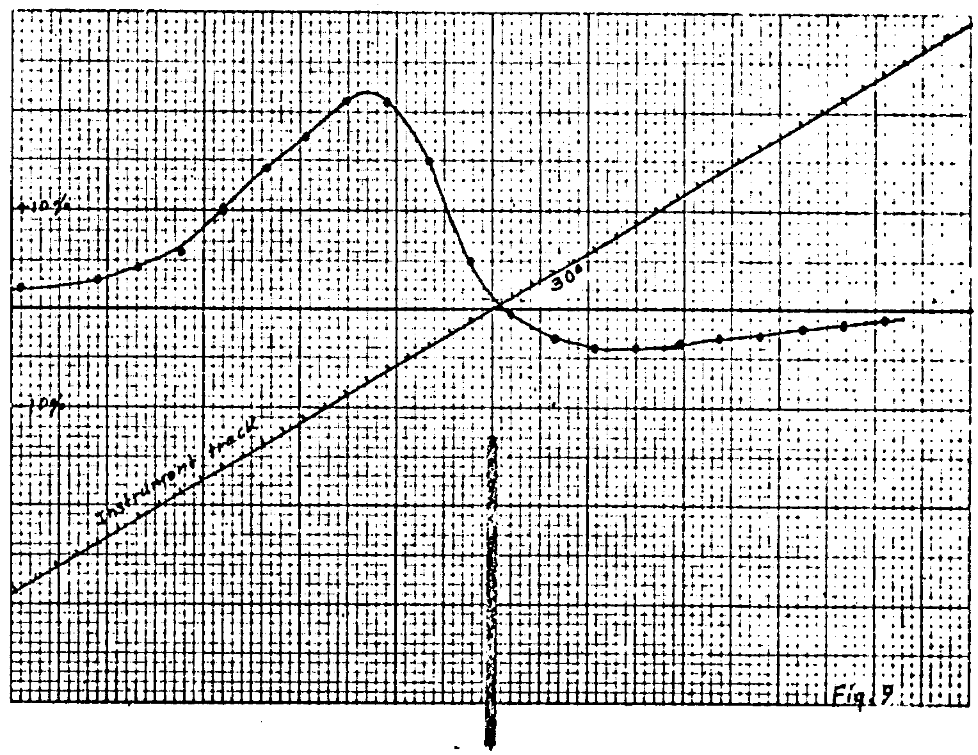

Fig. 9

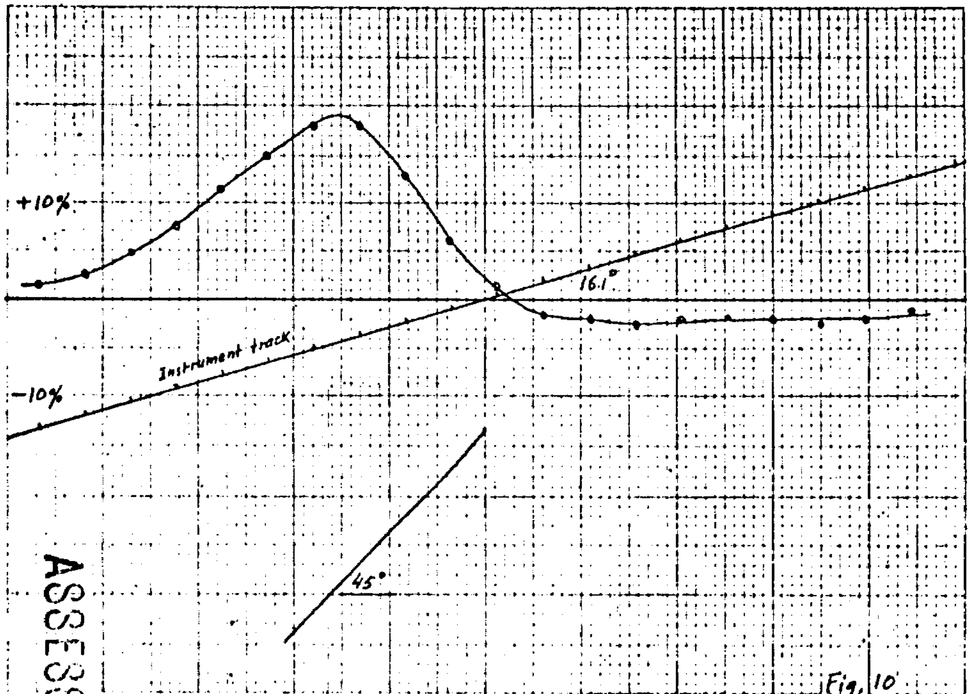

Fig. 10

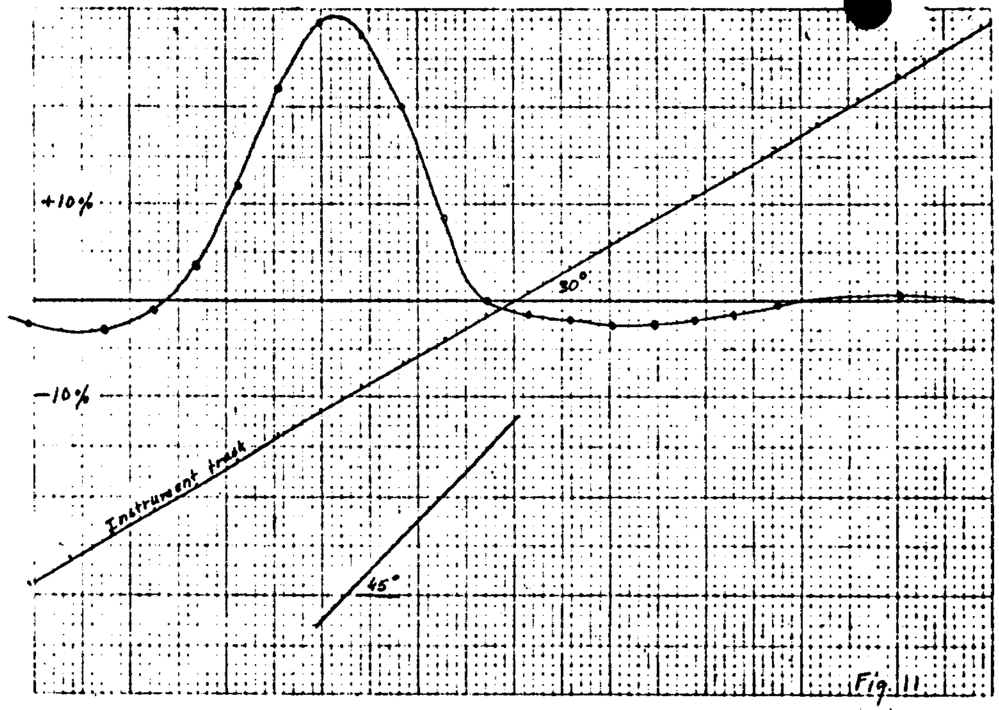

Fig. 11

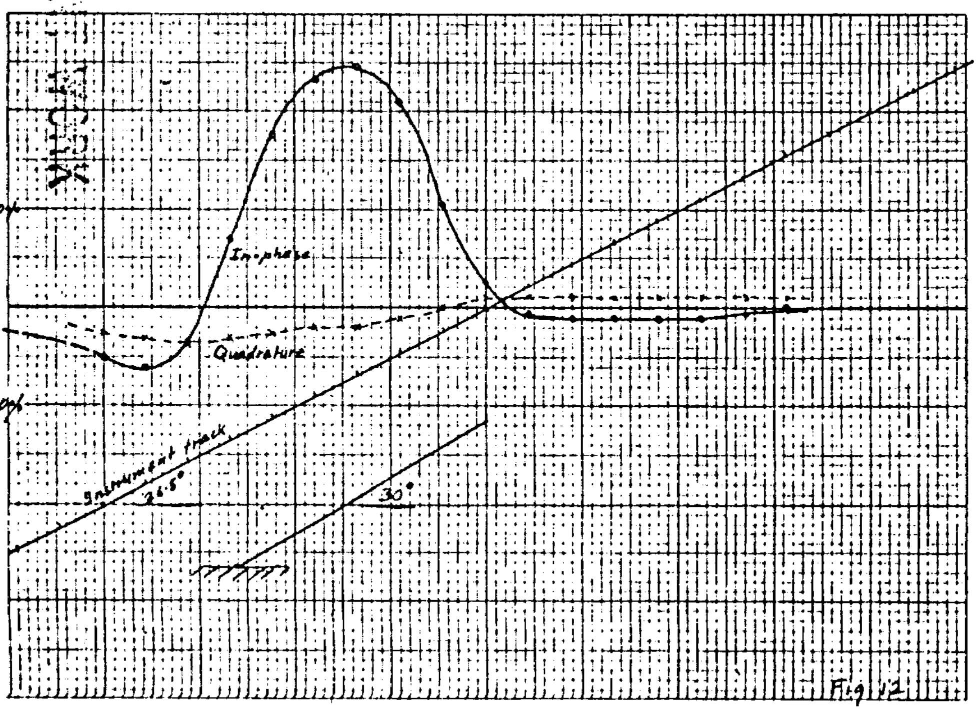

Fig 12

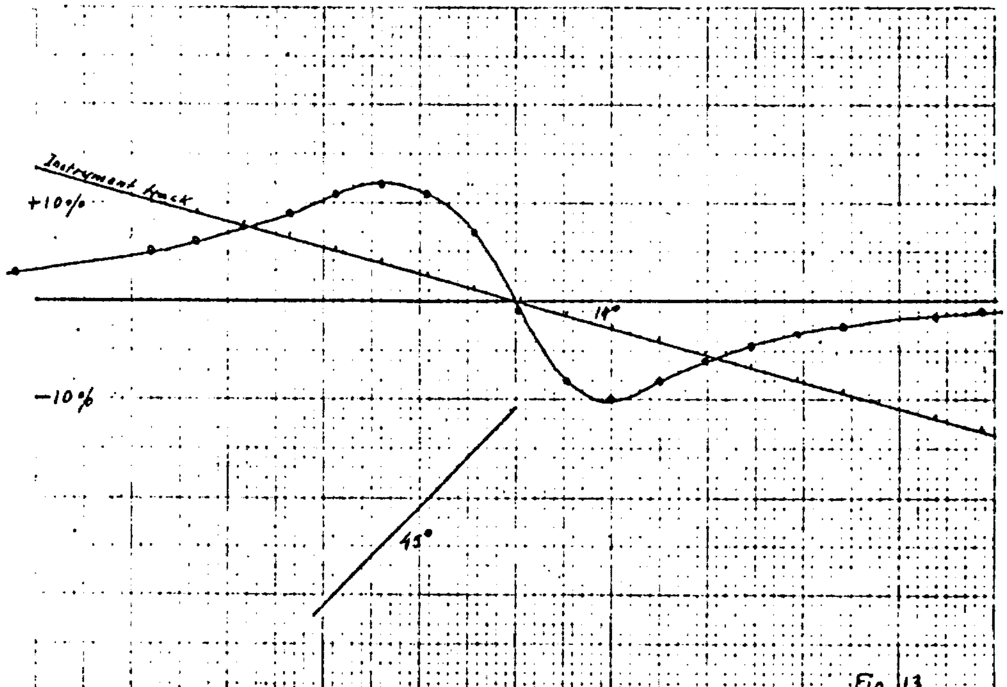

Fig. 13

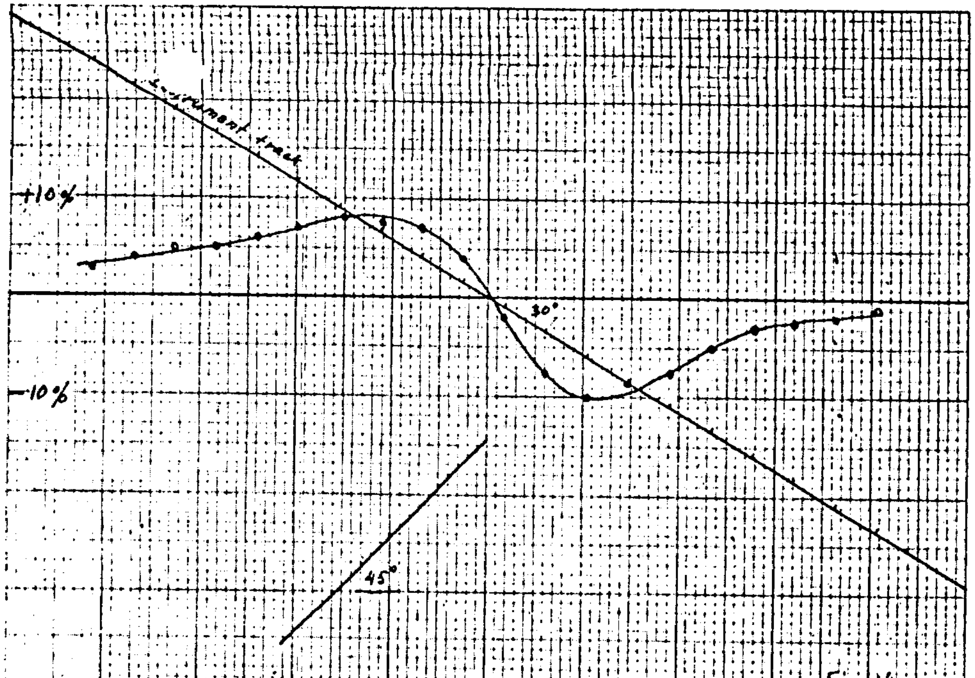

Fig. 14

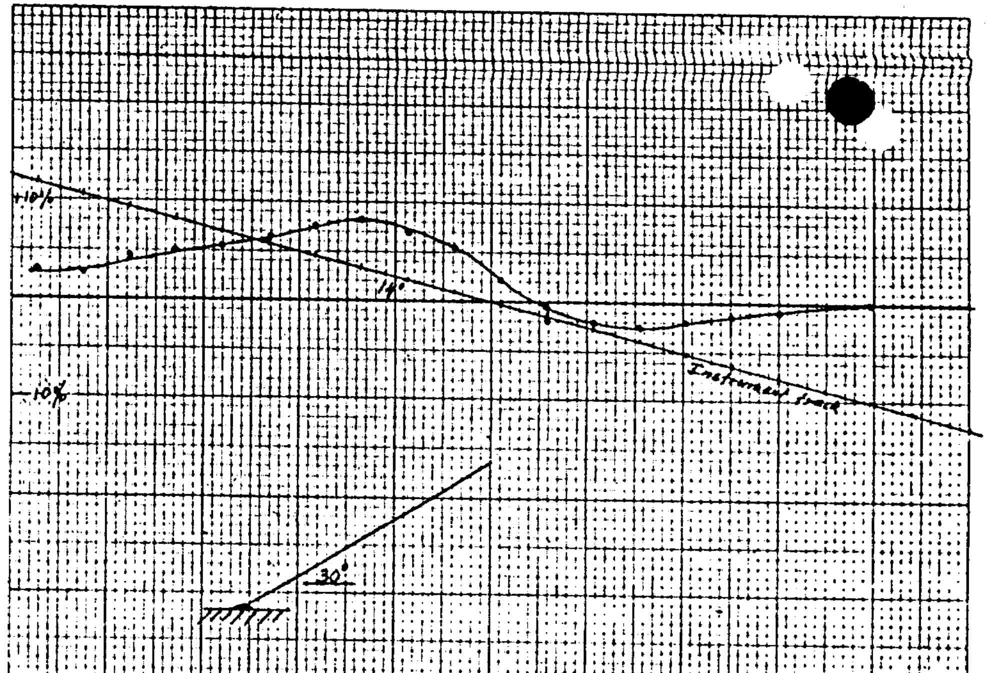

Fig. 15

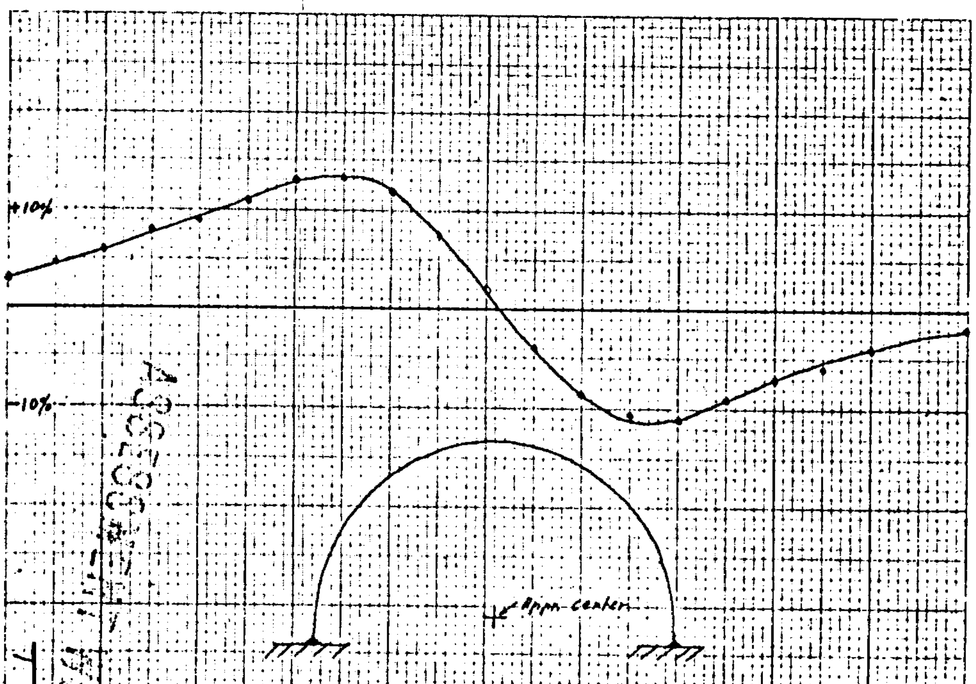

Fig. 16

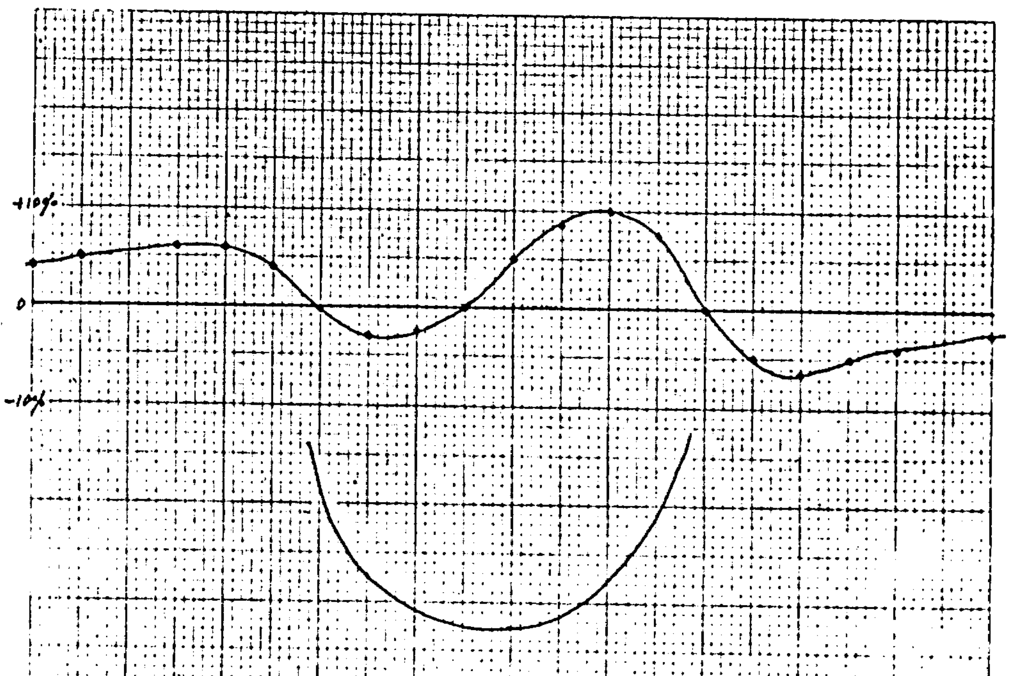

Fig. 17

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2 Thorncliffe Park Drive, Toronto 17, Ontario, Canada. Tel. (416) 425-1821, Cables: Geonics

May 1970

Explanation of the Figures and Graphs

FIGURE 1 The EM16 VLF instrument, showing the main parts and controls.

FIGURE 2 is the block diagram of the EM16. The diagram is self-explanatory. Both the coils (reference and signal coil) are housed in the lower part of the handle. The directions of the axis of the coils are as follows. The reference coil axis is basically horizontal and is kept more or less parallel to the primary field during measurement. The signal coil is at right angles to the reference coil and its axis is, of course, vertical.

The signal amplifier has the two inputs, one connected to the signal coil and one to the reference channel. By tilting the coils, the operator minimizes the signal from the signal (vertical axis) coil. Any remaining signal is reduced to zero by the quadrature control in the reference channel. The signal amplifier