ARIS SUMMARY SHEET

District Geologist, Victoria — Off Confidential: 89.06.03

ASSESSMENT REPORT 17702 — MINING DIVISION: Victoria

PROPERTY: Eagle
LOCATION: LAT 48 50 00 LONG 124 19 00
UTM 10 5400102 414238
NTS 092C16W

CAMP: 023 Sarita - Gordon River Area

CLAIM(S): Eagle 4
OPERATOR(S): Western Forest Products
AUTHOR(S): Harrington, J.R.
REPORT YEAR: 1987, 94 Pages
COMMODITIES
SEARCHED FOR: Gold,Silver
KEYWORDS: Volcanics,Sediments,Intrusives,Breccias,Faults,Veins
WORK
DONE: Geophysical,Geochemical,Physical
EMGR 2.5 km; VLF
LINE 2.5 km
MAGG 2.5 km
Map(s) - 1; Scale(s) - 1:2000
ROCK 44 sample(s) ;ME
Map(s) - 1; Scale(s) - 1:2000
SCGR 2.5 km
SOIL 9 sample(s) ;ME
RELATED
REPORTS: 14163,14925

GEOPHYSICAL REPORT

ON A COMBINED SURVEY EMPLOYING A MAGNETOMETER, VLF-EM, RADIOMETRIC AND BIOLOGICAL SPORE TECHNIQUE

ON THE

WESTERN FOREST PRODUCTS LTD. PROPERTY
BLOCK 75, CLAIM EAGLE 4
VICTORIA MINING DISTRICT
LAKE COWICHAN AREA
BRITISH COLUMBIA

AUTHOR: JAMES R. HARRINGTON, C.E.T.
CONSULTING GEOPHYSICS TECHNOLOGIST

MAPS AND DRAFING: MR. VINCENT ALLAN

DATE: SEPTEMBER 4, 1987

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ILLUSTRATIONS

APPENDIX

INTRODUCTION

In the summer of 1987, Mr. Vincent Allan and James R. Harrington, with assistance from Mr. Herbert Englund, conducted a combined Magnetometer, VLF-EM, and Radiometric geophysics survey on two grids, A87 and B87, in the Eagle 4 claim on Block 75 at Lake Cowichan on Vancouver Island, B.C. In addition, a new gold/silver sensing biological spore technique was tested under the supervision of Mr. Shawn Severn, Ph.D. of CBR International Corporation. The resulting data is discussed herein.

PROPERTY LOCATION AND ACCESS

The Eagle 4 claim is in the Victoria Mining District, 14 Kilometers south of Caycuse to the south of Lake Cowichan on Vancouver Island, B.C. NTS Map 92C/16. Access is via B.C. highways to Honeymoon Bay, then west on British Columbia Forest Products main haul road from Gordon river to Truck road #3 which leads to the centre of the claim.

WORK PREVIOUSLY SUBMITTED FOR ASSESSMENT PURPOSES

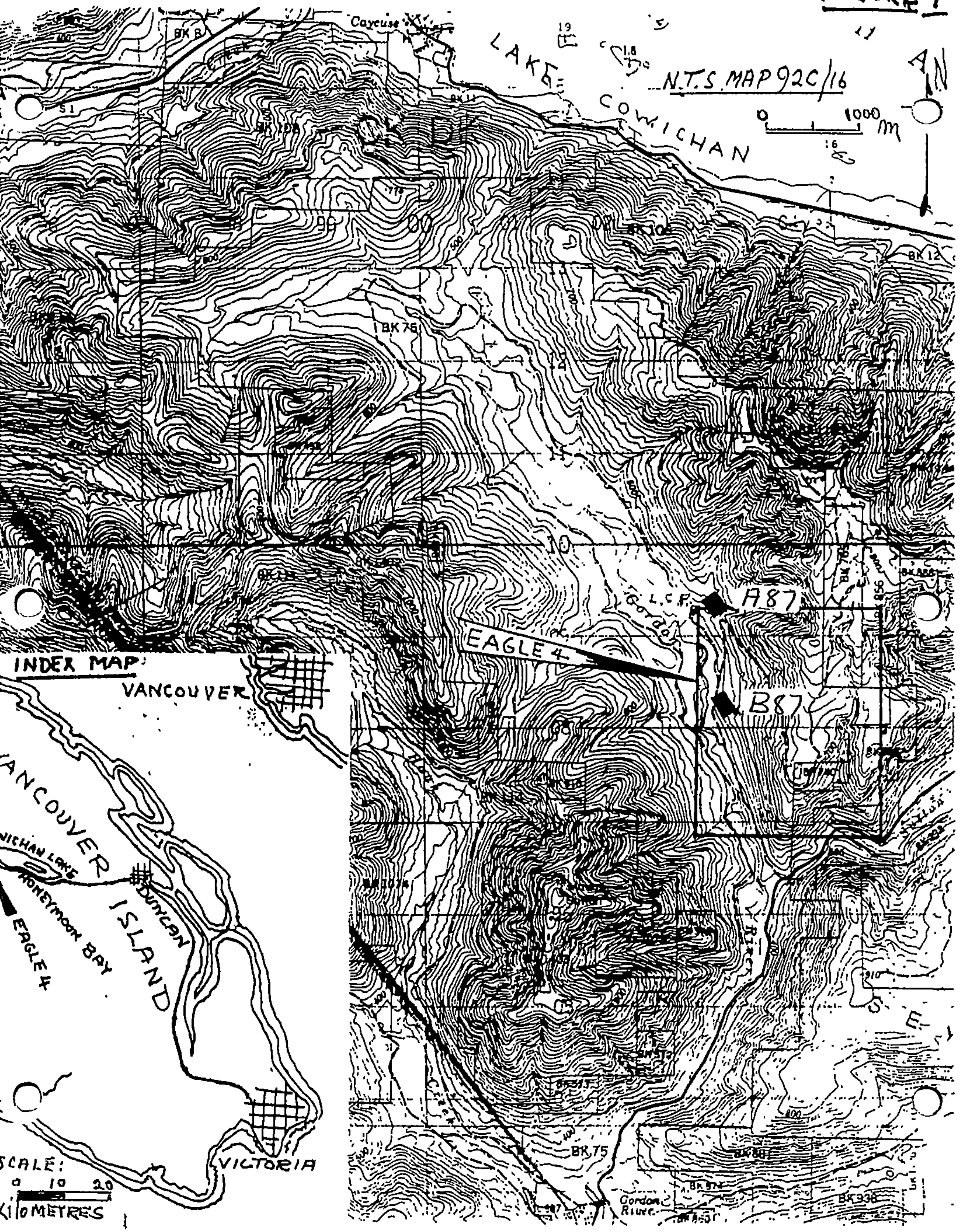
1986 - Geological report by Mr. V. Allan

PAST PRODUCERS

The Blue Grouse Copper Mine was located four miles to the north-east of the Eagle 4 claim. In the early fifties the mine produced over 15 millon pounds of copper, 80.5 thousand ounces of silver and seven ounces of gold. The adjacent Sunnyside property was also a producer, the amounts are not listed.

GENERAL GEOLOGY

The general geology of the Lake Cowichan area is described in the N.W.D. Massey and S.J. Friday report, "Geology of the Cowichan Lake Area, Vancouver Island, 1987 - 1" as follows.


N.T.S MAP 92C/16
0 1000 m
LAKE
COWICHAN
Cayeuse
A87
B87
EAGLE 4
L.C.P.
Gordon
BK 75
Gordon River
INDEX MAP
VANCOUVER
VANCOUVER ISLAND
COWICHAN LAKE
HONEYMOON BAY
EAGLE 4
DUNCAN
VICTORIA
SCALE:
0 10 20
KILOMETRES

Regional Setting

The Cowichan Lake area lies on the southern flank of the Horne Lake-Cowichan uplift, one of a series of major geanticlines that make up the structural fabric of southern Vancouver Island (Figure 3-9-1). The area is underlain by all the formations typical of Wrangellia (Sicker Group, Vancouver Group and Bonanza Group) and its successor basin (Nanaimo Group). It lies between the two main study areas of the LITHOPROBE 1 Project.

Stratigraphy

The oldest rocks in the Cowichan Lake area belong to the Paleozoic Sicker Group, which contains volcanic and sedimentary units ranging from Late Silurian to Early Permian in age. These are intruded by mafic sills, and overlain unconformably by basaltic volcanics of the Late Triassic Karmutsen Formation. Succeeding limestone, argillites and tuffaceous sediments of the Quatsino and Parson Bay Formations (which with the Karmutsen Formation make up the Vancouver Group) are conformably to disconformable overlain by marine sediments and marine to subaerial volcanics of the Early to Middle Jurassic Bonanza Group. All of these sequences have been intruded by granodioritic stocks of the Middle Jurassic Island intrusions. Late Cretaceous sediments of the Nanaimo Group lie unconformably on the older sequences.

Equipment Description

Proton Magnetometer - Geometrics Unimag, model G-836, provides 10 gamma resolution over a range from 20,000 to 100,000 gammas and is powered from an internal 12 volt DC lead acid gell battery. see appendix _1_ .

VLF-EM Receiver - Saber VLF receiver, model 27, provides measurements of the relative field strength, dip angle and quadrature components of the VLF communications stations. Relative field strength to 200 % accuracy of +-2 %, dip angle +60 to -60 degrees with an accuracy of 1 degree. The out-of-phase component (quadrature) of the magnetic field, perpendicular in direction to the resultant field, as a percent of the normal field strength. This is the minimum reading of the Field Strength meter obtained when measuring the dip angle Accuracy +-2%. The unit is powered from 8 internal 1.5 volt AA batteries.

Gamma Ray Scitillometer - Exploranium portable gamma ray scintillometer model GRS-101A, provides accurate and reliable determinations of gamma ray intensities from the radioactive elements: potassium (K40), uranium (as Bi214), and thorium (as Tl208). Analysis of gamma ray intensity aids in determining rock types, geologic contacts/faults and radioactive mineral concentrations. The unit counts all energies above 0.05 Mev. A sodium iodide crystal 1.5 Dia. x 1.5 inches converts gamma rays into faint flashes of light whose brilliance is proportional to the energy level of the gamma radiation measured. The accepted signals are averaged in a ratemeter circuit as counts per second and continously displayed on an anolog meter in ranges of 100F, 100, 300, 1000, 3000, and 10,000 C.P.S. Power is supplied by 2 nickelcadmium rechargeable 1.5 volt D cell batteries.(see appendix _1_)

Biotechnological Exploration Technique

The methods and procedures are described in appendix __2__

Correlation and Discussion of the Combined Results of the Magnetometer, VLF-EM, Background Radiometric and Biological surveys.

The purpose of the geophysics exploration program was to delineate possible zones or structures for an area in which gold and copper values had previously been located. The geophysics investigation methods employed were VLF-EM, magnetics, and radiometrics surveys. To assist in the interpretation of the data, a new biological method was tested, and found effective as an aid to identifying probable mineralized areas. On a regional basis the surveys were to determine the presence of potentially economic hardrock mineral deposits. Orthoganal VLF-EM stations are generally used to determine the possible strike of conductors, Seattle, Washington for north/south conductors (on Vancouver Island B.C.) and Annapolis, Maryland for east/west trending conductors. After an initial evaluation it was determined that the local structures trended northwest. Detailing was then conducted using Seattle, Washington (18.6 KHz.). Due to severe variations of the ionosphere, the relative field strength data was deemed of minimal value. Magnetic diurnal variations were checked regularly and corrected for as required. The use of a gamma ray scintillometer in general reconnaissance surveys for epithermal and hydrothermal gold deposits is based on the presence of radioactive potassium being a common occurrence in this type of deposit. Several attempts at employing this technique have met with varying degrees of success,
re: The Background Radiometric Survey of the Harrington Gold Property 1984, and Current Activities Forum 1984-8 Multiparameter Logging Techniques Applied to Gold Exploration (see appendix _3_).

The survey area was broken into two grids, with northeast trending traverse lines at intervals of 50 meters and stations every 25 meters. Grid number 1 (grid A87), in which traverses were made on surveyed and cut grid lines to the east of Caycuse Road, starting on the north bank of Shiela Creek at the legal corner post of Eagle 4 and Eagle 5, see figure _1_. Grid 2 (grid B87) is to the east of Caycuse Road and west of Truck Road # 3, again with surveyed and cut grid lines. Grid north/south traverses were done on all lines.

Grid # 1 (grid A87):

The VLF-EM was fairly non responsive, a few weak, low order conductors eg contact/faults were indicated. Elevation effects did account for some of the VLF-EM responses at the north end of the grid creating an overall gradient response. The Fraser Data filtering technique was applied to eliminate the elevation effects. The combined system of VLF-EM/ total field mag/ background radiation, did confirm the location of possible mineralized contact/fault anomalies, and is consistant with the controlling regional strike indicated in the report "Geology of the Cowichan lake Area, Vancouver Island (92C/16) by N.W.D. Massey and S.J. Friday paper 1987 - 1.

The weakly conductive anomalies are sub-parallel, striking approximatly 130 deg. with an apparent steep southwest dip. A possible cross cutting fault running grid north/south between lines 0+00 East and 0+50 East along the length of Shiela Creek may have offset conductors 1 and 2. This crossfaulting is of interest, in that an area of weakness has resulted, along which favourable gold values have been noted in geochemical soil samples. The overall evaluation is that no major conductors have been located, although the conductors that have been identified are stengthening as they trend to the southeast. The biological sampling on grid B87 has indicated that zero charged metals such as gold, silver, and arsenic are present, although at the same time it indicates that the area is not the prime source. The indicated source is to the northeast, which complements the findings from grid A87, strongly suggesting that further exploration should be conducted in that general area.

Grid A87 Conductor Descriptions

Conductor No. 1 :

Priority one, is indicative of a fault/contact, running from approximatly 0+50 east 0+63 north (VLF-EM resultant field dip angle crossover, rad high, weal mag low), through 1+00 east 0+63 north (VLF-EM inflection, weak rad high, mag high), 1+50 east 0+63 north (VLF-EM inflection, weak rad high, mag high), to 2+00 east 0+50 north (VLF-EM inflection, rad high, mag low). The anomaly is open ended to grid east. Outcrop samples containing pyrite taken on line 2+00 east at 0+50 east are indicative of a contact metamorphic feature. see figure _2_.

Conductor No. 2 :

approximatly runs from 0+00 east 1+13 north (VLF-EM inflection, weak rad high, mag low) to 0+50 east 1+13 north (VLF-EM inflection, rad high, mag low). This anomaly is open ended to grid west. see figure _2_.

Conductor No. 3 :

Is indicated as a low order conductive block seen only with the Fraser Filtered VLF-EM resultant field dip angle data. The anomaly is approximatly running from 1+00 east 0+13 south through 1+50 east 0+13 south to 2+00 north 0+00. Geochemical soil samples in the area of the conductor indicate anomalous copper values. see figure _2_.

Conductor No. 4 :

Seems to indicate a contact with a possible volcanic such as a granodirite, it approximatly runs from 0+00 east 2+13 north (VLF-EM inflection, bordered at 2+50 N with a rad high, mag low, contact), through 0+50 east 2+00 north (rad high, mag low), to 1+00 east 2+00 north (mag low, bordered by rad high at 1+87 N). see figure _2_.

Listing of anomalous
radiometric/magnetic gradients in Grid A87

* Radiometric background average counts per second 28 (cps)

LINE #	LOCATION	DESCRIPTION
0+00 E	0+00 N to 0+30 N	rad gradient 42 TO 46 cps associated mag low (fault/contact area)
	1+25 N to 1+37 N	rad gradient 35 cps, associated mag low (fault/contact area)
	2+50 N	rad gradient 35 cps, associated mag low (fault/contact area)
0+50 E	0+00 N	rad gradient 38 cps, mag gradient
	0+63 N	rad gradient 48 cps, associated mag low (fault/contact area)
	1+12 N to 1+25 N	rad gradient 34 TO 48 cps, associated mag low (fault/contact area)
	1+75 N to 2+12 N	rad gradient 37 TO 50 cps, associated mag low (fault/contact area)
1+00 E	0+25 S	rad gradient 35 cps, mag gradient
	1+50 N to 2+06 N	rad gradient 32 TO 40 cps, mag gradient
1+50 E	1+25 N	mag low
	0+25 S	mag low
2+00 E	1+50 N	mag low
	0+00 N to 0+75 N	rad gradient 27 TO 48 cps, associated mag low (fault/contact area)

The above listing is of line positions, in Grid A87 having anomalous radiometric values with associated magnetic anomalies. It is strongly suggested that the radiometric anomalies are in direct relationship to the weakly mineralized quartz carbonate filled faults and therefore attention to these locations is recommended. The types of afore mentioned faults are reference in the report "Geology of the Cowichan lake Area, Vancouver Island (92C/16) by N.W.D. Massey and S.J. Friday paper 1987 - 1, as being favourable to auriferous sulphides. Several minor possible faults were noted, their response to instrumentation was very poor and should be geologically mapped. It is also recommended that geochemical and biological samples be taken on line 0+50 east and 2+00 east at the following locations to test for gold, silver, arsenic and copper.

Line 0+50 east - 2+00 N (50 CPS), 1+20 N (48 CPS), 0+62 N (48 CPS).

Line 2+00 east - 0+50 N (48 CPS)

Grid # 2 (grid B87)

The VLF-EM was fairly non responsive, a few weak low order conductors eg contact/faults were indicated. Elevation effects did not account for the VLF-EM response on the grid. Traverses were along the face of the hill slope, averting a gradient response. The Fraser Data filtering technique was applied to eliminate elevation effects. The combined system of VLF-EM/ total field mag/ background radiation, did confirm the location of possible mineralized contact/fault anomalies, and is consistant with the controling regional strike indicated in the report "Geology of the Cowichan lake Area, Vancouver Island (92C/16) by N.W.D. Massey and S.J. Friday paper 1987 - 1.

Instrumentation and biological anomalies

The anomalies are sub-parallel, near vertical, striking approximatly 115 deg. Three anomalies have been identified, with biological anomalies being coincident with two locations (sample 5 line 1+50 E 0+00 N, and sample 10 at 2+13 E 0+66 N). The strongest of the biological samples # 7, was located on line 3+00 E at 1+10 N. This is of interest indicating that the grid "B87" is anomalous in zero charged metals, such as gold, silver, and arsenic. At the same time it indicates that the area is not the prime source and that the probable source is to the east of the grid. This complements the findings from grid A87, strongly suggesting that further exploration should be conducted in that general area. Note: due to the limited number of biological samples taken, this can only be the assumed direction. The overall evaluation is that no major conductors have been located in this grid. It is also suggested that geochemical soil samples be taken from the sites of the biological anomalies and tested for gold, silver, copper and arsenic, to confirm the above findings. see figure _4_ for sample locations, and for further detail relating to the biological sampling. see appendix _2_

Grid B87 Conductor Descriptions

Conductor No. 1 :

This anomaly is indicative of a fault/contact or narrow dike, running from approximatly 1+50 east 0+25 north (rad high, magnetic dipole centered at 0+12 north), through 2+00 east 0+50 north (VLF-EM c/o, weak rad high, mag low), 2+50 east 0+54 north (VLF-EM inflection, rad high 38 CPS, minor mag high), to 3+00 east 0+70 north (VLF-EM c/o, minor rad high, magnetic dipole). see figure _3_.

Conductor No. 2 :

Is a probable fault/contact, [redacted]s. This weak conductor runs approximatly from 0+50 east 0+75 north (VLF-EM c/o, rad high 40 CPS, mag low), through 1+00 east 0+75 north (VLF-EM c/o, mag low), to 1+50 east 1+75 north (VLF-EM inflection,rad high 32 CPS, mag low). see figure _3_.

Conductor No. 3 :

Is indicated as a low order conductive block or dike. It was seen as a VLF-EM inflection anomaly and is highlighted with the Fraser Filtered VLF-EM resultant field dip angle data. The anomaly is approximatly running from 0+50 east 0+12 south crossing the grid and exiting in an easterly direction from line 3+00 East 0+12 South. A strongly anomalous biological soil sample at 1+50 East 0+00 N borders the area of the indicated anomaly. see figure _3_.

Fraser Filter Anomaly Location	Associated Anomalies
East	
0+50, 0+12 South	magnetic dipole/minor radiation high
1+00, 0+12 south	magnetic gradient/minor radiation high
1+50, 0+12 South	minor magnetic dipole/minor radiation high biological high anomaly
2+00, 0+12 south	minor magnetic dipole/radiation high 34 CPS
2+50, 0+12 South	magnetic low/minor radiation high
3+00, 0+12 South	magnetic dipole/minor radiation high

Listing of anomalous
radiometric/magnetic gradients in Grid B87

* Radiometric background average counts per second 28 (cps)

LINE #	LOCATION	DESCRIPTION
0+50 E	0+75 N	rad gradient 40 cps, mag low
2+00 E	0+25 N	rad high 34 cps
2+50 E	0+54 N	rad gradient 38 cps associated mag high
	0+00 N to 0+12 S	rad gradient 33 cps, associated mag gradient
3+00 E	0+75 N to 0+50 N	rad gradient 32 TO 30 cps associated mag dipole
	0+10 S to 0+50 S	rad gradient 32 to 34 cps, associated mag gradient

CONCLUSIONS AND RECOMMENDATIONS

A multiparameter geophysics and biological survey was conducted on two grids in the Eagle 4 claim group at an area known as block 75 to the south of Lake Cowichan, on Vancouver Island B.C. in the Victoria Mining District. The survey was conducted by Mr. Vincent Allan and Mr. James R. Harrington. The survey disclosed the presence of several sub parallel weakly conductive fault/contact structures striking at approximatly 110 to 130 degrees. Open ended conductors have been indicated in both grids. Anomalous gold values have been note at mineralized outcrops in association with indicated conductors on grid A87 (conductor # 1 & 2).

It is recommended that additional coverage be obtained to the southeast using longer grid lines of approximatly 500 meters length minimum, spaced at 100 meter intervals. This will allow the various filtering methods enough data to function properly. As well, as an aid in delineating trends, further biological or geochemical sampling on a regional basis should be considered. It is recommended that biological or geochemical sampling of geophysical anomalies be conducted prior to further actions.

The use of the biological sampling technique has proved a usefull aid in evaluating the potencial presence of zero charged metals, such as gold, silver, and arsenic. Testing of the biological anomalies in grid B87 with geochemical soil samples will varify the validity of the new method.

The methods employed have been successful in delineating the suspected fault areas, although with difficulty. The targets would seem more suited to an Induced Polarization survey. In respect to the cost relationship ($3,000.00/day vs $250.00/day) the present method is much more economical and is proving effective.

Respectfully Submitted,

James R. Harrington C.E.T.,
Geophysics/Electronics Technologist

GEOPHYSICS COST STATEMENT

LABOUR

20 June	2 men @ $250.00 per day Technician @ $250.00 per day	$ 250.00 250.00
26 June	2 men @ $250.00 per day Technician @ $250.00 per day	$ 250.00 250.00
28 June	2 men @ $250.00 per day Technician @ $250.00 per day	$ 250.00 250.00
03 July	2 men @ $250.00 per day Technician @ $250.00 per day	$ 250.00 250.00
05 July	2 men @ $250.00 per day Technician @ $250.00 per day	$ 250.00 250.00
12 July	2 men @ $250.00 per day Technician @ $250.00 per day	$ 250.00 250.00
	Sub-Total	$3,000.00
04 Sept.	Geophysical Report	1,500.00
	Supervision and Administration	950.00
	TOTAL	$5,450.00

COST STATEMENT

GEOCHEMISTRY

LABOUR

Collecting soil samples	$ 295.00
Collecting biochem samples	295.00

ASSAYS

52 biochemical assays	390.00
14 I.C.P., A.A. & fire assays	248.00
SUPERVISION & ADMINISTRATION	704.00
TOTAL	$1,932.00

GEOLOGY AND PROSPECTING

LABOUR

Surveys of Gordon River; Sheila Ck; Ivan Ck; I.P. Ck; Jack Ck; and Maria Ck & Tributaries

3 men - 15 days @ $300.00 per day	$4,500.00
ADMINISTRATION, SUPPLIES, RENTALS	1,500.00
TOTAL	$6,000.00

ADDENDUM

GEOCHEMISTRY

Rock Geochemistry

This has been done on various outcrops in GRID A87 & B87.

In A87 from Line 0 + 50E - 0 + 25N Line 0 + 50E - 0+75N is an anomalous gold anomaly in disseminated sulphides.

At Line 2 + 00E - 0 + 25N a copper anomalous area.

From Line 2 + 00E - 0 + 75N to 0 + 125N is a gold anomalous area.

At I.P. Creek in lower Bonanza sediments, gold anomaly of 495 P.P.B.

In Jack Creek gold anomaly is 600 P.P.B.

Biochemistry

A new exploration technique is being tried out, explained in the geophysical report.

Biochem. samples were taken, along with geochem soil samples.

As a result of these assays, we found no correlation between the spore samples and soils.

What seems to correlate is high spore count over high rock geochem.

O.G.A. ENVIRONMENTAL ELECTRONICS LTD.

823 Old Esquimalt Rd.
Victoria, B.C.
Canada V9A 4W9
(604) 386-4015

CERTIFICATE

I, James R. Harrington, with a business address at 823 Old Esquimalt Road, Victoria, British Columbia, do hereby certify that:

1. I am a Senior Engineering Electronics/ Geophysics/ Oceanographic technician, and that I have been registered with the Ontario Association of Certified Engineering Technicians and Technologists from 1971.

2. I have been practising my profession for over 18 years.

3. I have no direct or indirect interest, nor do I expect to receive any interest directly or indirectly in the Eagle 4 group of claims, held by Mr. Don Hammond of Cobblehill B.C.

4. I have based this report on a review of the available geological data on the area, a review of exploration reports provided by the company, and on the geophysical data. The geophysical data was collected by myself, while conducting the combined geophysics survey employing a proton precession magnetometer, a VLF-EM receiver, and a gamma ray scintillometer during a visit to the property from June 20/87 to July 12/1987.

5. I consent to the use of this report by Western Forest Products Ltd. in any Filing Statement, Statement of Material Facts, Prospectus or for assessment work.

JAMES R. HARRINGTON, CET.
Sept. 4/ 1987

SELKIRK COLLEGE

CASTLEGAR, B. C., CANADA

COMMUNITY EDUCATION SERVICES

THIS IS TO CERTIFY THAT

V I N C E N T   A L L A N

HAS PARTICIPATED IN

"MINERAL EXPLORATION FOR PROSPECTORS"

156 Hour Course - May, 1981

Co-sponsored by the Ministry of Energy, Mines and Petroleum Resources; the Ministry of Education; and Continuing Education, Selkirk College

INSTRUCTOR/PROGRAM COORDINATOR

COMMUNITY EDUCATION

13a

MIN-EN LABORATORIES LTD.
Specialists in Mineral Environments
705 West 15th Street North Vancouver, B.C. Canada V7M 1T2

PHONE:(604)980-5814 OR (604)988-4524 TELEX:VIA USA 7601067 UC

Analytical Report

Company:V.ALLAN
Project:GRIDS A,B
Attention:V.ALLAN

File:8-0010
Date:JAN 12/88
Type:ROCK GEOCHEM

Date Samples Received :JAN 7/88
Samples Submitted by :V.ALLAN

Report on ....4 ROCKS, 9 SOILS................ Geochem Samples
....
.... Assay Samples
....

Copies sent to:
1. V.ALLAN, VICTORIA, B.C.
2.
3.

Samples: Sieved to mesh .....-80....... Ground to mesh ......-150......

Prepared samples stored:.....X....... discarded:.......................
rejects stored:.....X....... discarded:.............X..........

Methods of analysis:

AG-ACID DIGESTION CHEMICAL ANALYSIS.
AU-FIRE ASSAY.
26 ELEMENT MAJOR ICP.
31 ELEMENT TRACE ICP.

Remarks

Certificate of GEOCHEM

136

Company: WESTERN FOREST INDUSTRIES
Project:
Attention: VINCENT ALLEN

File: 6-405
Date: JULY 3/86
Type: ROCK GEOCHEM

We *hereby certify* the following results for samples submitted.

Sample Number	AG PPM	AU-FIRE PPB
#1	1.3	28
#2	1.0	1
#3	1.4	19
#4	1.4	9
#5	1.1	5
#6	1.0	15
#7	0.9	10
#8	1.0	2
#9	1.2	1

Sample	Cu	Ag PPM	Au g/T	Au oz./T	
10	26	2.1	.22	0.006	16/7/86
11	151	2.0	.21	0.006	
12	30	5.4	.22	0.006	
13	48	1.9	.04	0.001	
14	14	1.0	.06	0.002	
15	30	0.9	.08	0.002	
16	29	1.2	.04	0.001	
[illegible]	12	1.2	.02	0.001	
18	30	1.8	(.20)	0.006	26/7/86
19	14	1.0	.08	0.002	
20	60	1.4	.02	0.001	
21	16	1.0	(.15)	0.004	29/7/86
22	88	0.6	.02	0.001	
23	16	0.8	.05	0.001	
24	50	0.5	.01	0.001	
25	23	1.0	.03	0.001	
26	19	0.6	.02	0.001	
27	320	0.9	.07	0.002	
28	114	1.0	.02	0.001	
29	112	0.8	.04	0.001	
30	95	0.5	.02	0.001	
31	63	0.8	.01	0.001	
32	24	1.4	0.02	0.001	
33	26	0.2	0.01	0.001	
34	225	0.8	0.02	0.001	
35	12	0.7	0.01	0.001	
36	36	0.4	0.01	0.001	

Sample Number	AG PPM	AU-FIRE PPB
37	2.3	495
38	0.7	66
39	0.9	38
44	1.1	5

Certified by ____________

MIN-EN LABORATORIES LTD.

COMPANY: VINCENT ALLEN MIN EN LABS ICP REPORT [illegible]

PROJECT NO: 705 WEST 15TH ST., NORTH VANCOUVER, B.C. V7M 1T2 FILE NO: 6-405 / 3c

ATTENTION: VINCENT ALLEN (604)980-5814 OR (604)988-4524 * TYPE ROCK GEOCHEM * DATE:JULY 10, 1986

(VALUES IN PPM)	K	LI	MG	MN	MO	NA	NI	P	PB	SB	SR	TH
#1	1640	2	5630	478	4	470	10	290	18	5	48	1
#2	2430	5	9010	885	8	160	14	580	34	11	92	2
#3	2870	9	18070	1233	2	630	16	1400	32	11	58	2
#4	2670	10	20190	1252	1	610	19	1160	31	11	61	2
#5	2680	6	17370	1286	1	430	13	2000	22	9	27	1
#6	1820	7	10070	434	1	1540	11	880	26	8	52	1
#7	2480	5	13110	620	7	450	16	770	36	10	27	2
#8	940	6	15340	490	1	550	9	850	20	6	65	1
#9	900	5	13460	421	1	620	14	820	20	9	142	1

TRACE I.C.R.

COMPANY: VINCENT ALLEN
PROJECT NO: BLOCK 75
ATTENTION: VINCENT ALLEN

MIN-EN LABS ICP REPORT
705 WEST 15TH ST., NORTH VANCOUVER, B.C. V7M 1T2
(604)980-5814 OR (604)988-4524

(ACT:GE027) PAGE 1 OF 1
FILE NO: 6-671R
* TYPE ROCK GEOCHEM * DATE:DEC 11, 1986

13d

TRACE I.C.P.

