AGNEW LAKE PROJECT
GRIDS A & B
AGNEW LAKE AREA, PORTER TWP., ON
REPORT ON
JVX SPECTRAL IP/RESISTIVITY
MAGNETOMETER SURVEYS
JUNE 2003
URSA MAJOR MINERALS INC.

RECEIVED
OCT 13 2005
GEOSCIENCE ASSESSMENT OFFICE

JVX Ltd.

REPORT

ON

SPECTRAL IP/RESISTIVITY

And MAGNETOMETER

SURVEYS

CONDUCTED ON THE

AGNEW LAKE PROJECT

AGNEW LAKE AREA, PORTER TWP.

NE ONTARIO

NTS 41 I/5

For: **Ursa Major Minerals Inc.**
Suite 405, 100 Adelaide Street West
Toronto, Ontario
M5H 1S3

Tel: (416) 864-0615
Fax: (416) 864-0620

Attention: Mr. Richard Sutcliffe

By: **JVX Ltd.**
60 West Wilmot Street, Unit #22
Richmond Hill, Ontario
L4B 1M6

Tel: (905) 731-0972
Fax: (905) 731-9312

Contact: Mr. John Gilliatt
JVX Ref: 3-15 –Ursa June 2003

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICES

LIST OF PLATES

GRID A

GRID B

Pseudosections

Plate 2-B:	L 5000 E Chargeability, Resistivity, Spectral M-IP, Spectral Time Constant and Spectral C Pseudosection a=25m, Scale 1:2500
Plate 3-B:	L 5200 E Chargeability, Resistivity, Spectral M-IP, Spectral Time Constant and Spectral C Pseudosection a=25m, Scale 1:2500
Plate 4-B:	L 5400 E Chargeability, Resistivity, Spectral M-IP, Spectral Time Constant and Spectral C Pseudosection a=25m, Scale 1:2500
Plate 5-B:	L 5600 E Chargeability, Resistivity, Spectral M-IP and Time Constant and Spectral C Pseudosection a=25m, Scale 1:2500
Plate 6-B:	L 5800 E Chargeability, Resistivity, Spectral M-IP and Time Constant and Spectral C Pseudosection a=25m, Scale 1:2500
Plate 7-B:	L 6000 E Chargeability, Resistivity, Spectral M-IP and Time Constant and Spectral C Pseudosection a=25m, Scale 1:2500
Plate 8-B:	L 6200 E Chargeability, Resistivity, Spectral M-IP and Time Constant and Spectral C Pseudosection a=25m, Scale 1:2500
Plate 9-B:	L 6400 E Chargeability, Resistivity, Spectral M-IP and Time Constant and Spectral C Pseudosection a=25m, Scale 1:2500

Plan Maps

Plate 10-B:	Chargeability M7 (n=2) Plan Map, Scale 1:2500
Plate 11-B:	Chargeability M7 (n=4) Plan Map, Scale 1:2500
Plate 12-B:	Apparent Resistivity (n=2) Plan Map, Scale 1:2500
Plate 13-B:	Apparent Resistivity (n=4) Plan Map, Scale 1:2500
Plate 14-B:	Total Field Magnetics Plan Map, Scale 1:2500

IP Inversion Sections

Plate I-1:	L 5600 E DCIP2D Inversion, Scale 1:2500
Plate I-2:	L 5800 E DCIP2D Inversion, Scale 1:2500

1. INTRODUCTION

JVX Ltd. conducted Time-Domain ***Spectral*** Induced Polarization (IP)/Resistivity and Magnetometer surveys on behalf of Ursa Major Minerals Inc. on their Agnew Lake Project, Grids **A** and **B**.

The IP and Magnetometer Surveys on Grid **A** were carried out from May 25 through June 1, 2003. The IP Survey on Grid **B** was carried from March 14 through March 23 and May 21 and 22, 2003. The Magnetometer Survey on Grid **B** was carried out May 17, 23, 24 and June 2, 2003.

Grids **A** and **B** are located in Porter Township, approximately 50 kilometres west of Sudbury in Northern Ontario, NTS 41 I/5. The survey location is shown in Figure 1 and the survey grid with claims is shown in Figure 2.

The surveys were conducted to target selected areas of an elongated, northeast trending airborne magnetic high. The purpose of the surveys was to identify areas favourable for Ni-Cu-PGM mineralization within mafic intrusive rocks (Nipissing diabase). Recent drilling by Ursa Major Minerals Inc. southwest of the survey area in Shakespeare township has resulted in the discovery of a broad zone of significant Ni-Cu-PGM mineralization within the Nipissing diabase.

The surveys on **Grid A** covered the following claims:

1242357	1242358	3001657	3001687

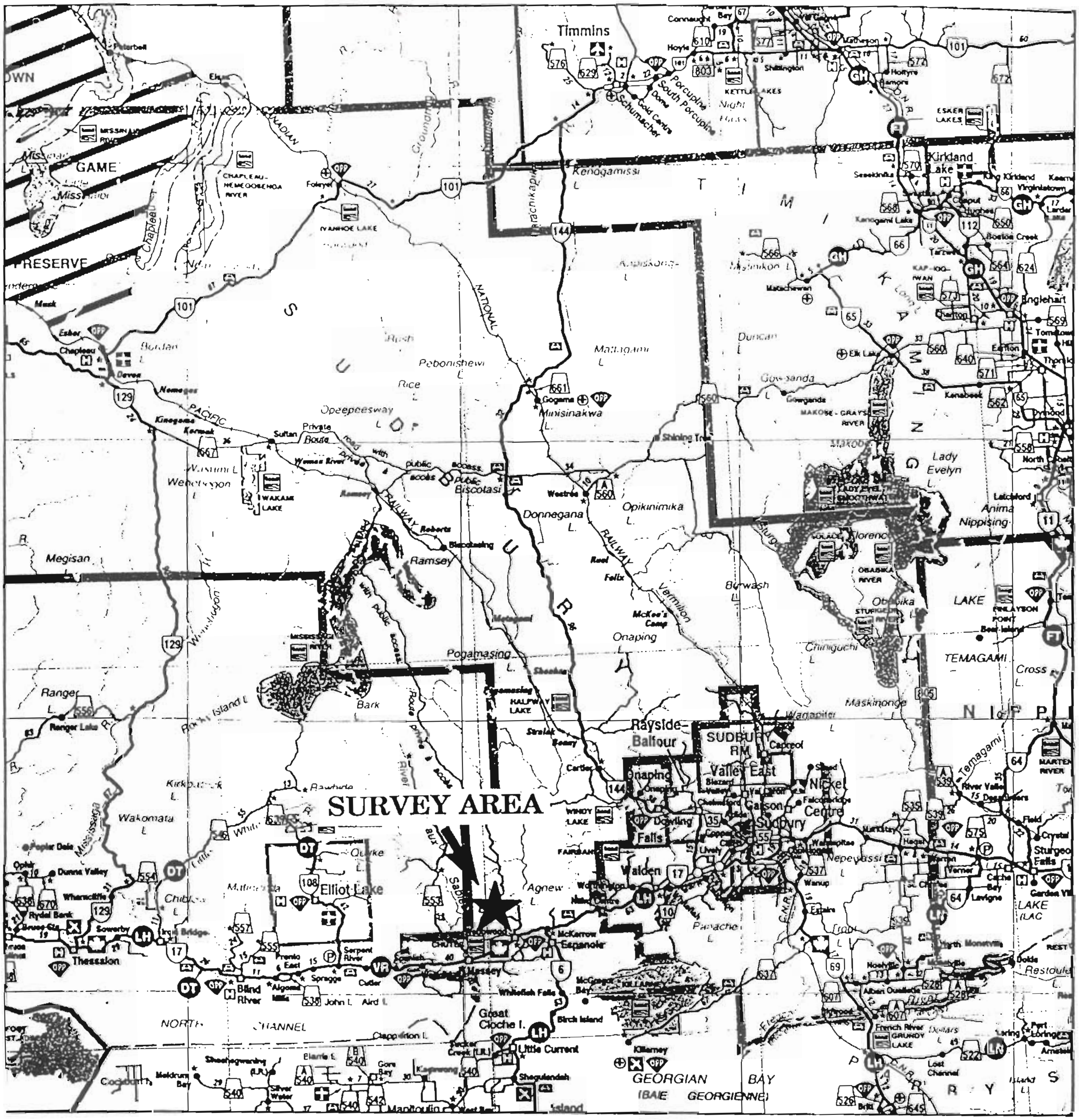
The surveys on **Grid B** covered the following claims:

1197695	1242362	1242363	1248654	3001695

2. PROPERTY GEOLOGY

In 1961, R.M. Ginn of the Ontario Department of Mines published his report on the Geology of Porter Township.

From his work, Grids **A** and **B** are generally underlained by various sedimentary units of Precambrian age. This would include quartzites, greywackes and subgreywackes and conglomerates. They are now commonly associated with the Huronian Supergroup. A northeast trending mafic intrusion (Nipissing diabase) occurs along the southern edge of Grid **B**. Regional faulting generally strikes east-northeast. Mineral occurrences in the township are sparse with a few copper showings in the west and northwest sections. Two (2) uranium showings have been identified in the extreme southeast corner of the township.



LOCATION MAP

URSA MAJOR MINERALS INC

GRIDS A & B

Agnew Lake Project

Porter Twp., Ontario

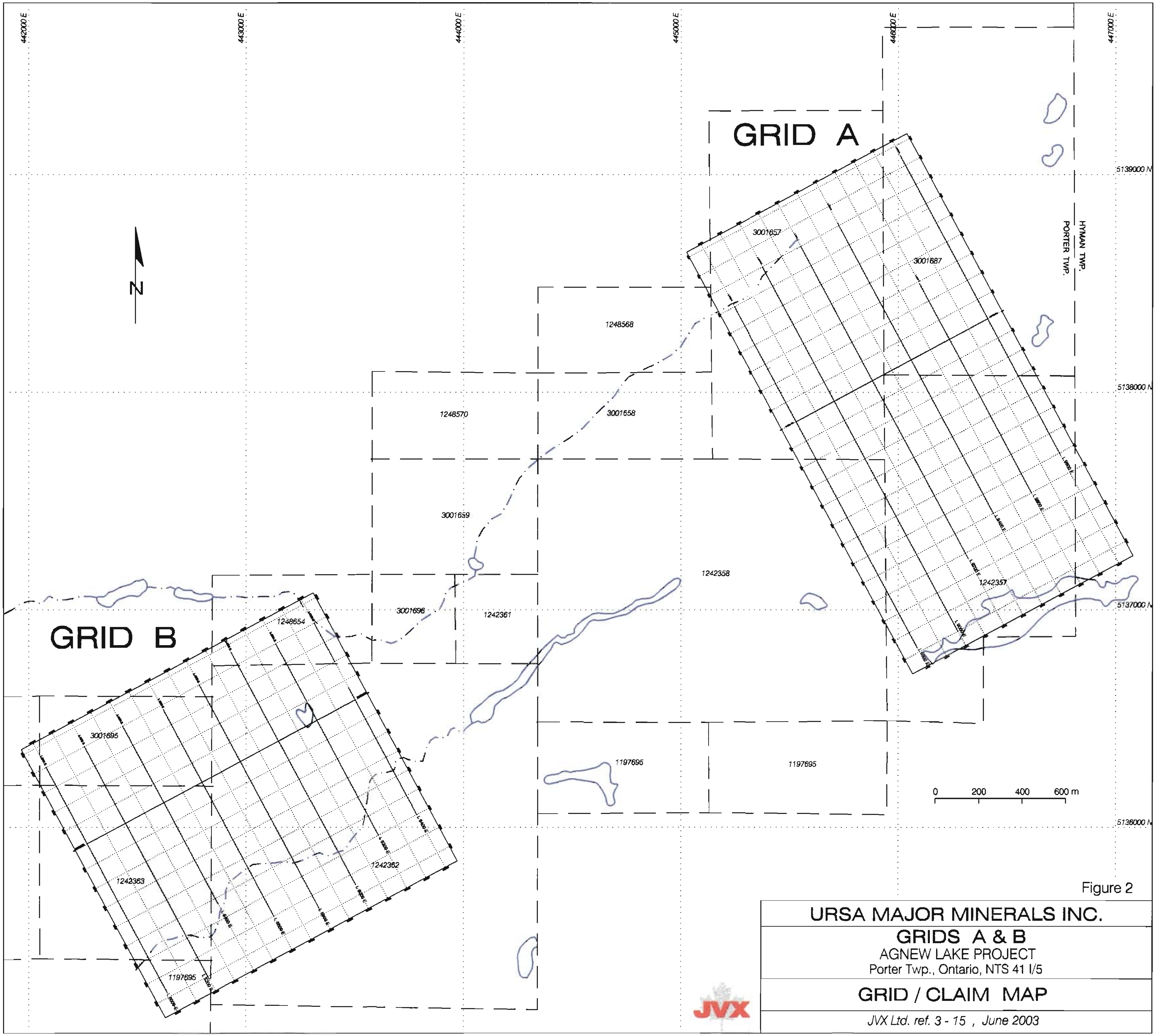
NTS 41 I/5

GROUND GEOPHYSICAL SURVEY

Scale: 1 : 1,600,000

Survey by **JVX Ltd.**
March-May 2003

Figure 1



GRID A
GRID B
N
442000 E
443000 E
444000 E
445000 E
446000 E
447000 E
5139000 N
5138000 N
5137000 N
5136000 N
HYMAN TWP.
PORTER TWP.
3001657
3001687
1248568
1248570
3001658
3001659
1242358
1242357
3001696
1242361
1248654
3001695
1242363
1242362
1197695
1197695
1197695
0 200 400 600 m
URSA MAJOR MINERALS INC.
GRIDS A & B
AGNEW LAKE PROJECT
Porter Twp., Ontario, NTS 41 I/5
GRID / CLAIM MAP
JVX Ltd. ref. 3 - 15 , June 2003

