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SYSTEMS CONTROL INC PALO ALTO CALIF

F/G 17/7

INTERNATIONAL OMEGA NAVIGATION SYSTEM, WESTERN PACIFIC OMEGA VA--ETC(U)

APR 79 F G KARKALIK, G F SAGE, W R VINCENT

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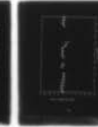
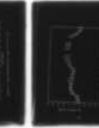
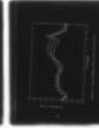
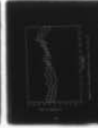
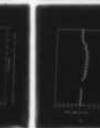
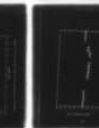
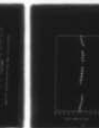
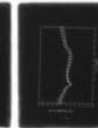
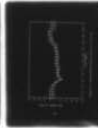
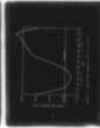
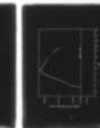
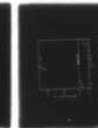
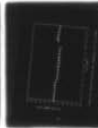
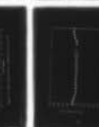
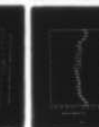
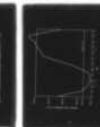
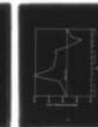
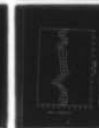
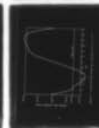
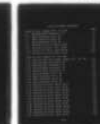
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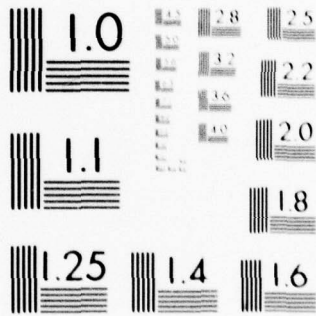
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INTERNATIONAL OMEGA NAVIGATION SYSTEM



6

International Omega Navigation System.

WESTERN PACIFIC OMEGA VALIDATION

VOLUME II APPENDICES

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OMEGA NAVIGATION SYSTEM OPERATIONS DETAIL
Washington, DC 20590

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INTRODUCTION

This document presents the data analysis results supporting the Omega performance evaluation summaries presented in Volume I, Section 5.3, Omega Performance Evaluation at the ONSOD Fixed Monitor Sites. The following listing relates each appendix to the Volume I Omega Performance Evaluation section which it supports.

VOLUME I

- 5.3.2 Kwajalein Data
- 5.3.3 Orote Point Data
- 5.3.4 Clark Data
- 5.3.5 Tsushima Data

VOLUME II

- Appendix A
- Appendix B
- Appendix C
- Appendix D

APPENDIX A
KWAJALEIN DATA

This appendix contains data which have been derived from magnetic tape recordings made at the ONSOD Omega monitoring site at Kwajalein, Marshall Islands. The total data base available from Kwajalein is summarized in Table 4.1 of the main text. Data representative of high solar illumination and low solar illumination months were selected from the total data base for detailed examination and analysis. These selected data have been formatted into convenient graphical presentations for inclusion in this appendix.

Three types of related graphic presentations of the Kwajalein data are presented. These are:

- (1) Phase Difference Monthly Summaries: Diurnal plots of the average monthly phase difference between pairs of Omega signals are provided. These plots represent data as observed by the Kwajalein Omega receiver and prior to processing or the addition of PPCs.
- (2) LOP Monthly Summaries: The phase difference data of item (1) were corrected with PPC values supplied by ONSOD, normalized to the Kwajalein site location and presented as diurnal plots of the monthly average LOP. Also included in the LOP monthly summaries is the diurnal standard deviation of the measured data.
- (3) Position Fix Summaries: Data from pairs of LOPs were combined to obtain site location as determined from the Omega data. Site location values were compared to the known geographic locations of the Kwajalein site to provide diurnal plots of north and east position fix errors.

The Kwajalein data plots are presented in sequences which are related to their method of generation. All plots for the month of January are presented as a group followed by the plots for September.

The sequence of the presentation of the January data is summarized in Figure A.1. Four plots of measured phase are followed by their related LOP monthly summaries. LOP pairs are then combined to produce pairs of north and east error plots which follow the LOP monthly summary plots. The September plots are presented in a similar manner as shown in Figure A.20, page A22.

