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VOLUME D: DATA AND ANALYSIS

L. F. FEHLNER
T. W. JERARDI
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This report (Volume D of TG 1298) documents the data that were recorded and the analyses that were performed in conjunction with an experiment conducted by The Johns Hopkins University Applied Physics Laboratory for the U.S. Air Force and the Defense Advanced Research Projects Agency to determine the validity of one facet of the theory of groundwave propagation at 100 kHz. Volume A is the summary report, Volume B describes test operations, and Volume C describes the measurement system.

This goal of the experiment was to determine if an analytic function could be developed for operational use that relates secondary phase factor to envelope to cycle difference so that geodetic position can be computed, accurately and in real time, from Loran-C coordinates. Field test data were collected and analyzed. They show trends that tend to support the hypothesis that the desired functional relationship exists, at least under certain conditions. Additional analysis and perhaps tests will be necessary to define these conditions or to prove conclusively the existence of such a relationship.

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1. INTRODUCTION

The Applied Physics Laboratory (APL) has conducted an experiment for the U.S. Air Force (USAF) and the Defense Advanced Research Projects Agency (DARPA) to determine the validity of one facet of the theory of groundwave propagation at 100 kHz. The theory indicates that, if proper account is taken of group and phase velocities in the propagation of pulses of the Loran-C radionavigation service, geodetic position should be computable using the vacuum speed of light and the times of arrival of the pulse and the carrier. Specifically, the test goal was to determine if an analytic function can be developed for operational use that relates secondary phase factor (SPF) to envelope-to-cycle difference (ECD) so that geodetic position can be computed accurately and in real time.

Test data were obtained in the eastern United States using the East Coast Loran-C chain and two identical measurement systems, one in a mobile test van and the other at a fixed site at the U.S. Naval Observatory (NAVOBSY). The van occupied 10 field sites during the course of the test. APL was assisted in this test by NAVOBSY and the Defense Mapping Agency Topographic Center (DMATC). The positions of all sites were precisely surveyed by DMATC using the Navy Navigation Satellite System. The sites are on ray paths from Loran-C stations through NAVOBSY. A team from NAVOBSY executed time transfers to each field site during the collection of loran data. The collected data include very accurate measurements of the Loran-C signal voltage and the absolute time at which they were made at each of the 10 pairs of sites.

The test operations, including site selection and surveys, acquisition of Loran-C and time transfer data, and a Loran-C receiver response test, were initiated in April 1974 and completed in November 1975. This report (Volume D of TG 1298) documents the data, its analysis, and findings. Volume A is the summary report, Volume B describes the test operations, and Volume C describes the measurement system. All volumes are written under the assumption that the reader is reasonably familiar with the Loran-C system of radionavigation. Reference 1 is suggested reading for those who are not.

As a result of extensive data analysis, it was possible to establish statistically significant

measures of SPF and ECD for each of the 12 tests conducted at the field sites and at NAVOBSY. The voltage measurements were used also to isolate the modulations of the carrier that give the pulses from the Carolina Beach, Dana, and Nantucket Stations their unique characteristics. The pulses from each station contain both in-phase and in-quadrature modulations of the carrier that make it impossible to make direct observations of the carrier. Largely because of this, the functional relationship between ECD and SPF that, it was hoped, would be derived from the data is presently not well defined. However, trends are observed in the data that tend to support the hypothesis that the desired functional relationship exists, at least under certain conditions. Additional analysis and perhaps tests will be necessary to define these conditions or to prove conclusively the existence of such a relationship.

2. OVERVIEW

Volume D of TG 1298 describes the processes that were applied to the portion of the field data that pertains to the primary goal of the experiment. It also records the processed data, a number of intermediate results, and findings regarding the attainment of the goal. We have chosen not to publish the raw field data and the rather voluminous computer output that was generated in developing an understanding of the data and their statistical characteristics.

The field data are recorded on approximately 100 10-in. reels of magnetic tape and will be stored indefinitely. Some of the reels of tape contain recordings of ancillary data. From one set of these data, the time difference coordinates of the satellite survey monuments at the various field sites could be determined. A second set was recorded to quantify any diurnal effect on Loran-C emissions. The ancillary data have not been processed, and at the present time there are no plans to do so.

The complete report is in four volumes. Volume A is a summary report that touches on all aspects of the experiment. It includes excerpts from this volume and discusses the findings of the experiment. Volume B describes test operations, and Volume C is a description of the measurement systems used to gather data. Volume D starts at the point in the experiment where all the observations of the Loran-C signals, along with other pertinent information, are available as recordings on magnetic tape.

If the reader wishes to understand this volume in relation to the complete experiment, it is suggested that Volume A should be read first. Otherwise, the reader will be exposed only to the collected data, its processing, and analysis.

3. DISCUSSION

RECORDED DATA

The data recorded on the magnetic tape are identified in Table 1. These data were recorded in blocks that were limited in size to 512 8-bit words (bytes). The format within each block is shown in Fig. 1.

The analog to digital (A to D) converters were adjusted such that 1 V produced the largest binary output number, i.e., 2 to the 13th power minus 1. Since each voltage measurement consisted of 13 bits plus a sign bit, two bytes were required for each measurement.

The locations of the voltage measurements on the Loran-C pulse are shown in Fig. 2. The odd-numbered measurements are shown as "x" bits and the even as "y" bits in Fig. 1. The block size accommodated all the voltage measurements on seven pulses, the Universal Time Coordinated (UTC) time of the first x sample in the block, and all the "header" data read from the Interface Unit (IU) of the measurement system. Four hundred seventy-seven bytes were used in each block.

The locations of the field sites and the days on which data were taken are given in Table 2. The exact geodetic positions of the survey monuments over which the antenna was placed at each field site and NAVOBSY are given in Volume B. At each field site and simultaneously at NAVOBSY, primary data were recorded on the magnetic tape in three files, each containing a 20-min segment of the data. The first file was started at 3:30 PM, the second at 3:51 PM, and the third at 4:12 PM EDT. No changes were made among recordings other than to indicate, if necessary, a change in the temperature of other environmental conditions on the IU control panel. Recordings of primary data were made with the voltage sample points located in time as shown in Fig. 2, with two exceptions. At Marietta, OH, the back side of the antenna was inadvertently pointed toward the Dana Station, and the voltage measurements were made 5 μs later than shown in Fig. 2. Later measurements made specifically for the purpose (5 μs earlier than shown in Fig. 2) showed that the effect of reverse pointing was limited to an inversion of the phase.

Table 1

Taped Data

Parameter	Digits/Bits	Units
Voltage at Odd Samples, x	13 bits + sign	V
Voltage at Even Samples, y	13 bits + sign	V
Attenuation	2 digits	dB
Time	13 digits	h, min, 10^{-7} s
Day Number	3 digits	-
Year	1 digit	-
Group Repetition Interval	3 digits	10^{-4} s
Station Code	1 digit	-
Site Code	2 digits	-
Weather Code	2 digits	-
Atmospheric Pressure	5 digits	10^{-3} in. Hg
Wet Bulb Temperature	3 digits	10^{-1} °C
Dry Bulb Temperature (outside)	3 digits	10^{-1} °C
Dry Bulb Temperature (inside)	3 digits	10^{-1} °C
Data Recording Mode	1 digit	-
Predicted Time Calibration	9 digits + sign	10^{-9} s
Note Code	1 digit	-

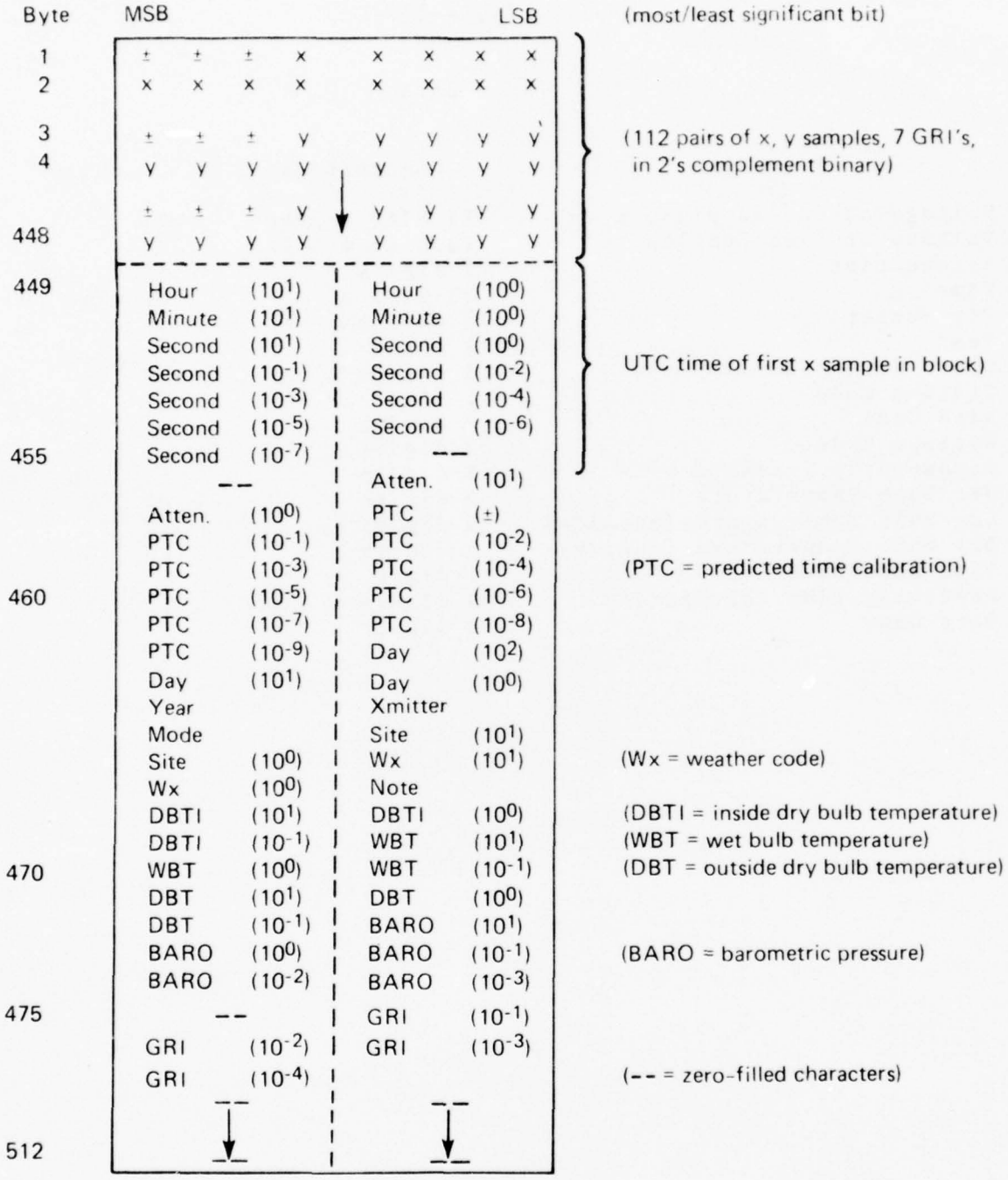


Fig. 1 Raw Data Tape Format for Each Block of Recording

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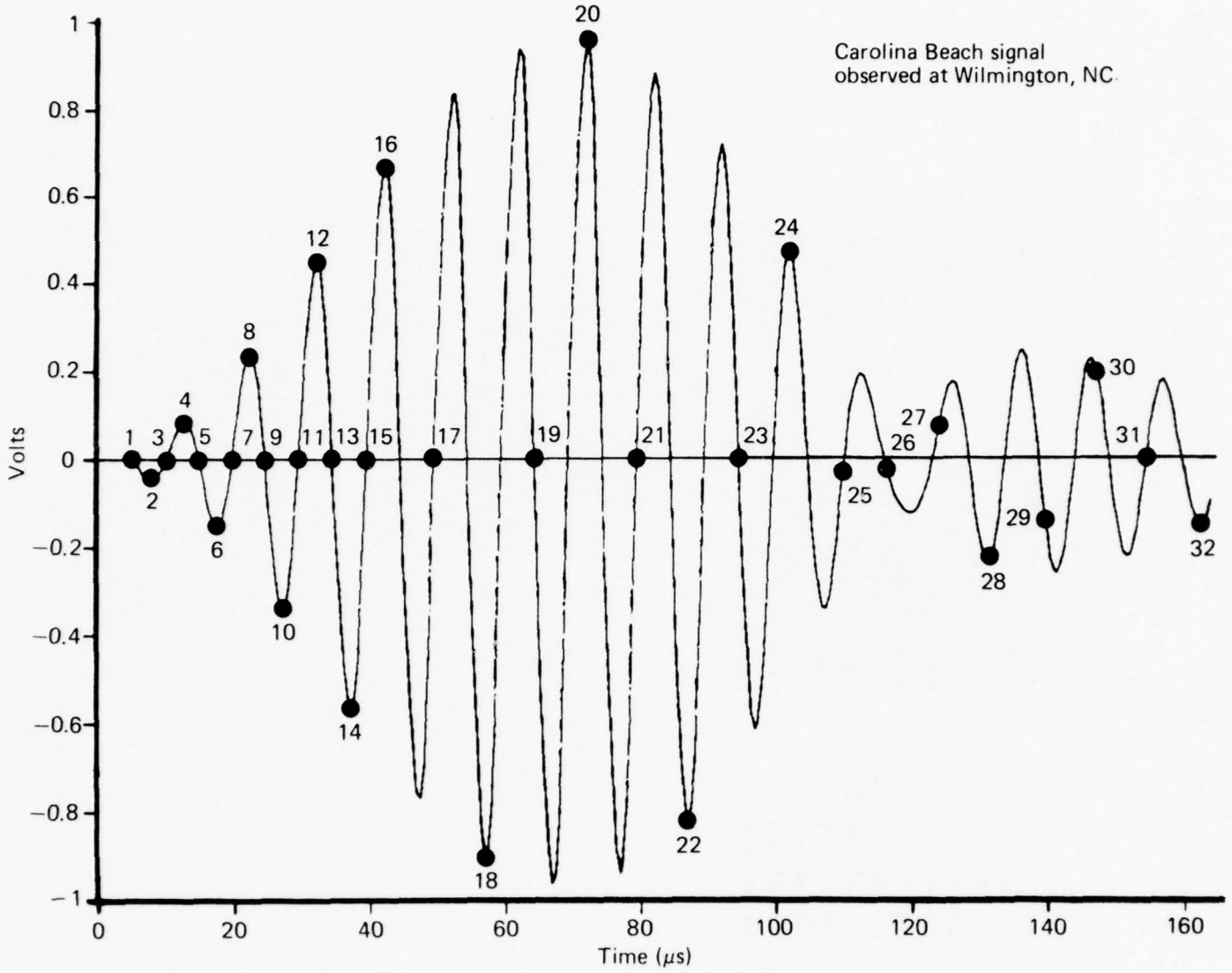


Fig. 2 Typical Loran-C Pulse Showing the Location of Sample Points

Table 2

Test Field Sites Visited

Site	Location	Test Date (1975)
Nantucket 1	Toms River, NJ	29 May
Baseline	NAVOBSY, DC	3 June
Dana 3	Georgetown, DE	5 June
Dana 2	Marietta, OH	10 June
Dana 1	Danville, IN	12 June
Nantucket 3	Bluefield, WV	17 June
Nantucket 2	Grottoes, VA	19 June
Carolina 2	Emporia, VA	24 June
Carolina 1	Wilmington, NC	26 June
Carolina 4	Dexter, NY	30 June
Carolina 3	Towanda, PA	2 July
Baseline	NAVOBSY, DC	7 July

During each recording session at each field site and at NAVOBSY, calibration data were also recorded in separate files on the tape. These data showed that the measurement systems retained their calibrations throughout the test. The calibration method is discussed in Volume B.

DATA PROCESSING

Refer to Fig. 3. The format of the data recorded on the tapes labeled "Field Site" and "Fixed Site" is shown in Fig. 1. The data from both of these tapes, together with job control cards, were subjected to preprocessing immediately upon the return of the tapes to the Laboratory on data-taking days (see Volume B). The preprocessor disregarded all voltage measurements over 1 V (first-stage editing). Its printed output consisted of the means and standard deviations of groups of 50 contiguous pulses and the grand means and standard deviations of the voltage measurements on all the pulses accepted from each 20-min segment of data. The data taken during calibration recordings were processed in the same way as those for pulses. The printed output of the preprocessor was used to assess the quality of the data prior to moving to the next site. The output also included a condensed data tape containing these grand means and standard deviations, as well as all the acceptable pulse data in a revised format. A deck of punched cards was also produced that recorded an editing criterion, taken to be twice the average of the standard deviations at each sample point along the pulse for use in further editing of the data. The second-stage editor rejected all the data for any pulse if any voltage sample of that pulse deviated from the mean by more than the editing criterion. The printed output of the second-stage editor was the same as that out of the preprocessor. The punched card output recorded the means of the accepted voltage samples taken during each 20-min data segment.

The processing shown in Fig. 3 up to the tape of condensed data was done in two stages on the IBM 360/91 computer. In the first stage, the first 16 voltage samples of the pulse were processed; in the second stage, the last 16. The computer programs for the data processing are documented in Appendix A.

There is one reel of tape of condensed data for each site and one for each recording of baseline data. There are 12 files of data on each of these tapes.

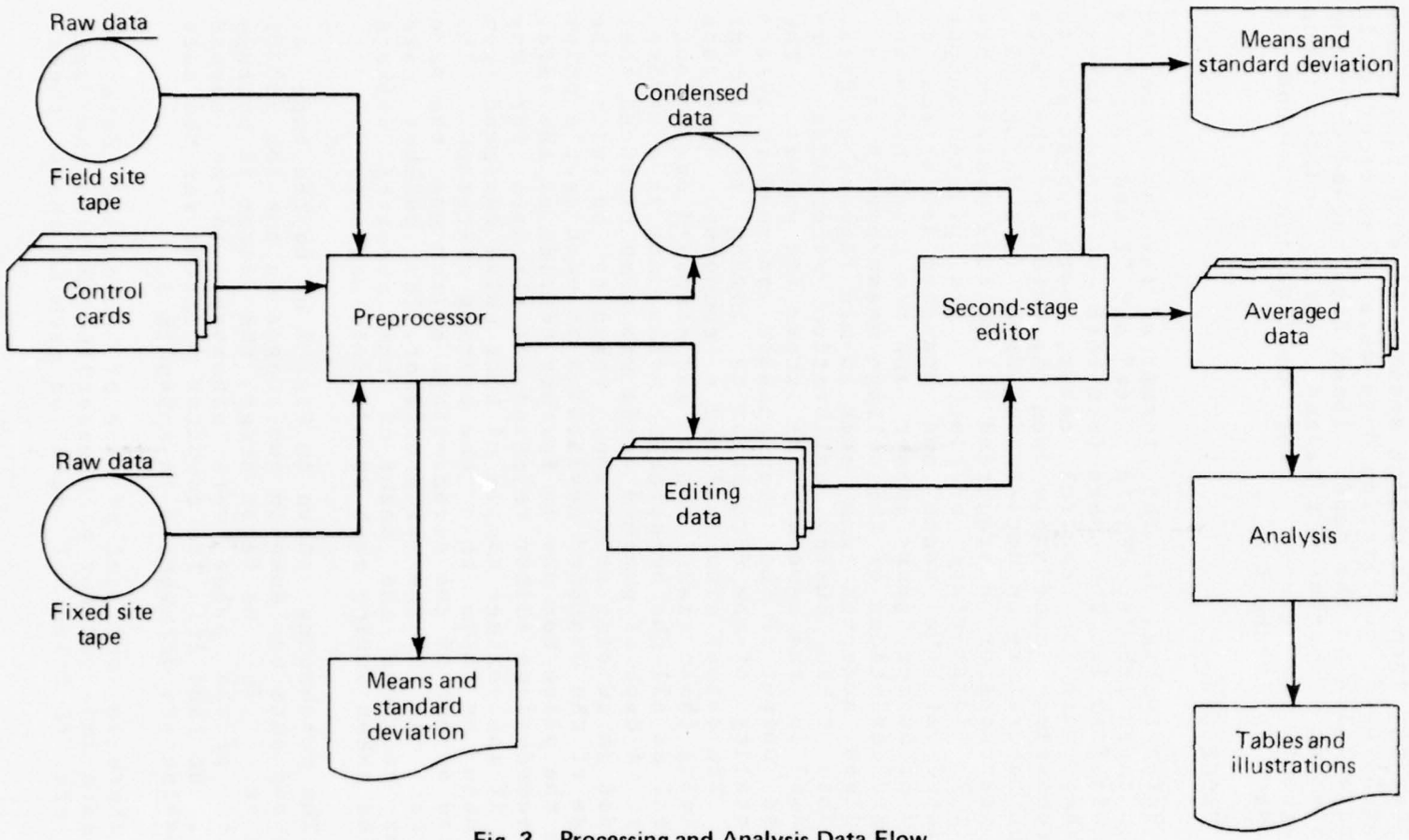


Fig. 3 Processing and Analysis Data Flow

Files 1 through 6 contain all the edited data for sample points 1 through 16, and files 7 through 12 for sample points 17 through 32. Files 1, 2, and 3 and 7, 8, and 9 contain 20-min segments of data recorded at NAVOBSY; files 4, 5, and 6 and 10, 11, and 12 contain the simultaneous recordings at the field site. Each file is organized into a succession of records. The first record is the header data, i.e., the data recorded from the front panel of the IU (see Volumes B and C). There are as many more records as there are pulses that survived first-stage editing. Each of these records contains the following data in the order mentioned: the UTC of the first voltage sample in the record, 16 mean voltages, 16 standard deviations of these voltages, and 800 voltage measurements, i.e., 16 measurements on 50 pulses. The preprocessor, in organizing the condensed data, correlated the time of sampling each pulse so that samples with the same index number on corresponding records for NAVOBSY and the field site are samples of the same pulse. This requires that both records be of the same length. This was done by making the field site data record the same length as NAVOBSY, either by truncating it or filling it with obviously false data (flags). Subsequently, the second-stage editor recognized these flags and processed only those data for which there were two observations of the same pulse.

ANALYSIS

Reduced Data

Analysis of the experimental results was performed on the mean values of voltage measured during each 20-min segment of data. These are the mean voltages recorded on the punched card output of the second-stage editor (Fig. 3). Appendix B contains a table of these data (Table B-1). Also included in Table B-1 are "Other Data," namely, the date, the time of the first data record in each 20-min segment, the difference in UTC time between NAVOBSY and the field site, the distance from the transmitting station to the recording site, and the attenuation setting of the attenuator (see Volume B). Appendix B also includes a table of the signal-to-noise ratios computed on a per-pulse basis for the first segment of data. These signal-to-noise ratios are indicative of the quality of edited data.

Polynomial Fits

The first step in the analysis was polynomial fitting of the mean voltages. The times of the voltage measurements along the pulse were very accurately timed at 2.5- and 7.5-μs intervals in synchronism with the output of the cesium standards. The odd- and even-numbered voltage measurements, therefore, are exactly in quadrature to each other when sampling a 100-kHz signal. To sample a loran pulse, the odd-numbered samples were taken near zero crossings, and the even near the peaks, i.e., in phase. In anticipation of the advantages of such orthogonality, the mean in-phase (I) voltages were fitted separately from the mean quadrature (Q) voltages. Although most difficult to confirm experimentally, it is assumed that the loran pulse starts with zero voltage and zero slope. To accommodate this assumption, it was decided to fit the I and Q mean voltages with polynomials with the coefficients of the first two terms (ascending order of degree) set to zero. After considerable experimentation, it was found that 10th degree polynomials fitted the mean voltages such that the maximum residuals were the same order of magnitude as the standard deviation of the voltages themselves. Because of the constraint imposed on the first two coefficients, these fittings required an iterative procedure to determine the difference in time between the time reference of the voltage samples and the start of the polynomials. Then, to realign the sample points in time, the polynomials were translated by this difference in time. The first two coefficients of the resulting polynomials are no longer zero. These polynomials were judged to be adequate representations of the measured data for use in later illustrations of the pulses and subsequent analyses. The computer program used for the polynomial fits is listed in Appendix C. The coefficients of all the fitted polynomials are presented in Appendix D.

Carrier Modulations and Pulse Shape

Initial plots of the I and Q polynomials indicated that the quadrature component was quite substantial in all of the observations. Since this could have been the result of misalignment between the zero crossings in the pulse and the Q (odd-numbered) sample points, the I and Q polynomials were jointly manipulated to determine whether or not there was a position on the pulse for the sample points where all the Q voltages

would be zero. This was done by developing an analytic solution for the sample point locations for which the energy in the quadrature component of the pulse was a minimum. The algebraic development of this solution, as well as the computer program to execute it, are described in Appendix C.

Appendix E contains plots of the I and Q components of the signal after adjustment for minimum energy in Q between 10 and 70 μs. Since the I and Q components are orthogonal at the 100-kHz frequency of the Loran-C carrier, the I component can be considered to be the modulation of the sine of the carrier, and Q the modulation of the cosine of the carrier; that is,

$$V(t-t0)=I(t-t0)\sin(\omega(t-t0)+\phi)+Q(t-t0)\cos(\omega(t-t0)+\phi), \quad (1)$$

where V is the signal voltage,
t is the time,
$t0$ is the reference time,
$I(t-t0)$ is the I polynomial,
$Q(t-t0)$ is the Q polynomial,
ω is the angular frequency corresponding to 100 kHz, and
ϕ is the phase angle measured at $t0$.

The shape of the pulse envelope was computed as the square root of the sum of the squares of voltages evaluated from the I and Q polynomials (see Appendix C). The envelope shapes are shown in Appendix E.

The Correction Function

The envelope shapes of Appendix E are presented in such a way that a comparison can be made between the shapes observed at the field sites and the shapes observed simultaneously at NAVOBSY. The purpose of these comparisons was to disclose the differences between observations of the pulses at the field sites and at NAVOBSY, and to quantify the difference in pulse arrival times by one number, which we called ECM (envelope-to-cycle measure).

An inspection of the envelope shapes presented in Appendix E indicates that ECM is many-valued; that is, it depends on the location on the pulse where the time comparison is made. This is a consequence of very complicated propagation effects acting on both the sine and cosine components of the signal. It was decided, therefore, that ECM would be evaluated as it would be

in a receiver that was perfectly phase tracking the Loran-C signal at the standard track point, that is, at the zero crossing at the end of the third cycle in the pulse, and also had the capability of measuring the envelope voltage at the same time as the phase track point.

The inferred locations of the zero crossings computed using Eq. (1) are presented in Tables F-1 and F-2 in Appendix F. Note that none of the zero crossings are 5 μs apart, as they would be if the carrier were only amplitude modulated. Note also in these tables that the zero crossing at the end of the third cycle is not at 30 μs under the condition of minimum energy in Q(t) over the leading edge. To align the standard track point of all the observed pulses at 30 μs, energy was shifted from I(t) to Q(t) such that the fractional parts of the "30.xxx-μs" columns of Tables F-1 and F-2 were removed (to about three decimal places). Using these revised polynomials for I(t) and Q(t), the zero crossings were recomputed using Eq. (1), and the pulse envelope shapes were also recomputed (see Appendix C for computing programs). These zero crossings are presented in Tables F-3 and F-4. Appendix F also presents expanded views of the leading edges of the envelopes as they appear, having aligned the standard track points at 30 μs.

An inspection of Figs. F-1 through F-12 indicates that the repositioning of the zero crossings does not resolve the problem of multivalued ECM. We continued, therefore, to approach the problem as our hypothetical receiver would. ECM was computed relative to NAVOBSY by computing the voltage difference between the field site and NAVOBSY observations and converting this voltage to time using the average slope of the two envelopes at 30 μs. The resulting values of ECM are presented in Table F-3.

SPF has usually been defined as it pertains to the propagation of a 100-kHz continuous wave (CW) groundwave. Since the 100-kHz carrier cannot be observed in pulses when they are transmitted with cosine modulation, this definition lacks application to the problem at hand (see Volume A for further discussion on this point). Therefore, we are faced with a new concept, namely, a secondary phase measure (SPM) defined with respect to the arrival time of the standard third-cycle zero crossing as follows:

$$SPM = (D/C) - T3, \quad (2)$$

where D is the distance over which the loran pulse propagates,
C is the vacuum speed of light, and
T3 is the time of arrival of the zero crossing at the end of the third cycle.

The vacuum speed of light used in computations was 299 792 456.2 m/s. The distance, D, and the time of arrival, T3, are computed from the basic data relative to their values that apply at NAVOBSY. The values of D and T3 used in Eq. (2) and the resulting values of SPM are included in Table F-3 of Appendix F. The value of T3 was computed as follows:

$$T3 = BTV - BTO - \Delta T + \Delta\Delta T, \quad (3)$$

where BTV is the block time at the field site, i.e., the time of the first voltage sample in a 20-min data segment,
BTO is the block time at NAVOBSY,
ΔT is the time transfer result, and
$\Delta\Delta T$ is the difference in time adjustments, computed relative to NAVOBSY, required to align all the standard third-cycle tracking points at 30 μs.

The values of BTV, BTO, and ΔT are tabulated as part of Table B-1 of Appendix B. The value of $\Delta\Delta T$ is obtained as an output of the computer programs used to align the standard third-cycle zero crossings.

The values computed for SPM are plotted against ECM in Fig. F-13 of Appendix F and in Fig. 26 of Volume A. This figure is a representation of the correction function that was sought as the principal goal of the experiment. SPM is plotted against distance from NAVOBSY in Fig. F-14, and ECM against distance from NAVOBSY in Fig. F-15. The attenuation of the signal is plotted against distance from the transmitters in Fig. F-16 of Appendix F and in Fig. 27 of Volume A. The significance of Figs. F-13 and F-16 is discussed in Volume A.

Frequency Filtering

As noted in Volume A, Fig. F-13 tends to describe a low-order functional relationship between SPM and ECM for only four of the twelve possible triads of points plotted in Fig. F-13. These four are connected by a straight line in Fig. F-13. In an attempt to understand why the remaining points appear to be in disarray, histograms were plotted initially of the data taken at NAVOBSY and simultaneously at Danville, IN, during the first 20-min recording. These histograms are shown in Appendix G as Figs. G-1 and G-2, respectively. Contours of equal frequency of occurrence are reasonably circular and concentric in Fig. G-2, indicating that the dominant interference is random. The marginal distributions are reasonably normal. This is not true in Fig. G-1. The inclined barbell contours indicate the presence of an interference that bears a coherent relationship with the loran signal. The distribution is double humped in spite of the fact that the marginal distributions are reasonably normal.

The recorded data were then subjected to a Fourier analysis to identify the coherent interference, if any, and to subsequently remove it. The results of the Fourier analysis are shown in Figs. G-3 through G-6 in Appendix G. Each point plotted in these figures is the sum of the squares of 16 adjacent Fourier coefficients. The plots, therefore, display the power spectral density at reduced frequency resolution. Figure G-3 is the power spectral density of the quadrature data, and Fig. G-4, the in-phase data, taken at NAVOBSY. Figures G-5 and G-6 show the power spectral densities for the simultaneous Danville, IN, data. Note that at Danville, IN, there is an interference at frequency number 124 and at NAVOBSY at frequency number 154. These interferences were removed by detecting those frequencies observable in the plots that had power levels that exceeded K times the average power level of all frequencies. Effective filtering was accomplished with K=128. Then all 16 Fourier coefficients associated with each detected frequency and 32 additional coefficients, i.e., 16 on each side, were set to zero. The resulting sets of coefficients were then subjected to the inverse Fourier transform, which reconstitutes the data set. Figures G-7 and G-8 show the histograms of the frequency filtered data.

Because of the difficulties with the Georgetown, DE, data that are obvious in Figs. F-13 and F-15, this same frequency filtering process was applied to the first-stage edited data of all three segments of the Georgetown data. Figures G-9 through G-32 show the results.

The "before" and "after" filtering times of arrival of the standard third-cycle zero crossing and the voltage at the 12th sample point were computed also. Their values, along with their standard deviations based on 8192 individual pulses, are presented in Tables 3 and 4.

A comparison of the mean values of the second-stage edited data after filtering in Tables 3 and 4 with the corresponding mean values computed for the unfiltered data indicates that both processes obtained the same result. We conclude, therefore, that the Georgetown problem is not the result of the coherent interference shown by the histograms. It now appears more likely that any measure of pulse arrival time is so sensitive a function of observed shape that even more sophisticated methods must be used to quantify it. Unfortunately, program plans did not permit further development of the analysis.

Table 3

Effect of Frequency Filter on Time of Arrival of Standard Third-Cycle Zero Crossing in Microseconds

		Before Filtering				After Filtering			
		First-Stage Edit		Second-Stage Edit		First-Stage Edit		Second-Stage Edit	
Site	Segment	Mean	Std.Dev.	Mean	Std.Dev.	Mean	Std.Dev.	Mean	Std.Dev.
Danville, IN	1	0.0006	0.0372	0.0004	0.0358	0.0006	0.0343	0.0003	0.0330
NAVOBSY	1	0.1375	0.6639	0.1332	0.6475	0.0095	0.3842	-0.0100	0.3216
Georgetown, DE	1	0.2808	0.9624	0.2715	0.7813	0.2270	0.8812	0.2147	0.6634
NAVOBSY	1	0.2015	0.9777	0.2051	0.8192	0.0850	0.8007	0.0823	0.5774
Georgetown, DE	2	0.2621	0.9889	0.2675	0.8008	0.2003	0.9089	0.2010	0.6896
NAVOBSY	2	0.1870	1.0039	0.1943	0.8393	0.0635	0.8505	0.0702	0.6068
Georgetown, DE	3	0.2554	0.9482	0.2659	0.7728	0.1955	0.8543	0.2051	0.6553
NAVOBSY	3	0.2083	0.9709	0.2022	0.8155	0.0838	0.7914	0.0815	0.5691

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Table 4

Effect of Frequency Filter on Amplitude of the 12th Sample Point in Volts

Site	Data Segment	Before Filtering: First-Stage Edit Mean	Before Filtering: First-Stage Edit Std.Dev.	Before Filtering: Second-Stage Edit Mean	Before Filtering: Second-Stage Edit Std.Dev.	After Filtering: First-Stage Edit Mean	After Filtering: First-Stage Edit Std.Dev.	After Filtering: Second-Stage Edit Mean	After Filtering: Second-Stage Edit Std.Dev.
Danville, IN	1	0.29079	0.00727	0.29078	0.00713	0.29071	0.00696	0.29070	0.00682
NAVOBSY	1	0.13209	0.04558	0.13137	0.04221	0.12204	0.02887	0.12213	0.02462
Georgetown, DE	1	0.11268	0.07499	0.10545	0.04206	0.09178	0.06516	0.09136	0.04059
NAVOBSY	1	0.14652	0.08069	0.13995	0.05444	0.12239	0.07112	0.12214	0.04615
Georgetown, DE	2	0.11423	0.07377	0.10716	0.04373	0.09151	0.06785	0.09209	0.04183
NAVOBSY	2	0.14861	0.08541	0.14087	0.05527	0.12110	0.07928	0.12232	0.04798
Georgetown, DE	3	0.11238	0.07054	0.10666	0.04103	0.09256	0.06169	0.09293	0.03842
NAVOBSY	3	0.14755	0.08004	0.14132	0.05462	0.12317	0.06951	0.12376	0.04490

4. CONCLUDING REMARKS

We hope that we have shed some light on the intricacies of Loran-C pulse propagation. However, much still remains to be understood. If there are others who wish to contribute their expertise, the recorded data can be made available to them. For copies of the data tapes, contact the Loran System Program Office of the U.S. Air Force Electronic Systems Division at Hanscom AFB, MA 01731.

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5. REFERENCE

1. Anon., "Loran-C System Characterization," Wild Goose Association Report, WGA Publication No. 1/1976, September 1976.

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Appendix A

DATA PROCESSING COMPUTER PROGRAMS

The fundamental data processing was accomplished in two stages, as shown in Fig. A-1. The first stage, referred to as the preprocessor, accepts the raw data tape as input, along with certain control parameters punched on IBM computer cards. The data on this tape were formatted by a Kennedy Model 9232 buffered formatter. The data from the fixed site were treated as the master system and were normally processed first, followed by field site data, which were time correlated, by program control, with the master system. Data fill of zeroes was output, when necessary, to flag missing simultaneous data at the beginning or end of the field site recording. Other than time correlation, both sets of data were processed in the same way.

The output of the preprocessor includes (a) a 9-track magnetic tape (condensed data) collated with all data from each mission, (b) a punched card deck of control parameters, and (c) a tabulation with means and standard deviations of the first 16 measurements of all 50 pulse blocks and the total 20-min data run.

A first-stage edit function is performed by removing all data that may have reached the limiting values of the A to D converter. These data are flagged and not included in any subsequent calculations. When it is found necessary to edit any measurement, the entire set of 32 readings of that pulse is eliminated.

Finally, a plot of the absolute mean values is presented showing the approximate shape of the loran pulse envelope and behavior of the zero crossing points.

The programs used for preprocessing the data are documented in Program Listings A-1 through A-28 and Flow Charts A-1 through A-28.

The second stage of processing starts with the second-stage editor. It accepts, as input, the output tape of the preprocessor and the punched card deck that contains the editing criteria. It then performs a 2 sigma editing on each data point in the 50 pulse blocks. Again, the entire pulse is removed from the computation of new means and standard deviations if any

one measurement exceeds the threshold. Intermediate means of each page are printed at the bottom of each page, and at the end of each data set the final mean and standard deviation about the block mean are printed.

The final page of printout contains certain group/phase measurement (GPM) computations. The first four values in the row labeled T10 through T16 describe the distance from the zero crossing to the measurement point for the 9th, 11th, 13th, and 15th sample of the pulse. The last three values, labeled GPM12 through GPM16, are intercept points of a straight line fit of successive five point sets of amplitude means surrounding the third cycle. All of the GPM calculations use the "page" means, A_i, made up of 14 block averages.

$$T(N) = -3.18 \times A_{N-1}/(A_N - A_{N-2})$$

$$GPM(N) = 10 \sum_i |A_i|/(2(|A_N| - |A_{N-8}|) + |A_{N-2}| - |A_{N-6}|)$$

$$i = N-8, N-6, N-4, N-2, N$$

The programs used for second-stage editing are documented in Program Listings A-29 through A-33 and Flow Charts A-29 through A-33.

A secondary data processing system, the group/phase frequency filter (Fig. A-2), accepts, as input, the original raw data tape and control parameters from punched cards. Although several options are available in the program, only histograms and frequency filtering of one pair of measurements were of interest. A specified amount of data is reduced, and the 11th sample, which is near a zero crossing, and the 12th sample of the pulse, which is near a peak, are presented both as a two-dimensional histogram (in pairs) and respective marginal histograms. Means and standard deviations are also computed. Both sets of data are then independently subjected to a Fast Fourier Transform. Any unwanted energy spectra are then notch filtered (coefficients set zero) and then returned to the time domain by use of the inverse transform. The reconstructed, filtered data are then redisplayed in

the initial histogram format, along with new means and standard deviations.

The programs used for frequency filtering are documented in Program Listings A-34 through A-58 and Flow Charts A-34 through A-58.

The three sets of programs described above call subroutines from a library. These subroutines are documented in Program Listings A-59 through A-67 and Flow Charts A-59 through A-67.

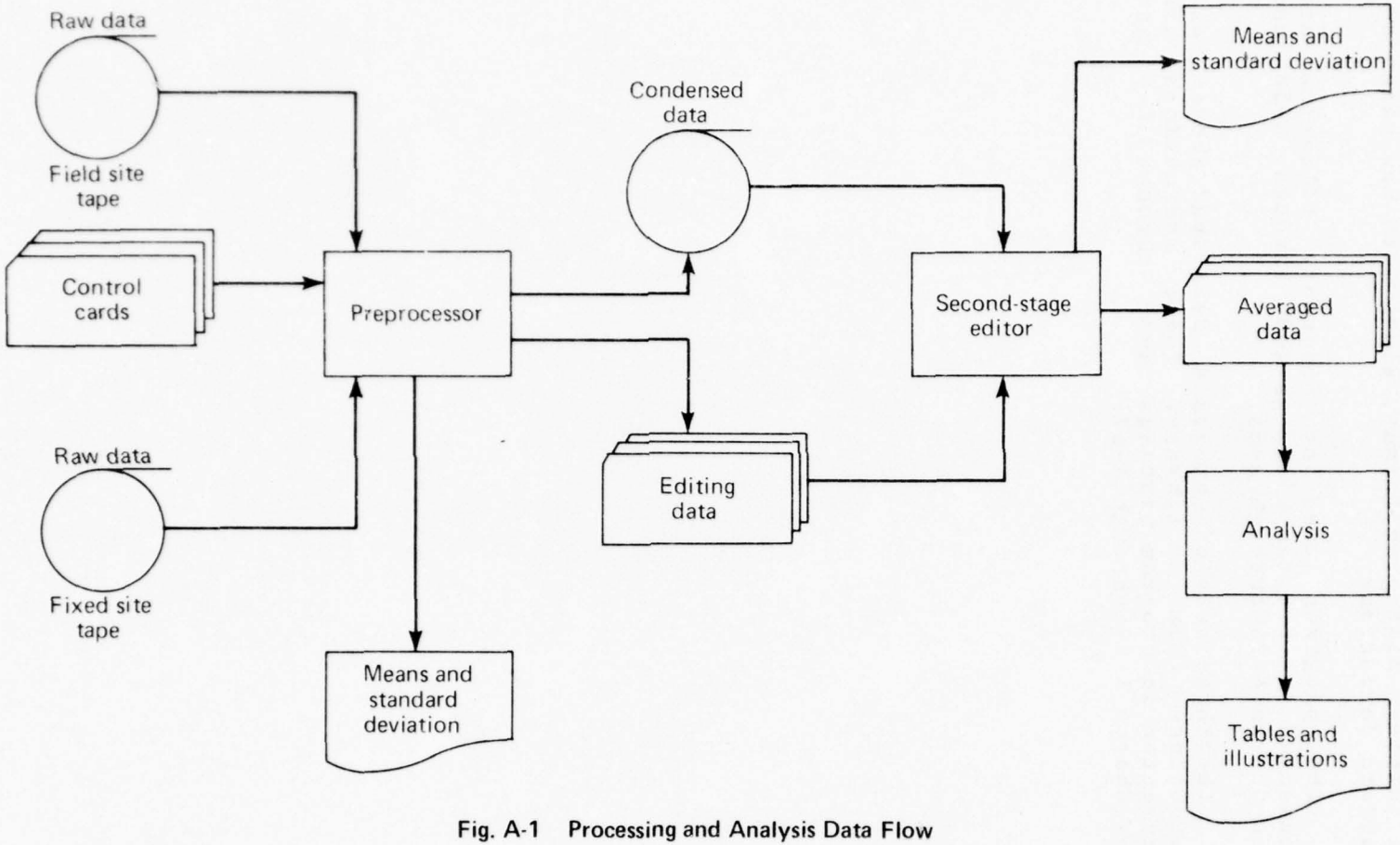


Fig. A-1 Processing and Analysis Data Flow

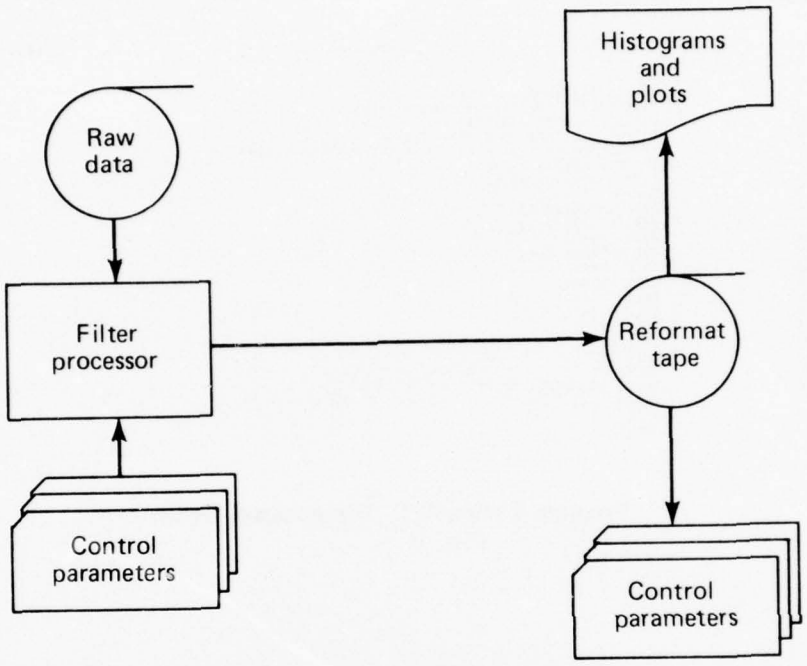


Fig. A-2 Frequency Filter Data Flow

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09/28/76 INPUT LISTING AUTOFLOW CHART SET - LORAN 1 GROUP PHASE PREPROCESSOR

FORTRAN MODULE (LIST,NAMS2)

CARD NO **** CONTENTS ****

```
      1          IMPLICIT REAL*8 (A-H,O-Z)
      2          DIMENSION JCHK(5),IHD(40),IBUF(128)
      3          DIMENSION GRDICT(3,16)
      4          DIMENSION ITMS(2,10),TREF(2,25)
      5          COMMON IHD,GRDICT,TREFR,TREFF,IREF,IRC,TREF,ITMS
      6          COMMON/GETDAT/IRT,IBUF
      7          COMMON/BIAS/IBIAS
      8          IRC=0
      9        1 CALL CPRINT(JCHK)
     10          IF(JCHK(1))3,4,2
     11        2 CALL SKIP
     12          CALL HDCHK(JCHK)
     13          CALL PRTTTL
     14          CALL DATE(JCHK)
     15          CALL PRTHD
     16          CALL MAINF
     17          CALL STAT1
     18          CALL GPM
     19        3 CALL PLOT
     20          GO TO 1
     21        4 IF(IHD(5).NE.0) GO TO 5
     22          REWIND 21
     23        5 STOP
     24          END
```

Program Listing A-1 Preprocessor Driver

09/28/76 INPUT LISTING AUTOFLOW CHART SET - LORAN 1 GROUP PHASE PREPROCESSOR

FORTRAN MODULE (LIST,NAMS3)

CARD NO **** CONTENTS ****

```
      1          SUBROUTINE SKIP
      2      C   SUB TO SKIP FIRST SHORT RECORD IN THE FILE
      3          DIMENSION IBUF(128)
      4          COMMON/GETDAT/IRT,IBUF
      5        1 CALL GETREC
      6          RETURN
      7          END
```

Program Listing A-2 Preprocessor Short Record Skip

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```
04/23/76        INPUT LISTING                    AUTOFLOW CHART SET - LORAN 1  GROUP PHASE PREPROCESSOR

FORTRAN MODULE      (LIST,NAMSO)

  CARD NO       ****                          CONTENTS                          ****

      1               SUBROUTINE CRDIN(JCHK)
      2               DIMENSION JCHK(1),IBUF(128),IHD(40)
      3               DIMENSION ITMR(3,25)
      4               DOUBLE PRECISION TREF(2,25)
      5               DOUBLE PRECISION GRDTOT(3,16)
      6               DOUBLE PRECISION TREFB,TREFF
      7               COMMON IHD,GRDTOT,TREFB,TREFF,IREF,IRC,TREF,ITMR
      8               COMMON/GETDAT/IPT,IBUF
      9               COMMON/BIAS/IBIAS
     10         C     IHD(20) IS USED TO PICKUP 2ND SET OF IA SAMPLES IN SUB BLOCK
     11         C     IHD(21) IS USED FOR INTERMEDIATE PRINTOUT IN SUB BLOCK
     12               IRD=5
     13               IREF=0
     14               READ(IRD,1000)(JCHK(K),K=1,5),(IHD(I),I=12,14),IBIAS,IHD(20),
     15              1IHD(21)
     16               IF(IHD(12))2,1,3
     17             2 TREFB=TREF(1,IHD(13))
     18               TREFF=TREF(2,IHD(13))
     19               IHD(12)=ITMR(1,IHD(13))
     20               IHD(14)=ITMR(3,IHD(13))
     21               IHD(13)=ITMR(2,IHD(13))
     22               IREF=1
     23               GO TO 1
     24             3 READ(IRD,1002)TREFB,TREFF
     25               IREF=1
     26             1 RETURN
     27          1000 FORMAT(11I6)
     28          1002 FORMAT(2F15.7)
     29               END
```

Program Listing A-3 Preprocessor Initialization

```
04/23/76        INPUT LISTING                    AUTOFLOW CHART SET - LORAN 1  GROUP PHASE PREPROCESSOR

FORTRAN MODULE      (LIST,NAMSO)

  CARD NO       ****                          CONTENTS                          ****

      1               SUBROUTINE HDCHK(JCHK)
      2               DIMENSION ICHK(5),JCHK(1),IHD(40),IBUF(128)
      3               COMMON IHD
      4               COMMON/GETDAT/IPT,IBUF
      5               DATA ICHK/' DAY',' YEAR',' XMTR',' SITE',' MODE'/
      6               IPT=6
      7               WRITE(IPT,1003)
      8         C     READ HEADER AND DECODE
      9               CALL RDHD
     10               DO 1 I=1,5
     11               IF(IHD(I).EQ.JCHK(I)) GO TO 1
     12               WRITE(IPT,1000)ICHK(I),IHD(I)
     13               WRITE(IPT,1001)
     14               JCHK(I)=IHD(I)
     15             1 CONTINUE
     16               RETURN
     17          1000 FORMAT(20X,A4,' DOES NOT MATCH',I3,' IS ON TAPE')
     18          1001 FORMAT(20X,'WILL USE CODE ON TAPE')
     19          1003 FORMAT('1')
     20               END
```

Program Listing A-4 Preprocessor Header Information Check

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FORTRAN MODULE [LIST,NAMSC]

CARD NO **** CONTENTS ****

```
      SUBROUTINE RDHD
      DIMENSION IBUF(128),IHD(40)
      DOUBLE PRECISION GRDIOT(2,1+),TREFR,TREFF
      COMMON IHD,GRDIOT,TREFR,TREFF,IREF
      COMMON/REINAT/IPT,IBUF
C     1=JULIAN DAY
C     2=YEAR-1970
C     3=XMTR NO.
C     4=SITE NO.
C     5=DATA MODE
C     6=ATMOS PRESS
C     7=OUTSIDE WET BULB
C     8=OUTSIDE DRY BULB
C     9=ATTENUATION
C     10=INSIDE DRY BULB
C     11=TIME CALIBRATION
C     12=HOURS START TIME
C     13=MINUTES START TIME
C     14=SECONDS START TIME
C     15=WEATHER CODE
C     16=NOTE CODE
C     17=GRI
C     18=START TIME IN SECONDS AFTER MIDNIGHT
C     20=16 SAMPLE SELECTION
C     21=INTERMEDIATE PRINTOUT FLAG
C     22=DAY NUMBER
C     23=MONTH NUMBER
C     39=MISSING RECORD COUNT
C     40=540 PULSE PER BLOCK COUNT
      IPT=6
    3 CALL GETREC
      GO TO(4,3,10,11),IRT
C     TIME TO EVEN SECOND
    4 J=IBUF(113)
      IF(IREF.NE.0) GO TO 6
      DO 1 K=1,3
      L=K+11
      CALL SHFT1(I,J,6)
      CALL BCDTB(IHD(L),I,2)
    1 CONTINUE
    6 CALL DATCOR
C     ATTENUATION
      J=IBUF(114)
      CALL SHFT1(I,J,24)
      CALL SHFT1(I,J,4)
      CALL BCDTB(IHD(9),I,2)
C     CALIBRATION TIME
      J=IBUF(115)
      M=1
      CALL SHFT1(I,J,4)
      IF(I.GT.0) M=-1
      IHD(11)=0
      DO 2 K=1,7
      CALL SHFT1(I,J,4)
    2 IHD(11)=IHD(11)*10+I
      J=IBUF(116)
      CALL SHFT1(I,J,8)
      CALL BCDTB(K,I,2)
      IHD(11)=(IHD(11)*100+K)*M
C     JULIAN DAY AND YEAR
      CALL SHFT1(I,J,12)
      CALL BCDTB(IHD(1),I,2)
      CALL SHFT1(IHD(2),J,4)
C     XMTR CODE
      CALL SHFT1(IHD(3),J,4)
C     MODE
      CALL SHFT1(IHD(5),J,4)
    5 J=IBUF(117)
C     SITE CODE
      CALL SHFT1(I,J,8)
      CALL BCDTB(IHD(4),I,2)
C     WEATHER CODE
      CALL SHFT1(I,J,8)
      CALL BCDTB(IHD(15),I,2)
C     NOTE CODE
      CALL SHFT1(IHD(16),J,4)
C     INSIDE TEMP
      CALL SHFT1(I,J,12)
      CALL BCDTB(IHD(10),I,3)
C     OUTSIDE TEMP(+FT,99Y)
      J=IBUF(118)
      CALL SHFT1(I,J,12)
      CALL BCDTB(IHD(7),I,3)
      CALL SHFT1(I,J,12)
      CALL BCDTB(IHD(8),I,3)
C     PRESSURE
      CALL SHFT1(I,J,8)
      CALL BCDTB(IHD(6),I,2)
      J=IBUF(119)
      CALL SHFT1(I,J,12)
      CALL BCDTB(K,I,3)
      IHD(6)=IHD(6)*1000+K
C     GRI
      CALL SHFT1(I,J,16)
      J=IBUF(120)
      CALL SHFT(I,J,4)
      CALL BCDTB(IHD(17),I,4)
C
C     TEMP PATCH TO START ON GOOD RECORD
C     IF(IHD(2)+IHD(17).NE.998) GO TO 3
C
C
      IHD(18)=IHD(12)*3600+IHD(13)*60+IHD(14)
      RETURN
   10 WRITE(IPT,1000)
      GO TO 3
   11 WRITE(IPT,1001)
      STOP
```

Program Listing A-5 Preprocessor Header Information Decommutator

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```
09/28/76        INPUT LISTING                    AUTOFLOW CHART SET - LORAN 1  GROUP PHASE PREPROCESSOR

 CARD NO        ****                             CONTENTS                      ****

    109          1000 FORMAT(' EOF ENCOUNTERED, TRY AGAIN',///)
    110          1001 FORMAT(' NO DD CARD THIS FILE')
    111               END
```

Program Listing A-5 Preprocessor Header Information Decommutator (concluded)

```
09/28/76        INPUT LISTING                    AUTOFLOW CHART SET - LORAN 1  GROUP PHASE PREPROCESSOR

FORTRAN MODULE      (LIST,NAMSC)

 CARD NO        ****                             CONTENTS                      ****

      1               SUBROUTINE DATCOR
      2          C    ADDED SUB TO CORRECT FOR WIRING ERROR IN CONTROL PANEL
      3          C    AN EXTRA FOUR BITS WERE INSERTED AFTER TIME OF DAY
      4               DIMENSION IBUF(128),IHD(40)
      5               COMMON IHD
      6               COMMON/GETDAT/IRT,IBUF
      7               I=IBUF(114)
      8               J=IBUF(115)
      9               CALL SHFT(I,J,-4)
     10               CALL SHFT(I,K,-4)
     11               CALL SHFT(I,J,8)
     12               IBUF(114)=I
     13               I=IBUF(115)
     14               DO 1 L=115,120
     15               J=IBUF(L)
     16               CALL SHFT(I,J,4)
     17               IBUF(L-1)=I
     18               CALL SHFT(I,J,28)
     19             1 CONTINUE
     20               RETURN
     21               END
```

Program Listing A-6 Preprocessor Data Format Converter

```
09/28/76        INPUT LISTING                    AUTOFLOW CHART SET - LORAN 1  GROUP PHASE PREPROCESSOR

FORTRAN MODULE      (LIST,NAMSC)

 CARD NO        ****                             CONTENTS                      ****

      1               SUBROUTINE BCDTB(I,J,K)
      2               M=0
      3               I=0
      4               L=-K+4
      5               CALL SHFT(J,M,L)
      6               DO 1 N=1,K
      7               I=I*10
      8               CALL SHFT(J,M,4)
      9             1 I=I+J
     10               RETURN
     11               END
```

Program Listing A-7 Preprocessor BCD to Binary Converter

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```
09/28/76        INPUT LISTING                    AUTOFLOW CHART SET - LORAN 1  GROUP PHASE PREPROCESSOR

FORTRAN MODULE      (LIST,NAMSQ)

 CARD NO      ****                          CONTENTS                          ****

      1              SUBROUTINE PRNTTL
      2              IPT=6
      3              WRITE(IPT,2000)
      4            1 WRITE(IPT,2002)
      5              WRITE(IPT,1000)
      6              WRITE(IPT,1001)
      7              WRITE(IPT,1002)
      8              WRITE(IPT,1003)
      9              WRITE(IPT,1004)
     10              WRITE(IPT,1005)
     11              WRITE(IPT,2001)
     12              WRITE(IPT,1006)
     13              WRITE(IPT,1007)
     14              WRITE(IPT,1008)
     15              WRITE(IPT,1009)
     16              WRITE(IPT,1010)
     17              WRITE(IPT,1011)
     18              WRITE(IPT,2001)
     19              WRITE(IPT,1012)
     20              WRITE(IPT,1013)
     21              WRITE(IPT,1014)
     22              WRITE(IPT,1015)
     23              WRITE(IPT,1016)
     24              WRITE(IPT,1017)
     25              WRITE(IPT,2001)
     26              RETURN
     27         1000 FORMAT(32X,'JJ',4X,'HH',4X,'HH',4X,'UU',4X,'UU',9X,'///',5X,
     28            1'AAAAAA',5X,'PPPPPP',5X,'LL')
     29         1001 FORMAT(32X,'JJ',4X,'HH',4X,'HH',4X,'UU',4X,'UU',8X,'///',5X,
     30            1'AA',4X,'AA',4X,'PP',4X,'PP',4X,'LL')
     31         1002 FORMAT(32X,'JJ',4X,'HHHHHHHH',4X,'UU',4X,'UU',7X,'///',6X,
     32            1'AAAAAAAA',4X,'PPPPPP',5X,'LL')
     33         1003 FORMAT(32X,'JJ',4X,'HH',4X,'HH',4X,'UU',4X,'UU',6X,'///',7X,
     34            1'AA',4X,'AA',4X,'PP',10X,'LL')
     35         1004 FORMAT(26X,'JJ',4X,'JJ',4X,'HH',4X,'HH',4X,'UU',4X,'UU',5X,'///',
     36            18X,'AA',4X,'AA',4X,'PP',10X,'LL')
     37         1005 FORMAT(27X,'JJJJJJ',5X,'HH',4X,'HH',5X,'UUUUUU',5X,'///',9X,
     38            1'AA',4X,'AA',4X,'PP',10X,'LLLLLLLL')
     39         1006 FORMAT(3X,'GGGGGG',5X,'88888',4X,'OOOOOO',5X,'UU',4X,'UU',4X,
     40            1'PPPPPPP',10X,'///',4Y,'PPPPPPP',5X,'HH',4X,'HH',5X,'AAAAAA',6X,
     41            2'SSSSSS',5X,'EEEEEEEE')
     42         1007 FORMAT('  GG',5X,'8',4X,'88',4X,'88',4X,'OO',4X,'OO',4X,'UU',4X,
     43            1'UU',4X,'PP',4X,'PP',9X,'///',5X,'PP',4X,'PP',4X,'HH',4X,'HH',4X,
     44            2'AA',4X,'AA',4X,'SS',5Y,'S',4Y,'EE')
     45         1008 FORMAT('  GG',10X,'88888',5X,'OO',4X,'OO',4X,'UU',4X,'UU',4X,
     46            1'PPPPPPP',8X,'//',4Y,'PPPPPPP',5X,'HHHHHHH',4X,'AAAAAAAA',5X,
     47            2'SSSSSS',5X,'EEEEEE')
     48         1009 FORMAT('  GG',3X,'888',4X,'88',2X,'88',6X,'OO',4X,'OO',4X,'UU',
     49            14X,'UU',4X,'PP',12Y,'///',7X,'PP',10X,'HH',4X,'HH',4X,'AA',4X,
     50            2'AA',10X,'SS',4Y,'EE')
     51         1010 FORMAT('  GG',4X,'GG',4X,'88',3X,'88',5X,'OO',4X,'OO',4X,'UU',4X,
     52            1'UU',4X,'PP',11Y,'///',9X,'PP',10X,'HH',4X,'HH',4X,'AA',4X,'AA',
     53            24X,'SS',4X,'SS',4X,'EE')
     54         1011 FORMAT('  GGGGGG',5X,'88',4X,'88',5X,'OOOOOO',4X,'UUUUUU',5X,
     55            1'PP',10X,'///',9X,'PP',10X,'HH',4X,'HH',4X,'AA',4X,'AA',5X,
     56            2'SSSSSS',5X,'EEEEEEEE')
     57         1012 FORMAT(44X,'TTTTTTTT',4X,'EEEEEEEE',5X,'SSSSSS',5X,'TTTTTTTT')
     58         1013 FORMAT(47X,'TT',7X,'EE',10X,'SS',5X,'S',7X,'TT')
     59         1014 FORMAT(47X,'TT',7X,'EEEEEE',7X,'SSSSSS',8X,'TT')
     60         1015 FORMAT(47X,'TT',7X,'EE',16X,'SS',7X,'TT')
     61         1016 FORMAT(47X,'TT',7X,'EE',10X,'SS',4X,'SS',7X,'TT')
     62         1017 FORMAT(47X,'TT',7X,'EEEEEEEE',5X,'SSSSSS',5X,'TT')
     63         2000 FORMAT(1H1,//)
     64         2001 FORMAT(//)
     65         2002 FORMAT(/////)
     66              END
```

Program Listing A-8 Preprocessor Title Page Printer

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```
09/28/76        INPUT LISTING                          AUTOFLOW CHART SET - LORAN 1  GROUP PHASE PREPROCESSOR

FORTRAN MODULE      (LIST,NAMSQ)

 CARD NO        ****                              CONTENTS                                  ****

      1              SUBROUTINE DATE(JCHK)
      2              DIMENSION IBUF(128),IHD(40)
      3              DIMENSION A(6,8),MO(12),JCHK(1)
      4              DOUBLE PRECISION A
      5              COMMON IHD
      6              COMMON/GETDAT/IRT,IBUF
      7              DATA MO/31,59,90,120,151,181,212,243,273,304,334,365/
      8              IPT=6
      9              I=JCHK(1)
     10              IY=JCHK(2)
     11              DO 1 J=1,12
     12              IF(I.GT.MO(J)) GO TO 1
     13              IM=J
     14              IHD(23)=IM
     15              ID=I
     16              IF(J.EQ.1) GO TO 4
     17              ID=I-MO(J-1)
     18            4 IHD(22)=ID
     19              GO TO 2
     20            1 CONTINUE
     21              RETURN
     22            2 CALL DDTOB(A,IM,ID,IY)
     23              DO 3 K=1,6
     24            3 WRITE(IPT,1000)(A(K,J),J=1,8)
     25              RETURN
     26         1000 FORMAT(15X,8(4X,A8))
     27              END
```

Program Listing A-9 Preprocessor Date Converter

```
09/28/76        INPUT LISTING                          AUTOFLOW CHART SET - LORAN 1  GROUP PHASE PREPROCESSOR

FORTRAN MODULE      (LIST,NAMSQ)

 CARD NO        ****                              CONTENTS                                  ****

      1              SUBROUTINE DDTOB(A,IM,ID,IY)
      2              DOUBLE PRECISION A,B,C,D
      3              DIMENSION A(6,8),B(6,11),C(54),D(12)
      4              EQUIVALENCE (B(1,1),C(1)),(B(1,10),D(1))
      5              DATA C/' 000000 ','00    00','00    00','00    00','00    00',
      6             1' 000000 ','   111  ','  1 11  ','    11  ','    11  ','    11  ',
      7             2' 1111111','  22222 ','22    22','      22','     22 ','    22  ',
      8             3'22222222',' 333333 ','33    33','      33','     33 ','    33  ',
      9             4' 333333 ','     444','   44 44',' 44   44','44444444','      44',
     10             5'      44','55555555','55      ','55555555 ','      55','55    55',
     11             6' 555555 ',' 666666 ','66      ','66666666 ','66    66','66    66',
     12             7' 666666 ','77777777',',      77 ','    77  ','   77   ','  77    ',
     13             8' 77     ',' 888888 ','88    88',' 888888 ','88    88','88    88',
     14             9' 888888 '/
     15              DATA D/' 999999 ','99    99',' 9999999',',      99','99    99',
     16             1' 999999 ','      //','     // ','   //  ','  //   ',' //    ',
     17             2' //     '/
     18              K=IM/10+1
     19              DO 1 I=1,6
     20            1 A(I,1)=B(I,K)
     21              K=IM-10*(K-1)+1
     22              DO 2 I=1,6
     23            2 A(I,2)=B(I,K)
     24              DO 3 I=1,6
     25              A(I,6)=B(I,11)
     26            3 A(I,3)=B(I,11)
     27              K=ID/10+1
     28              DO 4 I=1,6
     29            4 A(I,4)=B(I,K)
     30              K=ID-10*(K-1)+1
     31              DO 5 I=1,6
     32            5 A(I,5)=B(I,K)
     33              DO 6 I=1,6
     34            6 A(1,7)=B(1,8)
     35              K=IY+1
     36              DO 7 I=1,6
     37            7 A(I,8)=B(I,K)
     38              RETURN
     39              END
```

Program Listing A-10 Preprocessor Title Page Date Formatter

09/28/76 INPUT LISTING AUTOFLOW CHART SET - LORAN I GROUP PHASE PREPROCESSOR

$ORTRAN MODULE (LIST,NAMSQ)

CARD NO **** CONTENTS ****

```
      SUBROUTINE PRNTHD
      DIMENSION ASITE(3,12),AXMTR(2,9),AMODE(3,8),IHD(40),IBUF(128)
      DIMENSION WIND(3)
      DIMENSION WEATH1(2,5),WEATH2(2,10)
      DIMENSION ANOTE(2,2)
      DOUBLE PRECISION ASITE,AXMTR,AMODE,WEATH1,WEATH2,ANOTE
      COMMON IHD
      COMMON/GETDAT/IRT,IRTF
      DATA WIND/' LOW','HIGH'/
      DATA WEATH1/'CLEAR   ',' ','SCATTERE','D TO 50%',
     1'BROKEN T','O 90%  ','OVERCAST',' TO 100','OBSCURAT','ION 100%'/
      DATA WEATH2/'THUNDERS','TORMS  ','RAIN SHO','WERS   ',
     1'DRIZZLE ',' ','FREEZING',' DRIZZLE','SNOW  ',' ',
     2'HAIL  ',' ','GROUND F','OG  ','FOG COVE','R  ',
     3'SUNNY  ',' ','HAZE  ',' '/
      DATA ANOTE/'SEE LOG','**********','NO PROBL','EM******'/
      DATA ASITE/'NAVAL OBS','ERVATORY',', D.C. ','CAROLINA',' BEACH 0',
     1'NE  ','CAROLINA',' BEACH T','WO  ','CAROLINA',' BEACH TH',
     2'REE  ','CAROLINA',' BEACH FO','UR  ','DANA ONE',' ',
     3'  ','DANA TWO',' ','  ','DANA THR','EE  ',
     4'  ','NANTUCKE','T ONE  ',' ','NANTUCKE','T TWO  ',
     5'  ','NANTUCKE','T THREE ',' ','APL/JHU ',' ',
     6' '/
      DATA AXMTR/'CAROLINA',' BEACH  ','JUPITER ','INLET  ','CAPE RAC',
     1'E  ','NANTUCKE','T  ','DANA  ',' ','CAPE MAY',
     2'  ','LORAN ST','MULATED ','100 KH C','ESIUM  ','SPECIAL ',
     3'TEST  '/
      DATA AMODE/'PRIMARY ','DATA  ',' ','SKYWAVE ','STUDY  ',
     1'  ','CALIBRAT','ION RUN ',' ','LAE EQUI','PMENT TE',
     2'ST  ','VAN EQUI','PMENT TE','ST  ','ANCILLAR','Y DATA  ',
     3'  ','SKYWAVE ','DIURNAL ',' ','SKYWAVE ','DETACHED',
     4'  '/
      IPT=6
      IWT=21
      WRITE(IPT,1011)
      IY=70+IHD(2)
      WRITE(IPT,1000)IHD(23),IHD(22),IY
      IY=1970+IHD(2)
      WRITE(IPT,1001)IHD(1),IY
      J=IHD(4)+1
      WRITE(IPT,1002)(ASITE(I,J),I=1,3)
      J=IHD(3)+1
      WRITE(IPT,1003)(AXMTR(I,J),I=1,2)
      J=IHD(5)+1
      WRITE(IPT,1004)(AMODE(I,J),I=1,3)
      WRITE(IPT,1012)IHD(9)
      HD=IHD(6)*.03386
      WRITE(IPT,1005)HD
      WRITE(IPT,1006)
      HD=IHD(7)/10.
      WRITE(IPT,1007)HD
      HD=IHD(8)/10.
      WRITE(IPT,1008)HD
      WRITE(IPT,1009)
      HD=IHD(10)/10.
      WRITE(IPT,1008)HD
      WRITE(IPT,1010)IHD(11)
      WRITE(IPT,1013)IHD(12),IHD(13),IHD(14)
      M=1
      K=IHD(15)/10
      IF(K.GT.4) M=2
      K=MOD(K,5)+1
      L=MOD(IHD(15),10)+1
      WRITE(IPT,1018)
      WRITE(IPT,1014)(WEATH1(N,K),N=1,2)
      WRITE(IPT,1017)(WEATH2(N,L),N=1,2)
      WRITE(IPT,1015)WIND(M)
      WRITE(IPT,1019)IHD(17)
      WRITE(IPT,1016)(ANOTE(N,IHD(14)+1),N=1,2)
C
C
      IF(IHD(5).NE.0) GO TO 1
      WRITE(21)IHD
C
C
    1 RETURN
 1000 FORMAT(35X,'GROUP/PHASE TEST PREPROCESSING',2X,I2,2('/',I2))
 1001 FORMAT('0',34X,'JULIAN DAY NO.',I4,9X,'YEAR NO.',I5)
 1002 FORMAT('0',34X,'DATA RECORDED AT:',3X,3A8)
 1003 FORMAT('0',34X,'TRANSMITTER LOCATED AT:',3X,2A8)
 1004 FORMAT('0',34X,'DATA RECORDING MODE:',3X,3A8)
 1005 FORMAT('0',34X,'ATMOSPHERIC PRESSURE:',F7.1,' MILLIBARS')
 1006 FORMAT('0',34X,'EXTERNAL TEMPERATURE (DEGREES CENTIGRADE)')
 1007 FORMAT(45X,'WET BULB',F6.1)
 1008 FORMAT(45X,'DRY BULB',F6.1)
 1009 FORMAT('0',34X,'INTERNAL TEMPERATURE (DEGREES CENTIGRADE)')
 1010 FORMAT('0',34X,'PRED. TIME CALIB:',I11,'.0E-09 SECONDS')
 1011 FORMAT('1',/////)
 1012 FORMAT('0',34X,'ATTENUATION IN DB:',I3)
 1013 FORMAT('0',34X,'START TIME:',I4,':',I2,':',I2)
 1014 FORMAT(45X,'CLOUD COVER: ',2A8)
 1015 FORMAT(45X,A4,' GROUND WINDS')
 1016 FORMAT(////,35X,'************',2A8,'************')
 1017 FORMAT(45X,'GENERAL CONDITIONS: ',2A8)
 1018 FORMAT('0',34X,'WEATHER:')
 1019 FORMAT('0',34X,'GROUP REPETITION INTERVAL:',I4,'.0E-04')
      END
```

Program Listing A-11 Preprocessor Header Page Printer

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FORTRAN MODULE (LIST,NAMSO)

CARD NO **** CONTENTS ****

```
      SUBROUTINE MAINE
      DIMENSION IBUF(128),DAT(800),IHD(40)
      DIMENSION ITMR(3,25)
      DIMENSION GRDTOT(3,16)
      DOUBLE PRECISION TREF(2,25)
      DOUBLE PRECISION TB,TBP,TD,GRI
      DOUBLE PRECISION GRDTOT
      DOUBLE PRECISION TREFB,TREFE
      COMMON IHD,GRDTOT,TREFB,TREFE,IREF,IRC,TREF,ITMR
      COMMON/GETDAT/IRT,IBUF
      IPT=6
      IJF=0
      CALL CLEAR(GRDTOT,48)
      GRI=IHD(17)*.000100
C     IHD(37) IS TOTAL NO. OF REJECTED PULSES
      IHD(37)=0
C     IHD(38) IS TOTAL NO OF MISSING RECORDS
      IHD(38)=0
      NPRNT=14
      IPCT=0
      IERR=0
      CALL TIME(TB)
      IRC=IRC+1
      TREF(1,IRC)=TB
      ITMR(1,IRC)=IHD(12)
      ITMR(2,IRC)=IHD(13)
      ITMR(3,IRC)=IHD(14)
      TBP=TB
      IF(IREF.EQ.0) GO TO 9
      CALL FINDT(TREFB,TBP,GRI,IPCT,IJF)
    8 IF(NPRNT.LT.14)GO TO 9
      WRITE(IPT,1003)
      WRITE(IPT,1004)
      NPRNT=0
    9 CALL SET(DAT)
      IDCT=0
C     IHD(39) IS USED TO COUNT MISSING RECORDS
      IHD(39)=0
C     IHD(40) IS USED TO COUNT BAD PULSES IN A BLOCK
      IHD(40)=0
      TD=TBP+IPCT*GRI
      IF(IJF.NE.0) GO TO 16
   10 CALL BLOCK(DAT,IDCT,IPCT,IERR)
      IF(IDCT.LT.800) GO TO 11
      CALL STAT(TD,DAT)
      TREF(2,IRC)=TD
      IHD(37)=IHD(37)+IHD(40)
      IHD(38)=IHD(38)+IHD(39)
      IF(IHD(21).EQ.0) GO TO 100
      IF((GRDTOT(3,1)+.5).GE.500) RETURN
  100 NPRNT=NPRNT+1
      IF(IREF.EQ.0) GO TO 101
      IF(DABS(TD-TREFE).LT..01) GO TO 21
      IF(TD.GT.TREFE) GO TO 21
  101 IF(IPCT.LT.7) GO TO 8
   11 TBP=TBP+7*GRI
      IPCT=0
      IF(IERR.NE.0) GO TO 14
   12 CALL GETREC
      GO TO(13,12,17,18),IRT
C     TEST FOR CHANGE OF RECORDING MODE
   13 CALL MODES(MDSV)
      IF(IHD(5).NE.MDSV) GO TO 19
      CALL TIME(TB)
C     TEST FOR MISSING RECORD
   14 IF((TB-TBP).GT..6) GO TO 16
C     TEST FOR INTERMEDIATE RECORD
      IF((TBP-TB).GT..001) GO TO 12
      IERR=0
      TBP=TB
   15 IF(800-IDCT)8,8,10
   16 IERR=1
      IHD(39)=IHD(39)+1
      IJF=0
      GO TO 15
C  19 SHOULD ATTEMPT BACKSPACE ON INPUT IF POSSIBLE
   19 CONTINUE
   17 IF(IHD(5).NE.0) GO TO 20
      IF(IREF.EQ.0) GO TO 22
      TB=9999.
      GO TO 16
   21 IF(TB.EQ.9999.) GO TO 22
      CALL SKIPFL
   22 ENDFILE 21
   20 RETURN
   18 WRITE(IPT,1000)
      STOP
 1000 FORMAT(' NO DD CARD THIS FILE')
 1003 FORMAT(1H1,16(2X,'AVG.',2X))
 1004 FORMAT(1X,16(3X,'S.DEV'),/)
      END
```

Program Listing A-12 Preprocessor Main Data Handler

```
04/28/76        INPUT LISTING                    AUTOFLOW CHART SET - LORAN 1  GROUP PHASE PREPROCESSOR

FORTRAN MODULE      (LIST,NAMSO)

 CARD NO        ****                        CONTENTS                        ****

      1              SUBROUTINE BLOCK(DAT,IPCT,IPCT,IERR)
      2              DIMENSION DAT(1),IBUF(128),IHD(40)
      3              COMMON IHD
      4              COMMON/GETDAT/IRT,IBUF
      5              IPT=6
      6              IP=IPCT+1
      7              DO 2 I=IP,7
      8              DO 1 J=1,6
      9              IPCT=IPCT+2
     10              IF(IERR.NE.0) GO TO 1
     11        C     IHD(20) USED FOR PICKING UP ANY SERIES OF 1A PULSES
     12              K=1A*(I-1)+J+IHD(20)
     13              CALL XY(IPCT,K,DAT,J)
     14            1 CONTINUE
     15        C     IHD(21) IS USED FOR INTERMEDIATE PRINTOUT OF EACH READING
     16              IF(IHD(21).EQ.0) GO TO 4
     17              M=IPCT-15
     18              WRITE(IPT,1000)(DAT(N),N=M,IPCT)
     19            4 IF(IPCT.EQ.200) GO TO 3
     20            2 CONTINUE
     21            3 IPCT=I
     22              RETURN
     23         1000 FORMAT(1X5E5.4)
     24              END
```

Program Listing A-13 Preprocessor Data Blocker

```
04/28/76        INPUT LISTING                    AUTOFLOW CHART SET - LORAN 1  GROUP PHASE PREPROCESSOR

FORTRAN MODULE      (LIST,NAMSO)

 CARD NO        ****                        CONTENTS                        ****

      1              SUBROUTINE FINDT(TREFP,TRP,GRI,IPCT,IJF)
      2              IMPLICIT REAL*8(A-H,O-Z)
      3              DIMENSION IBUF(128)
      4              COMMON/GETDAT/IRT,IBUF
      5              TD=DABS(TREFP-TRP)
      6              IF(TD.LT..01) RETURN
      7              DO 1 I=1,100000
      8              T=TD-GRI*I
      9              IF(DABS(T).LT..01) GO TO 2
     10            1 CONTINUE
     11            2 IPCT=MOD(I,7)
     12              N=I/7
     13              IF(TRP-TREFP) 3,5,10
     14            3 IF(N.EQ.0) RETURN
     15              DO 4 I=1,N
     16            4 CALL GETREC
     17              CALL TIME(TRP)
     18            5 RETURN
     19           10 IF(IPCT.EQ.0) GO TO 11
     20              N=N+1
     21              IPCT=7-IPCT
     22           11 TRP=TRP-N*7*GRI
     23              IJF=1
     24              RETURN
     25              END
```

Program Listing A-14 Preprocessor Pulse Time Locater

```
09/28/76        INPUT LISTING                    AUTOFLOW CHART SET - LORAN 1  GROUP PHASE PREPROCESSOR

FORTRAN MODULE      (LIST,NAMSQ)

  CARD NO       ****                          CONTENTS                      ****

      1             SUBROUTINE TIME(TB)
      2             DIMENSION IBUF(128),IHD(40)
      3             DOUBLE PRECISION TB
      4             COMMON IHD
      5             COMMON/GETDAT/IRT,IBUF
      6             COMMON/BIAS/IBIAS
      7             K=IBUF(113)
      8             TB=0.000
      9             DO 1 I=1,3
     10             J=I+11
     11             CALL SHFT1(L,K,8)
     12             CALL BCDTB(M,L,2)
     13           1 TB=(M-IHD(J))*60**(3-I)+TB
     14             CALL SHFT1(L,K,8)
     15             CALL BCDTB(M,L,2)
     16             TB=TB+M*.01D0
     17             K=IBUF(114)
     18             CALL SHFT1(L,K,20)
     19             CALL BCDTB(M,L,6)
     20             TB=TB+M*.000000100+IBIAS
     21             RETURN
     22             END
```

Program Listing A-15 Preprocessor Time Decoder

```
09/28/76        INPUT LISTING                    AUTOFLOW CHART SET - LORAN 1  GROUP PHASE PREPROCESSOR

FORTRAN MODULE      (LIST,NAMSQ)

  CARD NO       ****                          CONTENTS                      ****

      1             SUBROUTINE SET(DAT)
      2             DIMENSION DAT(1)
      3             DO 1 I=1,600
      4           1 DAT(I)=9999.
      5             RETURN
      6             END
```

Program Listing A-16 Preprocessor Data Block Initializer

```
09/28/76        INPUT LISTING                    AUTOFLOW CHART SET - LORAN 1  GROUP PHASE PREPROCESSOR

FORTRAN MODULE      (LIST,NAMSQ)

  CARD NO       ****                          CONTENTS                      ****

      1             SUBROUTINE XY(IDCT,K,DAT,L)
      2             DIMENSION DAT(1),IBUF(128),IHD(40)
      3             COMMON IHD
      4             COMMON/GETDAT/IRT,IBUF
      5             I=IBUF(K)
      6             CALL SHFT1(J,I,32)
      7             CALL SHFT2(J,I,-16)
      8             DAT(IDCT-1)=J*1.220B375E-3
      9             CALL SHFT1(J,I,32)
     10             CALL SHFT2(J,I,-16)
     11             DAT(IDCT)=J*1.220B375E-3
     12             CALL EDIT(IDCT,DAT,L)
     13             RETURN
     14             END
```

Program Listing A-17 Preprocessor Measurement Decoder

```
09/28/7-        INPUT LISTING                    AUTOFLOW CHART SET - LORAN 1  GROUP PHASE PREPROCESSOR

FORTRAN *OULE      (LIST,NAMSQ)

 CARD NO        ****                  CONTENTS                  ****

      1              SUBROUTINE STAT(TD,DAT)
      2              DIMENSION DAT(1),XY(16),XY2(16),XYSD(16),XYN(16)
      3              DIMENSION GRDTOT(3,16)
      4              DIMENSION IBUF(128),IHD(40)
      5              DOUBLE PRECISION TD,XY,XY2,XYSD,XYN
      6              DOUBLE PRECISION GRDTOT
      7              DOUBLE PRECISION TEMP
      8              COMMON IHD,GRDTOT
      9              COMMON/GETDAT/IPT,IBUF
     10              IPT=6
     11              CALL CLEAR(XYN,16)
     12              CALL CLEAR(XY,16)
     13              CALL CLEAR(XY2,16)
     14              CALL CLEAR(XYSD,16)
     15              DO 1 I=1,800
     16              IF(DAT(I).GT.9000.) GO TO 1
     17              J=MOD(I,16)
     18              IF(J.EQ.0) J=16
     19              TEMP=DAT(I)
     20              XY(J)=XY(J)+TEMP
     21              XY2(J)=XY2(J)+TEMP**2
     22              XYN(J)=XYN(J)+1
     23            1 CONTINUE
     24              DO 2 I=1,16
     25              IF(XYN(I).EQ.0) GO TO 2
     26              GRDTOT(1,I)=GRDTOT(1,I)+XY(I)
     27              GRDTOT(2,I)=GRDTOT(2,I)+XY2(I)
     28              GRDTOT(3,I)=GRDTOT(3,I)+XYN(I)
     29              XY(I)=XY(I)/XYN(I)
     30              XY2(I)=XY2(I)/XYN(I)
     31              XYSD(I)=DSQRT(XY2(I)-XY(I)**2)
     32            2 CONTINUE
     33              WRITE(IPT,1003)TD,XYN(1),IHD(40),IHD(39)
     34              WRITE(IPT,1000)XY
     35              WRITE(IPT,1001)XYSD
     36              IF(IHD(5).NE.0) GO TO 3
     37              WRITE(21)TD,XY,XYSD,XYN,(DAT(I),I=1,800)
     38            3 RETURN
     39           1000 FORMAT(1X,16E8.4)
     40           1001 FORMAT(2X,16E8.4,/)
     41           1003 FORMAT(' BLOCK TIME = ',F12.7,
     42               110X,'TOTAL PULSES KEPT =',I3,/,
     43               210X,'NO. OF PULSES EDITED =',I2,
     44               310X,'NO. OF MISSING RECORDS =',I2)
     45              END
```

Program Listing A-18 Preprocessor Intermediate Statistics

```
09/28/76        INPUT LISTING                    AUTOFLOW CHART SET - LORAN 1  GROUP PHASE PREPROCESSOR

FORTRAN MODULE      (LIST,NAMSQ)

 CARD NO        ****                          CONTENTS                        ****

      1              SUBROUTINE CLEAR(X,N)
      2              DOUBLE PRECISION X(N)
      3              DO 1 I=1,N
      4            1 X(I)=0.000
      5              RETURN
      6              END
```

Program Listing A-19 Preprocessor Array Reset

```
09/28/76        INPUT LISTING                    AUTOFLOW CHART SET - LORAN 1  GROUP PHASE PREPROCESSOR

FORTRAN MODULE      (LIST,NAMSQ)

 CARD NO        ****                          CONTENTS                        ****

      1              SUBROUTINE EDIT(IDCT,DAT,J)
      2              DIMENSION IBUF(128),IHD(40)
      3              DIMENSION DAT(1)
      4              COMMON IHD
      5              COMMON/GETDAT/IRT,IBUF
      6              IF(ABS(DAT(IDCT-1)).GT.10.) GO TO 1
      7              IF(ABS(DAT(IDCT)).GT.10.) GO TO 1
      8              RETURN
      9            1 IDCT=IDCT-2*J
     10              IHD(40)=IHD(40)+1
     11              DO 2 J=1,8
     12              IDCT=IDCT+2
     13              DAT(IDCT-1)=9999.
     14              DAT(IDCT)=9999.
     15            2 CONTINUE
     16              RETURN
     17              END
```

Program Listing A-20 Preprocessor First-Stage Editor

09/28/76 INPUT LISTING AUTOFLOW CHART SET - LORAN 1 GROUP PHASE PREPROCESSOR

FORTRAN MODULE (LIST,NAMS)

CARD NO **** CONTENTS ****

```
      SUBROUTINE STATI
      DIMENSION IBUF(128),IHD(40)
      DIMENSION GRDTOT(3,16)
      DOUBLE PRECISION GRDTOT
      COMMON IHD,GRDTOT
      COMMON/GETDAT/IRT,IBUF
      IPT=6
      DO 1 I=1,16
      IF(GRDTOT(3,I).EQ.0) GO TO 1
      GRDTOT(1,I)=GRDTOT(1,I)/GRDTOT(3,I)
      GRDTOT(2,I)=GRDTOT(2,I)/GRDTOT(3,I)
      GRDTOT(3,I)=DSQRT(GRDTOT(3,I)-GRDTOT(1,I)**2)
    1 CONTINUE
      I=GRDTOT(3,1)+.5
      WRITE(IPT,1002)I
      WRITE(IPT,1000)(GRDTOT(1,I),I=I,16)
      WRITE(IPT,1001)(GRDTOT(2,I),I=1,16)
      WRITE(IPT,1003)IHD(37)
      WRITE(IPT,100-)IHD(38)
      IF(IHD(5).NE.0) GO TO 3
      ADD=0.
      DO 2 J=1,16
    2 ADD=ADD+GRDTOT(2,J)
      ADD=ADD/8
      WRITE(7,1005)ADD
      WRITE(7,1005)(GRDTOT(1,I),I=1,16)
    3 RETURN
 1000 FORMAT(1X,16F8.4)
 1001 FORMAT(2X,16F8.4,/)
 1002 FORMAT(' GRAND TOTALS OVER',I6,' PULSES ARE AS FOLLOWS')
 1003 FORMAT(///,10X,'TOTAL NUMBER OF REJECTED PULSES =',I5)
 1004 FORMAT(///,10X,'TOTAL NUMBER OF MISSING OR SHORT RECORDS =',I5)
 1005 FORMAT(8F9.4,/,8F9.4)
      END
```

Program Listing A-21 Preprocessor Final Statistics

09/28/76 INPUT LISTING AUTOFLOW CHART SET - LORAN 1 GROUP PHASE PREPROCESSOR

FORTRAN MODULE (LIST,NAMSC)

CARD NO **** CONTENTS ****

```
      SUBROUTINE MODESR(MDSV)
      DIMENSION IBUF(128),IHD(40)
      COMMON IHD
      COMMON/GETDAT/IRT,IBUF
      CALL SHFT1(MDSV,IBUF(117),4)
      RETURN
      END
```

Program Listing A-22 Preprocessor Recording Mode Decoder

```
09/28/76        INPUT LISTING                    AUTOFLOW CHART SET - LORAN 1  GROUP PHASE PREPROCESSOR

FORTRAN MODULE      (LIST,NAMSQ)

 CARD NO        ****                          CONTENTS                                    ****

      1              SUBROUTINE PLOT
      2              DIMENSION IHD(40),IBUF(128)
      3              DIMENSION GRDTOT(3,16),MARK(14)
      4              DOUBLE PRECISION GRDTOT
      5              COMMON IHD,GRDTOT
      6              COMMON/GETDAT/IPT,IBUF
      7              IPT=6
      8              WRITE(IPT,1000)
      9              AMX=0
     10              DO 1 I=2,16
     11              IF(AMX.LT.DABS(GRDTOT(1,I))) AMX=DABS(GRDTOT(1,I))
     12            1 CONTINUE
     13              MX=AMX+1
     14              MD=55/MX
     15              DO 10 I=1,55
     16              L=55-I
     17              IC=1078657024
     18              IF(MOD(L,MD).EQ.0) IC=(L/MD)*65536+1089470464
     19              DO 20 J=1,14
     20              V=DABS(GRDTOT(1,J+2))
     21              MARK(J)=1073741824
     22              K=55-MD*V
     23              IF(I.NE.K) GO TO 20
     24              MARK(J)=-9227+A8C0+MOD(J,2)*25165824-0
     25           20 CONTINUE
     26           10 WRITE(IPT,1001) IC,MARK
     27              WRITE(IPT,1002)
     28              RETURN
     29         1000 FORMAT('1',13X,14('*',6X))
     30         1001 FORMAT(11X,A2,1X,14(A1,4X))
     31         1002 FORMAT(14X,14('*',6X))
     32              END
```

Program Listing A-23 Preprocessor Plotter

```
09/28/76        INPUT LISTING                    AUTOFLOW CHART SET - LORAN 1  GROUP PHASE PREPROCESSOR

FORTRAN MODULE      (LIST,NAMSQ)

 CARD NO        ****                          CONTENTS                                    ****

      1              SUBROUTINE SKIPFL
      2              DIMENSION IBUF(128)
      3              COMMON/GETDAT/IPT,IBUF
      4            1 CALL GETREC
      5              GO TO(1,1,3,2),IRT
      6            2 WRITE(6,1000)
      7            3 RETURN
      8         1000 FORMAT(1X,'NO DD CARD THIS FILE (SKIPFL)')
      9              END
```

Program Listing A-24 Preprocessor File Skip

09/28/76 INPUT LISTING AUTOFLOW CHART SET - LORAN 1 GROUP PHASE PREPROCESSOR

FORTRAN MODULE (LIST,NAMSQ)

CARD NO **** CONTENTS ****

```
      SUBROUTINE GPM
      IMPLICIT REAL*8(A-H,O-Z)
      DIMENSION IHD(40),GRDTOT(3,14),OUT(7)
      COMMON IHD,GRDTOT
      IPT=6
      DO 1 I=1,4
      J=2*(I+4)
    1 OUT(I)=-GRDTOT(1,J-1)*3.18/(GRDTOT(1,J)-GRDTOT(1,J-2))
      DO 2 I=1,3
      J=I+4
      OUT(J)=0.000
      DO 3 K=1,5
      L=2*(I+K)
    3 OUT(J)=OUT(J)+DABS(GRDTOT(1,L))
      K=2*(I+1)
      TEMP=2*(DABS(GRDTOT(1,K+8))-DABS(GRDTOT(1,K)))
      TEMP=TEMP+DABS(GRDTOT(1,K+6))-DABS(GRDTOT(1,K+2))
    2 OUT(J)=OUT(J)*10/TEMP
      WRITE(IPT,1000)(I,I=10,14,2),(J,J=12,16,2)
      IF(IHD(3).NE.7) GO TO 4
      WRITE(IPT,1001)(OUT(I),I=1,4)
      GO TO 5
    4 WRITE(IPT,1001)OUT
    5 SX=0
      SXT=0
      T=-12.5
      DO 10 I=1,4
      T=T+5
      SX=SX+OUT(I)
   10 SXT=SXT+OUT(I)*T
      A=SX/4
      B=SXT/125
      T=-12.5
      DO 11 I=1,4
      T=T+5
   11 OUT(I)=OUT(I)-A-B*T
      WRITE(IPT,1002)(OUT(I),I=1,4)
      RETURN
 1000 FORMAT(///,4(6X,'T ',I2),3(4X,'GPM ',I2))
 1001 FORMAT(7F10.3)
 1002 FORMAT(1X,4(2X,'(',F6.3,')'))
      END
```

Program Listing A-25 Preprocessor Group Phase Measurement Calculator

```
09/28/76        INPUT LISTING                    AUTOFLOW CHART SET - LORAN 1  GROUP PHASE PREPROCESSOR

FORTRAN MODULE      (LIST,NAMSQ)

  CARD NO       ****                        CONTENTS                        ****

      1             SUBROUTINE SHFT(I,J,K)
      2             CALL SHFTL(I,J,K,L)
      3             RETURN
      4             END
```

Program Listing A-26 Preprocessor Logical Shift Caller

```
09/28/76        INPUT LISTING                    AUTOFLOW CHART SET - LORAN 1  GROUP PHASE PREPROCESSOR

FORTRAN MODULE      (LIST,NAMSQ)

  CARD NO       ****                        CONTENTS                        ****

      1             SUBROUTINE SHFT1(I,J,K)
      2             I=0
      3             CALL SHFTL(I,J,K,L)
      4             RETURN
      5             END
```

Program Listing A-27 Preprocessor Clear and Logical Shift Caller

```
09/28/76        INPUT LISTING                    AUTOFLOW CHART SET - LORAN 1  GROUP PHASE PREPROCESSOR

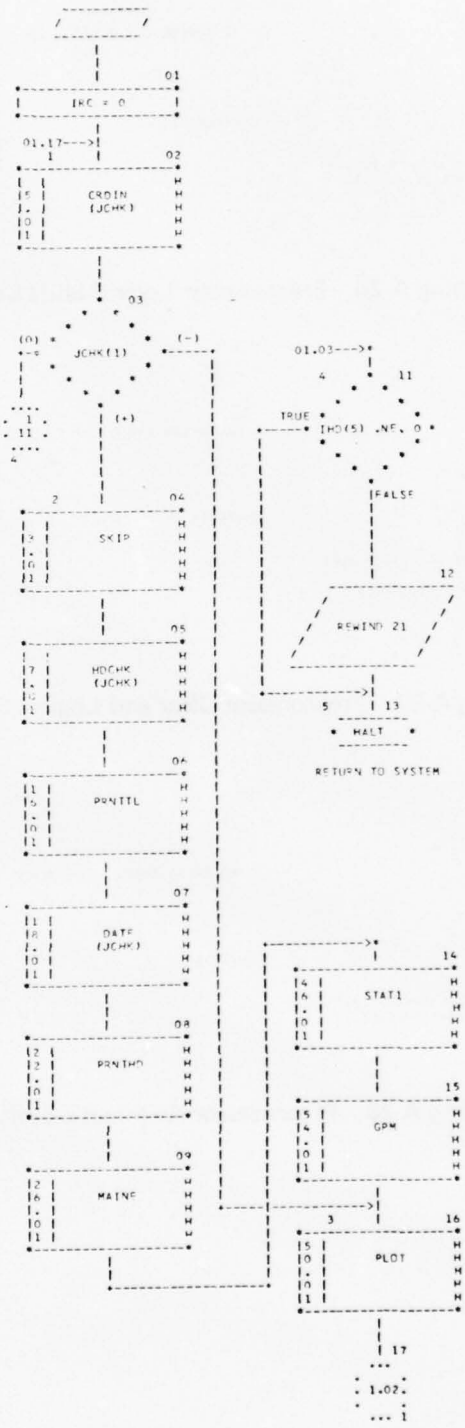
FORTRAN MODULE      (LIST,NAMSQ)

  CARD NO       ****                        CONTENTS                        ****

      1             SUBROUTINE SHFT2(I,J,K)
      2             CALL SHFTA(I,J,K,L)
      3             RETURN
      4             END
```

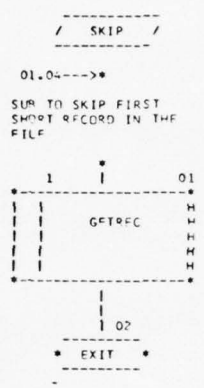
Program Listing A-28 Preprocessor Arithmetic Shift Caller

CHART TITLE - PROCEDURES



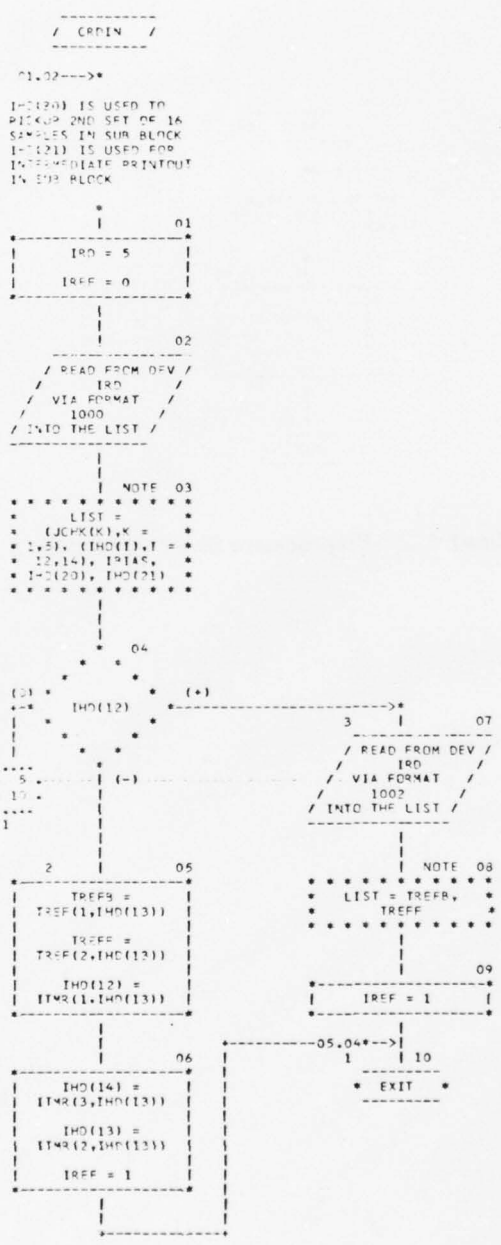
Flow Chart A-1 Preprocessor Driver

CHART TITLE - SUBROUTINE SKIP



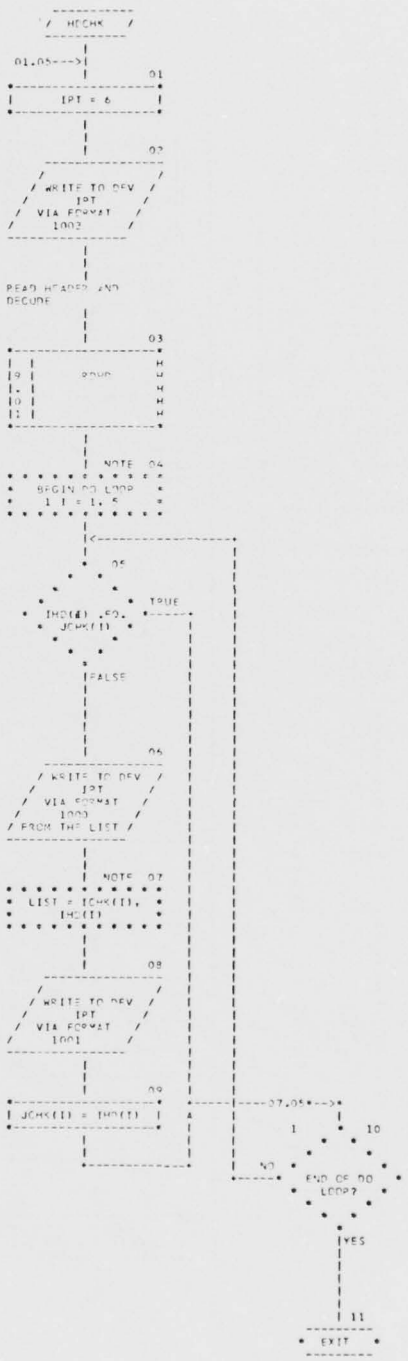
Flow Chart A-2 Preprocessor Short Record Skip

CHART TITLE - SUBROUTINE CRDIN(JCHK)



Flow Chart A-3 Preprocessor Initialization

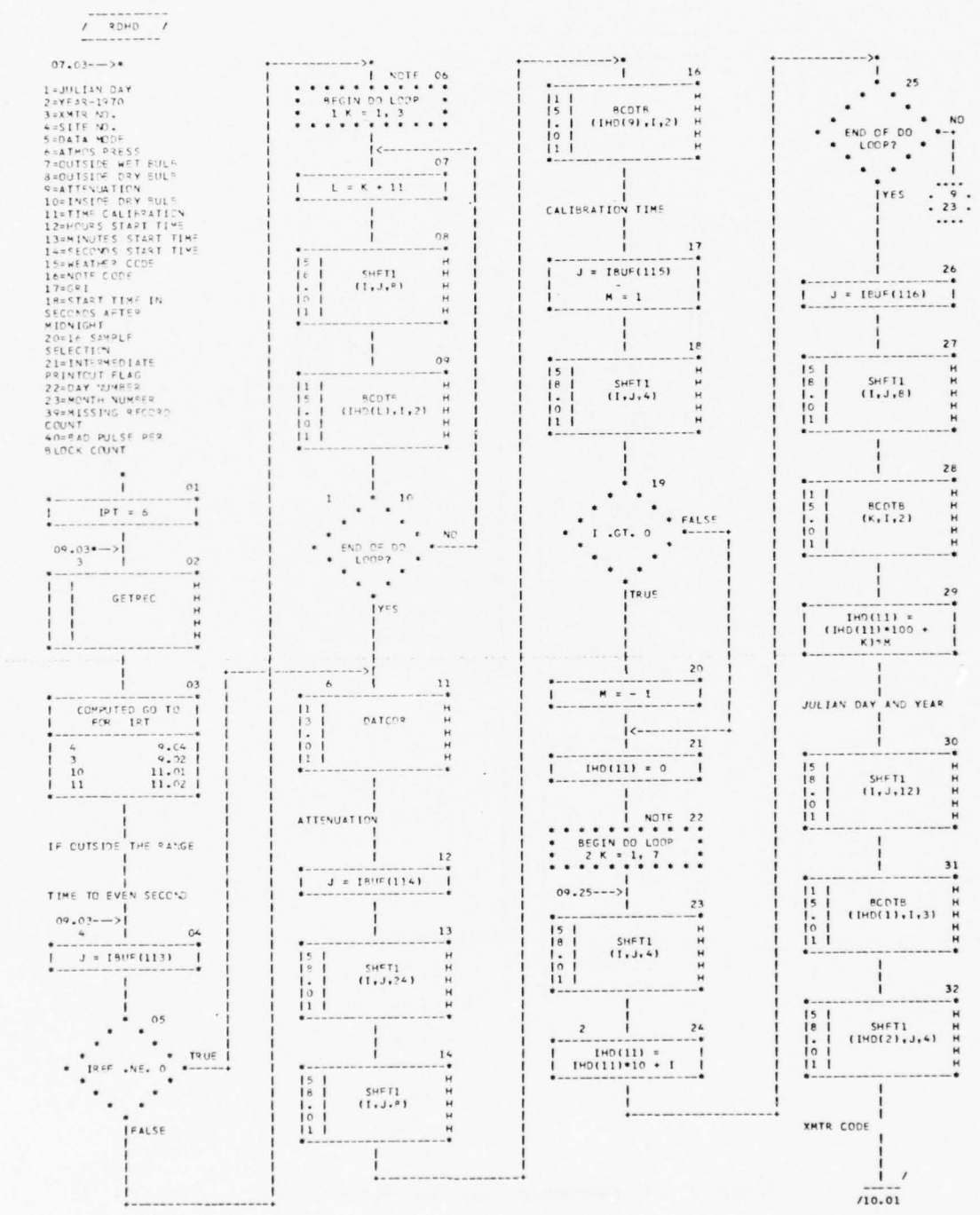
CHART TITLE - SUBROUTINE HDCHK(JCHK)



Flow Chart A-4 Preprocessor Header Information Check

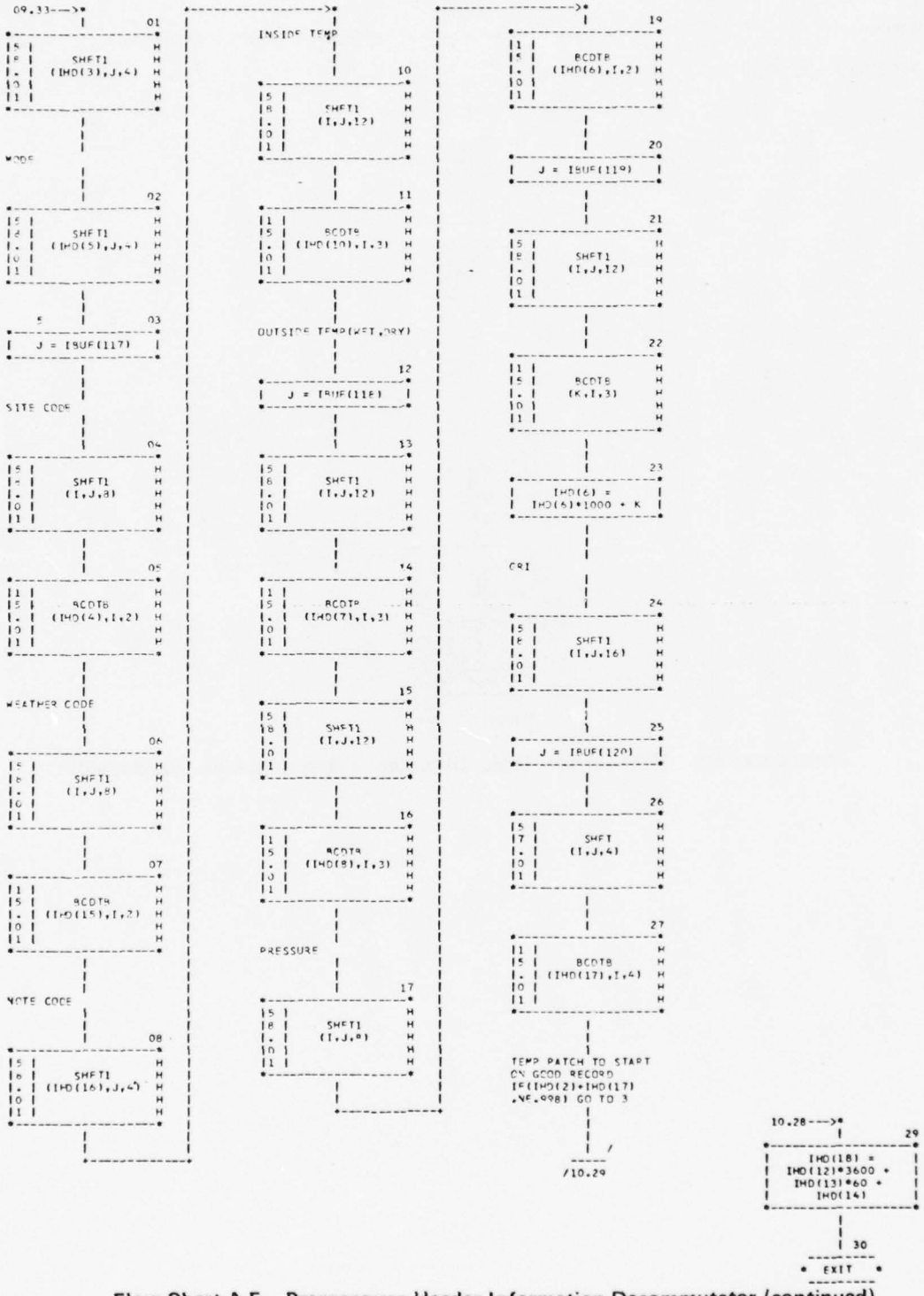
CHART TITLE - SUBROUTINE BLOCKDAT,IPCT,IPCT,IERR)

CHART TITLE - SUBROUTINE RDHD



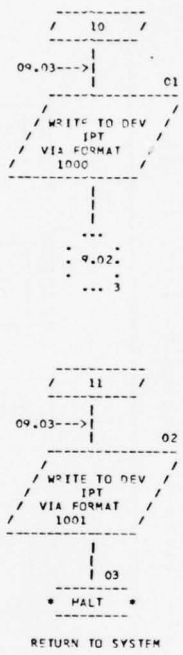
Flow Chart A-5 Preprocessor Header Information Decommutator

CHART TITLE - SUBROUTINE RDHD



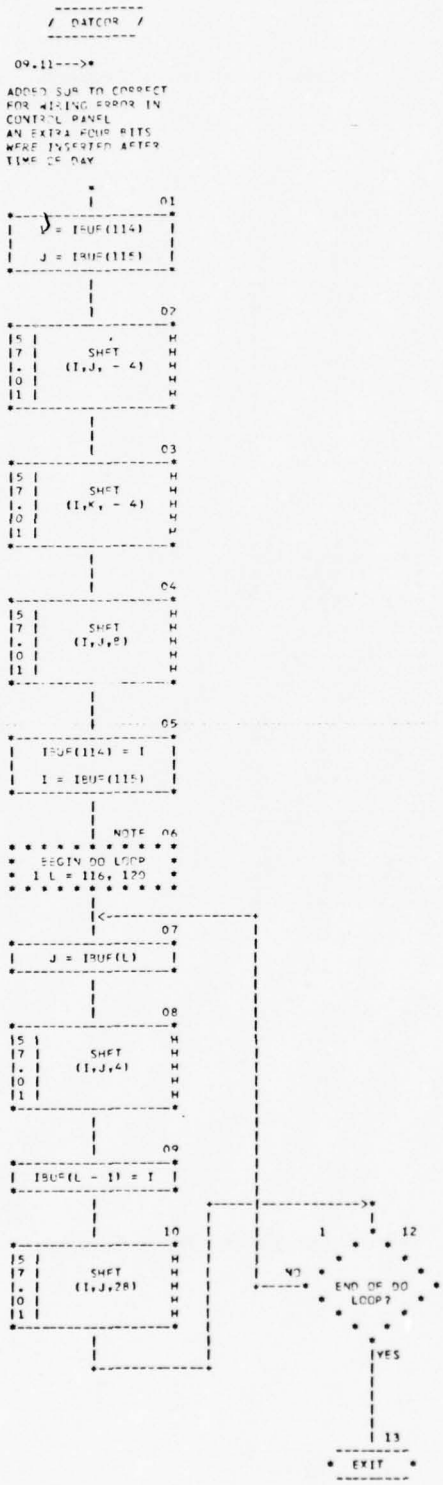
Flow Chart A-5 Preprocessor Header Information Decommutator (continued)

CHART TITLE - SUBROUTINE RDHD



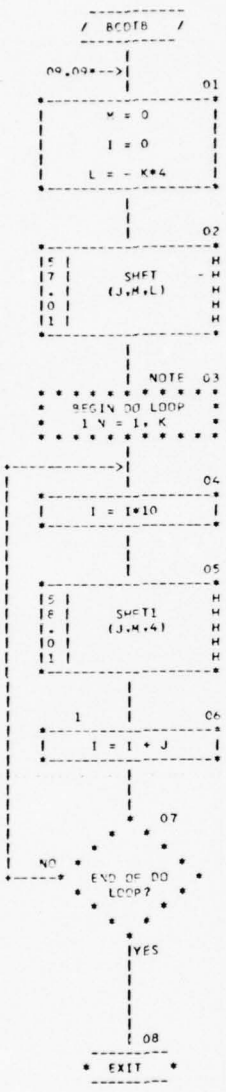
Flow Chart A-5 Preprocessor Header Information Decommutator (concluded)

CHART TITLE - SUBROUTINE DATCOR



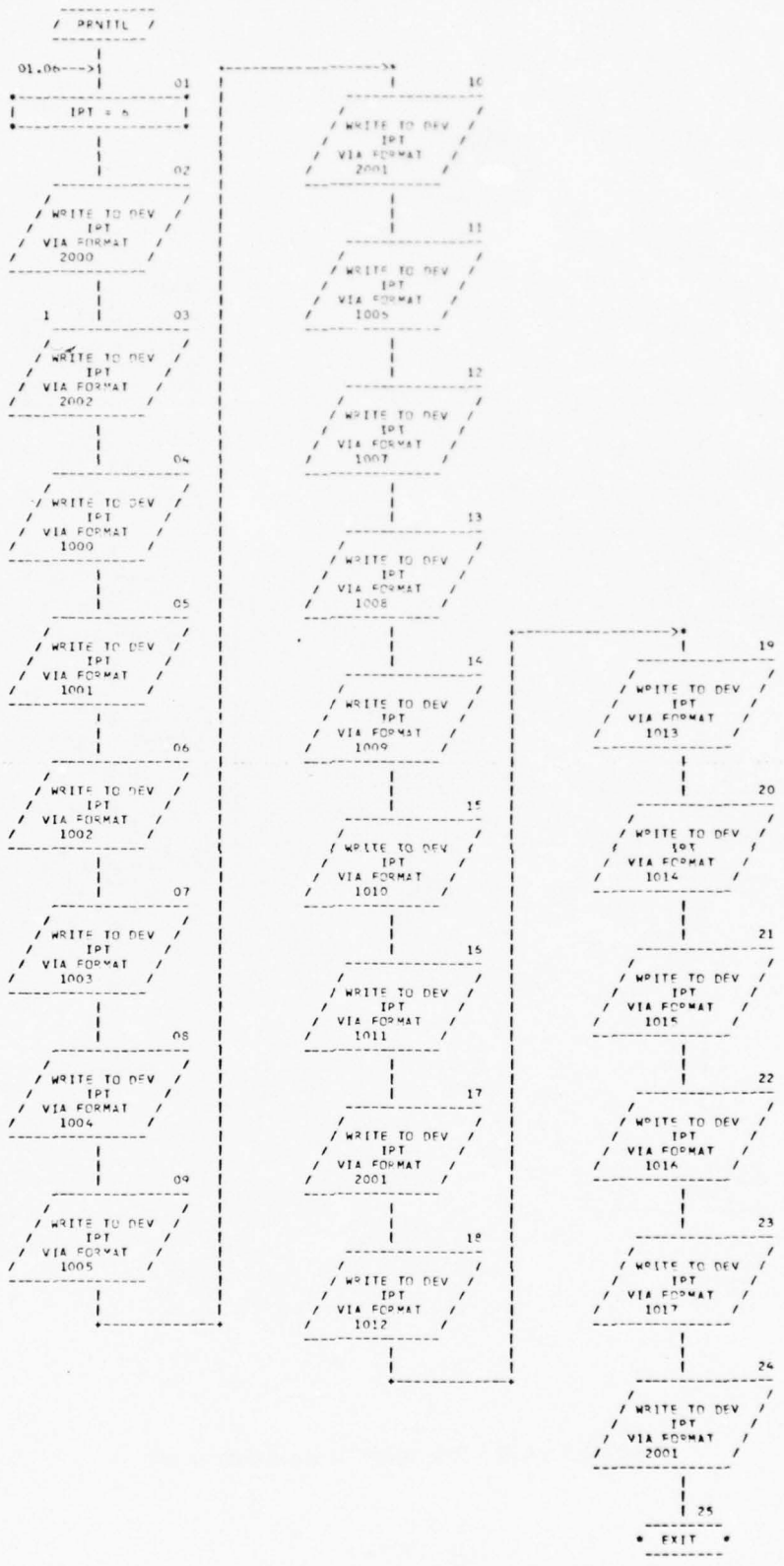
Flow Chart A-6 Preprocessor Data Format Converter

CHART TITLE - SUBROUTINE BCDTB(I,J,K)



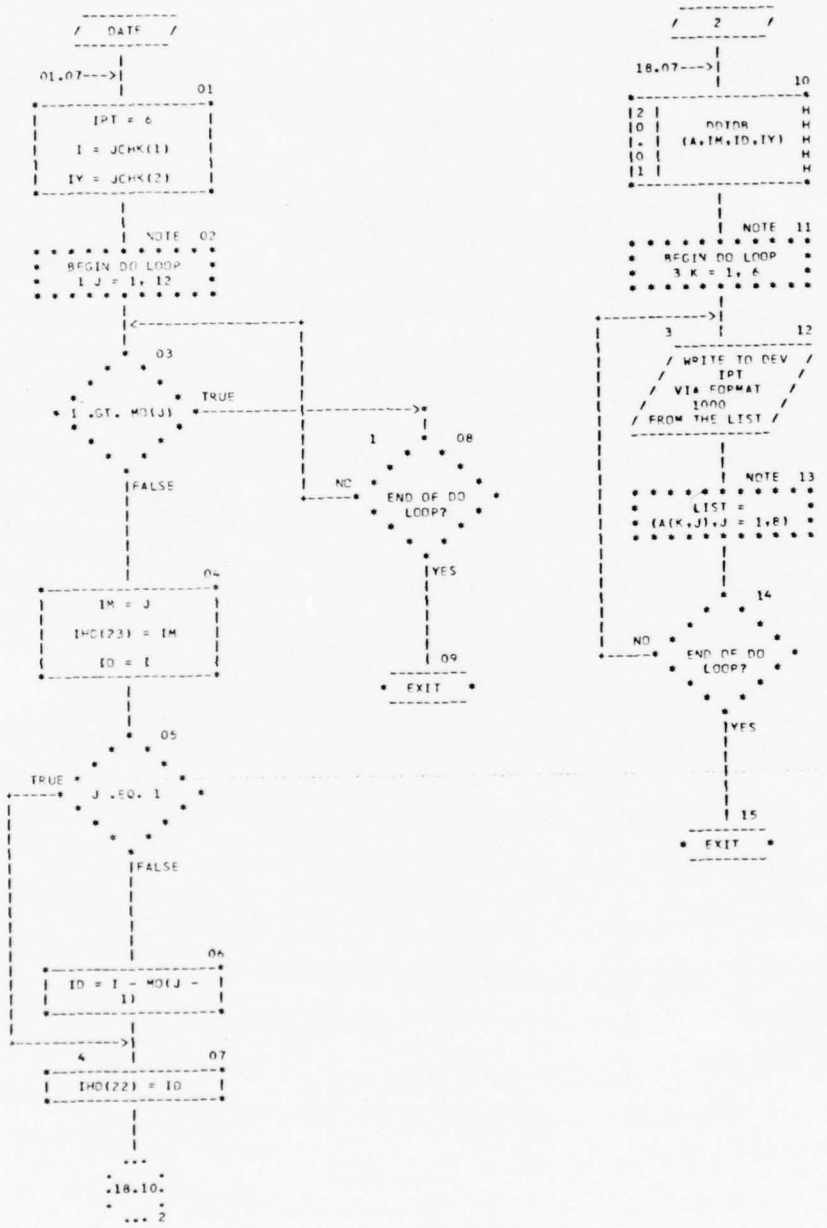
Flow Chart A-7 Preprocessor BCD to Binary Converter

CHART TITLE - SUBROUTINE PRNTTL

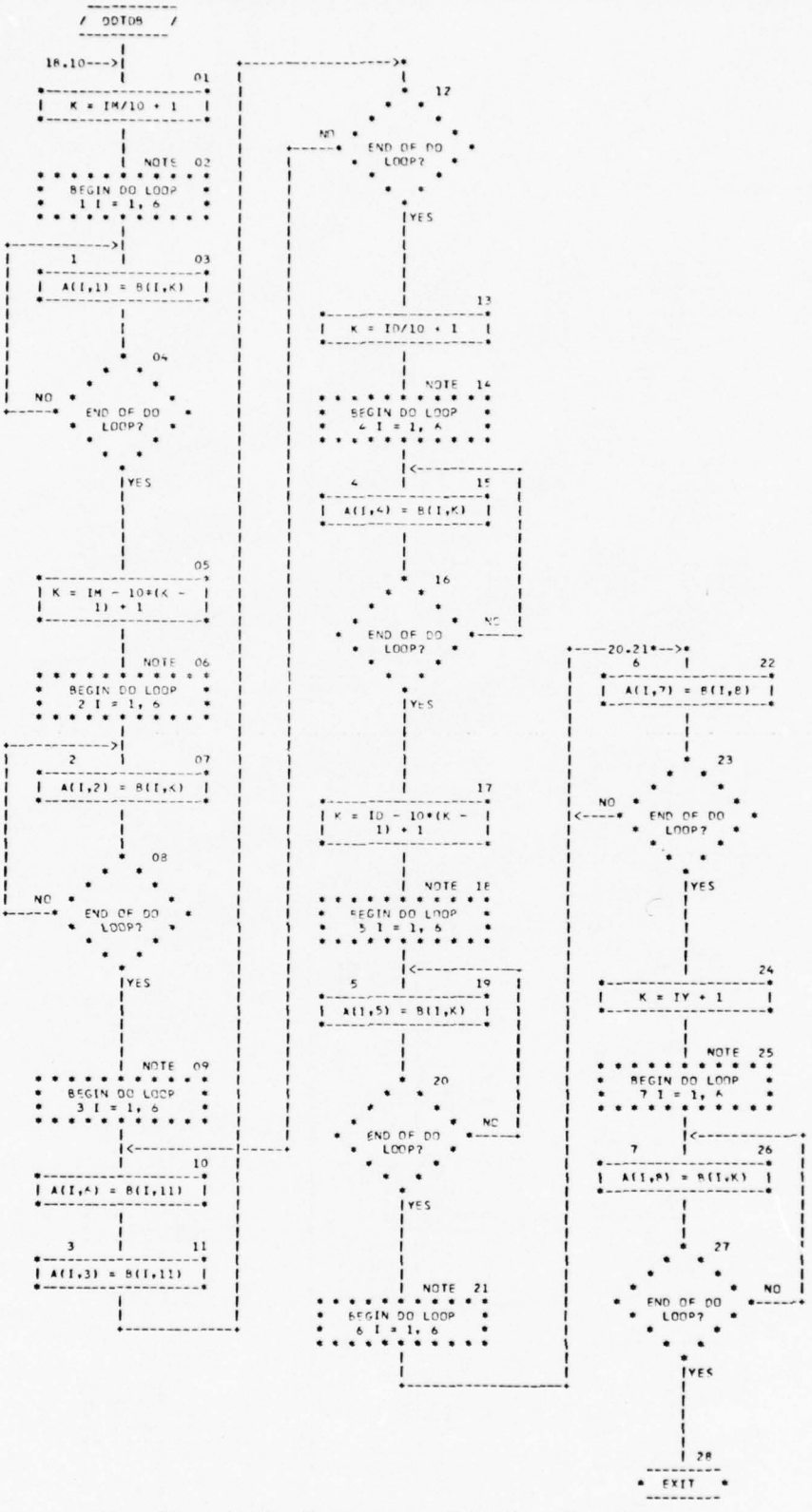


Flow Chart A-8 Preprocessor Title Page Printer

CHART TITLE - SUBROUTINE DATE(JCHK)

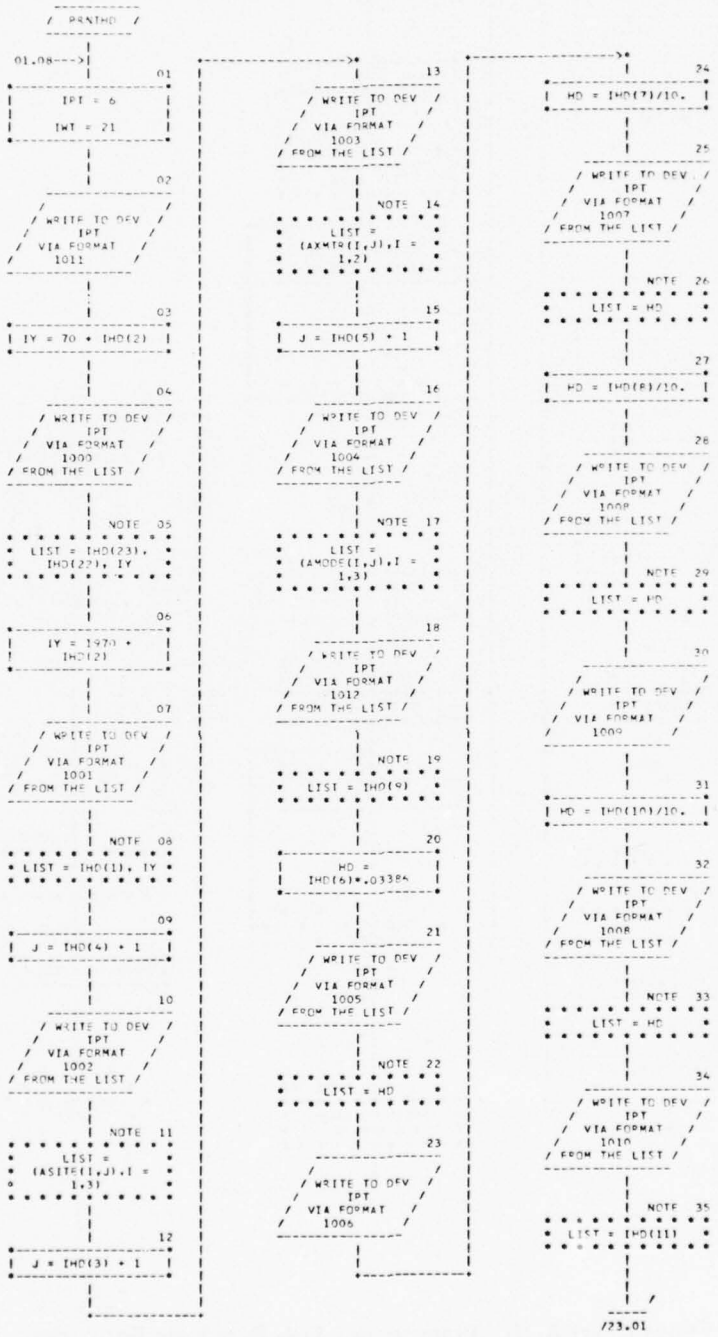


Flow Chart A-9 Preprocessor Date Converter



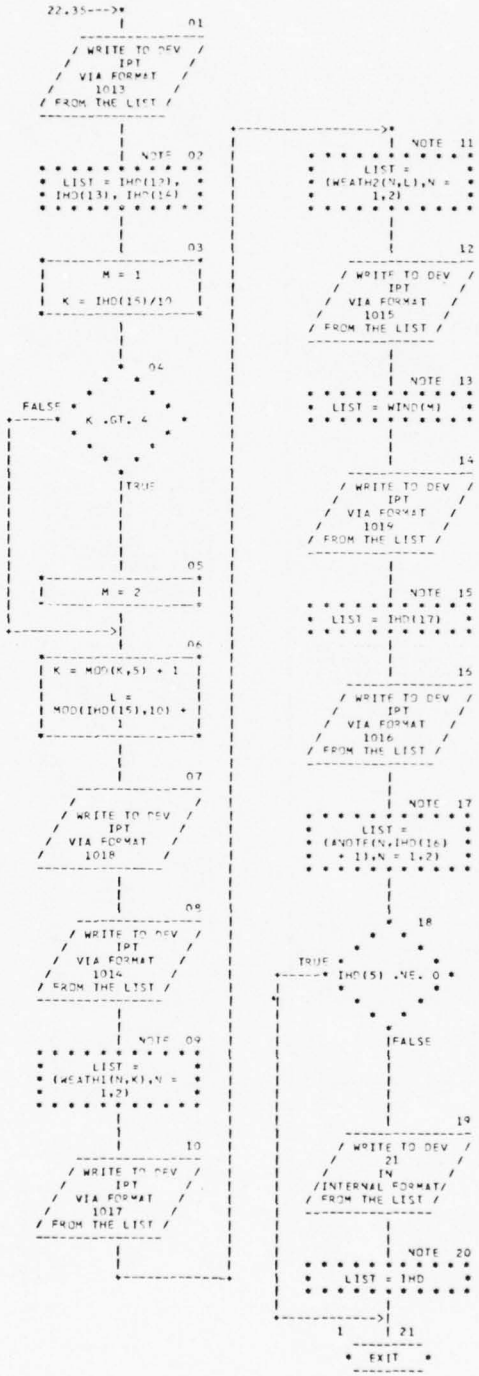
Flow Chart A-10 Preprocessor Title Page Date Formatter

CHART TITLE - SUBROUTINE PRNTHD



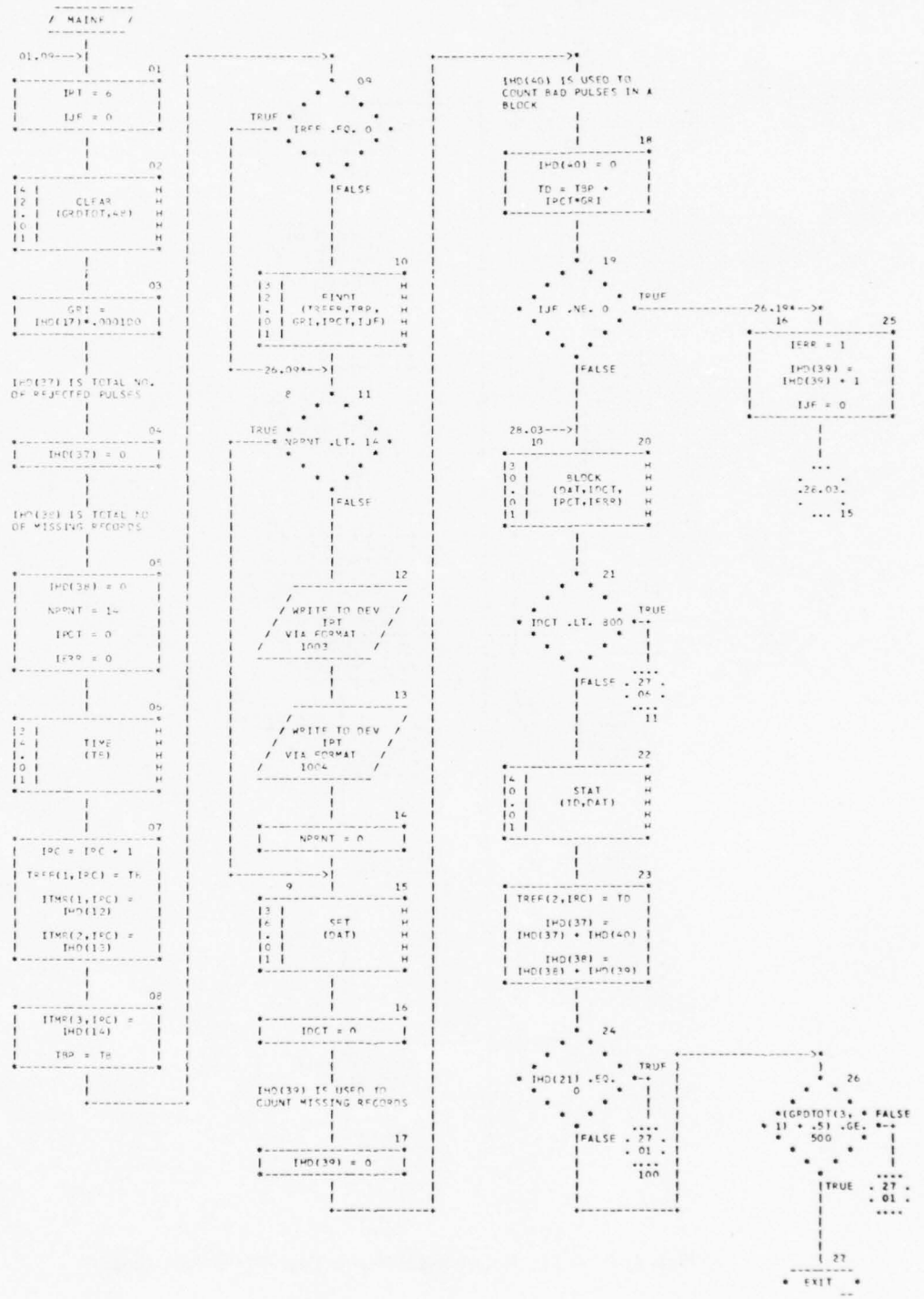
Flow Chart A-11 Preprocessor Header Page Printer

CHART TITLE - SUBROUTINE PRNTHD



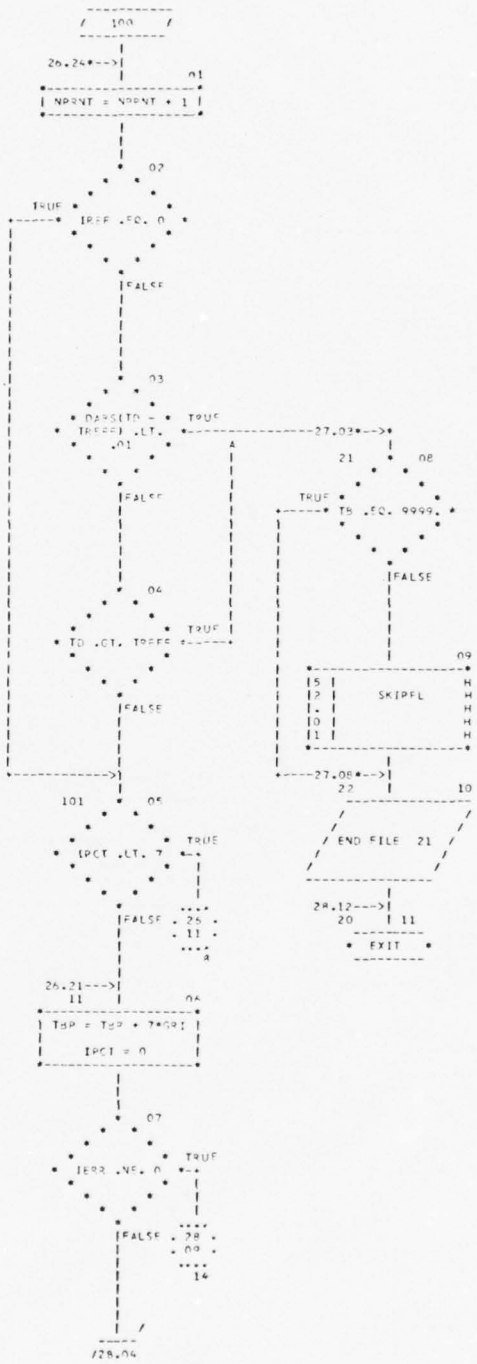
Flow Chart A-11 Preprocessor Header Page Printer (concluded)

CHART TITLE - SUBROUTINE MAINE



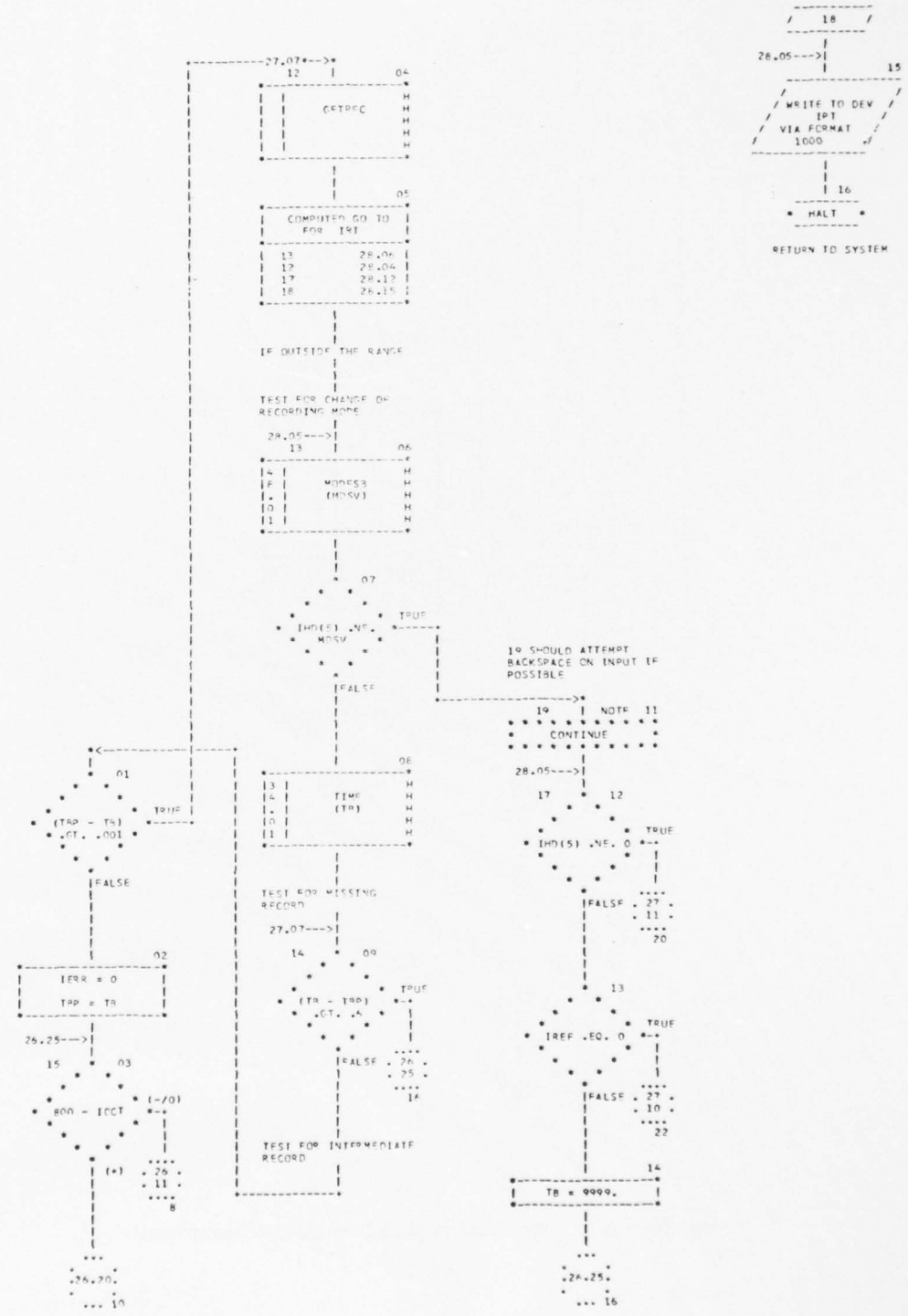
Flow Chart A-12 Preprocessor Main Data Handler

CHART TITLE - SUBROUTINE MAINE



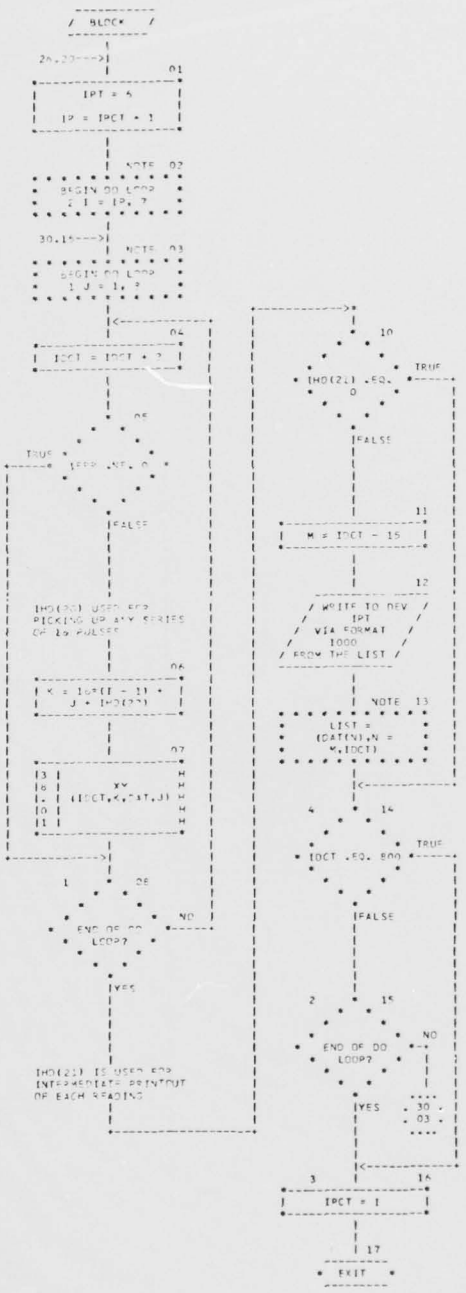
Flow Chart A-12 Preprocessor Main Data Handler (continued)

CHART TITLE - SUBROUTINE MAINE



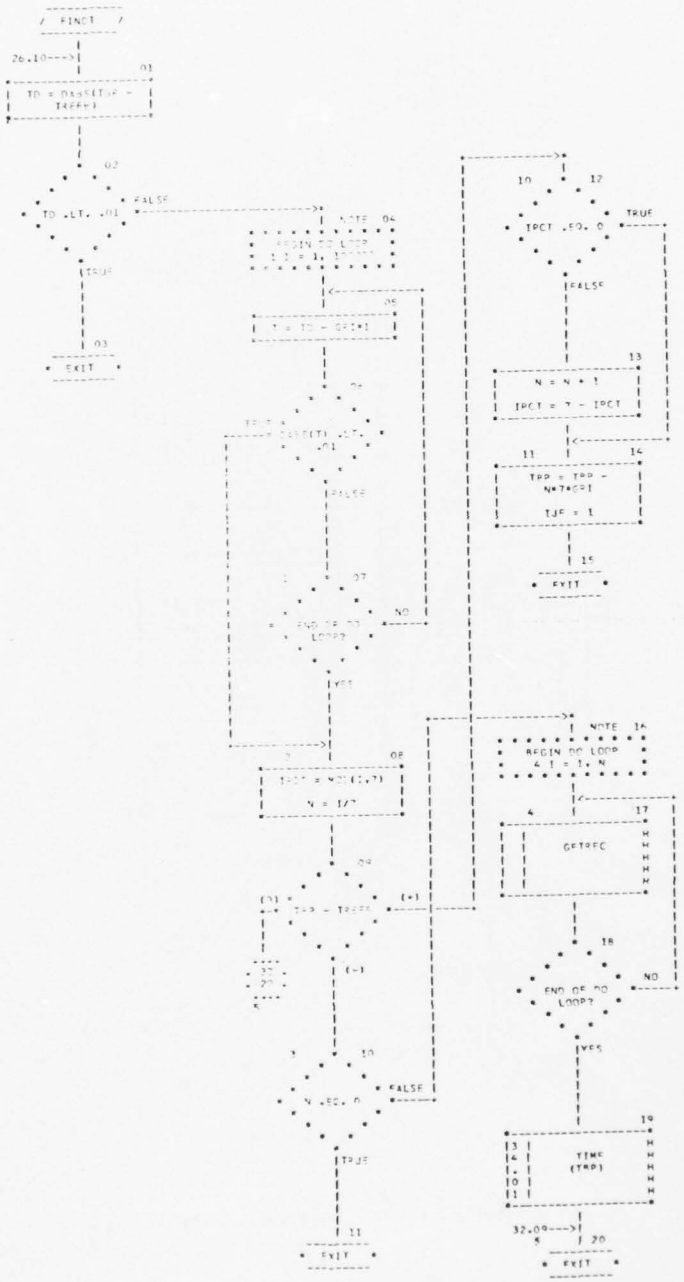
Flow Chart A-12 Preprocessor Main Data Handler (concluded)

CHART TITLE - SUBROUTINE BLOCK(DAT,IDCT,IPCT,IERR)



