

UNCLASSIFIED

AD NUMBER	
ADC018374	
CLASSIFICATION CHANGES	
TO:	unclassified
FROM:	secret
LIMITATION CHANGES	
TO:	Approved for public release, distribution unlimited
FROM:	Controlling DoD Organization: U.S. Naval Electronic Systems Command, Washington, DC 20360.
AUTHORITY	
ONR ltr, 31 Jan 2006; ONR ltr, 31 Jan 2006	

THIS PAGE IS UNCLASSIFIED

AD-C018374

~~TITLE (and Subtitle)~~
MOORED SURVEILLANCE SYSTEM FIELD VALIDATION TEST
SENSOR PERFORMANCE ANALYSIS.
VOL. III, VERNIER RESOLUTION DATA PRODUCTS (U).
Volume III.
~~Author(s)~~

SECRET (This page is UNCLASSIFIED.)

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) MOORED SURVEILLANCE SYSTEM FIELD VALIDATION TEST SENSOR PERFORMANCE ANALYSIS VOL. III, VERNIER RESOLUTION DATA PRODUCTS (U) Volume III		5. TYPE OF REPORT & PERIOD COVERED final report 10 JAN 77 - 31 MAR 78
6. AUTHOR(s) Steven L. Watkins Judith L. Winterkamp		7. PERFORMING ORG. REPORT NUMBER ARL-TR-78-3
9. PERFORMING ORGANIZATION NAME AND ADDRESS Applied Research Laboratories The University of Texas at Austin Austin, Texas 78712		8. CONTRACT OR GRANT NUMBER(s) N00039-77-C-0003
11. CONTROLLING OFFICE NAME AND ADDRESS Naval Electronic Systems Command Department of the Navy Washington, DC 20360		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS Items 0003 and 0004
12. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office) ARL-TR-78-3		12. REPORT DATE 31 December 1978
		13. NUMBER OF PAGES 403
		14. SECURITY CLASS. (of this report) SECRET
		15. DECLASSIFICATION/DOWNGRADING SCHEDULE See reverse side.
16. DISTRIBUTION STATEMENT (of this Report) None		
17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)		
18. SUPPLEMENTARY NOTES		
19. KEY WORDS (Continue on reverse side if necessary and identify by block number) rapidly deployable surveillance system moored surveillance system DIFAR		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) (U) Volume III of this report contains the detailed vernier frequency resolution data products used to analyze candidate sensor performance based on the Moored Surveillance System Field Validation Test. In addition, this volume contains a brief discussion of each type of display and the methods used to generate it.		

DD FORM 1 JAN 73 1473

EDITION OF 1 NOV 63 IS OBSOLETE

(This page is unclassified)

404 434 **SECRET**

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE(When Data Entered)

15a.

DD 254, 12/10/76,

Cont. NO0039-77-C-0003

CLASSIFIED BY OPNAVINST S5510.72C, 4 Sep 73

EXEMPT FROM GDS OF E.O. 11652

EXEMPTION CATEGORY 3

DECLASSIFIED ON 31 Dec 2007

NATIONAL SECURITY INFORMATION

*Unauthorized Disclosure Subject to Criminal
Sanctions*

Accession For	
NTIS GRA&I	☒
DDC TAB	☒
Unannounced	☐
Justification	
By _____	
Distribution/	
Availability Codes	
Dist.	Avail and/or special
9	

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE(When Data Entered)

UNCLASSIFIED

TABLE OF CONTENTS

	<u>Page</u>
LIST OF TABLES	v
LIST OF FIGURES	vii
I. INTRODUCTION	1
II. cw DATA PRODUCTS	3
III. AMBIENT SOUND FIELD DATA PRODUCTS	17
IV. DISCUSSION	21
REFERENCES	23
APPENDICES	25

UNCLASSIFIED

LIST OF TABLES

<u>Table</u>	<u>Title</u>	<u>Page</u>
III-1	Vernier Resolution Data Base (U)	4
III-2	Vernier Resolution Processing Parameters (U)	5
III-3	cw Projector Characteristics for Vernier Resolution Data Products	6
III-4	Vernier Resolution Line History Plots	8
III-5	Vernier Resolution Propagation Loss or Signal, Noise, and Array Gain versus Range Plots	10
III-6	Vernier Resolution Probability of Detection versus Range Plots	12
III-7	Vernier Resolution Bearing Error versus Signal-To-Noise: Ratio Plots	14
III-8	Vernier Resolution Signal-To-Noise Ratio versus Range Plots	15
III-9	Lines Deleted from Clutter Measurements (U)	19

LIST OF FIGURES

<u>Figure No.</u>	<u>Title</u>	<u>Appendix</u>
III-1 - III-23	Summary Detection Curves (U)	A
III-24 - III-163	Line History Curves (U)	B
III-164 - III-171	Propagation Loss versus Range Curves (U)	C
III-172 - III-199	Array Gain versus Range Curves (U)	D
III-200 - III-235	Percentage Detection versus Range Curves (U)	E
III-236 - III-257	Bearing Error versus Signal-to-Noise Ratio Curves (U)	F
III-258 - III-293	Signal-to-Noise Ratio versus Range Curves (U)	G
III-294 - III-301	Noise Gain Timeseries Curves (U)	H
III-302 - III-312	Clutter Timeseries Curves (U)	I
III-313 - III-354	Ambient Sound Field Level versus Frequency Curves (U)	J

CONFIDENTIAL

I. INTRODUCTION

- (C) During November 1975, the Moored Surveillance System (MSS) Field Validation Test (FVT) was conducted under the sponsorship of the MSS Project Office (PME 124-30) of Naval Electronic Systems Command. Applied Research Laboratories, The University of Texas at Austin (ARL:UT), participated in the processing and analysis of the acquired ACODAC data.
- (C) The results of this work, performed under Contract N00039-77-C-0003, are contained in a four volume report describing the measurements and analyses of candidate sensor performance based on data from the MSS-FVT. Volume I describes the data collection system and the measurement system used to obtain the results. Volume II contains data products obtained with standard frequency resolution processing. This volume, Volume III, contains the data products obtained with vernier frequency resolution processing. Volume IV contains the background information, summary data products, and analysis.
- (U) Since the MSS-FVT was completed, the name of the MSS program has been changed to Rapidly Deployable Surveillance System (RDSS). To avoid ambiguity, the term MSS will be used throughout this report. However, the issues addressed here are those specified by the MSS Project Office and are those issues that were of current interest to RDSS at the time that this report was written.
- (U) This volume, III, which contains the detailed vernier frequency resolution data products, is partitioned into four sections. The first is this introduction. The second section describes the cw data products. The third section describes the ambient sound field (ASF) data products. The fourth and final section briefly discusses the utilization of these data products. Much of the text in this volume is similar to that found

CONFIDENTIAL

UNCLASSIFIED

(U) in Volumes I and II, but it is repeated here so that each volume can be used independently of the others.

UNCLASSIFIED

CONFIDENTIAL

II. cw DATA PRODUCTS

(U) The detailed vernier frequency resolution cw data products contained in this volume were extracted from the data intervals shown in Table III-1. A summary of the processing parameters is shown in Table III-2. The cw projector characteristics used in performing these measurements are summarized in Table III-3. The cw projector source levels for the CFAV KAPUSKACING are higher than those reported previously (Ref. 1). These revisions were made in order to reconcile the propagation loss curves from the CFAV KAPUSKACING with those from the other sources. A detailed description of the measurement system can be found in Volume I.

(C) Several different types of cw data products are contained herein. Each type is described briefly, and a table of the curves is given. The abbreviations used in these tables and the text are:

QT	CFAV QUEST
KP	CFAV KAPUSKACING
CH	R/V CHAIN
O	Omnidirectional Sensor
SC	Single Cardioids Sensor
MGL	Maximum Gain Limacons Sensor
VD	Vertical Dipole Sensor
DC	Differenced Cardioids Sensor

These curves were included in this report to substantiate the observations in Volume IV, and to furnish a data base for future issues not addressed by this report. For completeness, each curve containing any data was included, even though the small number of samples may minimize its statistical significance.

CONFIDENTIAL

(C)

TABLE III-1

VERNIER RESOLUTION DATA BASE (U)

Low Band (46 to 84 Hz) Single and Differenced Arrays

Site A1 1200Z 17 Nov[321] - 0039Z 18 Nov[322]

Site A2 1200Z 17 Nov[321] - 1859Z 17 Nov[321]

Site A3 1200Z 17 Nov[321] - 2359Z 21 Nov[325]

Midband (145-183 Hz) Single and Differenced Arrays

Site A1 1200Z 17 Nov[321] - 2359Z 17 Nov[321]

Site A2 1200Z 17 Nov[321] - 1859Z 17 Nov[321]

Site A3 1200Z 17 Nov[321] - 2359Z 17 Nov[321]

1200Z 21 Nov[325] - 2359Z 21 Nov[325]

High Band (300-338 Hz) Single Array

Site A1 1200Z 17 Nov[321] - 0529Z 18 Nov[322]

Site A2 1200Z 17 Nov[321] - 1859Z 17 Nov[321]

Site A3 1200Z 17 Nov[321] - 2359Z 21 Nov[325]

[] Julian Day

Z Greenwich Mean Time

CONFIDENTIAL

SECRET

(S)

TABLE III-2

VERNIER RESOLUTION PROCESSING PARAMETERS (U)

Parameter	Value
Sample Rate:	100 Hz (obtained from zero crossings of tape servo signal)
Frequency Range	46 to 84 Hz (low band) 145 to 183 Hz (midband) 300 to 338 Hz (high band)
FFT Length	81.92 sec (8192 samples)
Spectral Window	Hanning
Frequency Spacing	0.0122 Hz
3 dB Bandwidth	0.0176 Hz
Equivalent Noise Bandwidth	0.0183 Hz
FFT Overlap	50%
ALI Interval	5 min
ALI Type	Rectangular Integration
FFT/ALI	7
Time Bandwidth Product	5.76
Equivalent Degrees of Freedom	13.4
Probability of False Alarm	10^{-3}
Detection Threshold	-14.6 dB/Hz

UNCLASSIFIED

TABLE III-3
CW PROJECTOR CHARACTERISTICS FOR VERNIER RESOLUTION DATA PRODUCTS

TOW PLATFORM	NOMINAL FREQUENCY (Hz)	NOMINAL LEVEL (dB/μPa)	17 NOV FIELD EVENT ON/OFF TIMES (Z)	NOMINAL DEPTH (m)	19 NOV FIELD EVENT ON/OFF TIMES (Z)	NOMINAL DEPTH (m)	21 NOV FIELD EVENT ON/OFF TIMES (Z)	NOMINAL DEPTH (m)
CFAV QUEST	55	141	1230/2230	110	1224/2215	95	1217/2030	110
	155	134	1230/2230	110	---	---	1217/2030	110
	305	136	1230/2230	110	1224/2215	95	1217/2030	110
CFAV KAPUSKACING	64	162	1230/2318	110	1230/2230	115	1230/2030	120
	160	151	1230/2318*	110	---	---	1230/2030	120
R/V CHAIN	70	166	1225/2200	100	1225/2200	95	1230/2030	85
	170	156	1225/2200	100	---	---	1230/2030	85
	355	154	1645/2200	100	1225/2200	95	1230/2030	85

* FREQUENCY VARYING 1 CYCLE

UNCLASSIFIED

CONFIDENTIAL

- (C) Data products of the first type are termed summary detection plots (Appendix A, Figs. III-1 - III-23). These are plots of each detected line within a frequency band as a function of time. The solid symbols indicate that the line was detected in multiple cells and/or on multiple beams of the sensor. The X symbols indicate that the line was only detected in a single cell on a single beam of the sensor. The solid line emanating from each symbol indicates the maximum signal-to-noise ratio (S/N) of any cell of the line. If the sensor provides bearing information, the solid line also indicates the estimated bearing, north being toward the top of the plot. The dashed lines indicate which of the detections were linked by the tracking algorithm. These displays are intended to provide qualitative information about the environment in which the processor must function in terms of line loading and relative clutter density between sensors and frequency regimes. More quantitative information will be found in section III of this volume.
- (C) Data products of the next type (Appendix B, Figs. III-24 - III-163) are termed line history plots, and are cataloged in Table III-4. These are plots of the estimated CW signal parameter values as a function of time. The top portion of the plot contains a solid line indicating ground truth source-to-receiver range in nautical miles and X's indicating the number of equivalent degrees of freedom for each ALI. The second portion contains a solid line denoting ground truth receiver-to-source bearing, X's indicating the estimated signal bearing and $\square$'s indicating the estimated noise bearing. Gaps in the solid ground truth lines indicate intervals of missing data, such as calibration signal intervals. The third portion contains the estimated ambient sound field (ASF) levels in dB// μ Pa/Hz^{1/2}. The omnidirectional (O) and vertical dipole (VD) sensor curves contain a single trace of connected X's. The single cardioids (SC), maximum gain limacons (MGL) and differenced cardioids (DC) curves contain a trace for each beam. Each beam is labeled by the first letter of its main axis bearing (north, east, south, and west). ASF level estimates were displayed only when the signal was detected. The fourth portion of the plot contains the estimated sound pressure level (SPL) in dB// μ Pa of the received signal. The O and VD sensor curves each contain

CONFIDENTIAL

UNCLASSIFIED

(U)

TABLE III-4

VERNIER RESOLUTION LINE HISTORY PLOTS

Source Platform		Source Frequency	17 NOV (321)												19 NOV (323)						21 NOV (325)					
			Site A1						Site A2						Site A3						Site A3					
			0	SC	MGL	VD	DC	0	SC	MGL	VD	DC	0	SC	MGL	VD	DC	0	SC	MGL	VD	DC	0	SC	MGL	VD
QT	55	24	25	26	27	28	60	61	62	ND	63	95	96	97	98	99	ND	ND	ND	ND	ND	ND	141	ND	142	
KP	64	37	38	39	40	41	72	73	74	75	76	108	109	110	111	112	131	132	133	134	146	147	148	149		
CH	70	47	48	49	50	51	82	83	84	85	86	118	119	120	121	122	135	136	137	138	154	155	156	157		
QT	155	29	30	31	32	33	64	65	66	67	68	100	101	102	103	104	---	---	---	---	ND	143	ND	ND		
KP	160	42	43	44	45	46	77	78	79	80	81	113	114	115	116	117	---	---	---	---	150	151	152	153		
CH	170	52	53	54	55	56	87	88	89	90	91	123	124	125	126	127	---	---	---	---	158	159	160	161		
QT	305	34	35	36	--	--	69	70	71	--	--	105	106	107	---	---	ND	ND	---	---	144	145	---	---		
CH	335	57	58	59	--	--	92	93	94	--	--	128	129	130	---	---	139	140	---	---	162	163	---	---		

ND - Not Detected

UNCLASSIFIED

CONFIDENTIAL

- (C) two traces: the X's denote the levels for the cell with the highest S/N (most detectable); the +'s denote the levels summed over all detected cells, as is normally done when computing propagation loss. The SC, MGL, and DC sensor curves each contain four traces, each giving the levels for the most detectable cell on a beam and annotated in the same manner as the ASF levels. The fifth portion of the plot contains the S/N in decibels relative to a 1 Hz noise band. The traces are defined in the same manner as the SPL curves. The dashed line denotes the detection threshold. The bottom portion of the plot contains two traces: the X's denote the estimated signal frequency, and the $\square$'s denote the line's bandwidth. These displays contain all of the information known about the signal. All of the remaining cw data products are derived from these data.
- (C) Data products of the next type (Appendix C, Figs. III-164 - III-171) are termed propagation loss plots, and are cataloged under the 0 sensor columns of Table III-5. These plots contain curves of the estimated cw propagation loss in decibels as a function of range in nautical miles. Below these are other traces denoting the associated signal excess, $(S+N)/N$, at each range bin in decibels relative to the noise level in the analysis bandwidth. These traces indicate the confidence associated with the measurements. The bottom traces denote the estimated background ASF levels associated with each range bin. These measurements were derived for a 1 nmi range bin, and smoothed with a 3-bin sliding average. The received signal power was estimated from that cell with the highest S/N of any detected cell on any beam. Since these are single cell measurements, they will show more loss than the total received SPL technique, such as was used in Ref. 2. This difference is discussed in Volume IV.
- (C) Data products of the next type (Appendix D, Figs. III-172 - III-199) are termed signal, noise, and array gain plots, and are cataloged in Table III-5 under the sensors other than 0. These are plots of measured

UNCLASSIFIED

(U)

TABLE III-5

VERNIER RESOLUTION PROPAGATION LOSS OR SIGNAL,
NOISE, AND ARRAY GAIN VERSUS RANGE PLOTS

Source Platform	Source Frequency	17 NOV (321)																								19 NOV (323)						21 NOV (325)					
		Site A1						Site A2						Site A3						Site A3						Site A3											
		0	SC	MGL	VD	DC	0	SC	MGL	VD	DC	0	SC	MGL	VD	DC	0	SC	VD	DC	0	SC	VD	DC	0	SC	VD	DC									
QT	55	164	172	173	174	175	164	172	173	ND	175	164	172	173	174	175	ND	ND	ND	ND	ND	172	ND	175	ND	172	ND	175									
KP	64	165	176	177	178	179	165	176	177	178	179	165	176	177	178	179	165	176	178	179	165	176	178	179	165	176	178	179									
CH	70	166	180	181	182	183	166	180	181	182	183	166	180	181	182	183	166	180	182	183	166	180	182	183	166	180	182	183									
QT	155	167	184	185	186	187	167	184	185	186	187	167	184	185	186	187	---	---	---	---	---	---	---	---	ND	184	ND	ND									
KP	160	168	185	189	190	191	168	188	189	190	191	168	188	189	190	191	---	---	---	---	---	---	---	---	168	188	190	191									
CH	170	169	192	193	194	195	169	192	193	194	195	169	192	193	194	195	---	---	---	---	---	---	---	---	169	192	194	195									
QT	305	170	196	197	---	---	170	196	197	---	---	170	196	197	---	---	ND	ND	---	---	---	---	---	---	170	196	---	---									
CH	335	171	198	199	---	---	171	198	199	---	---	171	198	199	---	---	171	198	---	---	---	---	---	---	171	198	---	---									

ND - Not Detected

UNCLASSIFIED

CONFIDENTIAL

(C) sensor signal, noise, and S/N levels relative to those of an omnidirectional sensor (0) as a function of range. The top portion of the plot indicates how many samples (0 sensor detections) occurred in each range bin. The next portion contains traces denoting the measured signal gain of the sensor, where signal gain is the ratio of the received SPL of this sensor over that of the 0 sensor. The next portion contains traces denoting the measured array gain of the sensor, where array gain is the ratio of the S/N of this sensor over that of the 0 sensor. The bottom portion contains traces denoting the measured noise gain of the sensor, where noise gain is the ratio of the ASF level of this sensor over that of the 0 sensor. Since signal gain is primarily a function of range, whereas noise gain is a function primarily of time, this display allows array gain to be interpreted in terms of both range and time. All of the traces were computed with 1 nmi range bins and smoothed with a 3 nmi sliding average.

(C) When computing average S/N as a function of range, if the signal is not detected during every ALI, the resultant average will be biased high. This bias occurs because only the highest S/N ratios are detected. In order to reduce this bias, the detection threshold (Table III-2) has been substituted for the missing S/N wherever the target was not detected. This debiasing technique was used both for computing array gain and for generating curves of S/N versus range.

(C) Data products of the next type (Appendix E, Figs. III-200 - III-235) are termed percentage detection plots, and are cataloged in Table III-6. These curves of single line detection percentages were calculated as the number of independent detection opportunities (ALI intervals) that the specified source was within a given integer 1 mile range interval and that resulted in detection, divided by the number of such opportunities. For multibeam sensors, detection on any beam was considered a detection for the sensor. If the number of equivalent degrees of freedom for an ALI was less than that specified in Table III-2 (some portion of the ALI interval was missing), and the signal was not detected,

UNCLASSIFIED

TABLE III-6
VERNIER RESOLUTION PROBABILITY OF
DETECTION VERSUS RANGE PLOTS

(U)

Source Platform	Source Frequency	17 NOV (321)												19 NOV (323)				21 NOV (325)							
		Site A1						Site A2						Site A3											
		0	SC	MGL	VD	DC	0	SC	MGL	VD	DC	0	SC	MGL	VD	DC	0	SC	VD	DC	0	SC	VD	DC	
QT	55	200	201	202	203	204	200	201	202	ND	204	200	201	202	203	204	ND	ND	ND	ND	ND	201	ND	204	
KP	64	213	214	215	216	217	213	214	215	216	217	213	214	215	216	217	213	214	216	217	213	214	216	217	
CH	70	223	224	225	226	227	223	224	225	226	227	223	224	225	226	227	223	224	226	227	223	224	226	227	
QT	155	205	206	207	208	209	205	206	207	208	209	205	206	207	208	209	---	---	---	---	---	ND	206	ND	ND
KP	160	218	219	220	221	222	218	219	220	221	222	218	219	220	221	222	---	---	---	---	---	218	219	221	222
CH	170	228	229	230	231	232	228	229	230	231	232	228	229	230	231	232	---	---	---	---	---	228	229	231	232
QT	305	210	211	212	---	---	210	211	212	---	---	210	211	212	---	---	ND	ND	---	---	---	210	211	---	---
CH	335	233	234	235	---	---	233	234	235	---	---	233	234	235	---	---	233	234	---	---	---	233	234	---	---

ND - Not Detected

UNCLASSIFIED

CONFIDENTIAL

(C) then the ALI was not counted as a valid detection opportunity. These editing criteria were required because the detection threshold for each ALI was determined by its number of degrees of freedom. All of the traces were smoothed with a 3 nmi sliding average. If the sensor furnished a bearing estimate, its rms bearing error was also plotted as a function of range.

(C) Data products of the next type (Appendix F, Figs. III-236 - III-257) are termed bearing error plots, and are cataloged in Table III-7. These are curves of the number of bearing estimates (detections), the mean bearing error (estimated bearing *minus* ground truth bearing), the rms bearing error, and the bearing error standard deviation, all plotted as a function of S/N in dB//1 Hz noise band. The ground truth bearing was computed from the navigation reconstruction as the great circle receiver-to-source bearing at the receiver and at the beginning of the ALI. The estimated bearings were corrected for magnetic variation and acoustically debiased (see Volume I). Each trace was smoothed with a 3 dB sliding average.

(C) Data products of the last type (Appendix G, Figs. III-258 - III-293) are curves of S/N (dB//1 Hz noise band) versus range (nmi), and are cataloged in Table III-8. These measurements were obtained from the detected cell with the highest S/N on any beam. As described earlier, these results are partially debiased by substitutions of the detection threshold during ALI intervals without signal detections. The detection threshold is drawn on each plot. Each trace was smoothed with a 3 nmi sliding average.

UNCLASSIFIED

TABLE III-7
VARIATION IN SOLUTION BEARING ERROR
VERSUS SIGNAL-TO-NOISE RATIO PLOTS

Source Platform	Source Frequency	17 NOV (321)										19 NOV (323)										21 NOV (325)									
		Site A1					Site A2					Site A3					Site A3					Site A3									
		0	SC	MC/L	VD	DC	0	SC	MC/L	VD	DC	0	SC	MC/L	VD	DC	0	SC	VD	DC	0	SC	VD	DC	0	SC	VD	DC			
QT	55	---	236	237	---	238	---	236	237	---	238	---	236	237	---	238	---	ND	---	---	ND	---	236	---	238	---	236	---	238		
KP	64	---	244	245	---	246	---	244	245	---	246	---	244	245	---	246	---	244	---	---	246	---	244	---	246	---	244	---	246		
CI	70	---	250	251	---	252	---	250	251	---	252	---	250	251	---	252	---	250	---	---	252	---	250	---	252	---	250	---	252		
QT	155	---	239	240	---	241	---	239	240	---	241	---	239	240	---	241	---	---	---	---	---	---	239	---	ND	---	239	---	ND		
KP	160	---	247	248	---	249	---	247	248	---	249	---	247	248	---	249	---	---	---	---	---	---	247	---	249	---	247	---	249		
CI	170	---	253	254	---	255	---	253	254	---	255	---	253	254	---	255	---	---	---	---	---	---	253	---	255	---	253	---	255		
QT	305	---	242	243	---	---	---	242	243	---	---	---	242	243	---	---	---	ND	---	---	---	---	242	---	---	---	242	---	---		
CI	335	---	256	257	---	---	---	256	257	---	---	---	256	257	---	---	---	---	---	---	---	---	256	---	---	---	256	---	---		

ND - Not Detected

UNCLASSIFIED

UNCLASSIFIED

TABLE III-8
VERNIER RESOLUTION SIGNAL-TO-NOISE RATIO VERSUS RANGE PLOTS

(U)

Source Platform	Source Frequency	17 NOV (321)												19 NOV (323)						21 NOV (325)						
		Site A1						Site A2						Site A3						Site A5						
		0	SC	MCL	VD	DC	0	SC	MCL	VD	DC	0	SC	MCL	VD	DC	0	SC	MCL	VD	DC	0	SC	MCL	VD	DC
QT	55	258	259	260	261	262	258	259	260	ND	262	258	259	260	261	262	ND	ND	ND	ND	ND	ND	259	ND	262	
LP	64	271	272	273	274	275	271	272	273	274	275	271	272	273	274	275	271	272	273	274	275	271	272	273	274	275
CH	79	281	282	283	284	285	281	282	283	284	285	281	282	283	284	285	281	282	283	284	285	281	282	283	284	285
QT	155	263	264	265	266	267	263	264	265	266	267	263	264	265	266	267	---	---	---	---	---	---	---	---	---	---
LP	160	276	277	278	279	280	276	277	278	279	280	276	277	278	279	280	---	---	---	---	---	---	---	---	---	---
CH	170	286	287	288	289	290	286	287	288	289	290	286	287	288	289	290	---	---	---	---	---	---	---	---	---	---
QT	305	268	269	270	---	---	268	269	270	---	---	268	269	270	---	---	ND	ND	---	---	---	---	---	---	---	---
CH	335	291	292	293	---	---	291	292	293	---	---	291	292	293	---	---	291	292	---	---	---	---	---	---	---	---

ND - Not Detected

UNCLASSIFIED

CONFIDENTIAL

III. AMBIENT SOUND FIELD DATA PRODUCTS

- (U) Three types of ambient sound field (ASF) measurements were performed: sound pressure levels at an omnidirectional sensor, noise gains of directional sensors, and clutter (processor loading) statistics of each sensor. The vernier frequency resolution ASF data products herein span an interval of 4 1/2 days, but have limited frequency coverage. The standard frequency resolution ASF data products in Volume II cover a wide frequency range (40 to 600 Hz), but are of only 12 hours duration. Each data product set can be used to extrapolate the other to different frequencies or times.
- (U) Data products of the first type (Appendix H, Figs. III-294 - III-301), are termed timeseries plots, and reveal the time dependence of the ASF measured in selected 1 Hz bands. The first three figures contain the omnidirectional ASF levels ($\text{dB}/\mu\text{Pa}/\text{Hz}^{1/2}$) in each vernier band. The remaining figures contain the noise gains (dB) where noise gain is the ratio of the ASF level of this sensor over that of the omnidirectional sensor. These timeseries plots were derived from ASF measurements summed over 1 Hz bands. The noise gains were derived for a 1 Hz band which was relatively free from contamination by tonals. The 1 Hz summation increased the number of equivalent degrees of freedom, and thus decreased the variance of the measurements.
- (C) Data products of the second type (Appendix I, Figs. III-302 - III-312), are termed clutter timeseries plots. These are plots of the number of detected cells, the number of lines formed, and the number of lines linked, for each ALI interval as a function of time. These measurements were obtained during field events only, and a separate curve is provided for each such event. The measurements were performed for three contiguous 10 Hz bands of 819 cells each. The results for each band were similar and have been combined into a single 30 Hz band for these curves.

CONFIDENTIAL

- (C) The clutter timeseries plots are intended to portray the shore link and processor capacity required for operations in the absence of targets. In order to provide accurate clutter measurements, it is necessary to first eliminate the loading incurred due to the presence of the exercise vessels and projectors. Table III-9 lists those lines which have been deleted from the clutter measurements, along with their probable sources.
- (U) Data products of the last type (Appendix J, Figs. III-313 - III-354), are termed 3D plots. These are 3-dimensional representations of omnidirectional ASF levels ($\text{dB}/\mu\text{Pa}/\text{Hz}^{1/2}$) as a function of time and frequency. Each trace represents the average over a 10 min interval and has been smoothed so as to maintain a constant number of equivalent degrees of freedom. Plots of data from the vertical dipole sensor are also included. These displays serve as a roadmap of the data since they reveal signatures, tones, artifacts, and broadband trends.

CONFIDENTIAL

(C)

TABLE III-9

LINES DELETED FROM CLUTTER MEASUREMENTS (U)

LOW FREQUENCY VERNIER (50 to 80 Hz)

55 Hz	Scheduled QUEST Projector Line
64 Hz	Scheduled KAPUSKACING Projector Line
70 Hz	Scheduled CHAIN Projector Line
76 Hz	ARL:UT Translator Artifact
79 Hz	ARL:UT Translator Artifact

MIDFREQUENCY VERNIER (150 to 180 Hz)

155 Hz	Scheduled QUEST Projector Line
160 Hz	Scheduled KAPUSKACING Projector Line
170 Hz	Scheduled CHAIN Projector Line

HIGH FREQUENCY VERNIER (305 to 335 Hz)

305 Hz	Scheduled QUEST Projector Line
320 Hz	KAPUSKACING Projector Harmonic (5x64 or 2x160)
324 Hz	KAPUSKACING Projector Sum Frequency (64+260)
335 Hz	Scheduled CHAIN Projector Line

CONFIDENTIAL

CONFIDENTIAL

IV. DISCUSSION

- (U) The analysis of these data is contained in Volume IV. However, a brief discussion of some of their limitations may prevent those readers not having access to Volume IV from drawing unwarranted conclusions.
- (C) The curves in this volume denote the estimated averages of complex stochastic processes. The estimates are displayed as a function of a single variable, such as range, even though they may be highly dependent on another variable, such as the time dependence of S/N or array gain. The signal, noise, and array gain displays allow the time and range dependencies to be somewhat separated, whereas the percentage detection and S/N versus range displays do not. Even though the propagation loss and signal, noise, and array gain displays separate the time dependence of the ASF from the range dependence of the signal field, they do not isolate the time dependence of the signal field. However, since these curves are in good agreement for all three data intervals at Site A3, the day-to-day time dependence of the signal field, as observed with a 5 min ALI, is probably small.
- (U) Since the curves are estimated averages of complex stochastic processes (assumed to be stationary in a wide sense), the variance of these estimates is highly dependent on the number of sample measurements. For most of the cw curves, and particularly for the lower level signals, the number of samples is small (<10). The variance of each curve has been decreased by a smoothing window which effectively tripled the number of samples in each bin, but also decreased the resolution of the curve. However, the statistical fluctuation of these estimates does not entirely account for the apparently anomalous results from the low level signals. As is discussed in Volume IV, these results are sometimes severely biased. This is because a fixed threshold detection process

CONFIDENTIAL

(U) was used to extract signal measurements, and thus only that portion of the signal SPL distribution lying above the threshold was used to estimate its average. For the higher level sources, more of the SPL distribution was detected and used to estimate its average. As was discussed earlier, a simple technique was used to partially debias the S/N results.

(C) The results that appear most anomalous are those at 55 Hz, where the entire SPL distribution is undetectable. The 55 Hz detections occurred only when the ASF level in the signal cell exceeded the estimated ASF mean level sufficiently that it forced the signal-plus-noise level above the detection threshold. This results in erroneous cw measurements (Ref. 3). This phenomenon is discussed more fully in Volume IV. (pp. 62-65).

UNCLASSIFIED

REFERENCES

1. Steven L. Watkins, "MSS/FVT cw Projector Reconstruction," Applied Research Laboratories Technical Report No. 76-16 (ARL-TR-76-16), Applied Research Laboratories, The University of Texas at Austin, October 1976. UNCLASSIFIED
2. Steven L. Watkins, "MSS/FVT Ambient Sound Field and cw Propagation Measurements for Near-Bottom Sensors at Site A3" (U), Applied Research Laboratories Technical Report No. 76-52 (ARL-TR-76-52), Applied Research Laboratories, The University of Texas at Austin, December 1976. CONFIDENTIAL
3. Jack A. Shooter and Steven L. Watkins, "Estimation of Background Ambient Noise Level from the Spectral Analysis of Time Series with Application to cw Propagation Loss Measurements," J. Acoust. Soc. Am. 62, 84-90 (1977). UNCLASSIFIED

UNCLASSIFIED

APPENDIX A

SUMMARY DETECTION CURVES (U)

(FIGURES III-1 - III-23)

UNCLASSIFIED

CONFIDENTIAL

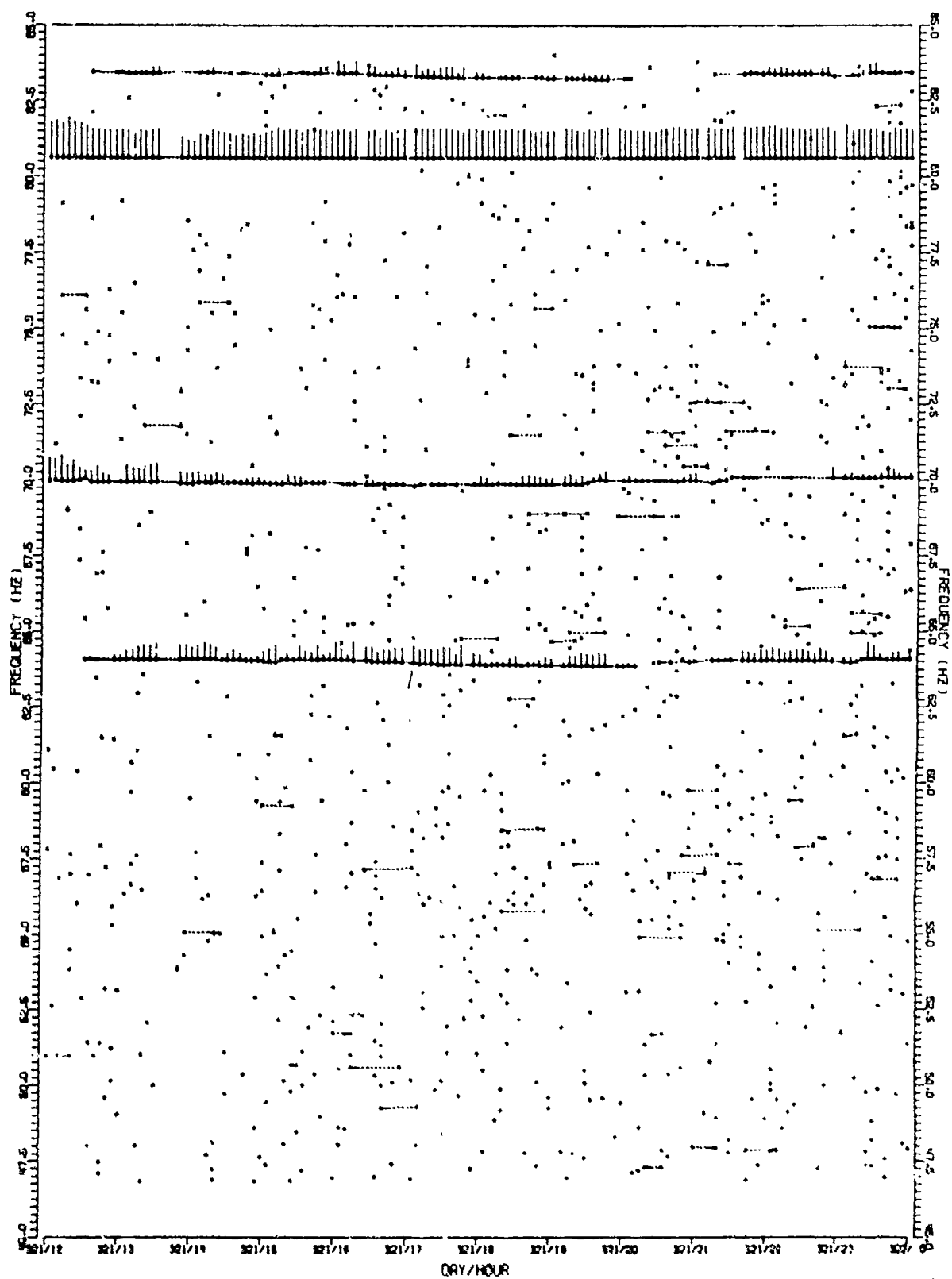


FIGURE III-1
BSS-FVT LOW-BAND DETECTION OVERVIEW DURING THE 17 NOV FIELD EVENT AT SITE A1
OBTAINED VIA THE OMNIDIRECTIONAL SENSOR WITH VERNIER RESOLUTION (1)

AS-77-2601

CONFIDENTIAL

CONFIDENTIAL

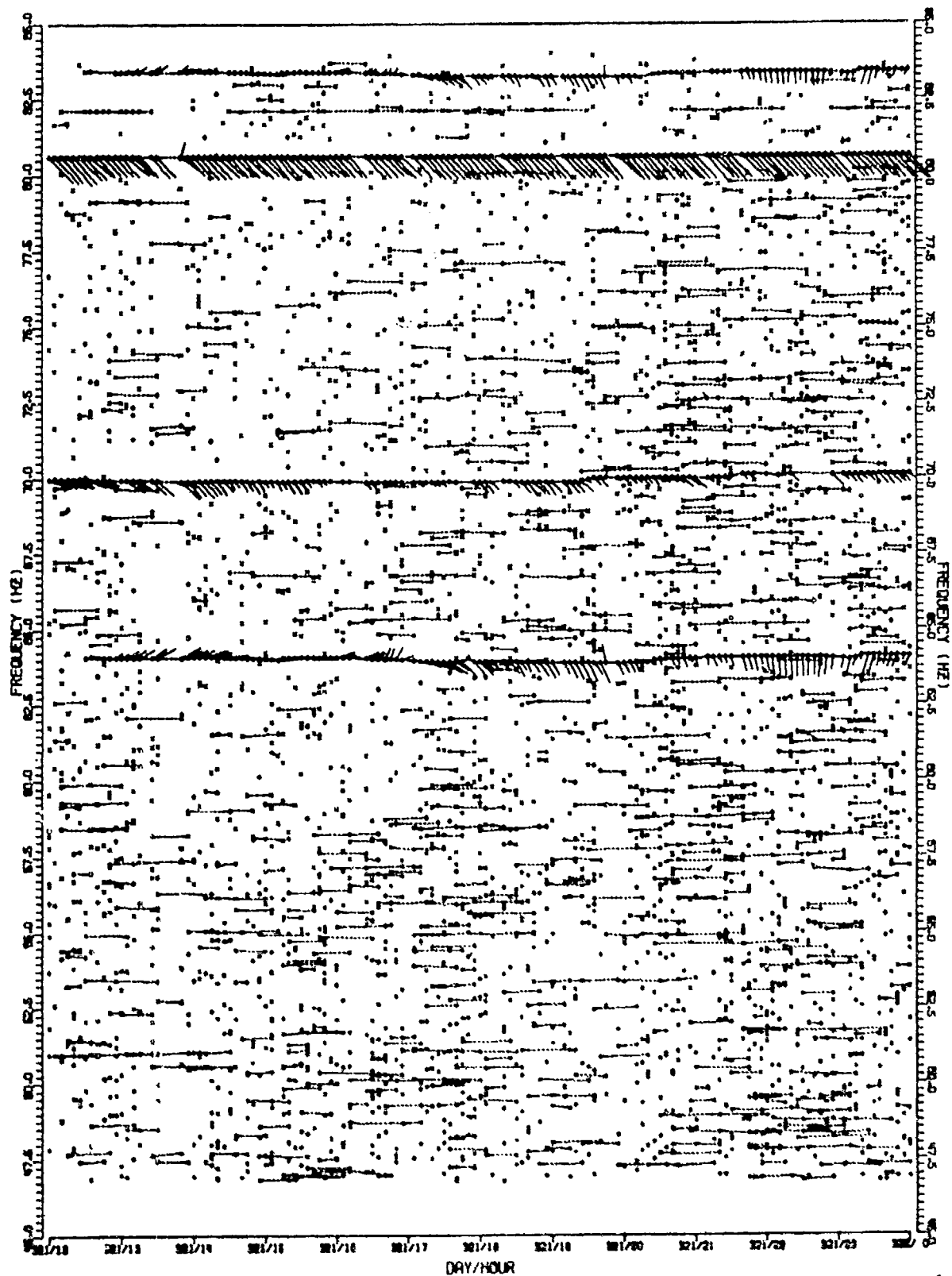


FIGURE 11-2
KSS-FVT LOW-BAND DETECTION OVERVIEW DURING THE 17 NOV FIELD EVENT AT SITE A1
OBTAINED VIA THE SINGLE CARDIOIDS SENSOR WITH VERNIER RESOLUTION (U)

AS-77-2602

CONFIDENTIAL

CONFIDENTIAL

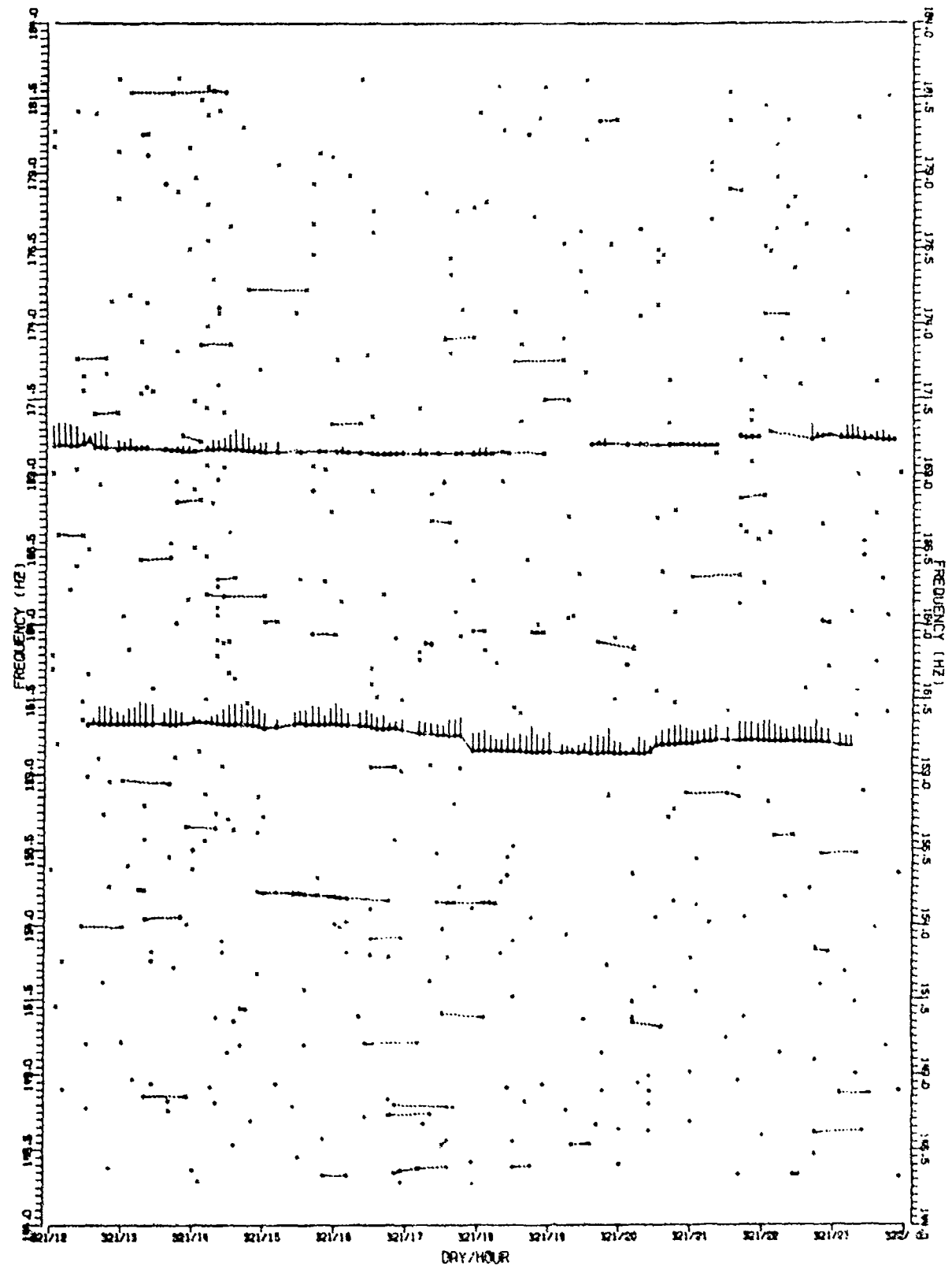


FIGURE 111-3
MSS-FVT MID-BAND DETECTION OVERVIEW DURING THE 17 NOV FIELD EVENT AT SITE A1
OBTAINED VIA THE OMNIDIRECTIONAL SENSOR WITH VERNIER RESOLUTION (U)

AS-77-2603

CONFIDENTIAL

CONFIDENTIAL

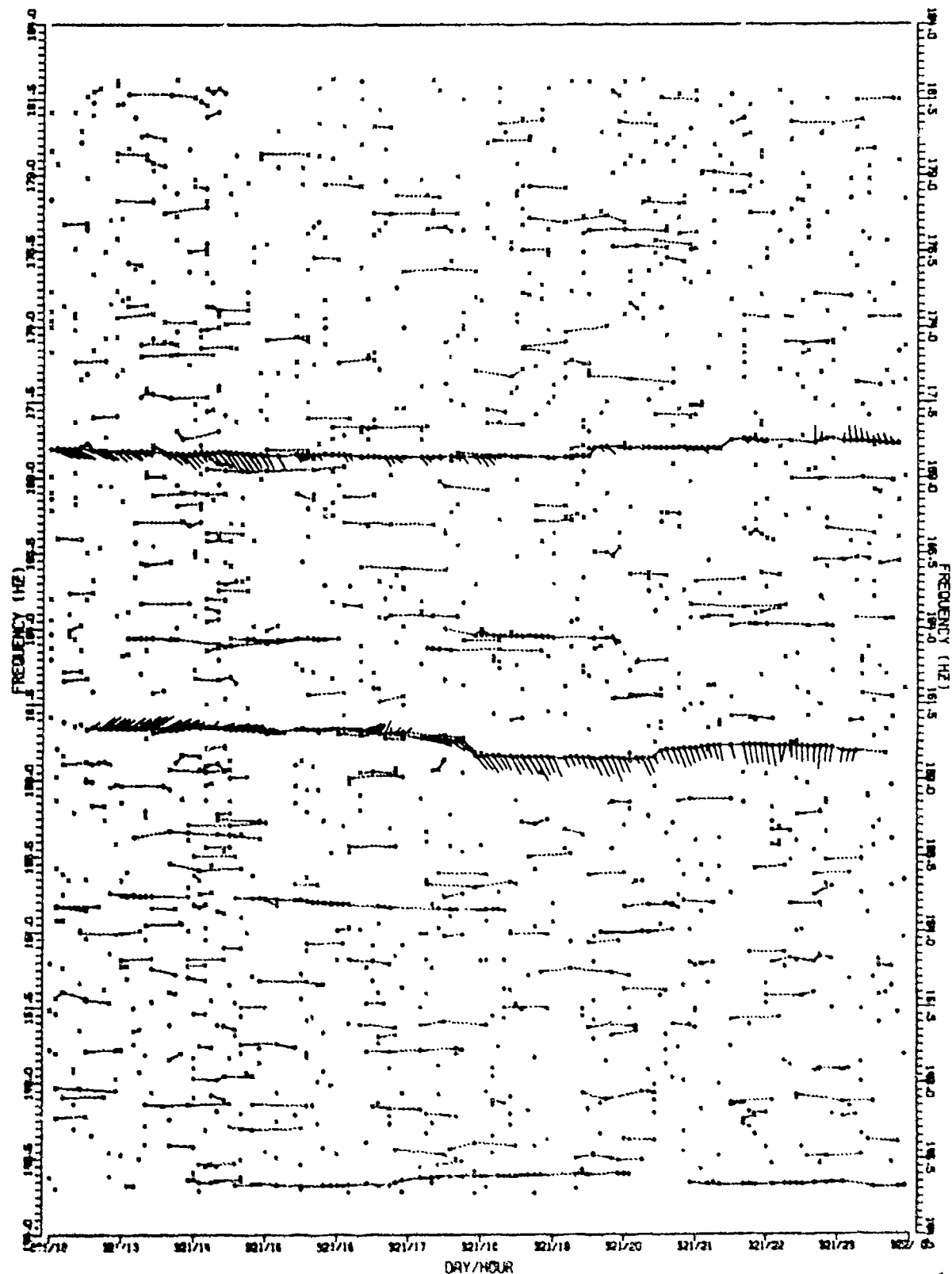


FIGURE 111-4
MSS-FVT MID-BAND DETECTION OVERVIEW DURING THE 17 NOV FIELD EVENT AT SITE A1
OBTAINED VIA THE SINGLE CAROTIDS SENSOR WITH VERNIER RESOLUTION (U)

AS-77-2604

CONFIDENTIAL

CONFIDENTIAL

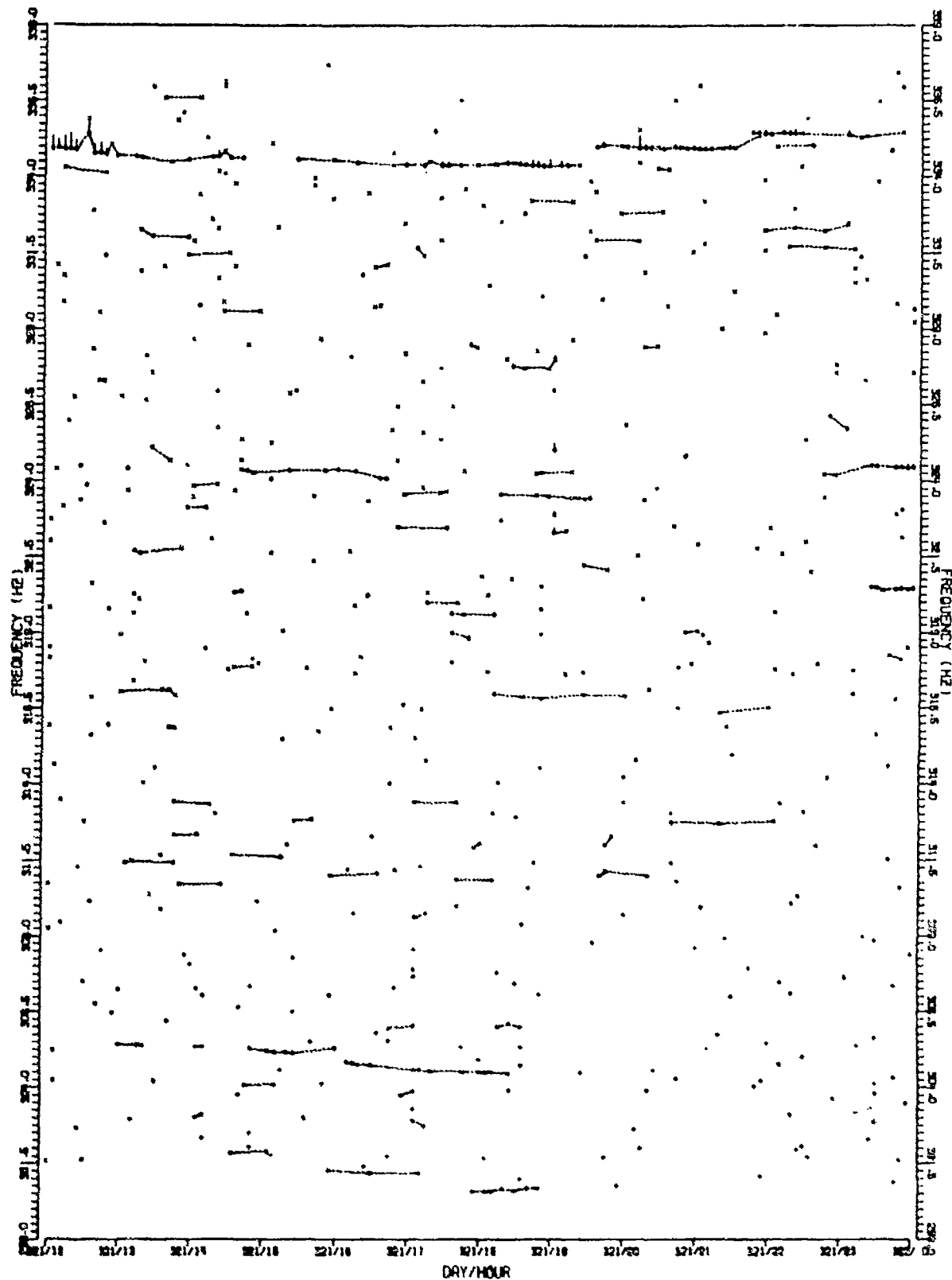
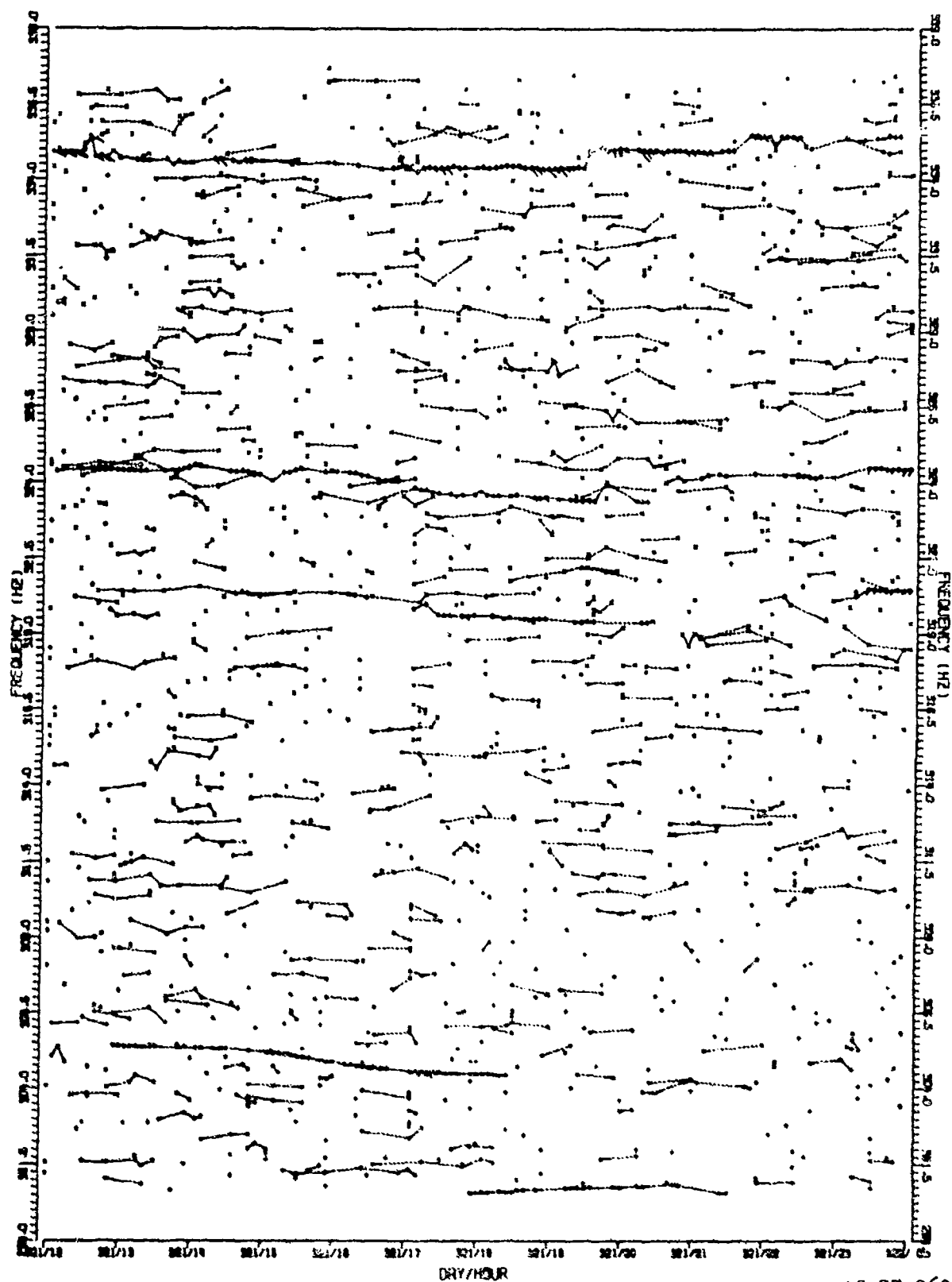


FIGURE 111-5
HSS-FVT HIGH-BAND DETECTION OVERVIEW DURING THE 17 NOV FIELD EVENT AT SITE A1
OBTAINED VIA THE OMNIDIRECTIONAL SENSOR WITH VELOCITY RESOLUTION (U)

AS-77-2605

CONFIDENTIAL

CONFIDENTIAL



AS-77-2606

FIGURE 111-6
MSS-FVT HIGH-BAND DETECTION OVERVIEW DURING THE 17 NOV FIELD EVENT AT SITE A1
OBTAINED VIA THE SINGLE CARDIOTIS SENSOR WITH VERNIER RESOLUTION (U)

CONFIDENTIAL

CONFIDENTIAL

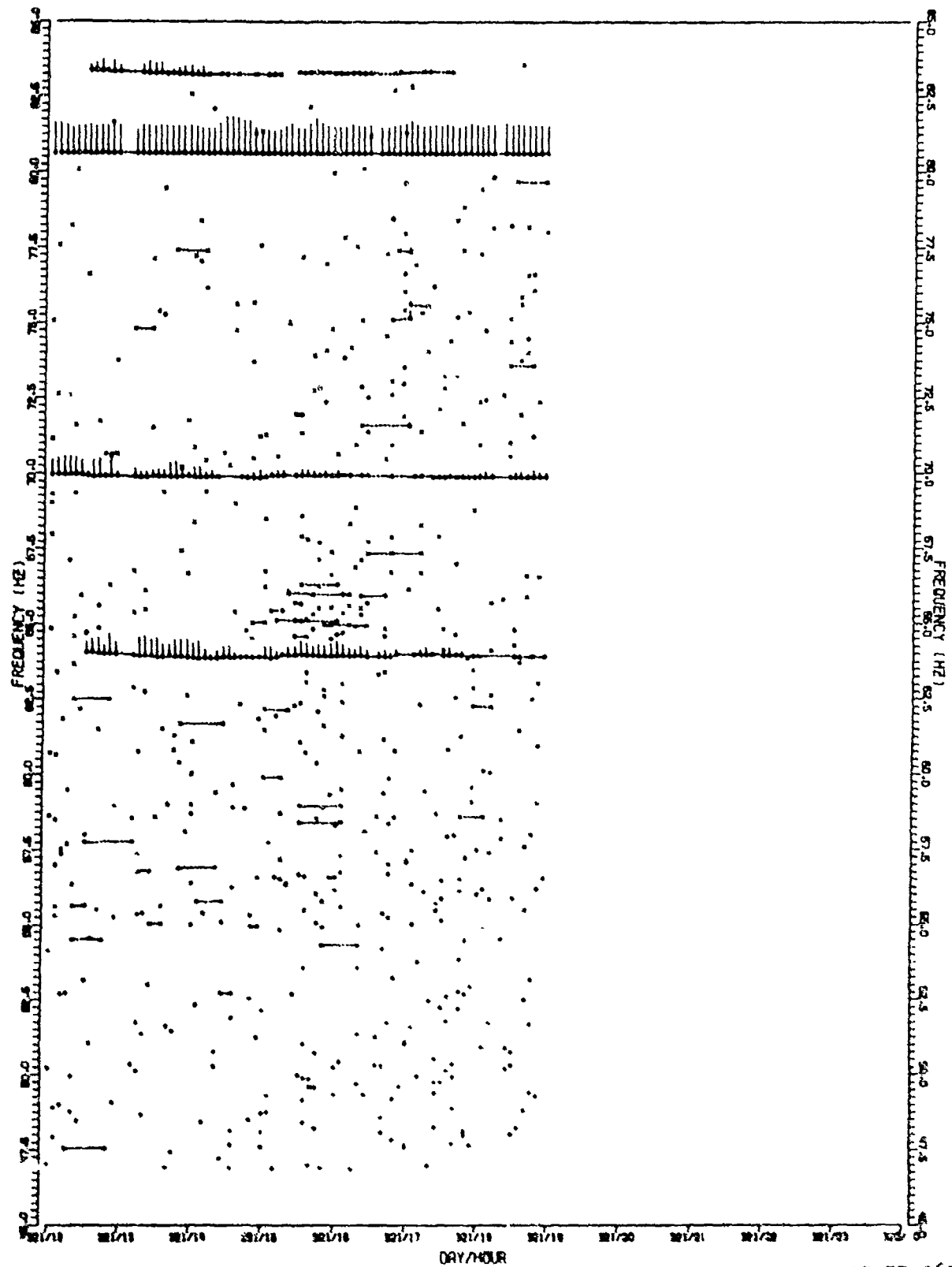


FIGURE 111-7
MSS-FVT LOW-BAND DETECTION OVERVIEW DURING THE 17 NOV FIELD EVENT AT SITE R2
OBTAINED VIA THE OMNIDIRECTIONAL SENSOR WITH VERNIER RESOLUTION (U)

AS-77-2607

CONFIDENTIAL

CONFIDENTIAL

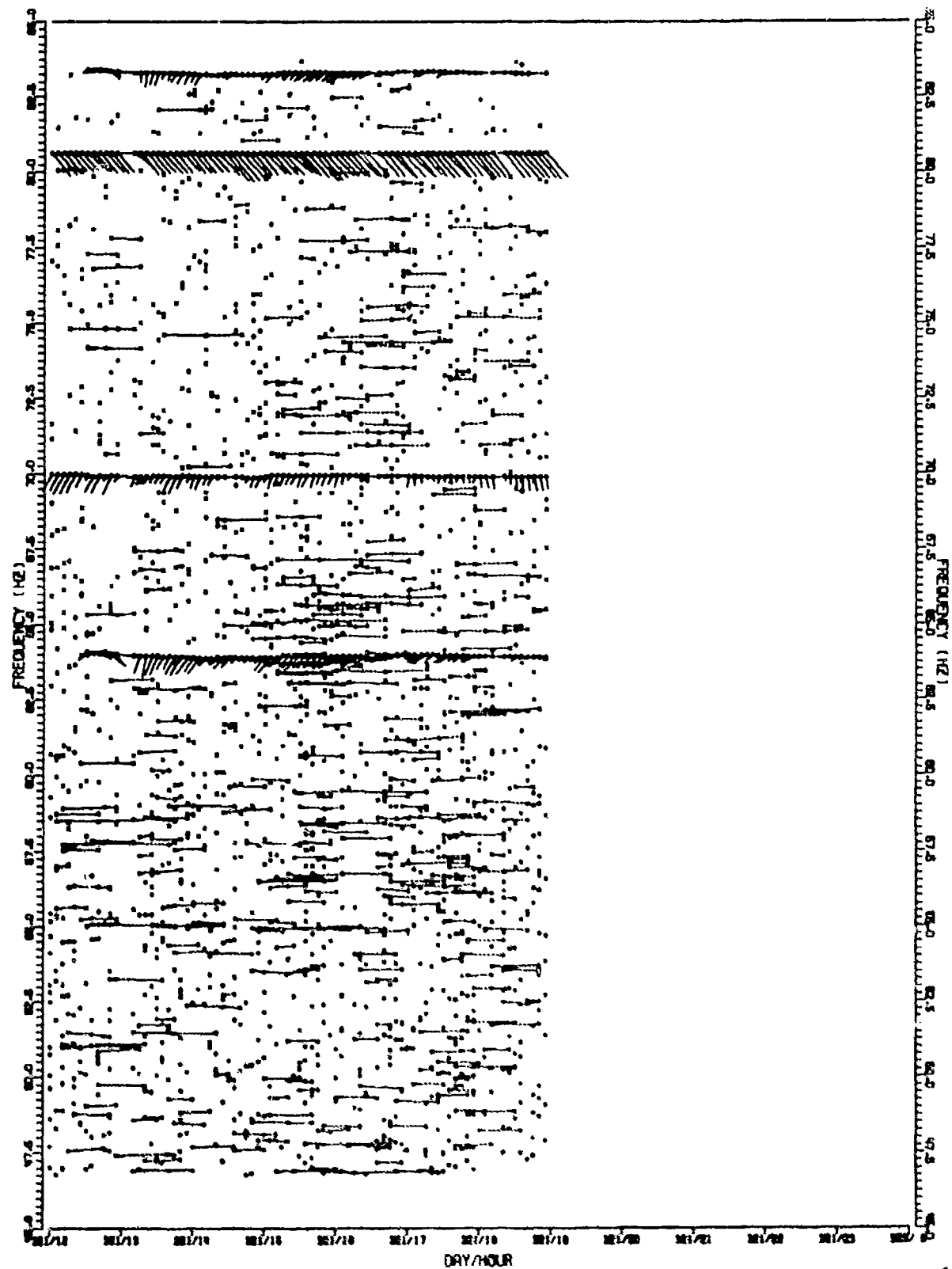


FIGURE III-8
MSS-FVT LOW-BAND DETECTION OVERVIEW DURING THE 17 NOV FIELD EVENT AT SITE A2
OBTAINED VIA THE SINGLE CARDIOIDS SENSOR WITH VERTICAL RESOLUTION (U)

AS-77-2608

CONFIDENTIAL

CONFIDENTIAL

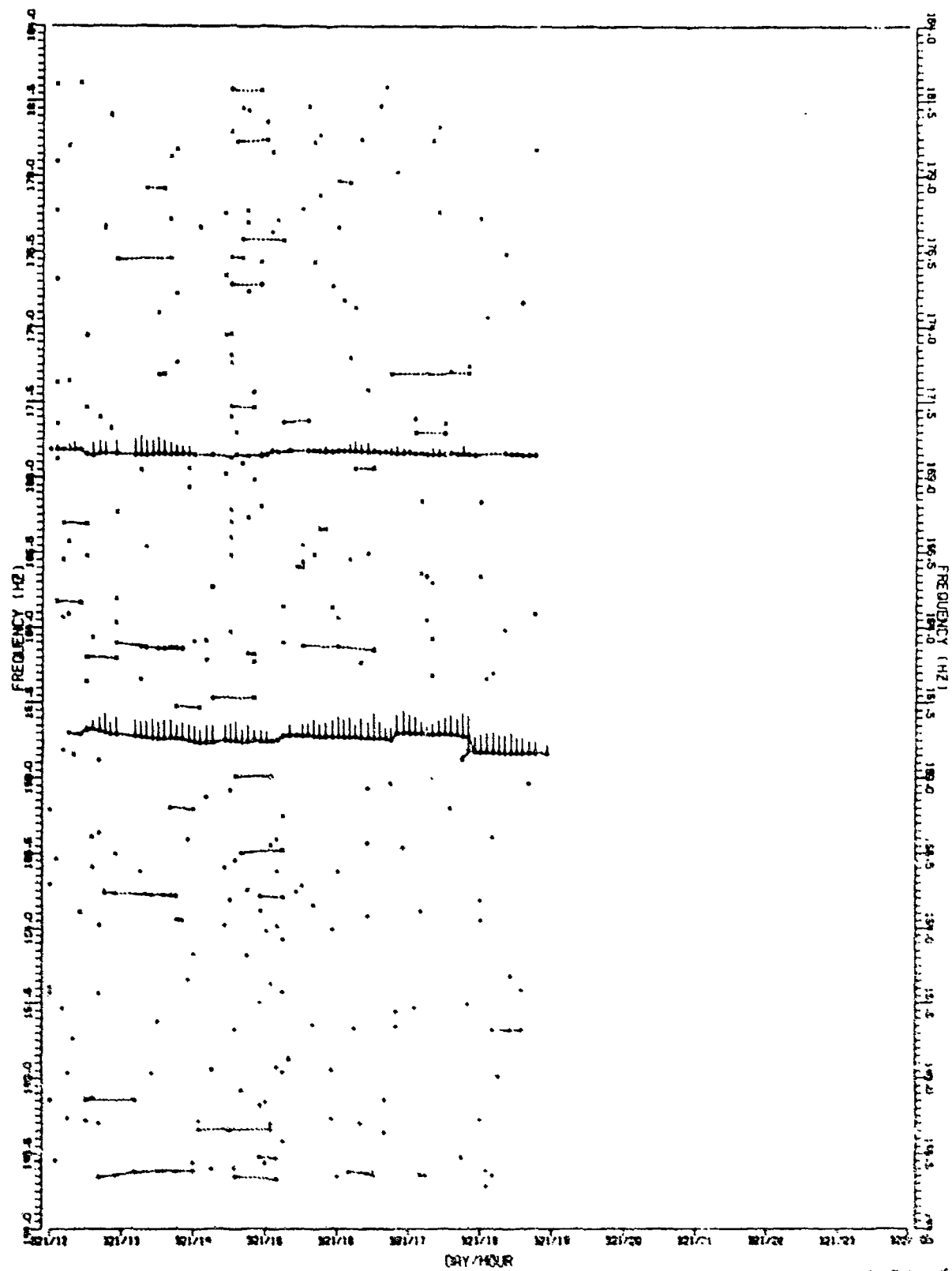


FIGURE 111-9
MSS-FVT MID-BAND DETECTION OVERVIEW DURING THE 17 NOV FIELD EVENT AT SITE A2
OBTAINED VIA THE OMNIDIRECTIONAL SENSOR WITH VERNIER RESOLUTION (U)

AS-77-2609

CONFIDENTIAL

CONFIDENTIAL

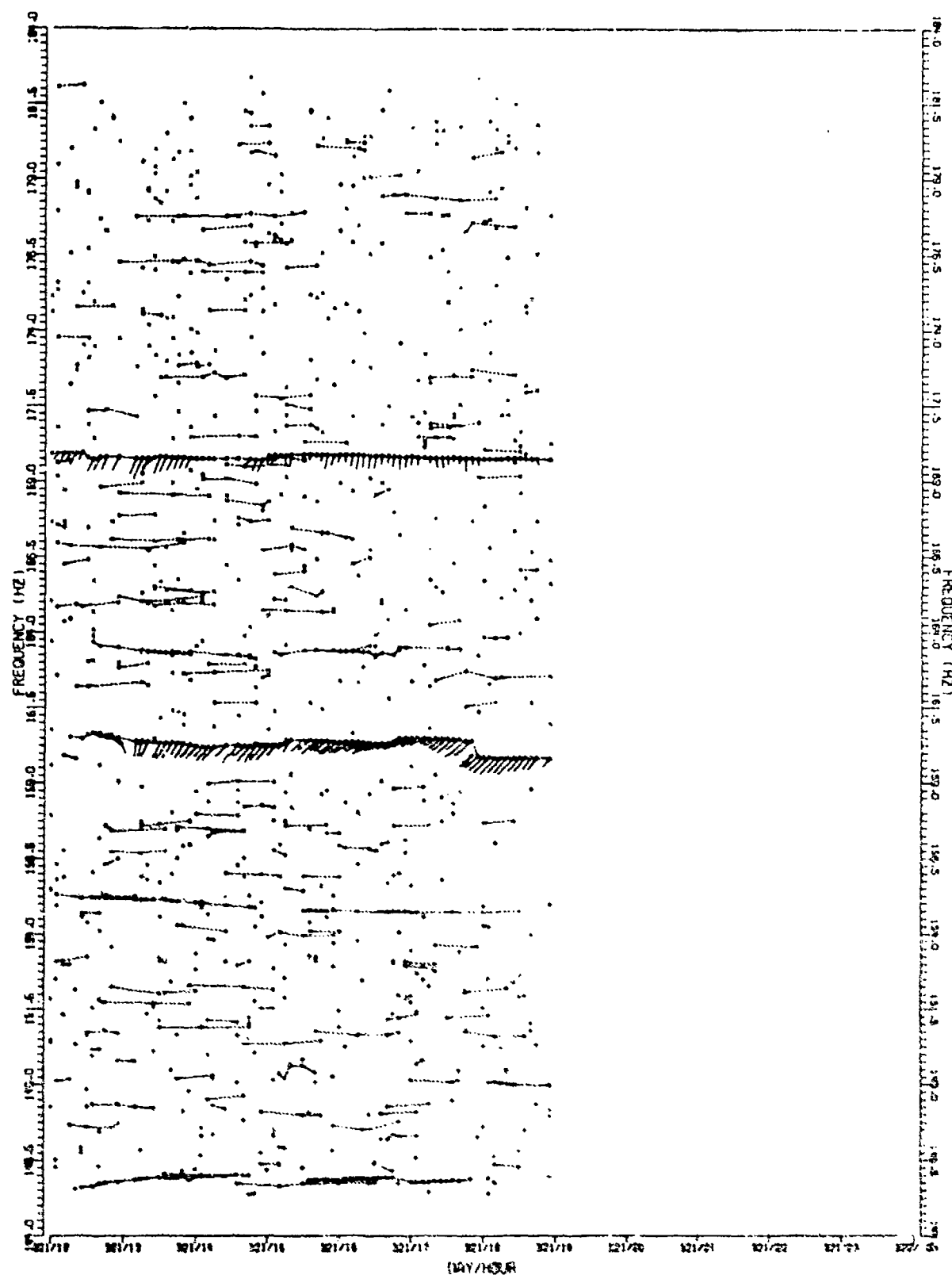


FIGURE 111.10
MSS-EVT MID-BAND DETECTION OVERVIEW DURING THE 17 NOV FIELD EVENT AT SITE Z2
OBTAINED VIA THE SINGLE CAROTIDS SENSOR WITH VERNIER RESOLUTION (1)

AS-77-2610

CONFIDENTIAL

CONFIDENTIAL

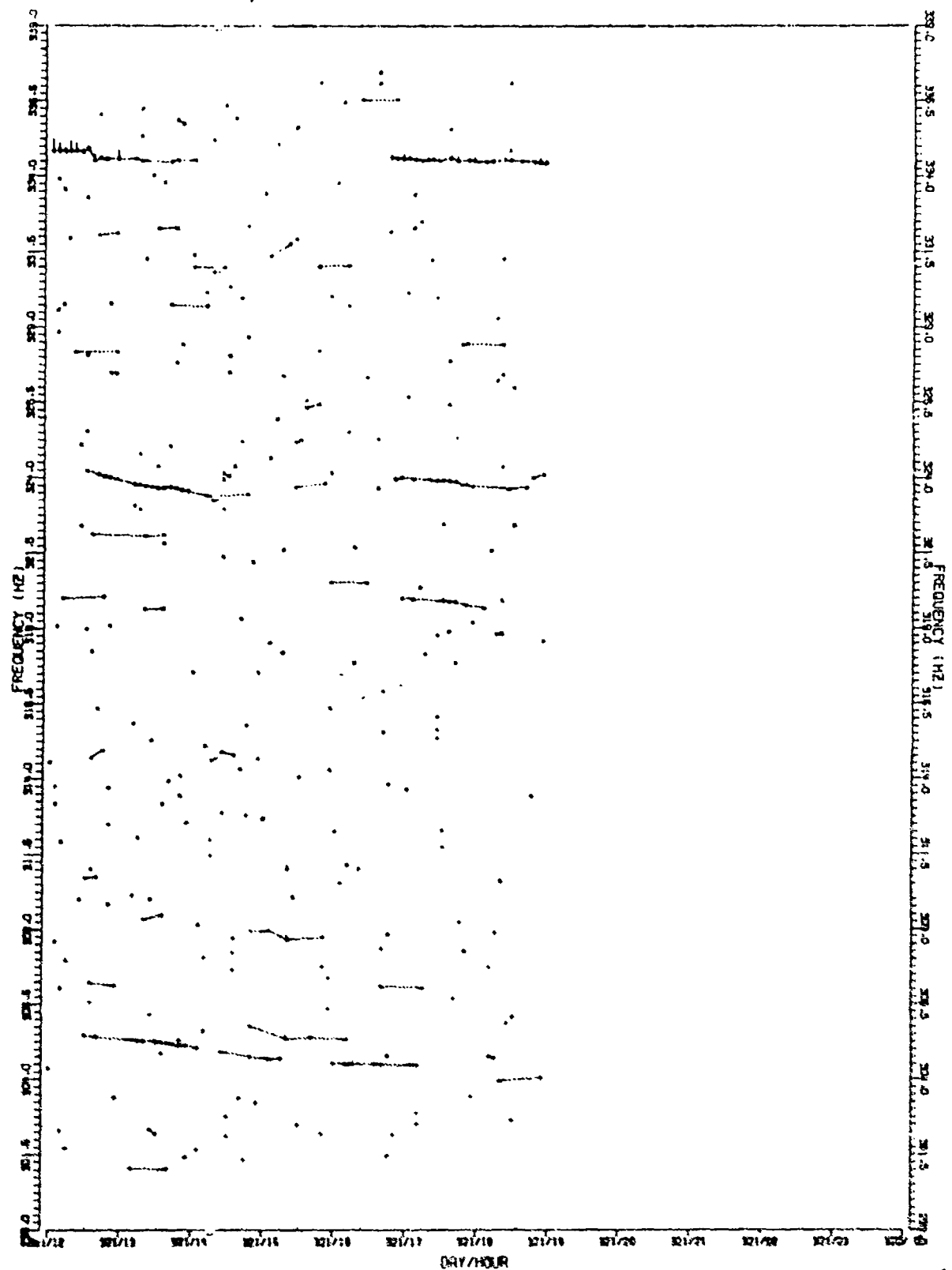


FIGURE 111-11
HSS-FVT HIGH-SPAD DETECTION OVERVIEW DURING THE 17 NOV FIELD EVENT AT SITE #2
20-2100 VIA THE OMNIDIRECTIONAL SENSOR WITH VERTIER RESOLUTION 111

AS-77-2611

CONFIDENTIAL

CONFIDENTIAL

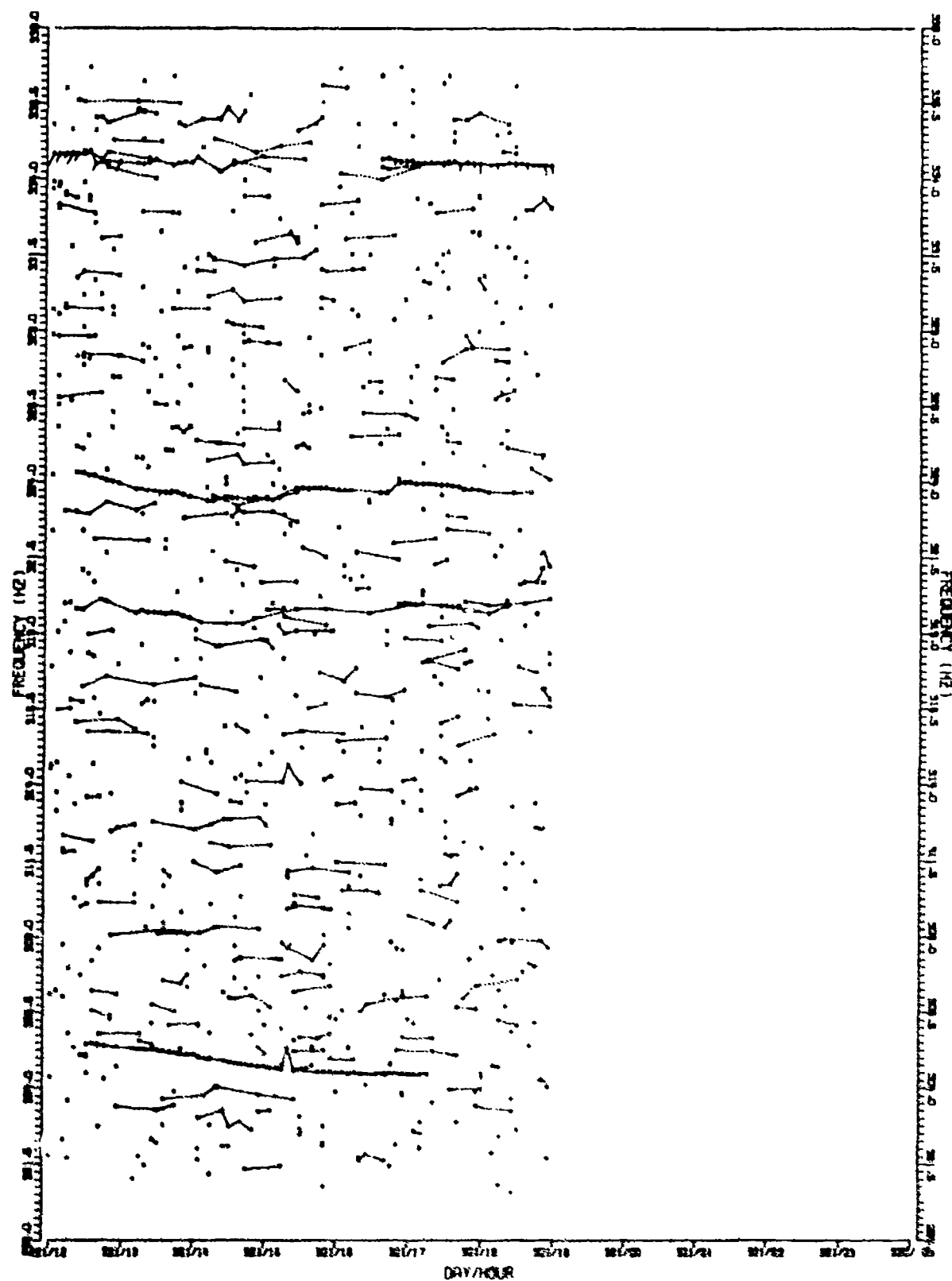


FIGURE 111-12
MSS-FVT HIGH-BAND DETECTION OVERVIEW DURING THE 17 NOV FIELD EVENT AT SITE R2
OBTAINED VIA THE SENSITIVE CAPTAIN'S SENSOR WITH VERNIER RESOLUTION (11)

AS-77-2612

CONFIDENTIAL

CONFIDENTIAL



FIGURE 111-13
NKS-FVT LOW-FREQUENCY DETECTION OVERVIEW DURING THE 17 NOV FIELD EVENT AT SITE A3
OBTAINED VIA THE OMNIDIRECTIONAL SENSOR WITH VERTICAL RESOLUTION (V)

AS-77-2613

CONFIDENTIAL

CONFIDENTIAL

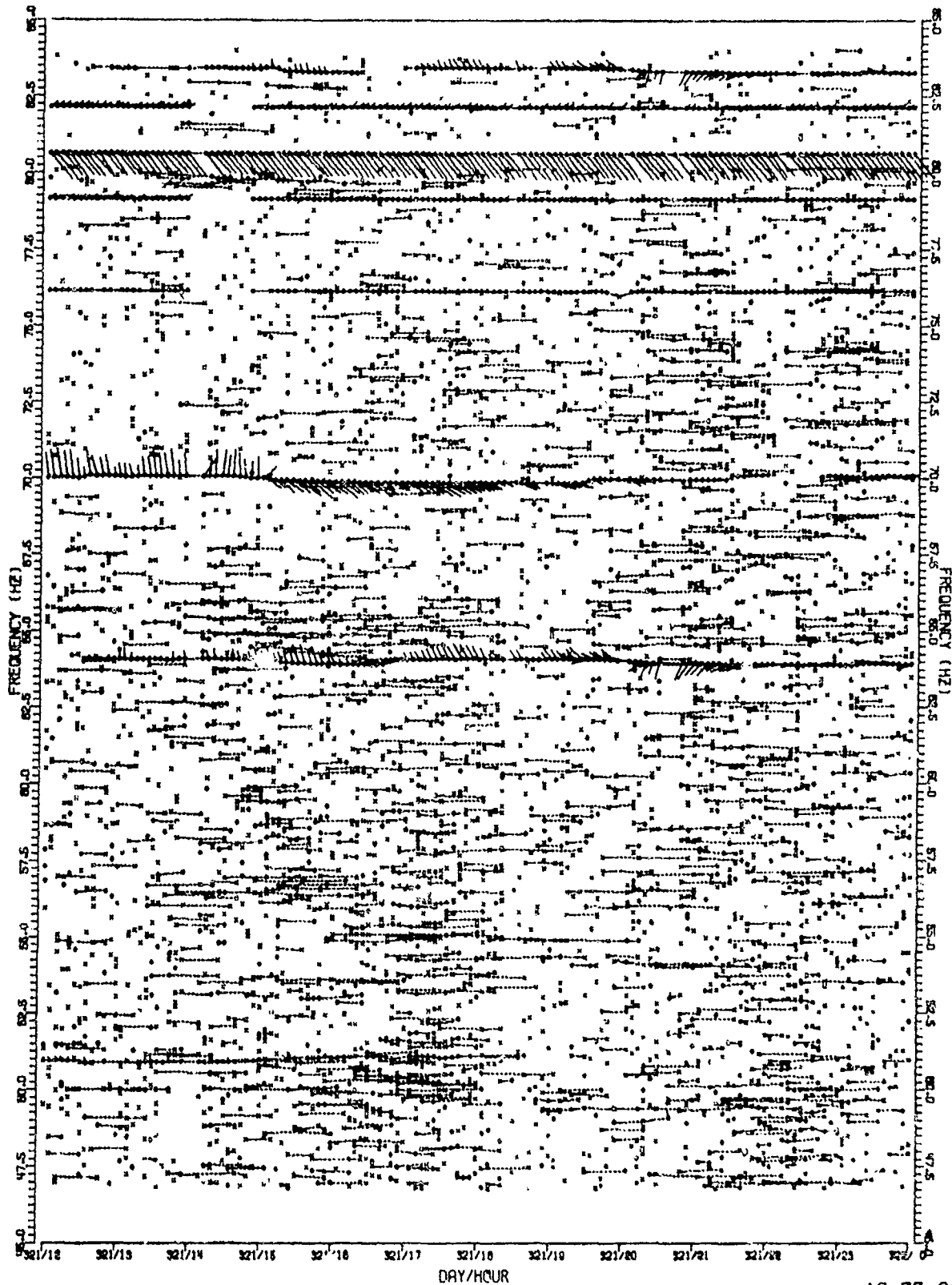


FIGURE 11'-14

MSS-FVT LOW-BAND DETECTION OVERVIEW DURING THE 17 NOV FIELD EVENT AT SITE A3
OBTAINED VIA THE SINGLE CARDIOTIS SENSOR WITH VERNIER RESOLUTION (U)

AS-77-2614

CONFIDENTIAL

CONFIDENTIAL

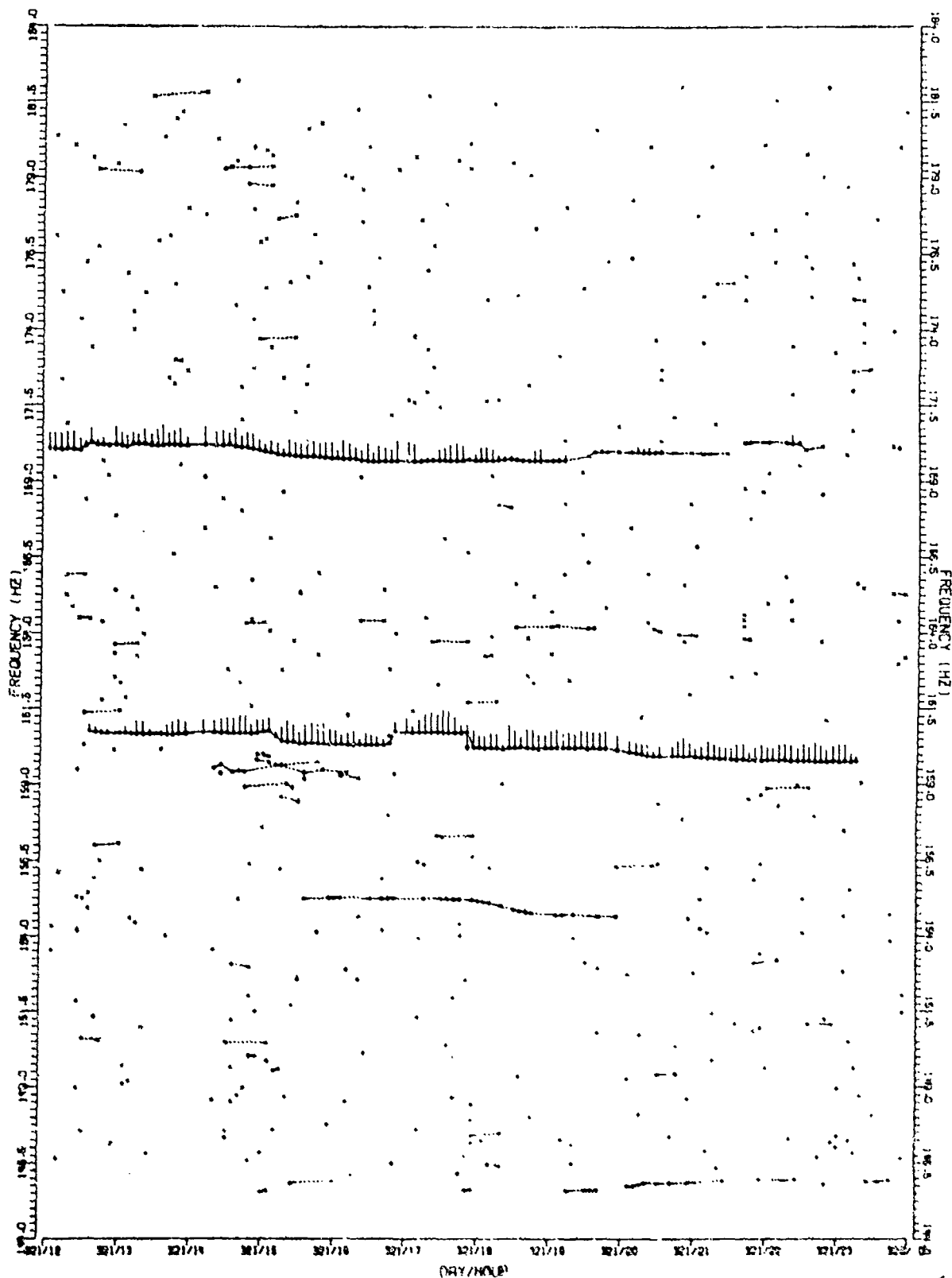


FIGURE 111-15
MSS-FVT MID-BAND DETECTION OVERVIEW DURING THE 17 NOV FIELD EVENT AT SITE A3
OBTAINED VIA THE OMNIDIRECTIONAL SENSOR WITH VERNIER RESOLUTION (U)

AS-77-2615

CONFIDENTIAL

CONFIDENTIAL

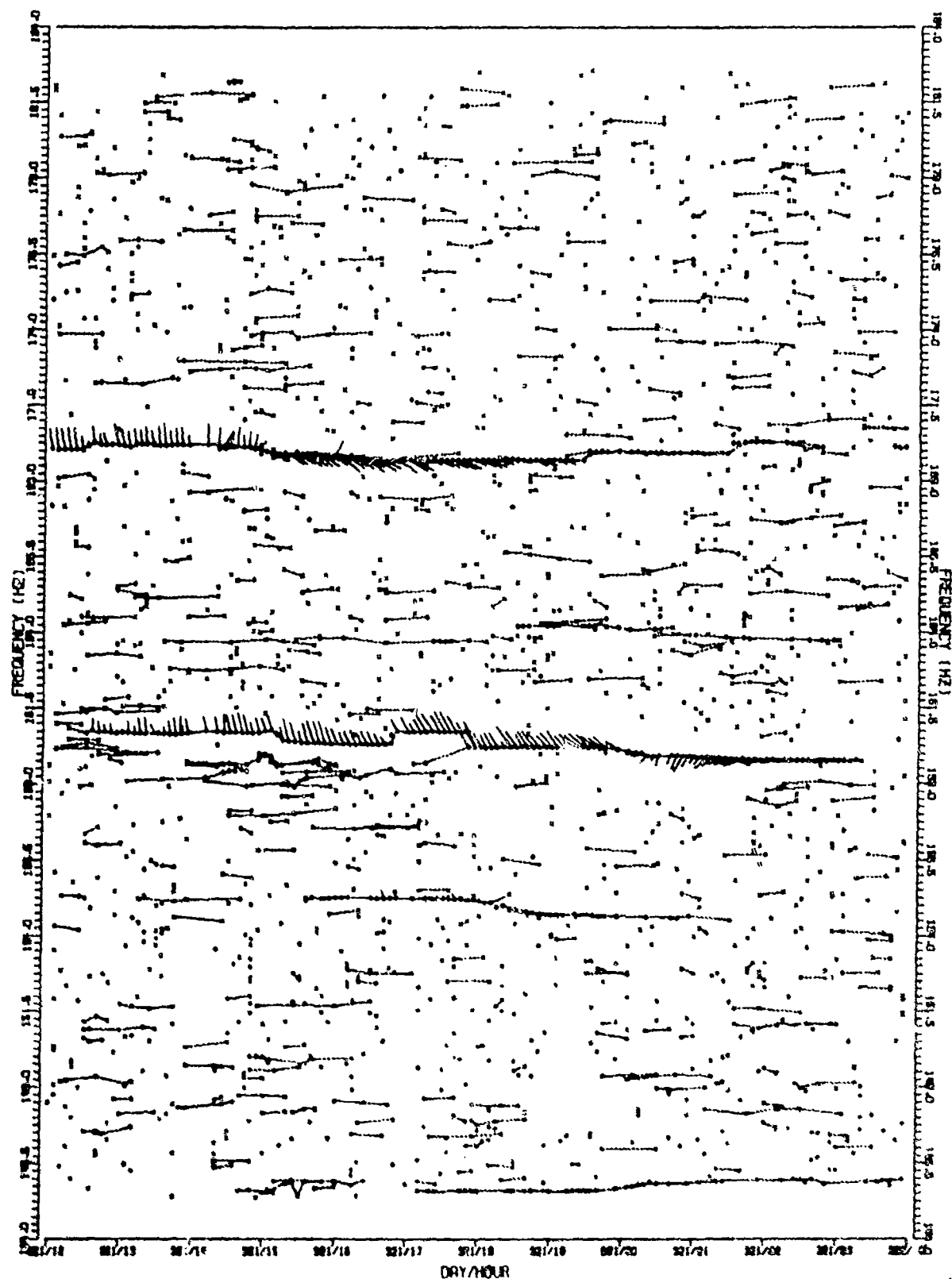


FIGURE 111-16
MSS-FVT MID-BAND DETECTION OVERVIEW DURING THE 17 NOV FIELD EVENT AT SITE R3
OBTAINED VIA THE SINGLE CARDIOTIDS SENSOR WITH VERNIER RESOLUTION (U)

AS-77-2616

CONFIDENTIAL

CONFIDENTIAL

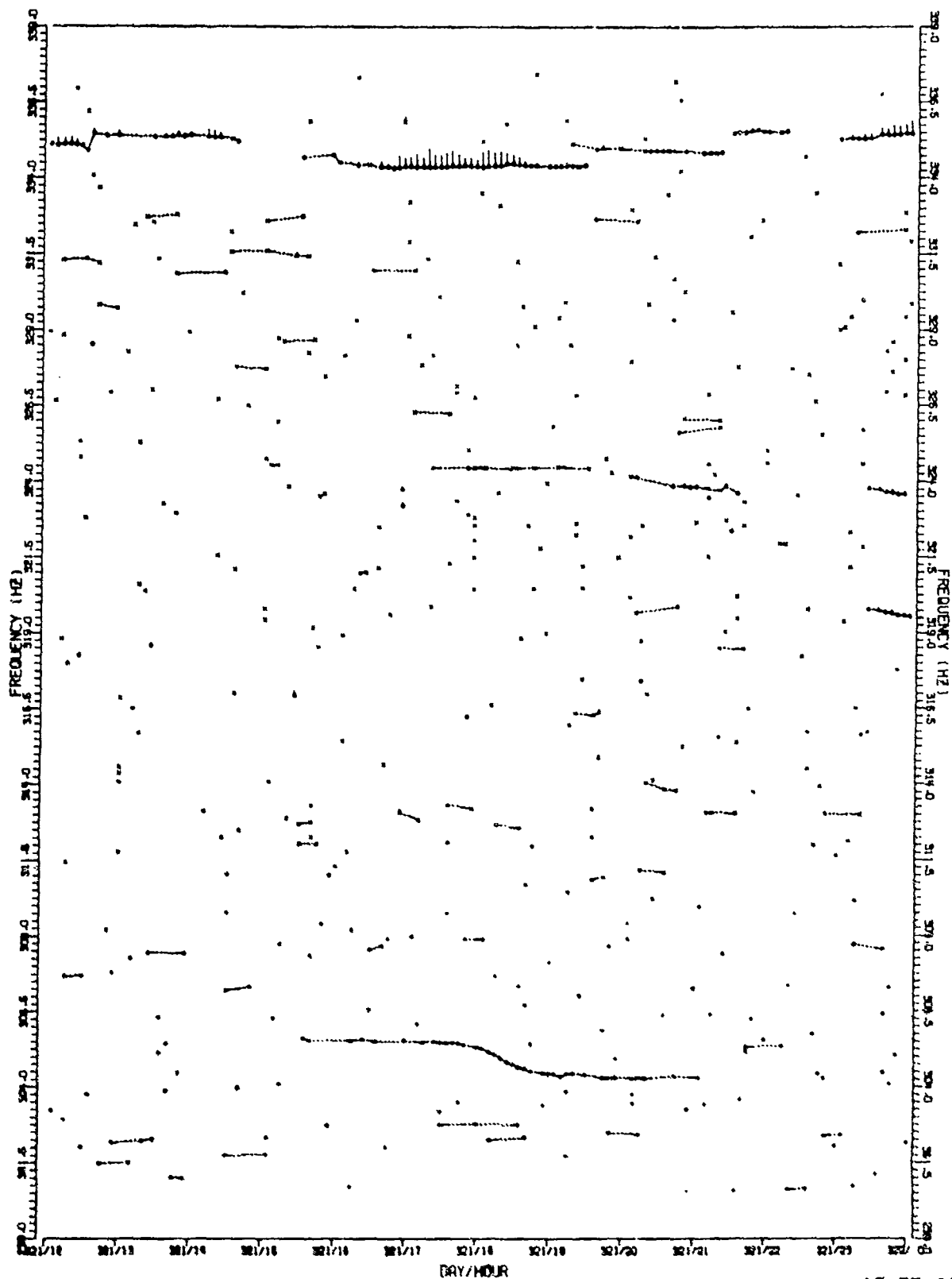


FIGURE 111-17
HSS-FVT HIGH-BAND DETECTION OVERVIEW DURING THE 17 NOV FIELD EVENT AT SITE A3
OBTAINED VIA THE OMNIDIRECTIONAL SENSOR WITH VERNIER RESOLUTION (U)

AS-77-2617

CONFIDENTIAL

CONFIDENTIAL

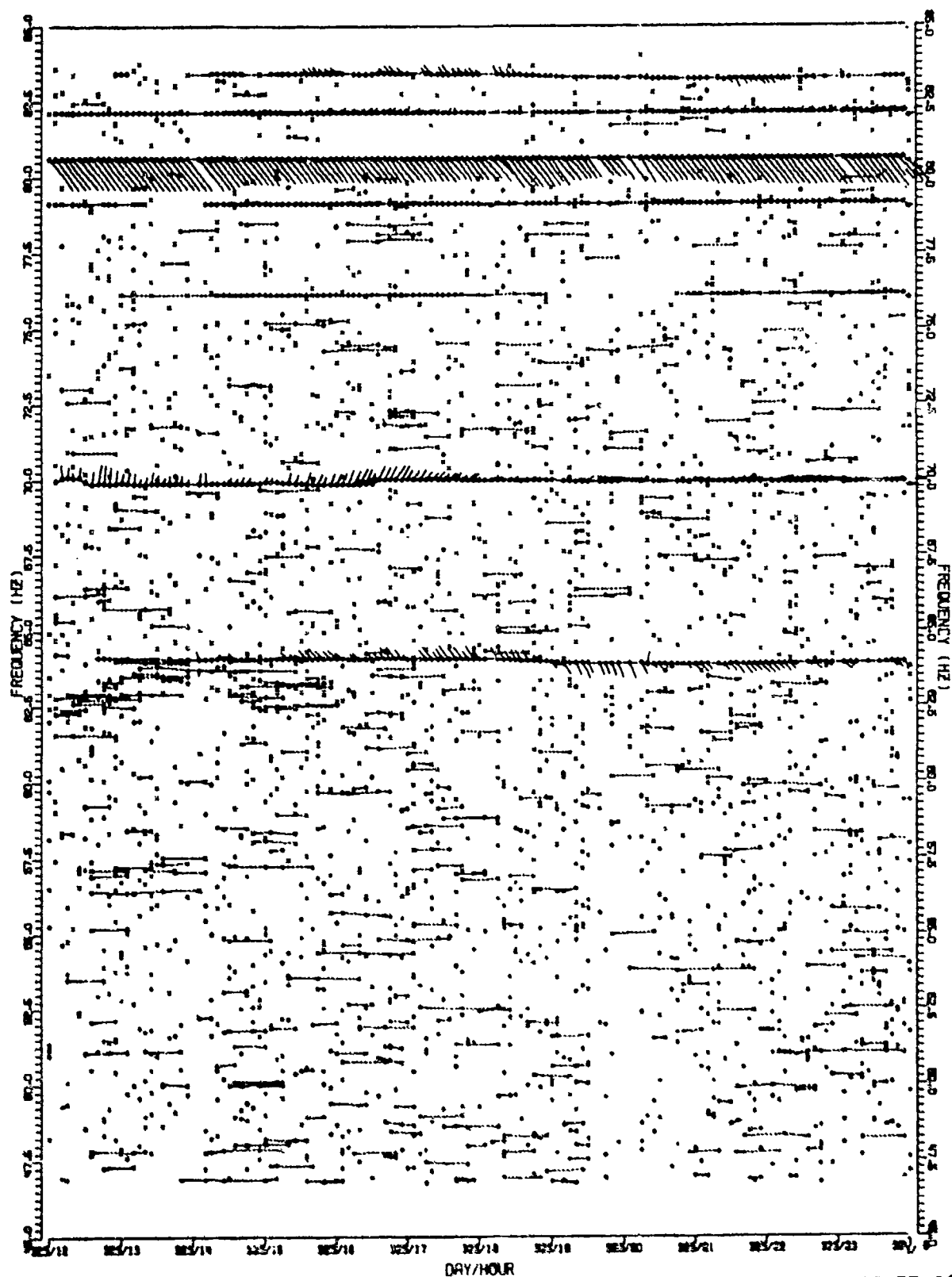


FIGURE 111-19
KSS-FVT LOW-BAND DETECTION OVERVIEW DURING THE 19 NOV FIELD EVENT AT SITE A3
OBTAINED VIA THE SINGLE CAROTIDS SENSOR WITH VERNIER RESOLUTION (U)

AS-77-2619

CONFIDENTIAL

CONFIDENTIAL

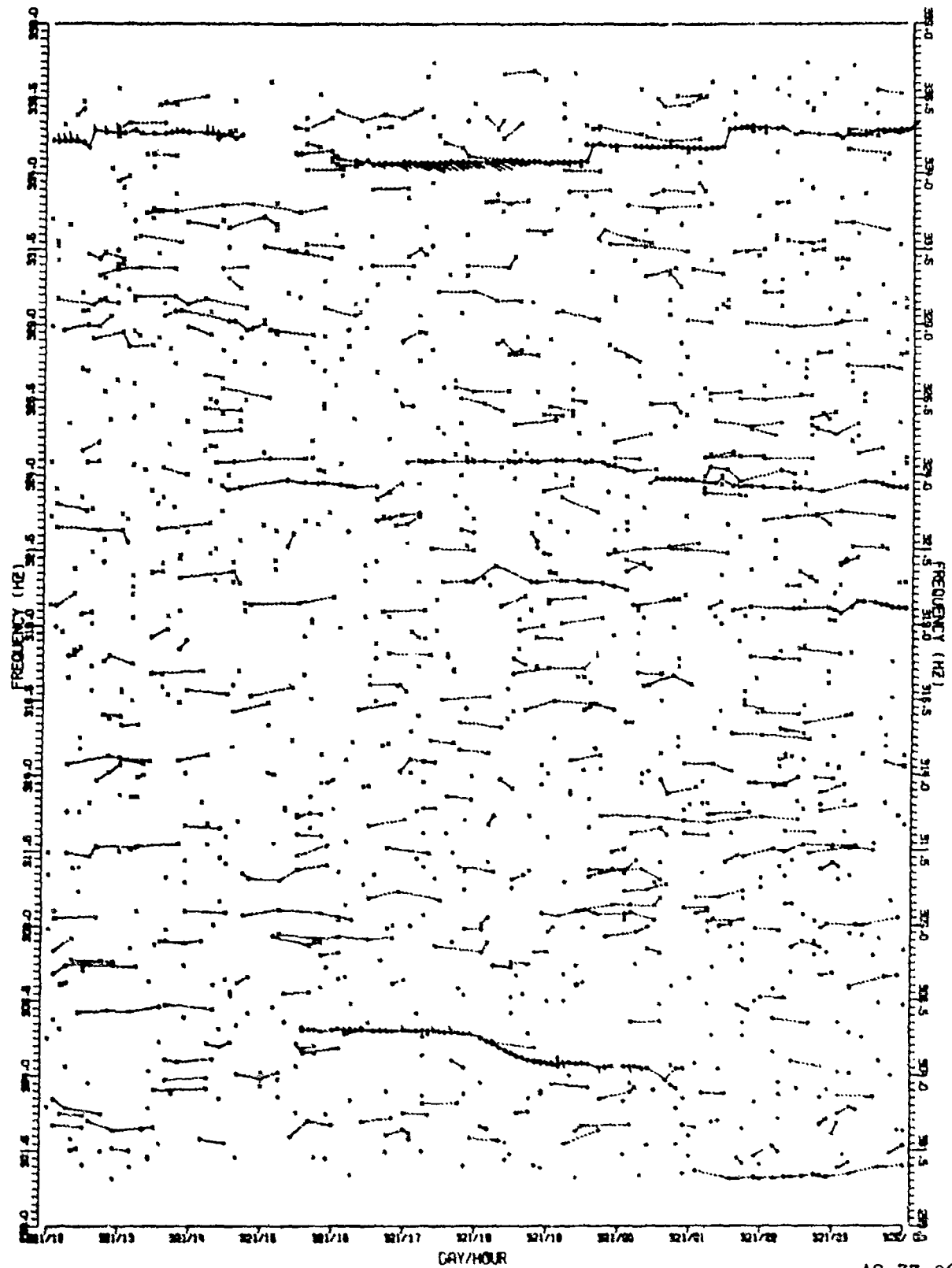


FIGURE 111-18
MSS-FVT HIGH-BAND DETECTION OVERVIEW DURING THE 17 NOV FIELD EVENT AT SITE A3
OBTAINED VIA THE SINGLE CARDIOTODS SENSOR WITH VERNIER RESOLUTION (U)

AS-77-2618

CONFIDENTIAL

CONFIDENTIAL

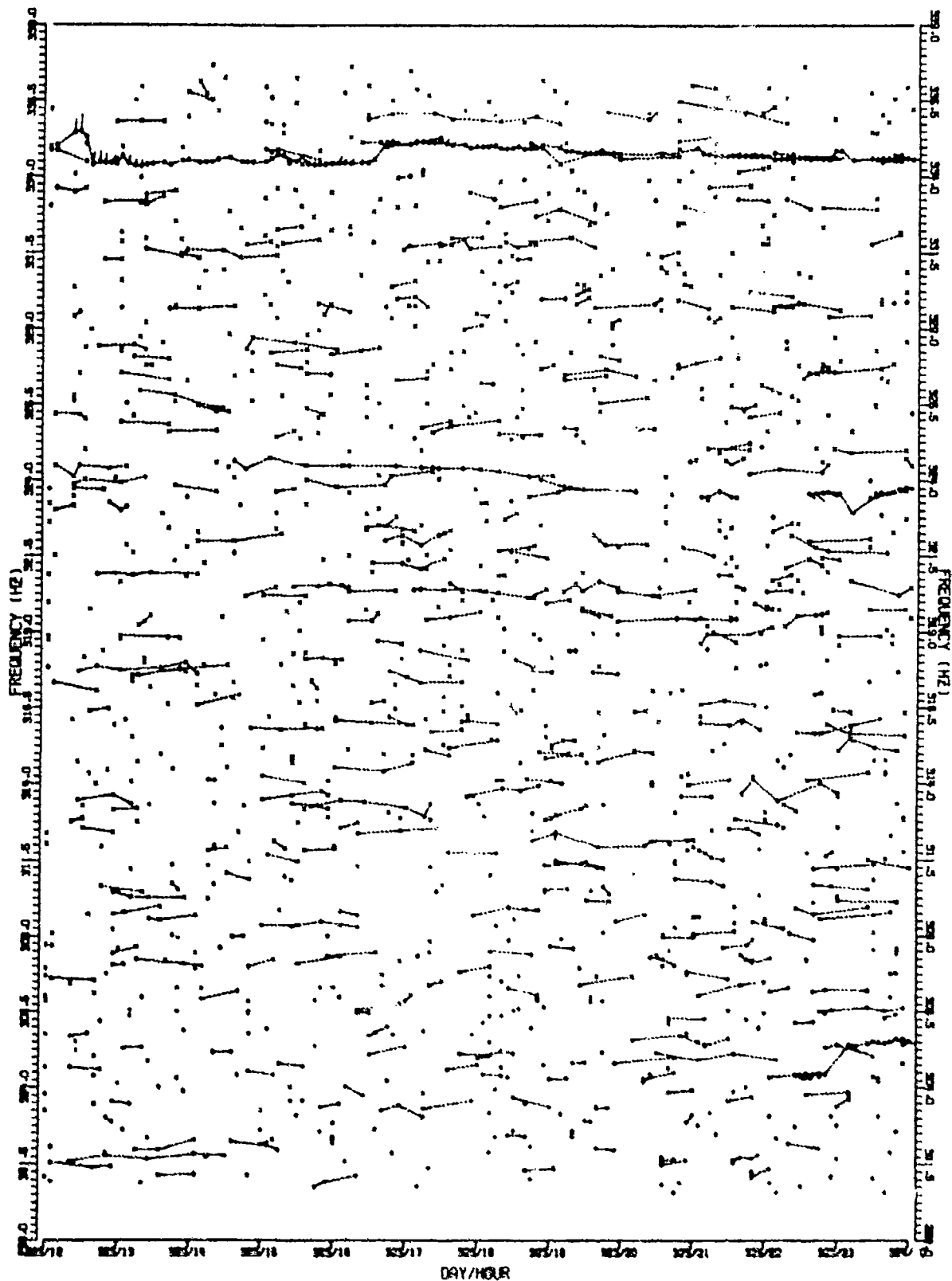


FIGURE 111-20
MSS-FVT HIGH-BAND DETECTION OVERVIEW DURING THE 19 NOV FIELD EVENT AT SITE A3
OBTAINED VIA THE SINGLE CHADTODS SENSOR WITH VERTICAL RESOLUTION 101

AS-77-2620

CONFIDENTIAL

CONFIDENTIAL

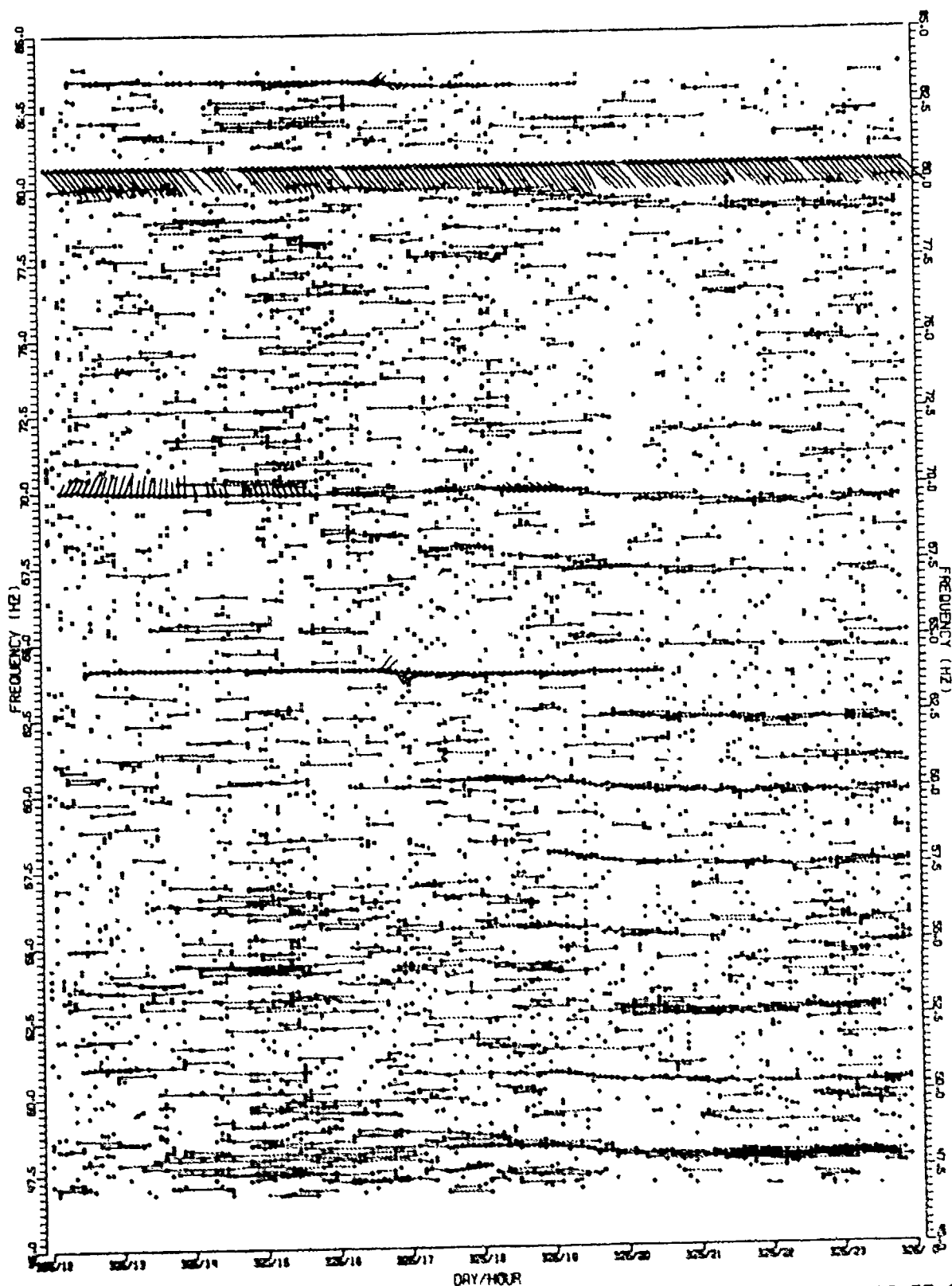


FIGURE 111-21
MSS-FVT LOW-BAND DETECTION OVERVIEW DURING THE 21 NOV FIELD EVENT AT SITE A3
OBTAINED VIA THE SINGLE CARDIOTDS SENSOR WITH VERNIER RESOLUTION (U)

AS-77-2621

CONFIDENTIAL

CONFIDENTIAL

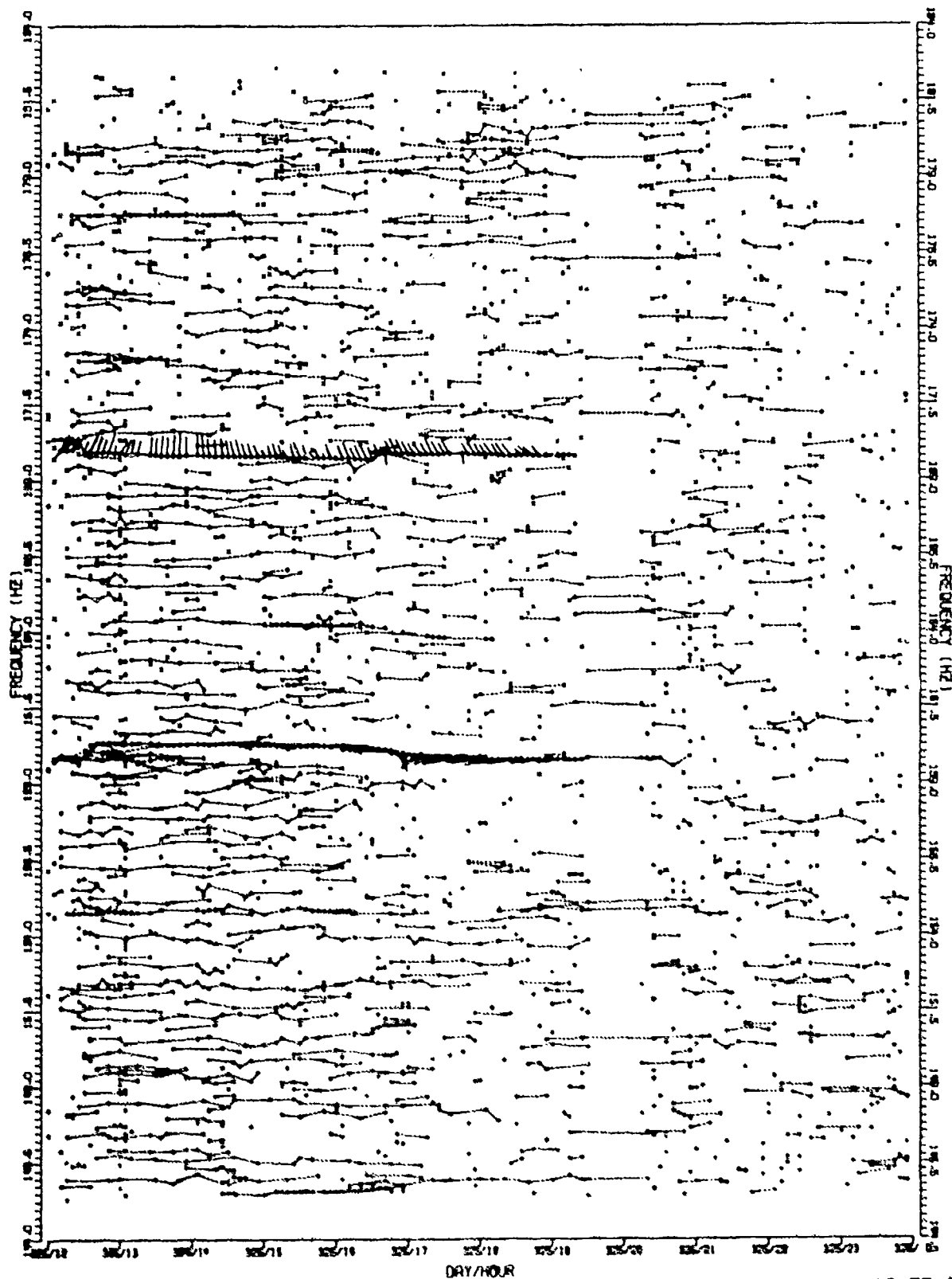


FIGURE 111-22
MSS-FV1 MID-BAND DETECTION OVERVIEW DURING THE 21 NOV FIELD EVENT AT SITE A3
OBTAINED VIA THE SINGLE CARDIOTIS SENSOR WITH VERNIER RESOLUTION (U)

AS-77-2622

CONFIDENTIAL

CONFIDENTIAL

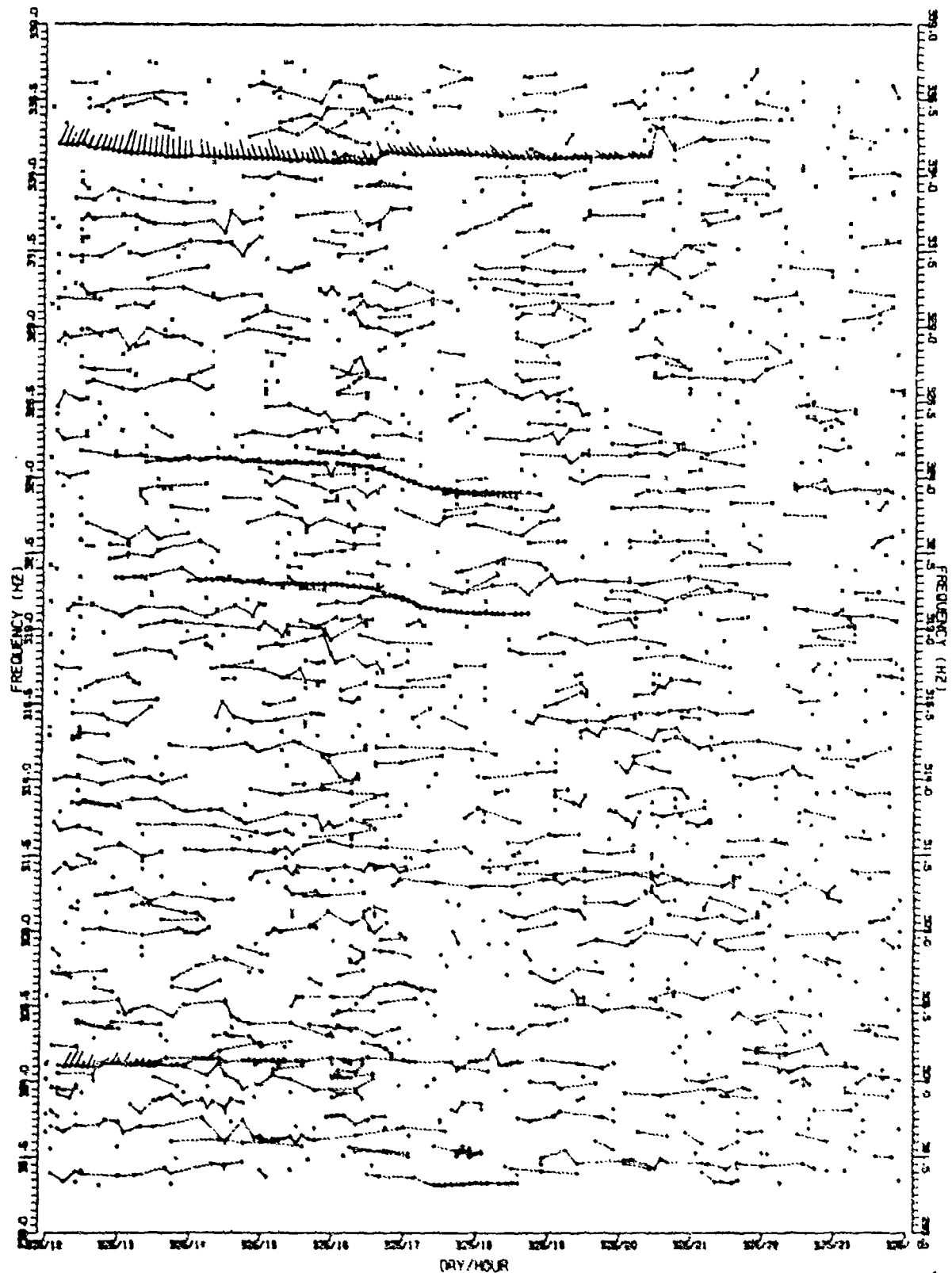


FIGURE 111-23
KSS-FVT HIGH-BAND DETECTION OVERVIEW DURING THE 21 NOV FIELD EVENT AT SITE A3
OBTAINED VIA THE SINGLE CAROTIDS JUNK WITH FINER RESOLUTION (U)

AS-77-2623

(The reverse of this page is blank.)

CONFIDENTIAL

UNCLASSIFIED

APPENDIX B

LINE HISTORY CURVES (U)

(FIGURES III-24 - III-163)

51

(The reverse of this page is blank.)

UNCLASSIFIED

CONFIDENTIAL

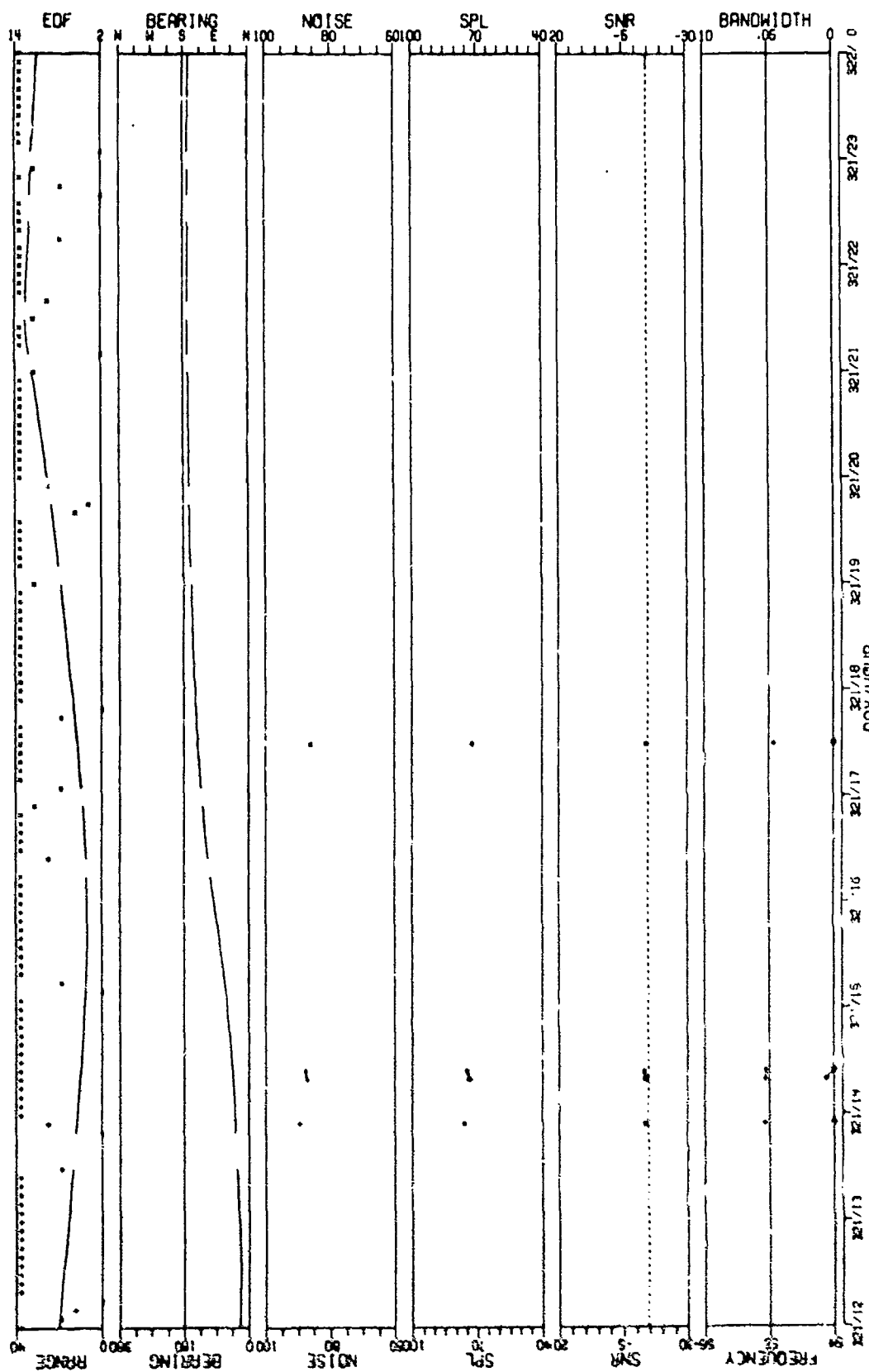


FIGURE 111-24
HSS-FVT 55 HZ LINE HISTORY AS OBSERVED VIA THE OMNIDIRECTIONAL SENSOR
AT SITE A1 DURING THE 17 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

AS-77-2624

CONFIDENTIAL

CONFIDENTIAL



FIGURE 111-25
MCS-FVT 55 H2 LINE HISTORY AS OBSERVED VIA THE SINGLE CARDIOIDS SENSOR
AT SITE R1 DURING THE 17 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

AS-77-2625

CONFIDENTIAL

CONFIDENTIAL

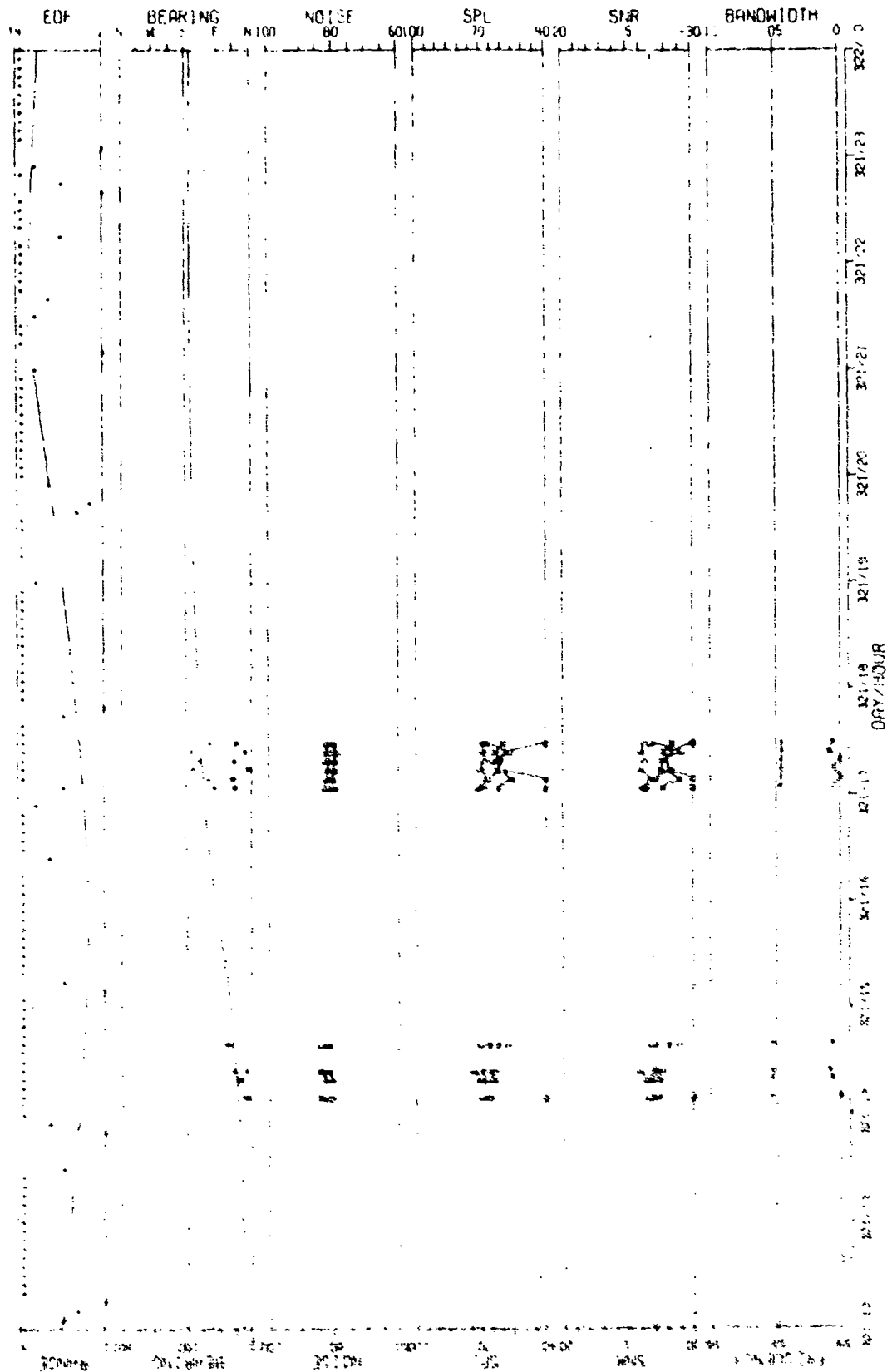


FIGURE 11-26
MAX GAIN LIMA CONS. SENSOR
OBSERVED VIA THE MAX GAIN LIMA CONS. SENSOR
DURING THE 17 NOV FIELD EVENT WITH VERNIER RESOLUTION 101

9-77-2676

CONFIDENTIAL

CONFIDENTIAL

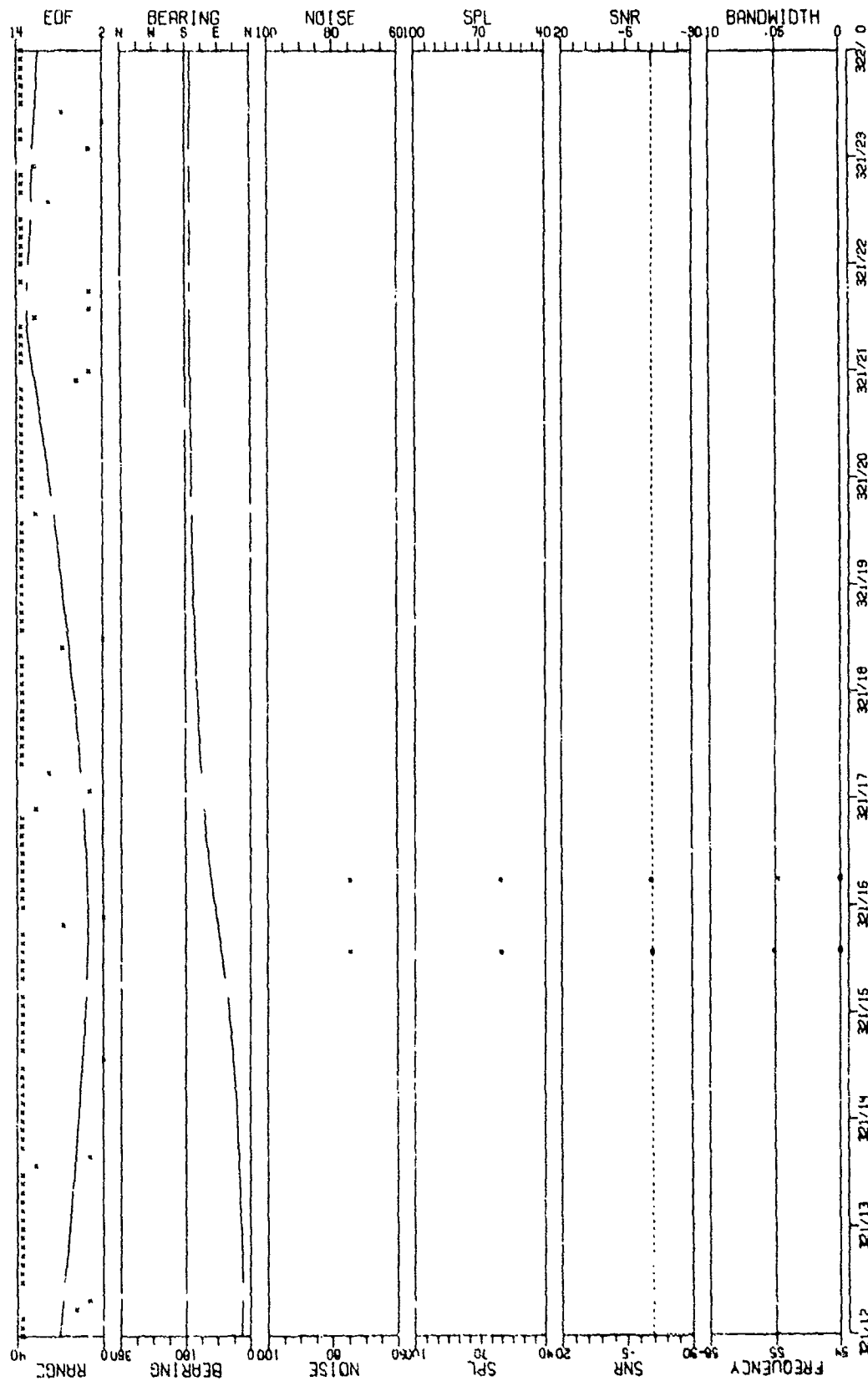


FIGURE 111-27
MSS-FVT 55 HZ LINE HISTORY AS OBSERVED VIA THE VERTICAL DIPOLE SENSOR
AT SITE A1 DURING THE 17 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

AS-77-2627

CONFIDENTIAL

CONFIDENTIAL

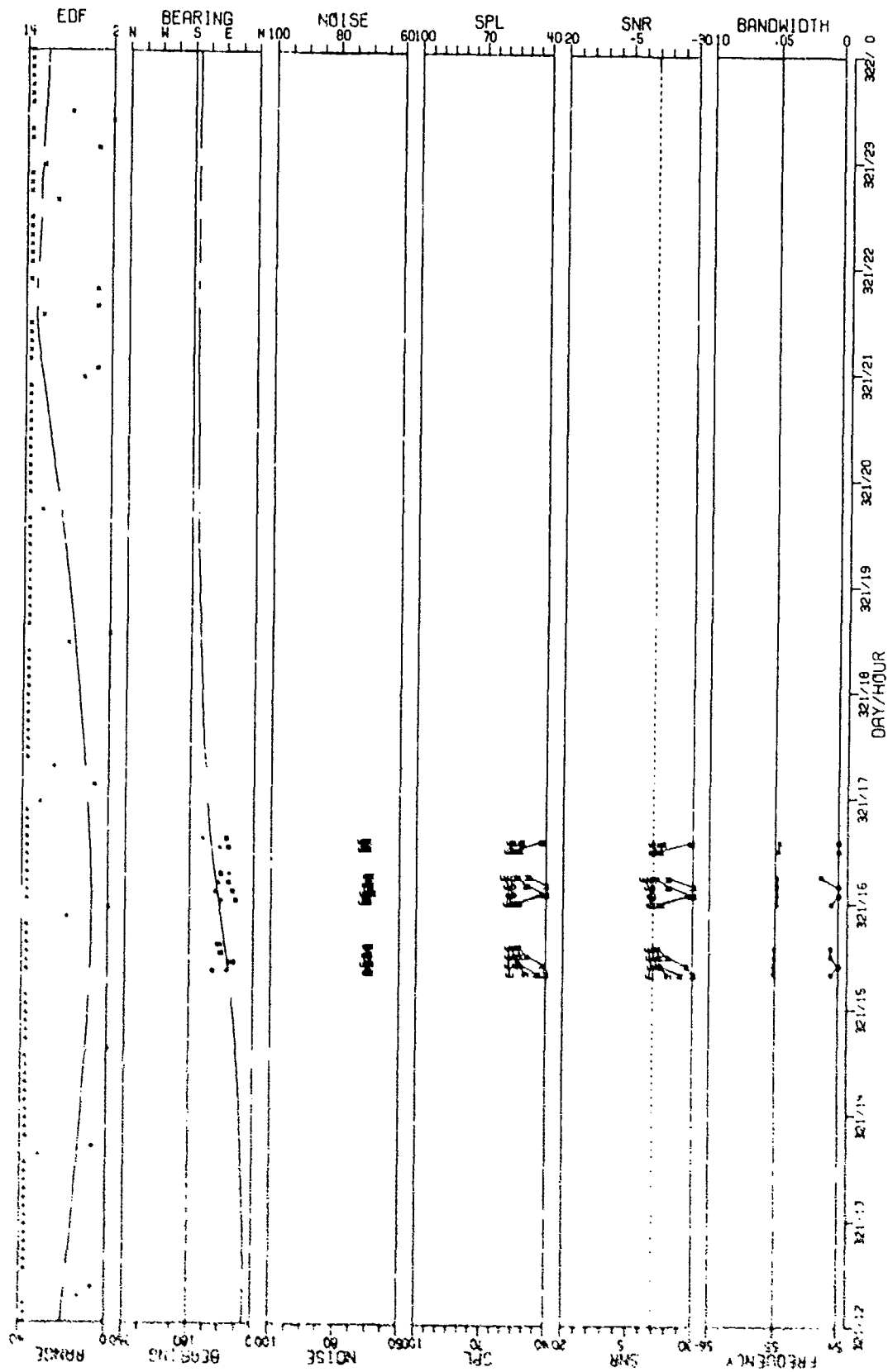


FIGURE III-28
MSS-FV 55 H2 LINE HISTORY AS OBSERVED VIA THE DIFFERENCED CARDIOLDS SENSOR
A. SITE A: DURING THE 17 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

AS-77-2628

CONFIDENTIAL

CONFIDENTIAL

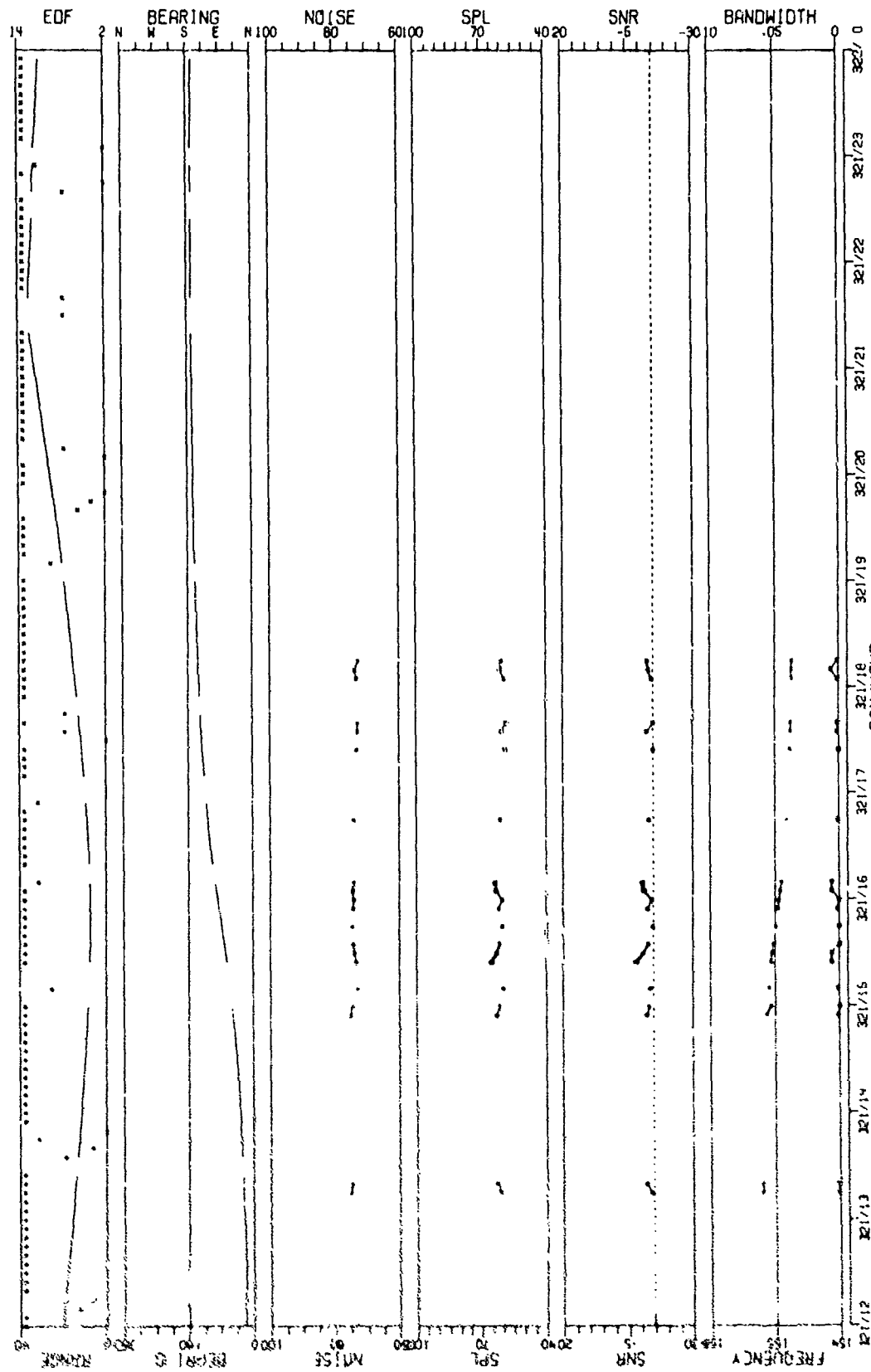


FIGURE 111-29
HSS-FVT 155 FZ LINE HISTORY AS OBSERVED VIA THE OMNIDIRECTIONAL SENSOR
AT SITE A1 DURING THE 17 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

AS-77-2629

CONFIDENTIAL

CONFIDENTIAL

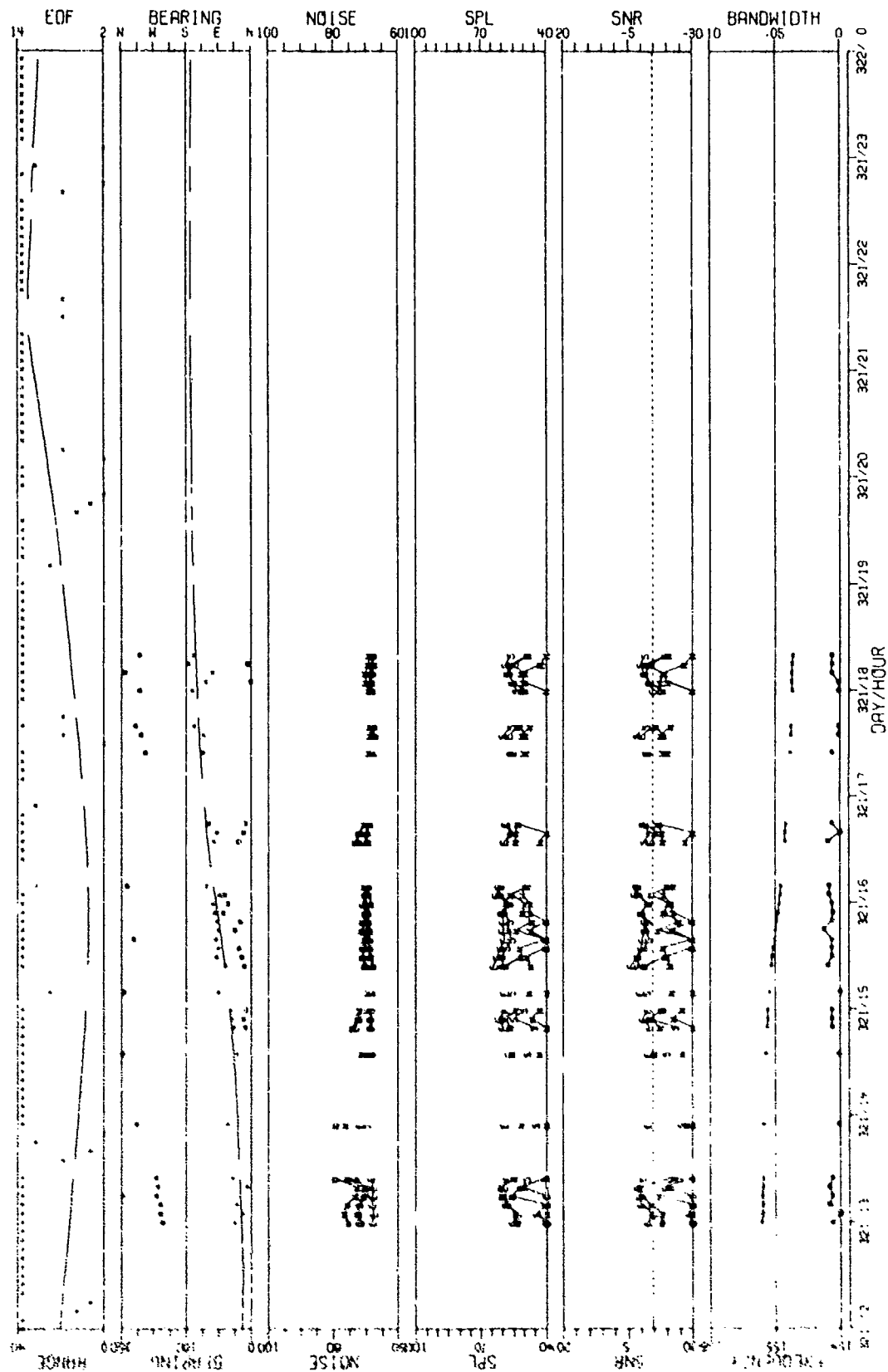


FIGURE 111-30
MES-FVT 155 HZ LINE HISTORY AS OBSERVED VIA THE SINGLE CARDIOTIDS SENSOR
AT SITE #1 DURING THE 17 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

AS-77-2630

CONFIDENTIAL

CONFIDENTIAL

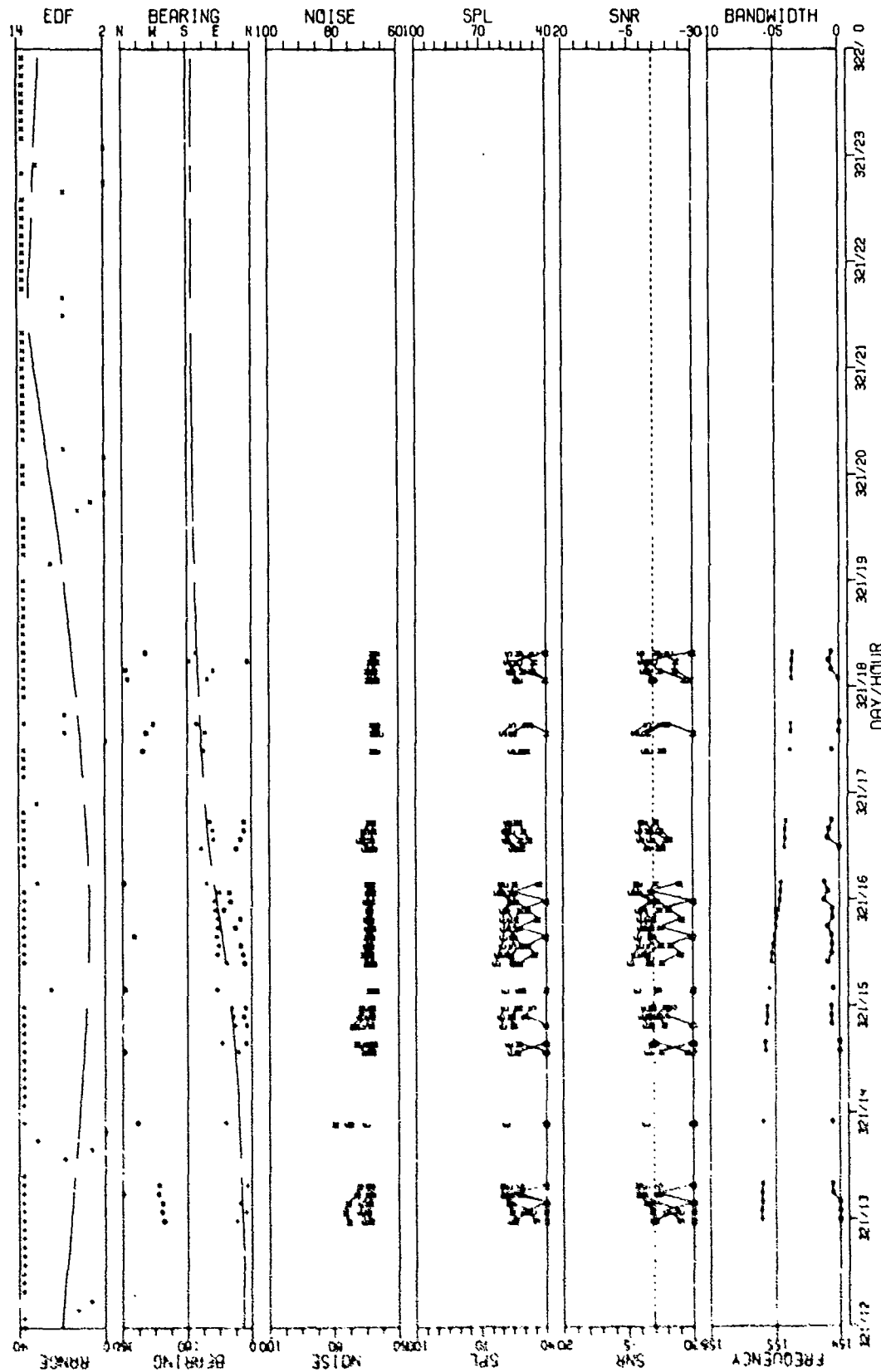


FIGURE 111-31
MSS-FVT 155 HZ LINE HISTORY AS OBSERVED VIA THE MAX GAIN LINACONS SENSOR
AT SITE A1 DURING THE 17 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

AS-77-2631

CONFIDENTIAL

CONFIDENTIAL

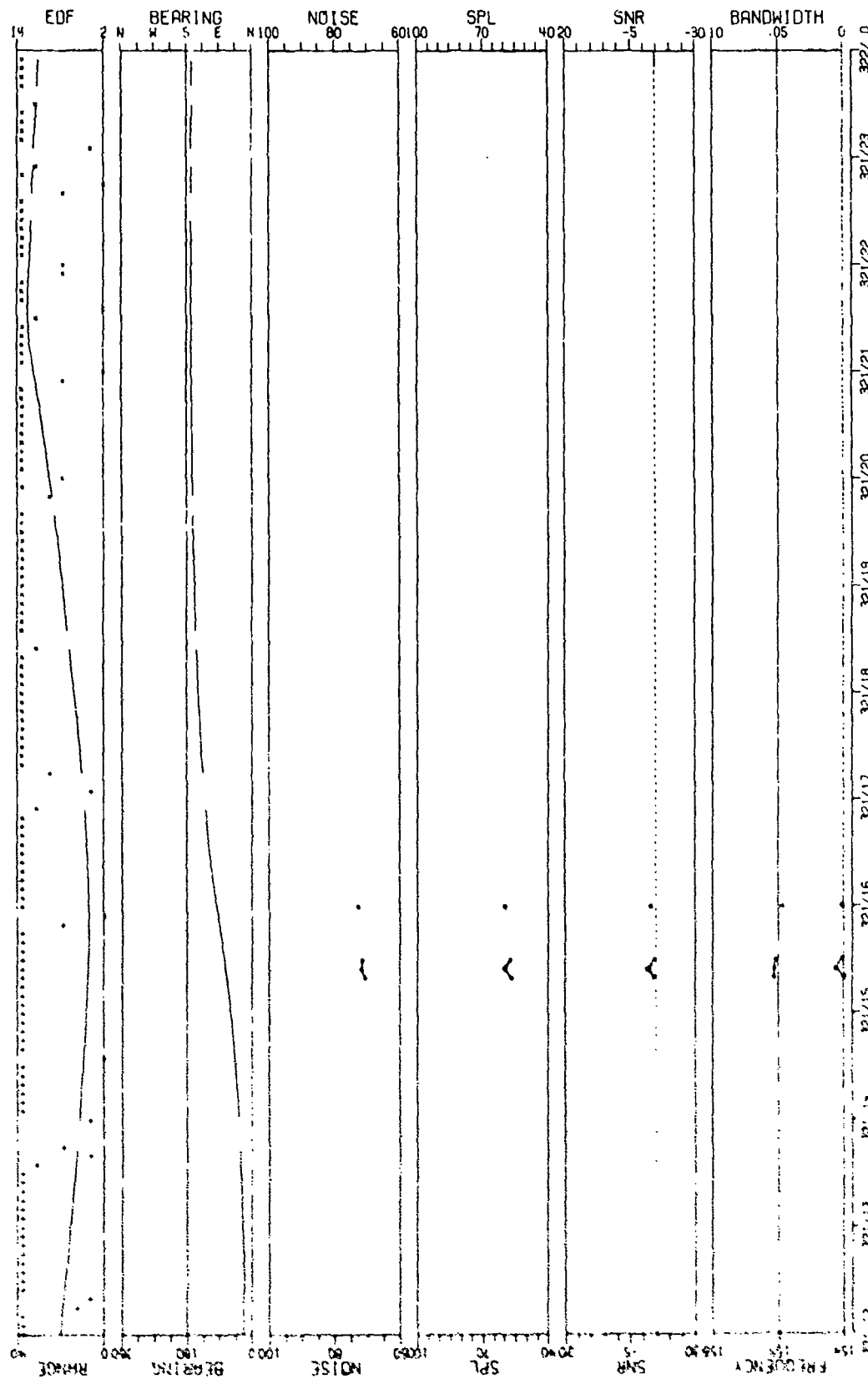


FIGURE 111-32
MGS-FVT 155 HZ LINE HISTORY AS OBSERVED VIA THE VERTICAL DIPOLE SENSOR
AT SITE A1 DURING THE 17 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

AS-77-2632

CONFIDENTIAL

CONFIDENTIAL

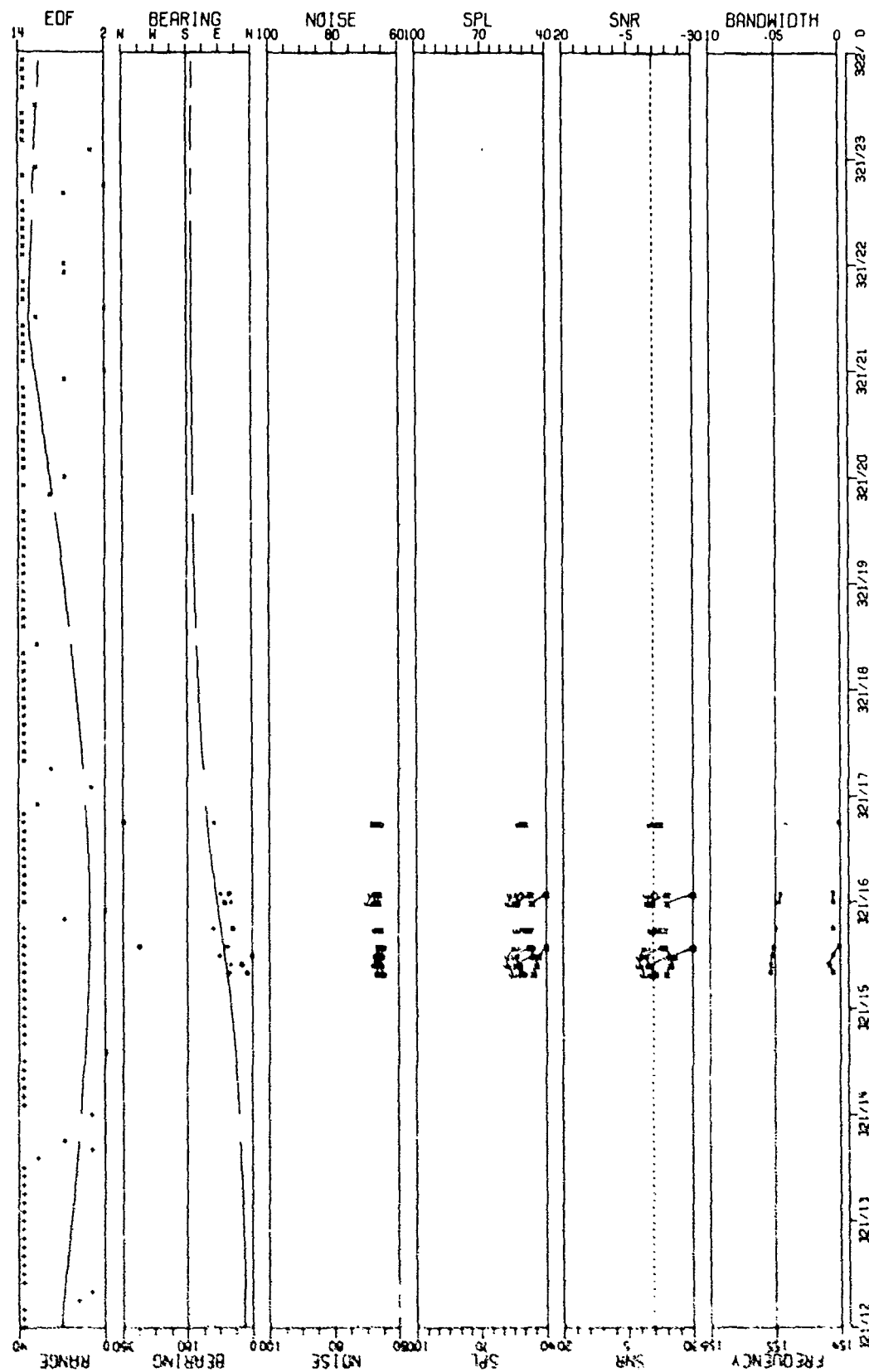


FIGURE 111-33
MCS-FVT 155 H2 LINE HISTORY AS OBSERVED VIA THE DIFFERENCED CARDIOIDS SENSOR
AT SITE A1 DURING THE 17 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

AS-77-2633

CONFIDENTIAL

CONFIDENTIAL

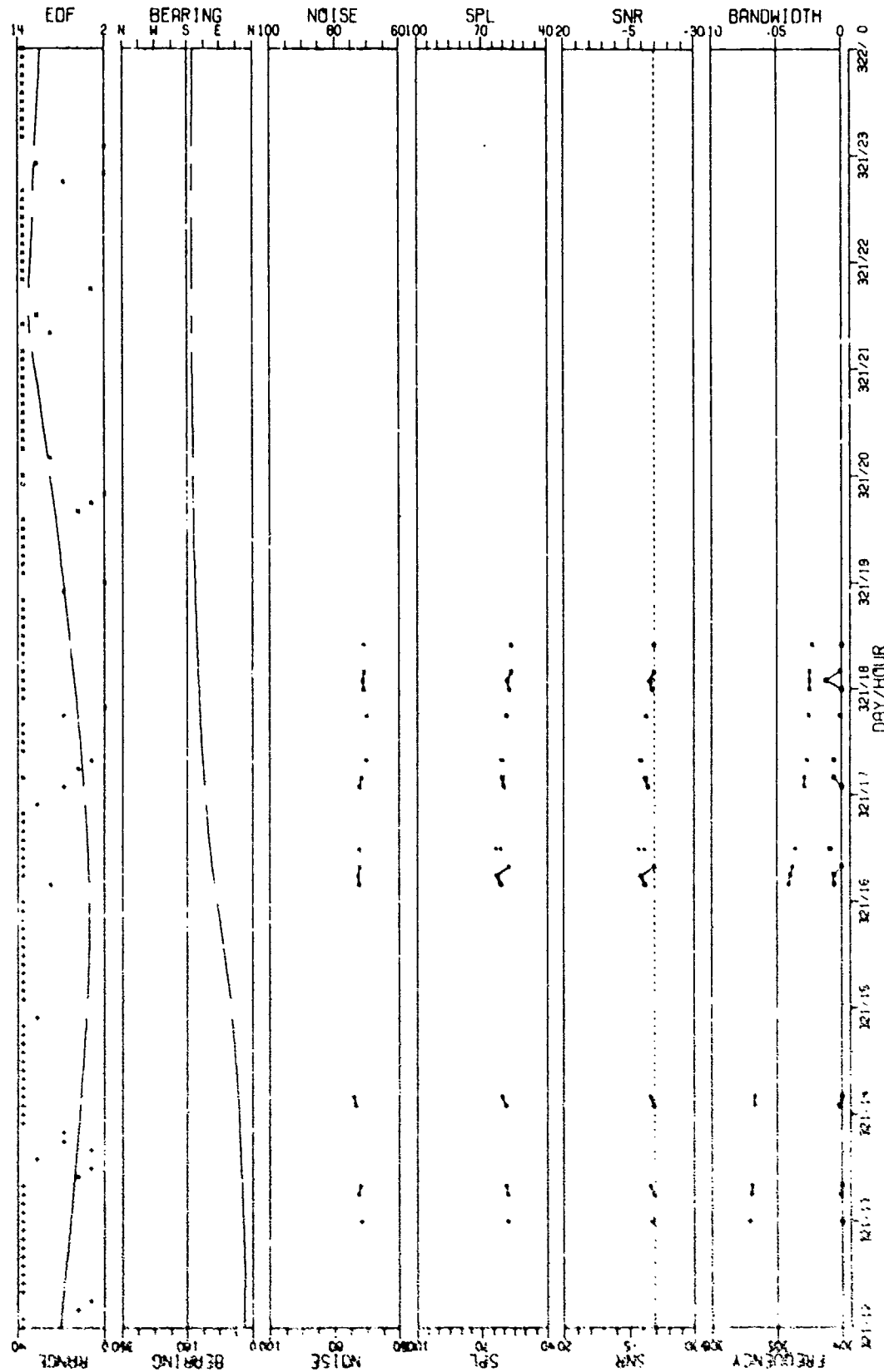


FIGURE III-34
WGS-FV7 30S HZ LINE HISTORY AS OBSERVED VIA THE OMNIDIRECTIONAL SENSOR
AT SITE A1 DURING THE 17 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

AS-77-2634

CONFIDENTIAL

CONFIDENTIAL

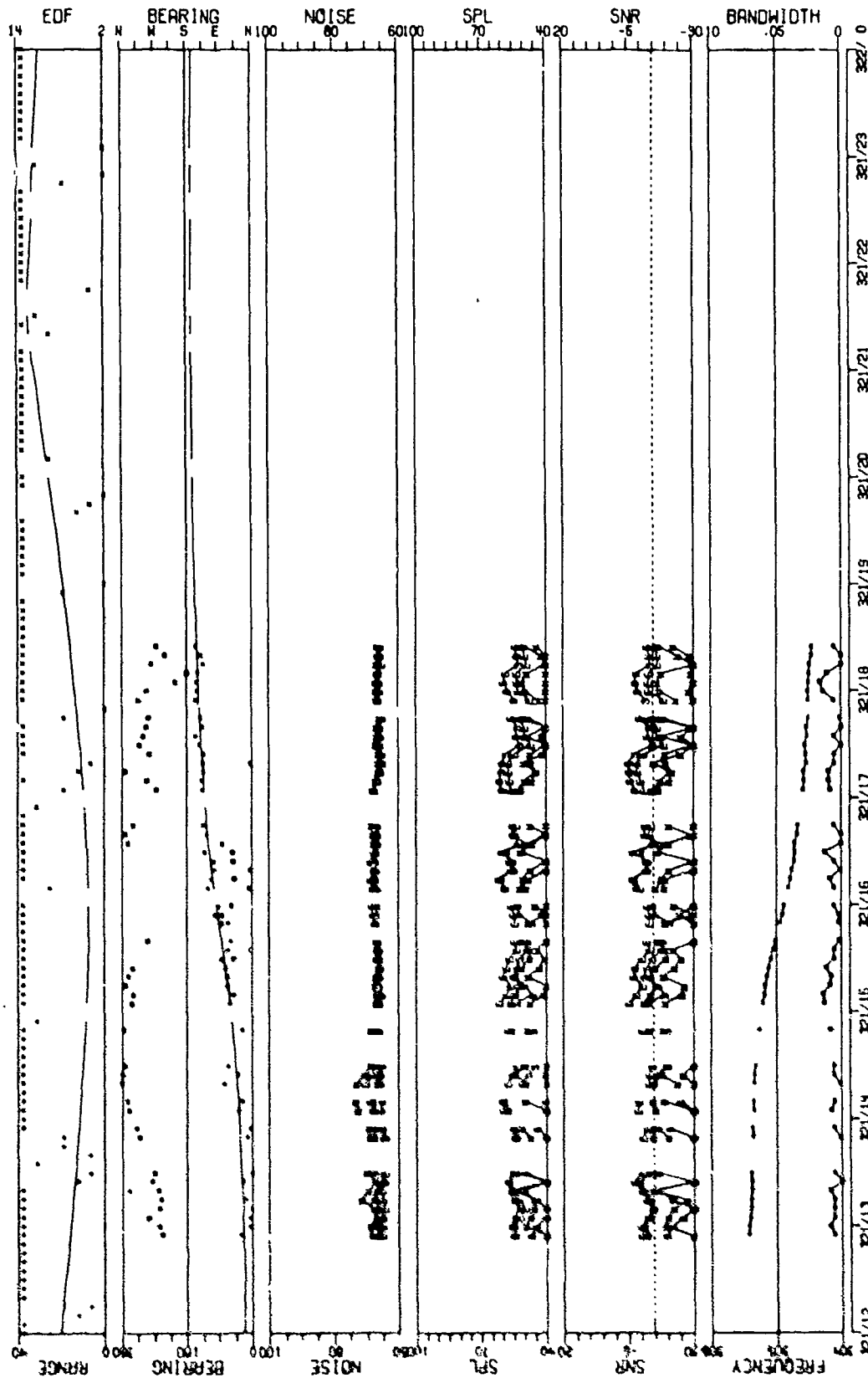


FIGURE 111-35
MSS-FVT 305 HZ LINE HISTORY AS OBSERVED VIA THE SINGLE CARDIOIDS SENSOR
AT SITE R1 DURING THE 17 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

AS-77-2635

CONFIDENTIAL

CONFIDENTIAL

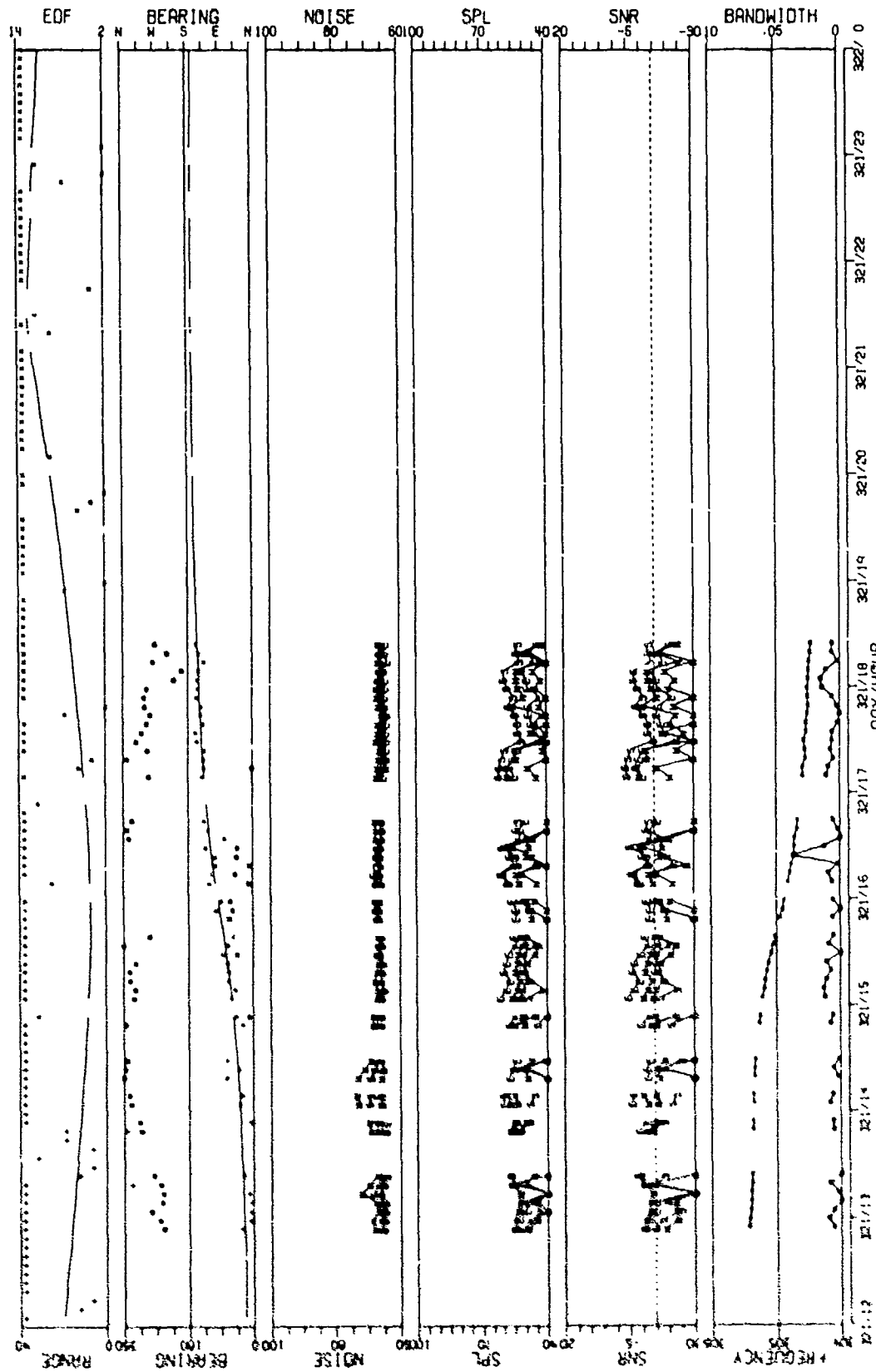


FIGURE 111-36
MSS-FVT 305 HZ LINE HISTORY AS OBSERVED VIA THE MAX GAIN LIMACONS SENSOR
A- SITE A1 DURING THE 17 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