(PPM)	10	11	12
AG	2.0	2.3	5.8
AL	20540	25950	7310
AS	1	71	42
B	19	28	15
BA	61	141	256
BE	4.6	8.4	5.0
BI	5	17	9
CA	39210	45210	4880
CD	4.5	5.1	2.5
CO	13	18	8
CU	25	150	29
FE	102160	60940	33530
K	2950	3290	3110
LI	7	11	1
MG	10690	26220	1870
MN	476	1614	155
MO	1	5	3
NA	150	50	60
NI	14	32	11
P	470	1290	1030
PB	30	75	34
SB	9	17	7
SR	26	49	62
TH	1	1	1
U	1	1	1
V	65.3	159.2	21.9
ZN	14	85	18
GA	1	1	1
GE	1	1	1
SE	2	4	2
SN	7	12	7
W	9	21	9
CR	26	23	38

PROJECT NO: GRIDS A   705 WEST 15TH ST., NORTH VANCOUVER, B.C. V7M 1T2   FILE NO: 8-0010/P1

ATTENTION: V.ALLAN   (604)980-5814 OR (604)988-4524   * TYPE SOIL GEOCHEM *   DATE:JAN 12, 1988

(PPM)	45	46	47	48	49	50	51	52	53
AG	1.2	1.0	.9	.9	1.1	1.2	1.5	.9	1.1
AL	51470	48080	40610	59590	51810	55850	49550	50140	53850
AS	11	8	7	9	12	10	25	14	21
B	68	62	53	75	64	70	63	63	70
BA	56	81	49	60	91	121	55	70	150
BE	2.2	2.2	2.5	2.2	1.8	2.0	2.0	2.1	2.0
BI	2	1	1	1	2	2	1	2	1
CA	4060	1860	1440	1660	2810	3040	2380	2770	4740
CD	.5	.1	.2	.4	.6	.4	1.1	.4	1.1
CO	7	5	2	4	9	11	12	7	14
CU	47	40	27	27	53	66	103	42	103
FE	70090	69650	86340	72590	60770	63300	61540	67560	65530
K	610	490	290	500	750	1000	650	560	1180
LI	21	24	13	17	14	14	15	16	16
MG	6070	7760	6320	6070	8670	12220	19820	8770	18480
MN	488	312	229	395	829	821	807	483	733
MO	1	1	1	2	1	1	1	1	1
NA	70	90	80	80	110	110	80	90	120
NI	3	1	1	3	3	5	48	10	22
P	3340	2430	2220	3810	5380	3160	3060	2190	1860
PB	4	16	6	7	12	8	11	11	7
SB	3	5	2	8	5	5	4	4	7
SR	3	11	6	10	4	13	1	7	21
TH	1	1	1	1	1	1	2	1	2
U	1	1	1	1	1	1	1	1	1
V	131.4	163.1	231.5	168.7	141.8	147.3	150.4	161.3	150.2
ZN	47	59	30	54	72	68	53	43	64
GA	1	1	1	1	1	1	1	1	1
SN	2	1	1	2	1	1	1	2	1
W	4	3	3	4	4	4	4	3	4
CR	3	1	1	2	1	1	43	1	6
AU-PPB	7	6	4	3	4	4	9	3	5

TRACE ICP

/3f

COMPANY: V.ALLAN
PROJECT NO: GRIDS A
ATTENTION: V.ALLAN

MIN-EN LABS ICP REPORT
705 WEST 15TH ST., NORTH VANCOUVER, B.C. V7M 1T2
(604)980-5814 OR (604)988-4524

FILE NO: 8-0010/P1
* TYPE ROCK GEOCHEM * DATE:JAN 12, 1988

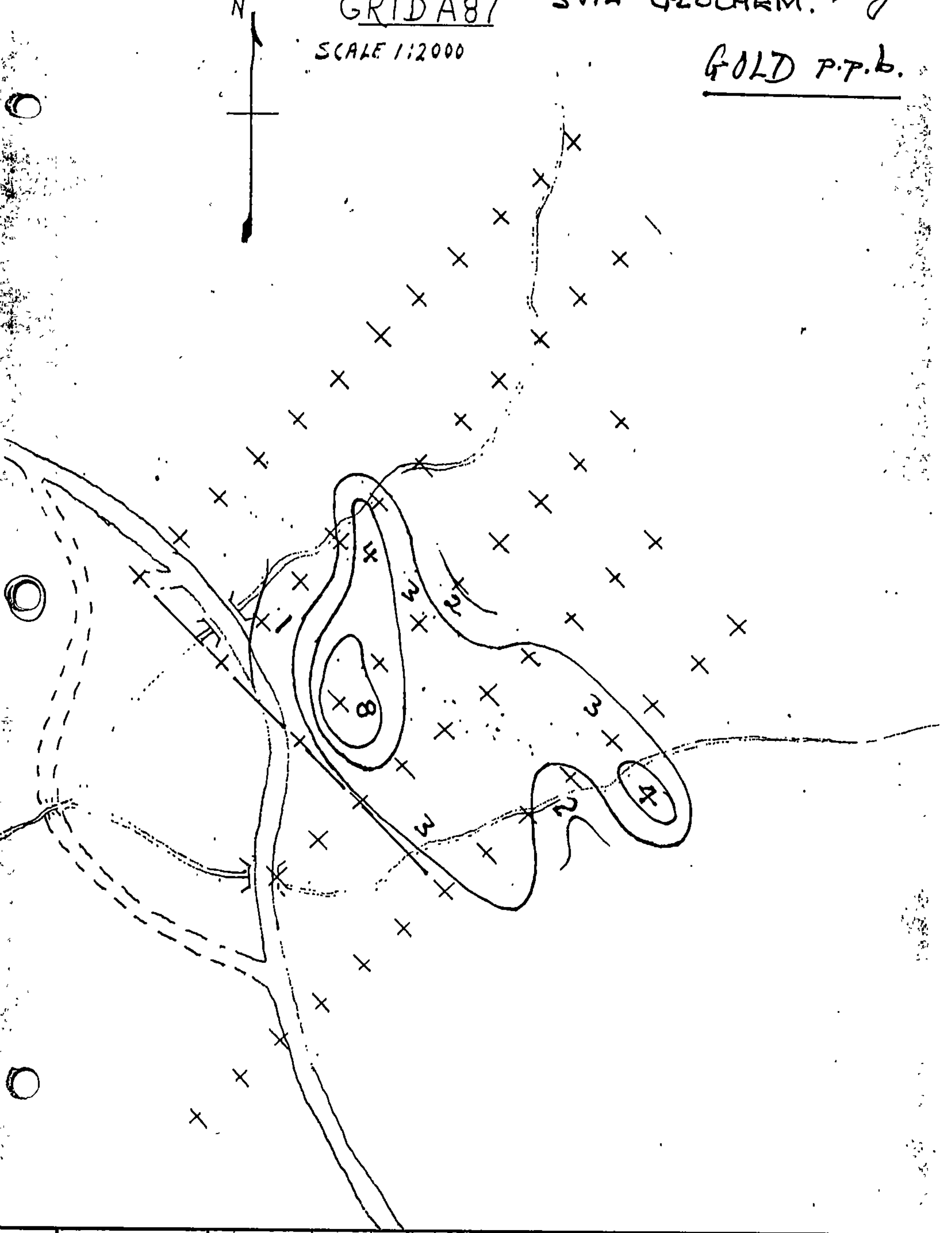
MAJOR I.C.P.

(%)	37	38	39	44
AL2O3	11.25	18.04	16.62	17.56
BA	.005	.010	.008	.042
BE	.001	.001	.001	.001
CAO	10.13	3.26	6.82	6.27
CO	.005	.005	.005	.005
CR2O3	.04	.01	.04	.01
CU	.005	.005	.005	.005
FE2O3	12.85	6.74	9.78	10.53
K2O	.26	.35	.34	1.40
MGO	20.98	2.26	7.52	5.95
MNO2	.37	.10	.26	.31
MO	.005	.005	.005	.005
NA2O	.02	6.45	2.96	3.68
NB	.01	.01	.01	.01
NI	.007	.005	.012	.005
P2O5	.22	.24	.15	.25
PB	.005	.005	.005	.005
RB	.04	.02	.03	.03
SIO2	34.67	59.61	46.58	44.84
SN	.006	.005	.005	.005
SR	.01	.04	.04	.04
TIO2	.47	.58	1.08	.91
V	.005	.005	.019	.023
W	.005	.005	.005	.005
ZN	.071	.005	.005	.005
ZR	.005	.009	.006	.005

GRID A87 SOIL GEOCHEM. 13g

SCALE 1:2000

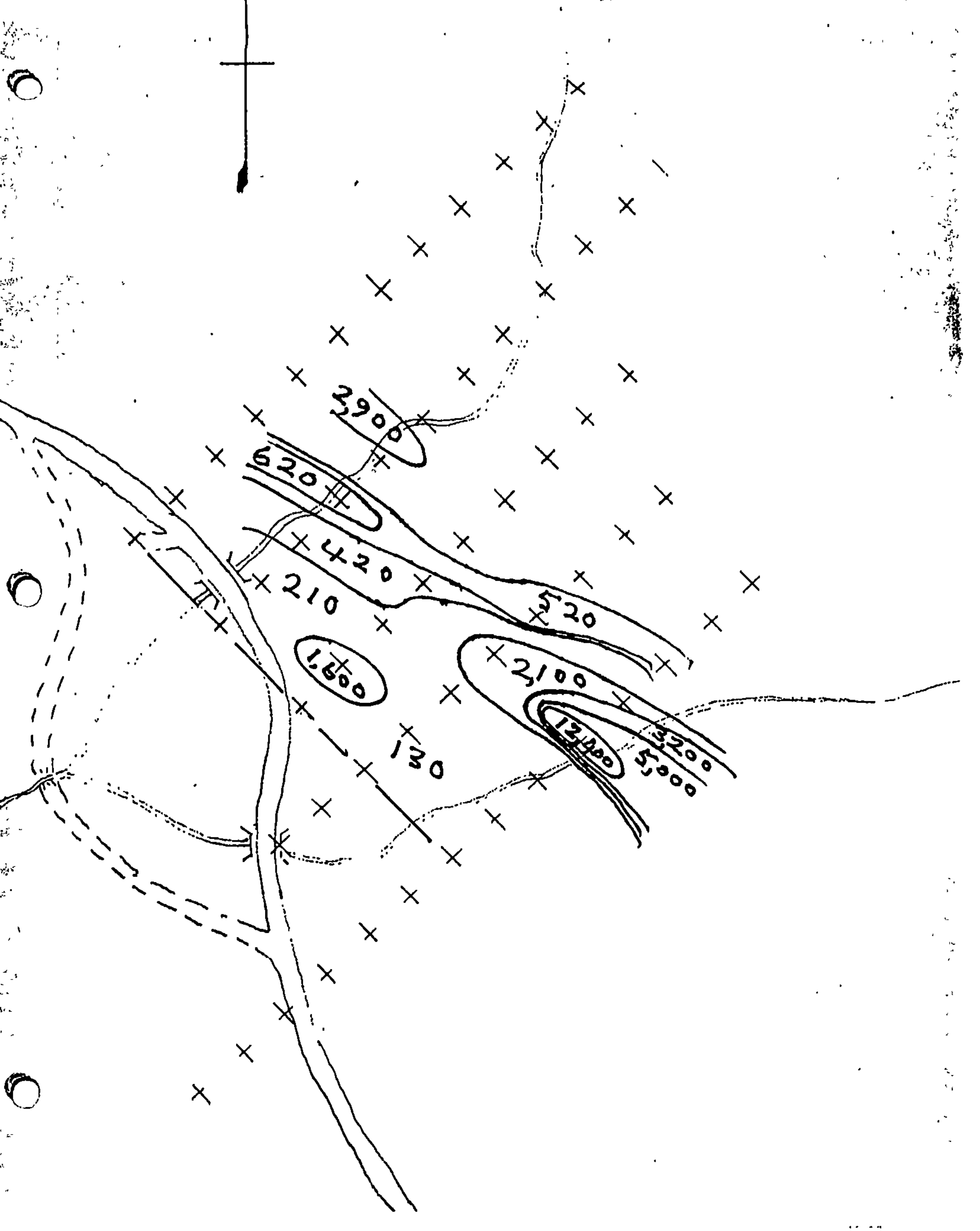
GOLD p.p.b.

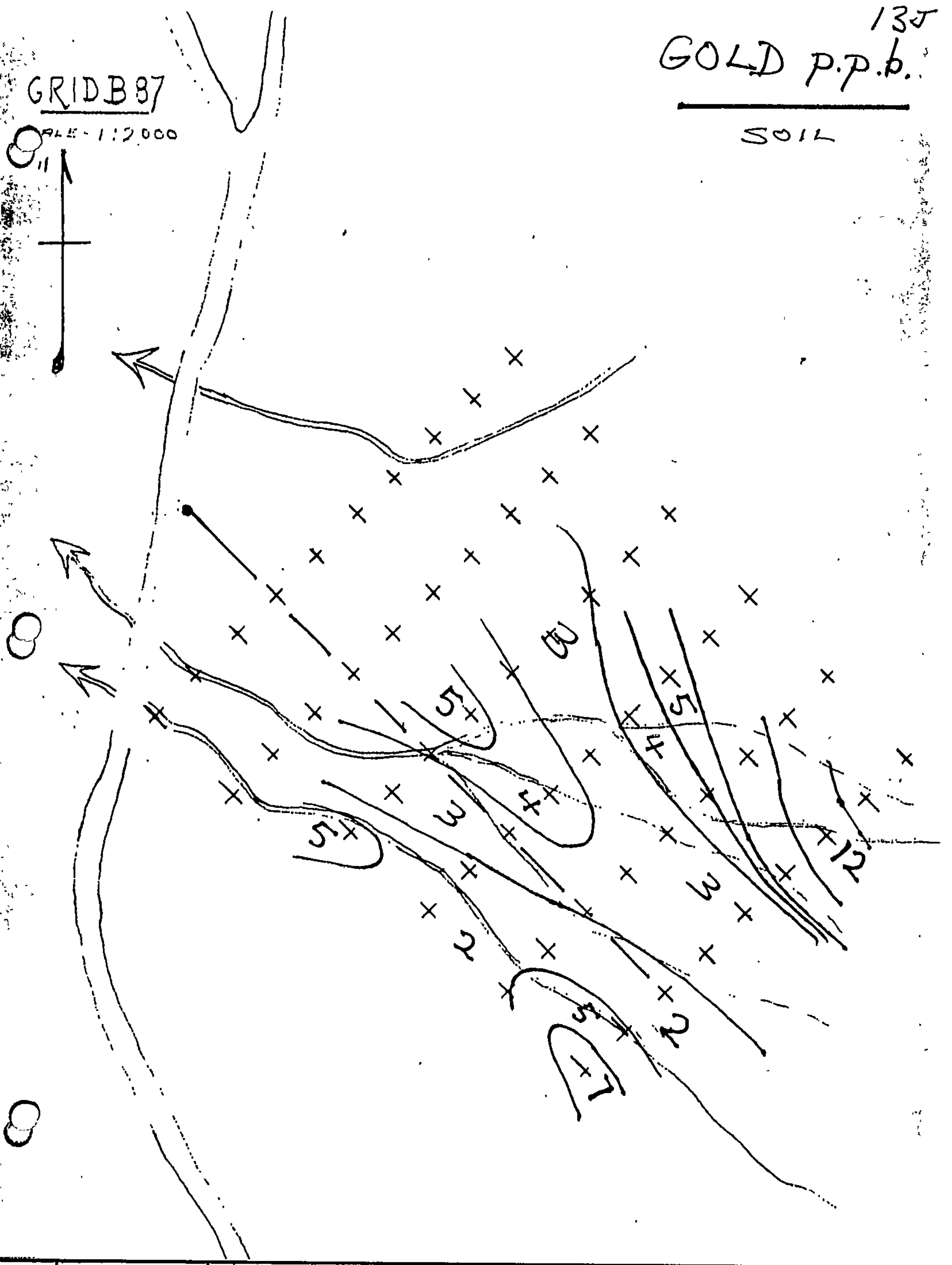


GRID A81

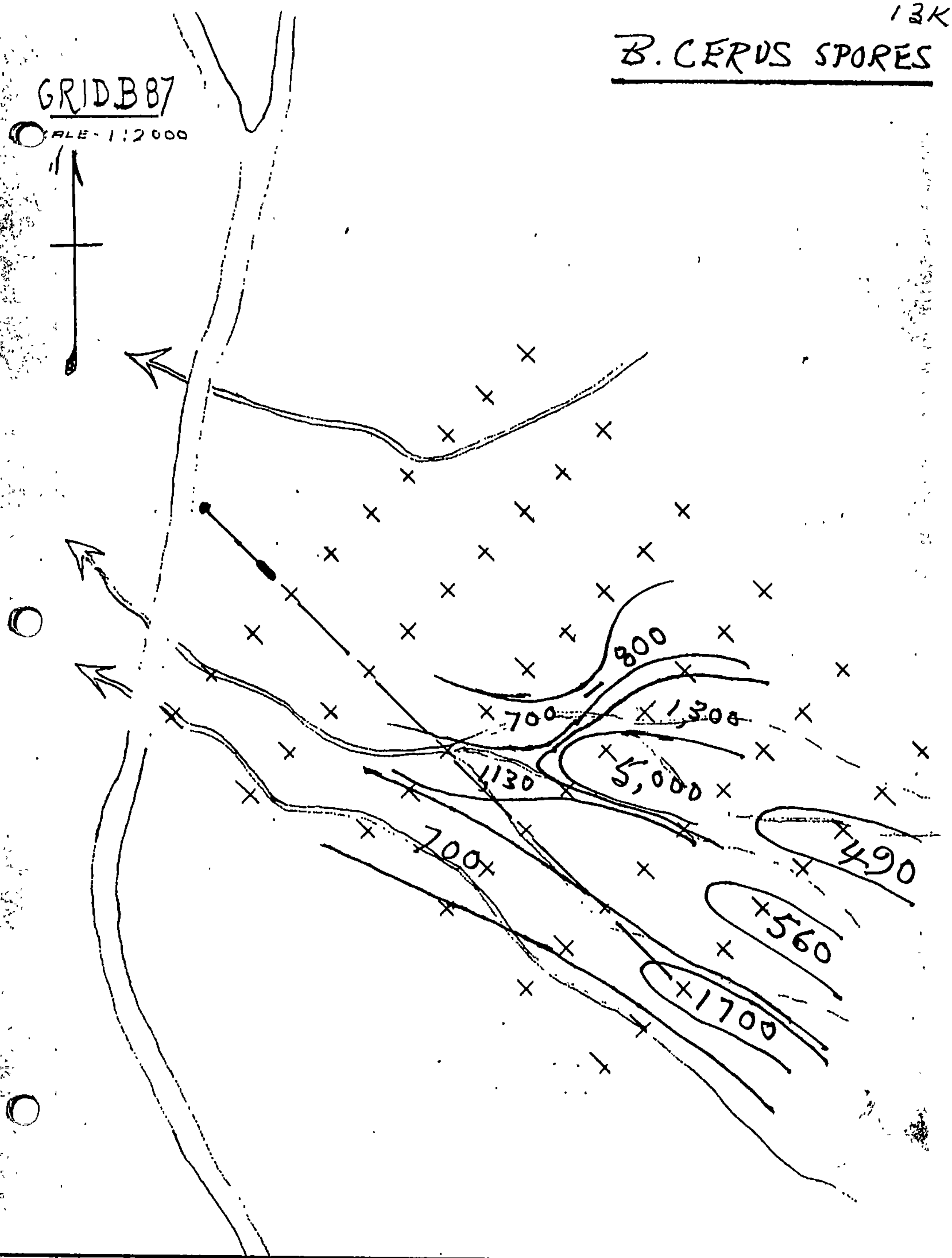
SCALE 1:2000

B. CERUS SPORES 13h




GOLD p.p.b.
SOIL
GRID B 87
ALE - 1:2000
3
5
5
4
4
3
5
3
12
2
2
5
1

13K


B. CERUS SPORES
GRID B87
SCALE - 1:2000
800
700
1,300
5,000
1130
700
490
560
1700

GEOLOGY

Exploration work is being done in the area, principally to find gold.

Any assays over 100 P.P.B. are being further investigated.

The headwaters of the Gordon River are in an area of soft, incompetent rocks of the Parsons Bay and lower Bonanza sediments. It is hard for me to differentiate between them.

These rocks are intruded by medium grained granodiorite, diorite, and fine grained felsic intrusions.

Massive swarms of porphyries intrude along strike, that is north-west.

There also seems to be a resurgence of the Karmutsen volcanics as dykes and sills.

In some areas the volcanic tuffs are so highly altered they look like intrusives.

In gride A87, Ivan & Sheila Creeks seem to be the sides of an offset fault. This area is underlain by porphory intrusions, some maybe of Tertiary age. Surface rocks are breccias, tuffs, flows and sediments of the Bonanza formation.

Gold anomalies are found in quartz-feldspar veins cutting the porphorias at 110-120° strike and dipping 60-80° south.

In grid B87, volcanic tuffs, basalts and breccias are altered with chlorite and epidote amygdules up to 1 cm.

All the porous rocks are highly silicified and limey.

In Jack Creek the highest gold anomaly so far, has been found in an epithermal vein with a Barium anomaly. It is cutting through sediments of the lower bonanza sediments.

We will be doing an I.P. and S.P. survey from A87 to B87 inclusive.

Appendix I

SPECIFICATIONS

SOURCE OF PRIMARY FIELD: VLF Communication Stations 12 to 24K hz

NUMBER OF STATIONS: 7 switch selectable

STATIONS AVAILABLE: The seven stations my be selected from:

Code	Station & Location	Frequency
CM	Cutler, Maine	17.8 KHz
SW	Seattle, Washington	18.6 KHz
AM	Annapolis, Maryland	21.4 KHz
H	Lauiualei, Hawaii	23.4 KHz
BOF	Bordeaux, France	15.1 KHz
E	Rugby, England	16.0 KHz
MS	Gorki, Russia	17.1 KHz
OD	Odessa (Black Sea)	15.6 KHz
NC	Australia, N.W.C.	22.3 KHz
YJ	Yosamai, Japan	17.4 KHz
HN	Hegaland, Norway	17.6 KHz
TJ	Tokyo, Japan	20.0 KHz
A	Buenos Aires	23.6 KHz

CHECK THAT STATION IS TRANSMITTING: Audible signal from speaker.

PARAMETERS MEASURED:

(1) DIP ANGLE in degrees of the magnetic field component, from the horizontal, of the major axis of the polarization ellipse. Detected by a minimum on the field strength meter and read from an inclinometer with a range of ± 90° and an accuracy of ± ½°.

(2) FIELD STRENGTH (total or horizontal) of the magnetic component of the VLF field, (amplitude of the major axis of the polarization ellipse). Measured as a percent of normal field strength established at a base station. Accuracy ± 2% dependent on signal. Meter has two ranges: 0 — 300% and 0 — 600%.

(3) OUT-OF-PHASE component of the magnetic field, perpendicular in direction to the resultant field, as a percent of normal field strnegth, (amplitude of the minor axis of the polarization ellipse). This is the minimum reading of the Field Strength meter obtained when measuring the dip angle. Accuracy ± 2%.

OPERATING TEMPERATURE RANGE: -30°C (-20°F) to +50°C (120°F)

DIMENSIONS AND WEIGHT: 9 x 19 x 27cm — 2.7Kg (6 lb)

SHIPPING: Instrument with foam lined wooden case, shipping wt. — 6.0Kg (13 lb)

BATTERIES: 2 of 9 volt — Eveready 216
Average life expectancy — 20 hours for continuous operation

Sensor:	Noise cancelling, high signal. Internally mounted in console.
Console Size:	$22\frac{1}{2}$" l. × $3\frac{1}{4}$" w. × 5" h. (58 × 8.3 × 12.7 cm)
Console Weight:	7 lbs. (3.2 kg) Includes batteries, sensor and shoulder harness.

1.4 INVENTORY INSPECTION

When received from the manufacturer, the UniMag™ Proton Magnetometer should include the following items:

1.	UniMag Console including sensor	1 ea
2.	AC battery charger	1 ea
3.	Adjustable shoulder strap	1 ea
4.	Battery Pack	2 ea
5.	Operator's manual	1 ea
6.	Applications Manual	1 ea
7.	Attache Case	1 ea
8.	Teflon pipe tape	1 strip

4. Now place the suspected object at the distance from the sensor expected during actual survey operation. Take several more readings and note the measurements.

5. If the measurements made in Step 4 above differ by more than ± 1 count (extreme right-hand number) from those measurements made in Step 3, then the object is magnetic.

IF THE ARTICLE IS HIGHLY MAGNETIC, OR IF UniMag IS OPERATED INSIDE OR NEAR A BUILDING OR VEHICLE, THE SIGNAL WILL BE LOST, GIVING COMPLETELY ERRATIC READINGS AND LOSS OF ± 1 COUNT REPEATABILITY.

UniMag should not be operated in areas that are known sources of radio frequency energy, power line noise (transformers), or operated in buildings. UniMag will NOT operate properly if it is placed directly on the ground.

1.3 SPECIFICATIONS

Resolution:	10 gamma throughout tuning range
Tuning Range:	20, 000 to 100, 000 gammas (world-wide)
Tuning Mechanism:	Multi-position switch with twenty-four overlapping steps.
Sampling Rate:	Manual pushbutton, new reading every 4 seconds.
Output:	4 digit, illuminated display directly in gammas.
Power Requirements:	12V DC, 500 ma average
Power Source:	Two internally mounted and rechargeable 6 volt, 1 amp/hr non-spill gelled electrolyte batteries. Charge state or replacement signified by flashing readout display.
AC Battery Charger:	Input: 115/220V, 50/60 Hz AC Output: 14V DC
Total Readings:	5, 000 readings from fully charged batteries.
Temperature Range:	-40^{o} to $+60^{o}$C Note: Battery capacity decreases with low temperature operation.
Accuracy (Total Field):	10 gamma through -20^{o} to $+60^{o}$C temperature range

Scintillometer

WARRANTY

Exploranium, a division of GeoMetrics, guarantees this instrument to be in perfect operating condition, fully tested, and complete as described for one full year beginning with the date of receipt, but not to exceed fifteen months from the shipping date.

Exploranium and GeoMetrics guarantee that all spectrometers and associated parts offered for sale are free from defects in materials and workmanship, carefully tested, and in first class operating condition. In the event of malfunction, Exploranium, at its own expense, will repair or replace any materials, equipment, work, or parts which prove defective or deficient under normal operating conditions.

Exploranium and GeoMetrics reserve the right to perform warranty services in Toronto, Ontario, or Sunnyvale, California, or at the customer's installation site, whichever is most expedient. Neither Exploranium nor GeoMetrics are responsible for delays or defects in the quality of results from misuse, mishandling, unauthorized modifications, installation or other operation conditions outside factory control.

The above paragraphs apply to all instruments supplied by Exploranium, but exclude photomultiplier tubes, batteries and any damage done thereby, as well as major ancillary equipment in certain systems.

WARRANTY SERVICE

If warranty repair should be necessary, or if technical advice is required, contact either of the following, as most convenient.

Exploranium Corporation of Canada Division of GeoMetrics 436 Limestone Crescent Downsview (Toronto), Canada M3J 2S4	GeoMetrics Inc. 395 Java Drive Sunnyvale, California 94086 U.S.A.
Telephone: (416) 661-1966 Cable: "EXPLOR" Telex: 06-22694	Telephone: (408) 734-4616 Cable: "GEOMETRICS" Telex: 357-435

1.0 GENERAL INFORMATION

1.1 INTRODUCTION

The Model GRS-101 Total Count Scintillometer is a complete field system designed for man-carry applications requiring accurate and reliable determination of gamma ray intensities from the radioactive elements: Potassium (K^{40}), Uranium (as Bi^{214}), and Thorium (as Tl^{208}). Analysis of gamma ray intensity aids in determining rock types, geologic contacts, radioactive mineral concentrations and additional information useful in mineral exploration. The inherent simplicity of the GRS-101 allows rapid, accurate measurements to be obtained from a compact field instrument. This is a precision instrument, however, and reasonable attention must be given to handling, battery condition and sudden temperature changes.

1.2 THEORY OF OPERATION

The GRS-101 Scintillometer is an instrument that transforms incident gamma ray radiation into a visual readout of radioactive intensity as a function of the natural radioactive material present in geologic phenomena. A sodium iodide crystal converts gamma rays into faint flashes of light whose brilliance is proportional to the energy level of the gamma radiation measured. These light flashes are detected by a high gain photomultiplier tube (PMT), amplified, and fed to circuitry which accepts only those signals above a certain energy. The accepted signals are averaged in a ratemeter circuit as counts per second and continuously displayed on a 250° meter on the instrument front panel. The frequency or signal count rate displayed is the intensity of all gamma ray energy above the preset threshold.

Gamma rays are emitted by certain atoms of elements which are inherently unstable and decay spontaneously with a half life and emitting energy characteristic of all nuclei within that element group. The emission energy is usually expressed in thousands or millions of electron volts (Kev or Mev). The following table describes the unstable elements of interest to radiometric surveys, and the daughter products measured by the GRS-101.

GAMMA RAY ENERGY EMISSION

Parent Atom	Daughter Product	γ Energy Emissions
Potassium 40	Potassium 40	1.46 Mev
Uranium 238	Bismuth 214	.608 - 2.44 Mev
Thorium 232	Thalium 208	.277 - 2.62 Mev

1.3 SPECIFICATIONS

Energy Response:	Total Count (all energies above 0.05 Mev)
Crystal Detector:	1.5" Dia. x 1.5" (38.1 mm x 38.1 mm) • standard
Ratemeter Ranges:	100F, 100, 300, 1000, 3000, 10000 C.P.S.
Countrate Display:	250° meter
Time Constant:	Automatically selected with rates for smooth meter response
Power Requirements:	2 "D" Cells (Battery Life 100 hours continuous with alkaline cells)
Temp. Range:	Limited only by batteries
Audio Alarm	Selectable Trigger points, 25%, 50%, 75% of full scale
Weight:	2.5 lbs 1.1 Kg.
Housing:	Aluminum

1.4 INVENTORY INSPECTION

When received from the manufacturer, the Portable Gamma Ray Spectrometer, Model GRS 101, should include the following items:

1. GRS101 Console 1 each
2. Radioactive test source 1 each
3. Batteries: Type "D" Alkaline 2 each
4. Operator's Manual 1 each
5. Wrist Strap 1 each

1.5 INSTRUMENT STORAGE

After use, GRS 101 should be stored such as to prevent damage, loss, or possible contamination through continuous contact with radioactive dust particles.

If the instrument is to be shipped as air or surface freight or long-term storage is anticipated (one month or longer), the batteries should be removed from the console to safeguard against damage from electrolytic leakage or corrosion of battery contacts. Always inspect the batteries, or install new batteries, before using the GRS101 after long storage.

2.0 FIELD OPERATIONS

2.1 INTRODUCTION

The GRS 101 comes complete and ready for field operation. A few simple procedures should be observed to insure optimum results, and it is recommended that the operator follow each step as outlined to become familiar with the various controls, indicators, and survey guidelines.

2.2 NEW INSTRUMENT CHECKOUT

When the instrument is first received from the manufacturer, check the switches for mechanical operation and inspect for damage, examine batteries (separately packed) for any leakage. If the batteries appear in good condition unscrew battery port cap (counter clockwise) install cells positive end in and refit cap securely.

Appendix 2

A.G.O. ENVIRONMENTAL ELECTRONICS LTD.