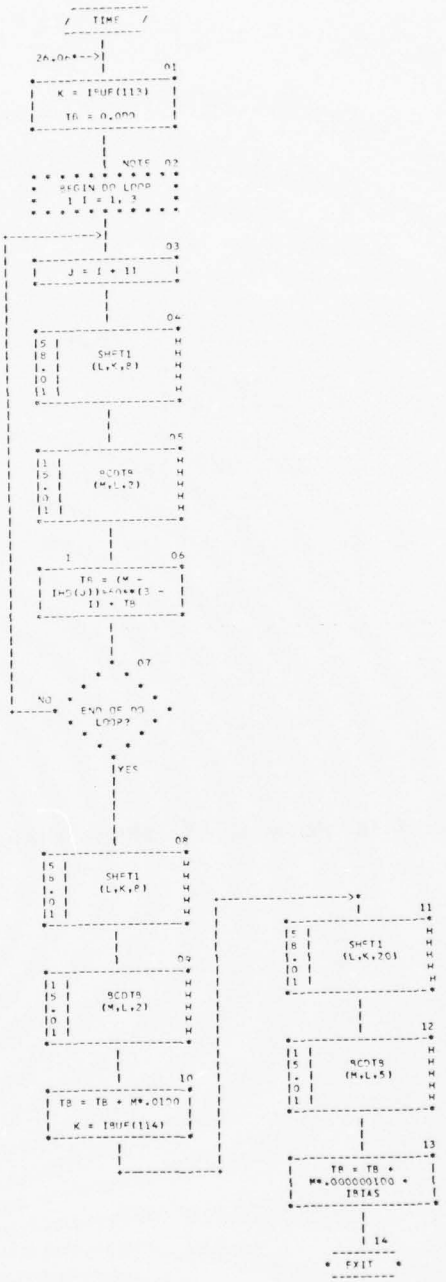
Flow Chart A-13 Preprocessor Data Blocker

CHART TITLE - SUBROUTINE FINCTI(...,FI,TRP,GRI,IPCT,IJF)



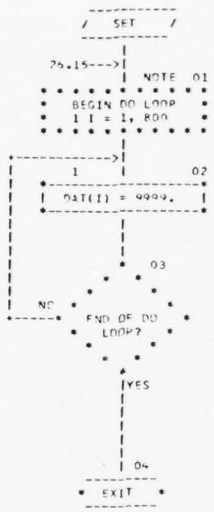
Flow Chart A-14 Preprocessor Pulse Time Locater

CHART TITLE - SUBROUTINE TIME(I1)



Flow Chart A-15 Preprocessor Time Decoder

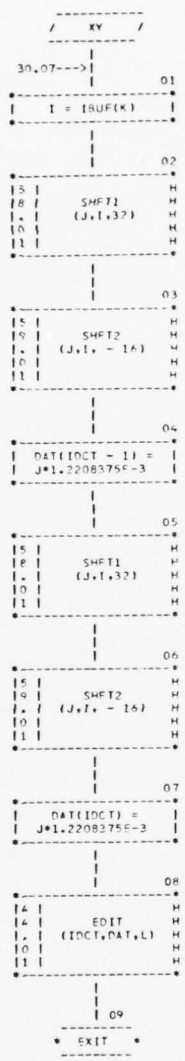
CHART TITLE - SUBROUTINE SET(DAT)



Flow Chart A-16 Preprocessor Data Block Initializer

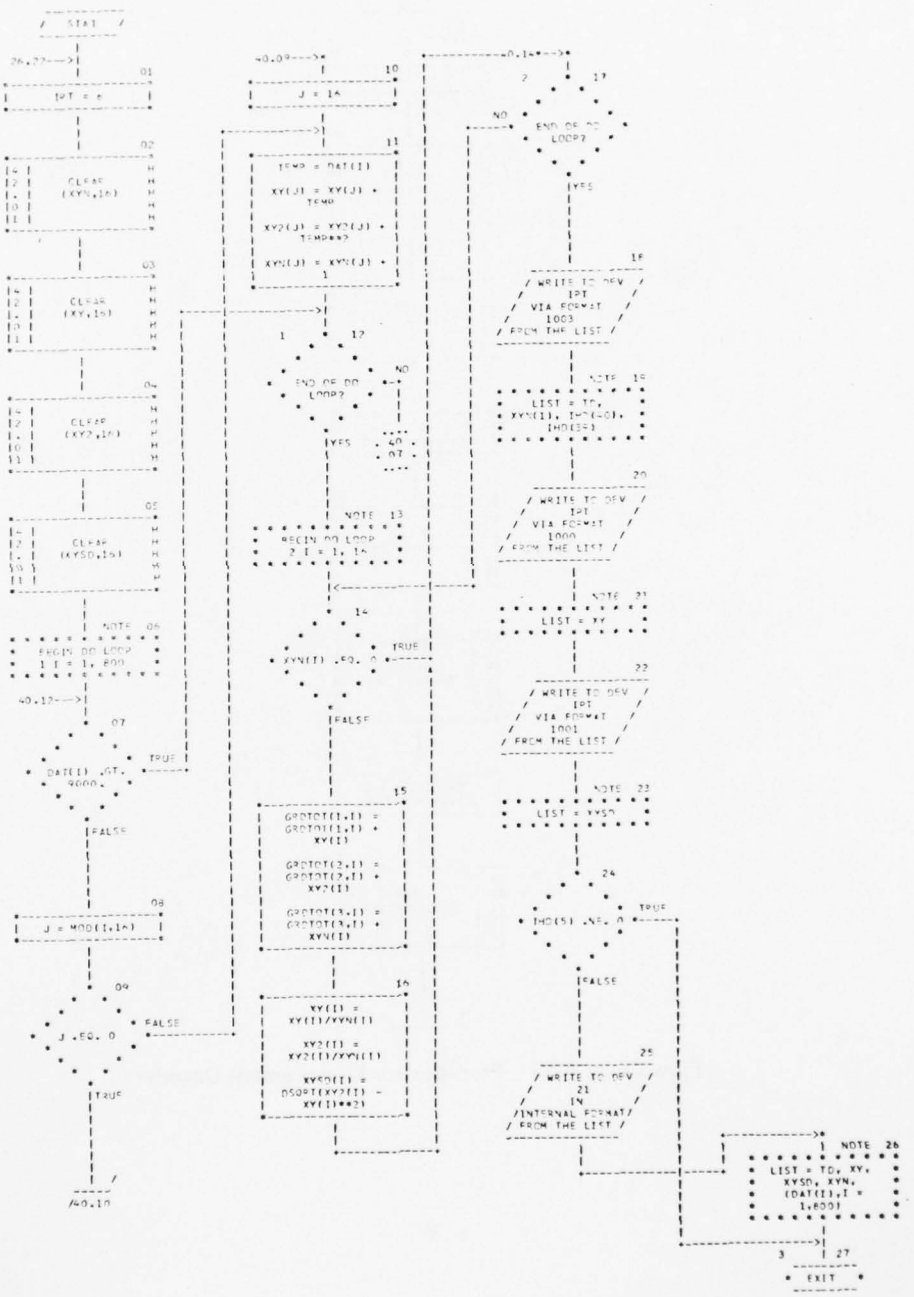
09/28/78 AUTOFLOW CHART SET - LORAN 1 GROUP PHASE PREPROCESSOR PAGE 38

CHART TITLE - SUBROUTINE XY(IDCT,K,DAT,L)



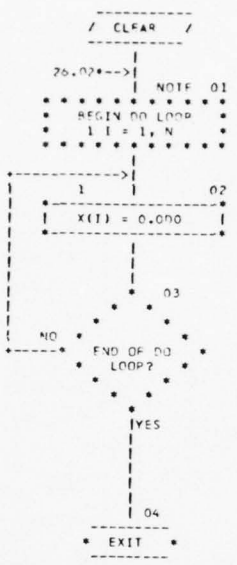
Flow Chart A-17 Preprocessor Measurement Decoder

CHART TITLE = SUBROUTINE STAT(I),DAT)



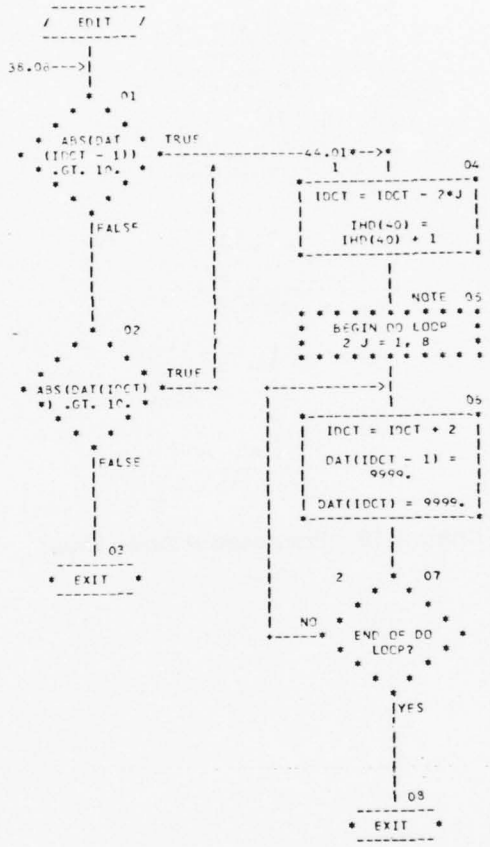
Flow Chart A-18 Preprocessor Intermediate Statistics

CHART TITLE - SUBROUTINE CLEAR(X,N)



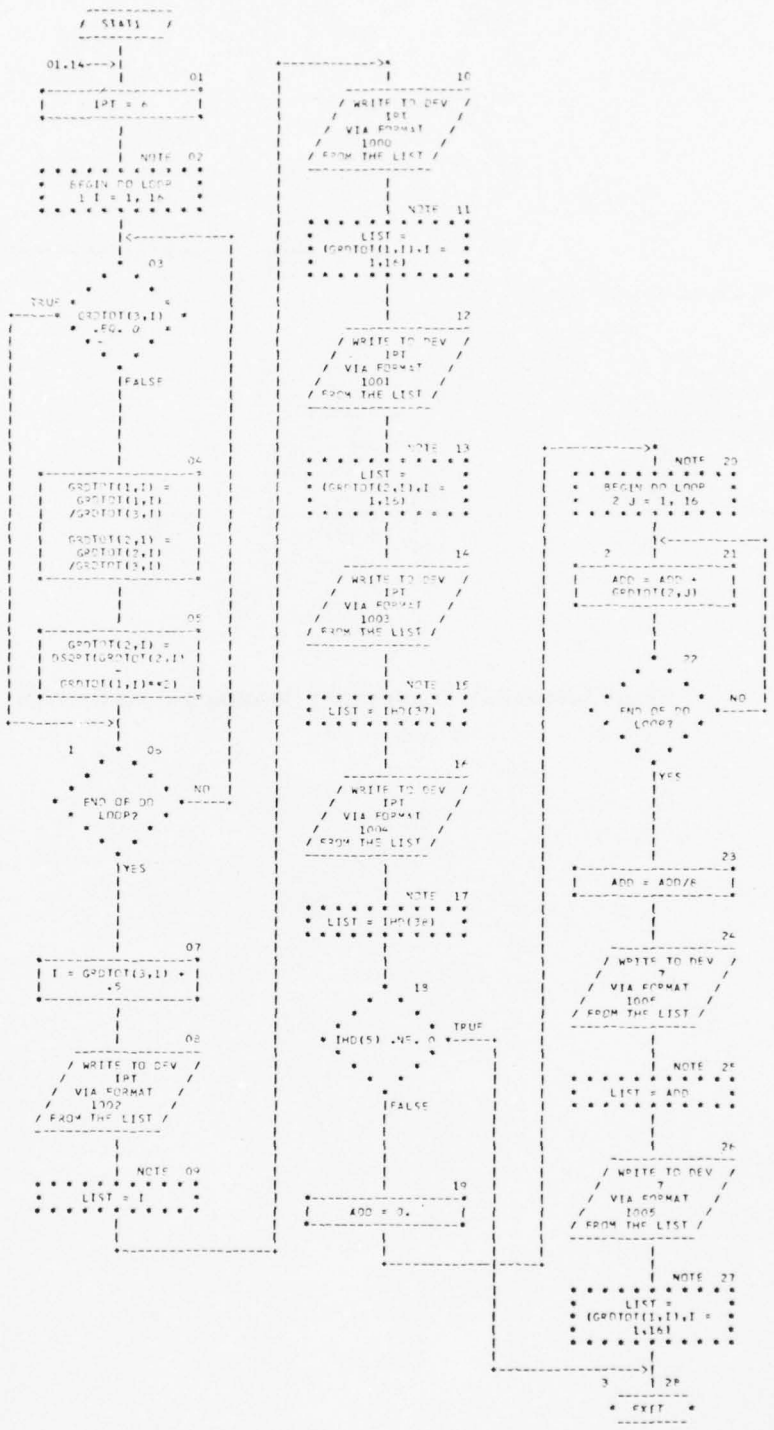
Flow Chart A-19 Preprocessor Array Reset

CHART TITLE - SUBROUTINE EDIT(IDCT,DAT,J)



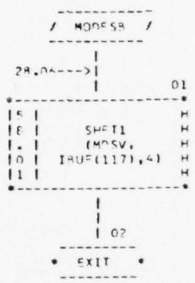
Flow Chart A-20 Preprocessor First-Stage Editor

CHART TITLE - SUPERVISING STATI



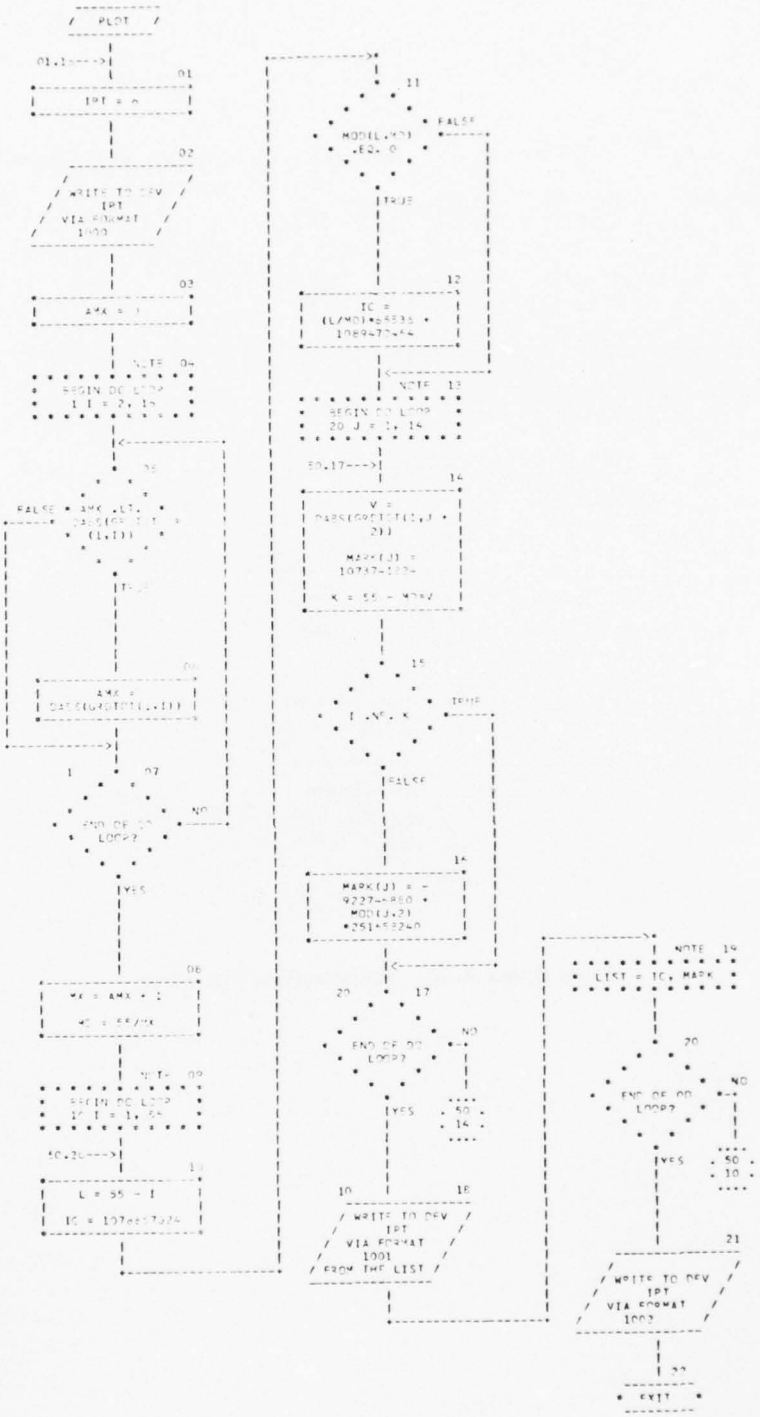
Flow Chart A-21 Preprocessor Final Statistics

CHART TITLE - SUBROUTINE MODESB(MDSV)



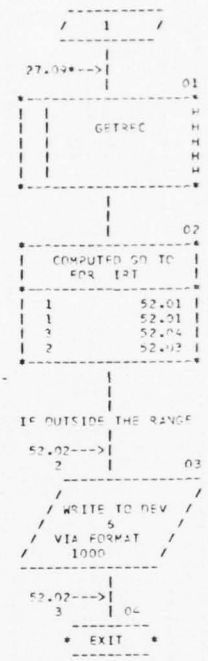
Flow Chart A-22 Preprocessor Recording Mode Decoder

CHART TITLE - SUBROUTINE PLOT



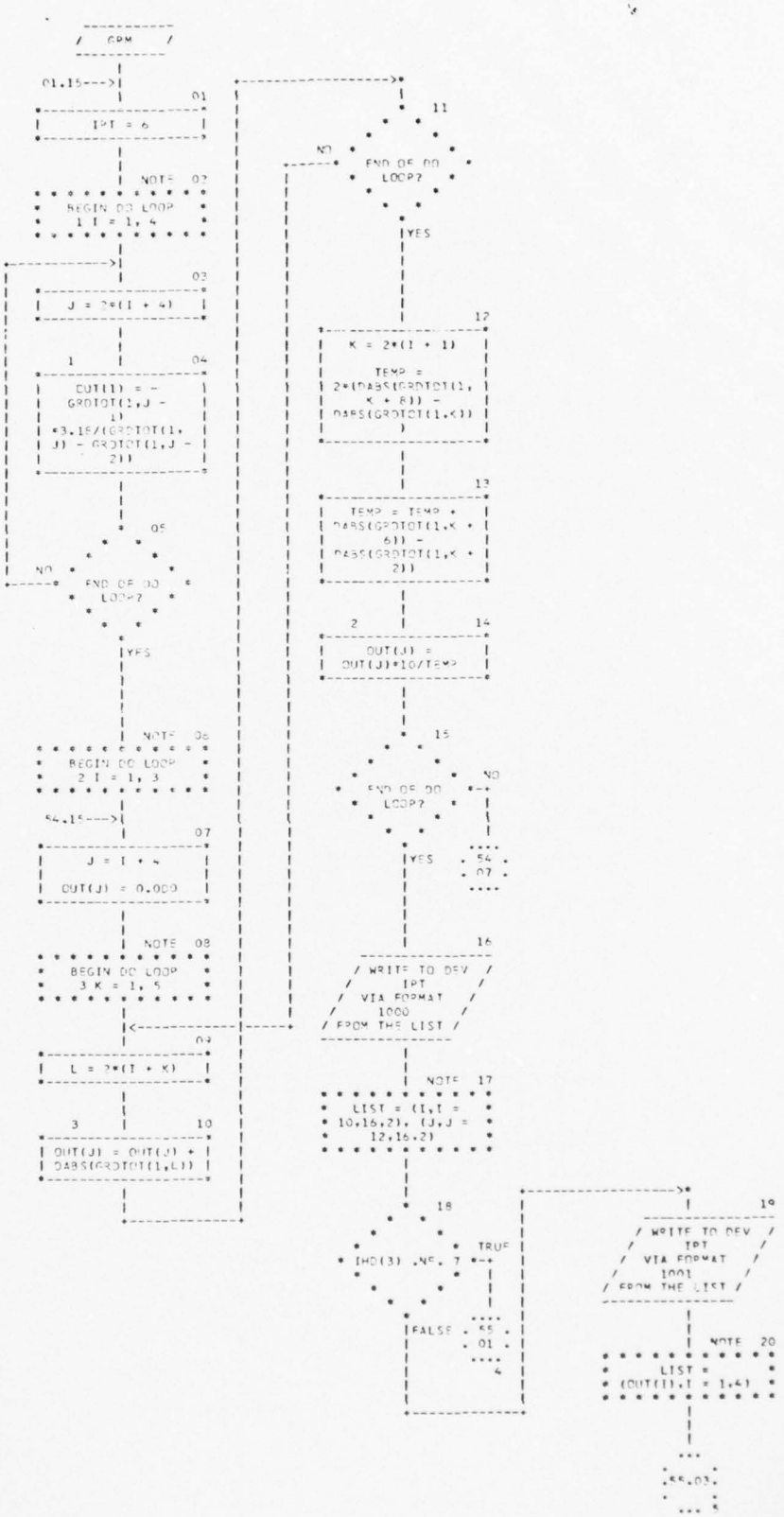
Flow Chart A-23 Preprocessor Plotter

CHART TITLE - SUBROUTINE SKIPFL



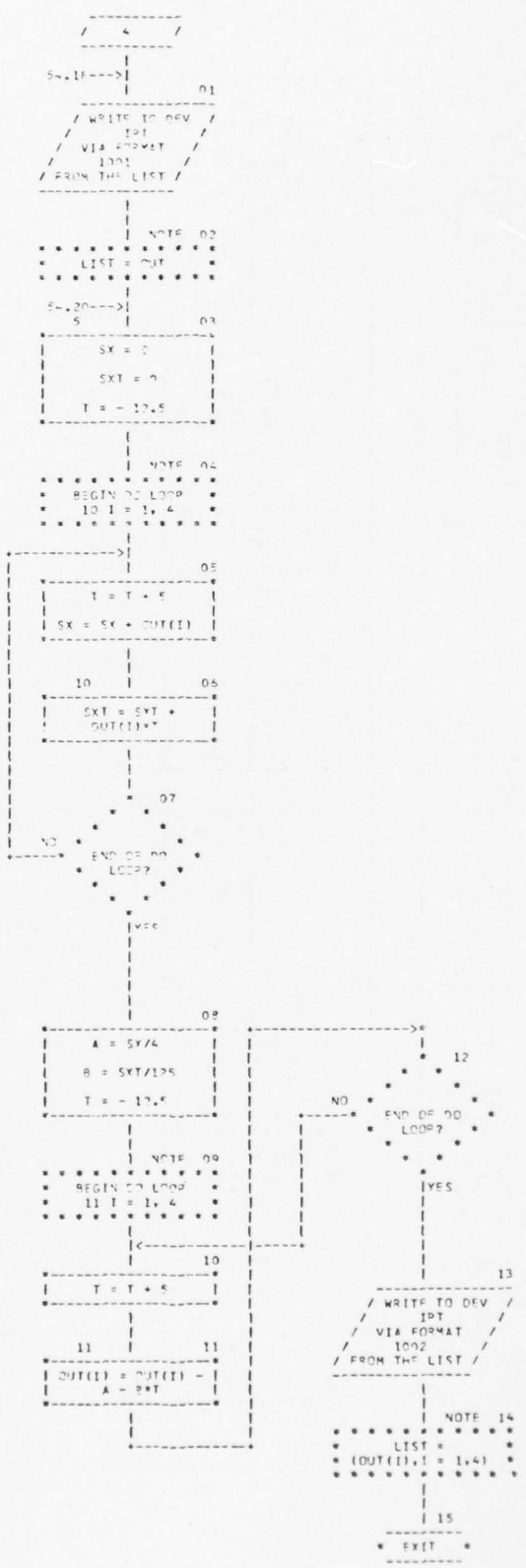
Flow Chart A-24 Preprocessor File Skip

CHART TITLE - SUBROUTINE CPM



Flow Chart A-25 Preprocessor Group Phase Measurement Calculator

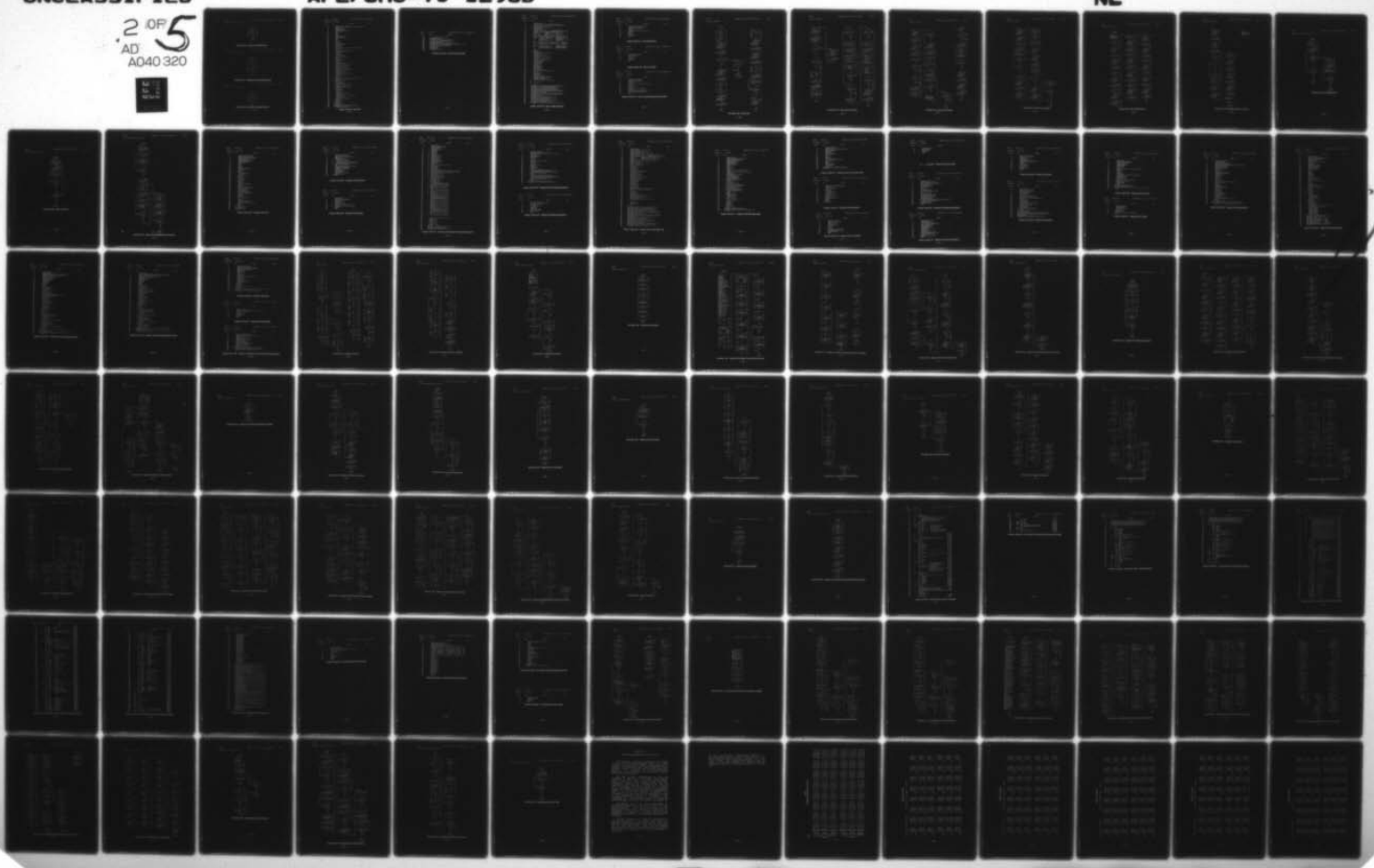
CHART TITLE - SUBROUTINE GPX



Flow Chart A-25 Preprocessor Group Phase Measurement Calculator (concluded)

AD-A040 320 JOHNS HOPKINS UNIV LAUREL MD APPLIED PHYSICS LAB F/G 17/7
EXPERIMENTAL RESEARCH ON THE PROPAGATION OF LORAN-C SIGNALS. VO--ETC(U)
JAN 77 L F FEHLNER, T W JERARDI, T A MCCARTY N00017-72-C-4401
UNCLASSIFIED APL/JHU-TG-1298D NL

2 OF 5
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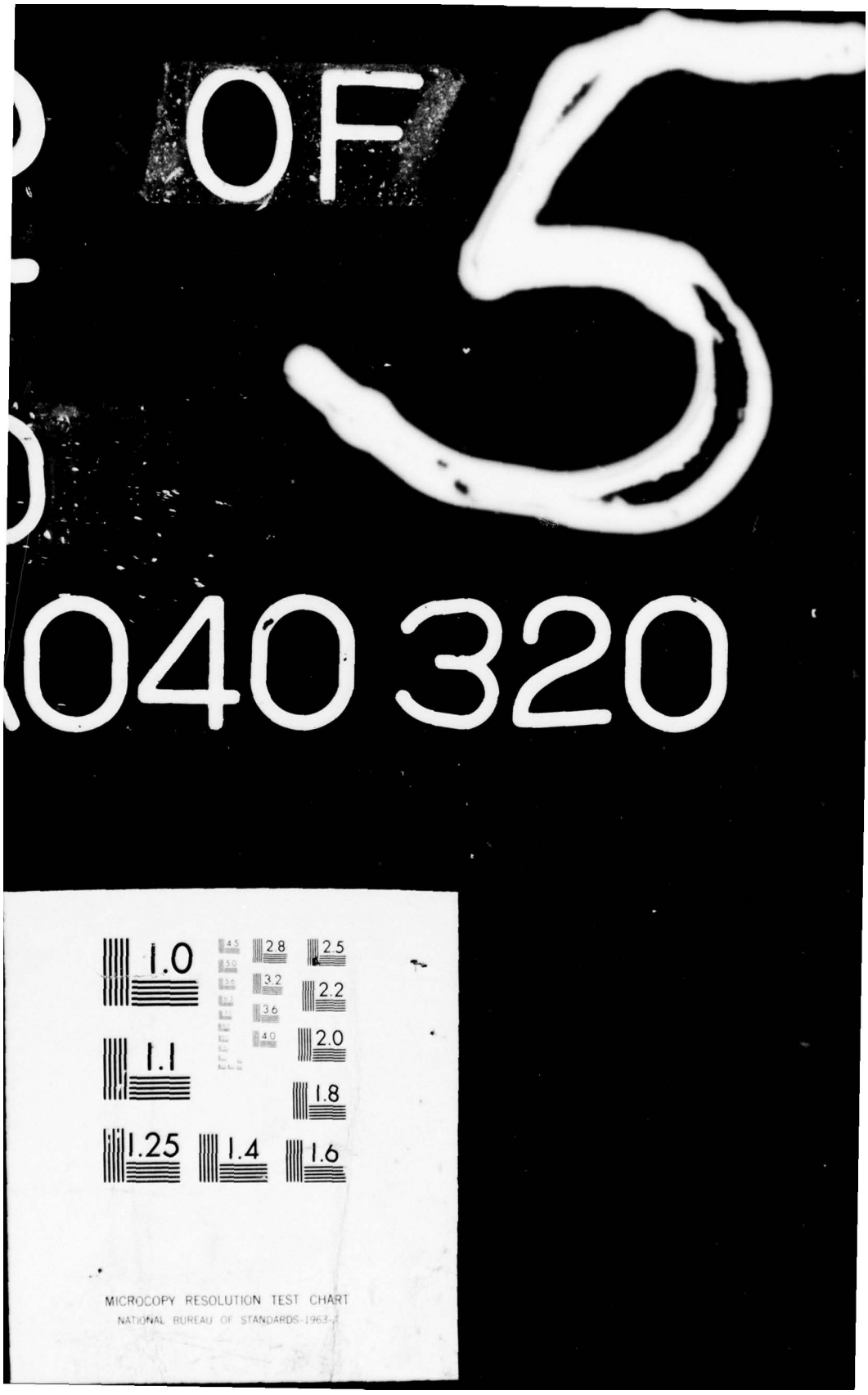
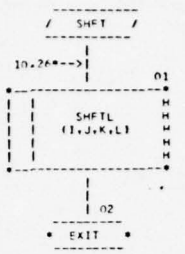
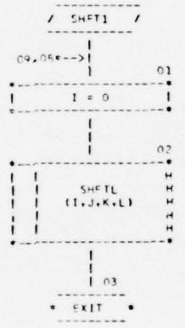

OF
5
040 320
1.0
1.1
1.25
1.4
1.6
1.8
2.0
2.2
2.5
2.8
3.2
3.6
4.0
MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

CHART TITLE - SUBROUTINE SHFT(I,J,K)



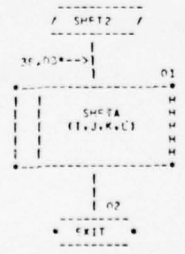
Flow Chart A-26 Preprocessor Logical Shift Caller

CHART TITLE - SUBROUTINE SHFT1(I,J,K)



Flow Chart A-27 Preprocessor Clear and Logical Shift Caller

CHART TITLE - SUBROUTINE SHFT2(I,J,K)



Flow Chart A-28 Preprocessor Arithmetic Shift Caller

FORTRAN MODULE (LIST,NAMSQ)

CARD NO **** CONTENTS ****

```
      IMPLICIT REAL*8 (A-C,E-H,O-Z)
      DIMENSION XY(16),XYSD(16),XYN(16),DAT(800),DATA(16,50),IHD(40),
     1SUM(4,16)
      DIMENSION EDNOM(16)
      DIMENSION SUM1(16)
      DIMENSION OUT(7,100)
      EQUIVALENCE (DATA(1,1),DAT(1))
      COMMON SUM,IHD
      KNT=14
      ICD=5
      IPT=6
      IRD=20
      IWT=21
    3 READ(ICD,1000)THRESH
      IF(THRESH.EQ.0) GO TO 810
      READ(ICD,1007)EDNOM
      KTT=0
      NP=0
      NA=0
      LCNT=0
      ISC=0
      READ(IRD)IHD
      CALL PRNTHD
      WRITE(IPT,1004)THRESH
      WRITE(IPT,1000)EDNOM
      CALL CLEAR(4,16)
      DO 4 I=1,16
    4 SUM1(I)=0.D0
    1 WRITE(IPT,1001)
    2 READ(IRD,END=800,ERR=900)TD,XY,XYSD,XYN,(DAT(I),I=1,800)
      CALL CLEAR(2,16)
      ICNT=0
      DO 11 I=1,50
      CALL EDIT(DAT,EDNOM,THRESH,I,IFLG)
      IF(IFLG.EQ.1) GO TO 11
      ICNT=ICNT+1
      ISC=ISC+1
      DO 10 J=1,16
      TEMP=DATA(J,I)
      SUM(1,J)=SUM(1,J)+TEMP
      SUM1(J)=SUM1(J)+TEMP
      SUM(2,J)=SUM(2,J)+TEMP**2
   10 CONTINUE
   11 CONTINUE
      NE=XYN(1)-ICNT+.1
      IF(ICNT.EQ.0) GO TO 21
      NA=NA+1
      NP=NP+ICNT
      DO 20 I=1,16
      SUM(1,I)=SUM(1,I)/ICNT
      SUM(2,I)=SUM(2,I)/ICNT
      SUM(2,I)=DSQRT(SUM(2,I)-SUM(1,I)**2)
      SUM(3,I)=SUM(3,I)+SUM(1,I)
      SUM(4,I)=SUM(4,I)+SUM(1,I)**2
   20 CONTINUE
   21 WRITE(IPT,1002)TD,ICNT,NE
      WRITE(IPT,1003)(SUM(1,I),I=1,16)
      WRITE(IPT,1004)(SUM(2,I),I=1,16)
      LCNT=LCNT+1
      IF(MOD(LCNT,KNT).NE.0) GO TO 24
      IF(ISC.EQ.0) GO TO 24
      DO 22 I=1,16
   22 SUM1(I)=SUM1(I)/ISC
      WRITE(IPT,1014)KNT,(SUM1(I),I=3,16)
      KTT=KTT+1
      CALL GPM(SUM1,OUT,KTT)
      ISC=0
      DO 23 I=1,16
   23 SUM1(I)=0.
C  24 WRITE(IWT)TD,ICNT,((SUM(1,J),J=1,16),(SUM(2,K),K=1,16),
C     1(DAT(L),L=1,800)
   24 IF(MOD(LCNT,KNT).EQ.0) GO TO 1
      GO TO 2
  800 IF(NA.EQ.0) GO TO 3
      DO 801 I=1,16
      SUM(3,I)=SUM(3,I)/NA
      SUM(4,I)=SUM(4,I)/NA
      SUM(4,I)=DSQRT(SUM(4,I)-SUM(3,I)**2)
  801 CONTINUE
      WRITE(IPT,1006)NP,NA
      WRITE(IPT,1003)(SUM(3,I),I=1,16)
      WRITE(IPT,1004)(SUM(4,I),I=1,16)
      ADD=0.
      DO 25 I=1,16
  802 ADD=ADD+SUM(4,I)
   25 SUM1(I)=SUM(3,I)
      ADD=ADD/4
      WRITE(7,1015)ADD
      WRITE(7,1015)(SUM(3,I),I=1,16)
      KTT=KTT+1
      CALL GPM(SUM1,OUT,KTT)
      WRITE(IPT,1011)
      WRITE(IPT,1012)((I,I=10,16,2),(J,J=12,16,2)
      DO 26 I=1,KTT
      IF(I.NE.KTT) GO TO 26
      WRITE(IPT,1014)
   26 WRITE(IPT,1013)(OUT(J,I),J=1,7)
C     ENDFILE IWT
      GO TO 3
  810 REWIND IRD
C     REWIND IWT
      STOP
  900 WRITE(IPT,100A)TD
      GO TO 2
 1000 FORMAT(5F10.0)
 1001 FORMAT(1H1,16(2X,'AVG','2X)/(1X,16(3X,'S.DEV')/)
 1002 FORMAT(' BLOCK TIME = ',F12.7,
     110X,'TOTAL PULSES KEPT =',I3,
```

Program Listing A-29 Editor Driver

```
CARD NO      ****                    CONTENTS                    ****

  109            210X,'TOTAL PULSES EDITED =',I3)
  110         1003 FORMAT(1X,16FA.4)
  111         1004 FORMAT(2X,16FA.4,/)
  112         1005 FORMAT(' TOTAL NO. OF PULSES USED =',I6,
  113             110X,'TOTAL NO. OF AVERAGES USED =',I5)
  114         1006 FORMAT(' PARITY ERROR AT TIME =',F12.7)
  115         1007 FORMAT(8F9.4/8F9.4)
  116         1008 FORMAT('0',34X,'EDITING WINDOW =',F4.2,' VOLTS')
  117         1009 FORMAT('0',34X,'EDITING AVERAGES USED =',/,20X,8F9.5,/,25X,8F9.5)
  118         1010 FORMAT(2X,I2,' BLOCK AVG. =',14F8.4)
  119         1011 FORMAT(4(6X,'T ',I2),3(4X,'GPM ',I2))
  120         1012 FORMAT(7F10.3)
  121         1013 FORMAT(1H1)
  122         1014 FORMAT(1H0)
  123         1015 FORMAT(8F9.4,/,8F9.4)
  124              END
```

Program Listing A-29 Editor Driver (concluded)

FORTRAN MODULE (LIST,NAMSQ)

CARD NO **** CONTENTS ****

```
      SUBROUTINE PRNTHD
      DOUBLE PRECISION ASITE,AXMTR,AMODE,WEATH1,WEATH2,ANOTE
      DIMENSION ASITE(3,12),AXMTR(2,9),AMODE(3,8),IHD(40),IBUF(128)
      DIMENSION WIND(2)
      DIMENSION WEATH1(2,5),WEATH2(2,10)
C     DIMENSION ANOTE(2,2)
      COMMON IBUF,IHD
      DATA WIND/' LOW',' HIGH'/
      DATA WEATH1/'CLEAR   ',' ','SCATTERE','D TO 50%',
     1'BROKEN T','O 90%  ','OVERCAST',' TO 100%','OBSCURAT','ION 100%'/
      DATA WEATH2/'THUNDERS','TORMS  ','RAIN SHO','WERS   ',
     1'DRIZZLE ',' ','FREEZING',' DRIZZLE','SNOW  ',' ',
     2'HAIL  ',' ','GROUND F','OG  ','FOG COVE','R  ',
     3'SUNNY  ',' ','HAZE  ',' '/
C     DATA ANOTE/'SEE LOG','**********',' NO PROBL','EMS*****'/
      DATA ASITE/'NAVAL OB','SERVATOR','Y, D.C.','CAROLINA',' BEACH O',
     1'NE  ','CAROLINA',' BEACH T','WO  ','CAROLINA',' BEACH T',
     2'HREE  ','CAROLINA',' BEACH F','OUR  ','DANA ONE',' ',
     3' ','DANA TWO',' ',' ','DANA THR','EE  ',
     4' ','NANTUCKE','T ONE  ',' ','NANTUCKE','T TWO  ',
     5' ','NANTUCKE','T THREE ',' ','APL/JHU ',' ',
     6' '/
      DATA AXMTR/'CAROLINA',' BEACH  ',' JUPITER ',' INLET  ',' CAPE RAC',
     1'E  ','NANTUCKE',' T  ','DANA  ',' ','CAPE MAY',
     2' ','LORAN SI','MULATER ','100 KH C','ESIUM  ','SPECIAL ',
     3'TEST  '/
      DATA AMODE/'PRIMARY ',' DATA  ',' ','SKYWAVE ',' STUDY  ',
     1' ','CALIBRAT',' ION RUN ',' ','LAB EQUI',' PMENT TE',
     2'ST  ',' VAN EQUI',' PMENT TE',' ST  ',' ANCILLAR',' Y DATA  ',
     3' ',' SKYWAVE ',' DIURNAL ',' ','SKYWAVE ',' DETACHED',
     4' '/
      INT=21
      IPT=6
      WRITE(IPT,1011)
      IY=70+IHD(2)
      WRITE(IPT,1004)IHD(23),IHD(22),IY
      IY=1970+IHD(2)
      WRITE(IPT,1001)IHD(1),IY
      J=IHD(4)+1
      WRITE(IPT,1002)(ASITE(I,J),I=1,3)
      J=IHD(3)+1
      WRITE(IPT,1003)(AXMTR(I,J),I=1,2)
      J=IHD(5)+1
      WRITE(IPT,1004)(AMODE(I,J),I=1,3)
      WRITE(IPT,1012)IHD(9)
      HD=IHD(6)*.03186
      WRITE(IPT,1005)HD
      WRITE(IPT,1004)
      HD=IHD(7)/10.
      WRITE(IPT,1007)HD
      HD=IHD(8)/10.
      WRITE(IPT,1004)HD
      WRITE(IPT,1008)
      HD=IHD(10)/10.
      WRITE(IPT,1004)HD
      WRITE(IPT,1010)IHD(11)
      WRITE(IPT,1013)IHD(12),IHD(13),IHD(14)
      M=1
      K=IHD(15)/10
      IF(K.GT.4) M=2
      K=MOD(K,5)+1
      L=MOD(IHD(15),10)+1
      WRITE(IPT,1014)
      WRITE(IPT,1016)(WEATH1(N,K),N=1,2)
      WRITE(IPT,1017)(WEATH2(N,L),N=1,2)
      WRITE(IPT,1015)WIND(M)
      WRITE(IPT,1019)IHD(17)
C     WRITE(IPT,1016)(ANOTE(N,IHD(16)+1),N=1,2)
C
C
C     WRITE(IWT)IHD
C
C
C
    1 RETURN
 1000 FORMAT(35X,'GROUP/PHASE TEST PREPROCESSING',2X,I2,2('/',I2))
 1001 FORMAT('0',34X,'JULIAN DAY NO.',I4,9X,'YEAR NO.',I5)
 1002 FORMAT('0',34X,'DATA RECORDED AT:',3X,3A8)
 1003 FORMAT('0',34X,'TRANSMITTER LOCATED AT:',3X,2A8)
 1004 FORMAT('0',34X,'DATA RECORDING MODE:',3X,3A8)
 1005 FORMAT('0',34X,'ATMOSPHERIC PRESSURE:',F7.1,' MILLIBARS')
 1006 FORMAT('0',34X,'EXTERNAL TEMPERATURE (DEGREES CENTIGRADE):')
 1007 FORMAT(45X,'WET BULB',F5.1)
 1008 FORMAT(45X,'DRY BULB',F5.1)
 1009 FORMAT('0',34X,'INTERNAL TEMPERATURE (DEGREES CENTIGRADE):')
 1010 FORMAT('0',34X,'PRED. TIME CALIB:',I11,'.0E-09 SECONDS')
C1011 FORMAT('1',//////)
 1011 FORMAT('1',/////)
 1012 FORMAT('0',34X,'ATTENUATION IN DB:',I3)
 1013 FORMAT('0',34X,'START TIME:',I4,':',I2,':',I2)
 1014 FORMAT(45X,'CLOUD COVER: ',2A8)
 1015 FORMAT(45X,A4,' GROUND WINDS')
C1016 FORMAT(////,35X,'***********',2A8,'***********')
 1017 FORMAT(45X,'GENERAL CONDITION: ',2A8)
 1018 FORMAT('0',34X,'WEATHER:')
 1019 FORMAT('0',34X,'GROUP REPETITION INTERVAL:',I4,'.0E-04')
      END
```

Program Listing A-30 Editor Header Page Printer

```
09/27/76        INPUT LISTING                          AUTOFLOW CHART SET - LORAN 2  GROUP PHASE EDITOR

FORTRAN MODULE      (LIST,NAMSQ)

 CARD NO      ****                          CONTENTS                          ****

      1              SUBROUTINE EDIT(DATA,XY,TH,I,IFLG)
      2              IMPLICIT REAL*8 (A-C,E-H,O-Z)
      3              DIMENSION XY(16),DATA(16,50)
      4              IFLG=0
      5              DO 1 J=1,16
      6              IF(DABS(DATA(J,I)-XY(J)).GT.TH) GO TO 2
      7            1 CONTINUE
      8              RETURN
      9            2 IFLG=1
     10              DO 3 J=1,16
     11            3 DATA(J,I)=9999.
     12              RETURN
     13              END
```

Program Listing A-31 Second-Stage Editor

```
09/27/76        INPUT LISTING                          AUTOFLOW CHART SET - LORAN 2  GROUP PHASE EDITOR

FORTRAN MODULE      (LIST,NAMSQ)

 CARD NO      ****                          CONTENTS                          ****

      1              SUBROUTINE CLEAR(I,J)
      2              IMPLICIT REAL*8(A-H,O-Z)
      3              DIMENSION A(4,14)
      4              COMMON A
      5              DO 1 II=1,I
      6              DO 1 JJ=1,J
      7            1 A(II,JJ)=0.00
      8              RETURN
      9              END
```

Program Listing A-32 Editor Array Reset

```
09/27/76        INPUT LISTING                          AUTOFLOW CHART SET - LORAN 2  GROUP PHASE EDITOR

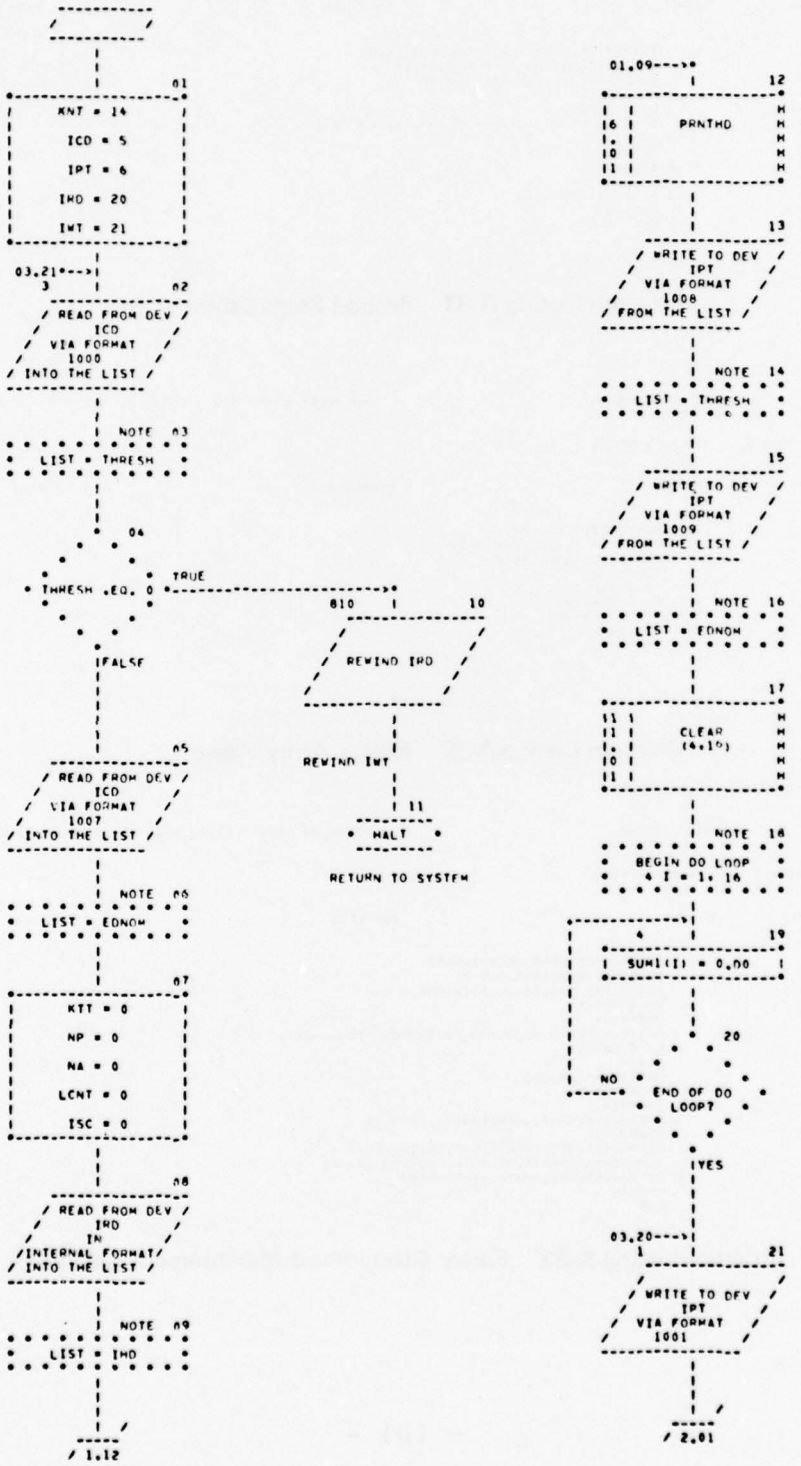
FORTRAN MODULE      (LIST,NAMSQ)

 CARD NO      ****                          CONTENTS                          ****

      1              SUBROUTINE GPM(SUM,OUT,KNT)
      2              IMPLICIT REAL*8(A-H,O-Z)
      3              DIMENSION SUM(14),OUT(7,100)
      4              DO 1 I=1,4
      5              J=2*(I+4)
      6            1 OUT(I,KNT)=-SUM(J-1)*3.18/(SUM(J)-SUM(J-2))
      7              DO 2 I=1,3
      8              J=I+4
      9              OUT(J,KNT)=0.000
     10              DO 3 K=1,5
     11              L=2*(I+K)
     12            3 OUT(J,KNT)=OUT(J,KNT)+DABS(SUM(L))
     13              K=2*(I+1)
     14              TEMP=2*(DABS(SUM(K+8))-DABS(SUM(K)))
     15              TEMP=TEMP+DABS(SUM(K+6))-DABS(SUM(K+2))
     16            2 OUT(J,KNT)=10.*OUT(J,KNT)/TEMP
     17              RETURN
     18              END
```

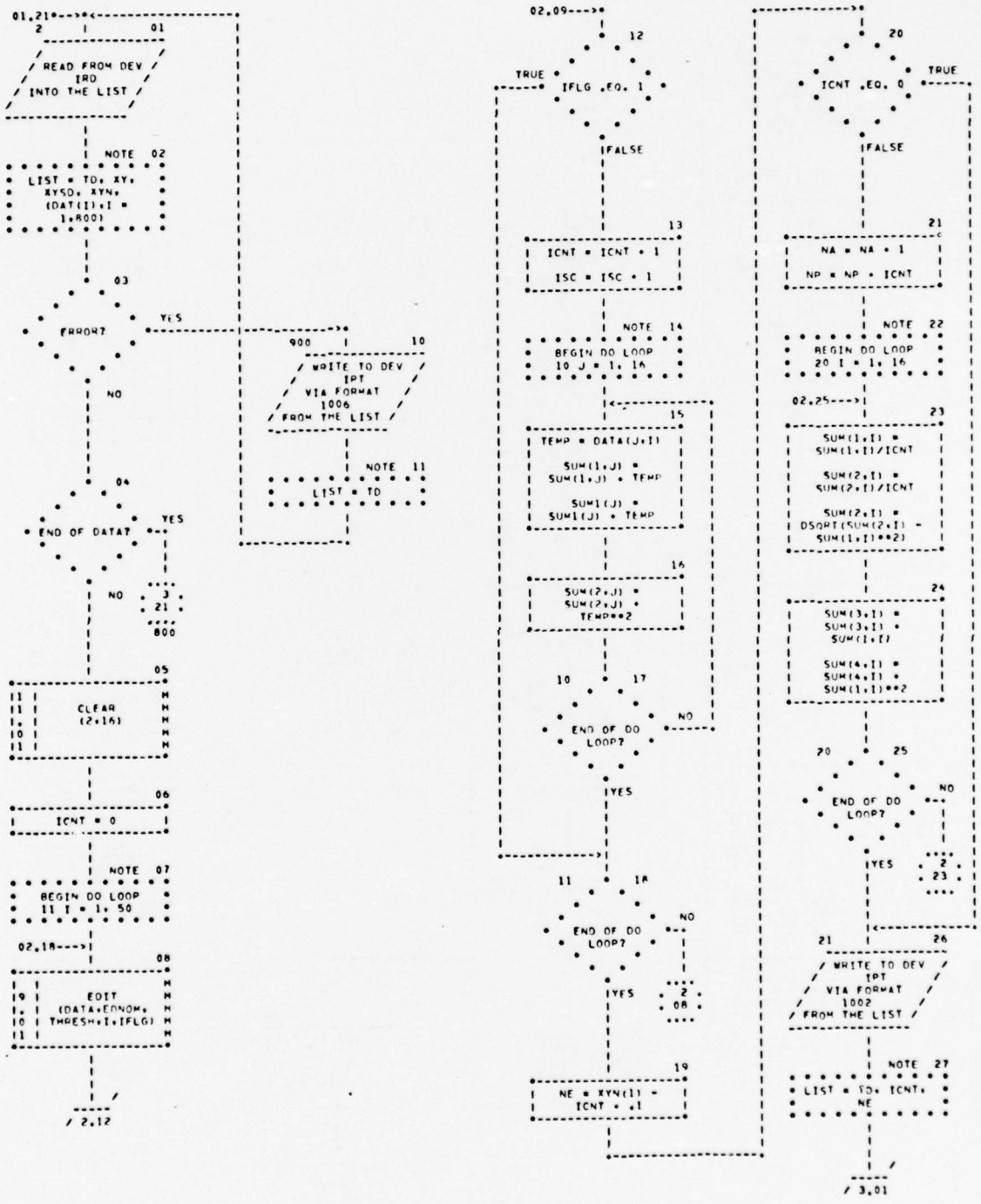
Program Listing A-33 Editor Group Phase Measurement Calculator

CHART TITLE - PROCEDURES



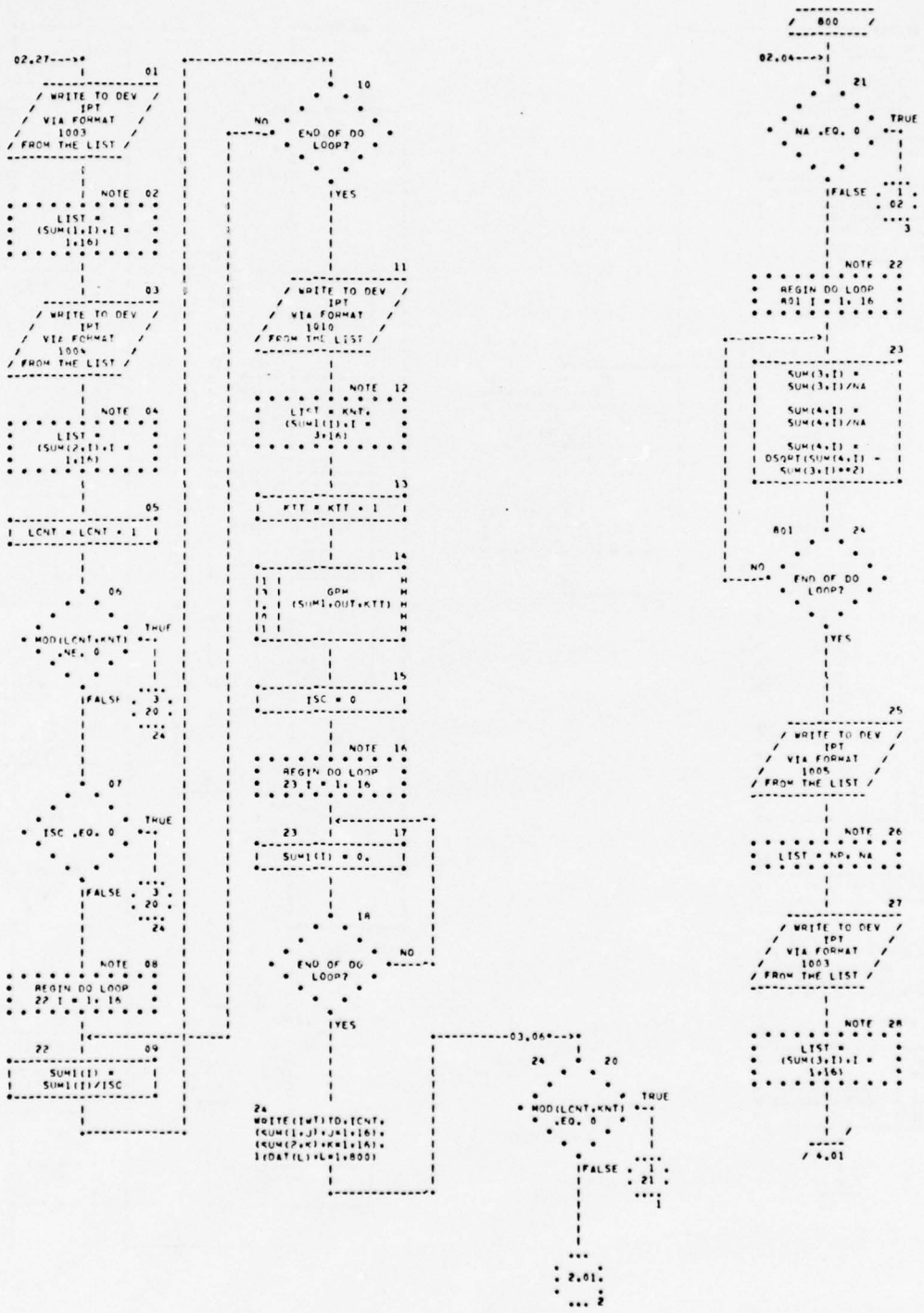
Flow Chart A-29 Editor Driver

CHART TITLE - PROCEDURES



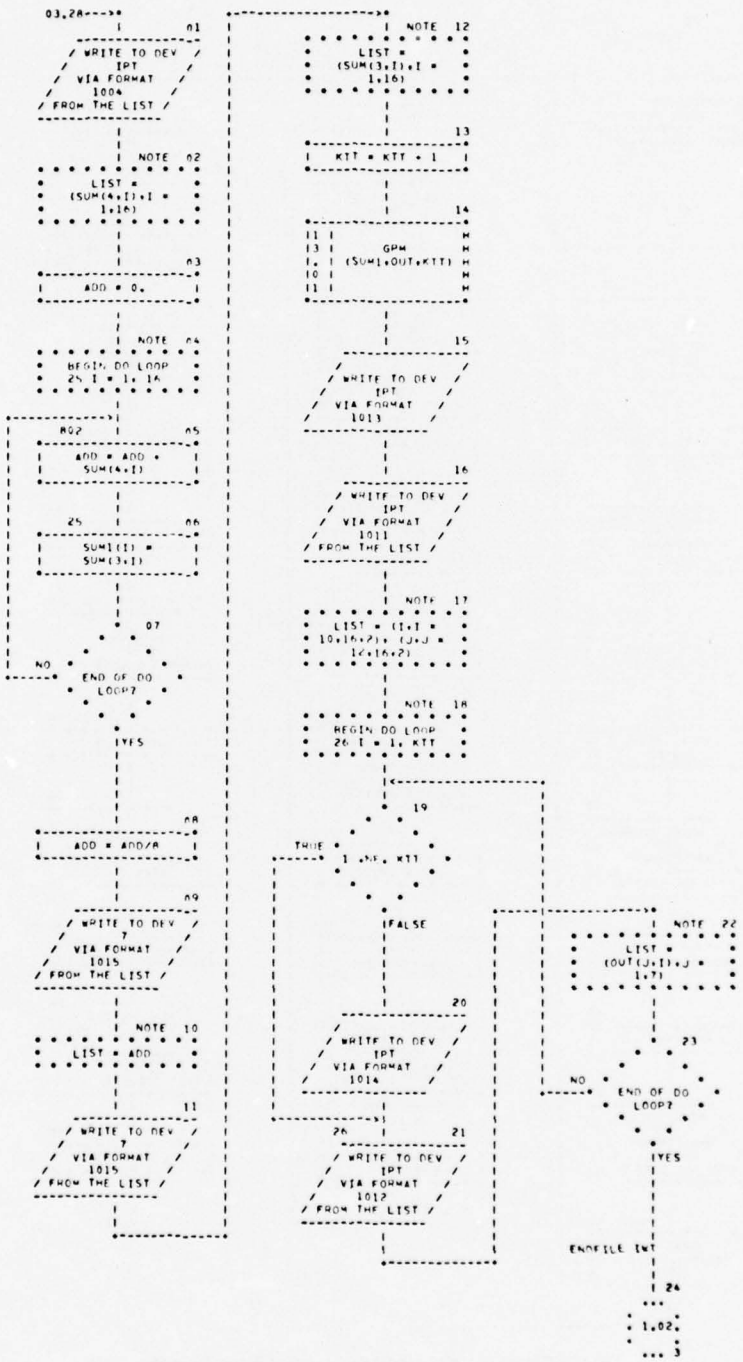
Flow Chart A-29 Editor Driver (continued)

CHART TITLE - PROCEDURES



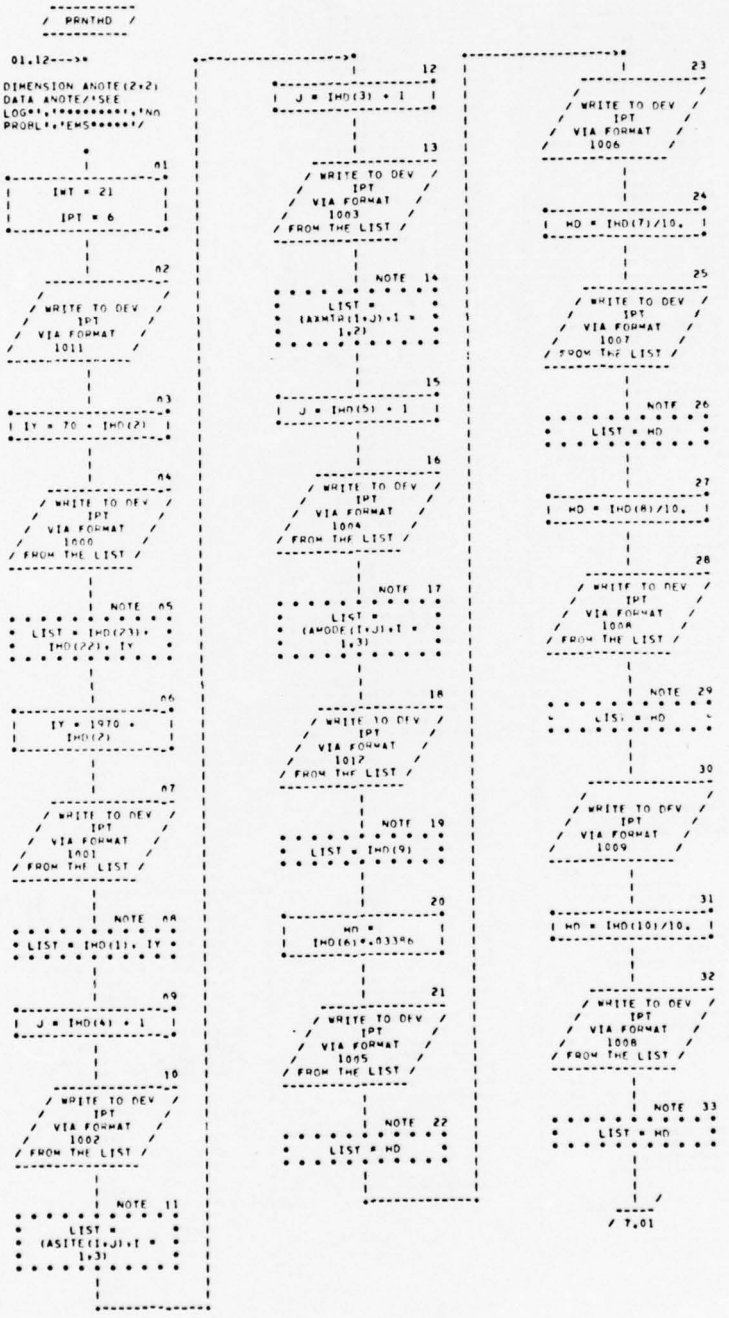
Flow Chart A-29 Editor Driver (continued)

CHART TITLE - PROCEDURES



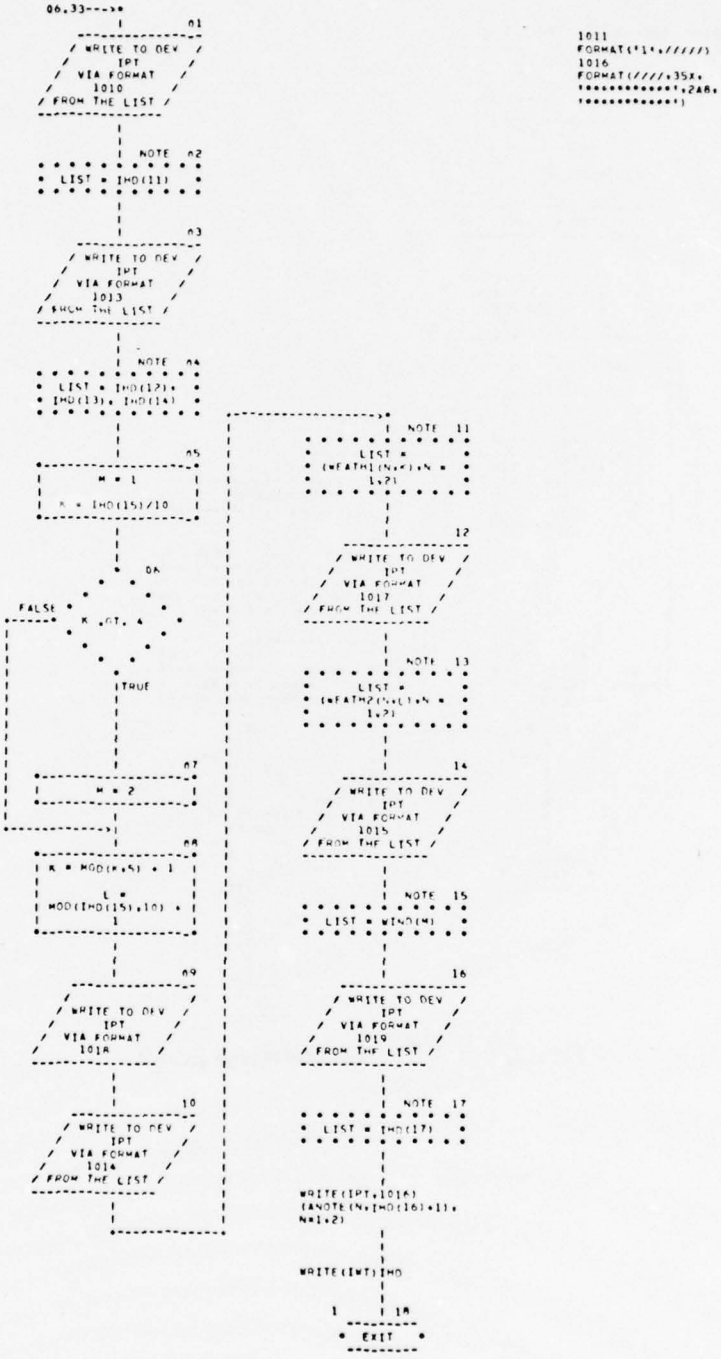
Flow Chart A-29 Editor Driver (concluded)

CHART TITLE = SUBROUTINE PRNTHD



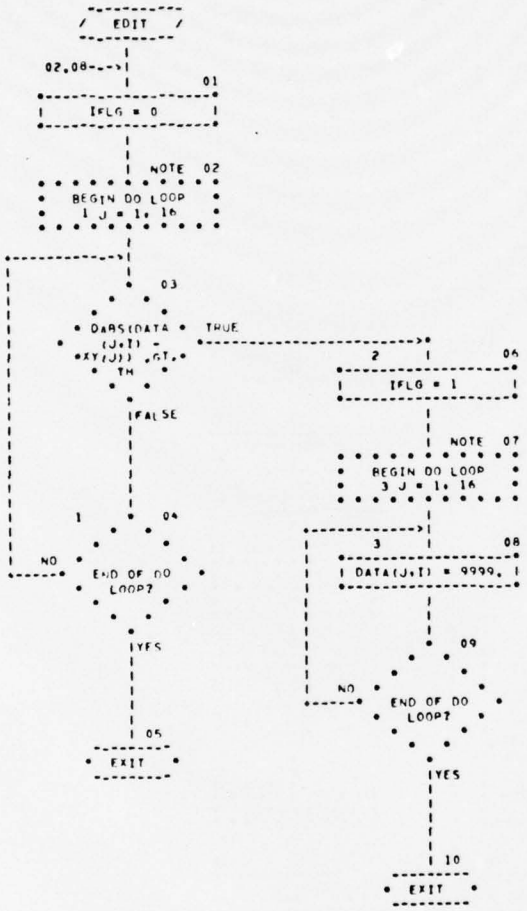
Flow Chart A-30 Editor Header Page Printer

CHART TITLE - SUBROUTINE PRNTHD



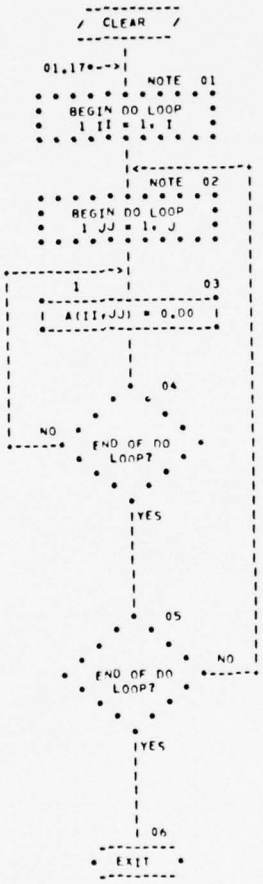
Flow Chart A-30 Editor Header Page Printer (concluded)

CHART TITLE - SUBROUTINE EDIT(DATA,XY,TH,I,IFLG)



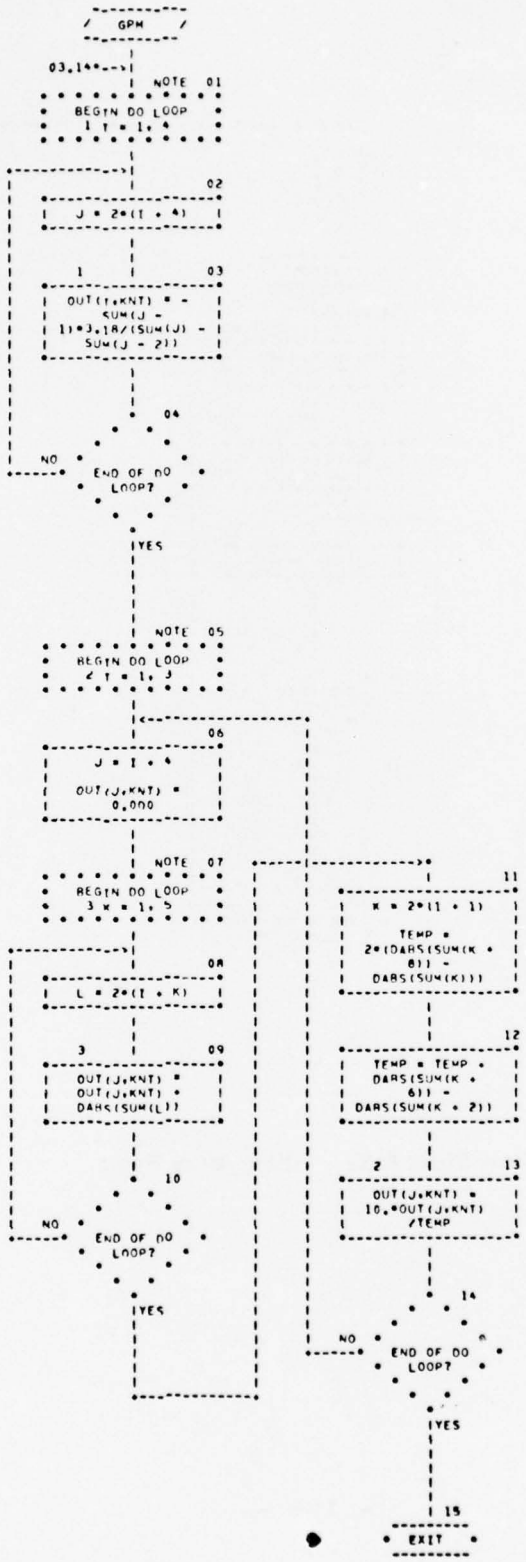
Flow Chart A-31 Second-Stage Editor

CHART TITLE - SUBROUTINE CLEAR(I,J)



Flow Chart A-32 Editor Array Reset

CHART TITLE - SUBROUTINE GPM(SUM,OUT,KNT)



Flow Chart A-33 Editor Group Phase Measurement Calculator

FORTRAN MODULE (LIST,NAMSQ)

```
CARD NO ****                    CONTENTS                    ****

      1          IMPLICIT REAL*8(A-C,E-H,O-Z)
      2          DIMENSION B(256,2),AVGPWR(2)
      3          DIMENSION JCHK(5),IHD(40),IBUF(128)
      4          DIMENSION GRDTOT(3,32),ARR(8194,2)
      5          DIMENSION DQI(8192)
      6          COMMON IHD,GRDTOT,ARR,DQI,B
      7          COMMON/GETCAT/IRT,IBUF
      8          COMMON/CARD/TTA,SDTOA,SN,FS
      9          COMMON/PRINT/IPT
     10          IPT=6
     11          IRC=0
     12          IFLG=0
     13          TP=62.5
     14          PHI=0.0
     15          ECD=0.0
     16        1 CALL CRDIN(JCHK,AEF)
     17          IF(JCHK(1).EQ.999) GO TO 4
     18          CALL INIT
     19          ITRY=0
     20        2 CALL RDHD
     21          CALL CODE(ITRY)
     22          IF(ITRY.EQ.0) GO TO 8
     23          IF(ITRY.LE.7) GO TO 2
     24          ENDFILE 21
     25          CALL SKIPFL
     26          GO TO 1
     27        8 CALL PRNTTL(IHD,IPT)
     28          CALL PRNTHD
     29          CALL MAINE
     30          CALL COMP(TADJ)
     31          CALL STATI
     32        5 CALL HIST
     33          CALL PLOT
     34          IF(JCHK(2).EQ.0) GO TO 3
     35          IF(JCHK(3).EQ.0) GO TO 6
     36          CALL TOA
     37          CALL AMP
     38        6 CALL OFFTA(ARR,IHD(25),0)
     39          CALL OFFTA(ARR(1,2),IHD(25),0)
     40          CALL PLOT(AVGPWR)
     41          IF(JCHK(3).EQ.0) GO TO 7
     42          CALL EDITP(AVGPWR)
     43          CALL PLOT(AVGPWR)
     44        7 CALL OFFTA(ARR,IHD(25),2)
     45          CALL OFFTA(ARR(1,2),IHD(25),2)
     46          IF(JCHK(3).EQ.0) GO TO 3
     47          CALL HIST
     48          CALL MVAMP
     49        3 CALL PRNTTL(IHD,IPT)
     50          CALL PRNTHD
     51          CALL SNFS(JCHK,AEF,1)
     52          CALL TOA
     53          CALL AMP
     54          IF(JCHK(3).NE.0) GO TO 1
     55          CALL SNFS(JCHK,AEF,2)
     56          WRITE(7,100)(IHD(I),TTA,SDTOA,SN,FS
     57          WRITE(7,1002)TP,PHI,ECD,TADJ
     58          GO TO 1
     59        4 REWIND 21
     60          WRITE(7,1001)
     61          STOP
     62     1000 FORMAT(16,4D16.9)
     63     1001 FORMAT(3X,'999')
     64     1002 FORMAT(4F15.5)
     65          END
```

Program Listing A-34 Frequency Filter Driver

09/28/76 INPUT LISTING AUTOFLOW CHART SET - LORAN 3 GROUP PHASE FILTER

FORTRAN MODULE (LIST,NAMSQ)

CARD NO **** CONTENTS ****

```
      1                SUBROUTINE CRDIN(JCHK,AEF)
      2                IMPLICIT REAL*8(A-C,E-H,O-Z)
      3                DIMENSION JCHK(5),IBUF(128),IHD(40)
      4                COMMON IHD
      5                COMMON/GETDAT/IRT,IBUF
      6                COMMON/PRINT/IPT
      7          C     1 = POWER OF TWO (999 STOP)
      8          C     2 = FOURIER (1=YES,0=NO)
      9          C     3 = FILTER LEVEL(NOT EQ ZERO-AMP CALC AT T12)
     10          C     4 = T READING FOR AMPLITUDE CALCULATION
     11          C     IHD(29) = PROCESS DAY NUMBER
     12          C     AEF = ANT EFFECTIVE HEIGHT
     13                IRD=5
     14              3 READ(IRD,1000)(JCHK(I),I=1,5),IHD(29),AEF
     15                IF(JCHK(1).EQ.0) JCHK(1)=12
     16                IF(JCHK(4).EQ.0) JCHK(4)=91
     17                IF(JCHK(5).EQ.0) JCHK(5)=18
     18                IF(AEF.EQ.0) AEF=.007
     19                IHD(26)=JCHK(5)
     20                IHD(27)=JCHK(3)
     21                IHD(28)=2**JCHK(1)
     22                IF(JCHK(3).NE.0) IHD(26)=12
     23              1 RETURN
     24           1000 FORMAT(6I6,F6.2)
     25                END
```

Program Listing A-35 Frequency Filter Card Input

09/28/76 INPUT LISTING AUTOFLOW CHART SET - LORAN 3 GROUP PHASE FILTER

FORTRAN MODULE (LIST,NAMSQ)

CARD NO **** CONTENTS ****

```
      1                SUBROUTINE INIT
      2                IMPLICIT REAL*8(A-H,O-Z)
      3                DIMENSION IHD(40),GROTOT(3,32)
      4                COMMON IHD,GROTOT
      5                IHD(25)=0
      6          C     IHD(35)=PULSE COUNT
      7                IHD(35)=0
      8                CALL CLEAR(GROTOT,192)
      9          C     IHD(37) IS TOTAL NO. OF REJECTED PULSES
     10                IHD(37)=0
     11          C     IHD(38) IS TOTAL NO OF MISSING RECORDS
     12                IHD(38)=0
     13                RETURN
     14                END
```

Program Listing A-36 Frequency Filter Initializer

FORTRAN MODULE (LIST,NAMSQ)

```
CARD NO  ****                    CONTENTS                    ****

     1          SUBROUTINE RDHD
     2          DIMENSION IBUF(128),IHD(40)
     3          DOUBLE PRECISION GRDTOT(3,32)
     4          COMMON IHD,GRDTOT
     5          COMMON/GETDAT/IRT,IBUF
     6          COMMON/PRINT/LPT
     7      C   1=JULIAN DAY
     8      C   2=YEAR-1970
     9      C   3=XMTR NO.
    10      C   4=SITE NO.
    11      C   5=DATA MODE
    12      C   6=ATMOS PRESS
    13      C   7=OUTSIDE WET BULB
    14      C   8=OUTSIDE DRY BULB
    15      C   9=ATTENUATION
    16      C   10=INSIDE DRY BULB
    17      C   11=OBJECT OF RUN
    18      C   12=HOURS START TIME
    19      C   13=MINUTES START TIME
    20      C   14=SECONDS START TIME
    21      C   15=WEATHER CODE
    22      C   16=NOTE CODE
    23      C   17=GRI
    24      C   18=START TIME IN SECONDS AFTER MIDNIGHT
    25      C   19=MODE OF RUN
    26      C   20=MISSION OF RUN
    27      C   21=RUN NUMBER
    28      C   22=DAY NUMBER
    29      C   23=MONTH NUMBER
    30      C   25=FFT POINT FLAG(SUB XY)
    31      C   26=AMP CALC ON 3RD CYCLE OR PEAK OF PULSE---SET IN CRDIN
    32      C   27=FILTER LEVEL MULTIPLIER USED IN EDITF-----SET IN CRDIN
    33      C   28=POWER OF 2 FOR NO. OF POINTS TO PROCESS
    34      C   29=PROCESSING DAY NUMBER
    35      C   30=PULSE NUMBER
    36      C   31=PULSE CODE TABLE START
    37      C   35=PULSE COUNT
    38      C   39=MISSING RECORD COUNT
    39      C   40=BAD PULSE PER BLOCK COUNT
    40      C   SKIP FIRST RECORD
    41          2 CALL GETREC
    42            GO TO(3,2,12,900),IRT
    43          3 CALL GETREC
    44            GO TO(4,3,10,11),IRT
    45      C     TIME TO EVEN SECOND
    46          4 CALL RCDTB(113,1,2,IBUF,128,IHD(12))
    47            CALL RCDTB(113,3,2,IBUF,128,IHD(13))
    48            CALL RCDTB(113,5,2,IBUF,128,IHD(14))
    49      C     ATTENUATION
    50          6 CALL RCDTB(114,8,2,IBUF,128,IHD(9))
    51      C     OBJECT
    52            CALL RCDTB(115,3,2,IBUF,128,IHD(11))
    53      C     MODE
    54            CALL RCDTB(115,5,2,IBUF,128,IHD(19))
    55      C     MISSION
    56            CALL RCDTB(115,7,2,IBUF,128,IHD(20))
    57      C     RUN NUMBER
    58            CALL RCDTB(116,1,1,IBUF,128,IHD(21))
    59      C     PULSE NUMBER
    60            CALL RCDTB(116,2,2,IBUF,128,IHD(30))
    61      C     JULIAN DAY AND YEAR
    62            CALL RCDTB(116,4,3,IBUF,128,IHD(1))
    63            IF(IHD(29).EQ.0) IHD(29)=IHD(1)
    64            CALL RCDTB(116,7,1,IBUF,128,IHD(2))
    65      C     XMTR CODE
    66            CALL RCDTB(116,8,1,IBUF,128,IHD(3))
    67      C     MODE
    68            CALL RCDTB(117,1,1,IBUF,128,IHD(5))
    69      C     SITE CODE
    70            CALL RCDTB(117,2,2,IBUF,128,IHD(4))
    71      C     WEATHER CODE
    72            CALL RCDTB(117,4,2,IBUF,128,IHD(15))
    73      C     NOTE CODE
    74            CALL RCDTB(117,6,1,IBUF,128,IHD(16))
    75      C     INSIDE TEMP
    76            CALL RCDTB(117,7,3,IBUF,128,IHD(10))
    77      C     OUTSIDE TEMP(WET,DRY)
    78            CALL RCDTB(118,2,3,IBUF,128,IHD(7))
    79            CALL RCDTB(118,5,3,IBUF,128,IHD(8))
    80      C     PRESSURE
    81            CALL RCDTB(119,4,5,IBUF,128,IHD(6))
    82      C     GRI
    83            CALL RCDTB(119,5,5,IBUF,128,IHD(17))
    84      C
    85      C
    86      C
    87            IHD(18)=IHD(12)*3600+IHD(13)*60+IHD(14)
    88            RETURN
    89         10 WRITE(LPT,1000)
    90            GO TO 1
    91         11 WRITE(LPT,1001)
    92            STOP
    93         12 WRITE(LPT,1002)
    94            GO TO 2
    95        900 WRITE(LPT,2000)
    96            STOP
    97       1000 FORMAT(' EOF ENCOUNTERED, TRY AGAIN',///)
    98       1001 FORMAT(' NO DD CARD THIS FILE')
    99       1002 FORMAT(' EOF FIRST REC SKIP')
   100       2000 FORMAT(' NO DD CARD FOR FIRST FILE SKIP')
   101            END
```

Program Listing A-37 Frequency Filter Header Information Decommutator

```
09/28/76        INPUT LISTING                    AUTOFLOW CHART SET - LORAN 3  GROUP PHASE FILTER

FORTRAN MODULE      (LIST,NAMSQ)

 CARD NO      ****                    CONTENTS                    ****

      1              SUBROUTINE CODE(ITRY)
      2              DIMENSION IHD(40),ITAB(7,4),NTAB(7)
      3              DATA ITAB/1,1,1,1,1,1,1,1,-1,-1,1,1,-1,1,-1,1,-1,1,
      4             1-1,-1,-1,-1,-1,-1,1/
      5              COMMON IHD
      6              COMMON/PRINT/IPT
      7            1 CALL GETTAB(NTAB)
      8              DO 4 I=1,4
      9              DO 4 J=1,4
     10              DO 2 K=J,7
     11              L=K-J+1
     12              IF(NTAB(L).NE.ITAB(K,I)) GO TO 4
     13            2 CONTINUE
     14              DO 3 K=1,4
     15              M=J+K-1
     16            3 IHD(K+30)=ITAB(M,I)
     17              GO TO 10
     18            4 CONTINUE
     19            5 WRITE(IPT,1003)
     20              ITRY=ITRY+1
     21              RETURN
     22           10 IF(IHD(5).GT.2) GO TO 20
     23              IF(MOD(IHD(30),2).EQ.0.AND.I.EQ.3) GO TO 13
     24              IF(I.EQ.1.AND.IHD(30).EQ.1.OR.IHD(30).EQ.5) GO TO 13
     25              IF(I.EQ.4.AND.IHD(30).EQ.3.OR.IHD(30).EQ.7) GO TO 13
     26              WRITE(IPT,1002)(IHD(N),N=31,34)
     27              ITRY=0
     28              RETURN
     29           20 IF(MOD(IHD(30),2).EQ.0.AND.I.EQ.2) GO TO 13
     30              IF(I.EQ.1.AND.IHD(30).EQ.1.OR.IHD(30).EQ.9) GO TO 13
     31              IF(I.EQ.4.AND.IHD(30).EQ.5.OR.IHD(30).EQ.13) GO TO 13
     32              IF(I.EQ.3.AND.MOD(IHD(30),2).EQ.1) GO TO 13
     33              WRITE(IPT,1002)(IHD(N),N=31,34)
     34              ITRY=0
     35           13 RETURN
     36         1003 FORMAT('1',20X,'PHASE CODE NOT IN TABLE')
     37         1002 FORMAT('1',20X,'INCORRECT PHASE CODE INPUT',4I4)
     38              END
```

Program Listing A-38 Frequency Filter Pulse Phase Code Decoder

```
09/28/76        INPUT LISTING                    AUTOFLOW CHART SET - LORAN 3  GROUP PHASE FILTER

FORTRAN MODULE      (LIST,NAMSQ)

 CARD NO      ****                    CONTENTS                    ****

      1              SUBROUTINE GETTAB(NTAB)
      2              DIMENSION NTAB(7),IHD(40),IBUF(128)
      3              COMMON IHD
      4              COMMON/GETDAT/IRT,IBUF
      5              COMMON/PRINT/IPT
      6              DO 1 I=1,7
      7              J=16*(I-1)+10
      8              L=IBUF(J)
      9              CALL SHFTL(K,L,48,M)
     10              CALL SHFTA(K,L,-16,M)
     11            1 NTAB(I)=K/IABS(K)
     12              RETURN
     13              END
```

Program Listing A-39 Frequency Filter Phase Code Generator

FORTRAN MODULE (LIST,NAMSQ)

CARD NO **** CONTENTS ****

```
      SUBROUTINE PRNTHD
      DIMENSION AMODE(3,8),IHD(40),IBUF(128)
      DIMENSION WIND(2)
      DIMENSION WEATH1(2,5),WEATH2(2,10)
      DIMENSION ANOTE(2,2)
      DOUBLE PRECISION AMODE,WEATH1,WEATH2,ANOTE,TB
      DATA WIND/' LOW','HIGH'/
      DATA WEATH1/'CLEAR    ',' ','SCATTERE',' TO 50%',
     1'BROKEN T',' TO 90%  ',' ','OVERCAST',' TO 100%','OBSCURAT',' ION 100%'/
      DATA WEATH2/'THUNDERS',' TORMS  ',' RAIN SHO',' WERS  ',
     1'DRIZZLE ',' ','FREEZING',' DRIZZLE',' SNOW  ',' ',
     2' HAIL   ',' ','GROUND F',' OG     ',' FOG COVE',' R     ',
     3' SUNNY  ',' ',' HAZE   ',' '/
      DATA ANOTE/' SEE LOG',' ',' NO PROBL',' EMS     '/
      DATA AMODE/' ',' ',' ',
     1' LORAN C ',' MASTER ',' ',
     2' LORAN C ',' SECONDAR',' Y ',
     3' LORAN D ',' MASTER ',' ',
     4' LORAN D ',' X OR Z S',' LAVE ',
     5' LORAN D ',' Z SLAVE ',' '/
      COMMON IHD
      COMMON/GETDAT/IRT,IBUF
      COMMON/PRINT/IPT
      IRT=21
      WRITE(IPT,1011)
      IY=70+IHD(2)
      WRITE(IPT,1000)IHD(21),IHD(22),IY
      CALL DATE(IHD(29),ID,IM)
      WRITE(IPT,1020)IM,ID,IY
      IY=1970+IHD(2)
      WRITE(IPT,1001)IHD(1),IY
      WRITE(IPT,1002) IHD(4)
      WRITE(IPT,1003) IHD(3)
      J=IHD(5)+1
      WRITE(IPT,1004)(AMODE(I,J),I=1,3)
      WRITE(IPT,1022)IHD(33)
      WRITE(IPT,1012)IHD(9)
      HD=IHD(6)*.0333%
      WRITE(IPT,1005)HD
      WRITE(IPT,1006)
      HD=IHD(7)/10.
      WRITE(IPT,1007)HD
      HD=IHD(8)/10.
      WRITE(IPT,1008)HD
      WRITE(IPT,1009)
      HD=IHD(10)/10.
      WRITE(IPT,1008)HD
      WRITE(IPT,1010)IHD(11),IHD(19),IHD(20),IHD(21)
      WRITE(IPT,1011)IHD(22),(WEATH1(N),N=1,5)
      M=1
      K=IHD(15)/10
      IF(K.GT.4) M=2
      K=MOD(K,5)+1
      L=MOD(IHD(15),10)+1
      WRITE(IPT,1013)
      WRITE(IPT,1014)(WEATH1(N,K),N=1,2)
      WRITE(IPT,1017)(WEATH2(N,L),N=1,2)
      WRITE(IPT,1015)IHD(34)
      WRITE(IPT,1019)IHD(17)
      WRITE(IPT,1016)(ANOTE(N,IHD(16)+1),N=1,2)
      IF(IHD(35).GT.0) GO TO 1
C
C
      WRITE(21)IHD
      CALL TIME(TB)
      WRITE(IPT,1021)TB
C
C
    1 RETURN
 1000 FORMAT(45X,'LORAN SIGNAL ENVIRONMENT',2X,I2,2('/',I2))
 1001 FORMAT('0',44X,'DAY NO.',I4,9X,'YEAR NO.',I5)
 1002 FORMAT('0',44X,'DATA COLLECTION SITE CODE =',I3)
 1003 FORMAT('0',44X,'TRANSMITTER CONFIGURATION CODE =',I2)
 1004 FORMAT('0',44X,'DATA RECORDING MODE:',3X,3A4)
 1005 FORMAT('0',44X,'ATMOSPHERIC PRESSURE: ',F7.1,' MILLIBARS')
 1006 FORMAT('0',44X,'EXTERNAL TEMPERATURE (DEGREES CENTIGRADE)')
 1007 FORMAT(55X,'WET BULB',F5.1)
 1008 FORMAT(55X,'DRY BULB',F5.1)
 1009 FORMAT('0',44X,'INTERNAL TEMPERATURE (DEGREES CENTIGRADE)')
 1010 FORMAT('0',44X,'PROJECT/MODE/MISSION/RUN',4X,3(I2,'/'),I1)
 1011 FORMAT('1',//)
 1012 FORMAT('0',44X,'ATTENUATION IN DB: ',I3)
 1013 FORMAT('0',44X,'START TIME:',I4,':',I2,':',I2)
 1014 FORMAT(55X,'CLOUD COVER: ',2A4)
 1015 FORMAT(55X,A4,' GROUND WINDS')
 1016 FORMAT(//,45X,'************',2A8,'************',///)
 1017 FORMAT(55X,'GENERAL CONDITION: ',2A4)
 1018 FORMAT('0',44X,'WEATHER:')
 1019 FORMAT('0',44X,'GROUP REPETITION INTERVAL:',I4,'.3E-04')
 1020 FORMAT('0',44X,'PROCESSING DATE',2X,I2,2('/',I2))
 1021 FORMAT('0',44X,'TIME OF FIRST BLOCK IN SECS:',F10.7)
 1022 FORMAT('0',44X,'PULSE NUMBER:',I3)
      END
```

Program Listing A-40 Frequency Filter Header Page Printer

09/28/76 INPUT LISTING AUTOFLOW CHART SET - LORAN 3 GROUP PHASE FILTER

FORTRAN MODULE (LIST,NAMSQ)

CARD NO **** CONTENTS ****

```
      SUBROUTINE MAINE
      DIMENSION IBUF(128),DAT(1600),IHD(40)
      DIMENSION GROTOT(3,32)
      DOUBLE PRECISION TB,TBP,TD,GRI
      DOUBLE PRECISION GROTOT
      COMMON IHD,GROTOT
      COMMON/GETDAT/IRT,IBUF
      COMMON/PRINT/IPT
      GRI=IHD(17)*.000100
      IPCT=0
      IERR=0
      CALL TIME(TB)
      TBP=TB
    9 CALL SET(DAT)
      IDCT=0
C     IHD(39) IS USED TO COUNT MISSING RECORDS
      IHD(39)=0
C     IHD(40) IS USED TO COUNT BAD PULSES IN A BLOCK
      IHD(40)=0
      TD=TBP+IPCT*GRI
   10 CALL BLOCK(DAT,IDCT,IPCT,IERR)
      IF(IDCT.LT.1600) GO TO 11
      CALL OUTPUT(TD,DAT)
      IHD(37)=IHD(37)+IHD(40)
      IHD(38)=IHD(38)+IHD(39)
      IF(IHD(25).GE.IHD(28)) GO TO 30
  101 IF(IPCT.LT.7) GO TO 9
   11 TBP=TBP+7*GRI
      IPCT=0
      IF(IERR.NE.0) GO TO 14
   12 CALL GETREC
      GO TO(13,12,17,18),IRT
C     TEST FOR CHANGE OF RECORDING MODE
   13 CALL ACMTM(117,1,1,IBUF,128,MDSV)
      IF(IHD(5).NE.MDSV) GO TO 17
      CALL TIME(TB)
C     TEST FOR MISSING RECORD
   14 IF((TB-TBP).GT.6*GRI) GO TO 16
C     TEST FOR INTERMEDIATE RECORD
      IF((TBP-TB).GT..001) GO TO 12
      IERR=0
      TBP=TB
   15 IF(1630-IDCT)9,9,10
   16 IERR=1
      IHD(39)=IHD(39)+1
      WRITE(IPT,1001)TBP
      GO TO 15
   17 WRITE(IPT,1002)TD
      I=13
   23 IF(IHD(25).GE.2**I) GO TO 24
      I=I-1
      IF(I.EQ.0) RETURN
      GO TO 23
   24 IHD(25)=I
      ENDFILE 21
   20 RETURN
   30 CALL SKIPFL
      GO TO 17
   18 WRITE(IPT,1000)
      STOP
 1000 FORMAT(' NO DD CARD THIS FILE')
 1001 FORMAT(' RECORD MISSING AT TIME',F14.7)
 1002 FORMAT('0',44X,'TIME OF LAST BLOCK IN SECS=',F12.7,///)
      END
```

Program Listing A-41 Frequency Filter Main Data Handler

```
09/28/76        INPUT LISTING                    AUTOFLOW CHART SET - LORAN 3  GROUP PHASE FILTER

FORTRAN MODULE      (LIST,NAMSQ)

 CARD NO        ****                          CONTENTS                          ****

      1              SUBROUTINE CONF(TADJ)
      2              IMPLICIT REAL*8(A-H,O-Z)
      3              DIMENSION IHD(40),GROTOT(3,32),ARR(8194,2)
      4              COMMON IHD,GROTCT,ARR
      5              COMMON/PRINT/IPT
      6              AMAX=0.0
      7              DO 1 I=2,32,2
      8              A=DABS(GROTOT(1,I))
      9              IF(A.LE.AMAX) GO TO 1
     10              AMAX=A
     11              II=I
     12            1 CONTINUE
     13              AMIN=9999.
     14              DO 2 I=2,20,2
     15              A=DABS(.5-DABS(GROTOT(1,I)/AMAX))
     16              IF(A.GE.AMIN) GO TO 2
     17              AMIN=A
     18              I2=I
     19            2 CONTINUE
     20              WRITE(IPT,1000)II
     21              WRITE(IPT,1001)I2
     22              TADJ=5*(18-II)
     23              RETURN
     24         1000 FORMAT(50X,'MAX VOLTAGE READING AT I=',I2)
     25         1001 FORMAT(//,50X,'MID VOLTAGE READING AT I=',I2)
     26              END
```

Program Listing A-42 Frequency Filter Lock-On Confirmation

```
09/28/76        INPUT LISTING                    AUTOFLOW CHART SET - LORAN 3  GROUP PHASE FILTER

FORTRAN MODULE      (LIST,NAMSQ)

 CARD NO        ****                          CONTENTS                          ****

      1              SUBROUTINE BLOCK(DAT,IDCT,IPCT,IERR)
      2              DIMENSION DAT(1),IBUF(128),IHD(40)
      3              COMMON IHD
      4              COMMON/GETDAT/IRT,IBUF
      5              COMMON/PRINT/IPT
      6              IP=IPCT+1
      7              DO 2 I=IP,7
      8              IHD(35)=IHD(35)+1
      9              N=MOD(IHD(35)+3,4)+31
     10              DO 1 J=1,16
     11              IDCT=IDCT+2
     12              IF(IERR.NE.0) GO TO 1
     13              K=16*(I-11)+J
     14              CALL XY(IDCT,K,DAT,J,N)
     15            1 CONTINUE
     16            4 IF(IDCT.EQ.1600) GO TO 3
     17            2 CONTINUE
     18            3 IPCT=I
     19              RETURN
     20         1000 FORMAT(16F8.4)
     21              END
```

Program Listing A-43 Frequency Filter Data Blocker

```
10/14/76        INPUT LISTING                    AUTOFLOW CHART SET - LORAN 3  GROUP PHASE FILTER

FORTRAN MODULE      (LIST,NAMSQ)

 CARD NO        ****                          CONTENTS                          ****

      1              SUBROUTINE TIME(TB)
      2              DIMENSION IBUF(128),IHD(40)
      3              DOUBLE PRECISION TB
      4              COMMON IHD
      5              COMMON/GETDAT/IRT,IBUF
      6              COMMON/PRINT/IPT
      7              TB=0.000
      8              DO 1 I=1,3
      9              J=I+11
     10              K=I*2-1
     11              CALL BCDTB(IBUF,K,2,IBUF,128,M)
     12            1 TB=(M-IHD(J))*60**(3-I)+TB
     13              CALL BCDTB(IBUF,7,7,IBUF,128,M)
     14              TB=TB+M*.000000100
     15              RETURN
     16              END
```

Program Listing A-44 Frequency Filter Time Decoder

```
10/14/76        INPUT LISTING                    AUTOFLOW CHART SET - LORAN 3  GROUP PHASE FILTER

FORTRAN MODULE      (LIST,NAMSQ)

  CARD NO       ****                          CONTENTS                          ****

      1             SUBROUTINE SET(DAT)
      2             DIMENSION DAT(1)
      3             DO 1 I=1,1600
      4           1 DAT(I)=9959.
      5             RETURN
      6             END
```

Program Listing A-45 Frequency Filter Array Reset

```
09/28/76        INPUT LISTING                    AUTOFLOW CHART SET - LORAN 3  GROUP PHASE FILTER

FORTRAN MODULE      (LIST,NAMSQ)

  CARD NO       ****                          CONTENTS                          ****

      1             SUBROUTINE XY(IDCT,K,DAT,L,N)
      2             DIMENSION QI(8192)
      3             DIMENSION DAT(L),IBUF(128),IHD(40)
      4             DOUBLE PRECISION ARR(8194,2),GRDTOT(3,32)
      5             DOUBLE PRECISION A
      6             COMMON IHD,GRDTOT,ARR,QI
      7             COMMON/GETDAT/IPT,IBUF
      8             COMMON/PRINT/IPT
      9             J=0
     10             I=IBUF(K)
     11             CALL SHFTL(J,I,32,M)
     12             CALL SHFTA(J,I,-16,M)
     13             DAT(IDCT-1)=J*1.220837SE-3*IHD(N)
     14             J=0
     15             CALL SHFTL(J,I,32,M)
     16             CALL SHFTA(J,I,-16,M)
     17             DAT(IDCT)=J*1.220837SE-3*IHD(N)
     18             IF(IHD(25).GE.8192) GO TO 10
     19             IF(MOD(IDCT,32).NE.12) GO TO 1
     20             IHD(25)=IHD(25)+1
     21             ARR(IHD(25),1)=DAT(IDCT-1)
     22             ARR(IHD(25),2)=DAT(IDCT)
     23       C     IHD(26) IS SET IN CRDIN AS 3RD CYCLE OR PEAK PULSE AMP PLOT
     24           1 IF(MOD(IDCT,32).NE.IHD(26)) GO TO 10
     25             A=DAT(IDCT-1)**2+DAT(IDCT)**2
     26             QI(IHD(25))=DSQRT(A)
     27            10 CALL EDIT(IDCT,DAT,L)
     28             RETURN
     29             END
```

Program Listing A-46 Frequency Filter Measurement Decoder

```
09/28/76        INPUT LISTING                    AUTOFLOW CHART SET - LORAN 3  GROUP PHASE FILTER

FORTRAN MODULE      (LIST,NAMSQ)

  CARD NO       ****                          CONTENTS                          ****

      1             SUBROUTINE OUTPUT(TD,DAT)
      2             DIMENSION DAT(1)
      3             DIMENSION GRDTOT(3,32)
      4             DIMENSION IBUF(128),IHD(40)
      5             DOUBLE PRECISION TD,XY,XY2,XYSD,XYN
      6             DOUBLE PRECISION GRDTOT
      7             DOUBLE PRECISION TEMP
      8             COMMON IHD,GRDTOT
      9             COMMON/GETDAT/IPT,IBUF
     10             COMMON/PRINT/IPT
     11             DO 1 I=1,1600
     12             IF(DAT(I).GT.9000.) GO TO 1
     13             J=MOD(I,32)
     14             IF(J.EQ.0) J=32
     15             GRDTOT(1,J)=GRDTOT(1,J)+DAT(I)
     16             GRDTOT(2,J)=GRDTOT(2,J)+DAT(I)**2
     17             GRDTOT(3,J)=GRDTOT(3,J)+1
     18           1 CONTINUE
     19             WRITE(2)TD,(DAT(I),I=1,1600)
     20           3 RETURN
     21             END
```

Program Listing A-47 Frequency Filter Output Tape Writer

09/28/76 INPUT LISTING AUTOFLOW CHART SET - LORAN 3 GROUP PHASE FILTER

FORTRAN MODULE (LIST,NAMSQ)

CARD NO **** CONTENTS ****

```
      1            SUBROUTINE EDIT(IDCT,DAT,J)
      2            DIMENSION IBUF(128),IHD(40)
      3            DIMENSION DAT(1)
      4            COMMON IHD
      5            COMMON/GETDAT/IRT,IBUF
      6            COMMON/PRINT/IPT
      7            IF(ABS(DAT(IDCT-1)).GT.10.) GO TO 1
      8            IF(ABS(DAT(IDCT)).GT.10.) GO TO 1
      9            RETURN
     10          1 IDCT=IDCT-2*J
     11            IHD(43)=IHD(40)+1
     12            DO 2 J=1,16
     13            IDCT=IDCT+2
     14            DAT(IDCT-1)=9999.
     15            DAT(IDCT)=9999.
     16          2 CONTINUE
     17            RETURN
     18            END
```

Program Listing A-48 Frequency Filter Editor

09/28/76 INPUT LISTING AUTOFLOW CHART SET - LORAN 3 GROUP PHASE FILTER

FORTRAN MODULE (LIST,NAMSQ)

CARD NO **** CONTENTS ****

```
      1            SUBROUTINE STAT1
      2            DIMENSION IBUF(128),IHD(40)
      3            DIMENSION GRDTOT(3,32)
      4            DOUBLE PRECISION GRDTOT,AMAX
      5            COMMON IHD,GRDTOT
      6            COMMON/GETDAT/IRT,IBUF
      7            COMMON/PRINT/IPT
      8            DO 1 I=1,32
      9            IF(GRDTOT(3,I).EQ.0) GO TO 1
     10            GRDTOT(1,I)=GRDTOT(1,I)/GRDTOT(3,I)
     11            GRDTOT(2,I)=GRDTOT(2,I)/GRDTOT(3,I)
     12            GRDTOT(2,I)=DSQRT(GRDTOT(2,I)-GRDTOT(1,I)**2)
     13          1 CONTINUE
     14            I=GRDTOT(3,1)+.5
     15            WRITE(IPT,1002)I
     16            WRITE(IPT,1006)
     17            WRITE(IPT,1000)(GRDTOT(1,I),I=1,32)
     18            WRITE(IPT,1007)
     19            WRITE(IPT,1001)(GRDTOT(2,I),I=1,32)
     20            WRITE(IPT,1003)IHD(37)
     21            WRITE(IPT,1004)IHD(39)
     22            WRITE(7,1004)
     23         1004 FORMAT(10X,'10')
     24            WRITE(7,1000)(GRDTOT(1,I),I=1,32)
     25            WRITE(7,1005)(GRDTOT(2,I),I=1,32)
     26          3 RETURN
     27         1000 FORMAT(1X,16F8.4,/)
     28         1001 FORMAT(2X,16F8.4,/)
     29         1002 FORMAT('1GRAND TOTALS OVER',I4,' PULSES ARE AS FOLLOWS')
     30         1003 FORMAT(///,10X,'TOTAL NUMBER OF REJECTED PULSES =',I5)
     31         1004 FORMAT(///,10X,'TOTAL NUMBER OF MISSING OR SHORT RECORDS =',I5)
     32         1005 FORMAT(8F9.4)
     33         1006 FORMAT(///' MEANS IN VOLTS TIMES 10')
     34         1007 FORMAT(///' STANDARD DEVIATIONS ABOUT THE MEANS')
     35            END
```

Program Listing A-49 Frequency Filter Statistics

```
09/28/76        INPUT LISTING                          AUTOFLOW CHART SET - LORAN 3  GROUP PHASE FILTER

FORTRAN MODULE      (LIST,NAMSQ)

 CARD NO        ****                                CONTENTS                                ****

      1              SUBROUTINE PLOT
      2              DIMENSION IHD(40),IBUF(128)
      3              DIMENSION GRDTOT(3,32),MARK(32)
      4              DOUBLE PRECISION GRDTOT
      5              COMMON IHD,GRDTOT
      6              COMMON/GETDAT/IRT,IBUF
      7              COMMON/PRINT/IPT
      8              WRITE(IPT,1000)
      9              AMX=0
     10              DO 1 I=1,32
     11              IF(AMX.LT.DABS(GRDTOT(1,I))) AMX=DABS(GRDTOT(1,I))
     12            1 CONTINUE
     13              MX=AMX+1
     14              MD=55/MX
     15              DO 10 I=1,55
     16              L=55-I
     17              IC=1078657024
     18              IF(MOD(L,MD).EQ.0) IC=(L/MD)*65536+1089470464
     19              DO 20 J=1,32
     20              V=DABS(GRDTOT(1,J))
     21              MARK(J)=1073741824
     22              K=55-MD*V
     23              IF(I.NE.K) GO TO 20
     24              MARK(J)=-922746880+MOD(J,2)*251658240
     25           20 CONTINUE
     26           10 WRITE(IPT,1001) IC,MARK
     27              WRITE(IPT,1002)
     28              WRITE(IPT,1003)
     29              RETURN
     30         1001 FORMAT('1',3X,1A6('I',3X),1A6('/',3X))
     31         1002 FORMAT(1X,A2,1X,32(A1,3X))
     32         1002 FORMAT(4X,16('I',3X),16('/',3X))
     33         1003 FORMAT(24X,'2.5E-6 SECS PER DIVISION',40X,'7.5E-6 SECS PER DIVISIO
                    1N')
     34              END
     35
```

Program Listing A-50 Frequency Filter I/Q Plotter

```
09/28/76        INPUT LISTING                          AUTOFLOW CHART SET - LORAN 3  GROUP PHASE FILTER

FORTRAN MODULE      (LIST,NAMSQ)

 CARD NO        ****                                CONTENTS                                ****

      1              SUBROUTINE SKIPFL
      2              DIMENSION IBUF(128)
      3              COMMON/GETDAT/IRT,IBUF
      4              COMMON/PRINT/IPT
      5            1 CALL GETREC
      6              GO TO(1,2,3,2),IRT
      7            2 WRITE(IPT,1000)
      8            3 RETURN
      9         1000 FORMAT(1X,'NO DD CARD THIS FILE (SKIPFL)')
     10              END
```

Program Listing A-51 Frequency Filter File Skip

FORTRAN MODULE (LIST,NAMSQ)

```
CARD NO  ****                    CONTENTS                    ****

    1            SUBROUTINE PLOTI(AVGPWR)
    2            DIMENSION DQI(8192)
    3            DIMENSION ICH(128)
    4            DIMENSION MARK(2),IHD(40),ITIT(2)
    5            DOUBLE PRECISION AVGPWR(2),GAP
    6            DOUBLE PRECISION APR(8194,2),GRDTOT(3,32),B(256,2),BMAX,BMIN
    7            DOUBLE PRECISION TOTPWR
    8            COMMON IHD,GRDTOT,APR,DQI,B
    9            DATA MARK/'    ','****'/
   10            DATA ITIT/'QQQQ','IIII'/
   11            COMMON/PRINT/IPT
   12            DO 6 M=1,2
   13            L=0
   14            TOTPWR=0.000
   15            DCPWR=APR(1,M)**2+APR(2,M)**2
   16            WRITE(IPT,1001)ITIT(M),DCPWR
   17            NPNT=2**IHD(25)
   18            L1=NPNT/256
   19            L2=NPNT-L1+2
   20            L3=L1/2
   21            DO 2 I=2,L2,L1
   22            L=L+1
   23            B(L,M)=0.000
   24            DO 1 J=1,L1,2
   25            K=I+J
   26          1 B(L,M)=B(L,M)+APR(K,M)**2+APR(K+1,M)**2
   27            TOTPWR=TOTPWR+B(L,M)
   28          2 CONTINUE
   29            BMAX=-9999.
   30            BMIN=9999.
   31            DO 3 I=1,256
   32            BMAX=DMAX1(B(I,M),BMAX)
   33            BMIN=DMIN1(B(I,M),BMIN)
   34          3 CONTINUE
   35            SPD=BMAX-BMIN
   36            GAP=127/SPD
   37            DO 4 I=1,128
   38          4 ICH(I)=MARK(1)
   39            DO 5 I=1,256
   40            K=(B(I,M)-BMIN)*GAP+1.01
   41            ICH(K)=MARK(2)
   42            WRITE(IPT,1000)I,ICH
   43            ICH(K)=MARK(1)
   44          5 CONTINUE
   45            AVGPWR(M)=TOTPWR*L1/NPNT
   46            WRITE(IPT,1002)BMIN,BMAX,TOTPWR,AVGPWR(M)
   47          6 CONTINUE
   48            RETURN
   49         1000 FORMAT(1X,I3,128A1)
   50         1001 FORMAT('1',48X,'TOTAL DC POWER IN',1X,A1,' =',F7.4)
   51         1002 FORMAT(1H ,'MIN VALUE =',E10.4,4X,'MAX VALUE =',E10.4,4X,
   52             1'TOTAL AC POWER =',F7.4,4X,'AVG AC POWER =',F7.4)
   53            END
```

Program Listing A-52 Frequency Filter Envelope Plotter

FORTRAN MODULE (LIST,NAMSQ)

CARD NO **** CONTENTS ****

```
      SUBROUTINE HIST
      IMPLICIT REAL*8(A-H,O-Z)
      DIMENSION ARR(8194,2),GRDTOT(3,32),IHD(40)
      DIMENSION JIS(20,20),IBUC(2,20)
      COMMON IHD,GRDTOT,ARR
      COMMON/PRINT/IPT
      SIG6=3*(GRDTOT(2,11)+GRDTOT(2,12))
      SIG=SIG6/6
      ISIG=6
      AINC=2*SIG6/20
      BNDQ=GRDTOT(1,11)-SIG6
      UBNDQ=GRDTOT(1,11)+SIG6
      BNDI=GRDTOT(1,12)-SIG6
      UBNDI=GRDTOT(1,12)+SIG6
      CALL CLEAR(JIS,400)
      CALL CLEAR(IBUC,40)
      IQ=0
      IA=0
      IAQ=0
      AVQ=0.0
      AVI=0.0
      I1=2**IHD(25)
      DO 20 I=1,I1
      KFLG=0
      LFLG=0
      DO 3 K=1,20
      AQ=AINC*(K-1)+BNDQ
      IF(ARR(I,1).GE.AQ) GO TO 2
      GO TO 4
    2 IF(ARR(I,1).LE.(AQ+AINC)) GO TO 5
    3 CONTINUE
    4 IQ=IQ+1
      KFLG=1
    5 DO 7 L=1,20
      AI=AINC*(L-1)+BNDI
      IF(ARR(I,2).GE.AI) GO TO 6
      GO TO 8
    6 IF(ARR(I,2).LE.(AI+AINC)) GO TO 9
    7 CONTINUE
    8 IA=IA+1
      LFLG=1
    9 IF(KFLG+LFLG-1)11,20,10
   10 IQ=IQ-1
      IA=IA-1
      IAQ=IAQ+1
      GO TO 20
   11 JIS(K,L)=JIS(K,L)+1
      AVQ=AVQ+ARR(I,1)
      AVI=AVI+ARR(I,2)
      IBUC(1,K)=IBUC(1,K)+1
      IBUC(2,L)=IBUC(2,L)+1
      ICNT=ICNT+1
   20 CONTINUE
      I2=2**IHD(25)-IQ-IA-IAQ
      AVQ=AVQ/I2
      AVI=AVI/I2
      WRITE(IPT,1001)
      DO 30 I=1,20
   30 WRITE(IPT,1000)(JIS(21-I,J),J=1,20),IBUC(1,21-I)
      WRITE(IPT,1002)
      WRITE(IPT,1003)(IBUC(2,K),K=1,20)
      WRITE(IPT,1004)I1
      WRITE(IPT,1013)SIG
      WRITE(IPT,1010)ISIG
      WRITE(IPT,1005)IQ
      WRITE(IPT,1006)IA
      WRITE(IPT,1007)IAQ
      WRITE(IPT,1008)AVQ
      WRITE(IPT,1009)AVI
      RETURN
 1000 FORMAT(16X,20I5,4X,I5,//)
 1001 FORMAT('1',56X,'T11-T12 HISTOGRAM',49X,'T11',/)
 1002 FORMAT('1',54X,'T12 DISTRIBUTION')
 1003 FORMAT(16X,20I5///)
 1004 FORMAT(53X,'TOTAL NO. PAIRS    =',I5,/)
 1005 FORMAT(53X,'T11 EDIT PAIRS     =',I4,/)
 1006 FORMAT(53X,'T12 EDIT PAIRS     =',I4,/)
 1007 FORMAT(53X,'T11,12 EDIT PAIRS =',I4,/)
 1008 FORMAT(53X,'T11 AVERAGE        =',F7.4,/)
 1009 FORMAT(53X,'T12 AVERAGE        =',F7.4,/)
 1010 FORMAT(53X,'EDITING LEVEL      =',I2,' SIGMA',/)
 1013 FORMAT(53X,'T11,12 EDIT SIGMA =',F7.4,/)
      END
```

Program Listing A-53 Frequency Filter Histogram Printer

FORTRAN MODULE (LIST,NAMSQ)

CARD NO **** CONTENTS ****

```
      SUBROUTINE TOA
      IMPLICIT REAL*8(A-C,E-H,O-Z)
      DIMENSION DAT(8192)
      DIMENSION IHD(40),GRDTCT(3,32),ARR(8194,2),TITLE(2)
      DIMENSION IBUC(24),LINE(24),MARK(2),JBUC(24)
      DATA TITLE/'BEFORE  ',' AFTER  '/
      DATA MARK/'   ','*****'/
      COMMON IHD,GRDTCT,ARR
      COMMON/CARD/AVG,STD,SN,FS
      COMMON/PRINT/IPT
      CALL CLEAR(DAT,8192)
      DO 100 J=1,2
      GO TO(8,9),J
    8 AMAX=-9999.
      AMIN=9999.
    9 STD=0.0
      AVG=0.0
      ICNT=0
      CALL CLEAR(IBUC,24)
      NPNT=2**IHD(25)
      DO 1 I=1,NPNT
      IF(DAT(I).GT.9000.) GO TO 1
      ICNT=ICNT+1
      GO TO(6,7),J
    6 IF(ARR(I,2).GT.0.0) GO TO 2
      ARR(I,1)=-ARR(I,1)
      ARR(I,2)=-ARR(I,2)
    2 DAT(I)=DATAN2(ARR(I,1),ARR(I,2))*1.591549
      IF(DAT(I).GT.AMAX) AMAX=DAT(I)
      IF(DAT(I).LT.AMIN) AMIN=DAT(I)
    7 AVG=AVG+DAT(I)
      STD=STD+DAT(I)**2
    1 CONTINUE
      AVG=AVG/ICNT
      STD=STD/ICNT
      STD=DSQRT(STD-AVG**2)
      AINC=(AMAX-AMIN)/24
      ICNT=0
      DO 5 I=1,NPNT
      IF(DAT(I).GT.9000.) GO TO 5
      ICNT=ICNT+1
      DO 3 K=1,24
      BUC=AMIN+K*AINC
      IF(DAT(I).LE.BUC) GO TO 4
    3 CONTINUE
      K=K-1
    4 IBUC(K)=IBUC(K)+1
    5 CONTINUE
      MAX=0
      DO 10 I=1,24
   10 IF(IBUC(I).GT.MAX) MAX=IBUC(I)
      DO 11 I=1,24
   11 JBUC(I)=IBUC(I)*49./MAX+1.1
      WRITE(IPT,1000)TITLE(J)
      DO 20 I=1,50
      DO 12 K=1,24
      LINE(K)=MARK(1)
      IF(I-1.EQ.JBUC(K)) LINE(K)=MARK(2)
   12 CONTINUE
      WRITE(IPT,1001)LINE
   20 CONTINUE
      WRITE(IPT,1002)IBUC
      WRITE(IPT,1003)AVG,STD,ICNT
      DO 21 I=1,NPNT
      DAT=DAT(I)
      IF(DABS(DAT-AVG).GT.3*STD) DAT(I)=9999.
   21 CONTINUE
  100 CONTINUE
      RETURN
 1000 FORMAT(1H1,43X,'TOA ',A6,' EDITING (3RD CYCLE)',/)
 1001 FORMAT(5X,24(4X,A1))
 1002 FORMAT(5X,24I5,/)
 1003 FORMAT(24X,'AVERAGE TOA =',F8.4,' MICROSECONDS',4X,'S.D. TOA =',
     1F8.4,4X,'NO. OF POINTS =',I5)
      END
```

Program Listing A-54 Frequency Filter TOA Distribution Plotter

FORTRAN MODULE (LIST,NAMSQ)

CARD NO **** CONTENTS ****

```
      SUBROUTINE AMP
      IMPLICIT REAL*8(A-C,E-H,O-Z)
      DIMENSION IHD(40),GRDTOT(3,32),ARR(8194,2),TITLE(2),DQI(8192)
      DIMENSION IBUC(24),LINE(24),MARK(2),JBUC(24)
      DATA TITLE/'BEFORE  ',' AFTER  '/
      DATA MARK/'    ','*****'/
      COMMON IHC,GRDTOT,ARR,DQI
      COMMON/PRINT/IPT
      DO 100 J=1,2
      GO TO(8,9),J
    8 AMAX=-9999.
      AMIN=9999.
    9 STD=0.0
      AVG=0.0
      ICNT=0
      CALL CLEAR(IBUC,24)
      NPNT=2**IHD(25)
      DO 1 I=1,NPNT
      IF(DQI(I).GT.9000.) GO TO 1
      ICNT=ICNT+1
      GO TO(6,7),J
    6 IF(DQI(I).GT.AMAX)AMAX=DQI(I)
      IF(DQI(I).LT.AMIN)AMIN=DQI(I)
    7 AVG=DQI(I)+AVG
      STD=DQI(I)**2+STD
    1 CONTINUE
      AVG=AVG/ICNT
      STD=STD/ICNT
      STD=DSQRT(STD-AVG**2)
      AINC=(AMAX-AMIN)/24
      ICNT=0
      DO 5 I=1,NPNT
      IF(DQI(I).GT.9000.) GO TO 5
      ICNT=ICNT+1
      DO 3 K=1,24
      BUC=AMIN+K*AINC
      IF(DQI(I).LE.BUC) GO TO 4
    3 CONTINUE
      K=K-1
    4 IBUC(K)=IBUC(K)+1
    5 CONTINUE
      MAX=0
      DO 10 I=1,24
   10 IF(IBUC(I).GT.MAX) MAX=IBUC(I)
      DO 11 I=1,24
   11 JBUC(I)=IBUC(I)*99./MAX+1.1
      WRITE(IPT,1000)TITLE(J),IHD(26)
      DO 20 I=1,50
      DO 12 K=1,24
      LINE(K)=MARK(1)
      IF(I-1).EQ.JBUC(K)) LINE(K)=MARK(2)
   12 CONTINUE
      WRITE(IPT,1001)LINE
   20 CONTINUE
      WRITE(IPT,1002)IBUC
      WRITE(IPT,1003)AVG,STD,ICNT
      DO 21 I=1,NPNT
      QI=DQI(I)
      IF(DABS(QI-AVG).GT.3*STD) DQI(I)=9999.
   21 CONTINUE
  100 CONTINUE
      IF(IHD(25).EQ.12) RETURN
      GRDTOT(1,IHD(26))=AVG
      GRDTOT(2,IHD(26))=STD
      RETURN
 1000 FORMAT(1H1,45X,'AMPLITUDE ',A6,' EDITING',2X,'(SAMPLE ',I2,')',/)
 1001 FORMAT(5X,24(4X,A1))
 1002 FORMAT(5X,24I5,/)
 1003 FORMAT(27X,'AVERAGE AMPLITUDE =',F8.4,' VOLTS',4X,'S.D. AMPLITUDE
     1=',F8.4,4X,'NO. OF POINTS =',I5,/)
      END
```

Program Listing A-55 Frequency Filter Amplitude Distribution Plotter

09/28/76 INPUT LISTING AUTOFLOW CHART SET - LORAN 3 GROUP PHASE FILTER

FORTRAN MODULE (LIST,NAMSQ)

CARD NO **** CONTENTS ****

```
      SUBROUTINE EDITF(AVGPWR)
      IMPLICIT REAL*8(A-C,E-H,O-Z)
      DIMENSION S(256,2),AVGPWR(2),DQI(8192)
      DIMENSION ARR(8194,2),IHD(40),GRDTOT(3,32)
      COMMON IHD,GRDTOT,ARR,DQI,B
      COMMON/PRINT/IPT
      NPNT=2**IHD(25)
      WRITE(IPT,1000)
      DO 100 I=1,2
      CONT=0
      L1=NPNT/256
      DO 10 J=1,256
      IF(B(J,I).LT.IHD(27)*AVGPWR(I)) GO TO 10
      L2=(J-3)*L1+3
      L3=L2+5*L1-1
      IF(L2.LT.3) L2=3
      DO 5 K=L2,L3
      IF(K.GT.8194) GO TO 5
      IF(ARR(K,I).EQ.0) GO TO 5
      ARR(K,I)=0.000
      CONT=CONT+1
    5 CONTINUE
   10 CONTINUE
      II=10*I
      WRITE(IPT,1001)CONT,II
  100 CONTINUE
      RETURN
 1000 FORMAT(1H1,45X,'ALL OUTPUT DATA',/,46X,'FOLLOWING THIS SECTION',/,
     146X,'ARE FREQUENCY',/,50X,'FILTERED',///)
 1001 FORMAT(40X,I4,' POINTS FILTERED OUT ON T',I2,/)
      END
```

Program Listing A-56 Frequency Filter Notch

09/28/76 INPUT LISTING AUTOFLOW CHART SET - LORAN 3 GROUP PHASE FILTER

FORTRAN MODULE (LIST,NAMSQ)

CARD NO **** CONTENTS ****

```
      SUBROUTINE SAMP
      IMPLICIT REAL*8(A-C,E-H,O-Z)
      DIMENSION S(256,2),GRDTOT(3,32),ARR(8194,2),DQI(8192)
      COMMON IHD,GRDTOT,ARR,DQI
      COMMON/PRINT/IPT
      NPNT=2**IHD(25)
      DO 1 I=1,NPNT
      DQI(I)=ARR(I,2)
    1 CONTINUE
      RETURN
      END
```

Program Listing A-57 Frequency Filter Data Selector

09/28/76 INPUT LISTING AUTOFLOW CHART SET - LORAN 3 GROUP PHASE FILTER

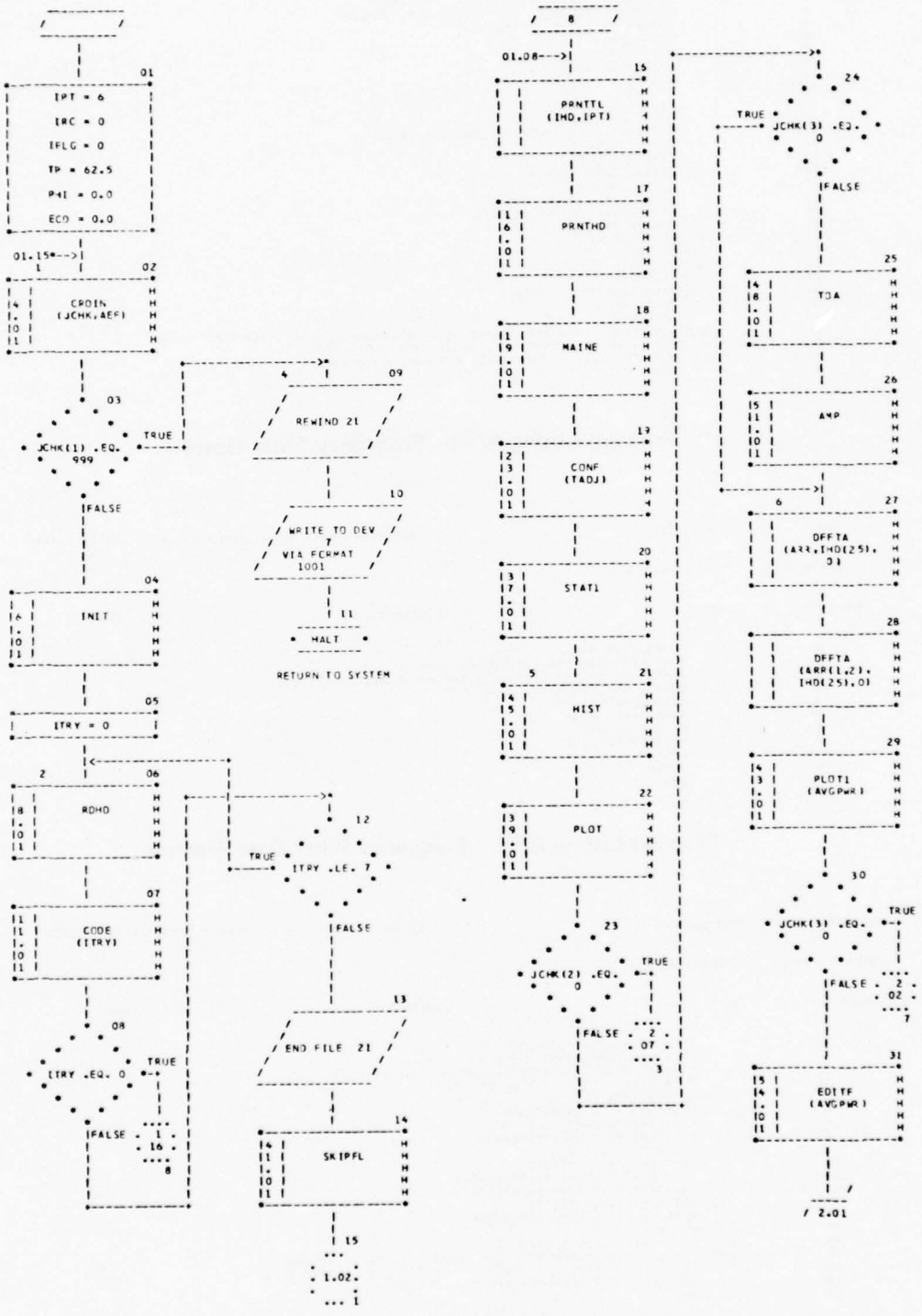
FORTRAN MODULE (LIST,NAMSQ)

CARD NO **** CONTENTS ****

```
      SUBROUTINE SNFS(JCHK,AEF,I)
      IMPLICIT REAL*8(A-C,E-H,O-Z)
      DIMENSION JCHK(5),IHD(40),GRDTOT(3,32),FIT(2)
      DATA FIT/'BEFORE ',' AFTER '/
      COMMON IHD,GRDTOT
      COMMON/CARD/TDA,SDTCA,SN,FS
      COMMON/PRINT/IPT
      AMP=DABS(GRDTOT(I,IHD(26)))
      SD=GRDTOT(2,IHD(26))
      SN=20.*DLOG10(AMP/SD)
      PWR=(IHD(9)-JCHK(4)+100.)/20.00
      FS=.707107*AMP*10**PWR/AEF
      WRITE(IPT,1000)FIT(I)
      WRITE(IPT,1001)SN,FS,IHD(26)
      RETURN
 1000 FORMAT(52X,A6,' EDITING')
 1001 FORMAT(35X,'SIGNAL TO NOISE RATIO = ',F5.1,' DB',/,
     135X,'FIELD STRENGTH = ',F7.0,' MICROVOLTS PER METER',/,
     250X,'BOTH MEASUREMENTS BASED ON T',I2)
      END
```

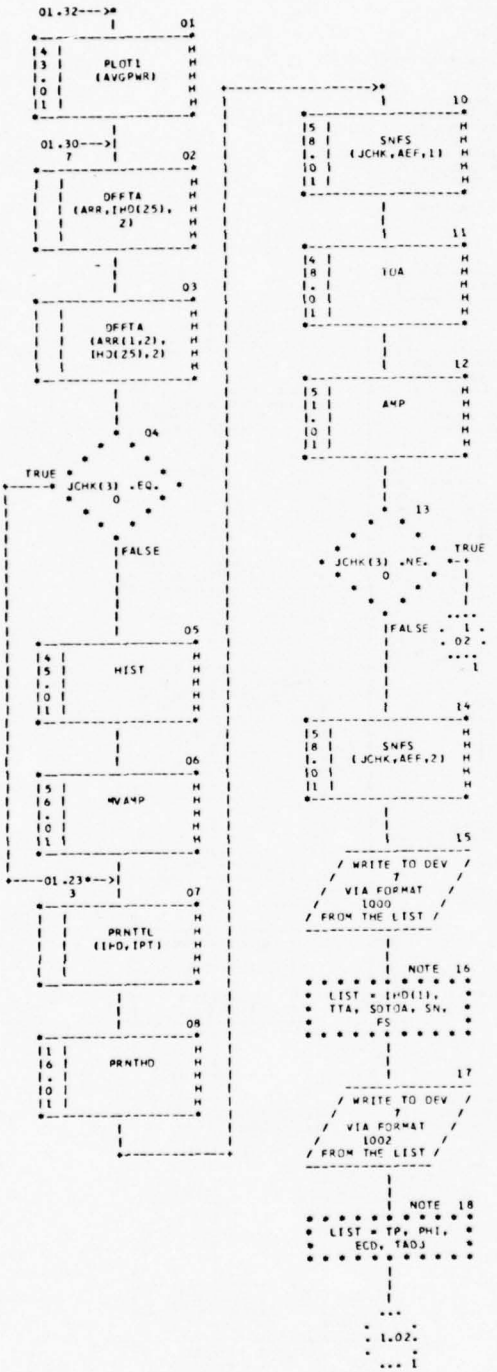
Program Listing A-58 Frequency Filter Signal-to-Noise and Field Strength Calculator

CHART TITLE - PROCEDURES



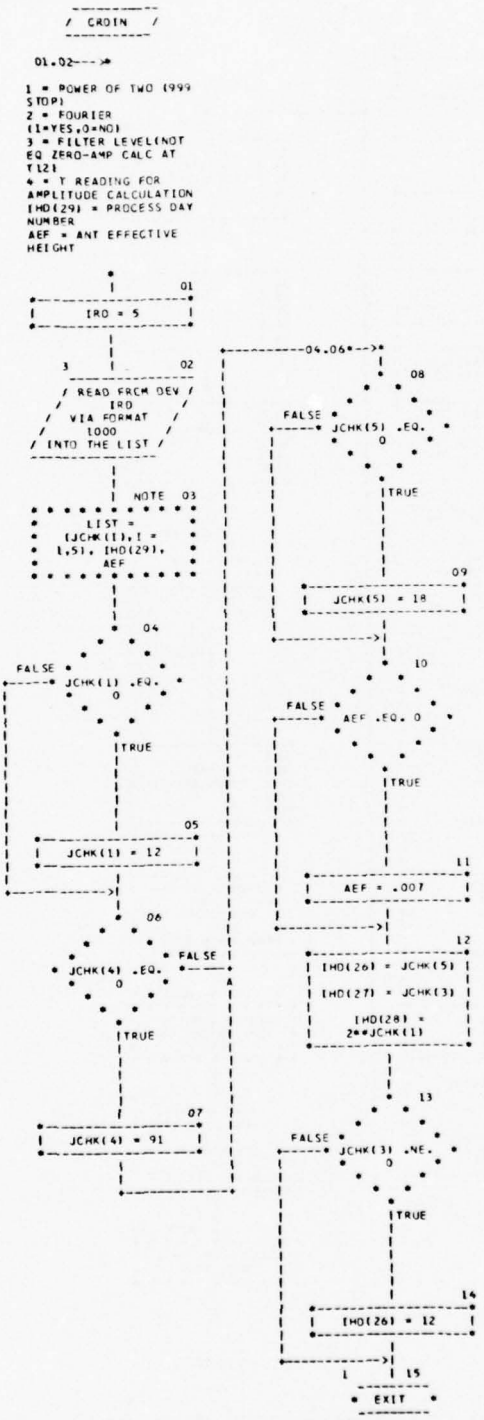
Flow Chart A-34 Frequency Filter Driver

CHART TITLE - PROCEDURES



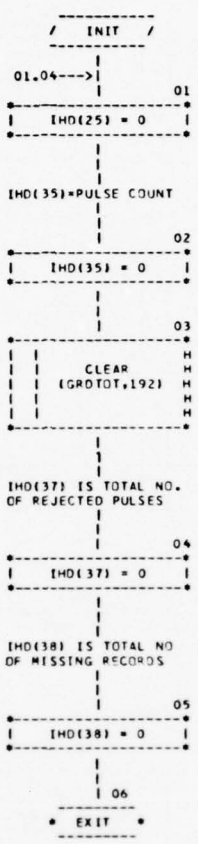
Flow Chart A-34 Frequency Filter Driver (concluded)

CHART TITLE - SUBROUTINE CRDIN(JCHK,AEF)



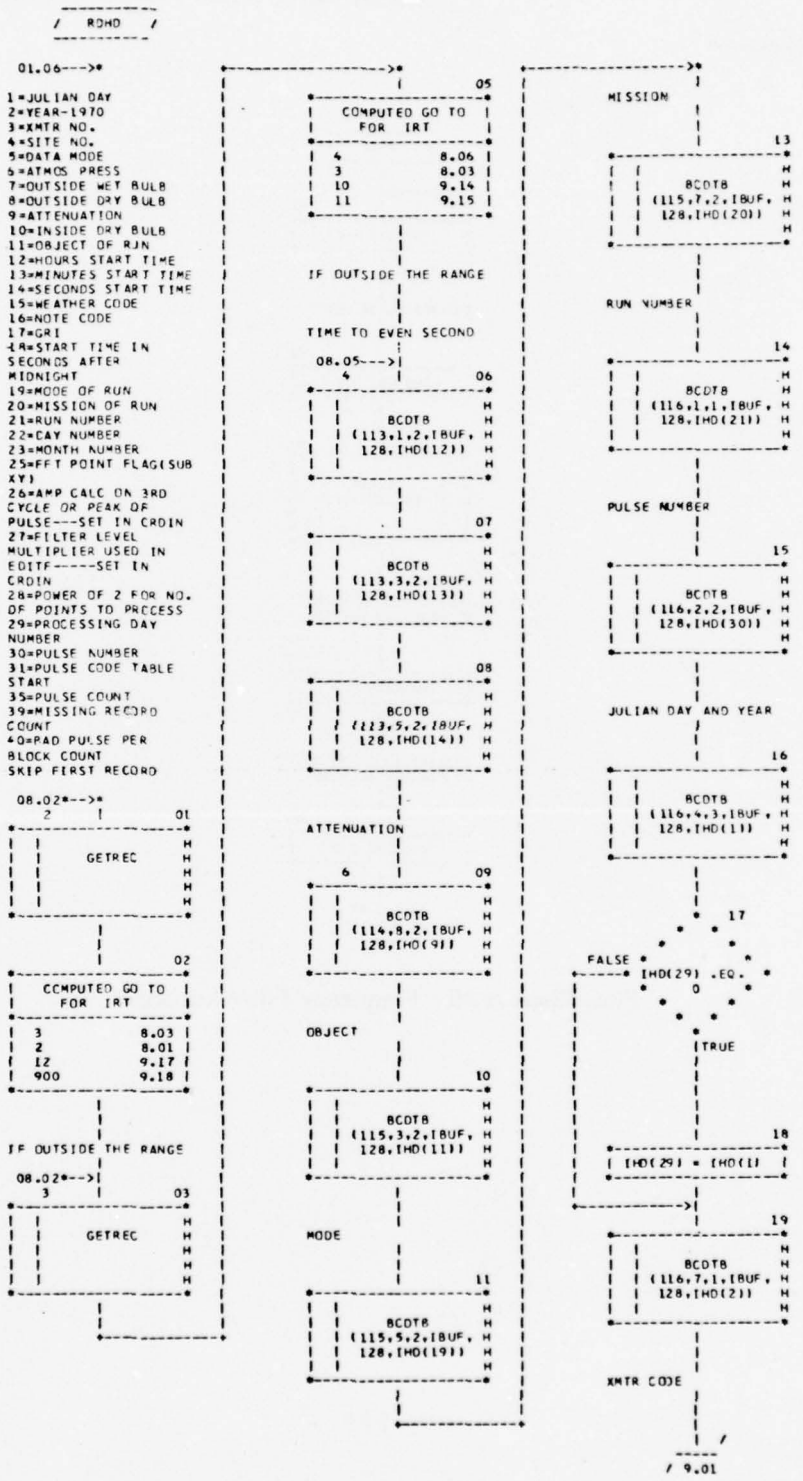
Flow Chart A-35 Frequency Filter Card Input

CHART TITLE - SUBROUTINE INIT



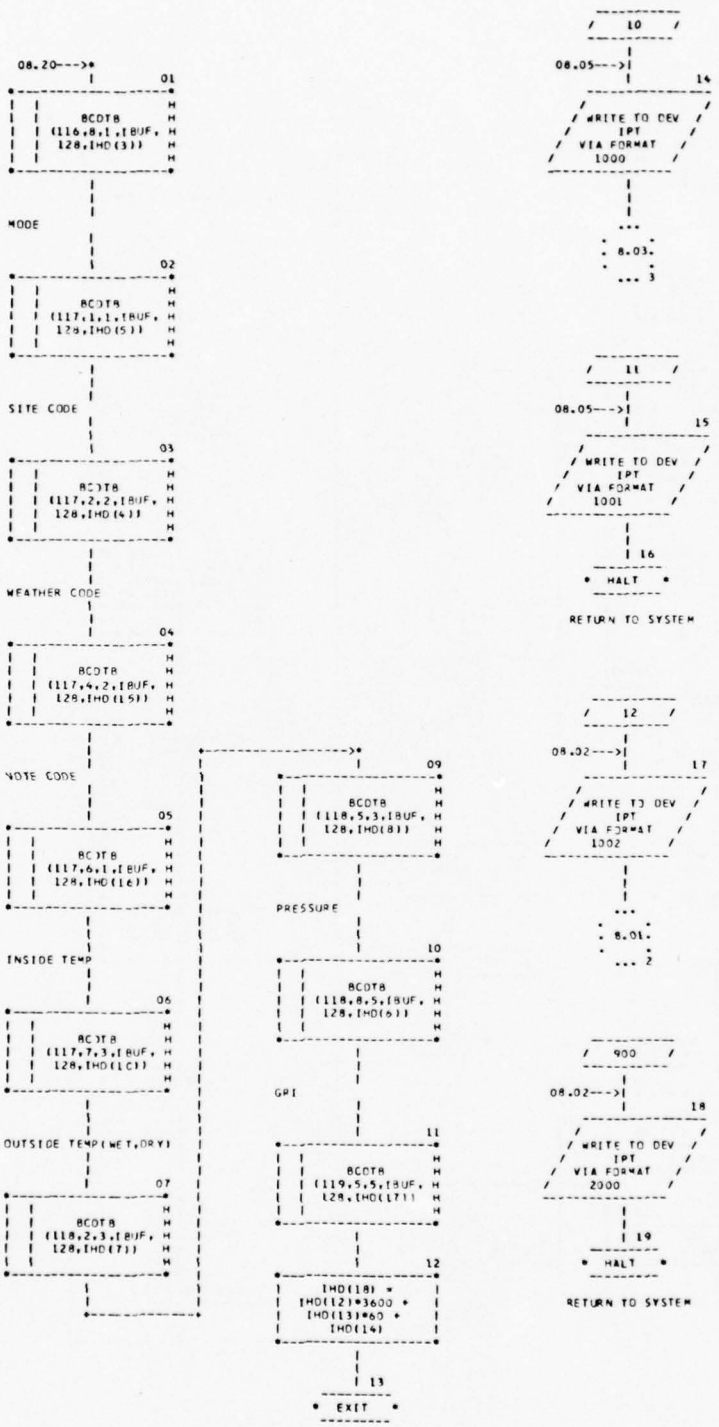
Flow Chart A-36 Frequency Filter Initializer

