# APPENDIX C

TO THE REPORT ON THE 2004 ENTRANCE PEAK PROJECT: POLY PROPERTY, SKEENA MINING DIVISION, STEWART MINING CAMP, NORTHWESTERN BRITISH COLUMBIA:

> Report on IP/Resistivity and Magnetic Surveys Poly Property Stewart, British Columbia

# for

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## Spectral IP/Resistivity and Magnetic Surveys Poly Property – Stewart, British Columbia Lateegra Resources Corp.

### 1. Introduction

In June and July 2004, **JVX Ltd. (JVX)** completed Spectral IP/resistivity and magnetic surveys for **Geofine Exploration Consultants Ltd. (Geofine)** on behalf of **Lateegra Resources Corp. (Lateegra).** The Poly Property is located 42 kilometres east of Stewart in the Entrance Peak Area of Northwestern British Columbia. The property is easily accessible from Stewart via Provincial Highway 37A (Figure 1).

The targeted mineralization on the Poly Property may contain gold, silver and base metals in a similar geological setting to the Red Mountain Gold-Silver Deposit located 20 km to the west. Red Mountain was discovered in the late 1980's and is hosted in deformed and altered pyroclastics rocks of the Hazelton Group intruded by a quartz monzonite pluton.

The discovery of the Red Mountain deposit refocused exploration in the area. In 1991, highly anomalous gold, silver and zinc values were obtained from sulfidized boulders near the shoulder of old Hwy. 37A. Follow-up work in 1992 led to the discovery of the Highway Zone Creek (HZC) showing located 900 m north of the old Hwy. 37A in upper Highway Zone Creek. A regional geological evaluation conducted by Geofine during the 1999 and 2000 field seasons led to the staking of the Poly property. The work included soil and stream geochemical sampling. Anomalous values for several elements including gold, silver, copper, lead and zinc were obtained from both soil and boulder samples from an area of oxidation and alteration now referred to as the Highway 37A Zone. Detailed geochemical sampling confirmed an alteration zone extending to the northwest to the HZC Showing. In 2002, Geofine cut a 7-km grid and completed additional geochemical and geological surveys. These surveys were designed to further define the type and extent of the polymetallic mineralization. The geological work resulted in the discovery of the East Creek (EC) Showing in East Creek east of the HZC showing. A vertical field magnetic survey was also completed. This survey located the western edge of a quartz monzonite pluton that is now referred to as the Entrance Peak quartz monzonite pluton.

Spectral IP/resistivity surveys were conducted to map bedrock chargeabilities. Chargeability highs correlating with the anomalous geochemical trend outlined above could reflect economic concentrations of the targeted mineralization. The present magnetic surveys were intended to confirm the results of the earlier magnetic survey and to provide additional details on geology and structure.

The Poly Property covers seven (7) unpatented mining claims (**Poly 1-7**) in the Skeena Mining Division of the Stewart Gold Camp. The surveys included 7.375 km of



LATEEGRA RESOURCES CORP. Project Manager: Geofine Exploration Consultants Ltd.

POLY PROPERTY ENTRANCE PEAK, STEWART GOLD CAMP

Stewart, British Columbia

# NTS 104 A/4

GROUND GEOPHYSICAL SURVEY

Scale 1: 3,200,000 (approx.)

JVX Ltd. ref. no. 4-26 September 2004 Figure 1



# JVX

Spectral IP/resistivity on eleven (11) east/west lines with line separations varying from 35 to 150 metres (Figure 2). Magnetic survey coverage included these same lines and also the main north/south baseline (BL5000E) and Line 5375E. The surveys covered portions of the following claims:

Poly 1 Poly 2 Poly 3 Poly 4

Survey coverage details, methods, personnel, instrumentation, data processing and presentation are described in Appendix 1.

# 2. Property Geology

The general project area is underlained by pyroclastics rocks belonging to the Lower Jurassic Unuk River Formation of the Hazelton Group. In the western section, shales and argillites unconformably overlay the Unuk and Betty Creek Formation volcanics. Along the east edge of the Poly Property, the pyroclastic rocks and argillites of the Salmon River Formation are intruded by the Eocene age Entrance Peak quartz monzonite pluton.

The majority of the survey area is covered with overburden and/or with large angular float boulders and blocks. Bedrock is exposed in both the East and Highway Zone creeks approximately 150 to 300 metres north of Line 5600N. Further detail on the mineralization in Highway Zone Creek is provided below:

From the Lateegra website (www.lateegra.com),

"Mineralization in the Highway Zone Creek showing is associated with a northnorthwest trending fracture system located near the contact of brecciated and silica flooded Hazelton volcanic rocks and argillites of the Salmon Arm Formation. It is also located to the west of a quartz monzonite pluton and the mineralization comprises veins, stringers, and disseminations of pyrrhotite, arsenopyrite, galena, sphalerite, chalcopyrite, and tetrahedrite. Chip samples from the zone have returned up to 9.85 g/t gold, 1163 g/t silver, 0.33% copper, 0.54% lead and 0.33% zinc over three metres width."

## 3. Discussion of Results

Results of the geophysical surveys have been plotted as described in the Data Processing section of Appendix 1. Anomalous geophysical zones and trends have been identified and transferred to a compilation map. Mx Chargeability anomalies interpreted from the pseudosections have been identified on the compilation map using the following classifications: 1) Moderate - 10 to 20 mV/V, 2) Strong 20 to 40 mV/V, 3) Very Strong -40 to 60 mV/V and 4) Extremely Strong - greater than 60 mV/V. The compilation map suggests the location and extent (in plan) of the probable top of the chargeable body. The chargeability anomalies have been grouped into three (3) zones labeled A to C on the compilation map. In the south half of the grid, south of Line 5200N, chargeability is moderate to strong. The north half of the grid contains several strong to very strong anomalies with peak chargeabilities exceeding 60 mV/V on lines 5400 and 5600E.