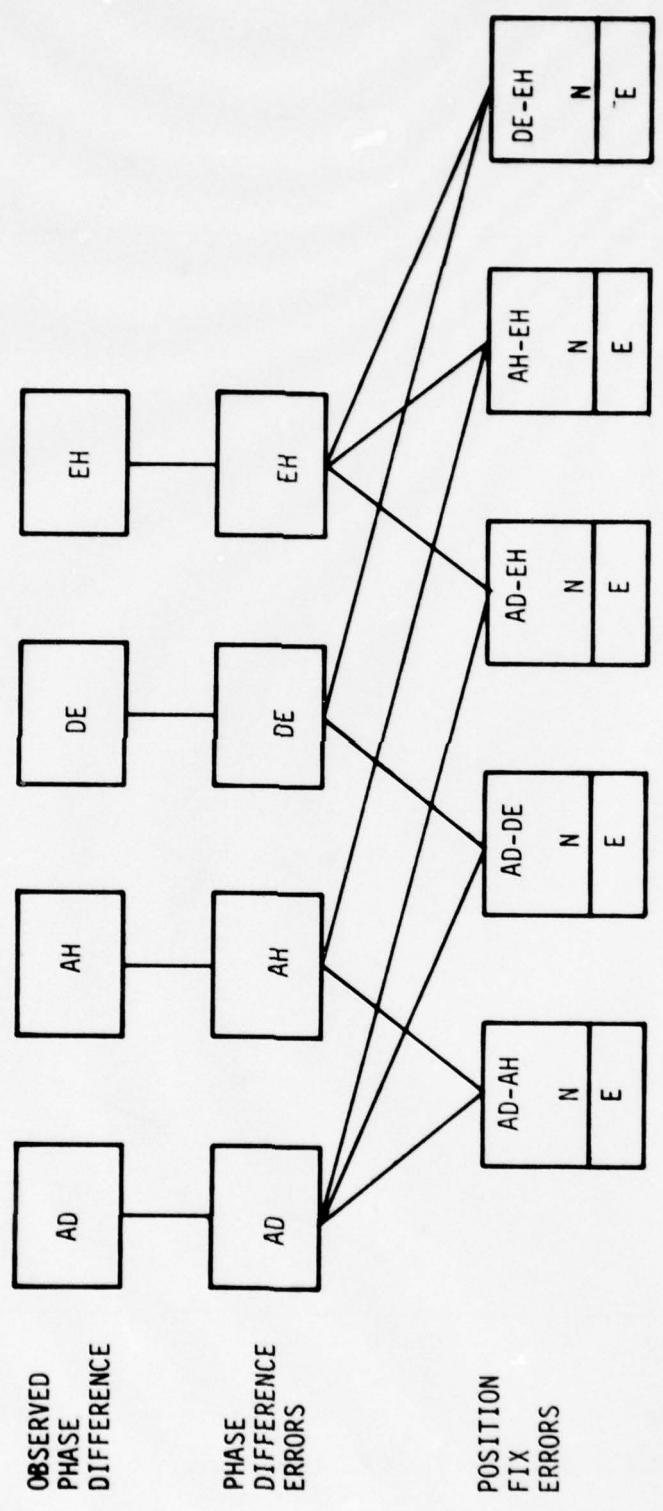


Figure A.1 Kwajalein Data Graphs, January 1977, 10.2

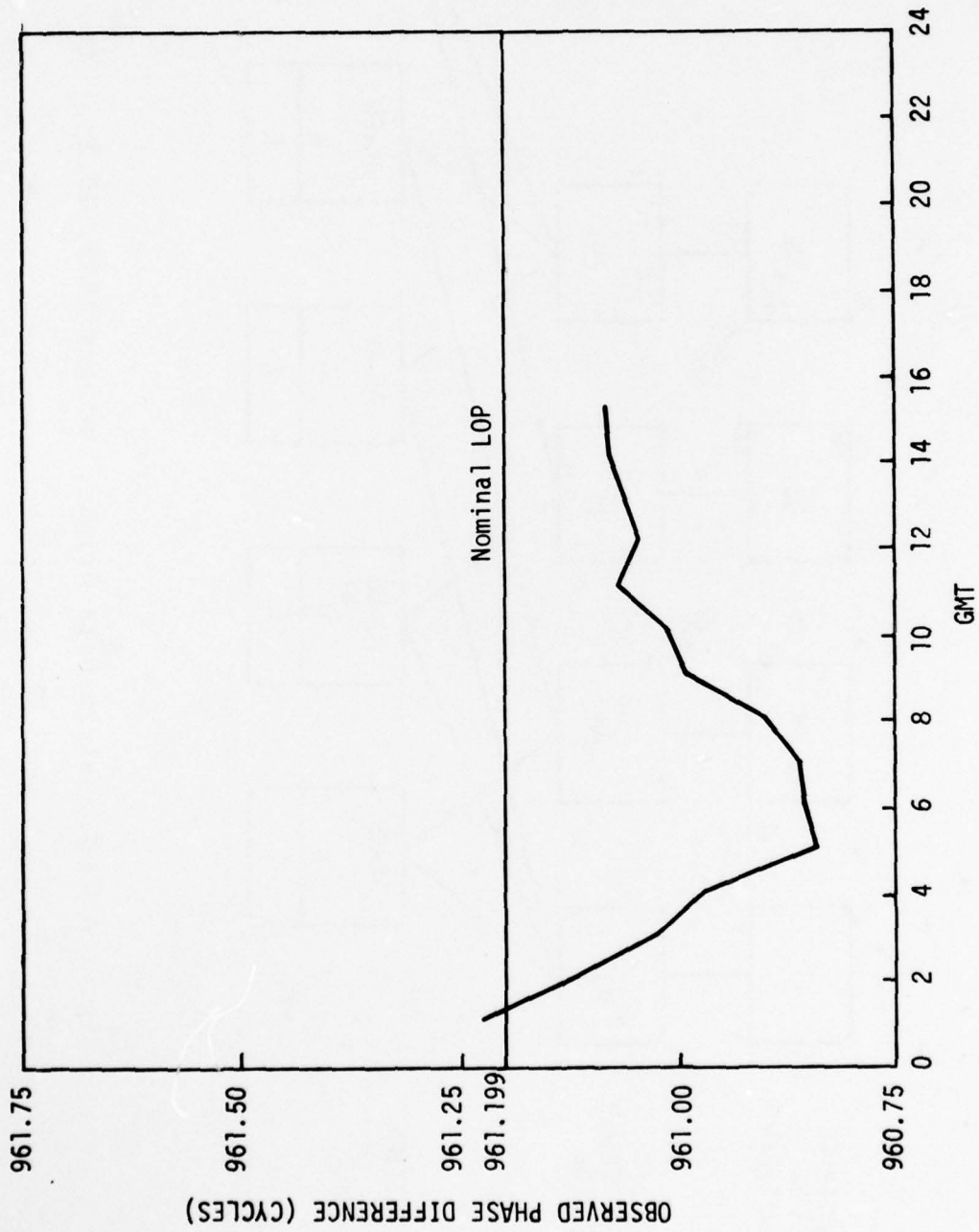


Figure A.2 Observed Phase Difference, Kwajalein, AD, 10.2, 1/77

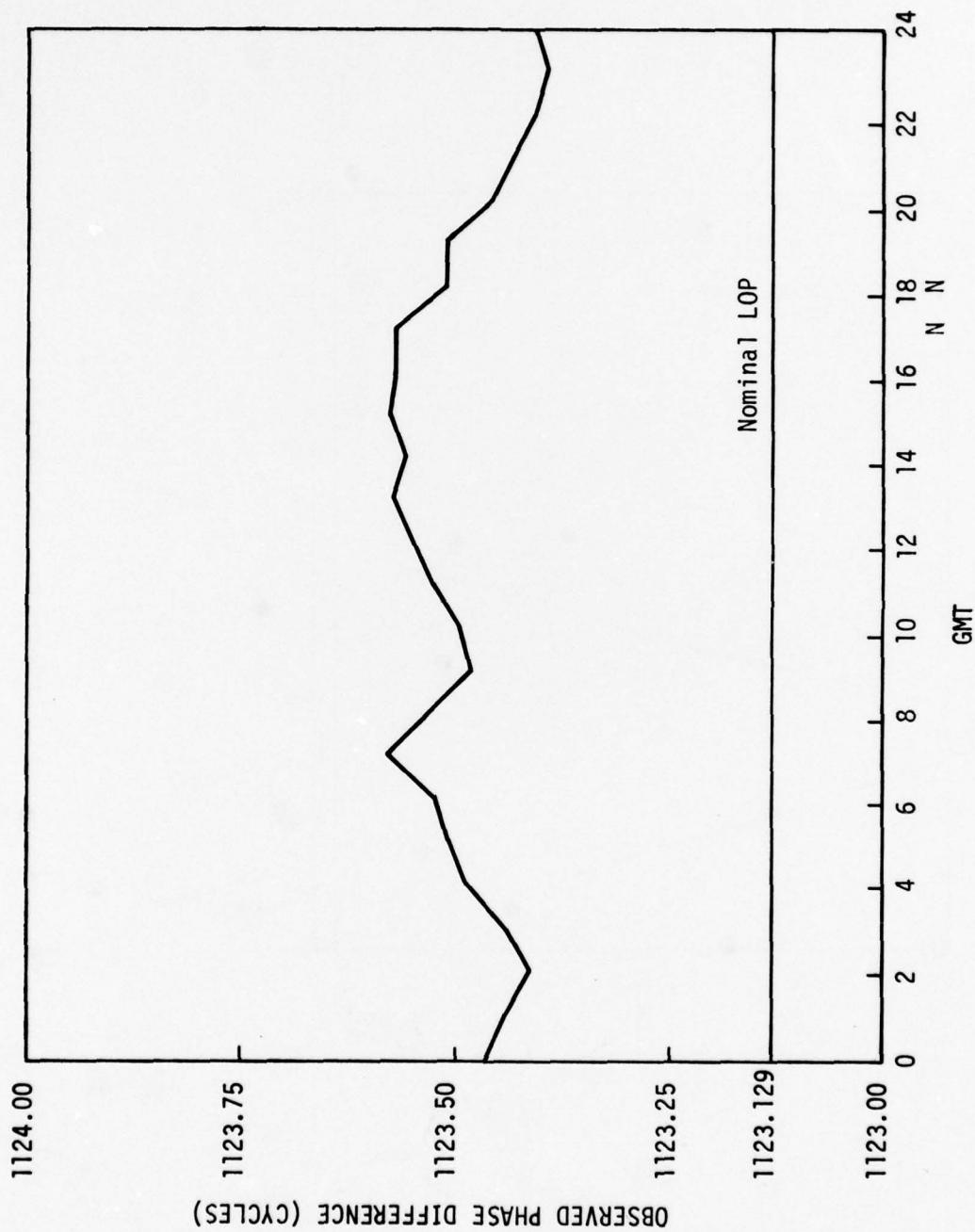


Figure A.3 Observed Phase Difference, Kwajalein, AH, 10.2, 1/77

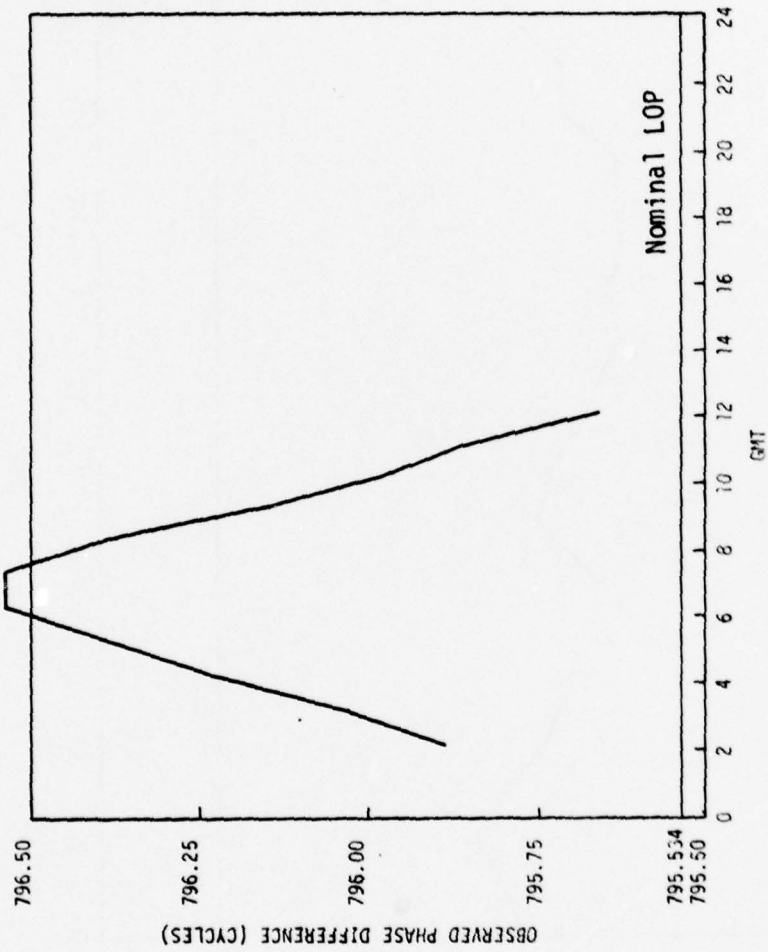


Figure A.4 Observed Phase Difference, Kwajalein, DE, 10.2, 1/77

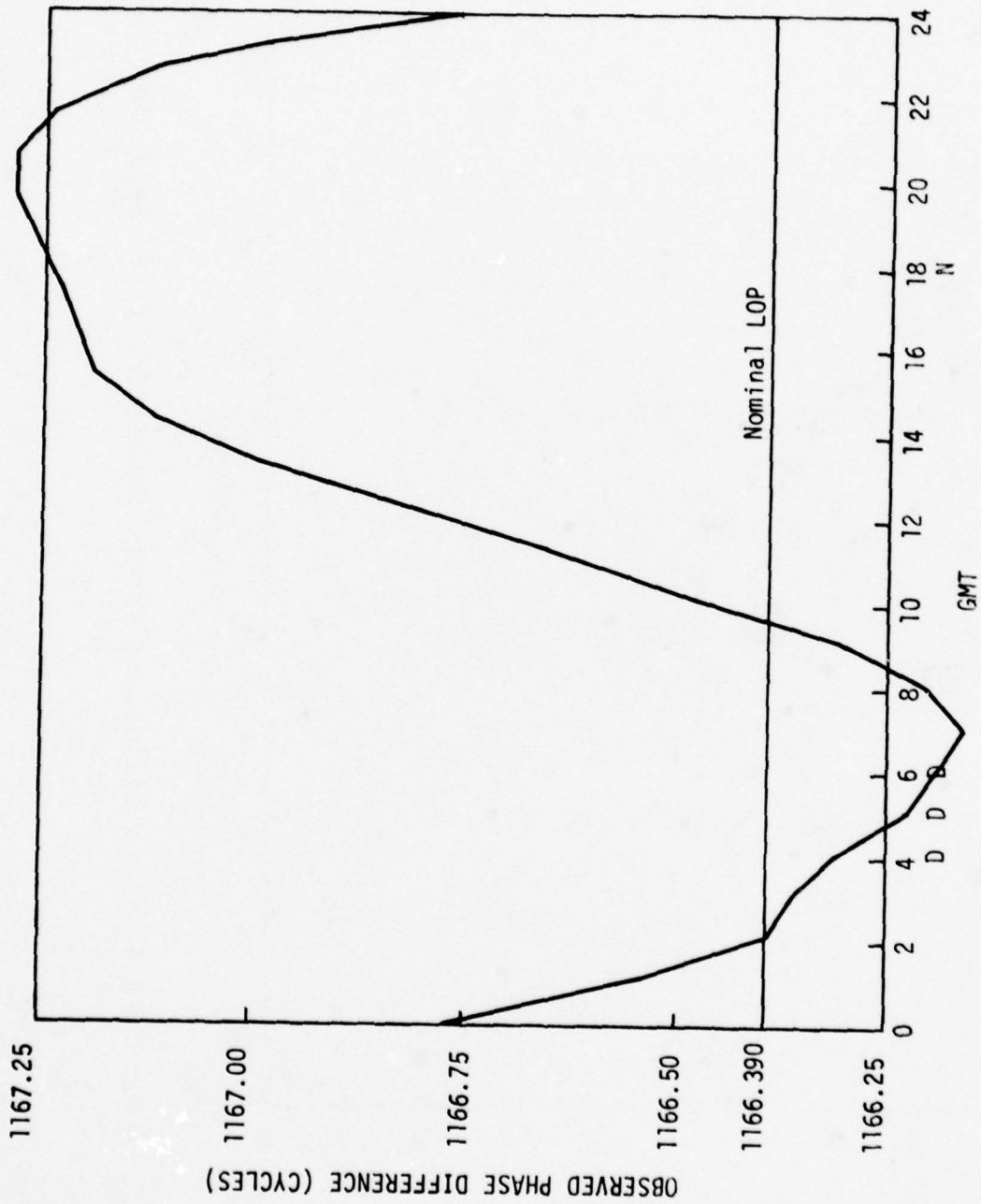


Figure A.5 Observed Phase Difference, Kwajalein, EH, 10.2, 1/77

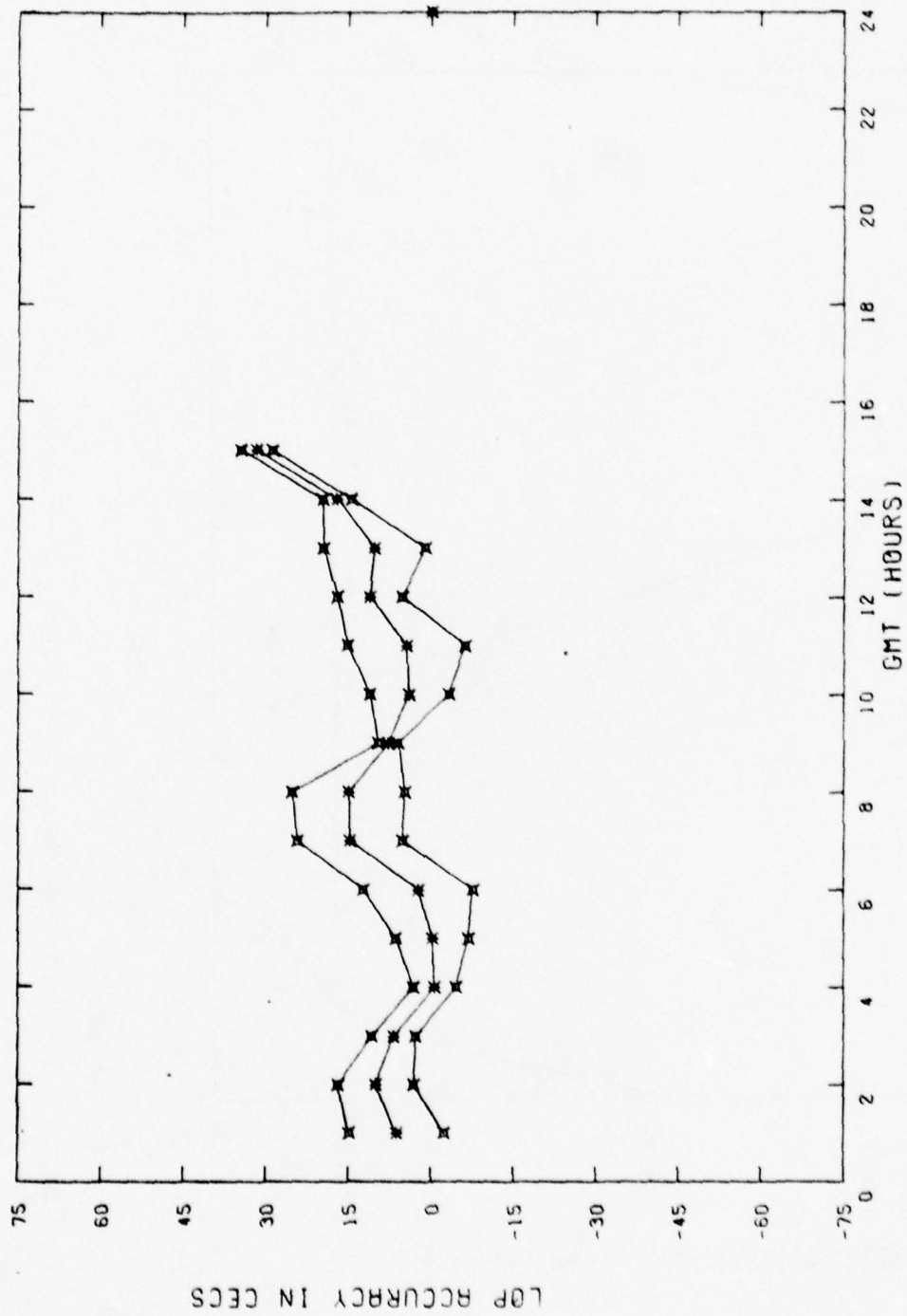


Figure A.6 Phase Difference Error, Kwajalein, 1/77, 10.2, AD

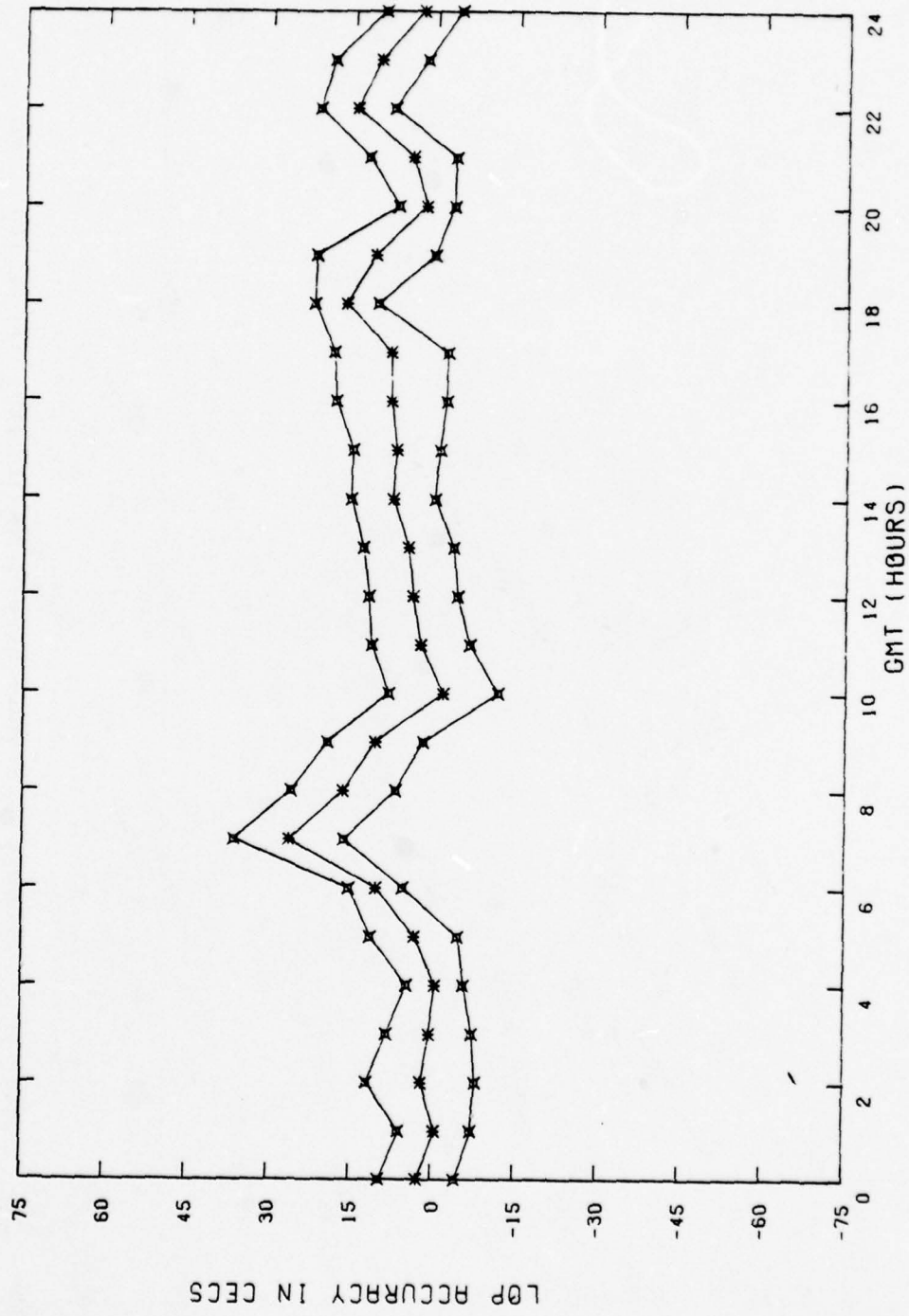


Figure A.7 Phase Difference Error, Kwajalein, 1/77, 10.2, AH

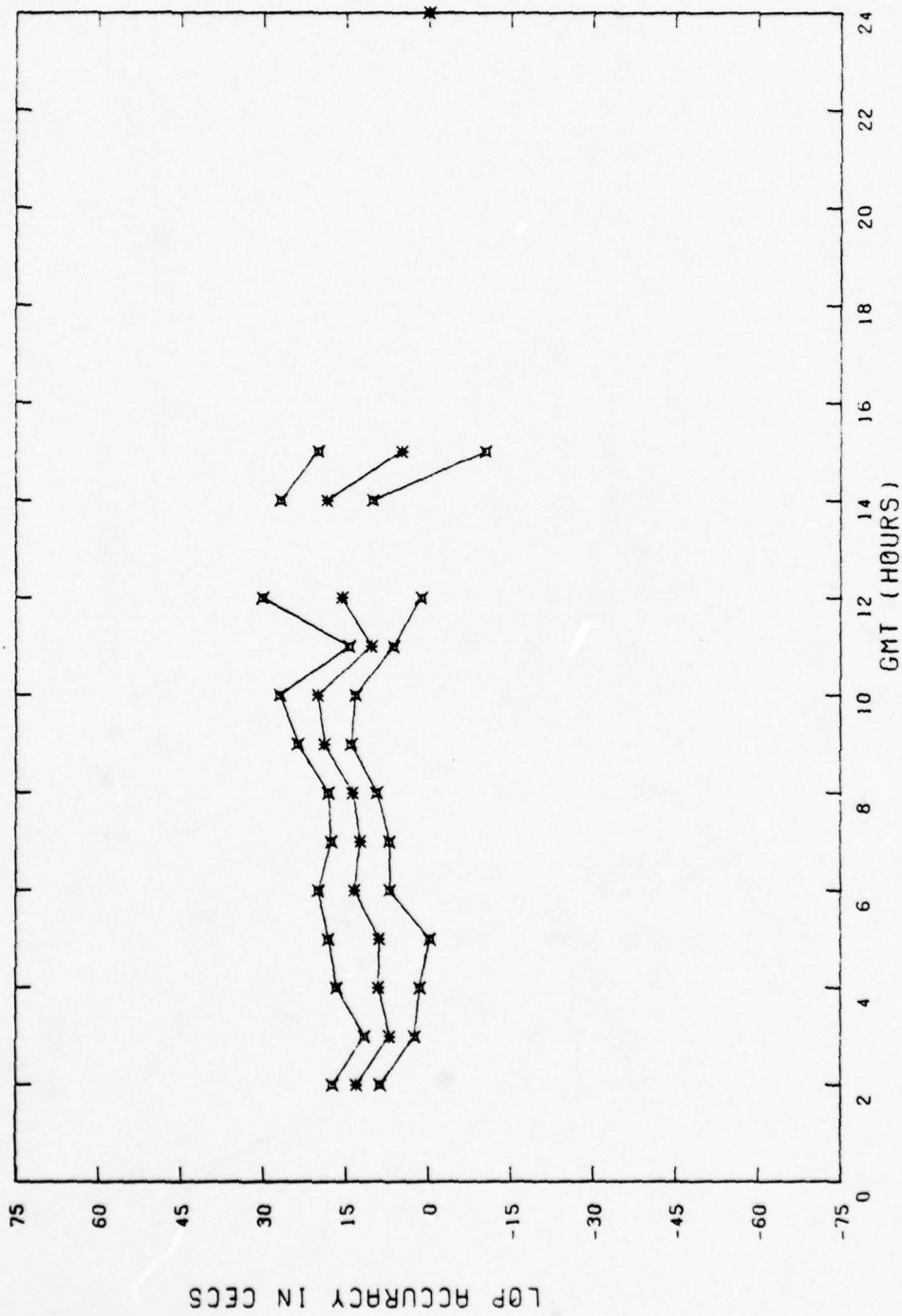


Figure A.8 Phase Difference Error, Kwajalein, 1/77, 10.2, DE

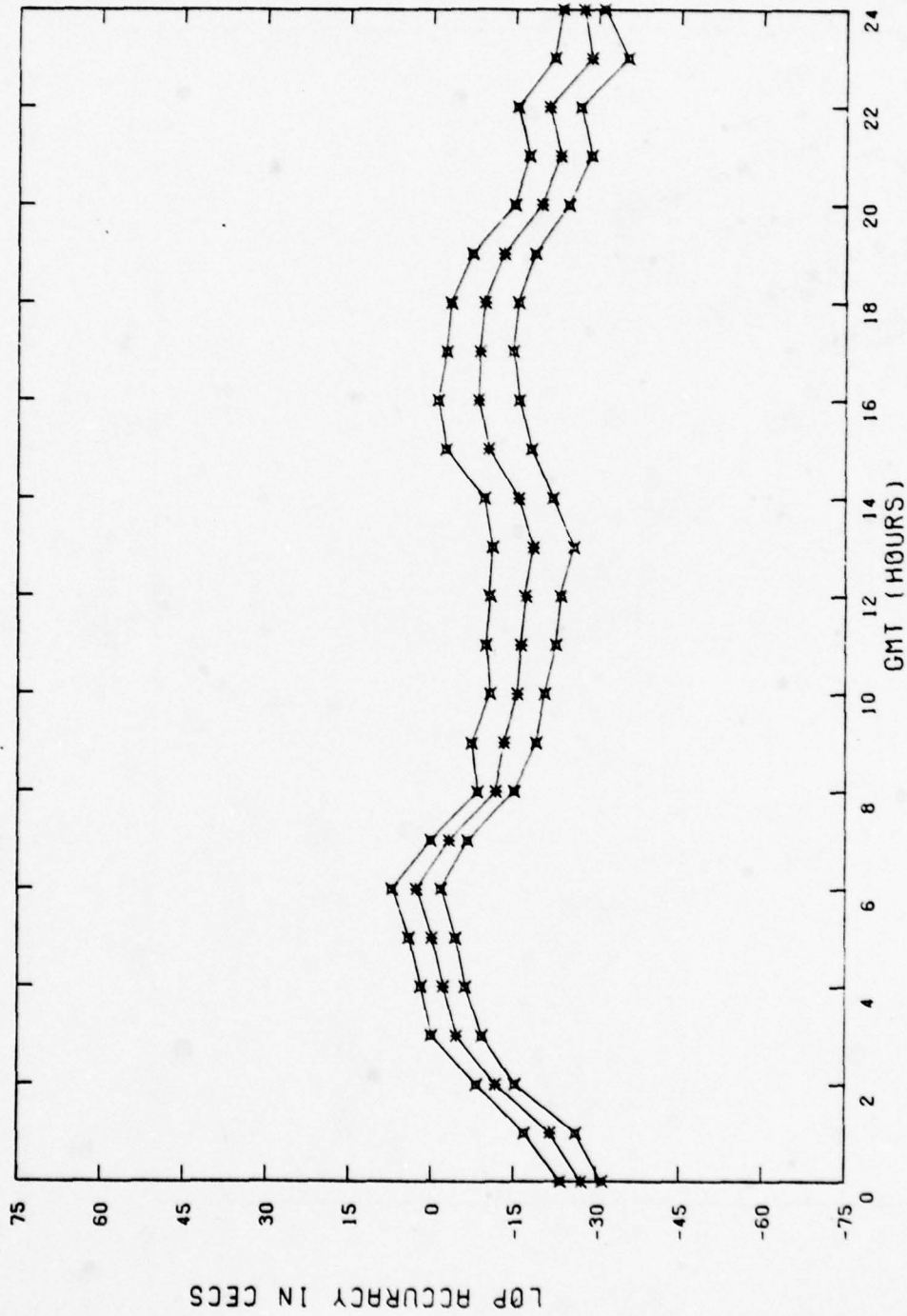


Figure A.9 Phase Difference Error, Kwajalein, 1/77, 10.2, EH

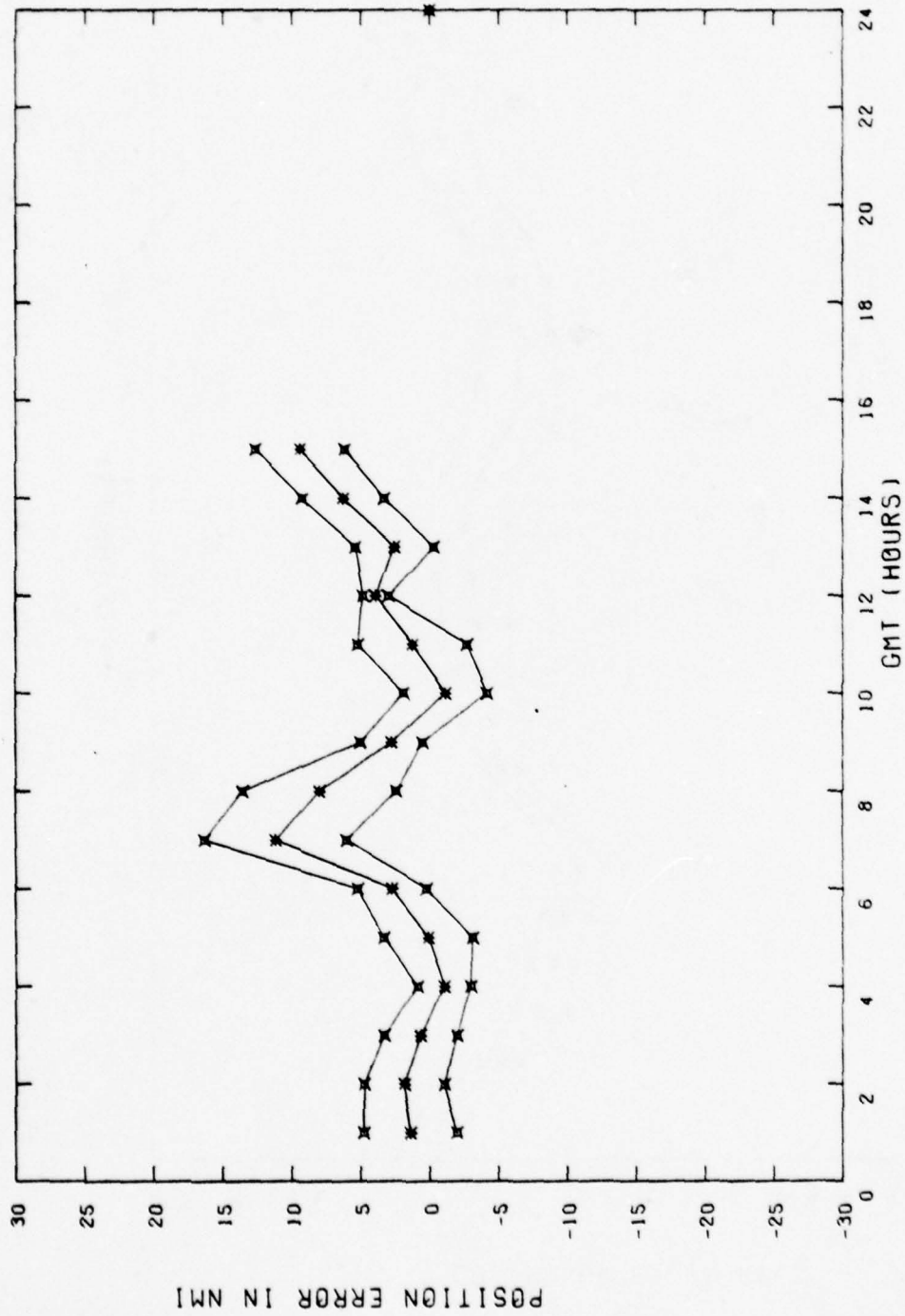


Figure A.10 Position Fix Error, North, Kwajalein, 1/77, 10.2, AD-AH

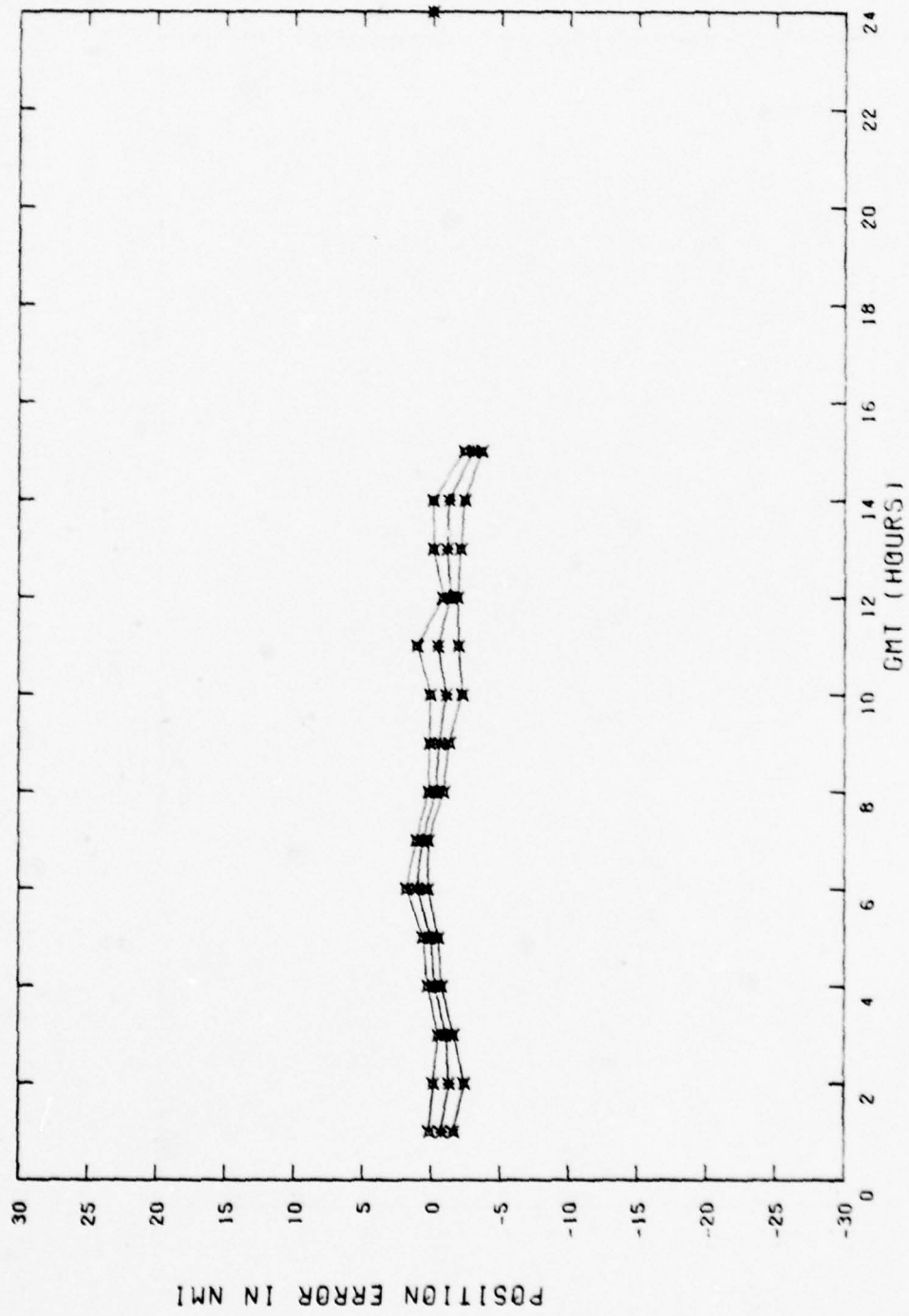


Figure A.11 Position Fix Error, East, Kwajalein, 1/77, 10.2, AD-AH

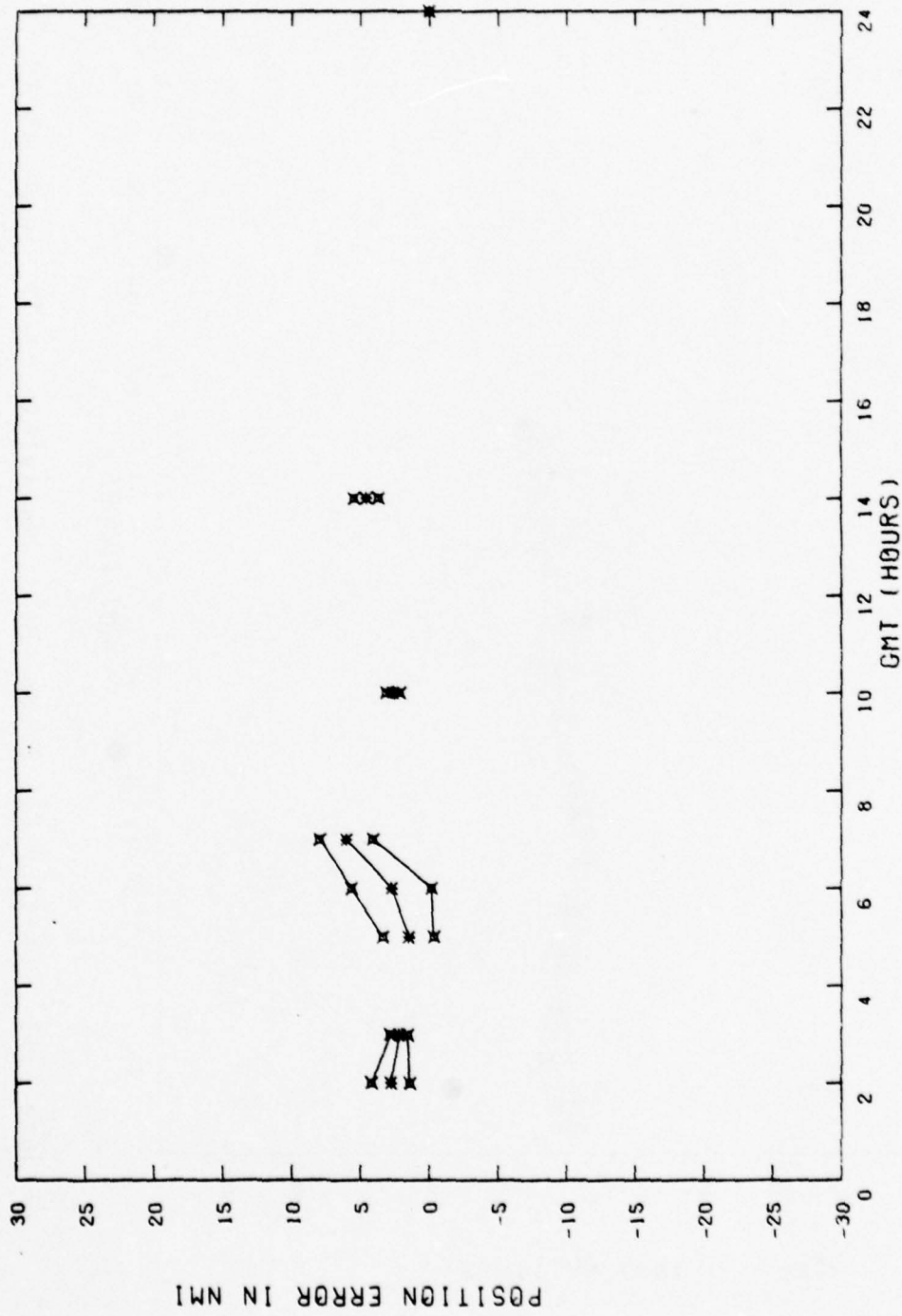


Figure A.12 Position Fix Error, North, Kwajalein, 1/77, 10.2, AD-DE

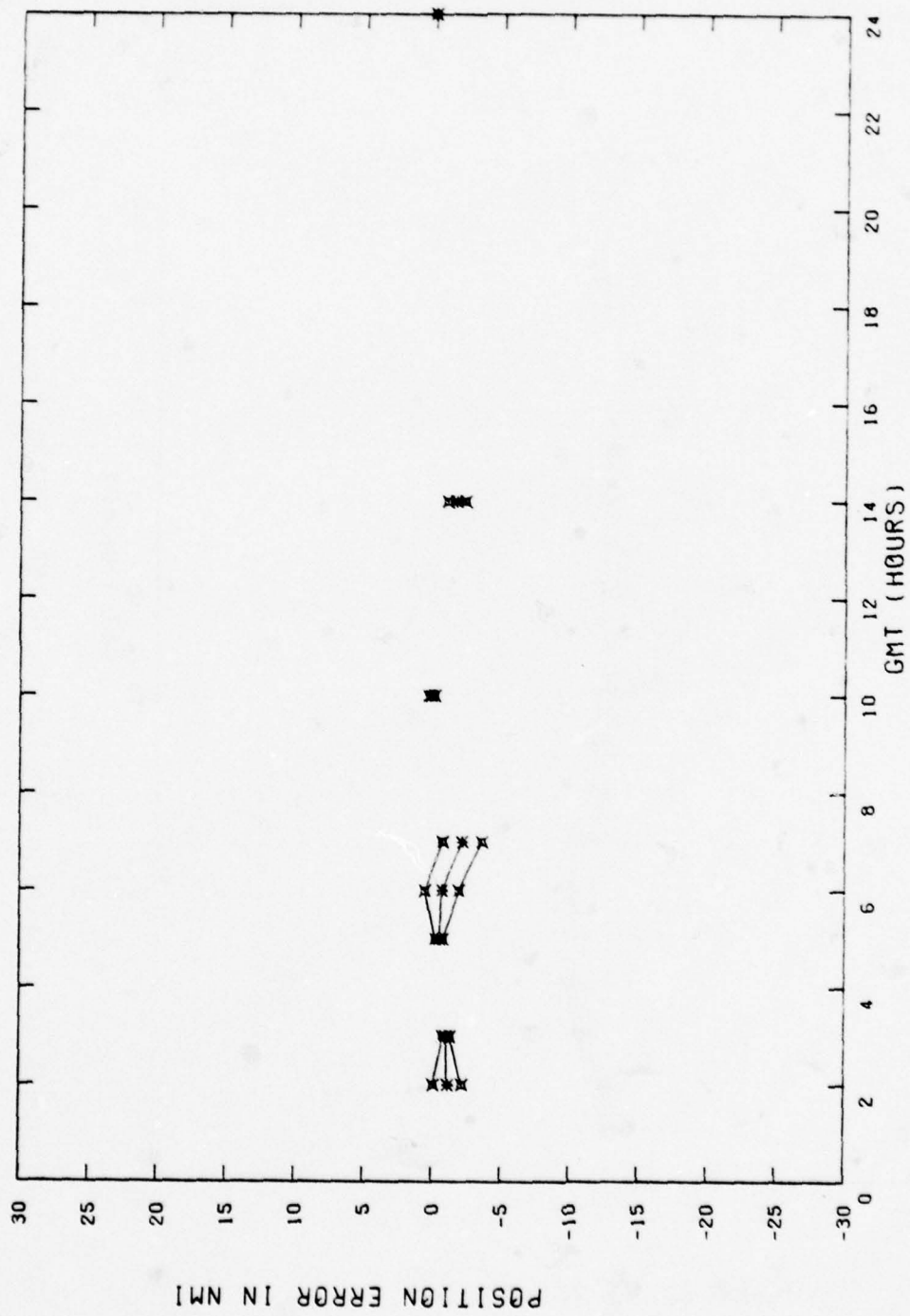


Figure A.13 Position Fix Error, East, Kwajalein, 1/77, 10.2, AD-DE

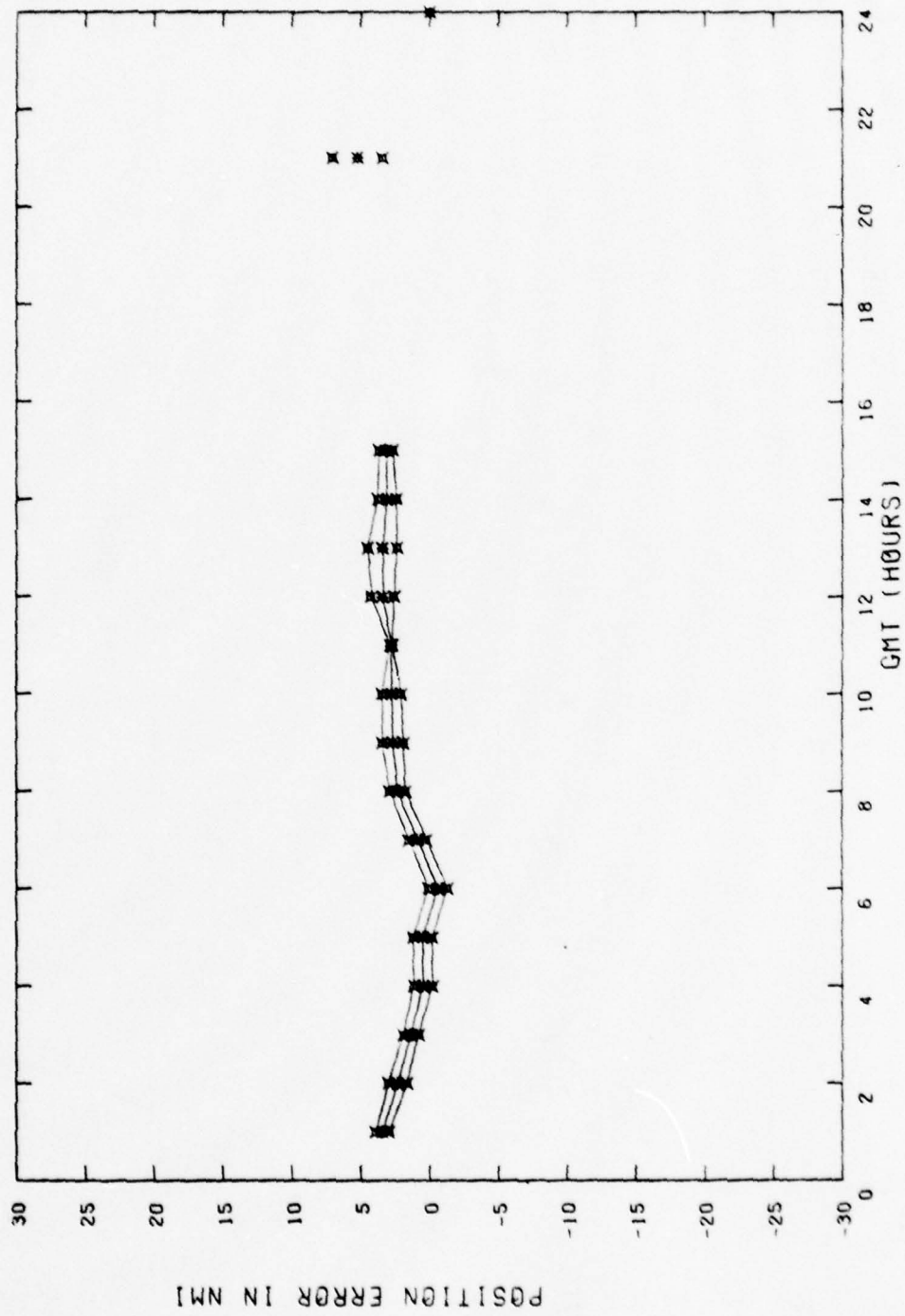


Figure A.14 Position Fix Error, North, Kwajalein, 1/77, 10.2, AD-EH

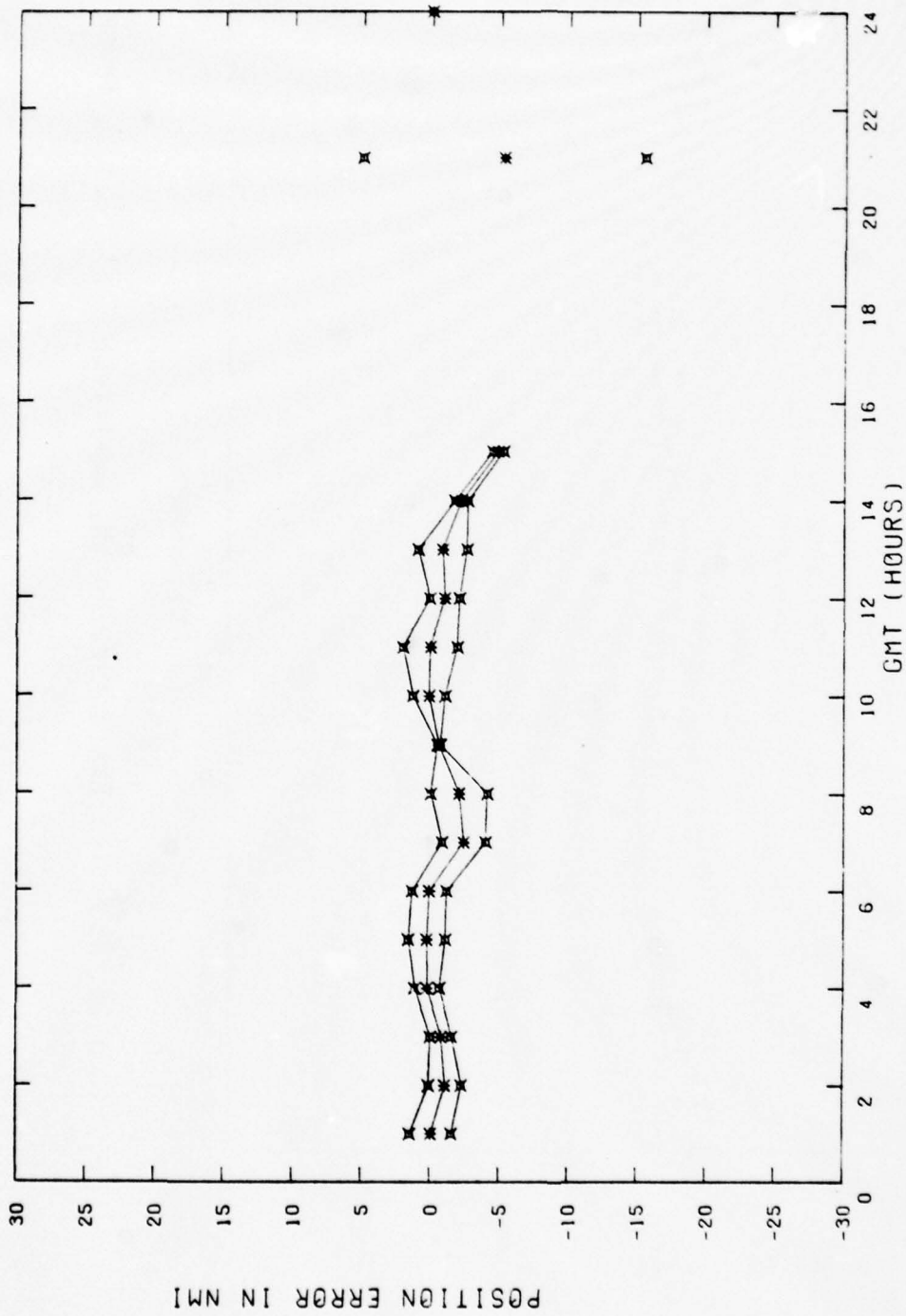


Figure A.15 Position Fix Error, East, Kwajalein, 1/77, 10.2, AD-EH

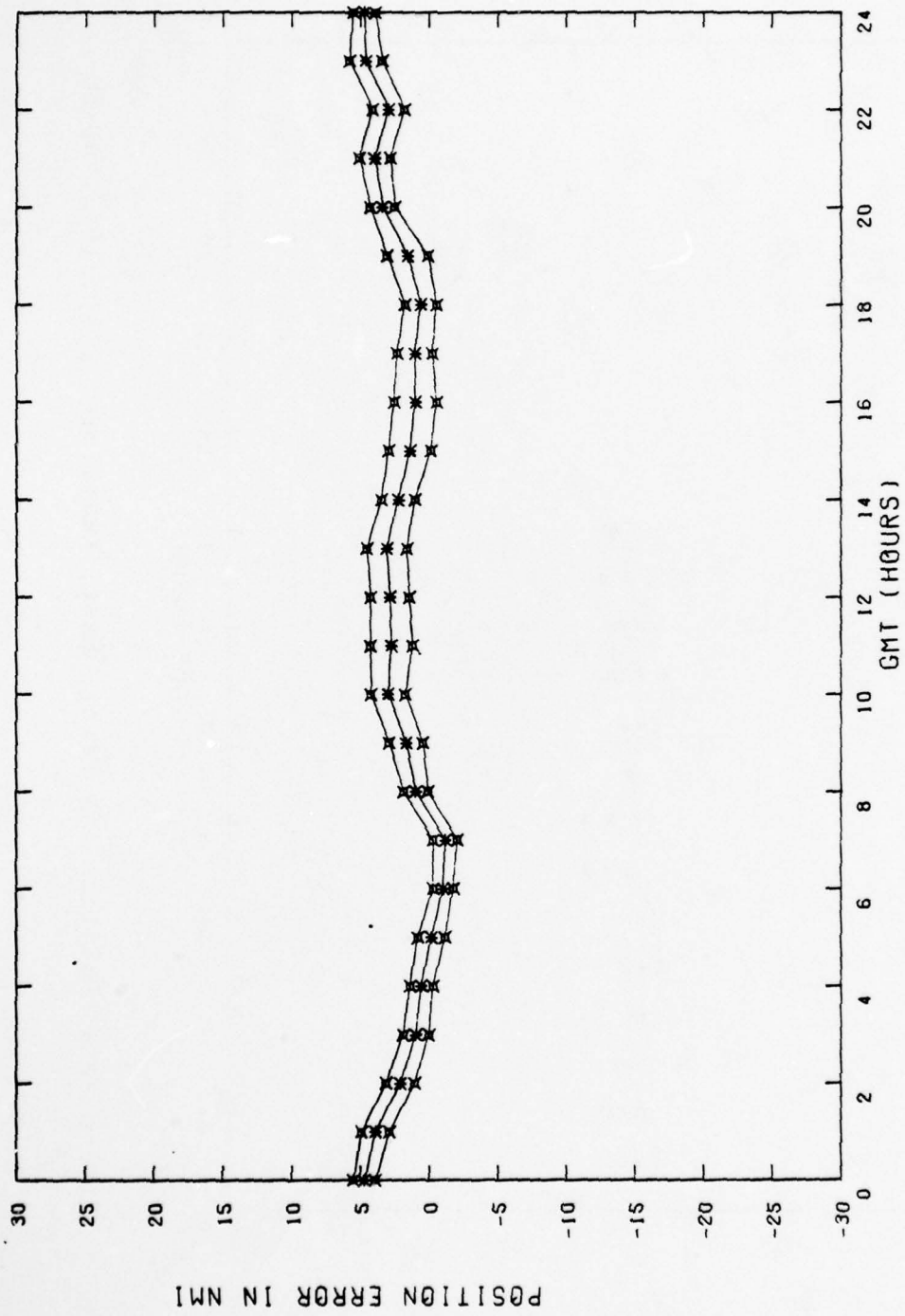


Figure A.16 Position Fix Error, North, Kwajalein, 1/77, 10.2, AH-EH

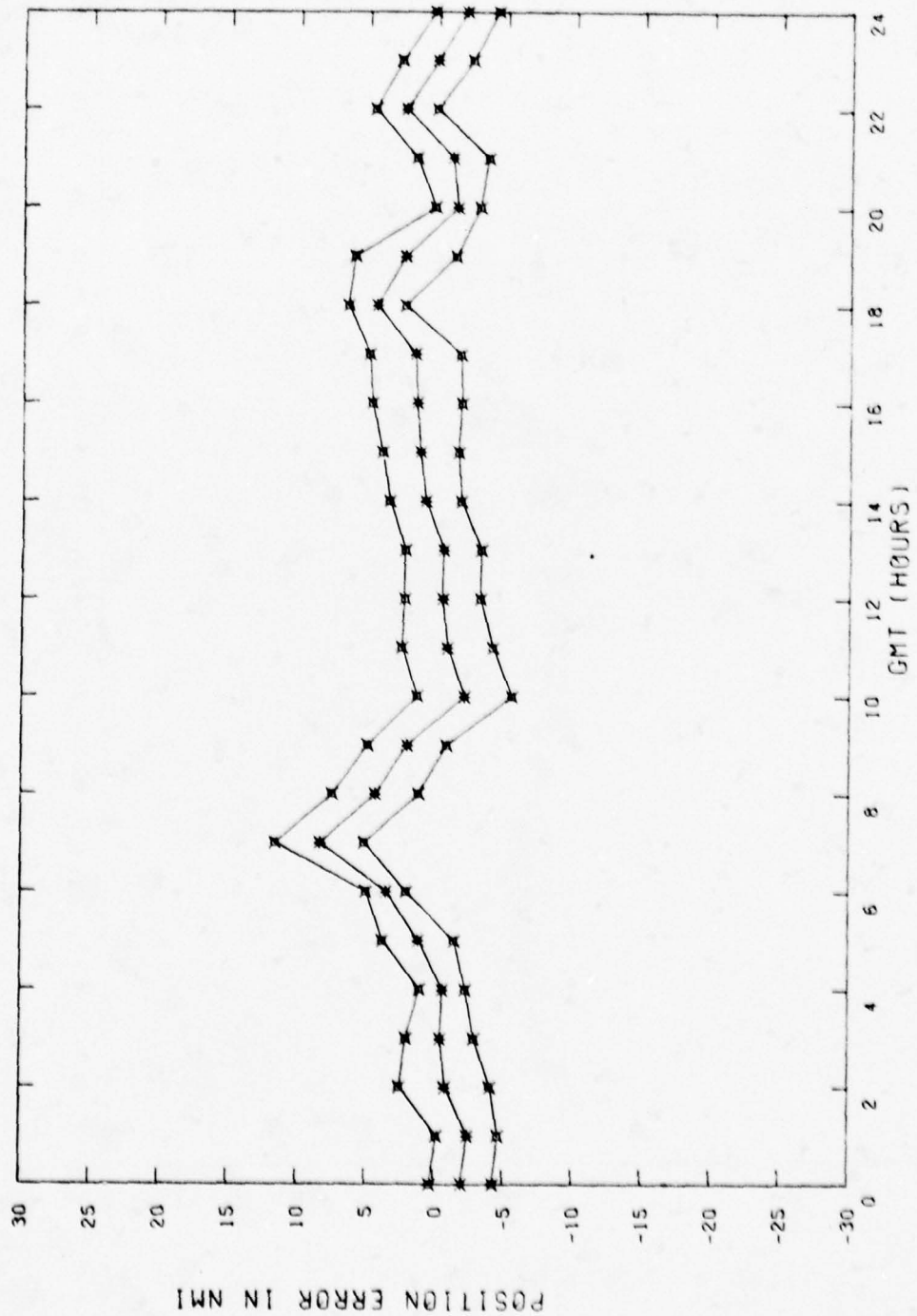


Figure A.17 Position Fix Error, East, Kwajalein, 1/77, 10.2, AH-EH

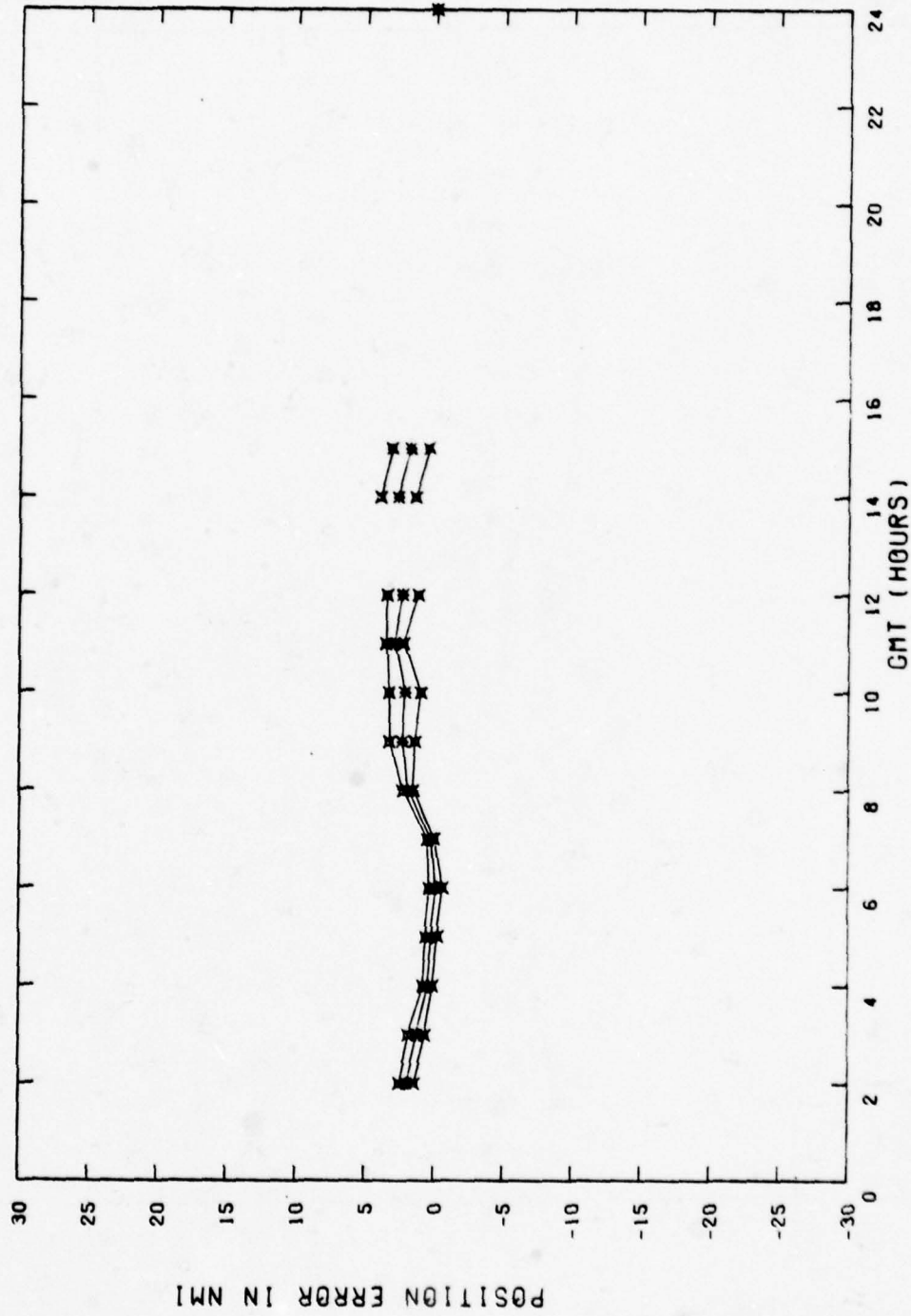


Figure A.18 Position Fix Error, North, Kwajalein, 1/77, 10.2, DE-EH

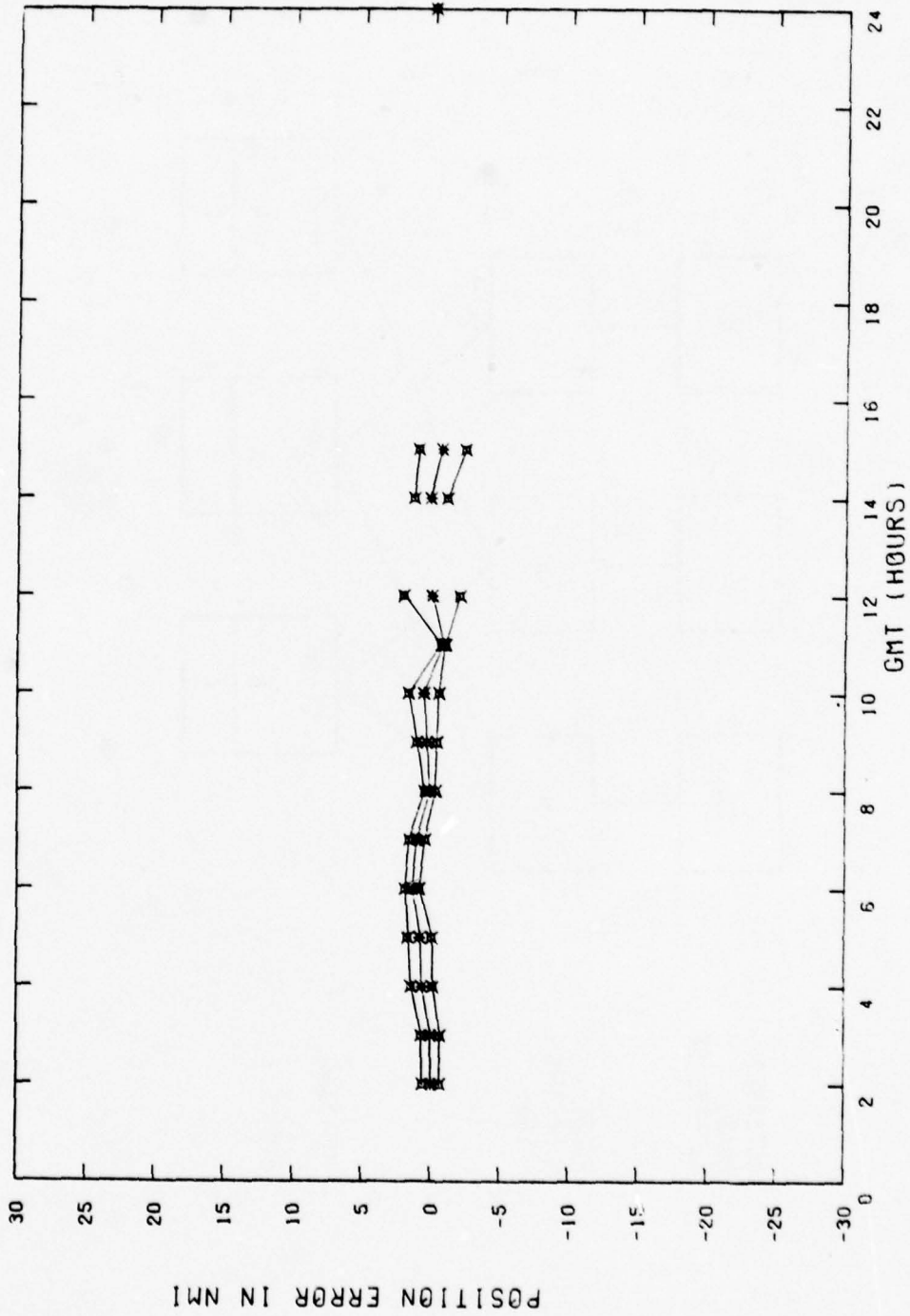


Figure A.19 Position Fix Error, East, Kwajalein, 1/77, 10.2, DE-EH

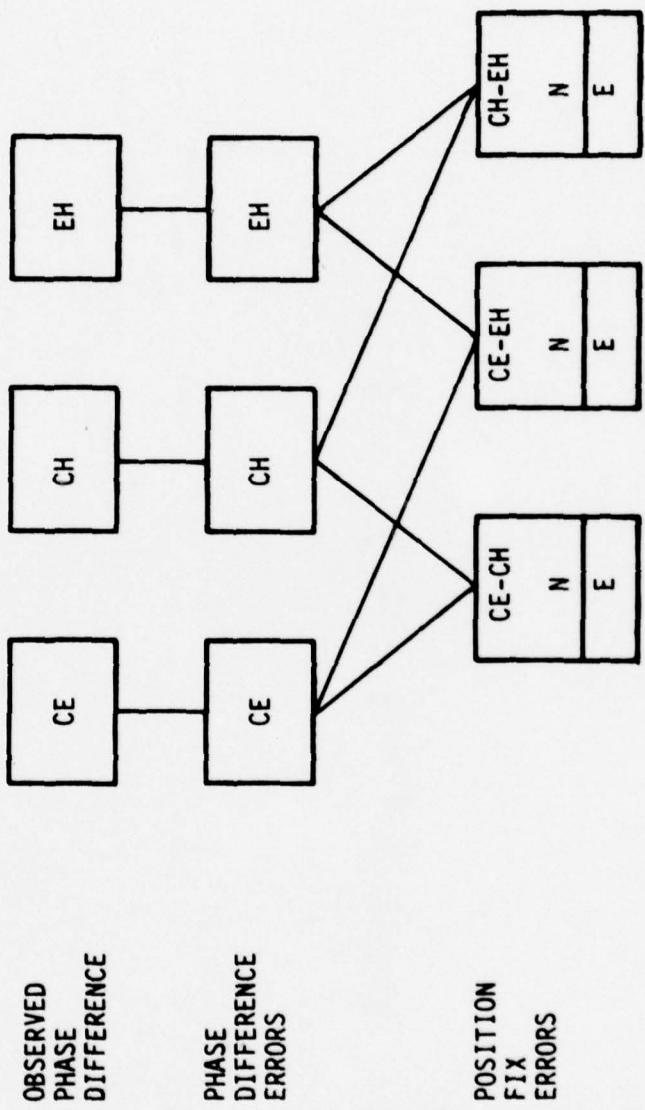


Figure A.20 Kwajalein Data Graphs, September 1977, 10.2

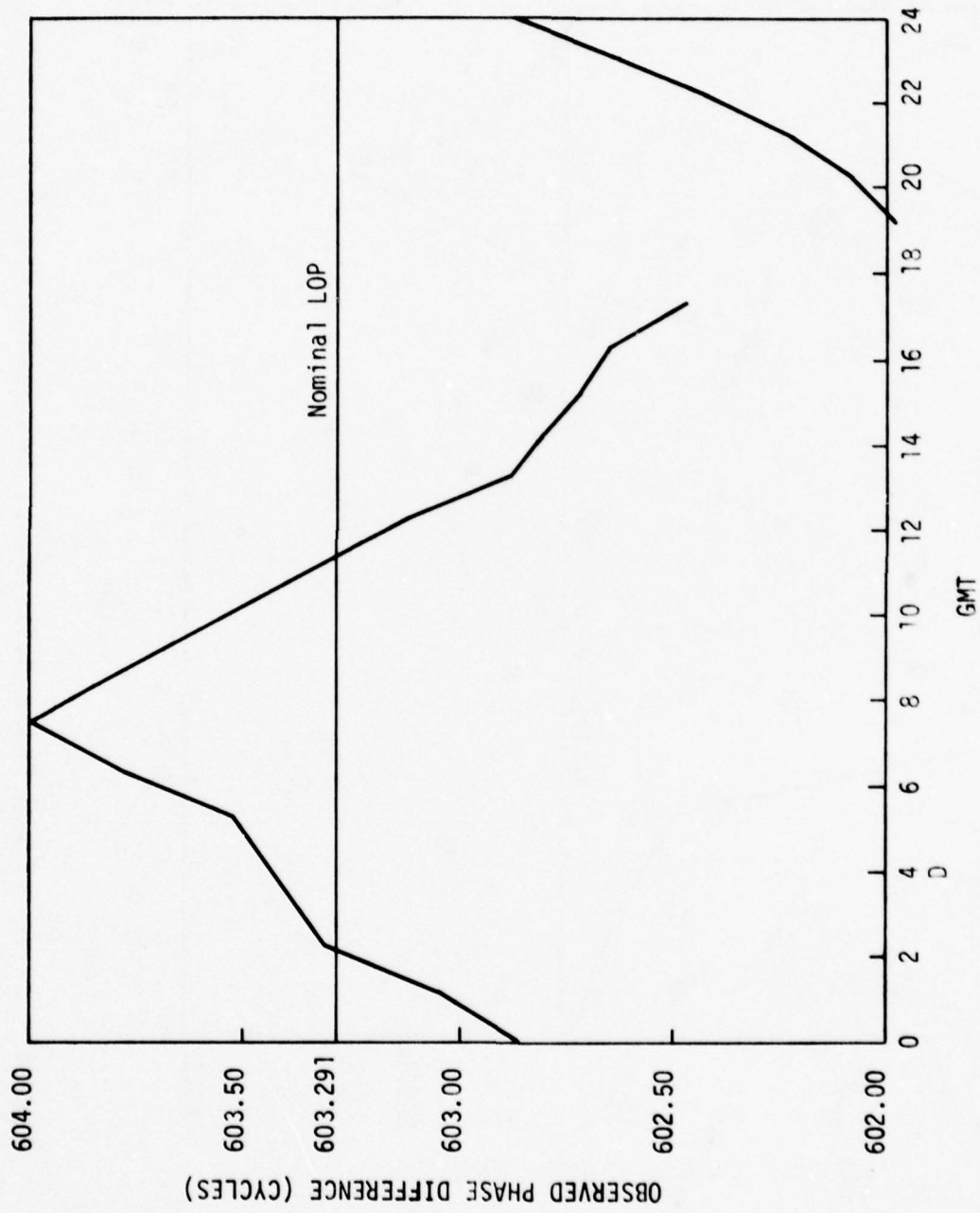


Figure A.21 Observed Phase Difference, Kwajalein, CE, 10.2, 9/77

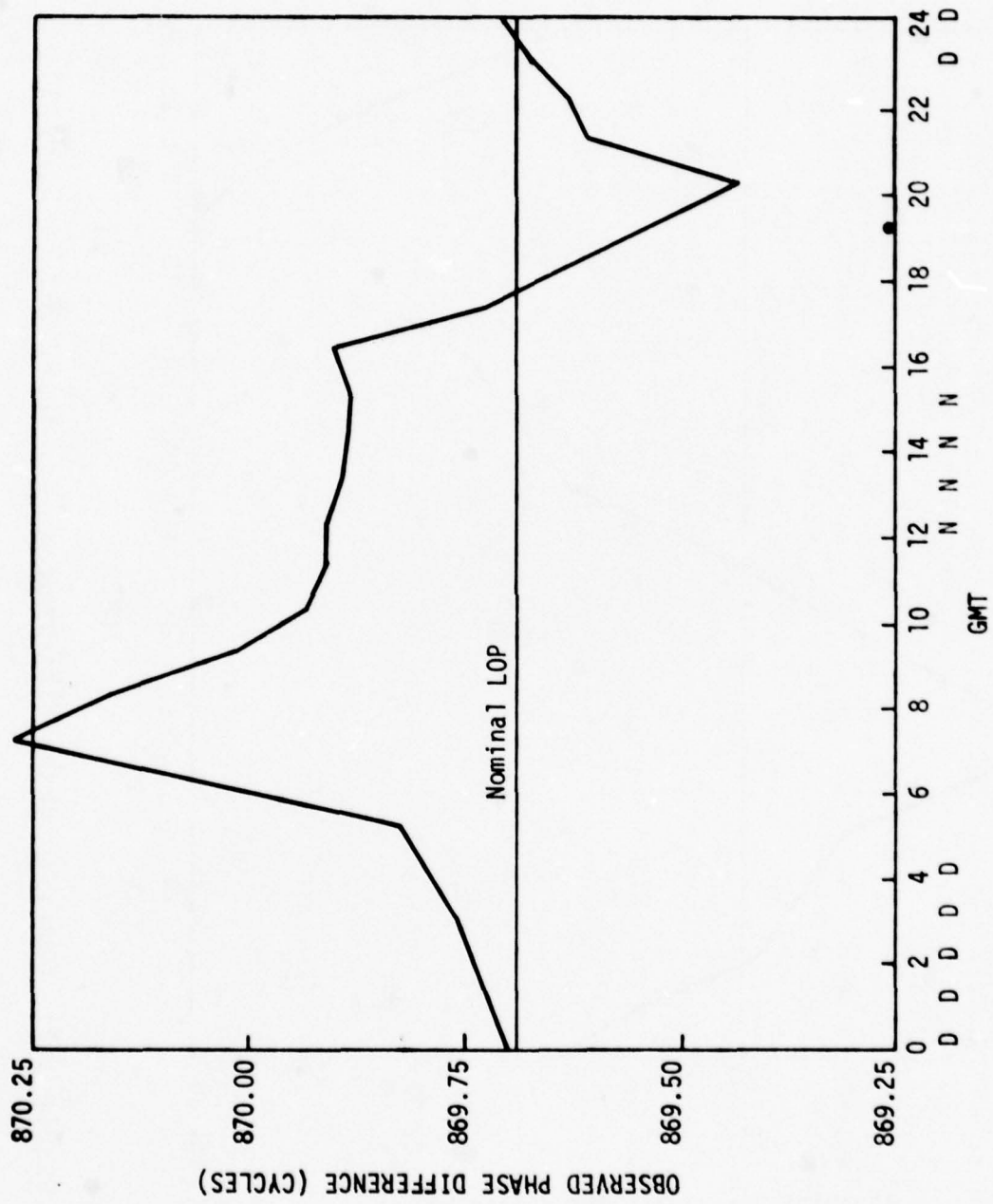


Figure A.22 Observed Phase Difference, Kwajalein, CH, 10.2, 9/77

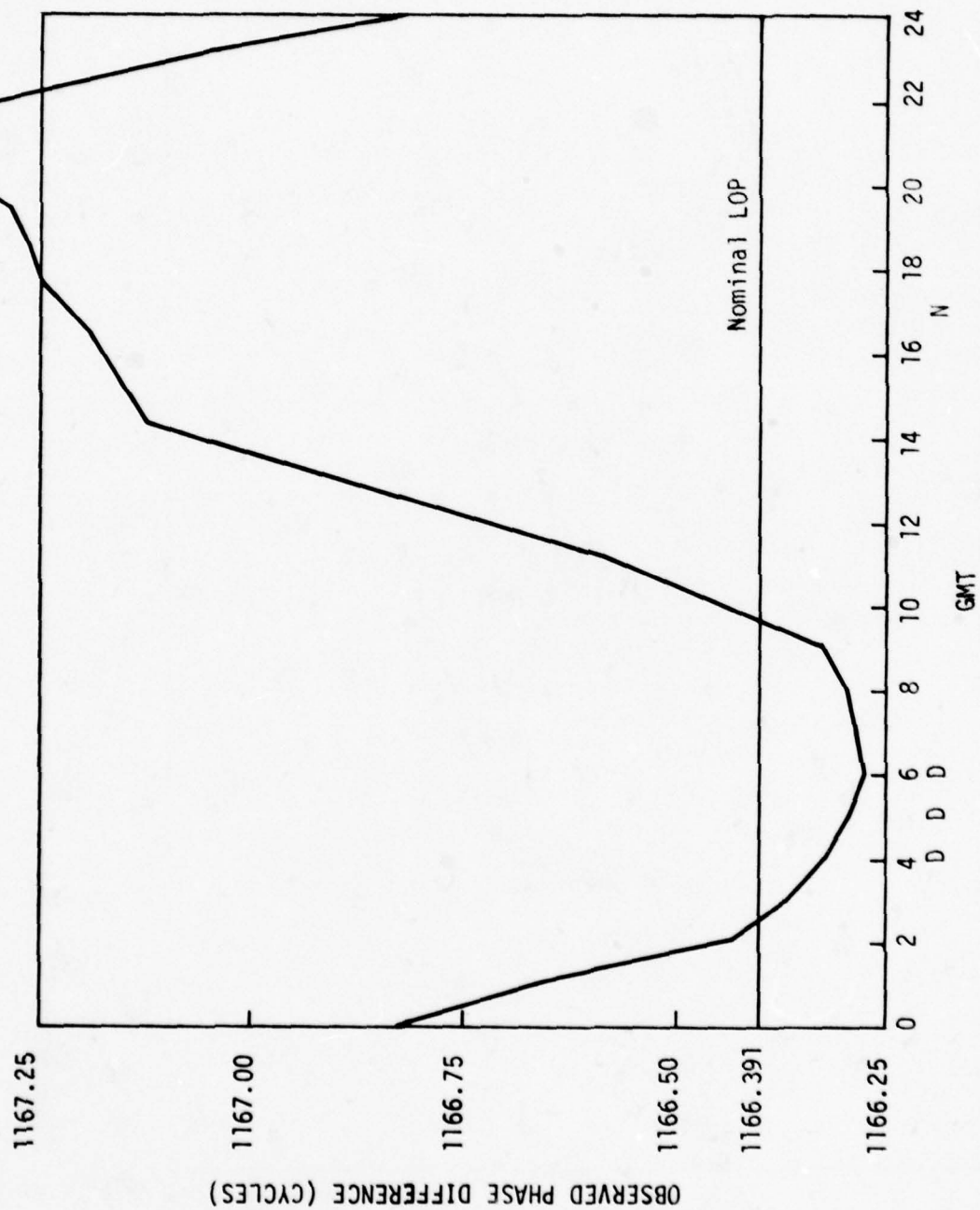


Figure A.23 Observed Phase Difference, Kwajalein, EH, 10.2, 9/77

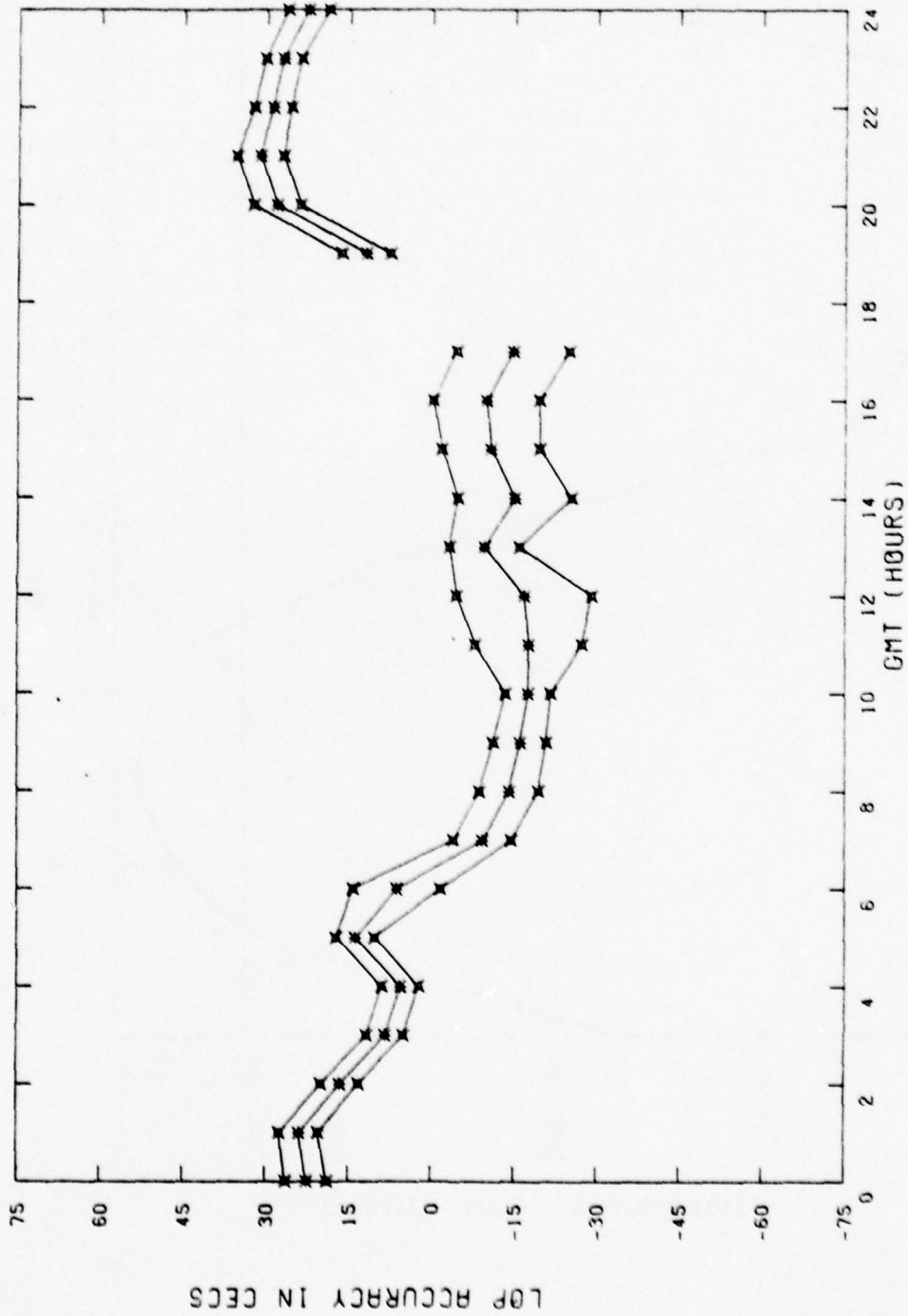


Figure A.24 Phase Difference Error, Kwajalein, 9/77, 10.2, CE

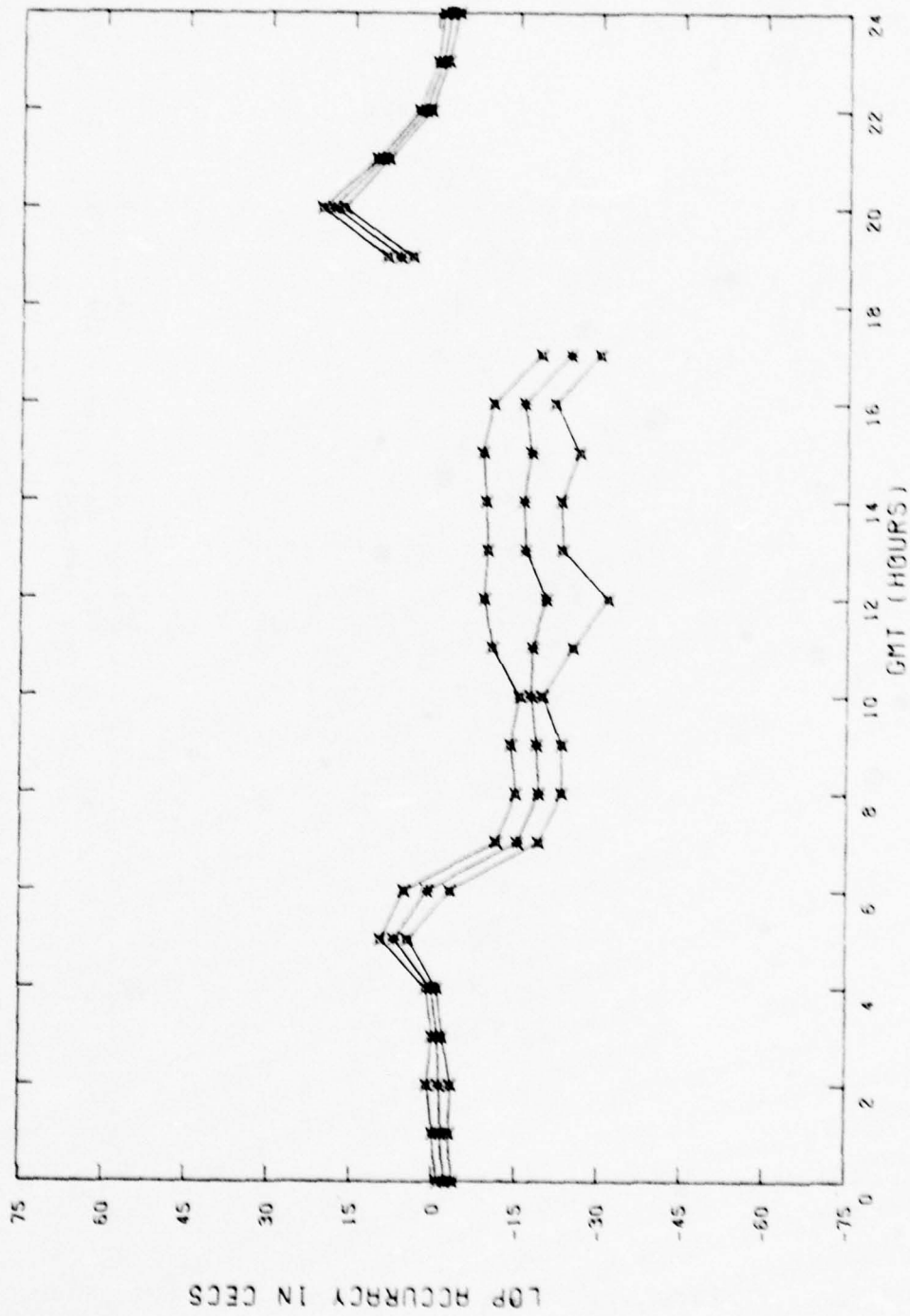


Figure A.25 Phase Difference Error, Kwajalein, 9/77, 10.2, CH

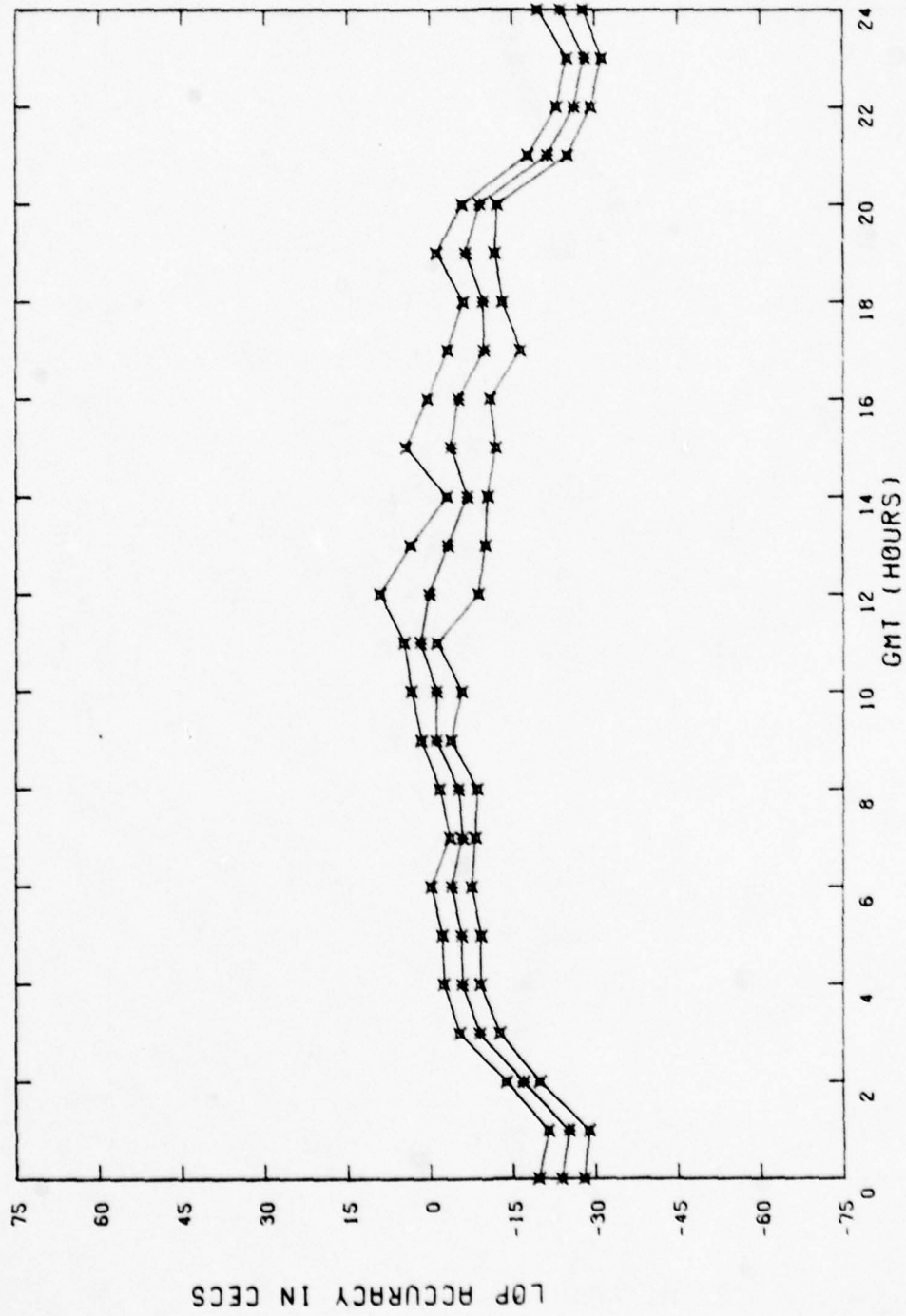


Figure A.26 Phase Difference Error, Kwajalein, 9/77, 10.2, EH

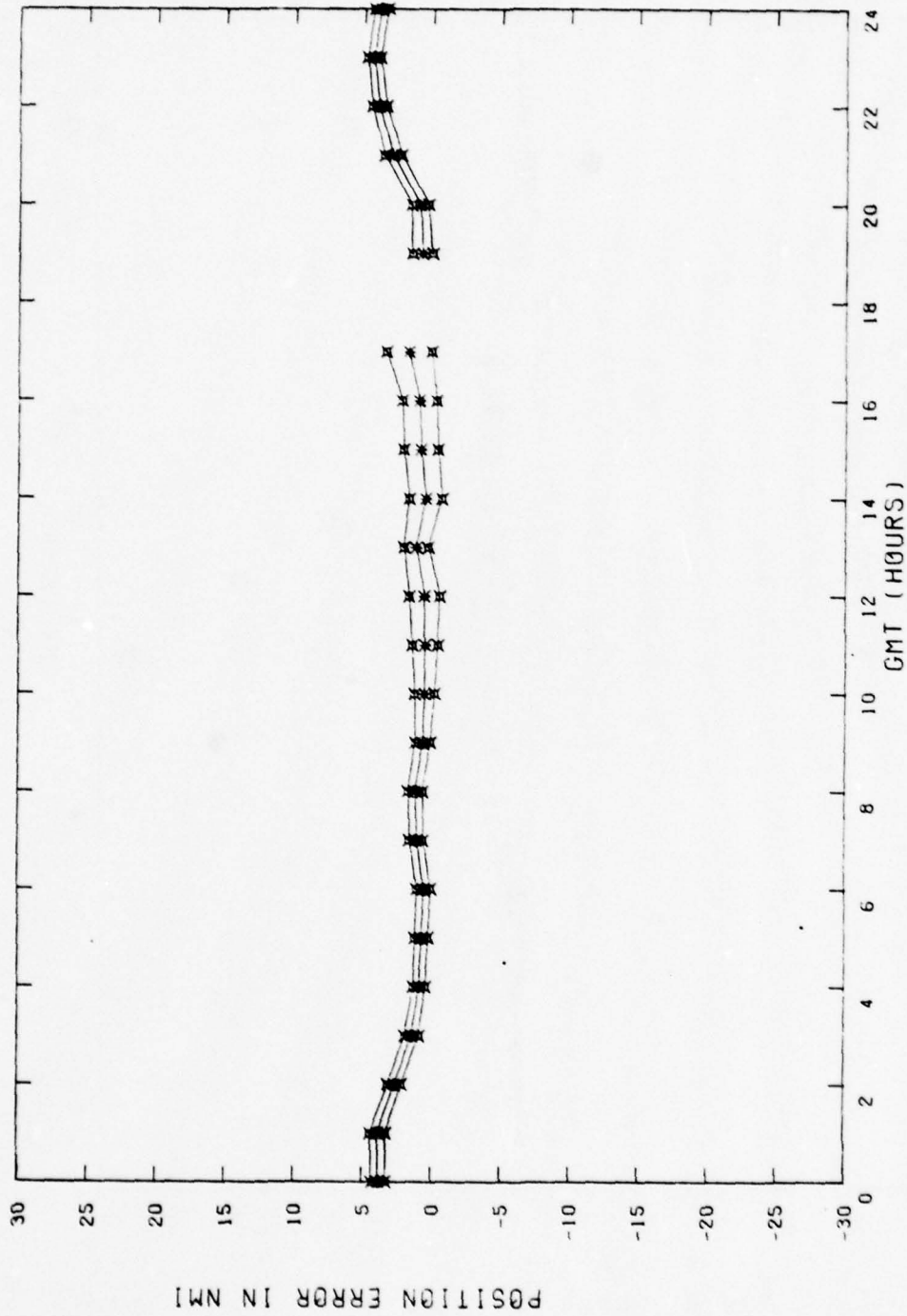


Figure A.27 Position Fix Error, North, Kwajalein, 9/77, 10.2, CE-CH

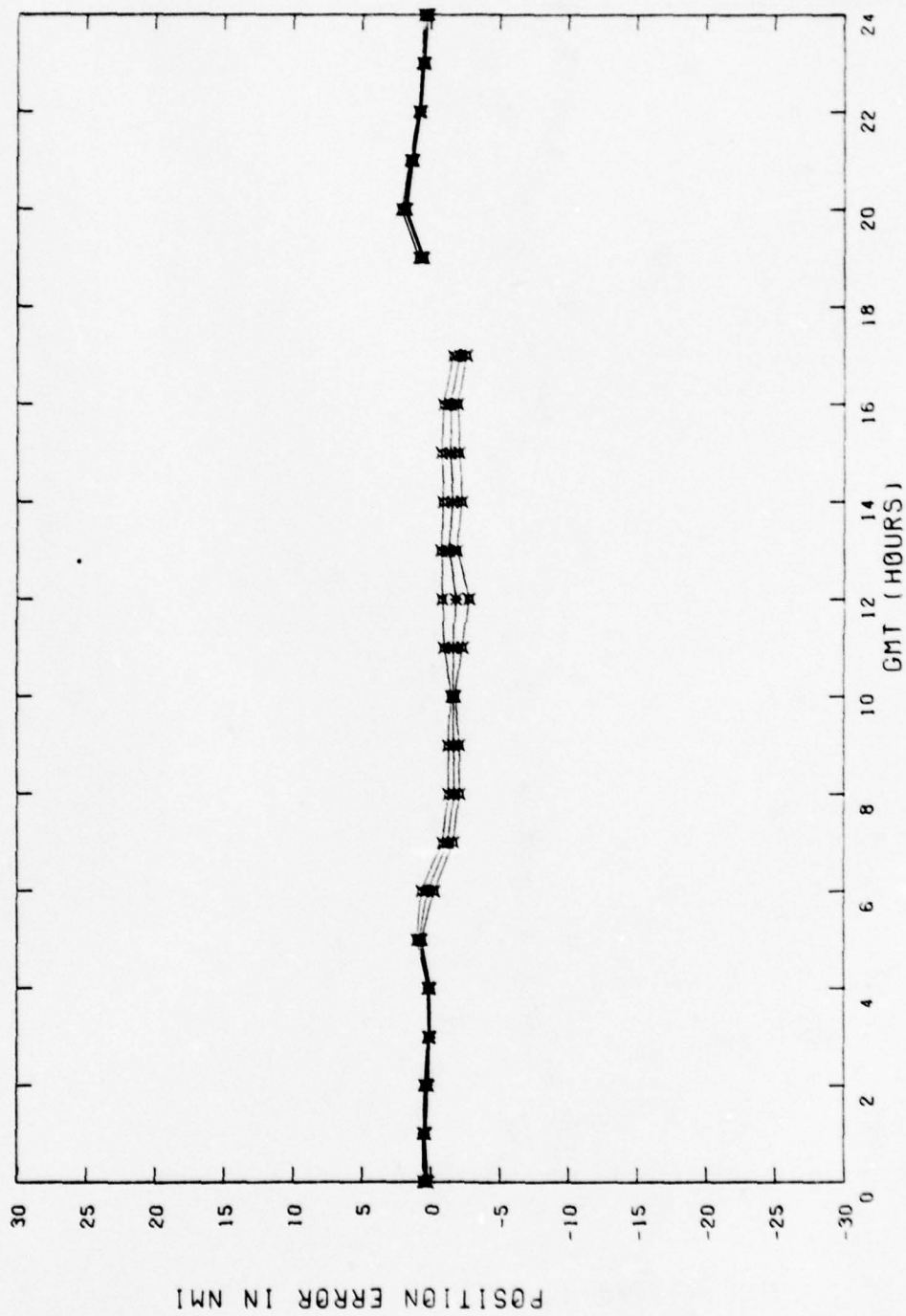


Figure A.28 Position Fix Error, East, Kwajalein, 9/77, 10.2, CE-CH

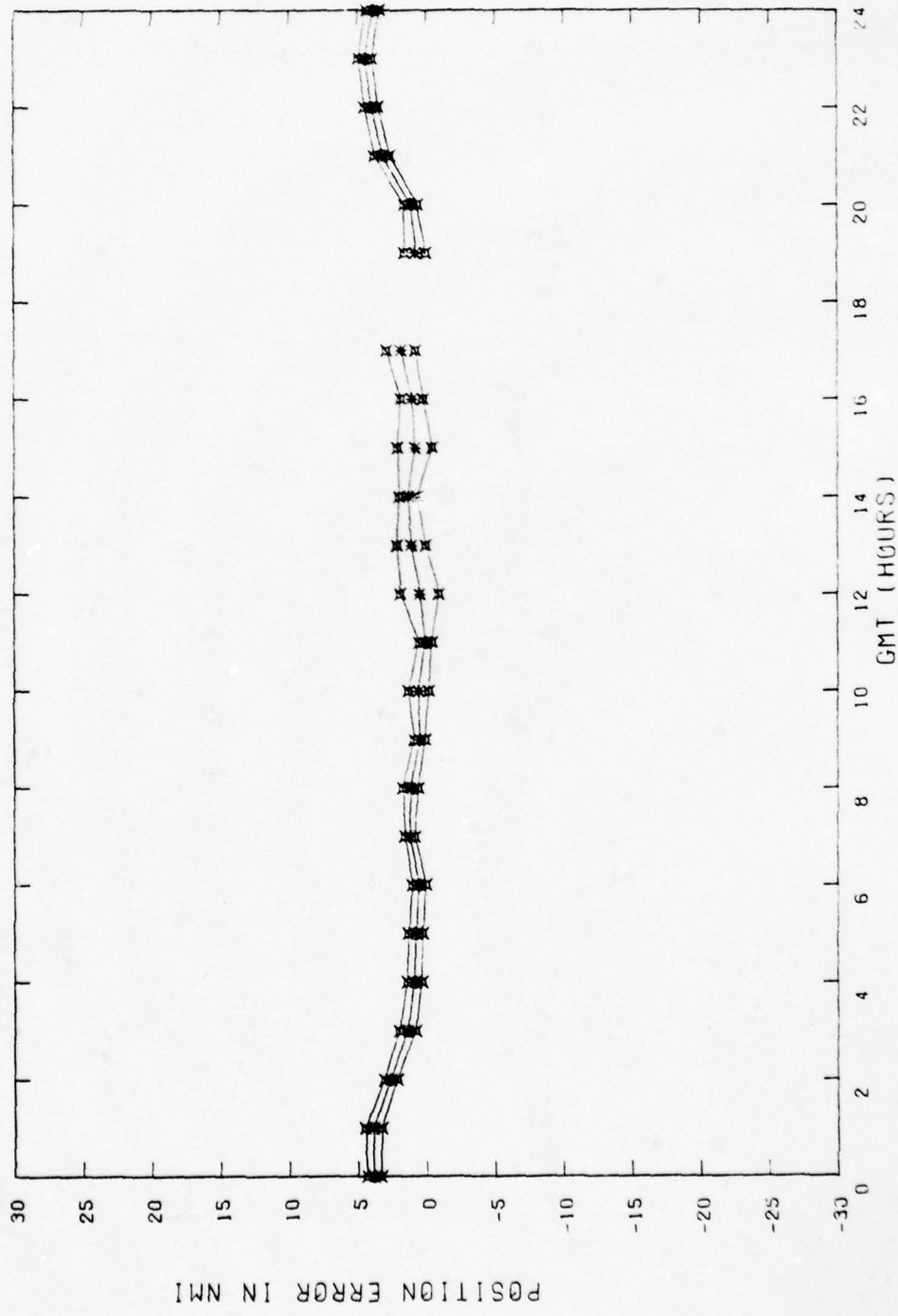


Figure A.29 Position Fix Error, North, Kwajalein, 9/77, 10.2, CE-EH

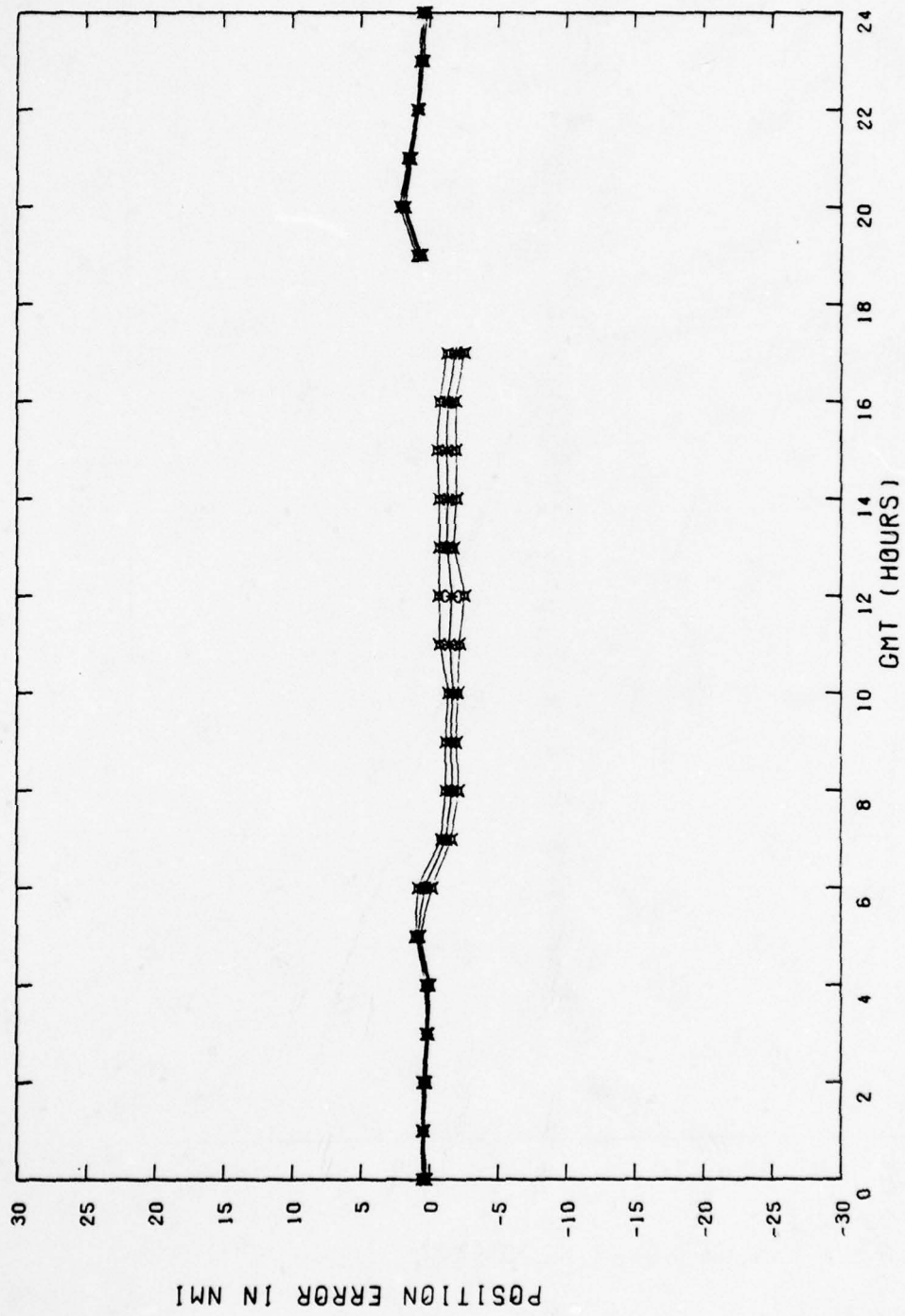


Figure A.30 Position Fix Error, East, Kwajalein, 9/77, 10.2, CE-EH

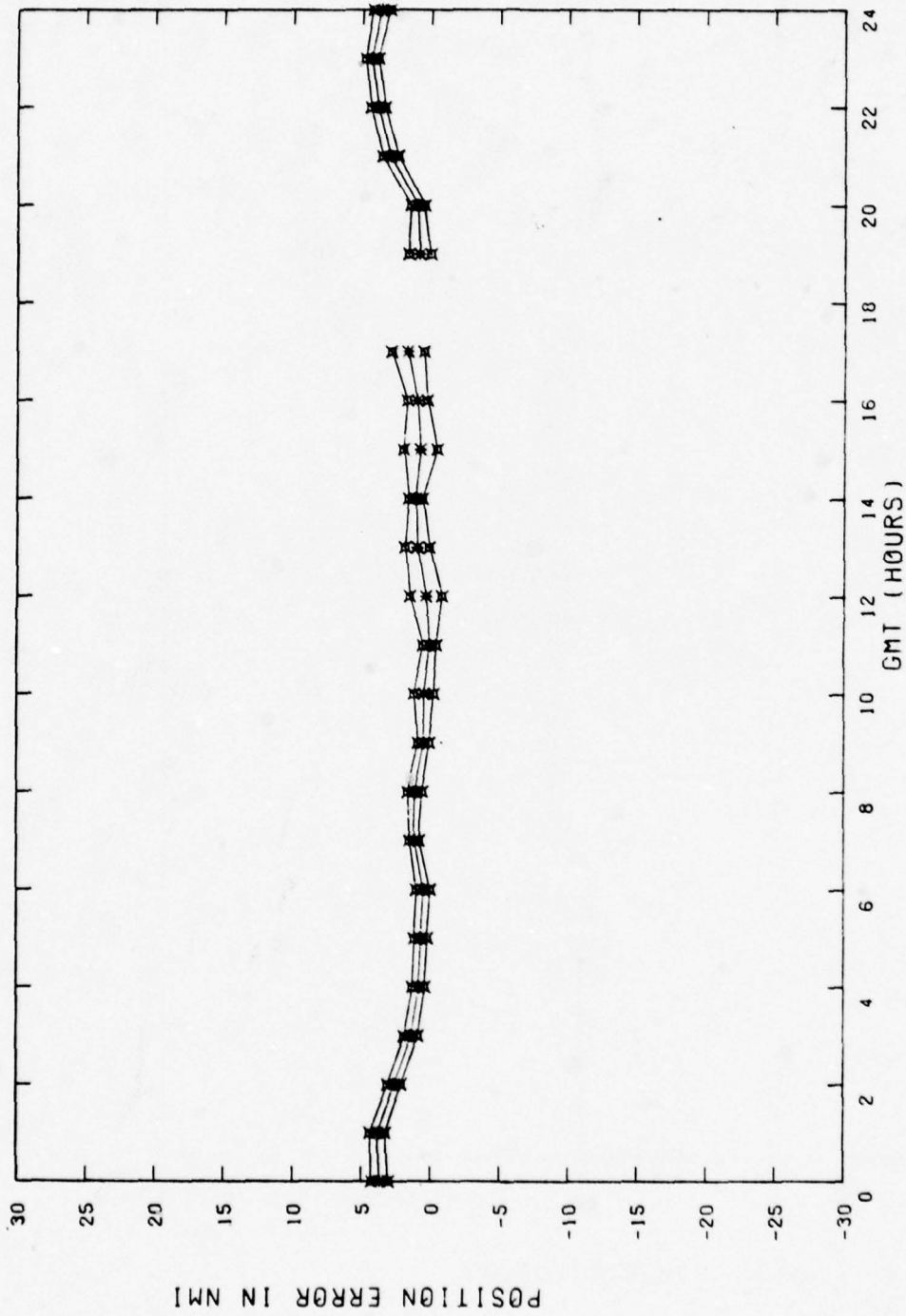


Figure A.31 Position Fix Error, North, Kwajalein, 9/77, 10.2, CH-EH

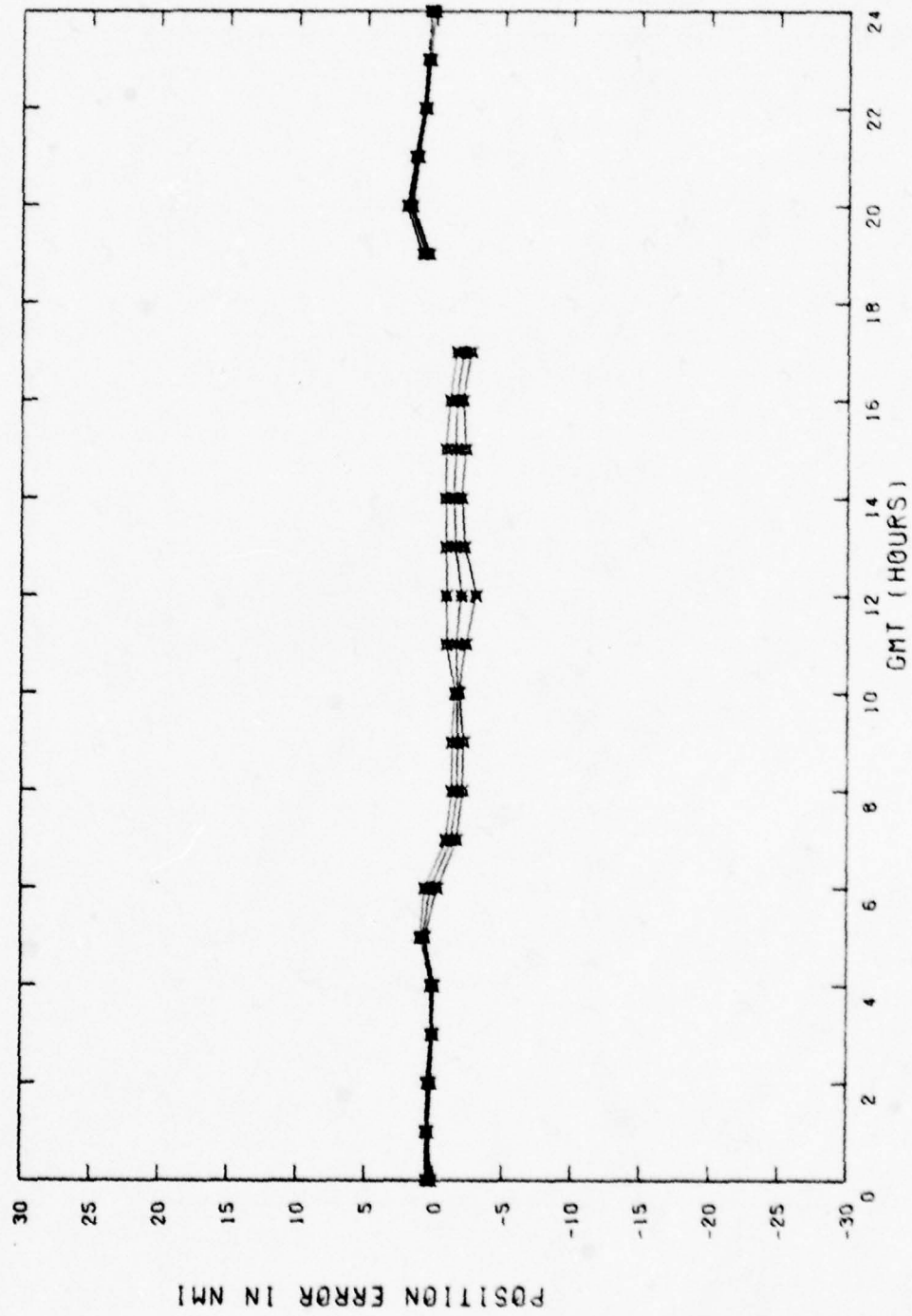


Figure A.32 Position Fix Error, East, Kwajalein, 9/77, 10.2, CH-EH

APPENDIX B
OROTE POINT DATA

This appendix contains data which have been derived from magnetic tape recordings made at the ONSOD Omega monitoring site at Orote Point, Guam. The total data base available from Orote Point is summarized in Table 4.1 of the main text. Data taken during the months of February, March, July, and September were selected from the total data base for detailed examination and analysis. These selected data have been formatted into convenient graphical presentations for inclusion in this appendix.

Three types of related graphic presentations of the Orote Point data are presented. These are:

- (1) Phase Difference Monthly Summaries: Diurnal plots of the average monthly phase difference between pairs of Omega signals are provided. These plots represent data as observed by the Orote Point Omega receiver and prior to processing or the addition of PPCs.
- (2) LOP Monthly Summaries: The phase difference data of item (1) were corrected with PPC values supplied by ONSOD, normalized to the Orote Point site location and presented as diurnal plots of the monthly average LOP. Also included in the LOP monthly summaries is the diurnal standard deviation of the measured data.
- (3) Position Fix Summaries: Data from pairs of LOPs were combined to obtain site location as determined from the Omega data. Site location values were compared to the known geographic locations of the Orote Point site to provide diurnal plots of north and east position fix errors.

The Orote Point data plots are presented in sequences which are related to their method of generation. The 10.2 kHz February data are presented as a group followed by the 10.2 kHz September data.

The sequence of the presentation of the February data is summarized in Figure B.1. Two plots of measured phase difference summaries for stations CH and DH are followed by their related LOP monthly summaries. LOP pairs are then combined to produce pairs of north and east error plots. The September data are presented in a similar manner as shown in Figure B.12.

Additional Orote Point data were processed and plotted to permit a comparison between 10.2 and 13.6 kHz results. The ONSOD master file was reviewed to determine months containing both 10.2 and 13.6 data and data from selected months were processed and plotted in a manner similar to the previous Orote Point data. The sequence of presentation of these 10.2 and 13.6 kHz data are shown in Figures B.1 and B.32, respectively.