has zero output when both input signals are equal in amplitude and phase. Thus the setting of the quadrature control for minimum output from the receiver indicates the relative amount of the quadrature signal of the vertical coil. The measured value does not depend on the absolute value of the signal, only the relative values are measured.

FIGURE 3 shows the proper planning of survey in relation to the direction of strike and primary field, direction of survey lines etc.

FIGURE 4 explains the time delay (phase lag) ø of travelling electromagnetic wave above and in the conductive ground. The amplitude of the wave in the ground is also attenuated.

Subsidiary of Deering Milliken Inc.

FIGURE 5 shows on the left the physical direction of the primary (H_x) and secondary (H_z) field vectors in relation to conductive ground and target. The location of secondary current distribution in the target is shown schematically. We see that most current concentration is in the upper edge of the good conductor. The return secondary current is more spread due to the diminishing primary field in the conductive rock. On the right, the time vectors show the retarded phase of H_x in the target and the phase advance of the secondary field H_z compared to H_x. We must remember that the H_z will have additional phase lag when it penetrates back towards the surface.

This figure shows a positive real component of the H_z while the quadrature remains negative.

FIGURE 6 This graph shows the primary field attenuation in nepers, relative amplitude and phase lag in radian of the primary field as function of depth and conductivity of the ground. This graph is for 20 kHz.

FIGURE 7 shows the maximum obtainable amplitude H_z from a sphere or horizontal cylinder as a function of the radius-to-depth ratio. The schematic on the left shows the depth determination for the spherical or cylinderical target.

The equation for the phase shift and attenuation of the primary field in conductive material, where $\sigma/\epsilon\omega \gg 1$, is

$$\alpha = \beta = \sqrt{\frac{\omega\mu\sigma}{2}}$$

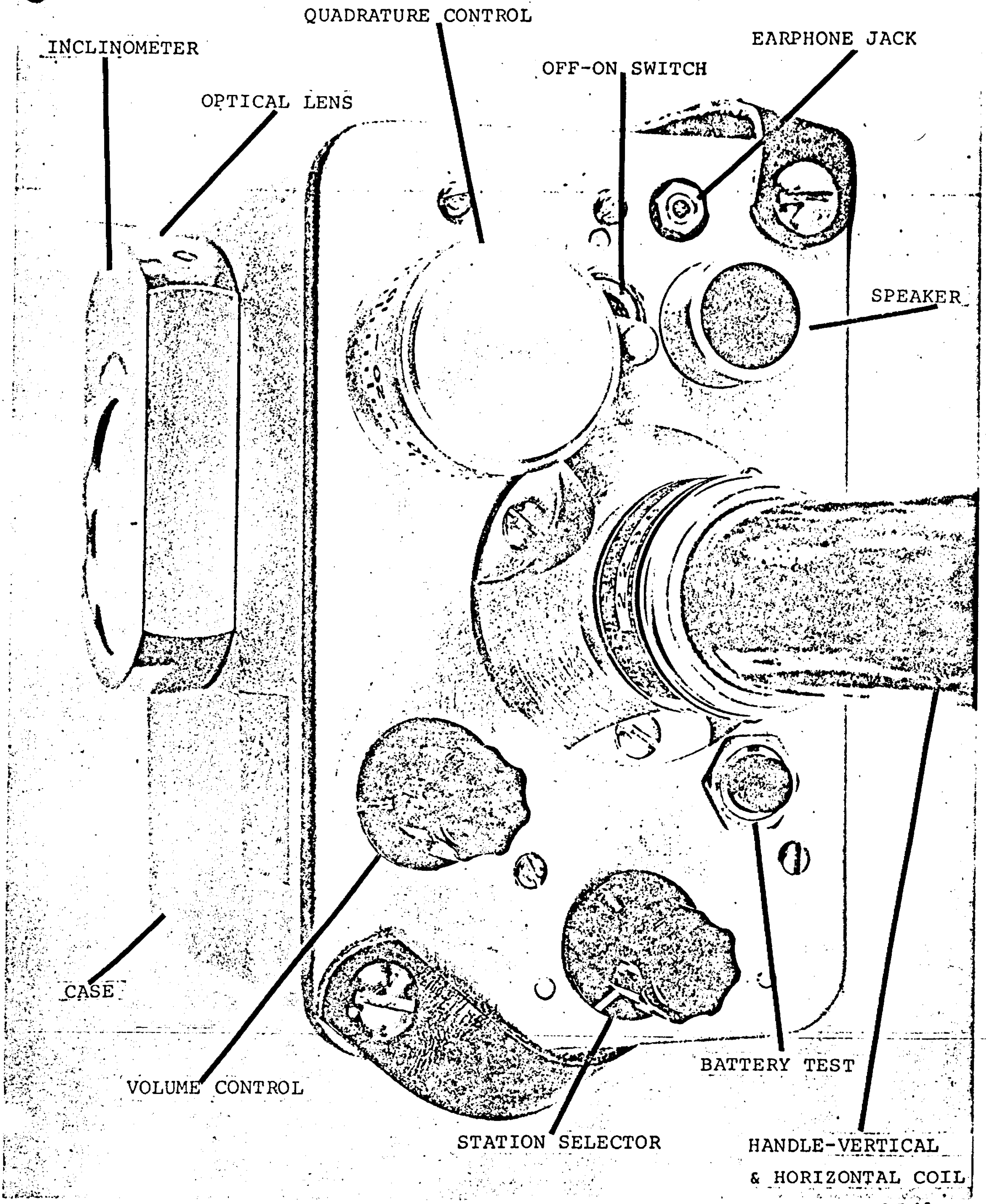
where α = attenuation, nepers/m
β = phase lag, radian/m
$\omega = 2\pi f$
μ = magn. permeability $= 4\pi \times 10^{-7}$
σ = Ʊ/m

FIGURE 8 This graph gives the amplitude and phase shift of the field (in conductive media) as function of skin depth, $\delta = 1/\alpha$.
This equation gives the skin-depth in meters for certain conductivity and frequency. Normalize this to one. and the graph in figure 8 gives the amplitude and phase shift of the wave at any relative depth.

FIGURE 9 The vertical field from a long wire source is plotted here. A vertical semi-infinite sheet target would be simulated this way. In practice it hardly works accurately due to the spread of the secondary current in the target because of the finite conductivity and the attenuation and phase shift of the primary field as function of depth.