CHART TITLE - SUBROUTINE RDHD



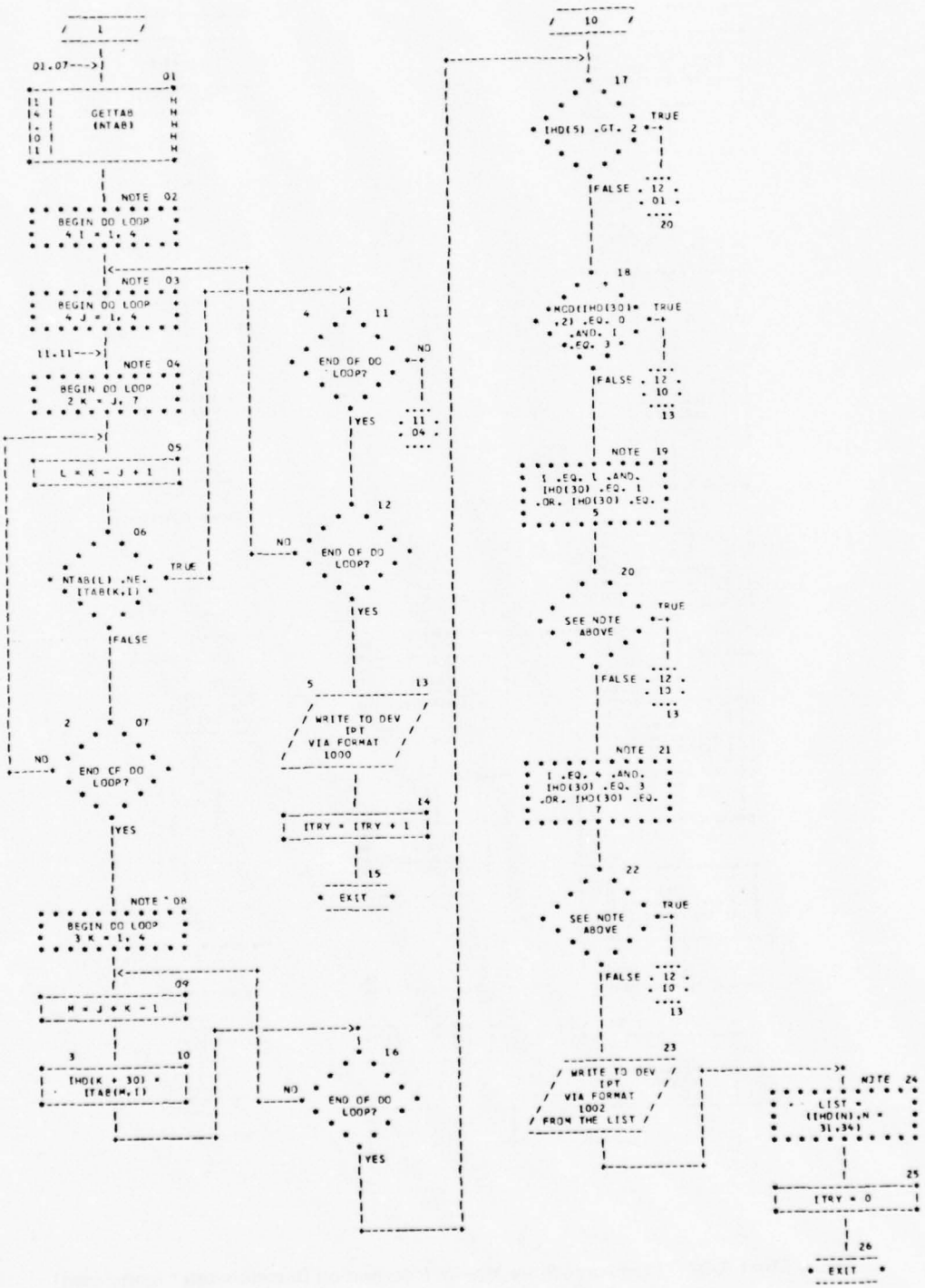
Flow Chart A-37 Frequency Filter Header Information Decommutator

CHART TITLE - SUBROUTINE RDHD



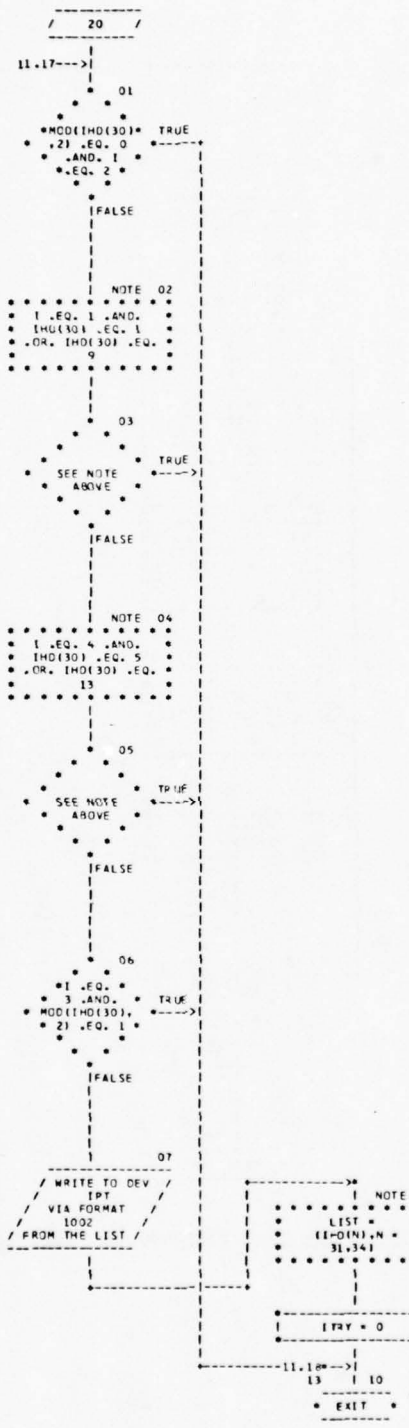
Flow Chart A-37 Frequency Filter Header Information Decommutator (concluded)

CHART TITLE - SUBROUTINE CODE(ITRY)



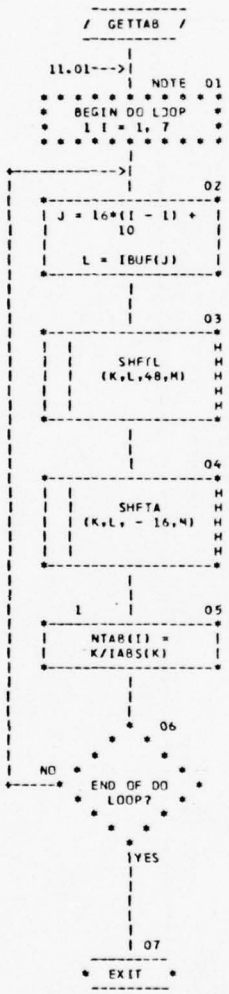
Flow Chart A-38 Frequency Filter Pulse Phase Code Decoder

CHART TITLE - SUBROUTINE CODE(ITRY)



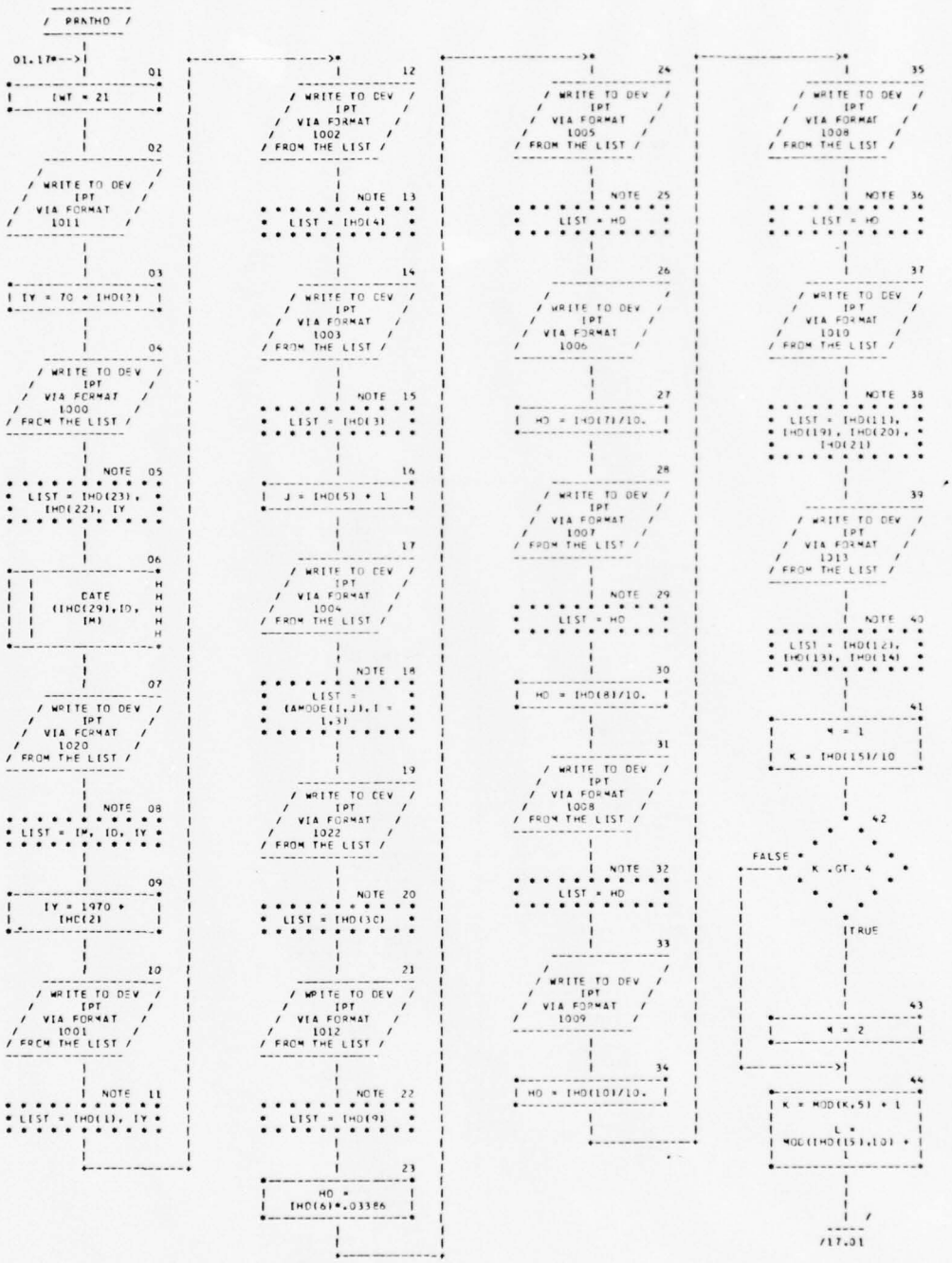
Flow Chart A-38 Frequency Filter Pulse Phase Code Decoder (concluded)

CHART TITLE - SUBROUTINE GETTAB(NTAB)



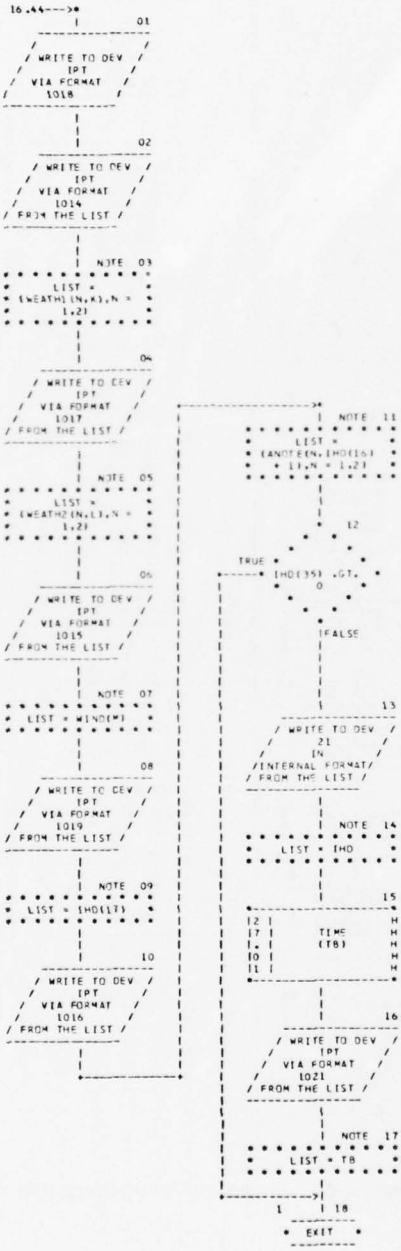
Flow Chart A-39 Frequency Filter Phase Code Generator

CHART TITLE - SUBROUTINE PRNTHD



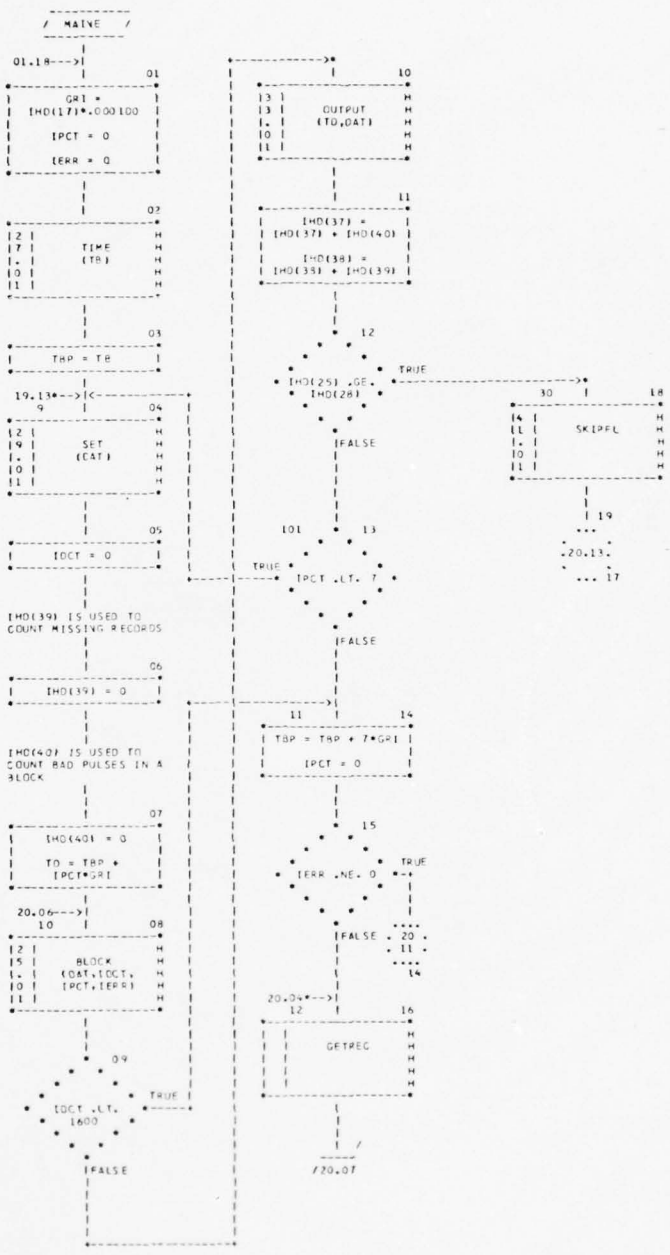
Flow Chart A-40 Frequency Filter Header Page Printer

CHART TITLE - SUBROUTINE PRNTHD



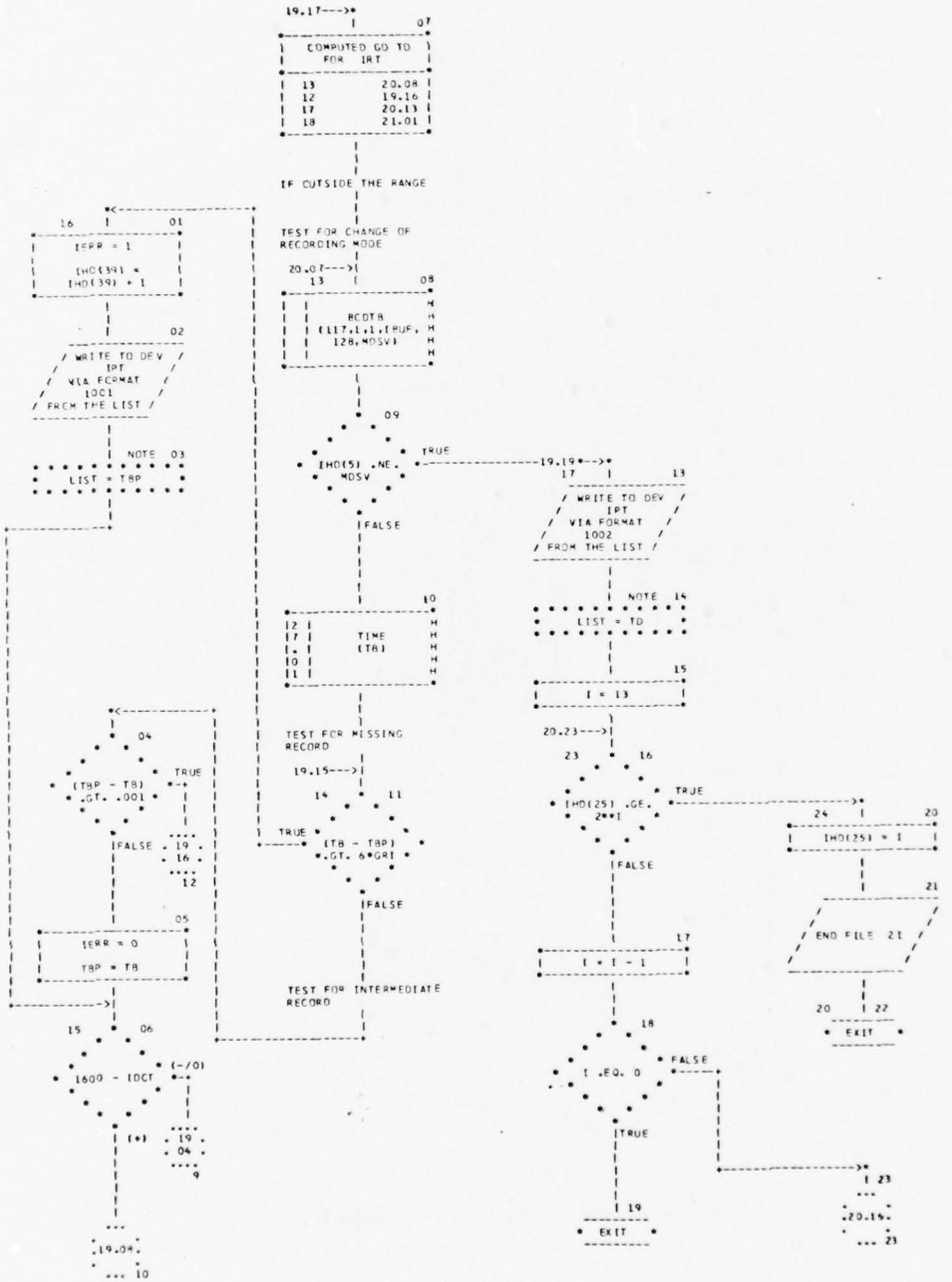
Flow Chart A-40 Frequency Filter Header Page Printer (concluded)

CHART TITLE - SUBROUTINE MAINE



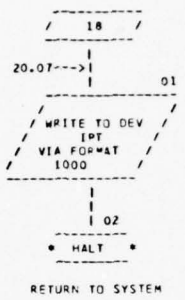
Flow Chart A-41 Frequency Filter Main Data Handler

CHART TITLE - SUBROUTINE MAINE



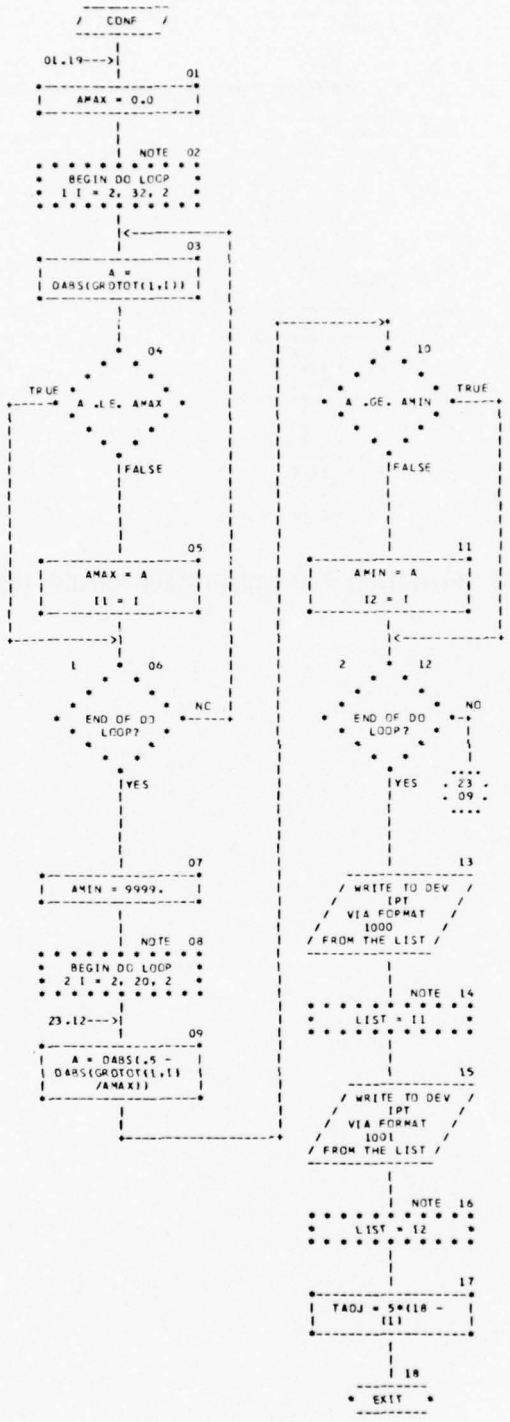
Flow Chart A-41 Frequency Filter Main Data Handler (continued)

CHART TITLE - SUBROUTINE MAINE



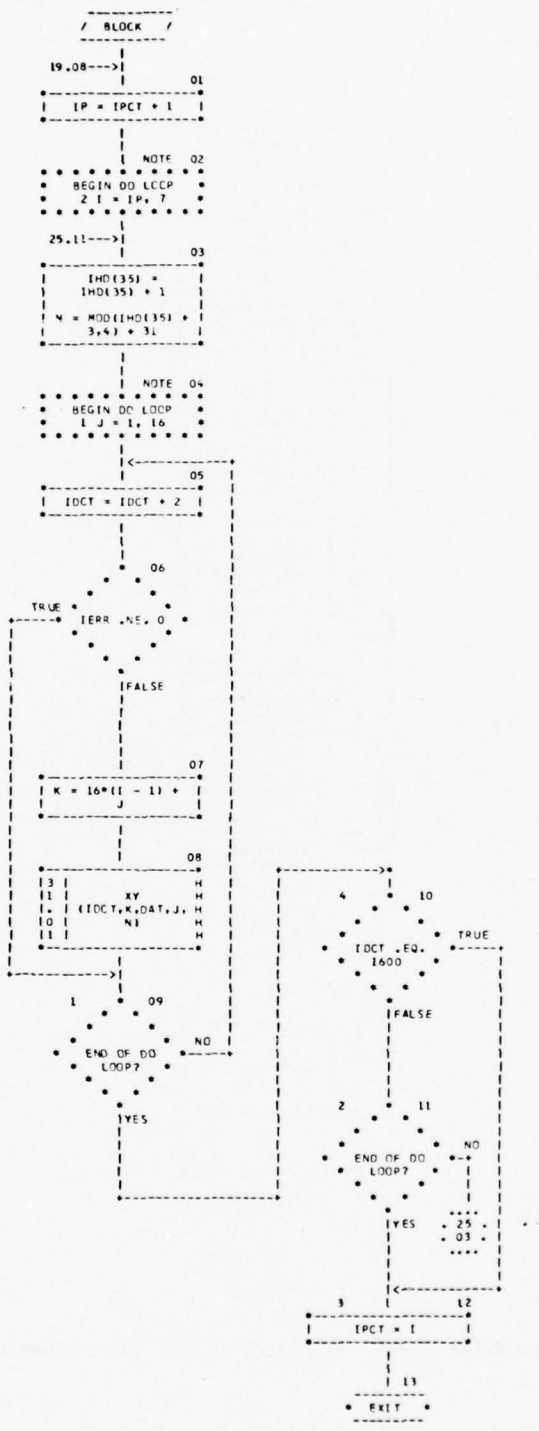
Flow Chart A-41 Frequency Filter Main Data Handler (concluded)

CHART TITLE - SUBROUTINE CONFITADJ)



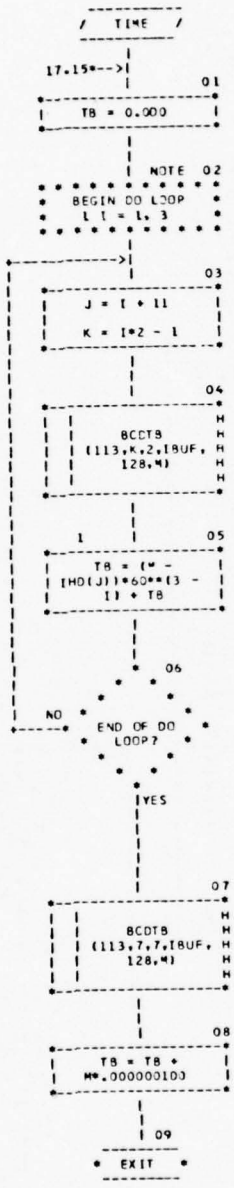
Flow Chart A-42 Frequency Filter Lock-On Confirmation

CHART TITLE - SUBROUTINE BLOCK(DAT,IDCT,IPCT,IERR)



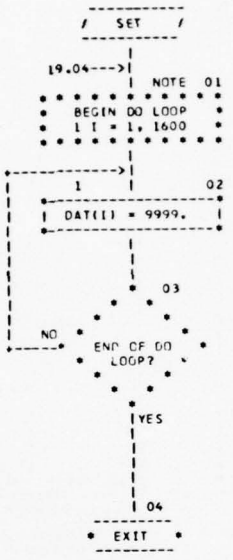
Flow Chart A-43 Frequency Filter Data Blocker

CHART TITLE - SUBROUTINE TIME(TB)



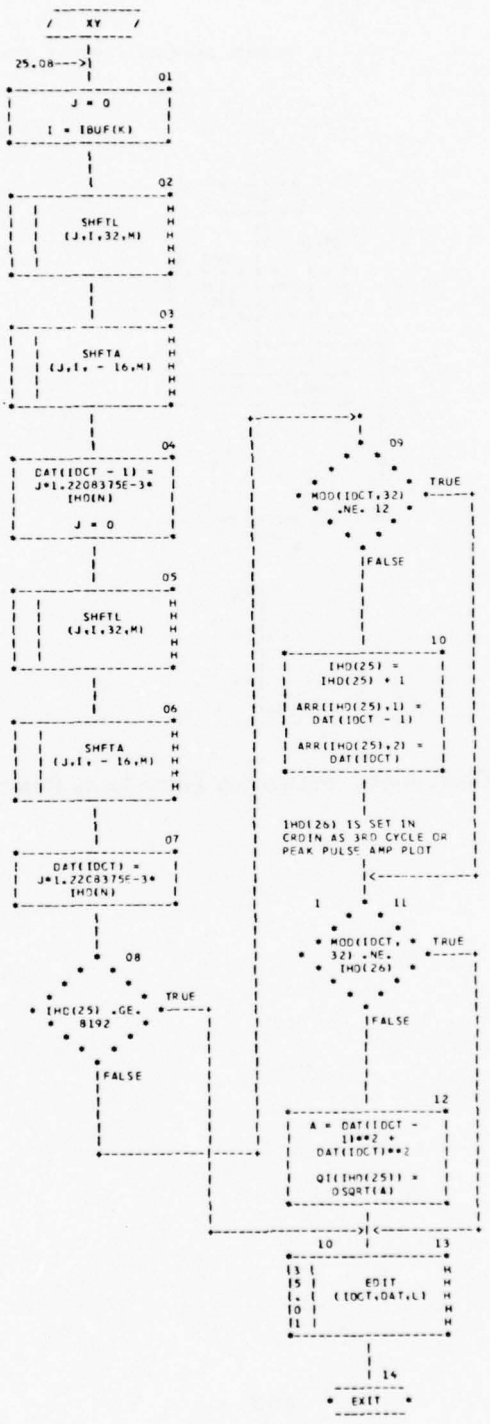
Flow Chart A-44 Frequency Filter Time Decoder

CHART TITLE - SUBROUTINE SET(DAT)



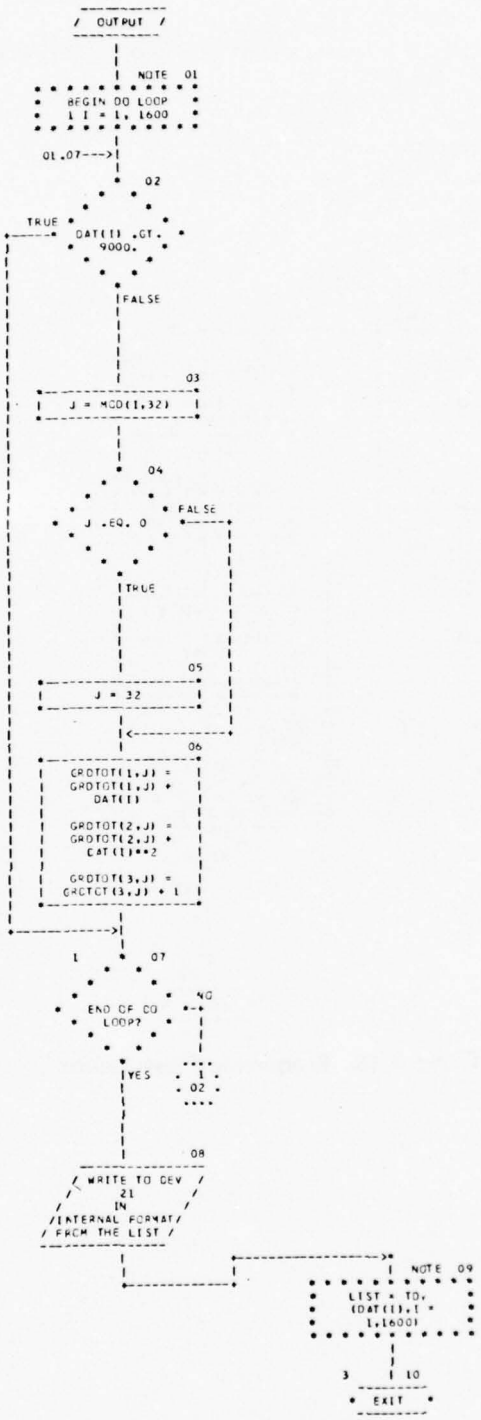
Flow Chart A-45 Frequency Filter Array Reset

CHART TITLE - SUBROUTINE XY(IDCT,K,DAT,L,N)



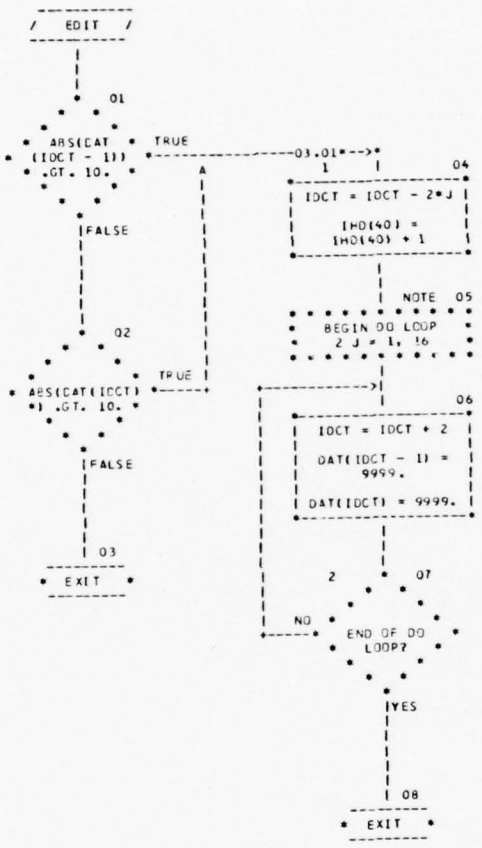
Flow Chart A-46 Frequency Filter Measurement Decoder

CHART TITLE - SUBROUTINE OUTPUT(TD,DAT)



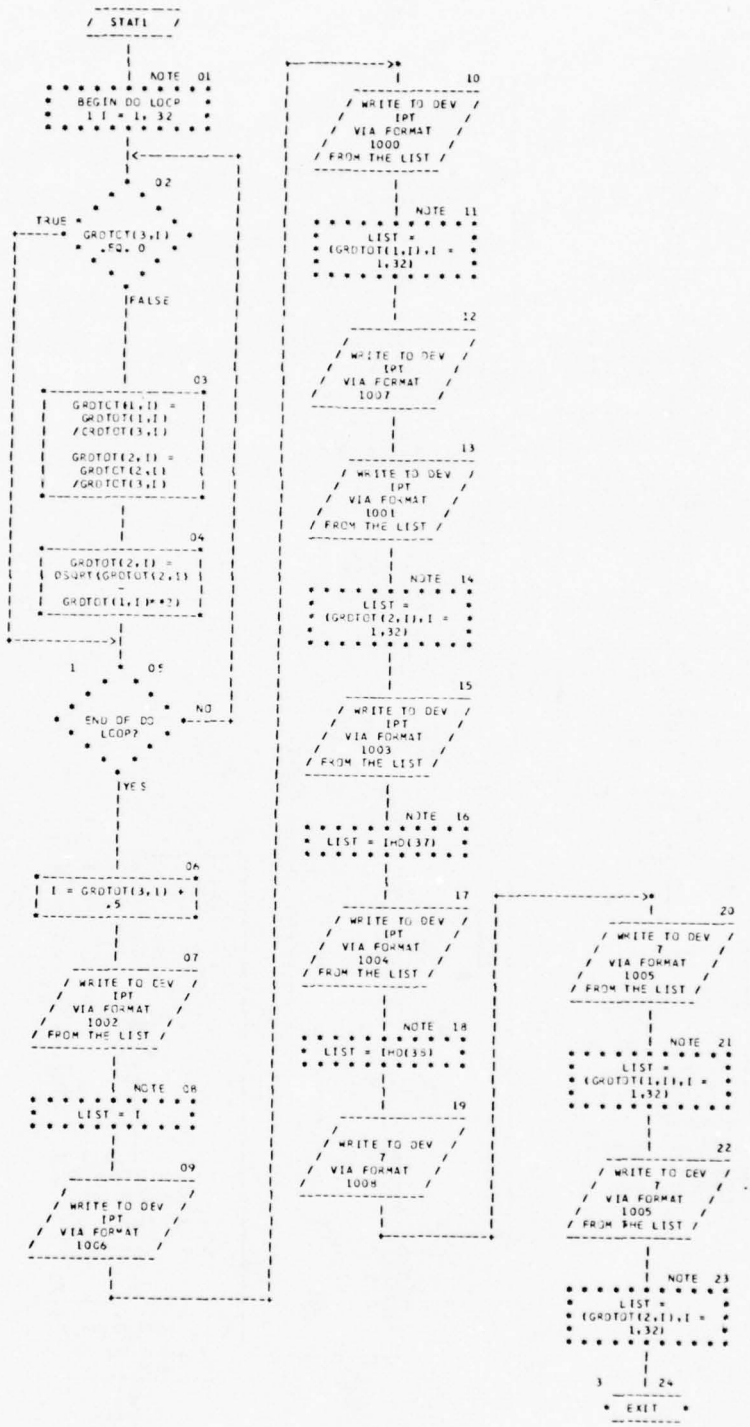
Flow Chart A-47 Frequency Filter Output Tape Writer

CHART TITLE - SUBROUTINE EDIT(IDCT,DAT,J)



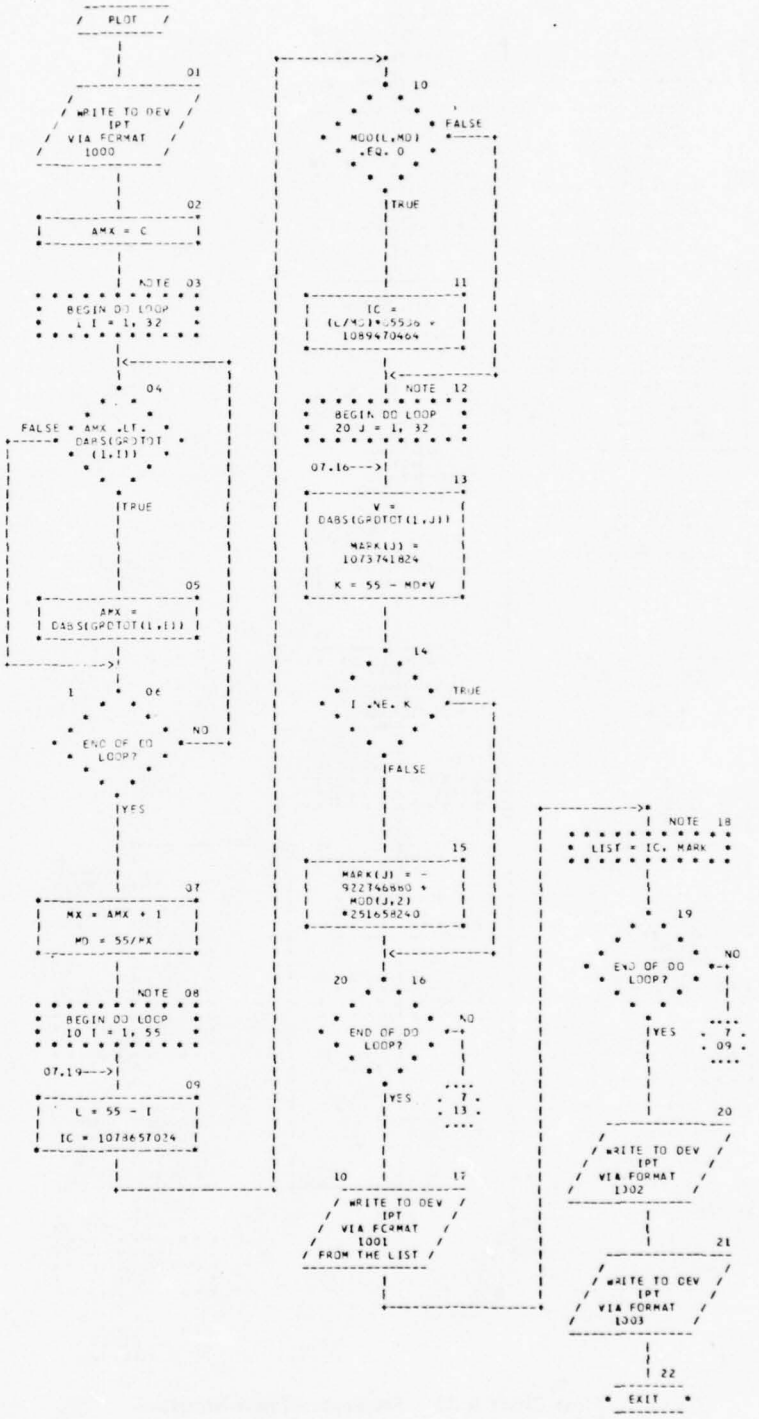
Flow Chart A-48 Frequency Filter Editor

CHART TITLE - SUBROUTINE STAT1



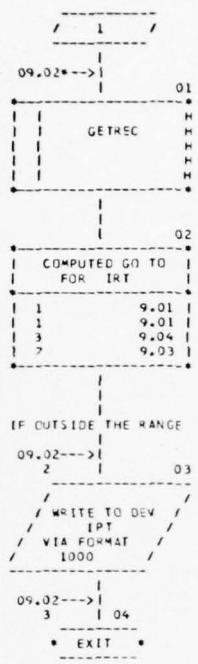
Flow Chart A-49 Frequency Filter Statistics

CHART TITLE - SUBROUTINE PLOT



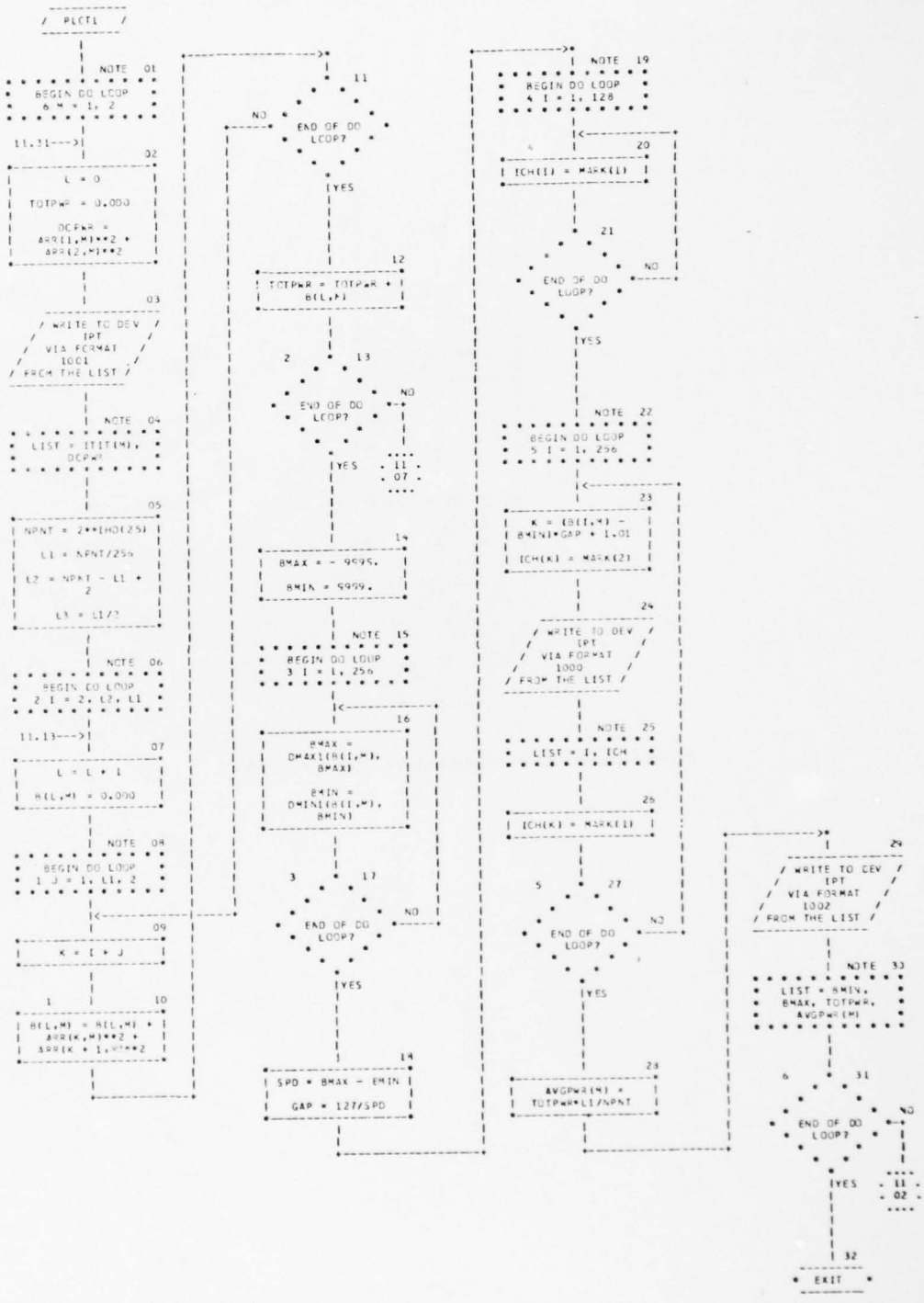
Flow Chart A-50 Frequency Filter I/Q Plotter

CHART TITLE - SUBROUTINE SKIPFL



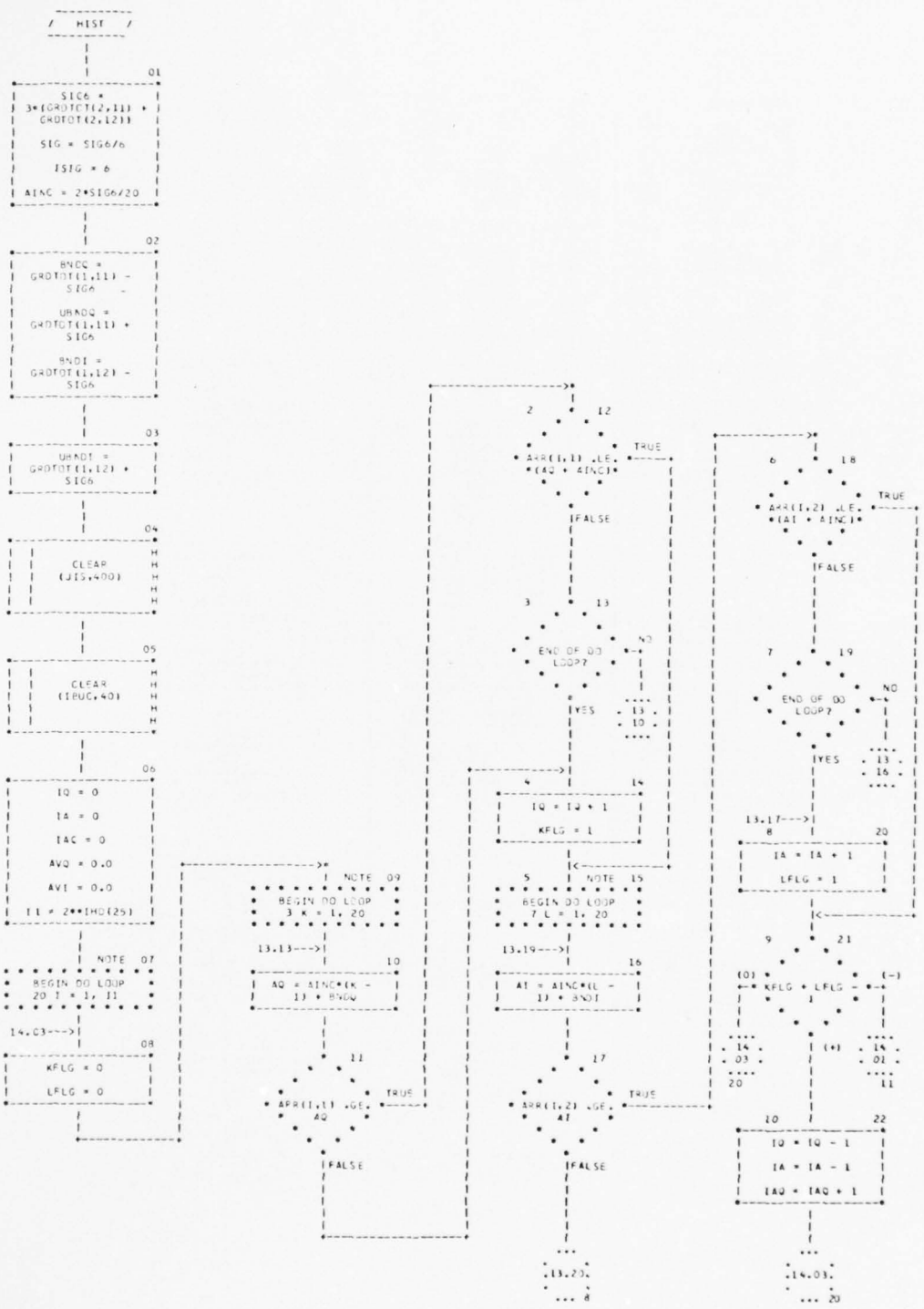
Flow Chart A-51 Frequency Filter File Skip

CHART TITLE - SUBROUTINE PLOTI(AVGPWR)



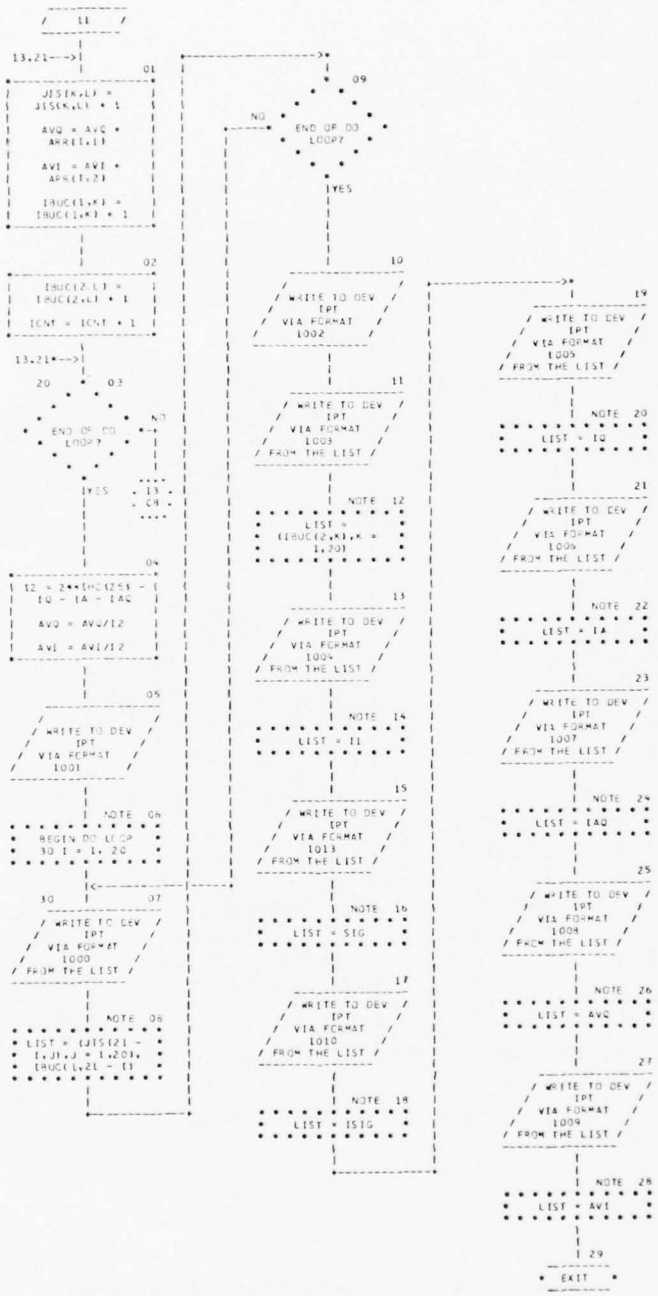
Flow Chart A-52 Frequency Filter Envelope Plotter

CHART TITLE - SUBROUTINE HIST



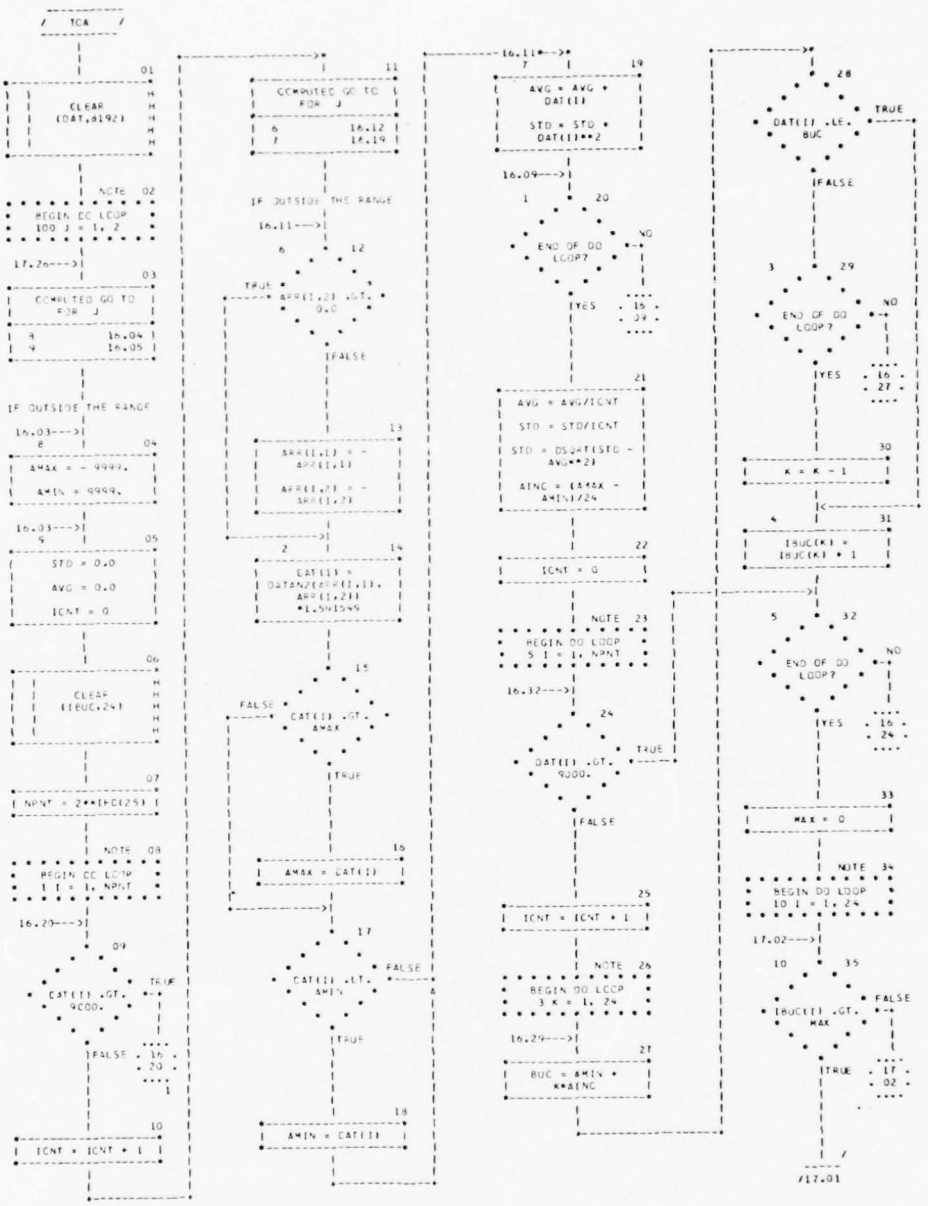
Flow Chart A-53 Frequency Filter Histogram Printer

CHART TITLE - SUBROUTINE HIST



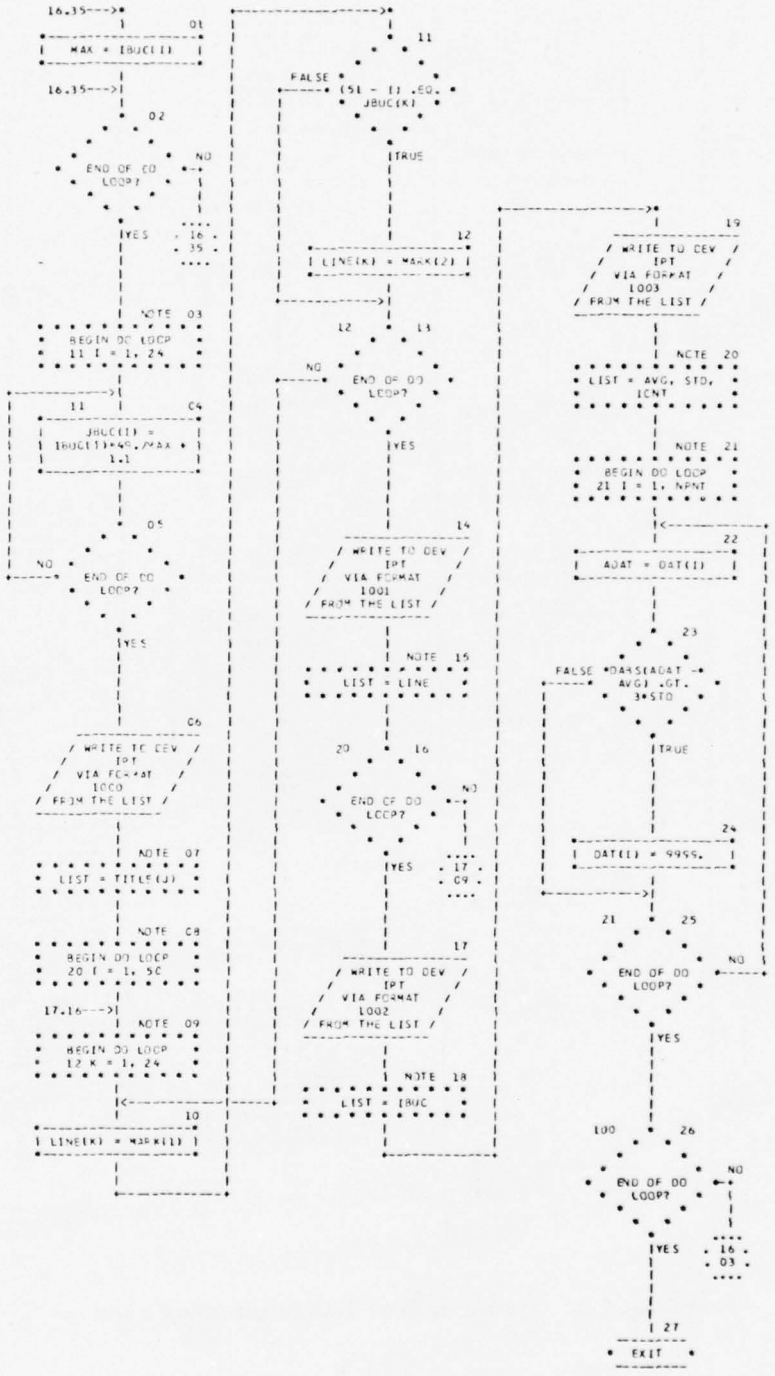
Flow Chart A-53 Frequency Filter Histogram Printer (concluded)

CHART TITLE - SUBROUTINE TOA



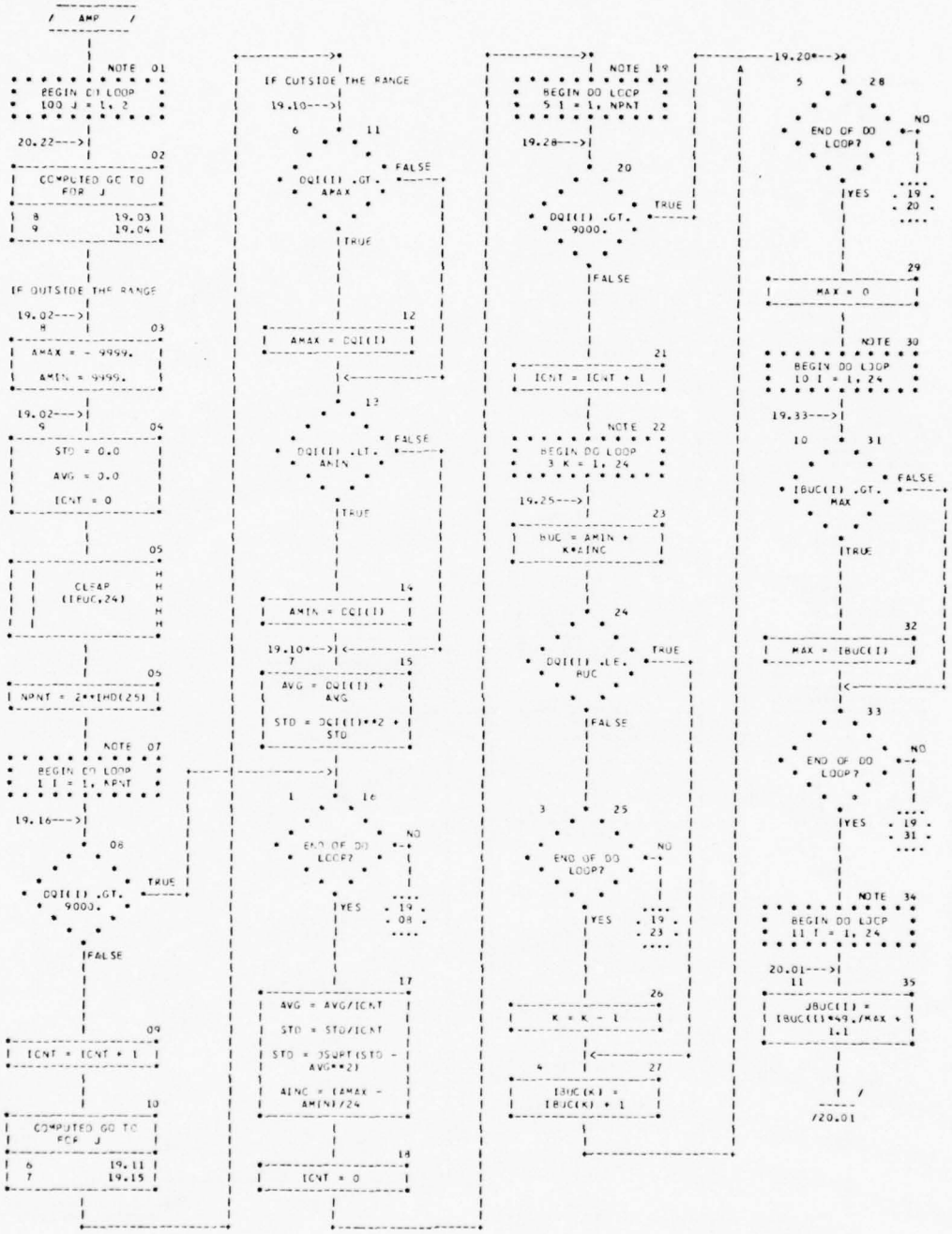
Flow Chart A-54 Frequency Filter TOA Distribution Plotter

CHART TITLE - SUBROUTINE TOA



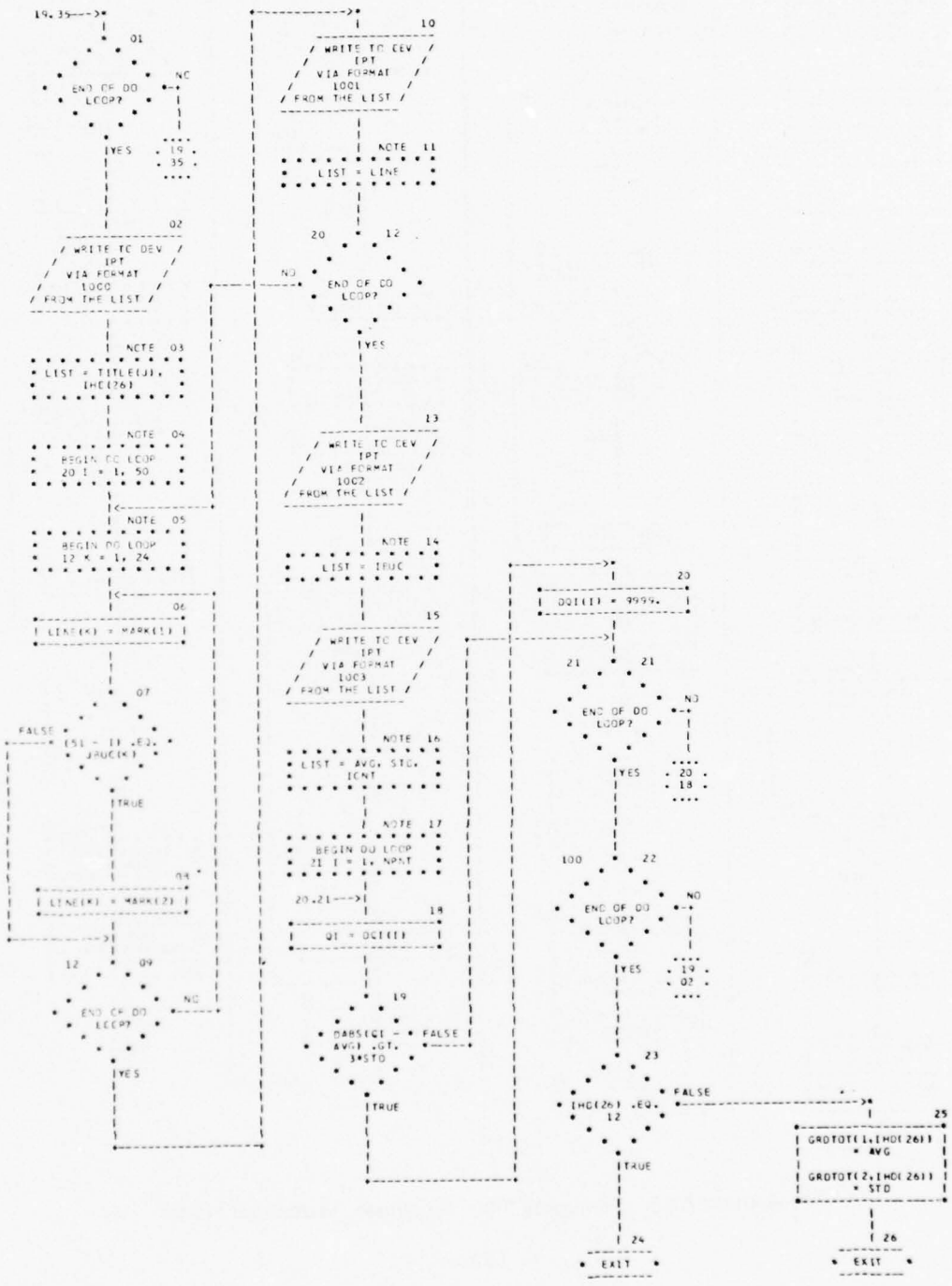
Flow Chart A-54 Frequency Filter TOA Distribution Plotter (concluded)

CHART TITLE - SUBROUTINE AMP



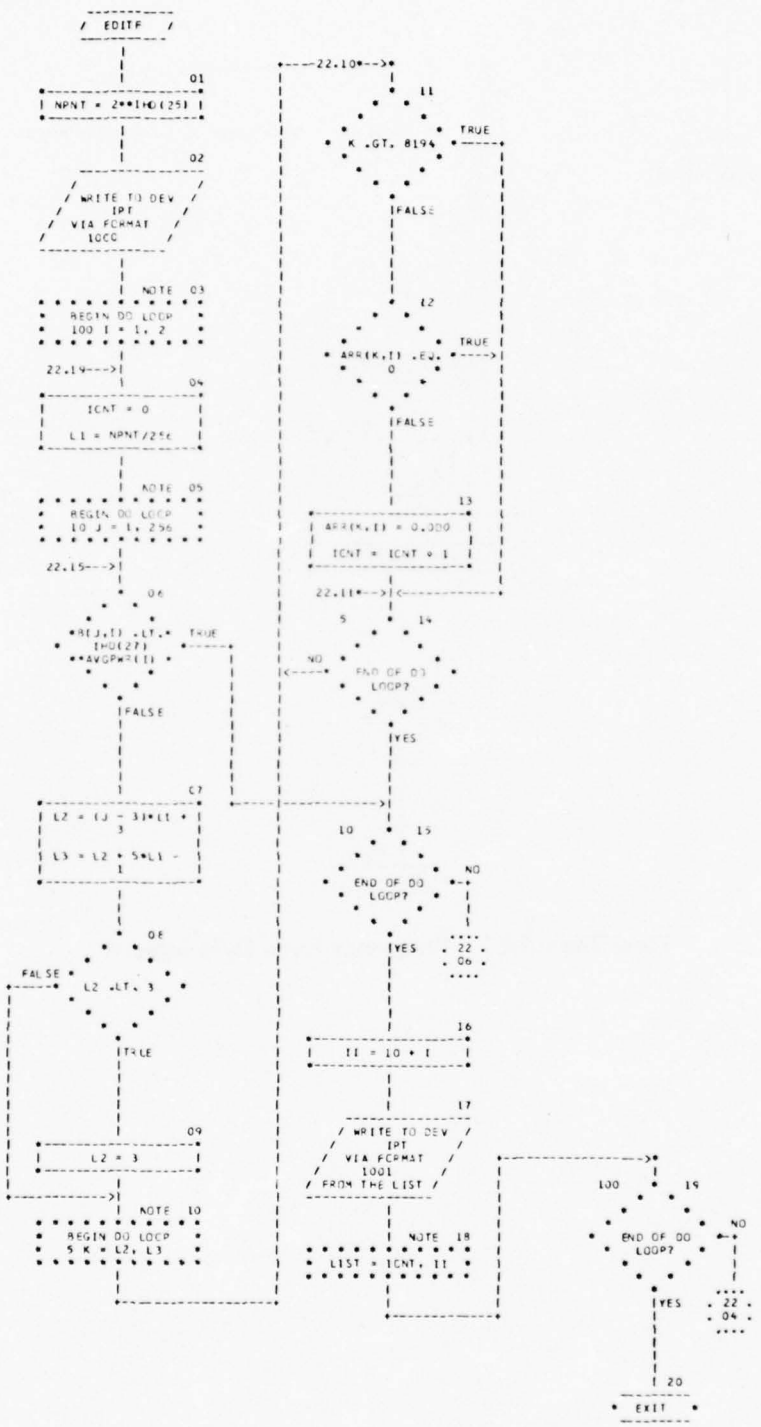
Flow Chart A-55 Frequency Filter Amplitude Distribution Plotter

CHART TITLE - SUBROUTINE AMP



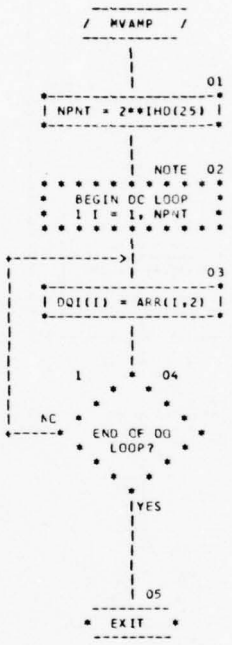
Flow Chart A-55 Frequency Filter Amplitude Distribution Plotter (concluded)

CHART TITLE - SUBROUTINE EDITF(AVGPHR)



Flow Chart A-56 Frequency Filter Notch

CHART TITLE - SUBROUTINE MVAMP



Flow Chart A-57 Frequency Filter Data Selector

CHART TITLE - SUBROUTINE SNFS(JCHK,AEF,I)



Flow Chart A-58 Frequency Filter Signal-to-Noise and Field Strength Calculator

ASSEMBLY MODULE ILIST,NAMSQ)

CARD NO **** CONTENTS ****

```
                MACRO
&NAME           SAVEM &A,&B,&C
                EXTENDED SAVE MACRO
*               THIS MACRO PROVIDES THE FOLLOWING:
.*                    ISSUES A STANDARD SAVE MACRO  (CONTROL PROGRAM SERVICES)
.*                    GENERATES AN 18-WORD SAVE AREA
.*                    PERFORMS LINKAGE OF HIGHER AND LOWER SAVE AREAS
.*                    INSERTS CURRENT SAVE AREA ADDRESS IN REG 13
.*                    DOES NOT ALTER OTHER REGISTERS
*               WHEN USING SAVEM, EXIT MAY BE ACCOMPLISHED BY:
*               L     13,4(13)
*               RETURN  (N,M)
                LCLC  &XQS
&XQS            SETC  'XQX'.'&SYSNDX'
&XQS            DS    0C                    NEED A NAME TO COUNT FROM
&NAME           SAVE  &A,&B,&C              JUST AS IN C.P.S. MANUAL
                LR    11,13                 HOLD 13 (HIGHER SAVE AREA)
                CNOP  0,4                   ALIGN SAVE AREA
                BAL   13,*-&XQS+76(15)      JUMP PAST SAVE AREA
                DC    18F'0'                SAVE AREA...13 POINTS HERE NOW
                ST 13,8(11)                 PUT LOWER ADDRESS IN HIGHER SAVE A.
                ST    11,4(13)              AND HIGHER ADDRESS IN LOWER SAVE A.
                L     11,64(11)             RESTORE FROM HIGHER SAVE AREA
                MEND                                                          GET 0000
                SPACE 2                                                       GET 0005
*               USAGE:                                                        GET 0010
*                                                                             GET 0015
*               CALL GETREC, OR                                               GET 0020
*               CALL GETL,                                                    GET 0025
*                                                                             GET 0030
*               WHERE USER HAS DEFINED A LABELLED COMMON/GETDAT/ERR,DATA-     GET 0035
*               WHERE ERR IS A FULL WORD AND DATA HAS A LENGTH OF             GET 0040
*               AT LEAST 'LRECL' BYTES.                                       GET 0045
                SPACE 2                                                       GET 0050
GETREC          CSECT                                                         GET 0055
GETL            EQU   *                                                       GET 0060
                ENTRY GETL                                                    GET 0065
                SPACE 2                                                       GET 0075
                SAVEM (14,12),,*                                              GET 0080
                LR    10,15                                                   GET 0085
                USING GETREC,10                                               GET 0090
                L     11,=V(GETDAT)                                           GET 0095
                USING GETDAT,11                                               GET 0100
                LA    12,DCB                                                  GET 0105
                USING IHADCB,12                                               GET 0110
                SPACE                                                         GET 0115
                TM    DCBOFLGS,X'10'                                          GET 0120
                BO    GET                   IF DCB OPEN, READ RECORD          GET 0125
                SPACE                                                         GET 0130
                OPEN  (DCB,(INPUT))                                           GET 0135
                TM    DCBOFLGS,X'10'                                          GET 0140
                BZ    NODD                  SET ERROR FLAG TO NO MORE TAPES   GET 0145
                SPACE 2                                                       GET 0150
GET             EQU   *                                                       GET 0155
                MVC   ERW(4),=XL4'1' INITIALIZE TO GOOD I/O                   GET 0160
*                                                                             GET 0165
                GET   DCB,INCY                                                GET 0170
                SPACE 2                                                       GET 0175
RTN             EQU   *                                                       GET 0180
                L     13,4(13)                                                GET 0185
                RETURN (14,12),T                                              GET 0190
                EJECT                                                         GET 0195
ERROR           EQU   *                                                       GET 0200
                ST    0,AOFSSI              CONTAINS ADDRESS OF STANDARD      GET 0205
*                                           STATUS INDICATORS AND A DISPLACEMENT GET 0210
*                                           VALUE TO REACH THE CCW            GET 0215
                ST    1,AOFDCB              CONTAINS ADDRESS OF DCB           GET 0220
                MVC   ERW(4),=XL4'2' SET TO I/O ERROR                         GET 0225
                LR    1,0                   PUT IOB ADDRESS INTO R1           GET 0230
                MVC   SAVIOB(20),0(1)       MOVE INTO LOCAL AREA FOR          GET 0235
*                                           REFERENCE IF CALLING PROGRAM TERMINATES GET 0240
*                                           WITH A DUMP                       GET 0245
                BR    14                    RETURN TO SYSTEM, WHICH WILL      GET 0250
*                                           RETURN TO STATMENT AFTER GET      GET 0255
                SPACE 2                                                       GET 0260
EOF             EQU   *                                                       GET 0265
                MVC   ERW(4),=XL4'3' SET TO END OF FILE                       GET 0270
                CLOSE (DCB)                                                   GET 0275
                SPACE 2                                                       GET 0280
*               CHANGE DDNAME BY INCREMENTING 'INPUT1' TO 'INPUT2' ETC.       GET 0281
                LH    4,=H'0'                                                 GET 0282
                IC    4,DCBDDNAM+5                                            GET 0283
                AH    4,=H'1'                                                 GET 0284
                CH    4,=H'250'                                               GET 0285
                BC    4,LESS                                                  GET 0286
                IC    4,DCBDDNAM+5                                            GET 0287
                AH    4,=H'1'                                                 GET 0288
                STC   4,DCBDDNAM+5                                            GET 0289
                IC    4,=X'F0'                                                GET 0300
LESS            STC   4,DCBDDNAM+6                                            GET 0305
                B     RTN                                                     GET 0310
                SPACE 2                                                       GET 0315
NODD            EQU   *                                                       GET 0320
                MVC   ERW(4),=XL4'4' SET TO NO DD CARD                        GET 0321
                B     RTN                                                     GET 0322
                SPACE 2                                                       GET 0323
*               ENTRY TO CLOSE A FILE AND INCREMENT THE DDNAME.               GET 0324
*               SETS UP THE BASE REGISTER SO THAT IT WILL HAVE THE
*               SAME VALUE THROUGHOUT THE CSECT.  IT THEN PERFORMS
*               THE SAME PROCEDURE AS THOUGH AN END-OF-FILE WERE ENCOUNTERED
                SPACE 2
CFILE           SAVEM (14,12),,*
                ENTRY CFILE
                USING CFILE,15                                                GET 0328
                L     10,=A(GETREC)                                           GET 0329
                DROP  15                                                      GET 0330
                USING GETREC,10                                               GET 1330
                L     11,=V(GETDAT)
```

Program Listing A-59 Group Phase Library Raw Data Tape Reader

```
CARD NO  ****                          CONTENTS                          ****

  109                LA     12,DCB                                      GET 1332
  110                B      EOF                                         GET 1331
  111                EJECT
  112     AOFSSI     DC     F'0'                                        GET 1333
  113     AOFDCB     DC     F'0'                                        GET 1335
  114     SAVIOB     DC     20X'00'                                     GET 1340
  115                SPACE  2                                           GET 1345
  116     DCB        DCB    DSORG=PS,MACRF=(GM),DDNAME=INPUT01,         XGET 1350
  117                       EODAD=EOF,SYNAD=ERROR,EROPT=ACC             GET 1355
  118                SPACE  2                                           GET 1360
  119     GETDAT     DSECT                                              GET 1365
  120     ERW        DS     F                                           GET 1370
  121     INCY       DS     F                                           GET 1375
  122                DCBD   DSORG=(QS),DEVD=(TA)                        GET 1380
  123                END                                                GET 1385
```

Program Listing A-59 Group Phase Library Raw Data Tape Reader (concluded)

ASSEMBLY MODULE (LIST,NAMSQ)

```
CARD NO          ****                    CONTENTS                    ****

      1          *  FORTRAN CALLABLE ROUTINE TO CONCATENATE TWO FULL WORDS, SHIFT
      2          *  LOGICALLY LEFT OR RIGHT A SPECIFIED NUMBER OF PLACES, AND STORE
      3          *  LO-ORDER AND HI-ORDER  RESULT BACK IN ORIGINAL WORDS.
      4          *  CALLING SEQUENCE:  CALL SHFTL(A,B,C,RC) WHERE A AND B ARE ORIGINAL
      5          * TWO WORDS, C IS NUMBER OF SHIFTS AND SIGN BIT + FOR  LEFT SHIFT
      6          *  AND - FOR RIGHT SHIFT, AND RC IS RETURN CODE.  RC=16 IF |C| >64.
      7          *
      8          *
      9          SHFTL  CSECT
     10                 SAVE    (14,12),,*
     11                 USING   SHFTL,12
     12                   LR    12,15
     13                   ST    13,SAVE+4
     14                   LR    2,13
     15                   LA    13,SAVE
     16                 ST      13,8(2)
     17                   LR    2,1     PARAMETER LIST POINTER
     18                   LA    10,0        SET RC=0
     19          *
     20          *  PICK UP FIRST AND SECOND PARAMETERS IN REGS 6 AND 7
     21                   L     6,0(0,2)     ADDR OF A
     22                   L     4,0(6)       A
     23                   L     7,4(2)
     24                   L     5,0(7)       B
     25          *
     26          *  PICK UP 3RD PARAMETER AND GET NB OF SHIFTS
     27                   L     8,8(2)
     28                   L     9,0(8)       C
     29                   LPR   9,9              POS VALUE OF C IN R9
     30                   LTR   9,9  SEE IF NO. SHIFTS = 0
     31                   BE    EXIT
     32                   C     9,=F'64'  SEE IF |NB. SHIFTS| > 64
     33                   BH    GR64   YES
     34                   TM    0(8),X'80'  IS C NEG
     35                   BNO    POS
     36          LR       SRDL  4,1    SHIFT RT  SINCE C IS NEG
     37                   BCT   9,LR
     38                   B     STORE
     39          POS      SLDL  4,1    SHIFT LEFT SINCE C POS
     40                   BCT   9,POS  LOOP FOR ALL
     41          *
     42          *  STORE RC AND EXIT
     43          STORE    ST    4,0(6)    A
     44                   ST    5,0(7)     B
     45          EXIT     L     11,12(2)   ADDR OF RC
     46                   ST    10,0(11)   STORE RETURN CODE IN RC
     47                   L     13,SAVE+4
     48                   RETURN  (14,12)
     49          *
     50          GR64     LA    10,16
     51                   B     EXIT
     52          *
     53          SAVE     DS    18F
     54                   END SHFTL
```

Program Listing A-60 Group Phase Library Logical Shift Routine

ASSEMBLY MODULE (LIST,NAMSQ)

```
CARD NO  ****                          CONTENTS                          ****

     1   *  FORTRAN CALLABLE ROUTINE TO CONCATENATE TWO FULL WORDS, SHIFT
     2   *  ARITHMETICALLY LEFT OR RIGHT A SPECIFIED NUMBER OF PLACES, AND STORE
     3   *  LO-ORDER AND HI-ORDER  RESULT BACK IN ORIGINAL WORDS.
     4   *  CALLING SEQUENCE:  CALL SHFTA(A,B,C,RC) WHERE A AND B ARE ORIGINAL
     5   * TWO WORDS, C IS NUMBER OF SHIFTS AND SIGN BIT + FOR  LEFT SHIFT
     6   *  AND - FOR RIGHT SHIFT, AND RC IS RETURN CODE.  RC=16 IF |C| >64.
     7   *
     8   *
     9   SHFTA  CSECT
    10          SAVE    (14,12),,*
    11          USING   SHFTA,12
    12            LR    12,15
    13            ST    13,SAVE+4
    14            LR    2,13
    15            LA    13,SAVE
    16            ST    13,8(2)
    17            LR    2,1     PARAMETER LIST POINTER
    18            LA    10,0        SET RC=0
    19   *
    20   *  PICK UP FIRST AND SECOND PARAMETERS IN REGS 6 AND 7
    21            L     6,0(0,2)    ADDR OF A
    22            L     4,0(6)      A
    23            L     7,4(2)
    24            L     5,0(7)      B
    25   *
    26   *  PICK UP 3RD PARAMETER AND GET NB OF SHIFTS
    27            L     8,8(2)
    28            L     9,0(8)      C
    29            LPR   9,9             POS VALUE OF C IN R9
    30            LTR   9,9  SEE IF NO. SHIFTS = 0
    31            BE    EXIT
    32            C     9,=F'64'  SEE IF |NB. SHIFTS| > 64
    33            BH    GR64    YES
    34            TM    0(8),X'80'  IS C NEG
    35            BNO    POS
    36   LR       SRDA  4,1   SHIFT RT  SINCE C IS NEG
    37            BCT   9,LR
    38            B     STORE
    39   POS      SLDA  4,1   SHIFT LEFT SINCE C POS
    40            BCT   9,POS  LOOP FOR ALL
    41   *
    42   *  STORE RC AND EXIT
    43   STORE    ST    4,0(6)    A
    44            ST    5,0(7)     B
    45   EXIT     L     11,12(2)   ADDR OF RC
    46            ST    10,0(11)   STORE RETURN CODE IN RC
    47            L     13,SAVE+4
    48            RETURN  (14,12)
    49   *
    50   GR64     LA    10,16
    51            B     EXIT
    52   *
    53   SAVE     DS    18F
    54            END SHFTA
```

Program Listing A-61 Group Phase Library Arithmetic Shift Routine

ASSEMBLY MODULE TEST,NAMSD3

```
CARD NO  ****                          CONTENTS                          ****

    1    DFFTA   CSECT                                                   DFTA   1
    2    * DFFTA ONE DIMENSIONAL DOUBLE PRECISION FAST FOURIER TRANSFORM. THIS   DFTA   2
    3    *       VERSION IS USED WITH FORTRAN IV.                        DFTA   3
    4    *       USE:  CALL DFFTA(A,M,KOPT)                              DFTA   4
    5    *             A IS DOUBLE PREC. FLOATING POINT INPUT AND OUTPUT ARRAY.  DFTA   5
    6    *             A IS DIMENSIONED 2**M FOR COMPLEX CALCULATIONS.    DFTA   6
    7    *             IN THIS CASE A(1) IS FIRST REAL PART, A(2) IS FIRST DFTA   7
    8    *             IMAGINARY PART, A(3) IS SECOND REAL PART, A(4) IS SECOND  DFTA   8
    9    *             IMAGINARY PART ETC. UP TO 2**(M-1) COMPLEX NUMBERS.  DFTA   9
   10    *             A IS DIMENSIONED 2**M+2 FOR REAL CALCULATIONS.    DFTA  10
   11    *             IN THIS CASE REAL VALUES OF DATA ARE PUT INTO A(1),....   DFTA  11
   12    *             A(2**M). COEFFICIENTS A0/2,B0=0,A1,B1,.....(AN/2)/2,  DFTA  12
   13    *             BN/2=0 MUST BE PUT INTO A(1),....A(2**M+2) RESPECTIVELY.  DFTA  13
   14    *             M IS FIXED POINT INTEGER INDICATING NUMBER OF VALUES  DFTA  14
   15    *             IN A AS IT IS USED ABOVE.                         DFTA  15
   16    *             KOPT IS A FIXED POINT INTEGER.                    DFTA  16
   17    *             IF KOPT=0, INPUT IS REAL DATA, OUTPUT IS COEFFICIENTS.  DFTA  17
   18    *             IF KOPT=2, INPUT IS COEFFICIENTS, OUTPUT IS REAL DATA.  DFTA  18
   19    *             IF W=E**(2*PI*J/N), F(J) IS THE COMPLEX DATA OR INVERSE  DFTA  19
   20    *             COMPLEX FOURIER TRANSFORM, AND C(K) IS THE COMPLEX  DFTA  20
   21    *             FOURIER TRANSFORM, THEN                           DFTA  21
   22    *                   F(J) = SUM(C(K)*W**(J*K)), J=0,1,....,N-1.  DFTA  22
   23    *             WHERE THE SUMMATION IS FOR K=0,1,....,N-1, AND    DFTA  23
   24    *                   C(K) = 1/N*SUM(F(J)*W**(-J*K)), K=0,1,....,N-1.  DFTA  24
   25    *             WHERE THE SUMMATION IS FOR J=0,1,....,N-1.        DFTA  25
   26    *             IF KOPT=1, INPUT IS COMPLEX DATA OR INCREASE COMPLEX  DFTA  26
   27    *             FOURIER TRANSFORM, OUTPUT IS COMPLEX FOURIER TRANSFORM.  DFTA  27
   28    *             IF KOPT=3, INPUT IS COMPLEX FOURIER TRANSFORM, OUTPUT  DFTA  28
   29    *             IS INVERSE COMPLEX FOURIER TRANSFORM OR COMPLEX DATA.  DFTA  29
   30    *             IF M<3, NO COMPUTATION WILL TAKE PLACE.           DFTA  30
   31           USING *,15          USE BRANCH REGISTER AS BASE REGISTER  DFTA  31
   32           USING A,2                                                 DFTA  32
   33           USING S,3                                                 DFTA  33
   34           B     DFFTA1                                              DFTA  34
   35           DC    XL1'09'                                             DFTA  35
   36           DC    C'DFFTA'                                            DFTA  36
   37    DFFTA1 SAVE  (14,12)       SAVE REGISTERS IN SAVE AREA          DFTA  37
   38           DROP  15                                                  DFTA  38
   39           BALR  10,0                                                DFTA  39
   40           USING *,10         STANDARD PROGRAM BASE REGISTER         DFTA  40
   41           LR    3,13         OLD SAVE AREA ADDRESS                  DFTA  41
   42           LA    13,AREA      NEW SAVE AREA ADDRESS                  DFTA  42
   43           ST    13,8(0,3)    ADDRESS OF NEW SAVE AREA INTO OLD AREA DFTA  43
   44           ST    3,4(0,13)    ADDRESS OF OLD AREA TO WORD 2 OF NEW AREA  DFTA  44
   45           MVC   AD(12),0(1)  PARAMETER ADDRESSES                   DFTA  45
   46           MVI   AD+8,X'00'                                          DFTA  46
   47           L     4,AD+4       ADDRESS OF M TO R4                     DFTA  47
   48           L     4,0(0,4)     M                                      DFTA  48
   49           C     4,=F'2'                                             DFTA  49
   50           BC    13,DFFTA20   EXIT IF M<3                            DFTA  50
   51    DFFTA2 L     2,AD         ADDRESS OF A TO R2                     DFTA  51
   52           S     2,=F'8'      ADDRESS OF A - ONE WORD                DFTA  52
   53           L     6,AD+8                                              DFTA  53
   54           MVC   KOPT,0(6)    STORE KOPT                             DFTA  54
   55           MVC   DFFTA13,PS   FILL INSTRUCTION FOR + IMAGINARY PART  DFTA  55
   56           LA    5,1          1 TO R5                                DFTA  56
   57           SLA   5,3(4)       (2**M)*8 FOR 8 BYTE WORDS TO R5        DFTA  57
   58           ST    5,N          STORE NUMBER ELEMENTS IN A ARRAY       DFTA  58
   59           LR    6,5                                                 DFTA  59
   60           SRA   6,4          N/2 FLOATING POINT FOR FT FACTOR       DFTA  60
   61           ST    6,FL+4       NH                                     DFTA  61
   62           SLA   6,3          NH FOR 8 BYTE WORDS                    DFTA  62
   63           ST    6,NH                                                DFTA  63
   64           SDR   4,4                                                 DFTA  64
   65           AD    4,FL                                                DFTA  65
   66           STD   4,FN         FLOATING POINT N/2                     DFTA  66
   67           LR    7,6                                                 DFTA  67
   68           SRA   7,1                                                 DFTA  68
   69           A     7,=F'16'     NQ FOR 8 BYTE WORDS                    DFTA  69
   70           ST    7,NQ                                                DFTA  70
   71           C     4,OLDM                                              DFTA  71
   72           L     3,SBA        CURRENT ADDRESS OF S TO R3             DFTA  72
   73           BC    8,DFFTA5     DO NOT GENERATE S STORAGE IF EQUAL     DFTA  73
   74           CLC   OLDM,=F'0'                                          DFTA  74
   75           BC    8,DFFTA3     NO STORAGE TO RELEASE IF OLDM=0.       DFTA  75
   76           L     0,OLDS                                              DFTA  76
   77           L     1,SBA                                               DFTA  77
   78           A     1,=F'8'      CORRECT S ADDRESS TO RELEASE           DFTA  78
   79           FREEMAIN R,LV=(0),A=(1)                                   DFTA  79
   80    DFFTA3 ST    4,OLDM       NEW M TO OLDM                          DFTA  80
   81           LR    0,5                                                 DFTA  81
   82           SRA   0,2                                                 DFTA  82
   83           A     0,=F'8'      N/4+1 - 8 BYTE WORDS - REQUIRED FOR S  DFTA  83
   84           ST    0,OLDS                                              DFTA  84
   85           GETMAIN R,LV=(0)                                          DFTA  85
   86           LR    3,1                                                 DFTA  86
   87           S     3,=F'8'      S ADDRESS TO R3                        DFTA  87
   88           ST    3,SBA                                               DFTA  88
   89           LR    8,7                                                 DFTA  89
   90           S     8,=F'8'      L-2 FOR 8 BYTE WORDS                   DFTA  90
   91           LD    0,=D'3.14159265358979323E+0'                        DFTA  91
   92           DD    0,FN                                                DFTA  92
   93           STD   0,RI         2*PI/N TO RI                           DFTA  93
   94           LA    1,ARG        ARGUMENT IS RI                         DFTA  94
   95           L     15,VDSIN                                            DFTA  95
   96           BALR  14,15        SIN(RI) TO DS                          DFTA  96
   97           STD   0,DS                                                DFTA  97
   98           LA    1,ARG        ARGUMENT IS RI                         DFTA  98
   99           L     15,VDCOS                                            DFTA  99
  100           BALR  14,15        COS(RI) TO DC                          DFTA 100
  101           STD   0,DC                                                DFTA 101
  102           SDR   0,0          0 TO FR0                               DFTA 102
  103           STD   0,S+8        0 TO S(1)                              DFTA 103
  104           SDR   4,4                                                 DFTA 104
  105           LD    0,=D'1.E+0'                                         DFTA 105
  106           LDR   6,0                                                 DFTA 106
  107           STD   0,S(8)       1.E0 TO S(N+1)                         DFTA 107
  108           LD    0,DS                                                DFTA 108
```

Program Listing A-62 Group Phase Library Fast Fourier Transform

CARD NO	****		CONTENTS	****
109		STD 0,S+16	SIN(R1) TO S(2)	DFTA 109
110		LA 9,24	INDEX	DFTA 110
111		LA 14,8	INCREMENT	DFTA 111
112		LR 15,5		DFTA 112
113		SRA 15,3		DFTA 113
114		A 15,=F'8'	COMPARAND N/8+1 FOR 8 BYTE WORDS	DFTA 114
115		CNOP 0,8	ALIGN LOOP ON DOUBLE-WORD BOUNDARY	DFTA 115
116	DFFTA4	SR 8,14	L-I TO INDEX REGISTER - 4 BYTE WORDS	DFTA 116
117		LD 0,0C		DFTA 117
118		MDR 0,6		DFTA 118
119		LDR 2,0		DFTA 119
120		SDR 2,4		DFTA 120
121		LDR 4,6		DFTA 121
122		ADR 0,2		DFTA 122
123		LDR 6,0		DFTA 123
124		MD 0,D5		DFTA 124
125		STD 2,S(8)	FR2 TO S(L-I)	DFTA 125
126		STD 0,S(9)	FR0 TO S(I)	DFTA 126
127		BXLE 9,14,DFFTA4	SIN(2*PI/N*J), J=0,1,....,N/4 IN S(I),...	DFTA 127
128	DFFTA5	CLI KOPT+3,X'02'		DFTA 128
129		BC 8,DFFTA17	REAL SYNTHESIS IF KOPT=2	DFTA 129
130		BC 2,DFFTA7	PUT ARRAY IN BIT REVERSED FORM IF KOPT=3	DFTA 130
131		LD 4,=D'1.E+0'		DFTA 131
132		DD 4,FN	1/N TO FR4	DFTA 132
133		MVC DFFTA13,MS	FILL INSTRUCTION FOR - IMAGINARY PART	DFTA 133
134		LA 9,8	1 - 8 BYTE WORDS - TO INDEX REGISTER	DFTA 134
135		LA 14,16	2 - 8 BYTE WORDS - TO INCREMENT REGISTER	DFTA 135
136		L 15,N	N WORDS FOR COMPARAND REGISTER	DFTA 136
137		CNOP 0,8	ALIGN LOOP ON DOUBLE-WORD BOUNDARY	DFTA 137
138	DFFTA6	LD 0,A(9)		DFTA 138
139		LD 2,A+8(9)		DFTA 139
140		MDR 0,4		DFTA 140
141		MDR 2,4		DFTA 141
142		STD 0,A(9)		DFTA 142
143		STD 2,A+8(9)		DFTA 143
144		BXLE 9,14,DFFTA6	MULTIPLY A ARRAY BY 1/N	DFTA 144
145	DFFTA7	LA 7,8	1 TO J - 8 BYTE WORDS	DFTA 145
146		LR 1,7	1 TO INDEX I - 8 BYTE WORDS	DFTA 146
147		LA 4,16	2 TO INCREMENT REGISTER - 8 BYTE WORDS	DFTA 147
148		L 5,N	N TO R5	DFTA 148
149		CNOP 0,8	ALIGN LOOP ON DOUBLE-WORD BOUNDARY	DFTA 149
150	DFFTA8	CR 7,1	COMPARE J TO I	DFTA 150
151		LD 0,A(7)	REAL A(J)	DFTA 151
152		LD 2,A+8(7)	IMAG A(J)	DFTA 152
153		LD 4,A(1)	REAL A(I)	DFTA 153
154		LD 6,A+8(1)	IMAG A(I) - ALL TO REGISTERS	DFTA 154
155		BC 12,DFFTA9	JC=I, DO NOT SWAP	DFTA 155
156		STD 0,A(1)		DFTA 156
157		STD 2,A+8(1)		DFTA 157
158		STD 4,A(7)	SWAP A(I) AND A(J) - BOTH	DFTA 158
159		STD 6,A+8(7)	REAL AND IMAGINARY PARTS	DFTA 159
160	DFFTA9	LR 8,5	N (OR 2*NH) TO K	DFTA 160
161	DFFTA10	SRA 8,1	K/2 TO K	DFTA 161
162		SR 7,8	J-K TO J	DFTA 162
163		BC 2,DFFTA10	IF J>K, GO BACK	DFTA 163
164		AR 7,8		DFTA 164
165		AR 7,8	J-K+K+K OR J+K TO J	DFTA 165
166		BXLE 1,4,DFFTA8	GO BACK IF I<=N	DFTA 166
167		LA 8,16	2 - 8 BYTE WORDS - TO R8	DFTA 167
168		LR 9,8	2 TO I	DFTA 168
169		L 6,NH	NH TO ID	DFTA 169
170		LR 7,6		DFTA 170
171		SRA 7,1		DFTA 171
172		A 7,=F'8'	NH/2+1 TO R7 - 8 BYTE WORDS	DFTA 172
173		ST 7,NH2P1		DFTA 173
174		L 15,N	N TO R15	DFTA 174
175		LR 0,15	N TO I5	DFTA 175
176	DFFTA11	ER 14,9		DFTA 176
177		SLA 14,1	2*I TO IST	DFTA 177
178		L 7,NH2P1	NH/2+1 TO IR	DFTA 178
179		CR 14,15	COMPARE IST TO N	DFTA 179
180		L 4,=F'8'	1 TO IND - 8 BYTE WORDS	DFTA 180
181		LR 1,4	1 TO J	DFTA 181
182		BC 2,DFFTA16	FINISHED IF IST>N	DFTA 182
183	DFFTA12	LD 0,S(4)	S(IND) TO FR0	DFTA 183
184	DFFTA13	DS H	LDR 0,0 OR LNDR 0,0 - POSSIPLE SIGN CHANGE	DFTA 184
185		LNR 11,4	-IND TO R11	DFTA 185
186		A 11,NQ		DFTA 186
187		LD 2,S(11)	SINQ-IND) TO FR2	DFTA 187
188		BXLE 4,6,DFFTA14	BRANCH IF IND+ID<=IR	DFTA 188
189		SR 7,7	0 TO IR	DFTA 189
190		SR 4,0	IND-IS (OR 2*ID) TO IND	DFTA 190
191		BC 4,DFFTA14	DO NOT CHANGE SIGN FIRST LOOP	DFTA 191
192		LCDR 2,2	CHANGE SIGN OF SINQ-IND)	DFTA 192
193	DFFTA14	STD 0,S1	STORE IMAGINARY PART OF CURRENT W	DFTA 193
194		STD 2,C0	STORE REAL PART OF CIRRENT W	DFTA 194
195		LR 5,1	J TO K	DFTA 195
196		LR 11,1		DFTA 196
197		AR 11,9	K+I TO L	DFTA 197
198	DFFTA15	LD 0,C0		DFTA 198
199		LD 4,S1		DFTA 199
200		LDR 2,0		DFTA 200
201		LDR 6,4		DFTA 201
202		MD 0,A(11)	C0*A(L) TO FR0	DFTA 202
203		MD 4,A+8(11)	S1*A(L+1) TO FR4	DFTA 203
204		SDR 0,4	C0*A(L)-S1*A(L+1) TO FR0 OR AAR	DFTA 204
205		MD 2,A+8(11)	C0*A(L+1) TO FR2	DFTA 205
206		MD 6,A(11)	S1*A(L) TO FR6	DFTA 206
207		ADR 2,6	C0*A(L+1)+S1*A(L) TO FR2 OR AAI	DFTA 207
208		LCDR 4,0	-AAR TO FR4	DFTA 208
209		LCDR 6,2	-AAI TO FR6	DFTA 209
210		AD 0,A(5)	A(K)+AAR TO FR0	DFTA 210
211		AD 2,A+8(5)	A(K+1)+AAI TO FR2	DFTA 211
212		AD 4,A(5)	A(K)-AAR TO FR4	DFTA 212
213		AD 6,A+8(5)	A(K+1)-AAI TO FR6	DFTA 213
214		STD 0,A(5)	FR0 TO A(K)	DFTA 214
215		STD 2,A+8(5)	FR2 TO A(K+1)	DFTA 215
216		STD 4,A(11)	FR4 TO A(L)	DFTA 216
217		STD 6,A+8(11)	FR6 TO A(L+1)	DFTA 217
218		AR 11,14	L+IST OR NEXT K+I TO L	DFTA 218
219		BXLE 5,14,DFFTA15	STOP IF K+IST>N	DFTA 219

Program Listing A-62 Group Phase Library Fast Fourier Transform (continued)

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CARD NO  ****                          CONTENTS                                  ****

  220            BXLE  1,8,DFFTA12   STOP IF J>I                                DFTA 220
  221            LR    9,14          EST TO I                                   DFTA 221
  222            SRA   0,1           IS/2 TO IS                                 DFTA 222
  223            SRA   6,1           ID/2 TO ID                                 DFTA 223
  224            BC    15,DFFTA11                                               DFTA 224
  225  DFFTA16   TM    KOPT+3,X'01'  IF LOW ORDER BIT IS 1, KOPT = 1 OR 3       DFTA 225
  226            BC    1,DFFTA20     EXIT IF LOW ORDER BIT IS 1                 DFTA 226
  227  DFFTA17   LA    4,16          2 - 8 BYTE WORDS - TO I                    DFTA 227
  228            LA    1,8           1 - 8 BYTE WORDS - TO R1                   DFTA 228
  229            L     7,NQ                                                     DFTA 229
  230            SR    7,4           NQ-I TO R7                                 DFTA 230
  231            LA    9,24          3 - 8 BYTE WORDS - TO INITIAL K            DFTA 231
  232            LR    8,4           2 - 8 BYTE WORDS                           DFTA 232
  233            A     8,N                                                      DFTA 233
  234            SR    8,9           N-K+2 TO INITIAL J                         DFTA 234
  235            LR    14,4          2 - 8 BYTE WORDS - TO INCREMENT REGISTER   DFTA 235
  236            L     15,NH                                                    DFTA 236
  237            SR    15,1          NH-1 TO COMPARAND REGISTER                 DFTA 237
  238  DFFTA18   LD    0,A(9)        A(K) TO FR0                                DFTA 238
  239            LD    2,A+8(9)      A(K+1) TO FR2                              DFTA 239
  240            LD    4,A+8(8)      A(J+1) TO FR4                              DFTA 240
  241            LD    6,A(8)        A(J) TO FR6                                DFTA 241
  242            AD    0,A(8)        A(K)+A(J) TO AAR                           DFTA 242
  243            SD    2,A+8(8)      A(K+1)-A(J+1) TO AAI                       DFTA 243
  244            AD    4,A+8(9)      A(J+1)+A(K+1) TO ABR                       DFTA 244
  245            SD    6,A(9)        A(J)-A(K) TO ABI                           DFTA 245
  246            STD   0,A(8)        STORE AAR                                  DFTA 246
  247            STD   2,A+8(8)      STORE AAI                                  DFTA 247
  248            LDR   0,4           ABR TO FR0                                 DFTA 248
  249            LDR   2,6           ABI TO FR2                                 DFTA 249
  250            MD    0,S(7)        ABR*CO                                     DFTA 250
  251            MD    2,S(7)        ABI*CO                                     DFTA 251
  252            MD    4,S(4)        ABR*SI                                     DFTA 252
  253            MD    6,S(4)        ABI*SI                                     DFTA 253
  254            AR    4,1           I+1 TO I                                   DFTA 254
  255            SR    7,1           NQ-I TO R7                                 DFTA 255
  256            ADR   0,6           ABR*CO+ABI*SI TO AW                        DFTA 256
  257            SDR   4,2           ABR*SI-ABI*CO TO ABI                       DFTA 257
  258            LCDR  2,0           -AW TO FR2                                 DFTA 258
  259            LDR   6,4           ABI TO FR6                                 DFTA 259
  260            AD    0,A(8)        AAR+AW                                     DFTA 260
  261            AD    2,A(8)        AAR-AW                                     DFTA 261
  262            SD    4,A+8(8)      -AAI+ABI                                   DFTA 262
  263            AD    6,A+8(9)      AAI+ABI                                    DFTA 263
  264            HDR   0,0                                                      DFTA 264
  265            HDR   2,2                                                      DFTA 265
  266            HDR   4,4                                                      DFTA 266
  267            HDR   6,6                                                      DFTA 267
  268            STD   0,A(9)        .5*(AAR+AW) TO A(K)                        DFTA 268
  269            STD   2,A(8)        .5*(AAR-AW) TO A(J)                        DFTA 269
  270            STD   4,A+8(9)      .5*(-AAI+ABI) TO A(K+1)                    DFTA 270
  271            STD   6,A+8(8)      .5*(AAI+ABI) TO A(J+1)                     DFTA 271
  272            SR    8,14          J-2 TO J                                   DFTA 272
  273            BXLE  9,14,DFFTA14  STOP IF K>(NH-1)                           DFTA 273
  274            LD    0,A+8         A(1) TO AW                                 DFTA 274
  275            LDR   2,0                                                      DFTA 275
  276            A     1,N           K+1 TO INDEX REGISTER                      DFTA 276
  277            CLI   KOPT+3,X'02'                                             DFTA 277
  278            BC    6,DFFTA19     BRANCH IF KOPT .=2                         DFTA 278
  279            AD    0,A(1)        KOPT=2                                     DFTA 279
  280            STD   0,A+8         AW+A(N+1) TO A(1)                          DFTA 280
  281            SD    2,A(1)                                                   DFTA 281
  282            STD   2,A+16        AW-A(N+1) TO A(2)                          DFTA 282
  283            MVI   KOPT+3,X'03'  CHANGE OPTION TO 3                         DFTA 283
  284            BC    15,DFFTA7     GO TO BIT REVERSAL SECTION                 DFTA 284
  285  DFFTA19   AD    0,A+16                                                   DFTA 285
  286            SD    2,A+16                                                   DFTA 286
  287            HDR   0,0                                                      DFTA 287
  288            HDR   2,2                                                      DFTA 288
  289            SDR   4,4                                                      DFTA 289
  290            STD   0,A+8         .5*(AW+A(2)) TO A(1)                       DFTA 290
  291            STD   2,A(1)        .5*(AW-A(2)) TO A(N+1)                     DFTA 291
  292            STD   4,A+16        0 TO A(2)                                  DFTA 292
  293            STD   6,A+4(1)      0 TO A(N+2)                                DFTA 293
  294  DFFTA20   L     13,AREA+4     OLD SAVE AREA ADDRESS                      DFTA 294
  295            LM    14,12,12(13)  RESTORE REGISTER CONTENTS                  DFTA 295
  296            MVI   12(13),X'FF'                                             DFTA 296
  297            BCR   15,14         RETURN                                     DFTA 297
  298  A         DSECT                                                          DFTA 298
  299  S         DSECT                                                          DFTA 299
  300  DFFTA     CSECT                                                          DFTA 300
  301  FN        DS    D                                                        DFTA 301
  302  RI        DS    D                                                        DFTA 302
  303  DS        DS    D                                                        DFTA 303
  304  DC        DS    D                                                        DFTA 304
  305  SI        DS    D                                                        DFTA 305
  306  CO        DS    D                                                        DFTA 306
  307  FL        DC    X'4E000000300000000'                                     DFTA 307
  308  AD        DS    3F                                                       DFTA 308
  309  OLDM      DC    F'0'                                                     DFTA 309
  310  OLDS      DS    F                                                        DFTA 310
  311  N         DS    F                                                        DFTA 311
  312  NH        DS    F                                                        DFTA 312
  313  NQ        DS    F                                                        DFTA 313
  314  NH2P1     DS    F                                                        DFTA 314
  315  SRA       DS    F                                                        DFTA 315
  316  KOPT      DS    F                                                        DFTA 316
  317  AREA      DS    18F                                                      DFTA 317
  318  ARG       DC    X'80'                                                    DFTA 318
  319            DC    AL3(RI)                                                  DFTA 319
  320  PS        LDR   0,0           INSTRUCTION FOR + IMAGINARY PART           DFTA 320
  321  MS        LNDR  0,0           INSTRUCTION FOR - IMAGINARY PART           DFTA 321
  322  VDSIN     DC    V(DSIN)                                                  DFTA 322
  323  VDCOS     DC    V(DCOS)                                                  DFTA 323
  324            END                                                            DFTA 324
```

Program Listing A-62 Group Phase Library Fast Fourier Transform (concluded)

FORTRAN MODULE (LIST,NAMS2)

```
CARD NO ****                    CONTENTS                    ****

      1       SUBROUTINE PRNTTL(IHD,IPT)
      2       DOUBLE PRECISION A(6,8)
      3       DIMENSION IHD(40)
      4       WRITE(IPT,2000)
      5       WRITE(IPT,1006)
      6       WRITE(IPT,1007)
      7       WRITE(IPT,1008)
      8       WRITE(IPT,1009)
      9       WRITE(IPT,1010)
     10       WRITE(IPT,1011)
     11       WRITE(IPT,2001)
     12       WRITE(IPT,1012)
     13       WRITE(IPT,1013)
     14       WRITE(IPT,1014)
     15       WRITE(IPT,1015)
     16       WRITE(IPT,1016)
     17       WRITE(IPT,1017)
     18       WRITE(IPT,2001)
     19       WRITE(IPT,1018)
     20       WRITE(IPT,1019)
     21       WRITE(IPT,1020)
     22       WRITE(IPT,1021)
     23       WRITE(IPT,1022)
     24       WRITE(IPT,1023)
     25       WRITE(IPT,2001)
     26       CALL DATE(IHD(1),ID,IM)
     27       IHD(2)=ID
     28       IHD(3)=IM
     29       CALL DCTOB(A,IM,ID,IHD(2))
     30       DO 3 K=1,6
     31     3 WRITE(IPT,2002)(A(K,J),J=1,4)
     32       WRITE(IPT,2001)
     33       WRITE(IPT,1003)
     34       WRITE(IPT,1001)
     35       WRITE(IPT,1002)
     36       WRITE(IPT,1003)
     37       WRITE(IPT,1004)
     38       WRITE(IPT,1005)
     39       RETURN
     40  1000 FORMAT(32X,'JJ',4X,'HH',4X,'HH',4X,'UU',4X,'UU',9X,'///',5X,
     41     1'AAAAAA',5X,'PPPPPPP',5X,'LL')
     42  1001 FORMAT(32X,'JJ',4X,'HH',4X,'HH',4X,'UU',4X,'UU',8X,'///',5X,
     43     1'AA',4X,'AA',4X,'PP',4X,'PP',4X,'LL')
     44  1002 FORMAT(32X,'JJ',4X,'HH',4X,'HH',4X,'UU',4X,'UU',7X,'///',6X,
     45     1'AAAAAAAA',4X,'PPPPPPP',5X,'LL')
     46  1003 FORMAT(32X,'JJ',4X,'HH',4X,'HH',4X,'UU',4X,'UU',6X,'///',7X,
     47     1'AA',4X,'AA',4X,'PP',10X,'LL')
     48  1004 FORMAT(26X,'JJ',4X,'JJ',4X,'HH',4X,'HH',4X,'UU',4X,'UU',5X,'///',
     49     18X,'AA',4X,'AA',4X,'PP',10X,'LL')
     50  1005 FORMAT(27X,'JJJJJJ',3X,'HH',4X,'HH',5X,'UUUUUU',5X,'///',9X,
     51     1'AA',4X,'AA',4X,'PP',10X,'LLLLLLLL')
     52  1006 FORMAT(37X,'LL',11X,'OOOOOO',5X,'RRRRRRR',6X,'AAAAAA',5X,'VV',4X,
     53     1'NN')
     54  1007 FORMAT(37X,'LL',10X,'OO',4X,'OO',4X,'RR',4X,'RR',4X,'AA',4X,'AA',
     55     14X,'NNN',3X,'NN')
     56  1008 FORMAT(37X,'LL',10X,'OO',4X,'OO',4X,'RRRRRR',5X,'AAAAAAAA',4X,
     57     1'NN',1X,'N',2X,'NN')
     58  1009 FORMAT(37X,'LL'10X,'OO',4X,'OO',4X,'RR',2X,'RR',6X,'AA',4X,'AA',
     59     14X,'NN',2X,'N',1X,'NN')
     60  1010 FORMAT(37X,'LL',10X,'OO',4X,'OO',4X,'RR',3X,'RR',5X,'AA',4X,'AA',
     61     14X,'VV',3X,'NNN')
     62  1011 FORMAT(37X,'LLLLLLLL',5X,'OOOOOO',5X,'RR',4X,'RR',4X,'AA',4X,'AA',
     63     14X,'NN',4X,'NN')
     64  1012 FORMAT(32X,'SSSSSS',6X,'IIIIII',6X,'GGGGGG',5X,'NN',5X,'NN',5X,
     65     1'AAAAAA',5X,'LL')
     66  1013 FORMAT(31X,'SS',5X,'S',7X,'II',7X,'GG',5X,'G',4X,'NNN',3X,'NN',
     67     14X,'AA',4X,'AA',4X,'LL')
     68  1014 FORMAT(32X,'SSSSSS',4X,'II',7X,'GG',10X,'NN',1X,'N',2X,'VV',4X,
     69     1'AAAAAAAA',4X,'LL')
     70  1015 FORMAT(37X,'SS',7X,'II',7X,'GG',3X,'GGG',4X,'NN',2X,'N',1X,'NN'
     71     14X,'AA',4X,'AA',4X,'LL')
     72  1015 FORMAT(31X,'SS',4X,'SS',7X,'II',7X,'GG',4X,'GG',4X,'NN',3X,'NNN',
     73     14X,'AA',4X,'AA',4X,'LL')
     74  1017 FORMAT(32X,'SSSSSS',6X,'IIIIII',6X,'GGGGGG',5X,'NN',4X,'NN',4X,
     75     1'AA',4X,'AA',4X,'LLLLLLLL')
     76  1018 FORMAT(1X,'EEEEEEEE',4X,'NN',4X,'NN',4X,'VV',4X,'VV',5X,'IIIIII',
     77     15X,'RRRRRR',4X,'000000',5X,  'NN',4X,'NN',4X,'MM',4X,'MM',4X,
     78     2'EEEEEEEE',4X,'NN',4X,'NN',4X,'TTTTTTTT')
     79  1019 FORMAT(1X,'EE',10X,'NNN',3X,'NN',4X,'VV',4X,'VV',7X,'II',7X,'RR',
     80     14X,'RR',4X,'OO',4X,'OO','NNNN' ,3X,'NN',4X,'MMM',2X,'MMM',4X,
     81     1'EE',10X,
     82     2'NNN',3X,'NN',7X,'TT')
     83  1020 FORMAT(1X,'EEEEEE',6X,'NN',1X,'N',2X,'NN',4X,'VV',4X,'VV',7X,'II',
     84     17X,'RRRRRR',5X,'OO',4X,'OO',4X,'NN',1X,'N',2X,'NN',4X,'MM',1X,
     85     1'MM',
     86     21X,'MM',4X,'EEEEEE',6X,'NN',1X,'N',2X,'NN',7X,'TT')
     87  1021 FORMAT(1X,'EE',10X,'NN',2X,'NN',1X,'NN',5X,'VV',2X,'VV',8X,'II',
     88     17X,'RR',2X,'RR',6X,'OO',4X,'OO',4X,'NN',2X,'N',1X,'NN',4X,'MM',
     89     14X,'MM',
     90     24X,'EE',10X,'NN',2X,'N',1X,'NN',7X,'TT')
     91  1022 FORMAT(1X,'EE',10X,'NN',3X,'NNN',6X,'VVVV',9X,'II',7X,'RR',3X,
     92     1'RR',5X,'OO',4X,'OO',4X,'NN',3X,'NNN',4X,'MM',4X,'MM',4X,'EE',10X,
     93     1'NN',
     94     23X,'NNN',7X,'TT')
     95  1023 FORMAT(1X,'EEEEEEEE',4X,'NN',4X,'NN',7X,'VV',8X,'IIIIII',5X,'RR',
     96     14X,'RR',5X,'OOOOOO',5X,'NN',4X,'NN',4X,'MM',4X,'MM',4X,
     97     2'EEEEEEEE',4X,'NN',4X,'NN',7X,'TT')
     98  2000 FORMAT(1H1,/////)
     99  2001 FORMAT(//)
    100  2002 FORMAT(15X,8(4X,A8))
    101       END
```

Program Listing A-63 Group Phase Library Title Page Printer

FORTRAN MODULE (LIST,NAMSQ)

CARD NO **** CONTENTS ****

```
      SUBROUTINE DATE(I,ID,IM)
      DIMENSION MO(12)
      DATA MO/31,60,91,121,152,182,213,244,274,305,335,366/
C     DAY NUMBERS ARE SET FOR LEAP YEAR
      IPT=6
      DO 1 J=1,12
      IF(I.GT.MO(J)) GO TO 1
      IM=J
      ID=I
      IF(J.EQ.1) GO TO 2
      ID=I-MO(J-1)
      GO TO 2
    1 CONTINUE
    2 RETURN
      END
```

Program Listing A-64 Group Phase Library Date Converter

FORTRAN MODULE (LIST,NAMSQ)

CARD NO **** CONTENTS ****

```
      SUBROUTINE DDTOB(A,IM,ID,IY)
      DOUBLE PRECISION A,B,C,D
      DIMENSION A(6,8),B(6,11),C(54),D(12)
      EQUIVALENCE (B(1,1),C(1)),(B(1,10),D(1))
      DATA C/' 000000 ','00    00','00   00','00    00','00   03   00',
     1' 000000 ','  111  ','  1 11  ','     11  ','     11  ','     11  ',
     2' 1111111','  22222 ','22   22','      22 ','    22  ','22      ',
     3'2222222222',' 333333 ','33   33','     333',' 33333 ','33    33',
     4' 333333 ','   4444 ','  44 44 ',' 44  44 ','444444444',' 44444 ',
     5'  444 ','5555555555','55      ','5555555 ','      55 ','55    55',
     6' 555555 ',' 666666 ','66      ','6666666 ','66    66 ','66    66',
     7' 666666 ','77777777',' 77  77 ','    77  ','   77   ','  77    ',
     8' 77   ',' 888888 ','88    88',' 888888 ','88    88',' 88    88',
     9' 888888 '/
      DATA D/' 999999 ','99    99',' 9999999',' 99  99 ','99    99',
     1' 999999 ','      //',' // // ','  //   ','  //   ','  //    ',
     2'  //    '/
      K=IM/10+1
      DO 1 I=1,6
    1 A(I,1)=B(I,K)
      K=IM-10*(K-1)+1
      DO 2 I=1,6
    2 A(I,2)=B(I,K)
      DO 3 I=1,6
      A(I,6)=B(I,11)
    3 A(I,3)=B(I,11)
      K=ID/10+1
      DO 4 I=1,6
    4 A(I,4)=B(I,K)
      K=ID-10*(K-1)+1
      DO 5 I=1,6
    5 A(I,5)=B(I,K)
      DO 6 I=1,6
    6 A(I,7)=B(I,8)
      K=IY+1
      DO 7 I=1,6
    7 A(I,8)=B(I,K)
      RETURN
      END
```

Program Listing A-65 Group Phase Library Date Formatter

```
09/28/76        INPUT LISTING                    AUTOFLOW CHART SET - FORTRAN    GROUP PHASE LIBRARY

FORTRAN MODULE      (LIST,NAMSQ)

 CARD NO        ****                              CONTENTS                          ****

      1              SUBROUTINE ACDTB(IW,ICN,NC,IARR,J,K)
      2              DIMENSION IARR(J)
      3              IPT=6
      4              IC=ICN
      5              N=NC
      6              K=0
      7              IBND=IC+N-1
      8              IF((J-IW)*8.LT.(IBND-8) GO TO 900
      9              NW=(IBND+7)/8
     10              DO 1 I=1,NW
     11              L=(IC-1)*4
     12              I1=0
     13              I2=IARR(IW+I-1)
     14              CALL SHFTL(I1,I2,L,M)
     15              ICF=IBND
     16              IF(ICF.GT.8) ICF=8
     17              DO 2 L=IC,ICF
     18              I1=0
     19              CALL SHFTL(I1,I2,4,M)
     20              K=K*10+I1
     21            2 CONTINUE
     22              N=N-ICF+IC-1
     23              IBND=N
     24              IC=1
     25            1 CONTINUE
     26              RETURN
     27          900 WRITE(IPT,1000)
     28              RETURN
     29         1000 FORMAT('CHAR REQUEST EXCEEDS ARRAY SIZE')
     30              END
```

Program Listing A-66 Group Phase Library BCD to Binary Converter

```
09/28/76        INPUT LISTING                    AUTOFLOW CHART SET - FORTRAN    GROUP PHASE LIBRARY

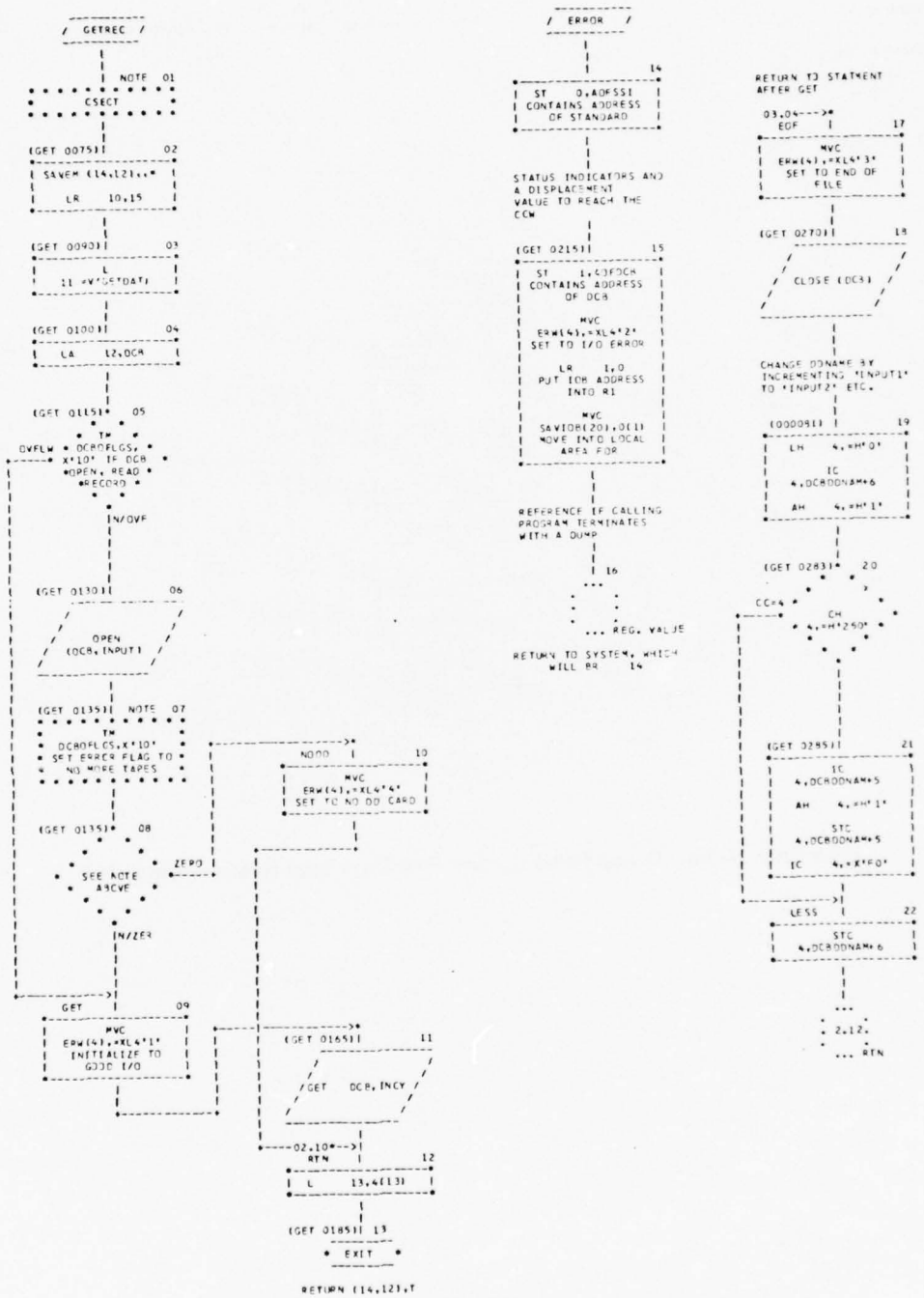
FORTRAN MODULE      (LIST,NAMSQ)