Figure 2

3. SURVEY SPECIFICATIONS and PRODUCTION SUMMARIES

IP/Resistivity	
Transmitter	Scintrex IPC-7 2.5 kW
Receiver	Scintrex IPR-12
Array Type	pole-dipole
Transmit Cycle Time	2 sec
Receive Cycle Time	2 sec
Number of Potential Electrode Pairs	Alternating 7 then 6
Electrode Spacing	25m.
Number of Lines Surveyed	6 lines
Survey Coverage	4750 m

Table 1: Specifications for the IP/Resistivity Surveys on Grid A

Line	Pole Dipole type "n" & "a"-spacing	From Station	To Station	Distance (m.)	No. of Readings
8800E	Combo n=1-7,1-6 a=25 & 50 m	225 S	650 N	875	34
9000E	Combo n=1-7,1-6 a=25 & 50 m	225 S	700 N	925	36
9200E	Combo n=1-7,1-6 a=25 & 50 m	225 S	750 N	975	38
9400E	Combo n=1-7,1-6 a=25 & 50 m	25 S	800 N	825	32
9600E	Combo n=1-7,1-6 a=25 & 50 m	25 S	250 N	275	10
9800E	Combo n=1-7,1-6 a=25 & 50 m	0 N	875 N	875	35
Total				**4750**	**185**

Table 2: Production Summary for the IP/Resistivity Surveys on Grid A

IP/Resistivity	
Transmitter	Scintrex IPC-7 2.5 kW
Receiver	Scintrex IPR-12
Array Type	pole-dipole
Transmit Cycle Time	2 sec
Receive Cycle Time	2 sec
Number of Potential Electrode Pairs	6
Electrode Spacing	25m.
Number of Lines Surveyed	8 lines
Survey Coverage	7800 m

Table 1: Specifications for the IP/Resistivity Surveys on Grid B

Line	Pole-Dipole type "n" & "a"-spacing	From Station	To Station	Distance (m.)	No. of Readings
5000E	n=1-6,a=25 m	775 S	400 N	1175	38
5200E	n=1-6,a=25 m	825 S	425 N	1250	47
5400E	n=1-6,a=25 m	675 S	400 N	1075	38
5600E	n=1-6,a=25 m	675 S	375 N	1050	40
5800E	n=1-6,a=25 m	750 S	400 N	1150	45
6000E	n=1-6,a=25 m	100 S	425 N	525	18
6200E	n=1-6,a=25 m	425 S	675 N	1100	21
6400E	n=1-6,a=25 m	400 S	75 N	475	13
Total				**7800**	**260**

Table 2: Production Summary for the IP/Resistivity Surveys on Grid B

GRID A: MAGNETICS	
Instrument-base station	Scintrex Envimag
Sensor Type	Proton Precession
Instrument-rover	GSM-19
Sensor Type	Overhauser
Station Spacing	12.5 m
Number of Lines Surveyed	6 lines and 1 base line
Survey Coverage	10462.5 m

Table 3: Specifications for the Magnetometer Surveys on Grid A

Line	From Station	To Station	Distance (m)	No. of Readings
8800E	1175 S	600 N	1775	143
9000E	1200 S	700 N	1900	153
9200E	925 S	700 N	1625	131
9400E	800 S	712.5 N	1512.5	122
9600E	800 S	287.5 N	1087.5	88
9800E	712.5 N	850 N	1562.5	126
BL 0N	8800 E	9800E	1000	81
Total			**10462.5**	**844**

Table 4: Production Summary for the Magnetometer Surveys on Grid A

GRID B: MAGNETICS	
Instrument-base station	Scintrex Envimag
Sensor Type	Proton Precession
Instrument-rover	GSM-19
Sensor Type	Overhauser
Station Spacing	12.5 m
Number of Lines Surveyed	8 lines and 1 base line
Survey Coverage	10162.5m

Table 3: Specifications for the Magnetometer Surveys on Grid B

Line	From Station	To Station	Distance (m)	No. of Readings
5000 E	775 S	400 N	1175	95
5200 E	812.5 S	400 N	1212.5	98
5400 E	525 S	400 N	925	75
5600 E	700 S	375 N	1075	87
5800 E	762.5 S	400 N	1162.5	93
6000 E	750 S	462.5 N	1212.5	91
6200 E	600 S	400 N	1000	70
6400 E	600 S	400 N	1000	70
BL 0 N	5000 E	6400 E	1400	113
Total			**10162.5**	**792**

Table 4: Production Summary for the Magnetometer Surveys on Grid B

4. PERSONNEL

Ted Lang (Geophysical Technician, Party Chief):
Mr. Lang acted as Party Chief and was responsible for day-to-day field operations and overall data quality.

Tim Charlebois (Geophysical Technician):
Tim Charlebois assisted Mr. Lang with the day-to-day field operations of the IP survey, operated the IPR12 receiver and carried out the magnetometer survey.

Three (3) additional technicians were employed to perform the fieldwork.

John Gilliatt (Senior Geophysicist):
Mr. Gilliatt processed and plotted the data, prepared this report and is responsible for data storage. He also liaised with the field party chief.

Ms.Dagmar Piska (Draftsperson):
Ms. Piska assisted with the plots, carried out the drafting on the figures/plates and assembled this report.

Blaine Webster (President):
Mr. Webster provided overall supervision of the survey, and prepared this report.

5. FIELD INSTRUMENTATION

JVX supplied the geophysical instruments specified in Appendix A.

5.1 IP TRANSMITTER

The **Scintrex IPC-7/2.5 kW Time Domain Transmitter** was used. The transmitter generates square wave current output with a period of 4, 8, or 16 seconds. A digital multimeter in series with the transmitter is used to measure the magnitude of the current output.

5.2 IP RECEIVER

The **Scintrex IPR-12 Time Domain Receiver** was used. This unit sample the voltage decay curve as measured by the potential electrodes at different points in time. Readings are repeated until they converge to within a tolerance level, and the data are stored in solid-state memory. Spectral parameters ***Tau*** and ***M-IP*** are also calculated and recorded automatically.

5.2.1 Grid A: Special Penetrating Array

A modified pole-dipole survey configuration was used. This "Special Penetrating Array" consisted of 9 mobile electrodes: one current electrode C_1 and eight potential electrodes (P_1 to P_8) connected to the receiver by means of the "Snake", a multiconductor cable. The dipoles nearest the current source were kept shorter than the dipoles further away. A diagram of the array is provided in Appendix C.

The infinity current location C_2 was maintained approximately at:
the UTM: 5140100 N,445000 E.

The potential electrodes were stainless steel rods ranging in length from 75-100 cm. At each station good electrical contact was ensured.

5.2.2 Grid B: The Pole-dipole Array

The "pole-dipole" survey configuration was used over the ground survey lines. This array consists of one current electrode C_1 and seven potential electrodes,P_1 to P_7 connected to the receiver by means of the "Snake" (field cable). The infinity current location C_2 is maintained at a large distance from the grid at location 5134350N and 443150 E.
This distance is about 10 times the potential electrode spacing "a" times 6 (the maximum number of "n" used in the pole-dipole survey).