Apparent resistivity is variable over the survey area. High values (>10,000 ohmm) occur only on the east side of the grid. Weak resistivity highs occur on Lines 5100 and 5200N between the Baseline (BL5000E) and 5100E and on Lines 5300 to 5500N west of 4900E. A broad resistivity low is observed along the south and southwest boundary of the grid. A well-defined resistivity low occurs between Lines 5300 and 5600N at 5100E. This low exhibits a strong association with strong to very strong chargeability highs.

Magnetic relief over the grid is moderate. The deep-seated Strohn Creek Pluton at the east edge of the survey produces a strong west to east gradient in the magnetic field. The highest magnetic value occurs on Line 5100N east of 5300E. A 1<sup>st</sup> Vertical Derivative of the Magnetic Field was generated to enhance near-surface features. Several weak magnetic trends have been identified. Some of these correlate with strong chargeability anomalies. Structural features have also been interpreted including two (2) north-northeast/south-southwest faults (F-1 and F-2) that appear to correlate with the Highway Zone and East Creeks respectively.

Detailed discussion of the Mx Chargeability zones is provided below:

#### Zone A

This zone extends from Line 5100 to 5400N near the western limit of the grid. On lines 5300 and 5400N the chargeable source is well-defined with peak chargeabilities on 5300N exceeding 30 mV/V. Spectral MIP values are high with long Tau suggesting that the source is coarse-grained. South of 5300N the zone is poorly defined and appears to be depth limited. This zone exhibits a strong correlation to anomalous polymetallic geochemical values. Prospecting on line 5300N between 4825 and 4850E is recommended. Establishing line 5250N to the west of the baseline and extending lines 5200N and 5350N should be considered if prospecting results are favourable.

#### Zone B

This zone trends north-south and extends from Line 5300 to at least 5600N. It exhibits a strong correlation with Highway Zone Creek west of the Baseline 5000E. It is on strike with the HZC showing 300 m north of 5600N. The majority of the anomalies are strong with a very strong response (>40 mV/V) on Line 5600E. Zone B coincides with a weak resistivity low. On line 5500N it flanks the east edge of a deep (n=5) resistivity high. The zone also correlates with a weak, narrow magnetic high. Spectral MIP values are high (400 to 500 mV/V) with corresponding long Taus suggesting moderate to high concentrations of coarse-grained sulphide mineralization. There is a strong correlation to the F-1 fault and to anomalous geochemical values. Drilling is recommended with several targets outlined in Section 4 below. Where feasible, additional surveying should be considered north of 5600N towards the HZC showing.

#### Zone C

Zone C contains the strongest chargeability responses on the grid. The zone extends for at least 800 metres from the south boundary at Line 4800N to Line 5600N. North of Line 5200N, the zone trends north-south and contains several very strong chargeability anomalies occurring at or near the surface. These anomalies are associated with a strong, well-defined resistivity low, high to very high Spectral MIP values and long Taus. They also occur in the vicinity of several creeks including the East Creek. From Line 5200N to 4800N, Zone C trends northwest-southeast. The chargeability zones are not as strong and generally occur at moderate depths (n=2 to n=4) in association with moderate resistivity lows. MIP values are high with corresponding long Taus.

Zone C is associated with low magnetic values apart from a weak magnetic high between Lines 5350N and 5500N. In the south section, near Highway 37A, the zone does occur along the west flank of a broad magnetic high. This magnetic high is caused by the western edge of the Entrance Peak quartz monzonite pluton. Anomalous polymetallic geochemical values exhibit a direct or flanking correlation to the southern part of this zone especially in vicinity of Highway 37A.

Zone C could host considerable coarse-grained sulphides. It represents an excellent target for drilling based on the geochemical results and its proximity to the Entrance Peak quartz monzonite pluton. Recommended drillhole locations are provided in Section 4 below. Additional IP/resistivity surveys should be completed on the southern part of Zone C (Lines 5200N to 4800N) prior to drilling. The surveys should be designed to explore the zone at depth (i.e., "a" = 25 m, n= 7 to 12).

## 4. Drill Targets

Twelve (12) high priority drill targets have been selected. Most of the targets have been interpreted from the 2D IP inversion results and are drawn on the compilation map. As a result, some targets may appear slightly offset from the chargeability zones interpreted from the pseudosections if the zones occur at moderate depths (deeper than n=2).