 CARD NO        ****                              CONTENTS                          ****

      1              SUBROUTINE CLEAR(X,N)
      2              DIMENSION X(N)
      3              DO 1 I=1,N
      4            1 X(I)=0.0
      5              RETURN
      6              END
```

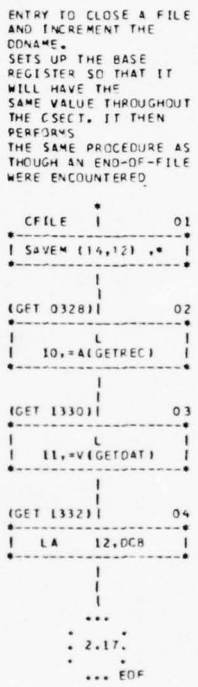
Program Listing A-67 Group Phase Library Array Reset

CHART TITLE -



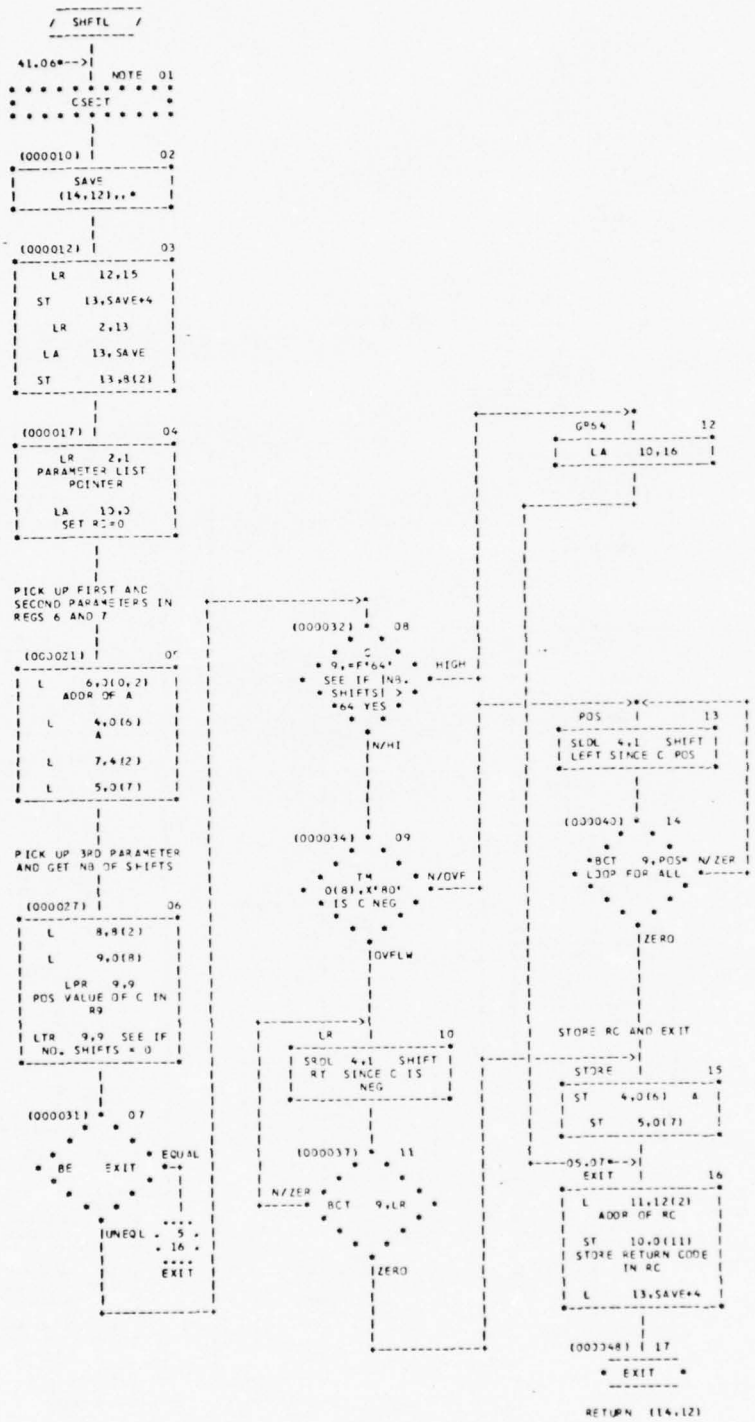
Flow Chart A-59 Group Phase Library Raw Data Tape Reader

CHART TITLE -



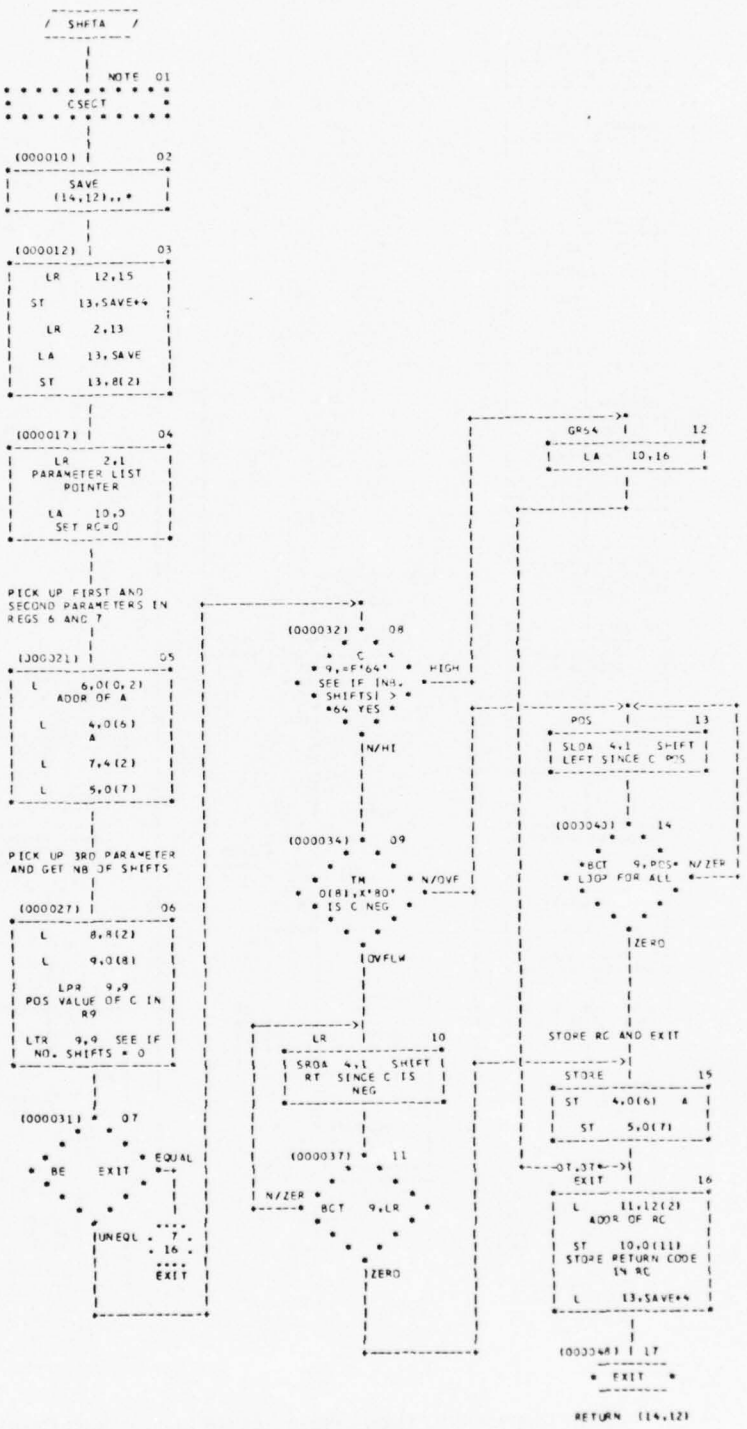
Flow Chart A-59 Group Phase Library Raw Data Tape Reader (concluded)

CHART TITLE -



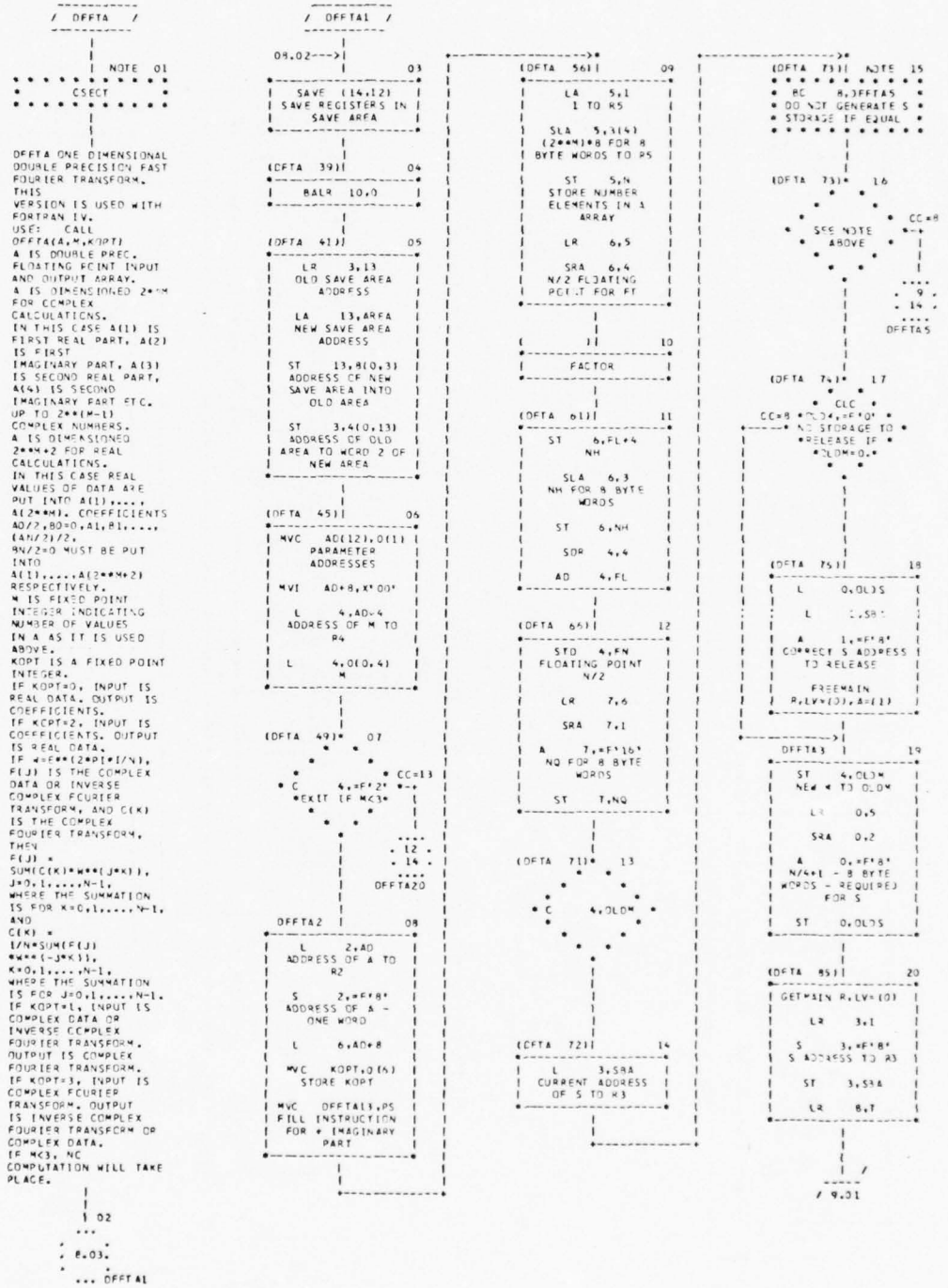
Flow Chart A-60 Group Phase Library Logical Shift Routine

CHART TITLE -



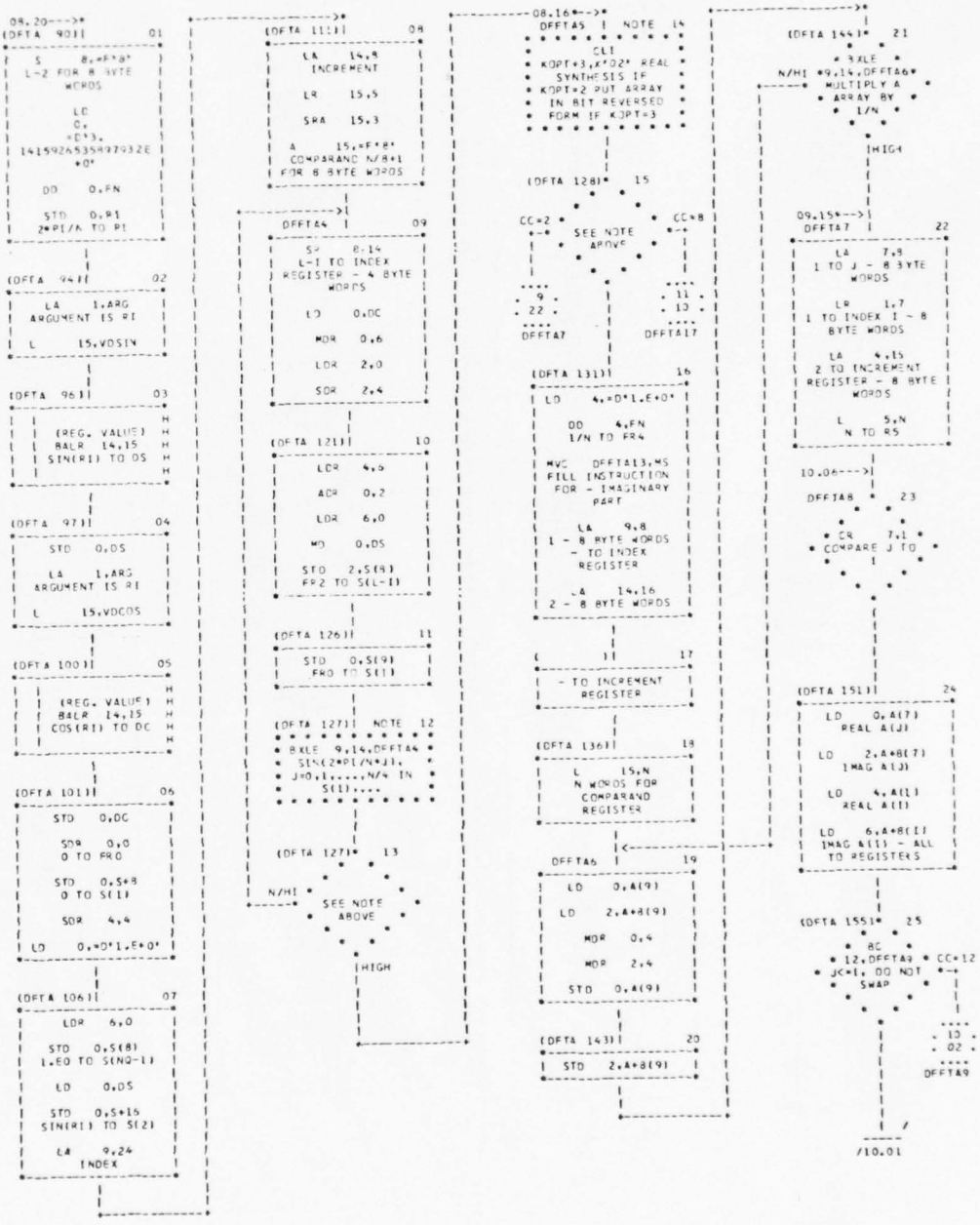
Flow Chart A-61 Group Phase Library Arithmetic Shift Routine

CHART TITLE -



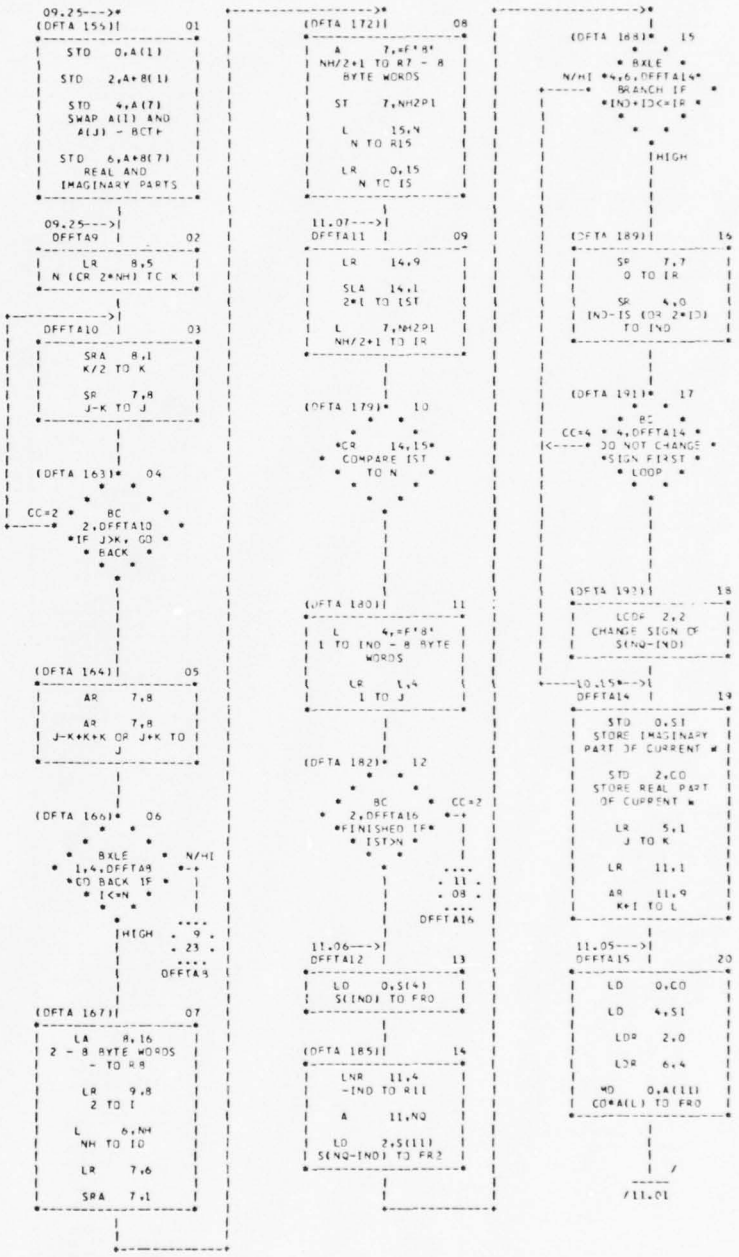
Flow Chart A-62 Group Phase Library Fast Fourier Transform

CHART TITLE -



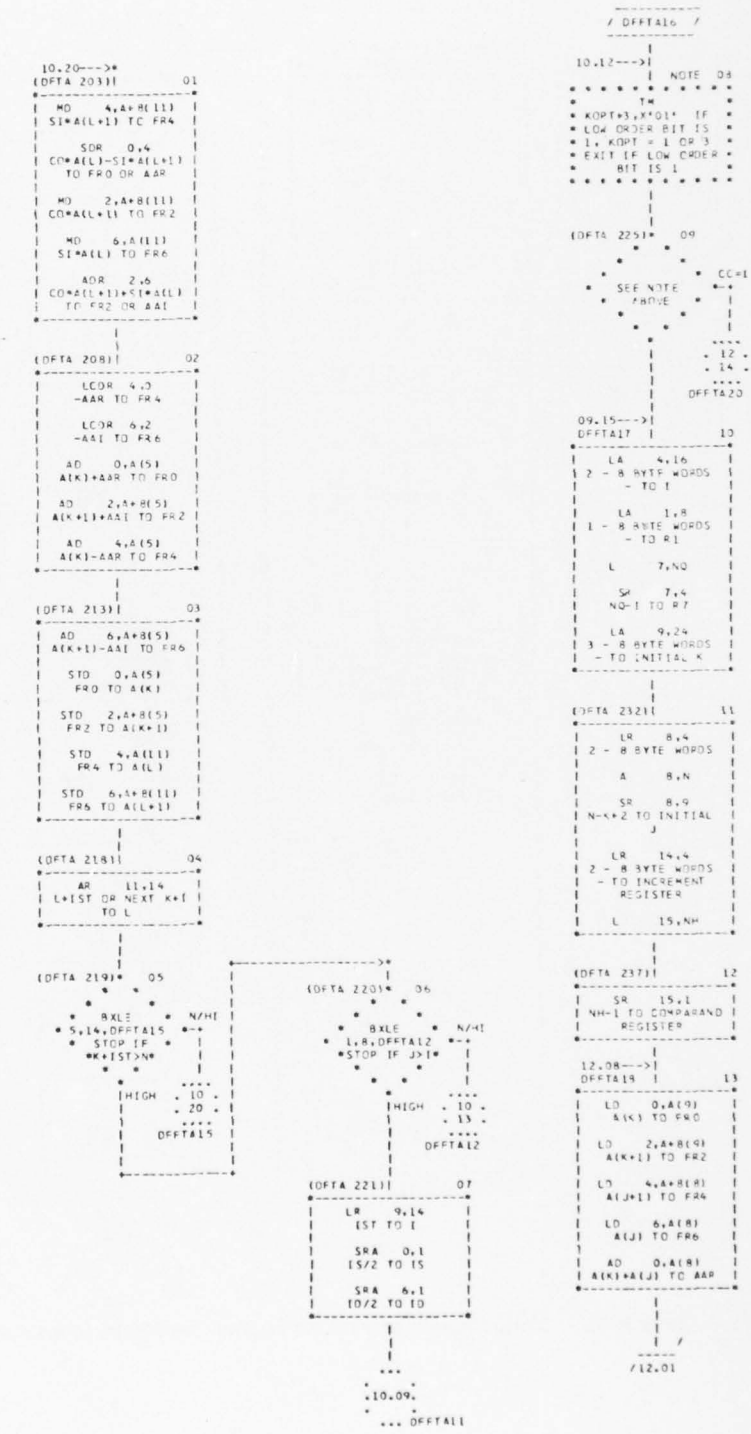
Flow Chart A-62 Group Phase Library Fast Fourier Transform (continued)

CHART TITLE -



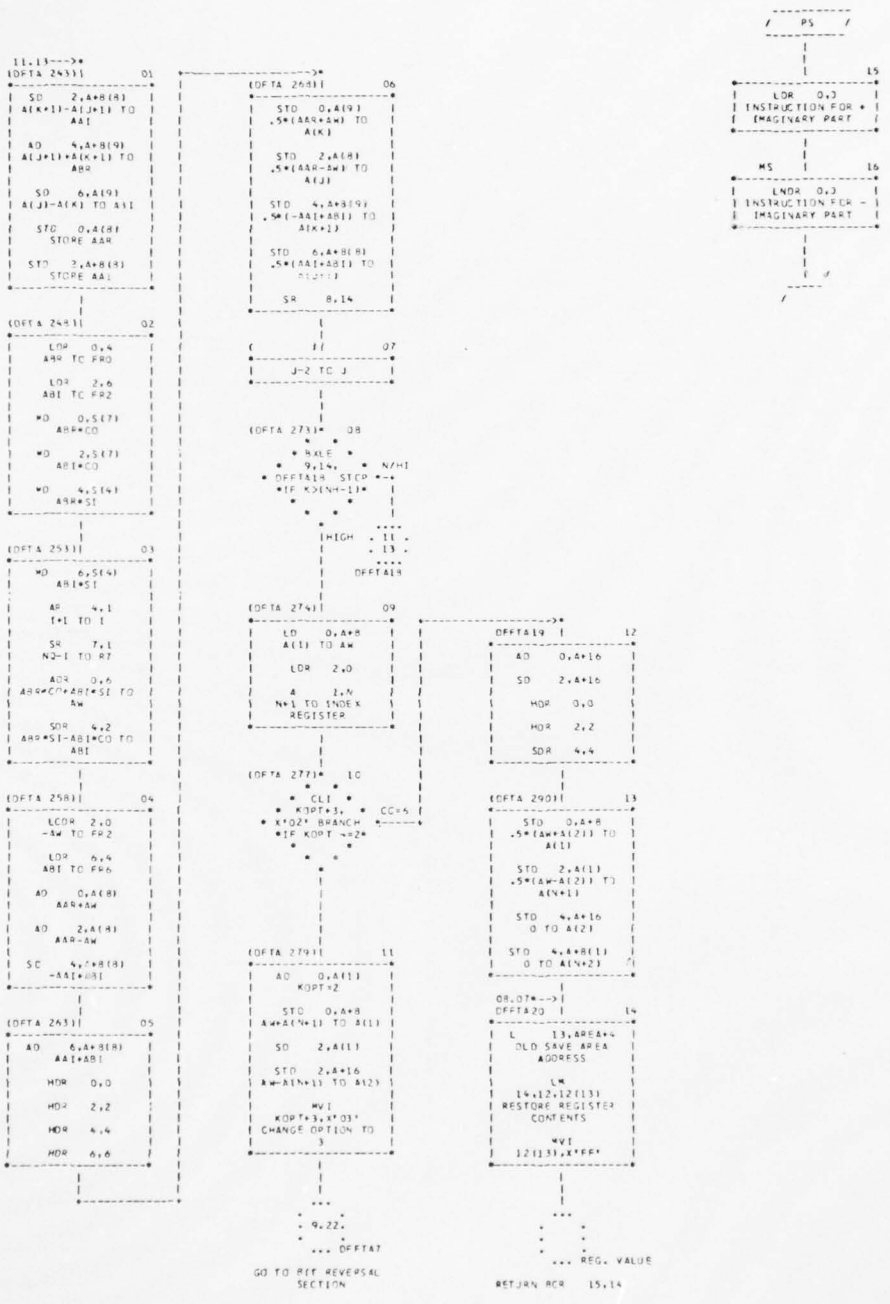
Flow Chart A-62 Group Phase Library Fast Fourier Transform (continued)

CHART TITLE -



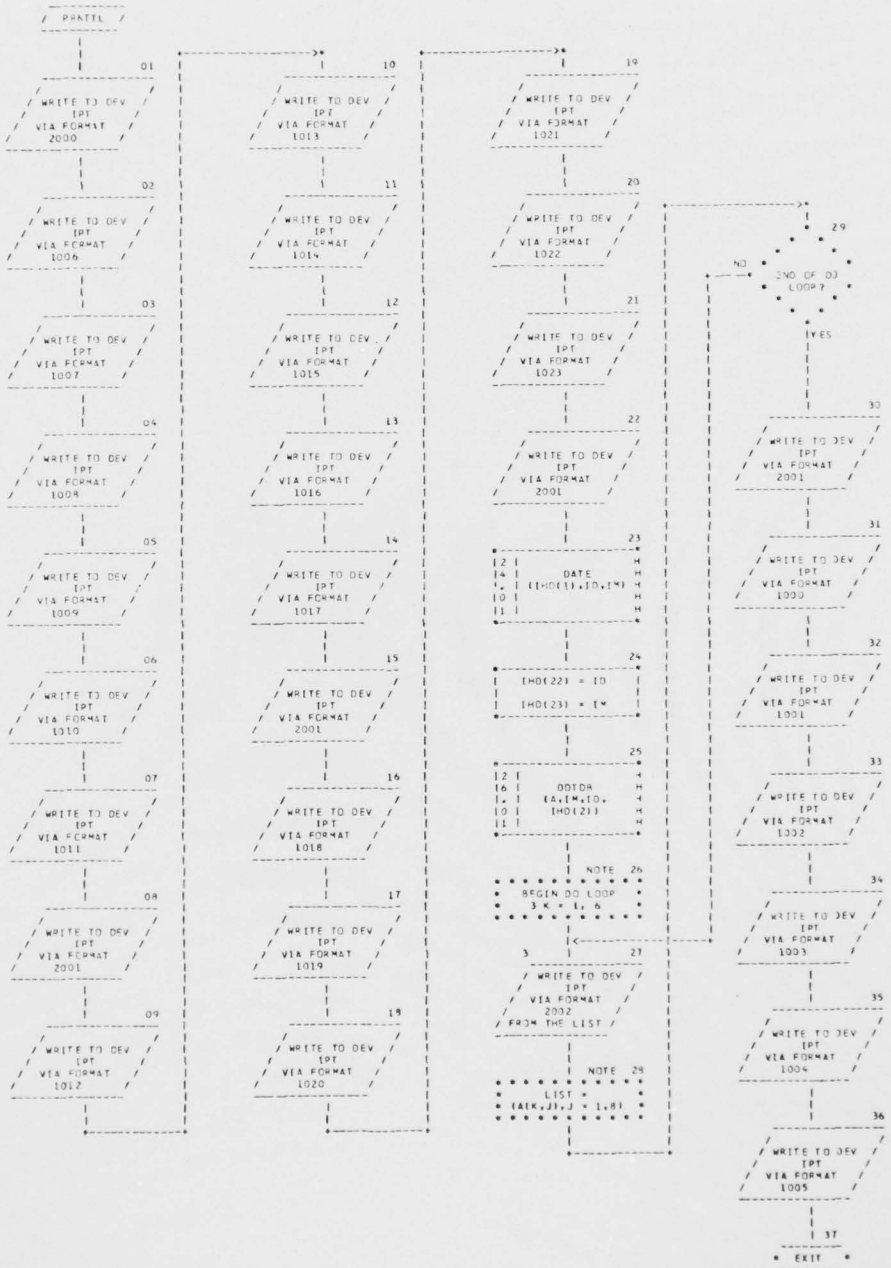
Flow Chart A-62 Group Phase Library Fast Fourier Transform (continued)

CHART TITLE -



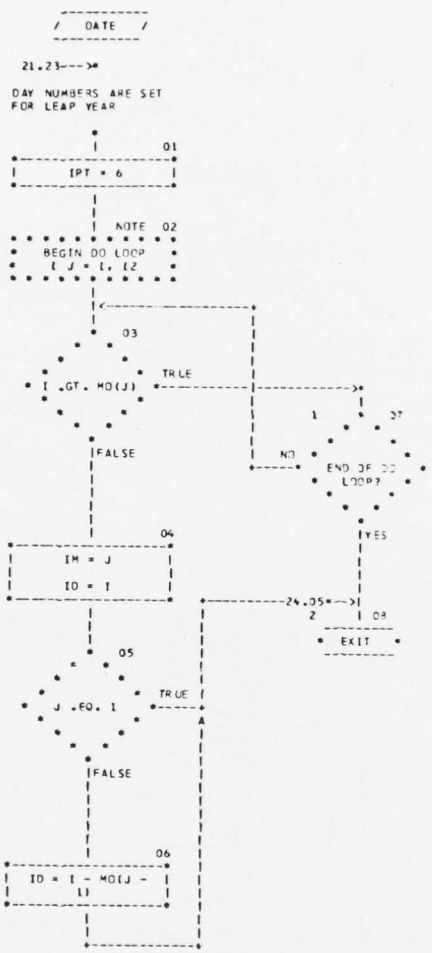
Flow Chart A-62 Group Phase Library Fast Fourier Transform (concluded)

CHART TITLE - SUBROUTINE PRNTTL(IHD,IPT)



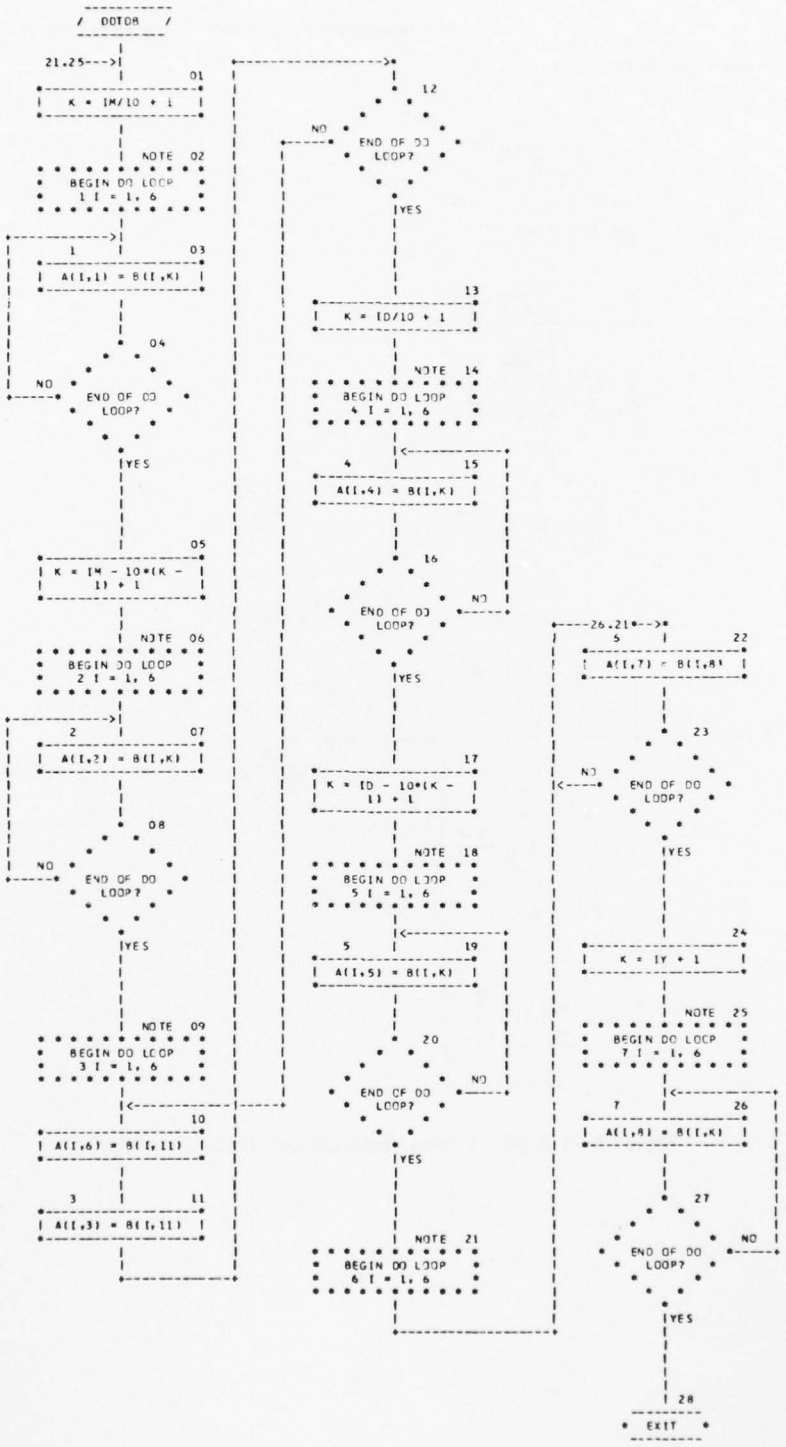
Flow Chart A-63 Group Phase Library Title Page Printer

CHART TITLE - SUBROUTINE DATE(I,ID,IM)



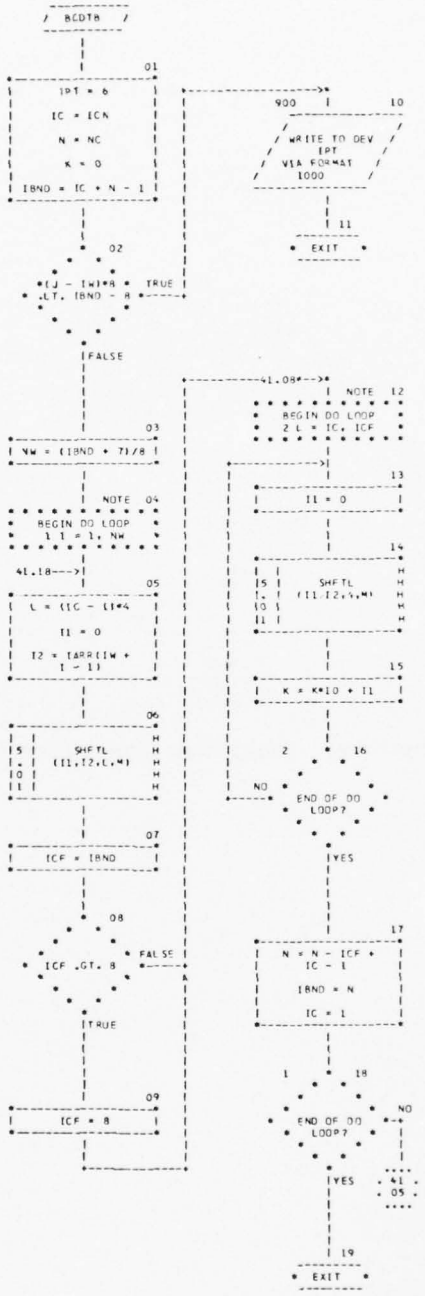
Flow Chart A-64 Group Phase Library Date Converter

CHART TITLE - SUBROUTINE DDTDB(A,IM,ID,IY)



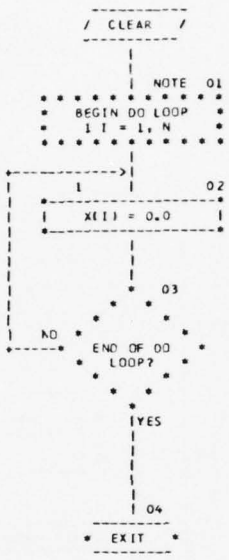
Flow Chart A-65 Group Phase Library Date Formatter

CHART TITLE - SUBROUTINE BCDTB(IW,ICN,NC,IARR,J,K)



Flow Chart A-66 Group Phase Library BCD to Binary Converter

CHART TITLE - SUBROUTINE CLEARX,N)



Flow Chart A-67 Group Phase Library Array Reset

Appendix B

VOLTAGE MEASUREMENTS AND OTHER DATA

This appendix contains a tabulation of the means of each of 32 voltage measurements made at each field site and simultaneously at NAVOBSY. These means are the averages of second-stage edited data taken over 20-min periods. At each field site and at NAVOBSY data were taken for 1 h. Therefore, the data are conveniently broken into three segments, i.e., the first, second, and third 20-min periods.

The mean voltage measurements in volts are presented in Table B-1. This table also contains "other" data. These data are the year and day number, hour of the day, minute, second, block time, time difference, distance, and attenuation (see the key tabulated on the first page of Table B-1). Time is UTC. The "block time" is the time of the first mean voltage measurement in the data segment in milliseconds modulo 1 s. The "time difference" is the difference in time at the field site relative to NAVOBSY. The "distance" is the distance from the measurement antenna to the transmitting station in kilometers. The "attenuation" is the attenuation in decibels that was introduced into the measurement system to achieve the desired voltage at the A to D converter (see Volume C).

The nominal times of the voltage measurements in microseconds relative to the start of the pulse are given in Table B-2. There are two exceptions. All the measurements made at the field site at Marietta, OH, were made 5 μs later than the nominal values, and the measurements of segment 2 made with the field site equipment at NAVOBSY on 1975 day number 188 were made 5 μs earlier.

All the voltage data of Table B-1 are plotted in Figs. B-1 through B-12. The sample points where the measurements were made were located on the pulse such that the odd-numbered samples were near zero crossings and the even near peaks. Thus, the odd-numbered samples were very nearly in quadrature with the carrier and the even in phase (see Fig. 2 in the main body of the text).

The quality of the data is indicated in Table B-3 by the signal-to-noise ratios of the edited data. These signal-to-noise ratios were computed on a "per pulse" basis. The signal-to-noise ratios shown for stage 2 edited data in Table B-3 apply to the data tabulated in Table B-1 and plotted in Figs. B-1 through B-12.

Table B-1

Voltage Measurements and Other Data

(Key)

NAVOBSY	Segment 1	Voltage 1	Voltage 2	Voltage 3	Voltage 4	Voltage 5	Voltage 6	Voltage 7	Voltage 8
		Voltage 9	Voltage 10	Voltage 11	Voltage 12	Voltage 13	Voltage 14	Voltage 15	Voltage 16
		Voltage 17	Voltage 18	Voltage 19	Voltage 20	Voltage 21	Voltage 22	Voltage 23	Voltage 24
		Voltage 25	Voltage 26	Voltage 27	Voltage 28	Voltage 29	Voltage 30	Voltage 31	Voltage 32
		Year.Day	Hour	Minute	Second	Block Time	Time Diff.	Distance	Attenuation
	Segment 2	Voltage 1	Voltage 2	Voltage 3	Voltage 4	Voltage 5	Voltage 6	Voltage 7	Voltage 8
		Voltage 9	Voltage 10	Voltage 11	Voltage 12	Voltage 13	Voltage 14	Voltage 15	Voltage 16
		Voltage 17	Voltage 18	Voltage 19	Voltage 20	Voltage 21	Voltage 22	Voltage 23	Voltage 24
		Voltage 25	Voltage 26	Voltage 27	Voltage 28	Voltage 29	Voltage 30	Voltage 31	Voltage 32
		Year.Day	Hour	Minute	Second	Block Time	Time Diff.	Distance	Attenuation
	Segment 3	Voltage 1	Voltage 2	Voltage 3	Voltage 4	Voltage 5	Voltage 6	Voltage 7	Voltage 8
		Voltage 9	Voltage 10	Voltage 11	Voltage 12	Voltage 13	Voltage 14	Voltage 15	Voltage 16
		Voltage 17	Voltage 18	Voltage 19	Voltage 20	Voltage 21	Voltage 22	Voltage 23	Voltage 24
		Voltage 25	Voltage 26	Voltage 27	Voltage 28	Voltage 29	Voltage 30	Voltage 31	Voltage 32
		Year.Day	Hour	Minute	Second	Block Time	Time Diff.	Distance	Attenuation
Field site	Segment 1	Voltage 1	Voltage 2	Voltage 3	Voltage 4	Voltage 5	Voltage 6	Voltage 7	Voltage 8
		Voltage 9	Voltage 10	Voltage 11	Voltage 12	Voltage 13	Voltage 14	Voltage 15	Voltage 16
		Voltage 17	Voltage 18	Voltage 19	Voltage 20	Voltage 21	Voltage 22	Voltage 23	Voltage 24
		Voltage 25	Voltage 26	Voltage 27	Voltage 28	Voltage 29	Voltage 30	Voltage 31	Voltage 32
		Year.Day	Hour	Minute	Second	Block Time	Time Diff.	Distance	Attenuation
	Segment 2	Voltage 1	Voltage 2	Voltage 3	Voltage 4	Voltage 5	Voltage 6	Voltage 7	Voltage 8
		Voltage 9	Voltage 10	Voltage 11	Voltage 12	Voltage 13	Voltage 14	Voltage 15	Voltage 16
		Voltage 17	Voltage 18	Voltage 19	Voltage 20	Voltage 21	Voltage 22	Voltage 23	Voltage 24
		Voltage 25	Voltage 26	Voltage 27	Voltage 28	Voltage 29	Voltage 30	Voltage 31	Voltage 32
		Year.Day	Hour	Minute	Second	Block Time	Time Diff.	Distance	Attenuation
	Segment 3	Voltage 1	Voltage 2	Voltage 3	Voltage 4	Voltage 5	Voltage 6	Voltage 7	Voltage 8
		Voltage 9	Voltage 10	Voltage 11	Voltage 12	Voltage 13	Voltage 14	Voltage 15	Voltage 16
		Voltage 17	Voltage 18	Voltage 19	Voltage 20	Voltage 21	Voltage 22	Voltage 23	Voltage 24
		Voltage 25	Voltage 26	Voltage 27	Voltage 28	Voltage 29	Voltage 30	Voltage 31	Voltage 32
		Year.Day	Hour	Minute	Second	Block Time	Time Diff.	Distance	Attenuation

Table B-1 (continued)

FIELD SITE: WILMINGTON,NC STATION: CAROLINA BEACH XMTR: 19

.00774	-.02584	-.01532	.05631	.02256	-.10326	-.02975	.16843
.03307	-.24823	-.03254	.33842	.02515	-.43280	-.01207	.52222
-.03263	-.71975	-.10282	-.76834	-.12343	-.67351	-.05860	-.42083
-.03864	-.09162	.12139	-.12748	-.13826	.16473	.06997	-.09604
1975.177	19.00000	30.00000	.00000	713.93690	.00000	544.24396	17.
.00764	-.02595	-.01510	.05611	.02241	-.10274	-.03018	.16836
.03338	-.24843	-.03255	.33869	.02476	-.43267	-.01173	.52186
-.03247	-.72027	-.10310	-.76743	-.12519	-.66693	-.06207	-.40740
-.03429	-.07135	.11835	-.14904	-.13573	.18307	.06688	-.10684
1975.177	19.00000	51.00000	.00000	235.13690	.00000	544.24396	17.
.00757	-.02558	-.01503	.05599	.02183	-.10196	-.02920	.16663
.03256	-.24566	-.03224	.33529	.02497	-.42902	-.01174	.51746
-.03244	-.71389	-.10213	-.76065	-.12346	-.66279	-.06125	-.40724
-.03442	-.07582	.11707	-.14205	-.13390	.17650	.06676	-.10272
1975.177	20.00000	12.00000	.00000	451.43690	.00000	544.24396	17.
.00918	-.02496	-.01671	.05501	.02286	-.10179	-.02766	.16346
.02920	-.23799	-.02518	.31941	.01788	-.40350	-.00024	.48046
-.04009	-.64459	-.10048	-.67389	-.11372	-.57378	-.05688	-.33714
-.03235	-.04814	.10064	-.13044	-.10818	.14214	.04421	-.07130
1975.177	19.00000	30.00000	.00000	712.20320	6.64600	23.57207	46.
.00917	-.02503	-.01670	.05515	.02277	-.10189	-.02769	.16354
.02927	-.23800	-.02525	.31927	.01796	-.40337	-.00015	.48020
-.04015	-.64402	-.10100	-.67343	-.11410	-.57355	-.05713	-.33708
-.03212	-.04844	.10038	-.13000	-.10804	.14173	.04402	-.07112
1975.177	19.00000	51.00000	.00000	233.40320	6.64600	23.57207	46.
.00904	-.02491	-.01648	.05473	.02248	-.10110	-.02728	.16219
.02890	-.23598	-.02508	.31658	.01774	-.40004	-.00037	.47600
-.03950	-.63918	-.09980	-.66804	-.11272	-.56883	-.05639	-.33467
-.03229	-.04862	.09989	-.12821	-.10742	.13986	.04389	-.07013
1975.177	20.00000	12.00000	.00000	449.70320	6.64600	23.57207	46.

Table B-1 (continued)

FIELD SITE: EMPORIA,VA *STATION: CAROLINA BEACH* *XMTR:* 19

.01082	-.02956	-.01958	.06305	.02777	-.11347	-.03573	.18180
.03934	-.26432	-.03864	.35702	.03010	-.45541	-.01588	.55060
.03878	-.77805	.13440	-.85982	-.18091	.77559	.13628	-.48607
.02083	.09786	.10270	-.15556	-.14886	.19493	.08304	-.11553
1975.175	19.00000	30.00000	.00000	343.43710	.00000	544.24396	16.
.01049	-.02861	-.01823	.06086	.02502	-.10864	-.03199	.17371
.03496	-.25301	-.03337	.34216	.02428	-.43654	-.00830	.52700
.04685	-.74498	.14087	-.82120	-.18388	.73934	.13994	-.46157
.02338	.09314	.09817	-.14674	-.14212	.18492	.07841	-.11003
1975.175	19.00000	51.00000	.00000	559.73710	.00000	544.24396	16.
.01060	-.02895	-.01865	.06157	.02584	-.11019	-.03323	.17633
.03655	-.25685	-.03526	.34735	.02621	-.44307	-.01069	.53519
.04468	-.75605	.13832	-.83503	-.18169	.75149	.13389	-.46869
.01367	.09309	.11134	-.15203	-.15693	.19253	.09031	-.11717
1975.175	20.00000	12.00000	.00000	776.03710	.00000	544.24396	16.
.01142	-.02879	-.01936	.06177	.02514	-.11240	-.02992	.17710
.03037	-.25672	-.02547	.34227	.01588	-.43413	-.00252	.52001
.05972	-.72233	.15041	-.78836	-.18637	.70123	.13412	-.42662
.01280	.07695	.10529	-.14235	-.14562	.16522	.08050	-.09339
1975.175	19.00000	30.00000	.00000	342.60520	6.44600	293.34381	23.
.01068	-.02770	-.01795	.05919	.02279	-.10770	-.02674	.16968
.02670	-.24581	-.02142	.32797	.01104	-.41517	-.01089	.49803
.06544	-.69066	.15782	-.75110	-.19213	.66575	.13771	-.40334
.01544	.07293	.10171	-.13211	-.13981	.15240	.07518	-.08562
1975.175	19.00000	51.00000	.00000	558.90520	6.44600	293.34381	23.
.01097	-.02824	-.01851	.06022	.02369	-.10937	-.02796	.17221
.02813	-.24951	-.02293	.33276	.01306	-.42153	-.00803	.50555
.06356	-.70095	.15510	-.76317	-.19016	.67667	.13640	-.41037
.01445	.07471	.10317	-.13331	-.14255	.15249	.07822	-.08287
1975.175	20.00000	12.00000	.00000	775.20520	6.44600	293.34381	23.

Table B-1 (continued)

FIELD SITE: TOWANDA,PA STATION: CAROLINA BEACH XMTR: 20

.01175	-.02400	-.02036	.05285	.02994	-.09998	-.03685	.16329
.03970	-.24184	-.03652	.32843	.02781	-.42025	-.01308	.50681
.02934	-.71883	-.09869	-.80186	-.13021	-.74844	-.08986	-.51468
.02418	-.16145	.04665	-.12157	-.08840	.21171	.07277	-.14923
1975.183	19.00000	30.00000	1.00000	924.73660	.00000	544.24396	16.
.01208	-.02385	-.02122	.05318	.03095	-.10069	-.03821	.16457
.04113	-.24373	-.03774	.33016	.02948	-.42247	-.01508	.50892
.02557	-.72327	-.09487	-.80884	-.12516	-.75813	-.08246	-.52718
.01588	-.17554	.05451	-.10727	-.09459	.19819	.07685	-.13963
1975.183	19.00000	51.00000	.00000	750.83660	.00000	544.24396	16.
.01184	-.02439	-.02048	.05348	.03012	-.10091	-.03731	.16495
.03996	-.24418	-.03625	.33087	.02749	-.42327	-.01265	.50990
.02947	-.72469	-.09987	-.81081	-.13294	-.76340	-.09294	-.53654
.02711	-.18781	.04406	-.09430	-.08637	.18689	.07176	-.13385
1975.183	20.00000	12.00000	.00000	272.03660	.00000	544.24396	16.
.00454	-.02276	-.00866	.04751	-.00892	-.08697	-.01201	.13645
.00854	-.19917	-.00630	.26606	-.00266	-.33863	-.01109	.40677
.04212	-.57326	-.10237	-.63355	-.13586	-.57180	-.11305	-.36517
.06362	-.07799	-.01586	-.13237	-.01788	.17867	.02570	-.10495
1975.183	19.00000	30.00000	1.00000	925.82550	6.98700	867.73125	6.
.00475	-.02021	-.00968	.04507	.01093	-.08531	-.01493	.13565
.01231	-.19960	-.01090	.26822	.00179	-.34223	-.00704	.41160
.04057	-.57993	-.10532	-.64353	.14329	-.58782	-.12574	-.38633
.08368	-.09849	-.04040	-.11751	.00303	.17218	.01546	-.10647
1975.183	19.00000	51.00000	.00000	751.92550	6.98700	867.73125	6.
.00616	-.02340	-.00996	.04858	-.00997	-.08822	-.01285	.13788
.00939	-.20089	-.00713	.26857	-.00223	-.34159	-.01116	.41033
.04368	-.57890	-.10782	-.64584	-.14784	-.59402	-.13435	-.39090
.09089	-.09968	-.04148	-.11605	-.00041	.16897	.01930	-.10269
1975.183	20.00000	12.00000	.00000	273.12550	6.98700	867.73125	6.

Table B-1 (continued)

FIELD SITE: DEXTER,NY *STATION: CAROLINA BEACH* *XMTR:* 19

.00779	-.02653	-.01420	.05623	.02139	-.10372	-.02905	.16928
.03362	-.25181	-.03412	.34397	.02821	-.44152	-.01627	.53300
-.02372	-.73786	.08731	-.78576	-.10026	.68710	-.03583	-.42748
-.05594	.08961	.12665	-.13618	-.13035	.17411	.05762	-.10029
1975.181	19.00000	30.00000	.00000	561.23680	.00000	544.24396	17.
.00714	-.02579	-.01430	.05559	.02201	-.10315	-.02947	.16885
.03350	-.24998	-.03362	.34085	.02839	-.43694	-.01846	.52739
-.01765	-.73201	.08027	-.78294	-.09944	.67904	-.03465	-.41223
-.05608	.07457	.12120	-.15359	-.12303	.19395	.05545	-.11014
1975.181	19.00000	51.00000	2.00000	167.73680	.00000	544.24396	17.
.00727	-.02636	-.01380	.05595	.02139	-.10340	-.02860	.16903
.03250	-.25053	-.03210	.34149	.02615	-.43757	-.01578	.52810
-.02061	-.73307	.08361	-.78347	-.10228	.67980	-.03364	-.41464
-.06112	.07734	.12921	-.15110	-.13223	.19177	.06297	-.10988
1975.181	20.00000	12.00000	.00000	298.73680	.00000	544.24396	17.
-.00033	-.01146	.00024	.02414	-.00089	-.04284	.00104	.06757
.00285	-.09680	-.00412	.12909	.00693	-.16096	-.01042	.19280
-.02112	-.26384	.03908	-.29161	-.04481	.26391	-.02071	-.17264
.00795	.05464	.02537	-.02527	-.02773	.04721	.01370	-.03294
1975.181	19.00000	30.00000	.00000	563.14810	6.84200	1113.94586	6.
-.00016	-.01136	.00019	.02381	-.00093	-.04256	.00087	.06721
.00269	-.09644	-.00390	.12839	.00675	-.15998	-.00996	.19137
-.02113	-.26191	.03759	-.28898	-.03949	.26194	-.01313	-.17193
.01714	.05511	.03406	-.02433	-.03402	.04705	.01545	-.03389
1975.181	19.00000	51.00000	2.00000	169.64810	6.84200	1113.94586	6.
-.00006	-.01153	.00003	.02393	-.00128	-.04266	.00125	.06715
.00309	-.09642	-.00422	.12847	.00720	-.16033	-.01063	.19183
-.02135	-.26205	.03776	-.28938	-.03947	.26292	-.01322	-.17308
-.01710	.05636	.03412	-.02317	-.03403	.04648	.01550	-.03392
1975.181	20.00000	12.00000	.00000	300.64810	6.84200	1113.94586	6.

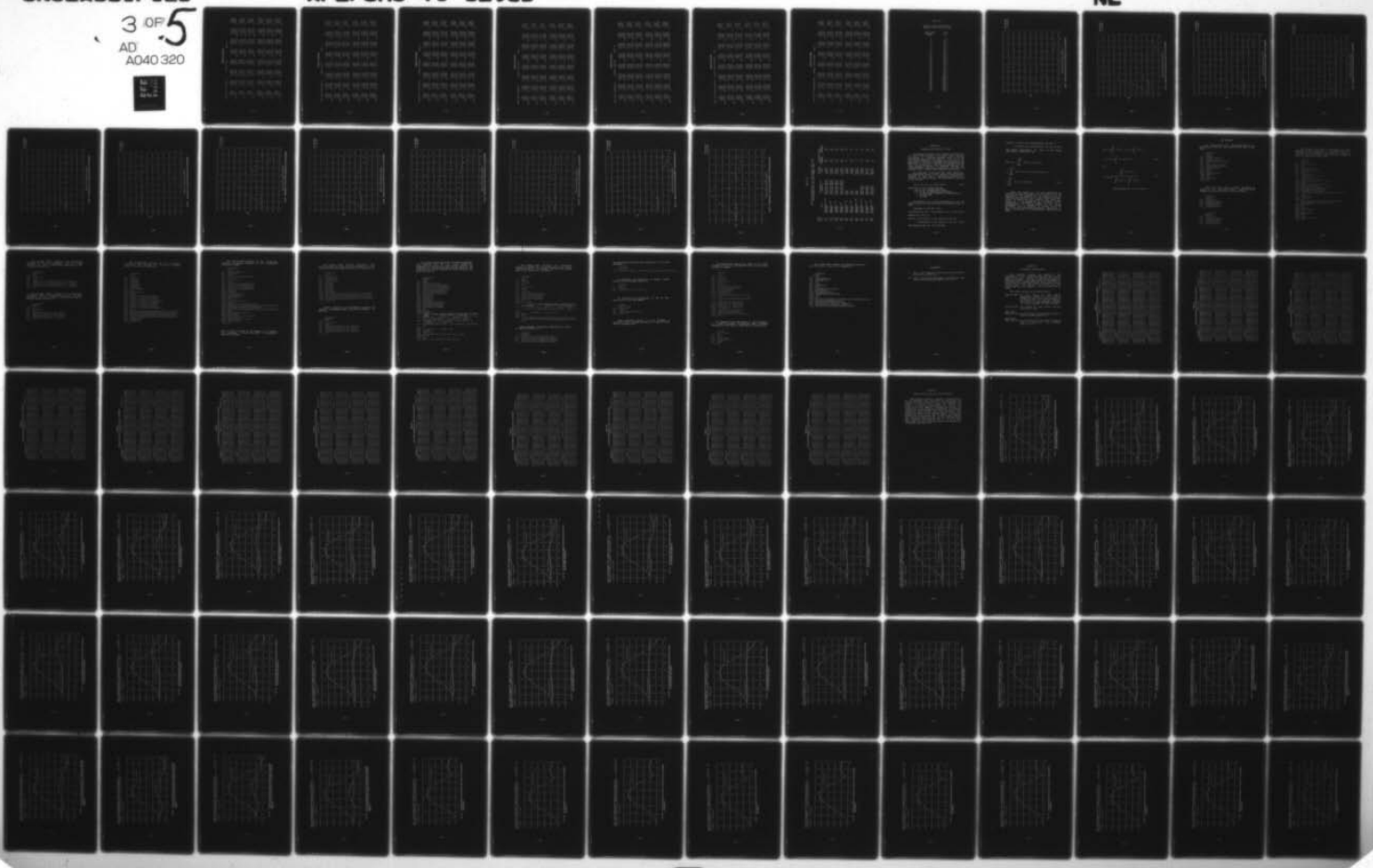
Table B-1 (continued)

FIELD SITE: DANVILLE,IN *STATION: DANA* *XMTR: 19*

.00105	-.00208	-.00192	.01414	.00299	-.03274	-.00314	.05709
-.00361	-.08792	.00298	.12197	.00327	-.16090	-.00316	.19923
.00392	-.31012	-.00092	-.37752	.00854	-.37440	-.02621	-.27512
.04822	-.11474	-.05946	-.02712	.04955	.08490	-.01945	-.06526
1975.163	19.00000	30.00000	.00000	970.59740	.00000	903.08343	6.
.00132	-.00134	-.00217	.01268	.00334	-.03209	-.00351	.05664
-.00374	-.08827	.00257	.12239	.00300	-.16150	-.00307	.20071
-.00432	-.31120	-.00137	-.37974	.00557	-.37650	-.01991	-.27544
.04004	-.11316	-.05133	-.02996	.04287	.08699	-.01520	-.06527
1975.163	19.00000	51.00000	3.00000	967.29740	.00000	903.08343	6.
.00064	-.00143	-.00186	.01329	.00333	-.03304	-.00339	.05775
-.00394	-.08953	.00298	.12360	.00358	-.16237	-.00398	.20125
-.00542	-.31315	-.00138	-.38202	.00739	-.38118	-.02525	-.28157
.04625	-.11999	-.05840	-.02497	.04923	.08484	-.01946	-.06528
1975.163	20.00000	12.00000	.00000	708.09740	.00000	903.08343	6.
.01171	-.02355	-.01648	.05275	-.01519	-.09491	-.01245	.15009
.00589	-.21614	-.00020	.29057	-.01010	-.36950	-.01746	.44692
.03718	-.65275	-.07248	-.75402	.10290	-.70906	-.12200	-.46226
.12284	-.10429	-.09046	-.16814	.02970	.23243	.02393	-.12013
1975.163	19.00000	30.00000	.00000	967.87130	5.08500	85.94620	30.
.01194	-.02351	-.01678	.05294	-.01559	-.09535	-.01286	.15081
.00641	-.21704	-.00071	.29165	-.00934	-.37065	-.01684	.44810
.03628	-.65416	-.07201	-.75580	.10242	-.71154	-.12221	-.46462
.12358	-.10592	-.09143	-.16740	.03018	.23264	.02408	-.12094
1975.163	19.00000	51.00000	3.00000	964.57130	5.08500	85.94620	30.
.01195	-.02364	-.01677	.05323	-.01572	-.09573	-.01305	.15132
.00679	-.21761	-.00106	.29233	-.00880	-.37147	-.01658	.44899
.03574	-.65539	-.07194	-.75726	.10270	-.71254	-.12313	-.46484
.12498	-.10474	-.09282	-.16942	.03091	.23465	.02461	-.12191
1975.163	20.00000	12.00000	.00000	705.37130	5.08500	85.94620	30.

AD-A040 320 JOHNS HOPKINS UNIV LAUREL MD APPLIED PHYSICS LAB F/G 17/7
EXPERIMENTAL RESEARCH ON THE PROPAGATION OF LORAN-C SIGNALS. VO--ETC(U)
JAN 77 L F FEHLNER, T W JERARDI, T A MCCARTY N00017-72-C-4401
UNCLASSIFIED APL/JHU-TG-1298D NL

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AD
A040 320




OF
5
0320

Table B-1 (continued)

FIELD SITE: MARIETTA,OH STATION: DANA XMTR: 19

.00427	-.00274	-.00420	.01391	.00446	-.03363	-.00442	.05850
.00320	-.08947	-.00253	.12288	.00150	-.16060	-.00078	.19680
.00117	-.29843	-.00994	-.35427	.02031	.33728	-.03411	-.22787
.05111	.06623	.05329	-.06335	.03682	.10440	-.00481	-.06642
1975.161	19.00000	30.00000	.00000	798.69740	.00000	903.08343	6.
.00415	-.00276	-.00384	.01328	.00513	-.03450	-.00327	.05739
.00359	-.08929	-.00261	.12266	.00160	-.16011	-.00186	.19773
.00061	-.29783	-.00899	-.35360	.02025	.33583	-.03491	-.22493
.05296	.06361	.05622	-.06571	.03865	.10621	-.00628	-.06749
1975.161	19.00000	51.00000	.00000	319.89740	.00000	903.08343	6.
.00427	-.00281	-.00426	.01402	.00424	-.03374	-.00378	.05789
.00292	-.08917	-.00215	.12255	.00126	-.16072	-.00020	.19693
.00203	-.29874	-.00932	-.35548	.01863	.33902	-.03151	-.23001
.04765	.06952	.05011	-.05979	.03422	.10169	-.00450	-.06554
1975.161	20.00000	12.00000	1.00000	231.29740	.00000	903.08343	6.
-.01256	.04341	-.01401	-.07881	-.01262	.12551	-.00914	-.18077
-.00458	.24520	-.00044	-.31187	-.00550	.38132	-.01248	-.44542
-.02856	.60636	.05847	-.66472	-.09050	-.57653	-.11578	-.32343
.11933	.02274	.08366	.16733	-.01602	-.17949	-.03987	.06732
1975.161	19.00000	30.00000	.00000	797.44440	4.96600	526.90533	12.
-.01259	.04291	.01431	-.07831	-.01321	.12504	-.01009	-.18034
-.00585	.24488	.00104	-.31176	-.00371	.38134	-.01088	-.44570
-.02602	.60720	.05648	-.66640	-.08904	-.58012	-.11473	-.32926
-.11969	.03038	.08521	.15934	-.01820	-.17290	-.03807	.06365
1975.161	19.00000	51.00000	.00000	318.64440	4.96600	526.90533	12.
-.01255	.04305	-.01401	-.07840	-.01267	.12510	-.00930	-.18037
-.00481	.24487	-.00030	-.31160	-.00553	.38109	-.01256	-.44529
-.02873	.60636	.05905	-.66564	-.09189	-.58017	-.11887	-.33151
-.12365	.03467	.08915	.15359	-.02250	-.16710	-.03404	.06010
1975.161	20.00000	12.00000	1.00000	230.04440	4.96600	526.90533	12.

Table B-1 (continued)

FIELD SITE: GEORGETOWN,DE *STATION: DANA* *XMTR: 19*

-.00088	-.00076	-.00143	.01327	-.00016	-.03206	.00044	.05726
-.00267	-.08802	-.00392	.12226	-.00576	-.16081	-.00744	.19852
.01163	-.30103	-.02404	-.35610	.03650	.33156	-.05048	-.21562
.06246	-.05159	-.05986	-.07662	.03798	.11468	-.00522	-.07028
1975.156	19.00000	30.00000	.00000	617.19730	.00000	903.08343	6.
-.00140	-.00070	-.00191	.01277	-.00092	-.03243	.00031	.05653
-.00146	-.08831	-.00332	.12239	-.00539	-.16064	-.00632	.19949
.01011	-.30596	-.02250	-.36910	.03672	.35538	-.05356	-.24794
.06873	-.08663	-.06872	-.04600	.04857	.09671	-.01431	-.06731
1975.156	19.00000	51.00000	.00000	138.39730	.00000	903.08343	6.
-.00129	-.00068	-.00163	.01300	-.00052	-.03283	.00077	.05733
-.00221	-.08910	-.00381	.12363	-.00577	-.16249	-.00692	.20156
.01148	-.30884	-.02535	-.37289	.04114	.35911	-.05905	-.25018
.07398	-.08633	-.07282	-.04992	.05040	.10242	-.01423	-.07163
1975.156	20.00000	12.00000	.00000	354.69730	.00000	903.08343	6.
-.00127	-.00777	-.00082	.01690	-.00216	-.03011	.00435	.04674
-.00770	-.06797	-.01033	.09127	-.01461	-.11667	-.01851	.14178
.02843	-.20812	-.04887	-.24427	.06425	.22754	-.07442	-.14942
.07373	-.04154	-.05770	-.04205	.02682	.06678	-.00477	-.03926
1975.156	19.00000	30.00000	.00000	617.70450	4.58000	1053.51698	6.
-.00164	-.00794	-.00111	.01677	-.00155	-.03002	.00357	.04694
-.00672	-.06844	-.00971	.09198	-.01442	-.11711	-.01835	.14262
.02861	-.20948	-.05235	-.24679	.07241	.23123	-.08648	-.15281
.08843	-.04266	-.07184	-.04249	.03710	.06948	-.00085	-.04285
1975.156	19.00000	51.00000	.00000	138.90450	4.58000	1053.51698	6.
-.00118	-.00790	-.00092	.01666	-.00187	-.03025	.00354	.04738
-.00735	-.06935	-.01024	.09267	-.01517	-.11817	-.01895	.14330
.03028	-.20790	-.05401	-.24092	.07372	.21936	-.08519	-.13754
.08387	-.02608	-.06335	-.05699	.02565	.07677	.01095	-.04288
1975.156	20.00000	12.00000	.00000	355.20450	4.58000	1053.51698	6.

Table B-1 (continued)

FIELD SITE: TOMS RIVER,NJ STATION: NANTUCKET XMTR: 23

.01104	-.02482	-.01493	.04858	.01630	-.08269	-.02030	.13051
.01914	-.18772	-.01943	.25484	.01562	-.32948	-.00956	.40363
.00736	-.61003	-.03984	.73088	-.06612	-.72093	-.06865	-.56035
.04692	-.30189	-.00739	.04455	-.02457	.13371	.03331	-.20305
1975.149	19.00000	30.00000	.00000	147.65630	.00000	657.57608	8.
.01315	-.02474	-.01910	.05163	.02229	-.09097	-.02558	.14300
-.02379	-.20438	-.02298	.27452	.01873	-.35128	-.01481	.42939
.00412	-.65714	-.02936	.79209	.05844	-.78227	-.05054	-.62641
.03604	-.35585	-.00281	.07163	-.03780	.11885	.03900	-.20620
1975.149	19.00000	51.00000	1.00000	158.35630	.00000	657.57608	8.
.01290	-.02895	-.01631	.05378	.01988	-.09286	-.02268	.14296
-.02316	-.20486	-.02442	.27731	.02035	-.35547	-.01717	.43739
-.00244	-.66608	-.03462	.80107	-.06133	-.79401	-.05057	-.63959
.03532	-.36367	.00238	.07660	-.04352	.11643	.04121	-.20931
1975.149	20.00000	12.00000	.00000	679.55630	.00000	657.57608	8.
.01172	-.02659	-.01702	.05488	.01933	-.09634	-.02127	.15087
.01993	-.21786	-.01676	.29404	.01063	-.37738	-.00062	.45998
.02066	-.68445	-.06156	-.80552	.08184	-.77918	-.07183	-.58558
.03433	-.28746	.02103	-.00035	-.05870	.18983	.05482	-.25685
1975.149	19.00000	30.00000	.00000	146.74690	4.05700	384.34588	13.
.01318	-.02946	-.01932	.05980	.02224	-.10460	-.02512	.16263
.02457	-.23419	-.02221	.31528	.01714	-.40419	-.00866	.49254
.01341	-.73396	-.05625	.86799	-.07413	-.84914	-.06778	-.64576
.02944	-.32561	.02652	.01121	-.06331	.20051	.05667	-.28104
1975.149	19.00000	51.00000	1.00000	157.44690	4.05700	384.34588	13.
.01346	-.02989	-.01947	.06096	.02248	-.10621	-.02525	.16510
.02467	-.23748	-.02191	.31953	.01663	-.40944	-.00804	.49884
.01517	-.74253	-.05924	.87872	-.07772	-.85969	-.07023	-.65526
.02958	-.33231	.02962	.01534	-.06882	.19963	.06374	-.28205
1975.149	20.00000	12.00000	.00000	678.64690	4.05700	384.34588	13.

Table B-1 (continued)

FIELD SITE: GROTTOES,VA *STATION: NANTUCKET* *XMTR: 23*

.01011	-.02735	-.01213	.05162	.01432	-.08888	-.01382	.13740
.01244	-.19902	-.00763	.26809	.00204	-.34619	-.00687	.42540
.02650	-.65280	-.06061	.79603	-.08153	-.80063	-.07510	-.63493
.04683	-.35304	.00359	.06444	-.03906	.14019	.04596	-.22860
1975.170	19.00000	30.00000	.00000	512.75600	.00000	657.57608	8.
.01077	-.02771	-.01315	.05280	.01531	-.09086	-.01512	.14071
.01348	-.20348	-.00889	.27446	.00276	-.35412	-.00664	.43483
.02720	-.66655	-.06251	.81203	-.08341	-.81722	-.07709	-.64890
.04735	-.36270	.00473	.06896	-.04161	.14020	.04915	-.23125
1975.170	19.00000	51.00000	.00000	729.05600	.00000	657.57608	8.
.01215	-.02754	-.01367	.05233	.01638	-.09199	-.01406	.14031
.01212	-.20136	-.00804	.27107	.00204	-.34816	-.00470	.42913
.02561	-.65917	-.06053	.80501	-.08074	-.81532	-.07214	-.65634
.04229	-.37932	.00961	.09095	-.04750	.11764	.05358	-.21414
1975.170	20.00000	12.00000	.00000	250.25600	.00000	657.57608	8.
-.00136	-.01582	-.00147	.02944	-.00098	-.04979	.00289	.07625
-.00669	-.10951	.00969	.14732	-.01405	-.18804	.01792	.22957
.02755	-.34912	-.04222	.42386	.04784	-.42270	-.04223	-.32859
.02618	-.17691	-.00563	.02578	-.01190	.08169	.01708	-.12570
1975.170	19.00000	30.00000	.00000	513.33110	5.92900	827.58950	3.
-.00187	-.01656	-.00215	.03042	-.00010	-.05154	.00196	.07895
-.00608	-.11287	.00922	.15116	-.01332	-.19251	.01686	.23502
.02753	-.35639	-.04390	.43055	-.05255	-.42487	-.04800	-.32595
.03299	-.16866	-.01182	.01502	-.00843	.09003	.01606	-.13139
1975.170	19.00000	51.00000	.00000	729.63110	5.92900	827.58950	3.
-.00180	-.01620	-.00237	.03031	-.00025	-.05127	.00149	.07819
-.00533	-.11165	.00803	.14966	-.01202	-.19076	.01565	.23279
.02591	-.35241	-.03938	.42626	-.04323	-.42122	-.03499	-.32322
.01683	-.15802	.00411	.01451	-.02105	.09069	.02281	-.13162
1975.170	20.00000	12.00000	.00000	250.83110	5.92900	827.58950	3.

Table B-1 (continued)

FIELD SITE: BLUEFIELD,WV STATION: NANTUCKET XMTR: 23

.00931	-.02835	-.01485	.05312	.01917	-.08897	-.02263	.13654
.02318	-.19605	-.02079	.26404	.01633	-.34082	-.00964	.41951
.00443	-.64473	.02615	.77767	-.04143	-.77595	-.03929	-.61410
.01442	-.33858	.02534	.05454	-.04608	.13993	.04285	-.21987
1975.168	19.00000	30.00000	.00000	738.05610	.00000	657.57608	8.
.00726	-.02527	-.01173	.04708	.01624	-.08121	-.01833	.12532
-.01892	-.18141	-.01815	.24739	.01521	-.32199	-.01224	.40111
-.00388	-.62777	.00605	.76882	-.01346	-.77637	-.00755	-.62339
-.01450	-.35342	.04819	.07113	-.05965	.12703	.04942	-.21073
1975.168	19.00000	51.00000	.00000	954.35610	.00000	657.57608	8.
.00752	-.02584	-.01087	.04762	.01413	-.08024	-.01731	.12394
-.01996	-.18168	-.01998	.24910	.01755	-.32524	-.01410	.40434
-.00760	-.63466	.00065	.77815	-.00807	-.78543	-.00522	-.62873
-.01382	-.35327	.04540	.06565	-.05653	.13476	.04600	-.21864
1975.168	20.00000	12.00000	.00000	475.55610	.00000	657.57608	8.
-.00248	-.01162	-.00020	.02241	.00210	-.03699	-.00610	.05148
.00700	-.07060	-.00711	.09156	.00283	-.11734	-.00166	.14438
.01232	-.23190	-.02523	.29096	.03404	-.29370	-.04717	-.24687
.04390	-.16038	-.02055	.04924	.00483	.03279	.00452	-.07307
1975.168	19.00000	30.00000	.00000	739.41860	5.70200	1063.42459	3.
-.00327	-.01088	-.00144	.02072	.00075	-.03427	-.00471	.04803
.00580	-.06628	-.00623	.08618	.00299	-.11124	-.00011	.13801
.00832	-.22570	-.01821	.28724	.02576	-.29313	-.04051	-.24852
.04093	-.16250	-.02117	.05121	.00754	.03186	.00107	-.07300
1975.168	19.00000	51.00000	.00000	955.71860	5.70200	1063.42459	3.
-.00270	-.01065	-.00106	.02048	.00120	-.03402	-.00502	.04807
.00629	-.06631	-.00699	.08661	.00437	-.11222	-.00111	.13937
.00707	-.22751	-.02074	.29013	.03647	-.29619	-.06011	-.24965
.06721	-.16020	-.04892	.04628	.02954	.03769	-.01051	-.07783
1975.168	20.00000	12.00000	.00000	476.91860	5.70200	1063.42459	3.

Table B-1 (continued)

FIELD SITE: NAVOBSY,BASELINE STATION: CAROLINA BEACH XMTR: 19

.01045	-.02715	-.01738	.05700	.02407	-.10266	-.02976	.16388
.03219	-.23990	-.02978	.32576	.02060	-.41844	-.00346	.50779
.05006	-.72699	-.13691	-.80529	-.17576	.72157	-.12538	-.44608
.00974	-.08531	.10562	-.15318	-.14391	.19116	.07930	-.11081
1975.154	19.00000	27.00000	.00000	443.93800	.00000	544.24396	16.
.01112	-.02855	-.01824	.05870	.02665	-.10743	-.03382	.17276
.03728	-.25469	-.03509	.34596	.02552	-.44388	-.00915	.53802
.04551	-.76478	.13662	-.83825	-.17635	.74897	-.12305	-.46771
.00946	-.09767	.10330	-.14727	-.13808	.18649	.07255	-.10648
1975.154	21.00000	9.00000	.00000	203.63800	.00000	544.24396	16.
.01036	-.02807	-.01862	.05877	.02665	-.10778	-.03391	.17255
.03754	-.25530	-.03461	.34531	.02584	-.44428	-.00908	.53796
.04761	-.76215	.13940	-.83491	-.17935	.74617	-.12242	-.46933
.00317	-.10536	.11443	-.13623	-.15325	.17462	.08710	-.10087
1975.154	22.00000	43.00000	.00000	344.33800	.00000	544.24396	16.
.00842	-.02550	-.01385	.05326	.01799	-.09463	-.02159	.15010
.02208	-.21796	-.01889	.29481	.01020	-.37725	-.00484	.45739
.04872	-.65429	.12391	-.72605	-.15545	.64871	-.10610	-.39722
.00027	-.07115	.09715	-.14600	-.12619	.17983	.06670	-.10523
1975.154	19.00000	27.00000	.00000	443.94250	4.42400	544.24396	16.
.00825	-.02809	-.01228	.05614	-.01583	-.10150	-.01713	.15956
.01501	-.23341	-.00736	.31384	-.00574	-.40058	-.02523	.48350
.07966	-.68361	-.16687	-.74904	-.19796	.66564	-.13677	-.41327
.01583	-.08396	.09537	-.13514	-.12838	.17069	.06718	-.10047
1975.154	21.00000	9.00000	.00000	203.64260	4.42400	544.24396	16.
.00741	-.02725	-.01230	.05578	-.01583	-.10029	-.01748	.15866
.01576	-.23187	-.00860	.31259	-.00394	-.39964	-.02425	.48274
.07851	-.67936	-.16422	-.74475	-.19392	.66272	-.13095	-.41375
.00594	-.09086	.10581	-.12460	-.14006	.16031	.07914	-.09482
1975.154	22.00000	43.00000	.00000	344.34260	4.42400	544.24396	16.

Table B-1 (concluded)

FIELD SITE: NAVOBSY,BASELINE STATION: CAROLINA BEACH XMTR: 19

.01306	-.02176	-.02458	.05206	.03400	-.09827	-.04180	.16117
.04288	-.23767	-.03637	.32216	.02153	-.41055	-.00401	.49200
-.07071	-.67323	-.17612	-.71869	-.20903	-.63005	-.13200	-.40220
-.00645	-.10829	.12457	-.09265	-.16382	.13322	.10107	-.08154
1975.188	17.00000	34.00000	.00000	183.23630	.00000	544.24396	17.
.01292	-.02133	-.02407	.05155	.03357	-.09665	-.04070	.15945
.04076	-.23360	-.03384	.31745	.01836	-.40294	-.00717	.48332
-.07509	-.65997	-.17886	-.70646	-.21180	-.62382	-.13502	-.40485
-.00149	-.12052	.11622	-.07634	-.15721	.11845	.09679	-.07422
1975.188	17.00000	57.00000	.00000	651.23630	.00000	544.24396	17.
.01328	-.02253	-.02436	.05281	.03481	-.09981	-.04261	.16371
.04404	-.24146	-.03757	.32767	.02182	-.41686	-.00333	.50004
.07212	-.68497	-.17941	-.73370	-.21513	-.64902	-.14044	-.42102
.00344	-.12296	.11593	-.08222	-.15885	.12560	.09893	-.07793
1975.188	18.00000	23.00000	.00000	456.23630	.00000	544.24396	17.
.01241	-.02309	-.02270	.05309	.03114	-.09936	-.03801	.16146
.03940	-.23747	-.03402	.32147	.02079	-.40927	-.00148	.49171
-.06332	-.67463	-.16240	-.72134	-.19159	-.63510	-.11619	-.40248
-.01367	-.09956	.12375	-.10489	-.15546	.14146	.09930	-.08785
1975.188	17.00000	34.00000	.00000	183.24370	7.34200	544.24396	16.
-.00452	.00847	.01133	-.02426	-.01920	.05518	-.02588	-.10121
-.02753	.16360	.02383	-.23766	-.01245	.32128	-.00715	-.40470
-.06978	.61472	-.18260	-.70006	-.24595	.66213	-.19350	-.48993
-.05951	.20786	-.08407	.03336	.15674	-.12156	-.12364	.09533
1975.188	17.00000	57.00000	.00000	651.83880	7.34200	544.24396	16.
.01267	-.02407	-.02292	.05424	.03195	-.10138	-.03899	.16429
.04060	-.24183	-.03582	.32759	.02185	-.41677	-.00008	.50115
-.06272	-.68840	-.16379	-.73861	-.19615	-.65638	-.12412	-.42330
-.00467	-.11476	.11660	-.09483	-.15121	.13461	.08687	-.08525
1975.188	18.00000	23.00000	.00000	456.24370	7.34200	544.24396	16.

Table B-2

Nominal Time of Measurement
Triggers from Start of Pulse

Measurement Number	Time (μs)
1	5
2	7.5
3	10
4	12.5
5	15
6	17.5
7	20
8	22.5
9	25
10	27.5
11	30
12	32.5
13	35
14	37.5
15	40
16	42.5
17	50
18	57.5
19	65
20	72.5
21	80
22	87.5
23	95
24	102.5
25	110
26	117.5
27	125
28	132.5
29	140
30	147.5
31	155
32	162.5

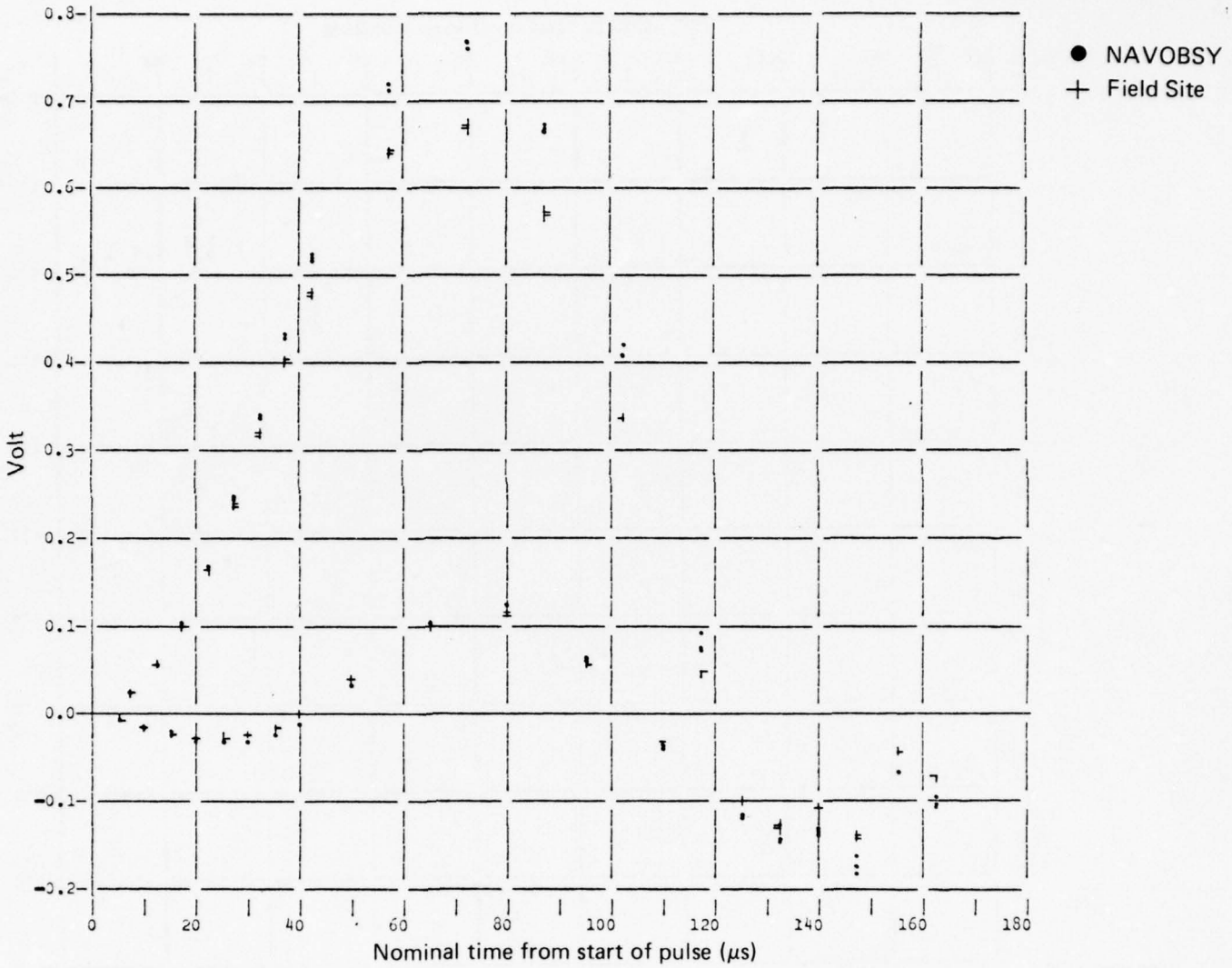


Fig. B-1 Observations of Loran-C Pulse at Wilmington, NC, and NAVOBSY

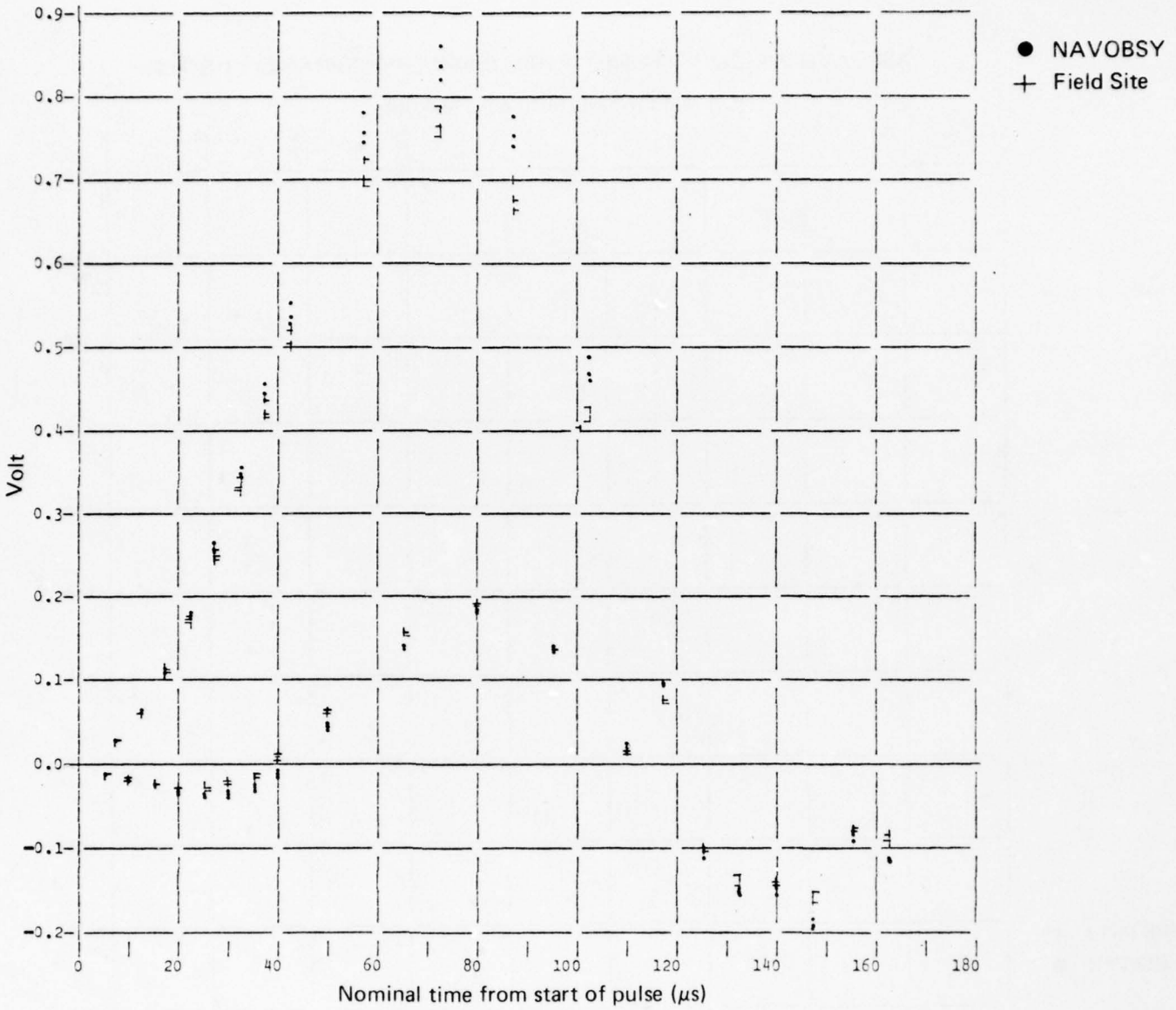


Fig. B-2 Observations of Loran-C Pulse at Emporia, VA, and NAVOBSY

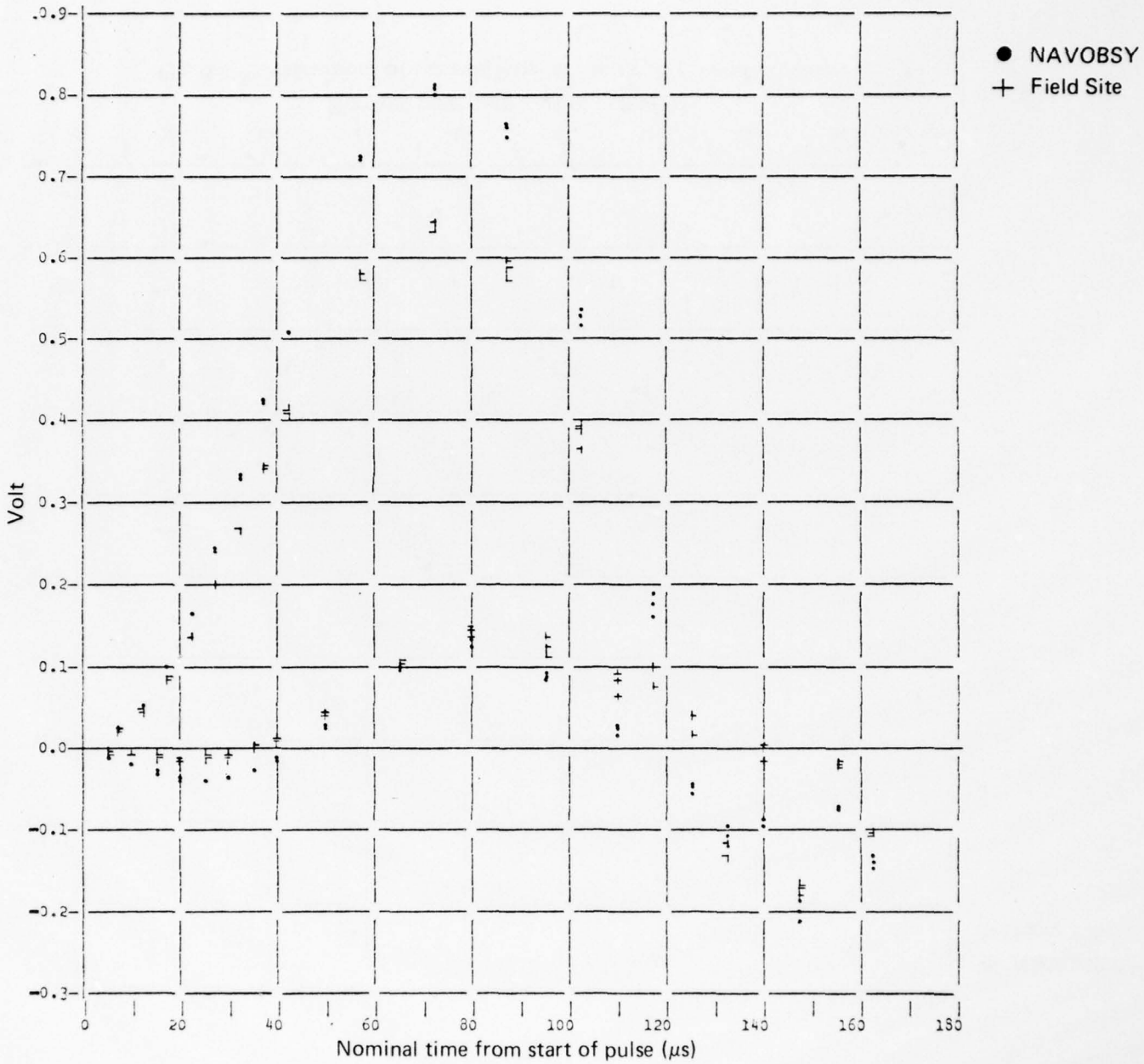


Fig. B-3 Observations of Loran-C Pulse at Towanda, PA, and NAVOBSY

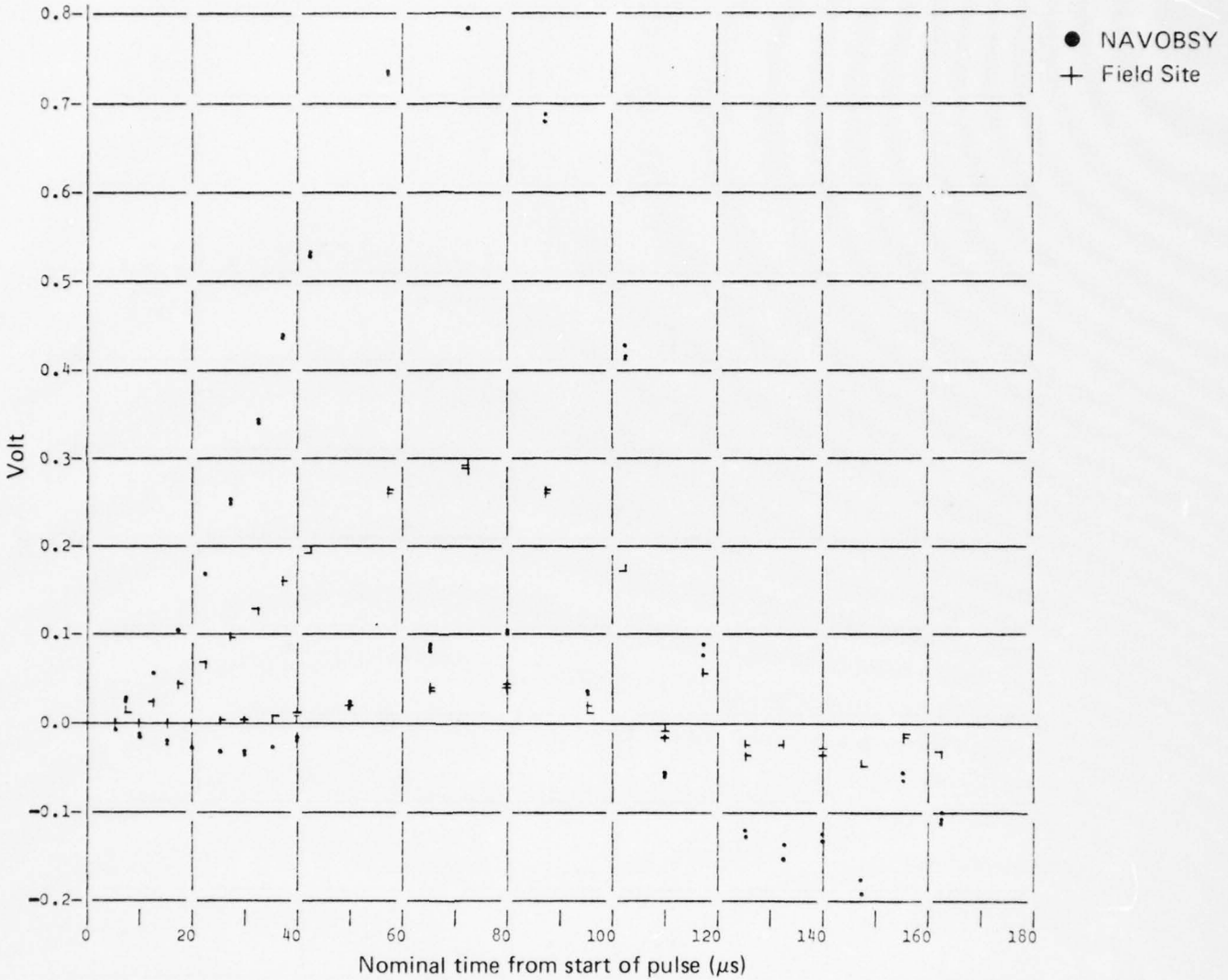


Fig. B-4 Observations of Loran-C Pulse at Dexter, NY, and NAVOBSY

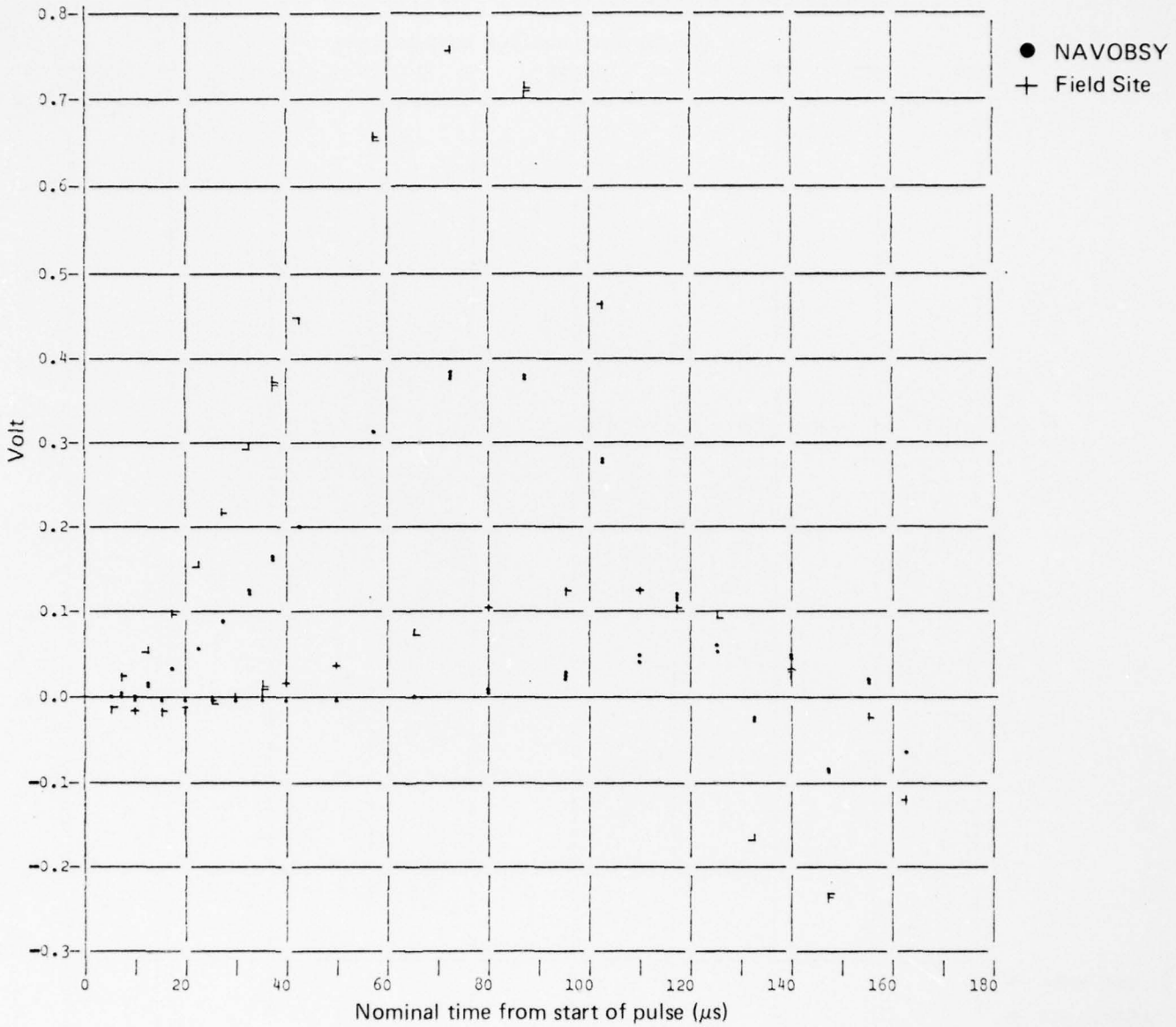


Fig. B-5 Observations of Loran-C Pulse at Danville, IN, and NAVOBSY

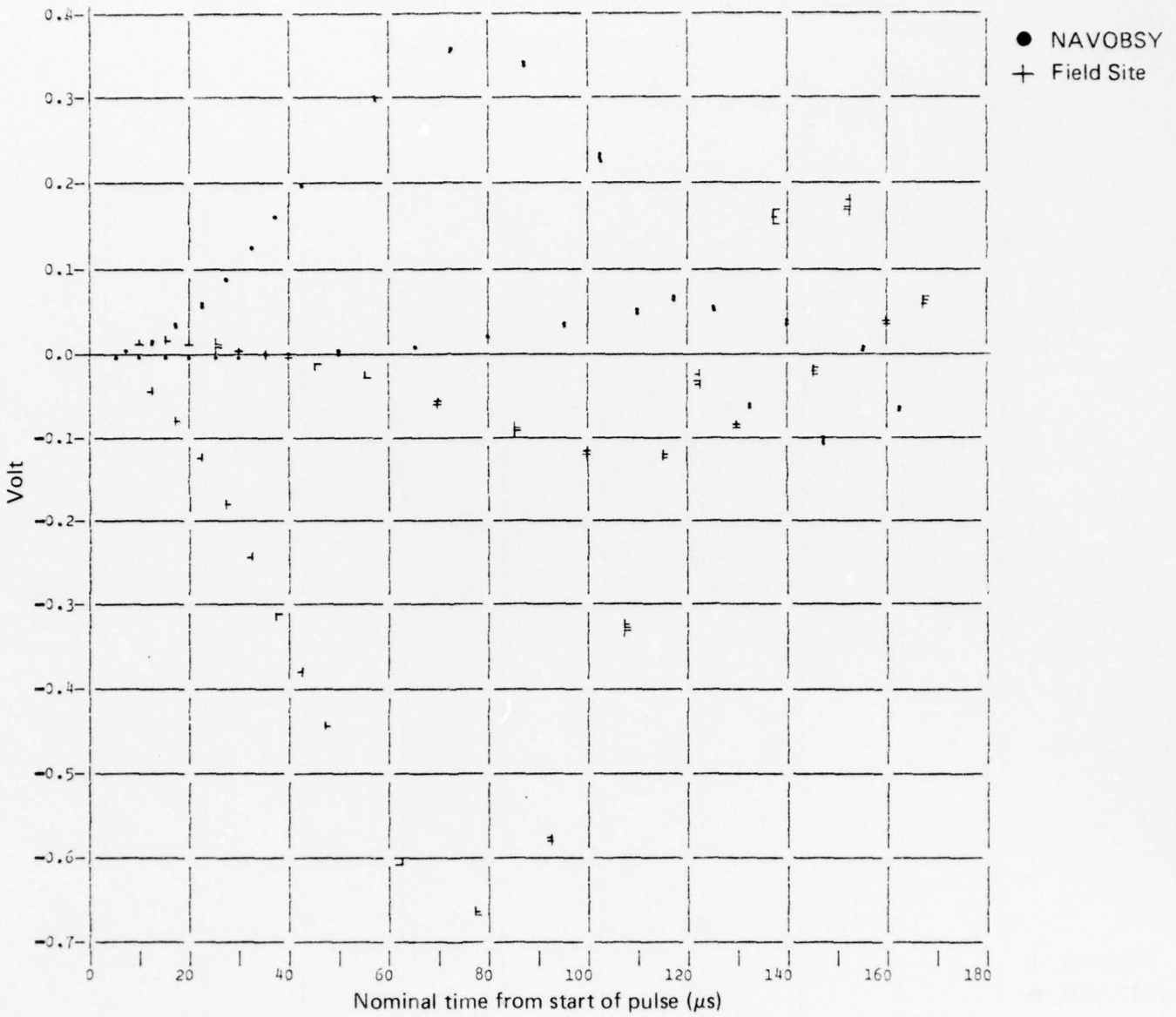


Fig. B-6 Observations of Loran-C Pulse at Marietta, OH, and NAVOBSY

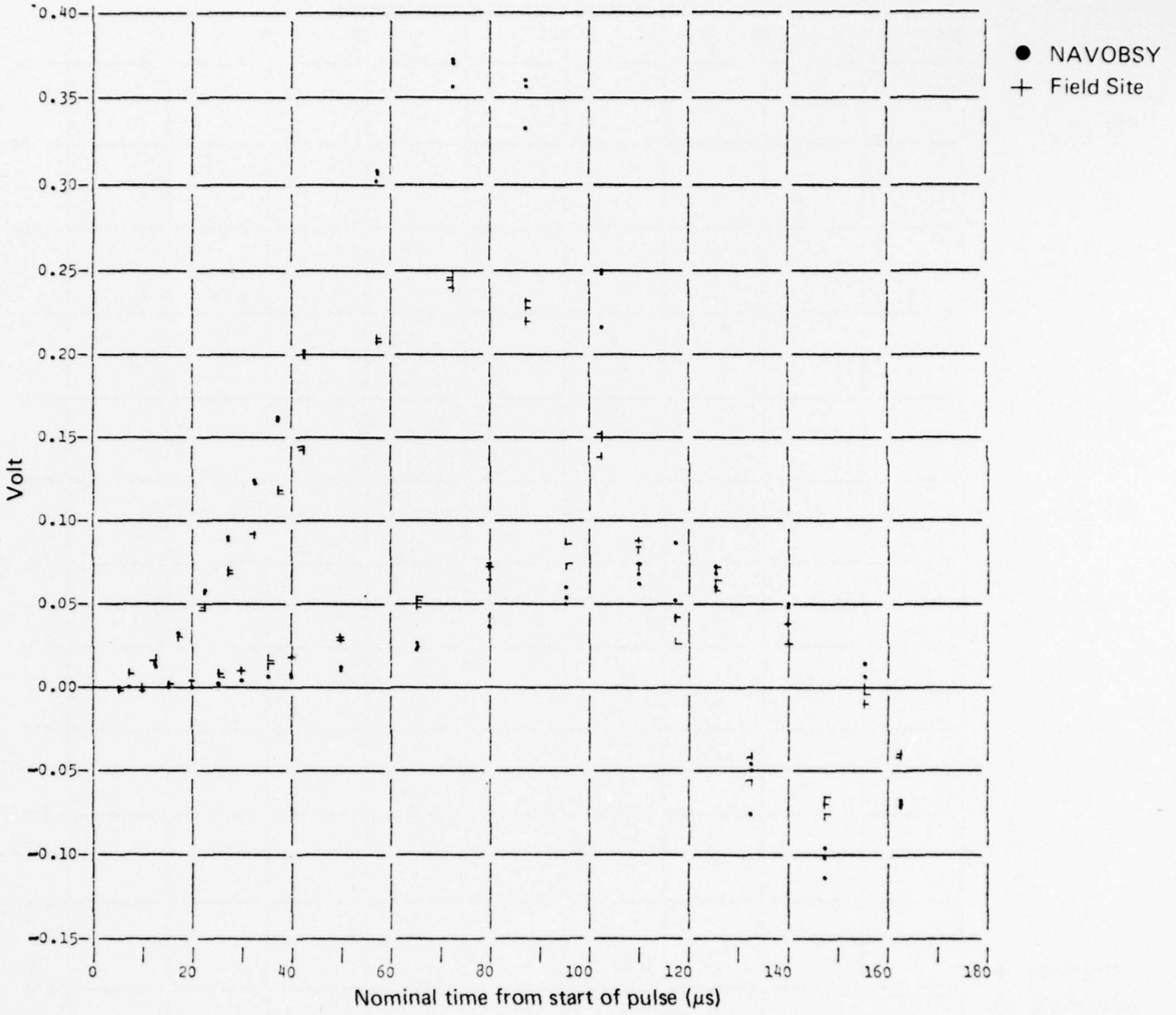


Fig. B-7 Observations of Loran-C Pulse at Georgetown, DE, and NAVOBSY

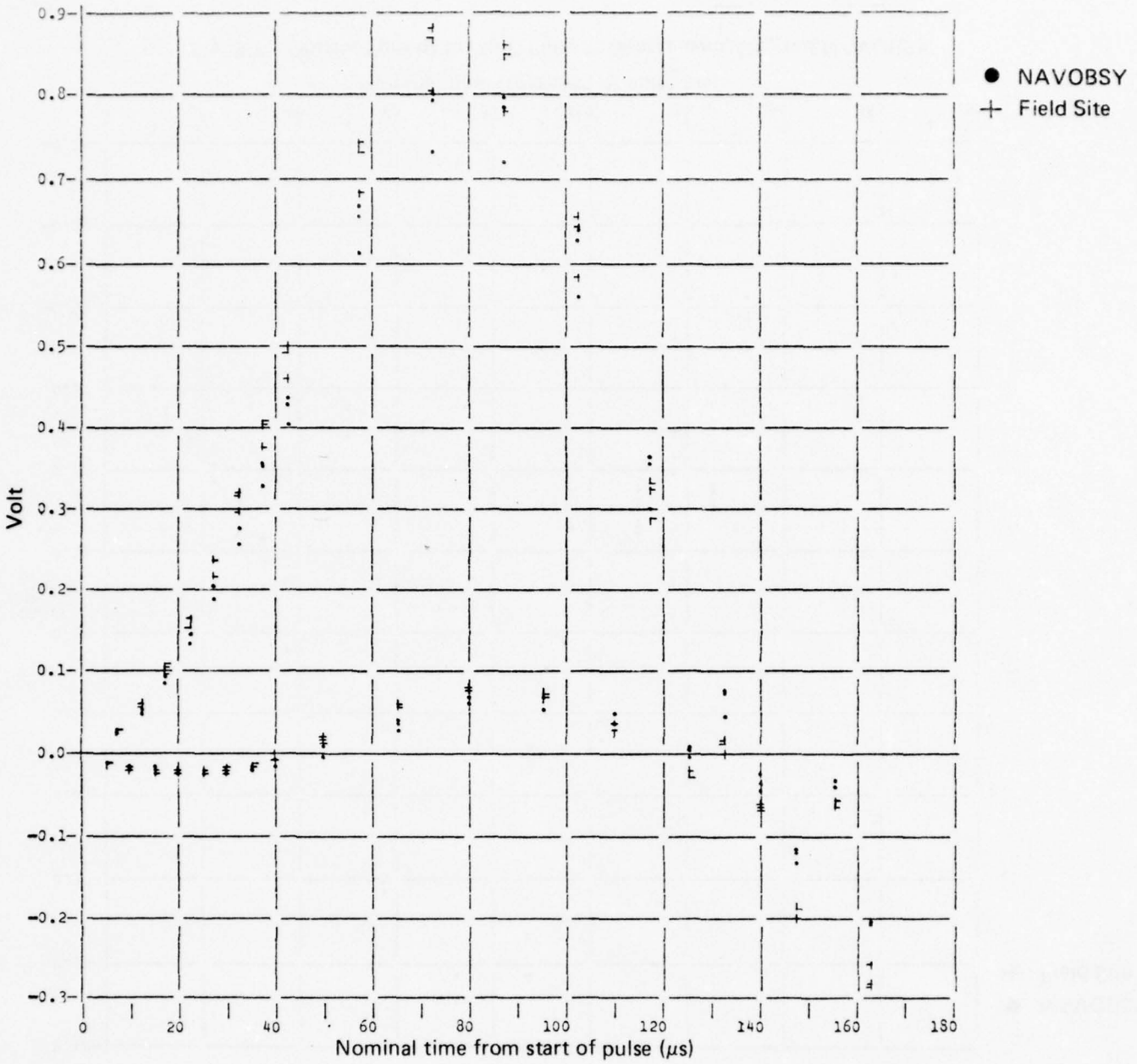


Fig. B-8 Observations of Loran-C Pulse at Toms River, NJ, and NAVOBSY

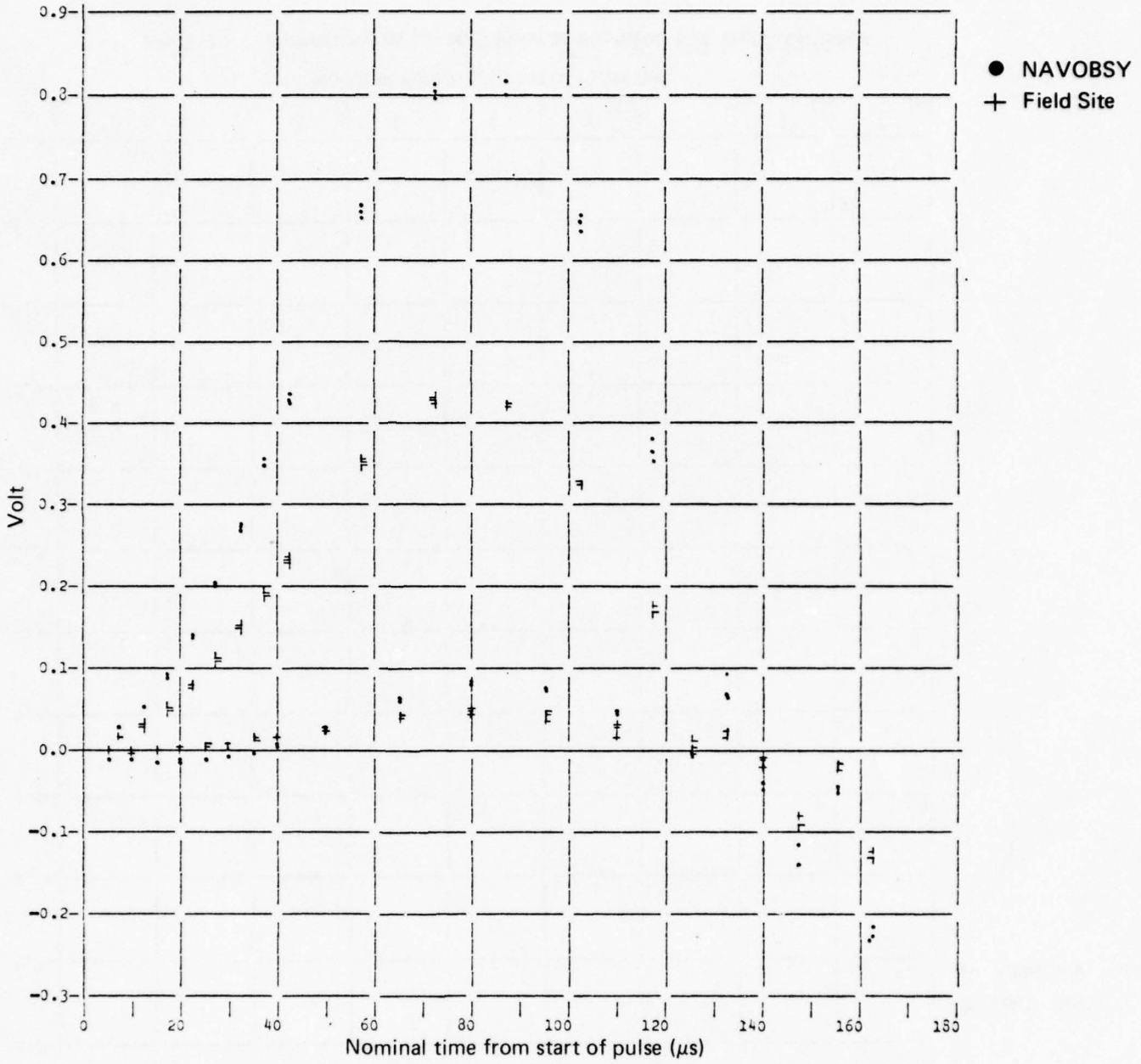


Fig. B-9 Observations of Loran-C Pulse at Grottoes, VA, and NAVOBSY

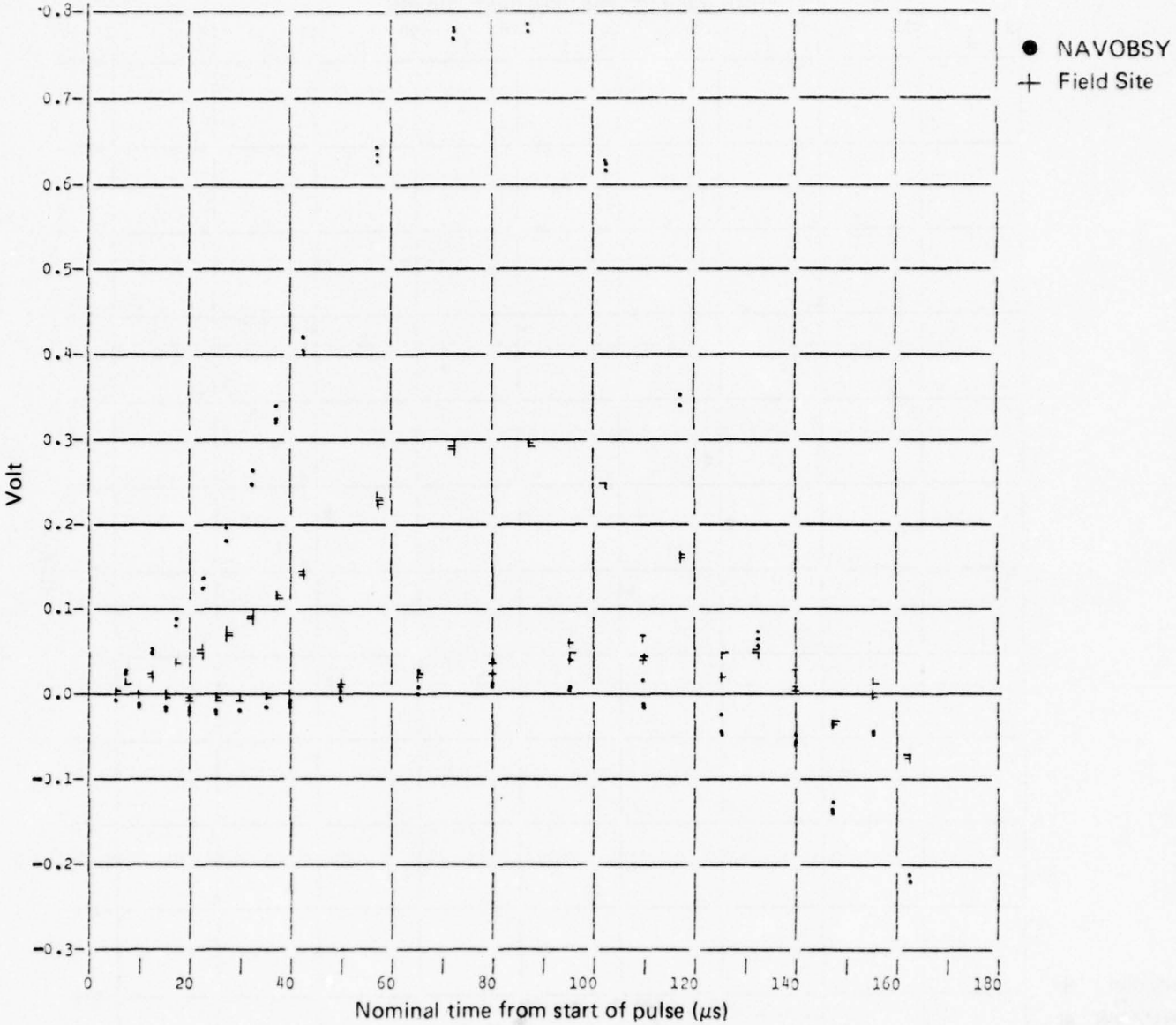


Fig. B-10 Observations of Loran-C Pulse at Bluefield, WV, and NAVOBSY

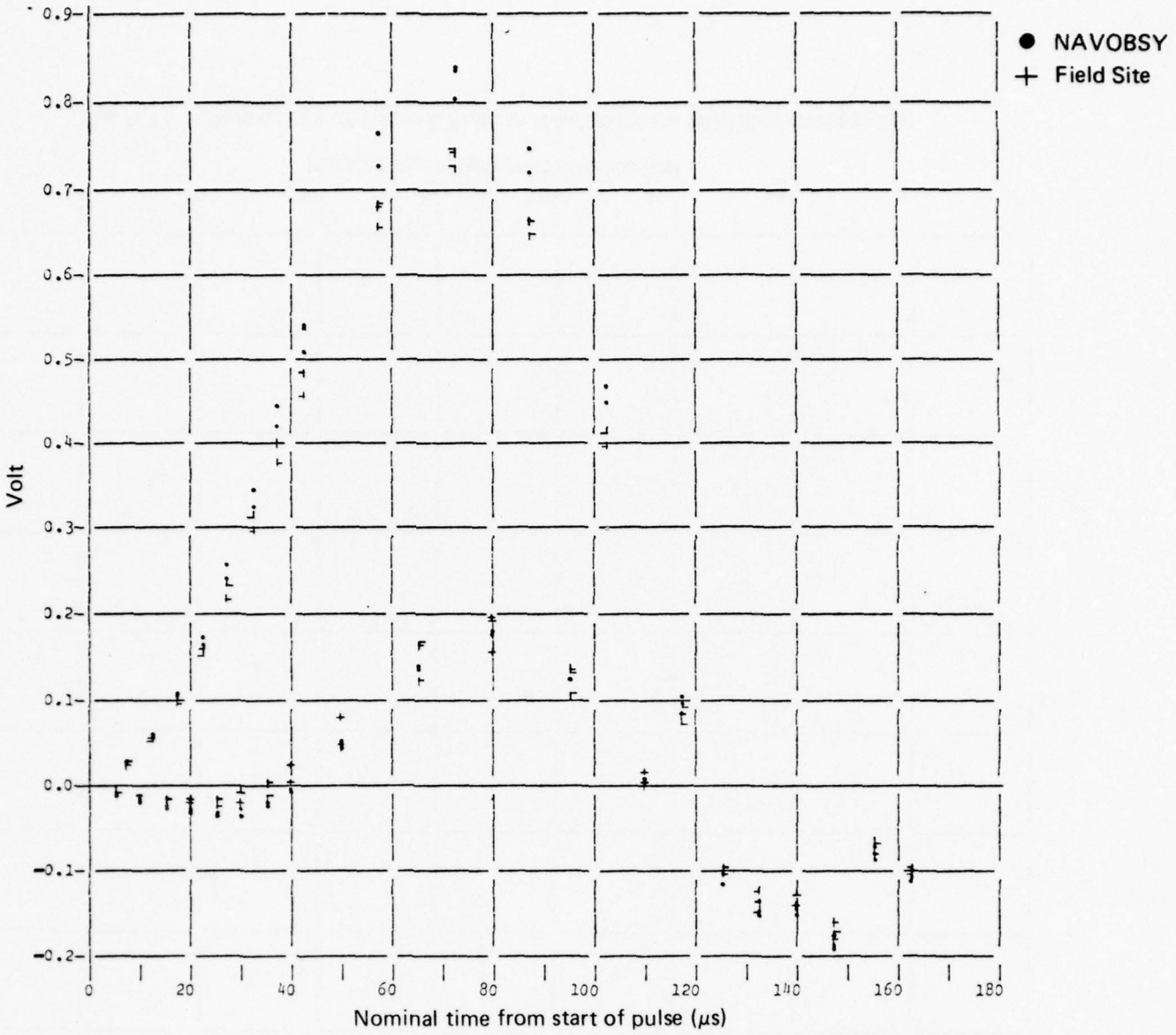


Fig. B-11 *Observations of Loran-C Pulse at NAVOBSY on 1975 Day Number 154*

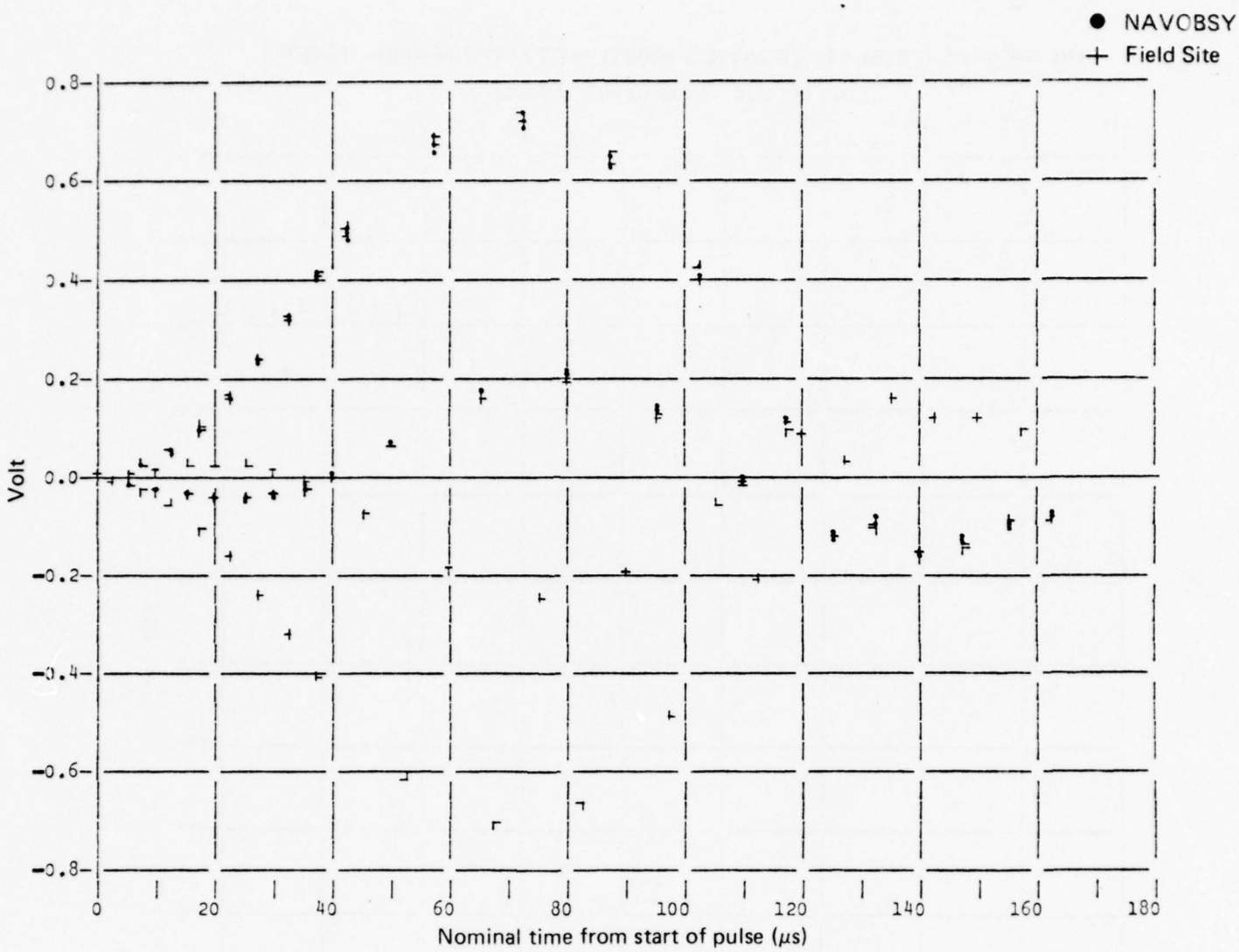


Fig. B-12 Observations of Loran-C Pulse at NAVOBSY on 1975 Day Number 188

Table B-3

Signal-to-Noise Ratio of the Primary Data from Measurements at the 12th Sample Point

1975 Day No.	Site	Transmitting Station	Station to Site (m)	Edited Data Stage 1 S/N(dB)	Edited Data Stage 2 S/N(dB)
177	Wilmington, NC	Carolina Beach	23572	32	34
177	NAVOBSY	Carolina Beach	544244	21	24
175	Emporia, VA	Carolina Beach	293344	30	33
175	NAVOBSY	Carolina Beach	544244	23	26
183	Towanda, PA	Carolina Beach	867731	10	11
183	NAVOBSY	Carolina Beach	544244	19	23
181	Dexter, NY	Carolina Beach	1113946	21	23
181	NAVOBSY	Carolina Beach	544244	18	18
163	Danville, IN	Dana	85946	32	34
163	NAVOBSY	Dana	903083	7	9
161	Marietta, OH	Dana	526905	30	32
161	NAVOBSY	Dana	903083	8	9
156	Georgetown, DE	Dana	1053517	3	8
156	NAVOBSY	Dana	903083	4	8
149	Toms River, NJ	Nantucket	384346	22	27
149	NAVOBSY	Nantucket	657576	6	9
170	Grottoes, VA	Nantucket	827590	8	15
170	NAVOBSY	Nantucket	657576	13	20
168	Bluefield, WV	Nantucket	1063425	7	11
168	NAVOBSY	Nantucket	657576	14	16

Appendix C

PROGRAMS FOR ANALYSIS OF DATA

This appendix presents the computer programs that were used in the analysis of the data. These programs are written in a computer language known as APL (A Programming Language). See Refs. C-1 and C-2 for the exact interpretation of the language as executed on the Laboratory's IBM 360/91 computer. The program entitled TFIT fits a polynomial to the data of Appendix B by the least squares criterion. The remaining programs are straightforward algebraic manipulation and plotting routines. One of these, SLEW, requires elaboration.

As mentioned in the main text under "Analysis," the polynomials fitted to the I and Q data were jointly adjusted so that the Q polynomial represented a condition of minimum energy. This adjustment is arrived at as follows:

$$V(t) = I(t) \sin \omega t + Q(t) \cos \omega t, \qquad \text{(C-1)}$$

where $V(t)$ is the voltage function,
$I(t)$ is the in-phase modulation,
$Q(t)$ is the in-quadrature modulation,
ω is the angular frequency corresponding to 100 kHz, and
t is time.

The problem is to find an adjustment, Δt, of the sample points in time that results in minimum energy in $Q(t)$.

Introduce Δt into Eq. (C-1).

$$V(t+\Delta t)=I(t+\Delta t) \sin \omega (t+\Delta t)+Q(t+\Delta t) \cos \omega (t+\Delta t). \qquad \text{(C-2)}$$

Rewrite Eq. (C-2) as

$$V(t+\Delta t) = I(t+\Delta t)(\sin \omega t \cos \omega \Delta t+\cos \omega t \sin \omega \Delta t)$$
$$+ Q(t+\Delta t)(\cos \omega t \cos \omega \Delta t-\sin \omega t \sin \omega \Delta t). \qquad \text{(C-3)}$$

Rearranging terms, Eq. (C-3) becomes

$$V(t+\Delta t) = (I(t+\Delta t)\cos \omega\Delta t - Q(t+\Delta t)\sin \omega\Delta t)\sin \omega t + (Q(t+\Delta t)\cos \omega\Delta t + I(t+\Delta t)\sin \omega\Delta t)\cos \omega t. \quad (C-4)$$

The energy proportional to that of the cosine modulation is observed to be

$$EQ(t+\Delta t) = \int_{t_1+\Delta t}^{t_2+\Delta t} Q^2(t+\Delta t)\cos^2 \omega\Delta t\, dt + 2\int_{t_1+\Delta t}^{t_2+\Delta t} Q(t+\Delta t)\, I(t+\Delta t)\cos \omega\Delta t \sin \omega\Delta t\, dt + \int_{t_1+\Delta t}^{t_2+\Delta t} I^2(t+\Delta t)\sin^2 \omega\Delta t\, dt . \quad (C-5)$$

Since the energy in the sine modulation as measured is large with respect to the cosine due to the locations of the samples on the pulse, it can be expected that a solution for Δt will produce very small values. By comparison, the interval over which Eq. (C-5) is to be integrated is arbitrarily large. Therefore, a reasonably accurate solution for Δt corresponding to minimum energy in the cosine modulation can be obtained by letting $t+\Delta t=t$ in Eq. (C-5), and then taking the partial derivative of EQ(t) with respect to Δt and setting it equal to zero. Thus,

$$\sin 2\,\omega\Delta t \int_{t_1}^{t_2} I^2(t)\,dt - \sin 2\,\omega\Delta t \int_{t_1}^{t_2} Q^2(t)\,dt$$

$$+ 2\cos 2\,\omega\Delta t \int_{t_1}^{t_2} Q(t)\,I(t)\,dt = 0\,, \qquad \text{(C-6)}$$

and

$$\Delta t = \frac{1}{2\omega} \tan^{-1} \frac{2\int_{t_1}^{t_2} Q(t)\,I(t)\,dt}{\int_{t_1}^{t_2} Q^2(t)\,dt - \int_{t_1}^{t_2} I^2(t)\,dt}\,. \qquad \text{(C-7)}$$

SLEW executes Eq. (C-7) to find Δt.

The program CASES calls the program TFIT to fit polynomials to sets of data identified by JMIN through JMAX.

```
      ∇CASES[□]∇
    ∇ CASES
[1]   J←JMIN
[2]   →CLEAR×⍳WHICH='Q'
[3]   ICT←((D-1),0)⍴0
[4]   STARTI←SDI←BIGI←MUI←⍳0
[5]   →DO
[6] CLEAR:QCT←((D-1),0)⍴0
[7]   STARTQ←SDQ←BIGQ←MUQ←⍳0
[8] DO:→0×⍳J=JMAX
[9]   J←J+1
[10]  TFIT
[11]  →SAVQ×⍳WHICH='Q'
[12]  SAVEI
[13]  →DO
[14] SAVQ:SAVEQ
[15]  →DO
    ∇
```

CASES also calls SAVEQ or SAVEI, depending on whether Q or I data are fitted. SAVEQ and SAVEI arrange the results of TFIT in suitable arrays.

```
      ∇SAVEQ[□]∇
    ∇ SAVEQ
[1]   QCT←QCT,QC
[2]   MUQ←MUQ,¯1↑MEAN
[3]   BIGQ←BIGQ,¯1↑MAX
[4]   SDQ←SDQ,¯1↑SIG
[5]   STARTQ←STARTQ,T0
    ∇
```

```
      ∇SAVEI[□]∇
    ∇ SAVEI
[1]   ICT←ICT,IC
[2]   MUI←MUI,¯1↑MEAN
[3]   BIGI←BIGI,¯1↑MAX
[4]   SDI←SDI,¯1↑SIG
[5]   STARTI←STARTI,T0
    ∇
```

The program TFIT fits a polynomial by least squares to a set of either Q or I data identified by J. The degree of the polynomial, D, must be at least 2. The first two coefficients of the polynomial (ascending order of degree) are set to zero.

```
      ∇TFIT[□]∇
    ∇ TFIT
[1]   ΔT←T0←K←LL←NN←0
[2]   L←2
[3]   N←1
[4]   MAX←MEAN←SIG←⍳0
[5]  DO:→0×⍳(L>12)+(N>11)
[6]   K←K+1
[7]   →Q×⍳WHICH='Q'
[8]   IT←0.1×(-T0)+(2.5+5×⍳8),
      42.5+15×⍳8
[9]   IC←ID[;,J]⌹IT∘.*1+⍳D
[10]  RES←((IT∘.*1+⍳D)+.×,IC)-ID[;J]
[11]  →MORE
[12] Q:QT←0.1×(-T0)+(5×⍳8),35+15×⍳8
[13]  QC←QD[;,J]⌹QT∘.*1+⍳D
[14]  RES←((QT∘.*1+⍳D)+.×,QC)-QD[;J]
[15] MORE:MAX←MAX,1↑RES[⍒|RES]
[16]  MEAN←MEAN,(+/RES)÷⍴RES
[17]  SIG←SIG,((+/(RES-MEAN[K])*2)÷((⍴RES)-D-1))*
      0.5
[18]  →SKIP×⍳K≠1
[19]  T0←T0+ΔT←1
[20]  →DO
[21] SKIP:→(SKIP1×SIG[K-1×ΔT>0]>SIG[K-1×ΔT<0])+
      SKIP2×SIG[K-1×ΔT>0]<SIG[K-1×ΔT<0]
[22] SKIP1:N←N+LL
[23]  LL←0
[24]  NN←2
[25]  T0←T0+ΔT←1÷2*L
[26]  →DO
[27] SKIP2:L←L+NN
[28]  NN←0
[29]  LL←2
[30]  T0←T0+ΔT←-1÷2*N
[31]  →DO
    ∇
```

The program TRANS1 translates the polynomials produced by TFIT to rereference time by a time increment, T0, which is determined iteratively by TFIT to obtain the best fit.

```
      ∇TRANS1[□]∇
    ∇ TRANS1
[1]   K←0
[2]  DO:→0×ιK=ELE
[3]   K←K+1
[4]   ITVP[;K]←(-0.1×(VAN/STARTI)[K]) TRP ITVP[;K]
[5]   QTVP[;K]←(-0.1×(VAN/STARTQ)[K]) TRP QTVP[;K]
[6]   ITOP[;K]←(-0.1×(OBS/STARTI)[K]) TRP ITOP[;K]
[7]   QTOP[;K]←(-0.1×(OBS/STARTQ)[K]) TRP QTOP[;K]
[8]   →DO
    ∇
```

The program TRANS2 translates the polynomials produced by SLEW to rereference time by the time increments, ΔTV and ΔT0, which is determined by SLEW to achieve minimum energy in Q.

```
      ∇TRANS2[□]∇
    ∇ TRANS2
[1]   K←0
[2]  DO:→0×ιK=ELE
[3]   K←K+1
[4]   ITVS[;K]←(ΔTV[K]÷10) TRP ITVR[;K]
[5]   QTVS[;K]←(ΔTV[K]÷10) TRP QTVR[;K]
[6]   ITOS[;K]←(ΔTO[K]÷10) TRP ITOR[;K]
[7]   QTOS[;K]←(ΔTO[K]÷10) TRP QTOR[;K]
[8]   →DO
    ∇
```

The program SLEW executes Eq. (C-7) to produce polynomials that describe the condition of minimum energy in the cosine modulation.

```
      ∇SLEW[□]∇
    ∇ SLEW
[1]   L← 1 7
[2]   QCO←QTOP
[3]   ICO←ITOP
[4]   QCV←QTVP
[5]   ICV←ITVP
[6]   ELE←1↓⍴QCO
[7]   ROW←1↑⍴QCO
[8]   ΔTH←THO←THV←⍳0
[9]   J←0
[10] DO:→END×⍳J=ELE
[11]  J←J+1
[12]  INT1←L PI ICO[;J] PP QCO[;J]
[13]  INT2←L PI ICO[;J] PP ICO[;J]
[14]  INT3←L PI QCO[;J] PP QCO[;J]
[15]  THO←THO,0.5×¯3○(2×INT1)÷INT3-INT2
[16]  INT1←L PI ICV[;J] PP QCV[;J]
[17]  INT2←L PI ICV[;J] PP ICV[;J]
[18]  INT3←L PI QCV[;J] PP QCV[;J]
[19]  THV←THV,0.5×¯3○(2×INT1)÷INT3-INT2
[20]  →DO
[21] END:QTVR←(QCV×(ROW,ELE)⍴2○THV)+ICV×(ROW,ELE)⍴1○THV
[22]  ITVR←(-QCV×(ROW,ELE)⍴1○THV)+ICV×(ROW,ELE)⍴2○THV
[23]  QTOR←(QCO×(ROW,ELE)⍴2○THO)+ICO×(ROW,ELE)⍴1○THO
[24]  ITOR←(-QCO×(ROW,ELE)⍴1○THO)+ICO×(ROW,ELE)⍴2○THO
[25]  ΔTV←THV×10÷○2
[26]  ΔTO←THO×10÷○2
[27]  ΔT←ΔTV-ΔTO
    ∇
```

The program ZEROS computes the time of the zero crossings in pulses described by the polynomials produced by TRANS1.

```
      ∇ZEROS[□]∇
    ∇ ZEROS
[1]   T←2.25+0.25×⍳321
[2]   DT←T[2]-T[1]
[3]   T←T÷10
[4]   RO←RV←ΔZTO←ΔZTV←ZTO←ZTV←⍳0
[5]   J←0
[6]  DO:→0×⍳J=36
[7]   J←J+1
[8]   CMO←(((⍴T),1)⍴T)⊥ΦQTOP[;J]
[9]   SMO←(((⍴T),1)⍴T)⊥ΦITOP[;J]
[10]  CMV←(((⍴T),1)⍴T)⊥ΦQTVP[;J]
[11]  SMV←(((⍴T),1)⍴T)⊥ΦITVP[;J]
[12]  S←1○2×T
[13]  C←2○2×T
[14]  LO←(S×SMO)+C×CMO
[15]  LV←(S×SMV)+C×CMV
[16]  ZCTO←ZCTV←⍳0
[17]  JJ←0
[18] DO3:→SKIP3×⍳JJ=(⍴T)-1
[19]  JJ←JJ+1
[20]  →SKIP×⍳((×LO[JJ])+×LO[JJ+1])≠0
[21]  ZCTO←ZCTO,2.25+(JJ×DT)+(DT×LO[JJ])÷LO[JJ]-LO[JJ+1]
[22] SKIP:→DO3×⍳((×LV[JJ])+×LV[JJ+1])≠0
[23]  ZCTV←ZCTV,2.25+(JJ×DT)+(DT×LV[JJ])÷LV[JJ]-LV[JJ+1]
[24]  →DO3
[25] SKIP3:→SAVE×⍳(⍴ZCTO)<17
[26]  ZCTO←1↓ZCTO
[27] SAVE:ΔZTO←ΔZTO,ZCTO-5×⍳⍴ZCTO
[28]  ZTO←ZTO,ZCTO
[29]  ΔZTV←ΔZTV,ZCTV-5×⍳⍴ZCTV
[30]  ZTV←ZTV,ZCTV
[31]  →DO
    ∇
```

The P in lines 8 through 11 was changed to 3 to compute zero crossings in pulses described by polynomials produced by TRANS3.

The program SLEWZ produces polynomials that describe pulses that have the zero crossing at the end of the third cycle aligned with the 30-μs sample point.

```
      ∇SLEWZ[□]∇
    ∇ SLEWZ
[1]   ΔTV←ΔZTV[;6]
[2]   ΔTO←ΔZTO[;6]
[3]   THV←ΔTV÷10÷○2
[4]   THO←ΔTO÷10÷○2
[5]   QCO←QTOP
[6]   ICO←ITOP
[7]   QCV←QTVP
[8]   ICV←ITVP
[9]   ROW←1↑⍴QCO
[10]  ELE←1↓⍴QCO
[11]  QTVR←(QCV×(ROW,ELE)⍴2○THV)+ICV×(ROW,ELE)⍴1○THV
[12]  ITVR←(-QCV×(ROW,ELE)⍴1○THV)+ICV×(ROW,EL )⍴2○THV
[13]  QTOR←(QCO×(ROW,ELE)⍴2○THO)+ICO×(ROW,ELE)⍴1○THO
[14]  ITOR←(-QCO×(ROW,ELE)⍴1○THO)+IC×(ROW,ELE)⍴2○THO
[15]  ΔT←ΔTV-ΔTO
    ∇
```

TRANS3 translates the polynomials produced by SLEWZ to rereference time by the time increments, ΔTV and ΔTO.

```
      ∇TRANS3[□]∇
    ∇ TRANS3
[1]   K←0
[2]  DO:→0×⍳K=ELE
[3]   K←K+1
[4]   ITV3[;K]←(ΔTV[K]÷10) TRP ITVR[;K]
[5]   QTV3[;K]←(ΔTV[K]÷10) TRP QTVR[;K]
[6]   ITO3[;K]←(ΔTO[K]÷10) TRP ITOR[;K]
[7]   QTO3[;K]←(ΔTO[K]÷10) TRP QTOR[;K]
[8]   →DO
    ∇
```

The program LORAN evaluates the slewed polynomials that describe the sine and cosine modulation, normalizes the results to unit energy, adjusts the attenuation of the received signal by the amount of the normalization factor, computes the pulse envelope, and plots the results.

```
      ∇LORAN[⎕]∇
    ∇ LORAN
[1]   ROT←0
[2]   T←0.1×2.5+2.5×⍳63
[3]   EQO←(((⍴T),1)⍴T)⊥ΦQTOS[;J]
[4]   EIO←(((⍴T),1)⍴T)⊥ΦITOS[;J]
[5]   EQV←(((⍴T),1)⍴T)⊥ΦQTVS[;J]
[6]   EIV←(((⍴T),1)⍴T)⊥ΦITVS[;J]
[7]   NO←(+/(EQO*2)+EIO*2)*0.5
[8]   NV←(+/(EQV*2)+EIV*2)*0.5
[9]   EQO←EQO÷NO
[10]  EIO←EIO÷NO
[11]  EQV←EQV÷NV
[12]  EIV←EIV÷NV
[13]  EO←((EQO*2)+EIO*2)*0.5
[14]  EV←((EQV*2)+EIV*2)*0.5
[15]  BELO←DBO[J]+20×10⍟NO
[16]  BELV←DBV[J]+20×10⍟NV
[17]  →⎕
[18] ONE:K←0
[19] DO:WAIT←⍞
[20]  'LORAN-C SIGNAL VOLTAGE PLOTTED AGAINST TIME IN MICROS
      ECONDS          1975 DAY NO.:', 4 0 ▼DAY[J]
[21]  'FIELD SITE: ',SITE[J;],'    STATION: ',STA[J;],'   XM
      TR: ',(2 0 ▼XMTR[J]),'  DATA SEGMENT: ',SEG[J;]
[22]  'ATTENUATION:  ',(6 3 ▼BELO),' DB AT NAVOBSY,  ',(
      6 3 ▼BELV),' DB AT FIELD SITE'
[23]  'SECONDARY PHASE FACTOR:  ',(6 3 ▼SPF[J]),' MICROSECON
      DS'
[24]  ''
[25]  '. ←→NAVOBSY   + ←→FIELD SITE'
[26]  WAIT←⍞
[27]  →SKIP×⍳K=1
[28]  50 120 FPLOT(EIO,EIV,EQO AND EQV) VS T×10
[29] TWO:K←1
[30]  →DO
[31] SKIP: 50 120 FPLOT(EO AND EV) VS T×10
    ∇
```

The program EDGE evaluates the polynomials produced by TRANS3 over the leading edge of the pulses, normalizes them to unit energy, and plots the leading edge of the envelope of the pulses.

```
      ∇EDGE[□]∇
    ∇ EDGE L
[1]   RQT←0
[2]   T←9+⍳76
[3]   EO←EV←⍳0
[4]   K←0
[5]  DO:→END×⍳K=3
[6]   J←L+K
[7]   K←K+1
[8]   '3' EVAL T
[9]   NVE←((EQV*2)+EIV*2)*0.5
[10]  NOE←((EQO*2)+EIO*2)*0.5
[11]  EO←EO,NOE÷NOE[1↑⍒NOE]
[12]  EV←EV,NVE÷NVE[1↑⍒NVE]
[13]  →DO
[14] END:WAIT←□
[15]  '      LORAN-C SIGNAL VOLTAGE PLOTTED AGAINST TIME IN
      MICROSECONDS          1975 DAY NO.:', 4 0 ▼DAY[J]
[16]  '      FIELD SITE: ',SITE[J;],'    STATION: ',STA[J;],'
         XMTR: ',(2 0 ▼XMTR[J]),'  DATA SEGMENT:   ALL'
[17]  ''
[18]  '      . ←→NAVOBSY    + ←→FIELD SITE'
[19]  WAIT←□
[20]  S←⍴T
[21]  40 120 FPLOT((S↑EO),(S↑EV),(S↓(2×S)↑EO),(S↓(2×S)↑EV),(
      (-S)↑EO) AND(-S)↑EV) VS T,T,(10+T),(10+T),(20+T) AND
      20+T
    ∇
```

EVAL evaluates polynomials identified by A and J at times specified by T.

```
      ∇EVAL[□]∇
    ∇ A EVAL T
[1]   EQO←(((⍴T),1)⍴T÷10)⊥⌽('QTO',A)[;J]
[2]   EIO←(((⍴T),1)⍴T÷10)⊥⌽('ITO',A)[;J]
[3]   EQV←(((⍴T),1)⍴T÷10)⊥⌽('QTV',A)[;J]
[4]   EIV←(((⍴T),1)⍴T÷10)⊥⌽('ITV',A)[;J]
    ∇
```

The program TRP translates any polynomial, P, by a time increment, Δ.

```
      ∇TRP[□]∇
    ∇ R←Δ TRP P
[1]   R←(((1-⍳⍴P)⌽((⍴P),(⍴P))⍴Δ*¯1+⍳⍴P)×(¯1+⍳⍴P)∘.!¯1+⍳⍴P)+.×P
    ∇
```

PI integrates any polynomial, P, between limits given by the two-element vector, L.

```
      ∇PI[□]∇
    ∇ R←L PI P
[1]   P←P÷⍳⍴P
[2]   R←+/P×((1↓L)*⍳⍴P)-(1↑L)*⍳⍴P
    ∇
```

PP multiplies two polynomials, P1 and P2. They need not be of the same degree.

```
      ∇PP[□]∇
    ∇ P←P1 PP P2;D
[1]   P←P1∘.×P2
[2]   D←1↑⍴P
[3]   P←(1-⍳D)⌽P,((D,D-1)⍴0)
[4]   P←+/[1] P
    ∇
```

These programs require P to be arranged in ascending order of degree starting with 0 and all terms must be accounted for.

The program ECM computes the change in ECM, ΔECM, between the field site and NAVOBSY from the polynomials produced by TRANS3.

```
      ∇ECM[□]∇
    ∇ ECM
[1]   ΔECM←⍳0
[2]   T←64+⍳21
[3]   J←JMIN
[4]  DO:→0×⍳J=JMAX
[5]   J←J+1
[6]   '3' EVAL T
[7]   NVE←((EQV*2)+EIV*2)*0.5
[8]   NOE←((EQO*2)+EIO*2)*0.5
[9]   NV←÷NVE[1↑⍒NVE]
[10]  NO←÷NOE[1↑⍒NOE]
[11]  '3' EVAL 30
[12]  EV←NV×(((QV←EQV)*2)+(IV←EIV)*2)*
      0.5
[13]  EO←NO×(((QO←EQO)*2)+(IO←EIO)*2)*
      0.5
[14]  QTOD[;J]←1 PD QTO3[;J]×NO
[15]  ITOD[;J]←1 PD ITO3[;J]×NO
[16]  QTVD[;J]←1 PD QTV3[;J]×NV
[17]  ITVD[;J]←1 PD ITV3[;J]×NV
[18]  'D' EVAL 30
[19]  DEV←((IV×EIV)+QV×EQV)÷EV
[20]  DEO←((IO×EIO)+QO×EQO)÷EO
[21]  ΔECM←ΔECM,(EV-EO)÷-0.05×DEV+DEO
[22]  →DO
    ∇
```

PD computes the Dth derivative of the polynomial, P. P must be arranged in ascending order of degree starting with zero and all terms must be accounted for.

```
      ∇PD[□]∇
    ∇ R←D PD P;K;L
[1]   K←0
[2]   L←⍴P
[3]  DO:→0×⍳K=D⌊L
[4]   R←P←1↓P×¯1+⍳⍴P
[5]   K←K+1
[6]   →DO
    ∇
```

The program DBEL computes the adjusted attenuation that is plotted in Fig. F-16 of Appendix F.