AS-77-2636

CONFIDENTIAL

CONFIDENTIAL

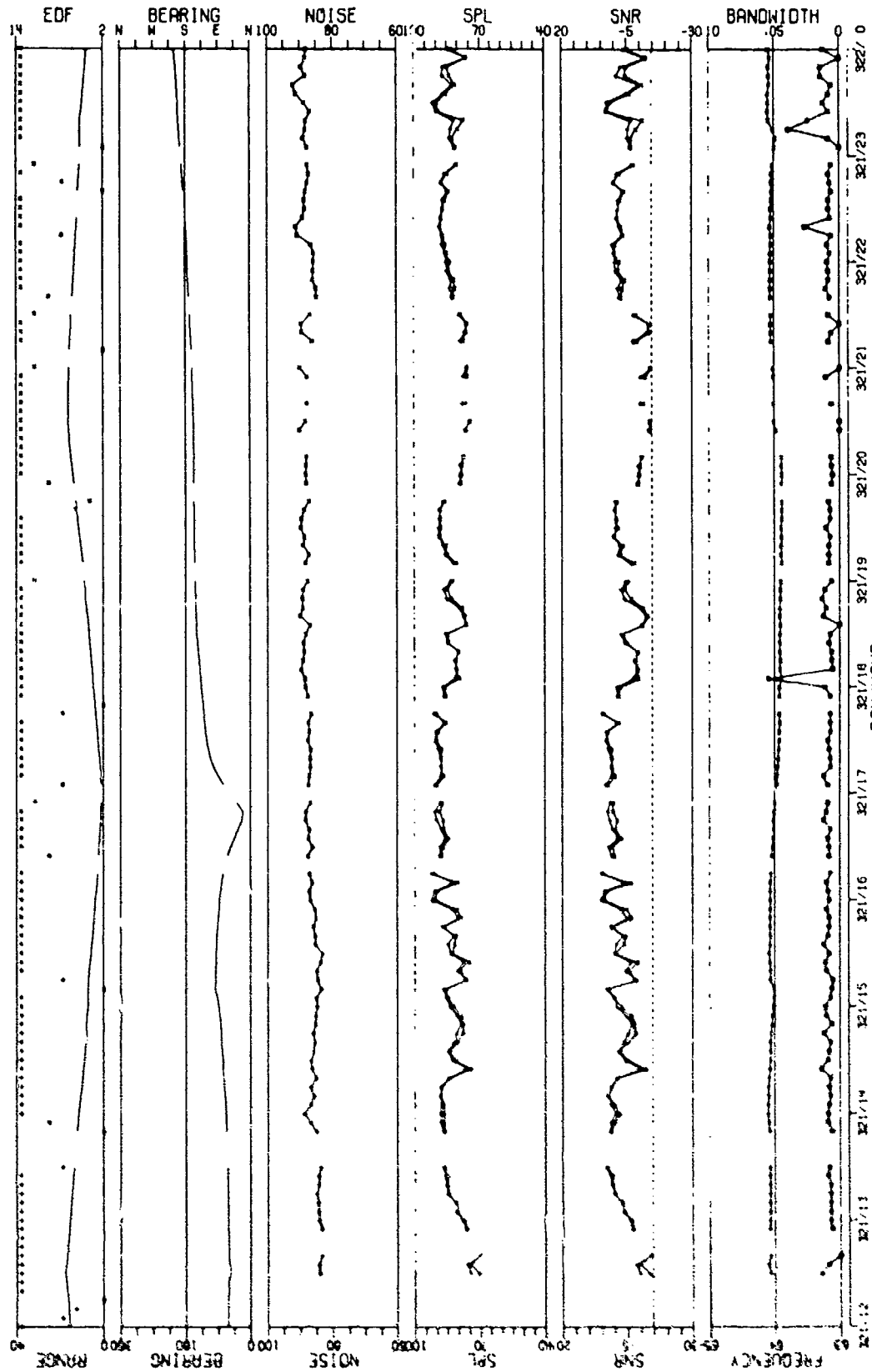


FIGURE 111-37
MSS-FVT 64 HZ LINE HISTORY AS OBSERVED VIA THE OMNIDIRECTIONAL SENSOR
AT SITE R1 DURING THE 17 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

AS-77-2637

CONFIDENTIAL

CONFIDENTIAL

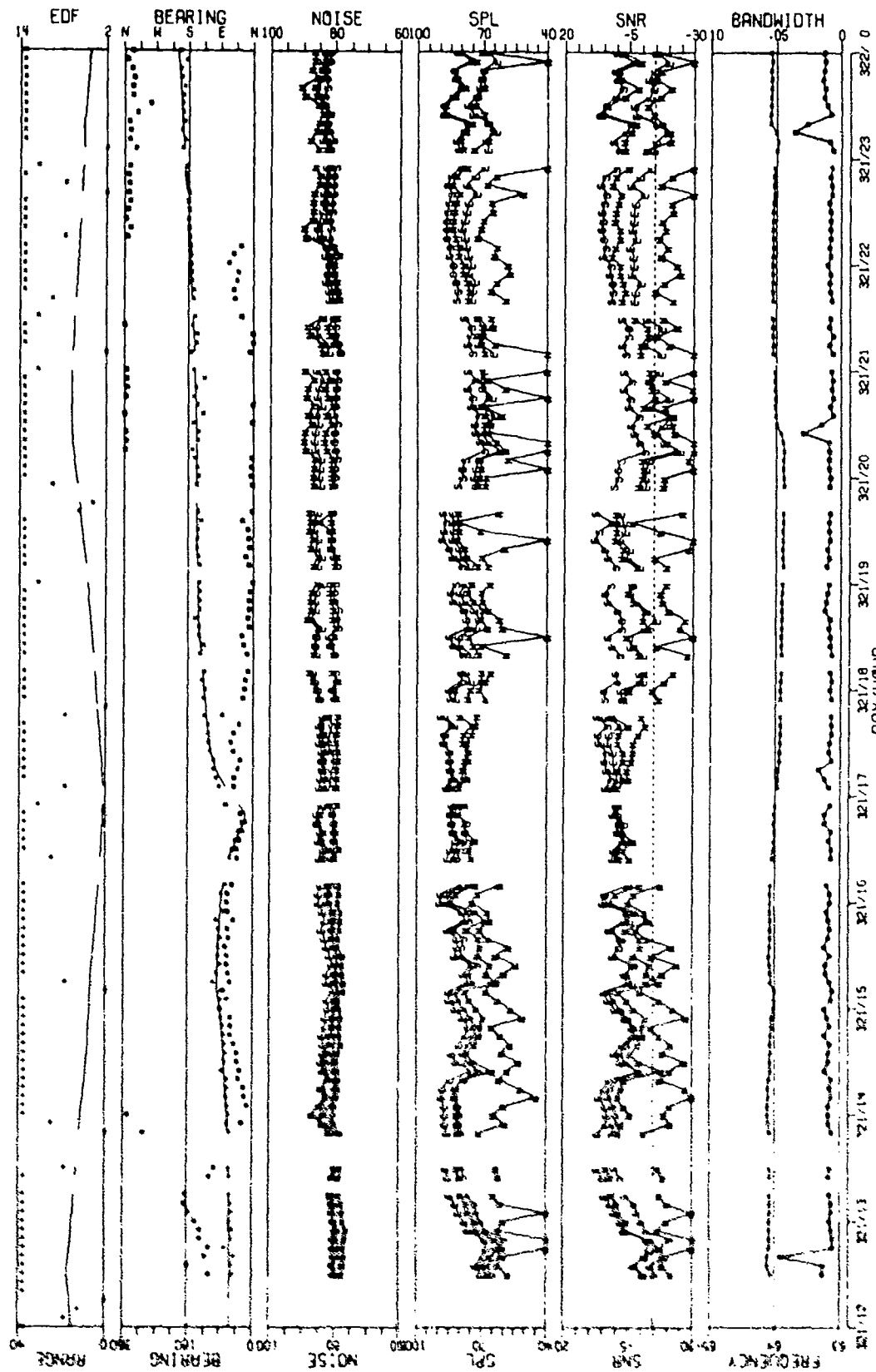


FIGURE 111-38
MOS FMT 64 HZ LINE HISTORY AS OBSERVED VIA THE SINGLE CARDIOTIDS SENSOR
G: SITE A: DURING THE 17 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

AR-77-2638

CONFIDENTIAL

CONFIDENTIAL

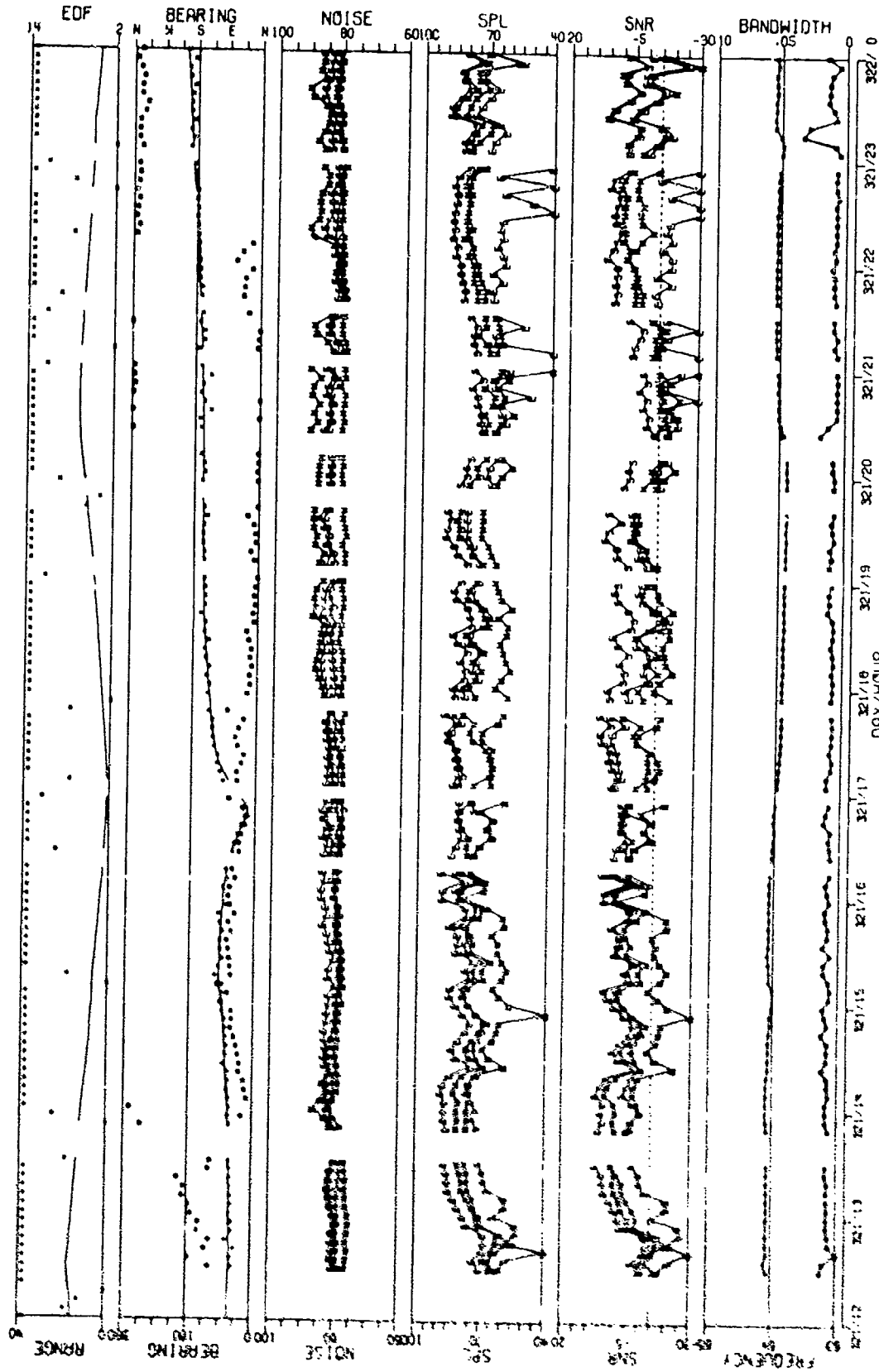


FIGURE III-39
MGS-5VT 64 HZ LINE HISTORY AS OBSERVED VIA THE MAX GAIN LIMACONS SENSOR
AT SITE A1 DURING THE 17 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

AS-77-2639

CONFIDENTIAL

CONFIDENTIAL

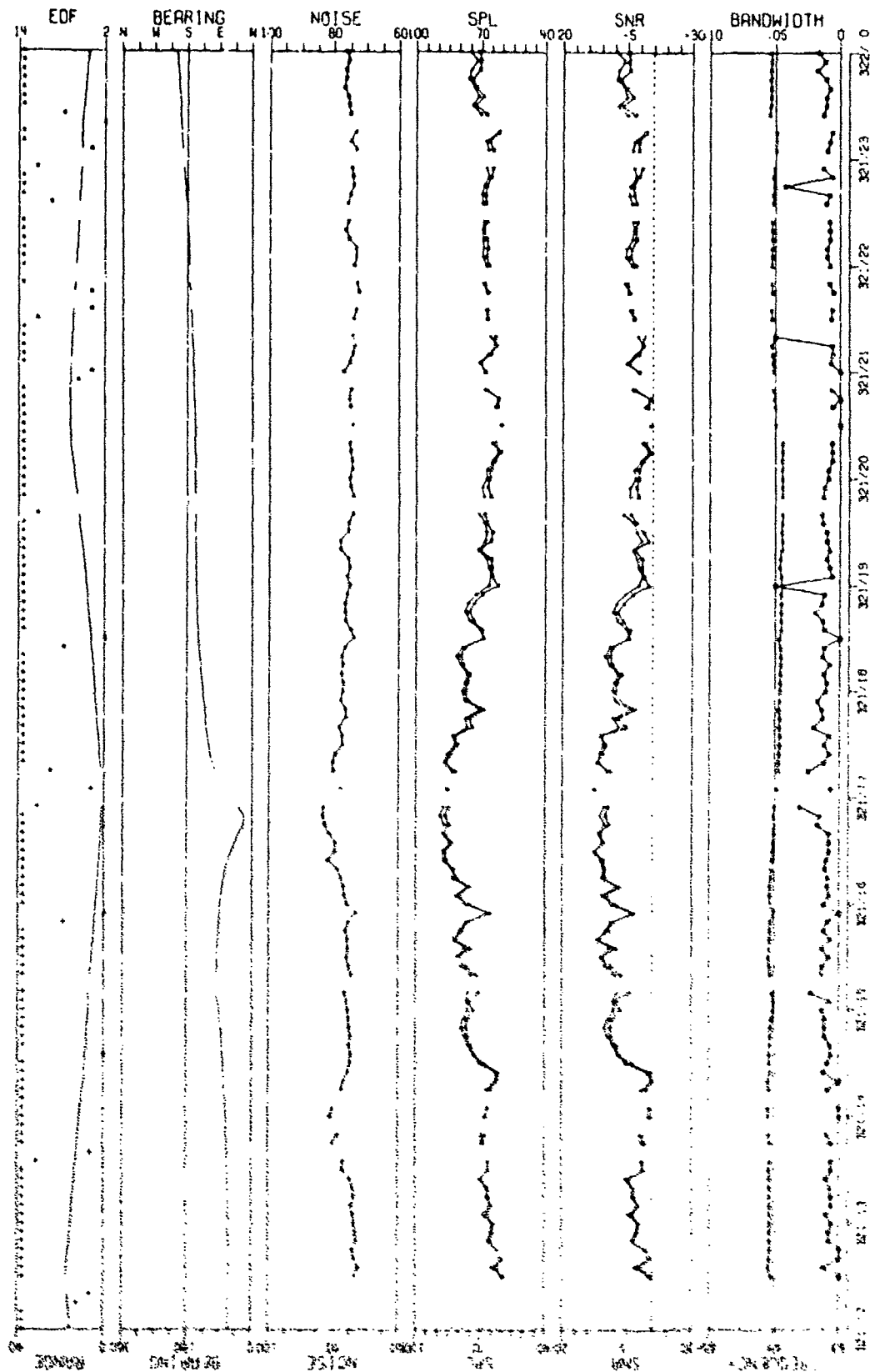


FIGURE 111-40
MSG-17' SN HZ LINE HISTORY AS OBSERVED VIA THE VERTICAL DIPOLE SENSOR
AT 0114 R1 DURING THE 17 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

AS-74-0642

CONFIDENTIAL

CONFIDENTIAL



FIGURE 111-11
 NOISE RESOLUTION SENSORS
 OBSERVED AT THE 1000' RANGE
 DURING THE 1000' RANGE TEST

AS-77-1641

70
 CONFIDENTIAL

CONFIDENTIAL

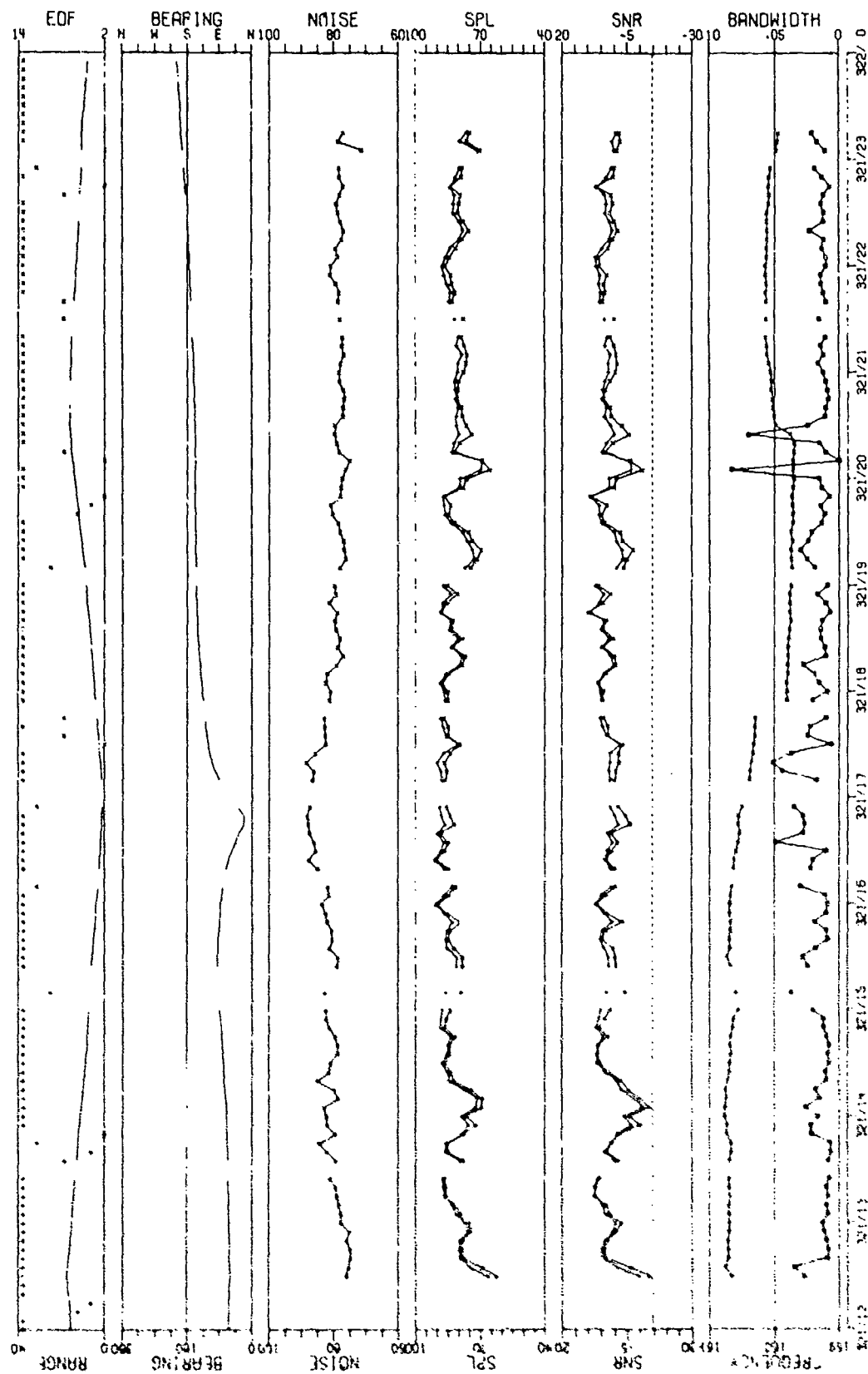


FIGURE 111-42
H2S-67 160 HZ LINE HISTORY AS OBSERVED VIA THE OMNIDIRECTIONAL SENSOR
H2S-67 160 HZ LINE HISTORY AS OBSERVED VIA THE OMNIDIRECTIONAL SENSOR
H2S-67 160 HZ LINE HISTORY AS OBSERVED VIA THE OMNIDIRECTIONAL SENSOR

AS-77-000

CONFIDENTIAL

CONFIDENTIAL



FIGURE 111-43
MSS-FVT 160 HZ LINE HISTORY AS OBSERVED VIA THE SINGLE CAROIDS SENSOR
AT SITE A1 DURING THE 17 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

AS-77-2643

CONFIDENTIAL

CONFIDENTIAL

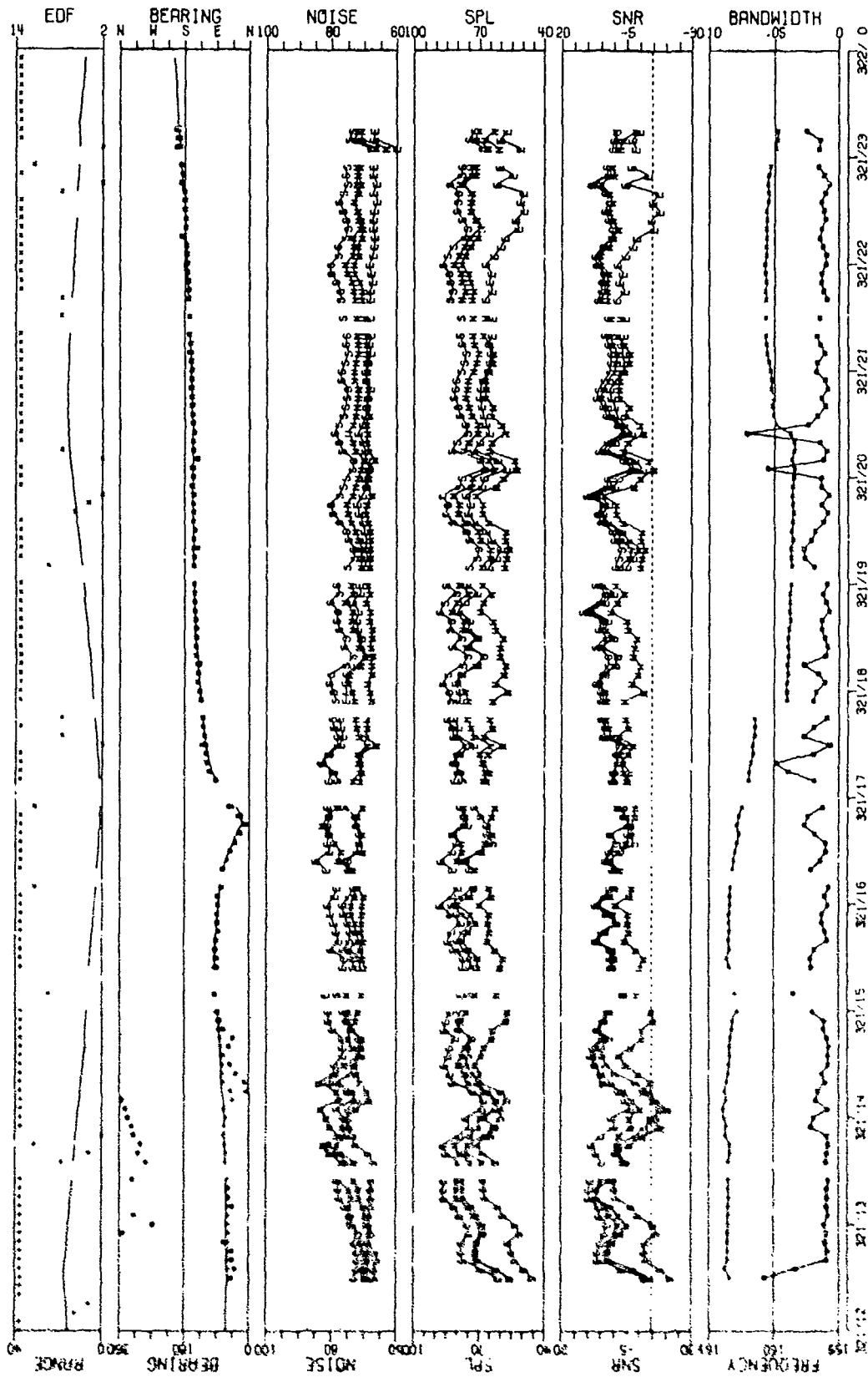


FIGURE 11J-44
MSS-FVT 160 H2 LINE HISTORY AS OBSERVED VIA THE MAX GAIN LIMACONS SENSOR
A- SITE A1 DURING THE 17 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

AG-77-2644

CONFIDENTIAL

CONFIDENTIAL

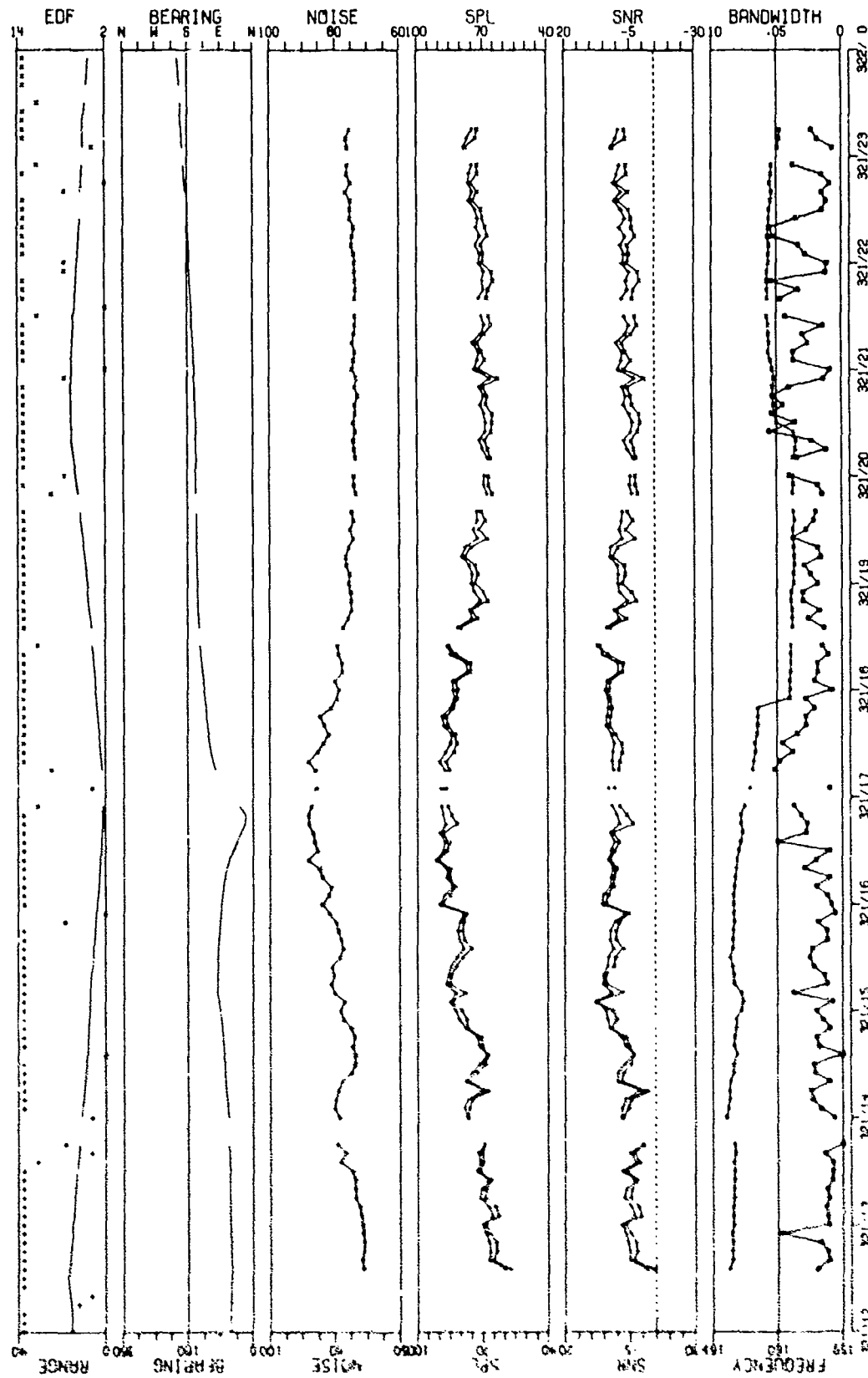


FIGURE 111-45
HSS-FVT 160 H2 LINE HISTORY AS OBSERVED VIA THE VERTICAL DIPOLE SENSOR
AT SITE A1 DURING THE 17 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

AS-77-2645

CONFIDENTIAL

CONFIDENTIAL

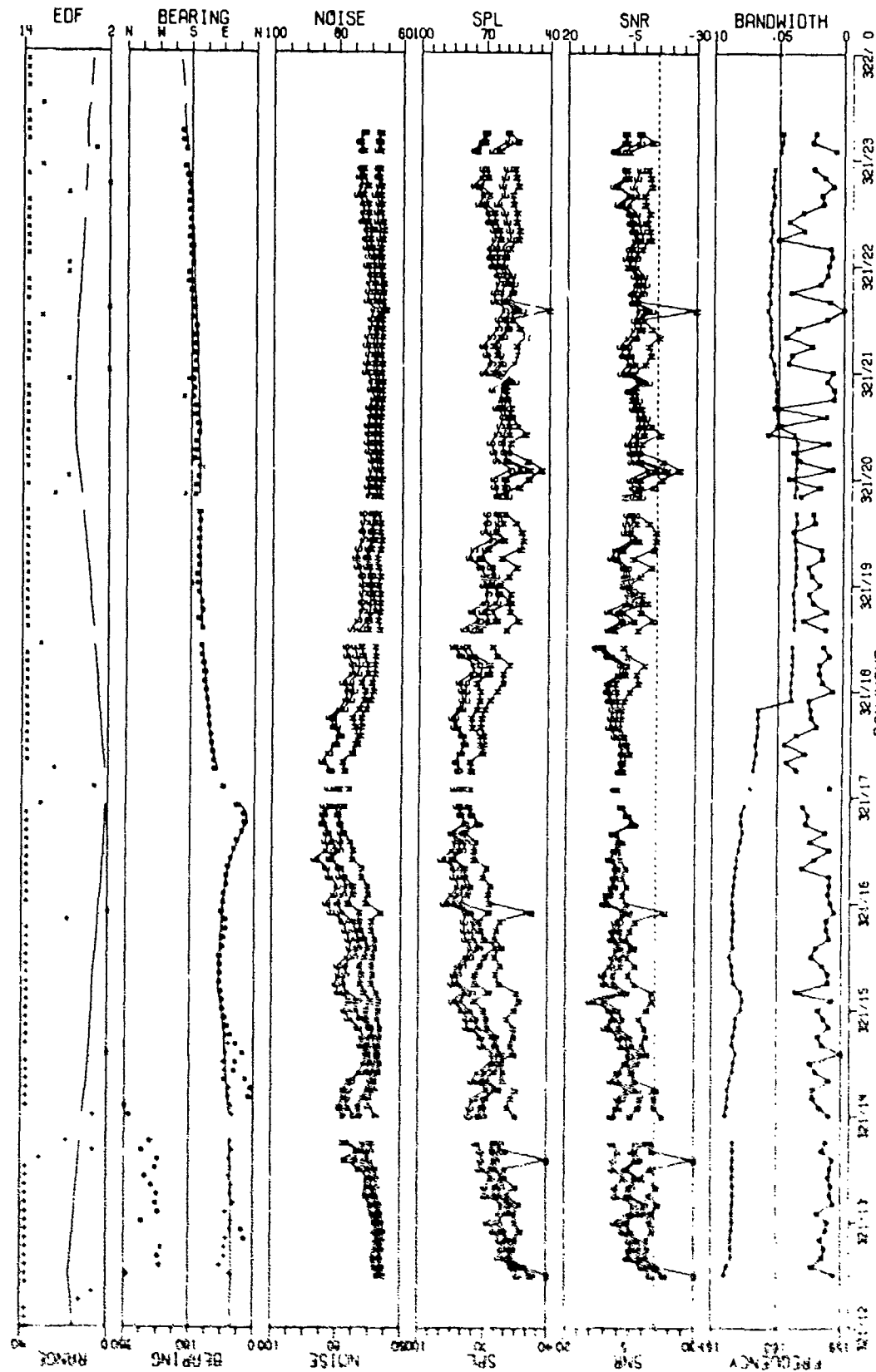


FIGURE III-46
MS3 PVT 150 HZ LINE HISTORY AS OBSERVED VIA THE DIFFERENCED CARDIOIDS SENSOR
AT SITE A1 DURING THE 17 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

AS-77-2646

CONFIDENTIAL

CONFIDENTIAL

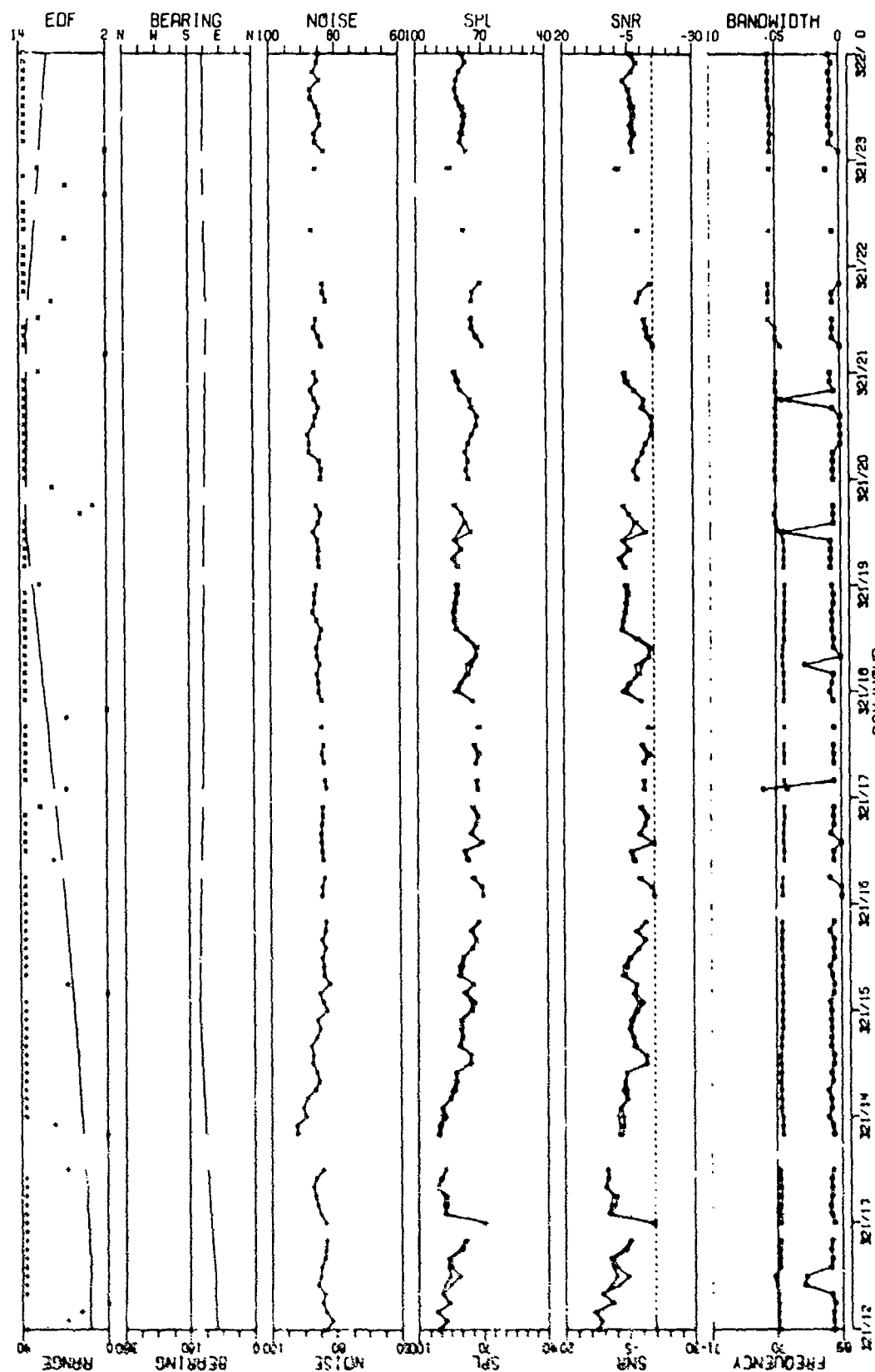


FIGURE 111-47
MSS-FVT 70 HZ LINE HISTORY AS OBSERVED VIA THE OMNIDIRECTIONAL SENSOR
AT SITE A1 DURING THE 17 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

AS-77-2647

CONFIDENTIAL

CONFIDENTIAL

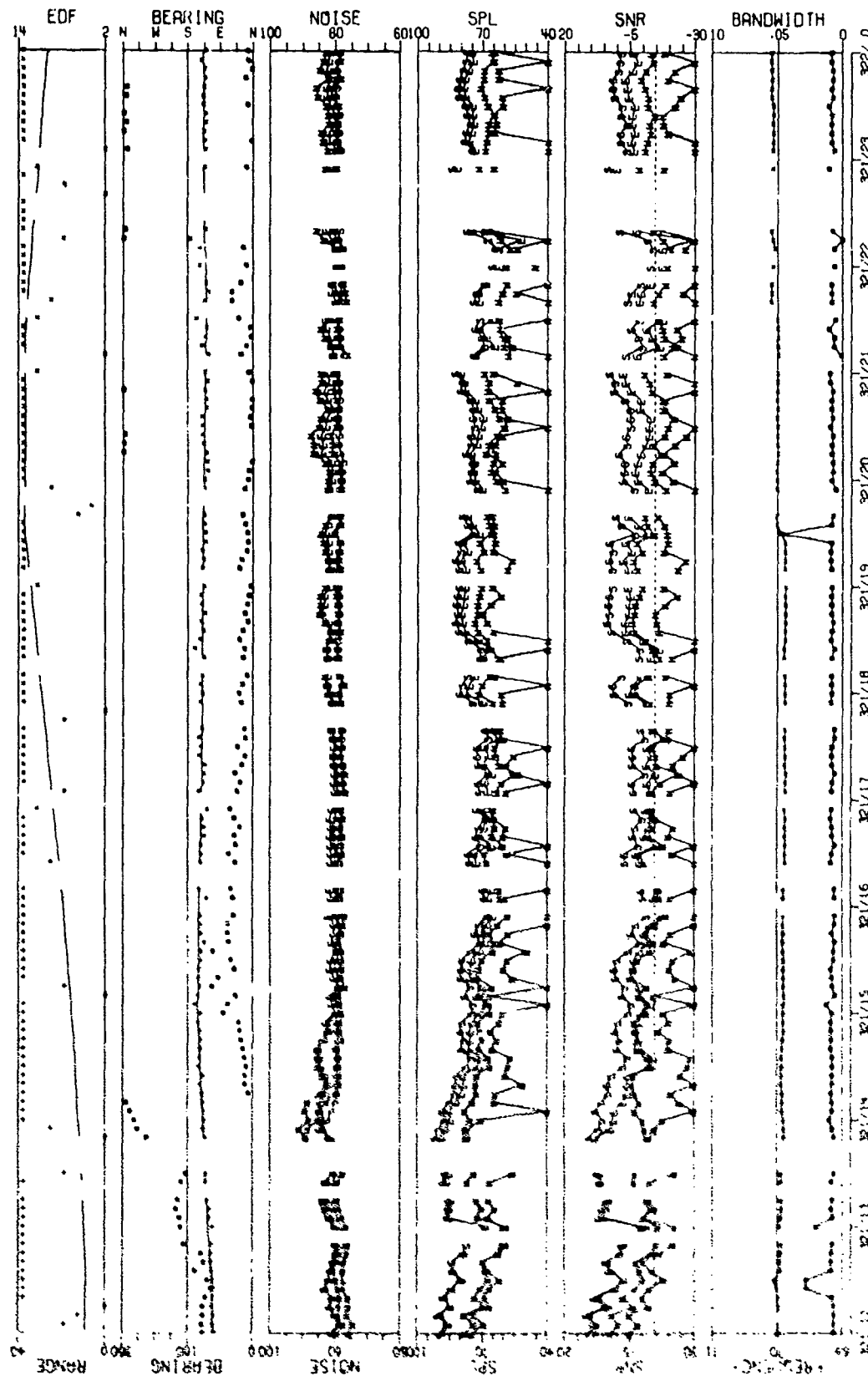


FIGURE 111-48
WSS-FVT 70 HZ LINE HISTORY AS OBSERVED VIA THE SINGLE CARDIOIDS SENSOR
GY SITE R; DURING THE 17 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

AS-77-2649

CONFIDENTIAL

CONFIDENTIAL

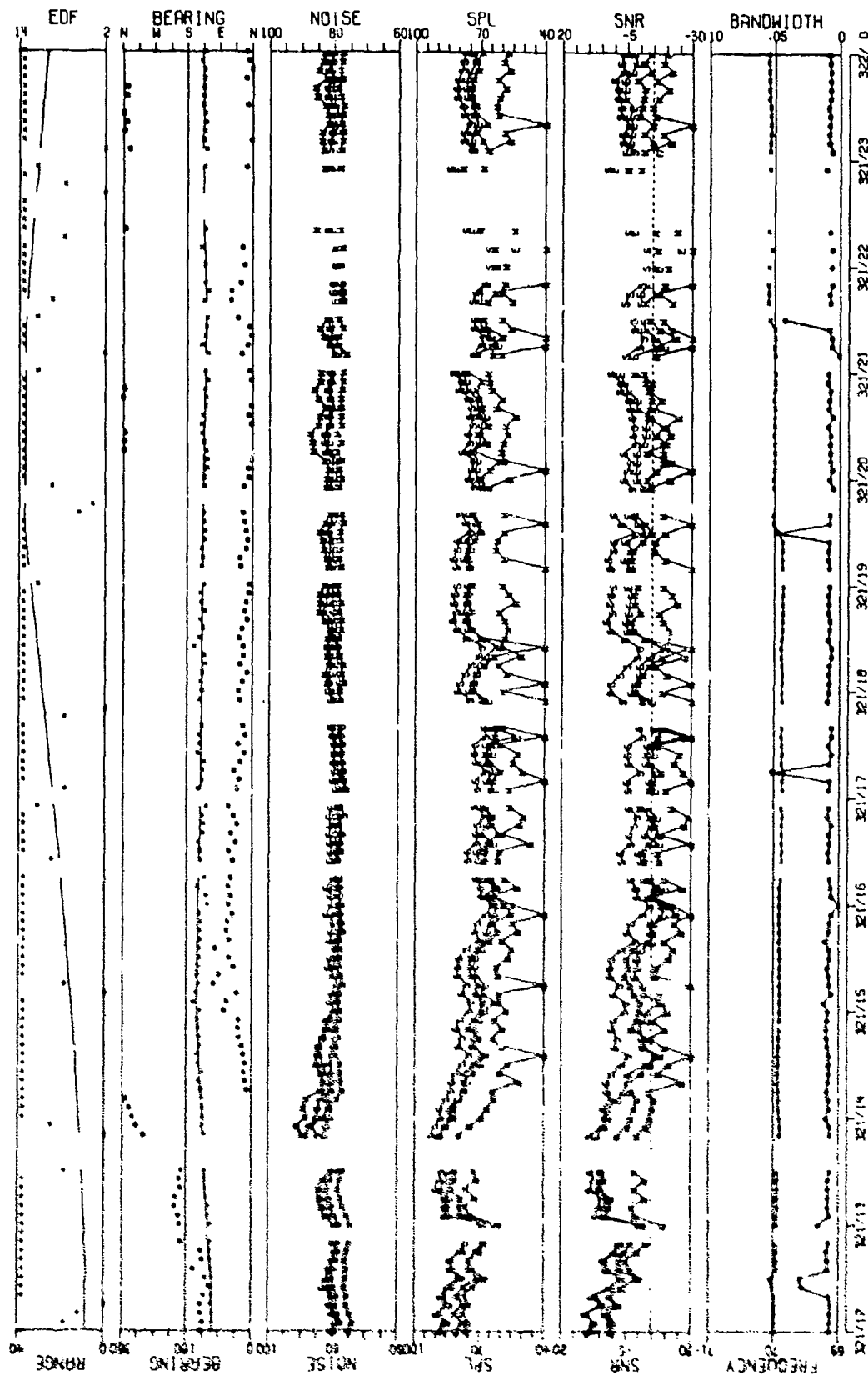


FIGURE 111-49
HSS-FYI 70 HZ LINE HISTORY AS OBSERVED VIA THE MAX GAIN LIMACONS SENSOR
AT SITE R1 DURING THE 17 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

AS-77-2649

CONFIDENTIAL

CONFIDENTIAL

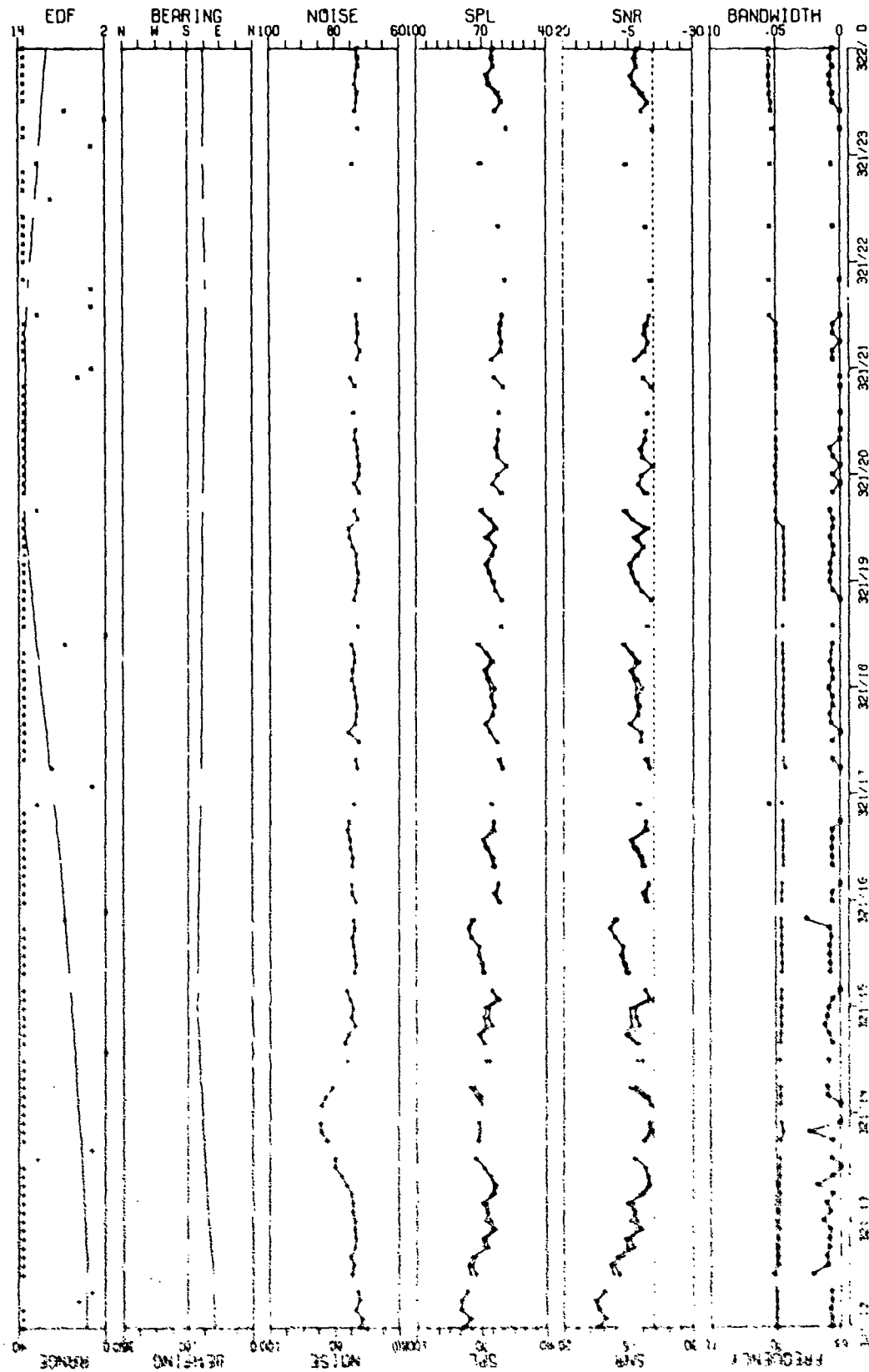


FIGURE 111-50
MCS-FV 70 M2 LINE HISTORY AS OBSERVED VIA THE VERTICAL DIPOLE SENSOR
AT SITE A1 DURING THE 17 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

05-77-2650

CONFIDENTIAL

CONFIDENTIAL

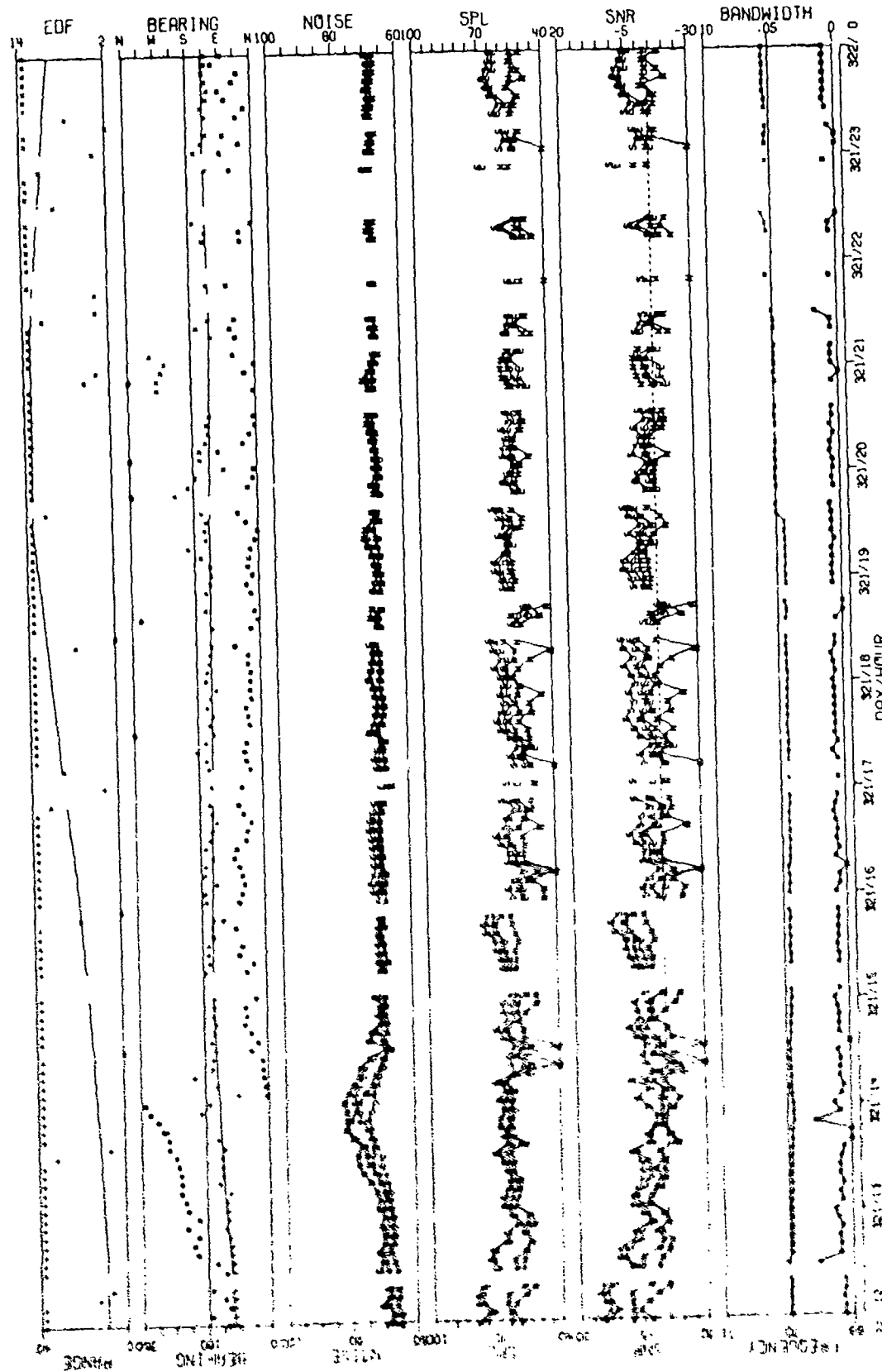


FIGURE 111-51
WGS-51 70 HZ LINE HISTORY AS OBSERVED VIA THE DIFFERENCED CAROTIDIDS SENSOR
AT SITE AT DURING THE 17 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

AS-77-2651

CONFIDENTIAL

CONFIDENTIAL

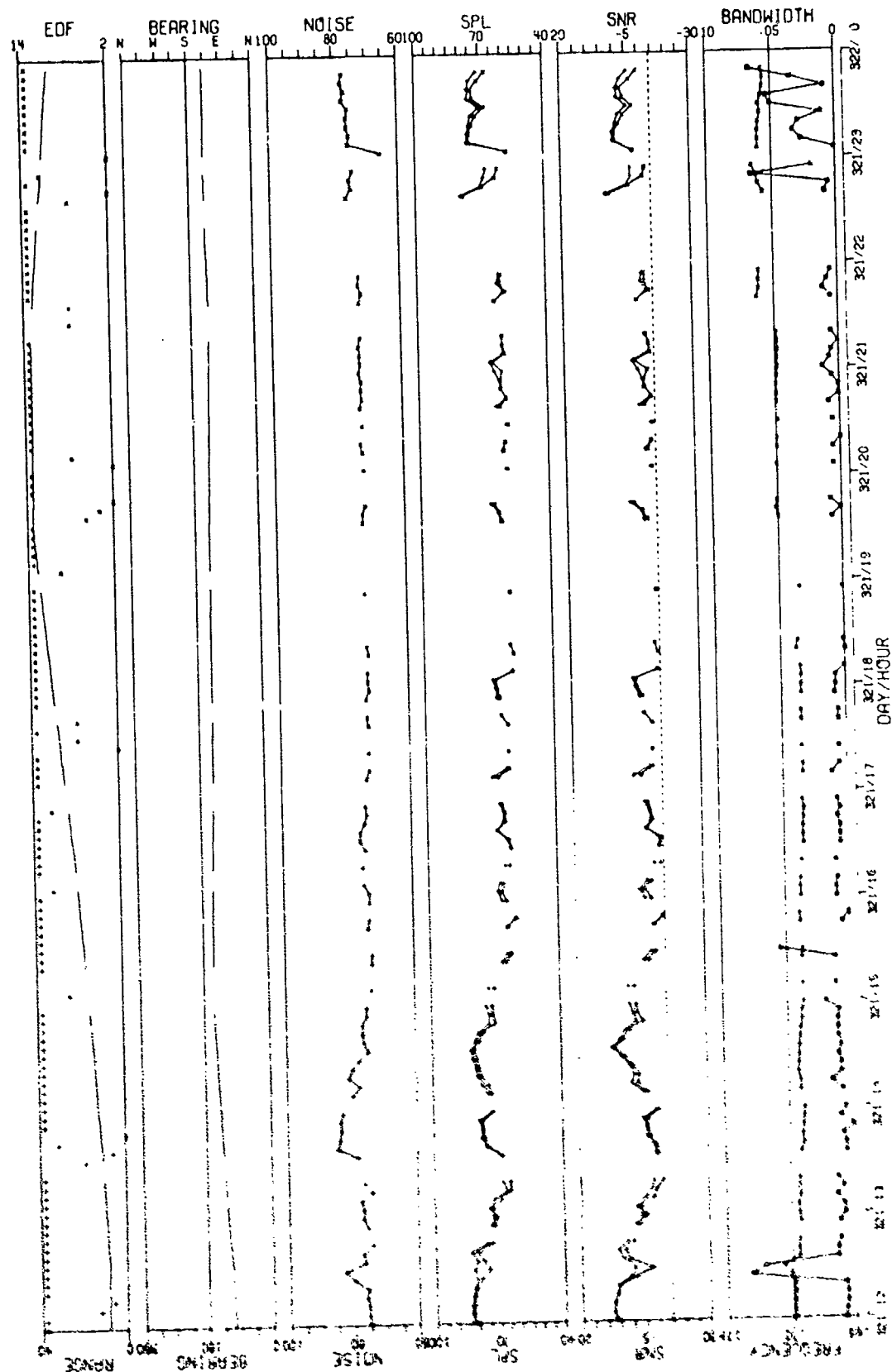


FIGURE 111-52
MCS FV1 170 M2 LINE HISTORY AS OBSERVED VIA THE OMNIDIRECTIONAL SENSOR
AT SITE R1 DURING THE 17 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

AS-77-2652

CONFIDENTIAL

CONFIDENTIAL

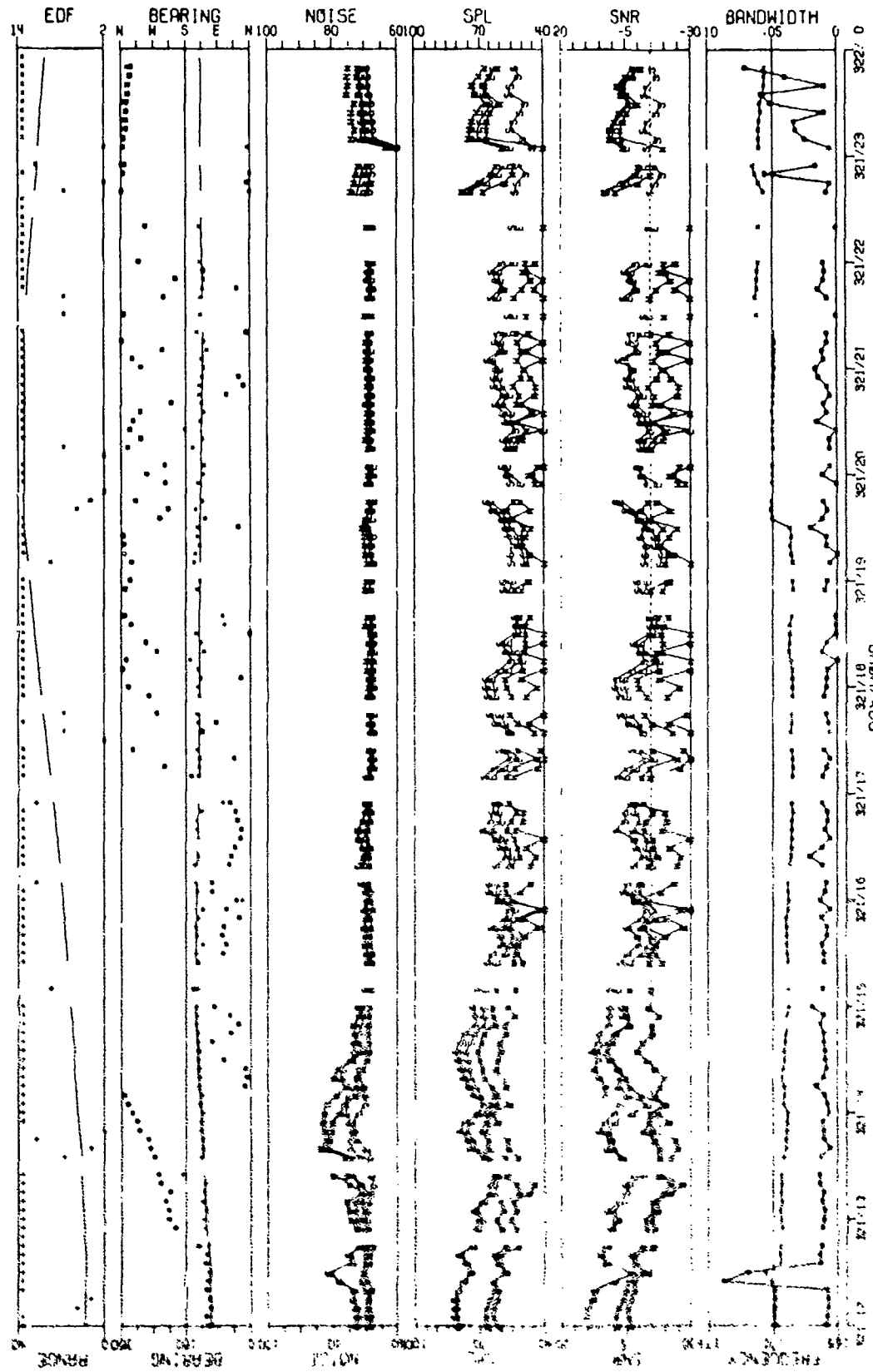


FIGURE 111-53
HSS-FV 170 12 LINE HISTORY AS OBSERVED VIA THE SINGLE CARDIOIDS SENSOR
AT SITE R1 DURING THE 17 NOV FIELD EVENT 1, 1TH VERNIER RESOLUTION (U)

AG-77-2653

CONFIDENTIAL

CONFIDENTIAL

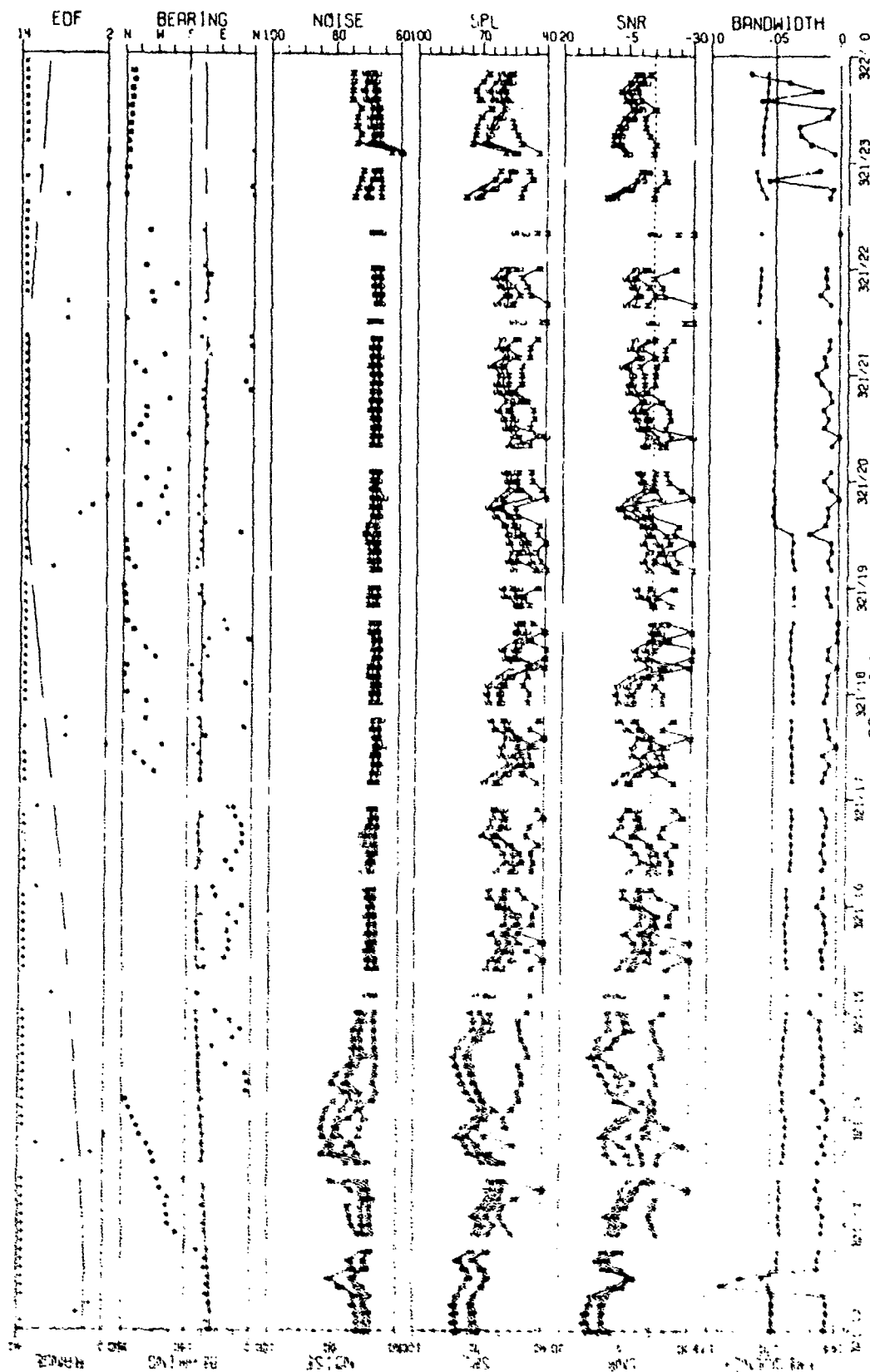


FIGURE III-54
MAX GAIN LIMA CONS. SENSOR
ON 321/10 DURING THE 17 W. FIELD EVENT WITH VERNIER RESOLUTION (U)

CONFIDENTIAL

CONFIDENTIAL

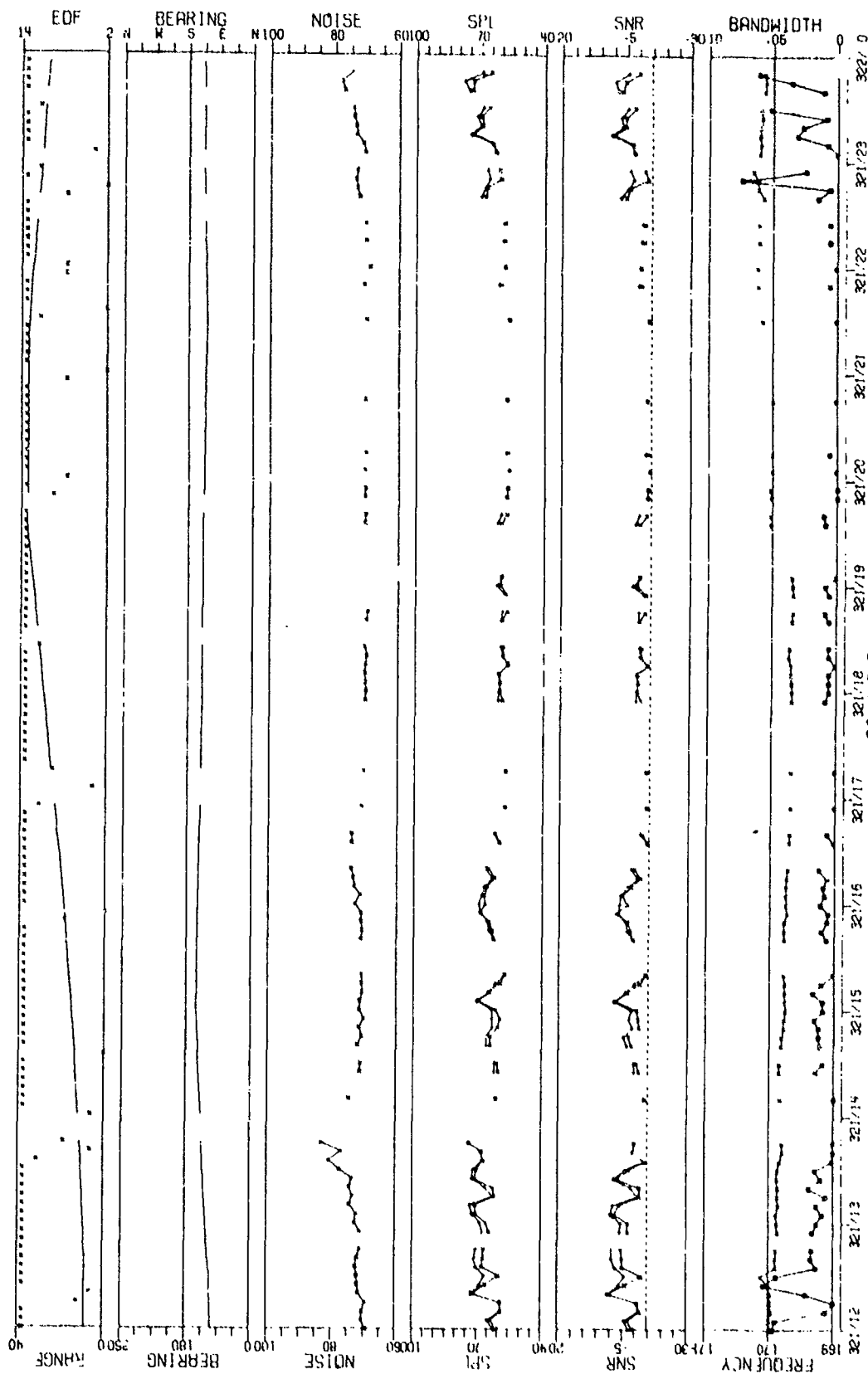


FIGURE 111-55
MCS-F/T 170 HZ LINE HISTORY AS OBSERVED VIA THE VERTICAL DIPOLE SENSOR
AT SITE R1 DURING THE 17 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

AS-77-0655

CONFIDENTIAL

CONFIDENTIAL

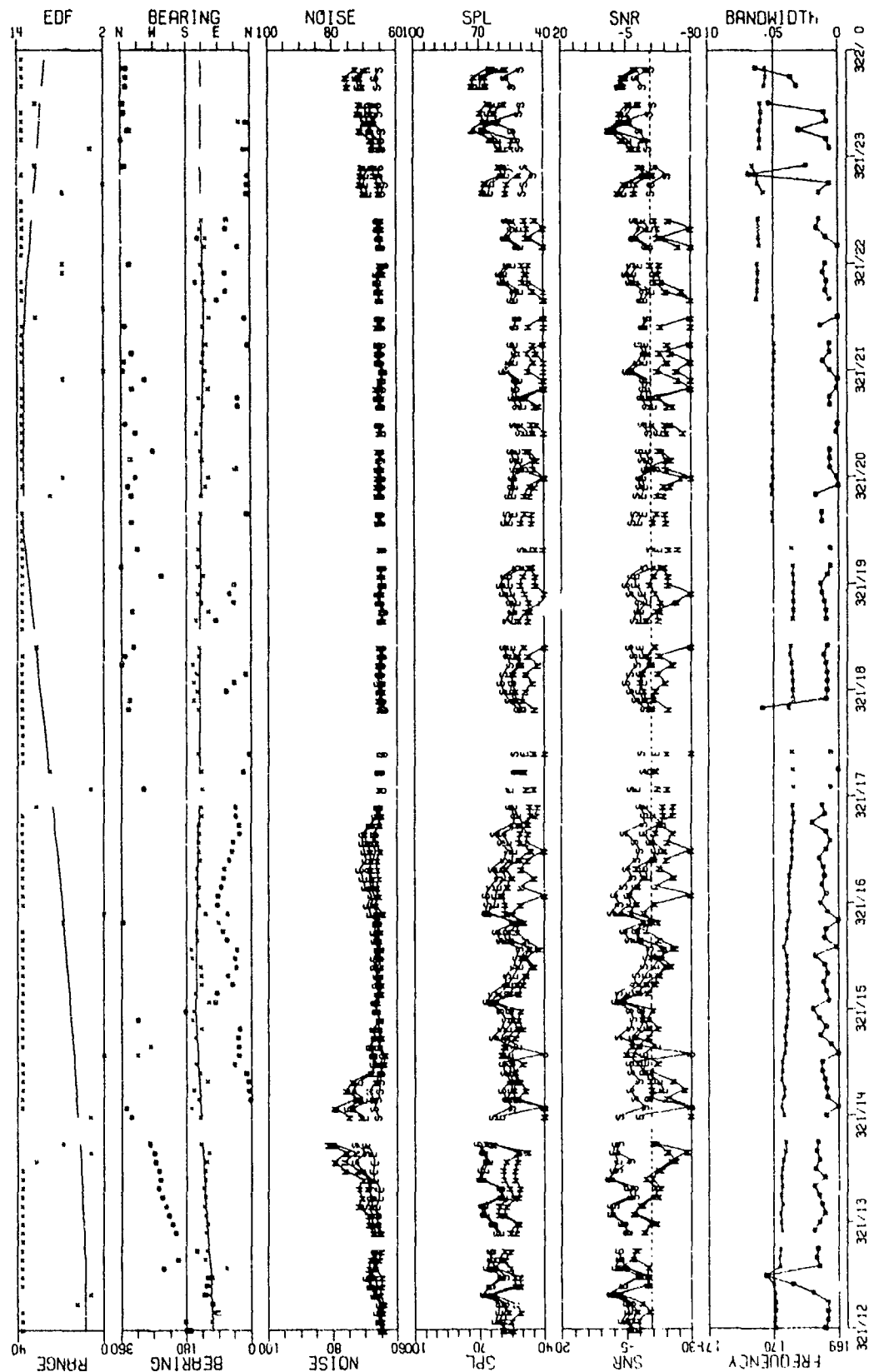


FIGURE 111-56
MSS-EVT 170 HZ LINE HISTORY AS OBSERVED VIA THE DIFFERENCED CAROTIDS SENSOR
AT SITE A1 DURING THE 17 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

AS-77-2656

CONFIDENTIAL

CONFIDENTIAL

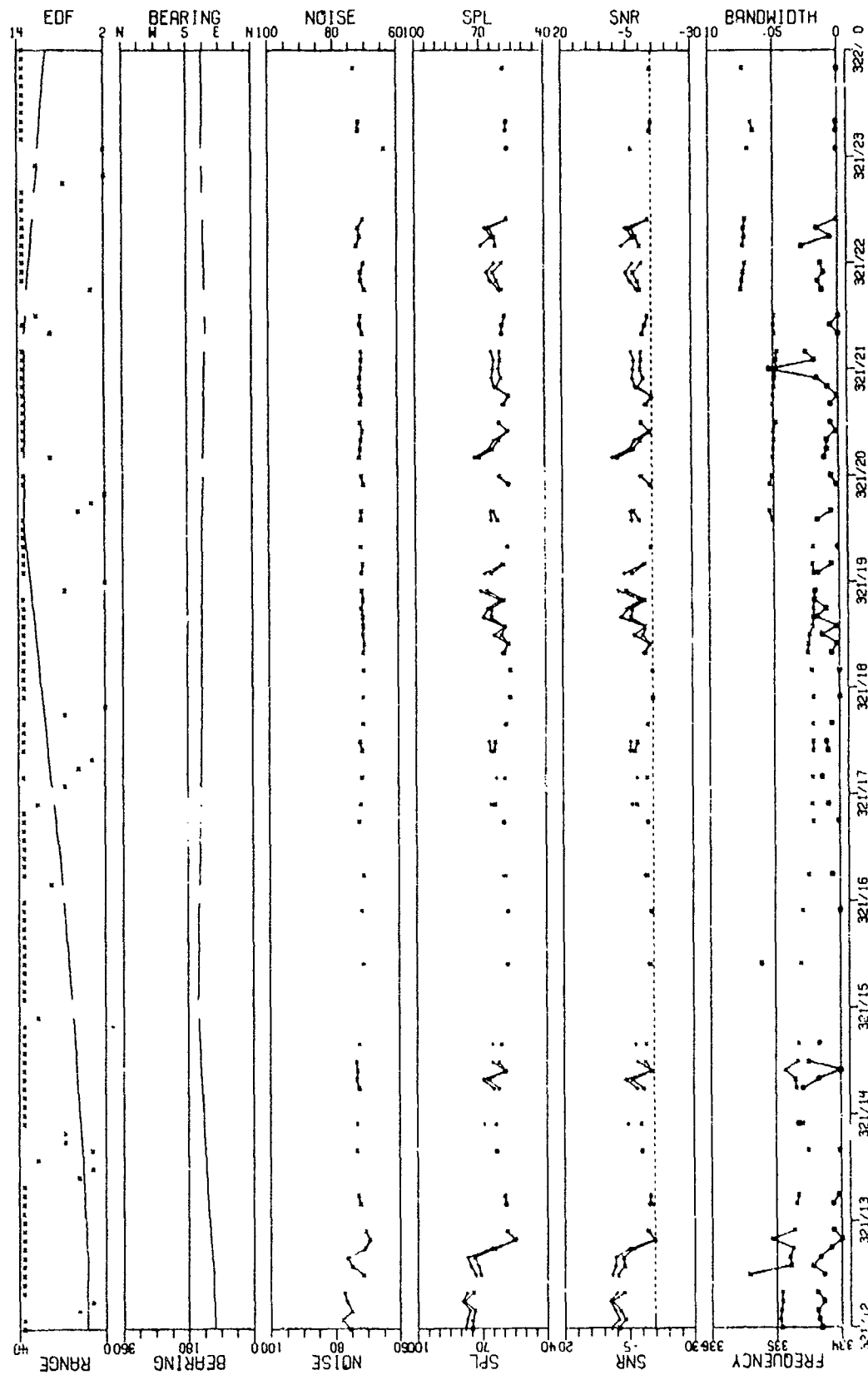


FIGURE III-57
MSS-FVT 335 HZ LINE HISTORY AS OBSERVED VIA THE OMNIDIRECTIONAL SENSOR
AT SITE A1 DURING THE 17 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

AS-77-2657

CONFIDENTIAL

CONFIDENTIAL

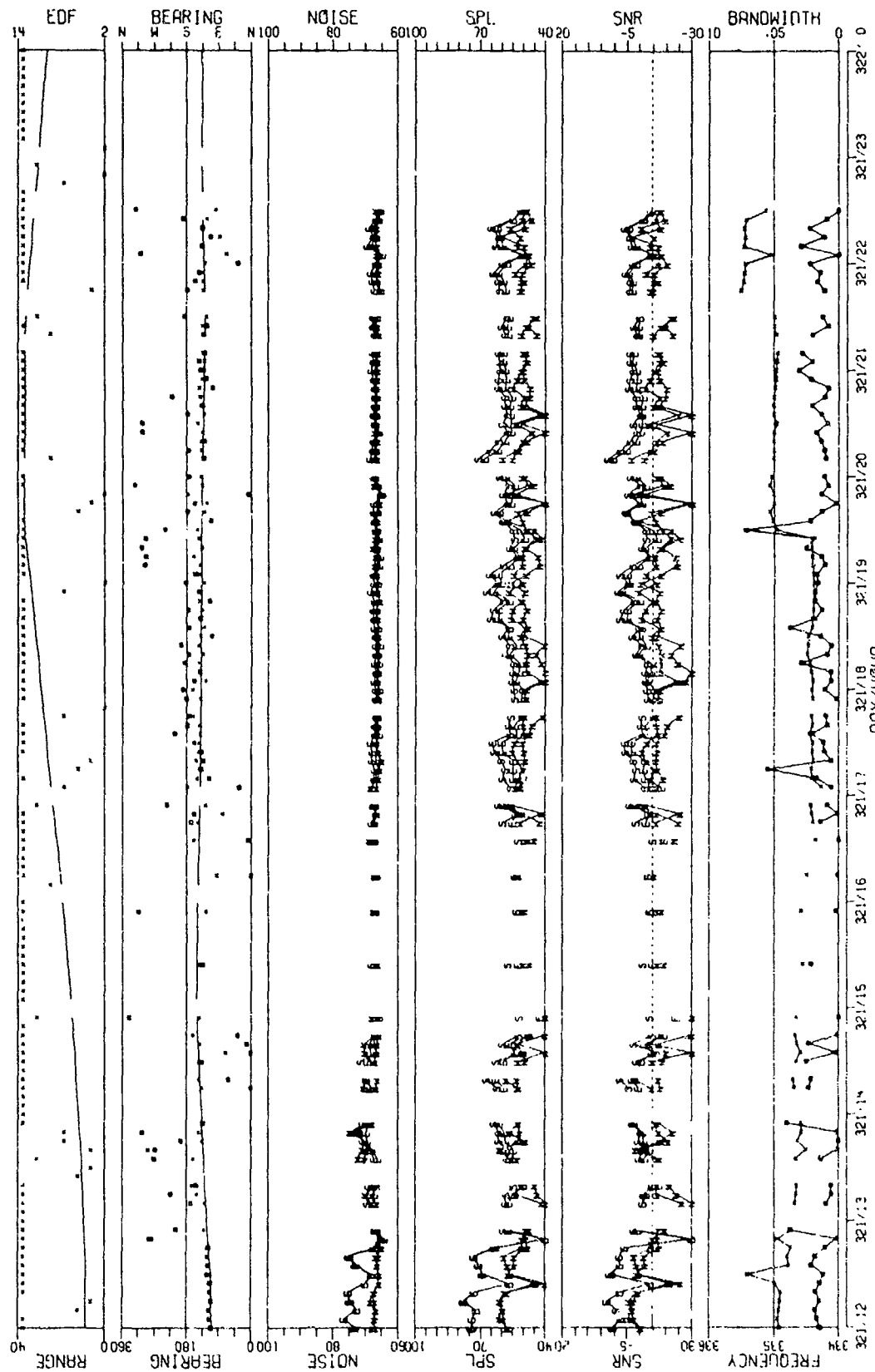


FIGURE 111-58
MSS-FVT 335 HZ LINE HISTORY AS OBSERVED VIA THE SINGLE CARDIOLIDS SENSOR
AT SITE R; DURING THE 17 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

AS-77-2658

CONFIDENTIAL

CONFIDENTIAL

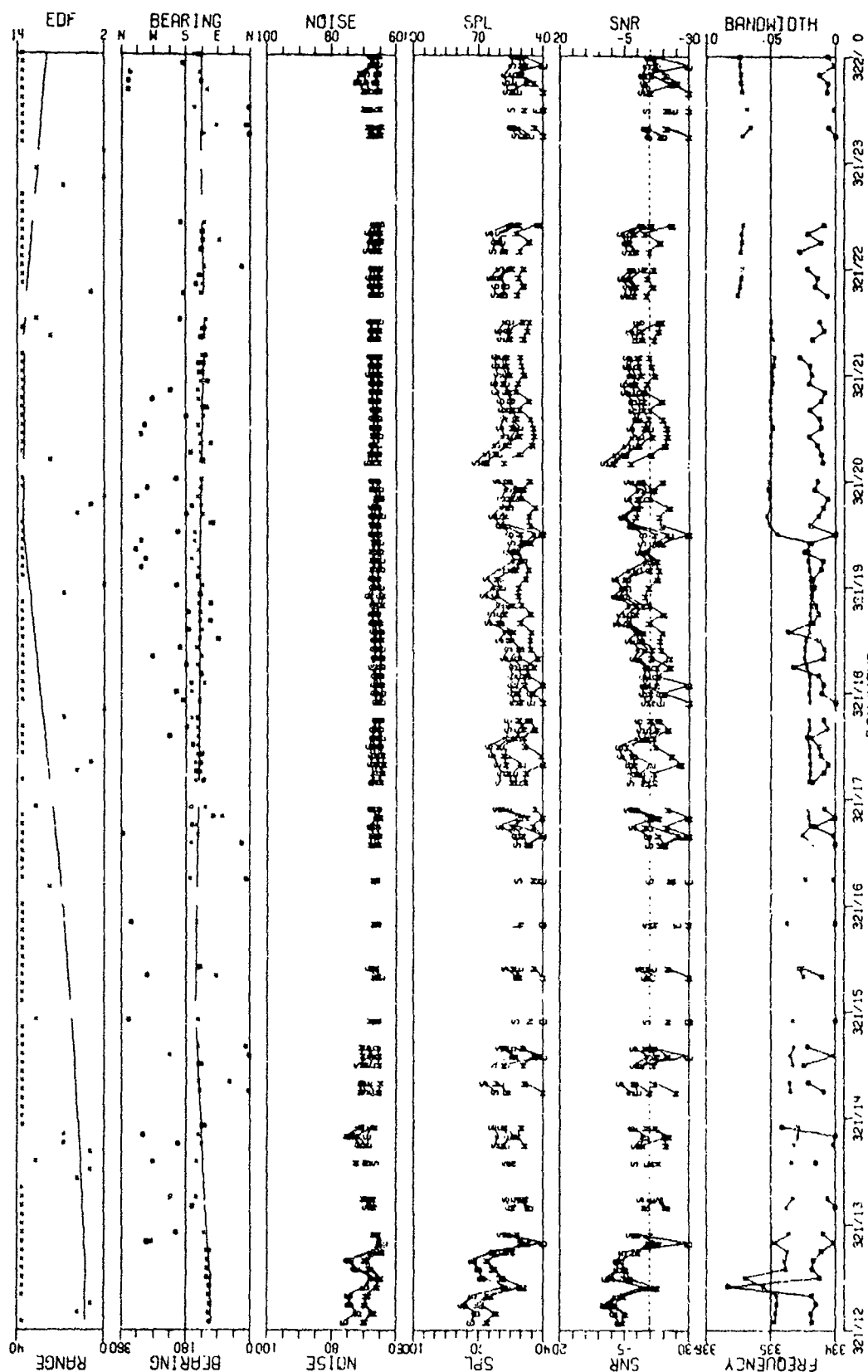


FIGURE 111-59
MSG-FVT 335 HZ LINE HISTORY AS OBSERVED VIA THE MAX GAIN LIMACONS SENSOR
AT SITE A1 DURING THE 17 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

AS-77-2659

CONFIDENTIAL

CONFIDENTIAL

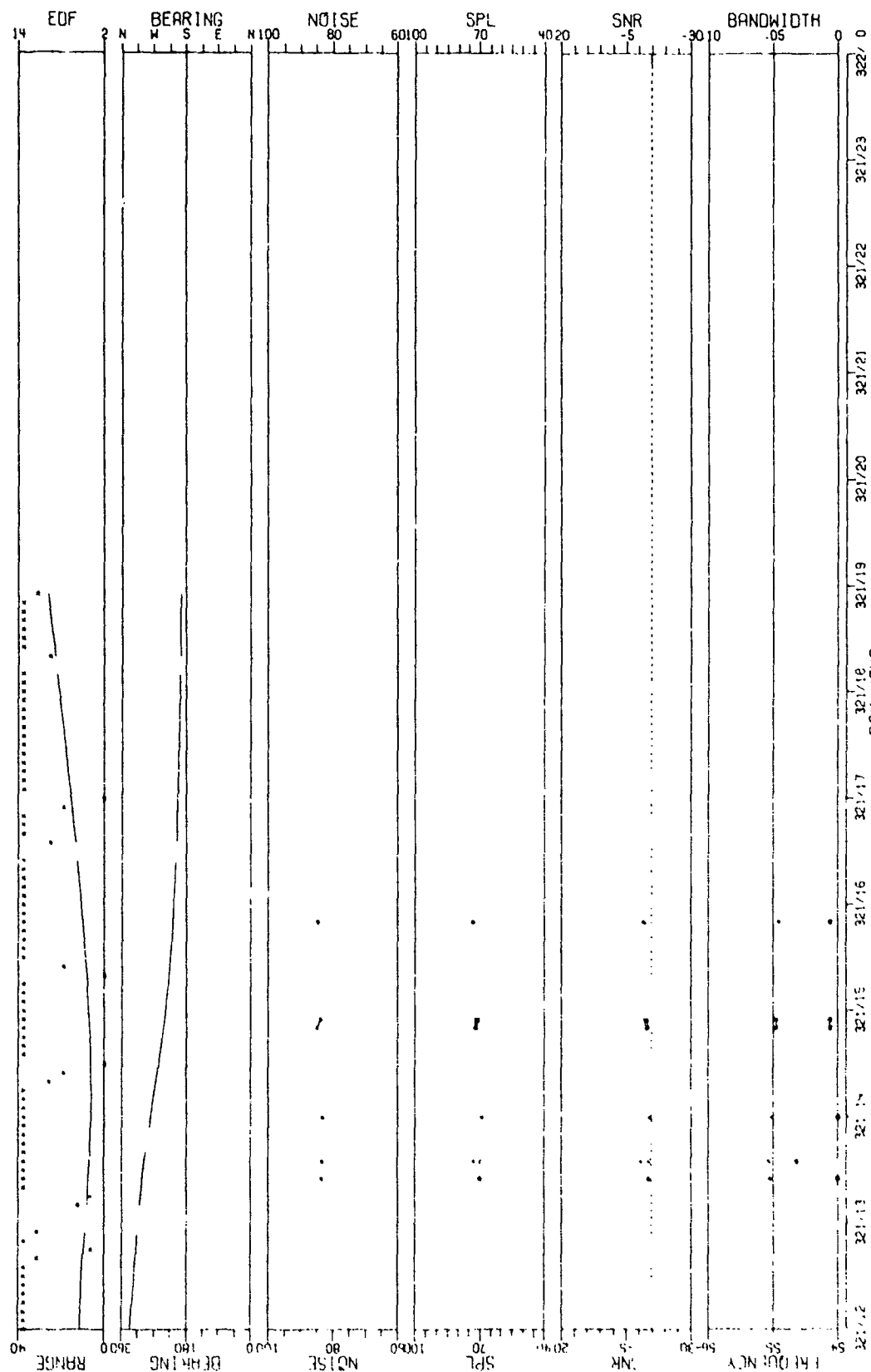


FIGURE 111-60
MCS-FV1 55 HZ LINE HISTORY AS OBSERVED VIA THE OMNIDIRECTIONAL SENSOR
AT SITE R2 DURING THE 17 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

AS-77-2660

CONFIDENTIAL

CONFIDENTIAL

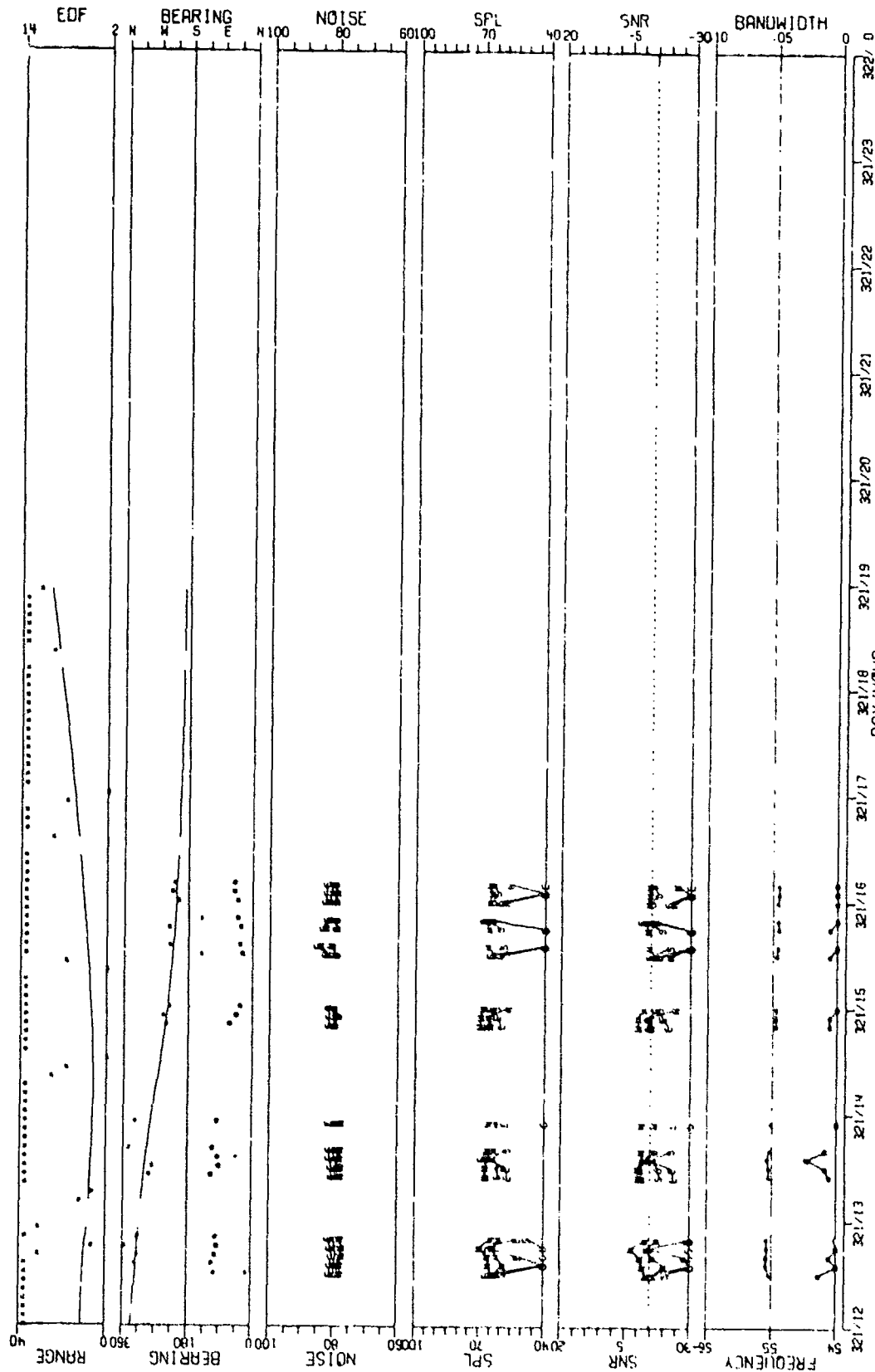


FIGURE 111-61
HSS-FVT 55 HZ LINE HISTORY AS OBSERVED VIA THE SINGLE CARDIOTIDS SENSOR
AT SITE A2 DURING THE 17 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

AS-77-2661

CONFIDENTIAL

CONFIDENTIAL

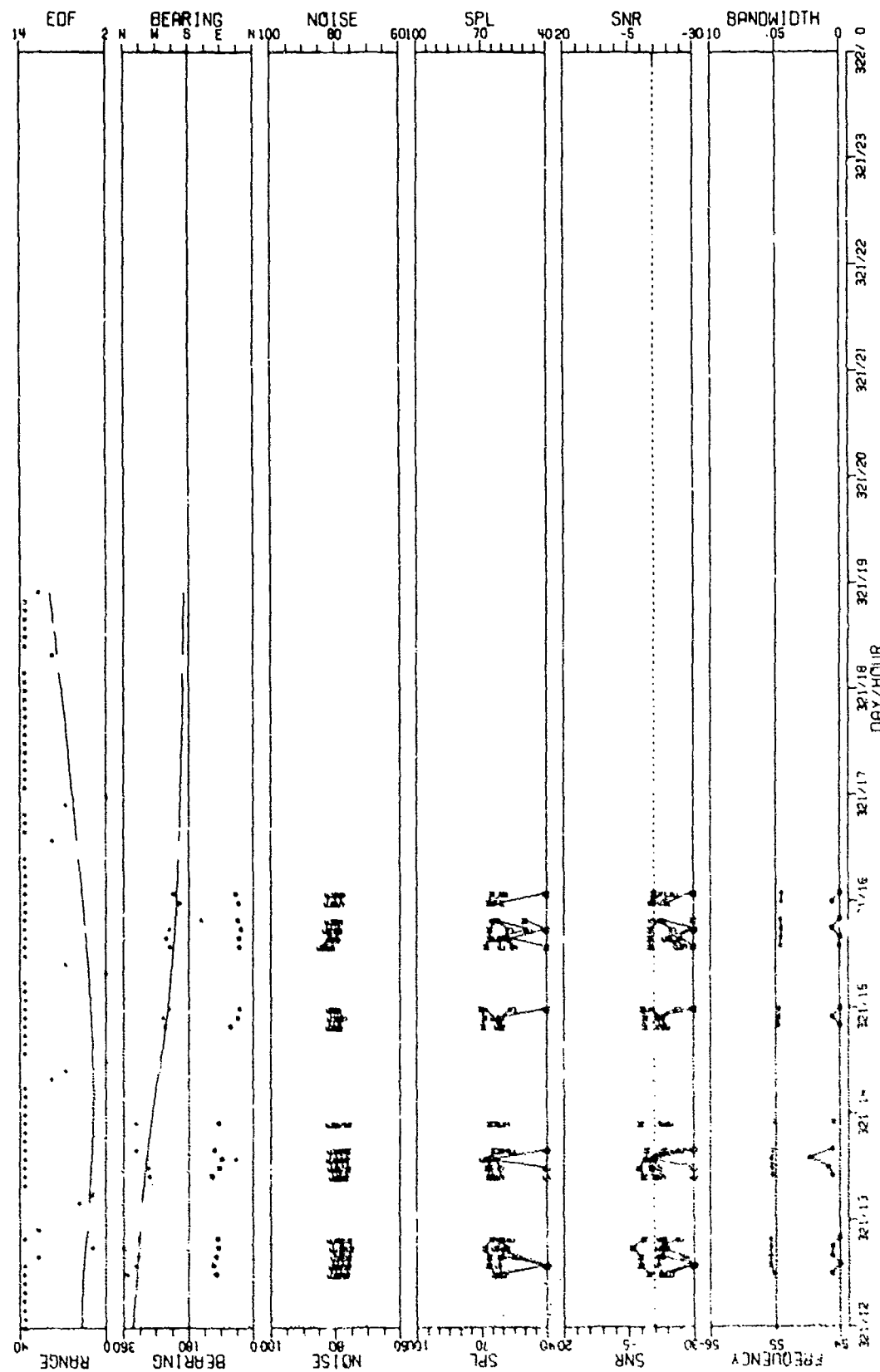


FIGURE 111-62
 455-FVT 55 1/2 LINE HISTORY AS OBSERVED VIA THE MAX GAIN LIMACONS SENSOR
 AT SITE A2 DURING THE 17 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

AS-77-2662

CONFIDENTIAL

CONFIDENTIAL

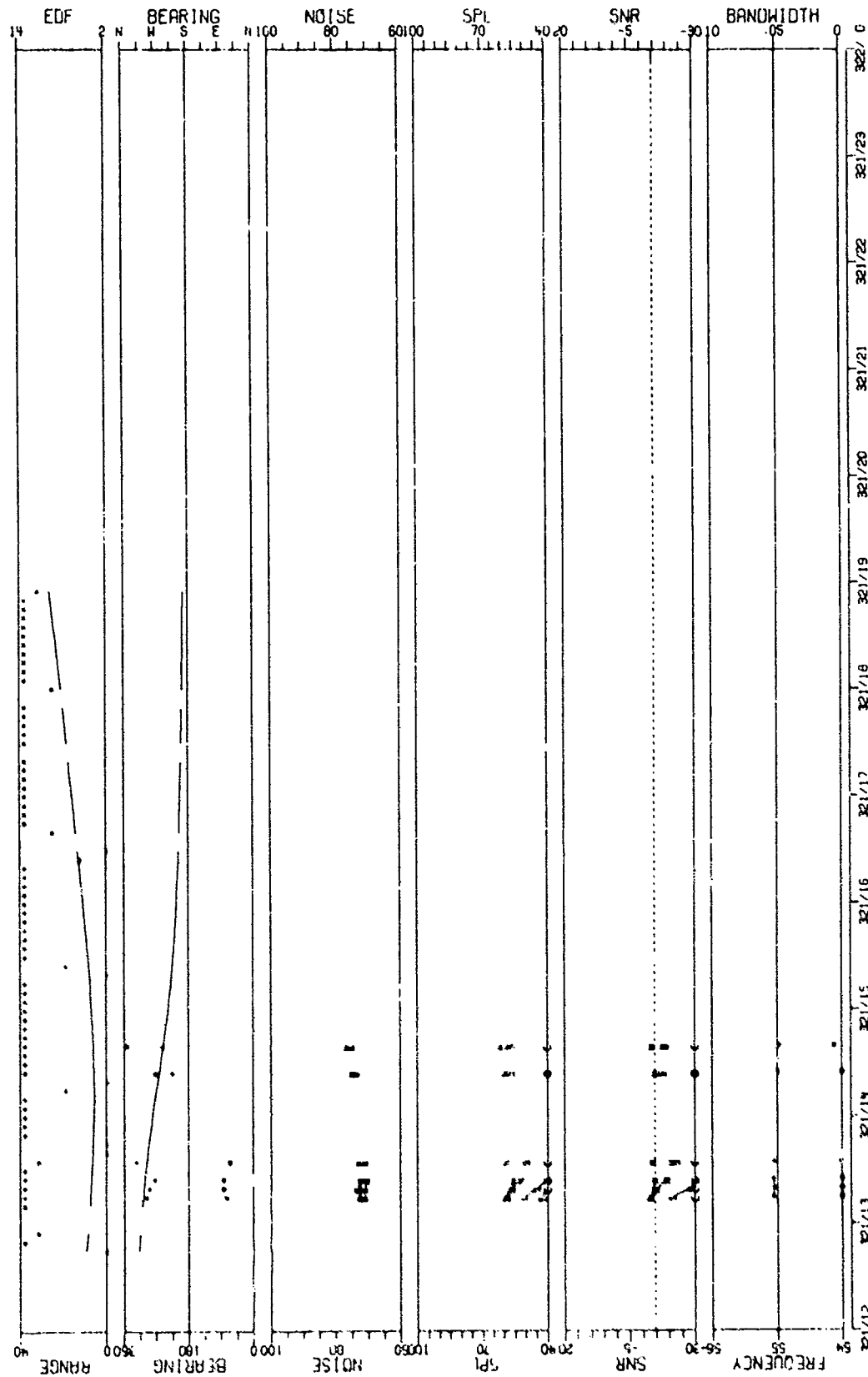


FIGURE 111-63
MSS-FVT 55 HZ LINE HISTORY AS OBSERVED VIA THE DIFFERENCED CARDOIDS SENSOR
AT SITE A2 DURING THE 17 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

AS-77-2663

CONFIDENTIAL

CONFIDENTIAL

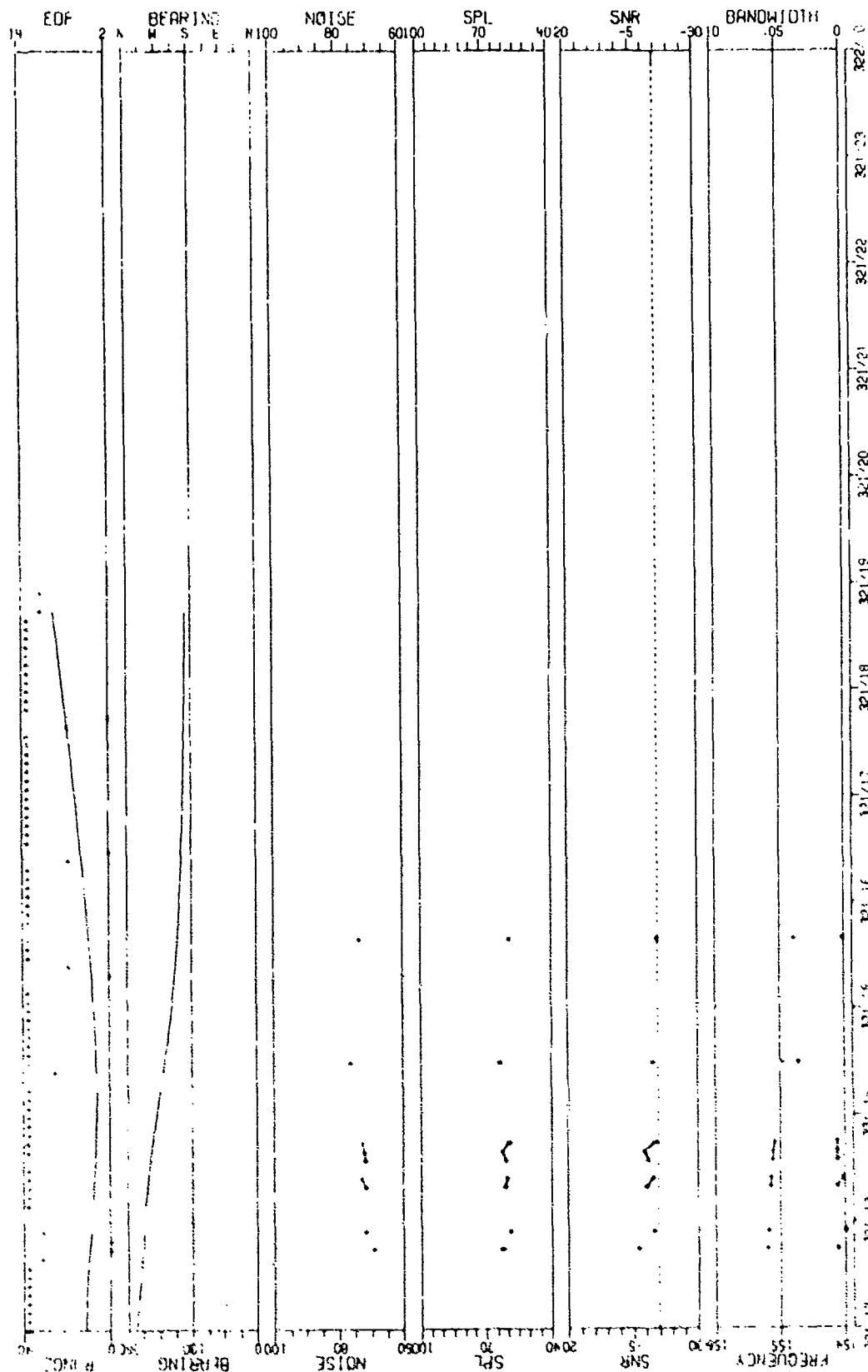


FIGURE 111-64
155 MZ LINE HISTORY AS OBSERVED VIA THE OMNIDIRECTIONAL SENSOR
AT SITE A2 DURING THE 17 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

AS-77-2664

CONFIDENTIAL

CONFIDENTIAL

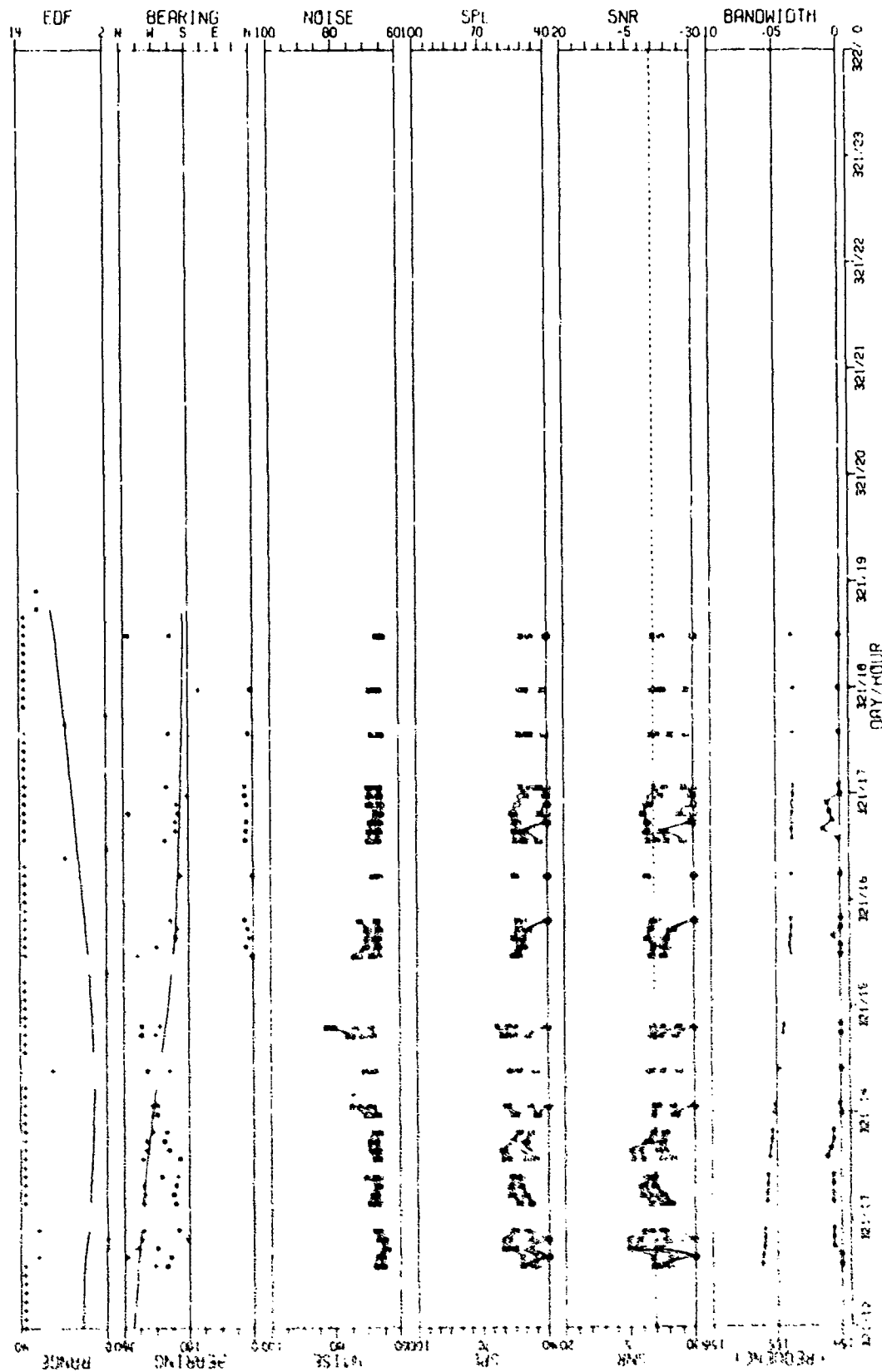


FIGURE 111
HISTORICAL LINE HISTORY AS OBSERVED VIA THE SINGLE CAROTID SENSOR
DURING THE 17 NOV FIELD EVENT WITH VERNIER RESOLUTION 1U

AS-77-2669

CONFIDENTIAL

CONFIDENTIAL

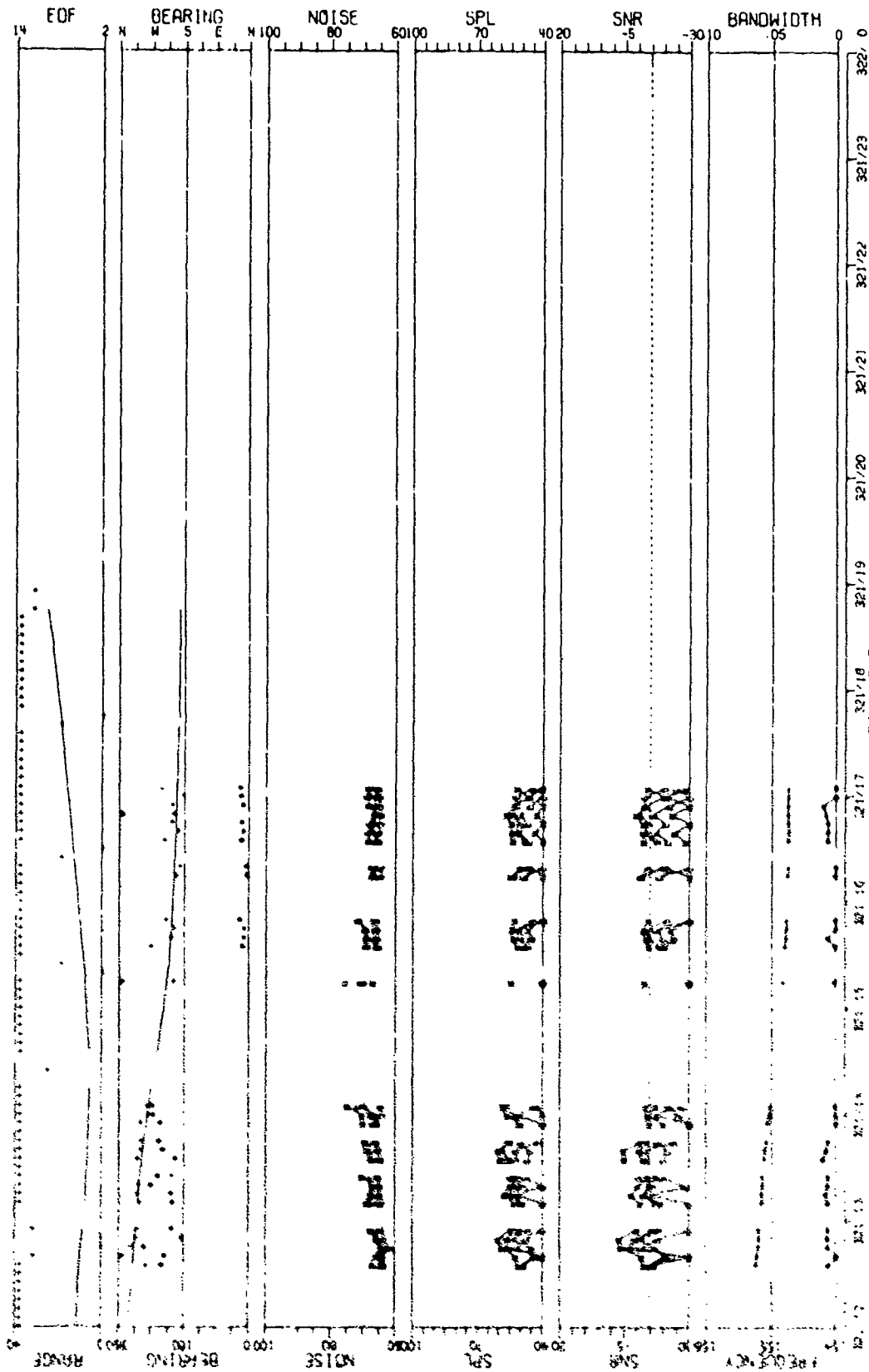


FIGURE 111-66
 HISTORY AS OBSERVED VIA THE MAX GAIN LIMACONS SENSOR
 DURING THE 17 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

AS-77-2666

CONFIDENTIAL

CONFIDENTIAL

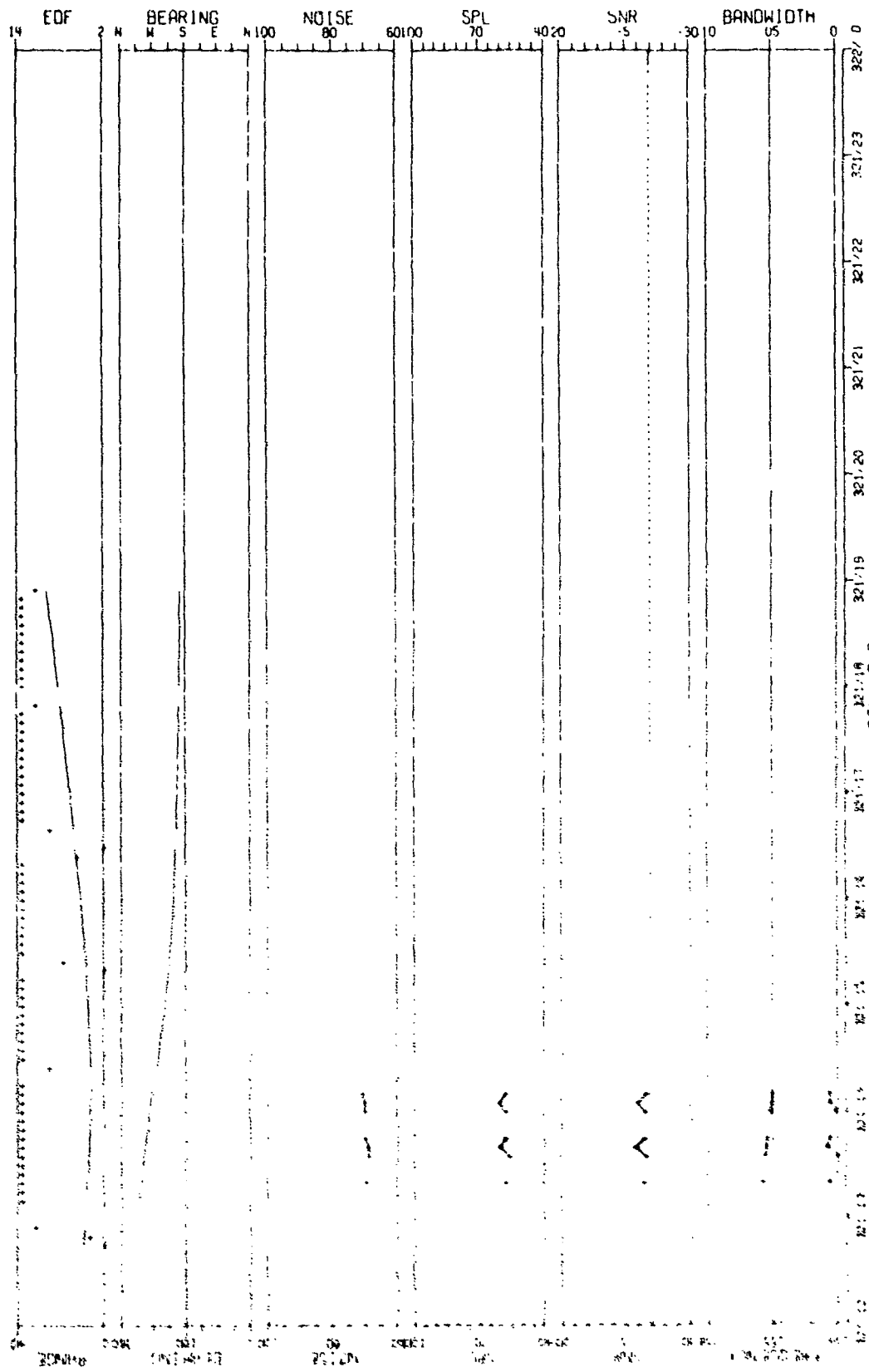


FIGURE 11-67
AC OBSERVED VIA THE VERTICAL DIPOLE SENSOR
DURING THE 12 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

AS-77-2667

CONFIDENTIAL

CONFIDENTIAL

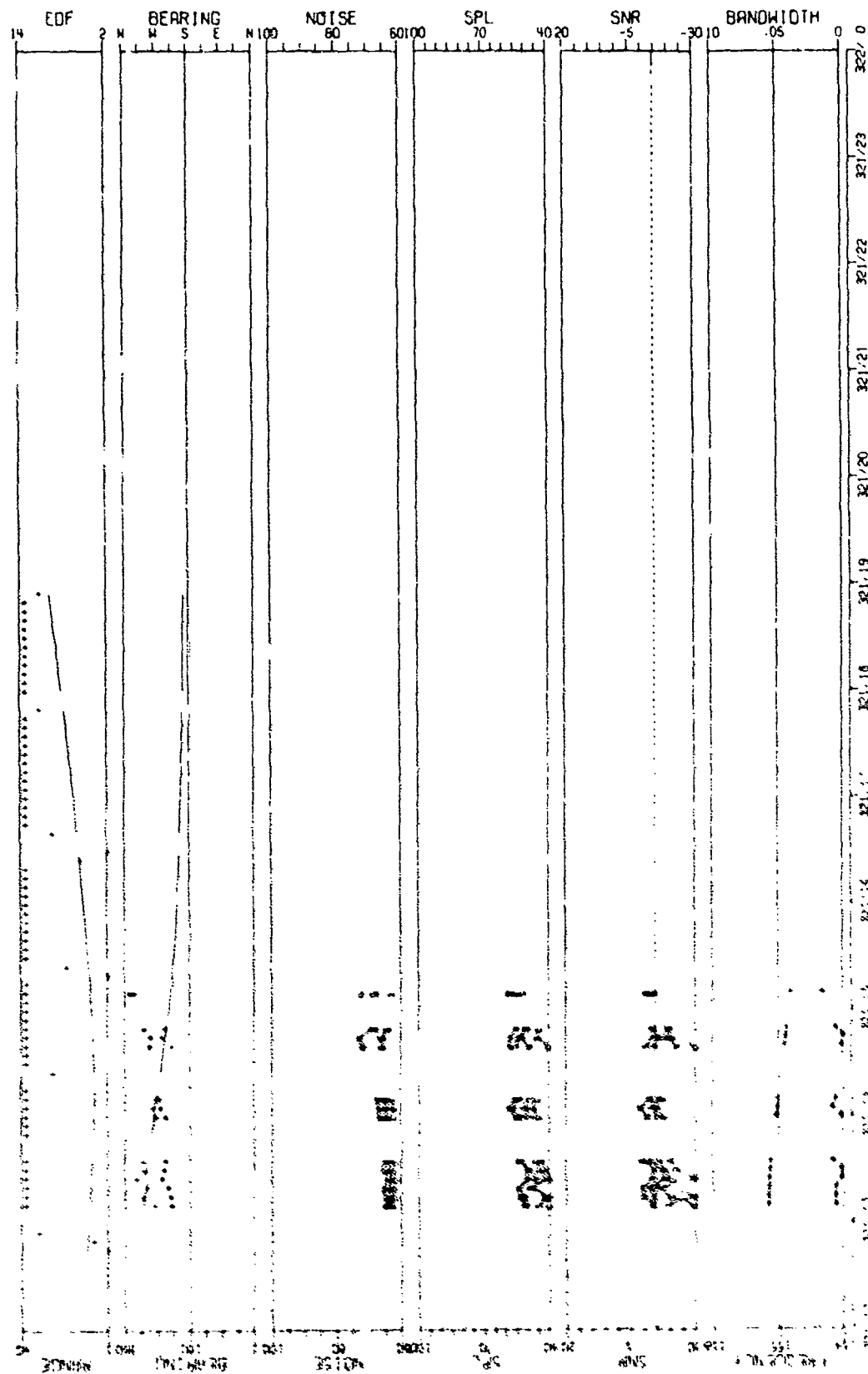


FIGURE 111-68
NOISE AND SPL LINE HISTOGRAMS OBSERVED VIA THE DIFFERENCED CARDIOIDS SENSOR
AT 321/18 DURING THE 11 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

CONFIDENTIAL

CONFIDENTIAL

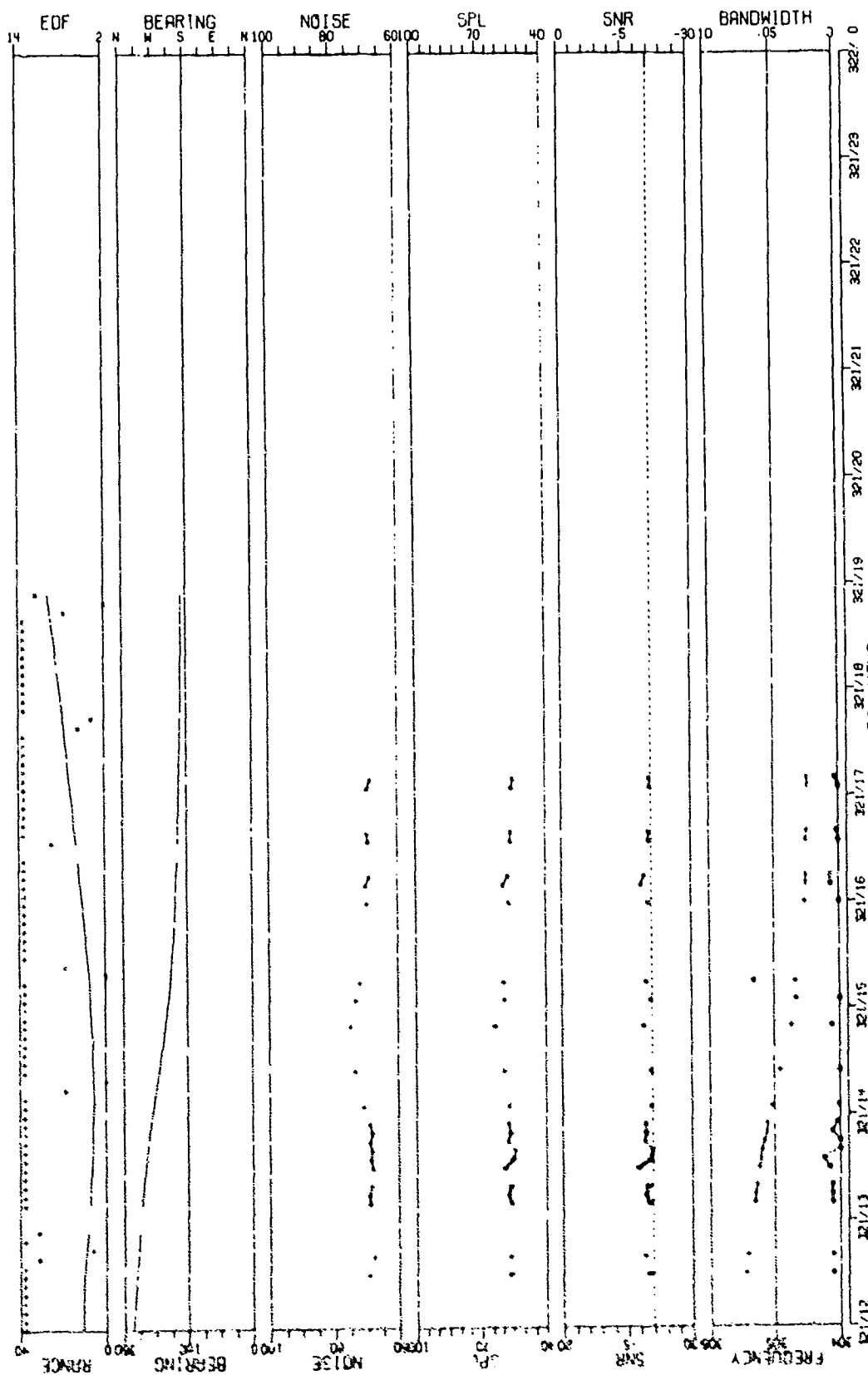


FIGURE 111-69
MSS-FVT 305 HZ LINE HISTORY AS OBSERVED VIA THE OMNIDIRECTIONAL SENSOR
AT SITE R2 DURING THE 17 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

AS-77-2669

98
CONFIDENTIAL

CONFIDENTIAL

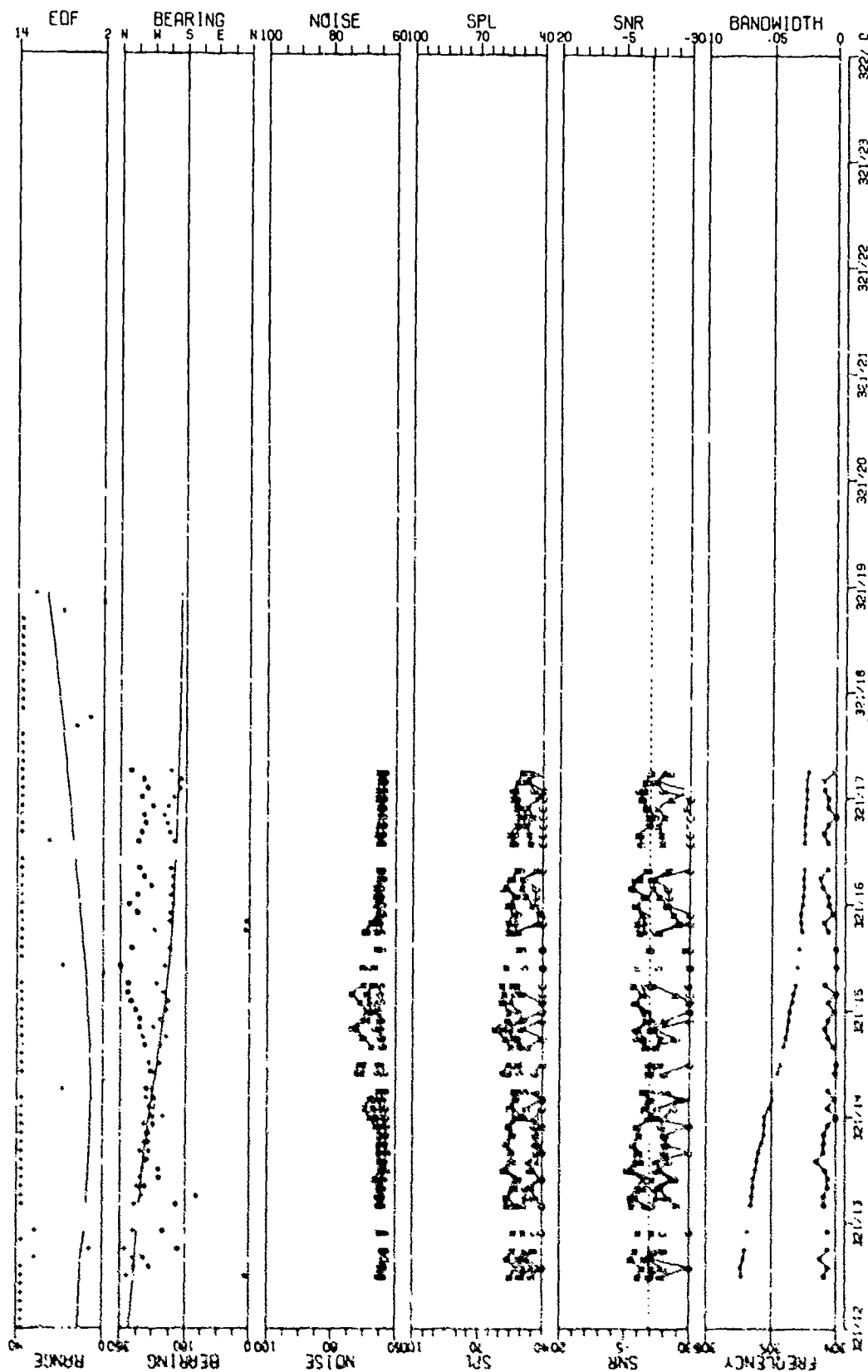


FIGURE 111-70
MSS-FVT 305 HZ LINE HISTORY AS OBSERVED VIA THE SINGLE CAROTIDS SENSOR
AT SITE R2 DURING THE 17 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

AS-77-2670

CONFIDENTIAL

CONFIDENTIAL

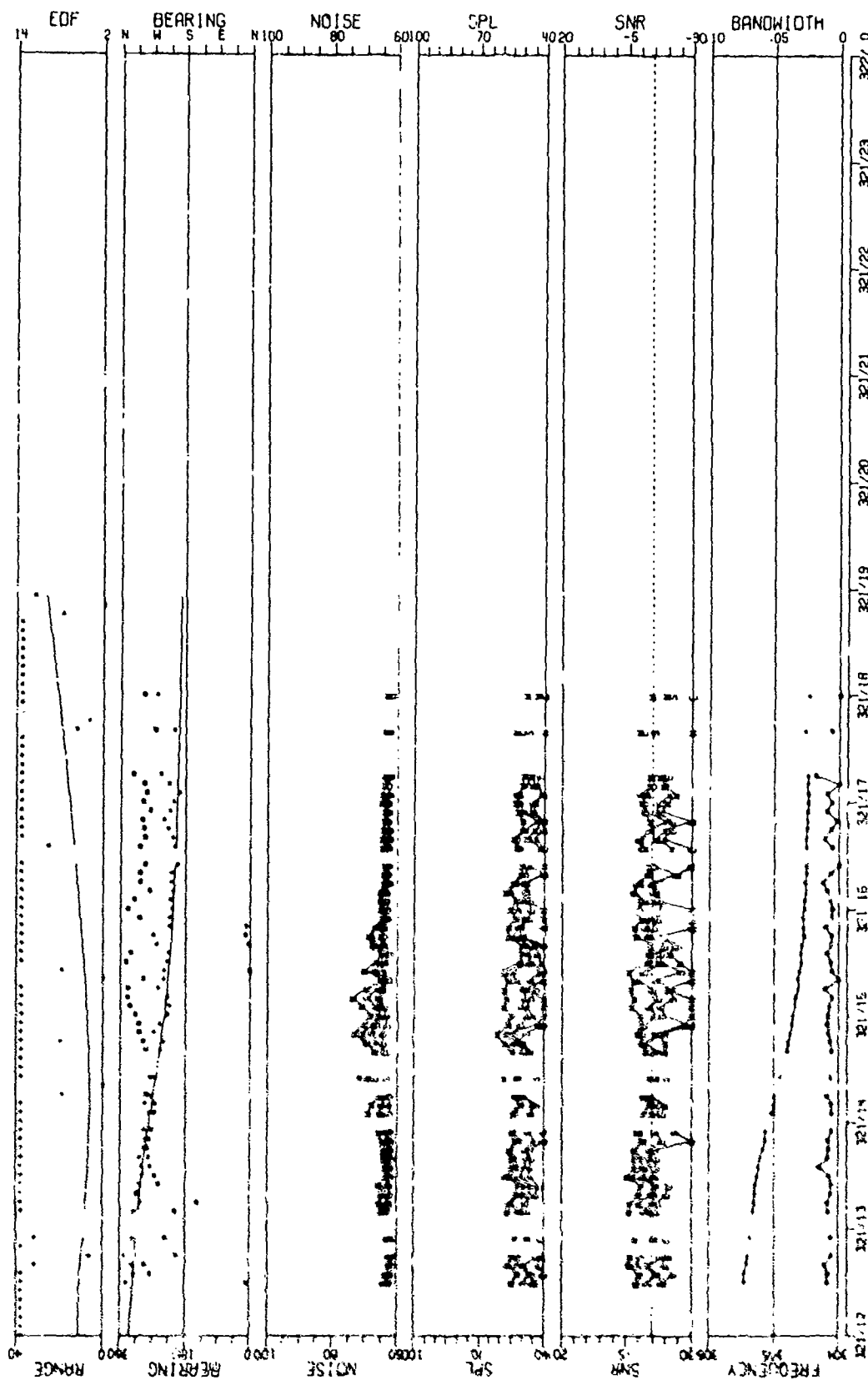


FIGURE 111-71
M3S-FV1 305 MZ LINE HISTORY AS OBSERVED VIA THE MAX GAIN LIMCONS SENSOR
AT SITE A2 DURING THE 17 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

AS-77-2671

CONFIDENTIAL

CONFIDENTIAL

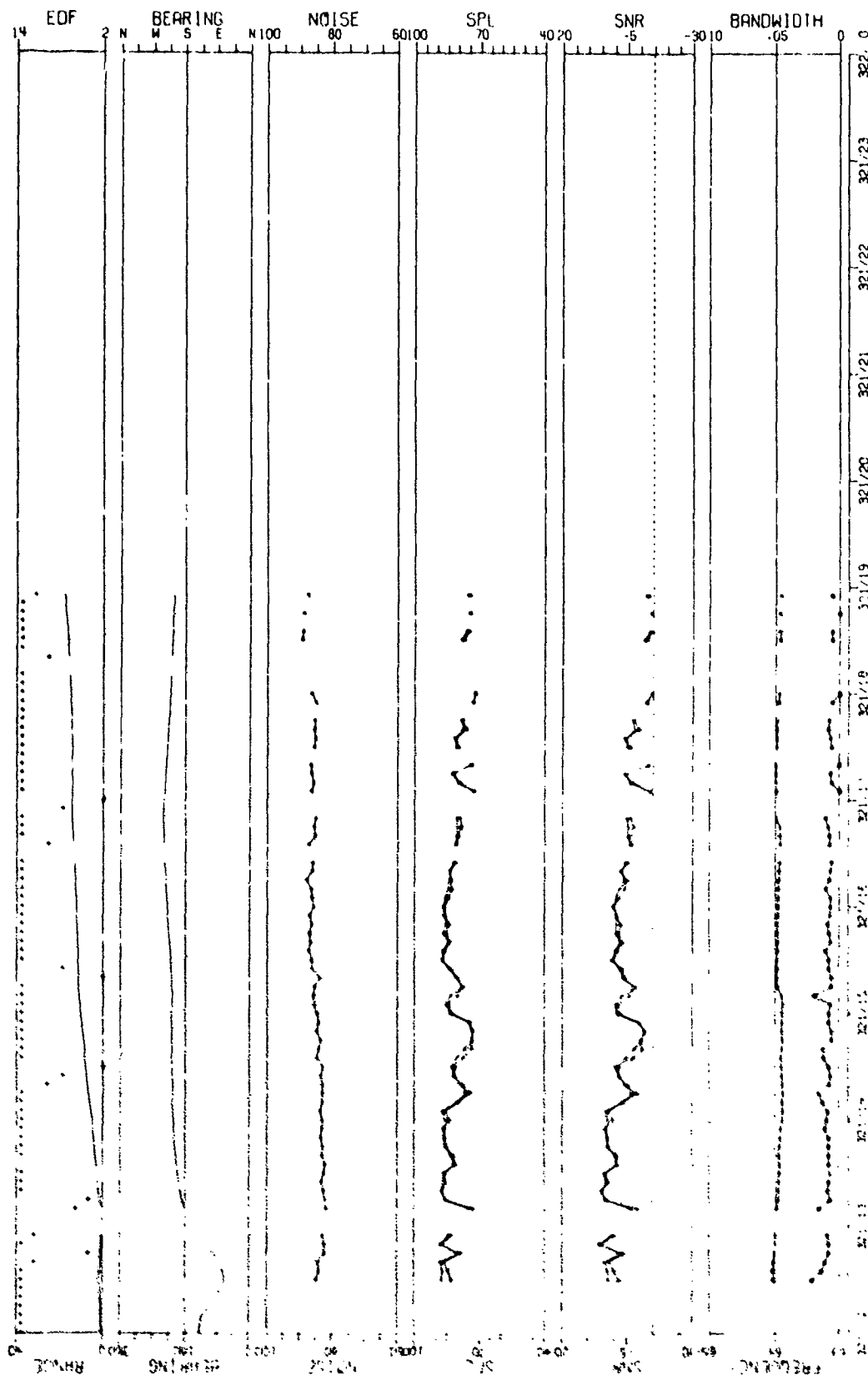


FIGURE 11-72
HISTORY AS OBSERVED VIA THE OMNIDIRECTIONAL SENSOR
DURING THE 17 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

AG-77-2070

CONFIDENTIAL

CONFIDENTIAL

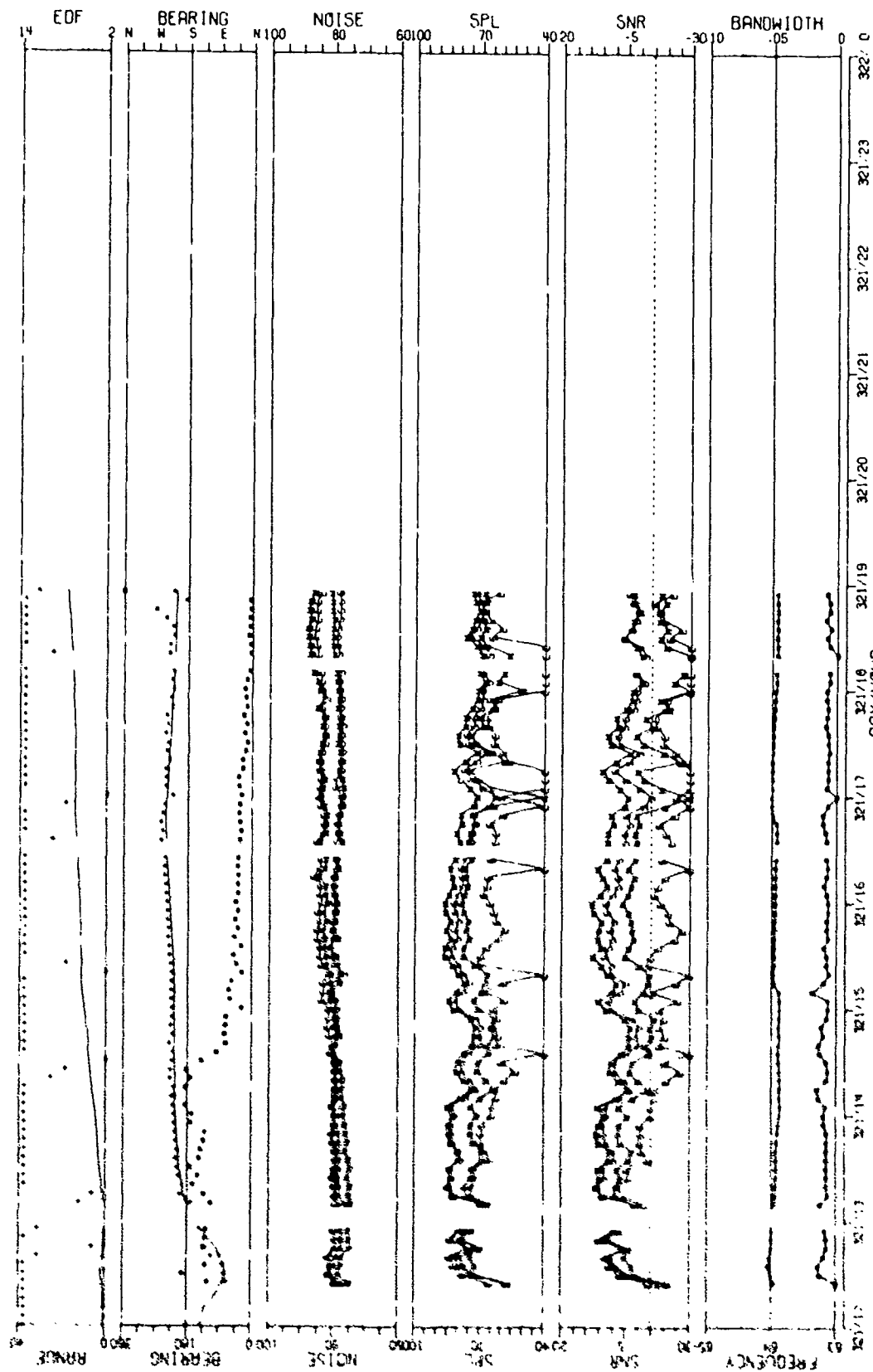


FIGURE 111-73
MSS-FVT 64 HZ LINE HISTORY AS OBSERVED VIA THE SINGLE CARDIOIDS SENSOR
AT SITE A2 DURING THE 17 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

AS-77-2673

CONFIDENTIAL

CONFIDENTIAL

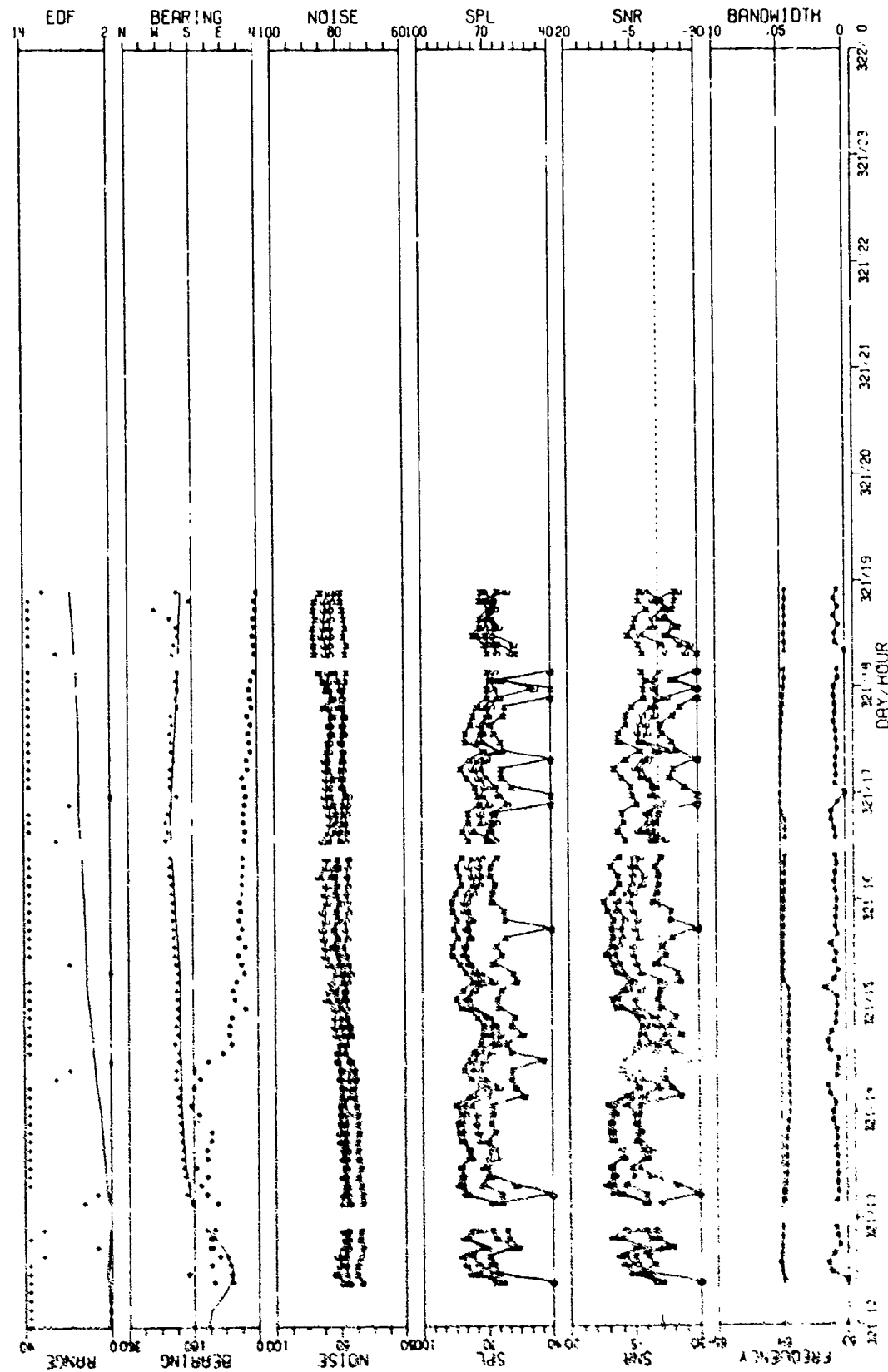


FIGURE 111-74
 WGS-FVT 64 HZ LINE HISTORY AS OBSERVED VIA THE MAX GAIN LIMACONS SENSOR
 AT 5150 AC DURING THE 17 NOV FIELD EVAL WITH VERNIER RESOLUTION (U)

AS-77-2674

CONFIDENTIAL

CONFIDENTIAL

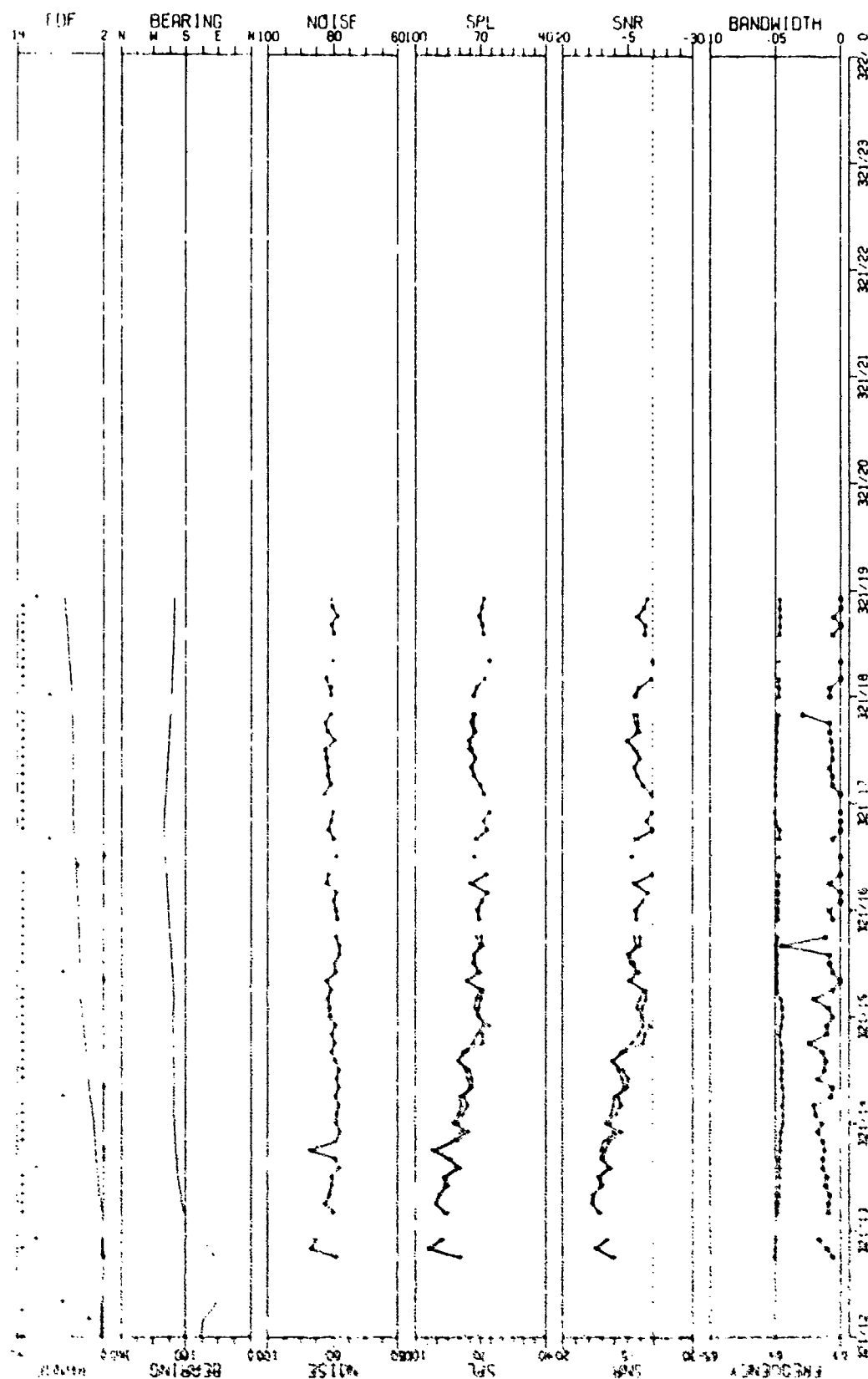


FIGURE 111-75
HCS-FVT 64 H2 LINE HISTORY AS OBSERVED VIA THE VERTICAL DIPOLE SENSOR
AT SITE A2 DURING THE 17 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

AG-77-2675

104
CONFIDENTIAL

CONFIDENTIAL

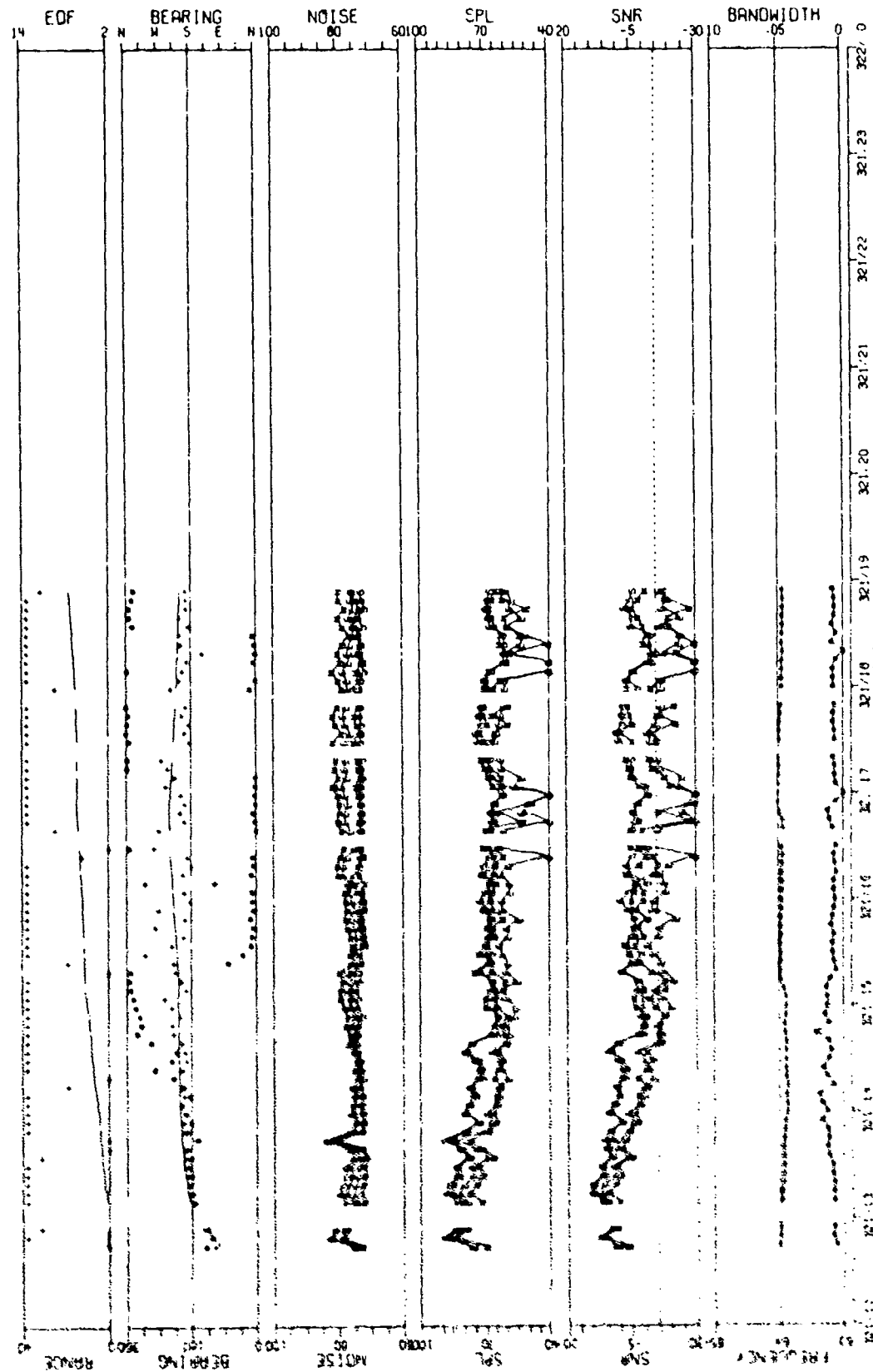


FIGURE 111-76
WCS 111-76 H2 LINE HISTORY AS OBSERVED VIA THE DIFFERENCED CARDIOIDS SENSOR
AT 111-76 DURING THE 111-76 FIELD EVENT WITH VERNIER RESOLUTION (U)

AS-77-2676

CONFIDENTIAL

CONFIDENTIAL

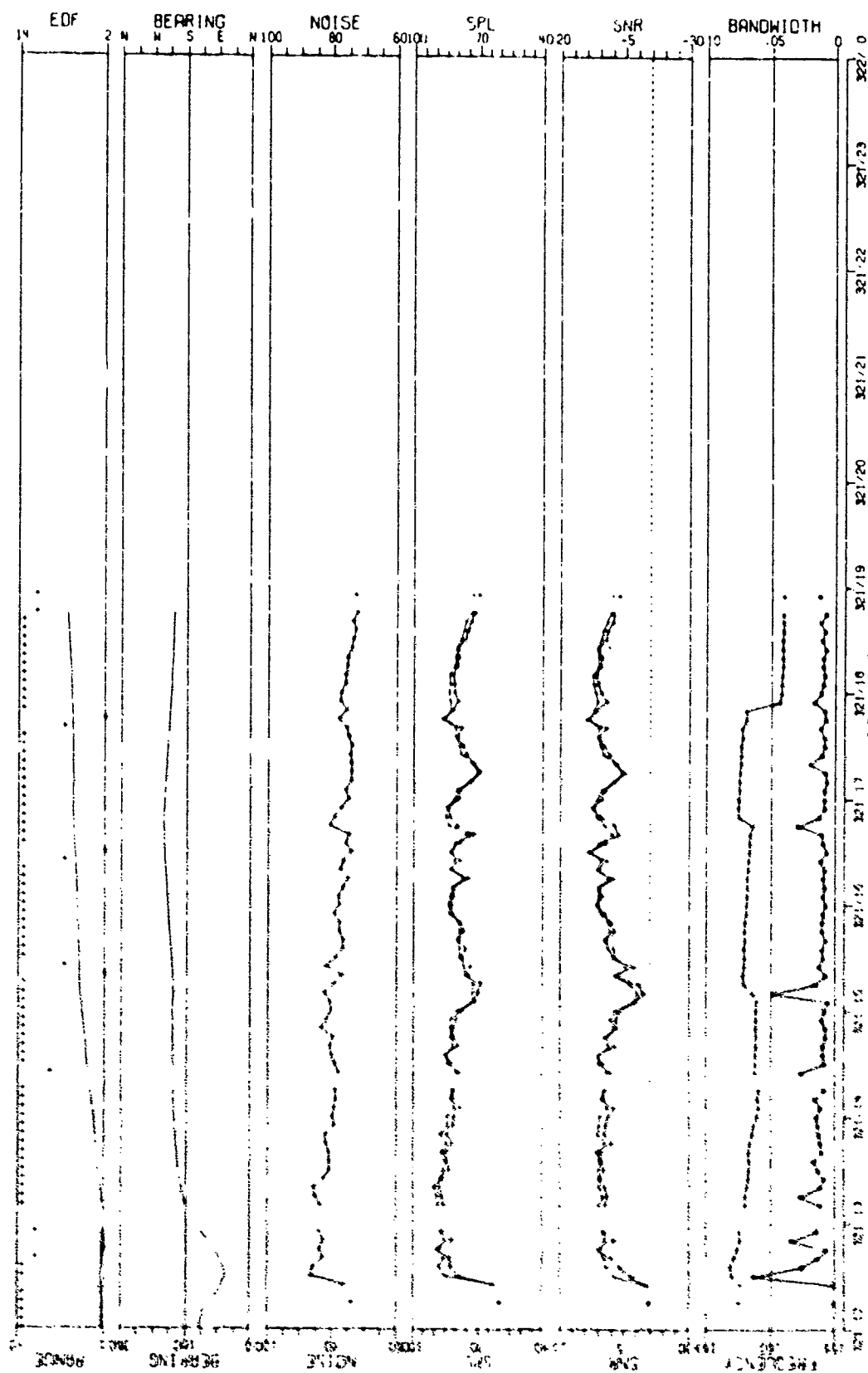


FIGURE 111-77
WES-FVT 160 HZ LINE HISTORY AS OBSERVED VIA THE OMNIDIRECTIONAL SENSOR
AT 111E 40 DURING THE 17 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

AS-77-2677

CONFIDENTIAL

CONFIDENTIAL

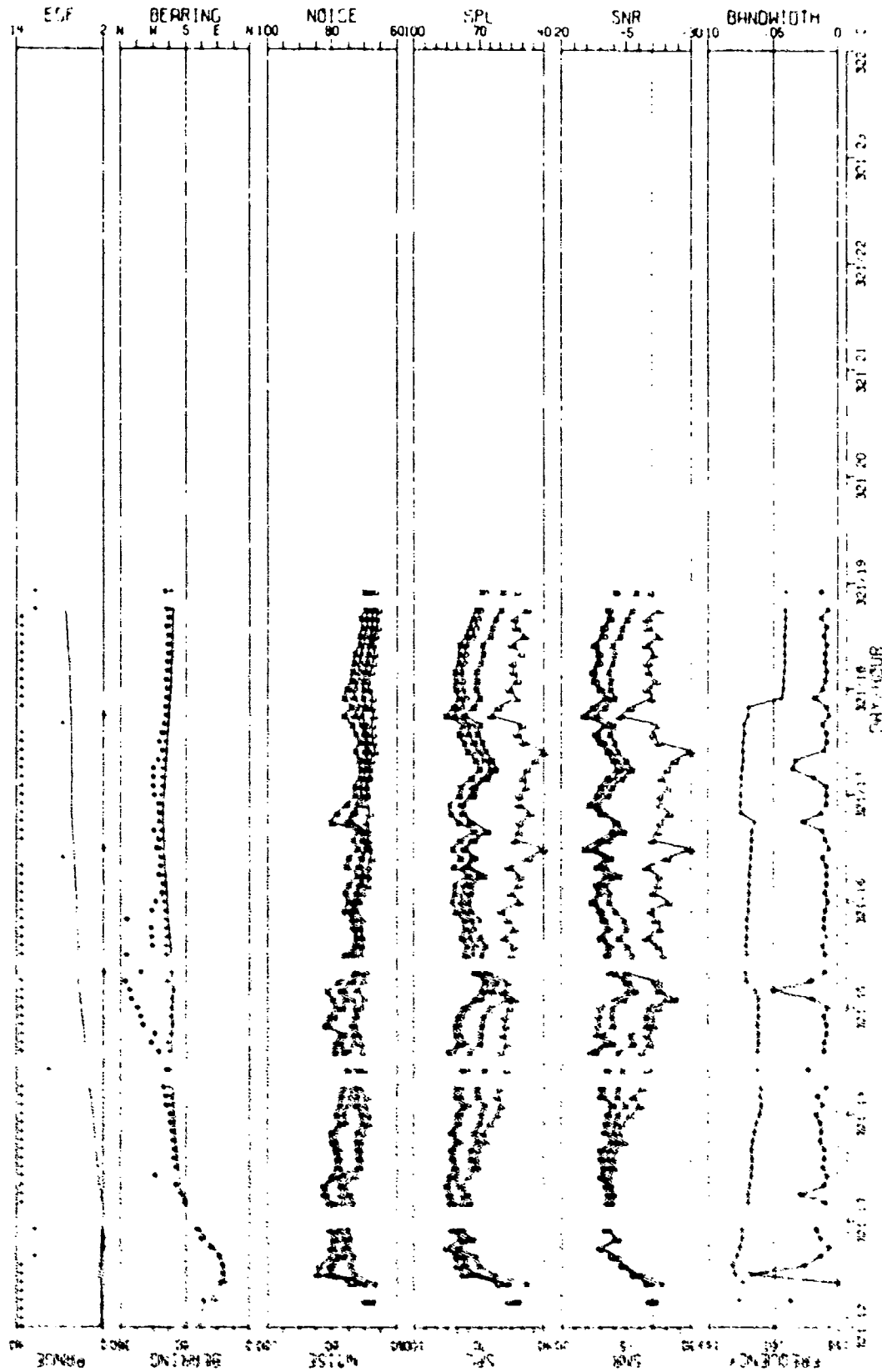


FIGURE 111 'B
NOISE AND BEARING HISTORY AS OBSERVED VIA THE SINGLE CARDIoids SENSOR
DURING THE 11th FIELD EVENT WITH VERNIER RESOLUTION 101

AS-77-2676

CONFIDENTIAL

CONFIDENTIAL



FIGURE 111 73
NOISE AND SNR OBSERVED VIA THE MAX GRIN LHMCONS SENSOR
DURING THE 17 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

AG-77-2679

CONFIDENTIAL

CONFIDENTIAL

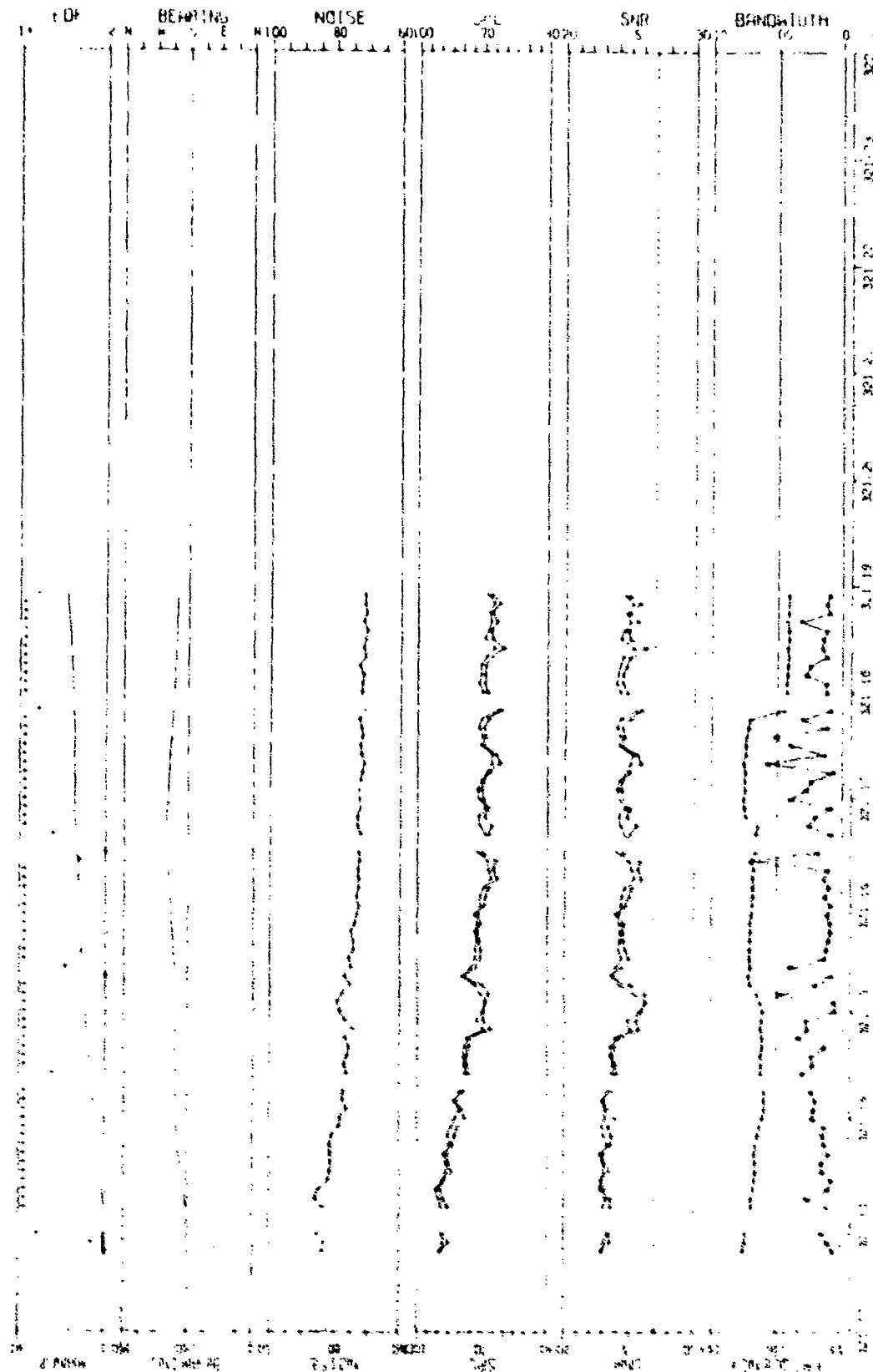


FIGURE 111-80
 THE 100 Hz LINE HISTORY AS OBSERVED VIA THE VERTICAL DIPOLE SENSOR
 ON 11/18/80 DURING THE 1100 FIELD EVENT WITH 100 Hz RESOLUTION (1)

AG-77-2650

CONFIDENTIAL

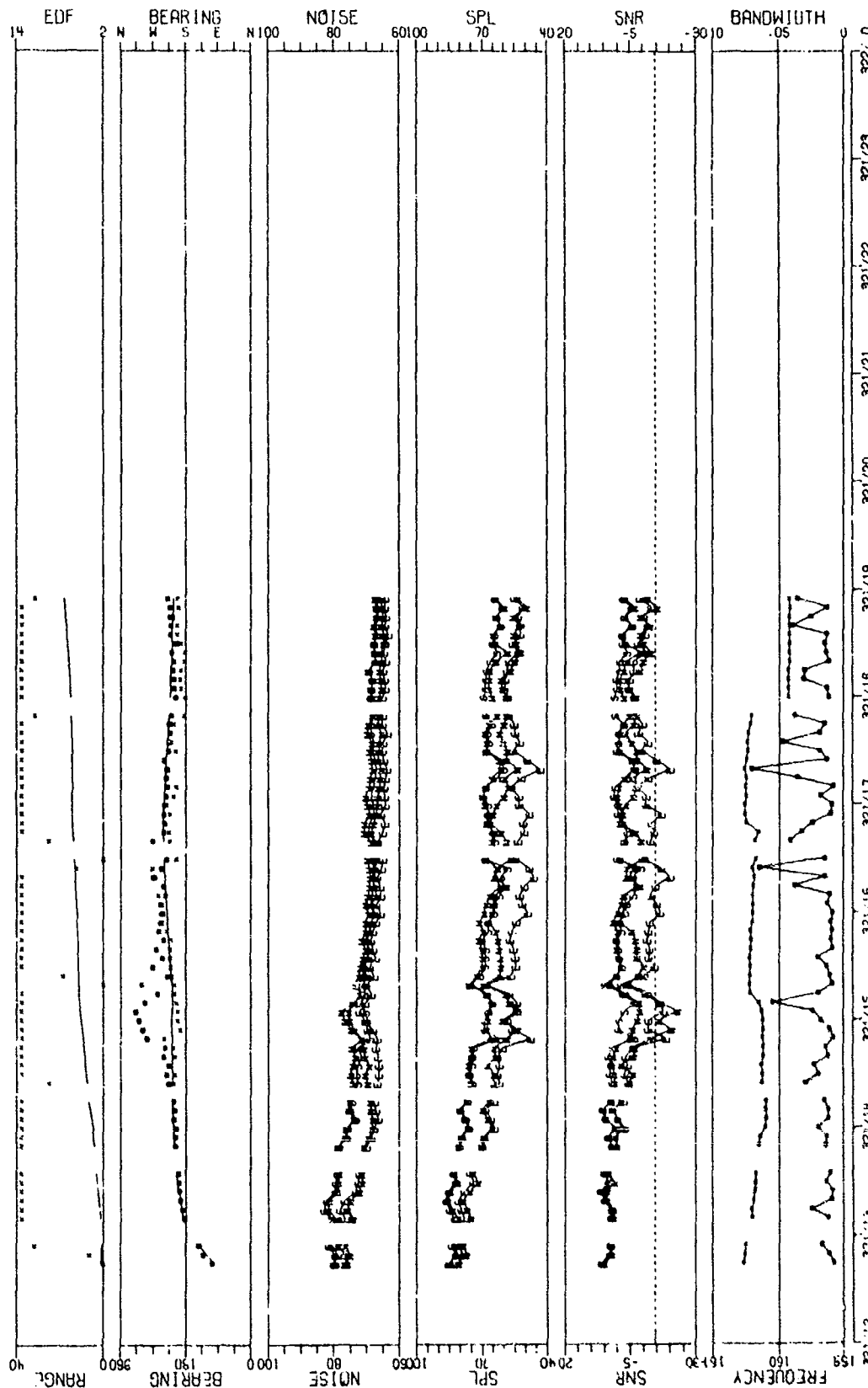


FIGURE III-81
MSS-FVT 160 HZ LINE HISTORY AS OBSERVED VIA THE DIFFERENCED CARDIOIDS SENSOR
AT SITE A2 DURING THE 17 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

CONFIDENTIAL

CONFIDENTIAL

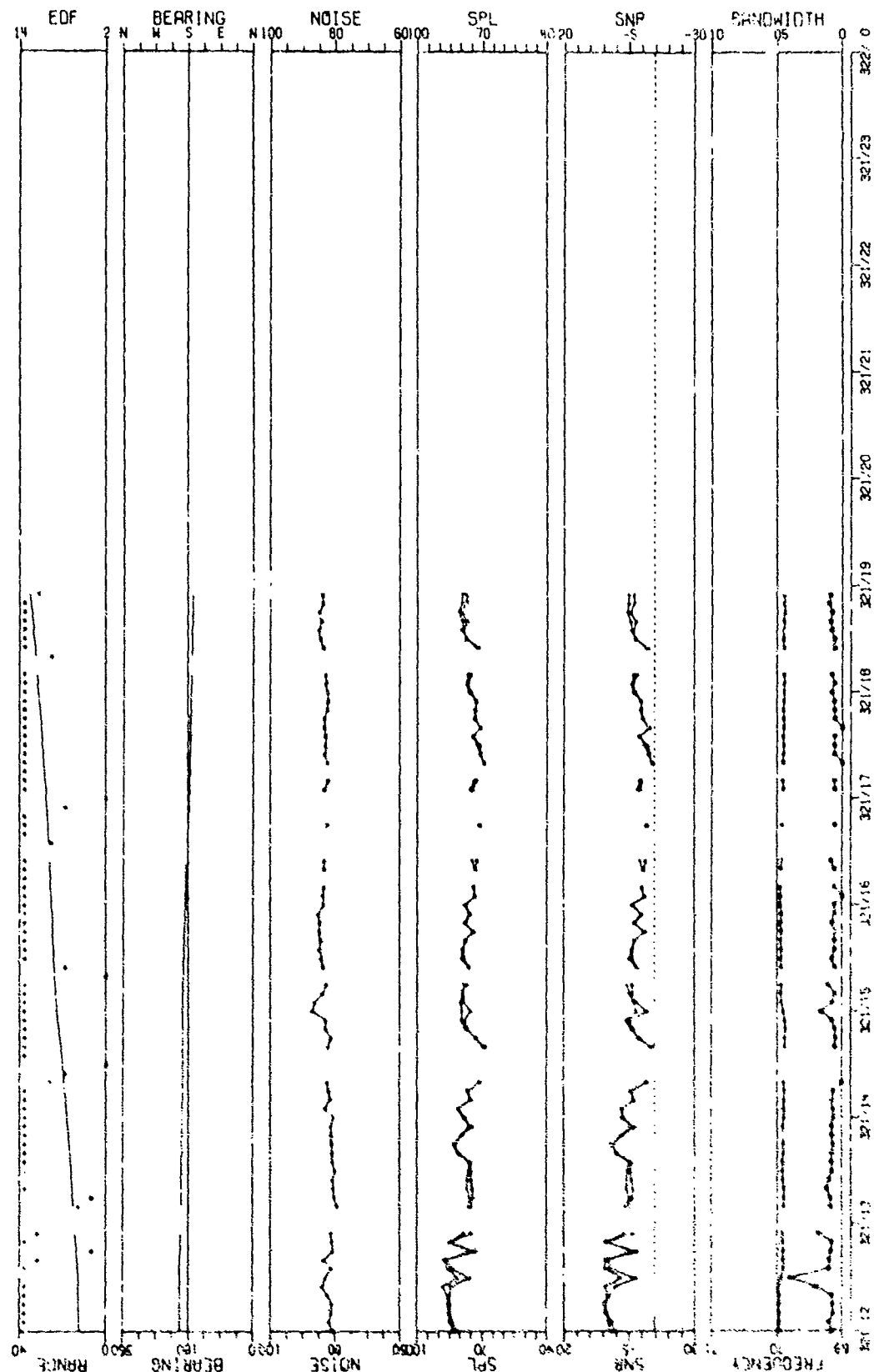


FIGURE 111-82
HISTORY AS OBSERVED VIA THE OMNIDIRECTIONAL SENSOR
AT SITE R2 DURING THE 17 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