ASSESSMENT WORK
T-1052

FIG. 1 EM 16



ASSESSMENT WORK

T-1052

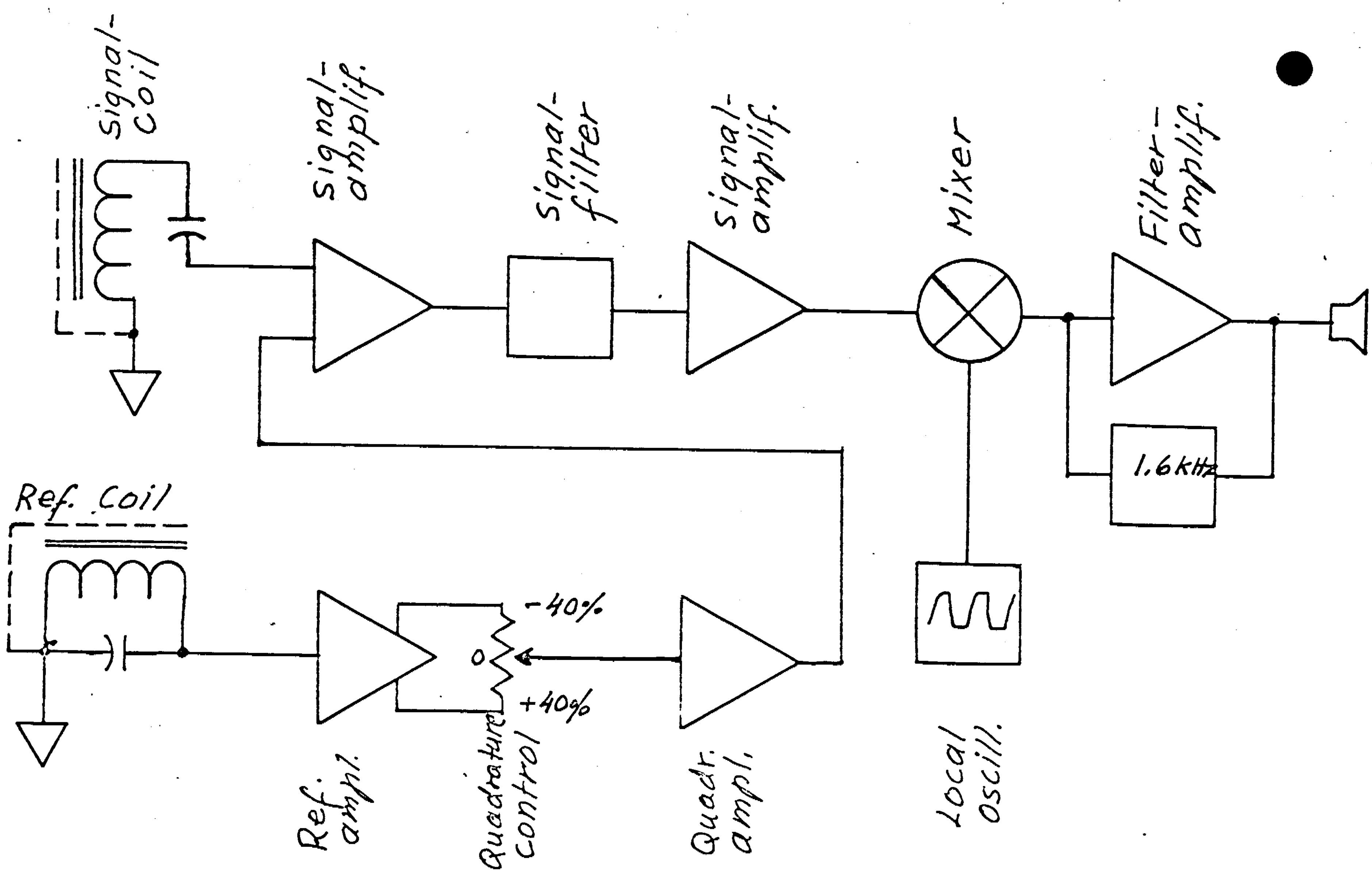
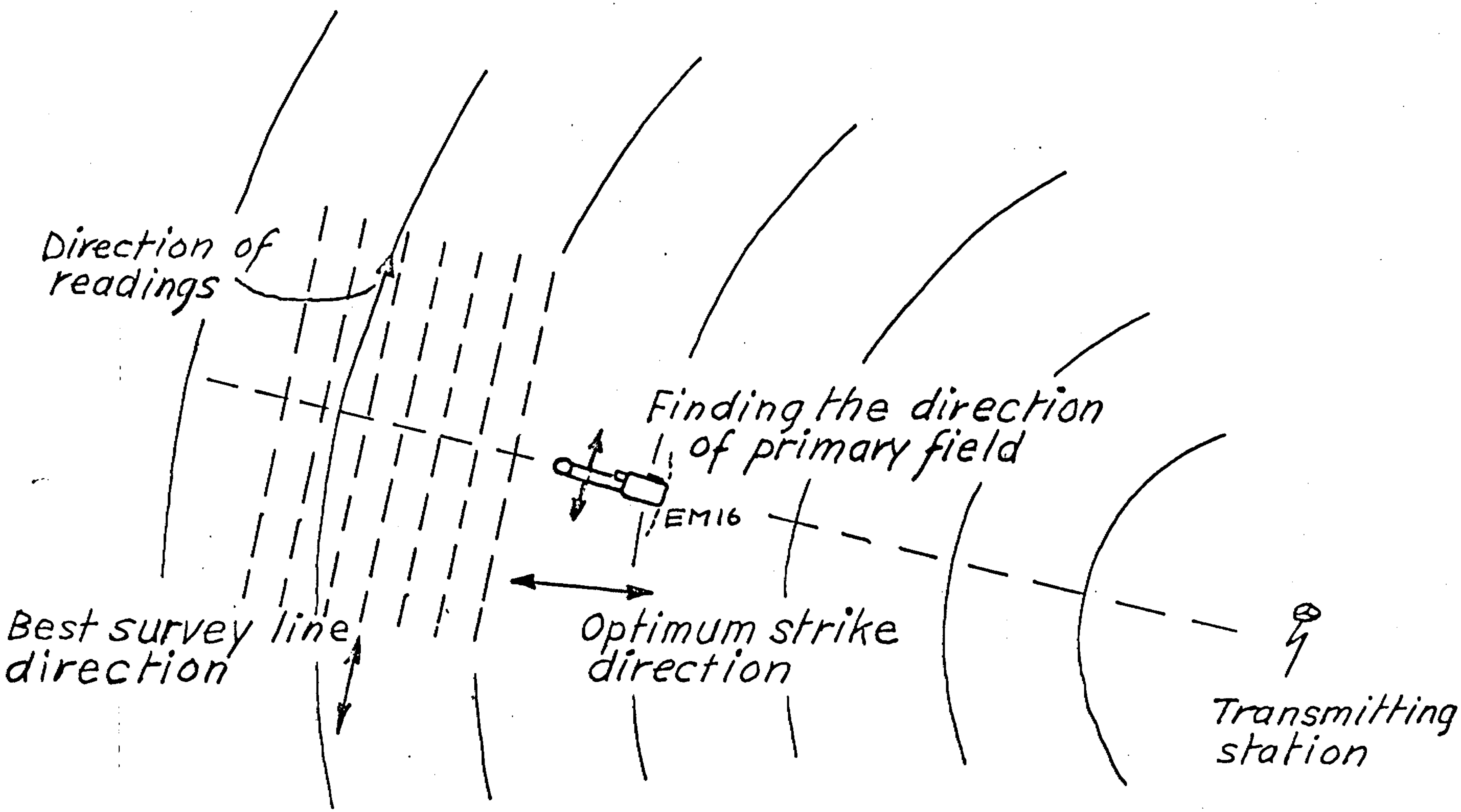