Drillholes are shown on the compilation map and the corresponding 2D IP inversion maps. An initial six (6) hole program (Phase 1) has been designed to test Zones **B** and **C**. A follow-up six (6) hole Phase 2 program should be considered if favourable results are obtained from Phase 1. Specifications of the drill holes are provided in the following tables:

PHASE 1				
Target #	Location	Azimuth (Deg.)	Dip (Deg.)	Length (m)
1	5400N/5050E	90	-45	125
2	5500N/5025E	90	-45	125
3	5500N/4915E	90	-45	125
4	5200N/5050E	90	-45	125
5	4950N/5160E	90	-45	175
6	4800N/5235E	90	-45	175

**Table 1: Specifications for the Phase 1 Drill Program** 

PHASE 2				
Target #	Location	Azimuth (Deg.)	Dip (Deg.)	Length (m)
7	5450N/5025E	90	-45	125
8	5450N/4900E	90	-45	125
9	5600N/5050E	90	-45	125
10	5600N/4935E	90	-45	100
11	5350N/5060E	90	-45	100
12	5350N/4935E	90	-45	100

Table 2: Specifications for the Phase 2 Drill Program

## 5. Summary and Recommendations

Several chargeability anomalies have been outlined by the IP/resistivity surveys. Most of these anomalies are grouped into three (3) generally north-south trending IP Zones. Zones **B** and **C** contain the highest chargeabilities and exhibit moderate to strong correlation with resistivity lows. Zone **B** could extend further north of the grid towards the **HZC** showing whereas **C** is open to both the north and south. All (3) zones coincide or flank high polymetallic geochemical values.

The magnetic surveys have confirmed the results of the earlier vertical field magnetic survey completed in 2002 including the location of the Entrance Peak quartz monzonite pluton along the east edge of the property. Structural trends were interpreted from the results of the 1<sup>st</sup> Vertical Derivative Magnetic Map. North-Northeast/South-southwest trending faults correlate with Zone **B** and northern section of Zone **C**.

Drilling Zones **B** and **C** has been strongly recommended. Depending on results, additional IP/resistivity surveys could be considered. This will include both surface and borehole surveys. The borehole surveys could be useful as drilling extends zones to

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depth. Time-domain electromagnetic (surface and borehole) surveys should also be considered if conductive sulphides are intersected in the drilling.

If there are any questions about the survey or its interpretation please contact the author.

Respectfully submitted,

John Selle

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#### Appendix 1

## Survey, Data Processing, Presentation and Archives

Spectral induced polarization (IP)/resistivity and magnetic surveys were conducted over the Poly Property, located near Stewart, British Columbia. The IP and magnetometer surveys were carried out in the period from June 29 to July 10, 2004.

The Poly Property grid is made up of east/west traverse lines of variable separation. Traverse line and station numbers are based on idealized coordinates.

#### Personnel

John Marsh acted as party chief. He operated the IP receiver and was responsible for all technical aspects of the field survey. Chris Bellamy from JVX ran the IP transmitter. Field assistants were provided by **Geofine**. JVX office staff handled the data processing and presentation in Toronto, Canada.

#### Instrumentation

#### Scintrex IPR12 time domain receiver.

For each potential electrode pair, the IPR12 measures the primary voltage (Vp) and the ratio of secondary to primary voltages (Vs/Vp) at 11 points on the IP decay (2 second current pulse). These 11 points (or slices or windows) are labeled M4 to M14. There is the option for an additional user defined slice (Mx). Units of measurement are millivolts (Vp) and milliVolts/Volt (mV/V) for M0 to M10 and Mx. Time settings are

Vp : 200 to 1600	msec
M4 centered at	60 msec (50 to 70)
M5 centered at	90 msec (70 to 110)
M6 centered at	130 msec (110 to 150)
M7 centered at	190 msec (150 to 230)
M8 centered at	270 msec (230 to 310)
M9 centered at	380 msec (310 to 450)
M10 centered at	520 msec (450 to 590)
M11 centered at	705 msec (590 to 820)
M12 centered at	935 msec (820 to 1050)
M13 centered at	1230 msec (1050 to 1410)
M14 centered at	1590 msec (1410 to 1770)
Mx centered at	870 msec (690 to 1050)

The apparent resistivity is calculated from Vp, the transmitted current and appropriate geometric factors. M4 to M14 define the IP decay curve. The Mx slice is presented in the contoured pseudosections.

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The IPR12 receiver calculates the theoretical decay that best fits the measured decay, based on the Cole-Cole impedance model developed in the 1970s. JVX uses proprietary software to recalculate a refined theoretical decay without the restrictions imposed by limitations in the receiver software.

## Huntec 2500 2.5 kW time domain transmitter

This transmitter is powered by a 5.5 hp motor generator and produces a commutated square wave current output with current on times of 2, 4, 8, or 16 seconds. A 2-second current pulse was used (base frequency of .125 Hz). Voltage, current and circuit resistance are displayed in digital form.

#### Scintrex ENVIMAG magnetometer

The ENVI MAG is part of a ground proton precession magnetometer / gradiometer / VLF system. In stop and measure mode, total magnetic intensities are measured to 0.1 nT and recorded with line, station, date and time in digital memory. A second magnetometer was operated as a base station so that diurnal variation in the intensity of the magnetic field could be eliminated by differencing the two data sets. The Base Station was located approximately at: 50+75 N, 47+60 E.

#### **Survey Specifications and Production Summary**

A standard pole-dipole array with 6 potential electrode pairs was used for the IP/Resistivity surveys. The distance from the current electrode to the first potential electrode was always 25 m. This is described as a=25 m, n=1,6.

As the shape of IP anomalies in pole-dipole surveys depends on the orientation of the array, the current – potential electrode orientation is fixed for any survey grid. Over the Poly Property, the potential electrodes were always laid out to the east of the current electrode.

Total magnetic intensity readings were taken every 12.5-m along both the east-west traverse lines and north-south baselines.