AS-77-2682

CONFIDENTIAL

CONFIDENTIAL

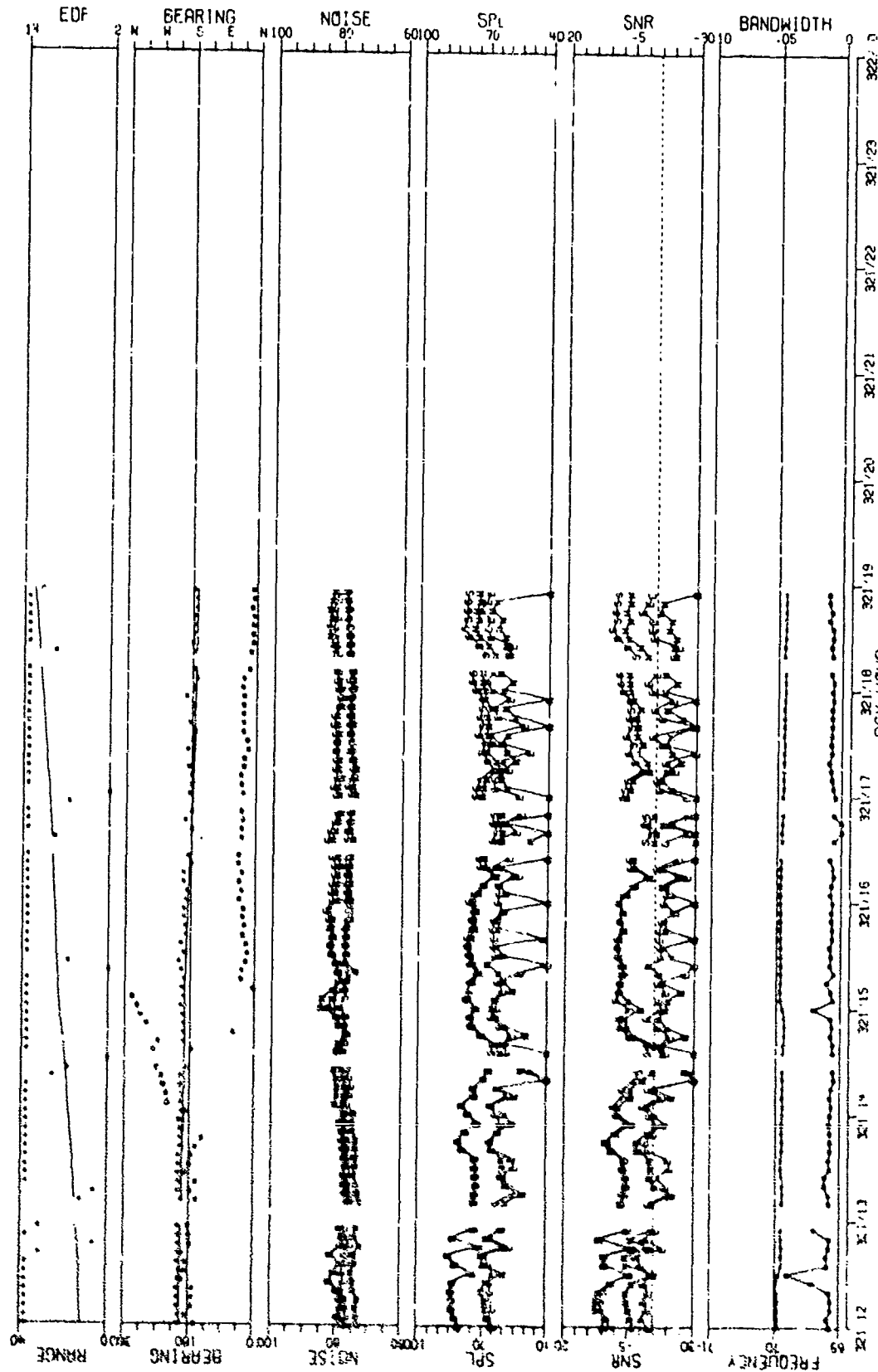


FIGURE 111-83
MCS-FVT 70 HZ LINE HISTORY AS OBSERVED VIA THE SINGLE CEROTIDS SENSOR
AT SITE R2 DURING THE 17 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

AS-77-2683

CONFIDENTIAL

CONFIDENTIAL



FIGURE 111-84
MCS-FVT 70 HZ LINE HISTORY AS OBSERVED VIA THE MAX GRIN LIMACONS SENSOR
AT SITE A2 DURING THE 17 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

AS-77-2684

CONFIDENTIAL

CONFIDENTIAL

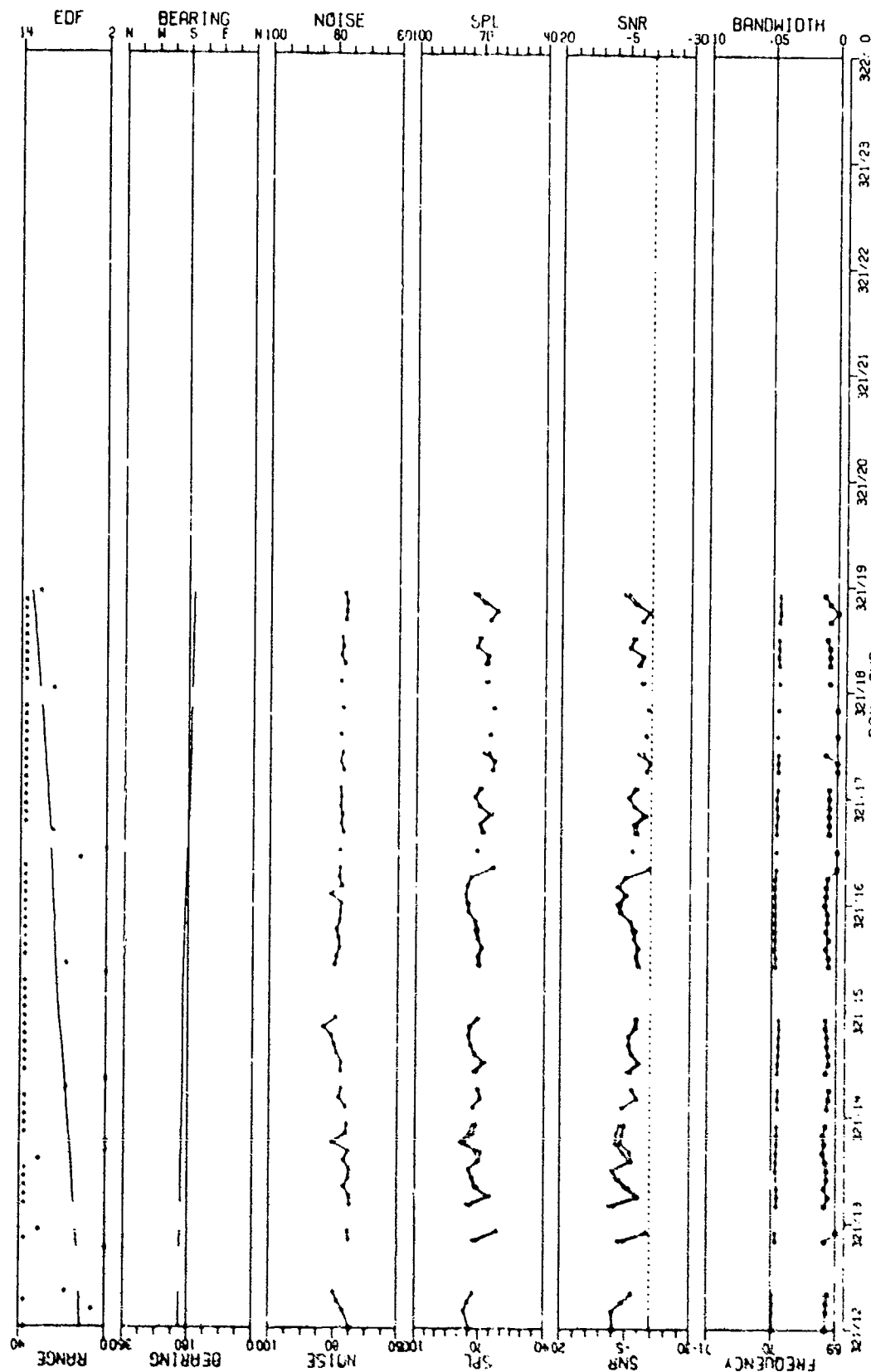


FIGURE 111-85
MSS-FVY 70 HZ LINE HISTORY AS OBSERVED VIA THE VERTICAL DIPOLE SENSOR
AT SITE A2 DURING THE 17 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

AS-77-2685

CONFIDENTIAL

CONFIDENTIAL



FIGURE 111-86
MSS-FVT 70 HZ LINE HISTORY AS OBSERVED VIA THE DIFFERENCED CAROTIDIOS SENSOR
AT SITE A2 DURING THE 17 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

AS-77-2686

CONFIDENTIAL

CONFIDENTIAL

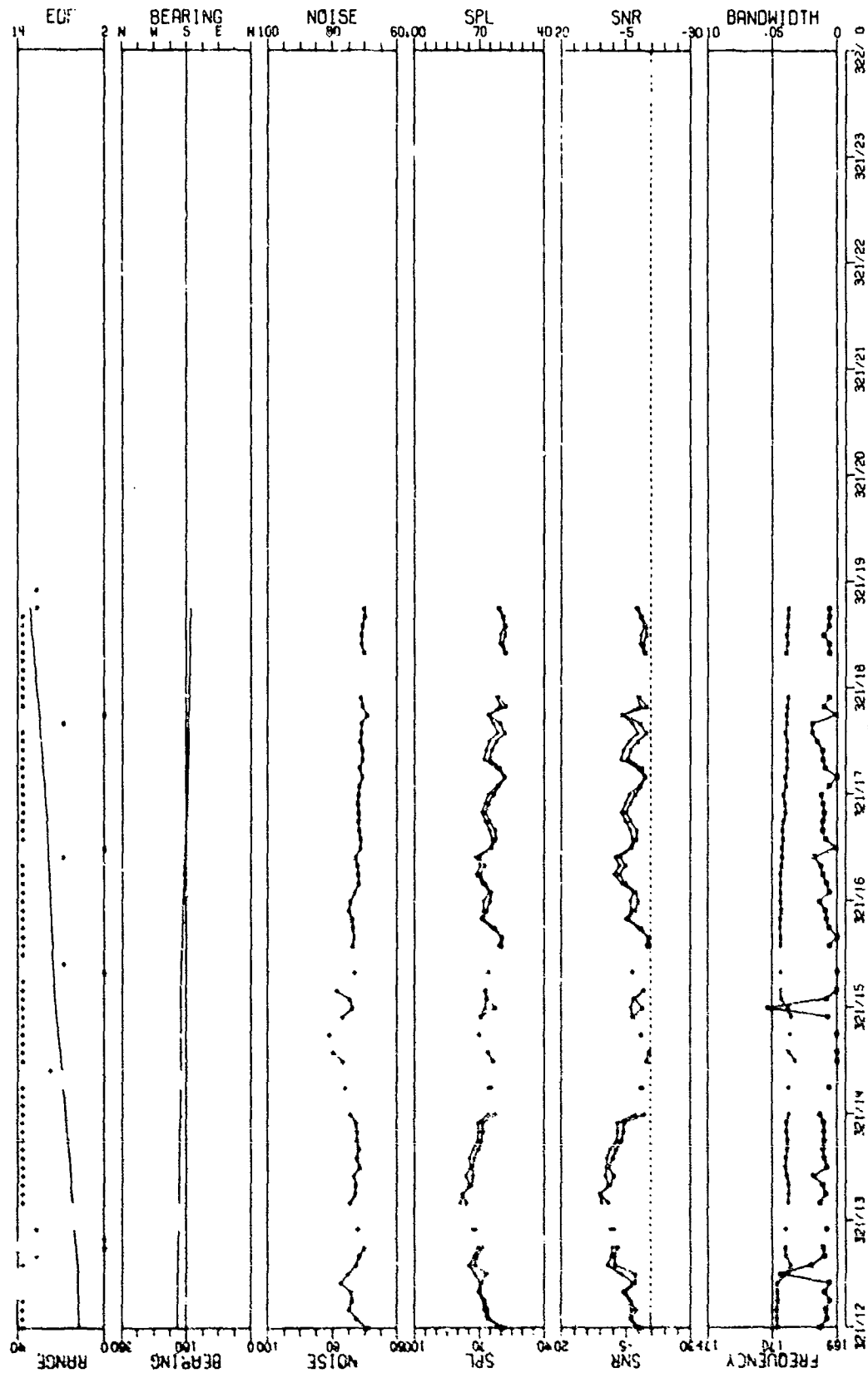


FIGURE 111-87
HSS-FVT 170 H2 LINE HISTORY AS OBSERVED VIA THE OMNIDIRECTIONAL SENSOR
AT SITE P2 DURING THE 17 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

AS-77-2687

CONFIDENTIAL

CONFIDENTIAL

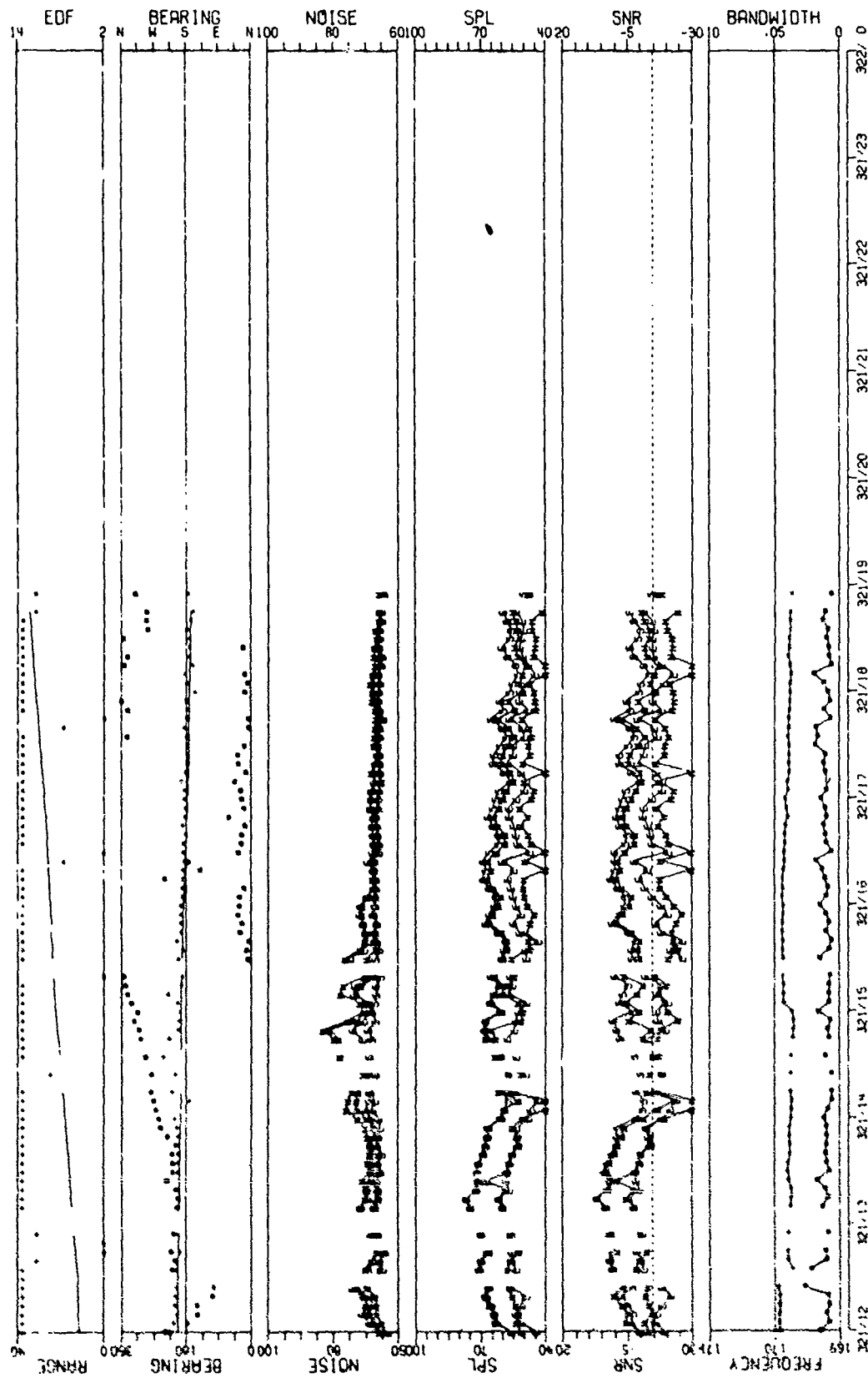


FIGURE 111-88
MSS FV1 170 HZ LINE HISTORY AS OBSERVED VIA THE SINGLE CAROTIDS SENSOR
AT SITE A2 DURING THE 17 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

AS-77-2688

CONFIDENTIAL

CONFIDENTIAL

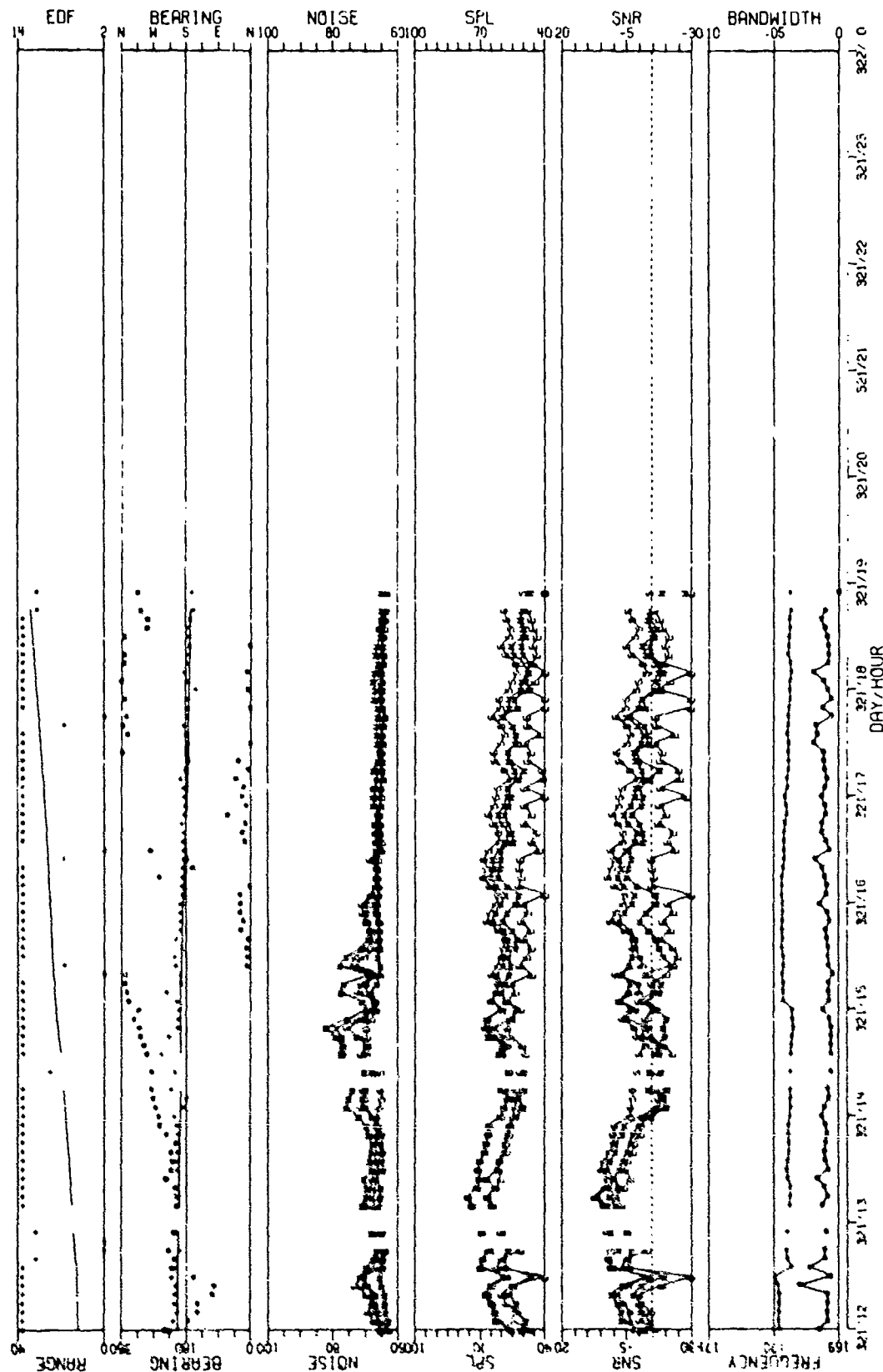


FIGURE 111-89
MSS-FVT 170 HZ LINE HISTORY AS OBSERVED VIA THE MAX GAIN LIMACONS SENSOR
AT SITE R2 DURING THE 17 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

AS-77-2689

CONFIDENTIAL

CONFIDENTIAL

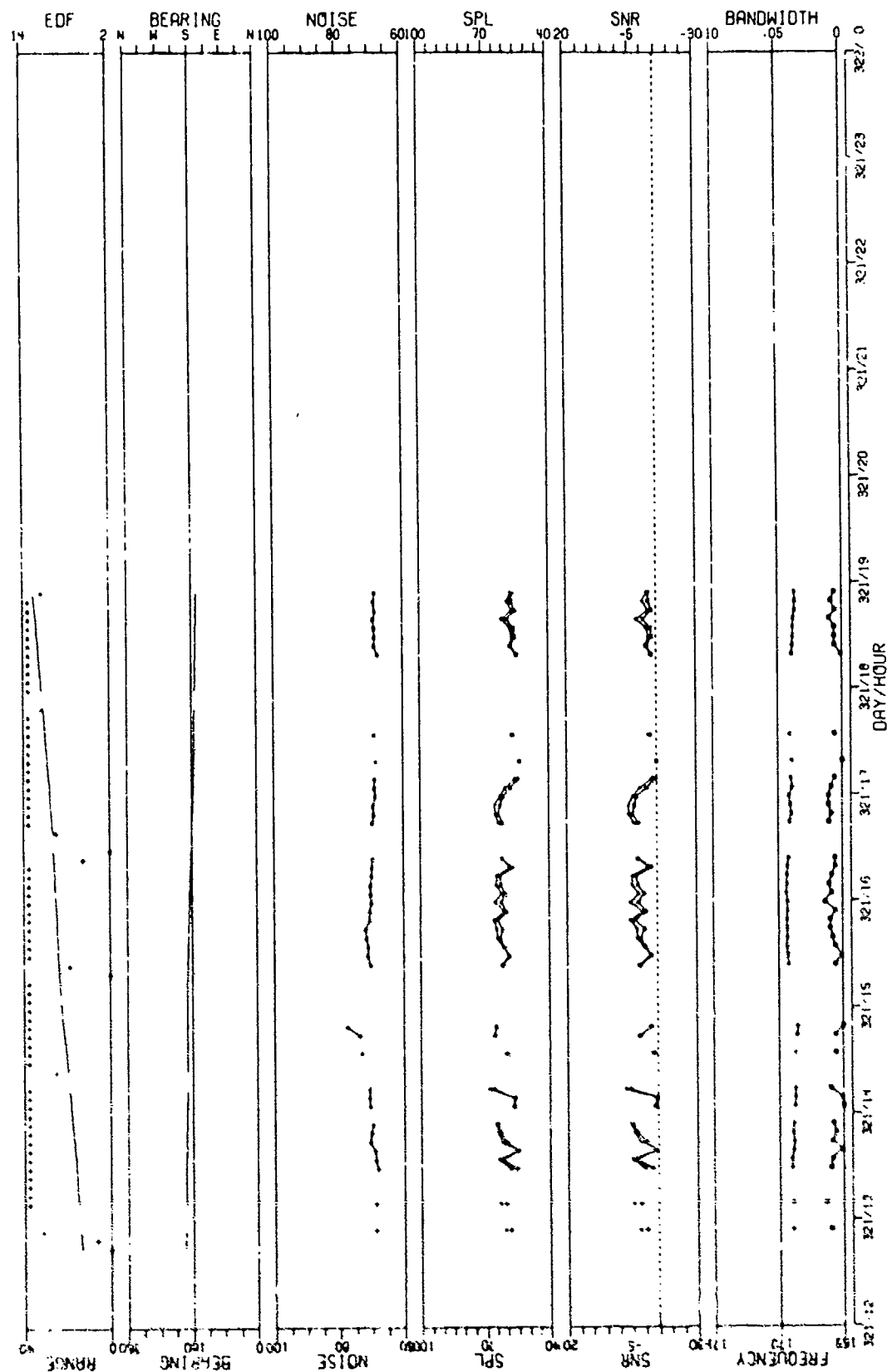


FIGURE 111-90
MSS-EVT 170 HZ LINE HISTORY AS OBSERVED VIA THE VERTICAL DIPOLE SENSOR
AT SITE R2 DURING THE 17 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

AS-77-2690

CONFIDENTIAL

CONFIDENTIAL

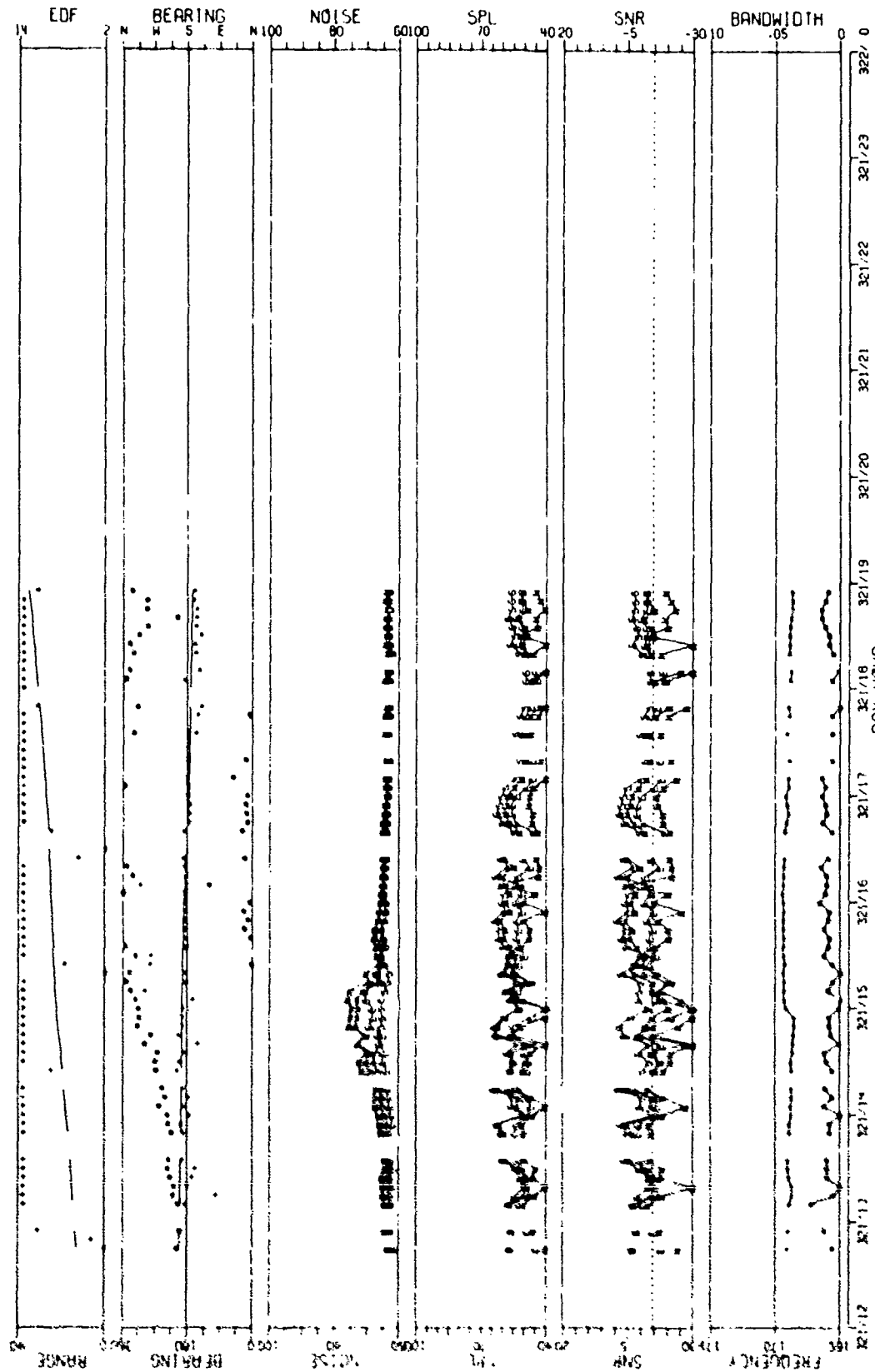


FIGURE 111-91
MSS-FWT 170 HZ LINE HISTORY AS OBSERVED VIA THE DIFFERENCED CARDIOIDS SENSOR
AT SITE R2 DURING THE 17 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

AS-77-2691

CONFIDENTIAL

CONFIDENTIAL

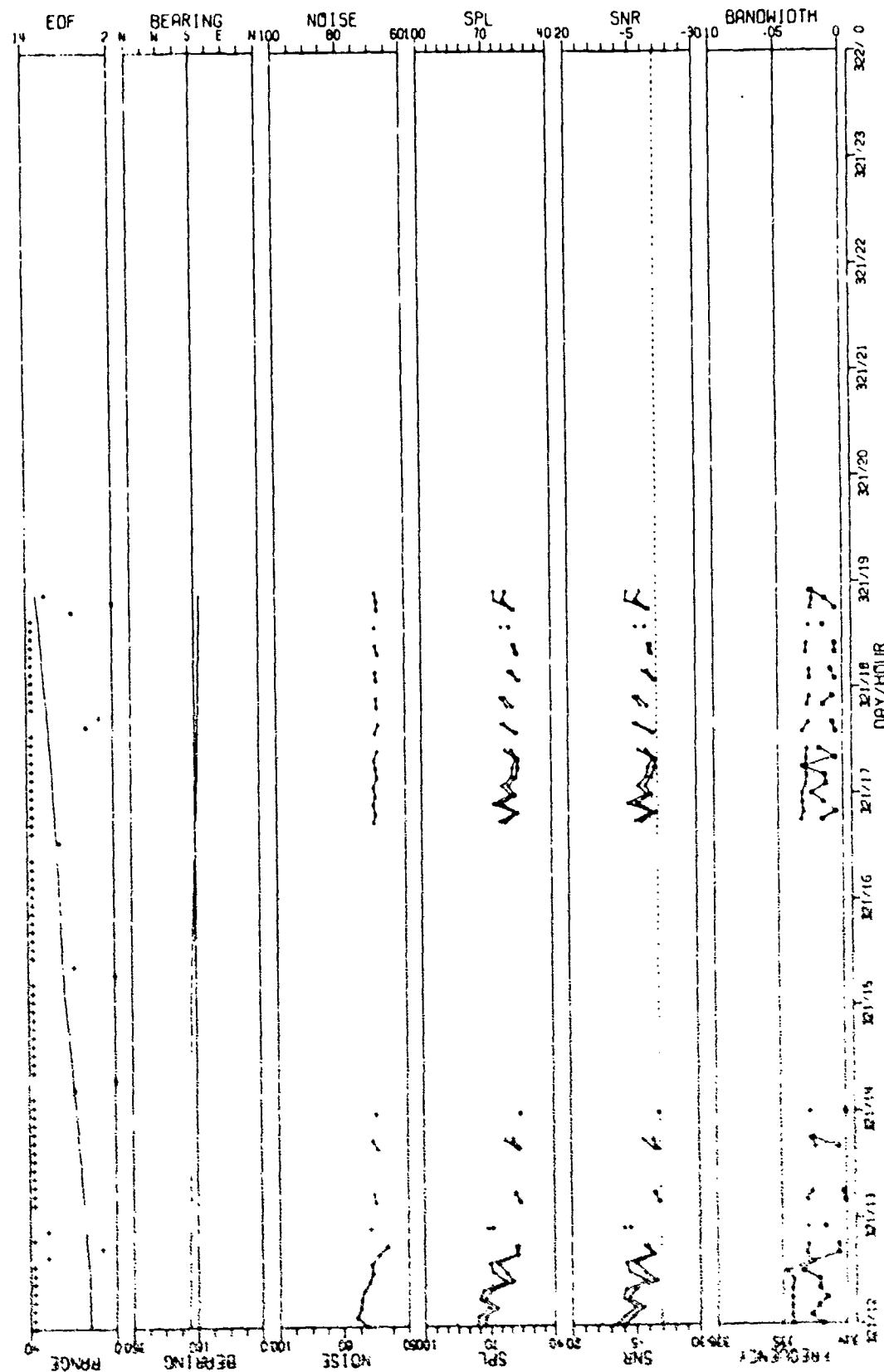


FIGURE III-92
HSS FV1 185 H2 LINE HISTORY AS OBSERVED VIA THE OMNIDIRECTIONAL SENSOR
AT 3111 HZ DURING THE 1-10 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

AS-77-2692

CONFIDENTIAL

CONFIDENTIAL

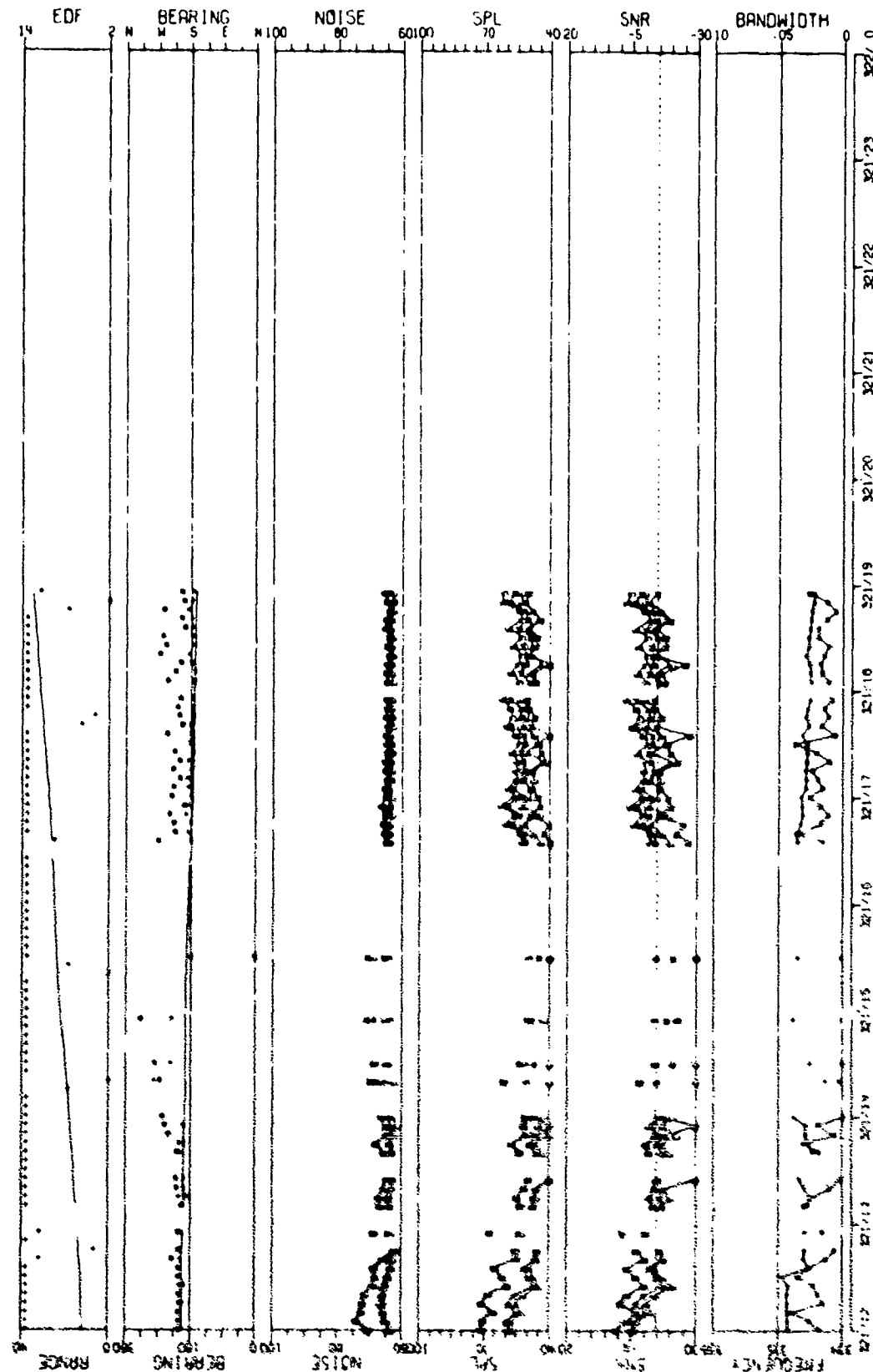


FIGURE 111-93
MSS-FVT-RX5-R2 LINE HISTORY AS OBSERVED VIA THE SINGLE CAROTIDUS SENSOR
AT SITE R2 DURING THE 17 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

AS-77-2693

122
CONFIDENTIAL

CONFIDENTIAL

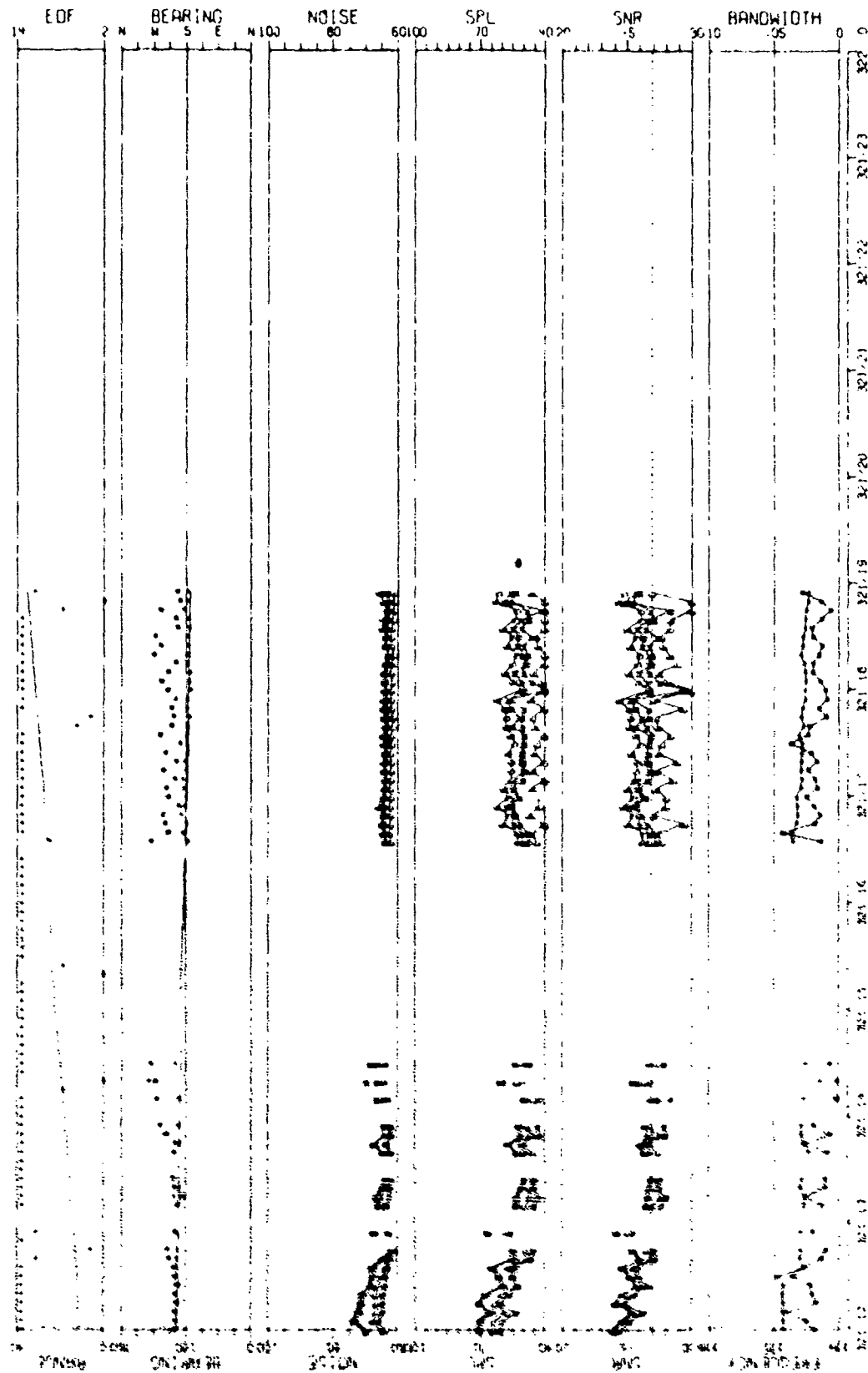


FIGURE 111-94
 111-94: 301:18-301:19 LINE HISTORY AS OBSERVED VIA THE MAX GAIN LIMACONS SENSOR
 OF 111-94 DURING THE 111-94 FIELD EVENT WITH VERNIER RESOLUTION 10°

AS-77-2694

CONFIDENTIAL

CONFIDENTIAL

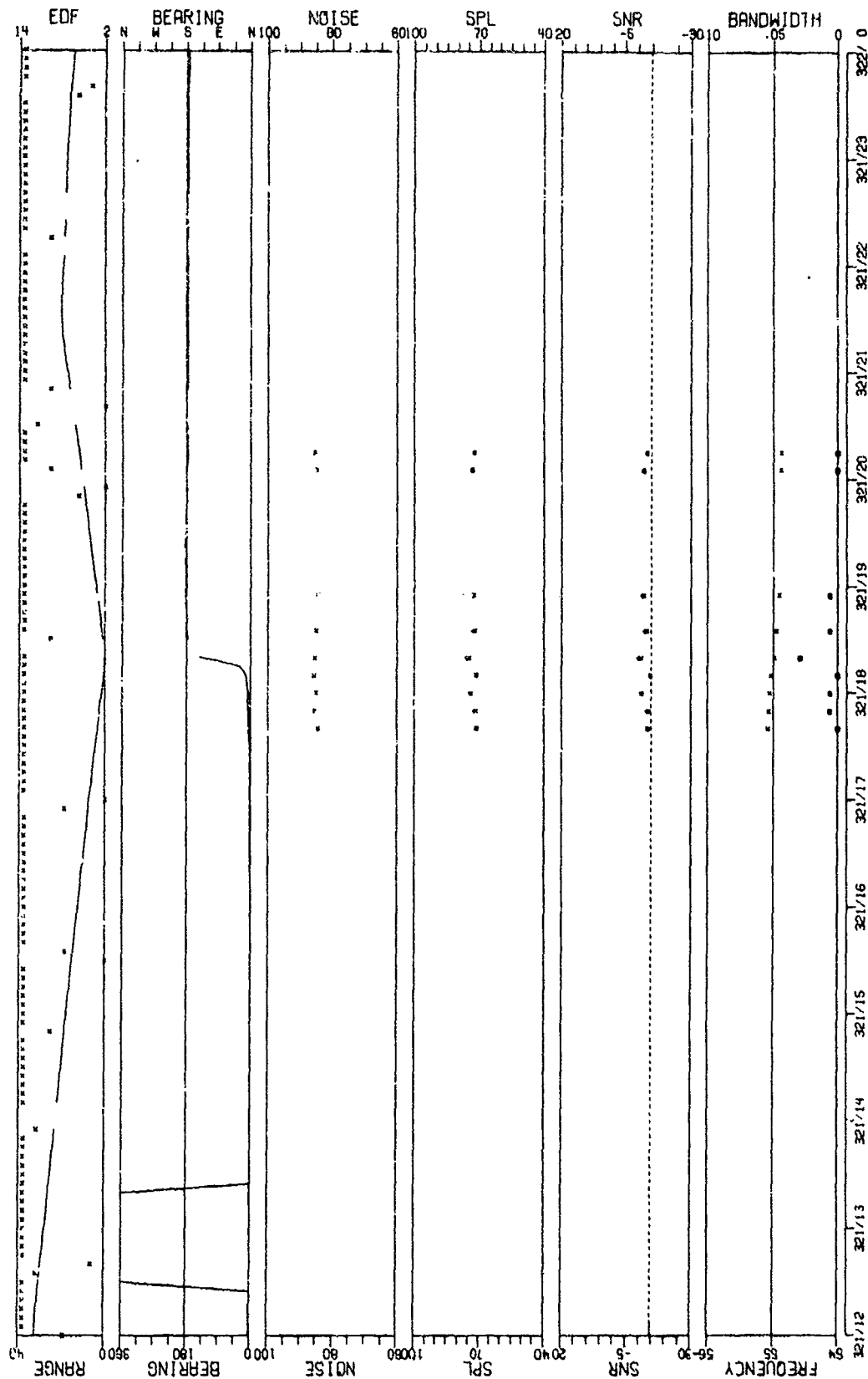


FIGURE 111-95
MSS-FVT 55 HZ LINE HISTORY AS OBSERVED VIA THE OMNIDIRECTIONAL SENSOR
AT SITE A3 DURING THE 17 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

AS-77-2695

CONFIDENTIAL

CONFIDENTIAL

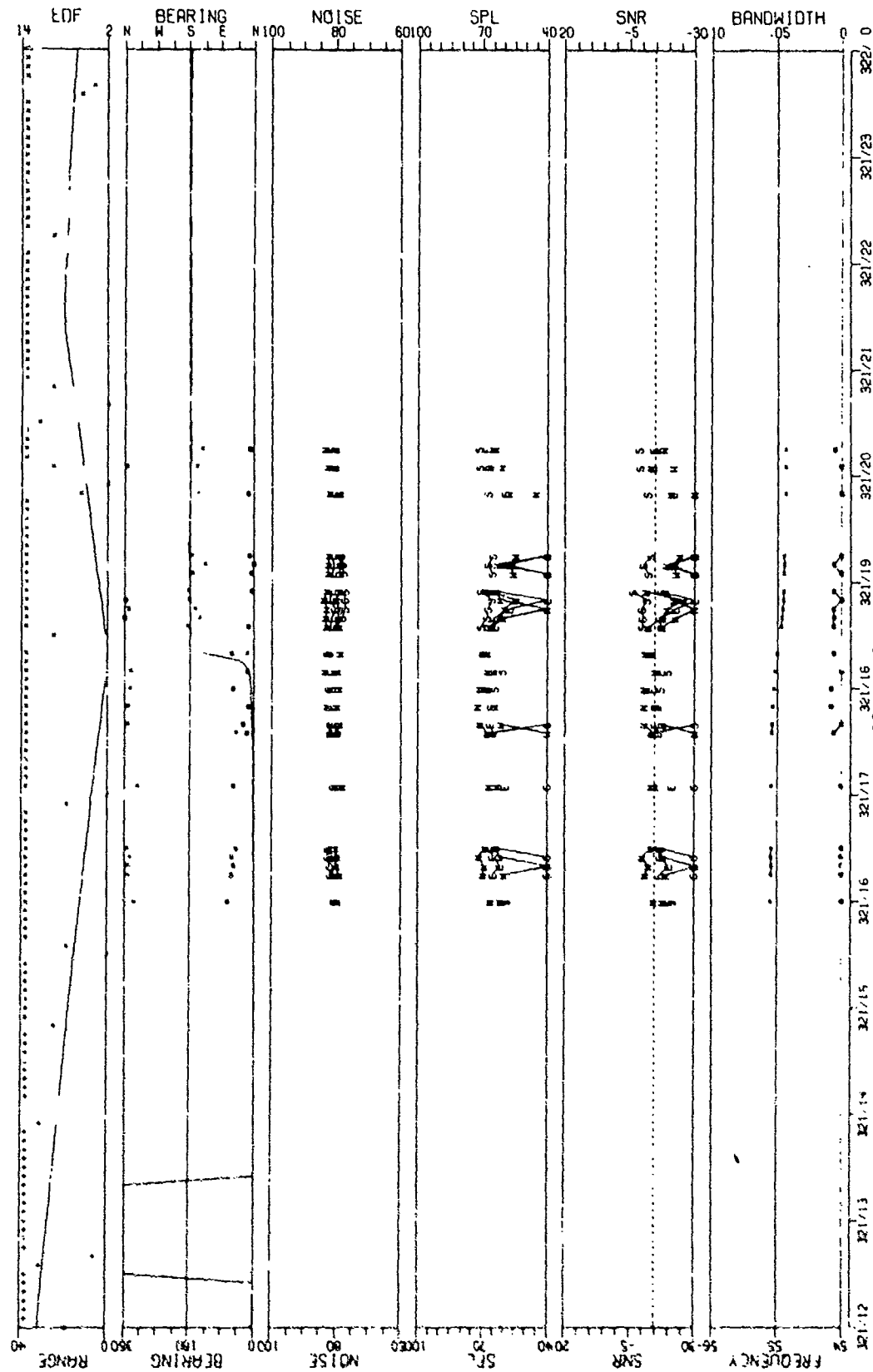


FIGURE 111-96
MSS-FVI 55 HZ LINE HISTORY AS OBSERVED VIA THE SINGLE CARDIOTIDS SENSOR
AT SITE A3 DURING THE 17 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

AS-77-2696

CONFIDENTIAL

CONFIDENTIAL

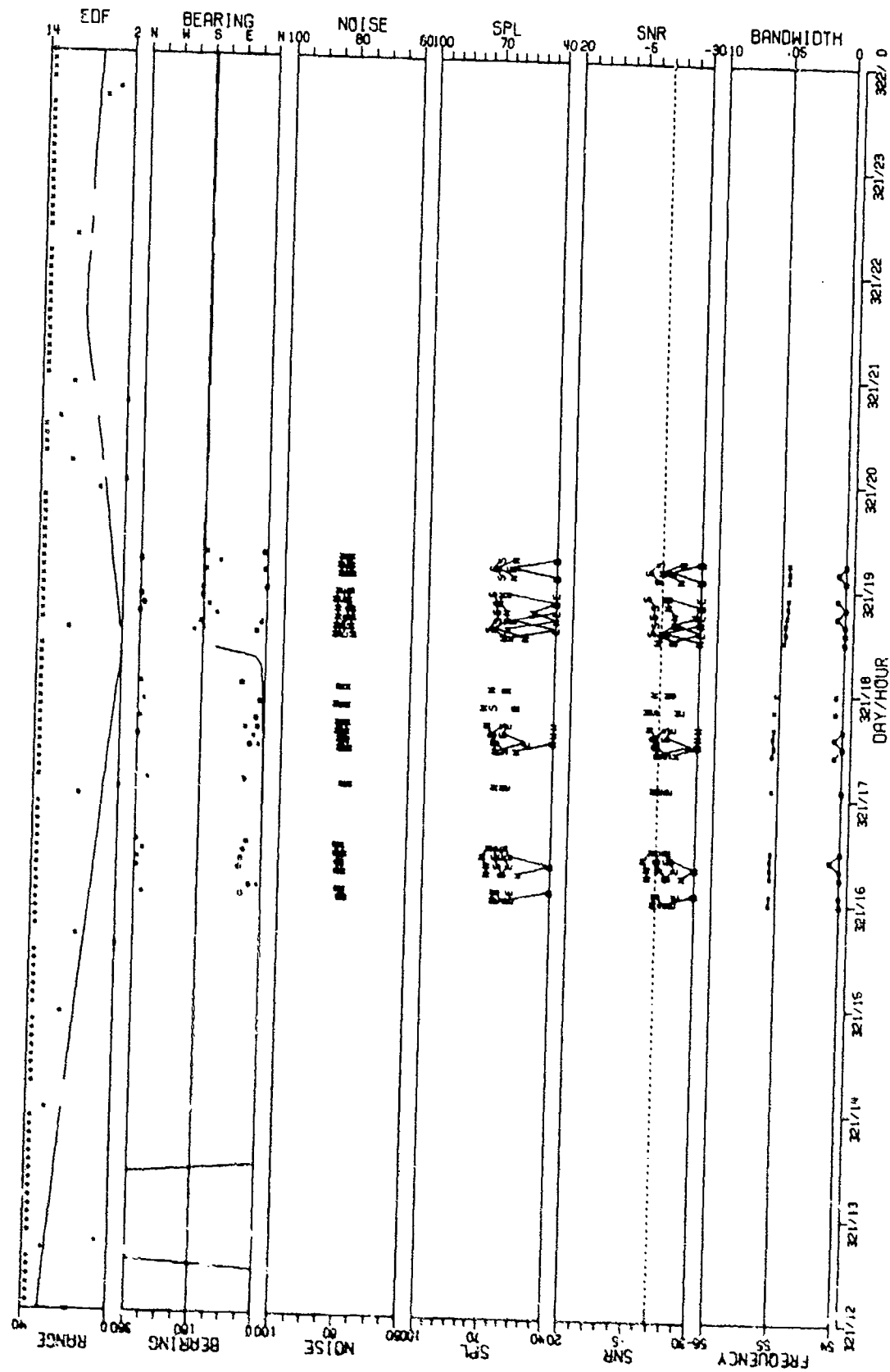


FIGURE 111-97
HSS-FVT 55 HZ LINE HISTORY AS OBSERVED VIA THE MAX GAIN LIMCONS SENSOR
AT SITE A3 DURING THE 17 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

AS-77-2697

CONFIDENTIAL

CONFIDENTIAL

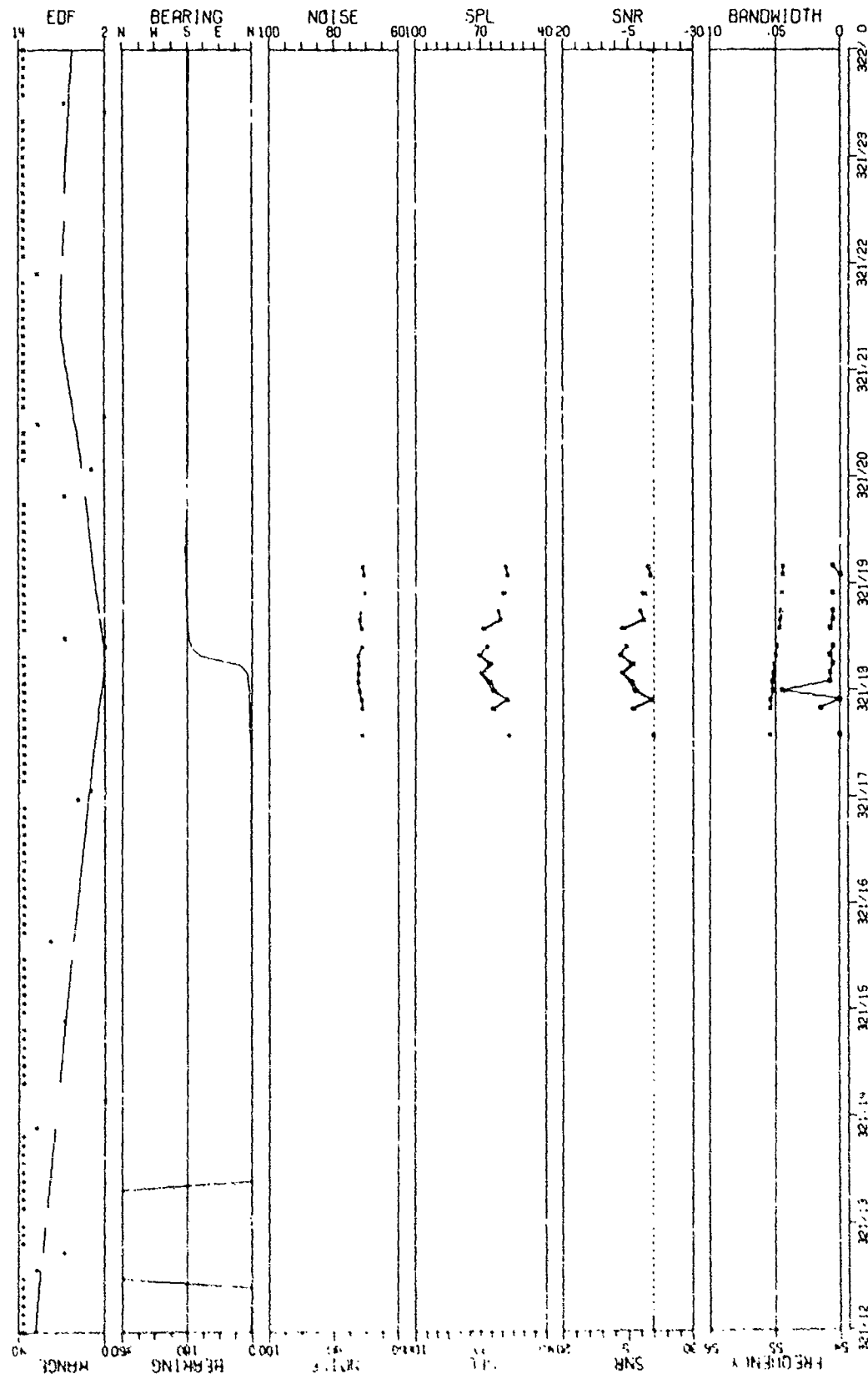


FIGURE 111-98
MSS-FVT 55 HZ LINE HISTORY AS OBSERVED VIA THE VERTICAL DIPOLE SENSOR
AT SITE A3 DURING THE 17 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

AS-77-2698

CONFIDENTIAL

CONFIDENTIAL

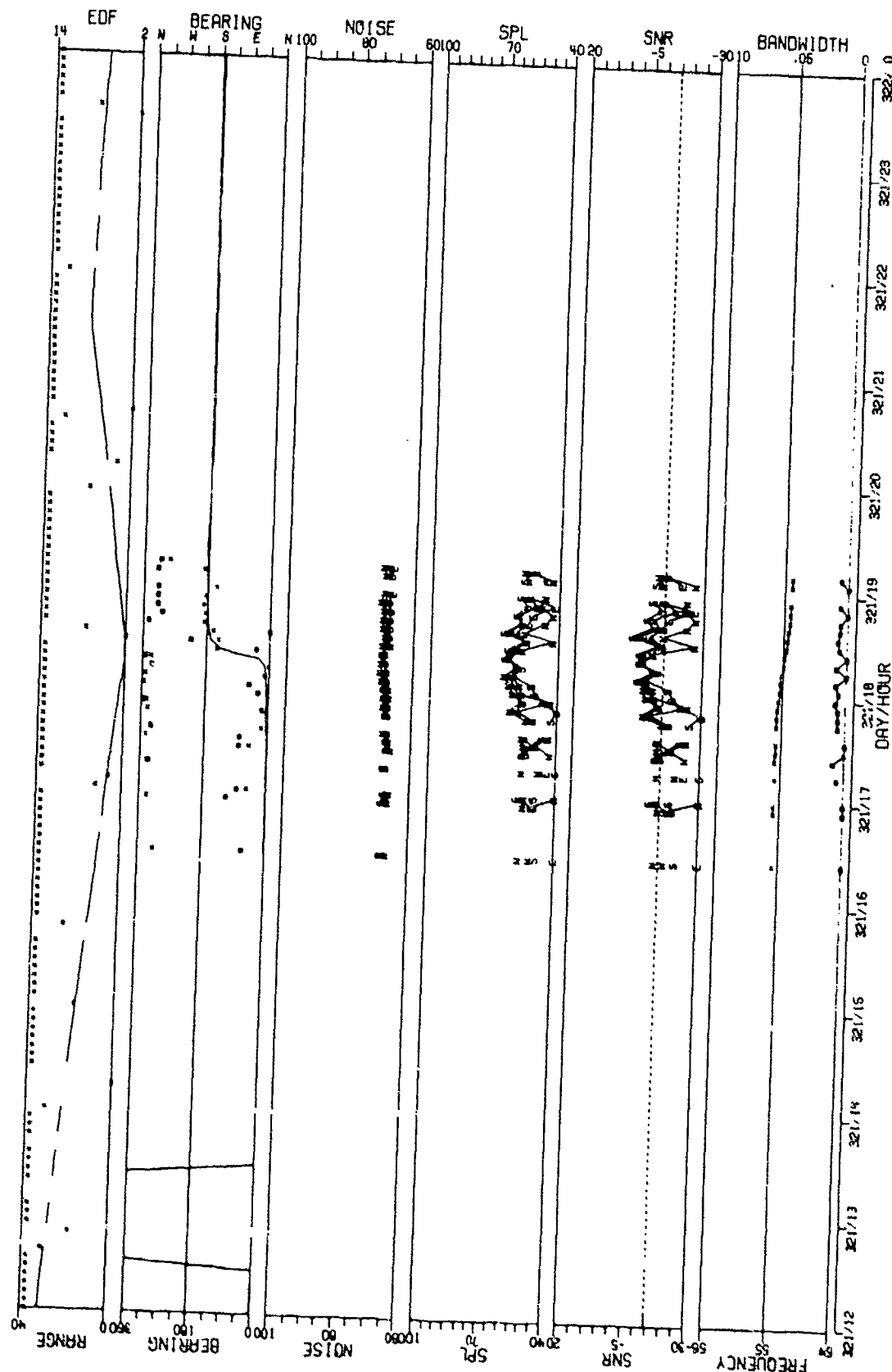


FIGURE 111-99
MSS-FVT 55 HZ LINE HISTORY AS OBSERVED VIA THE DIFFERENCED CARDIOIDS SENSOR
AT SITE A3 DURING THE 17 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

AS-77-2699

CONFIDENTIAL

CONFIDENTIAL



FIGURE III-100
MCS-FVT 155 HZ LINE HISTORY AS OBSERVED VIA THE OMNIDIRECTIONAL SENSOR
AT SITE A3 DURING THE 17 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

AS-77-2700

CONFIDENTIAL

CONFIDENTIAL

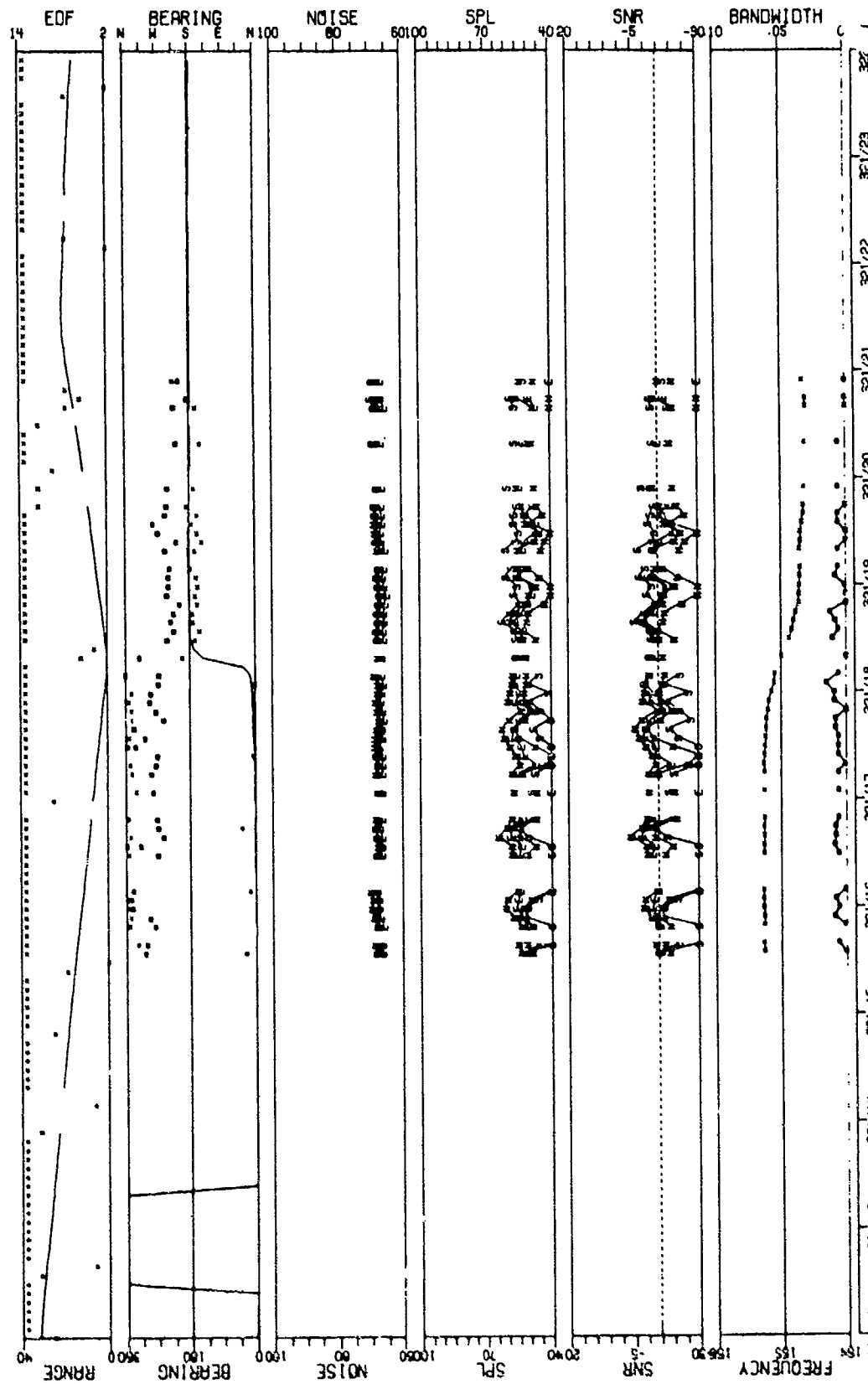


FIGURE 111-101
MSS-FVT 155 HZ LINE HISTORY AS OBSERVED VIA THE SINGLE CARDIoids SENSOR
AT SITE A3 DURING THE 17 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

AS-77-2701

CONFIDENTIAL

CONFIDENTIAL

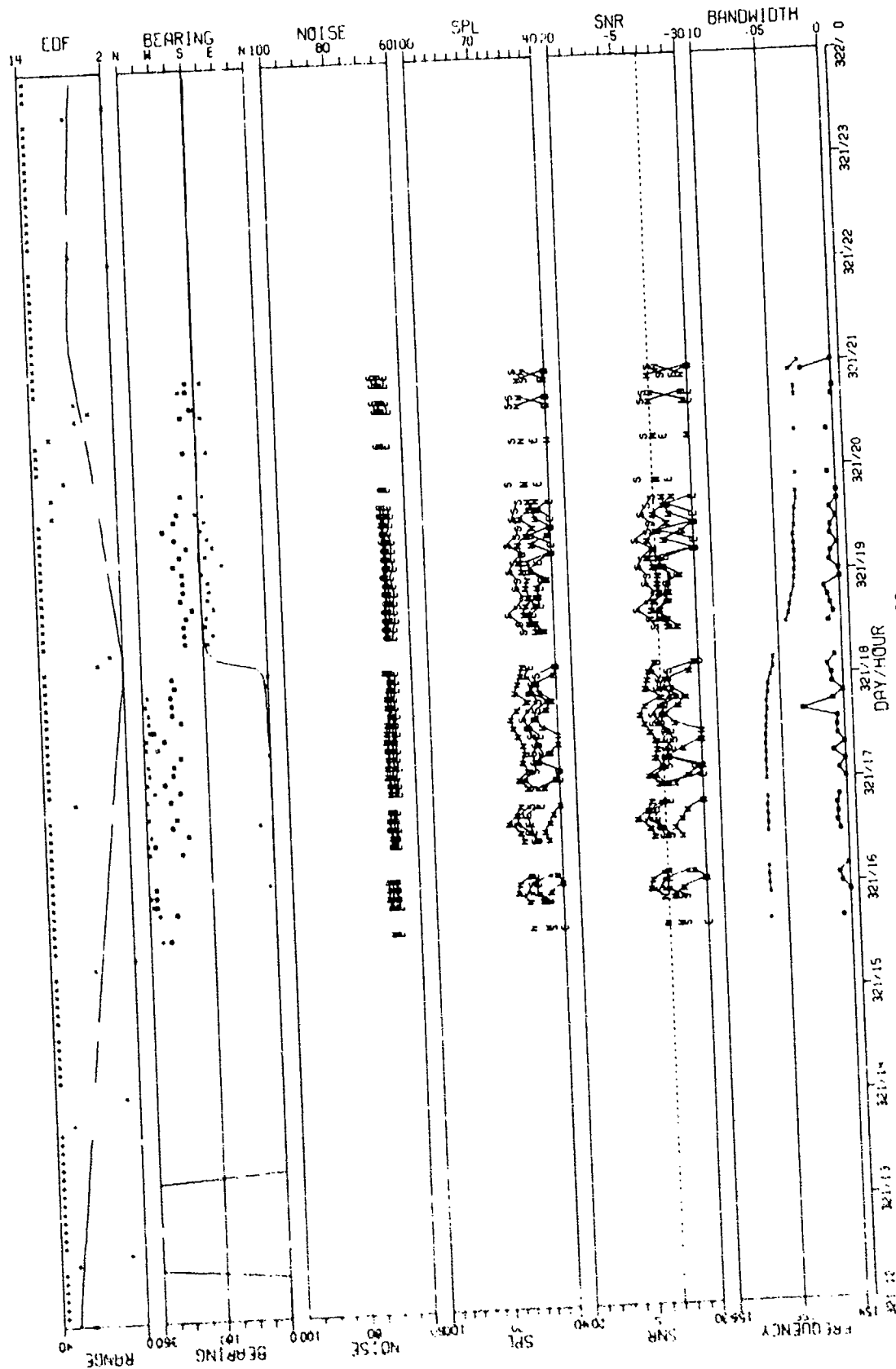


FIGURE 111-102
WSS-F71 155 HZ LINE HISTORY AS OBSERVED VIA THE MAX GAIN LIMACONS SENSOR
AT SITE A3 DURING THE 17 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

AS-77-2702

CONFIDENTIAL

CONFIDENTIAL



FIGURE III-103
MSS-FVT 155 HZ LINE HISTORY AS OBSERVED VIA THE VERTICAL DIPOLE SENSOR
AT SITE A3 DURING THE 17 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

AS-77-2703

CONFIDENTIAL

CONFIDENTIAL

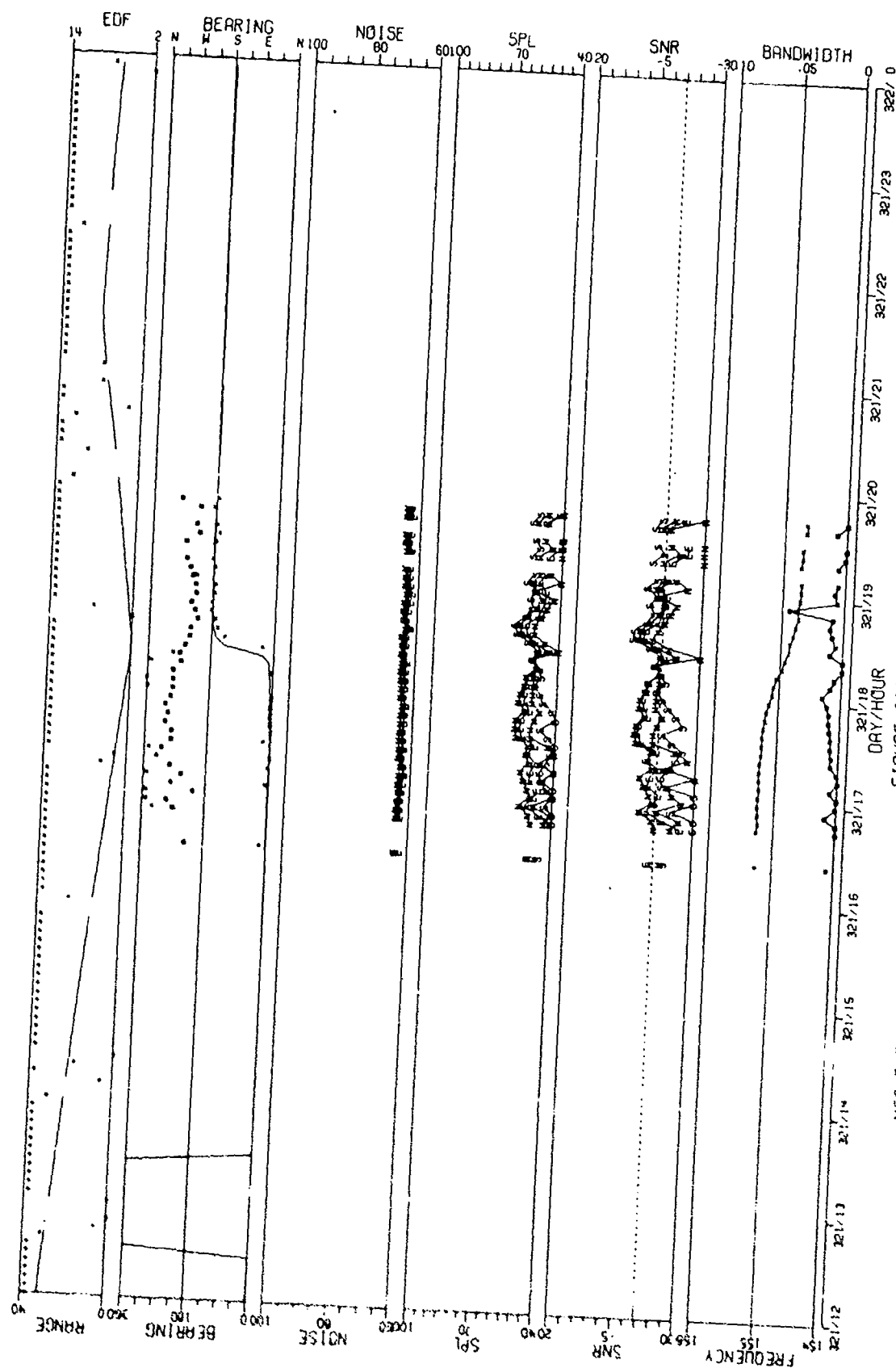


FIGURE 111-104
MSS-FVT 155 H2 LINE HISTORY AS OBSERVED VIA THE DIFFERENCED CAROTIDS SENSOR
AT SITE A3 DURING THE 17 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

133
CONFIDENTIAL

AS-77-2704

CONFIDENTIAL

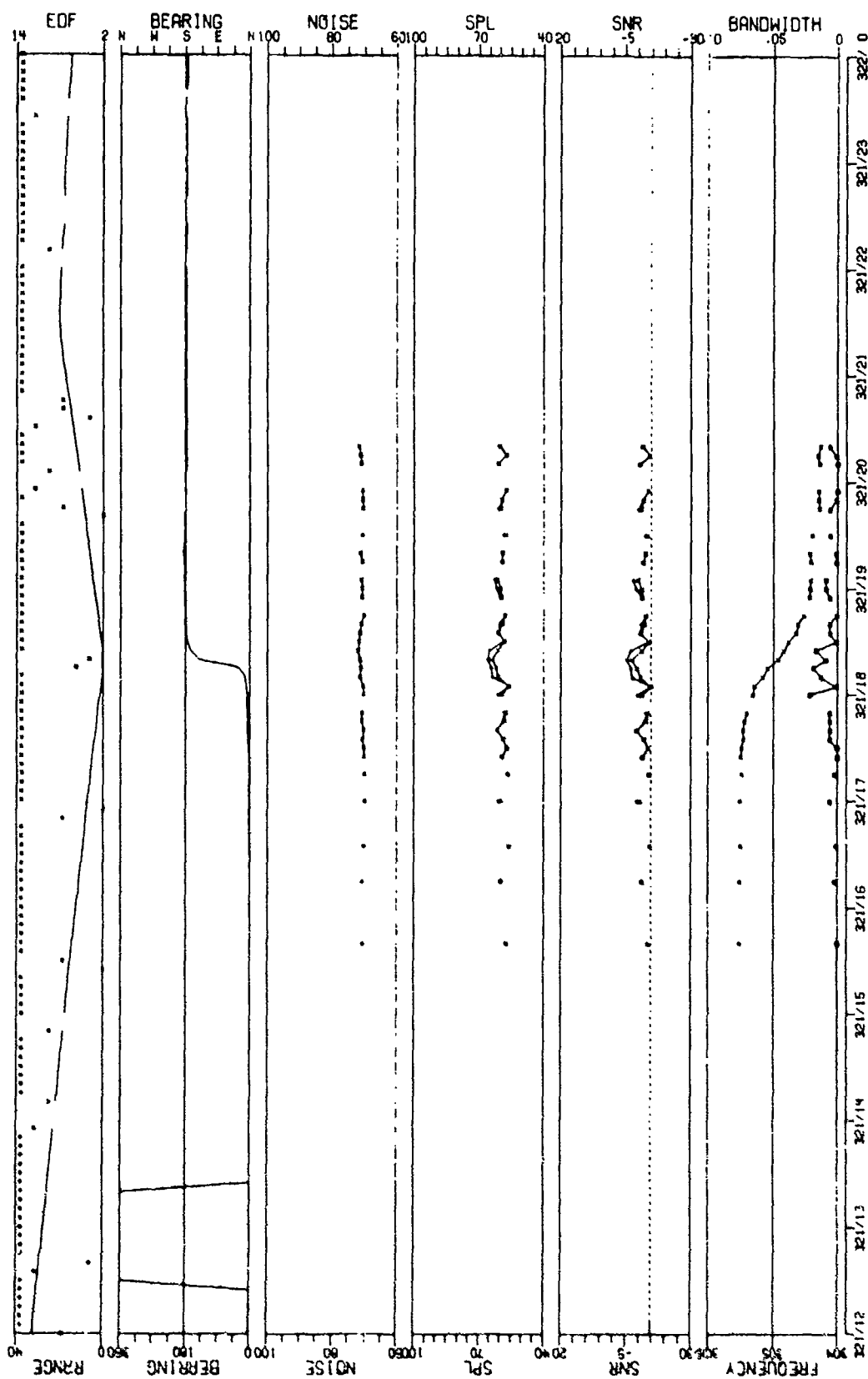


FIGURE III-105
HSS-FVT 305 HZ LINE HISTORY AS OBSERVED VIA THE OMNIDIRECTIONAL SENSOR
AT SITE A3 DURING THE 17 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

AS-77-2705

CONFIDENTIAL

CONFIDENTIAL

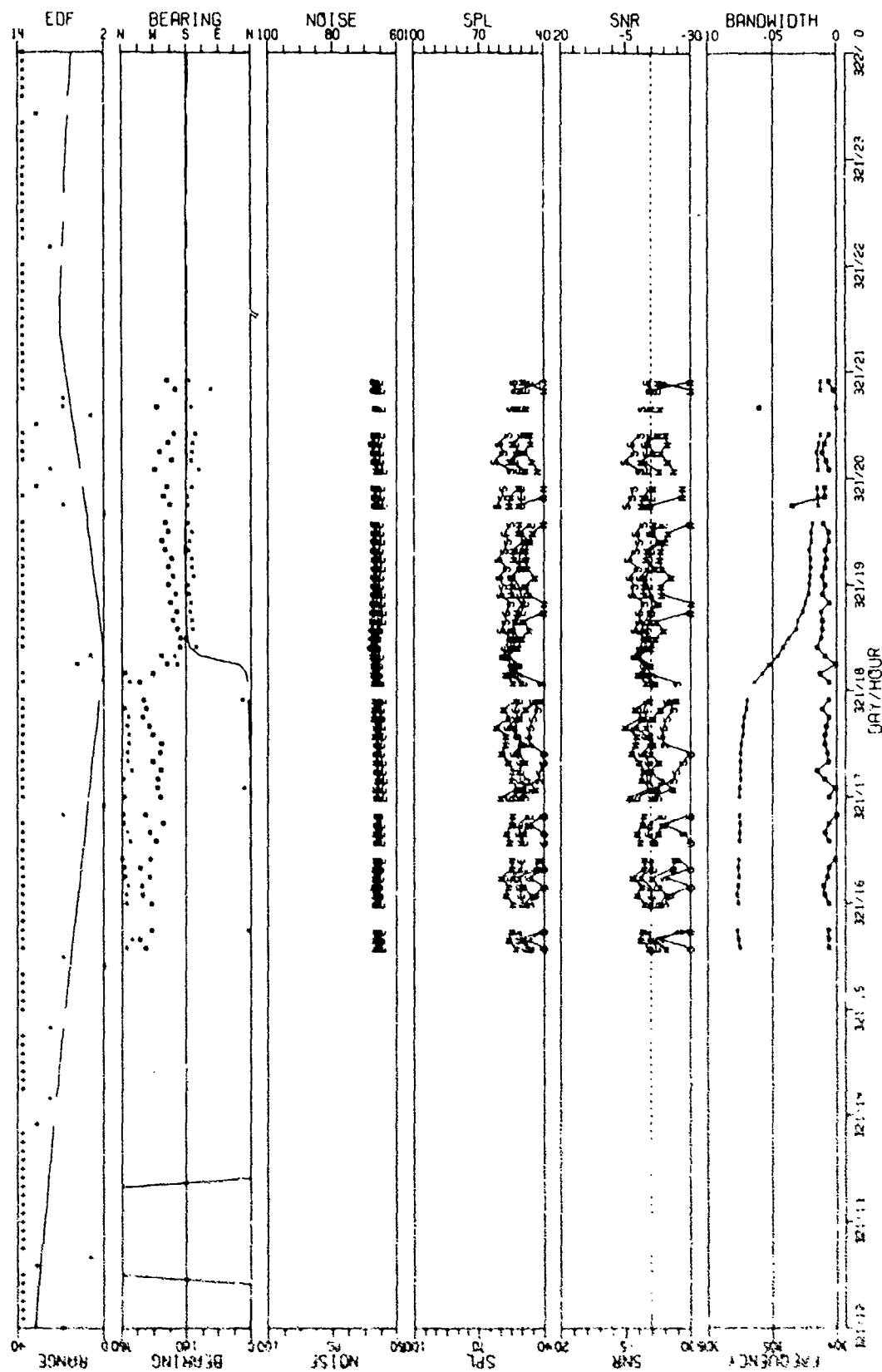


FIGURE 111-106
MSG-FVT 305 HZ LINE HISTORY AS OBSERVED VIA THE SINGLE CARDIOIDS SENSOR
AT SITE 03 DURING THE 17 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

AS-77-2706

CONFIDENTIAL

CONFIDENTIAL

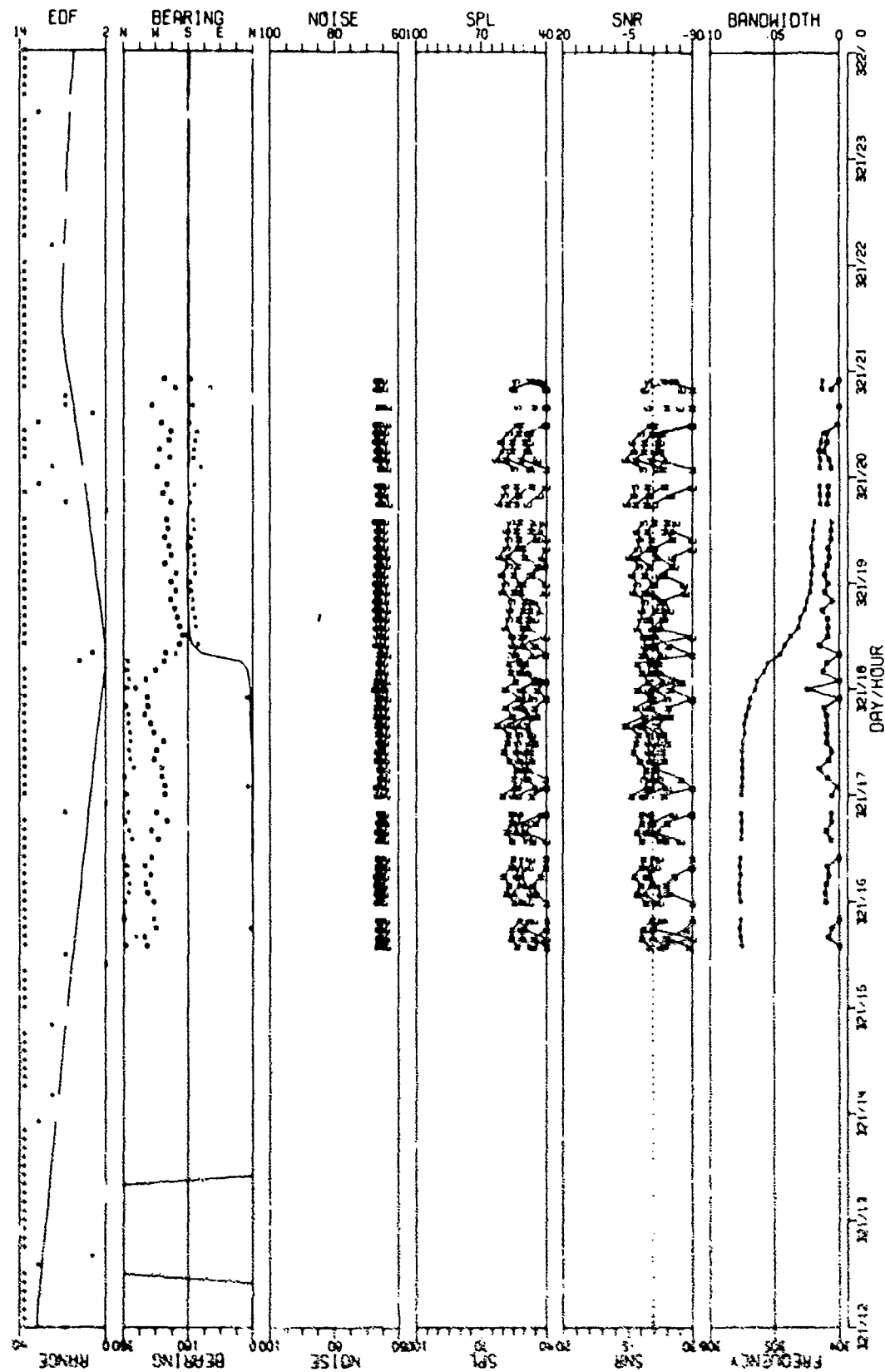


FIGURE 111-107
MSS-FVT 305 HZ LINE HISTORY AS OBSERVED VIA THE MAX GAIN LIMACONS SENSOR
AT SITE A3 DURING THE 17 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

AS-77-2707

CONFIDENTIAL

CONFIDENTIAL

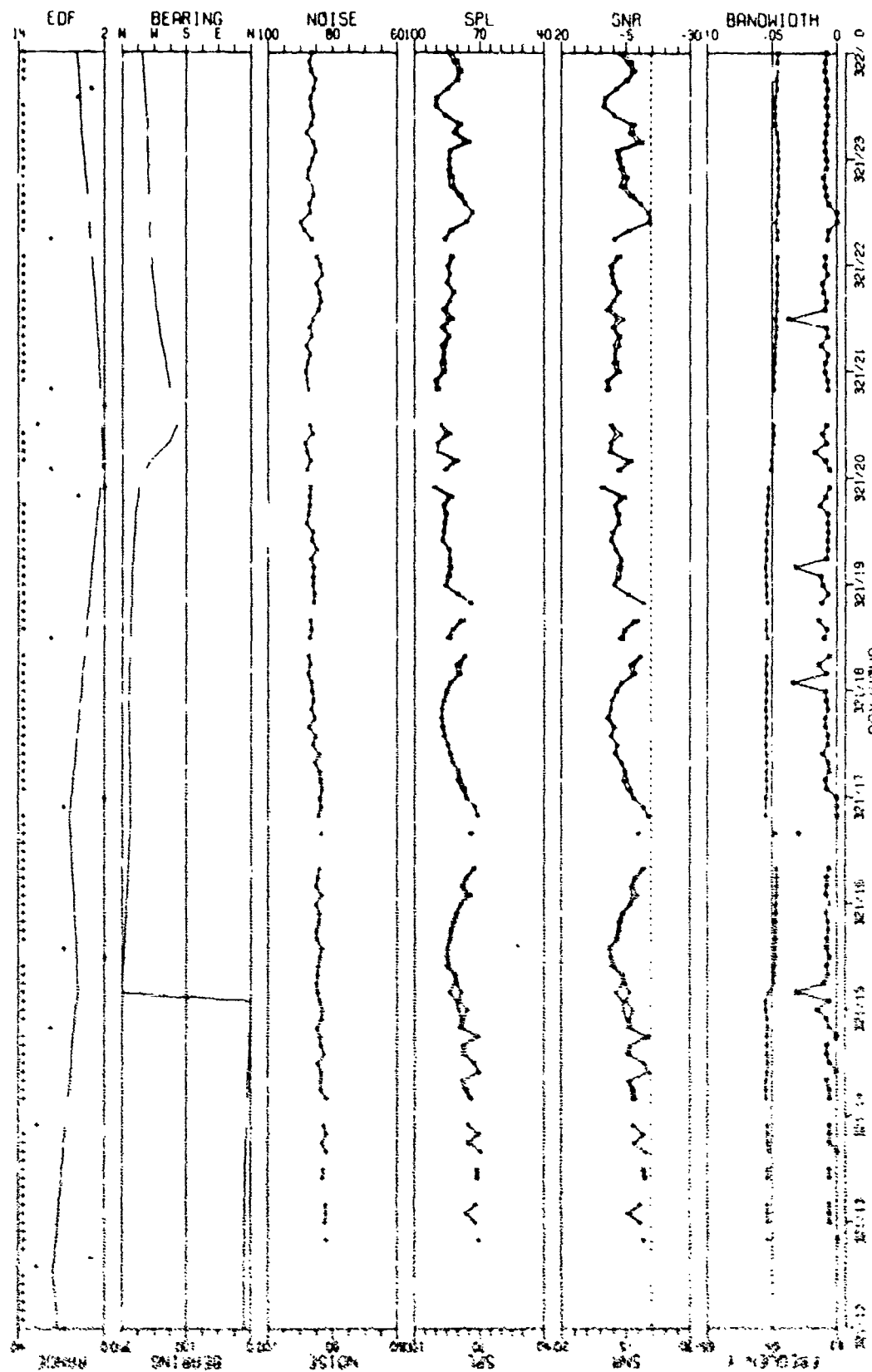


FIGURE 111-108
 405-1475 64 1/2 LINE HISTORY AS OBSERVED VIA THE OMNIDIRECTIONAL SENSOR
 # 511 43 DURING THE 17 NOV FIELD EVENT WITH VERNIER RESOL "N (U)

AS-77-2708

CONFIDENTIAL

CONFIDENTIAL

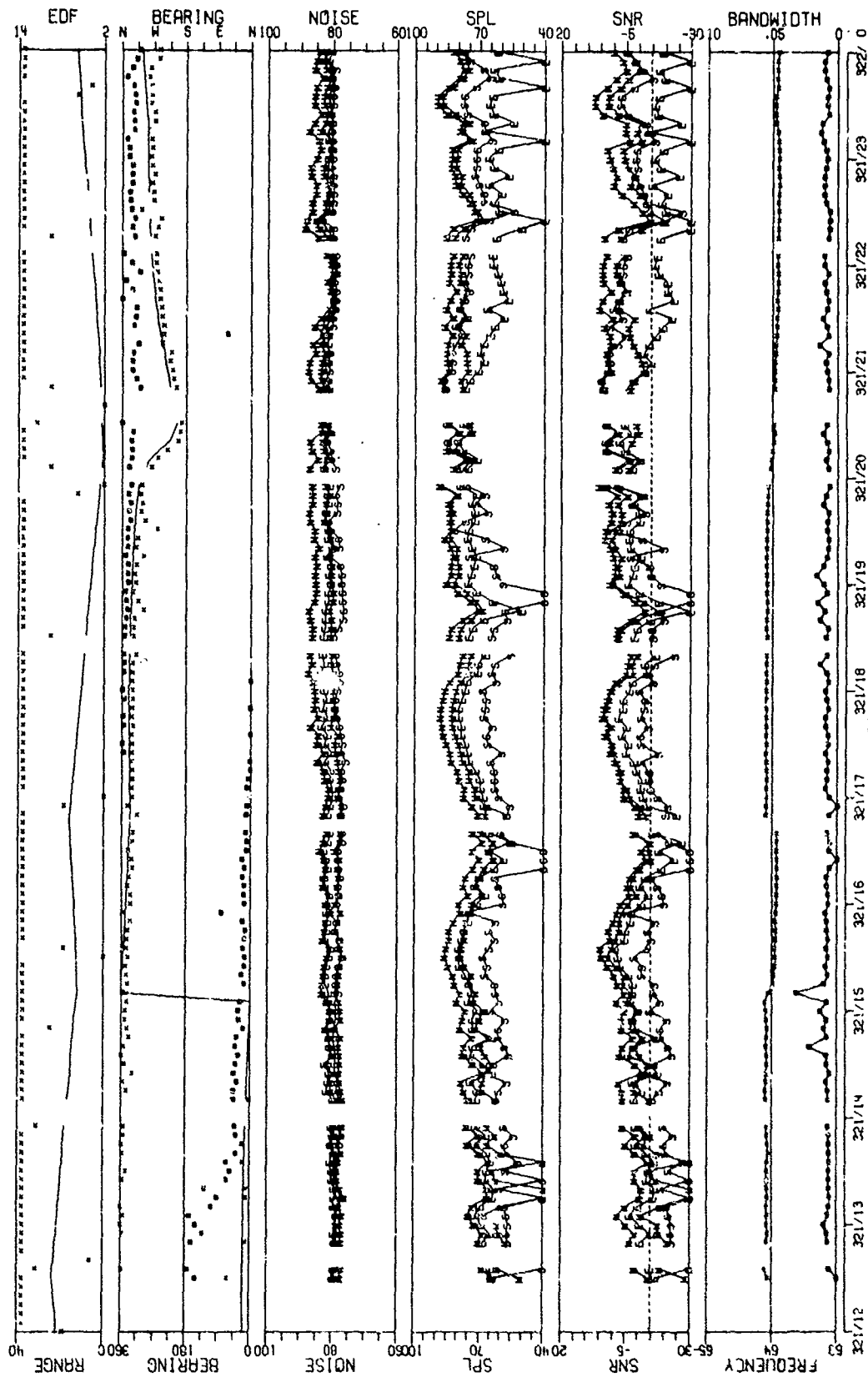


FIGURE III-109
MSS-FVT 64 HZ LINE HISTORY AS OBSERVED VIA THE SINGLE CARDOIDS SENSOR
AT SITE A3 DURING THE 17 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

AS-77-2709

CONFIDENTIAL

CONFIDENTIAL

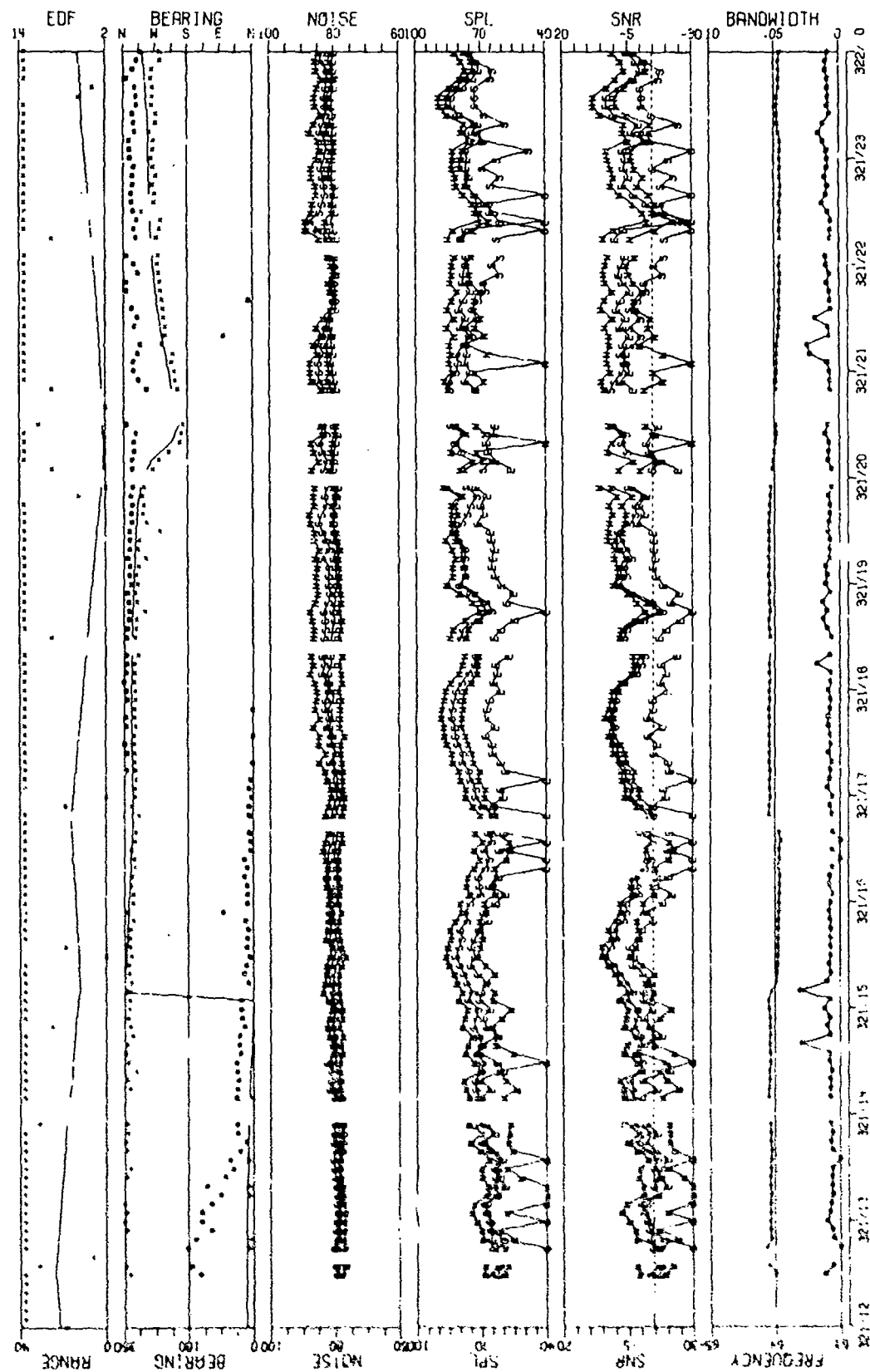


FIGURE III-110
MSS-FVT 64 HZ LINE HISTORY AS OBSERVED VIA THE MAX GAIN LIMACONS SENSOR
AT SITE A3 DURING THE 17 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

AS-77-2710

CONFIDENTIAL

CONFIDENTIAL

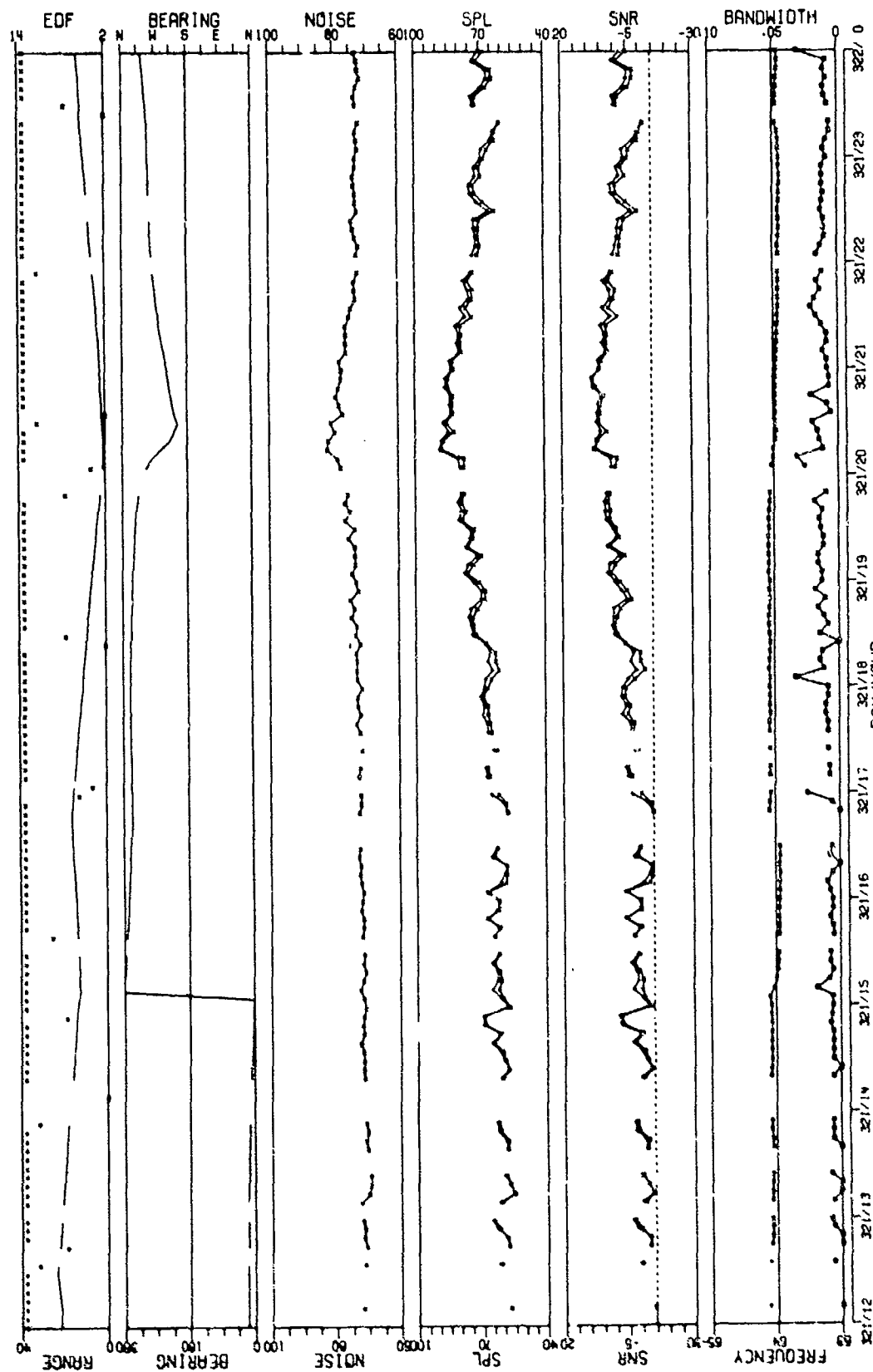


FIGURE III-111
MSS-FVT 64 HZ LINE HISTORY AS OBSERVED VIA THE VERTICAL DIPOLE SENSOR
AT SITE A3 DURING THE 17 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

AS-77-2711

CONFIDENTIAL

CONFIDENTIAL

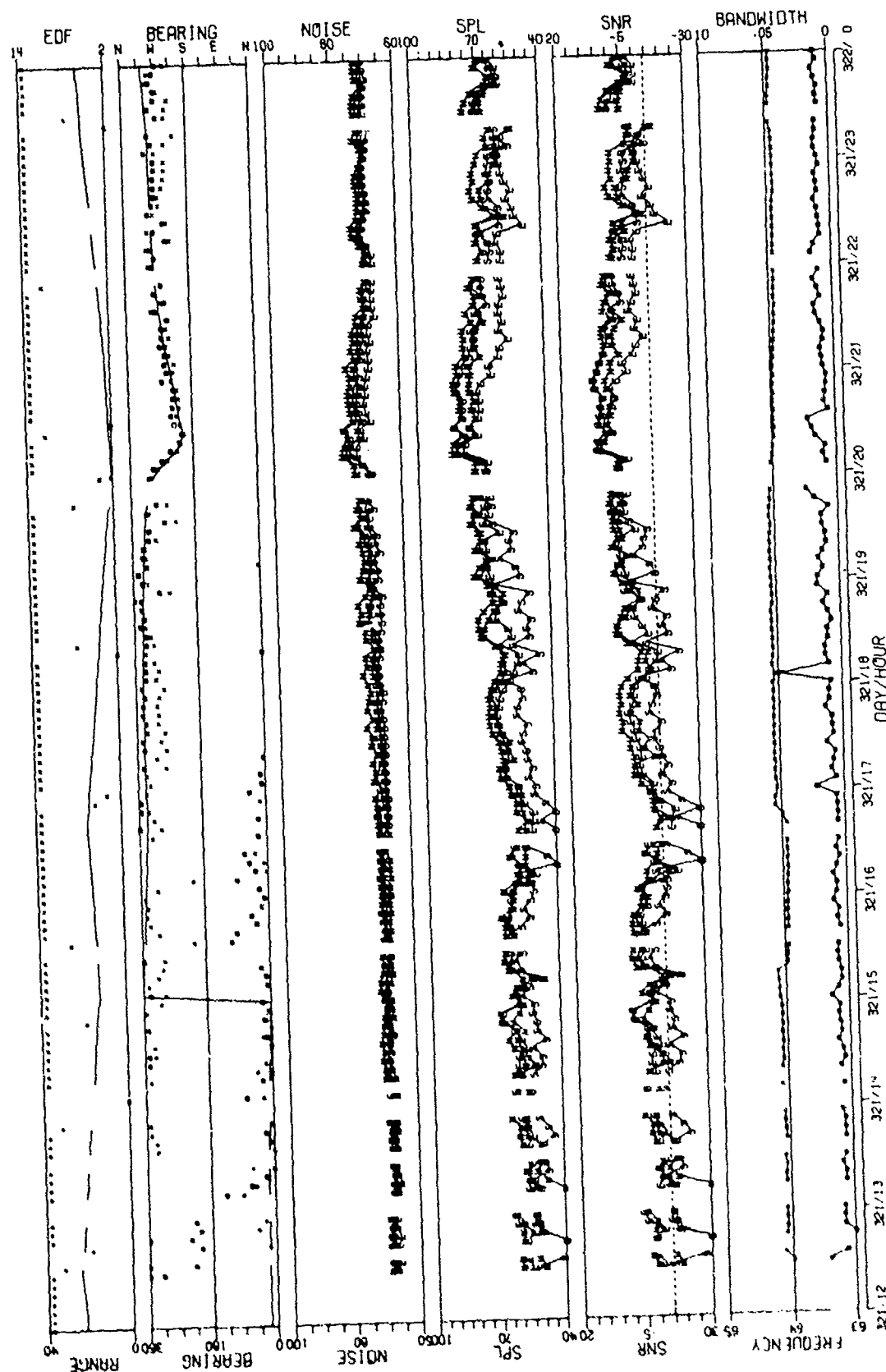


FIGURE III-112
MSS-FVT 64 HZ LINE HISTORY AS OBSERVED VIA THE DIFFERENCED CAROTIDIOS SENSOR
AT SITE A3 DURING THE 17 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

AS-77-2712

CONFIDENTIAL

CONFIDENTIAL

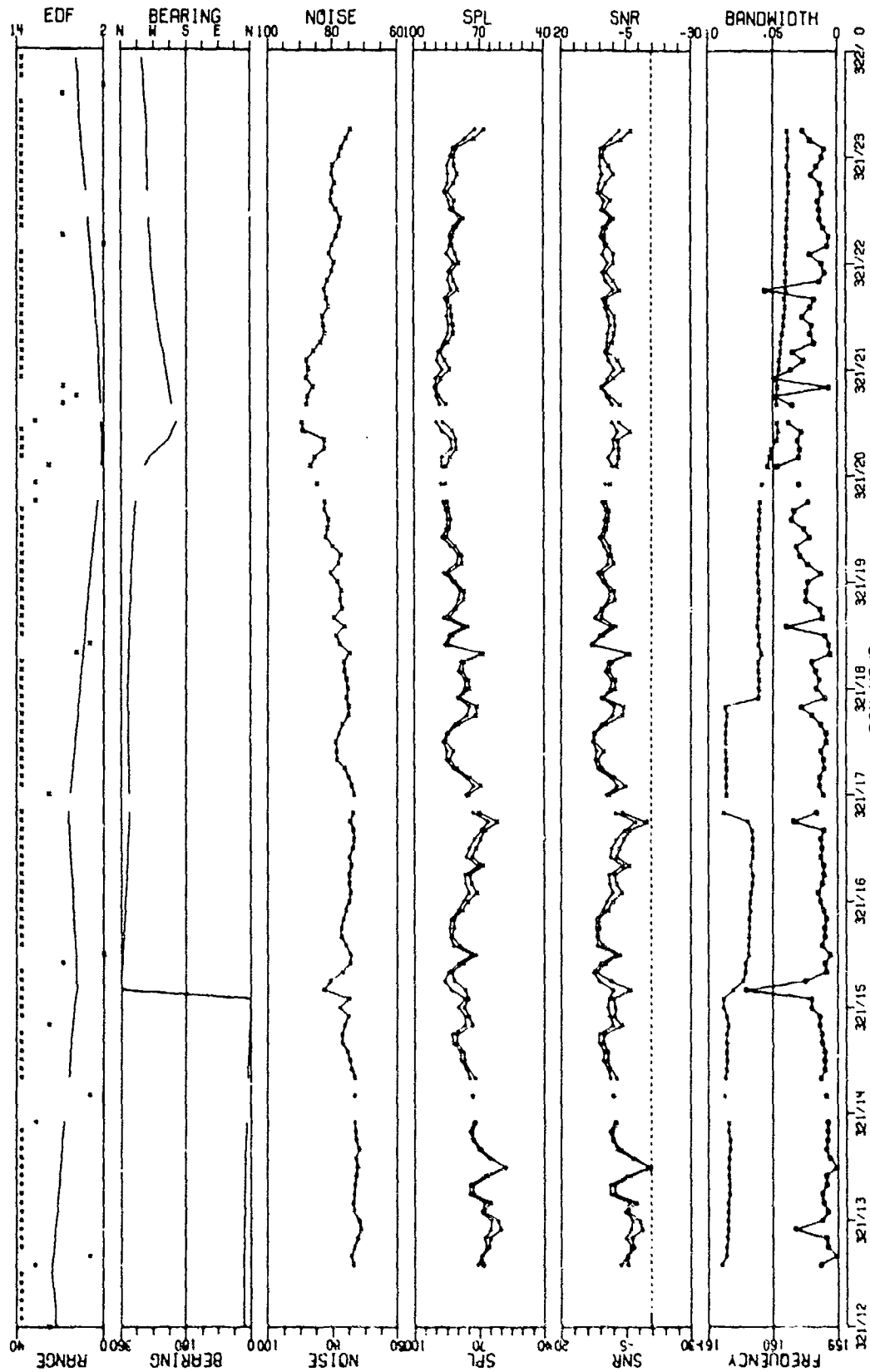


FIGURE III-113
MSS-FVT 160 HZ LINE HISTORY AS OBSERVED VIA THE OMNIDIRECTIONAL SENSOR
AT SITE A3 DURING THE 17 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

AS-77-2713

CONFIDENTIAL

CONFIDENTIAL

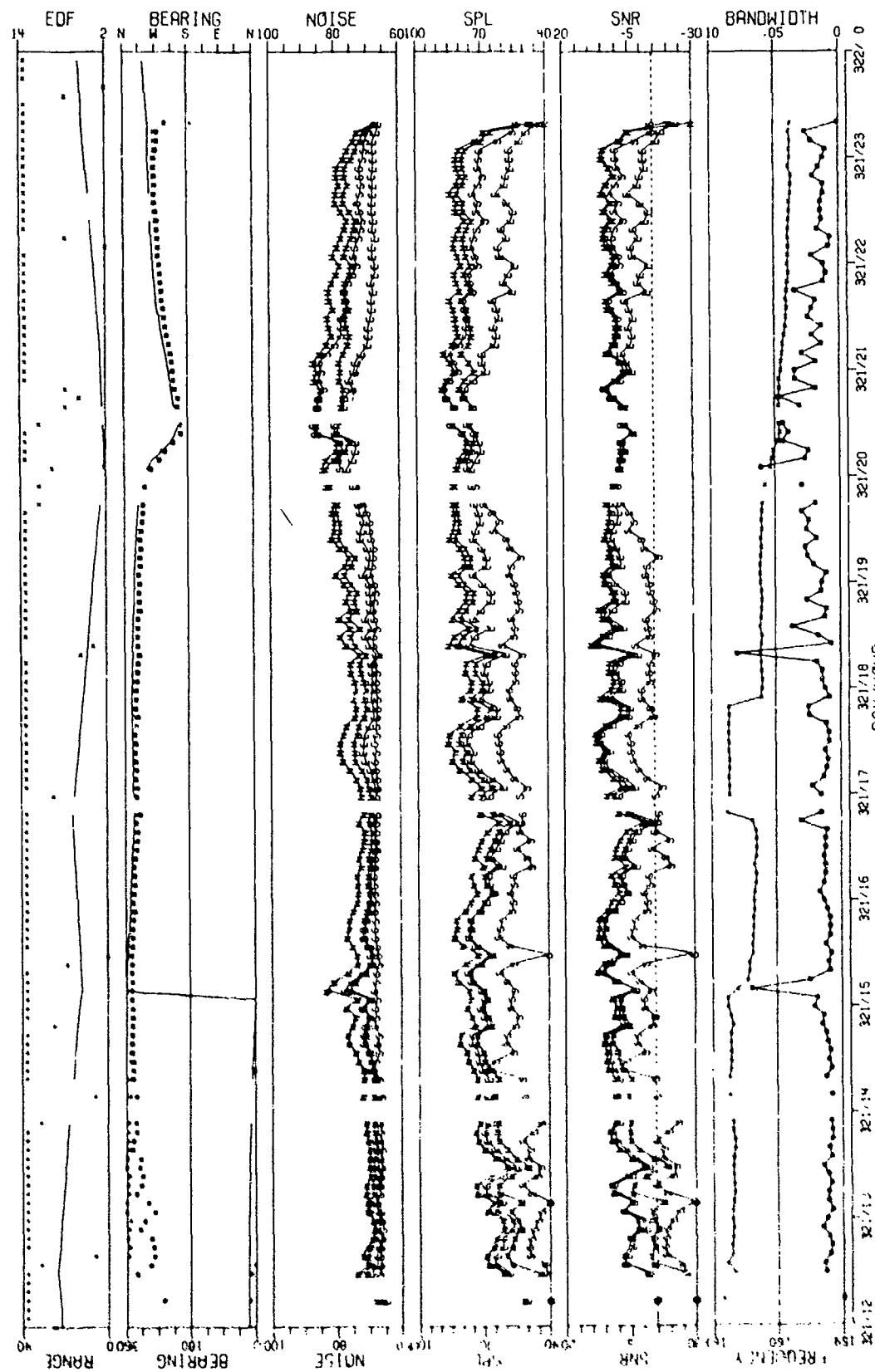


FIGURE III-114
MSS-FY1 160 HZ LINE HISTORY AS OBSERVED VIA THE SINGLE CARDIOIDS SENSOR
AT SITE A3 DURING THE 17 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

AS-77-2714

CONFIDENTIAL

CONFIDENTIAL



FIGURE 111-115
MSS-FVT 160 HZ LINE HISTORY AS OBSERVED VIA THE MAX GAIN LIMCONS SENSOR
AT SITE A3 DURING THE 17 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

AS-77-2715

CONFIDENTIAL

CONFIDENTIAL

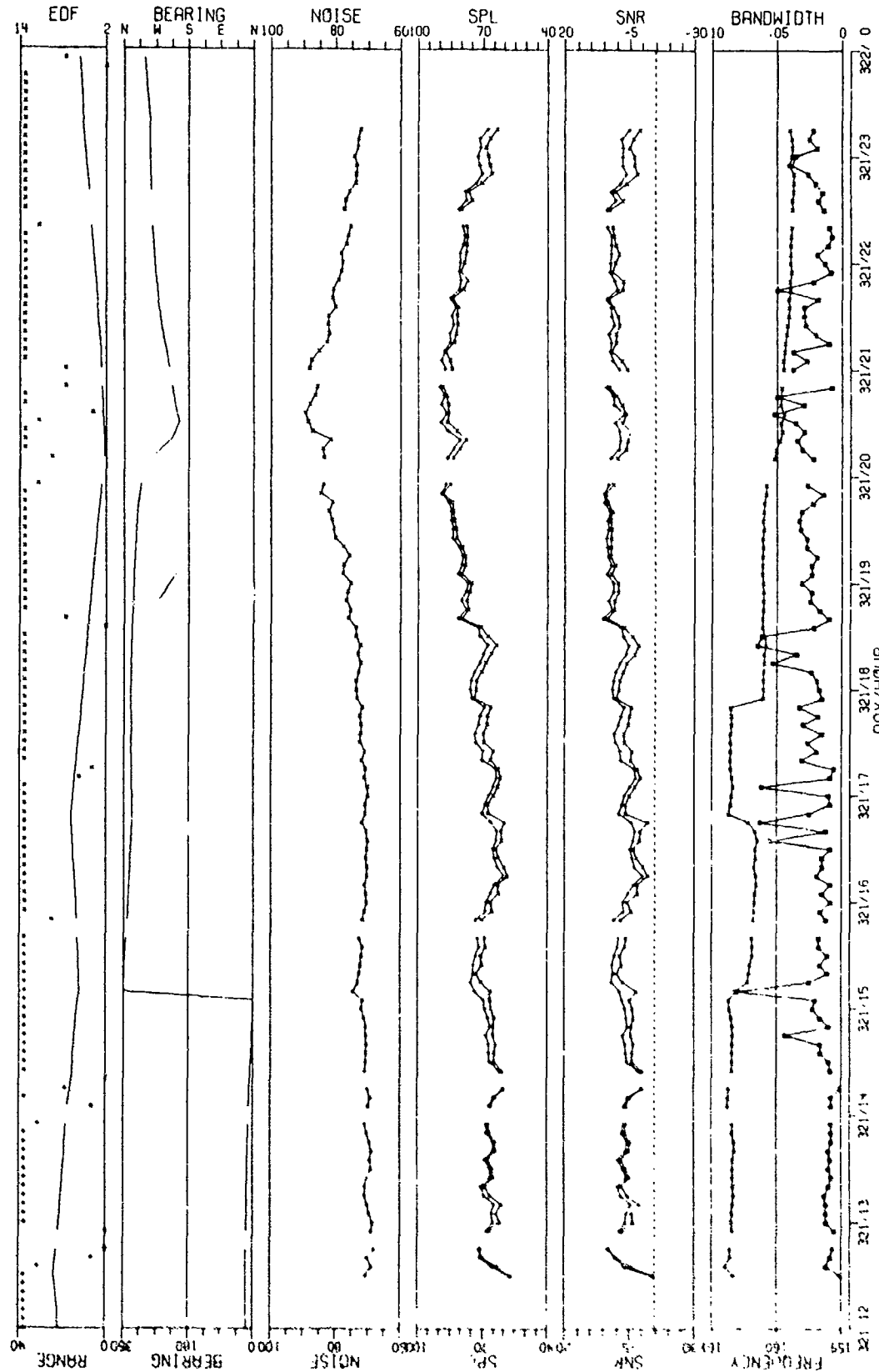


FIGURE III-116
MCS-FVT 160 HZ LINE HISTORY AS OBSERVED VIA THE VERTICAL DIPOLE SENSOR
BY SITE A3 DURING THE 17 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

AS-77-2716

CONFIDENTIAL

CONFIDENTIAL

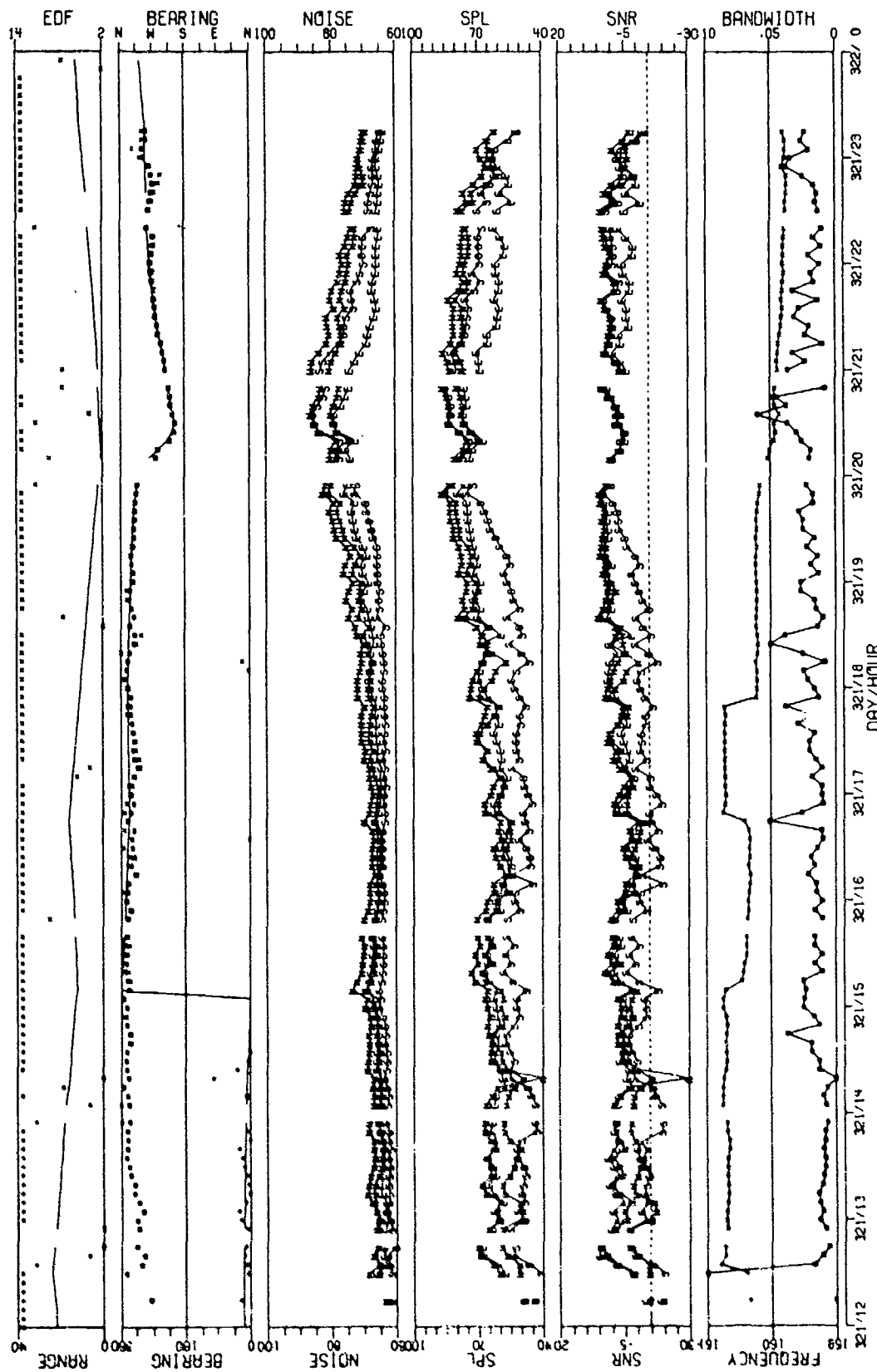


FIGURE III-117
MSS-FVT 160 HZ LINE HISTORY AS OBSERVED VIA THE DIFFERENCED CARDIOIDS SENSOR
AT SITE A3 DURING THE 17 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

AS-77-2717

CONFIDENTIAL

CONFIDENTIAL

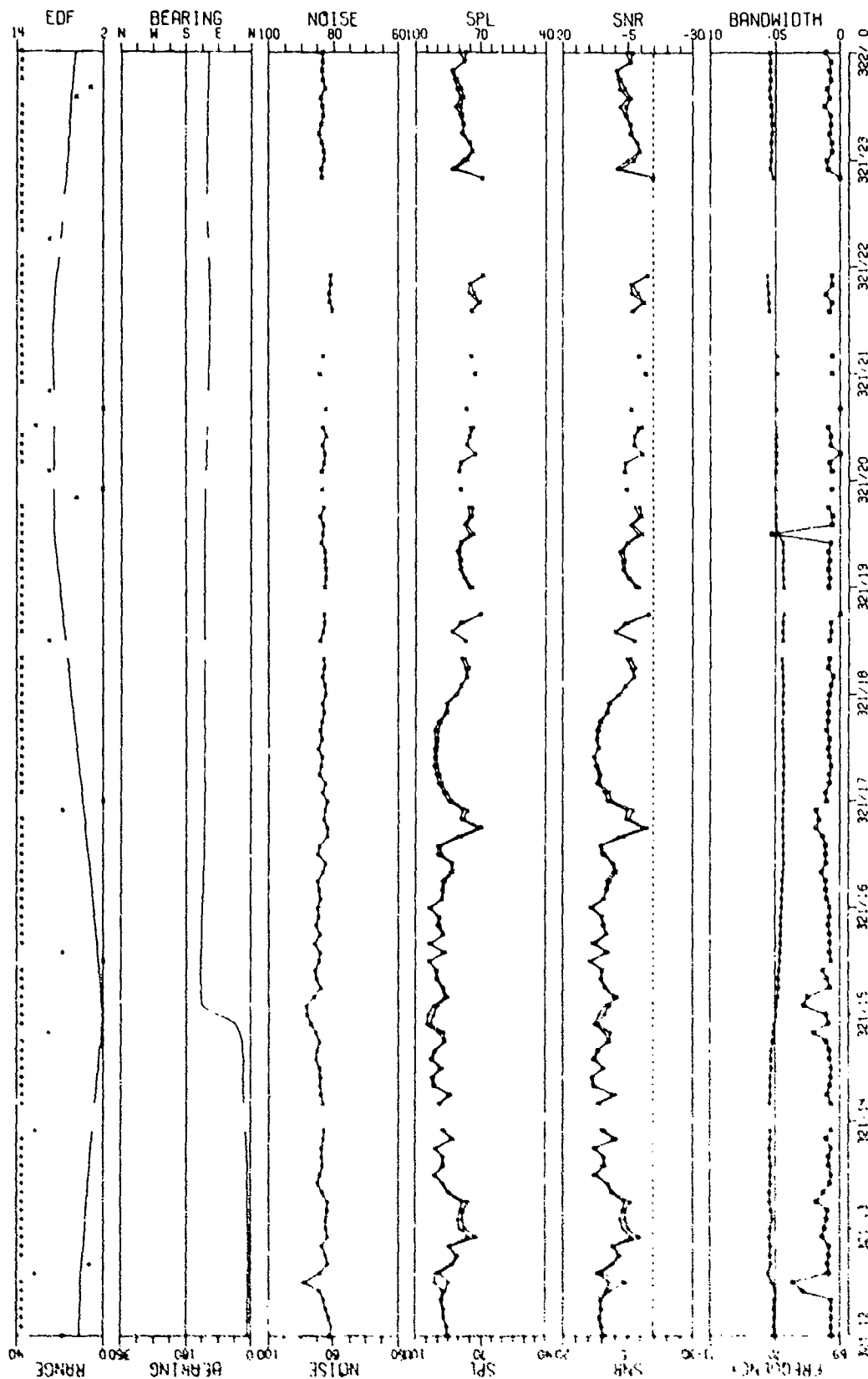


FIGURE 11'-118
WSS-FAT TO H2 LINE HISTORY AS OBSERVED VIA THE OMNIDIRECTIONAL SENSOR
AT SITE R3 DURING THE 17 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

AS-77-2718

CONFIDENTIAL

CONFIDENTIAL

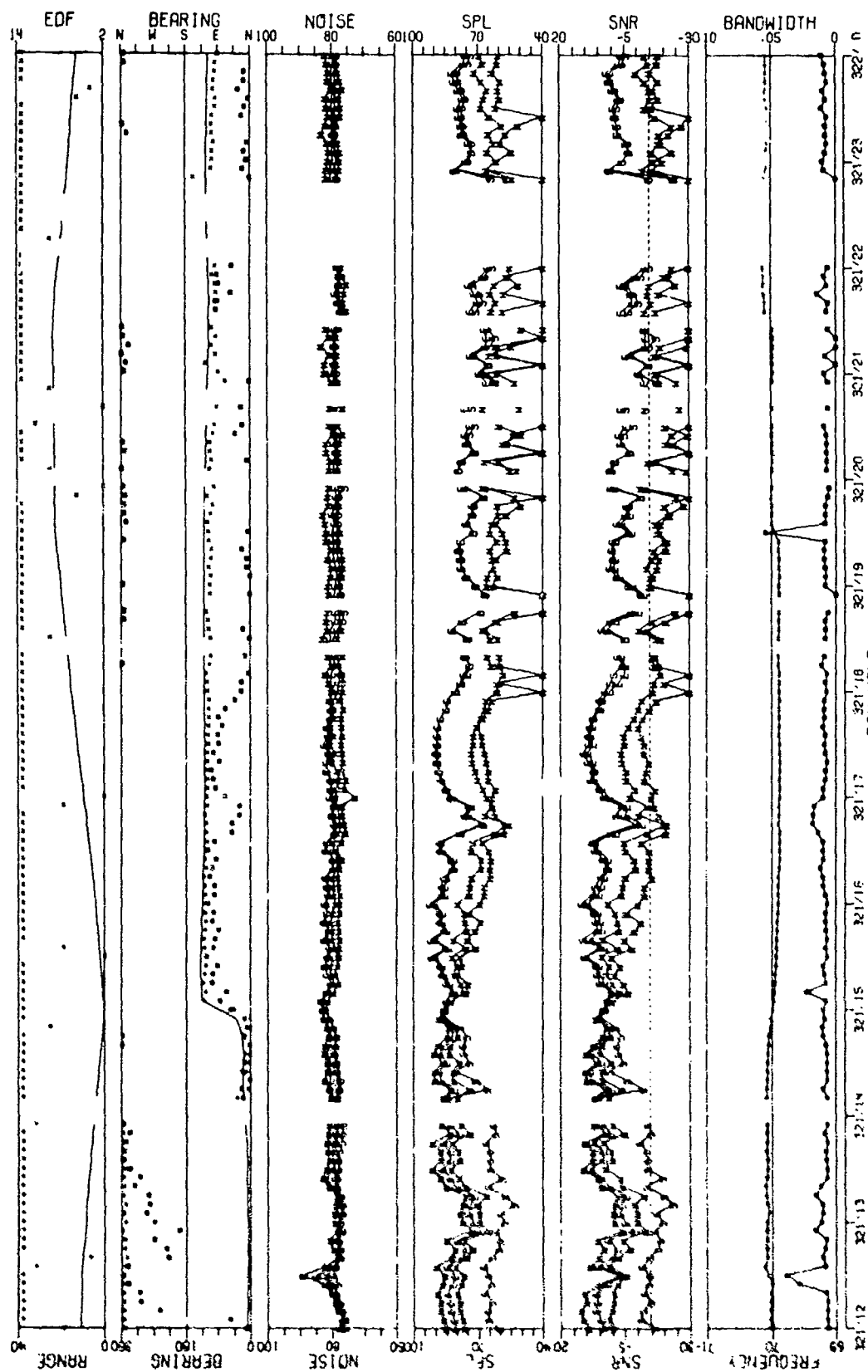


FIGURE III-119
MSS-FVT 70 HZ LINE HISTORY AS OBSERVED VIA THE SINGLE CARDIOLIDS SENSOR
AT SITE A3 DURING THE 17 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

AS-77-2719

CONFIDENTIAL

CONFIDENTIAL

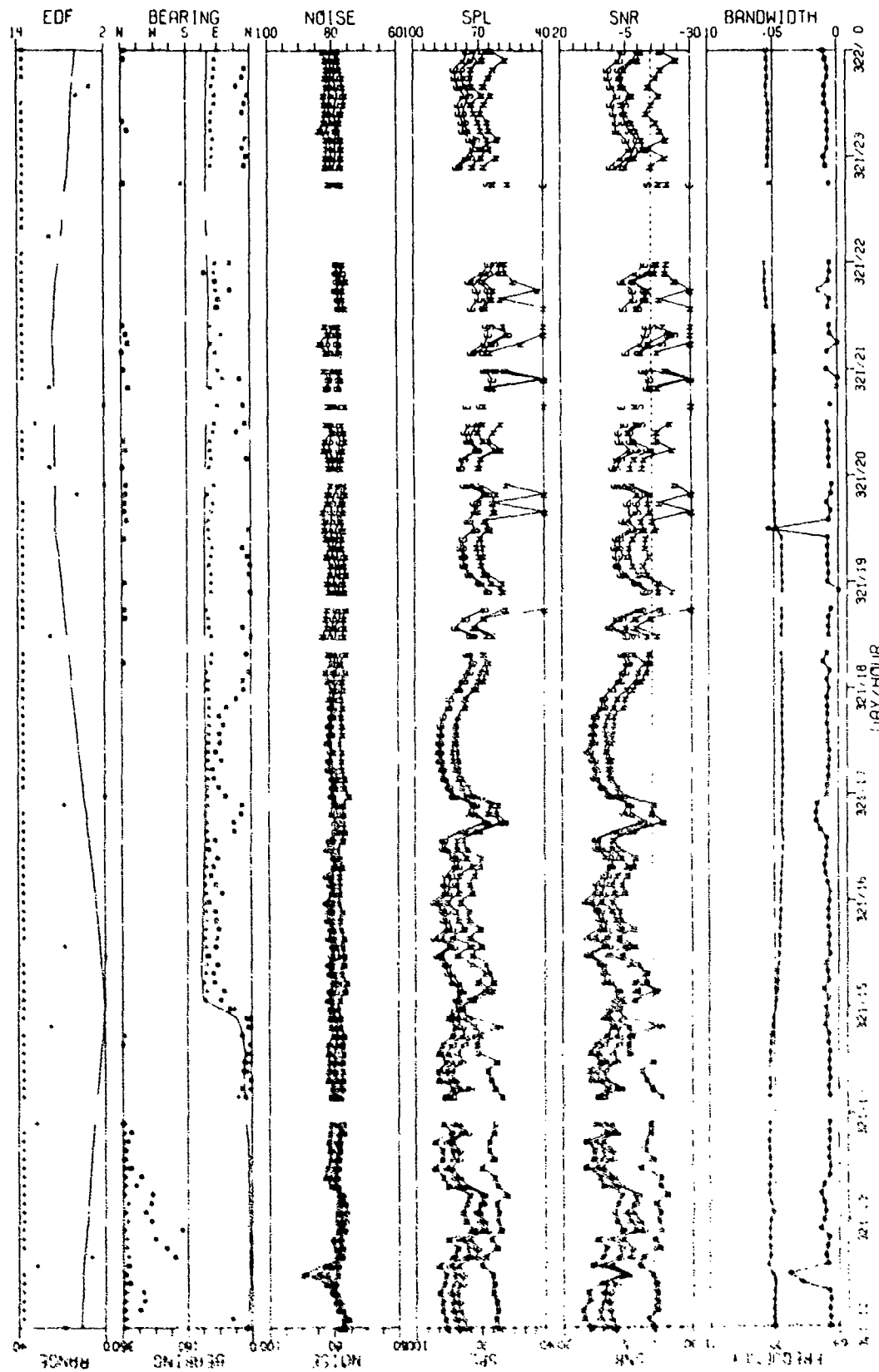


FIGURE 111-120
MAX. 500 Hz LINE HISTORY, AS OBSERVED VIA THE MAX GAIN LIMACONS SENSOR
AT 321/18 DURING THE 17 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

AS-77-2720

CONFIDENTIAL

CONFIDENTIAL

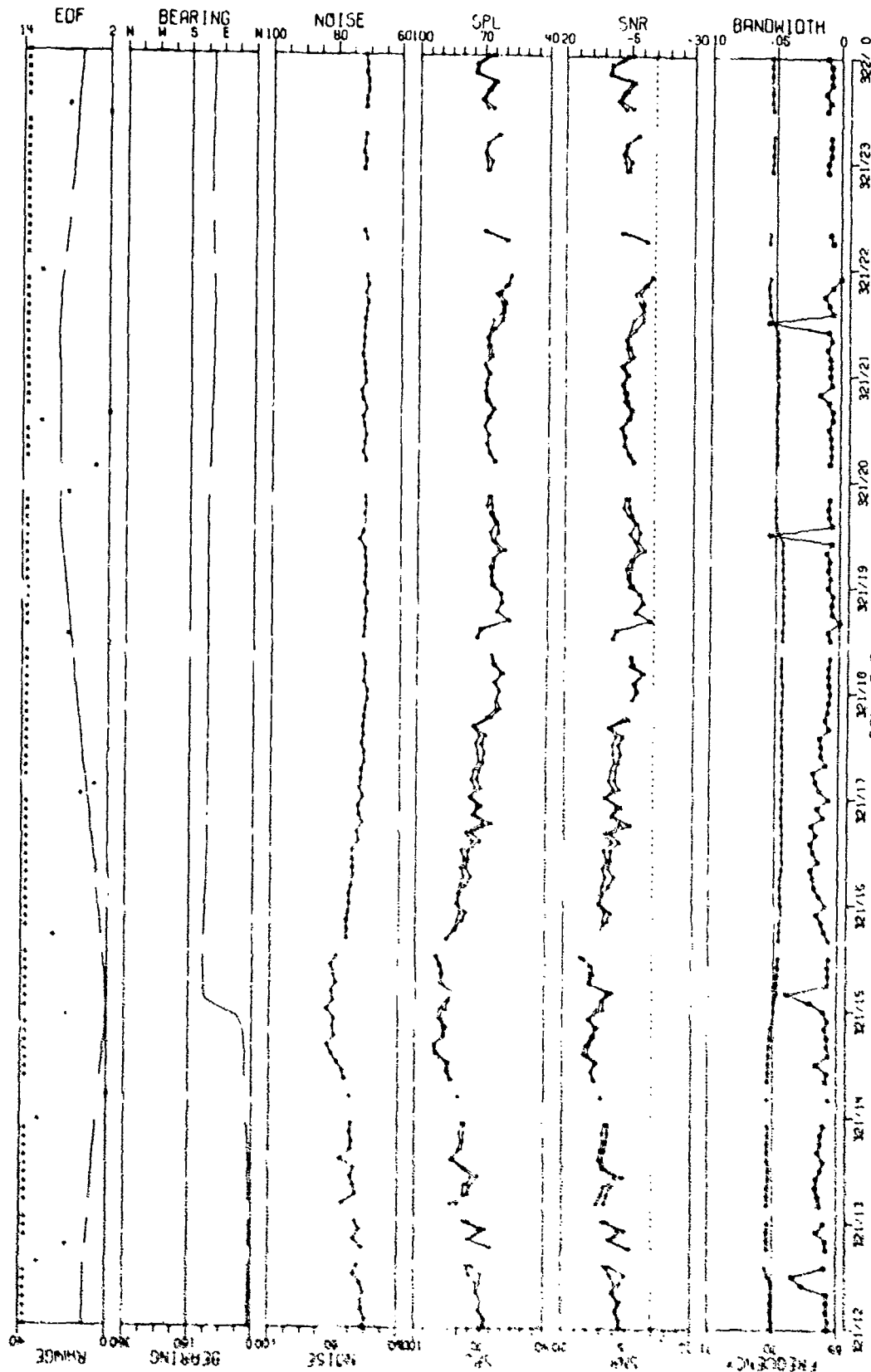


FIG. PE 111-121
MSS-FVT 70 N2 LINE HISTORY AS OBSERVED VIA THE VERTICAL DIPOLE SENSOR
AT SITE A3 DURING THE 17 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

CONFIDENTIAL

151
CONFIDENTIAL

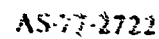


FIGURE 111-122
Atrial fibrillation as observed via the differentiated cardioiods sensor (U) during time 17 new field event with vernier resolution (U)

CONFIDENTIAL

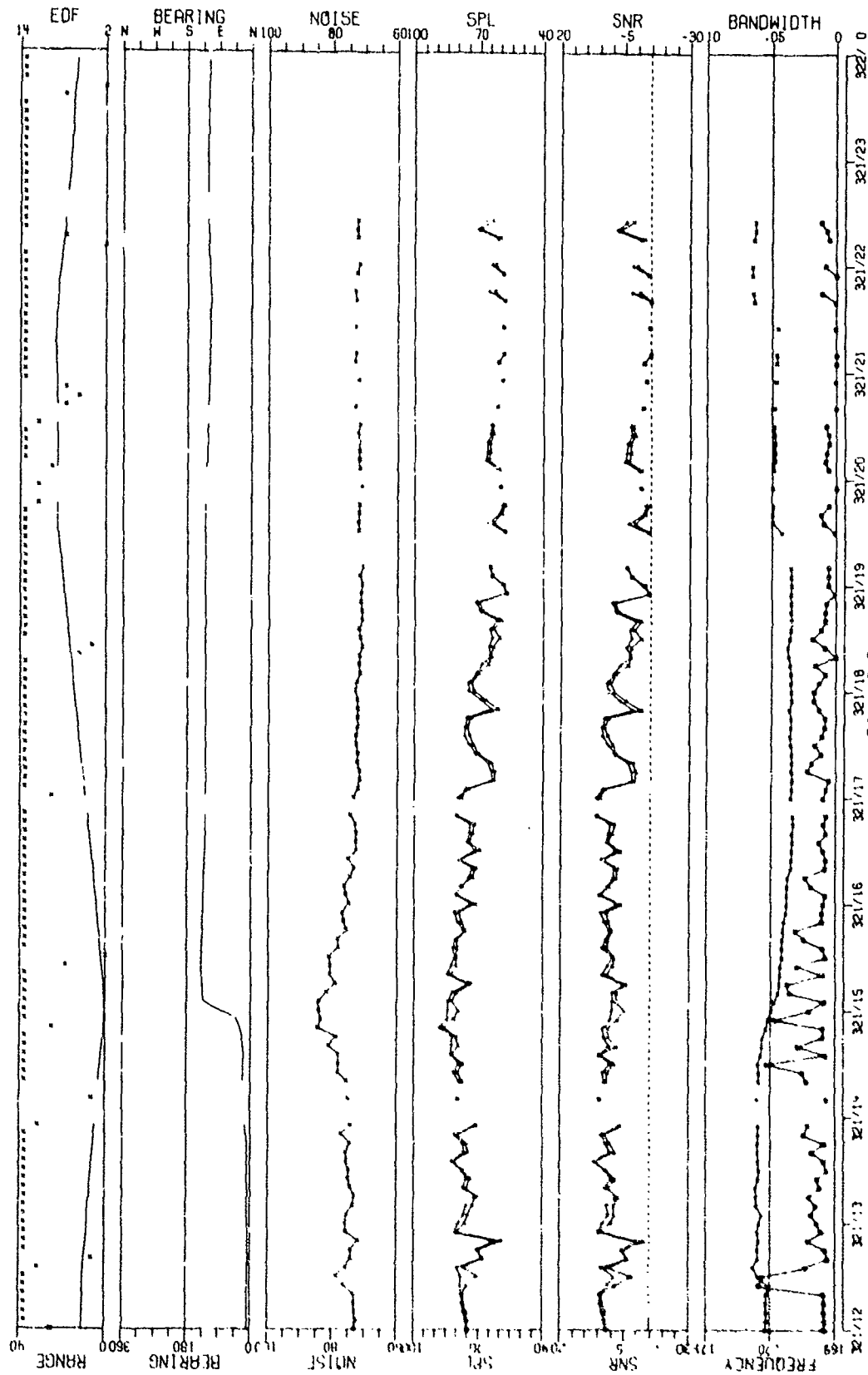


FIGURE 11-123
MSS-F/T 170 HZ LINE HISTORY AS OBSERVED VIA THE OMNIDIRECTIONAL SENSOR
BY SITE A3 DURING THE 17 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

AS-77-2723

CONFIDENTIAL

CONFIDENTIAL

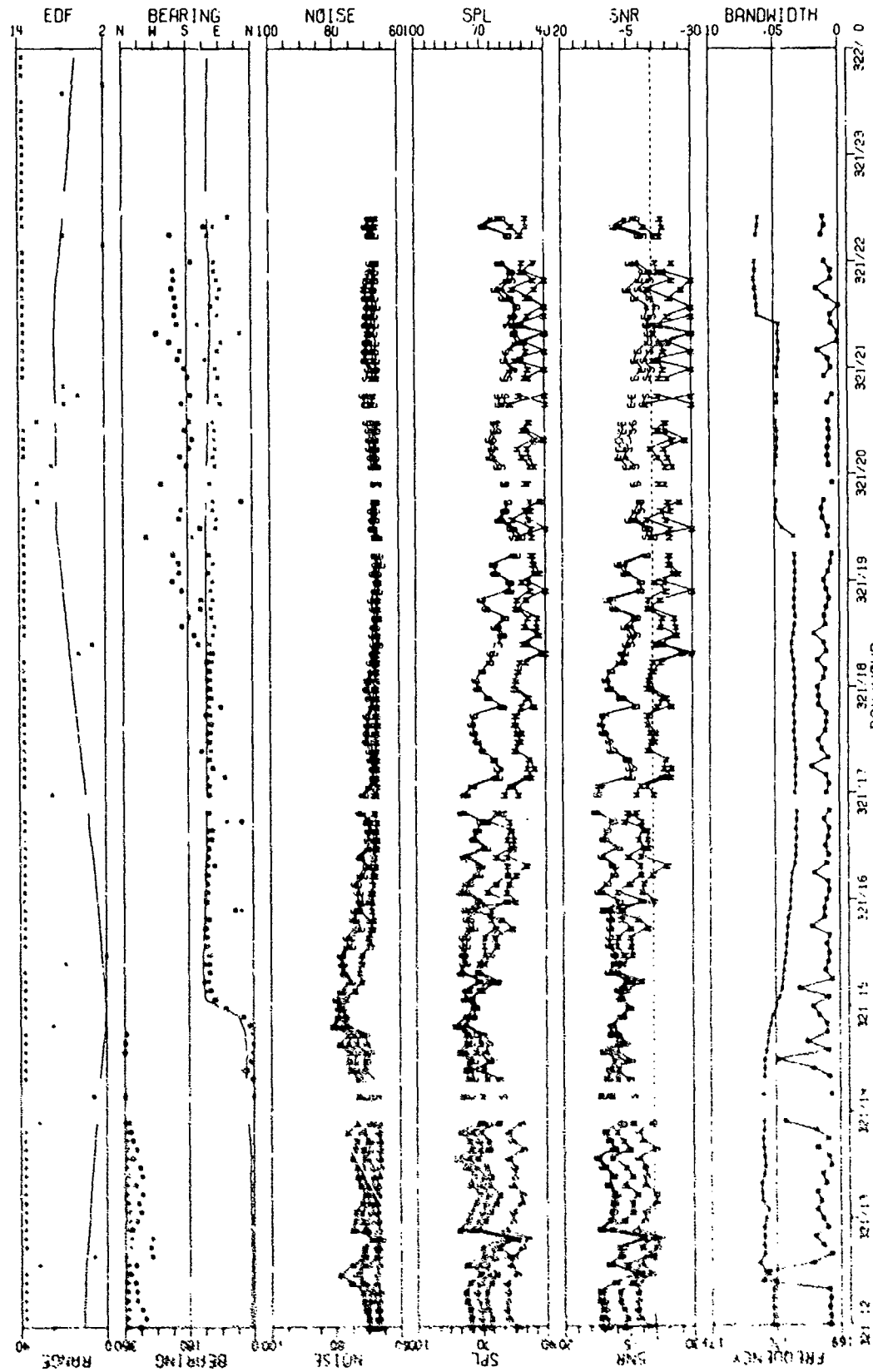


FIGURE 111-124
HSS-FUT 10 HZ LINE HISTORY AS OBSERVED VIA THE SINGLE CARDIOIDS SENSOR
AT SITE AS DURING THE 17 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

AS-77-2724

CONFIDENTIAL

CONFIDENTIAL

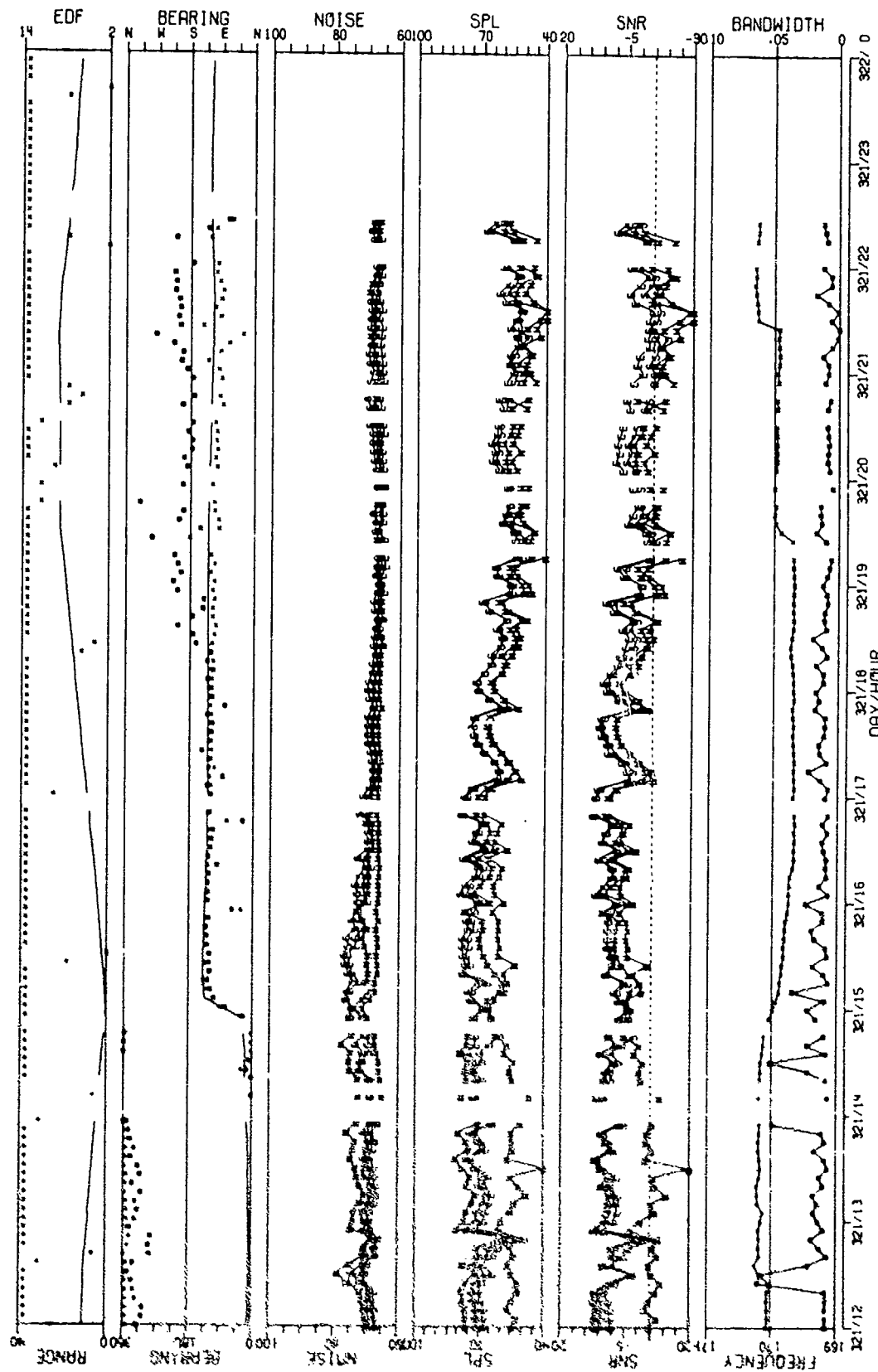


FIGURE 11: -125
MSS-FVT 170 HZ LINE HISTORY AS OBSERVED VIA THE MAX GAIN LIMACONS SENSOR
AT SITE A3 DURING THE 17 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

AS-77-2725

CONFIDENTIAL

CONFIDENTIAL

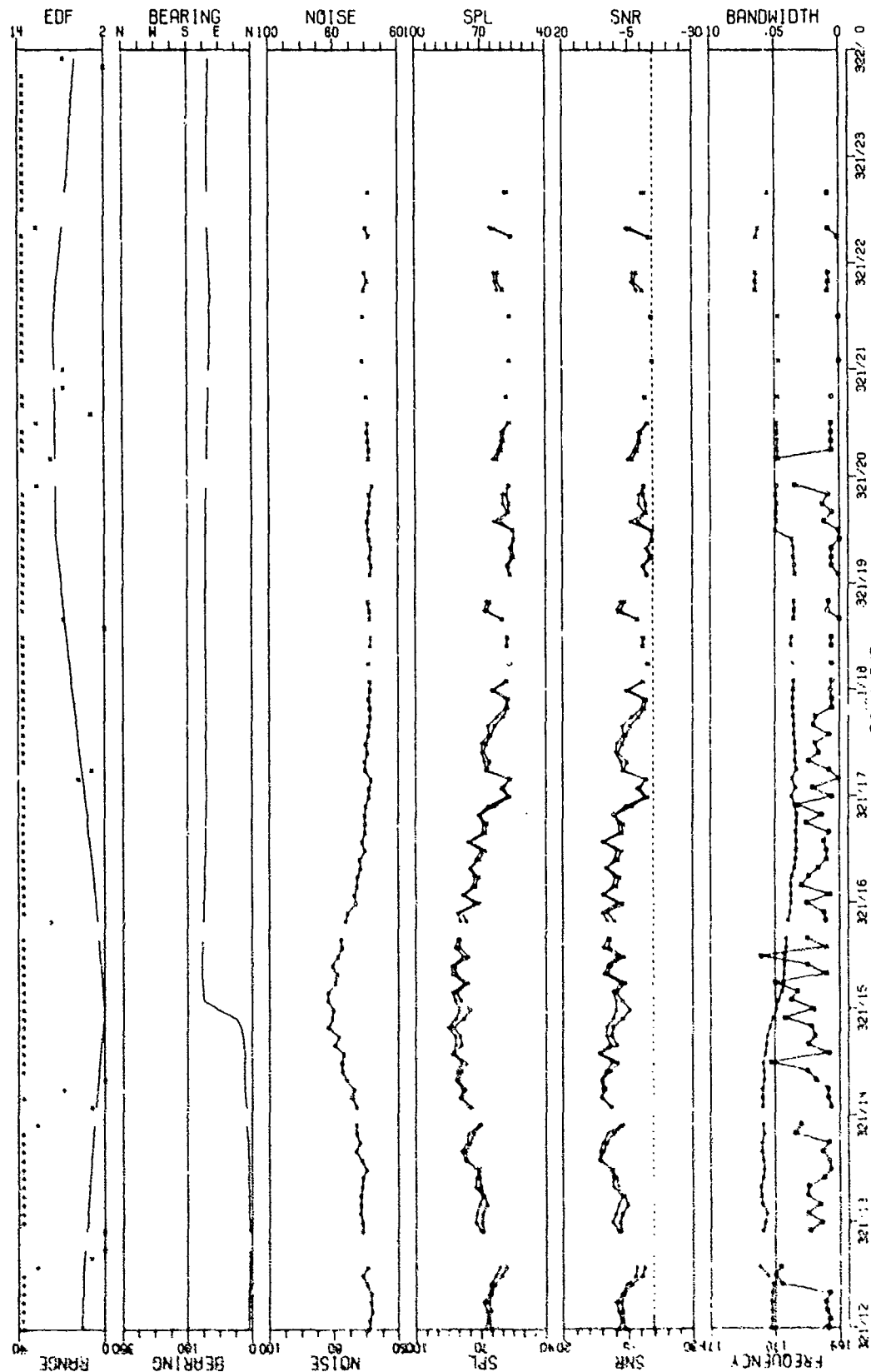


FIGURE 111-126
MCS-FVI :70 HZ LINE HISTORY AS OBSERVED VIA THE VERTICAL DIPOLE SENSOR
AT SITE A3 DURING THE 17 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

AS-77-2726

CONFIDENTIAL

CONFIDENTIAL

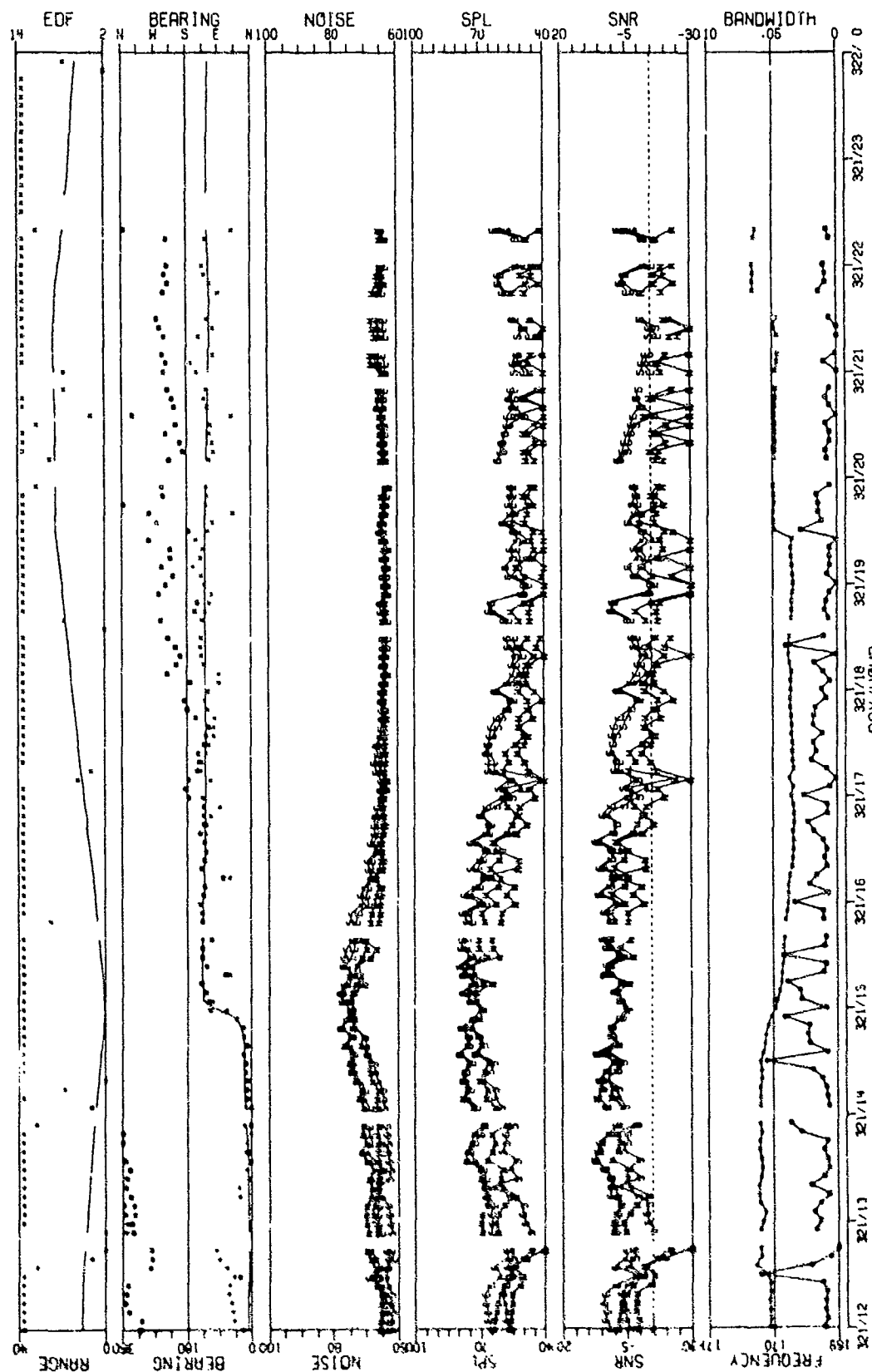


FIGURE III-127
MSS-FVT 170 HZ LINE HISTORY AS OBSERVED VIA THE DIFFERENCED CARDIOIDS SENSOR
AT SITE A3 DURING THE 17 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

CONFIDENTIAL

CONFIDENTIAL

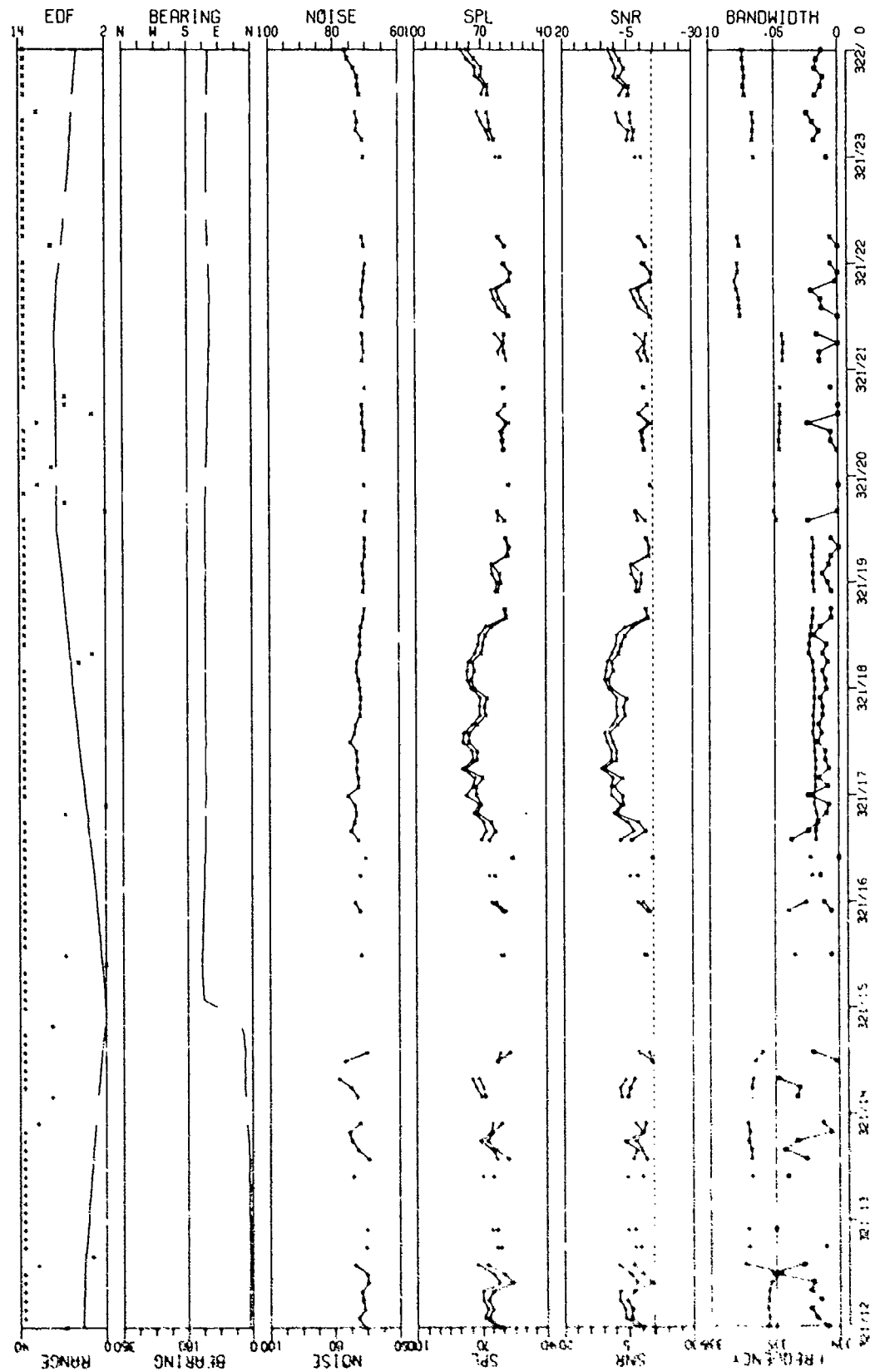


FIGURE 111-128
MCS-FVT 325 HZ LINE HISTORY AS OBSERVED VIA THE OMNIDIRECTIONAL SENSOR
AT 31°E H3 DURING THE 17 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

CONFIDENTIAL

CONFIDENTIAL

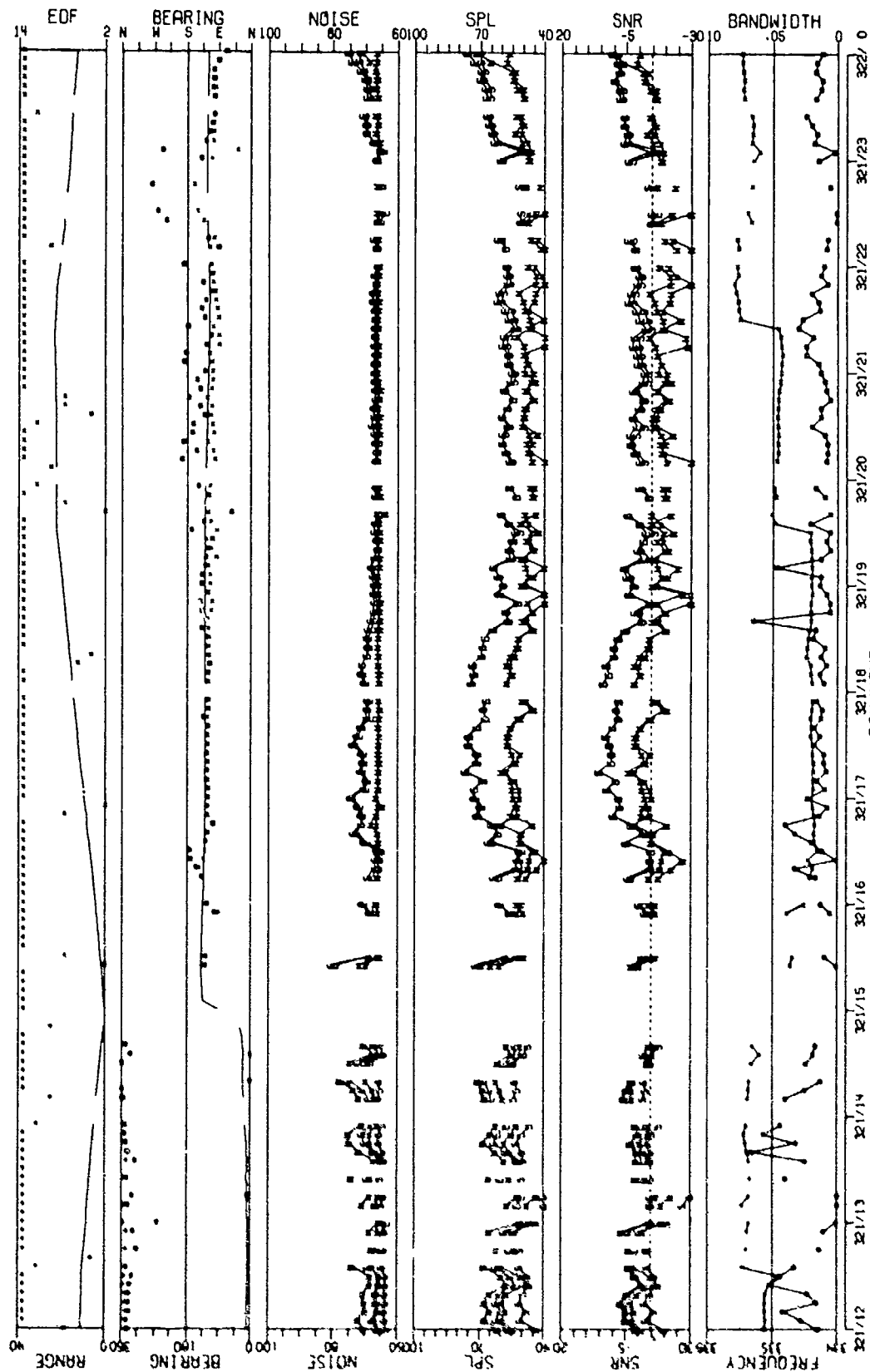


FIGURE III-129
MSS-FVT 335 HZ LINE HISTORY AS OBSERVED VIA THE SINGLE CAROTIDIOS SENSOR
AT SITE R3 DURING THE 17 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

CONFIDENTIAL

CONFIDENTIAL

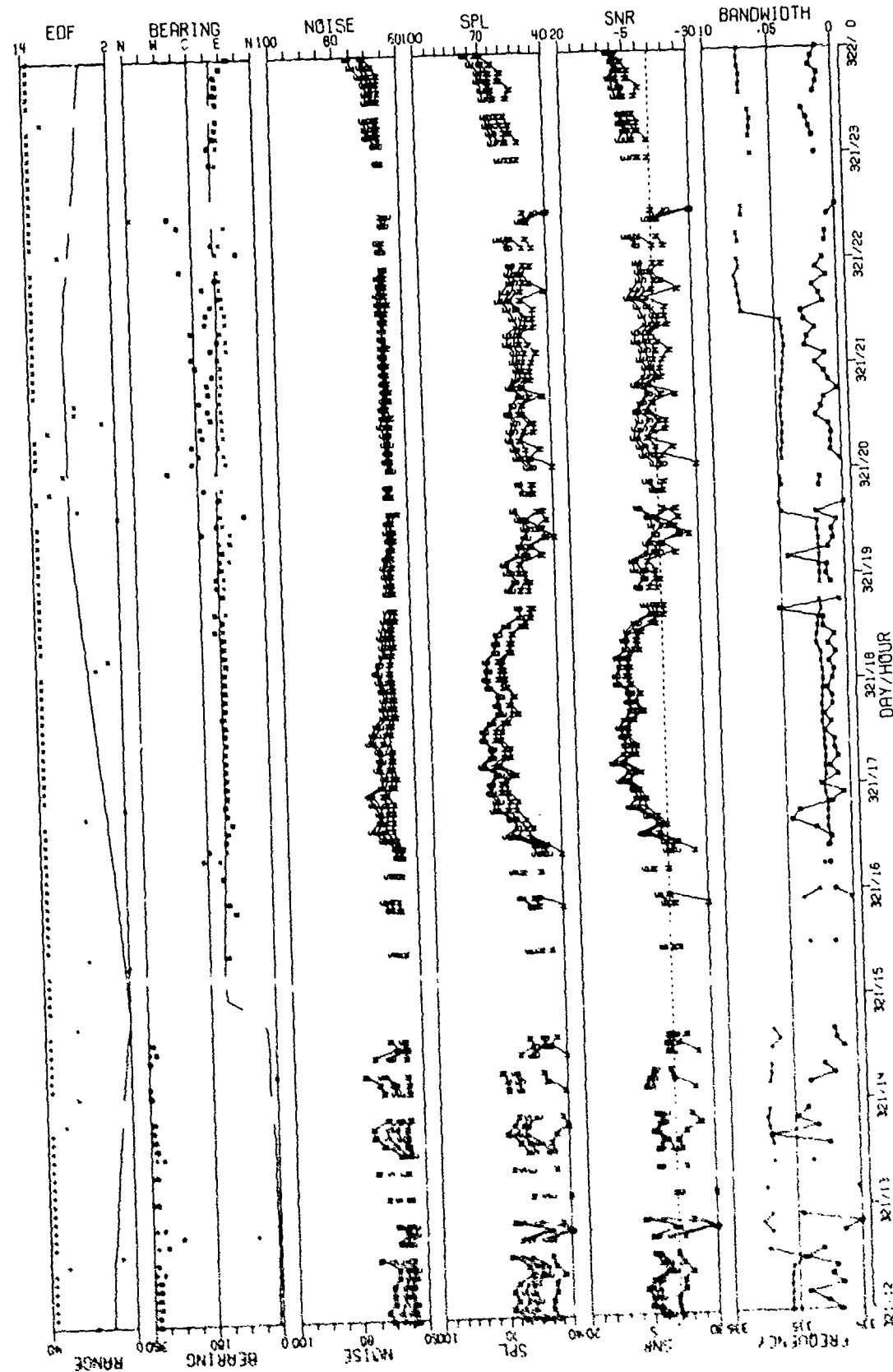


FIGURE III-130
 MCS-FVT 335 HZ LINE HISTORY AS OBSERVED VIA THE MAX GAIN LIMACONS SENSOR
 AT SITE A3 DURING THE 17 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

AS-77-2730

CONFIDENTIAL

CONFIDENTIAL

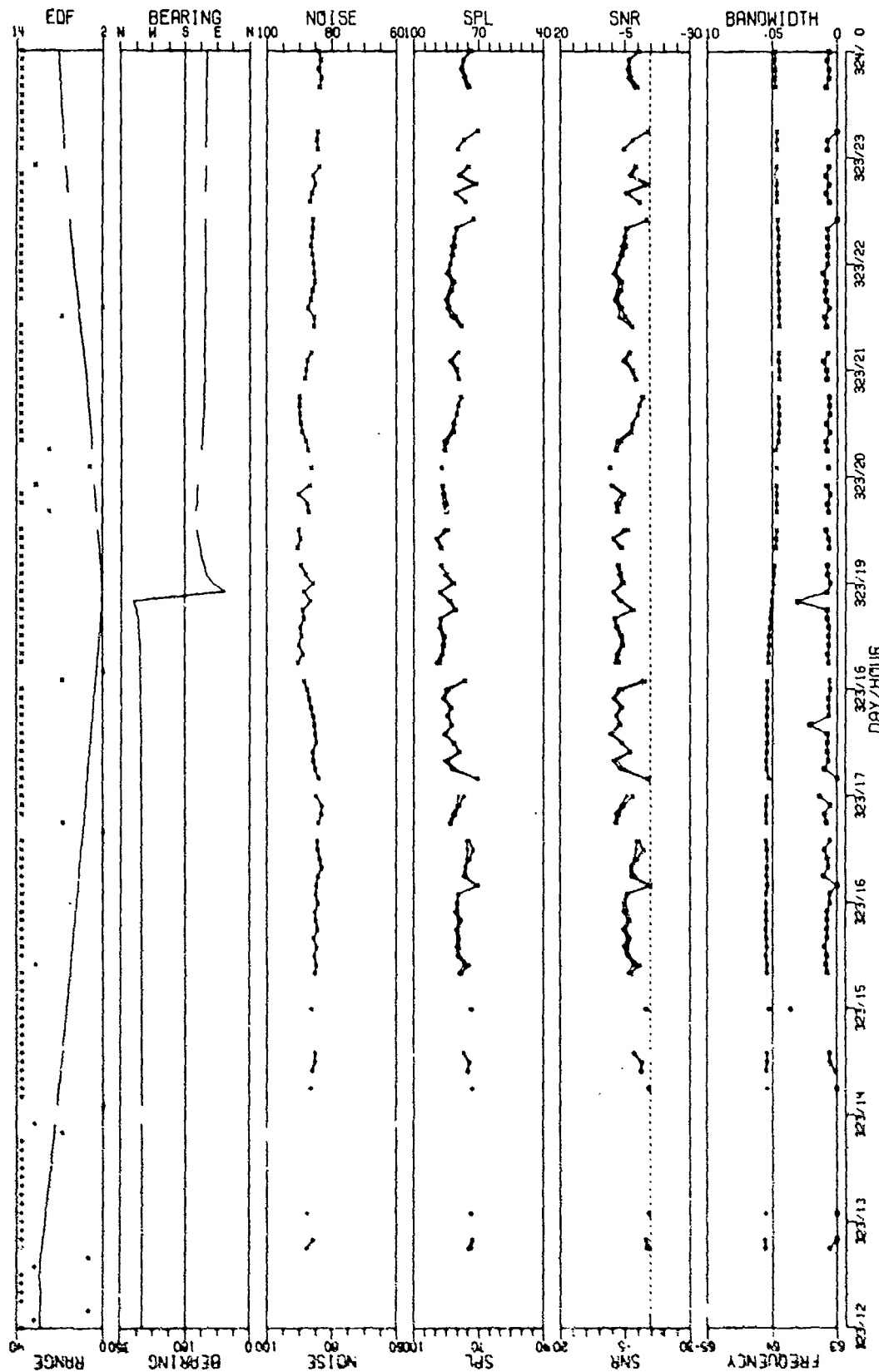


FIGURE III-131
MSS-FVT 64 HZ LINE HISTORY AS OBSERVED VIA THE OMNIDIRECTIONAL SENSOR
AT SITE A3 DURING THE 19 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

AS-77-2731

CONFIDENTIAL

CONFIDENTIAL



FIGURE III-132
MSS-FV 64 HZ LINE HISTORY AS OBSERVED VIA THE SINGLE CAROTIDS SENSOR
AT SITE A3 DURING THE 19 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

AS-77-2732

CONFIDENTIAL

CONFIDENTIAL

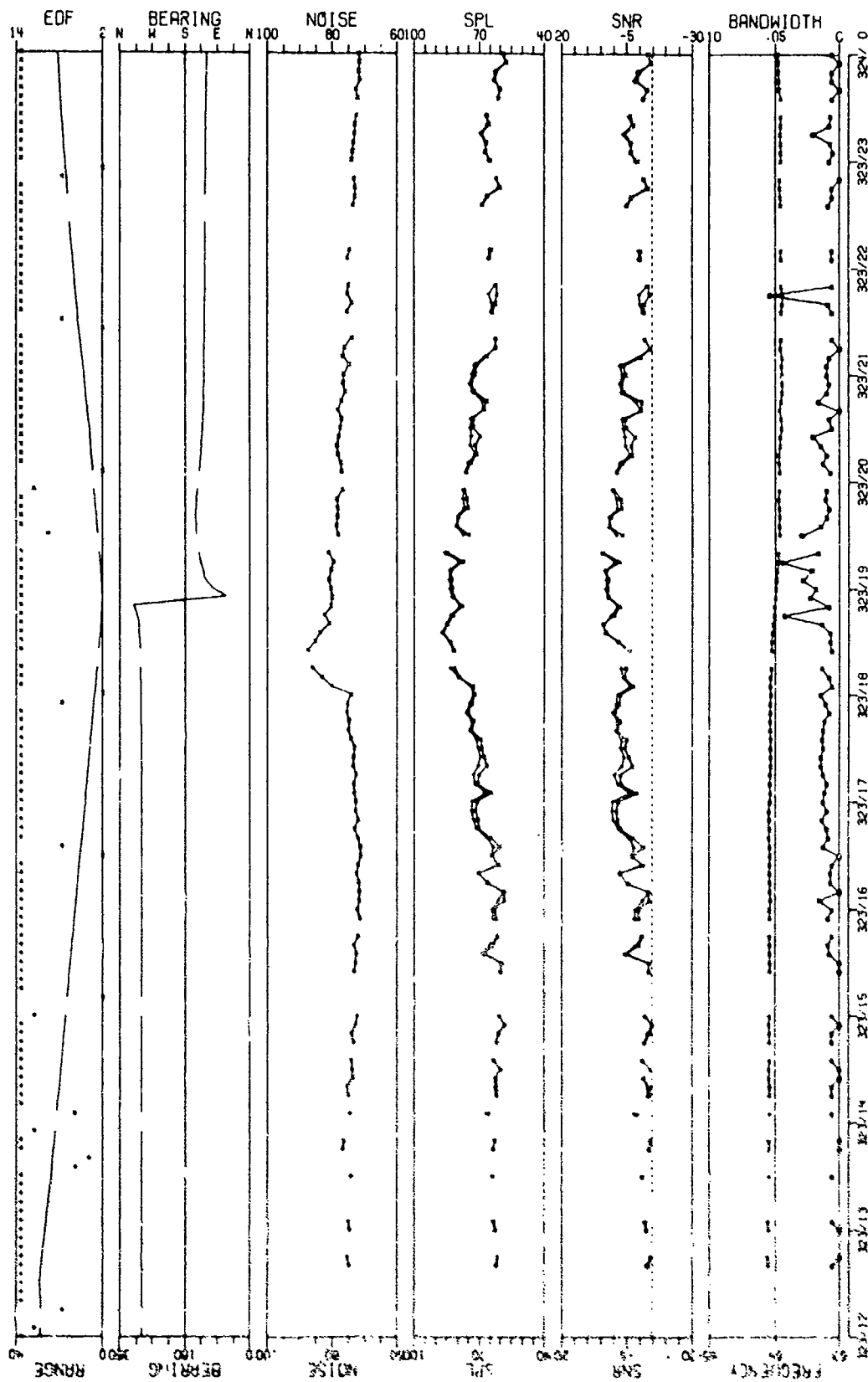


FIGURE 111-133
MSS-FVT 64 HZ LINE HISTORY AS OBSERVED VIA THE VERTICAL DIPOLE SENSOR
AT SITE A3 DURING THE 19 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

AS-77-2733

CONFIDENTIAL

CONFIDENTIAL

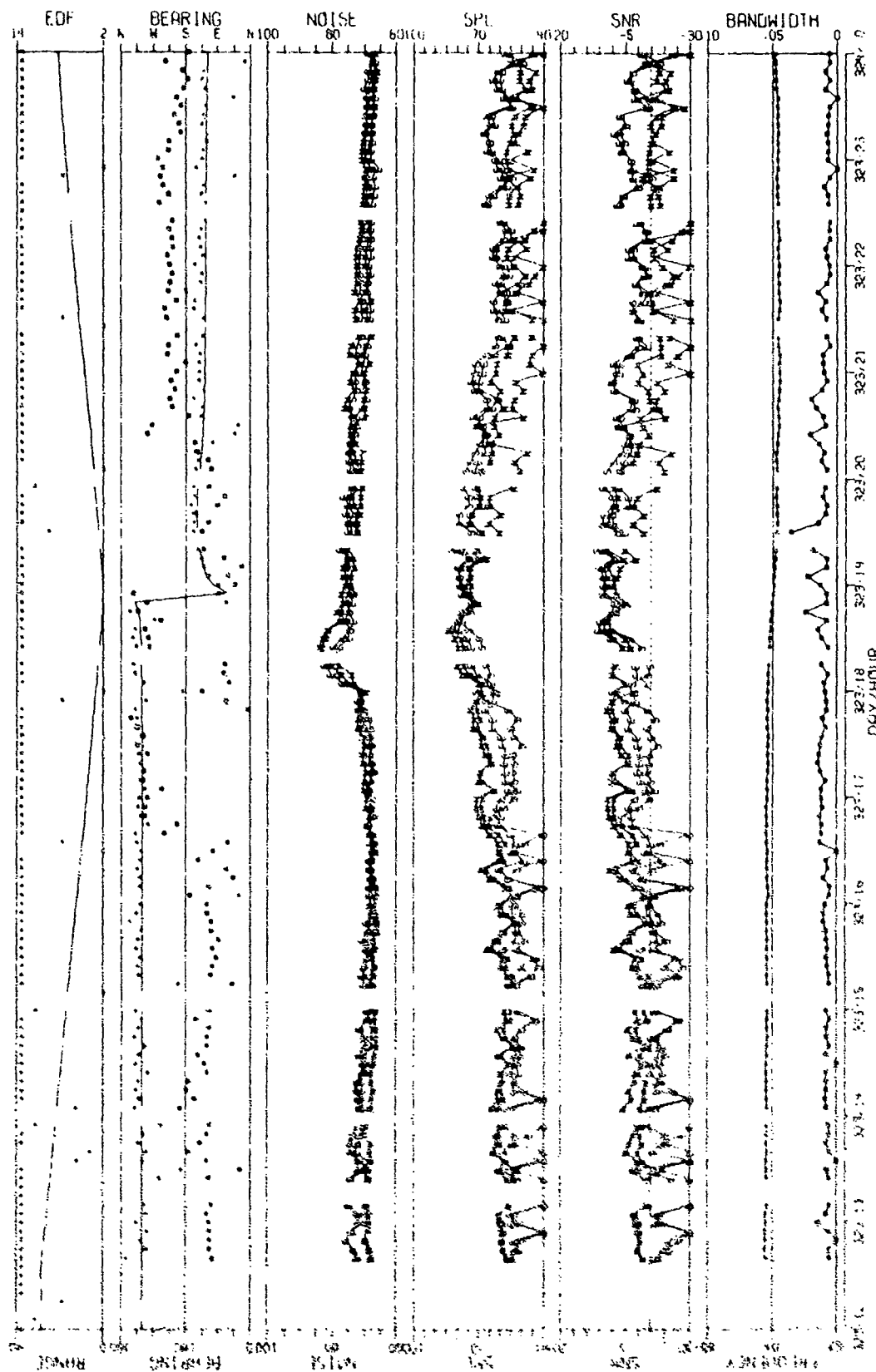


FIGURE 111-134
MSE-F/T 64 HZ LINE HISTORY AS OBSERVED VIA THE DIFFERENCED CARDIoids SENSOR
2" SIZE AS DURING THE 19 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

AS-77-2734

CONFIDENTIAL

CONFIDENTIAL

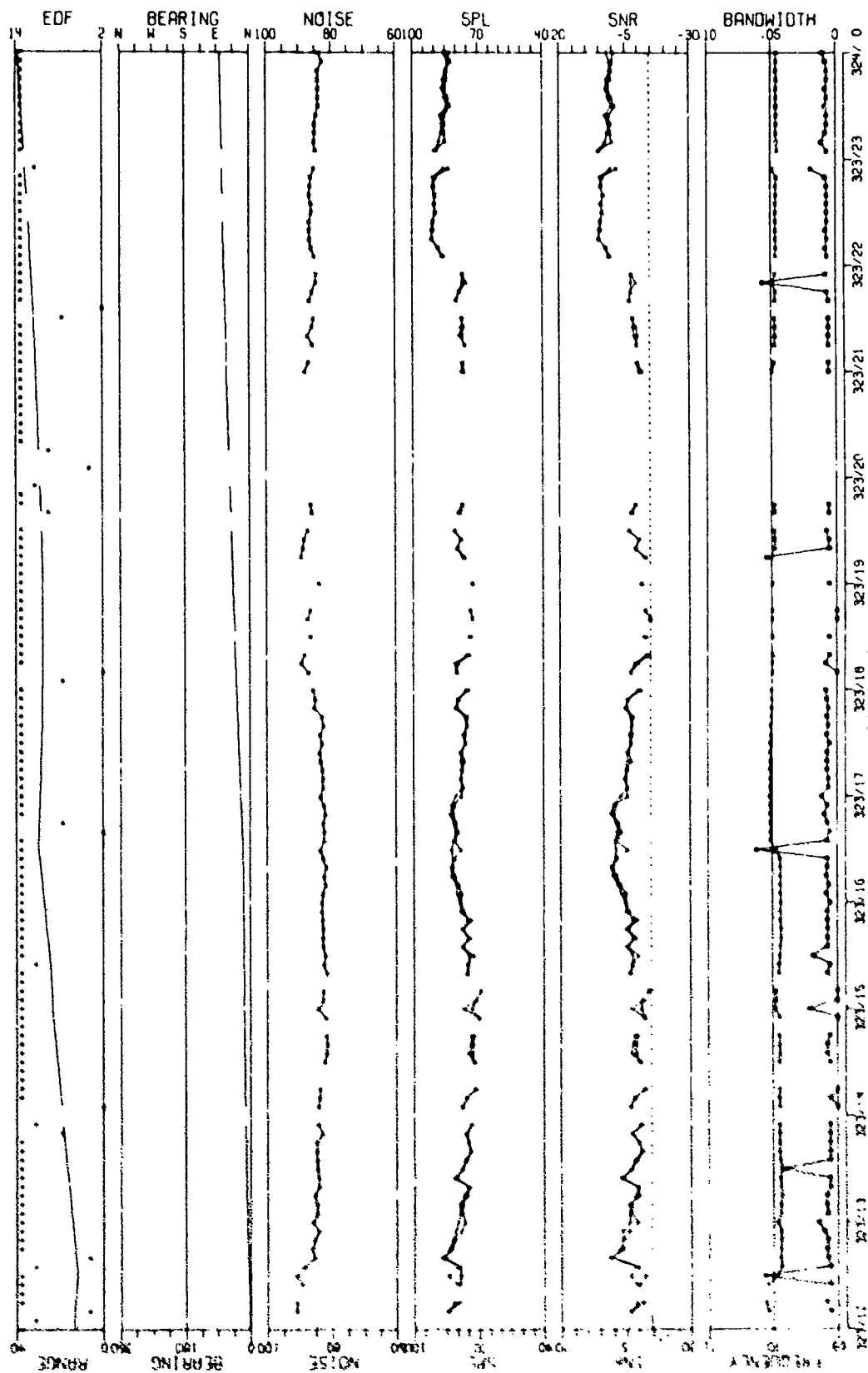


FIGURE III-135
MESSAGE TO H2 LINE HISTORY AS OBSERVED VIA THE OMNIDIRECTIONAL SENSOR
AT SITE A3 DURING THE 13 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

15-77-2735

CONFIDENTIAL

CONFIDENTIAL

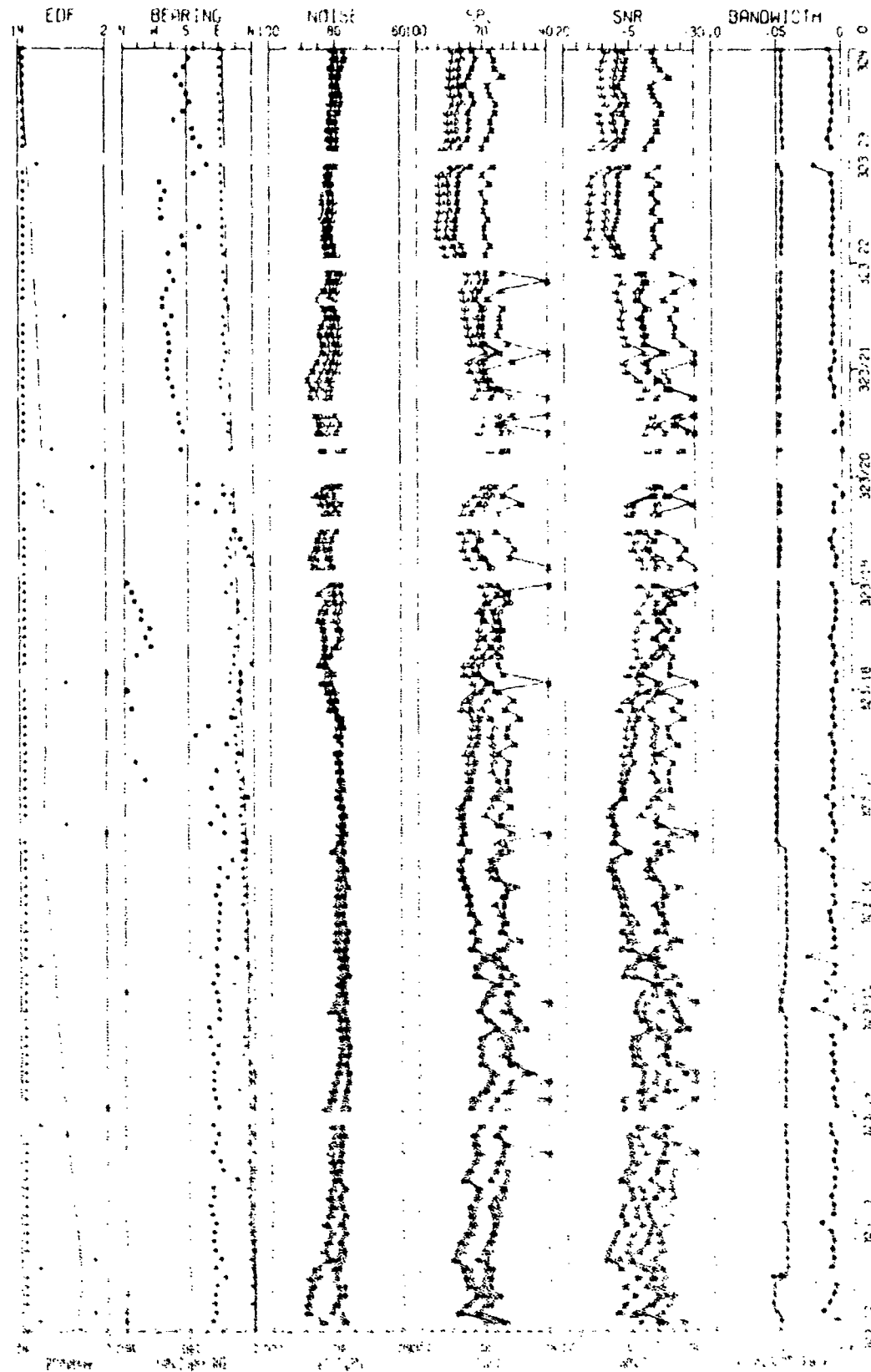


FIGURE 111 136
 NOISE HISTORY AS OBSERVED VIA THE SINGLE CARGOIDS SENSOR
 FOR THE 1000 HZ BANDWIDTH WITH VERNIER RESOLUTION 10.