```
      ∇DBEL[□]∇
    ∇ DBEL
[1]   M←⍳0
[2]   LOSS←ATTEN[;2]+1
[3]   NDB←LOSS[⍳12]
[4]   K←0
[5]   J←13
[6]  DO:→END×⍳K=2
[7]   K←K+1
[8]   N←20×10⍟DIST[J]÷DIST[1]
[9]   NN←LOSS[1]-N
[10]  M←M,NNN←NN-LOSS[J]
[11]  NDB←NDB,LOSS[J+0,⍳8]+NNN
[12]  J←22
[13]  →DO
[14] END:N←+/N÷⍴N←LOSS[30+⍳6],ATTEN[(⍳12);1],ATTEN[(30+⍳6);1]
[15]  NN←+/NN÷⍴NN←ATTEN[(12+⍳9);1]
[16]  NNN←+/NNN÷⍴NNN←ATTEN[(21+⍳9);1]
[17]  NDB←NDB,(3⍴N),(3⍴NN+M[1]),3⍴NNN+M[2]
[18]  DIST←DIST[⍳30],(3⍴CARB),(3⍴DANA),3⍴NANT
    ∇
```

REFERENCES

C-1 Anon., "APL Language," IBM Corporation Publication GC26-3847-0, March 1975.

C-2 Anon., "Graphs and Histograms in APL/360-370," IBM Corporation Publication SB21-0415-0, 1972.

Appendix D

POLYNOMIAL COEFFICIENTS

This appendix records the values of the coefficients of the polynomials that were used in the analysis of data. Tables D-1 through D-12 tabulate these coefficients. The coefficients are presented in ascending order of degree from the top to the bottom of each column of eleven coefficients. The groups of three columns under the name of each field site are coefficients for data segments 1, 2, and 3 from left to right.

The tables contain the following labels:

QTOP and QTVP are the labels for 10th degree polynomials fitted to Q data taken at NAVOBSY and data taken simultaneously at the field site, i.e., the van. P denotes polynomials of more permanent interest; i.e., they represent the data as taken.

ITOP and ITVP are defined the same, except the data fitted are I data.

QTOS, QTVS
ITOS, and ITVS are the labels for polynomials slewed to achieve minimum energy in Q.

QTO3, QTV3,
ITO3, and ITV3 are the labels for polynomials slewed so that the third-cycle zero crossings align at 30 μs.

Table D-1
Polynomial Coefficients for Q Data Taken at NAVOBSY

Wilmington, NC

1 *PRNT QTOP*

-1.3611E-03	-1.0702E-03	-1.6513E-03	-4.2154E-03	-6.3153E-03	-5.8961E-03	-1.8603E-03	-1.3594E-03	-1.5519E-03
-8.6702E-03	-8.0823E-03	-8.5907E-03	-1.1479E-02	-6.9351E-03	-7.9246E-03	-1.2534E-02	-1.2236E-02	-1.2247E-02
-1.0772E-02	-1.2432E-02	-8.4534E-03	-5.1642E-03	-3.8554E-03	-3.9061E-03	-1.6747E-02	-2.2579E-02	-1.9456E-02
8.6946E-03	9.8213E-03	6.1062E-03	2.4760E-03	1.1920E-03	9.5935E-04	1.4839E-02	2.1135E-02	1.7466E-02
-4.6007E-03	-4.9331E-03	-3.3476E-03	-1.5682E-03	6.9461E-04	5.5592E-04	-6.6441E-03	-9.6625E-03	-7.7629E-03
1.6795E-03	1.7307E-03	1.3456E-03	8.8976E-04	2.1223E-04	2.5032E-04	2.0030E-03	2.7935E-03	2.2631E-03
-3.3887E-04	-3.4265E-04	-2.8609E-04	-2.1454E-04	-1.0022E-04	-1.0549E-04	-3.6492E-04	-4.8787E-04	-4.0066E-04
3.8084E-05	3.8167E-05	3.3025E-05	2.6044E-05	1.4594E-05	1.4955E-05	3.9026E-05	5.0696E-05	4.2012E-05
-2.4105E-06	-2.4052E-06	-2.1224E-06	-1.7182E-06	-1.0420E-06	-1.0514E-06	-2.4095E-06	-3.0730E-06	-2.5501E-06
8.0862E-08	8.0526E-08	7.1898E-08	5.9337E-08	3.7564E-08	3.7451E-08	7.9762E-08	1.0053E-07	8.3820E-08
-1.1223E-09	-1.1169E-09	-1.0049E-09	-8.4461E-10	-5.4970E-10	-5.4240E-10	-1.0982E-09	-1.3736E-09	-1.1449E-09

Dexter, NY

10 *PRNT QTOP*

-2.5838E-03	-3.4954E-04	-3.5477E-04	-2.6701E-05	-1.5014E-04	-7.4360E-04	-1.4737E-03	-1.3984E-03	-2.1373E-03
-8.0091E-03	-5.5930E-03	-5.5819E-03	-8.8678E-04	-2.6716E-03	-6.6337E-03	-5.2000E-03	-5.1242E-03	-4.7150E-03
-4.6024E-03	-2.0110E-02	-1.9638E-02	-7.7921E-03	-1.3260E-02	-1.8007E-02	-1.0386E-03	-1.1611E-03	8.4010E-04
1.7733E-03	1.7502E-02	1.7244E-02	7.2089E-03	1.2499E-02	1.4935E-02	5.4435E-03	5.6608E-03	2.9734E-03
-1.4469E-03	-8.4464E-03	-8.3008E-03	-3.1127E-03	-5.5666E-03	-6.2237E-03	-3.5158E-03	-3.6618E-03	-2.2274E-03
8.8485E-04	2.5508E-03	2.5004E-03	7.0378E-04	1.4038E-03	1.4963E-03	1.0909E-03	1.1330E-03	7.3330E-04
-2.1908E-04	-4.5040E-04	-4.4016E-04	-1.1488E-04	-2.1533E-04	-2.2050E-04	-1.9207E-04	-1.9835E-04	-1.3392E-04
2.7027E-05	4.6336E-05	4.5097E-05	1.0837E-05	2.0503E-05	2.0309E-05	2.0175E-05	2.0693E-05	1.4443E-05
-1.7972E-06	-2.7494E-06	-2.6621E-06	-6.2429E-07	-1.1818E-06	-1.1380E-06	-1.2508E-06	-1.2739E-06	-9.1352E-07
6.2077E-08	8.7538E-08	8.4251E-08	2.0002E-08	3.7690E-08	3.5451E-08	4.2187E-08	4.2669E-08	3.1287E-08
-8.7787E-10	-1.1612E-09	-1.1102E-09	-2.7232E-10	-5.0958E-10	-4.7006E-10	-5.9633E-10	-5.9911E-10	-4.4741E-10

Georgetown, DE

Toms River, NJ

Grottoes, VA

19 *PRNT QTOP*

-9.7391E-06	-5.1329E-05	-9.4713E-05	-7.7912E-03	-1.6842E-03	-3.2227E-03	-4.8736E-03	-5.6599E-03	-5.7249E-03
-4.8196E-04	-1.1879E-03	-1.4712E-03	-6.6283E-03	-1.4650E-02	-1.5696E-02	-1.0338E-02	-1.0325E-02	-1.3337E-02
-5.6275E-03	-6.0777E-03	-4.6653E-03	-2.4566E-04	-2.3927E-02	-9.9588E-03	-1.5299E-04	-3.0757E-04	-3.3852E-04
8.2313E-03	9.0561E-03	7.9408E-03	2.0472E-04	3.2777E-02	1.9985E-02	4.3897E-03	3.3991E-03	7.4698E-03
-4.4045E-03	-4.7965E-03	-4.3912E-03	-6.7753E-06	-1.0674E-02	-1.1944E-02	-2.6315E-03	-2.0163E-03	-4.9743E-03
1.2519E-03	1.3414E-03	1.2586E-03	7.4971E-05	4.5530E-03	3.6634E-03	8.6922E-04	6.9171E-04	1.6260E-03
-2.0947E-04	-2.1993E-04	-2.0939E-04	-2.4874E-05	-7.2863E-04	-6.3856E-04	-1.6488E-04	-1.3613E-04	-2.9824E-04
2.1012E-05	2.1887E-05	2.1021E-05	3.3943E-06	7.0348E-05	6.5010E-05	1.8307E-05	1.5531E-05	3.2076E-05
-1.2609E-06	-1.3007E-06	-1.2559E-06	-2.3978E-07	-4.0350E-06	-3.9767E-06	-1.1818E-06	-1.0229E-06	-2.0139E-06
4.1418E-08	4.2420E-08	4.1091E-08	8.7453E-09	1.2667E-07	1.3036E-07	4.1171E-08	3.6194E-08	6.8447E-08
-5.7276E-10	-5.8360E-10	-5.6641E-10	-1.3085E-10	-1.6766E-09	-1.7906E-09	-5.9880E-10	-5.3298E-10	-9.7360E-10

Bluefield, WV

Baseline, Day 154

Baseline, Day 188

28 *PRNT QTOP*

-3.9121E-03	-2.4772E-03	-2.8705E-03	-6.8555E-03	-5.3612E-03	-4.3018E-03	-4.2138E-03	-4.2455E-03	-4.5206E-03
-8.7291E-03	-7.7891E-03	-6.3276E-03	-5.0551E-03	-9.3130E-03	-1.0134E-02	-1.4057E-02	-1.3721E-02	-1.3567E-02
-4.2067E-03	-4.2838E-03	-3.1234E-03	-5.0483E-03	-3.8932E-03	-4.7054E-03	-9.4226E-03	-9.1846E-03	-8.9478E-03
1.6573E-03	2.0006E-03	1.0167E-03	8.4312E-04	2.9933E-04	8.3317E-04	3.6948E-03	3.1970E-03	2.2022E-03
-6.2482E-04	-3.5945E-04	-4.2575E-04	9.5620E-04	1.6057E-04	-3.0885E-04	-3.7998E-04	-9.1297E-05	-5.2728E-04
-3.4706E-04	-5.0685E-05	-2.1448E-04	-3.0803E-05	-3.7432E-04	-5.0055E-04	-2.9042E-04	-1.1371E-04	-4.1750E-05
6.7326E-05	-1.8735E-05	-3.7879E-05	-5.9269E-05	-1.2868E-04	-1.4880E-04	-9.4595E-05	-5.7216E-05	-5.3560E-05
-6.9356E-06	-2.1624E-06	-3.4055E-06	-9.5540E-06	-1.7515E-05	-1.9280E-05	-1.2446E-05	-8.1464E-06	-8.5172E-06
3.9987E-07	-1.1916E-07	-1.5870E-07	-6.9614E-07	-1.2131E-06	-1.3024E-06	-8.1713E-07	-5.3227E-07	-5.9361E-07
-1.2096E-08	-2.9846E-09	-3.2975E-09	-2.5002E-08	-4.2845E-08	-4.5232E-08	-2.6816E-08	-1.6669E-08	-1.9035E-08
1.4862E-10	2.3124E-11	1.5754E-11	-3.6137E-10	-6.1605E-10	-6.4182E-10	-3.5249E-10	-2.0197E-10	-2.6019E-10

Table D-2

Polynomial Coefficients for Q Data Taken at Field Sites

Wilmington, NC

1 PRNT QTVP

-3.9435E-03	-3.9580E-03	-3.9124E-03	-6.3398E-03	-6.0672E-03	-6.3115E-03	-1.4463E-04	-1.4660E-04	-1.1182E-03
-8.5863E-03	-8.5788E-03	-8.3722E-03	-9.7117E-03	-8.7483E-03	-8.7634E-03	-3.3310E-03	-3.4248E-03	-7.6824E-03
-4.8567E-03	-4.7758E-03	-4.7852E-03	-2.9579E-03	-2.7013E-03	-2.9371E-03	-1.7400E-02	-1.8256E-02	-8.9438E-03
5.1924E-04	5.0060E-04	4.4787E-04	1.6862E-04	3.2942E-05	-9.0495E-05	2.0084E-02	1.9995E-02	1.3556E-02
7.0012E-04	6.5866E-04	7.1325E-04	1.0840E-04	2.2460E-04	3.4100E-04	-1.0126E-02	-1.0041E-02	-7.4787E-03
-5.6070E-05	-3.1532E-05	-5.7075E-05	-3.0129E-04	-2.5312E-04	-2.1695E-04	-2.8941E-03	-2.9100E-03	-2.2701E-03
-2.3800E-05	-2.9551E-05	-2.3734E-05	-1.0430E-04	-9.4340E-05	-8.0295E-05	-4.8189E-04	-4.9217E-04	-3.9167E-04
4.7138E-06	5.4185E-06	4.7042E-06	1.4136E-05	1.2979E-05	1.2385E-05	4.7505E-05	4.9217E-05	3.9435E-05
-3.5248E-07	-4.0020E-07	-3.5141E-07	-9.7034E-07	-8.9317E-07	-8.5895E-07	-2.7379E-06	-2.8730E-06	-2.3035E-06
1.2260E-08	1.3956E-08	1.2203E-08	3.3926E-08	3.1169E-08	3.0094E-08	8.5422E-08	9.0669E-08	7.2538E-08
-1.6600E-10	-1.9073E-10	-1.6487E-10	-4.8324E-10	-4.4238E-10	-4.2816E-10	-1.1162E-09	-1.1970E-09	-9.5438E-10

Emporia, VA

Towanda, PA

Dexter, NY

10 PRNT QTVP

-5.9869E-03	-3.2072E-03	-1.1007E-03	-4.1431E-03	-4.2464E-03	-4.2311E-03	2.3173E-03	1.6815E-03	2.6045E-03
-2.2980E-02	-1.3306E-02	-5.7945E-03	-1.5420E-02	-1.5705E-02	-1.5671E-02	1.0779E-02	1.0051E-02	1.0829E-02
-3.4540E-02	-2.1496E-02	-1.1568E-02	-5.4779E-03	-5.4786E-03	-5.5239E-03	7.0518E-03	8.9793E-03	5.8176E-03
-2.6103E-02	-1.7289E-02	-1.0975E-02	-1.4855E-02	-1.5020E-02	-1.4949E-02	-1.1771E-02	-1.4140E-02	-1.0343E-02
-1.0901E-02	-7.5841E-03	-5.3008E-03	-7.5676E-03	-7.7958E-03	-7.7500E-03	-5.4473E-03	-6.4345E-03	-4.7528E-03
-2.7212E-03	-1.9784E-03	-1.4725E-03	-2.0641E-03	-2.1079E-03	-2.0963E-03	-1.3577E-03	-1.5941E-03	-1.1762E-03
-4.1443E-04	-3.1171E-04	-2.4084E-04	-3.2902E-04	-3.3715E-04	-3.3555E-04	-2.0291E-04	-2.3791E-04	-1.7497E-04
-3.8598E-05	-2.9729E-05	-2.3443E-05	-3.2042E-05	-3.2925E-05	-3.2797E-05	-1.8720E-05	-2.1009E-05	-1.6111E-05
2.1435E-06	1.6775E-06	1.3357E-06	1.8718E-06	1.9277E-06	1.9217E-06	1.0452E-06	1.2125E-06	9.0007E-07
-6.5207E-08	-5.1559E-08	-4.1179E-08	-6.0203E-08	-6.2114E-08	-6.1971E-08	-3.2342E-08	-3.7346E-08	-2.7916E-08
8.3676E-10	6.6580E-10	5.3109E-10	8.1885E-10	8.4609E-10	8.4473E-10	4.2408E-10	4.8039E-10	3.6794E-10

Danville, IN

Marietta, OH

Georgetown, DE

19 PRNT QTVP

-9.6804E-04	-7.8681E-04	-3.2625E-04	-5.1299E-03	-6.6822E-03	-6.8537E-03	-6.4154E-04	-5.6021E-04	-8.7765E-04
-2.1490E-03	-2.6213E-03	-2.0712E-03	-1.3112E-02	-1.3756E-02	-1.3958E-02	-2.3547E-03	-3.0364E-03	-2.9194E-03
1.5344E-03	4.5466E-04	-1.4085E-03	-2.3694E-03	-1.0521E-03	-9.2465E-04	-7.2307E-05	-1.7521E-03	-8.5073E-05
-2.6980E-03	-4.0130E-03	-5.6973E-03	-6.2634E-03	-4.5983E-03	-4.6412E-03	-3.5515E-03	-6.0214E-03	-3.5242E-03
-2.1165E-03	-2.7340E-03	-3.4698E-03	-3.3869E-03	-2.7759E-03	-2.8361E-03	-2.1324E-03	-3.4542E-03	-2.1111E-03
-7.0643E-04	-8.6107E-04	-1.0472E-03	-1.0669E-03	-9.7546E-04	-1.0023E-03	-6.3045E-04	-9.9022E-04	-6.2779E-04
-1.2820E-04	-1.5063E-04	-1.7937E-04	-1.9656E-04	-1.9328E-04	-1.9905E-04	-1.0658E-04	-1.6580E-04	-1.0698E-04
-1.3561E-05	-1.5516E-05	-1.8252E-05	-2.1310E-05	-2.2003E-05	-2.2680E-05	-1.0732E-05	-1.6437E-05	-1.0816E-05
-8.3680E-07	-9.3829E-07	-1.0947E-06	-1.3453E-06	-1.4393E-06	-1.4841E-06	-6.3562E-07	-9.6233E-07	-6.4208E-07
2.7546E-08	3.0842E-08	3.5770E-08	4.5882E-08	5.0454E-08	5.2034E-08	2.0503E-08	3.0741E-08	2.0710E-08
-3.9037E-10	-4.2536E-10	-4.9106E-10	-6.5407E-10	-7.3525E-10	-7.5835E-10	-2.7815E-10	-4.1345E-10	-2.8040E-10

Toms River, NJ

Grottoes, VA

Bluefield, WV

28 PRNT QTVP

7.2776E-04	1.2794E-03	9.1799E-04	-4.3567E-03	-3.7523E-03	-3.8399E-03	-3.7251E-03	-1.4941E-05	-3.9514E-03
3.9907E-03	5.0096E-03	4.2901E-03	-7.5338E-03	-8.2792E-03	-6.4224E-03	-1.4103E-02	-1.0804E-03	-1.4102E-02
1.4294E-03	6.0008E-06	8.7398E-04	-2.0811E-03	-1.8633E-03	-2.3433E-03	-9.3300E-03	-1.9191E-02	-8.8920E-03
-1.0536E-02	-8.8485E-03	-9.0697E-03	-5.1438E-04	-2.1142E-03	-3.0325E-04	-6.5811E-03	-1.2300E-02	-5.5985E-03
-6.9479E-03	-5.9906E-03	-5.9349E-03	-2.1741E-04	-1.1703E-03	-2.5805E-04	-2.7467E-03	-4.9930E-03	-2.1025E-03
-2.0007E-03	-1.7335E-03	-1.7017E-03	-3.0457E-04	-6.2487E-04	-1.4956E-04	-1.0825E-03	-1.5646E-03	-9.2444E-04
-3.1564E-04	-2.7251E-04	-2.6819E-04	-8.5188E-05	-1.4821E-04	-6.1459E-05	-2.3524E-04	-2.8033E-04	-2.0972E-04
-2.9182E-05	-2.4971E-05	-2.4752E-05	-1.0342E-05	-1.7545E-05	-8.2254E-06	-2.7274E-05	-3.0062E-05	-2.4795E-05
1.5748E-06	1.3287E-06	1.3297E-06	6.4498E-07	1.1174E-06	5.2999E-07	1.7354E-06	1.7740E-06	1.5930E-06
-4.5865E-08	-3.7951E-08	-3.8417E-08	-2.0474E-08	-3.7010E-08	-1.6922E-08	-5.7721E-08	-5.5606E-08	-5.3204E-08
5.5609E-10	4.4839E-10	4.6021E-10	2.6396E-10	5.0388E-10	2.1624E-10	7.8865E-10	7.2631E-10	7.3010E-10

Baseline, Day 154

Baseline, Day 188

Table D-3

Polynomial Coefficients for I Data Taken at NAVOBSY

Wilmington, NC

1 PRNT ITOP

2.0045E-03	2.2003E-03	1.8809E-03	1.7284E-03	2.1064E-03	2.4089E-03	1.5812E-03	1.2381E-03	1.4647E-03
1.5730E-02	1.6008E-02	1.5469E-02	1.6592E-02	1.7280E-02	1.7920E-02	1.3062E-02	1.1934E-02	1.2913E-02
2.6223E-02	2.4552E-02	2.7093E-02	3.4998E-02	3.0476E-02	2.8441E-02	2.4064E-02	2.6417E-02	2.5524E-02
-1.4940E-02	-1.3231E-02	-1.6213E-02	-2.0325E-02	-1.7305E-02	-1.4938E-02	-9.5037E-03	-1.0590E-02	-1.0537E-02
1.4994E-02	1.4183E-02	1.5576E-02	1.6545E-02	1.5046E-02	1.4047E-02	1.1236E-02	1.1431E-02	1.1647E-02
-5.6172E-03	-5.4027E-03	-5.7504E-03	-5.8785E-03	-5.4508E-03	-5.2226E-03	-4.4503E-03	-4.4513E-03	-4.5481E-03
1.0453E-03	1.0127E-03	1.0663E-03	1.0828E-03	1.0114E-03	9.8029E-04	8.5210E-04	8.4741E-04	8.6651E-04
-1.1028E-04	-1.0714E-04	-1.1208E-04	-1.1462E-04	-1.0745E-04	-1.0487E-04	-9.1455E-05	-9.0688E-05	-9.2731E-05
6.6986E-06	6.5253E-06	6.7981E-06	7.0336E-06	6.6083E-06	6.4807E-06	5.6218E-06	5.5655E-06	5.6886E-06
-2.1862E-07	-2.1343E-07	-2.2170E-07	-2.3228E-07	-2.1858E-07	-2.1513E-07	-1.8480E-07	-1.8274E-07	-1.8668E-07
2.9684E-09	2.9032E-09	3.0092E-09	3.1904E-09	3.0058E-09	2.9664E-09	2.5182E-09	2.4880E-09	2.5399E-09

Dexter, NY

10 PRNT ITOP

2.5176E-03	3.4987E-03	3.7681E-03	5.3371E-03	6.6730E-03	8.5172E-03	4.2642E-03	3.3047E-03	2.8325E-03
1.7116E-02	1.6675E-02	1.7311E-02	2.7847E-02	3.0860E-02	3.8666E-02	2.2702E-02	1.8315E-02	1.6415E-02
2.3763E-02	1.6499E-02	1.6154E-02	4.2875E-02	4.1952E-02	5.2953E-02	3.4252E-02	2.7944E-02	2.5893E-02
-1.4278E-02	-4.0141E-03	-4.3171E-03	-1.9154E-02	-1.6469E-02	-2.3104E-02	-1.2079E-02	-8.0731E-03	-6.9409E-03
1.5395E-02	9.5917E-03	9.8947E-03	7.6602E-03	6.2601E-03	8.4371E-03	4.7570E-03	3.3733E-03	2.9842E-03
-5.8218E-03	-4.1370E-03	-4.2372E-03	-1.9457E-03	-1.5882E-03	-2.0177E-03	-1.2890E-03	-1.0014E-03	-9.1474E-04
1.0852E-03	8.0614E-04	8.2300E-04	3.0158E-04	2.4901E-04	3.0228E-04	2.1266E-04	1.7505E-04	1.6266E-04
-1.1423E-04	-8.6777E-05	-8.8403E-05	-2.8983E-05	-2.4318E-05	-2.8495E-05	-2.1606E-05	-1.8497E-05	-1.7375E-05
6.9852E-06	5.3380E-06	5.4276E-06	1.6800E-06	1.4329E-06	1.6334E-06	1.3139E-06	1.1564E-06	1.0944E-06
-2.2567E-07	-1.7574E-07	-1.7830E-07	-5.3498E-08	-4.6290E-08	-5.1667E-08	-4.3543E-08	-3.9089E-08	-3.7184E-08
3.0570E-09	2.4015E-09	2.4338E-09	7.1605E-10	6.2687E-10	6.8849E-10	6.0221E-10	5.4839E-10	5.2353E-10

Georgetown, DE

19 PRNT ITOP

7.7659E-03	5.0521E-03	5.2388E-03	6.7832E-03	1.5592E-03	4.0898E-03	7.7864E-03	7.5985E-03	4.1913E-03
-3.4606E-02	4.8751E-04	5.9599E-04	1.5192E-02	1.2897E-02	1.9543E-02	1.6102E-02	1.6555E-02	1.8222E-02
4.5642E-02	7.8490E-03	8.0202E-03	9.1907E-03	2.5199E-02	1.9368E-02	9.9700E-03	1.0459E-02	1.7232E-02
-1.7821E-02	3.3498E-03	3.3362E-03	3.2017E-03	5.3235E-03	7.1285E-03	3.9226E-03	3.6955E-03	3.5885E-03
6.4236E-03	5.1830E-04	5.2905E-04	1.7619E-03	3.3907E-03	6.2934E-03	1.2185E-03	1.3480E-03	4.3300E-03
-1.5668E-03	-1.5657E-04	-1.5119E-04	-1.0590E-03	-9.9883E-04	-2.0736E-03	-8.6692E-04	-9.1772E-04	-1.5218E-03
2.3997E-04	5.7601E-05	5.6425E-05	2.1489E-04	1.4460E-04	3.4217E-04	1.8132E-04	1.9101E-04	2.7990E-04
-2.2950E-05	-8.1726E-06	-8.0322E-06	-2.3435E-05	-1.2005E-05	-3.2581E-05	-2.0230E-05	-2.1265E-05	-2.8594E-05
1.3430E-06	6.0363E-07	5.9401E-07	1.4613E-06	5.8574E-07	1.8198E-06	1.2883E-06	1.3518E-06	1.7159E-06
-4.3397E-08	-2.2675E-08	-2.2321E-08	-4.8842E-08	-1.5508E-08	-5.5283E-08	-4.3834E-08	-4.5926E-08	-5.5920E-08
5.9051E-10	3.4145E-10	3.3604E-10	6.7740E-10	1.6988E-10	7.0392E-10	6.1652E-10	6.4516E-10	7.6166E-10

Bluefield, WV

28 PRNT ITOP

4.3741E-03	3.0811E-03	5.5845E-03	2.0569E-03	2.2733E-03	2.0799E-03	1.3745E-03	1.5337E-03	1.7358E-03
2.0032E-02	1.7469E-02	1.8907E-02	1.6583E-02	1.7505E-02	1.6881E-02	1.1352E-02	1.1380E-02	1.2376E-02
1.8384E-02	1.9954E-02	1.1499E-02	2.8430E-02	2.8452E-02	2.9266E-02	2.1717E-02	1.9766E-02	2.0247E-02
-8.1555E-03	-1.1242E-02	-4.4464E-03	-1.9450E-02	-1.5864E-02	-1.7075E-02	-5.0182E-03	-2.8901E-03	-4.0263E-03
6.9220E-03	8.3893E-03	5.9014E-03	1.4216E-02	1.5418E-02	1.5391E-02	8.6094E-03	7.4255E-03	8.4956E-03
-2.2598E-03	-2.5999E-03	-2.0755E-03	-5.0632E-03	-5.5830E-03	-5.5592E-03	-3.7008E-03	-3.3699E-03	-3.7476E-03
3.7724E-04	4.2397E-04	3.5567E-04	9.2569E-04	1.0265E-03	1.0207E-03	7.2595E-04	6.7363E-04	7.4251E-04
-3.6716E-05	-4.0718E-05	-3.5140E-05	-9.7254E-05	-1.0789E-04	-1.0714E-04	-7.8523E-05	-7.3590E-05	-8.0803E-05
2.1074E-06	2.3175E-06	2.0393E-06	5.9339E-06	6.5690E-06	6.5138E-06	4.8439E-06	4.5065E-06	5.0042E-06
-6.5987E-08	-7.2172E-08	-6.4410E-08	-1.9517E-07	-2.1537E-07	-2.1326E-07	-1.5967E-07	-1.5110E-07	-1.6540E-07
8.6767E-10	9.4583E-10	8.5317E-10	2.6720E-09	2.9394E-09	2.9067E-09	2.1824E-09	2.0704E-09	2.2651E-09

Emporia, VA

2.1064E-03	2.4089E-03	1.5812E-03	1.2381E-03	1.4647E-03				
1.7280E-02	1.7920E-02	1.3062E-02	1.1934E-02	1.2913E-02				
3.0476E-02	2.8441E-02	2.4064E-02	2.6417E-02	2.5524E-02				
-1.7305E-02	-1.4938E-02	-9.5037E-03	-1.0590E-02	-1.0537E-02				
1.5046E-02	1.4047E-02	1.1236E-02	1.1431E-02	1.1647E-02				
-5.4508E-03	-5.2226E-03	-4.4503E-03	-4.4513E-03	-4.5481E-03				
1.0114E-03	9.8029E-04	8.5210E-04	8.4741E-04	8.6651E-04				
-1.0745E-04	-1.0487E-04	-9.1455E-05	-9.0688E-05	-9.2731E-05				
6.6083E-06	6.4807E-06	5.6218E-06	5.5655E-06	5.6886E-06				
-2.1858E-07	-2.1513E-07	-1.8480E-07	-1.8274E-07	-1.8668E-07				
3.0058E-09	2.9664E-09	2.5182E-09	2.4880E-09	2.5399E-09				

Danville, IN

6.6730E-03	8.5172E-03	4.2642E-03	3.3047E-03	2.8325E-03				
3.0860E-02	3.8666E-02	2.2702E-02	1.8315E-02	1.6415E-02				
4.1952E-02	5.2953E-02	3.4252E-02	2.7944E-02	2.5893E-02				
-1.6469E-02	-2.3104E-02	-1.2079E-02	-8.0731E-03	-6.9409E-03				
6.2601E-03	8.4371E-03	4.7570E-03	3.3733E-03	2.9842E-03				
-1.5882E-03	-2.0177E-03	-1.2890E-03	-1.0014E-03	-9.1474E-04				
2.4901E-04	3.0228E-04	2.1266E-04	1.7505E-04	1.6266E-04				
-2.4318E-05	-2.8495E-05	-2.1606E-05	-1.8497E-05	-1.7375E-05				
1.4329E-06	1.6334E-06	1.3139E-06	1.1564E-06	1.0944E-06				
-4.6290E-08	-5.1667E-08	-4.3543E-08	-3.9089E-08	-3.7184E-08				
6.2687E-10	6.8849E-10	6.0221E-10	5.4839E-10	5.2353E-10				

Toms River, NJ

1.5592E-03	4.0898E-03	7.7864E-03	7.5985E-03	4.1913E-03				
1.2897E-02	1.9543E-02	1.6102E-02	1.6555E-02	1.8222E-02				
2.5199E-02	1.9368E-02	9.9700E-03	1.0459E-02	1.7232E-02				
-5.3235E-03	-7.1285E-03	-3.9226E-03	-3.6955E-03	-3.5885E-03				
3.3907E-03	6.2934E-03	1.2185E-03	1.3480E-03	4.3300E-03				
-9.9883E-04	-2.0736E-03	-8.6692E-04	-9.1772E-04	-1.5218E-03				
1.4460E-04	3.4217E-04	1.8132E-04	1.9101E-04	2.7990E-04				
-1.2005E-05	-3.2581E-05	-2.0230E-05	-2.1265E-05	-2.8594E-05				
5.8574E-07	1.8198E-06	1.2883E-06	1.3518E-06	1.7159E-06				
-1.5508E-08	-5.5283E-08	-4.3834E-08	-4.5926E-08	-5.5920E-08				
1.6988E-10	7.0392E-10	6.1652E-10	6.4516E-10	7.6166E-10				

Baseline, Day 154

2.2733E-03	2.0799E-03	1.3745E-03	1.5337E-03	1.7358E-03				
1.7505E-02	1.6881E-02	1.1352E-02	1.1380E-02	1.2376E-02				
2.8452E-02	2.9266E-02	2.1717E-02	1.9766E-02	2.0247E-02				
-1.5864E-02	-1.7075E-02	-5.0182E-03	-2.8901E-03	-4.0263E-03				
1.5418E-02	1.5391E-02	8.6094E-03	7.4255E-03	8.4956E-03				
-5.5830E-03	-5.5592E-03	-3.7008E-03	-3.3699E-03	-3.7476E-03				
1.0265E-03	1.0207E-03	7.2595E-04	6.7363E-04	7.4251E-04				
-1.0789E-04	-1.0714E-04	-7.8523E-05	-7.3590E-05	-8.0803E-05				
6.5690E-06	6.5138E-06	4.8439E-06	4.5065E-06	5.0042E-06				
-2.1537E-07	-2.1326E-07	-1.5967E-07	-1.5110E-07	-1.6540E-07				
2.9394E-09	2.9067E-09	2.1824E-09	2.0704E-09	2.2651E-09				

Towanda, PA

1.5812E-03	1.2381E-03	1.4647E-03						
1.3062E-02	1.1934E-02	1.2913E-02						
2.4064E-02	2.6417E-02	2.5524E-02						
-9.5037E-03	-1.0590E-02	-1.0537E-02						
1.1236E-02	1.1431E-02	1.1647E-02						
-4.4503E-03	-4.4513E-03	-4.5481E-03						
8.5210E-04	8.4741E-04	8.6651E-04						
-9.1455E-05	-9.0688E-05	-9.2731E-05						
5.6218E-06	5.5655E-06	5.6886E-06						
-1.8480E-07	-1.8274E-07	-1.8668E-07						
2.5182E-09	2.4880E-09	2.5399E-09						

Marietta, OH

4.2642E-03	3.3047E-03	2.8325E-03						
2.2702E-02	1.8315E-02	1.6415E-02						
3.4252E-02	2.7944E-02	2.5893E-02						
-1.2079E-02	-8.0731E-03	-6.9409E-03						
4.7570E-03	3.3733E-03	2.9842E-03						
-1.2890E-03	-1.0014E-03	-9.1474E-04						
2.1266E-04	1.7505E-04	1.6266E-04						
-2.1606E-05	-1.8497E-05	-1.7375E-05						
1.3139E-06	1.1564E-06	1.0944E-06						
-4.3543E-08	-3.9089E-08	-3.7184E-08						
6.0221E-10	5.4839E-10	5.2353E-10						

Grottoes, VA

7.7864E-03	7.5985E-03	4.1913E-03						
1.6102E-02	1.6555E-02	1.8222E-02						
9.9700E-03	1.0459E-02	1.7232E-02						
3.9226E-03	3.6955E-03	3.5885E-03						
1.2185E-03	1.3480E-03	4.3300E-03						
-8.6692E-04	-9.1772E-04	-1.5218E-03						
1.8132E-04	1.9101E-04	2.7990E-04						
-2.0230E-05	-2.1265E-05	-2.8594E-05						
1.2883E-06	1.3518E-06	1.7159E-06						
-4.3834E-08	-4.5926E-08	-5.5920E-08						
6.1652E-10	6.4516E-10	7.6166E-10						

Baseline, Day 188

1.3745E-03	1.5337E-03	1.7358E-03						
1.1352E-02	1.1380E-02	1.2376E-02						
2.1717E-02	1.9766E-02	2.0247E-02						
-5.0182E-03	-2.8901E-03	-4.0263E-03						
8.6094E-03	7.4255E-03	8.4956E-03						
-3.7008E-03	-3.3699E-03	-3.7476E-03						
7.2595E-04	6.7363E-04	7.4251E-04						
-7.8523E-05	-7.3590E-05	-8.0803E-05						
4.8439E-06	4.5065E-06	5.0042E-06						
-1.5967E-07	-1.5110E-07	-1.6540E-07						
2.1824E-09	2.0704E-09	2.2651E-09						

Table D-4

Polynomial Coefficients for I Data Taken at Field Sites

Wilmington, NC			Emporia, VA			Towanda, PA		
1 *PRNT ITVP*								
2.9970E-03	3.0814E-03	2.8575E-03	2.7156E-03	2.5243E-03	2.8163E-03	1.8483E-03	8.4507E-04	2.0912E-03
1.5205E-02	1.5301E-02	1.5152E-02	1.7438E-02	1.6702E-02	1.7344E-02	1.3402E-02	9.5356E-03	1.4359E-02
1.7409E-02	1.7171E-02	1.7985E-02	2.4762E-02	2.4394E-02	2.3499E-02	2.1308E-02	2.4035E-02	2.1298E-02
-1.7331E-03	-1.4751E-03	-2.4857E-03	-7.5227E-03	-7.9835E-03	-7.0027E-03	-8.3964E-03	-1.0176E-02	-9.1256E-03
7.0971E-03	6.9515E-03	7.3521E-03	9.4557E-03	9.4221E-03	9.0935E-03	8.3837E-03	9.2710E-03	9.0912E-03
-3.3558E-03	-3.3190E-03	-3.3956E-03	-3.9052E-03	-3.8239E-03	-3.7679E-03	-3.2022E-03	-3.4826E-03	-3.4783E-03
6.8279E-04	6.7710E-04	6.8564E-04	7.6802E-04	7.4647E-04	7.4123E-04	6.0430E-04	6.5519E-04	6.6083E-04
-7.5499E-05	-7.4973E-05	-7.5516E-05	-8.4474E-05	-8.1724E-05	-8.1488E-05	-6.4513E-05	-6.9870E-05	-7.1040E-05
4.7308E-06	4.7020E-06	4.7201E-06	5.3200E-06	5.1313E-06	5.1300E-06	3.9660E-06	4.2910E-06	4.3929E-06
-1.5784E-07	-1.5693E-07	-1.5721E-07	-1.7909E-07	-1.7234E-07	-1.7260E-07	-1.3075E-07	-1.4130E-07	-1.4551E-07
2.1795E-09	2.1676E-09	2.1671E-09	2.4954E-09	2.3978E-09	2.4044E-09	1.7800E-09	1.9311E-09	1.9988E-09

Dexter, NY			Danville, IN			Marietta, OH		
10 *PRNT ITVP*								
3.6805E-03	3.6489E-03	4.0035E-03	1.2416E-03	1.1483E-03	1.1137E-03	-1.1780E-02	-1.0673E-02	-1.0713E-02
4.8394E-03	4.6221E-03	4.5874E-03	1.2111E-02	1.1778E-02	1.1730E-02	9.1299E-04	2.0549E-03	2.2409E-03
4.9803E-03	5.0219E-03	4.7121E-03	2.7270E-02	2.8002E-02	2.8647E-02	-1.2606E-02	-1.1973E-02	-1.1869E-02
3.8224E-03	3.8736E-03	3.9672E-03	9.5333E-03	9.8372E-03	1.0359E-02	-7.4860E-03	-7.4811E-03	-7.4787E-03
-1.1915E-05	-5.6861E-05	-5.2684E-08	8.0772E-03	8.1547E-03	8.3648E-03	1.1921E-03	1.0628E-03	1.0462E-03
-4.9890E-04	-4.8700E-04	-5.2267E-04	-3.0077E-03	-3.0247E-03	-3.0735E-03	-3.4107E-04	-3.8515E-04	-3.9160E-04
1.3710E-04	1.3553E-04	1.4350E-04	5.7123E-04	5.7426E-04	5.8125E-04	-1.2681E-04	-1.3445E-04	-1.3556E-04
-1.7465E-05	-1.7332E-05	-1.8281E-05	-6.2153E-05	-6.2507E-05	-6.3134E-05	1.7642E-05	1.8382E-05	1.8479E-05
1.1980E-06	1.1913E-06	1.2533E-06	3.9073E-06	3.9314E-06	3.9656E-06	-1.2566E-06	-1.3075E-06	-1.3118E-06
-4.2656E-08	-4.2467E-08	-4.4600E-08	-1.3157E-07	-1.3244E-07	-1.3348E-07	4.6166E-08	4.7383E-08	4.7472E-08
6.1859E-10	6.1619E-10	6.4635E-10	1.8337E-09	1.8465E-09	1.8600E-09	-6.7480E-10	-6.8997E-10	-6.9043E-10

Georgetown, DE			Toms River, NJ			Grottoes, VA		
19 *PRNT ITVP*								
2.4360E-03	3.3216E-03	3.8452E-03	4.6542E-03	5.2603E-03	5.2197E-03	7.5176E-03	7.7780E-03	7.3531E-03
2.7420E-03	1.3922E-03	8.9564E-05	1.6755E-02	1.8907E-02	1.9261E-02	3.8315E-03	3.7320E-03	3.9559E-03
4.6386E-03	4.9479E-03	5.9385E-03	1.4834E-02	1.6185E-02	1.5812E-02	7.7417E-03	8.7433E-03	8.8178E-03
2.3126E-03	2.5698E-03	2.5296E-03	1.4237E-03	7.7523E-04	4.6367E-04	3.2265E-03	2.9589E-03	2.8157E-03
-3.0871E-04	-4.2703E-04	-5.4308E-04	-2.6445E-03	-3.2530E-03	-3.4022E-03	-5.1137E-04	-5.4401E-04	-5.3175E-04
1.3098E-04	1.1749E-04	7.1326E-05	1.3476E-03	1.5771E-03	1.6207E-03	1.0594E-04	6.6198E-05	5.7972E-05
-4.4379E-05	-4.5712E-05	-3.6333E-05	-2.6595E-04	-3.1059E-04	-3.1008E-04	3.9746E-05	2.9419E-05	2.6073E-05
6.1377E-06	6.5944E-06	5.4888E-06	2.8664E-05	3.3626E-05	3.4406E-05	-5.5514E-06	-4.2426E-06	-3.9055E-06
-4.4705E-07	-4.9042E-07	-4.1555E-07	-1.7733E-06	-2.0898E-06	-2.1381E-06	4.0035E-07	3.1803E-07	2.9505E-07
1.6680E-08	1.8498E-08	1.5803E-08	5.8898E-08	6.9659E-08	7.1287E-08	-1.5407E-08	-1.2225E-08	-1.1356E-08
2.4977E-10	2.7955E-10	2.3964E-10	8.1257E-10	9.6357E-10	9.8658E-10	2.3405E-10	1.8791E-10	1.7492E-10

Bluefield, WV			Baseline, Day 154			Baseline, Day 188		
28 *PRNT ITVP*								
4.9883E-04	4.8467E-04	5.2011E-04	2.4247E-03	3.0135E-03	3.5212E-03	1.1948E-03	3.0548E-03	1.4000E-03
5.8701E-03	5.5455E-03	5.5861E-03	1.6293E-02	1.8269E-02	1.8275E-02	1.1049E-02	2.6916E-02	1.2946E-02
1.5008E-02	1.4677E-02	1.3856E-02	2.3187E-02	2.2923E-02	1.9363E-02	2.5670E-02	7.0080E-02	2.6767E-02
-7.2424E-03	-6.6196E-03	-5.9711E-03	-1.1297E-02	-1.1166E-02	-7.7496E-03	-1.1304E-02	-5.4693E-02	-1.2199E-02
1.8954E-03	1.7025E-03	1.5332E-03	1.0655E-02	1.1333E-02	9.9206E-03	1.1718E-02	3.0477E-02	1.2562E-02
-8.7925E-05	-4.7550E-05	-3.4220E-05	-3.9095E-03	-4.2470E-03	-3.9289E-03	-4.5251E-03	-8.7954E-03	-4.8292E-03
-4.6754E-05	-5.1676E-05	-4.9705E-05	7.2330E-04	7.9169E-04	7.4823E-04	8.5582E-04	1.4247E-03	9.1291E-04
9.2987E-06	9.6275E-06	9.1153E-06	-7.6552E-05	-8.3858E-05	-8.0167E-05	-9.1048E-05	-1.3684E-04	-9.7167E-05
-7.5267E-07	-7.8347E-07	-7.1890E-07	4.6979E-06	5.1339E-06	4.9425E-06	5.5656E-06	7.7500E-06	5.9427E-06
2.9170E-08	2.9277E-08	2.7408E-08	-1.5525E-07	-1.6902E-07	-1.6349E-07	-1.8244E-07	-2.3910E-07	-1.9480E-07
-4.4501E-10	-4.4451E-10	-4.1667E-10	2.1343E-09	2.3142E-09	2.2458E-09	2.4847E-09	3.0980E-09	2.6548E-09

Table D-5

Polynomial Coefficients for Q Data Taken at NAVOBSY

Wilmington, NC

1 PRNT QTOS

-1.3904E-03	-1.1198E-03	-1.6723E-03	-4.1776E-03	-6.3589E-03	-5.9541E-03	-1.8230E-03	-1.3118E-03	-1.5117E-03
-9.4409E-03	-8.8419E-03	-9.3959E-03	-1.2582E-02	-8.3531E-03	-9.3347E-03	-1.3064E-02	-1.2461E-02	-1.2613E-02
-1.2837E-02	-1.4420E-02	-1.0519E-02	-8.1589E-03	-6.7828E-03	-6.4973E-03	-1.8713E-02	-2.4577E-02	-2.1606E-02
-9.9286E-03	-1.0953E-02	-7.3847E-03	-4.2752E-03	-5.2057E-04	-4.4795E-04	-1.5712E-02	-2.2095E-02	-1.8452E-02
-5.7154E-03	-6.0038E-03	-4.4913E-03	-2.9989E-03	-3.0816E-04	-7.7824E-04	-7.4599E-03	-1.0449E-02	-8.6221E-03
-2.0820E-03	-2.1200E-03	-1.7565E-03	-1.3889E-03	-7.5210E-04	-7.4169E-04	-2.3070E-03	-3.0763E-03	-2.5772E-03
-4.1228E-04	-4.1401E-04	-3.6087E-04	-3.0517E-04	-1.9941E-04	-1.9078E-04	-4.2145E-04	-5.3974E-04	-4.5868E-04
-4.5700E-05	-4.5594E-05	-4.0779E-05	-3.5524E-05	-2.5035E-05	-2.4629E-05	-4.4926E-05	-5.6113E-05	-4.8093E-05
-2.8571E-06	-2.8516E-06	-2.5873E-06	-2.2941E-06	-1.6789E-06	-1.6444E-06	-2.7697E-06	-3.3994E-06	-2.9254E-06
-9.5601E-08	-9.4962E-08	-8.6909E-08	-7.8189E-08	-5.8478E-08	-5.6995E-08	-9.1458E-08	-1.1109E-07	-9.5717E-08
-1.3204E-09	-1.3113E-09	-1.2068E-09	-1.1015E-09	-8.3540E-10	-8.1017E-10	-1.2559E-09	-1.5153E-09	-1.3050E-09

Dexter, NY

10 PRNT QTOS

-2.6364E-03	-4.5926E-04	-4.8859E-04	2.6413E-05	-7.3789E-05	-6.1842E-04	-1.5255E-03	-1.4288E-03	-2.1701E-03
-8.8667E-03	-6.0246E-03	-6.0952E-03	-5.9163E-04	-2.2928E-03	-5.0506E-03	-4.8539E-03	-4.8068E-03	-4.4619E-03
-5.8702E-03	-2.1184E-02	-2.0853E-02	-7.3398E-03	-1.2740E-02	-1.7215E-02	-1.5887E-03	-1.5318E-03	-4.1412E-04
-2.5724E-03	-1.7909E-02	-1.7705E-02	-7.0024E-03	-1.2282E-02	-1.4578E-02	-5.6569E-03	-5.7864E-03	-3.1036E-03
-2.2784E-03	-8.9532E-03	-8.8748E-03	-3.0319E-03	-5.4864E-03	-6.0964E-03	-3.5994E-03	-3.7133E-03	-2.2028E-03
-1.1040E-03	-2.7496E-03	-2.7248E-03	-7.4368E-04	-1.3043E-03	-1.4568E-03	-1.1128E-03	-1.1473E-03	-7.4959E-04
-2.7602E-04	-4.8767E-04	-4.8217E-04	-1.1181E-04	-2.1237E-04	-2.1630E-04	-1.9556E-04	-2.0073E-04	-1.3669E-04
-3.2957E-05	-5.0254E-05	-4.9506E-05	-1.0546E-05	-2.0222E-05	-1.9913E-05	-2.0519E-05	-2.0935E-05	-1.4730E-05
-2.1535E-06	-2.9862E-06	-2.9282E-06	-6.0756E-07	-1.1656E-06	-1.1157E-06	-1.2711E-06	-1.2805E-06	-9.3115E-07
-7.3584E-08	-9.5229E-08	-9.2884E-08	-1.9474E-08	-3.7177E-08	-3.4757E-08	-4.2845E-08	-4.3150E-08	-3.1873E-08
-1.0326E-09	-1.2651E-09	-1.2267E-09	-2.6530E-10	-5.0276E-10	-4.6094E-10	-6.0523E-10	-6.0569E-10	-4.5550E-10

Georgetown, DE

19 PRNT QTOS

-4.7290E-04	-2.2072E-04	-2.2174E-04	-7.9357E-03	-1.6775E-03	-3.2419E-03	-5.2113E-03	-5.9857E-03	-5.8226E-03
-1.6717E-03	-1.1029E-03	-1.1069E-03	-7.0164E-03	-1.4693E-02	-1.5897E-02	-1.1235E-02	-1.1257E-02	-1.1320E-02
-8.5117E-03	-6.6980E-03	-5.3371E-03	-4.8567E-04	-2.4273E-02	-1.0319E-02	-8.4384E-04	-3.8524E-04	-8.3066E-04
-9.4234E-03	-9.0284E-03	-7.8960E-03	-1.2243E-04	-3.2911E-02	-2.0167E-02	-4.2617E-03	-3.2476E-03	-7.8450E-03
-4.8301E-03	-4.8190E-03	-4.4118E-03	-5.4635E-05	-1.6733E-02	-1.2058E-02	-2.7398E-03	-2.1252E-03	-5.2047E-03
-1.3526E-03	-1.3588E-03	-1.2770E-03	-1.0319E-04	-4.5672E-03	-3.6966E-03	-9.2745E-04	-7.5167E-04	-1.7285E-03
-2.2336E-04	-2.2391E-04	-2.1369E-04	-3.0559E-05	-7.3050E-04	-6.4369E-04	-1.7632E-04	-1.4801E-04	-3.1550E-04
-2.2400E-05	-2.2369E-05	-2.1545E-05	-4.0107E-06	-7.0491E-05	-6.6273E-05	-1.9536E-05	-1.6014E-05	-3.3772E-05
-1.8400E-06	-1.8335E-06	-1.7917E-06	-2.7800E-07	-4.0414E-06	-4.0014E-06	-1.2578E-06	-1.1025E-06	-2.1122E-06
-4.3911E-08	-4.3588E-08	-4.2367E-08	-1.0016E-08	-1.2682E-07	-1.3108E-07	-4.3089E-08	-3.8837E-08	-7.1552E-08
-6.0591E-10	-6.0052E-10	-5.8480E-10	-1.4839E-10	-1.6700E-09	-1.7992E-09	-6.3336E-10	-5.6934E-10	-1.0146E-09

Bluefield, WV

28 PRNT QTOS

-3.9491E-03	-2.4658E-03	-2.8099E-03	-6.9233E-03	-5.3896E-03	-4.3051E-03	-4.0199E-03	-4.0671E-03	-4.3821E-03
-8.9652E-03	-7.6900E-03	-6.0920E-03	-6.4498E-03	-1.0678E-02	-1.1445E-02	-1.4959E-02	-1.4693E-02	-1.4654E-02
-4.4502E-03	-4.1531E-03	-2.9656E-03	-7.9356E-03	-6.5182E-03	-7.5952E-03	-1.2723E-02	-1.2325E-02	-1.1933E-02
-1.7563E-03	-2.8304E-03	-9.6262E-04	-8.5503E-04	-1.3003E-03	-2.5381E-03	-4.5219E-03	-3.7002E-03	-2.8196E-03
-5.4019E-04	-3.0833E-04	-5.0044E-04	-5.2995E-04	-1.3059E-03	-1.8854E-03	-1.6972E-03	-1.1062E-03	-7.5613E-04
-3.1913E-04	-6.6498E-05	-2.4110E-04	-5.6503E-04	-8.9953E-04	-1.0497E-03	-8.4956E-04	-6.4391E-04	-5.9755E-04
-6.2627E-05	-2.1317E-05	-4.2474E-05	-1.5469E-04	-2.2421E-04	-2.4670E-04	-2.0076E-04	-1.6144E-04	-1.6207E-04
-6.4754E-06	-2.4109E-06	-3.8621E-06	-1.9499E-05	-2.7458E-05	-2.9453E-05	-2.3775E-05	-1.9300E-05	-2.0188E-05
-3.7331E-07	-1.3334E-07	-1.8530E-07	-1.2986E-06	-1.8132E-06	-1.9152E-06	-1.5087E-06	-1.2236E-06	-1.3099E-06
-1.1261E-08	-3.4267E-09	-4.1398E-09	-4.4695E-08	-6.2368E-08	-6.5133E-08	-4.9431E-08	-3.9307E-08	-4.3346E-08
-1.3760E-10	-2.8822E-11	-2.6913E-11	-5.2959E-10	-8.8064E-10	-9.1110E-10	-6.5969E-10	-5.1200E-10	-5.8048E-10

Emporia, VA

-4.1776E-03	-6.3589E-03	-5.9541E-03	-1.8230E-03	-1.3118E-03	-1.5117E-03			
-1.2582E-02	-8.3531E-03	-9.3347E-03	-1.3064E-02	-1.2461E-02	-1.2613E-02			
-8.1589E-03	-6.7828E-03	-6.4973E-03	-1.8713E-02	-2.4577E-02	-2.1606E-02			
-4.2752E-03	-5.2057E-04	-4.4795E-04	-1.5712E-02	-2.2095E-02	-1.8452E-02			
-2.9989E-03	-3.0816E-04	-7.7824E-04	-7.4599E-03	-1.0449E-02	-8.6221E-03			
-1.3889E-03	-7.5210E-04	-7.4169E-04	-2.3070E-03	-3.0763E-03	-2.5772E-03			
-3.0517E-04	-1.9941E-04	-1.9078E-04	-4.2145E-04	-5.3974E-04	-4.5868E-04			
-3.5524E-05	-2.5035E-05	-2.4629E-05	-4.4926E-05	-5.6113E-05	-4.8093E-05			
-2.2941E-06	-1.6789E-06	-1.6444E-06	-2.7697E-06	-3.3994E-06	-2.9254E-06			
-7.8189E-08	-5.8478E-08	-5.6995E-08	-9.1458E-08	-1.1109E-07	-9.5717E-08			
-1.1015E-09	-8.3540E-10	-8.1017E-10	-1.2559E-09	-1.5153E-09	-1.3050E-09			

Danville, IN

2.6413E-05	-7.3789E-05	-6.1842E-04	-1.5255E-03	-1.4288E-03	-2.1701E-03			
-5.9163E-04	-2.2928E-03	-5.0506E-03	-4.8539E-03	-4.8068E-03	-4.4619E-03			
-7.3398E-03	-1.2740E-02	-1.7215E-02	-1.5887E-03	-1.5318E-03	-4.1412E-04			
-7.0024E-03	-1.2282E-02	-1.4578E-02	-5.6569E-03	-5.7864E-03	-3.1036E-03			
-3.0319E-03	-5.4864E-03	-6.0964E-03	-3.5994E-03	-3.7133E-03	-2.2028E-03			
-7.4368E-04	-1.3043E-03	-1.4568E-03	-1.1128E-03	-1.1473E-03	-7.4959E-04			
-1.1181E-04	-2.1237E-04	-2.1630E-04	-1.9556E-04	-2.0073E-04	-1.3669E-04			
-1.0546E-05	-2.0222E-05	-1.9913E-05	-2.0519E-05	-2.0935E-05	-1.4730E-05			
-6.0756E-07	-1.1656E-06	-1.1157E-06	-1.2711E-06	-1.2805E-06	-9.3115E-07			
-1.9474E-08	-3.7177E-08	-3.4757E-08	-4.2845E-08	-4.3150E-08	-3.1873E-08			
-2.6530E-10	-5.0276E-10	-4.6094E-10	-6.0523E-10	-6.0569E-10	-4.5550E-10			

Toms River, NJ

-7.9357E-03	-1.6775E-03	-3.2419E-03	-5.2113E-03	-5.9857E-03	-5.8226E-03			
-7.0164E-03	-1.4693E-02	-1.5897E-02	-1.1235E-02	-1.1257E-02	-1.1320E-02			
-4.8567E-04	-2.4273E-02	-1.0319E-02	-8.4384E-04	-3.8524E-04	-8.3066E-04			
-1.2243E-04	-3.2911E-02	-2.0167E-02	-4.2617E-03	-3.2476E-03	-7.8450E-03			
-5.4635E-05	-1.6733E-02	-1.2058E-02	-2.7398E-03	-2.1252E-03	-5.2047E-03			
-1.0319E-04	-4.5672E-03	-3.6966E-03	-9.2745E-04	-7.5167E-04	-1.7285E-03			
-3.0559E-05	-7.3050E-04	-6.4369E-04	-1.7632E-04	-1.4801E-04	-3.1550E-04			
-4.0107E-06	-7.0491E-05	-6.6273E-05	-1.9536E-05	-1.6014E-05	-3.3772E-05			
-2.7800E-07	-4.0414E-06	-4.0014E-06	-1.2578E-06	-1.1025E-06	-2.1122E-06			
-1.0016E-08	-1.2682E-07	-1.3108E-07	-4.3089E-08	-3.8837E-08	-7.1552E-08			
-1.4839E-10	-1.6700E-09	-1.7992E-09	-6.3336E-10	-5.6934E-10	-1.0146E-09			

Baseline, Day 154

-6.9233E-03	-5.3896E-03	-4.3051E-03	-4.0199E-03	-4.0671E-03	-4.3821E-03			
-6.4498E-03	-1.0678E-02	-1.1445E-02	-1.4959E-02	-1.4693E-02	-1.4654E-02			
-7.9356E-03	-6.5182E-03	-7.5952E-03	-1.2723E-02	-1.2325E-02	-1.1933E-02			
-8.5503E-04	-1.3003E-03	-2.5381E-03	-4.5219E-03	-3.7002E-03	-2.8196E-03			
-5.2995E-04	-1.3059E-03	-1.8854E-03	-1.6972E-03	-1.1062E-03	-7.5613E-04			
-5.6503E-04	-8.9953E-04	-1.0497E-03	-8.4956E-04	-6.4391E-04	-5.9755E-04			
-1.5469E-04	-2.2421E-04	-2.4670E-04	-2.0076E-04	-1.6144E-04	-1.6207E-04			
-1.9499E-05	-2.7458E-05	-2.9453E-05	-2.3775E-05	-1.9300E-05	-2.0188E-05			
-1.2986E-06	-1.8132E-06	-1.9152E-06	-1.5087E-06	-1.2236E-06	-1.3099E-06			
-4.4695E-08	-6.2368E-08	-6.5133E-08	-4.9431E-08	-3.9307E-08	-4.3346E-08			
-5.2959E-10	-8.8064E-10	-9.1110E-10	-6.5969E-10	-5.1200E-10	-5.8048E-10			

Towanda, PA

-1.8230E-03	-1.3118E-03	-1.5117E-03						
-1.3064E-02	-1.2461E-02	-1.2613E-02						
-1.8713E-02	-2.4577E-02	-2.1606E-02						
-1.5712E-02	-2.2095E-02	-1.8452E-02						
-7.4599E-03	-1.0449E-02	-8.6221E-03						
-2.3070E-03	-3.0763E-03	-2.5772E-03						
-4.2145E-04	-5.3974E-04	-4.5868E-04						
-4.4926E-05	-5.6113E-05	-4.8093E-05						
-2.7697E-06	-3.3994E-06	-2.9254E-06						
-9.1458E-08	-1.1109E-07	-9.5717E-08						
-1.2559E-09	-1.5153E-09	-1.3050E-09						

Marietta, OH

-1.5255E-03	-1.4288E-03	-2.1701E-03						
-4.8539E-03	-4.8068E-03	-4.4619E-03						
-1.5887E-03	-1.5318E-03	-4.1412E-04						
-5.6569E-03	-5.7864E-03	-3.1036E-03						
-3.5994E-03	-3.7133E-03	-2.2028E-03						
-1.1128E-03	-1.1473E-03	-7.4959E-04						
-1.9556E-04	-2.0073E-04	-1.3669E-04						
-2.0519E-05	-2.0935E-05	-1.4730E-05						
-1.2711E-06	-1.2805E-06	-9.3115E-07						
-4.2845E-08	-4.3150E-08	-3.1873E-08						