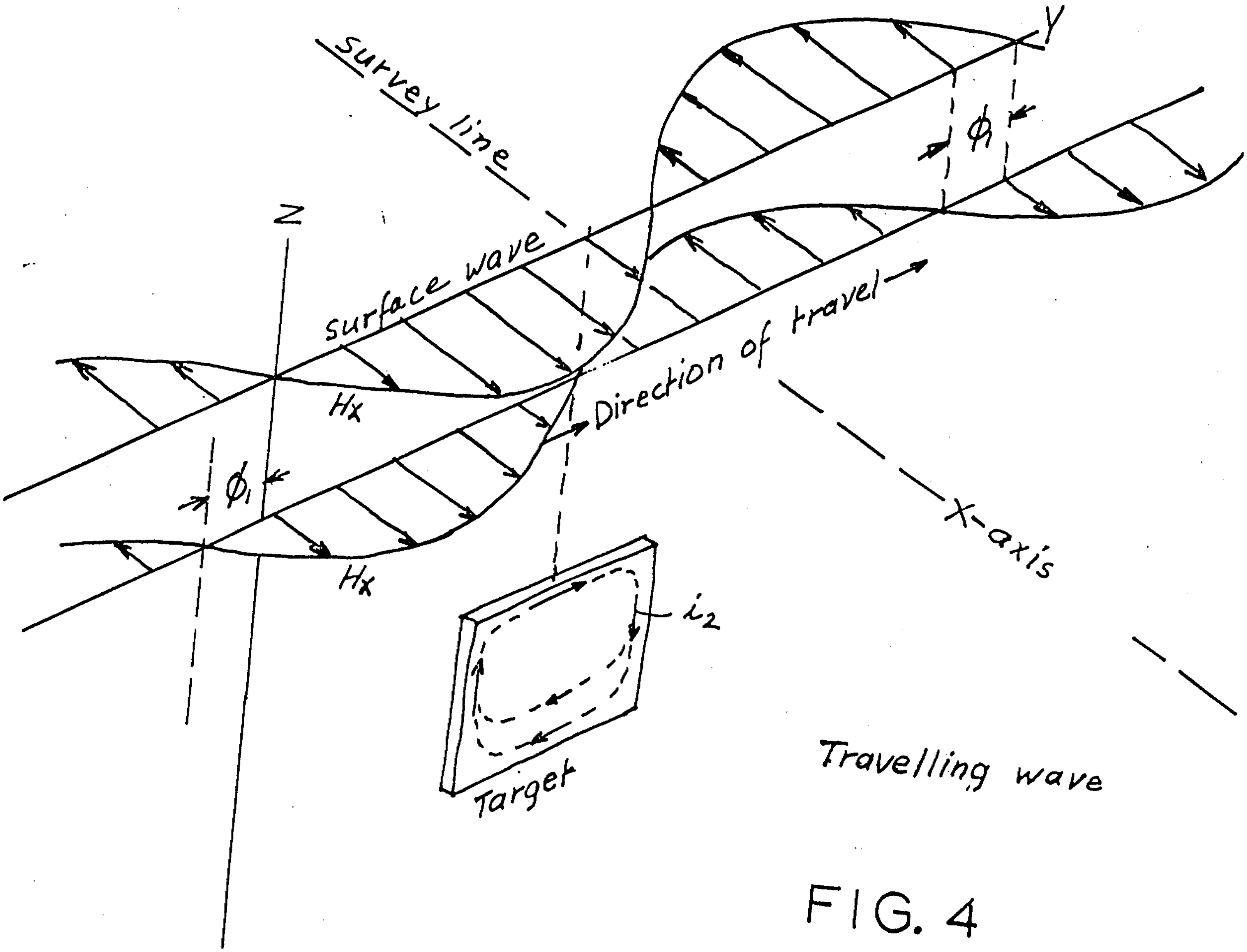
FIG. 2

EM16 VLF-EM
Block Diagram
GEONICS LTD.



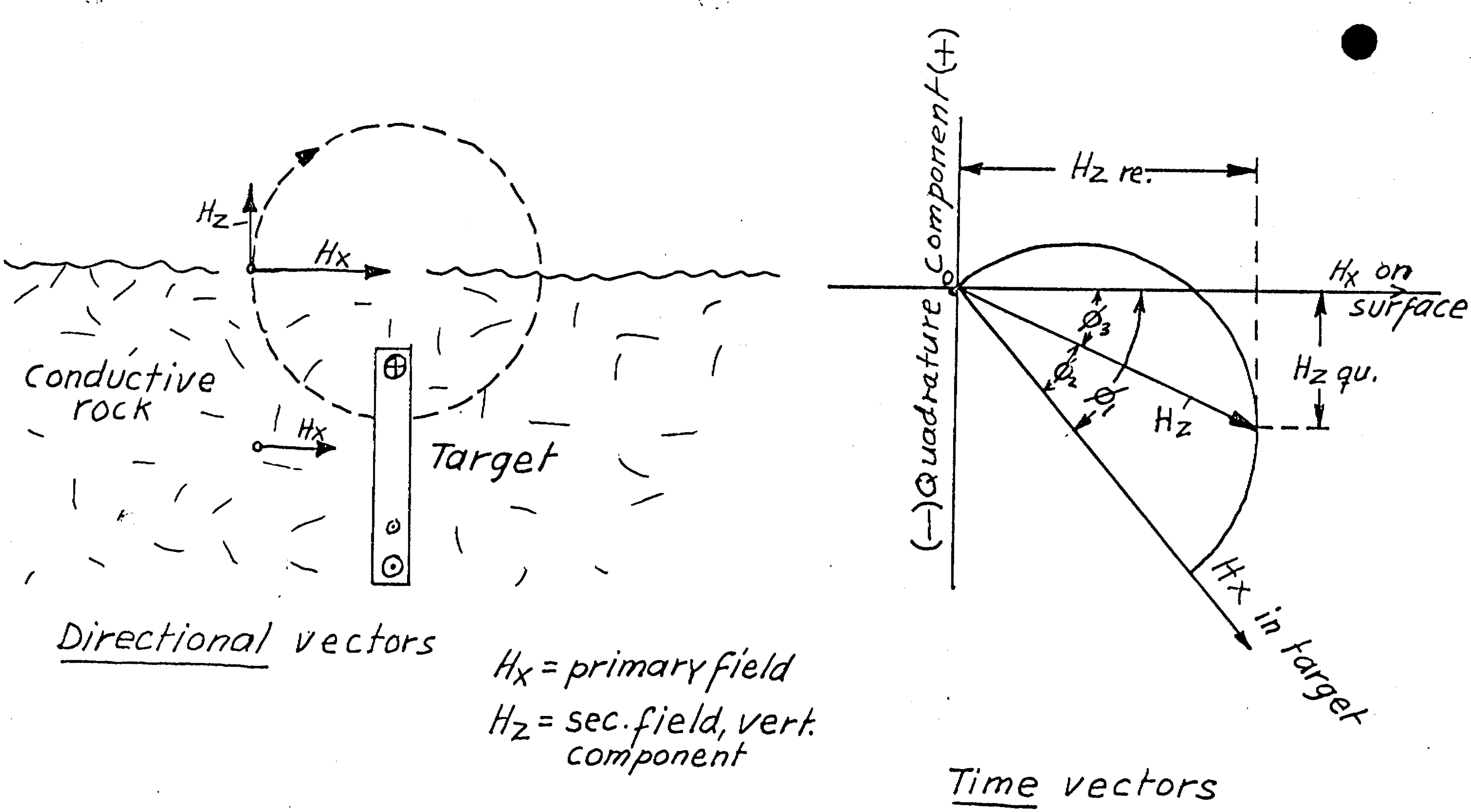
Planning of survey

FIG. 3



Travelling wave

FIG. 4



Conductive target in conductive medium

FIG. 5

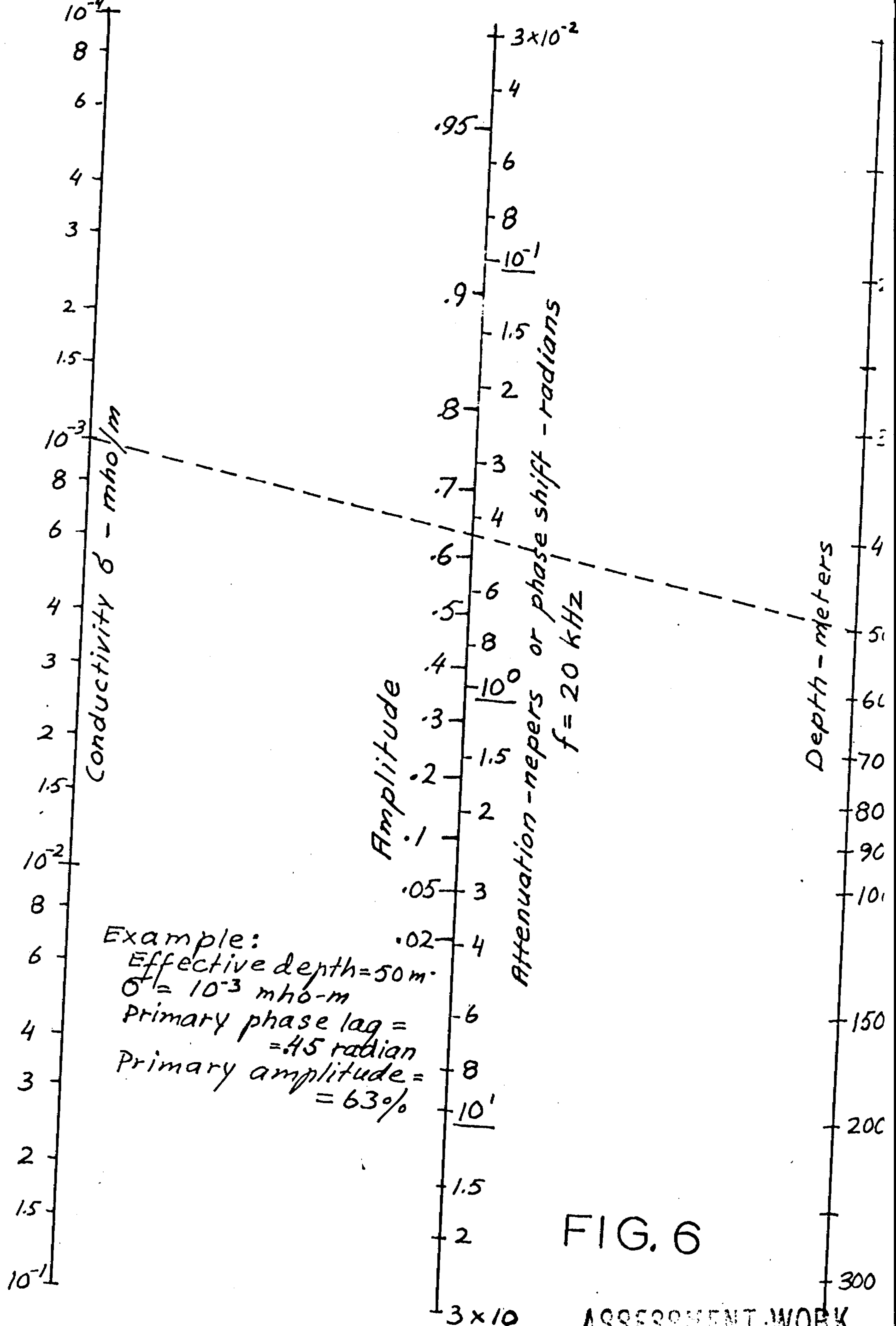
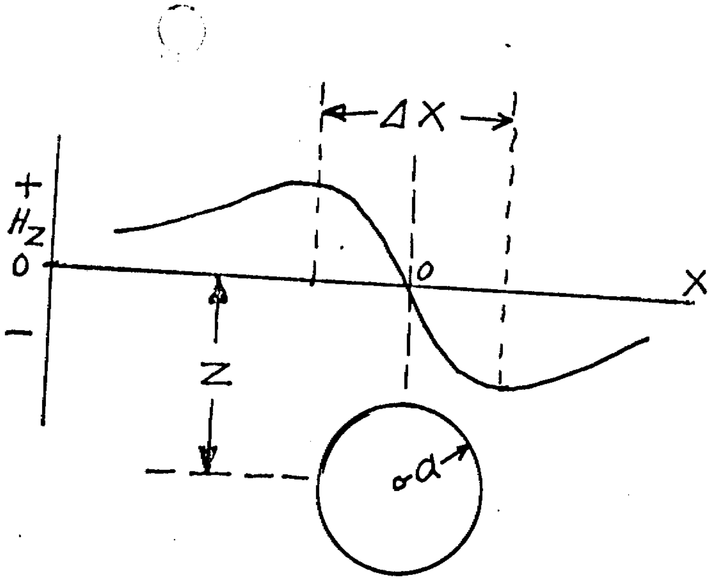