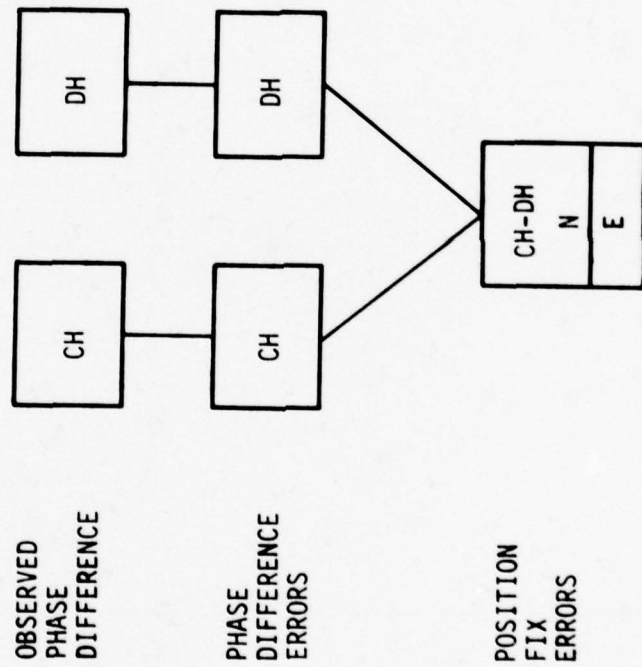


Figure B.1 Orote Pt. Data Graphs, February, 1976, 10.2

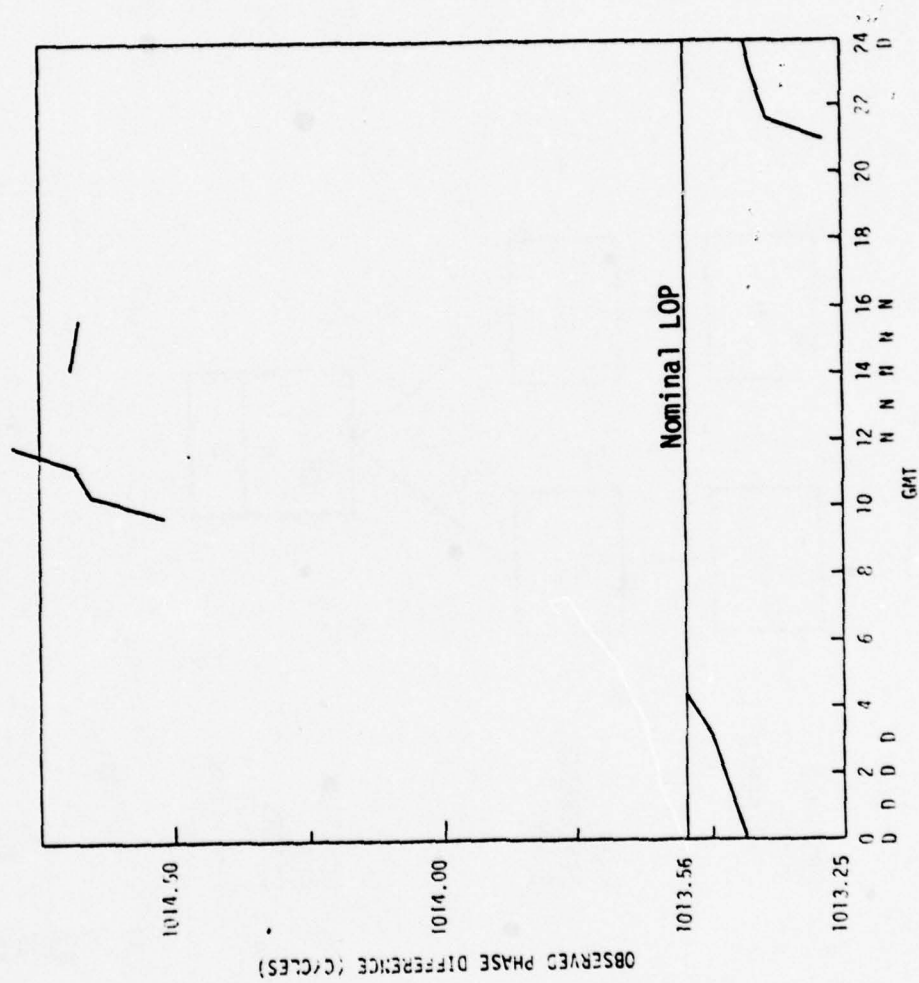


Figure B.2 Observed Phase Difference, Orote, 2/76, 10.2, CH

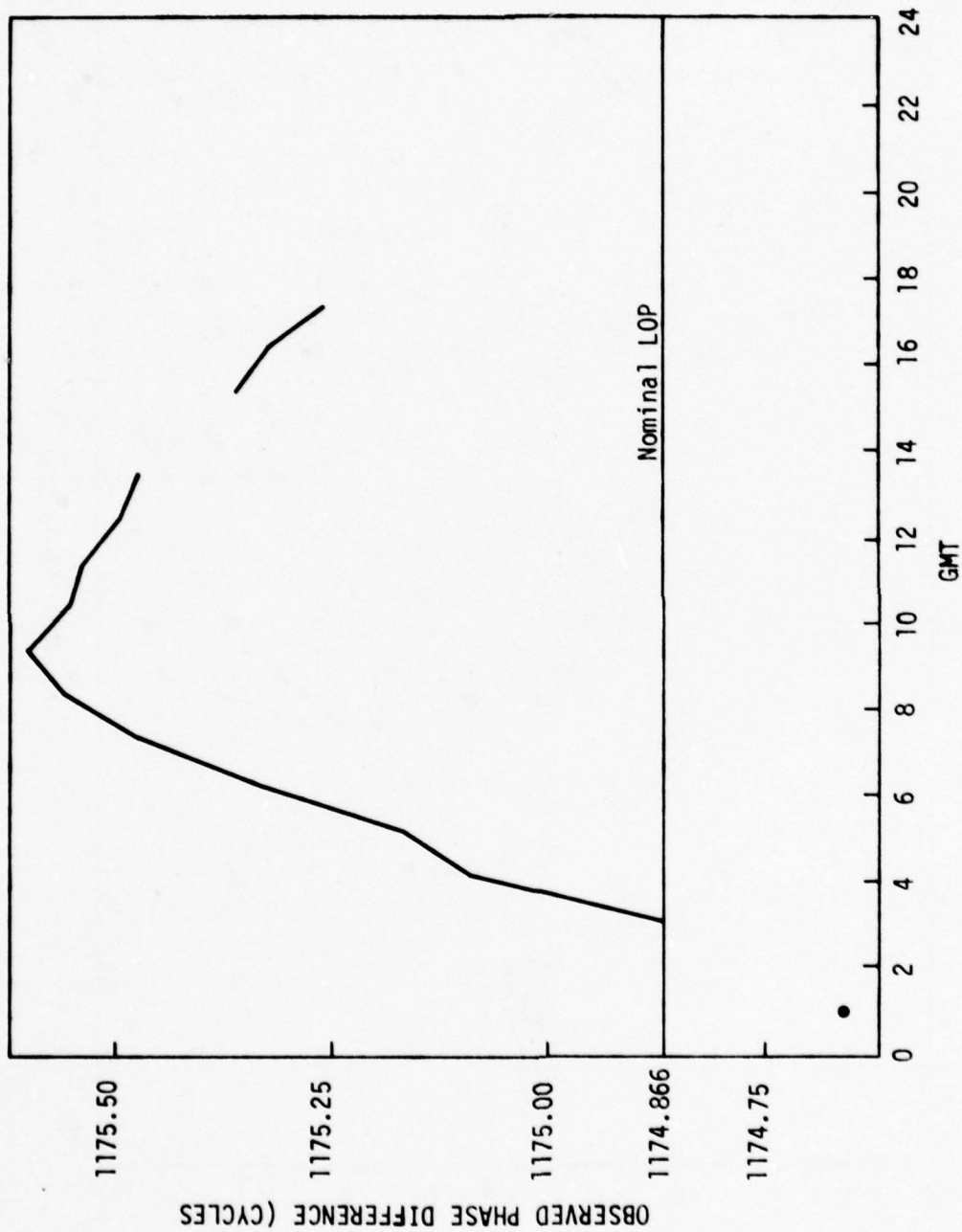


Figure B.3 Observed Phase Difference, Orote Pt., DH, 10.2, 2/76

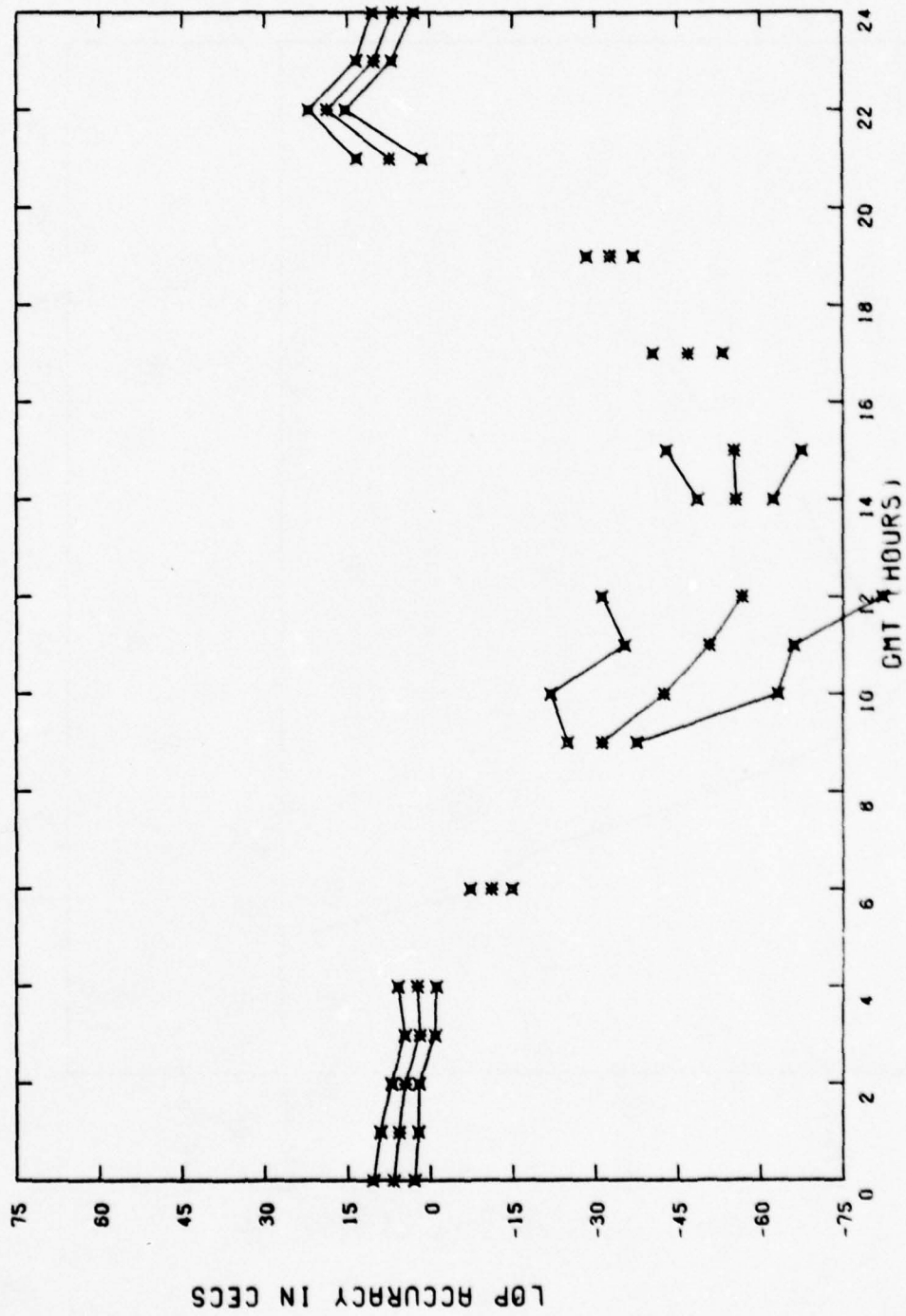


Figure B.4 Phase Difference Error, Orote, 2/76, 10.2, CH

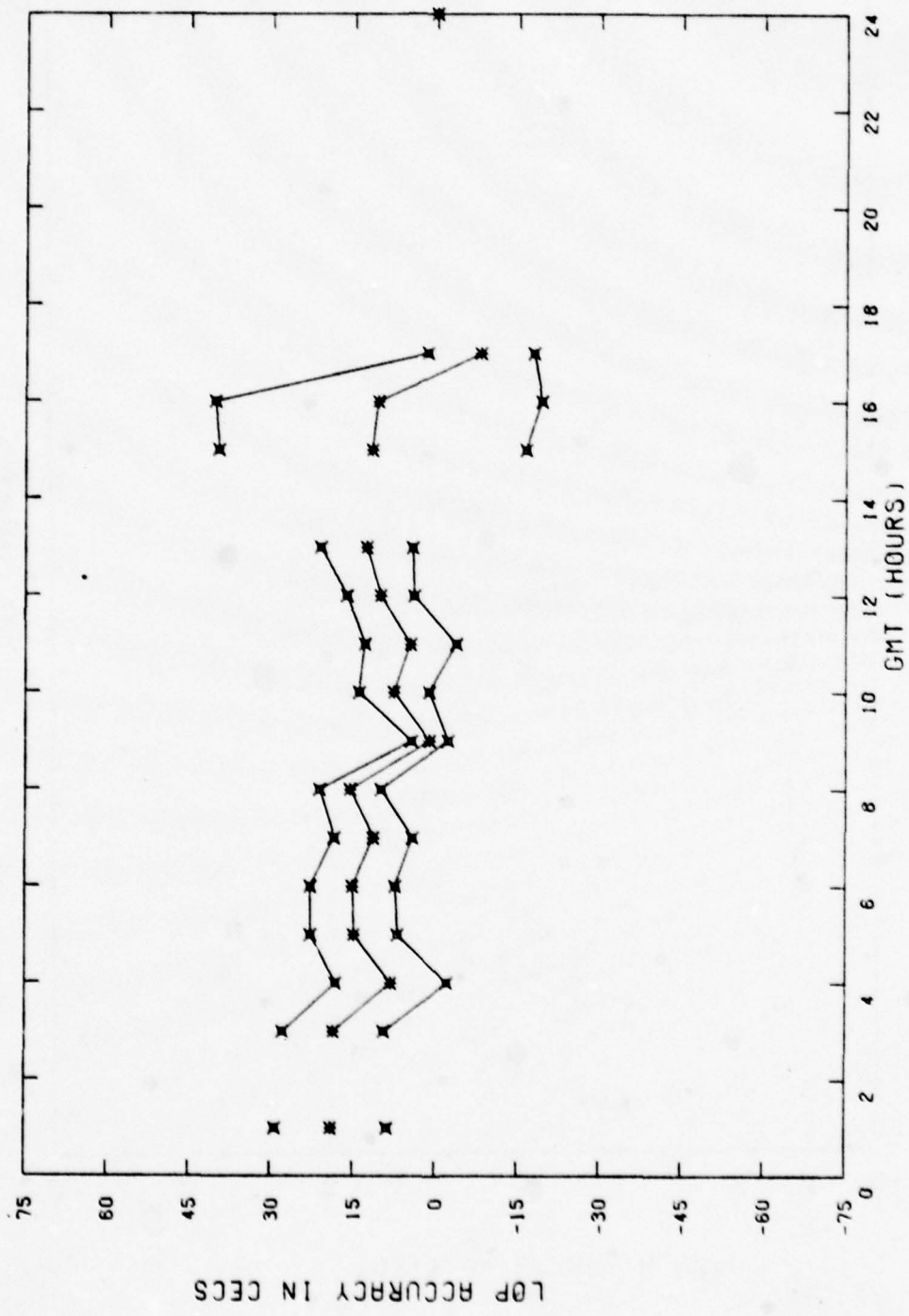


Figure B.5 Phase Difference Error, Orote, 2/76, 10.2, DH

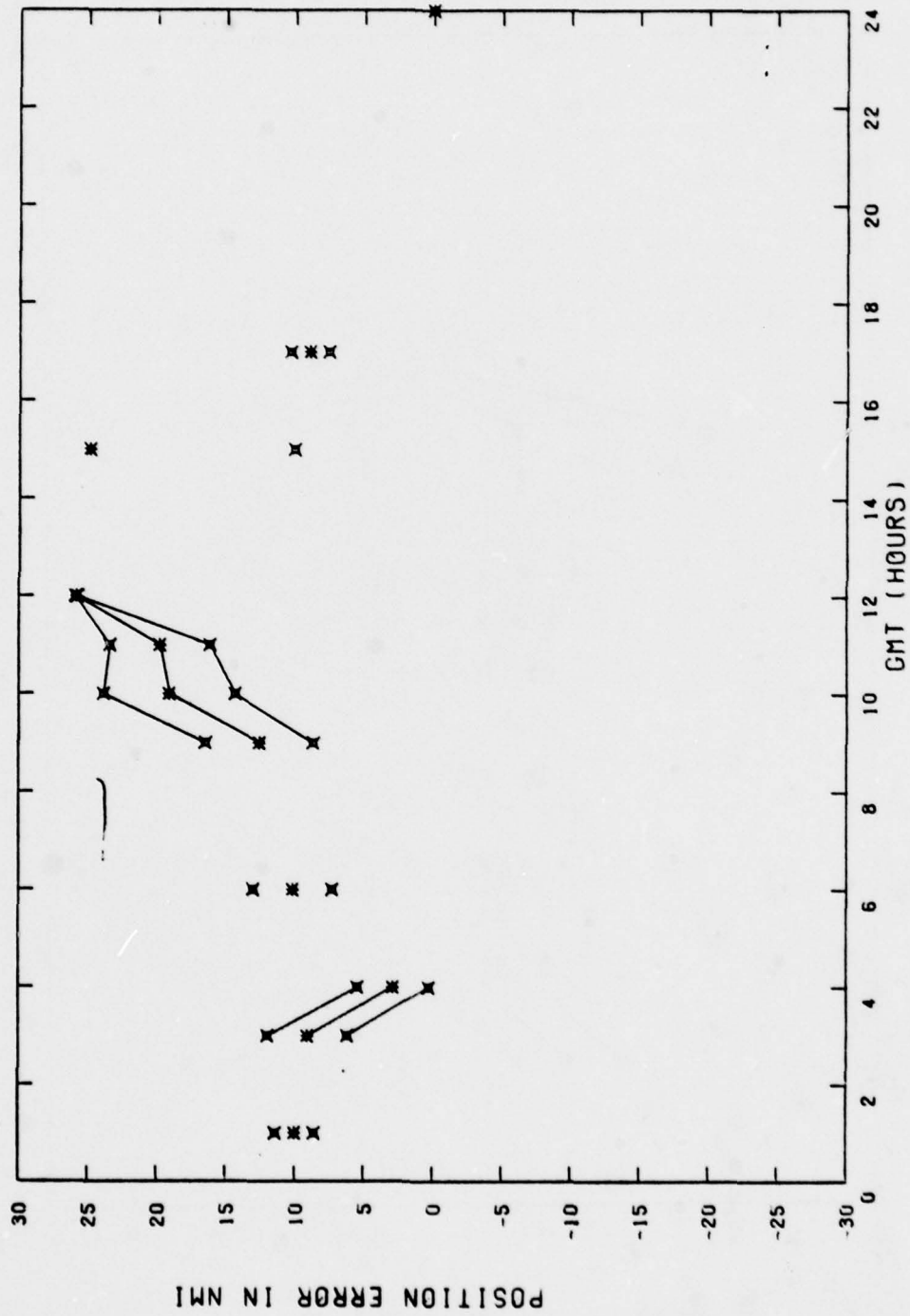


Figure B.6 Position Fix Error, North, Orote, 2/76, 10.2, CH-DH

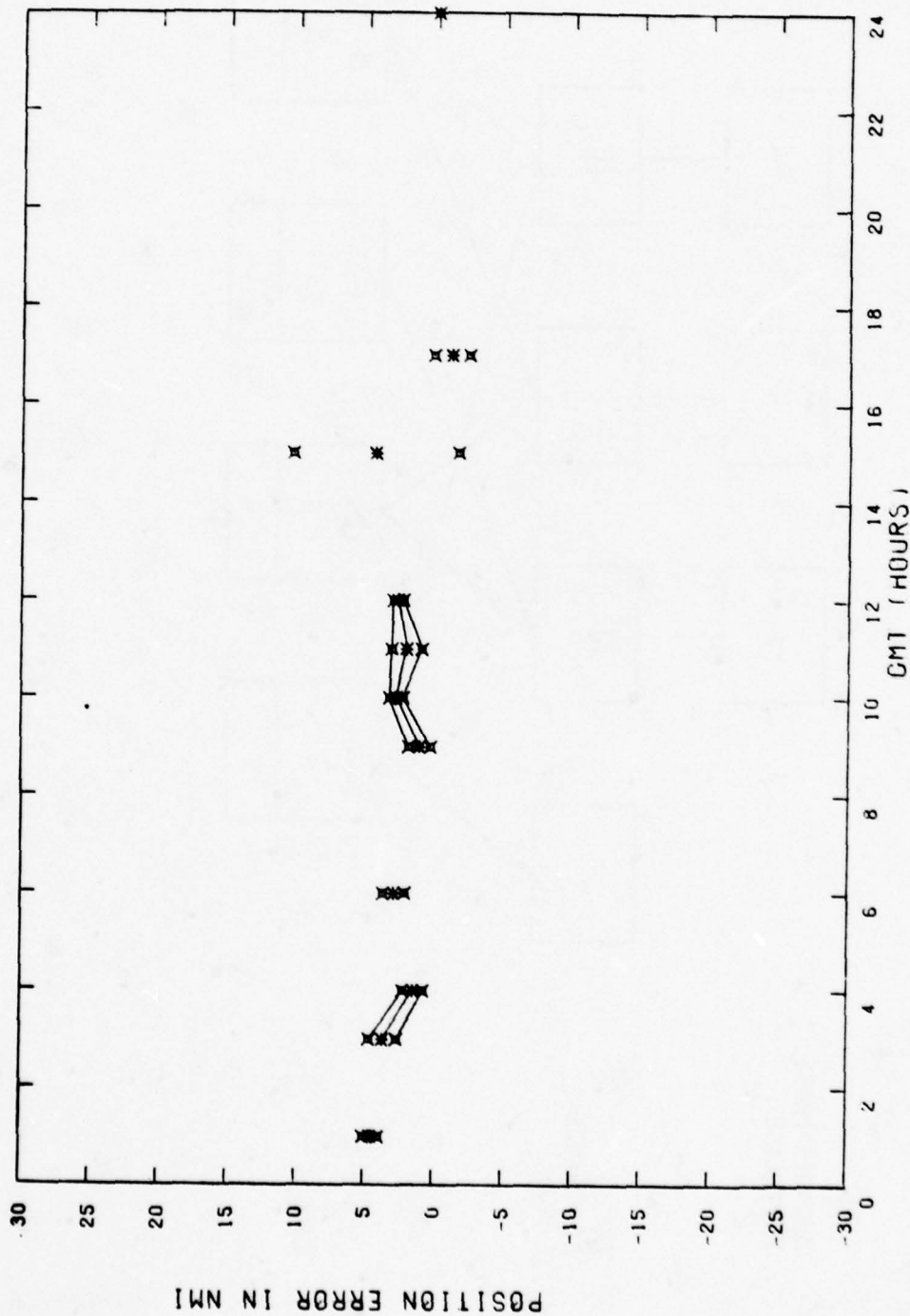


Figure B.7 Position Fix Error, Fast, Orote, 2/76, 10.2, CH-DH

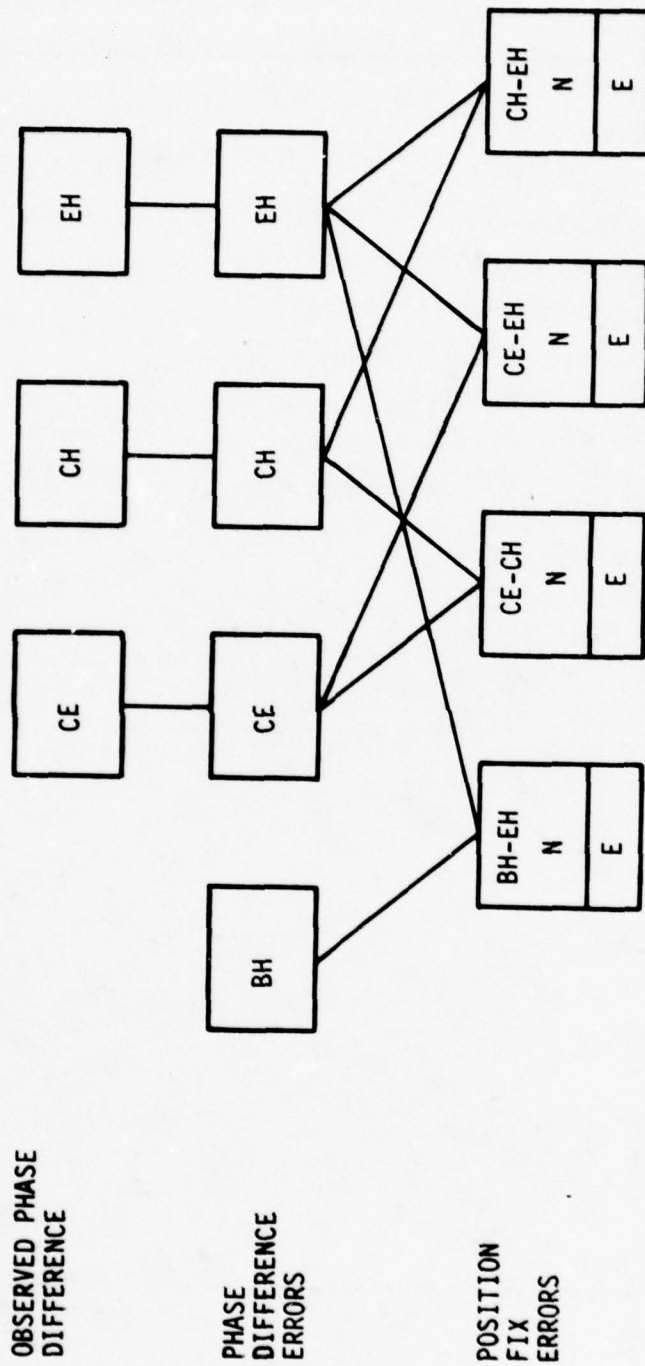


Figure B.8 Orote Pt. Data Graphs, September 1977, 10.2

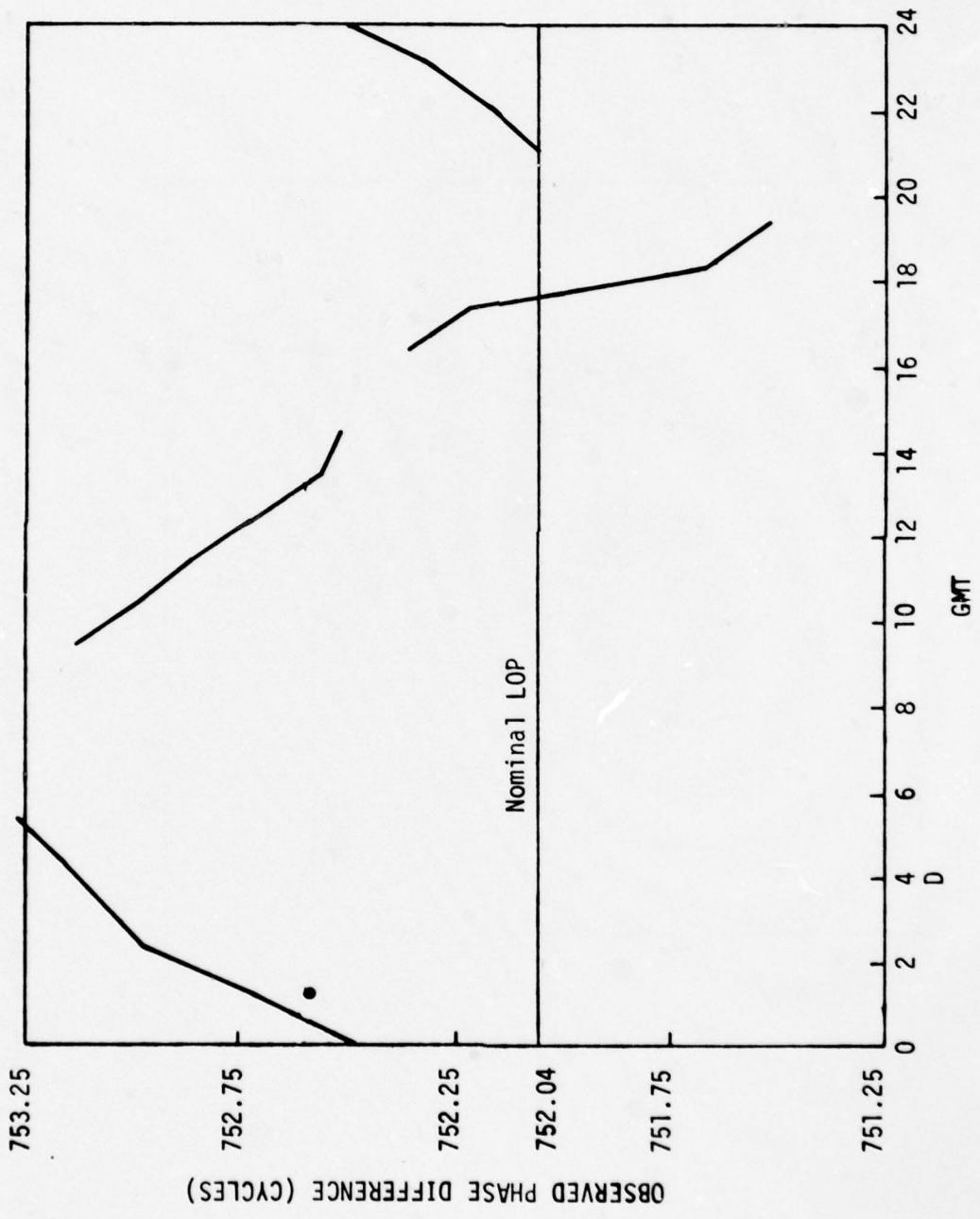


Figure B.9 Observed Phase Difference, Orote Pt., CE, 9/77

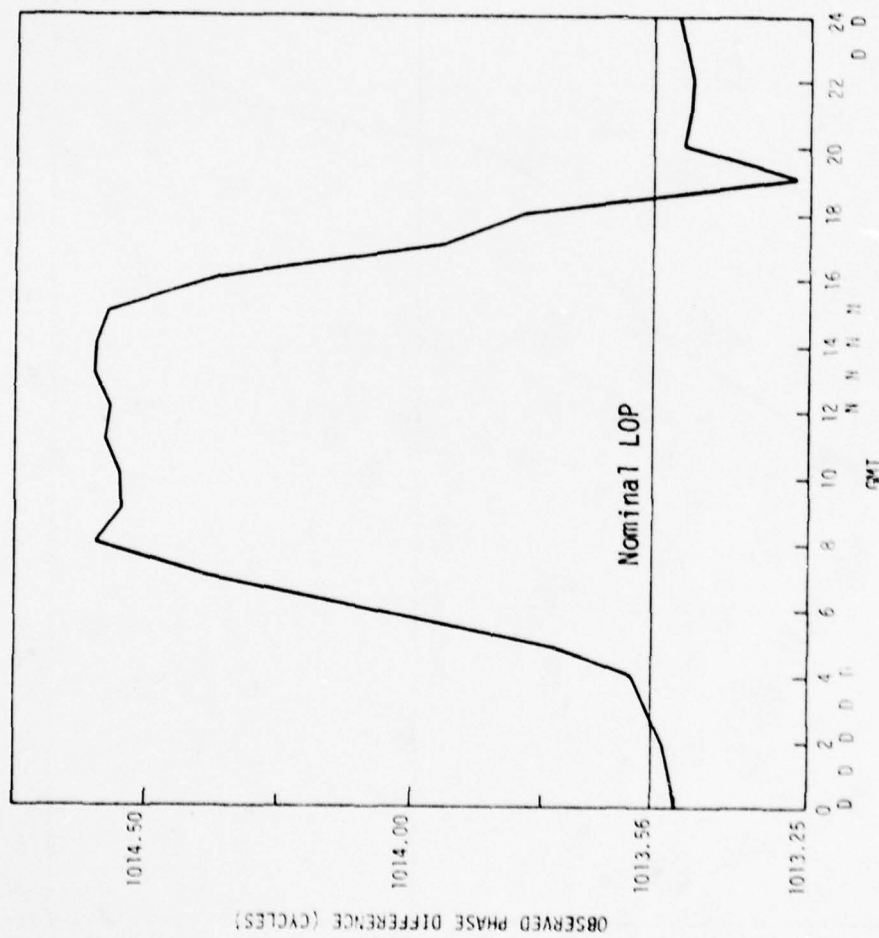


Figure B.10 Observed Phase Difference, Orote, 9/77, 10.2, CH

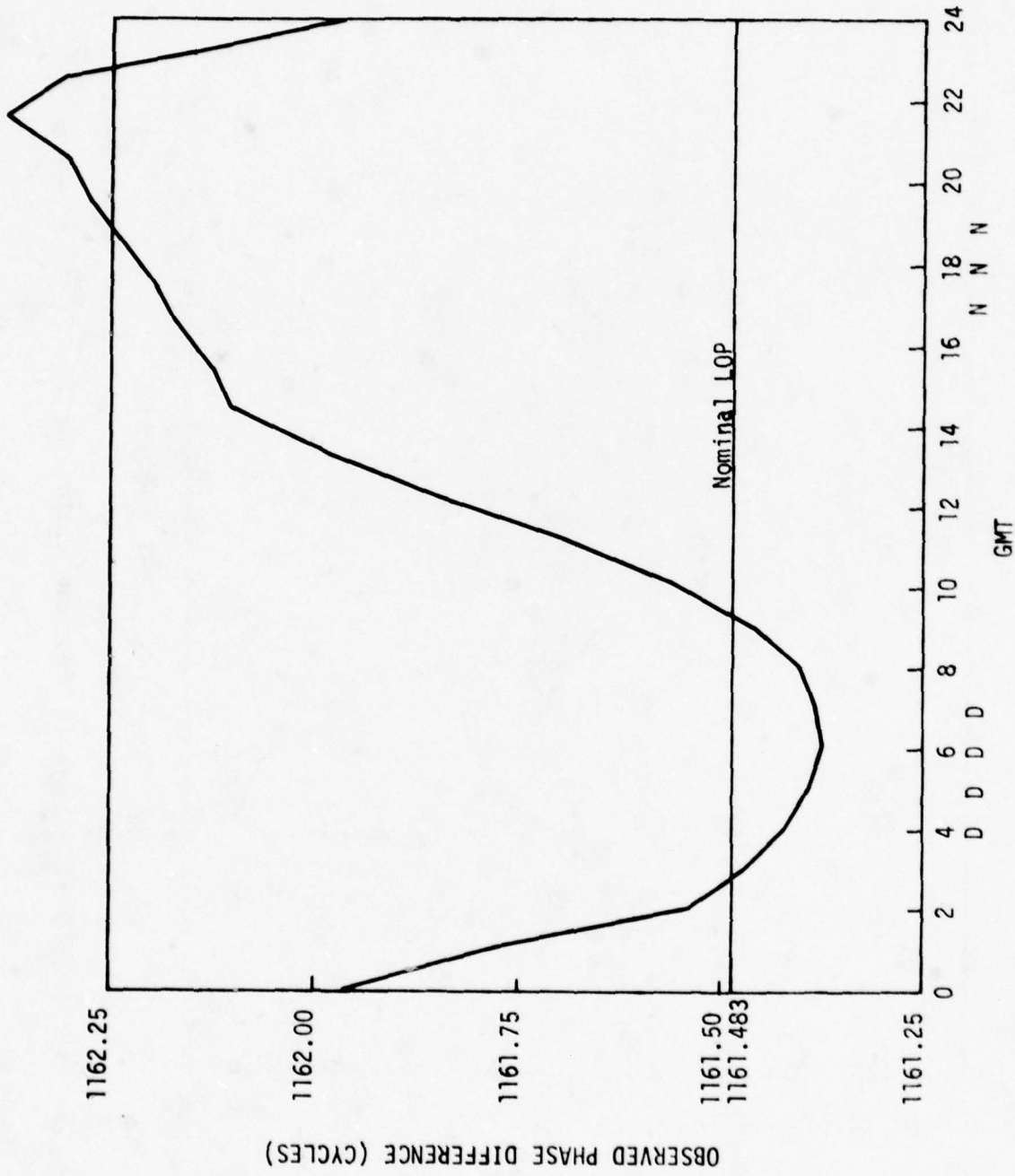


Figure B.11 Observed Phase Difference, Orote, 9/77, 10.2, EH

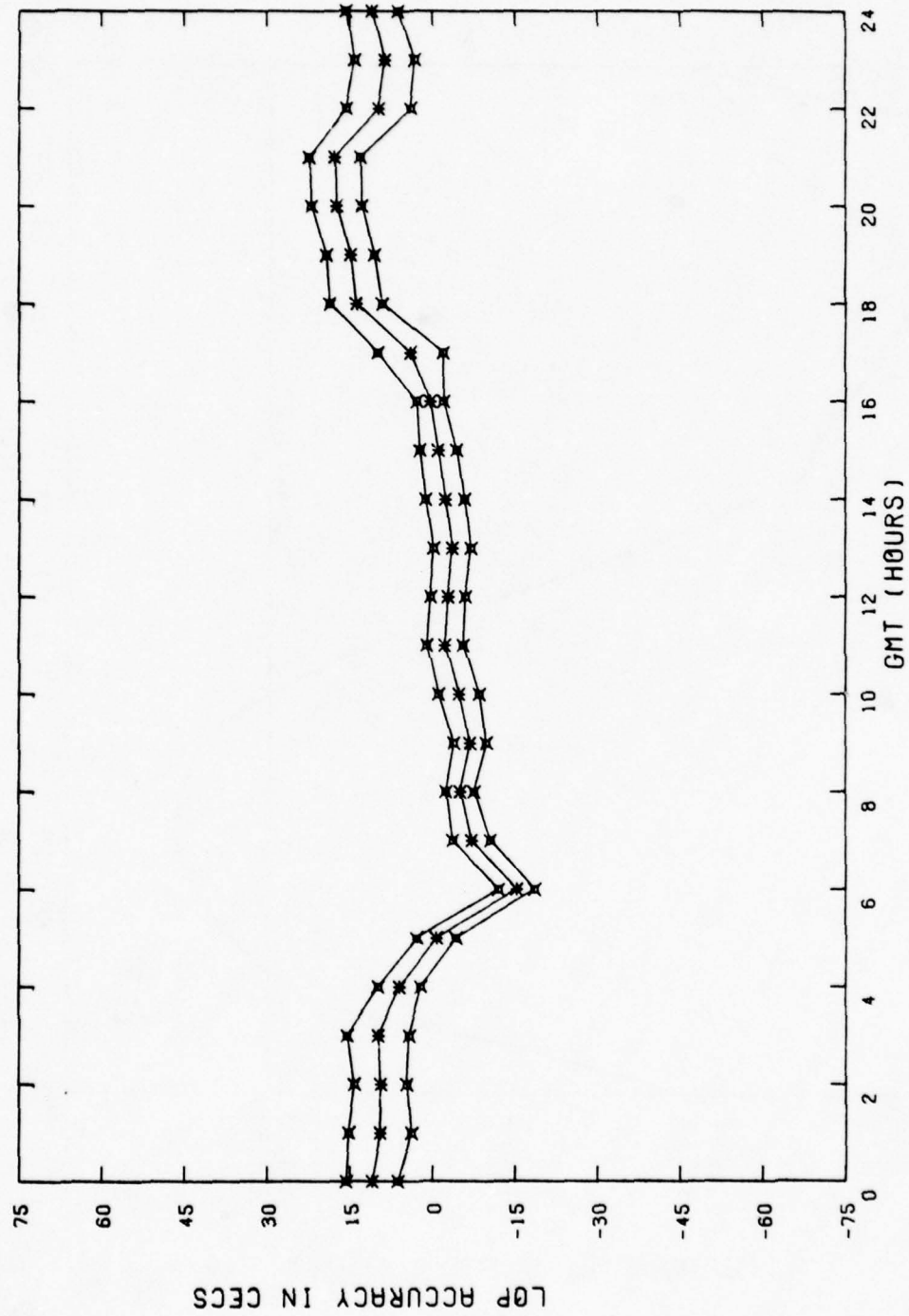


Figure B.12 Phase Difference Error, Orote, 9/77, 10.2, BH

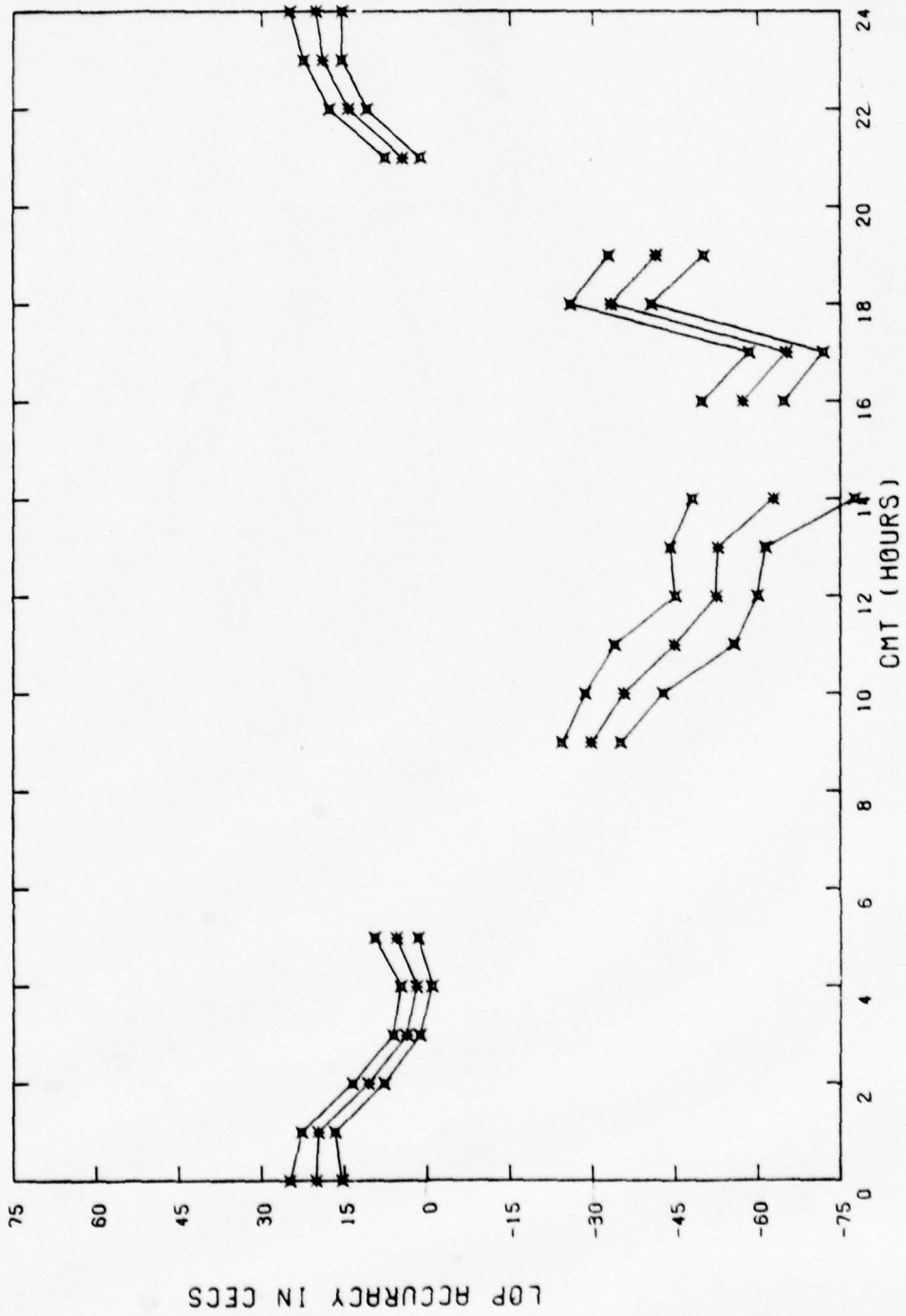


Figure B.13 Phase Difference Error, Orote, 9/77, 10.2, CE

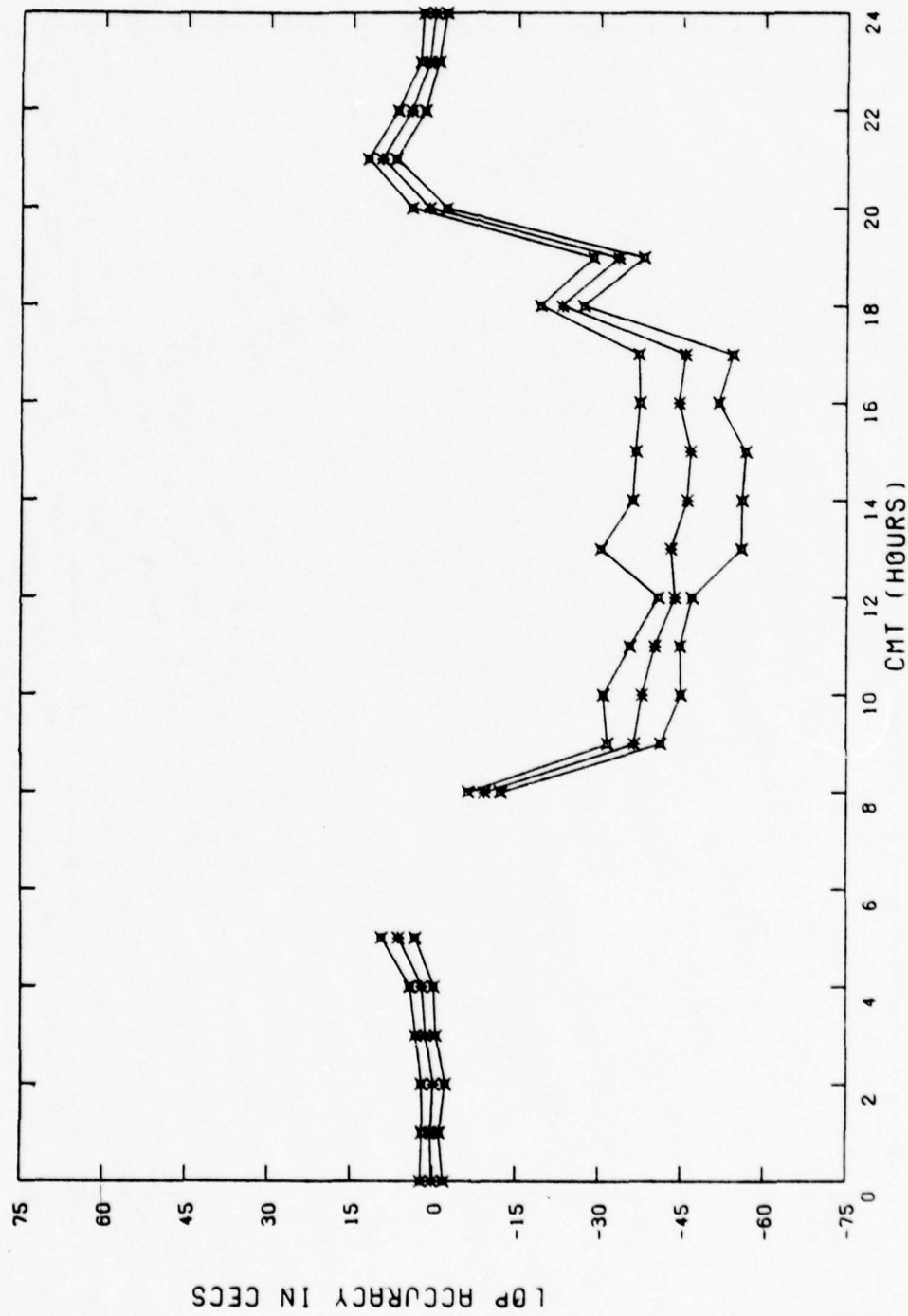


Figure B.14 Phase Difference Error, Orote, 9/77, 10.2, CH

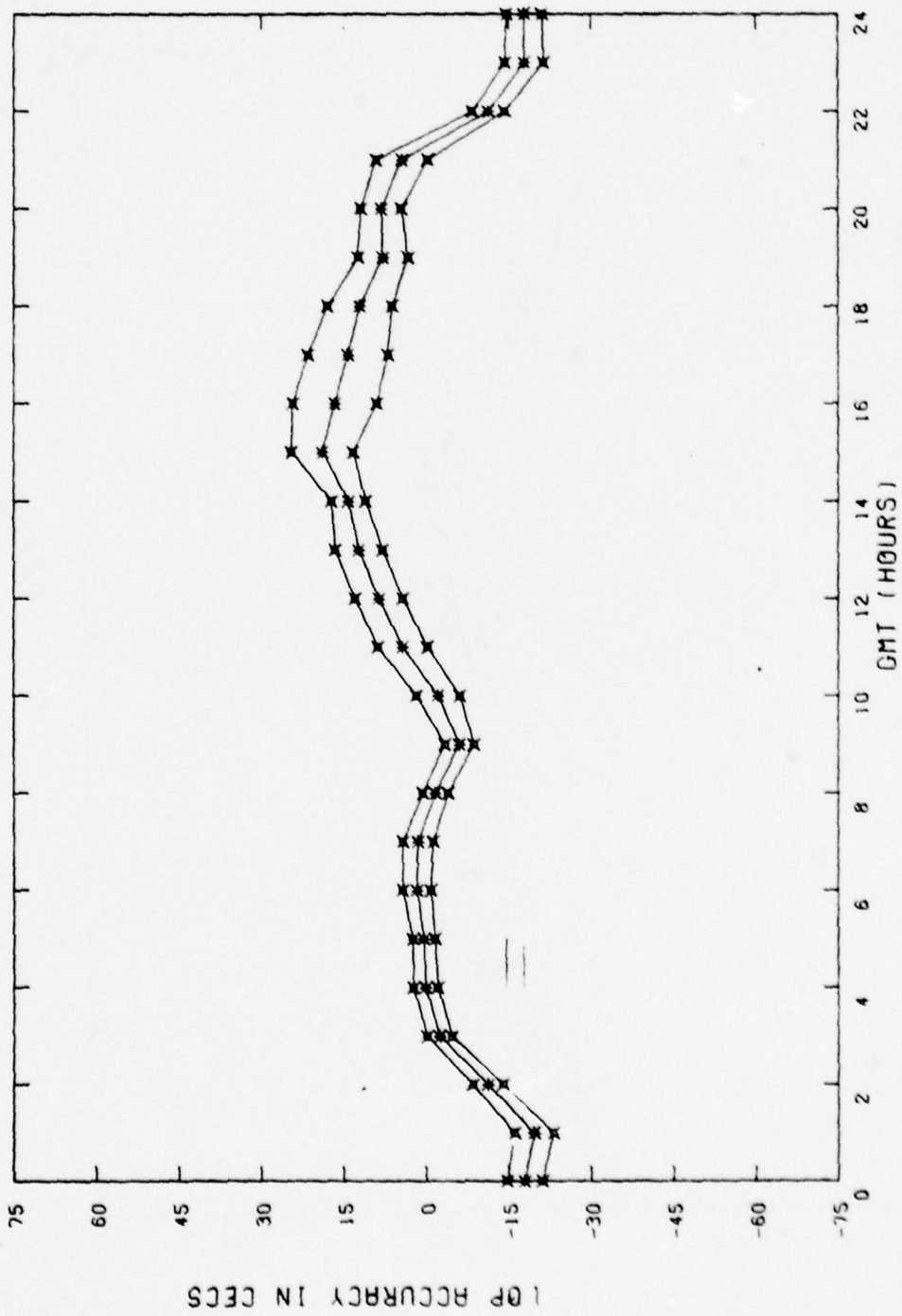


Figure B.15 Phase Difference Error, Orote, 9/77, 10.2, EH

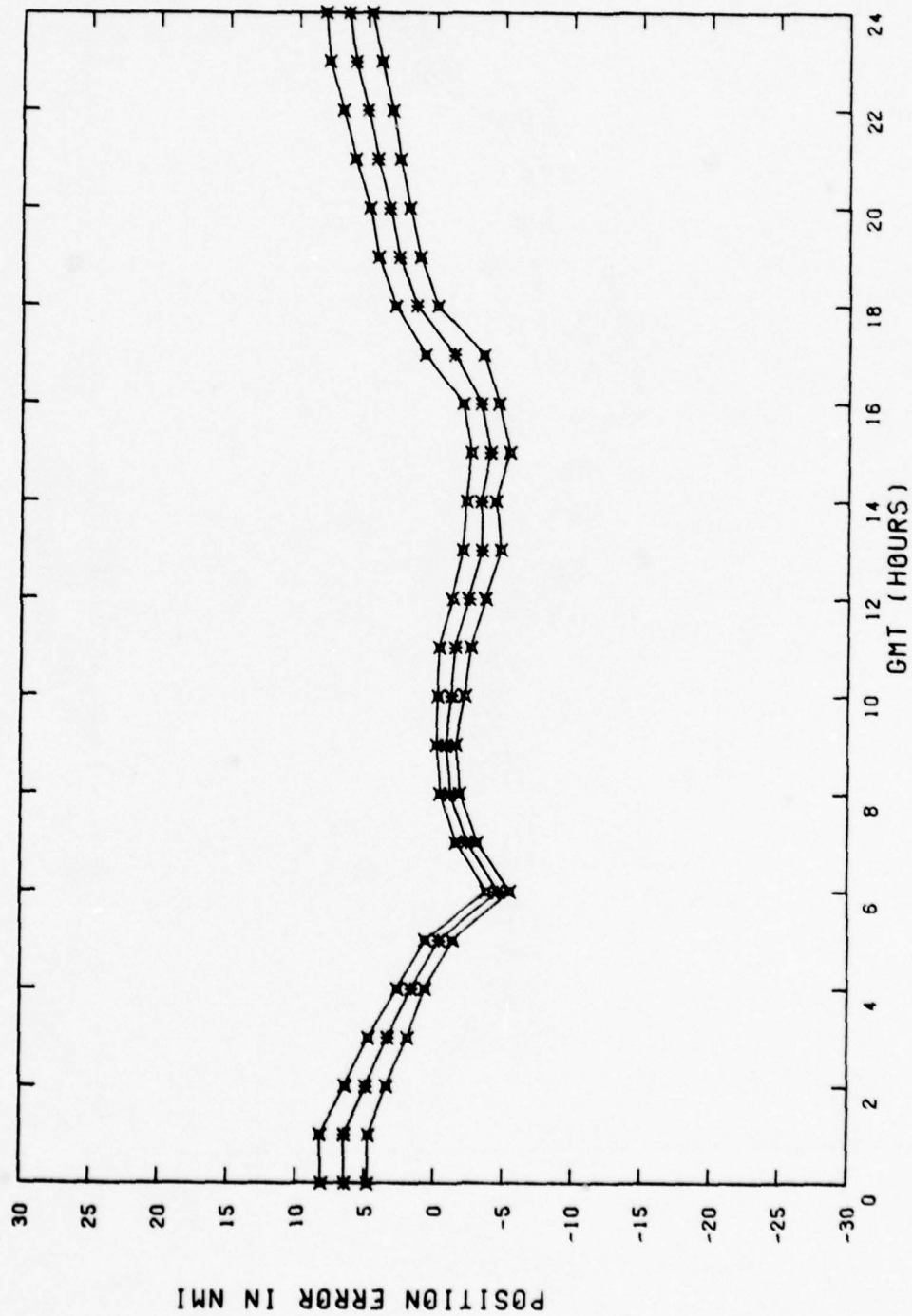


Figure B.16 Position Fix Error, North, Orote, 9/77, 10.2, BH-EH

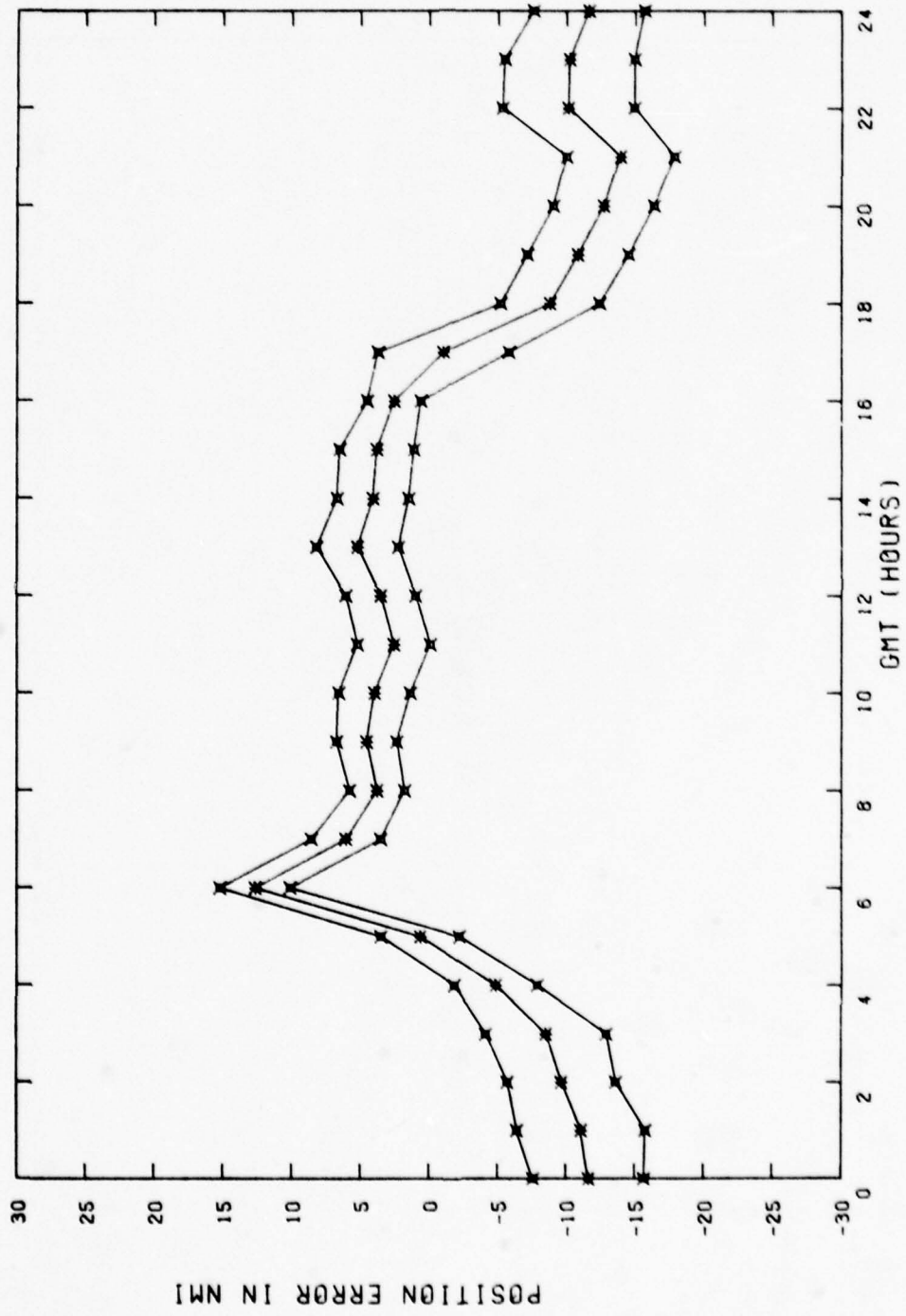


Figure B.17 Position Fix Error, East, Orote, 9/77, 10.2, BH-EH

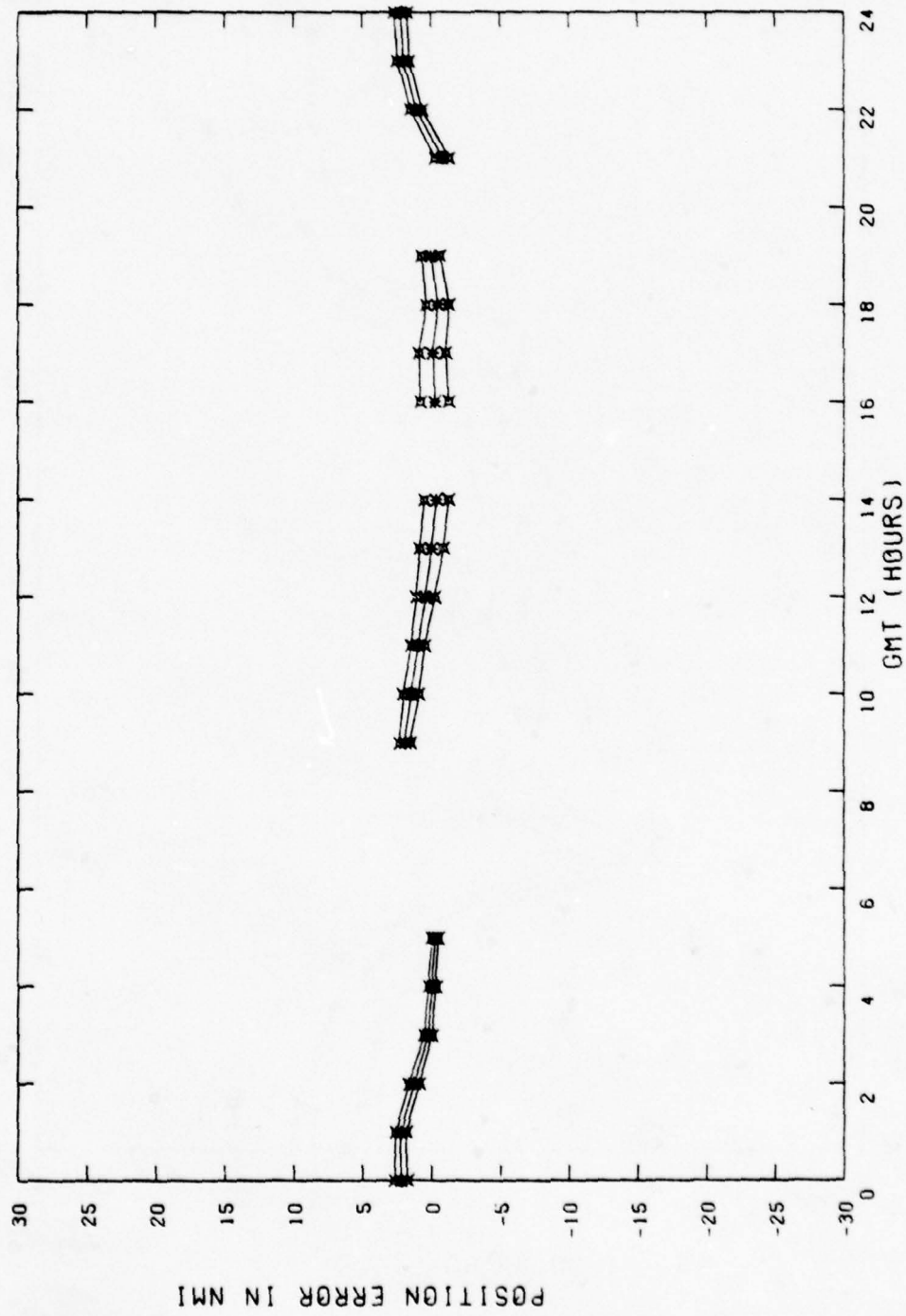


Figure B.18 Position Fix Error, North, Orote, 9/77, 10.2, CE-CH

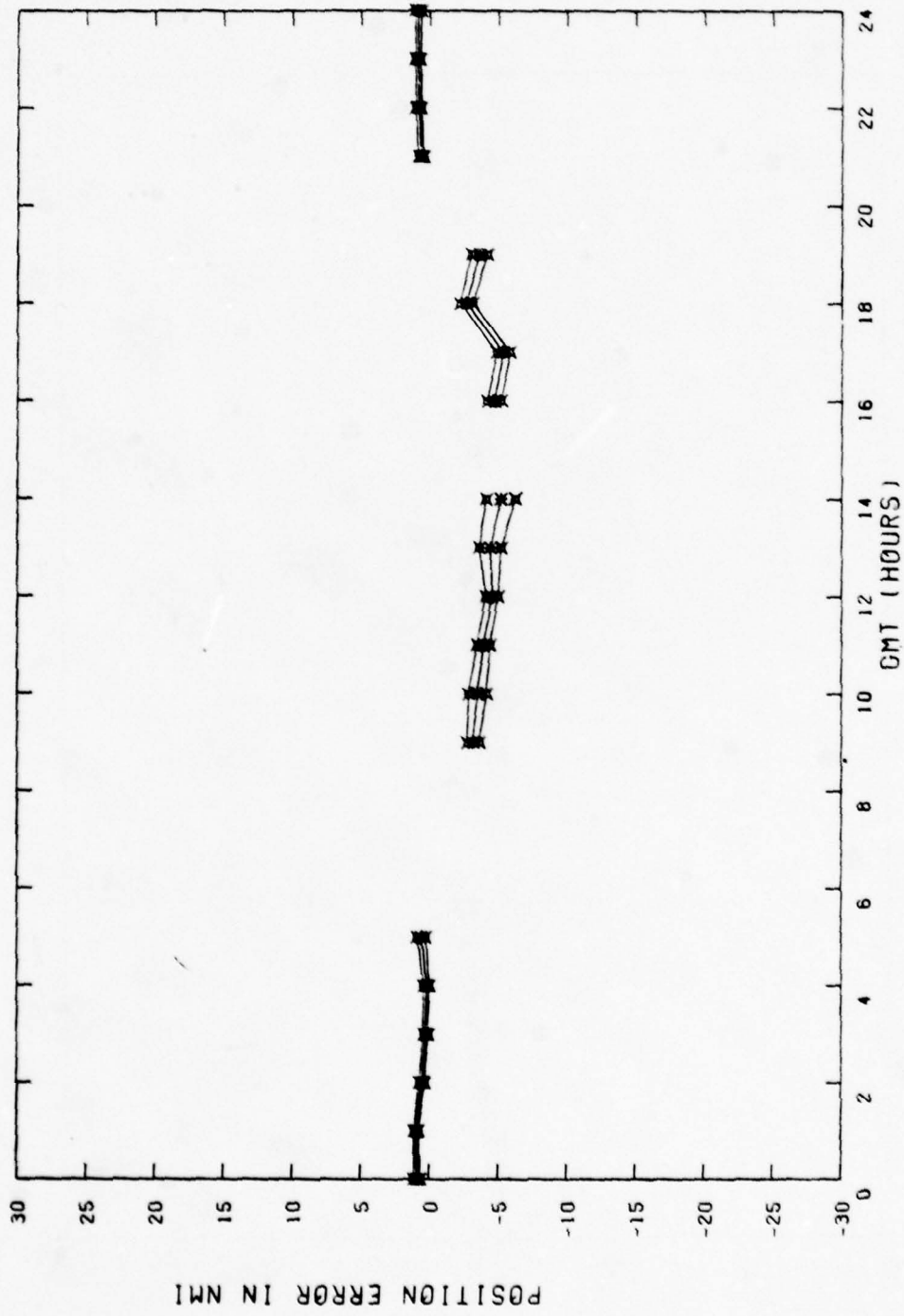


Figure B.19 Position Fix Error, East, Orote, 9/77, 10.2, CE-CH

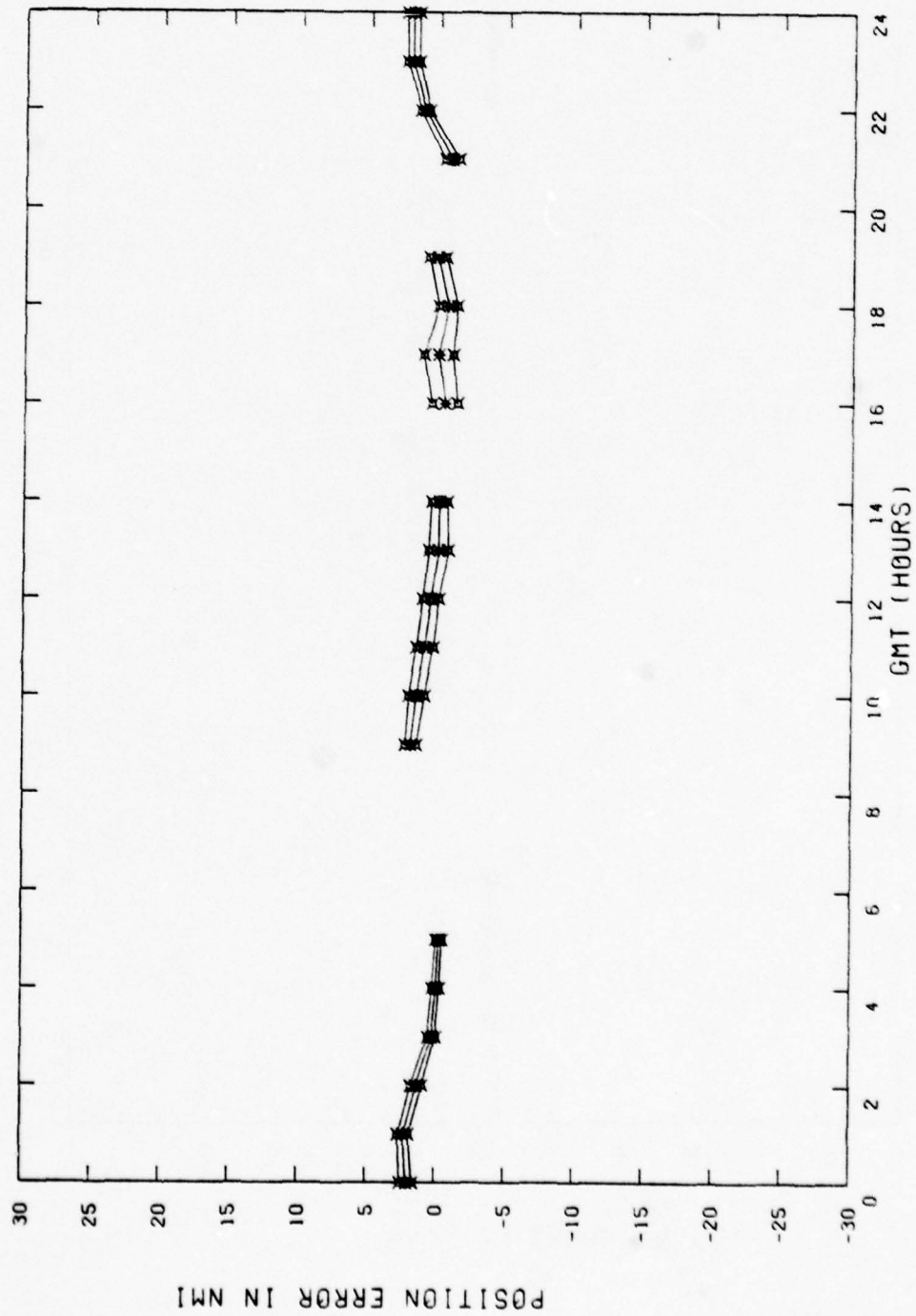


Figure B.20 Position Fix Error, North, Orote, 9/77, 10.2, CE-EH

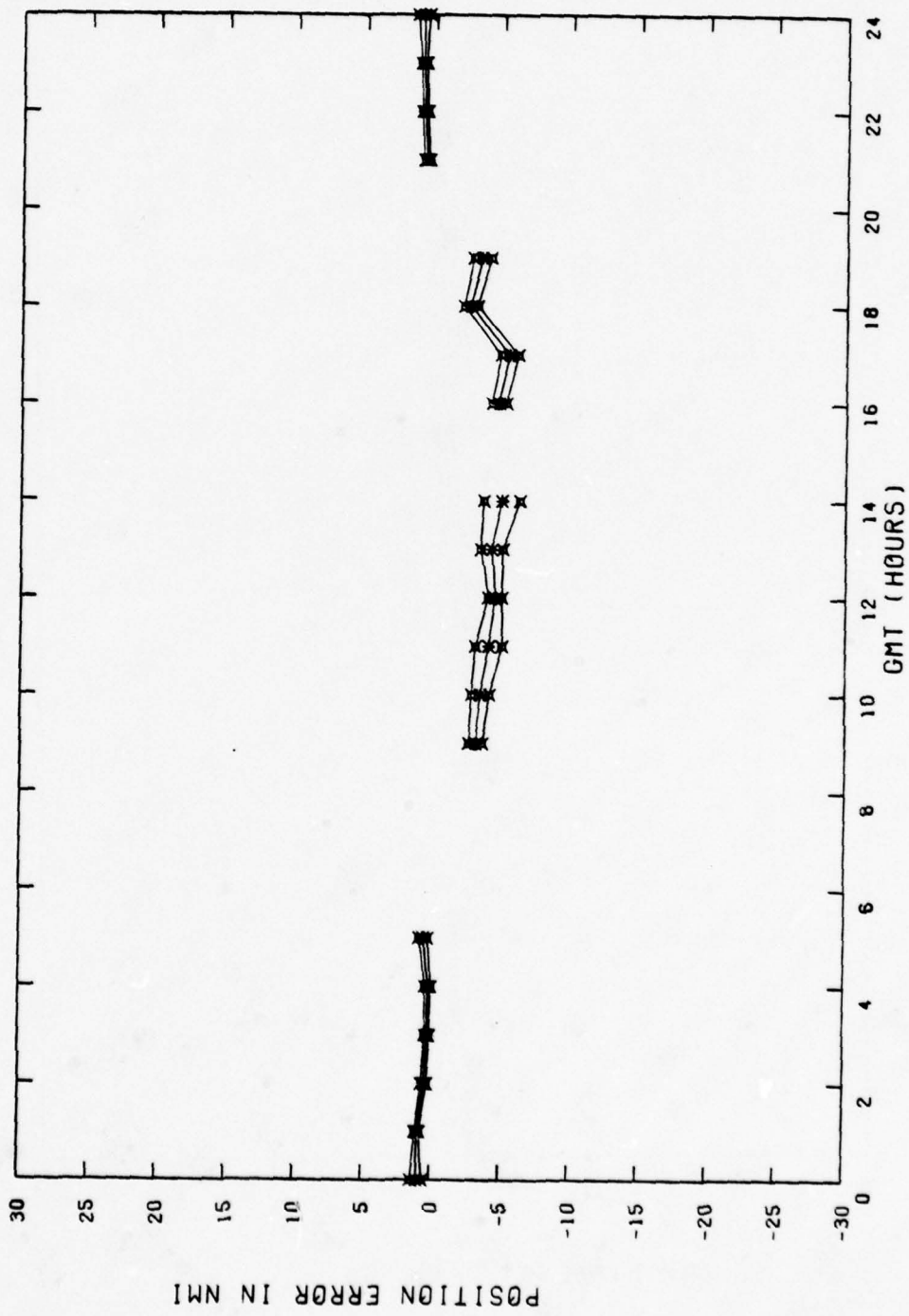


Figure B.21 Position Fix Error, East, Orote, 9/77, 10.2, CE-EH

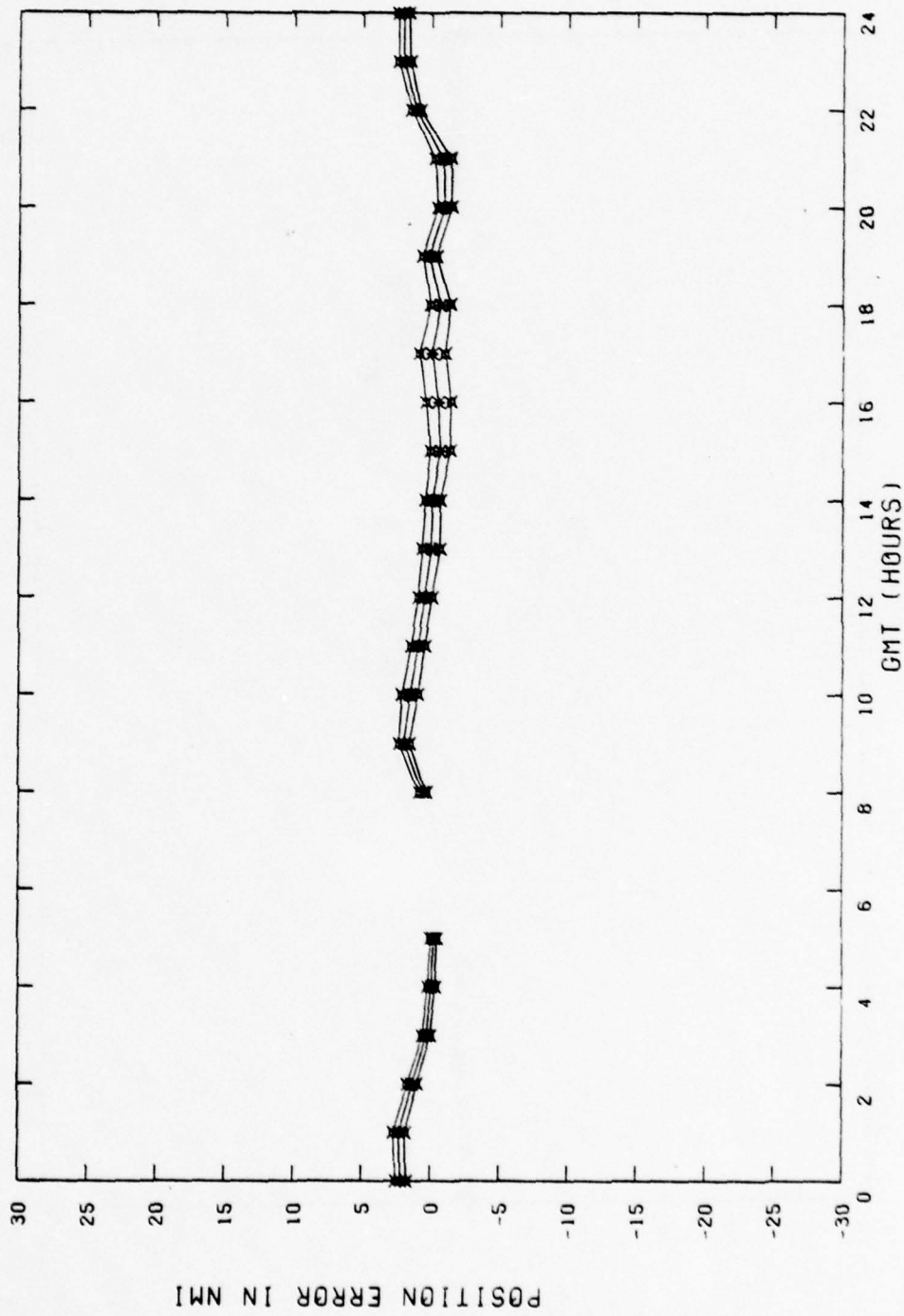


Figure B.22 Position Fix Error, North, Orote, 9/77, 10.2, CH-EH

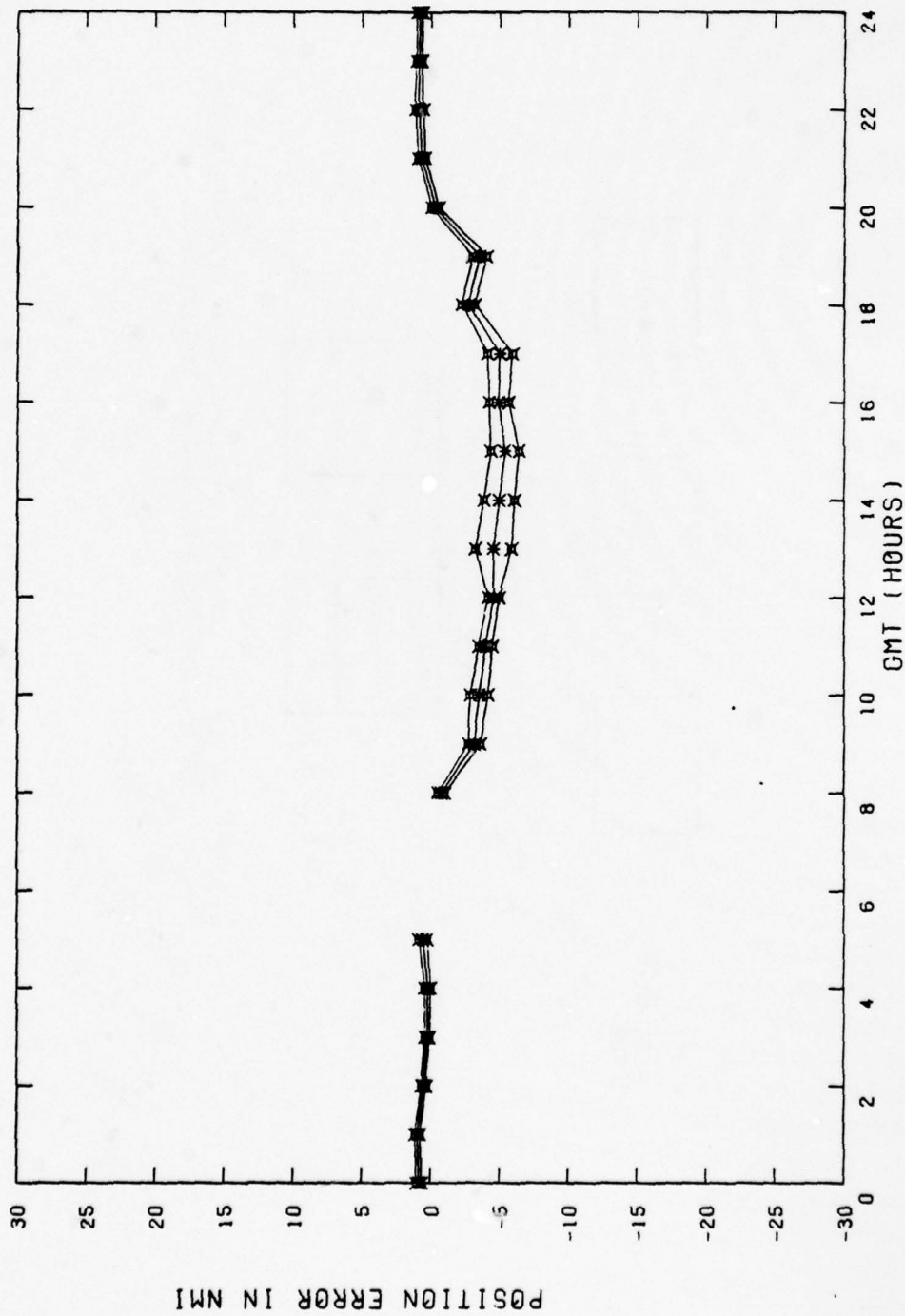
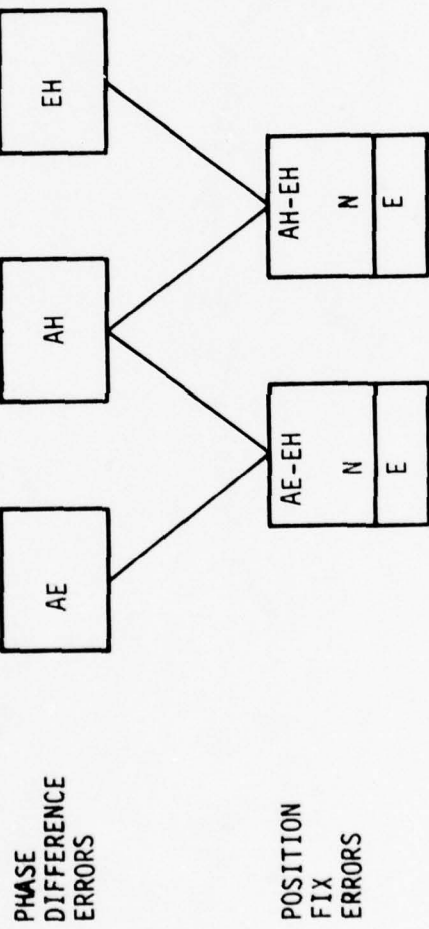


Figure B.23 Position Fix Error, East, Orote, 9/77, 10.2, CH-EH



NOTE: AE-EH not provided because of poor crossing angle.
DH not available because of lack of data.

Figure B.24 Orote Pt. Data Graphs, July, 1976, 10.2.