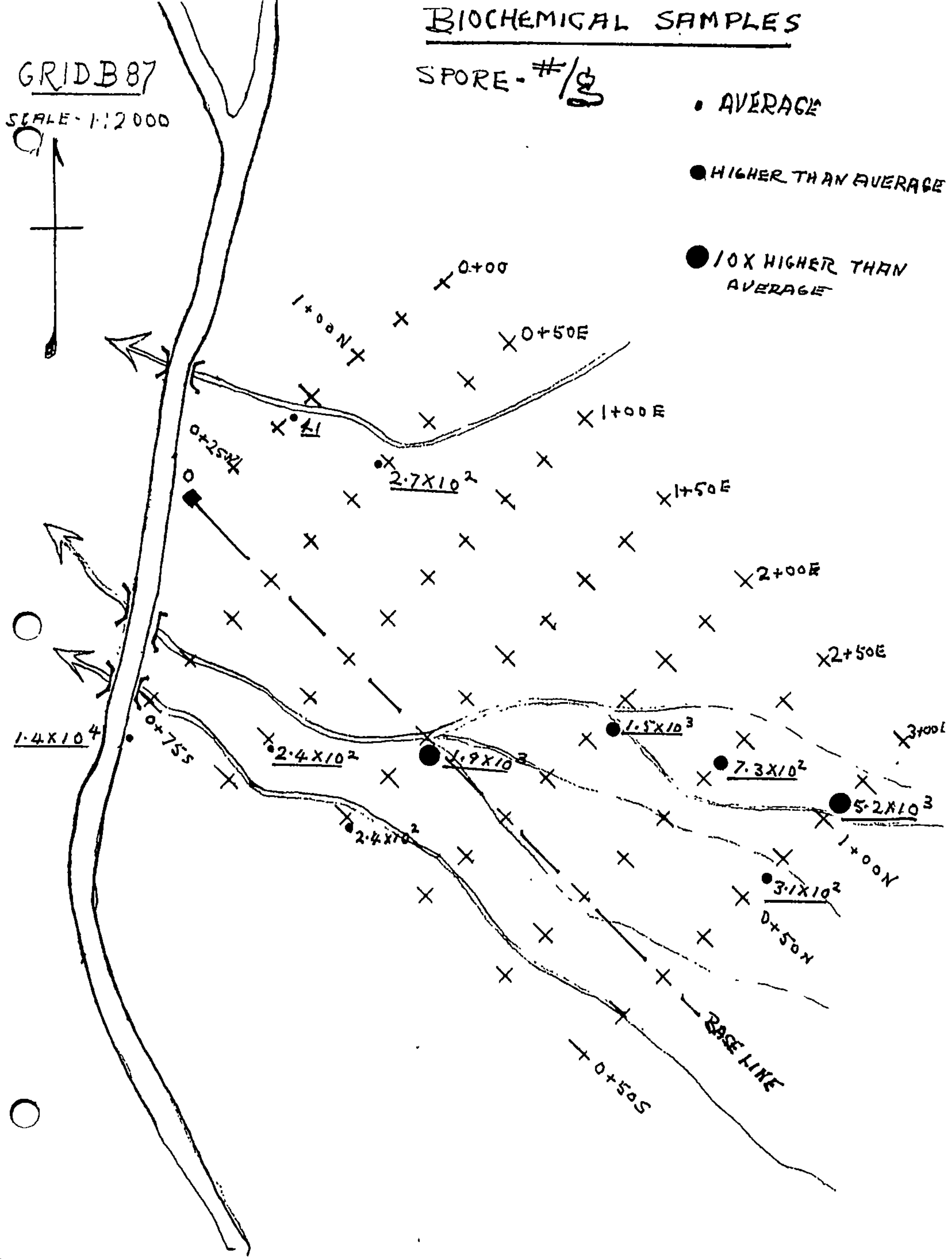
PRESENTS

A NEW EXPLORATION METHOD FOR

GOLD / SILVER / PLATINUM

New consise answers are available, resulting from the combination of Magnetometer, VLF-EM, Background Radiometric and Biological surveys.

The purpose of the geophysics exploration program is to deliniate possible zones or structures for an area in which gold and silver values have been located. The geophysics investigation methods employed are VLF-EM, total field magnetics, and radiometrics surveys. A new experimental biological method, which tests for the presence of spores of the microorganism Bacillus cereus, is presently in use to assist in the interpretation of the data. These spores are concentrated in areas of zero charged metals, such as gold, silver, arsenic, and, to a small extent, copper. The combined methods seem to present an effective new and powerful aid in the process of identifying probable mineralized zones which contain the aforementioned metals. The biological sampling is particularly useful in qualifying those ambiguous VLF-EM and mag anomalies that plague the exploration process. On a regional basis the surveys are designed to rapidly determine the presence of potential economic hardrock mineral deposits. Orthoganal VLF-EM stations are generally used to determine the possible strike of conductors; Seattle, Washington for north/south conductors and Annapolis, Maryland for east/west trending conductors. After an initial evaluation to determine the local geological structure, detailing is then conducted using the appropriate VLF-EM transmitter, eg: Seattle, Washington (18.6 KHz.) for north/south conductors. The use of a gamma ray scintillometer in general reconnaissance surveys for epithermal and hydrothermal gold deposits is based on the presence of radioactive potassium being a common occurrence in this type of deposit. Several attempts at employing this technique have met with varying degrees of success, re The Background Radiometric Survey of the Harrington Gold Property 1984, and Current Activities Forum 1984-8 Multiparameter Logging Techniques Applied to Gold Exploration (see appendix __1__). The low level background radiation method combined with the total field magnetic signature of an area has proven very successful in deliniating ultra basic intrusions (source of platinum metals). The radiometric signature of the sulphide deposit of interest must be determined for each case at the time of the survey. eg. some sulphide deposits containing low values of quartz/carbonates,or k-spars produce radiation lows, an inverse response to that seen from epithermal gold deposits.


BIOCHEMICAL SAMPLES
SPORE - #/g
GRID B 87
SCALE - 1:12000
• AVERAGE
● HIGHER THAN AVERAGE
● 10X HIGHER THAN AVERAGE
0+00
1+00N
0+50E
1+00E
0+25W
0
1+50E
2+00E
2+50E
3+00E
0+75S
1.4X10^4
2.7X10^2
2.4X10^2
1.9X10^3
1.5X10^3
7.3X10^2
5.2X10^3
2.4X10^2
3.1X10^2
1+00N
0+50N
BASE LINE
0+50S

Appendix 3

PAPER 84-8

CURRENT ACTIVITIES FORUM 1984
PROGRAM WITH ABSTRACTS

1984

SOME THOUGHTS ON GOLD DEPOSITS HOSTED BY IRON FORMATION WITH PARTICULAR REFERENCE TO THE LUPIN MINE, CONTWOYTO LAKE AREA, NWT AND TO GOLD MINERALIZATION IN THE GERALDTON CAMP, ONTARIO.*

J.A. Kerswill[1] and C.D. Anglin[2]

In some gold deposits in iron formation, notably the Lupin Mine, much of the mineralization is stratiform. Such gold is relatively uniformly distributed in thin but laterally extensive beds of cherty sulphide-rich iron formation, consistent with syngenetic concentration of gold from hydrothermal fluid during deposition or early diagenesis of the chemical sediments.

In other deposits, for example portions of the Hard Rock and MacLeod-Cockshutt Mines in the Geraldton area, gold is restricted to veins and/or sulphide-rich areas immediately adjacent to veins. These gold ores are structurally-controlled and evidence to date indicates an entirely epigenetic origin.

A number of deposits in iron formation possess both styles of mineralization suggesting a more complex genesis. At the Lupin Mine, significant gold occurs in arsenic-rich ore adjacent to gold-bearing quartz veins.

Similarities and differences in other features may be genetically significant. In both areas iron formation occurs as thin beds within thick sequences of turbidites in an Archean greenstone belt. Iron formation at Lupin is typically sulphide- or silicate-rich. Much of the iron formation at Geraldton is oxide-rich although there are local carbonate- and sulphide-rich zones. Sulphide-rich iron formation at Lupin may be a primary chemical sediment, but the carbonate- and sulphide-rich zones at Geralton are epigenetic replacements of oxide facies. At Lupin gold is apparently restricted to iron formation, but at the Hard Rock and MacLeod-Cockshutt mines gold also occurs in shear zones in greywacke and albite porphyry. Arsenopyrite, associated with pyrite, is ubiquitous in gold ore in iron formation at Geraldton. At Lupin there is an intimate association between gold and arsenic in ore adjacent to quartz veins but much of the well-bedded pyrrhotite-rich stratiform ore is arsenic-poor.

The above evidence suggests that gold deposits in iron formation can be formed with or without syngenetic concentration of gold during chemical sedimentation. The presence of sulphides may be the most critical exploration guide for both types. Complex structures related to regional shear zones are favourable for the Geraldton type. Syngenetic pyrrhotite-rich iron formation may be the most critical indicator for Lupin type, and significant oxide facies may be a negative characteristic. Arsenides, although they seem to be directly linked to epigenetic gold concentration processes, are a positive feature for both types.

[1] Economic Geology Division
[2] Memorial University

MULTIPARAMETER LOGGING TECHNIQUES APPLIED TO GOLD EXPLORATION

T.J. Urbancic[1] and C.J. Mwenifumbo[2]

Gold is usually found in such small quantities that direct detection with geophysical techniques has not been possible. Instead such techniques have been used to delineate lithological units favourable for gold mineralization. Multiparameter techniques might be used to further subdivide these units into zones with the maximum likelihood for high gold content.

Most gold deposits are associated with mass rock alteration zones (adularization, sericitization, pyritization and silicification). These zones are often characterized by enrichment in potassium, and in sulphides. Theoretically it should be possible to use gamma ray spectrometry to outline areas enriched in potassium (as well as the radioactive elements U and Th); to use IP/resistivity methods to detect the presence of sulphides, and temperature gradient measurements to locate structural features such as faults and lithological boundaries.

Several boreholes intersecting gold mineralization in the Larder Lake area of Ontario were logged with gamma ray spectral, IP/resistivity and temperature methods. Two types of ore bodies are found in this area: carbonate ore bodies consisting of irregular lenses of quartz stockworks lying within highly altered and brecciated carbonatized ultramafic rocks, and flow type ore bodies, consisting of pyritized and silicified zones lying within altered volcanic tuffs and flows. This study was conducted in the flow type ore bodies, where the gold is associated with pyrite mineralization.

Preliminary logging data indicate that, in the Larder Lake area, zones with low resistivity values, high potassium content and an increased IP effect are associated with increased pyrite content (greater than 5%) and gold mineralization. If there is a corresponding increase in uranium and thorium content, the lithological unit lacks any substantial amount of auriferous mineralization. In general there is a negative correlation between the temperature gradient and resistivity except in the volcanic units with brown carbonate alteration which show a positive correlation of low resistivity to low temperature gradient. In most of the boreholes examined, the gold mineralization occurs within these pyritized brown carbonate alteration zones.

[1] University of Toronto, Toronto, Ontario
[2] Resource Geophysics and Geochemistry Division

* Titles appear in the language in which the [illegible]

Equipment Description

Proton Magnetometer -

Geometrics Unimag, model G-836, provides 10 gamma resolution over a range from 20,000 to 100,000 gammas and is powered from an internal 12 volt DC lead acid gell battery. see appendix __2__ .

VLF-EM Receiver -

Saber VLF receiver, model 27, provides measurements of the relative field strength, dip angle and quadrature components of the VLF communications stations. Relative field strength to 200 % accuracy of +-2 %, dip angle +60 to -60 degrees with an accuracy of 1 degree. The out-of-phase component (quadrature) of the magnetic field, perpendicular in direction to the resultant field, as a percent of the normal field strength. This is the minimum reading of the Field Strength meter obtained when measuring the dip angle, Accuracy +-2%. The unit is powered from 8 internal 1.5 volt AA batteries.

Gamma Ray Scintillometer -

Exploranium portable gamma ray scintillometer model GRS-101A, provides accurate and reliable determinations of gamma ray intensities from the radioactive elements: potassium (K40), uranium (as Bi214), and thorium (as Tl208). Analysis of gamma ray intensity aids in determining rock types or units, geologic contacts/faults and radioactive mineral concentrations. The unit counts all energies above 0.05 Mev. A sodium iodide crystal 1.5 Dia. x 1.5 inches converts gamma rays into faint flashes of light whose brilliance is proportional to the energy level of the gamma radiation measured. The accepted signals are averaged in a ratemeter circuit as counts per second and are continously displayed on an analogue meter in ranges of 100F, 100, 300, 1000, 3000, and 10,000 C.P.S. Power is supplied by 2 nickel-cadmium rechargeable 1.5 volt D cell batteries.(see appendix __2__)

Appendix 5 GRID A87

GRID NAME: Block 75/grid # 2 Seatle
LINE NO.- E 0+00

STATION	DIP	PHASE	FS	RAD		MAG
275	14	2	125	30	18	5618
250	12	2	125	35	-18	5582
225	10	2	120	34	2	5602
200	12	2	115	29	8	5608
175	12	2	110	30	-9	5591
150	11	2	95	30	0	5600
125	7	1	115	35	-27	5573
100	12	3	100	29	16	5616
75	10	3	95	32	-21	5579
50	8	3	100	32	26	5626
25	6	3	110	46	-22	5578
0	5	5	125	42	5	5605

MAG	AV3MAG	AV5MAG	STATI	DIP	SUM DIP	FR FILT
5618			275	14		
5582	5596.0		250	12	26	
5602	5598.5	5599.7	225	10	22	-4 2+12N
5608	5602.3	5600.0	200	12	22	2
5591	5597.5	5595.5	175	12	24	1
5600	5591.0	5595.2	150	11	23	-6
5573	5590.5	5589.4	125	7	18	-4 1+12N
5616	5596.0	5599.4	100	12	19	4
5579	5600.0	5595.1	75	10	22	-1
5626	5602.3	5603.9	50	8	18	-8
5578	5596.8	5595.3	25	6	14	-7
5605	5597.0	5600.2	0	5	11	-9

STATION	DIP	PHASE	FS	RAD		MAG
279					-18	5582
275	14	2	125	30	18	5618
267	14	2	125	31	-3	5597
250	12	2	125	35	-18	5582
225	10	2	120	34	2	5602
200	12	2	115	29	8	5608
175	12	2	110	30	-9	5591
150	11	2	95	30	0	5600
137	8			34	-9	5591
125	7	1	115	35	-27	5573
100	12	3	100	29	16	5616
87					20	5620
75	10	3	95	32	-21	5579
50	8	3	100	32	26	5626
25	6	3	110	46	-22	5578
0	5	5	125	42	5	5605

GRID NAME: Block 75/grid 2(A) Seatle
LINE NO.- E 0+50

STATION	DIP	PHASE	FS	RAD		MAG
275	13	2	125	29	-3	5597
250	15	2	118	32	-38	5562
225	15	2	98	29	-65	5535
200	13	2	95	50	-60	5540
175	9	1	85	37	2	5602
150	9	1	80	32	-10	5590
125	5	1	82	34	-46	5554
100	6	2	78	32	-34	5566
75	6	2	82	32	-6	5594
50	-1	1	80	32	15	5615
25	-5	2	85	31	5	5605
0	-7	2	90	38	2	5602

MAG	AV3MAG	AV5MAG
5597		
5562	5564.0	
5535	5543.0	5554.3
5540	5554.3	5558.6
5602	5583.5	5575.7
5590	5584.0	5577.8
5554	5566.0	5572.4
5566	5570.0	5576.5
5594	5592.3	5589.7
5615	5607.3	5602.6
5605	5606.8	5604.8
5602	5602.3	5603.3

STATI	DIP	SUM DIP	FR FILT
275	13		
250	15	28	
225	15	30	0
200	13	28	-8
175	9	22	-10
150	9	18	-8
125	5	14	-7
100	6	11	-2
75	6	12	-6
50	-1	5	-18
25	-5	-6	-17
0	-7	-12	-1

STATION	DIP	PHASE	FS	RAD		MAG
275	13	2	125	29	-3	5597
267	12	2	120	30	-25	5575
250	15	2	118	32	-38	5562
225	15	2	98	29	-65	5535
220	15	2	98	29	-65	5535
212				38	-39	5561
200	13	2	95	50	-60	5540
175	9	1	85	37	2	5602
150	9	1	80	32	-10	5590
125	5	1	82	34	-46	5554
120	8	1	82	48	-73	5527
112	8	1	80	38	30	5570

100	6	2	78	32	-34	5566
75	6	2	82	32	-6	5594
62	1	1	80	48	-27	5573
50	-1	1	80	32	15	5615
25	-5	2	85	31	5	5605
0	-7	2	90	38	2	5602

GRID NAME: Block 75/grid 2(A) Seatle
LINE NO.- E 0+50

STATION	DIP	PHASE	FS	RAD		MAG
275	13	2	125	29	-3	5597
267	12	2	120	30	-25	5575
250	15	2	118	32	-38	5562
225	15	2	98	29	-65	5535
220	15	2	98	29	-65	5535
212				38	-39	5561
200	13	2	95	50	-60	5540 ←
175	9	1	85	37	2	5602
150	9	1	80	32	-10	5590
125	5	1	82	34	-46	5554
120	8	1	82	48	-73	5527
112	8	1	80	38	30	5570
100	6	2	78	32	-34	5566
75	6	2	82	32	-6	5594
62	1	1	80	48	-27	5573 ←
50	-1	1	80	32	15	5615
25	-5	2	85	31	5	5605
0	-7	2	90	38	2	5602

GRID NAME: Block 75/grid # 2 (A) Seatle (VLF)
LINE NO.- E 1+00

STATION	DIP	PHASE	FS	RAD		MAG
200	8	2	85	32	-29	5571
175	7	2	85	38	-19	5581
150	6	2	90	32	-24	5576
125	5	1	85	30	-22	5578
100	4	2	85	28	-12	5588
75	2	1	92	29	30	5630
50	2	2	92	33	30	5630
25	-1	1	95	26	6	5606
0	-2	2	110	30	-1	5599
-25	1	4	130	35	0	5600
-50	0	5	125	24	-6	5594

MAG	AV3MAG	AV5MAG	STATI	DIP	SUM DIP	FR FI
5571			200	8		
5581	5577.3		175	7	15	
5576	5577.8	5578.1	150	6	13	-
5578	5580.0	5585.1	125	5	11	-
5588	5596.0	5597.4	100	4	9	-
5630	5619.5	5614.0	75	2	6	-
5630	5624.0	5617.9	50	2	4	-
5606	5610.3	5611.2	25	-1	1	-
5599	5601.0	5603.2	0	-2	-3	-
5600	5598.3	5599.2	-25	1	-1	
5594	5597.0	5597.5	-50	0	1	

STATION	DIP	PHASE	FS	RAD		MAG
206				33	-17	5583
200	8	2	85	32	-29	5571
187				40	-11	5589
175	7	2	85	38	-19	5581
150	6	2	90	32	-24	5576
125	5	1	85	30	-22	5578
100	4	2	85	28	-12	5588
75	2	1	92	29	30	5630
50	2	2	92	33	30	5630
37	0	1	92	32	25	5625
25	-1	1	95	26	6	5606
0	-2	2	110	30	-1	5599
-25	1	4	130	35	0	5600
-50	0	5	125	24	-6	5594

GRID NAME: Block 75/grid # 2 (A) Seatle (VLF)
LINE NO.- E 1+00

STATION	DIP	PHASE	FS	RAD		MAG
200	8	2	85	32	-29	5571
175	7	2	85	38	-19	5581
150	6	2	90	32	-24	5576
125	5	1	85	30	-22	5578
100	4	2	85	28	-12	5588
75	2	1	92	29	30	5630
50	2	2	92	33	30	5630
25	-1	1	95	26	6	5606
0	-2	2	110	30	-1	5599
-25	1	4	130	35	0	5600
-50	0	5	125	24	-6	5594

GRID NAME: Block 75/grid # 2 (A) Seatle (VLF)
LINE NO.- E 1+50

STATION	DIP	PHASE	FS	RAD		MAG
150	11	2	125	32	-23	5577
125	10	2	130	30	-32	5568
100	5	2	125	22	-28	5572
75	4	2	140	24	-9	5591
50	6	2	140	28	11	5611
25	5	2	135	26	2	5602
0	6	4	150	28	13	5613
-25	12	6	140	28	-14	5586
-50	7	3	135	35	20	5620

MAG	AV3MAG	AV5MAG
5577		
5568	5571.3	
5572	5575.8	5579.4
5591	5591.3	5590.0
5611	5603.8	5601.5
5602	5607.0	5603.3
5613	5603.5	5605.9
5586	5601.3	5601.2
5620	5606.5	5606.5

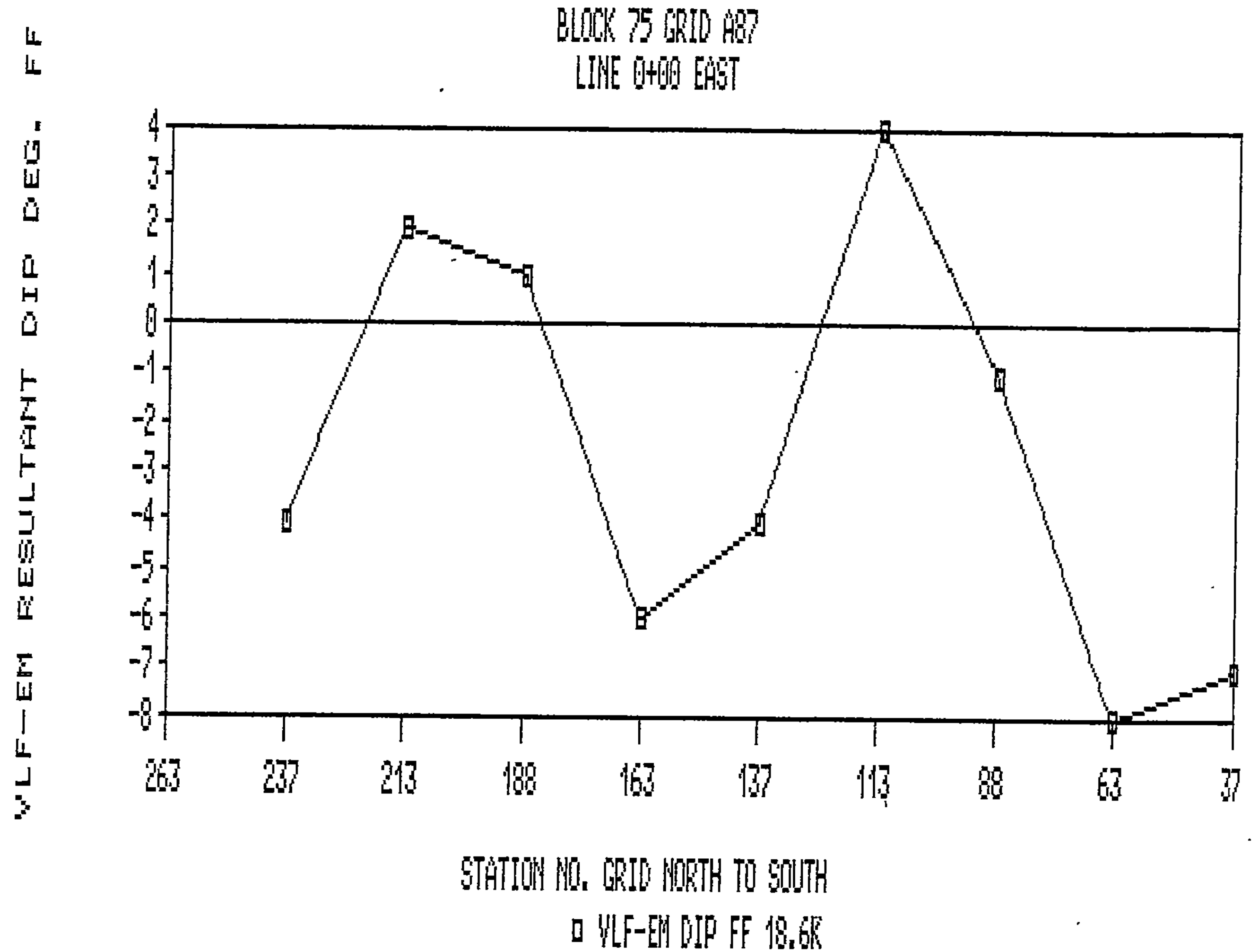
STATI	DIP	SUM DIP	FR FILT
150	11		
125	10	21	
100	5	15	-12
75	4	9	-5
50	6	10	2
25	5	11	1
0	6	11	7
-25	12	18	8
-50	7	19	-11

GRID NAME: Block 75/grid # 2 (A) Seatle (VLF)

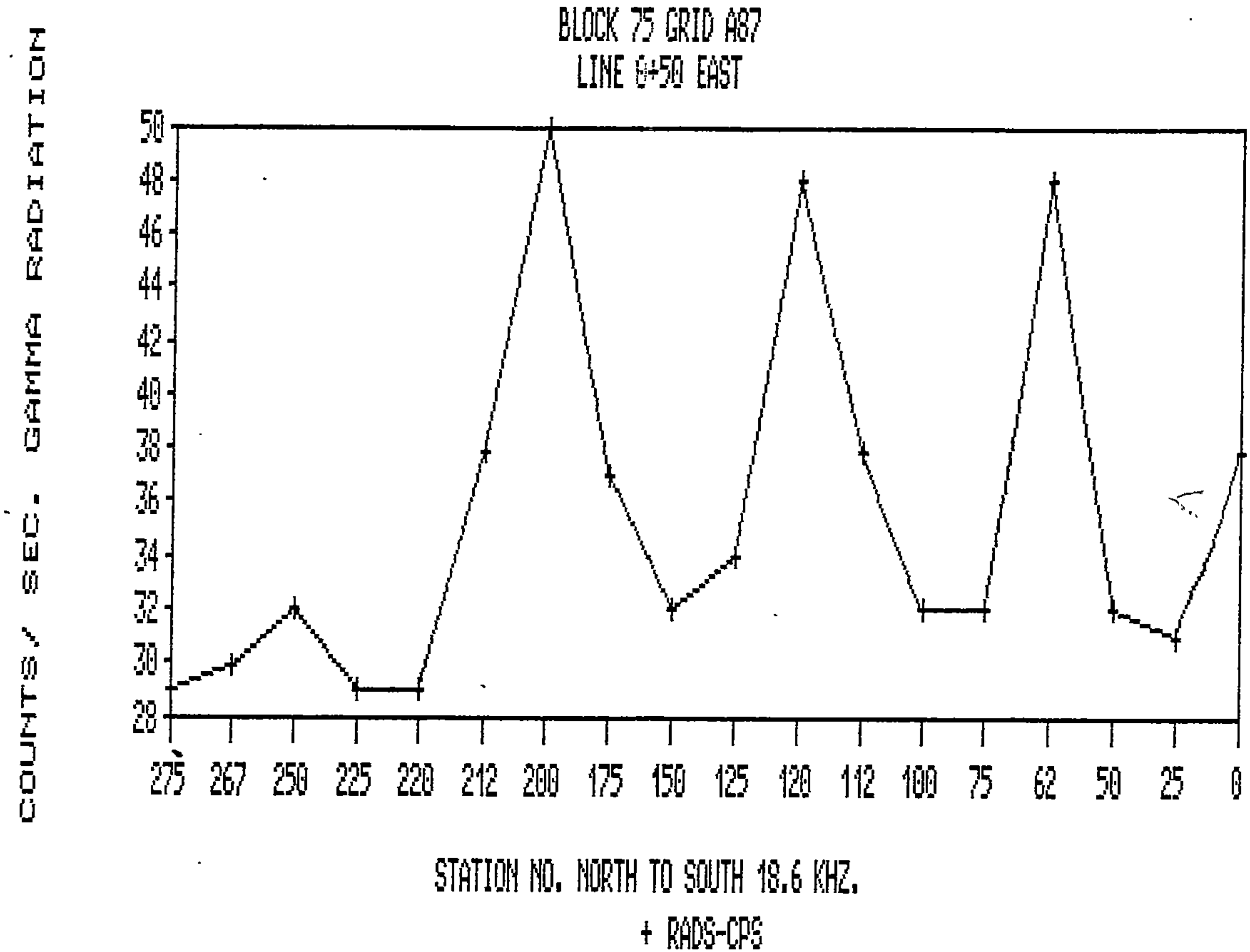
LINE NO.- E 2+00

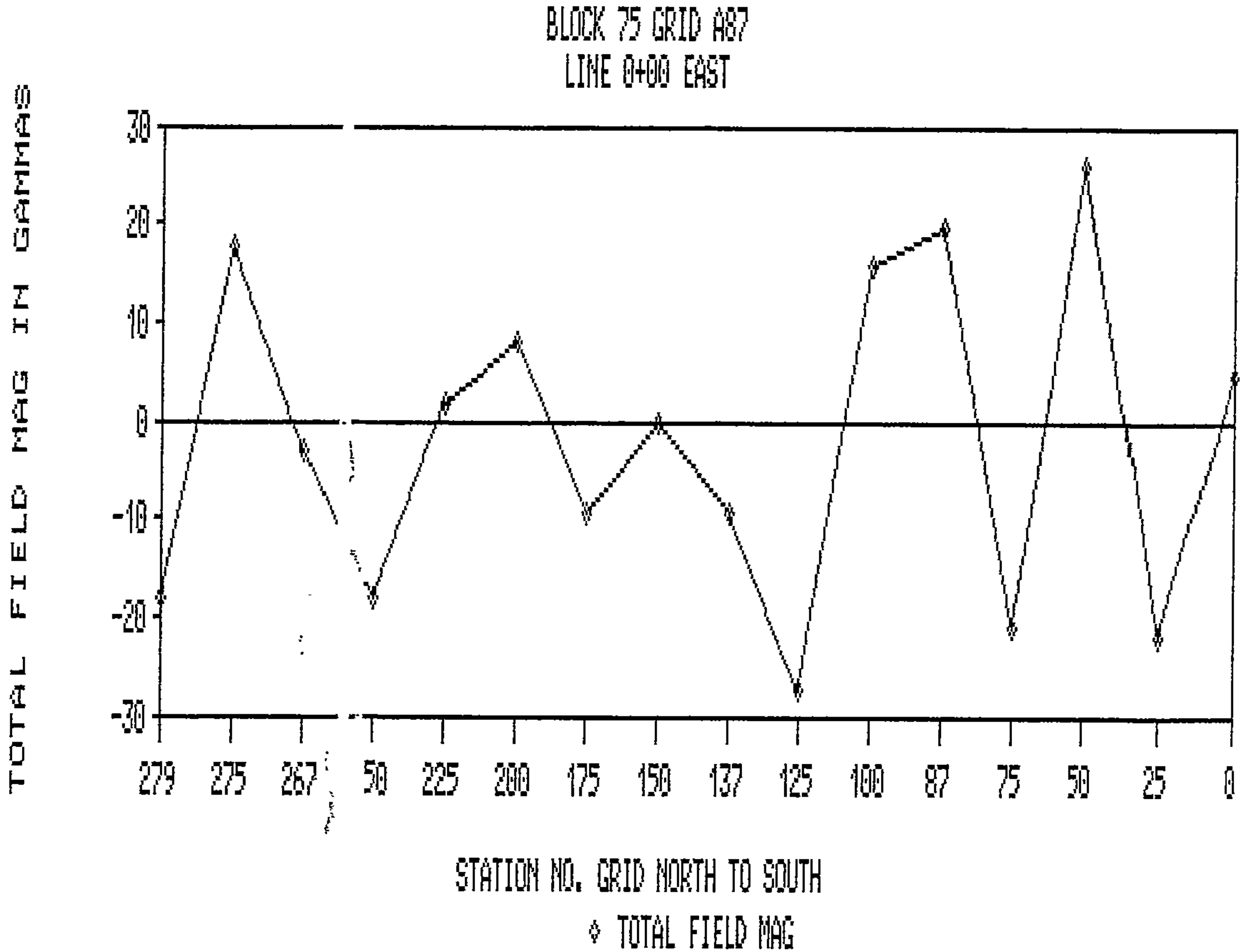
STATION	DIP	PHASE	FS	RAD		MAG
175	16	5	125	26	-15	5585
150	13	3	125	24	-21	5579
125	12	3	120	28	-17	5583
100	7	1	125	29	17	5617
75	4	1	130	34	-11	5589
50	3	1	135	48	-33	5567 ←
25	4	2	142	27	-14	5586
0	8	2	140	30	-21	5579
-25	10	3	130	24	-16	5584
-50	11	4	135	29	-23	5577
-75	12	5	125	29	-14	5586
-100	9	3	110	34	-21	5579
-125	6	4	110	24	7	5607
-150	3	3	100	28	12	5612
-175	-3	2	95	32	32	5632

MAG	AV3MAG	AV5MAG	STATI	DIP	SUM DIP	FR FILT
5585			175	16		
5579	5581.5		150	13	29	
5583	5590.5	5589.8	125	12	25	-10
5617	5601.5	5595.8	100	7	19	-14
5589	5590.5	5589.3	75	4	11	-12
5567	5577.3	5581.4	50	3	7	-4
5586	5579.5	5580.9	25	4	7	5
5579	5582.0	5580.0	0	8	12	11 ←
5584	5581.0	5582.0	-25	10	18	9
5577	5581.0	5580.6	-50	11	21	5
5586	5582.0	5584.7	-75	12	23	0
5579	5587.8	5589.1	-100	9	21	-8
5607	5601.3	5602.8	-125	6	15	-12
5612	5615.8	5610.5	-150	3	9	-15
5632	5619.0	5615.9	-175	-3	0	-12