FIG. 6

ASSESSMENT WORK

T-105



Long cylinder or sphere in horizontal field $H_x = 1$

Depth $Z = 1.16\ \Delta X$ for cylinder,
$Z = \Delta X$ for sphere
$\sigma = \infty$

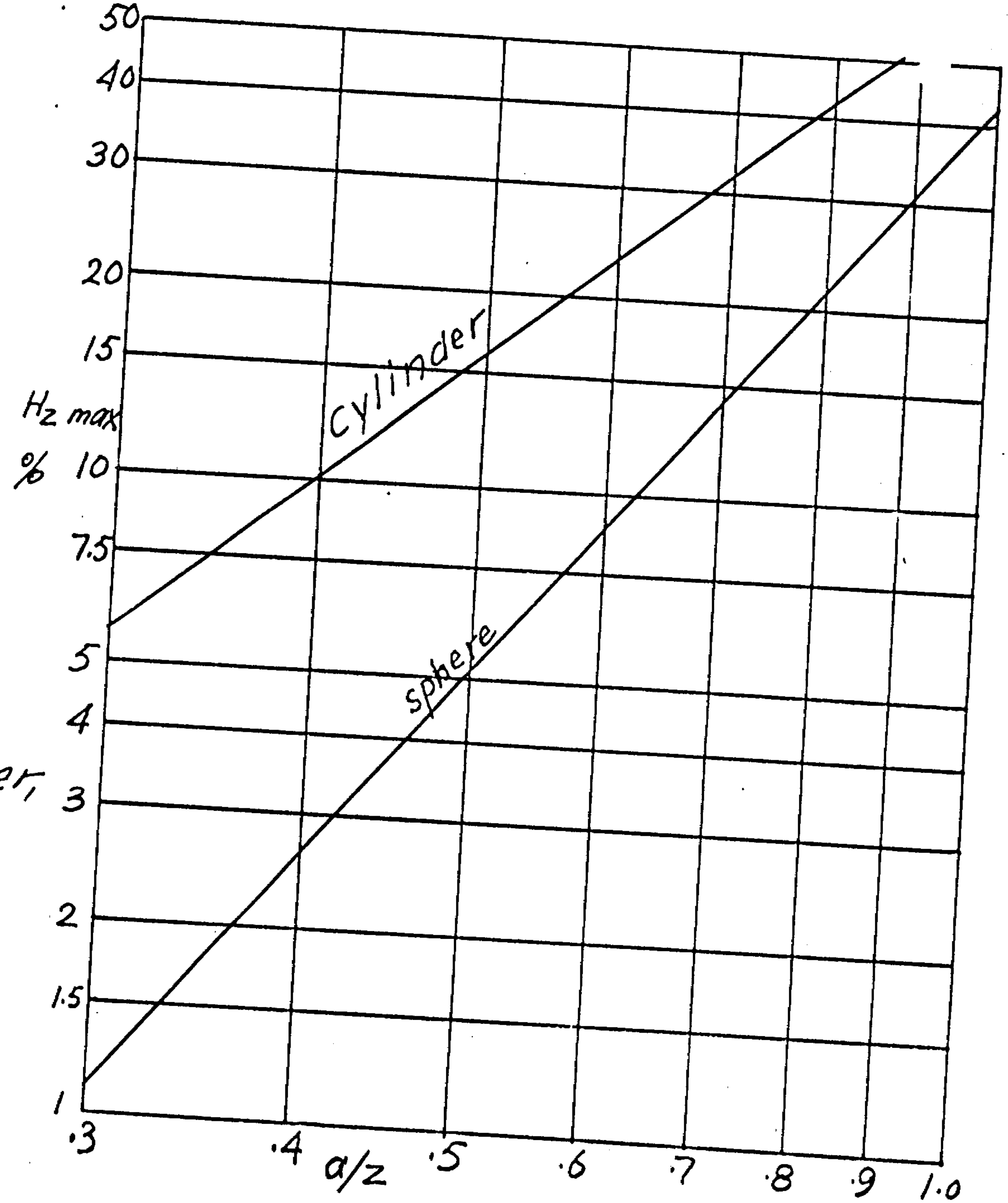
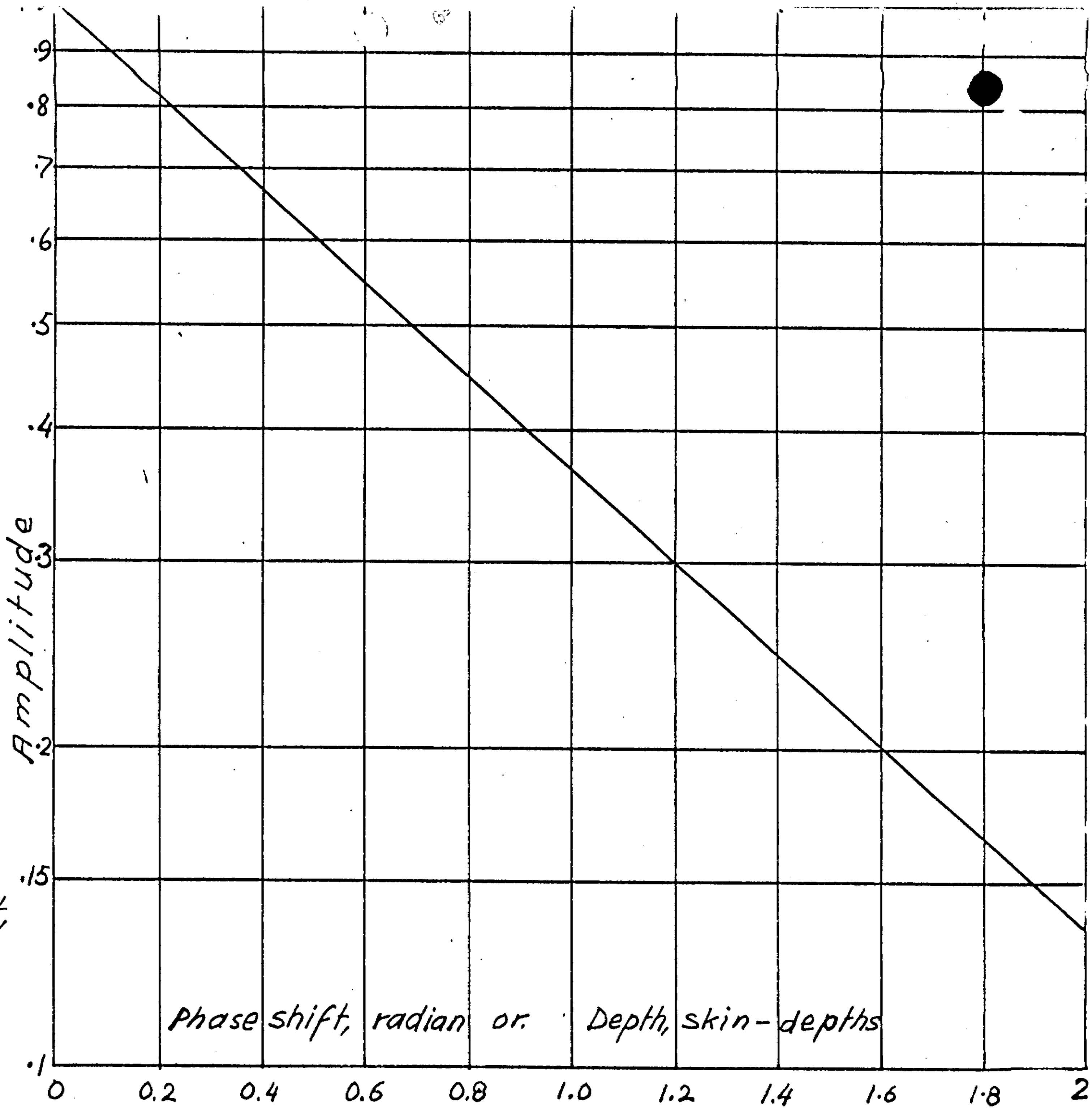


FIG. 7



Primary field in conductive rock.