The survey coverage and the daily production summary are provided in the following tables:

	IP/RESISTIVITY SURVEY – POLY PROPERTY				
Line	Survey	From	То	Distance	
	Configuration	Station	Station	(m)	
4800	Pole Dipole:a=25m,n=1,6	5175	5650	475	
4950	Pole Dipole:a=25m,n=1,6	4675	5800	1125	
4985	Pole Dipole:a=25m,n=1,6	4800	5400	600	
5100	Pole Dipole:a=25m,n=1,6	4400	5500	1100	
5200	Pole Dipole:a=25m,n=1,6	4775	5475	700	
5300	Pole Dipole:a=25m,n=1,6	4700	5450	750	
5350	Pole Dipole:a=25m,n=1,6	4875	5400	525	
5400	Pole Dipole:a=25m,n=1,6	4750	5450	700	
5450	Pole Dipole:a=25m,n=1,6	4875	5300	425	
5500	Pole Dipole:a=25m,n=1,6	4725	5225	500	
5600	Pole Dipole:a=25m,n=1,6	4850	5325	475	
Total				7375	

MAGNETOMETER SURVEY - POLY PROPERTY				
Line	From To		Distance	No. of
	Station	Station	(m)	Readings
L4800N	5175E	5650E	475	39
L4950N	4675E	5575E	900	73
L4985N	4800E	5400E	600	50
L5100N	4400E	5500E	1100	89
L5200N	4775E	5475E	700	57
L5300N	4750E	5500E	750	62
L5350N	4900E	5400E	500	41
L5400N	4862.5E	5500E	637.5	52
L5450N	4950E	5300E	350	29
L5500N	4750E	5250E	500	41
L5600N	4850E	5300E	450	27
L4800N	4850E	5000E	150	14
TL5375E	4800N	4950N	150	13
BL5000E	4950N	5600N	650	54
Total			7912.5	641

	DAILY PRODUCTION SUMMARY					
Day	Description of Work	Grid	Line	From	То	Length (m)
Sun June27						
Mon June28	Travel Toronto to Stewart	Poly Property				

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	DAILY PRODUCT	ION SUM	IARY			_
Day	Description of Work	Grid	Line	From	То	Length (m)
Tue June29	IP Prep	Poly Property				
Wed June30	I.P. Survey, a=25m,n=6	Poly Property	4950N	4675E	5800E	1125
Thu July1	I.P. Survey, a=25m,n=6	Poly Property	4800N 5100N	5175E 4400E	5650E 5500E	475 1100
Frí July2	I.P. Survey, a=25m,n=6, Rain on and off all day	Poly Property	5200N	4775E	5475E	700
Sat July3	I.P. Survey, a=25m,n=6, Rain on and off all day	Poly Property	5300N 5400N	4700E 4750E	5450E 5450E	750 700
Sun July4	I.P. Survey, a=25m,n=6	Poly Property	5500N 5600N	4725E 4850E	5225E 5325E	500 475
Mon July5	Magnetometer Survey	Poly Property				
Tue July6	Magnetometer Survey	Poly Property				
Wed July7	Heavy Rain all day	Poly Property				
Thu July8	Magnetometer Survey	Poly Property				
Fri July9	I.P. Survey, a=25m,n=6, Mag Survey also carried out today	Poly Property	5350N 5450N 4985N	4875E 4875E 4800E	5400E 5300E 5400E	525 425 600
Sat July10	Magnetometer Survey	Poly Property				
Sun July11	Travel					
Mon July12	Travel					
IP PRODUCTION TOTAL				7375		

## **Data Processing**

At the end of every survey day, the IP/resistivity data, magnetic survey and magnetic base station data were transferred to a PC. The data were checked for quality and completeness and edited as required. Base station corrections were applied to the magnetic data. The data were archived on CD for transfer to JVX Ltd. in Toronto.

Data were processed and plotted using the Geosoft Sushi (IP pseudosections, 2D IP inversions) and Oasis Montaj V4.1 and V6 (Stacked Mx Chargeability and Resistivity pseudosections, Contoured n=2 Mx Chargeability and Resistivity, Total Magnetic Field and 1<sup>st</sup> Vertical Derivative) geophysical data processing systems (see <u>www.geosoft.com</u>). JVX Impedance modelling software is based on a suite of programs, originally developed by Scintrex and later modified by JVX. 2DIP inversions were carried out with software from the UBC-Geophysical Inversion Facility (see <u>www.geop.ubc.ca</u>). The compilation map was prepared using AutoCAD drafting software (see <u>www.autodesk.com</u>).

The pseudosections are plotted using standard depth and position conventions. These plot forms have been found to give a reasonable image of target location, width and depth where 1) the anomalously chargeable or resistive body is an isolated, near-vertical tabular body, 2) background chargeabilities and resistivities (overburden and host rock) are uniform and 3) the terrain is relatively flat. They are more difficult to interpret for irregular or nearby chargeable bodies or where there is any amount of conductive cover or topographic relief. Forward or inverse modelling may be useful in such cases. Colour contours are assigned by equal area distribution for each individual pseudosection. Minor line to line changes in colour assignment may occur. Stacked pseudosections were plotted using the colour zone for line 5400E.

## Impedance Modelling

The Cole-Cole impedance model was developed in the 1970s after it became clear that chargeability is not a simple physical property like resistivity. Field studies revealed it to be a complex physical property that involves at least three physical characteristics of the chargeable body. In this model, the low frequency electrical impedance -  $Z(\omega)$  - of rocks and soils is defined by 4 parameters. They are

- r<sub>0</sub>: DC resistivity in ohm.m
- m: true chargeability amplitude in V/V
- tau: time constant in seconds
- c: exponent

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The form of the model is given by

 $Z(\omega) = r_0 \{1 - m [1 - (1+(i\omega\tau)^c)^{-1}]\}$  ohm.m where  $\omega$  is the angular frequency (2 $\pi$ f).