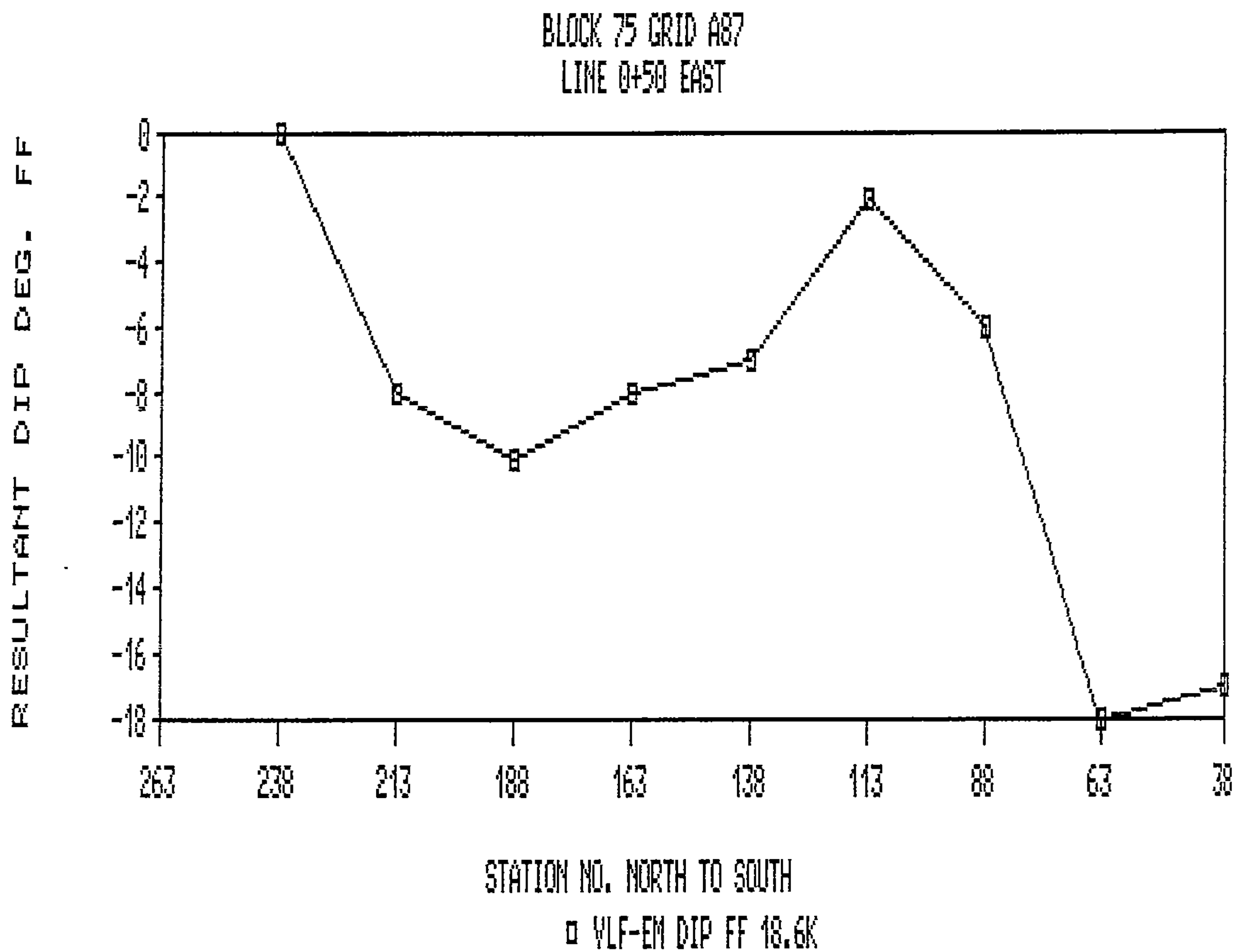


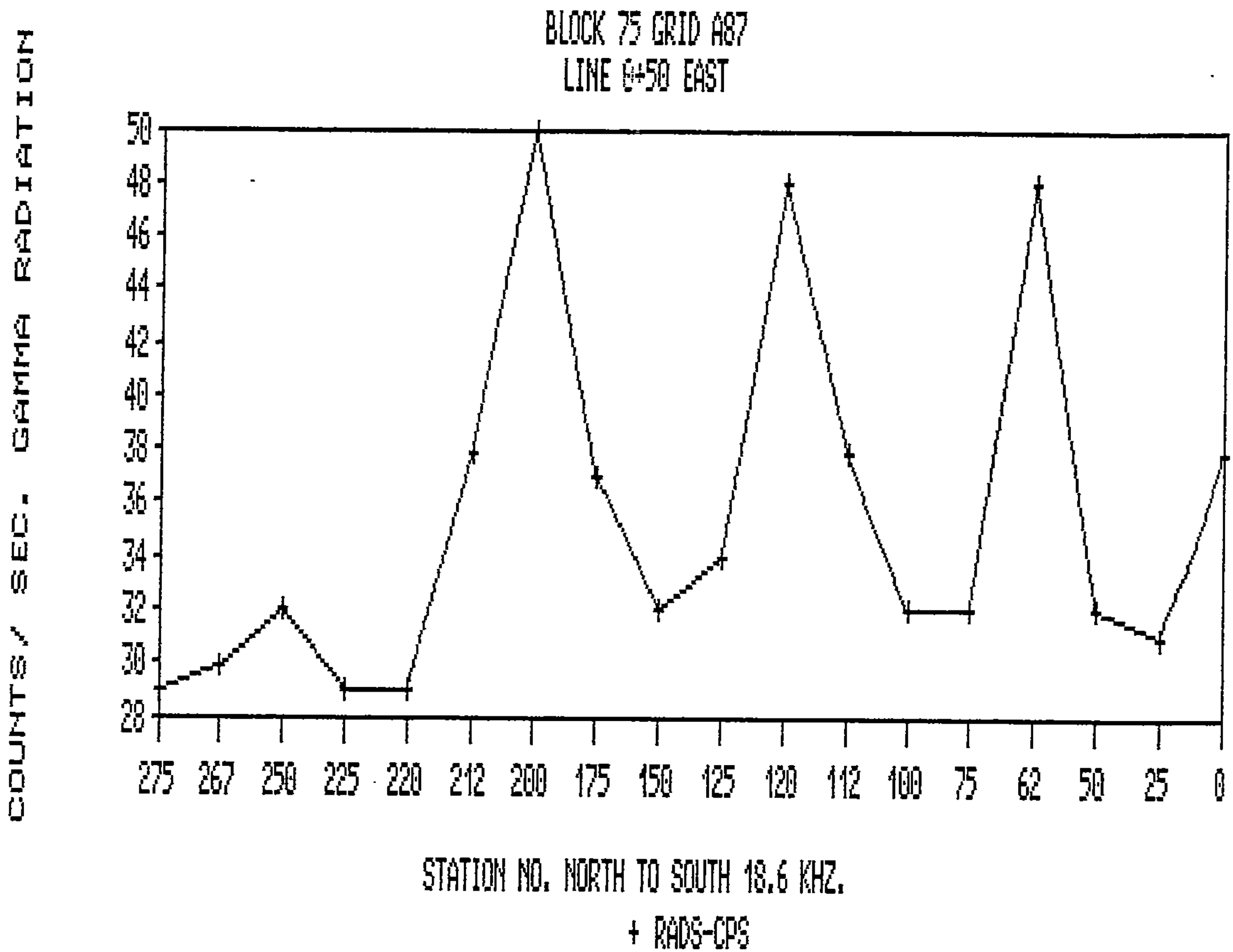
BLOCK 75 GRID A87
LINE 0+00 EAST
VLF-EM RESULTANT DIP DEG. FF
4
3
2
1
0
-1
-2
-3
-4
-5
-6
-7
-8
263
237
213
188
163
137
113
88
63
37
STATION NO. GRID NORTH TO SOUTH
VLF-EM DIP FF 18.6K

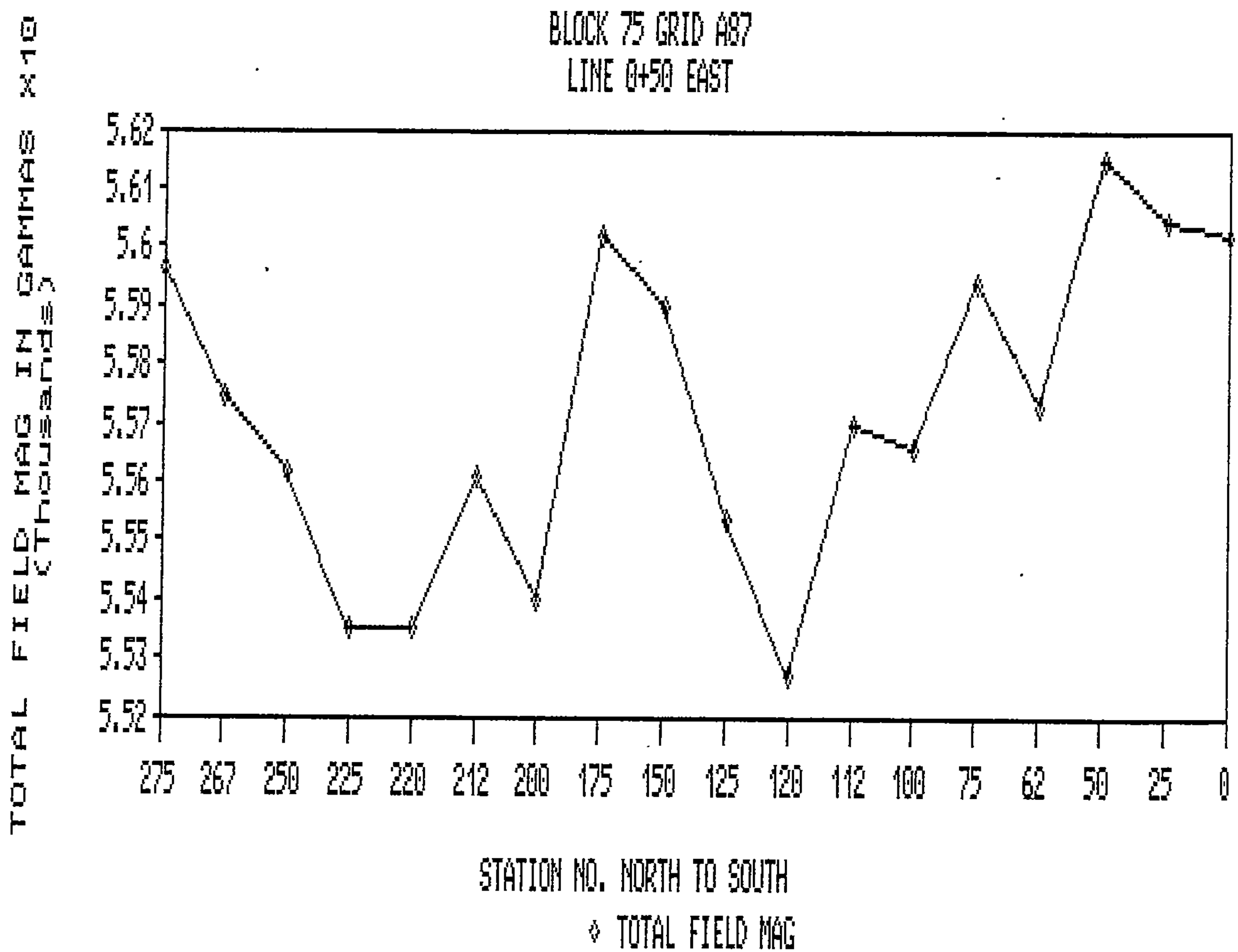

BLOCK 75 GRID A87
LINE 0+50 EAST
COUNTS / SEC. GAMMA RADIATION
50
48
46
44
42
40
38
36
34
32
30
28
275 267 250 225 220 212 200 175 150 125 120 112 100 75 62 50 25 0
STATION NO. NORTH TO SOUTH 18.6 KHZ.
+ RADS-CPS

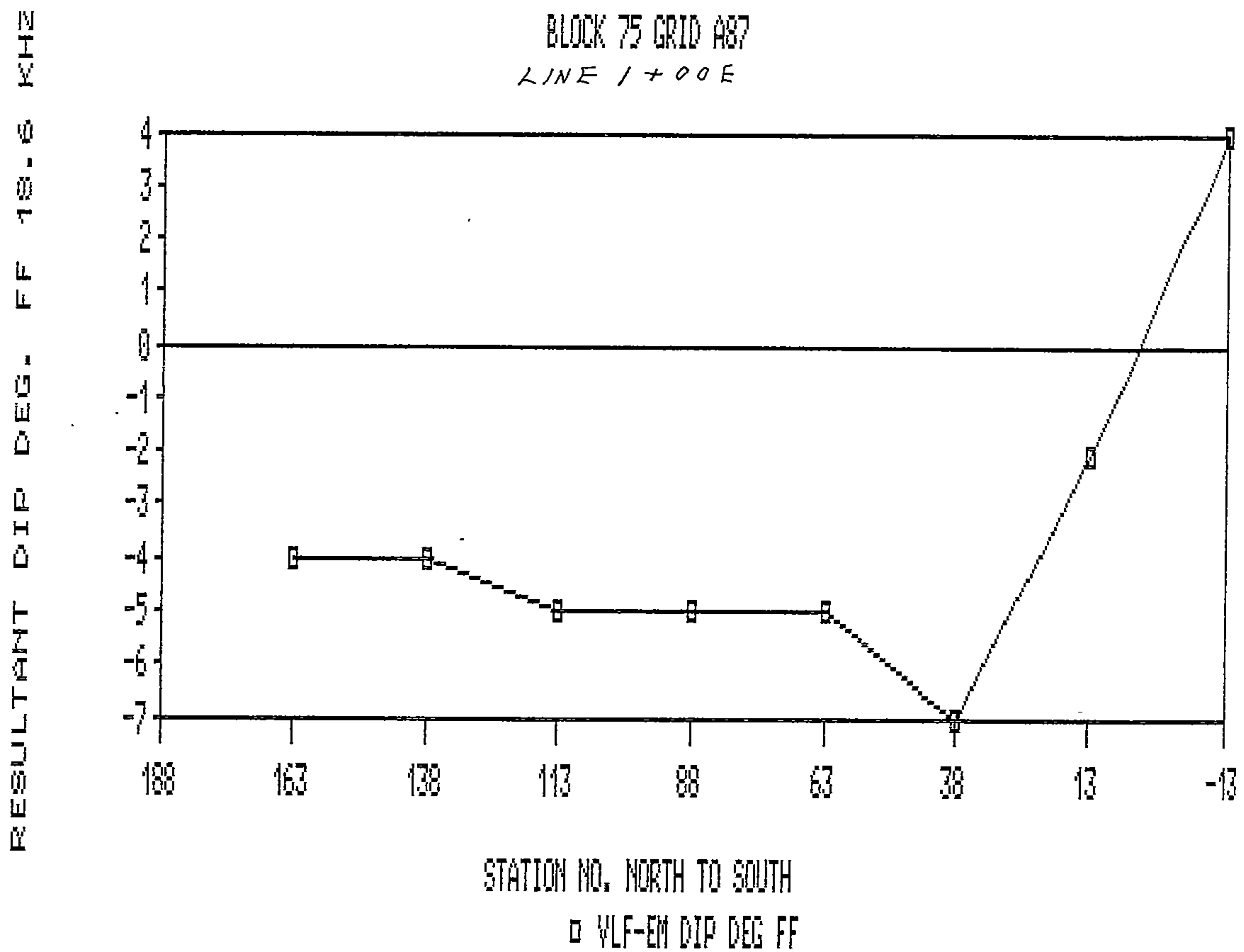


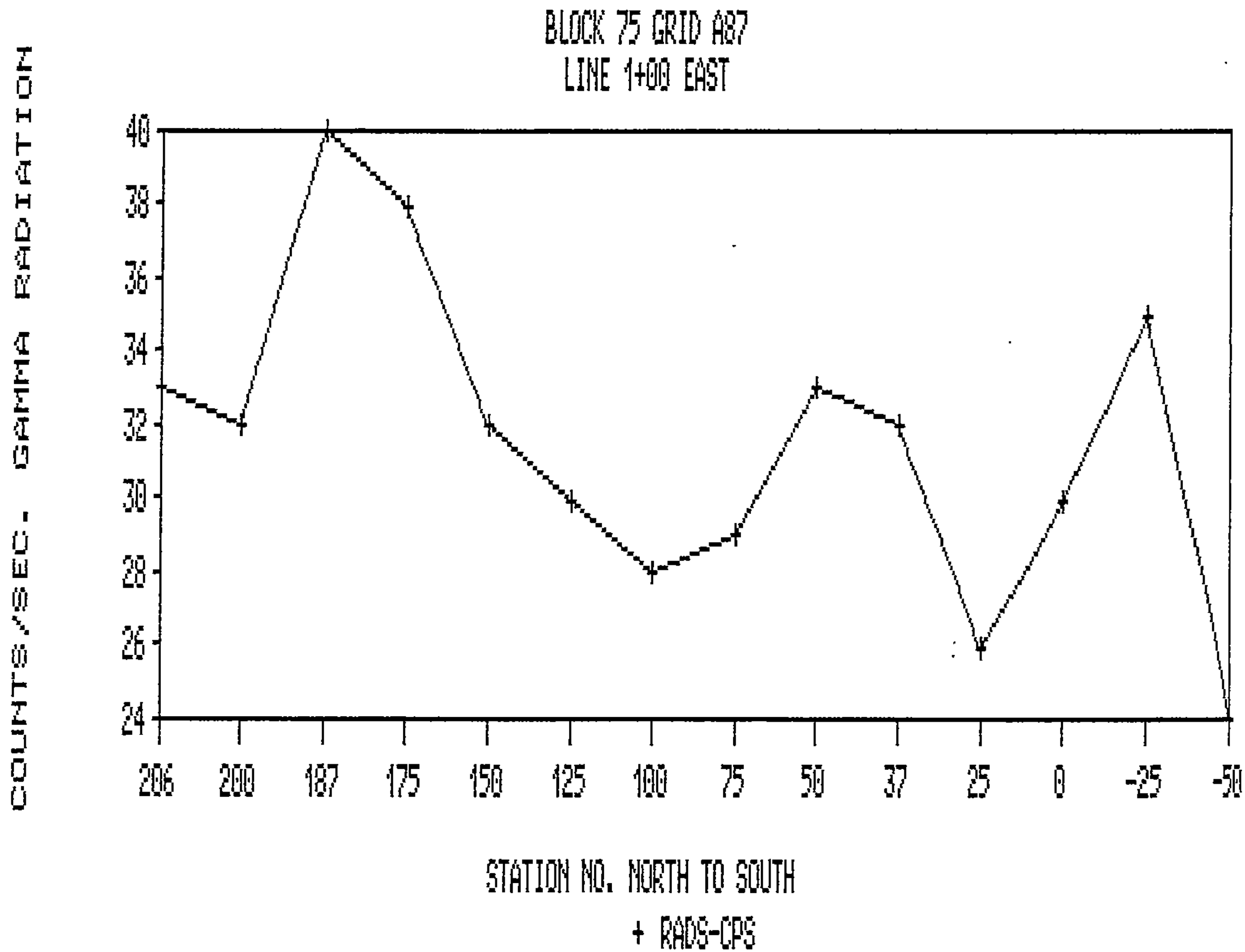
BLOCK 75 GRID A87
LINE 0+00 EAST
TOTAL FIELD MAG IN GAMMAS
30
20
10
0
-10
-20
-30
279
275
267
50
225
200
175
150
137
125
100
87
75
50
25
0
STATION NO. GRID NORTH TO SOUTH
◊ TOTAL FIELD MAG

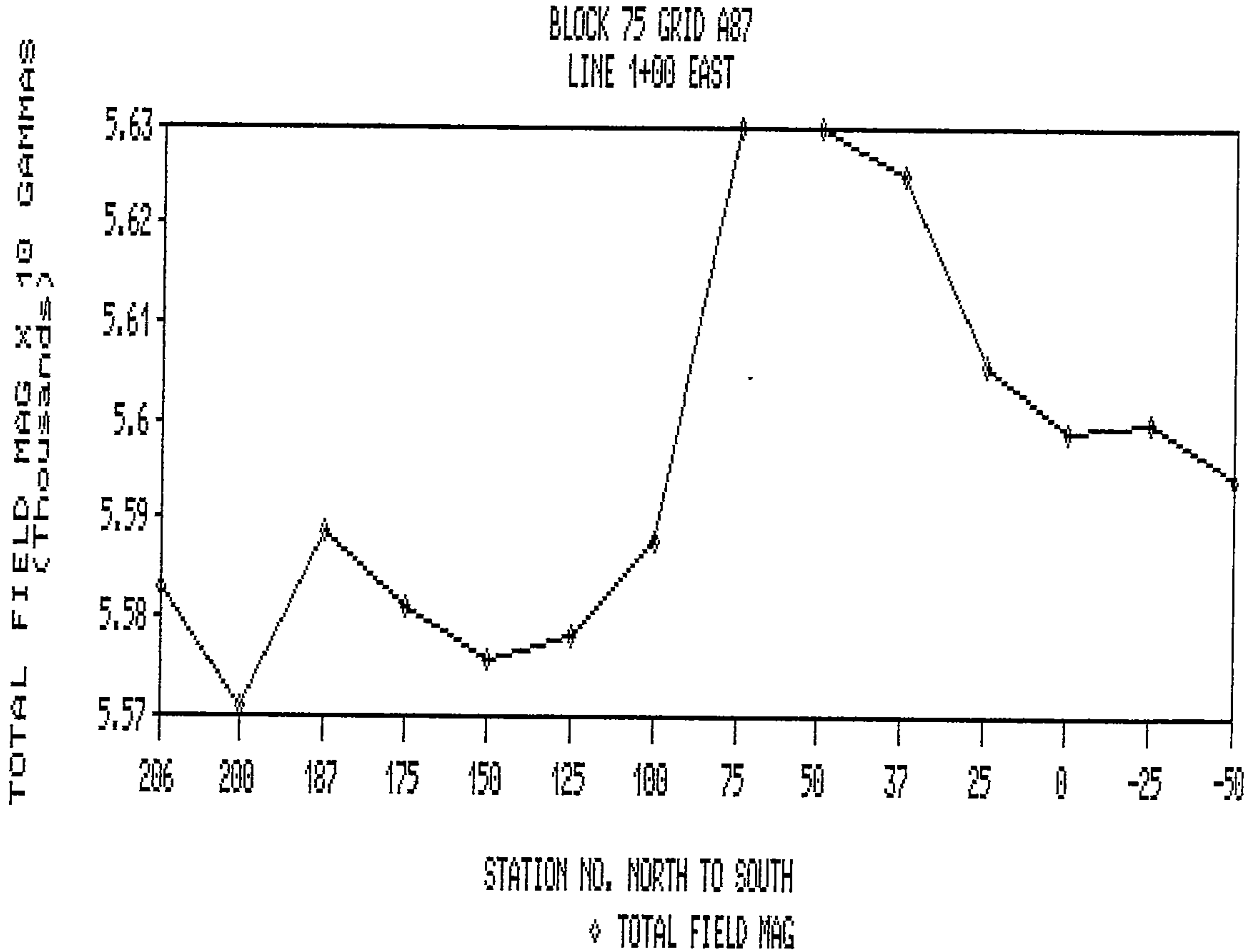

BLOCK 75 GRID A87
LINE 0+50 EAST
RESULTANT DIP DEG. FF
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
263
238
213
188
163
138
113
88
63
38
STATION NO. NORTH TO SOUTH
VLF-EM DIP FF 18.6K

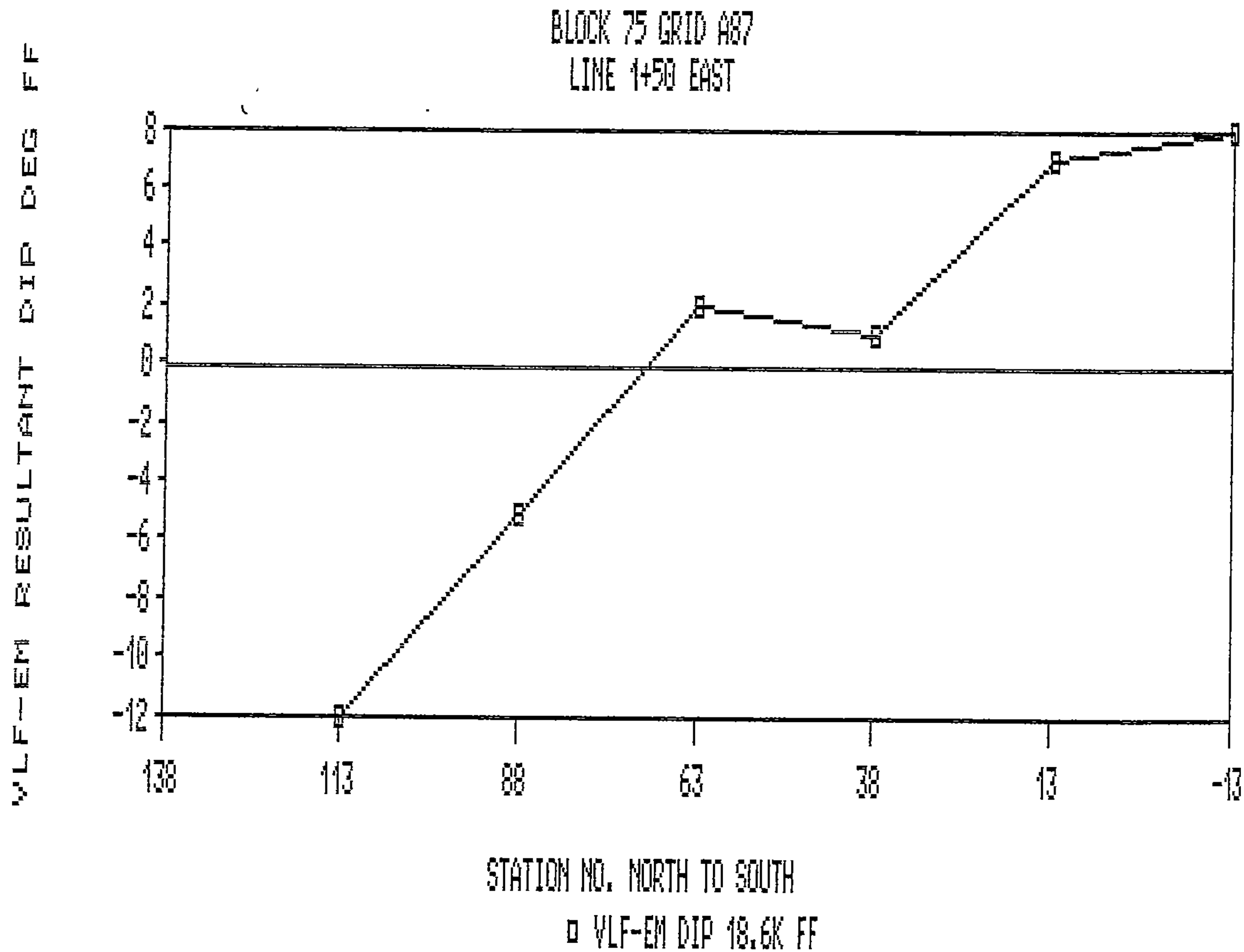

BLOCK 75 GRID A87
LINE 0+50 EAST
COUNTS/ SEC. GAMMA RADIATION
50
48
46
44
42
40
38
36
34
32
30
28
275 267 250 225 220 212 200 175 150 125 120 112 100 75 62 50 25 0
STATION NO. NORTH TO SOUTH 18.6 KHZ.
+ RADS-CPS

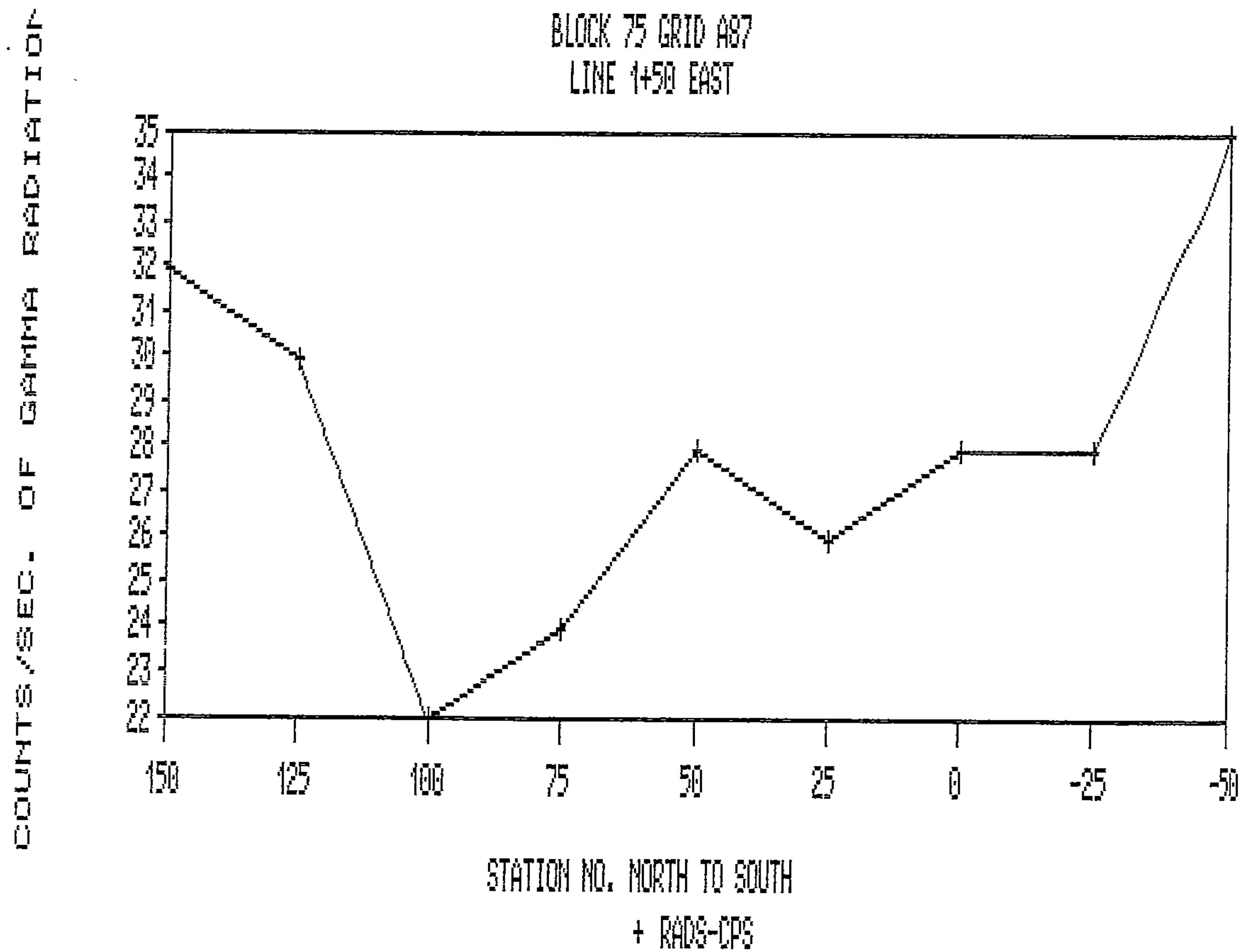

BLOCK 75 GRID A87
LINE 0+50 EAST
TOTAL FIELD MAG IN GAMMAS x10
(Thousands)
5.62
5.61
5.6
5.59
5.58
5.57
5.56
5.55
5.54
5.53
5.52
275
267
250
225
220
212
200
175
150
125
120
112
100
75
62
50
25
0
STATION NO. NORTH TO SOUTH
◊ TOTAL FIELD MAG


BLOCK 75 GRID A87
LINE 1+00E
RESULTANT DIP DEG. FF 18.6 KHZ
4
3
2
1
0
-1
-2
-3
-4
-5
-6
-7
188
163
138
113
88
63
38
13
-13
STATION NO. NORTH TO SOUTH
VLF-EM DIP DEG FF