AS-77-2736

CONFIDENTIAL

CONFIDENTIAL



FIGURE III-137
455-FVT 70 HZ LINE HISTORY AS OBSERVED VIA THE VERTICAL DIPOLE SENSOR
AT SITE A3 DURING THE 19 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

AS-77-2737

CONFIDENTIAL

CONFIDENTIAL

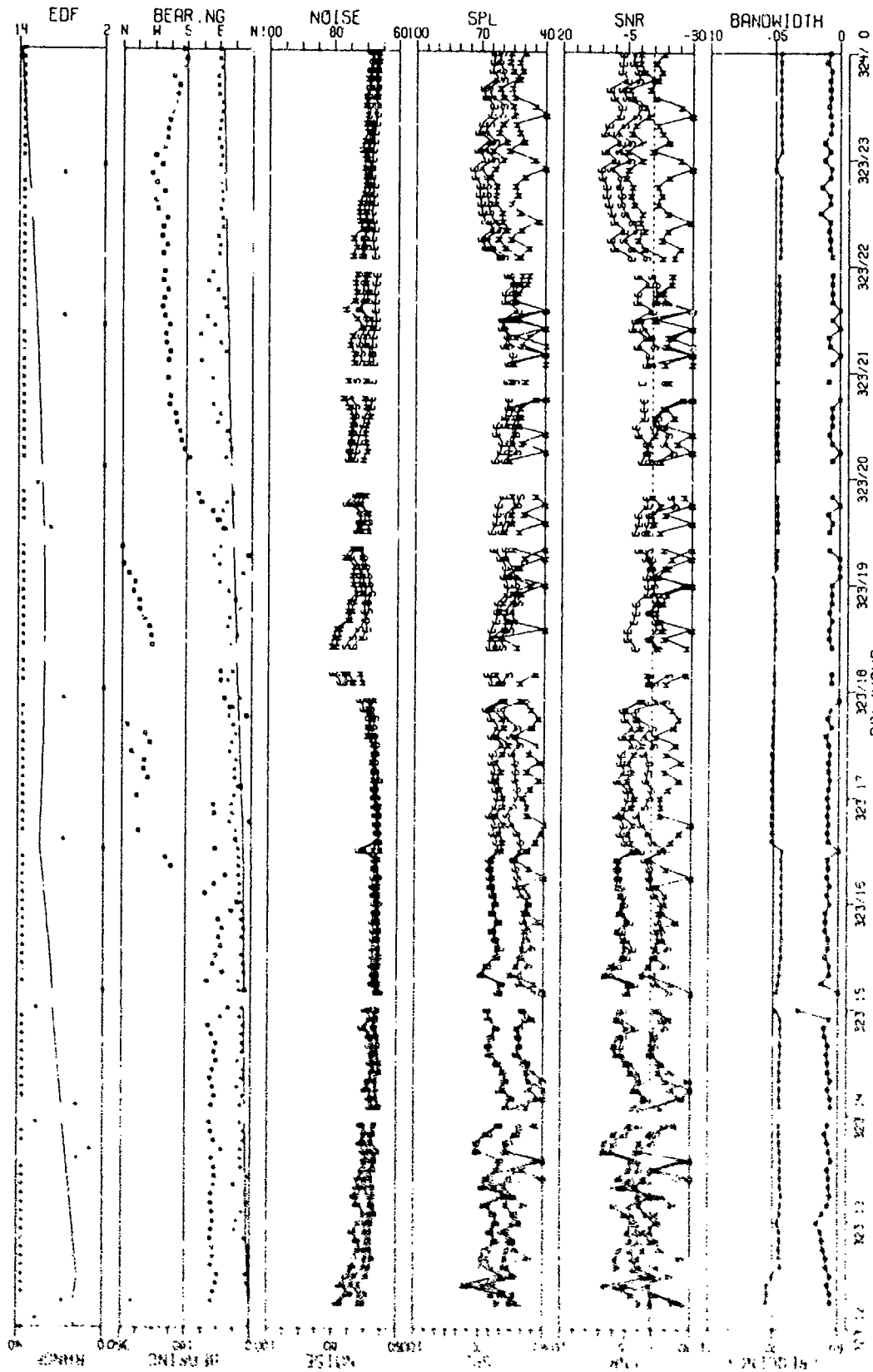


FIGURE III-138
MES-FAT 70 HZ LINE HISTORY AS OBSERVED VIA THE DIFFERENCED CARDIoids SENSOR
AT SITE P3 DURING THE 19 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

AS-77-2738

CONFIDENTIAL

CONFIDENTIAL

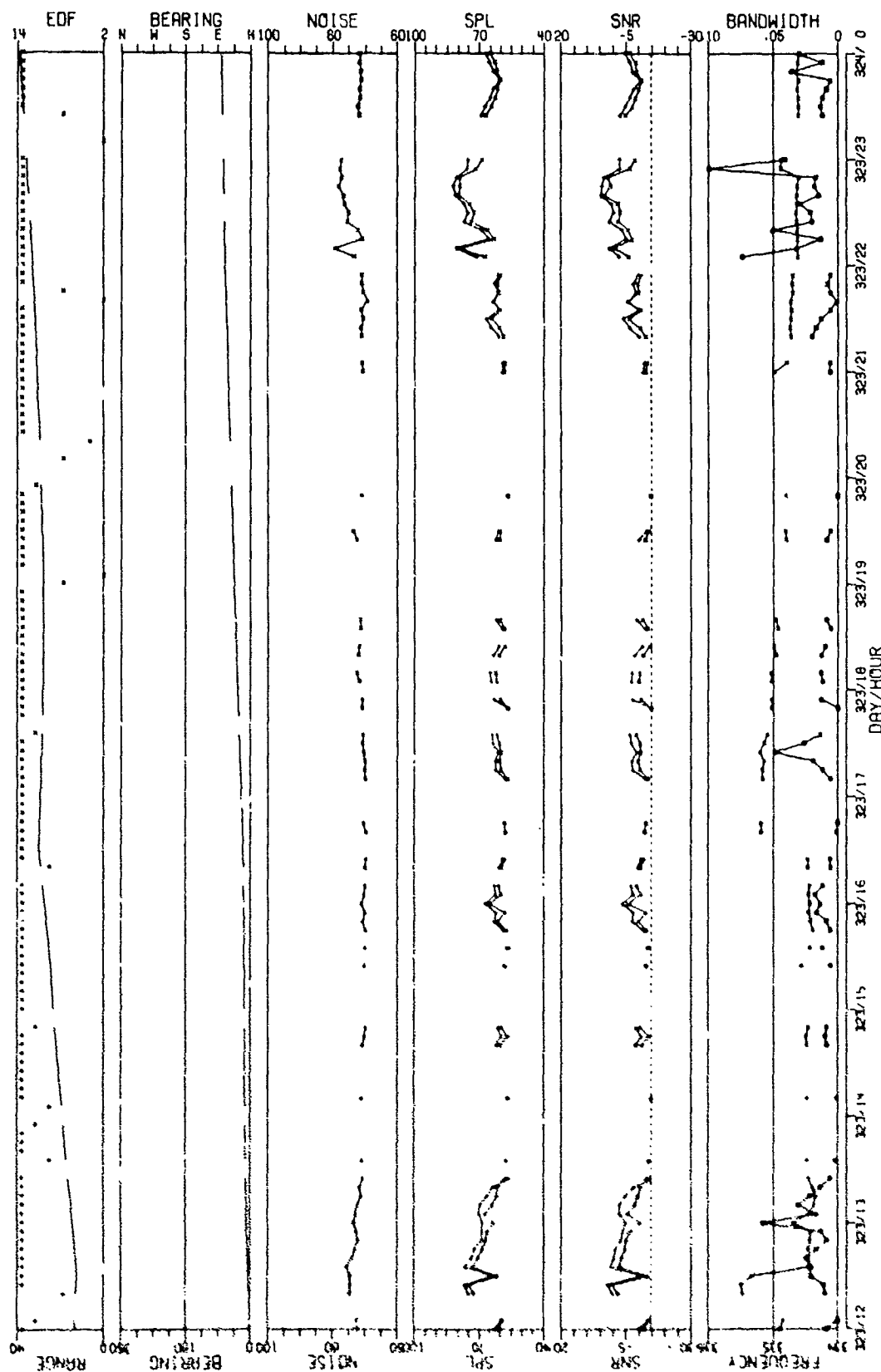


FIGURE III-139
MSS-FVT 335 HZ LINE HISTORY AS OBSERVED VIA THE OMNIDIRECTIONAL SENSOR
AT SITE A3 DURING THE 19 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

AS-77-2739

CONFIDENTIAL

CONFIDENTIAL

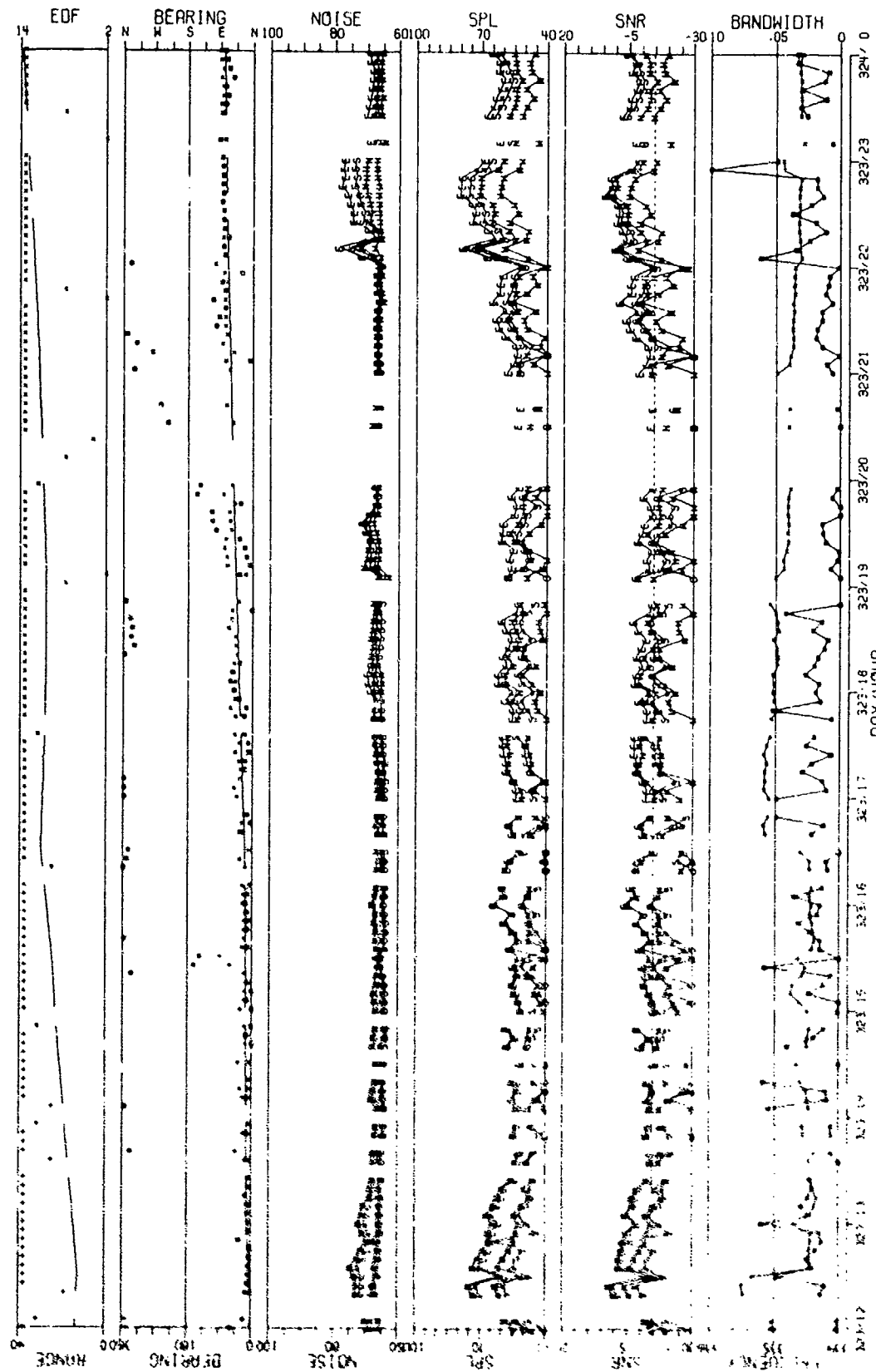
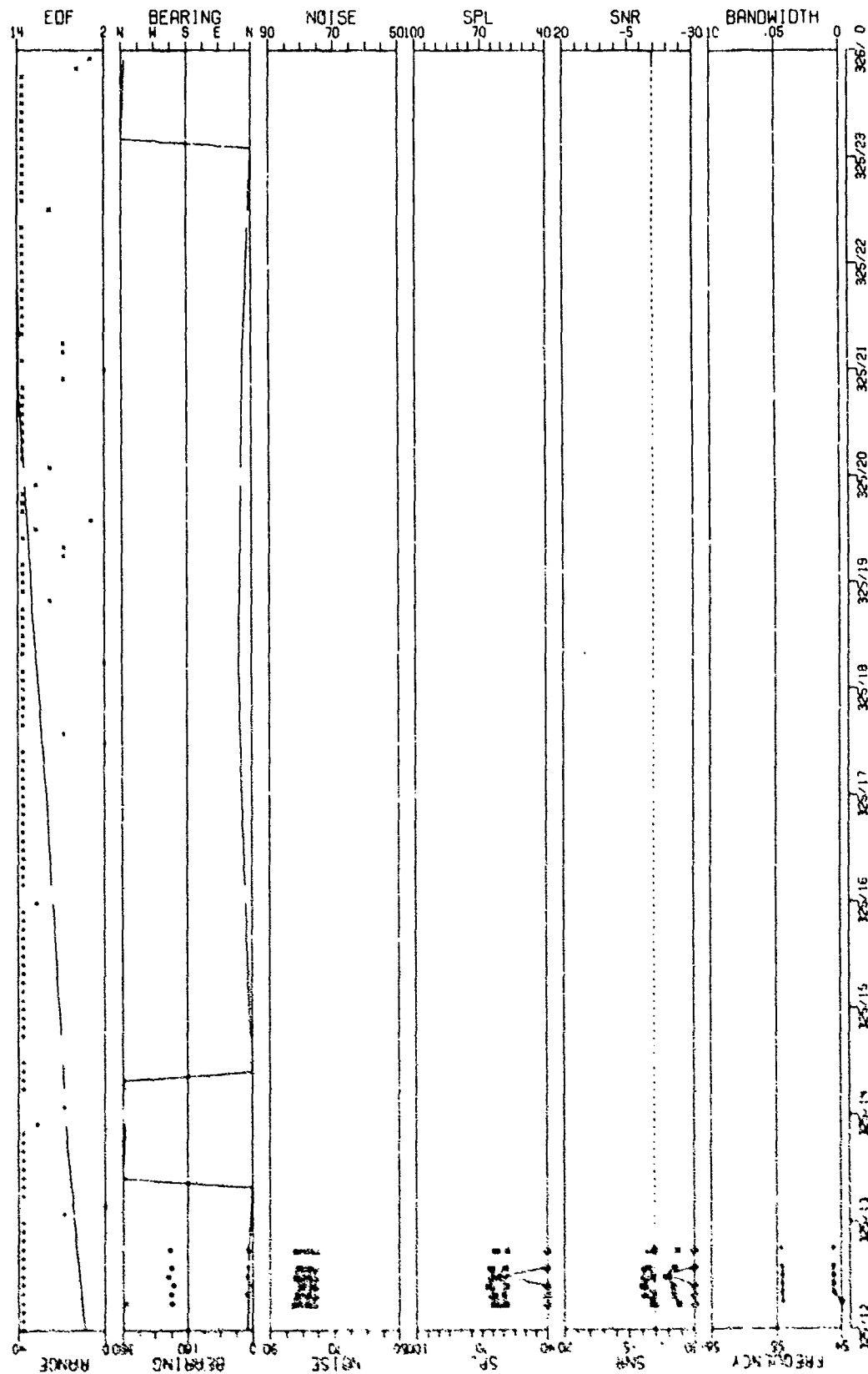


FIGURE 111-140
H2 LINE HISTORY AS OBSERVED VIA THE SINGLE CAROTIDS SENSOR
DURING THE 19 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

AS-77-2740

CONFIDENTIAL

CONFIDENTIAL



AS-77-2741

CONFIDENTIAL

CONFIDENTIAL

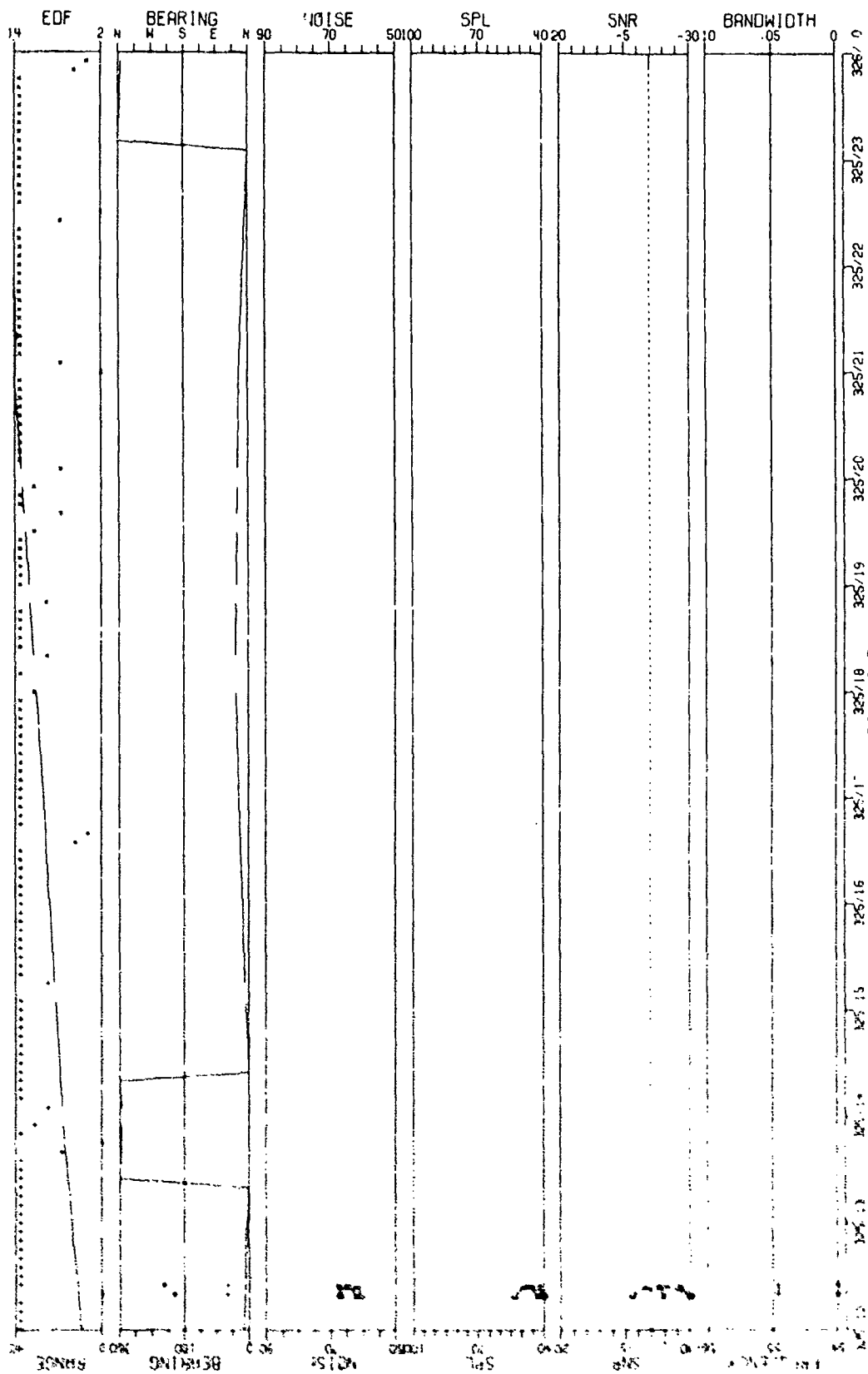


FIGURE 111-142
MCS-F, 1.55 MZ LINE HISTORY AS OBSERVED VIA THE DIFFERENCED CARDIOTIDS SENSOR
AT SITE A3 DURING THE 21 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

AS-77-2742

CONFIDENTIAL

CONFIDENTIAL

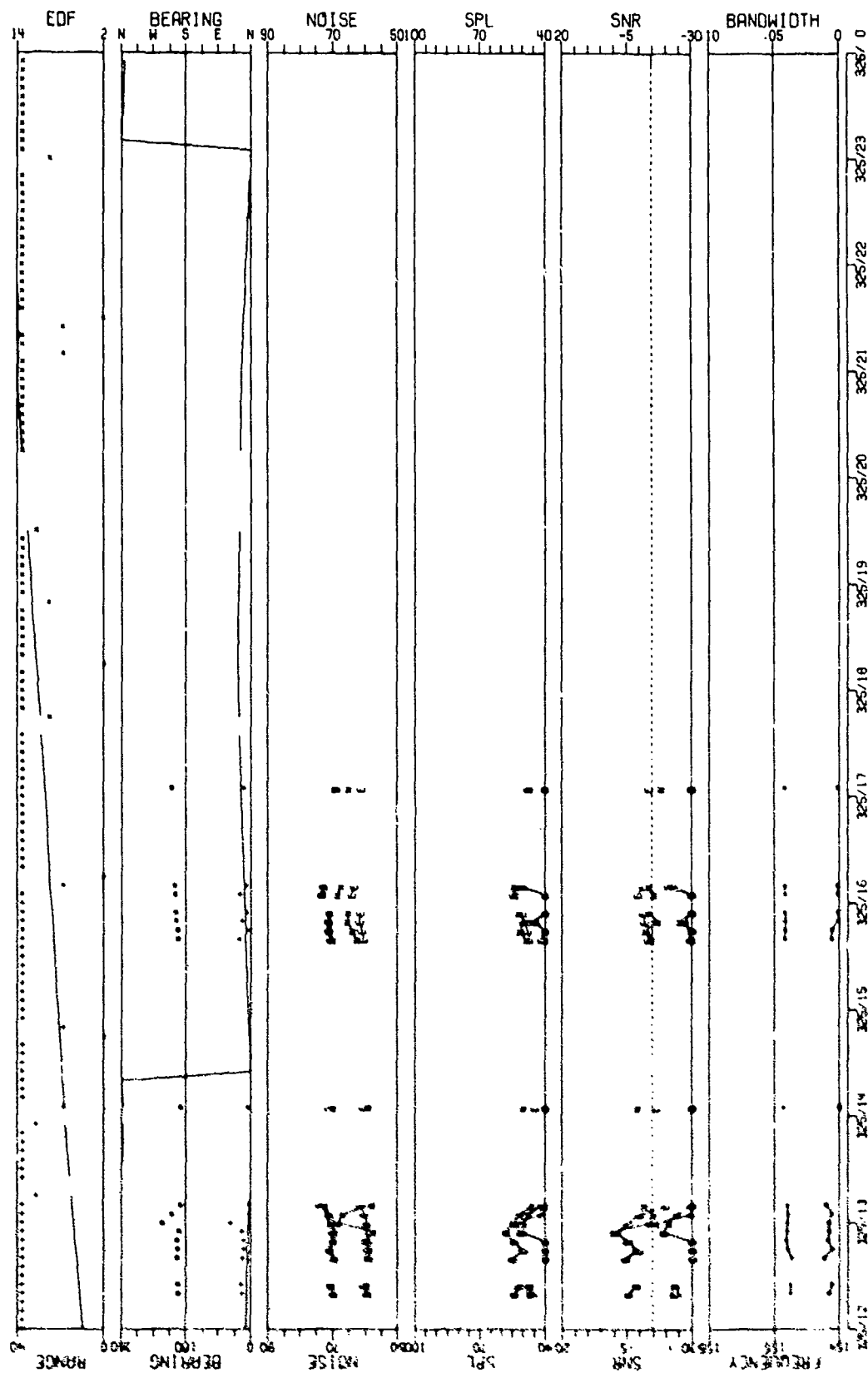


FIGURE III-143
MSS-FVT ISS H2 LINE HISTORY AS OBSERVED VIA THE SINGLE CARDIOIDS SENSOR
AT SITE A3 DURING THE 21 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

AS-77-2743

CONFIDENTIAL

CONFIDENTIAL

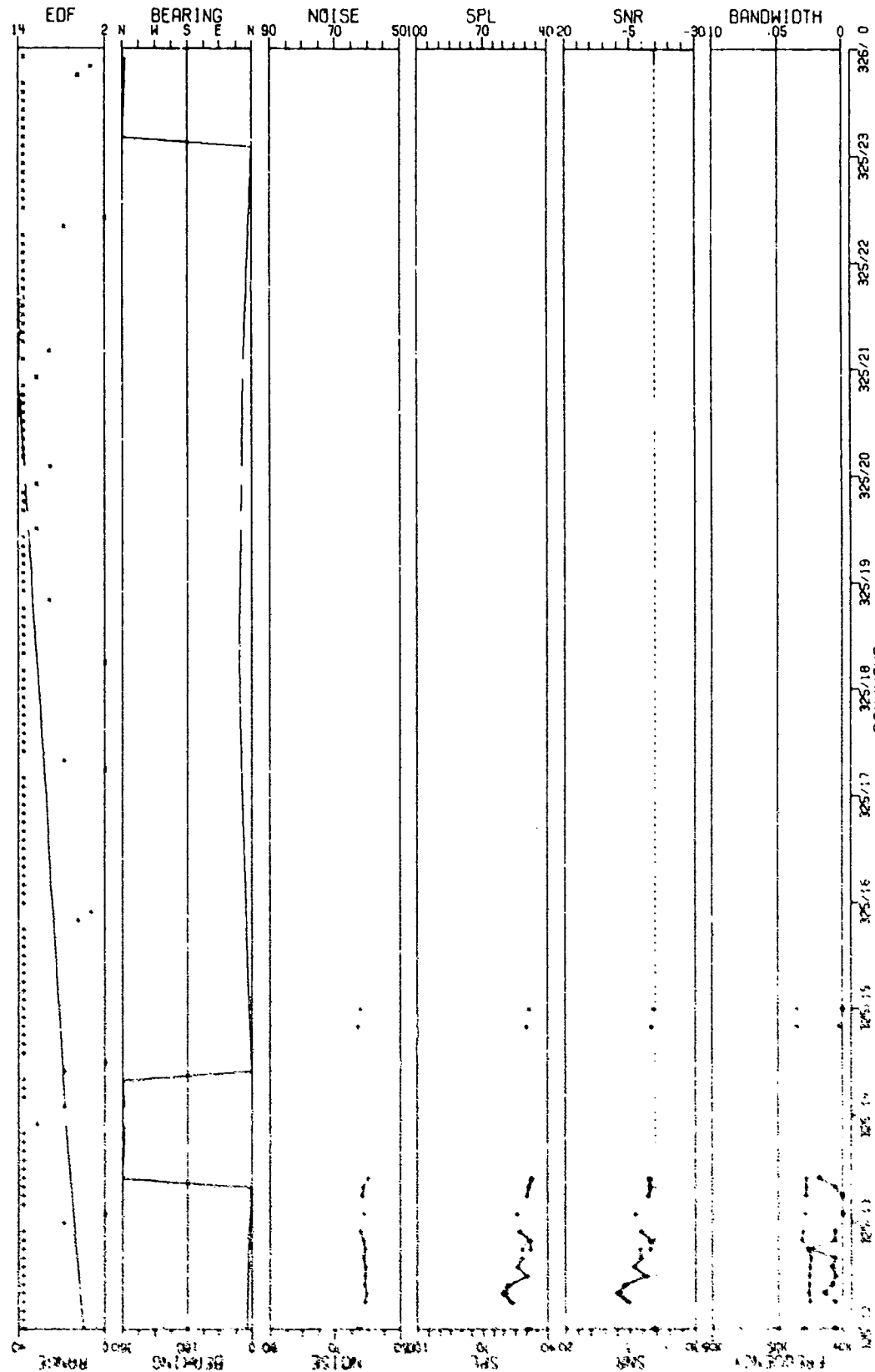


FIGURE 111-144
W2-FMT 305 HZ LINE HISTORY AS OBSERVED VIA THE OMNIDIRECTIONAL SENSOR
AT 61°E A3 DURING THE 21 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

CONFIDENTIAL

CONFIDENTIAL

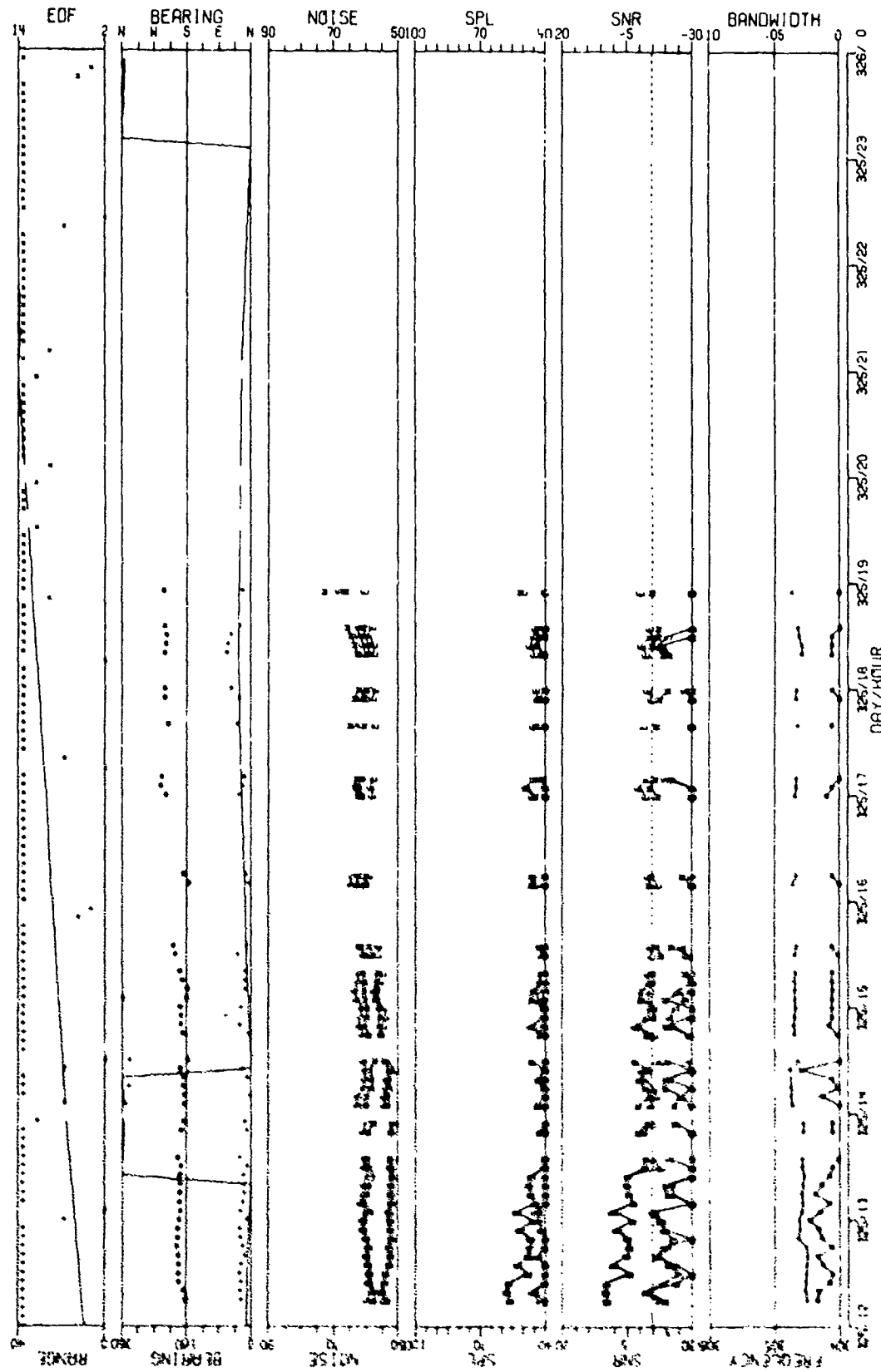


FIGURE 111-145
 NSS-FVT 305 HZ LINE HISTORY AS OBSERVED VIA THE SINGLE CARDOIDS SENSOR
 AT SITE A3 DURING THE 21 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

CONFIDENTIAL

CONFIDENTIAL

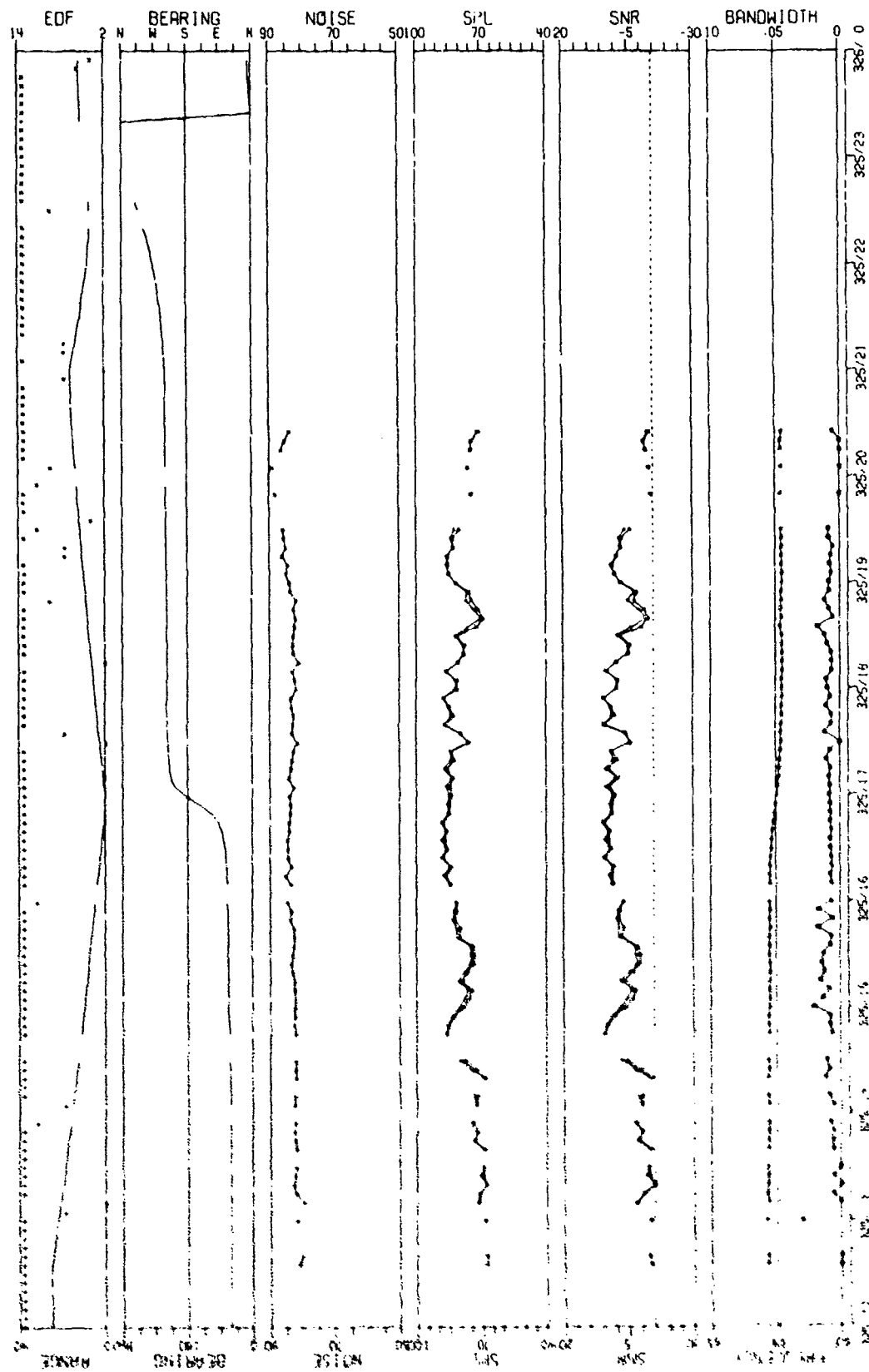


FIGURE III-146
 64 HZ LINE HISTOGRAM AS OBSERVED VIA THE OMNIDIRECTIONAL SENSOR
 DURING THE 2: NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

CONFIDENTIAL

CONFIDENTIAL

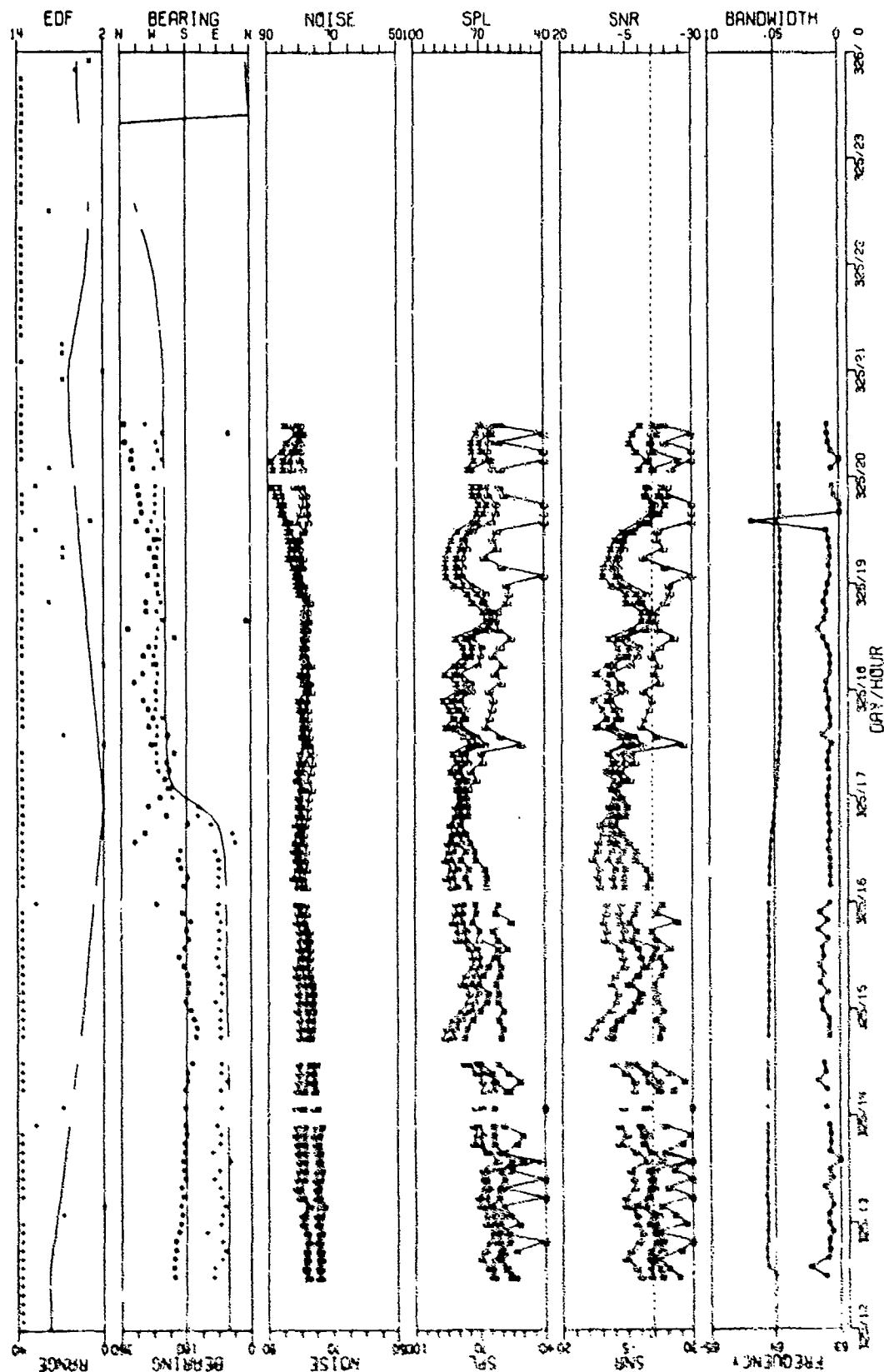


FIGURE 111-147
MSA-FV1 64 M2 LINE HISTORY AS OBSERVED VIA THE SINGLE CHROICIDS SENSOR
AT SITE A3 DURING THE 21 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

AS-77-2747

CONFIDENTIAL

CONFIDENTIAL

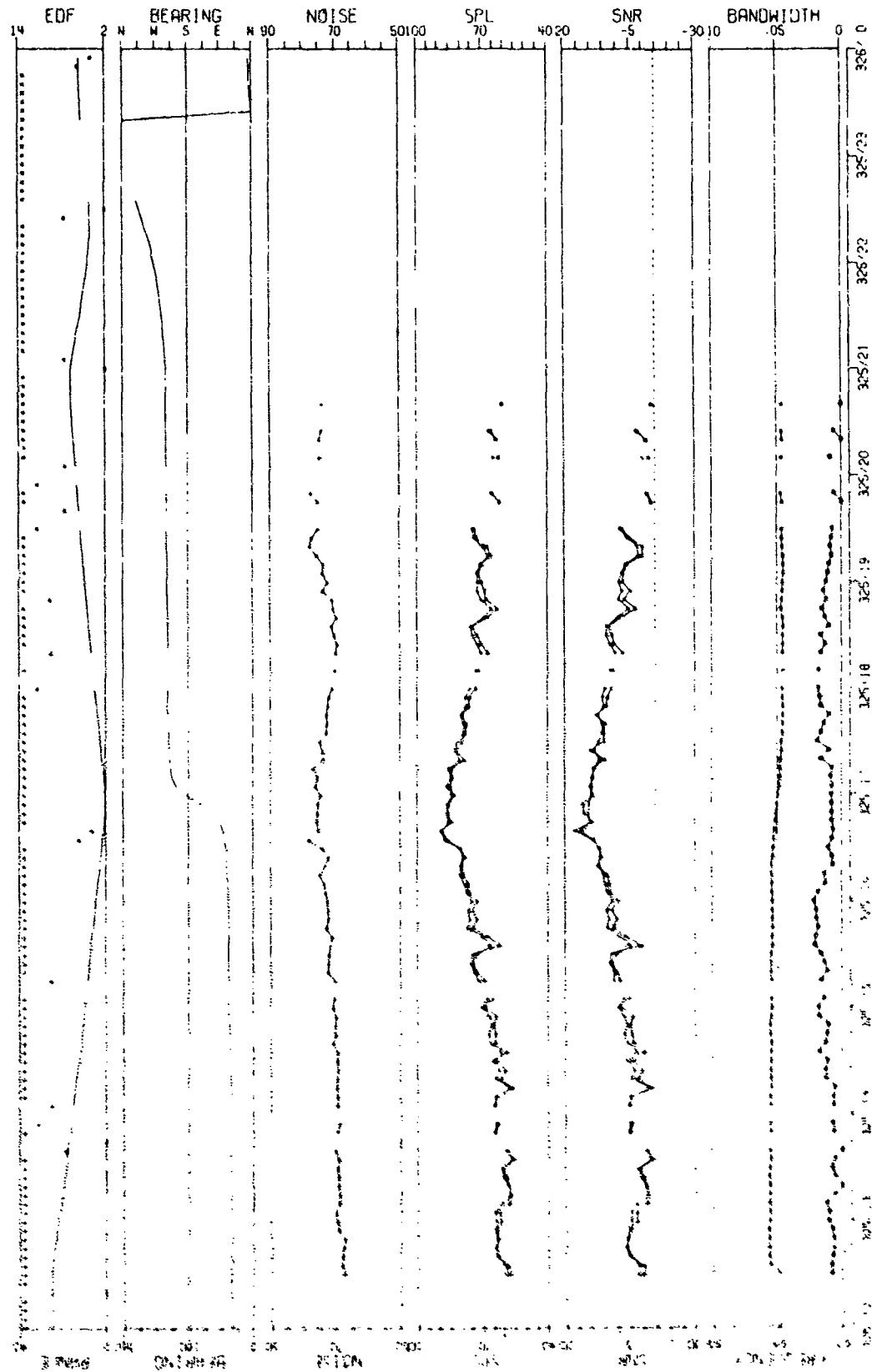


FIGURE 111-148
WAVEFORM AND LINE HISTORY AS OBSERVED VIA THE VERTICAL DIPOLE SENSOR
ON 21 NOV 1968 DURING THE 21 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

AS-77-2748

CONFIDENTIAL

CONFIDENTIAL

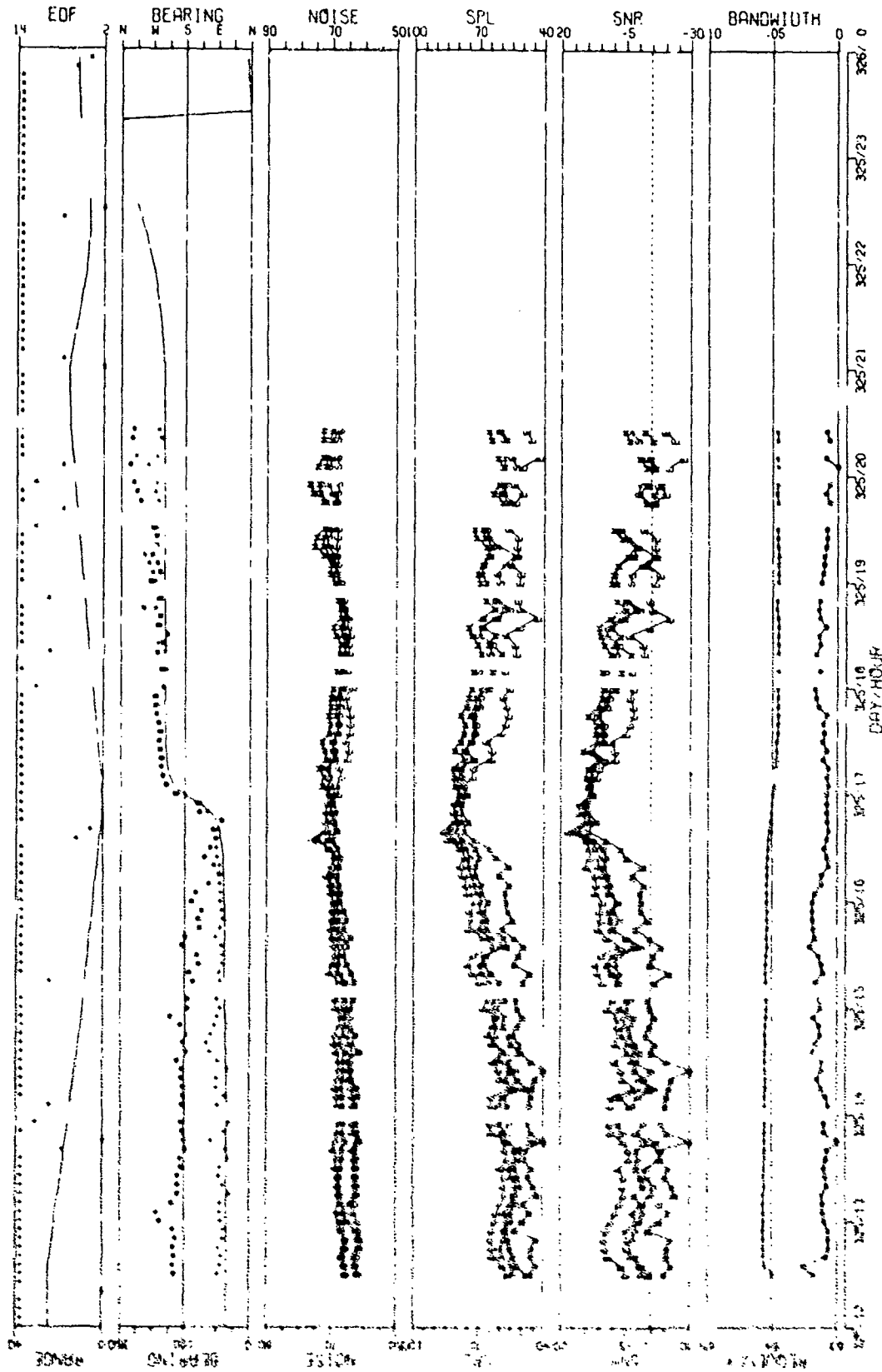


FIGURE 111-149
 ASS-FVT AN M2 LINE HISTORY AS OBSERVED VIA THE DIFFERENCED CAROTIDS SENSOR
 AT SITE A3 DURING THE 21 NO. FIELD EVENT WITH VERNIER RESOLUTION (U)

AS-77-2749

CONFIDENTIAL

CONFIDENTIAL

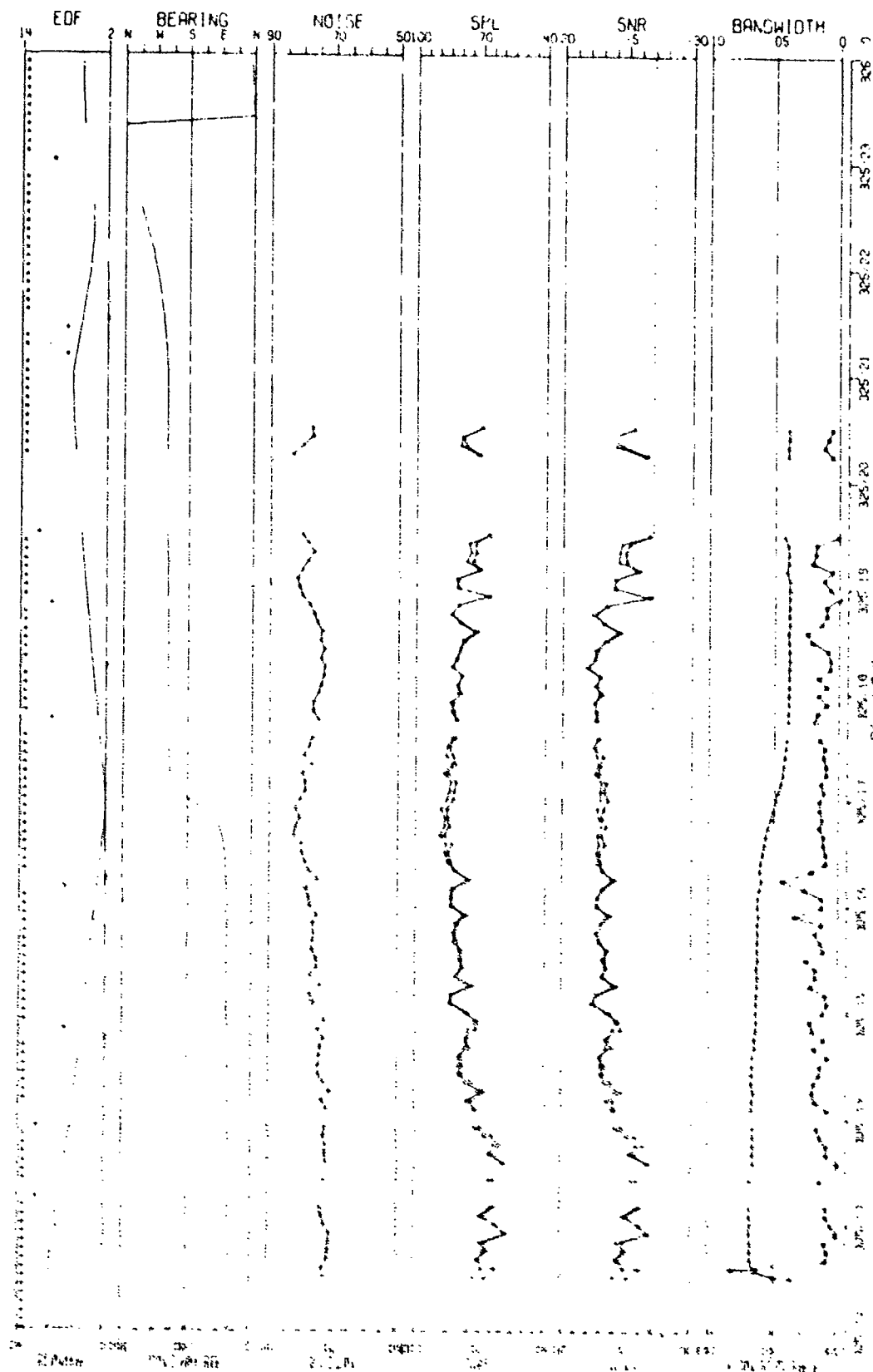


FIGURE 11-110
 A 150 Hz TONE OBSERVED VIA THE OMNIDIRECTIONAL SENSOR
 DURING THE "NO FILE EVENT" WITH "HINTER RESOLUTION (U)

179
 CONFIDENTIAL

AS-77-2750

CONFIDENTIAL

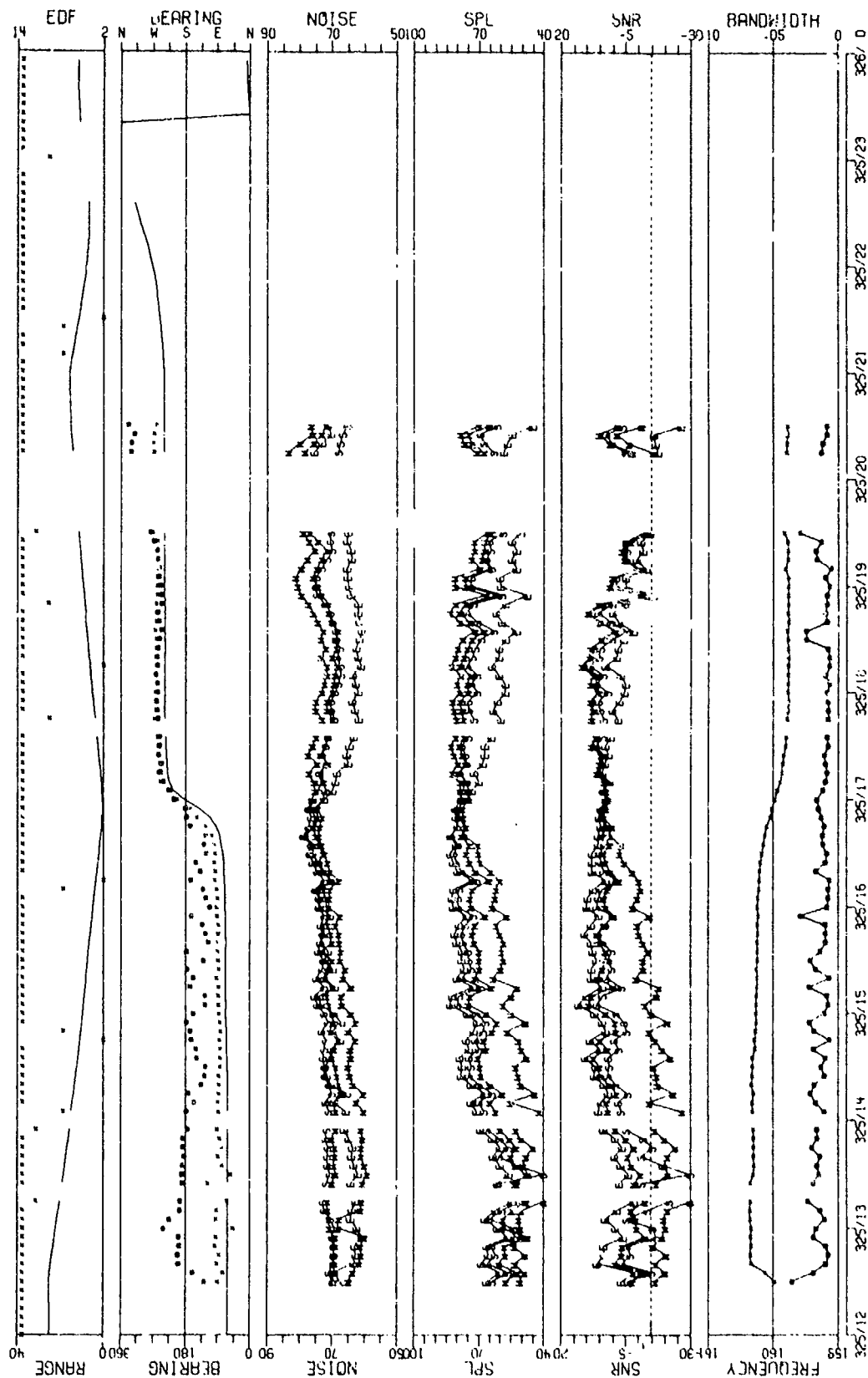


FIGURE III-151
MSS-FVT 160 HZ LINE HISTORY AS OBSERVED VIA THE SINGLE CARDIoids SENSOR
AT SITE A3 DURING THE 21 NOV FIELD EVENT WITH VERIER RESOLUTION (U)

CONFIDENTIAL

CONFIDENTIAL

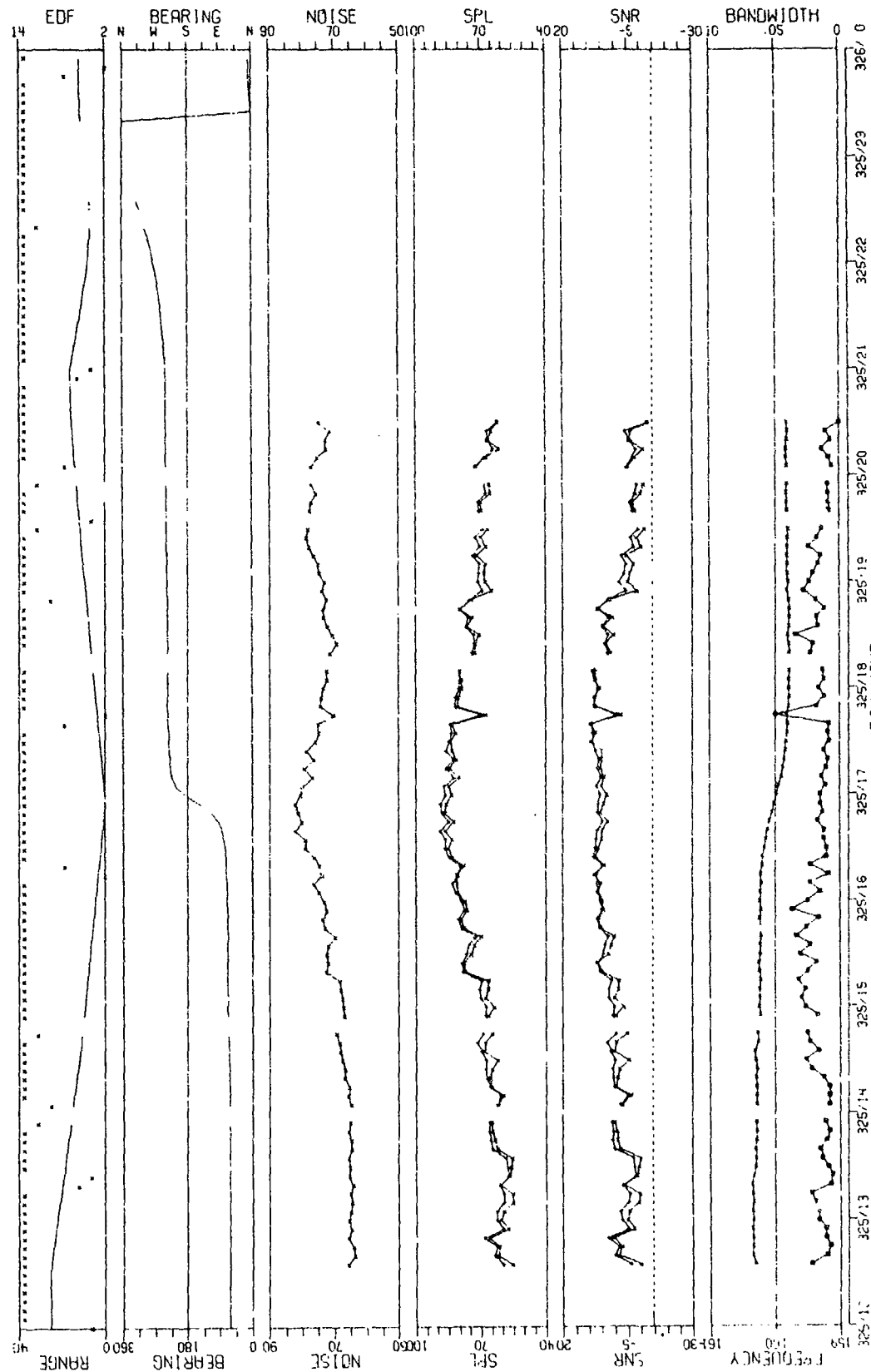


FIGURE 111-152
M55-FV1 160 HZ LINE HISTORY AS OBSERVED VIA THE VERTICAL DIPOLE SENSOR
AT SITE A3 DURING THE 21 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

CONFIDENTIAL

CONFIDENTIAL

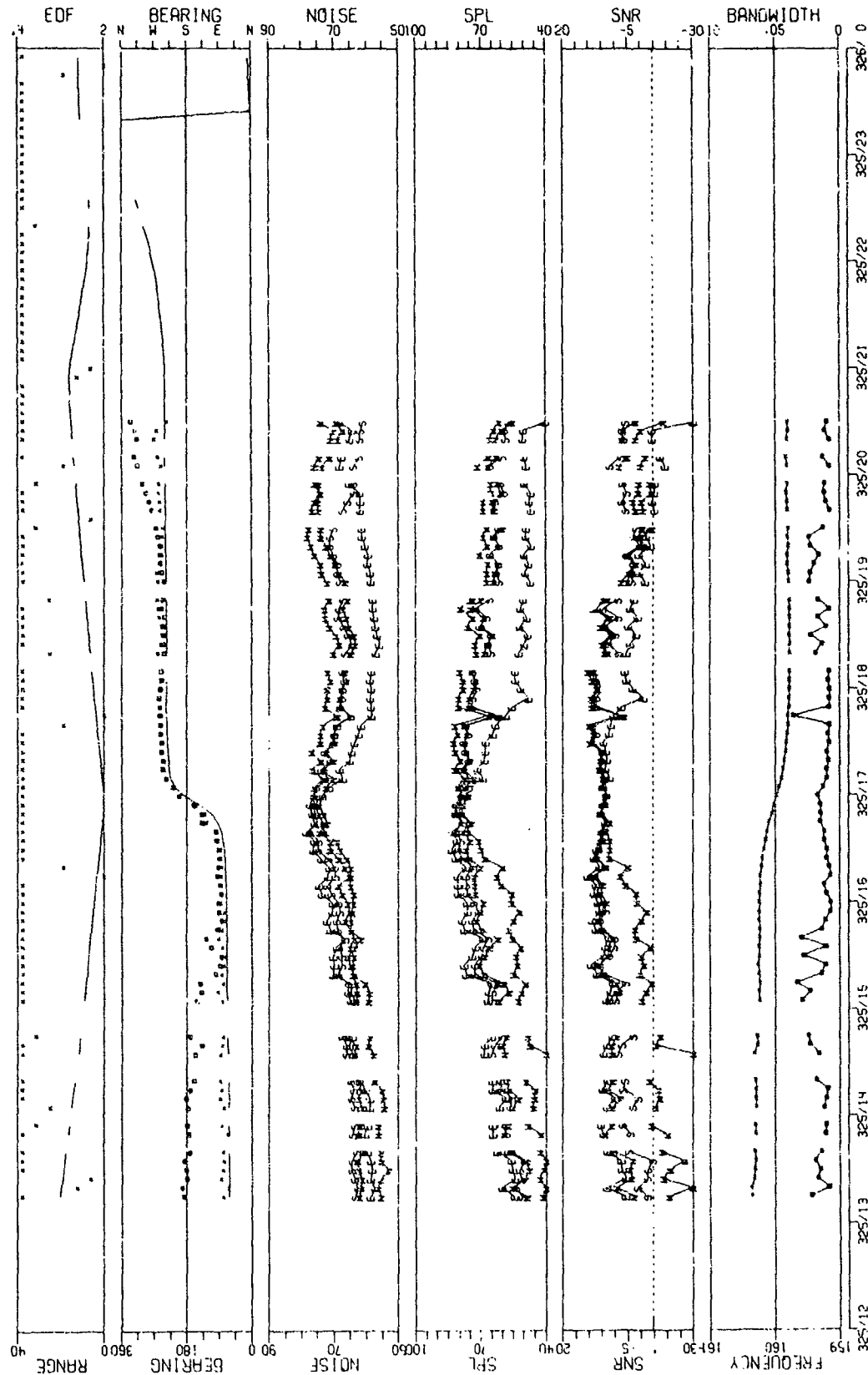


FIGURE III-153
MSS-FVT 160 HZ LINE HISTORY AS OBSERVED VIA THE DIFFERENCED CARDIOIDS SENSOR
AT SITE A3 DURING THE 21 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

AS-77-2753

CONFIDENTIAL

CONFIDENTIAL

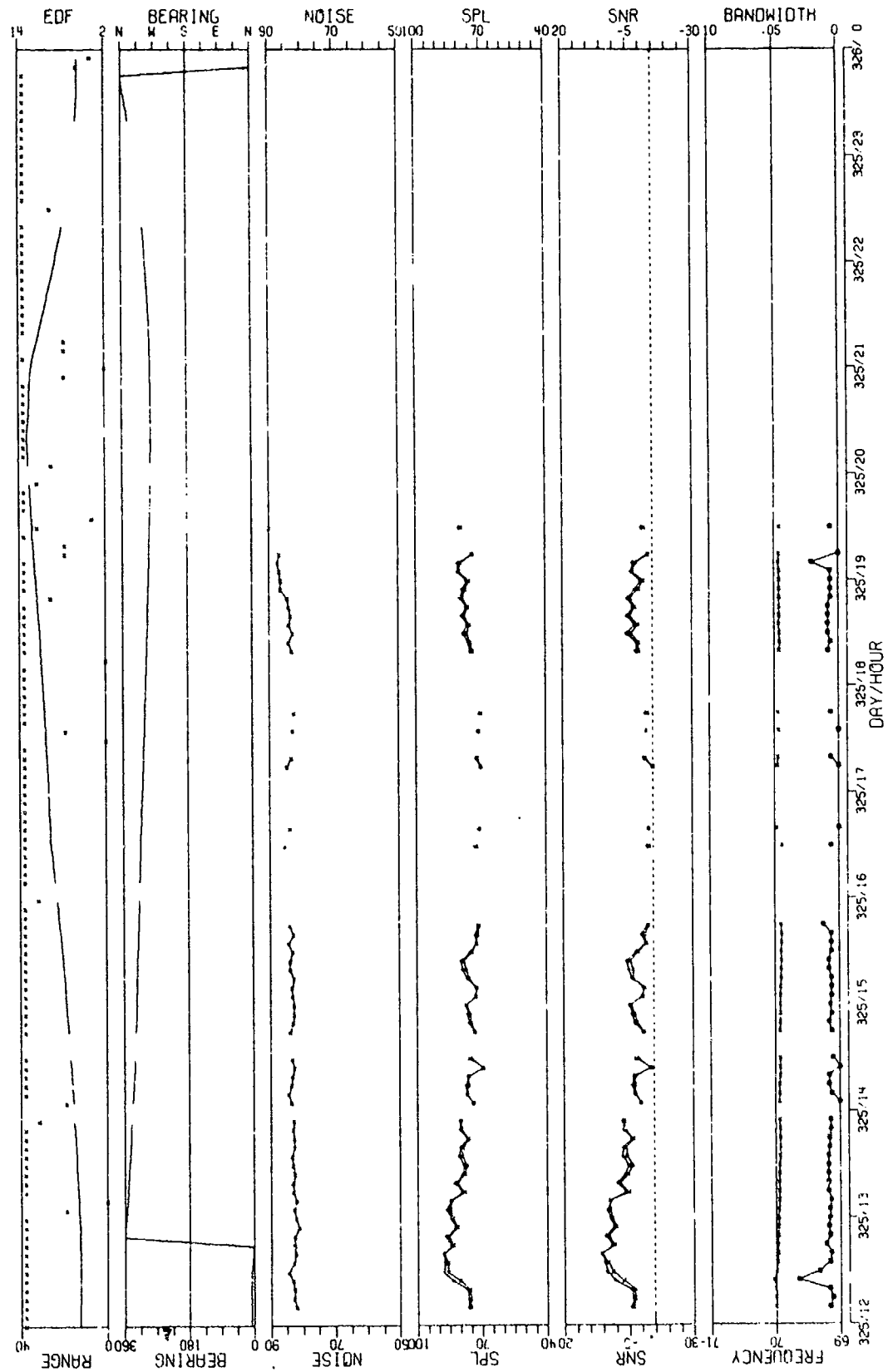


FIGURE 111-154
MSS-FVT 70 HZ LINE HISTORY AS OBSERVED VIA THE OMNIDIRECTIONAL SENSOR
AT SITE A3 DURING THE 21 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

CONFIDENTIAL

CONFIDENTIAL

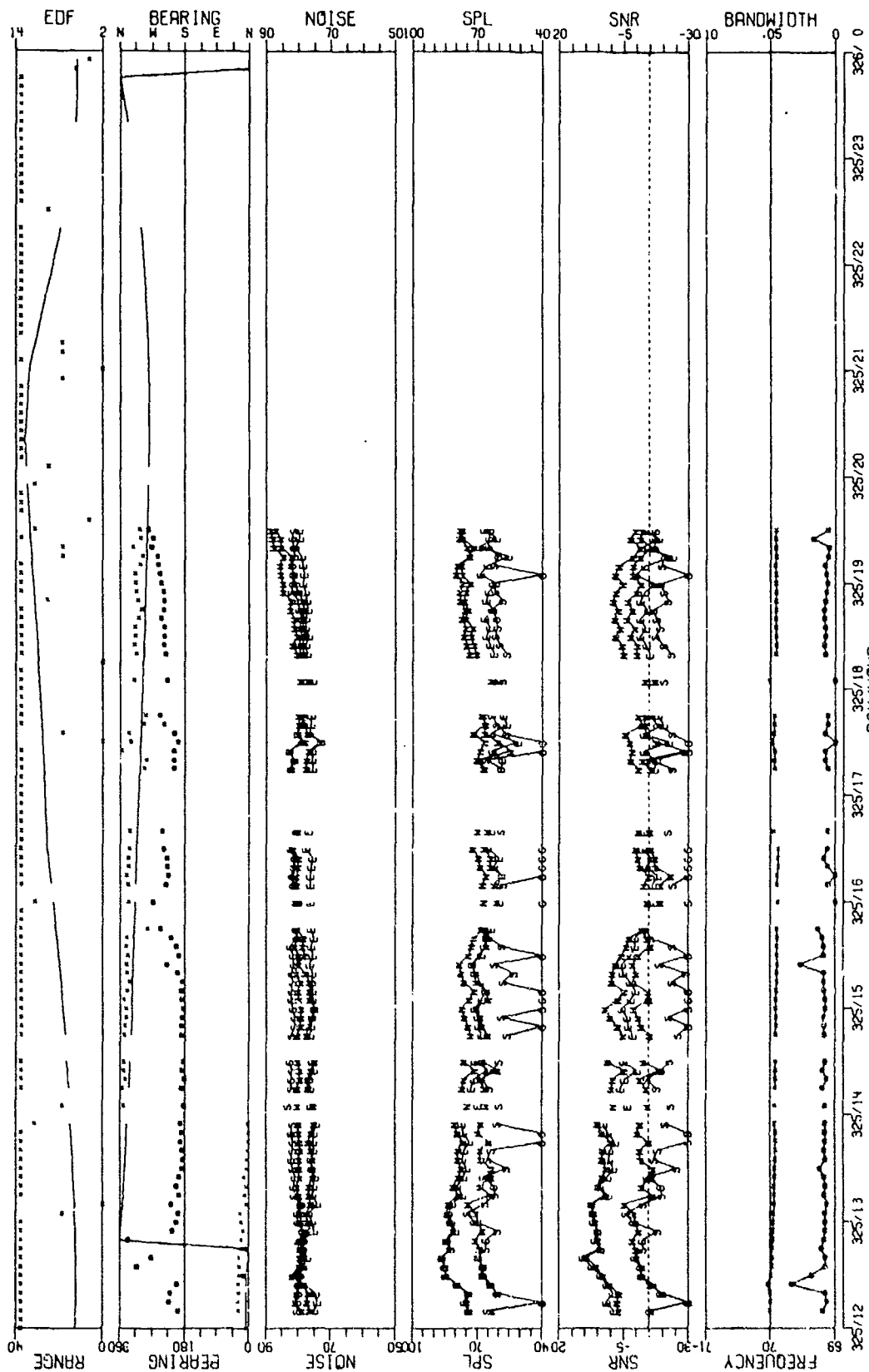


FIGURE III-155
MSS-FVT 70 HZ LINE HISTORY AS OBSERVED VIA THE SINGLE CAROTIDS SENSOR
AT SITE A3 DURING THE 21 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

AS-77-2755

CONFIDENTIAL

CONFIDENTIAL

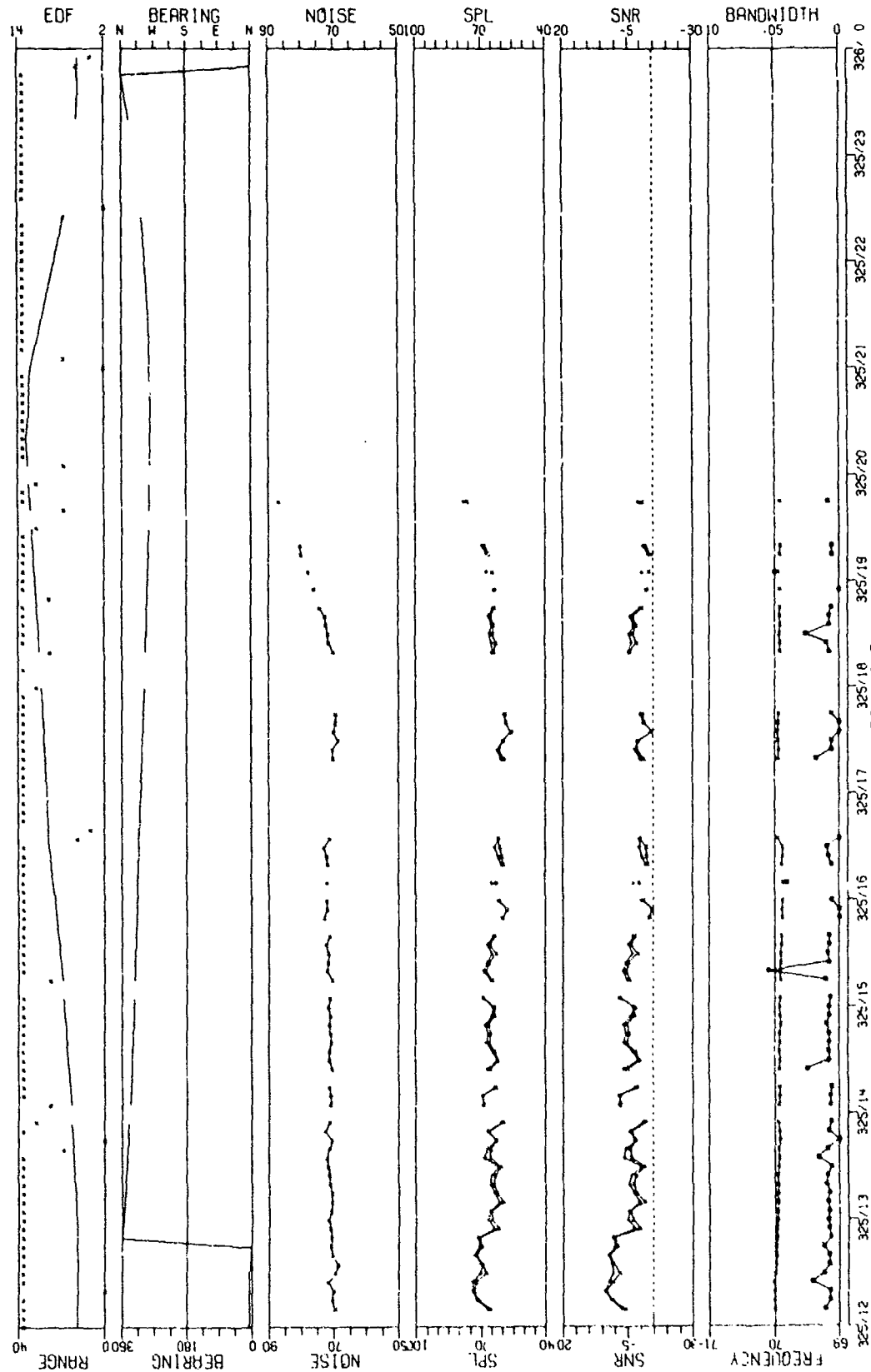


FIGURE III-156
WGS-FVT 70 HZ LINE HISTORY AS OBSERVED VIA THE VERTICAL DIPOLE SENSOR
AT SITE #3 DURING THE 21 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

AS-77-2756

CONFIDENTIAL

CONFIDENTIAL

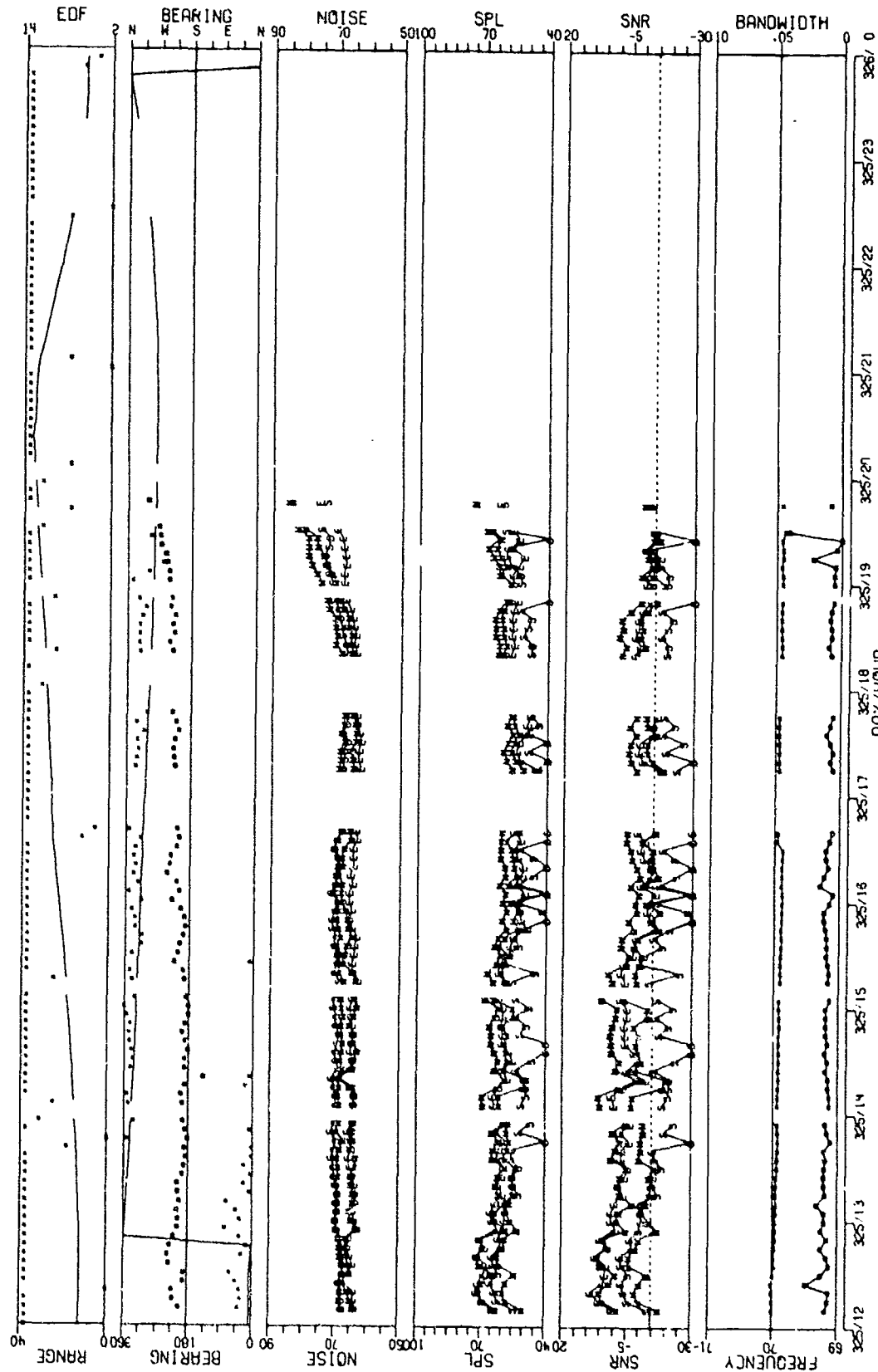


FIGURE 111-157
MSS-FVT 70 HZ LINE HISTORY AS OBSERVED VIA THE DIFFERENCED CARDIOTIOS SENSOR
AT SITE A3 DURING THE 21 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

AS-77-2757

CONFIDENTIAL

CONFIDENTIAL

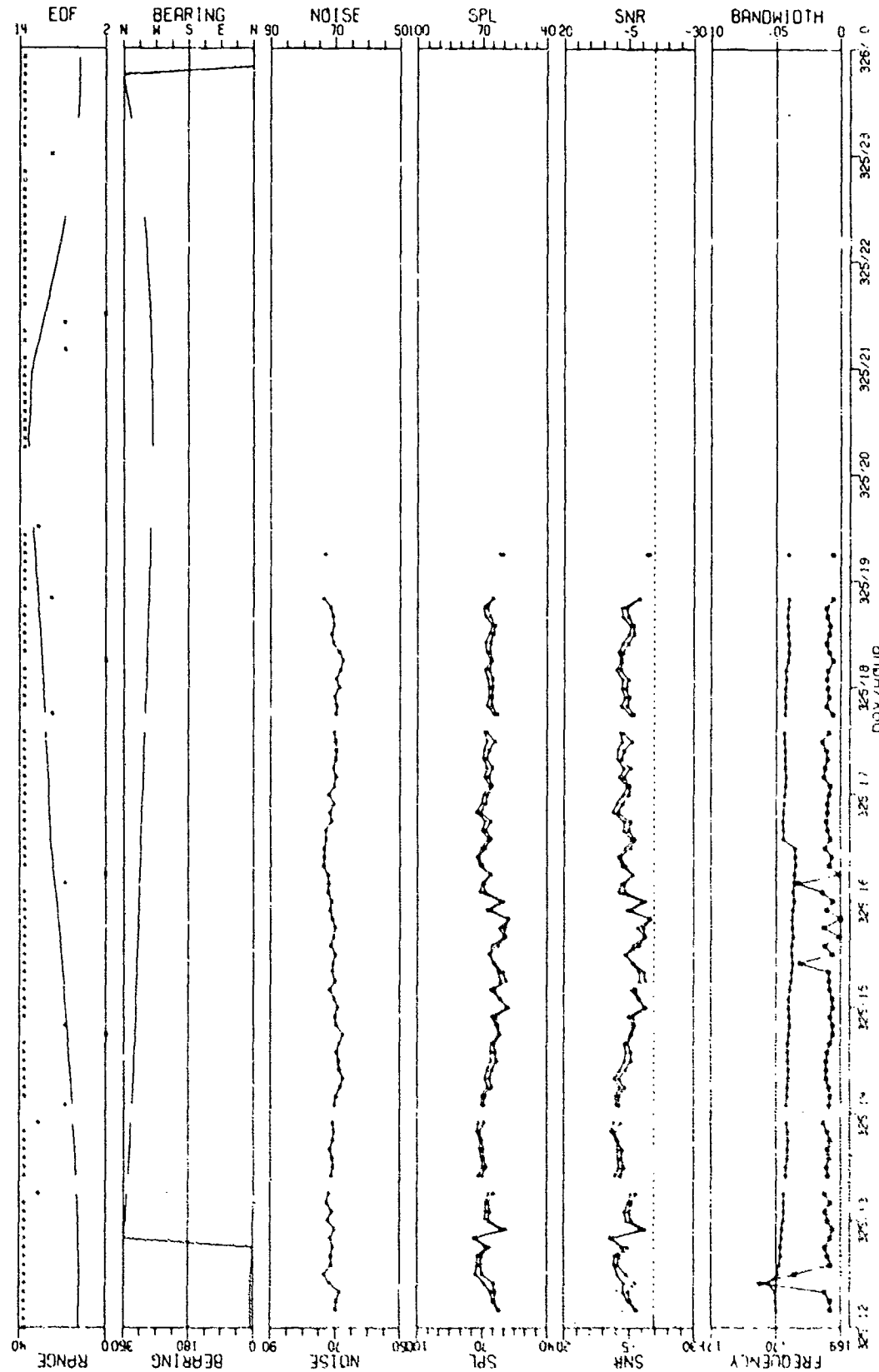


FIGURE III-158
HISTORY OF THE HISTORY AS OBSERVED VIA THE OMNIDIRECTIONAL SENSOR
AT 1700 HRS ON THE 21 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

AS-77-2758

CONFIDENTIAL

CONFIDENTIAL

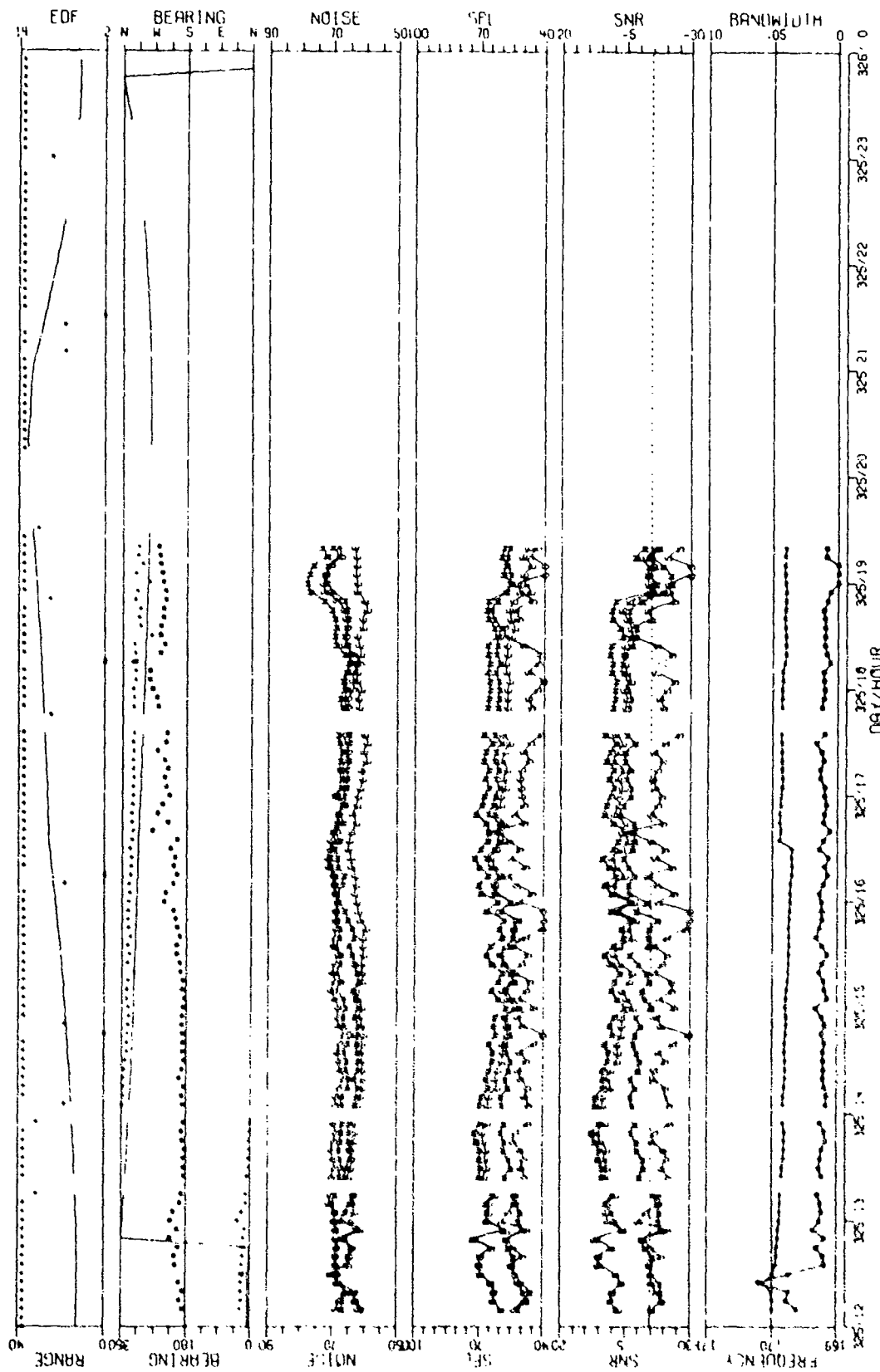


FIGURE III-159
HISTORICAL H2 LINE HISTORY AS OBSERVED VIA THE SINGLE CARCINOGEN SENSOR
DURING THE 21 NOV FIELD EVENT WITH VERNIER RESOLUTION TWT

AS-77-2759

CONFIDENTIAL

CONFIDENTIAL

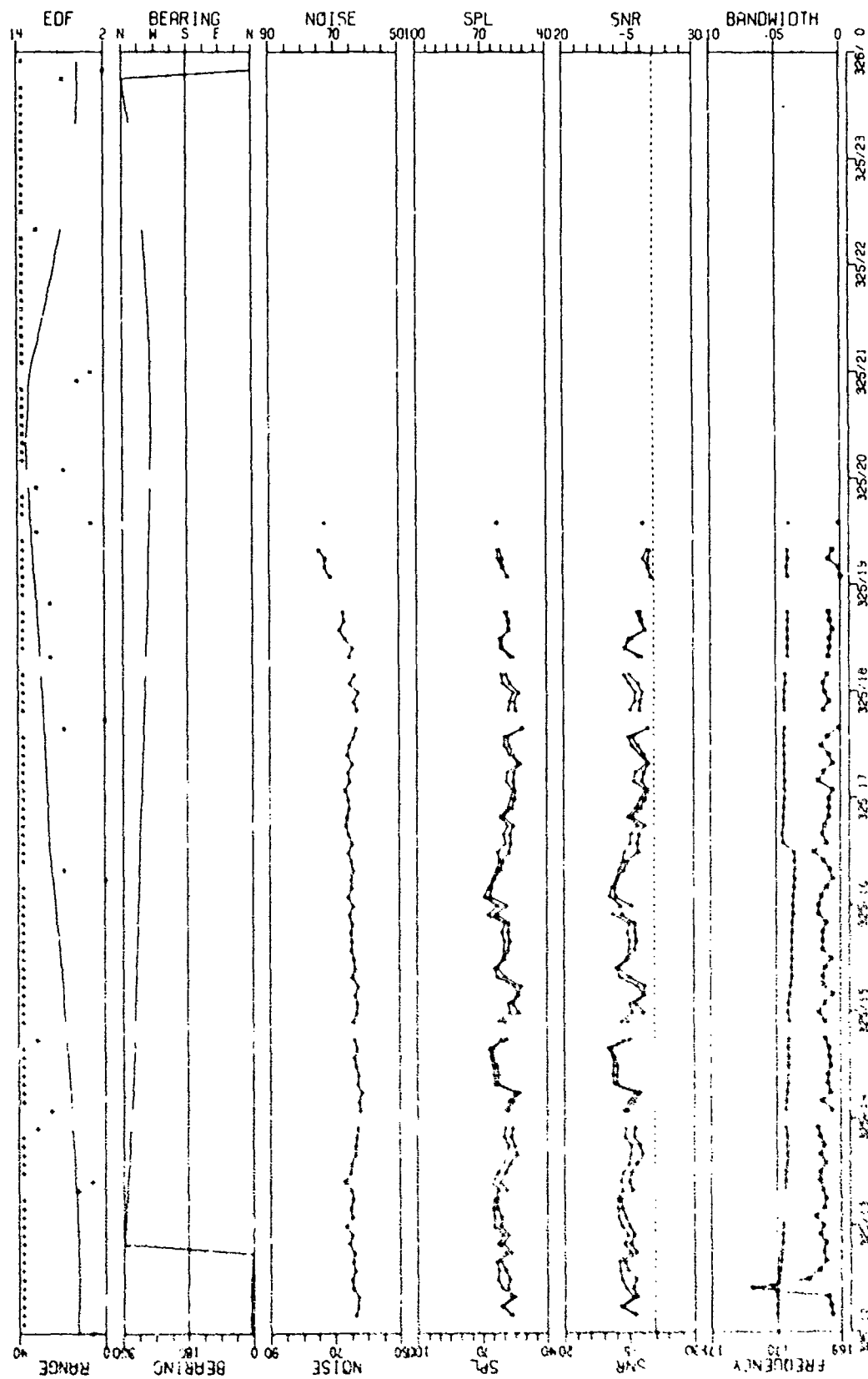


FIGURE 111-160
H22-111-160 H2 LINE HISTORY AS OBSERVED VIA THE VERTICAL DIPOLE SENSOR
21 NO. FIELD EVENT WITH VERNIER RESOLUTION 101

AS-77-2760

CONFIDENTIAL

CONFIDENTIAL

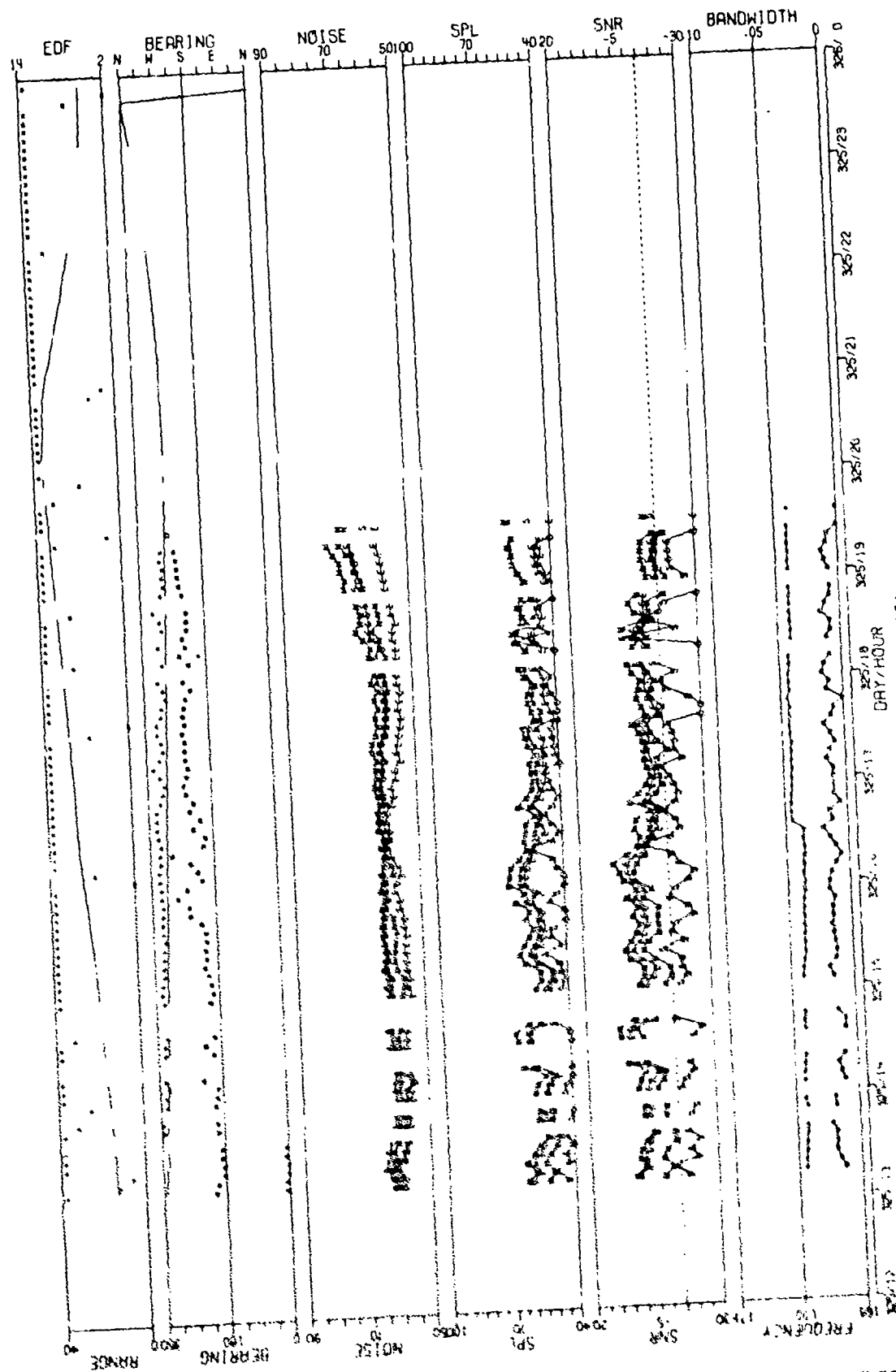


FIGURE 111-161
MSS FMT 170 HZ LINE HISTORY AS OBSERVED VIA THE DIFFERENCED CARDIOTIOS SENSOR
MSS AT SITE 23 DURING THE 21 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

AS-77-2761

CONFIDENTIAL

CONFIDENTIAL

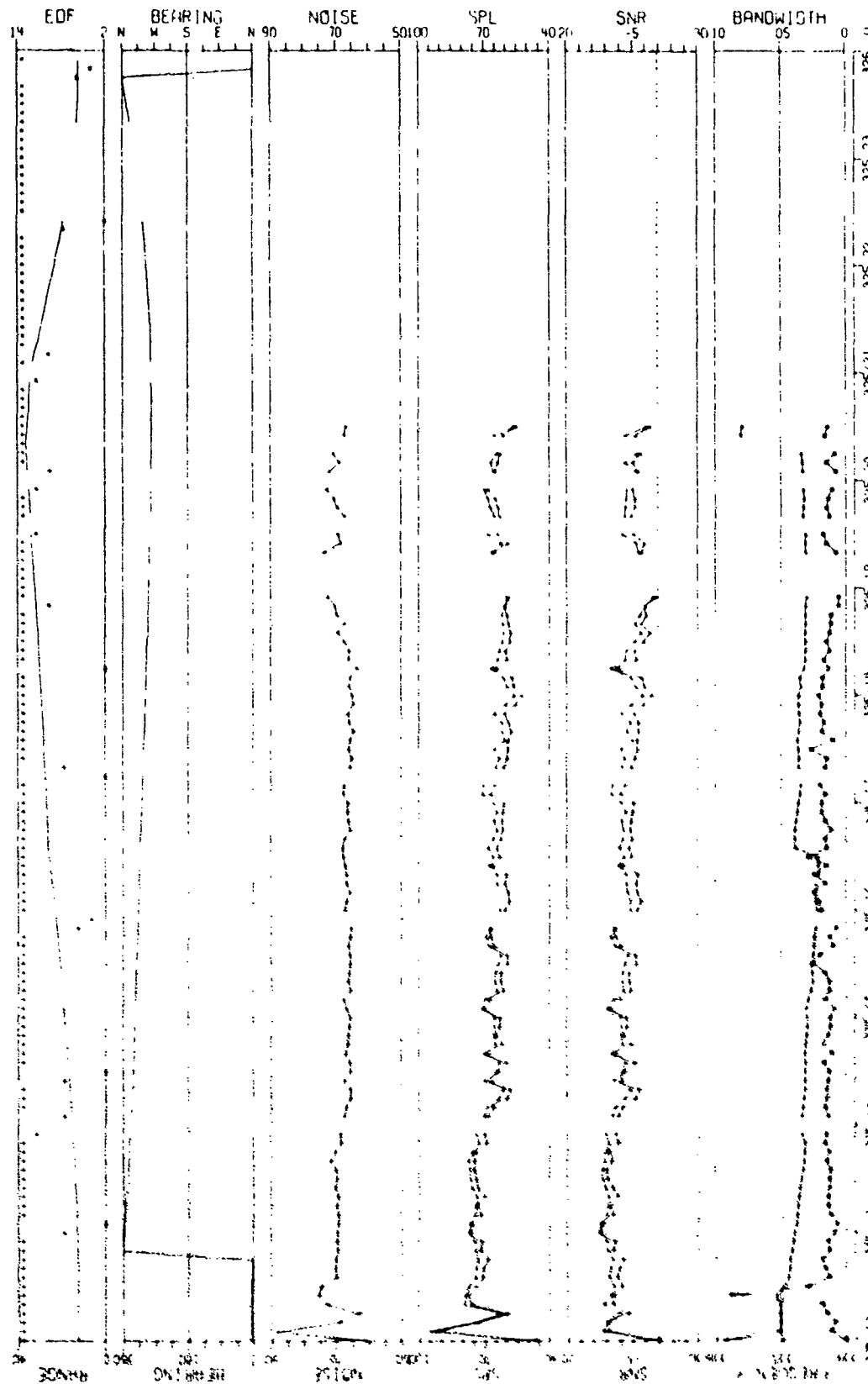


FIGURE 111-102
ACoustic sensor output with the OMIDIRECTIONAL SENSOR
ON THE 6' DOWNSIDE OF THE 1' FIELD EVENT WITH VERNIER RESOLUTION (U)

AS-77-2762

CONFIDENTIAL

CONFIDENTIAL



FIGURE 111-163
MCS-FVT 345 HZ LINE HISTORY AS OBSERVED VIA THE SINGLE CAROTIGIOS SENSOR
AT SITE W3 DURING THE 21 NOV FIELD EVENT WITH VERNIER RESOLUTION (U)

AS-77-2763

CONFIDENTIAL

UNCLASSIFIED

APPENDIX C

PROPAGATION LOSS versus RANGE CURVES (U)

(FIGURES III-164 - III-171)

UNCLASSIFIED

CONFIDENTIAL

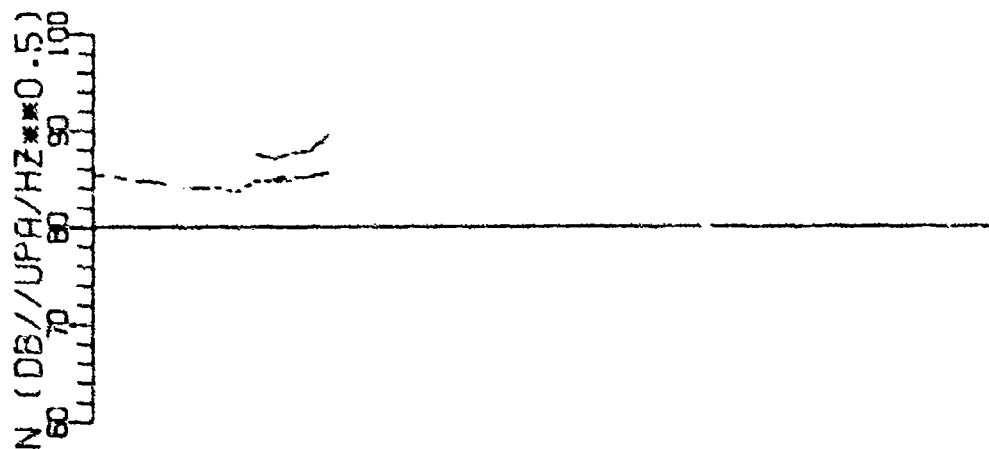
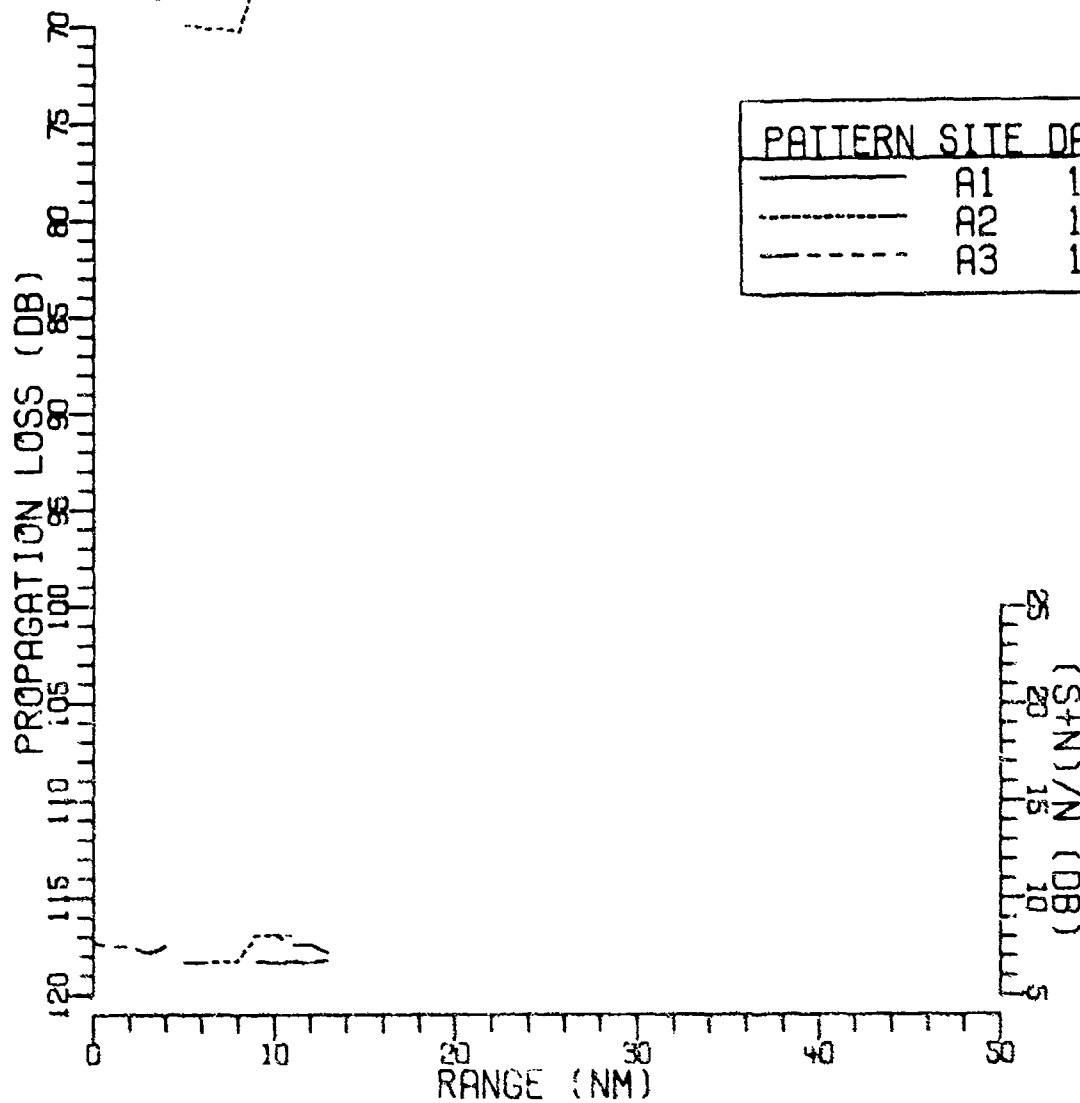


FIGURE III-164
MSS-FVT NEAR BOTTOM OMNIDIRECTIONAL SENSOR
PROPAGATION LOSS RESULTS FOR 55HZ AT 141DB (U)

195

CONFIDENTIAL

AS-77-2764

CONFIDENTIAL

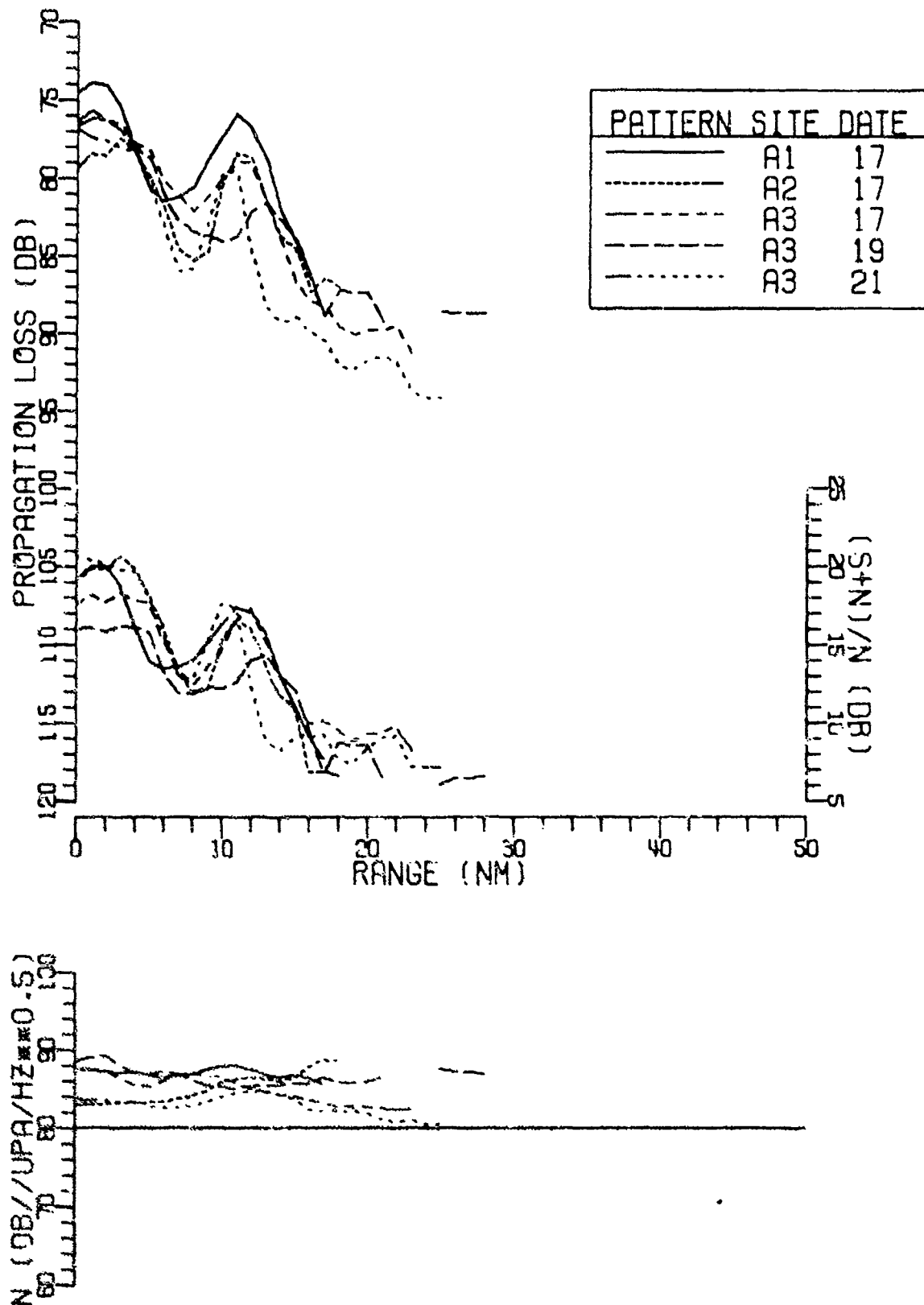


FIGURE III-165
MSS-FVT NEAR BOTTOM OMNIDIRECTIONAL SENSOR
PROPAGATION LOSS RESULTS FOR 64HZ AT 162DB (U)

CONFIDENTIAL

CONFIDENTIAL

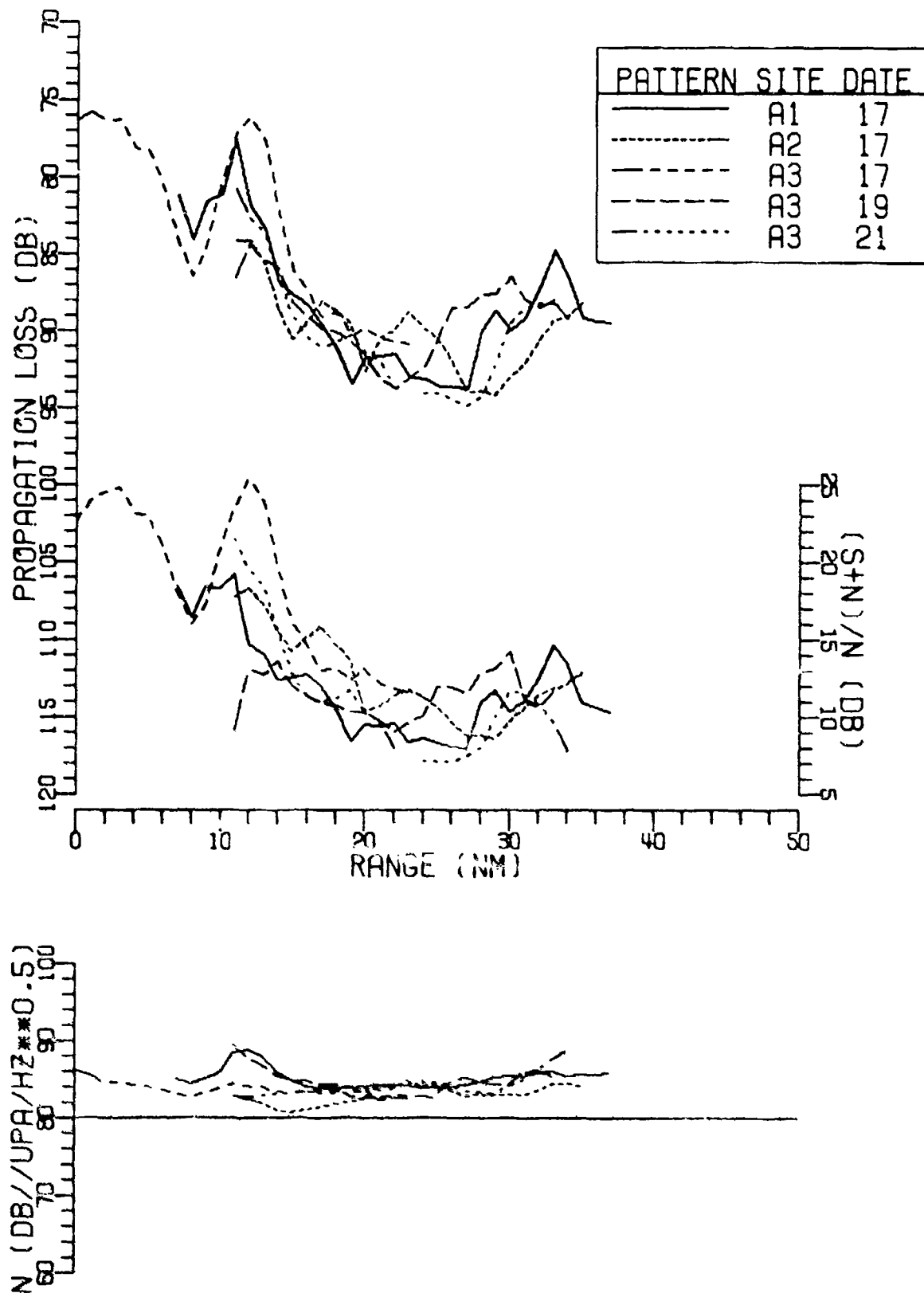


FIGURE III-166
MSS-FVT NEAR BOTTOM OMNIDIRECTIONAL SENSOR
PROPAGATION LOSS RESULTS FOR 70HZ AT 166DB (U)

CONFIDENTIAL

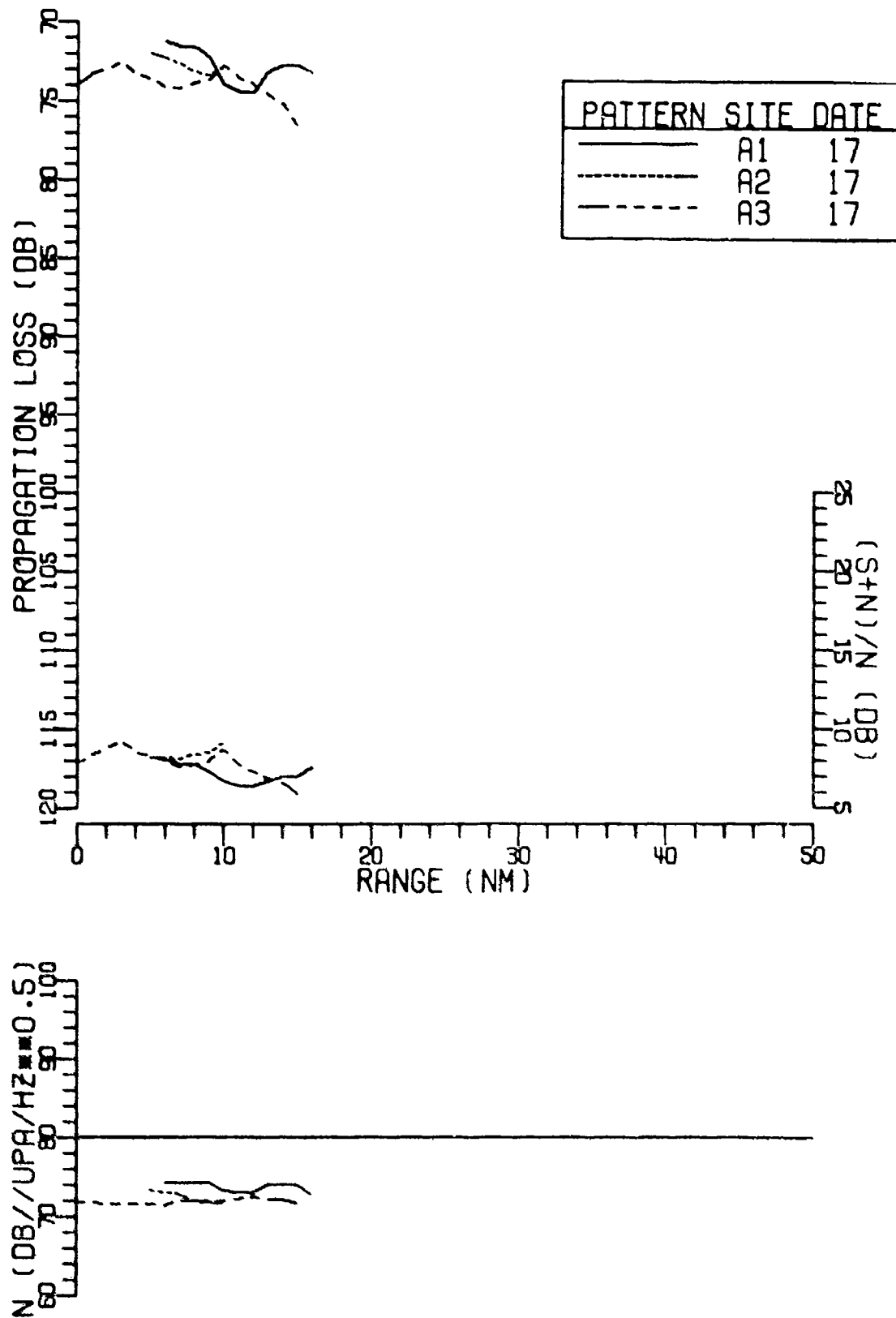


FIGURE III-167
MSS-FVT NEAR BOTTOM OMNIDIRECTIONAL SENSOR
PROPAGATION LOSS RESULTS FOR 155HZ AT 134DB (U)

CONFIDENTIAL

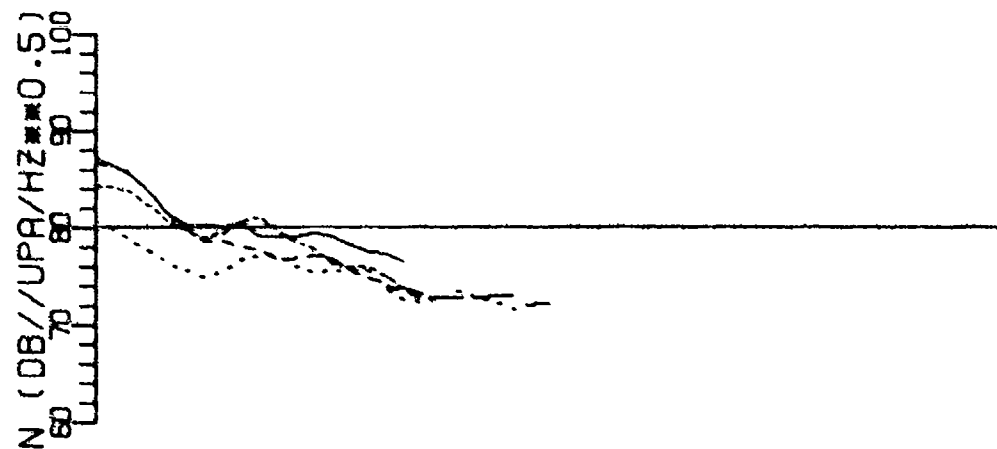
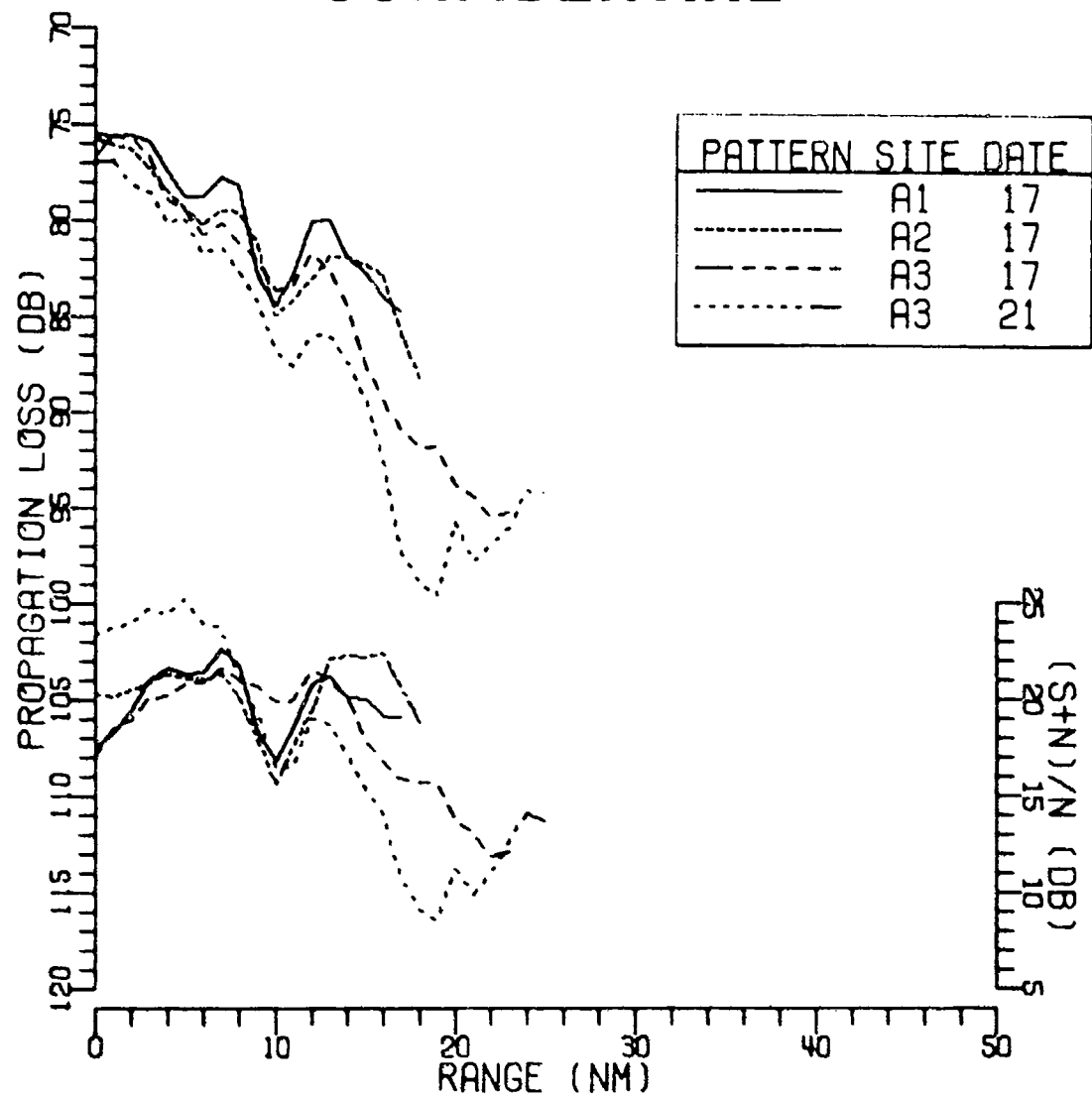


FIGURE III-168
MSS-FVT NEAR BOTTOM OMNIDIRECTIONAL SENSOR
PROPAGATION LOSS RESULTS FOR 160HZ AT 161DB (U)

CONFIDENTIAL

CONFIDENTIAL

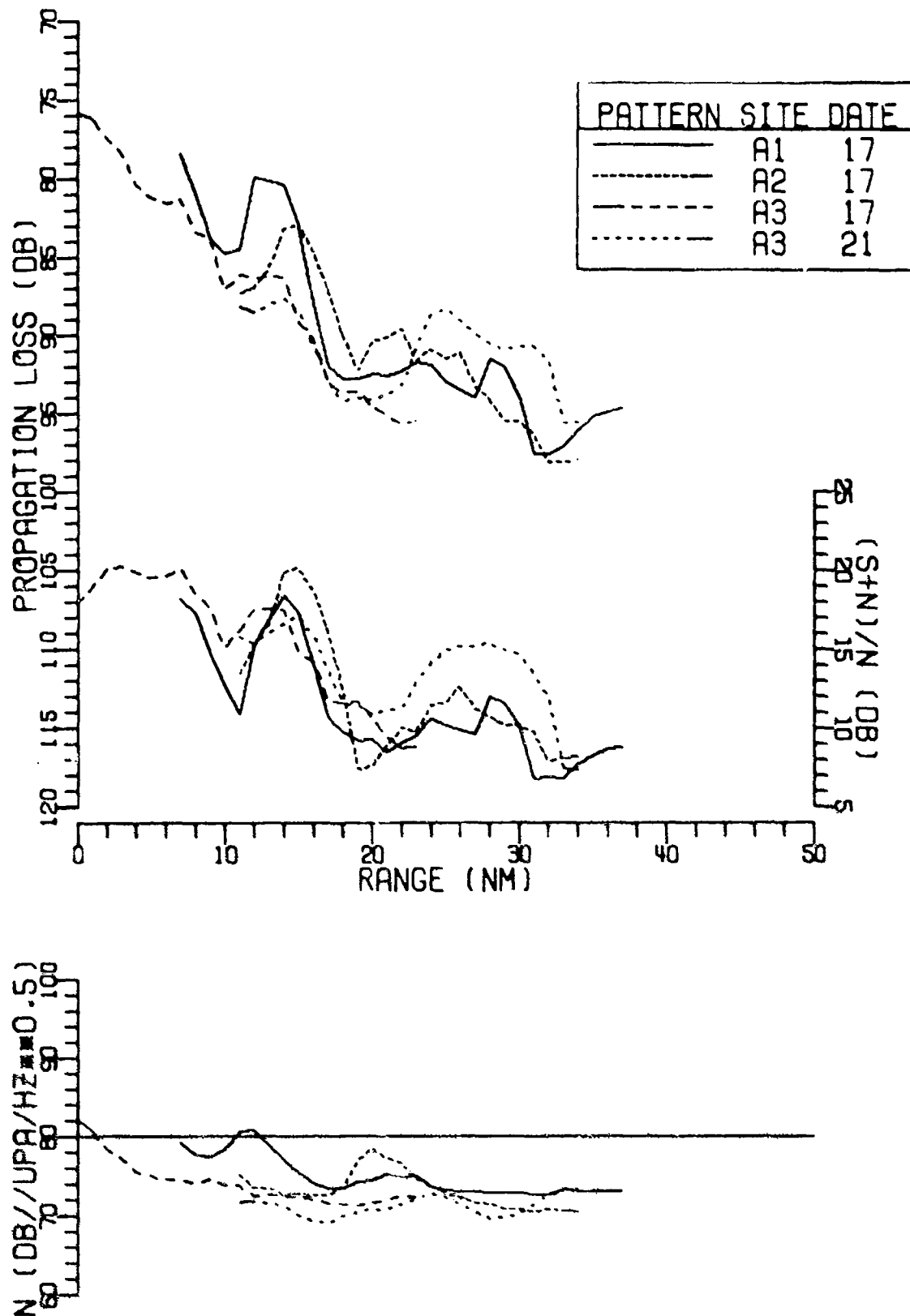


FIGURE III-169
MSS-FVT NEAR BOTTOM OMNIDIRECTIONAL SENSOR
PROPAGATION LOSS RESULTS FOR 170HZ AT 156DB (U)

CONFIDENTIAL

CONFIDENTIAL

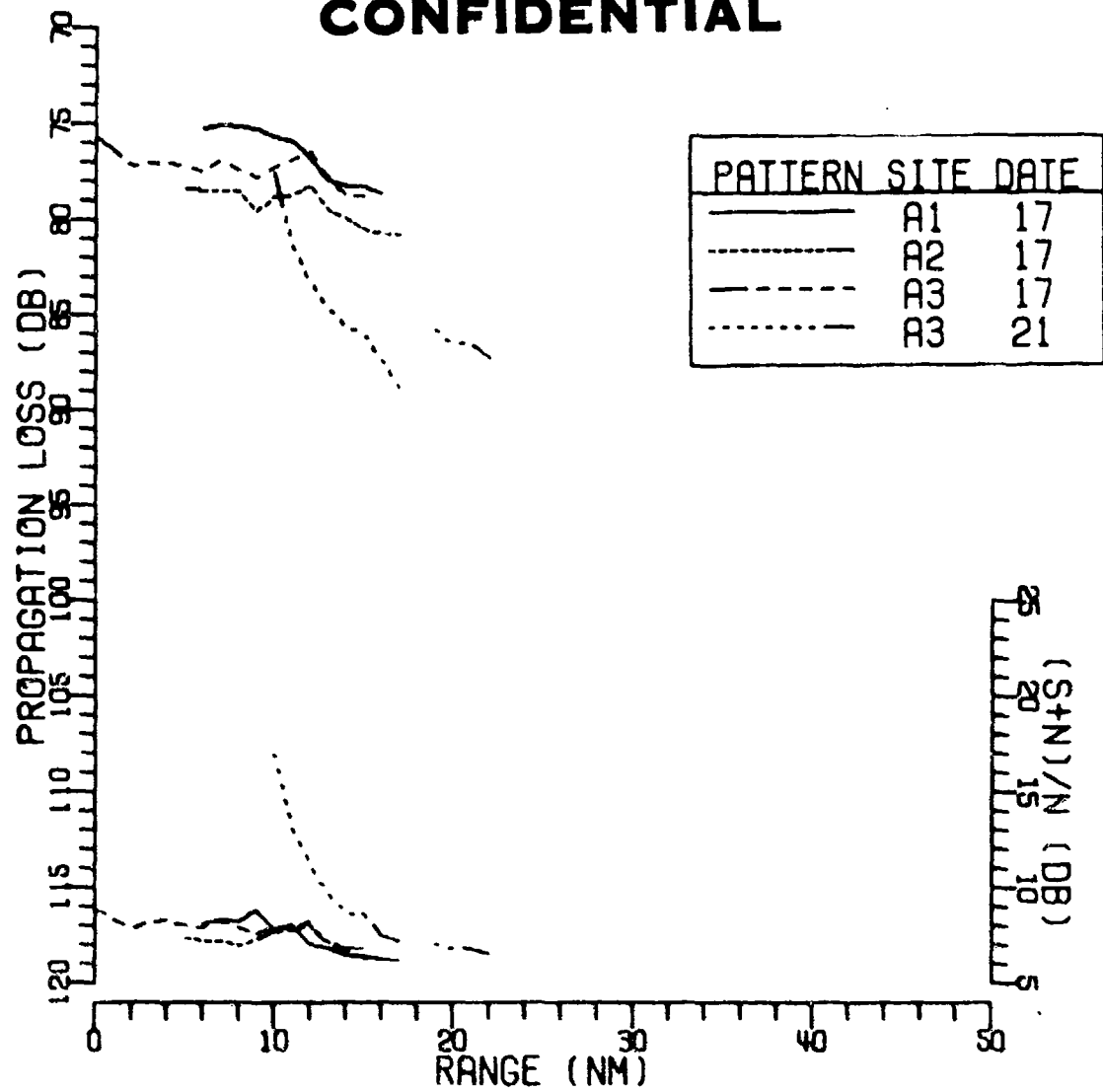


FIGURE III-170
MSS-FVT NEAR BOTTOM OMNIDIRECTIONAL SENSOR
PROPAGATION LOSS RESULTS FOR 305HZ AT 136DB (U)

AS-77-2770

CONFIDENTIAL

CONFIDENTIAL

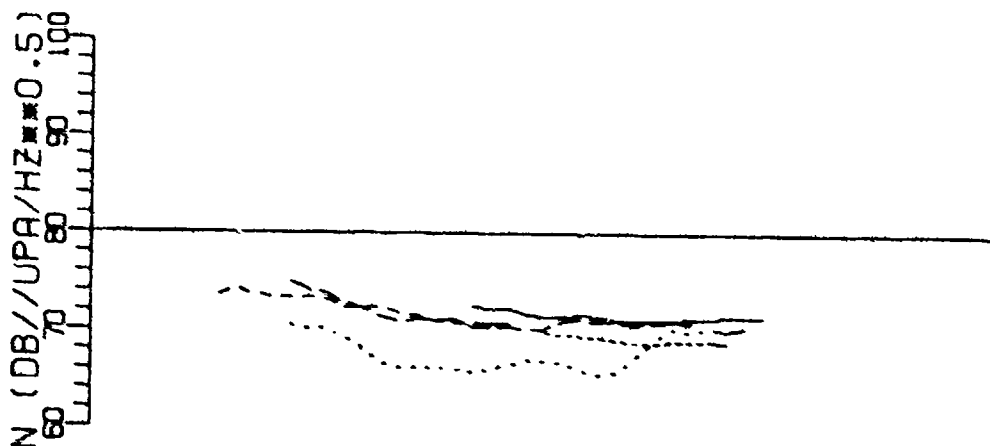
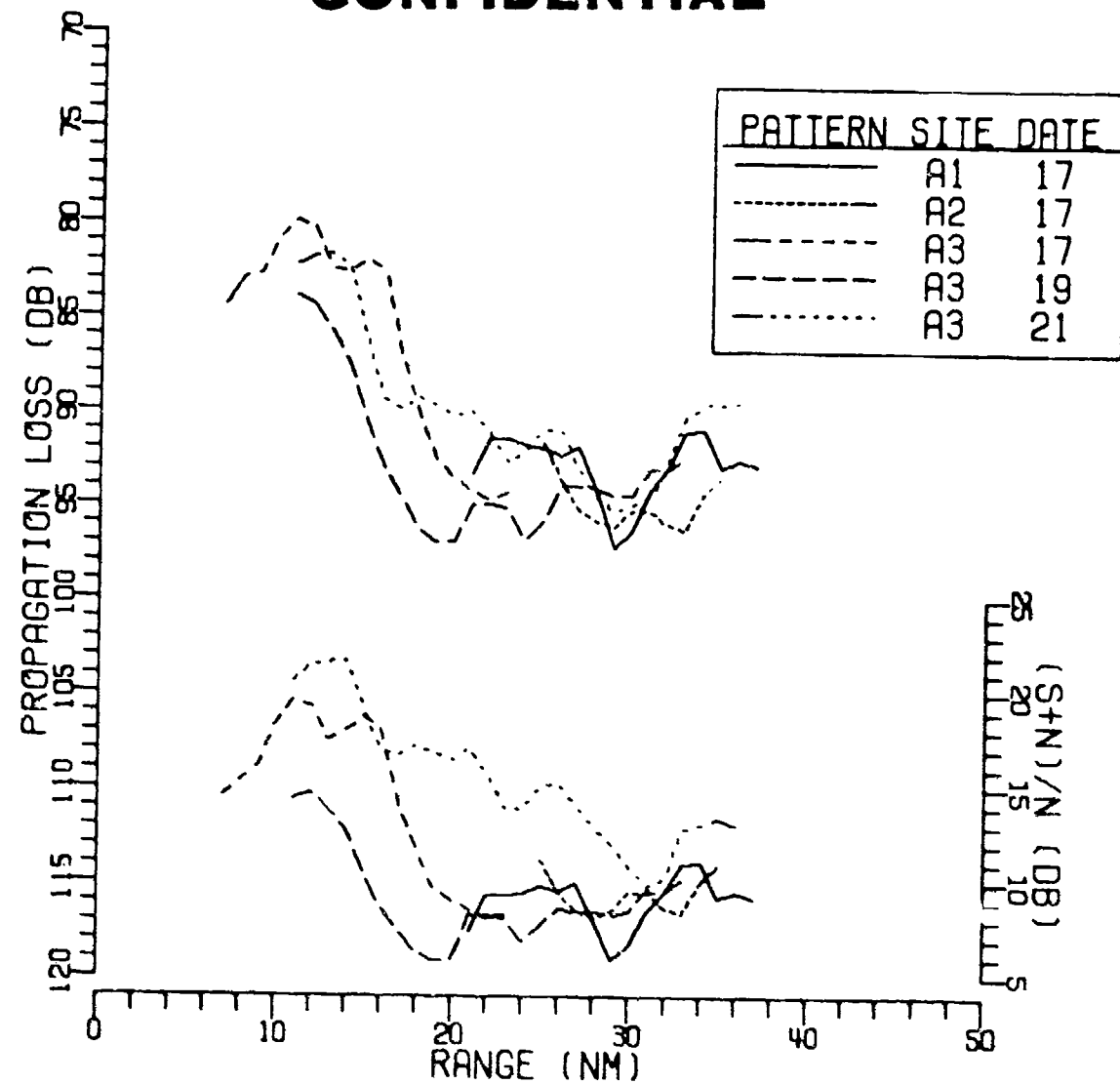


FIGURE III-171
MSS-FVT NEAR BOTTOM OMNIDIRECTIONAL SENSOR
PROPAGATION LOSS RESULTS FOR 335HZ AT 154DB (U)

CONFIDENTIAL

UNCLASSIFIED

APPENDIX D

ARRAY GAIN versus RANGE CURVES (U)

(FIGURES III-172 - III-199)

UNCLASSIFIED

SECRET

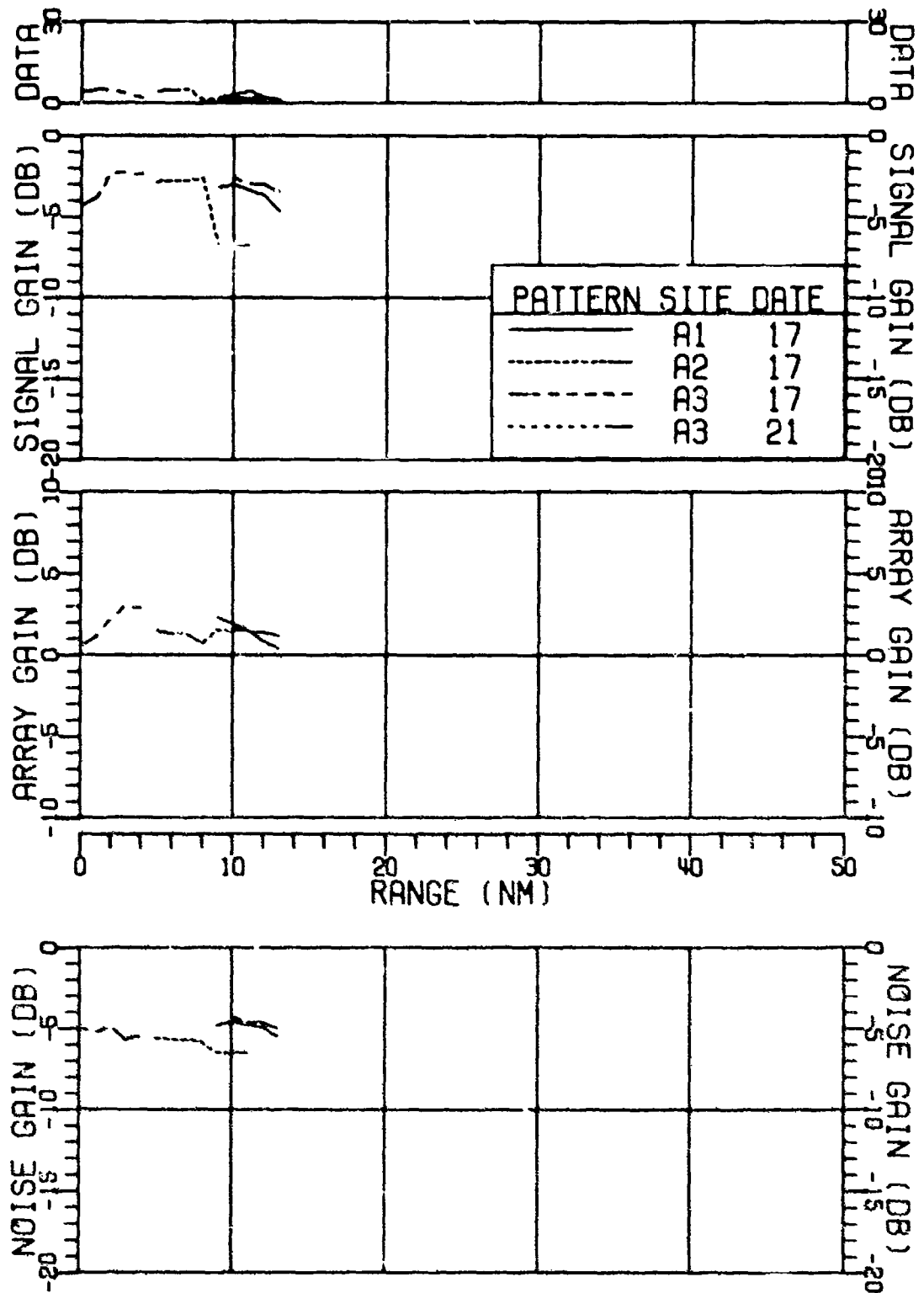


FIGURE III-172
MSS-FVT NEAR BOTTOM SINGLE CARDIOIDS SENSOR
ARRAY GAIN RESULTS FOR 55HZ AT 141DB (U)

AS-77-2772

SECRET

SECRET

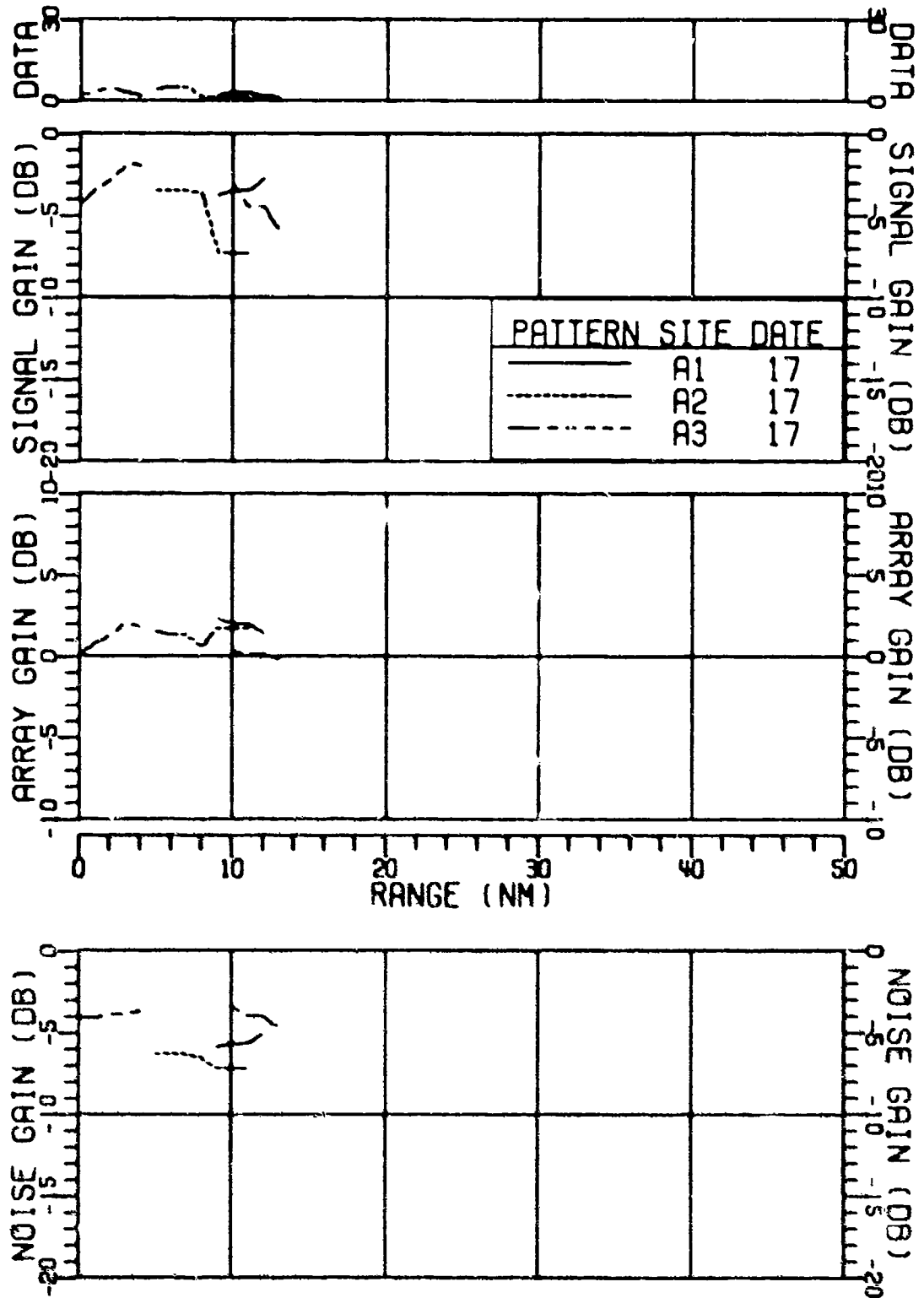


FIGURE III-173
MSS-FVT NEAR BOTTOM MAX GAIN LIMACONS SENSOR
ARRAY GAIN RESULTS FOR 55HZ AT 1410B (U)

AS-77-2773

204
SECRET

SECRET

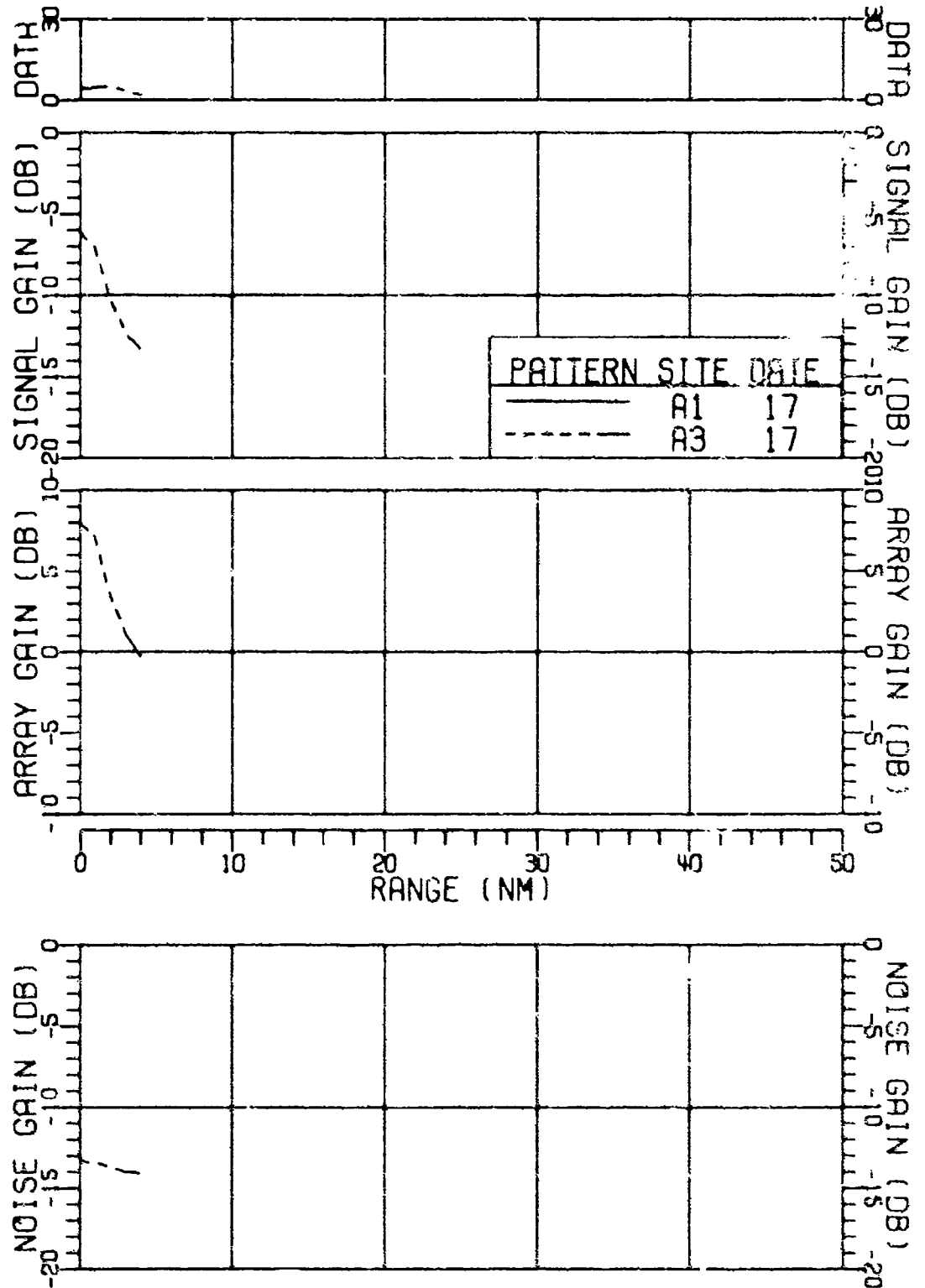


FIGURE III-174
MSS-FVT NEAR BOTTOM VERTICAL DIPOLE SENSOR
ARRAY GAIN RESULTS FOR 55HZ AT 141DB (U)

AS-77-2774

SECRET

SECRET

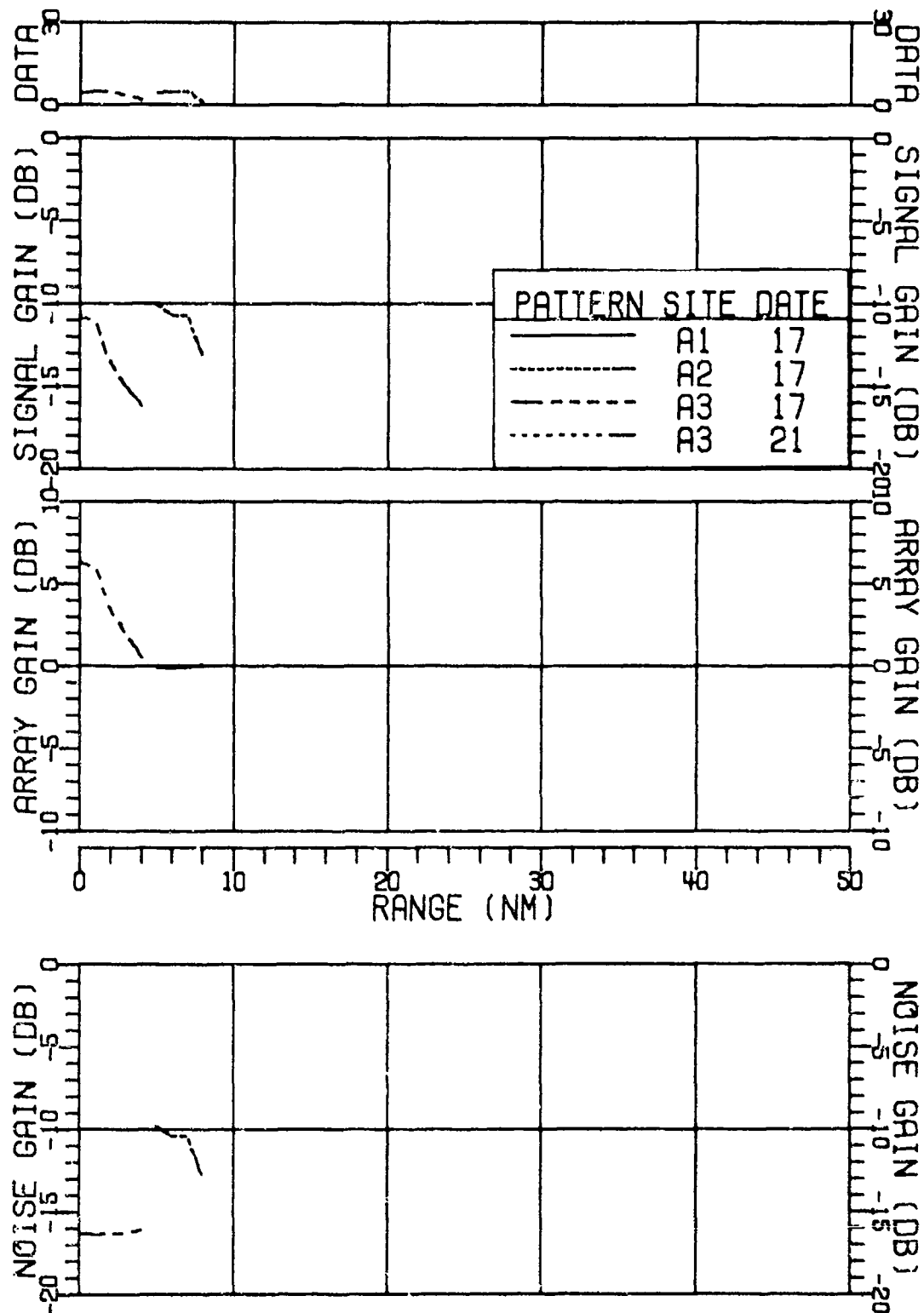


FIGURE III-175
MSS-FVT NEAR BOTTOM DIFFERENCED CARDIOIDS SENSOR
ARRAY GAIN RESULTS FOR 55HZ AT 141DB (U)

AS-77-2775

SECRET

SECRET

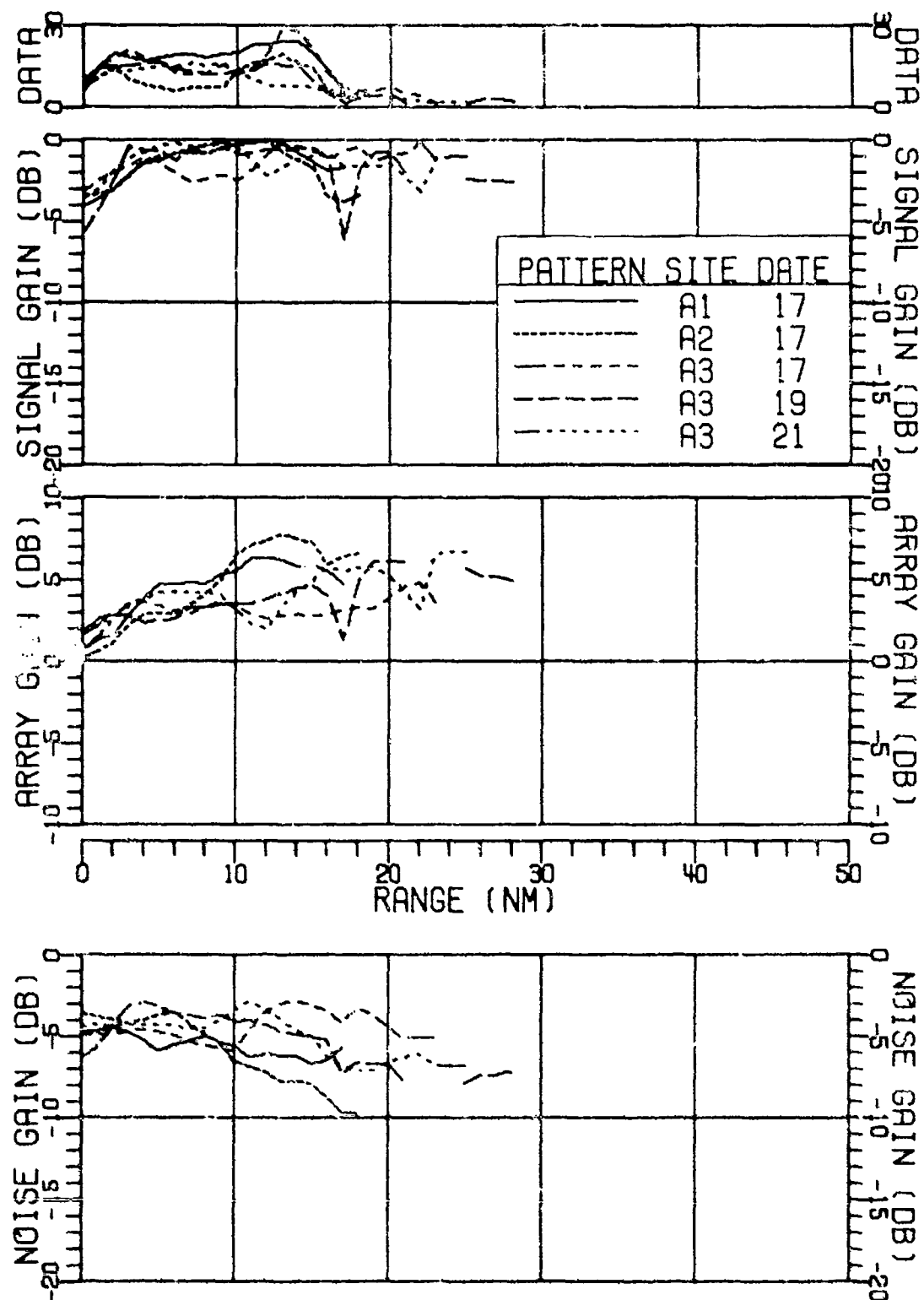


FIGURE III-176
MSS-FVT NEAR BOTTOM SINGLE CARDIOIDS SENSOR
ARRAY GAIN RESULTS FOR 64HZ AT 162DB (U)