6. DATA PROCESSING

After being transferred to a field computer at the end of each survey day, the data were examined, corrected, and organized by the instrument operator.

6.1 IP AND RESISTIVITY

The data were sent by e-mail to the head office of JVX in Richmond Hill, Ontario. They were processed and results were plotted on the following printers as was necessary:

- HEWLETT PACKARD DESIGNJET 750C 36 inch colour plotter
- MINOLTA 2200 Laser printer

The processing procedure is outlined below:

1) **JVX** in-house software was used to spatially reference the time-domain data. Spectral ***Tau, M-IP*** and ***c*** were calculated - in addition to chargeability and apparent resistivity. The spectral parameters describe the shape of the IP decay curve, giving information about:
    - the grain size (indicated by the parameter ***Tau***),
    - the magnitude of the chargeable source (indicated by ***M-IP***),
    - the variability of grain size (indicated by ***c***).

   The spectral parameters were calculated internally in the IPR-12 and with JVX in-house software. This software works on IPR-11 format data and it also varies the spectral value *c*, whereas the IPR-12 circuitry uses a fixed value for *c*=0.25. JVX's extensive experience with master-curve-matching provides more reliable interpretative results. In-house software was used to convert the time slices from IPR-12 windows to IPR-11 windows. The M0 slice was extrapolated based on the approximate straight-line character of the Log-Lin decay curve. This estimation proved satisfactory for our purposes, based on sensitivity analyses done on a test data sample.

2) The **GEOSOFT IP Package** was used to generate colour and black and white pseudosections of chargeability and resistivity data.

3) Plan maps of both chargeability and resistivity data were produced using **JVX** in-house software and the GEOSOFT Mapping Package. Additional drafting on the compilation map was done through **AutoCAD**.

Steps 1 through 3 were carried out in the Richmond Hill office.

7. INTERPRETATION METHODOLOGY

JVX uses its many years of experience in geophysical interpretation to extract the most accurate information from the data. The procedures involved are simplified for the sake of clarity.

7.1 IP AND RESISTIVITY

The IP and resistivity data are interpreted using the following procedure:

1) Chargeability anomalies are picked on the pseudosections and classified using the
following scheme *as a guide*:

Extremely Strong (> 40 mV/V) and well defined

Very Strong (30 to 40 mV/V) and well defined

Strong (20 to 30 mV/V) and well defined

Moderate (10 to 20 mV/V) and well defined

Weak (5 to 10 mV/V) and well defined

Very Weak (3 to 5 mV/V) and poorly defined

x x x x *Extremely Weak* (<3 mV/V) and very poorly defined

The peak of the anomaly provides a qualitative indication of the depth to the top of the anomalous source and the location of the centre of the body. Where possible, the location and dipole number of the peak are written beside the anomaly bar.

NOTE: Relatively deep pole-dipole anomalies (~ greater than n=3) should be inverted (**JVX** inversion software) to provide a better estimate of source characteristics, etc.

2) The spectral characteristics of the anomalies are examined. The peak value of *M- IP* is noted, and ***Tau*** is classified according to the following scheme:

IPR-12/JVX Scheme:

L *Long* (> 10 s)

M *Medium* (1 s to 10 s)

S *Short* (< 1 s)

3) Resistivity anomalies are picked on the pseudosections and classified using the following scheme *as a guide*:

no symbol	**VH(*n*)**	*Very High* (> 25 000 ohm m) — highly silicified
no symbol	**H(*n*)**	*High* (> 10 000 ohm m) — probably silicified
no symbol	**WH(*n*)**	*Weak High* (< 10 000 ohm m) — relative increase compared to surrounding material
—— ——	**SL(*n*)**	*Strong Low* — strong decrease in resistivity
— — —	**ML(*n*)**	*Moderate Low* — moderate decrease in resistivity
. . . . . .	**WL(*n*)**	*Weak Low* — weak resistivity decrease relative to surrounding material, where *n* is the dipole number at which the anomaly peak is located.

4) The anomalies from steps 1 to 3 are marked on the Compilation Map.

5) Zones of high chargeability are interpreted based on resistivity and geometric information.

6) The anomalies are rated according to JVX' past experience.

7) Interpretation of inversion models (not presented in this report) is done with basic shapes. As we gain practical experience carrying out and interpreting inversion models, the confidence level of interpreted source boundaries will naturally increase. The boundaries of the shapes are drawn with dotted lines to thick solid lines, representing the following:

—— *High confidence in source-core location*

—— *Good confidence in source-core location*

— — *Fair confidence in source-core location*

...... *Source-core location uncertain (main source in general vicinity)*

Note that the entire model depth-section is plotted, including regions where the inversion results are divergent. This is done because the cut off depth for divergence is non-uniform across the profile. The above interpreted source location serves to distinguish between interpreted true anomalies and these divergences.

8. DISCUSSION OF RESULTS

The results of the IP/Resistivity and Magnetometer surveys have been plotted as described in the previous section and are included in Appendix B of this report.

For each grid, the M7 chargeability, apparent resistivity and Spectral Parameters (MIP, Tau and c) and relative elevation and magnetic profiles are plotted on the pseudosections. IP anomaly axes and resistivity features have been interpreted from the pseudosections and transferred to the compilation maps.

The Spectral IP and resistivity data (n=2) and Total Field Magnetics are presented as coloured plan maps. Hatched magnetic and resistivity highs have been transferred to the compilation maps. Areas of very low resistivities that are thought to represent conductive overburden have also been identified on the compilation maps.

Coloured plan maps of the n=4 Spectral IP and resistivity data were generated to better illustrate anomalous chargeability and apparent resistivity zones occurring at moderate depths.

8.1 Grid "A"

Ten (10) IP zones have been outlined. The majority of the IP zones represent strong to extremely strong chargeable sources that correspond with a well-defined broad weak to moderate northeast trending magnetic high zone. However, these chargeability sources are generally associated with high resistivities and exhibit poor line-to-line correlation. The most important zones are likely **IP-2** on lines 9200E and 9400E and to a lesser extent **IP-7** on line 9800E.

The locations of the IP Zones are provided below:

IP – 1 - 8800E/537N to 9400E/712N
IP – 1a - 9800E/775N
IP – 2 - 9200E/537N to 9800E/625 to 700N
IP – 2a - 8800E/487N
IP – 3 - 8800E/275 to 375N to 9400E/350 to 475N
IP – 3a - 9800E/525 to 575N
IP – 4 - 8800E/200N to 9400E/250N
IP – 5 - 8800E/62N to 9600E/162N
IP – 6 - 9800E/437N
IP – 7 - 9800E/362N

IP-2 represents a two-line anomaly that may extend northeast to line 9800E (**IP-2a**). The chargeability sources are strong to very strong and exhibit a moderate association with a weak resistivity low within a broad zone of high resistivities. A weak magnetic high is coincident.