The true chargeability is a better measure of the volume percent of electronic conductors (e.g. some metallic sulphides, magnetite, graphite). The time constant is proportional to the area of the surface of an average grain. The exponent is a measure of the uniformity of the grain size. Common or possible ranges are 0 to 1 (m), .001 to 1000 seconds (tau) and .1 to .5 (c).

In time domain IP surveys, impedance model parameters may be estimated using a best fit between theoretical and measured decays. (Johnson, 1.M., 1984, Spectral induced polarization parameters as determined through timedomain measurements: Geophysics, 49, 1993-2004). Software to affect this best fit was developed by Scintrex in the 1980s.

Impedance model parameters are only apparent. Resistivity and true chargeability amplitudes are subject to the effects of array geometry, target shape, size and attitude, geometric and physical attenuation. The apparent time constant and c values are less affected by geometric effects.

#### Inverse Modelling

DCIP2D is a program library for forward modeling and inversion of DC resistivity and induced polarization data over two dimension structures. It was developed by the Geophysical Inversion Facility of the University of British Columbia.

The inversion is based on the iterative adjustment of a 2D synthetic mesh of resistivity and chargeability estimates in order to achieve a reasonable fit with the measured pseudosections. There are a number of settings to control and stabilize the calculated model and the non-unique output is influenced by the initial values of those settings.

## Archives

The results of the survey are archived on CD in directories PSEUDOS, STACKED PSEUDOS, 2D IP INVERSIONS, PLAN MAPS, COMPILATION MAP and REPORT. A list of the file types included on the CD follows:

TOTAL FIELD MAG and IP(n=2) Plan Maps

\*.MAP (geosoft viewable file)

\*.gdb (geosoft data base file)

**PSEUDOSECTIONS** 

\*.i12 - text file, raw IPR12 data dump

\*.MAP (geosoft file)

STACKED PSEUDOSECTIONS, 2D IP INVERSIONS and 1<sup>st</sup> VERTICAL DERIVATIVE MAG Maps

\*.MAP (geosoft file)

COMPILATION MAP .dxf AutoCAD drawing file

REPORT

.doc MS WORD files

# APPENDIX 2

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# SCINTREX

# **IPR-12 Time Domain Induced Polarization/Resistivity Receiver**

# **Specifications**

#### Inputs

1 to 8 dipoles are measured simultaneously.

#### Input Impedance 16 Megohms

#### SP Bucking

 $\pm 10$  volt range. Automatic linear correction operating on a cycle by cycle basis.

Input Voltage (Vp) Range 50 µvolt to 14 volt

Chargeability (M) Range 0 to 300millivolt

# Tau Range

1 millisecond to 1000 seconds

Reading Resolution of Vp, SP and M Vp, 10 microvolt; SP, 1 millivolt; M, 0.01 millivolt/volt

Absolute Accuracy of Vp, SP and M Better than 1%

Common Mode Rejection At input more than 100db

Vp Integration Time 10% to 80% of the current on time.

#### **IP Transient Program**

Total measuring time keyboard selectable at 1, 2, 4, 8, 16 or 32 seconds. Normally 14 windows except that the first four are not measured on the 1 second timing, the first three are not measured on the 2 second timing and the first is not measured on the 4 second timing. (See diagram on page 2.) An additional transient slice of minimum 10 ms width, and 10ms steps, with delay of at least 40 ms is keyboard selectable.

#### Transmitter Timing

Equal on and off times with polarity change each half cycle. On/off times of 1, 2, 4, 8, 16 or 32 seconds. Timing accuracy of  $\pm$ 100 ppm or better is required.

#### **External Circuit Test**

All dipoles are measured individually in sequence, using a 10 Hz square wave. The range is 0 to 2 Mohm with 0.1kohm resolution. Circuit resistances are displayed and recorded.

#### Synchronization

Self synchronization on the signal received at a keyboard selectable dipole. Limited to avoid mistriggering.

#### Filtering

RF filter, 10 Hz 6 pole low pass filter, statistical noise spike removal.

Internal Test Generator 1200 mV of SP; 807 mV of Vp and 30.28 mV/V of M.

#### Analog Meter

For monitoring input signals; switchable to any dipole via keyboard.

#### Keyboard

17 key keypad with direct one key access to the most frequently used functions.

#### Display

16 lines by 42 characters, 128 x 256 dots, Backlit Liquid Crystal Display. Displays instrument status and data during and after reading. Alphanumeric and graphic displays.

Display Heater Available for below -15°C operation.

#### **Memory Capacity**

Stores approximately 400 dipoles of information when 8 dipoles are measured simultaneously.

#### Real Time Clock

Data is recorded with year, month, day, hour, minute and second.

#### Digital Data Output

Formatted serial data output for printer and PC etc. Data output in 7 or 8 bit ASCII, one start, one stop bit, no parity format. Baud rate is keyboard selectable for standard rates between 300 baud and 51.6 kBaud. Selectable carriage return delay to accommodate slow peripherals. Handshaking is done by X-on/X-off.

#### Standard Rechargeable Batteries

Eight rechargeable Ni-Cad D cells. Supplied with a charger, suitable for 110/230V, 50 to 60 Hz, 10W. More than 20 hours service at +25°C, more than 8 hours at -30°C.

#### Ancillary Rechargeable Batteries

An additional eight rechargeable Ni-Cad D cells may be installed in the console along with the Standard Rechargeable Batteries. Used to power the Display Heater or as back up power. Supplied with a second charger. More than 6 hours service at -30°C.