-6.0523E-10	-6.0569E-10	-4.5550E-10						

Grottoes, VA

-5.2113E-03	-5.9857E-03	-5.8226E-03						
-1.1235E-02	-1.1257E-02	-1.1320E-02						
-8.4384E-04	-3.8524E-04	-8.3066E-04						
-4.2617E-03	-3.2476E-03	-7.8450E-03						
-2.7398E-03	-2.1252E-03	-5.2047E-03						
-9.2745E-04	-7.5167E-04	-1.7285E-03						
-1.7632E-04	-1.4801E-04	-3.1550E-04						
-1.9536E-05	-1.6014E-05	-3.3772E-05						
-1.2578E-06	-1.1025E-06	-2.1122E-06						
-4.3089E-08	-3.8837E-08	-7.1552E-08						
-6.3336E-10	-5.6934E-10	-1.0146E-09						

Baseline, Day 188

-4.0199E-03	-4.0671E-03	-4.3821E-03						
-1.4959E-02	-1.4693E-02	-1.4654E-02						
-1.2723E-02	-1.2325E-02	-1.1933E-02						
-4.5219E-03	-3.7002E-03	-2.8196E-03						
-1.6972E-03	-1.1062E-03	-7.5613E-04						
-8.4956E-04	-6.4391E-04	-5.9755E-04						
-2.0076E-04	-1.6144E-04	-1.6207E-04						
-2.3775E-05	-1.9300E-05	-2.0188E-05						
-1.5087E-06	-1.2236E-06	-1.3099E-06						
-4.9431E-08	-3.9307E-08	-4.3346E-08						
-6.5969E-10	-5.1200E-10	-5.8048E-10						

Table D-6

Polynomial Coefficients for Q Data Taken at Field Sites

Wilmington, NC			Emporia, VA			Towanda, PA		
1 *PRNT QTYS*								
-4.0478E-03	-4.0694E-03	-4.0091E-03	-6.3984E-03	-6.1213E-03	-6.3997E-03	-2.5669E-04	-1.6564E-04	-1.1837E-03
-9.5254E-03	-9.6327E-03	-9.4091E-03	-1.1424E-02	-1.0603E-02	-1.0520E-02	-4.0507E-03	-3.6938E-03	-8.8160E-03
-6.2725E-03	-6.1773E-03	-6.2483E-03	-5.8167E-03	-5.9227E-03	-5.8849E-03	-2.0686E-02	-2.1827E-02	-1.2044E-02
6.5150E-04	6.1440E-04	6.4155E-04	1.0973E-03	1.1584E-03	8.4665E-04	2.1629E-02	2.1583E-02	1.5092E-02
1.1045E-04	7.6001E-05	1.0282E-04	1.0389E-03	1.0826E-03	8.6139E-04	1.1245E-02	1.1232E-02	8.6792E-03
2.2133E-04	2.4448E-04	2.2355E-04	7.6510E-04	7.7264E-04	7.0542E-04	3.2772E-03	3.3153E-03	2.6916E-03
-7.9856E-05	-8.5440E-05	-8.0018E-05	-1.9412E-04	-1.9413E-04	-1.8292E-04	-5.5046E-04	-5.6474E-04	-4.6849E-04
-1.0873E-05	-1.1565E-05	-1.0864E-05	-2.3894E-05	-2.3764E-05	-2.2660E-05	-5.4585E-05	-5.6713E-05	-4.7475E-05
-7.3640E-07	-7.8353E-07	-7.3443E-07	-1.5789E-06	-1.5634E-06	-1.4994E-06	-3.1629E-06	-3.3228E-06	-2.7912E-06
2.5015E-08	2.6695E-08	2.4907E-08	5.4241E-08	5.3490E-08	5.1468E-08	9.9181E-08	1.0521E-07	8.8456E-08
-3.4145E-10	-3.6599E-10	-3.3939E-10	-7.6430E-10	-7.5069E-10	-7.2384E-10	-1.3017E-09	-1.3928E-09	-1.1704E-09

Dexter, NY			Danville, IN			Marietta, OH		
10 *PRNT QTYS*								
-6.7174E-03	-3.7751E-03	-1.5980E-03	-4.0309E-03	-4.1265E-03	-4.1105E-03	2.8291E-03	2.1060E-03	3.0638E-03
2.3530E-02	1.3491E-02	5.6924E-03	1.6100E-02	1.6346E-02	1.6302E-02	1.0684E-02	9.9763E-03	1.0822E-02
-3.6160E-02	-2.2726E-02	-1.2519E-02	-8.0744E-03	-8.0862E-03	-8.1521E-03	7.9670E-03	1.0843E-02	6.6580E-03
2.6291E-02	1.7300E-02	1.0859E-02	1.5927E-02	1.6100E-02	1.6056E-02	1.1549E-02	1.3974E-02	1.0099E-02
-1.1071E-02	-7.7040E-03	-5.3984E-03	-8.3898E-03	-8.5125E-03	-8.4749E-03	5.4359E-03	6.4370E-03	4.7418E-03
2.8010E-03	2.0494E-03	1.5438E-03	2.3108E-03	2.3517E-03	2.3413E-03	1.3836E-03	1.6214E-03	1.2038E-03
-4.3113E-04	-3.2746E-04	-2.5727E-04	-3.7405E-04	-3.8102E-04	-3.8011E-04	-2.1025E-04	-2.4456E-04	-1.8270E-04
4.0505E-05	3.1572E-05	2.5395E-05	3.6825E-05	3.7648E-05	3.7521E-05	1.9670E-05	2.2726E-05	1.7105E-05
-2.2668E-06	-1.7982E-06	-1.4646E-06	-2.1674E-06	-2.2196E-06	-2.2134E-06	-1.1111E-06	-1.2753E-06	-9.6870E-07
6.9438E-08	5.5732E-08	4.5657E-08	7.0026E-08	7.1816E-08	7.1658E-08	3.4698E-08	3.9570E-08	3.0358E-08
-8.9655E-10	-7.2516E-10	-5.9492E-10	-9.5422E-10	-9.7981E-10	-9.7818E-10	-4.5883E-10	-5.2028E-10	-4.0302E-10

Georgetown, DE			Toms River, NJ			Grottoes, VA		
19 *PRNT QTYS*								
-1.3130E-03	-1.3024E-03	-1.0006E-03	-5.2392E-03	-6.7768E-03	-6.9521E-03	-1.3329E-03	-1.2625E-03	-1.4862E-03
-2.6370E-03	-2.7962E-03	-1.8446E-03	-1.3838E-02	-1.4355E-02	-1.4616E-02	-2.6905E-03	-3.3005E-03	-3.2349E-03
4.8033E-04	7.8590E-04	3.0160E-03	3.2043E-03	1.6584E-03	1.6004E-03	9.8464E-04	2.8650E-03	1.0163E-03
-2.4803E-03	-3.7862E-03	-5.5211E-03	-6.2952E-03	-4.6311E-03	-4.6890E-03	-3.3493E-03	-5.9173E-03	-3.3765E-03
2.1317E-03	2.7385E-03	3.4636E-03	3.5499E-03	2.9088E-03	2.9853E-03	2.1222E-03	3.4630E-03	2.1003E-03
-7.4167E-04	-8.9597E-04	-1.0756E-03	-1.1385E-03	-1.0334E-03	-1.0664E-03	-6.4816E-04	-1.0156E-03	-6.3984E-04
1.3697E-04	1.5990E-04	1.8718E-04	2.1004E-04	2.0428E-04	2.1117E-04	1.1130E-04	1.6970E-04	1.1007E-04
-1.4645E-05	-1.6706E-05	-1.9253E-05	-2.2720E-05	-2.3164E-05	-2.3959E-05	-1.1303E-05	-1.6095E-05	-1.1198E-05
9.1095E-07	-1.0216E-06	-1.1548E-06	-1.4305E-06	-1.5100E-06	-1.5610E-06	-6.7567E-07	-9.9320E-07	-6.8871E-07
-3.0532E-08	-3.3861E-08	-3.8305E-08	-4.8652E-08	-5.2767E-08	-5.4579E-08	-2.1961E-08	-3.1052E-08	-2.1686E-08
4.2866E-10	4.6959E-10	5.2709E-10	6.9154E-10	7.6656E-10	7.9292E-10	2.9975E-10	4.2976E-10	2.9494E-10

Bluefield, WV			Baseline, Day 154			Baseline, Day 188		
28 *PRNT QTYS*								
6.5437E-04	1.2106E-03	8.5988E-04	-4.4351E-03	-3.9046E-03	-4.1126E-03	-3.5331E-03	-6.9403E-04	-3.7957E-03
3.3769E-03	4.7479E-03	4.0054E-03	-9.0861E-03	-1.0735E-02	-8.8757E-03	-1.4984E-02	-5.6039E-03	-1.5127E-02
-6.7831E-04	-4.9894E-04	-3.9922E-04	-4.6574E-03	-5.6851E-03	-5.3829E-03	-1.3213E-02	-3.3442E-02	-1.2556E-02
-1.0320E-02	-8.7029E-03	-8.9494E-03	-1.8237E-03	-4.1140E-03	-1.6092E-03	-8.3479E-03	-2.3087E-02	-7.4110E-03
6.9120E-03	5.9765E-03	5.9190E-03	-1.4264E-03	-3.0715E-03	-1.3511E-03	-4.4154E-03	-1.0817E-02	-3.8149E-03
-2.0107E-03	-1.7418E-03	-1.7107E-03	-7.4067E-04	-1.3155E-03	-7.7304E-04	-1.7026E-03	-3.2045E-03	-1.5691E-03
3.2029E-04	2.7602E-04	2.7169E-04	-1.6482E-04	-2.7431E-04	-1.7838E-04	-3.4979E-04	-5.4917E-04	-3.2906E-04
-2.9879E-05	-2.5486E-05	-2.5256E-05	-1.8683E-05	-3.0697E-05	-2.0609E-05	-3.9240E-05	-5.4751E-05	-3.7297E-05
1.6263E-06	1.3664E-06	1.3663E-06	1.1529E-06	1.9129E-06	1.2870E-06	2.4560E-06	3.1555E-06	2.3479E-06
-4.7781E-08	-3.9342E-08	-3.9761E-08	-3.7157E-08	-6.2950E-08	-4.1801E-08	-8.1097E-08	-9.7802E-08	-7.7765E-08
5.8474E-10	4.6912E-10	4.8015E-10	4.9226E-10	8.5619E-10	5.5634E-10	1.1039E-09	1.2603E-09	1.0609E-09

Table D-7

Polynomial Coefficients for I Data Taken at NAVOBSY

Wilmington, NC

1 *PRNT ITOS*

1.7482E-03	1.9587E-03	1.6070E-03	1.1031E-03	1.2454E-03	1.6197E-03	1.3387E-03	1.0556E-03	1.2417E-03
1.4555E-02	1.4908E-02	1.4273E-02	1.4699E-02	1.5607E-02	1.6303E-02	1.1767E-02	1.0801E-02	1.1607E-02
2.5907E-02	2.4069E-02	2.6978E-02	3.5259E-02	3.0782E-02	2.8636E-02	2.3218E-02	2.5329E-02	2.4522E-02
-1.4956E-02	-1.3137E-02	-1.6430E-02	-2.0914E-02	-1.8272E-02	-1.5780E-02	-8.9834E-03	-9.7523E-03	-9.8567E-03
1.4947E-02	1.4102E-02	1.5620E-02	1.6741E-02	1.5460E-02	1.4418E-02	1.1011E-02	1.1051E-02	1.1352E-02
-5.5570E-03	-5.3370E-03	-5.7198E-03	-5.8696E-03	-5.4973E-03	-5.2627E-03	-4.3646E-3	-4.3275E-03	-4.4456E-03
1.0291E-03	9.9500E-04	1.0527E-03	1.0719E-03	1.0085E-03	9.7713E-04	8.3360E-04	8.2341E-04	8.4554E-04
-1.0801E-04	-1.0485E-04	-1.1015E-04	-1.1203E-04	-1.0635E-04	-1.0381E-04	-8.9235E-05	-8.7997E-05	-9.0305E-05
6.5409E-06	6.3672E-06	6.6594E-06	6.8969E-06	6.5074E-06	6.3857E-06	5.4738E-06	5.3928E-06	5.5200E-06
-2.1296E-07	-2.0778E-07	-2.1663E-07	-2.2708E-07	-2.1442E-07	-2.1124E-07	-1.7961E-07	-1.7694E-07	-1.8118E-07
2.9857E-09	2.8207E-09	2.9341E-09	3.1110E-09	2.9393E-09	2.9048E-09	2.4434E-09	2.4042E-09	2.4619E-09

Emporia, VA

Towanda, PA

Dexter, NY

10 *PRNT ITOS*

2.2486E-03	3.3666E-03	3.6162E-03	5.2939E-03	6.6210E-03	8.4452E-03	4.2960E-03	3.3230E-03	2.8399E-03
1.6296E-02	1.6197E-02	1.6786E-02	2.7721E-02	3.0742E-02	3.8527E-02	2.2940E-02	1.8483E-02	1.6615E-02
2.3849E-02	1.5674E-02	1.5266E-02	4.2859E-02	4.2017E-02	5.3039E-02	3.4318E-02	2.7974E-02	2.5955E-02
-1.4670E-02	-3.5033E-03	-3.7719E-03	-1.9176E-02	-1.6560E-02	-2.3228E-02	-1.2041E-02	-8.0298E-03	-6.9231E-03
1.5537E-02	9.3537E-03	9.6403E-03	7.6750E-03	6.3063E-03	8.4971E-03	4.7192E-03	3.3384E-03	2.9603E-03
-5.8216E-03	-4.0544E-03	-4.1483E-03	-1.9503E-03	-1.6008E-03	-2.0334E-03	-1.2756E-03	-9.8066E-04	-9.0560E-04
1.0790E-03	7.8980E-04	8.0546E-04	3.0237E-04	2.5104E-04	3.0474E-04	2.1013E-04	1.7269E-04	1.6085E-04
-1.1314E-04	-8.4958E-05	-8.6443E-05	-2.9067E-05	-2.4510E-05	-2.8733E-05	-2.1328E-05	-1.8263E-05	-1.7199E-05
6.8407E-06	5.2235E-06	5.3044E-06	1.6853E-06	1.4449E-06	1.6473E-06	1.2960E-06	1.1416E-06	1.0808E-06
-2.2235E-07	-1.7191E-07	-1.7427E-07	-5.3680E-08	-4.6695E-08	-5.2116E-08	-4.2024E-08	-3.8581E-08	-3.6706E-08
3.0083E-09	2.3484E-09	2.3771E-09	7.1868E-10	6.3236E-10	6.9463E-10	5.9326E-10	5.4112E-10	5.1951E-10

Danville, IN

Marietta, OH

Georgetown, DE

19 *PRNT ITOS*

8.0742E-03	-5.0609E-03	-5.2396E-03	6.5168E-03	1.5277E-03	4.0112E-03	7.3510E-03	7.1135E-03	3.7115E-03
-3.5413E-02	3.0184E-04	3.6843E-04	1.4939E-02	1.2705E-02	1.9270E-02	1.5297E-02	1.5740E-02	1.7142E-02
4.5722E-02	7.4286E-03	7.6320E-03	9.1417E-03	2.5012E-02	1.9284E-02	9.8329E-03	1.0353E-02	1.7311E-02
-1.7544E-02	-3.8400E-03	-3.8184E-03	-3.1766E-03	-5.0630E-03	-6.9290E-03	-4.0296E-03	-3.8390E-03	-3.3110E-03
6.2274E-03	-7.6263E-04	-7.7839E-04	-1.7830E-03	-3.2557E-03	-6.1643E-03	-1.1024E-03	-1.2699E-03	-4.1126E-03
-1.5044E-03	-8.9113E-05	-8.0617E-05	-1.0620E-03	-9.6130E-04	-2.0318E-03	-8.2472E-04	-9.8638E-04	-1.5026E-03
2.2793E-04	-4.6529E-05	-4.4664E-05	-2.1484E-04	-1.3852E-04	-3.3464E-04	-1.7274E-04	-1.8414E-04	-2.6448E-04
-2.1792E-05	-7.0624E-06	-6.8418E-06	-2.3387E-05	-1.1414E-05	-3.1788E-05	-1.9230E-05	-2.0428E-05	-2.6073E-05
1.2713E-06	-5.3690E-07	-5.2209E-07	-1.4564E-06	-5.5169E-07	-1.7711E-06	-1.2214E-06	-1.2941E-06	-1.6049E-06
-4.0984E-08	-2.0471E-08	-1.9936E-08	-4.8627E-08	-1.4436E-08	-5.3669E-08	-4.1440E-08	-4.3816E-08	-5.2075E-08
5.5644E-10	3.1074E-10	3.0273E-10	6.7378E-10	1.5566E-10	6.8158E-10	5.8096E-10	6.1332E-10	7.0612E-10

Toms River, NJ

Grottoes, VA

Bluefield, WV

28 *PRNT ITOS*

4.2838E-03	3.1134E-03	5.6612E-03	1.1134E-03	1.5423E-03	1.4380E-03	5.6090E-04	6.6502E-04	8.4849E-04
1.9906E-02	1.7555E-02	1.9036E-02	1.5079E-02	1.5764E-02	1.4990E-02	8.3104E-03	8.3000E-03	9.4546E-03
1.8379E-02	1.9947E-02	1.1512E-02	2.8592E-02	2.8731E-02	2.9470E-02	2.0484E-02	1.8351E-02	1.9042E-02
-8.1899E-03	-1.1227E-02	-4.4103E-03	-1.7382E-02	-1.7723E-02	-1.7847E-02	-5.2301E-03	-3.1031E-03	-4.4633E-03
6.9522E-03	8.3787E-03	5.8737E-03	1.4649E-02	1.5772E-02	1.5701E-02	8.9847E-03	7.7594E-03	8.9113E-03
-2.2686E-03	-2.5971E-03	-2.0681E-03	-5.1223E-03	-5.6141E-03	-5.5773E-03	-3.7175E-03	-3.4101E-03	-3.8036E-03
3.7859E-04	4.2357E-04	3.5463E-04	9.2581E-04	1.0213E-03	1.0133E-03	7.1714E-04	6.6943E-04	7.3022E-04
-3.6035E-05	-4.0686E-05	-3.5059E-05	-9.6544E-05	-1.0660E-04	-1.0562E-04	-7.6804E-05	-7.2377E-05	-7.8653E-05
2.1135E-06	2.3161E-06	2.0359E-06	5.8610E-06	6.4591E-06	6.3913E-06	4.7098E-06	4.4658E-06	4.9015E-06
-6.6153E-08	-7.2143E-08	-6.4351E-08	-1.9200E-07	-2.1100E-07	-2.0851E-07	-1.5470E-07	-1.4734E-07	-1.6139E-07
8.6949E-10	9.4567E-10	8.5289E-10	2.6226E-09	2.8712E-09	2.8339E-09	2.1100E-09	2.0162E-09	2.2048E-09

Baseline, Day 154

Baseline, Day 188

Table D-8

Polynomial Coefficients for I Data Taken at Field Sites

Wilmington, NC

1 PRNT ITVS

2.4853E-03	2.5646E-03	2.3592E-03	1.6893E-03	1.4032E-03	1.6988E-03	1.6050E-03	5.7895E-04	1.7228E-03
1.4024E-02	1.4122E-02	1.3983E-02	1.5329E-02	1.4421E-02	1.5201E-02	1.2298E-02	8.3556E-03	1.2695E-02
1.7032E-02	1.6789E-02	1.7641E-02	2.4689E-02	2.4353E-02	2.3387E-02	1.9738E-02	2.3201E-02	2.0590E-02
-2.0582E-03	-1.7958E-03	-2.8273E-03	-8.1516E-03	-8.7060E-03	-7.9938E-03	-5.6976E-03	-8.5795E-03	-8.1551E-03
7.3477E-03	7.2077E-03	7.6055E-03	9.7695E-03	9.7663E-03	9.4379E-03	7.4970E-03	8.4347E-03	8.4910E-03
-3.4020E-03	-3.3630E-03	-3.4420E-03	-3.9279E-03	-3.8499E-03	-3.7985E-03	-2.9299E-03	-3.2199E-03	-3.2703E-03
6.8541E-04	6.7922E-04	6.8825E-04	7.6165E-04	7.3944E-04	7.3557E-04	5.5021E-04	6.0750E-04	6.2150E-04
-7.5355E-05	-7.4759E-05	-7.5371E-05	-8.3068E-05	-8.0109E-05	-8.0108E-05	-5.9544E-05	-6.4858E-05	-6.6805E-05
4.7050E-06	4.6721E-06	4.6943E-06	5.2042E-06	5.0027E-06	5.0133E-06	3.6680E-06	3.9860E-06	4.1317E-06
-1.5661E-07	-1.5560E-07	-1.5599E-07	-1.7450E-07	-1.6730E-07	-1.6798E-07	-1.2111E-07	-1.3132E-07	-1.3689E-07
2.1580E-09	2.1450E-09	2.1467E-09	2.4241E-09	2.3198E-09	2.3325E-09	1.6589E-09	1.7950E-09	1.8804E-09

Emporia, VA

Towanda, PA

Dexter, NY

10 PRNT ITVS

2.9108E-03	3.2075E-03	3.7845E-03	8.0026E-04	7.1190E-04	6.8315E-04	-1.1644E-02	-1.0571E-02	-1.0551E-02
7.1631E-03	5.8661E-03	5.0598E-03	1.0275E-02	9.9395E-03	9.8966E-03	1.6312E-04	1.4095E-03	1.4020E-03
1.0356E-03	2.5326E-03	3.2425E-03	2.7090E-02	2.7835E-02	2.8496E-02	-1.2031E-02	-1.1308E-02	-1.1356E-02
6.5915E-03	5.6667E-03	5.1430E-03	8.7530E-03	9.0520E-03	9.6061E-03	8.1263E-03	8.1786E-03	8.0430E-03
-1.1274E-03	-8.0532E-04	-5.1603E-04	7.6500E-03	7.7273E-03	7.9475E-03	1.4480E-03	1.3524E-03	1.2760E-03
-2.2265E-04	-2.9316E-04	-3.7974E-04	-2.8835E-03	-2.9000E-03	-2.9513E-03	-2.7690E-04	-3.1534E-04	-3.3672E-04
9.4874E-05	1.0471E-04	1.1980E-04	5.4991E-04	5.5280E-04	5.6016E-04	1.1722E-04	1.2406E-04	1.2738E-04
-1.3485E-05	-1.4348E-05	-1.5912E-05	-5.9932E-05	-6.0267E-05	-6.0929E-05	-1.6741E-05	-1.7411E-05	-1.7707E-05
9.7392E-07	1.0198E-06	1.1148E-06	3.7694E-06	3.7922E-06	3.8285E-06	1.2148E-06	1.2522E-06	1.2671E-06
-3.5734E-08	-3.7086E-08	-4.0211E-08	-1.2689E-07	-1.2771E-07	-1.2882E-07	-4.4505E-08	-4.5625E-08	-4.6025E-08
5.2822E-10	5.4519E-10	5.8813E-10	1.7670E-09	1.7791E-09	1.7930E-09	6.5219E-10	6.6615E-10	6.7056E-10

Danville, IN

Marietta, OH

Georgetown, DE

19 PRNT ITVS

2.1619E-03	3.0979E-03	3.7308E-03	4.2881E-03	4.9403E-03	4.8574E-03	7.3645E-03	7.6356E-03	7.1943E-03
2.0462E-03	6.0207E-04	-8.1864E-04	1.5901E-02	1.8273E-02	1.8563E-02	3.3444E-03	3.1567E-03	3.4301E-03
4.5906E-03	4.6532E-03	5.2188E-03	1.4666E-02	1.6127E-02	1.6758E-02	7.5294E-03	8.3057E-03	8.6403E-03
2.8346E-03	3.3746E-03	3.7270E-03	1.9415E-03	8.5970E-04	5.5314E-04	3.6038E-03	3.5853E-03	3.1610E-03
-6.8058E-04	-9.2968E-04	-1.2209E-03	-2.5311E-03	-3.2003E-03	-3.3442E-03	-7.1438E-04	-8.7992E-04	-7.1848E-04
-6.5055E-06	4.0090E-05	1.3128E-04	-1.3075E-03	-1.5537E-03	-1.5946E-03	-4.6293E-05	-3.0014E-05	-3.0080E-05
2.1532E-05	-1.7926E-05	-1.5440E-06	2.5787E-04	3.0525E-04	3.1214E-04	2.9591E-05	1.3432E-05	1.7479E-05
-3.5873E-06	-3.6955E-06	-1.9220E-06	-2.7733E-05	-3.2967E-05	-3.3073E-05	-4.5160E-06	-2.6500E-06	-2.9484E-06
2.9357E-07	3.1244E-07	1.0950E-07	1.7119E-06	2.0444E-06	2.0875E-06	3.4597E-07	2.2496E-07	2.3750E-07
-1.2452E-08	-1.2555E-08	-8.6672E-09	-5.6735E-08	-6.8004E-08	-6.9447E-08	-1.3355E-08	-9.1901E-09	-9.4772E-09
1.7614E-10	1.9638E-10	1.4066E-10	7.8093E-10	9.3877E-10	9.5901E-10	2.0566E-10	1.4669E-10	1.4911E-10

Toms River, NJ

Grottoes, VA

Bluefield, WV

28 PRNT ITVS

4.8293E-04	5.0214E-04	5.2014E-04	1.6840E-03	1.9950E-03	2.4990E-03	5.0787E-04	3.8210E-03	6.7305E-04
5.7785E-03	5.5543E-03	5.5717E-03	1.4593E-02	1.5639E-02	1.6152E-02	8.8654E-03	3.0507E-02	1.0010E-02
1.6323E-02	1.4922E-02	1.4034E-02	2.3422E-02	2.3193E-02	1.9372E-02	2.5908E-02	7.0694E-02	2.6145E-02
-8.0339E-03	-7.0956E-03	-6.4674E-03	-1.1913E-02	-1.1819E-02	-8.5956E-03	-1.1306E-02	-5.5011E-02	-1.2396E-02
2.3690E-03	1.9922E-03	1.8280E-03	1.0904E-02	1.1529E-02	1.0321E-02	1.1718E-02	3.0307E-02	1.2662E-02
-2.2030E-04	-1.2059E-04	-1.1920E-04	-3.9276E-03	-4.2136E-03	-3.9679E-03	-4.4409E-03	-8.6081E-03	-4.7805E-03
-2.6022E-05	-3.9040E-05	-3.6880E-05	-7.1897E-04	-7.7315E-04	-7.4348E-04	-8.3075E-04	-1.3703E-03	-8.9221E-04
7.3752E-06	8.4655E-06	7.8271E-06	7.5627E-05	8.1103E-05	7.8914E-05	8.7626E-05	1.3094E-04	9.4152E-05
-6.4783E-07	-7.0036E-07	-6.5439E-07	-4.6247E-06	-4.9348E-06	-4.8387E-06	-5.3202E-06	-7.3663E-06	-5.7267E-06
2.6071E-08	2.7462E-08	2.5595E-08	1.5250E-07	1.6179E-07	1.5952E-07	1.7392E-07	2.2614E-07	1.8707E-07
-4.0750E-10	-4.2257E-10	-3.9352E-10	2.0934E-09	2.2082E-09	2.1865E-09	2.3616E-09	2.9184E-09	2.5403E-09

Baseline, Day 154

Baseline, Day 188

Table D-9

Polynomial Coefficients for Q Data Taken at NAVOBSY

Wilmington, NC

1 PRNT QTO3

-1.2595E-03	-9.3945E-04	-1.5598E-03	-4.1563E-03	-6.1338E-03	-5.6897E-03	-1.8711E-03
-7.2011E-03	-6.6493E-03	-7.0722E-03	-9.4123E-03	-5.0188E-03	-5.8593E-03	-1.1442E-02
-7.5490E-03	-9.3151E-03	-5.2996E-03	-8.7409E-04	-6.4841E-04	-7.8373E-04	-1.2846E-02
6.8466E-03	8.1224E-03	4.2266E-03	2.4433E-05	2.9106E-03	2.4983E-03	1.3142E-02
2.8798E-03	3.2981E-03	1.6024E-03	4.6916E-04	2.3062E-03	2.1199E-03	5.0605E-03
1.0460E-03	1.1196E-03	7.0524E-04	1.5970E-04	3.8544E-04	3.4501E-04	1.4061E-03
2.2189E-04	2.2927E-04	1.6798E-04	7.9812E-05	1.1602E-05	1.1456E-06	2.5277E-04
2.5638E-05	2.6264E-05	2.0666E-05	1.1797E-05	2.6824E-06	2.8761E-06	2.7129E-05
1.6712E-06	1.6851E-06	1.3762E-06	8.4573E-07	3.0911E-07	3.0480E-07	1.5845E-06
5.6872E-08	5.7112E-08	4.7670E-08	3.0594E-08	1.3336E-08	1.2684E-08	5.6100E-08
7.9822E-10	8.0015E-10	6.7740E-10	4.5080E-10	2.1685E-10	2.0121E-10	7.7762E-10

-1.4140E-03	-1.5735E-03					
-1.1357E-02	-1.1188E-02					
-1.7849E-02	-1.5260E-02					
1.8959E-02	1.5500E-02					
7.9039E-03	6.1156E-03					
2.1574E-03	1.6555E-03					
3.7032E-04	2.8748E-04					
3.8337E-05	3.0059E-05					
2.3241E-06	1.8321E-06					
7.8193E-08	6.0180E-08					
1.0450E-09	8.2543E-10					

Towanda, PA

-1.8711E-03	-1.4140E-03	-1.5735E-03				
-1.1442E-02	-1.1357E-02	-1.1188E-02				
-1.2846E-02	-1.7849E-02	-1.5260E-02				
1.3142E-02	1.8959E-02	1.5500E-02				
5.0605E-03	7.9039E-03	6.1156E-03				
1.4061E-03	2.1574E-03	1.6555E-03				
2.5277E-04	3.7032E-04	2.8748E-04				
2.7129E-05	3.8337E-05	3.0059E-05				
1.5845E-06	2.3241E-06	1.8321E-06				
5.6100E-08	7.8193E-08	6.0180E-08				
7.7762E-10	1.0450E-09	8.2543E-10				

Dexter, NY

10 PRNT QTO3

-2.3977E-03	-3.2992E-05	-2.6228E-05	-1.3167E-04	-4.1657E-05	-4.4961E-04	-1.3971E-03
-6.2160E-03	-4.3453E-03	-4.3246E-03	-1.6743E-07	-1.7143E-03	-5.2563E-03	-5.7159E-03
-1.9243E-03	-1.7291E-02	-1.7069E-02	-6.4241E-03	-1.1940E-02	-1.6120E-02	-2.0484E-04
1.0626E-04	1.6445E-02	1.6222E-02	6.5836E-03	1.1946E-02	1.4085E-02	5.1187E-03
2.9243E-04	7.1578E-03	7.0523E-03	2.8677E-03	5.3621E-03	5.9205E-03	3.3877E-03
2.2240E-04	2.0421E-03	2.0088E-03	7.0277E-04	1.3540E-03	1.4260E-03	1.0573E-03
9.5429E-05	3.5441E-04	3.4758E-04	1.0556E-04	2.0777E-04	2.1034E-04	1.8670E-04
1.4027E-05	3.6197E-05	3.5334E-05	9.9514E-06	1.9784E-05	1.9363E-05	1.9644E-05
1.0110E-06	2.1341E-06	2.0704E-06	5.7343E-07	1.1404E-06	1.0840E-06	1.2103E-06
3.6540E-08	6.7405E-08	6.5003E-08	1.8395E-08	3.6378E-08	3.3792E-08	4.1167E-08
5.3284E-10	8.8967E-10	8.4973E-10	2.5097E-10	4.9211E-10	4.4825E-10	5.8250E-10

-1.3971E-03	-1.3402E-03	-2.0973E-03				
-5.7159E-03	-5.5634E-03	-5.0268E-03				
-2.0484E-04	-4.3191E-04	-1.3716E-03				
5.1187E-03	5.4122E-03	2.8105E-03				
3.3877E-03	3.5502E-03	2.1576E-03				
1.0573E-03	1.1044E-03	7.1296E-04				
1.8670E-04	1.9358E-04	1.3042E-04				
1.9644E-05	2.0209E-05	1.4079E-05				
1.2103E-06	1.2445E-06	8.9114E-07				
4.1167E-08	4.1702E-08	3.0542E-08				
5.8250E-10	5.8585E-10	4.3710E-10				

Georgetown, DE

19 PRNT QTO3

-3.2012E-04	-1.2297E-04	-1.1035E-04	-7.2701E-03	-1.7337E-03	-3.0336E-03	-4.6661E-03
-9.6951E-04	-1.1357E-03	-1.4324E-03	-5.3261E-03	-1.4036E-02	-1.4029E-02	-9.8001E-03
-7.5819E-03	-6.4775E-03	-5.1032E-03	-5.3940E-04	-2.0236E-02	-7.2593E-03	-2.4551E-04
9.0407E-03	9.0412E-03	7.9142E-03	4.7802E-04	3.1255E-02	1.8565E-02	4.4590E-03
4.6942E-03	4.8123E-03	4.4061E-03	1.3905E-04	1.5933E-02	1.1048E-02	2.5680E-03
1.3206E-03	1.3529E-03	1.2710E-03	1.4015E-05	4.3855E-03	3.3998E-03	8.3526E-04
2.1864E-04	2.2255E-04	2.1225E-04	6.7612E-06	7.0602E-04	5.9727E-04	1.5818E-04
2.1961E-05	2.2202E-05	2.1368E-05	1.4186E-06	6.8550E-05	6.2024E-05	1.7584E-05
1.3150E-06	1.3221E-06	1.2795E-06	1.1670E-07	3.9508E-06	3.7725E-06	1.1369E-06
4.3225E-08	4.3181E-08	4.1933E-08	4.6380E-09	1.2455E-07	1.2437E-07	3.9677E-08
5.9548E-10	5.9462E-10	5.7860E-10	7.3987E-11	1.6540E-09	1.7160E-09	5.7819E-10

-4.5605E-03	-5.4345E-03	-5.6495E-03				
-9.7031E-03	-9.7031E-03	-1.2712E-02				
-1.5153E-04	-7.5153E-04	-1.0289E-03				
3.4765E-03	7.2440E-03	7.2440E-03				
1.9465E-03	4.7855E-03	4.7855E-03				
6.5314E-04	1.5632E-03	1.5632E-03				
1.2844E-04	2.8759E-04	2.8759E-04				
1.4697E-05	3.1022E-05	3.1022E-05				
9.7095E-07	1.9524E-06	1.9524E-06				
3.4458E-08	6.8495E-08	6.8495E-08				
5.0900E-10	9.4766E-10	9.4766E-10				

Bluefield, WV

28 PRNT QTO3

-3.6094E-03	-2.2994E-03	-2.4392E-03	-6.6624E-03	-5.1991E-03	-4.1849E-03	-4.2614E-03
-6.9975E-03	-6.3985E-03	-4.7182E-03	-3.3988E-03	-7.2804E-03	-8.1927E-03	-1.2787E-02
-2.5307E-03	-2.5559E-03	-2.0848E-03	-2.2263E-03	-7.3886E-04	-1.4523E-03	-6.4460E-03
1.0008E-03	1.9859E-03	6.7751E-04	-2.3593E-03	-2.0827E-03	-1.0204E-03	3.0929E-03
1.1940E-03	3.1250E-04	9.1007E-04	-2.3698E-03	-1.8945E-03	-1.3784E-03	5.8409E-04
5.3631E-04	2.5950E-04	3.8843E-04	4.7708E-04	2.6628E-04	1.3168E-04	1.6756E-04
9.9291E-05	5.2931E-05	6.8031E-05	3.5914E-05	1.0074E-05	3.0451E-05	2.0325E-06
1.0076E-05	5.4613E-06	6.4104E-06	4.7926E-07	5.0230E-06	6.8456E-06	2.4049E-06
5.8164E-07	3.0773E-07	3.3428E-07	8.3269E-08	4.5274E-07	5.4706E-07	2.0311E-07
1.7823E-08	8.8787E-09	8.8727E-09	4.8433E-09	1.7941E-08	2.0540E-08	5.6003E-09
2.2445E-10	1.0059E-10	8.9864E-11	8.5385E-11	2.7664E-10	3.0505E-10	7.6501E-11

-4.2684E-03	-4.5071E-03					
-1.2531E-02	-1.2140E-02					
-6.6188E-03	-6.2010E-03					
2.9056E-03	1.8014E-03					
9.4243E-04	1.5572E-03					
2.9325E-04	4.2910E-04					
2.2812E-05	4.0826E-05					
6.1672E-07	1.7963E-06					
1.1586E-08	4.5862E-08					
1.3183E-09	1.3053E-09					
4.4438E-11	2.9298E-11					

Baseline, Day 154

-5.1991E-03	-4.1849E-03	-4.2614E-03				
-7.2804E-03	-8.1927E-03	-1.2787E-02				
-7.3886E-04	-1.4523E-03	-6.4460E-03				
-2.0827E-03	-1.0204E-03	3.0929E-03				
-1.8945E-03	-1.3784E-03	5.8409E-04				
2.6628E-04	1.3168E-04	1.6756E-04				
1.0074E-05	3.0451E-05	2.0325E-06				
5.0230E-06	6.8456E-06	2.4049E-06				
4.5274E-07	5.4706E-07	2.0311E-07				
1.7941E-08	2.0540E-08	5.6003E-09				
2.7664E-10	3.0505E-10	7.6501E-11				

Baseline, Day 188

-4.2684E-03	-4.5071E-03					
-1.2531E-02	-1.2140E-02					
-6.6188E-03	-6.2010E-03					
2.9056E-03	1.8014E-03					
9.4243E-04	1.5572E-03					
2.9325E-04	4.2910E-04					
2.2812E-05	4.0826E-05					
6.1672E-07	1.7963E-06					
1.1586E-08	4.5862E-08					
1.3183E-09	1.3053E-09					
4.4438E-11	2.9298E-11					

Table D-10

Polynomial Coefficients for I Data Taken at Field Sites

Wilmington, NC

1 PRNT QTV3

-3.7641E-03	-3.7700E-03	-3.7418E-03	-6.1952E-03	-5.9527E-03	-6.1631E-03	-1.1499E-04	-1.3261E-04	-1.0949E-03
-7.2934E-03	-7.2705E-03	-7.0812E-03	-8.2006E-03	-7.5142E-03	-7.3999E-03	-3.1545E-03	-3.2564E-03	-7.3883E-03
-3.2727E-03	-3.2072E-03	-3.1576E-03	-8.3854E-04	-9.1415E-04	-1.1034E-03	-1.6722E-02	-1.6865E-02	-8.2573E-03
4.3767E-04	4.3905E-04	3.0173E-04	-4.2704E-04	-5.1266E-04	-5.8810E-04	-1.9758E-02	-1.9311E-02	-1.3210E-02
-1.3034E-03	-1.2541E-03	-1.3386E-03	-9.1858E-04	-9.1987E-04	-1.0499E-03	-9.8916E-03	-9.5702E-03	-7.2076E-03
-3.5106E-04	-3.2496E-04	-3.5548E-04	-3.8374E-05	-3.2238E-05	-8.2203E-05	-2.8137E-03	-2.7493E-03	-2.1737E-03
-3.6801E-05	-3.0863E-05	-3.7097E-05	-3.7294E-05	-3.8478E-05	-2.9229E-05	-4.6745E-04	-4.6327E-04	-3.7403E-04
-2.0094E-06	-1.2914E-06	-2.0182E-06	-6.7718E-06	-6.8696E-06	-5.8941E-06	-4.6011E-05	-4.6221E-05	-3.7503E-05
-5.9286E-08	-2.0990E-08	-6.9263E-08	-5.0744E-07	-5.1046E-07	-4.5107E-07	-2.6480E-06	-2.6920E-06	-2.1909E-06
-1.8175E-09	-1.0803E-10	-1.8135E-09	-1.8380E-08	-1.8346E-08	-1.6399E-08	-8.2500E-08	-8.4827E-08	-6.8853E-08
2.8343E-11	3.4716E-12	2.8385E-11	-2.6710E-10	-2.6439E-10	-2.3777E-10	-1.0769E-09	-1.1181E-09	-9.0427E-10

Dexter, NY

10 PRNT QTV3

-6.2831E-03	-3.4243E-03	-1.3055E-03	-4.1384E-03	-4.2444E-03	-4.2311E-03	2.0922E-03	1.4298E-03	2.3952E-03
-2.3219E-02	-1.3385E-02	-5.7550E-03	-1.5460E-02	-1.5720E-02	-1.5671E-02	1.0804E-02	1.0074E-02	1.0814E-02
-3.5226E-02	-2.1985E-02	-1.1373E-02	-5.6092E-03	-5.5312E-03	-5.5220E-03	6.6421E-03	9.4555E-03	5.4245E-03
-2.6210E-02	-1.7313E-02	-1.0941E-02	-1.4910E-02	-1.5042E-02	-1.4949E-02	-1.1857E-02	-1.4237E-02	-1.0444E-02
-1.0981E-02	-7.6371E-03	-5.3461E-03	-7.7047E-03	-7.8105E-03	-7.7495E-03	-5.4484E-03	-6.4267E-03	-4.7543E-03
-2.7559E-03	-2.0071E-03	-1.5030E-03	-2.0768E-03	-2.1129E-03	-2.0961E-03	-1.3455E-03	-1.5767E-03	-1.1630E-03
-4.2151E-04	-3.1794E-04	-2.4778E-04	-3.3133E-04	-3.3807E-04	-3.3552E-04	-1.9958E-04	-2.3284E-04	-1.7137E-04
-3.9397E-05	-3.0451E-05	-2.4263E-05	-3.2288E-05	-3.3023E-05	-3.2793E-05	-1.8293E-05	-2.1251E-05	-1.5652E-05
-2.1948E-06	-1.7245E-06	-1.3897E-06	-1.8870E-06	-1.9337E-06	-1.9215E-06	-1.0157E-06	-1.1744E-06	-8.6850E-07
-6.6953E-08	-5.3101E-08	-4.3050E-08	-6.0710E-08	-6.2314E-08	-6.1964E-08	-3.1290E-08	-3.6000E-08	-2.6794E-08
-8.6145E-10	-6.8887E-10	-5.5772E-10	-8.2585E-10	-9.4885E-10	-8.4463E-10	-4.0973E-10	-4.6912E-10	-3.5182E-10

Georgetown, DE

19 PRNT QTV3

-1.2320E-03	-1.1425E-03	-7.8471E-04	-4.9479E-03	-6.3966E-03	-6.5798E-03	-1.1918E-03	-1.0722E-03	-1.3067E-03
-2.5313E-03	-2.7641E-03	-1.9439E-03	-1.2060E-02	-1.2196E-02	-1.2401E-02	-2.6274E-03	-3.2372E-03	-3.1486E-03
7.4381E-04	3.9741E-04	-2.5150E-03	-1.2447E-03	4.1599E-04	5.6093E-04	-7.9881E-04	-2.5648E-03	-7.4099E-04
-2.5442E-03	-3.8750E-03	-5.6039E-03	-6.2120E-03	-4.5194E-03	-4.5372E-03	-3.3941E-03	-5.9518E-03	-3.4239E-03
-2.1337E-03	-2.7467E-03	-3.4795E-03	-3.1653E-03	-2.4544E-03	-2.5083E-03	-2.1259E-03	-3.4037E-03	-2.1052E-03
-7.3475E-04	-8.8782E-04	-1.0706E-03	-9.6947E-04	-8.3392E-04	-8.5997E-04	-6.4495E-04	-1.0118E-03	-6.3674E-04
-1.3512E-04	-1.5747E-04	-1.8534E-04	-1.7811E-04	-1.6620E-04	-1.7191E-04	-1.1042E-04	-1.6878E-04	-1.0923E-04
-1.4411E-05	-1.6382E-05	-1.9003E-05	-1.9369E-05	-1.9124E-05	-1.9797E-05	-1.1197E-05	-1.6785E-05	-1.1093E-05
-8.9477E-07	-9.9844E-07	-1.1467E-06	-1.2275E-06	-1.2630E-06	-1.3077E-06	-6.5788E-07	-9.8568E-07	-6.6129E-07
-3.0011E-08	-3.3014E-08	-3.7639E-08	-4.2032E-08	-4.4658E-08	-4.6230E-08	-2.1676E-08	-3.1577E-08	-2.1412E-08
-4.2024E-10	-4.5712E-10	-5.1811E-10	-6.0174E-10	-6.5610E-10	-6.7909E-10	-2.9552E-10	-4.2570E-10	-2.9085E-10

Bluefield, WV

28 PRNT QTV3

8.2150E-04	1.3777E-03	1.0241E-03	-4.2447E-03	-3.7031E-03	-3.7568E-03	-3.7975E-03	-2.5585E-04	-4.0051E-03
4.5061E-03	5.4372E-03	4.8024E-03	-6.3608E-03	-7.7941E-03	-5.8637E-03	-1.2837E-02	-4.5564E-03	-1.2651E-02
2.2805E-03	7.8364E-04	1.6714E-03	-4.2965E-04	-1.2212E-03	-1.7341E-03	-5.8402E-03	-1.0630E-02	-5.3681E-03
-1.0723E-02	-9.0317E-03	-9.2207E-03	-2.6884E-04	-1.7976E-03	-7.1514E-05	-5.1074E-03	-5.8379E-03	-4.0391E-03
-5.9507E-03	-6.0065E-03	-5.9293E-03	-5.4530E-04	-8.5341E-04	-5.6958E-04	-1.3000E-03	-1.4208E-03	-6.2147E-04
-1.9779E-03	-1.7129E-03	-1.6770E-03	-2.2357E-05	-5.0684E-04	-2.5180E-05	-5.2820E-04	-5.3175E-04	-3.2467E-04
-3.0844E-04	-2.6579E-04	-2.6069E-04	-3.2934E-05	-1.2635E-04	-3.7772E-05	-1.3007E-04	-1.2116E-04	-9.6477E-05
-2.8201E-05	-2.4050E-05	-2.3745E-05	-4.8205E-06	-1.5243E-05	-5.6931E-06	-1.6223E-05	-1.4037E-05	-1.2775E-05
-1.5053E-06	-1.2634E-06	-1.2590E-06	-3.0689E-07	-9.7726E-07	-3.7425E-07	-1.0031E-06	-8.6850E-07	-8.6033E-07
-4.3343E-08	-3.5500E-08	-3.5870E-08	-9.3225E-09	-3.2419E-08	-1.1781E-08	-3.5783E-08	-2.7819E-08	-2.9319E-08
5.1901E-10	4.1351E-10	4.2293E-10	-1.1088E-10	-4.4129E-10	-1.4573E-10	-4.9111E-10	-3.6608E-10	-4.0494E-10

Emporia, VA

-6.1952E-03	-5.9527E-03	-6.1631E-03	-1.1499E-04	-1.3261E-04	-1.0949E-03			
-8.2006E-03	-7.5142E-03	-7.3999E-03	-3.1545E-03	-3.2564E-03	-7.3883E-03			
-8.3854E-04	-9.1415E-04	-1.1034E-03	-1.6722E-02	-1.6865E-02	-8.2573E-03			
-4.2704E-04	-5.1266E-04	-5.8810E-04	-1.9758E-02	-1.9311E-02	-1.3210E-02			
-9.1858E-04	-9.1987E-04	-1.0499E-03	-9.8916E-03	-9.5702E-03	-7.2076E-03			
-3.8374E-05	-3.2238E-05	-8.2203E-05	-2.8137E-03	-2.7493E-03	-2.1737E-03			
-3.7294E-05	-3.8478E-05	-2.9229E-05	-4.6745E-04	-4.6327E-04	-3.7403E-04			
-6.7718E-06	-6.8696E-06	-5.8941E-06	-4.6011E-05	-4.6221E-05	-3.7503E-05			
-5.0744E-07	-5.1046E-07	-4.5107E-07	-2.6480E-06	-2.6920E-06	-2.1909E-06			
-1.8380E-08	-1.8346E-08	-1.6399E-08	-8.2500E-08	-8.4827E-08	-6.8853E-08			
-2.6710E-10	-2.6439E-10	-2.3777E-10	-1.0769E-09	-1.1181E-09	-9.0427E-10			

Towanda, PA

-1.1499E-04	-1.3261E-04	-1.0949E-03						
-3.1545E-03	-3.2564E-03	-7.3883E-03						
-1.6722E-02	-1.6865E-02	-8.2573E-03						
-1.9758E-02	-1.9311E-02	-1.3210E-02						
-9.8916E-03	-9.5702E-03	-7.2076E-03						
-2.8137E-03	-2.7493E-03	-2.1737E-03						
-4.6745E-04	-4.6327E-04	-3.7403E-04						
-4.6011E-05	-4.6221E-05	-3.7503E-05						
-2.6480E-06	-2.6920E-06	-2.1909E-06						
-8.2500E-08	-8.4827E-08	-6.8853E-08						
-1.0769E-09	-1.1181E-09	-9.0427E-10						

Danville, IN

-4.1384E-03	-4.2444E-03	-4.2311E-03	2.0922E-03	1.4298E-03	2.3952E-03			
-1.5460E-02	-1.5720E-02	-1.5671E-02	1.0804E-02	1.0074E-02	1.0814E-02			
-5.6092E-03	-5.5312E-03	-5.5220E-03	6.6421E-03	9.4555E-03	5.4245E-03			
-1.4910E-02	-1.5042E-02	-1.4949E-02	-1.1857E-02	-1.4237E-02	-1.0444E-02			
-7.7047E-03	-7.8105E-03	-7.7495E-03	-5.4484E-03	-6.4267E-03	-4.7543E-03			
-2.0768E-03	-2.1129E-03	-2.0961E-03	-1.3455E-03	-1.5767E-03	-1.1630E-03			
-3.3133E-04	-3.3807E-04	-3.3552E-04	-1.9958E-04	-2.3284E-04	-1.7137E-04			
-3.2288E-05	-3.3023E-05	-3.2793E-05	-1.8293E-05	-2.1251E-05	-1.5652E-05			
-1.8870E-06	-1.9337E-06	-1.9215E-06	-1.0157E-06	-1.1744E-06	-8.6850E-07			
-6.0710E-08	-6.2314E-08	-6.1964E-08	-3.1290E-08	-3.6000E-08	-2.6794E-08			
-8.2585E-10	-9.4885E-10	-8.4463E-10	-4.0973E-10	-4.6912E-10	-3.5182E-10			

Marietta, OH

2.0922E-03	1.4298E-03	2.3952E-03						
1.0804E-02	1.0074E-02	1.0814E-02						
6.6421E-03	9.4555E-03	5.4245E-03						
-1.1857E-02	-1.4237E-02	-1.0444E-02						
-5.4484E-03	-6.4267E-03	-4.7543E-03						
-1.3455E-03	-1.5767E-03	-1.1630E-03						
-1.9958E-04	-2.3284E-04	-1.7137E-04						
-1.8293E-05	-2.1251E-05	-1.5652E-05						
-1.0157E-06	-1.1744E-06	-8.6850E-07						
-3.1290E-08	-3.6000E-08	-2.6794E-08						
-4.0973E-10	-4.6912E-10	-3.5182E-10						

Georgetown, DE

-4.9479E-03	-6.3966E-03	-6.5798E-03	-1.1918E-03	-1.0722E-03	-1.3067E-03			
-1.2060E-02	-1.2196E-02	-1.2401E-02	-2.6274E-03	-3.2372E-03	-3.1486E-03			
-1.2447E-03	4.1599E-04	5.6093E-04	-7.9881E-04	-2.5648E-03	-7.4099E-04			
-6.2120E-03	-4.5194E-03	-4.5372E-03	-3.3941E-03	-5.9518E-03	-3.4239E-03			
-3.1653E-03	-2.4544E-03	-2.5083E-03	-2.1259E-03	-3.4037E-03	-2.1052E-03			
-9.6947E-04	-8.3392E-04	-8.5997E-04	-6.4495E-04	-1.0118E-03	-6.3674E-04			
-1.7811E-04	-1.6620E-04	-1.7191E-04	-1.1042E-04	-1.6878E-04	-1.0923E-04			
-1.9369E-05	-1.9124E-05	-1.9797E-05	-1.1197E-05	-1.6785E-05	-1.1093E-05			
-1.2275E-06	-1.2630E-06	-1.3077E-06	-6.5788E-07	-9.8568E-07	-6.6129E-07			
-4.2032E-08	-4.4658E-08	-4.6230E-08	-2.1676E-08	-3.1577E-08	-2.1412E-08			
-6.0174E-10	-6.5610E-10	-6.7909E-10	-2.9552E-10	-4.2570E-10	-2.9085E-10			

Toms River, NJ

-6.3966E-03	-6.5798E-03	-1.1918E-03	-1.0722E-03	-1.3067E-03				
-1.2196E-02	-1.2401E-02	-2.6274E-03	-3.2372E-03	-3.1486E-03				
4.1599E-04	5.6093E-04	-7.9881E-04	-2.5648E-03	-7.4099E-04				
-4.5194E-03	-4.5372E-03	-3.3941E-03	-5.9518E-03	-3.4239E-03				
-2.4544E-03	-2.5083E-03	-2.1259E-03	-3.4037E-03	-2.1052E-03				
-8.3392E-04	-8.5997E-04	-6.4495E-04	-1.0118E-03	-6.3674E-04				
-1.6620E-04	-1.7191E-04	-1.1042E-04	-1.6878E-04	-1.0923E-04				
-1.9124E-05	-1.9797E-05	-1.1197E-05	-1.6785E-05	-1.1093E-05				
-1.2630E-06	-1.3077E-06	-6.5788E-07	-9.8568E-07	-6.6129E-07				
-4.4658E-08	-4.6230E-08	-2.1676E-08	-3.1577E-08	-2.1412E-08				
-6.5610E-10	-6.7909E-10	-2.9552E-10	-4.2570E-10	-2.9085E-10				

Grottoes, VA

-1.1918E-03	-1.0722E-03	-1.3067E-03						
-2.6274E-03	-3.2372E-03	-3.1486E-03						
-7.9881E-04	-2.5648E-03	-7.4099E-04						
-3.3941E-03	-5.9518E-03	-3.4239E-03						
-2.1259E-03	-3.4037E-03	-2.1052E-03						
-6.4495E-04	-1.0118E-03	-6.3674E-04						
-1.1042E-04	-1.6878E-04	-1.0923E-04						
-1.1197E-05	-1.6785E-05	-1.1093E-05						
-6.5788E-07	-9.8568E-07	-6.6129E-07						
-2.1676E-08	-3.1577E-08	-2.1412E-08						
-2.9552E-10	-4.2570E-10	-2.9085E-10						

Bluefield, WV

-4.2447E-03	-3.7031E-03	-3.7568E-03	-3.7975E-03	-2.5585E-04	-4.0051E-03			
-6.3608E-03	-7.7941E-03	-5.8637E-03	-1.2837E-02	-4.5564E-03	-1.2651E-02			
-4.2965E-04	-1.2212E-03	-1.7341E-03	-5.8402E-03	-1.0630E-02	-5.3681E-03			
-2.6884E-04	-1.7976E-03	-7.1514E-05	-5.1074E-03	-5.8379E-03	-4.0391E-03			
-5.4530E-04	-8.5341E-04	-5.6958E-04	-1.3000E-03	-1.4208E-03	-6.2147E-04			
-2.2357E-05	-5.0684E-04	-2.5180E-05	-5.2820E-04	-5.3175E-04	-3.2467E-04			
-3.2934E-05	-1.2635E-04	-3.7772E-05	-1.3007E-04	-1.2116E-04	-9.6477E-05			
-4.8205E-06	-1.5243E-05	-5.6931E-06	-1.6223E-05	-1.4037E-05	-1.2775E-05			
-3.0689E-07	-9.7726E-07	-3.7425E-07	-1.0031E-06	-8.6850E-07	-8.6033E-07			
-9.3225E-09	-3.2419E-08	-1.1781E-08	-3.5783E-08	-2.7819E-08	-2.9319E-08			
-1.1088E-10	-4.4129E-10	-1.4573E-10	-4.9111E-10	-3.6608E-10	-4.0494E-10			

Baseline, Day 154

-3.7031E-03	-3.7568E-03	-3.7975E-03	-2.5585E-04	-4.0051E-03				
-7.7941E-03	-5.8637E-03	-1.2837E-02	-4.5564E-03	-1.2651E-02				
-1.2212E-03	-1.7341E-03	-5.8402E-03	-1.0630E-02	-5.3681E-03				
-1.7976E-03	-7.1514E-05	-5.1074E-03	-5.8379E-03	-4.0391E-03				
-8.5341E-04	-5.6958E-04	-1.3000E-03	-1.4208E-03	-6.2147E-04				
-5.0684E-04	-2.5180E-05	-5.2820E-04	-5.3175E-04	-3.2467E-04				
-1.2635E-04	-3.7772E-05	-1.3007E-04	-1.2116E-04	-9.6477E-05				
-1.5243E-05	-5.6931E-06	-1.6223E-05	-1.4037E-05	-1.2775E-05				
-9.7726E-07	-3.7425E-07	-1.0031E-06	-8.6850E-07	-8.6033E-07				
-3.2419E-08	-1.1781E-08	-3.5783E-08	-2.7819E-08	-2.9319E-08				
-4.4129E-10	-1.4573E-10	-4.9111E-10	-3.6608E-10	-4.0494E-10				

Baseline, Day 188

-3.7568E-03	-3.7975E-03	-2.5585E-04	-4.0051E-03					
-5.8637E-03	-1.2837E-02	-4.5564E-03	-1.2651E-02					
-1.7341E-03	-5.8402E-03	-1.0630E-02	-5.3681E-03					
-7.1514E-05	-5.1074E-03	-5.8379E-03	-4.0391E-03					
-5.6958E-04	-1.3000E-03	-1.4208E-03	-6.2147E-04					
-2.5180E-05	-5.2820E-04	-5.3175E-04	-3.2467E-04					
-3.7772E-05	-1.3007E-04	-1.2116E-04	-9.6477E-05					
-5.6931E-06	-1.6223E-05	-1.4037E-05	-1.2775E-05					
-3.7425E-07	-1.0031E-06	-8.6850E-07	-8.6033E-07					
-1.1781E-08	-3.5783E-08	-2.7819E-08	-2.9319E-08					
-1.4573E-10	-4.9111E-10	-3.6608E-10	-4.0494E-10					

Table D-11

Polynomial Coefficients for Q Data Taken at NAVOBSY

Wilmington, NC			Emporia, VA			Towanda, PA		
1 PRNT ITO3								
2.4201E 03	2.5956E 03	2.3325E 03	2.5870E 03	3.1089E 03	3.4133E 03	2.0967E 03	1.6872E 03	1.9336E 03
1.7483E 02	1.7646E 02	1.7234E 02	1.9212E 02	1.8995E 02	1.9733E 02	1.5539E 02	1.4625E 02	1.5383E 02
2.6444E 02	2.5040E 02	2.7012E 02	3.4213E 02	2.8847E 02	2.7925E 02	2.5312E 02	2.8306E 02	2.7004E 02
-1.4750E 02	-1.3223E 02	-1.5709E 02	-1.9209E 02	-1.6046E 02	-1.3740E 02	-1.0340E 02	-1.2135E 02	-1.1637E 02
1.4914E 02	1.4161E 02	1.5349E 02	1.6043E 02	1.4408E 02	1.3424E 02	1.1517E 02	1.2090E 02	1.2047E 02
-5.6551E 03	-5.4507E 03	-5.7564E 03	-5.8160E 03	-5.3353E 03	-5.1104E 03	-4.5593E 03	-4.6618E 03	-4.6852E 03
1.0630E 03	1.0304E 03	1.0771E 03	1.0850E 03	1.0031E 03	9.7253E 04	8.7707E 04	8.8905E 04	8.9582E 04
-1.1278E 04	-1.0968E 04	-1.1402E 04	-1.1502E 04	-1.0747E 04	-1.0494E 04	-9.4658E 05	-9.5453E 05	-9.6247E 05
6.8834E 06	6.7112E 06	6.9510E 06	7.1488E 06	6.6479E 06	6.5227E 06	5.8426E 06	5.8764E 06	5.9246E 06
-2.2549E 07	-2.2030E 07	-2.2759E 07	-2.3713E 07	-2.2084E 07	-2.1744E 07	-1.9273E 07	-1.9353E 07	-1.9501E 07
3.0714E 09	3.0059E 09	3.0994E 09	3.2693E 09	3.0480E 09	3.0089E 09	2.6348E 09	2.6428E 09	2.6610E 09