Exploration Target: ***T-1*** is located on L9400E at 325N. On this line the top of the chargeable source is interpreted at n=2. This is near surface and therefore a surface expression could be observed. Favourable results could warrant a follow-up TDEM survey to investigate the zone at moderate depths.

IP-7 is a one-line chargeability source. The chargeability source is weak and poorly defined coincident with a relatively weak resistivity low. It is however associated with a strong, symmetrical magnetic high. The smoothness of the magnetic readings suggests the top of causative source is at a moderate depth. The magnetic feature could represent a moderate to strongly magnetic olivine diabase dike that has been identified by regional mapping and through interpretation of airborne magnetic data.

Exploration Target: T-2 is located on line 9800E at 362N and represents a moderate priority target. A TDEM survey should be considered to determine if the anomalous zone is conductive.

8.2 Grid "B"

Five (5) IP zones have been outlined. Most of the zones are located northwest of baseline in association a weak to moderate northeast trending magnetic high. The south-central and extremely northeast sections appear to have a layer of conductive overburden that masks bedrock responses.

The locations of the IP Zones are provided below:

IP - 1 - 5000E/187N to 6000E/262N
IP - 2 - 5600E/225N to 6000E/212N
IP - 3a - 5400E/212N to 5600E/137N
IP - 3b - 5400E/162N to 5600E/87N
IP - 4 - 5400E/612S to 5800E/687S

IP-1 is likely the most important chargeability zone on this grid. The zone extends from the southwest edge of the grid on L5000E to L6000E in the northeast. Chargeable sources with this zone are strong to very strong with weak to strong associations with resistivity lows. A very high priority (***T-1***) target has been selected for follow-up.

Exploration Target: ***T-1*** is located on L5800E at 287N and represents a very strong chargeable source, coincident with a magnetic high and resistivity low and occurring on the south facing side of a steep hill. These characteristics are similar to those associated with the Ni-Cu-PGM zone recently discovered by drilling immediately northeast of the existing Shakespeare deposit.

IP-2 is located immediately southeast of IP-1 on lines 5600E through 6000E. Chargeabilities are strong to very strong. On lines 5800E and 6000E the zone is on the northwest flank of a resistivity high.

IP inversions were carried out on lines 5600E and 5800E to better define **IP-1** and **IP-2** for follow-up. The inversions for line 5800E clearly show a strong, near vertical chargeability zone (**IP-1**) centred a few metres north of 300N. A strong correlation to a resistivity low is also apparent. An additional chargeability source centred near 225N would likely represent **IP-2**. This zone also correlates with a resistivity low and may dip moderately to the southeast. Both zones could also be linked as indicated by the resistivity inversion. The IP inversions on line 5600E clearly define a chargeability source coincident with the location of **IP-1**. Another chargeability source is likely centred between 225 and 250N but is not well defined.

IP-3a & IP-3b – These two zones represent moderate to strong chargeable sources within a broad area of elevated chargeabilities. Resistivity values are also high suggesting that any mineralization is likely associated with quartz rich rocks.

IP-4 – This zone is located along the southeast boundary of the grid. The zone exhibits moderate to strong chargeabilities and occurs along northwest edge of a strong resistivity zone. The zone could indicate minor mineralization occurring at a geological contact. It appears prospecting on line 5800E should provide the causative source.

In addition to the IP zones outlined above, three (3) one-line sources occur on line 5000E. These zones could possibly extend to the northeast but might masked by conductive overburden.

9. SUMMARY AND RECOMMENDATIONS

Several IP chargeability zones have been identified on Grids **A** & **B**. The majority of the IP zones are located northwest of the baseline in conjunction with a broad weak to moderate magnetic high. Many of the chargeable sources within these zones are rated strong to very strong. This likely is a result of the chargeability zones occurring in rock units that exhibit high to very high apparent resistivities. Some of the chargeable sources are coincident or flanking relative resistivity lows.

The most prominent IP chargeability zone is IP-1 on Grid **B**. This zone extends for one km along the northern section of the grid. The zone may extend southwest of the grid. The geophysical signature of this zone is comparable to geophysical signature associated with significant Ni-Cu-PGM mineralization recently discovered on the Falconbridge Option Property in Shakespeare township. This mineralization occurs ~200m northeast of the existing Shakepeare deposit. A very high priority target has been identified on Line 5800E.

Two exploration targets have been selected on Grid A. Both of these targets should be considered as moderate priority for follow-up.

A summary of the exploration targets on Grids **A** and **B** is provided below:

Grid	TARGET	LINE	STN	PRIORITY	Comments
A	T-1	9400E	325N	Moderate	Strong Mx associated with weak resistivity low and weak magnetic high. Prospecting follow by TDEM surveys if geology favourable
	T-2	9800E	362N	Moderate	Weak Mx with weak resistivity low and moderate to strong magnetic high. Follow-up with TDEM surveys.
B	T-1	5800E	287N	Very High	Strong Mx source with strong correlation to a resistivity low and magnetic high. Good potential along strike to the southwest. Prospecting and TDEM surveys prior to drilling are recommended.

Prior to drilling please contact JVX for final drill collar locations.
Respectfully submitted,

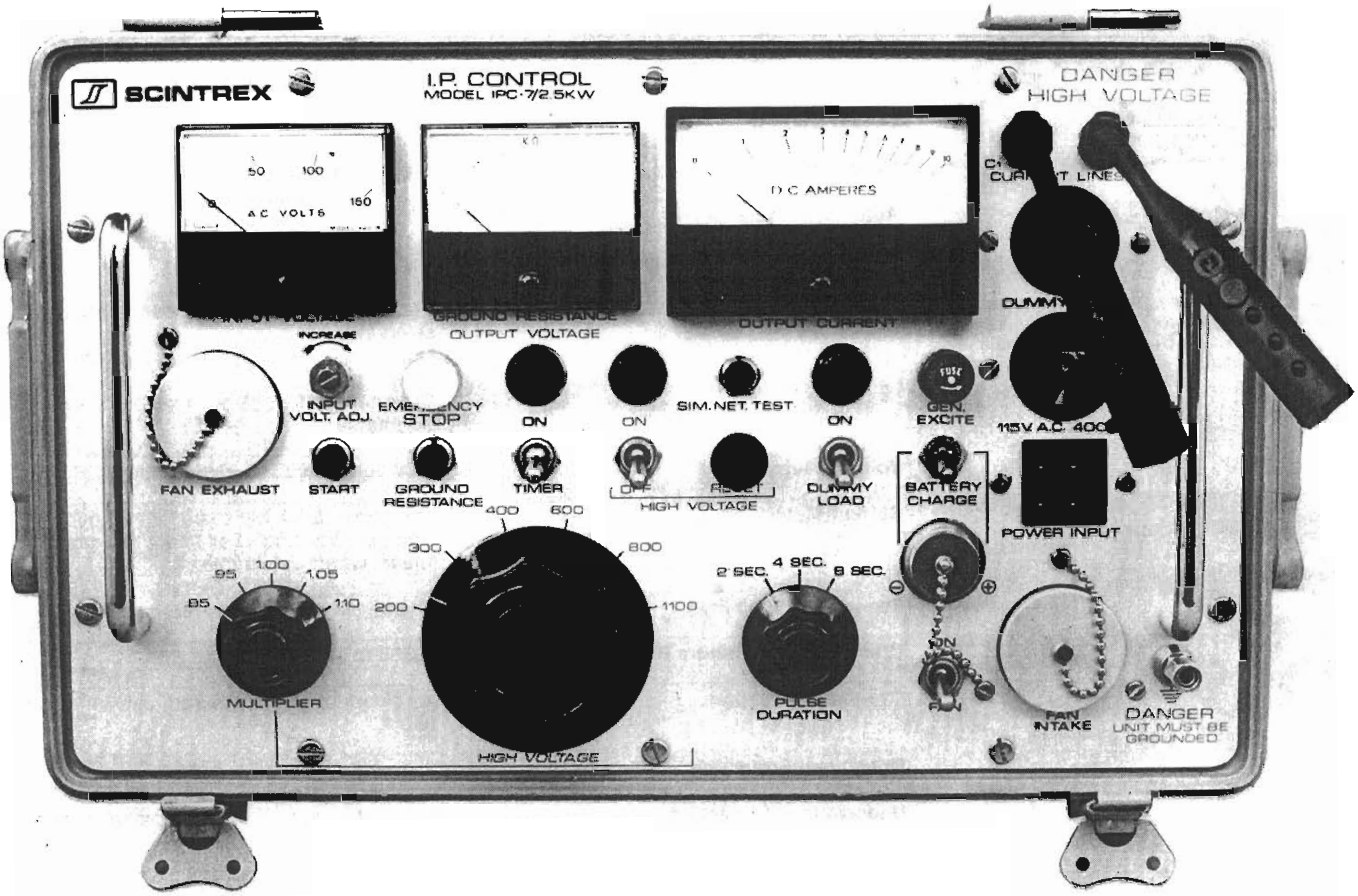
JVX Ltd.