#### **Use of Non-Rechargeable Batteries**

Can be powered by D size Alkaline batteries, but rechargeable batteries are recommended for longer life and lower cost over time.

Operating Temperature Range -30°C to +50°C

Storage Temperature Range -30°C to +50°C

Dimensions Console: 355 x 270 x 165 mm Charger: 120 x 95 x 55mm

#### Weights

Console: 5.8 kg Standard or Ancillary Rechargeable Batteries: 1.3 kg Charger: 1.1 kg

#### Transmitters available

IPC-9 200 W TSQ-2E 750 W TSQ-3 3 kW TSQ-4 10 kW



#### In Canada

222 Snidercroft Rd.	Tel.:	(905) 669-2280
Concord, Ontario	Fax:	(905) 669-6403
Canada, L4K 1B5	Telex:	(905) 06-964570

#### In the U.S.A.

85 River Rock Drive	Tel.:	(716) 298-1219
Unit # 202	Fax:	(716) 298-1317
Buffalo, N.Y.		
USA 14207		

IPR-12/94

M-4 SERIES Induced Polarization/ Resistivity 2.5 kW Transmitter



# DESCRIPTION

The HUNTEC M-4 2.5 kW Induced Polarization transmitter is designed for time domain, frequency domain (PFE) and complex resistivity applications. The unit converts primary 400 Hz ac power from an engine-alternator set to a regulated dc output current, set by the operator. Current regulation eliminates output waveform distortion due to electrode polarization effects. It is achieved in the transmitter by varying the alternator field currents. The transmitter is equipped with dummy loads to smooth out generator load variations.

## FEATURES

- Solid-state switching for long life and precise timing.
- Open circuit during the "off" time ensures no counter current flow.
- Resistance measurement for load matching.
- Precision crystal controlled timing.
- Failsafe operation protects against short-circuit and overvoltage.
- Automatic regulation of output current eliminates errors due to changing polarization potential and load resistance.



#### SPECIFICATIONS M-4 2.5 kW Transmitter

Power input:	96 — 144 V line to line 3 phase, 400 Hz (from Huntec generator set)
Output:	Voltage: 150 – 2200 V dc in 8 steps Current: 0.2 – 7 A regulated**
Current regulation:	Less than ±0.1% change for ±10% load change
Output frequency:	0.0625 Hz to 1 Hz (time domain, complex resistivity) 0.0625 Hz to 4 Hz (frequency domain) selectable from front panel An additional range of frequencies between 0.78 and 5.0 Hz is avail- able and can be selected by an internal switch.
Frequency	
accuracy:	±50 ppm - 30°C to +60°C
Output duty cycle: $T_{on}/(T_{on} + T_{off})$	0.5 to 0.9375 in increments of 0.0625 (time domain) 0.9375 (complex resistivity) 0.75 (frequency domain)
Output current meter:	Two ranges: 0-5 A and 0-10 A
Ground resistance meter:	Two ranges: 0-10 kΩ, 0-100 kΩ
Input voltage meter:	0-150 V
Dummy load:	Two levels: 500 kW and 1.75 kW
Temperature range:	-34°C to +50°C
Size:	53 cm x 43 cm x 29 cm
Weight:	26 kg

\*\*Smaller currents are obtainable, but outside the current regulation range the transmitter voltage is regulated, not the current.

## SPECIFICATIONS M-4 2.5 kW Engine Driven Alternator

Output:	120V ac 400 Hz 3.5 kVA maximum
Engine	Honda 5.5 HP air cooled,
	Single cylinder four cycle piston
	Engine with manual start.
Fuel:	Regular grade gasoline, tank capacity
	3.8L to give 4 h duration
Alternator:	Delta connected heavy duty automobile
	Type, belt driven, air cooled
Construction:	Backpack style carrying frame
	with mounted engine and alternator
Size:	35 cm x 31 cm x 61 cm
Weight(dry):	40 kg



HUNTEC GEOPHYSICS 1750 Brimley Road, Scarborough Ontario, Canada M1P 4X7 Phone: (416) 299-4100 Telex: 06-963640

P.O. Box 851, Dartmouth Nova Scotia, Canada B2Y 3Z5 Phone: (902) 463-2380 Telex: 019-31446 LOCATED AT: ARGO BUILDING, BEDFORD INSTITUTE OF OCEANOGRAPHY

In Europe and Scandinavia SLINGSBY ENGINEERING LIMITED Ings Lane, Kirkbymoorside York YO6 6EZ England Phone: 0751 31751 Telex: 57911

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# SCINTREX

# **ENVI-MAG Environmental Magnetometer/Gradiometer**

# Locating Buried Drums and Tanks?

The NEW ENVI-MAG is the solution to this environmental problem. ENVI-MAG is an inexpensive, lightweight, portable "WALKMAG" which enables you to survey large areas quickly and accurately. ENVI-MAG is a portable, proton precession magnetometer and/or gradiometer, for geotechnical, archaeological and environmental applications where high production, fast count rate and high sensitivity are required. It may also be used for other applications, such as mineral exploration, and may be configured as a total-field magnetometer. a vertical gradiometer or as a base station.