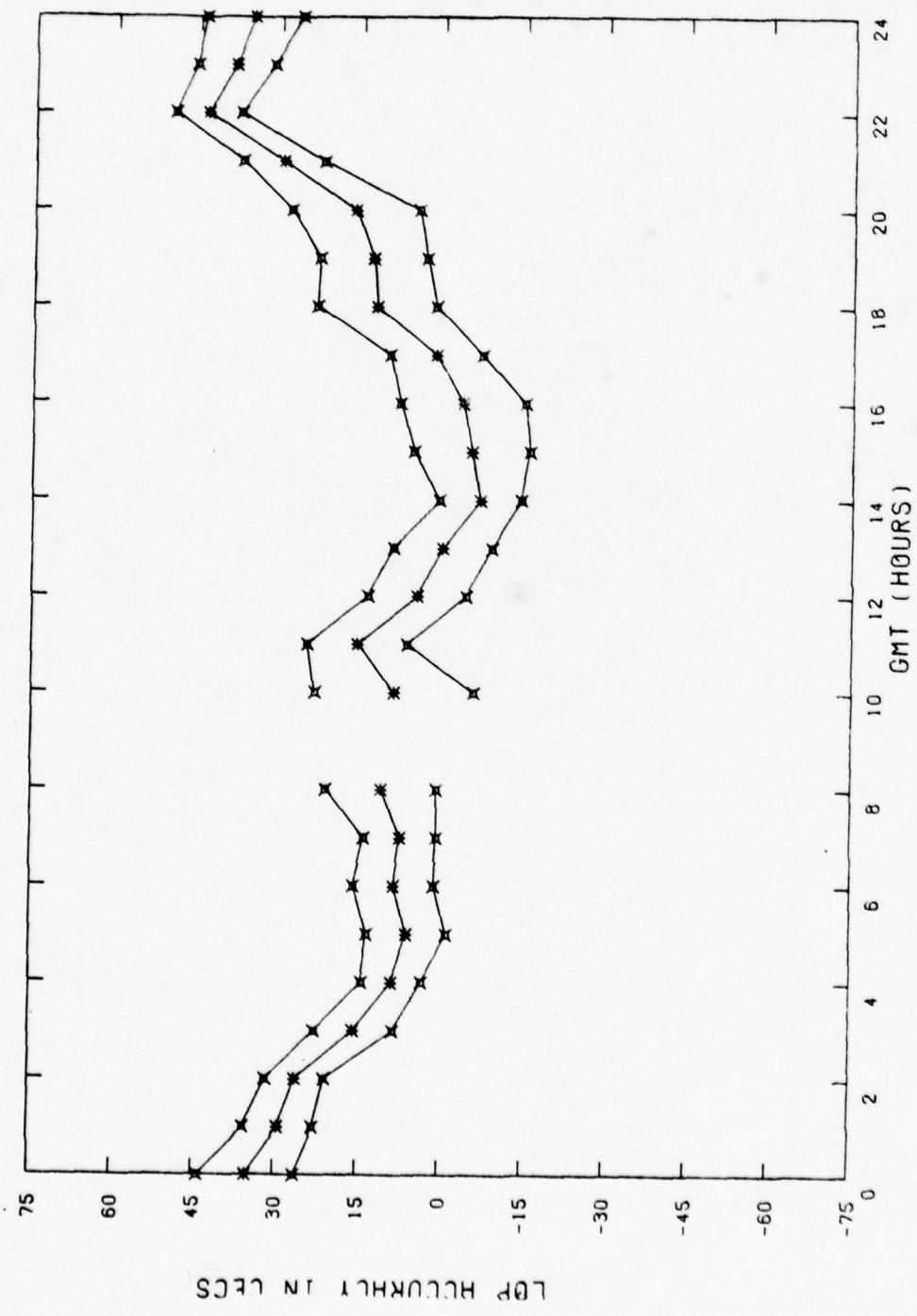


Figure B.25 Phase Difference Error, Orote, 7/76, 10.2, AE

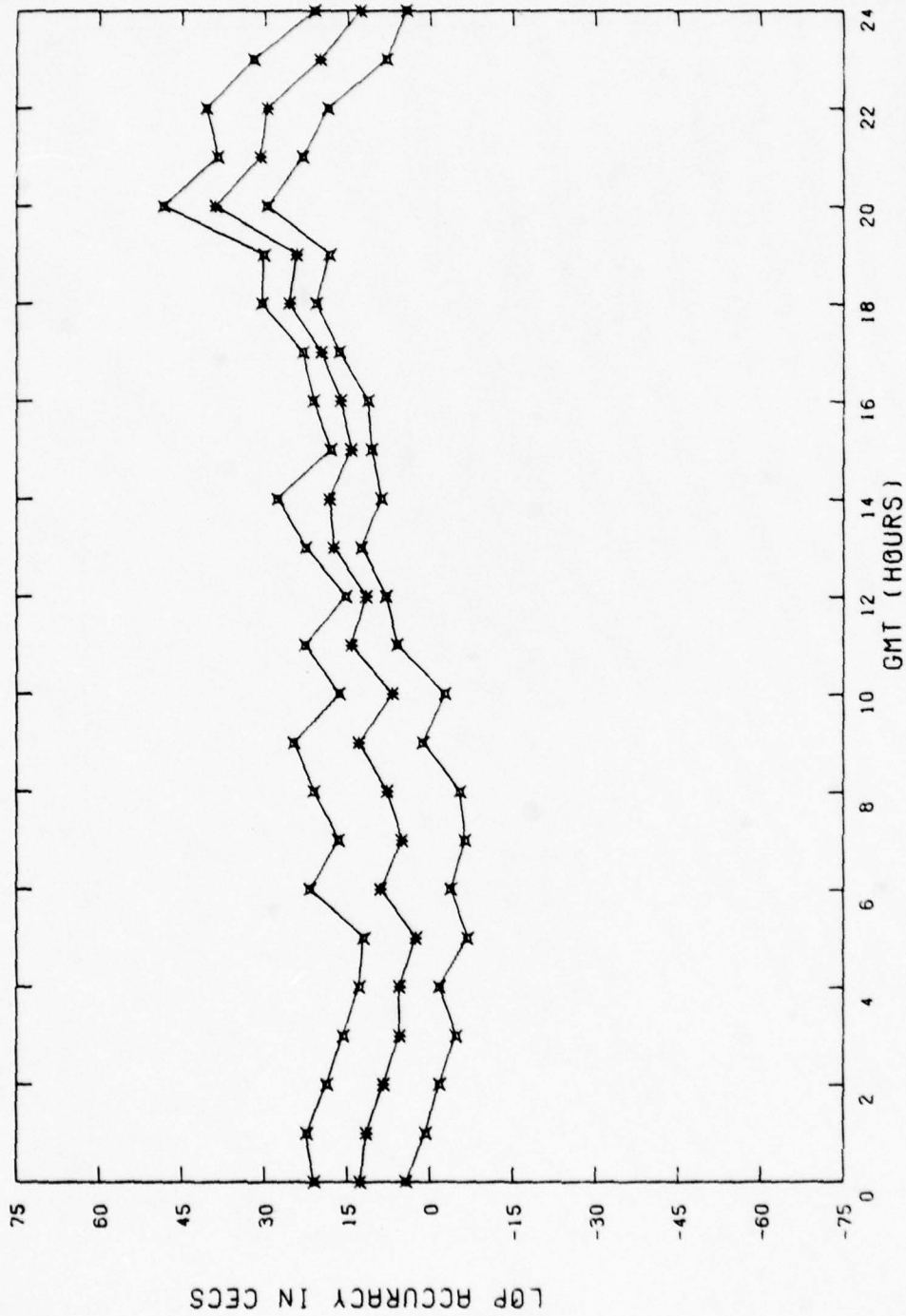


Figure B.26 Phase Difference Error, Orote, 7/76, 10.2, AH

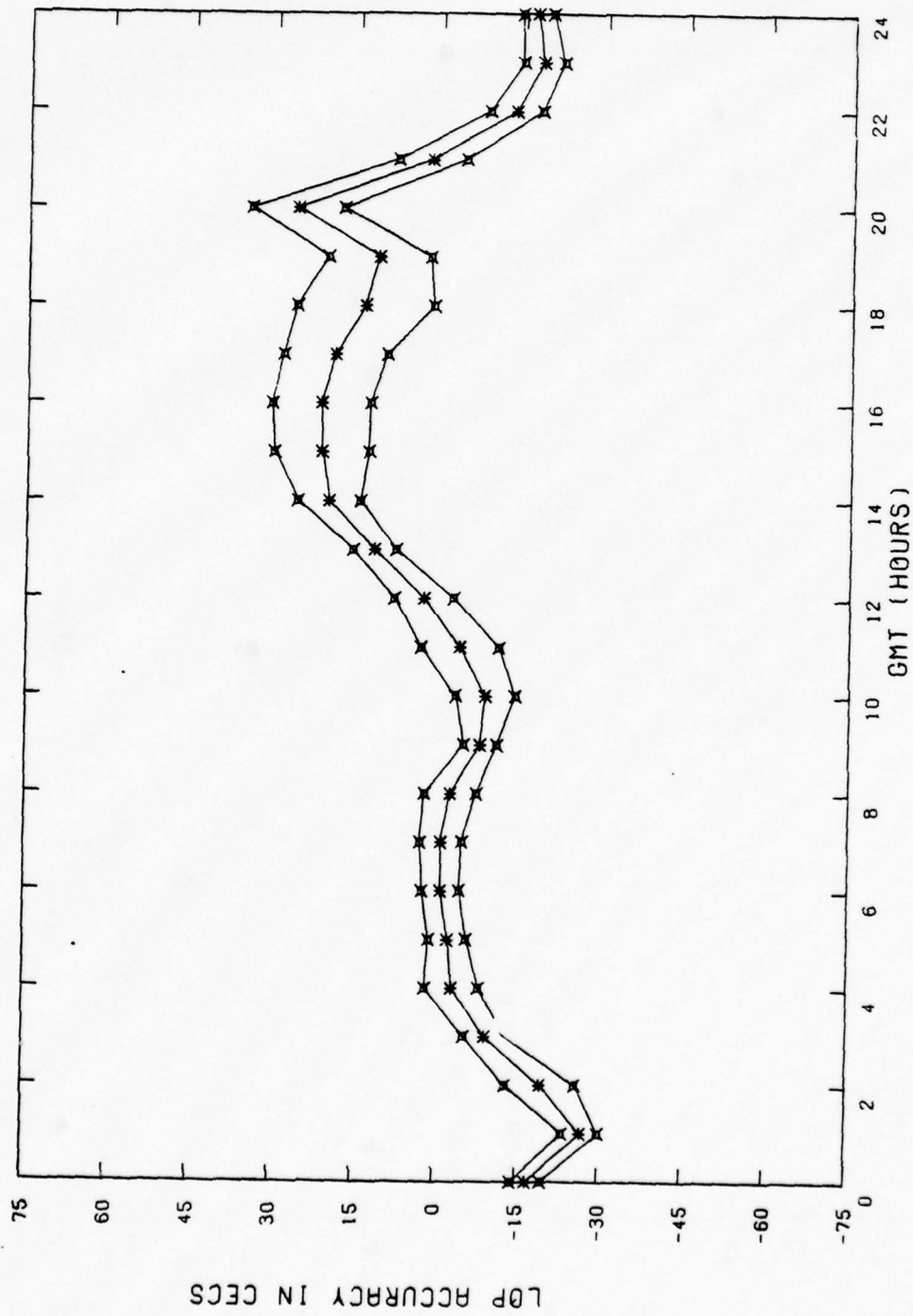


Figure B.27 Phase Difference Error, Orote, 7/76, 10.2, EH

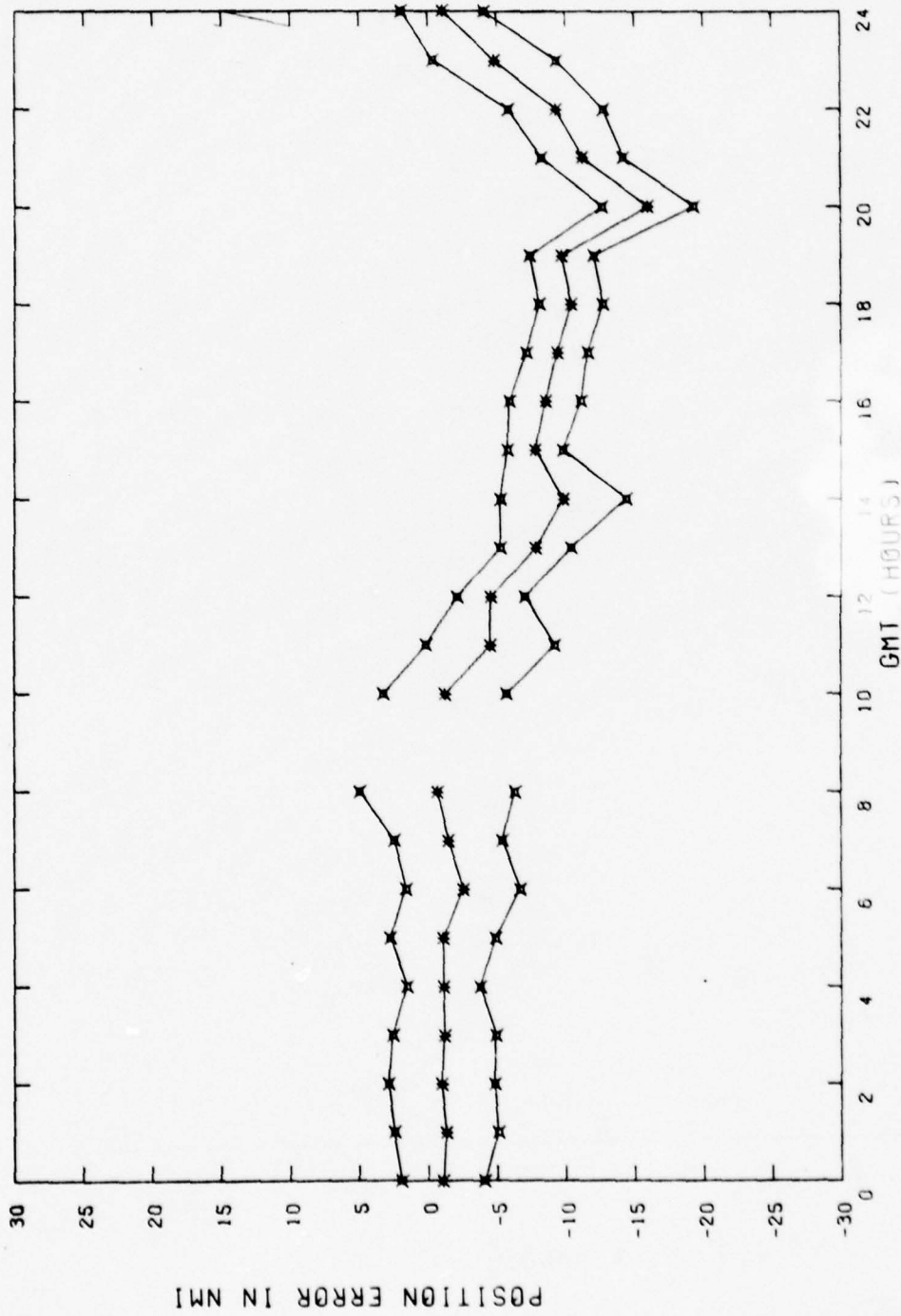


Figure B.28 Position Fix Error, North, Orote, 7/76, 10.2, AE-AH

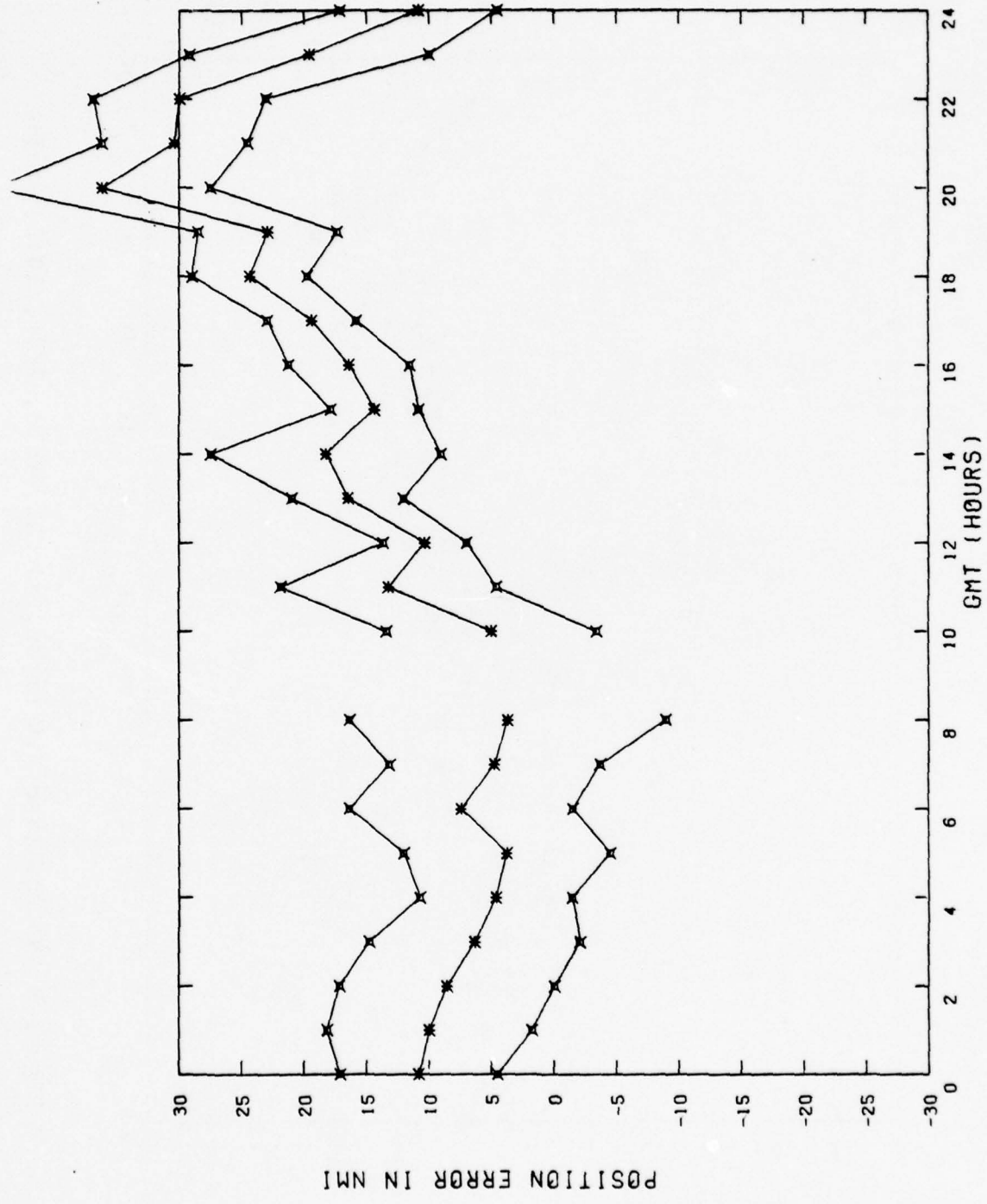


Figure B.29 Position Fix Error, East, Orote, 7/76, 10.2, AE-AH

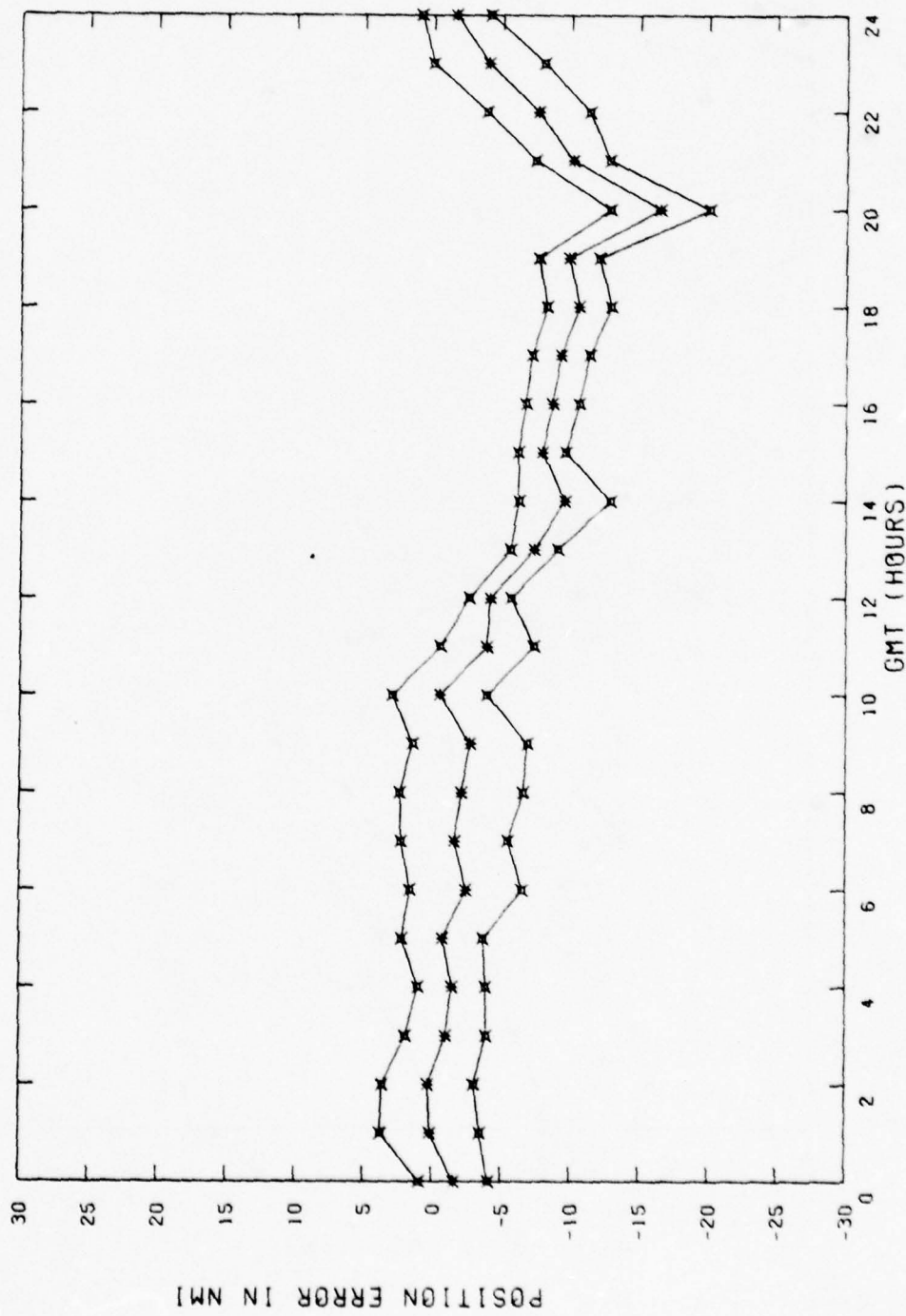


Figure B.30 Position Fix Error, North, Orote, 7/76, 10.2, AH-EH

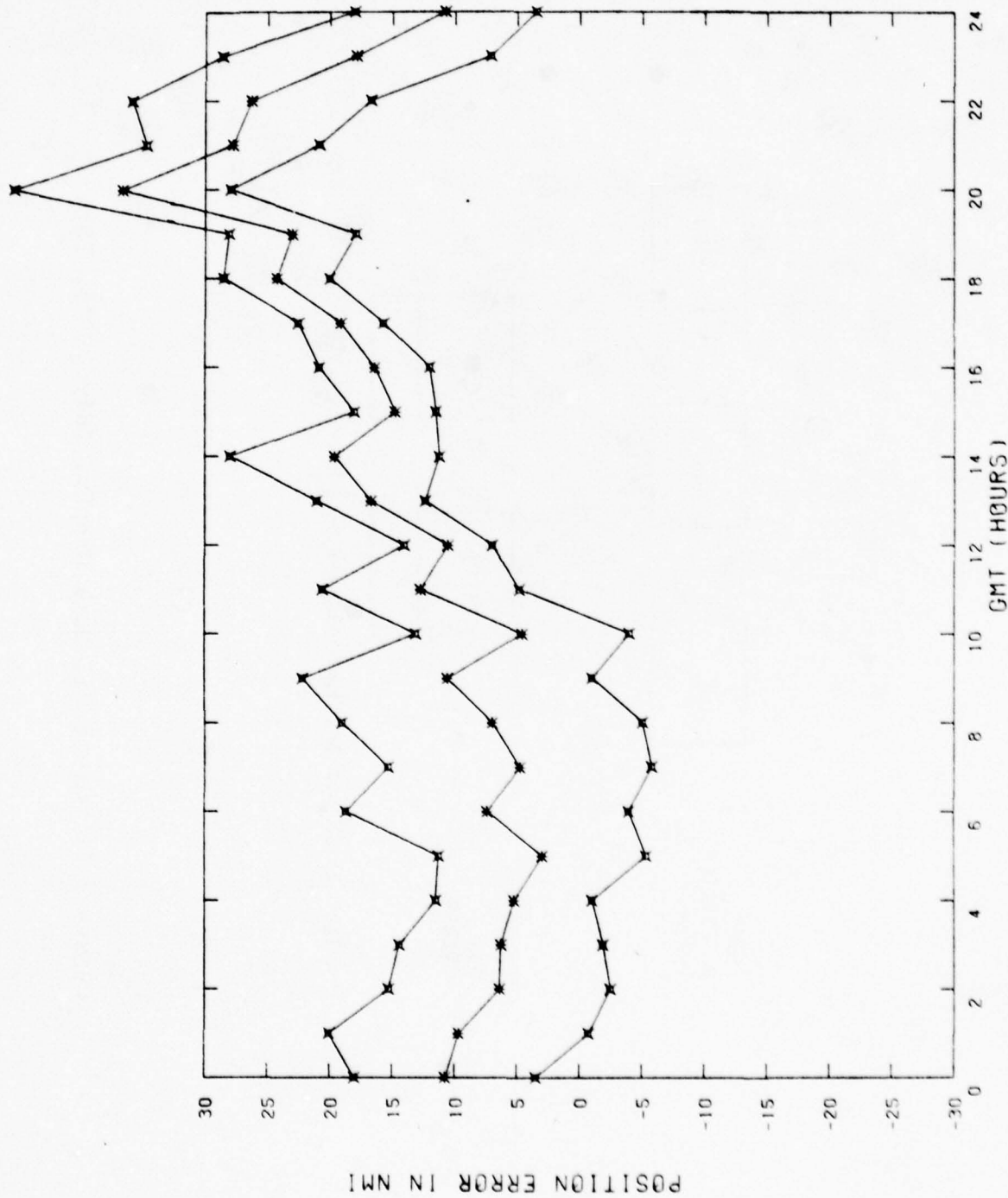
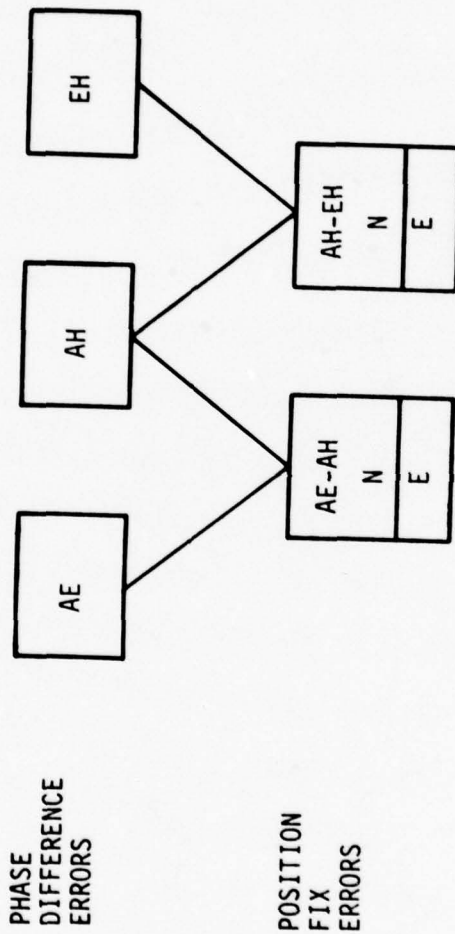


Figure B.31 Position Fix Error, East, Orote, 7/76, 10.2, AH-EH



NOTE: AE-EH not provided because of poor crossing angle.

Figure B.32 Orote Pt. Data Graphs, July, 1976, 13.6

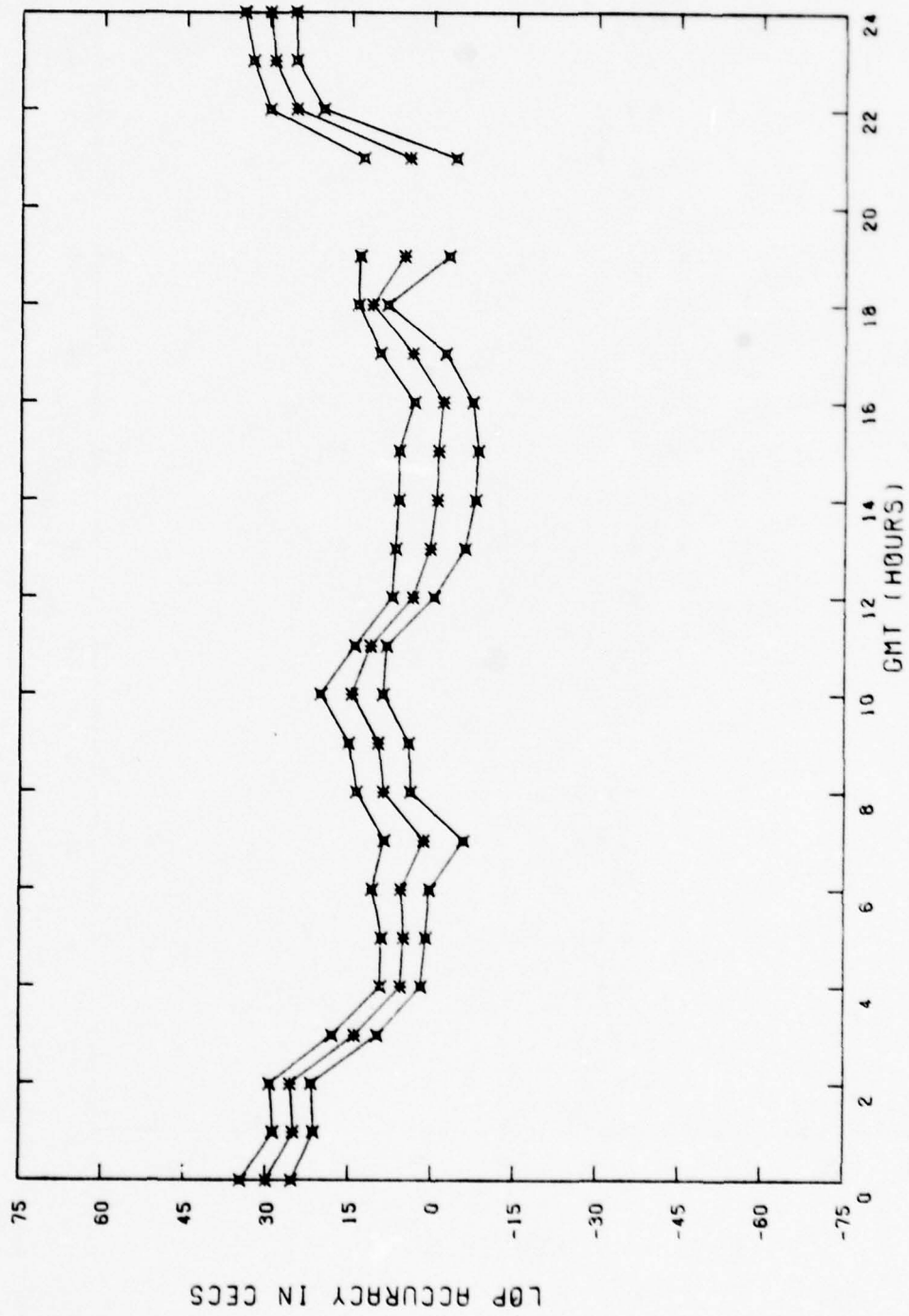


Figure B.33 Phase Difference Error, Orote, 7/76, 13.6, AE

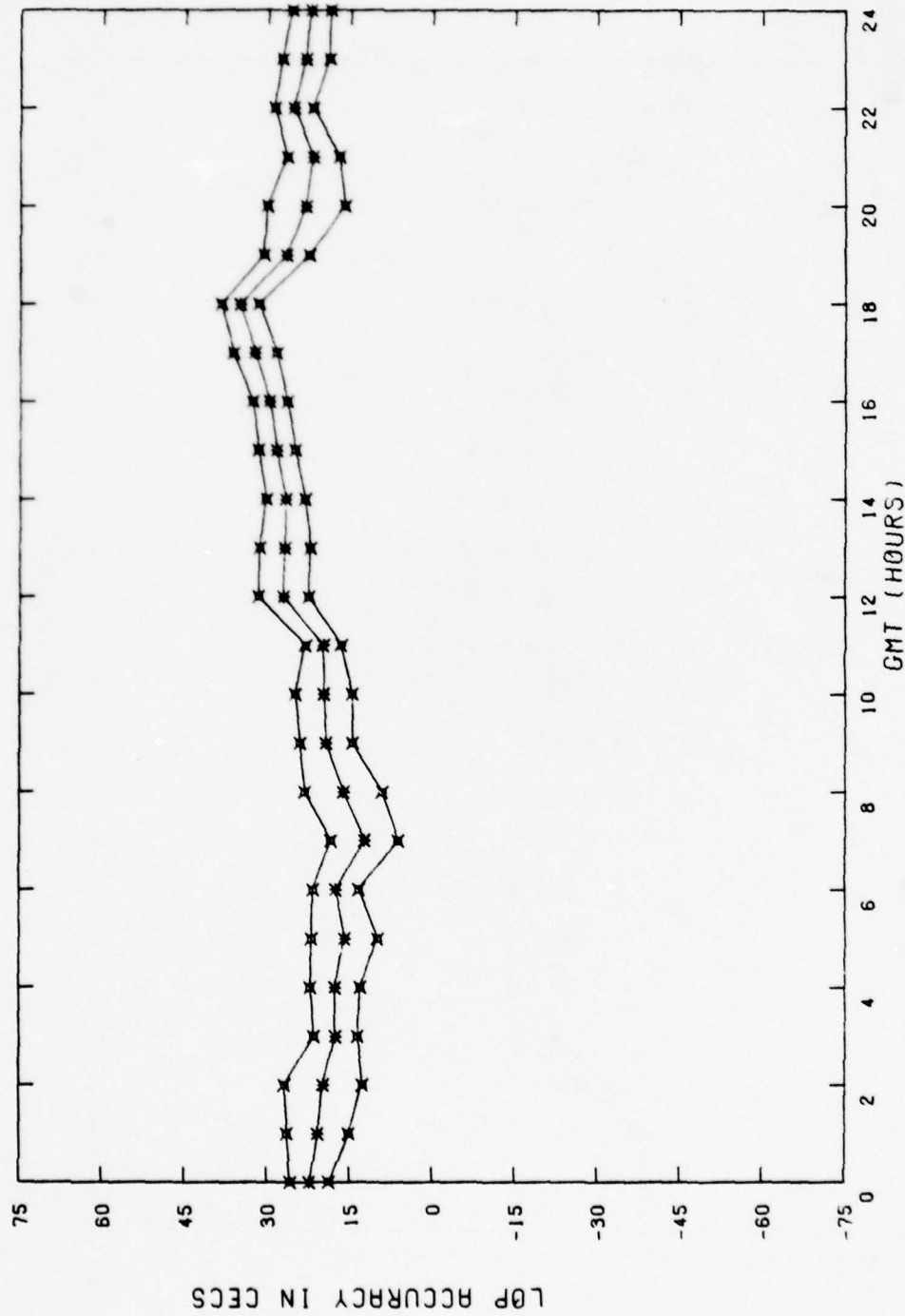


Figure B.34 Phase Difference Error, Orote, 7/76, 13.6, AH

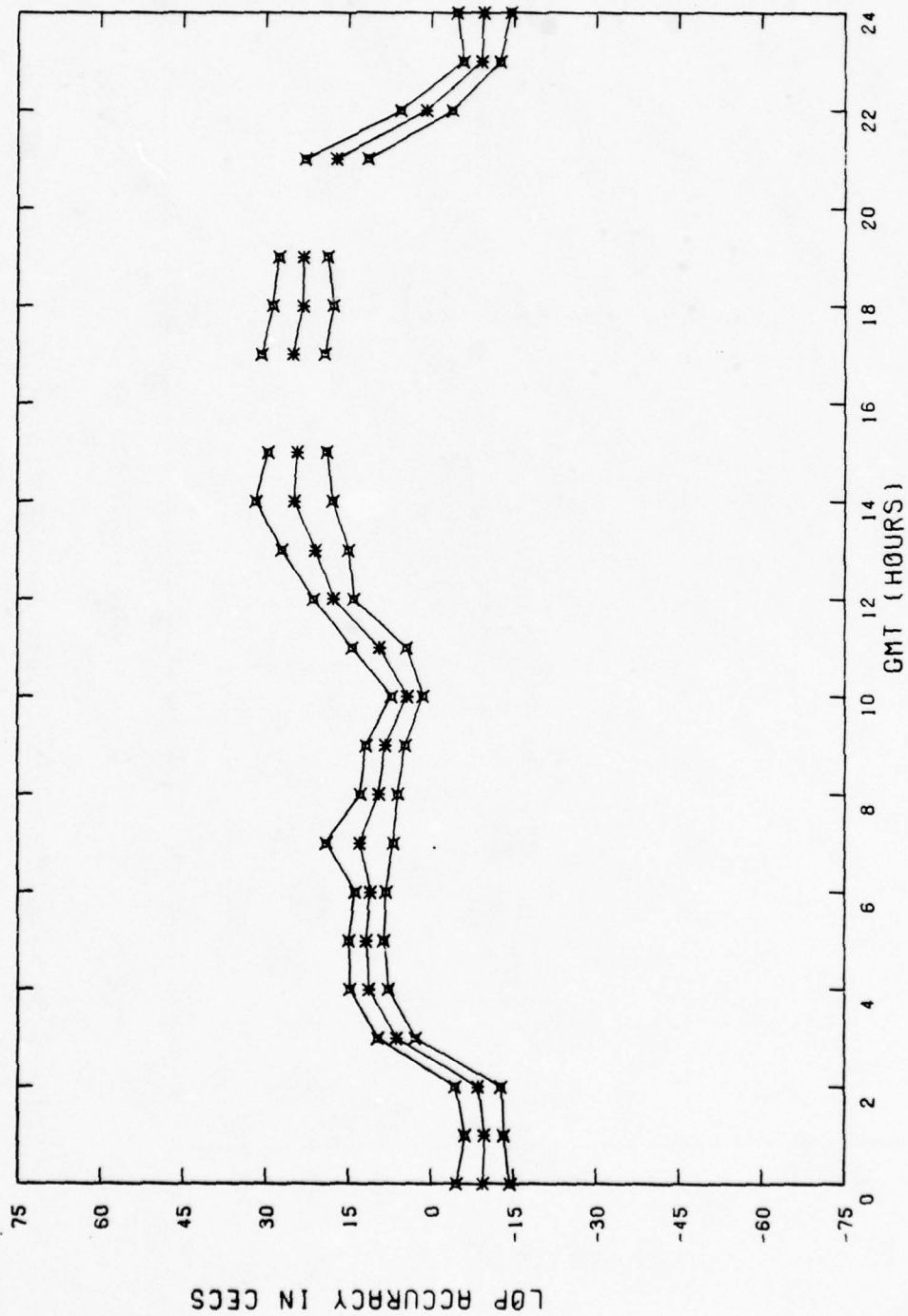


Figure B.35 Phase Difference Error, Orote, 7/76, 13.6, EH

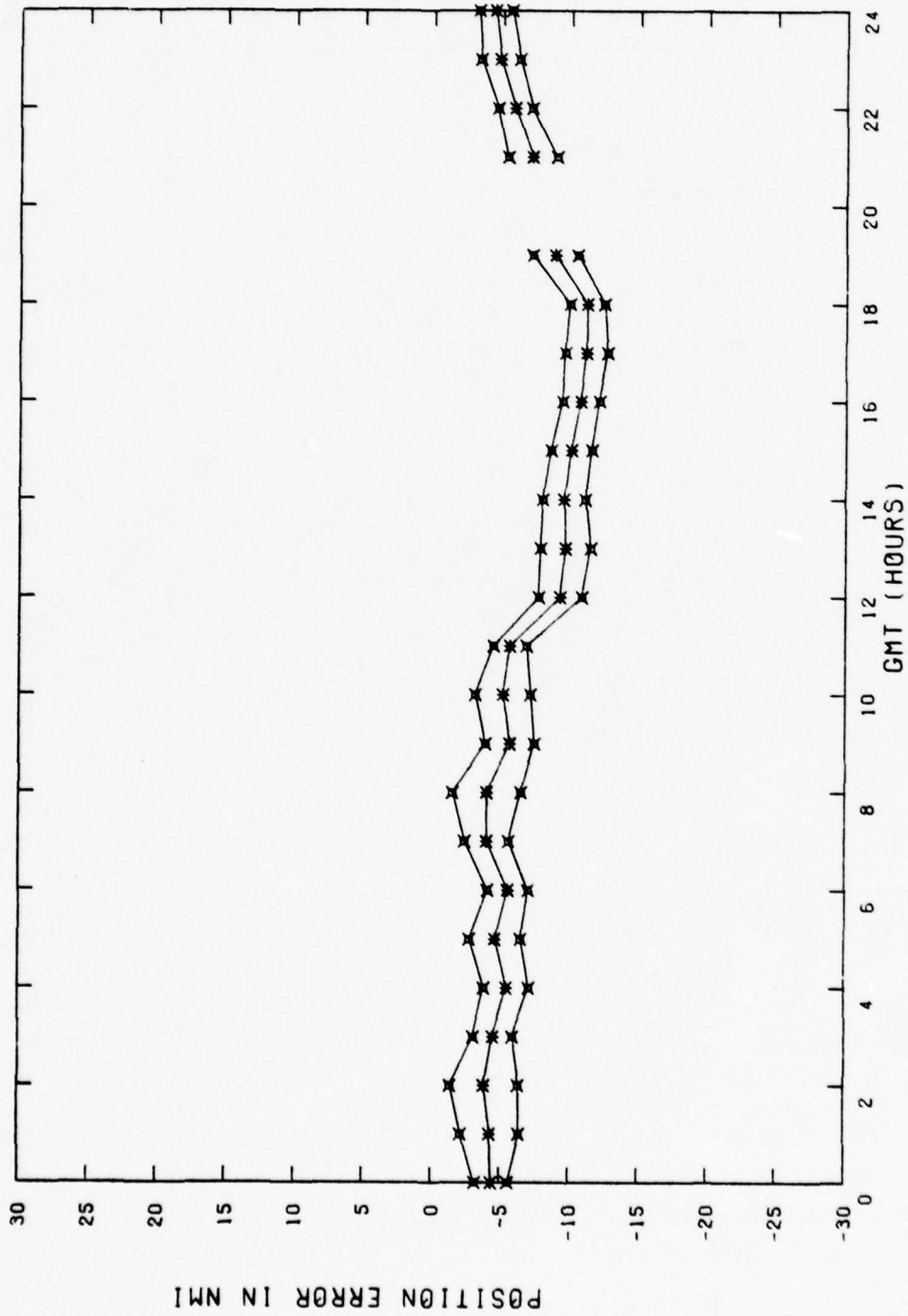


Figure B.36 Position Fix Error, North, Orote, 7/76, 13.6, AE-AH

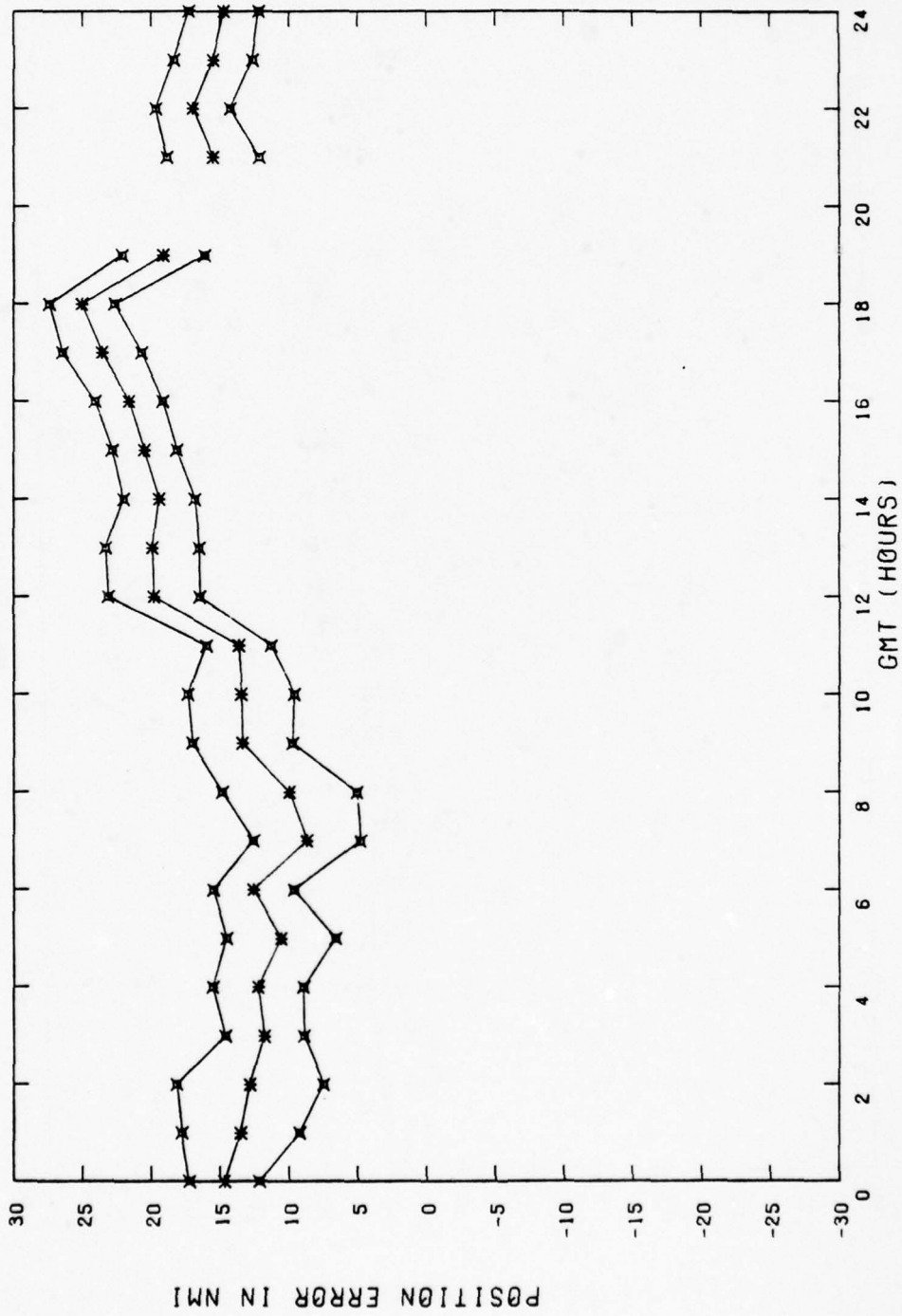


Figure B.37 Position Fix Error, East, Orote, 7/76, 13.6, AE-AH

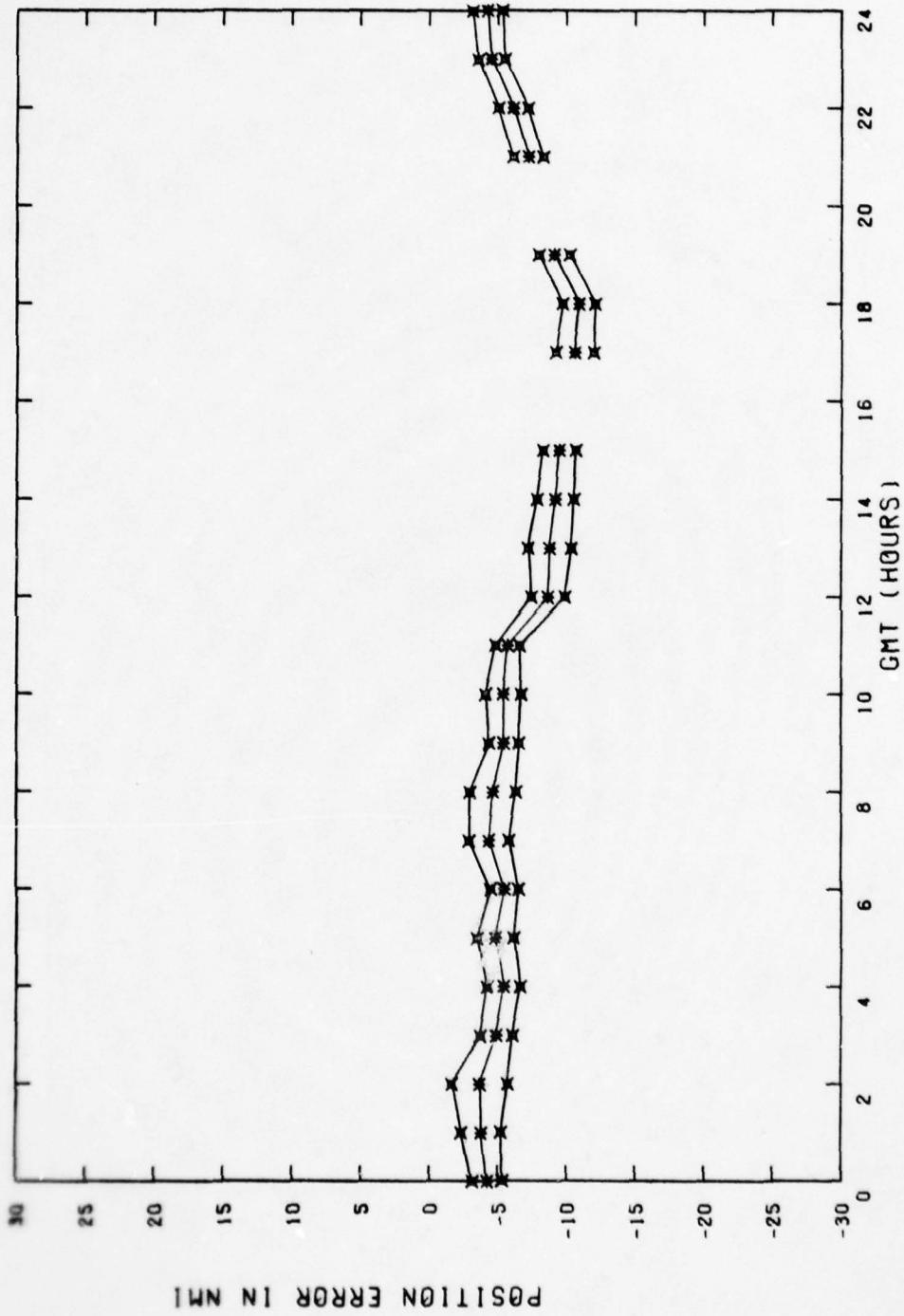


Figure B.38 Position Fix Error, North, Orote, 7/76, 13.6, AH-EH

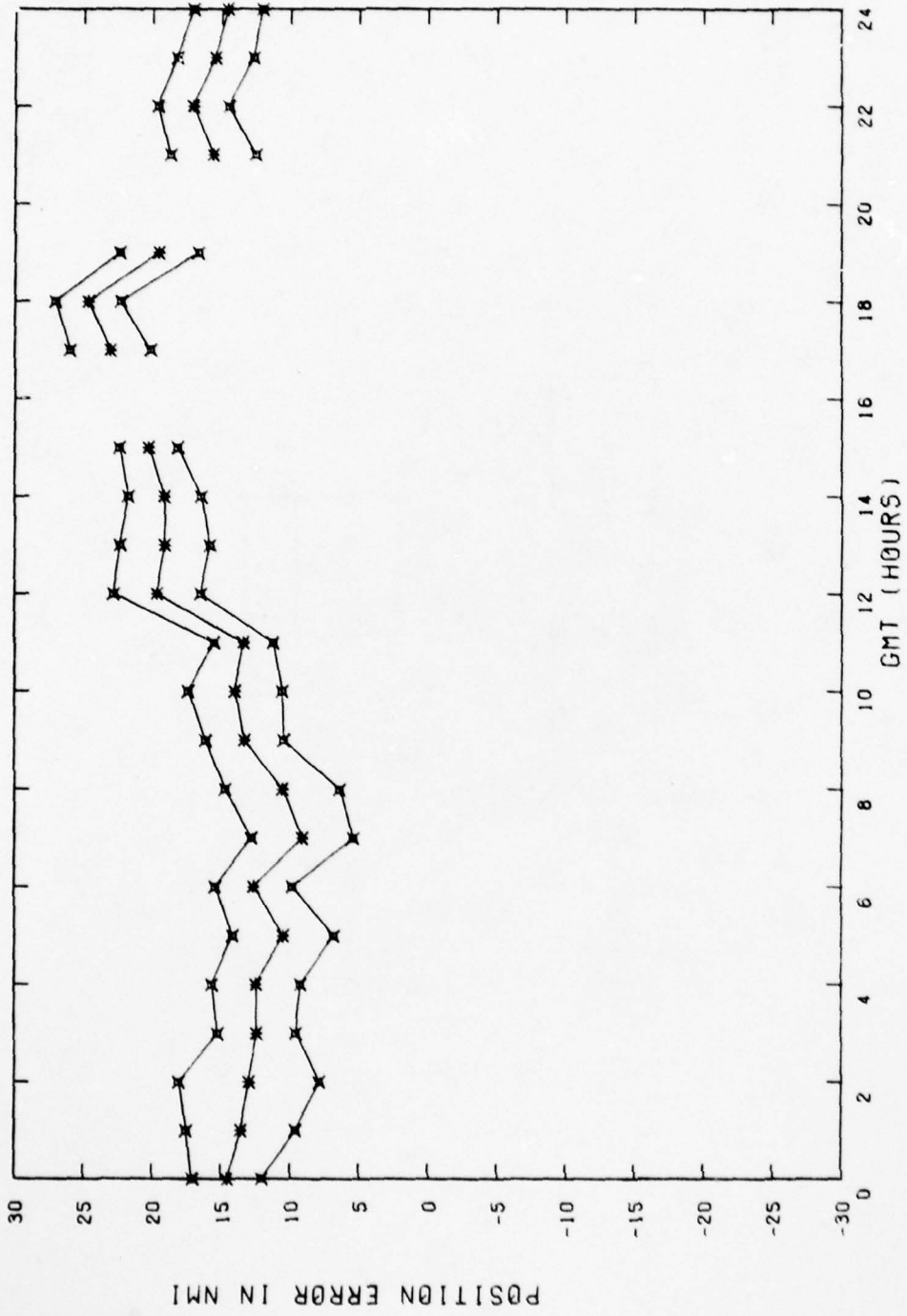


Figure B.39 Position Fix Error, East, Orote, 7/76, 13.6, AH-EH

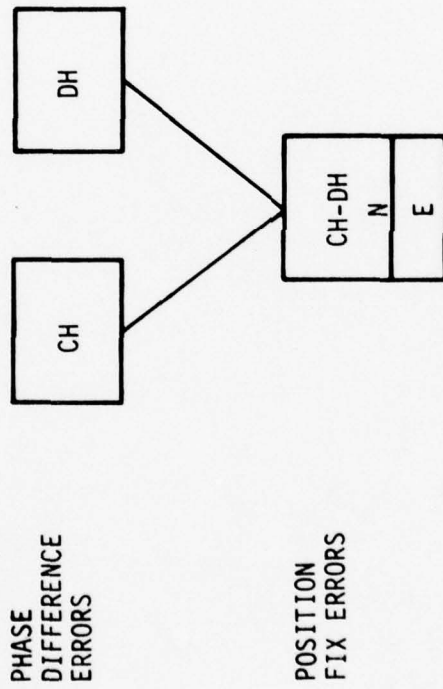


Figure B.40 Orote Pt. Data Graphs, March, 1976, 13.6

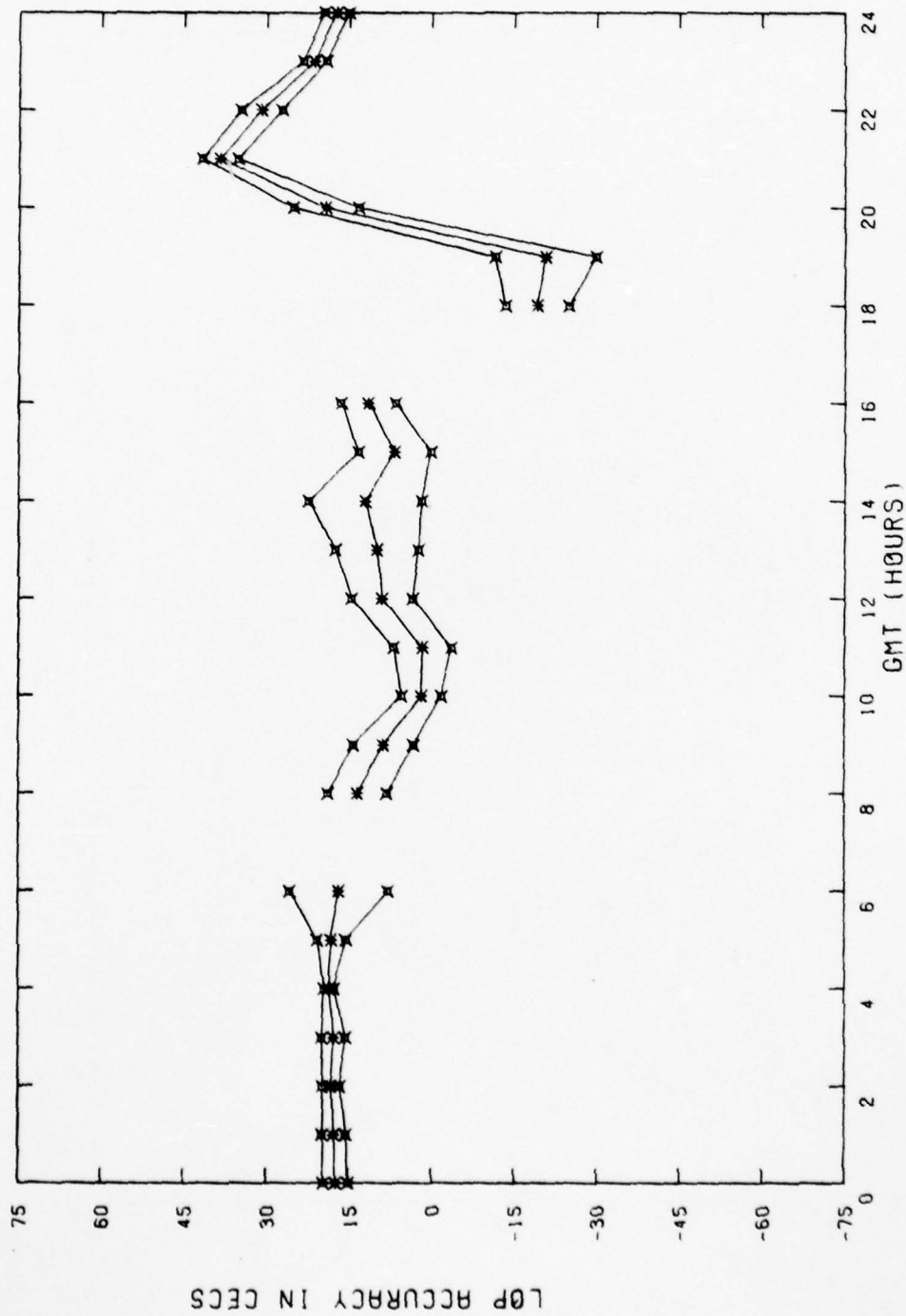


Figure B.41 Phase Difference Error, Orote, 3/76, 13.6, CH

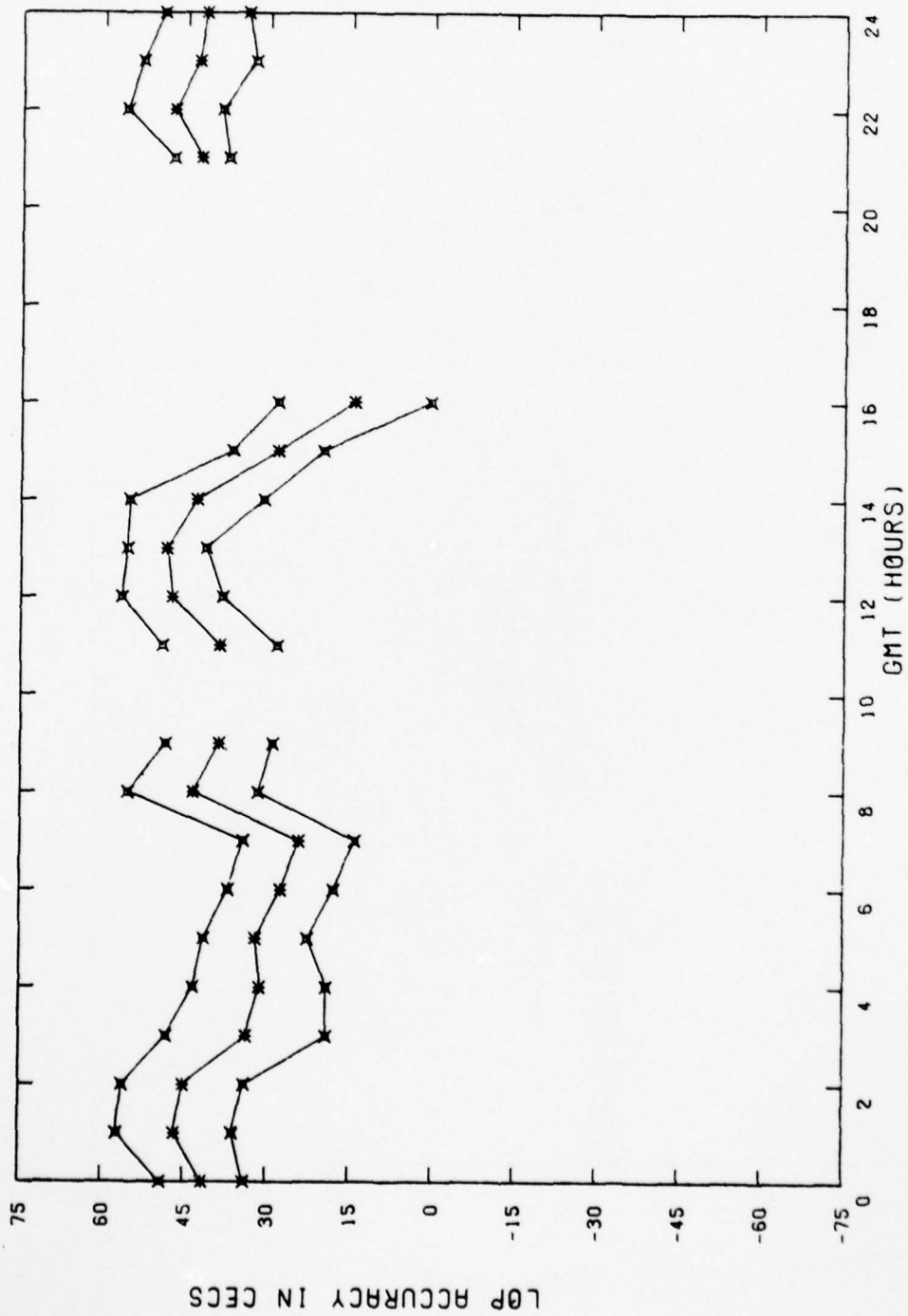


Figure B.42 Phase Difference Error, Orote, 3/76, 13.6, DH

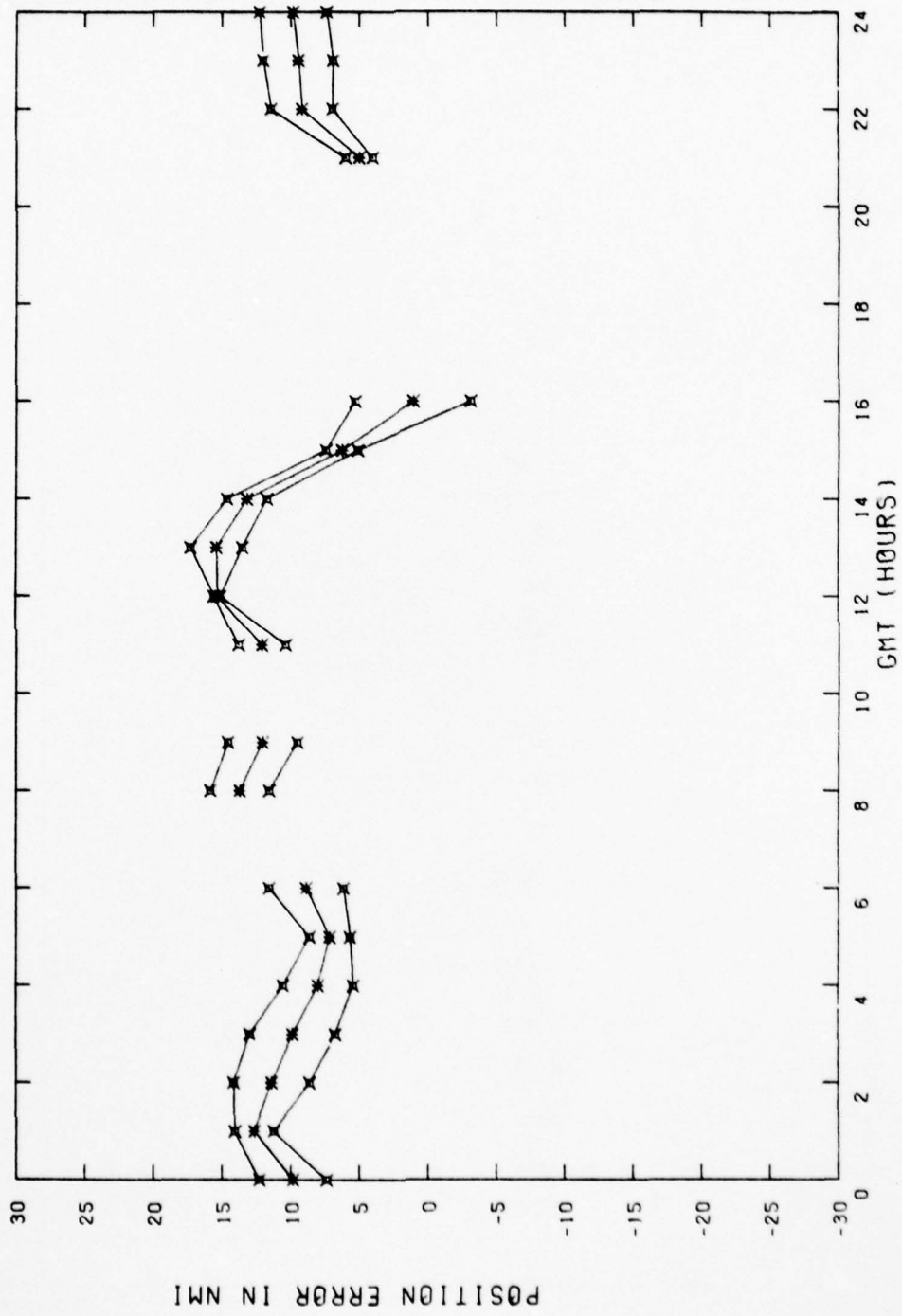


Figure B.43 Position Fix Error, North, Orote, 3/76, 13.6, CH-DH

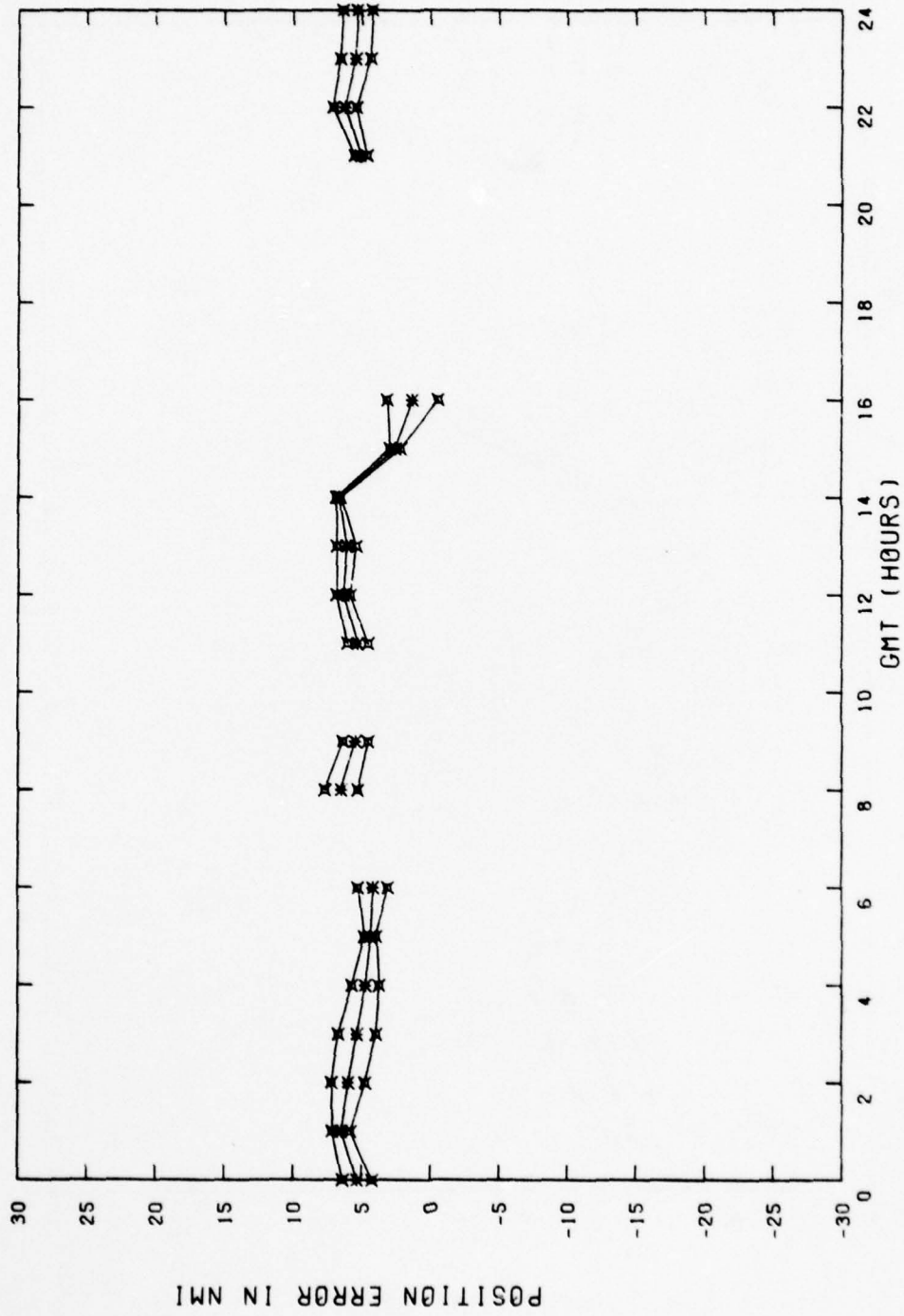


Figure B.44 Position Fix Error, East, Orote, 3/76, 13.6, CH-DH

APPENDIX C
CLARK AB DATA

This appendix contains data which have been derived from magnetic tape recordings made at the ONSOD Omega monitoring site at Clark AB, Philippines. The total data base available from Clark is summarized in Table 4.1 of the main text. Data taken during the months of January, July, and August were selected from the total data base for detailed examination and analysis. These selected data have been formatted into convenient graphical presentations for inclusion in this appendix.

Three types of related graphic presentations of the Clark AB data are presented. These are:

- (1) Phase Difference Monthly Summaries: Diurnal plots of the average monthly phase difference between pairs of Omega signals are provided. These plots represent data as observed by the Clark AB Omega receiver and prior to processing or the addition of PPCs.
- (2) LOP Monthly Summaries: The phase difference data of item (1) were corrected with PPC values supplied by ONSOD, normalized to the Clark AB site location and presented as diurnal plots of the monthly average LOP. Also included in the LOP monthly summaries is the diurnal standard deviation of the measured data.
- (3) Position Fix Summaries: Data from pairs of LOPs were combined to obtain site location as determined from the Omega data. Site location values were compared to the known geographic locations of the Clark AB site to provide diurnal plots of north and east position fix errors.

The Clark AB data plots are presented in sequences which are related to their method of generation. The 10 kHz January data are presented as a group followed by the 10.2 kHz August data.

The sequence of the presentation of the January data is summarized in Figure C.1. Three plots of measured phase difference summaries for stations AB, BE, and CH are followed by their related LOP monthly summaries. LOP pairs are then combined to produce pairs of north and east error plots. The August data are presented in a similar manner as shown in Figure C.12.

In addition, for comparison, the 10.2 kHz and 13.6 kHz data that were available for the month of July 1976 for LOP's AB, BE, and EH was examined. The 10.2 kHz BE-EH data are summarized in Figure C.33 on page C-35. Data at 10.2 kHz for AB was not available for this month. The 13.6 kHz data for AB, BE and EH is summarized in Figure C.38 on page C.40.