Depth, phase shift, amplitude

FIG. 8

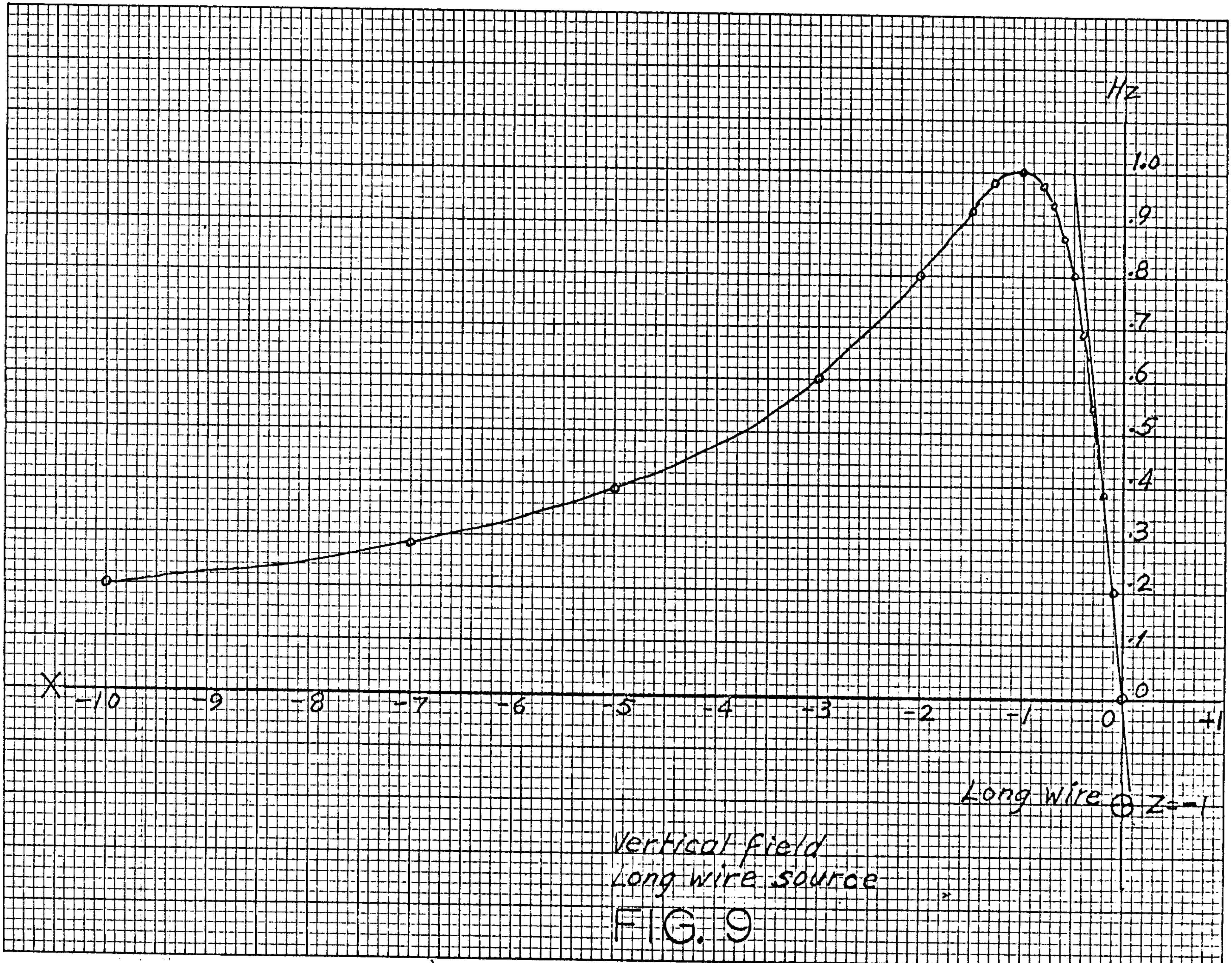
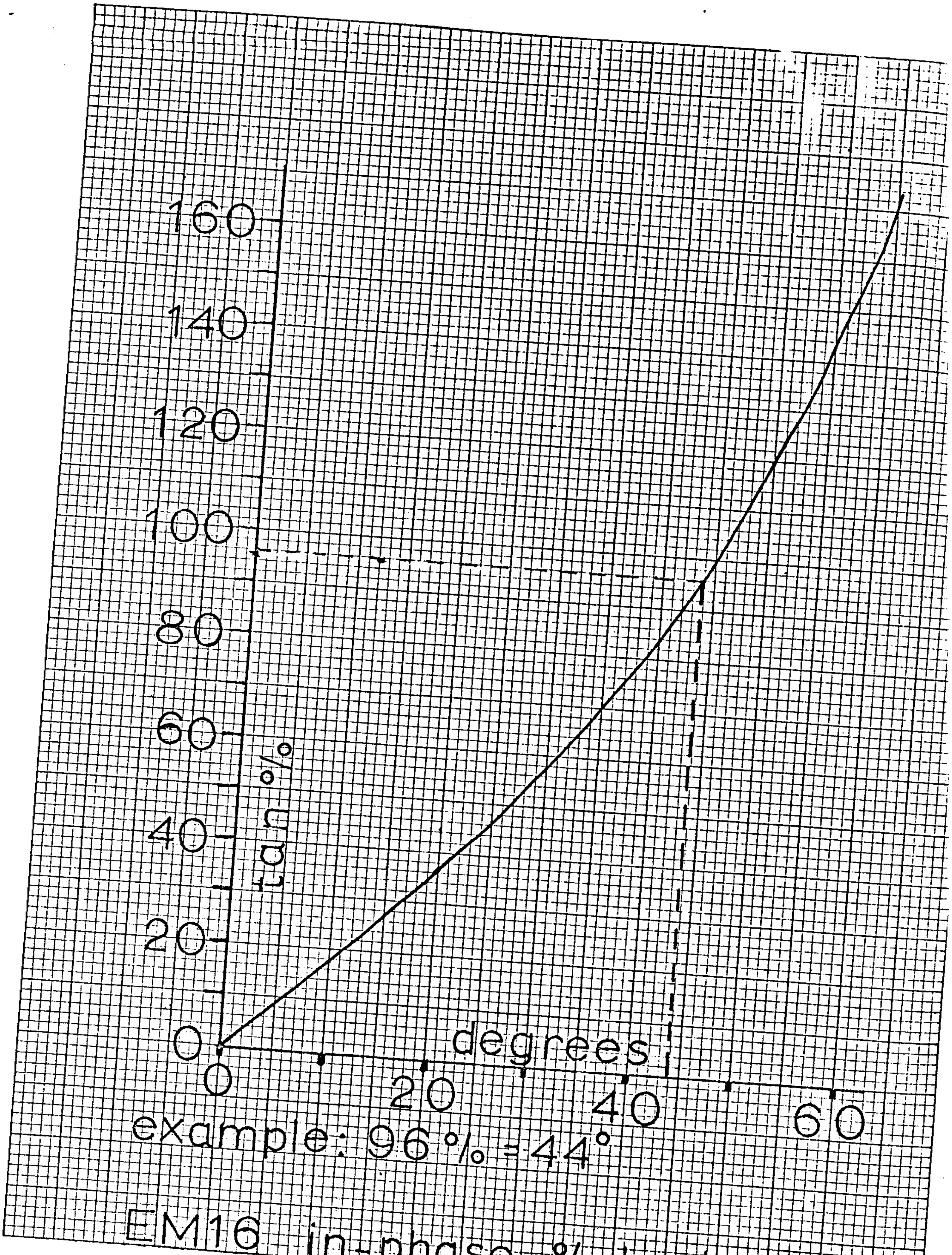


FIG. 9

ASSESSMENT WORK

T-1057



EM16 in-phase, % to degrees

ASSESSMENT WORK

T-1057

File 2.2256

Ministry of Natural Resources

Ontario

GEOPHYSICAL – GEOLO(
TECHNICAL DA:

42A06NE0058 2.2256 WHITNEY

900

TO BE ATTACHED AS AN APPE:
FACTS SHOWN HERE NEED N(
TECHNICAL REPORT MUST CONTAIN INTERPRETATION, CONCLUSIONS ETC.

PROJECTS UNIT

Type of Survey(s) EM-16

Township or Area Whitney

Claim Holder(s) Alamo Petroleum Ltd.
Suite 310 - 55 Yonge St. TORONTO

Survey Company

Author of Report R. S. Middleton

Address of Author 7 Fiesta Ln, TORONTO

Covering Dates of Survey September 1 – 9, 1976 (~~linecutting~~ to office)

Total Miles of Line Cut cut for geology survey

SPECIAL PROVISIONS CREDITS REQUESTED

ENTER 40 days (includes line cutting) for first survey.

ENTER 20 days for each additional survey using same grid.