#### The ENVI-MAG

- easily detects buried drums to depths of 10 feet or more
- more sensitive to the steel of a buried drum than EM or radar
- much less expensive than EM or radar
- survey productivity much higher than with EM or radar

#### Main features include:

- select sampling rates as fast as 2 times per second
- "WALKMAG" mode for rapid acquisition of data
- large internal memory, expandable to 200,000 readings
- easy to read, large LCD screen displays data both numerically and graphically
- ENVIMAP software for processing and mapping data

ENVI-MAG comprises several basic modules; a lightweight console with a large screen alphanumeric display and high capacity memory, a staff mounted sensor and sensor cable, rechargeable battery and battery charger, RS-232 cable and ENVIMAP processing and mapping software.

For gradiometry applications an upgrade kit is available, comprising an additional processor module for installation in the console, and a second sensor with a staff extender.



ENVI-MAG Proton Magnetometer in operation

For base station applications a Base Station Accessory Kit is available so that the sensor and staff may be converted into a base station sensor.

## Features and Benefits

#### "WALKMAG"

#### Magnetometer/Gradiometer

The "WALKMAG" mode of operation (sometimes known as "Walking Mag") is user-selectable from the keyboard. In this mode, data is acquired and recorded at the rate of 2 readings per second as the operator walks at a steady pace along a line. At desired intervals, the operator "triggers" an event marker by a single key stroke, assigning coordinates to the recorded data.

#### **True Simultaneous Gradiometer**

An optional upgrade kit is available to configure ENVI-MAG as a gradiometer to make true, simultaneous gradiometer measurements. Gradiometry is useful for geotechnical and archaeological surveys where small near surface magnetic targets are the object of the survey.

#### Selectable Sampling Rates

0.5 second, 1 second and 2 second reading rates user selectable from the keyboard.

#### Large-Key Keypad

The large-key keypad allows easy access for gloved-hands in cold-weather operations. Each key has a multi-purpose function.



Front panel of ENVI-MAG showing a graphic profile of data and large-key keypad

#### Large Capacity Memory

ENVI-MAG with standard memory stores up to 20,000 readings of total field measurements, 15,000 readings of gradiometry data or 100,000 readings as a base station. An expanded memory option is available which increases this standard capacity by a factor of 5.

#### Easy Review of Data

For quality of data and for a rapid analysis of the magnetic characteristics of the survey line, several modes of review are possible. These include the measurements at the last three stations, the ability to scroll through any or all previous readings in memory, and a graphic display of the previous data as profiles, line by line. This feature is very useful for environmental and archaeological surveys.

#### **Highly Productive**

The "WALKMAG" mode of operation acquires data rapidly at close station intervals, ensuring high-definition results. This increases survey productivity by a factor of 5 when compared to a conventional magnetometer survey.

#### "Datacheck" Quality Control of Data

"Datacheck" provides a feature wherein at the end of each survey line, data may be reviewed as a profile on ENVI-MAG's screen. Datacheck confirms that the instrument is functioning correctly and allows the user to note the magnetic relief (anomaly) on the line.

#### Large Screen Display

"Super-Twist" 64 x 240 dot (8 lines x 40 characters), LCD graphic screen provides good visibility in all light conditions. A display heater is optionally available for low-temperature operations below 0°C.



Close-up of the ENVI-MAG screen showing data presented afer each reading

#### Interactive Menus

The set-up of ENVI-MAG is menu-driven, and minimizes the operator's learning time, and on-going tasks.



Cose-up of display of ENVI-MAG showing interactive set-up menu

#### Specifications

**Total Field Operating Range** 

20,000 to 100,000 nT (gammas) Total Field Absolute Accuracy

+/- 1nT

#### Tuning

Fully solid state. Manual or automatic, keyboard selectable

#### Cycling (Reading) Rates

0.5, 1 or 2 seconds, up to 9999 seconds for base station applications, keyboard selectable

#### **Gradiometer Option**

Includes a second sensor, 20 inch (1/2m) staff extender and processor module

#### "WALKMAG" Mode

0.5 second for walking surveys, variable rates for hilly terrain

#### **Digital Display**

LCD "Super Twist", 240 x 64 dots graphics, 8 line x 40 characters alphanumerics

#### **Display Heater**

Thermostatically controlled, for cold weather operations

#### Standard Memory

Total Field Measurements: 28,000 readings Gradiometer Measurements: 21,000 readings Base Station Measurements: 151,000 readings

#### Expanded Memory

Total Field Measurements: 140,000 readings Gradiometer Measurements: 109,000 readings Base Station Measurements: 750,000 readings

#### Sensitivity

0.1 nT at 2 second sampling rate

#### Rechargeable Battery and Battery Charger

An "off-the-shelf" lead-acid battery and charger are provided as standard. The low-cost "Camcorder" type battery is available from electronic parts distributors everywhere.

**HELP-Line Available** 

Purchasers of ENVI-MAG are provided with a HELP-Line telephone number to call in the event assistance is needed with an application or instrumentation problem.

ENVIMAP Processing and Mapping Software

Supplied with ENVI-MAG, and custom designed for this purpose, is easy-to-use, very user-friendly, menu driven data processing and mapping software called ENVIMAP. This unique software appears to the user to be a single program, but is in fact a sequence of separate programs, each performing a specific task. Under the menu system, there are separate programs to do the following:

- a) read the ENVI-MAG data and reformat it into a standard compatible with the ENVIMAP software
- b) grid the data into a standard grid format
- c) create a vector file of posted values

#### Keyboard Input

17 keys, dual function, membrane type

#### Notebook Function

32 characters, 5 user-defined MACRO's for quick entry

#### **Real-Time Clock**

Records full date, hours, minutes and seconds with 1 second resolution, +/- 1 second stability over 12 hours

#### Digital Data Output

RS-232C interface, 600 to 57,600 Baud, 7 or 8 data bits, 1 start, 1 stop bit, no parity format. Selectable carriage return delay (0-999 ms) to accommodate slow peripherals. Handshaking is done by X-on/X-off

#### Analog Output

0 - 999 mV full scale output voltage with keyboard selectable range of 1, 10, 100, 1,000 or 10,000 nT full scale

#### **Power Supply**

Rechargeable "Camcorder" type, 2.3 Ah, Leadacid battery.