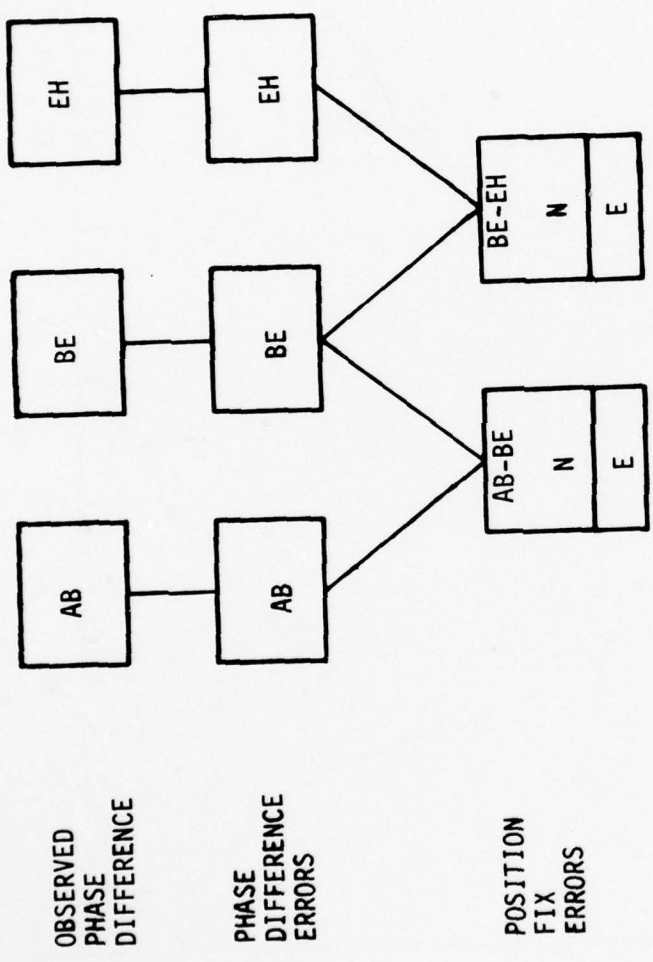


Figure C.1 Clark Air Base Data Graphs, January 1977, 10.2

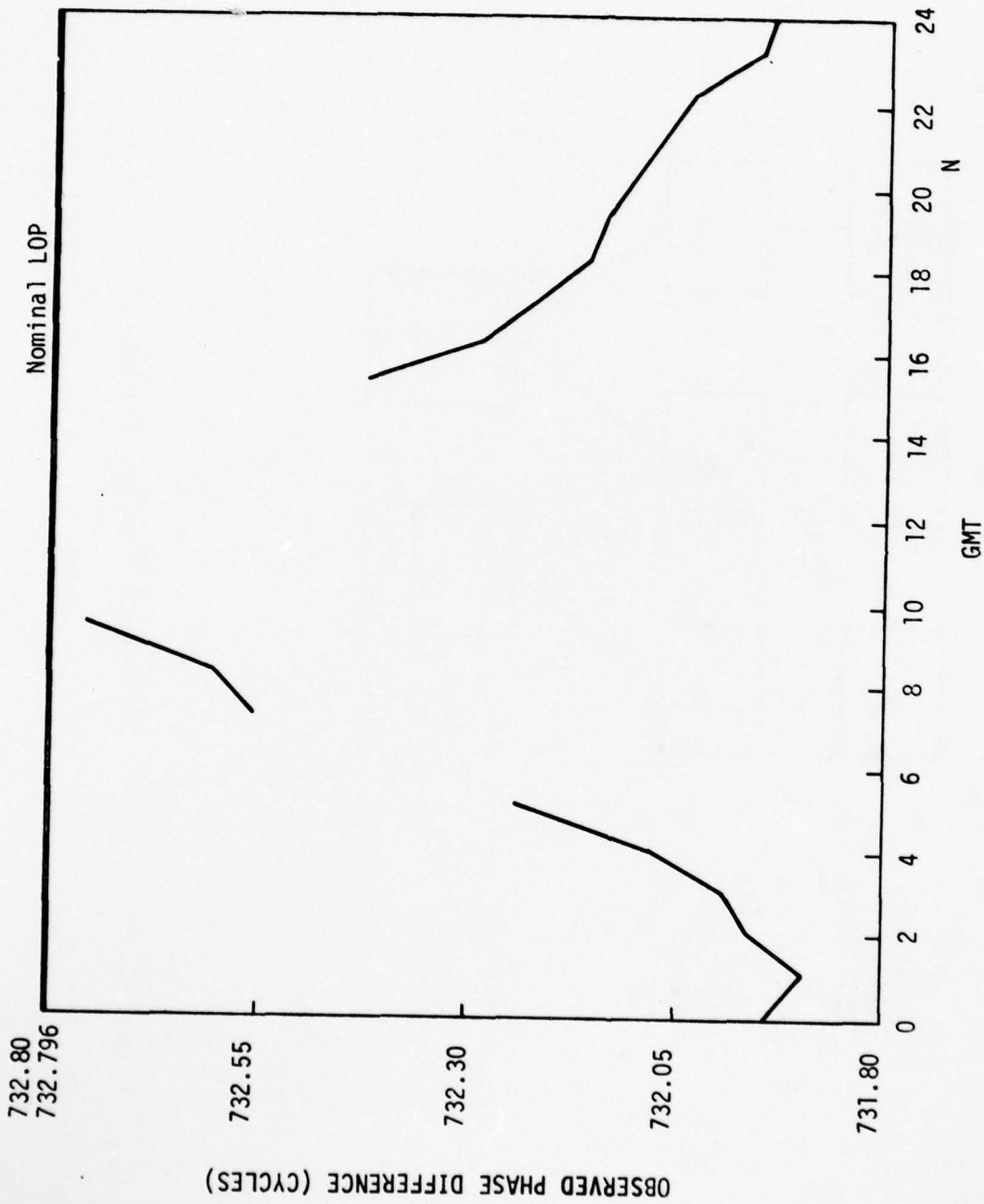


Figure C.2 Observed Phase Difference, Clark, AB, 10.2, 1/77

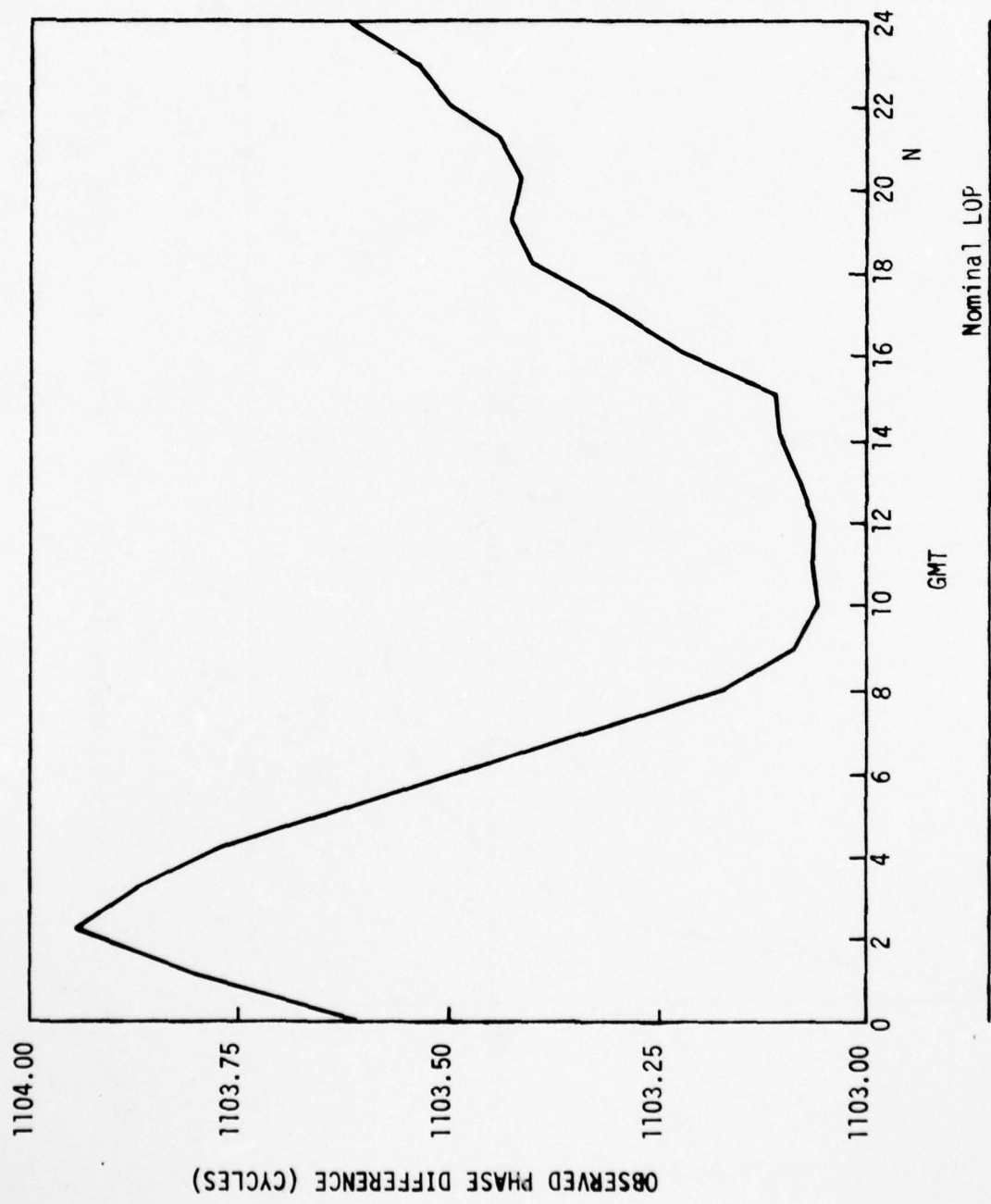


Figure C.3 Observed Phase Difference, Clark, BE, 10.2, 1/77

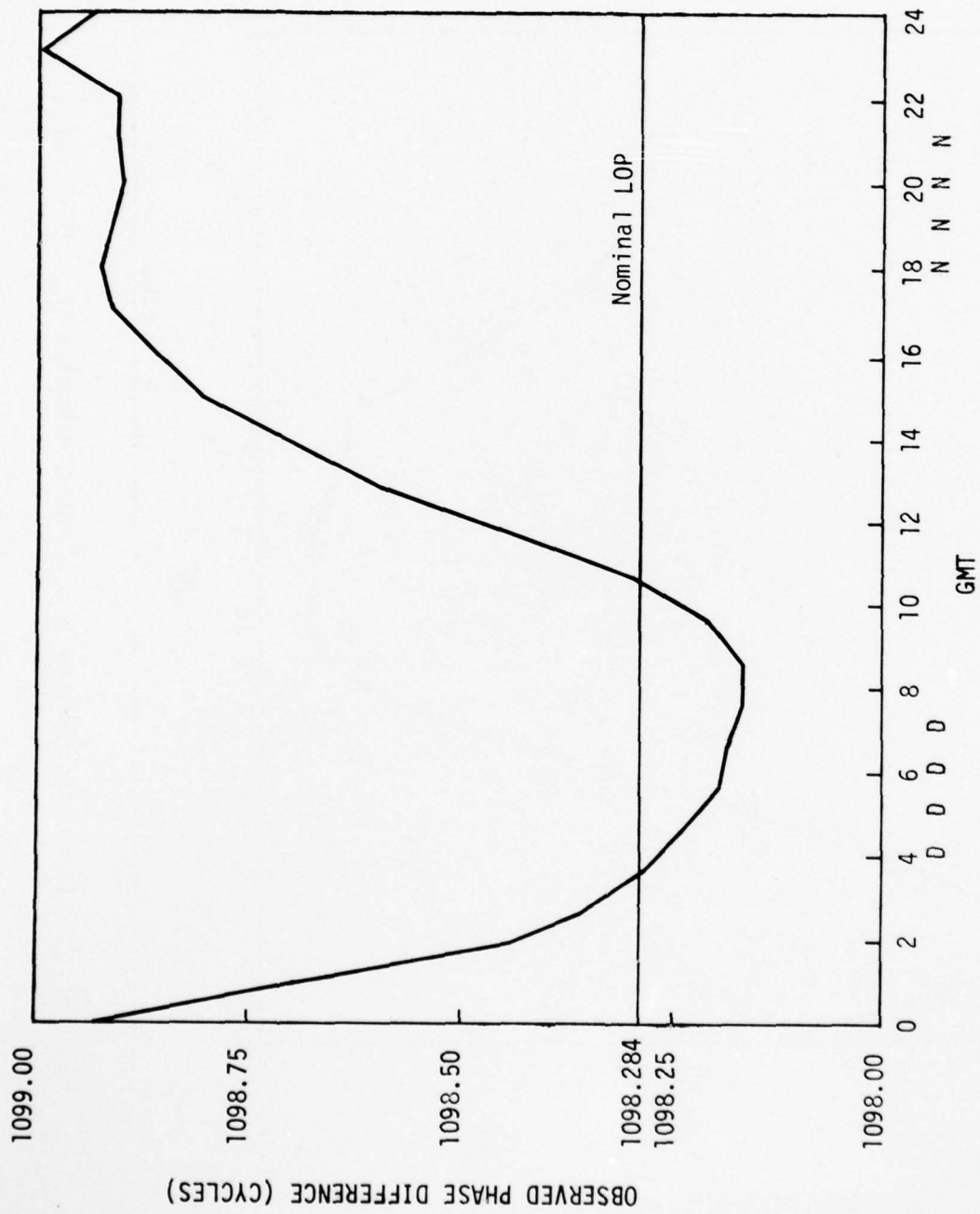


Figure C.4 Observed Phase Difference, Clark, EH, 10.2, 1/77

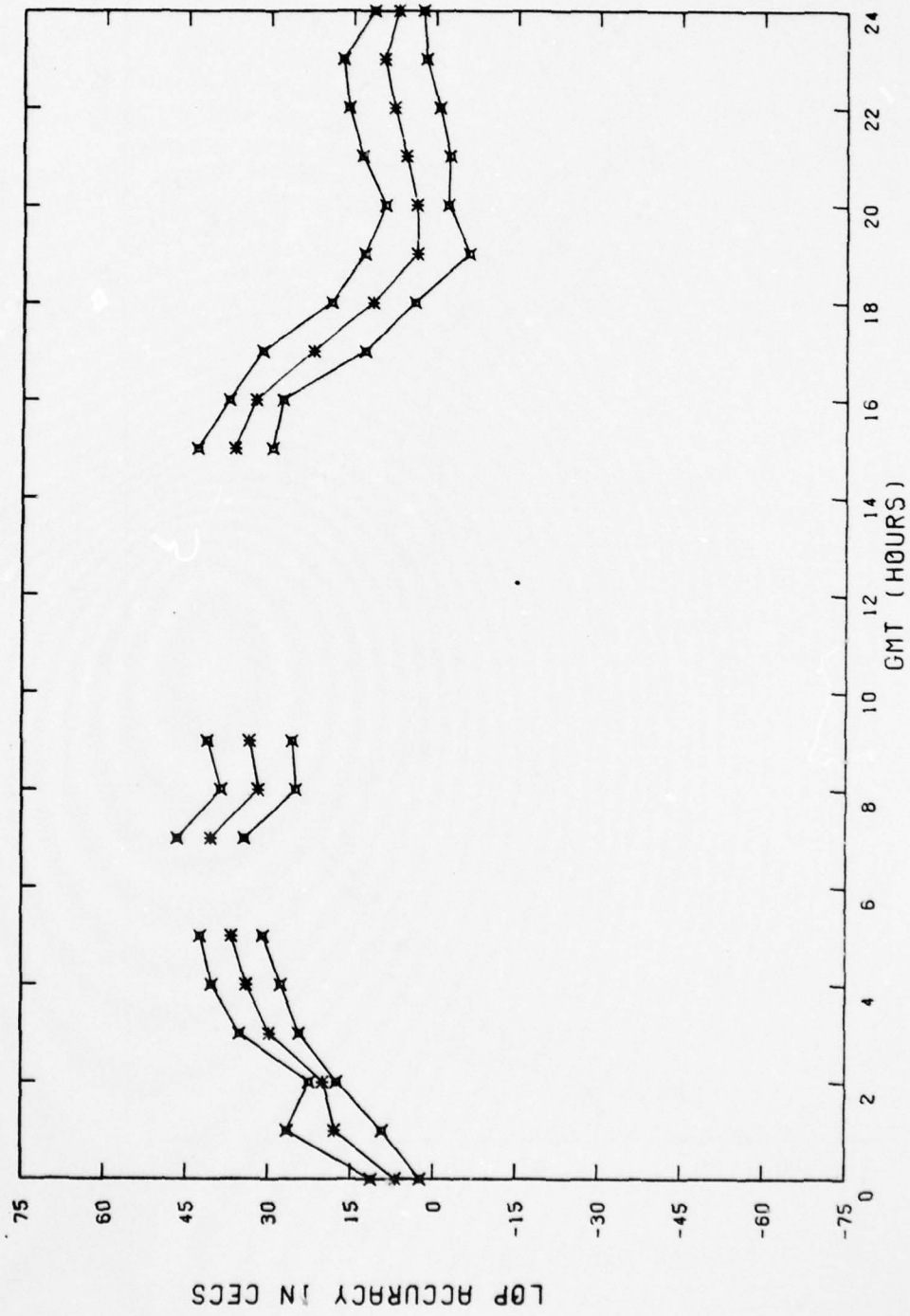


Figure C.5 Phase Difference Error, Clark, 1/77, 10.2, AB

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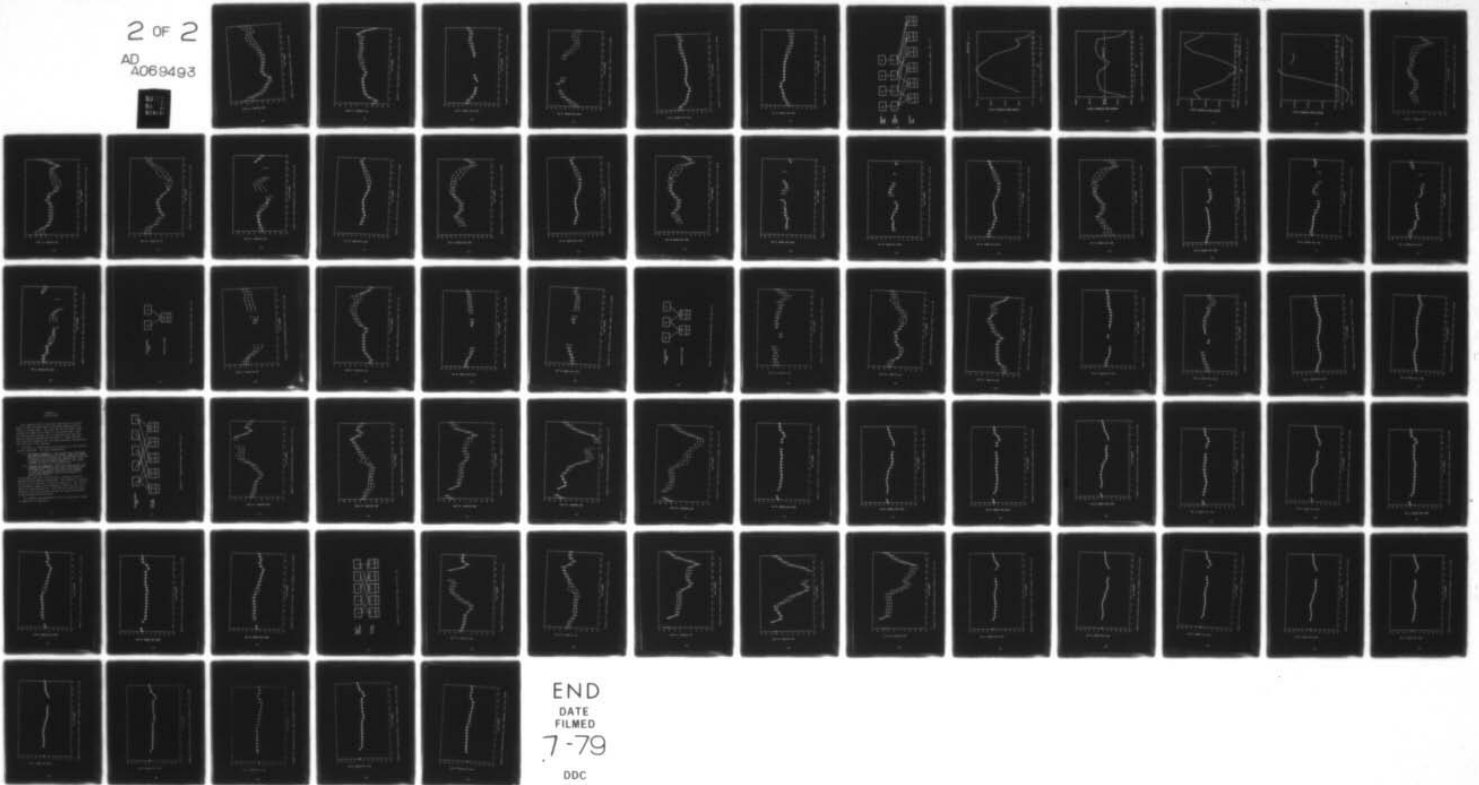
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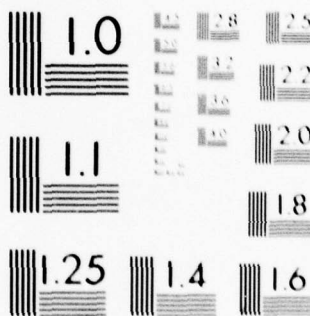
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MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