John Gilliatt

John Gilliatt, B.Sc.
Senior Geophysicist

APPENDIX A

SCINTREX IPC-7/2.5kW Induced Polarization and Commutated DC Resistivity Transmitter System



Function

The IPC-7/2.5 kW is a medium power transmitter system designed for time domain induced polarization or commutated DC resistivity work. It is the standard power transmitting system used on most surveys under a wide variety of geophysical, topographical and climatic conditions.

The system consists of three modules: A Transmitter Console containing a transformer and electronics, a Motor Generator and a Dummy Load mounted in the Transmitter Console cover. The purpose of the Dummy Load is to accept the Motor Generator output during those parts of the cycle when current is not transmitted into the ground, in order to improve power output and prolong engine life.

The favourable power-weight ratio and compact design of this system make it portable and highly versatile for use with a wide variety of electrode arrays.

Features

Maximum motor generator output, 2.5 kW; maximum power output, 1.85 kW; maximum current output, 10 amperes; maximum voltage output, 1210 volts DC

Removable circuit boards for ease in servicing.

Automatic on-off and polarity cycling with selectable cycling rates so that the optimum pulse time (frequency) can be selected for each survey.

The overload protection circuit protects the instrument from damage in case of an overload or short in the current dipole circuit.

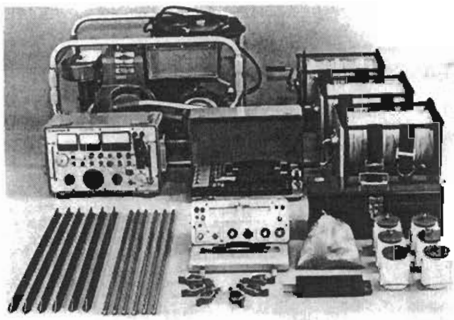
The open loop circuit protects workers by automatically cutting off the high voltage in case of a break in the current dipole circuit.

Both the primary and secondary of the transformer are switch selectable for power matching to the ground load. This ensures maximum power efficiency.

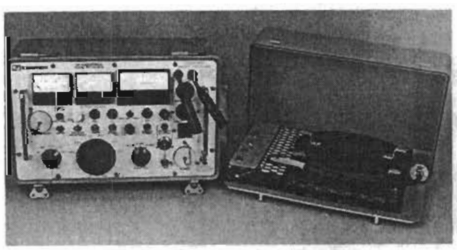
The built-in ohmmeter is used for checking the external circuit resistance to ensure that the current dipole circuit is grounded properly before the high voltage is turned on. This is a safety feature and also allows the operator to select the proper output voltage required to give an adequate current for a proper signal at the receiver.

The programmer is crystal controlled for the very high stability required for broadband (spectral) induced polarization measurements using the Scintrex IPR-11 Broadband Time Domain Receiver.

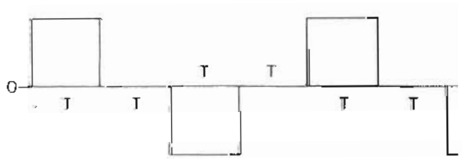
Technical Description of IPC-7/2.5 kW Transmitter System



Complete 2.5kW induced polarization system including motor-generator, reels with wire, tool kit, porous pots, simulator circuit, copper sulphate, IPR-8 receiver, dummy load, transmitter, electrodes and clips.



IPC-7 / 2.5kW transmitter console with lid and dummy load



Time Domain Waveform

Transmitter Console	
Maximum Output Power	1.85 kW maximum, defined as VI when current is on, into a resistive load
Output Current	10 amperes maximum
Output Voltage	Switch selectable up to 1210 volts DC
Automatic Cycle Timing	T:T:T:T; on:off:on:off
Automatic Polarity Change	Each 2T
Pulse Durations	Standard: T = 2,4 or 8 seconds, switch selectable Optional: T = 1,2,4 or 8 seconds, switch selectable Optional: T = 8,16,32 or 64 seconds, switch selectable
Voltage Meter	1500 volts full scale logarithmic
Current Meter	Standard: 10.0 A full scale logarithmic Optional: 0.3, 1.0, 3.0 or 10.0 A full scale linear, switch selectable
Period Time Stability	Crystal controlled to better than .01%
Operating Temperature Range	-30°C to +55°C
Overload Protection	Automatic shut-off at output current above 10.0 A
Open Loop Protection	Automatic shut-off at current below 100 mA
Undervoltage Protection	Automatic shut-off at output voltage less than 95 V
Dimensions	280 mm x 460 mm x 310 mm
Weight	30 kg
Shipping Weight	41 kg includes reusable wooden crate
Motor Generator	
Maximum Output Power	2.5 kVA, single phase
Output Voltage	110 V AC
Output Frequency	400 Hz
Motor	4 stroke, 8 HP Briggs & Stratton
Weight	59 kg
Shipping Weight	90 kg includes reusable wooden crate

SCINTREX

222 Snidercroft Road
Concord Ontario Canada
L4K 1B5

Telephone: (416) 669-2280
Cable: Geoscint Toronto
Telex: 06-964570

Geophysical and Geochemical Instrumentation and Services

SCINTREX

IPR-12 Time Domain Induced Polarization/Resistivity Receiver

;pecifications

ıputs
 to 8 dipoles are measured simultaneously.