AS-77-2776

SECRET

SECRET

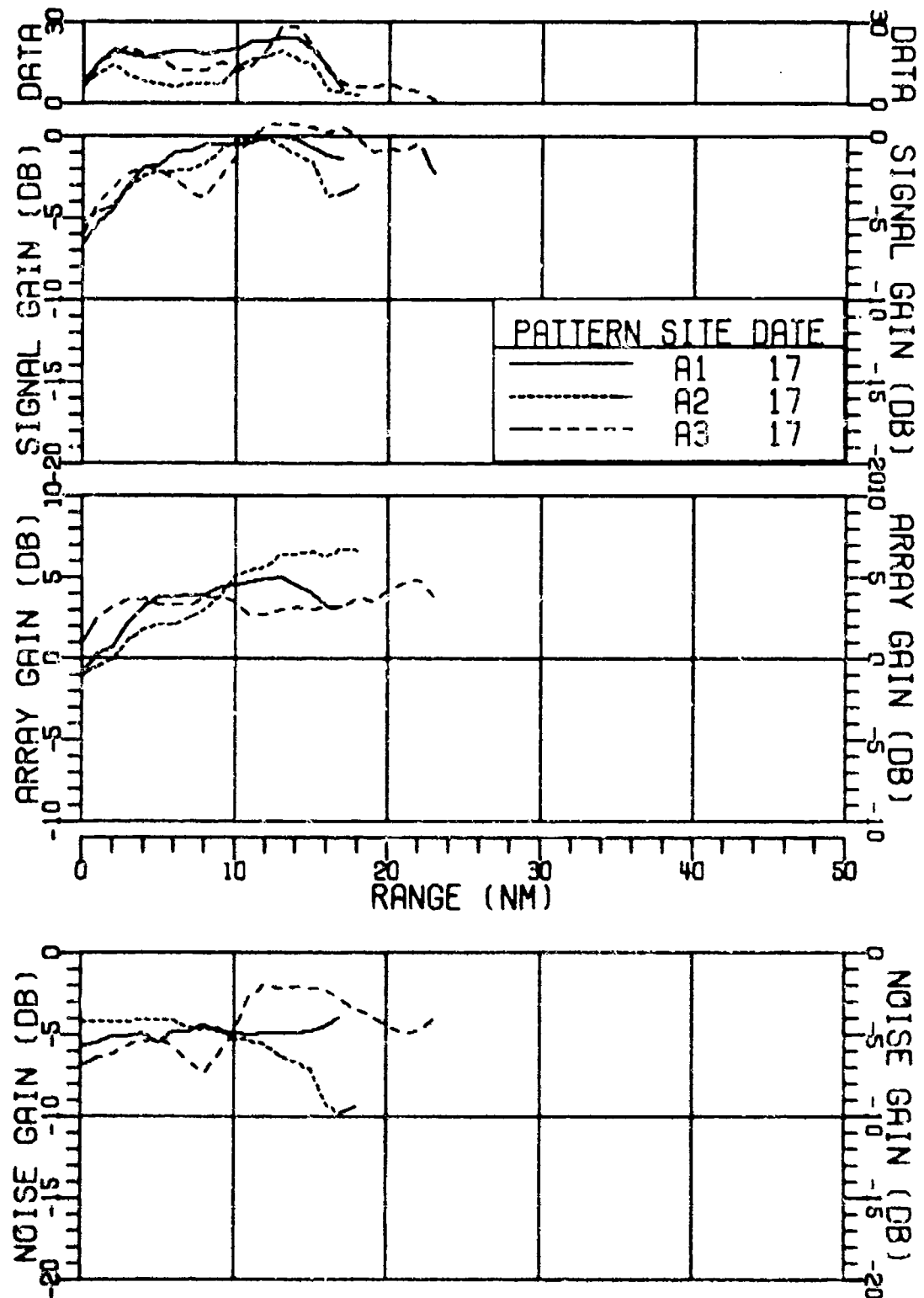


FIGURE III-177
MSS-FVT NEAR BOTTOM MAX GAIN LIMACONS SENSOR
ARRAY GAIN RESULTS FOR 64HZ AT 162DB (U)

AS-77-2777

SECRET

SECRET

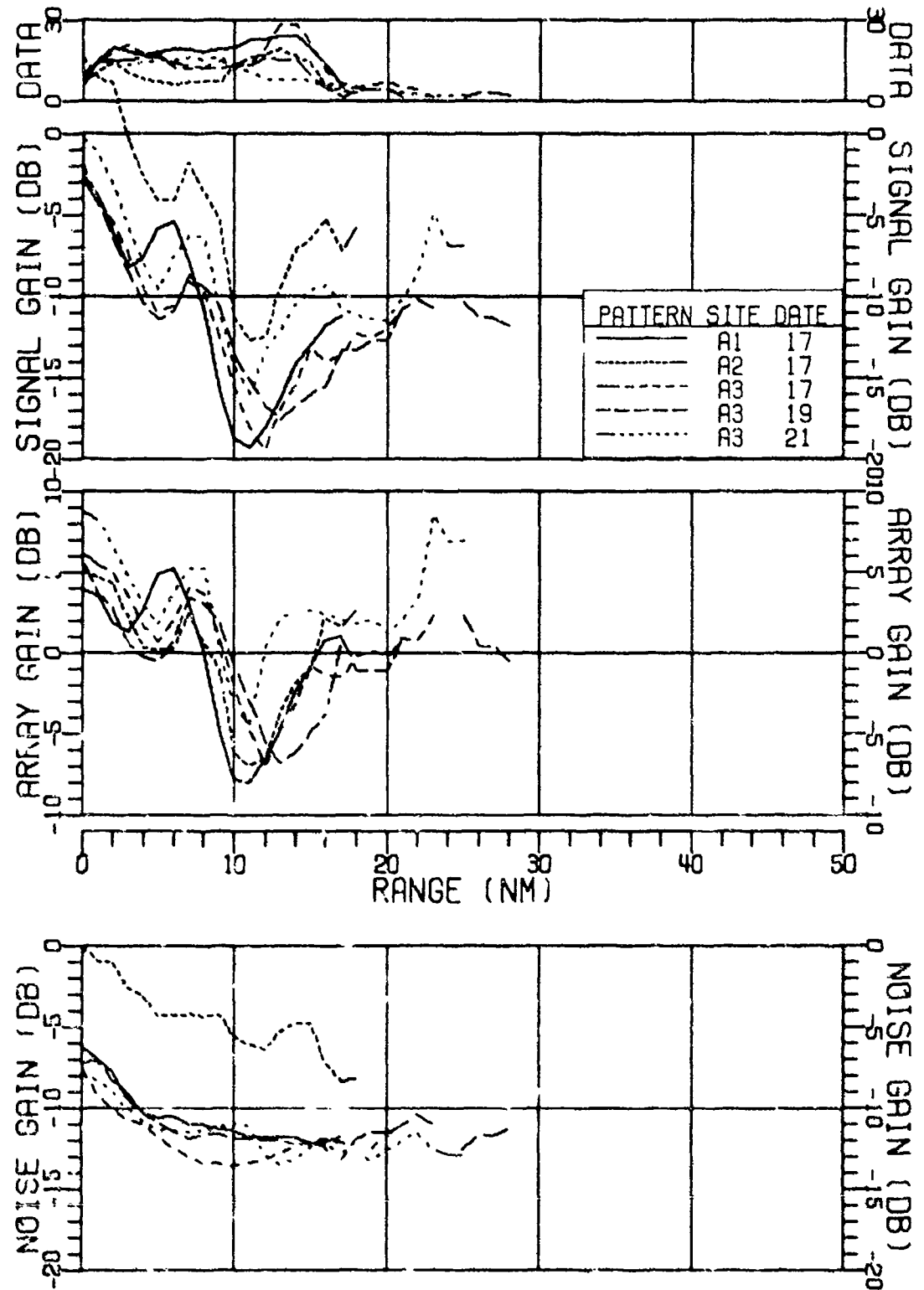


FIGURE III-178
MSS-FVT NEAR BOTTOM VERTICAL DIPOLE SENSOR
ARRAY GAIN RESULTS FOR 64HZ AT 162DB (U)

AS-77-2778

SECRET

SECRET

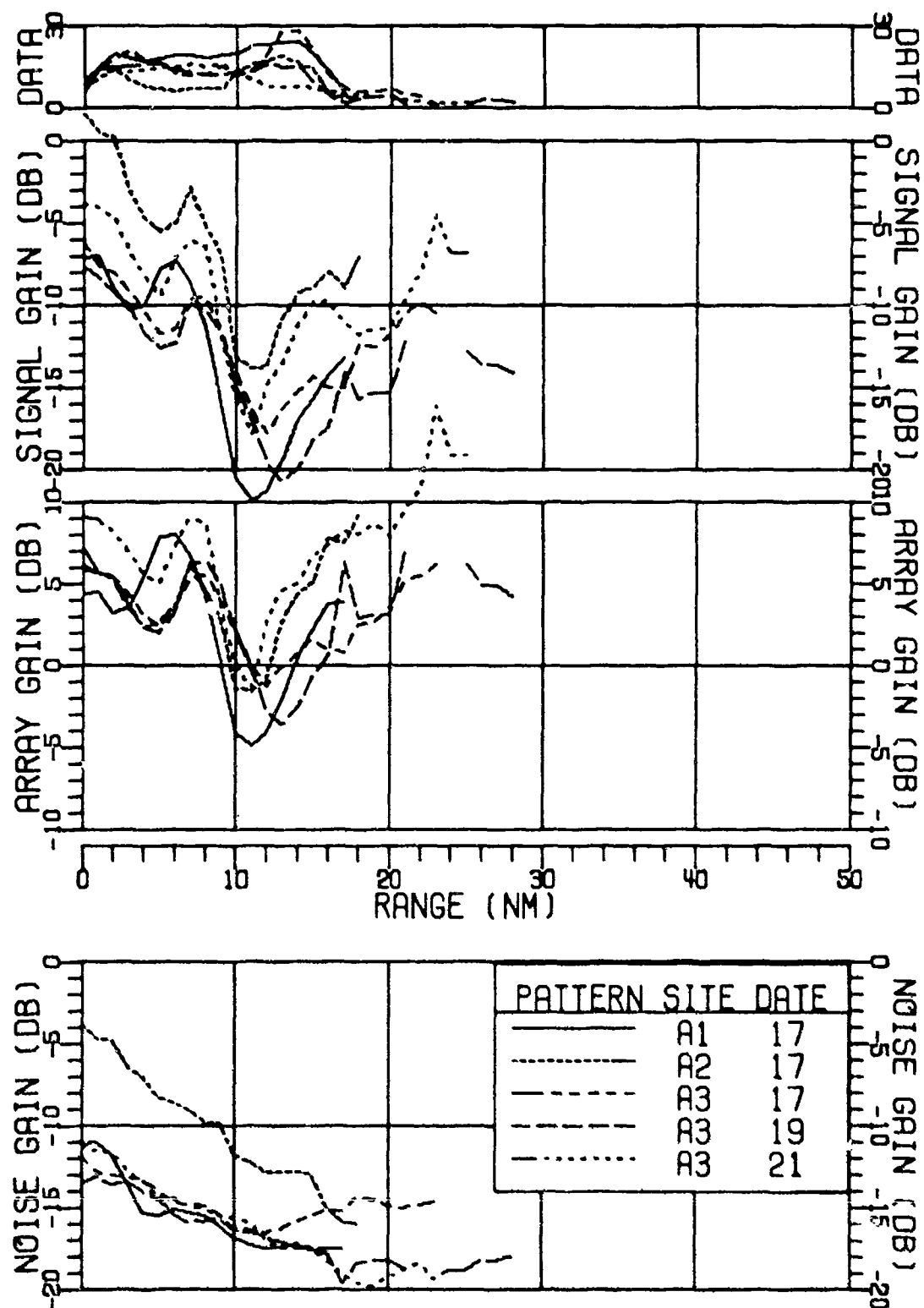


FIGURE III-179
MSS-FVT NEAR BOTTOM DIFFERENCED CARDIOIDS SENSOR
ARRAY GAIN RESULTS FOR 64HZ AT 162DB (U)

AS-77-2779

SECRET

SECRET

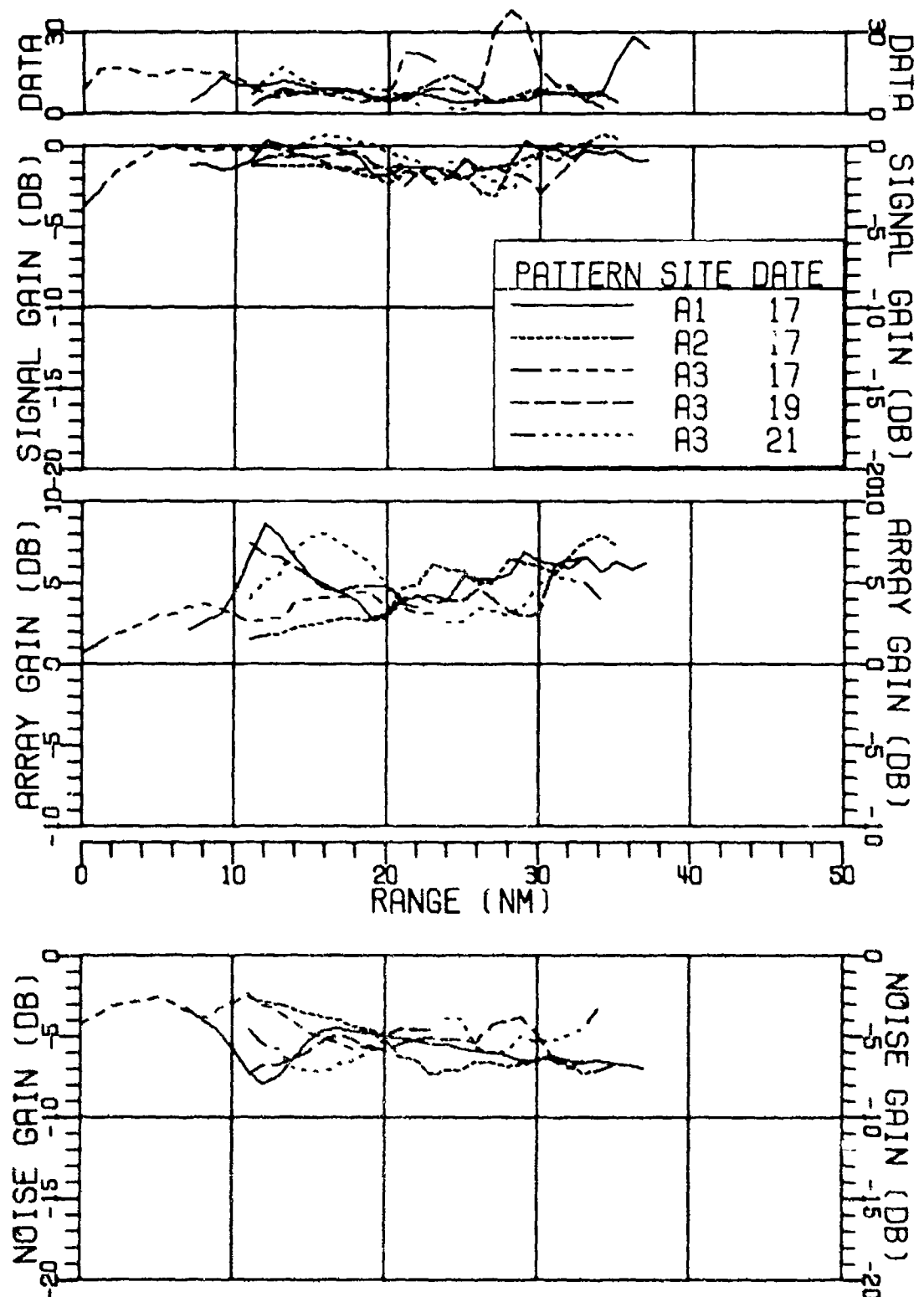


FIGURE III-180
MSS-FVT NEAR BOTTOM SINGLE CARDIOIDS SENSOR
ARRAY GAIN RESULTS FOR 70HZ AT 166DB (U)

AS-77-2780

SECRET

SECRET

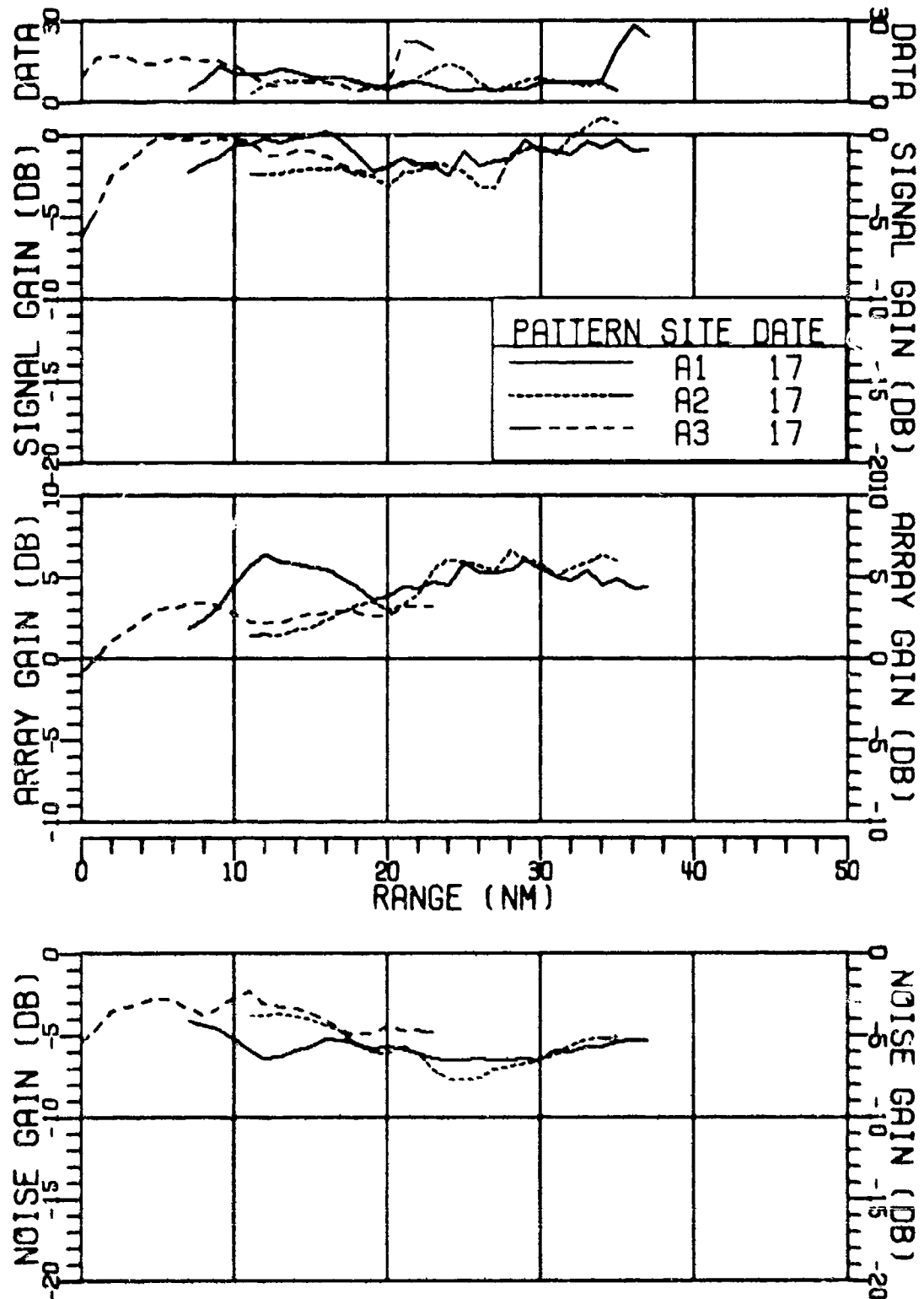


FIGURE III-181
MSS-FVT NEAR BOTTOM MAX GAIN LIMACONS SENSOR
ARRAY GAIN RESULTS FOR 70HZ AT 166DB (U)

AS-77-27R1

SECRET

SECRET

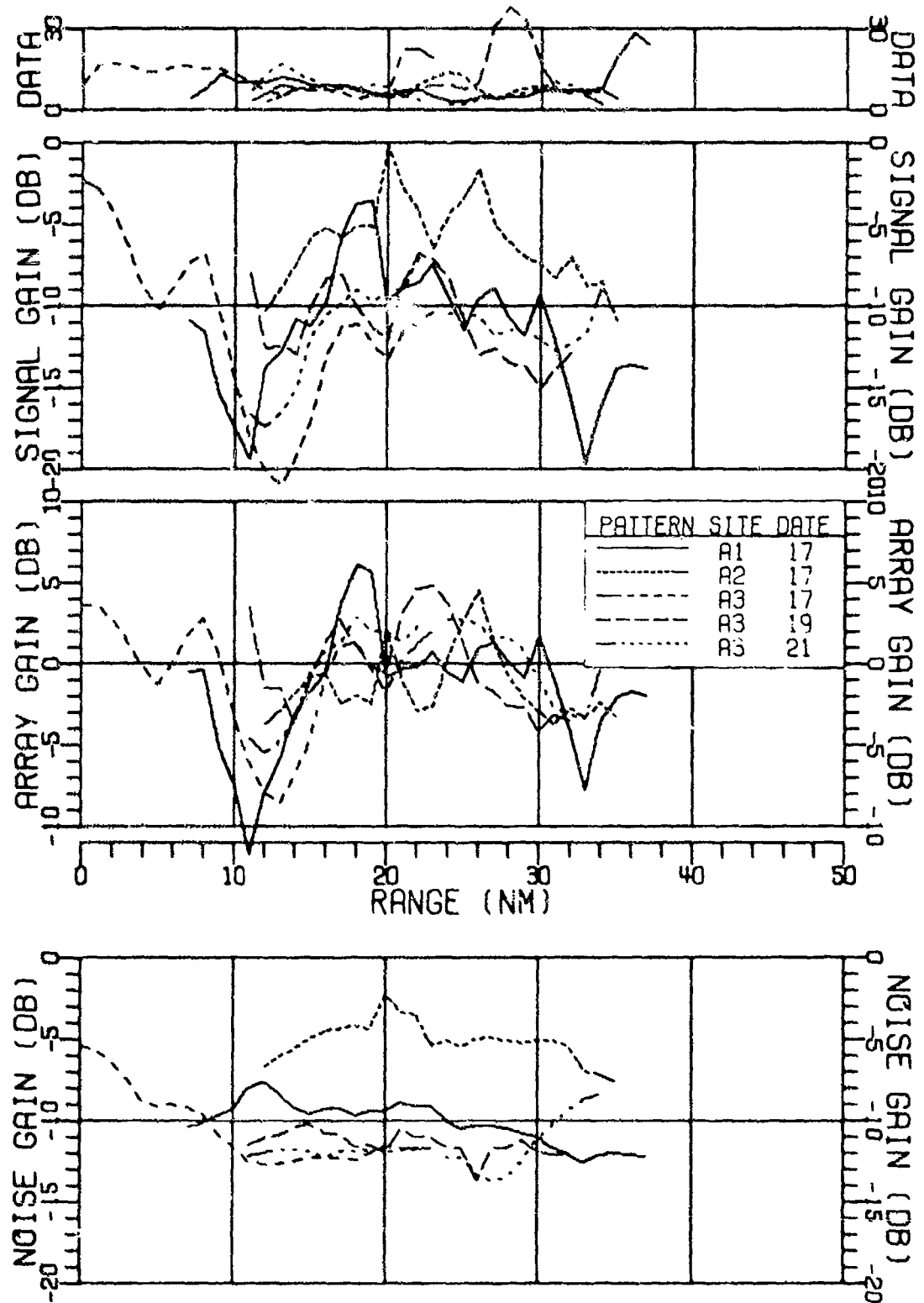


FIGURE III-182
MSS-FVT NEAR BOTTOM VERTICAL DIPOLE SENSOR
ARRAY GAIN RESULTS FOR 70HZ AT 166DB (U)

AS-77-2782

SECRET

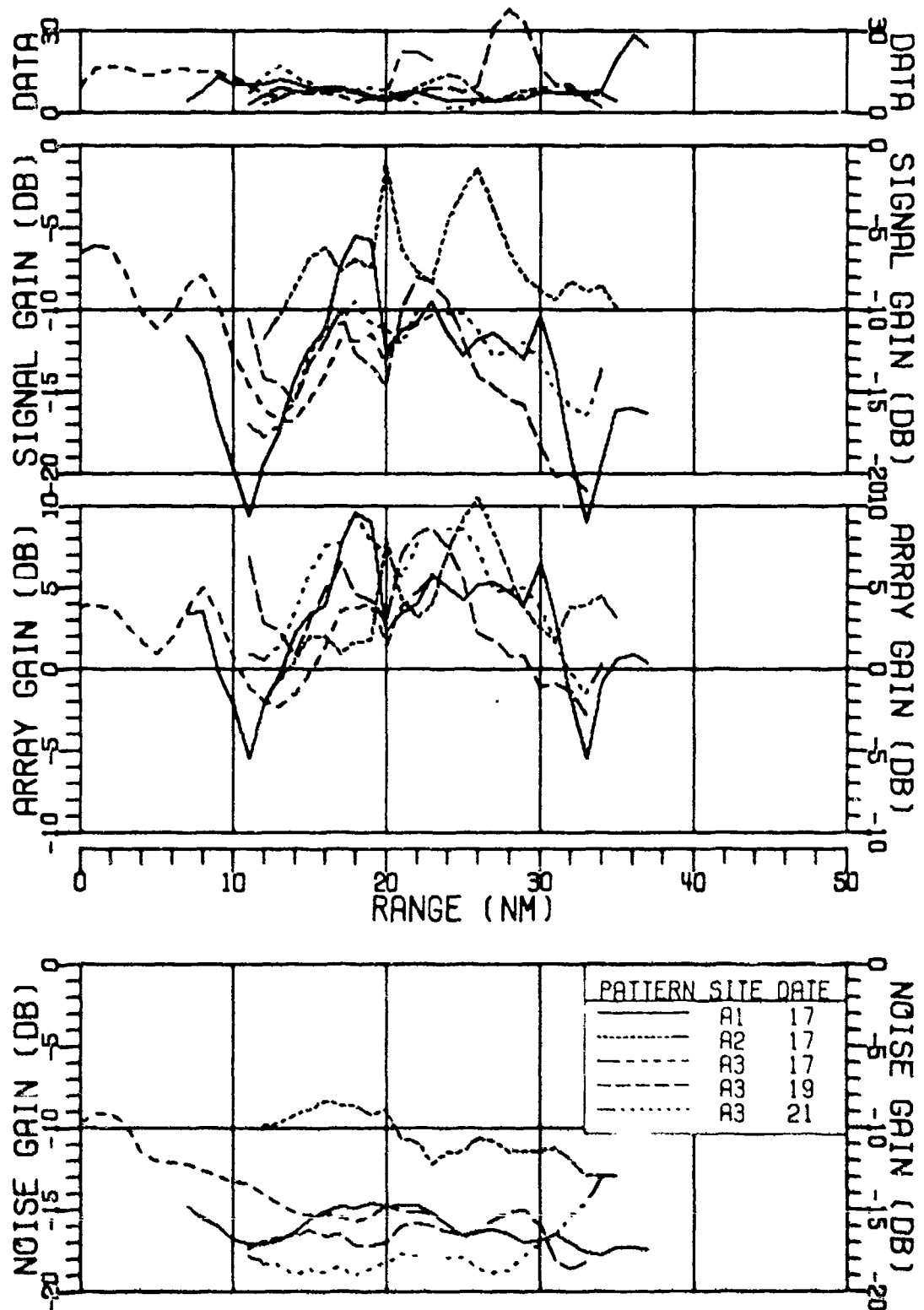


FIGURE III-183
MSS-FVT NEAR BOTTOM DIFFERENCED CARDIOIDS SENSOR
ARRAY GAIN RESULTS FOR 70HZ AT 166DB (U)

AS-77-2783

SECRET

SECRET

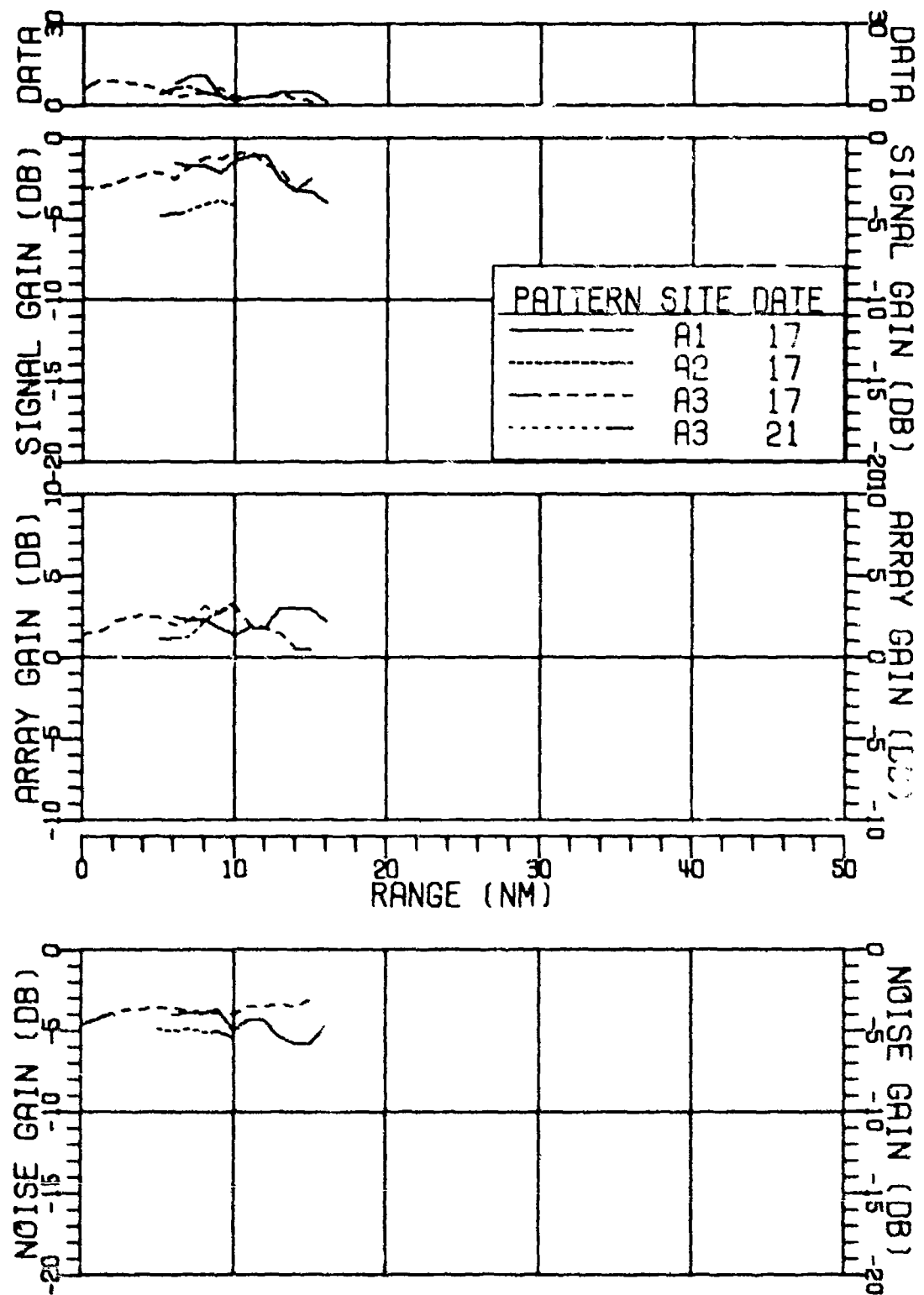


FIGURE III-184
MSS-FVT NEAR BOTTOM SINGLE CARDIOIDS SENSOR
ARRAY GAIN RESULTS FOR 155HZ AT 134DB (U)

AS 77-2784

SECRET

SECRET

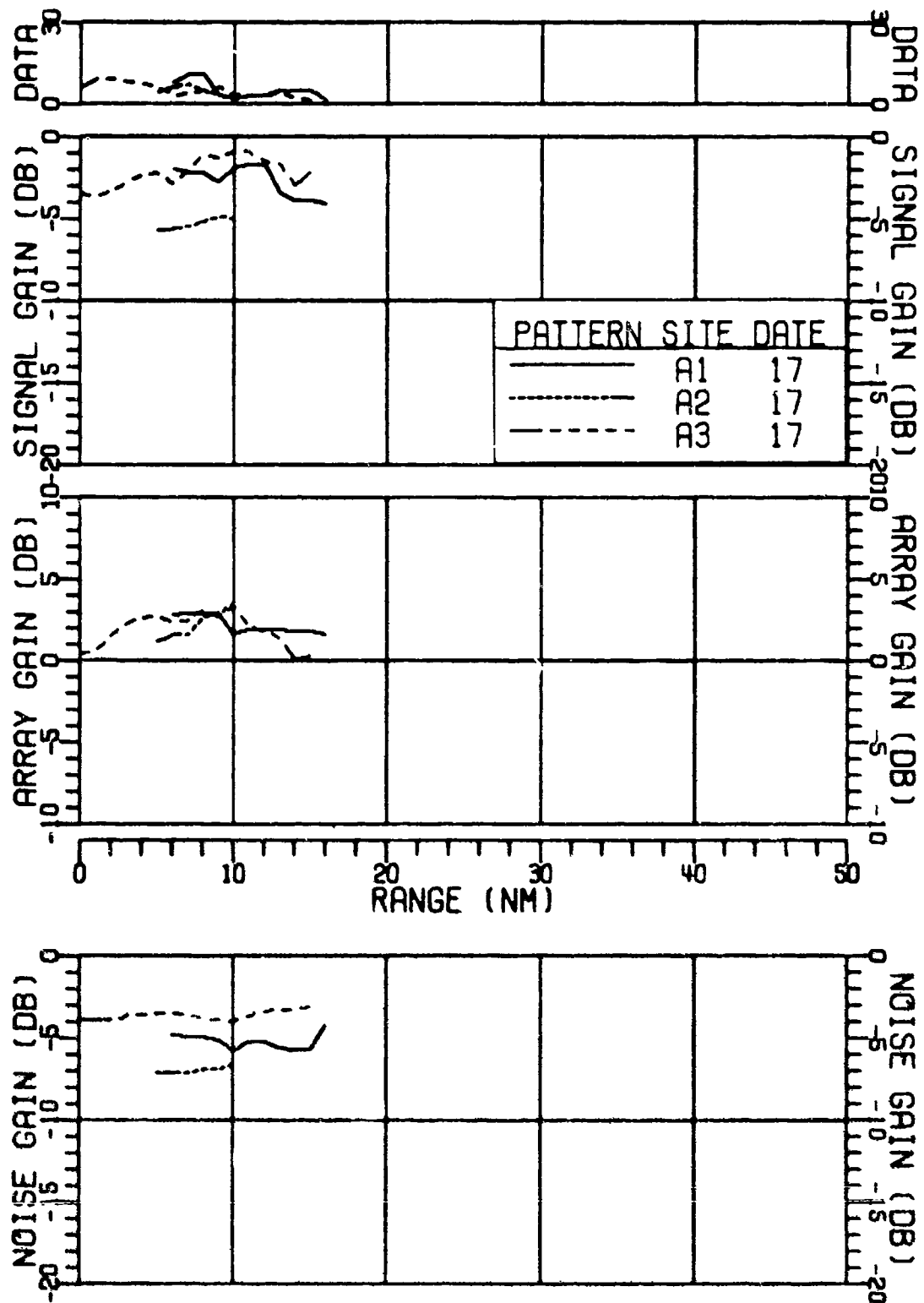


FIGURE III-185
MSS-FVT NEAR BOTTOM MAX GAIN LIMACONS SENSOR
ARRAY GAIN RESULTS FOR 155HZ AT 134DB (U)

AS-77-2785

SECRET

SECRET

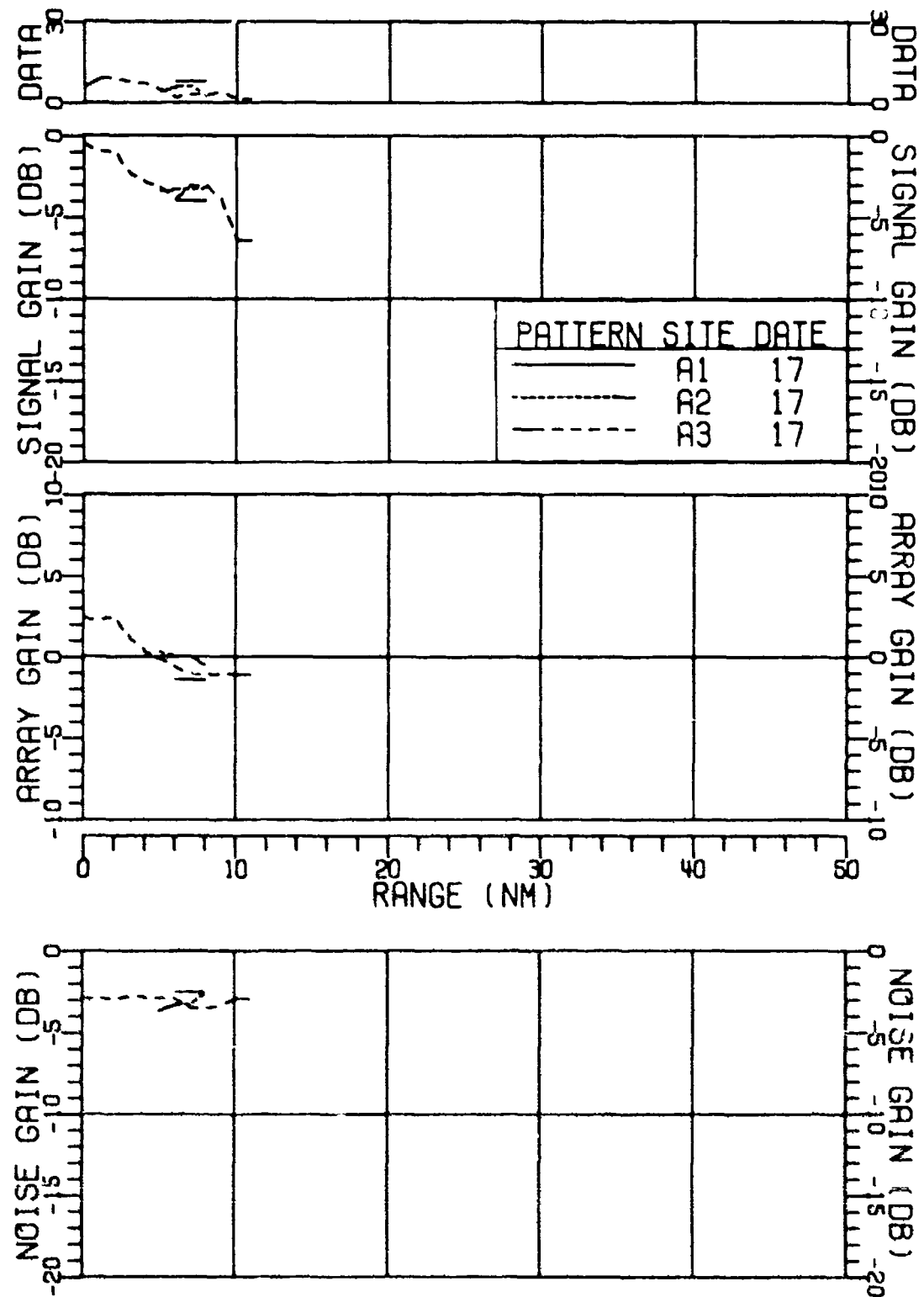


FIGURE III-186
MSS-FVT NEAR BOTTOM VERTICAL DIPOLE SENSOR
ARRAY GAIN RESULTS FOR 155HZ AT 1340B (U)

SECRET

SECRET

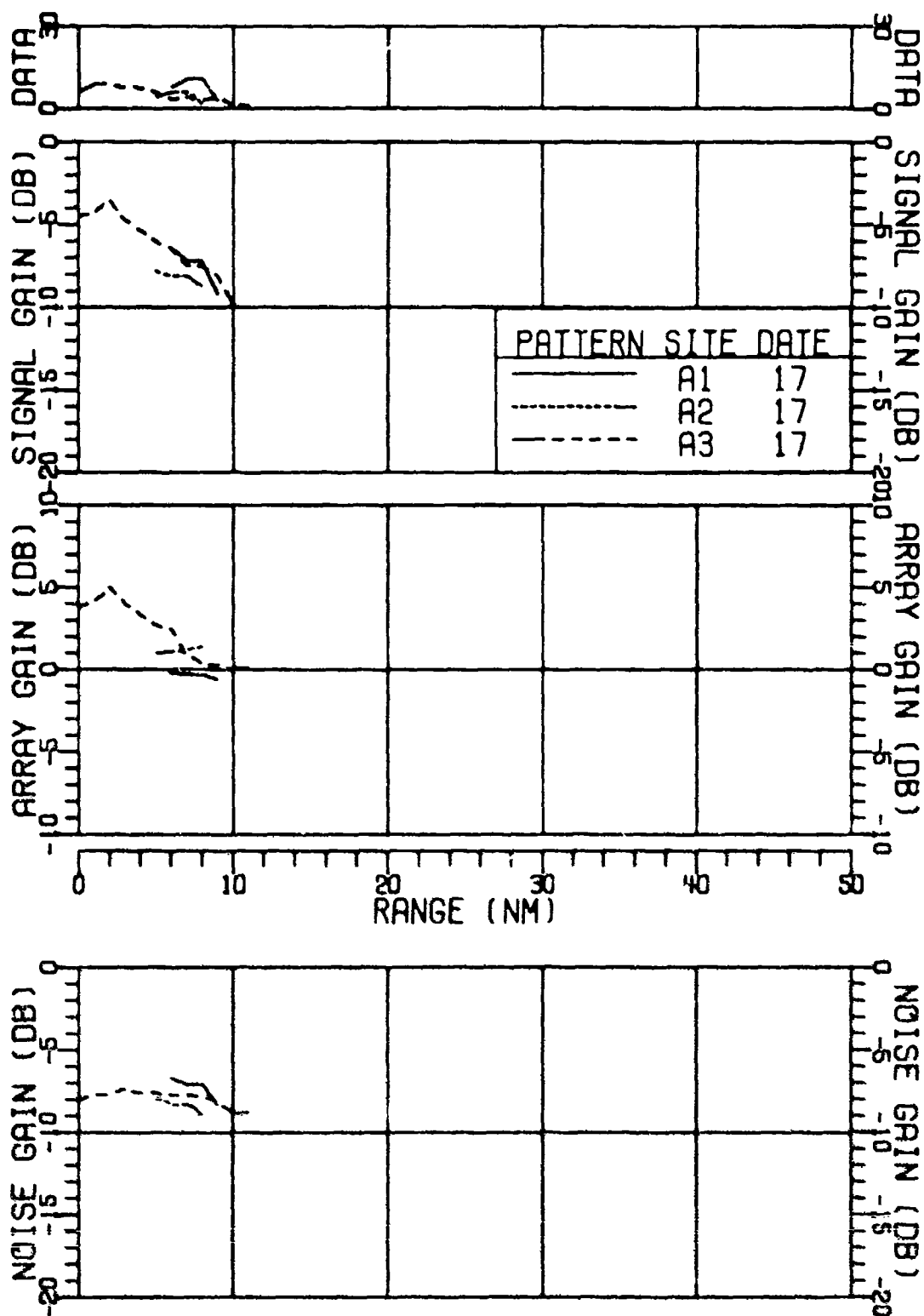


FIGURE III-187
MSS-FVT NEAR BOTTOM DIFFERENCED CARDIOIDS SENSOR
ARRAY GAIN RESULTS FOR 155HZ AT 134DB (U)

AS-77-2767

SECRET

SECRET

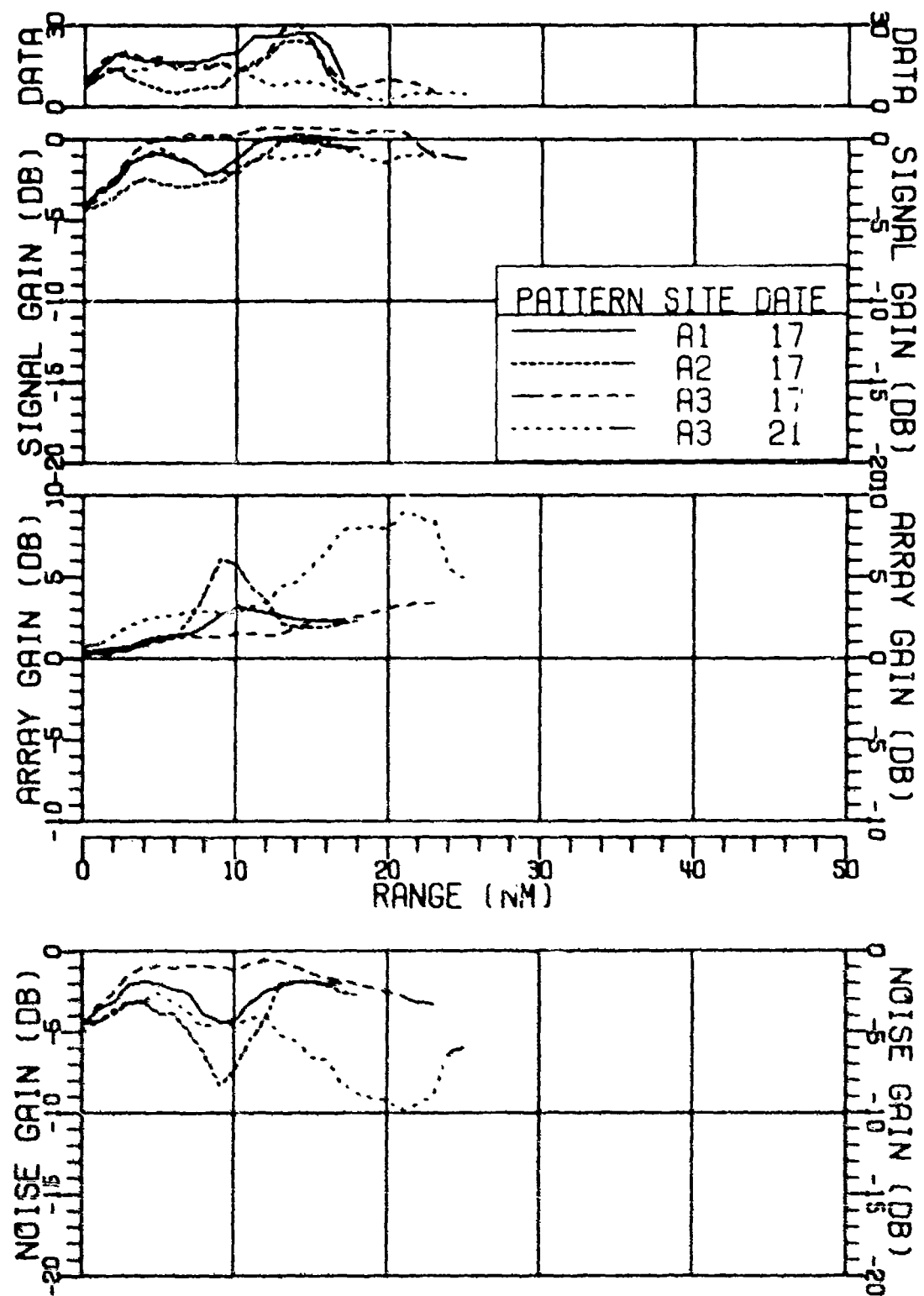


FIGURE III-188
MSS-FVT NEAR BOTTOM SINGLE CARDIOIDS SENSOR
ARRAY GAIN RESULTS FOR 160HZ AT 161DB (U)

AS-77-2788

221
SECRET

SECRET

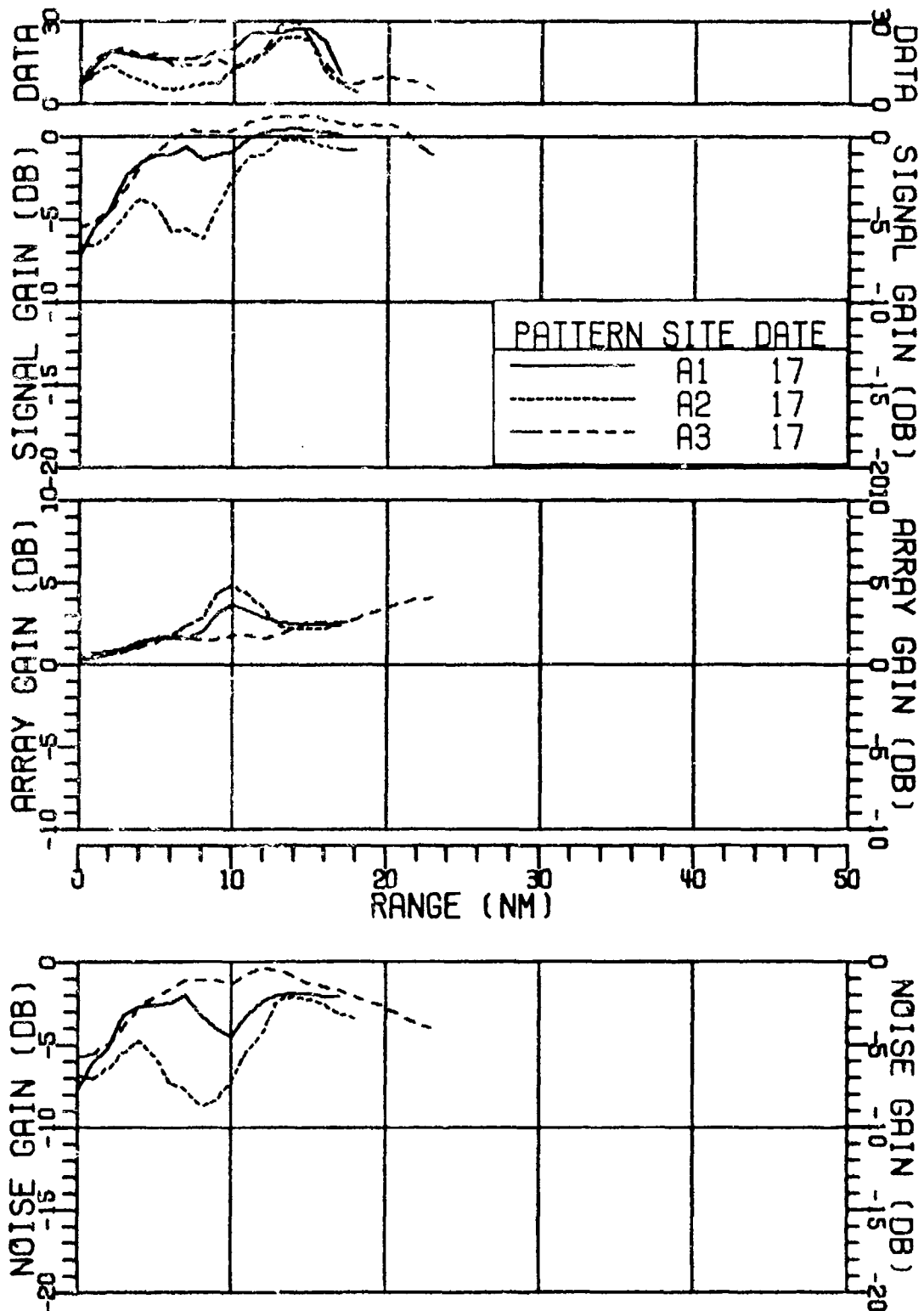


FIGURE III-189
MSS-FVT NEAR BOTTOM MAX GAIN LIMACONS SENSOR
ARRAY GAIN RESULTS FOR 160HZ AT 1610B (U)

AS-77-2789

SECRET

SECRET

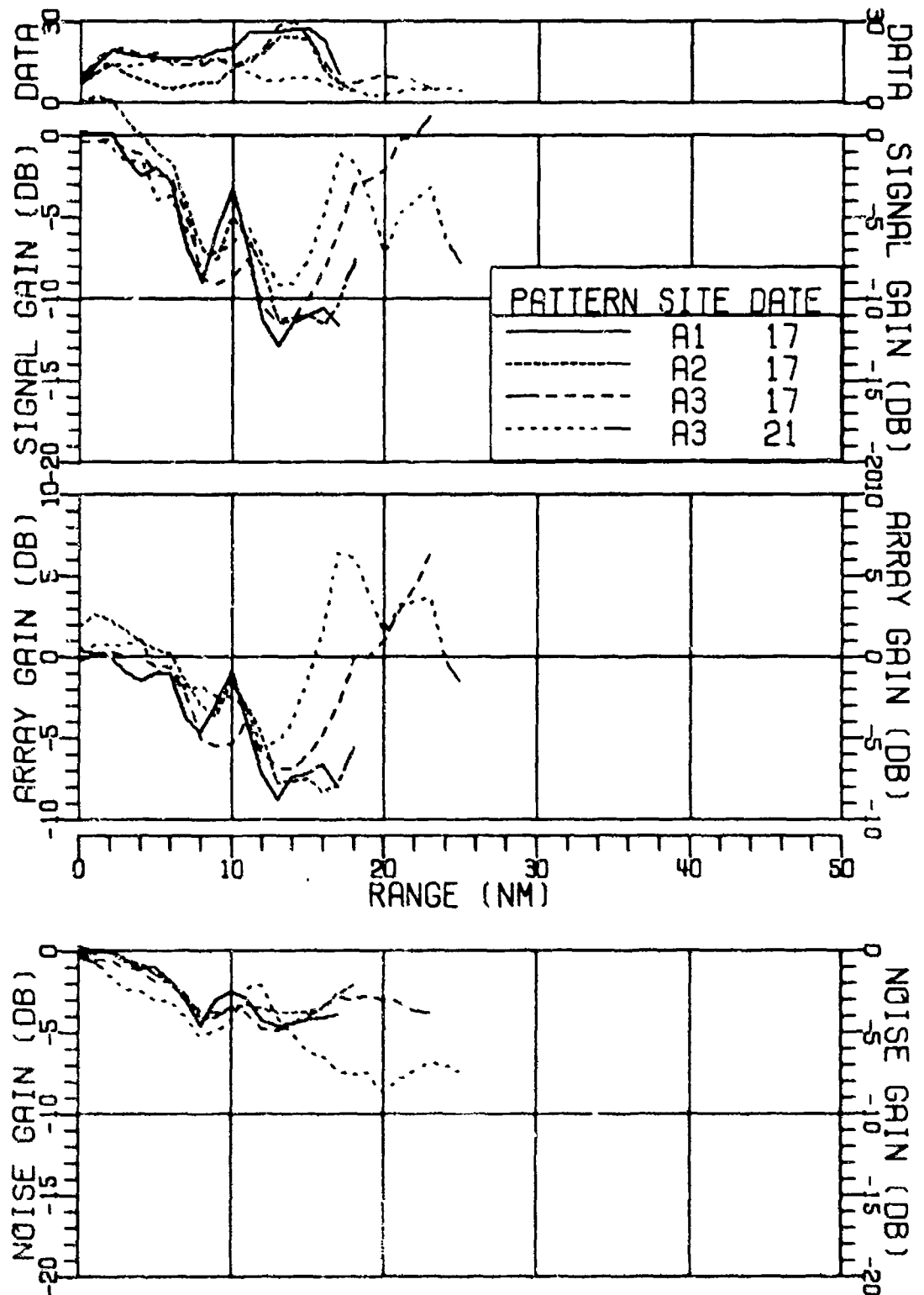


FIGURE III-190
MSS-FVT NEAR BOTTOM VERTICAL DIPOLE SENSOR
ARRAY GAIN RESULTS FOR 160HZ AT 161DB (U)

AS-77-2790

SECRET

SECRET

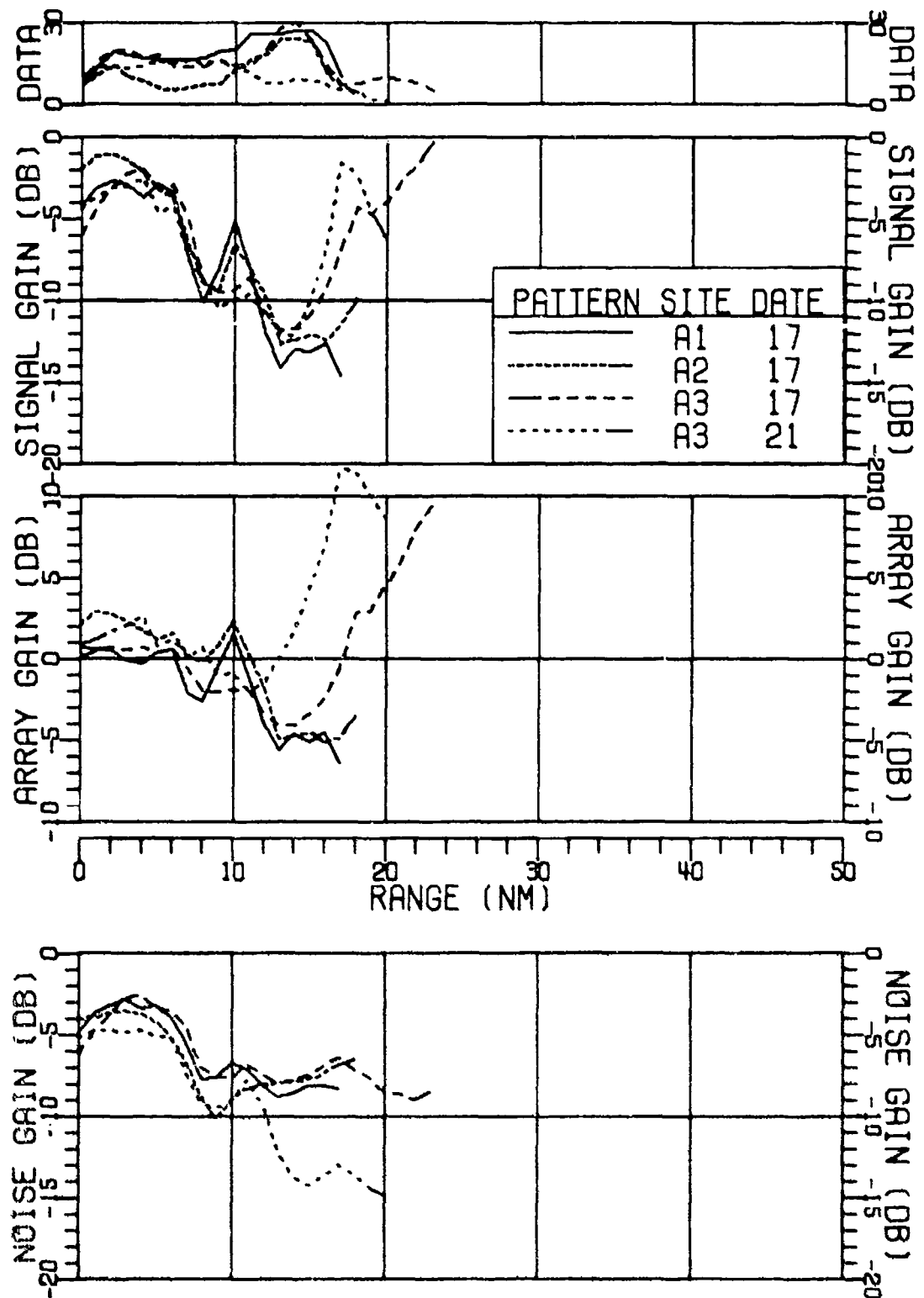


FIGURE III-191
MSS-FVT NEAR BOTTOM DIFFERENCED CARDIoids SENSOR
ARRAY GAIN RESULTS FOR 160HZ AT 161DB (U)

AS-77-2791

SECRET

SECRET

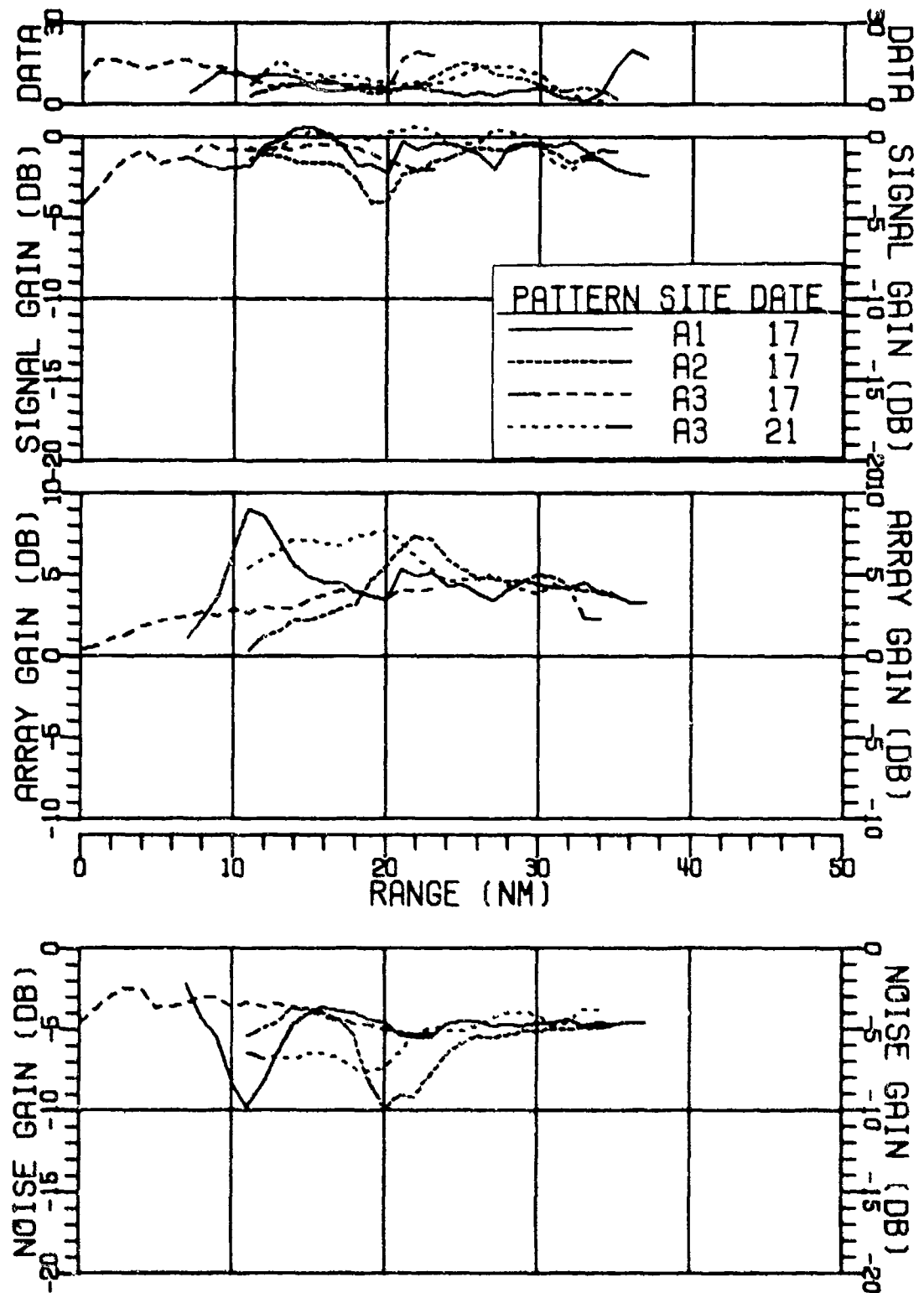


FIGURE III-192
MSS-FVT NEAR BOTTOM SINGLE CARDICIDS SENSOR
ARRAY GAIN RESULTS FOR 170HZ AT 156DB (U)

AS-77-2792

SECRET

SECRET

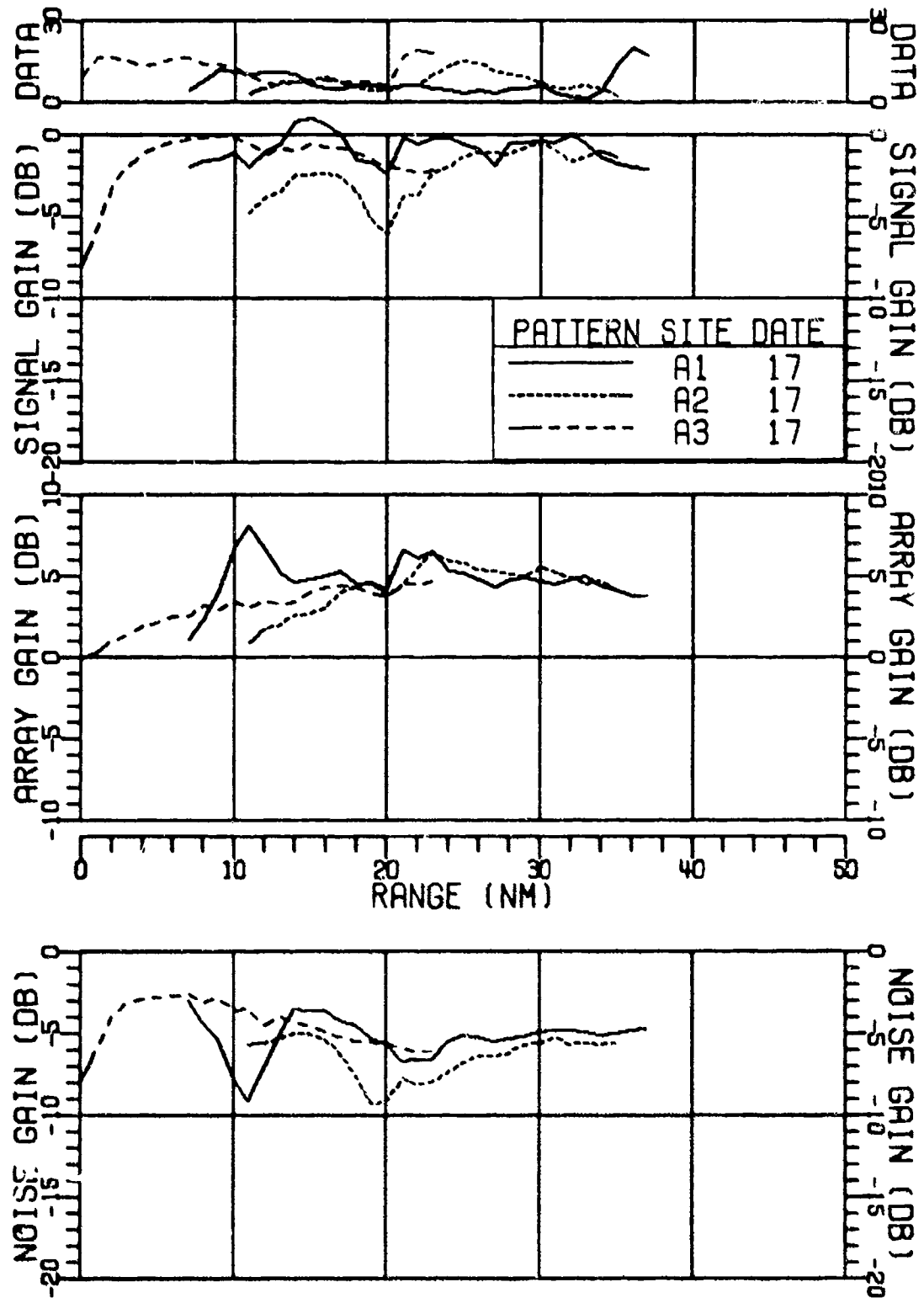


FIGURE III-193
MSS-FVT NEAR BOTTOM MAX GAIN LIMACONS SENSOR
ARRAY GAIN RESULTS FOR 170HZ AT 156DB (U)

AS-77-2793

SECRET

SECRET

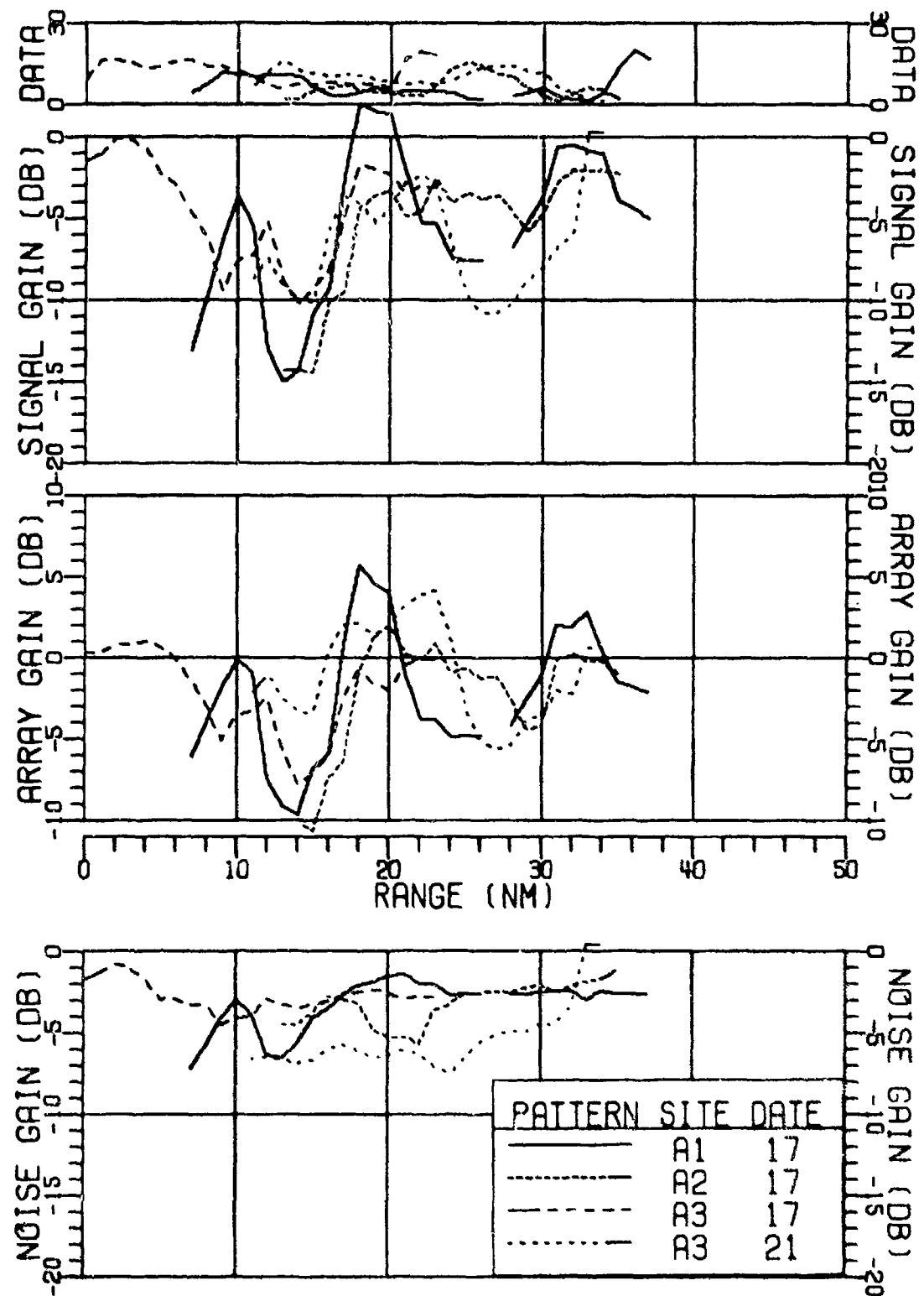


FIGURE III-194
MSS-FVT NEAR BOTTOM VERTICAL DIPOLE SENSOR
ARRAY GAIN RESULTS FOR 170HZ AT 156DB (U)

AS-77-2794

SECRET

SECRET

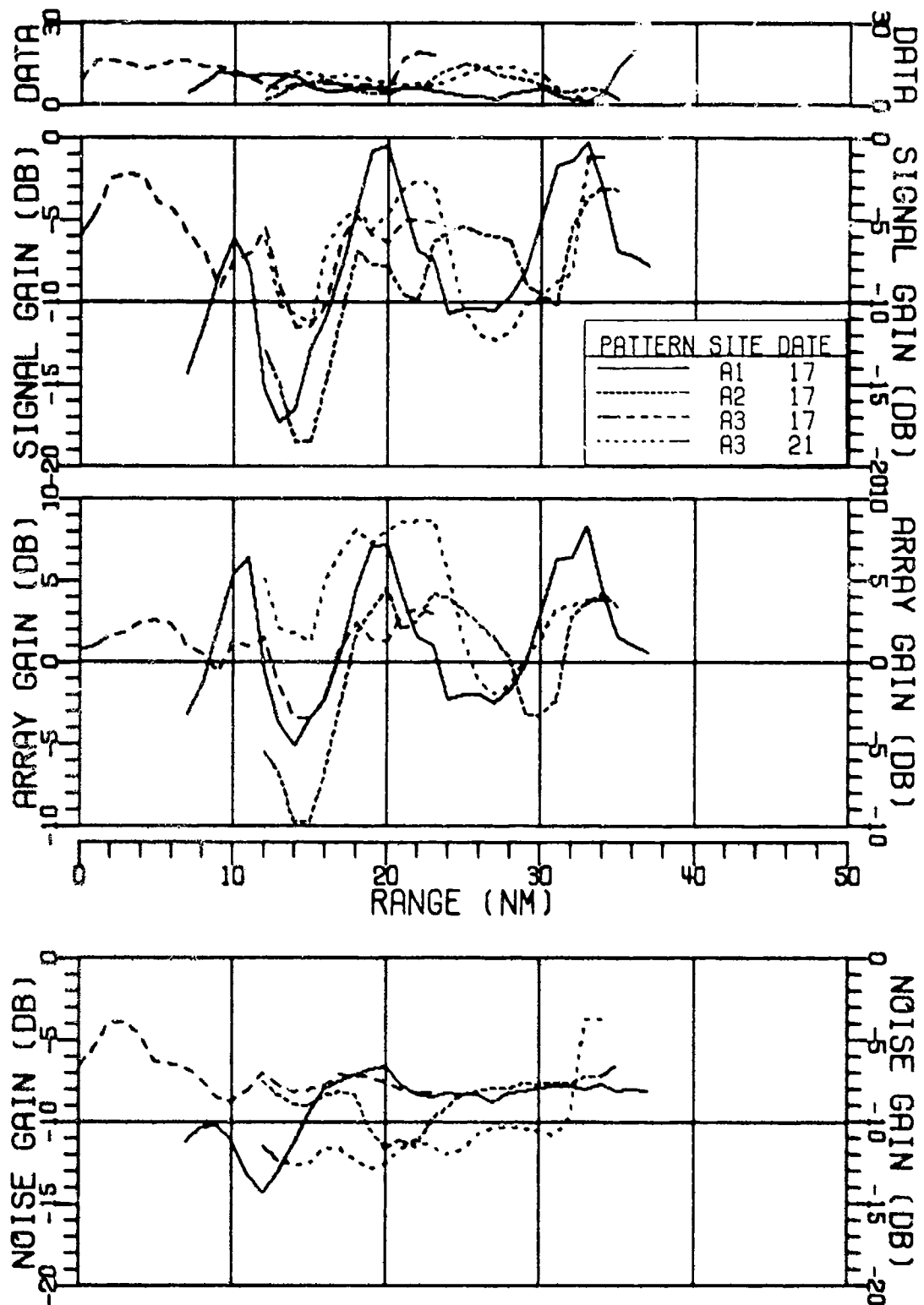


FIGURE III-195
MSS-FVT NEAR BOTTOM DIFFERENCED CARDIOIDS SENSOR
ARRAY GAIN RESULTS FOR 170HZ AT 156DB (U)

AS-77-2795

SECRET

SECRET

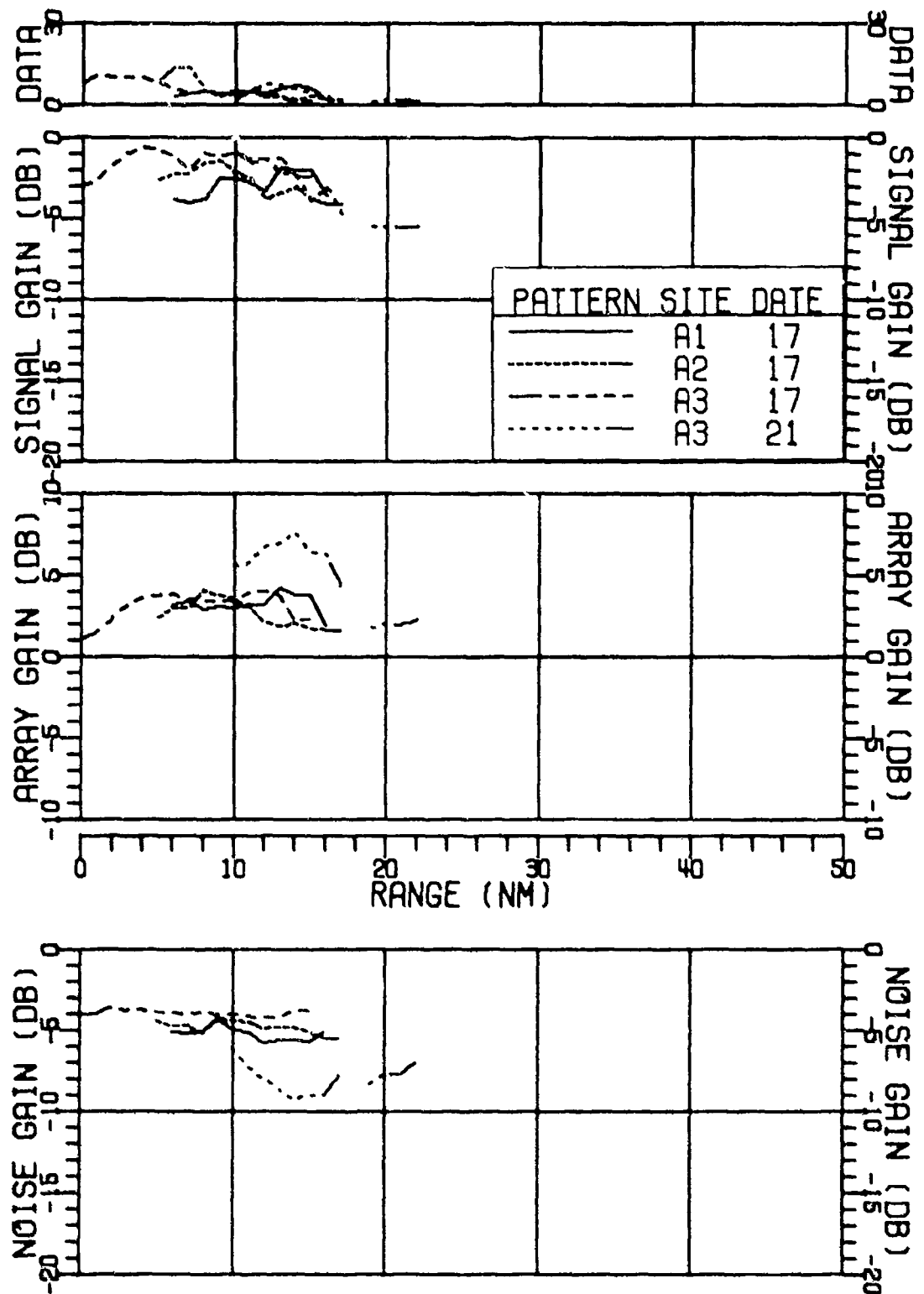


FIGURE III-196
MSS-FVT NEAR BOTTOM SINGLE CARDIOIDS SENSOR
ARRAY GAIN RESULTS FOR 305HZ AT 136DB (U)

AS-77-2796

SECRET

SECRET

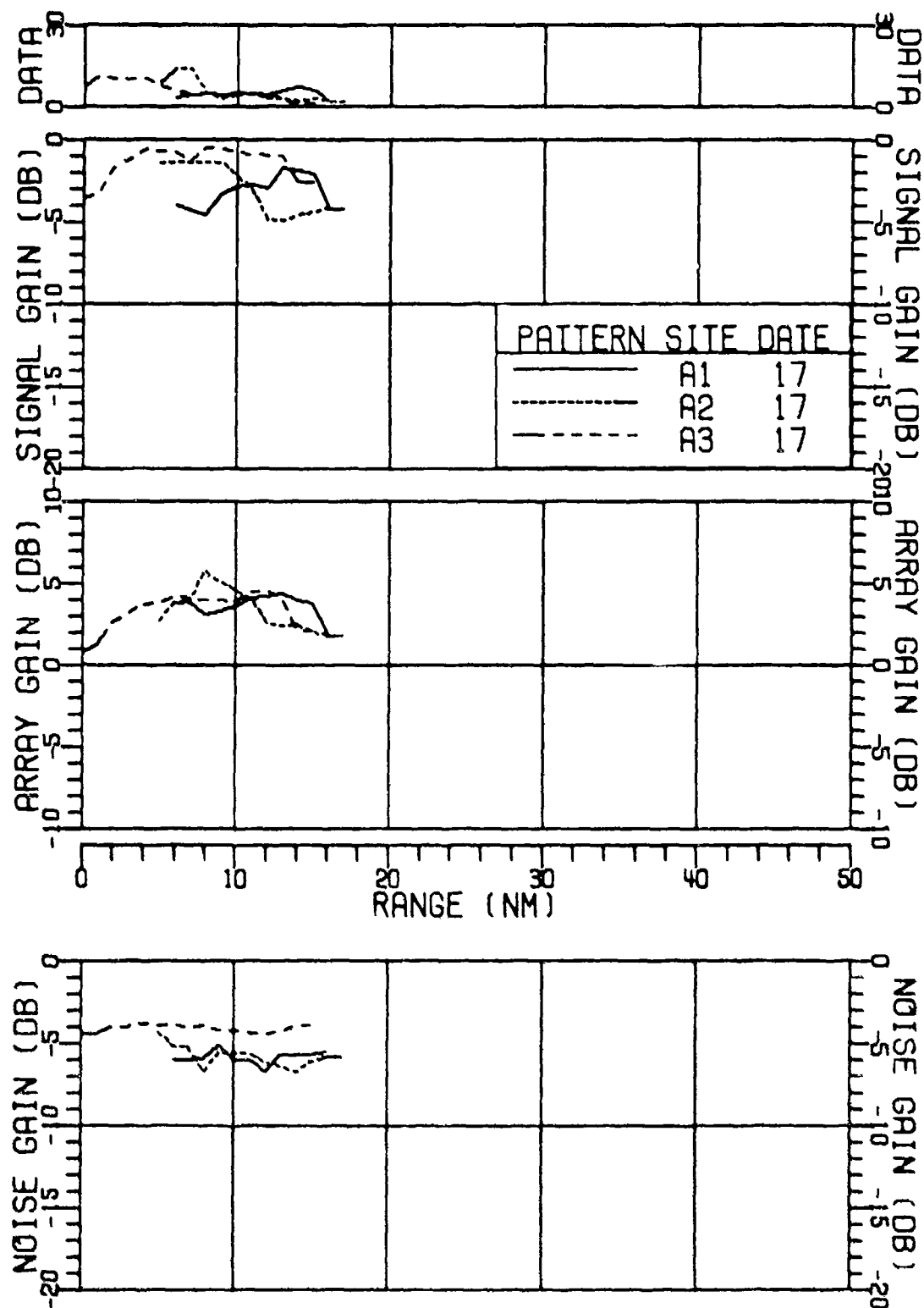


FIGURE III-197
MSS-FVT NEAR BOTTOM MAX GAIN LIMACONS SENSOR
ARRAY GAIN RESULTS FOR 305HZ AT 136DB (U)

AS-77-2797

SECRET

SECRET

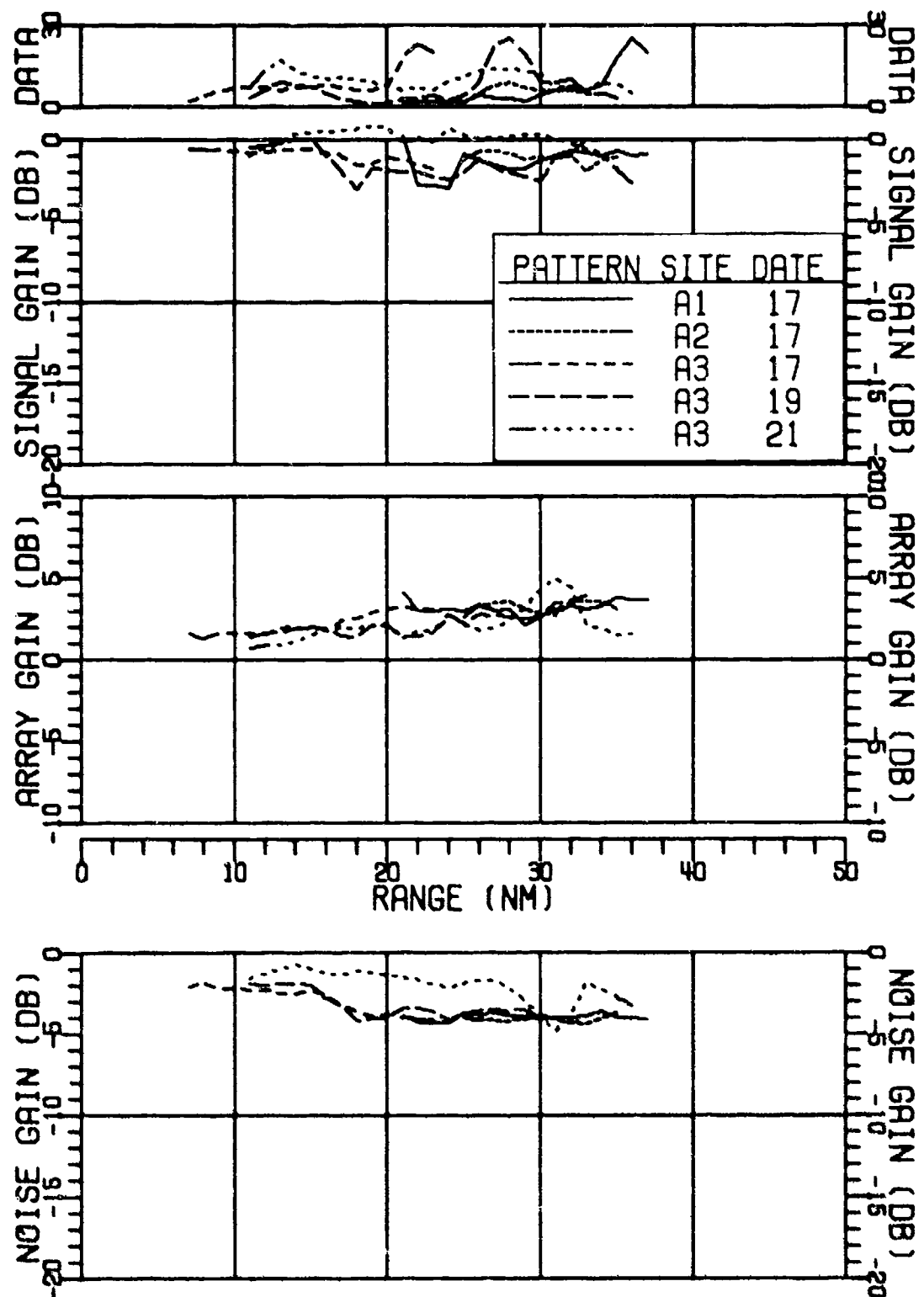


FIGURE III-198
MSS-FVT NEAR BOTTOM SINGLE CARDIOIDS SENSOR
ARRAY GAIN RESULTS FOR 335HZ AT 154DB (U)

AS-77-2798

SECRET

SECRET

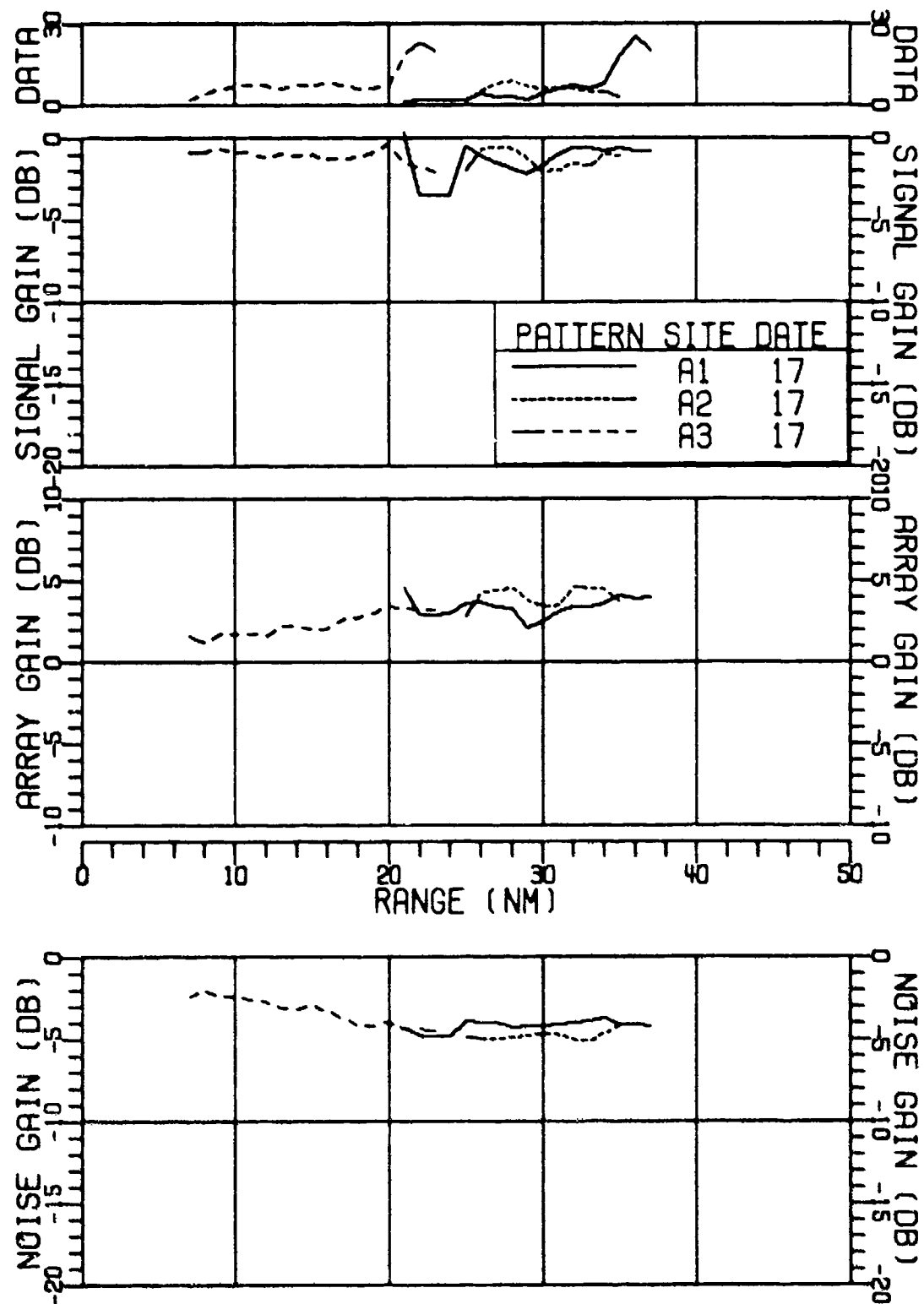


FIGURE III-199
MSS-FVT NEAR BOTTOM MAX GAIN LIMACONS SENSOR
ARRAY GAIN RESULTS FOR 335HZ AT 154DB (U)

AS-77-2799

SECRET

UNCLASSIFIED

APPENDIX E

PERCENTAGE DETECTION versus RANGE CURVES (U)

(FIGURES III-200 - III-235)

UNCLASSIFIED

SECRET

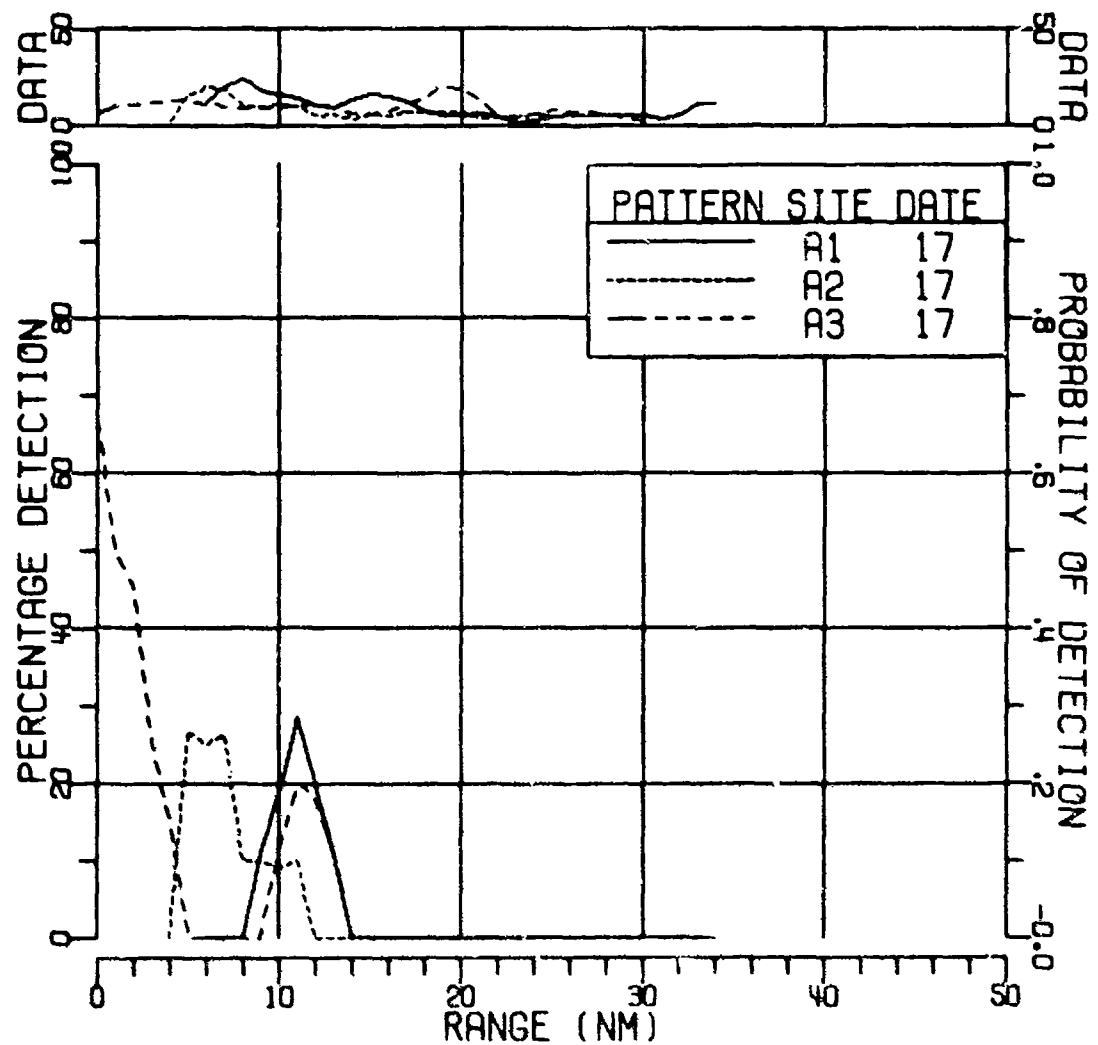


FIGURE III-200
MSS-FVT NEAR BOTTOM OMNIDIRECTIONAL SENSOR
DETECTION RESULTS FOR 55HZ AT 141DB (U)

AS-77-2800

235
SECRET

SECRET

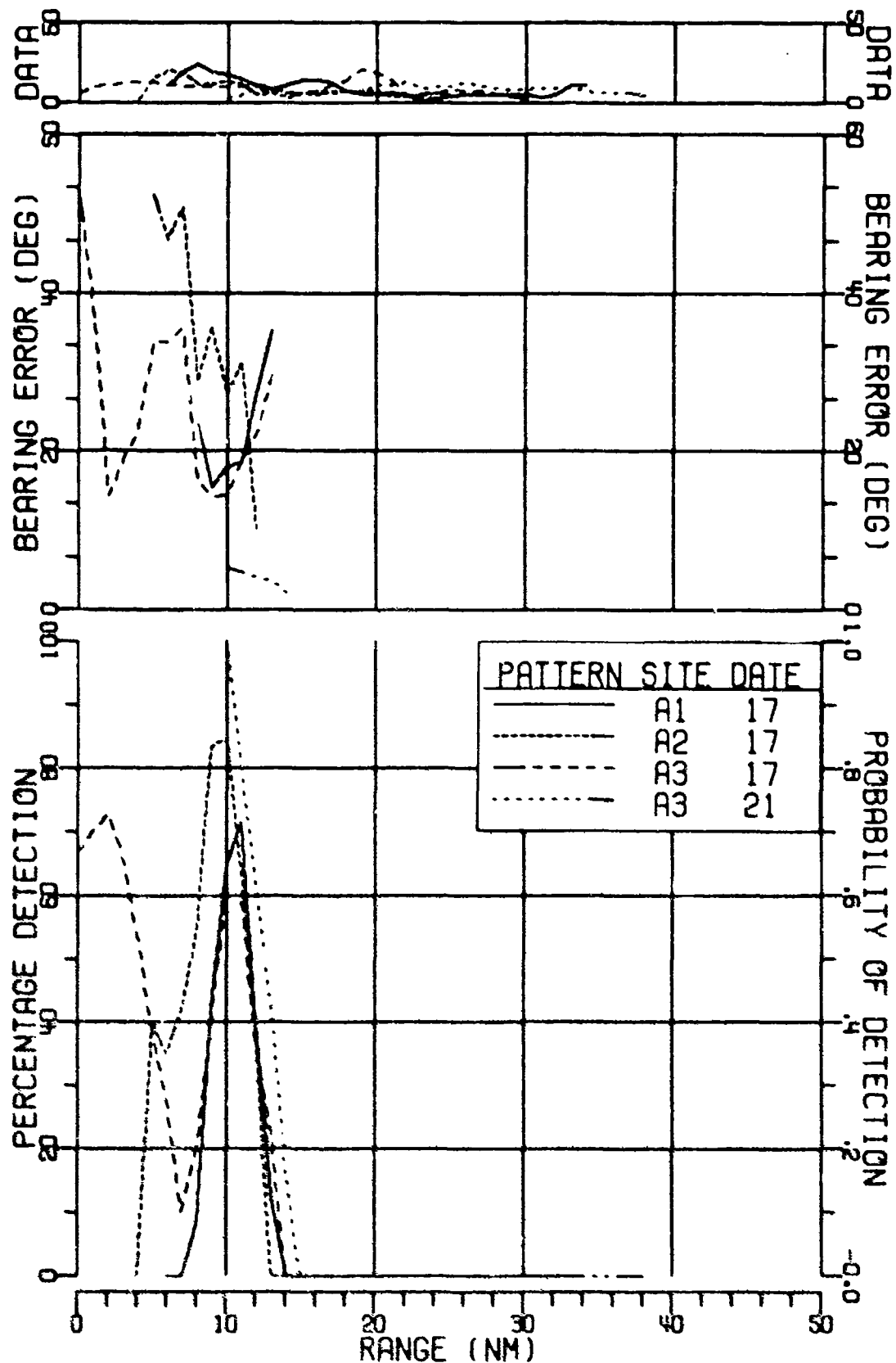


FIGURE III-201
MSS-FVT NEAR BOTTOM SINGLE CARDIOIDS SENSOR
DETECTION RESULTS FOR 55HZ AT 141DB (U)

SECRET

SECRET

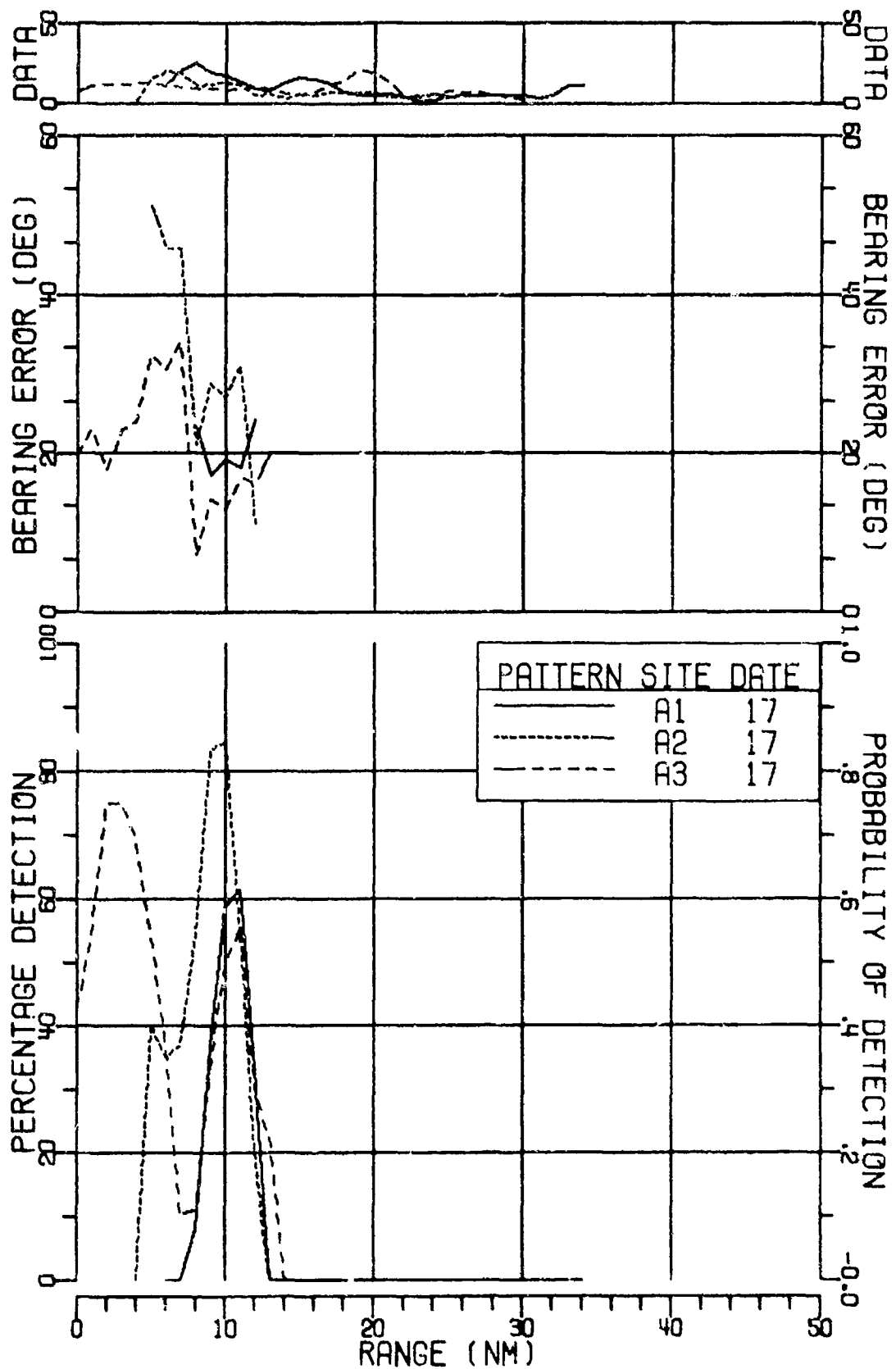


FIGURE III-202
MSS-FVT NEAR BOTTOM MAX GAIN LIMACONS SENSOR
DETECTION RESULTS FOR 55HZ AT 141DB (U)

SECRET

SECRET

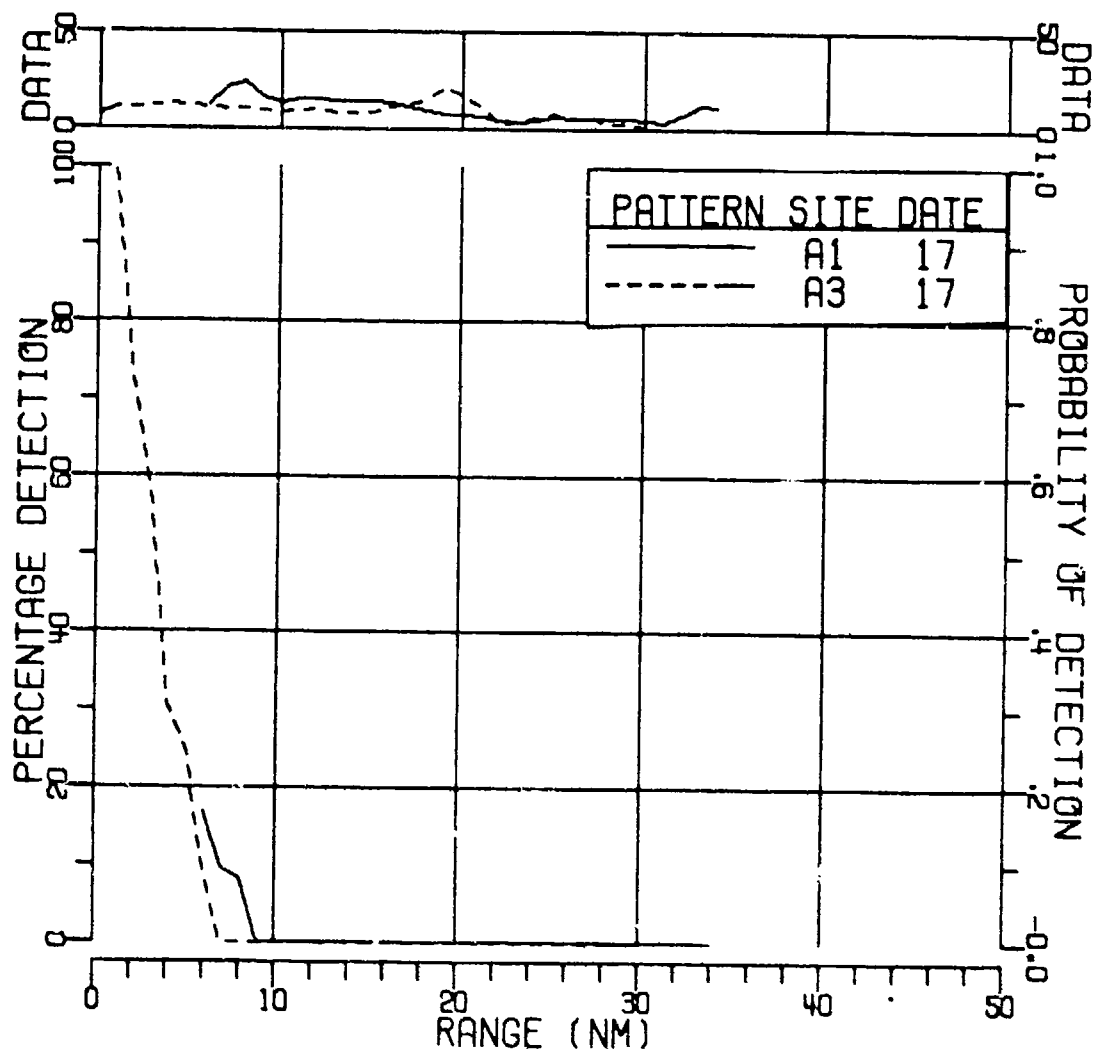


FIGURE III-203
MSS-FVT NEAR BOTTOM VERTICAL DIPOLE SENSOR
DETECTION RESULTS FOR 55HZ AT 141DB (U)

AS-77-2803

SECRET

SECRET

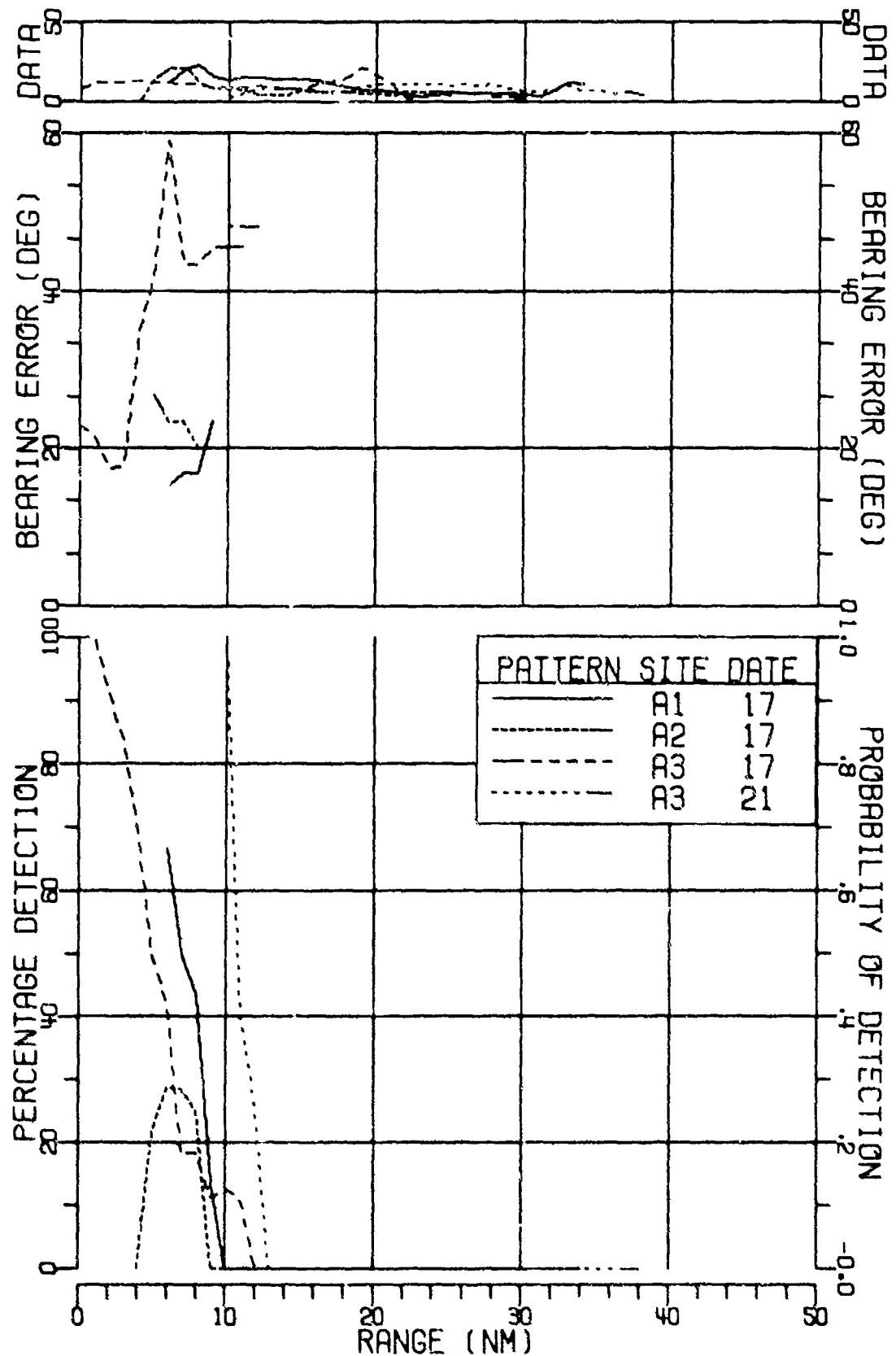


FIGURE III-204
MSS-FVT NEAR BOTTOM DIFFERENCED CARDIOIDS SENSOR
DETECTION RESULTS FOR 55HZ AT 141DB (U)

SECRET

SECRET

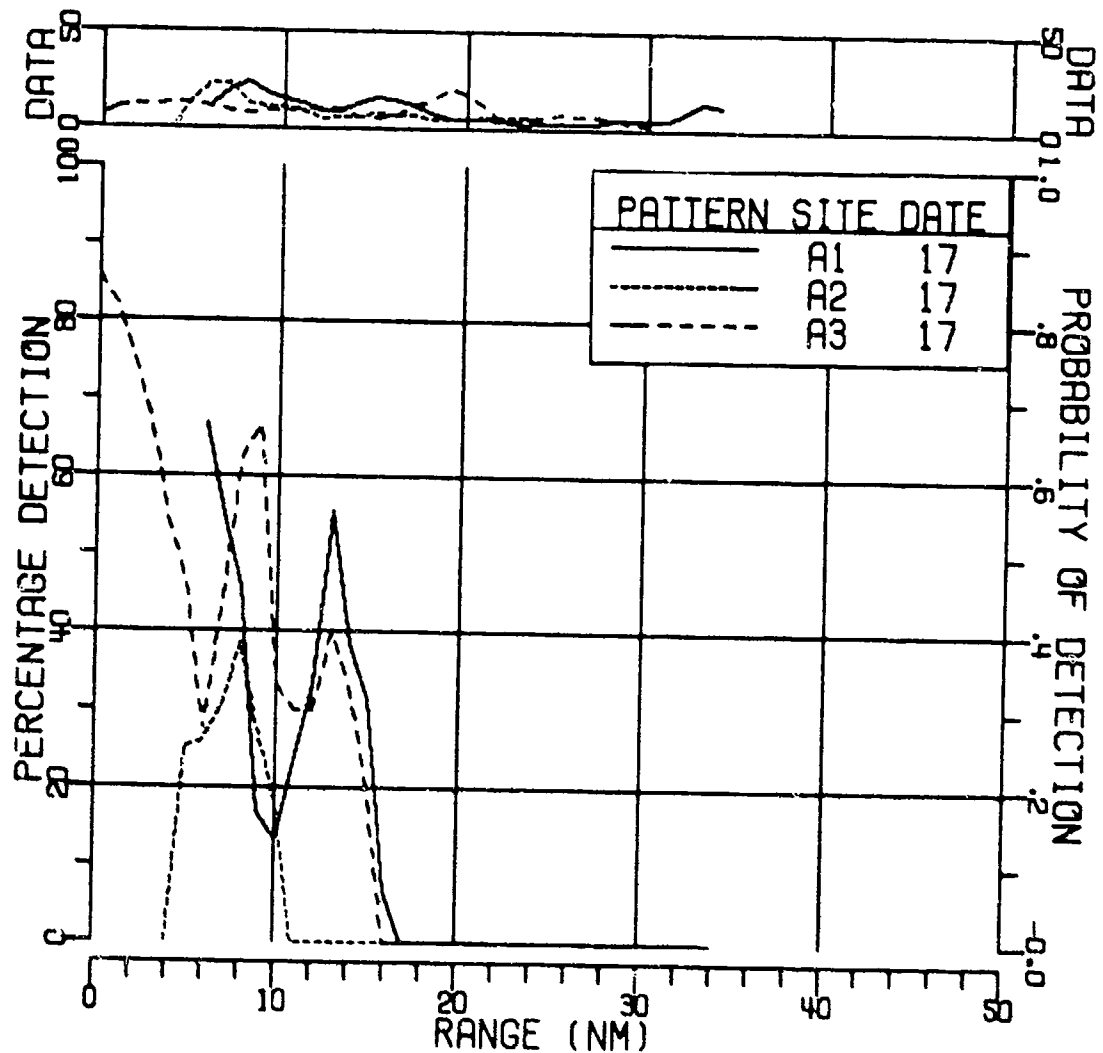


FIGURE III-205
MSS-FVT NEAR BOTTOM OMNIDIRECTIONAL SENSOR
DETECTION RESULTS FOR 155HZ AT 134DB (U)

AS-77-2805

SECRET

SECRET

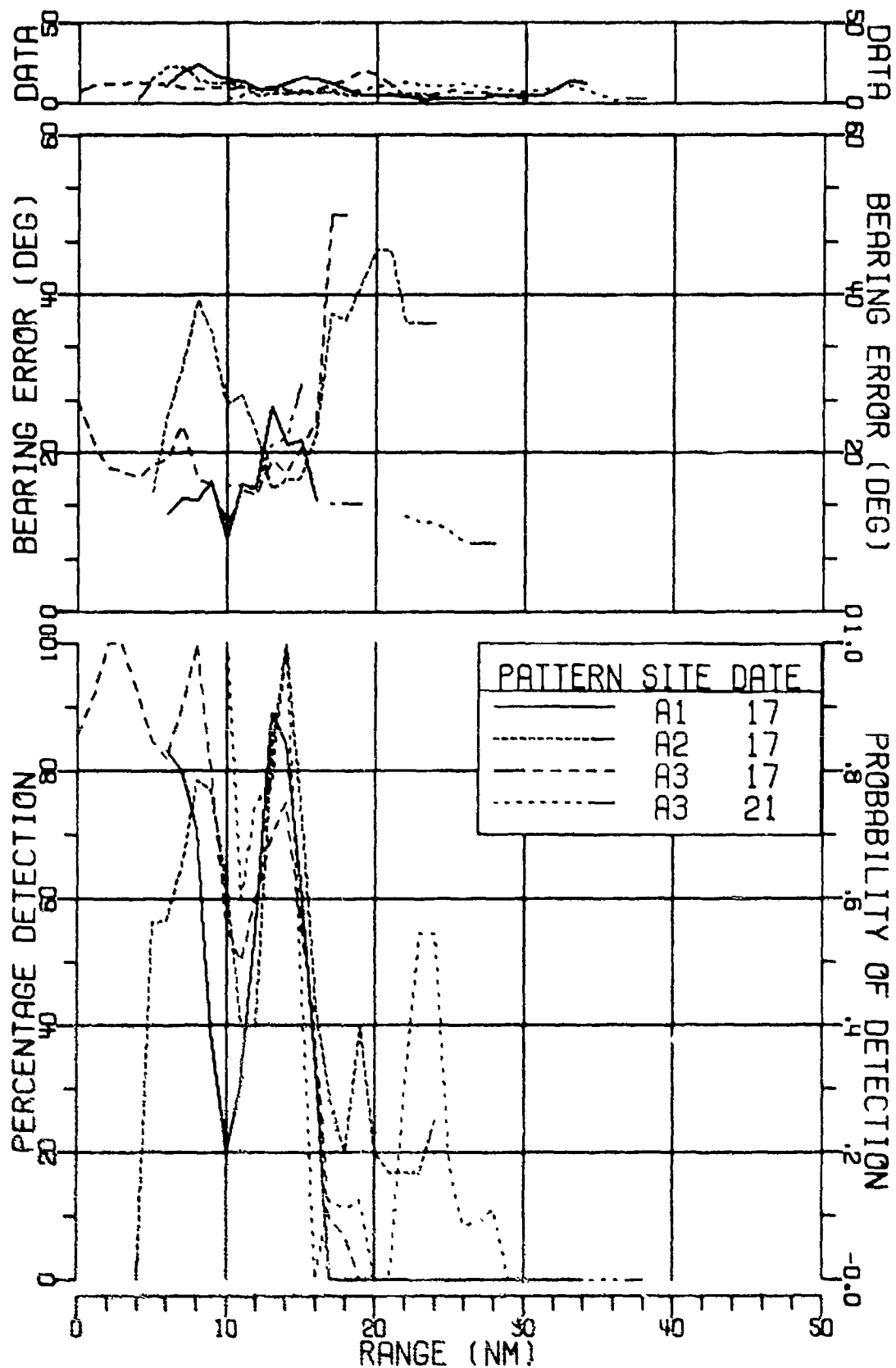


FIGURE III-206
MSS-FVT NEAR BOTTOM SINGLE CARDIOIDS SENSOR
DETECTION RESULTS FOR 155HZ AT 134DB (U)

241

SECRET

AS-77-2

SECRET

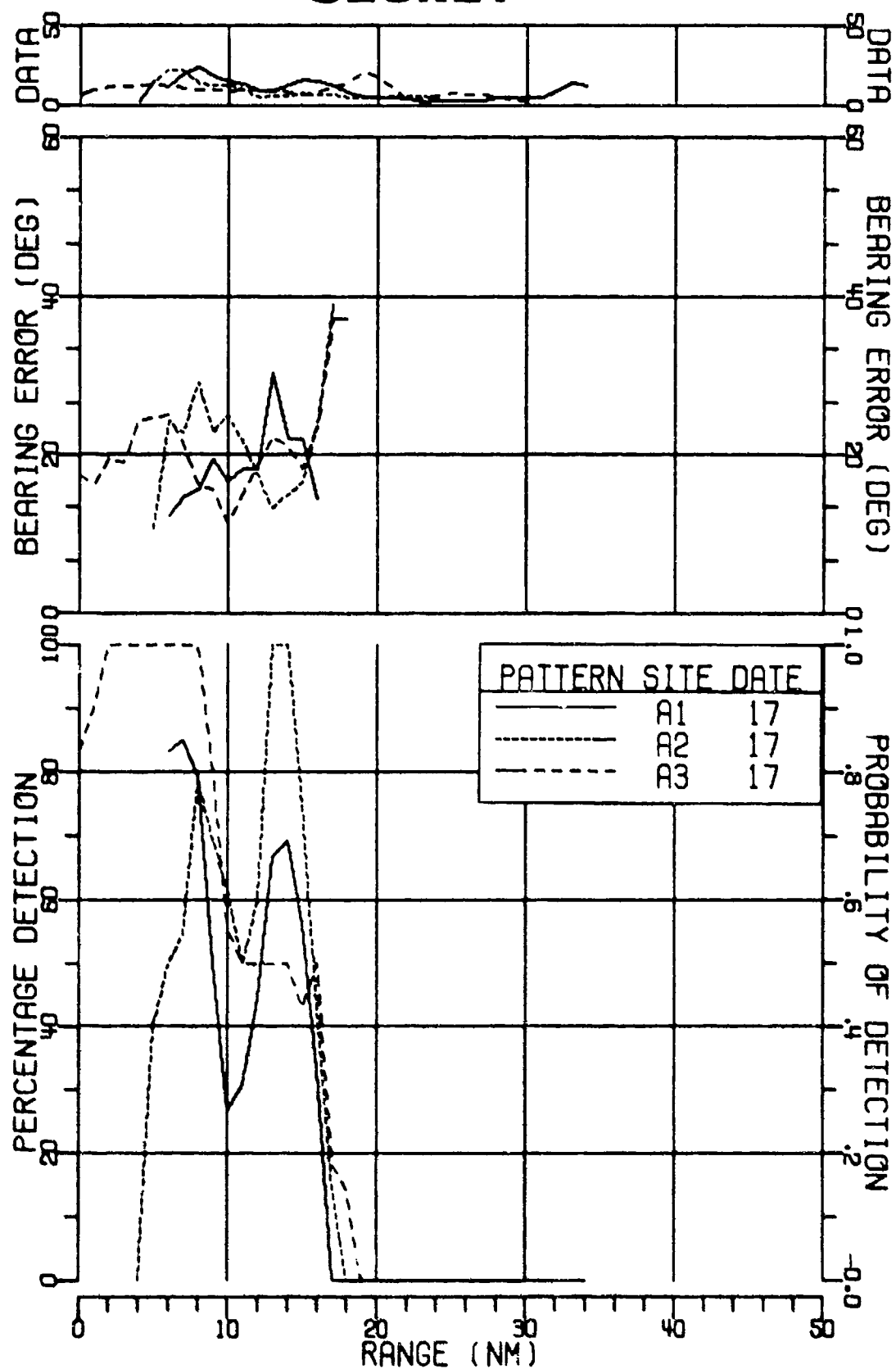


FIGURE III-207
MSS-FVT NEAR BOTTOM MAX GAIN LIMACONS SENSOR
DETECTION RESULTS FOR 155HZ AT 134DB (U)

SECRET

SECRET

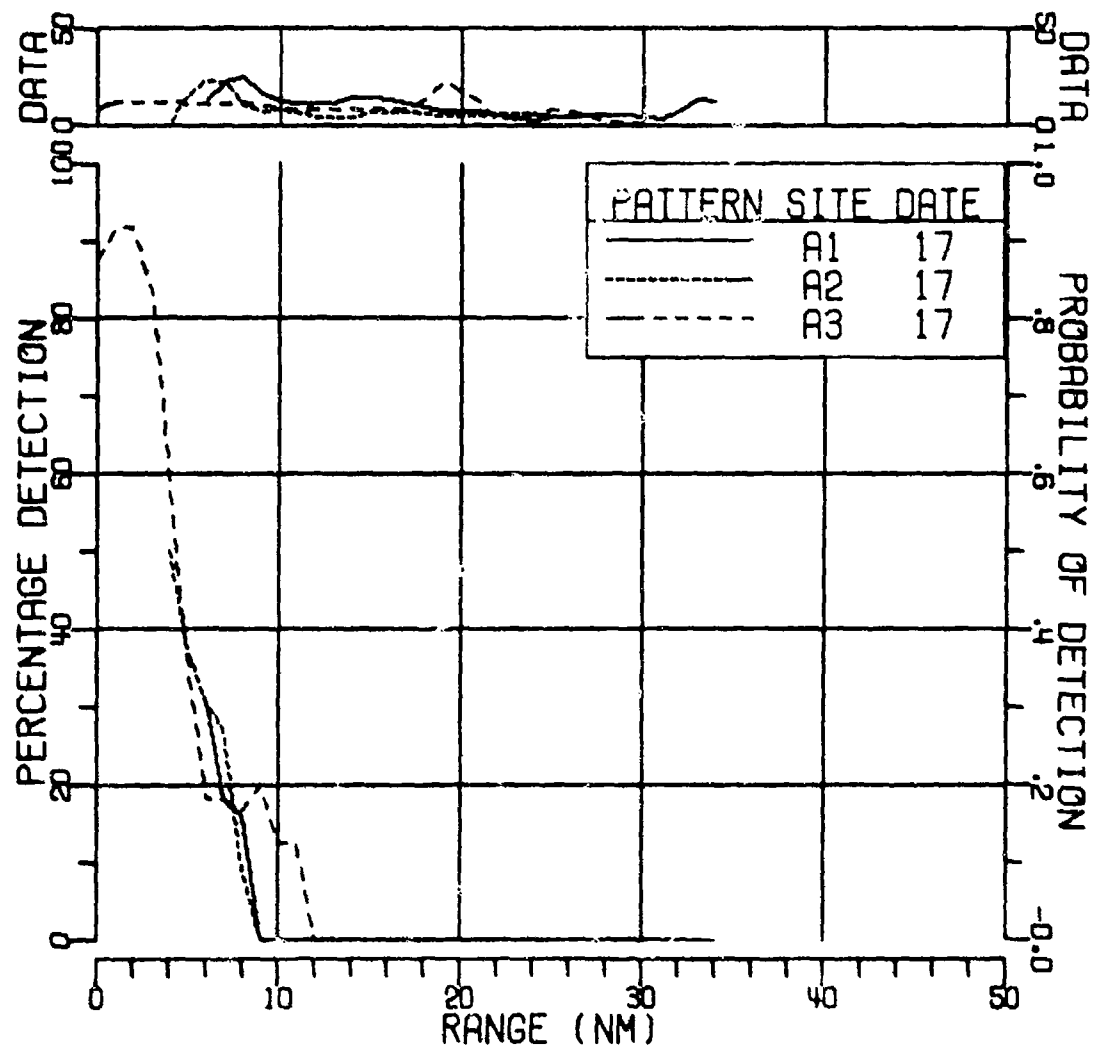


FIGURE III-208
MSS-FVT NEAR BOTTOM VERTICAL DIPOLE SENSOR
DETECTION RESULTS FOR 155HZ AT 134DB (U)

AS-77-2808

SECRET

SECRET

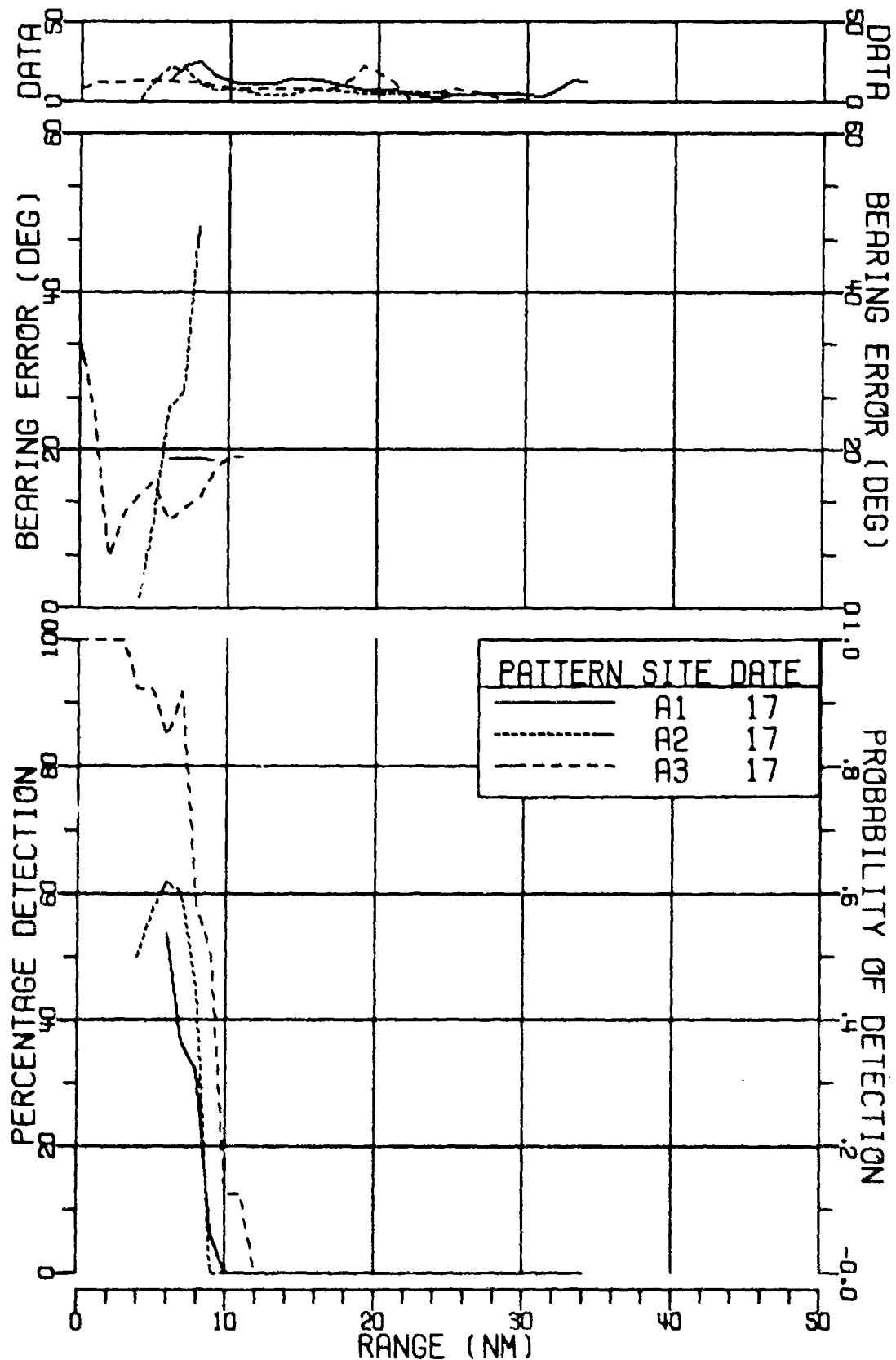


FIGURE III-209
MSS-FVT NEAR BOTTOM DIFFERENCED CARDIOIDS SENSOR
DETECTION RESULTS FOR 155HZ AT 134DB (U)

SECRET

SECRET

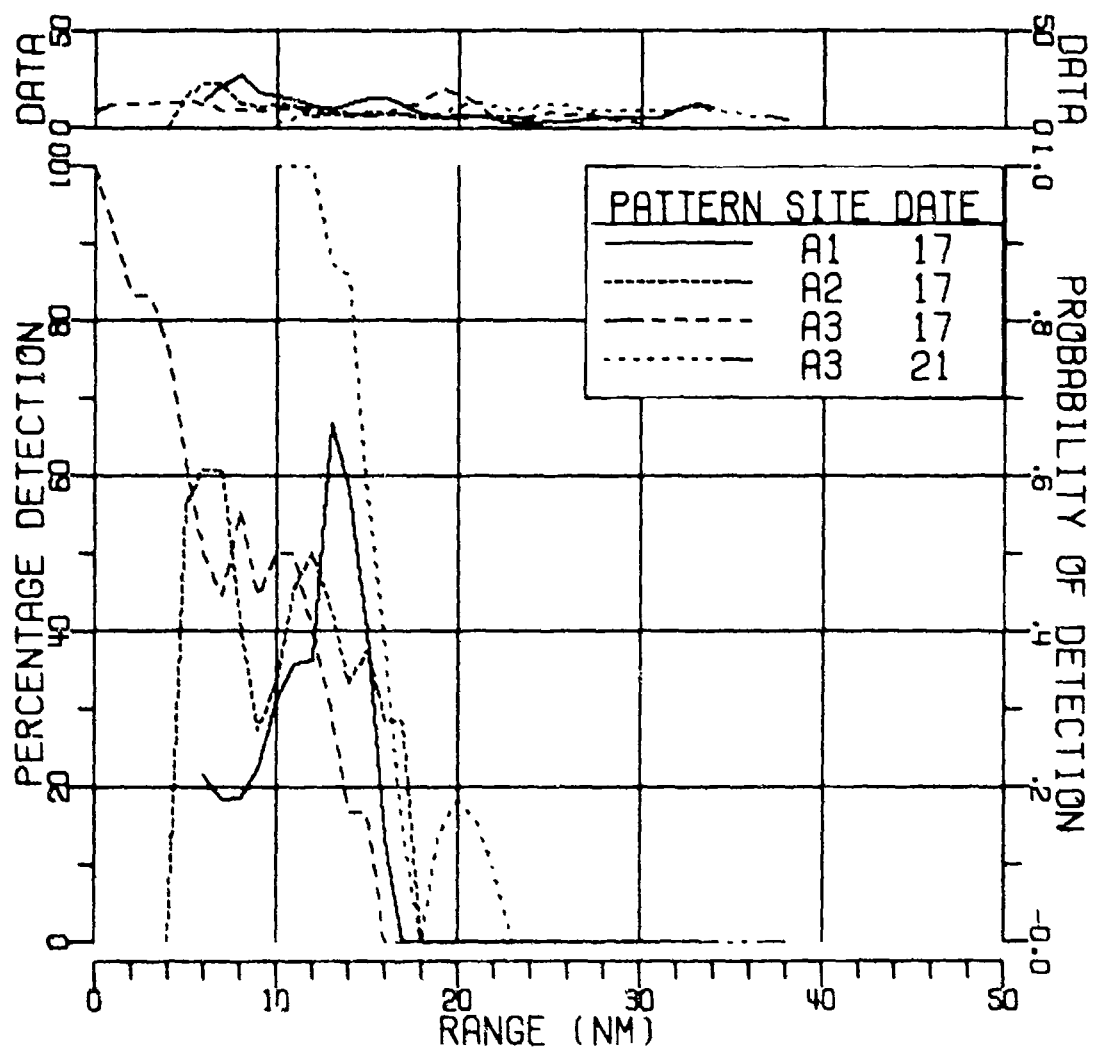


FIGURE III-210
MSS-FVT NEAR BOTTOM OMNIDIRECTIONAL SENSOR
DETECTION RESULTS FOR 305HZ AT 136DB (U)

AS-77-2810

SECRET

SECRET

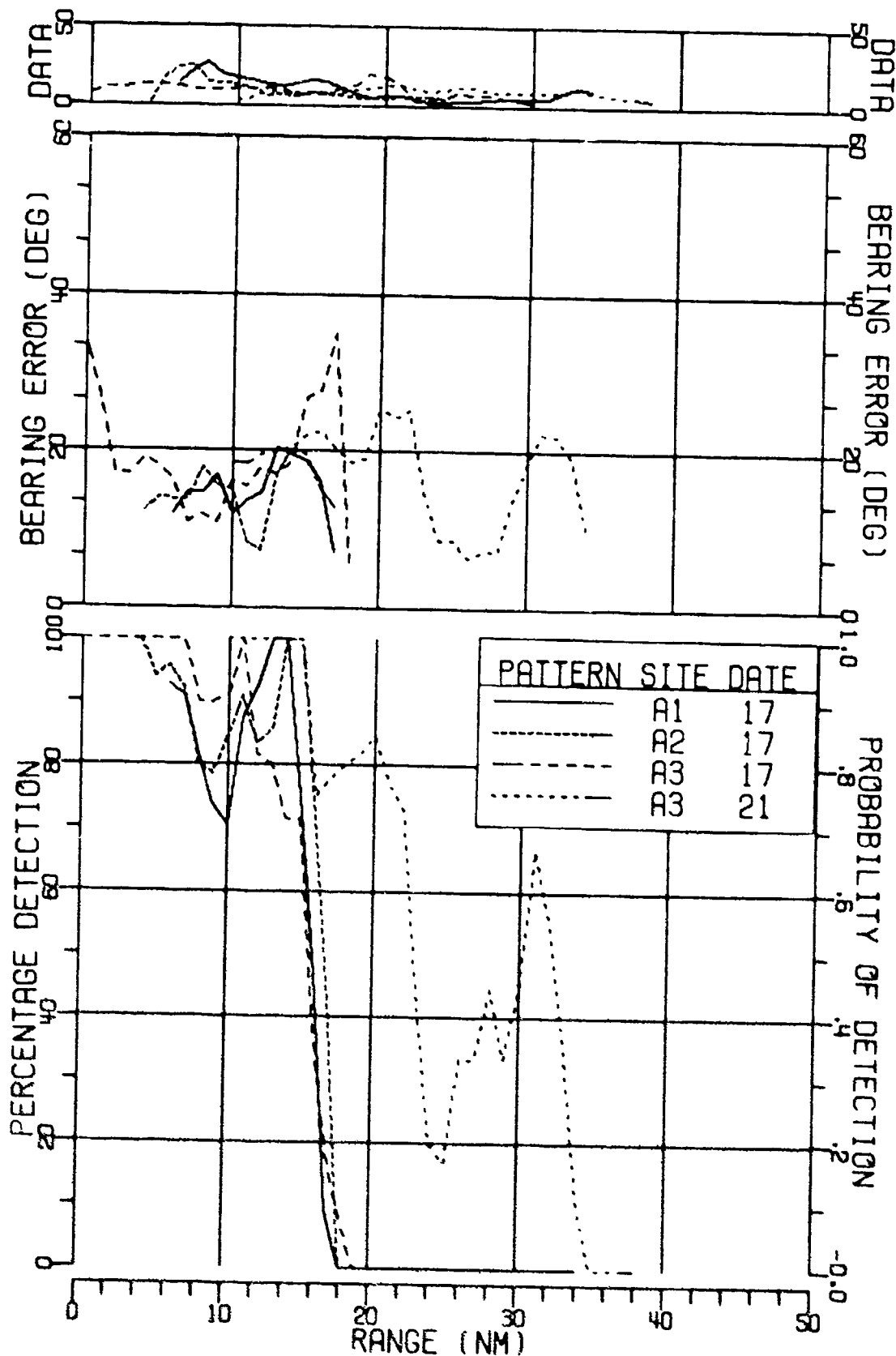


FIGURE III-211
MSS-FVT NEAR BOTTOM SINGLE CARDIOIDS SENSOR
DETECTION RESULTS FOR 305HZ AT 136DB (U)

246

SECRET

AS-77-2811

SECRET

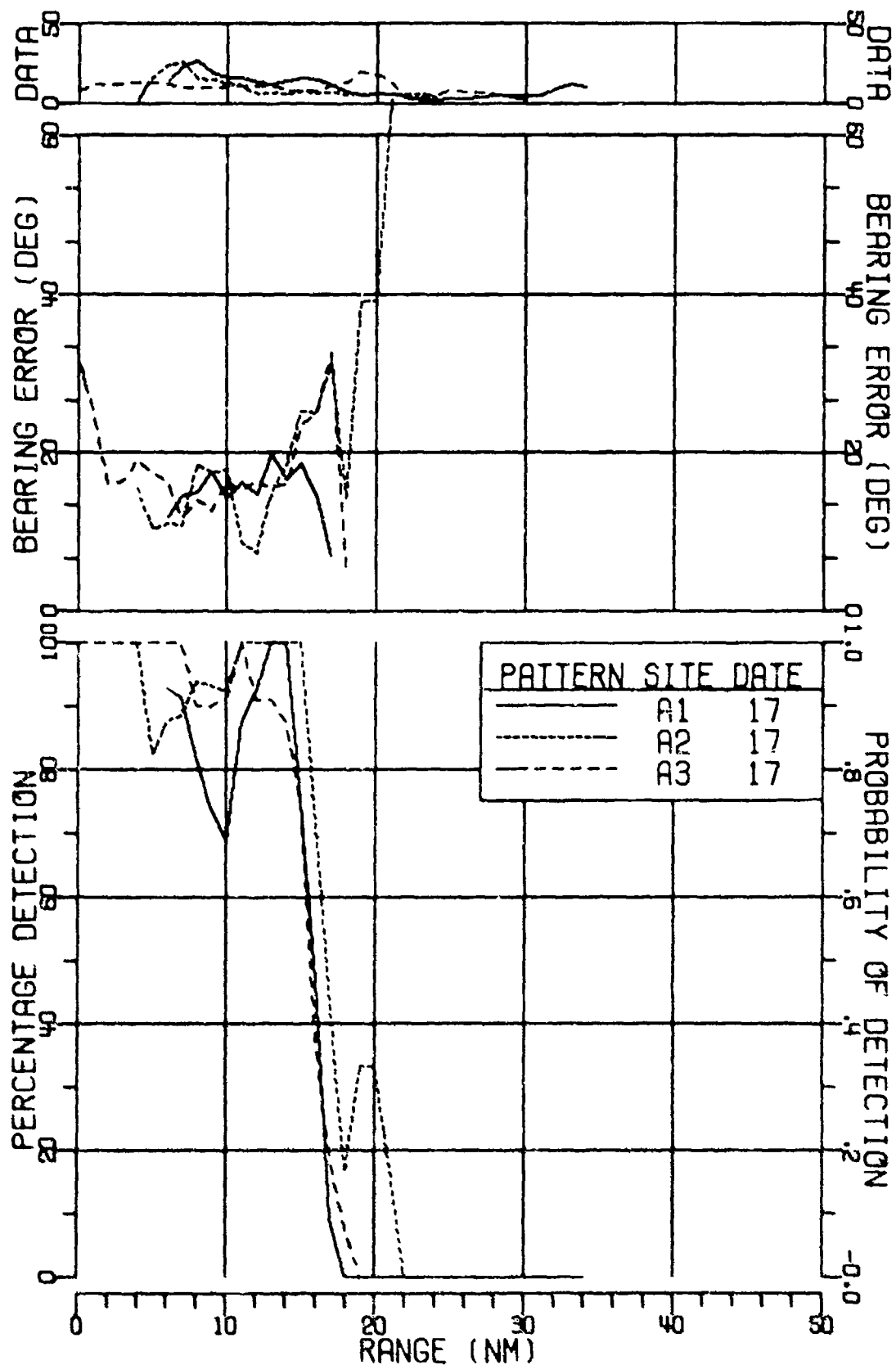


FIGURE III-212
MSS-FVT NEAR BOTTOM MAX GAIN LIMAcons SENSOR
DETECTION RESULTS FOR 305HZ AT 136DB (U)

SECRET

SECRET

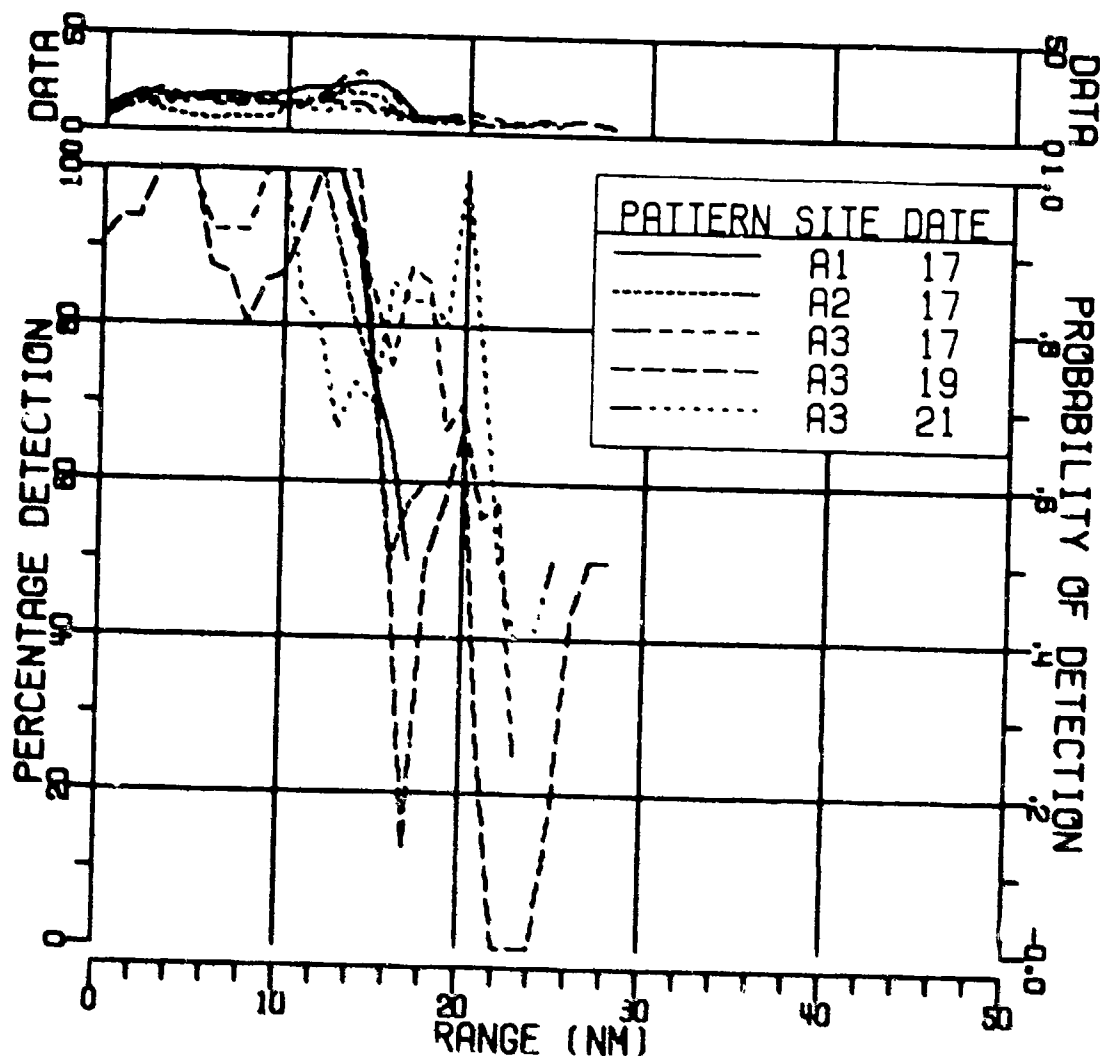


FIGURE III-213
MSS-FVT NEAR BOTTOM OMNIDIRECTIONAL SENSOR
DETECTION RESULTS FOR 64HZ AT 1620B (U)

AS-77-2813

248
SECRET

SECRET

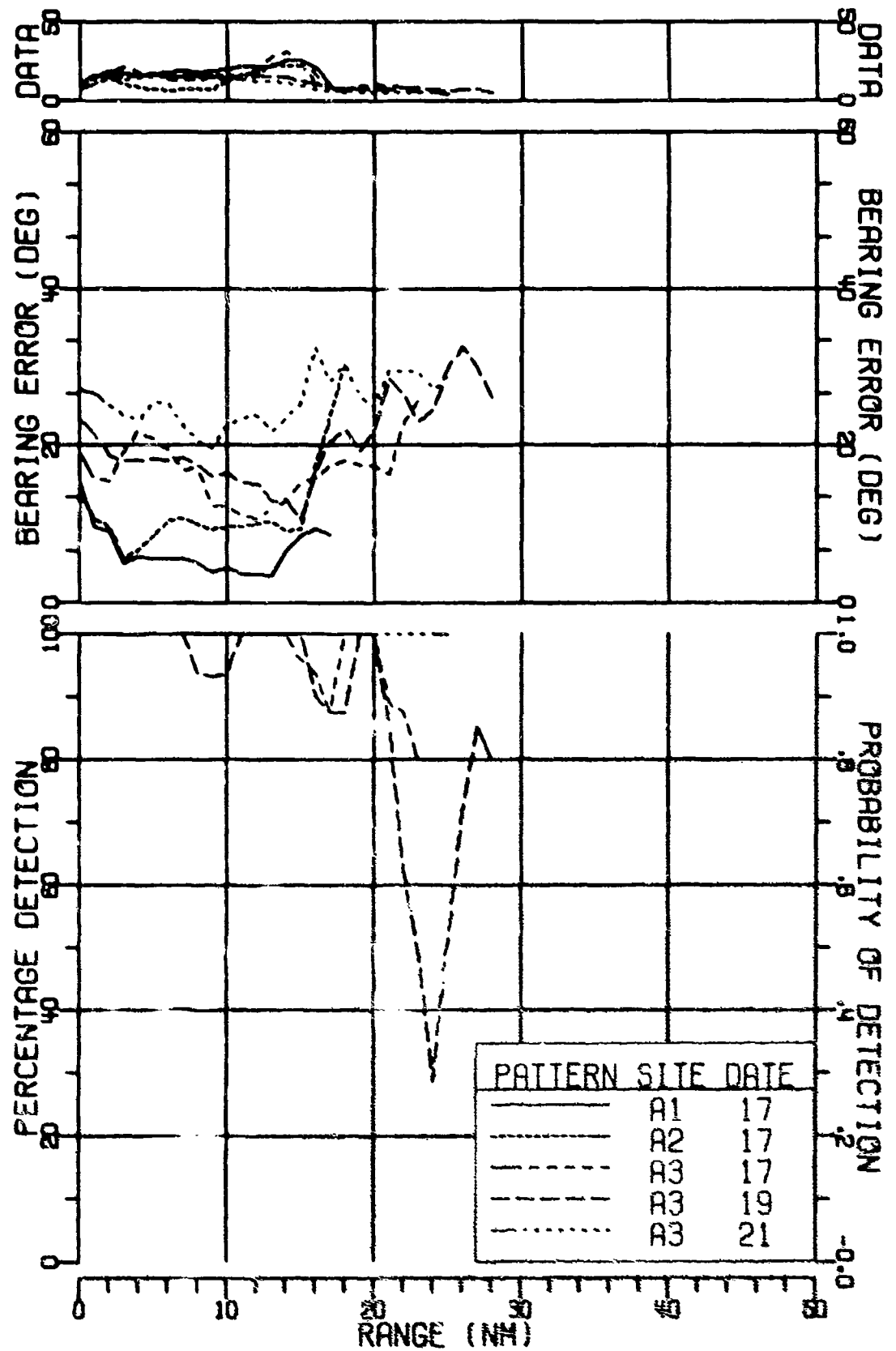


FIGURE III-214
MSS-FVT NEAR BOTTOM SINGLE CARDIOIDS SENSOR
DETECTION RESULTS FOR 64HZ AT 162DB (U)

SECRET

SECRET

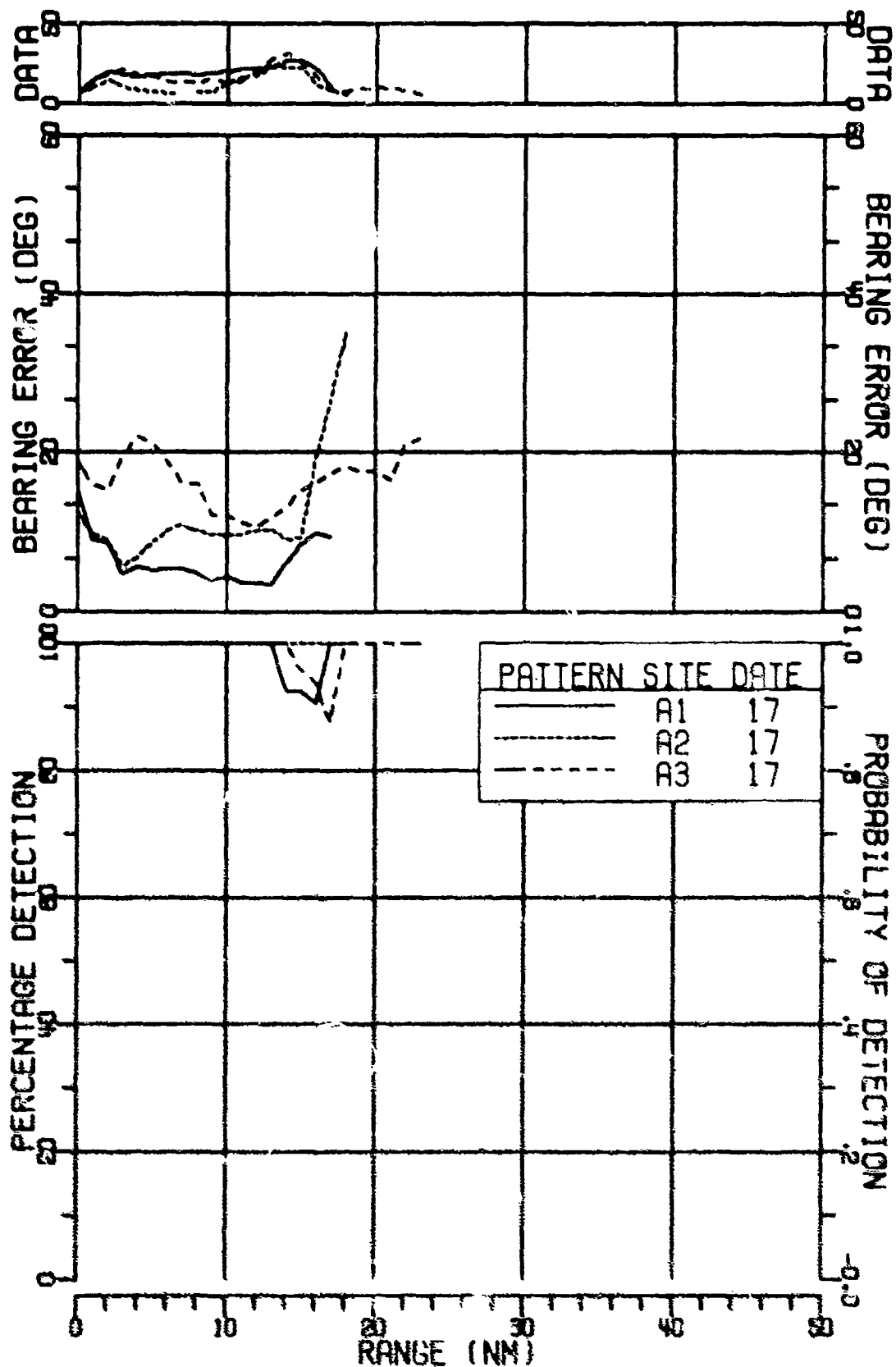


FIGURE III-215
 NSS-FVT NEAR BOTTOM MAX GAIN LIMAONS SENSOR
 DETECTION RESULTS FOR 64HZ AT 162DB (U)

250

AS-77-2815

SECRET

SECRET

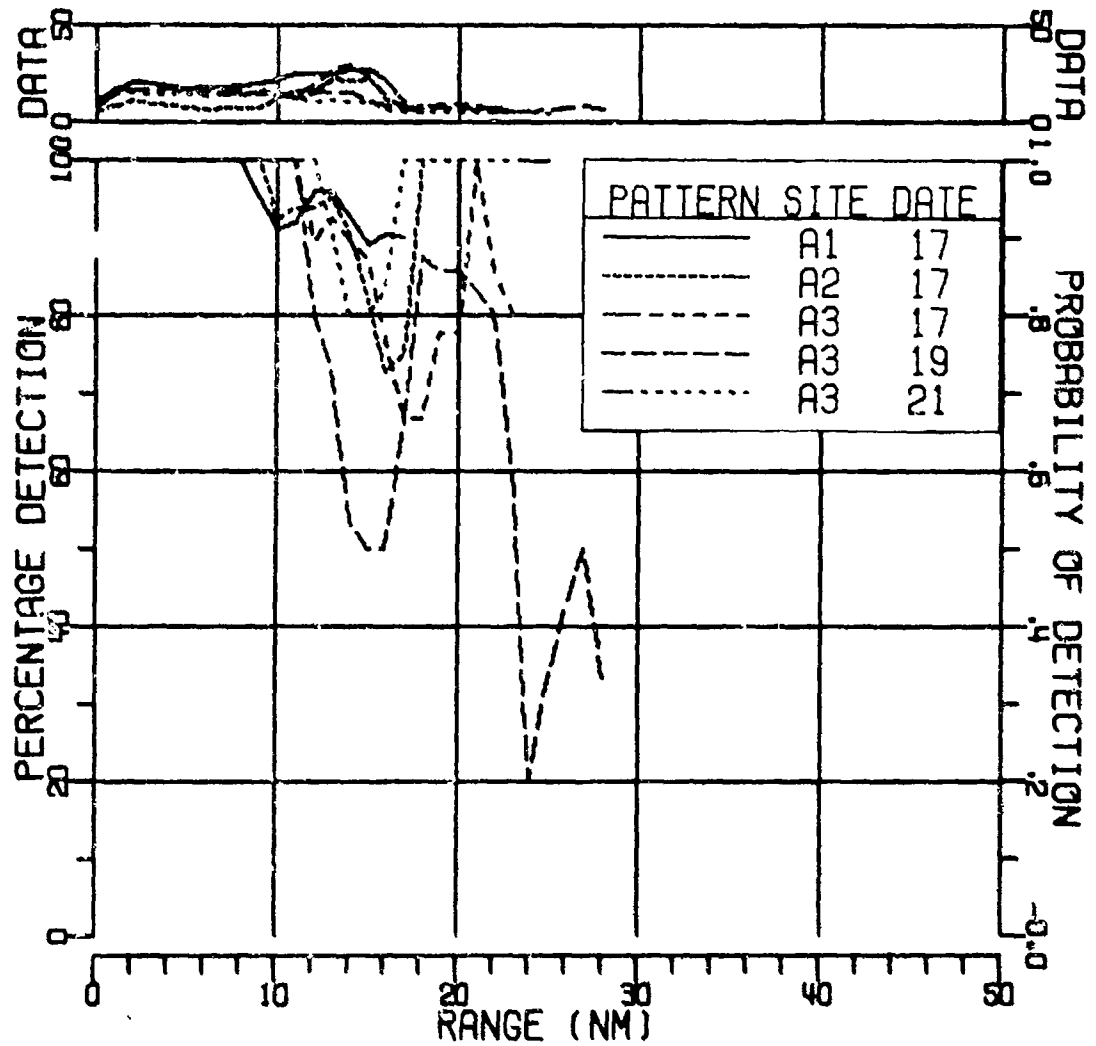


FIGURE III-216
MSS-FVT NEAR BOTTOM VERTICAL DIPOLE SENSOR
DETECTION RESULTS FOR 64HZ AT 162DB (U)

AS-77-16

SECRET

SECRET

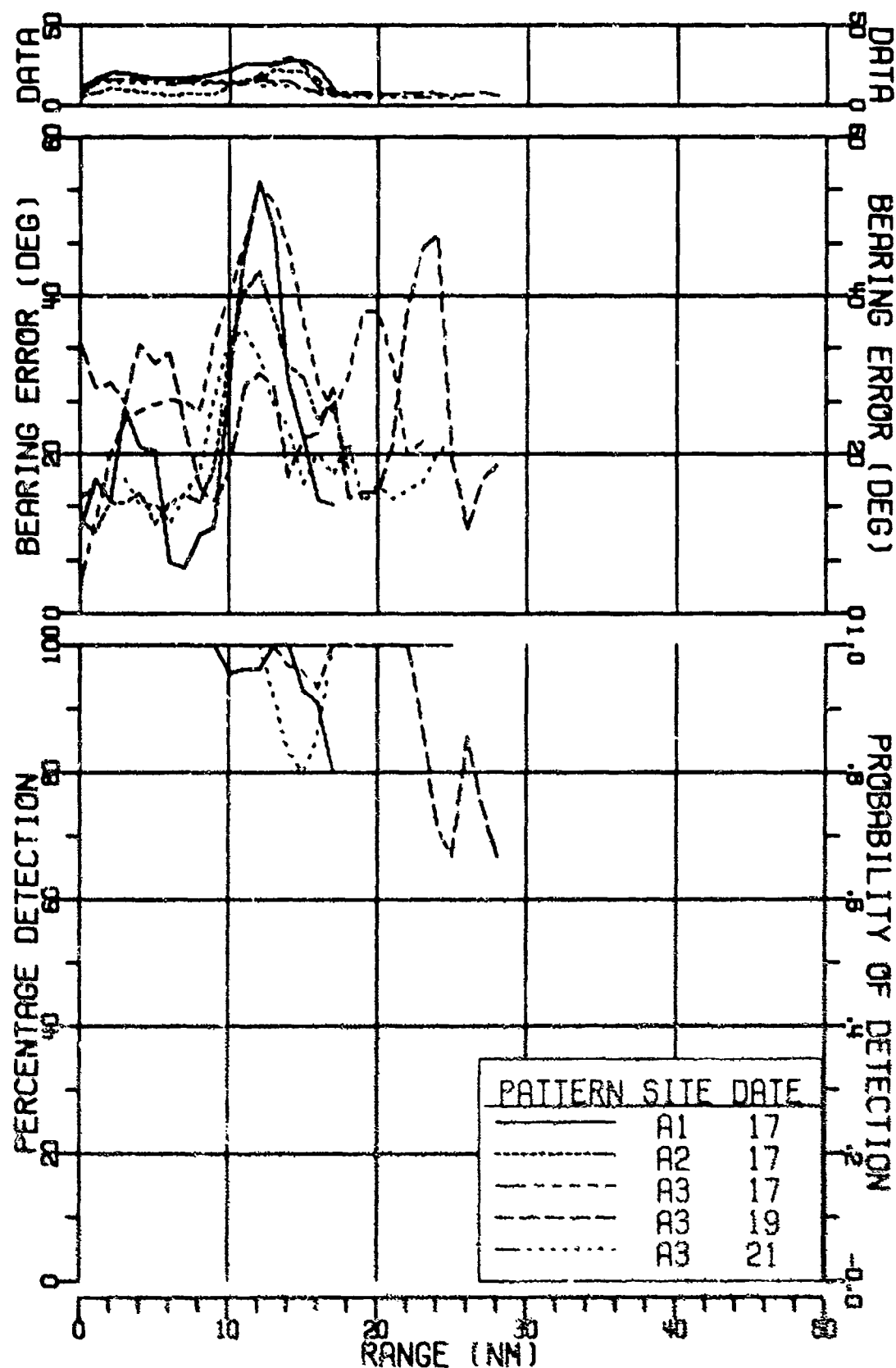


FIGURE III-217
MSS-FV1 NEAR BOTTOM DIFFERENCED CARDIOIDS SENSOR
DETECTION RESULTS FOR 64HZ AT 162DB (U)

SECRET

AS-77-2817

SECRET

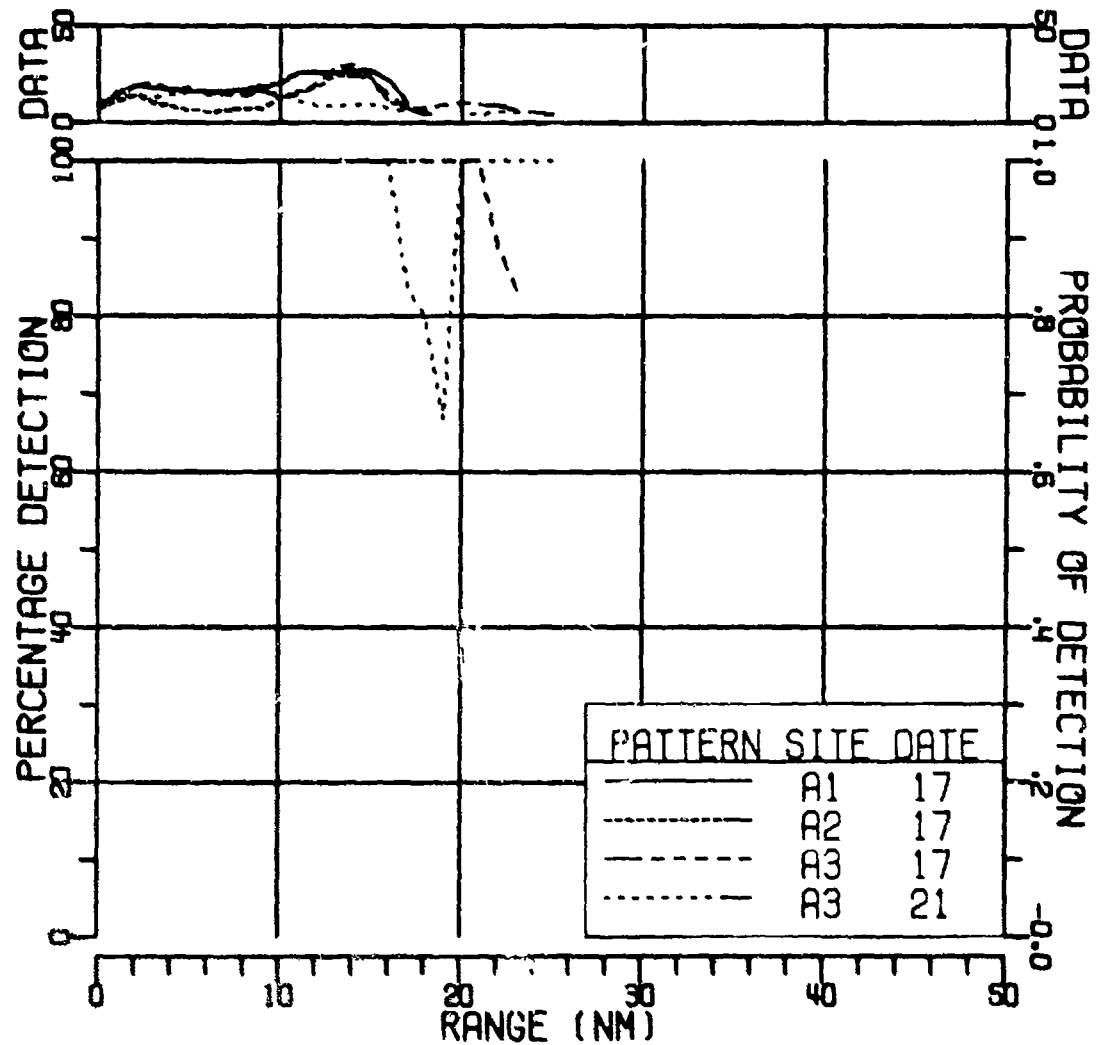


FIGURE III-218
MSS-FVT NEAR BOTTOM OMNIDIRECTIONAL SENSOR
DETECTION RESULTS FOR 160HZ AT 1610B (U)

AS-77-2818

253
SECRET

SECRET

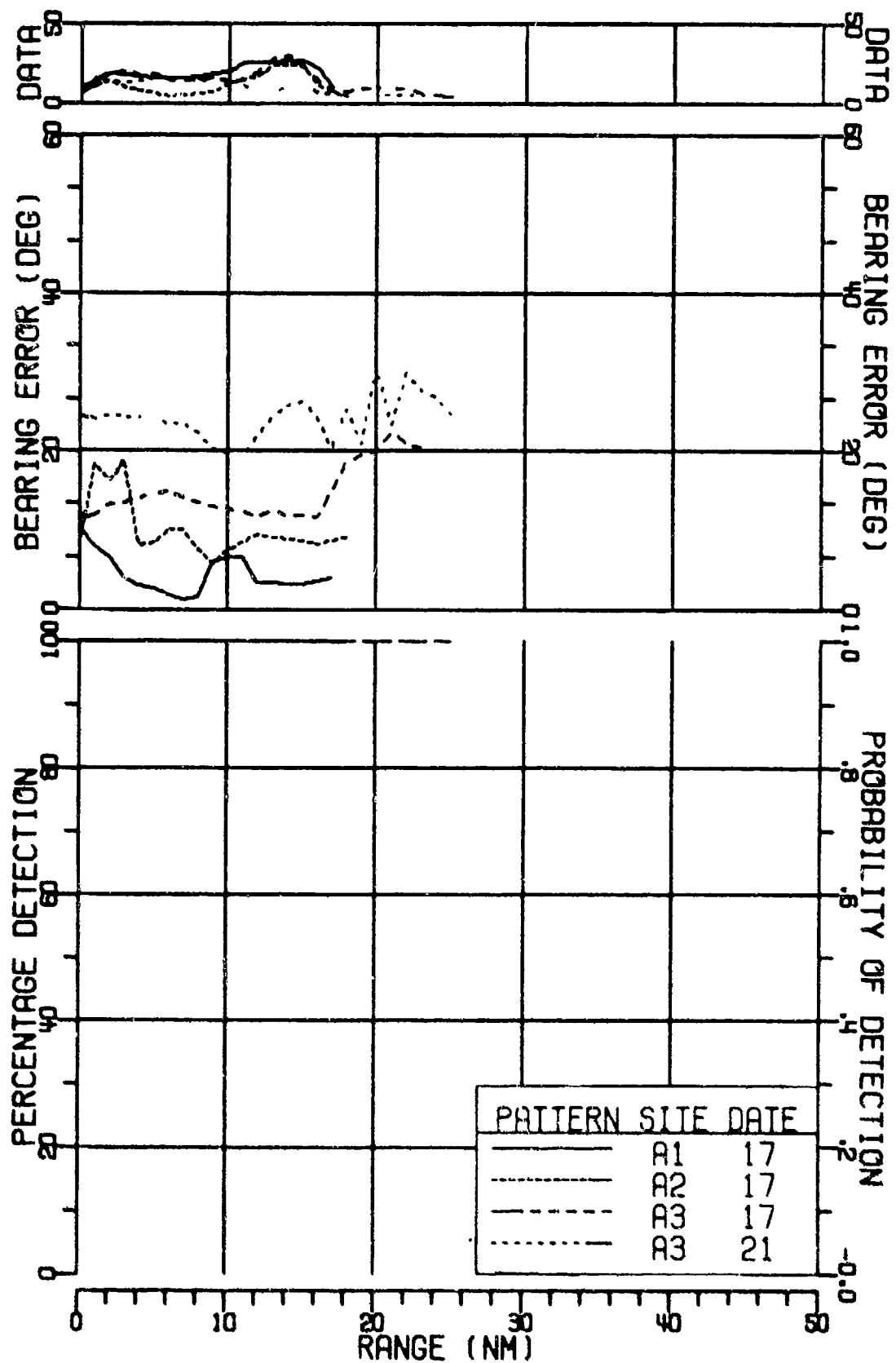


FIGURE III-219
MSS-FVT NEAR BOTTOM SINGLE CARDIOIDS SENSOR
DETECTION RESULTS FOR 160HZ AT 161DB (U)

SECRET

SECRET

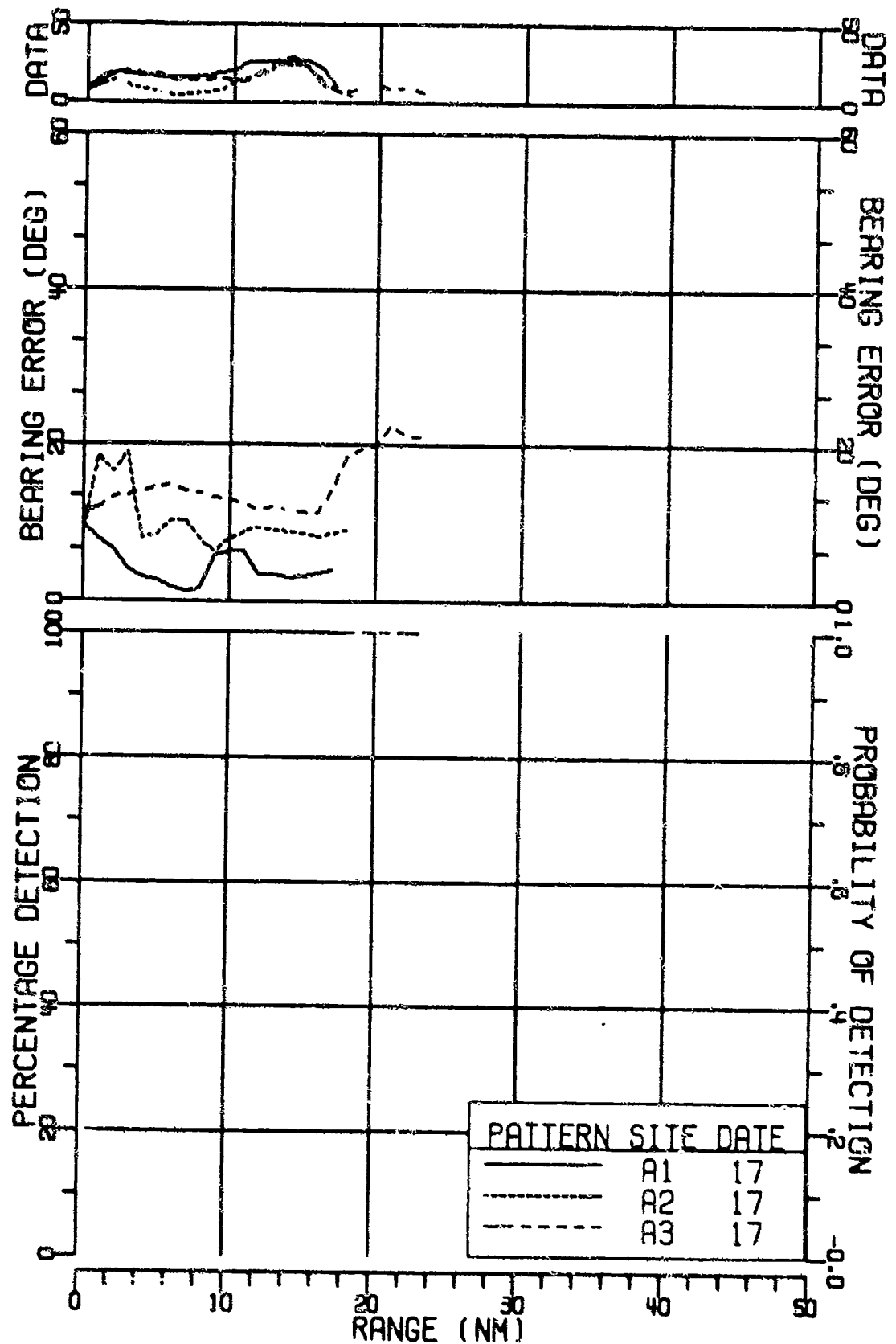


FIGURE III-220
MSS-FVT NEAR BOTTOM MAX GAIN LIMACONS SENSOR
DETECTION RESULTS FOR 160HZ AT 161DB (U)