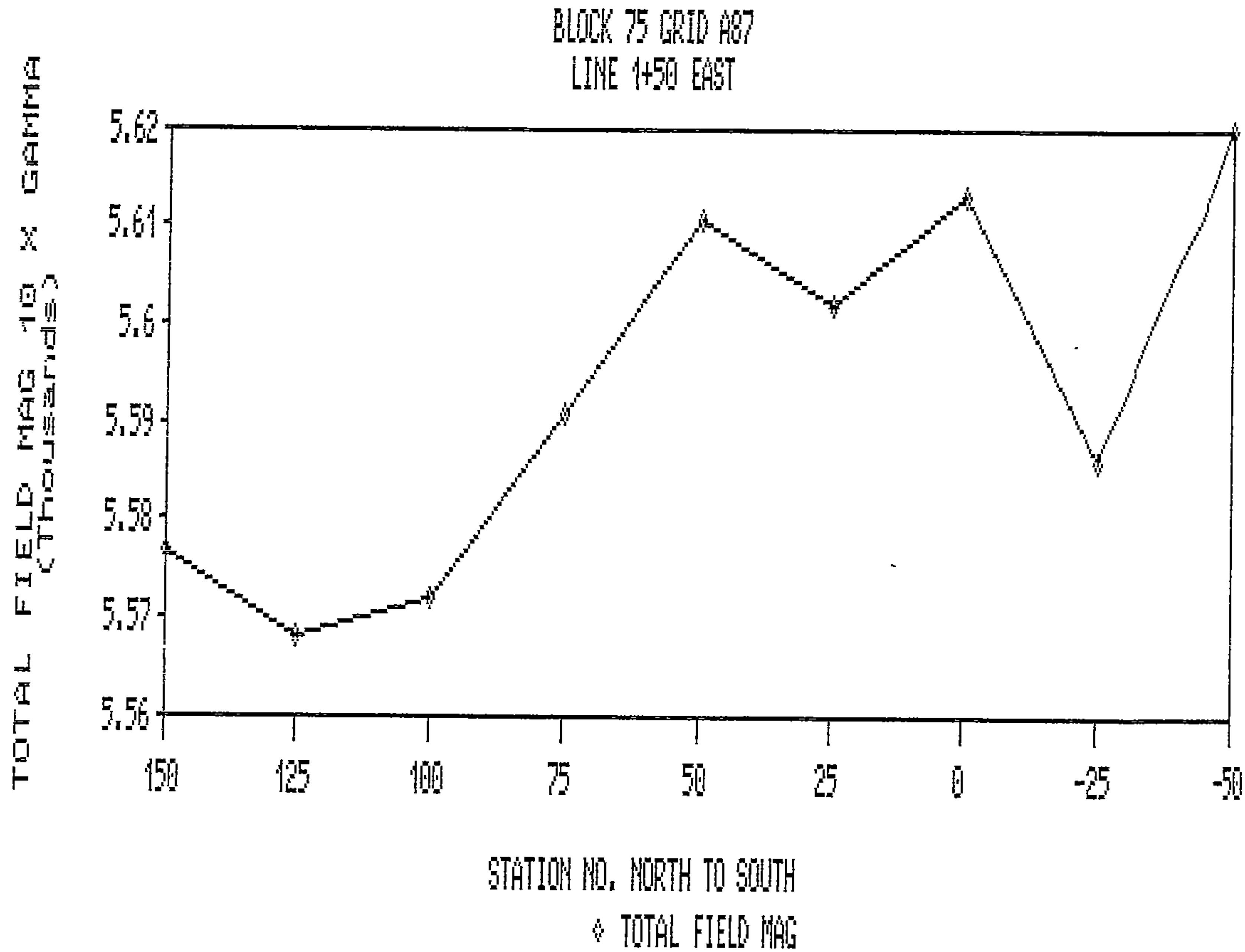

BLOCK 75 GRID A87
LINE 1+00 EAST
COUNTS/SEC. GAMMA RADIATION
40
38
36
34
32
30
28
26
24
206
200
187
175
150
125
100
75
50
37
25
0
-25
-50
STATION NO. NORTH TO SOUTH
+ RADS-CPS


BLOCK 75 GRID A87
LINE 1+00 EAST
TOTAL FIELD MAG x 10 GAMMAS (Thousands)
5.63
5.62
5.61
5.6
5.59
5.58
5.57
206
200
187
175
150
125
100
75
50
37
25
0
-25
-50
STATION NO. NORTH TO SOUTH
◇ TOTAL FIELD MAG

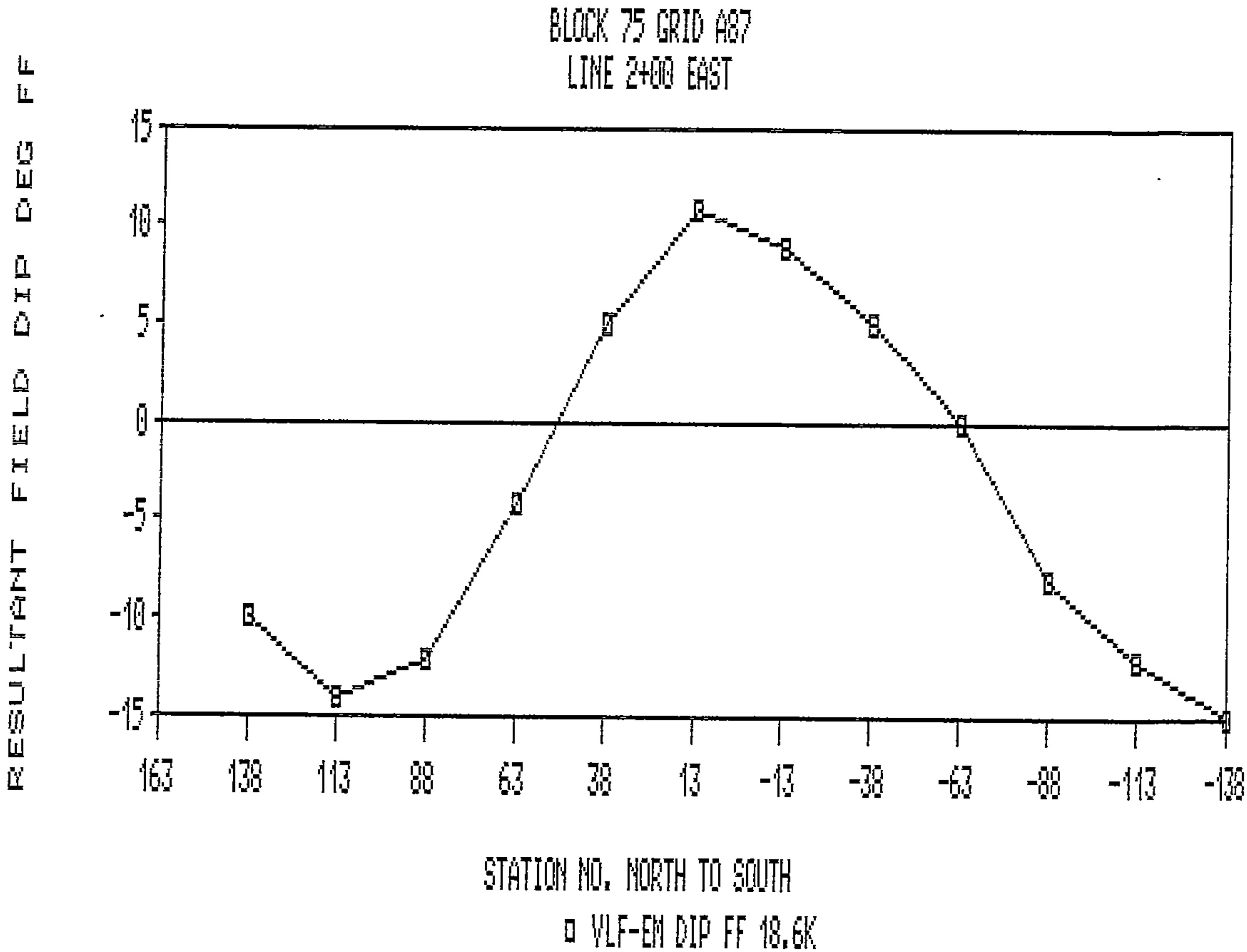

BLOCK 75 GRID A87
LINE 1+50 EAST
VLF-EM RESULTANT DIP DEG FF
8
6
4
2
0
-2
-4
-6
-8
-10
-12
138
113
88
63
38
13
-13
STATION NO. NORTH TO SOUTH
VLF-EM DIP 18.6K FF



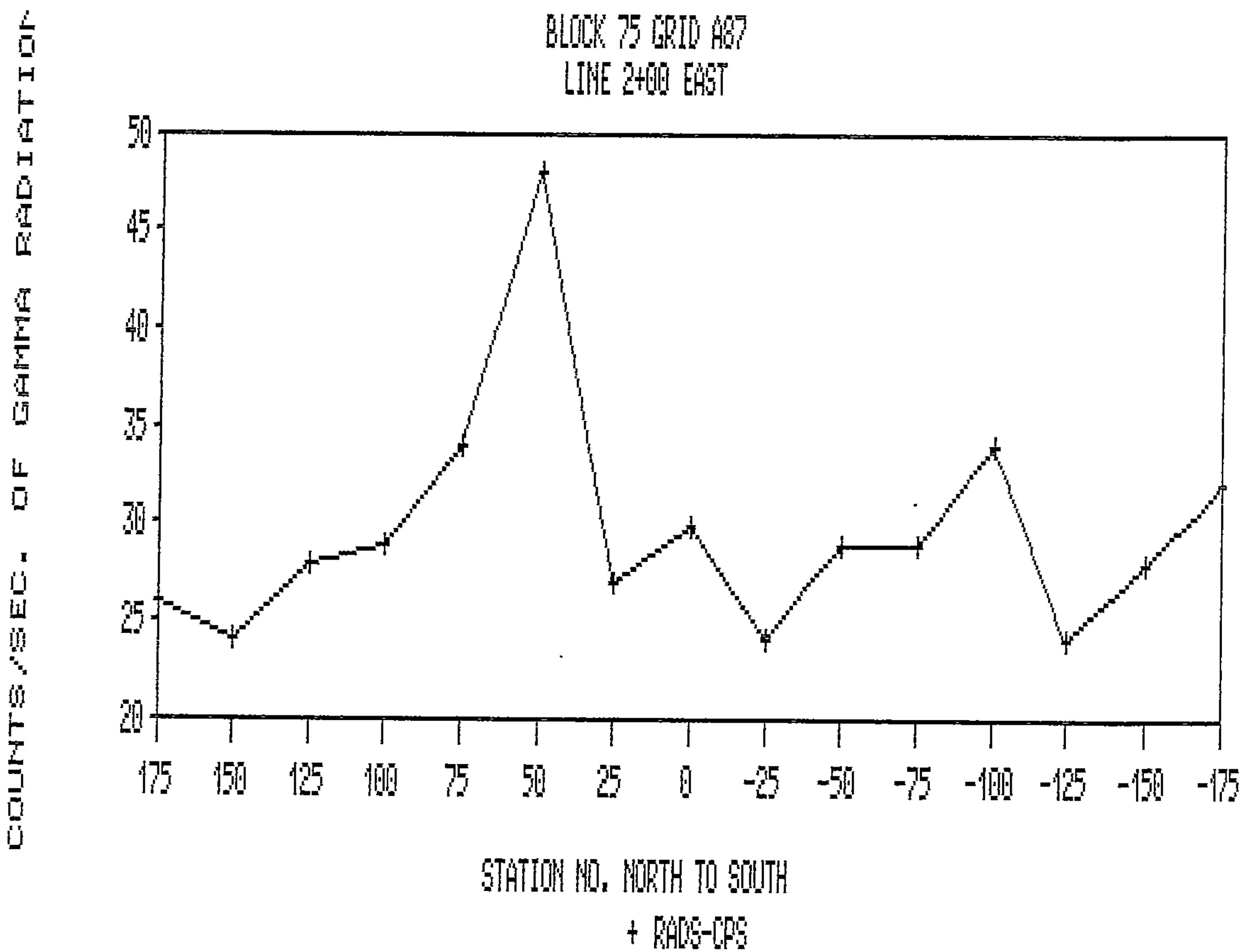
BLOCK 75 GRID A87
LINE 1+50 EAST
COUNTS/SEC. OF GAMMA RADIATION
35
34
33
32
31
30
29
28
27
26
25
24
23
22
150
125
100
75
50
25
0
-25
-50
STATION NO. NORTH TO SOUTH
+ RADS-CPS



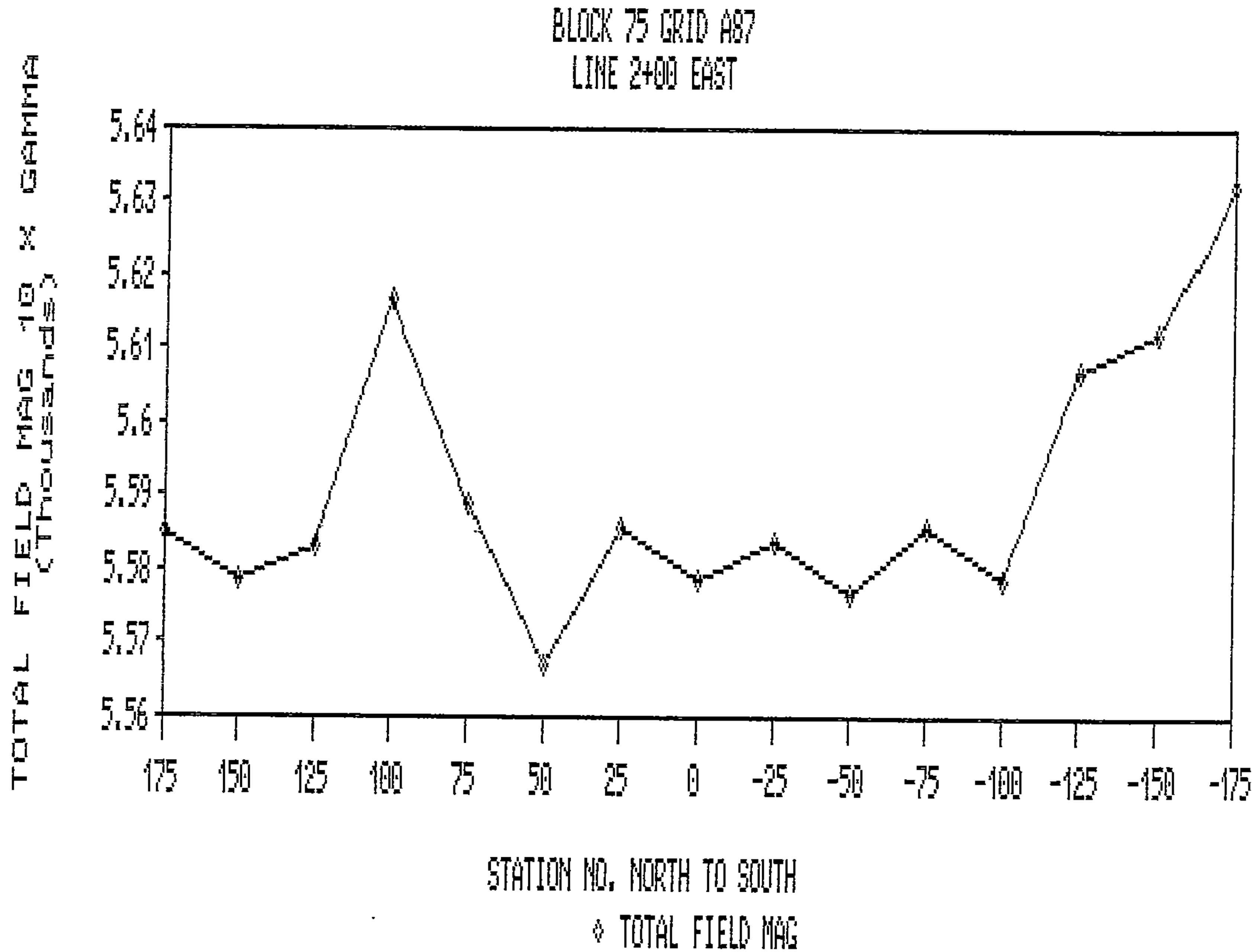
BLOCK 75 GRID A87
LINE 1+50 EAST
TOTAL FIELD MAG 10 X GAMMA
(Thousands)
5.62
5.61
5.6
5.59
5.58
5.57
5.56
150
125
100
75
50
25
0
-25
-50
STATION NO. NORTH TO SOUTH
◊ TOTAL FIELD MAG



BLOCK 75 GRID A87
LINE 2+00 EAST
RESULTANT FIELD DIP DEG FF
15
10
5
0
-5
-10
-15
163
138
113
88
63
38
13
-13
-38
-63
-88
-113
-138
STATION NO. NORTH TO SOUTH
VLF-EM DIP FF 18.6K



BLOCK 75 GRID A87
LINE 2+00 EAST
COUNTS/SEC. OF GAMMA RADIATION
50
45
40
35
30
25
20
175
150
125
100
75
50
25
0
-25
-50
-75
-100
-125
-150
-175
STATION NO. NORTH TO SOUTH
+ RADS-CPS


BLOCK 75 GRID A87
LINE 2+00 EAST
TOTAL FIELD MAG 10 X GAMMA
(Thousands)
5.64
5.63
5.62
5.61
5.6
5.59
5.58
5.57
5.56
175
150
125
100
75
50
25
0
-25
-50
-75
-100
-125
-150
-175
STATION NO. NORTH TO SOUTH
◊ TOTAL FIELD MAG

Appendix 6

GRID NAME: block 75 GRID #1 (BE7)
LINE NO.- E 0+50

STATION	DIP	PHASE	FS	RAD		MAG
100	4	3	120	25	0	5600
87	4	3	85	35	-4	5596
75	2	2	100	40	-10	5590
72					7	5607
70				25	27	5627
62	1	2	112	30	47	5647
50	-2	2	100	28	27	5627
25	-7	2	110	23	18	5618
13	-7	2	100	28	18	5618
0	-7	2	98	24	50	5650
-25	1	2	110	18	46	5646
-32	1	2	98	24	32	5632
-50	0	2	90	28	12	5612
-62	-3	2	90	30	17	5617
-75	-4	2	95	28	26	5626

MAG	AV3MAG	AV5MAG	STATI	DIP	SUM DIP	FR FILT
5600			100	4		
5596	5595.5		75	4	8	
5590	5595.8	5599.3	50	2	6	-6
5607	5607.8	5610.5	25	0	2	-6
5627	5627.0	5623.3	0	0	0	-1
5647	5637.0	5632.1	-25	1	1	-1
5627	5629.8	5628.3	-50	-2	-1	-10
5618	5620.3	5625.9	-75	-7	-9	-13
5618	5626.0	5628.1	-100	-7	-14	-5
5650	5641.0	5637.8	-125	-7	-14	8
5646	5643.5	5637.8	-150	1	-6	16 ← 0+125
5632	5630.5	5631.1	-175	1	2	7
5612	5618.3	5621.8	-200	0	1	-5
5617	5618.0	5617.6	-225	-3	-3	-8
5626	5617.3	5615.0	-250	-4	-7	-1

GRID NAME: Block 75/grid # 1 (B87)
LINE NO.- E 1+00

STATION	DIP	PHASE	FS	RAD		MAG
125					19	5619
100	4	3	120	25	29	5629
75	0	2	120	25	-1	5599
50	-1	2	120	24	33	5633
25	-3	2	120	30	72	5672
0	-2	2	138	30	62	5662
-25	-1	2	130	26	38	5638
-50	-2	2	120	28	22	5622
-75	-2	2	120	28	12	5612
-100	-2	2	125	18	15	5615

MAG	AV3MAG	AV5MAG	STATI	DIP	SUM DIP	FR FILT	
5619			125	0			
5629	5619.0		100	4	4		
5599	5615.0	5621.1	75	0	4	-5	
5633	5634.3	5636.5	50	-1	-1	-8	
5672	5659.8	5651.5	25	-3	-4	-4	
5662	5658.5	5652.3	0	-2	-5	1	
5638	5640.0	5640.4	-25	-1	-3	2	← D+125
5622	5623.5	5626.5	-50	-2	-3	-1	
5612	5615.3	5616.0	-75	-2	-4	-1	
5615	5610.5	5610.6	-100	-2	-4	~~2~~	

GRID NAME: Block 75/grid # 1 (B87)
LINE NO.- E 1+00

STATION	DIP	PHASE	FS	RAD	
125					19
112					37
100	4	3	120	25	29
75	0	2	120	25	-1
62	-1	2	120	28	23
50	-1	2	120	24	33
35				28	52
25	-3	2	120	30	72
15				25	73
0	-2	2	138	30	62
-25	-1	2	130	26	38
-45				28	11
-50	-2	2	120	28	22
-62	-2	2	120	28	19
-75	-2	2	120	28	12
-87					3
-100	-2	2	125	18	15

GRID NAME: Block 75/grid #1 (B87)
LINE NO.- E 1+50

STATION	DIP	PHASE	FS	RAD		MAG
100	3	2	98	32	25	5625
75	4	2	98	26	49	5649
62	1	2	95	29	50	5650
50	Ø	2	95	25	66	5666
25	-4	2	90	31	23	5623
12	-7	2	98	25	85	5685
Ø	-2	2	98	29	23	5623
-13	-1	2	98	23	37	5637
-25	-3	2	95	25	17	5617
-38	-2	1	110	25	12	5612
-5Ø	-1	2	118	25	-9	5591
-62					1	5601

GRID NAME: Block 75/grid #1
LINE NO.- E 1+5Ø

STATION	DIP	PHASE	FS	RAD		MAG
100	3	2	98	32	25	5625
75	4	2	98	26	49	5649
5Ø	Ø	2	95	25	66	5666
25	-4	2	90	31	23	5623
Ø	-2	2	98	29	23	5623
-25	-3	2	95	25	17	5617
-5Ø	-1	2	118	25	-9	5591

MAG	AV3MAG	AV5MAG
5625		
5649	5647.3	
5666	5651.Ø	5645.6
5623	5633.8	5633.6
5623	5621.5	5622.9
5617	5612.Ø	5611.9
5591	5599.8	5602.1

STATI	DIP	SUM DIP	FR FILT
100	3		
75	4	7	.
5Ø	Ø	4	-11
25	-4	-4	-1Ø
Ø	-2	-6	-1
-25	-3	-5	2 ← 0+12 S
-5Ø	-1	-4	4

GRID NAME: Block 75/grid # 1 (B87)
LINE NO.- E 2+00

STATION	DIP	PHASE	FS	RAD		MAG
100	3	2	98	21	30	5630
75	3	2	97	29	30	5630
50	-1	2	94	28	-5	5595
25	-9	4	92	24	28	5628
0	-1	2	97	30	25	5625
-25	2	2	100	34	29	5629
-50	1	2	115	30	10	5610

MAG	AV3MAG	AV5MAG	STATI	DIP	SUM DIP	FR FILT
5630			100	3		
5630	5621.3		75	3	6	
5595	5612.0	5615.1	50	-1	2	-16
5628	5619.0	5621.1	25	-9	-10	-12
5625	5626.8	5621.9	0	-1	-10	11
5629	5623.3	5621.4	-25	2	1	13
5610	5612.3	5612.3	-50	1	3	0

STATION	DIP	PHASE	FS	RAD		MAG
100	3	2	98	21	30	5630
75	3	2	97	29	30	5630
63	0	2	93	25	20	5620
50	-1	2	94	28	-5	5595
38	-8	3	92	25	28	5628
25	-9	4	92	24	28	5628
13	-5	2	110	27	26	5626
0	-1	2	97	30	25	5625
-25	2	2	100	34	29	5629
-50	1	2	115	30	10	5610

GRID NAME: Block 75/grid # 1 (BP7)
LINE NO.- E 2+50

STATION	DIP	PHASE	FS	RAD		MAG
100	4	2	93	25	59	5659
75	1	2	90	23	46	5646
50	-5	2	97	26	27	5627
25	-2	3	117	29	36	5636
0	-5	2	117	33	34	5634
-25	-2	2	118	29	18	5618
-50					9	5609

GRID NAME: Block 75/grid # 1
LINE NO.- E 2+50

STATION	DIP	PHASE	FS	RAD		MAG
100	4	2	93	25	59	5659
87	4	2	85	30	51	5651
75	1	2	90	23	46	5646
62	-1	2	90	25	10	5610
54	-1	2	95	38	49	5649
50	-5	2	97	26	27	5627
37	-6	3	100	26	10	5610
25	-2	3	117	29	36	5636
12	-3	2	117	29	21	5621
0	-5	2	117	33	34	5634
-12	-5	3	119	32	-4	5596
-25	-2	2	118	29	18	5618
-37					9	5609
-50					9	5609

MAG	AV3MAG	AV5MAG	STATI	DIP	SUM DIP	FR FILT
5659			100	4		
5646	5644.5		75	1	5	
5627	5634.0	5636.5	50	-5	-4	-12
5636	5633.3	5633.0	25	-2	-7	-3
5634	5630.5	5628.0	0	-5	-7	0
5618	5619.8	5619.4	-25	-2	-7	5
5609	5609.0	5610.6	-50	0	-2	7

5611

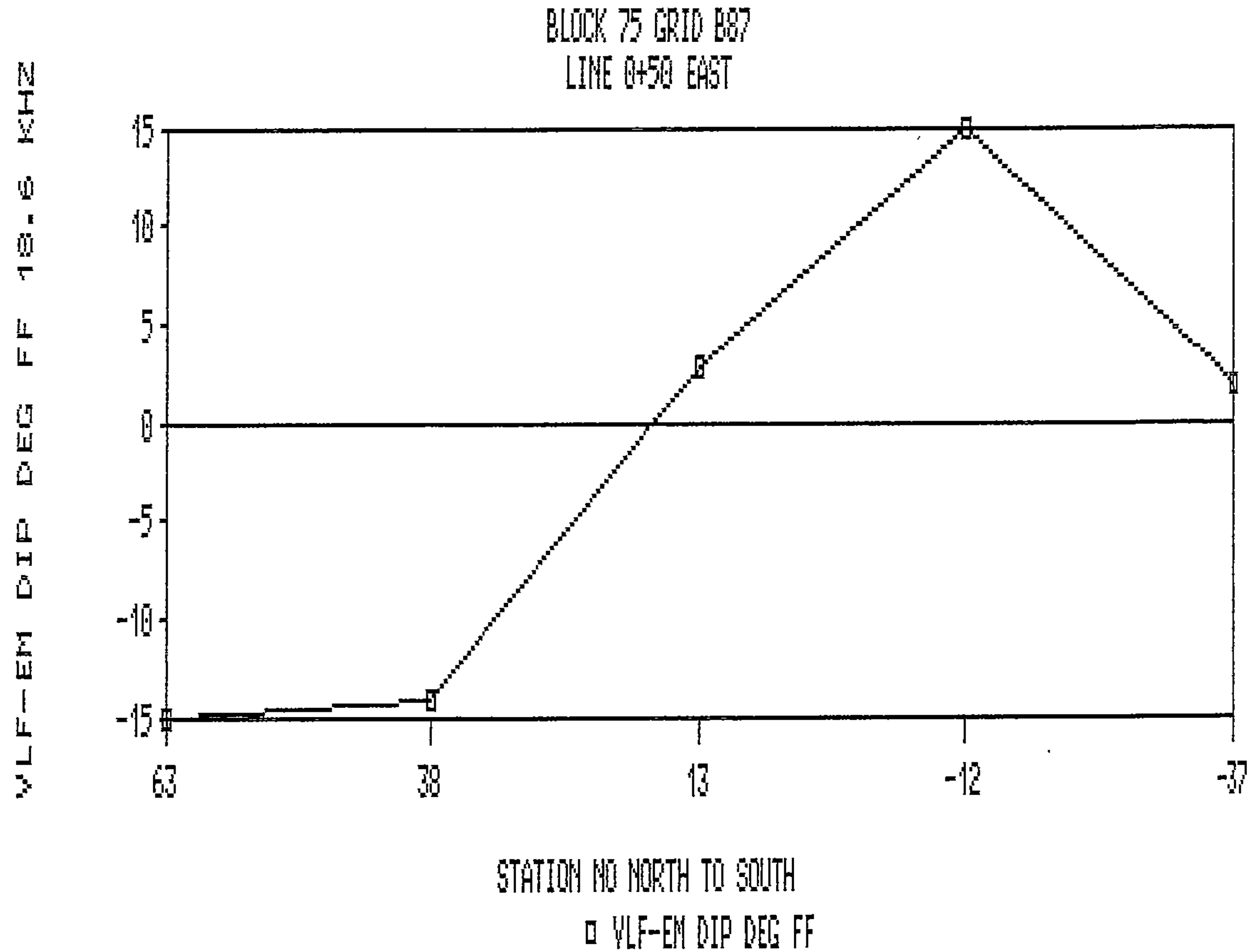
GRID NAME: Block 75/grid # 1 *(B87)*

LINE NO.- E 3+00

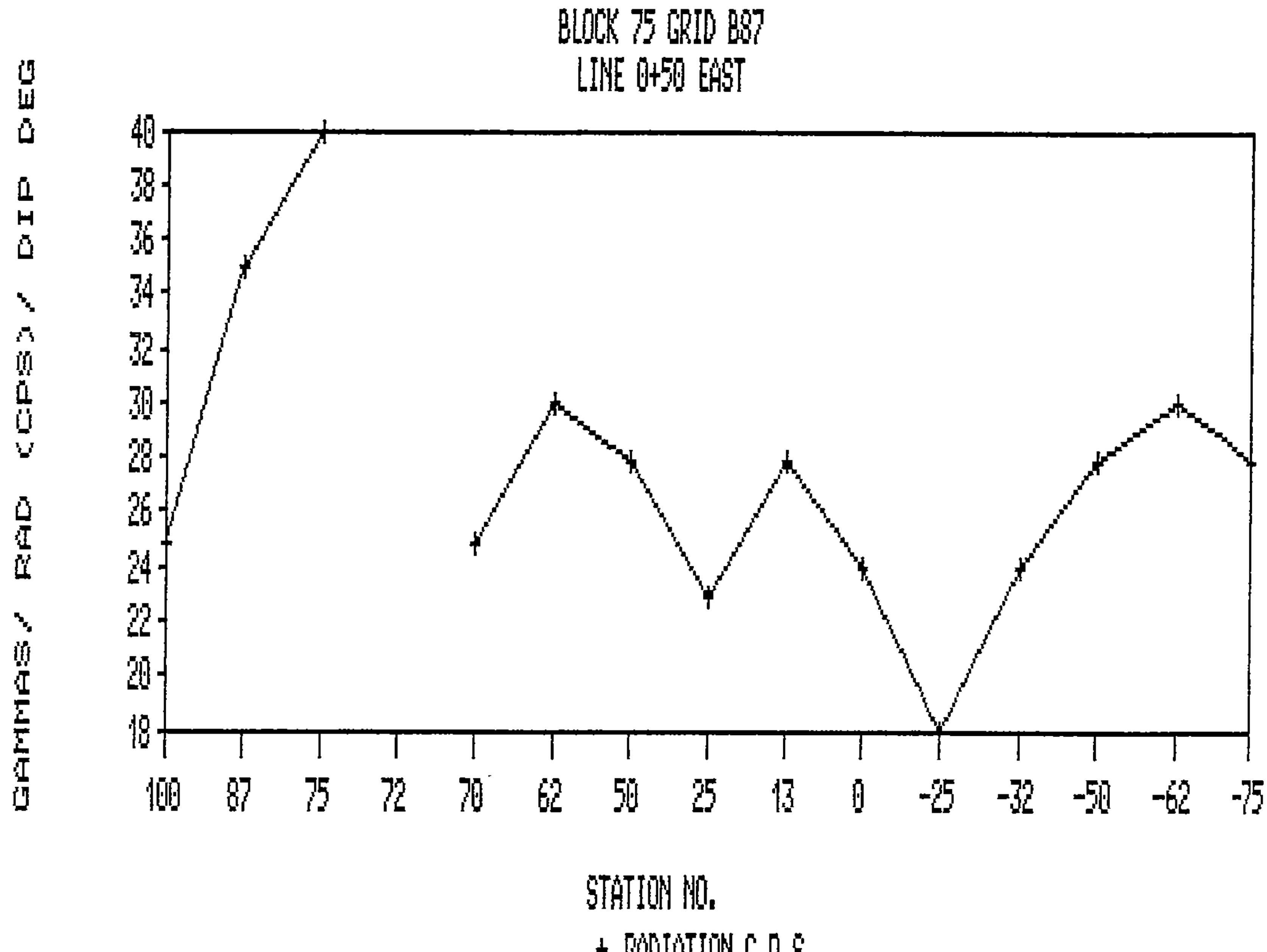
STATION	DIP	PHASE	FS	RAD		MAG
100	3	2	85	21	16	5616
75	2	2	85	32	26	5626
50	-1	2	100	30	14	5614
25	0	3	95	26	5	5605
0	-5	5	93	26	-17	5583
-25	-1	5	100	25	-18	5582
-50	4	2	93	34	11	5611