12 Volts at 0.65 Amp for magnetometer, 1.2 Amp for gradiometer,

External 12 Volt input for base station operations

Optional external battery pouch for cold weather operations

#### **Battery Charger**

110 Volt - 230 Volt, 50/60 Hz

#### Operating Temperature Range Standard 08 to 60%C

Standard 0° to 60°C Optional -40°C to 60°C with line and baseline identification that allows the user to add some title information and build a suitable surround

- d) contour the gridded data
- autoscale the combined results of the posting/surround step and the contouring step to fit on a standard 8.5 ins. wide dotmatrix printer
- f) rasterize and output the results of step e) to the printer

ENVIMAP is designed to be as simple as possible. The user is required to answer a few basic questions asked by ENVIMAP, and then simply toggles "GO" to let ENVIMAP provide default parameters for the making of the contour map. The user can modify certain characteristics of the output plot. ENVIMAP'S menu system is both keyboard and mouse operable. HELP screens are integrated with the menu system so that HELP is displayed whenever the user requests it. Options Available

- True simultaneous gradiometer upgrade
- Base station upgrade
- Display heater for low temperature operations
- External battery pouch

#### Dimensions

Console - 10 x 6 x 2.25 inches (250 mm x 152 mm x 55 mm)

T.F. sensor - 2.75 inches dia. x 7 inches (70 mm x 175 mm)

Grad. sensor and staff extender - 2.75 inches dia. x 26.5 inches (70 mm x 675 mm)

T.F. staff - 1 inch dia. x 76 inches (25 mm x 2 m)

#### Weight

Console - 5.4 lbs (2.45 kg) with rechargeable battery T. F. sensor - 2.2 lbs (1.15 kg) Grad. sensor - 2.5 lbs (1.15 kg) Staff - 1.75 lbs (0.8 kg)



222 Snidercro	ft Road
Concord, Onti	ario, Canada
L4K 1B5	
Telephone:	(416) 669-2280
Fax:	(416) 669-6403
	(416) 669-5132
Telex:	06-964570

In the USA: Scintrex Inc. 4600 Witmer Industrial Estates Unit 4 Niagara Falls, NY 14305 Telephone: (716) 298-1219 Fax: (716) 298-1317

















61+60 E

51+00 E

# 5350 N

Pole-Dipole Array

plot point

49+00 E

49+50 E

50+00 E

50+50 E



52+50 E

52+00 E

53+00 E

Mx Chargeability

(mV/V, 690ms-1050ms)



100 0















	4300E	4400E	4500E	4600E	4700E	4800E	4900E
6300N	+	+	+	+	+	+	+
6200N	+	+	+	+	+	*	+
6100N	+	+	+	+	+	HWY ZONE CIT	+
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5400N	+	+	+	+	L5 <u>4</u> 00 N	120.11 120.01 16.01 19.0 16.0 10.8 1 26.0 9.4 22.7 16.2 13.9 13.9 15.8 13.9	330 284 17.0 1971 46.6 20.9 23.3 17.5 27.9 26.3 26.5 23.3 26.1 27.7 27.3 26.5 28.5 L5350 N.9 10.4 10.0 20.0
5300N	+	+	+	+	L5300 N + 111.81 128 128	9.5 16.4 16.8 16.8 16.8 19.9 19.9 19.9 19.9 19.9 28.9 19.4 19.4 19.9 19.4 19.5 19.4 19.5 19.5 19.4 19.5 1	243 126.3 17.8 17.8 14.6 17.8 14.6 14.7 14.6 14.7 14.8 16.8
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4900N	+	+	÷	+	HWY 37A	7.8 81 8.8 9.6 9.6 7.8 7.4 7.7 7.2 8.1 +	11.1 10.8 120 125 9.8 10.8 11.2 19.30 11 +
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6300N	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
6200N	+	+	+	+	+	HWY	+	+	+	+	+	+	+	+	+
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4700N	+	+	+	+	+	+	+	B5000	+	+	+	+	+	+	+
4600N	+	+	+	+	+	+	+	π +	+	+	+	+	+	+	+
	4300E	4400E	4500E	4600E	4700E	4800E	4900E	5000E	5100E	5200E	5300E	5400E	5500E	5600E	5700E



# at relation



![](_page_40_Figure_0.jpeg)

![](_page_40_Figure_1.jpeg)

![](_page_41_Figure_0.jpeg)

![](_page_42_Figure_0.jpeg)

![](_page_43_Figure_0.jpeg)

![](_page_44_Figure_0.jpeg)

![](_page_45_Figure_0.jpeg)

![](_page_45_Figure_1.jpeg)

![](_page_46_Figure_0.jpeg)

![](_page_46_Figure_1.jpeg)

![](_page_47_Figure_0.jpeg)

![](_page_48_Figure_0.jpeg)

![](_page_48_Figure_1.jpeg)

![](_page_49_Figure_0.jpeg)

![](_page_50_Figure_0.jpeg)

![](_page_51_Figure_0.jpeg)