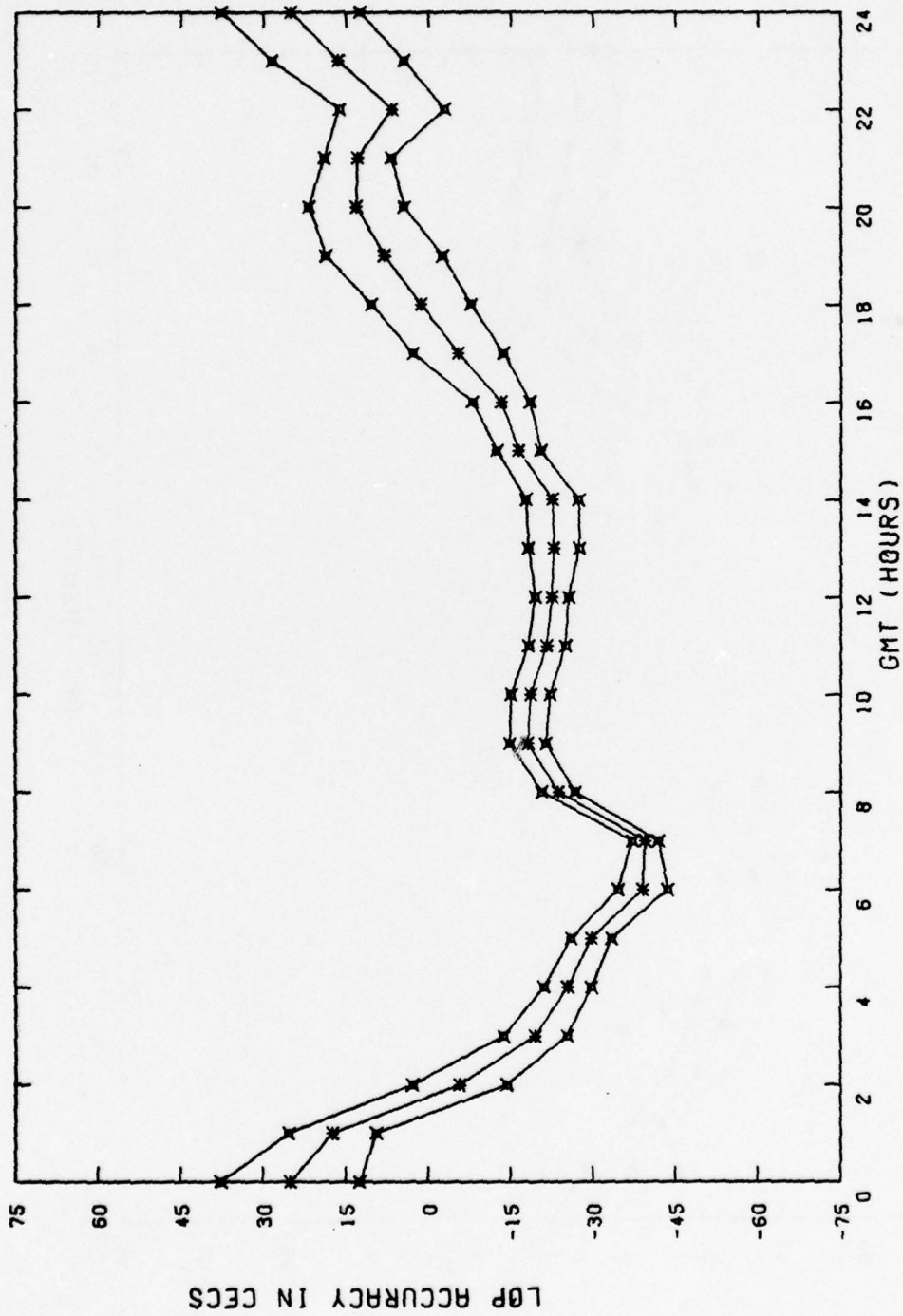


Figure C.6 Phase Difference Error, Clark, 1/77, 10.2, BE

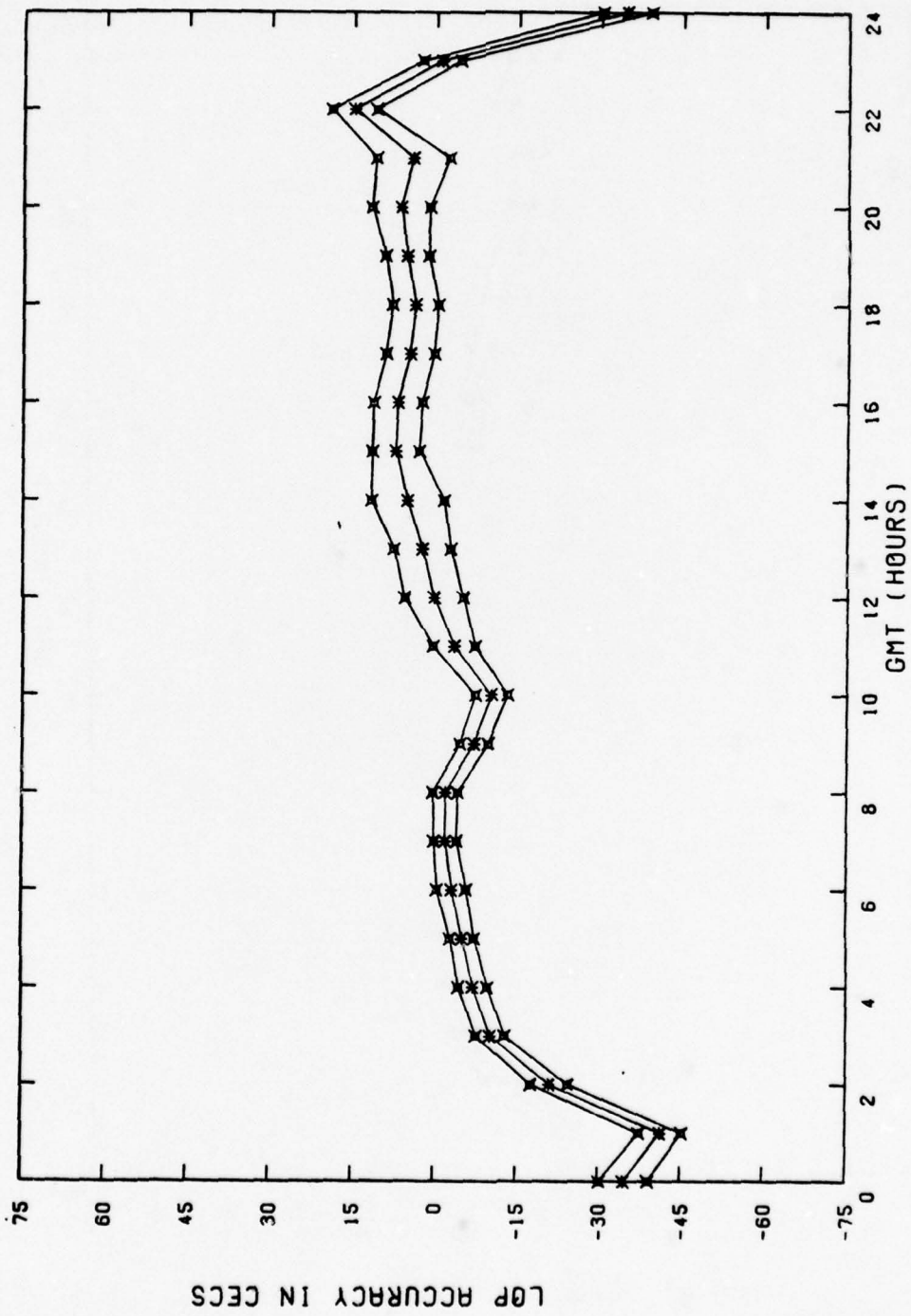


Figure C.7 Phase Difference Error, Clark, 1/77, 10.2, EH

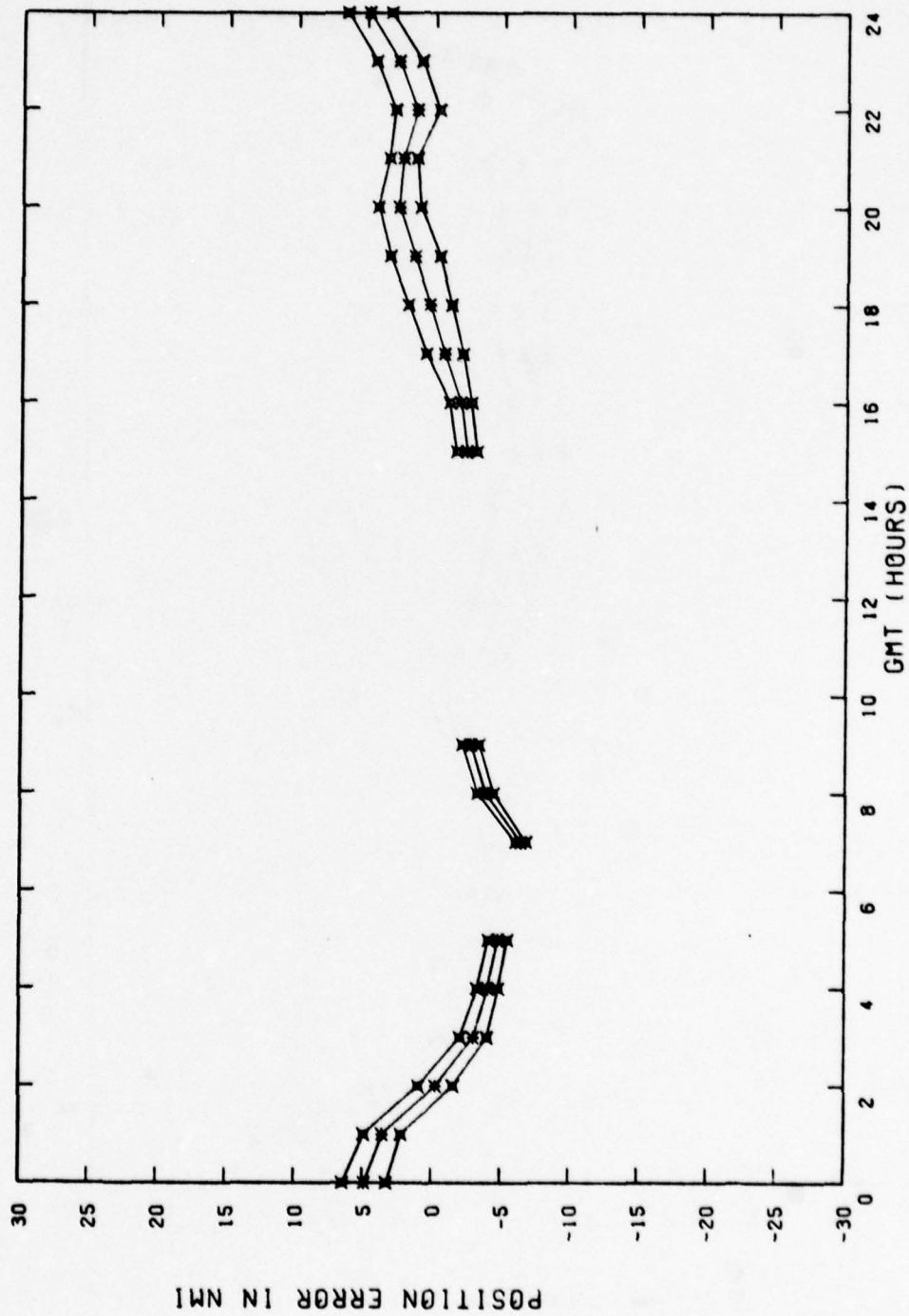


Figure C.8 Position Fix Error, North, Clark, 1/77, 10.2, AB-BE

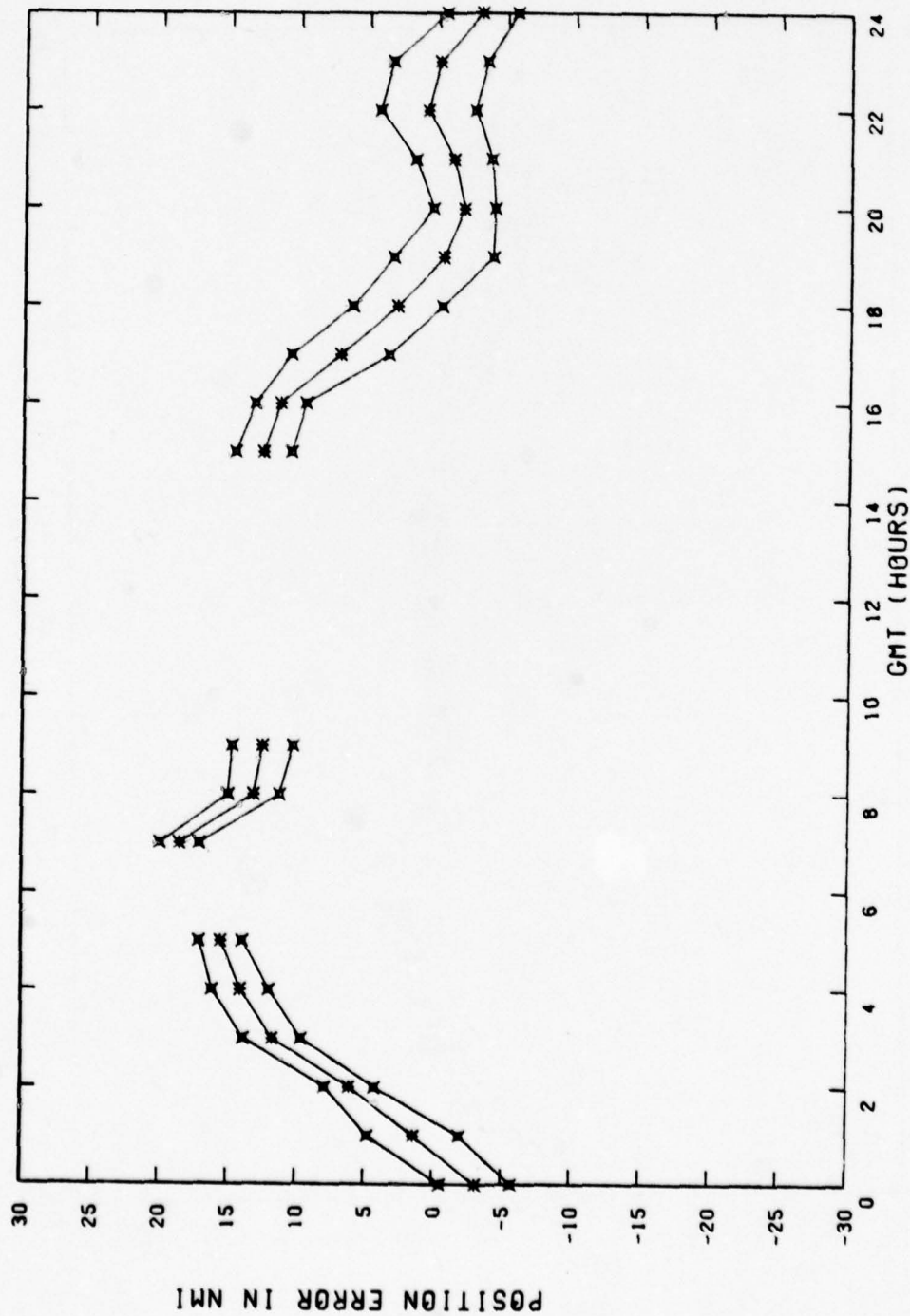


Figure C.9 Position Fix Error, East, Clark, 1/77, 10.2, AB-BE

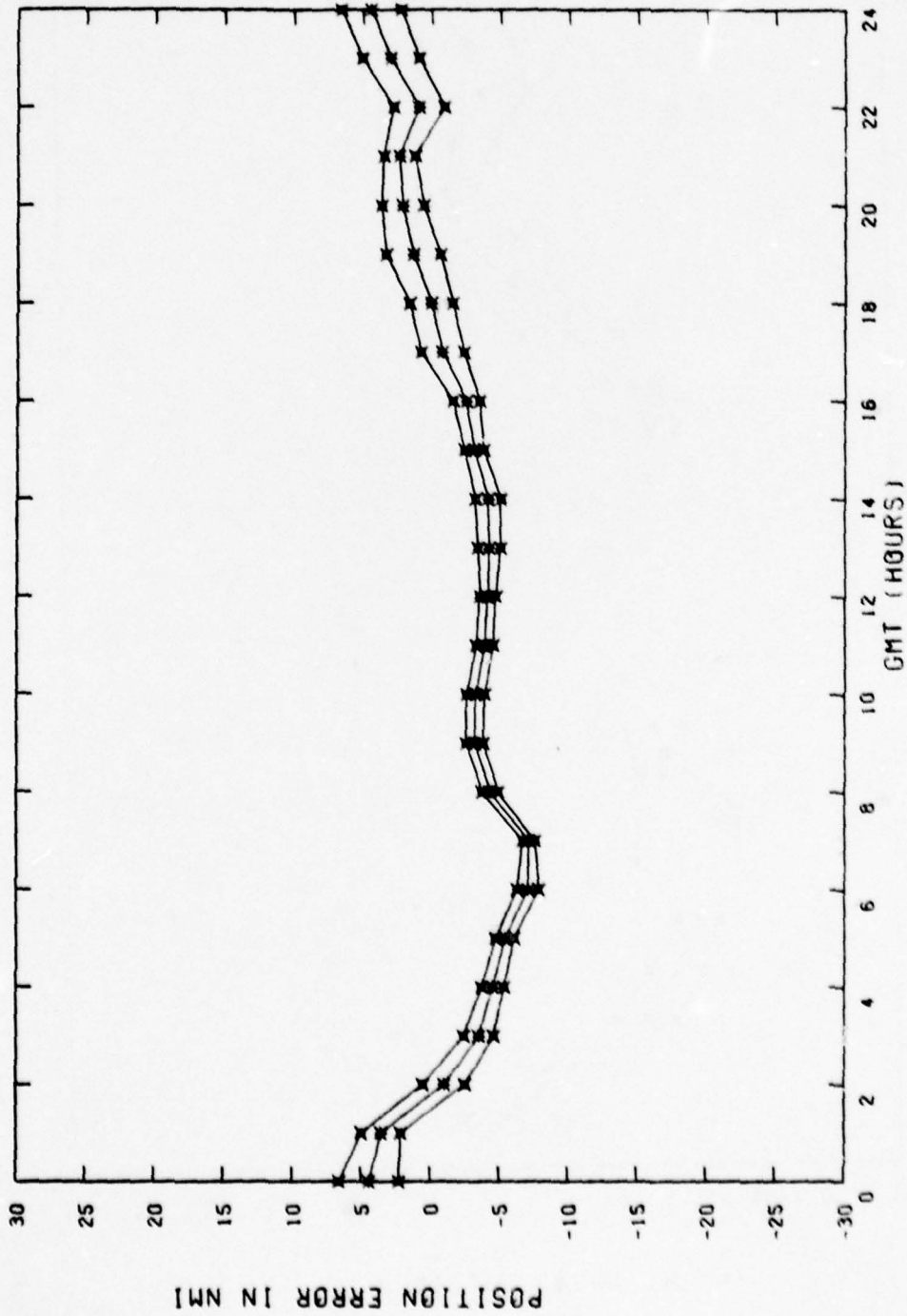


Figure C.10 Position Fix Error, North, Clark, 1/77, 10.2, BE-EH

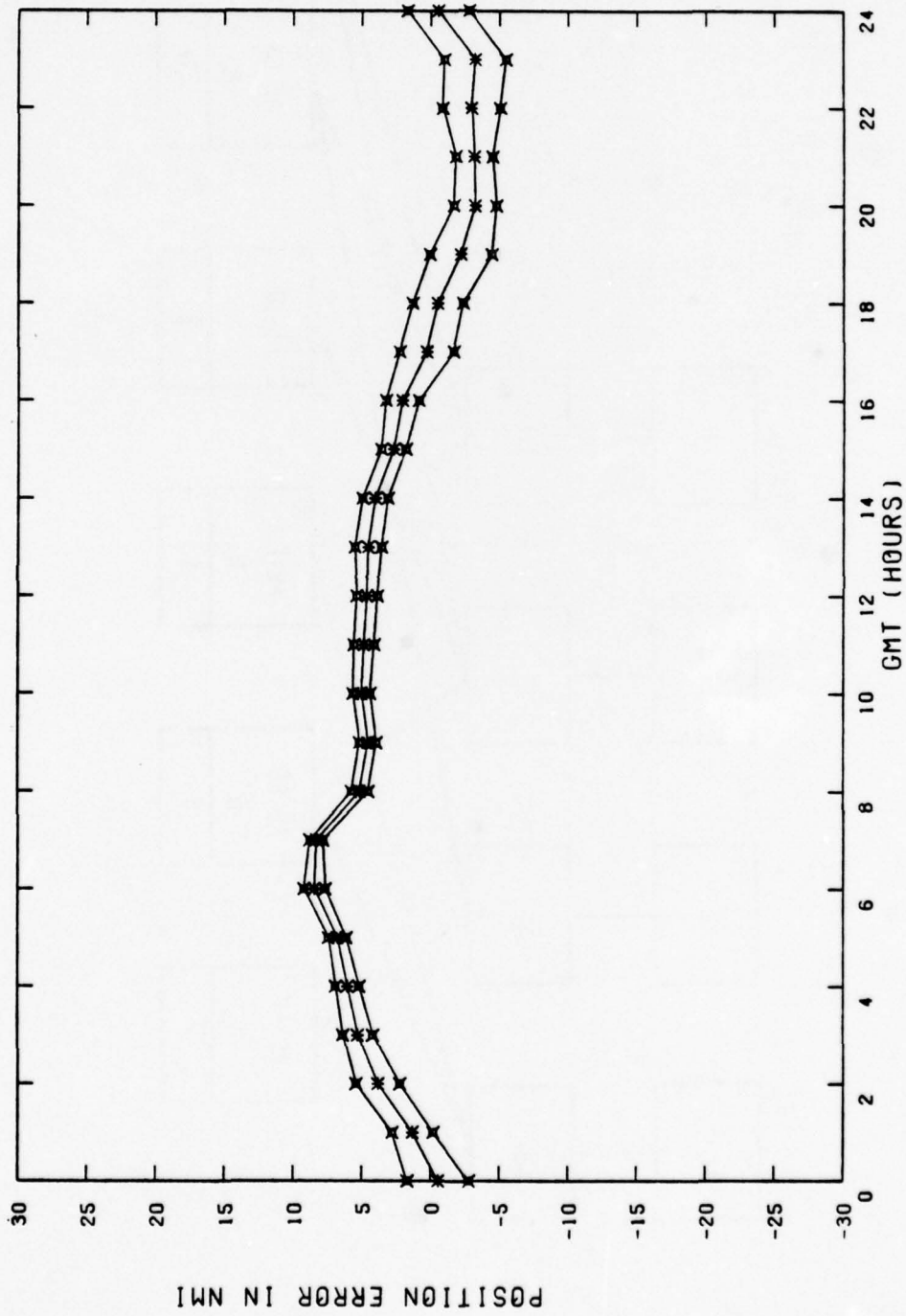


Figure C.11 Position Fix Error, East, Clark, 1/77, 10.2, BE-EH

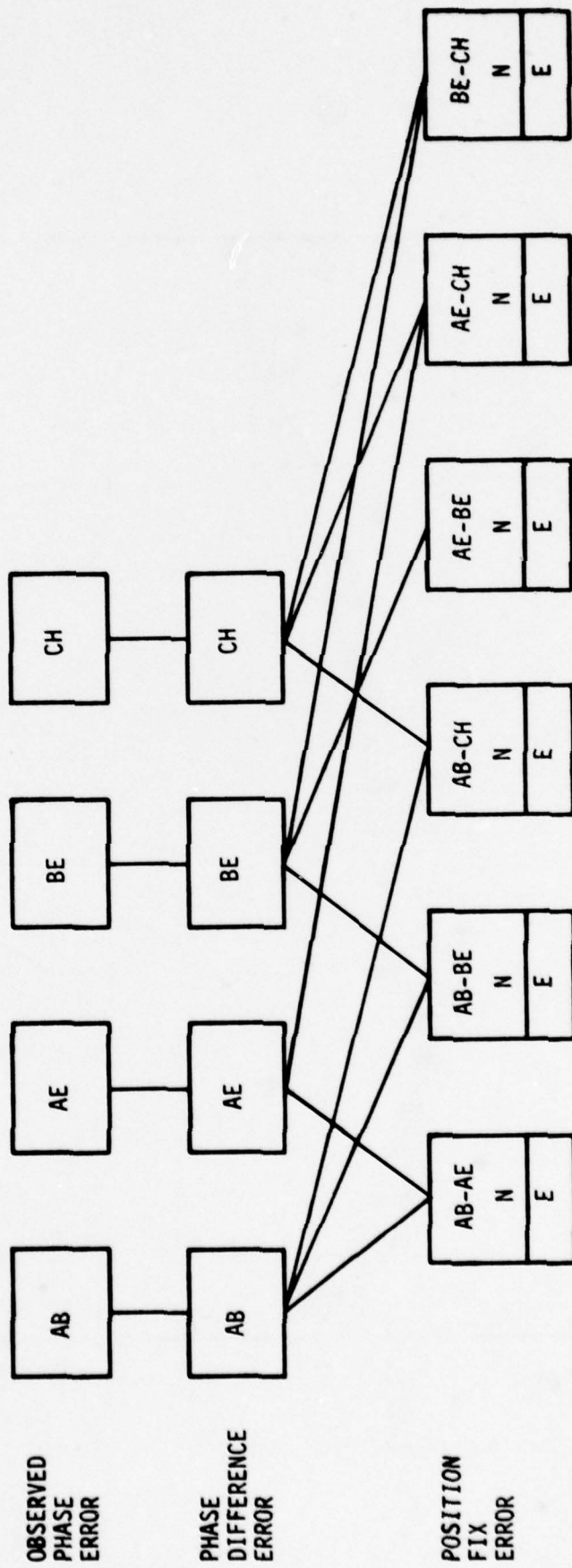


Figure C.12 Clark Air Base Data Graphs, August, 1977, 10.2

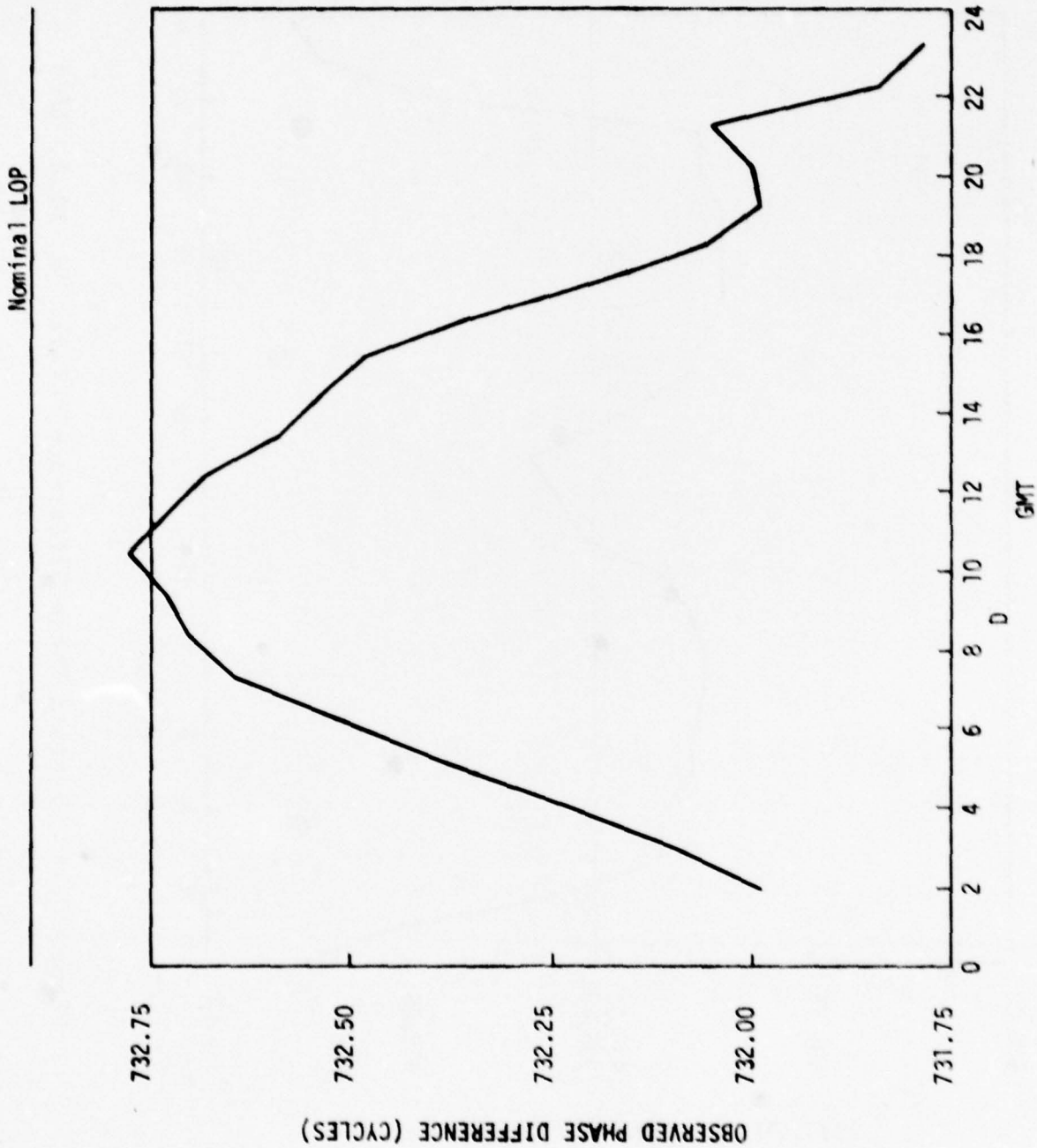


Figure C.13 Observed Phase Difference, Clark, AB, 10.2, 8/77

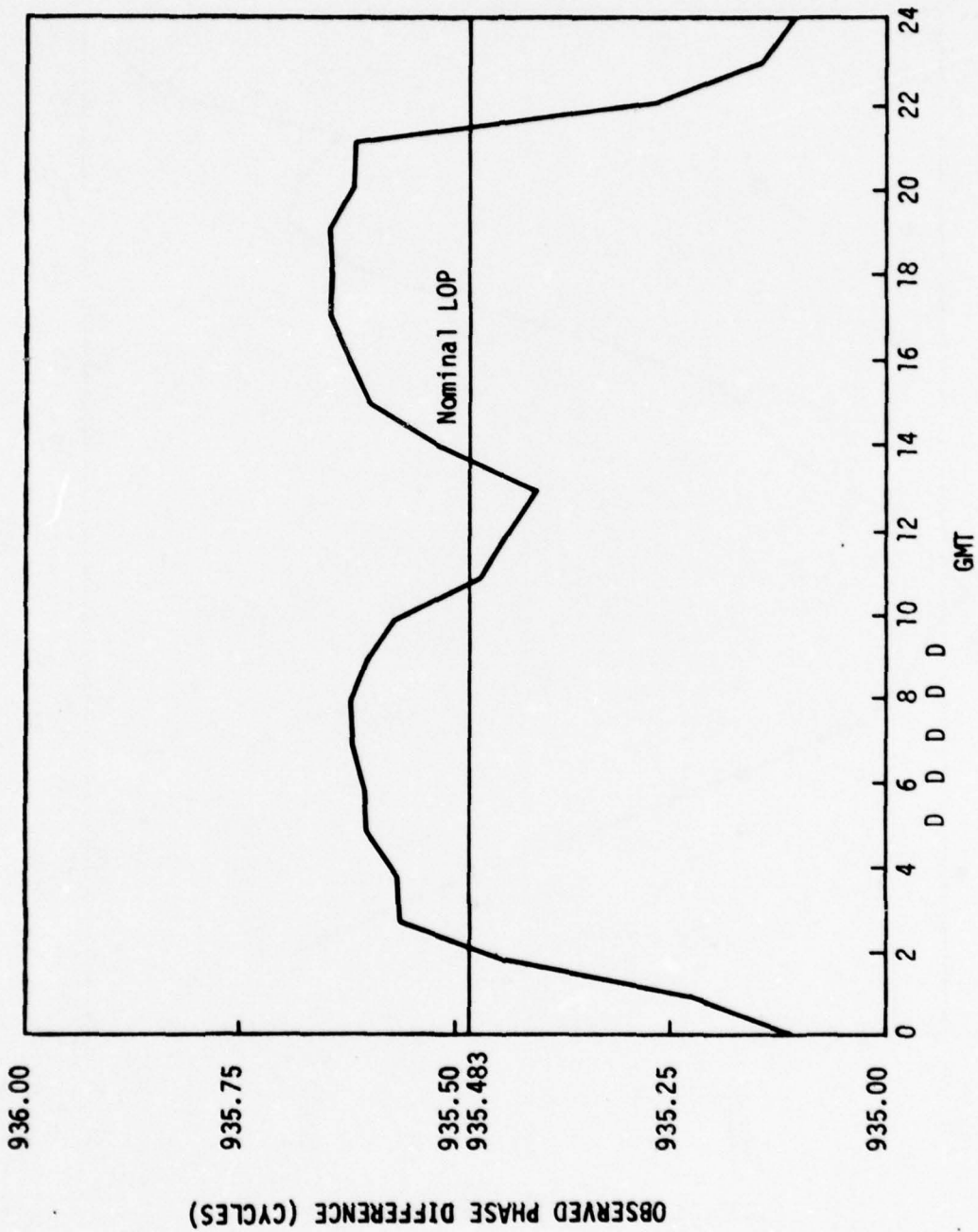


Figure C.14 Observed Phase Difference, Clark, AE, 10.2, 8/77

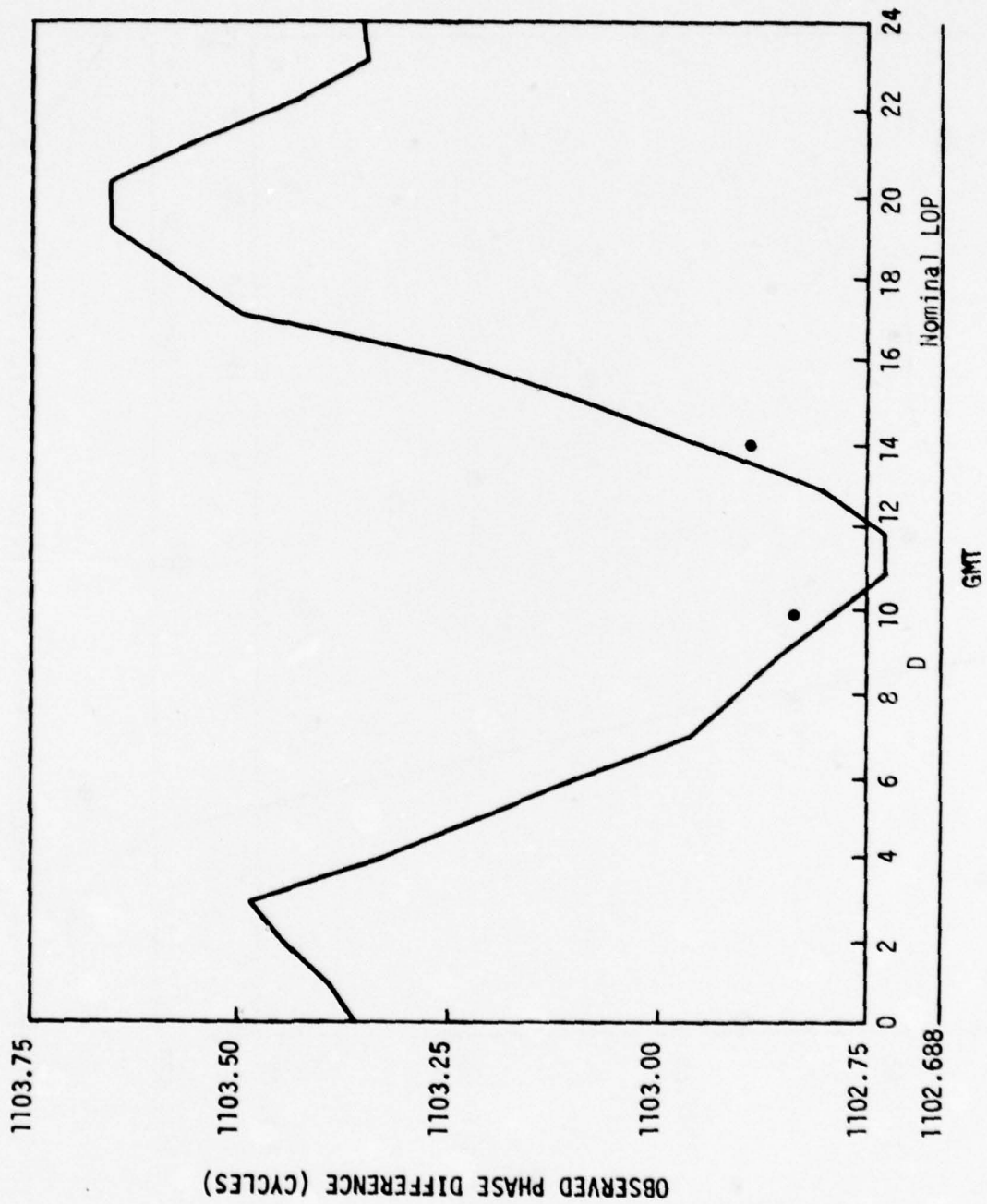


Figure C.15 Observed Phase Difference, Clark, BE, 10.2, 8/77

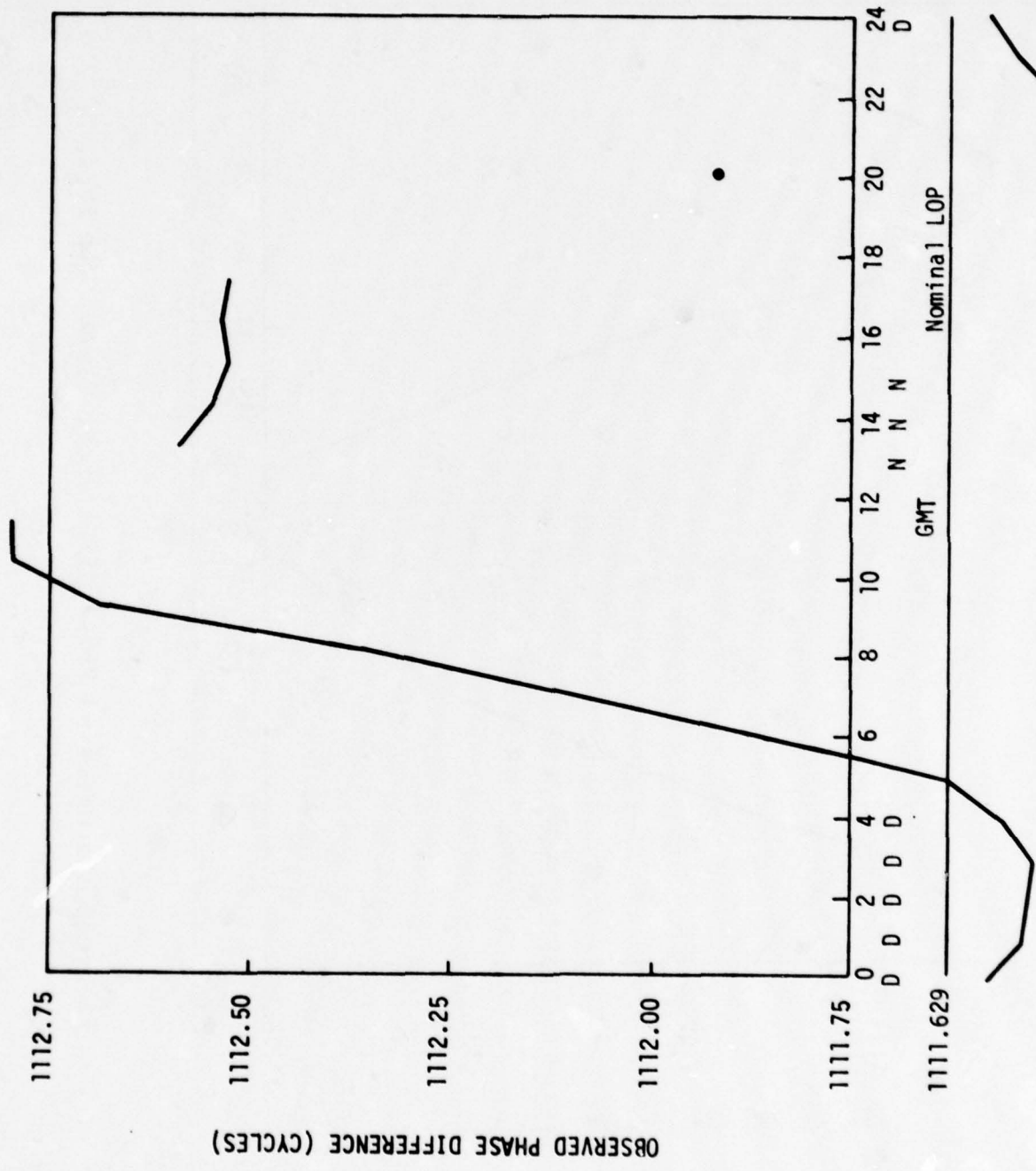


Figure C.16 Observed Phase Difference, Clark, CH, 10.2, 8/77

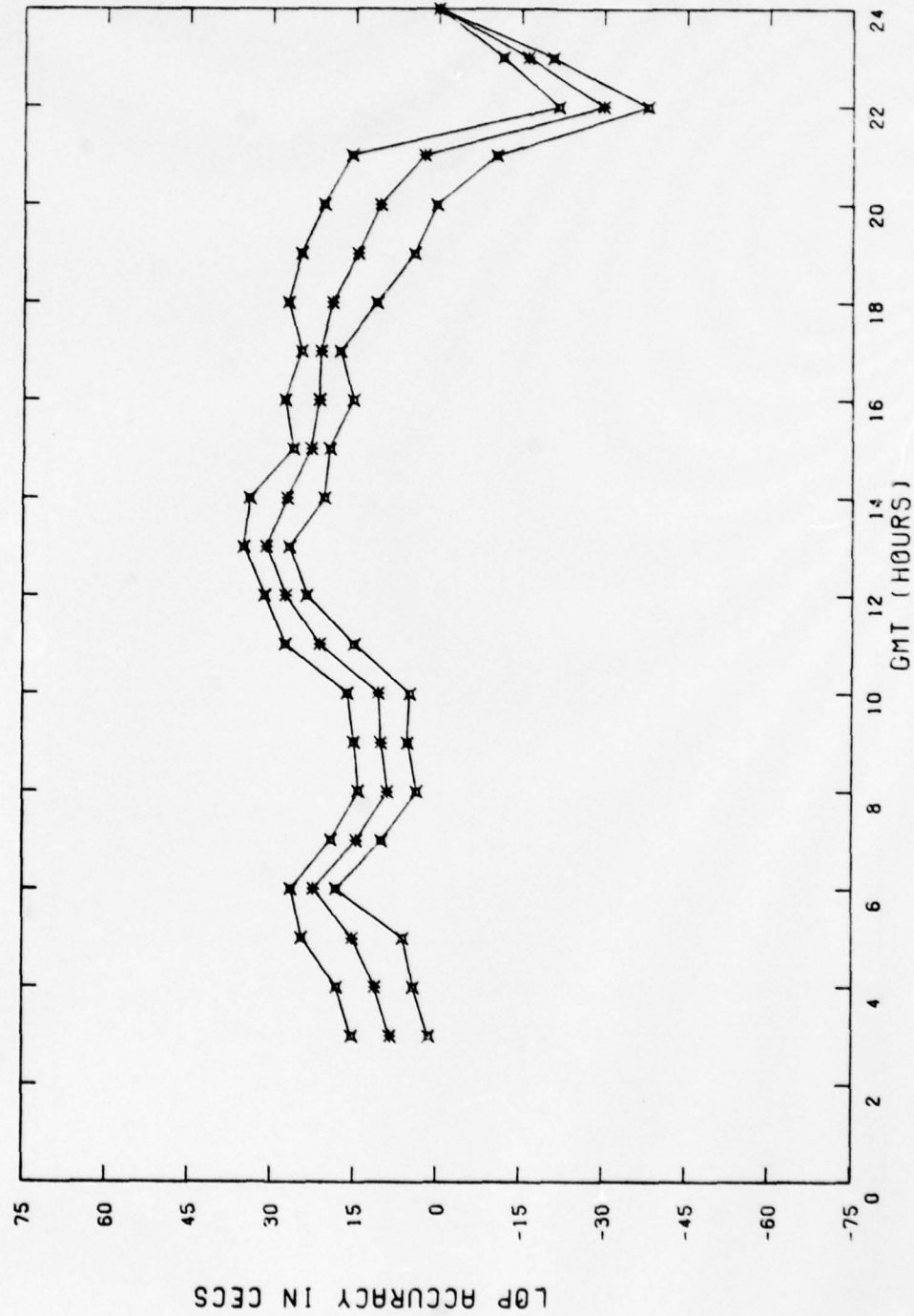


Figure C.17 Phase Difference Error, Clark, 8/77, 10.2, AB

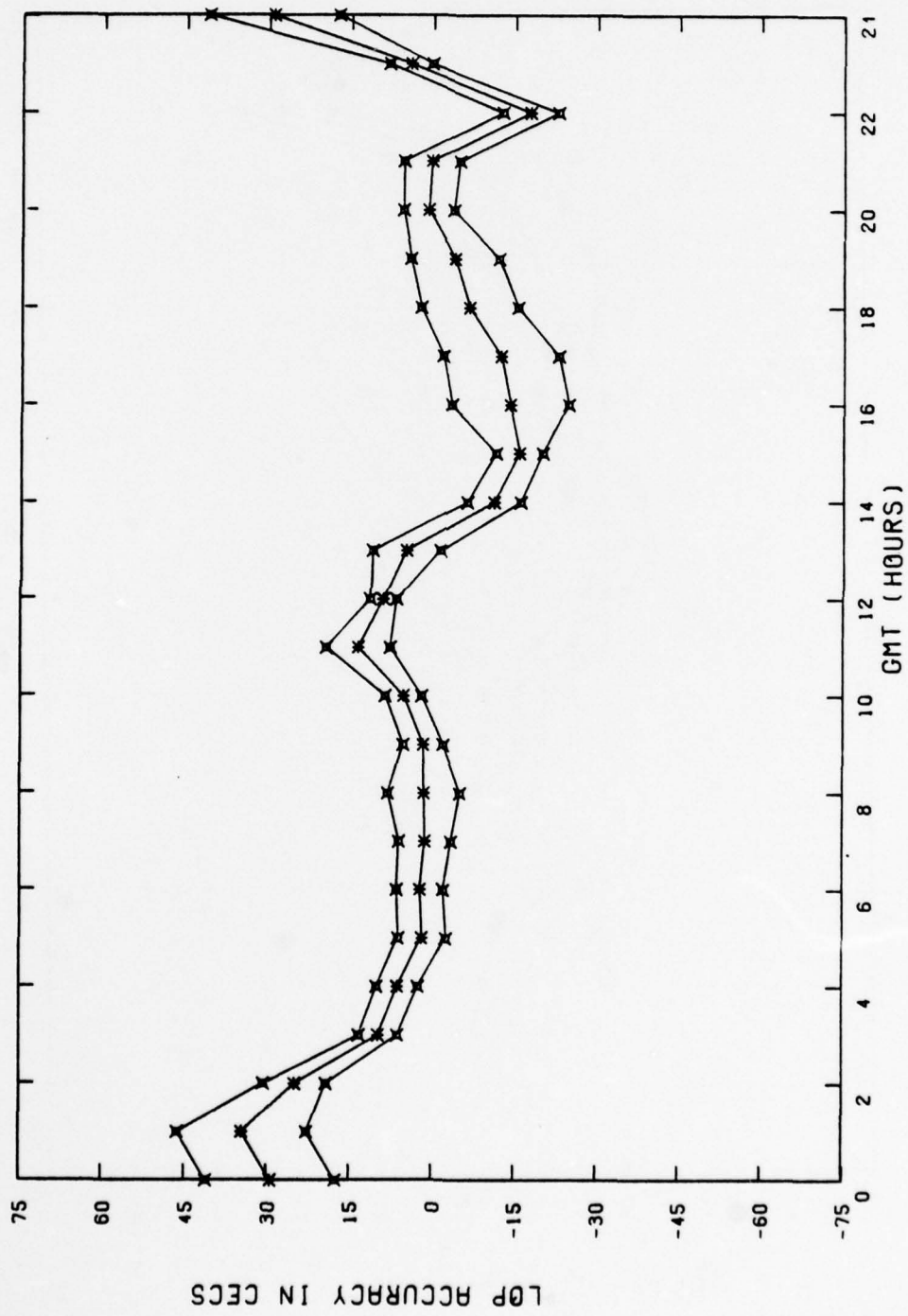


Figure C.18 Phase Difference Error, Clark, 8/77, 10.2, AE

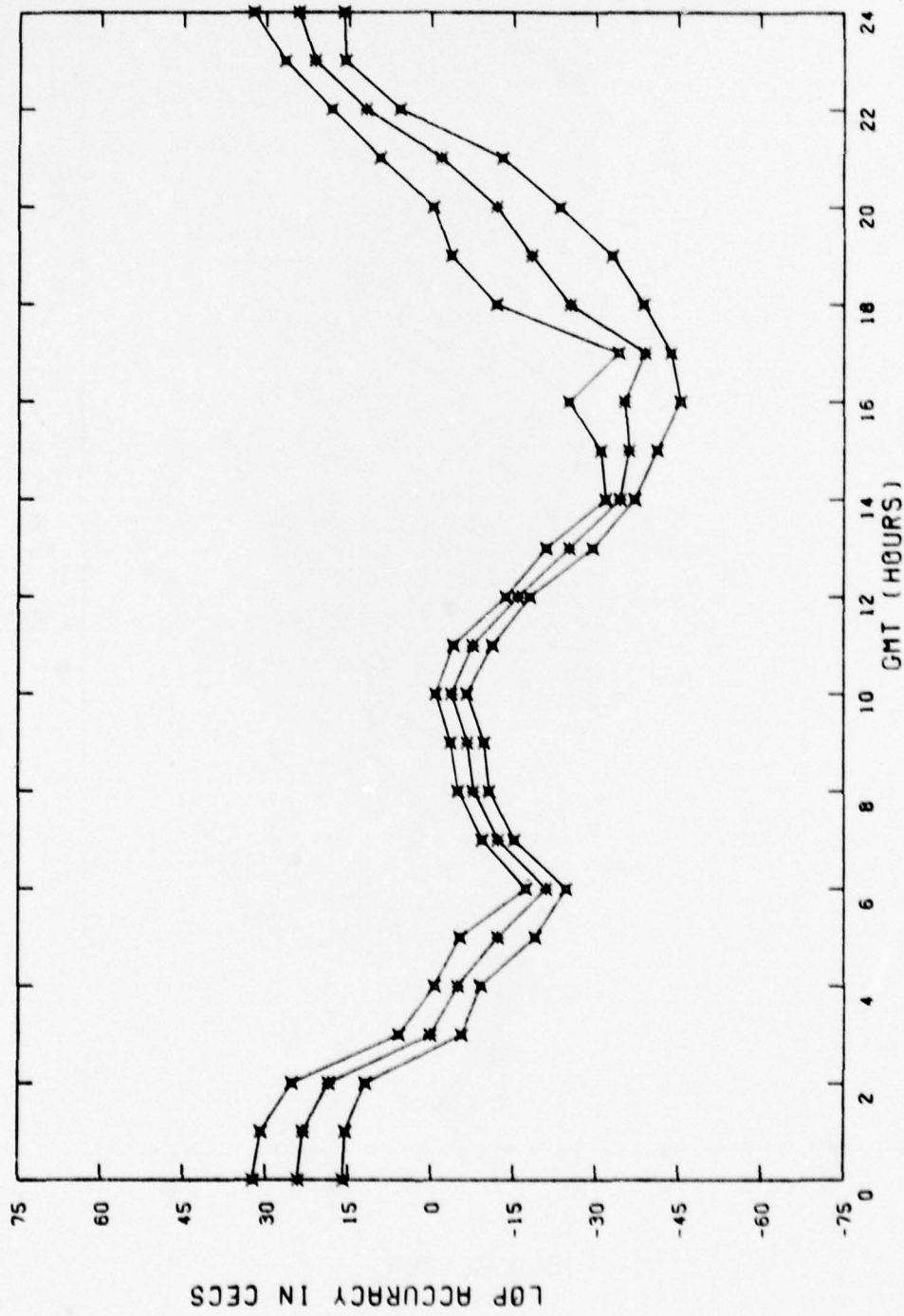


Figure C.19 Phase Difference Error, Clark, 8/77, 10.2, BE

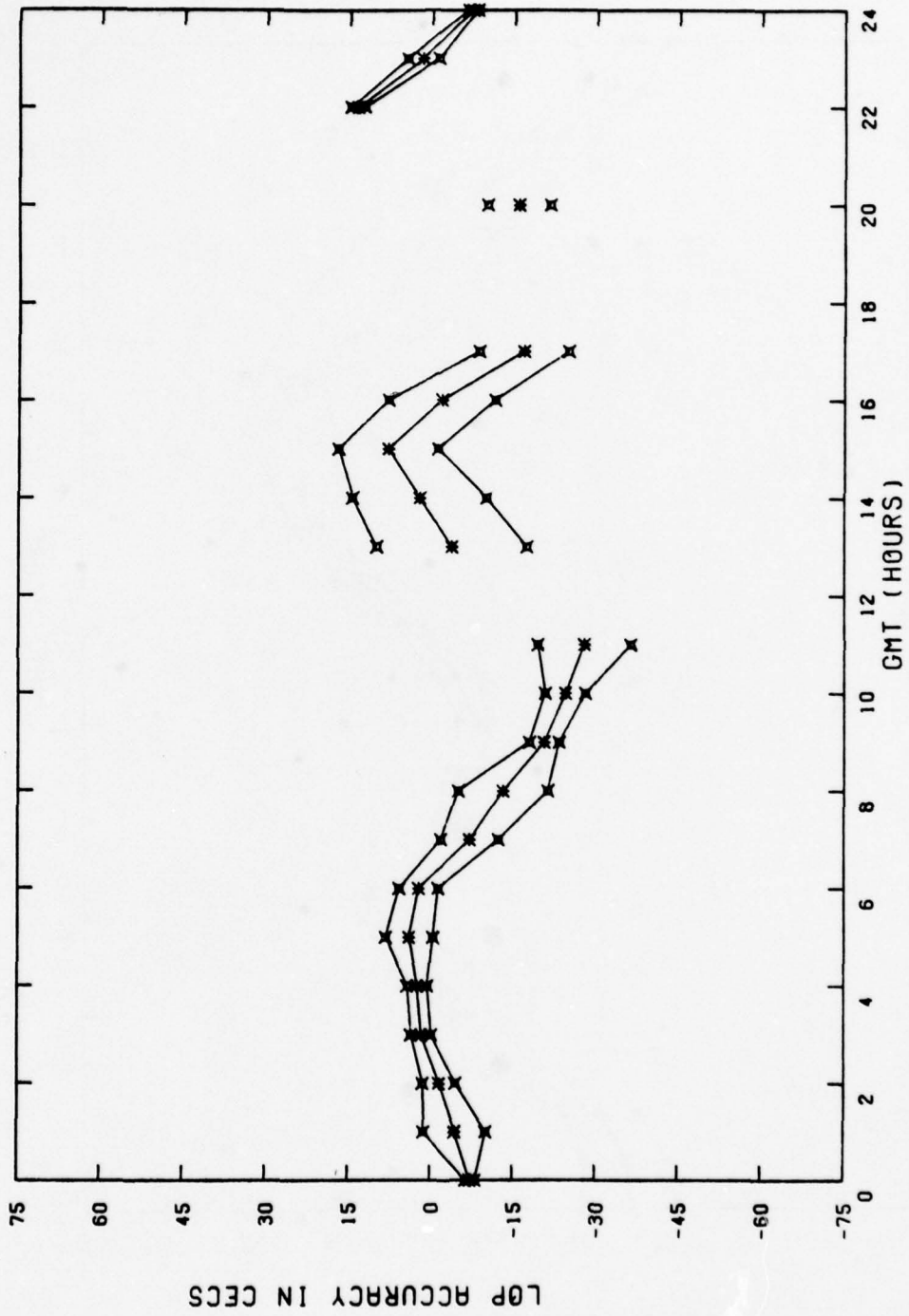


Figure C.20 Phase Difference Error, Clark, 8/77, 10.2, CH

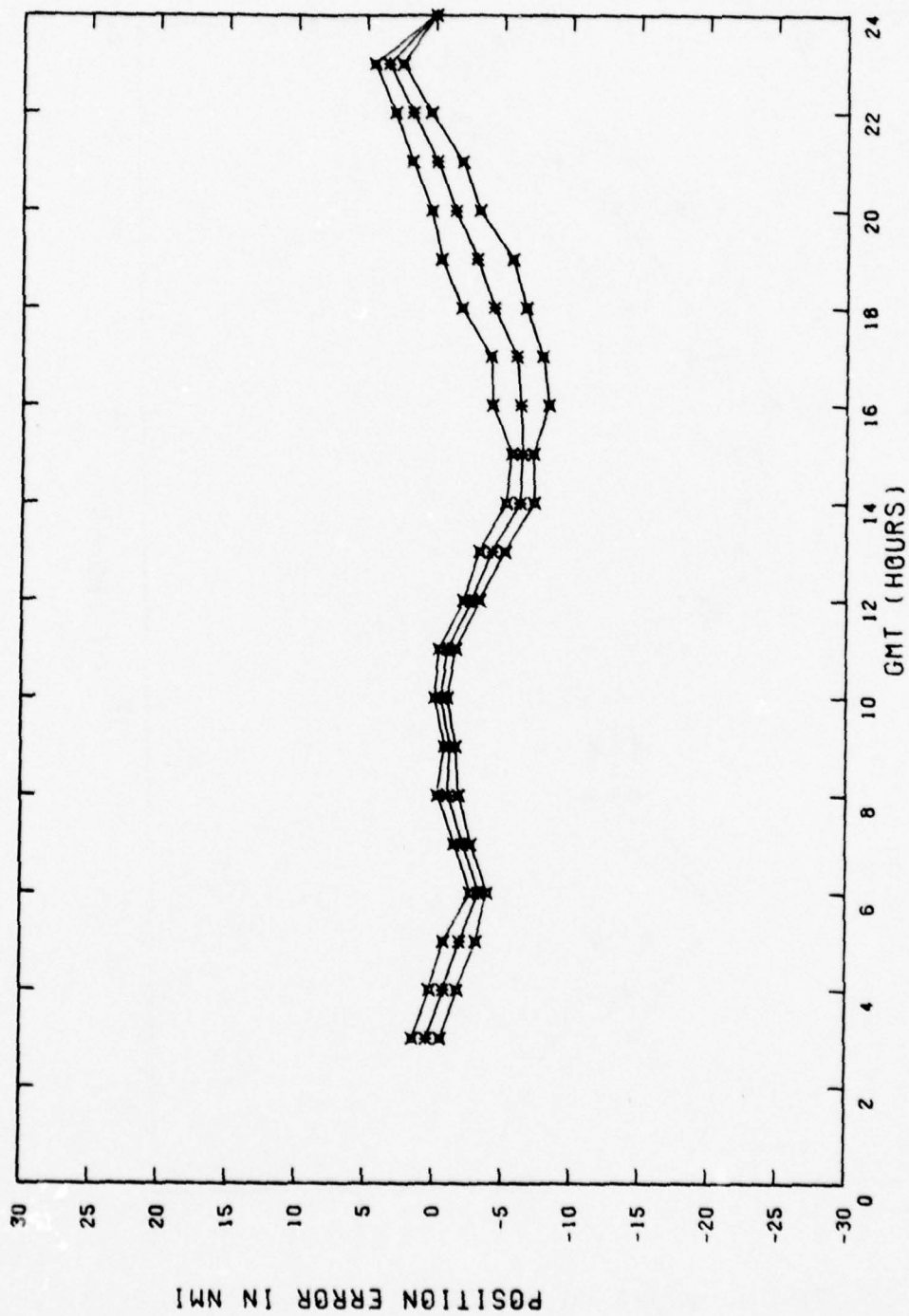


Figure C.21 Position Fix Error, North, Clark, 8/77, 10.2, AB-AE

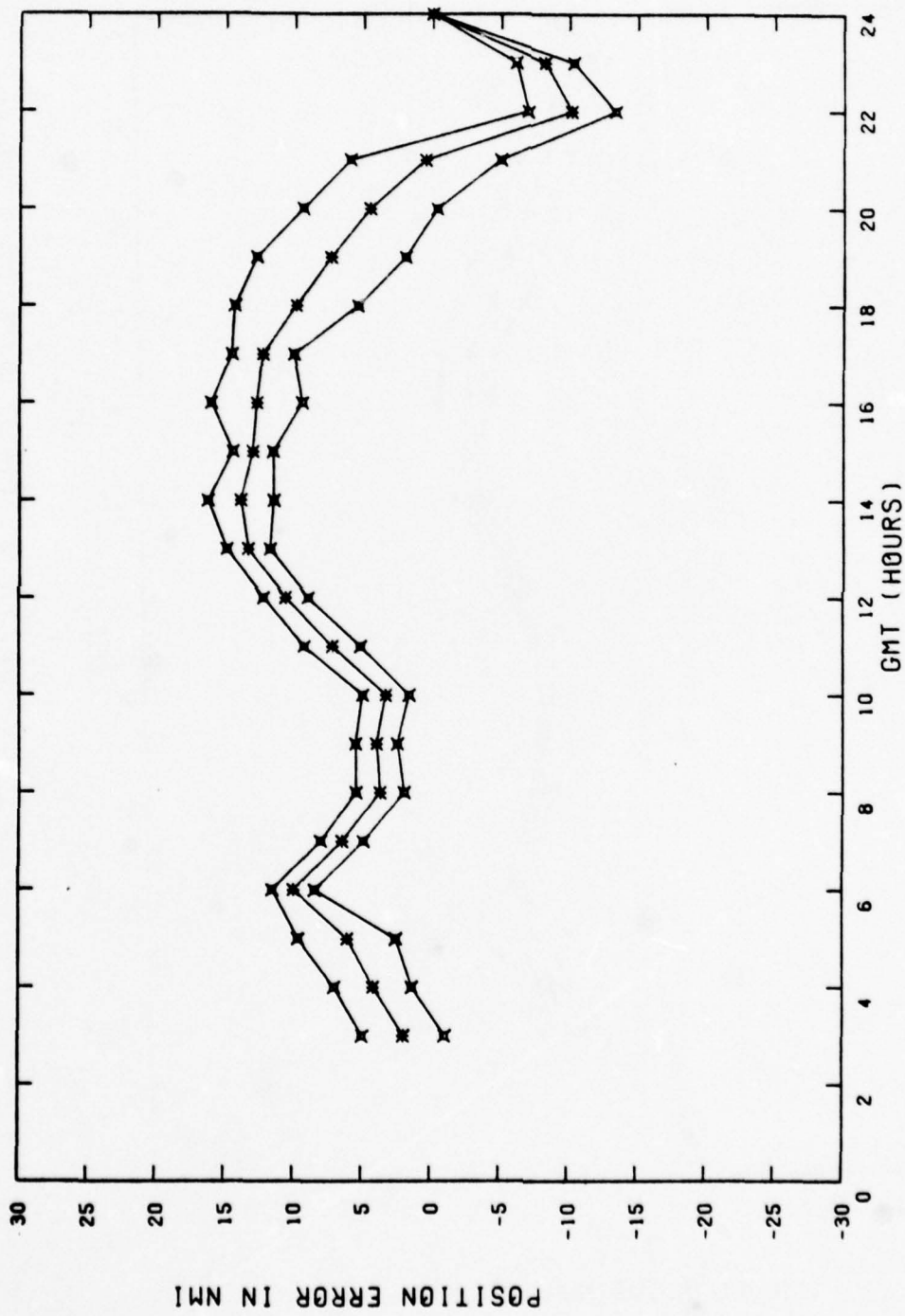


Figure C.22 Position Fix Error, East, Clark, 8/77, 10.2, AB-AE

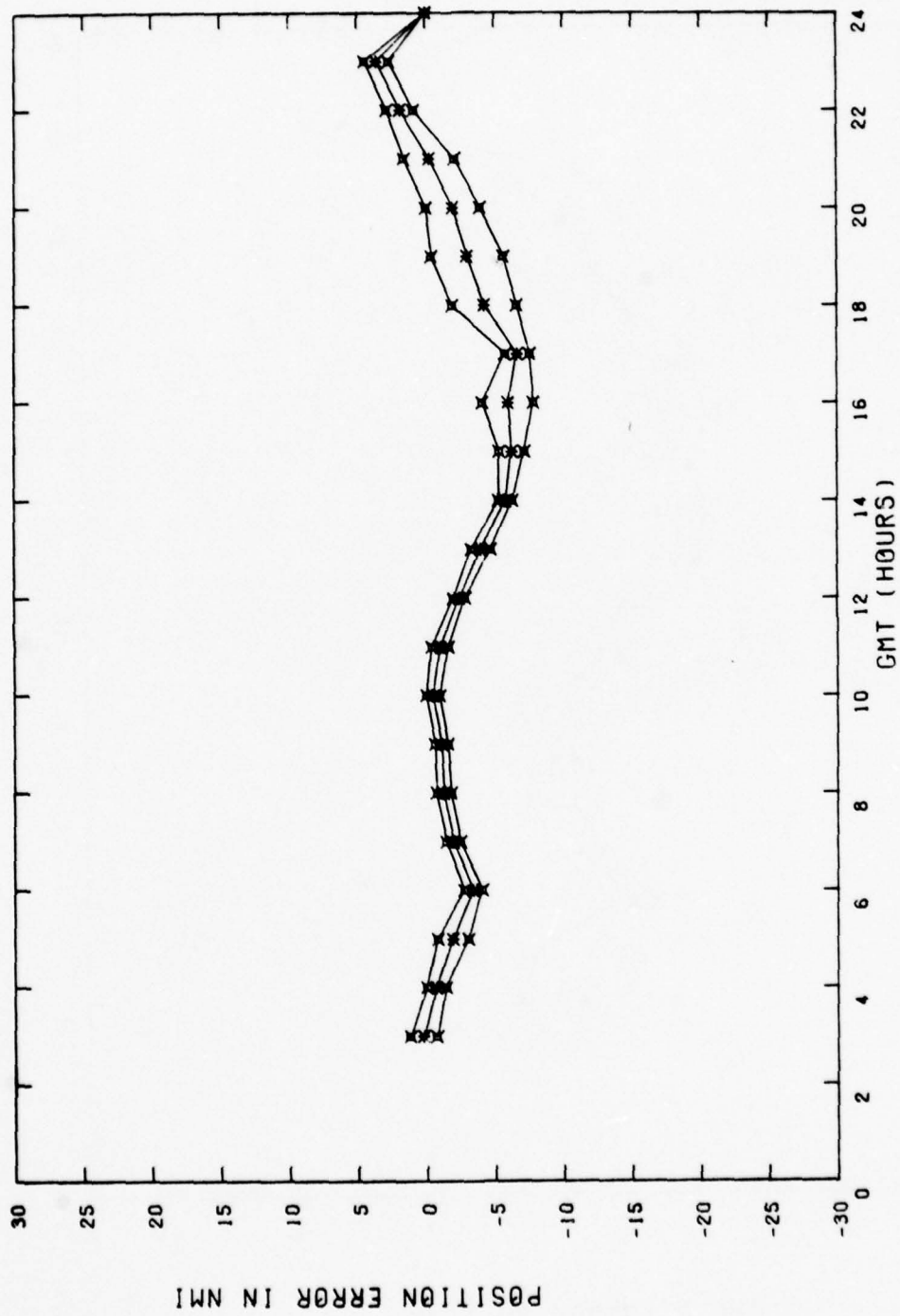


Figure C.23 Position Fix Error, North, Clark, 8/77, 10.2, AB-BE

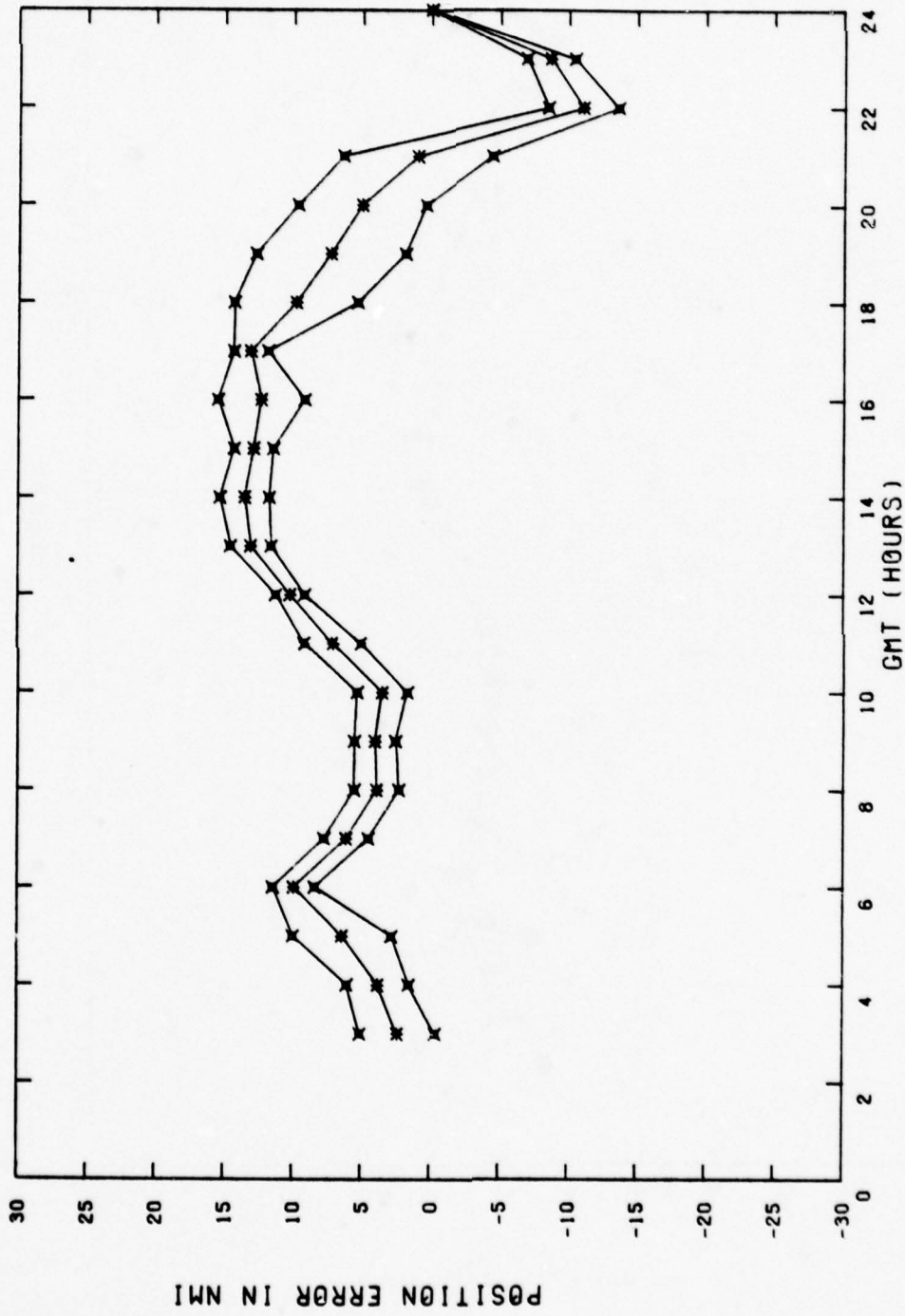


Figure C.24 Position Fix Error, East, Clark, 8/77, 10.2, AB-BE

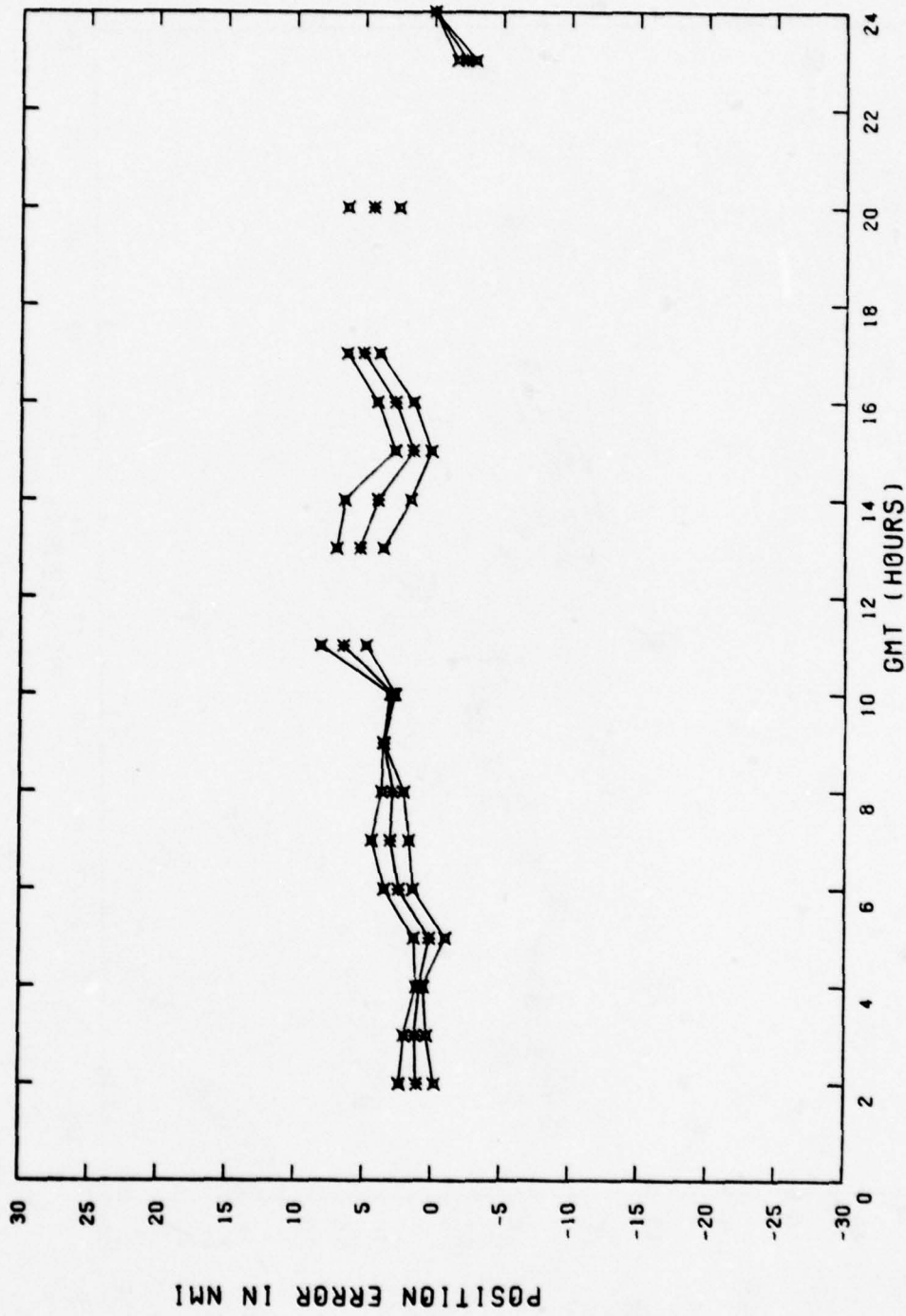


Figure C.25 Position Fix Error, North, Clark, 8/77, 10.2, AB-CH

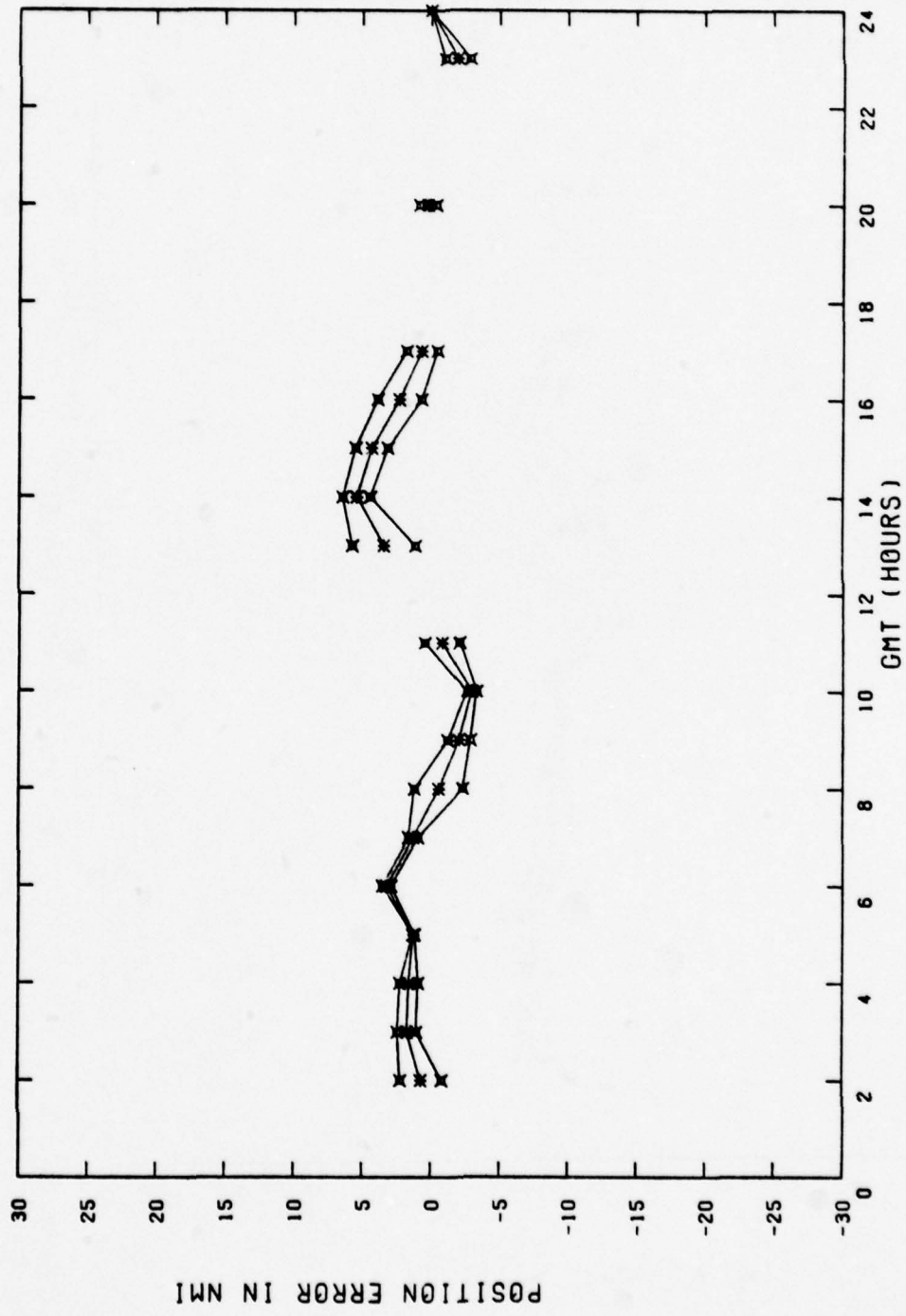


Figure C.26 Position Fix Error, East, Clark, 8/77, 10.2, AB-CH

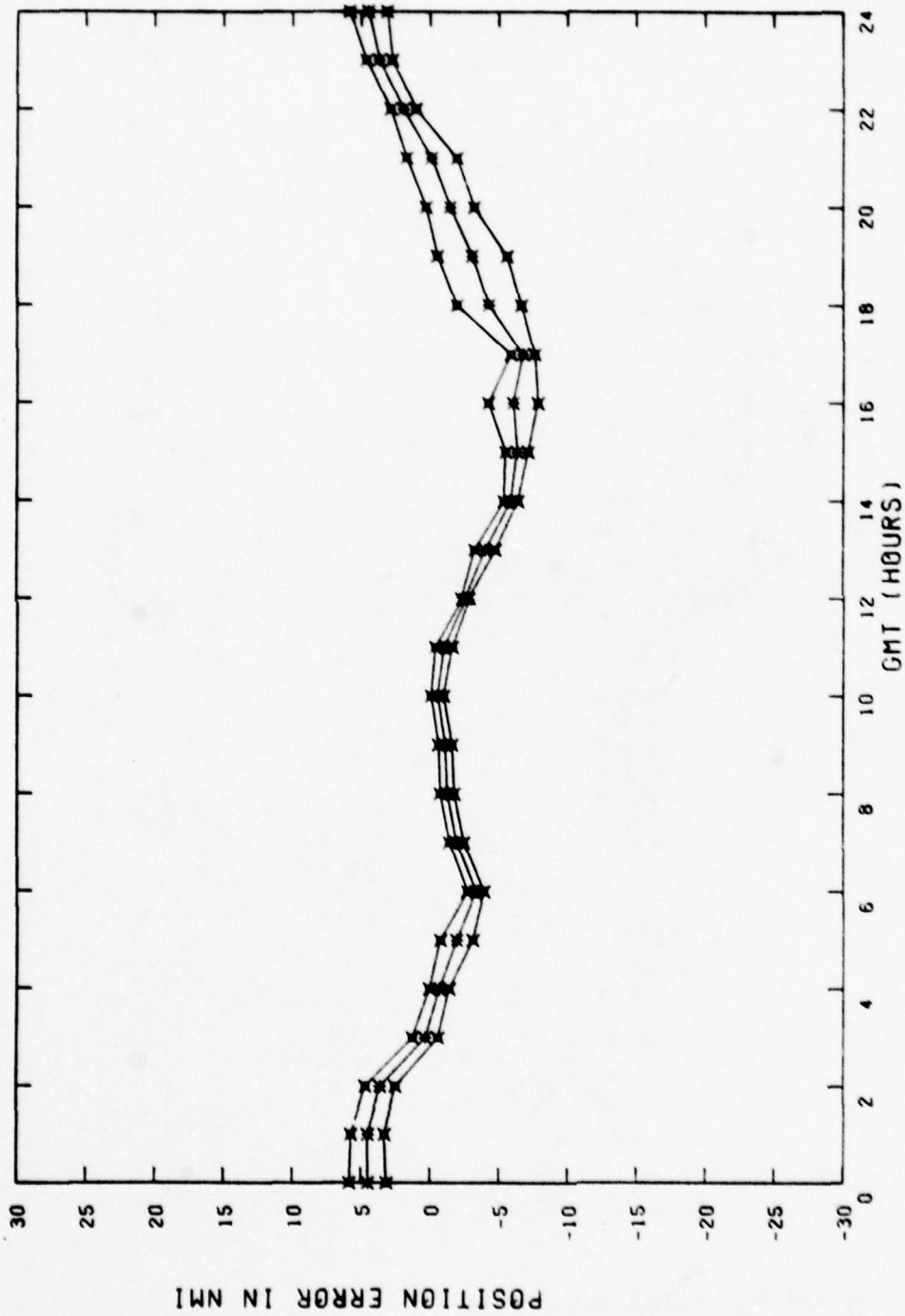


Figure C-27 Position Fix Error, North, Clark, 8/77, 10.2, AE-BE

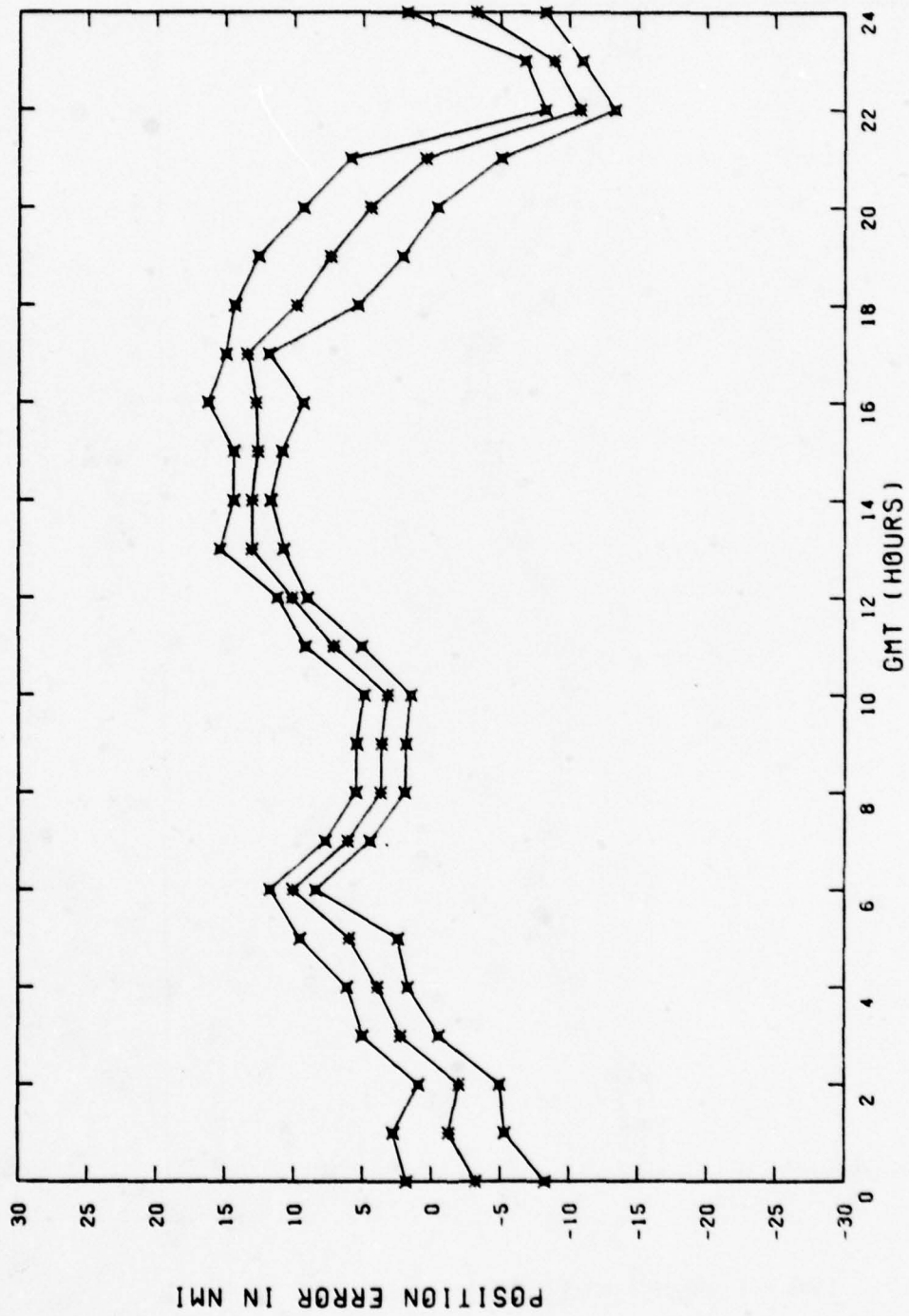


Figure C.28 Position Fix Error, East, Clark, 8/77, 10.2, AE-BE

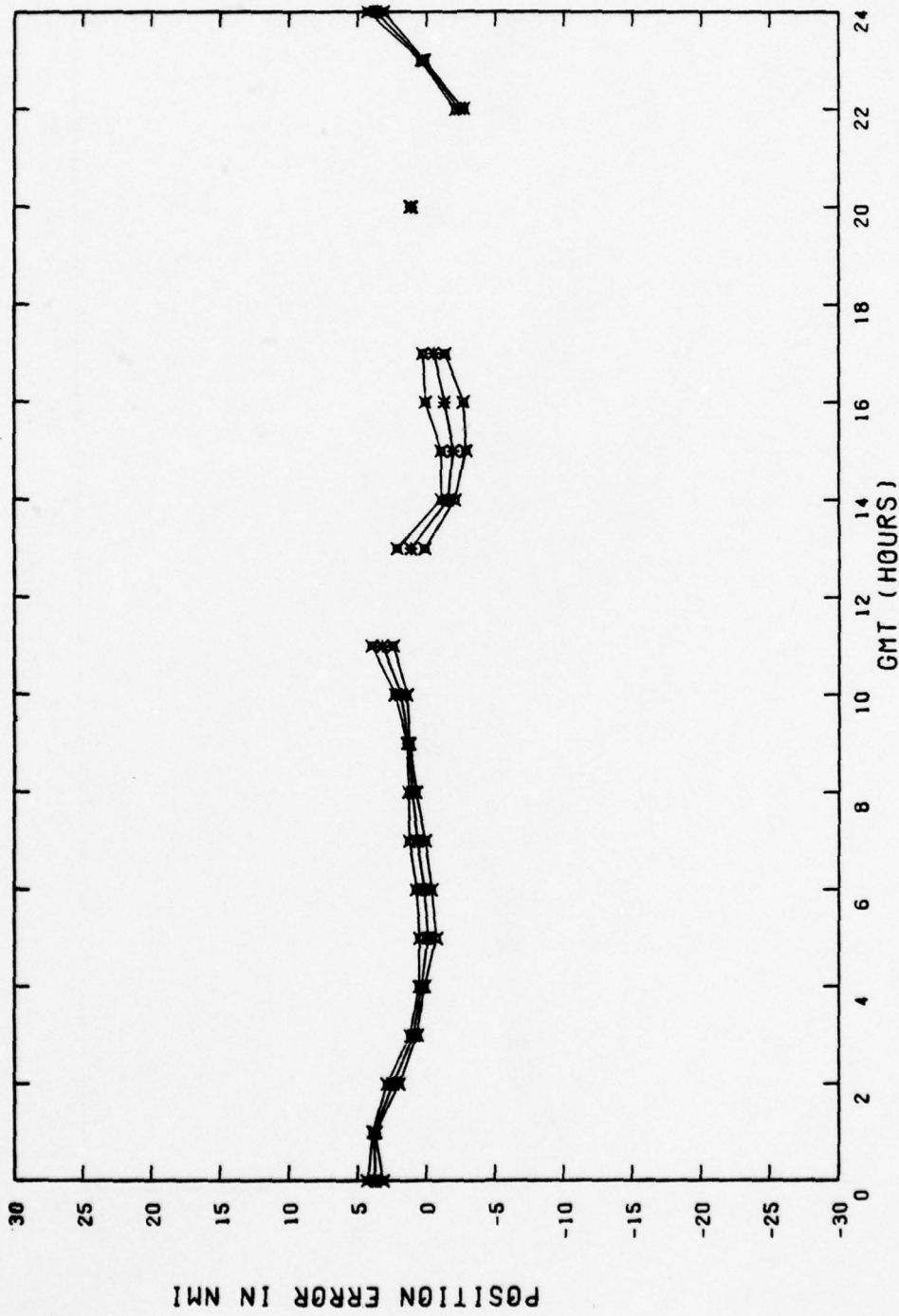


Figure C.29 Position Fix Error, North, Clark, 8/77, 10.2, AE-CH

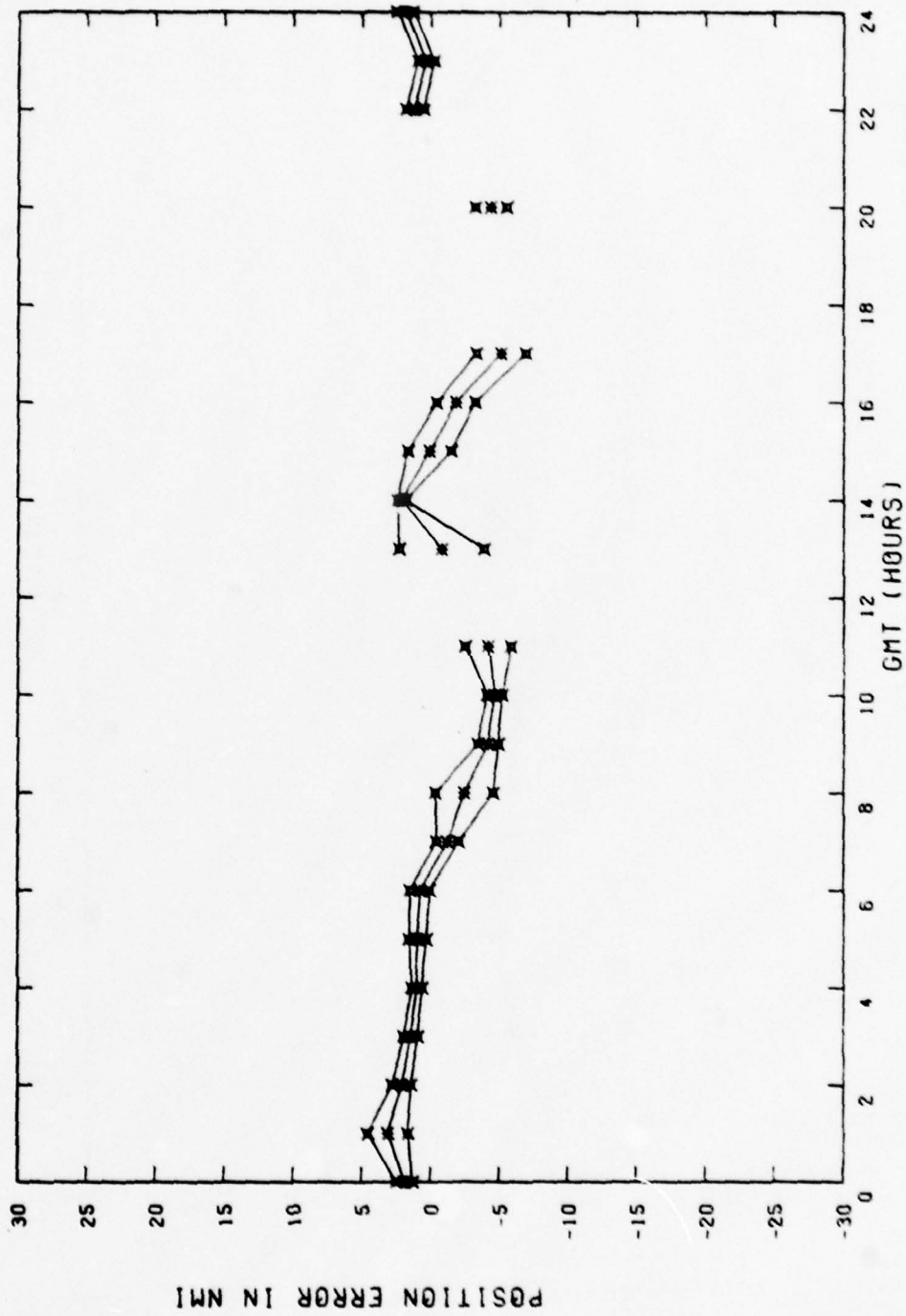


Figure C.30 Position Fix Error, East, Clark, 8/77, 10.2, AE-CH

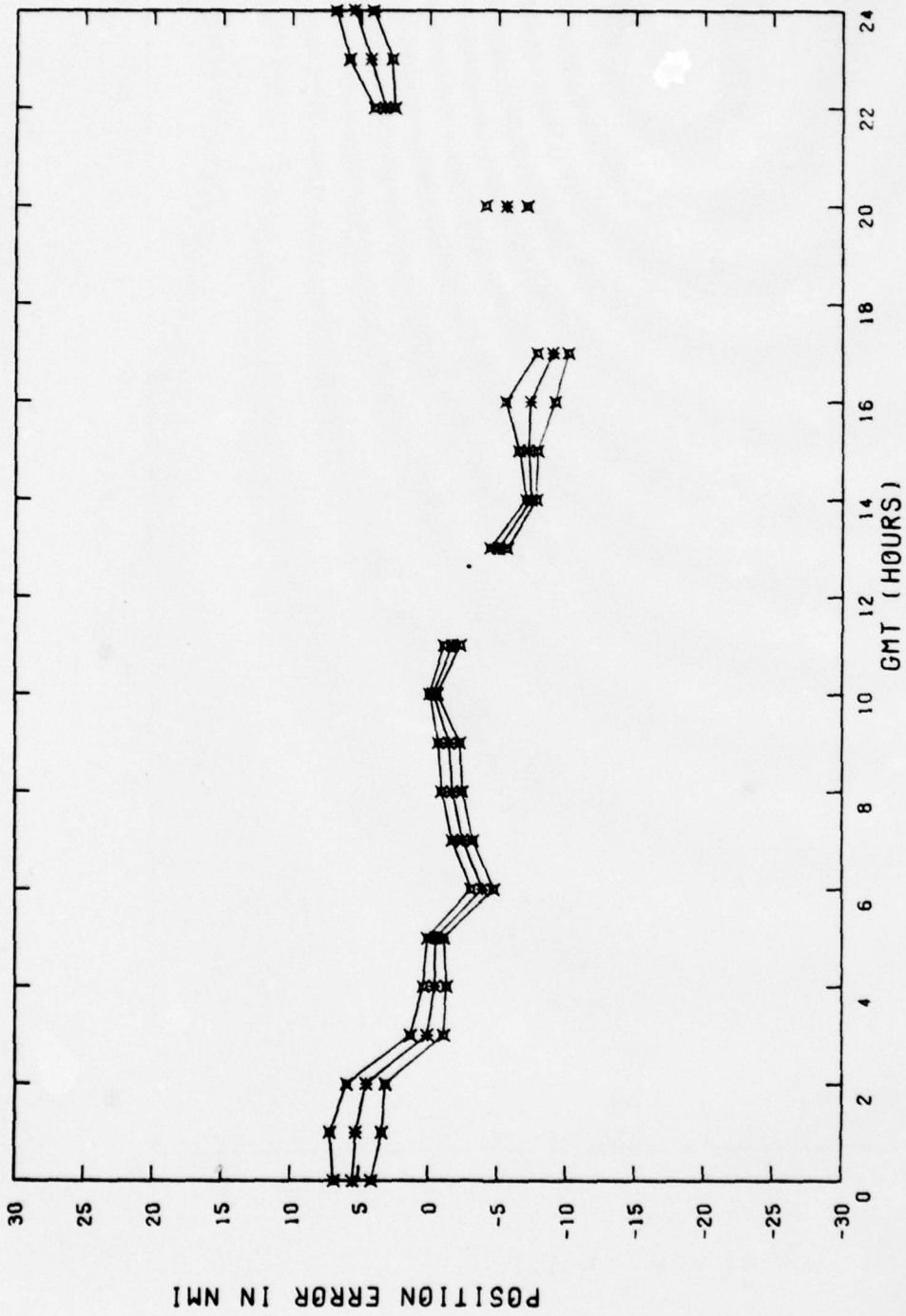


Figure C.31 Position Fix Error, North, Clark, 8/77, 10.2, BE-CH

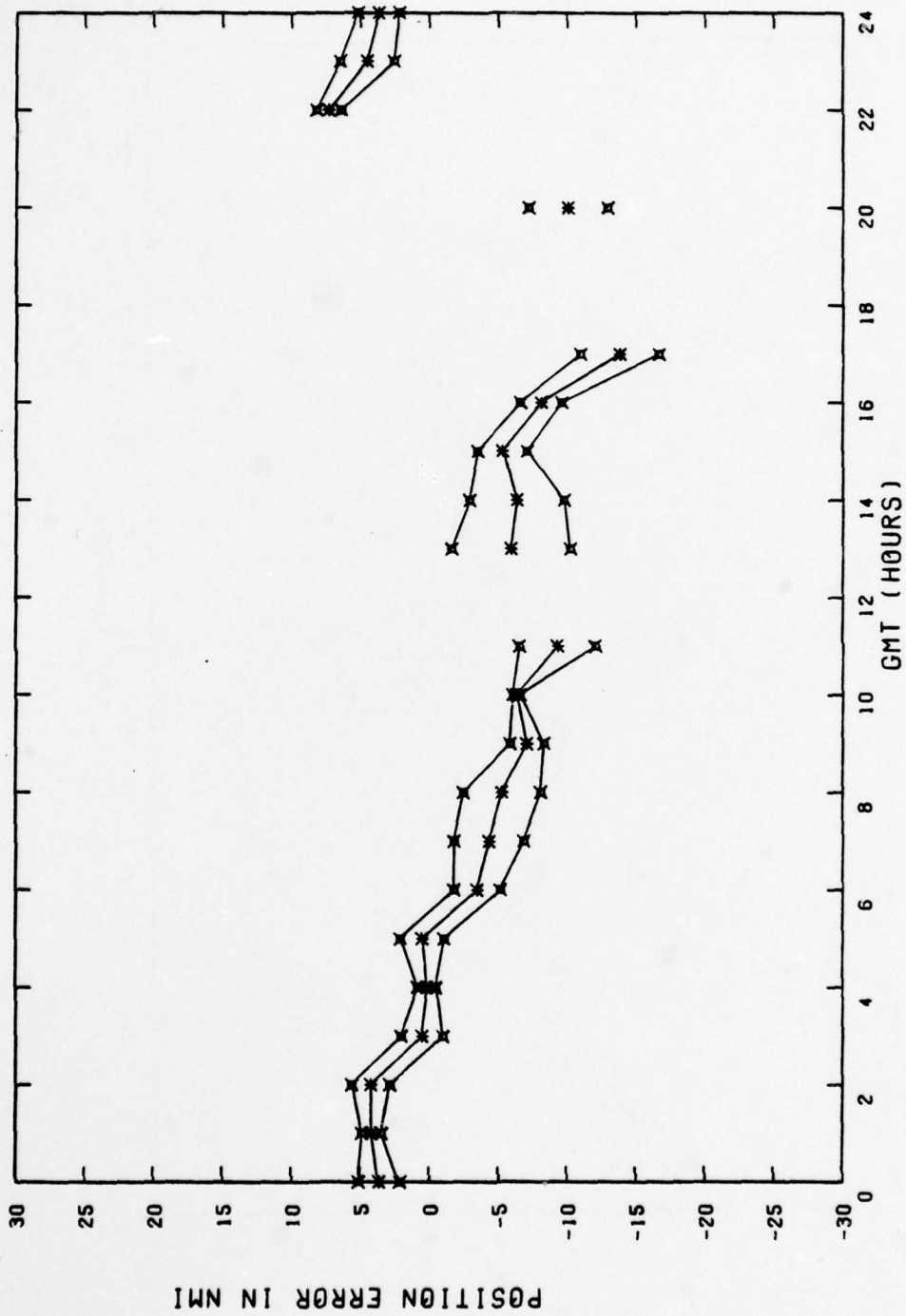


Figure C.32 Position Fix Error, East, Clark, 8/77, 10.2, BE-CH

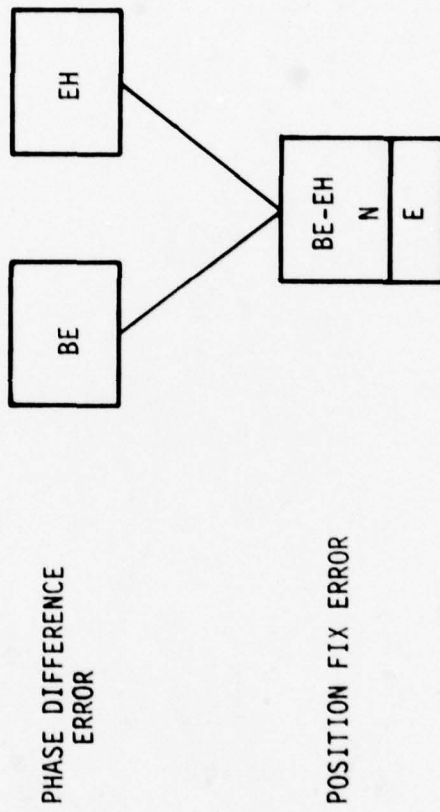


Figure C.33 Clark Air Base Data Graphs, July, 1976, 10.2