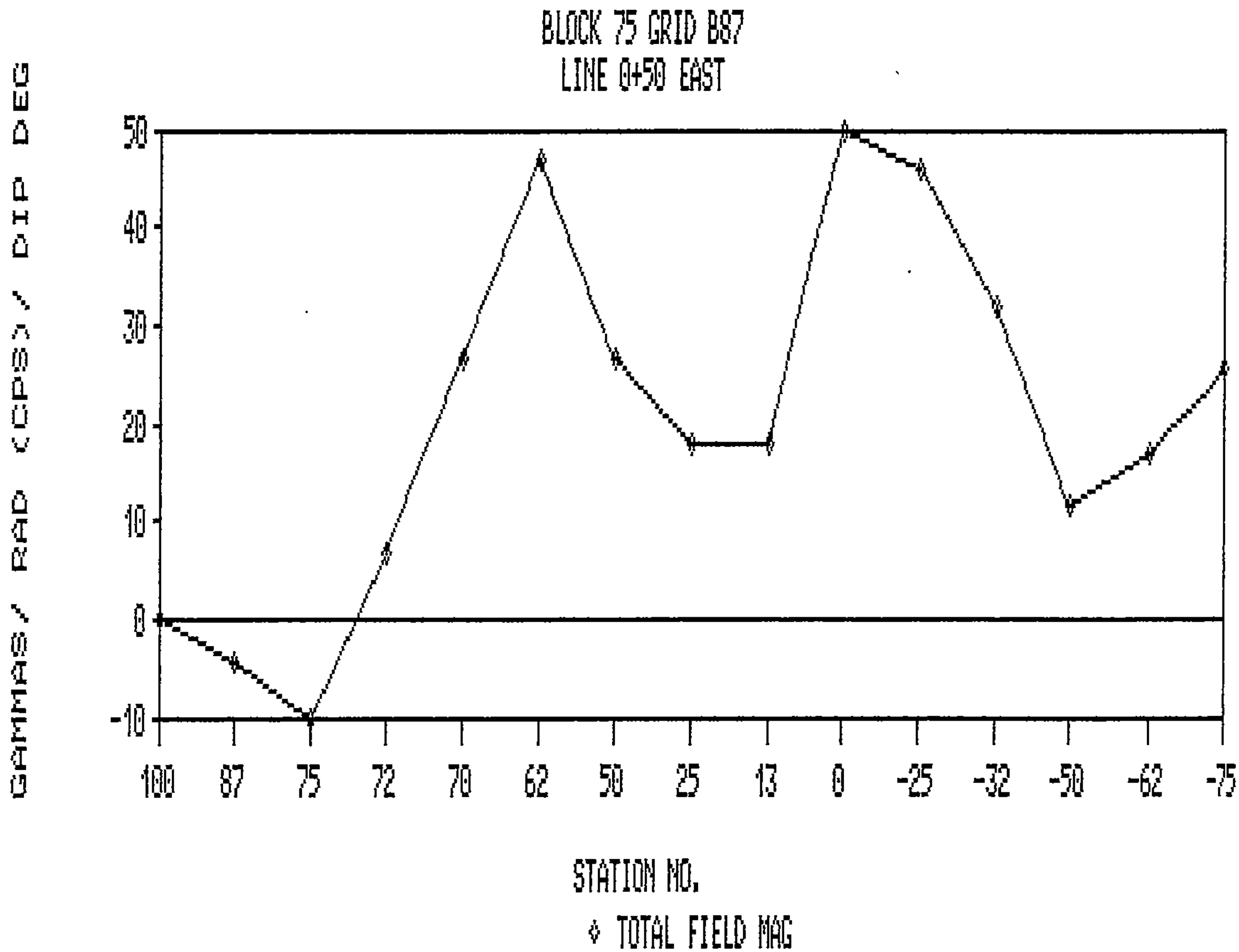
MAG	AV3MAG	AV5MAG	STATI	DIP	SUM DIP	FR FILT
5616			100	3		
5626	5620.5		75	2	5	
5614	5614.8	5611.7	50	-1	1	-6
5605	5601.8	5602.2	25	0	-1	-6
5583	5588.3	5593.1	0	-5	-5	-5
5582	5589.5	5592.1	-25	-1	-6	8
5611	5601.0	5599.1	-50	4	3	10

STATION	DIP	PHASE	FS	RAD		MAG
100	3	2	85	21	16	5616
87	1	2	85	25	32	5632
75	2	2	85	32	26	5626
63	-2	4	85	31	-8	5592
50	-1	2	100	30	14	5614
37	0	3	90	25	15	5615
25	0	3	95	26	5	5605
13	-3	4	95	17	2	5602
3					2	5602
0	-5	5	93	26	-17	5583
3					-4	5596
-10	-3	3	110	32	11	5611
-25	-1	5	100	25	-18	5582
-32				31	27	5627
-50	4	2	93	34	11	5611
-63	4	3	87	28	1	5601



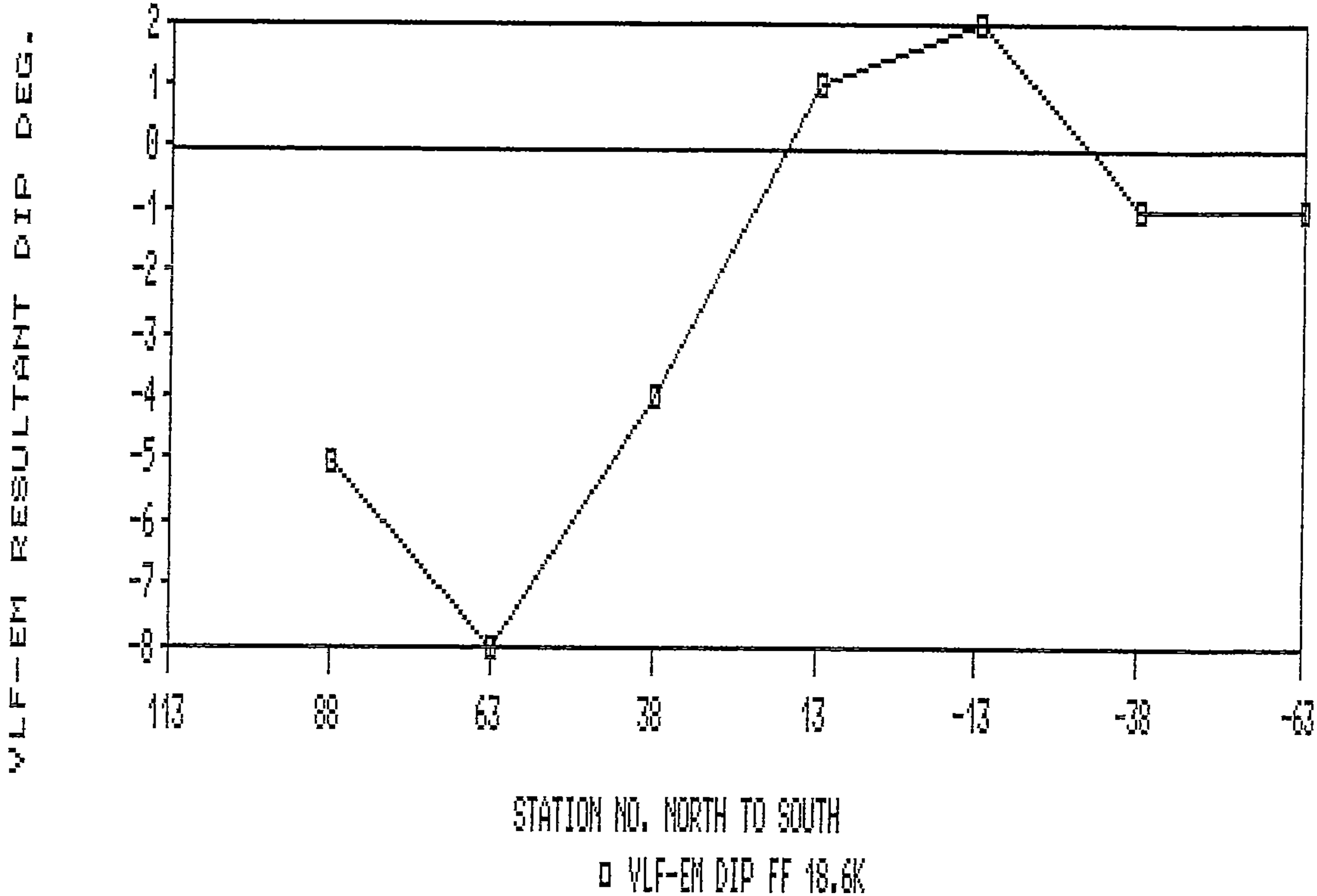
BLOCK 75 GRID B87
LINE 0+50 EAST
VLF-EM DIP DEG FF 18.6 KHZ
15
10
5
0
-5
-10
-15
63
38
13
-12
-37
STATION NO NORTH TO SOUTH
VLF-EM DIP DEG FF

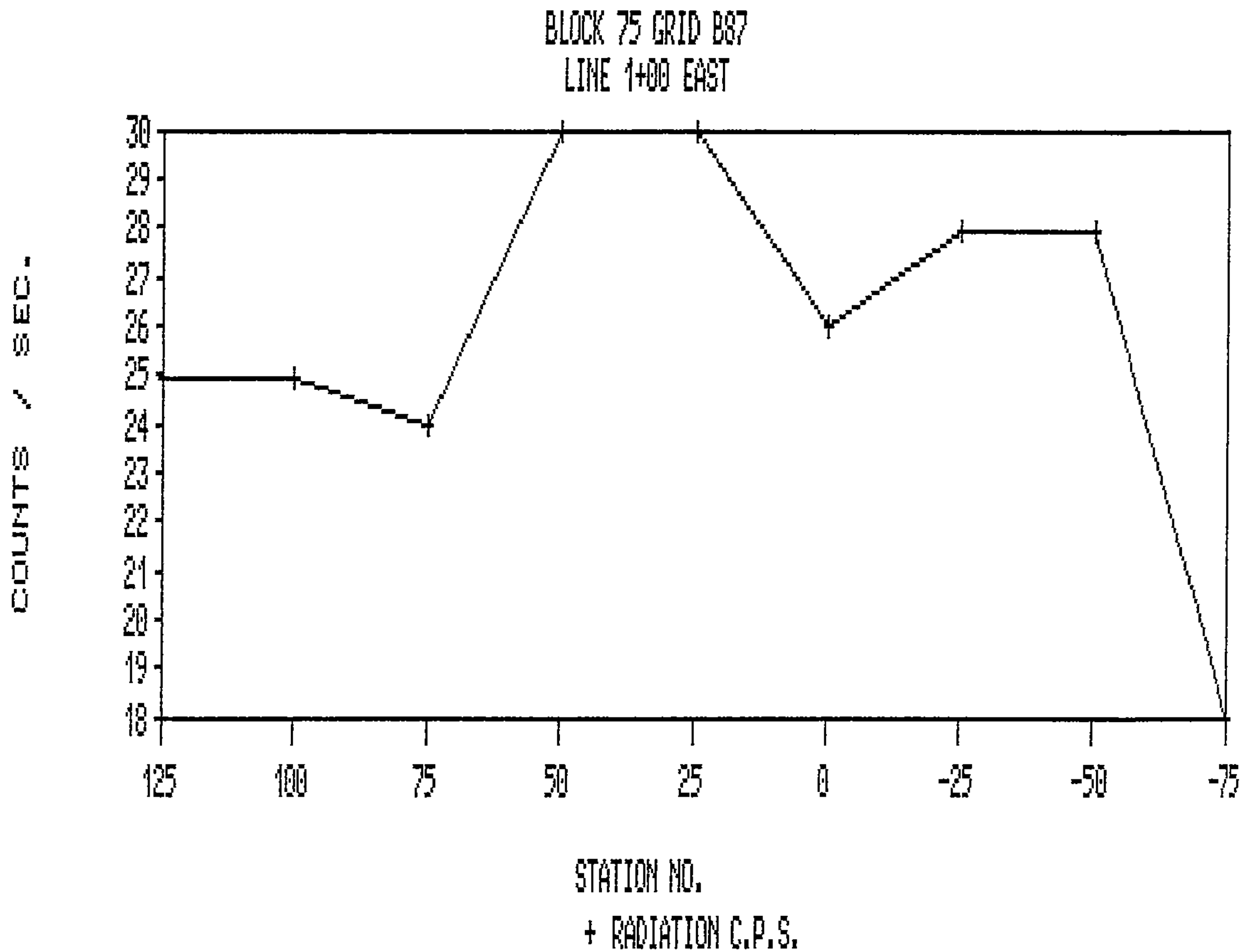

BLOCK 75 GRID B87
LINE 0+50 EAST
GAMMAS/ RAD (CPS)/ DIP DEG
40
38
36
34
32
30
28
26
24
22
20
18
100
87
75
72
70
62
50
25
13
0
-25
-32
-50
-62
-75
STATION NO.
+ RADIATION C.P.S.



BLOCK 75 GRID B87
LINE 0+50 EAST
GAMMAS / RAD (CPS) / DIP DEG
50
40
30
20
10
0
-10
100
87
75
72
70
62
50
25
13
0
-25
-32
-50
-62
-75
STATION NO.
◊ TOTAL FIELD MAG

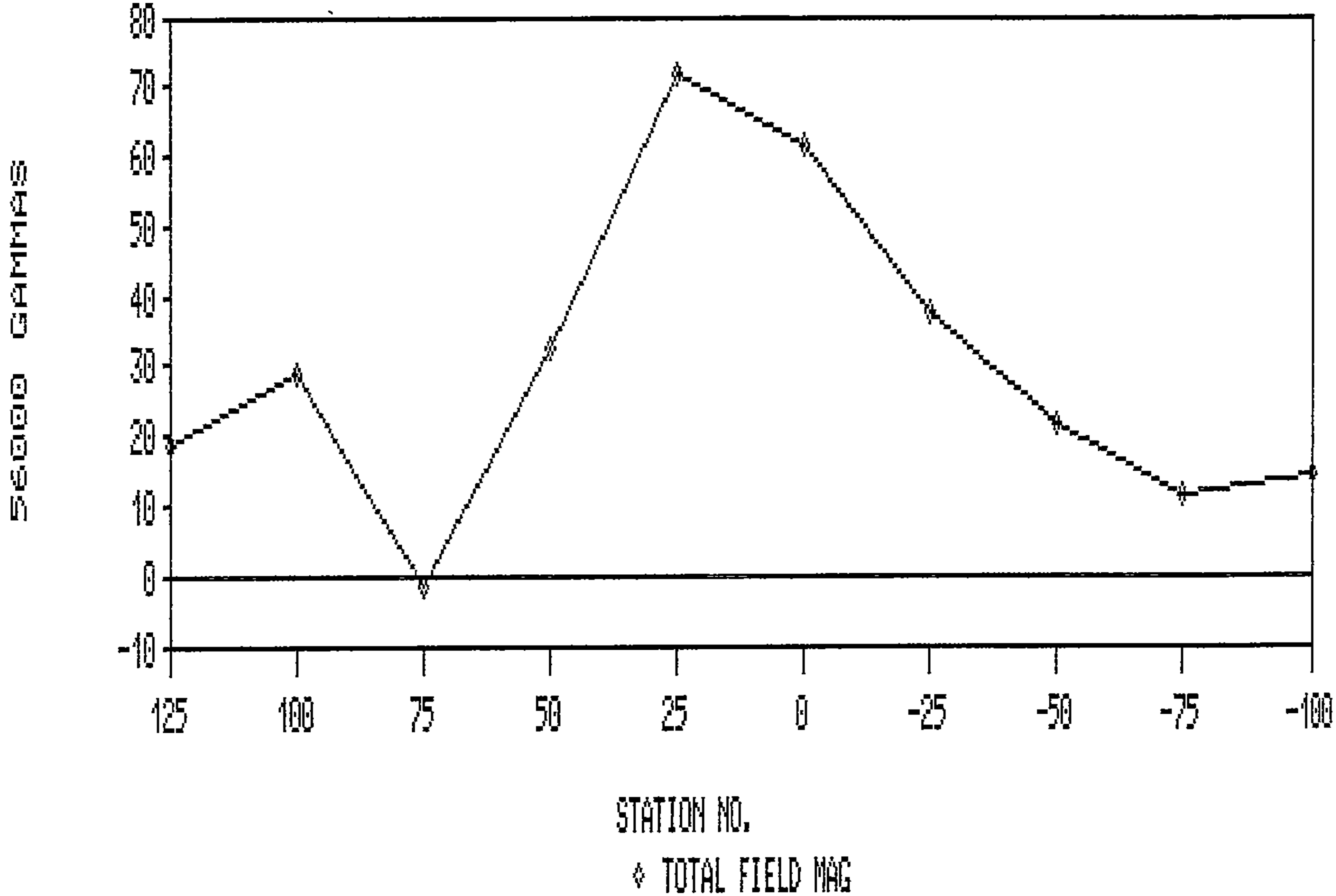
BLOCK O GRID 887
LINE 1+00 EAST

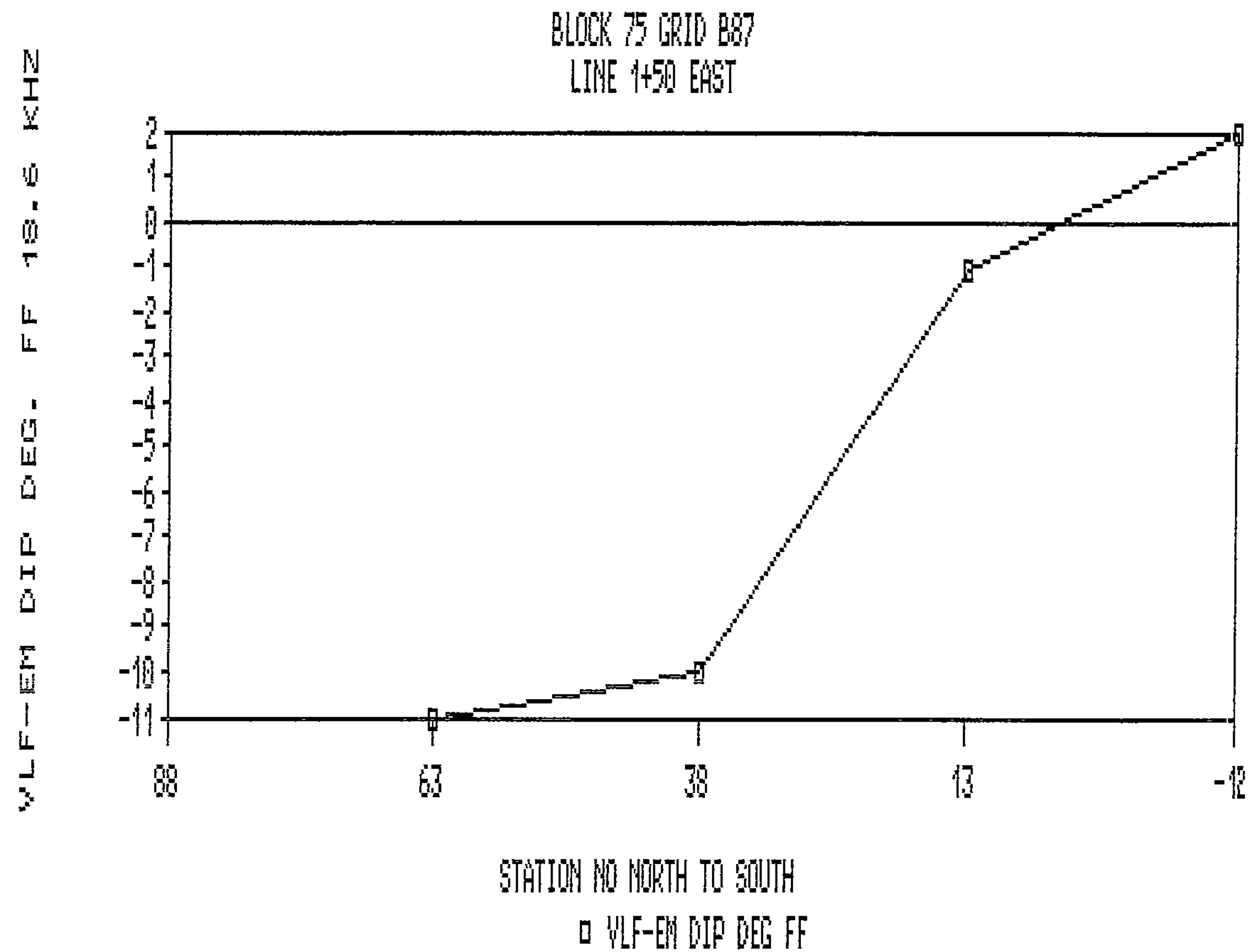


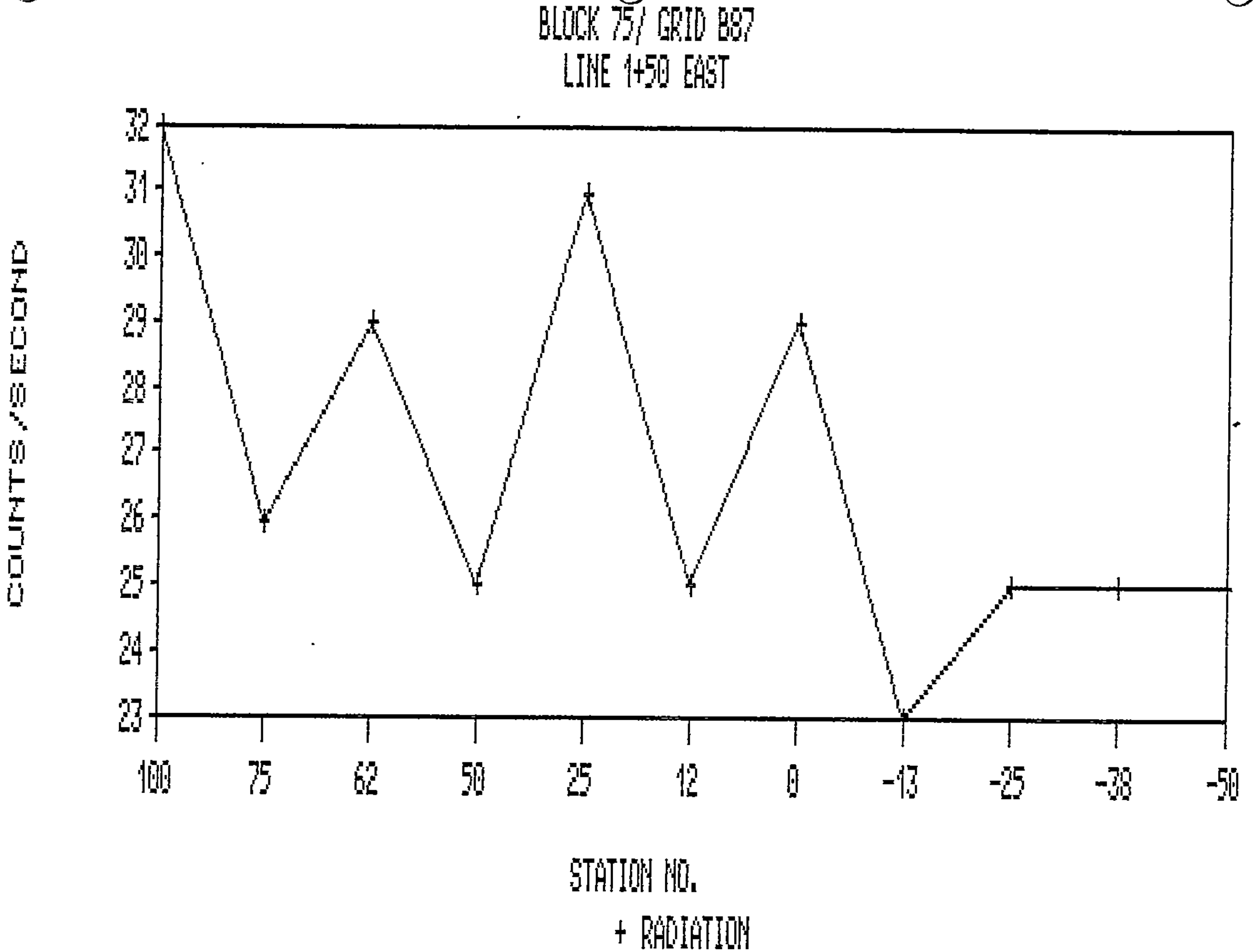


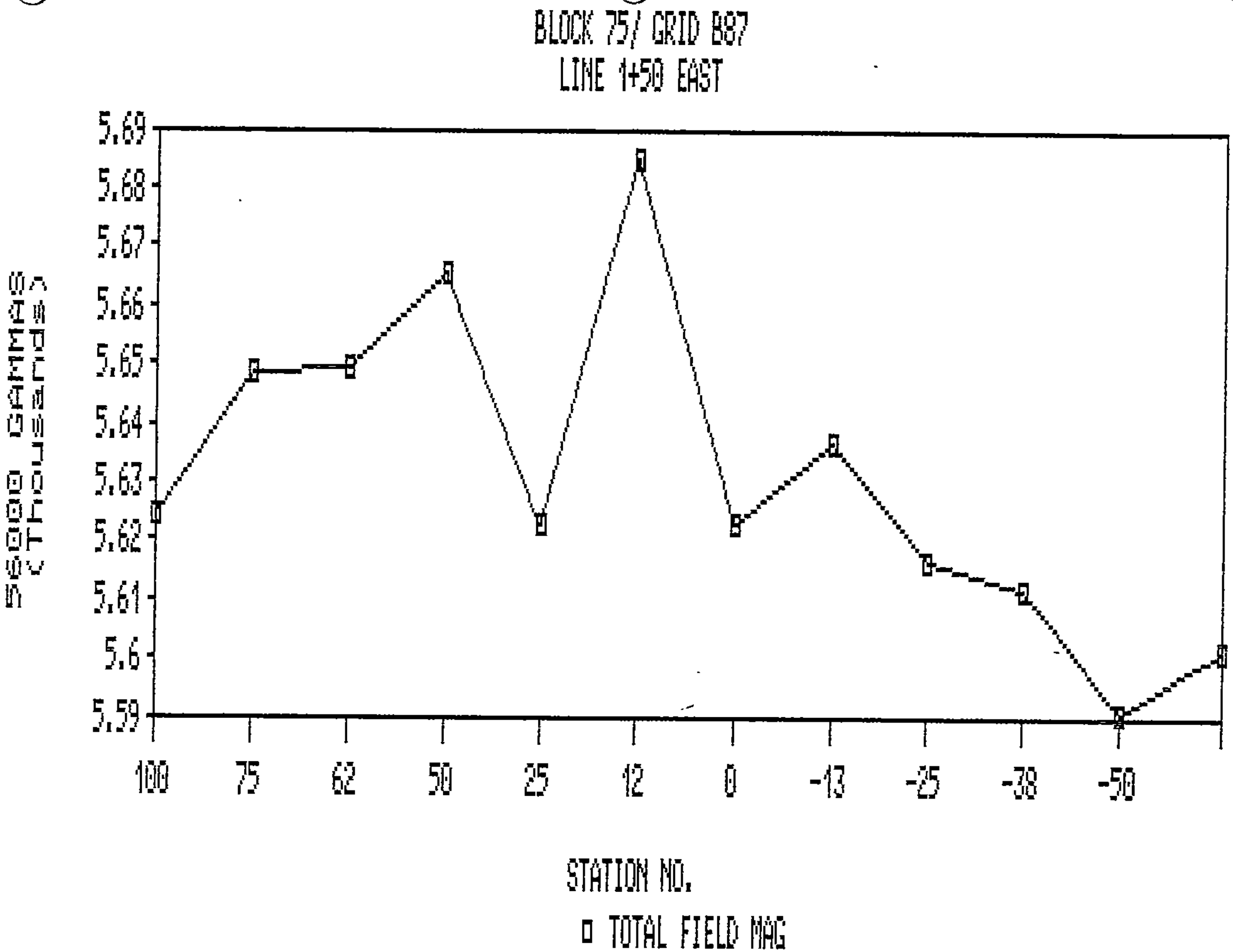
BLOCK 75 GRID B87
LINE 1+00 EAST
COUNTS / SEC.
30
29
28
27
26
25
24
23
22
21
20
19
18
125
100
75
50
25
0
-25
-50
-75
STATION NO.
+ RADIATION C.P.S.