Dexter, NY			Danville, IN			Marietta, OH		
10 PRNT ITO3								
3.1138E 03	3.8236E 03	4.0852E 03	5.2051E 03	6.5397E 03	8.3438E 03	4.2155E 03	3.2684E 03	2.8232E 03
1.8751E 02	1.7838E 02	1.8399E 02	2.7455E 02	3.0551E 02	3.8323E 02	2.2331E 02	1.7975E 02	1.6159E 02
2.3392E 02	1.8321E 02	1.7836E 02	4.2814E 02	4.2091E 02	5.3140E 02	3.4135E 02	2.7870E 02	2.5807E 02
-1.3309E 02	-5.1955E 03	-5.3043E 03	-1.9214E 02	-1.6695E 02	-2.3389E 02	-1.2129E 02	-9.1535E 03	-8.9601E 03
1.4944E 02	1.0082E 02	1.0339E 02	7.7020E 03	6.3755E 03	8.5767E 03	4.8119E 03	3.4403E 03	3.0127E 03
-5.7676E 03	-4.3037E 03	-4.3894E 03	-1.9589E 03	-1.6196E 03	-2.0544E 03	-1.3088E 03	-1.0241E 03	-9.2580E 04
1.0884E 03	8.3965E 04	8.5382E 04	3.0388E 04	2.5409E 04	3.0803E 04	2.1641E 04	1.7923E 04	1.6496E 04
-1.1552E 04	-9.0566E 05	-9.1878E 05	-2.9228E 05	-2.4823E 05	-2.9051E 05	-2.2020E 05	-1.8949E 05	-1.7626E 05
7.0452E 06	5.5793E 06	5.6482E 06	1.6955E 06	1.4630E 06	1.6659E 06	1.3405E 06	1.1851E 06	1.1109E 06
-2.3051E 07	-1.8387E 07	-1.8578E 07	-5.4034E 08	-4.7283E 08	-5.2718E 08	-4.4467E 08	-4.0075E 08	-3.7771E 08
3.1356E 09	2.5148E 09	2.5365E 09	7.2381E 10	6.4058E 10	7.0298E 10	6.1559E 10	5.6253E 10	5.3216E 10

Georgetown, DE			Toms River, NJ			Grottoes, VA		
19 PRNT ITO3								
7.9774E 03	5.0631E 03	5.2416E 03	7.6183E 03	1.9094E 03	4.6896E 03	8.0288E 03	7.8997E 03	4.4794E 03
-3.5167E 02	-3.6730E 04	-4.4732E 04	1.5937E 02	1.4919E 02	2.1522E 02	1.6530E 02	1.7044E 02	1.8839E 02
-4.5715E 02	7.5849E 03	7.7746E 03	9.3074E 03	2.6882E 02	1.9023E 02	1.0026E 02	1.0504E 02	1.7151E 02
-1.7641E 02	-3.6629E 03	-3.6478E 03	-3.2549E 03	-7.9491E 03	-8.5312E 03	-3.7032E 03	-3.6017E 03	-3.7406E 03
6.2934E 03	6.7430E 04	6.9007E 04	1.6865E 03	4.7640E 03	7.2046E 03	1.2811E 03	1.3936E 03	4.4507E 03
-1.5251E 03	-1.1354E 04	-1.0567E 04	-1.0444E 03	-1.3828E 03	-2.3714E 03	-8.8000E 04	-9.3560E 04	-1.6259E 03
2.3159E 04	5.0542E 05	4.8843E 05	2.1402E 04	2.0713E 04	3.9637E 04	1.8589E 04	1.9498E 04	2.8859E 04
-2.2173E 05	-7.4651E 06	-7.2651E 06	-2.3480E 05	-1.8110E 05	-3.8332E 05	-2.0766E 05	-2.1755E 05	-2.9572E 05
1.2948E 06	5.6112E 07	5.4766E 07	1.4703E 06	9.3948E 07	2.1747E 06	1.3243E 06	1.3859E 06	1.7793E 06
-4.1775E 08	-2.1271E 08	-2.0785E 08	-4.9310E 08	-2.5587E 08	-6.7101E 08	-4.5131E 08	-4.7181E 08	-5.8129E 08
5.6758E 10	3.2189E 10	3.1458E 10	6.8594E 10	3.1858E 10	8.6827E 10	6.3598E 10	6.6424E 10	7.9369E 10

Bluefield, WV			Baseline, Day 154			Baseline, Day 188		
28 PRNT ITO3								
4.9969E 03	3.5131E 03	6.0837E 03	3.0448E 03	3.2154E 03	2.8934E 03	2.1604E 03	2.2766E 03	2.5874E 03
2.1302E 02	1.2572E 02	1.9708E 02	1.7943E 02	1.9482E 02	1.8989E 02	1.3924E 02	1.3702E 02	1.4851E 02
1.8343E 02	1.9799E 02	1.1546E 02	2.8022E 02	2.7820E 02	2.8718E 02	2.2420E 02	2.0545E 02	2.0979E 02
-7.8902E 03	-1.1008E 02	-4.1982E 03	-1.5372E 02	-1.5624E 02	-1.5961E 02	-4.7697E 03	-2.7042E 03	-3.6113E 03
6.6854E 03	8.2227E 03	5.7011E 03	1.3635E 02	1.4795E 02	1.4029E 02	8.2231E 03	7.0490E 03	7.9877E 03
-2.1894E 03	-2.5541E 03	-2.0200E 03	-4.9501E 03	-5.4770E 03	-5.4692E 03	-3.6220E 03	-3.2837E 03	-3.6330E 03
3.6033E 04	4.1732E 04	3.4767E 04	9.1575E 04	1.0200E 03	1.0172E 03	7.2093E 04	6.6593E 04	7.3185E 04
-3.5731E 05	-4.0164E 05	-3.4488E 05	-9.6941E 05	-1.0822E 04	-1.0768E 04	-7.8681E 05	-7.3345E 05	-8.0417E 05
2.0559E 06	2.2915E 06	2.0098E 06	5.9451E 06	6.6287E 06	6.5844E 06	4.8701E 06	4.5710E 06	5.0088E 06
-6.4546E 08	-7.1562E 08	-6.3769E 08	-1.9626E 07	-2.1830E 07	-2.1649E 07	-1.6133E 07	-1.5162E 07	-1.6612E 07
8.5121E 10	9.4075E 10	8.4857E 10	2.6958E 09	2.9905E 09	2.9610E 09	2.2094E 09	2.0798E 09	2.2798E 09

Table D-12

Polynomial Coefficients for I Data Taken at Field Sites

Wilmington, NC

1 *PRNT ITV3*

3.5647E-03	3.6535E-03	3.4320E-03	3.5040E-03	3.1713E-03	3.5328E-03	1.8981E-03	9.1339E-04	2.1765E-03
1.6411E-02	1.6504E-02	1.5364E-02	1.8386E-02	1.7875E-02	1.8569E-02	1.3623E-02	9.9926E-03	1.4717E-02
1.7705E-02	1.7472E-02	1.8241E-02	2.4626E-02	2.4254E-02	2.3403E-02	2.1682E-02	2.5342E-02	2.1402E-02
-1.3820E-03	-1.1294E-03	-2.1111E-03	-7.0009E-03	-7.5288E-03	-6.5269E-03	-8.7138E-03	-1.0726E-02	-9.3140E-03
6.7724E-03	6.6421E-03	7.0225E-03	9.1555E-03	9.1564E-03	8.8039E-03	8.5462E-03	9.5541E-03	9.2048E-03
-3.2798E-03	-3.2455E-03	-3.3192E-03	-3.8534E-03	-3.7794E-03	-3.7175E-03	-3.2519E-03	-3.5711E-03	-3.5179E-03
6.7473E-04	6.6958E-04	6.7757E-04	7.6598E-04	7.4404E-04	7.3869E-04	6.1309E-04	6.7124E-04	6.6839E-04
-7.5083E-05	-7.4622E-05	-7.5109E-05	-8.4787E-05	-8.1973E-05	-8.1691E-05	-6.5423E-05	-7.1572E-05	-7.1859E-05
4.7232E-06	4.6988E-06	4.7125E-06	5.3622E-06	5.1648E-06	5.1620E-06	4.0207E-06	4.3950E-06	4.4436E-06
-1.5800E-07	-1.5729E-07	-1.5737E-07	-1.8100E-07	-1.7388E-07	-1.7413E-07	-1.3252E-07	-1.4471E-07	-1.4719E-07
2.1847E-09	2.1759E-09	2.1732E-09	2.5277E-09	2.4239E-09	2.4306E-09	1.8139E-09	1.9779E-09	2.0219E-09

Emporia, VA

Towanda, PA

Dexter, NY

10 *PRNT ITV3*

3.3941E-03	3.4932E-03	3.9217E-03	1.2185E-03	1.1391E-03	1.1140E-03	-1.1833E-02	-1.0726E-02	-1.0779E-02
5.7328E-03	5.0751E-03	4.7806E-03	1.2019E-02	1.1741E-02	1.1731E-02	1.2441E-03	2.4403E-03	2.5804E-03
3.4623E-03	4.1170E-03	4.1343E-03	2.7267E-02	2.8001E-02	2.8647E-02	-1.2837E-02	-1.2338E-02	-1.2081E-02
4.9925E-03	4.5376E-03	4.4296E-03	9.4961E-03	9.8225E-03	1.0359E-02	7.2074E-03	7.0712E-03	7.2229E-03
-4.4665E-04	-3.3317E-04	-2.0685E-04	8.0570E-03	8.1466E-03	8.3651E-03	1.0669E-03	8.9376E-04	9.4338E-04
-3.9157E-04	-4.1579E-04	-4.6583E-04	-3.0018E-03	-3.0224E-03	-3.0736E-03	3.6847E-04	4.2539E-04	4.1569E-04
1.2076E-04	1.2424E-04	1.3417E-04	5.7023E-04	5.7386E-04	5.8126E-04	-1.3086E-04	-1.4038E-04	-1.3910E-04
-1.5924E-05	-1.6242E-05	-1.7346E-05	-6.2049E-05	-6.2465E-05	-6.3136E-05	1.8019E-05	1.8931E-05	1.8808E-05
1.1113E-06	1.1208E-06	1.1988E-06	3.9008E-06	3.9288E-06	3.9659E-06	-1.2881E-06	-1.3387E-06	-1.3308E-06
-3.9984E-08	-4.0508E-08	-4.2875E-08	-1.3135E-07	-1.3235E-07	-1.3349E-07	4.6852E-08	4.8367E-08	4.8001E-08
5.8372E-10	5.9038E-10	6.2351E-10	1.8305E-09	1.8452E-09	1.8601E-09	-6.8410E-10	-7.0311E-10	-6.9878E-10

Danville, IN

Marietta, OH

Georgetown, DE

19 *PRNT ITV3*

2.2350E-03	3.1773E-03	3.7795E-03	5.1442E-03	6.0321E-03	5.9931E-03	7.4010E-03	7.6804E-03	7.2466E-03
2.2299E-03	8.5622E-04	5.9349E-04	1.7845E-02	2.0355E-02	2.0700E-02	3.4471E-03	3.3154E-03	3.5892E-03
4.6307E-03	4.7802E-03	5.4970E-03	1.4986E-02	1.6236E-02	1.6840E-02	7.5820E-03	8.4827E-03	8.7035E-03
2.7025E-03	3.1153E-03	3.3351E-03	1.1402E-03	5.7955E-04	2.7725E-04	3.5295E-03	3.4129E-03	3.0583E-03
-5.8477E-04	-7.6626E-04	-9.9904E-04	2.7818E-03	3.3599E-03	3.5086E-03	-6.7216E-04	-7.8722E-04	-6.6250E-04
-3.8895E-05	-1.1559E-05	6.4638E-05	-1.3953E-03	-1.6252E-03	-1.6693E-03	5.8898E-05	3.3830E-06	-1.9594E-05
2.7494E-05	2.7066E-05	1.3012E-05	2.7568E-04	3.2188E-04	3.2951E-04	3.1734E-05	1.7869E-05	2.0319E-05
-4.3275E-06	-4.6513E-06	-3.0998E-06	-2.9798E-05	-3.5050E-05	-3.5847E-05	-4.7350E-06	-3.0918E-06	-3.2381E-06
3.3369E-07	3.7122E-07	2.7007E-07	1.8487E-06	2.1895E-06	2.2389E-06	3.5910E-07	2.5097E-07	2.5499E-07
-1.2818E-08	-1.4520E-08	-1.1025E-08	-6.1578E-08	-7.3029E-08	-7.4999E-08	-1.3791E-08	-1.0037E-08	-1.0047E-08
1.9530E-10	2.2308E-10	1.7336E-10	8.5205E-10	1.0191E-09	1.0427E-09	2.1169E-10	1.5694E-10	1.5694E-10

Grottoes, VA

Bluefield, WVA

28 *PRNT ITV3*

5.1199E-04	4.5072E-04	5.1309E-04	2.9236E-03	3.1934E-03	3.7325E-03	1.8857E-03	2.5732E-03	2.1568E-03
5.9324E-03	5.5009E-03	5.5701E-03	1.7314E-02	1.8682E-02	1.8661E-02	1.4447E-02	2.4019E-02	1.5600E-02
1.5603E-02	1.4421E-02	1.3521E-02	2.2899E-02	2.2021E-02	1.9313E-02	2.6932E-02	6.9425E-02	2.6034E-02
-6.3170E-03	-5.8719E-03	-5.1196E-03	-1.0825E-02	-1.1025E-02	-7.5585E-03	-1.1118E-02	-5.3514E-02	-1.1823E-02
1.3432E-03	1.2492E-03	1.0279E-03	1.0422E-02	1.1269E-02	9.8098E-03	1.1531E-02	3.0041E-02	1.2207E-02
-6.5501E-05	-7.8411E-05	-1.0542E-04	-3.8718E-03	-4.2427E-03	-3.9093E-03	-4.5229E-03	-8.7587E-03	-4.7980E-03
7.0599E-05	7.1157E-05	7.1374E-05	7.2141E-04	7.9287E-04	7.4698E-04	8.6530E-04	1.4306E-03	9.1821E-04
-1.1494E-05	-1.1404E-05	-1.1106E-05	-7.6665E-05	-8.4124E-05	-8.0188E-05	-9.2756E-05	-1.3823E-04	-9.8513E-05
8.7138E-07	8.5823E-07	8.2612E-07	4.7160E-06	5.1555E-06	4.9493E-06	5.6993E-06	7.8623E-06	6.0568E-06
-3.2651E-08	-3.2004E-08	-3.0608E-08	-1.5607E-07	-1.6985E-07	-1.6382E-07	-1.8748E-07	-2.4334E-07	-1.9936E-07
4.8848E-10	4.7712E-10	4.5447E-10	2.1477E-09	2.3209E-09	2.2515E-09	2.5602E-09	3.1609E-09	2.7235E-09

Baseline, Day 154

Baseline, Day 188

Appendix E

CARRIER MODULATIONS AND PULSE ENVELOPES

This appendix presents graphical representations of the measured pulses. The plots are constructed from values of voltage evaluated from the polynomials of Tables D-5 through D-8. Figures E-1 through E-36 present the sine and cosine modulations for all the sites and all data segments. Figures E-37 through E-72 present the corresponding pulse envelopes. The voltages plotted on these figures are those associated with pulses that have the same energy. Tables E-1 and E-2 present the times of the zero crossings in the pulses relative to the reference time of the voltage samples. The vertical groups of three rows are for the three data segments. The labels C1, C2 ... C0 on the left denote the location of the instrumented van during data recordings (see Table E-3).

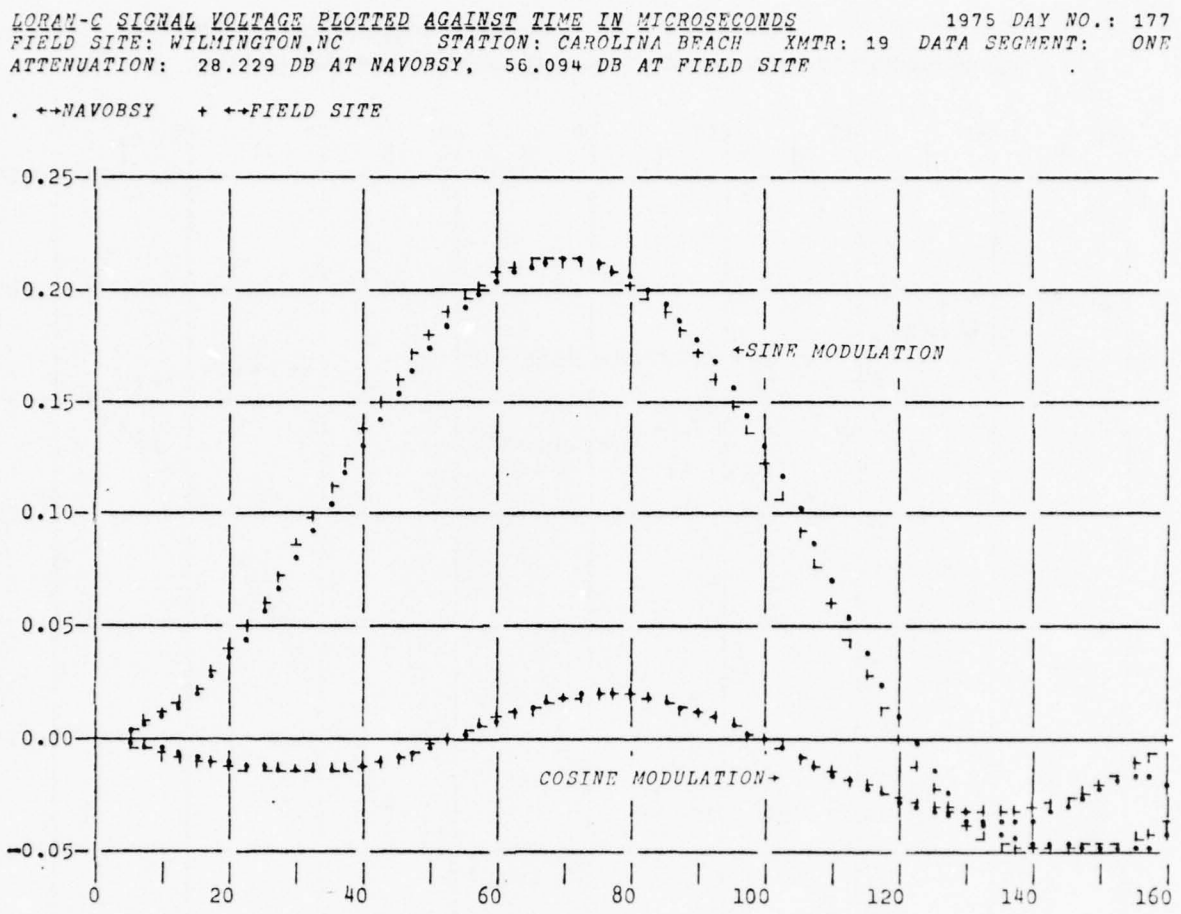


Fig. E-1 Sine and Cosine Modulations Observed Simultaneously at Wilmington, NC, and NAVOBSY; Data Segment 1

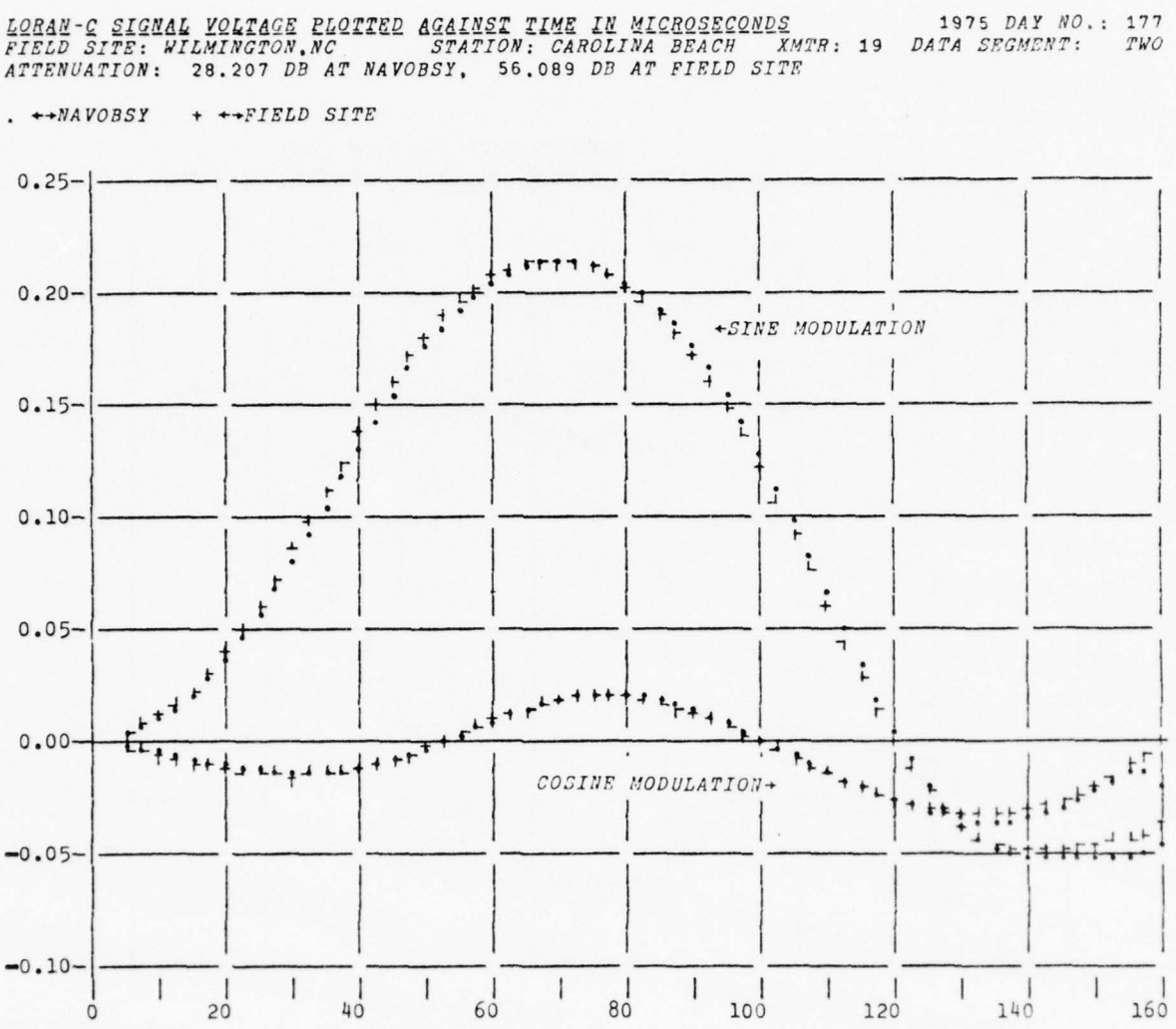


Fig. E-2 Sine and Cosine Modulations Observed Simultaneously at Wilmington, NC, and NAVOBSY; Data Segment 2

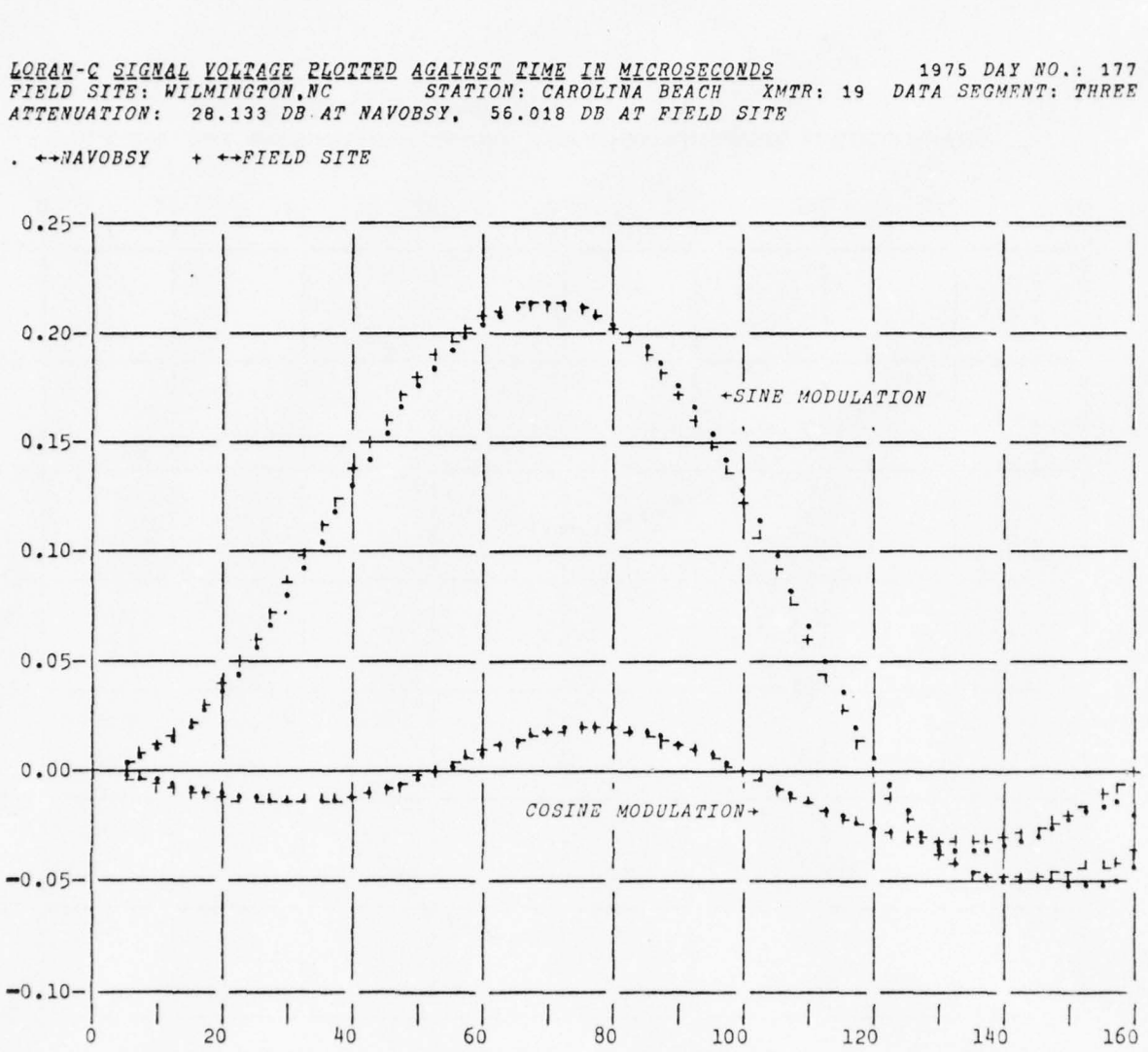


Fig. E-3 Sine and Cosine Modulations Observed Simultaneously at Wilmington, NC, and NAVOBSY; Data Segment 3

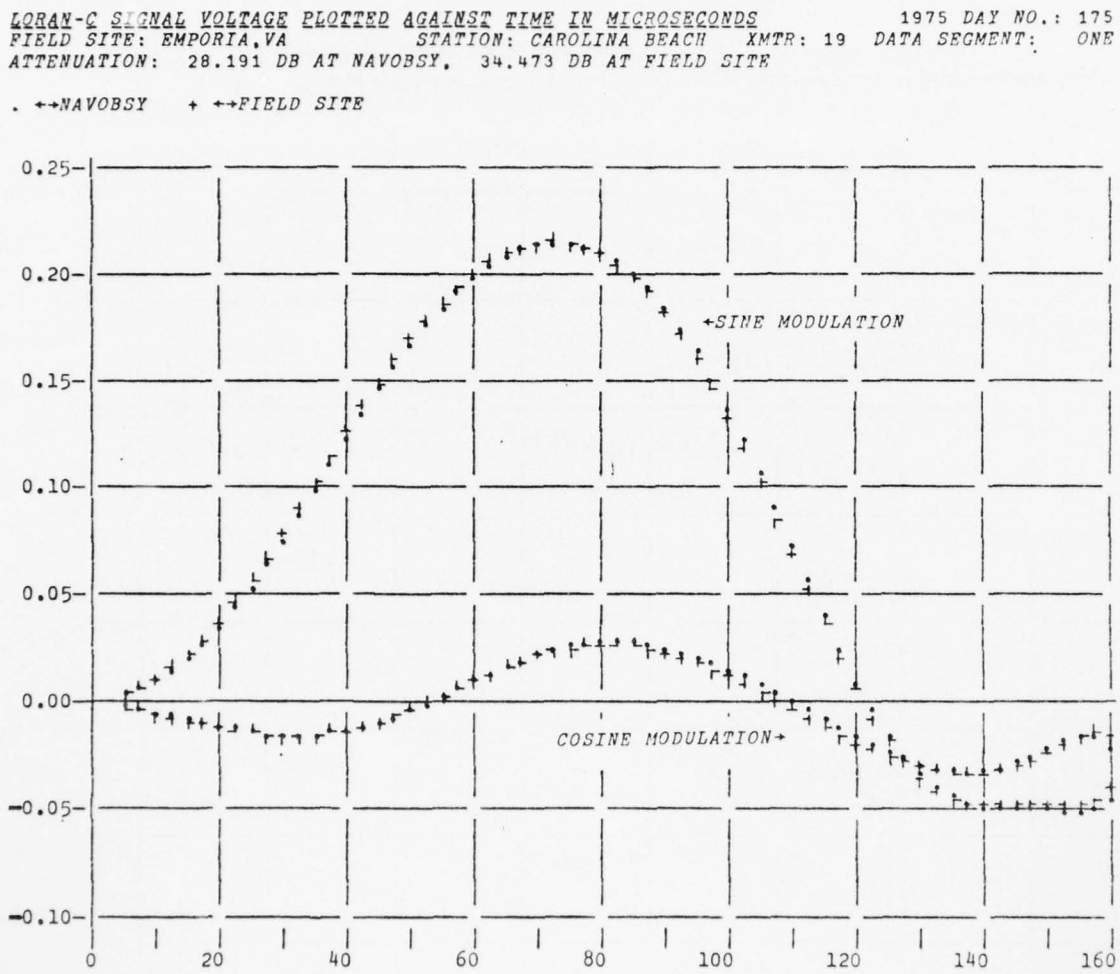


Fig. E-4 Sine and Cosine Modulations Observed Simultaneously at Emporia, VA, and NAVOBSY; Data Segment 1

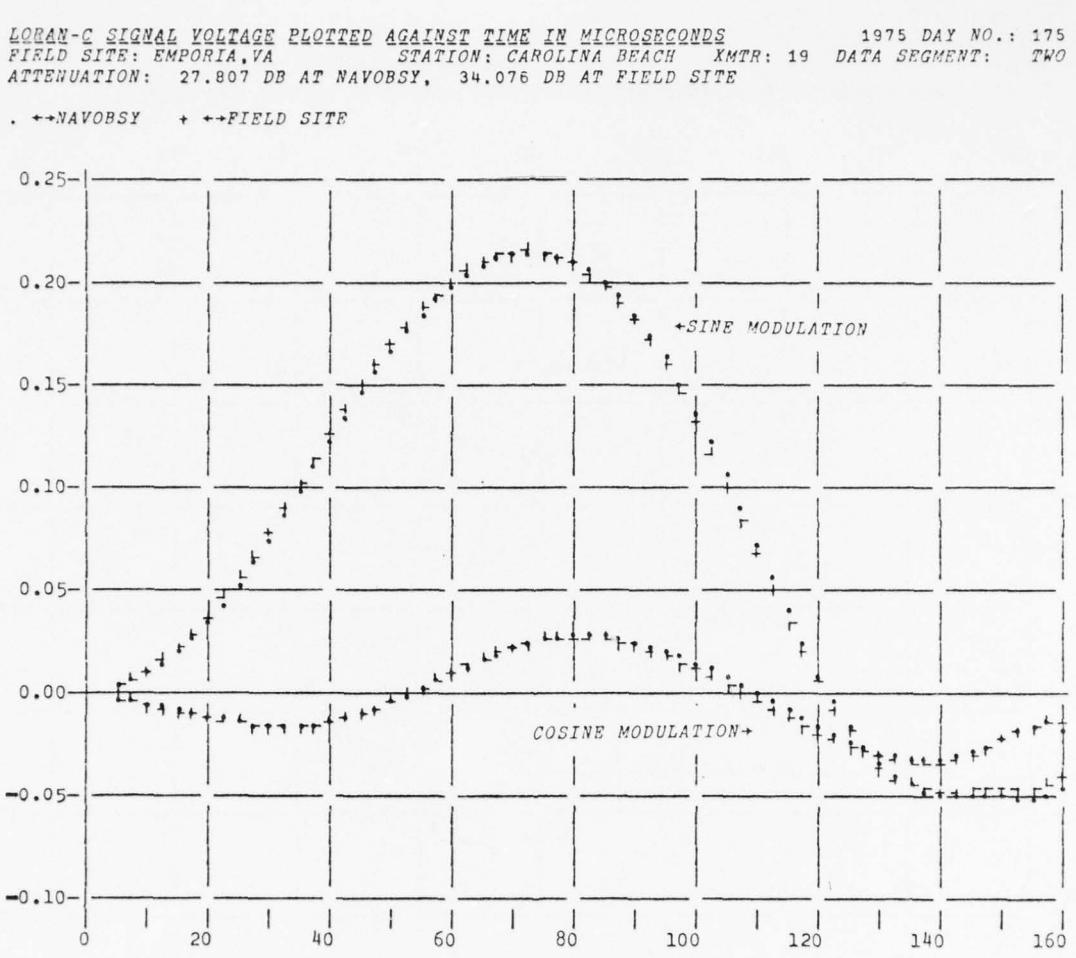


Fig. E-5 Sine and Cosine Modulations Observed Simultaneously at Emporia, VA, and NAVOBSY; Data Segment 2

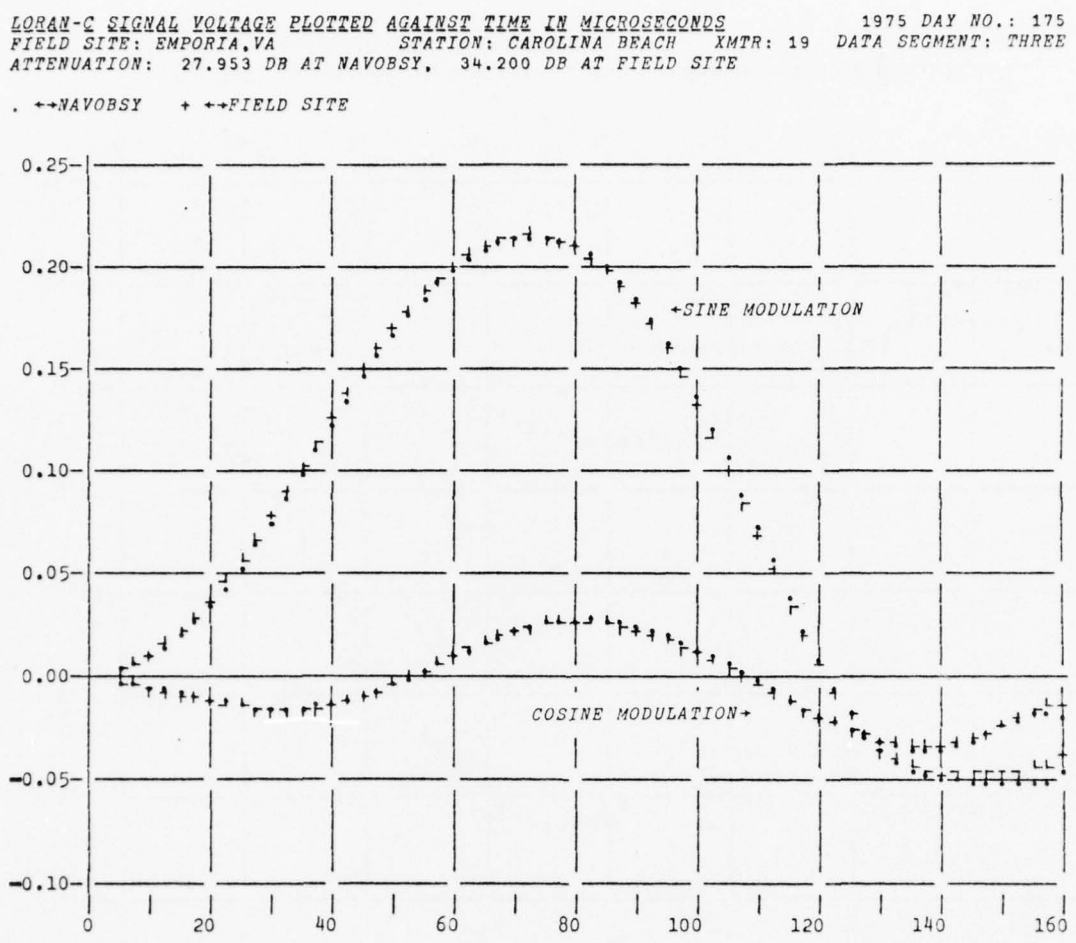


Fig. E-6 Sine and Cosine Modulations Observed Simultaneously at Emporia, VA, and NAVOBSY; Data Segment 3

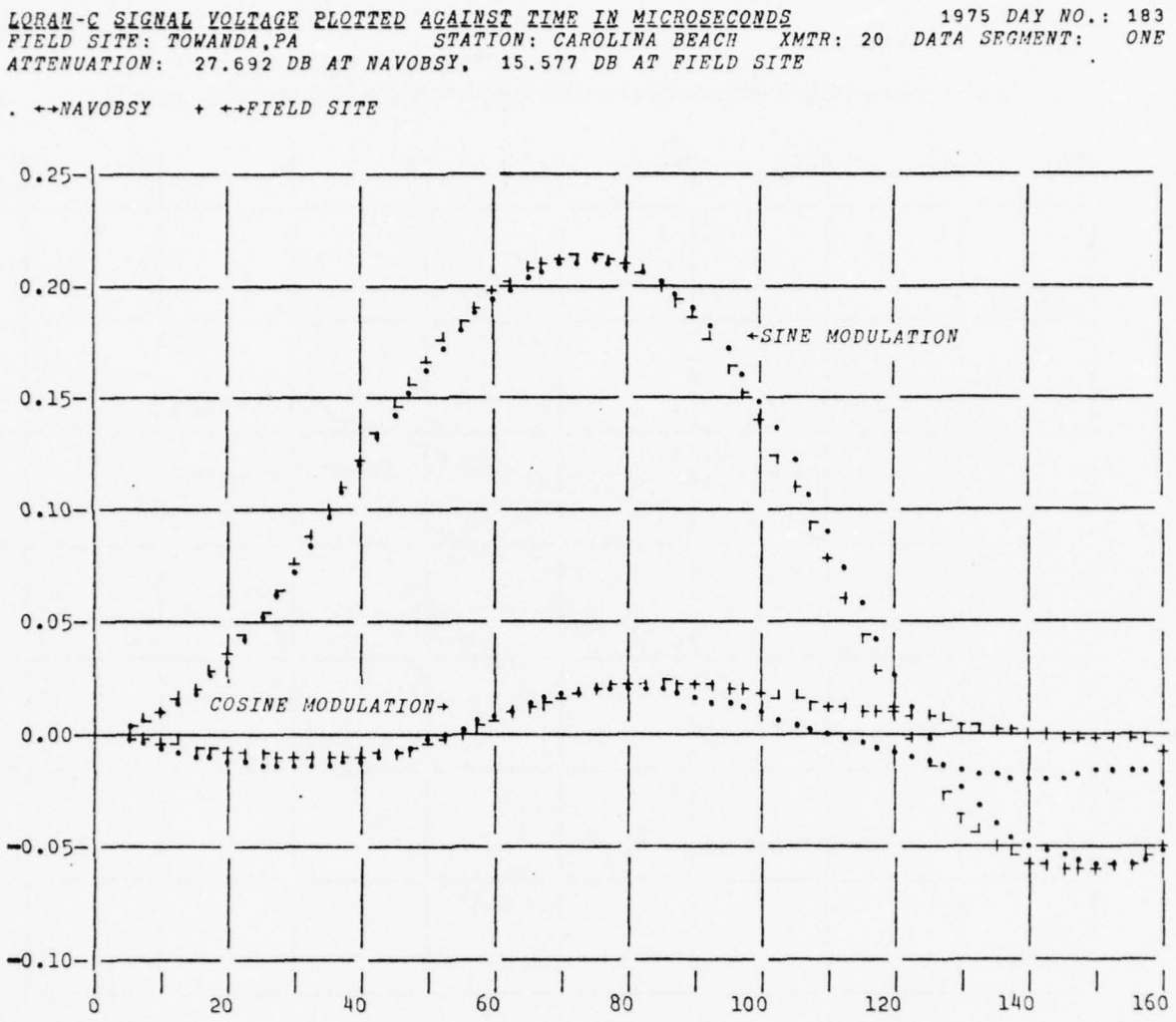


Fig. E-7 Sine and Cosine Modulations Observed Simultaneously at Towanda, PA, and NAVOBSY; Data Segment 1

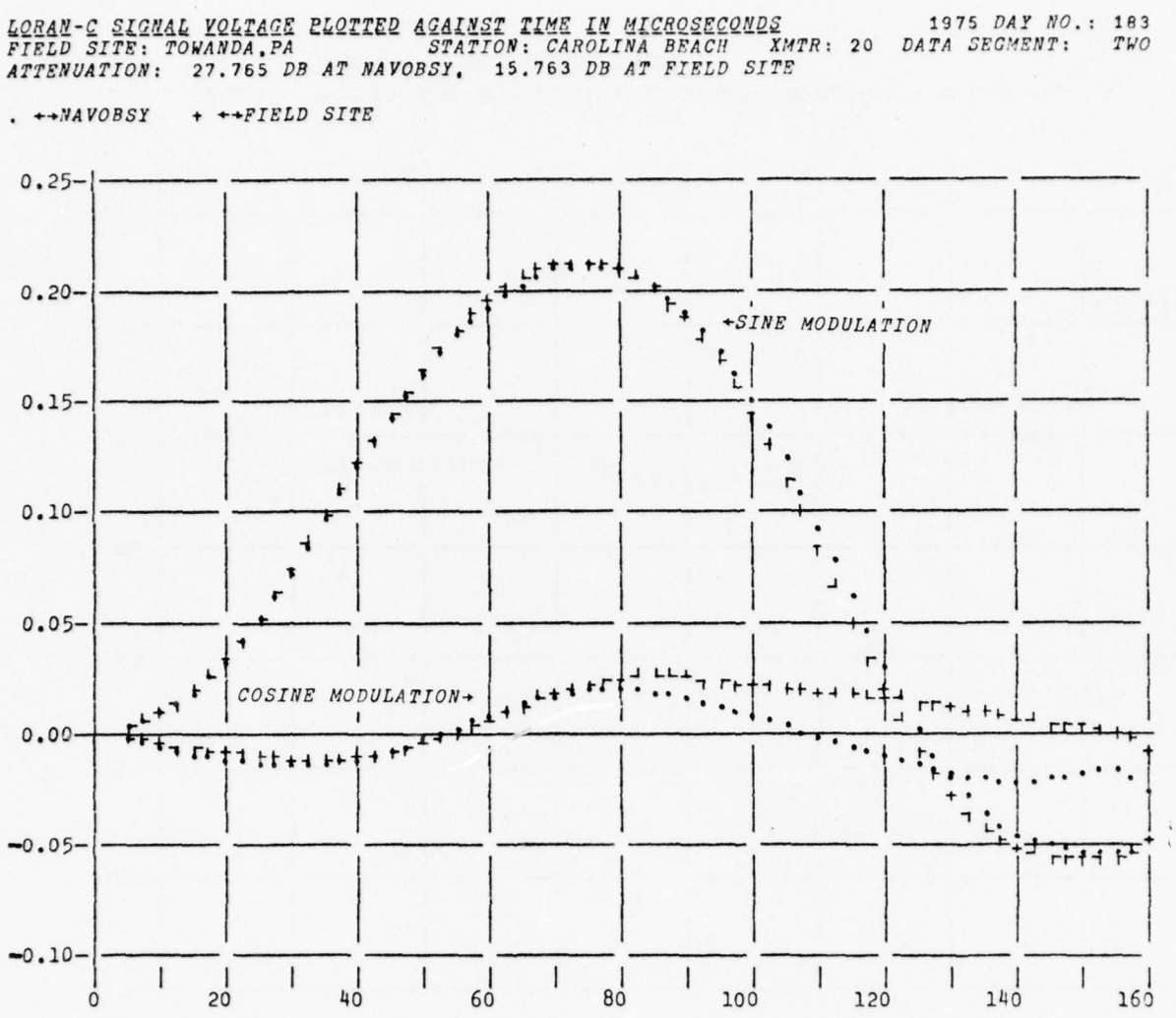


Fig. E-8 Sine and Cosine Modulations Observed Simultaneously at Towanda, PA, and NAVOBSY; Data Segment 2

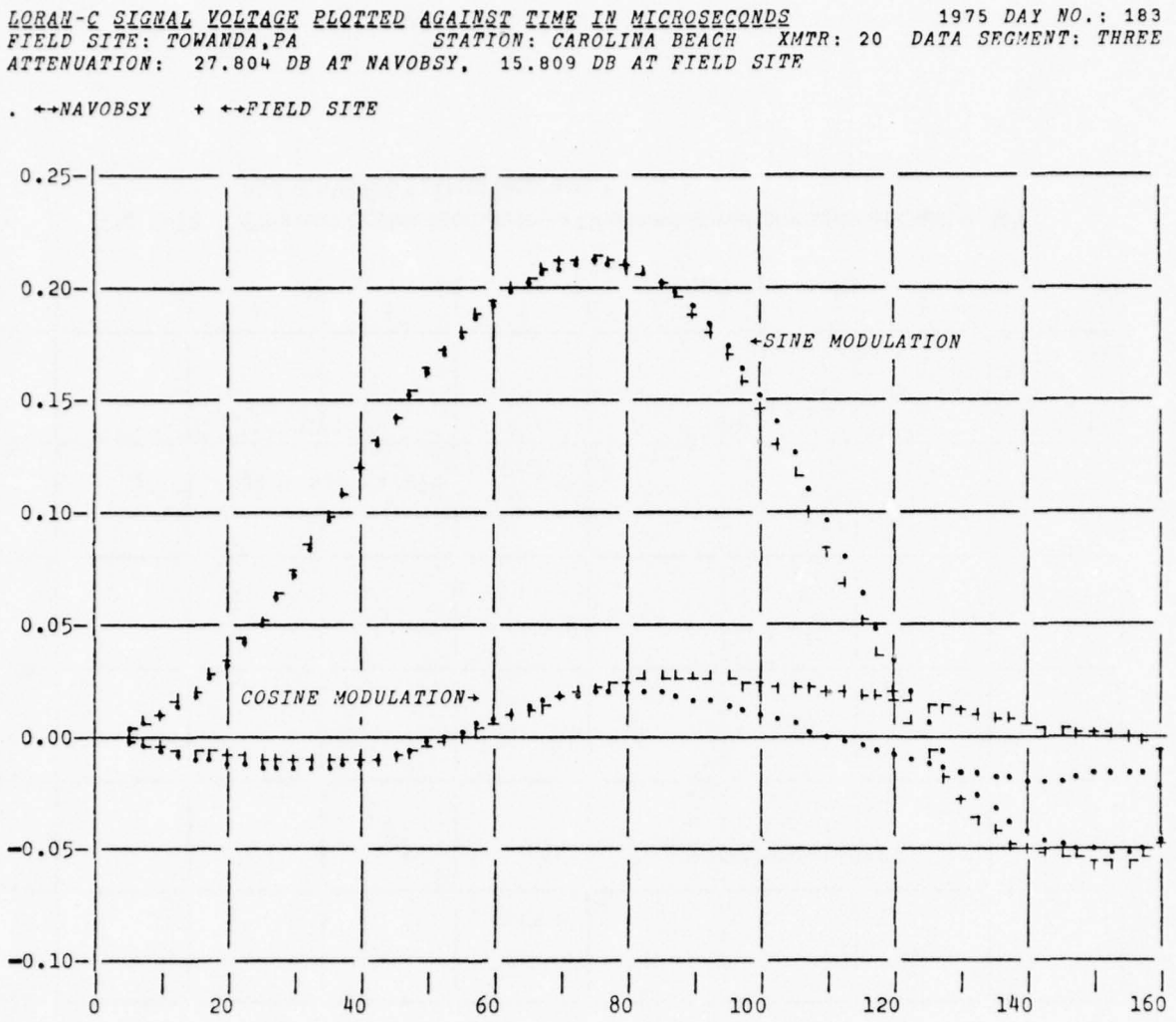


Fig. E-9 Sine and Cosine Modulations Observed Simultaneously at Towanda, PA, and NAVOBSY; Data Segment 3

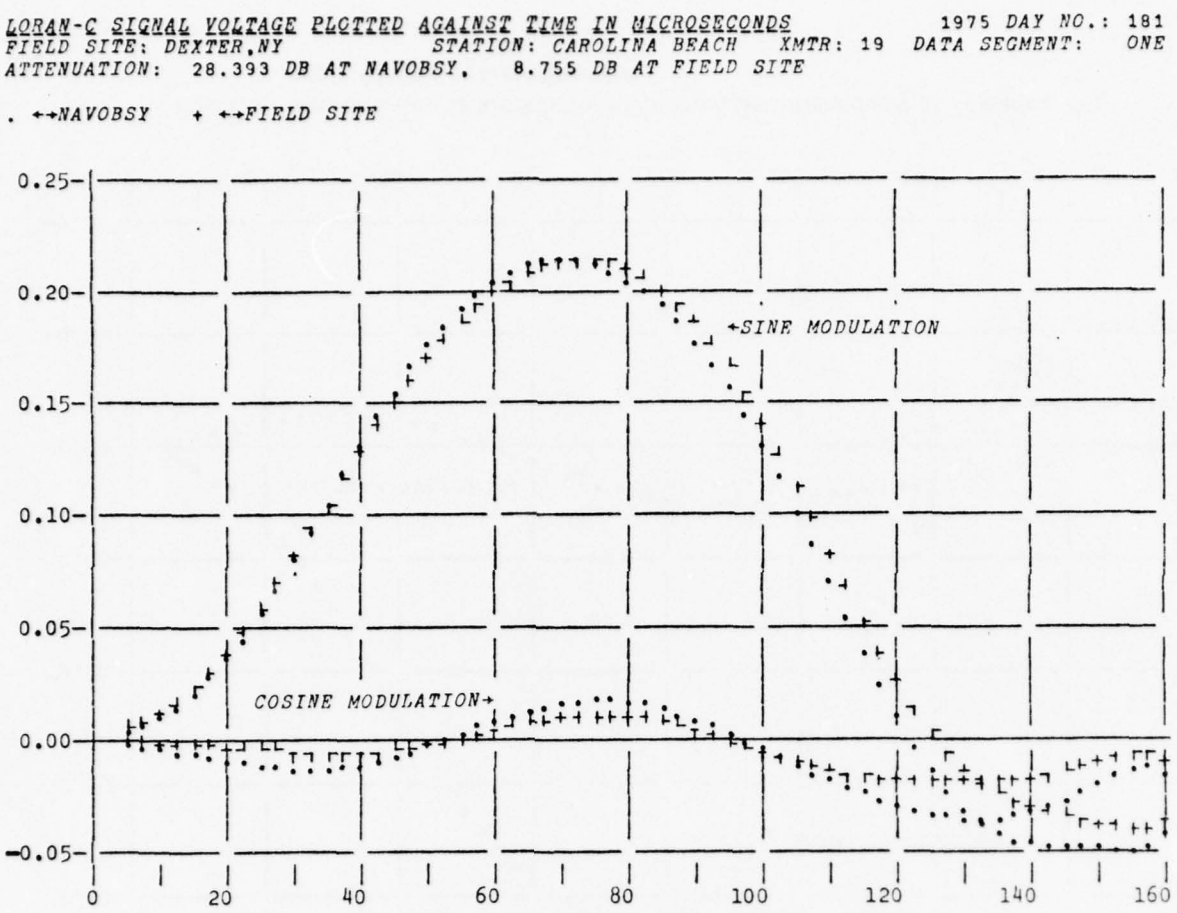


Fig. E-10 Sine and Cosine Modulations Observed Simultaneously at Dexter, NY, and NAVOBSY; Data Segment 1

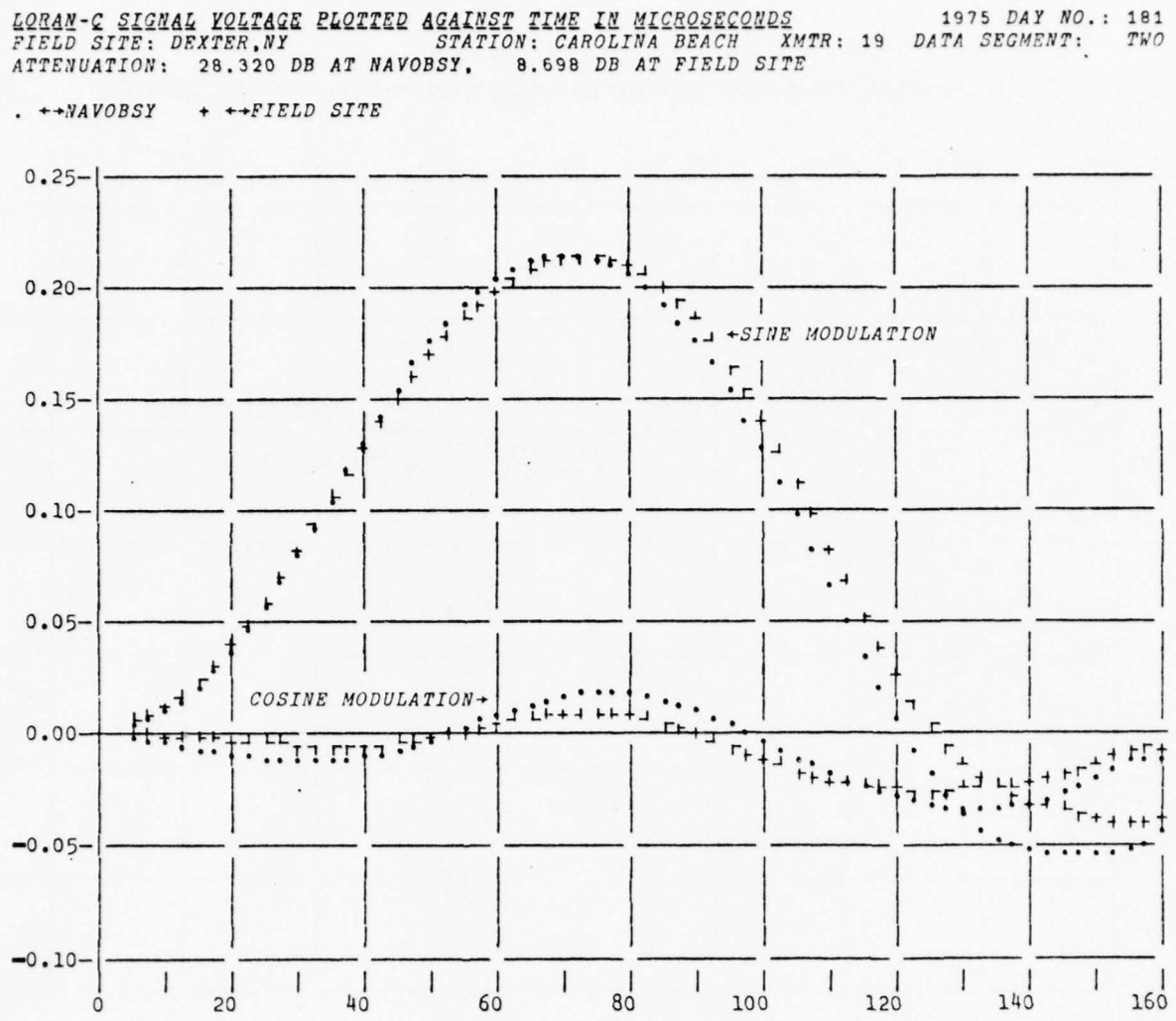


Fig. E-11 Sine and Cosine Modulations Observed Simultaneously at Dexter, NY, and NAVOBSY; Data Segment 2

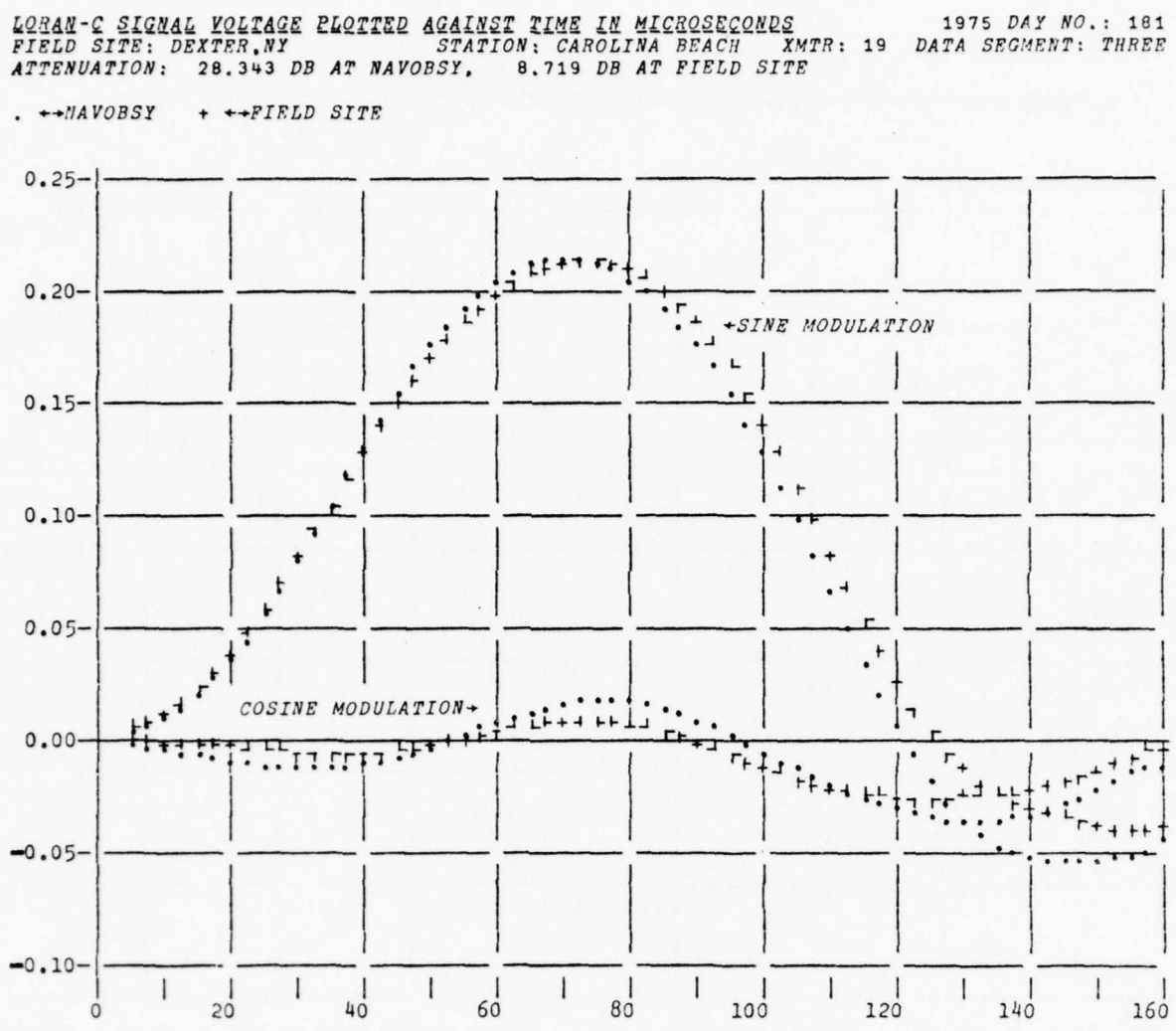


Fig. E-12 Sine and Cosine Modulations Observed Simultaneously at Dexter, NY, and NAVOBSY; Data Segment 3

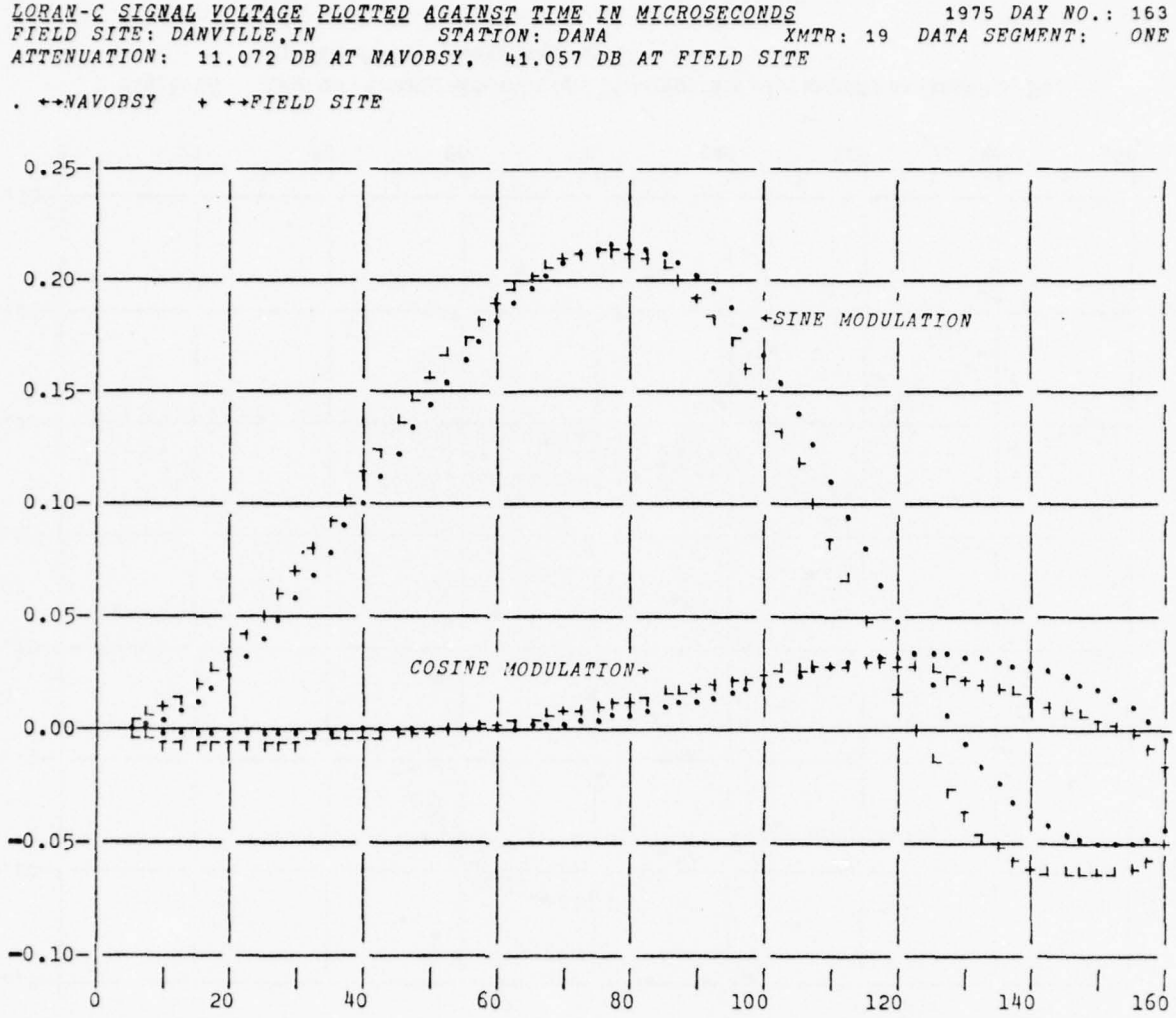


Fig. E-13 Sine and Cosine Modulations Observed Simultaneously at Danville, IN, and NAVOBSY; Data Segment 1

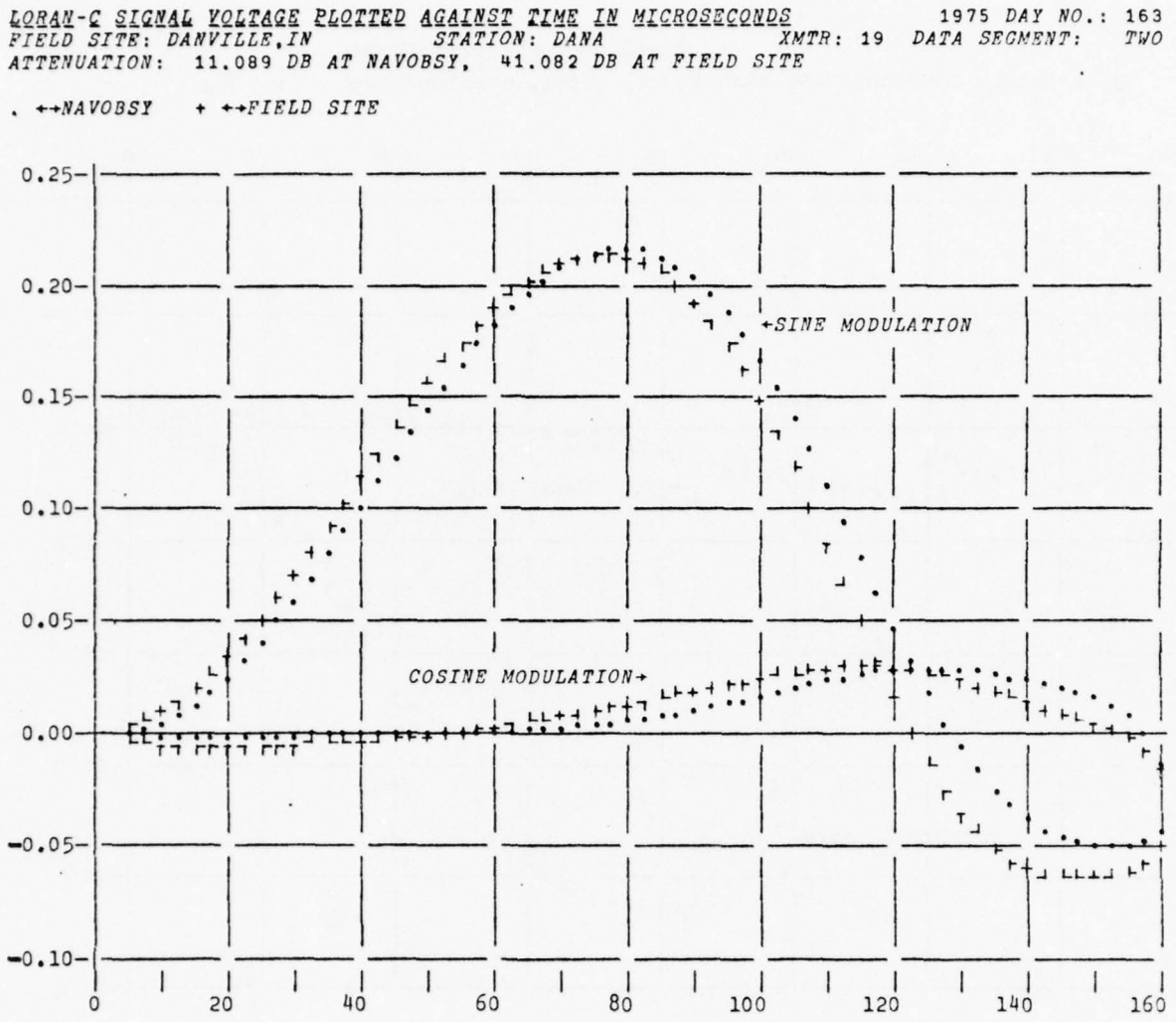


Fig. E-14 Sine and Cosine Modulations Observed Simultaneously at Danville, IN, and NAVOBSY; Data Segment 2

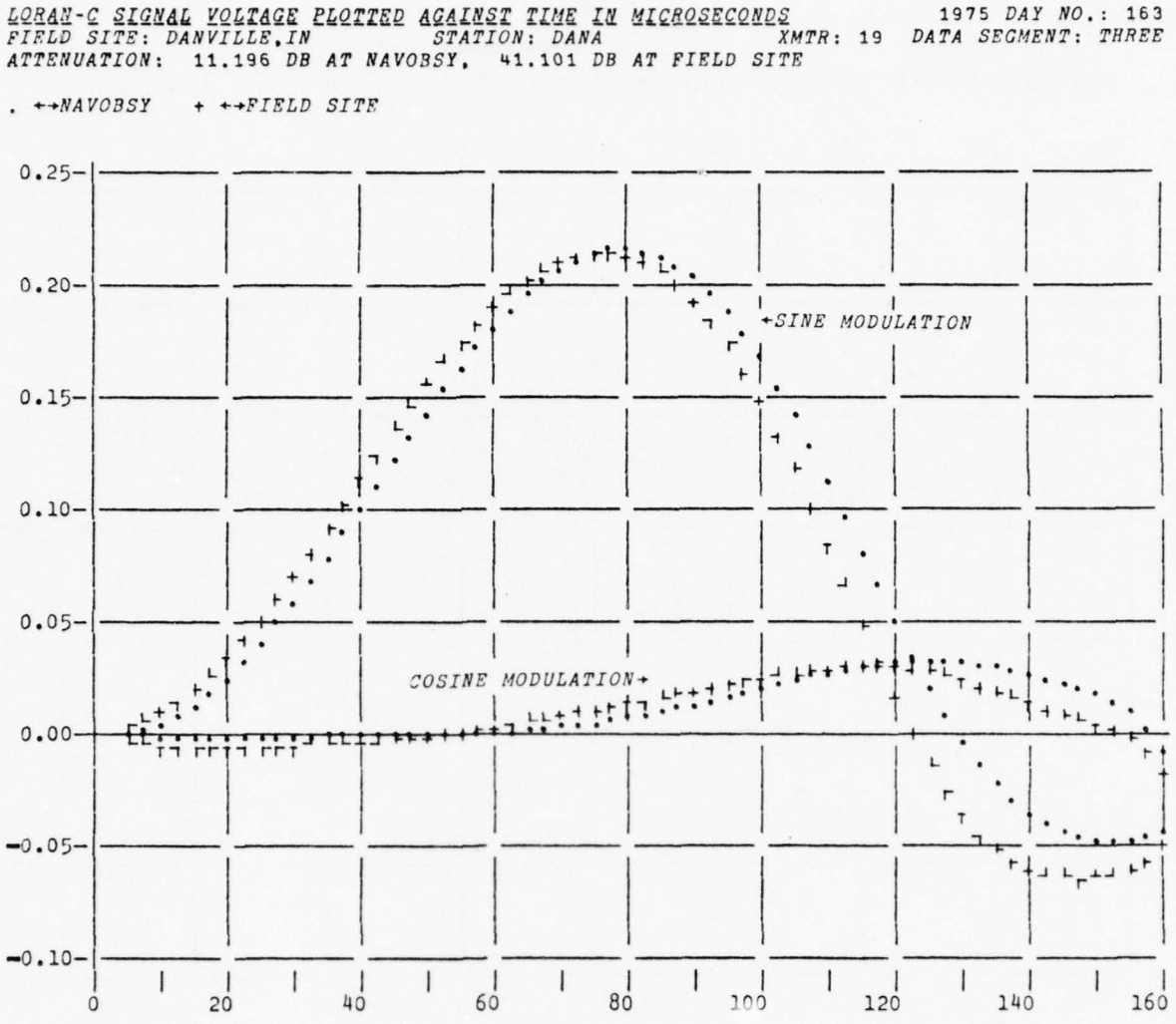


Fig. E-15 Sine and Cosine Modulations Observed Simultaneously at Danville, IN, and NAVOBSY; Data Segment 3

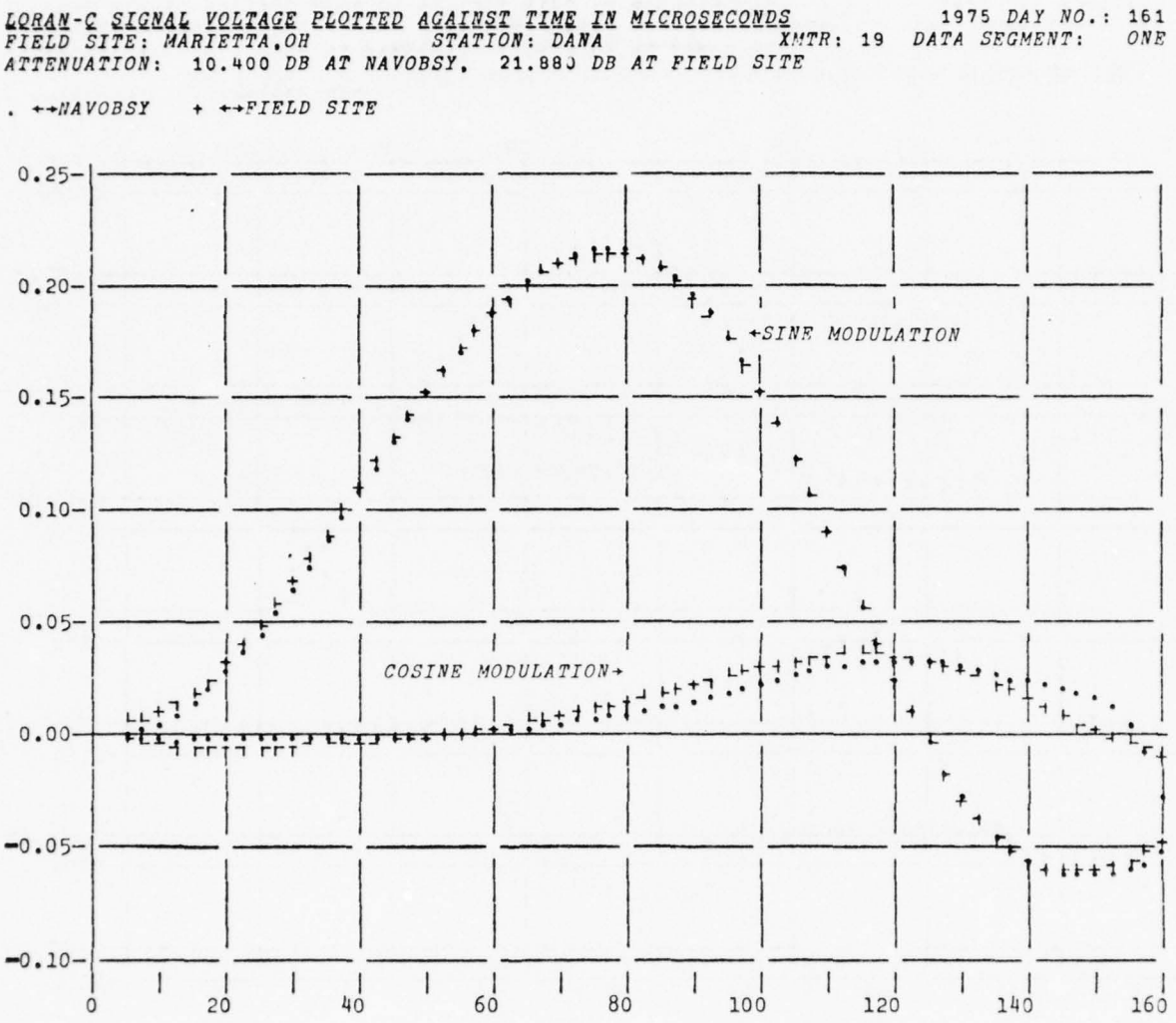


Fig. E-16 Sine and Cosine Modulations Observed Simultaneously at Marietta, OH, and NAVOBSY; Data Segment 1

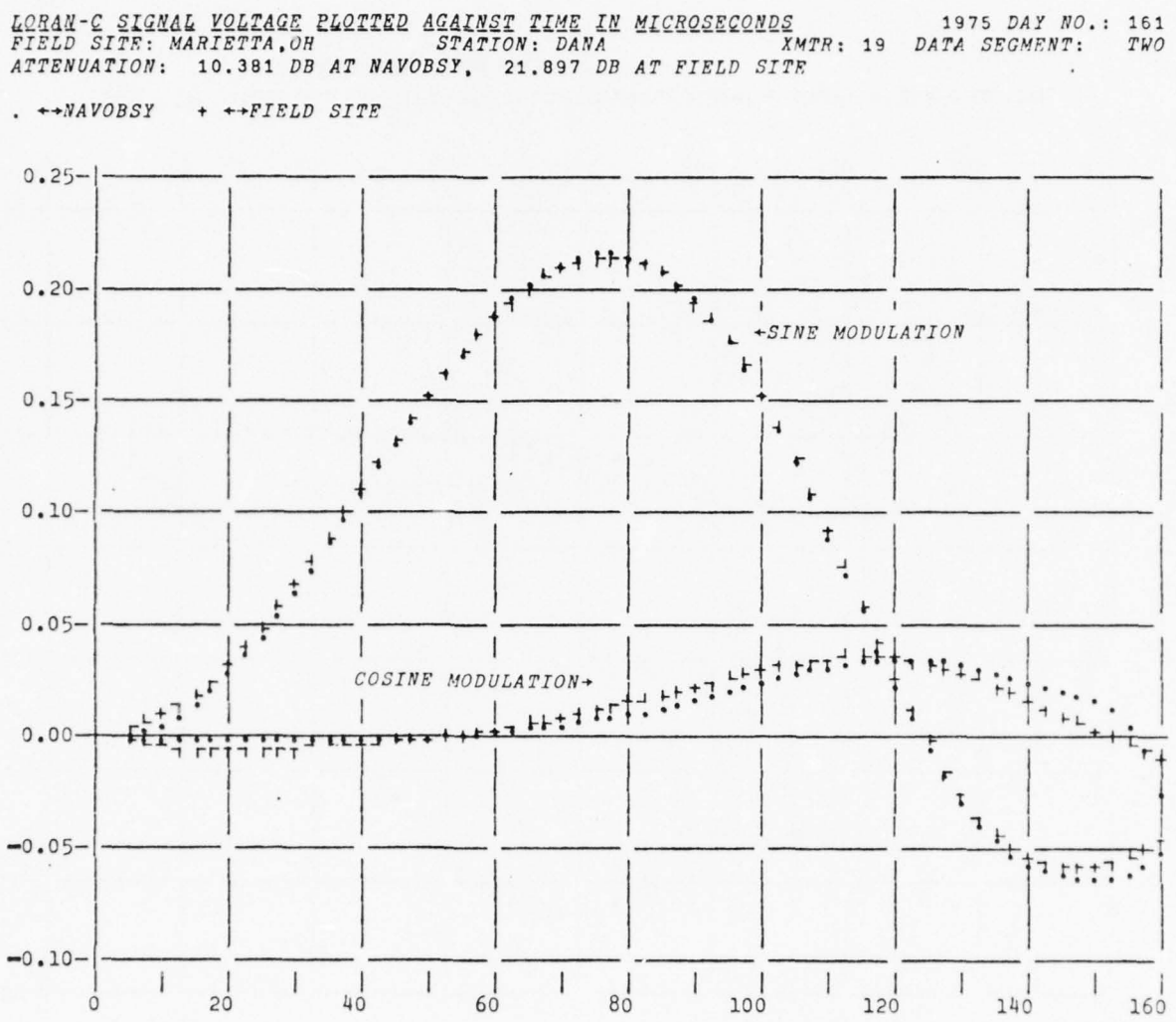


Fig. E-17 Sine and Cosine Modulations Observed Simultaneously at Marietta, OH, and NAVOBSY; Data Segment 2

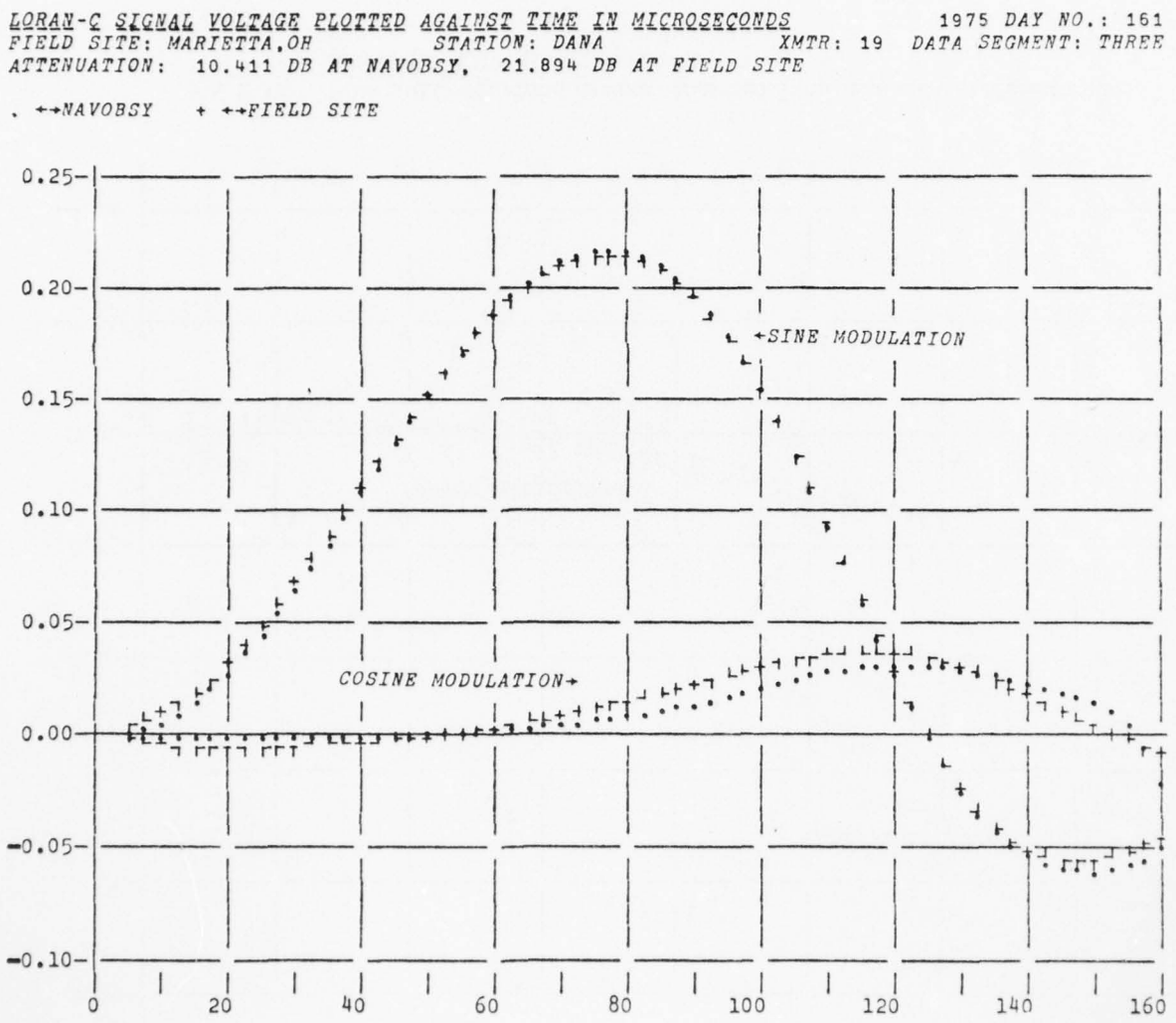


Fig. E-18 Sine and Cosine Modulations Observed Simultaneously at Marietta, OH, and NAVOBSY; Data Segment 3

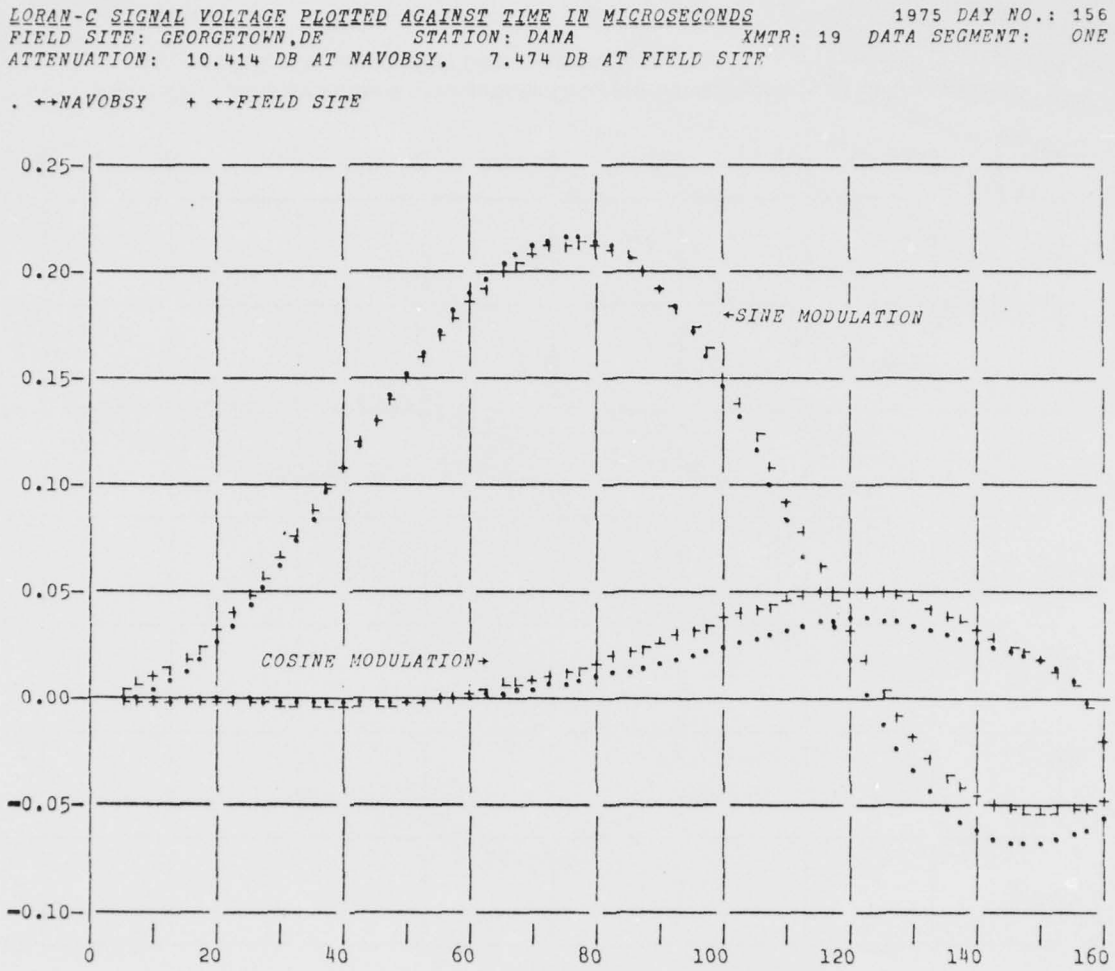


Fig. E-19 Sine and Cosine Modulations Observed Simultaneously at Georgetown, DE, and NAVOBSY; Data Segment 1

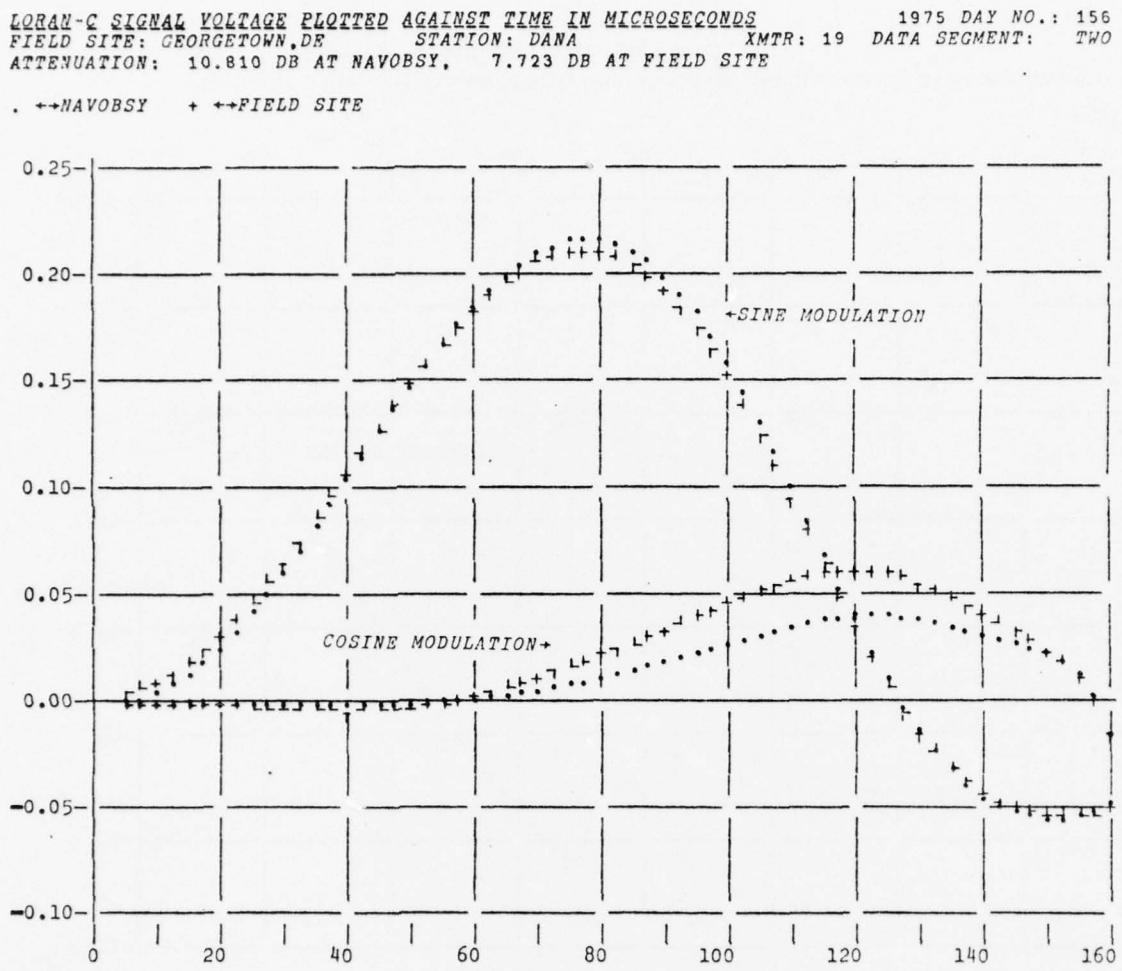


Fig. E-20 Sine and Cosine Modulations Observed Simultaneously at Georgetown, DE, and NAVOBSY; Data Segment 2

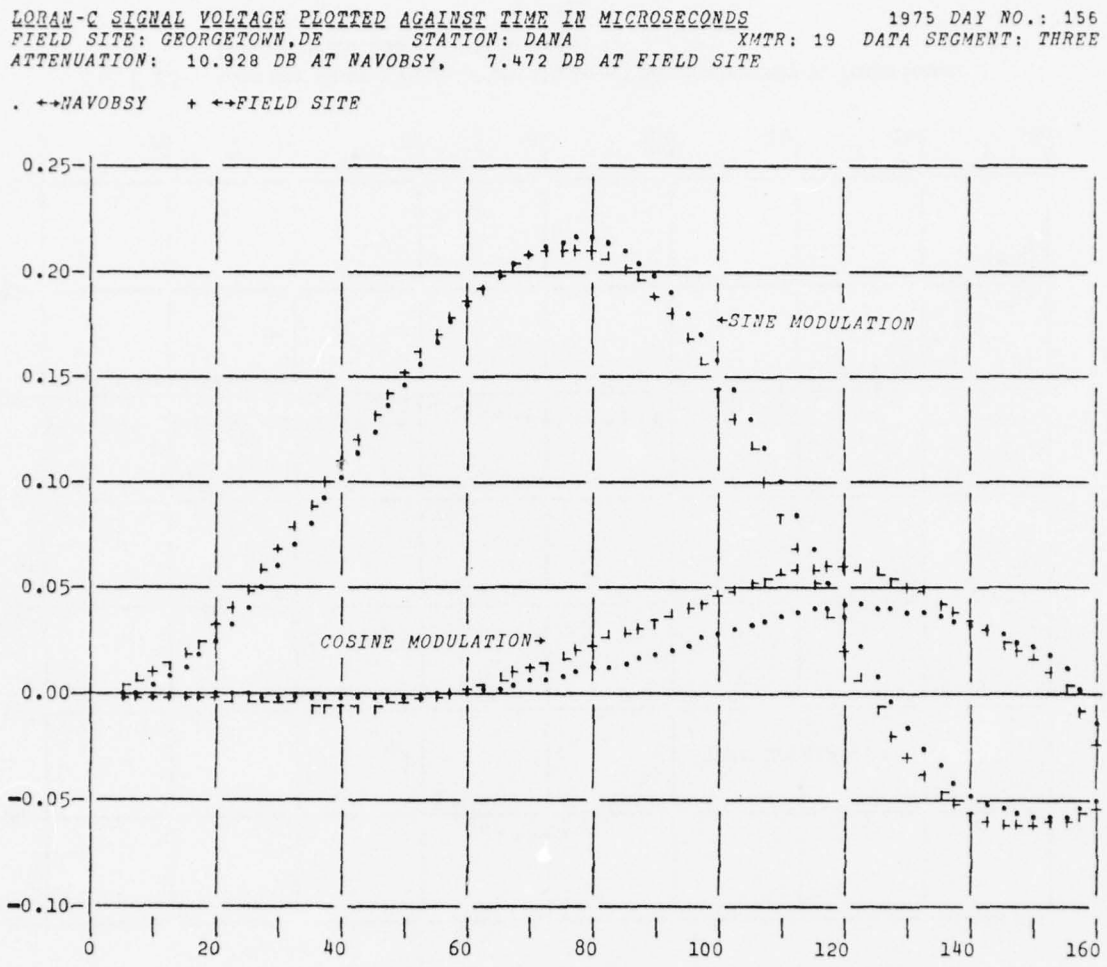


Fig. E-21 Sine and Cosine Modulations Observed Simultaneously at Georgetown, DE, and NAVOBSY; Data Segment 3

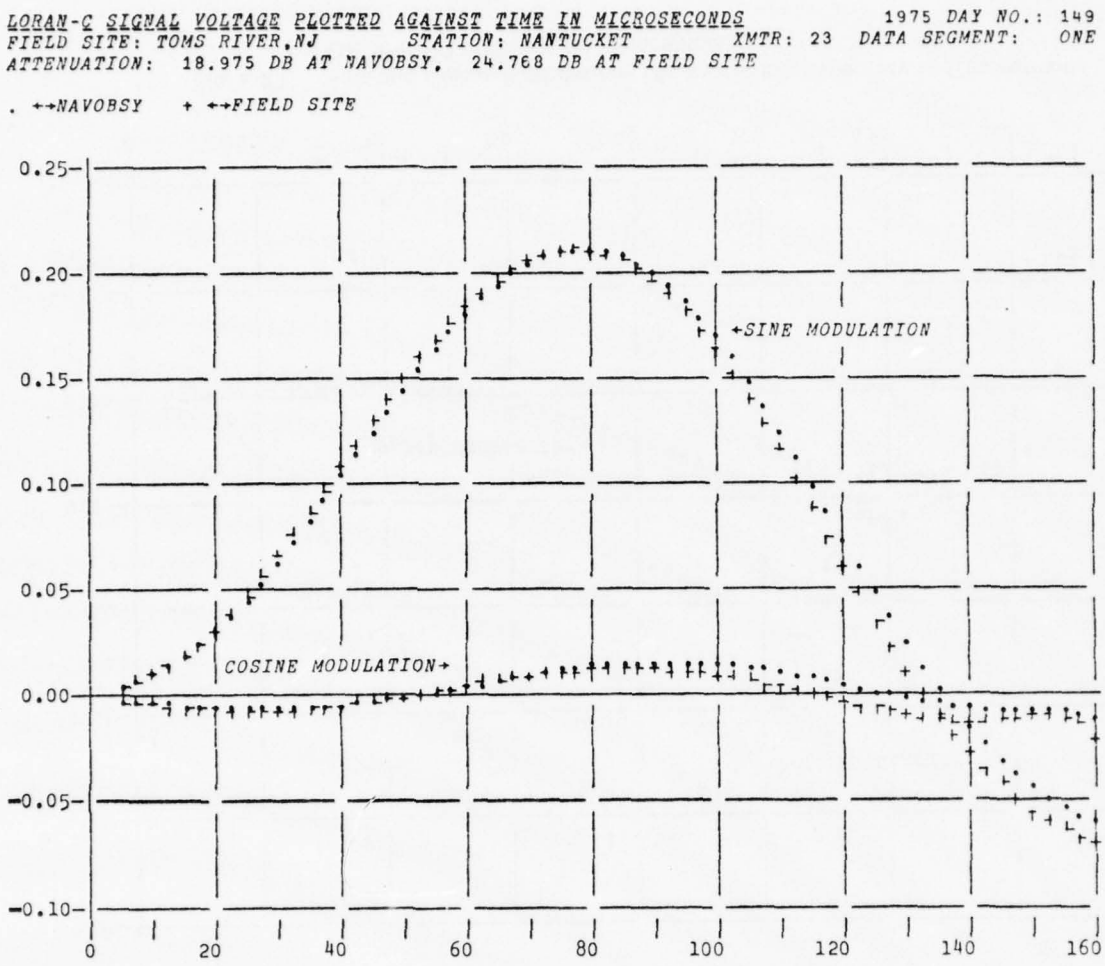


Fig. E-22 Sine and Cosine Modulations Observed Simultaneously at Toms River, NJ, and NAVOBSY; Data Segment 1

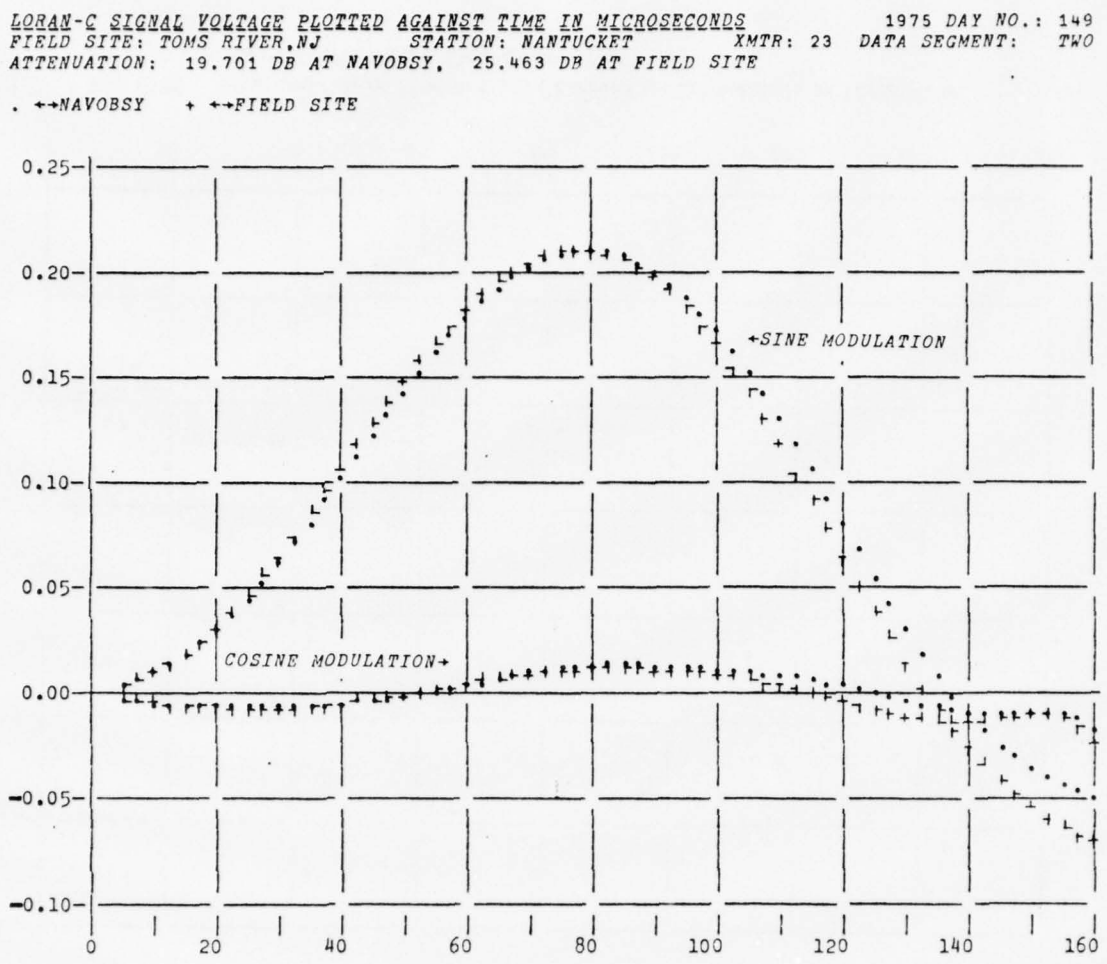


Fig. E-23 Sine and Cosine Modulations Observed Simultaneously at Toms River, NJ, and NAVOBSY; Data Segment 2

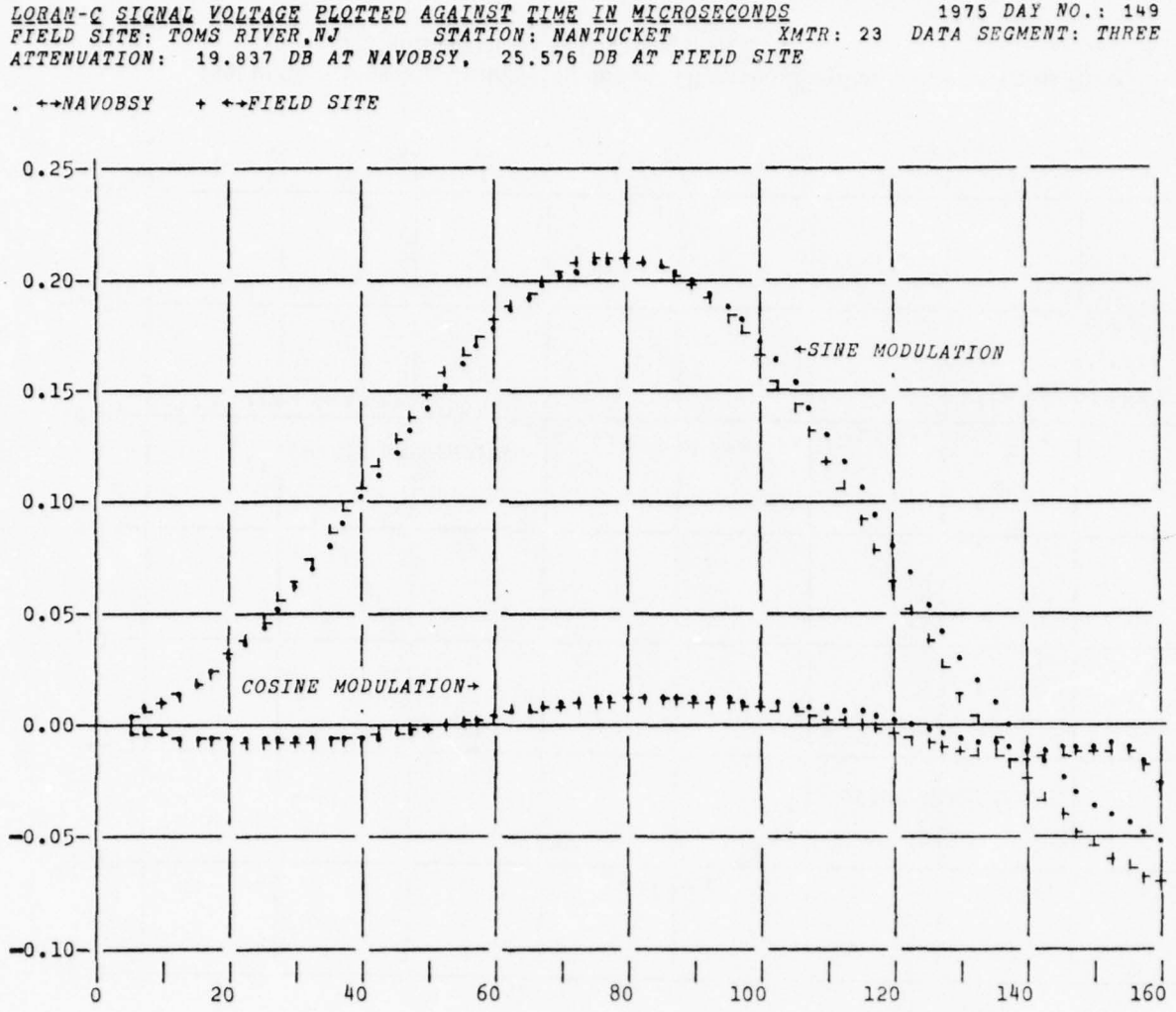


Fig. E-24 Sine and Cosine Modulations Observed Simultaneously at Toms River, NJ, and NAVOBSY; Data Segment 3

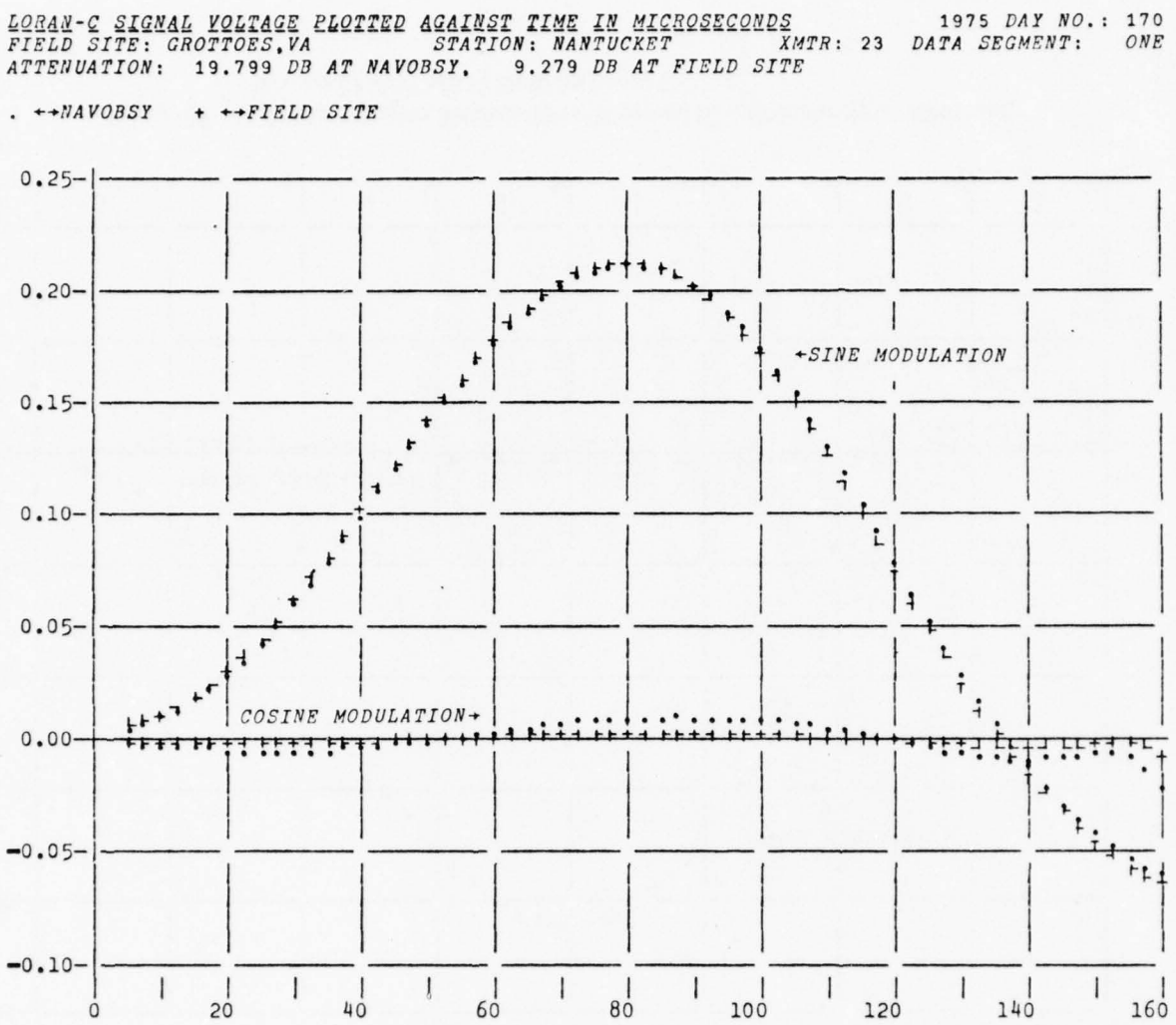


Fig. E-25 Sine and Cosine Modulations Observed Simultaneously at Grottoes, VA, and NAVOBSY; Data Segment 1

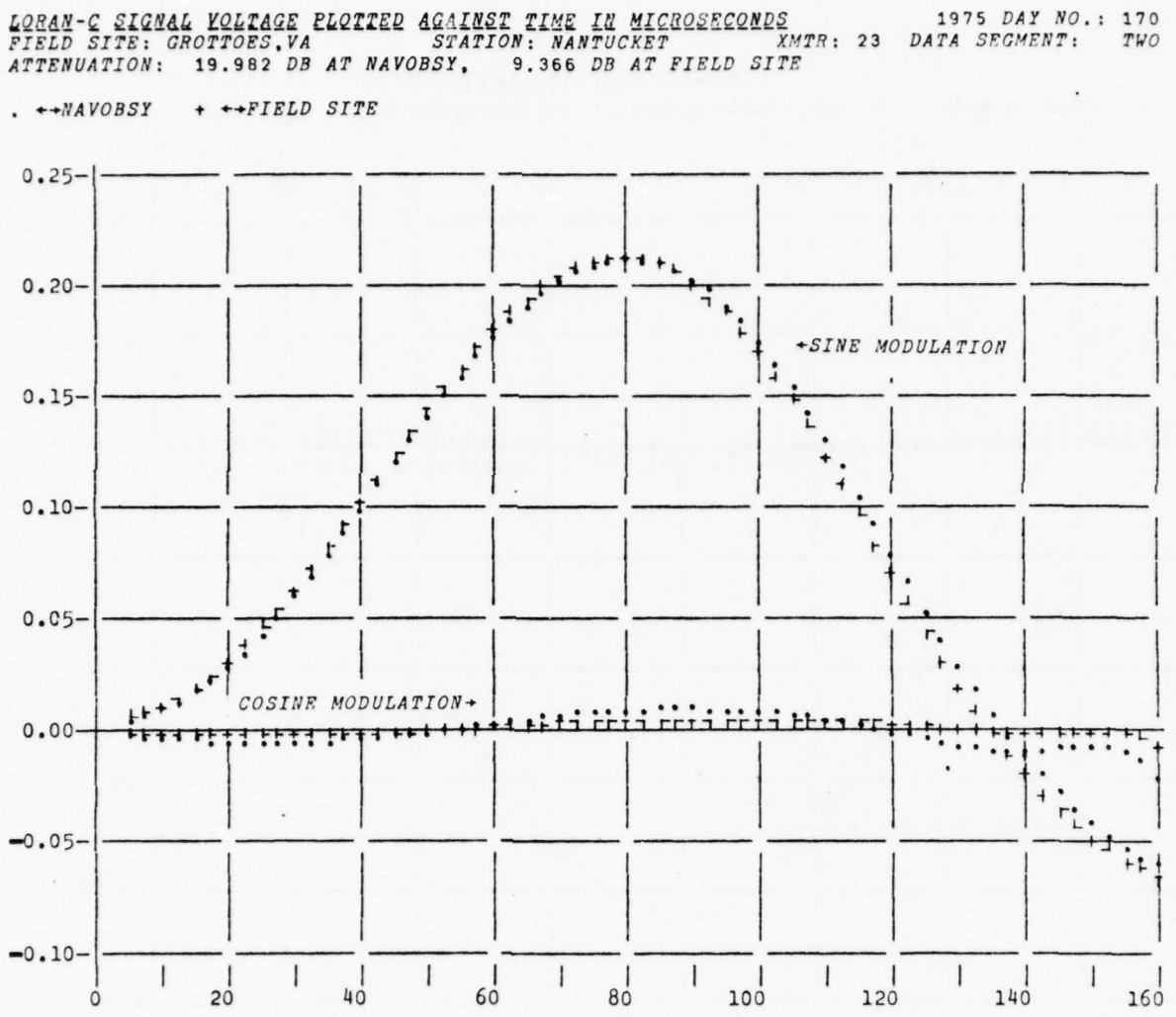


Fig. E-26 Sine and Cosine Modulations Observed Simultaneously at Grottoes, VA, and NAVOBSY; Data Segment 2

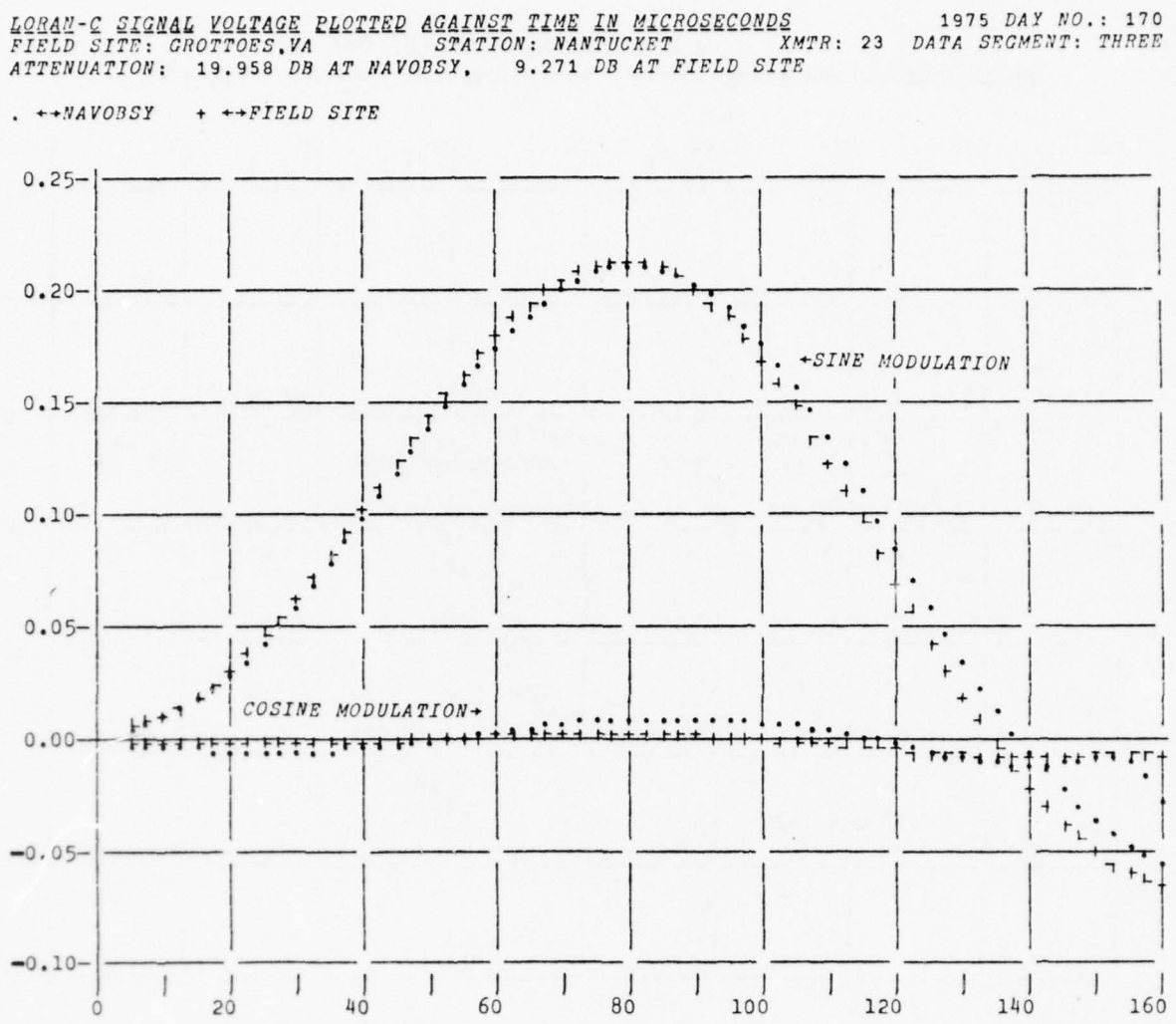


Fig. E-27 Sine and Cosine Modulations Observed Simultaneously at Grottoes, VA, and NAVOBSY; Data Segment 3

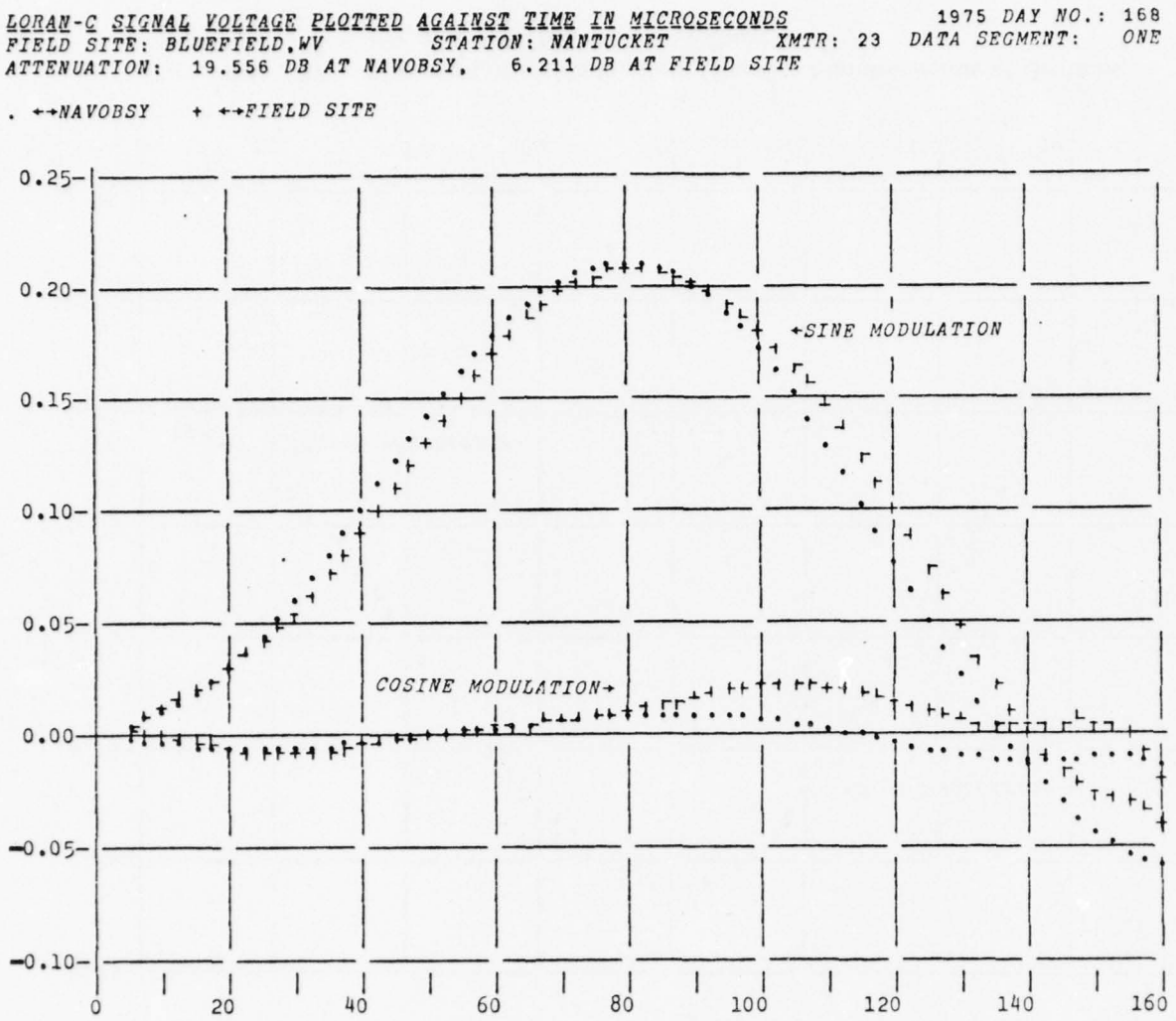


Fig. E-28 Sine and Cosine Modulations Observed Simultaneously at Bluefield, WV, and NAVOBSY; Data Segment 1

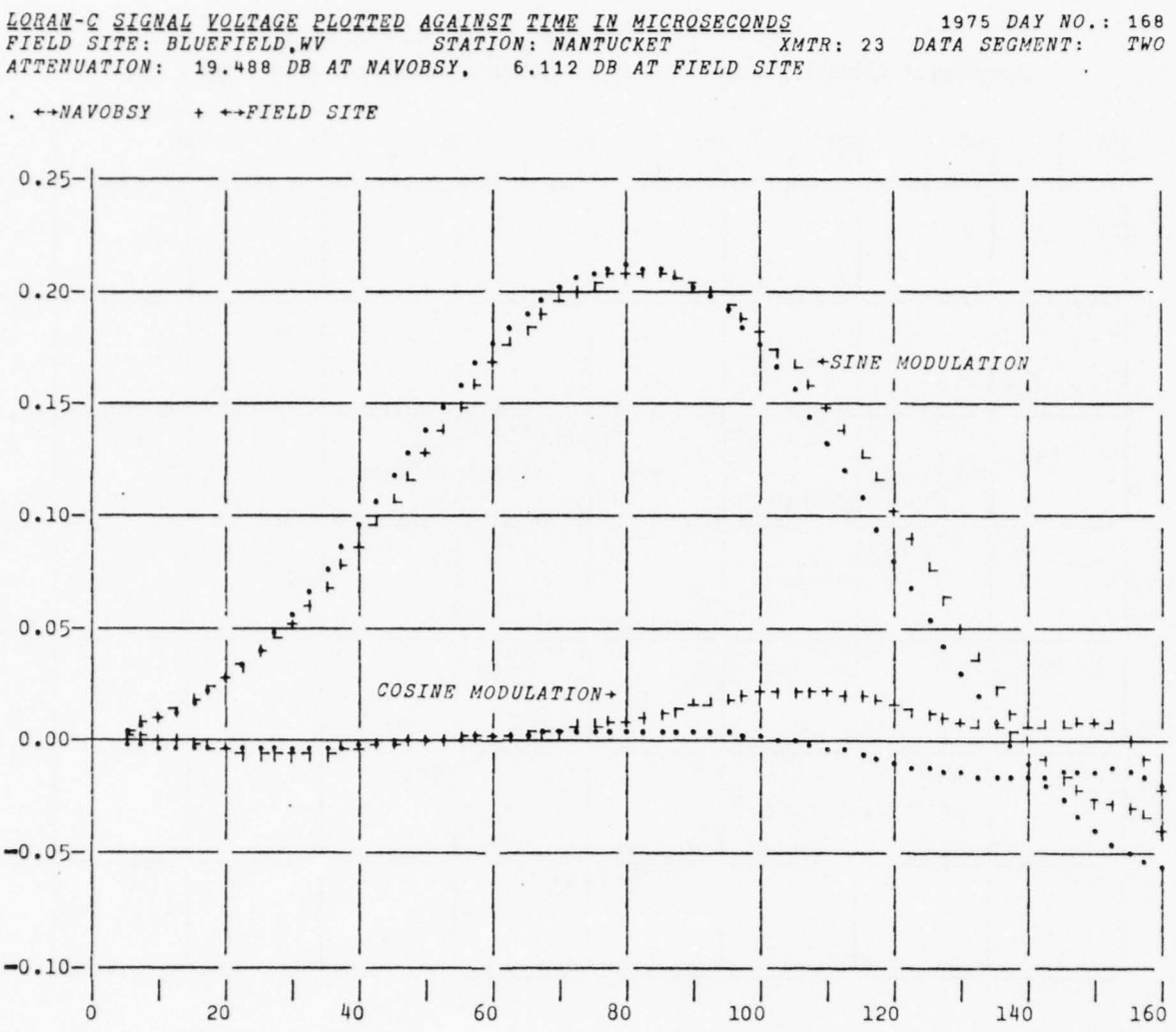


Fig. E-29 Sine and Cosine Modulations Observed Simultaneously at Bluefield, WV, and NAVOBSY; Data Segment 2

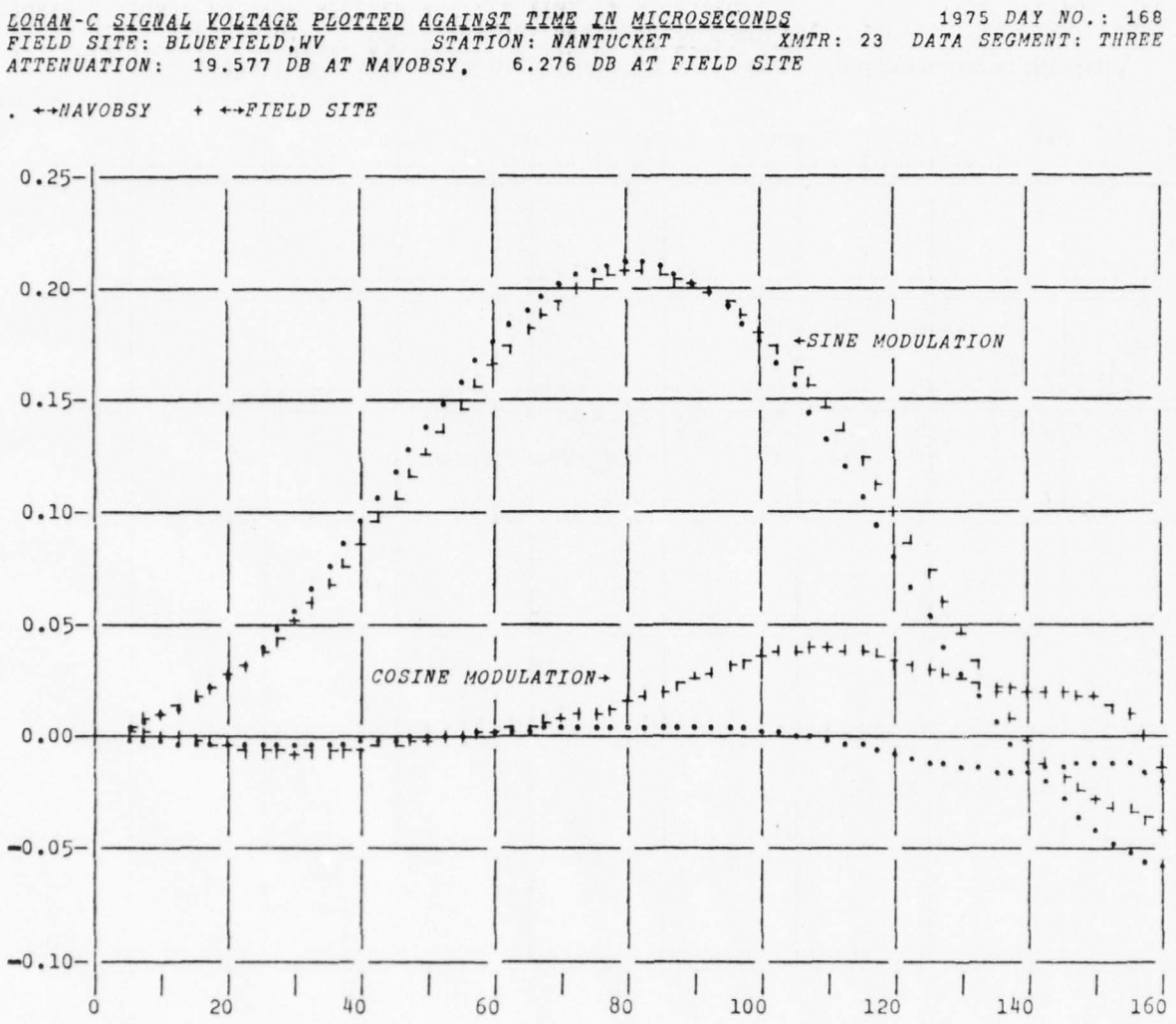


Fig. E-30 Sine and Cosine Modulations Observed Simultaneously at Bluefield, WV, and NAVOBSY; Data Segment 3

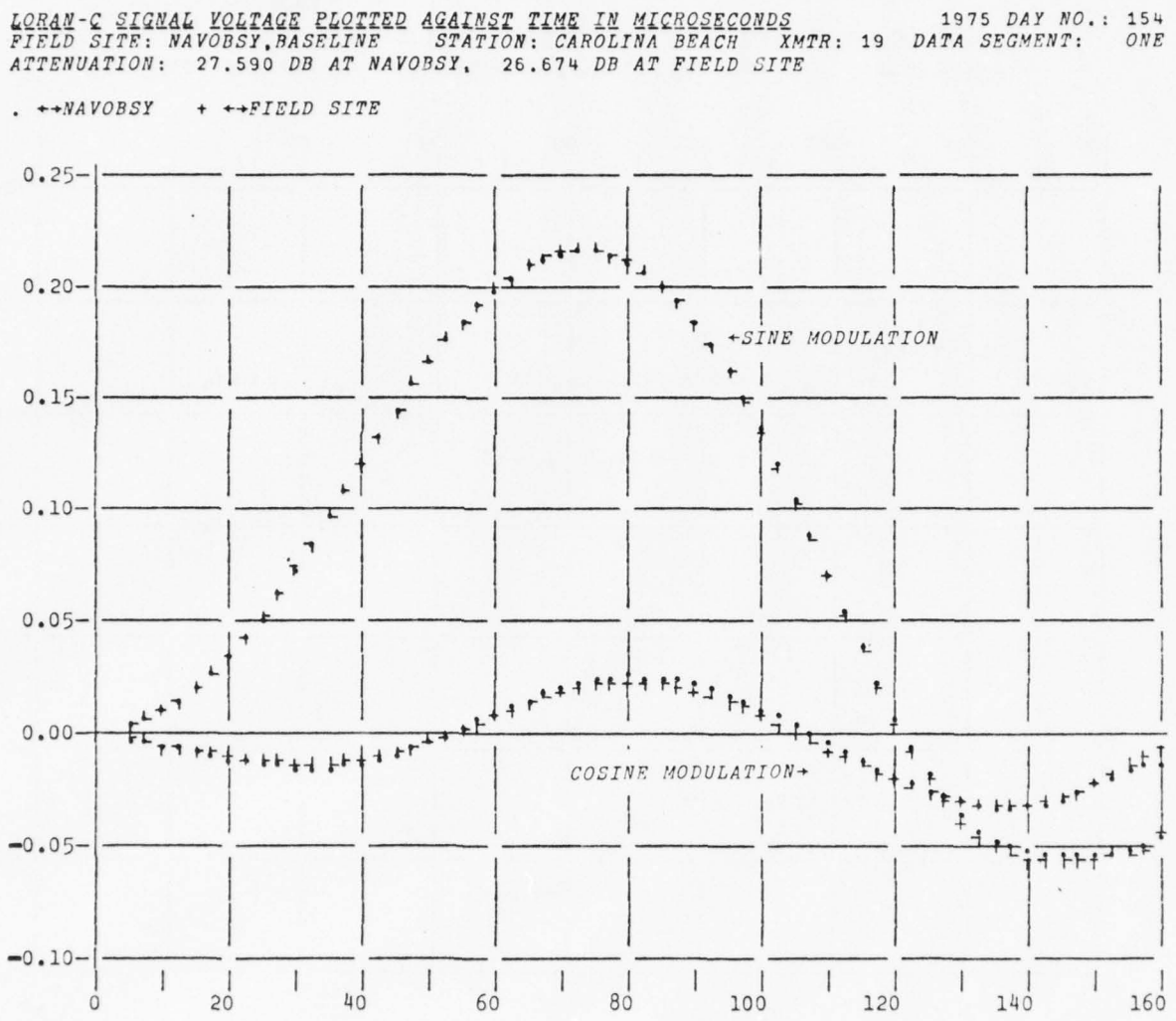


Fig. E-31 Sine and Cosine Modulations Observed Simultaneously at NAVOBSY by the Fixed and Field Site Equipment on 1975 Day No. 154; Data Segment 1

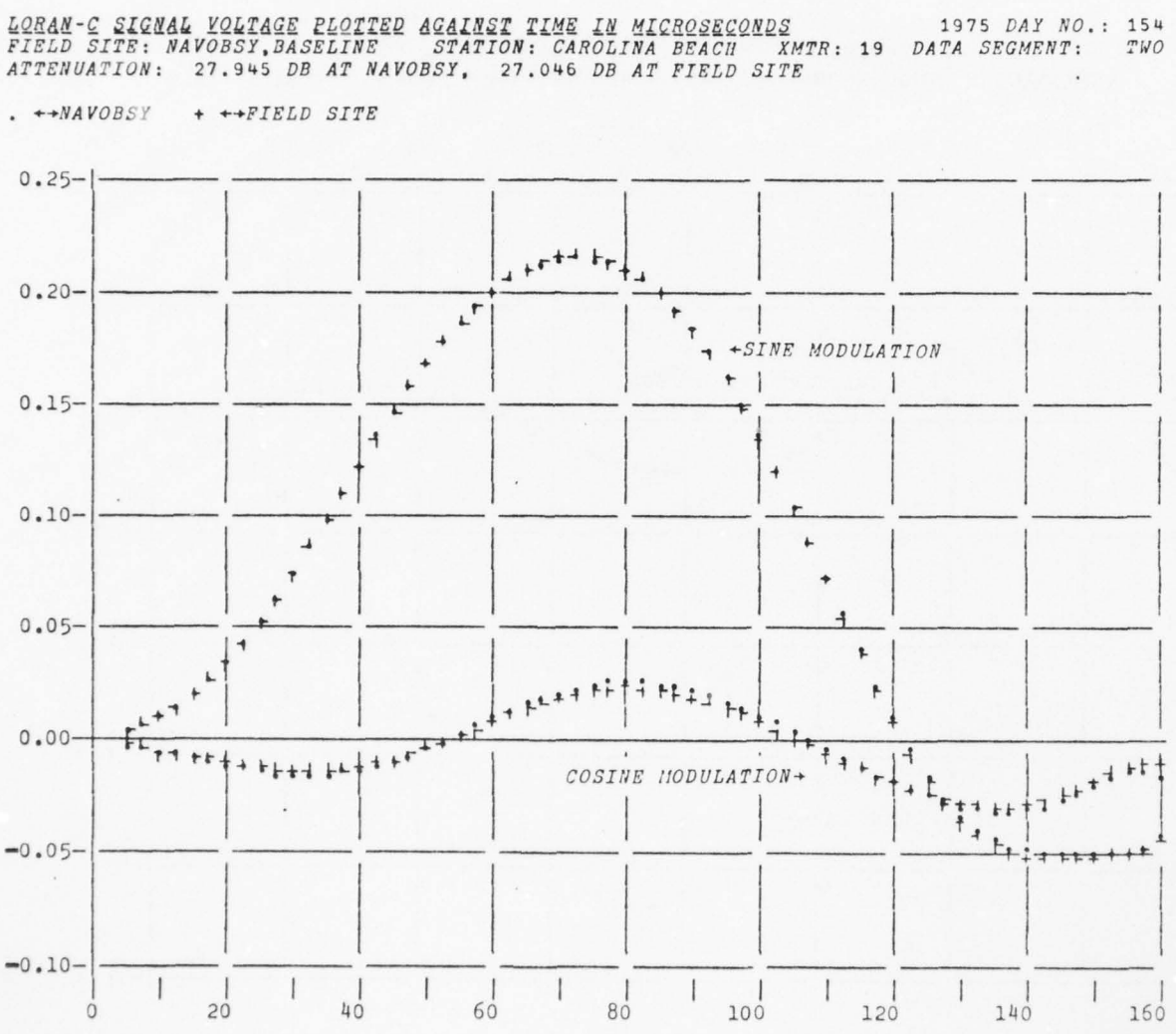


Fig. E-32 Sine and Cosine Modulations Observed Simultaneously at NAVOBSY by the Fixed and Field Site Equipment on 1975 Day No. 154; Data Segment 2

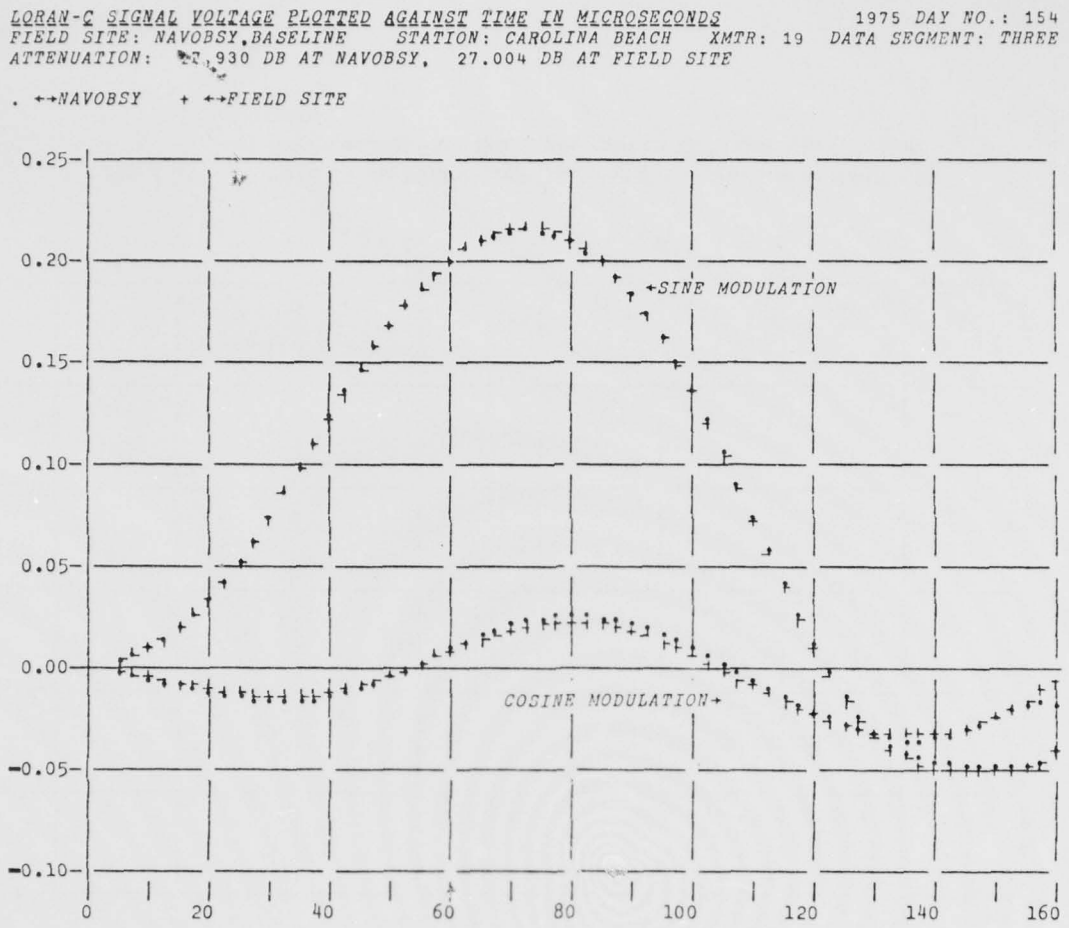


Fig. E-33 Sine and Cosine Modulations Observed Simultaneously at NAVOBSY by the Fixed and Field Site Equipment on 1975 Day No. 154; Data Segment 3

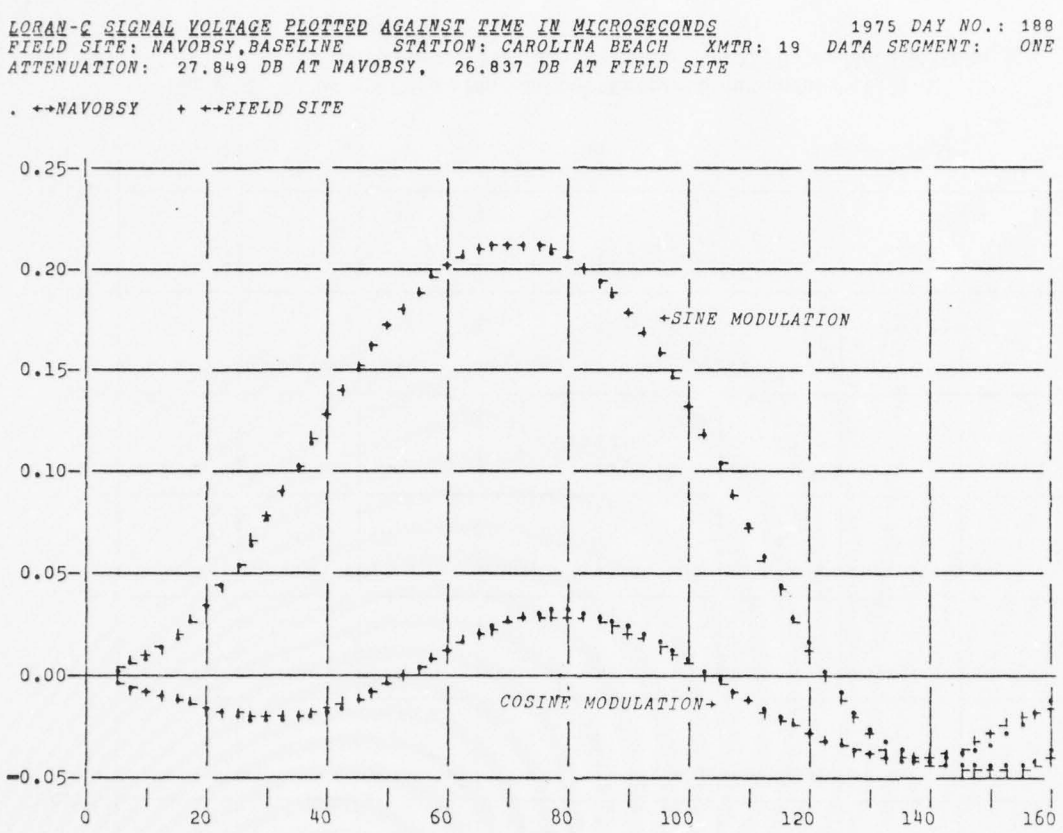


Fig. E-34 Sine and Cosine Modulations Observed Simultaneously at NAVOBSY by the Fixed and Field Site Equipment on 1975 Day No. 188; Data Segment 1

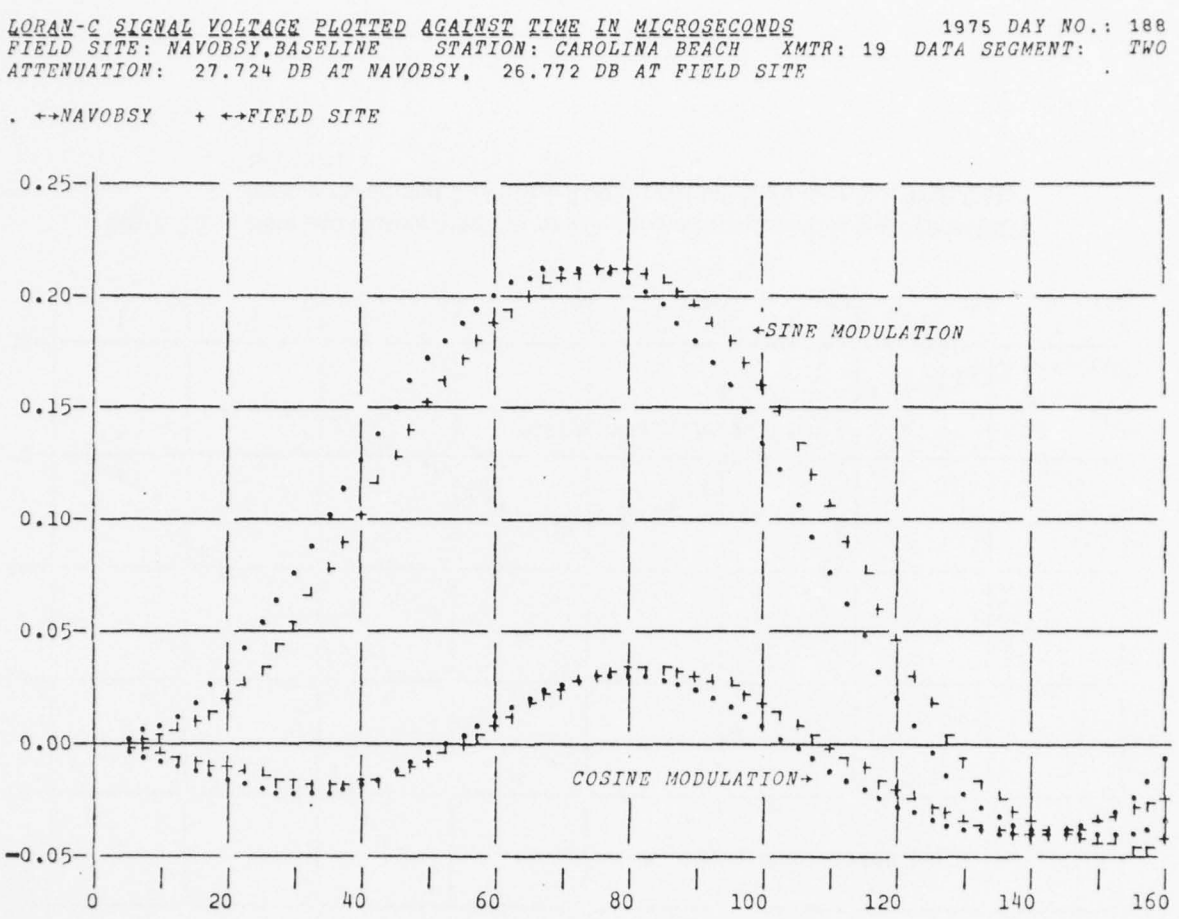


Fig. E-35 Sine and Cosine Modulations Observed Simultaneously at NAVOBSY by the Fixed and Field Site Equipment on 1975 Day No. 188; Data Segment 2

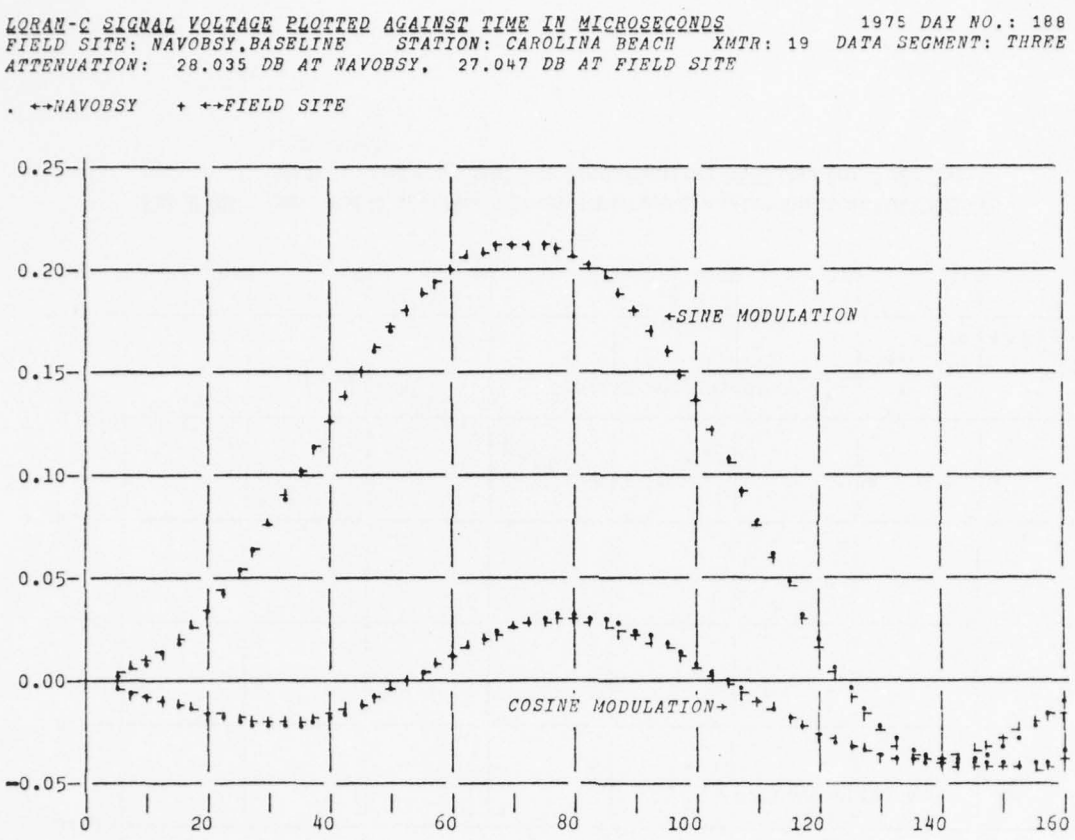


Fig. E-36 Sine and Cosine Modulations Observed Simultaneously at NAVOBSY by the Fixed and Field Site Equipment on 1975 Day No. 188; Data Segment 3

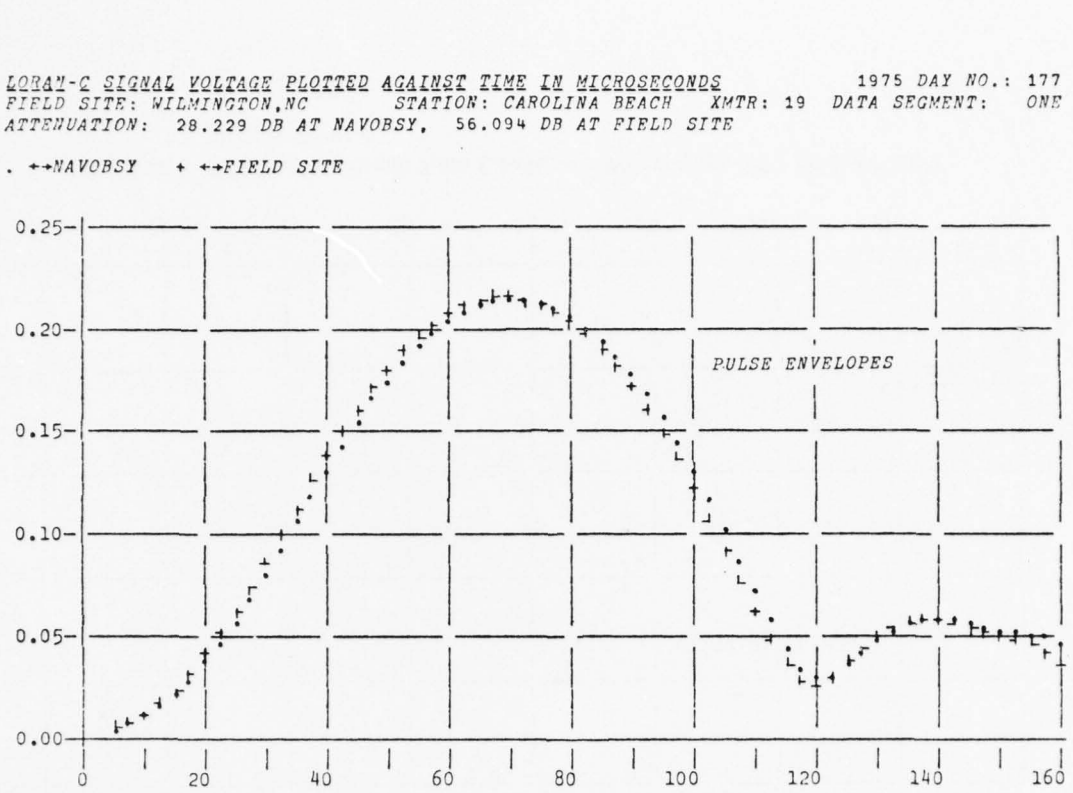


Fig. E-37 The Carolina Beach Pulse Envelope at Wilmington, NC, and NAVOBSY; *Data Segment 1*

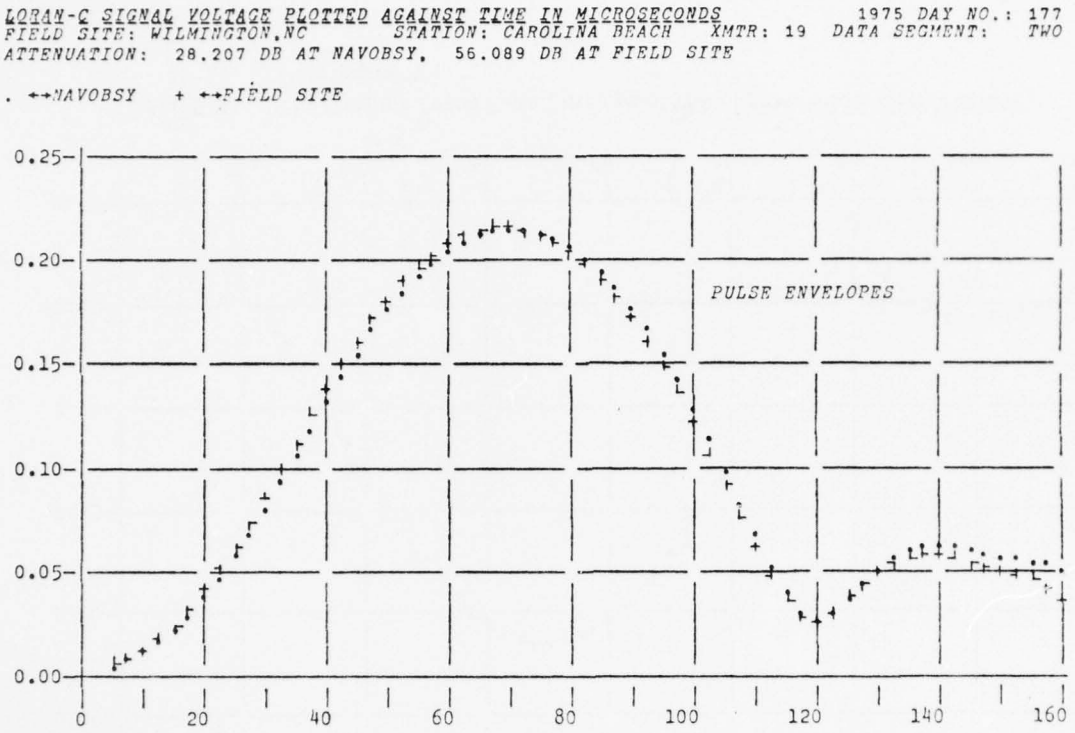


Fig. E-38 The Carolina Beach Pulse Envelope at Wilmington, NC, and NAVOBSY; Data Segment 2

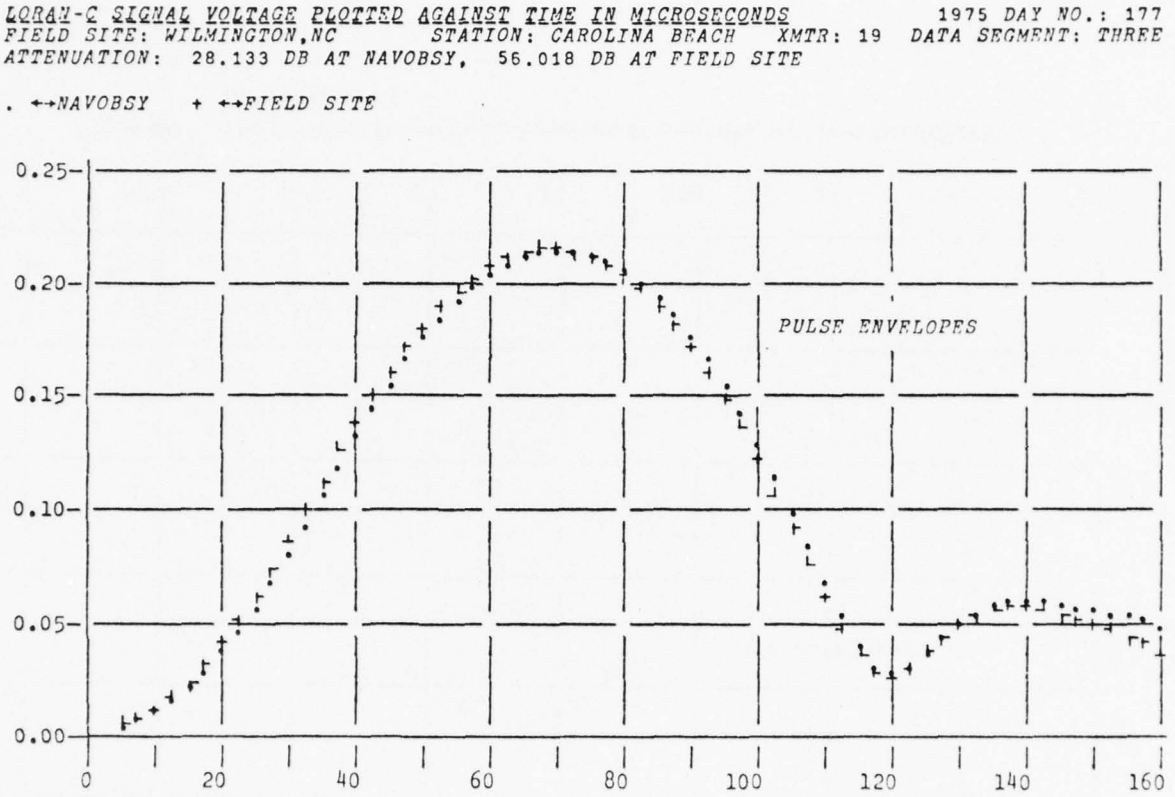


Fig. E-39 The Carolina Beach Pulse Envelope at Wilmington, NC, and NAVOBSY; Data Segment 3

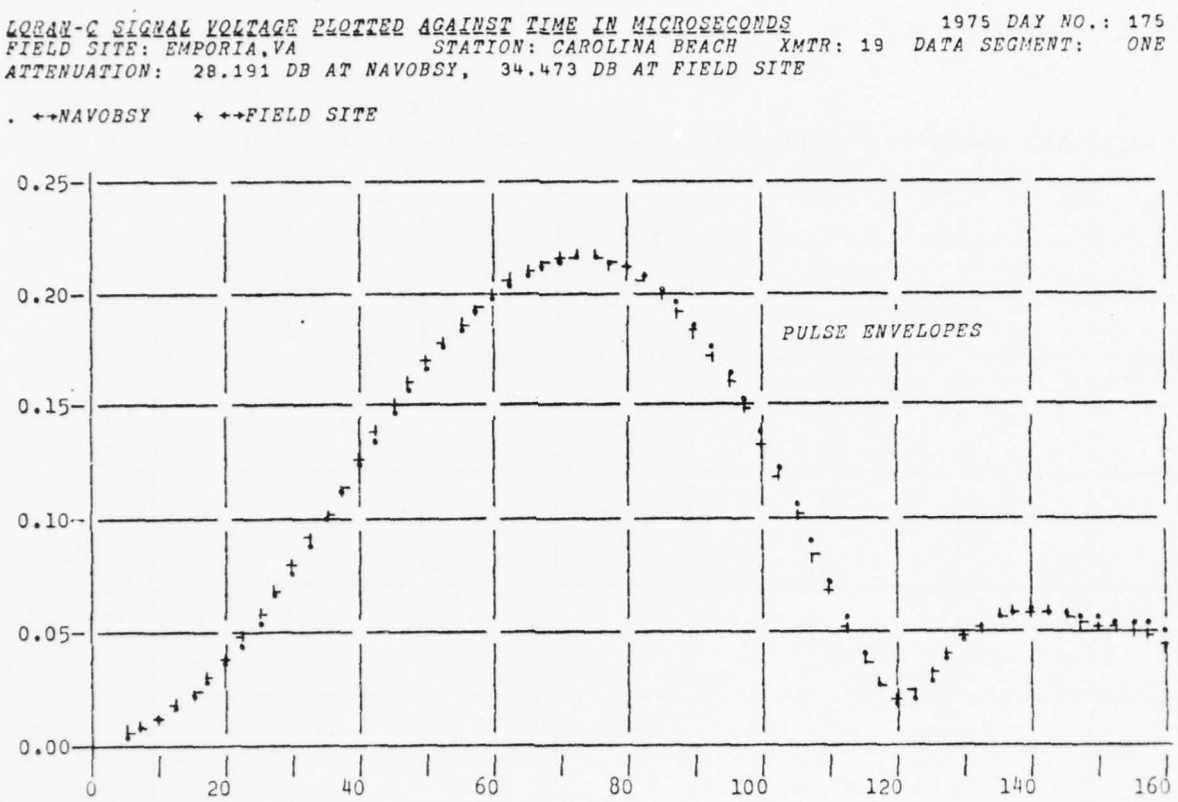


Fig. E-40 The Carolina Beach Pulse Envelope at Emporia, VA, and NAVOBSY; Data Segment 1

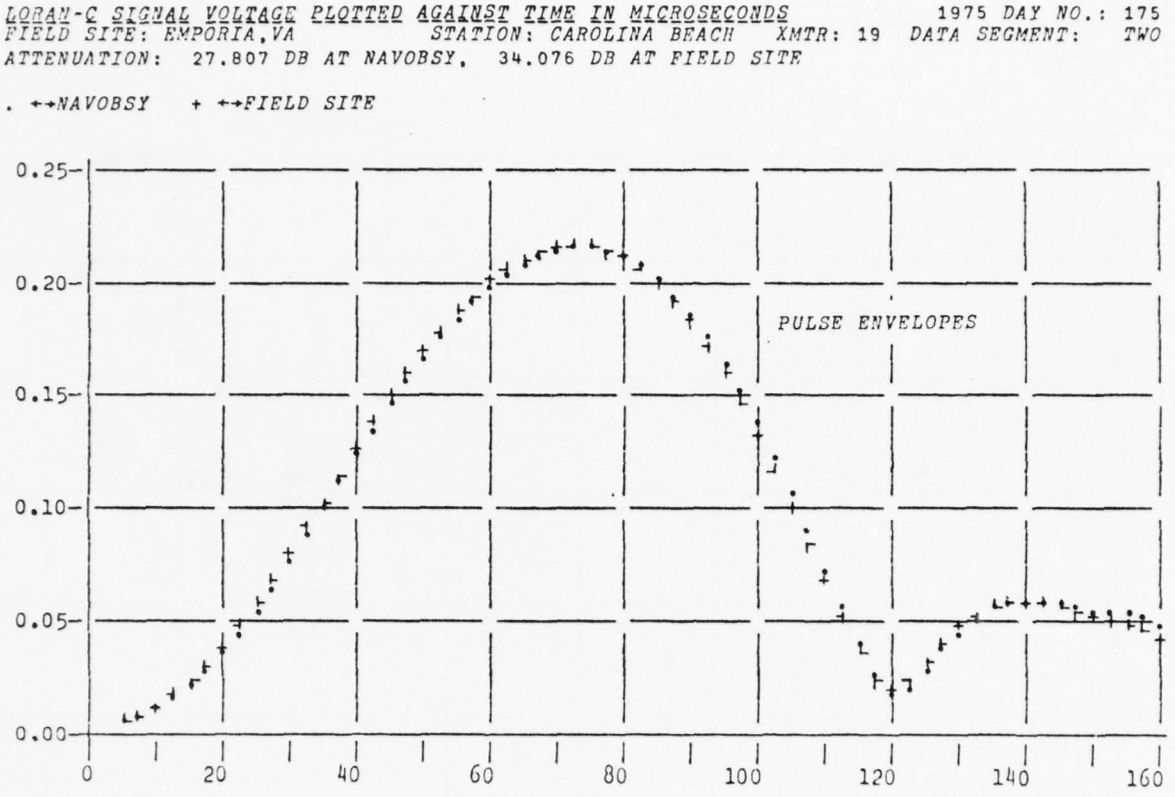


Fig. E-41 The Carolina Beach Pulse Envelope at Emporia, VA, and NAVOBSY; Data Segment 2

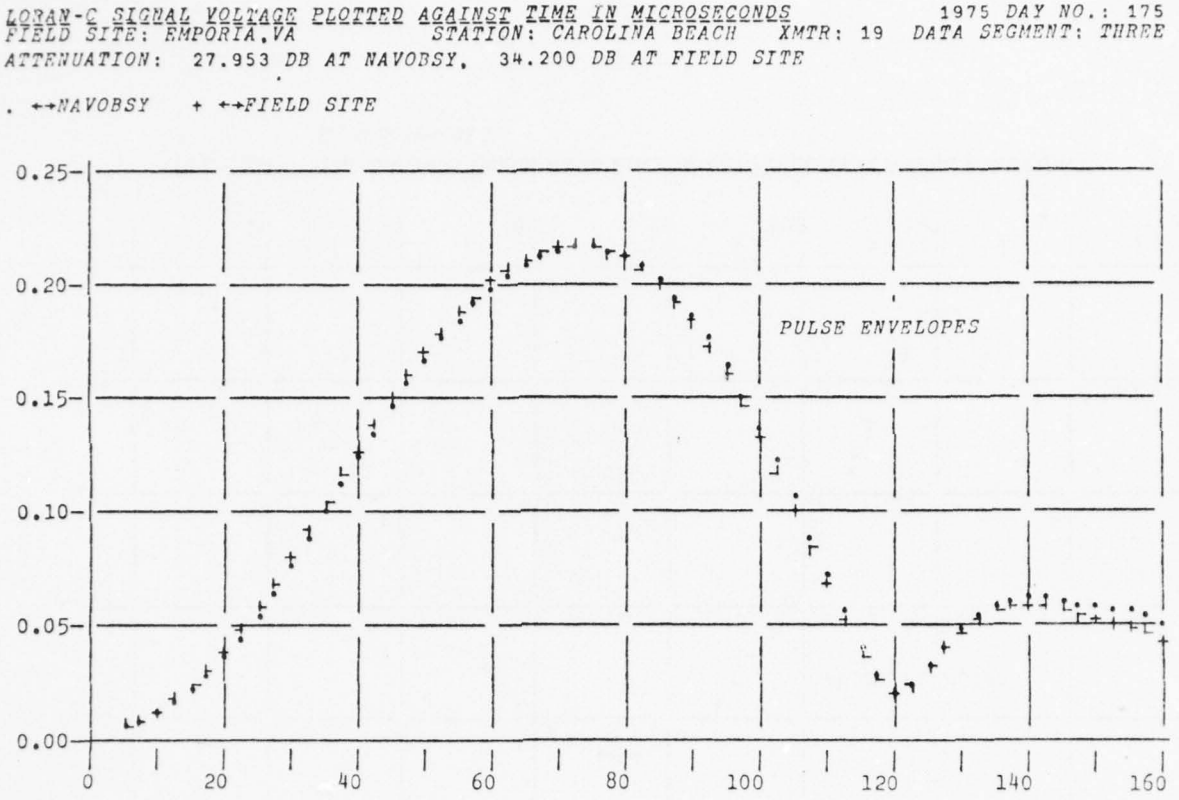


Fig. E-42 The Carolina Beach Pulse Envelope at Emporia, VA, and NAVOBSY; Data Segment 3

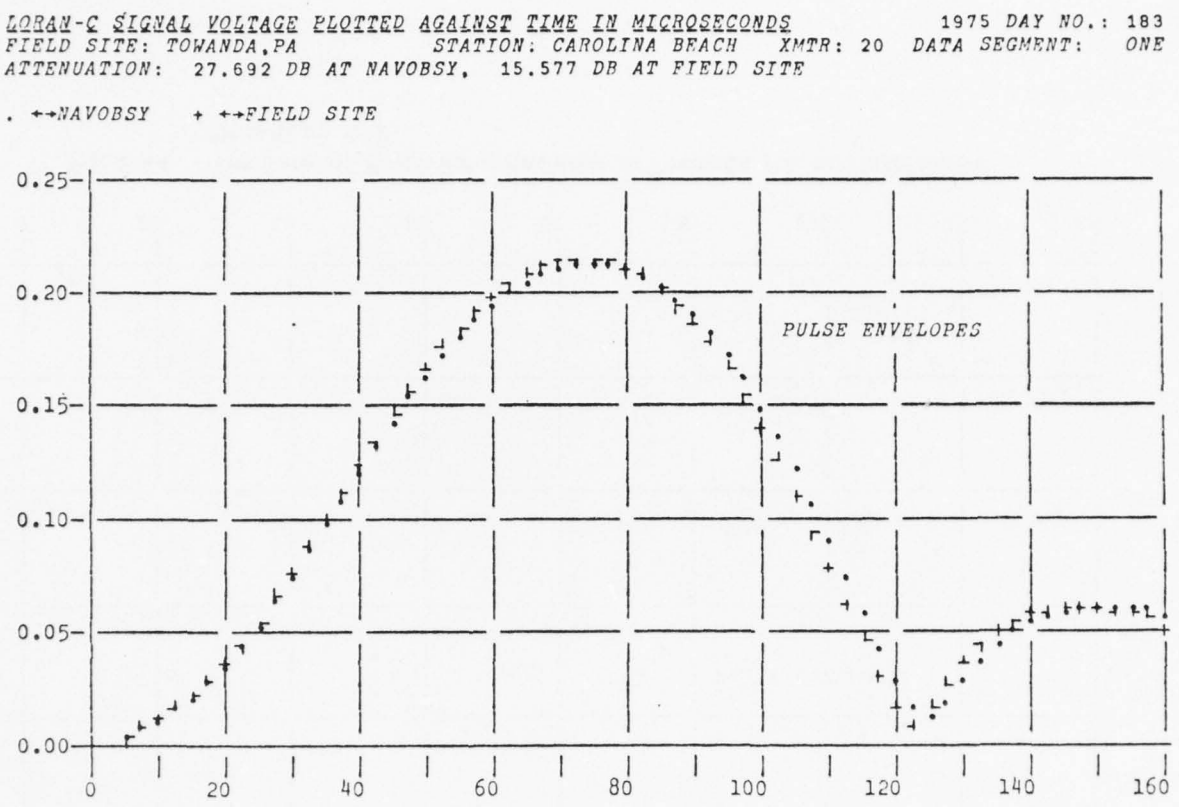


Fig. E-43 The Carolina Beach Pulse Envelope at Towanda, PA, and NAVOBSY; Data Segment 1

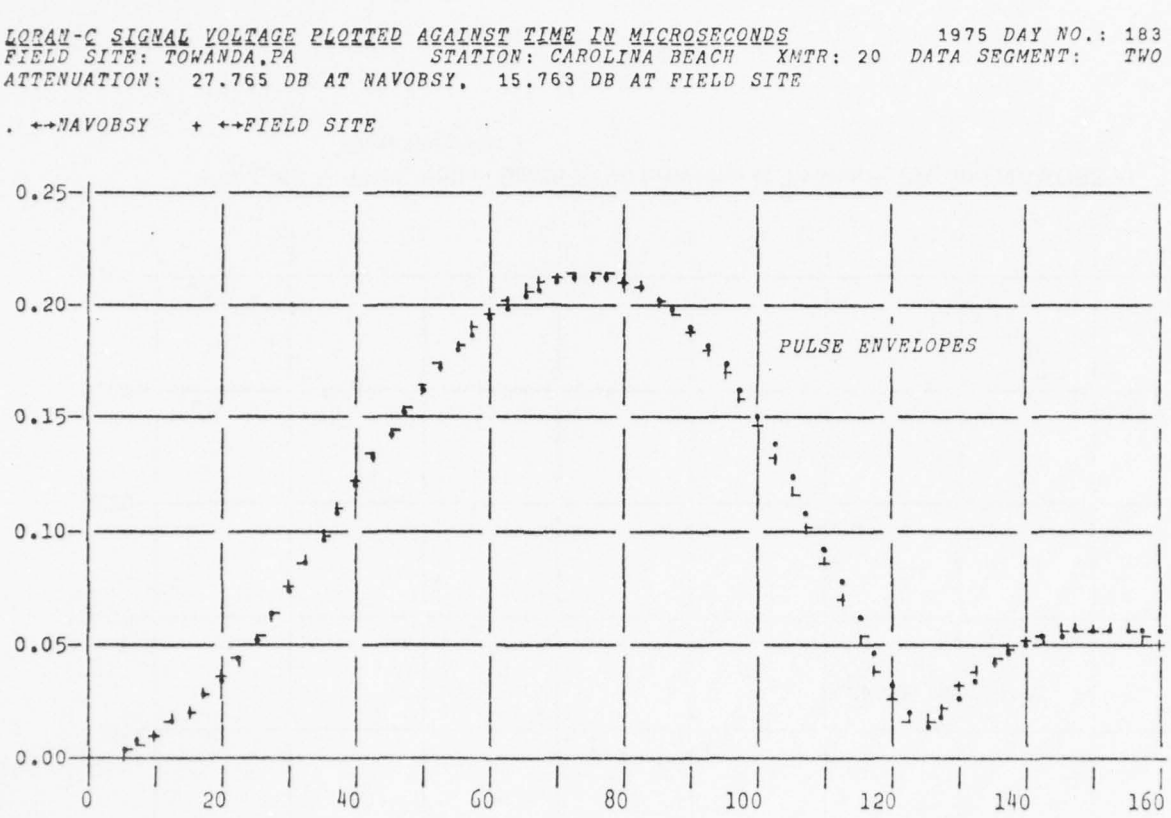


Fig. E-44 The Carolina Beach Pulse Envelope at Towanda, PA, and NAVOBSY; Data Segment 2

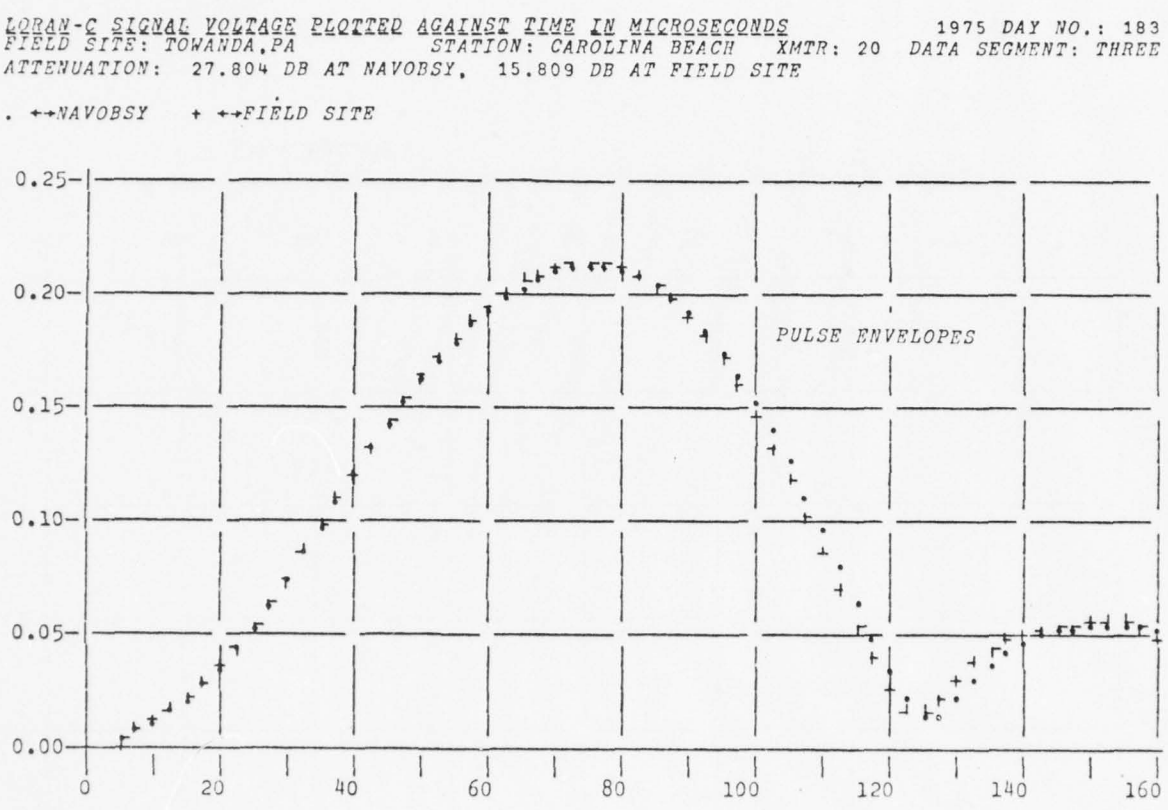


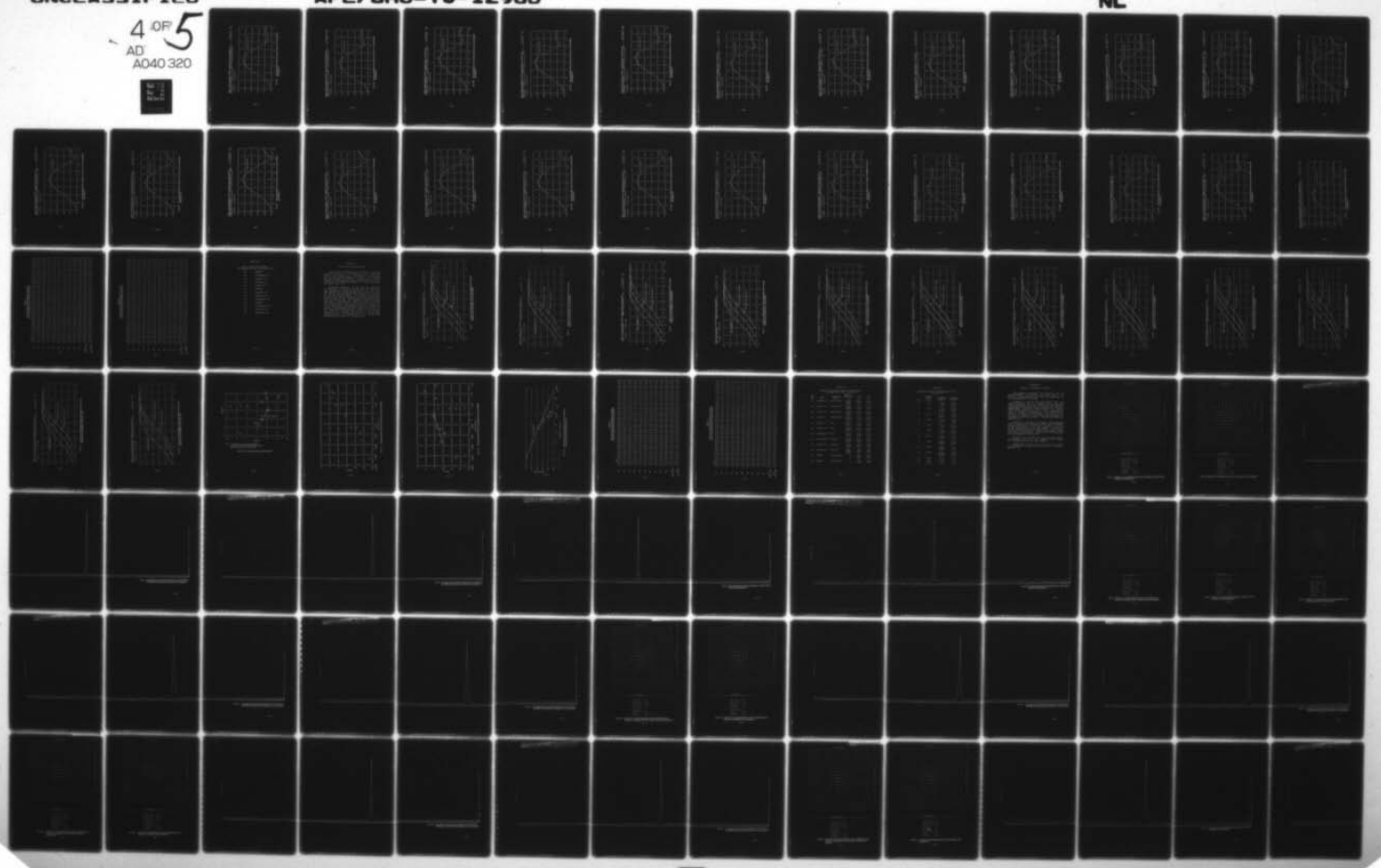
Fig. E-45 The Carolina Beach Pulse Envelope at Towanda, PA, and NAVOBSY; Data Segment 3



Fig. E-46 The Carolina Beach Pulse Envelope at Dexter, NY, and NAVOBSY; Data Segment 1

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EXPERIMENTAL RESEARCH ON THE PROPAGATION OF LORAN-C SIGNALS. VO--ETC(U)
JAN 77 L F FEHLNER, T W JERARDI, T A MCCARTY N00017-72-C-4401
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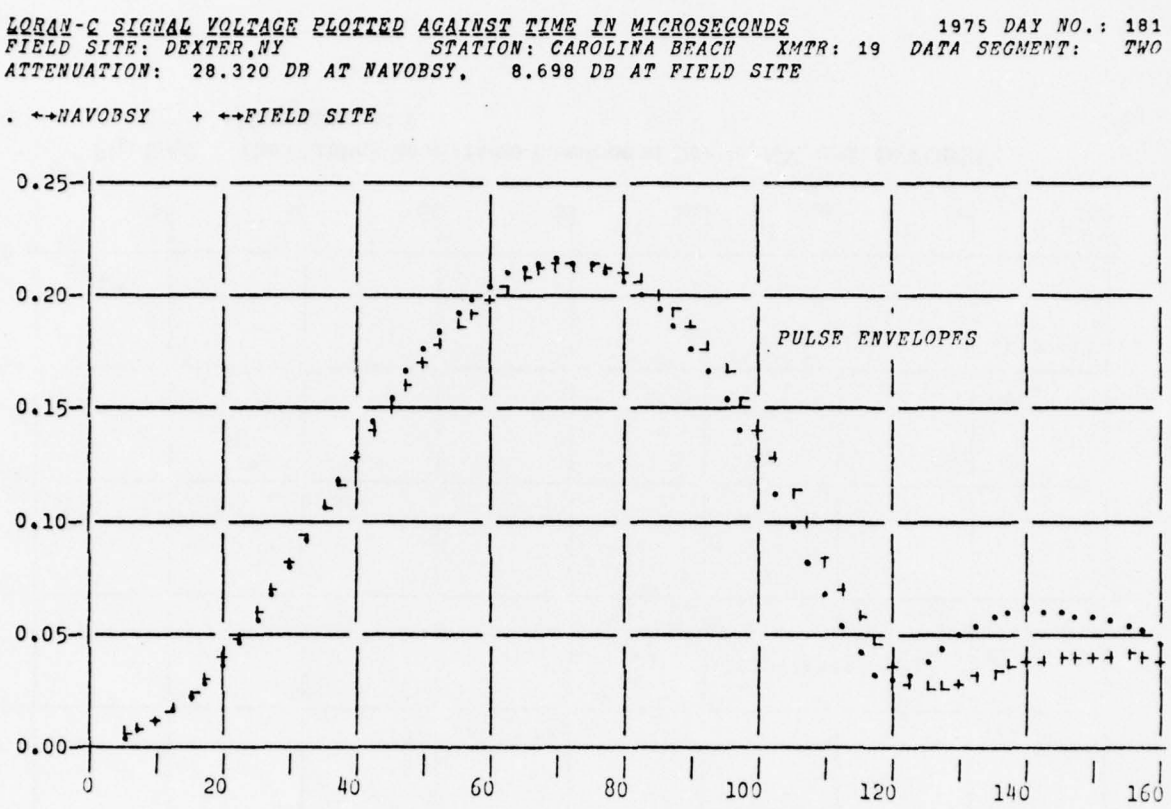


Fig. E-47 The Carolina Beach Pulse Envelope at Dexter, NY, and NAVOBSY; Data Segment 2

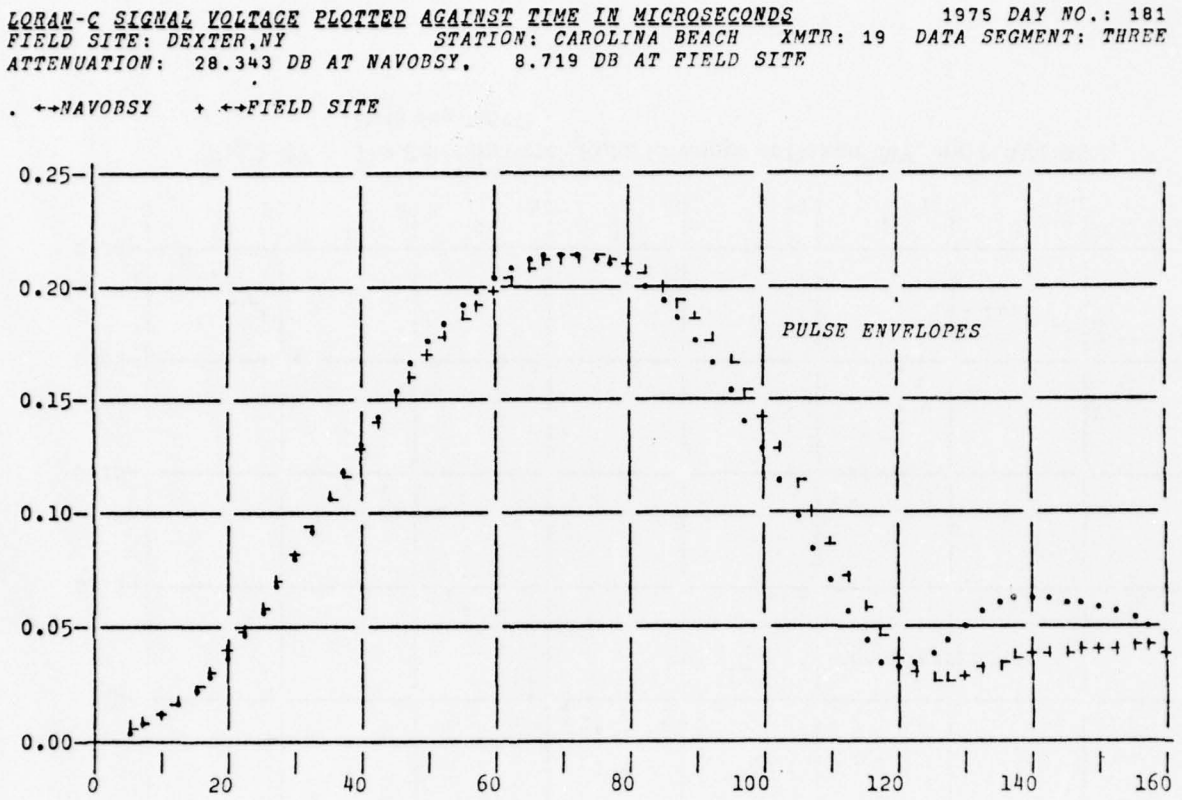


Fig. E-48 The Carolina Beach Pulse Envelope at Dexter, NY, and NAVOBSY; Data Segment 3

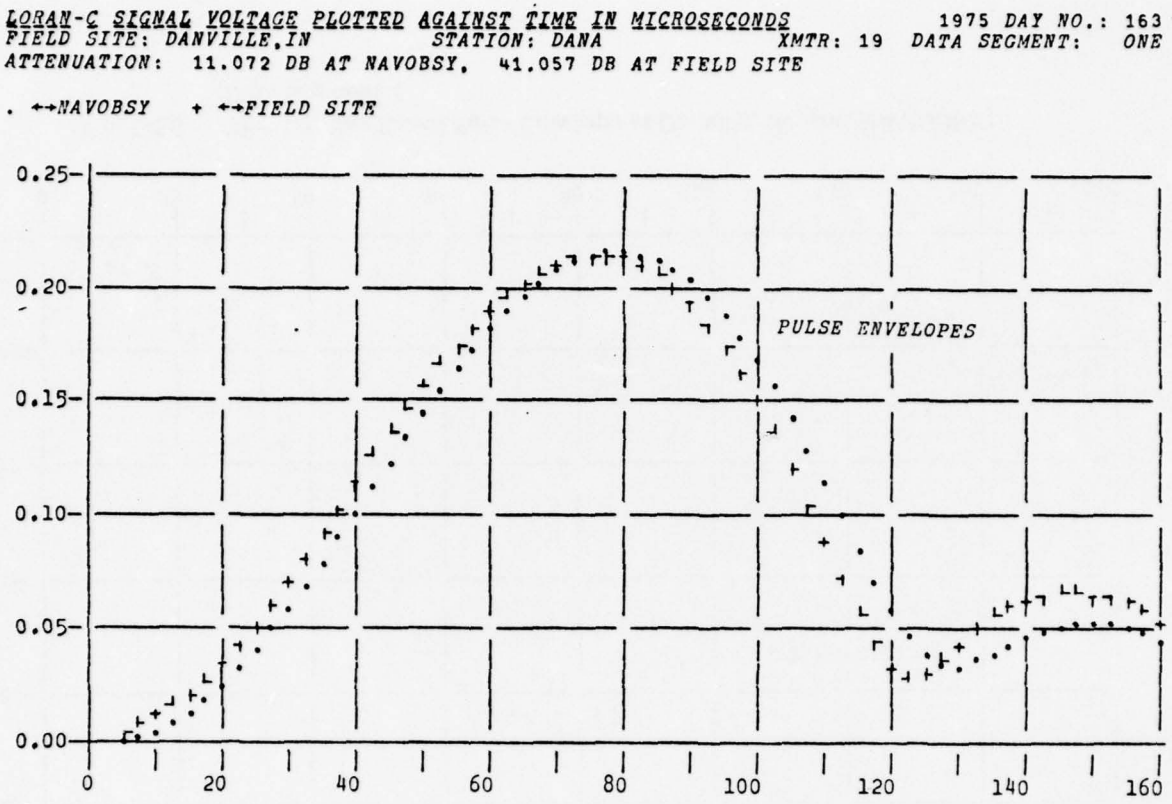


Fig. E-49 The Carolina Beach Pulse Envelope at Danville, IN, and NAVOBSY; Data Segment 1

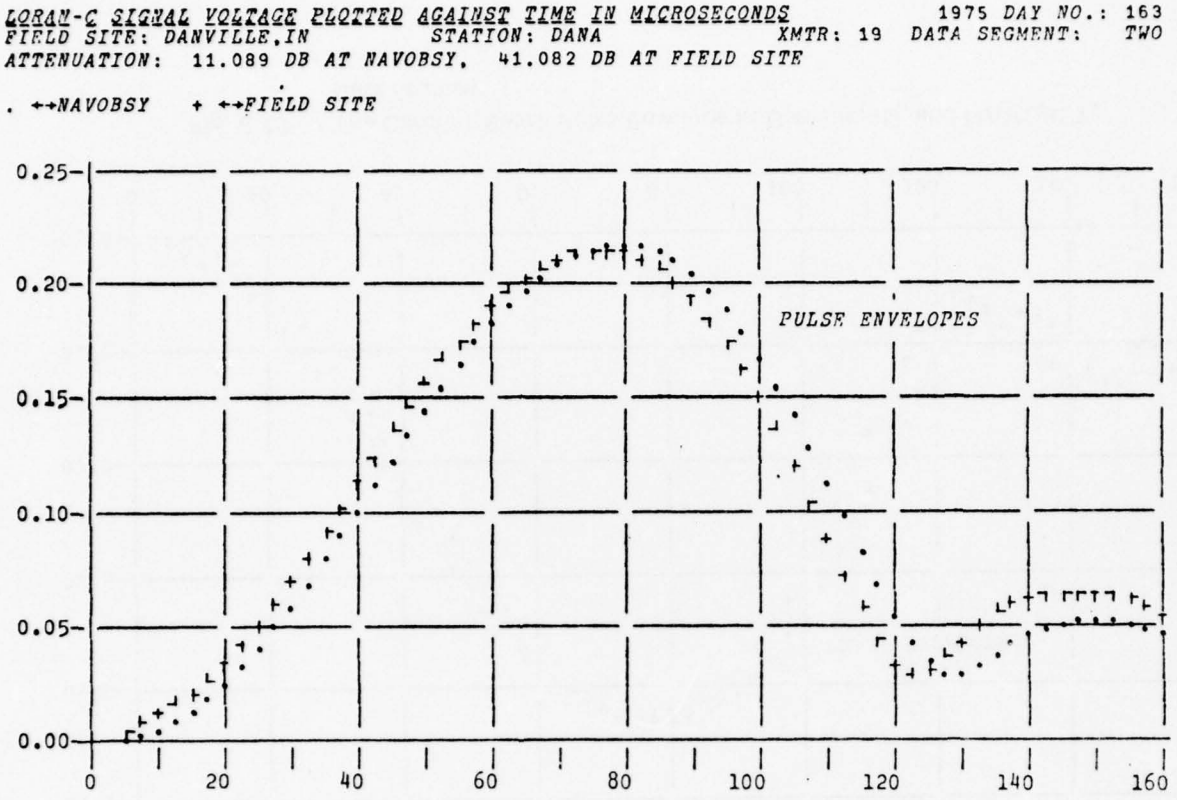


Fig. E-50 The Carolina Beach Pulse Envelope at Danville, IN, and NAVOBSY; Data Segment 2

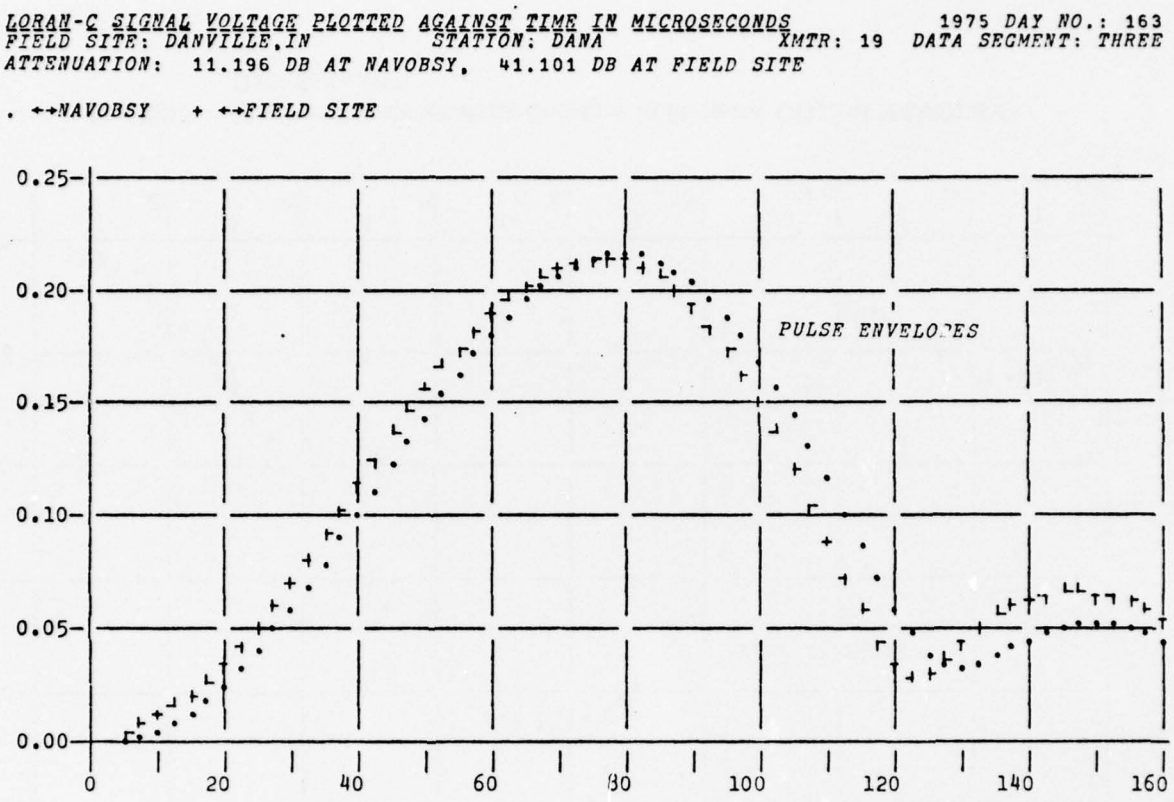


Fig. E-51 The Carolina Beach Pulse Envelope at Danville, IN, and NAVOBSY; Data Segment 3

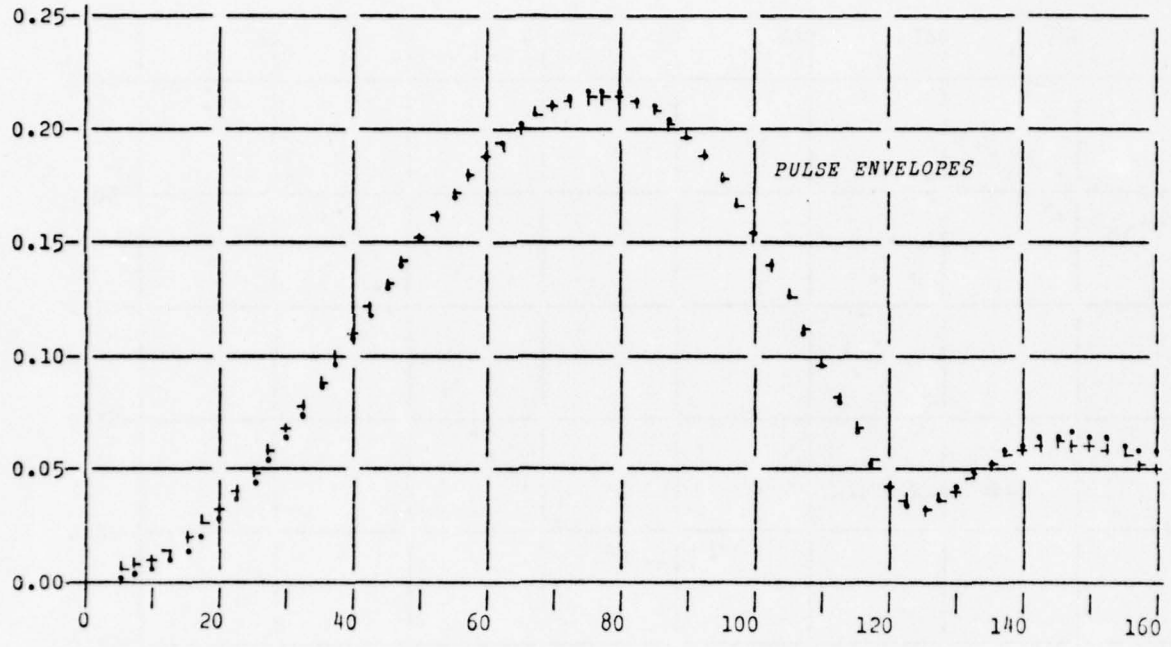


Fig. E-52 The Carolina Beach Pulse Envelope at Marietta, OH, and NAVOBSY; Data Segment 1

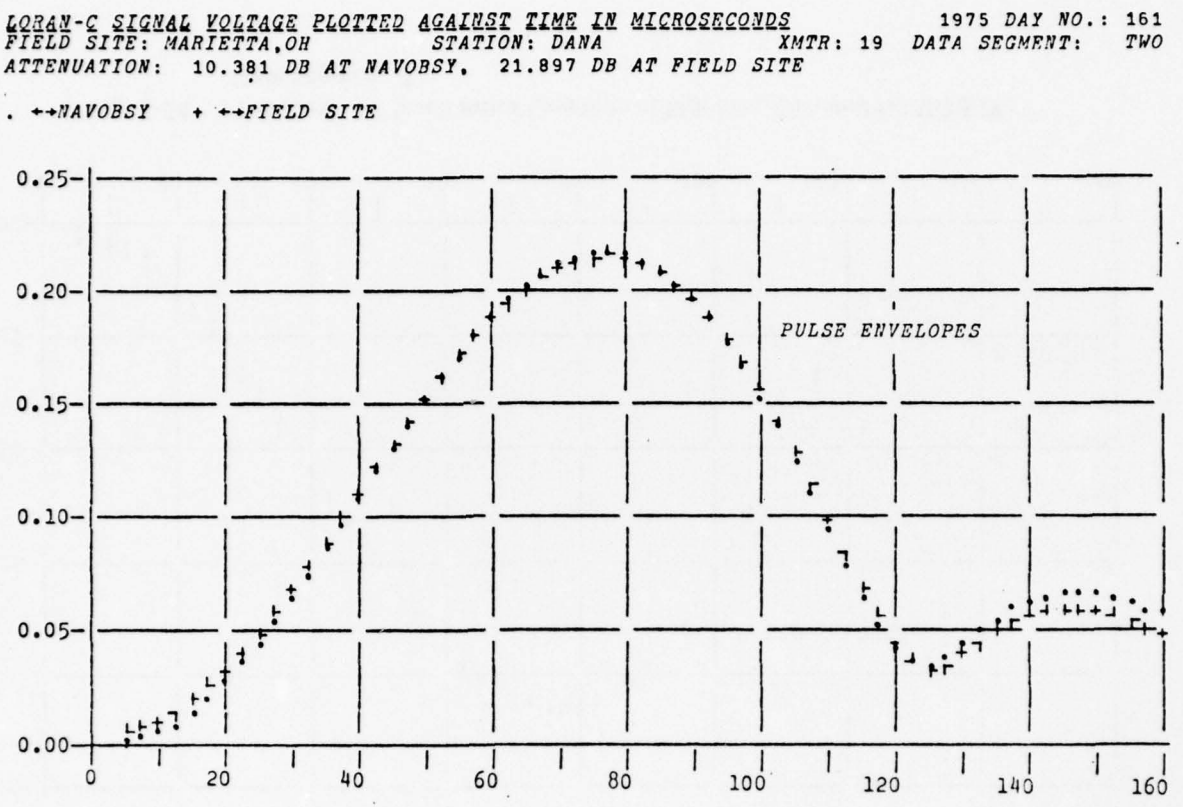


Fig. E-53 The Carolina Beach Pulse Envelope at Marietta, OH, and NAVOBSY; Data Segment 2

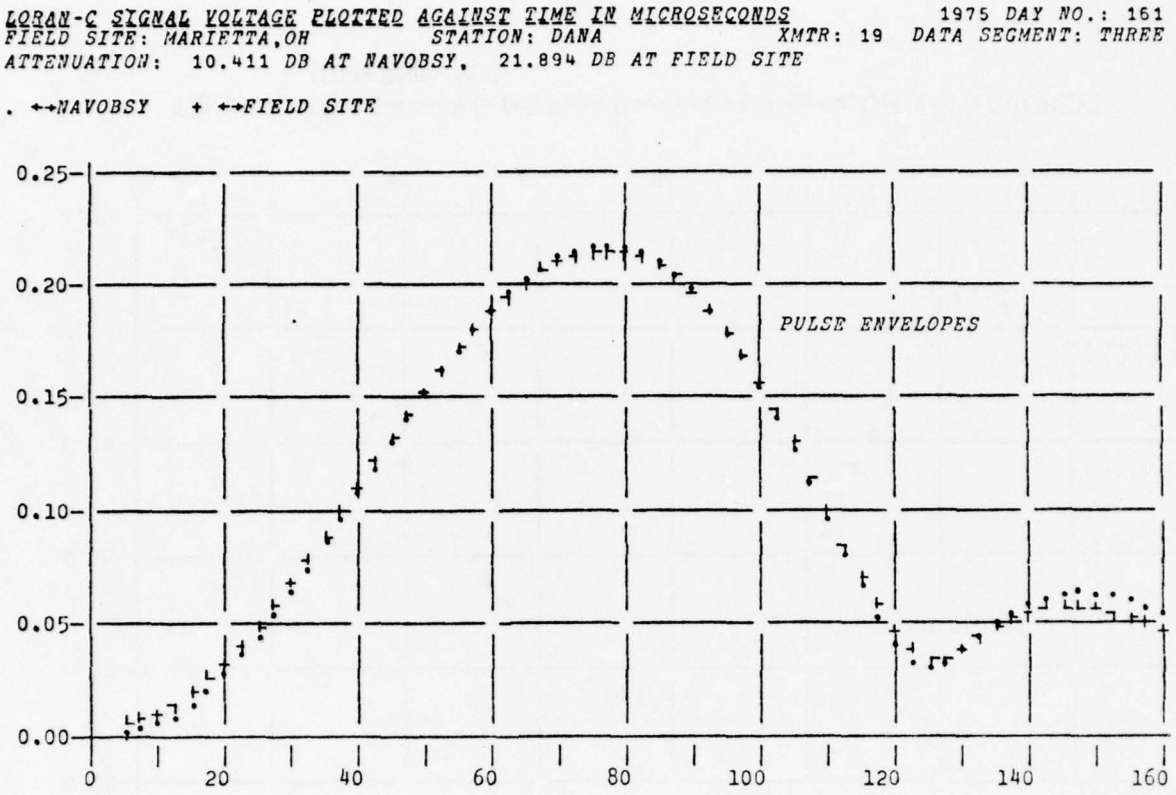


Fig. E-54 The Carolina Beach Pulse Envelope at Marietta, OH, and NAVOBSY; Data Segment 3

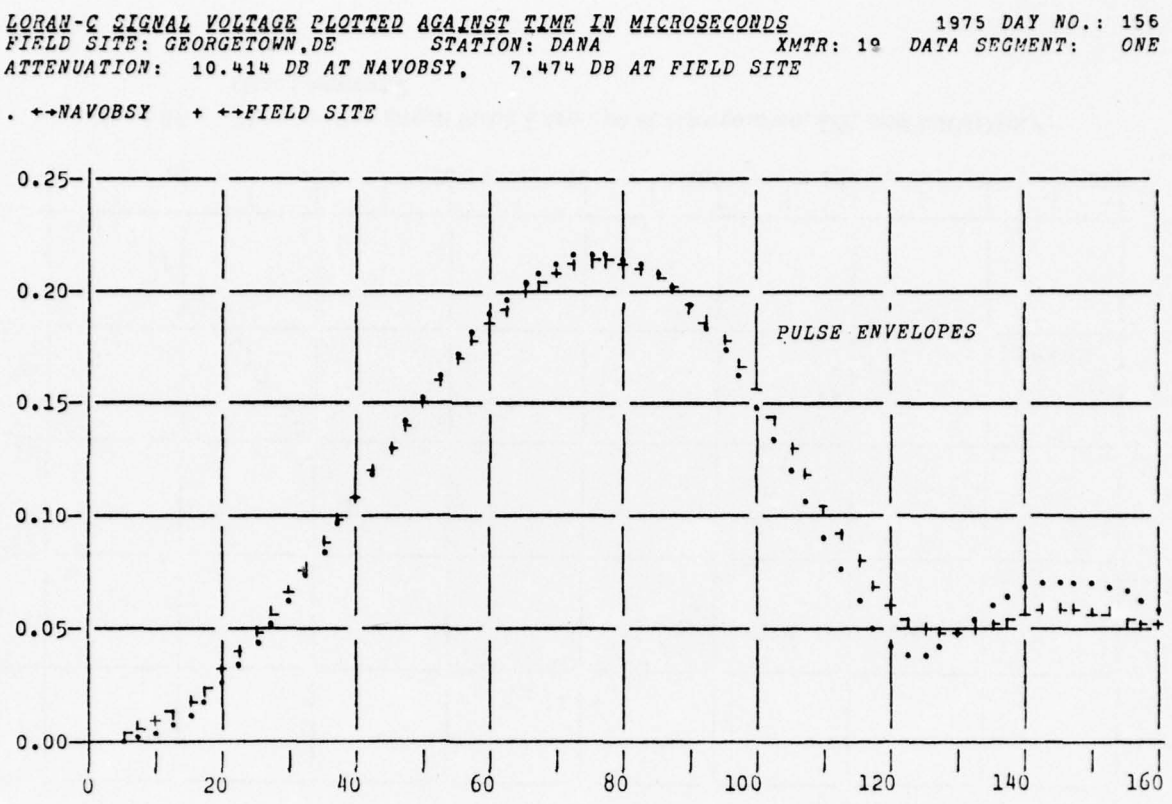


Fig. E-55 The Carolina Beach Pulse Envelope at Georgetown, DE, and NAVOBSY; Data Segment 1

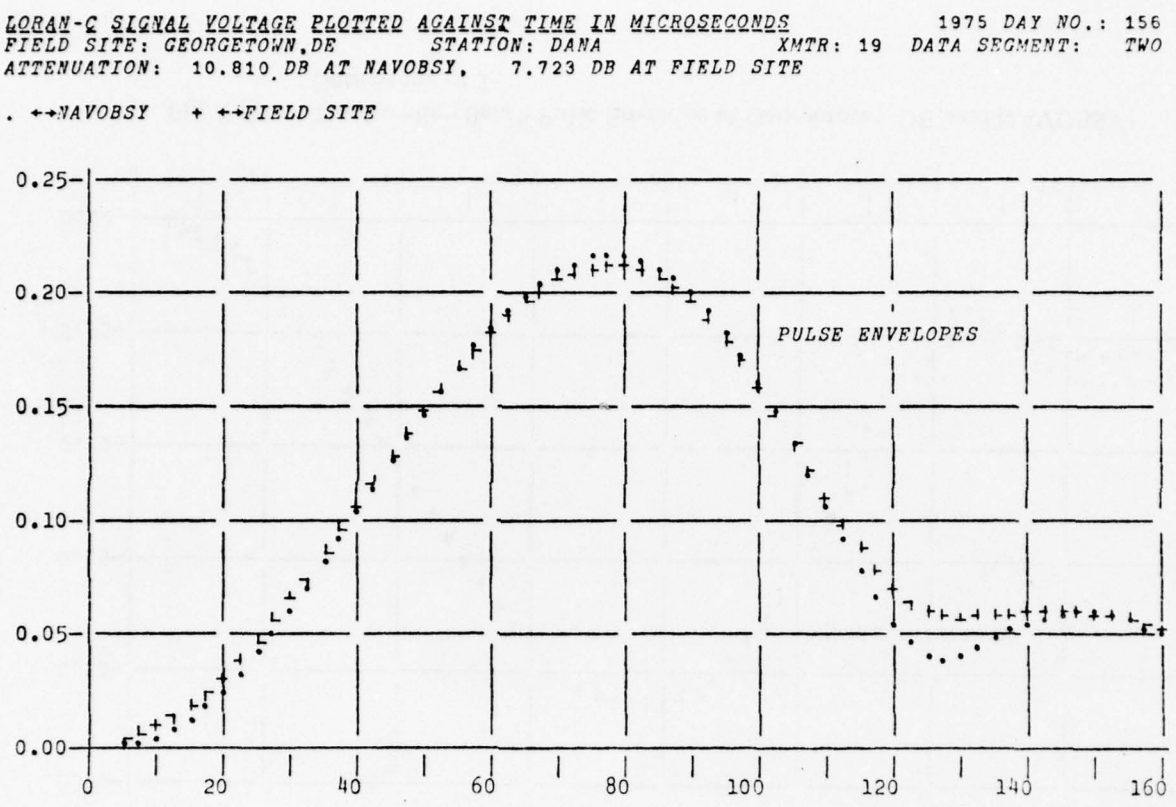


Fig. E-56 The Carolina Beach Pulse Envelope at Georgetown, DE, and NAVOBSY; Data Segment 2

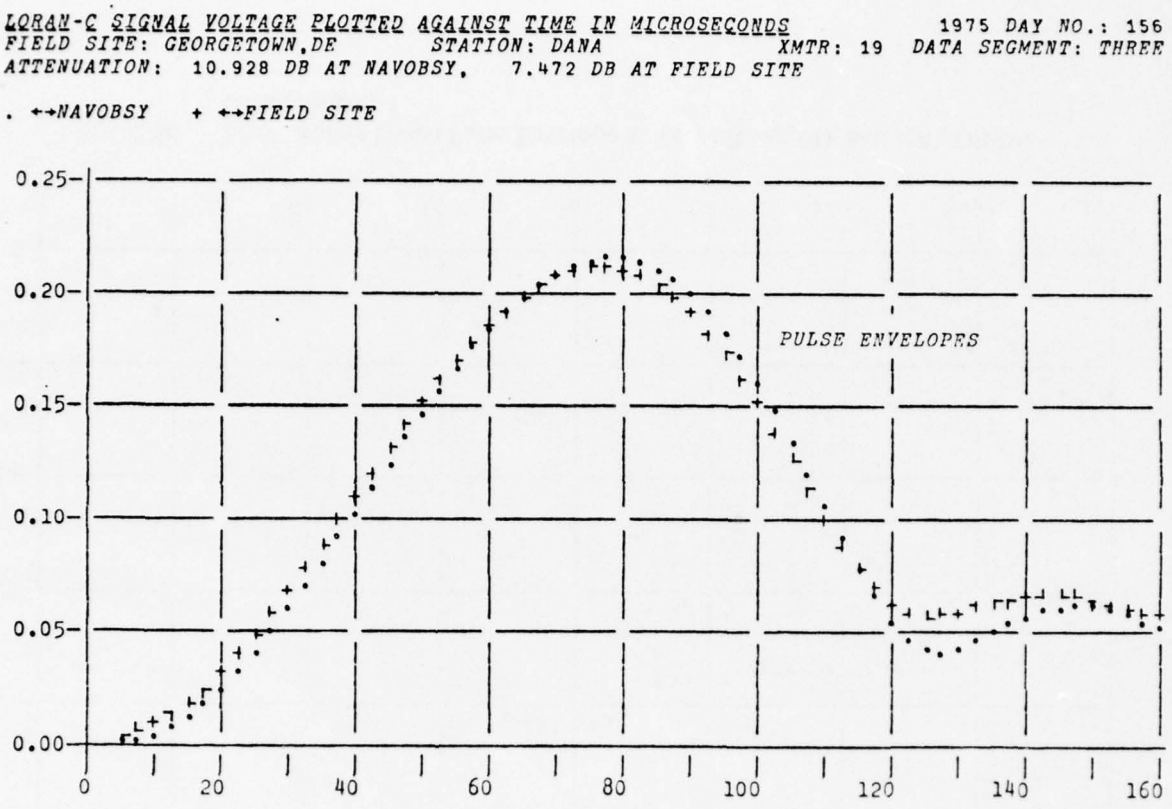


Fig. E-57 The Carolina Beach Pulse Envelope at Georgetown, DE, and NAVOBSY; Data Segment 3

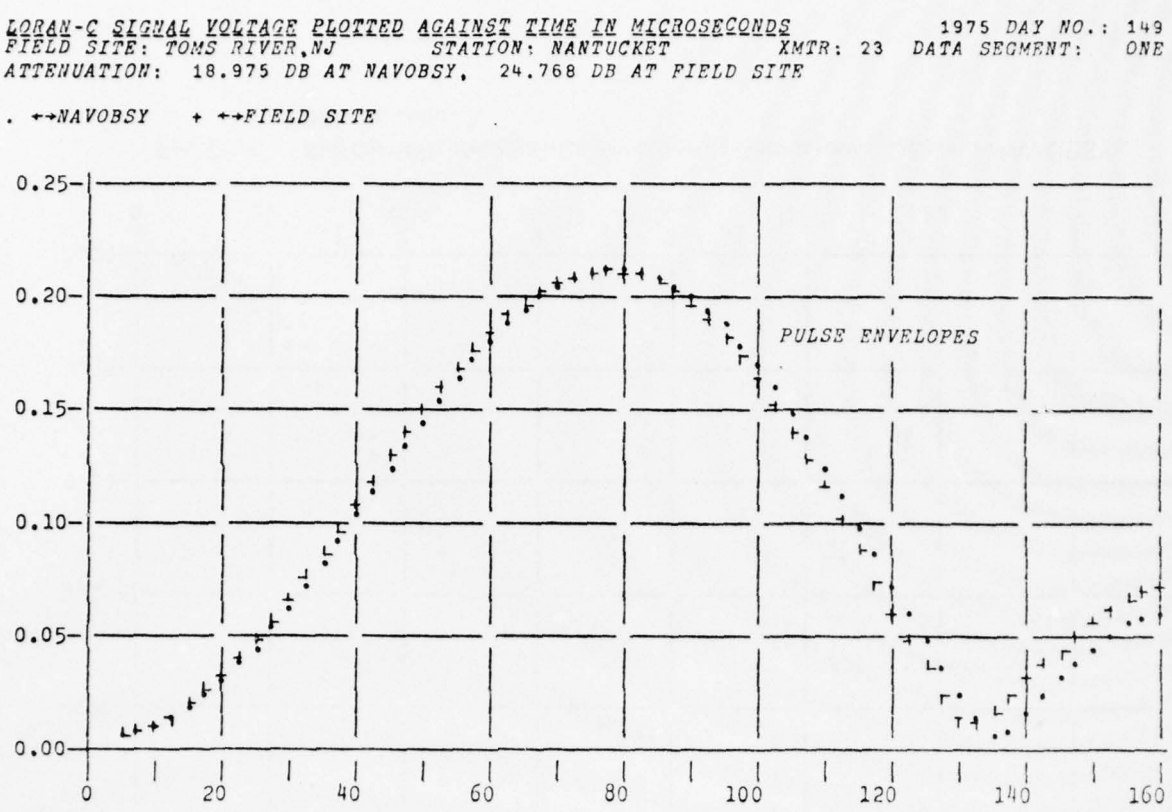


Fig. E-58 The Carolina Beach Pulse Envelope at Toms River, NJ, and NAVOBSY; Data Segment 1

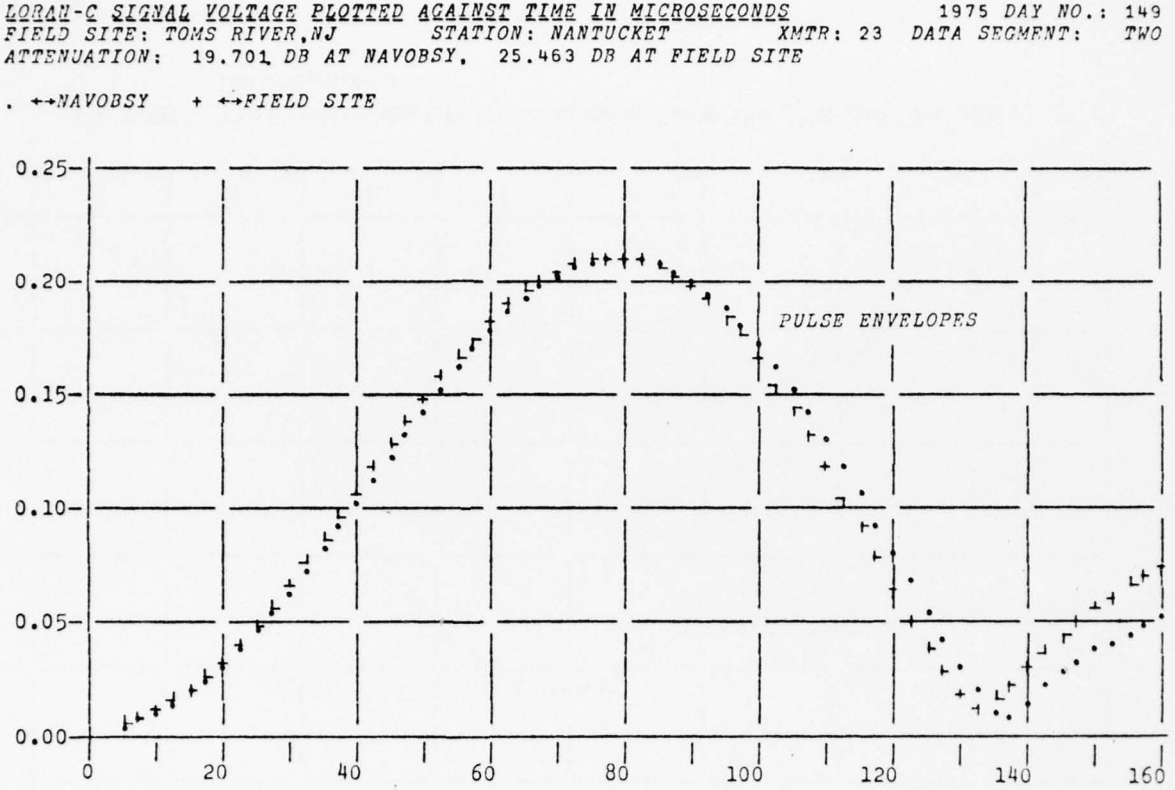


Fig. E-59 The Carolina Beach Pulse Envelope at Toms River, NJ, and NAVOBSY; Data Segment 2

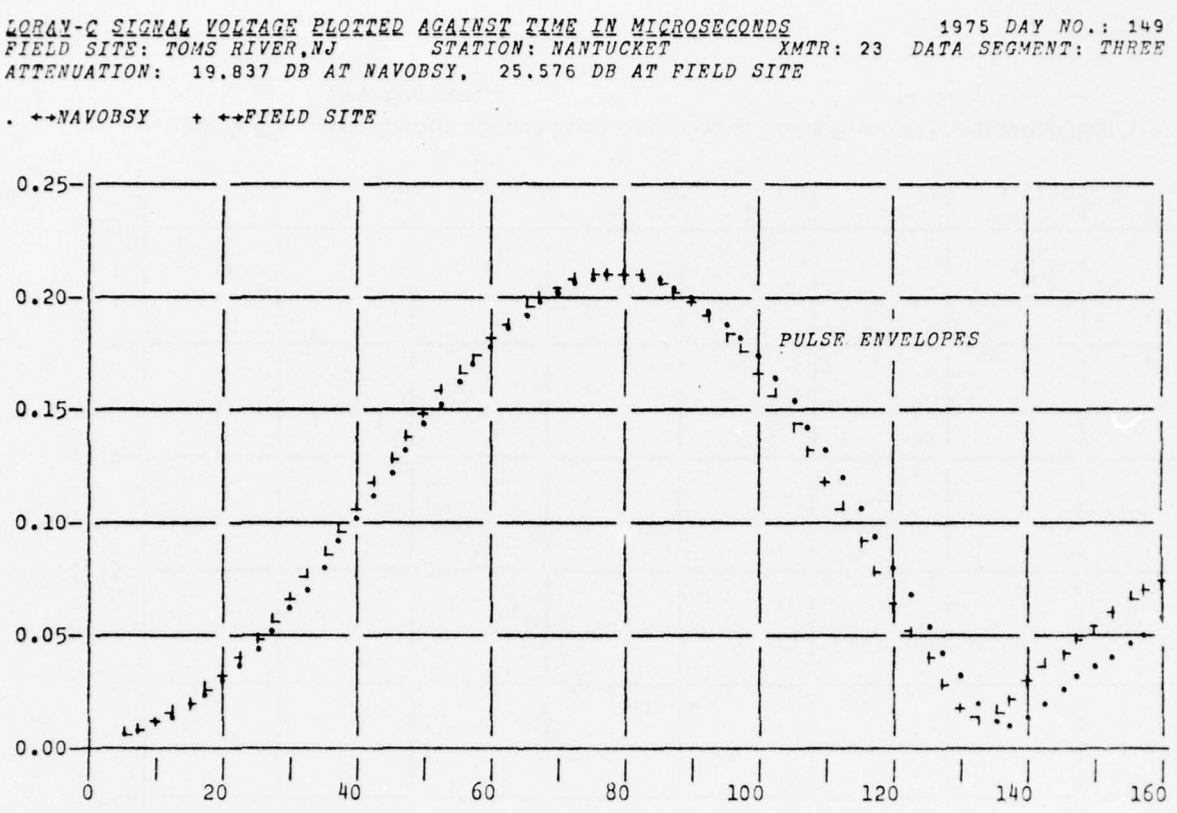


Fig. E-60 The Carolina Beach Pulse Envelope at Toms River, NJ, and NAVOBSY; Data Segment 3

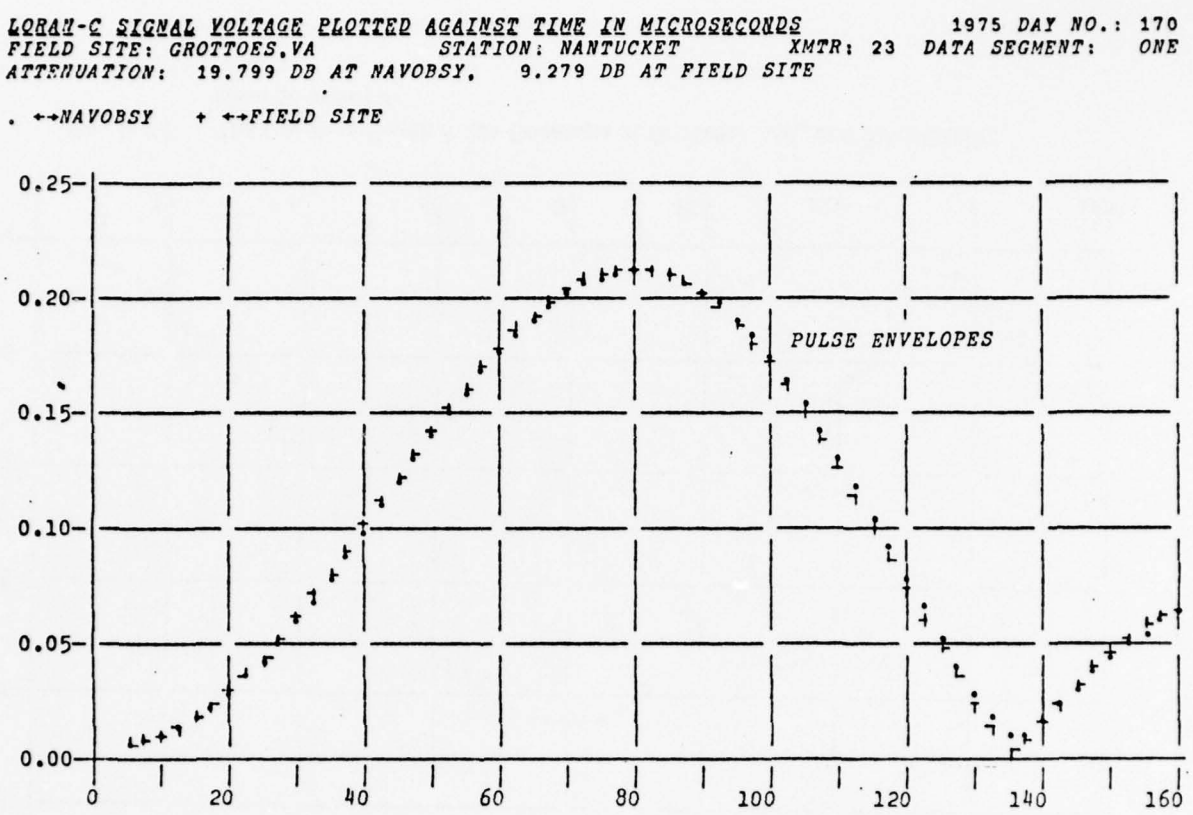


Fig. E-61 The Carolina Beach Pulse Envelope at Grottoes, VA, and NAVOBSY; Data Segment 1

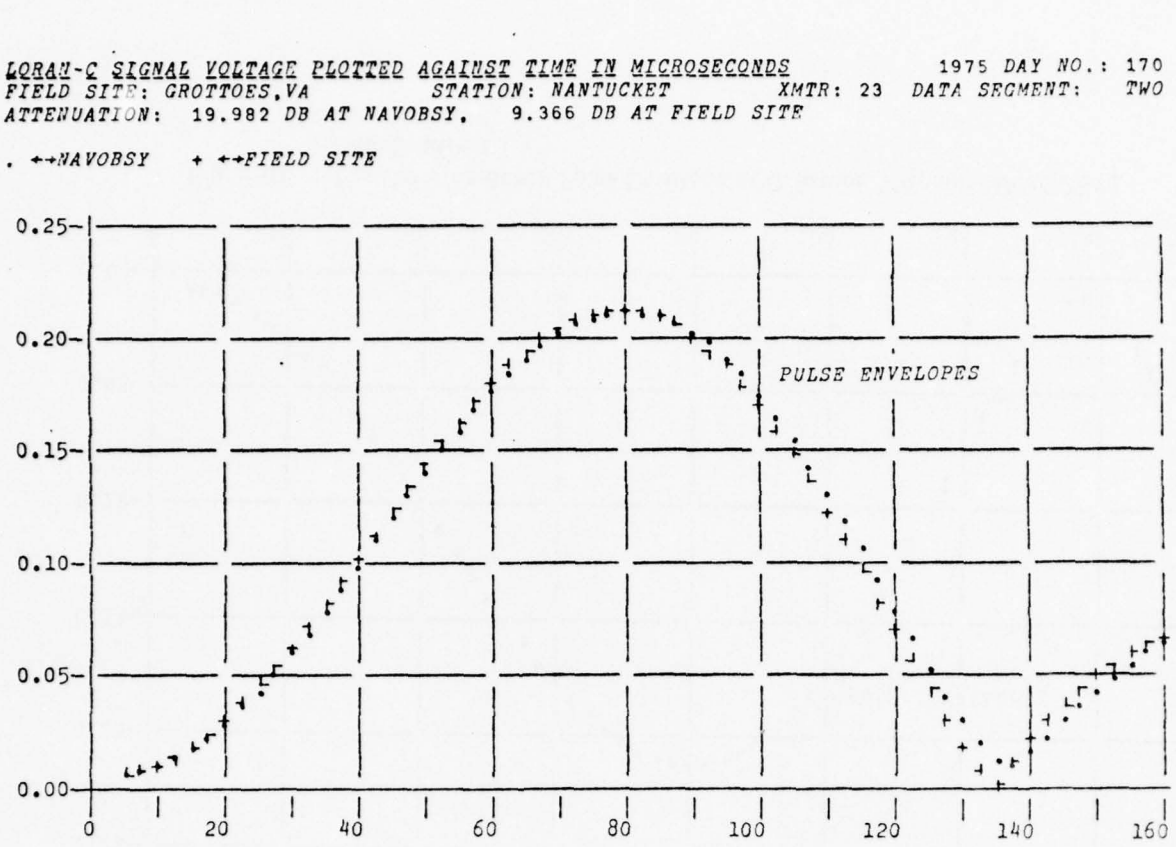


Fig. E-62 The Carolina Beach Pulse Envelope at Grottoes, VA, and NAVOBSY; Data Segment 2

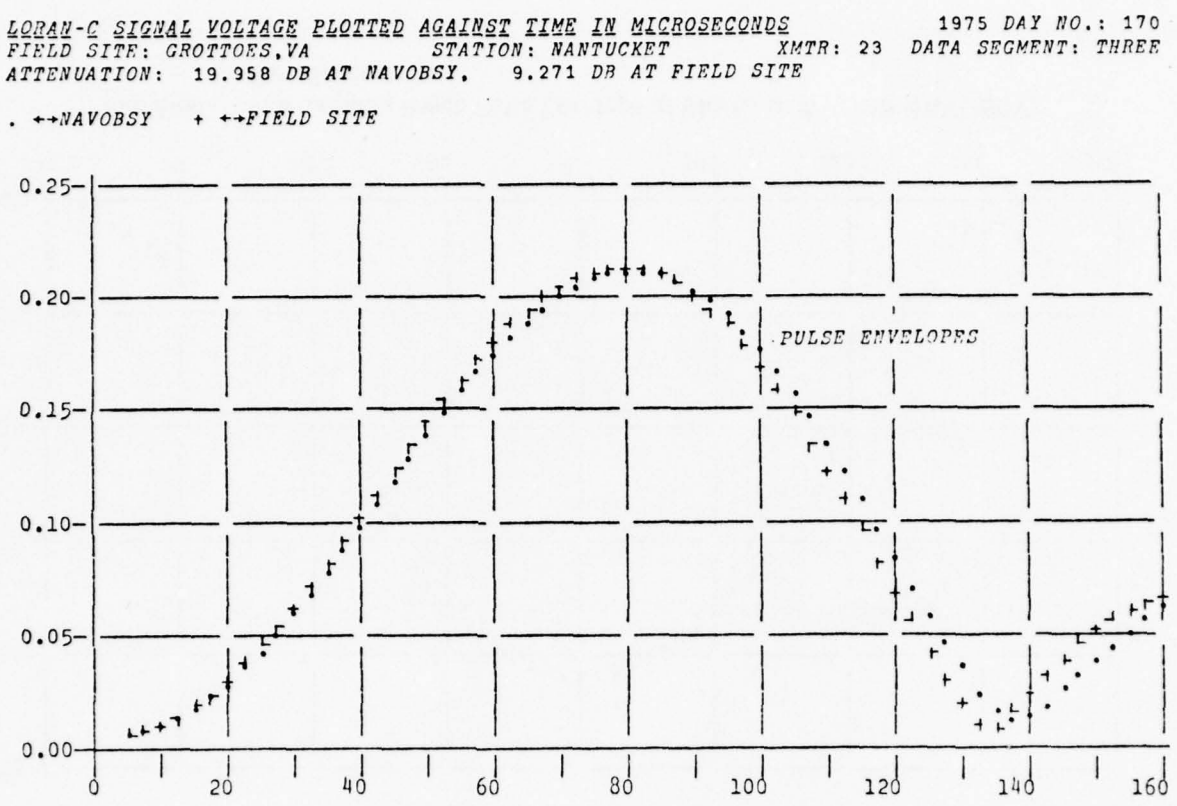


Fig. E-63 The Carolina Beach Pulse Envelope at Grottoes, VA, and NAVOBSY; Data Segment 3

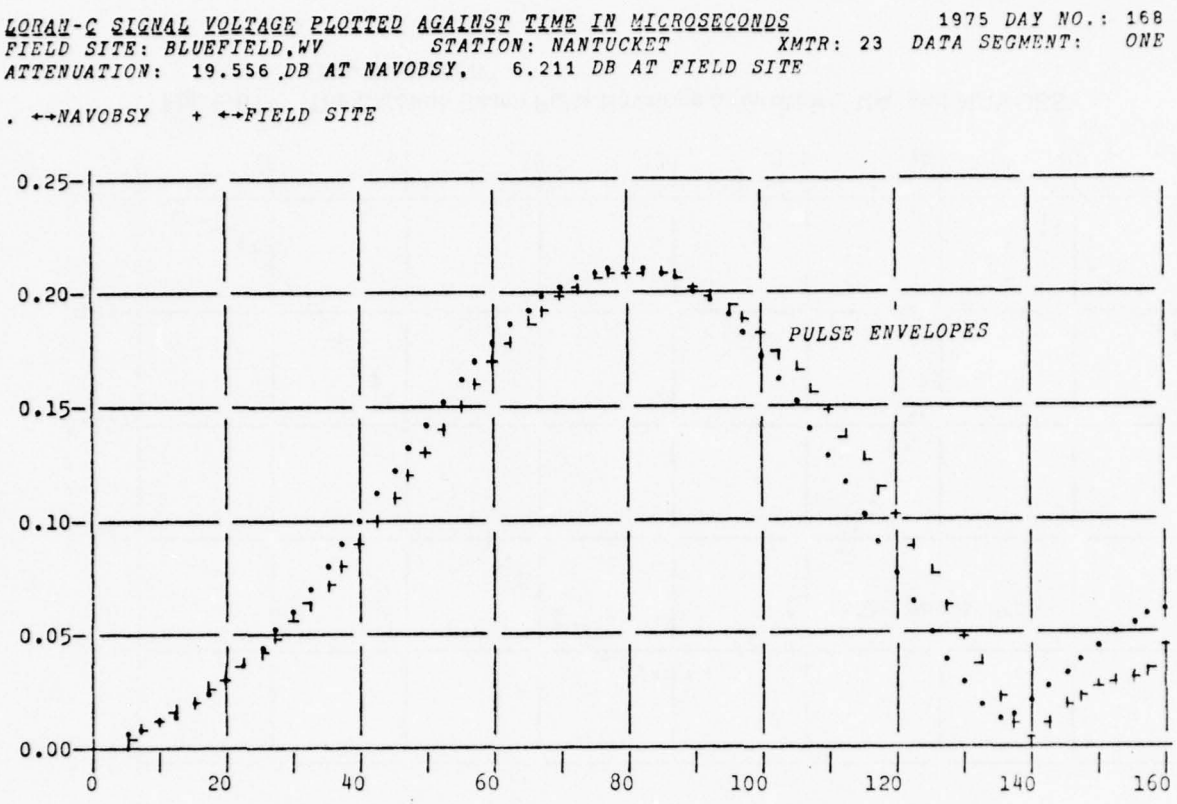


Fig. E-64 The Carolina Beach Pulse Envelope at Bluefield, WV, and NAVOBSY; Data Segment 1

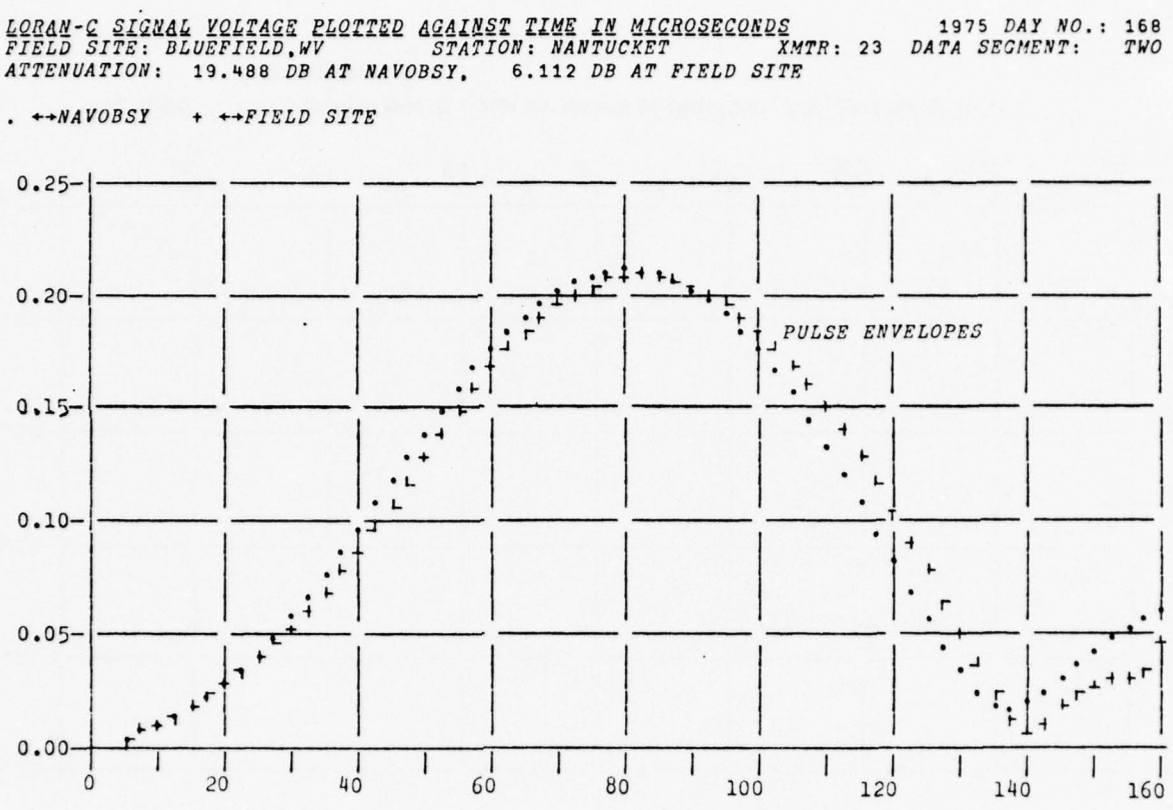


Fig. E-65 The Carolina Beach Pulse Envelope at Bluefield, WV, and NAVOBSY; Data Segment 2

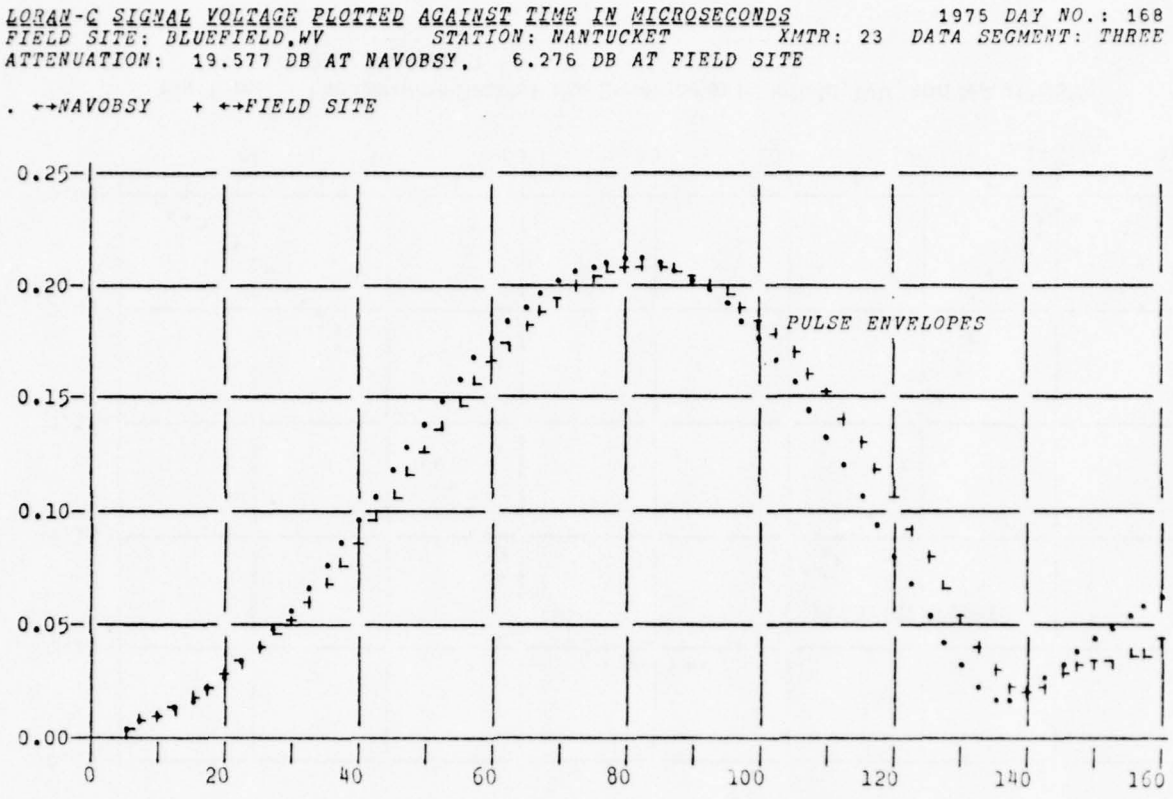


Fig. E-66 The Carolina Beach Pulse Envelope at Bluefield, WV, and NAVOBSY; Data Segment 3

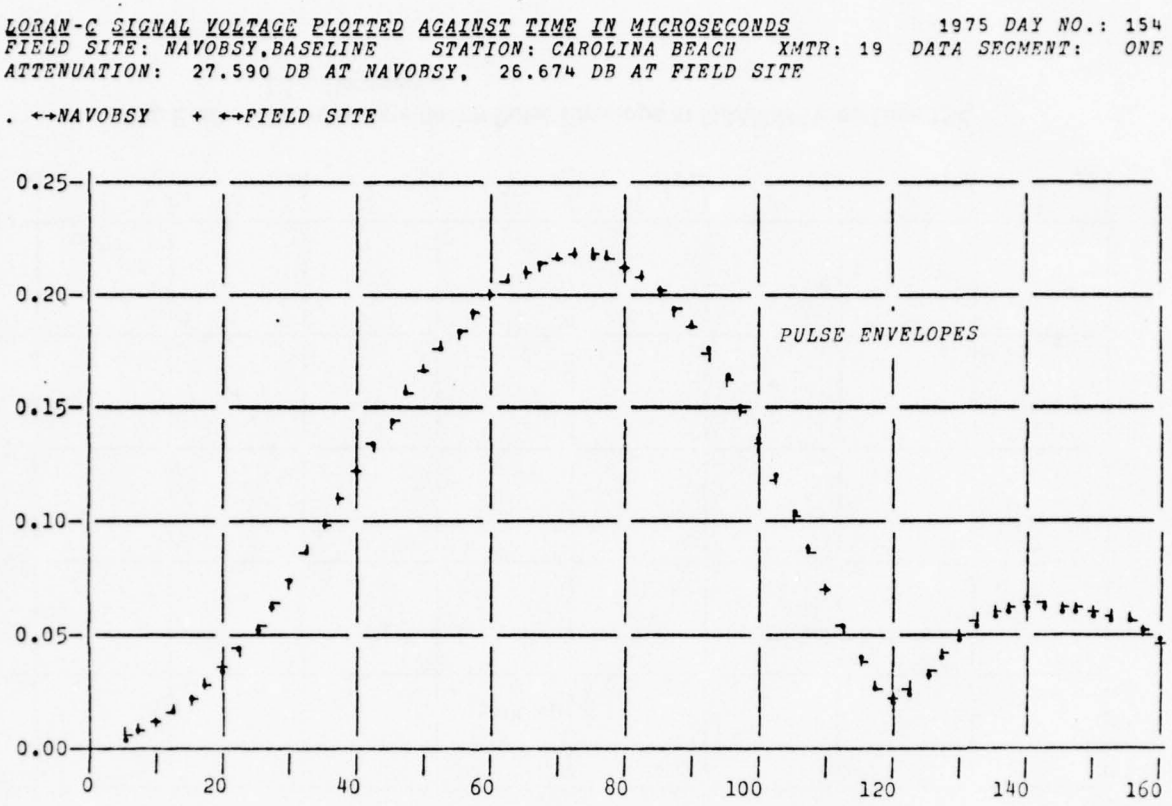


Fig. E-67 The Carolina Beach Pulse Envelope at NAVOBSY on Day 154; Data Segment 1

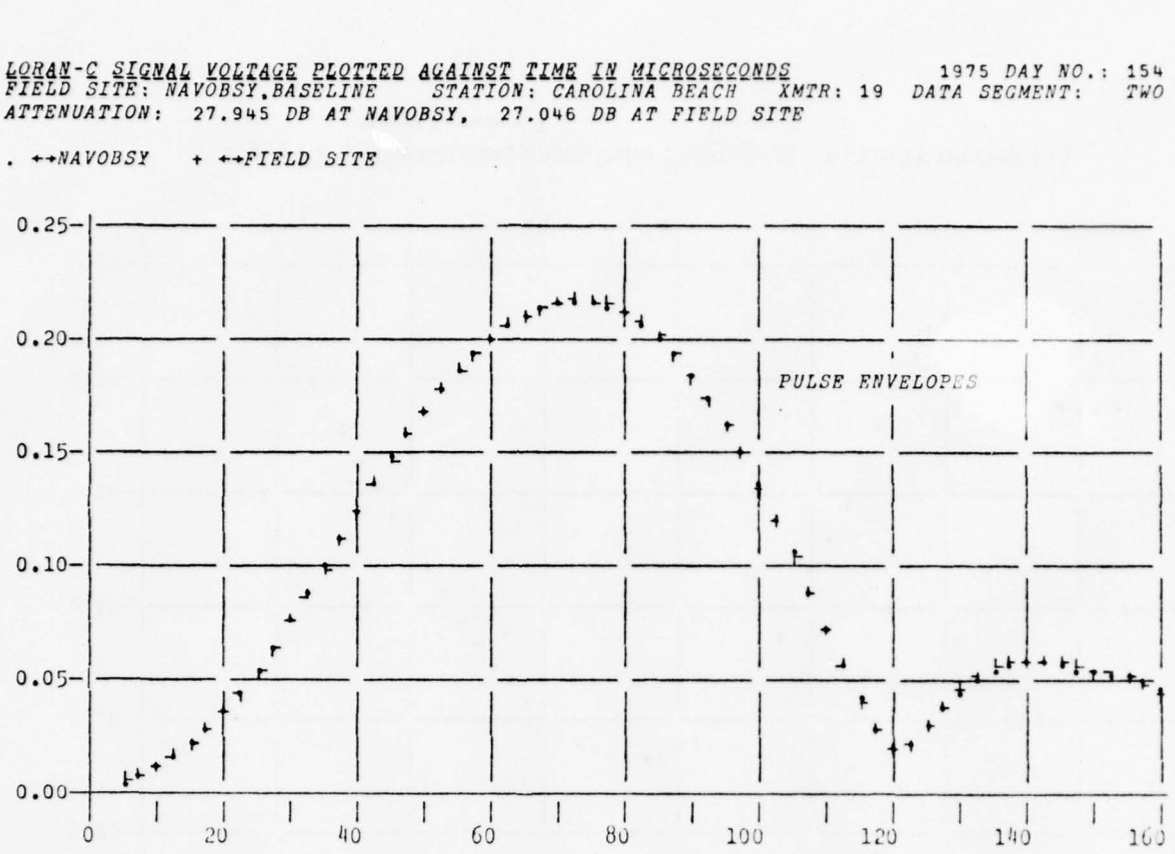


Fig. E-68 The Carolina Beach Pulse Envelope at NAVOBSY on Day 154; Data Segment 2

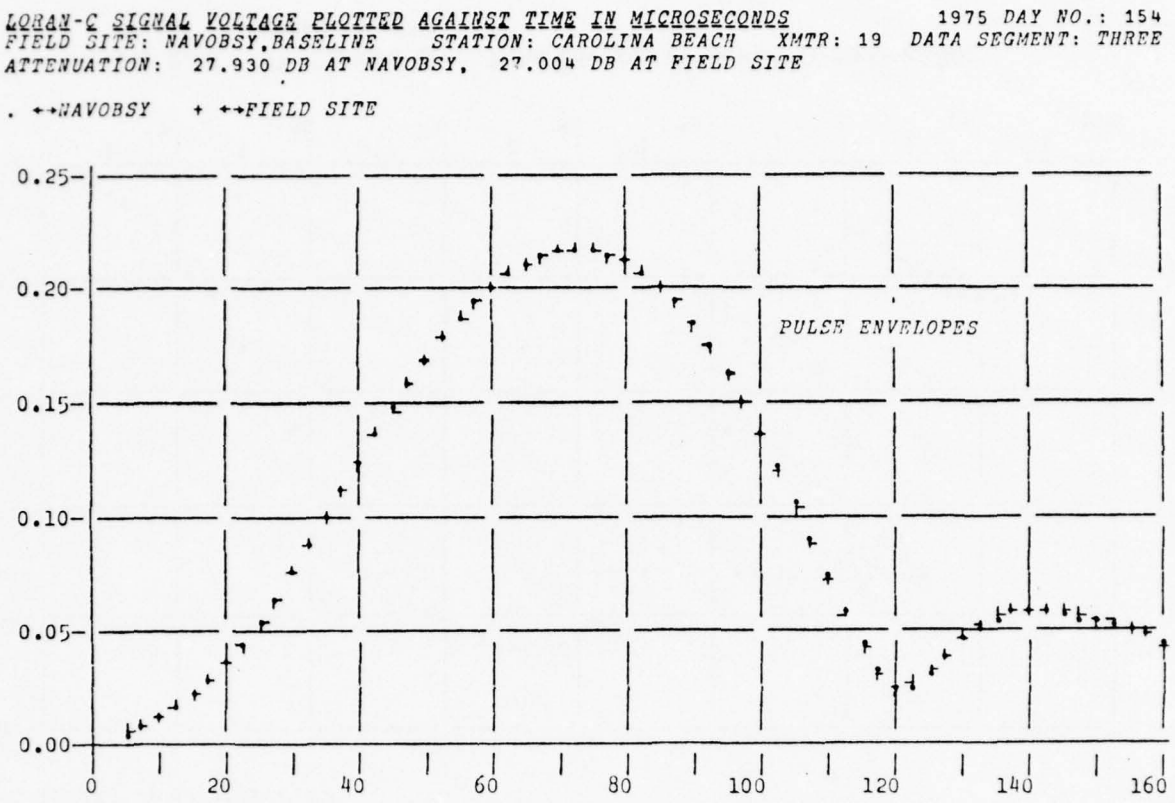


Fig. E-69 The Carolina Beach Pulse Envelope at NAVOBSY on Day 154; Data Segment 3

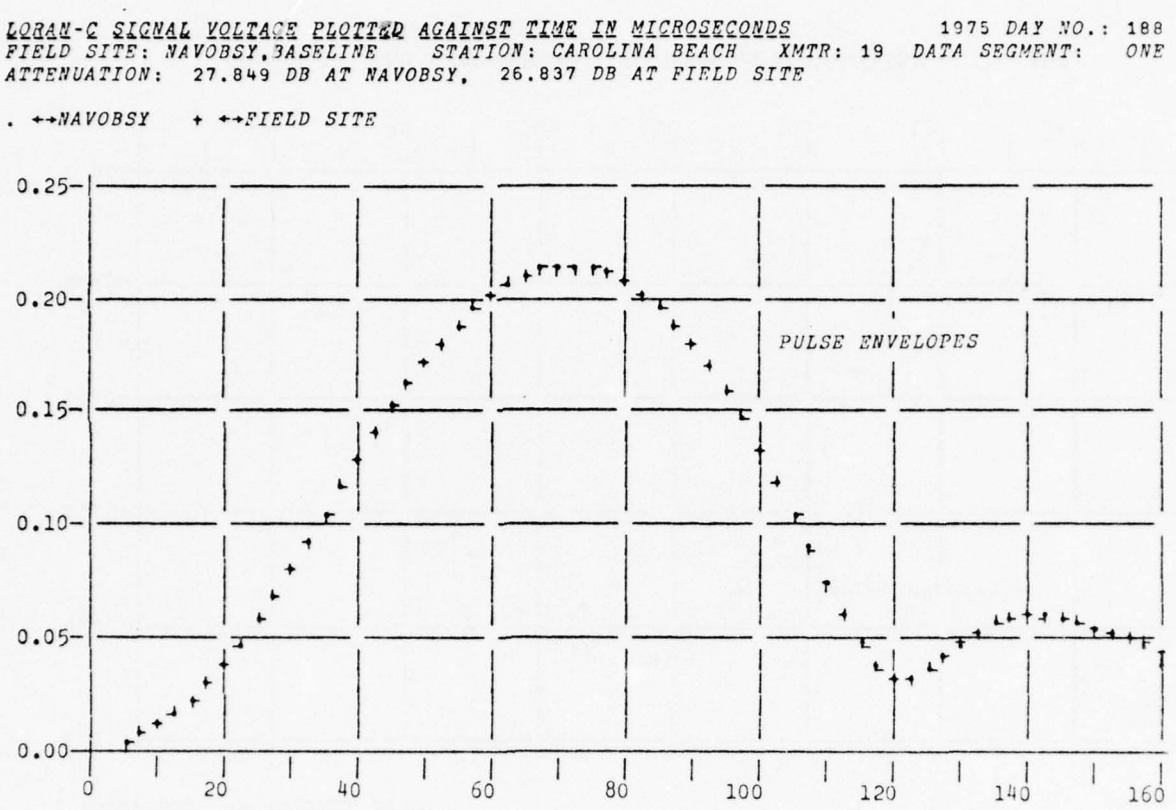


Fig. E-70 The Carolina Beach Pulse Envelope at NAVOBSY on Day 188; Data Segment 1

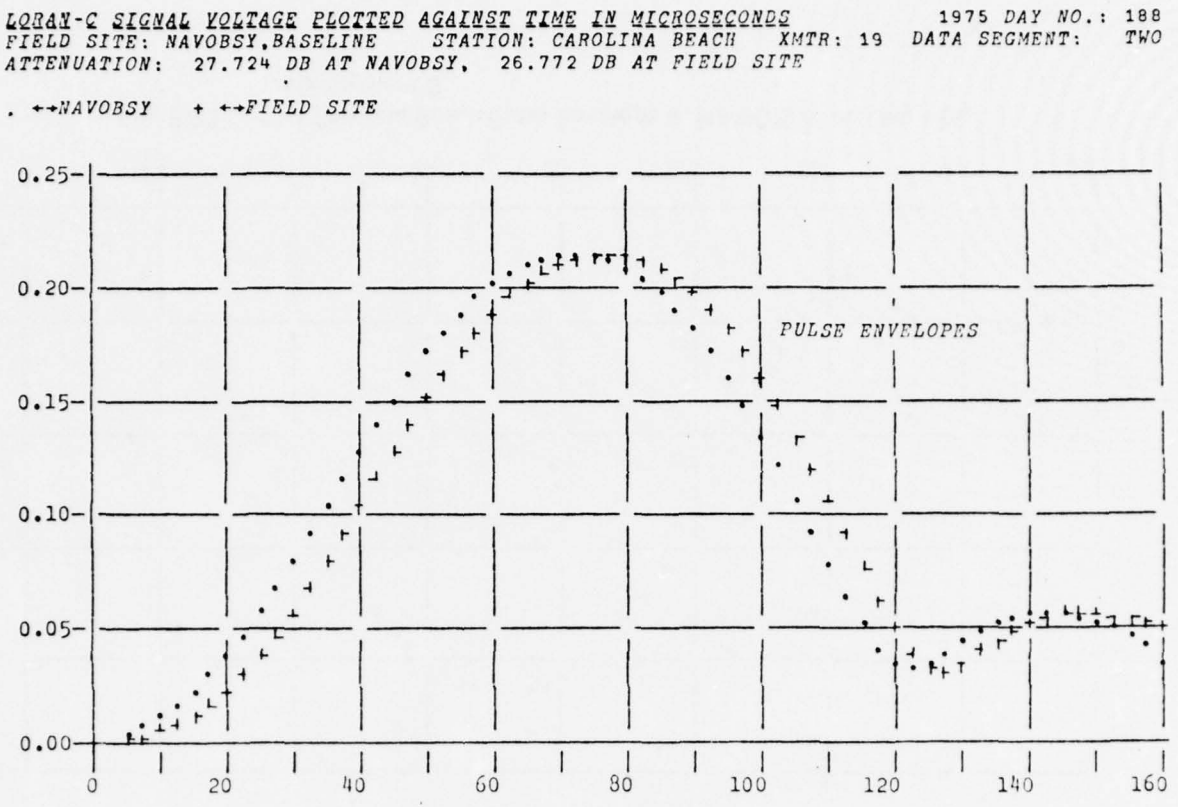


Fig. E-71 The Carolina Beach Pulse Envelope at NAVOBSY on Day 188; Data Segment 2

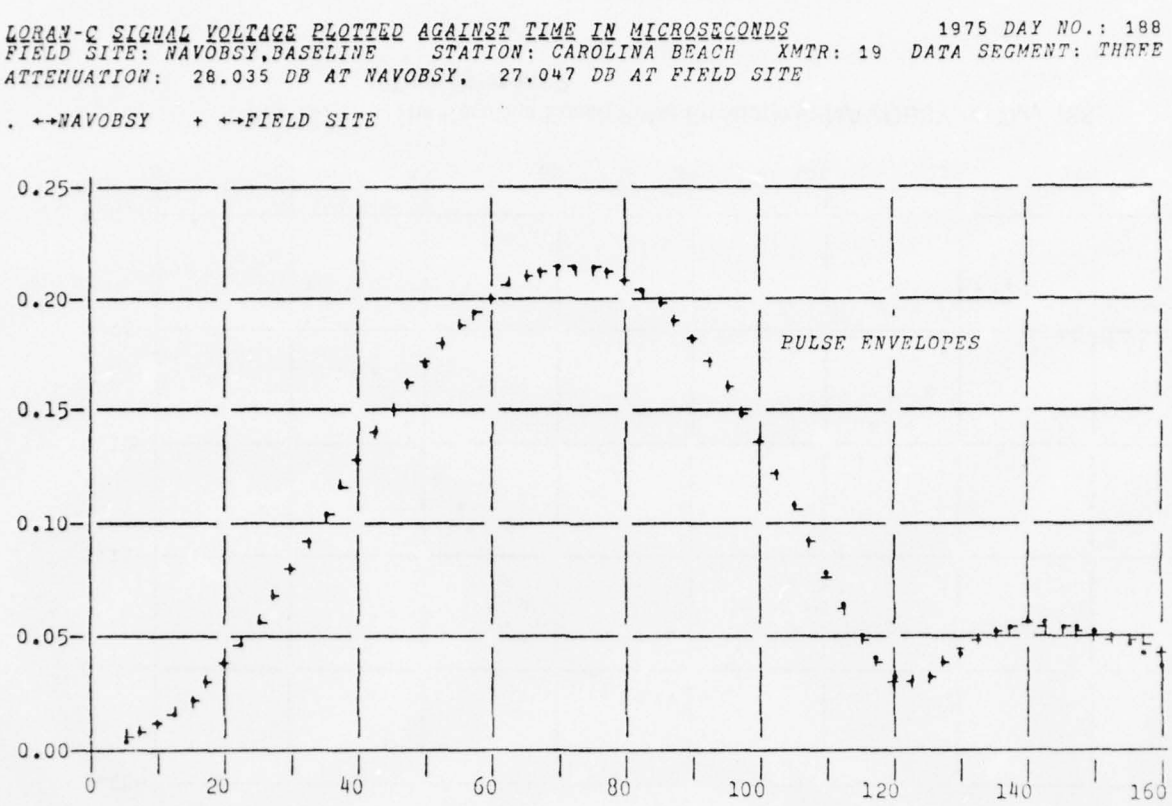


Fig. E-72 The Carolina Beach Pulse Envelope at NAVOBSY on Day 188; Data Segment 3

Table E-1

The Time of Zero Crossings Relative to the Time of the 11th Sample Point on the Pulse, NAVOBSY

	ZTO														
C1	5.706	10.574	15.447	20.338	25.249	30.171	35.102	40.039	44.979	49.922	54.869	59.823	64.785	69.757	74.742	79.740
	5.685	10.575	15.451	20.340	25.249	30.170	35.102	40.038	44.978	49.921	54.869	59.823	64.784	69.756	74.739	79.736
	5.702	10.562	15.440	20.335	25.248	30.170	35.102	40.039	44.978	49.921	54.869	59.823	64.785	69.756	74.740	79.737
C2	5.845	10.624	15.484	20.372	25.278	30.194	35.117	40.045	44.977	49.912	54.851	59.797	64.749	69.711	74.682	79.664
	5.829	10.591	15.458	20.352	25.260	30.175	35.097	40.024	44.954	49.888	54.828	59.773	64.726	69.688	74.660	79.641
	5.826	10.601	15.467	20.360	25.267	30.182	35.103	40.030	44.961	49.895	54.835	59.781	64.734	69.697	74.669	79.652
C3	6.028	10.799	15.590	20.424	25.297	30.198	35.116	40.047	44.984	49.927	54.876	59.832	64.796	69.770	74.753	79.747
	6.060	10.826	15.607	20.433	25.303	30.204	35.123	40.054	44.992	49.936	54.885	59.841	64.806	69.780	74.764	79.759
	6.022	10.799	15.590	20.422	25.295	30.195	35.115	40.045	44.983	49.927	54.876	59.832	64.796	69.769	74.752	79.745
C4	5.677	10.535	15.424	20.330	25.250	30.177	35.112	40.053	44.996	49.943	54.896	59.855	64.822	69.800	74.789	79.792
	5.618	10.567	15.444	20.333	25.246	30.176	35.116	40.061	45.009	49.958	54.911	59.869	64.834	69.809	74.795	79.795
	5.595	10.552	15.432	20.322	25.237	30.167	35.107	40.053	45.001	49.951	54.904	59.862	64.827	69.802	74.789	79.789
D1	6.321	10.426	15.205	20.113	25.069	30.047	35.036	40.030	45.026	50.023	55.018	60.012	65.004	69.994	74.982	79.965
	6.631	10.556	15.245	20.122	25.068	30.044	35.034	40.030	45.027	50.024	55.019	60.014	65.007	69.999	74.989	79.977
	6.454	10.462	15.224	20.121	25.073	30.050	35.040	40.036	45.033	50.030	55.025	60.018	65.009	69.998	74.984	79.968
D2	6.877	10.771	15.299	20.130	25.065	30.036	35.021	40.010	45.000	49.989	54.977	59.965	64.953	69.941	74.927	79.911
	6.841	10.758	15.292	20.126	25.064	30.038	35.025	40.015	45.006	49.995	54.983	59.970	64.957	69.943	74.928	79.911
	6.819	10.734	15.280	20.121	25.059	30.031	35.016	40.005	44.995	49.985	54.975	59.965	64.955	69.945	74.933	79.919
D3	6.582	10.283	15.032	19.963	24.942	29.938	34.937	39.936	44.931	49.924	54.914	59.902	64.889	69.874	74.857	79.837
	7.155	10.417	15.084	19.989	24.956	29.947	34.946	39.944	44.941	49.934	54.924	59.912	64.898	69.883	74.865	79.844
	7.149	10.352	15.050	19.969	24.945	29.940	34.940	39.939	44.935	49.926	54.915	59.902	64.886	69.869	74.850	79.827
N1	5.855	10.588	15.406	20.283	25.197	30.133	35.083	40.043	45.008	49.977	54.951	59.927	64.907	69.889	74.873	79.860
	6.056	10.753	15.496	20.318	25.208	30.142	35.099	40.067	45.038	50.010	54.982	59.956	64.933	69.914	74.900	79.890
	5.867	10.626	15.425	20.289	25.204	30.149	35.108	40.073	45.039	50.006	54.974	59.946	64.923	69.905	74.893	79.886
N2	5.720	10.496	15.314	20.191	25.109	30.052	35.010	39.975	44.946	49.921	54.900	59.883	64.869	69.858	74.850	79.844
	5.758	10.516	15.330	20.204	25.118	30.058	35.013	39.977	44.946	49.921	54.900	59.882	64.868	69.857	74.849	79.843
	5.864	10.547	15.329	20.193	25.108	30.053	35.013	39.980	44.951	49.926	54.904	59.885	64.870	69.859	74.852	79.847
N3	5.702	10.553	15.425	20.310	25.215	30.140	35.084	40.042	45.011	49.987	54.968	59.954	64.942	69.932	74.924	79.918
	5.645	10.508	15.385	20.280	25.194	30.131	35.085	40.053	45.030	50.013	55.001	59.992	64.985	69.980	74.976	79.974
	5.561	10.468	15.368	20.275	25.198	30.139	35.095	40.064	45.041	50.025	55.012	60.004	64.997	69.992	74.988	79.985
C0 (Day 154)	5.849	10.602	15.463	20.351	25.253	30.163	35.083	40.010	44.941	49.878	54.821	59.770	64.726	69.691	74.666	79.651
	5.855	10.632	15.491	20.372	25.272	30.182	35.101	40.028	44.958	49.894	54.835	59.783	64.739	69.703	74.678	79.664
	5.840	10.633	15.494	20.374	25.273	30.182	35.101	40.026	44.956	49.890	54.830	59.777	64.732	69.696	74.671	79.657
C0 (Day 188)	6.207	10.908	15.673	20.484	25.329	30.200	35.088	39.989	44.898	49.815	54.749	59.673	64.618	69.575	74.547	79.534
	6.207	10.908	15.669	20.477	25.320	30.189	35.076	39.976	44.884	49.801	54.726	59.660	64.604	69.562	74.534	79.522
	6.180	10.900	15.673	20.487	25.332	30.202	35.090	39.990	44.898	49.815	54.739	59.673	64.618	69.575	74.546	79.533

Table E-2
The Time of Zero Crossings Relative to the Time
of the 11th Sample Point on the Pulse, Field Sites

	ZTV														
C1	5.831	10.613	15.454	20.327	25.227	30.142	35.069	40.004	44.945	49.891	54.842	59.800	64.765	69.740	74.725	79.722
	5.826	10.611	15.452	20.327	25.227	30.142	35.070	40.005	44.945	49.890	54.842	59.799	64.764	69.738	74.723	79.721
	5.823	10.607	15.450	20.326	25.226	30.142	35.069	40.005	44.945	49.891	54.842	59.800	64.765	69.739	74.724	79.722
C2	5.883	10.610	15.444	20.322	25.223	30.137	35.060	39.988	44.919	49.855	54.796	59.743	64.697	69.661	74.635	79.620
	5.863	10.589	15.424	20.303	25.204	30.117	35.039	39.966	44.896	49.830	54.770	59.715	64.669	69.632	74.605	79.589
	5.864	10.596	15.432	20.311	25.212	30.125	35.047	39.974	44.904	49.839	54.779	59.725	64.679	69.642	74.616	79.600
C3	5.484	10.375	15.247	20.148	25.083	30.035	34.993	39.953	44.910	49.867	54.822	59.779	64.740	69.706	74.679	79.660
	5.597	10.447	15.300	20.193	25.119	30.064	35.017	39.970	44.922	49.873	54.825	59.778	64.735	69.699	74.670	79.649
	5.610	10.417	15.264	20.159	25.090	30.040	34.996	39.953	44.908	49.863	54.816	59.772	64.730	69.694	74.664	79.640
C4	5.087	10.000	14.988	19.964	24.947	29.935	34.923	39.907	44.886	49.860	54.832	59.803	64.778	69.761	74.753	79.757
	5.036	10.000	14.986	19.966	24.951	29.939	34.926	39.908	44.886	49.859	54.832	59.806	64.785	69.773	74.772	79.783
	5.002	9.995	14.971	19.952	24.942	29.933	34.922	39.905	44.883	49.857	54.830	59.805	64.785	69.773	74.772	79.784
D1	6.030	10.609	15.327	20.153	25.053	29.994	34.957	39.931	44.911	49.893	54.876	59.858	64.841	69.824	74.805	79.785
	6.046	10.618	15.333	20.158	25.056	29.998	34.960	39.934	44.914	49.895	54.878	59.860	64.843	69.825	74.807	79.786
	6.043	10.616	15.334	20.160	25.059	30.000	34.962	39.936	44.915	49.897	54.879	59.861	64.843	69.826	74.807	79.786
D2	5.756	10.579	15.350	20.191	25.094	30.036	34.999	39.972	44.952	49.933	54.916	59.898	64.879	69.858	74.836	79.809
	5.748	10.587	15.362	20.202	25.103	30.044	35.007	39.980	44.959	49.941	54.922	59.904	64.884	69.863	74.840	79.814
	5.783	10.584	15.352	20.193	25.096	30.037	34.999	39.972	44.951	49.933	54.915	59.897	64.878	69.857	74.834	79.807
D3	5.330	10.051	14.877	19.811	24.792	29.787	34.783	39.775	44.762	49.744	54.723	59.699	64.675	69.649	74.621	79.589
	5.428	10.119	14.925	19.841	24.811	29.799	34.792	39.780	44.764	49.741	54.715	59.686	64.655	69.622	74.587	79.547
	5.324	10.088	14.912	19.833	24.803	29.791	34.783	39.771	44.753	49.730	54.702	59.671	64.638	69.603	74.566	79.524
N1	5.893	10.612	15.404	20.264	25.168	30.100	35.049	40.007	44.971	49.941	54.914	59.891	64.873	69.858	74.848	79.840
	5.908	10.623	15.423	20.288	25.195	30.127	35.075	40.032	44.995	49.963	54.935	59.912	64.894	69.880	74.870	79.864
	5.909	10.620	15.419	20.285	25.192	30.124	35.072	40.029	44.991	49.959	54.931	59.908	64.889	69.875	74.865	79.859
N2	5.199	10.078	14.975	19.917	24.889	29.876	34.868	39.862	44.856	49.850	54.843	59.837	64.832	69.828	74.825	79.824
	5.251	10.130	15.010	19.939	24.904	29.887	34.878	39.871	44.863	49.855	54.845	59.836	64.827	69.820	74.814	79.810
	5.265	10.132	15.020	19.954	24.919	29.900	34.888	39.879	44.870	49.862	54.855	59.848	64.843	69.841	74.840	79.841
N3	4.435	9.913	15.138	20.212	25.192	30.126	35.048	39.979	44.927	49.893	54.873	59.862	64.854	69.846	74.834	79.817
	4.148	9.785	15.068	20.171	25.171	30.120	35.055	39.996	44.952	49.924	54.908	59.900	64.894	69.887	74.876	79.859
	4.297	9.834	15.090	20.186	25.185	30.136	35.073	40.014	44.968	49.935	54.913	59.896	64.880	69.861	74.837	79.805
C0	5.749	10.522	15.382	20.277	25.190	30.114	35.046	39.982	44.922	49.865	54.813	59.766	64.726	69.693	74.670	79.657
	5.664	10.454	15.313	20.205	25.118	30.043	34.975	39.910	44.849	49.791	54.737	59.688	64.647	69.614	74.591	79.579
(Day 154)	5.629	10.446	15.318	20.215	25.127	30.050	34.980	39.914	44.852	49.794	54.740	59.691	64.650	69.618	74.595	79.584
C0	6.122	10.834	15.614	20.442	25.303	30.188	35.087	39.997	44.912	49.834	54.763	59.700	64.647	69.608	74.583	79.573
	6.435	10.976	15.707	20.494	25.321	30.183	35.069	39.969	44.878	49.794	54.716	59.644	64.580	69.528	74.489	79.465
(Day 188)	6.100	10.826	15.615	20.446	25.308	30.192	35.092	40.001	44.917	49.839	54.768	59.704	64.652	69.612	74.586	79.575

Table E-3

Key to Labels That Denote
the Location of the Instrumented Van

C0	NAVOBSY
C1	Wilmington, NC
C2	Emporia, VA
C3	Towanda, PA
C4	Dexter, NY
D0	NAVOBSY
D1	Danville, IN
D2	Marietta, OH
D3	Georgetown, DE
N0	NAVOBSY
N1	Toms River, NJ
N2	Grottoes, VA
N3	Bluefield, WV

Appendix F

RESULTS OF PULSE ALIGNMENT

This appendix assembles the illustrative material associated with pulse alignment at the 11th sample point on the pulse, i.e., nominally 30 μs from the start of the pulses. Figures F-1 through F-12 present the leading edges of pulses so aligned. The voltages plotted in these figures result from evaluations of the polynomials of Tables D-9 through D-12 and normalized to a peak value of 1.

From these values of voltage, ECM was calculated as explained in the main body of text. The result of this calculation is plotted against SPM in Fig. F-13. SPM and ECM are plotted against SPM in Fig. F-13. SPM and ECM are plotted against the distance from NAVOBSY to the field site in Figs. F-14 and F-15. Figure F-16 presents the observed attenuation of the signal at each site relative to the field strength of Carolina Beach observed at Wilmington, NC. Tables F-1 and F-2 tabulate the times of zero crossings relative to the time of the 11th sample point. The vertical groups of three rows are for the three data segments. Table F-3 records the values of the distance from the transmitting station to the site, ECM and SPM plotted in Figs. F-13, F-14, and F-15. Table F-4 records the values of attenuation plotted in Fig. F-16. The labels C1, C2 ... N0 in these tables refer to the location of the van during data recordings (see Table E-3 of Appendix E).

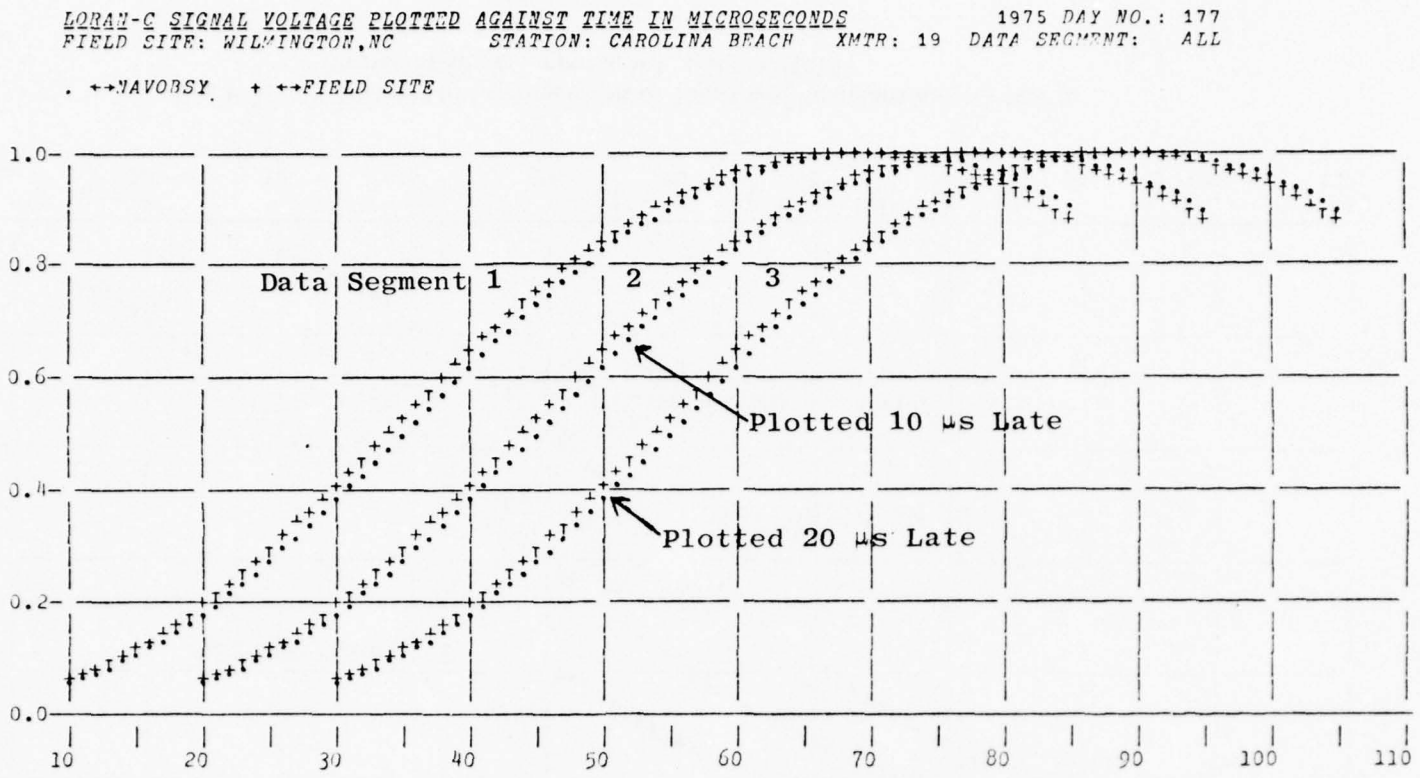


Fig. F-1 Locations of Leading Edges of Pulses with Standard Zero Crossings Aligned at 30 μs; Wilmington, NC, and NAVOBSY

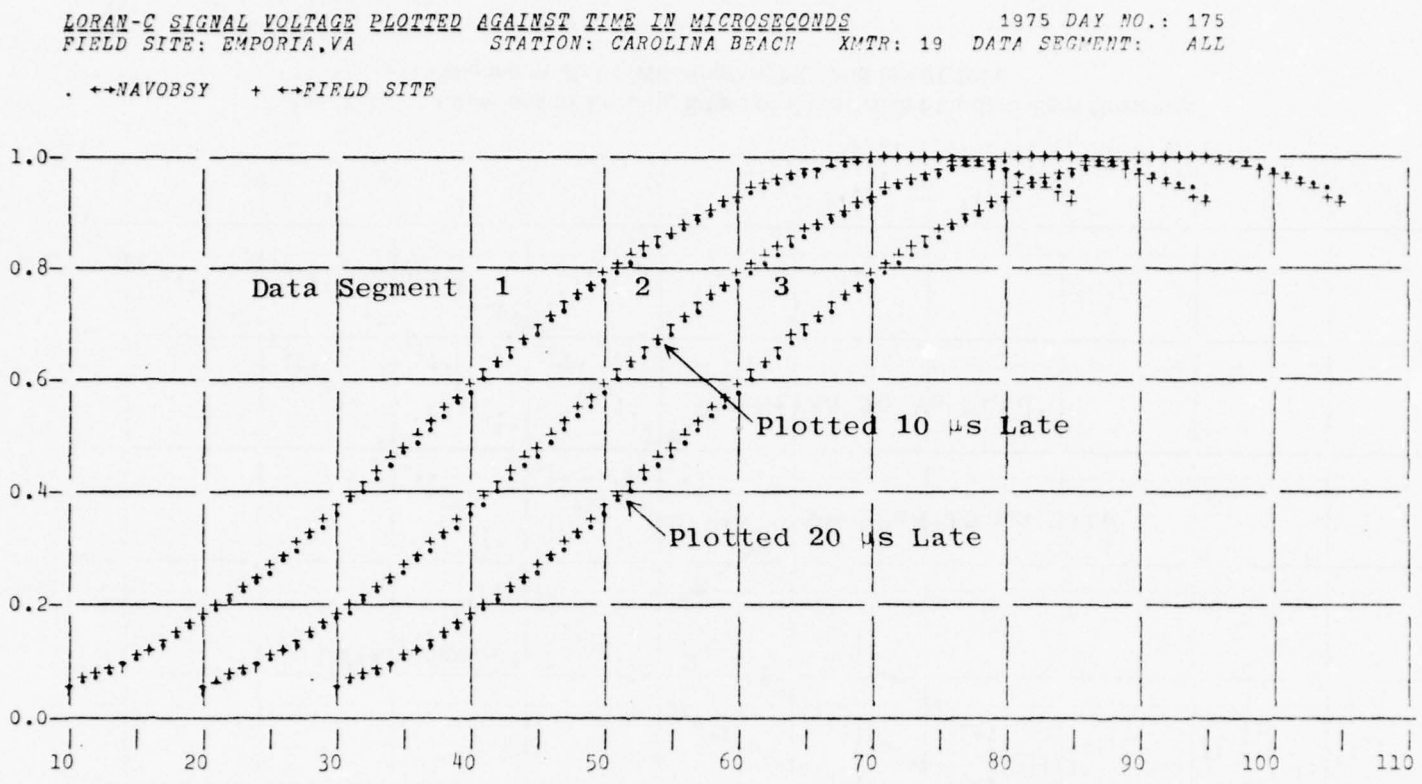


Fig. F-2 Locations of Leading Edges of Pulses with Standard Zero Crossings Aligned at 30 μs; Emporia, VA, and NAVOBSY

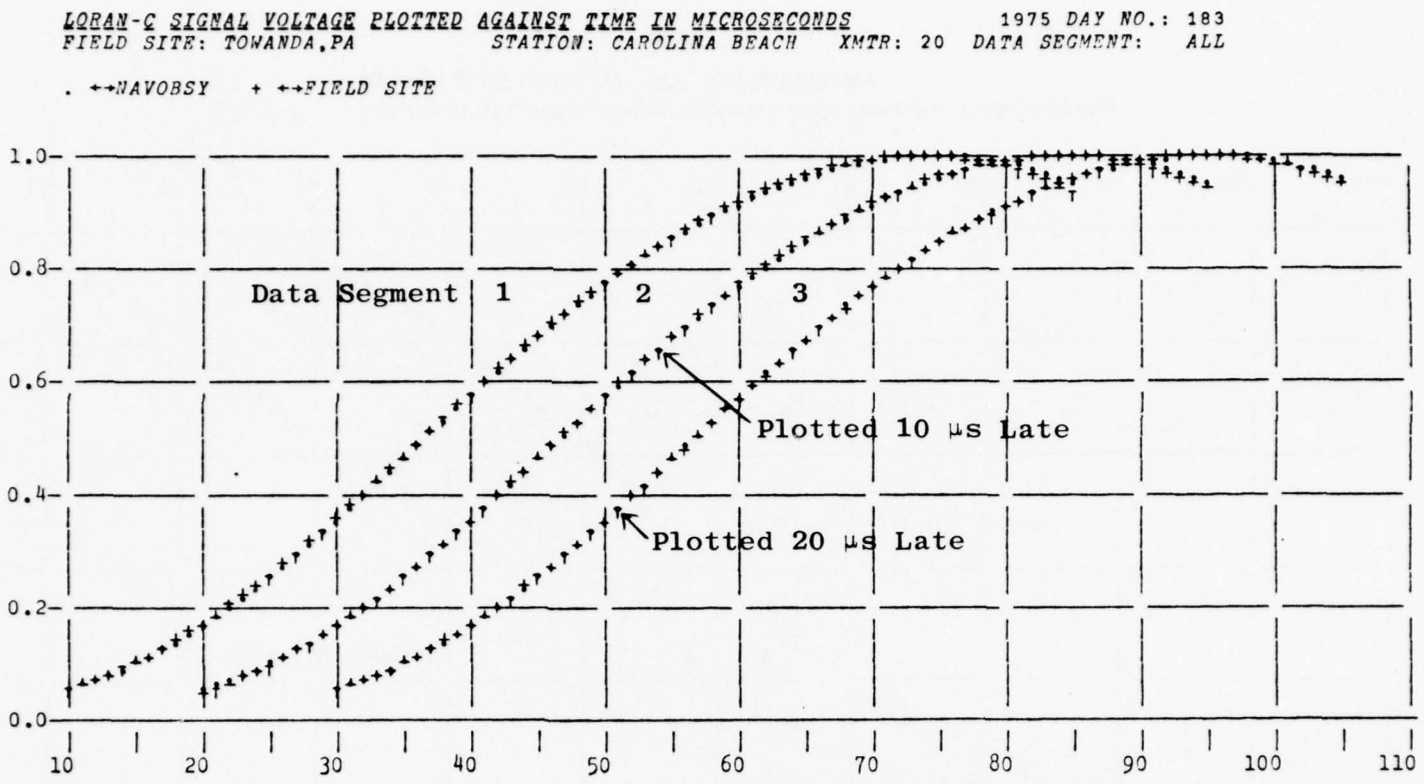


Fig. F-3 Locations of Leading Edges of Pulses with Standard Zero Crossings Aligned at 30 μs; Towanda, PA, and NAVOBSY

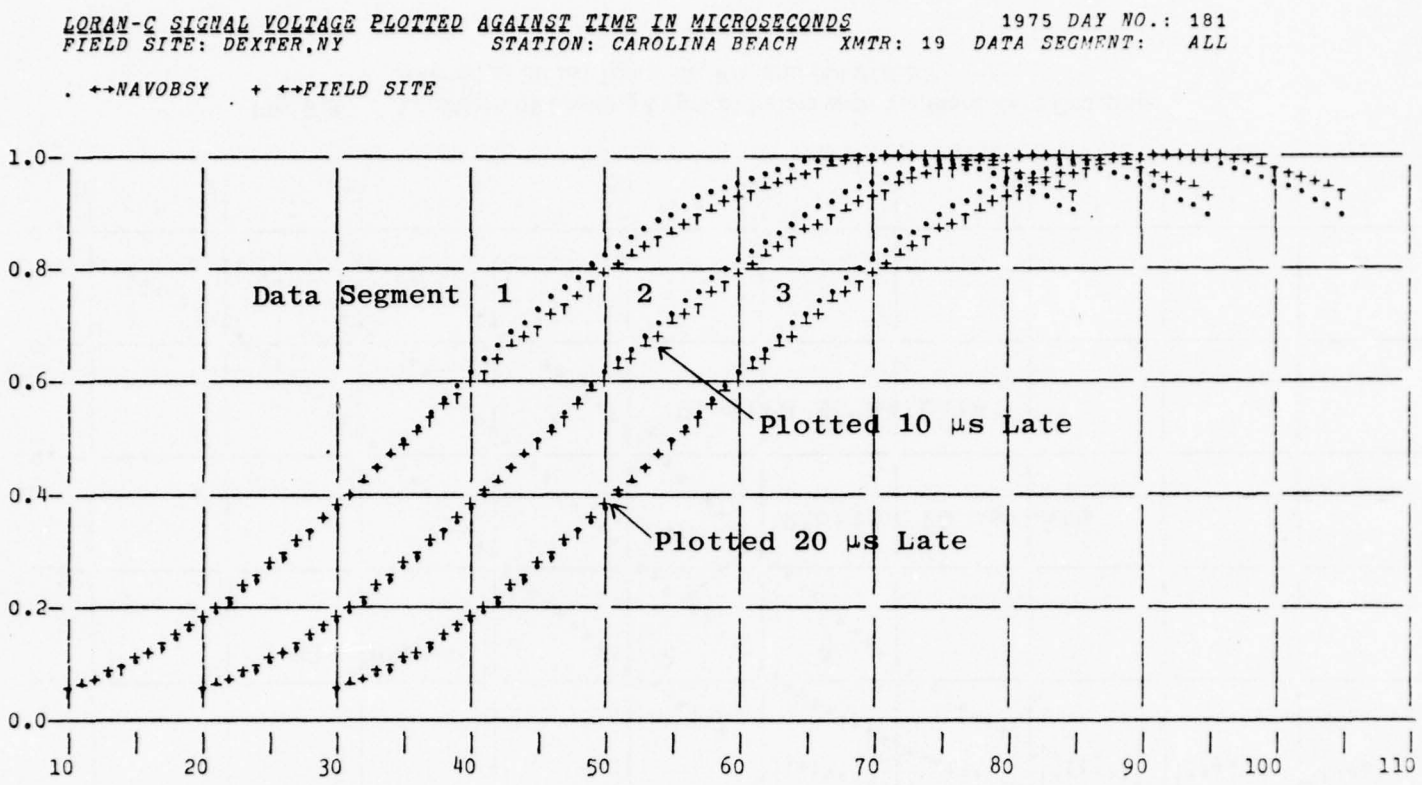


Fig. F-4 Locations of Leading Edges of Pulses with Standard Zero Crossings Aligned at 30 μs; Dexter, NY, and NAVOBSY

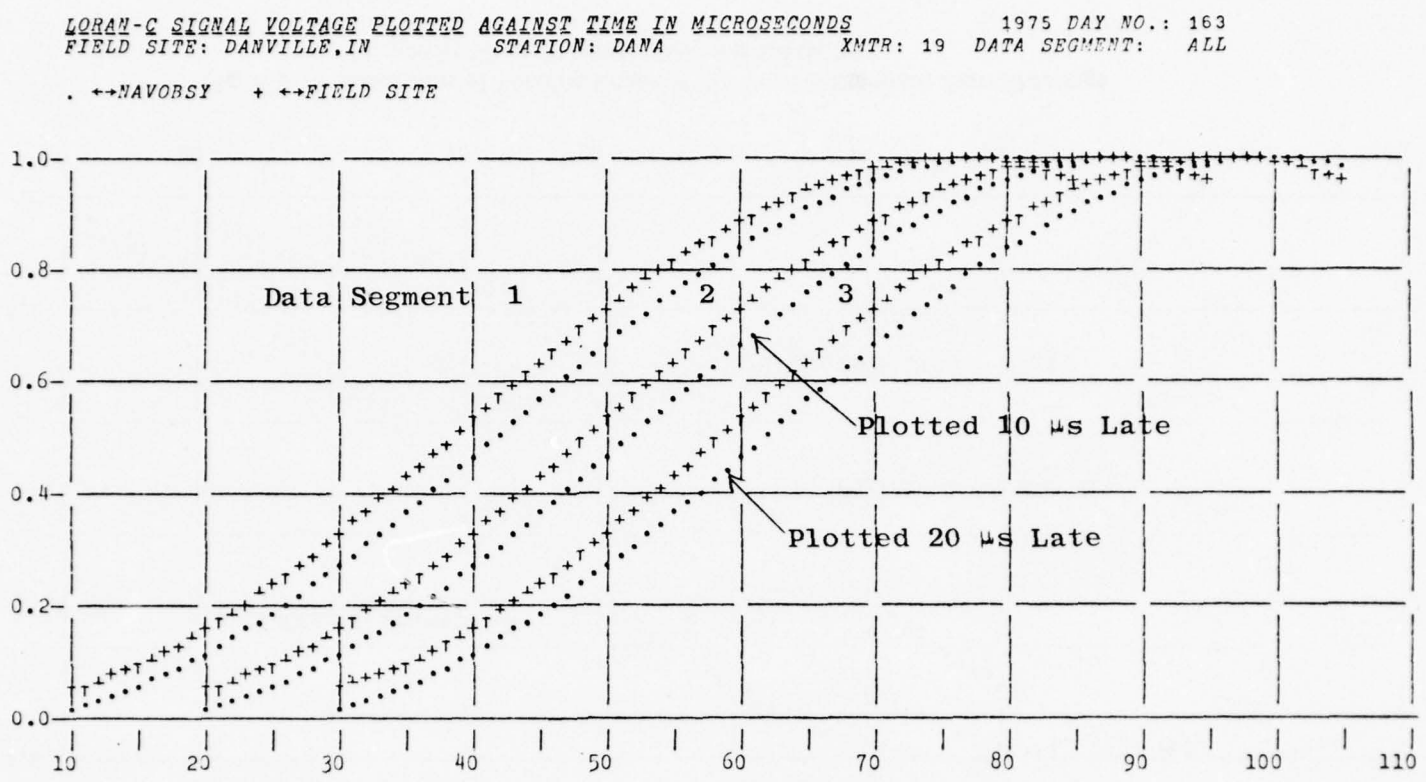


Fig. F-5 Locations of Leading Edges of Pulses with Standard Zero Crossings Aligned at 30 μs; Danville, IN, and NAVOBSY

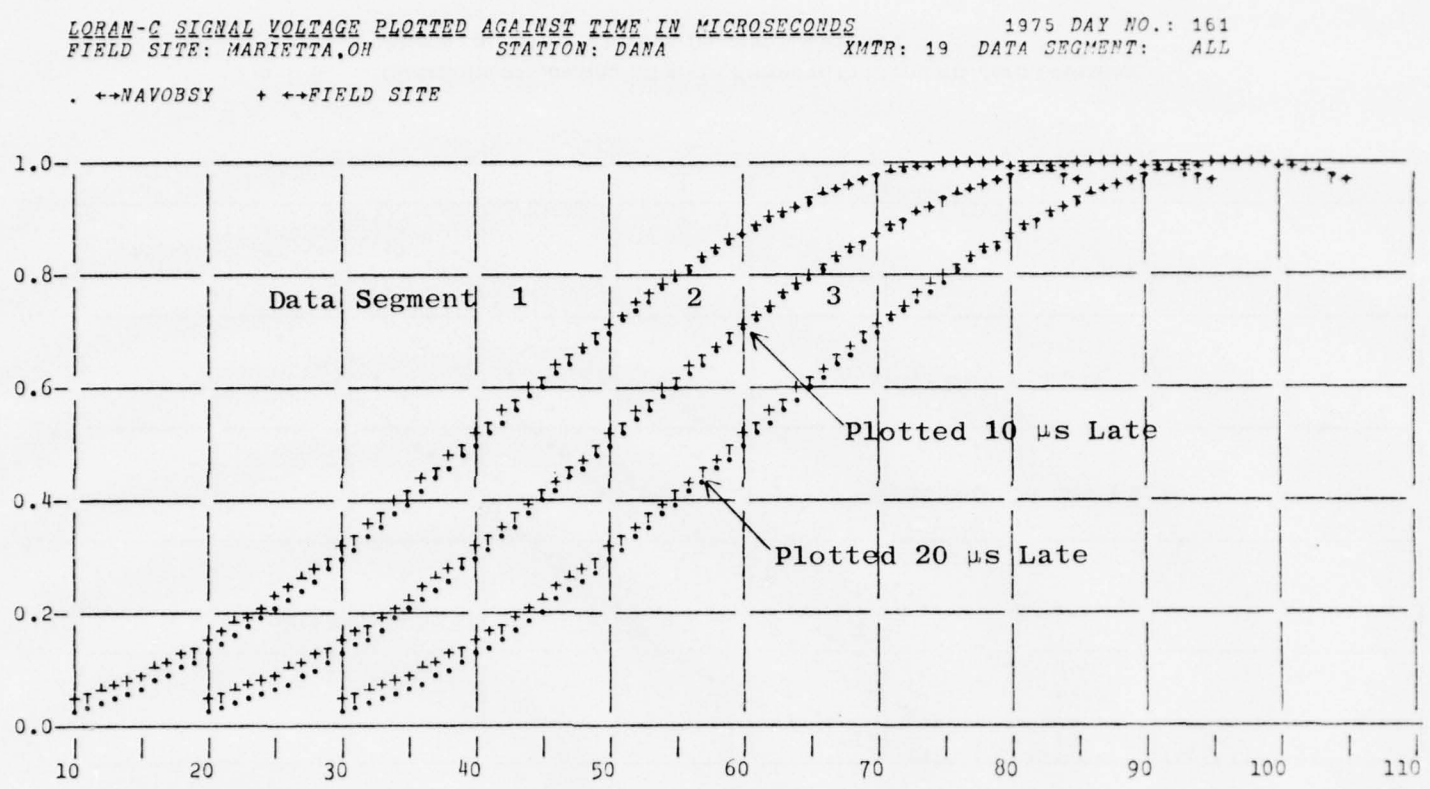


Fig. F-6 Locations of Leading Edges of Pulses with Standard Zero Crossings Aligned at 30 µs; Marietta, OH, and NAVOBSY

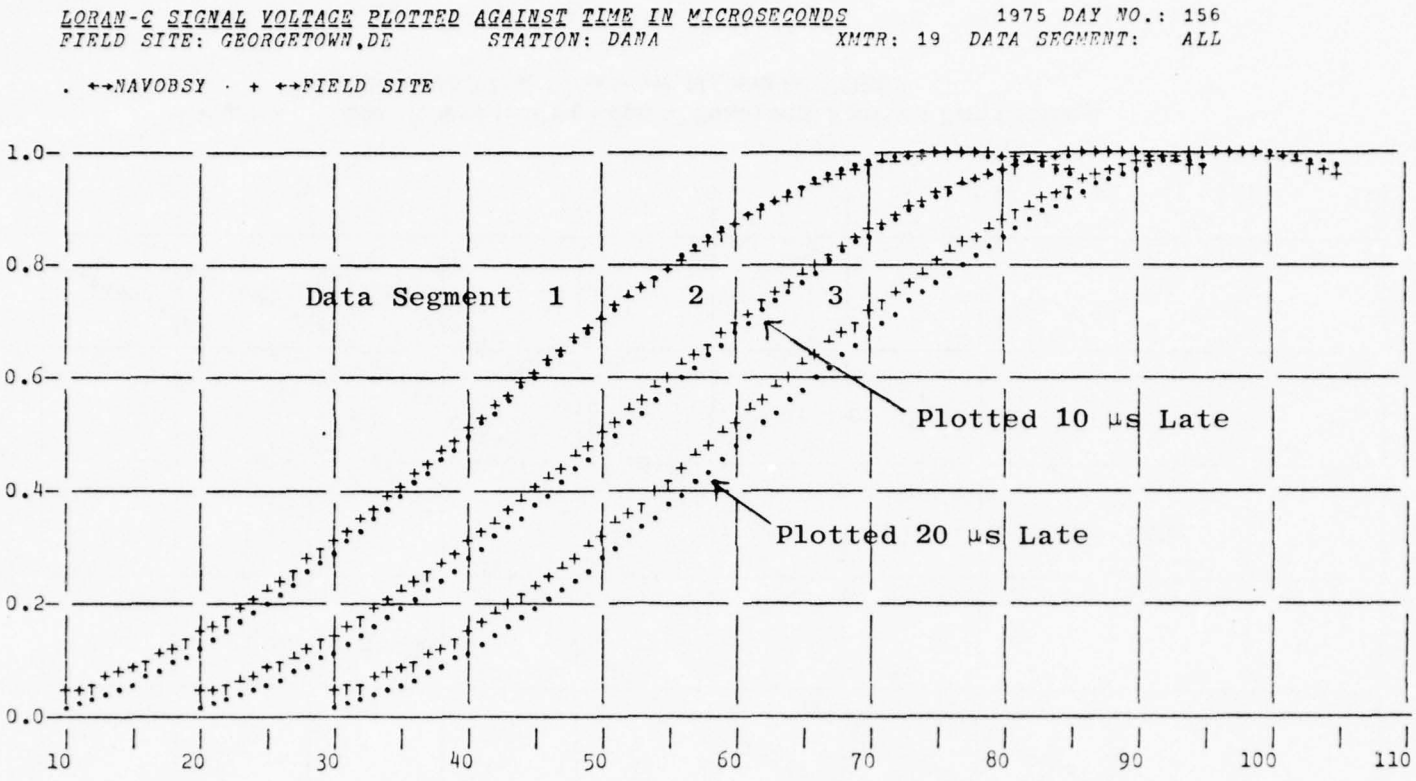


Fig. F-7 Locations of Leading Edges of Pulses with Standard Zero Crossings Aligned at 30 μs; Georgetown, DE, and NAVOBSY

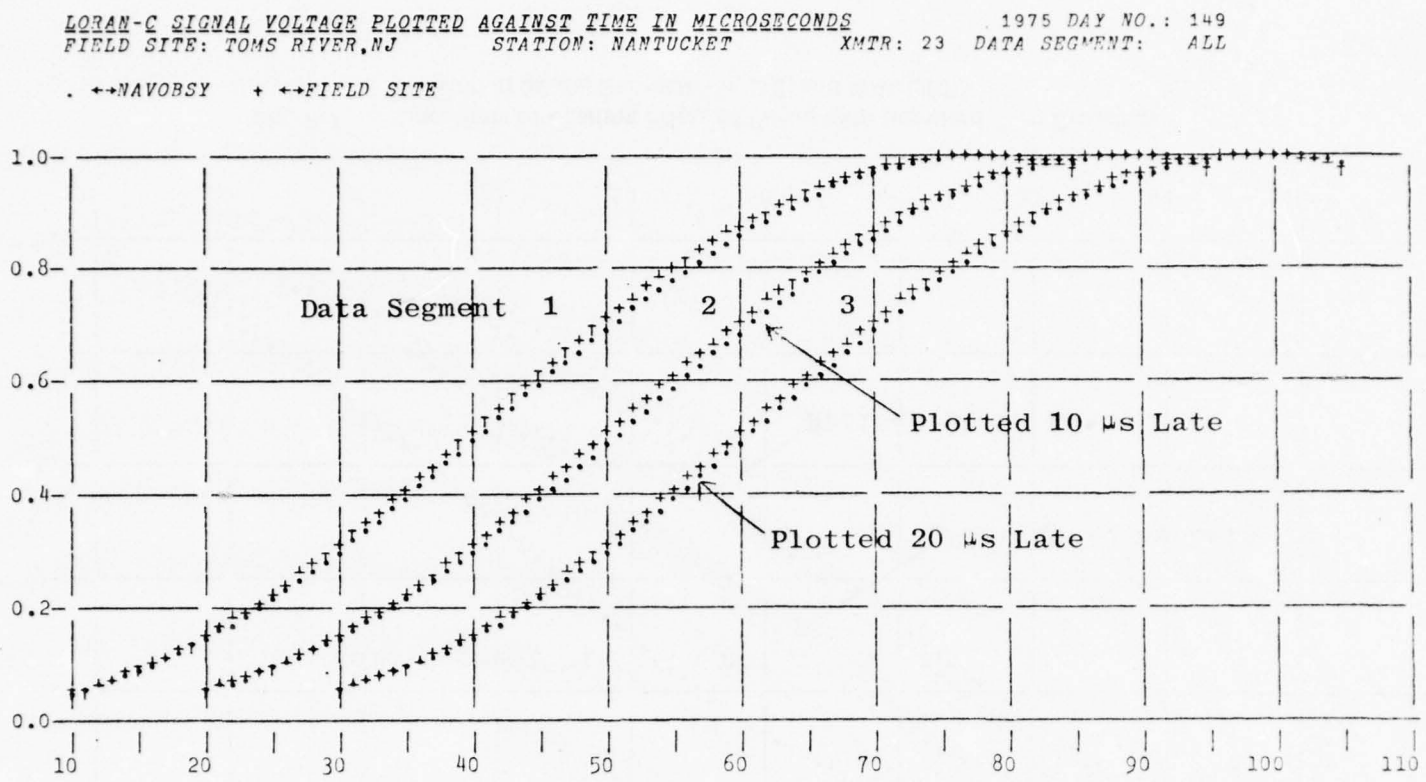


Fig. F-8 Locations of Leading Edges of Pulses with Standard Zero Crossings Aligned at 30 μs; Toms River, NJ, and NAVOBSY

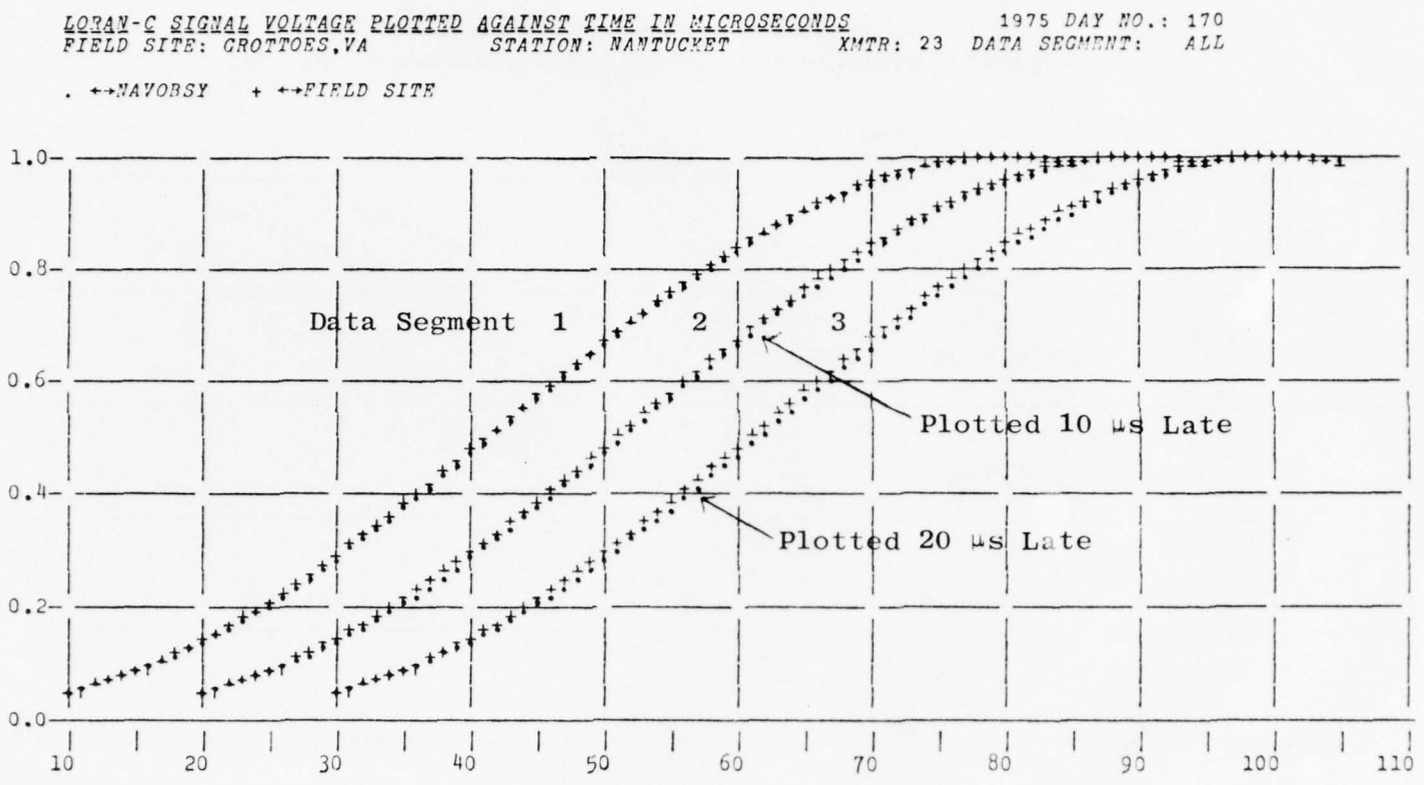


Fig. F-9 Locations of Leading Edges of Pulses with Standard Zero Crossings Aligned at 30 μs; Grottoes, VA, and NAVOBSY

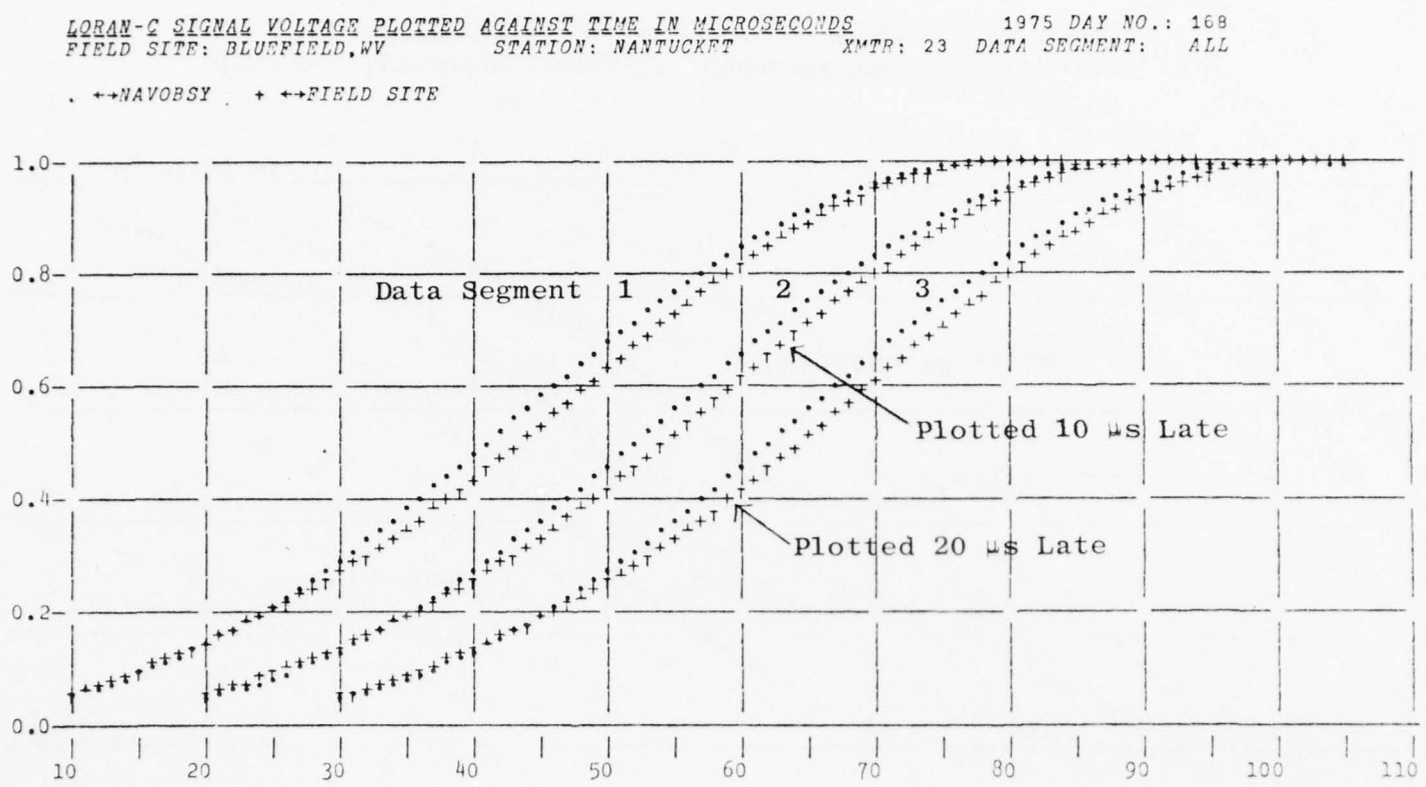


Fig. F-10 Locations of Leading Edges of Pulses with Standard Zero Crossings Aligned at 30 μs; Bluefield, WV, and NAVOBSY

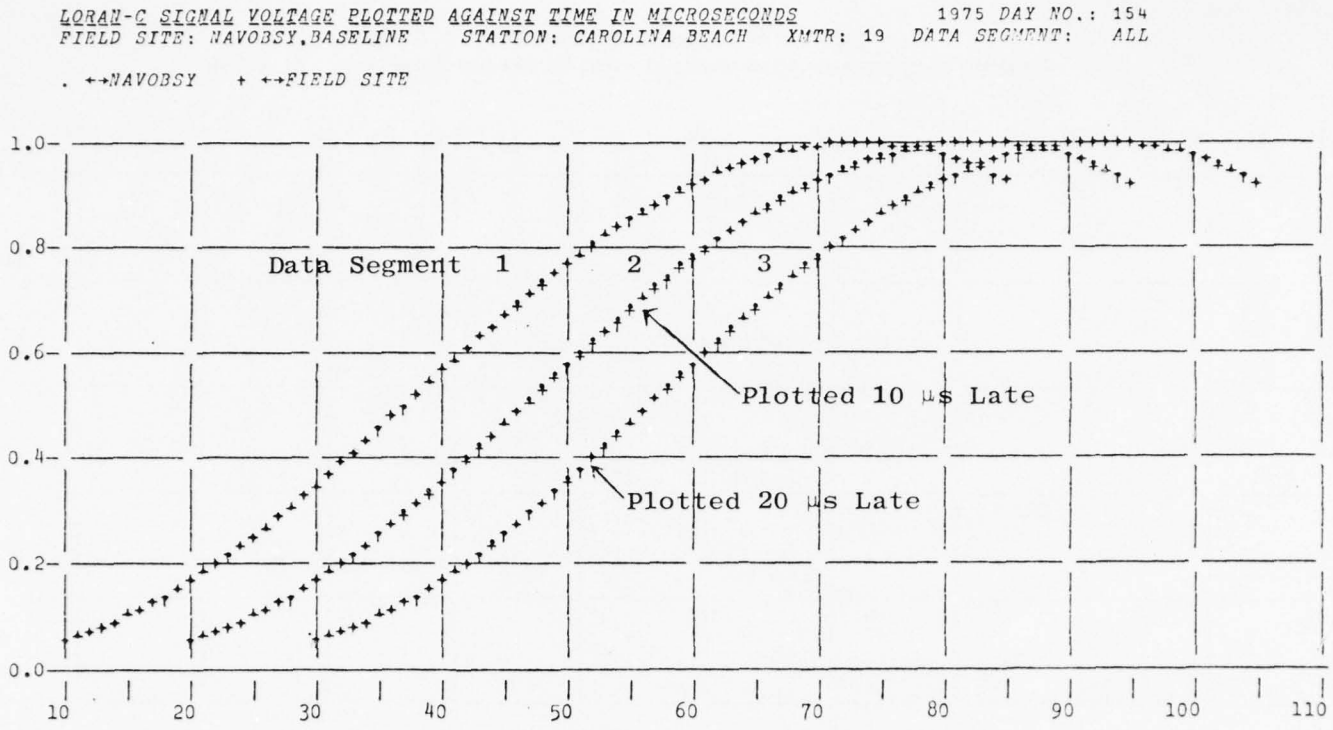


Fig. F-11 Locations of Leading Edges of Pulses with Standard Zero Crossings Aligned at 30 μs; NAVOBSY, 1975 Day No. 154

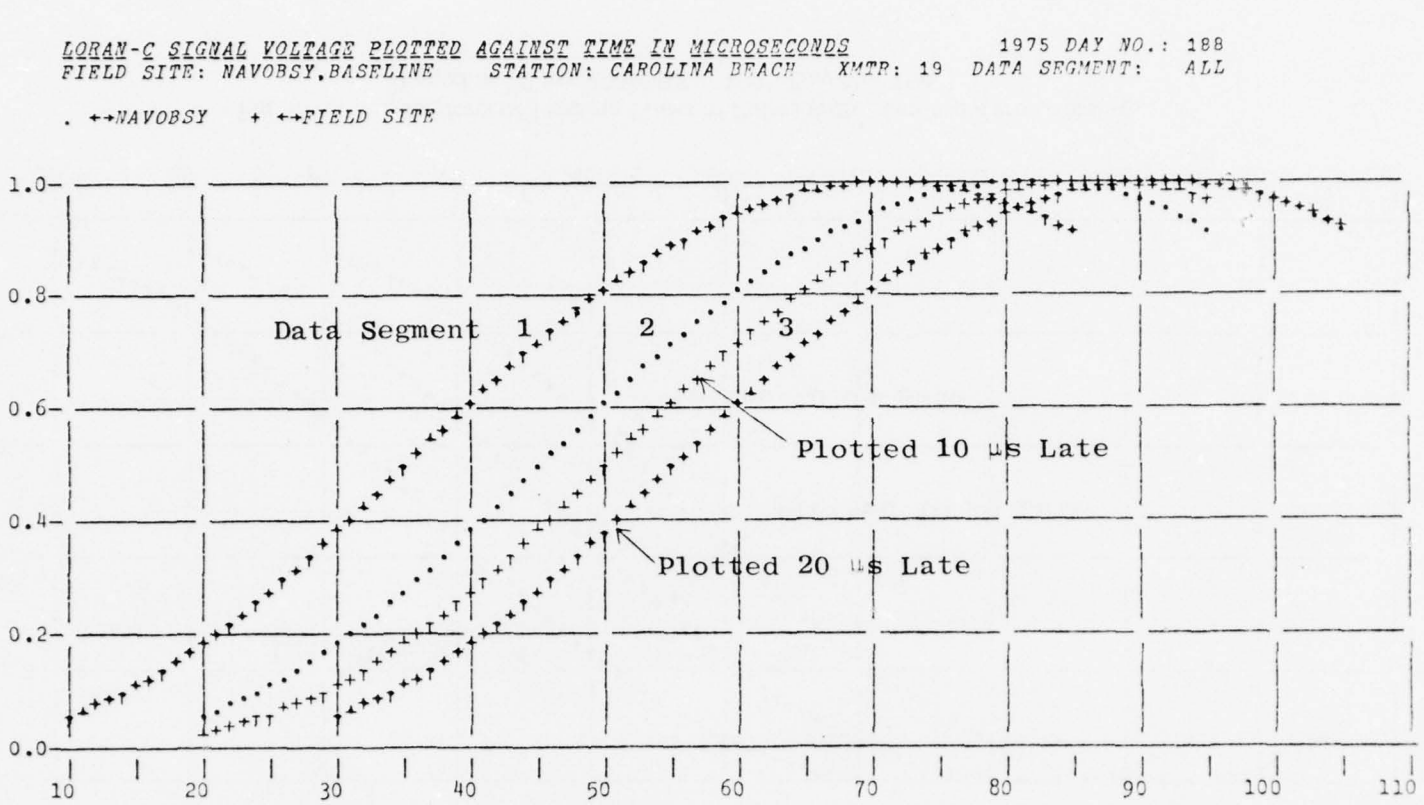
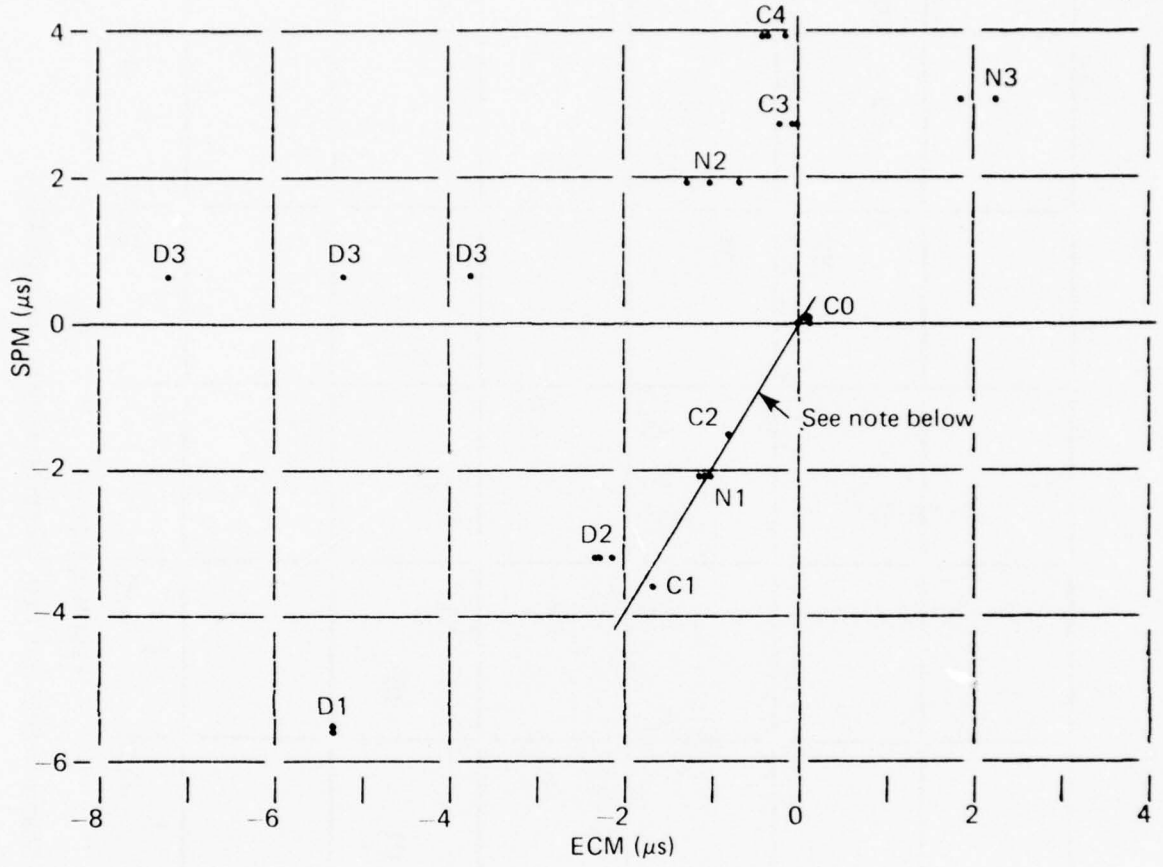


Fig. F-12 Locations of Leading Edges of Pulses with Standard Zero Crossings Aligned at 30 μs; NAVOBSY, 1975 Day No. 188



Note: The straight line is drawn through points for which both the field site and NAVOBSY are close to the inverse distance line in Fig. F-16.

Fig. F-13 The Relationship Between SPM and ECM

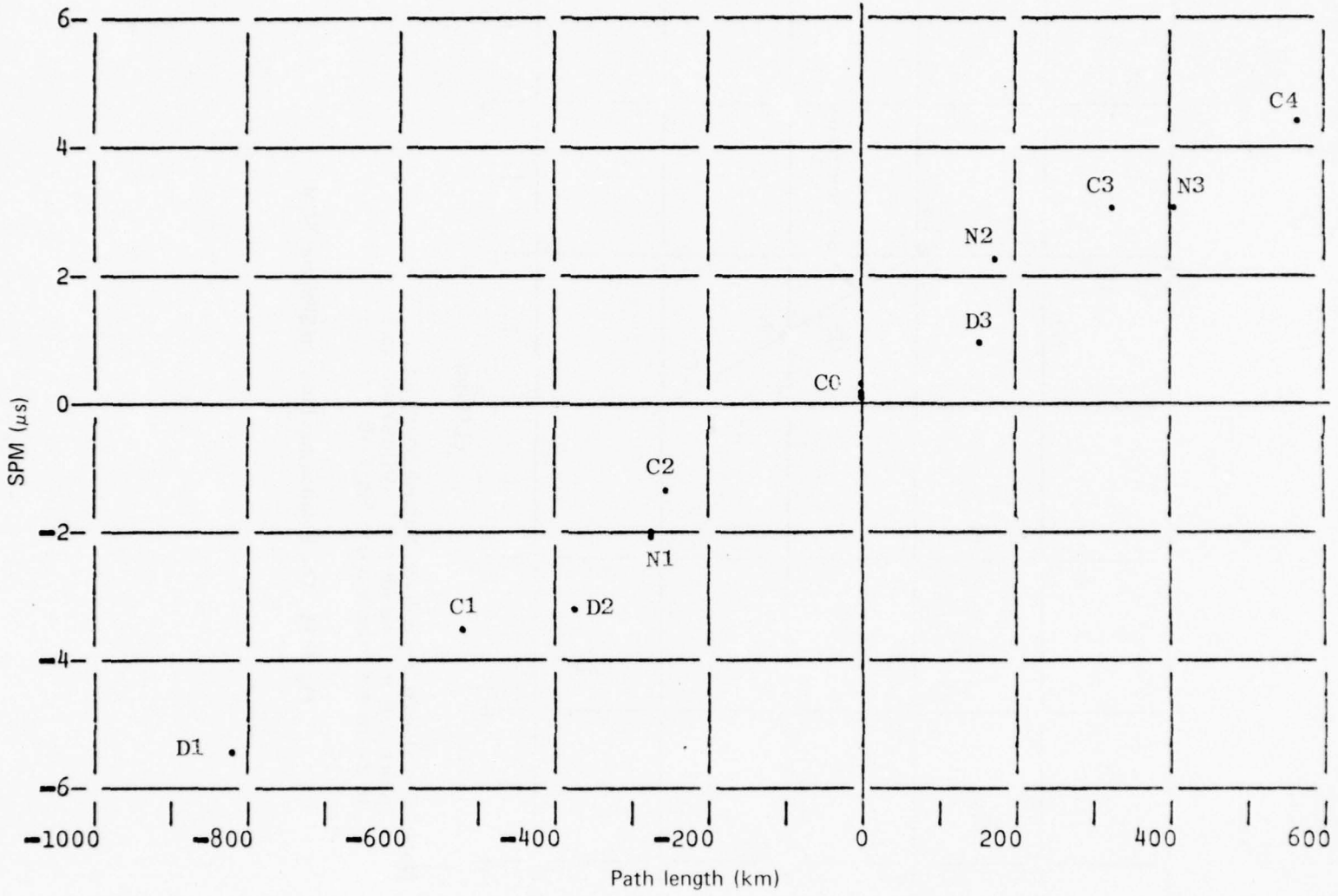


Fig. F-14 The Change in SPM with Path Length Measured from NAVOBSY

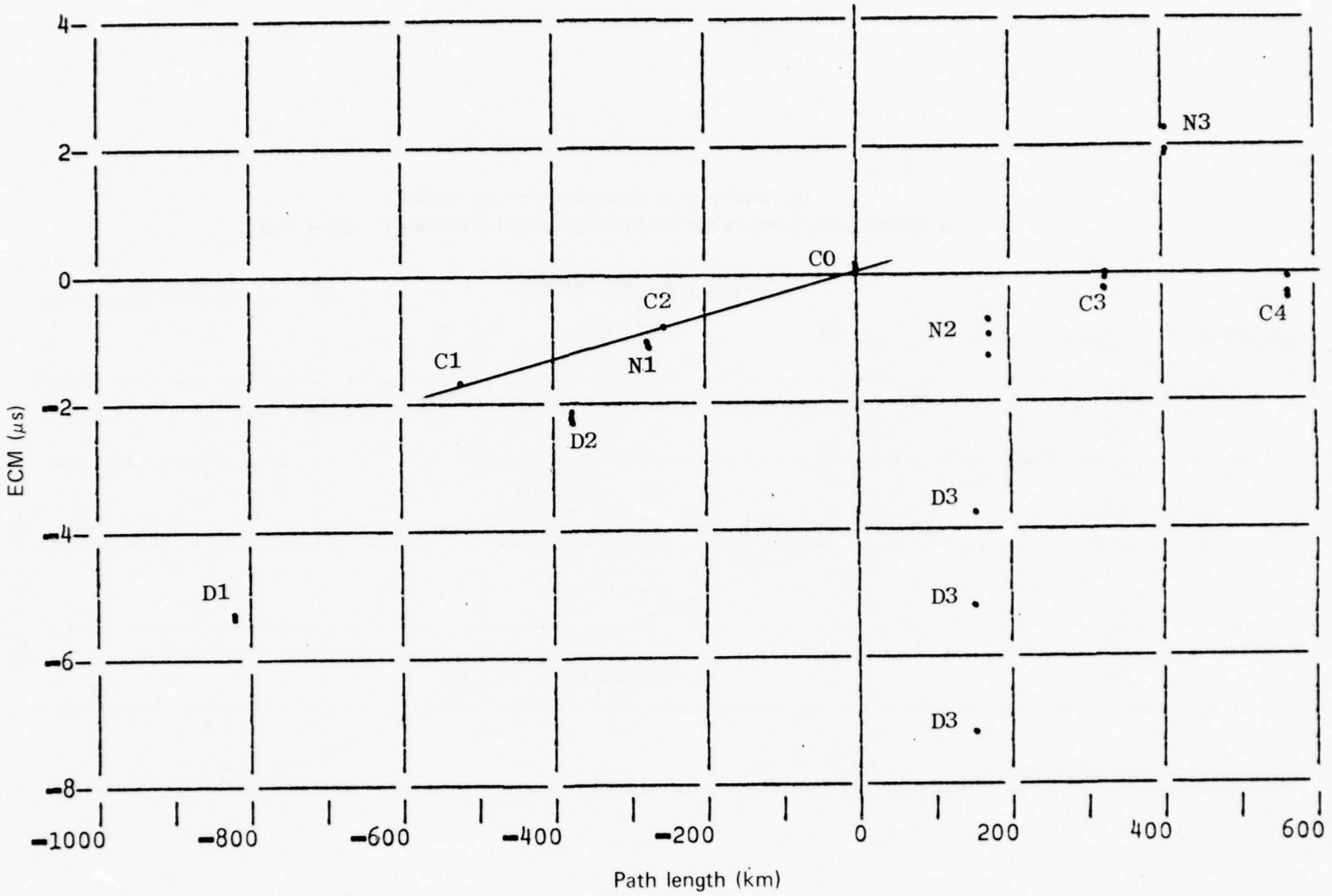


Fig. F-15 The Change in ECM with Path Length Measured from NAVOBSY

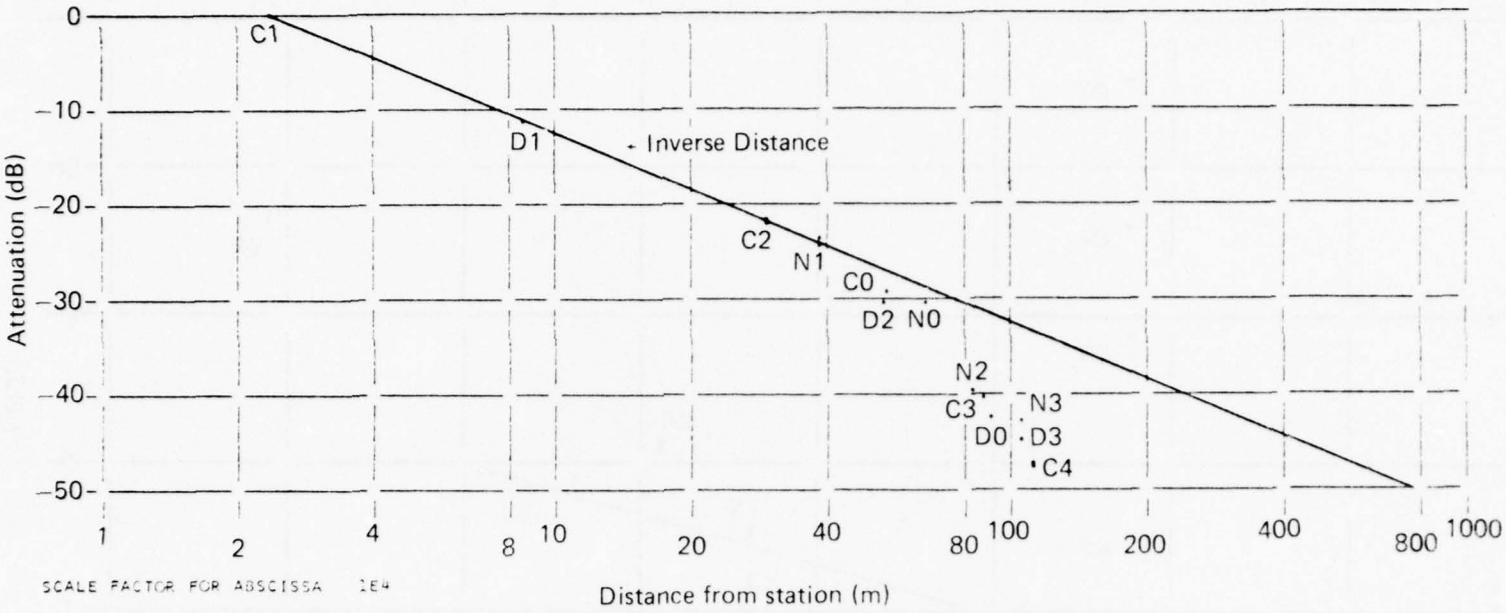


Fig. F-16 Attenuation of the Signal Relative to the Field Strength of Carolina Beach Observed at Wilmington, NC

Table F-1

The Time of Zero Crossings Relative to the Time of the 11th Sample Point on the Pulse, NAVOBSY

	ZTO3															
	5.536	10.403	15.277	20.167	25.077	30.001	34.932	39.868	44.808	49.751	54.699	59.652	64.614	69.587	74.571	79.570
C1	5.517	10.404	15.281	20.170	25.078	30.001	34.931	39.868	44.808	49.751	54.699	59.652	64.614	69.586	74.569	79.566
	5.532	10.391	15.271	20.165	25.077	30.001	34.931	39.868	44.808	49.751	54.699	59.652	64.614	69.586	74.570	79.567
	5.651	10.430	15.290	20.178	25.084	30.001	34.923	39.851	44.783	49.718	54.657	59.603	64.555	69.517	74.488	79.470
C2	5.654	10.416	15.284	20.177	25.084	30.001	34.922	39.848	44.779	49.713	54.653	59.598	64.552	69.513	74.485	79.466
	5.644	10.419	15.286	20.178	25.085	30.001	34.922	39.849	44.780	49.714	54.654	59.599	64.553	69.515	74.488	79.470
	5.829	10.601	15.393	20.227	25.099	30.001	34.919	39.849	44.786	49.729	54.678	59.634	64.599	69.572	74.556	79.549
C3	5.856	10.622	15.403	20.230	25.099	30.001	34.919	39.851	44.789	49.732	54.681	59.638	64.602	69.576	74.561	79.555
	5.825	10.603	15.395	20.228	25.099	30.001	34.919	39.850	44.788	49.731	54.680	59.636	64.600	69.574	74.557	79.550
	5.502	10.357	15.249	20.153	25.072	30.001	34.935	39.875	44.819	49.767	54.719	59.677	64.645	69.622	74.612	79.615
C4	5.443	10.391	15.263	20.157	25.070	30.001	34.940	39.885	44.833	49.783	54.735	59.693	64.658	69.633	74.619	79.619
	5.429	10.384	15.266	20.155	25.070	30.001	34.941	39.886	44.834	49.784	54.737	59.695	64.660	69.635	74.622	79.623
	6.277	10.378	15.157	20.066	25.022	30.001	34.989	39.983	44.979	49.975	54.971	59.965	64.957	69.947	74.934	79.918
D1	6.588	10.514	15.200	20.078	25.024	30.001	34.990	39.986	44.983	49.980	54.975	59.970	64.963	69.955	74.945	79.933
	6.401	10.410	15.173	20.072	25.023	30.001	34.991	39.986	44.983	49.980	54.975	59.967	64.958	69.948	74.934	79.918
	6.841	10.735	15.263	20.094	25.029	30.000	34.985	39.974	44.963	49.952	54.941	59.929	64.917	69.905	74.891	79.875
D2	6.804	10.719	15.255	20.088	25.026	30.000	34.987	39.977	44.967	49.956	54.944	59.932	64.919	69.905	74.891	79.873
	6.788	10.702	15.250	20.090	25.028	30.000	34.985	39.973	44.963	49.954	54.944	59.934	64.924	69.914	74.902	79.888
	6.644	10.343	15.093	20.026	25.005	30.001	35.000	39.999	44.994	49.986	54.976	59.964	64.951	69.936	74.919	79.899
D3	7.209	10.472	15.137	20.041	25.009	30.001	34.999	39.998	44.994	49.987	54.977	59.965	64.951	69.936	74.918	79.897