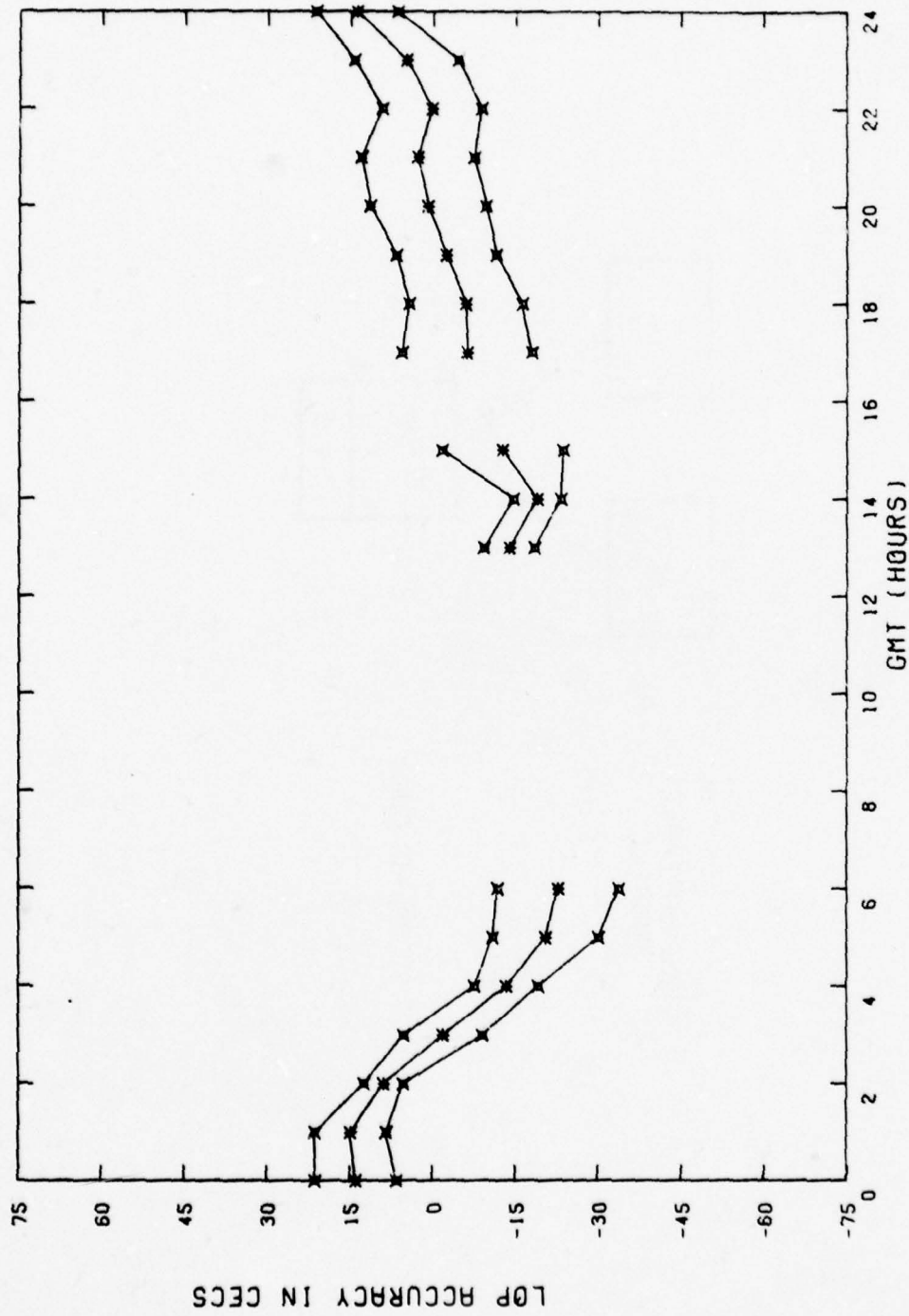


Figure C.34 Phase Difference Error, Clark, 7/76, 10.2, BE

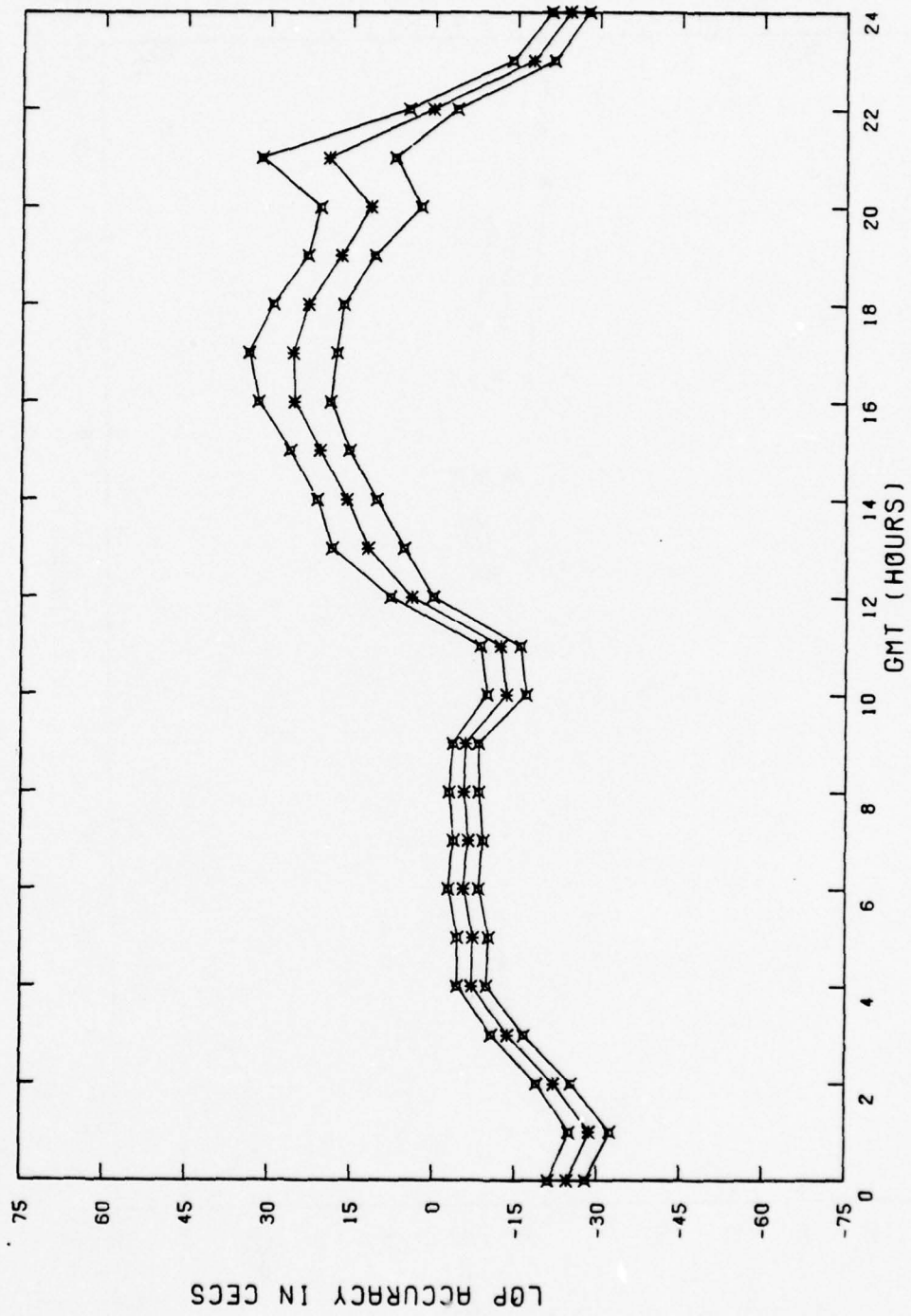


Figure C.35 Phase Difference Error, Clark, 7/76, 10.2, EH

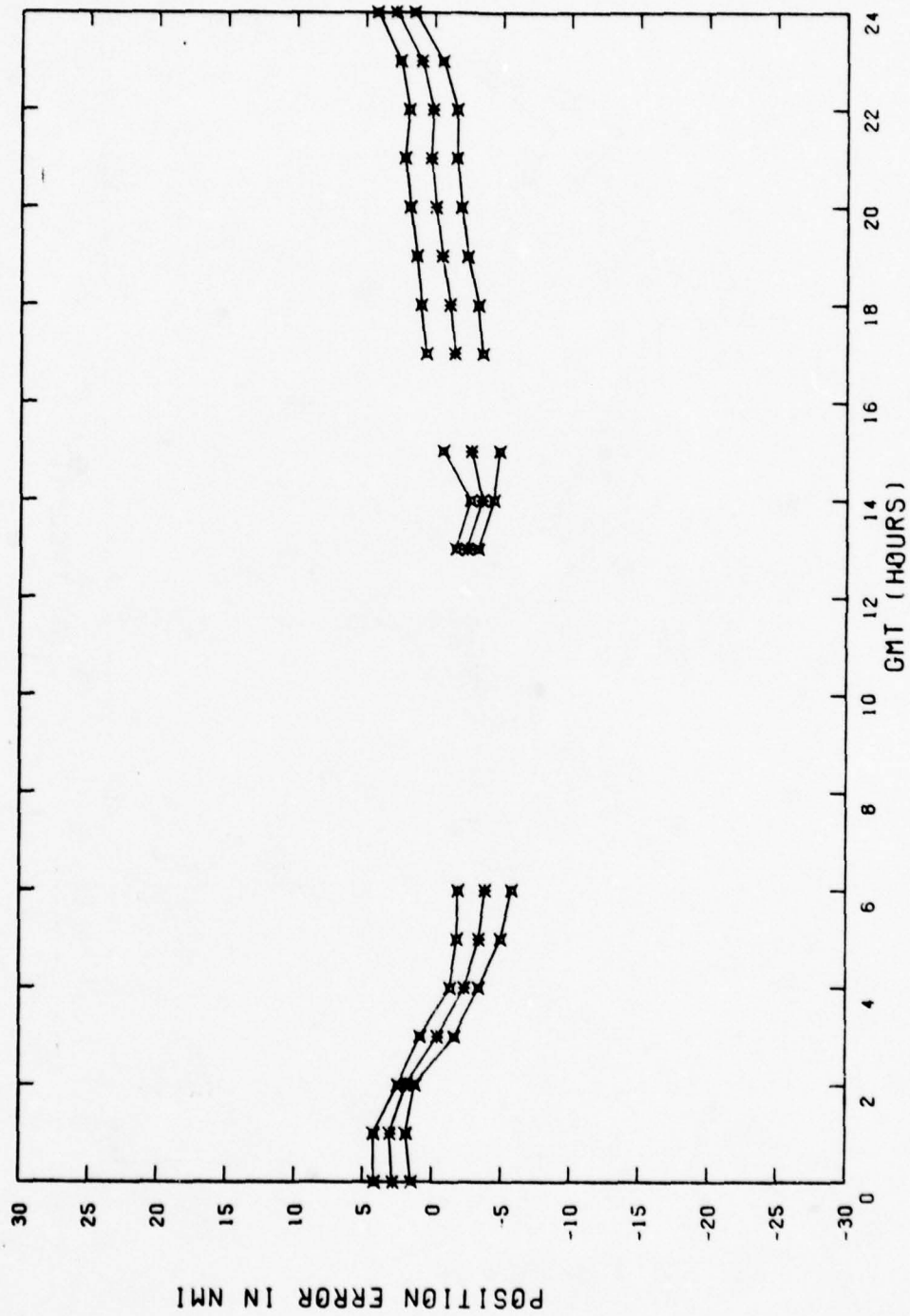


Figure C.36 Position Fix Error, North, Clark, 7/76, 10.2, BE-EH

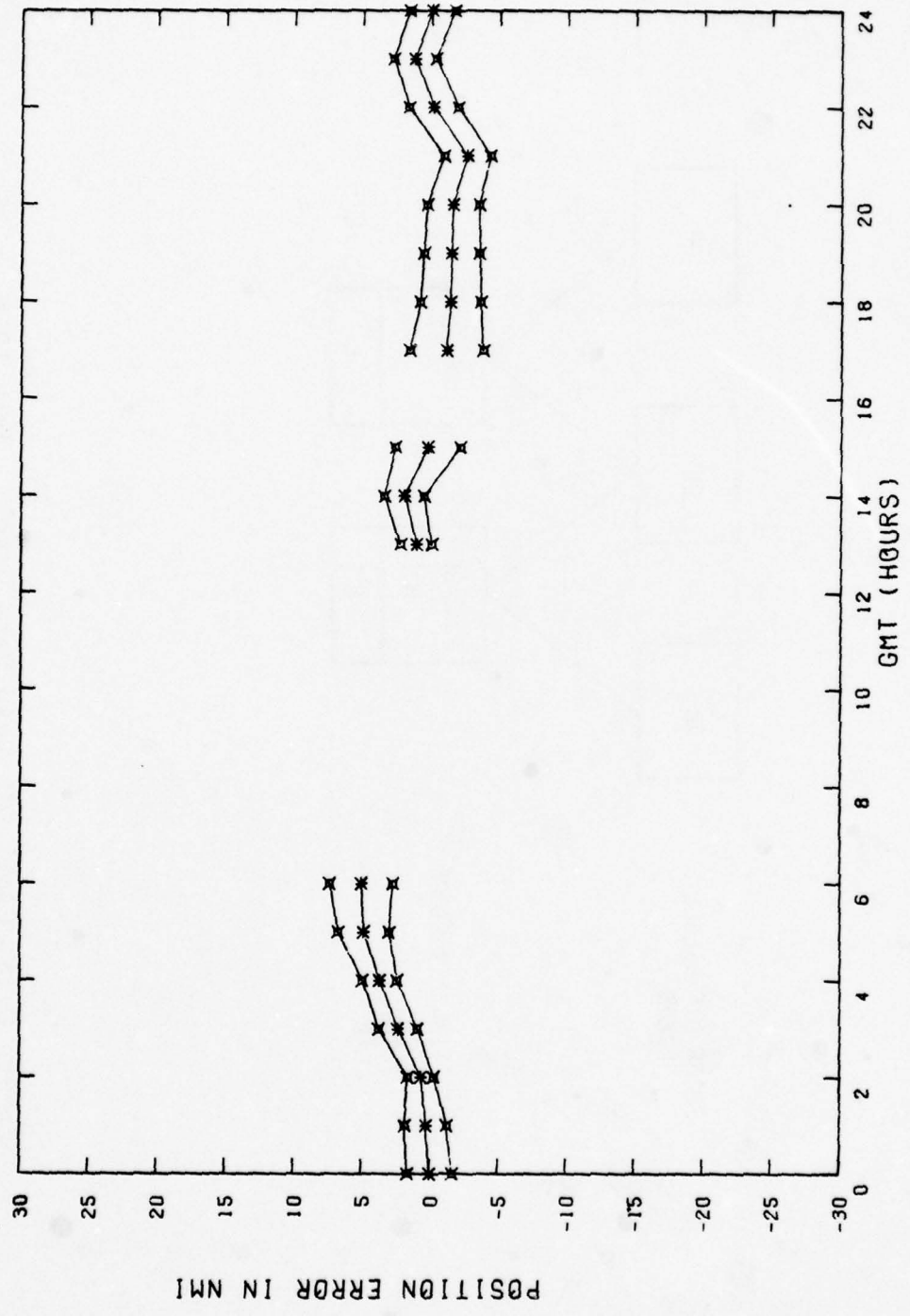


Figure C.37 Position Fix Error, East, Clark, 7/76, 10.2, BE-EH

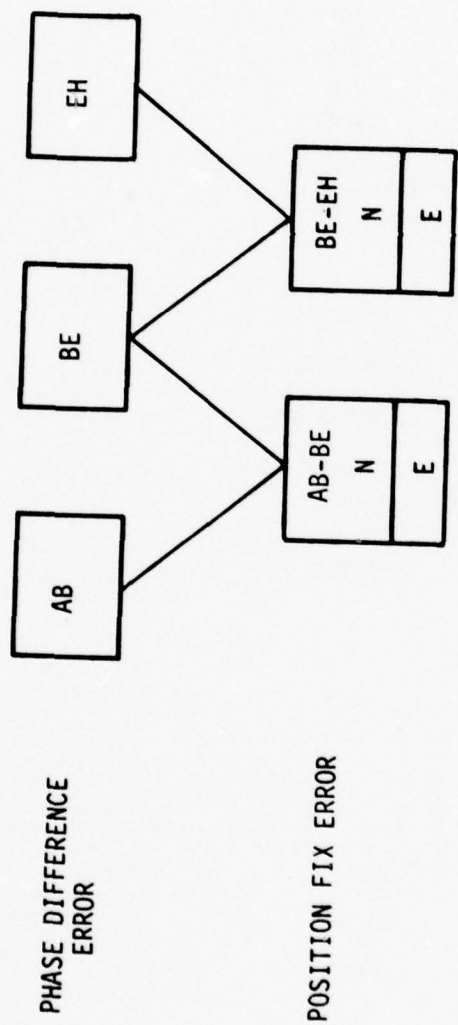


Figure C.38 Clark Air Base Data Graphs, July 1976, 13.6

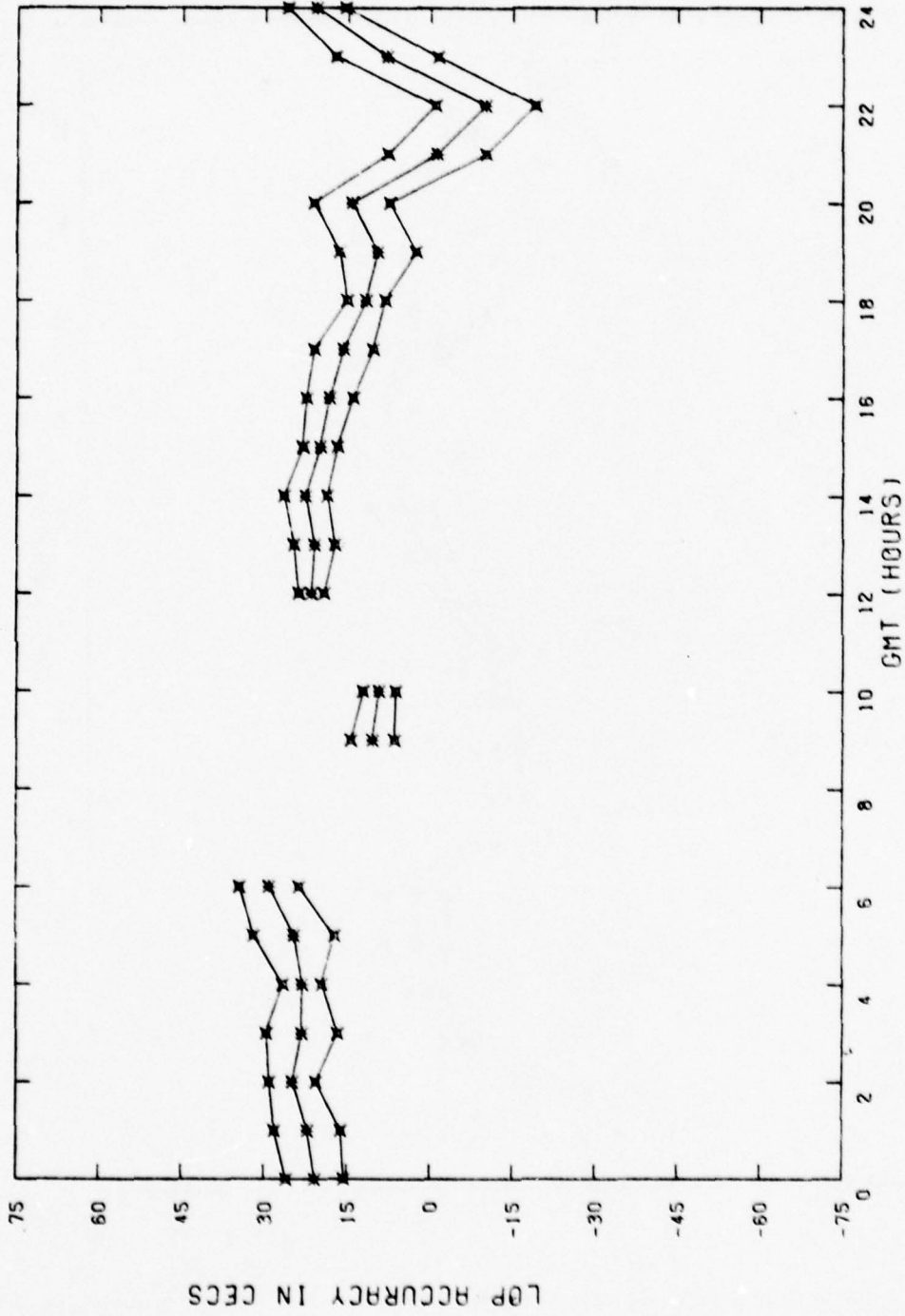


Figure C.39 Phase Difference Error, Clark, 7/76, 13.6, AB

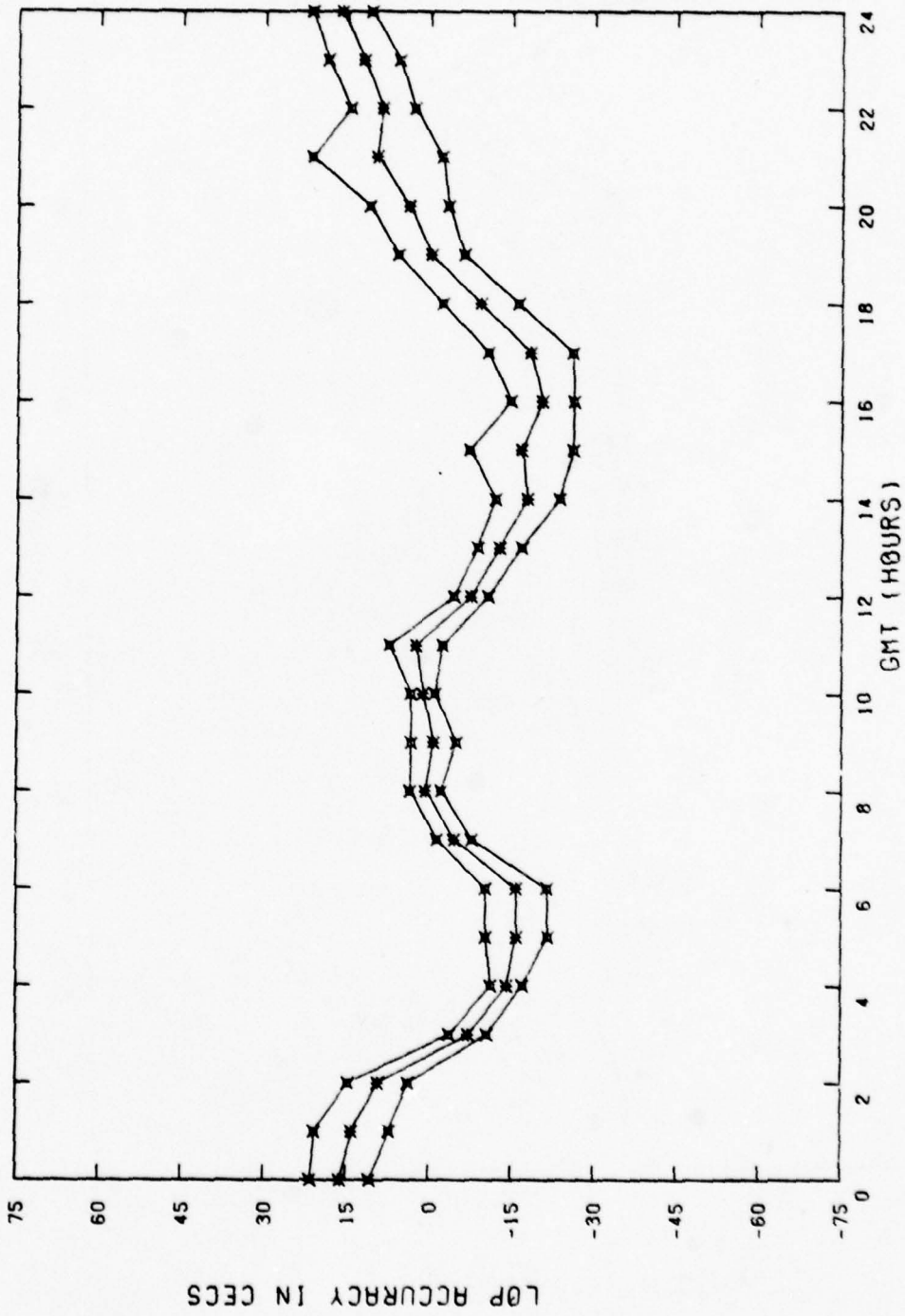


Figure C.40 Phase Difference Error, Clark, 7/76, 13.6, BE

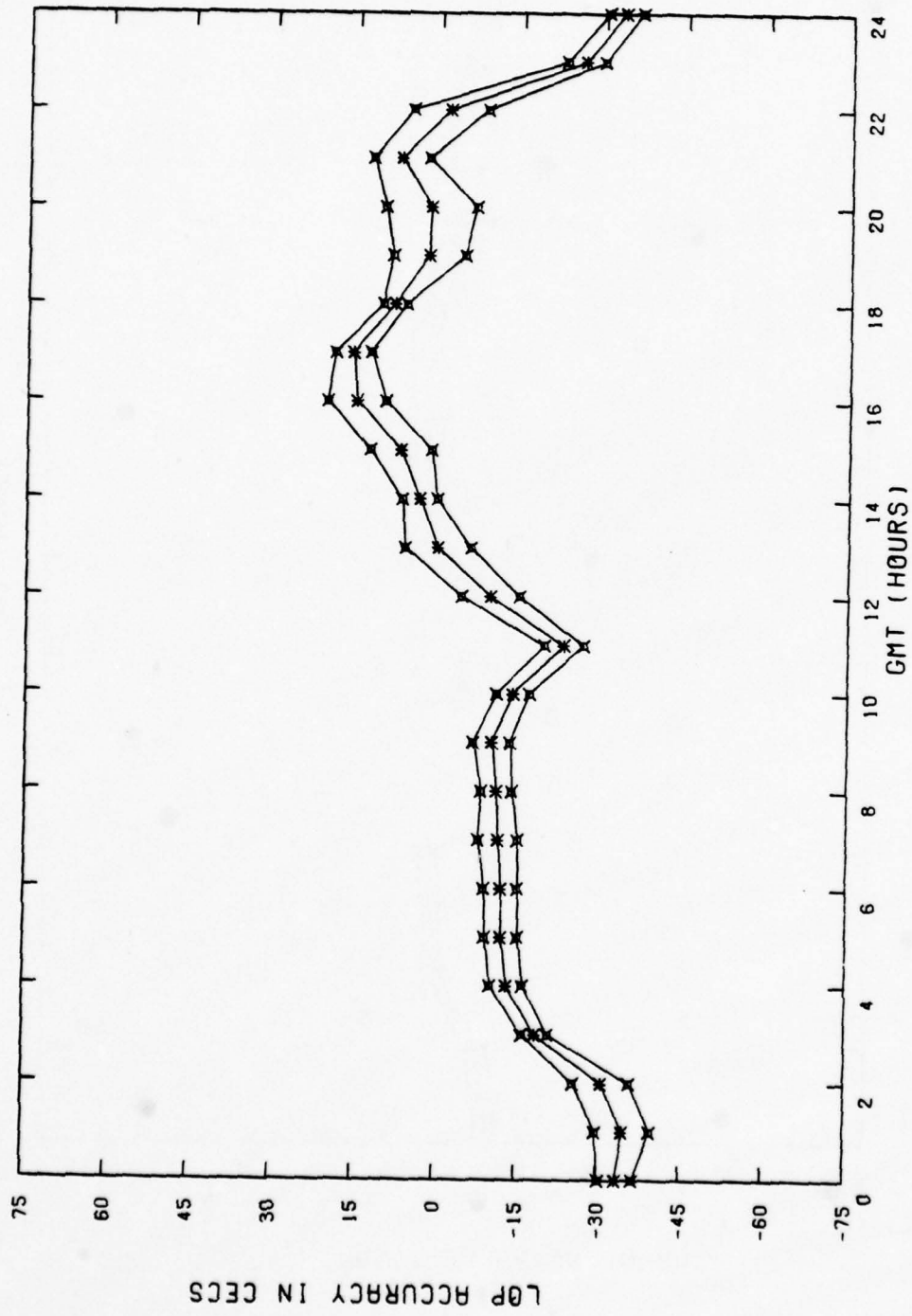


Figure C.41 Phase Difference Error, Clark, 7/76, 13.6, EH

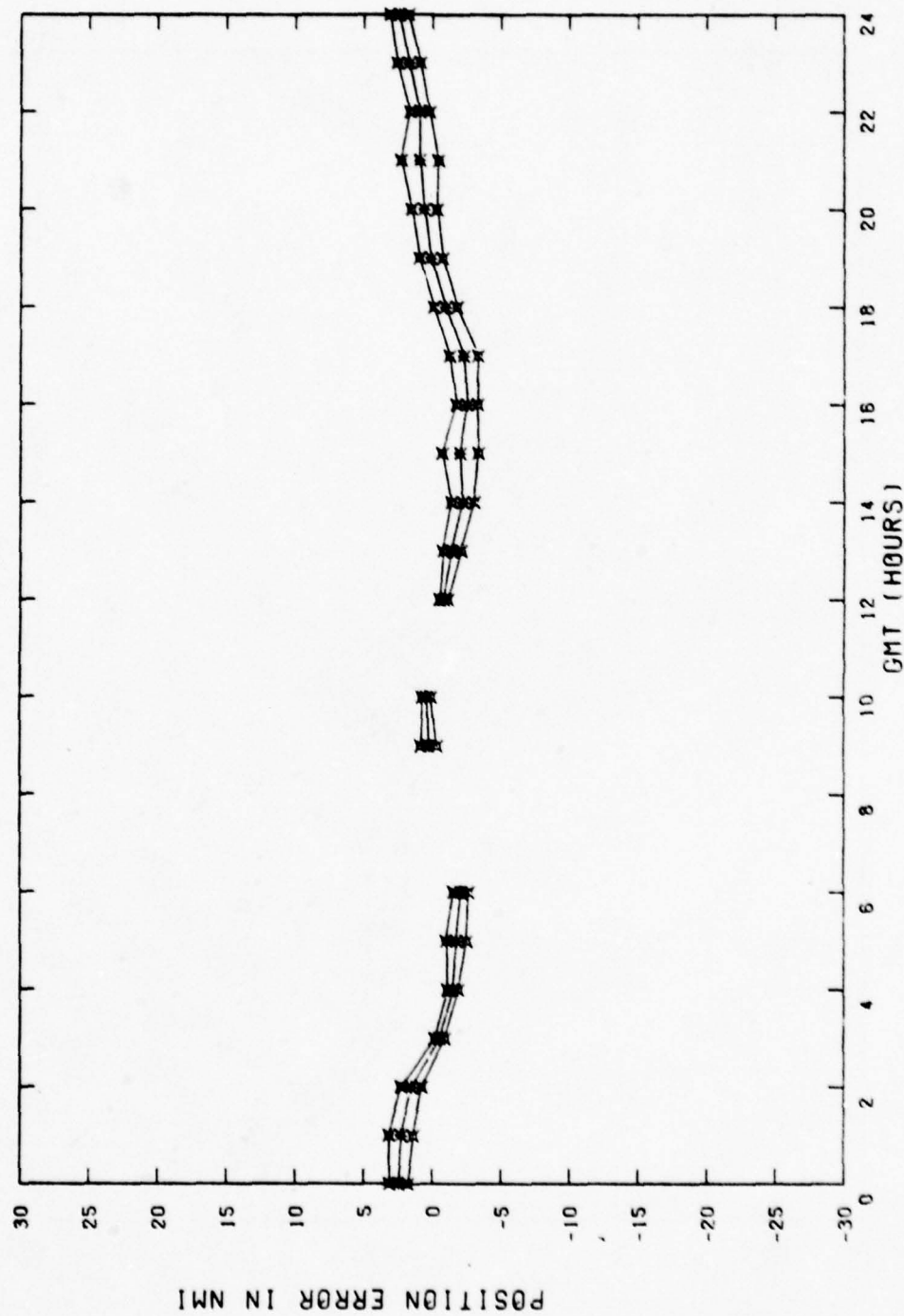


Figure C.42 Position Fix Error, North, Clark, 7/76, 13.6, AB-BE

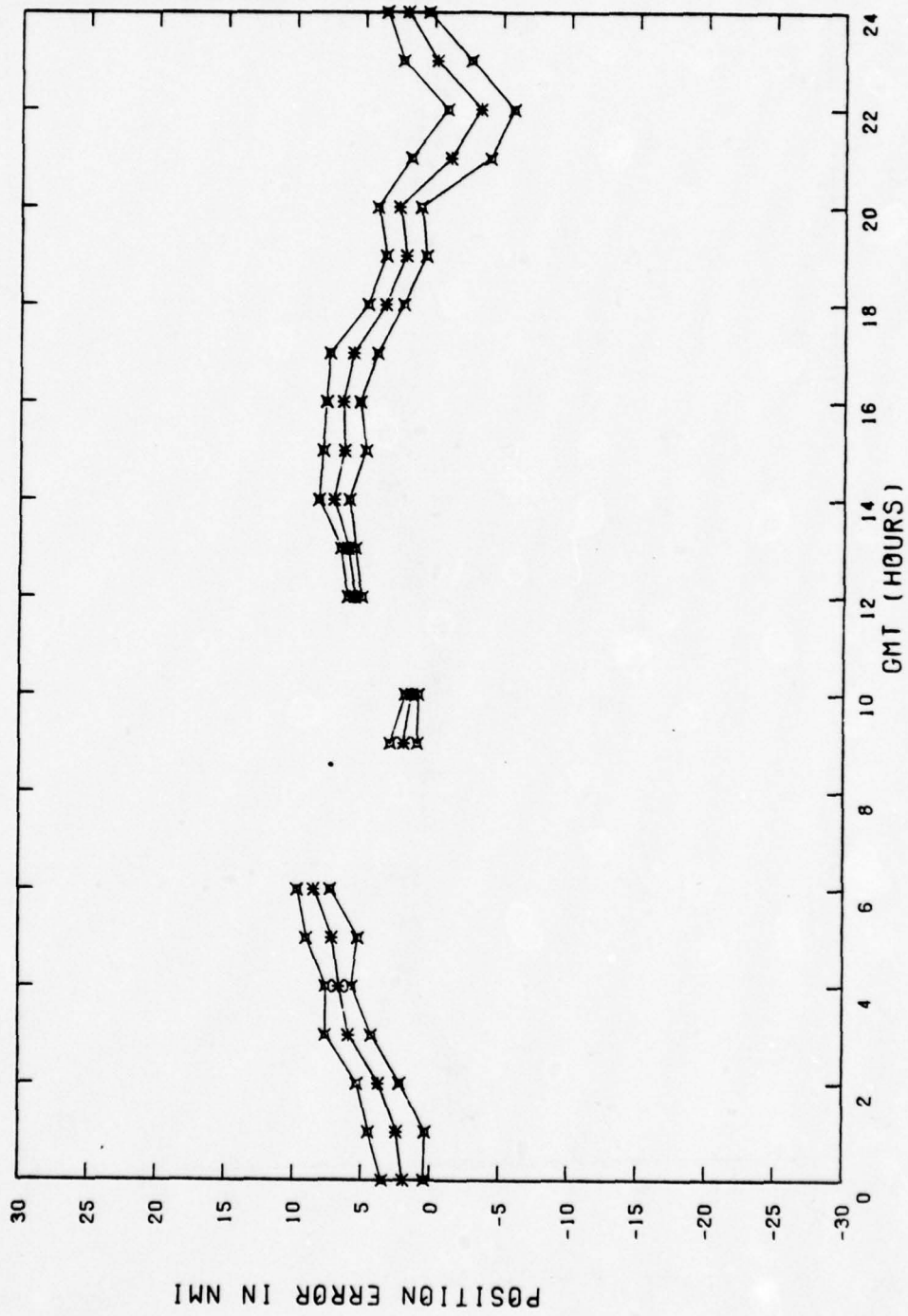


Figure C.43 Position Fix Error, East, Clark, 7/76, 13.6, AB-BE

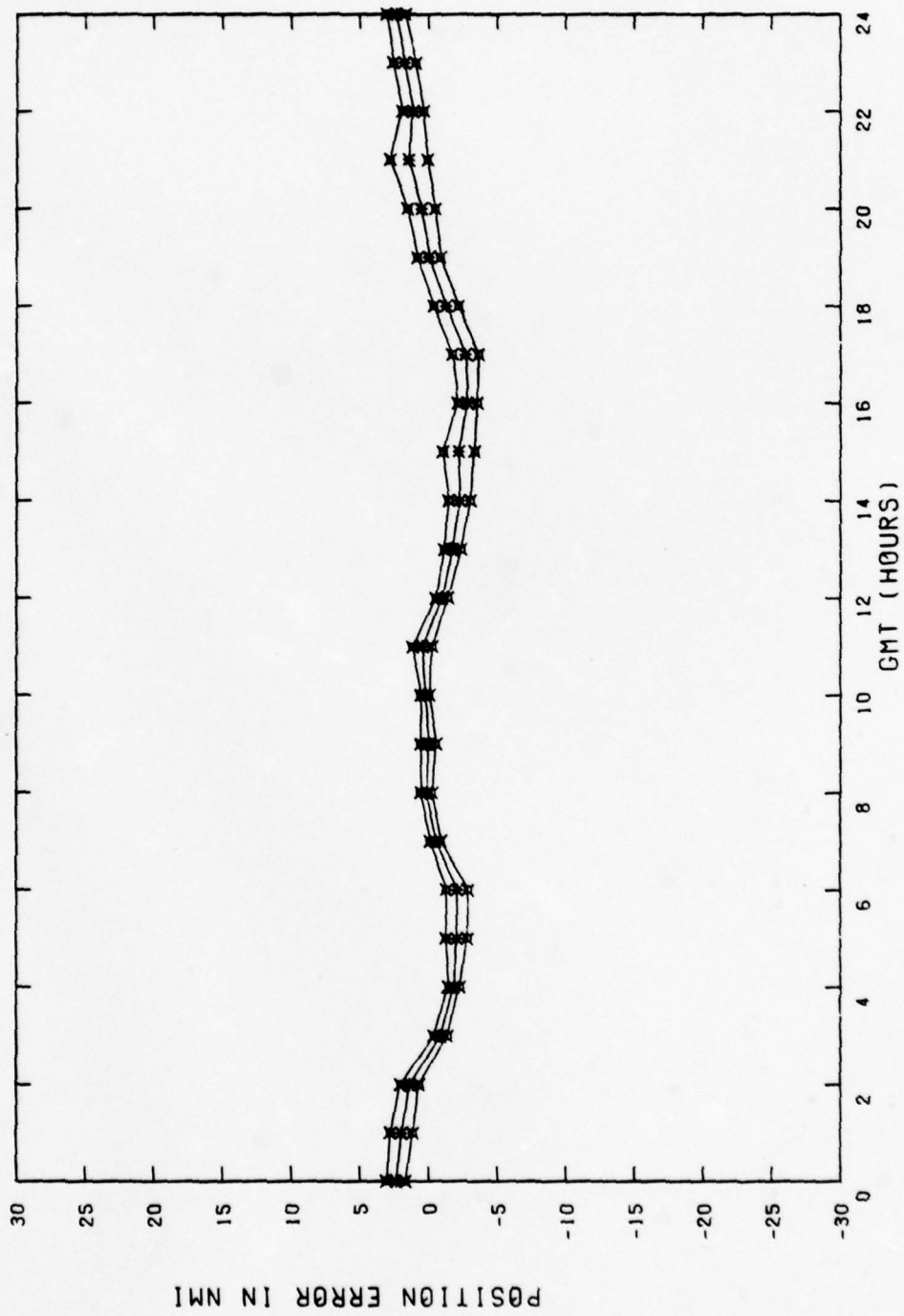


Figure C.44 Position Fix Error, North, Clark, 7/76, 13.6, BE-EH

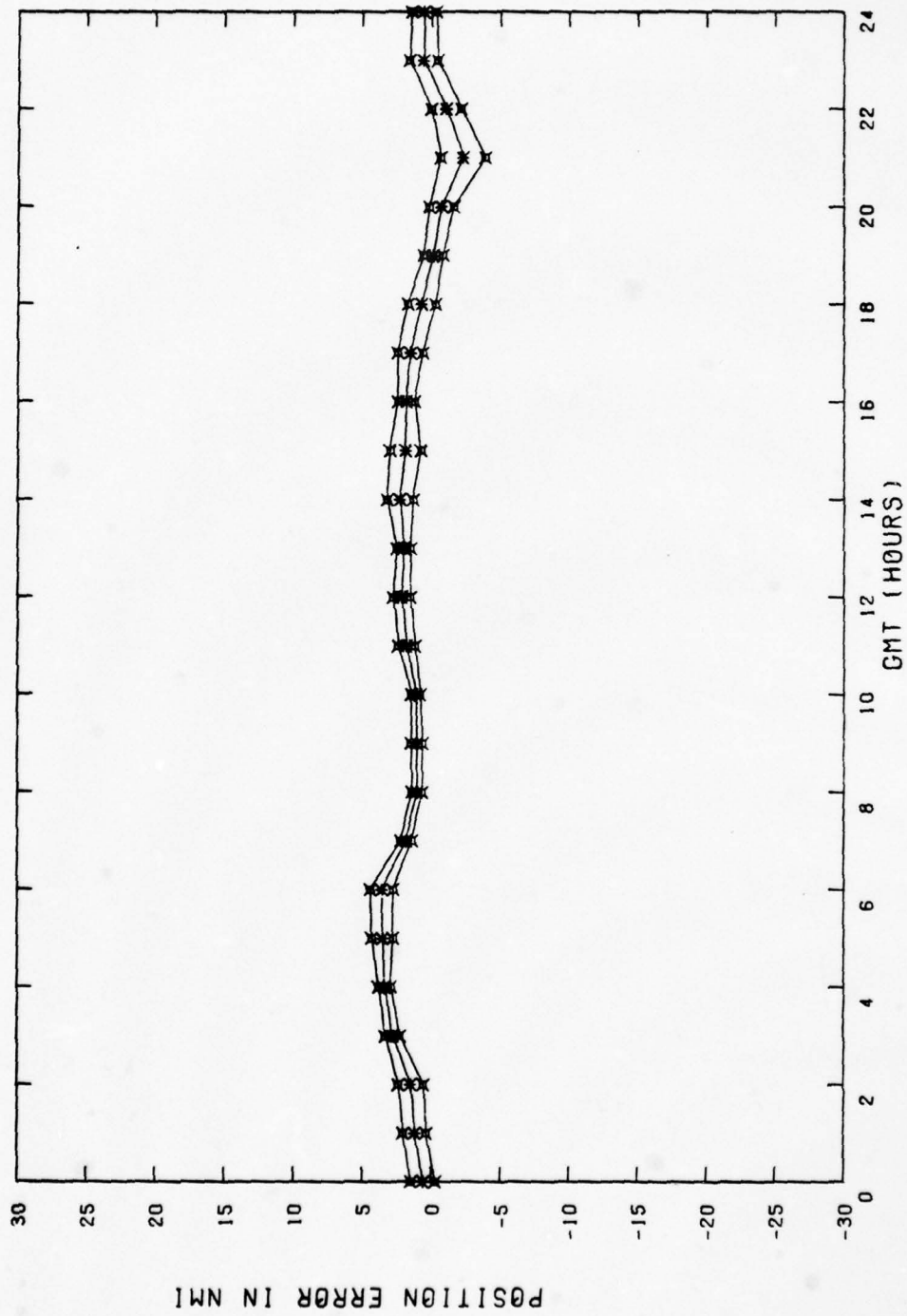


Figure C.45 Position Fix Error, East, Clark, 7/76, 13.6, BE-EH

APPENDIX D
Tsushima Data

This appendix contains data which have been derived from magnetic tape recordings made at the ONSOD Omega monitoring site at Tsushima, Japan. The total data base available from Tsushima is summarized in Table 4.1 of the main text. Data for representative periods were selected from the total data base for detailed examination and analysis. These selected data have been formatted into convenient graphical presentations for inclusion in this appendix.

Two types of related graphics presentations of the Tsushima data are presented. The plots presented are:

- (1) LOP Monthly Summaries: The measured phase difference data were corrected with PPC values supplied by ONSOD, normalized to the Tsushima site locations and presented as diurnal plots of the monthly average LOP. Also included in the LOP monthly summaries is the diurnal standard deviation of the measured data.
- (2) Position Fix Summaries: Data from pairs of LOPs were combined to obtain position fixes as determined from the Omega data. The position fixes were compared to the known geographic locations of the Tsushima site to provide diurnal plots of north and east position fix errors.

The Tsushima data plots are presented in sequences which are related to their method of generation. The sequence of presentation of all 10.2 kHz data is shown in Figure D.1. The six plots of LOP monthly summaries are followed by north and east error plots for selected LOP pairs. Only LOP pairs which are representative of pairs that would be used for navigation purposes in the Tsushima area are plotted.

The sequence of presentation of all 13.6 kHz data is shown in Figure D.17 on page D-18.