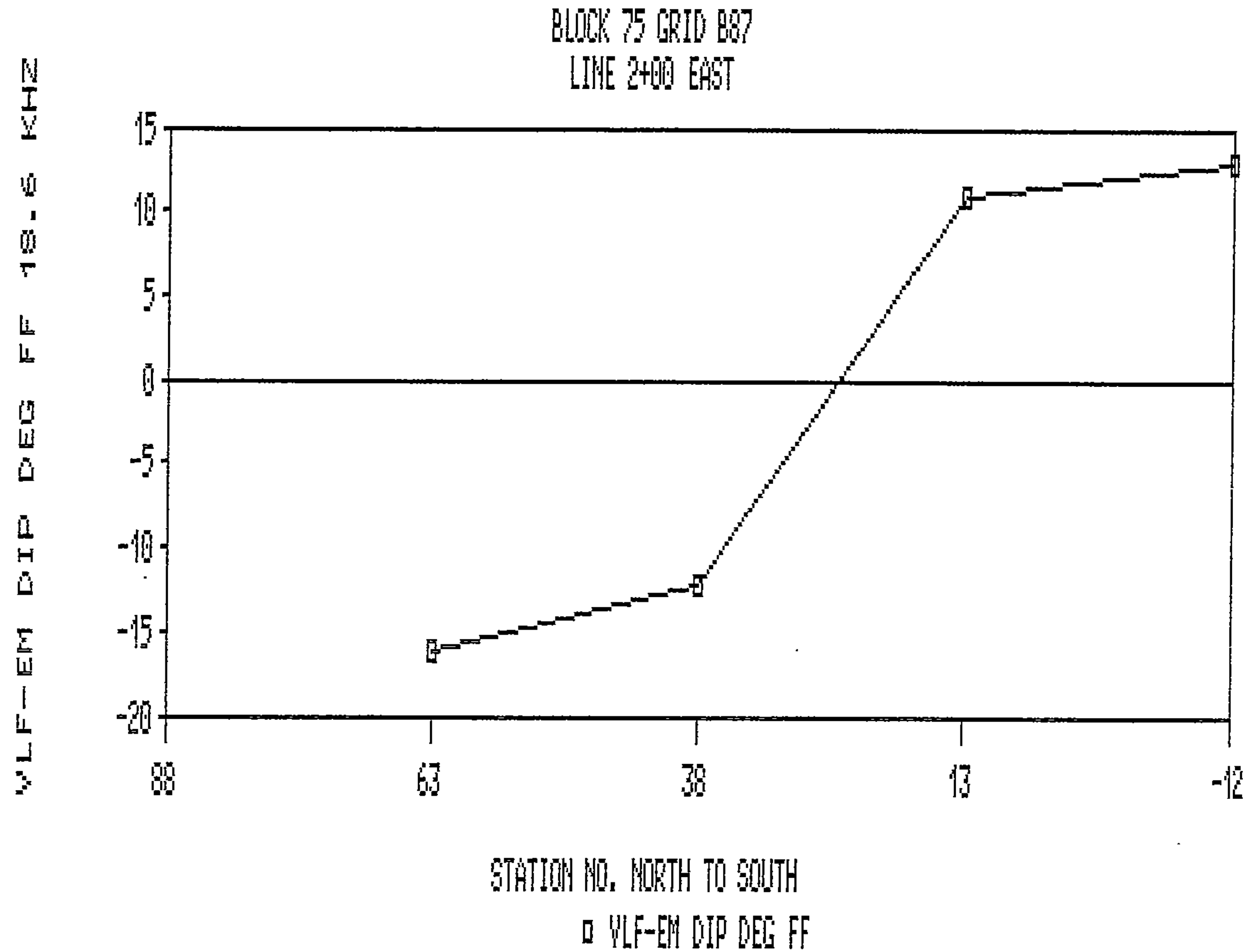
BLOCK 75 GRID B87
LINE 1+00 EAST



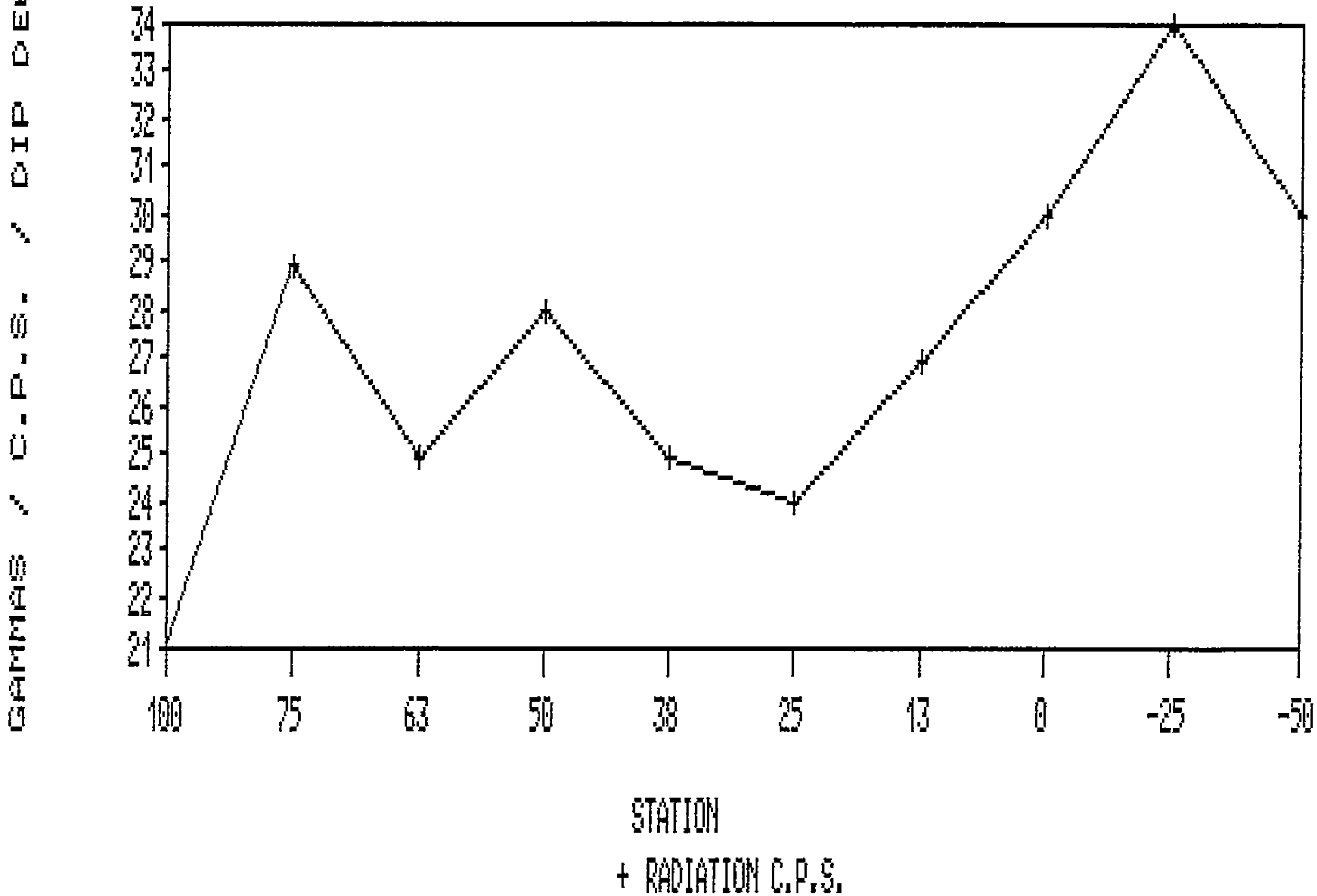

BLOCK 75 GRID B87
LINE 1+50 EAST
VLF-EM DIP DEG. FF 18.6 KHZ
2
1
0
-1
-2
-3
-4
-5
-6
-7
-8
-9
-10
-11
88
63
38
13
-12
STATION NO NORTH TO SOUTH
VLF-EM DIP DEG FF

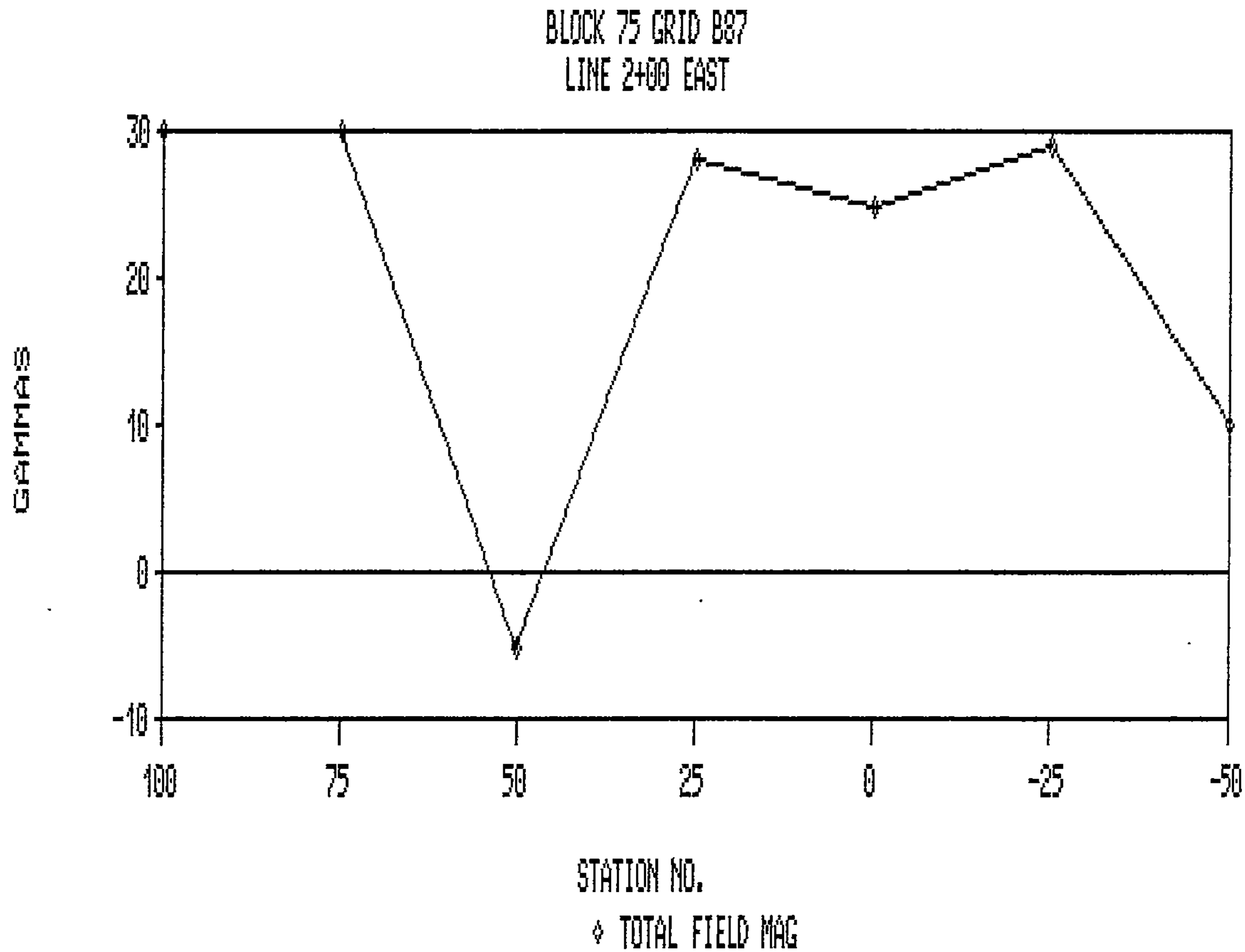

BLOCK 75/ GRID B87
LINE 1+50 EAST
COUNTS /SECOND
32
31
30
29
28
27
26
25
24
23
100
75
62
50
25
12
0
-13
-25
-38
-50
STATION NO.
+ RADIATION


BLOCK 75/ GRID B87
LINE 1+50 EAST
5.69
5.68
5.67
5.66
5.65
5.64
5.63
5.62
5.61
5.6
5.59
56000 GAMMAS
(Thousands)
100
75
62
50
25
12
0
-13
-25
-38
-50
STATION NO.
TOTAL FIELD MAG

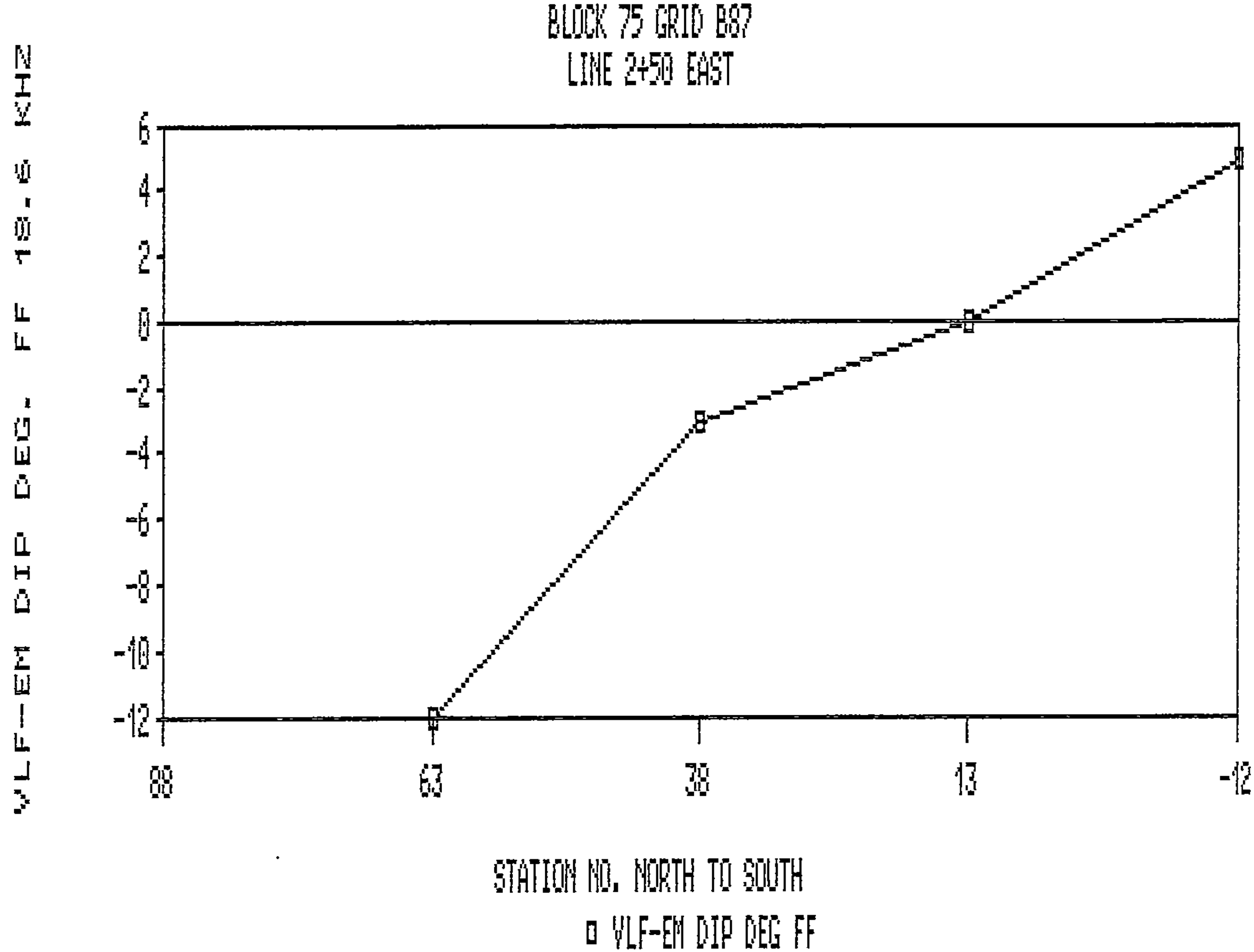

BLOCK 75 GRID B87
LINE 2+00 EAST
VLF-EM DIP DEG FF 18.6 KHZ
15
10
5
0
-5
-10
-15
-20
88
63
38
13
-12
STATION NO. NORTH TO SOUTH
VLF-EM DIP DEG FF

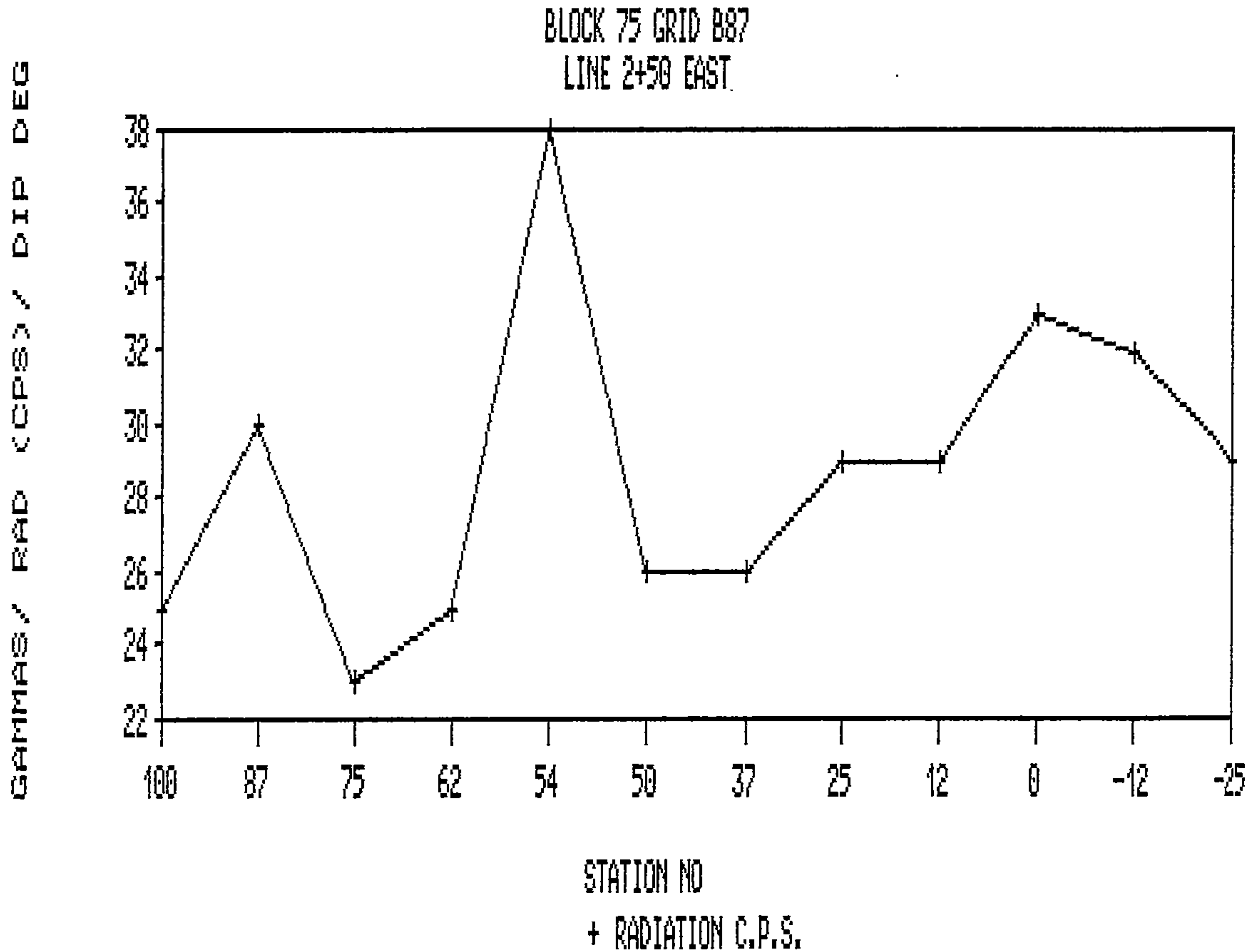
BLOCK [illegible] GRID B87
LINE 2+00 EAST

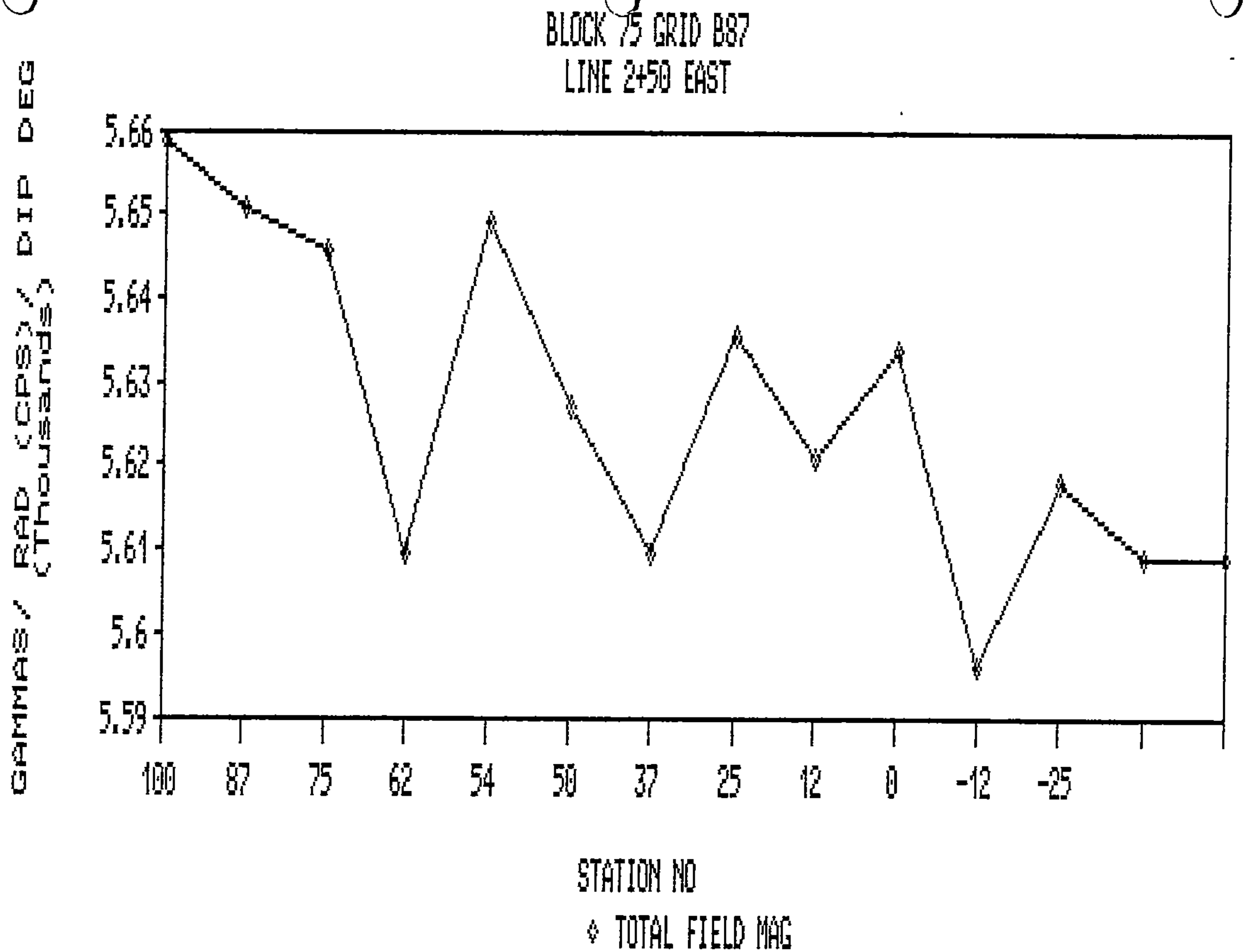




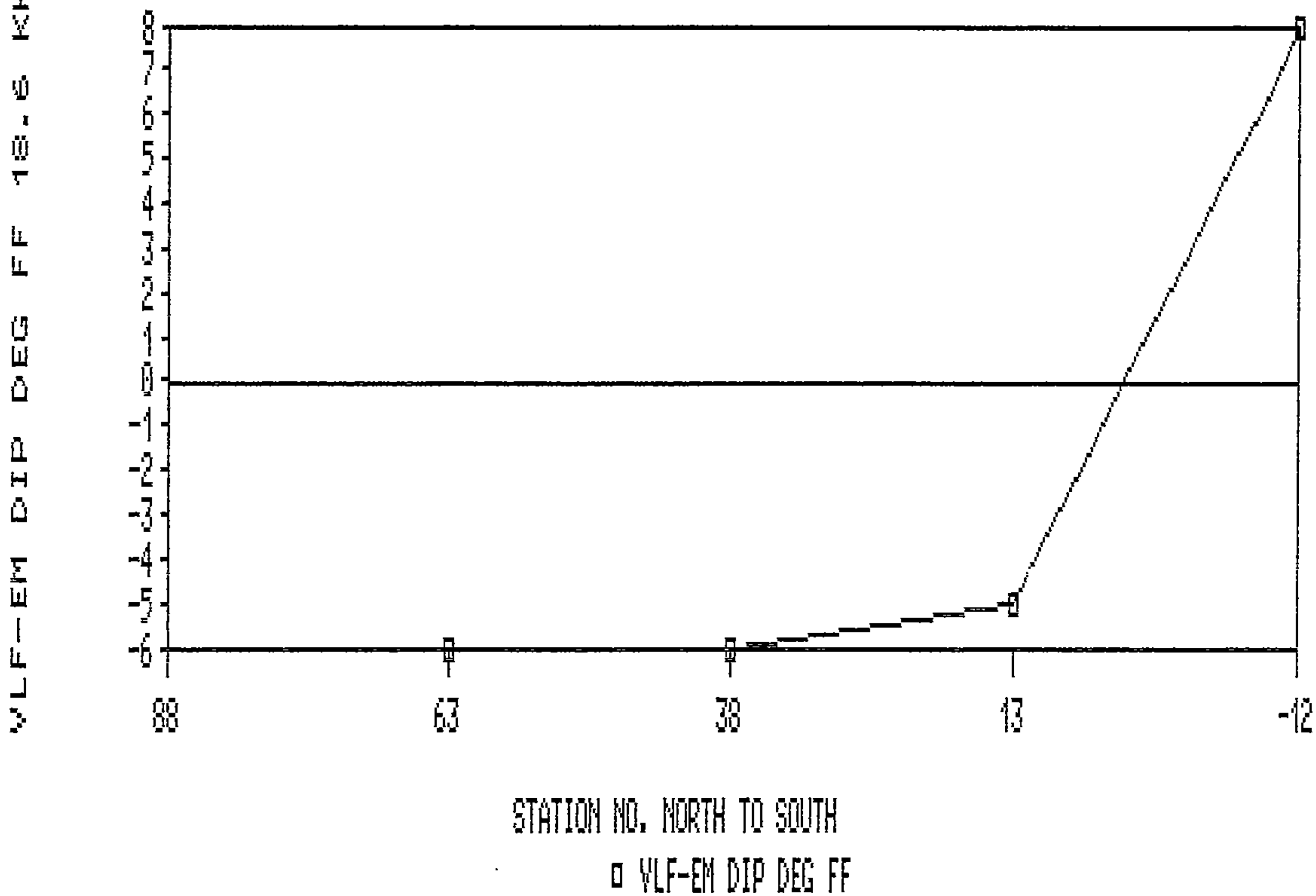
BLOCK 75 GRID B87
LINE 2+00 EAST
GAMMAS
30
20
10
0
-10
100
75
50
25
0
-25
-50
STATION NO.
◊ TOTAL FIELD MAG

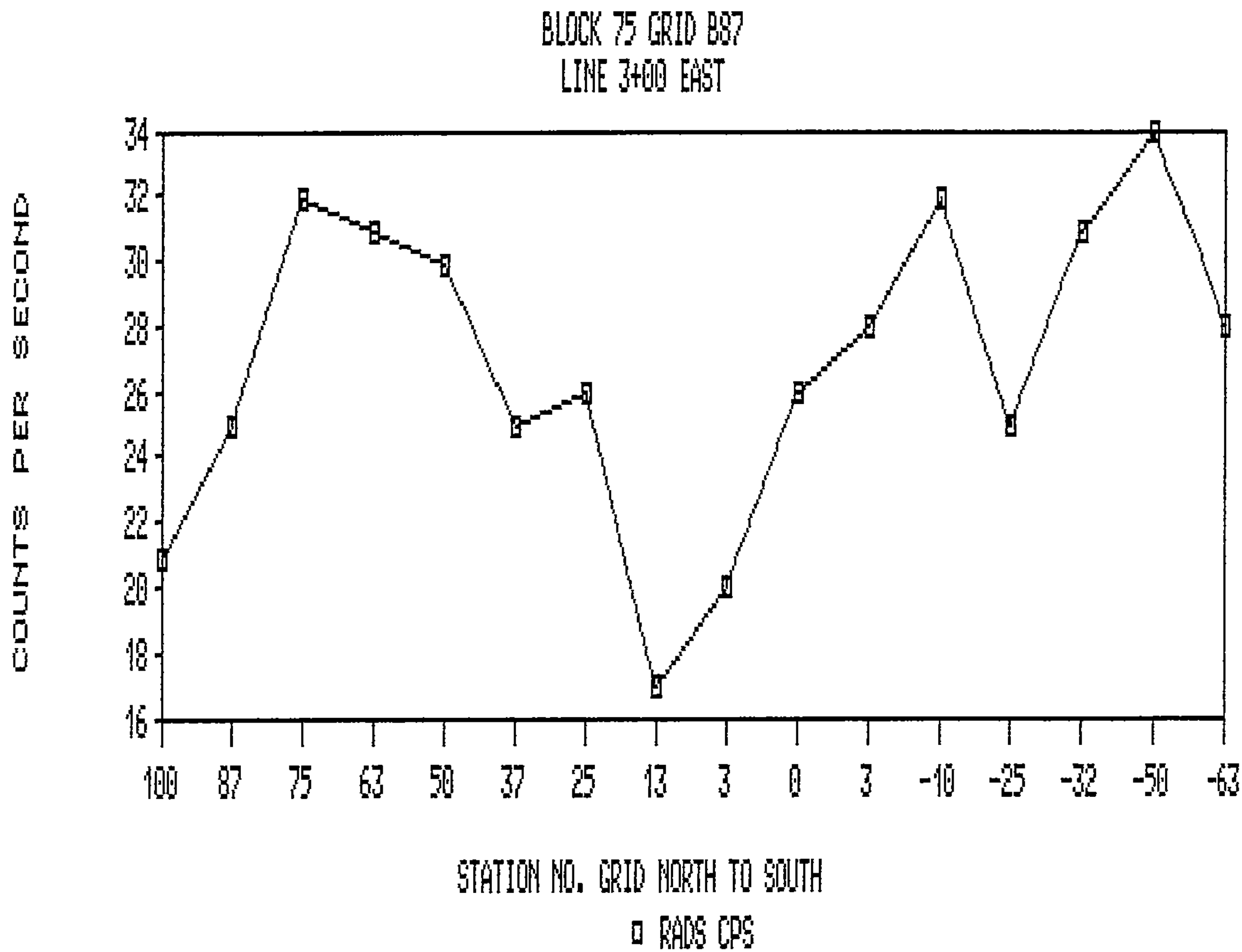

BLOCK 75 GRID B87
LINE 2+50 EAST
VLF-EM DIP DEG. FF 18.6 KHZ
6
4
2
0
-2
-4
-6
-8
-10
-12
88
63
38
13
-12
STATION NO. NORTH TO SOUTH
VLF-EM DIP DEG FF


BLOCK 75 GRID B87
LINE 2+50 EAST
GAMMAS / RAD (CPS) / DIP DEG
38
36
34
32
30
28
26
24
22
100
87
75
62
54
50
37
25
12
0
-12
-25
STATION NO
+ RADIATION C.P.S.


BLOCK 75 GRID B87
LINE 2+50 EAST
GAMMAS / RAD (CPS) / DIP DEG
(Thousands)
5.66
5.65
5.64
5.63
5.62
5.61
5.6
5.59
100
87
75
62
54
50
37
25
12
0
-12
-25
STATION NO
TOTAL FIELD MAG

BLOCK 75 GRID B87
LINE 3+00 EAST




BLOCK 75 GRID B87
LINE 3+00 EAST
COUNTS PER SECOND
34
32
30
28
26
24
22
20
18
16
100
87
75
63
50
37
25
13
3
0
3
-10
-25
-32
-50
-63
STATION NO. GRID NORTH TO SOUTH
RADS CPS

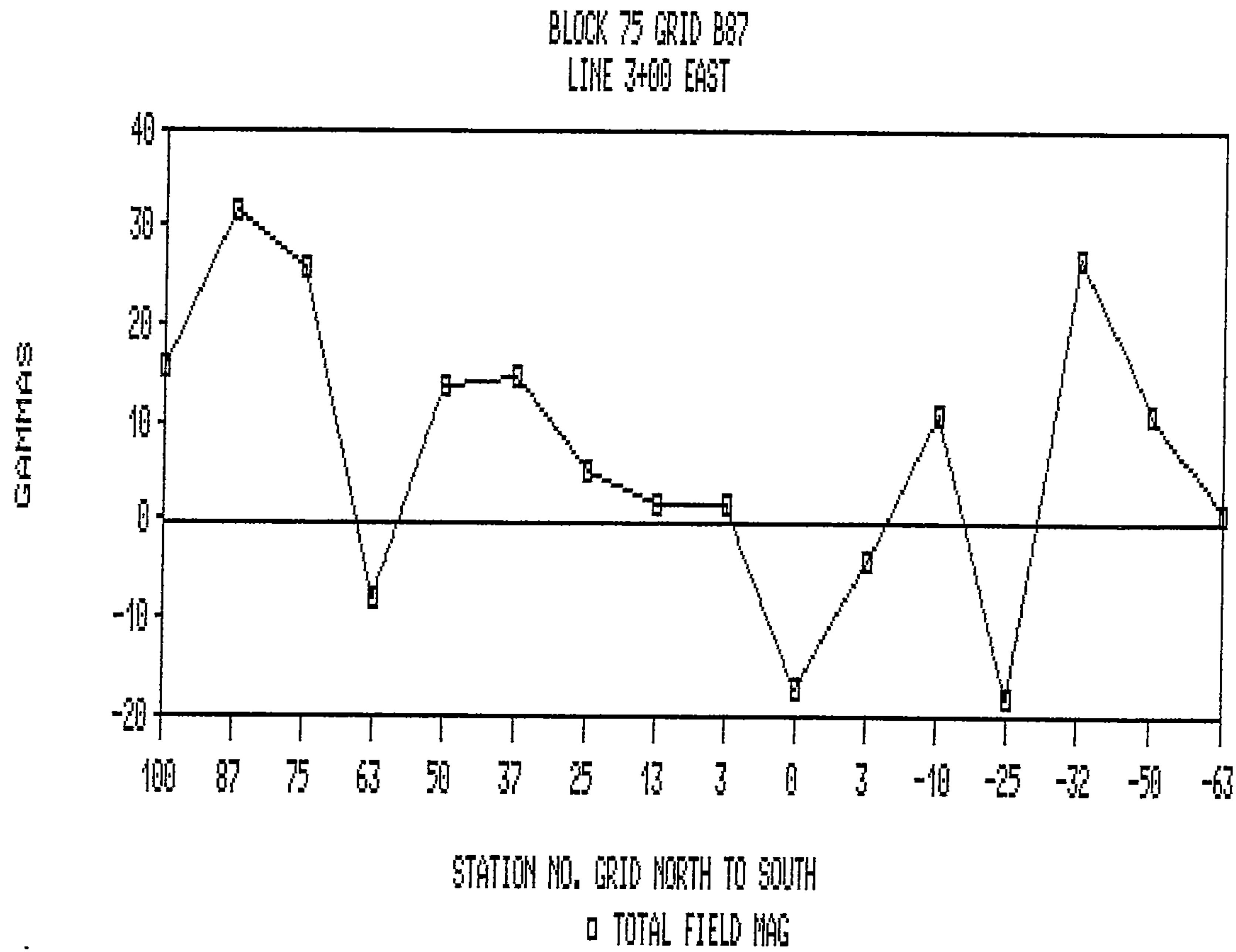
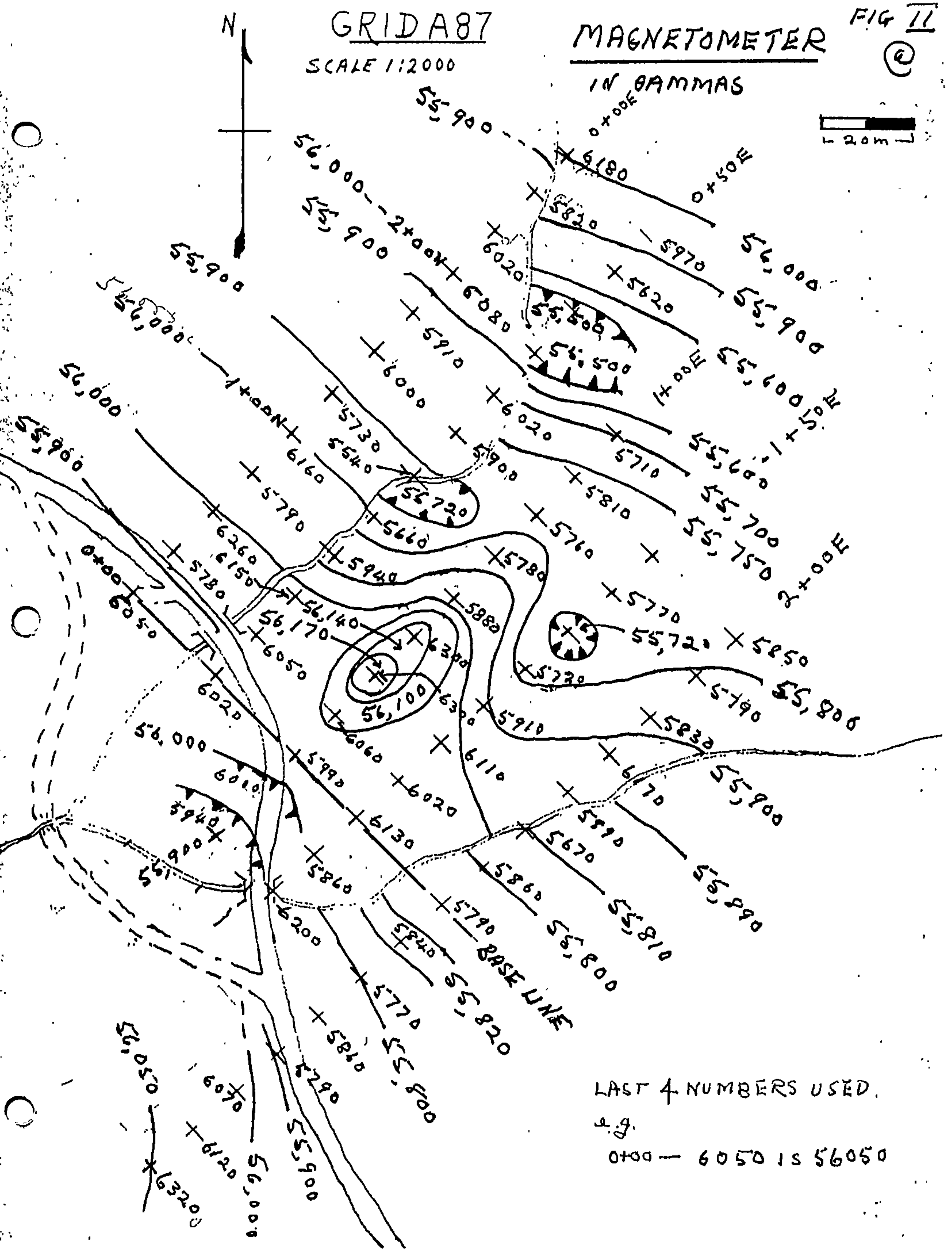