SECRET

SECRET

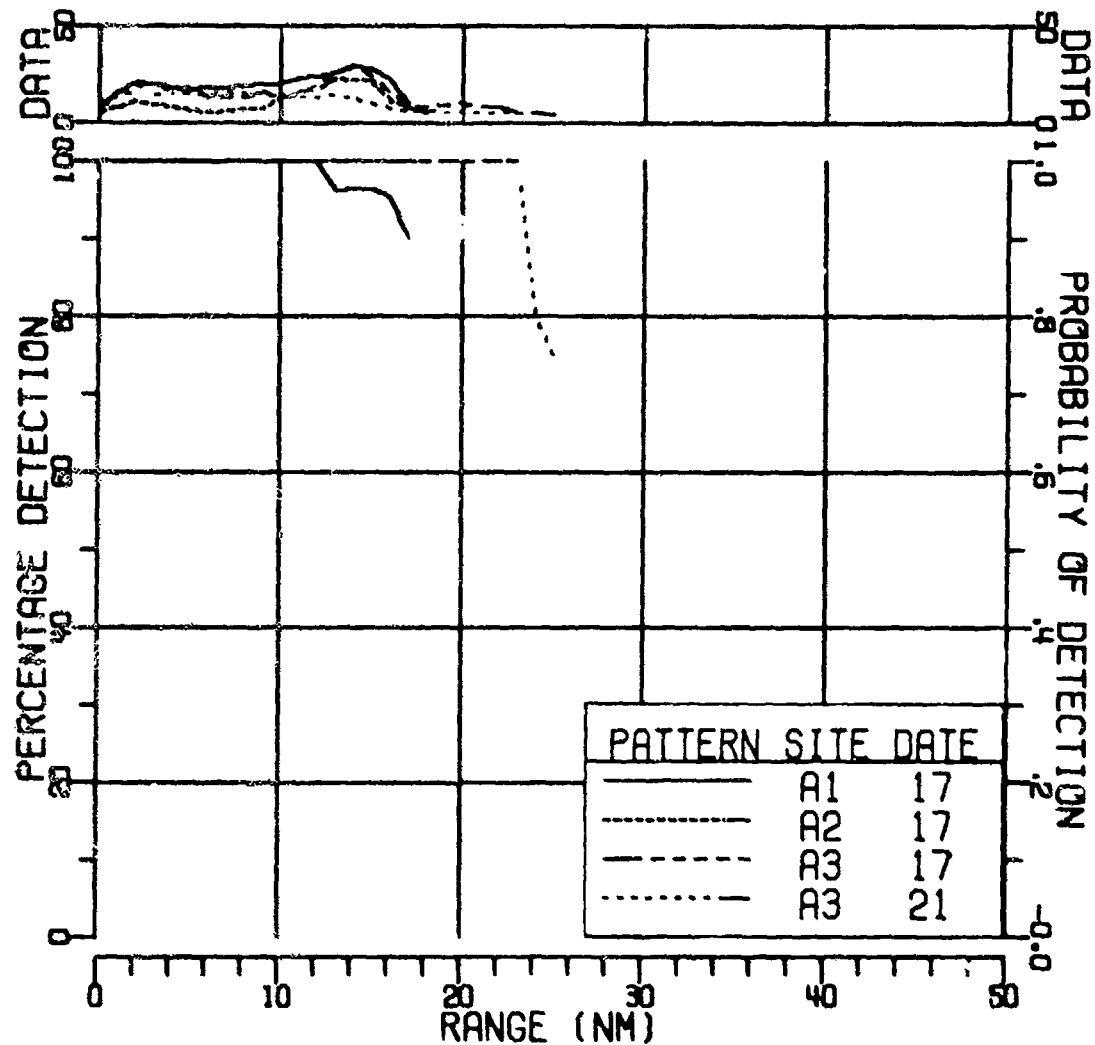


FIGURE III-221
MSS-FVT NEAR BOTTOM VERTICAL DIPOLE SENSOR
DETECTION RESULTS FOR 160HZ AT 161DB (U)

AS-77-2821

SECRET

SECRET

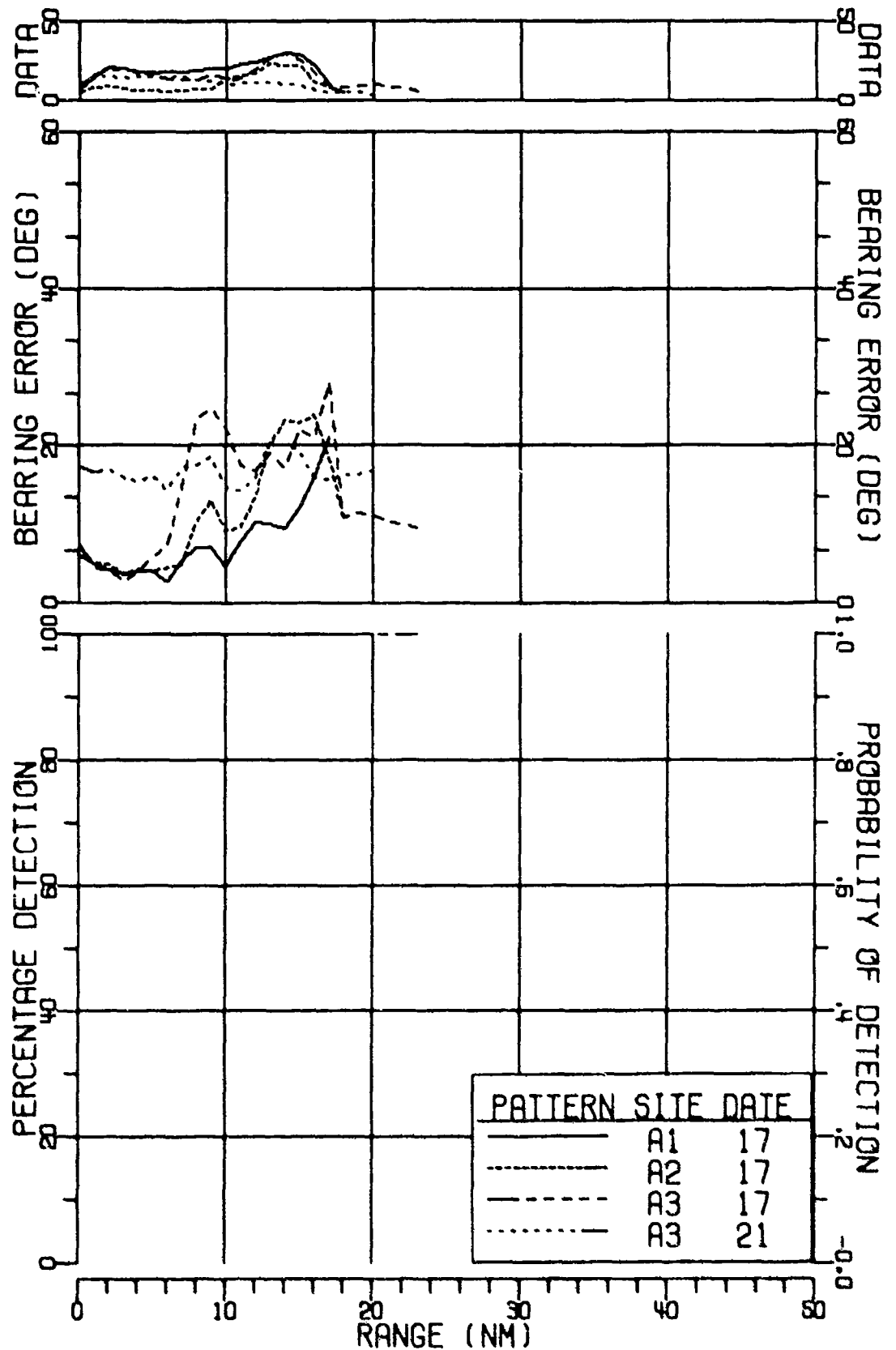


FIGURE III-222
MSS-FVT NEAR BOTTOM DIFFERENCED CARDIOIDS SENSOR
DETECTION RESULTS FOR 160HZ AT 161DB (U)

257

SECRET

AS-77-2

SECRET

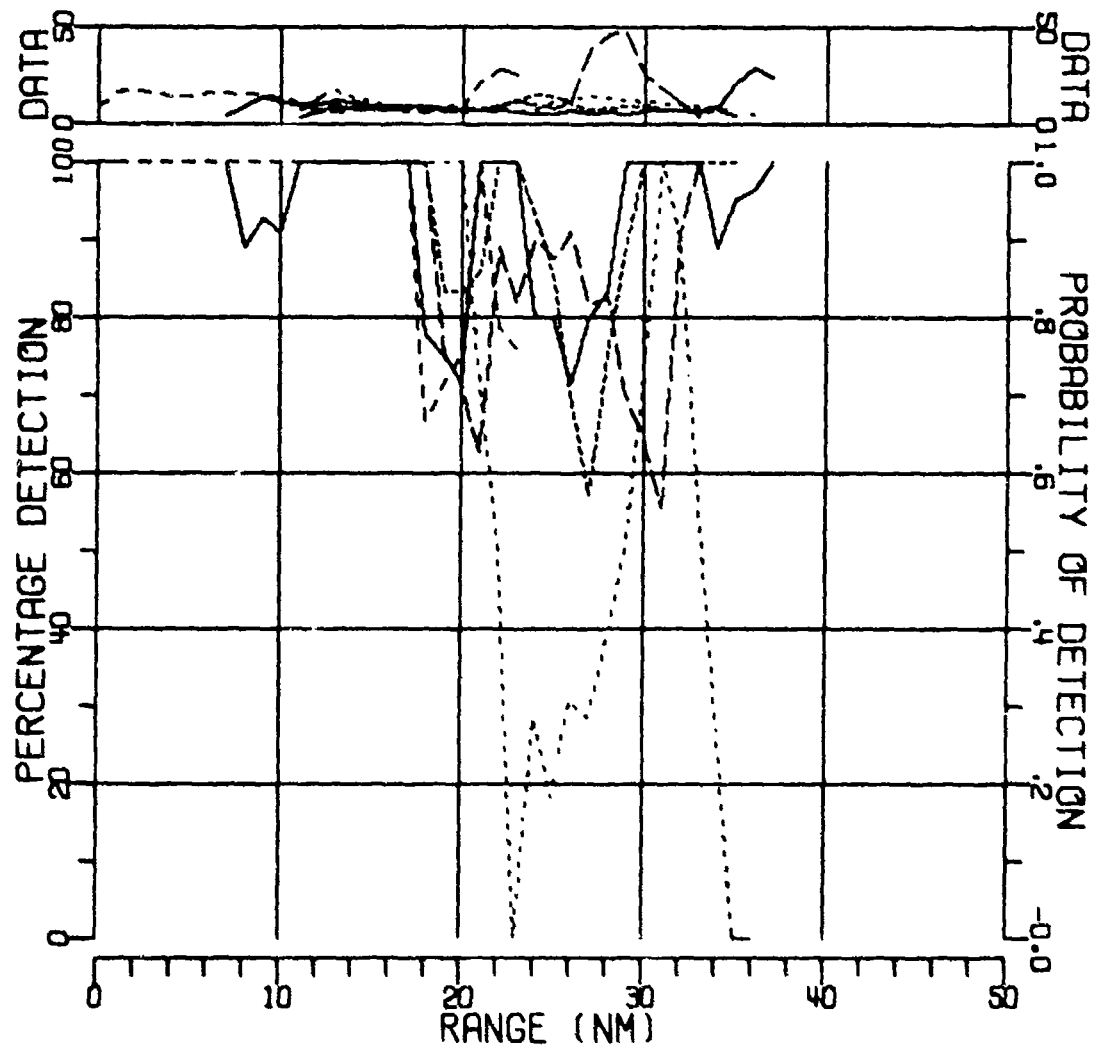


FIGURE III-223
MSS-FVT NEAR BOTTOM OMNIDIRECTIONAL SENSOR
DETECTION RESULTS FOR 70HZ AT 166DB (U)

PATTERN	SITE	DATE
————	A1	17
-----	A2	17
-----	A3	17
-----	A3	19
-----	A3	21

AS-77-2823

258
SECRET

SECRET

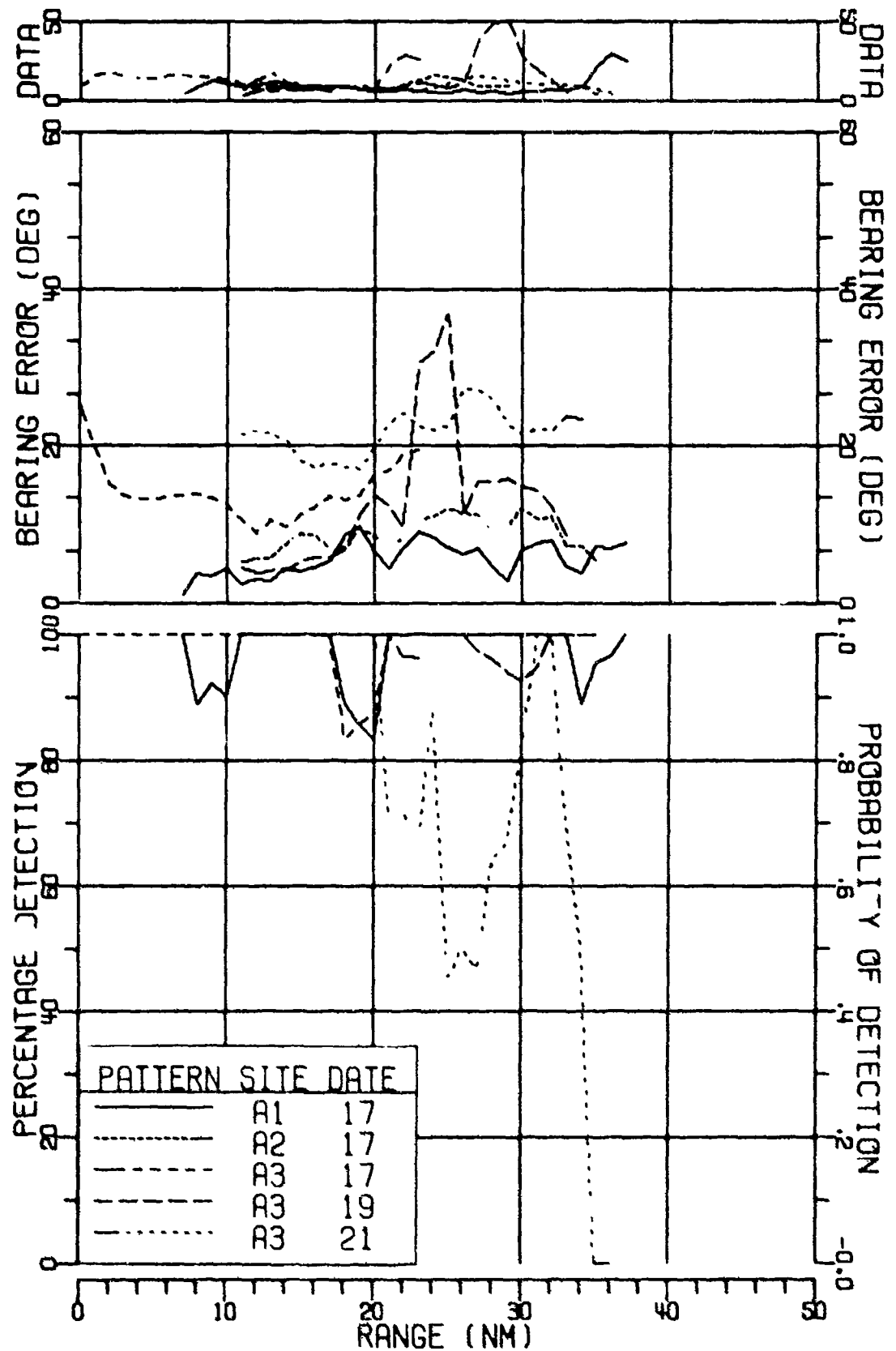


FIGURE III-224
MSS-FVT NEAR BOTTOM SINGLE CARDIOIDS SENSOR
DETECTION RESULTS FOR 70HZ AT 166DB (U)

259

SECRET

AS-77-28

SECRET

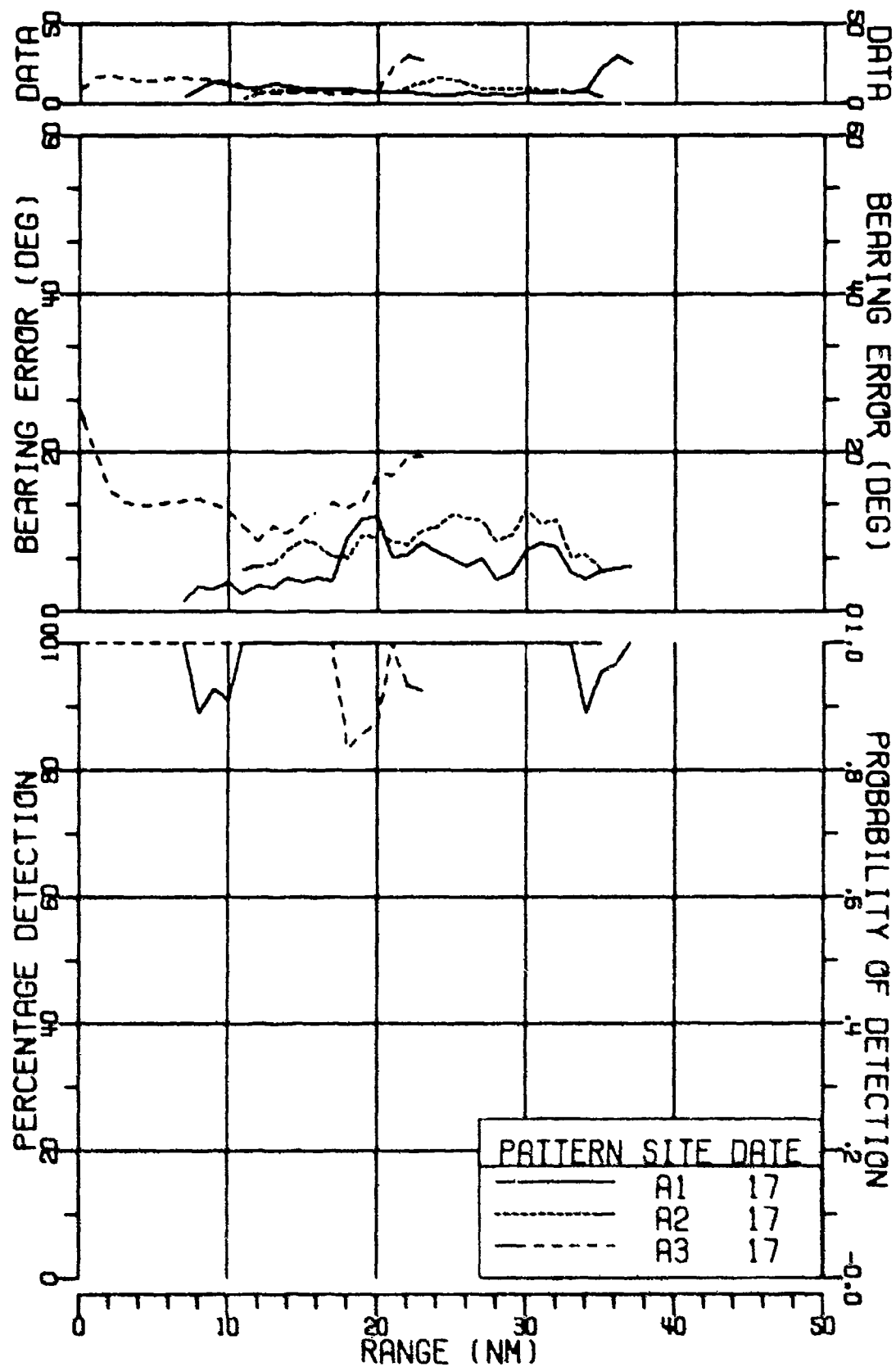


FIGURE III-225
MSS-FVT NEAR BOTTOM MAX GAIN LIMACONS SENSOR
DETECTION RESULTS FOR 70HZ AT 166DB (U)

SECRET

SECRET

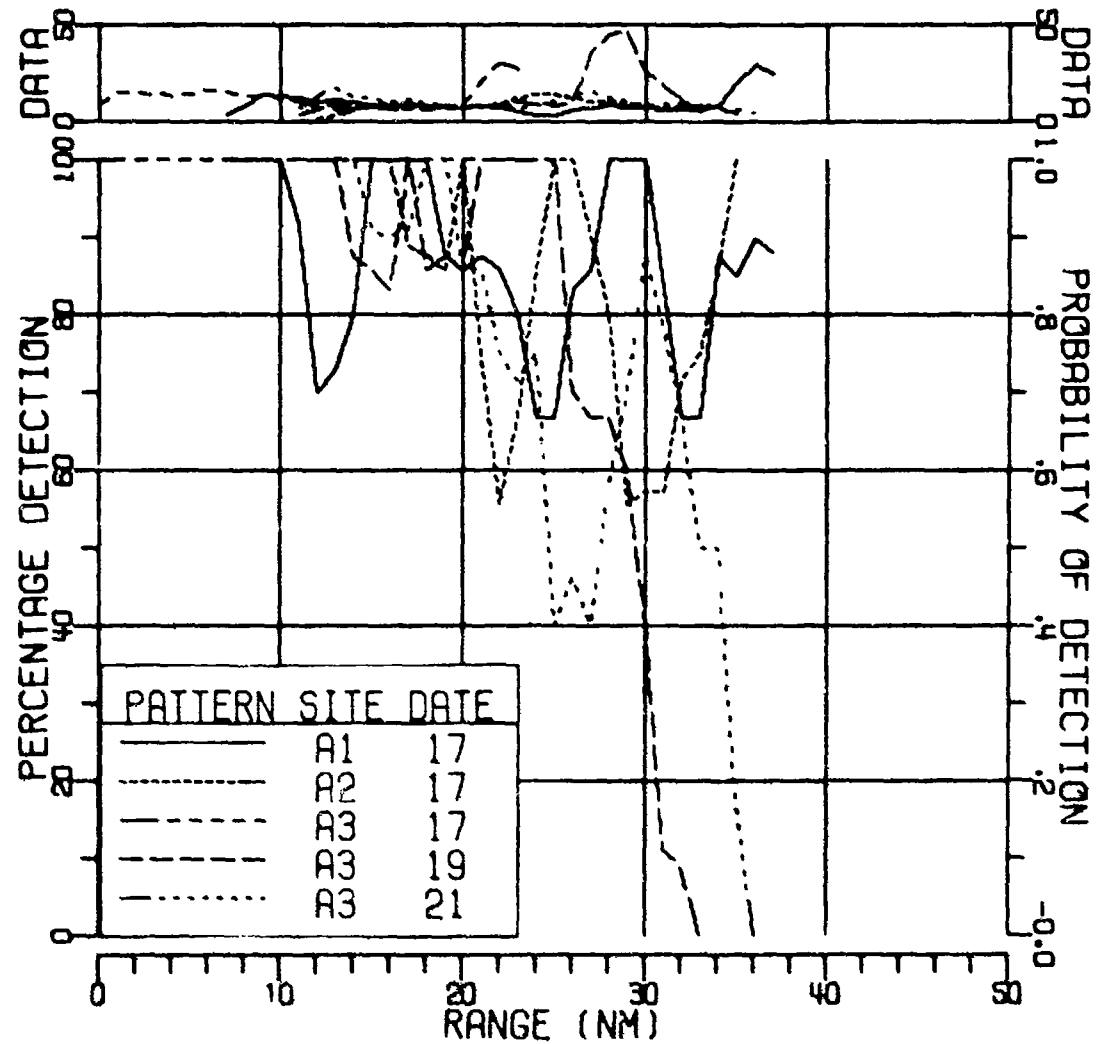


FIGURE III-226
MSS-FVT NEAR BOTTOM VERTICAL DIPOLE SENSOR
DETECTION RESULTS FOR 70HZ AT 166DB (U)

AS-77-7826

261
SECRET

SECRET

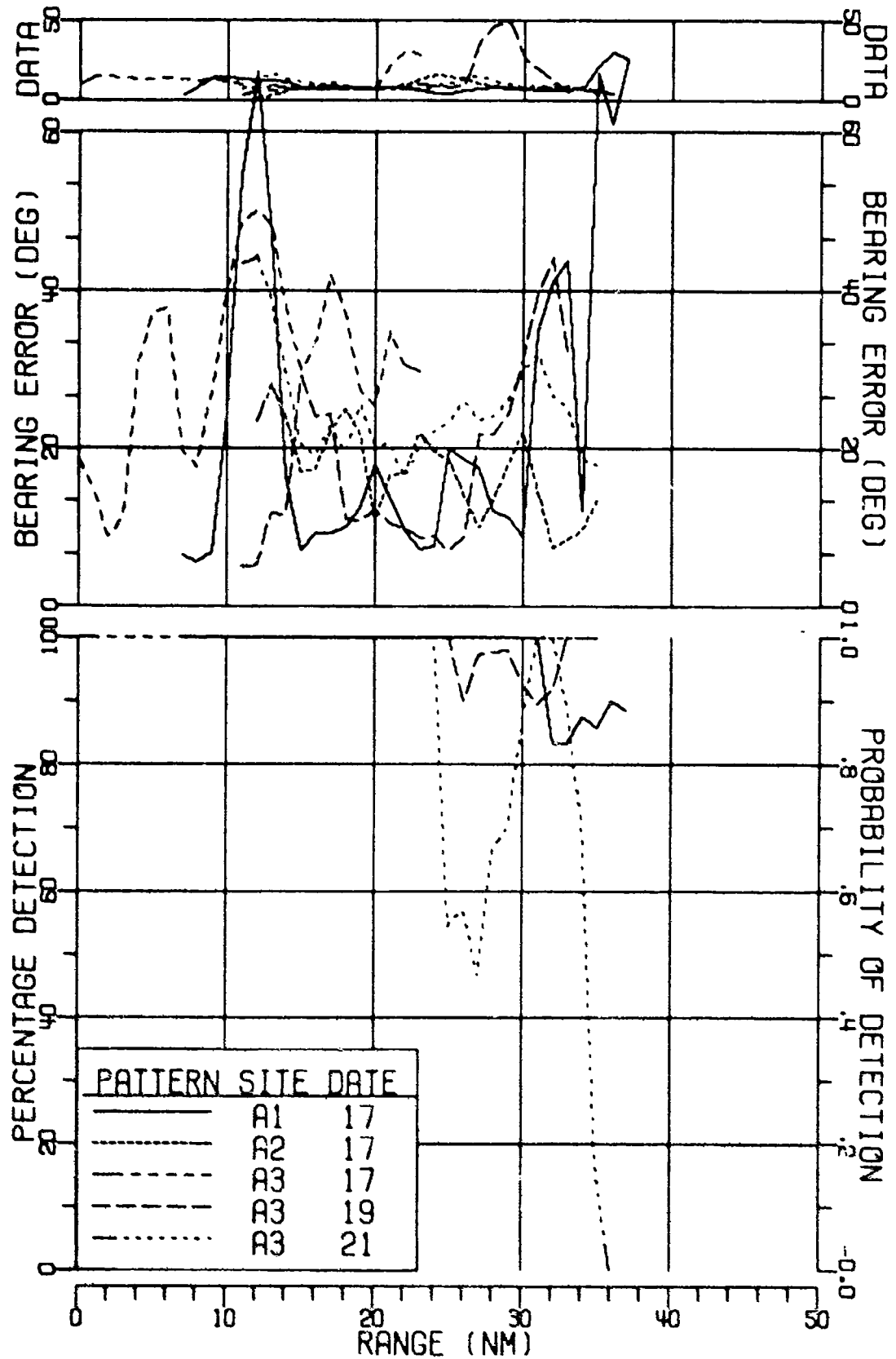


FIGURE III-227
MSS-FVT NEAR BOTTOM DIFFERENCED CARDIOIDS SENSOR
DETECTION RESULTS FOR 70HZ AT 166DB (U)

SECRET

SECRET

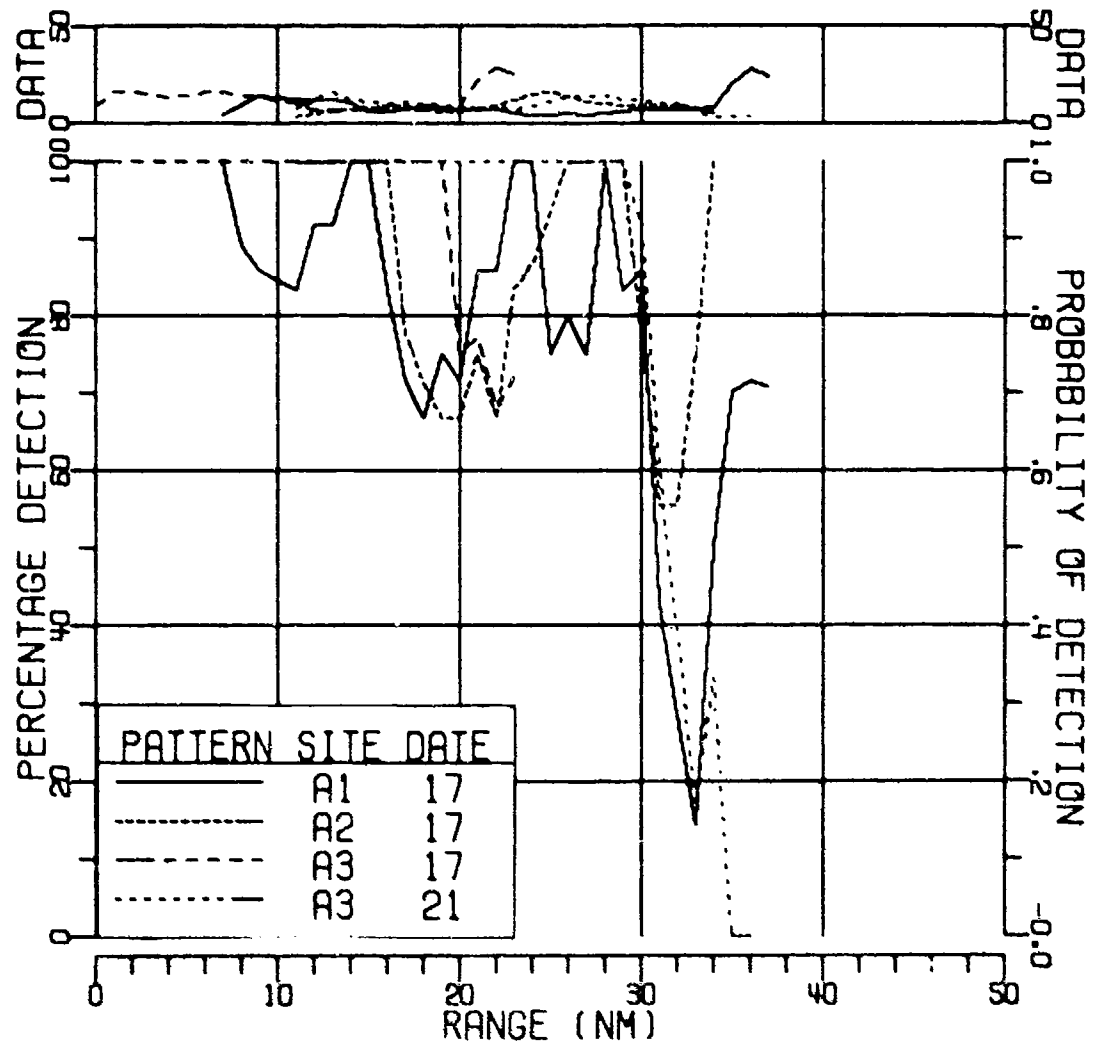


FIGURE III-228
MSS-FVT NEAR BOTTOM OMNIDIRECTIONAL SENSOR
DETECTION RESULTS FOR 170HZ AT 156DB (U)

AS-77-2828

263
SECRET

SECRET

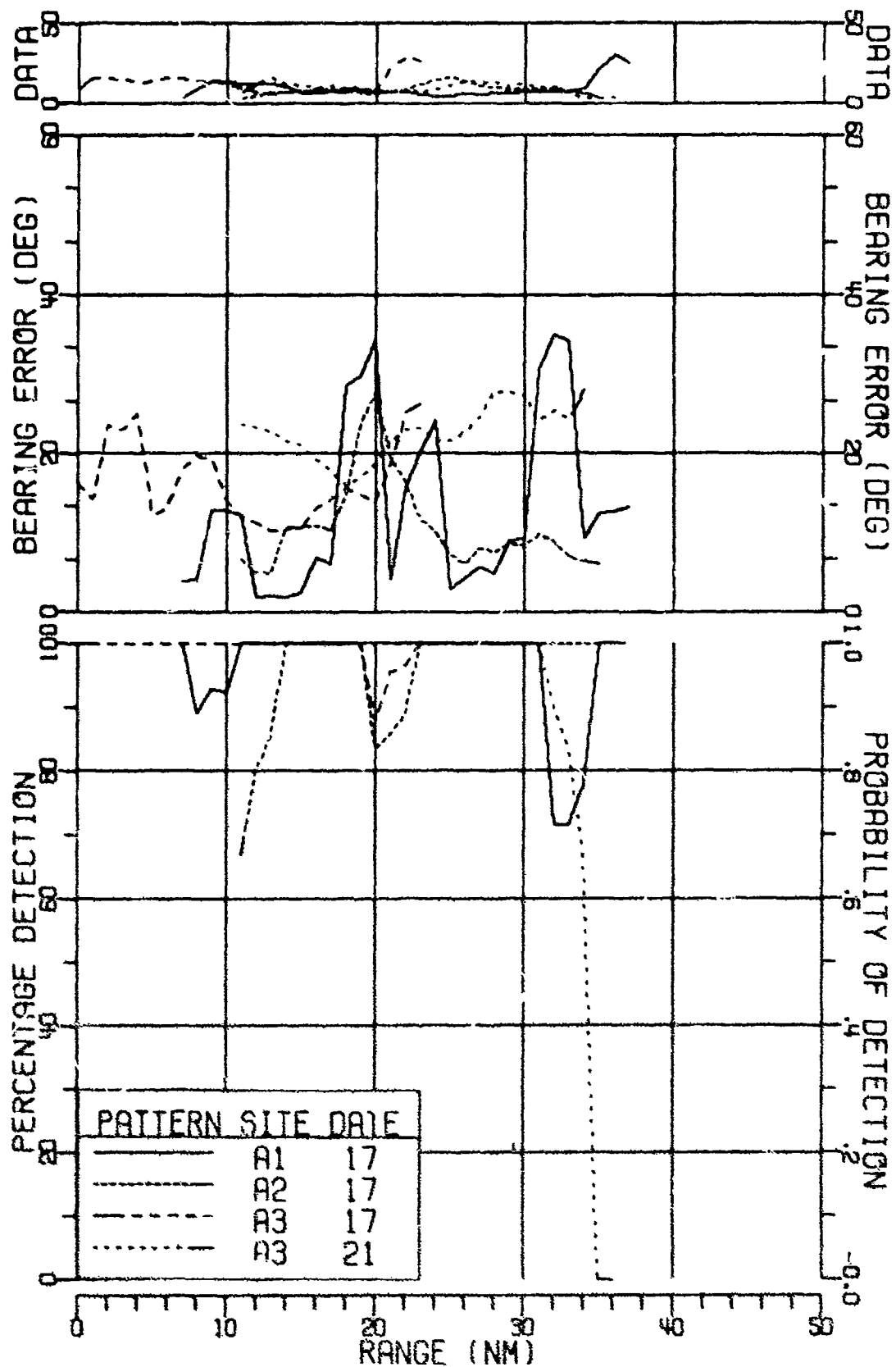


FIGURE III-229
MSS-FVT NEAR BOTTOM SINGLE CARDIOIDS SENSOR
DETECTION RESULTS FOR 170HZ AT 156DB (U)

264

AS-77-2829

SECRET

SECRET

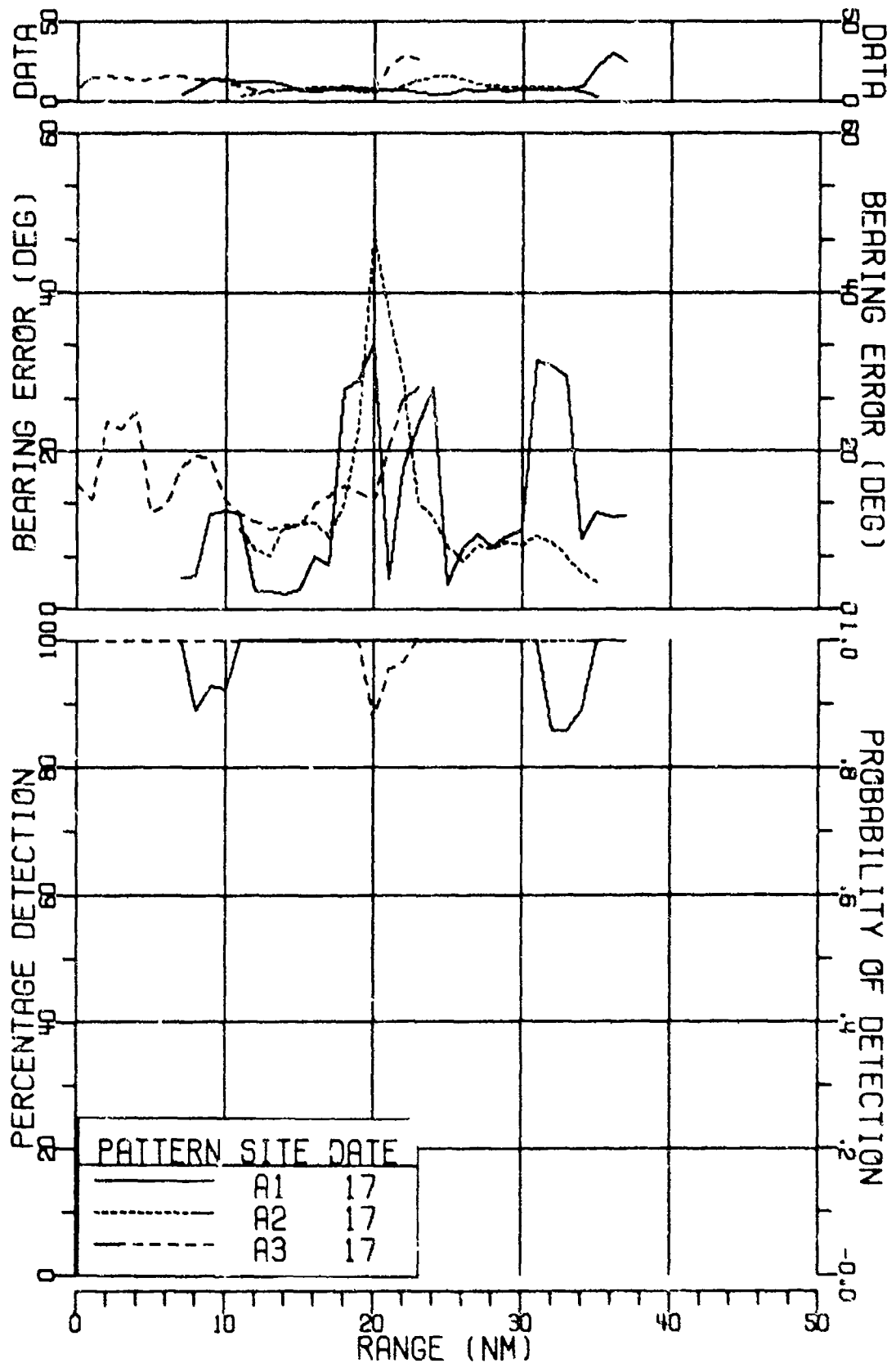


FIGURE III-230
MSS-FVT NEAR BOTTOM MAX GAIN LIMACONS SENSOR
DETECTION RESULTS FOR 170HZ AT 156DB (U)

265

SECRET

AS-77-283

SECRET

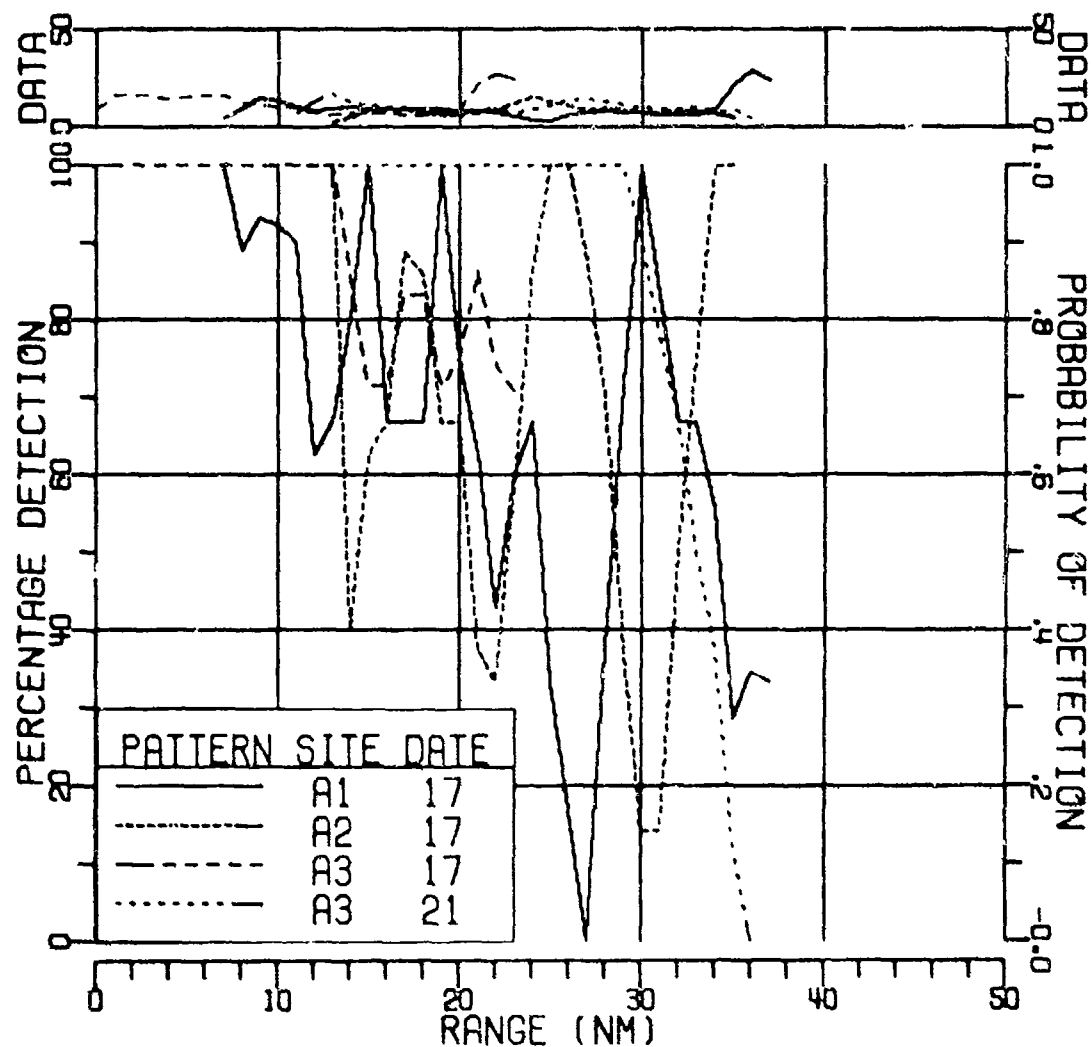


FIGURE III-231
MSS-FVT NEAR BOTTOM VERTICAL DIPOLE SENSOR
DETECTION RESULTS FOR 170HZ AT 156DB (U)

AS-77-2831

SECRET

SECRET

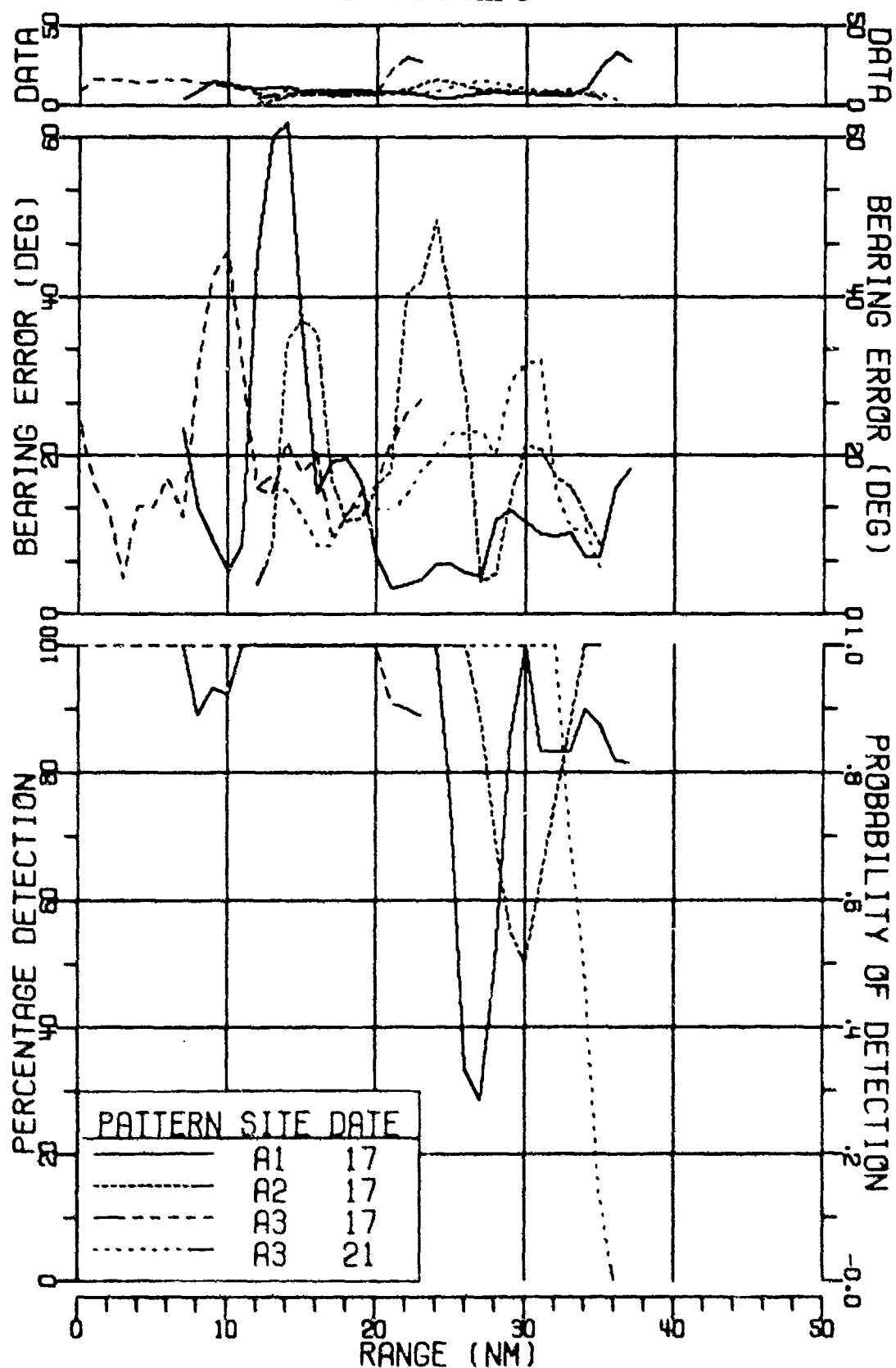


FIGURE III-232
MSS-FVT NEAR BOTTOM DIFFERENCED CARDIOIDS SENSOR
DETECTION RESULTS FOR 170HZ AT 156DB (U)

SECRET

SECRET

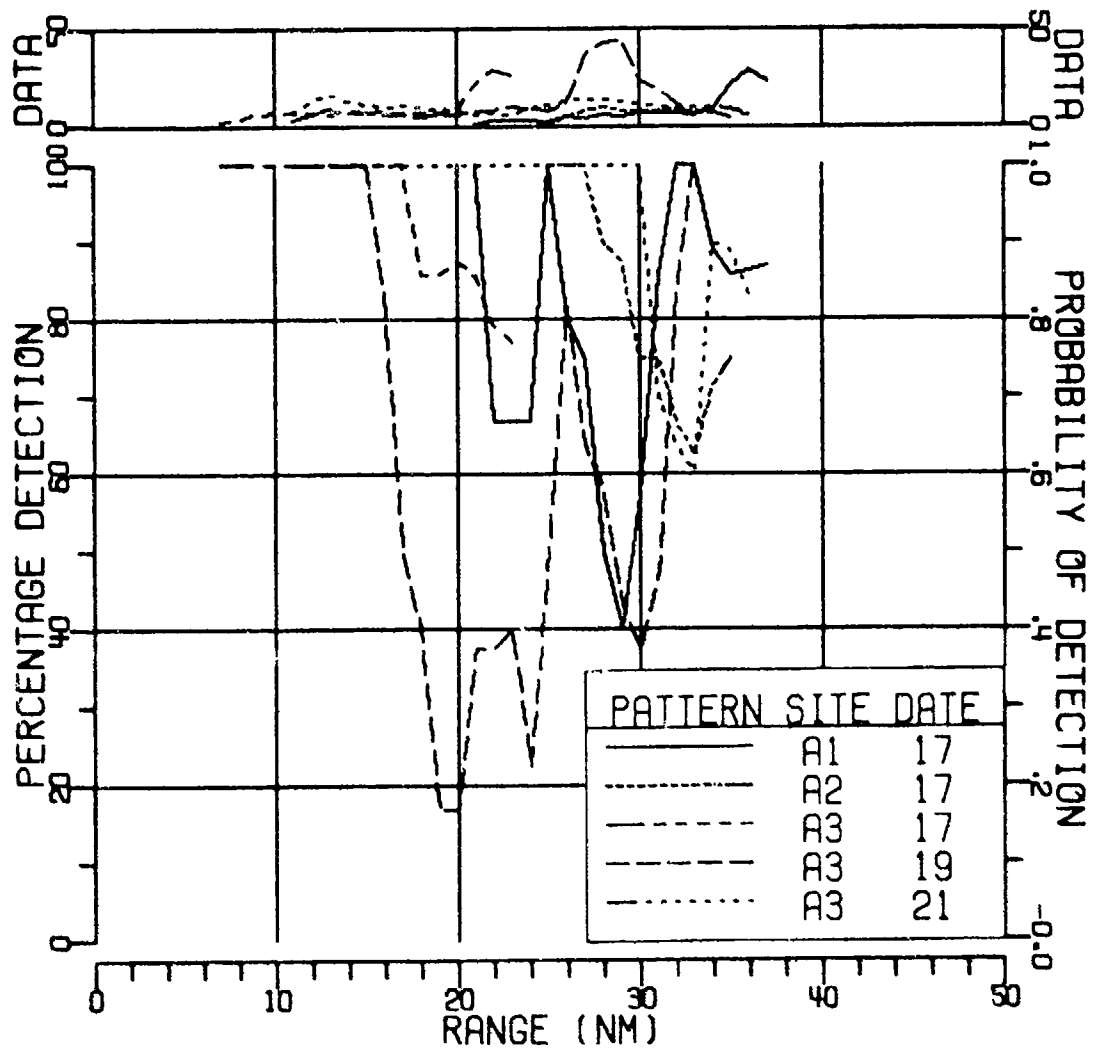


FIGURE III-233
MSS-FVT NEAR BOTTOM OMNIDIRECTIONAL SENSOR
DETECTION RESULTS FOR 335HZ AT 154DB (U)

AS-77-2833

SECRET

SECRET

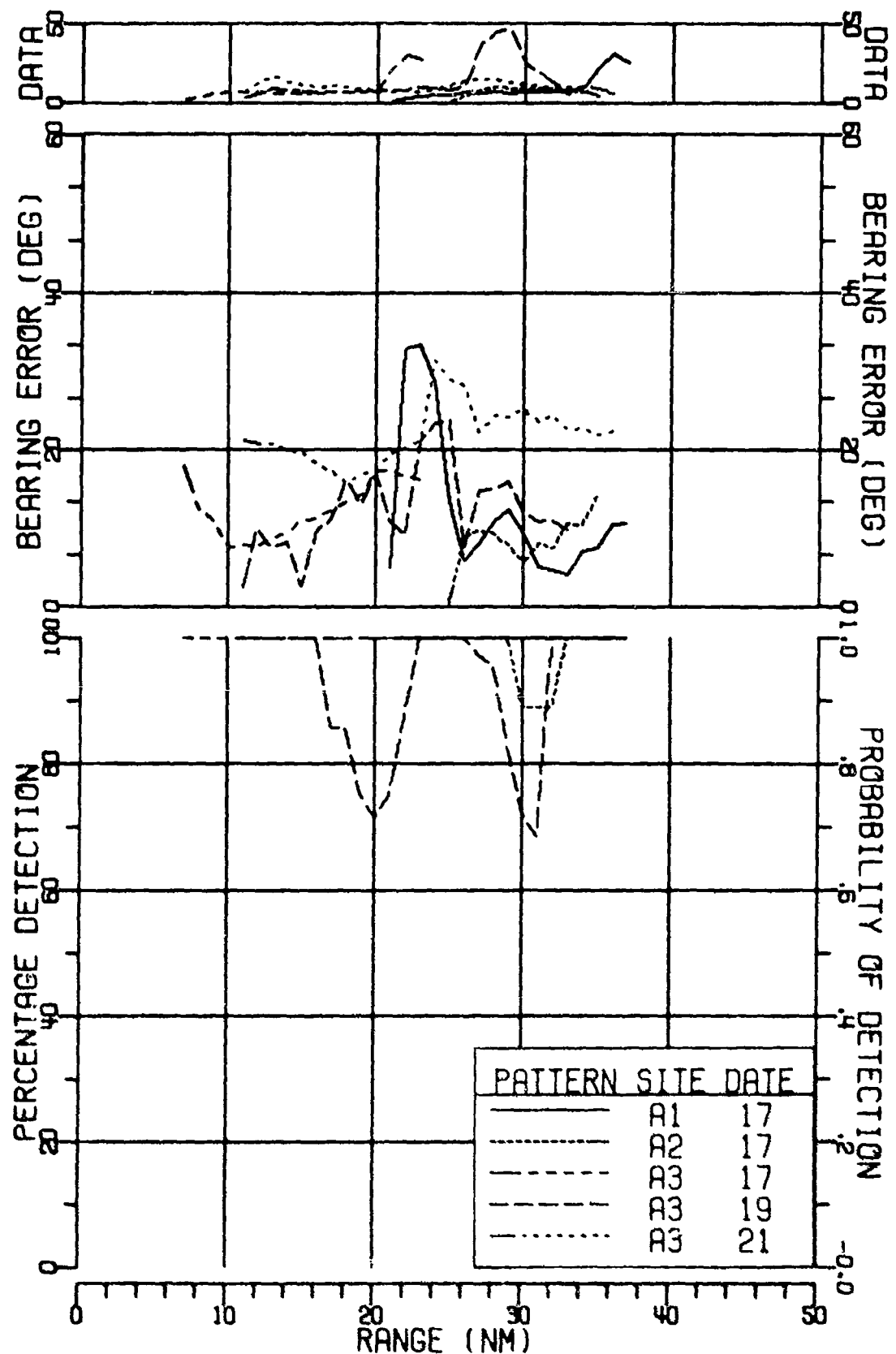


FIGURE III-234
MSS-FVT NEAR BOTTOM SINGLE CARDIOIDS SENSOR
DETECTION RESULTS FOR 335HZ AT 154DB (U)

SECRET

SECRET

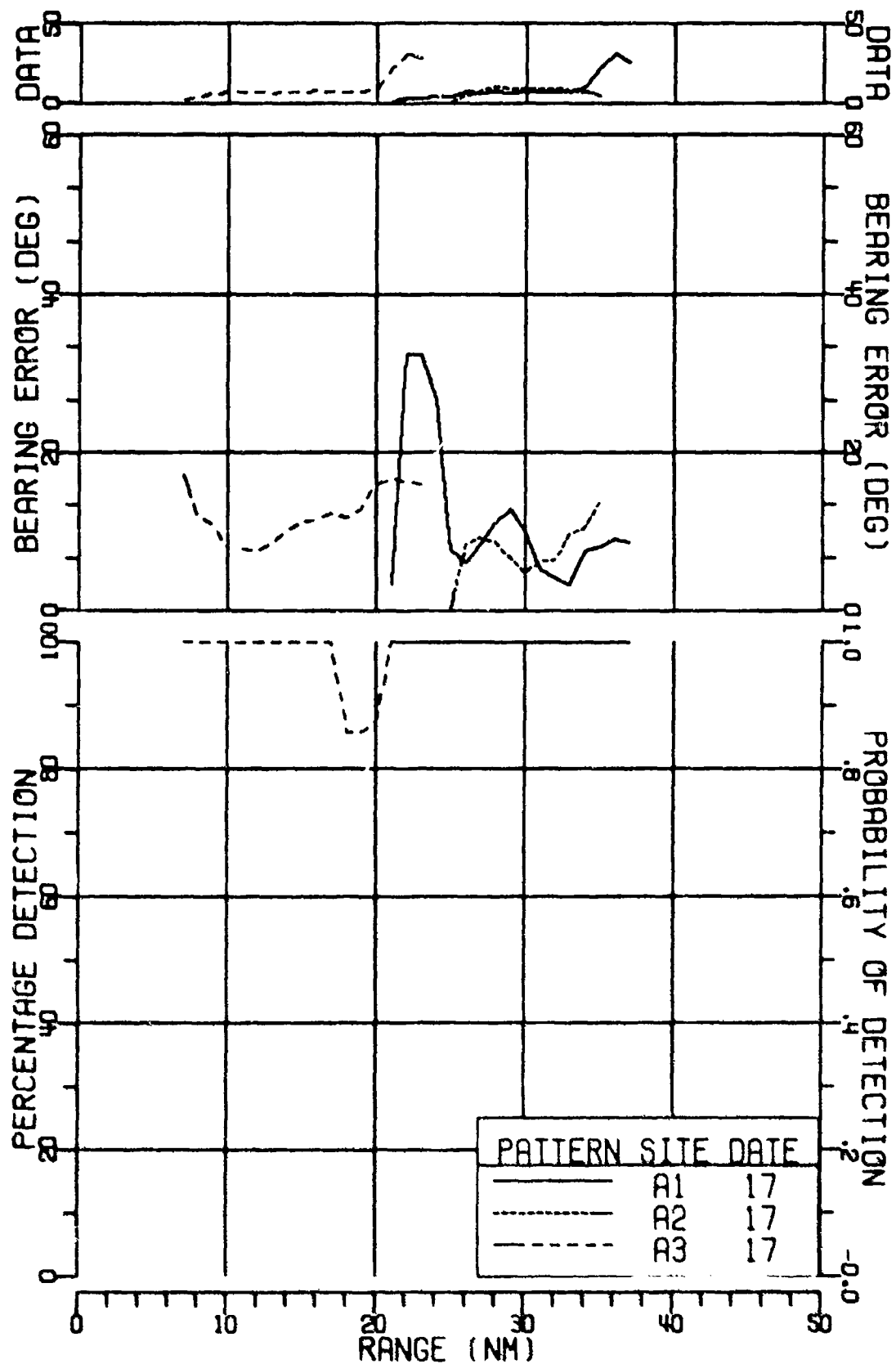


FIGURE III-235
MSS-FVT NEAR BOTTOM MAX GAIN LIMACONS SENSOR
DETECTION RESULTS FOR 335HZ AT 154DB (U)

SECRET

UNCLASSIFIED

APPENDIX F

BEARING ERROR versus SIGNAL-TO-NOISE RATIO CURVES (U)

(FIGURES III-236 - III-257)

UNCLASSIFIED

SECRET

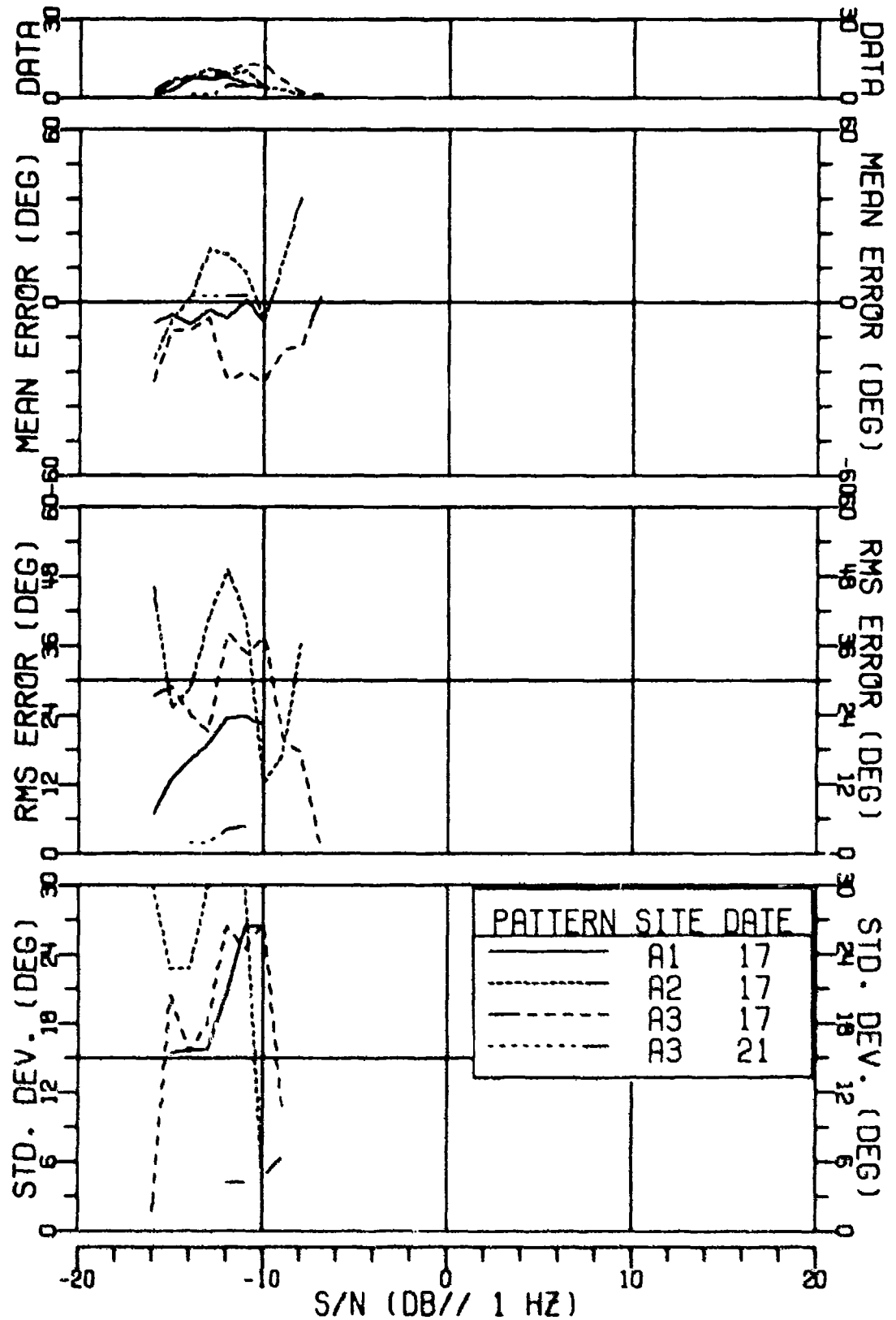


FIGURE III-236
MSS-FVT NEAR BOTTOM SINGLE CARDIOIDS SENSOR
BEARING ERROR RESULTS FOR 55HZ AT 141DB (U)

AS-77-283

SECRET

SECRET

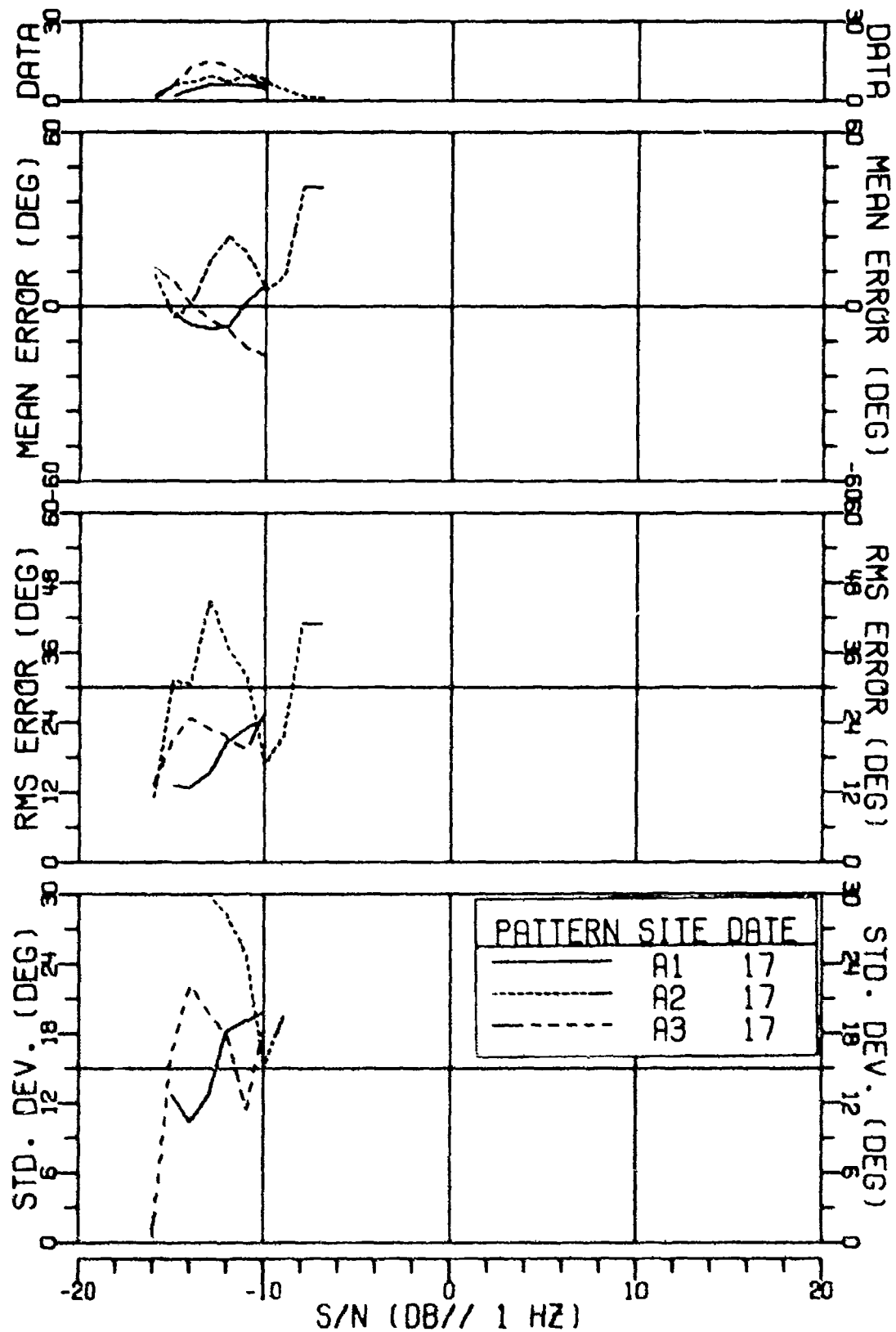


FIGURE III-237
MSS-FVT NEAR BOTTOM MAX GAIN LIMACONS SENSOR
BEARING ERROR RESULTS FOR 55HZ AT 141DB (U)

SECRET

SECRET

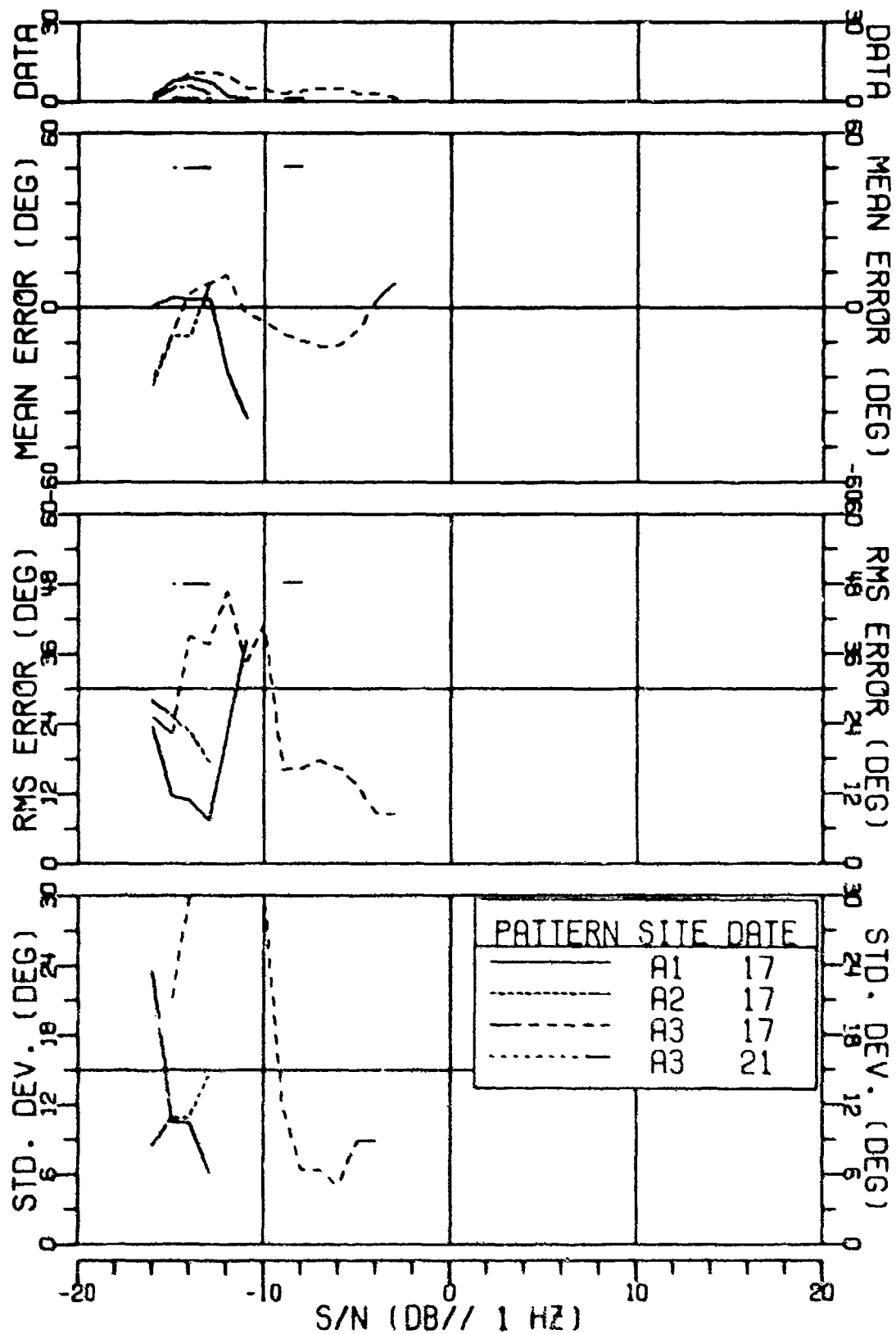


FIGURE III-238
MSS-FVT NEAR BOTTOM DIFFERENCED CARDIOIDS SENSOR
BEARING ERROR RESULTS FOR 55HZ AT 141DB (U)

AS-77-2838

SECRET

SECRET

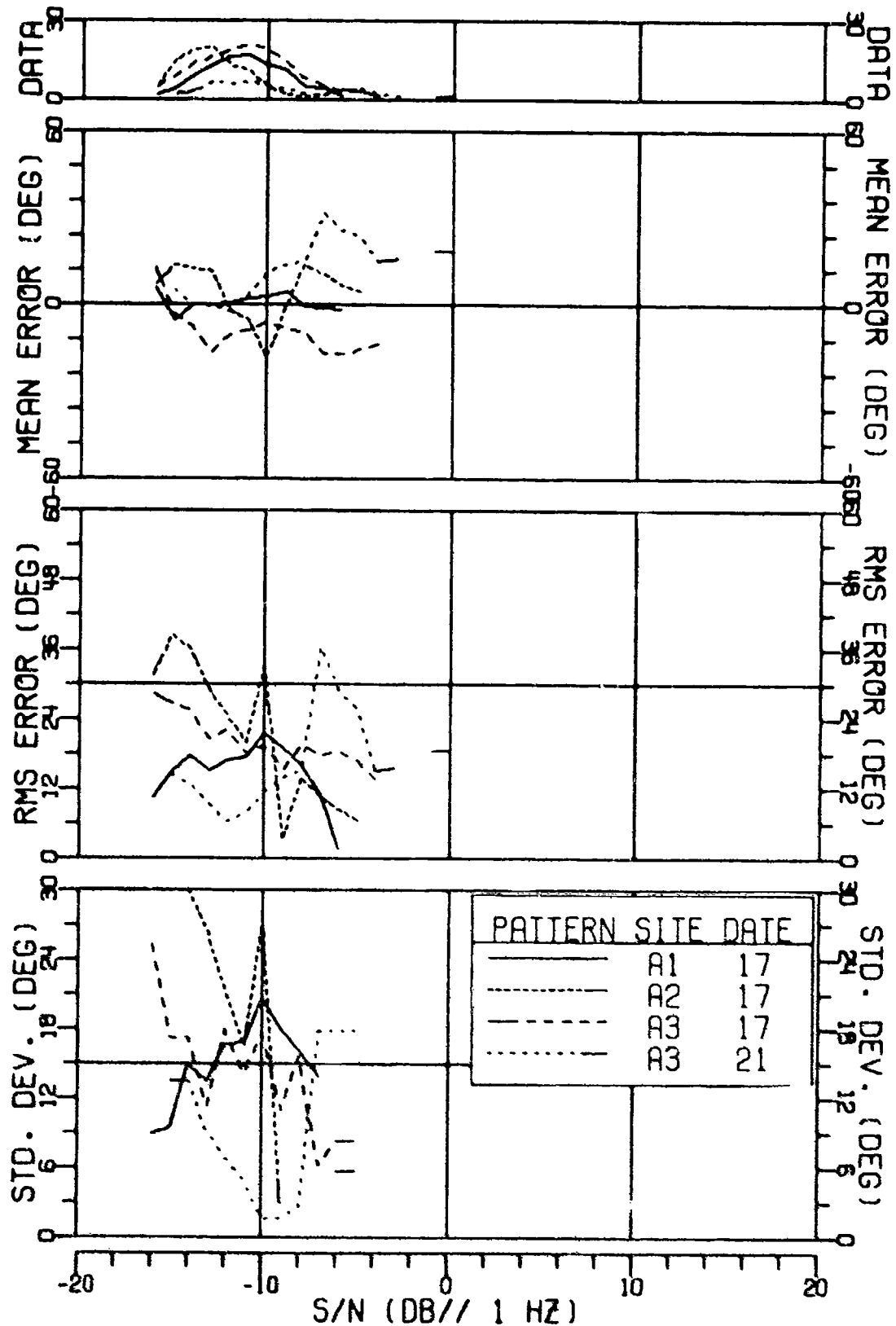


FIGURE III-239
MSS-FVT NEAR BOTTOM SINGLE CARDIOIDS SENSOR
BEARING ERROR RESULTS FOR 155HZ AT 134DB (U)

SECRET

SECRET

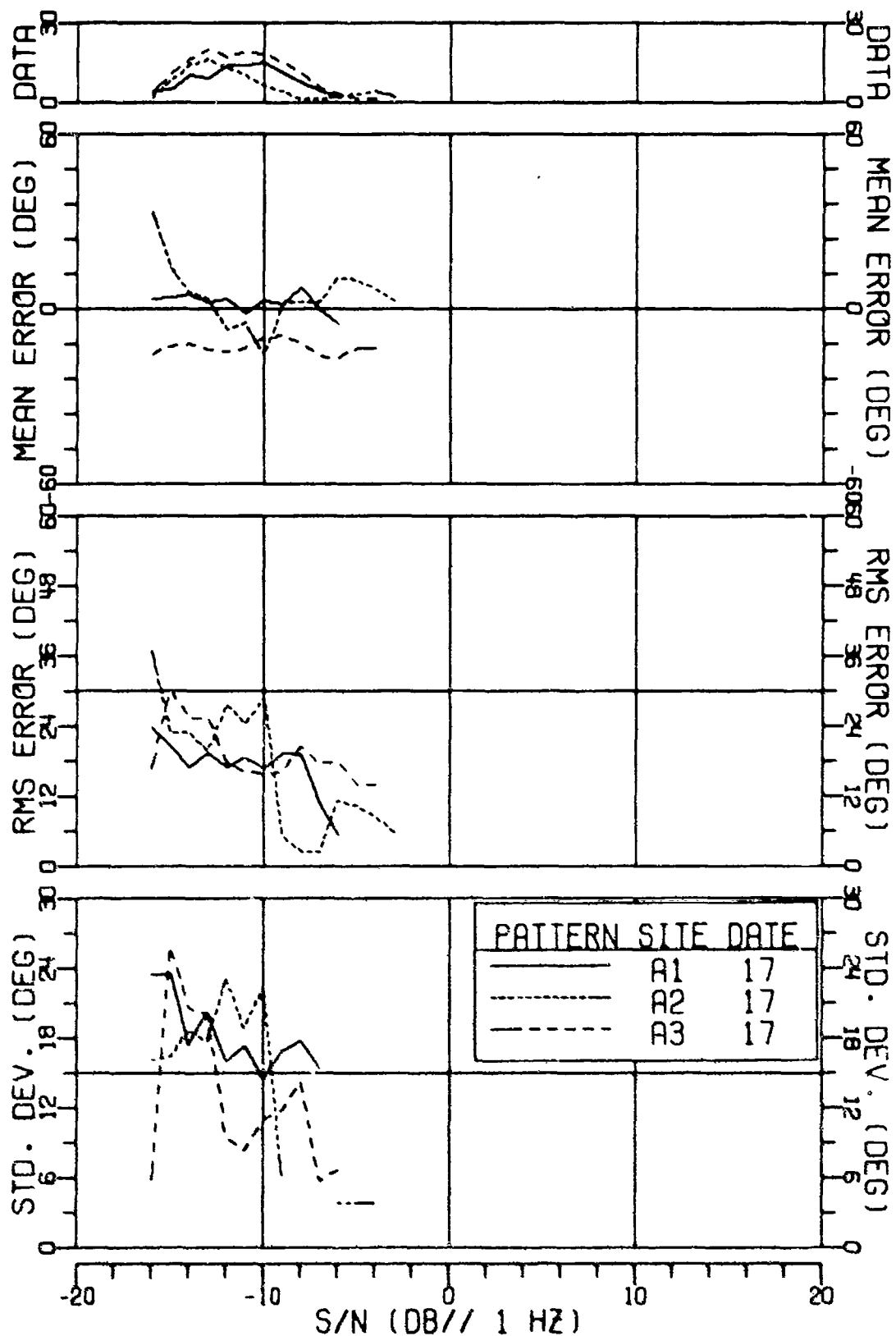


FIGURE III-240
MSS-FVT NEAR BOTTOM MAX GAIN LIMACONS SENSOR
BEARING ERROR RESULTS FOR 155HZ AT 134DB (U)

AS-77-2846

SECRET

SECRET

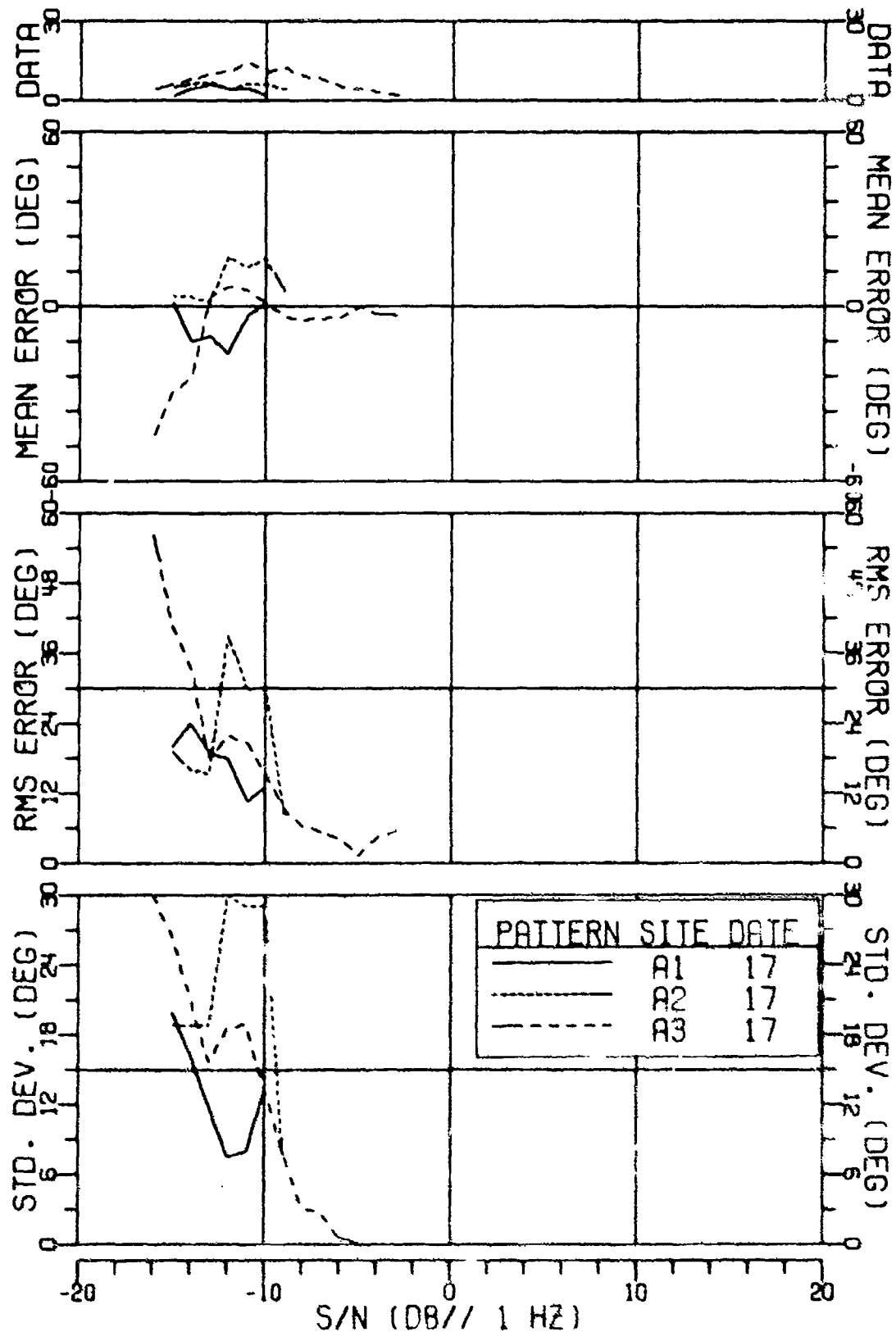


FIGURE III-241
MSS-FVT NEAR BOTTOM DIFFERENCED CARDIOIDS SENSOR
BEARING ERROR RESULTS FOR 155HZ AT 134DB (U)

SECRET

SECRET

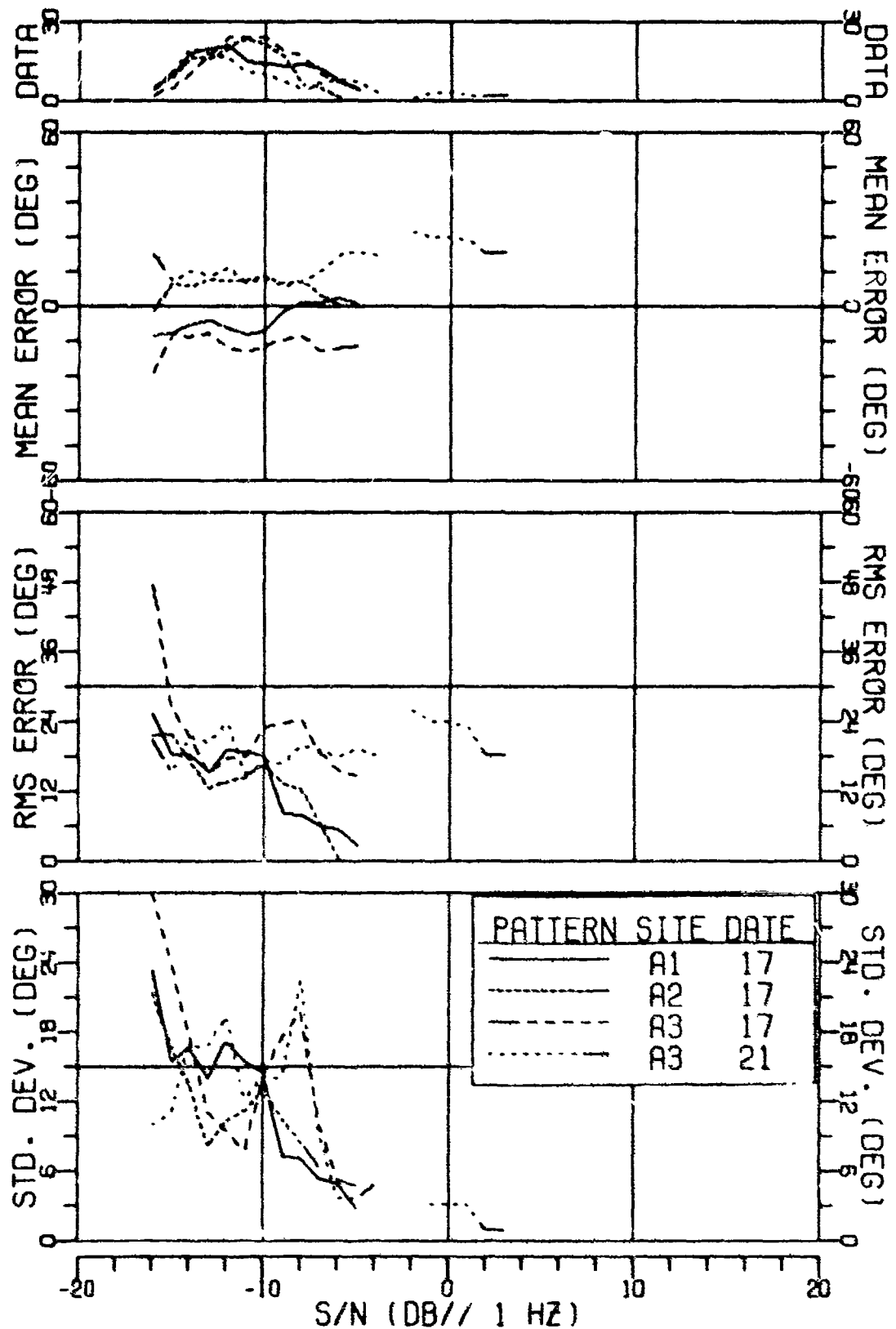


FIGURE III-242
MSS-FVT NEAR BOTTOM SINGLE CARDIOIDS SENSOR
BEARING ERROR RESULTS FOR 305 HZ AT 136DB (U)

AS-77-7847

SECRET

SECRET

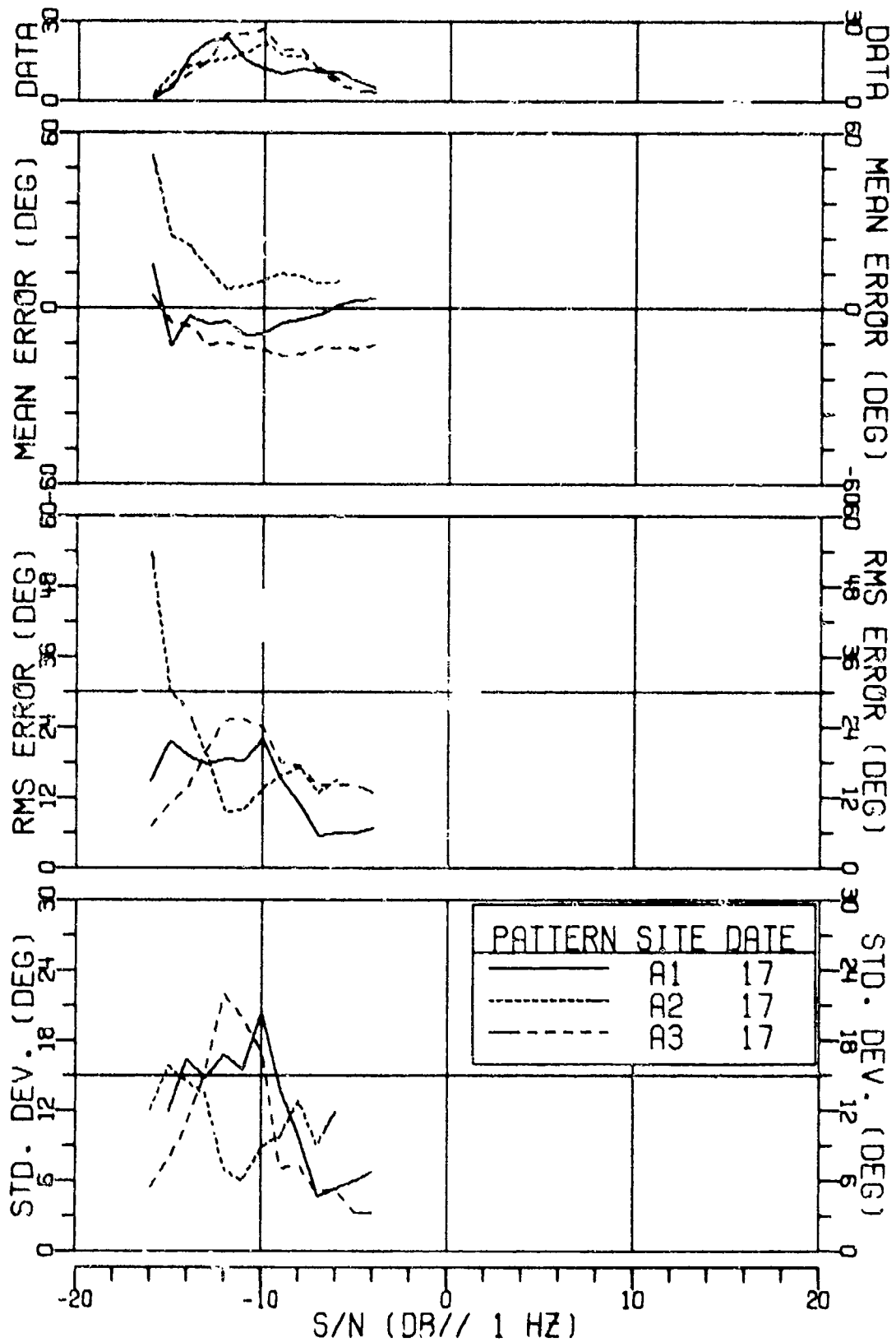


FIGURE III-243
MSS-FVT NEAR BOTTOM MAX GAIN LIMACONS SENSOR
BEARING ERROR RESULTS FOR 305 HZ AT 136DB (U)

SECRET

SECRET

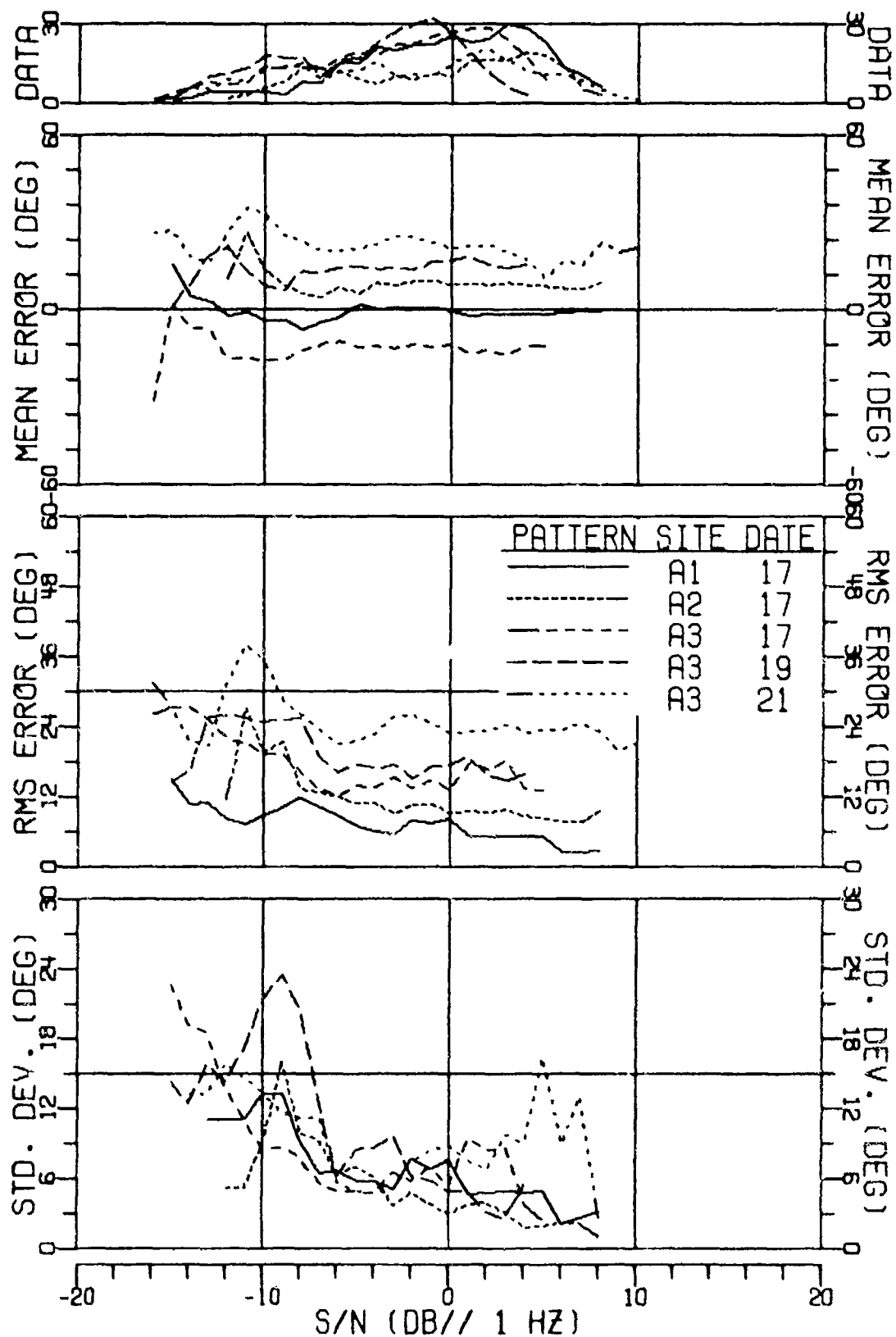


FIGURE III-244
MSS-FVT NEAR BOTTOM SINGLE CARDIOIDS SENSOR
BEARING ERROR RESULTS FOR 64HZ AT 162DB (U)

AS-77-2844

SECRET

SECRET

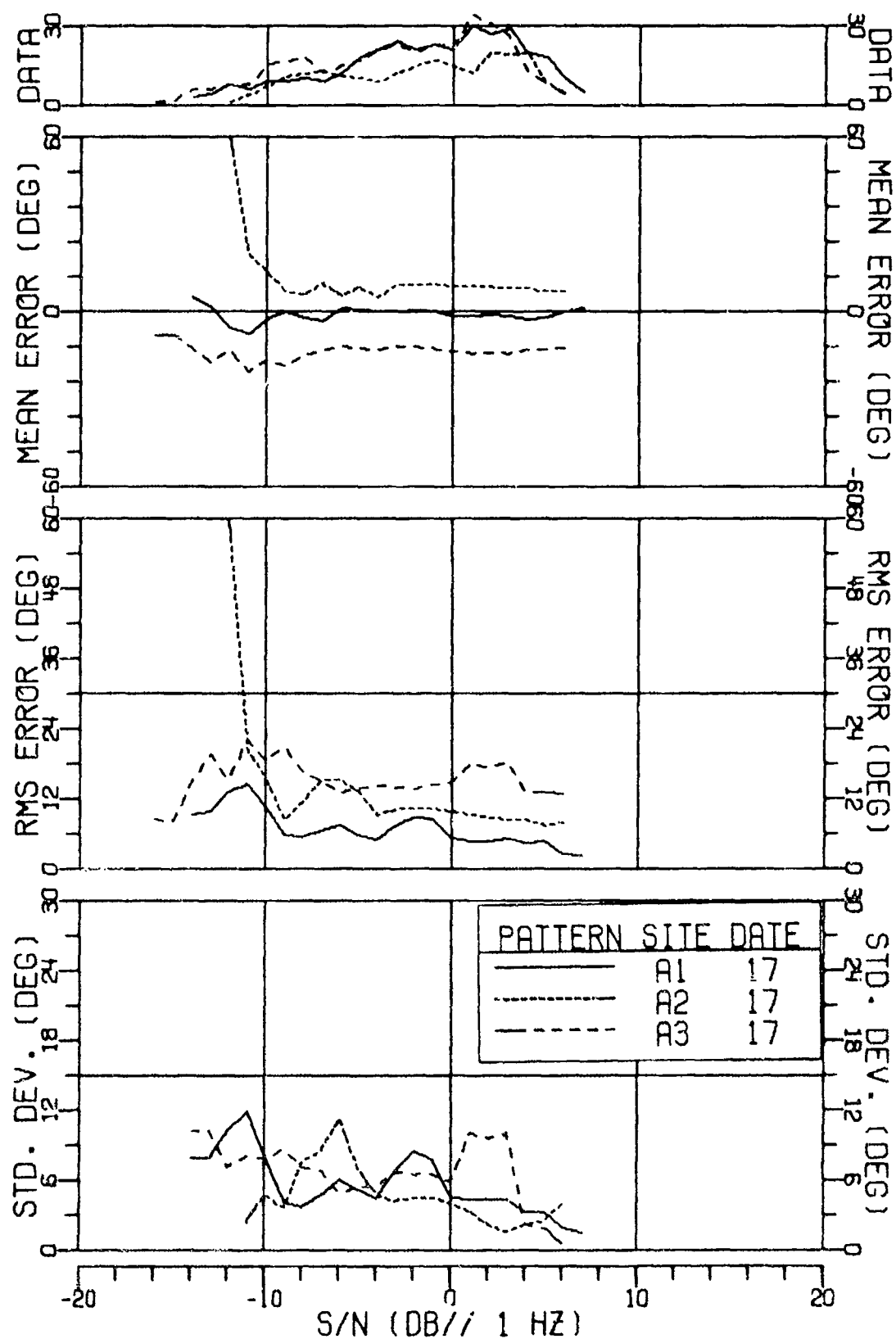


FIGURE III-245
MSS-FVT NEAR BOTTOM MAX GAIN LIMACONS SENSOR
BEARING ERROR RESULTS FOR 64HZ AT 16200 (U)

SECRET

SECRET

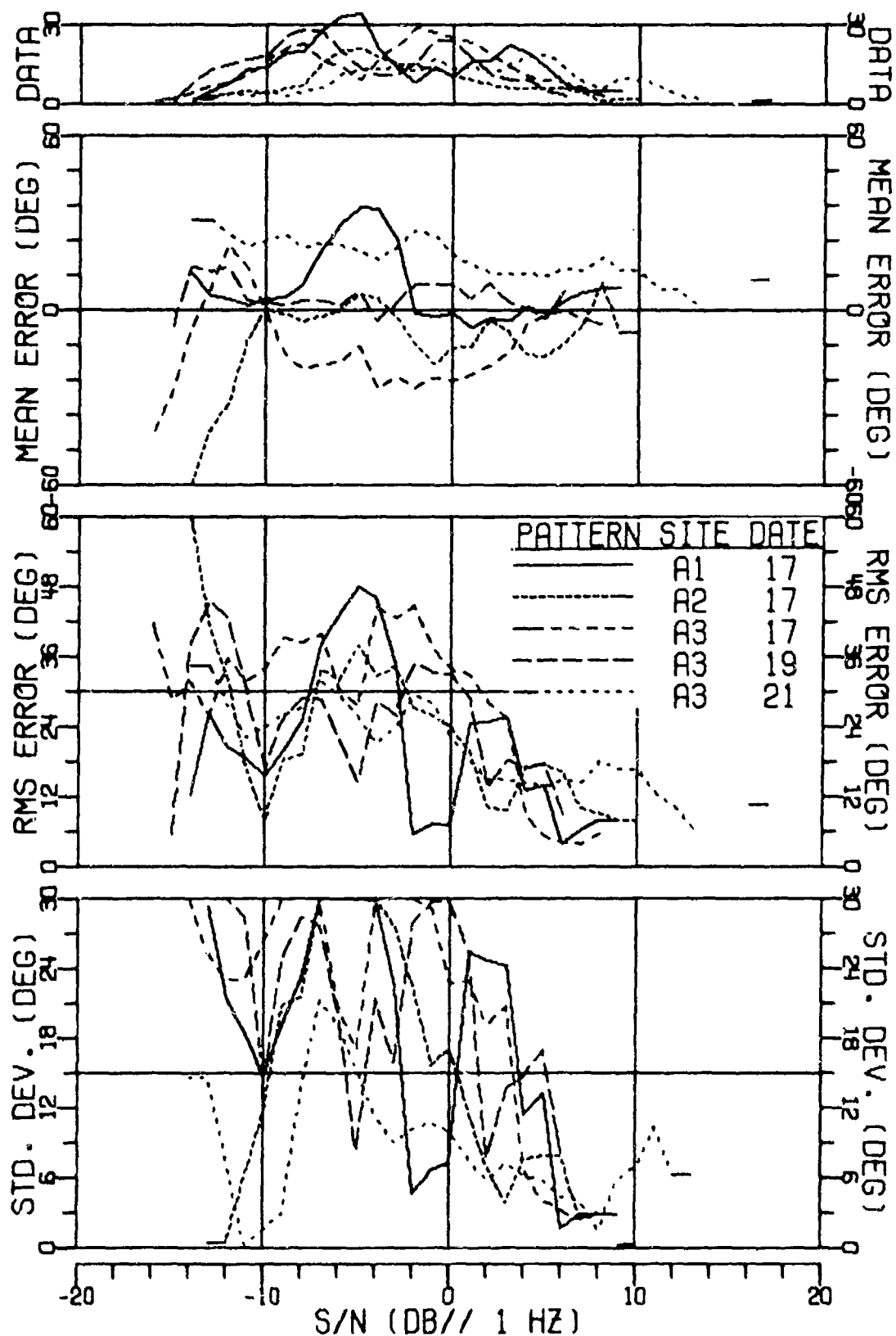


FIGURE III-246
MSS-FVT NEAR BOTTOM DIFFERENCED CARDIOIDS SENSOR
BEARING ERROR RESULTS FOR 64HZ AT 162DB (U)

AS-77-2846

SECRET

SECRET

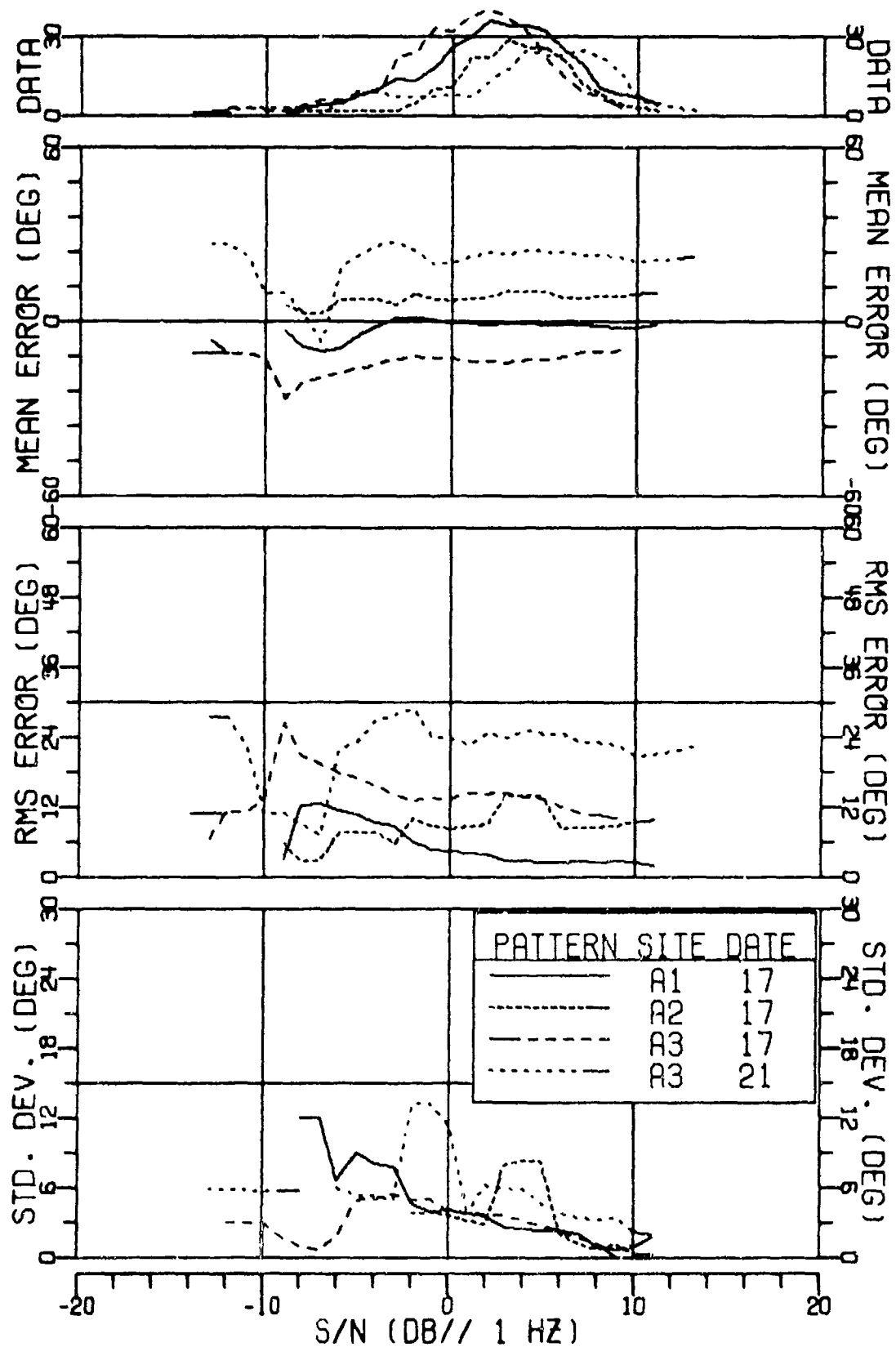


FIGURE III-247
MSS-FVT NEAR BOTTOM SINGLE CARDIOIDS SENSOR
BEARING ERROR RESULTS FOR 160HZ AT 161DB (U)

SECRET

SECRET

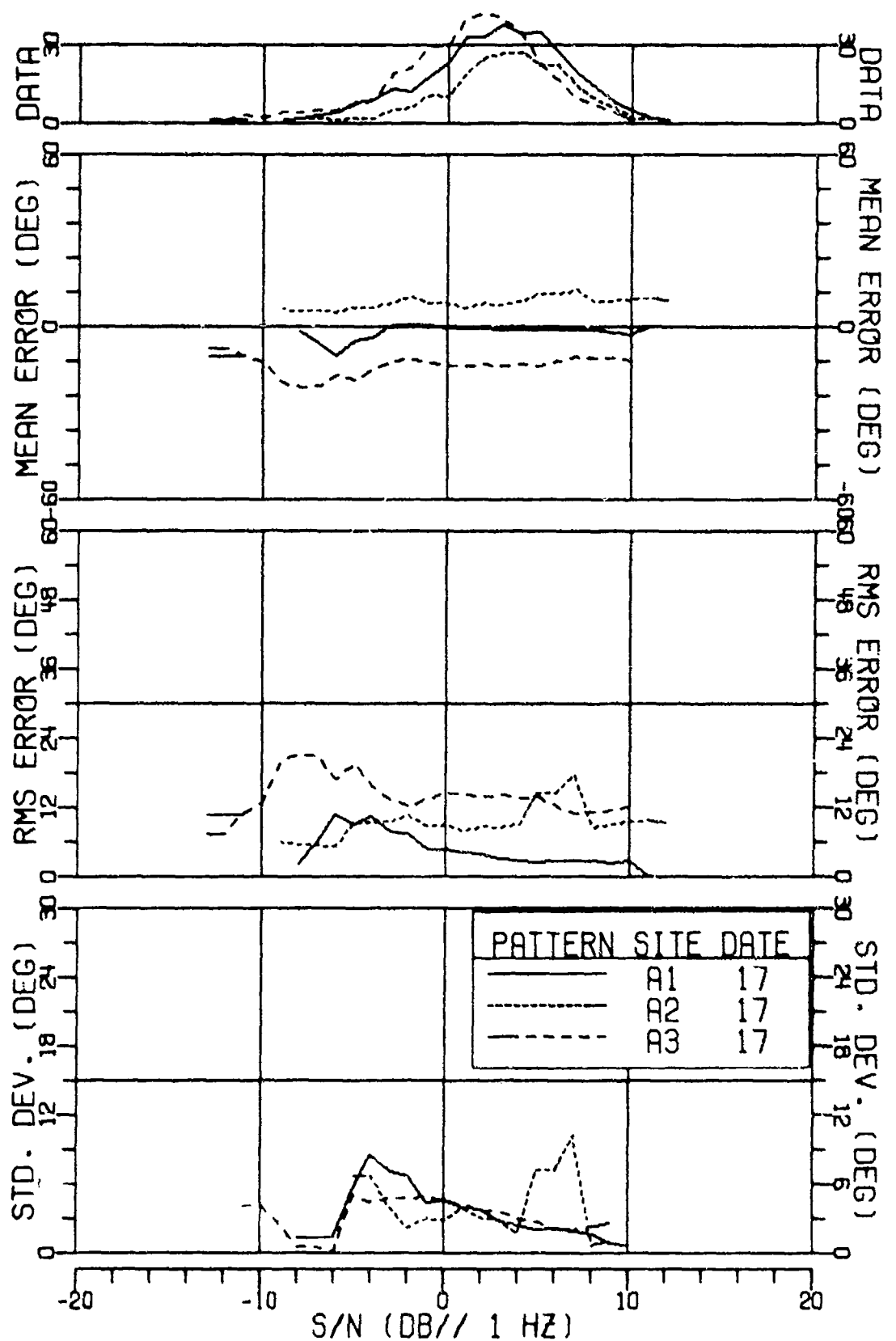


FIGURE III-248
MSS-FVT NEAR BOTTOM MAX GAIN LIMACONS SENSOR
BEARING ERROR RESULTS FOR 160HZ AT 161DB (U)

SECRET

SECRET

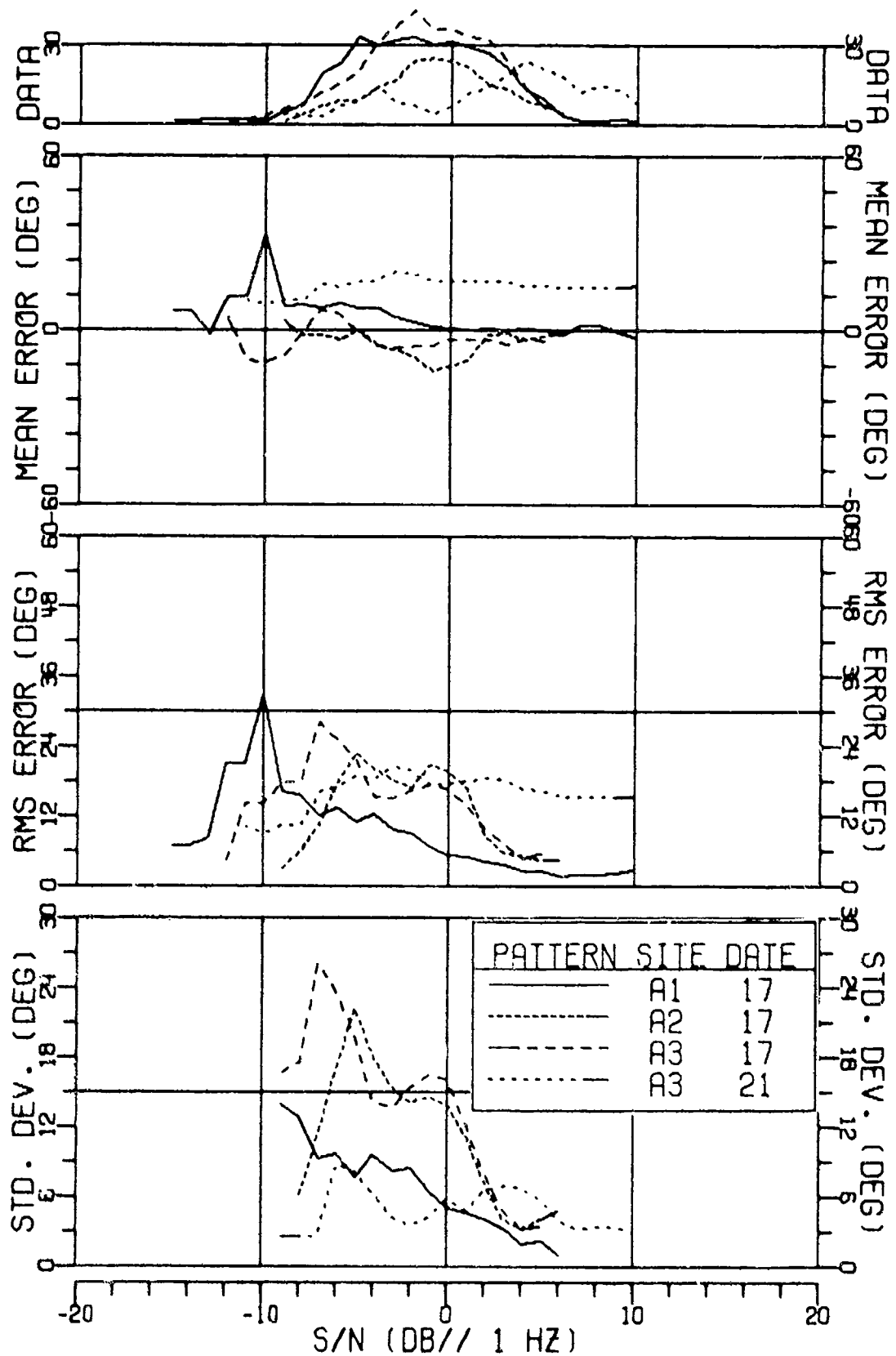


FIGURE III-249
MSS-FVT NEAR BOTTOM DIFFERENCED CARDIOIDS SENSOR
BEARING ERROR RESULTS FOR 160HZ AT 161DB (U)

SECRET

SECRET

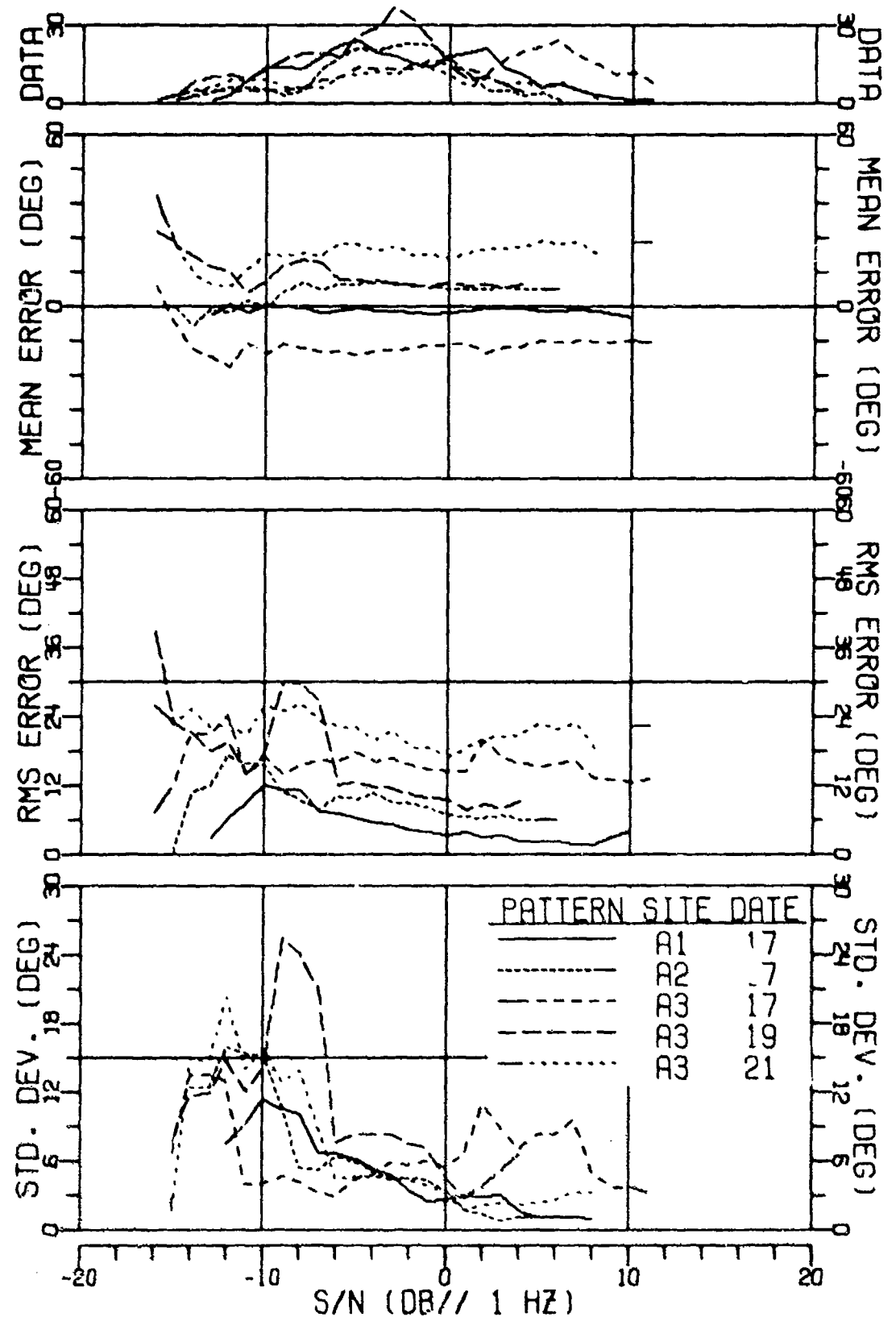


FIGURE III-250
MSS-FVT NEAR BOTTOM SINGLE CARDIOIDS SENSOR
BEARING ERROR RESULTS FOR 70HZ AT 166DB (U)

SECRET

SECRET

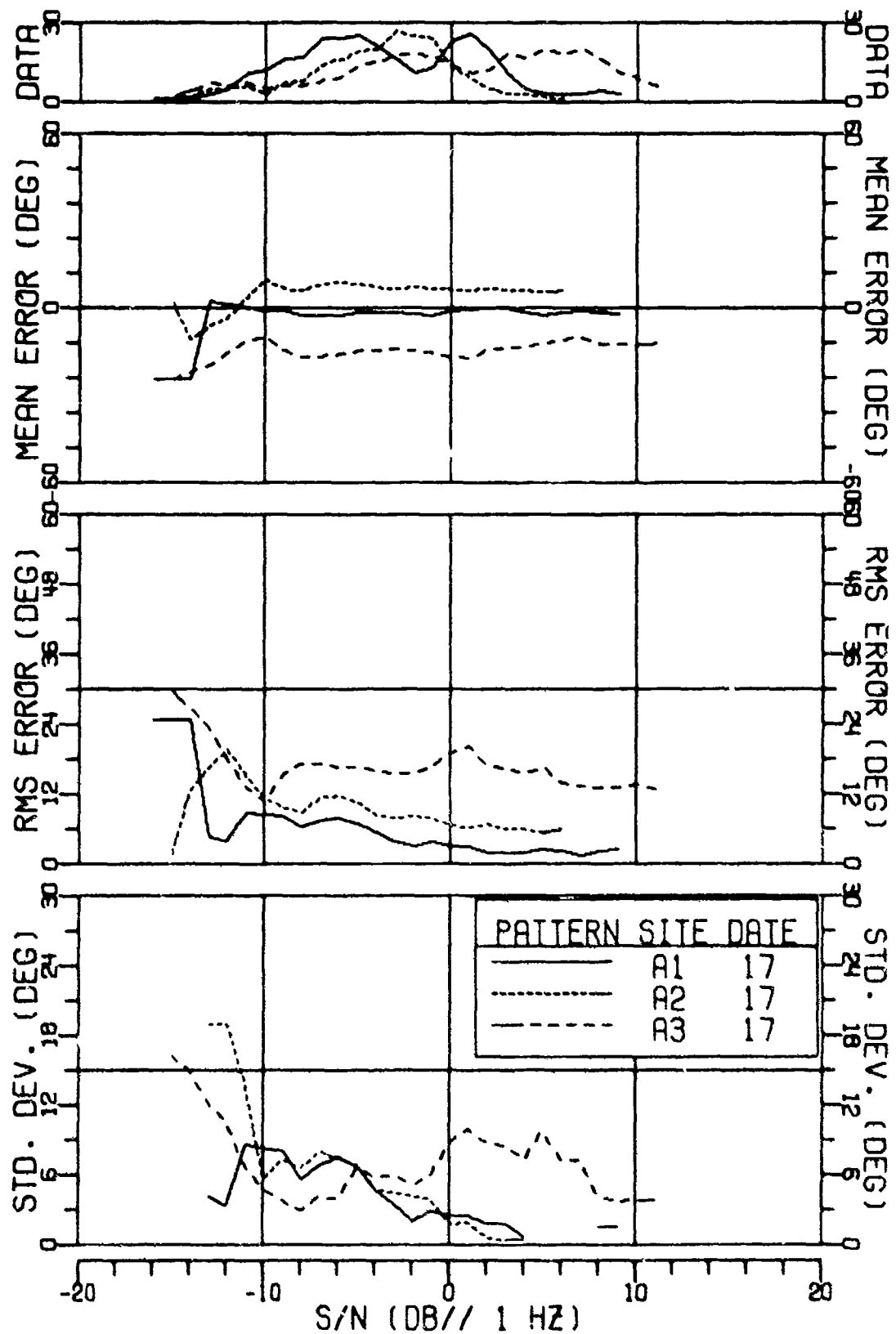


FIGURE III-251
MSS-FVT NEAR BOTTOM MAX GAIN LIMACONS SENSOR
BEARING ERROR RESULTS FOR 70HZ AT 1660B (U)

AS-77-2851

SECRET

SECRET

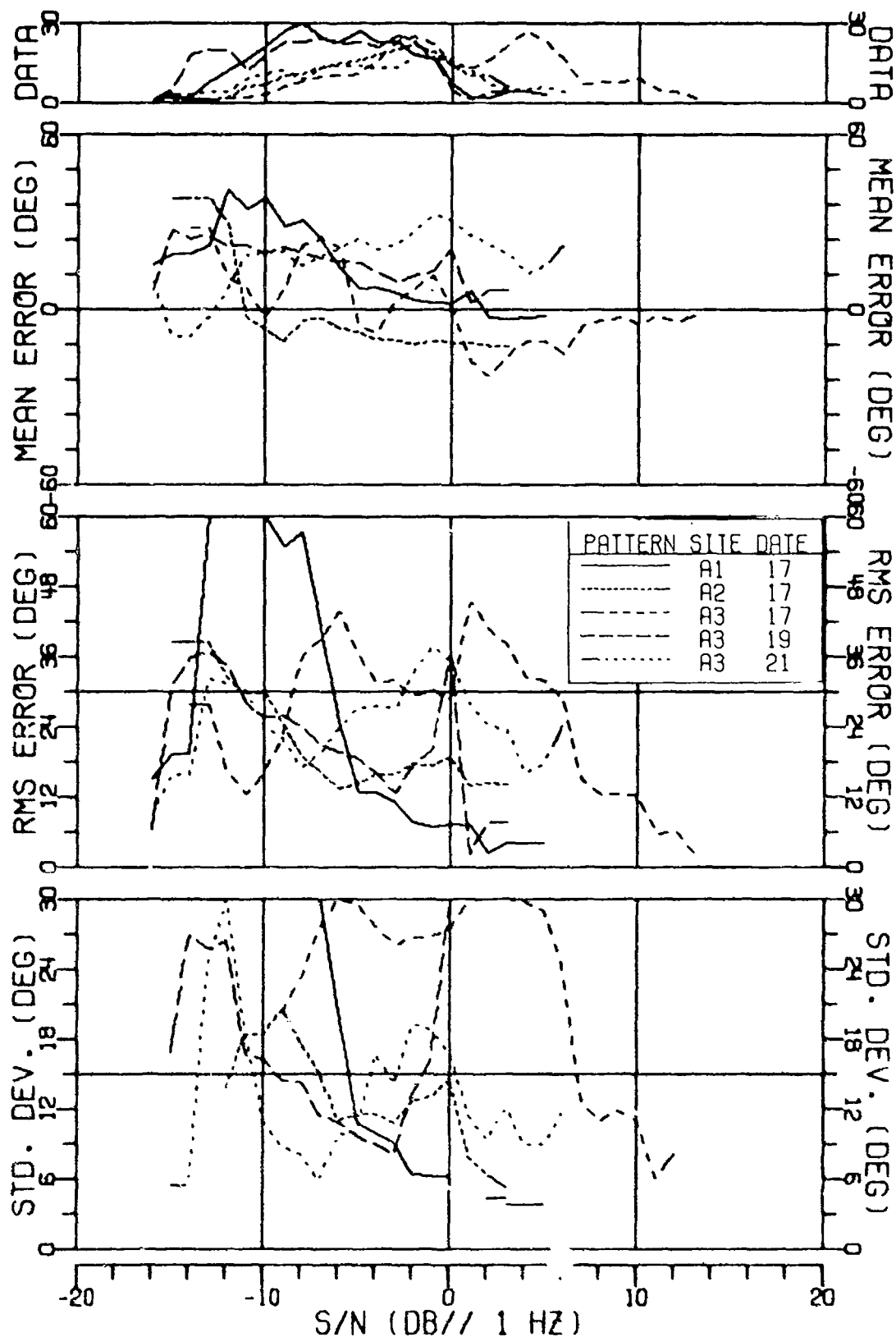


FIGURE III-252
MSS-FVT NEAR BOTTOM DIFFERENCED CARDIOIDS SENSOR
BEARING ERROR RESULTS FOR 70HZ AT 166DB (U)

SECRET

SECRET

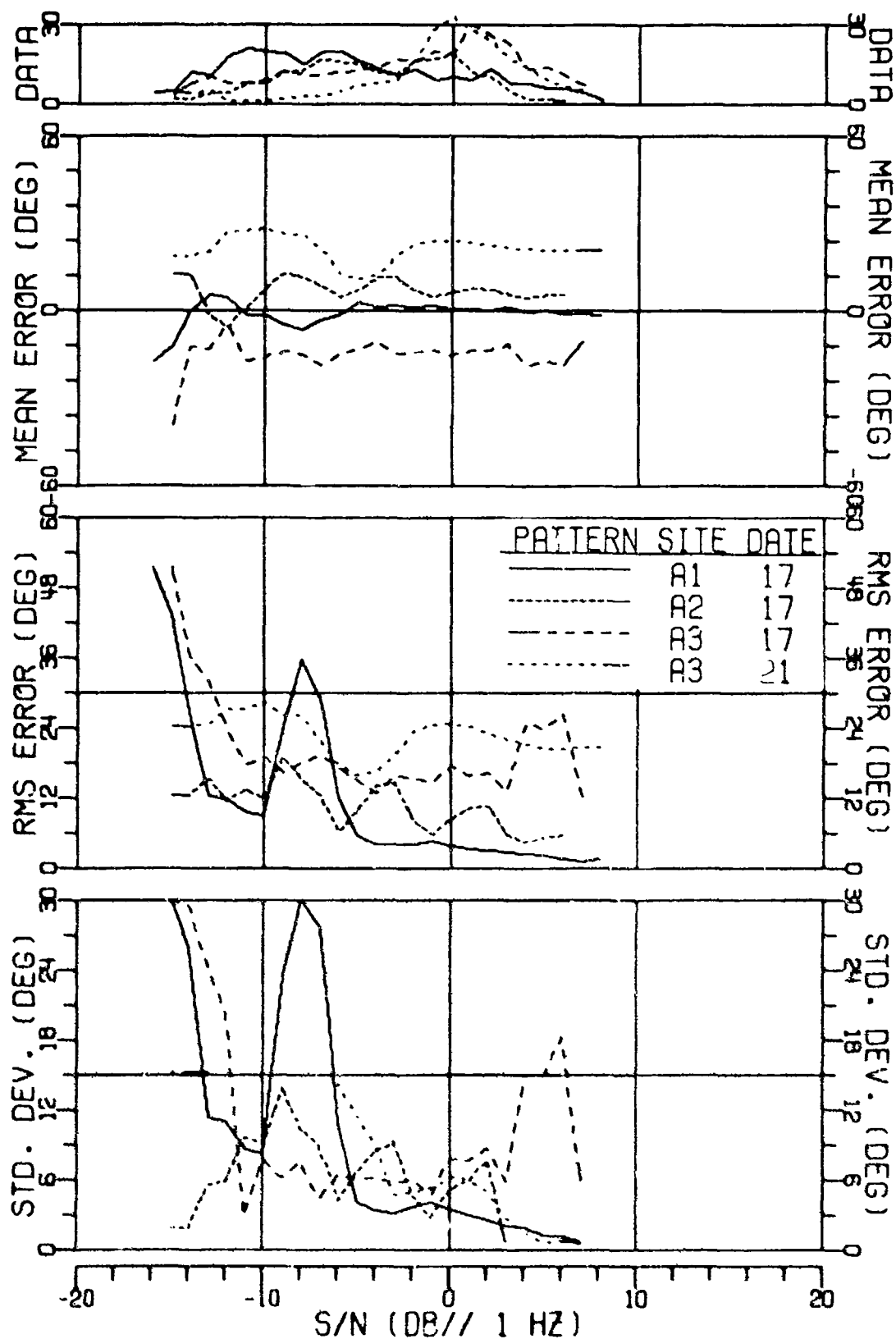


FIGURE III-253
MSS-FVT NEAR BOTTOM SINGLE CARDIOIDS SENSOR
BEARING ERROR RESULTS FOR 170HZ AT 156DB (U)

SECRET

SECRET

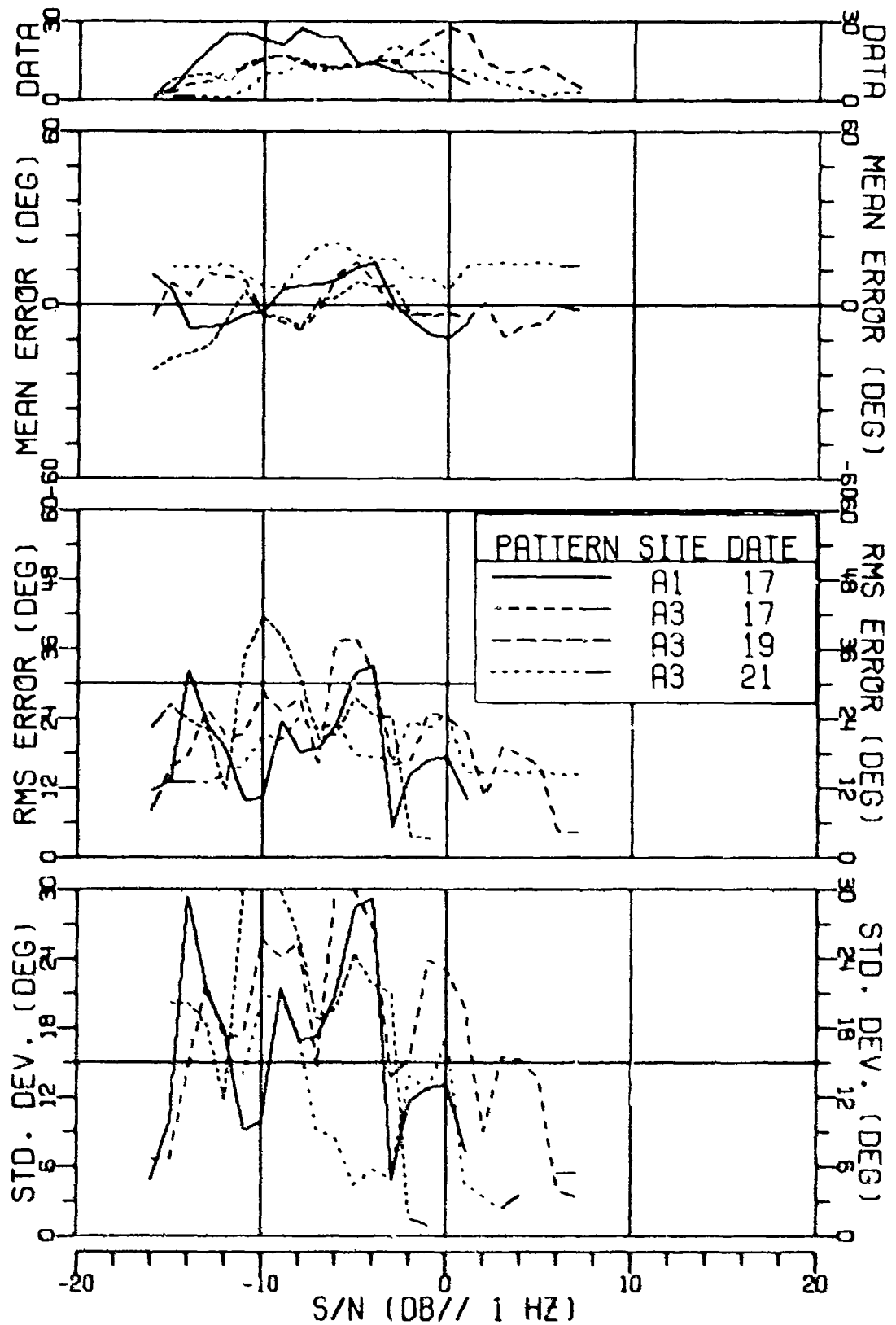


FIGURE III-255
MSS-FVT NEAR BOTTOM DIFFERENCED CARDIOIDS SENSOR
BEARING ERROR RESULTS FOR 170HZ AT 156DB (U)

AG-77-4, PA

SECRET

SECRET

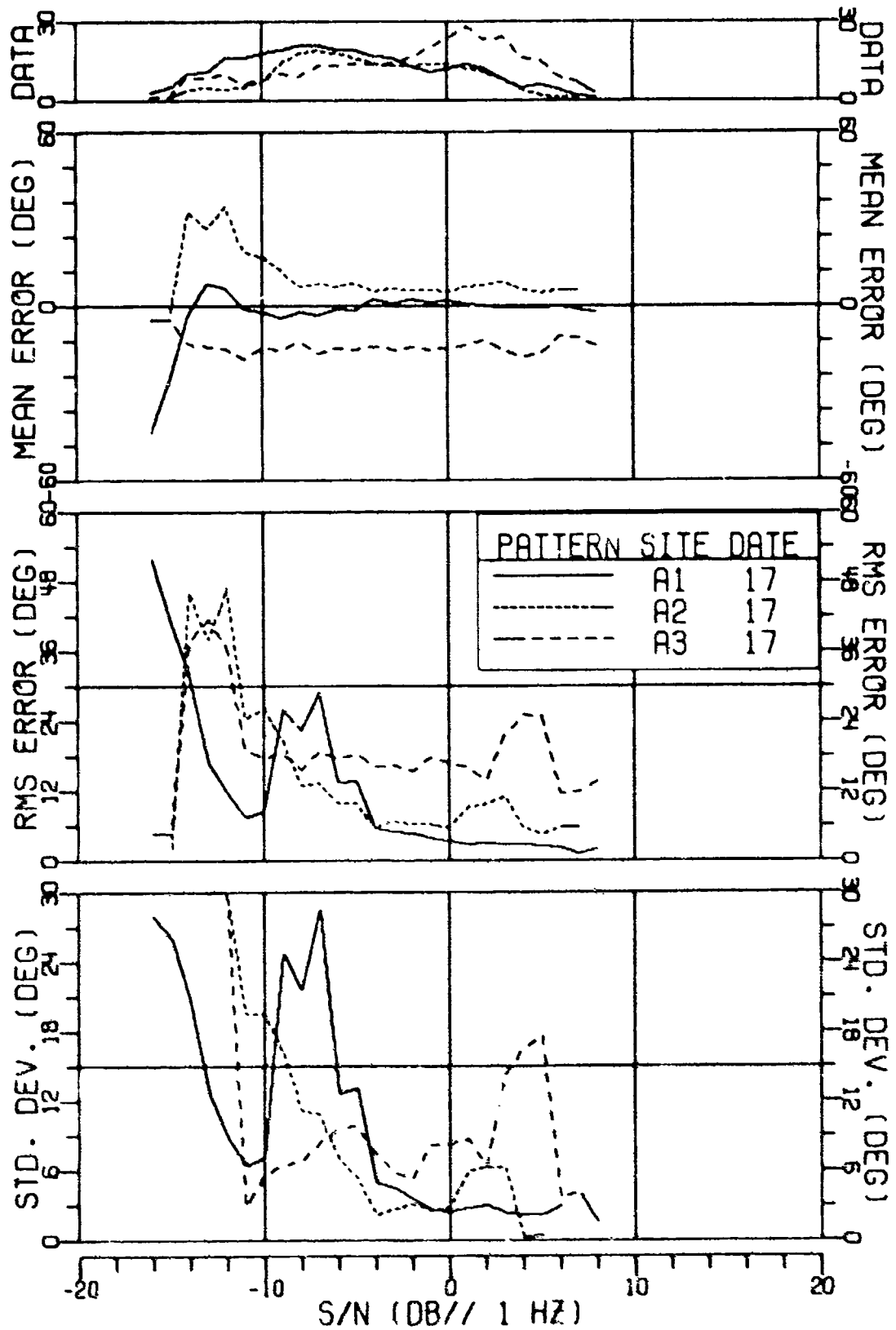


FIGURE III-254
MSS-FVT NEAR BOTTOM MAX GAIN LIMACONS SENSOR
BEARING ERROR RESULTS FOR 170HZ AT 156DB (U)

SECRET

SECRET

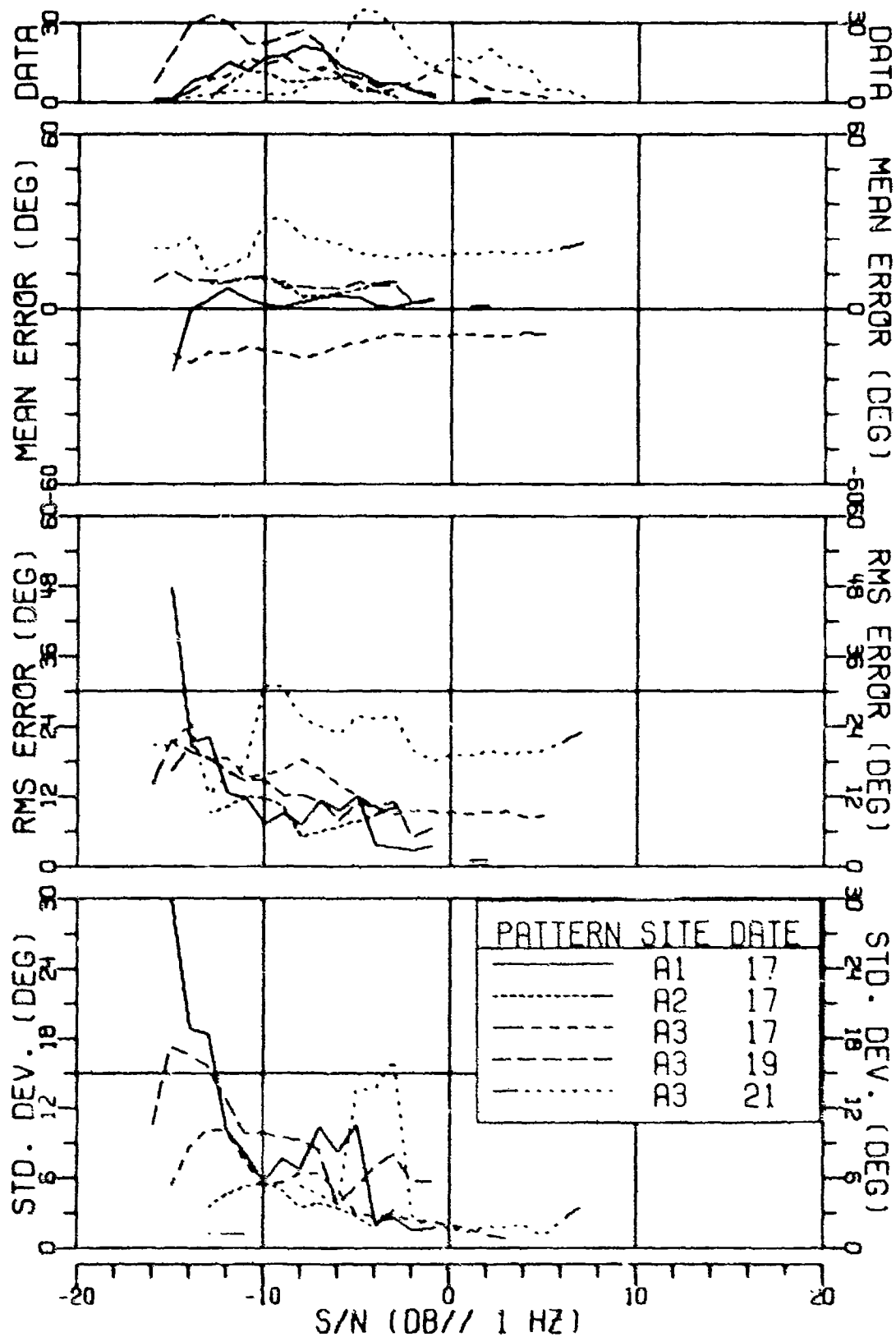


FIGURE III-256
MSS-FVT NEAR BOTTOM SINGLE CARDIOIDS SENSOR
BEARING ERROR RESULTS FOR 335HZ AT 154DB (U)

SECRET

SECRET

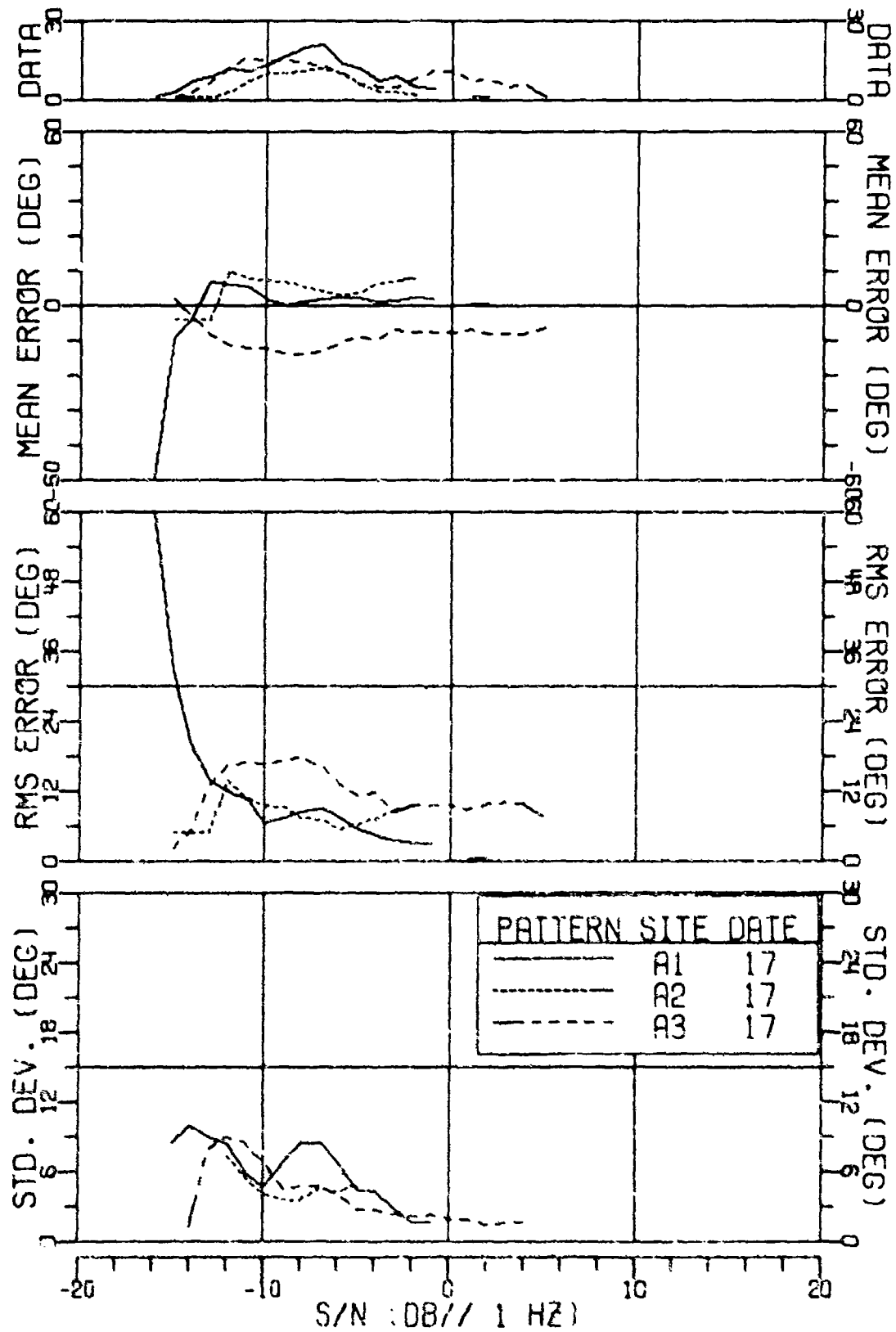


FIGURE III-257
MSS-FVT NEAR BOTTOM MAX GAIN LIMACONS SENSOR
BEARING ERROR RESULTS FOR 335HZ AT 1540B (U)

SECRET

UNCLASSIFIED

APPENDIX G

SIGNAL-TO-NOISE RATIO versus RANGE CURVES (U)

(FIGURES III-258 - III 293)

UNCLASSIFIED

SECRET

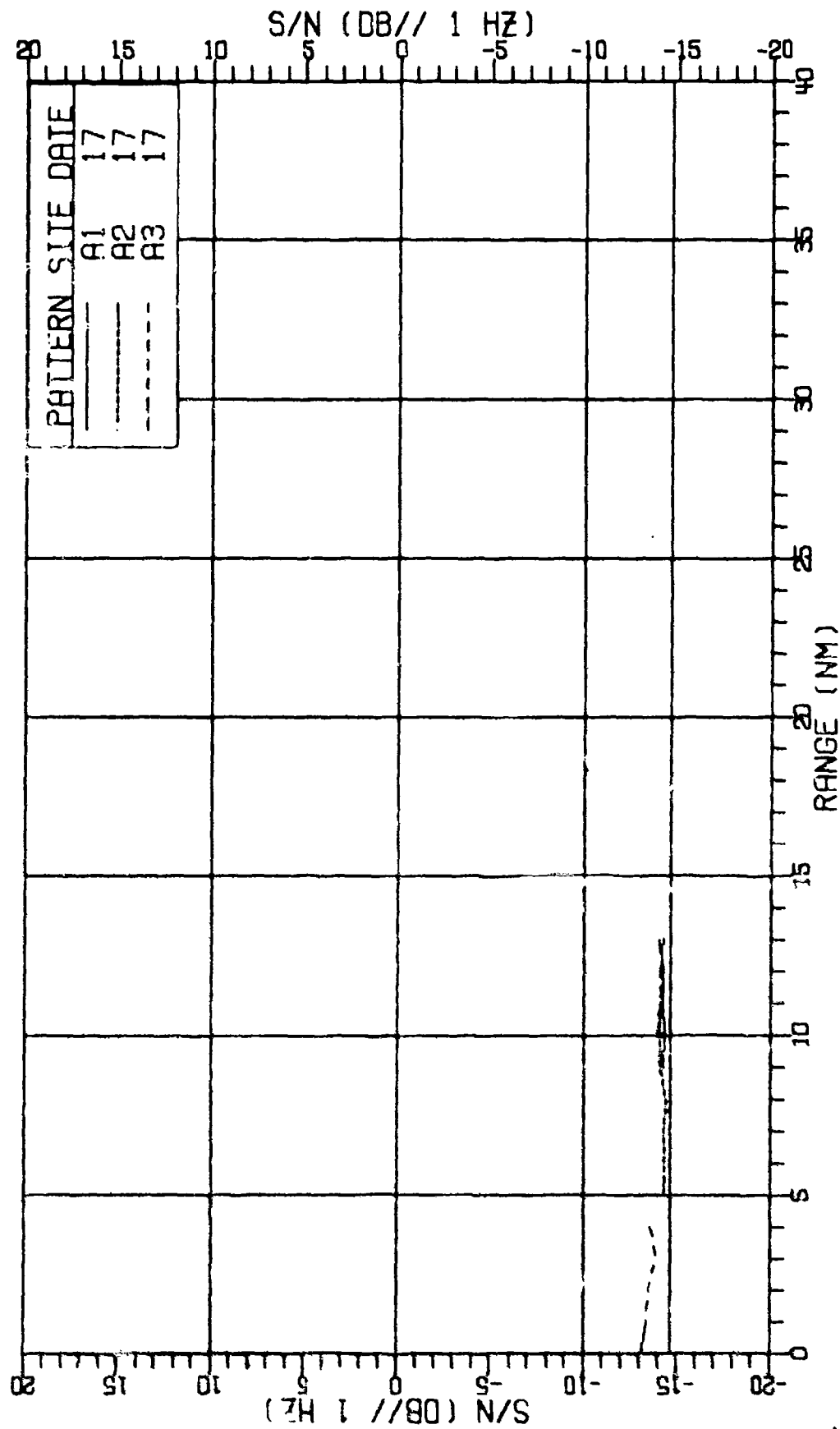


FIGURE III-258
MSS-FVT NEAR BOTTOM OMNIDIRECTIONAL SENSOR
SIGNAL-TO-NOISE RESULTS FOR 55HZ AT 141DB (U)

AS-77-2858

SECRET

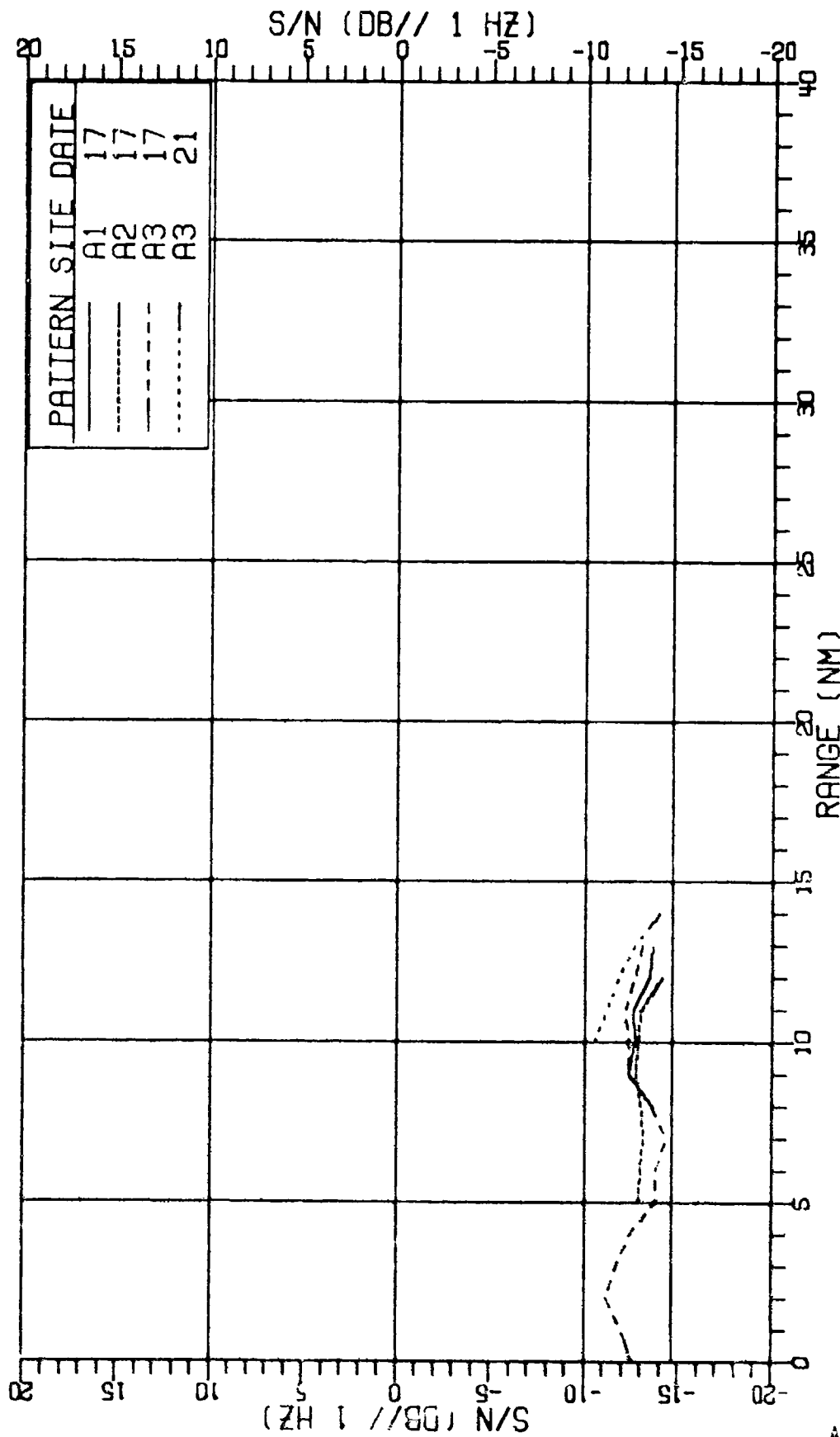


FIGURE III-259
MSS-FVT NEAR BOTTOM SINGLE CARDIOIDS SENSOR
SIGNAL-TO-NOISE RESULTS FOR 55HZ AT 141DB (U)

AS-77-2859

SECRET

SECRET

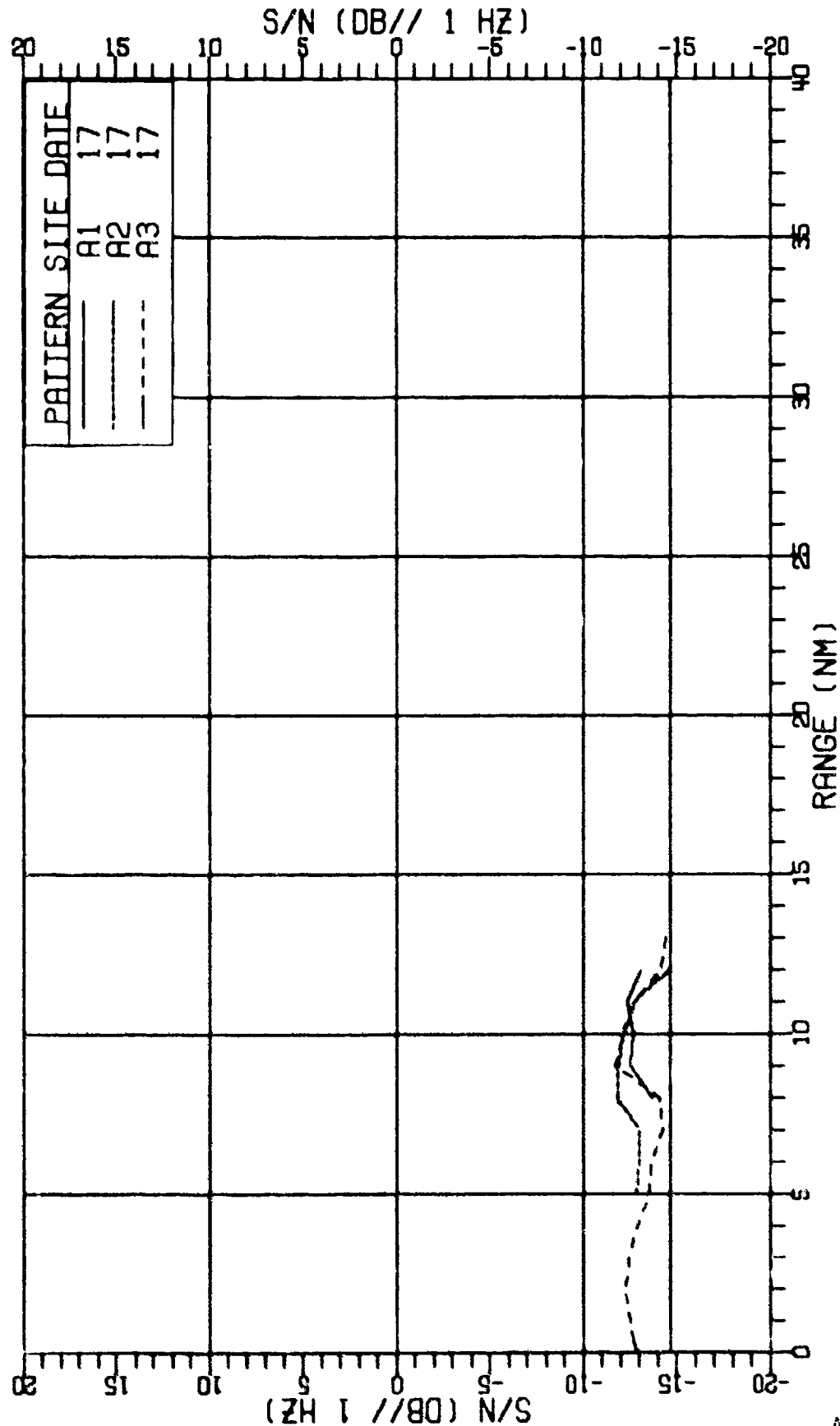


FIGURE III-260
MSS-FVT NEAR BOTTOM MAX GAIN LIMA CONS SENSOR
SIGNAL-TO-NOISE RESULTS FOR 55HZ AT 141DB (U)

AS-77-2860

SECRET

SECRET

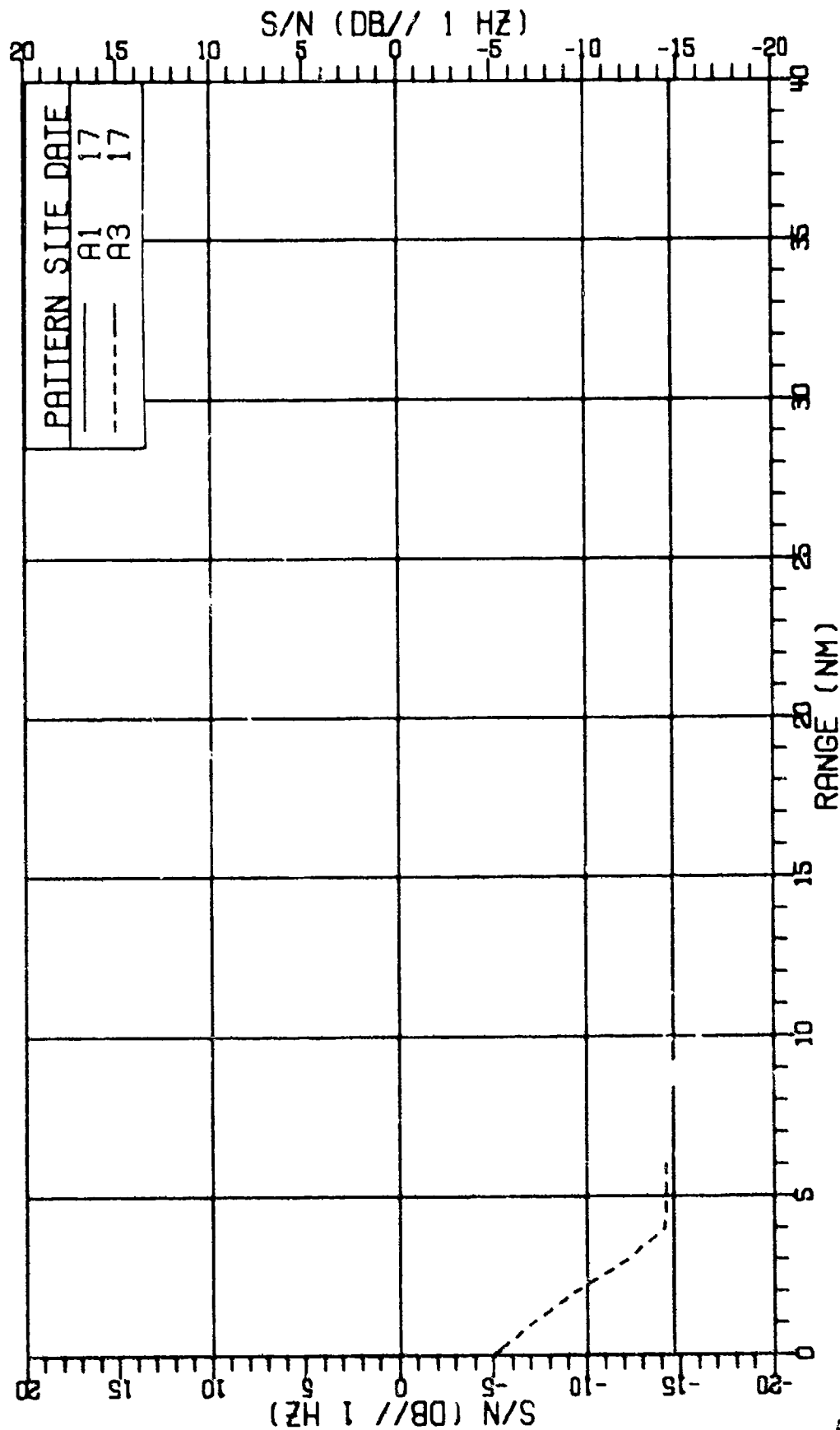


FIGURE 111-261
M3S-FVT NEAR BOTTOM VERTICAL DIPOLE SENSOR
SIGNAL-TO-NOISE RESULTS FOR 55HZ AT 1410B (U)

AS-77-2861

SECRET

SECRET

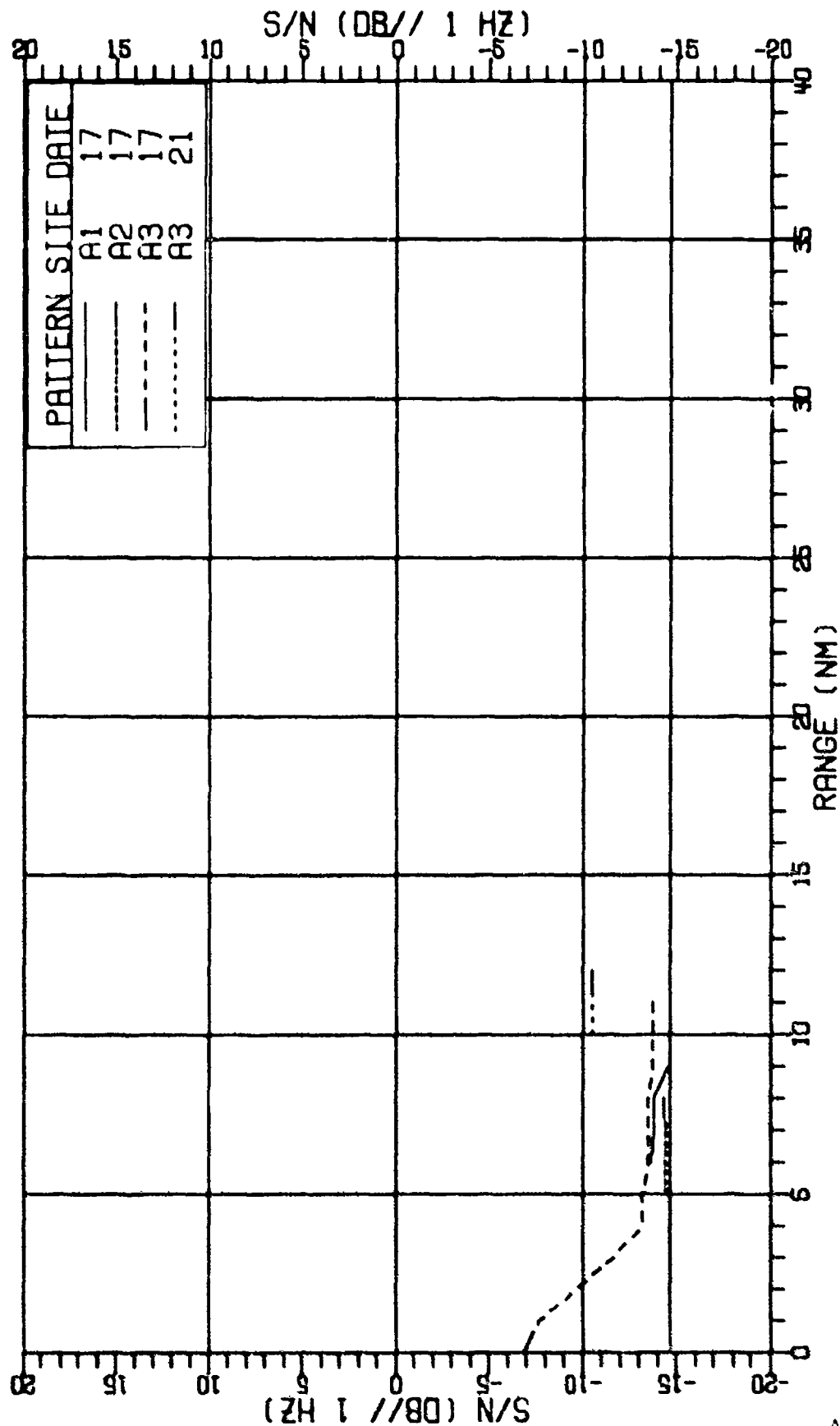


FIGURE 111-262
MSS-FVT NEAR BOTTOM DIFFERENCED CARDIOIDS SENSOR
SIGNAL-TO-NOISE RESULTS FOR 55HZ AT 14108 (U)

AS-77-2860

SECRET

SECRET

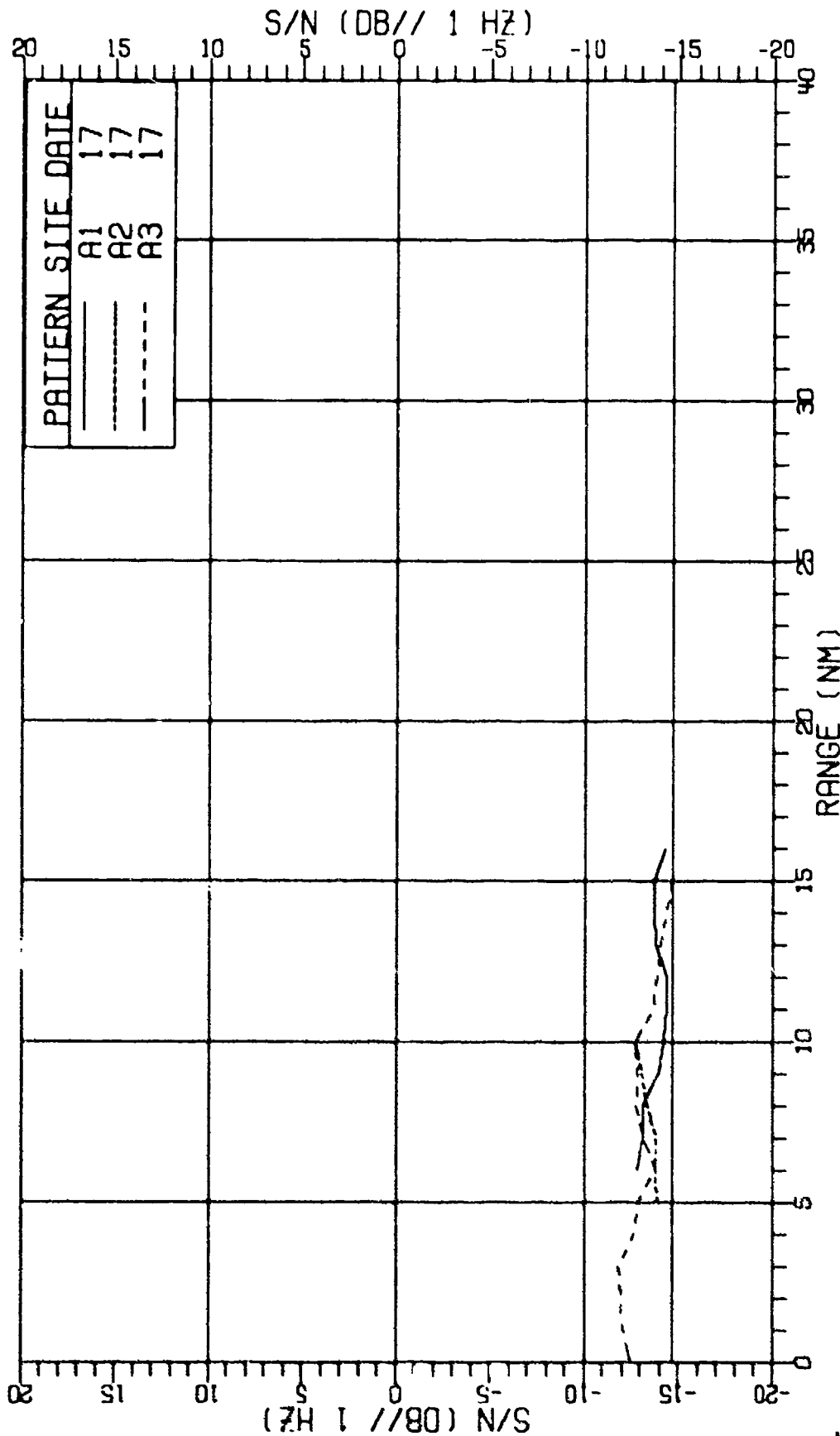


FIGURE III-263
MSS-FVT NEAR BOTTOM OMNIDIRECTIONAL SENSOR
SIGNAL-TO-NOISE RESULTS FOR 155HZ AT 134DB (U)

AS-77-2863

SECRET

SECRET

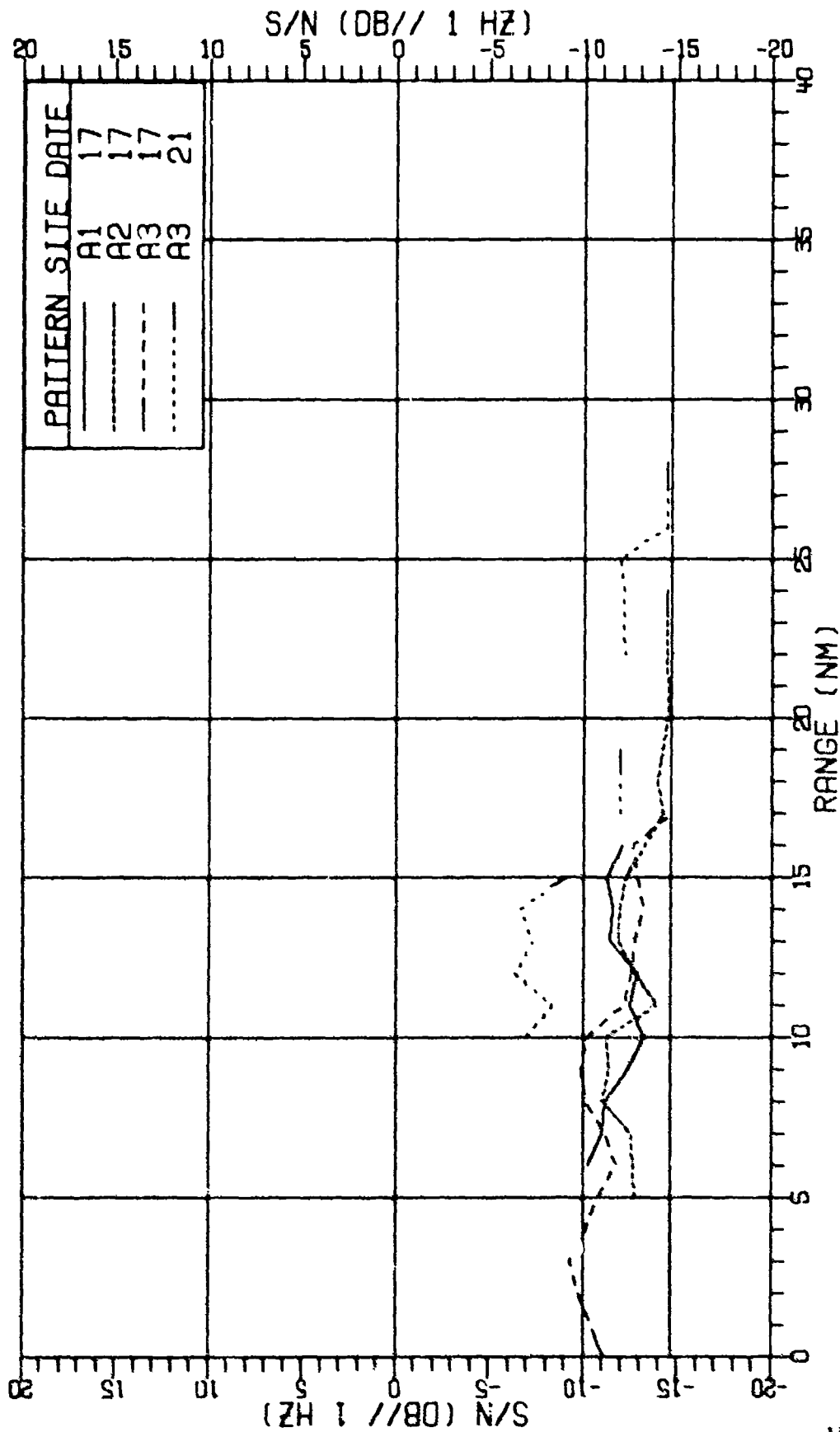


FIGURE III-264
MSS-FVT NEAR BOTTOM SINGLE CARDIOIDS SENSOR
SIGNAL-TO-NOISE RESULTS FOR 155HZ AT 134DB (U)