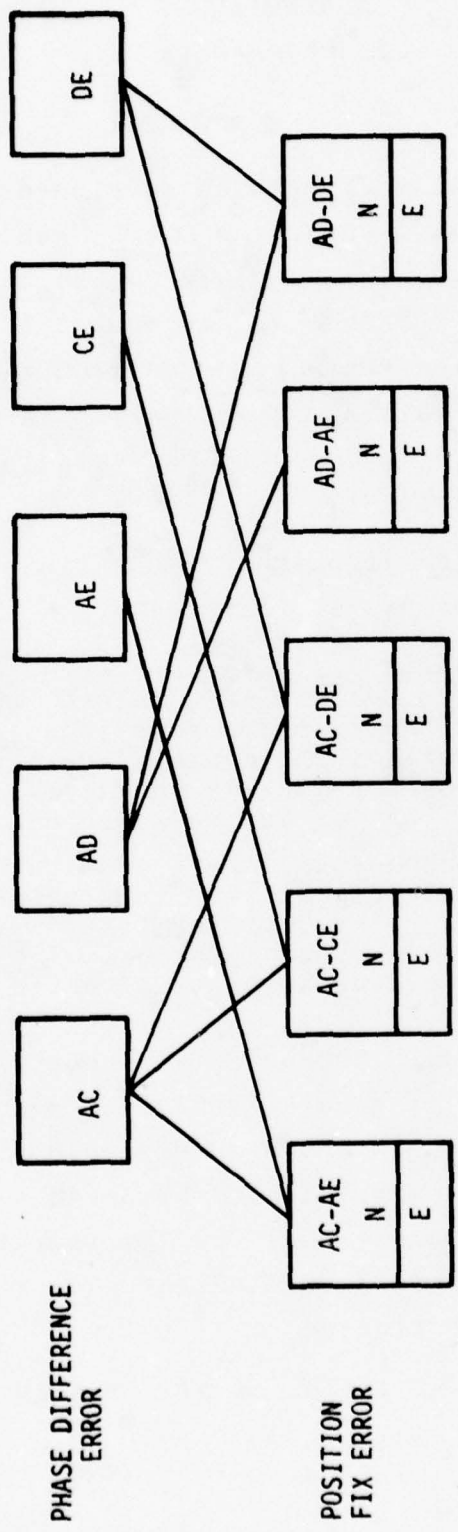


Figure D.1 Tsushima Data Graphs, July, 1976, 10.2

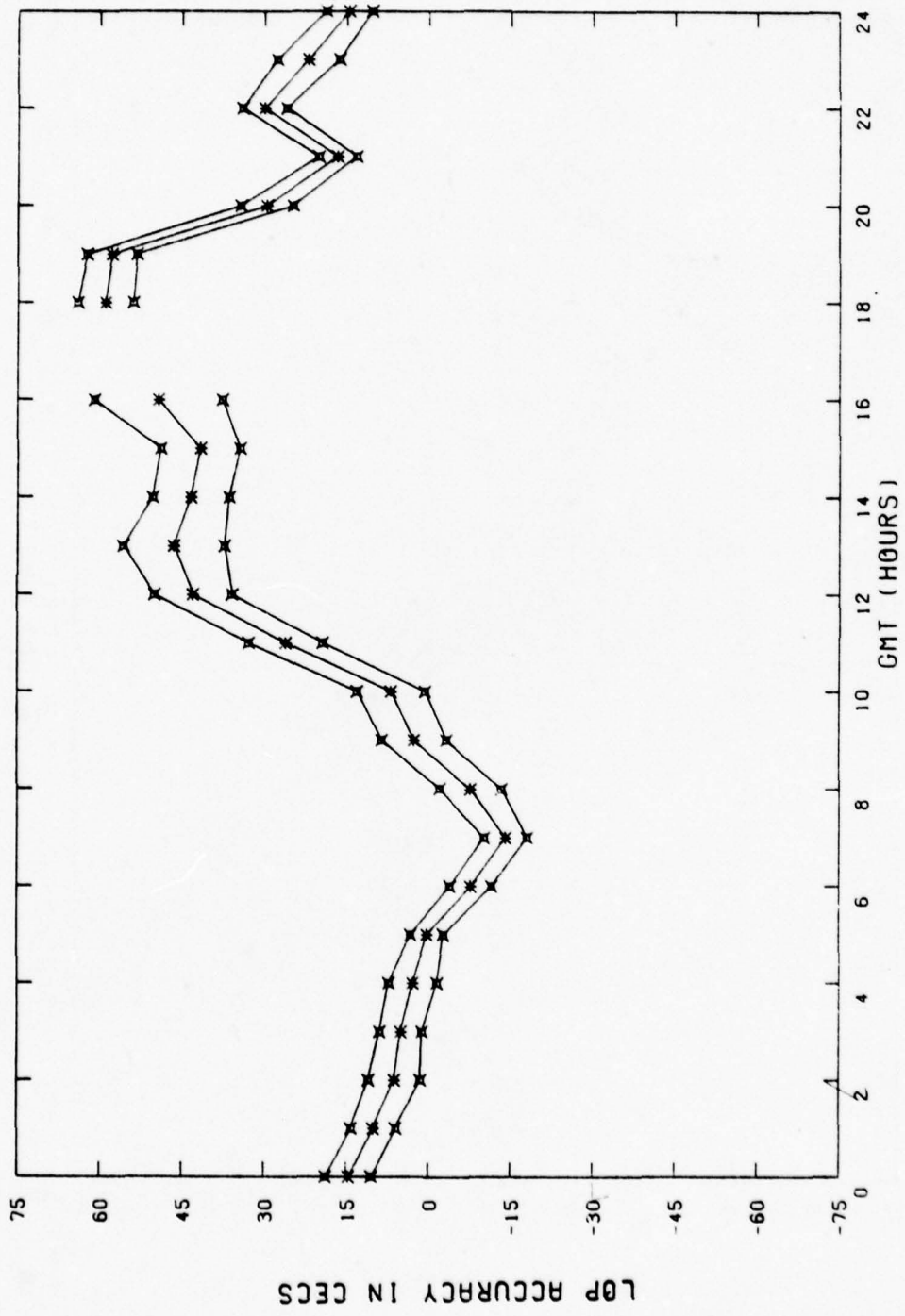


Figure D.2 Phase Difference Error, Tsushima, 7/76, 10.2, AC

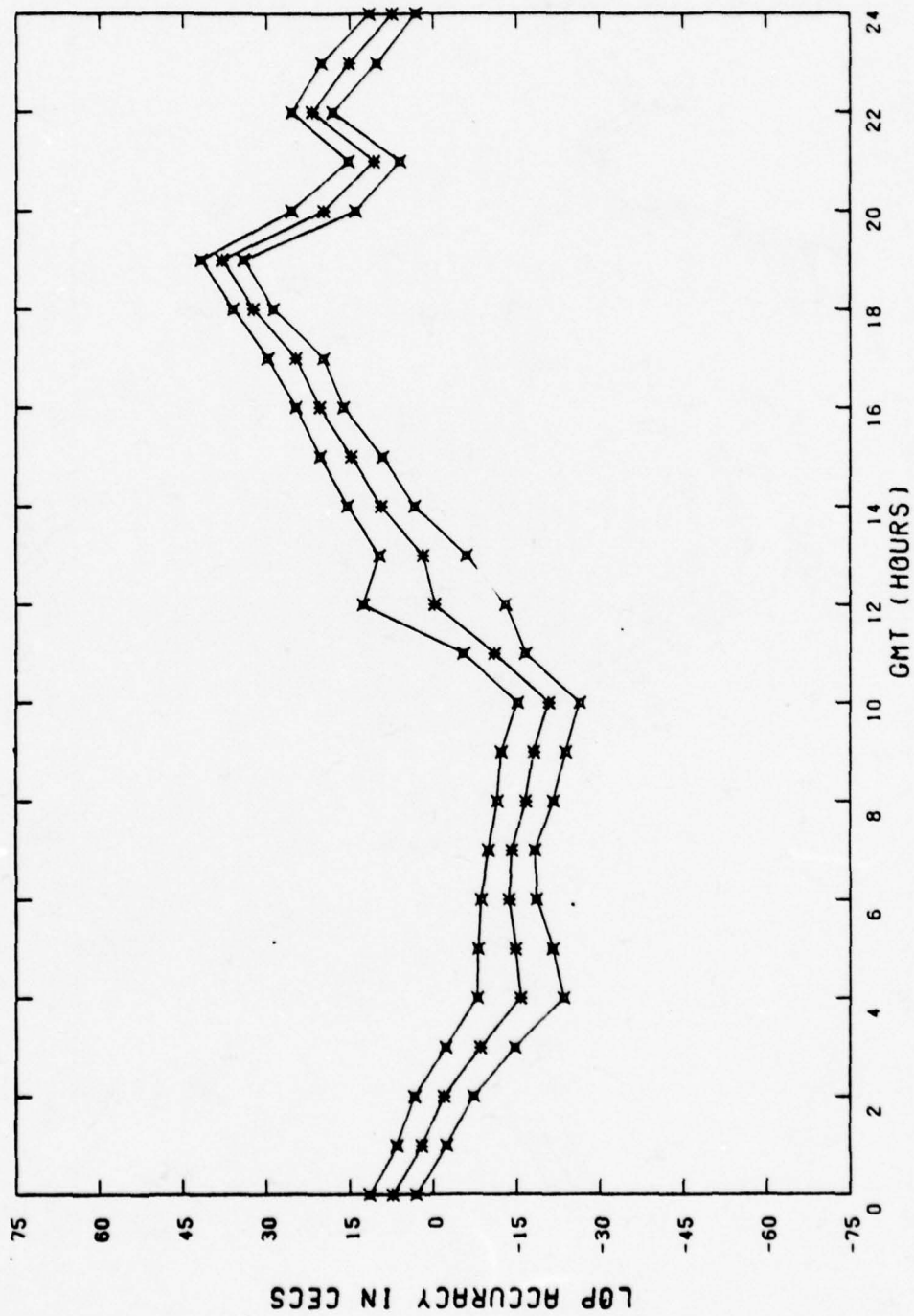


Figure D.3 Phase Difference Error, Tsushima, 7/76, 10.2, AD

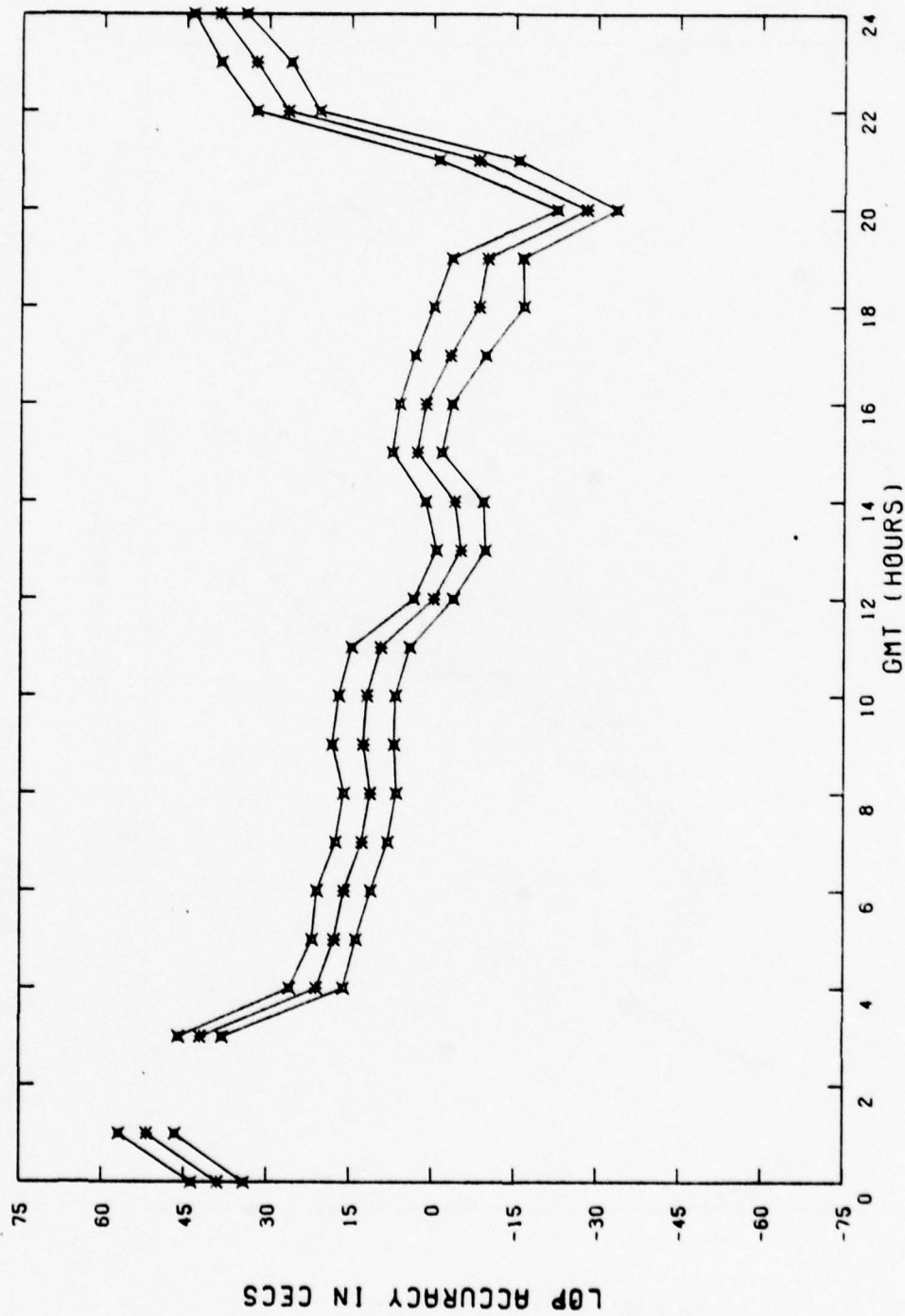


Figure D.4 Phase Difference Error, Tsushima, 7/76, 10.2, AE

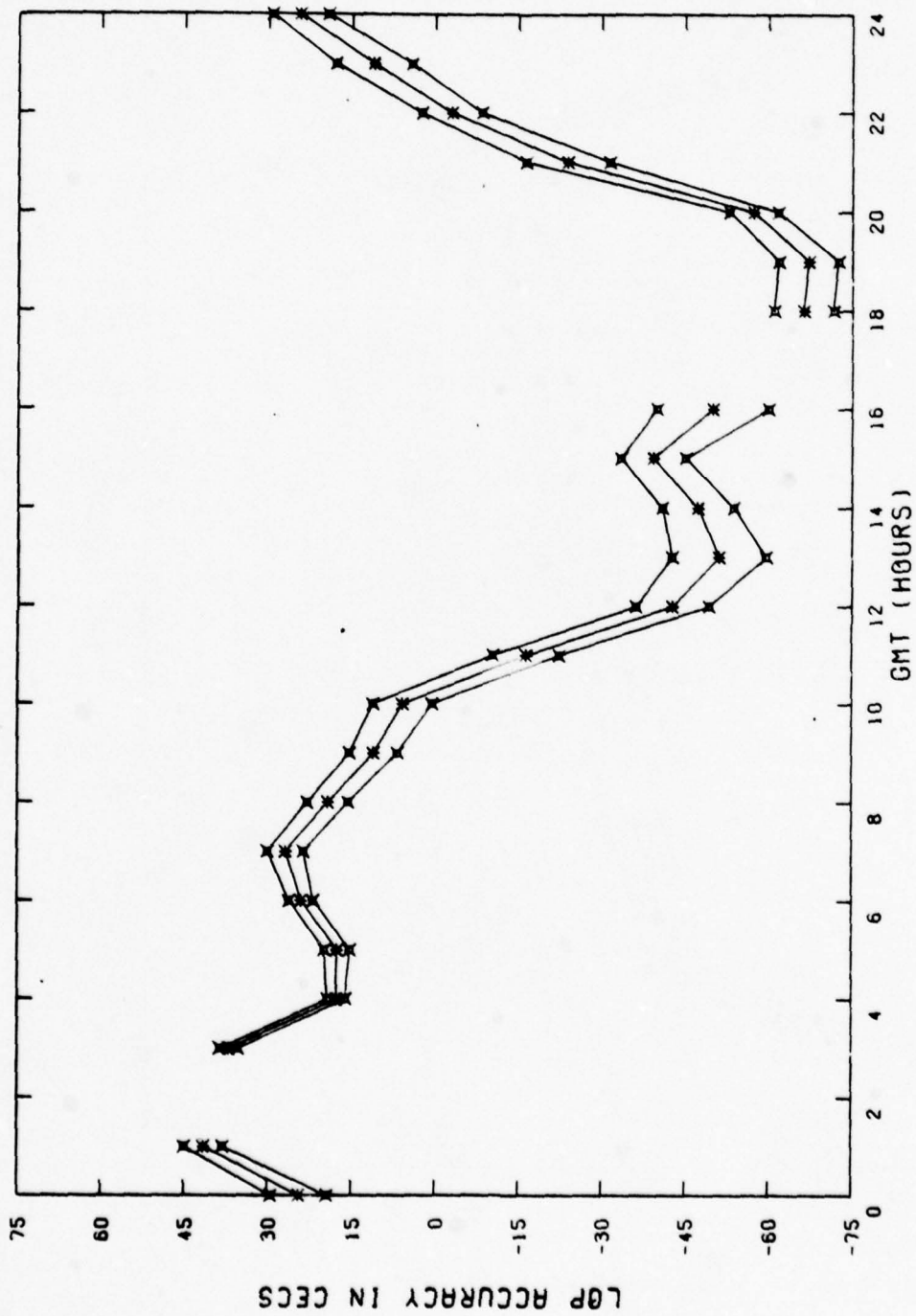


Figure D.5 Phase Difference Error, Tsushima, 7/76, 10.2, CE

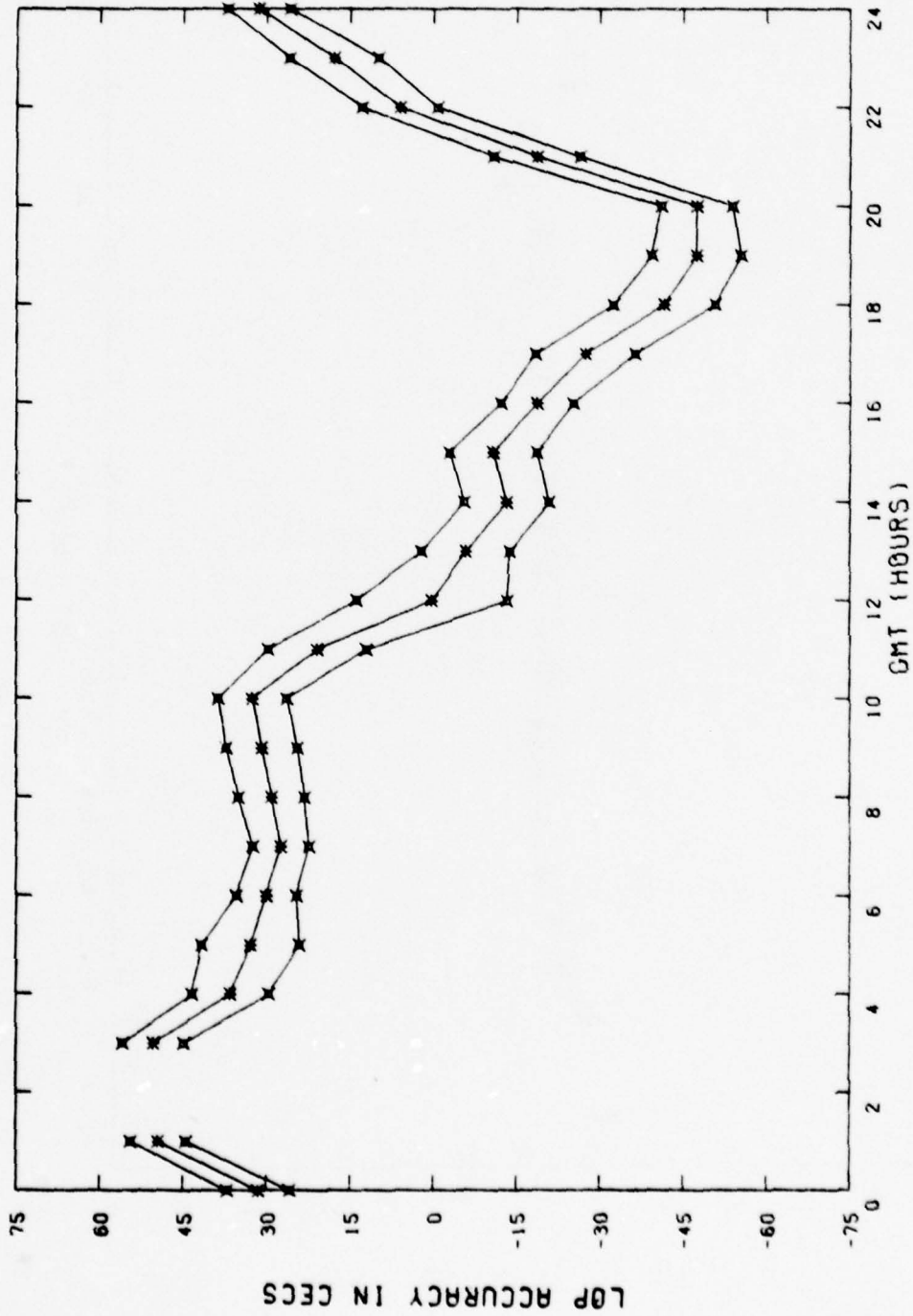


Figure D.6 Phase Difference Error, Tsushima, 7/76, 10.2, DE

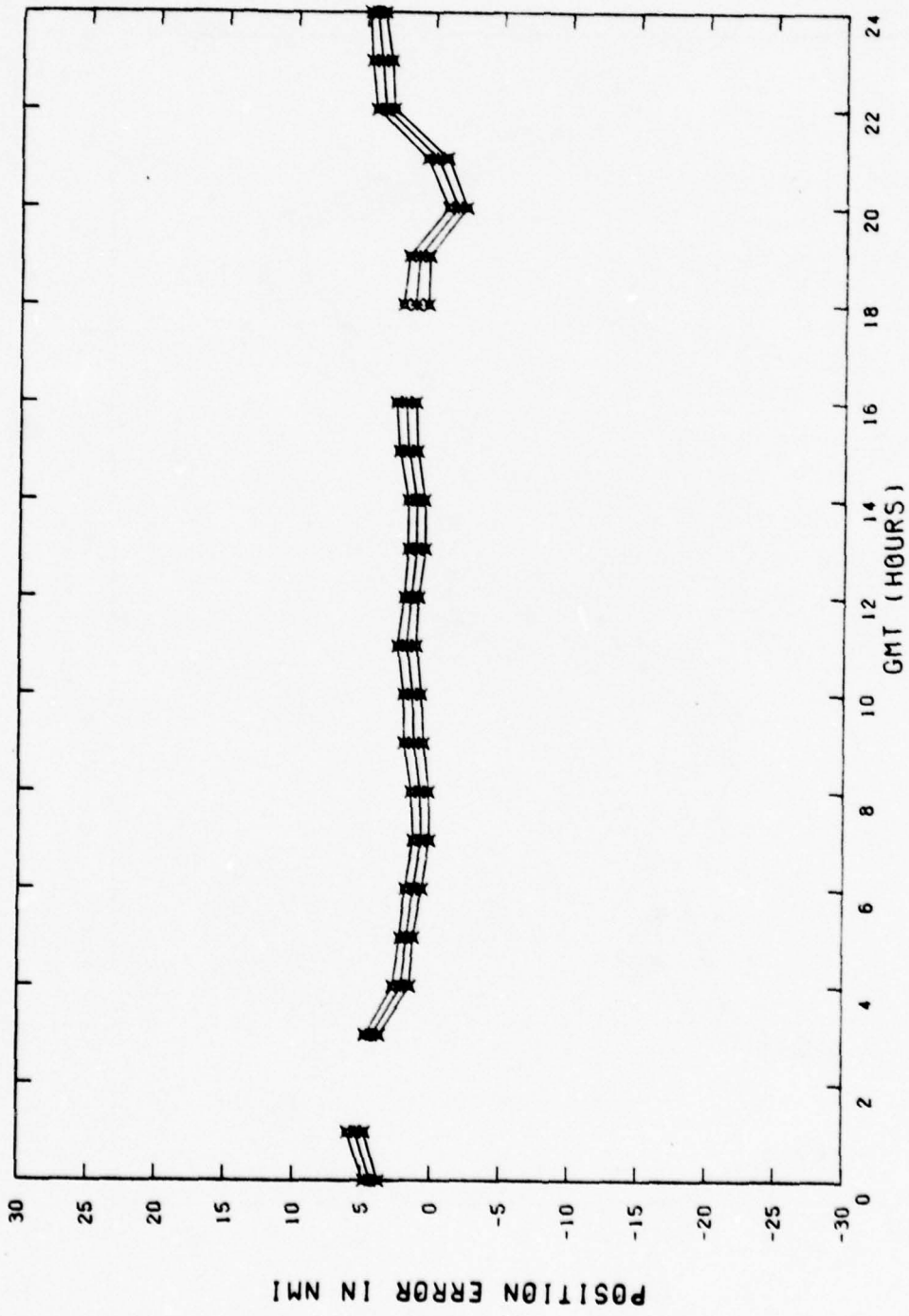


Figure D.7 Position Fix Error, North, Tsushima, 7/76, 10.2, AC-AE

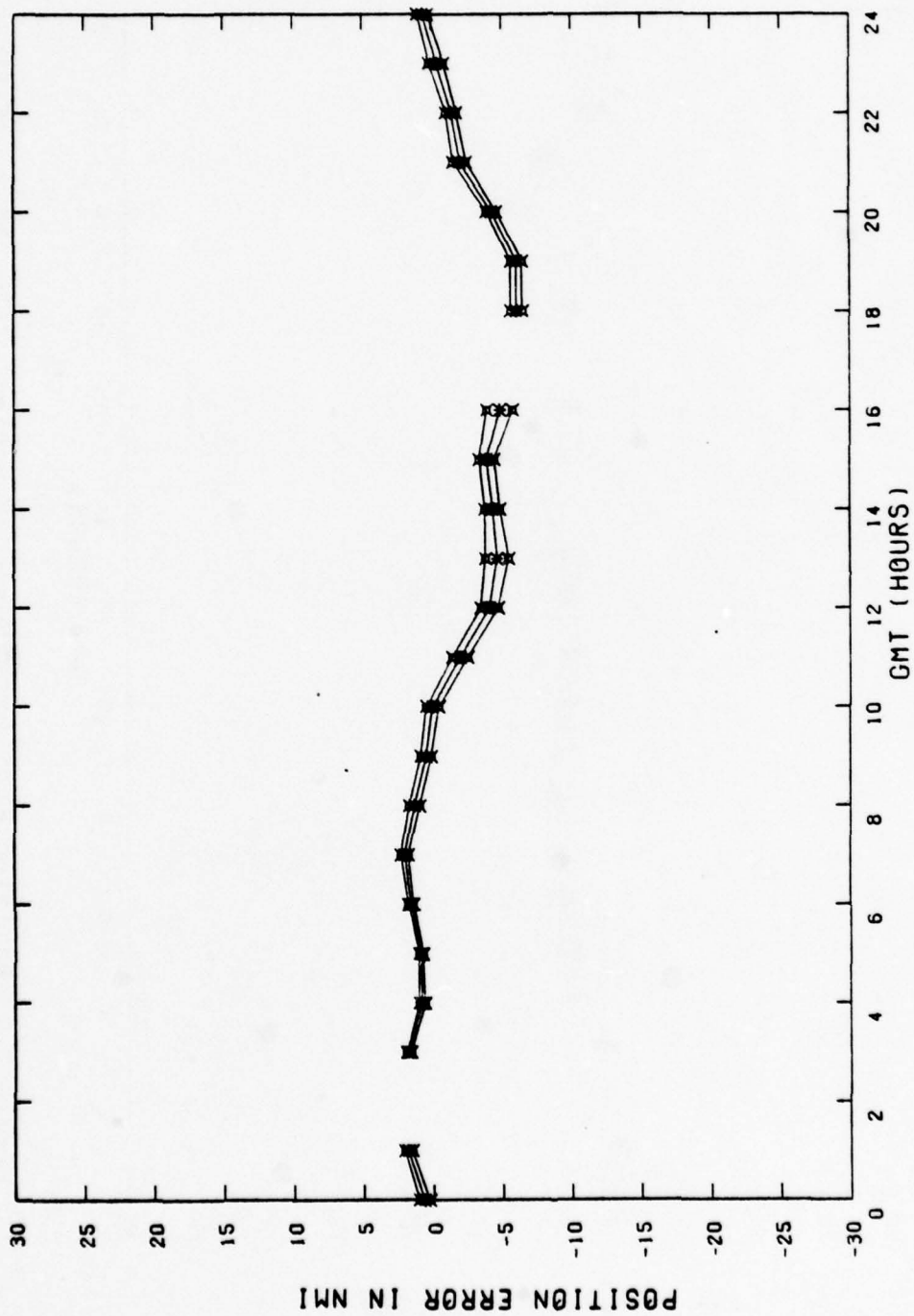


Figure D.8 Position Fix Error, East, Tsushima, 7/76, 10.2, AC-AE

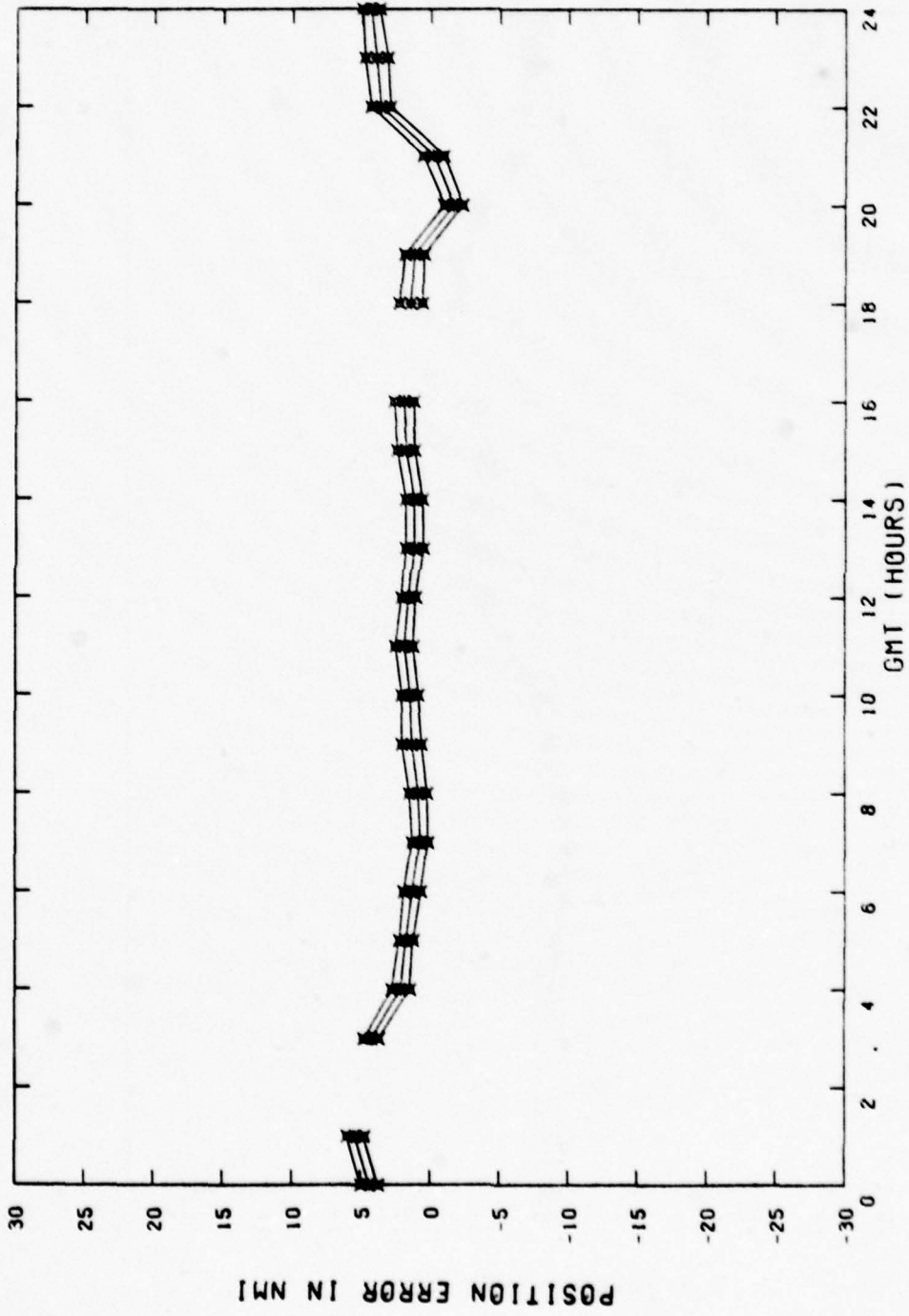


Figure D.9 Position Fix Error, North, Tsushima, 7/76, 10.2, AC-CE

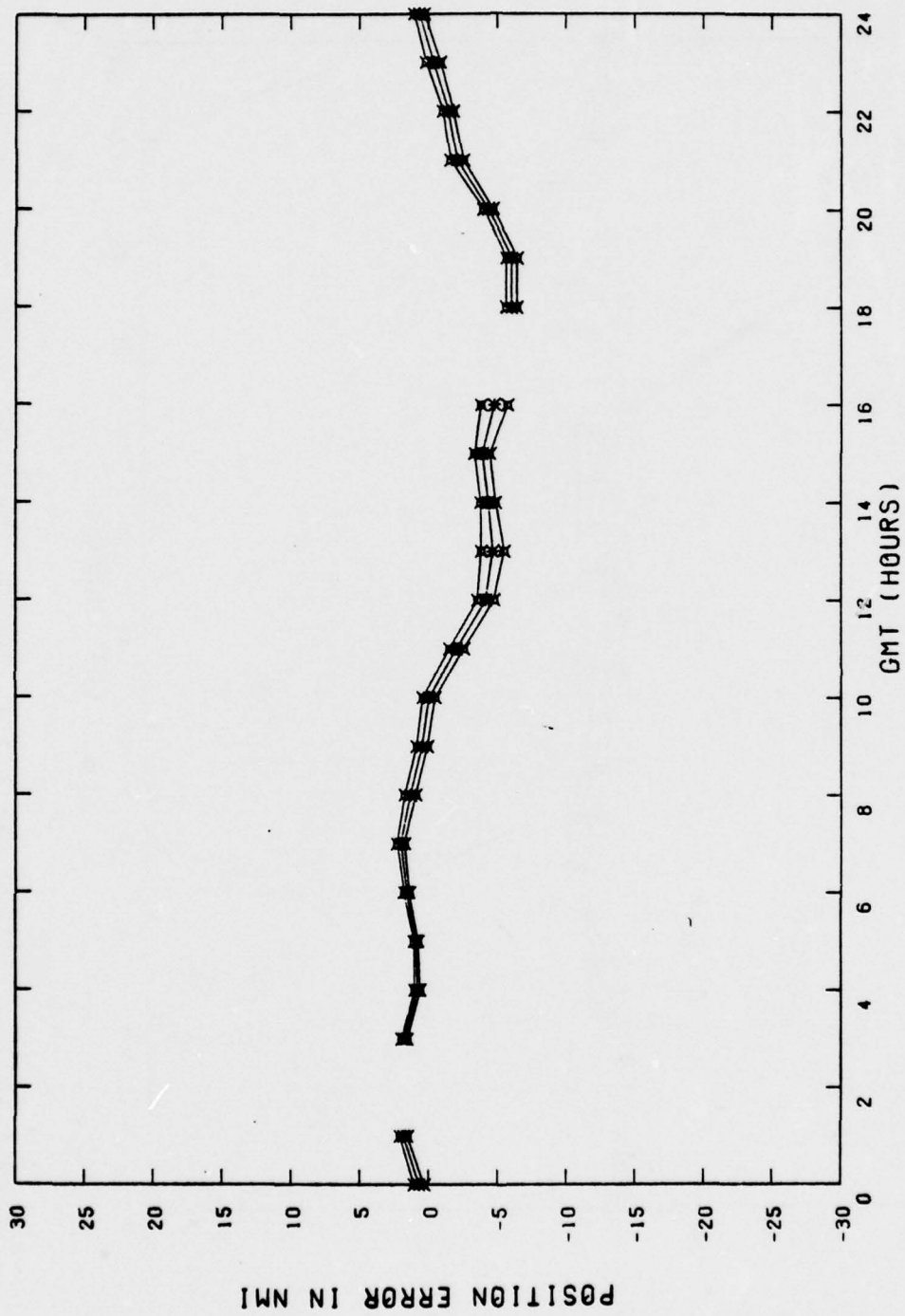


Figure D.10 Position Fix Error, East, Tsushima, 7/76, 10.2, AC-CE

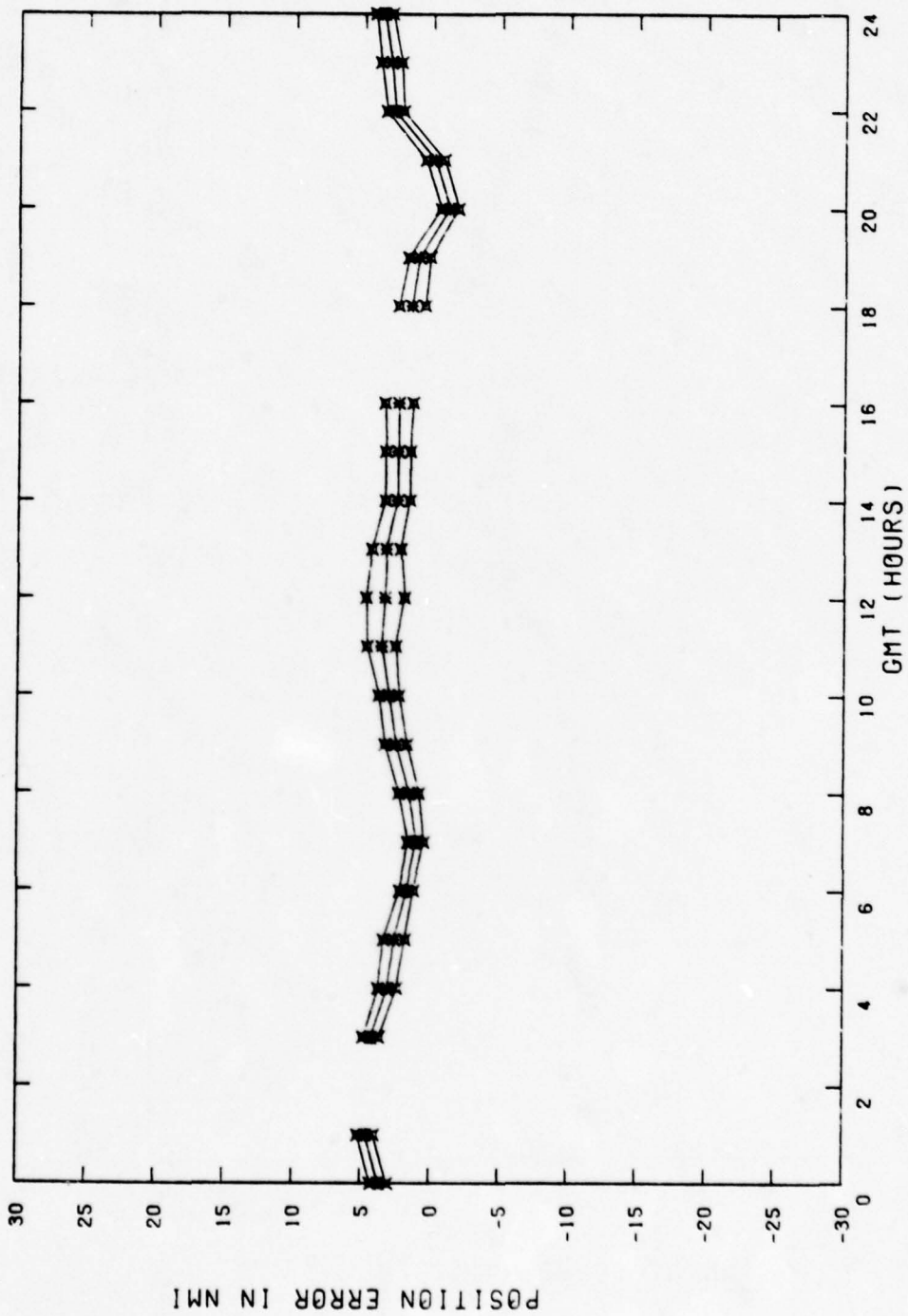


Figure D.11 Position Fix Error, North, Tsushima, 7/76, 10.2, AC-DE

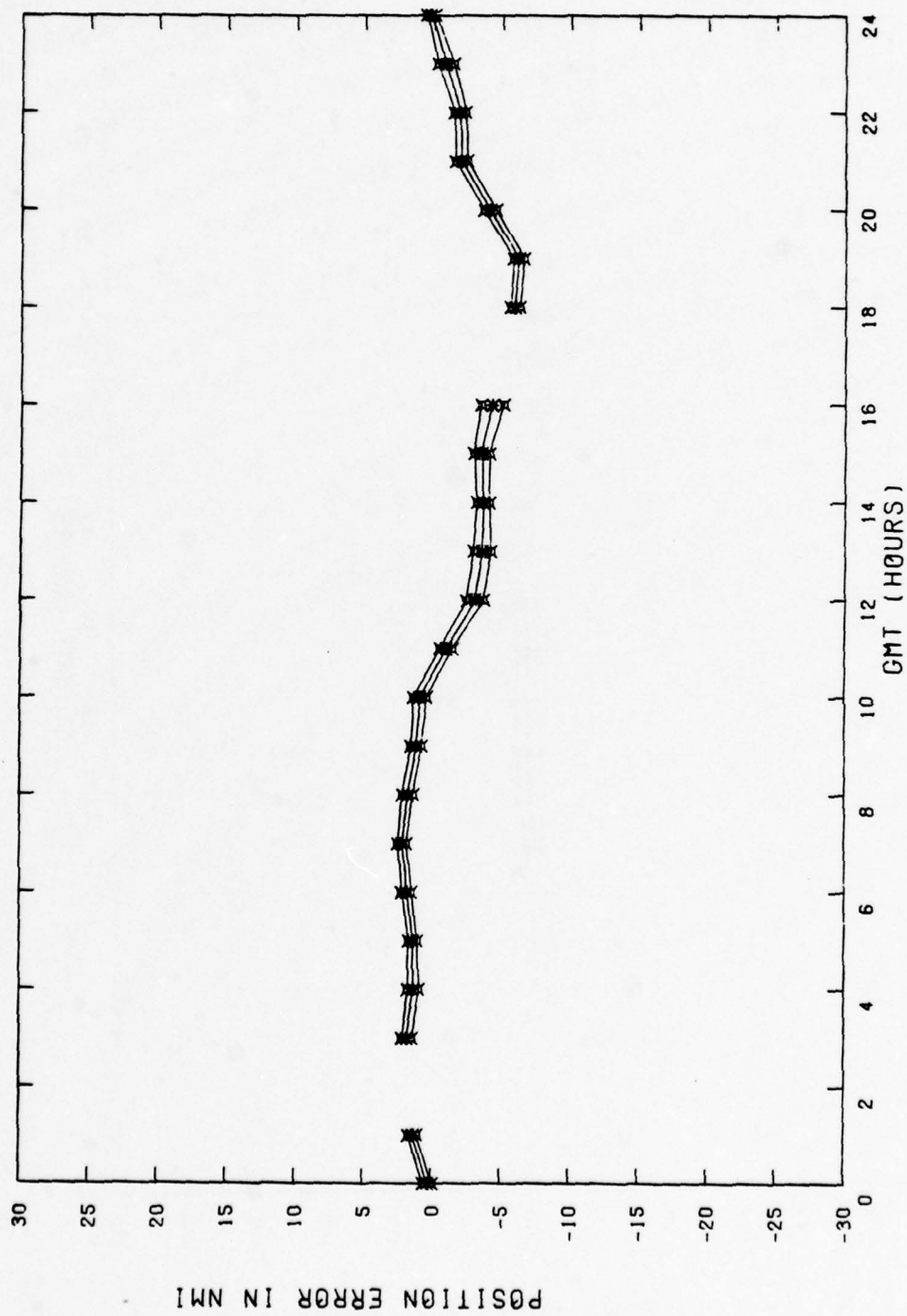


Figure D.12 Position Fix Error, East, Tsushima, 7/76, 10.2, AC-DE

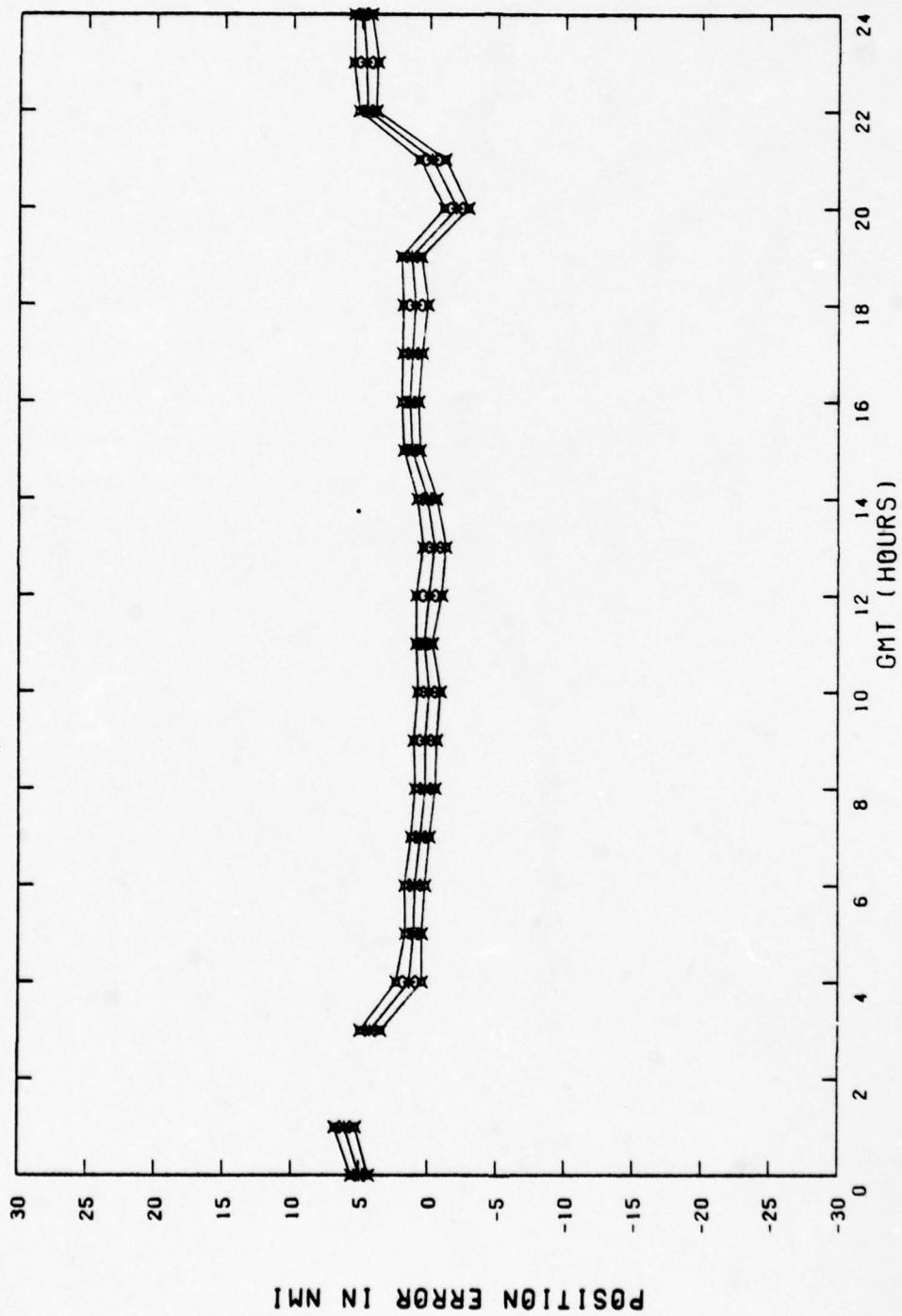


Figure D.13 Position Fix Error, North, Tsushima, 7/76, 10.2, AD-AE

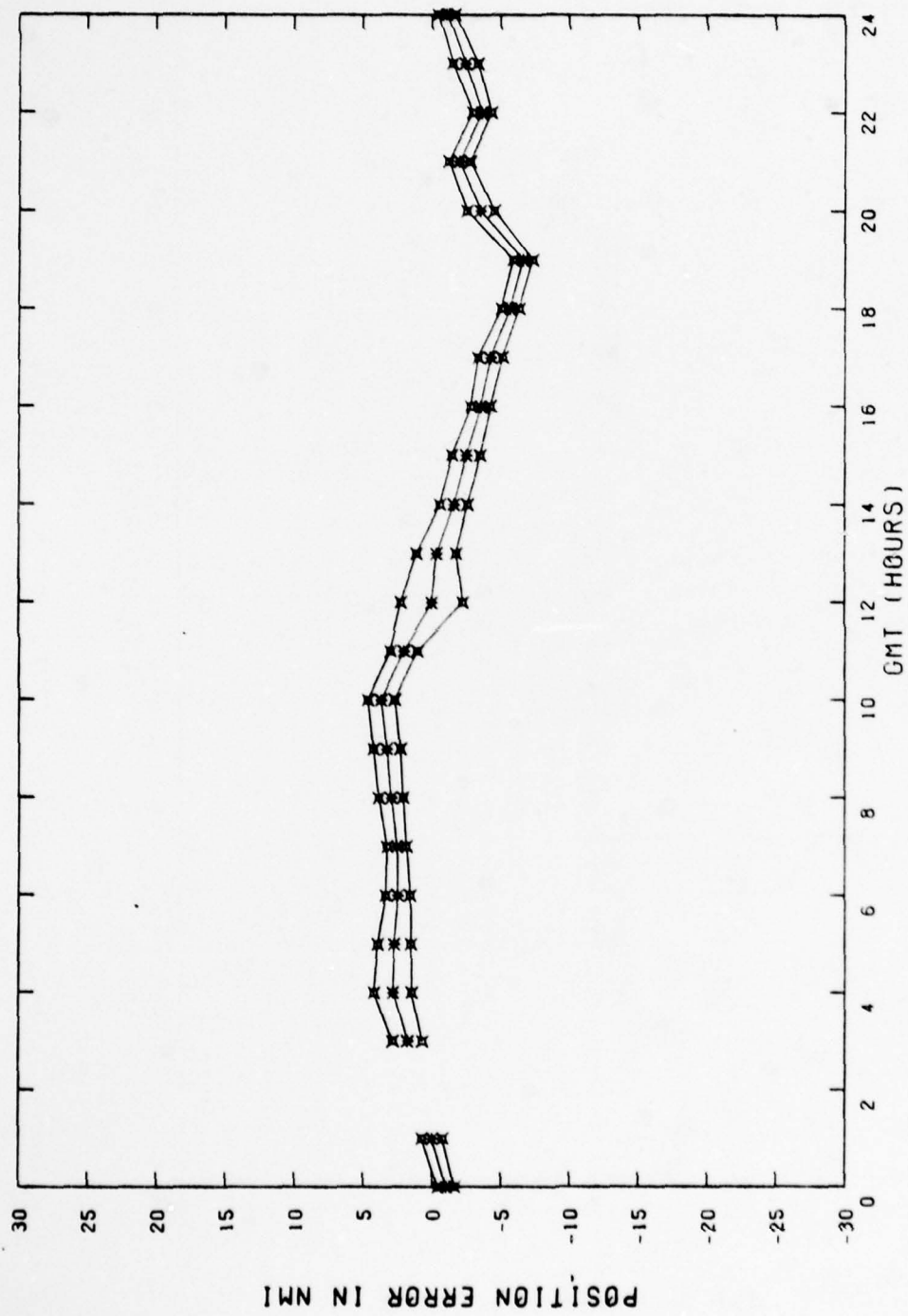


Figure D.14 Position Fix Error, East, Tsushima, 7/76, 10.2, AD-AE

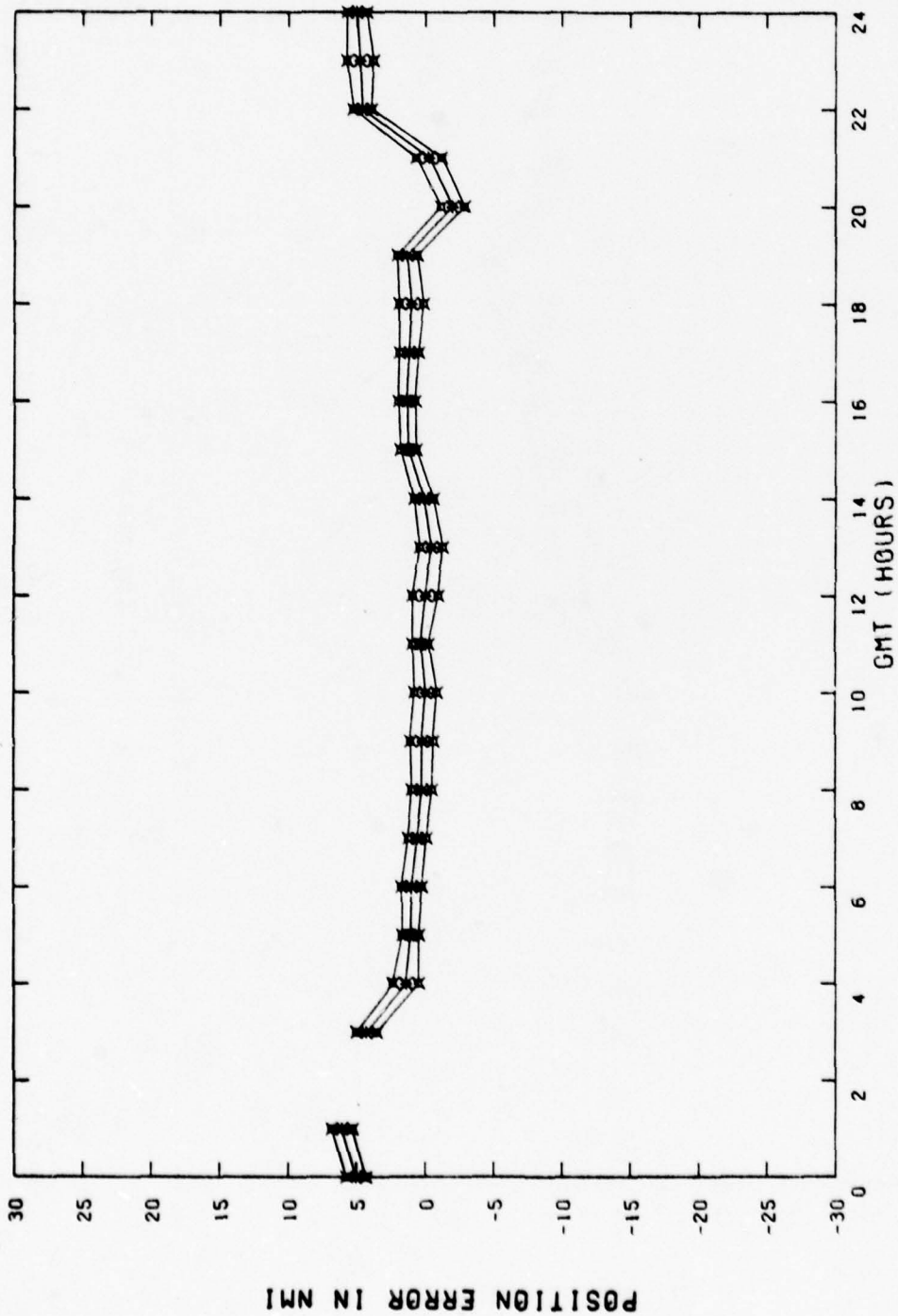


Figure D.15 Position Fix Error, North, Tsushima, 7/76, 10.2, AD-DE

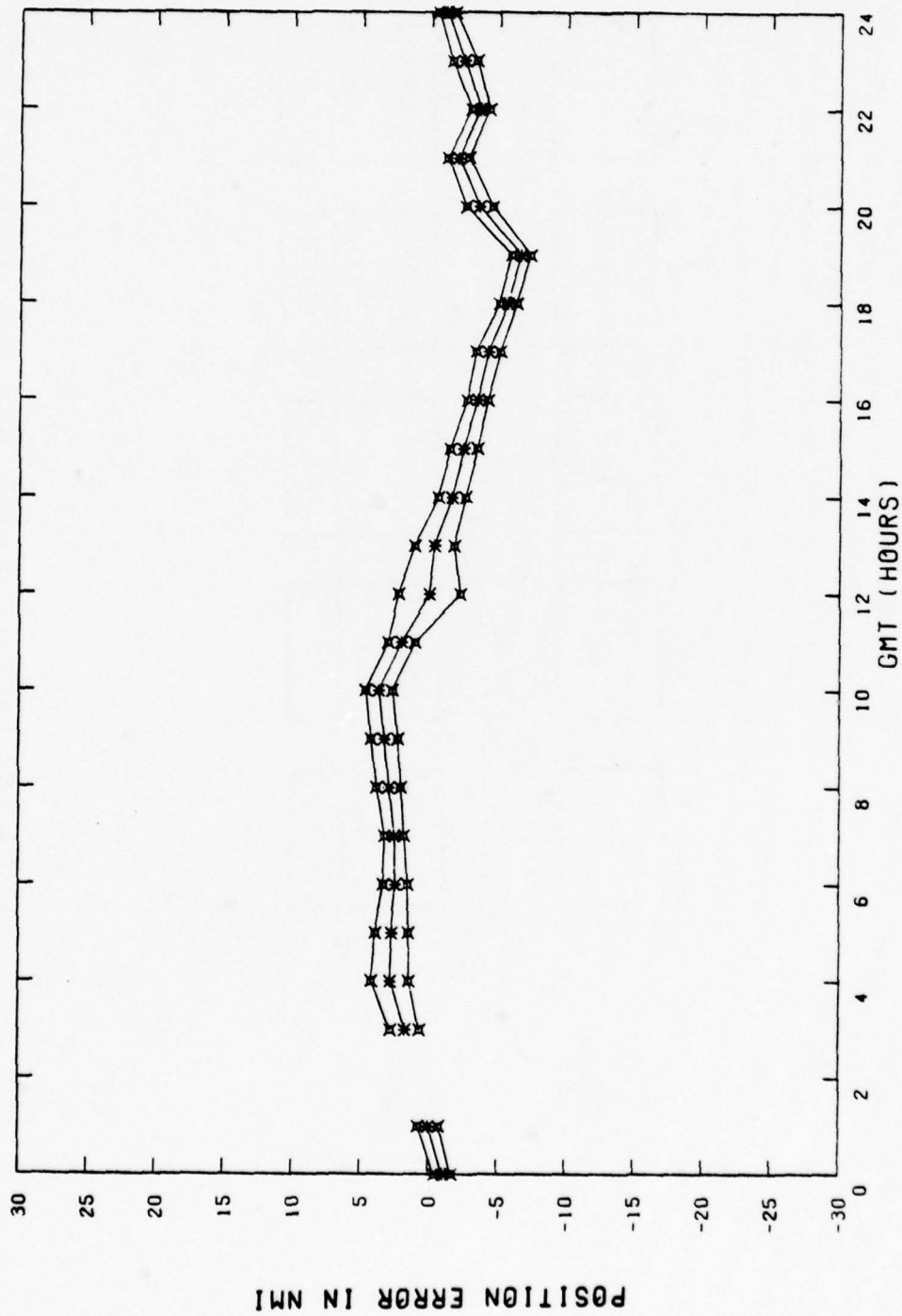


Figure D.16 Position Fix Error, East, Tsushima, 7/76, 10.2, AD-DE

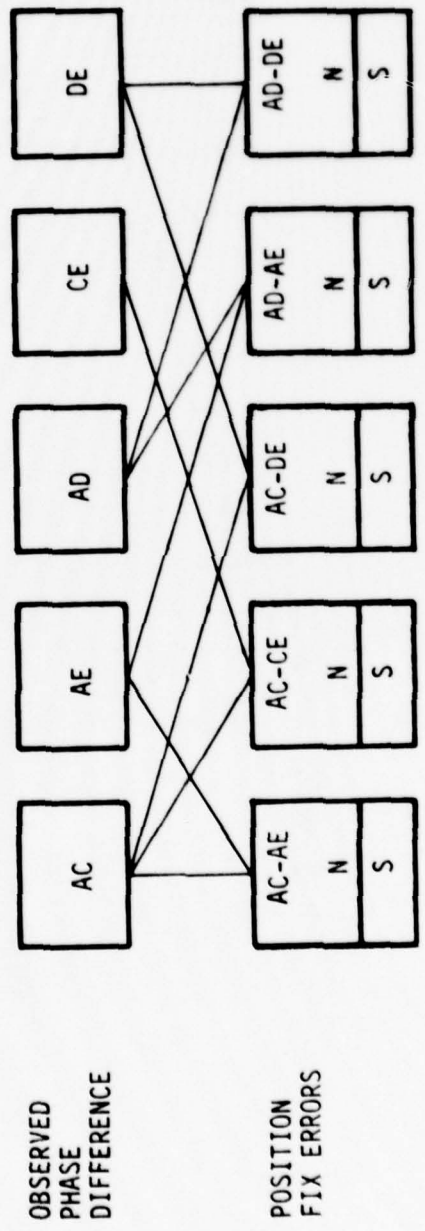


Figure D.17 Tsushima Data Graphs, July 1976, 13.6

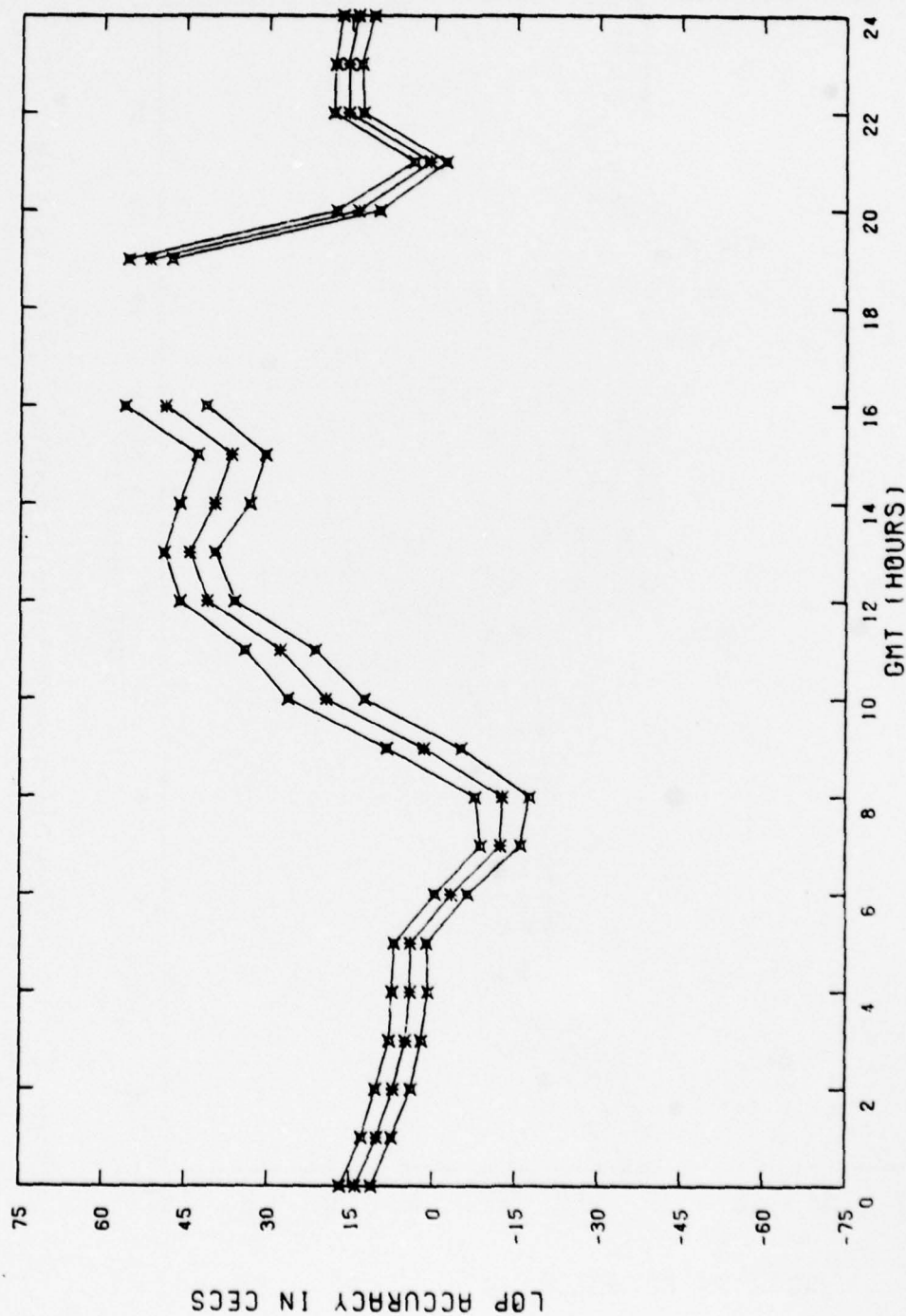


Figure D.18 Phase Difference Error, Tsushima, 7/76, 13.6, AC

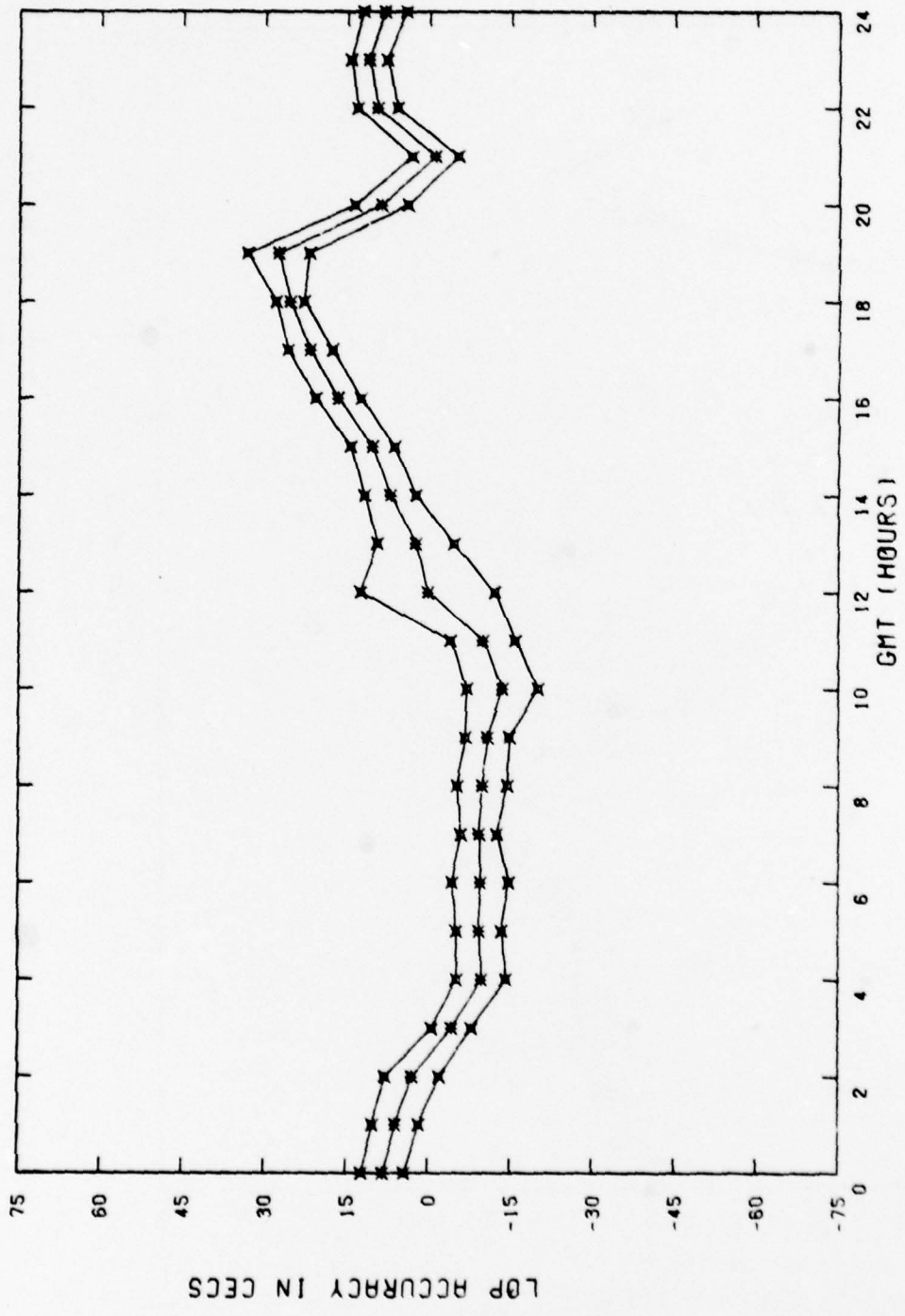


Figure D.19 Phase Difference Error, Tsushima, 7/76, 13.6 AD

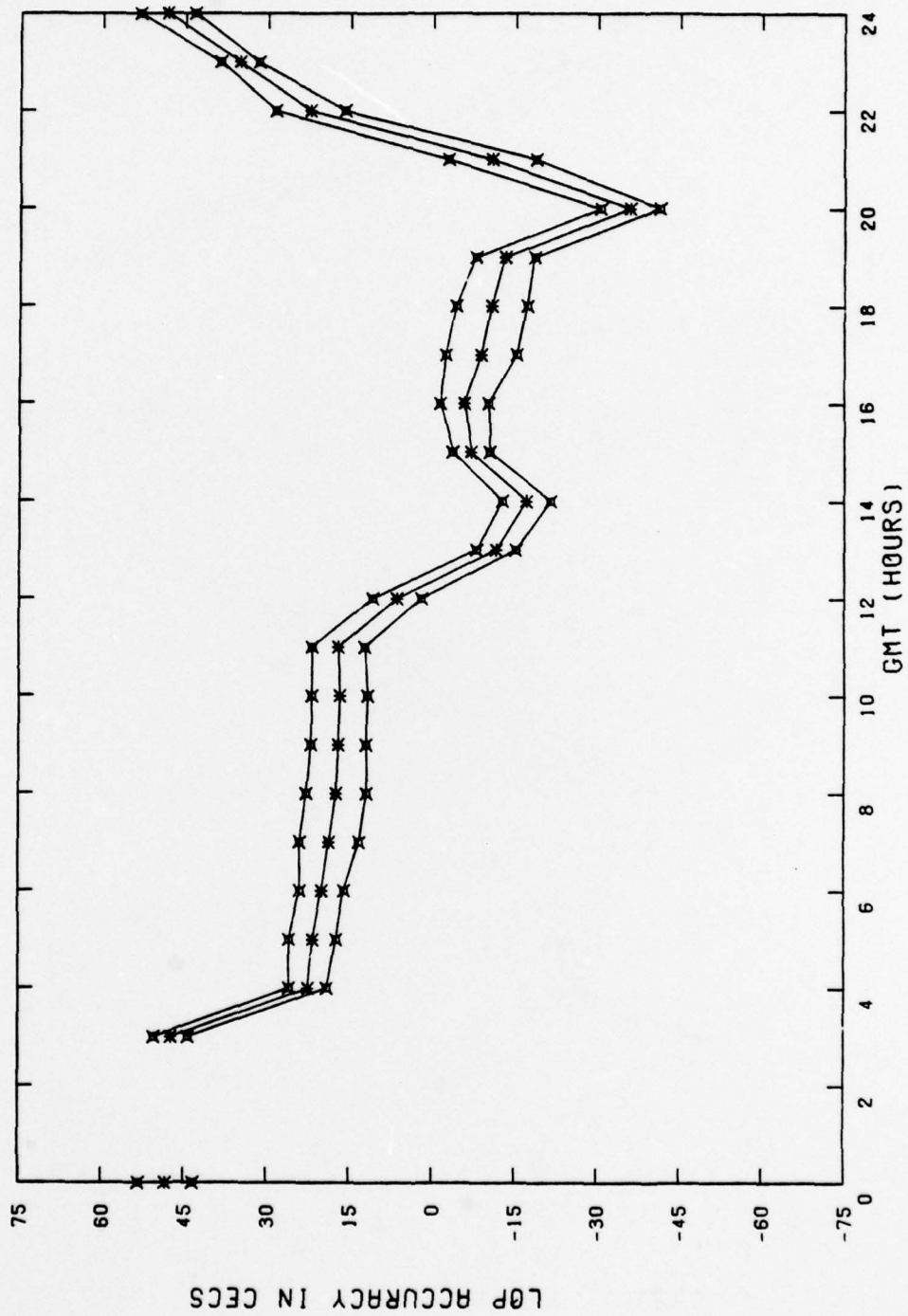


Figure D.20 Phase Difference Error, Tsushima, 7/76, 13.6, AE

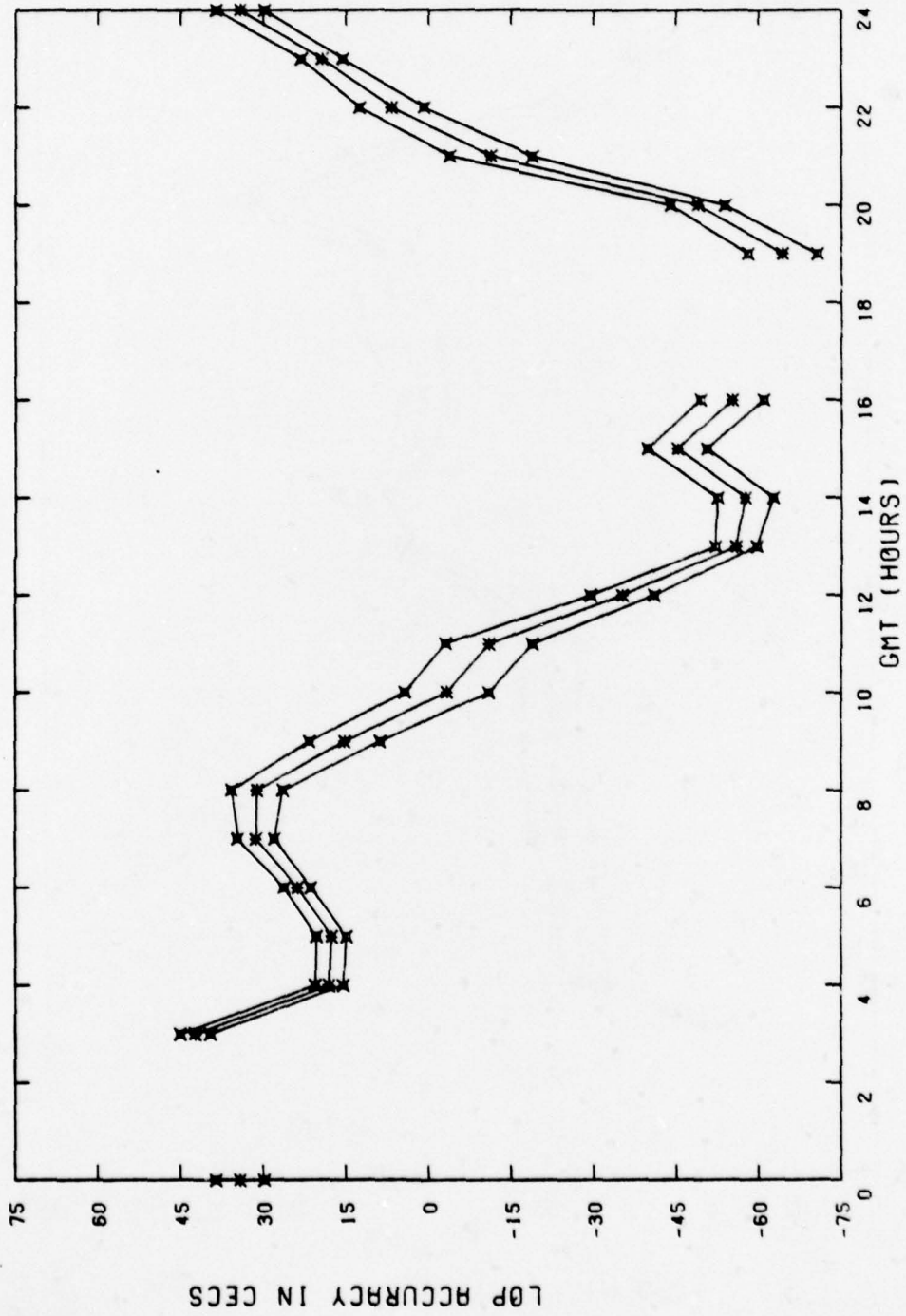


Figure D.21 Phase Difference Error, Tsushima, 7/76, 13.6, CE

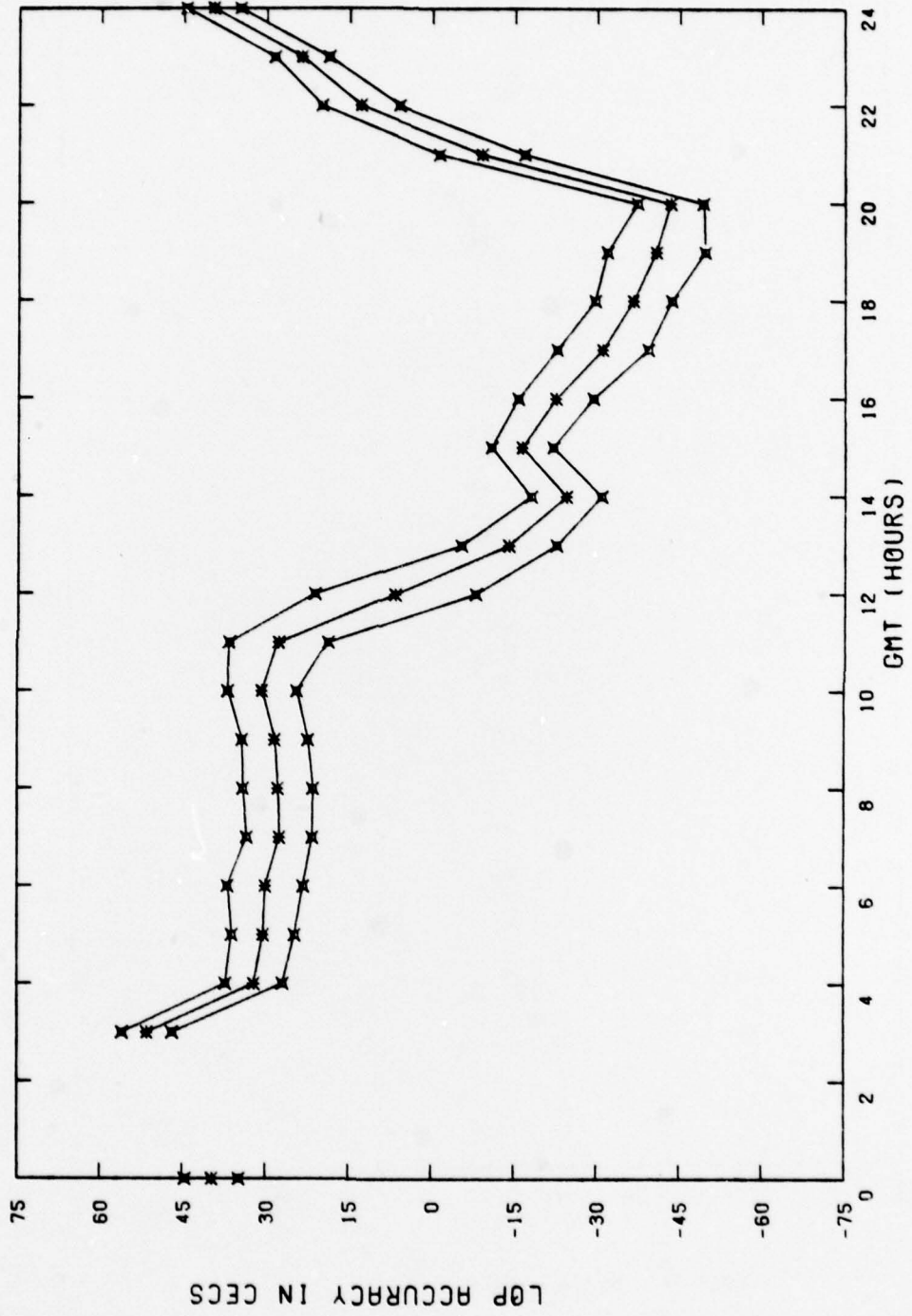


Figure D.22 Phase Difference Error, Tsushima, 7/76, 13.6, DE

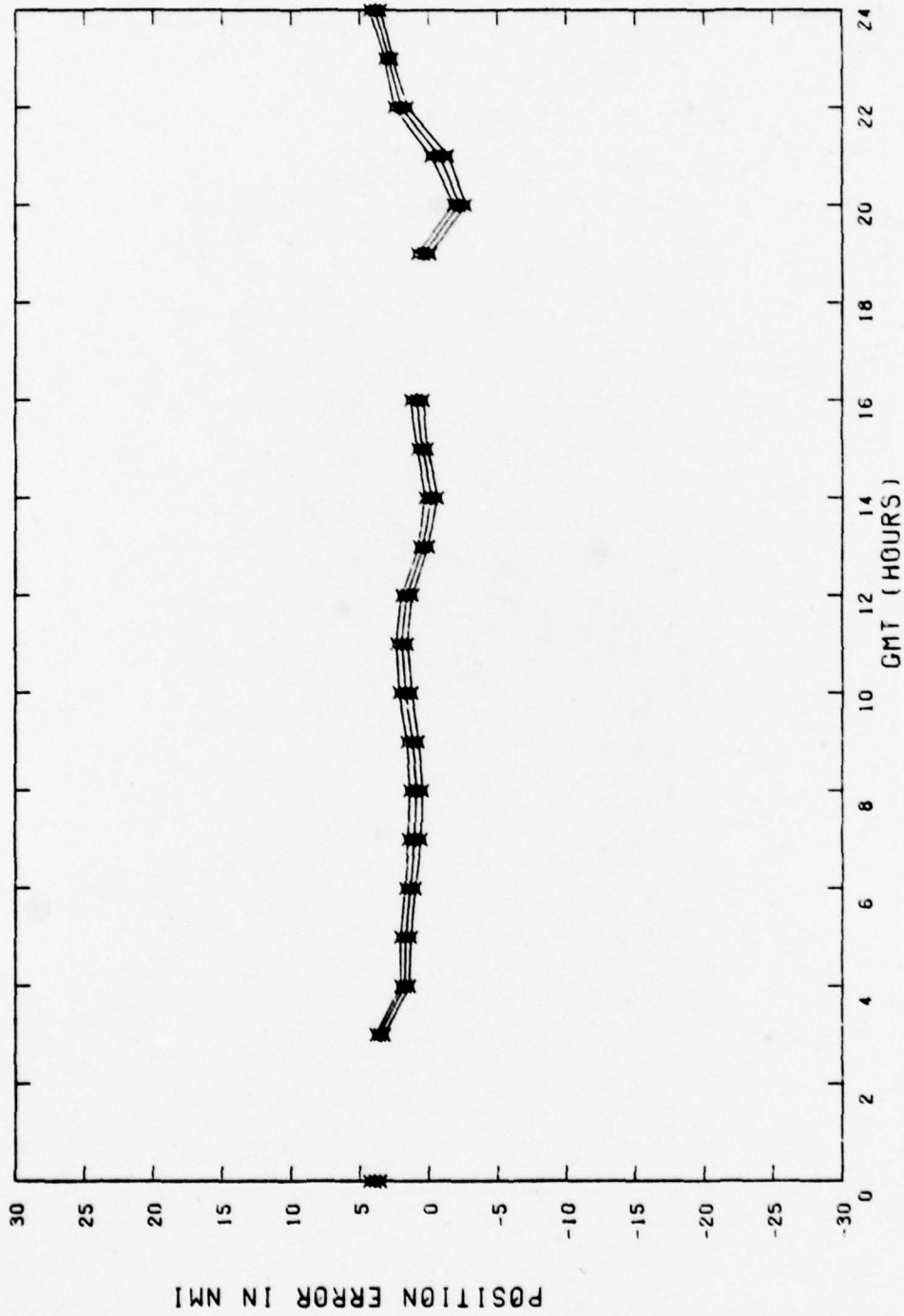


Figure D.23 Position Fix Error, North, Tsushima, 7/76, 13.6, AC-AE

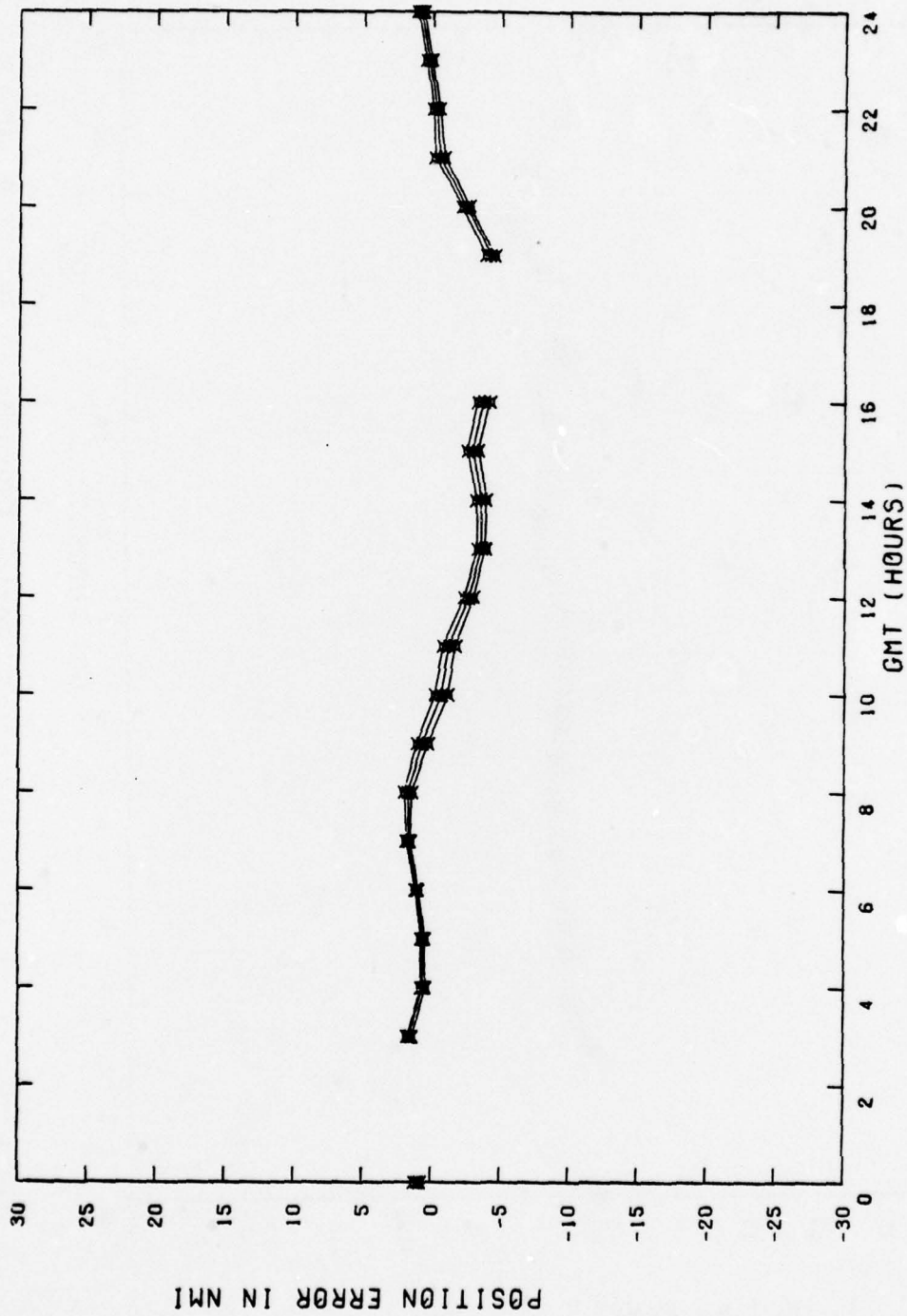


Figure D.24 Position Fix Error, East, Tsushima, 7/76, 13.6, AC-AE

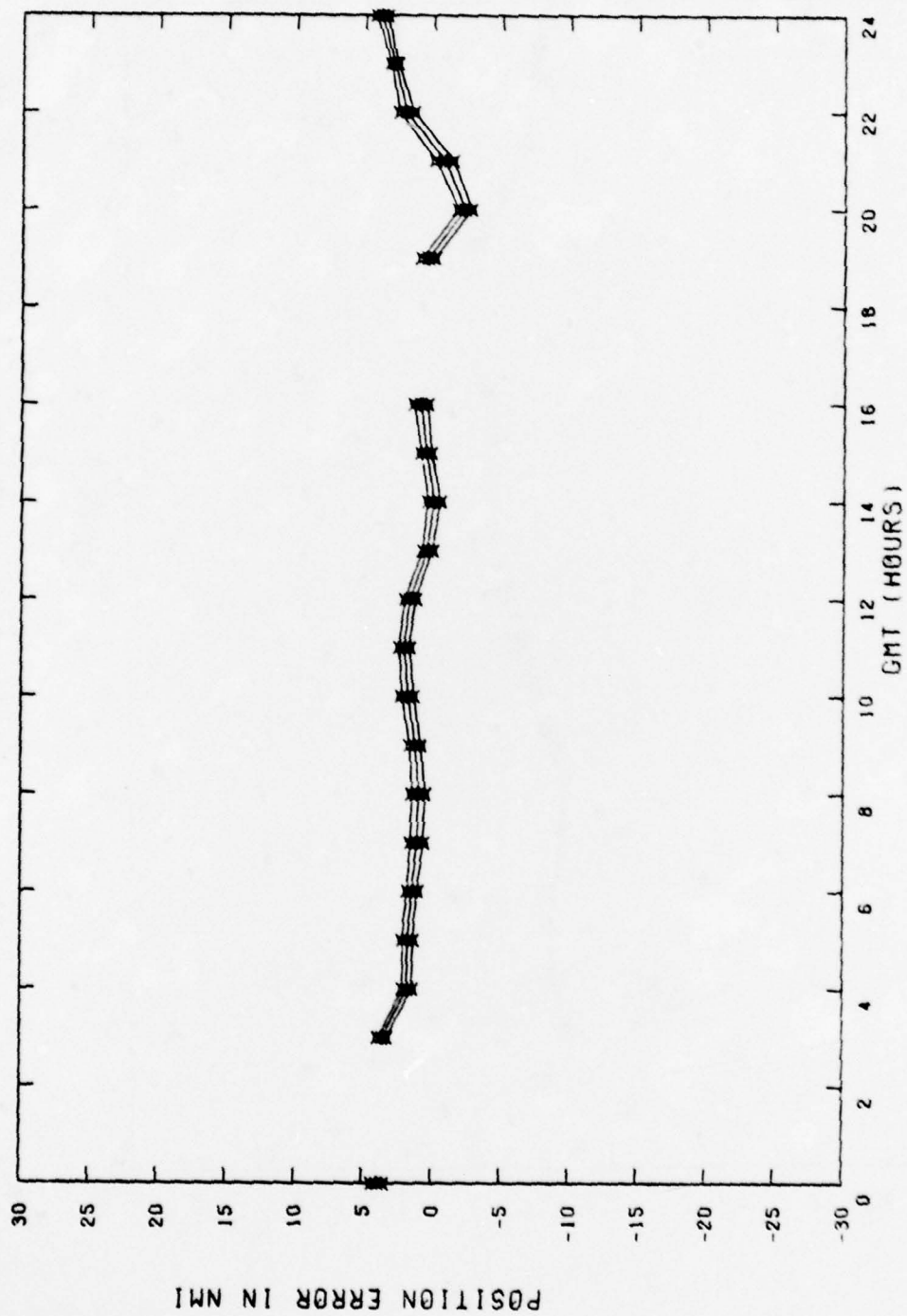


Figure D. 25 Position Fix Error, North, Tsushima, 7/76, 13.6, AC-CE

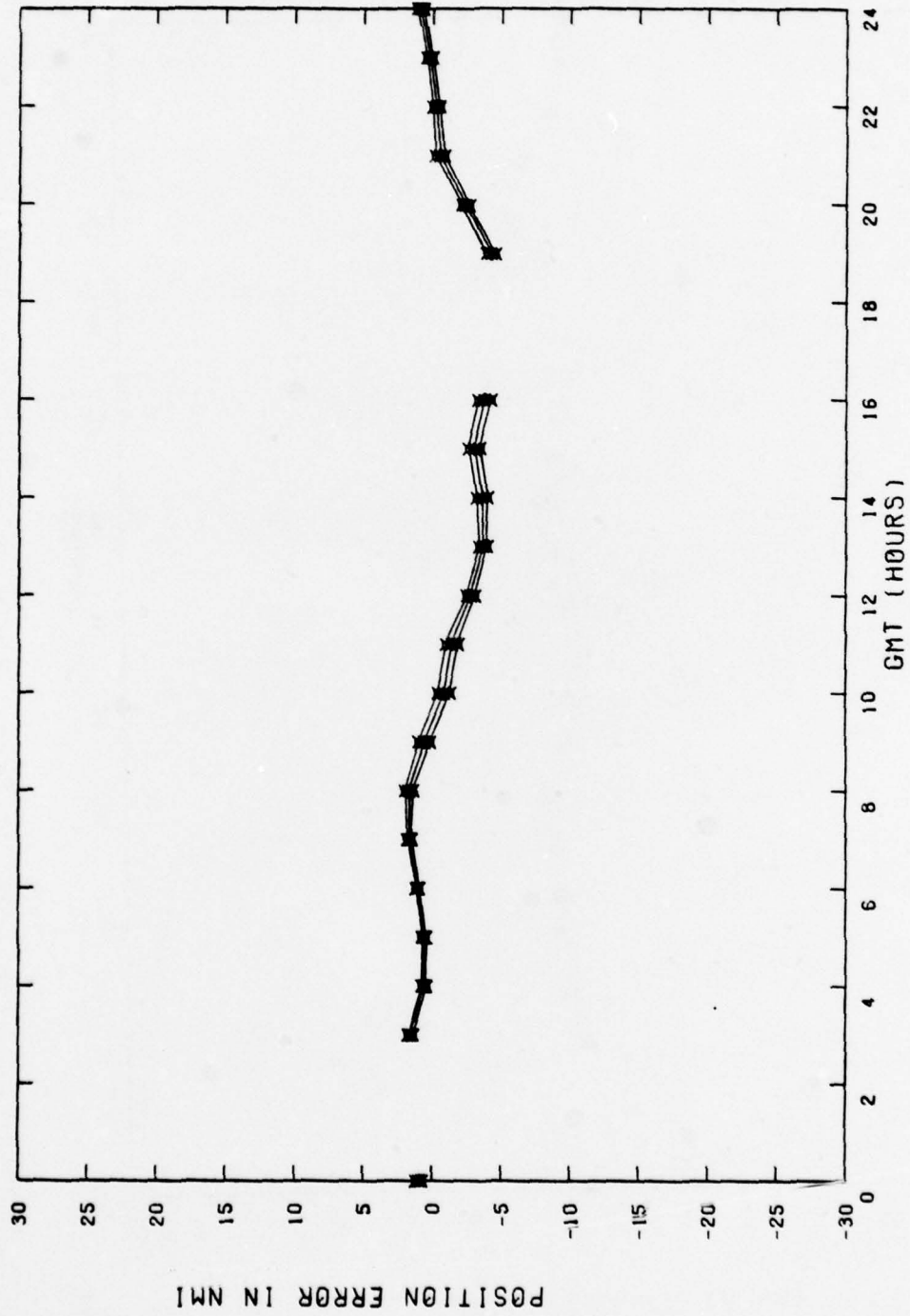


Figure D.26 Position Fix Error, East, Tsushima, 7/76, 13.6, AC-CE

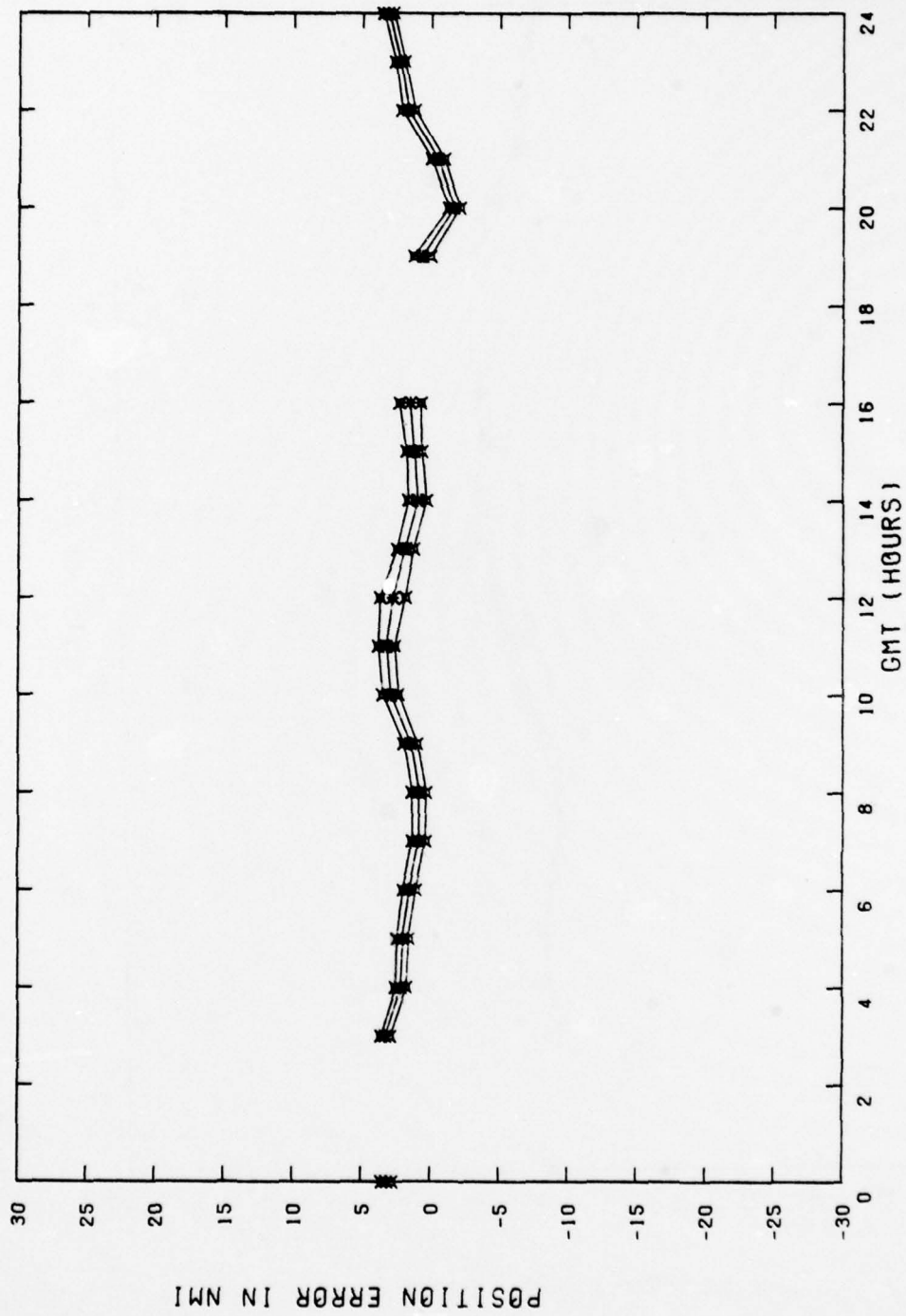


Figure D.27 Position Fix Error, North, Tsushima, 7/76, 13.6, AC-DE

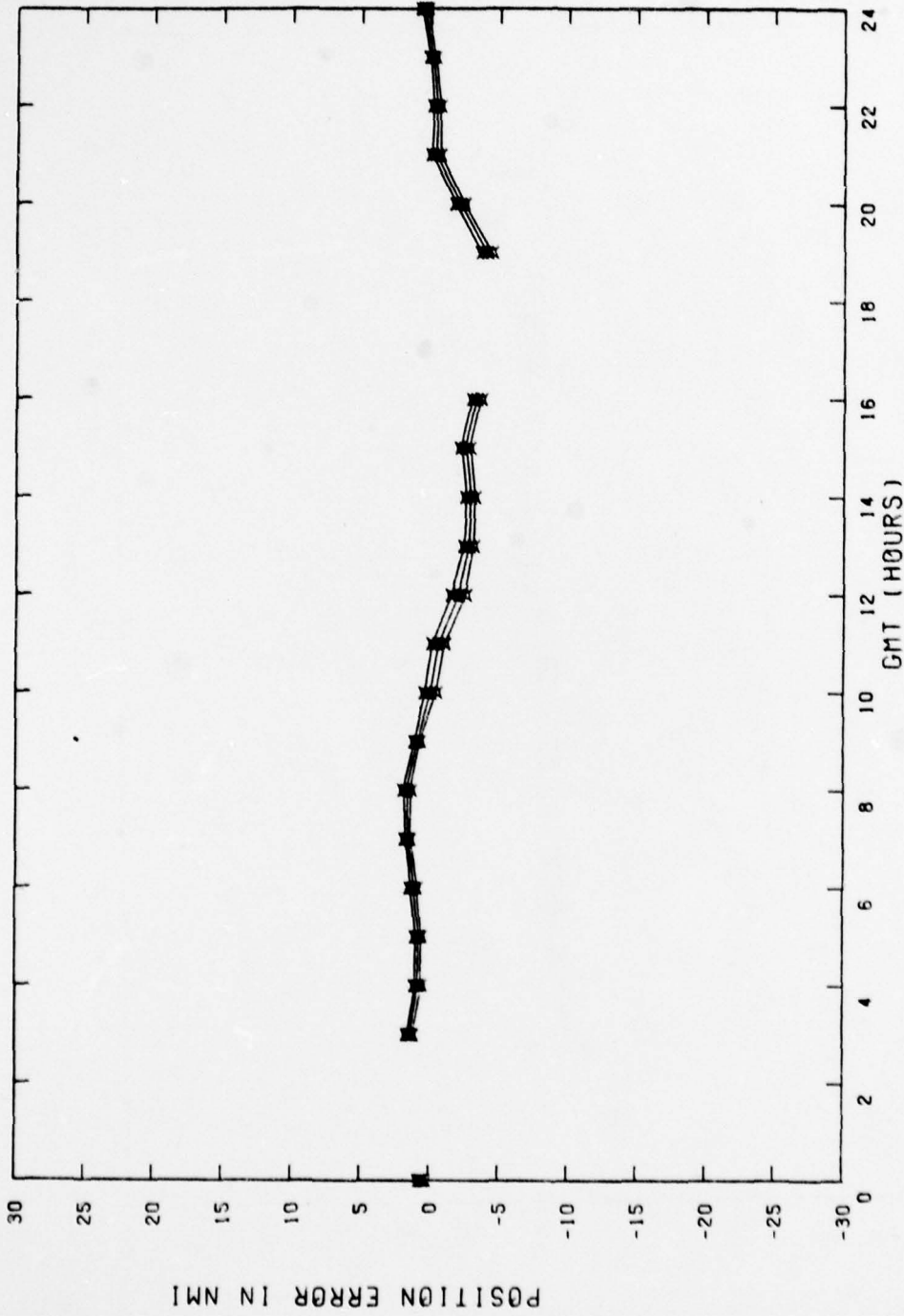


Figure D.28 Position Fix Error, East, Tsushima, East, 7/76, 13.6, AC-DE

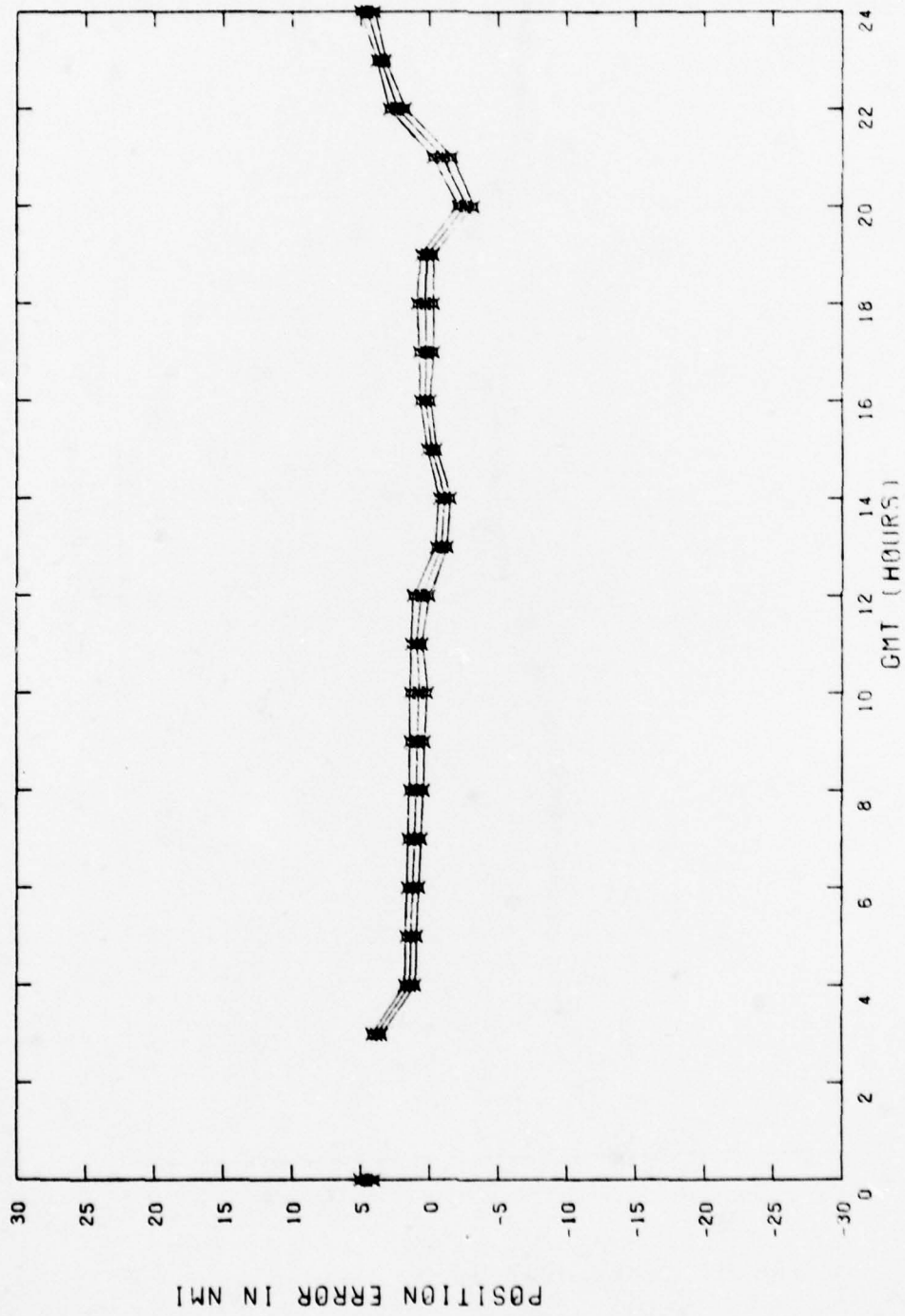


Figure D.29 Position Fix Error, North, Tsushima, 7/76, 13.6, AD-AE

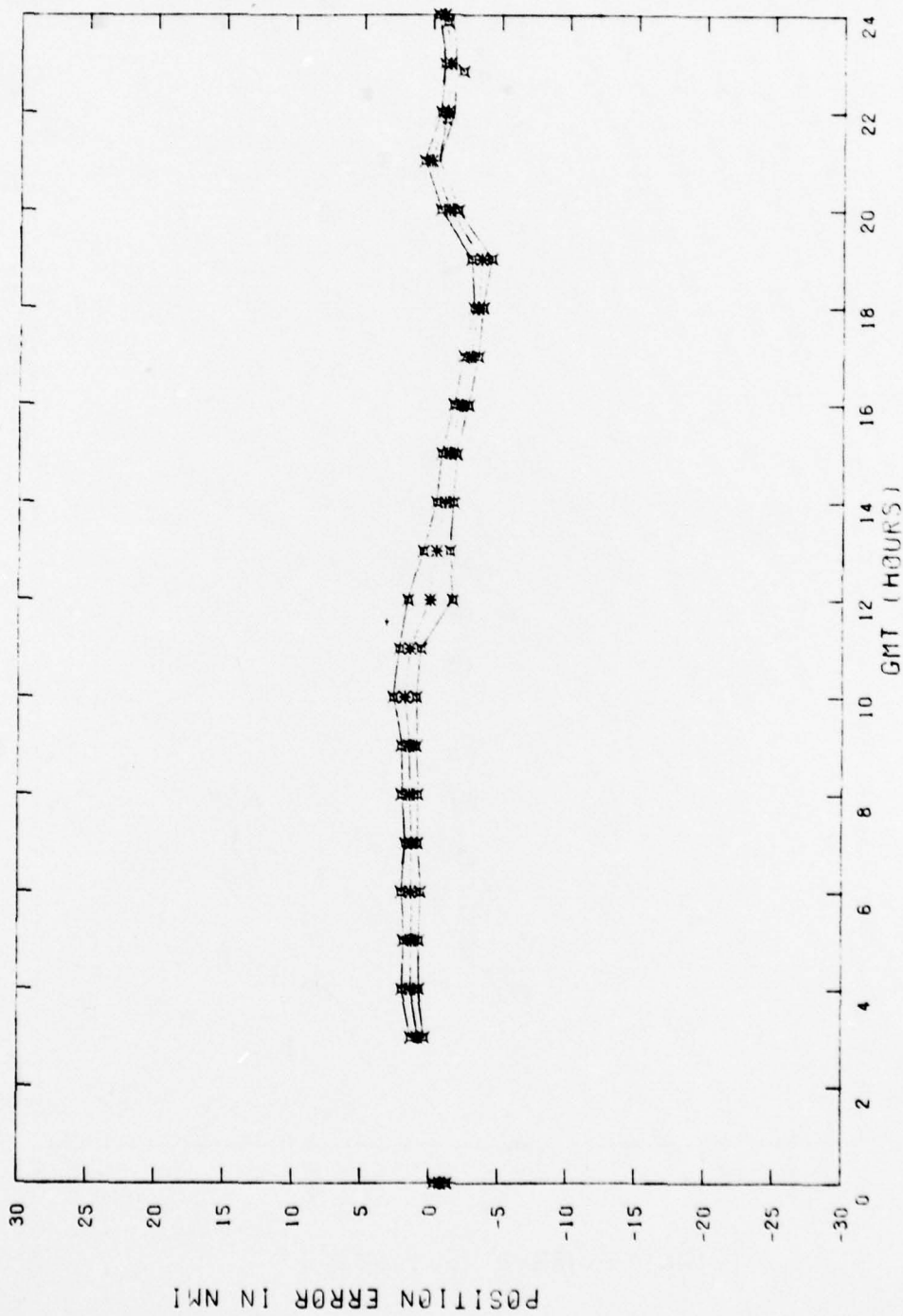


Figure D.30 Position Fix Error, East, Tsushima, 7/76, 13.6, AD-AE

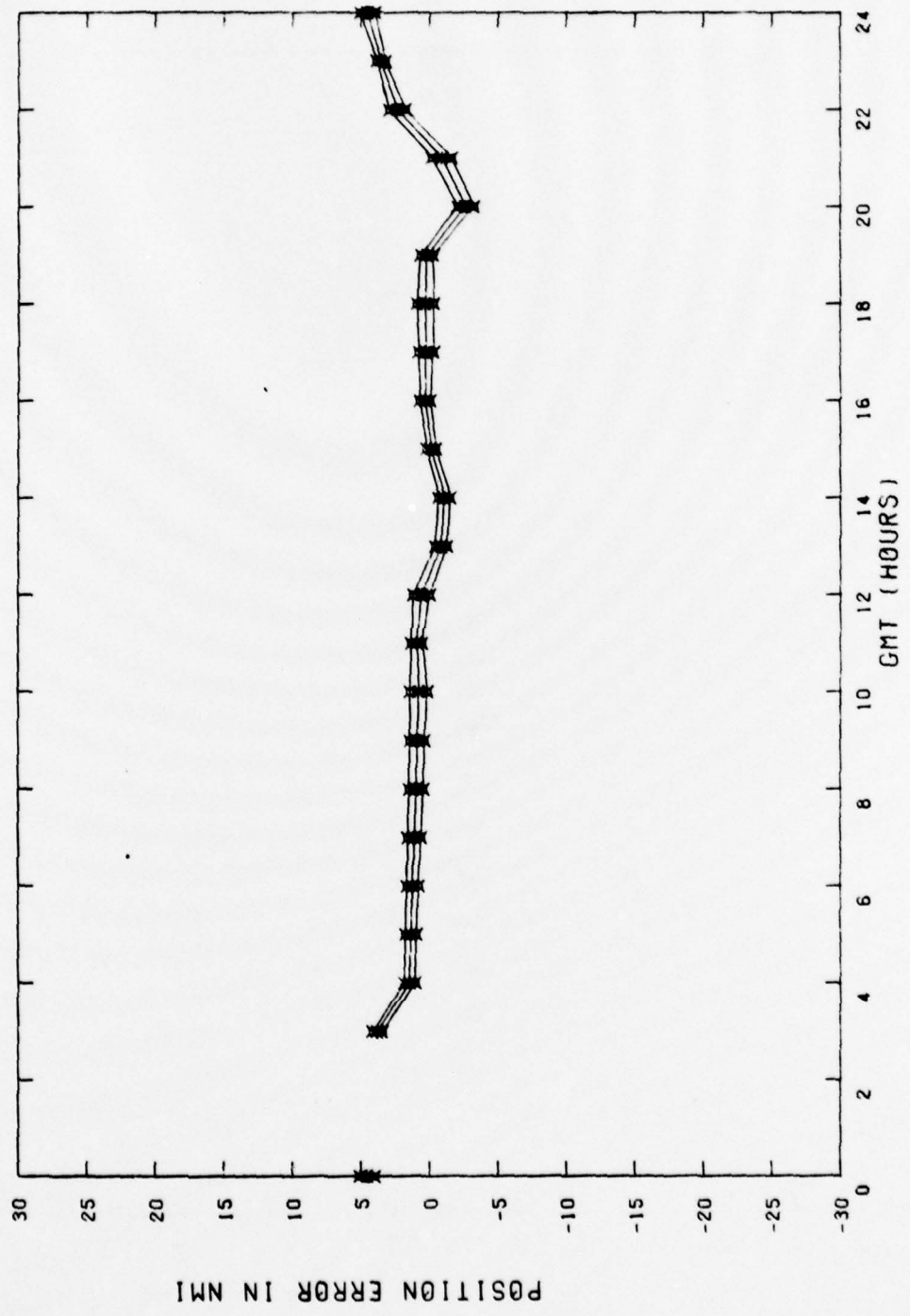


Figure D.31 Position Fix Error, North, Tsushima, 7/76, 13.6, AD-DE

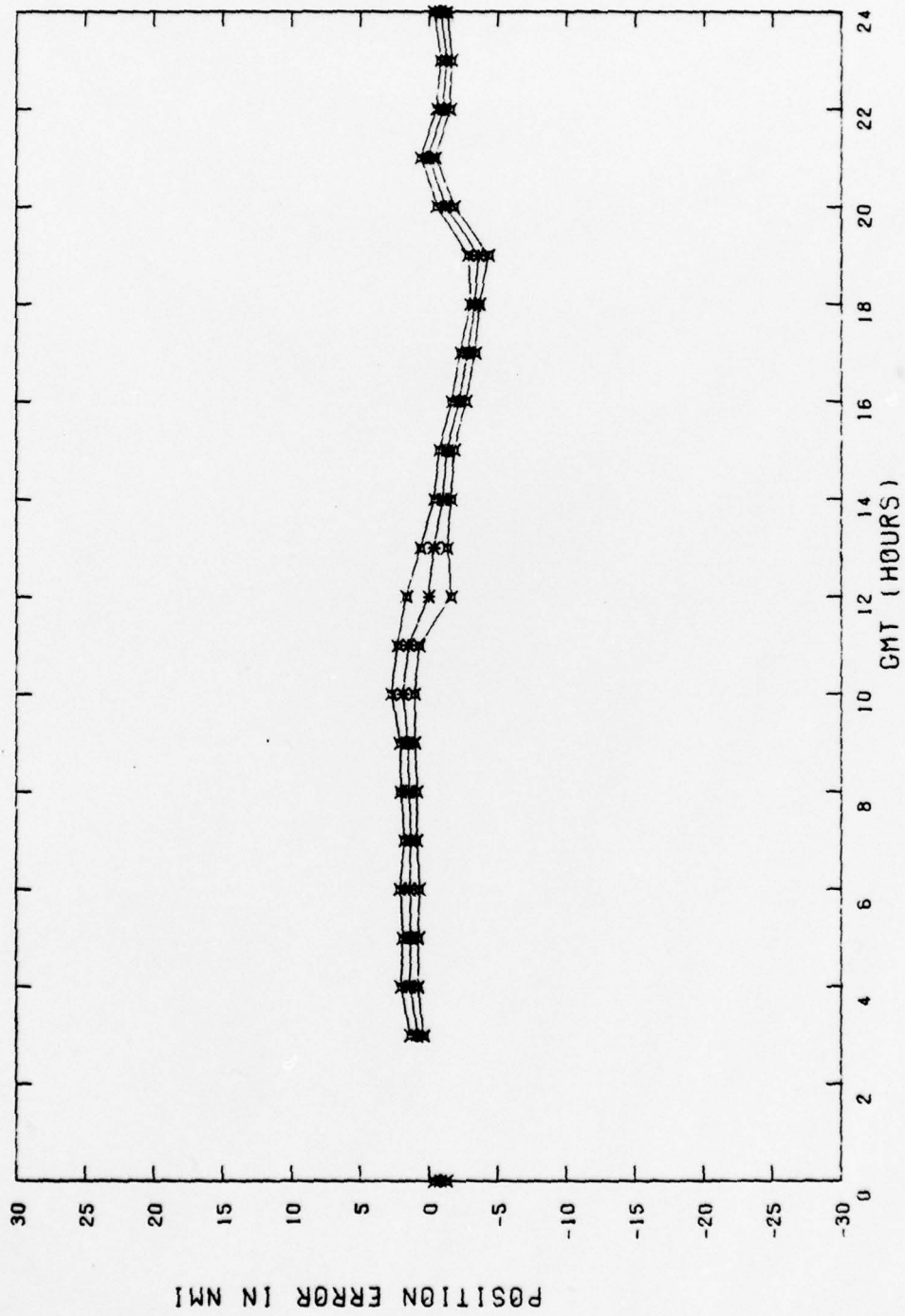


Figure D.32 Position Fix Error, East, Tsushima, 7/76, 13.6, AD-DE