ıput Impedance
6 Megohms

;P Bucking
:10 volt range. Automatic linear correction ›perating on a cycle by cycle basis.

ıput Voltage (Vp) Range
;0 µvolt to 14 volt

:hargeability (M) Range
ı to 300millivolt

'au Range
 millisecond to 1000 seconds

leading Resolution of Vp, SP and M
'p, 10 microvolt; SP, 1 millivolt; M, 0.01 nillivolt/volt

ıbsolute Accuracy of Vp, SP and M
3etter than 1%

:ommon Mode Rejection
ıt input more than 100db

p Integration Time
0% to 80% of the current on time.

› Transient Program
'otal measuring time keyboard selectable t 1, 2, 4, 8, 16 or 32 seconds. Normally 4 windows except that the first four are ot measured on the 1 second timing, the rst three are not measured on the 2 second timing and the first is not measured on ıe 4 second timing. (See diagram on age 2.) An additional transient slice of ıinimum 10 ms width, and 10ms steps, ‹ith delay of at least 40 ms is keyboard electable.

'ansmitter Timing
qual on and off times with polarity change ach half cycle. On/off times of 1, 2, 4, 8, 6 or 32 seconds. Timing accuracy of 100 ppm or better is required.

xternal Circuit Test
ll dipoles are measured individually in equence, using a 10 Hz square wave. he range is 0 to 2 Mohm with 0.1kohm esolution. Circuit resistances are disayed 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

SCINTREX

In Canada

222 Snidercroft Rd.
Concord, Ontario
Canada, L4K 1B5

Tel.: (905) 669-2280
Fax: (905) 669-6403
Telex: (905) 06-964570

In the U.S.A.

85 River Rock Drive
Unit # 202
Buffalo, N.Y.
U.S.A. 14207

Tel.: (716) 298-1219
Fax: (716) 298-1317

SCINTREX

ENVI GEOPHYSICAL SYSTEM

Total Field Operating Range
20,000 to 100,000 nT (gammas)

Total Field Absolute Accuracy:
±1 nT

Sensitivity:
0.1 nT at 2 second sampling rate

Tuning
Fully solid state. Manual or automatic keyboard selectable

Cycling (Reading) Rates
0.5, 1 or 2 second sensor, 1/2m (20 inch) staff extender and processor module

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

VLF Option
Includes a VLF sensor and harness assembly

'WALKMAG' Mode
0.5 seconds 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

Keyboard Input
17 keys, dual function, membrane type

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

Standard Memory
Total Field Measurements: 28,000 readings
Gradiometer Measurements: 21,000 readings
Base Station Measurements: 151,000 readings
VLF Measurements: 4,500 readings for 3 frequencies

Expanded Memory
Total Field Measurements: 140,000 readings
Gradiometer Measurements: 109,000 readings
Base Station Measurements: 750,000 readings
VLF Measurements: 24,000 readings for 3 frequencies

Real-Time Clock
Records full date, hours, minutes and seconds with 1 second resolution, ±1 second stability over 24 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. High speed Binary Dump

Analog Output
0-999 mV full scale output voltage with keyboard selectable range of 1, 10, 100, 1000 or 10,000 full scale

Power Supply
Rechargeable 'Camcorder' type, 2.3 Ah, Lead-acid 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: -40° to 60°C

Dimensions & Weight

Console:	250mm x 152mm x 55mm 10" x 6" x 2.25" 2.45 kg (5.4 lbs) with rechargeable battery
T.F. sensor:	70mm x 175mm 2.75"d x 7" 1 kg (2.2 lbs) (sensor)
Gradiometer sensor and staff extender:	70mm x 675mm 2.75"d x 26.5" 1.15 kg (2.5 lbs) (sensor)
T.F. staff:	25mm x 2m 1"d x 76" .8 kg (1.75 lbs)
VLF sensor Head:	140mm x 130mm 5.5"d x 5.1" .9kg (2 lbs)
VLF Electronics Module:	280mm x 190mm x 75mm 11" x 7.5" x 3" 1.7kg (3.7 lbs)

SCINTREX

Head Office
222 Snidercroft Road, Concord, Ontario, Canada L4K 1B5
Tel.: (905) 669-2280 • Fax: (905) 669-6403 • Telex: 06-964570
In the U.S.A.
525 Fort Worth Drive, Suite 216, Denton, Texas U.S.A. 76201
Tel.: (817) 591-7755 • Fax: (817) 591-1968
In Australia
1031 Wellington St., West Perth, West Australia 6005
Tel.: (619) 321-6934 • Fax: (619) 481-1201

GSM-19

Proton Magnetometer/VLF System

GSM-19 PROTON MAGNETOMETER/VLF

Proton Magnetometer/VLF System

Features:

- Omnidirectional Magnetometer with VLF.
- Remote control for observatory and air-borne base station applications.
- Streamlined grid coordinate system with "end of line" quick change capability.
- 128kb basic memory, expandable to 2MB.
- Programmable RS-232 high-speed data transfer to 19.2kb.
- 50 and 60Hz filter, user selectable.
- Automatic tuning and base station syn-chronization.

General

The GSM-19 is a state-of-the-art magnetometer/VLF system that delivers quality data and the extensive capabilities required to perform a broad spectrum of applications. Whether the application calls for detailed ground surveys, or remotely controlled magnetic observatory measurements, you can count on the GSM-19 system to meet your goals.

The proton magnetometer can be equipped with gradiometer or VLF options, and is upgradable to an Overhauser Magnetometer.

Simultaneous Gradiometer

Many mining, environmental, and archaeological applications call for high-sensitivity gradiometer surveys. The GSM-19 meets these needs in several ways. For example, simultaneous measurement of the magnetic field at both sensors eliminates diurnal magnetic effects.

"Walking" Magnetometer/Gradiometer

The "Walking" option enables acquisition of nearly continuous data on survey lines. Data is recorded at discrete time intervals (up to 2 readings-per-second) as the instrument travels along the line.

Omnidirectional VLF

With the omnidirectional VLF option, up to three stations of VLF data can be acquired without orienting. Moreover, the operator can record both magnetic and VLF data with a single stroke on the keypad.

Remote Control Operation

When used during observatory, marine, and airborne base station applications, this option allows users to set parameters and initiate measurements from a computer terminal using standard RS-232 commands. A real-time transmission capability is provided to allow data quality monitoring while marine or vehicle borne surveys are in progress.

Automatic Tuning

Tuning is automatic in all modes of operation with initial preset. An override option is also provided for manual and remote modes. Tuning steps are 1,000 gammas wide.

Adaptability to High Gradients

In standard instruments, a gradient in the magnetic field across the sensor volume can shorten the decay time of the proton precession signal. However, the GSM-19 monitors the signal decay, and calculates the optimal time interval for measurement. Warning messages appear on the display when the measuring interval becomes too short.