AS-77-2864

SECRET

SECRET

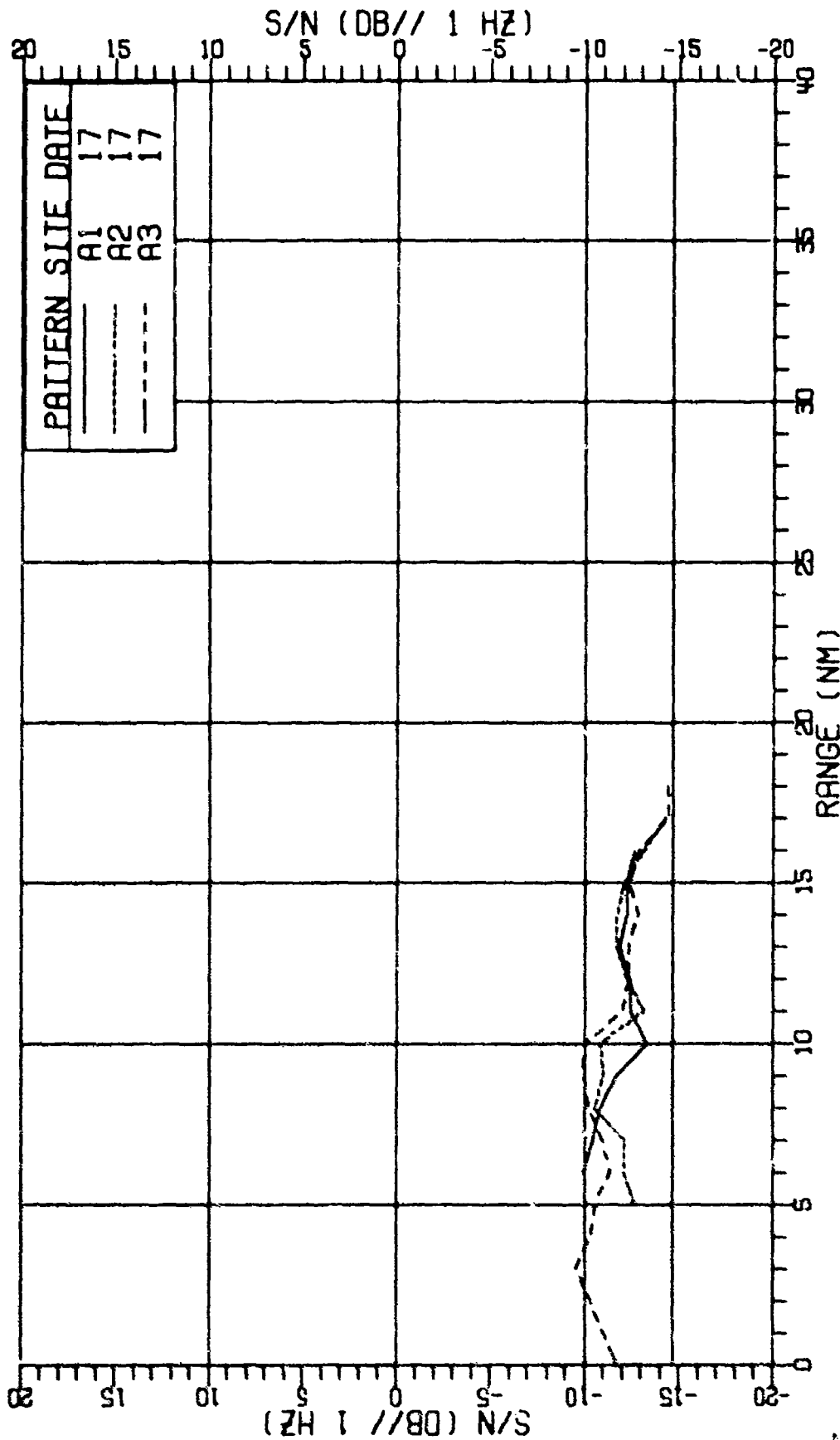


FIGURE 111-265
MSS-FVT NEAR BOTTOM MAX GAIN LIMACONS SENSOR
SIGNAL-TO-NOISE RESULTS FOR 155HZ AT 134DB (U)

AS-77-2865

SECRET

SECRET

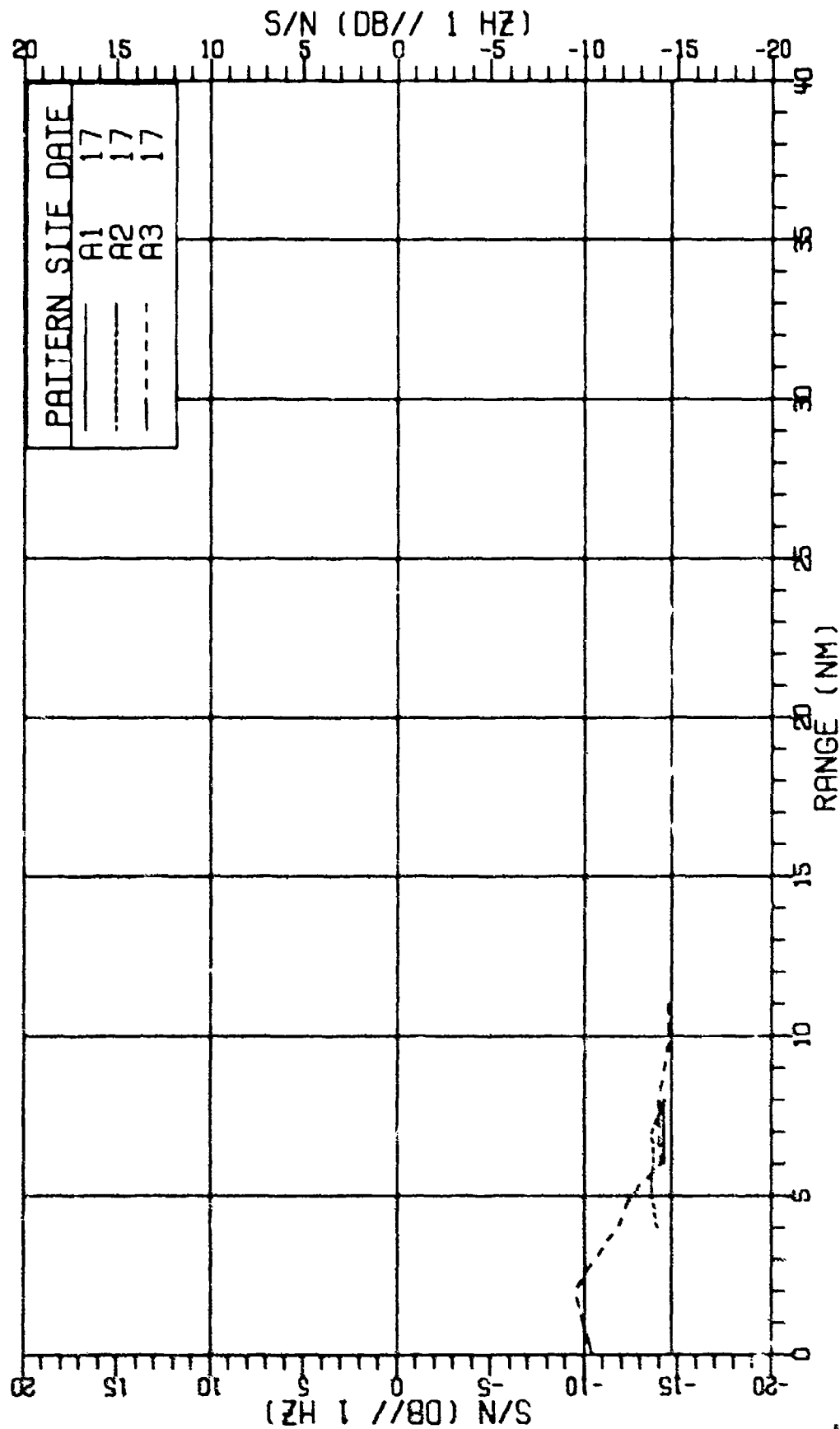


FIGURE 111-266
MSS-FVT NEAR BOTTOM VERTICAL DIPOLE SENSOR
SIGNAL-TO-NOISE RESULTS FOR 155HZ AT 134DB (U)

AS-77-1-166

SECRET

SECRET

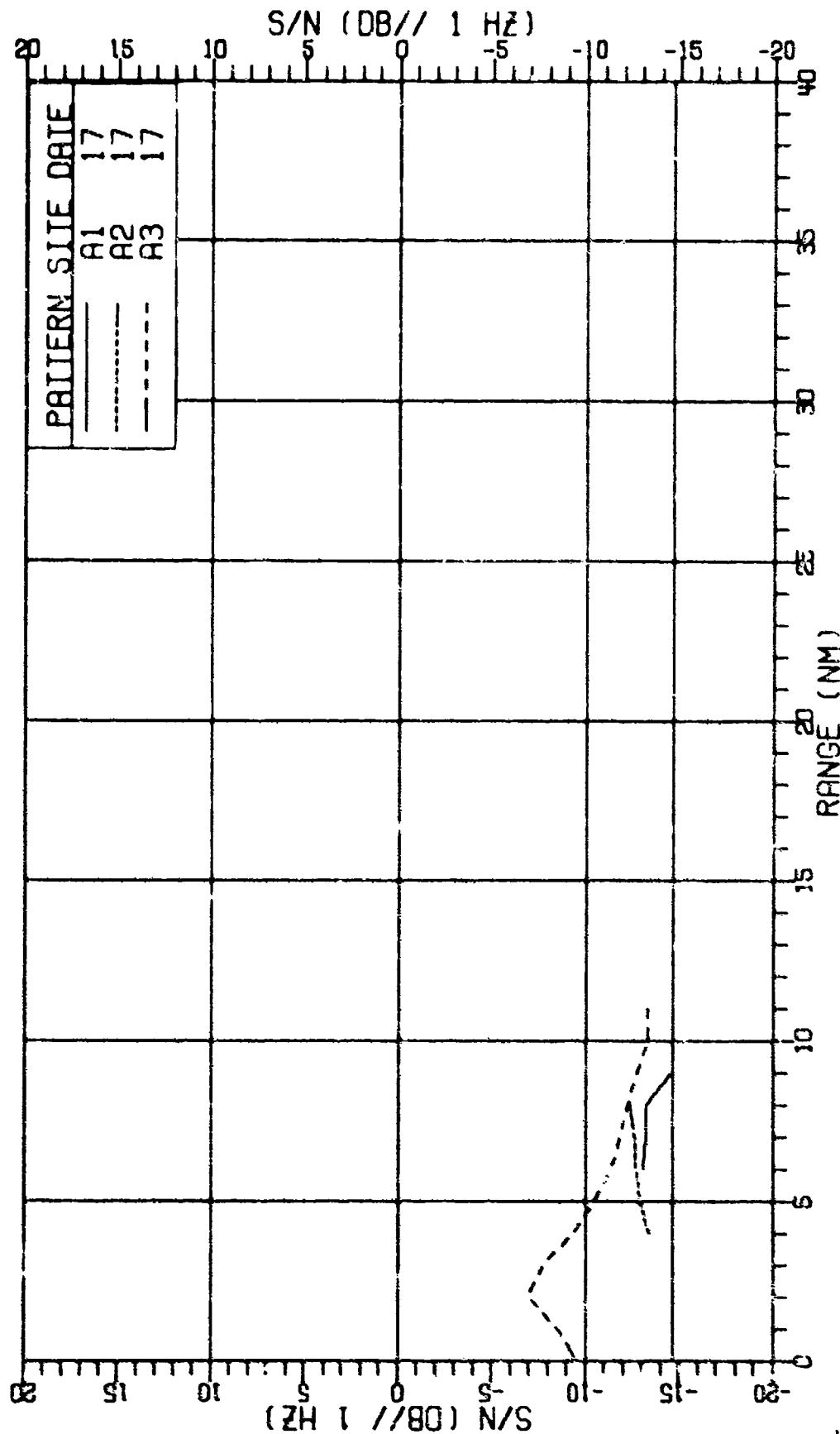


FIGURE 111-267
MSS-FVT NEAR BOTTOM DIFFERENCED CARDIOIDS SENSOR
SIGNAL-TO-NOISE RESULTS FOR 155HZ AT 134DB (U)

AS-77-2867

SECRET

SECRET

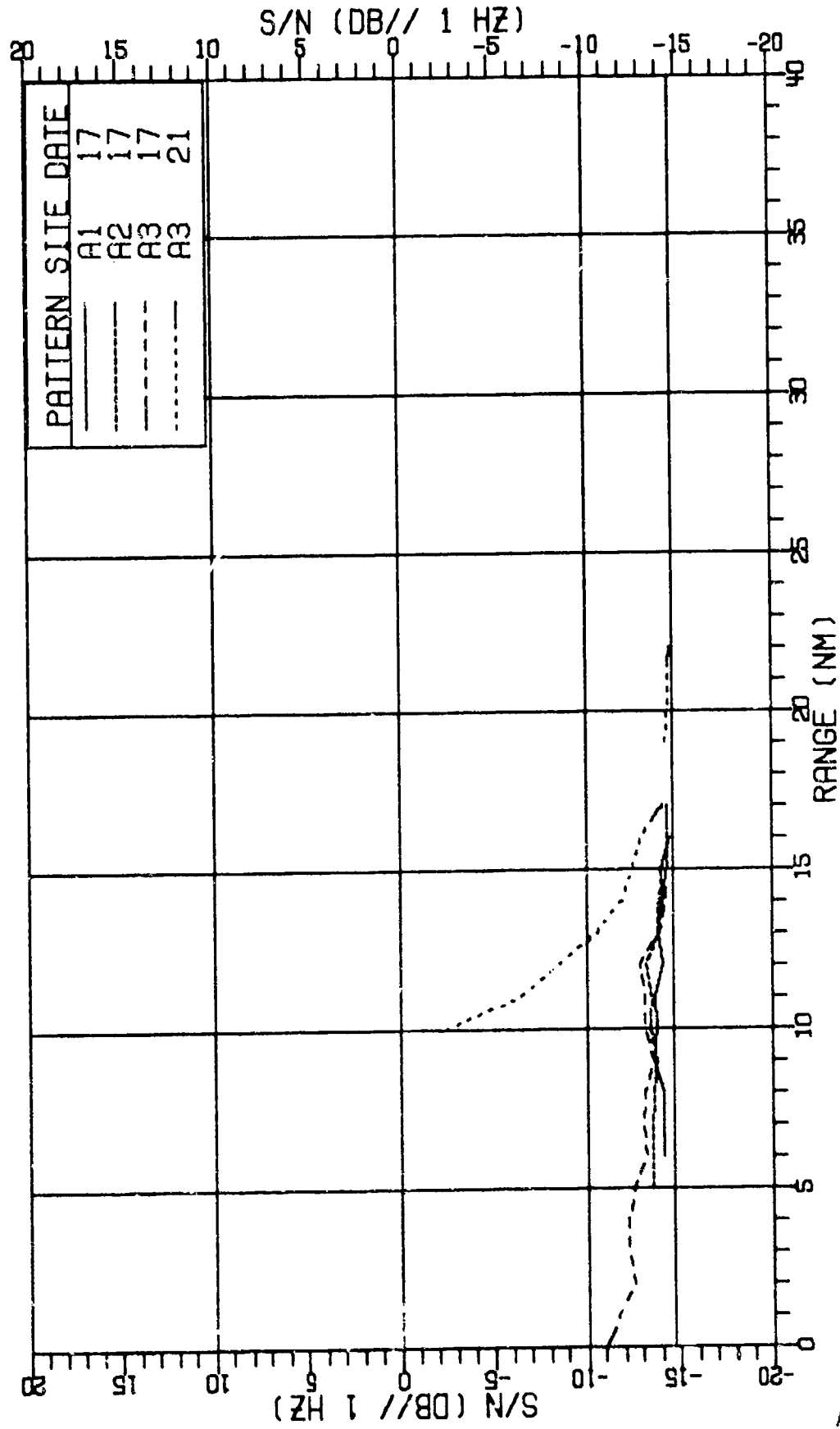


FIGURE 111-268
MSS-FVT NEAR BOTTOM OMNIDIRECTIONAL SENSOR
SIGNAL-TO-NOISE RESULTS FOR 305HZ AT 136DB (U)

AS-77-2862

SECRET

SECRET

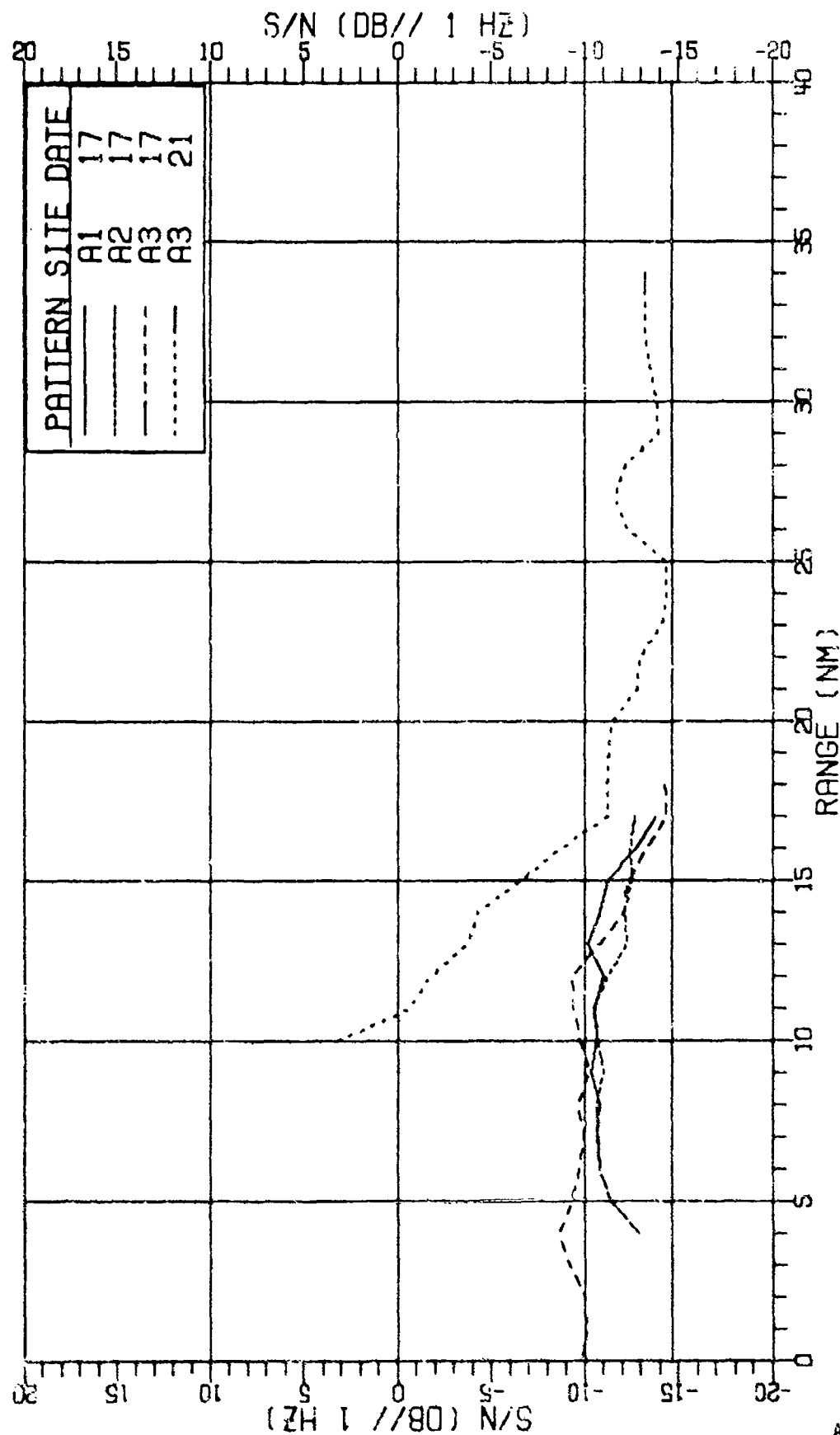


FIGURE III-263
MSS-FVT NEAR BOTTOM SINGLE CARDIOIDS SENSOR
SIGNAL-TO-NOISE RESULTS FOR 305HZ AT 136DB (U)

AS-77-2869

308
SECRET

SECRET

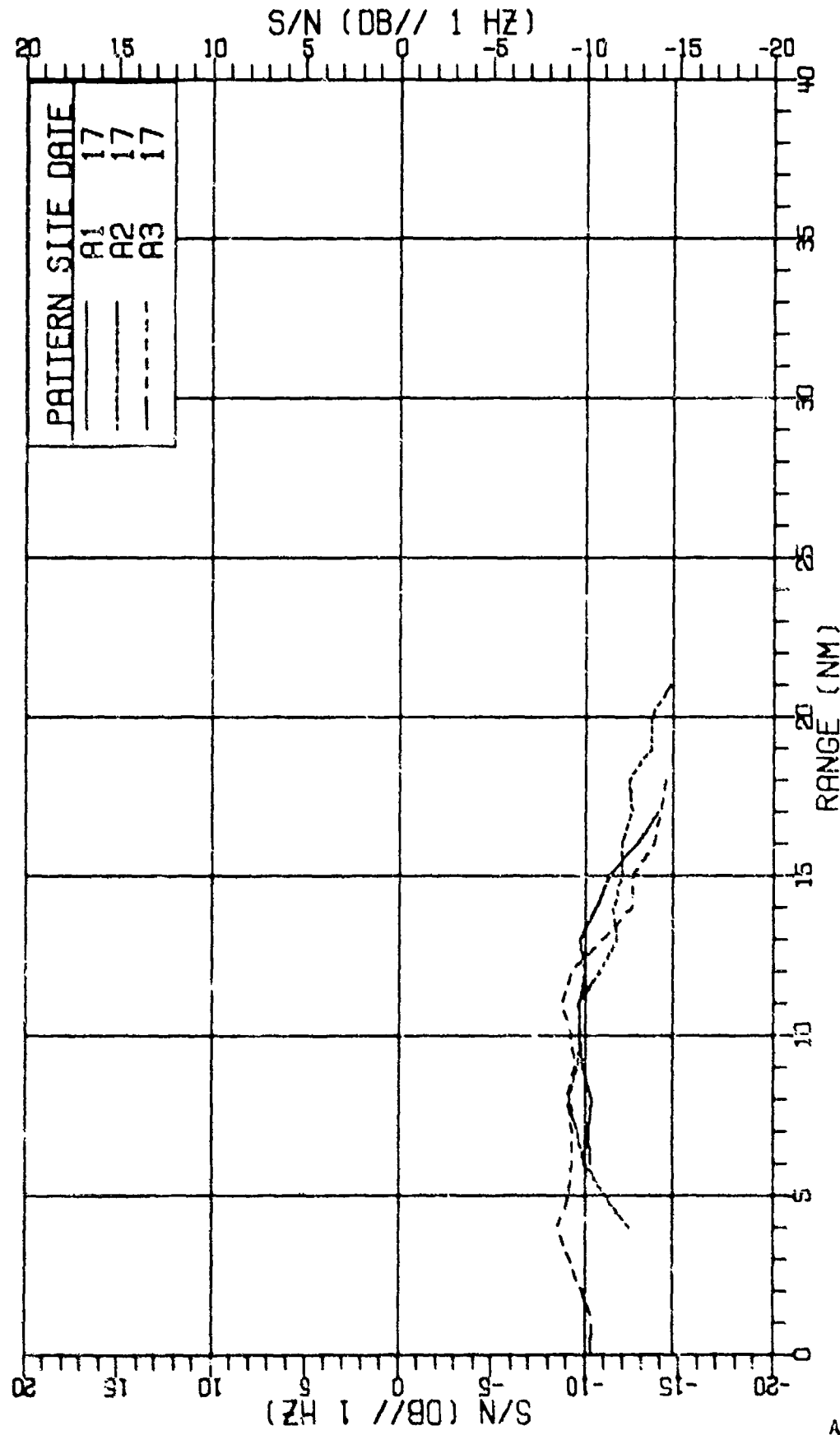


FIGURE 111-270
MSS-FVT NEAR BOTTOM MAX GAIN LIMACONS SENSOR
SIGNAL-TO-NOISE RESULTS FOR 305HZ AT 136DB (U)

AS-77-2870

SECRET

SECRET

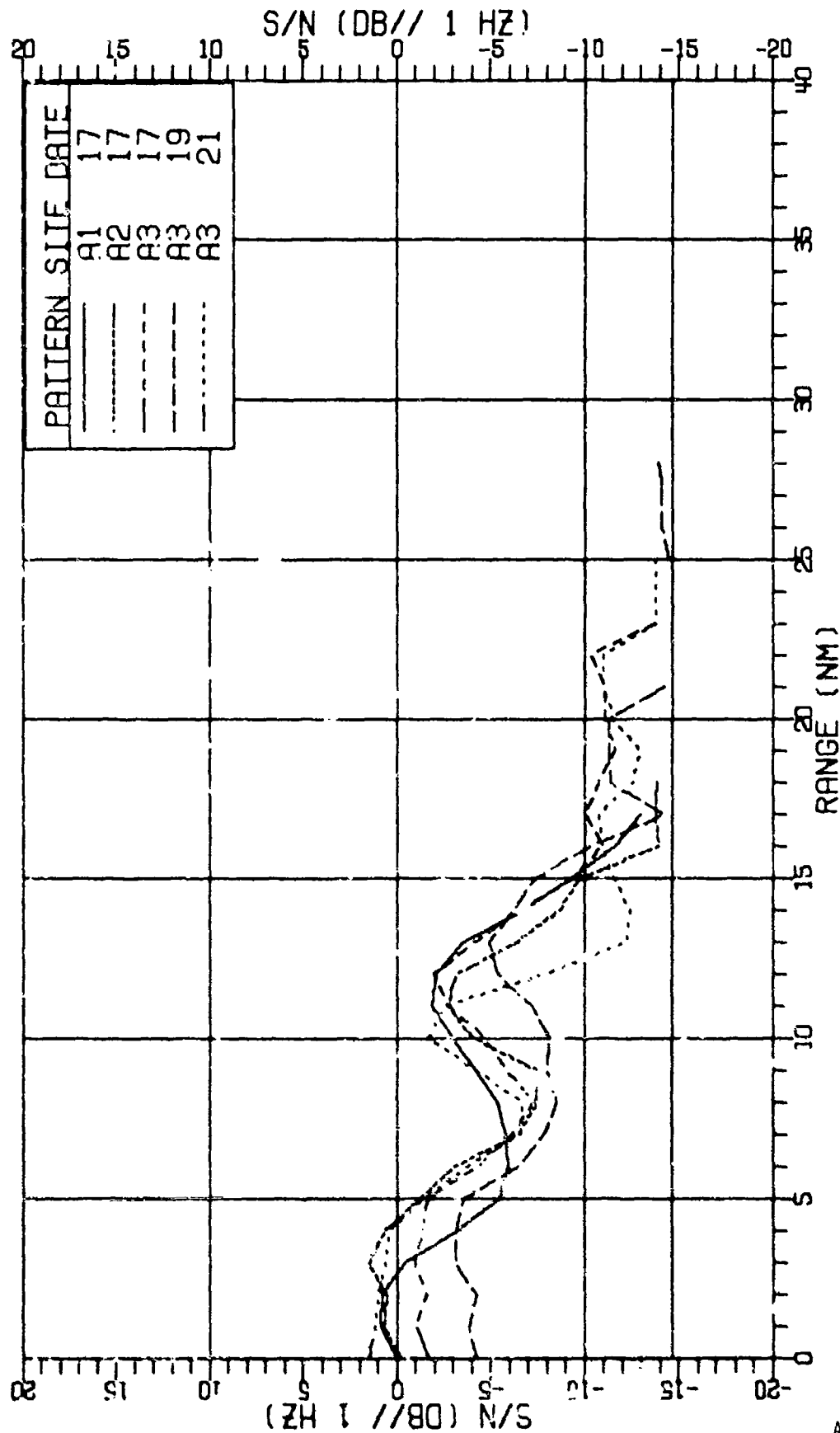


FIGURE III-271
MSS-FVT NEAR BOTTOM OMNIDIRECTIONAL SENSOR
SIGNAL-TO-NOISE RESULTS FOR 64HZ AT 162DB (U)

AS-77-2871

SECRET

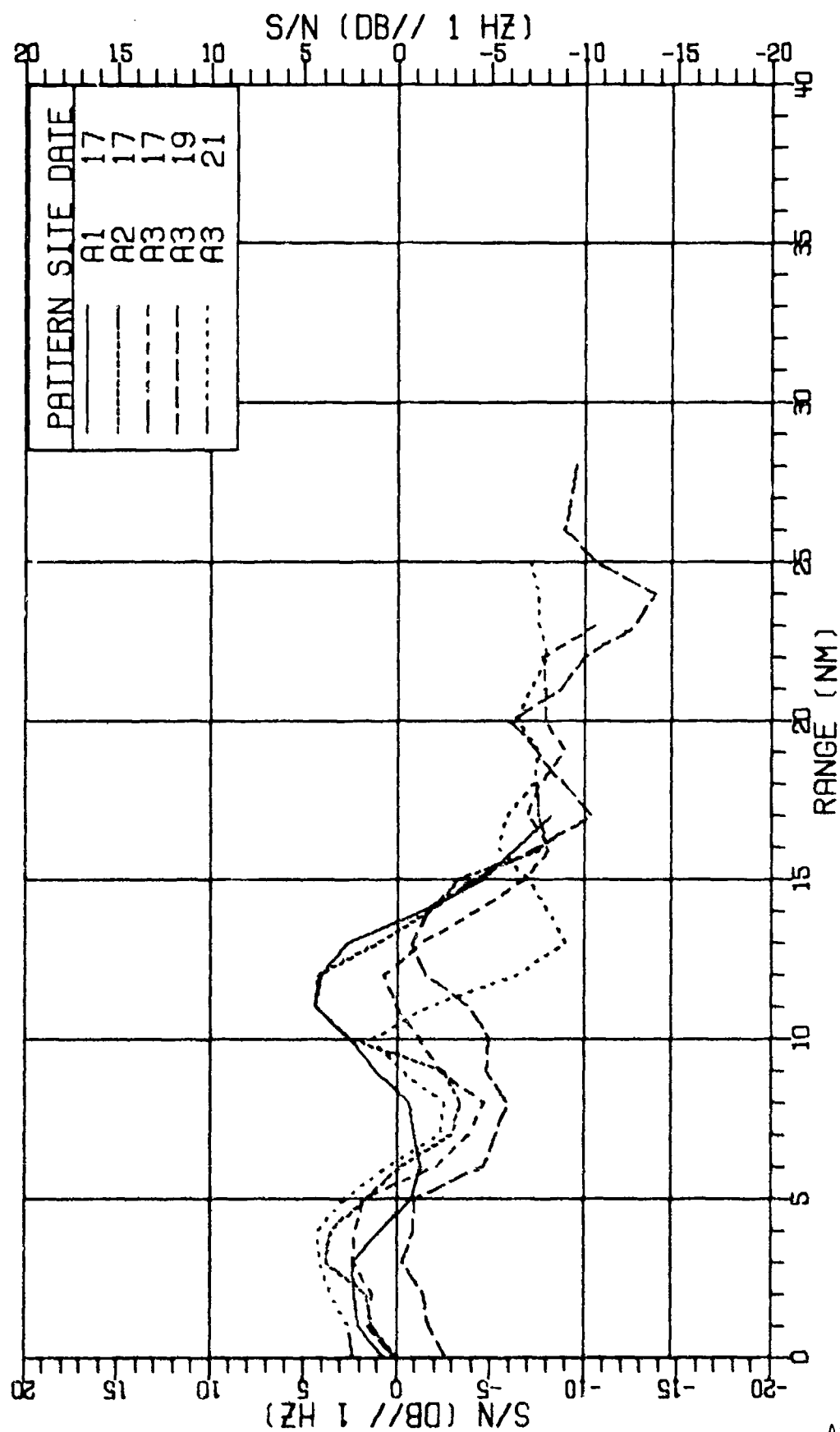


FIGURE 111-272
MSS-FVT NEAR BOTTOM SINGLE CARDIOIDS SENSOR
SIGNAL-TO-NOISE RESULTS FOR 64HZ AT 162DB (U)

AS-77-2872

SECRET

SECRET

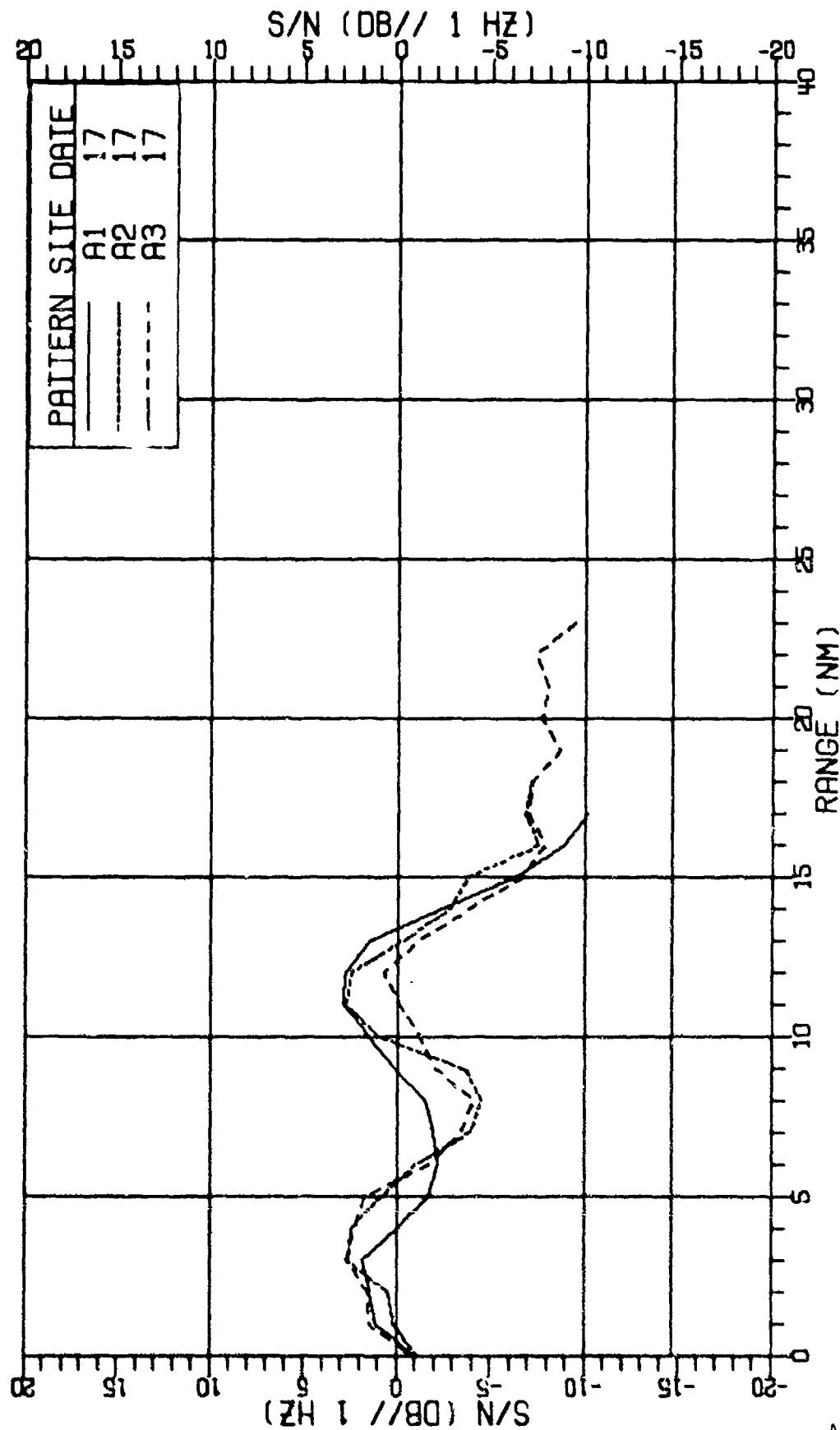


FIGURE III-273
MSS-FVT NEAR BOTTOM MAX GAIN LIMACONS SENSOR
SIGNAL-TO-NOISE RESULTS FOR 64HZ AT 162DB (U)

AS-77-2873

SECRET

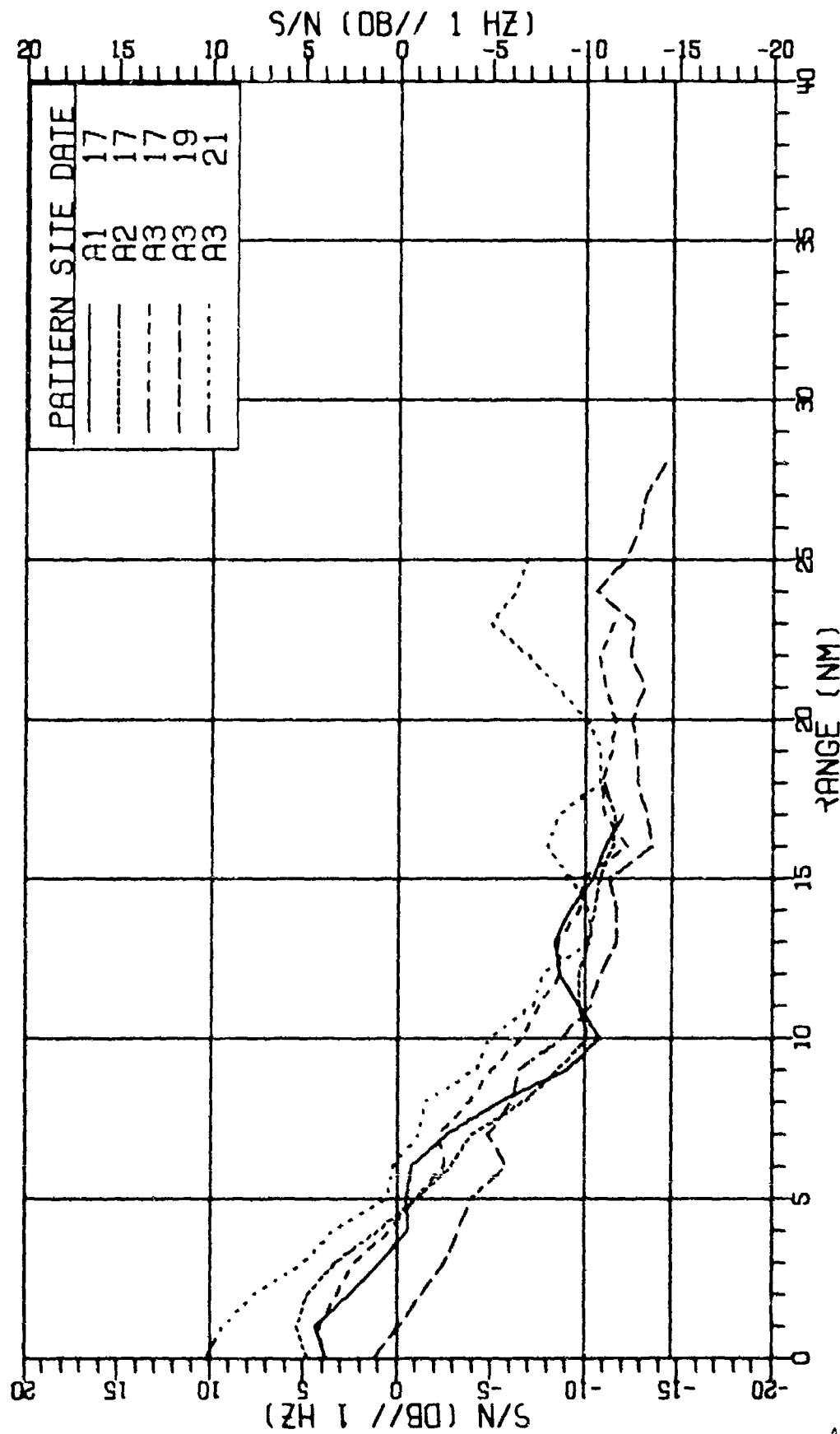


FIGURE 111-274
MSS-FVT NEAR BOTTOM VERTICAL DIPOLE SENSOR
SIGNAL-TO-NOISE RESULTS FOR 64HZ AT 162DB (11)

AS-77-2874

SECRET

SECRET

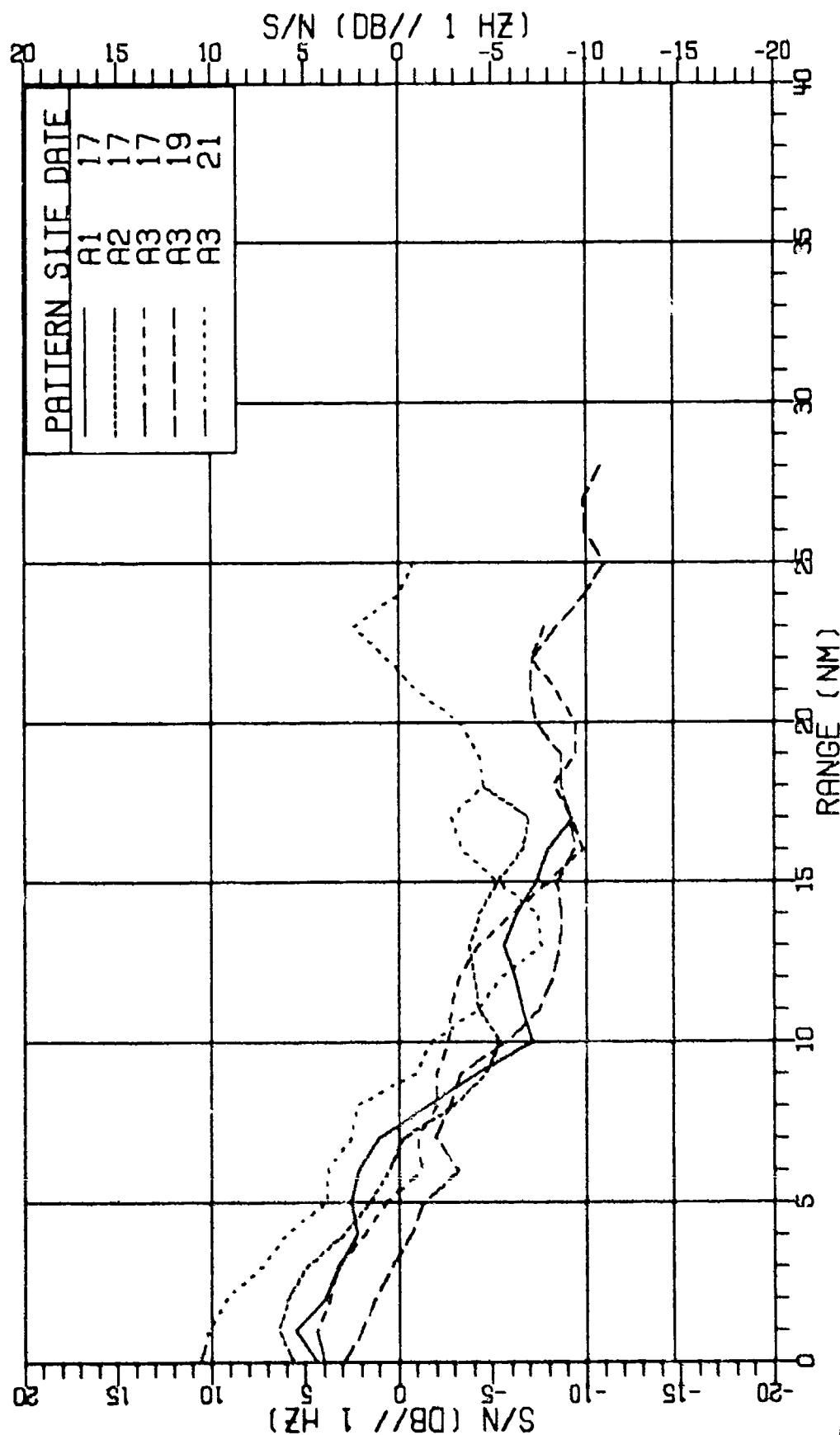


FIGURE 111-275
MSS-FVT NEAR BOTTOM DIFFERENCED CARDIOIDS SENSOR
SIGNAL-TO-NOISE RESULTS FOR 64HZ AT 162DB (U)

AS-77-2875

SECRET

SECRET

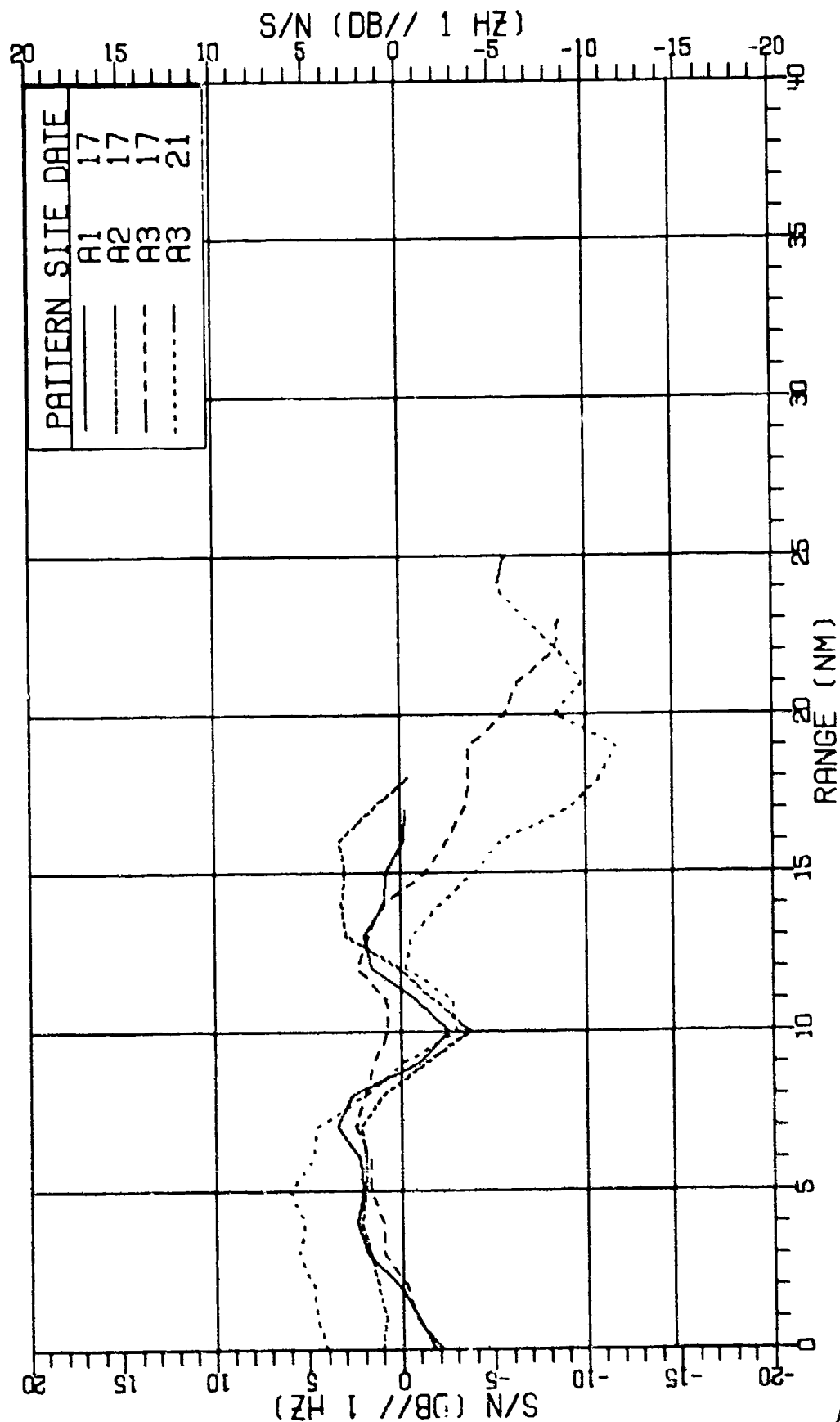


FIGURE III-276
MSS-FVT NEAR BOTTOM OMNIDIRECTIONAL SENSOR
SIGNAL-TO-NOISE RESULTS FOR 160HZ AT 161DB (U)

AS-77-2876

015
SECRET

SECRET

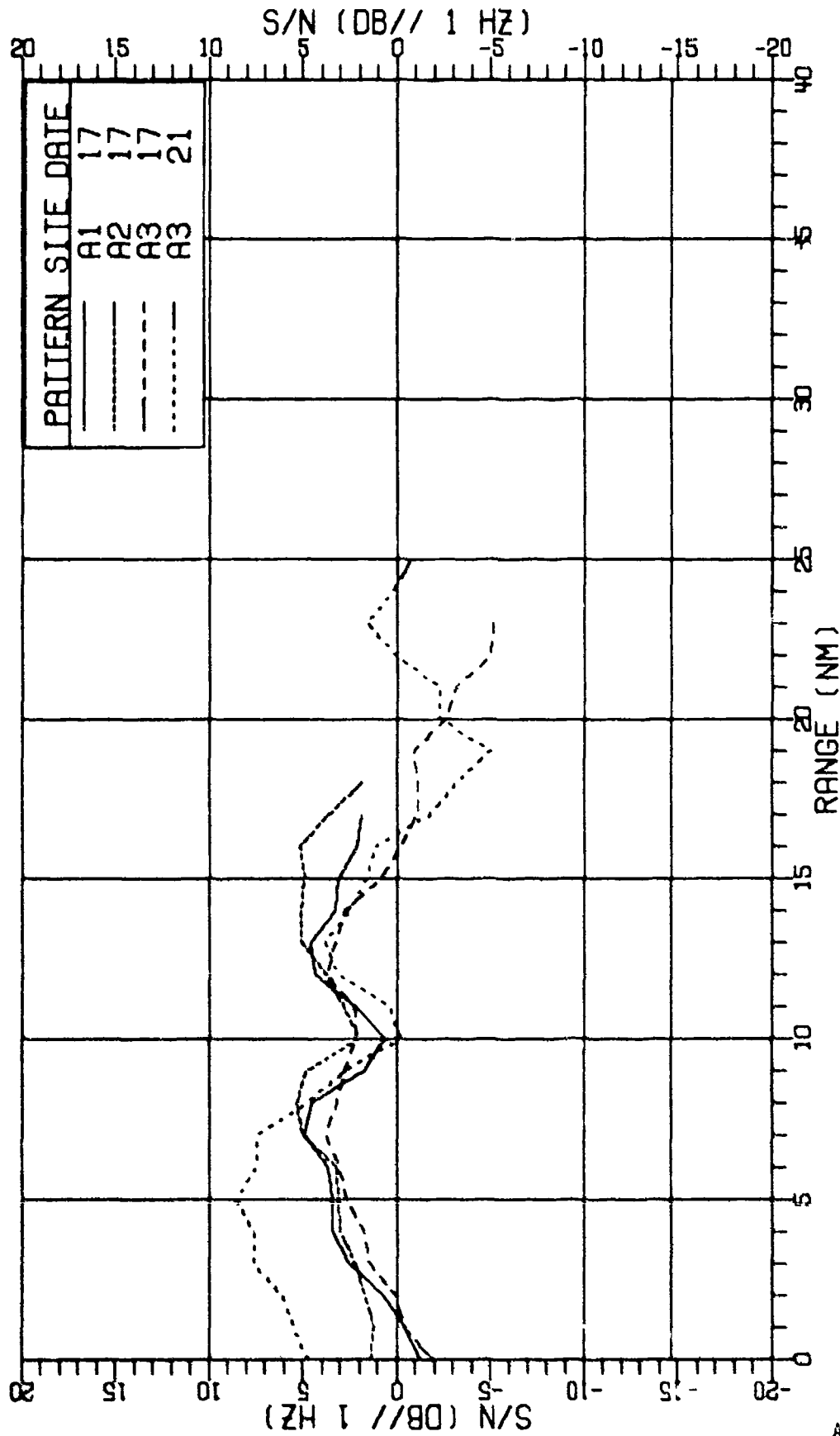


FIGURE 111-277
MSS-FVT NEAR BOTTOM SINGLE CARDIOIDS SENSOR
SIGNAL-TO-NOISE RESULTS FOR 160HZ AT 1610R (U)

AS-77-2877

SECRET

SECRET

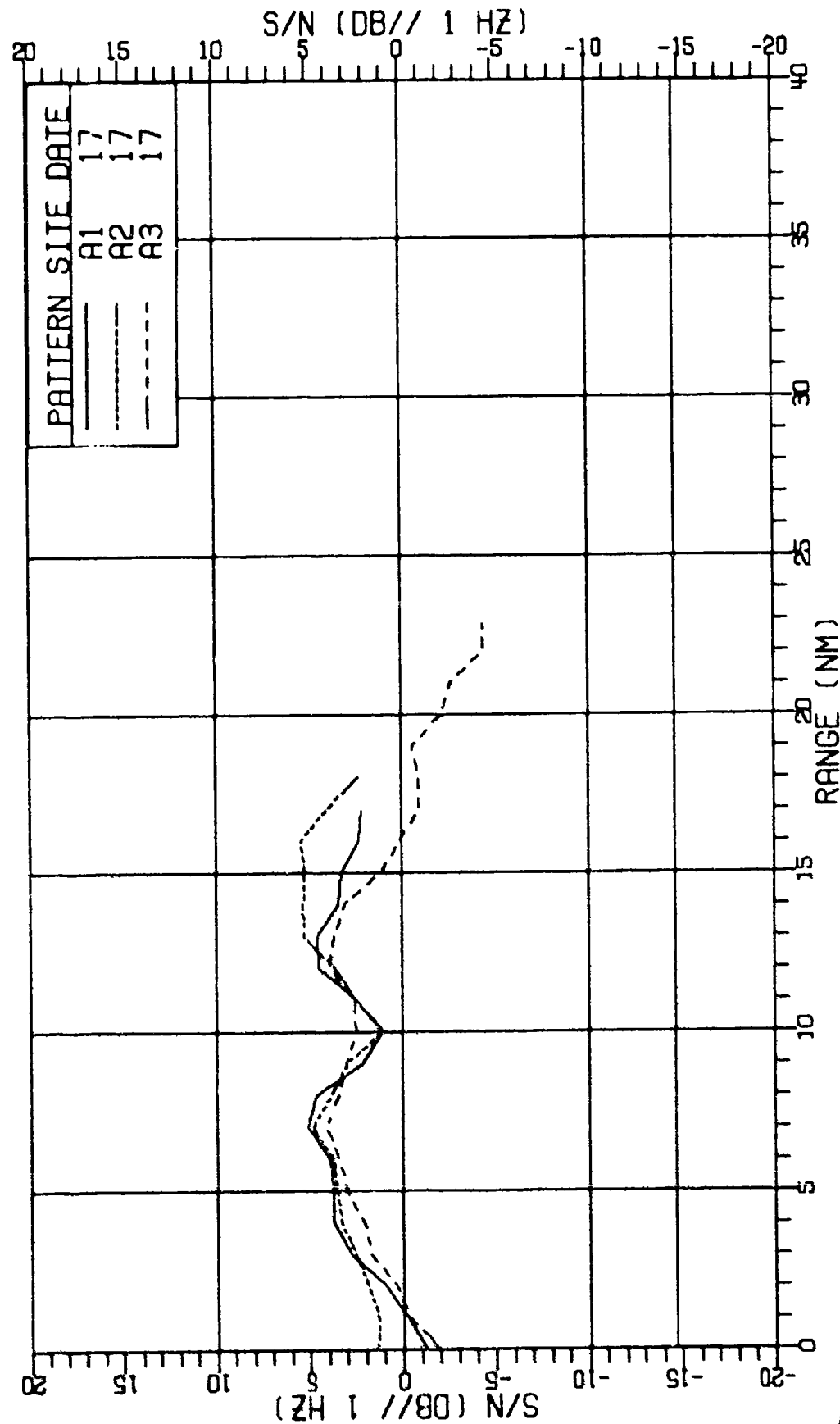


FIGURE III-278
MSS-FVT NEAR BOTTOM MAX GAIN LIMACONS SENSOR
SIGNAL-TO-NOISE RESULTS FOR 160HZ AT 161DB (U)

AS-77-2878

SECRET

SECRET

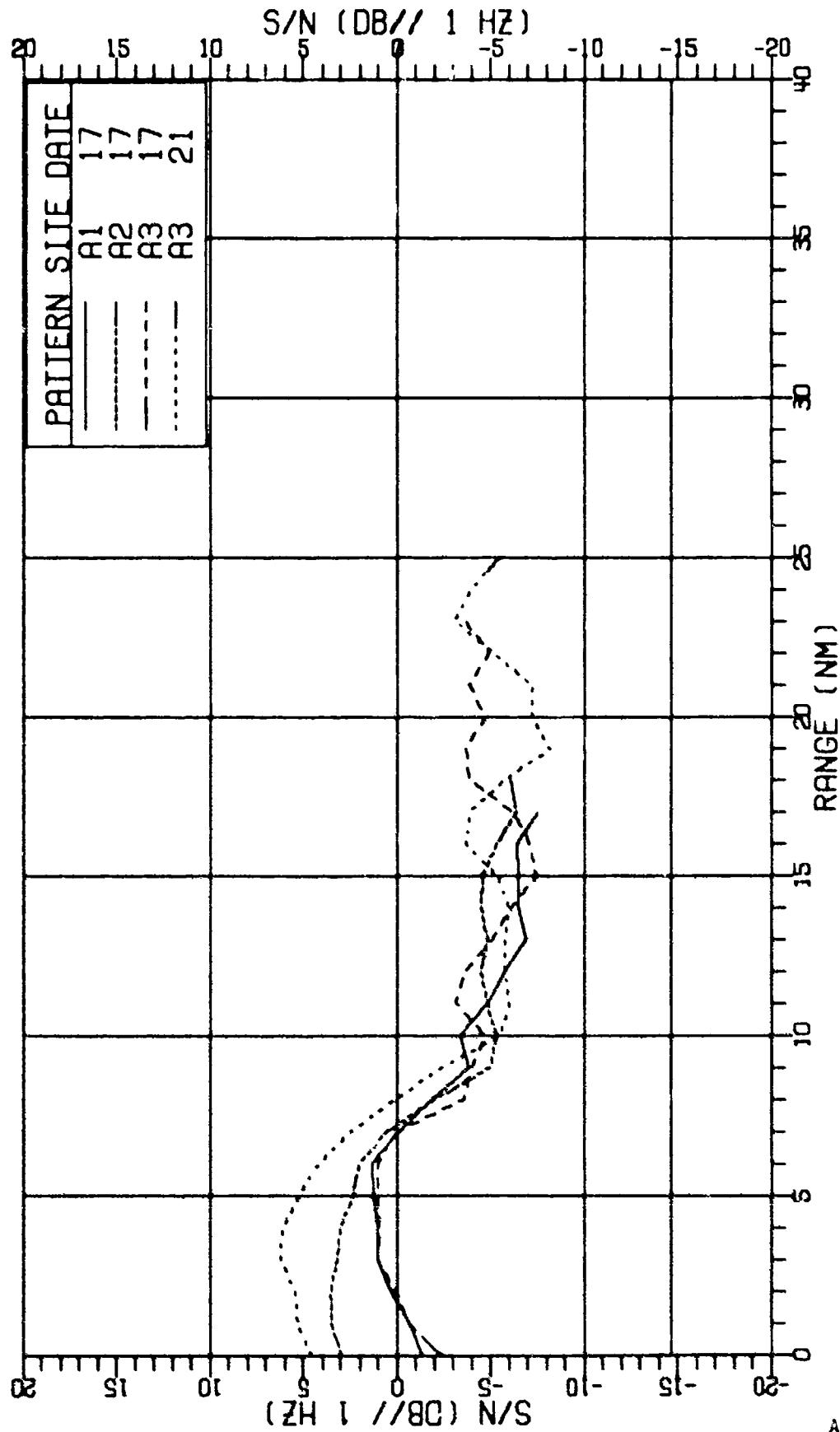


FIGURE 111-279
MSS-FVT NEAR BOTTOM VERTICAL DIPOLE SENSOR
SIGNAL-TO-NOISE RESULTS FOR 160HZ AT 161DB (U)

AS-77-2879

SECRET

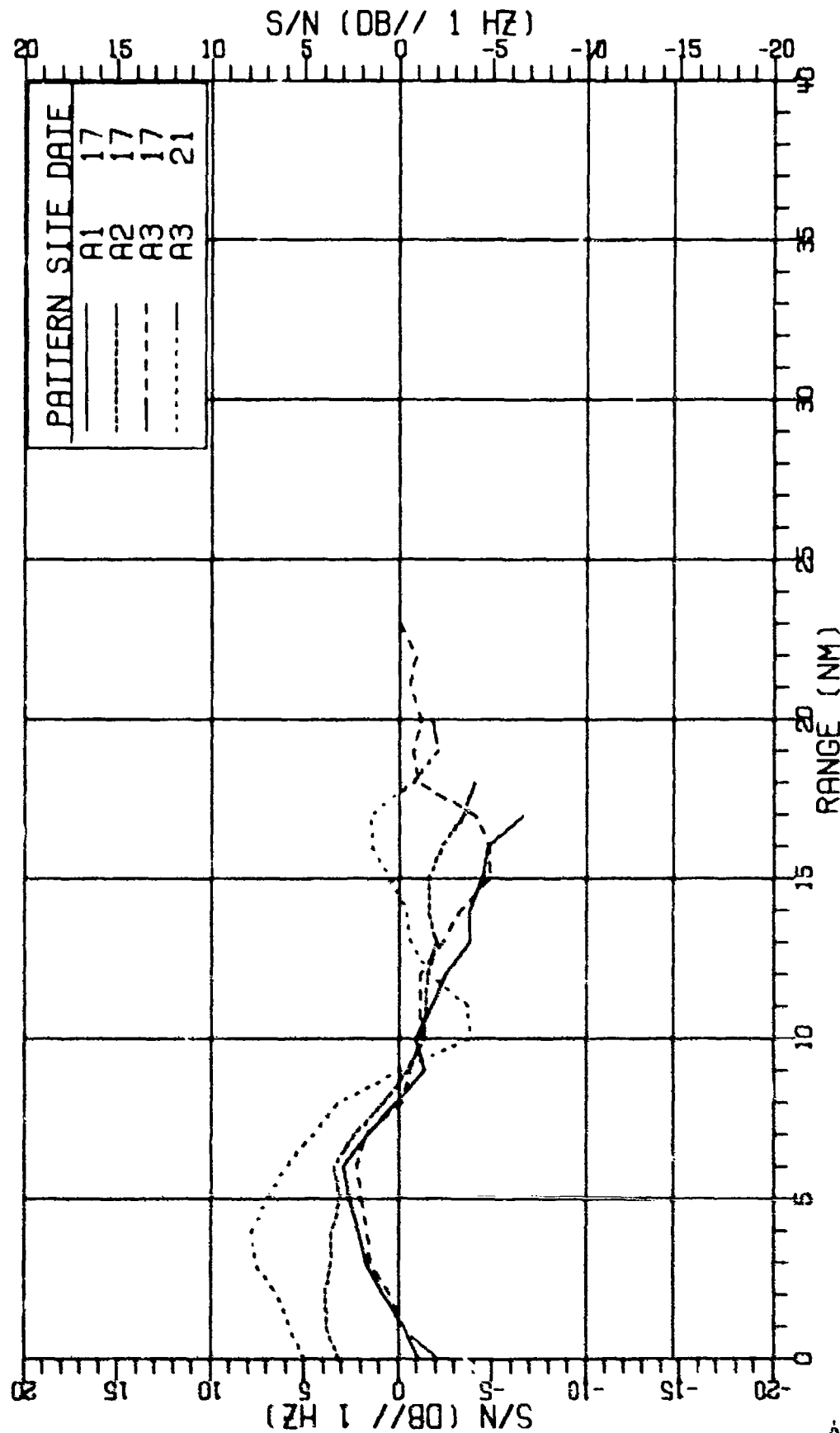


FIGURE III-280
MSS-FVT NEAR BOTTOM DIFFERENCED CARDIOIDS SENSOR
SIGNAL-TO-NOISE RESULTS FOR 160HZ AT 1610B (U)

AG-77-28-1

SECRET

SECRET

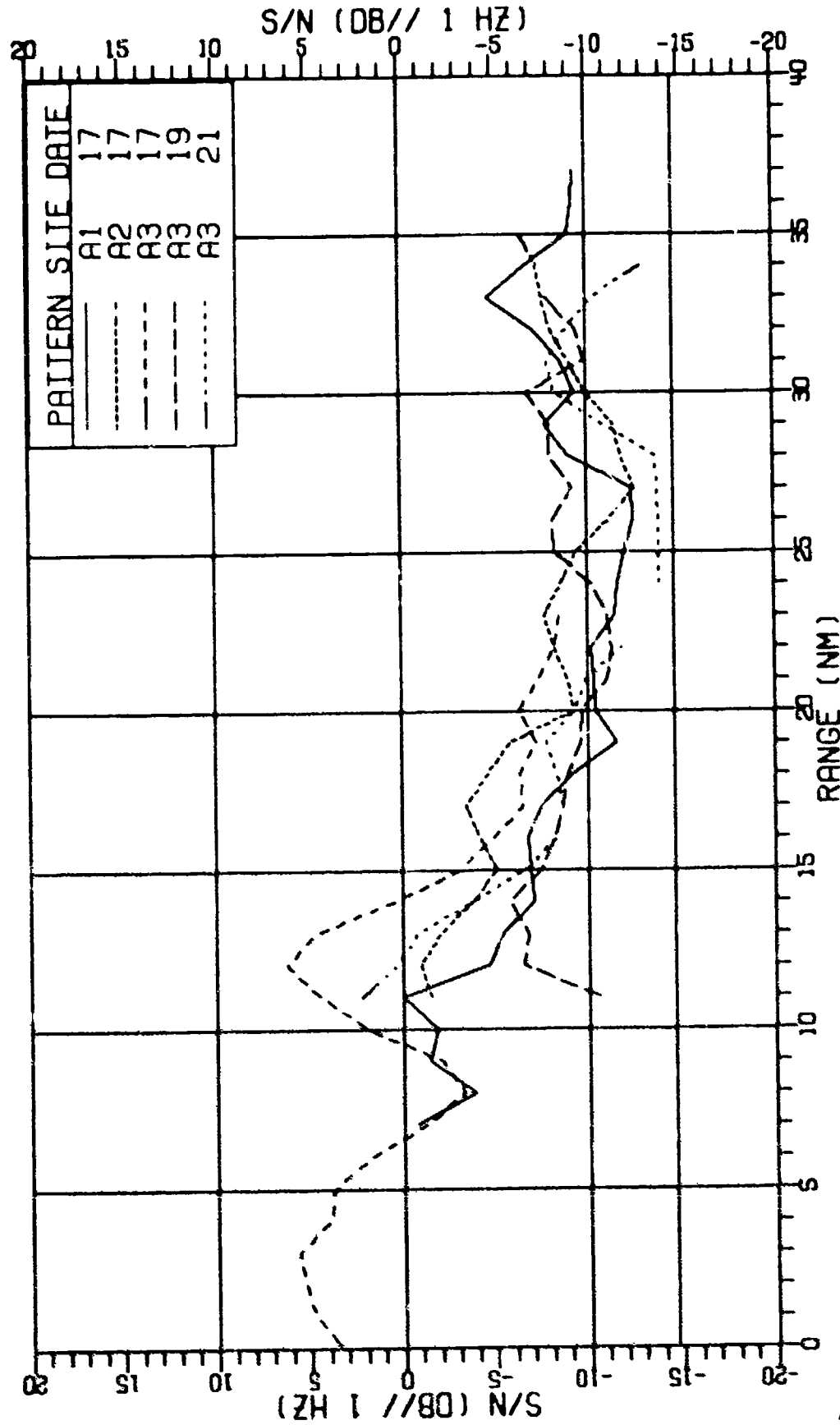


FIGURE III-281
MSS-FVT NEAR BOTTOM OMNIDIRECTIONAL SENSOR
SIGNAL-TO-NOISE RESULTS FOR 70HZ AT 166DB (U)

AS-77-2661

SECRET

SECRET

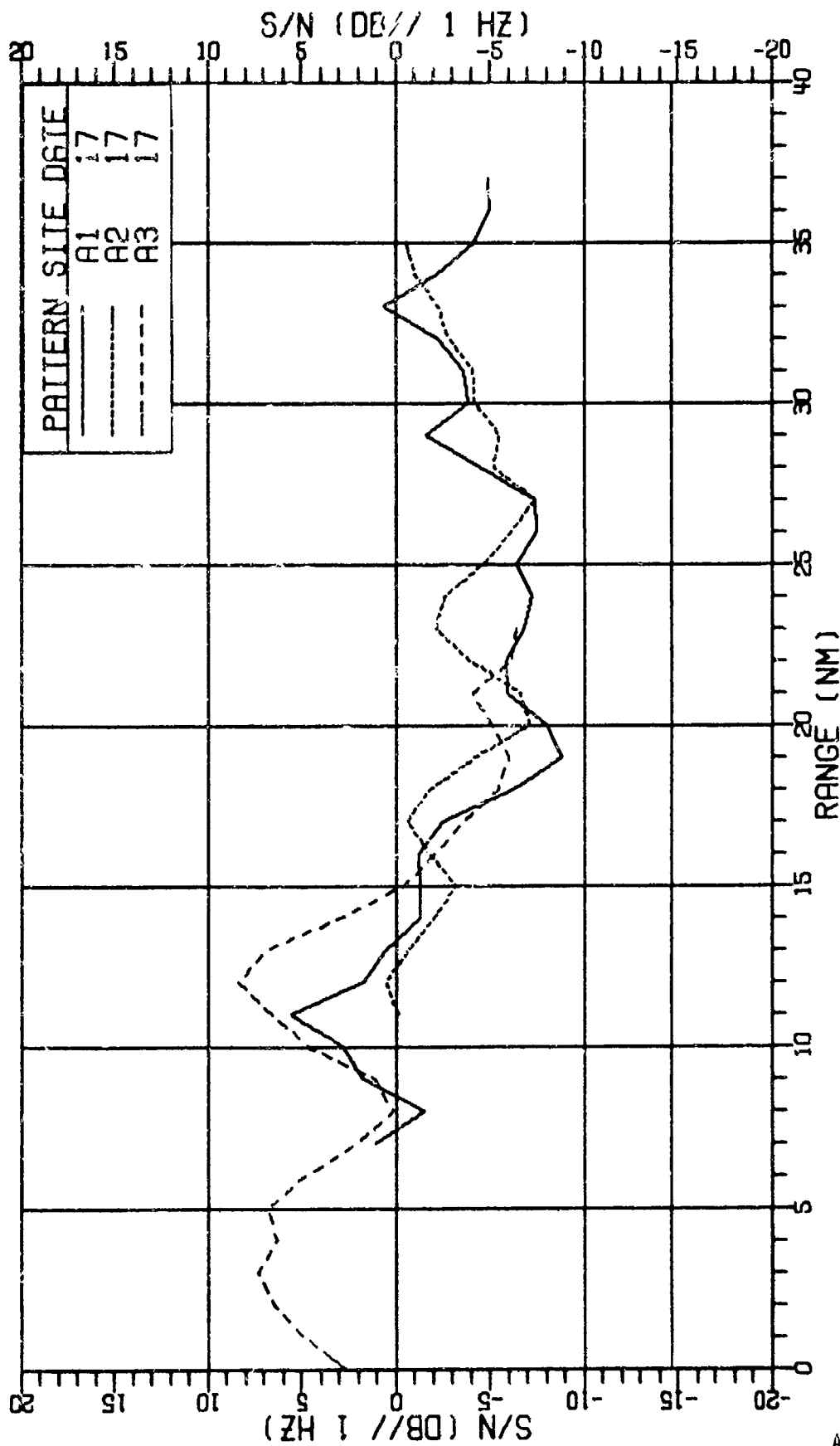


FIGURE III-283
MSS-FVT NEAR BOTTOM MAX GAIN LIMAcons SENSOR
SIGNAL-TO-NOISE RESULTS FOR 70HZ AT 166DB (U)

AS-77-2883

SECRET

SECRET

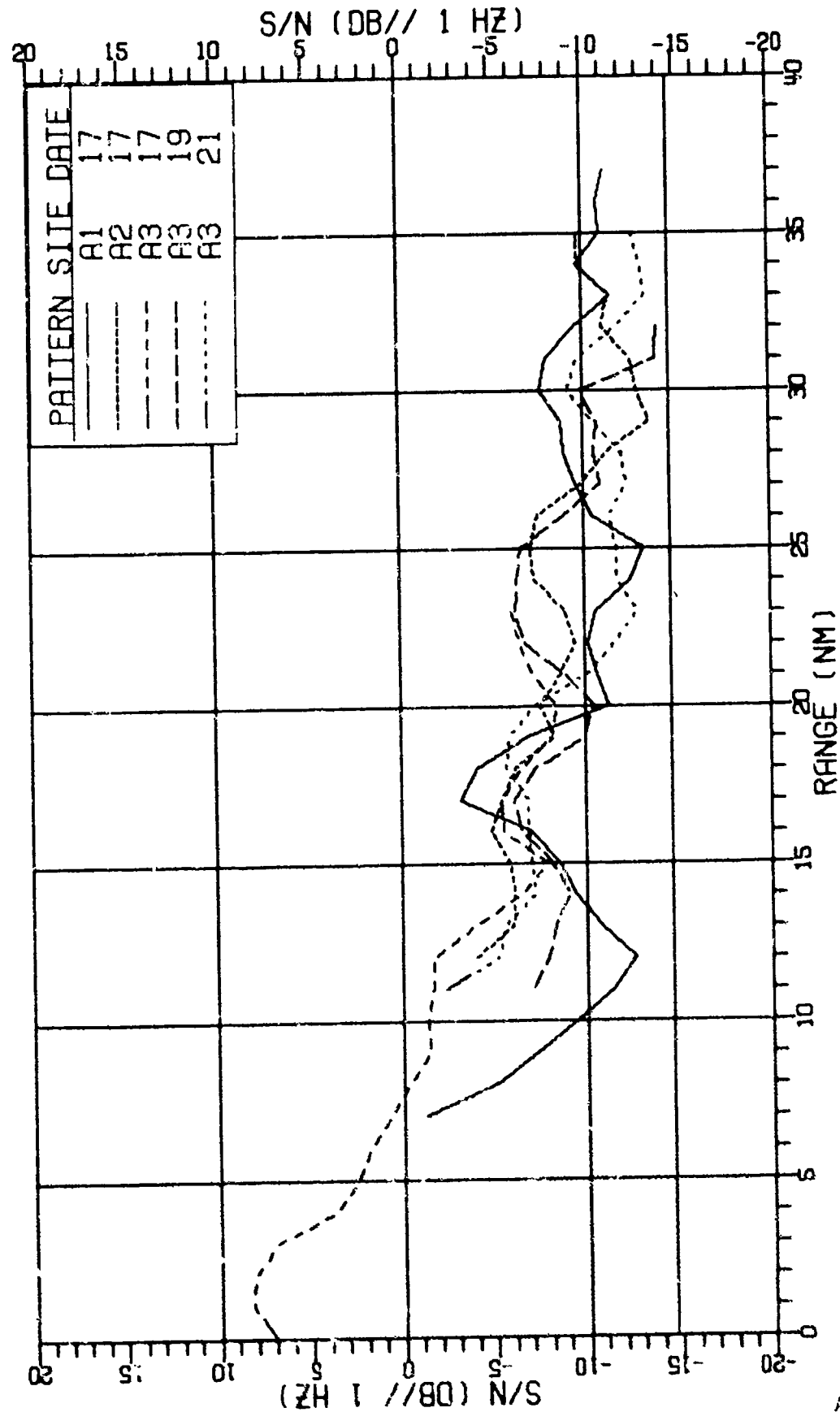


FIGURE III-284
MSS-FVT NEAR BOTTOM VERTICAL DIPOLE SENSOR
SIGNAL-TO-NOISE RESULTS FOR 70HZ AT 166DB (U)

AS-17-2884

SECRET

SECRET

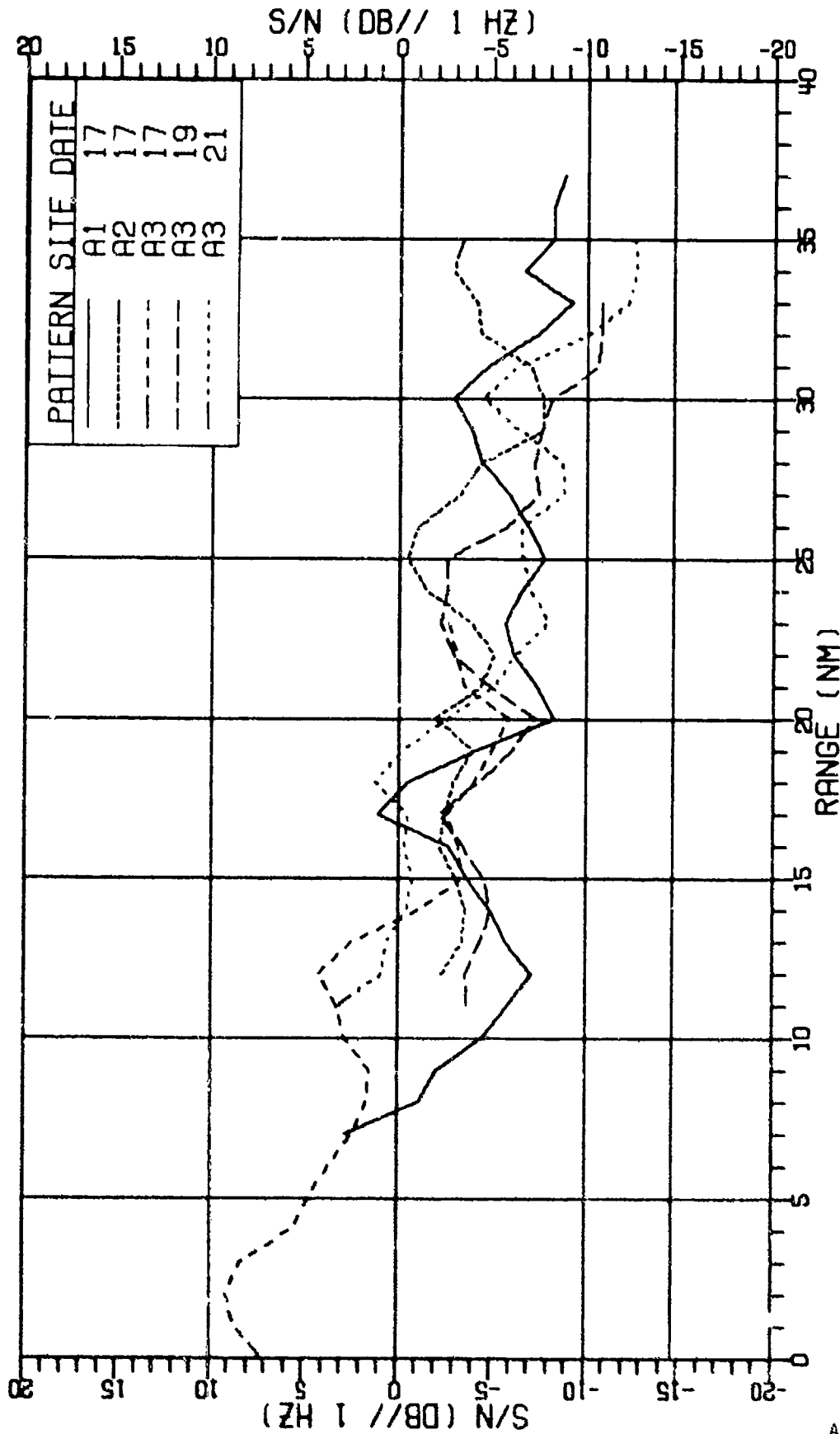


FIGURE III-285
MSS-FVT NEAR BOTTOM DIFFERENCED CARDIOIDS SENSOR
SIGNAL-TO-NOISE RESULTS FOR 70HZ AT 166DB (U)

AS-77-2885

SECRET

SECRET

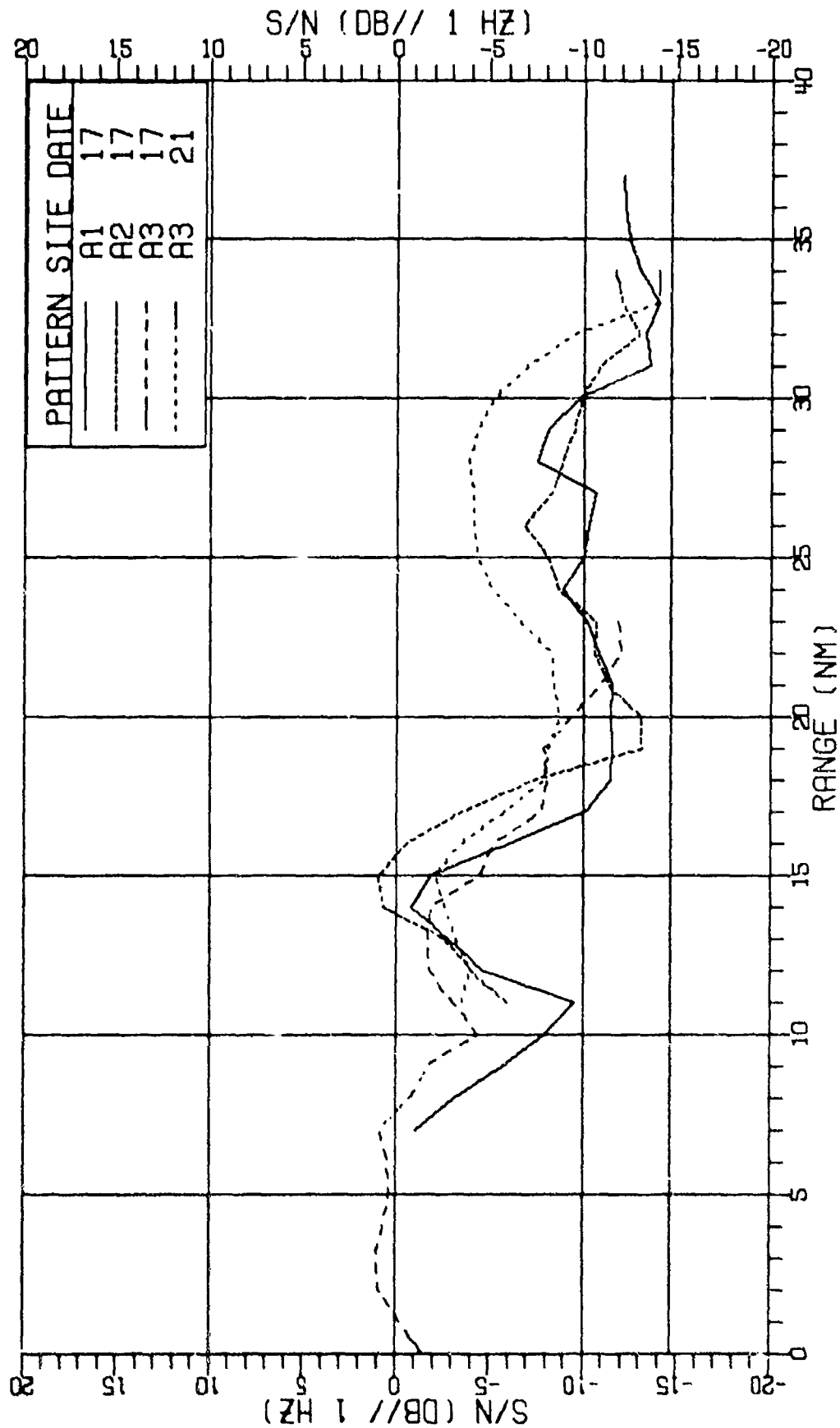


FIGURE III-286
MSS-FVT NEAR BOTTOM OMNIDIRECTIONAL SENSOR
SIGNAL-TO-NOISE RESULTS FOR 170HZ AT 156DB (U)

AS-77-2886

SECRET

SECRET

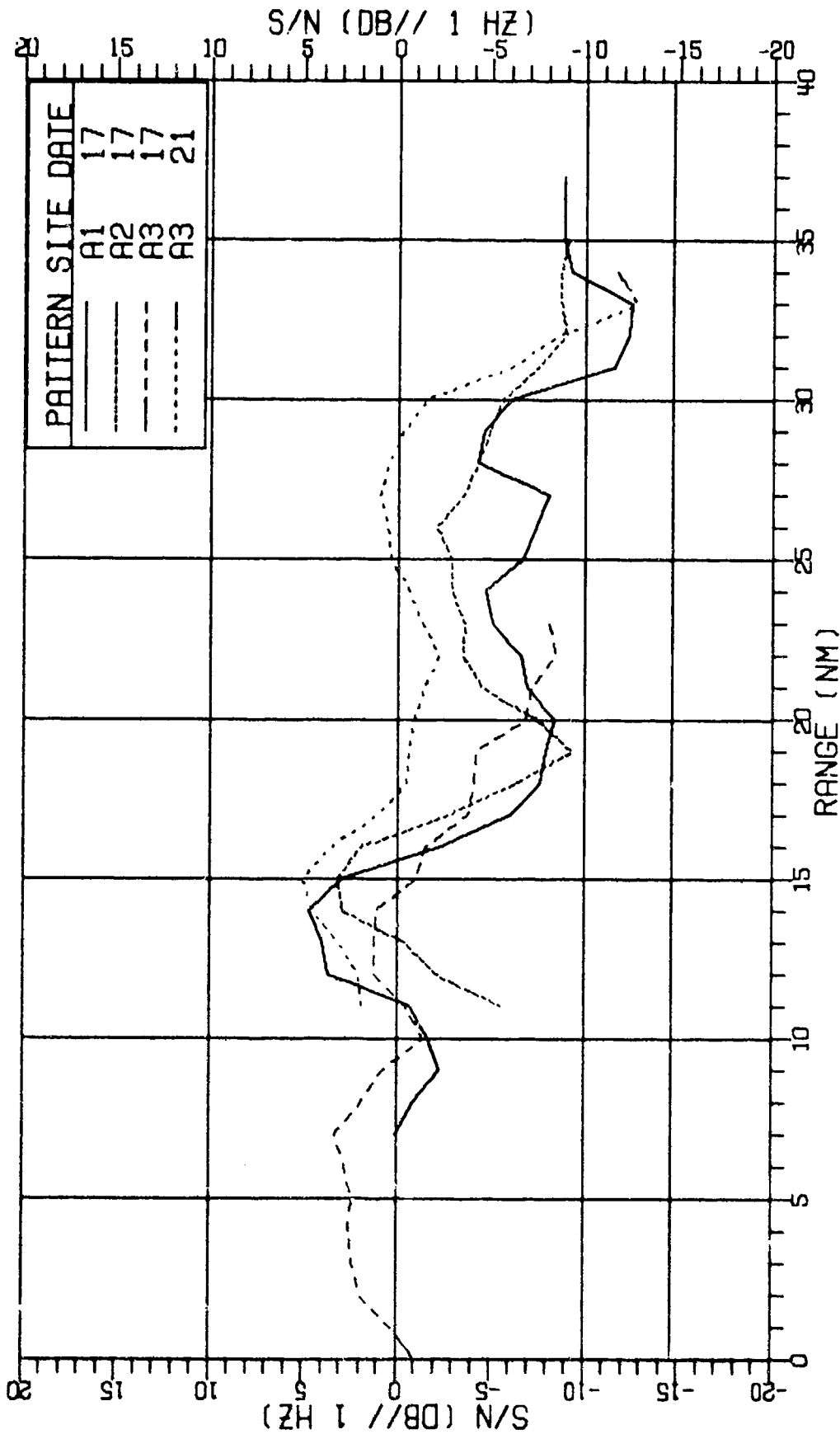


FIGURE III-287
MSS-FVT NEAR BOTTOM SINGLE CARDIOIDS SENSOR
SIGNAL-TO-NOISE RESULTS FOR 170HZ AT 156DB (U)

AS-77-2887

SECRET

SECRET

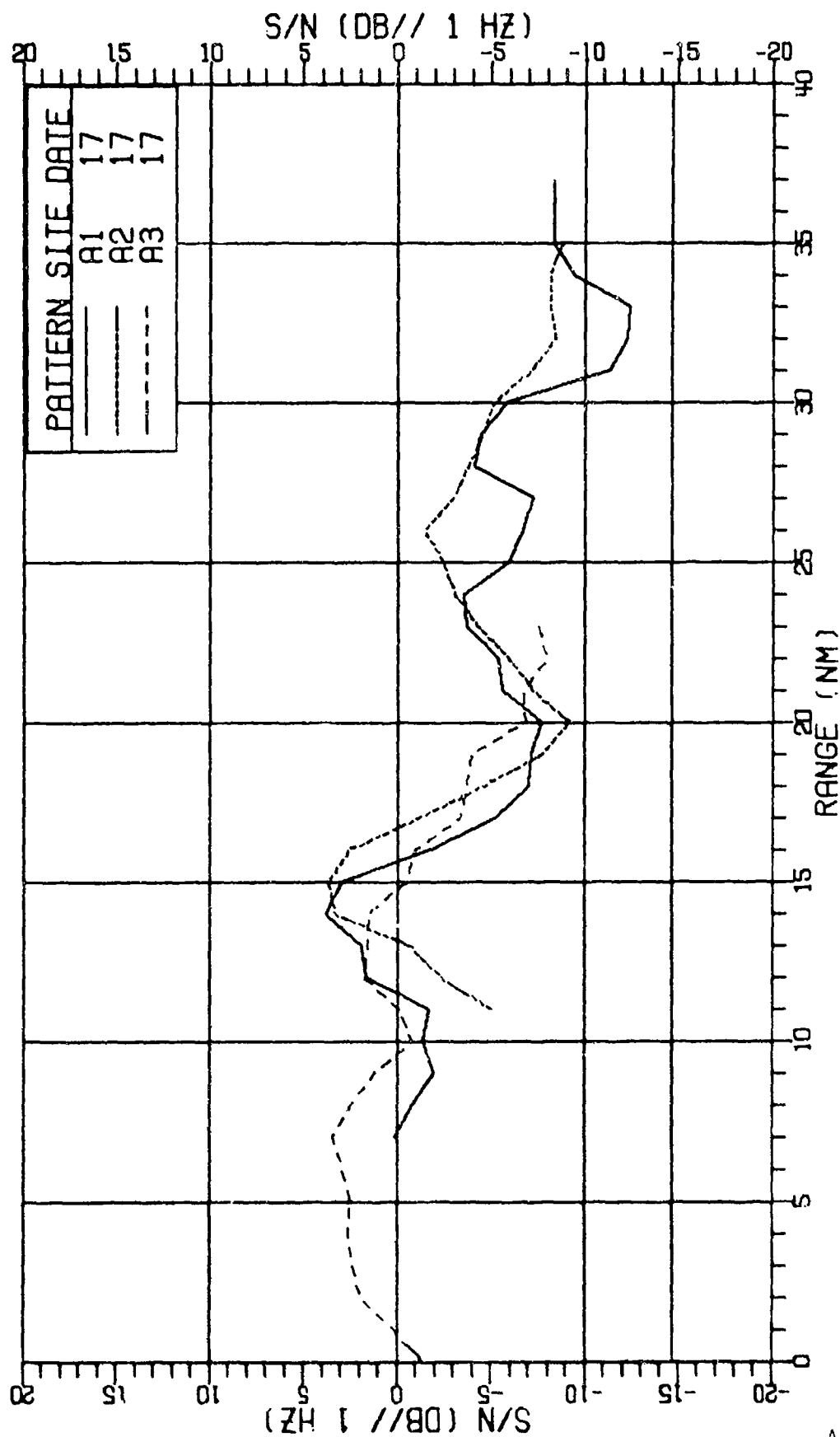


FIGURE III-288
MSS-FVT NEAR BOTTOM MAX GAIN LIMACONS SENSOR
SIGNAL-TO-NOISE RESULTS FOR 170HZ AT 156DB (U)

AS-77-2888

SECRET

SECRET

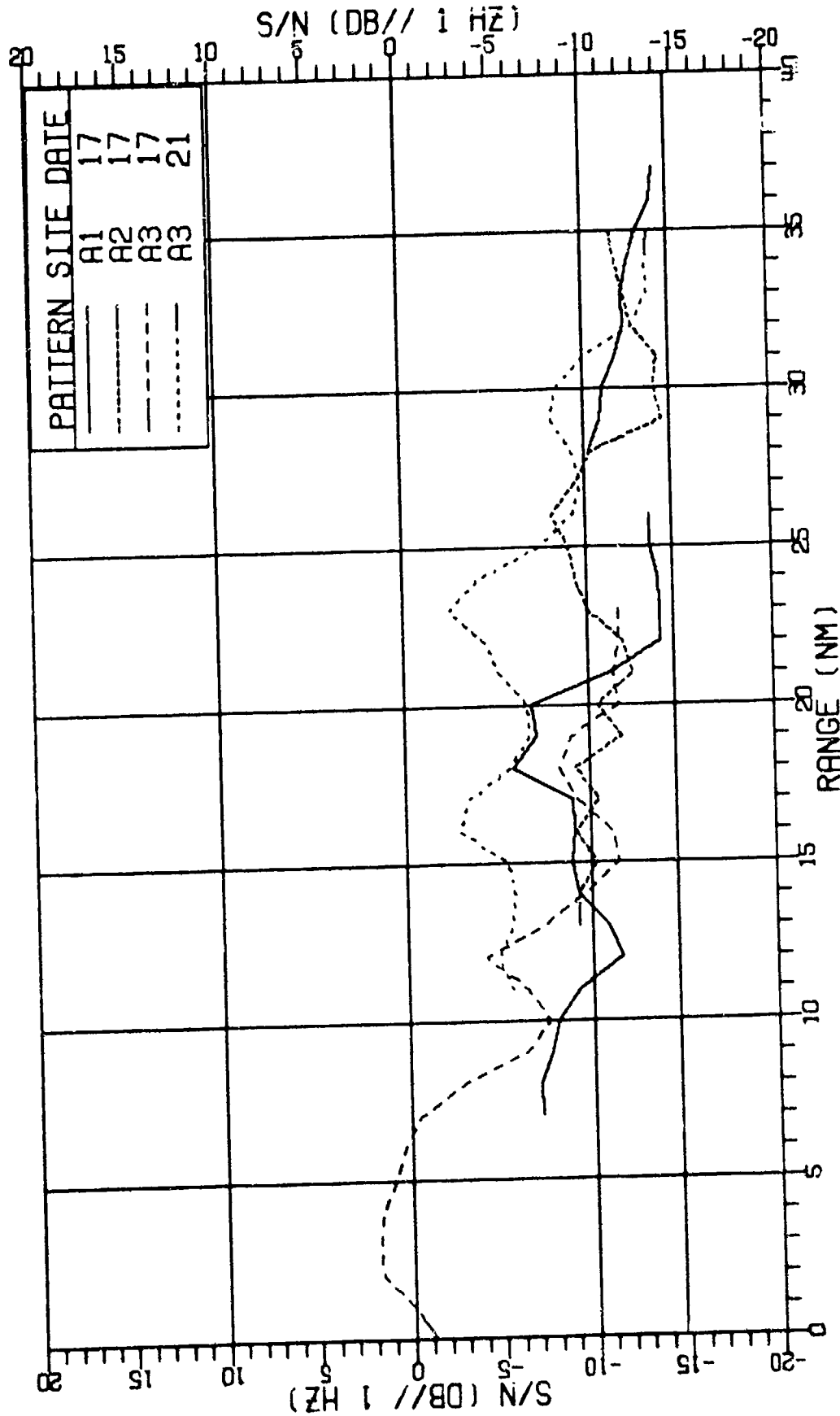


FIGURE 111-289
MSS-FVT NEAR BOTTOM VERTICAL DIPOLE SENSOR
SIGNAL-TO-NOISE RESULTS FOR 170HZ AT 156DB (U)

AS-77-2889

00/11/11

SECRET

SECRET

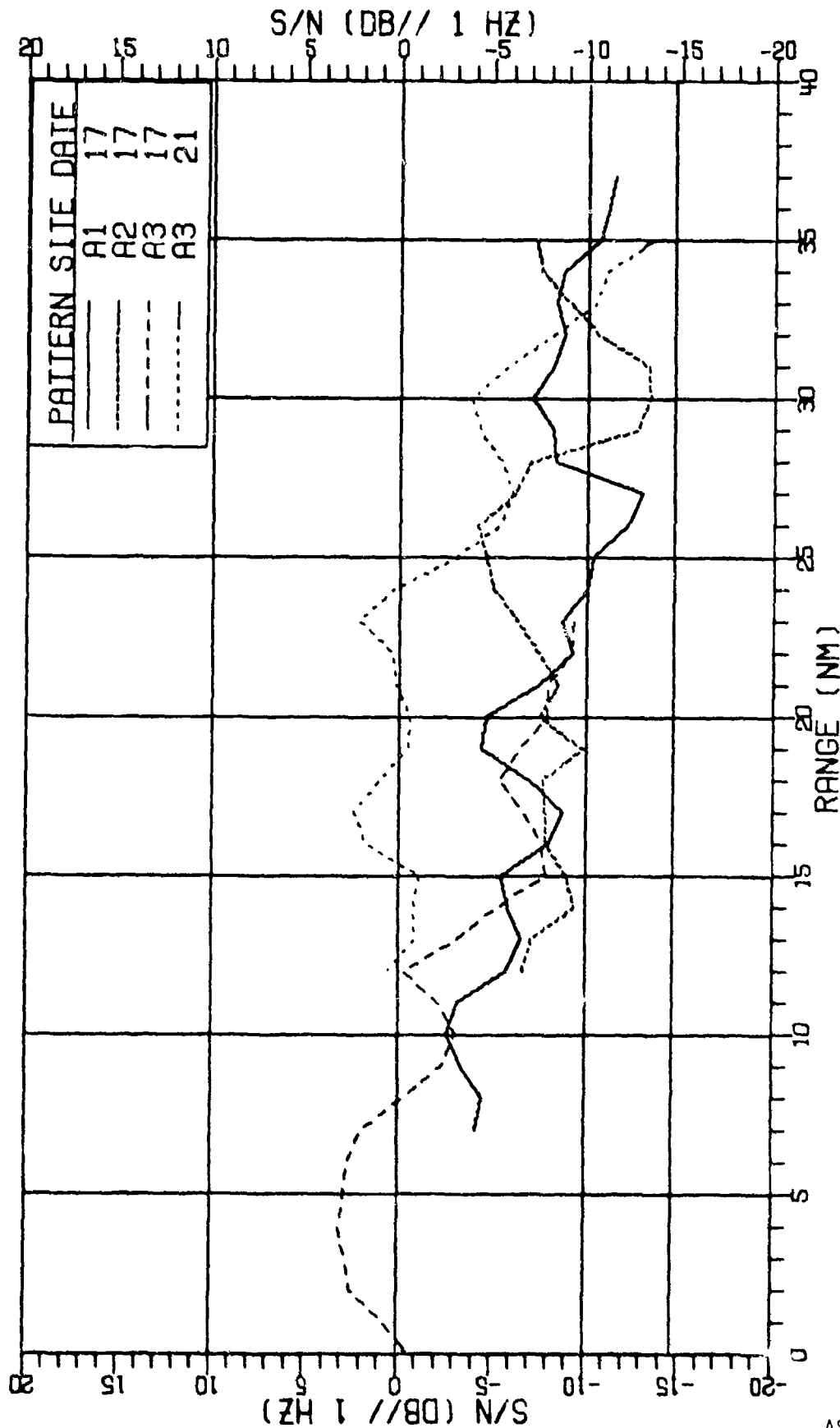


FIGURE 111-290
MSS-FVT NEAR BOTTOM DIFFERENCED CARDIOIDS SENSOR
SIGNAL-TO-NOISE RESULTS FOR 170HZ AT 156DB (U)

AS-77-2890

SECRET

SECRET

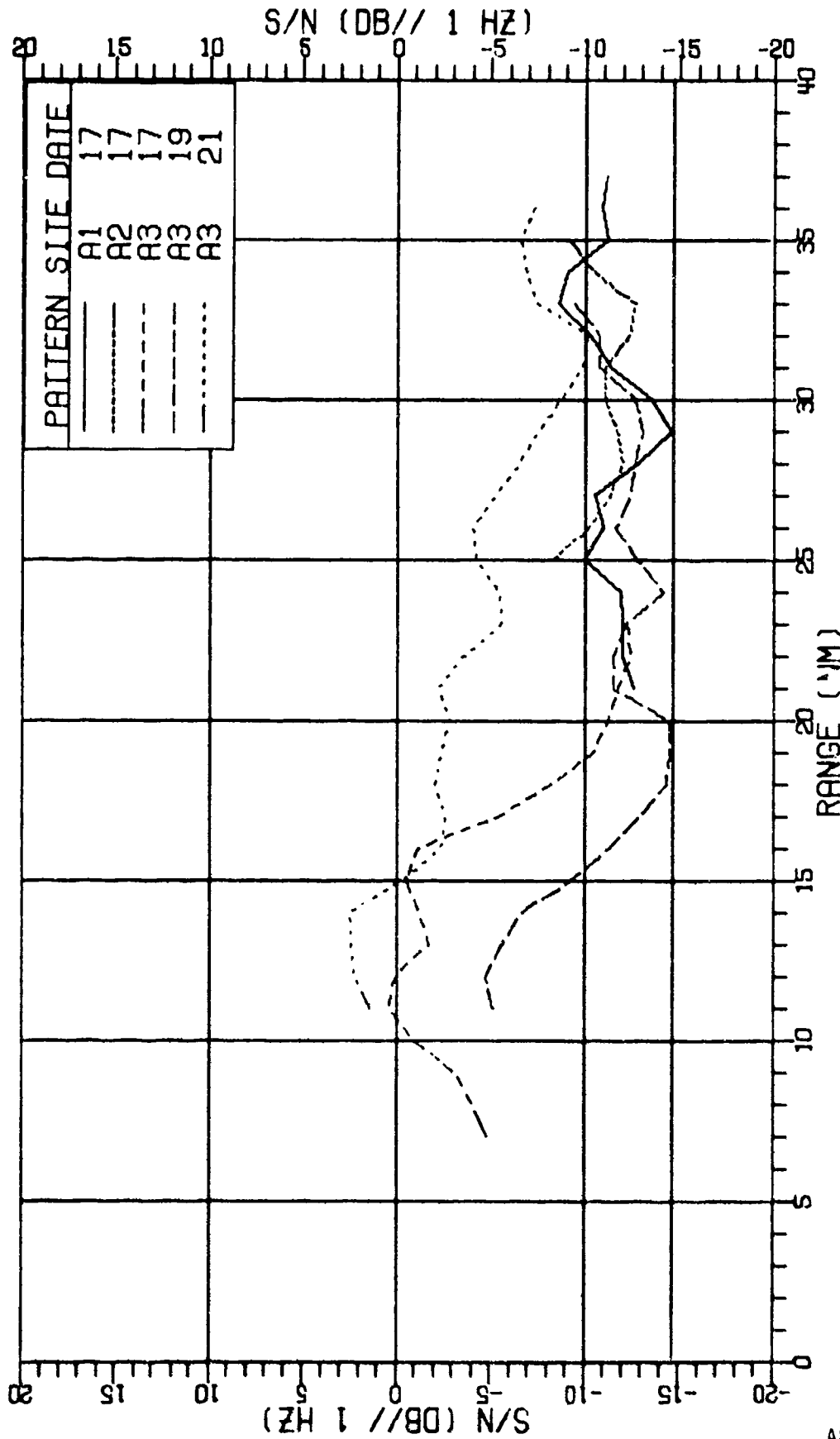


FIGURE 111-291
 MSS-FVT NEAR BOTTOM OMNIDIRECTIONAL SENSOR
 SIGNAL-TO-NOISE RESULTS FOR 335HZ AT 154DB (U)

AS-77-2891

SECRET

SECRET

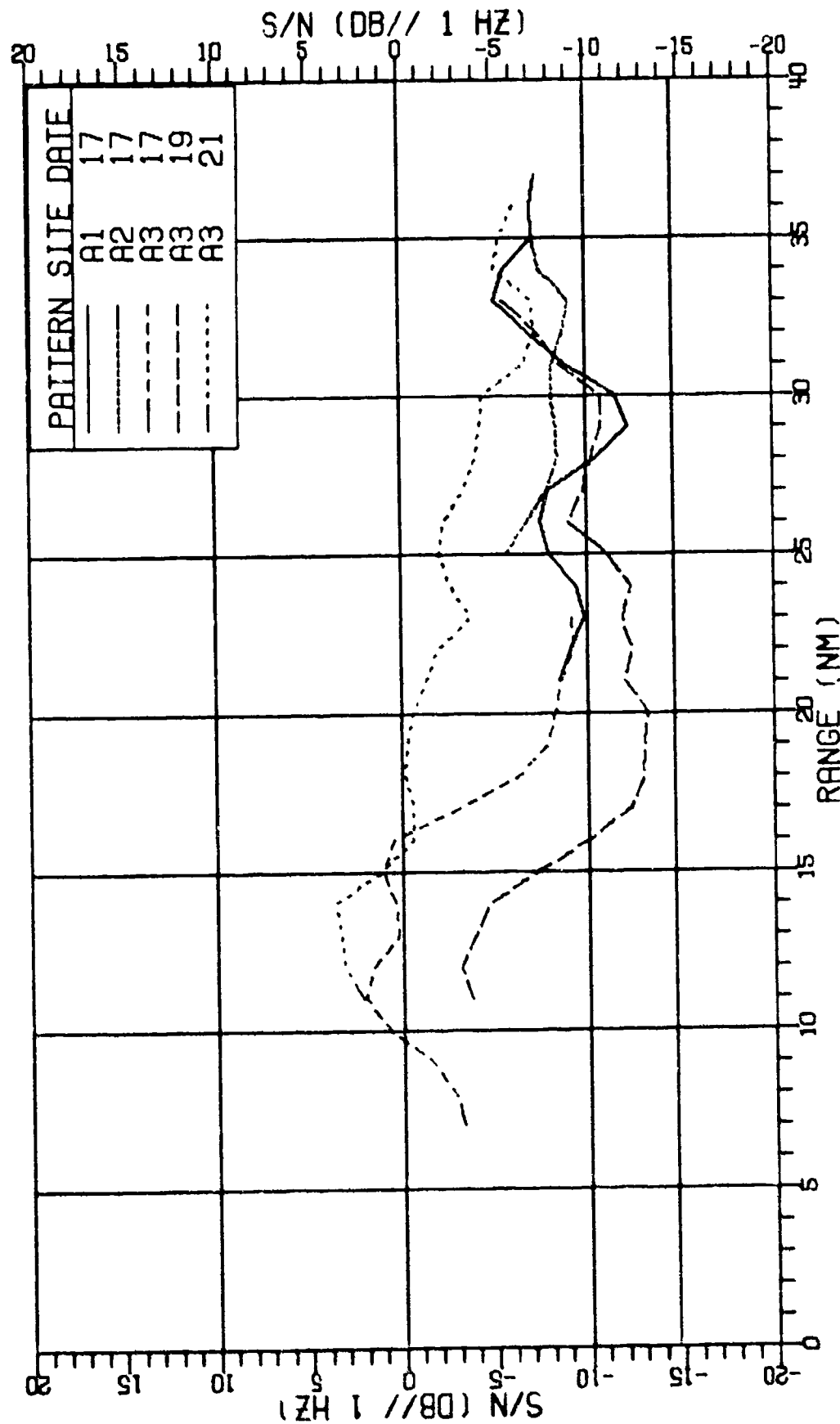


FIGURE 111-292
MSS-FVT NEAR BOTTOM SINGLE CARDIOIDS SENSOR
SIGNAL-TO-NOISE RESULTS FOR 335HZ AT 154DB (U)

AS-77-2892

SECRET

SECRET

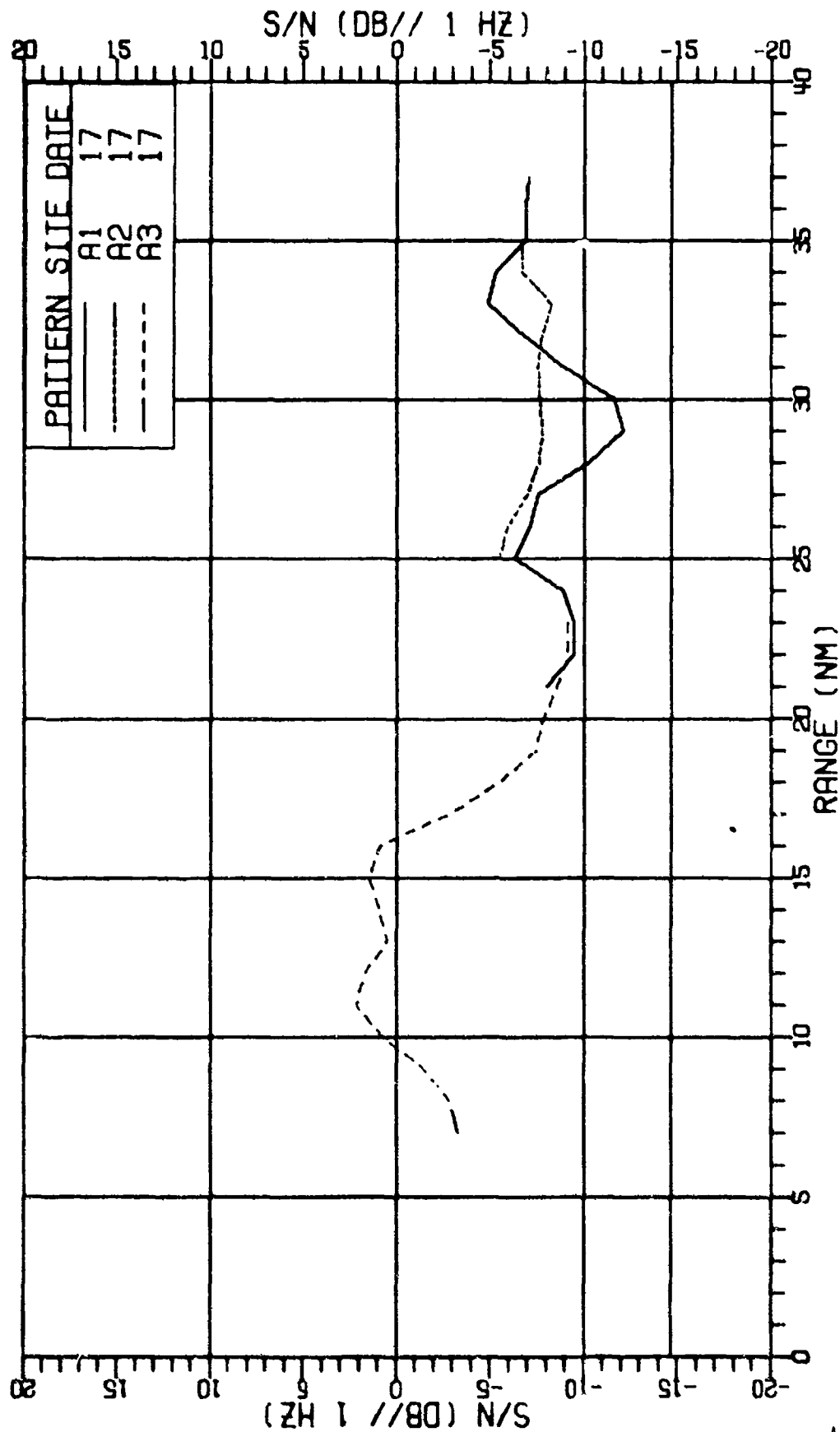


FIGURE 111-293
MSS-FVT NEAR BOTTOM MAX GAIN LI:1A CONS SENSOR
SIGNAL-TO-NOISE RESULTS FOR 335HZ AT 154DB (U)

AS-77-2893

SECRET

UNCLASSIFIED

APPENDIX H

NOISE GAIN TIMESERIES CURVES (U)

(FIGURES III-294 - III-301)

UNCLASSIFIED

CONFIDENTIAL

SPL (DB//UPA#2/MZ) - 10.0 DB/TIC

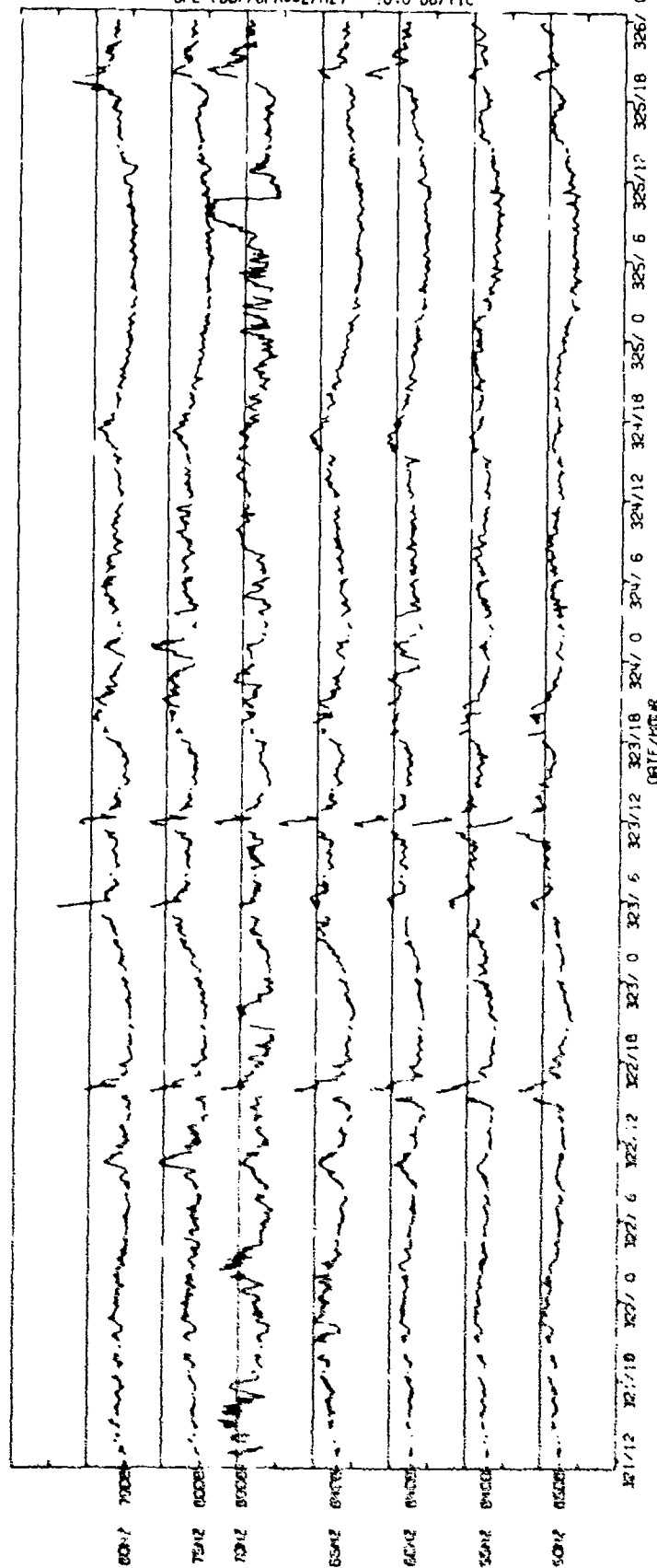


FIGURE 11-294
MSS-FVT PHASE 11 SITE A3 LOW FREQUENCY VERNIER
TIME SERIES OF 5 MIN AVERAGED AMBIENT SOUND FIELD LEVELS
THROUGH 1 HZ BANDS OF THE OMNIDIRECTIONAL SENSOR (U)

CONFIDENTIAL

CONFIDENTIAL

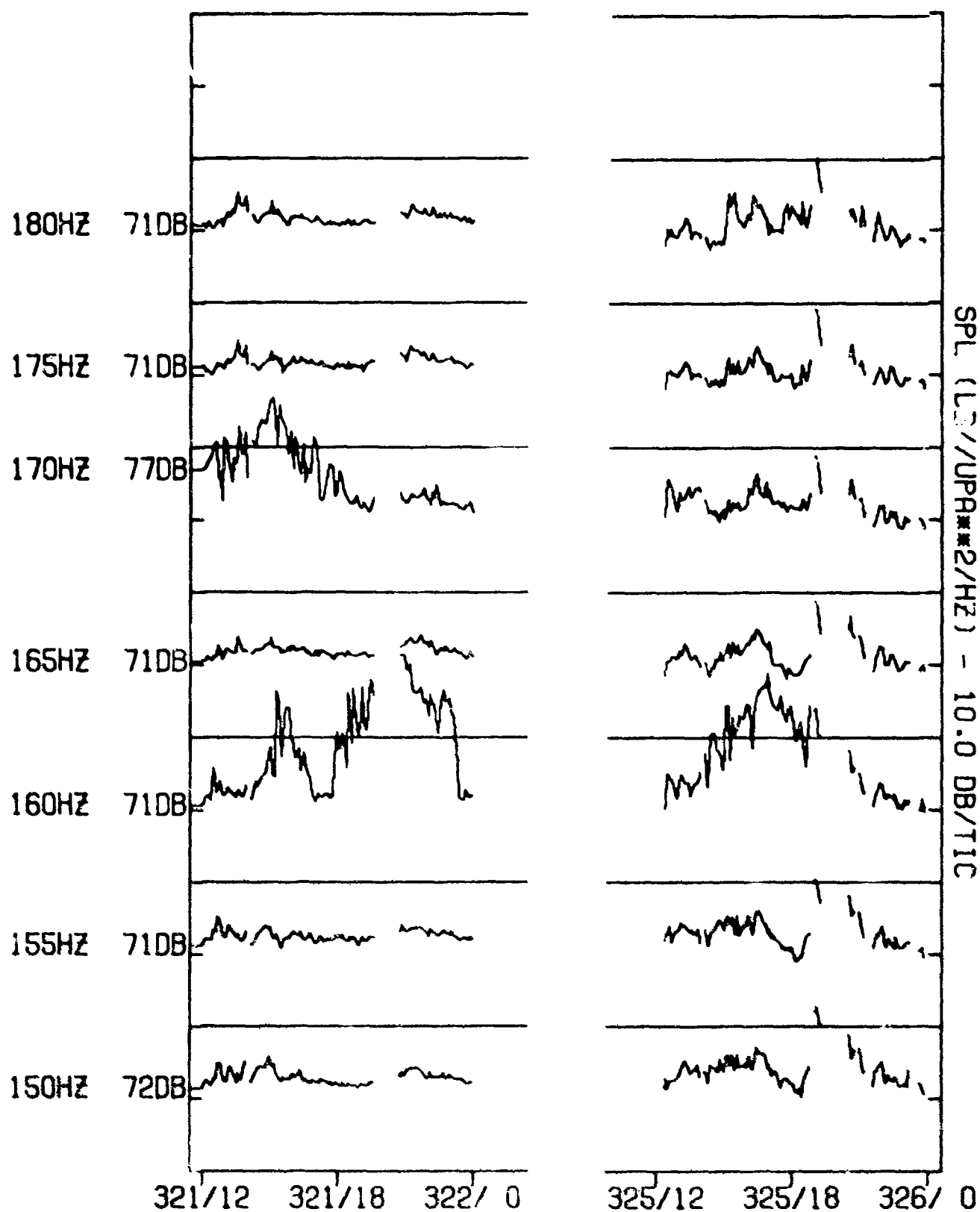


FIGURE III-295
MSS-FVT PHASE II SITE A3 MID FREQUENCY VERNIER
TIME SERIES OF 5 MIN AVERAGED AMBIENT SOUND FIELD LEVELS
THROUGH 1 HZ BANDS OF THE OMNIDIRECTIONAL SENSOR (U)

CONFIDENTIAL

CONFIDENTIAL

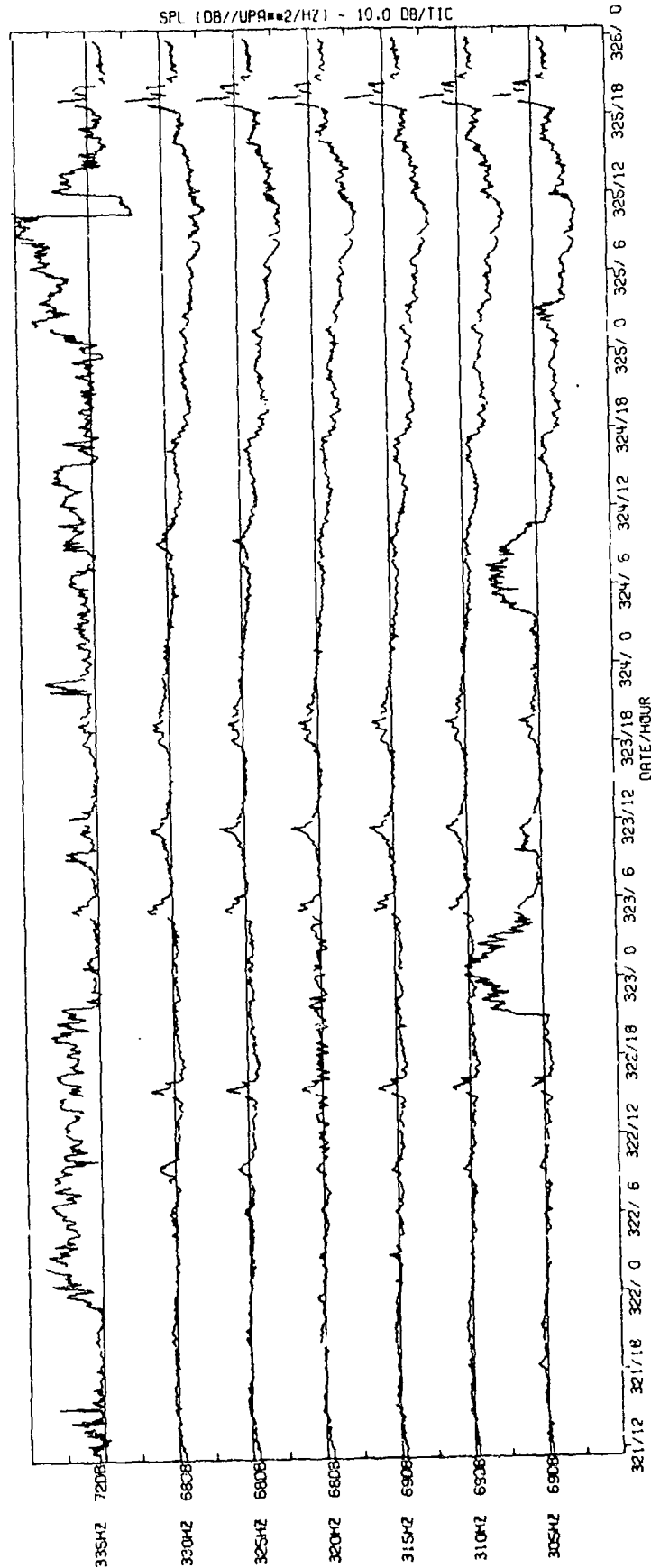


FIGURE III-296
MSS-FVT PHASE II SITE A3 HIGH FREQUENCY VERNIER
TIME SERIES OF 5 MIN AVERAGED AMBIENT SOUND FIELD LEVELS
THROUGH 1 HZ BANDS OF THE OMNIDIRECTIONAL SENSOR (U)

CONFIDENTIAL

CONFIDENTIAL

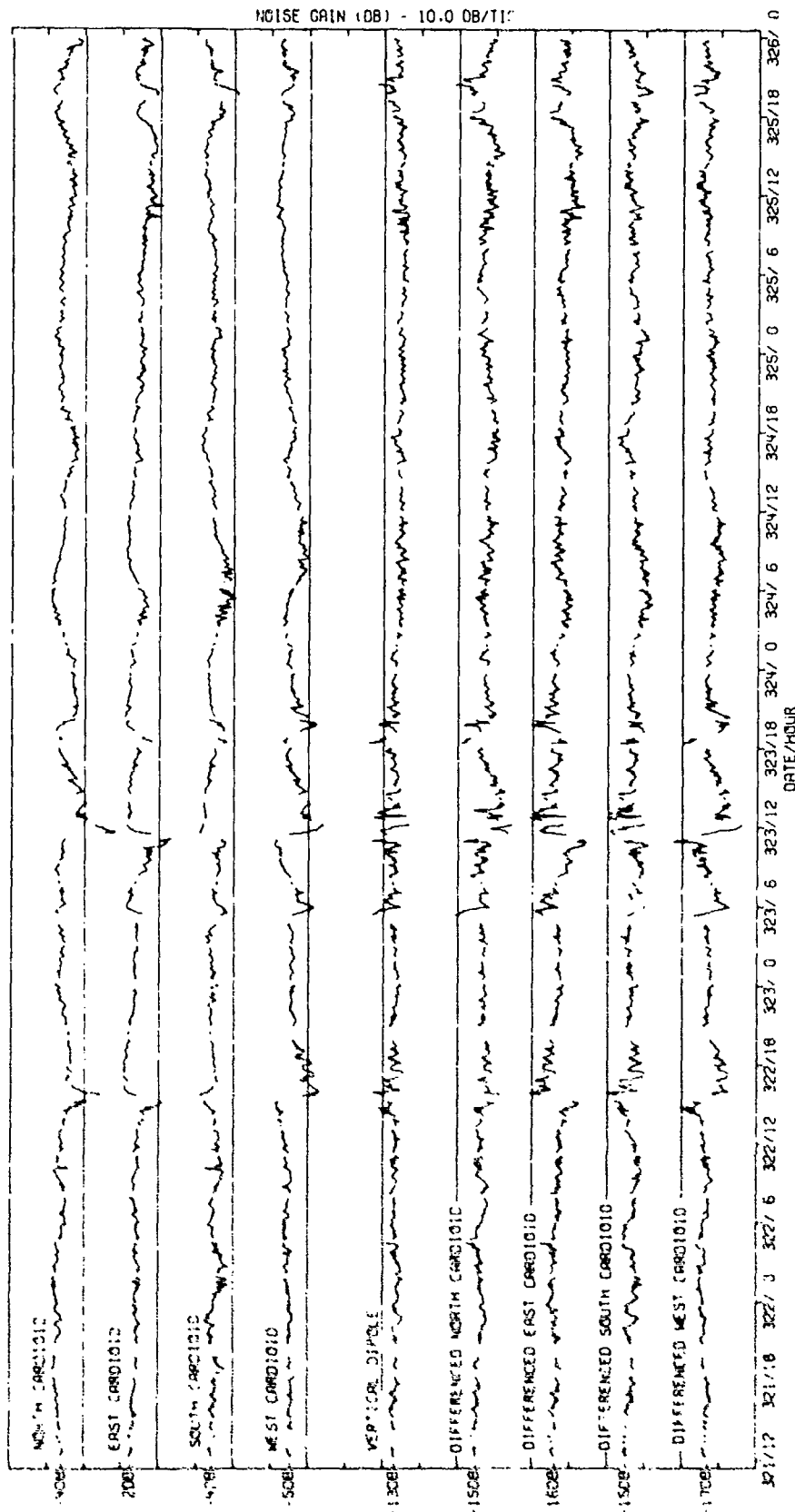


FIGURE 111-297
MSS-FVT PHASE 11 SITE A3 LOW FREQUENCY VERNIER
TIME SERIES OF 5 MIN AVERAGED NOISE GAIN LEVELS
FOR CARDIOID BEAMS AT 50 HZ (U)

CONFIDENTIAL

CONFIDENTIAL

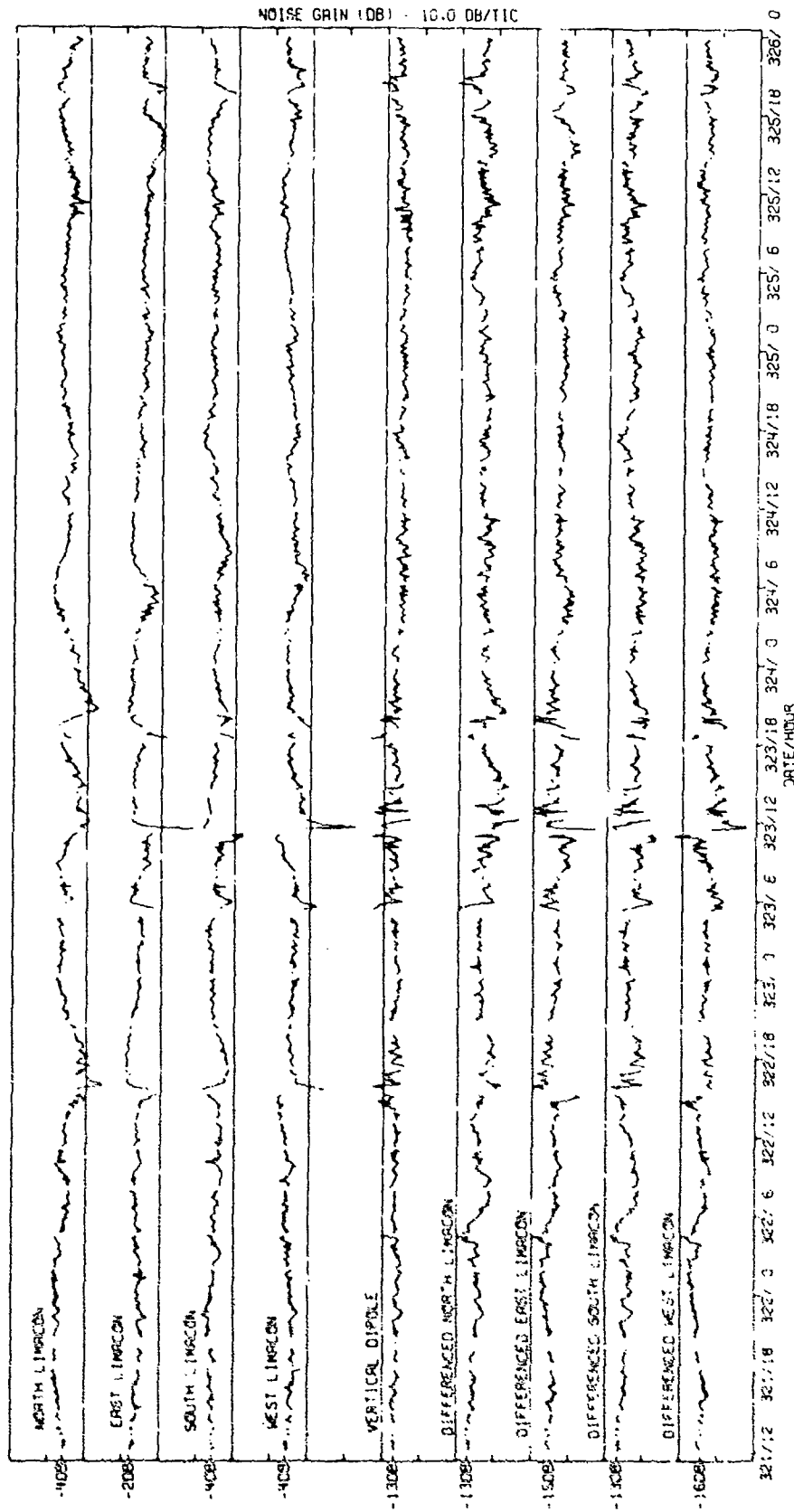


FIGURE III-298
MSS-FVT PHASE II SITE A3 LOW FREQUENCY VERNIER
TIME SERIES OF 5 MIN AVERAGED NOISE GAIN LEVELS
FOR LIMACON (0.33) BEAMS AT 50 HZ (U)

CONFIDENTIAL

CONFIDENTIAL

NOISE GRIN (DB) - 10.0 DB/TIC

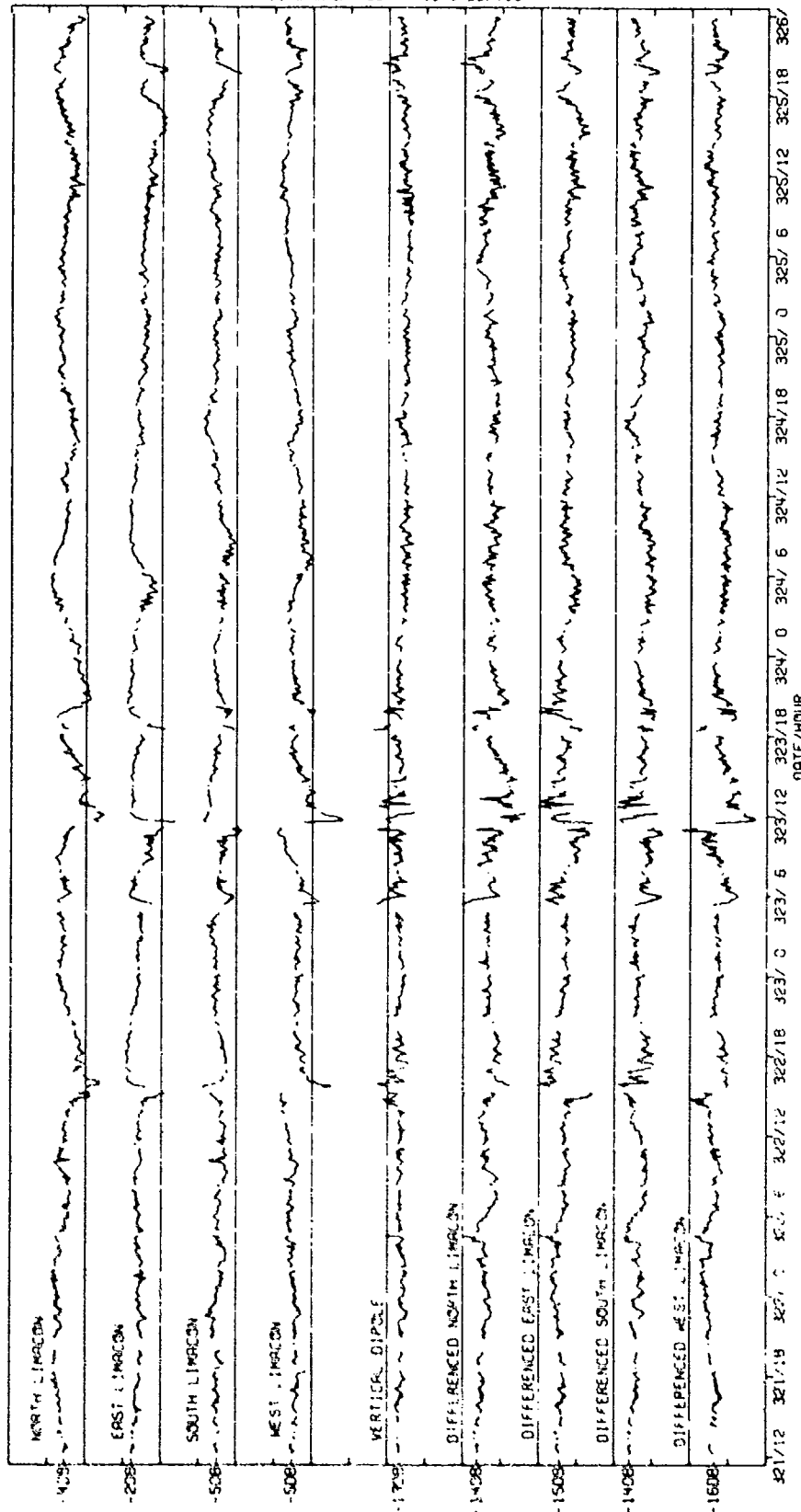


FIGURE 111-299
MSS-FVT PHASE II SITE A3 LOW FREQUENCY VERNIER
TIME SERIES OF 5 MIN AVERAGED NOISE GAIN LEVELS
FOR LIMA CON (0.50) BEAMS AT 50 HZ (U)

CONFIDENTIAL

AS-77-3392

CONFIDENTIAL

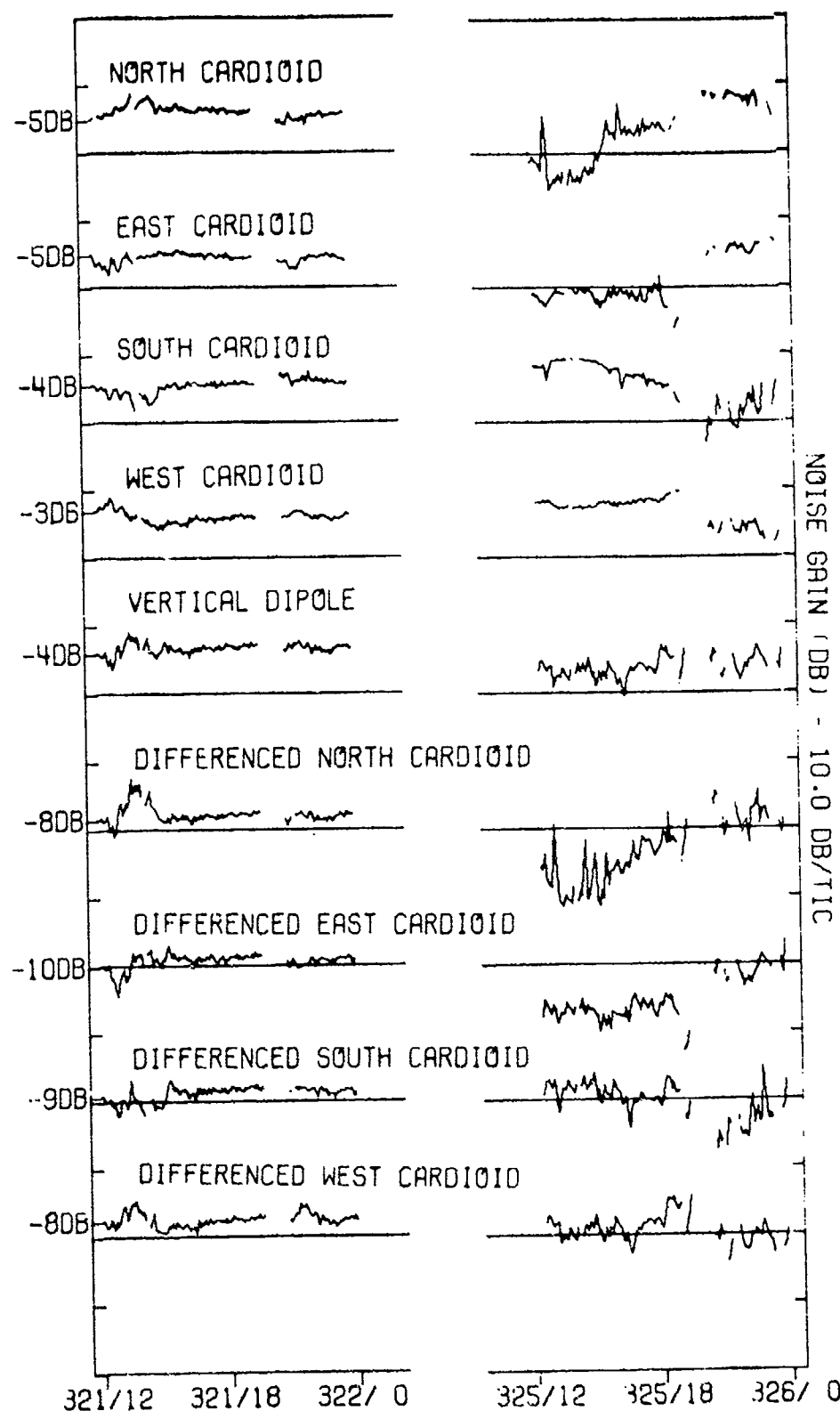


FIGURE III-300
MSS-FVT PHASE II SITE A3 MID FREQUENCY VERNIER
TIME SERIES OF 5 MIN AVERAGED NOISE GAIN LEVELS
FOR CARDIOID BEAMS AT 150 HZ (U)

341

AS-77-3393

CONFIDENTIAL

CONFIDENTIAL

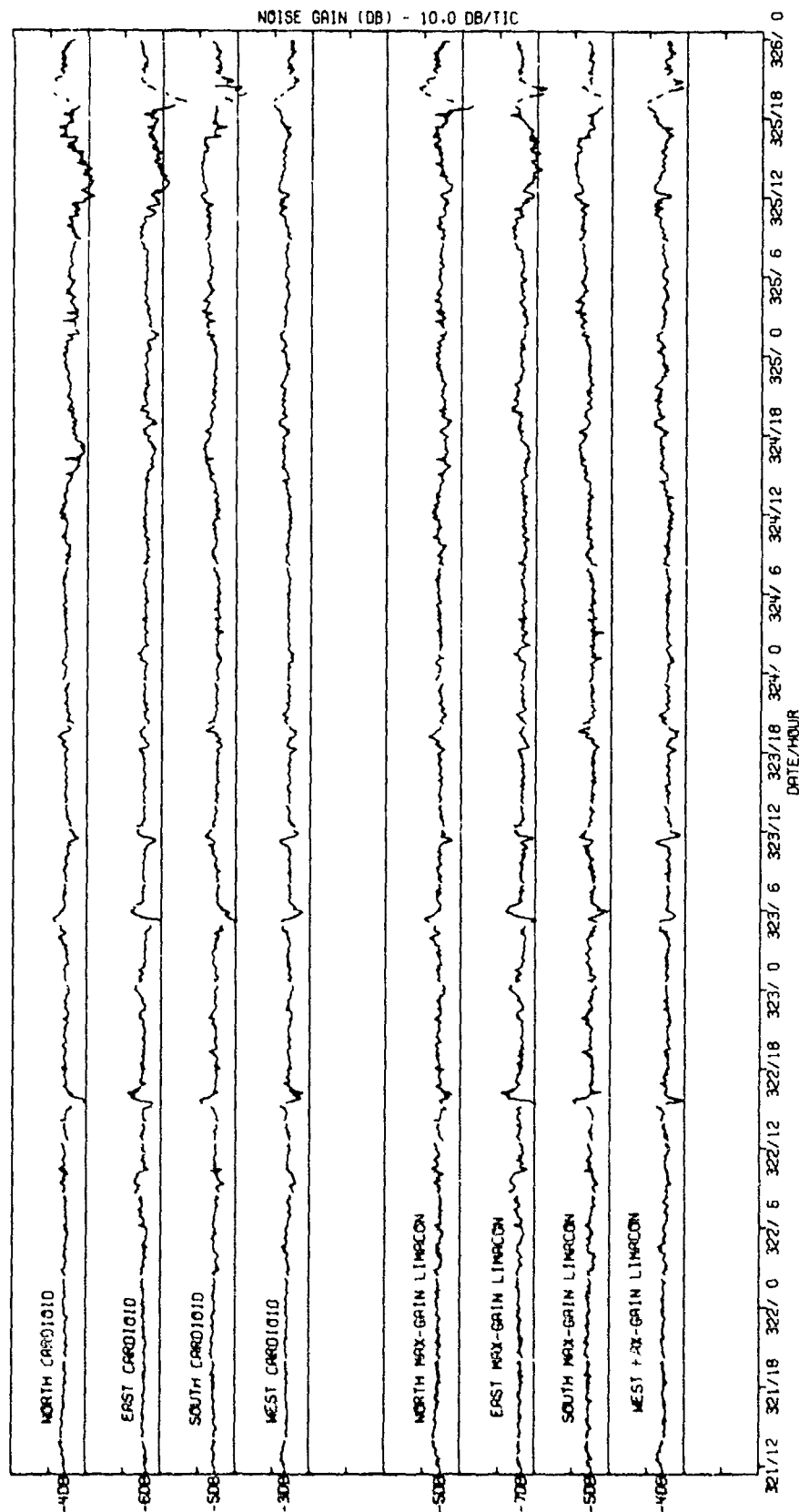


FIGURE III-301
MSS-FVT PHASE II SITE A3 HIGH FREQUENCY VERNIER
TIME SERIES OF 5 MIN AVERAGED NOISE GAIN LEVELS
FOR CARDI010 AND LIMACON (0.33) BEAMS AT 310 HZ (U)

AS-77-3394

CONFIDENTIAL

UNCLASSIFIED

APPENDIX I

CLUTTER TIMESERIES CURVES (U)

(FIGURES III-302 - III-312)

UNCLASSIFIED

CONFIDENTIAL

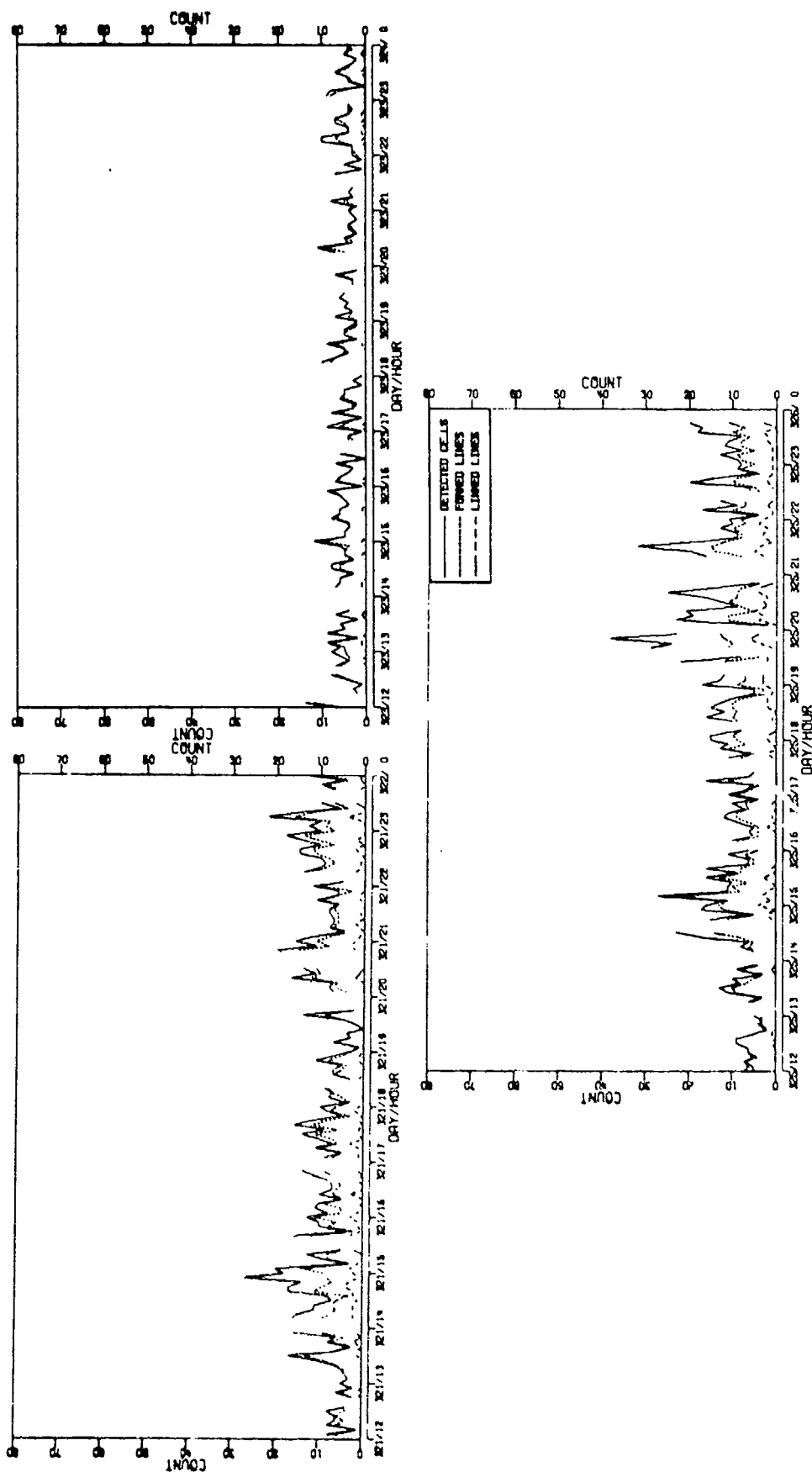


FIGURE III-302
MSS-FVT LOW-FREQUENCY VERNIER CLUTTER RESULTS
FOR THE OMNIDIRECTIONAL SENSOR AT SITE A3
DURING THE PHASE II FIELD EVENTS (U)

AS-77-3395

CONFIDENTIAL

CONFIDENTIAL

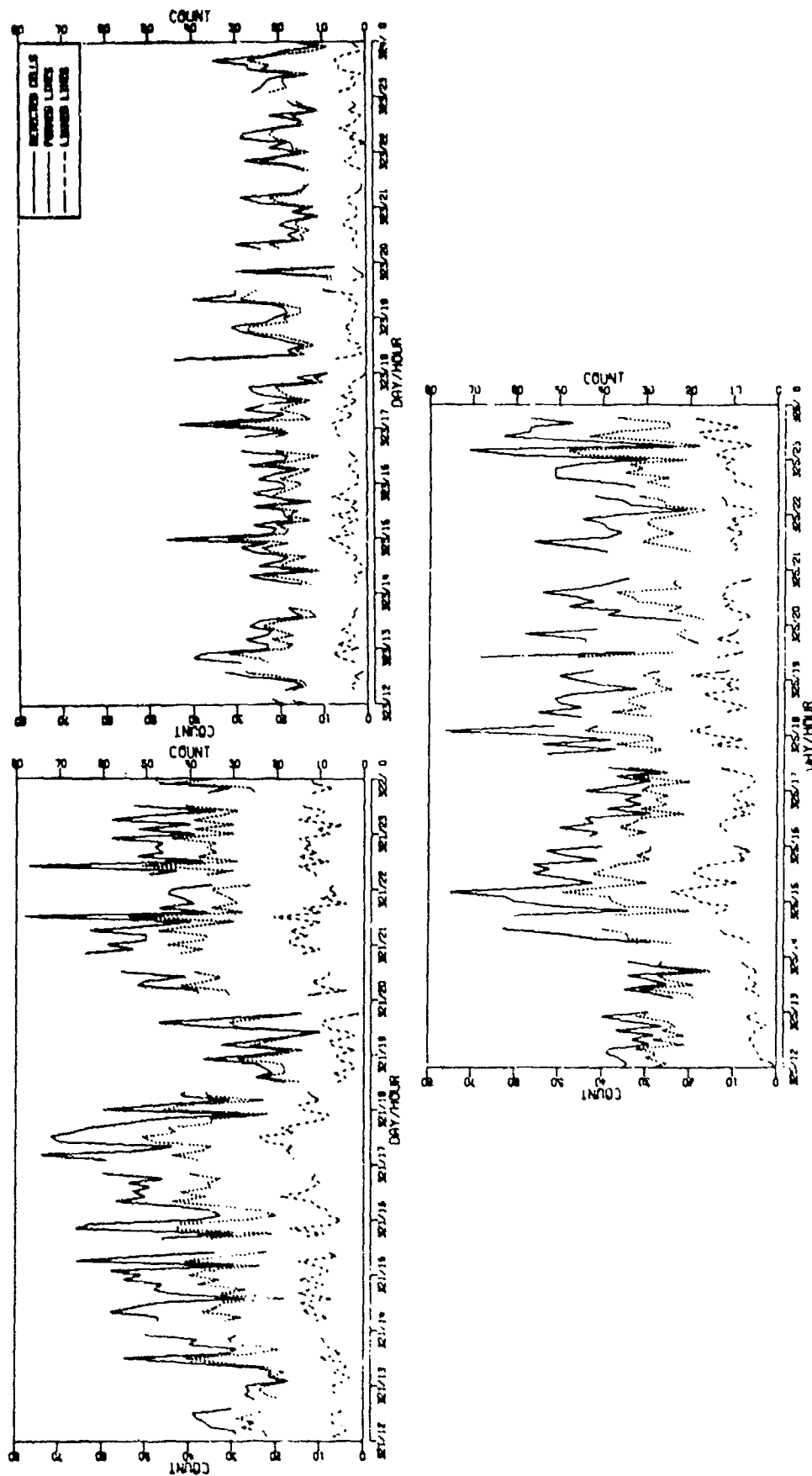


FIGURE III-303
MSS-FVT LOW-FREQUENCY VERNIER CLUTTER RESULTS
FOR THE SINGLE CARDIOIDS SENSOR AT SITE A3
DURING THE PHASE II FIELD EVENTS (U)

AS-77-3396

CONFIDENTIAL

CONFIDENTIAL

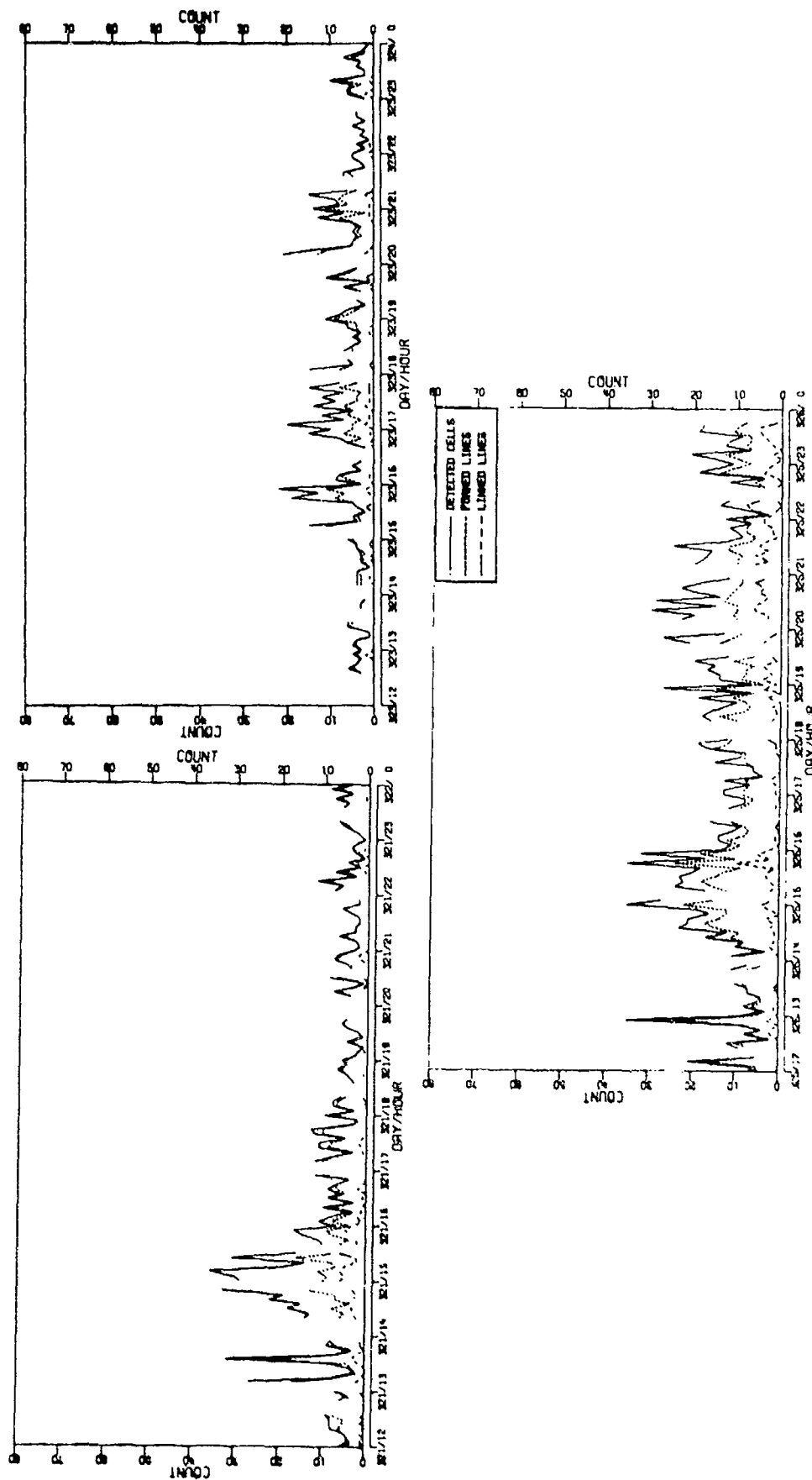


FIGURE III-304
MSS-FVT LOW-FREQUENCY VERNIER CLUTTER RESULTS
FOR THE VERTICAL DIPOLE SENSOR AT SITE A3
DURING THE PHASE II FIELD EVENTS (U)

AS-77-3397

CONFIDENTIAL

CONFIDENTIAL

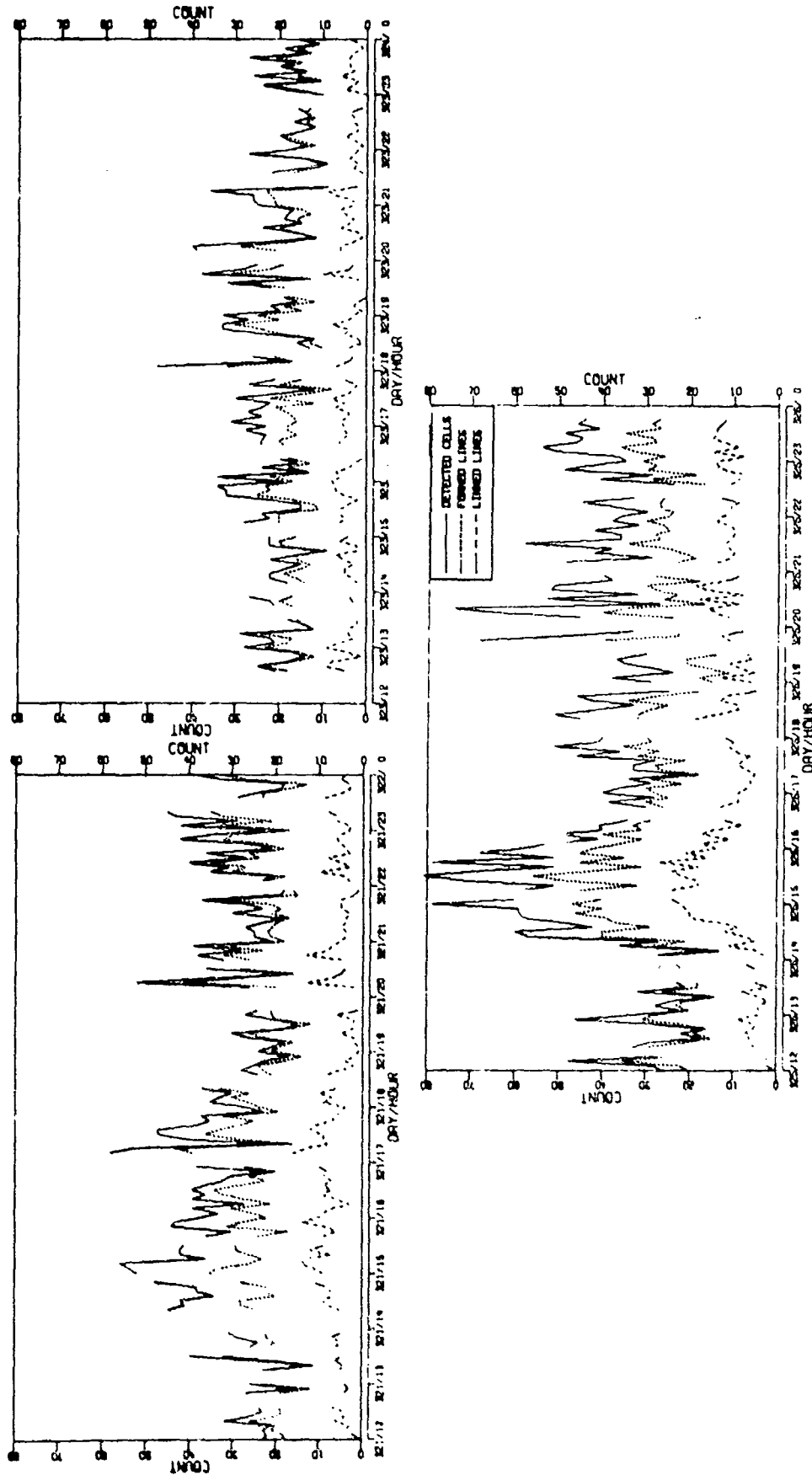


FIGURE 111-305
MSS-FVT LOW-FREQUENCY VERNIER CLUTTER RESULTS
FOR THE DIFFERENCED CARDOIDS SENSOR AT SITE A3
DURING THE PHASE II FIELD EVENTS (U)

AS-77-3398

CONFIDENTIAL

CONFIDENTIAL

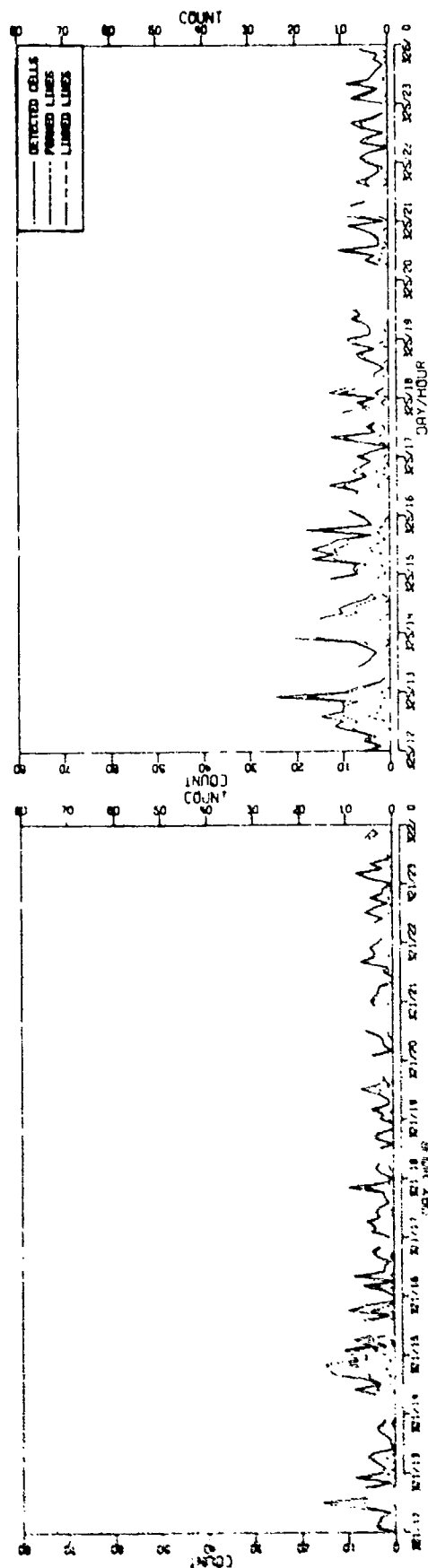


FIGURE III-306
MSS-FVT MID-FREQUENCY VERNIER CLUTTER RESULTS
FOR THE OMNIDIRECTIONAL SENSOR AT SITE A3
DURING THE PHASE II FIELD EVENTS (U)

AS-77-3399

CONFIDENTIAL

CONFIDENTIAL

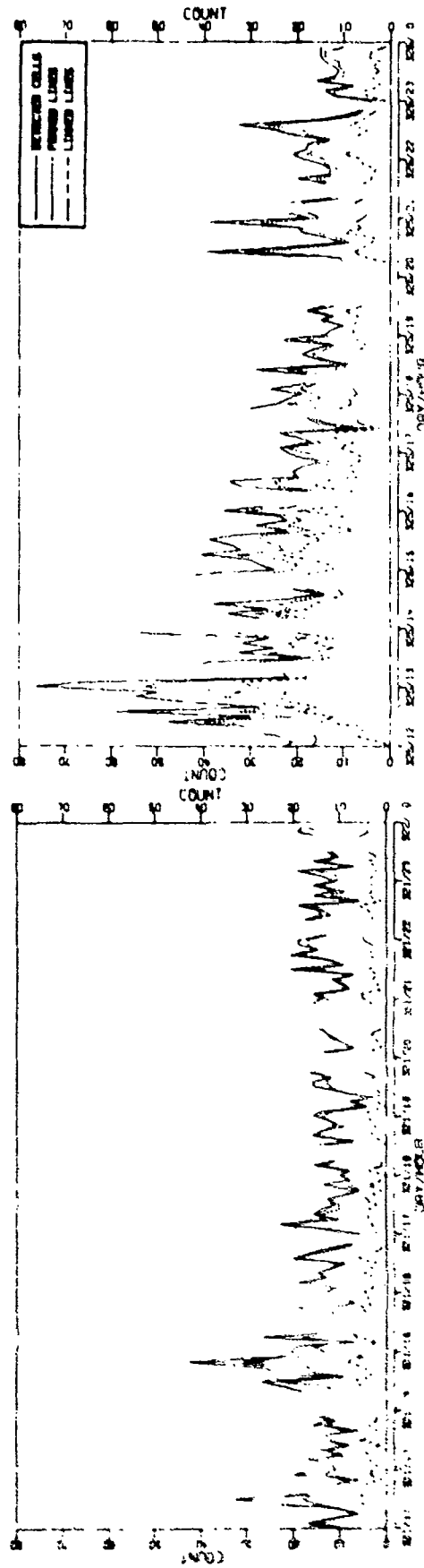


FIGURE III-307
MSS-FYT MID-FREQUENCY VERNIER CLUTTER RESULTS
FOR THE SINGLE CAROIDS SENSOR AT SITE A3
DURING THE PHASE II FIELD EVENTS (U)

AS-77-3400

CONFIDENTIAL

CONFIDENTIAL

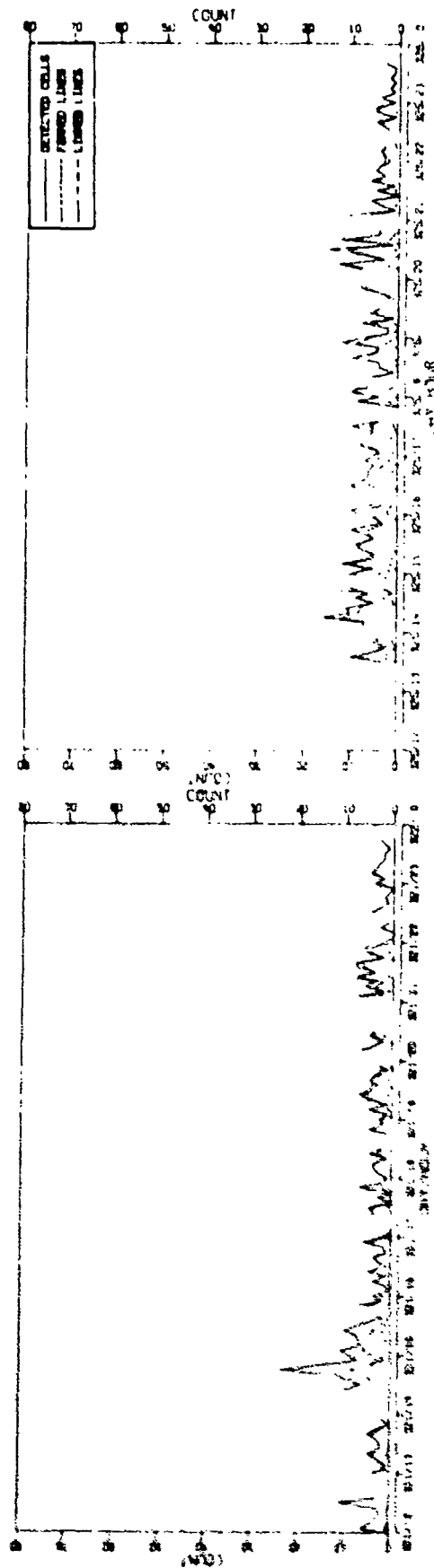


FIGURE 111-308
MSS-FVT MID-FREQUENCY VERNIER CLUTTER RESULTS
FOR THE VERTICAL DIPOLE SENSOR AT SITE A3
DURING THE PHASE II FIELD EVENTS (U)

AS-77-3401

CONFIDENTIAL

CONFIDENTIAL

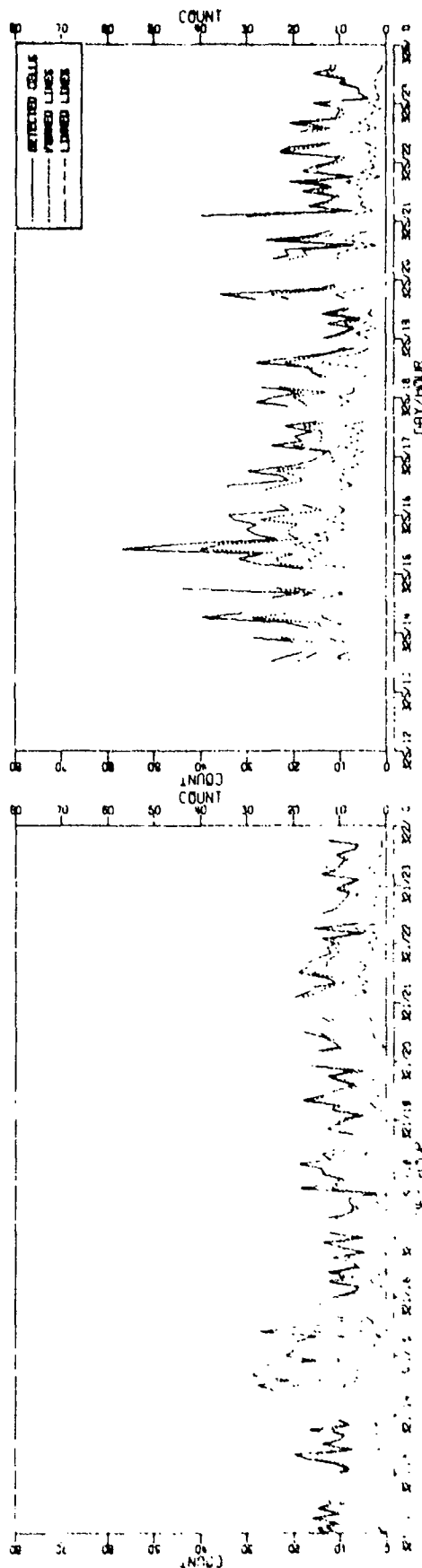


FIGURE 111-309
MSS-FVT MID-FREQUENCY VERNIER CLUTTER RESULTS
FOR THE DIFFERENCED CARDIOIDS SENSOR AT SITE A3
DURING THE PHASE II FIELD EVENTS (U)

AS-77-3402

CONFIDENTIAL

CONFIDENTIAL

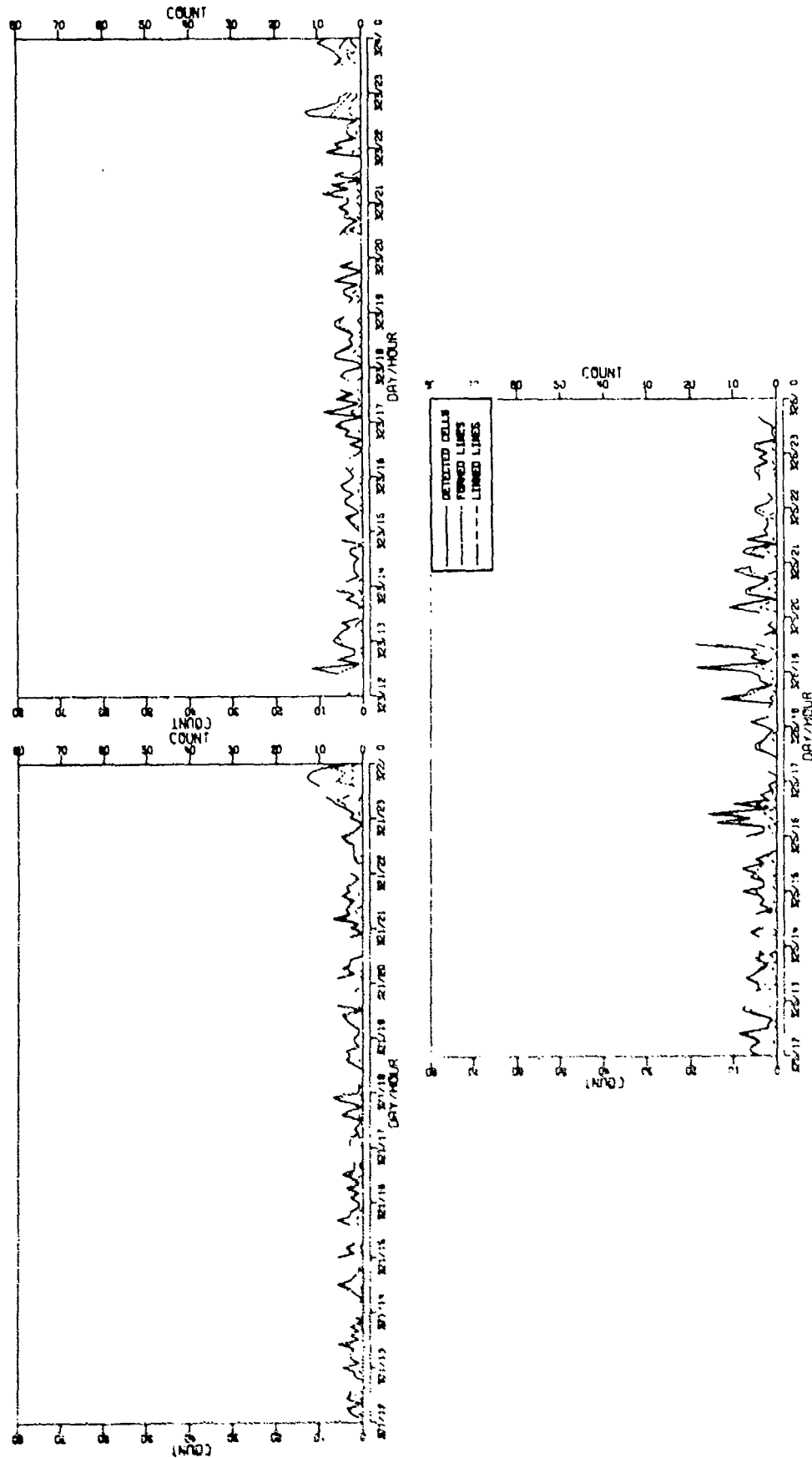


FIGURE 111-310
MSS-FVT HIGH-FREQUENCY VERNIER CLUTTER RESULTS
FOR THE OMNIDIRECTIONAL SENSOR AT SITE A3
DURING THE PHASE II FIELD EVENTS (U)

CONFIDENTIAL

CONFIDENTIAL

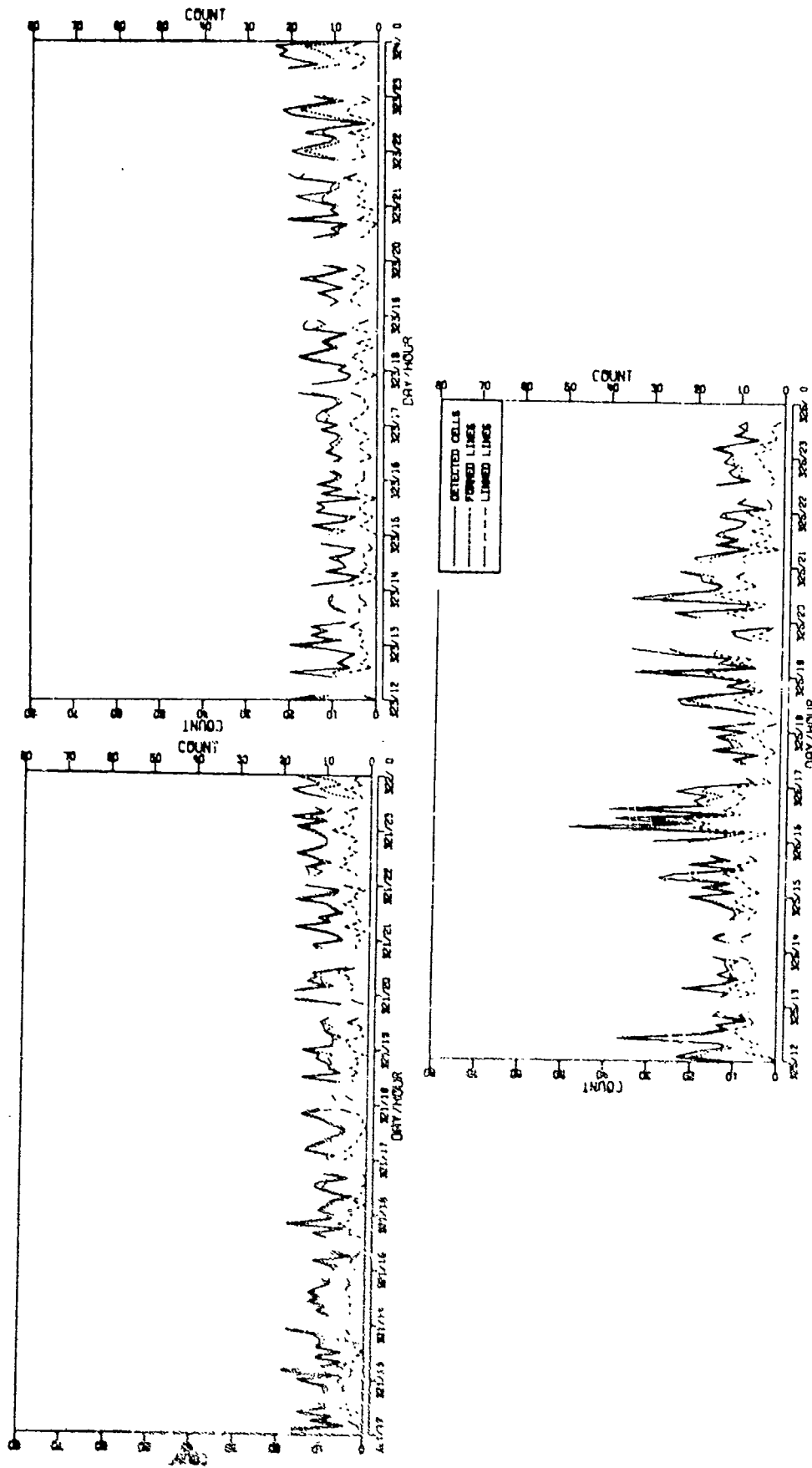


FIGURE III-311
MSS-FVT HIGH-FREQUENCY VERNIER CLUTTER RESULTS
FOR THE SINGLE CAROIDIDS SENSOR AT SITE A3
DURING THE PHASE II FIELD EVENTS (U)

CONFIDENTIAL

CONFIDENTIAL

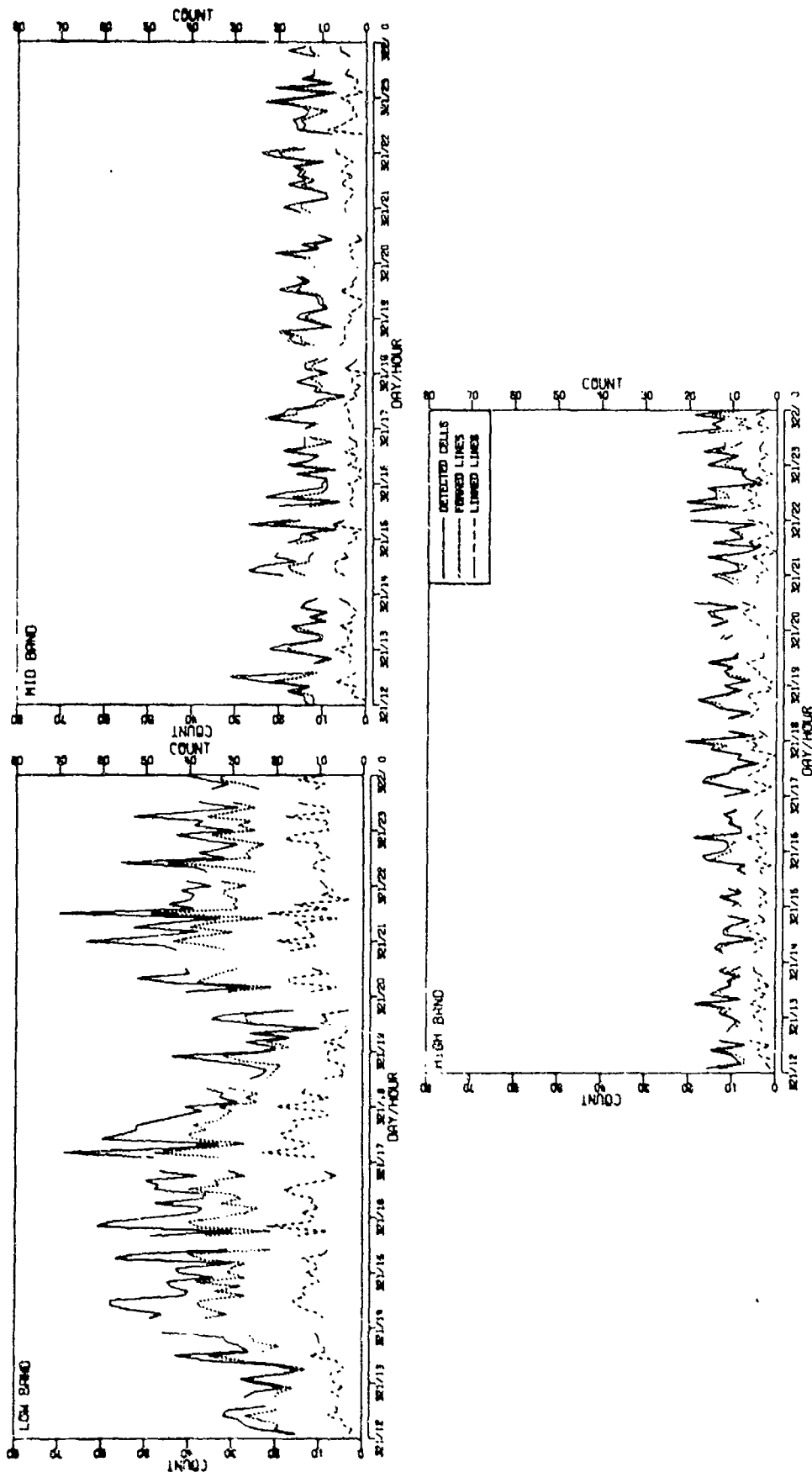


FIGURE III-312
MSS-FVT VERNIER RESOLUTION CLUTTER RESULTS
FOR THE MAX GAIN LIMAcons SENSOR AT SITE A3
DURING THE PHASE II FIELD EVENTS (U)

CONFIDENTIAL

UNCLASSIFIED

APPENDIX J

AMBIENT SOUND FIELD 3D PLOTS

(U) This appendix contains plots of a 3-dimensional representation of the ambient sound field. These plots were generated from vernier resolution calibrated covariance matrices. Only omnidirectional and vertical dipole data were plotted. Such displays are intended to aid the analyst in obtaining an overview of the available data base, in identifying artifacts, and by serving as a guide to later data selection and processing. Each plot covers a 12 h time interval. Each trace represents an intensity average over a 10 min time interval. The data identifier is described below.