BLOCK 75 GRID B87
LINE 3+00 EAST
40
30
20
10
0
-10
-20
GAMMAS
100
87
75
63
50
37
25
13
3
0
3
-10
-25
-32
-50
-63
STATION NO. GRID NORTH TO SOUTH
TOTAL FIELD MAG

FIG II @

GRID A87

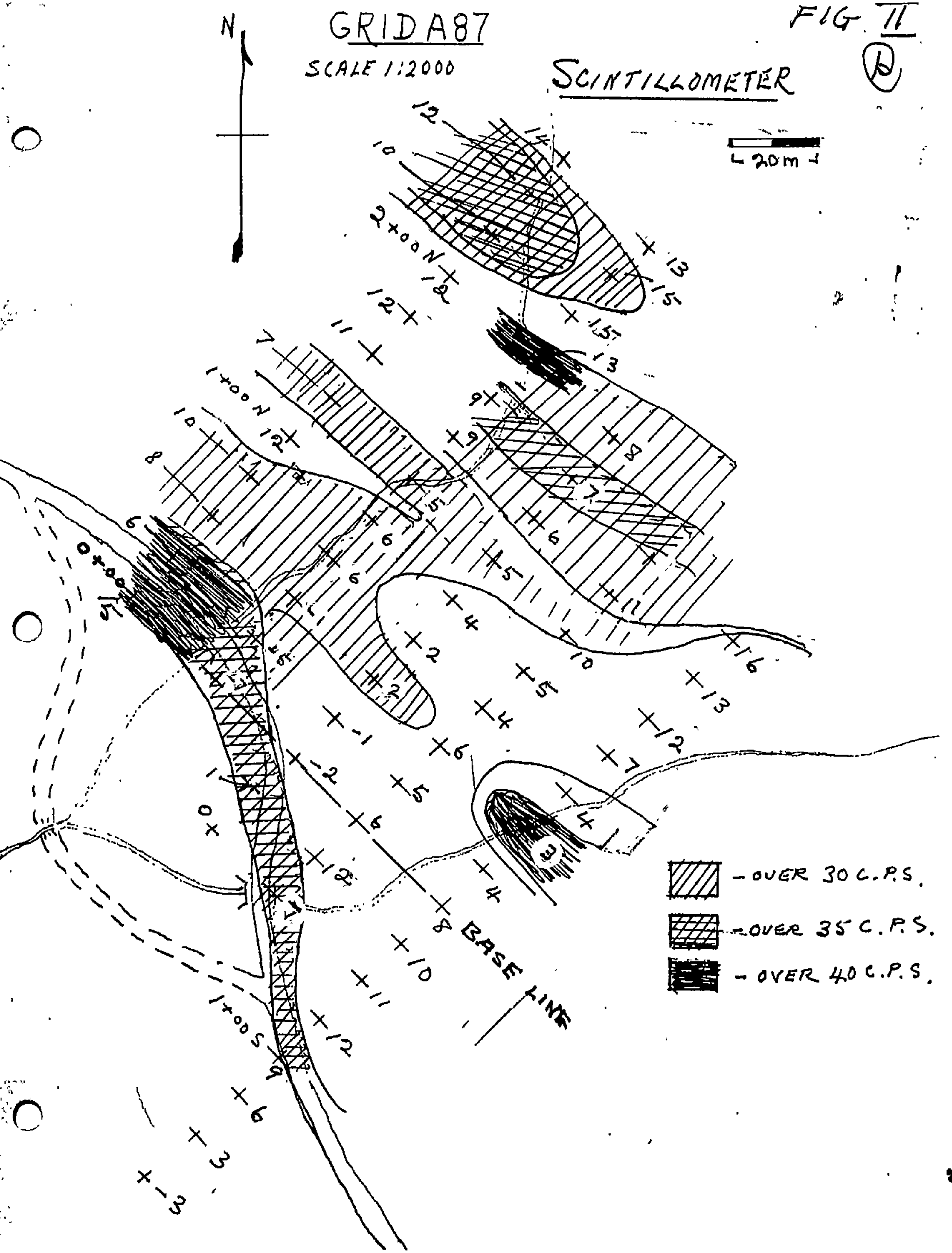
SCALE 1:2000

MAGNETOMETER IN GAMMAS



LAST 4 NUMBERS USED.
e.g.
0+00 — 6050 IS 56050

FIG. II



N
GRID A87
SCALE 1:2000
SCINTILLOMETER
20m
2+00N
1+00N
0+00
1+00S
BASE LINE
- OVER 30 C.P.S.
- OVER 35 C.P.S.
- OVER 40 C.P.S.

GRIDA81 V.L.F. E.M. CONDUCTORS FIG II

SCALE 1:2000

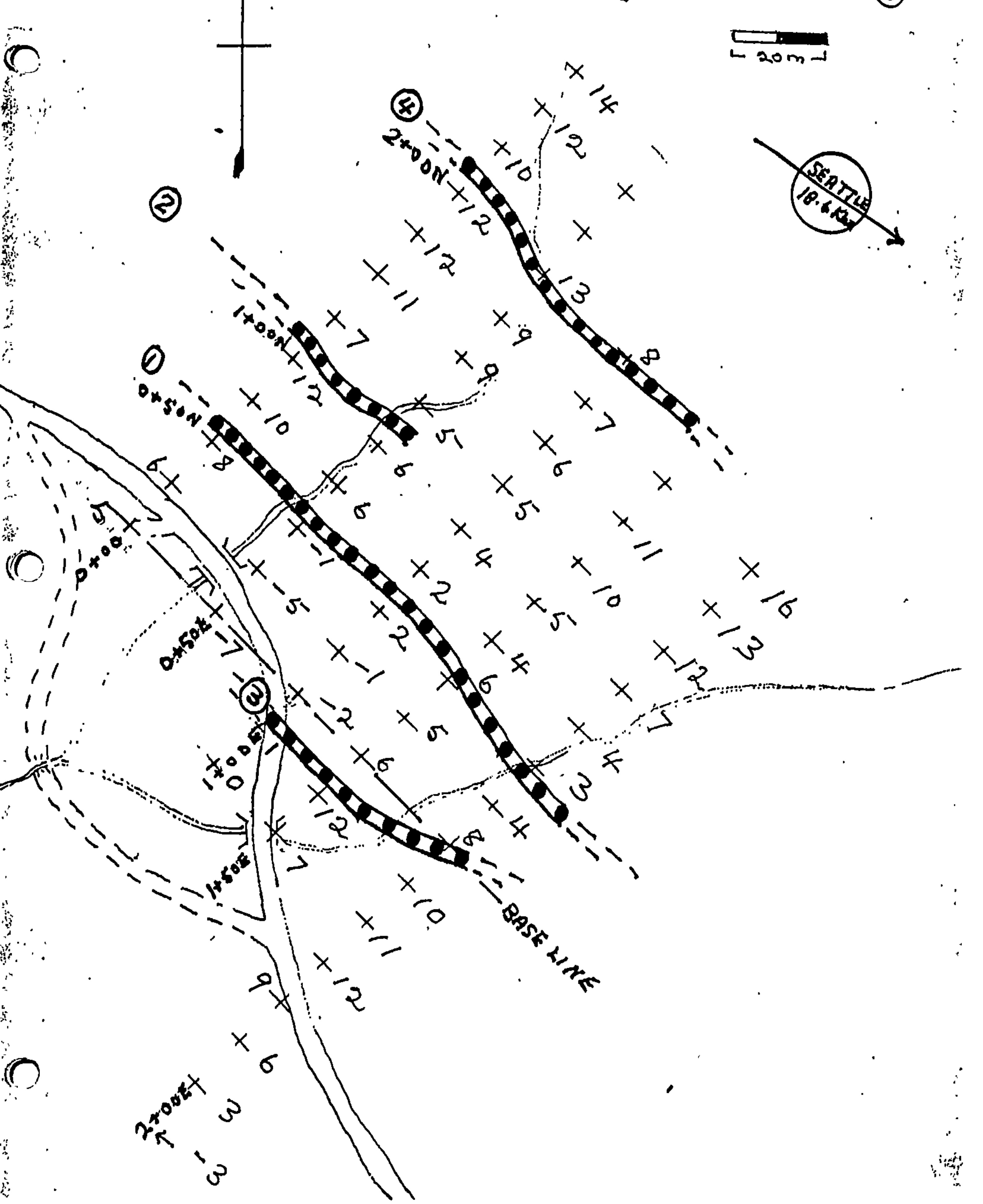
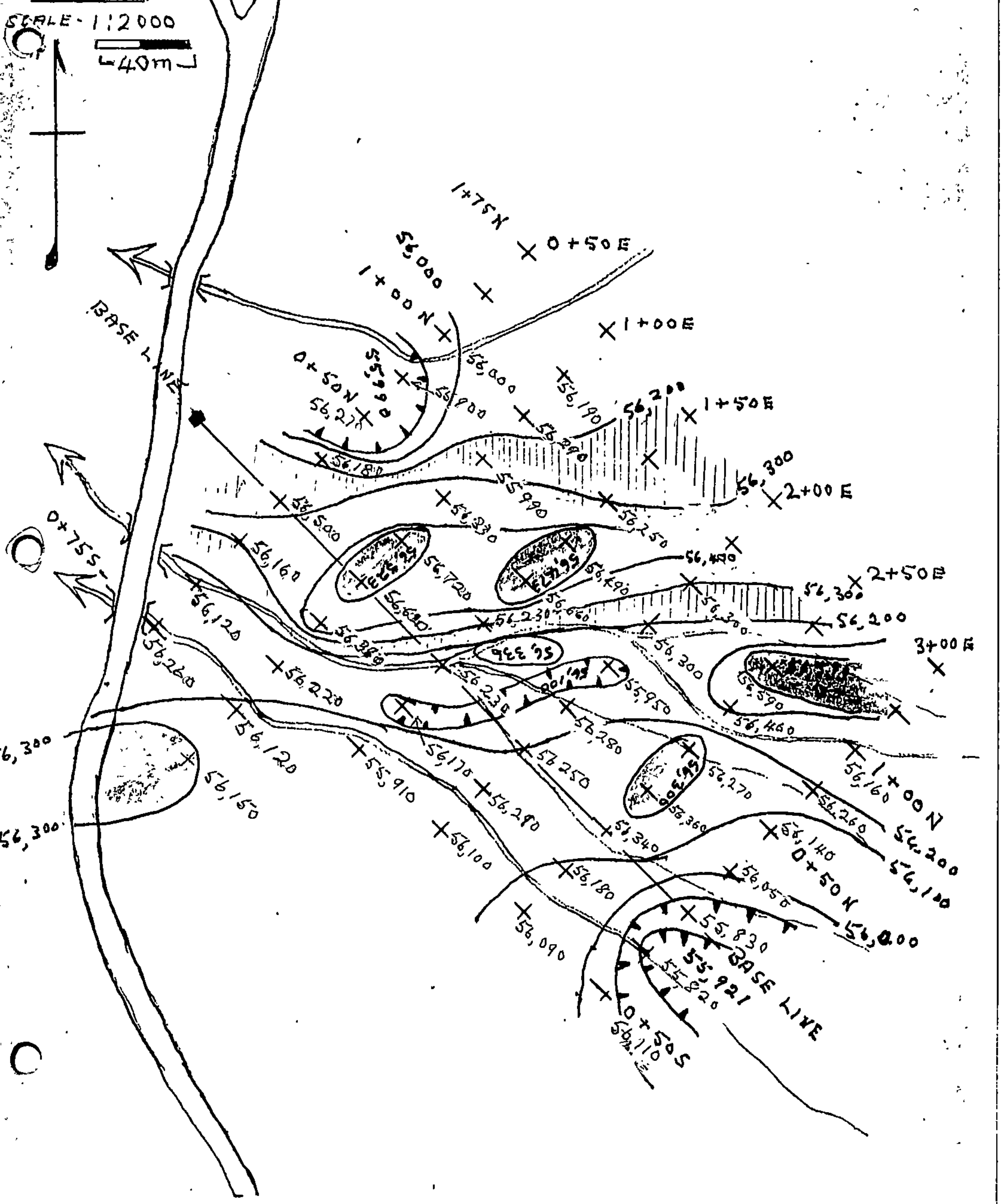
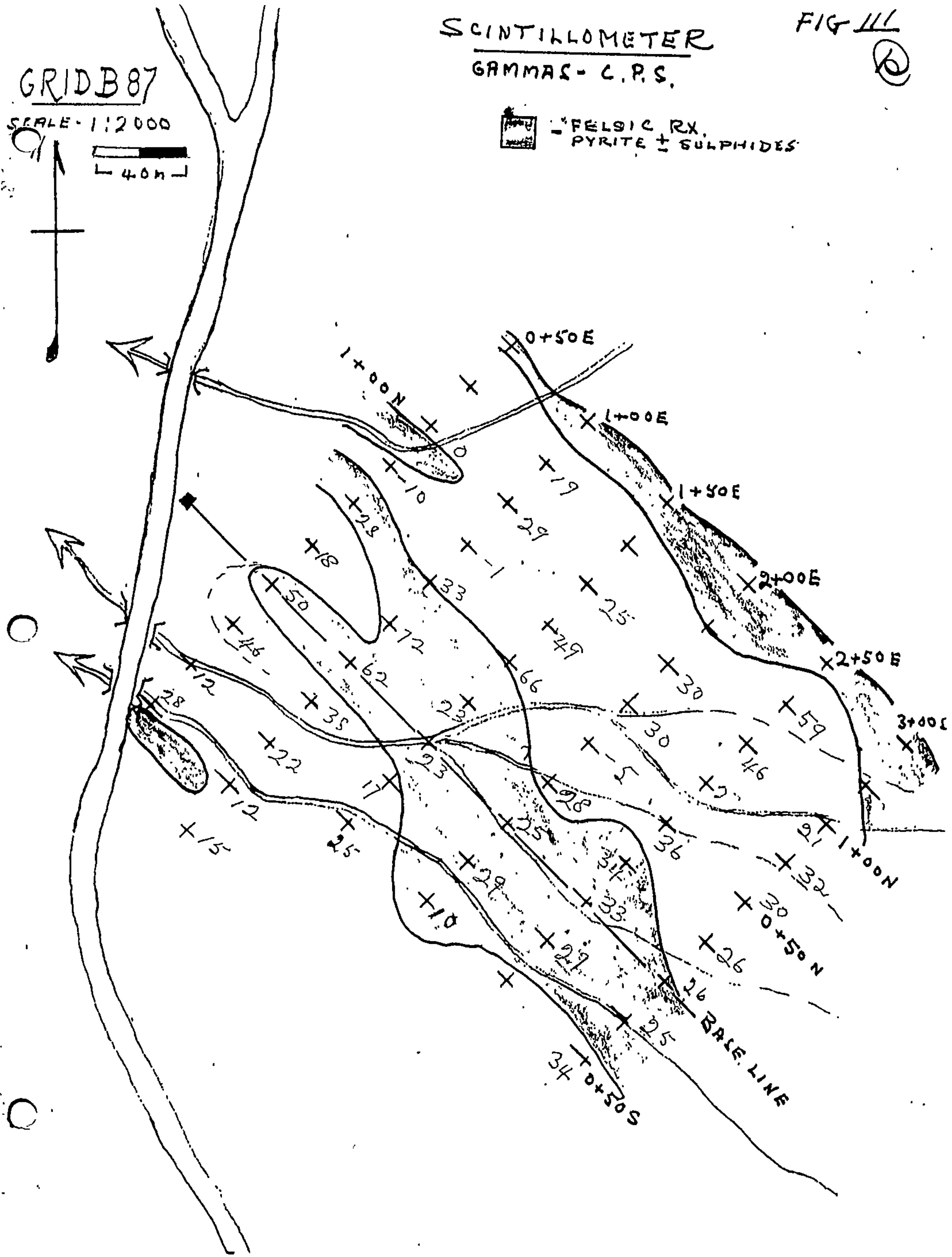


FIG. III

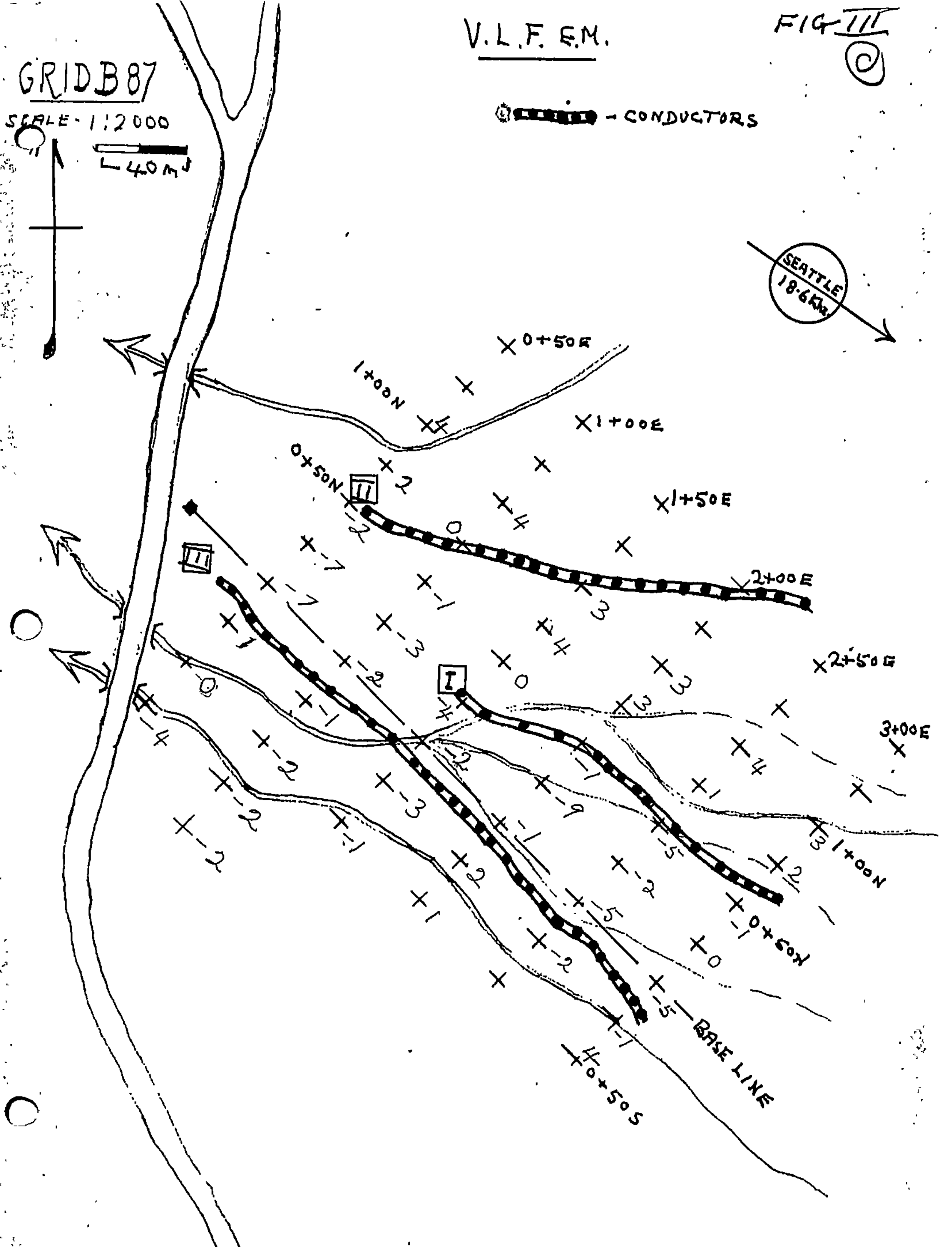
MAGNETOMETER

TOTAL FIELD IN GAMMAS





SCINTILLOMETER
GAMMAS - C.P.S.
FIG III
GRID B 87
SCALE - 1:2000
40m
FELSIC RX.
PYRITE ± SULPHIDES
0+50E
1+00E
1+50E
2+00E
2+50E
3+00E
1+00N
0+50N
0+50S
BASE LINE



V.L.F. E.M.
FIG III
GRID B87
SCALE - 1:2000
40 m
- CONDUCTORS
SEATTLE 18.6 KHz
0+50E
1+00E
1+50E
2+00E
2+50E
3+00E
1+00N
0+50N
0+50S
BASE LINE
I
II
III

FIG. 3-9-1

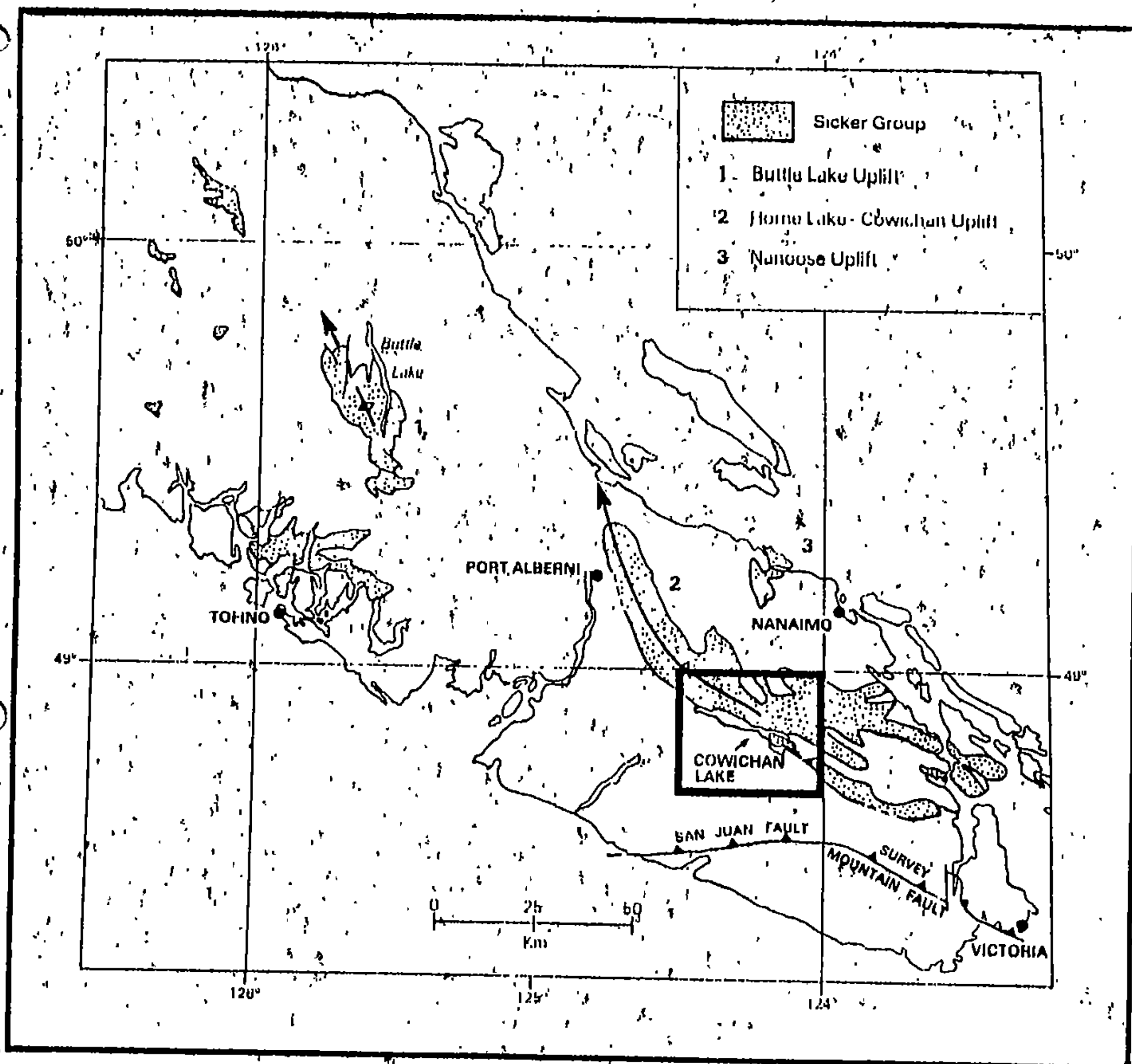


Figure 3-9-1. Location of the Cowichan Lake area, southern Vancouver Island, in relation to the three major geanticlinal uplifts cored by Sicker Group rocks (after Brandon *et al.*, 1986)

FIG. 3-9-2

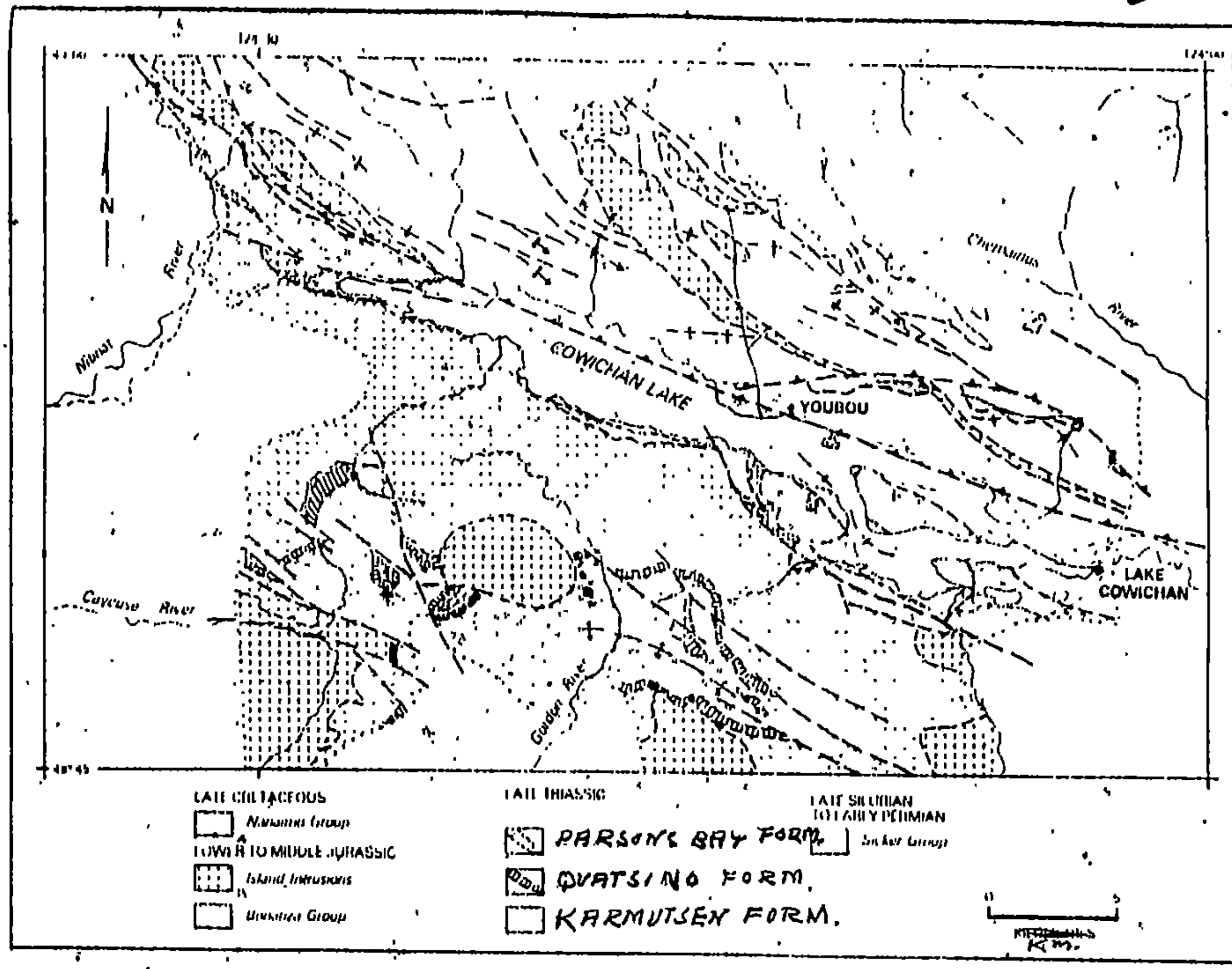


Figure 3-9-2. Geology and Structure of the Cowichan Lake area.

MAP 92C/16
SCALE-1:2,000
L.C.P. LATITUDE - 48°43'8"
LONGTITUDE - 124°19'45"
N
0 50 100
METRES
TRUCK RD. #3
GORDON RIVER MAIN
GORDON R.
CAYCUSE
SHEILA CK.
GRID A87
GRID B87
BASE LINE
652 m.
360 m.
210 m.
L.C.P.
MARIA CK.
I.P. CK.
JACK
LEGEND
VEINS (Au ANOMALOUS)
VOLCANIC FLOWS, BRECCIAS, TUFFS (± PYRITE)
BON.+ P. BAY SEDIMENTS (SULPHIDES + Au) .018 AND LESS OZ./T.
FELDSPAR PORPHYRIES
GRANODIORITE.
TERTIARY INTRUSION (?)
SHEARING
FAULT
BRECCIATED INTRUSION (INTRUSIVE BRECCIA)
BRECCIATED LIMEY ROCK (Au ANOMALOUS)
SKARNIFIED RX (Au ANOMALOUS)
MAR 88
17702


MAP 92C/16
SCALE - 1:2,000
L.C.P. LATITUDE - 48°49'8"
LONGTITUDE - 124°19'45"
METERS
FIGURE 4
GEOCHEMISTRY
GRID A87
GRID B87
SHEILA CK.
IVAN CK.
JACK CK.
MARIA CK.
TRUCK RD. #3
GORDON RIVER MAIN
CAYCUSE
BASELINE
L.C.P.
652 m.
210 m
360 m.
LEGEND
ROCK GEOCHEM.
26 ELEMENT MAJOR I.C.P.
15+ ELEMENT TRACE I.C.P.
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