Specifications

Performance

Resolution: 0.01nT

Relative Sensitivity: 0.2nT

Absolute Accuracy: 1nT

Range: 20,000 to 120,000nT

Gradient Tolerance: Over 7,000nT/m

Operating Temperature: -40°C to +60°C

Operating Modes

Manual: Coordinates, time, date and reading stored automatically at min. 3 second interval.

Base Station: Time, date and reading stored at 3 to 60 second intervals.

Mobile: Time, date and reading stored at coordinates of fiducial.

Remote Control: Optional remote control using RS-232 interface.

Input/Output: RS-232 or analog (optional) output using 6-pin weatherproof connector.

Storage Capacity

Manual Operation: 8,000 readings standard. 131,000 optional.

Base Station: 43,000 readings standard, 700,000 optional.

Gradiometer: 6,800 readings standard, 110,000 optional.

Dimensions and Weights

Dimensions: **Console:** 223 x 69 x 240mm. **Sensor:** 170 x 71mm diameter cylinder.

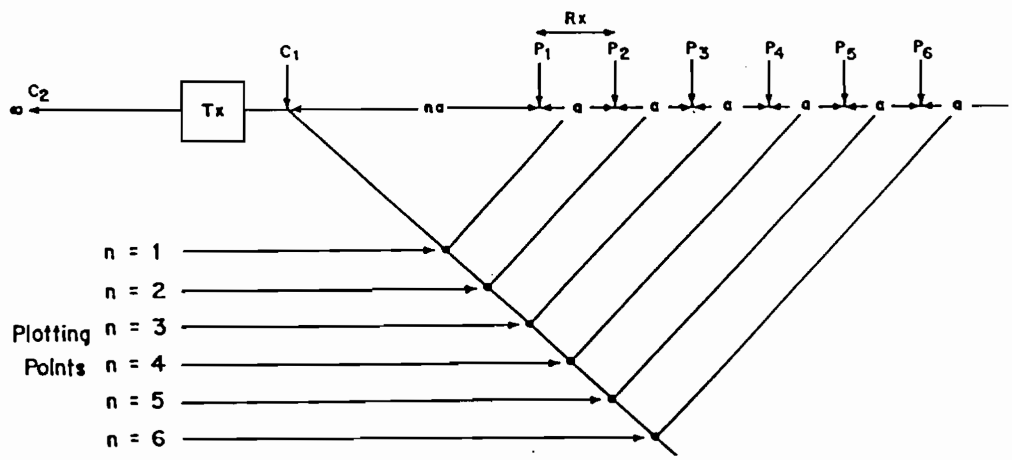
Weight: **Console:** 2.1kg. **Sensor** and Staff Assembly: 2.2kg

Standard Components

GSM-19 console, batteries, harness, charger, case, sensor with cable, connector, staff, and instruction manual.

Ordering Information

Description	Order Number
GSM-19 Proton Mag	350-170-0039
Gradiometer Option	350-170-0042
VLF Option	350-170-0069
Memory Upgrade, 128kb	350-170-0063
Analog Output	350-170-0040
Remote Option	350-170-0043



ARRAY GEOMETRY

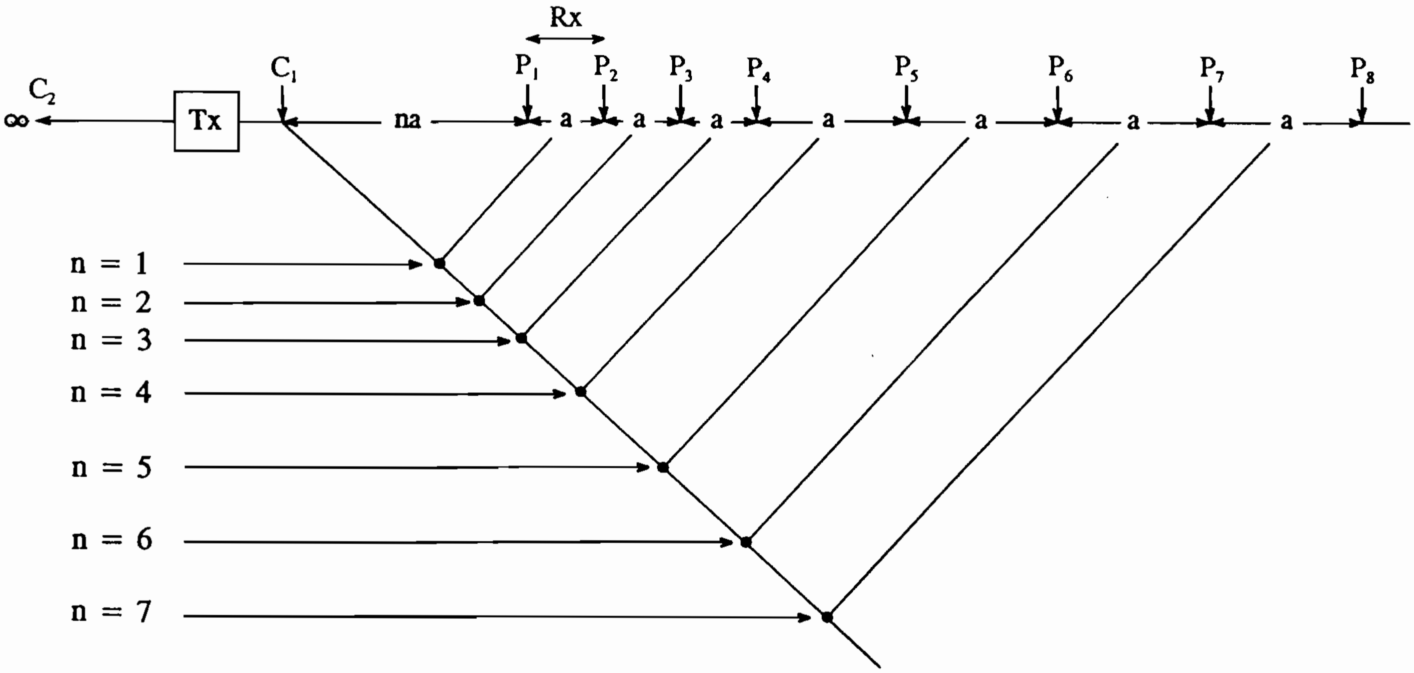
Apparent Resistivity:

$$\rho_a = 2\pi \; na(n+1) \; Vp/I$$

where

ρ_a = apparent resitivity (ohm.m)
n = dipole number (dimensionless)
a = dipole spacing (m)
Vp = primary voltage (mV)
I = primary current (mA)

Pole-Dipole Array
Array Geometry and Formula for Apparent Resistivity



ARRAY GEOMETRY

APPARENT RESISTIVITY :

$$\rho_a = 2\pi \, na \, (n+1) \, Vp \, / \, I$$

where ρ_a = apparent resistivity (ohm-m)

n = dipole number

a = dipole spacing (m)

Vp = primary voltage (mV)

I = primary current (mA)

" Special Penetrating Array "

Array Geometry and Formula for Apparent Resistivity

APPENDIX B