II AI S LBD
+Phase II
+ACODAC Site AI
+Single (S) or Differenced (D) Array
+Low Band (LBD), Midband (MBD),
or High Band (HBD) Data

CONFIDENTIAL

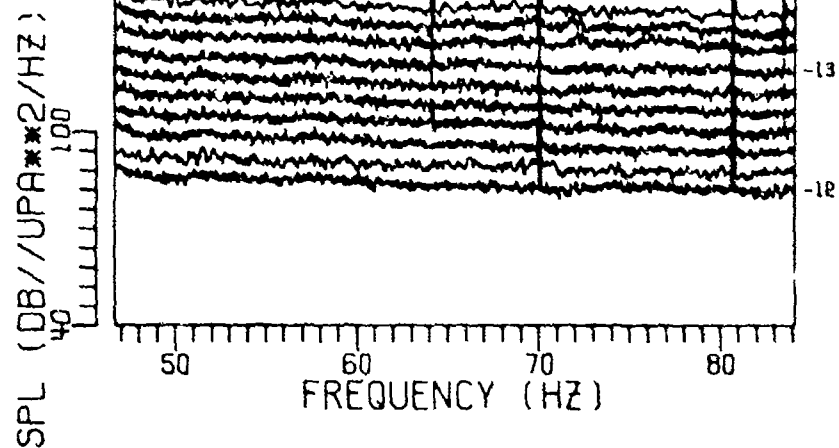


FIGURE III-313

IIA1SLBD 321/12/ 0 - 321/23/55

359

CONFIDENTIAL

CONFIDENTIAL

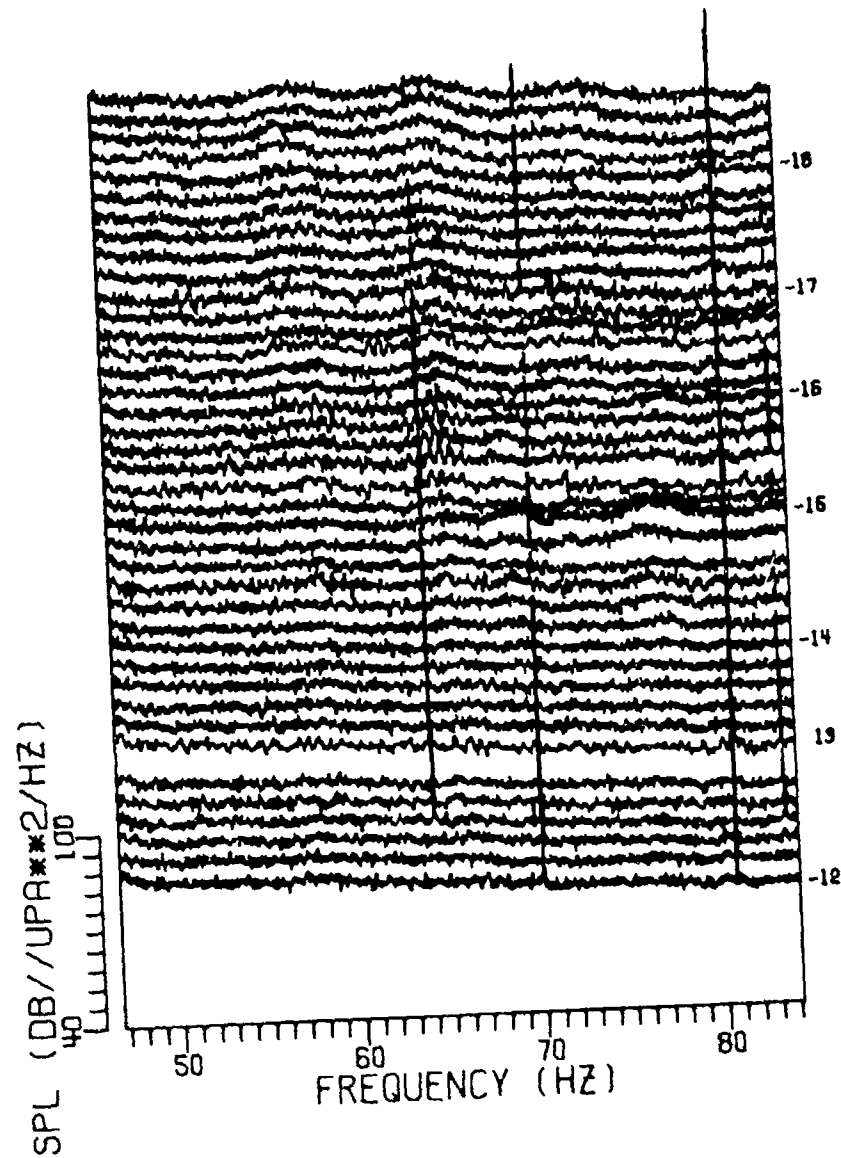


FIGURE III-314
IIA2SLBD 321/12/ 0 - 321/18/55

CONFIDENTIAL

CONFIDENTIAL

SPL (DB//UPA**2/HZ)

40 100

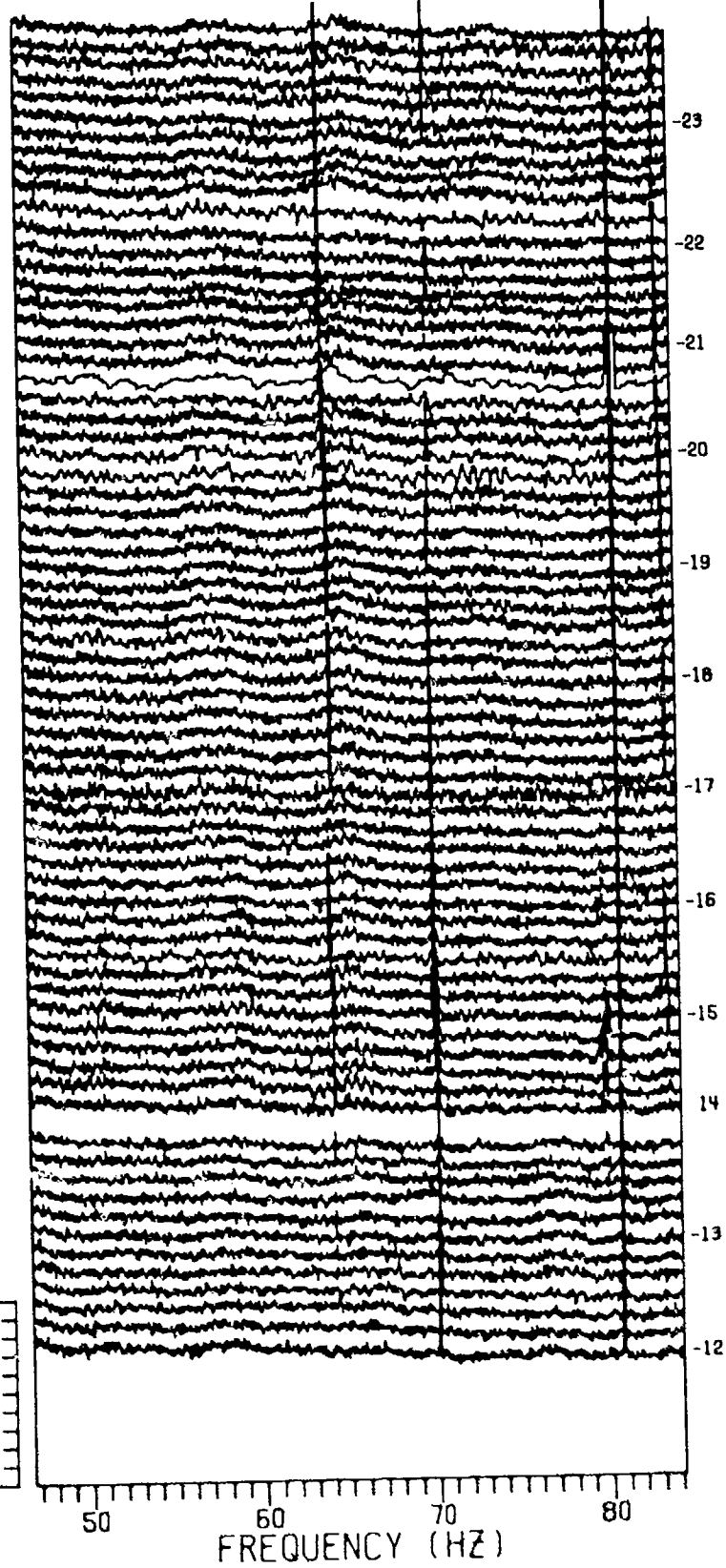


FIGURE III-315

IIA3SLBD 321/12/ 0 - 321/23/55

10.1

CONFIDENTIAL

CONFIDENTIAL

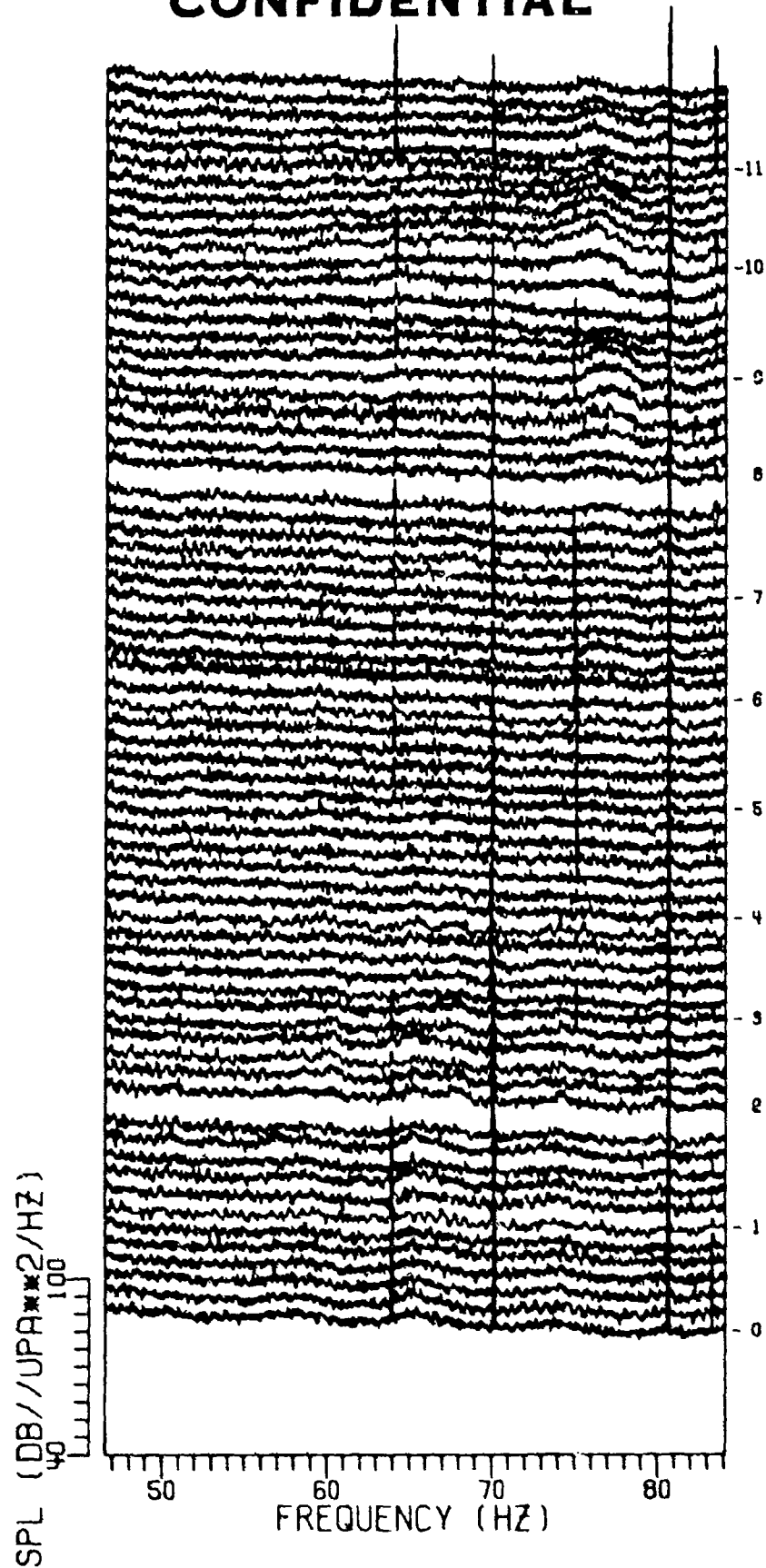


FIGURE III-316

IIA3SLBD 322/ 0/ 0 - 322/11/55

362

CONFIDENTIAL

CONFIDENTIAL

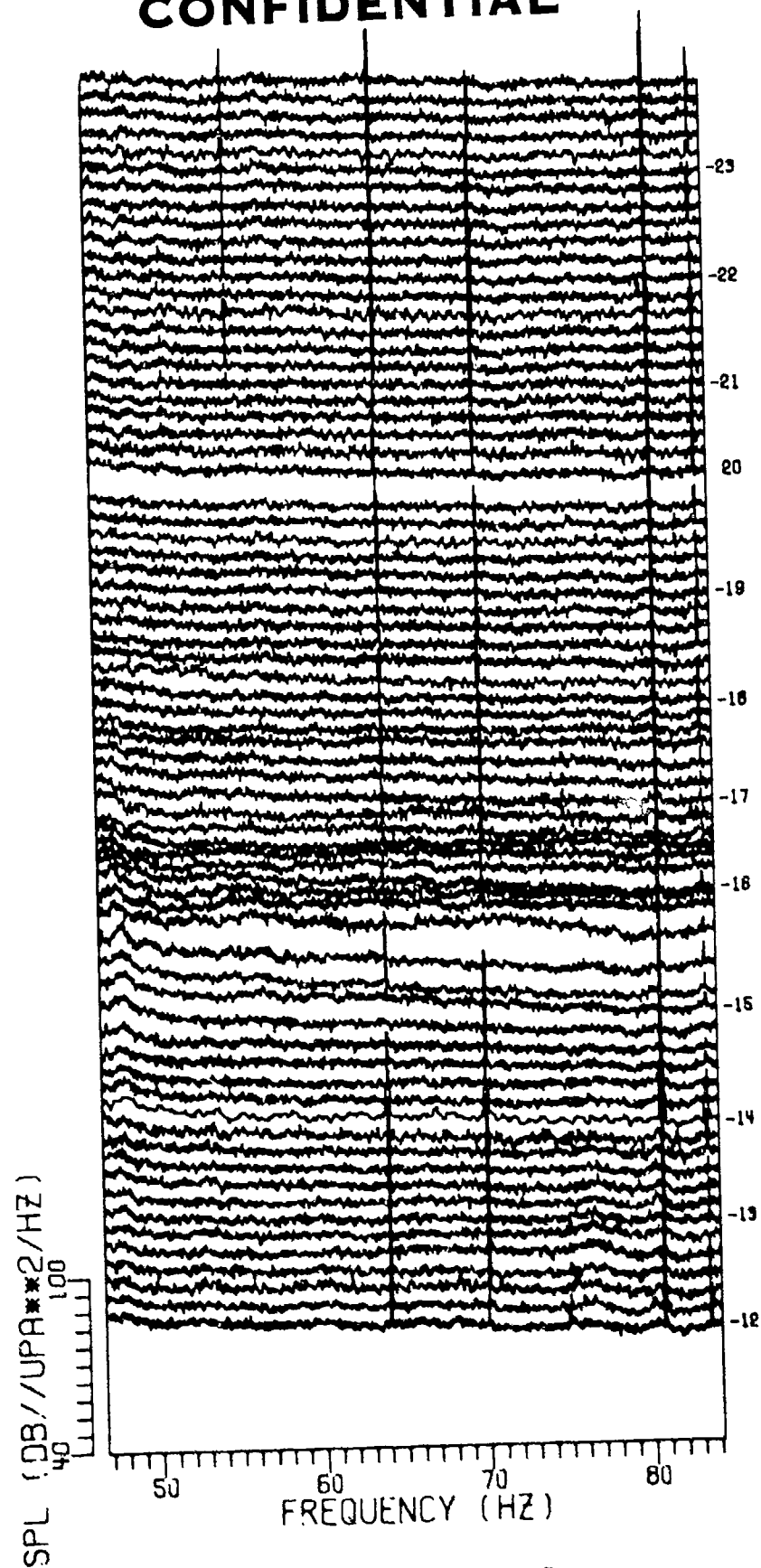


FIGURE III-317
IIA3SLBD 322/12/ 0 - 322/23/55

363

CONFIDENTIAL

CONFIDENTIAL

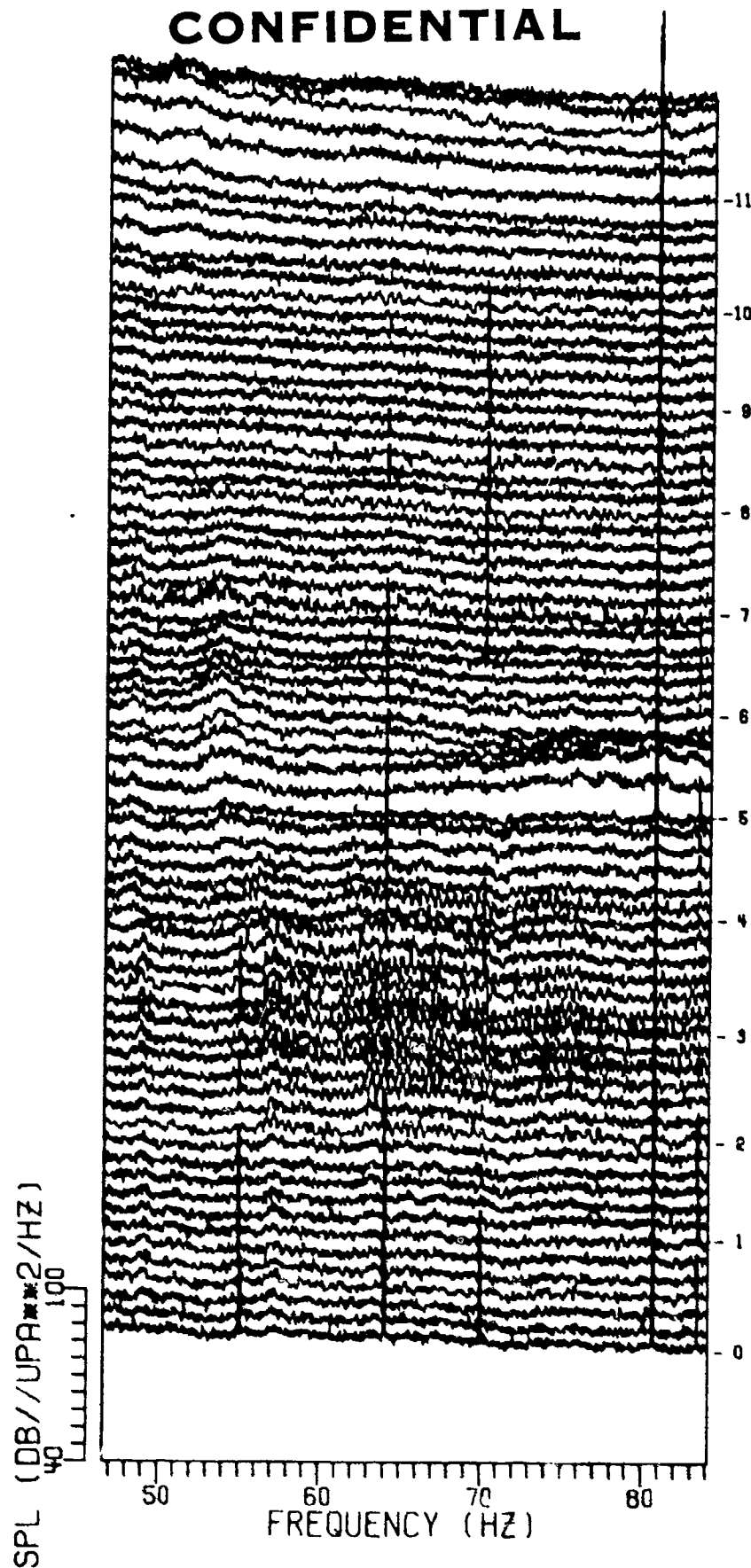


FIGURE III-318

IIR3SLBD 323/ 0/ 0 - 323/11/55

364

CONFIDENTIAL

CONFIDENTIAL

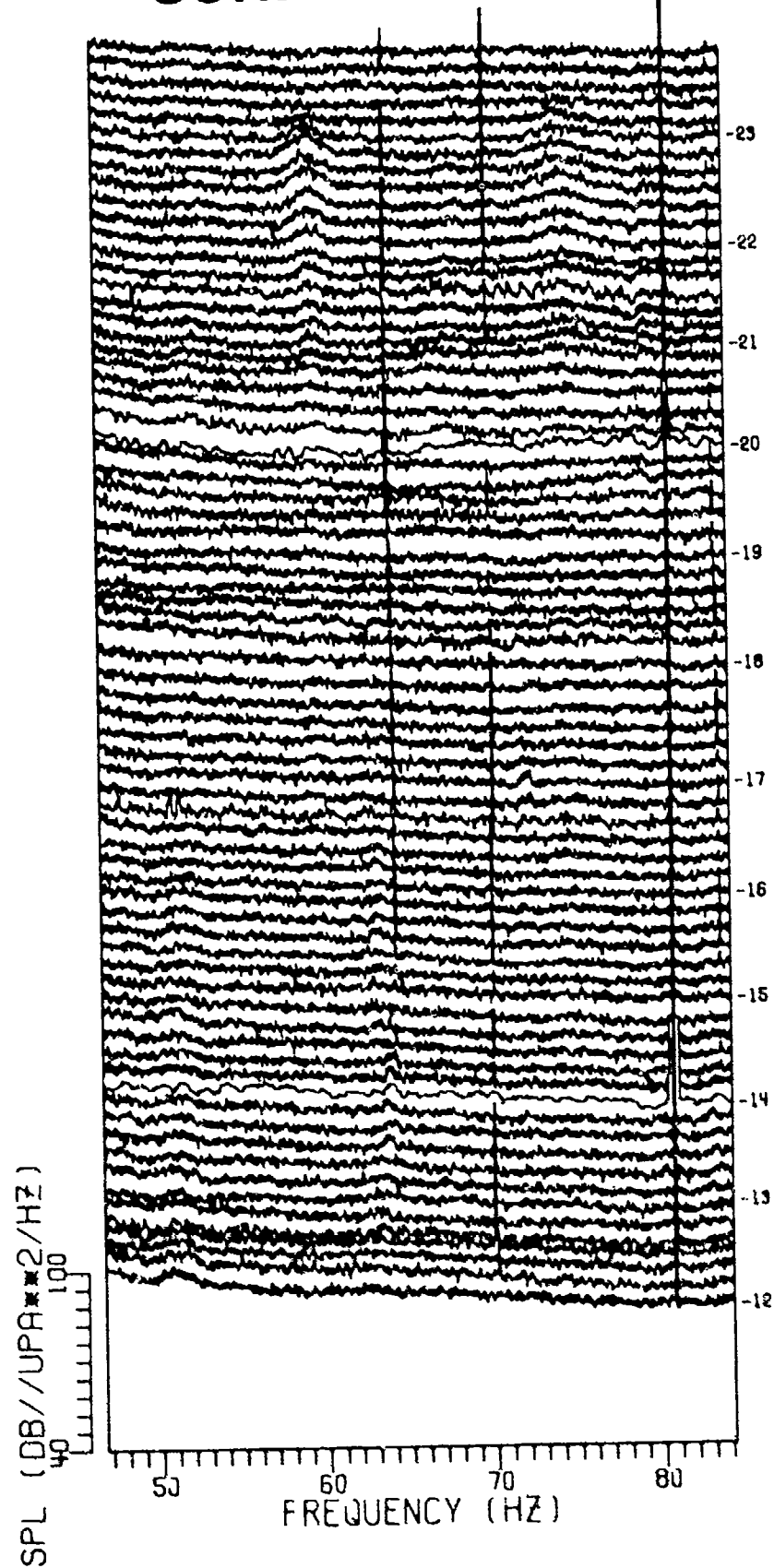


FIGURE III-319

IIA3SLBD 323/12/ 0 - 323/23/55

365

CONFIDENTIAL

CONFIDENTIAL

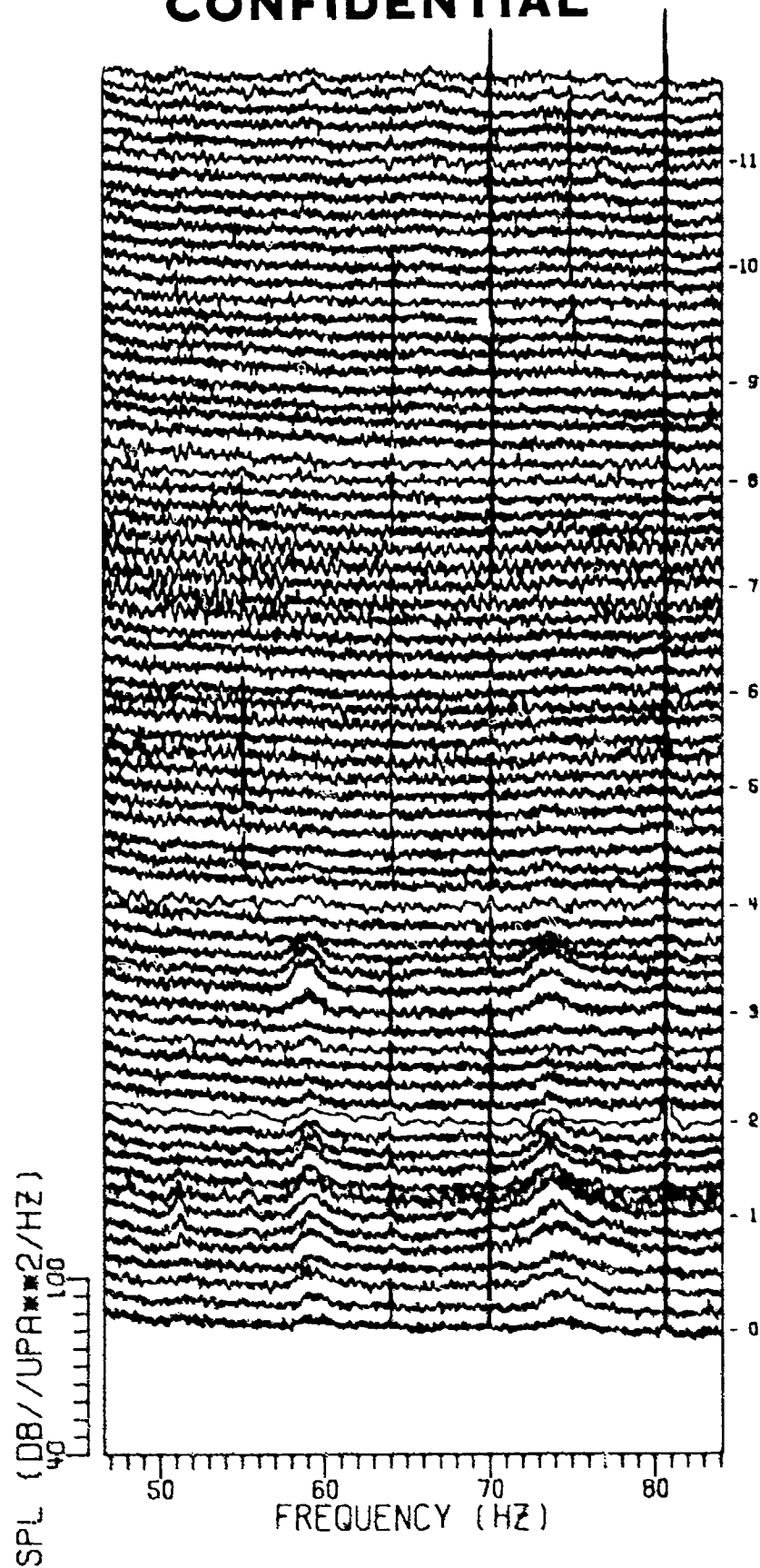


FIGURE III-320

IIA3SLBD 324/ 0/ 0 - 324/11/50

766

CONFIDENTIAL

CONFIDENTIAL

SPL (DB//UPA#2/HZ)
40 100

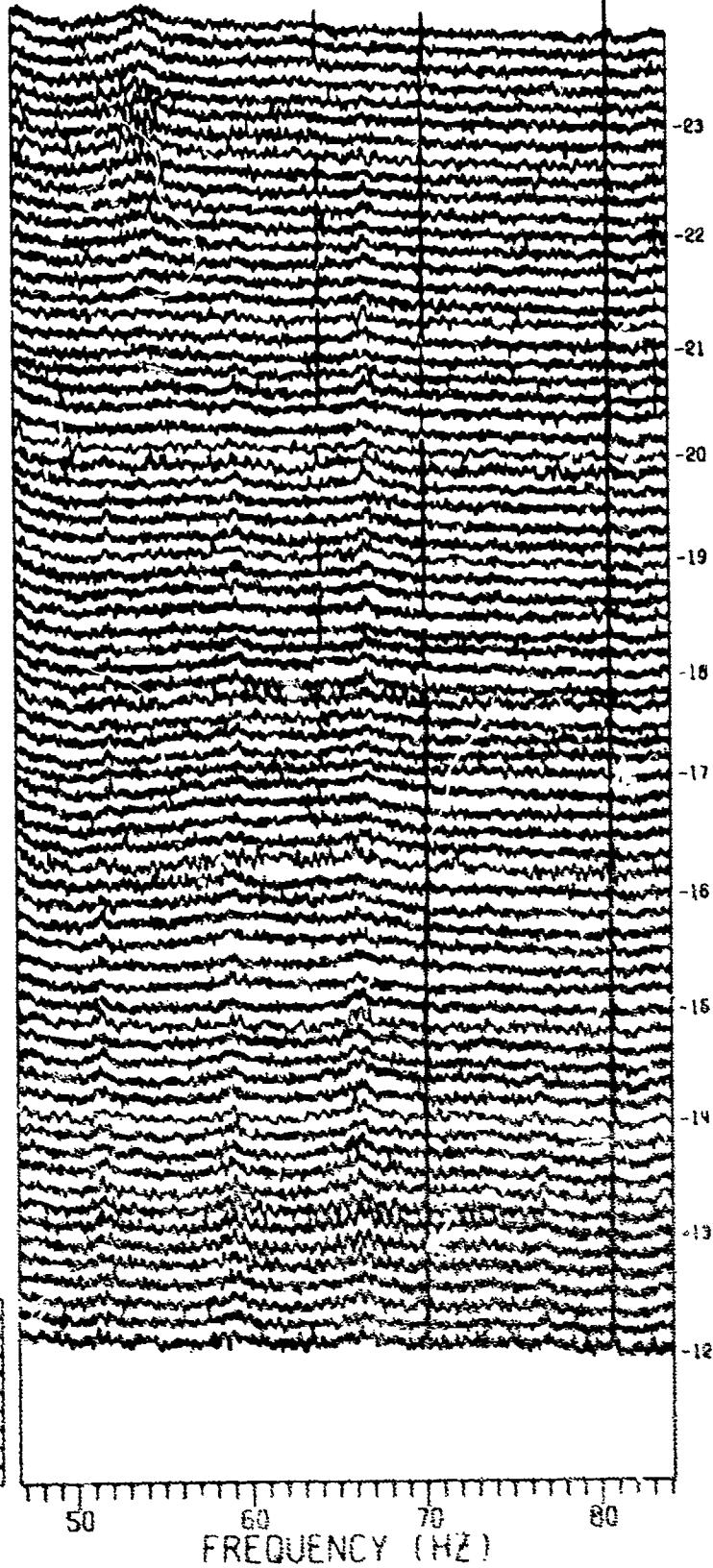


FIGURE III-321

IIA3SLBD 324/12/ 0 - 324/23/55

CONFIDENTIAL

CONFIDENTIAL

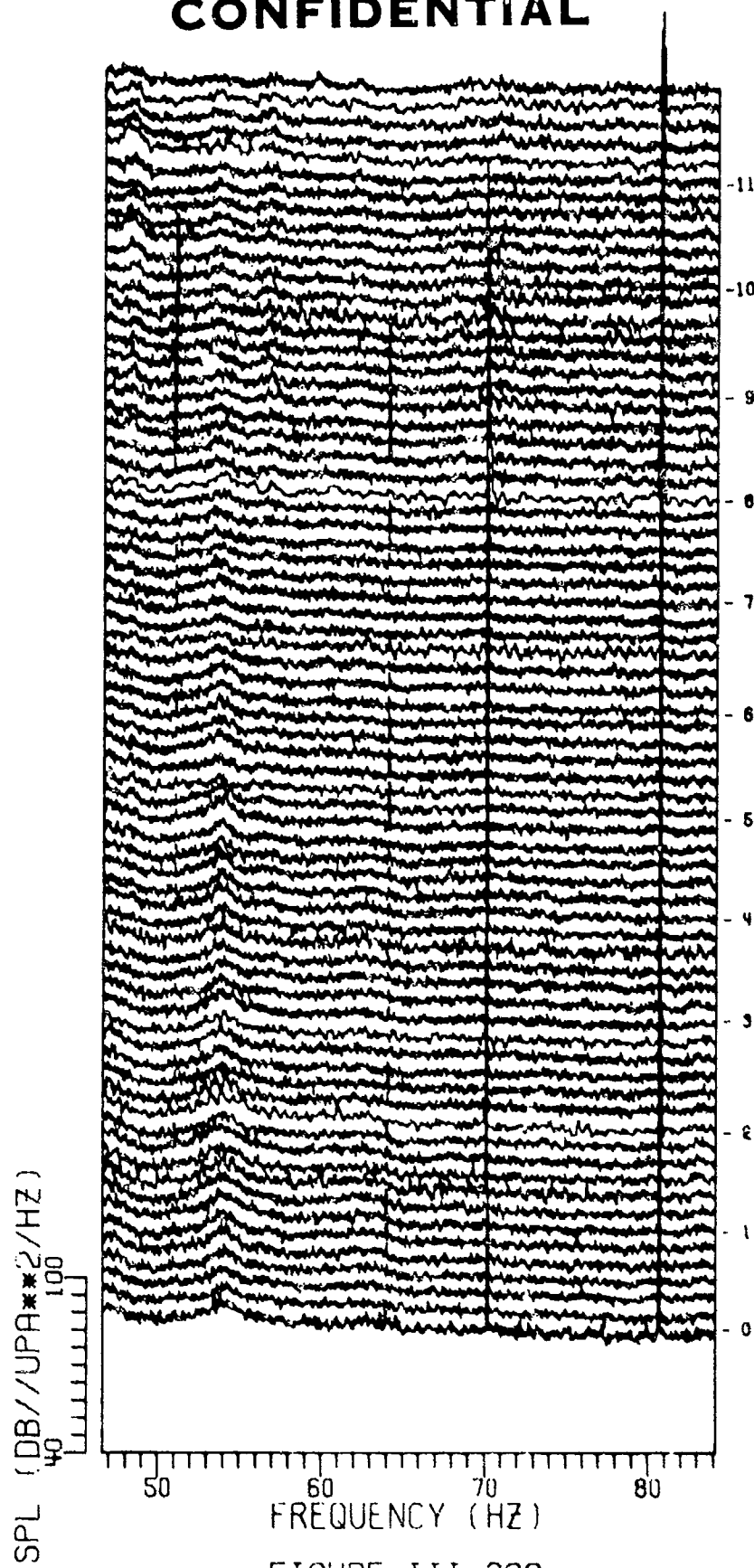


FIGURE III-322

IIA3SLBD 325/ 0/ 0 - 325/11/55

368

CONFIDENTIAL

CONFIDENTIAL

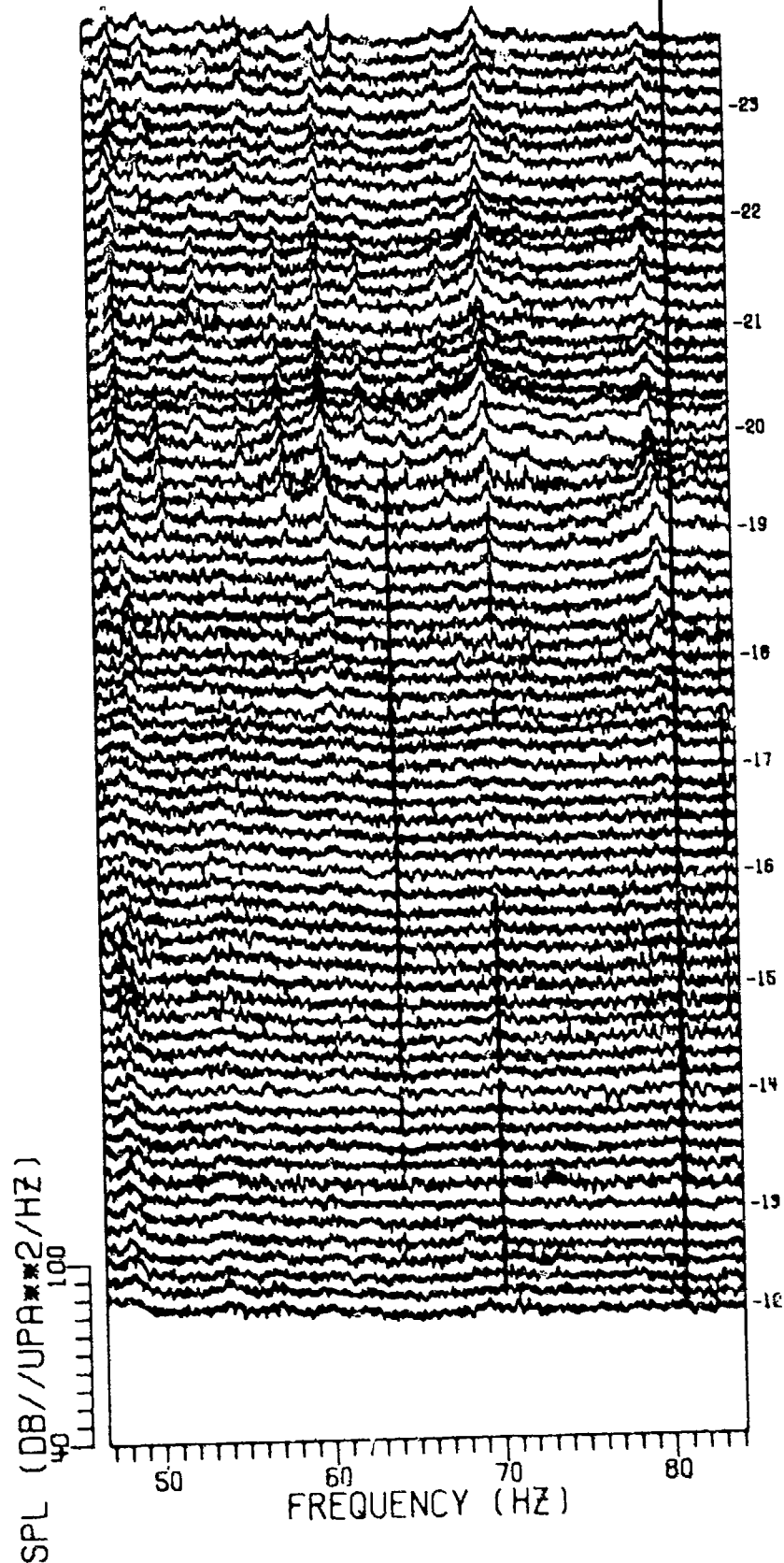


FIGURE III-323

IIA3SLBD 325/12/ 0 - 325/23/55

CONFIDENTIAL

CONFIDENTIAL

SPL (DB//UPA*2/HZ)

40 100

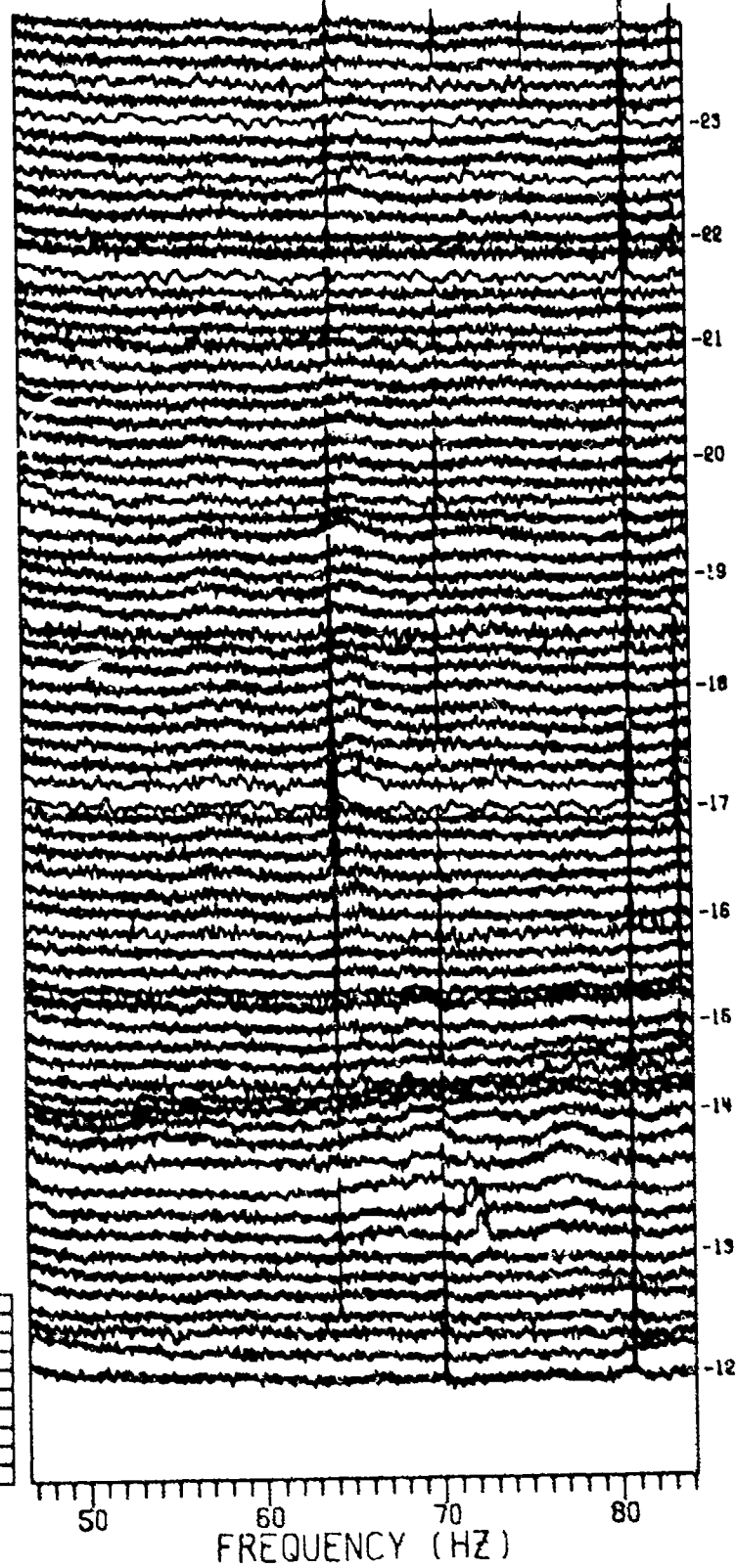


FIGURE III-324

IIAIDLBO 321/12/ 0 - 321/23/55

370

CONFIDENTIAL

CONFIDENTIAL

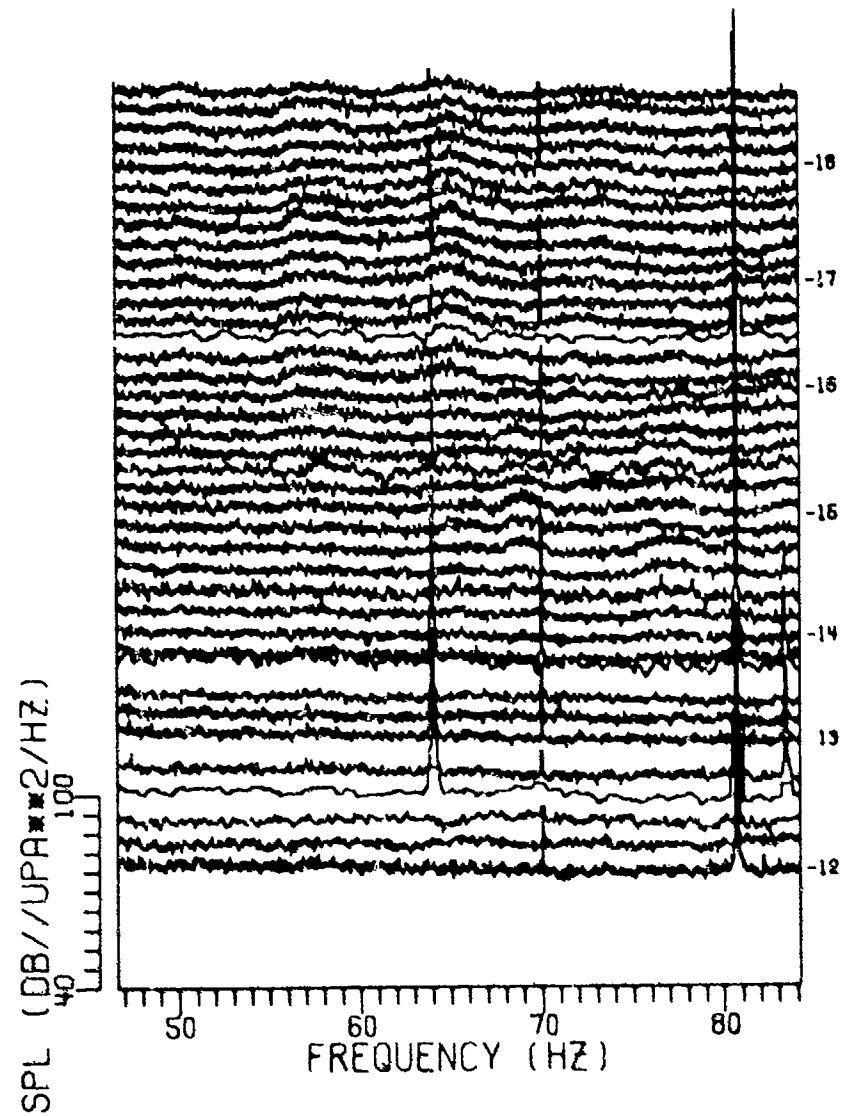


FIGURE III-325
IIA20L80 321/12/ 0 - 321/18/55

CONFIDENTIAL

CONFIDENTIAL

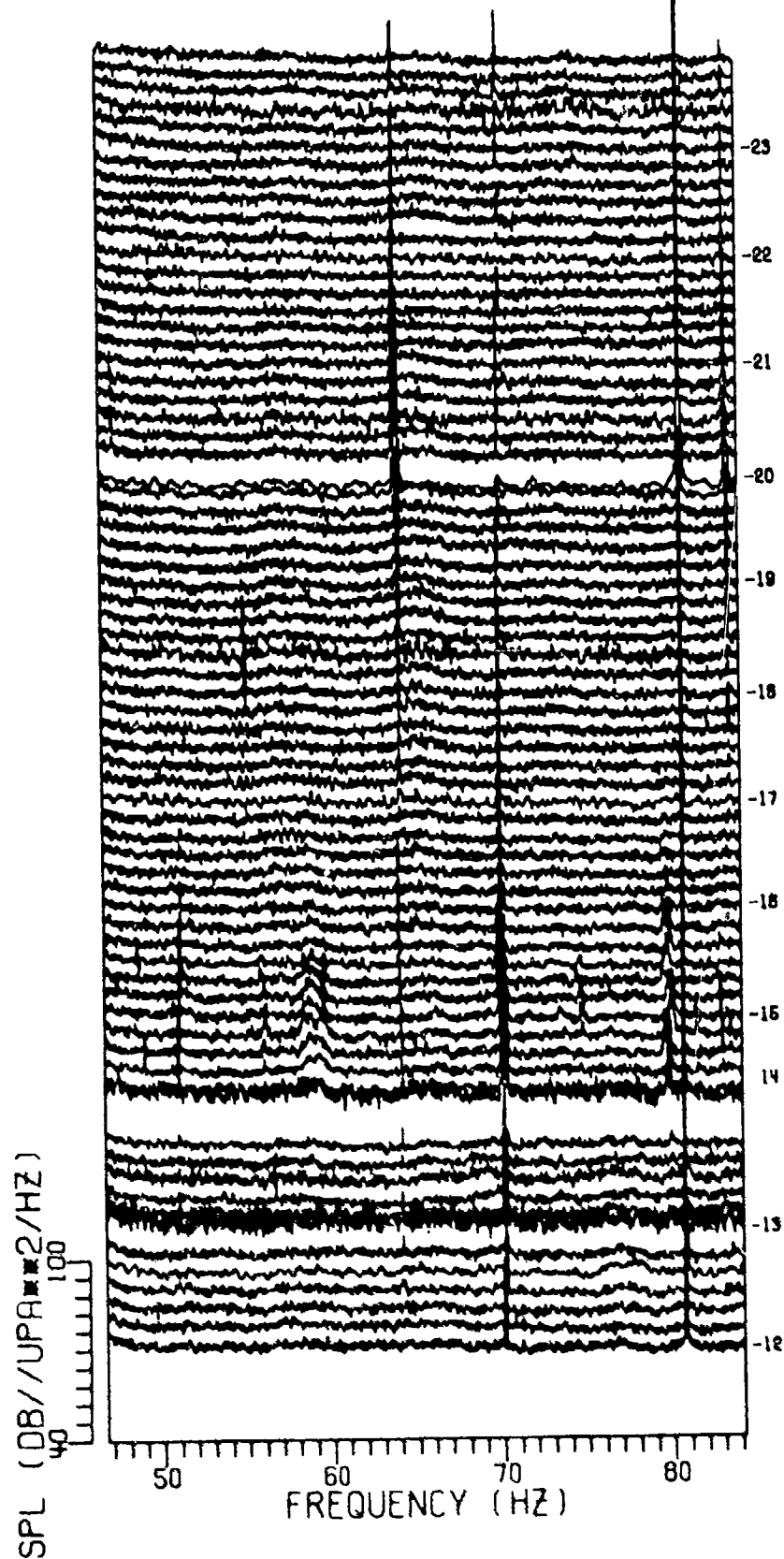


FIGURE III-326

IIA3DLBD 321/12/ 0 - 321/23/55

372

CONFIDENTIAL

CONFIDENTIAL

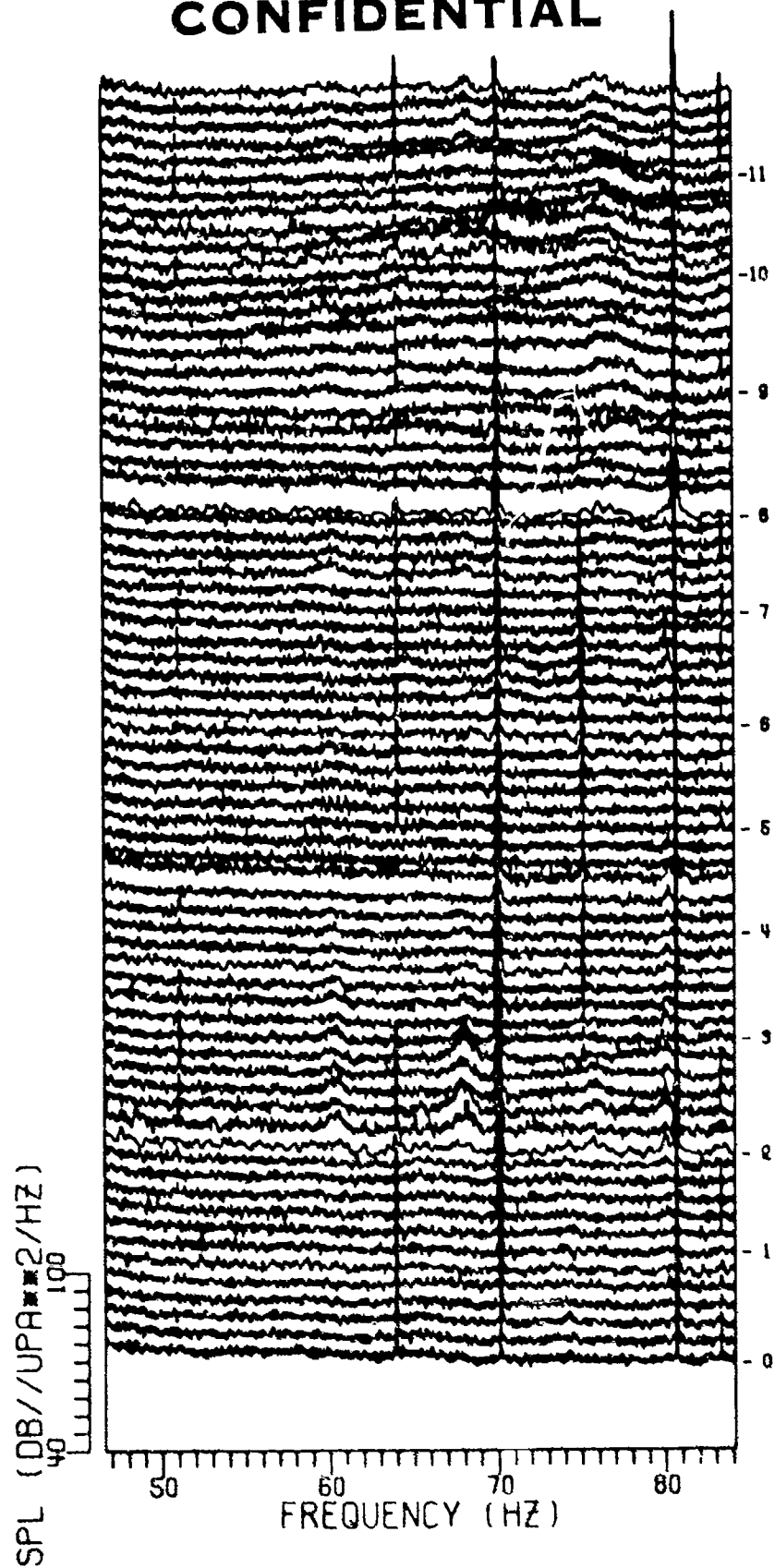


FIGURE III-327
IIA3DLBD 322/ 0/ 0 - 322/11/55

173

CONFIDENTIAL

CONFIDENTIAL

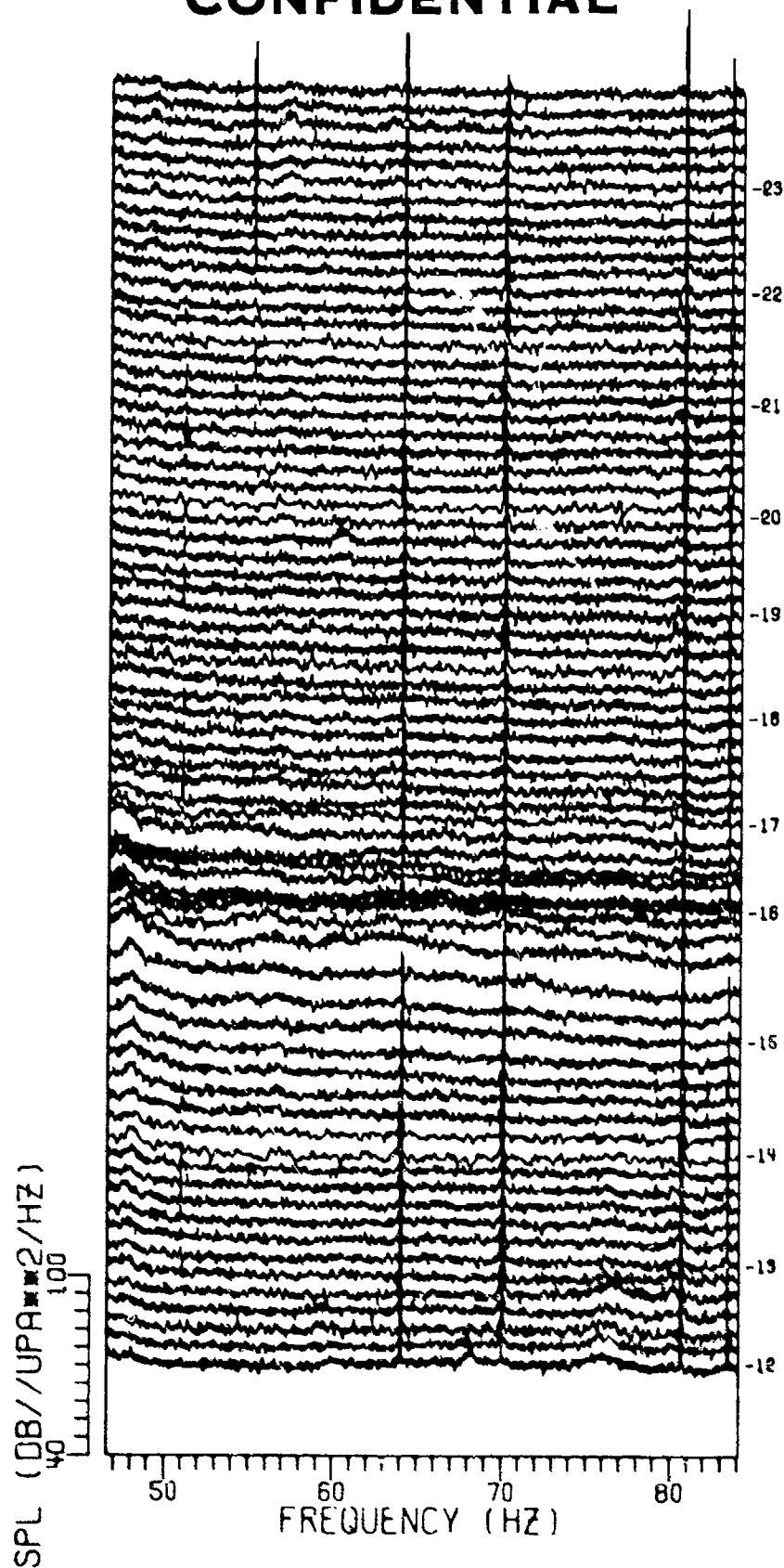


FIGURE III-328

IIA3DLB0 322/12/ 0 - 322/23/55

CONFIDENTIAL

CONFIDENTIAL

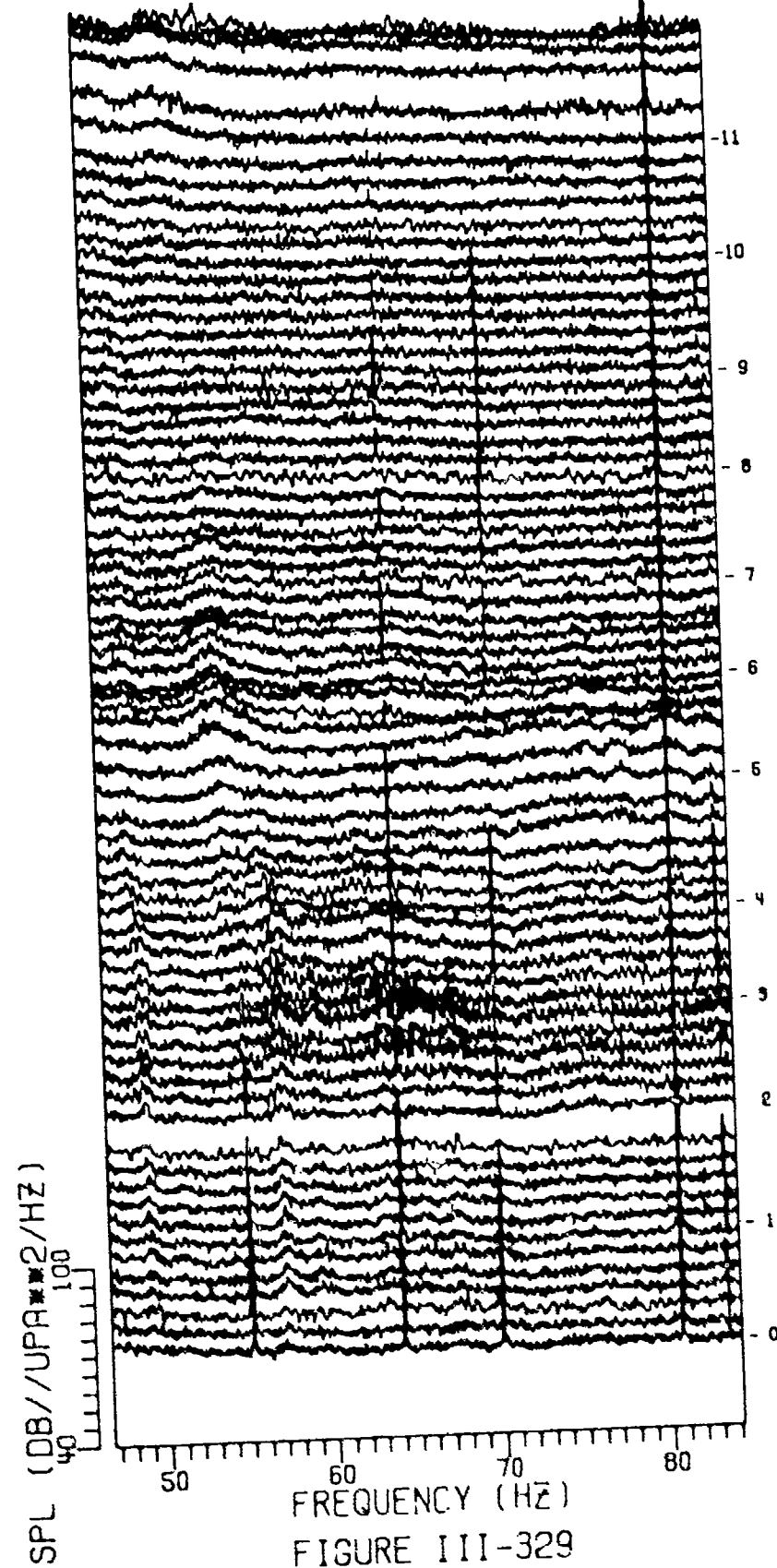


FIGURE III-329

IIR3DLBD 323/ 0/ 0 - 323/11/55

CONFIDENTIAL

CONFIDENTIAL

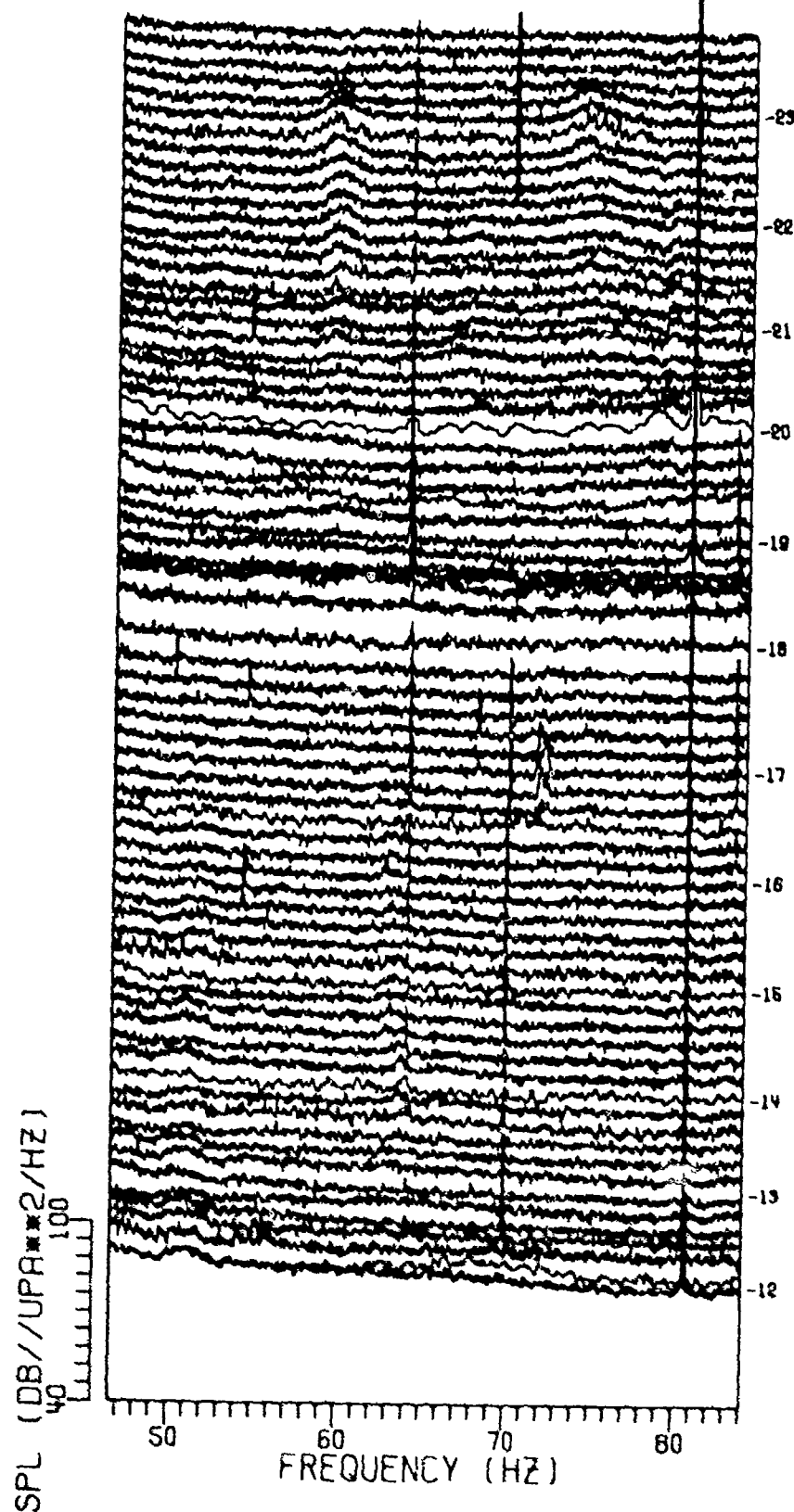


FIGURE III-330
IIA30LBD 323/12/ 0 - 323/23/55

CONFIDENTIAL

CONFIDENTIAL

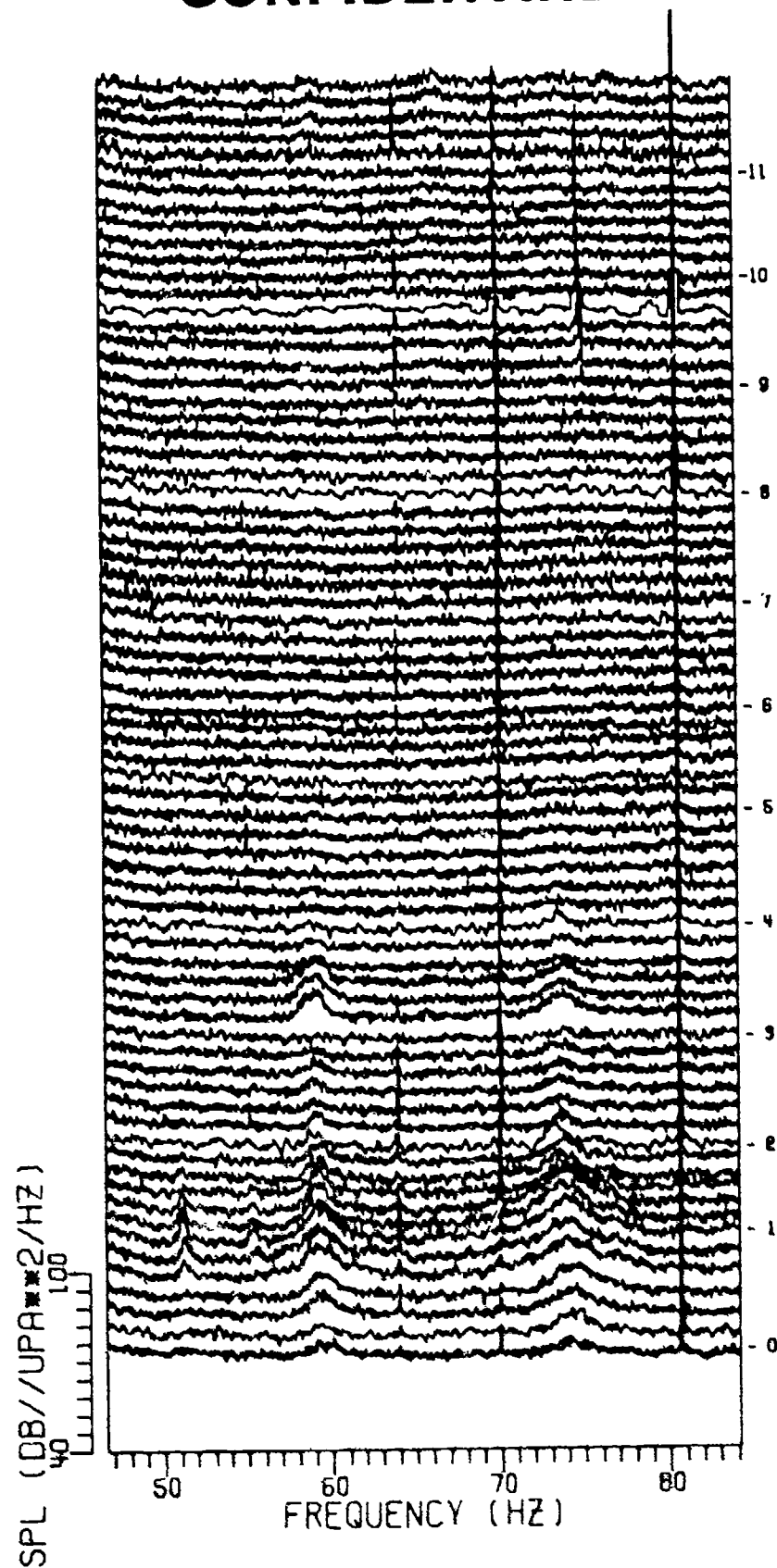


FIGURE III-331

IIA3DL80 324/ 0/ 0 - 324/11/55

CONFIDENTIAL

CONFIDENTIAL

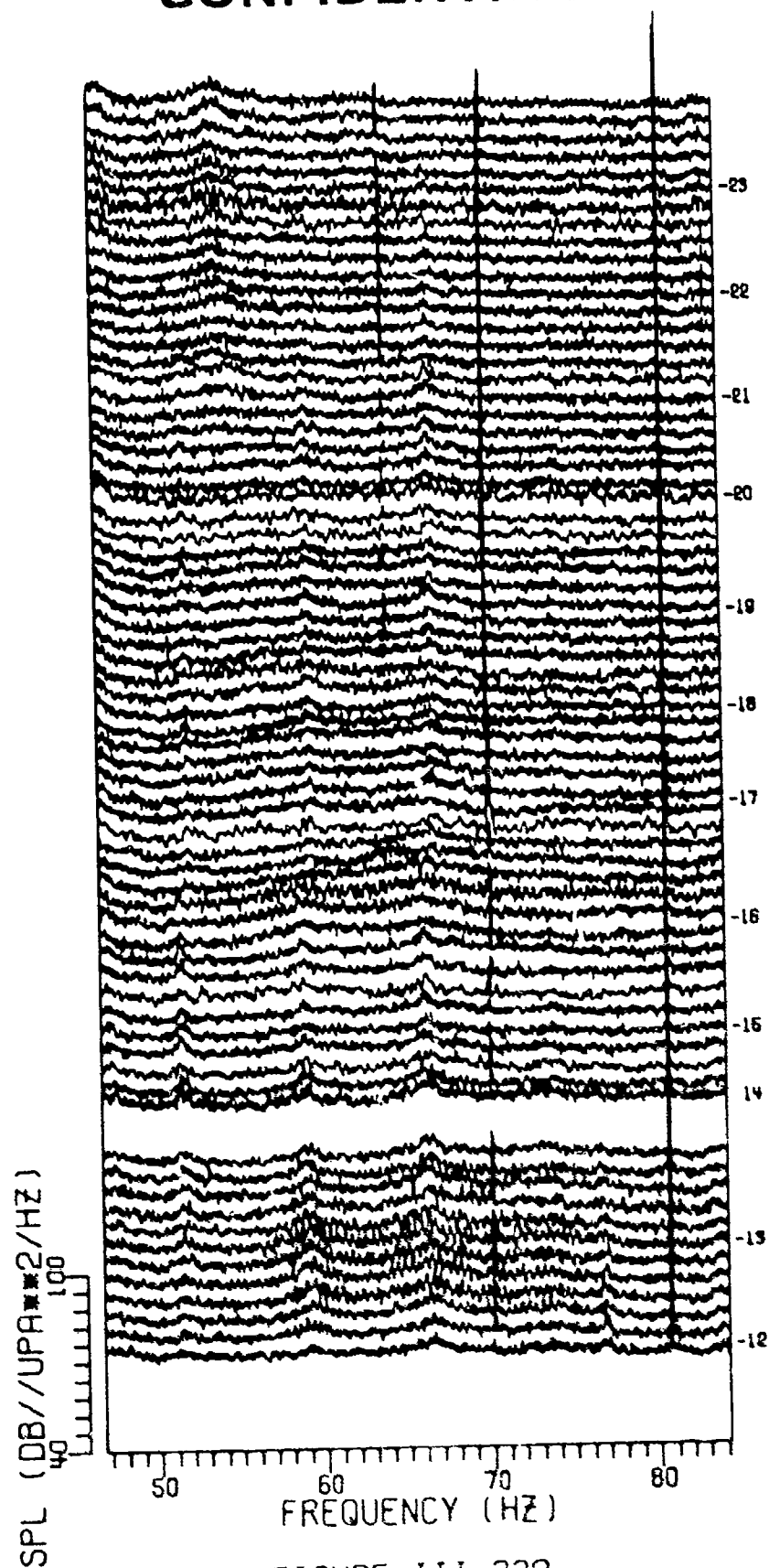


FIGURE III-332
IIR30LBD 324/12/ 0 - 324/23/55

CONFIDENTIAL

CONFIDENTIAL

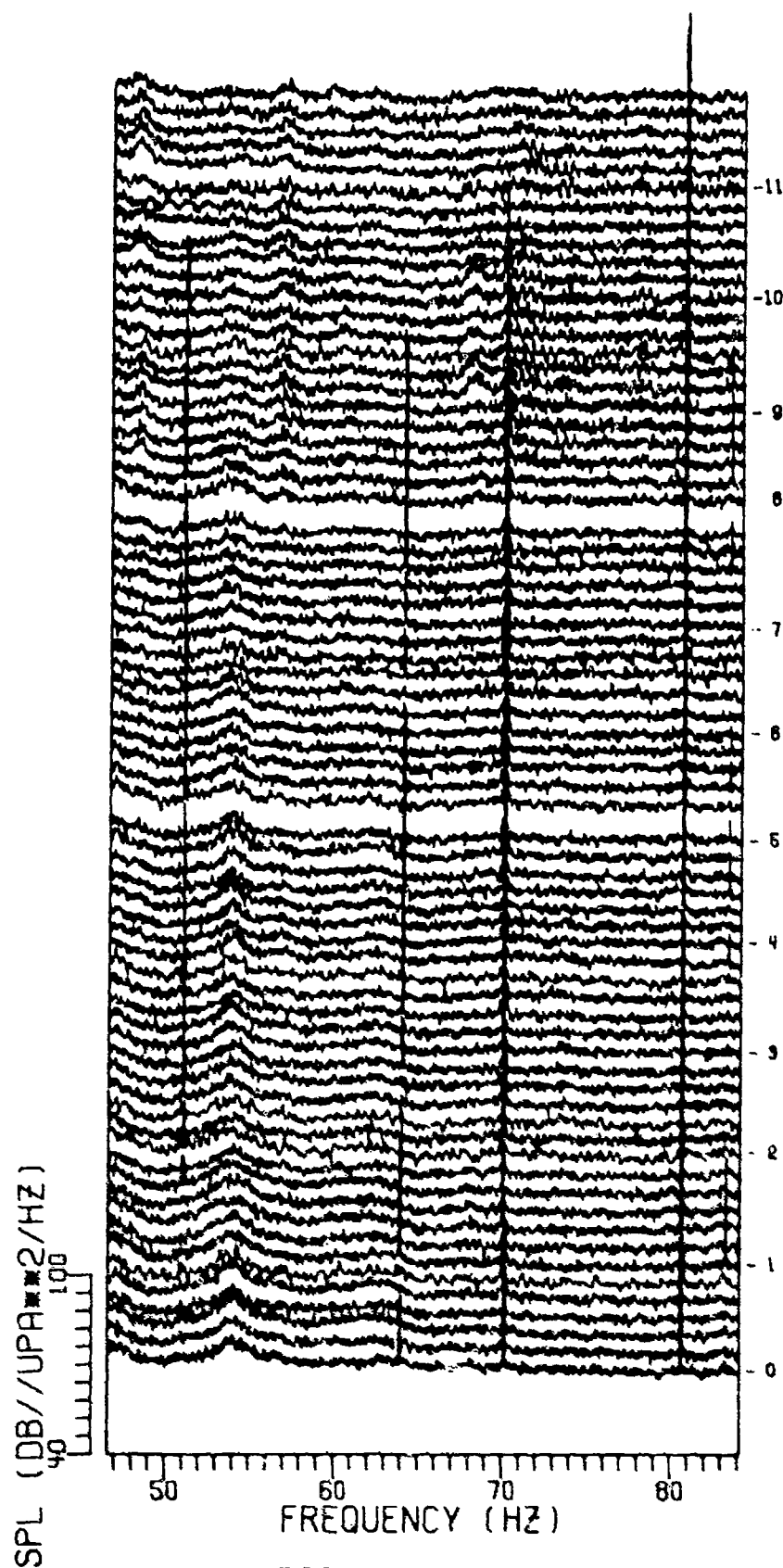


FIGURE III-333

I1A30LBD 325/ 0/ 0 - 325/11/55

CONFIDENTIAL

CONFIDENTIAL

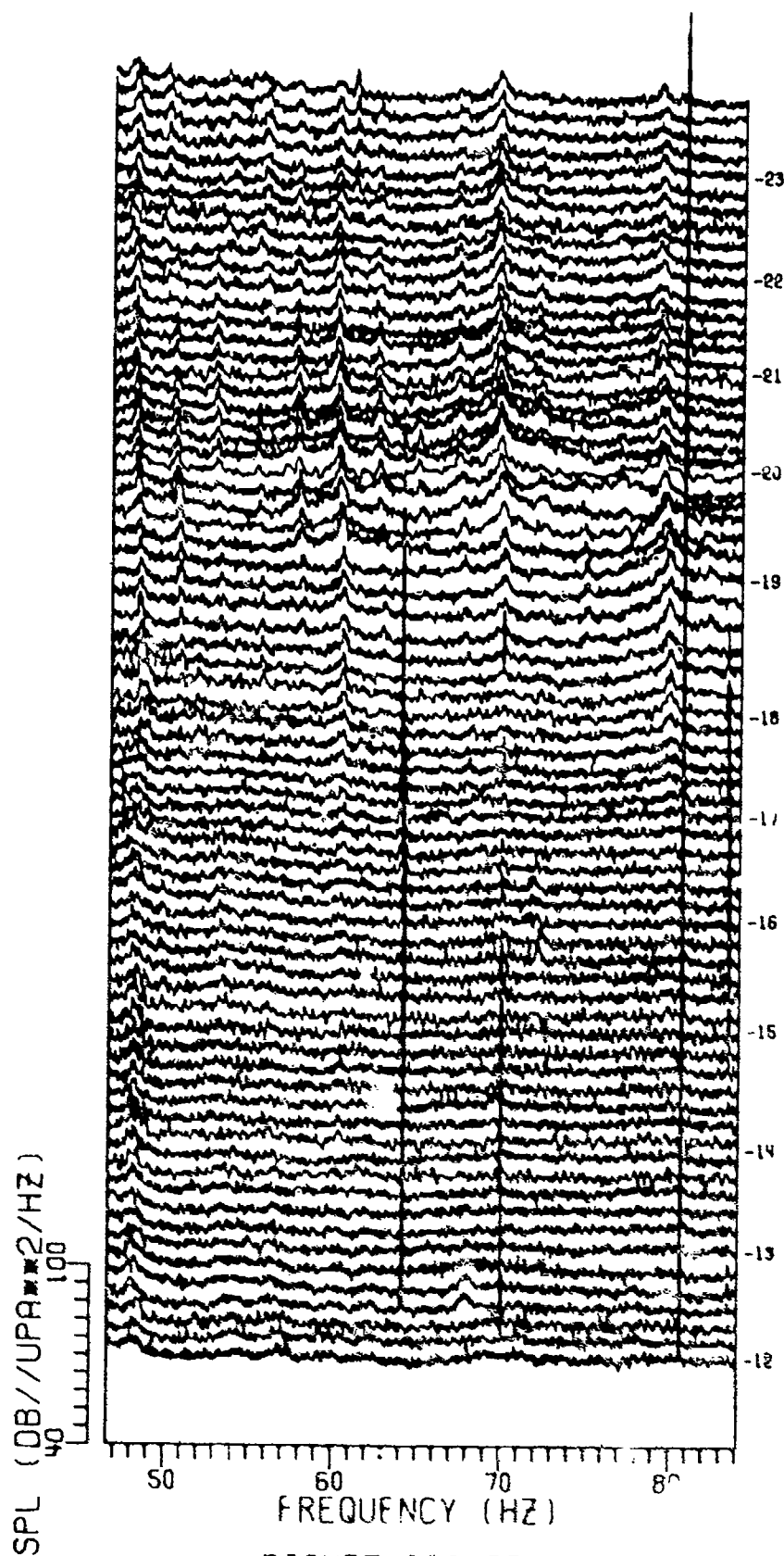
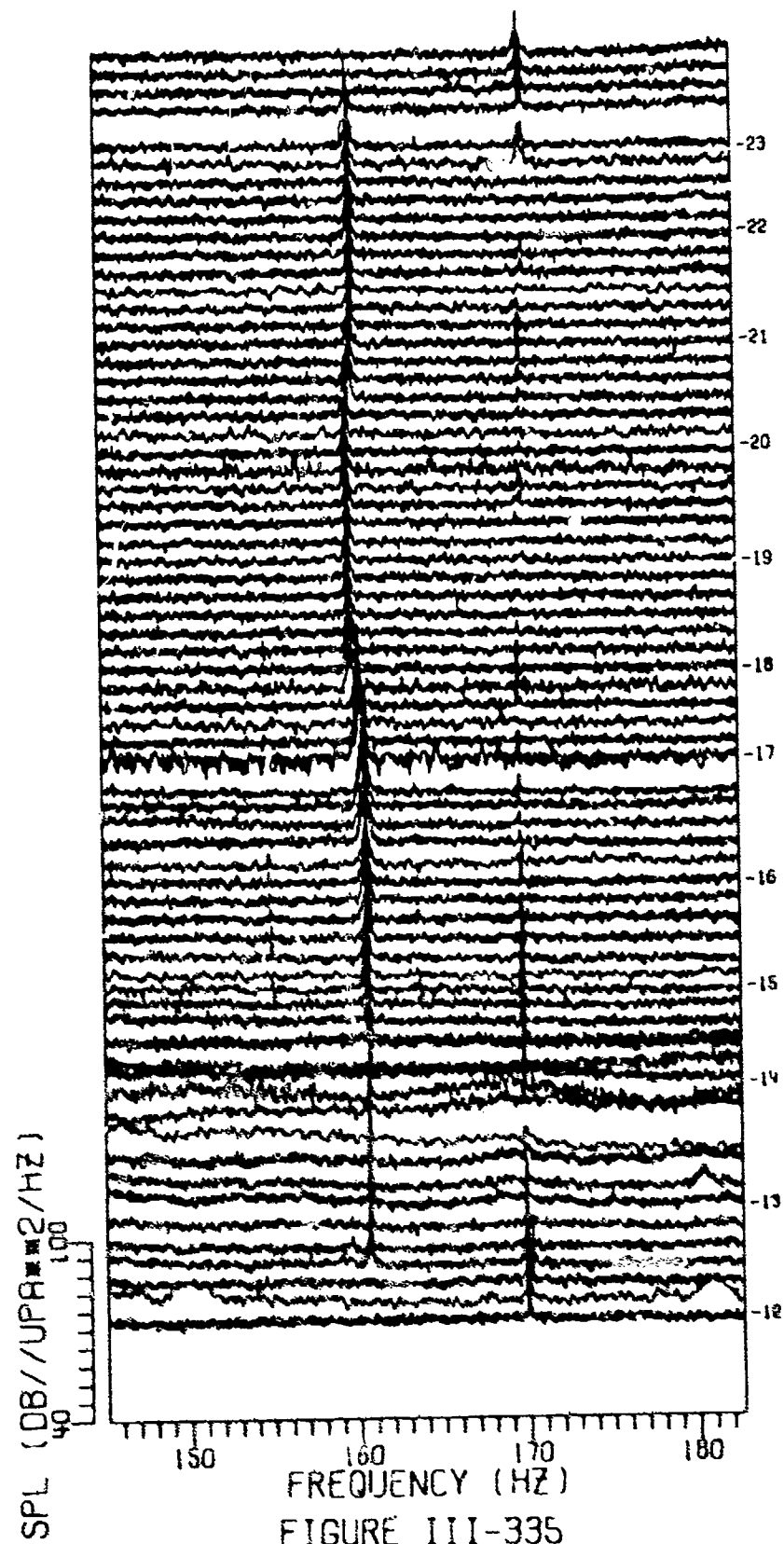


FIGURE III-334

IIA30LBD 325/12/ 0 - 325/23/55

CONFIDENTIAL

CONFIDENTIAL



IIAISMBO 321/12/ 0 - 321/23/55

281

CONFIDENTIAL

CONFIDENTIAL

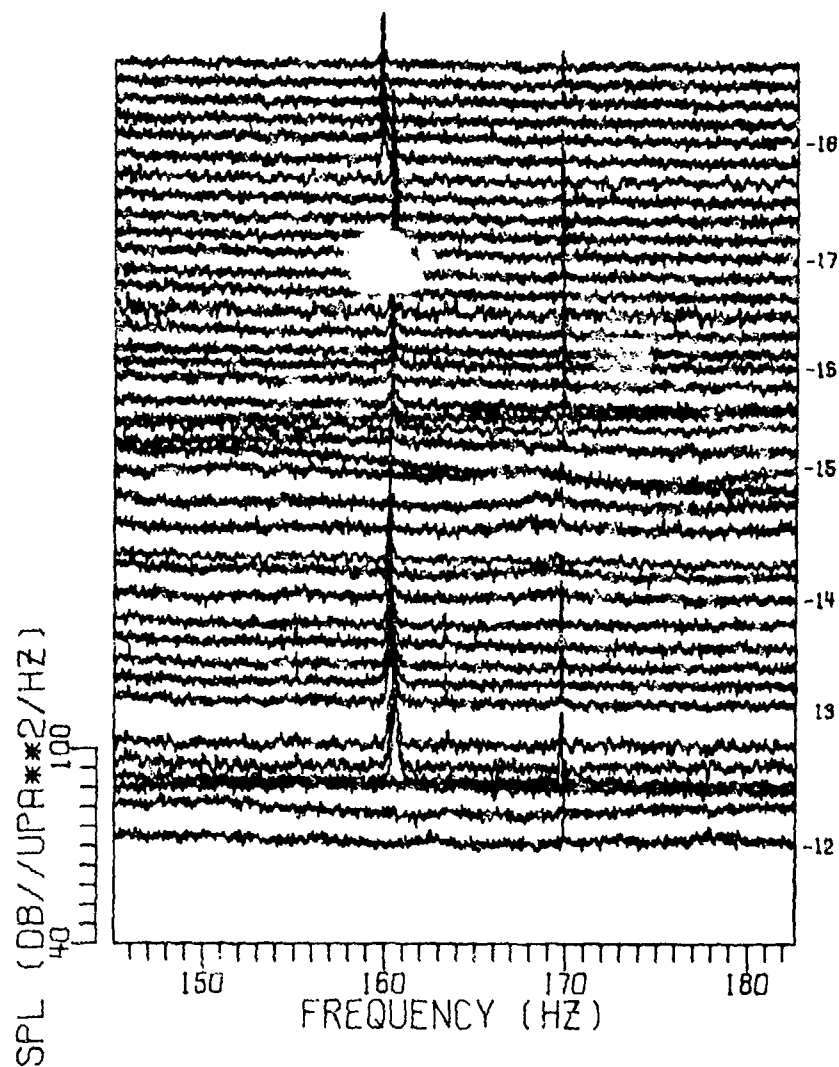


FIGURE III-336
IIA2SMBD 321/12/ 0 - 321/18/55

CONFIDENTIAL

CONFIDENTIAL

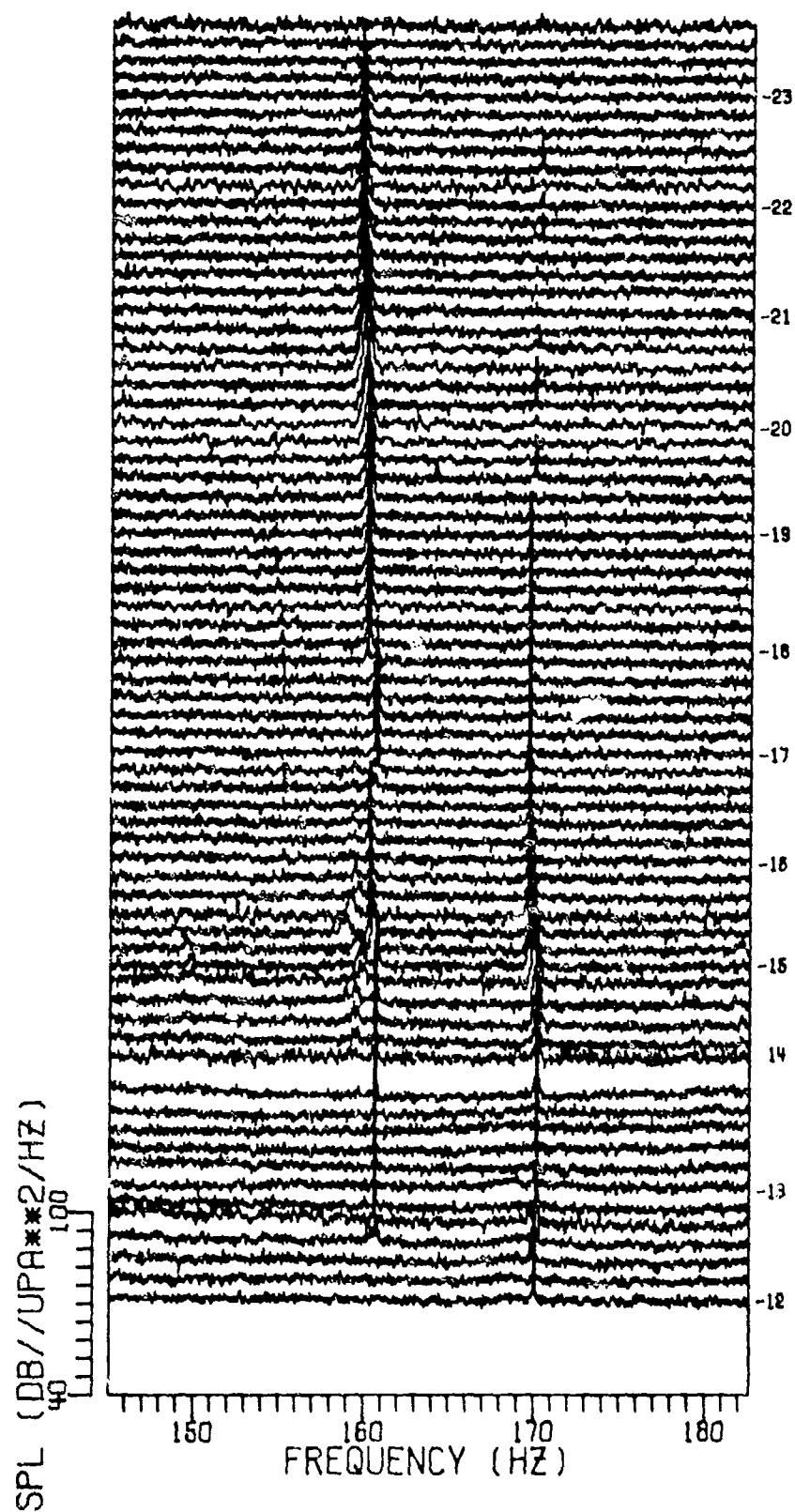


FIGURE III-337
IIR3SMBD 321/12/ 0 - 321/23/55

CONFIDENTIAL

CONFIDENTIAL

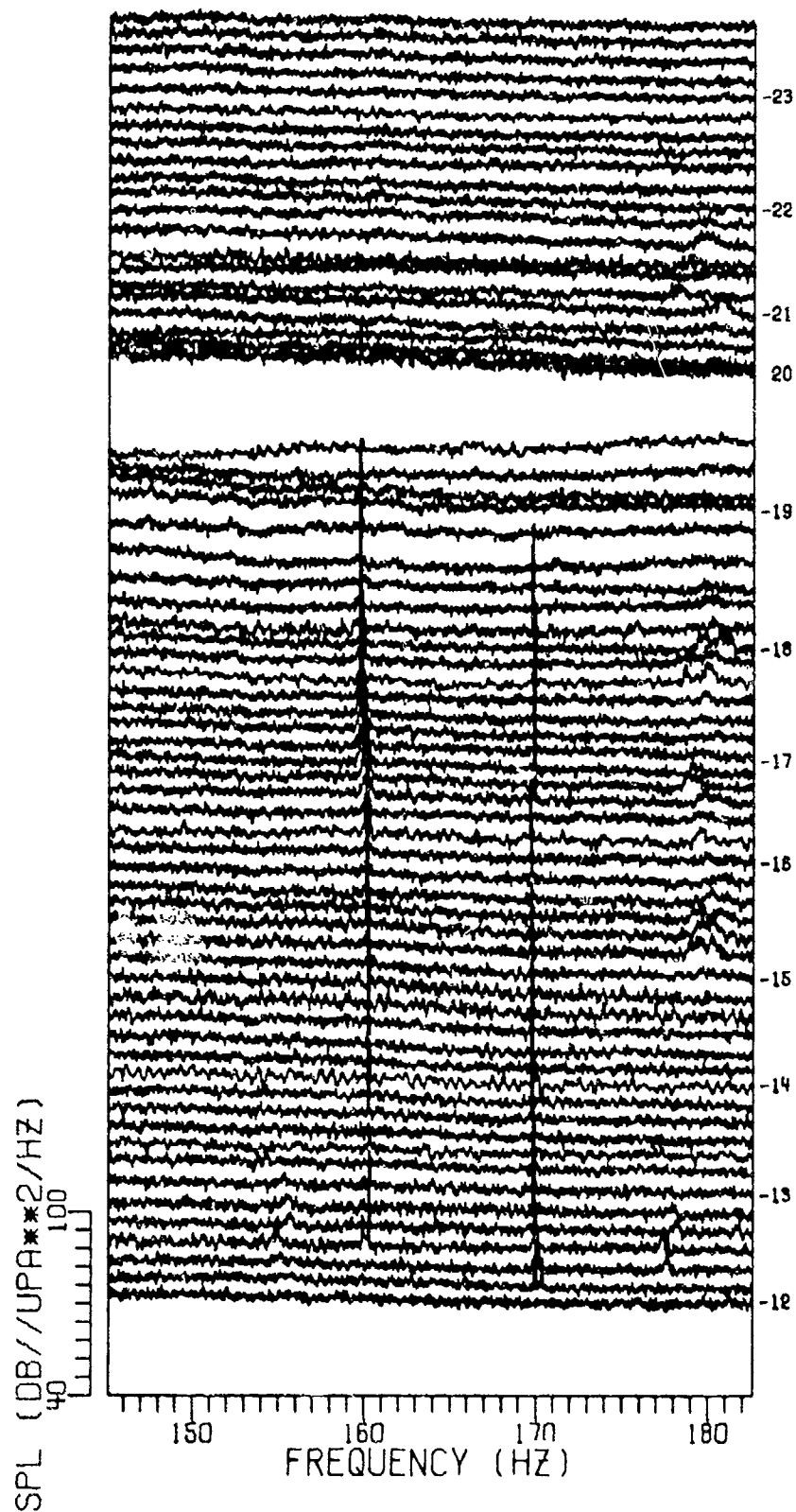


FIGURE III-338

IIA3SMBD 325/12/ 0 - 325/23/55

CONFIDENTIAL

CONFIDENTIAL

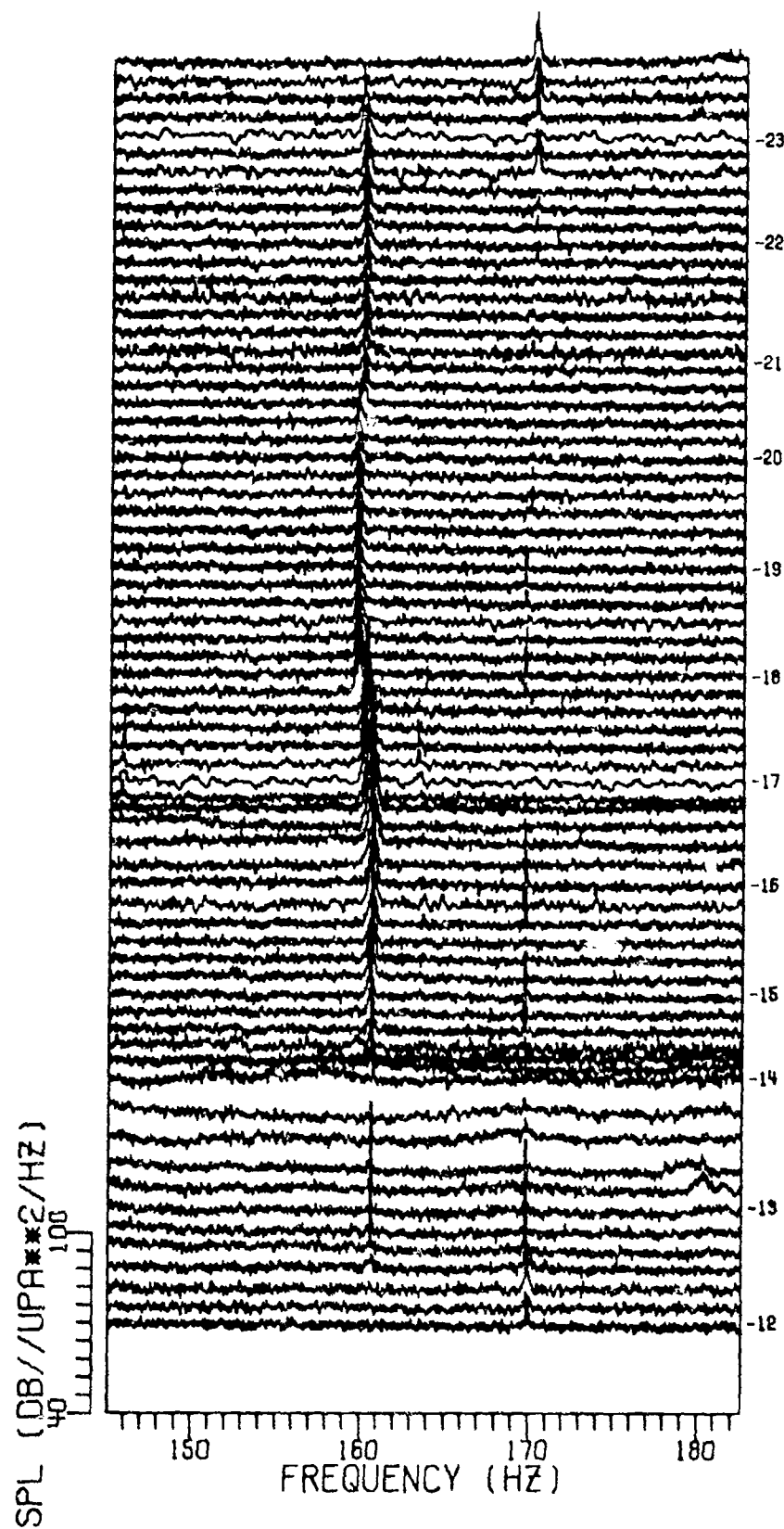


FIGURE III-339

IIA1DMBD 321/12/ 0 - 321/23/55

CONFIDENTIAL

CONFIDENTIAL

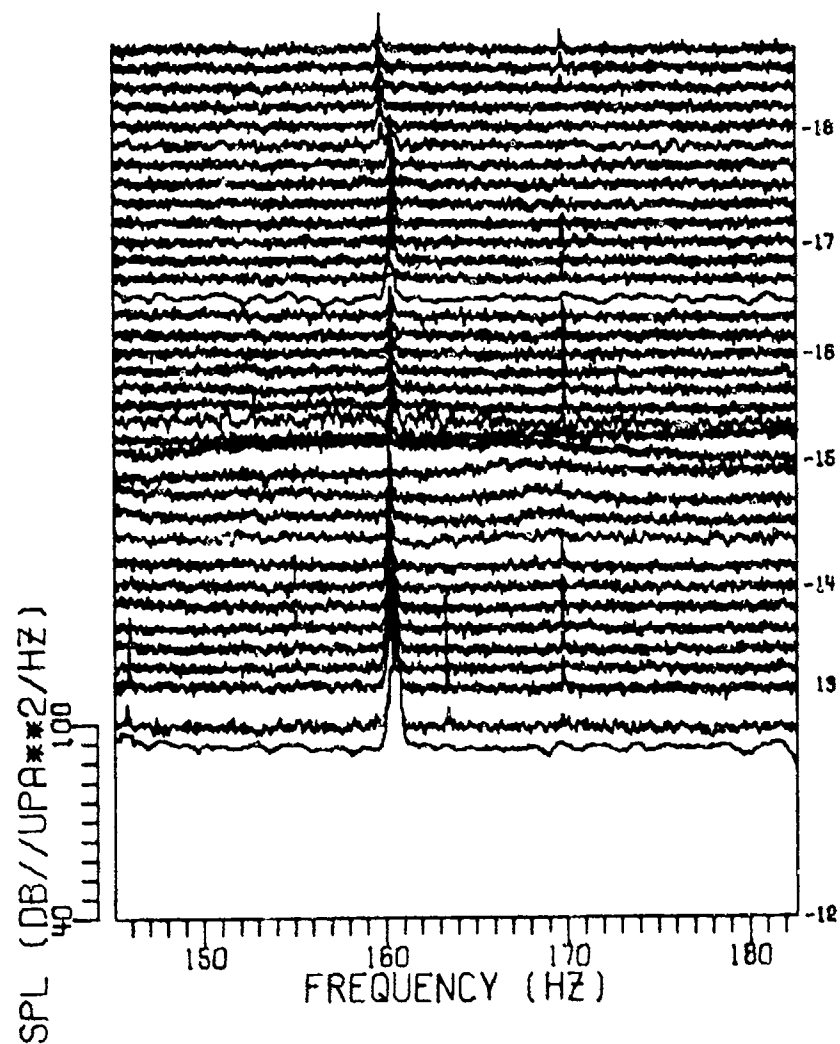


FIGURE III-340
IIA2DMBD 321/12/ 0 - 321/18/55

CONFIDENTIAL

CONFIDENTIAL

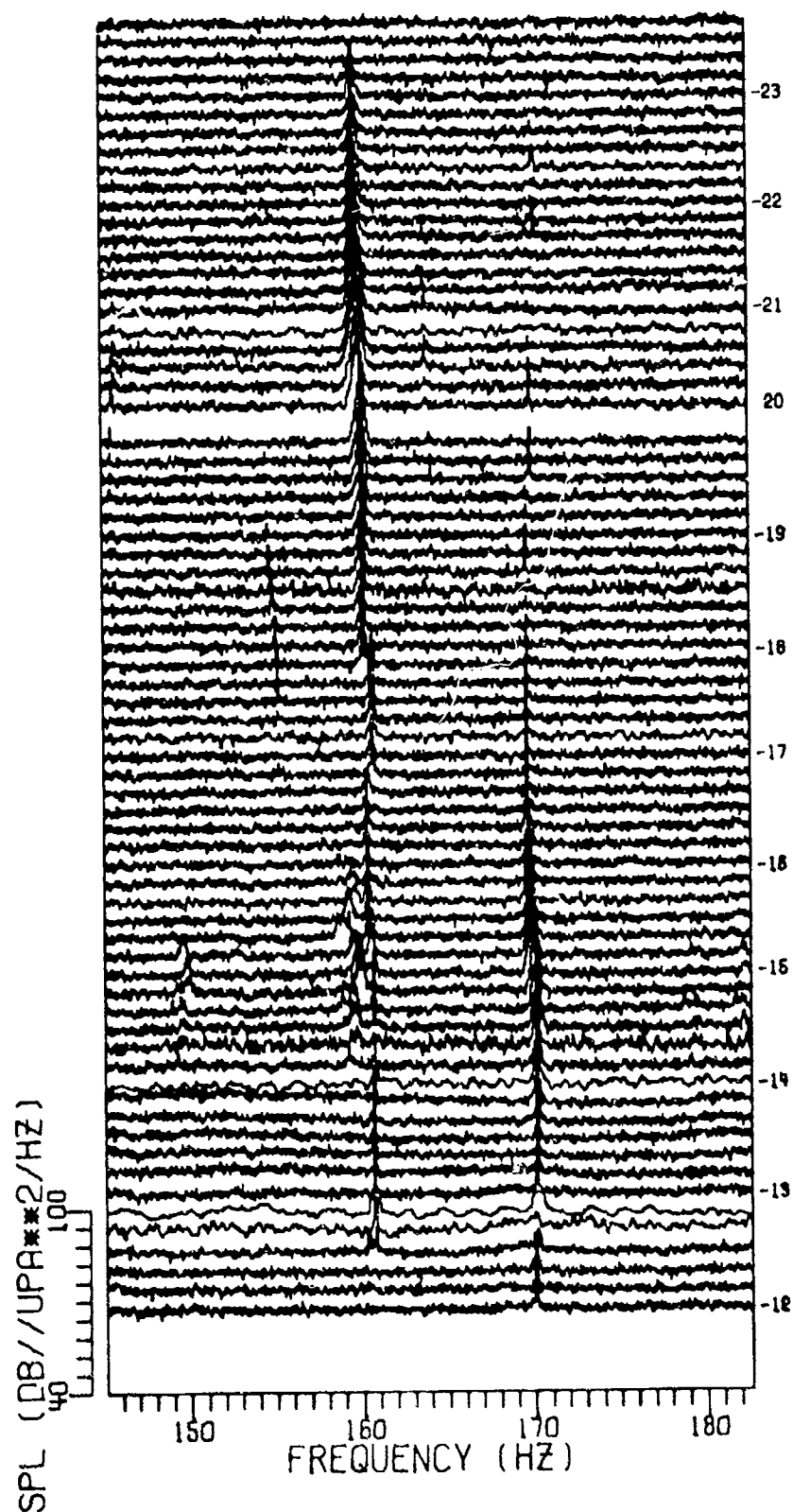


FIGURE III-341

IIA3DMBD 321/12/ 0 - 321/23/55

387

CONFIDENTIAL

CONFIDENTIAL

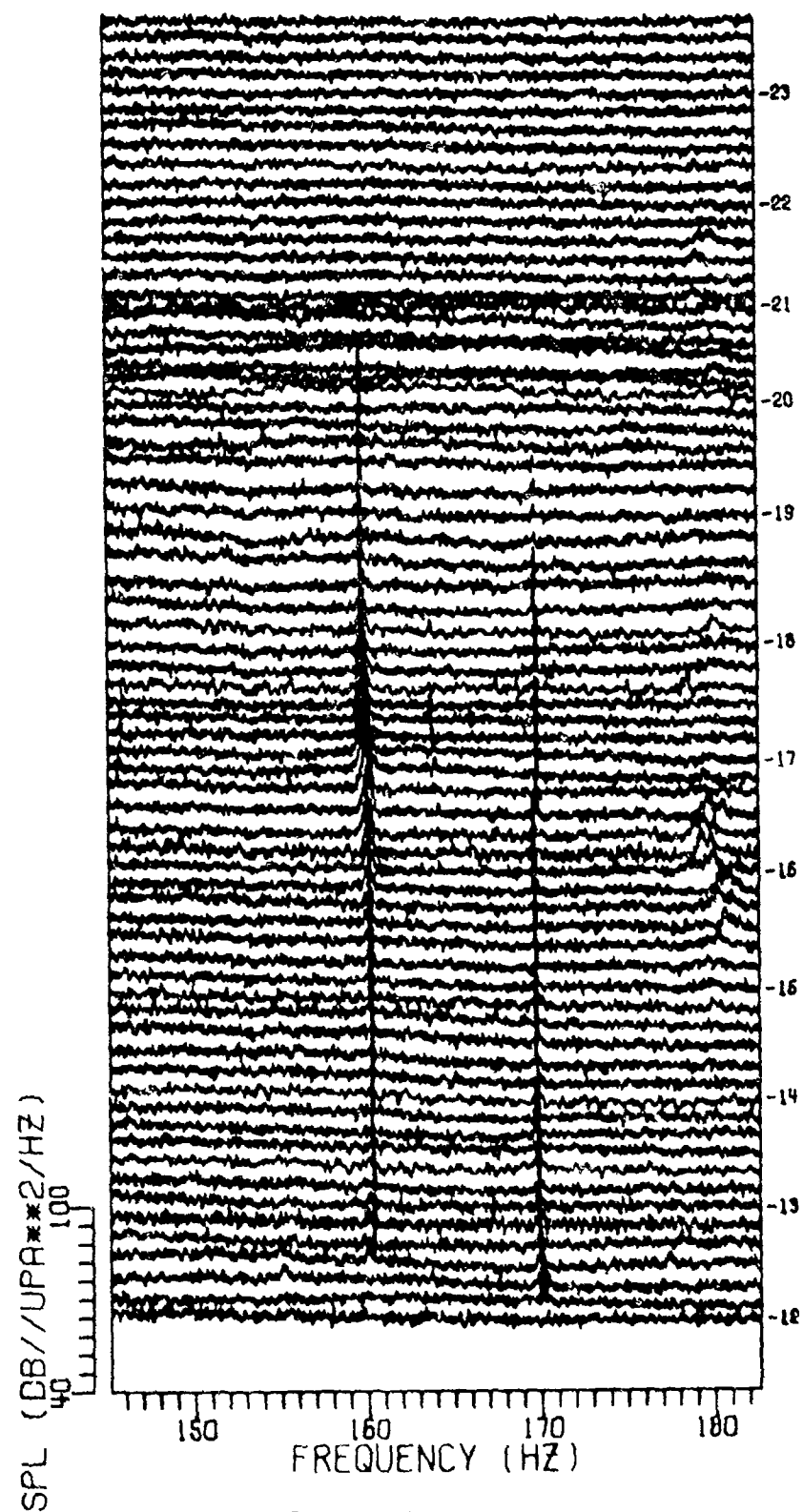


FIGURE III-342

IIR3DMBD 325/12/ 0 - 325/23/55

CONFIDENTIAL

CONFIDENTIAL

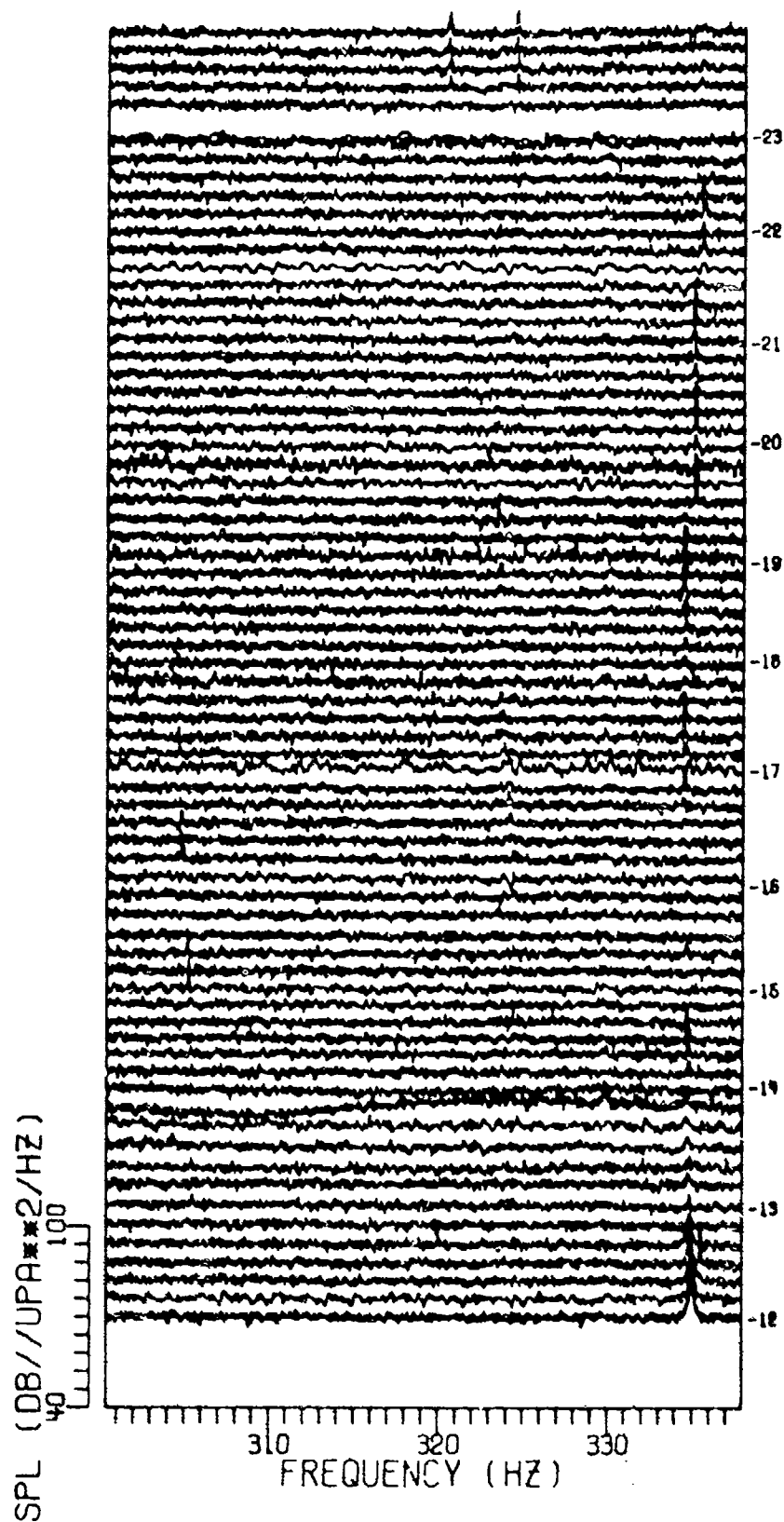


FIGURE III-343

IIA1SHBD 321/12/ 0 - 321/23/55

189

CONFIDENTIAL

CONFIDENTIAL

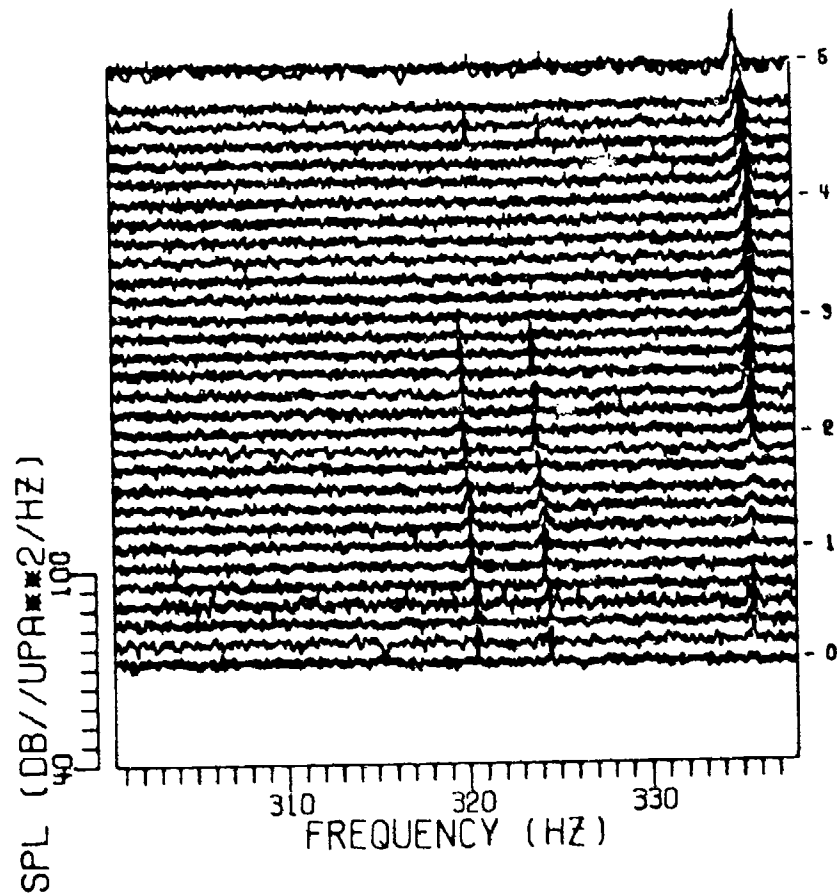


FIGURE III-344

IIA1SHBD 322/ 0/ 0 - 322/ 5/25

CONFIDENTIAL

CONFIDENTIAL

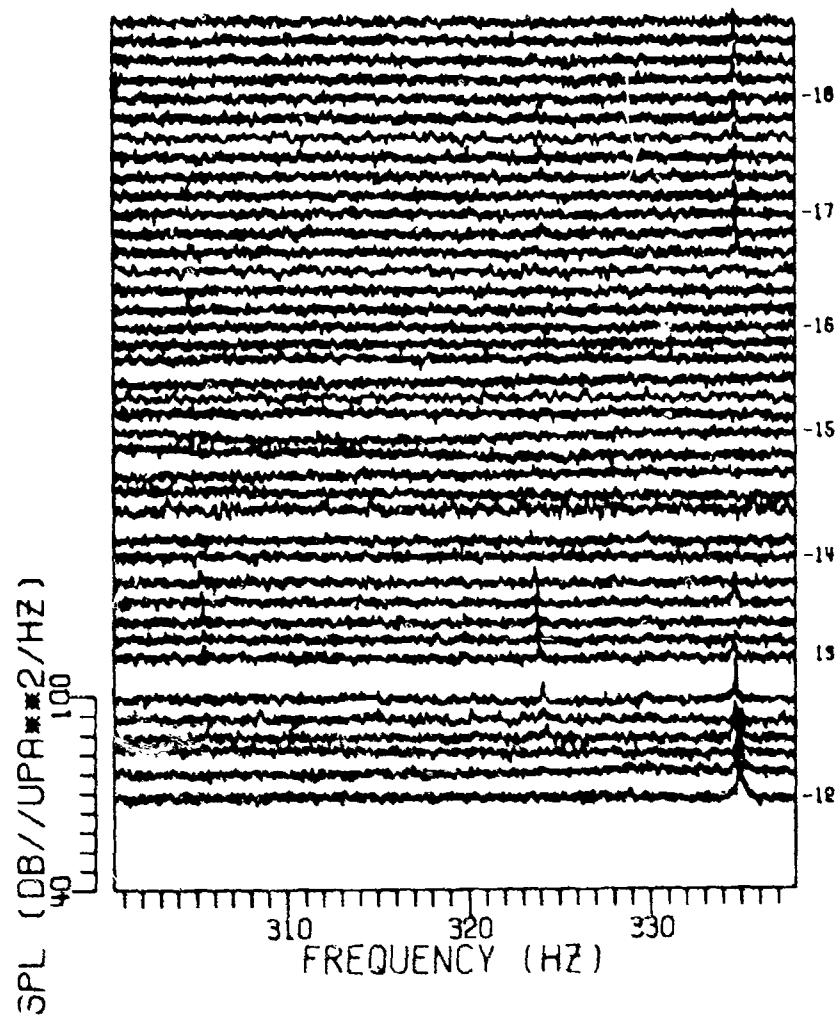


FIGURE III-345

IIR2SH80 321/12/ 0 - 321/18/55

CONFIDENTIAL

CONFIDENTIAL

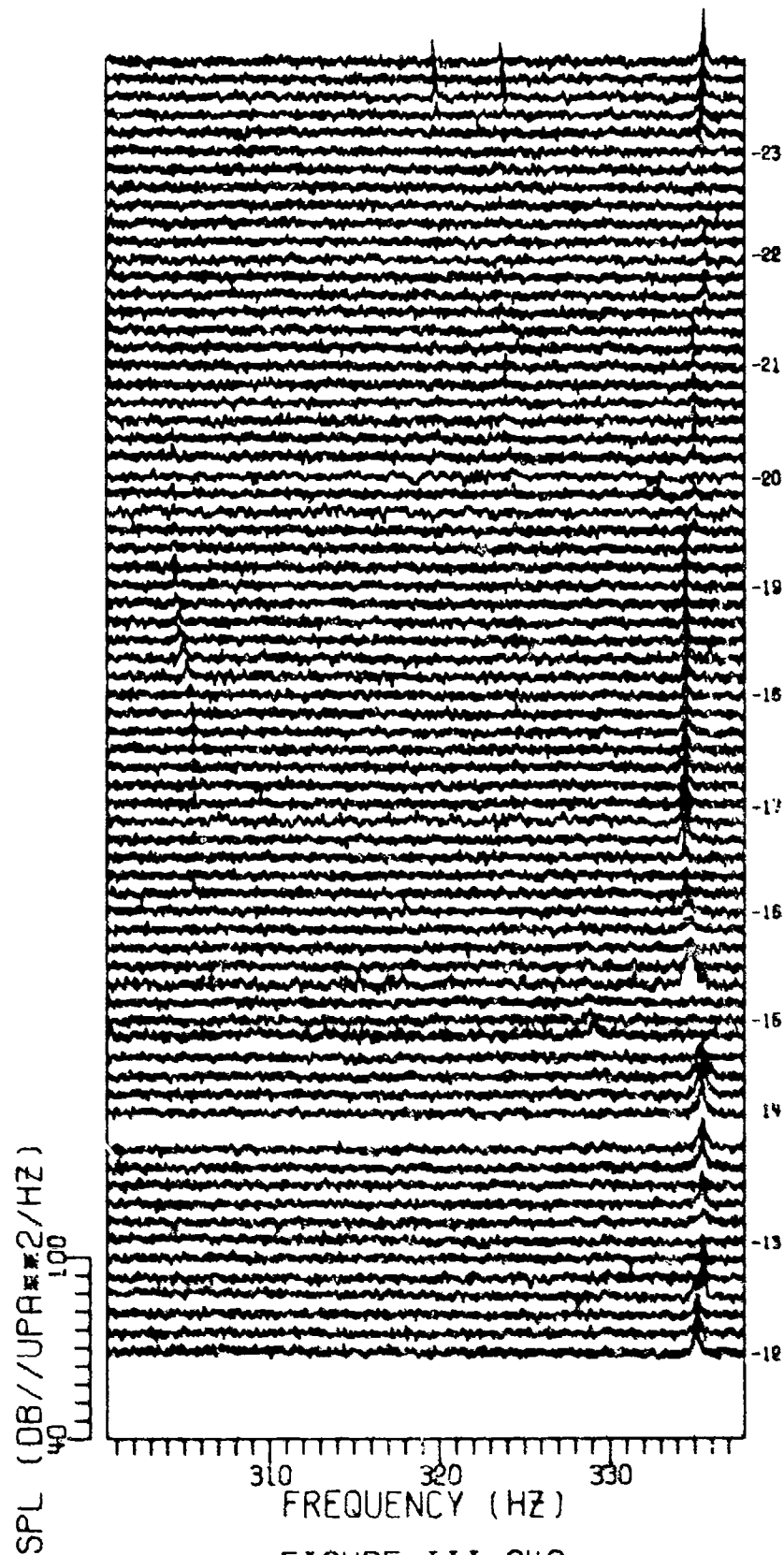


FIGURE III-346

IIR3SHBD 321/12/ 0 - 321/23/55

CONFIDENTIAL

CONFIDENTIAL

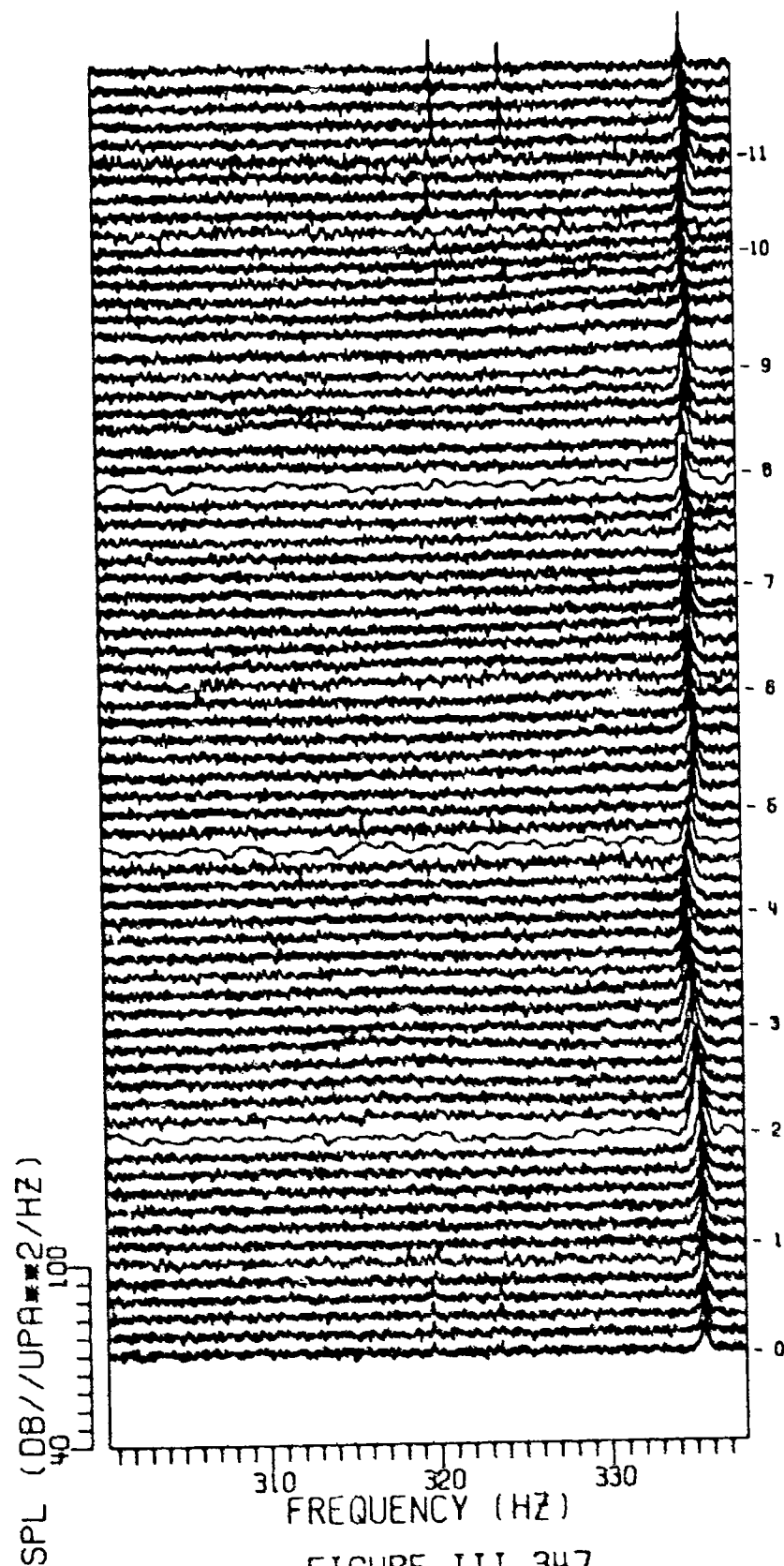


FIGURE III-347

11A3SHBD 322/ 0/ 0 - 322/11/55

193

CONFIDENTIAL

CONFIDENTIAL

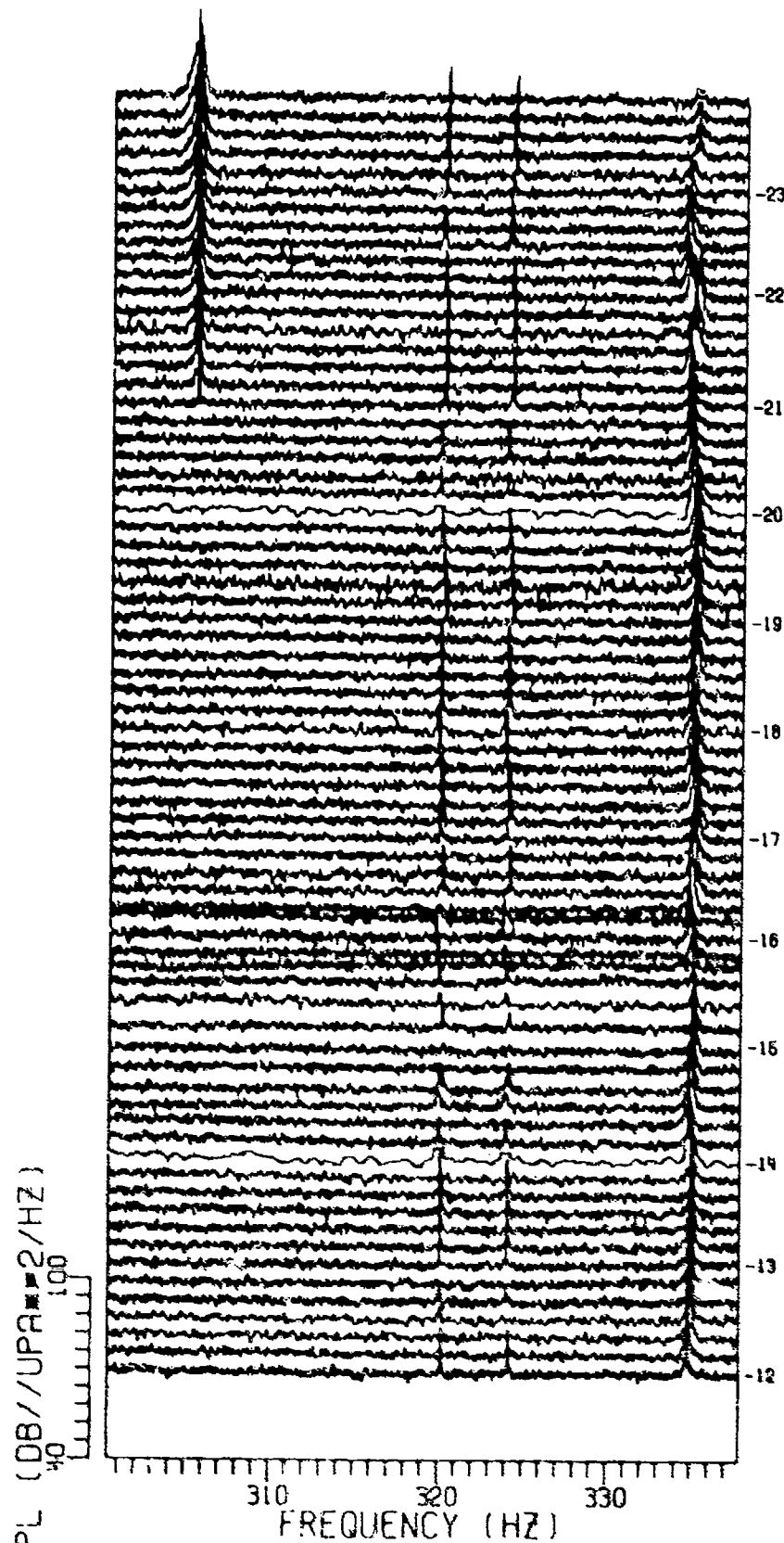


FIGURE III-348

IIA3SHBD 322/12/ 0 - 322/23/55

CONFIDENTIAL

CONFIDENTIAL

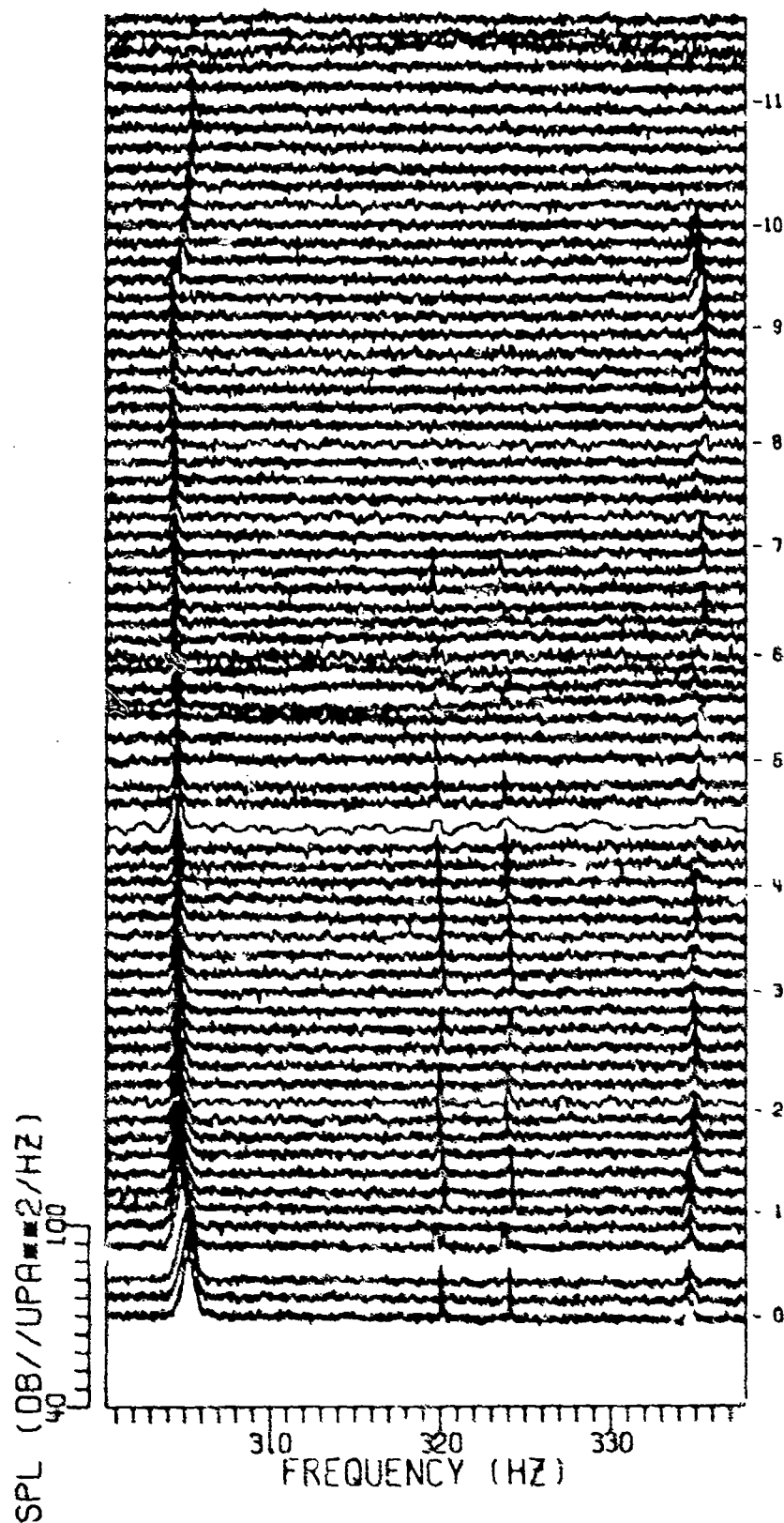


FIGURE III-349

IIA3SHBD 323/ 0/ 0 - 323/11/55
30%

CONFIDENTIAL

CONFIDENTIAL

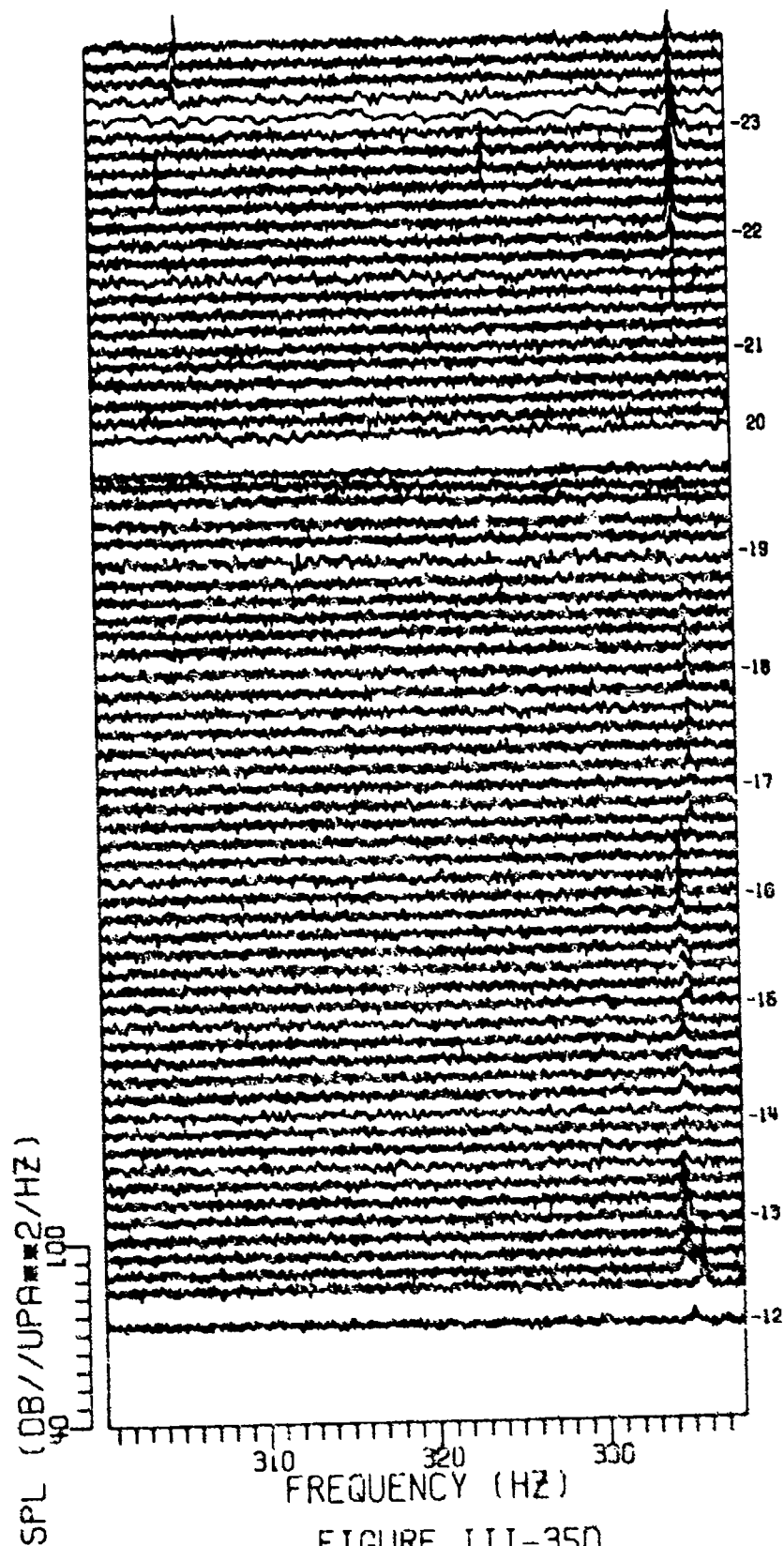


FIGURE III-350

IIR3SHBD 323/12/ 0 - 323/23/55

CONFIDENTIAL

CONFIDENTIAL

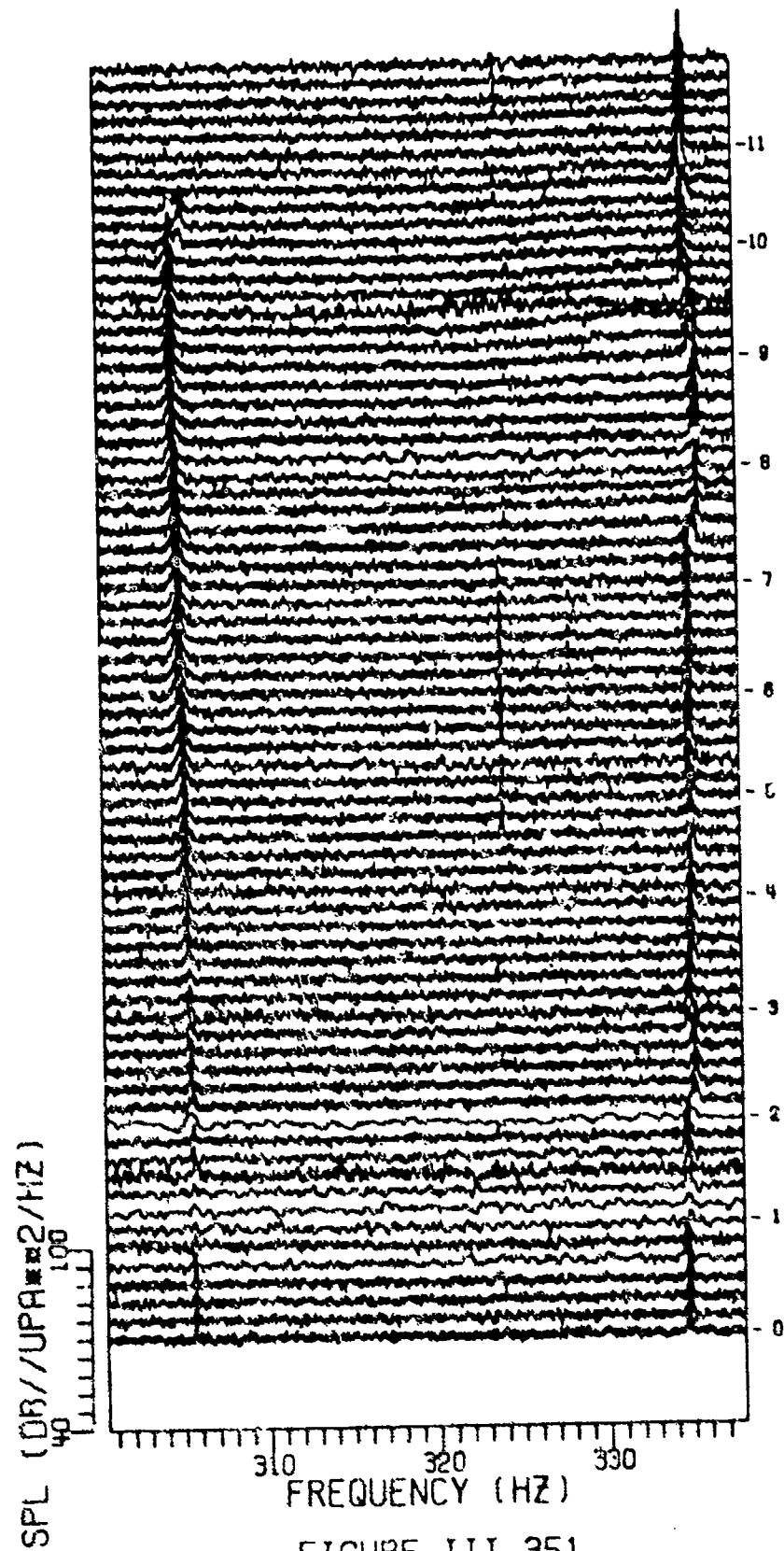


FIGURE III-351

IIA3SHBD 324/ 0/ 0 - 324/11/55

327

CONFIDENTIAL

CONFIDENTIAL

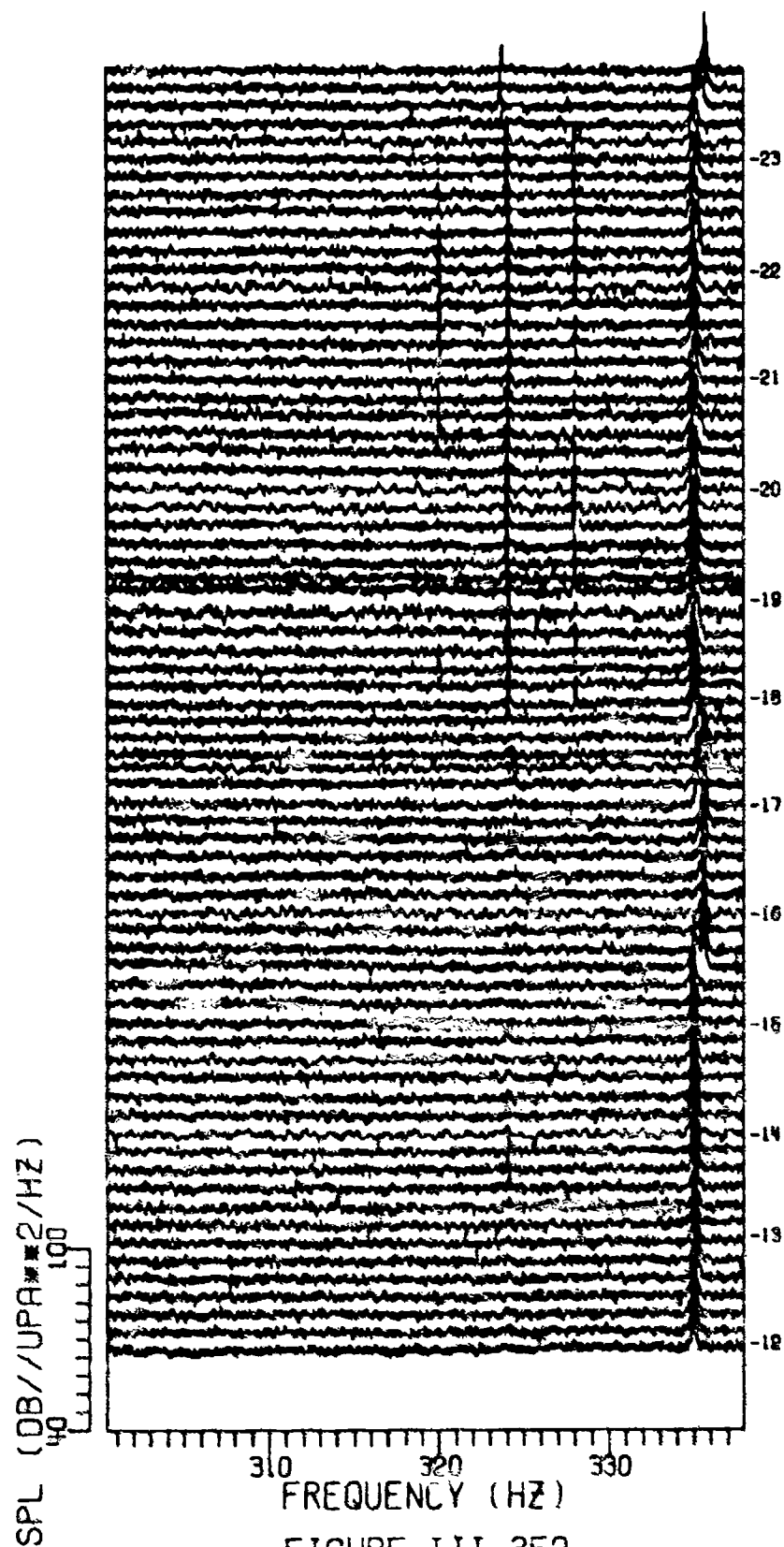


FIGURE III-352

IIA3SHBD 324/12/ 0 - 324/23/55

CONFIDENTIAL

CONFIDENTIAL

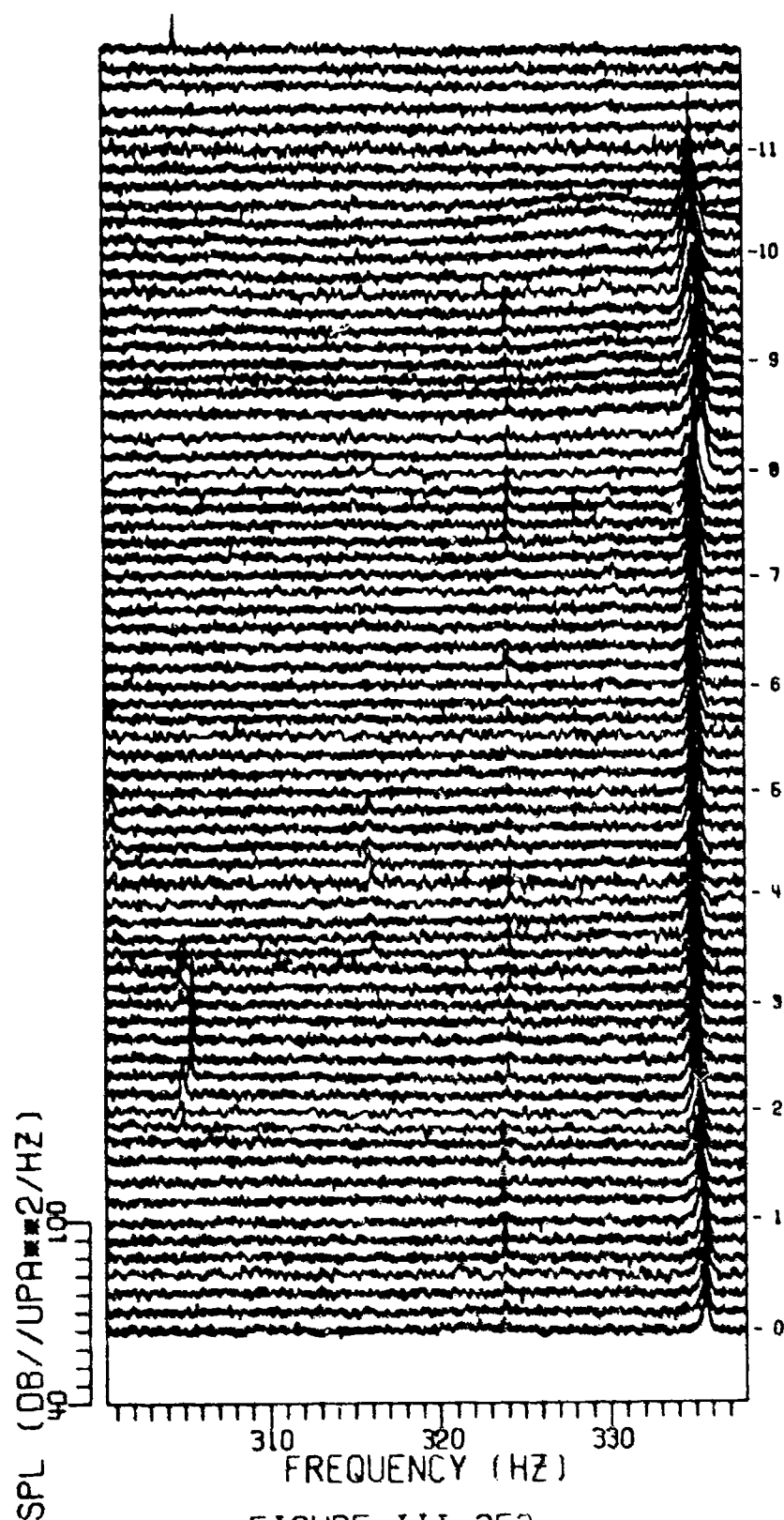


FIGURE III-353

IIA3SHBD 325/ 0/ 0 - 325/11/55

100

CONFIDENTIAL

CONFIDENTIAL

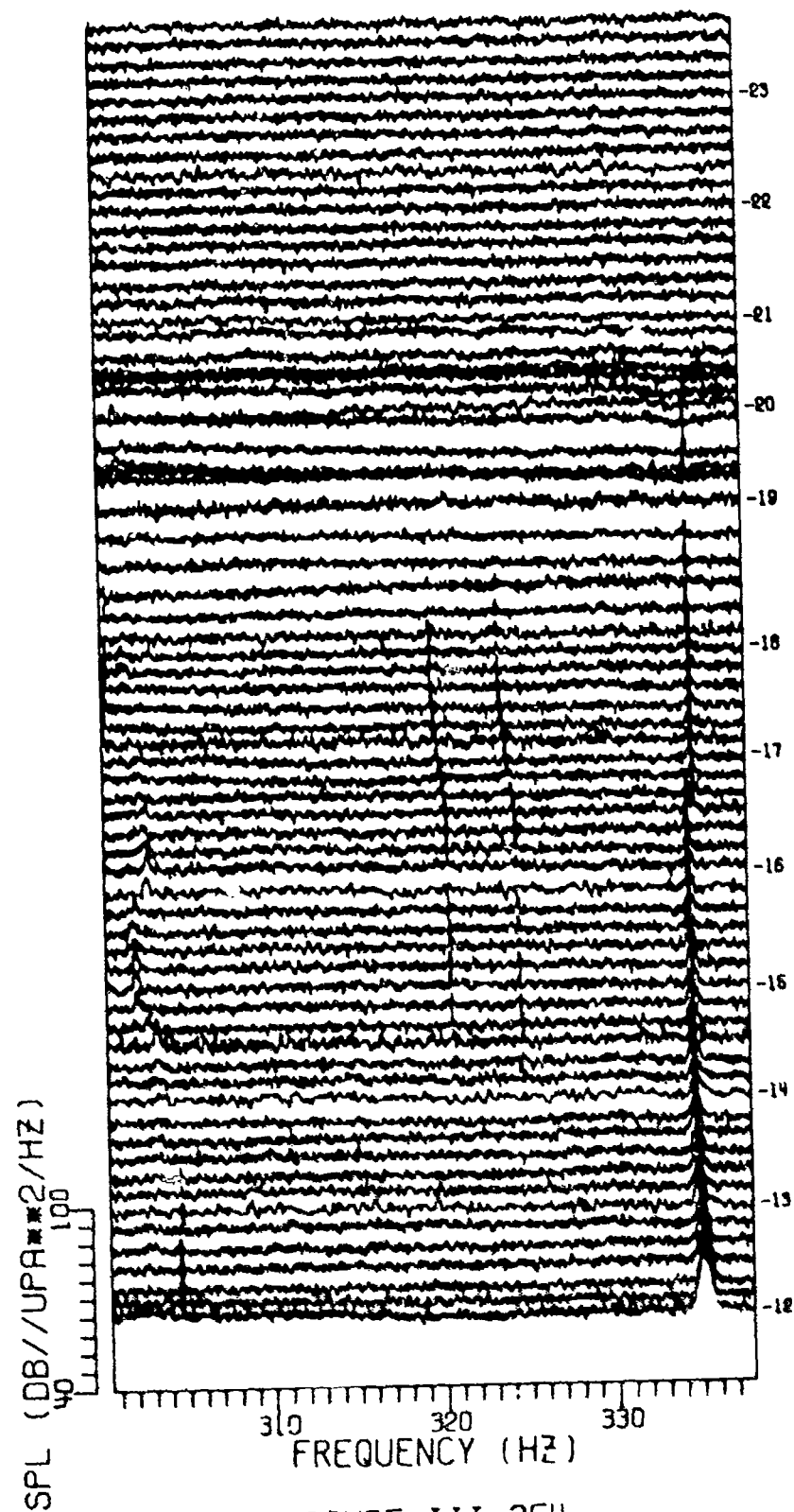


FIGURE III-354
IIA3SHBD 325/12/ 0 - 325/23/55

400

CONFIDENTIAL

SECRET**UNCLASSIFIED**

(This page is unclassified)

31 December 1978

DISTRIBUTION LIST FOR
ARI-TR-78-3
FINAL REPORT UNDER CONTRACT N00039-77-C-0003, (ITEMS 0003 AND 0004)
SECRET

Copy No.

Commander
Naval Electronic Systems Command
Department of the Navy
Washington, DC 20360
1 Attn: PME 124
2 PME 124-30
3 PME 124-40
4 PME 124-60
5 PME 124TA
6 ELEX 320

7 Office of Assistant Secretary of the Navy
(RE&S) Room 5E813, Pentagon
Washington, DC 20360
Attn: Mr. G. Cann

Chief of Naval Operations
Department of the Navy
Washington, DC 20350
8 Attn: OP-095
9 OP-951F
10 OP-951F1
11 OP-981

Commander
Naval Air Development Center
Department of the Navy
Warminster, PA 18974
12 Attn: Code 3091
13 Code 303

14 Commander
Naval Air Systems Command
Department of the Navy
Washington, DC 20360
Attn: Code PMA-264A

UNCLASSIFIED**SECRET**

(This page is unclassified)

SECRET

UNCLASSIFIED

(This page is unclassified)

Dist. List for ARL-TR-78-3 under Contract N00039-77-C-0003,
Items 0003 and 0004 (Cont'd)

Copy No.

- 15 Commanding Officer
 Naval Intelligence Support Center
 4301 Suitland Road
 Washington, DC 20390
 Attn: Code 222

- 16 Project Manager
 Anti-Submarine Warfare Systems Project Office
 Department of the Navy
 Washington, DC 20360
 Attn: ASW OIT

- Commanding Officer
 Naval Ocean Research and Development Activity
 Department of the Navy
 NSTL Station, MS 39529
- 17 Attn: S. Marshall, Code 340
- 18 G. Lewis, Code 500

- 19 - 20 Commanding Officer and Director
 Defense Documentation Center
 Cameron Station, Building 5
 5010 Duke Street
 Alexandria, VA 22314

- 21 TRW, INC.
 TRW Defense and Space Systems Group
 Washington Operation
 7600 Colshire Drive
 McLean, VA 22101
 Attn: W. Morley

- 22 Sanders Associates, Inc.
 95 Canal Street
 Nashua, NH 03606
 Attn: L. Gagne

- 23 Office of Naval Research
 Resident Representative
 Room 508, Federal Building
 Austin, TX 78701

- 24 Glen E. Ellis, ARL:UT

- 25 Loyd D. Hampton, ARL:UT

(This page is unclassified)

UNCLASSIFIED

SECRET

SECRET

UNCLASSIFIED

(This page is unclassified)

Dist. List for ARL-TR-78-3 under Contract N00039-77-C-0003,
Items 0003 and 0004 (Cont'd)

Copy No.

- 15 Commanding Officer
 Naval Intelligence Support Center
 4301 Suitland Road
 Washington, DC 20390
 Attn: Code 222
- 16 Project Manager
 Anti-Submarine Warfare Systems Project Office
 Department of the Navy
 Washington, DC 20360
 Attn: ASW OIT
- Commanding Officer
 Naval Ocean Research and Development Activity
 Department of the Navy
 NSTL Station, MS 39529
- 17 Attn: S. Marshall, Code 340
- 18 G. Lewis, Code 500
- 19 - 20 Commanding Officer and Director
 Defense Documentation Center
 Cameron Station, Building 5
 5010 Duke Street
 Alexandria, VA 22314
- 21 TRW, INC.
 TRW Defense and Space Systems Group
 Washington Operation
 7600 Colshire Drive
 McLean, VA 22101
 Attn: W. Morley
- 22 Sanders Associates, Inc.
 95 Canal Street
 Nashua, NH 03606
 Attn: L. Gagne
- 23 Office of Naval Research
 Resident Representative
 Room 508, Federal Building
 Austin, TX 78701
- 24 Glen E. Ellis, ARL:UT
- 25 Loyd D. Hampton, ARL:UT

(This page is unclassified)

UNCLASSIFIED

SECRET

SECRET

(This page is UNCLASSIFIED.)

Dist. List for ARL-TR-78-3 under Contract N00039-77-C-0003,
Items 0003 and 0004 (Cont'd)

Copy No.

26	Kenneth E. Hawker, ARL:UT
27	Stephen K. Mitchell, ARL:UT
28	Clark S. Penrod, ARL:UT
29	Jack A. Shooter, ARL:UT
30	Library, ARL:UT

(The reverse of this page is blank.)

SECRET

(This page is unclassified)



DEPARTMENT OF THE NAVY

OFFICE OF NAVAL RESEARCH
875 NORTH RANDOLPH STREET
SUITE 1425
ARLINGTON VA 22203-1995

IN REPLY REFER TO:

5510/1
Ser 321OA/011/06
31 Jan 06

MEMORANDUM FOR DISTRIBUTION LIST

Subj: DECLASSIFICATION OF LONG RANGE ACOUSTIC PROPAGATION PROJECT (LRAPP) DOCUMENTS

Ref: (a) SECNAVINST 5510.36

Encl: (1) List of DECLASSIFIED LRAPP Documents

1. In accordance with reference (a), a declassification review has been conducted on a number of classified LRAPP documents.
2. The LRAPP documents listed in enclosure (1) have been downgraded to UNCLASSIFIED and have been approved for public release. These documents should be remarked as follows:

Classification changed to UNCLASSIFIED by authority of the Chief of Naval Operations (N772) letter N772A/6U875630, 20 January 2006.

DISTRIBUTION STATEMENT A: Approved for Public Release; Distribution is unlimited.

3. Questions may be directed to the undersigned on (703) 696-4619, DSN 426-4619.

A handwritten signature in black ink, appearing to read "B. F. Link", is positioned above the typed name.

BRIAN LINK
By direction

Subj: DECLASSIFICATION OF LONG RANGE ACOUSTIC PROPAGATION PROJECT
(LRAPP) DOCUMENTS

DISTRIBUTION LIST:

NAVOCEANO (Code N121LC – Jaime Ratliff)
NRL Washington (Code 5596.3 – Mary Templeman)
PEO LMW Det San Diego (PMS 181)
DTIC-OCQ (Larry Downing)
ARL, U of Texas
Blue Sea Corporation (Dr. Roy Gaul)
ONR 32B (CAPT Paul Stewart)
ONR 321OA (Dr. Ellen Livingston)
APL, U of Washington
APL, Johns Hopkins University
ARL, Penn State University
MPL of Scripps Institution of Oceanography
WHOI
NAVSEA
NAVAIR
NUWC
SAIC

Declassified LRAPP Documents

Report Number	Personal Author	Title	Publication Source (Originator)	Pub. Date	Current Availability	Class.
Unavailable	Penrod, C. S., et al.	MOORED SURVEILLANCE SYSTEM FIELD VALIDATION TEST SENSOR PERFORMANCE ANALYSIS. VOLUME I. DATA COLLECTION AND MEASUREMENT SYSTEM DESCRIPTION	University of Texas, Applied Research Laboratories	781231	ADC018009	C
Unavailable	Watkins, S. L., et al.	MOORED SURVEILLANCE SYSTEM FIELD VALIDATION TEST SENSOR PERFORMANCE ANALYSIS. VOLUME III. VERNIER RESOLUTION DATA PRODUCTS	University of Texas, Applied Research Laboratories	781231	ADC018373	C
Unavailable	Watkins, S. L., et al.	MOORED SURVEILLANCE SYSTEM FIELD VALIDATION TEST SENSOR PERFORMANCE ANALYSIS. VOLUME II. STANDARD RESOLUTION DATA PRODUCTS	University of Texas, Applied Research Laboratories	781231	ADC018374	C
NORDATN44	Bucca, P. J.	ENVIRONMENTAL VARIABILITY DURING THE CHURCH STROKE II CRUISE FIVE EXERCISE (U)	Naval Ocean R&D Activity	790201	ADC020353; NS; AU; ND	C
NADC7820830	Balonis, R. M.	TEST STEERED VERTICAL LINE ARRAY (TSVLA) MEASUREMENTS FOR BEARING STAKE SURVEYS (U)	Naval Air Systems Command	790301	ADC018003; NS; ND	C
USIControl674779	Williams, W., et al.	REPORT OF THE LRAPP EXERCISE PLANNING WORKSHOP TRACOR INC ROCKVILLE MD 16 - 17 OCTOBER 1978 (U)	Underwater Systems, Inc.	790302	NS; ND	C
NOSCTR357	Hamilton, E. L., et al.	GEOACOUSTIC MODELS OF THE SEAFLOOR: GULF OF OMAN, ARABIAN SEA, AND SOMALI BASIN (U)	Naval Ocean Systems Center	790615	ND	C
Unavailable	Unavailable	RAPIDLY DEPLOYABLE SURVEILLANCE SYST (RDSS) ACOUSTIC VALIDATION TEST (AVT) EXERCISE PLAN (U)	Naval Electronic Systems Command	790625	AU	C
LRAPPRC79027	Brunson, B. A., et al.	GULF OF MEXICO AND CARIBBEAN SEA DATA AND MODEL BASE REPORT (U)	Tracor, Inc.	790701	ADC019153; NS; ND	C
Unavailable	Unavailable	BEARING STAKE BMS DATA QUALITY ASSESSMENT REPORT (U)	University of Texas, Applied Research Laboratories	790705	AU	C
PME12430	Unavailable	RAPIDLY DEPLOYABLE SURVEILLANCE SYSTEM (RDSS) ACOUSTIC VALIDATION TEST (AVT) DATA REDUCTION AND ANALYSIS PLAN (U)	Naval Electronic Systems Command	790815	NS; AU	C
Unavailable	Unavailable	RAPIDLY DEPLOYABLE SURVEILLANCE SYSTEM (RDSS) ACOUSTIC VALIDATION TEST (AVT) EXERCISE PLAN (U)	Naval Electronic Systems Command	790917	AU	C
NOSCTR467	Pedersen, M. A., et al.	PROPAGATION LOSS ASSESSMENT OF THE BEARING STAKE EXERCISE (U)	Naval Ocean Systems Center	790928	ADC020845; NS; AU; ND	C
NOSCTR466	Anderson, A. L., et al.	BEARING STAKE ACOUSTIC ASSESSMENT (U)	Naval Ocean Systems Center	790928	ADC020797; NS; AU; ND	C