	DAYS per claim
Geophysical	
–Electromagnetic	20
–Magnetometer	
–Radiometric	
–Other	
Geological	
Geochemical	

AIRBORNE CREDITS (Special provision credits do not apply to airborne surveys)

Magnetometer ____ Electromagnetic ____ Radiometric ____
(enter days per claim)

DATE: Nov 24/76 SIGNATURE: R. Middleton
Author of Report or Agent

2.7066 also on this file –

Res. Geol. ____ Qualifications ____

Previous Surveys

File No.	Type	Date	Claim Holder

MINING CLAIMS TRAVERSED
List numerically

(prefix)	(number)
P.	443578
	443579
	451039
	451040
	451041
	451042
(Mandays) P.	380506

If space insufficient, attach list

ASSESSMENT WORK

T-1052

TOTAL CLAIMS 7

OFFICE USE ONLY

ASSESSMENT WORK BREAKDOWN

1. Type of Survey .... EM-16 VLF EM
2. Township or Area .... Whitney Twp
3. Numbers of Mining Claims Traversed by Survey ... P. 380506

4. Number of Miles of Line Cut .... Flown ....
*5. Number of Stations Established 26
*6. Make and type of Instrument Used .... Geonics EM 16
*7. Scale Constant or Sensitivity .... ± 1%
*8. Frequency Used and Power Output .... 17.8 KHz Sta. NAA Cu

9. Summary of Assessment Credits (details on reverse side)

Total 8 hour Technical Days (Include Consultants, Draughting etc.) 1.5

Total 8 hour Line-Cutting Days ....

Calculation

1.5 (Technical) x 7 = 10.5 + — (Line-cutting) = 10.5 ÷ 1 (Number of claims) = 10.5 (Assessment cr[edits] per claim)

The dates listed on this form represent working time spent entirely within the limi[ts] of the above listed claims ☑ Check
If otherwise, please explain ....

Dated: November 24/76   Signed: R. Middleton

Note: (A) * Complete only if applicable.
(B) Complete list of names, addresses and dates on reverse side.
(C) Submit separate breakdown for each type of survey.
(D) Submit in duplicate.

ASSESSMENT WORK

T. 105

File 2.2256

Ontario

Ministry of Natural Resources

GEOPHYSICAL – GEOLOGICAL – GEOCHEMICAL TECHNICAL DATA STATEMENT

RECEIVED DEC 1 1976 PROJECTS UNIT

TO BE ATTACHED AS AN APPENDIX TO TECHNICAL REPORT
FACTS SHOWN HERE NEED NOT BE REPEATED IN REPORT
TECHNICAL REPORT MUST CONTAIN INTERPRETATION, CONCLUSIONS ETC.

Type of Survey(s) Magnetic

Township or Area Whitney Twp.

Claim Holder(s) Alamo Petroleum Ltd.
Suite 310 – 55 Yonge St. TORONTO

Survey Company

Author of Report R.S. Middleton

Address of Author 7 Fiesta Ln, TORONTO M5Y1X3

Covering Dates of Survey Aug 20 – Nov 18/76 (linecutting to office)

Total Miles of Line Cut

SPECIAL PROVISIONS CREDITS REQUESTED

ENTER 40 days (includes line cutting) for first survey.

ENTER 20 days for each additional survey using same grid.

	DAYS per claim
Geophysical	
–Electromagnetic	
–Magnetometer	20 see list
–Radiometric	
–Other	
Geological	
Geochemical	

AIRBORNE CREDITS (Special provision credits do not apply to airborne surveys)

Magnetometer ______ Electromagnetic ______ Radiometric ______
(enter days per claim)

DATE: Nov 24/76 SIGNATURE: R. Middleton
Author of Report or Agent

2.706 & also

Res. Geol. ______ Qualifications on this file –

Previous Surveys

File No.	Type	Date	Claim Holder

OFFICE USE ONLY

MINING CLAIMS TRAVERSED
List numerically

See attached list
(prefix) (number)

420074-87 (20 days mag. only)
443580-83 "
443586-7 "
444080 "
444083-4 "
427444 "
451039-43 "
420330-3 "
452637 40 days mag. + line
451063 "
482879-80 "
479905-6 "

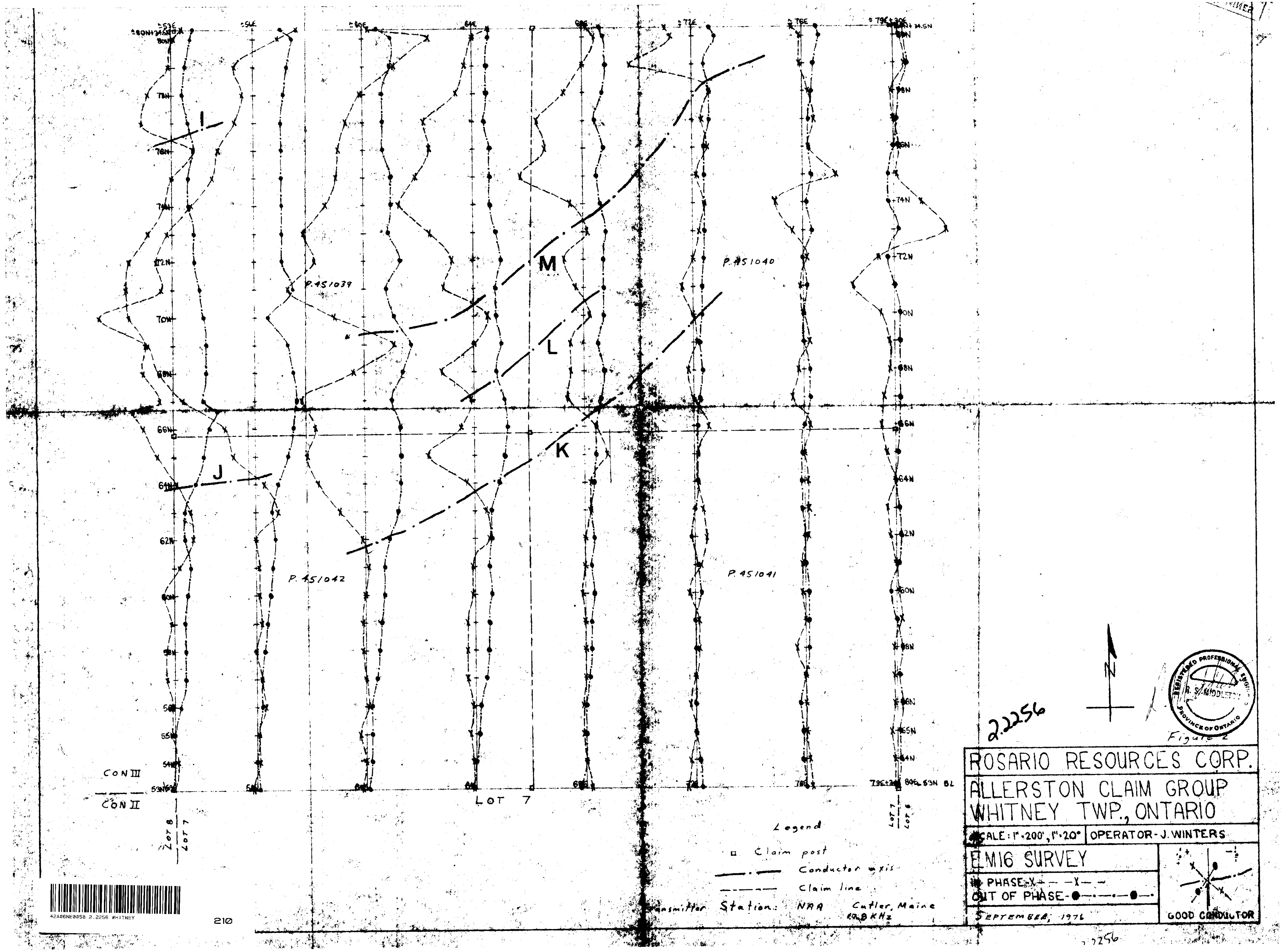
39 cl

If space insufficient, attach list

ASSESSMENT WORK
T-1052

TOTAL CLAIMS 39


III
II
I
N
8
7
6
SHAW TWP.
TOWNSHIP BOUNDARY
2225
R. S. MIDDLETON
REGISTERED PROFESSIONAL ENGINEER
PROVINCE OF ONTARIO
ROSARIO RESOURCES CORP.
ALLERSTON CLAIM GROUP
WHITNEY TOWNSHIP, ONTARIO
PLOTTED FROM LAND SURVEY MAP
SCALE 1" = 400'
DRAWN BY: R.P. BOWEN
GROUND MAGNETOMETER SURVEY
Instrument: McPhar MF-1
Operator: J. Winters
ASSESSMENT WORK



I
J
K
L
M
P. 451039
P. 451040
P. 451041
P. 451042
CON III
CON II
LOT 8
LOT 7
Legend
Claim post
Conductor axis
Claim line
Transmitter Station: NAA Cutler, Maine 17.8 KHz
Figure 2
2.2256
ROSARIO RESOURCES CORP.
ALLERSTON CLAIM GROUP
WHITNEY TWP., ONTARIO
SCALE: 1" = 200', 1" = 20°
OPERATOR - J. WINTERS
EM16 SURVEY
IN PHASE
OUT OF PHASE
GOOD CONDUCTOR
SEPTEMBER, 1976
R. S. MIDDLETON
REGISTERED PROFESSIONAL ENGINEER
PROVINCE OF ONTARIO
N
42A06NE0058 2.2256 WHITNEY
210

42A06NE0058 2.2256 WHITNEY 220


LOCATION MAP OF PORCUPINE CAMP
PAMOUR MINE
DOME MINE
SHAW
CLAIM MAP WHITNEY TWP.
ROSARIO OPTION
CODY TWP.
SHAW TWP.
Pond
10
9
8
TOWNSHIP BOUNDARY
SHAW TWP.

200