	7.209	10.412	15.109	20.029	25.006	30.001	35.001	39.999	44.995	49.986	54.975	59.961	64.946	69.929	74.910	79.887
	5.723	10.456	15.274	20.150	25.064	30.001	34.950	39.909	44.875	49.845	54.818	59.795	64.774	69.756	74.741	79.728
N1	5.913	10.609	15.353	20.175	25.066	30.001	34.958	39.925	44.896	49.867	54.840	59.814	64.792	69.773	74.758	79.748
	5.719	10.478	15.277	20.139	25.055	30.001	34.959	39.923	44.889	49.856	54.825	59.797	64.774	69.756	74.744	79.737
	5.667	10.442	15.263	20.139	25.057	30.001	34.957	39.922	44.894	49.869	54.848	59.831	64.817	69.806	74.797	79.792
N2	5.698	10.457	15.272	20.145	25.060	30.001	34.954	39.918	44.888	49.863	54.841	59.824	64.810	69.799	74.791	79.785
	5.812	10.494	15.277	20.140	25.056	30.001	34.959	39.926	44.898	49.873	54.851	59.832	64.818	69.806	74.799	79.794
	5.562	10.412	15.285	20.170	25.075	30.001	34.944	39.901	44.870	49.846	54.828	59.813	64.802	69.792	74.784	79.778
N3	5.516	10.376	15.256	20.148	25.064	30.001	34.954	39.922	44.898	49.882	54.870	59.861	64.854	69.849	74.846	79.844
	5.423	10.329	15.230	20.136	25.059	30.001	34.957	39.925	44.902	49.886	54.874	59.865	64.858	69.853	74.849	79.846
	5.686	10.439	15.300	20.187	25.089	30.001	34.920	39.846	44.778	49.714	54.657	59.606	64.563	69.528	74.503	79.488
C0	5.673	10.451	15.308	20.191	25.089	30.001	34.919	39.845	44.776	49.712	54.653	59.601	64.557	69.521	74.496	79.481
(Day 154)	5.658	10.452	15.311	20.193	25.090	30.001	34.919	39.844	44.774	49.708	54.648	59.595	64.550	69.514	74.488	79.474
	6.008	10.710	15.474	20.284	25.129	30.001	34.888	39.789	44.698	49.615	54.540	59.474	64.418	69.375	74.347	79.334
C0	6.019	10.720	15.482	20.288	25.131	30.001	34.887	39.787	44.696	49.612	54.537	59.471	64.416	69.373	74.345	79.334
(Day 188)	5.979	10.698	15.471	20.284	25.129	30.001	34.887	39.787	44.696	49.612	54.537	59.471	64.415	69.372	74.344	79.330

Table F-2

The Time of Zero Crossings Relative to the Time of the 11th Sample Point on the Pulse, Field Sites

	ZTV3														
C1	5.689	10.473	15.312	20.186	25.084	30.001	34.927	39.862	44.803	49.749	54.700	59.658	64.624	69.598	74.583	79.580
	5.684	10.470	15.310	20.185	25.084	30.001	34.927	39.862	44.803	49.749	54.699	59.657	64.622	69.596	74.581	79.579
	5.681	10.466	15.308	20.184	25.084	30.001	34.927	39.863	44.804	49.750	54.701	59.658	64.623	69.598	74.583	79.580
C2	5.749	10.474	15.307	20.185	25.086	30.001	34.923	39.850	44.782	49.718	54.659	59.606	64.561	69.525	74.498	79.483
	5.748	10.472	15.307	20.185	25.086	30.001	34.921	39.848	44.779	49.713	54.652	59.598	64.552	69.515	74.488	79.472
	5.741	10.472	15.308	20.186	25.087	30.001	34.921	39.848	44.779	49.714	54.653	59.600	64.554	69.517	74.490	79.474
C3	5.448	10.341	15.211	20.114	25.048	30.000	34.958	39.918	44.876	49.832	54.787	59.744	64.705	69.671	74.644	79.625
	5.534	10.382	15.236	20.128	25.055	30.001	34.952	39.905	44.858	49.809	54.761	59.714	64.671	69.635	74.606	79.585
	5.571	10.377	15.224	20.119	25.051	30.000	34.956	39.913	44.869	49.823	54.777	59.732	64.690	69.654	74.624	79.601
C4	5.152	10.064	15.053	20.030	25.013	30.001	34.989	39.973	44.952	49.926	54.897	59.869	64.844	69.826	74.818	79.823
	5.095	10.059	15.046	20.027	25.012	30.001	34.987	39.969	44.946	49.920	54.892	59.867	64.846	69.834	74.832	79.843
	5.067	10.060	15.038	20.020	25.009	30.001	34.989	39.972	44.949	49.923	54.896	59.871	64.852	69.840	74.839	79.850
D1	6.036	10.615	15.333	20.159	25.059	30.000	34.963	39.938	44.917	49.899	54.882	59.864	64.847	69.830	74.812	79.791
	6.049	10.620	15.335	20.160	25.059	30.000	34.963	39.937	44.916	49.898	54.880	59.863	64.845	69.828	74.809	79.789
	6.043	10.616	15.334	20.160	25.059	30.000	34.962	39.936	44.915	49.897	54.879	59.861	64.843	69.826	74.807	79.786
D2	5.719	10.544	15.315	20.155	25.058	30.000	34.963	39.937	44.916	49.898	54.880	59.862	64.843	69.823	74.800	79.774
	5.702	10.544	15.318	20.158	25.059	30.000	34.962	39.936	44.915	49.897	54.878	59.860	64.840	69.819	74.796	79.770
	5.747	10.547	15.315	20.156	25.059	30.000	34.962	39.935	44.914	49.896	54.878	59.860	64.841	69.820	74.797	79.770
D3	5.603	10.266	15.090	20.025	25.006	30.000	34.996	39.988	44.975	49.957	54.936	59.912	64.888	69.862	74.834	79.802
	5.628	10.321	15.125	20.042	25.012	30.000	34.992	39.981	44.964	49.942	54.916	59.887	64.856	69.823	74.788	79.747
	5.533	10.298	15.121	20.042	25.012	30.000	34.992	39.980	44.962	49.938	54.910	59.880	64.847	69.812	74.775	79.733
N1	5.794	10.513	15.305	20.163	25.068	30.001	34.949	39.907	44.871	49.841	54.814	59.792	64.773	69.758	74.747	79.740
	5.782	10.497	15.296	20.160	25.068	30.001	34.948	39.904	44.867	49.836	54.808	59.786	64.767	69.753	74.743	79.736
	5.786	10.498	15.296	20.160	25.068	30.001	34.947	39.904	44.867	49.835	54.807	59.784	64.765	69.751	74.741	79.735
N2	5.323	10.202	15.098	20.042	25.014	30.001	34.993	39.987	44.980	49.974	54.967	59.961	64.955	69.951	74.949	79.948
	5.362	10.244	15.122	20.052	25.017	30.001	34.992	39.984	44.976	49.967	54.958	59.948	64.940	69.932	74.927	79.923
	5.364	10.233	15.119	20.054	25.020	30.001	34.989	39.979	44.970	49.962	54.955	59.948	64.944	69.941	74.940	79.941
N3	4.309	9.788	15.013	20.085	25.066	30.001	34.922	39.852	44.801	49.767	54.747	59.736	64.728	69.720	74.708	79.690
	4.030	9.664	14.947	20.051	25.051	30.001	34.934	39.875	44.831	49.804	54.788	59.780	64.774	69.767	74.755	79.738
	4.160	9.698	14.954	20.050	25.049	30.001	34.936	39.877	44.832	49.799	54.777	59.760	64.744	69.725	74.701	79.689
C0	5.632	10.407	15.269	20.163	25.076	30.001	34.932	39.868	44.808	49.752	54.699	59.652	64.612	69.580	74.557	79.543
	5.621	10.410	15.271	20.162	25.075	30.000	34.931	39.867	44.806	49.748	54.694	59.645	64.604	69.571	74.548	79.536
(Day 154)	5.579	10.396	15.269	20.165	25.077	30.000	34.929	39.864	44.802	49.744	54.690	59.641	64.600	69.568	74.546	79.534
C0	5.935	10.646	15.427	20.255	25.115	30.001	34.899	39.809	44.725	49.647	54.575	59.512	64.460	69.420	74.395	79.386
	6.256	10.793	15.525	20.310	25.138	30.001	34.885	39.786	44.695	49.611	54.533	59.461	64.397	69.345	74.306	79.282
(Day 188)	5.908	10.634	15.423	20.254	25.115	30.001	34.899	39.809	44.725	49.647	54.575	59.512	64.460	69.419	74.393	79.383

Table F-3

Values of Distance, SPM, and ECM Plotted in Figs. F-13, F-14, and F-15

1975 Day No.	Field Site	Transmitting Station	NAVOBSY to Field Site (m)	SPM (μs)	ECM (μs)
177	Wilmington, NC	Carolina Beach	-520672	-3.600	-1.653
			-520672	-3.600	-1.656
			-520672	-3.600	-1.673
175	Emporia, VA	Carolina Beach	-250900	-1.490	-0.772
			-250900	-1.491	-0.829
			-250900	-1.489	-0.831
183	Towanda, PA	Carolina Beach	323487	2.713	-0.223
			323487	2.736	-0.049
			323487	2.720	-0.032
181	Dexter, NY	Carolina Beach	569702	3.894	-0.105
			569702	3.901	-0.355
			569702	3.904	-0.369
163	Danville, IN	Dana	-817137	-5.562	-5.301
			-817137	-5.555	-5.367
			-817137	-5.558	-5.346
161	Marietta, OH	Dana	-376178	-3.172	-2.272
			-376178	-3.165	-2.120
			-376178	-3.165	-2.353
156	Georgetown, DE	Dana	150434	0.677	-3.759
			150434	0.680	-5.212
			150434	0.679	-7.223
149	Toms River, NJ	Nantucket	-273230	-2.092	-1.053
			-273230	-2.074	-1.014
			-273230	-2.084	-1.100
170	Grottoes, VA	Nantucket	170013	1.891	-0.689
			170013	1.896	-0.985
			170013	1.914	-1.256
168	Bluefield, WV	Nantucket	405849	3.019	2.272
			405849	3.023	1.897
			405849	3.031	1.879
154	NAVOBSY	Carolina Beach	0	0.026	-0.010
			0	0.037	0.149
			0	0.044	0.153
188	NAVOBSY	Carolina Beach	0	0.046	0.053
			0	0.048	0.048

Table F-4

Adjusted Values of Attenuation Plotted in Fig. F-16

Site	Distance Station to Site (m)	Adjusted Attenuation (dB)	Measured Attenuation (dB)
C1	23572	0.000	43.762
		-0.005	43.757
		-0.075	43.687
C2	293344	-21.584	22.178
		-21.964	21.798
		-21.841	21.921
C3	867731	-40.541	3.222
		-40.390	3.372
		-40.340	3.422
C4	1113946	-47.354	-3.592
		-47.442	-3.680
		-47.431	-3.669
D1	85946	-11.237	32.526
		-11.215	32.547
		-11.199	32.563
D2	526905	-30.403	13.359
		-30.384	13.378
		-30.391	13.371
D3	1053517	-44.861	-1.099
		-44.700	-0.938
		-44.940	-1.178
N1	384346	-24.246	19.516
		-23.575	20.187
		-23.467	20.295
N2	827590	-39.701	4.061
		-39.592	4.170
		-39.695	4.067
N3	1063425	-42.921	0.841
		-42.996	0.766
		-42.867	0.895
C0	544244	-29.140	14.622
D0	903083	-42.485	1.277
N0	657576	-30.380	13.382

Appendix G

RESULTS OF FREQUENCY FILTERING

This appendix assembles the histograms and the plotted Fourier coefficients that were used in an attempt to understand the data taken at Georgetown, DE, and simultaneously at NAVOBSY.

Figures G-1 through G-8 are derived from data taken at Danville, IN, and NAVOBSY during the first 20-min recording. Figures G-1 and G-2 are histograms of first-stage edited data taken at NAVOBSY and Danville, respectively. Figures G-3 and G-4 present the Fourier coefficients derived from Q and I data, respectively, taken at NAVOBSY simultaneously with recording at Danville. The Danville coefficients are shown in Figs. G-5 and G-6. Figures G-7 and G-8 are the histograms of frequency filtered data taken at NAVOBSY and Danville, respectively.

Figures G-9 through G-12 present histograms and Fourier coefficients derived from data taken at NAVOBSY during recordings at Georgetown, DE, during the first 20-min data recording, i.e., data segment 1. Figure G-9 is the histogram of first-stage edited data. Figures G-10 and G-11 present the Fourier coefficients for Q and I data, respectively. Figure G-12 is the histogram of the frequency filtered data.

Figures G-13 through G-16 are the same as Figs. G-9 through G-12 but for data segment 2, and Figures G-17 through G-20 are for data segment 3.

Figures G-21 through G-32 are the same as Figs. G-9 through G-20 except that the data were recorded at Danville, IN.

T11-T12 HISTOGRAM

																				T11
0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	2
0	0	0	0	0	0	0	0	1	3	0	1	0	0	0	0	0	0	0	0	5
0	0	0	0	0	0	1	4	0	2	0	0	0	0	0	0	0	0	0	0	7
0	0	0	0	0	1	11	23	8	0	0	0	0	0	0	0	0	0	0	0	43
0	0	0	0	0	0	14	256	316	51	1	1	0	1	2	0	1	0	0	0	643
0	0	0	0	0	0	2	277	925	451	58	5	2	0	0	0	0	0	0	0	1720
0	0	0	0	0	1	1	34	449	715	410	50	3	0	0	1	0	0	0	0	1664
0	0	0	0	0	0	2	4	53	415	694	433	51	1	3	1	0	0	0	0	1657
0	0	0	0	0	0	1	2	1	53	471	951	307	9	0	0	0	1	0	0	1796
0	0	0	0	0	0	0	1	0	3	41	271	247	22	0	0	0	0	0	0	585
0	0	0	0	0	0	0	0	0	0	6	9	25	9	0	0	0	0	0	0	49
0	0	0	0	0	0	0	0	0	0	1	0	2	0	0	0	0	0	1	0	4
0	0	0	0	0	0	0	0	1	0	1	0	0	1	0	0	0	0	0	0	3
0	0	0	0	0	0	0	0	0	2	1	0	0	0	0	1	0	0	0	0	4
0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1
0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

T12 DISTRIBUTION

0	0	0	0	0	3	34	601	1754	1696	1685	1721	637	43	5	3	1	1	1	0

TOTAL NO. PAIRS = 8192

T11,12 EDIT SIGMA = 0.5234

EDITING LEVEL = 6 SIGMA

T11 EDIT PAIRS = 3

T12 EDIT PAIRS = 1

T11,12 EDIT PAIRS = 3

T11 AVERAGE =-0.0293

T12 AVERAGE = 1.2225

Fig. G-1 Histogram of First-Stage Edited Data Taken at NAVOBSY During Recording at Danville, IN; Data Segment 1

T11-T12 HISTOGRAM

																				T11
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	1	0	2	0	0	0	0	0	0	0	0	0	0	3
0	0	0	0	0	0	0	0	1	2	1	0	0	0	0	0	0	0	0	0	4
0	0	0	0	0	0	0	3	2	9	5	2	1	2	0	0	0	0	0	0	24
0	0	0	0	1	1	4	8	12	19	17	12	1	4	0	0	0	0	0	0	79
0	0	0	0	0	2	4	36	41	51	45	35	8	4	2	0	0	0	0	0	228
0	0	0	1	0	9	21	50	68	95	131	86	35	21	5	3	0	0	0	0	525
0	0	0	0	0	7	33	100	180	227	264	229	98	34	11	5	0	0	0	0	1188
0	0	0	0	2	9	48	139	291	393	421	403	171	73	13	4	2	0	0	0	1969
0	0	0	0	5	10	53	172	354	448	410	388	196	62	15	3	0	0	0	0	2116
0	0	0	0	2	7	43	127	215	328	306	189	95	34	6	1	0	0	0	0	1353
0	0	0	0	2	5	12	47	55	114	103	70	36	12	3	1	0	0	0	0	501
0	0	0	0	0	3	2	14	24	32	31	17	10	8	1	1	0	0	0	0	143
0	0	0	0	1	1	1	3	3	8	12	8	3	3	1	0	0	0	0	0	44
0	0	0	0	0	0	0	0	0	3	1	4	1	2	0	0	0	0	0	0	11
0	0	0	0	0	0	0	0	1	0	2	0	0	0	0	0	0	0	0	0	3
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

T12 DISTRIBUTION

0	0	0	1	13	54	221	700	1287	1731	1749	1443	655	260	57	18	2	0	0	0

TOTAL NO. PAIRS = 8192

T11,12 EDIT SIGMA = 0.0705

EDITING LEVEL = 6 SIGMA

T11 EDIT PAIRS = 0

T12 EDIT PAIRS = 1

T11,12 EDIT PAIRS = 0

T11 AVERAGE = 0.0012

T12 AVERAGE = 2.9070

Fig. G-2 Histogram of First-Stage Edited Data Taken at Danville, IN; Data Segment 1

TOTAL DC POWER IN Q = 0.0007

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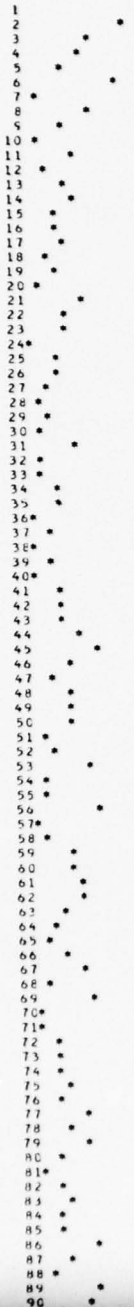
Fig. G-3 Power Spectral Density Showing Interference in Q Data Taken at NAVOBSY During Recording at Danville, IN; Data Segment 1

TOTAL DC POWER IN I = 1.4894

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Fig. G-4 Power Spectral Density Showing Interference in I Data Taken at NAVOBSY During Recording at Danville, IN; Data Segment 1

TOTAL DC POWER IN Q = 0.0000



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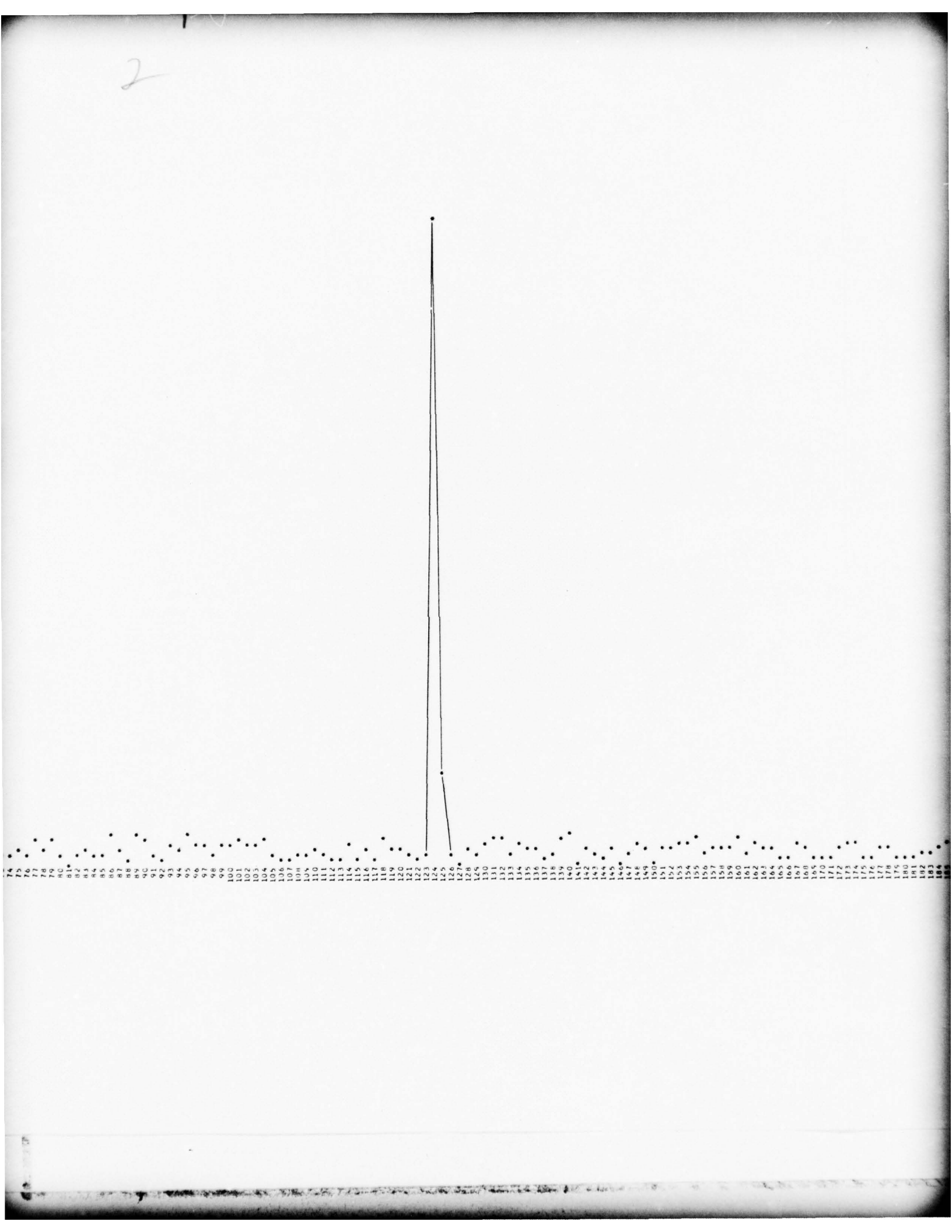


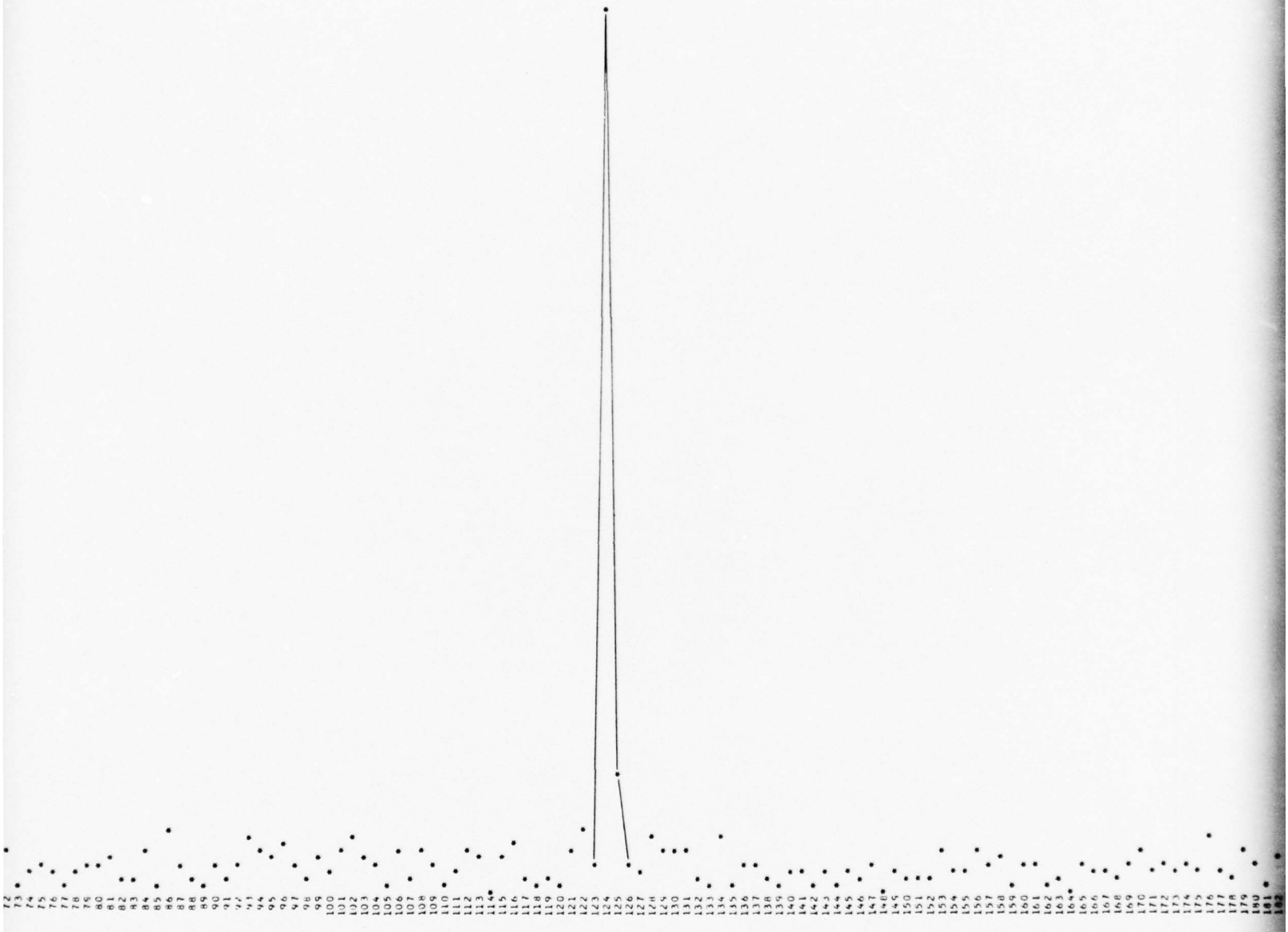


Fig. G-5 Power Spectral Density Showing Interference in Q Data Taken at Danville, IN; Data Segment 1

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TOTAL DC POWER IN I = 8.4512





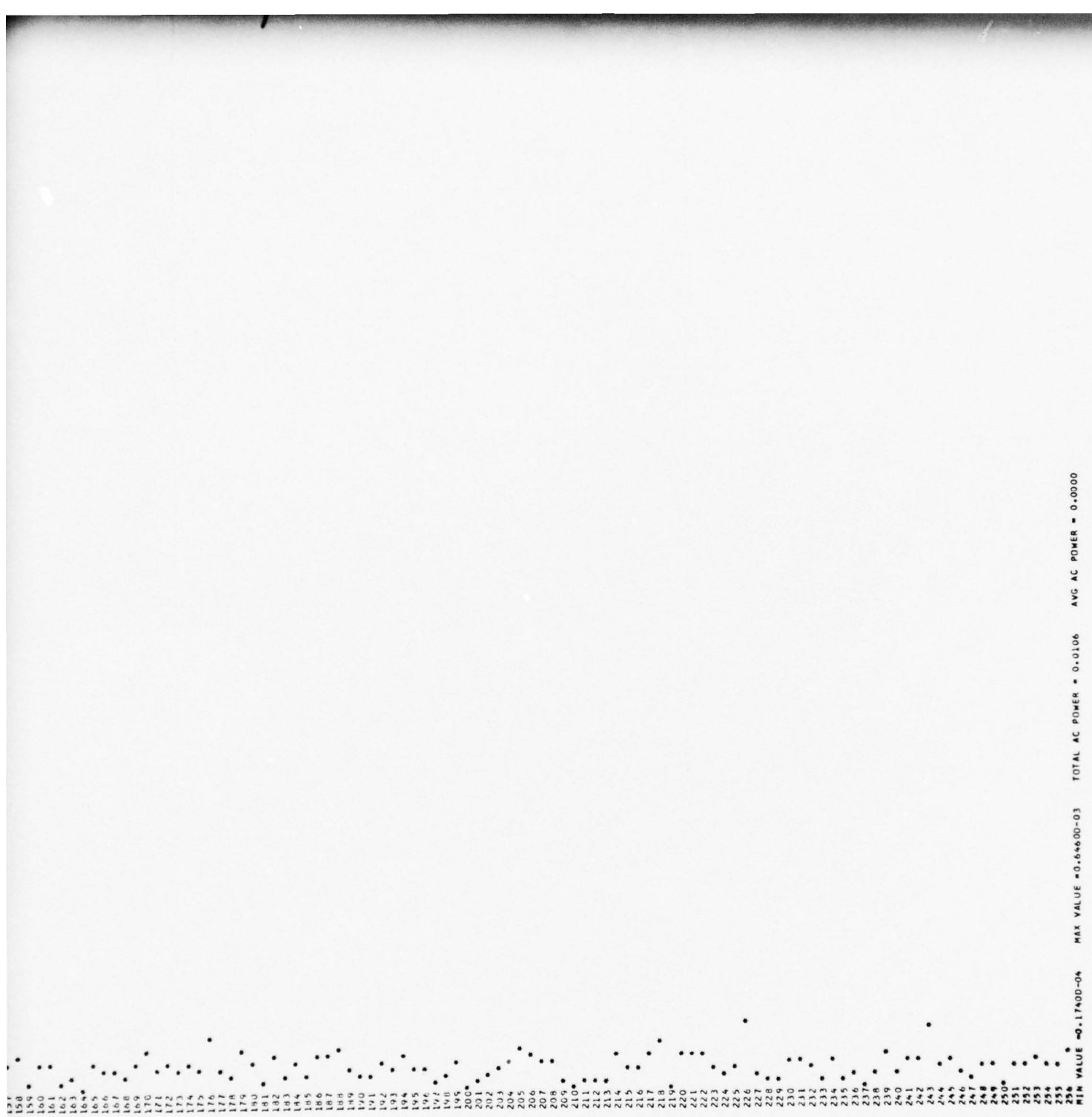


Fig. G-6 Power Spectral Density Showing Interference in I Data Taken at Danville, IN; Data Segment 1

T11-T12 HISTOGRAM T11

0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
0	0	0	0	1	0	0	1	0	3	1	1	1	1	0	0	0	0	0	0	9
0	0	0	0	0	1	1	2	2	0	1	0	1	0	0	0	0	0	0	0	8
0	0	0	0	0	0	1	35	67	8	0	1	0	1	1	0	1	0	0	0	115
0	0	0	0	0	0	0	36	282	256	64	3	2	1	0	0	0	0	0	0	646
0	0	0	0	0	1	0	6	256	1894	1094	46	3	3	0	0	0	0	0	0	3303
0	0	0	0	0	0	0	0	44	1091	1856	255	5	0	0	0	0	0	0	0	3291
0	0	0	0	0	0	0	2	7	44	314	248	54	1	0	1	1	0	0	0	672
0	0	0	0	0	0	0	1	3	3	17	51	33	3	0	0	1	0	0	0	117
0	0	0	0	0	0	0	0	1	3	0	3	6	1	0	0	0	0	0	0	14
0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
0	0	0	0	0	0	0	1	0	1	0	0	0	0	1	0	0	0	0	0	3
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1
0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	2
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

T12 DISTRIBUTION

0	0	0	0	1	2	5	84	663	3306	3349	648	110	11	2	1	3	0	0	0	

TOTAL NO. PAIRS = 8192

T11,12 EDIT SIGMA = 0.5234

EDITING LEVEL = 6 SIGMA

T11 EDIT PAIRS = 3

T12 EDIT PAIRS = 1

T11,12 EDIT PAIRS = 3

T11 AVERAGE =-0.0293

T12 AVERAGE = 1.2225

Fig. G-7 Histogram of First-Stage Edited Data Taken at NAVOBSY During Recording at Danville, IN, After Frequency Filtering; Data Segment 1

T11-T12 HISTOGRAM T11

0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	2
0	0	0	0	0	1	0	0	7	2	6	0	0	2	0	0	0	0	0	0	18
0	0	0	0	0	1	1	3	7	10	10	9	3	4	0	0	0	0	0	0	48
0	0	0	0	0	0	5	26	34	43	48	30	8	3	0	0	0	0	0	0	197
0	0	0	0	2	1	14	44	80	99	126	76	30	13	2	0	0	0	0	0	487
0	0	0	0	2	2	28	97	143	224	264	211	91	38	17	3	0	0	0	0	1120
0	0	0	0	1	8	41	163	306	442	491	421	179	64	16	3	0	0	0	0	2135
0	0	0	0	1	16	45	174	375	487	524	418	189	54	12	1	0	0	0	0	2296
0	0	0	0	3	2	30	125	244	279	323	177	79	25	6	0	1	0	0	0	1294
0	0	0	0	1	3	11	54	91	119	82	59	34	14	1	0	0	0	0	0	449
0	0	0	0	1	2	2	12	19	20	31	19	6	1	0	1	0	0	0	0	114
0	0	0	0	0	0	1	0	1	7	4	3	2	3	0	0	0	0	0	0	21
0	0	0	0	0	0	0	0	2	2	1	2	2	0	0	0	0	0	0	0	9
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

T12 DISTRIBUTION

0	0	0	0	11	36	178	679	1310	1735	1910	1425	623	221	54	8	1	0	0	0	

TOTAL NO. PAIRS = 8192

T11,12 EDIT SIGMA = 0.0705

EDITING LEVEL = 6 SIGMA

T11 EDIT PAIRS = 0

T12 EDIT PAIRS = 1

T11,12 EDIT PAIRS = 0

T11 AVERAGE = 0.0012

T12 AVERAGE = 2.9070

Fig. G-8 Histogram of First-Stage Edited Data Taken at Danville, IN, After Frequency Filtering; Data Segment 1

T11-T12 HISTOGRAM

																				T11
0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	2
0	0	0	0	1	0	0	1	1	1	0	0	1	0	0	0	0	0	0	0	5
0	0	0	0	0	1	0	0	0	1	0	0	0	1	1	1	0	0	0	0	5
0	0	0	0	0	1	1	0	0	0	1	3	0	1	1	0	0	0	0	0	8
0	0	1	1	1	0	2	0	0	0	3	0	1	1	1	0	0	0	0	0	11
0	2	0	1	1	4	1	5	6	4	5	5	2	2	1	0	0	0	0	1	40
0	0	0	0	3	1	4	8	18	17	12	4	6	4	2	0	0	0	2	0	81
0	0	0	3	2	9	3	33	86	62	26	19	6	7	6	0	3	1	0	0	266
0	1	1	0	3	5	18	82	640	489	114	37	13	12	0	0	1	1	1	1	1419
0	0	1	1	5	5	9	66	462	1078	463	98	29	15	5	4	0	3	1	0	2245
0	2	0	1	0	9	13	27	96	503	1076	506	66	11	8	1	2	0	0	1	2322
1	0	1	0	2	2	8	19	27	96	508	574	76	14	5	2	1	0	3	0	1339
0	0	1	0	1	0	4	11	17	24	54	78	32	10	1	4	0	0	0	1	240
0	1	0	1	0	2	2	2	4	9	17	15	10	1	2	4	0	0	0	0	70
0	0	0	0	0	1	2	0	5	7	5	6	4	2	1	2	0	0	0	0	35
0	0	0	1	0	0	1	3	3	3	5	4	0	3	0	2	0	0	0	0	25
0	1	0	0	0	0	0	1	1	1	1	0	2	2	2	0	0	0	0	0	11
0	0	0	0	1	0	1	1	2	0	1	0	0	0	0	0	0	0	0	0	5
0	0	0	0	1	0	1	0	1	0	0	0	0	0	0	0	0	0	1	1	5
0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2

T12 DISTRIBUTION

1	7	6	9	22	40	70	259	1369	2295	2292	1349	248	86	36	22	8	5	8	5

TOTAL NO. PAIRS = 8192

T11,12 EDIT SIGMA = 0.7757

EDITING LEVEL = 6 SIGMA

T11 EDIT PAIRS = 22

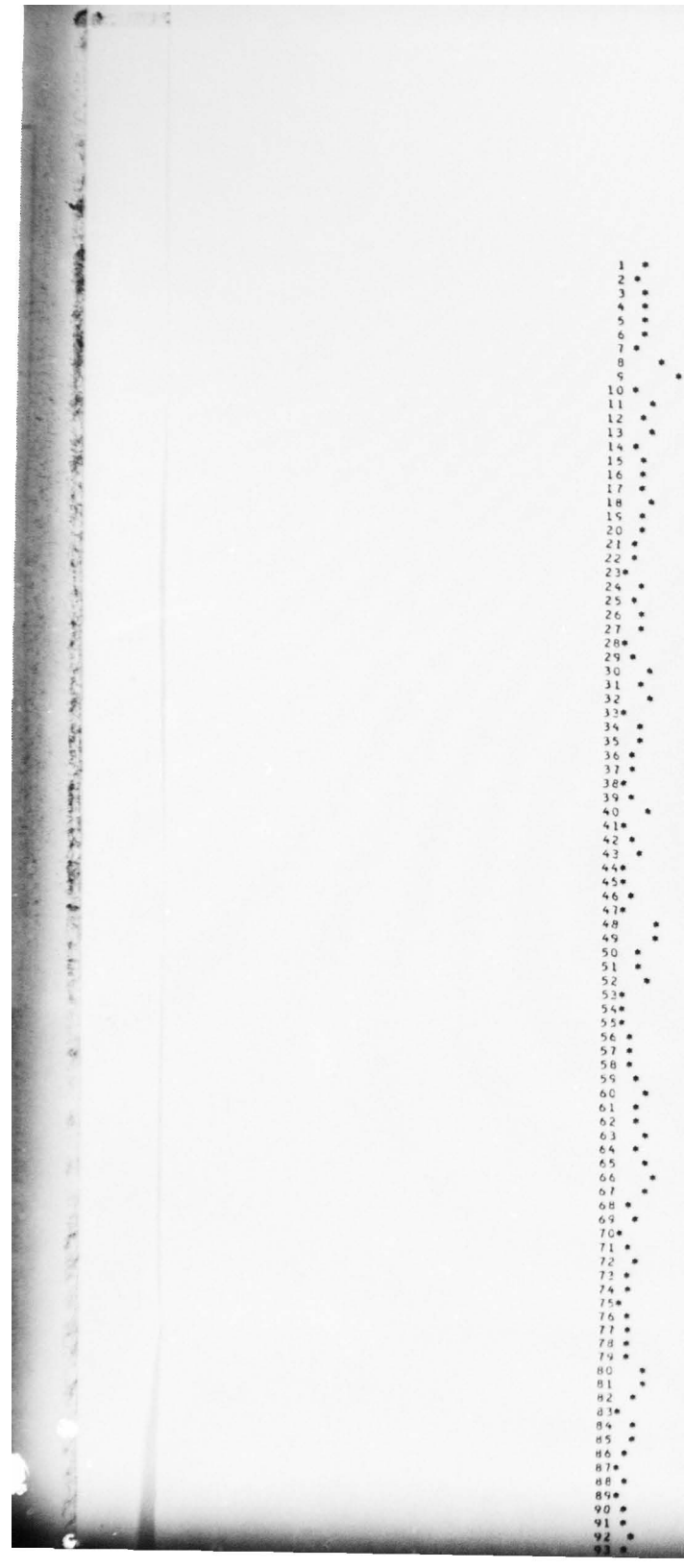
T12 EDIT PAIRS = 24

T11,12 EDIT PAIRS = 9

T11 AVERAGE = 0.0385

T12 AVERAGE = 1.2246

Fig. G-9 Histogram of First-Stage Edited Data Taken at NAVOBSY During Recording at Georgetown, DE; Data Segment 1



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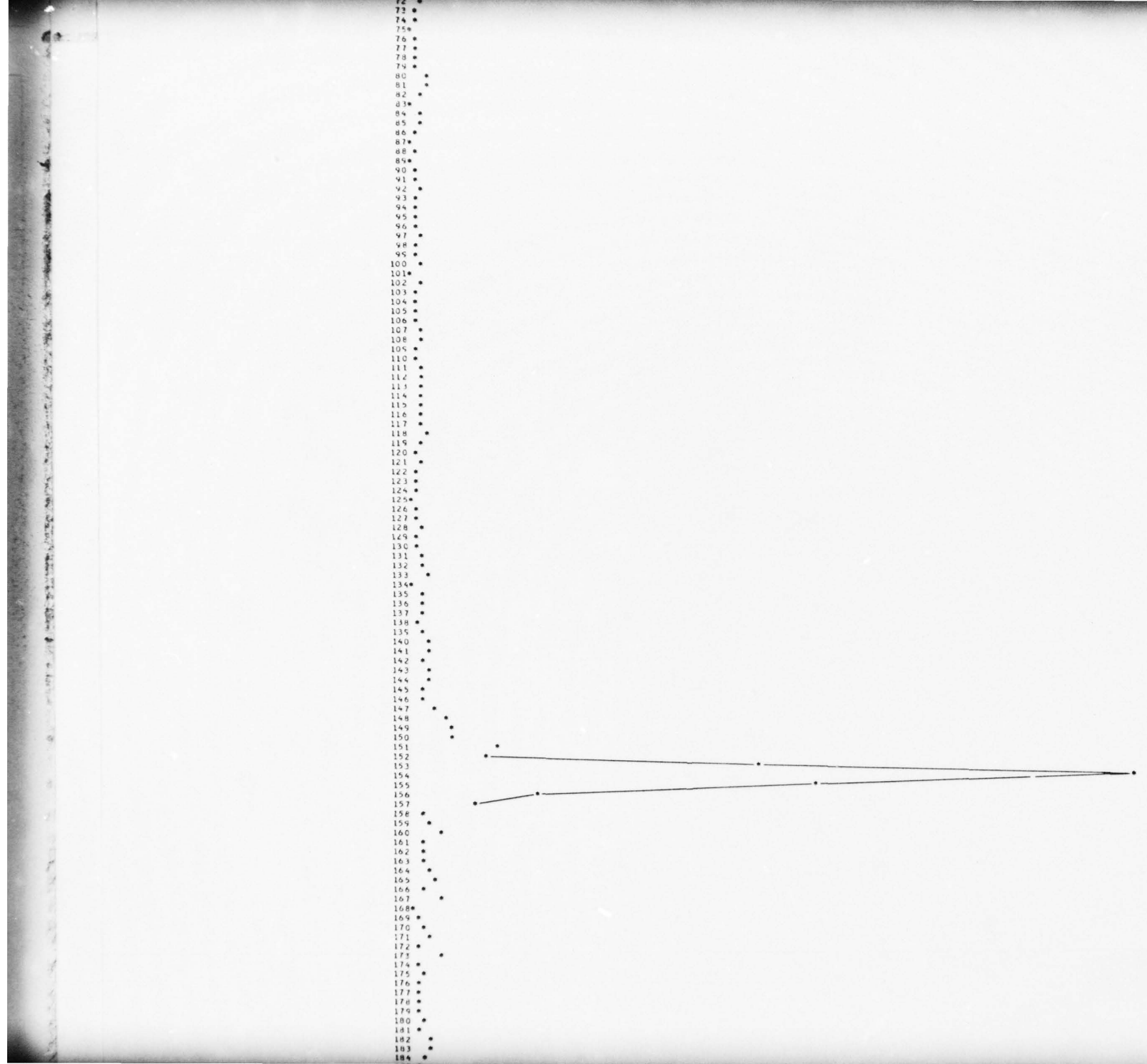
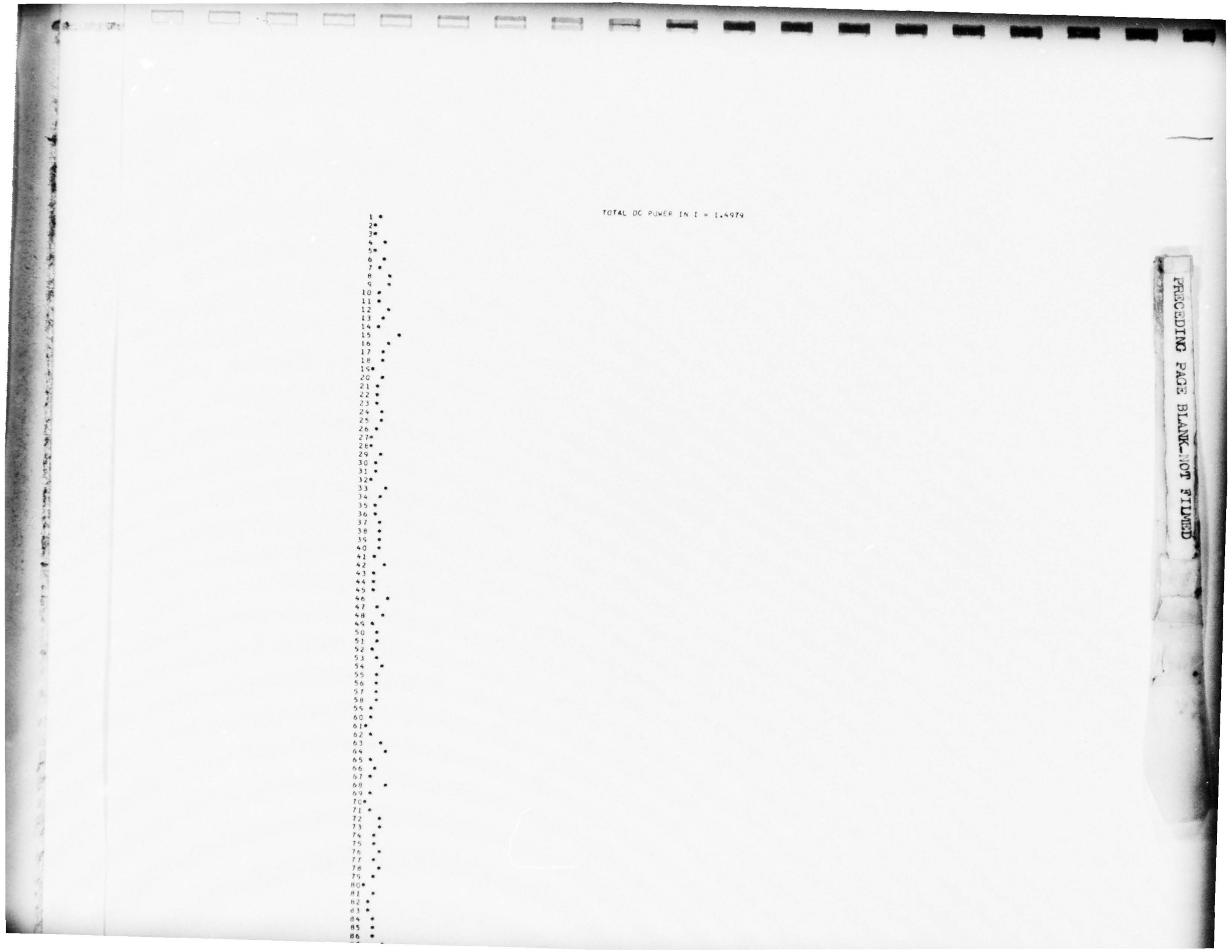


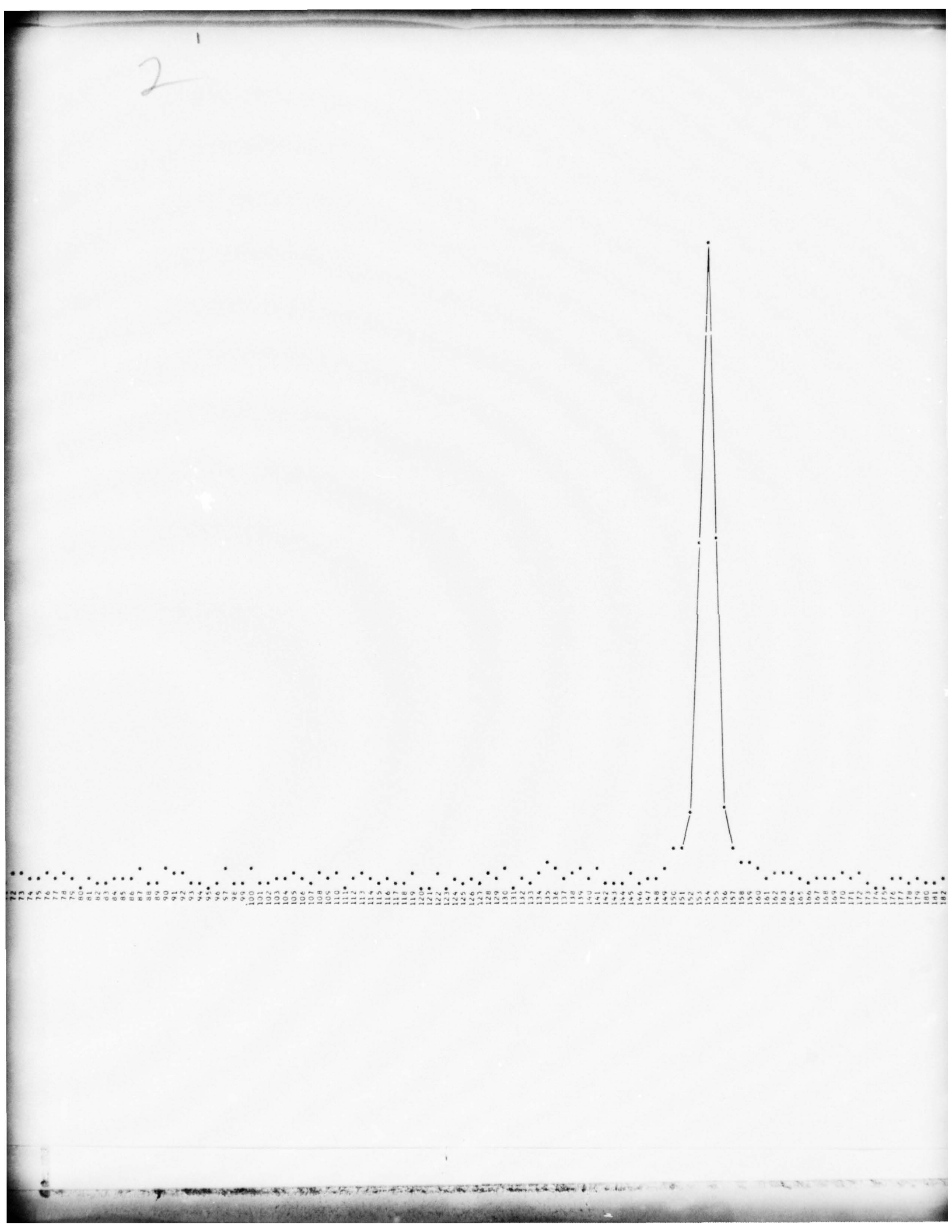


Fig. G-10 Power Spectral Density Showing Interference in Q Data Taken at NAVOBSY During Recording at Georgetown, DE; Data Segment 1

TOTAL DC POWER IN I = 1.4979



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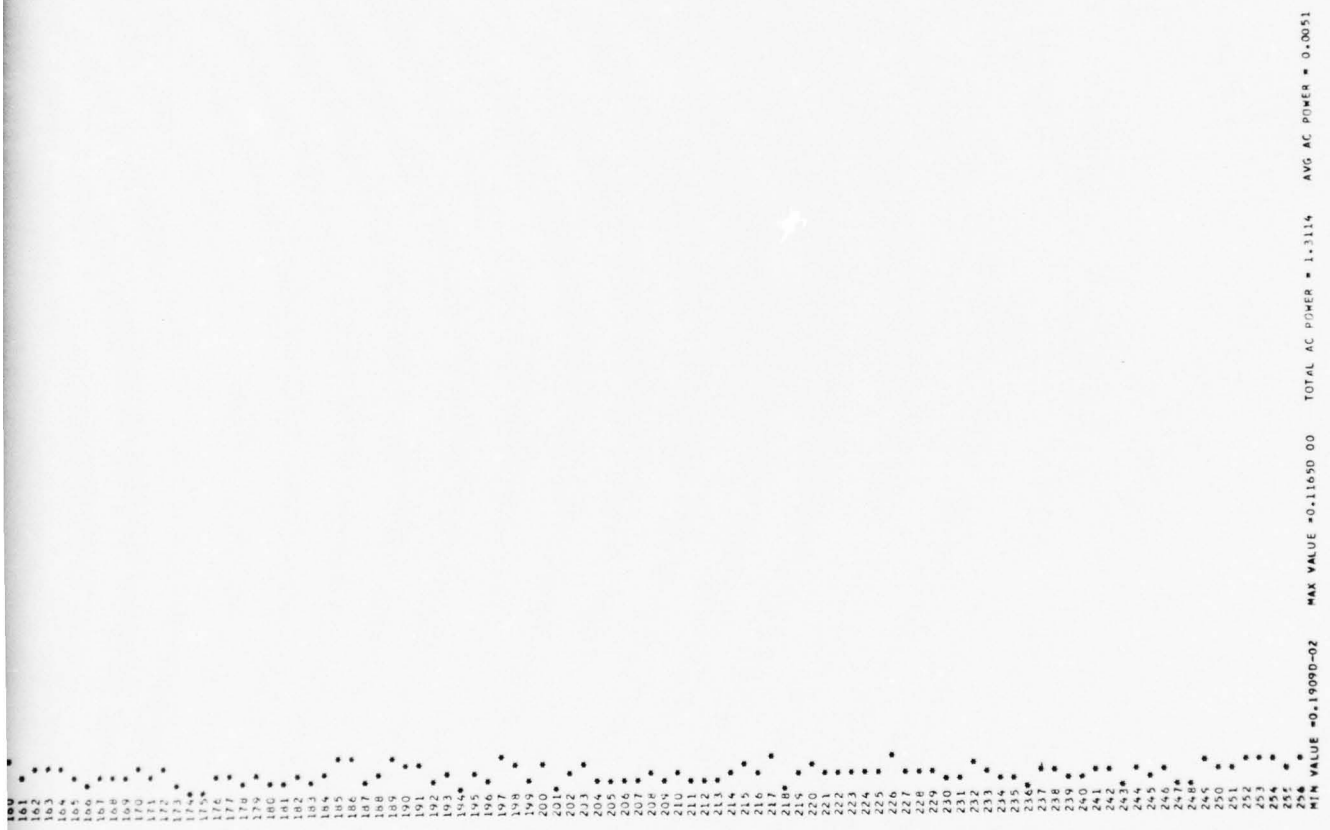


Fig. G-11 Power Spectral Density Showing Interference in I Data Taken at NAVOBSY During Recording at Georgetown, DE; Data Segment 1

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T11-T12 HISTOGRAM

																				T11
0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	2
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	1	0	0	0	0	1	2	0	1	3	0	0	0	0	0	0	8
0	0	0	0	0	0	1	0	0	1	1	1	0	0	1	1	0	0	0	0	6
0	0	1	0	0	1	1	1	2	0	1	3	1	0	0	0	0	0	0	0	11
0	0	1	2	1	2	2	3	1	2	3	0	2	0	1	1	0	1	0	1	23
0	1	1	1	0	1	2	10	11	8	7	9	11	3	0	2	0	1	1	0	69
0	1	1	0	3	4	8	4	29	29	31	20	10	6	2	1	1	1	0	0	151
0	0	1	0	3	6	7	16	127	256	155	39	21	11	6	1	2	2	0	0	653
2	0	0	2	4	4	10	35	258	1579	1097	168	22	10	5	2	1	3	0	0	3202
0	0	0	0	2	5	11	19	140	1082	1582	231	27	12	3	2	0	2	1	0	3119
0	0	0	0	1	2	14	19	39	154	263	104	23	8	3	0	2	1	0	0	633
0	0	2	0	2	1	6	3	20	23	28	22	11	3	2	3	0	0	0	0	126
0	0	0	0	0	1	4	5	12	13	14	10	2	2	4	1	0	0	0	0	68
0	0	2	0	0	0	2	1	2	5	8	3	4	0	2	1	0	0	0	0	30
1	0	0	0	0	0	1	2	5	2	1	1	2	0	3	1	0	0	0	0	19
0	0	1	0	0	1	1	0	1	0	0	0	2	0	1	1	1	0	0	0	9
0	0	0	0	0	1	0	1	0	1	0	0	0	0	0	0	0	0	0	0	3
0	0	1	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	4
0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1

T12 DISTRIBUTION

3	2	11	6	17	30	70	119	648	3156	3194	611	139	58	33	17	7	12	2	2

TOTAL NO. PAIRS = 8192

T11,12 EDIT SIGMA = 0.7757

EDITING LEVEL = 6 SIGMA

T11 EDIT PAIRS = 22

T12 EDIT PAIRS = 25

T11,12 EDIT PAIRS = 8

T11 AVERAGE = 0.0390

T12 AVERAGE = 1.2245

Fig. G-12 Histogram of First-Stage Edited Data Taken at NAVOBSY During Recording at Georgetown, DE, After Frequency Filtering; Data Segment 1

T11-T12 HISTOGRAM

																				T11
0	0	1	0	1	0	0	0	0	1	0	1	1	0	0	0	0	1	0	0	6
0	0	0	1	0	1	1	0	2	1	0	0	2	0	0	0	0	0	0	1	9
0	0	0	1	0	0	1	1	0	2	1	1	0	3	0	0	1	0	0	1	12
0	0	0	1	0	2	1	2	2	4	2	1	1	0	0	0	0	0	0	0	16
0	1	1	0	1	3	0	3	0	1	6	1	2	0	1	0	0	0	0	0	20
0	0	1	0	1	0	3	4	4	3	4	1	2	4	1	2	1	0	0	0	31
2	0	0	0	2	0	2	11	17	11	12	10	2	4	1	2	0	0	0	0	76
0	0	0	3	0	2	6	35	74	61	33	13	6	3	0	5	1	1	0	0	243
1	2	0	2	3	3	11	87	624	473	117	47	25	7	3	0	1	1	1	0	1408
0	0	2	2	1	6	13	64	467	1016	533	102	28	7	4	1	2	0	0	0	2248
0	1	1	2	7	5	8	22	101	502	1015	505	55	18	5	1	1	0	1	0	2250
1	1	1	0	2	3	8	13	40	96	509	627	74	5	2	0	1	0	1	0	1384
1	1	1	0	1	3	1	12	13	30	62	80	24	12	1	0	0	0	1	0	245
0	0	0	0	3	2	2	8	10	9	16	12	10	2	0	4	1	1	0	0	80
0	0	0	2	2	1	3	6	4	6	3	2	4	1	2	3	0	1	0	0	40
0	0	0	0	0	0	0	1	1	4	2	4	3	1	1	3	1	0	0	0	21
0	0	0	0	1	1	1	0	1	1	3	2	2	3	0	0	0	0	1	0	16
0	0	0	0	1	0	0	0	2	1	3	0	2	0	0	0	1	0	1	0	11
0	0	0	0	0	0	1	0	1	0	1	0	0	0	0	0	0	0	0	0	3
0	1	0	0	0	0	0	1	0	0	1	0	0	1	0	0	0	0	0	0	4

T12 DISTRIBUTION

5	7	3	14	26	32	62	270	1363	2222	2324	1409	243	71	21	21	11	5	7	2

TOTAL NO. PAIRS = 8192

T11,12 EDIT SIGMA = 0.7815

EDITING LEVEL = 6 SIGMA

T11 EDIT PAIRS = 22

T12 EDIT PAIRS = 36

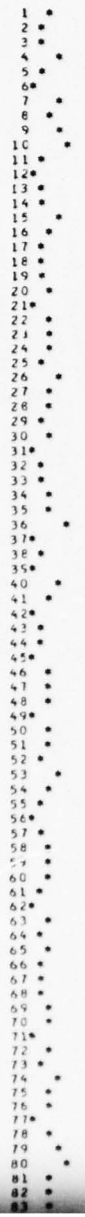
T11,12 EDIT PAIRS = 11

T11 AVERAGE = 0.0352

T12 AVERAGE = 1.2161

Fig. G-13 Histogram of First-Stage Edited Data Taken at NAVOBSY During Recording at Georgetown, DE; Data Segment 2

TOTAL DC POWER IN Q = 0.0008



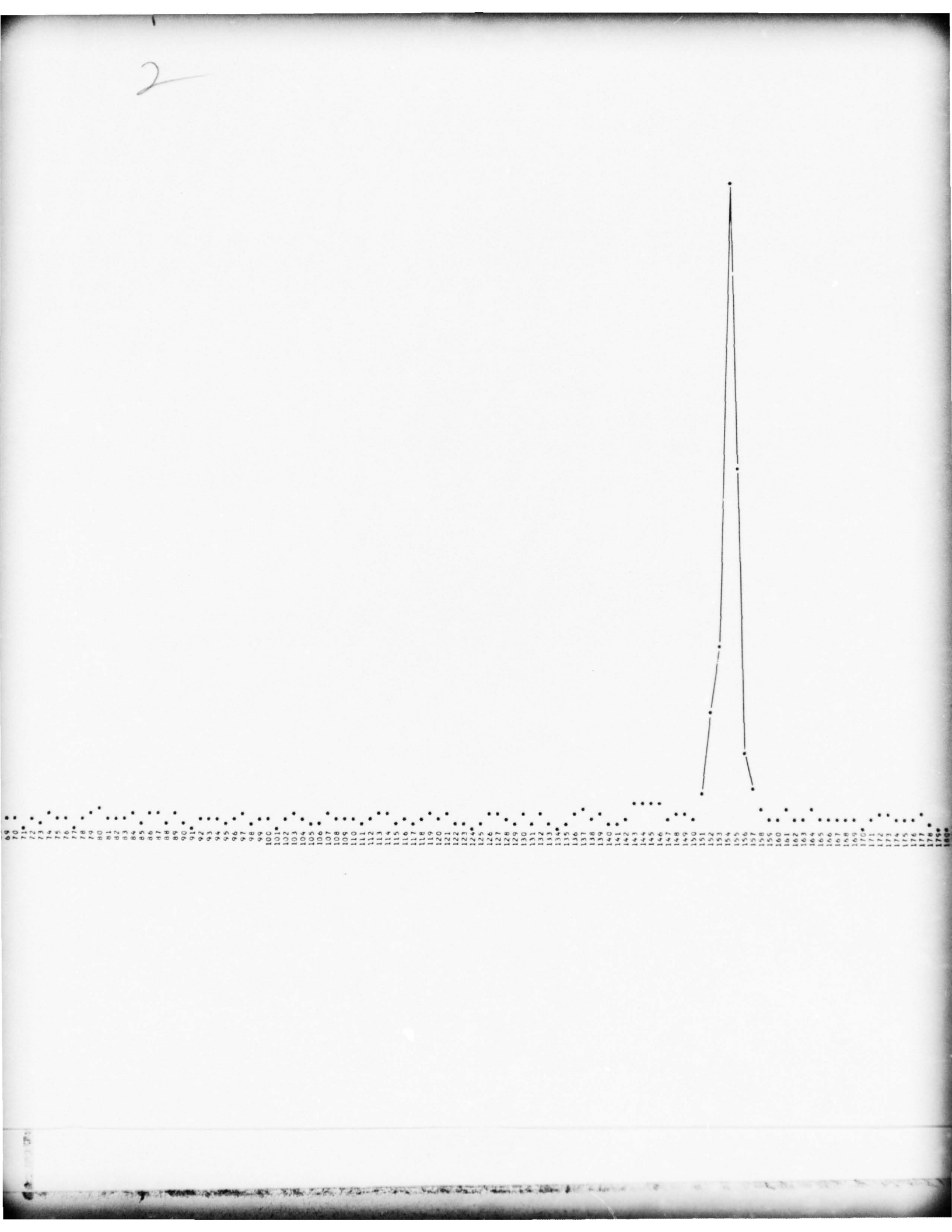
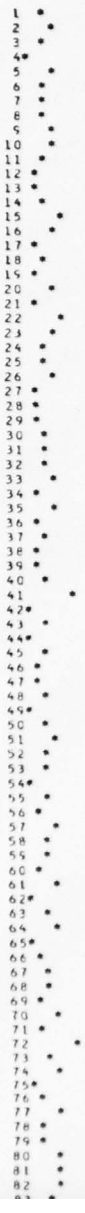




Fig. G-14 Power Spectral Density Showing Interference in Q Data Taken at NAVOBSY During Recording at Georgetown, DE; Data Segment 2

TOTAL DC POWER IN I = 1.4666



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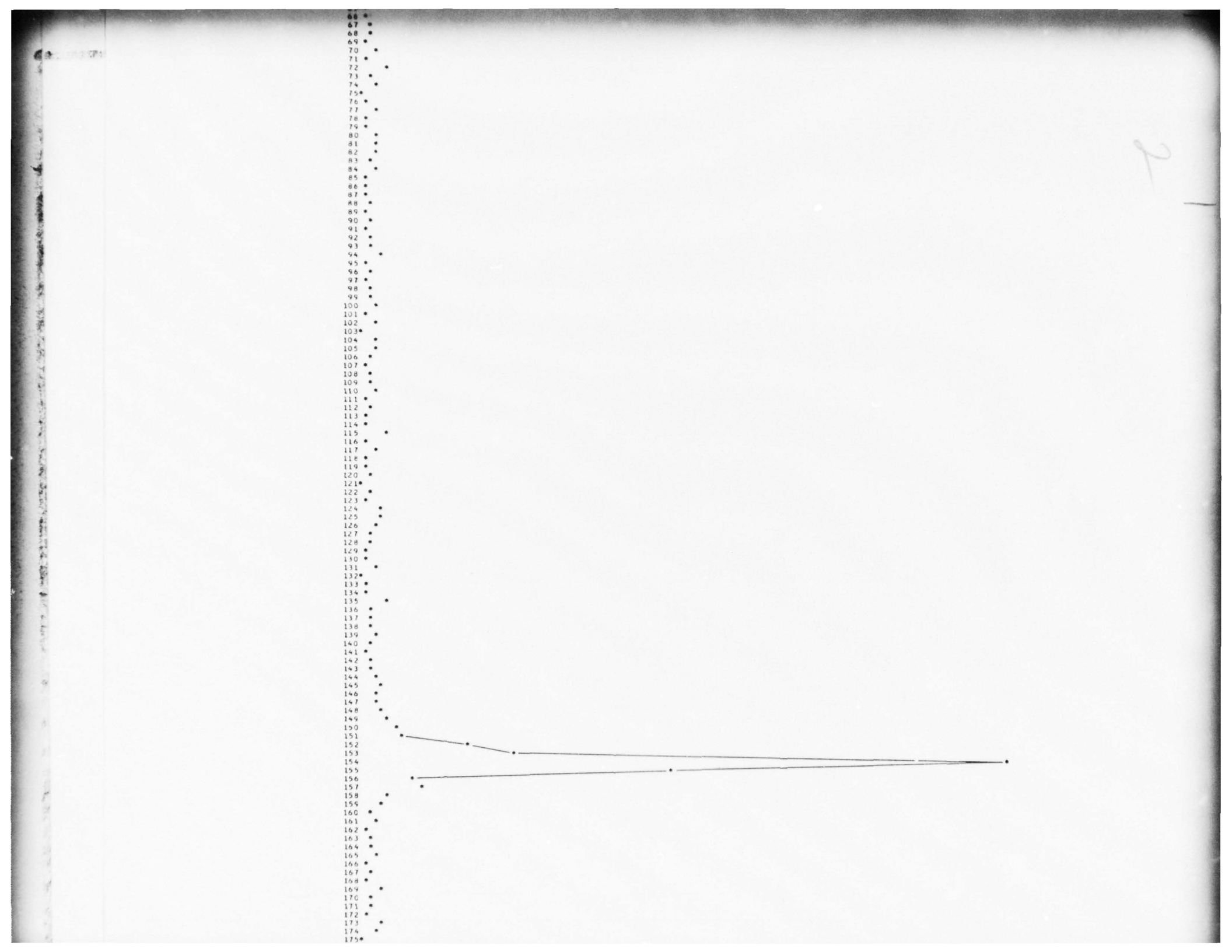


Fig. G-15 Power Spectral Density Showing Interference in I Data Taken at NAVOBSY During Recording at Georgetown, DE; Data Segment 2

T11-T12 HISTOGRAM

																				T11
0	0	0	0	0	0	0	0	0	0	0	2	1	0	0	0	0	0	0	0	3
0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	1	4
0	0	0	1	0	1	3	2	1	3	1	0	0	3	0	0	0	0	0	0	15
0	0	0	1	2	0	1	1	2	2	4	0	0	0	0	1	0	0	0	1	15
0	0	1	0	0	1	2	0	1	0	3	4	0	2	2	0	1	0	0	0	17
0	1	0	0	2	1	4	1	5	2	1	3	3	3	3	0	0	0	0	0	29
0	0	1	1	2	2	5	3	13	12	7	9	3	2	1	3	0	0	0	0	64
0	2	1	0	1	0	5	10	30	27	24	21	12	4	1	4	1	0	0	0	143
1	0	0	2	2	0	6	24	116	274	168	47	27	5	2	0	2	0	0	0	676
1	1	2	1	6	4	8	25	275	1508	1031	162	31	8	5	0	2	0	1	0	3071
1	0	0	0	3	6	17	22	123	1113	1545	265	30	6	1	1	1	1	0	0	3135
2	1	0	0	5	5	6	14	36	146	281	127	25	9	2	0	0	0	0	0	659
1	1	0	1	1	3	2	12	11	34	44	18	9	4	5	0	0	1	1	0	149
0	0	0	1	1	3	2	4	10	7	7	9	3	2	3	3	0	0	0	0	55
0	0	0	1	2	2	3	6	9	7	7	5	2	2	0	1	1	1	0	0	49
0	0	0	0	1	1	0	1	1	1	0	1	0	0	1	0	1	0	1	0	9
0	0	0	1	0	0	0	1	0	2	1	2	3	0	0	1	0	0	1	1	13
0	0	0	0	0	1	1	0	1	1	1	2	1	1	0	1	1	0	0	0	11
0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	2
0	0	1	1	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	4

T12 DISTRIBUTION

6	6	6	12	28	30	66	126	636	3139	3125	677	150	53	27	15	10	4	4	3

TOTAL NO. PAIRS = 8192

T11,12 EDIT SIGMA = 0.7815

EDITING LEVEL = 6 SIGMA

T11 EDIT PAIRS = 22

T12 EDIT PAIRS = 36

T11,12 EDIT PAIRS = 11

T11 AVERAGE = 0.0331

T12 AVERAGE = 1.2156

Fig. G-16 Histogram of First-Stage Edited Data Taken at NAVOBSY During Recording at Georgetown, DE, After Frequency Filtering; Data Segment 2

T11-T12 HISTOGRAM T11

0	0	0	0	0	0	0	1	2	0	0	0	0	0	0	0	0	0	0	0	3
0	0	0	1	0	0	0	2	3	1	0	0	0	0	1	0	0	0	0	0	8
0	0	0	0	1	1	0	1	0	2	0	0	1	0	0	0	0	0	0	0	6
0	0	0	0	2	1	3	0	1	1	2	0	0	0	1	1	0	0	0	0	12
0	0	1	1	2	1	2	2	0	4	1	2	6	2	0	1	1	0	0	1	27
0	1	1	2	1	0	2	4	5	7	8	3	2	3	1	0	1	0	1	1	43
1	0	0	0	3	4	3	9	18	13	10	4	7	0	1	1	0	1	0	0	75
1	0	1	0	0	2	8	40	104	63	29	12	7	9	2	0	0	0	0	0	278
1	1	0	1	5	6	13	113	599	501	108	30	18	9	2	3	1	1	0	1	1413
1	1	2	2	1	1	16	56	486	951	500	104	25	13	2	1	3	0	0	0	2165
1	1	2	2	1	9	8	28	117	488	937	524	62	16	5	4	0	0	2	0	2207
1	1	1	2	3	1	4	14	23	110	517	618	98	16	3	1	1	1	0	0	1415
0	0	1	1	3	1	3	8	14	33	81	126	41	7	3	1	1	0	0	0	328
0	0	0	0	3	2	3	3	10	10	12	13	7	6	3	1	0	0	1	0	74
2	0	0	1	0	0	2	4	4	1	7	6	7	3	3	0	1	0	0	1	42
0	0	0	2	0	1	0	0	3	1	0	1	0	0	2	0	1	0	0	0	11
0	0	0	0	1	0	3	1	0	0	0	0	2	2	1	0	1	1	1	0	13
0	0	1	0	0	0	0	1	0	1	1	1	0	0	0	0	1	0	0	0	6
0	0	0	1	0	0	0	1	3	0	0	0	1	0	0	0	0	0	1	0	7
0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1

T12 DISTRIBUTION

8	5	10	17	26	30	70	288	1392	2187	2213	1444	284	88	32	14	12	4	6	4

TOTAL NO. PAIRS = 8192

T11,12 EDIT SIGMA = 0.7445

EDITING LEVEL = 6 SIGMA

T11 EDIT PAIRS = 26

T12 EDIT PAIRS = 25

T11,12 EDIT PAIRS = 7

T11 AVERAGE = 0.0430

T12 AVERAGE = 1.2269

Fig. G-17 Histogram of First-Stage Edited Data Taken at NAVOBSY During Recording at Georgetown, DE; Data Segment 3

TOTAL DC POWER IN Q = 0.0023

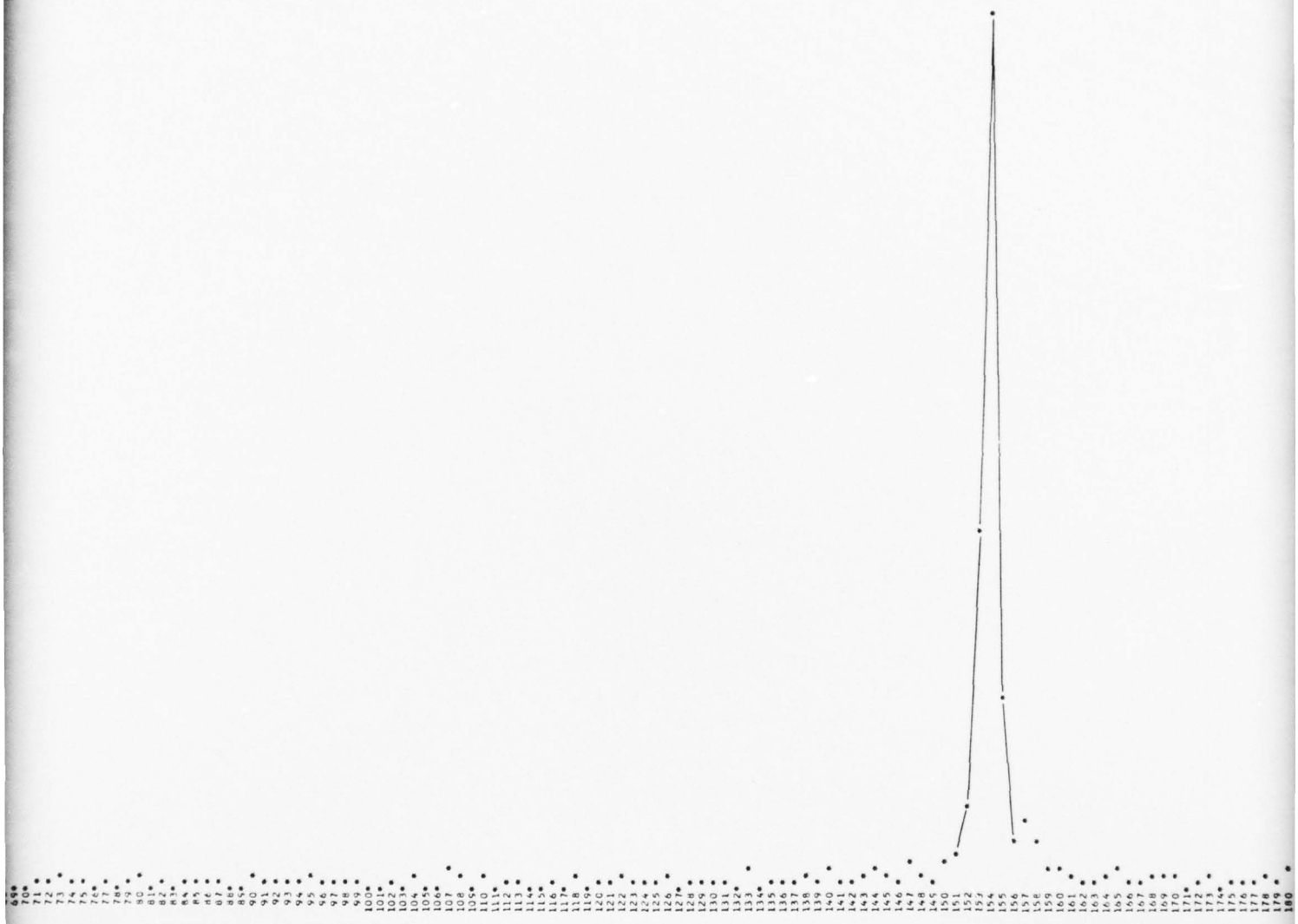


Fig. G-18 Power Spectral Density Showing Interference in Q Data Taken at NAVOBSY During Recording at Georgetown, DE; Data Segment 3

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TOTAL DC POWER IN I = 1.5171

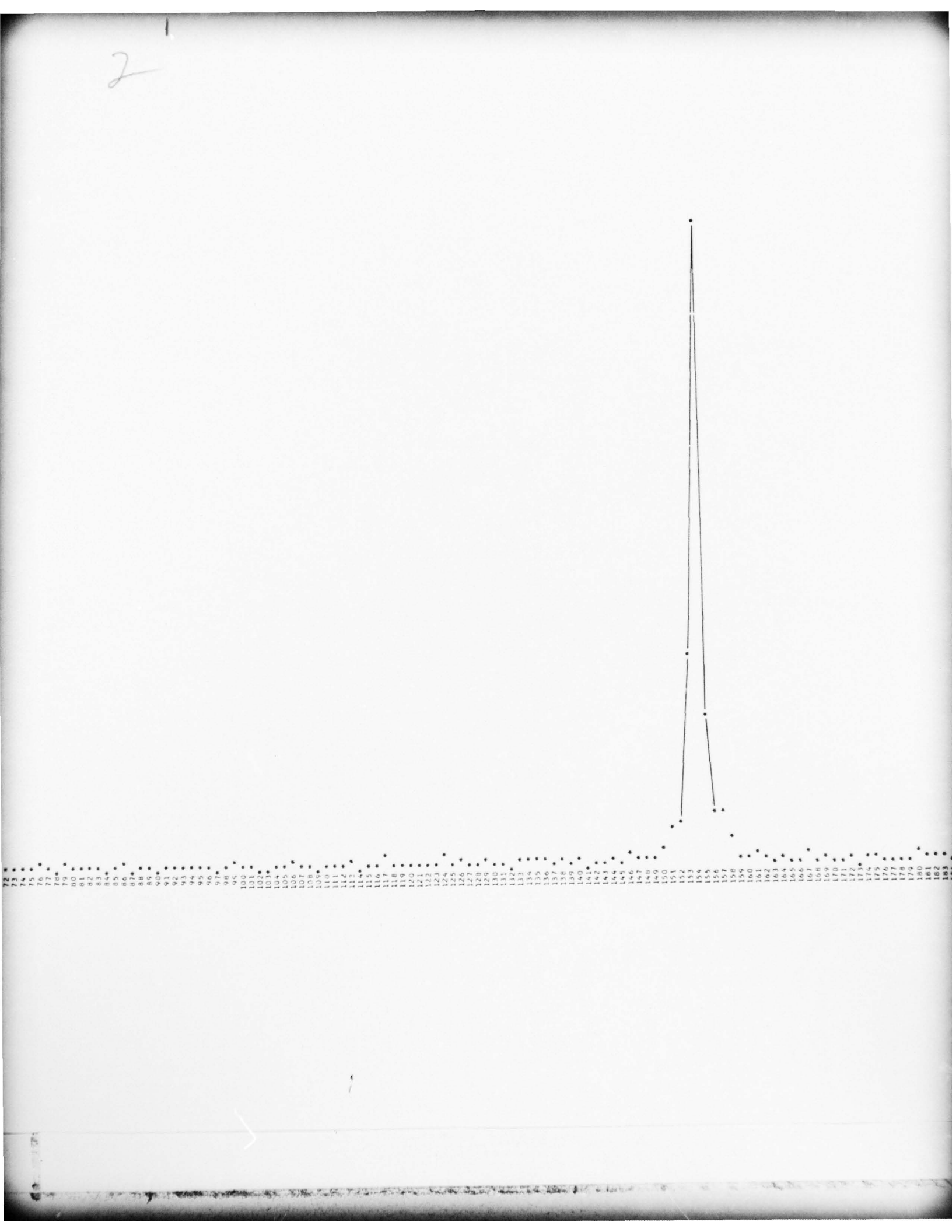




Fig. G-19 Power Spectral Density Showing Interference in I Data Taken at NAVOBSY During Recording at Georgetown, DE; Data Segment 3

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T11-T12 HISTOGRAM

																				T11
0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	1	3
0	0	0	0	1	0	0	0	3	1	0	0	0	0	0	0	0	0	0	0	5
0	0	0	0	1	1	0	0	1	3	0	0	0	0	1	1	0	0	0	0	8
0	0	0	1	1	0	0	1	2	1	2	2	0	2	0	0	0	0	0	0	12
0	0	0	0	0	0	3	1	1	1	2	3	0	1	1	0	0	1	0	0	14
0	1	0	3	0	0	2	1	4	4	5	4	2	6	2	1	0	3	0	0	38
1	1	0	1	3	2	5	6	8	11	9	9	7	4	0	0	0	0	0	0	67
0	0	0	1	0	6	2	5	30	38	31	17	10	5	3	2	1	0	1	0	152
2	1	0	0	4	3	8	21	134	288	171	35	24	7	2	3	0	1	0	0	704
1	1	0	1	1	4	8	46	270	1359	1051	164	24	6	5	1	0	1	0	0	2943
0	2	1	3	1	5	6	27	147	1141	1527	258	29	10	1	1	0	1	0	1	3201
0	0	1	3	1	3	2	18	43	163	297	134	21	6	2	2	1	0	0	0	697
0	1	1	2	1	3	3	8	21	33	45	28	14	6	2	0	0	2	0	0	172
1	0	0	0	2	4	4	7	3	10	13	3	6	4	1	0	1	0	0	0	59
0	0	0	1	2	0	2	4	1	1	1	8	1	1	0	1	0	0	0	0	23
1	0	0	0	0	0	3	0	2	0	2	1	2	1	3	1	1	1	0	0	18
0	1	0	1	1	1	0	1	1	0	0	0	1	0	2	0	0	0	1	0	10
0	0	0	0	0	0	0	1	2	1	0	2	0	0	0	0	0	0	0	0	6
0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	3
0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	2

T12 DISTRIBUTION

6	9	3	18	19	32	50	148	673	3055	3157	708	141	60	26	13	4	10	3	2

TOTAL NO. PAIRS = 8192

T11,12 EDIT SIGMA = 0.7445

EDITING LEVEL = 6 SIGMA

T11 EDIT PAIRS = 25

T12 EDIT PAIRS = 23

T11,12 EDIT PAIRS = 7

T11 AVERAGE = 0.0435

T12 AVERAGE = 1.2272

Fig. G-20 **Histogram of First-Stage Edited Data Taken at NAVOBSY During Recording at Georgetown, DE, After Frequency Filtering; Data Segment 3**

T11-T12 HISTOGRAM

																				T11
0	0	0	0	0	0	1	0	0	3	0	1	0	0	0	0	0	1	0	0	6
0	0	0	0	0	1	1	0	0	1	2	0	0	1	0	0	0	0	0	0	6
1	0	0	0	0	2	1	0	0	1	2	0	0	1	0	0	0	0	0	1	9
0	1	0	0	0	0	0	1	1	0	1	2	1	0	0	2	0	0	0	0	9
0	0	0	1	2	1	2	3	2	0	0	0	1	2	2	0	0	0	0	0	16
0	0	0	1	1	1	2	3	6	4	1	5	2	1	0	1	0	1	0	0	29
0	0	0	0	2	0	6	11	12	12	7	4	3	3	1	2	0	1	0	1	65
0	0	1	2	4	6	6	13	46	55	35	15	10	2	2	0	0	2	0	0	199
0	0	2	1	1	4	15	41	330	417	141	34	26	3	3	2	0	3	1	0	1024
0	0	1	3	4	6	12	58	433	1263	644	130	33	11	5	3	5	0	0	1	2612
0	1	1	1	2	1	11	27	152	764	1310	425	51	11	6	4	1	2	0	0	2770
0	0	1	1	1	7	4	17	47	110	463	304	43	9	6	5	1	1	0	0	1025
0	1	0	0	1	1	3	10	11	42	52	41	17	8	3	2	2	0	0	0	194
0	0	0	1	0	2	2	1	9	9	12	15	8	3	3	1	1	1	0	0	68
0	0	0	2	0	0	1	4	4	4	5	5	7	4	1	2	0	1	1	0	41
0	0	0	0	0	1	0	0	0	3	0	0	2	1	3	0	0	0	0	0	10
0	0	0	0	1	0	1	0	1	1	0	2	0	1	1	1	0	0	0	0	9
0	0	0	0	0	0	1	1	2	0	0	0	0	0	1	0	0	0	0	1	6
0	0	0	0	0	0	0	0	1	1	0	0	0	0	1	0	0	1	0	0	4
0	0	0	0	0	0	1	0	0	1	1	0	1	0	0	0	1	1	0	0	6

T12 DISTRIBUTION

1	3	6	13	19	33	70	190	1057	2691	2676	983	210	61	38	25	11	15	2	4

TOTAL NO. PAIRS = 8192

T11,12 EDIT SIGMA = 0.6249

EDITING LEVEL = 6 SIGMA

T11 EDIT PAIRS = 35

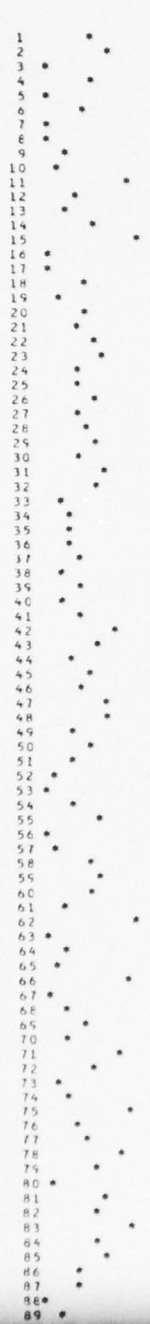
T12 EDIT PAIRS = 37

T11,12 EDIT PAIRS = 12

T11 AVERAGE = 0.1042

T12 AVERAGE = 0.9175

Fig. G-21 Histogram of First-Stage Edited Data Taken at Georgetown, DE; Data Segment 1


TOTAL DC POWER IN Q = 0.0133

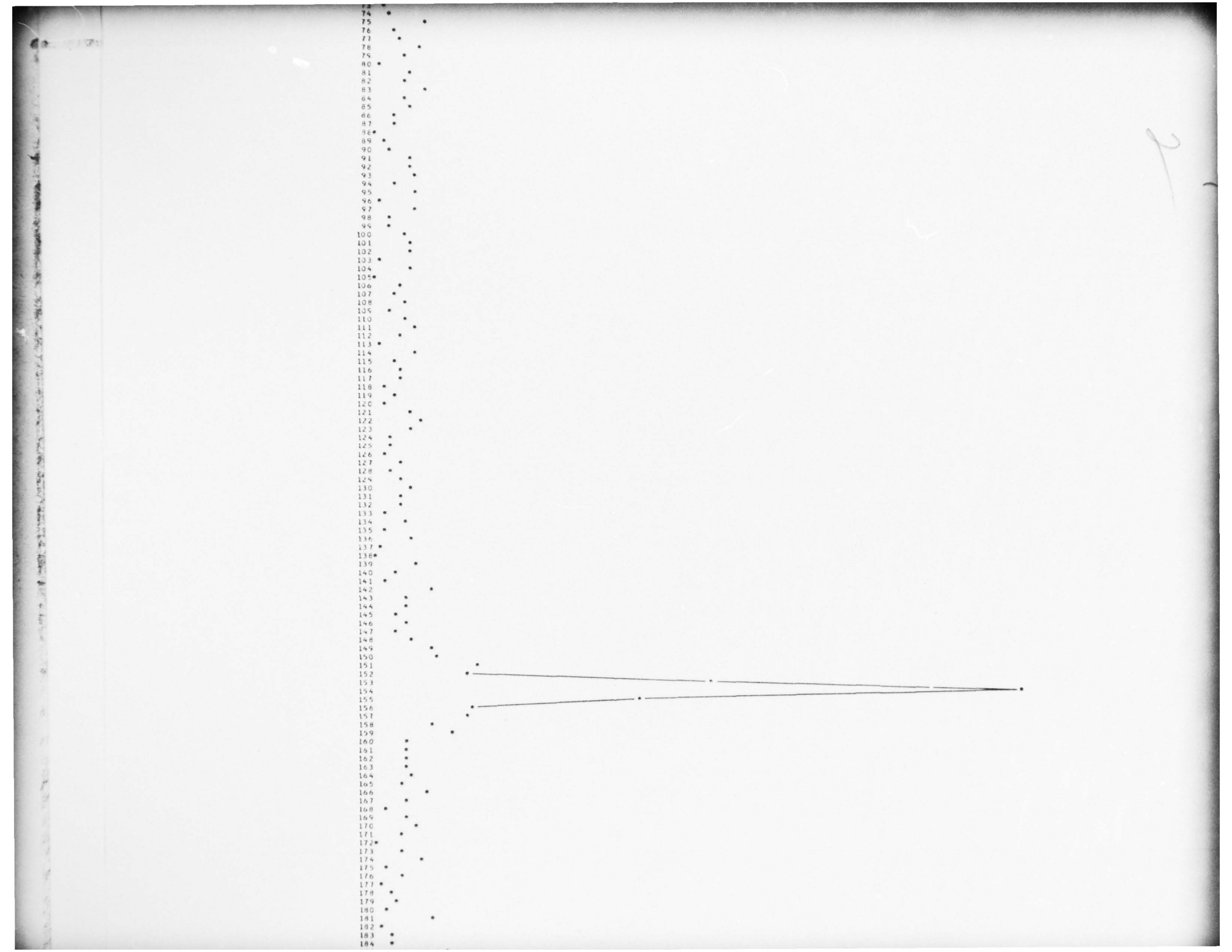
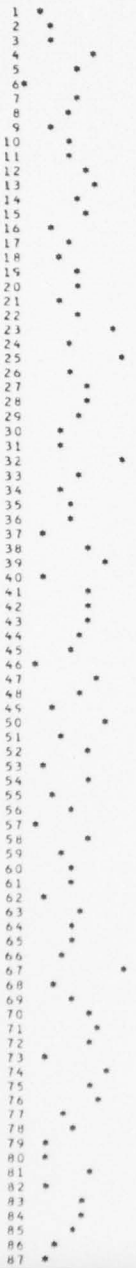




Fig. G-22 Power Spectral Density Showing Interference in Q Data Taken at Georgetown, DE; Data Segment 1

TOTAL DC POWER IN 1 = 0.8424

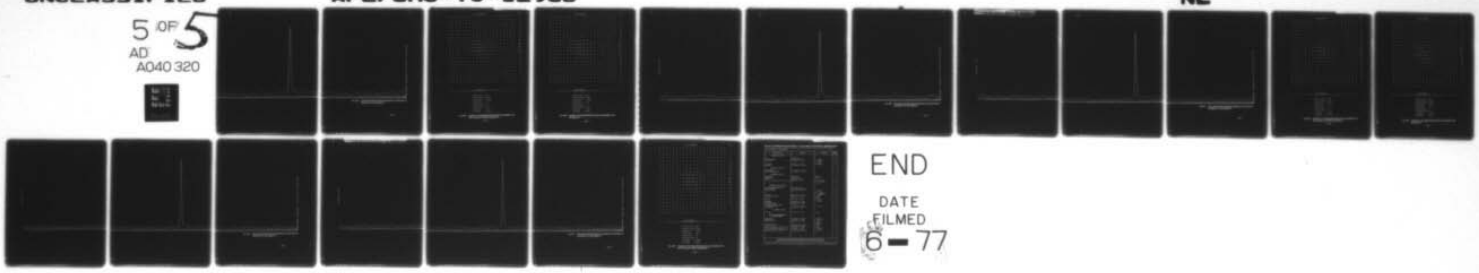


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EXPERIMENTAL RESEARCH ON THE PROPAGATION OF LORAN-C SIGNALS. VO--ETC(U)
JAN 77 L F FEHLNER, T W JERARDI, T A MCCARTY N00017-72-C-4401

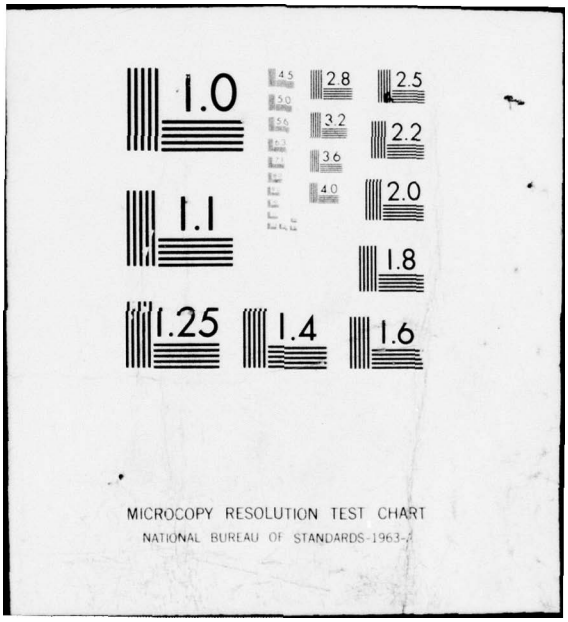
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2.8
3.2
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4.0
4.5
5.0
5.6
MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-

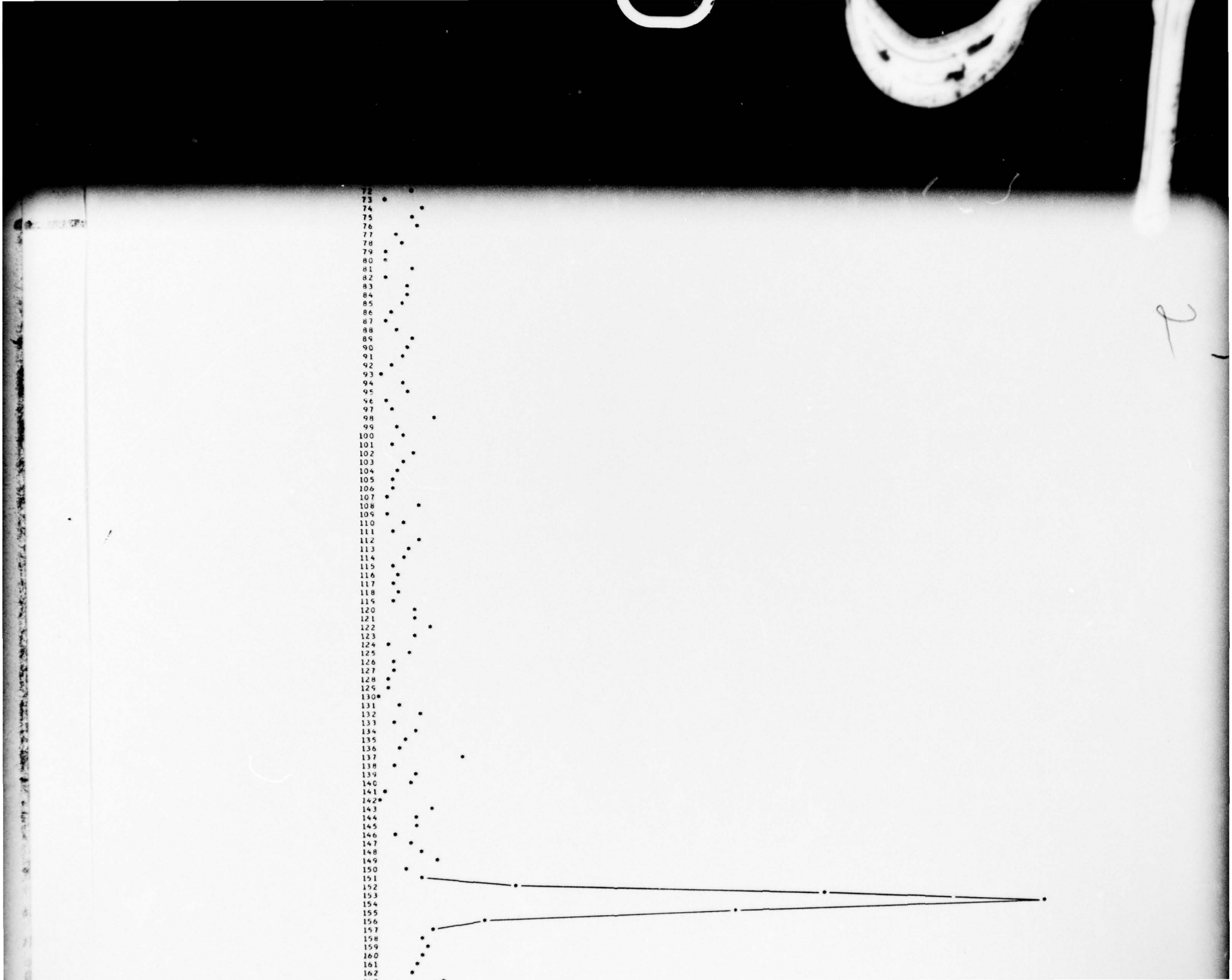




Fig. G-23 Power Spectral Density Showing Interference in I Data Taken at Georgetown, DE; Data Segment 1

T11-T12 HISTOGRAM

																				T11
0	0	0	0	1	0	1	0	1	0	3	0	0	1	0	0	0	0	0	0	7
0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	1	0	0	4
1	0	0	0	0	0	2	0	0	1	0	1	1	1	0	0	0	0	0	1	8
0	0	0	0	1	1	0	0	0	1	2	1	1	0	0	1	0	0	0	0	8
0	0	1	0	3	1	0	3	4	0	0	0	3	0	2	0	1	0	0	0	18
0	0	0	1	0	1	3	2	5	5	3	3	2	2	1	0	0	0	0	1	29
0	0	0	0	2	3	4	5	10	9	2	3	4	2	1	2	2	1	0	1	51
0	0	1	1	5	4	5	12	29	29	42	20	10	4	1	0	2	1	0	1	167
0	0	0	4	1	5	7	26	114	262	164	51	23	6	4	0	0	1	2	0	670
0	1	0	1	2	5	13	44	334	1389	1035	164	34	10	3	5	3	1	0	1	3045
0	0	3	1	3	4	12	29	159	1105	1435	274	34	10	8	2	0	2	0	0	3081
0	1	0	0	1	4	9	17	47	182	311	133	24	11	4	4	1	1	0	0	750
0	0	1	0	0	3	4	7	20	27	32	26	11	4	3	1	2	0	0	0	141
0	0	0	0	1	1	1	5	6	12	12	18	3	4	1	0	1	1	1	0	67
0	0	0	1	1	0	1	0	4	6	1	4	7	1	1	0	1	0	1	0	29
0	0	0	1	0	1	0	0	1	1	1	3	1	1	1	1	0	0	0	0	12
1	0	0	0	0	0	1	1	1	1	0	0	0	1	1	1	0	0	1	0	9
0	0	0	0	0	0	1	0	3	0	0	0	1	0	1	0	0	0	0	0	6
0	0	0	0	0	0	0	0	1	2	0	0	0	0	0	0	0	0	1	0	4
0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	1	1	0	4

T12 DISTRIBUTION

2	2	6	10	21	33	64	151	739	3033	3044	702	159	59	32	18	13	10	7	5

TOTAL NO. PAIRS = 8192

T11,12 EDIT SIGMA = 0.6249

EDITING LEVEL = 6 SIGMA

T11 EDIT PAIRS = 37

T12 EDIT PAIRS = 35

T11,12 EDIT PAIRS = 10

T11 AVERAGE = 0.1046

T12 AVERAGE = 0.9185

Fig. G-24 Histogram of First-Stage Edited Data Taken at Georgetown, DE, After Frequency Filtering; Data Segment 1

T11-T12 HISTOGRAM

																				T11
0	0	0	1	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	3
0	0	0	0	0	0	0	1	1	1	0	1	0	0	1	0	0	0	0	0	5
0	0	0	0	0	1	1	1	1	0	1	0	1	0	0	0	0	0	0	0	6
0	1	1	1	1	1	0	1	3	1	2	0	0	1	0	0	0	0	0	0	13
0	0	0	2	1	0	3	0	4	2	1	1	2	1	0	2	2	1	0	0	22
0	0	1	0	2	1	2	3	1	4	4	5	1	0	0	1	0	0	1	0	26
1	0	1	0	0	3	5	9	9	11	14	7	2	3	3	0	0	0	0	1	69
0	1	1	0	2	1	8	25	42	55	33	15	9	4	2	1	1	0	0	1	201
1	0	0	6	4	2	11	33	295	446	129	42	16	11	2	4	0	0	2	2	1006
1	1	0	1	1	4	16	48	439	1355	768	145	29	13	4	4	0	0	0	2	2831
0	0	0	1	1	6	12	26	134	662	1268	411	58	7	3	2	2	1	0	0	2594
0	1	0	3	1	0	3	15	38	162	401	307	48	14	4	5	0	1	0	0	1003
0	0	0	0	2	4	5	9	15	21	52	44	13	5	2	2	2	0	0	0	175
0	0	0	1	1	2	4	4	10	7	6	8	9	4	3	1	0	0	1	0	61
0	0	0	0	1	1	1	2	6	8	5	4	2	5	4	0	1	0	0	0	40
0	1	0	1	2	1	1	0	0	1	4	5	1	1	0	0	0	0	1	0	19
0	0	1	0	1	0	1	1	2	4	2	1	0	0	1	0	0	2	0	0	16
0	0	1	0	0	1	1	1	1	1	0	0	0	3	1	0	1	0	0	0	11
0	0	0	0	1	0	1	0	2	1	0	0	1	0	0	0	0	0	0	0	6
0	0	1	0	0	0	1	0	0	0	2	0	0	0	1	0	0	0	0	0	5

T12 DISTRIBUTION

3	5	7	17	21	28	76	180	1003	2743	2692	996	192	72	31	22	9	5	5	6

TOTAL NO. PAIRS = 8192

T11,12 EDIT SIGMA = 0.6575

EDITING LEVEL = 6 SIGMA

T11 EDIT PAIRS = 29

T12 EDIT PAIRS = 39

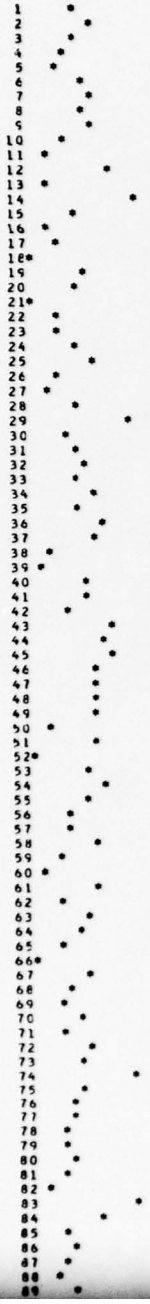
T11,12 EDIT PAIRS = 11

T11 AVERAGE = 0.0942

T12 AVERAGE = 0.9173

Fig. G-25 Histogram of First-Stage Edited Data Taken at Georgetown, DE; Data Segment 2

TOTAL DC POWER IN Q = 0.0079



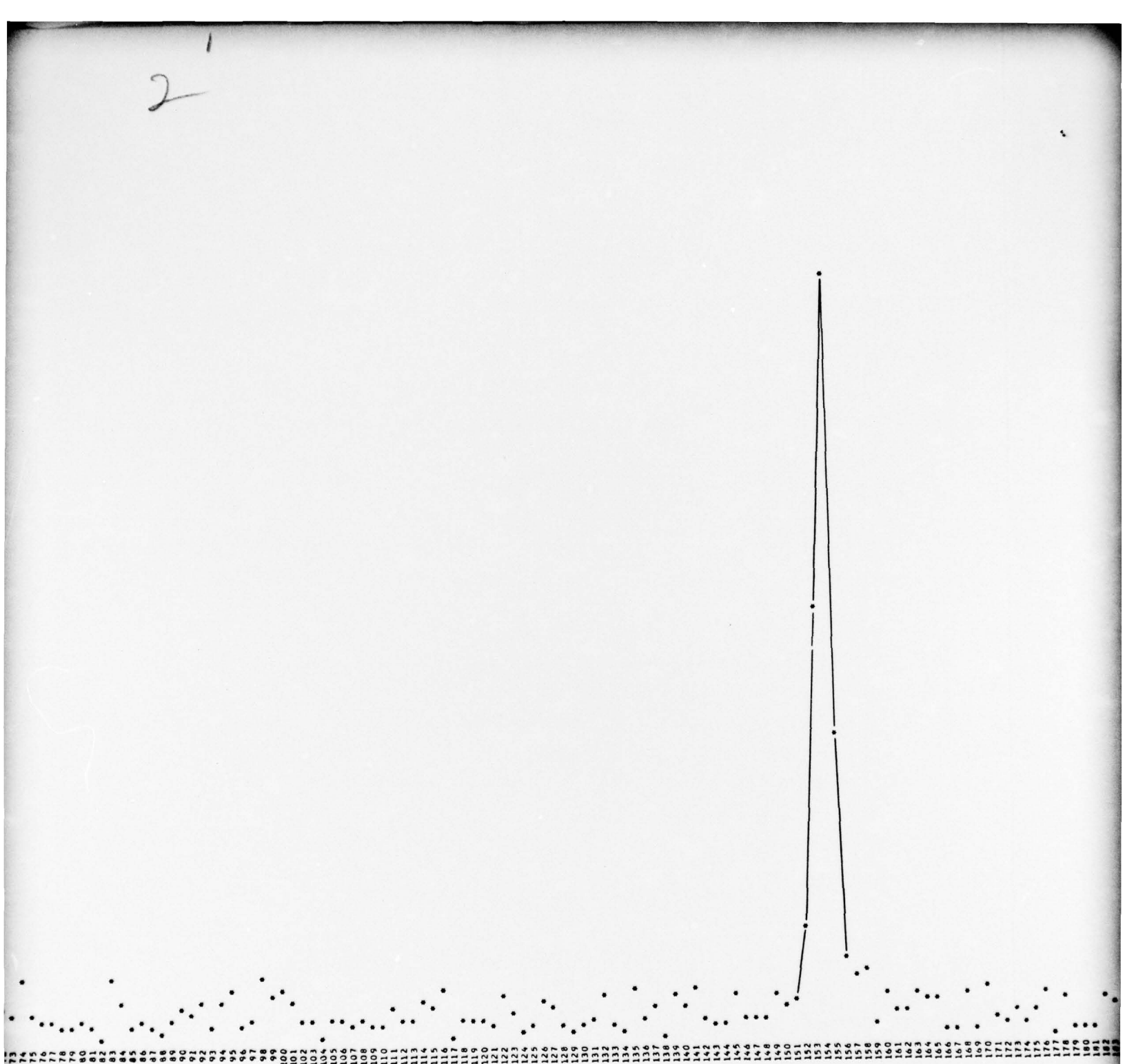
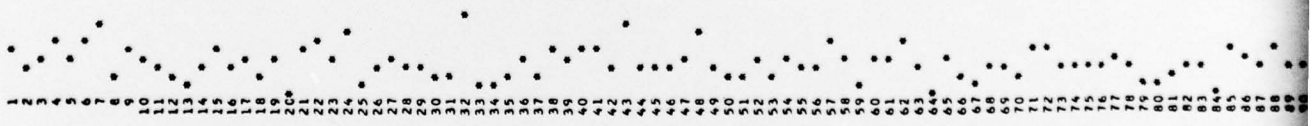




Fig. G-26 Power Spectral Density Showing Interference in Q Data Taken at Georgetown, DE; Data Segment 2

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TOTAL DC POWER IN I = 0.8373



2

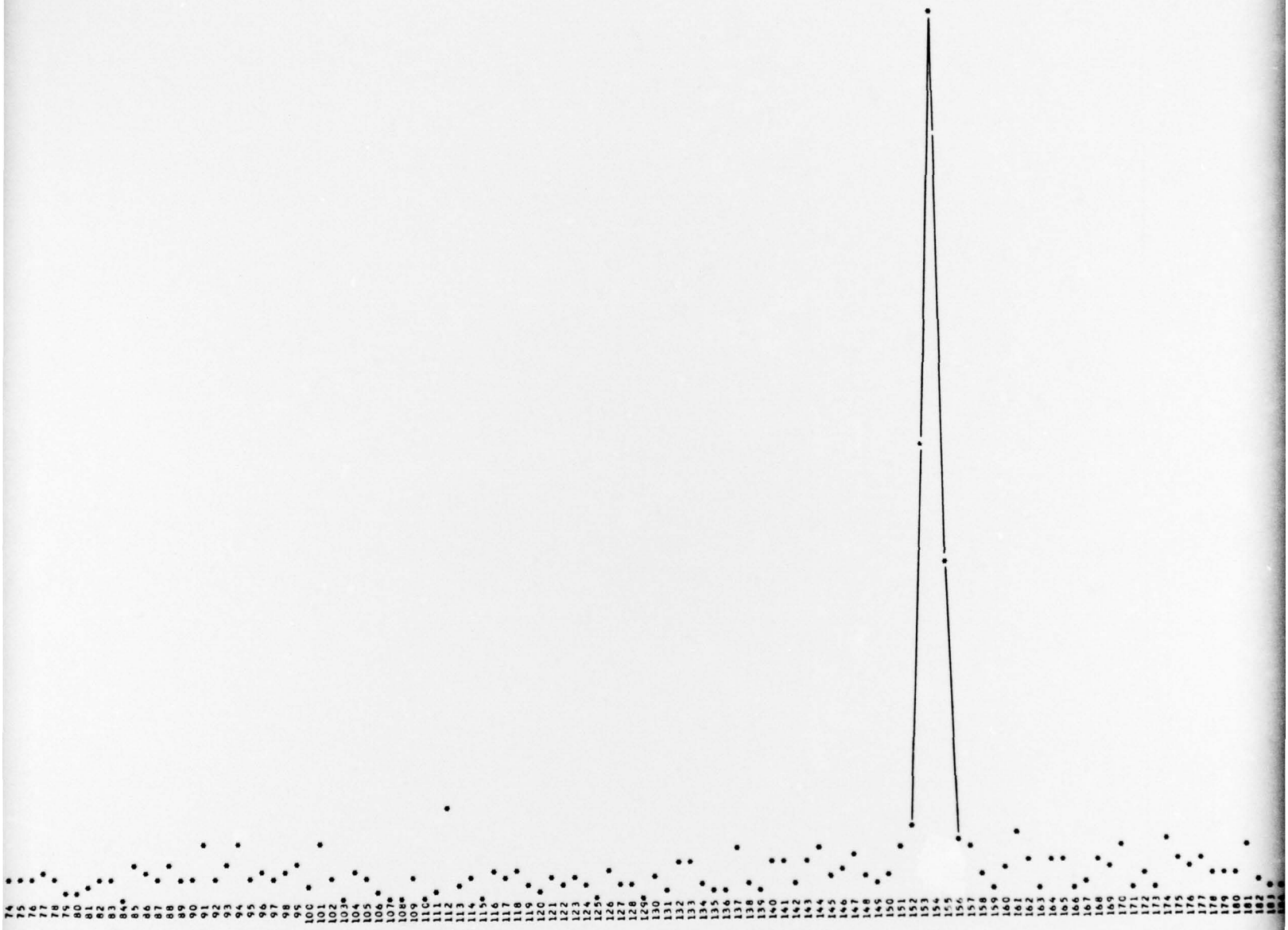

74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130 131 132 133 134 135 136 137 138 139 140 141 142 143 144 145 146 147 148 149 150 151 152 153 154 155 156 157 158 159 160 161 162 163 164 165 166 167 168 169 170 171 172 173 174 175 176 177 178 179 180 181 182



Fig. G-27 Power Spectral Density Showing Interference in I Data Taken at Georgetown, DE; Data Segment 2

T11-T12 HISTOGRAM

																				T11
0	0	0	1	0	0	0	0	0	0	2	1	0	0	0	0	0	0	0	0	4
0	0	0	0	0	0	0	1	1	1	0	0	0	0	1	0	0	0	0	0	4
0	1	0	0	0	1	0	3	0	1	0	0	0	0	0	0	0	0	0	1	7
1	0	1	1	1	1	0	1	0	3	1	1	1	0	1	0	1	0	0	0	14
0	0	0	1	2	0	1	1	7	4	1	1	1	1	0	1	0	0	1	0	22
0	0	0	1	1	1	1	5	1	3	3	0	3	2	0	0	2	1	0	0	24
0	1	0	1	0	1	2	8	7	11	8	6	6	3	1	1	0	0	1	0	57
1	1	0	2	1	1	8	13	23	34	33	23	6	2	5	2	0	0	1	1	157
1	0	0	1	0	2	8	28	117	304	167	46	22	8	7	1	1	0	1	2	716
0	1	2	1	10	2	15	36	285	1485	1107	157	30	6	5	1	2	0	2	0	3147
0	1	0	0	2	3	9	30	162	1025	1428	278	34	13	6	3	1	0	0	0	2995
0	0	1	1	1	2	2	13	51	167	297	105	30	11	3	2	0	0	1	0	687
0	0	0	1	0	4	3	16	15	25	27	25	10	4	3	2	0	1	0	0	136
0	0	0	2	0	2	3	7	11	8	8	11	4	9	1	1	0	0	0	0	67
1	0	0	0	2	0	1	3	3	1	8	4	0	4	0	0	1	0	0	0	28
0	0	0	1	1	2	1	2	2	2	5	2	0	0	0	0	0	0	0	0	18
0	0	1	0	1	0	2	0	3	1	0	0	2	1	1	1	1	1	1	0	16
0	1	0	0	0	0	1	1	0	2	1	1	0	0	2	0	0	0	0	0	9
0	0	0	0	1	0	1	0	2	0	1	0	0	0	0	0	0	0	0	1	6
0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1

T12 DISTRIBUTION

4	6	5	14	23	22	58	168	690	3077	3097	661	149	65	36	15	9	3	8	5

TOTAL NO. PAIRS = 8192

T11,12 EDIT SIGMA = 0.6575

EDITING LEVEL = 6 SIGMA

T11 EDIT PAIRS = 33

T12 EDIT PAIRS = 35

T11,12 EDIT PAIRS = 9

T11 AVERAGE = 0.0966

T12 AVERAGE = 0.9170

Fig. G-28 Histogram of First-Stage Edited Data Taken at Georgetown, DE, After Frequency Filtering; Data Segment 2

T11-T12 HISTOGRAM

																				T11
0	1	0	0	0	0	0	0	0	0	2	0	0	0	0	1	0	0	0	0	4
0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	2
0	0	0	0	1	0	0	1	3	0	0	0	1	1	0	1	0	0	0	0	8
0	0	0	0	0	0	0	0	2	2	0	1	1	0	0	0	0	0	0	0	6
0	1	0	1	0	0	1	0	2	2	2	1	1	0	0	0	1	0	0	1	13
1	0	0	1	1	2	1	4	4	5	3	5	2	2	1	1	0	0	0	0	33
0	0	0	2	2	1	5	10	9	8	8	11	5	4	0	1	0	1	0	0	67
0	0	0	0	4	3	5	19	59	64	36	13	6	3	2	0	2	0	1	0	217
0	0	0	2	1	8	9	53	330	481	137	48	15	9	3	0	1	1	0	0	1098
0	1	3	1	3	1	7	41	416	1189	817	176	24	11	5	3	2	1	0	0	2701
2	1	0	4	2	1	10	32	151	750	1158	437	52	11	4	0	0	0	0	1	2616
0	1	0	0	1	5	7	17	41	152	430	287	51	13	5	1	1	2	0	0	1014
0	0	0	4	4	1	3	7	16	40	43	56	22	3	2	3	0	1	0	0	205
1	0	0	0	3	0	4	2	3	12	11	9	10	3	1	0	3	0	0	0	62
0	0	1	0	1	0	0	2	2	7	8	5	3	5	3	2	0	0	0	0	39
0	0	1	0	1	1	2	1	0	1	4	4	2	2	2	1	0	0	0	0	22
0	0	0	0	0	0	1	1	1	0	1	1	1	1	1	0	0	0	0	0	8
0	0	0	0	0	0	1	0	2	1	1	2	0	1	2	0	0	0	1	0	11
0	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	1	1	0	0	5
1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	3

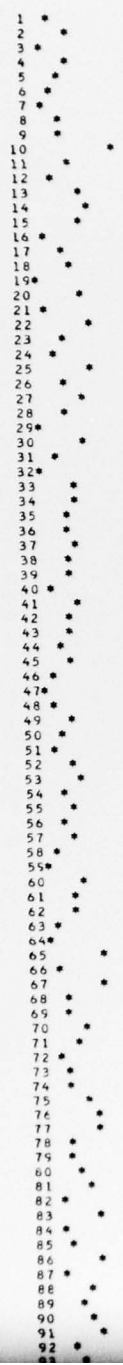
T12 DISTRIBUTION

5	5	6	16	24	24	56	150	1041	2715	2661	1057	196	69	32	14	11	8	2	2

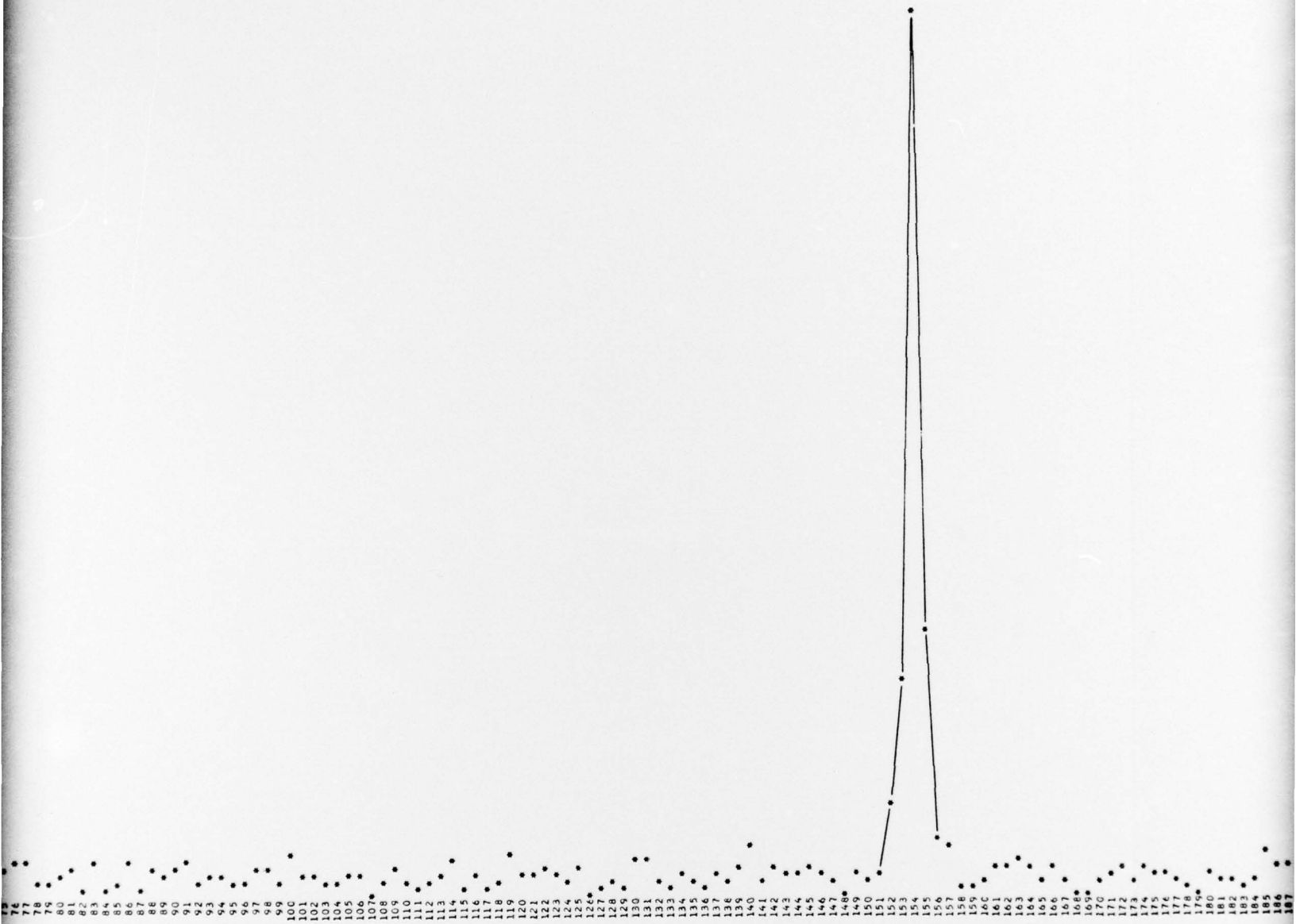
TOTAL NO. PAIRS = 8192
T11,12 EDIT SIGMA = 0.6278
EDITING LEVEL = 6 SIGMA
T11 EDIT PAIRS = 25
T12 EDIT PAIRS = 19
T11,12 EDIT PAIRS = 14
T11 AVERAGE = 0.0976
T12 AVERAGE = 0.9247

Fig. G-29 Histogram of First-Stage Edited Data Taken at Georgetown, DE; Data Segment 3

TOTAL DC POWER IN Q = 0.0085



2



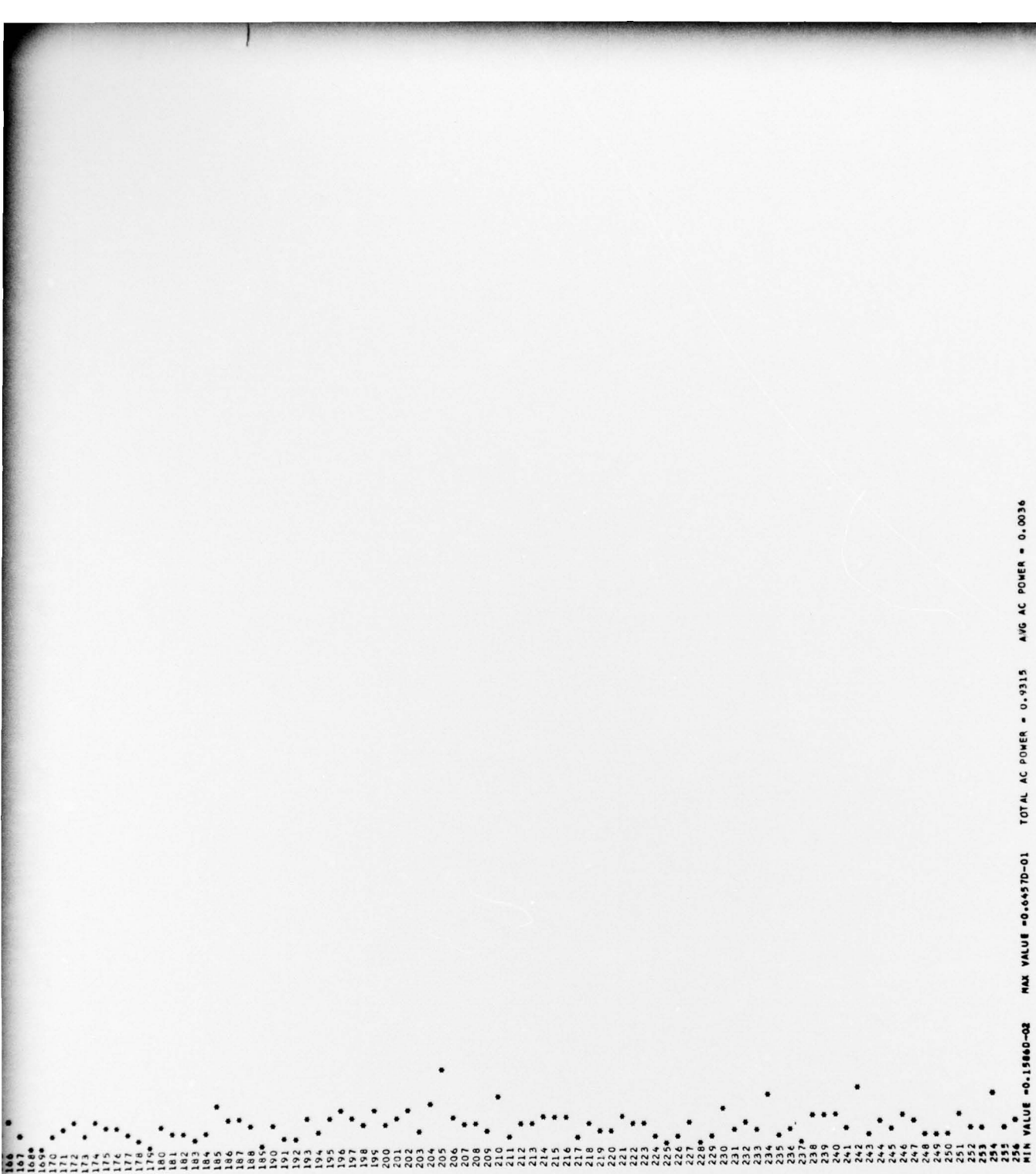
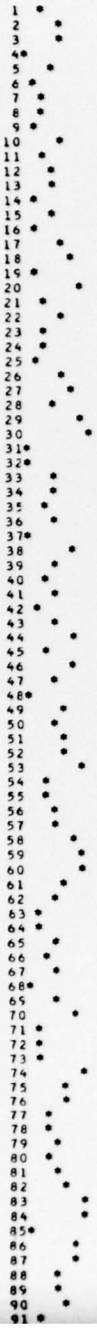
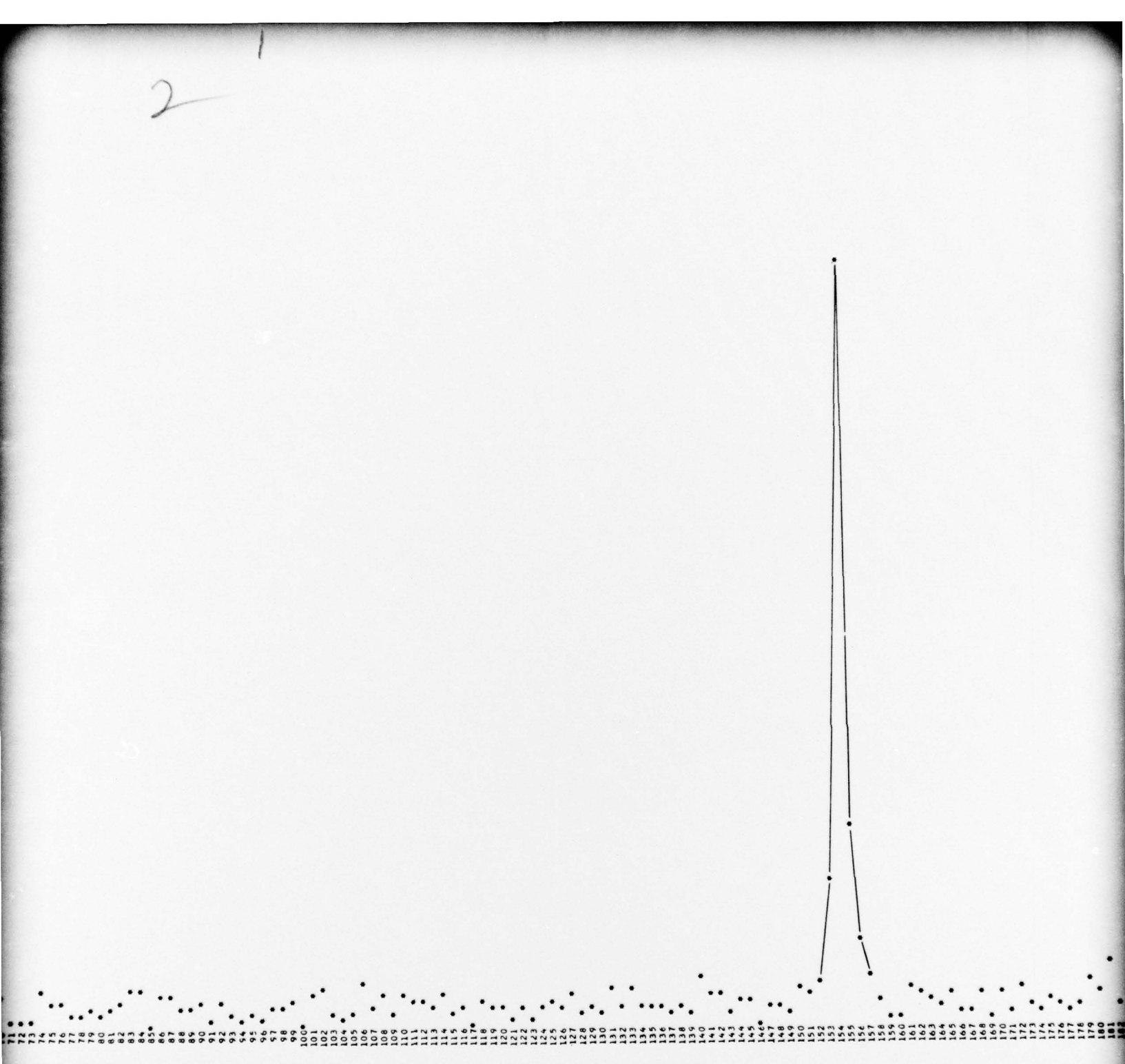


Fig. G-30 Power Spectral Density Showing Interference in Q Data Taken at Georgetown, DE; Data Segment 3

TOTAL DC POWER IN I = 0.8568





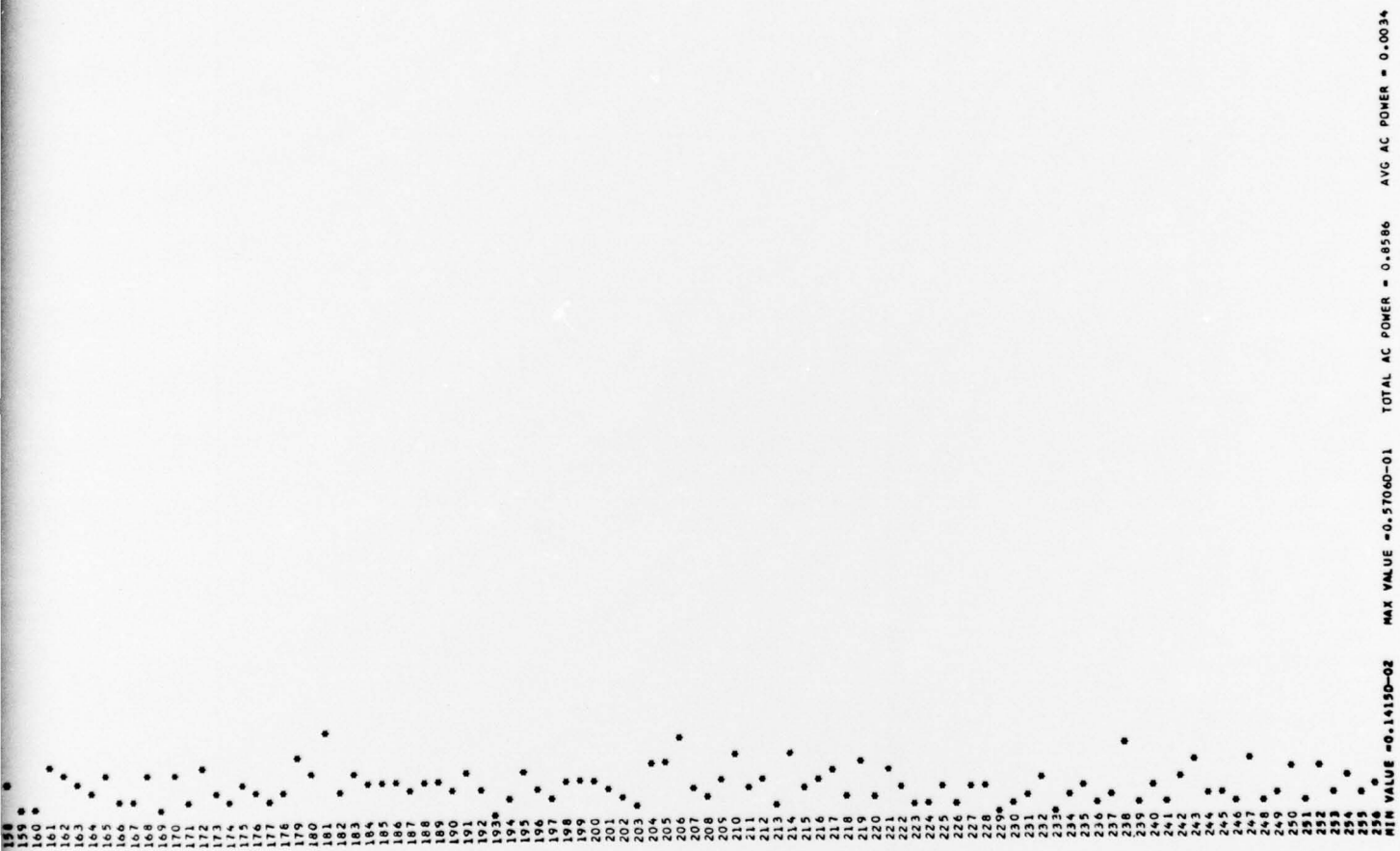


Fig. G-31 Power Spectral Density Showing Interference in I Data Taken at Georgetown, DE; Data Segment 3

T11-T12 HISTOGRAM

																				T11
0	0	0	0	0	0	0	0	0	0	1	1	0	0	1	0	0	0	0	0	3
0	1	0	0	0	0	0	0	1	0	2	1	0	0	1	0	0	0	0	0	6
0	0	0	1	0	0	0	1	0	2	0	0	0	0	1	0	0	0	0	0	5
0	0	0	0	0	0	0	0	1	3	2	1	0	1	0	0	0	0	0	0	8
1	0	0	1	1	0	1	0	1	2	1	3	0	1	1	0	0	0	0	0	13
0	0	1	0	1	0	0	3	7	2	1	2	2	3	0	0	1	0	0	1	24
0	1	0	1	2	0	4	8	10	11	6	6	2	2	2	1	0	1	0	1	58
0	0	0	0	4	2	5	9	27	42	34	20	10	5	2	1	1	0	0	1	163
1	2	0	0	1	6	6	23	154	330	173	51	13	11	4	0	0	2	0	0	777
0	1	1	0	3	2	9	25	298	1416	1137	197	30	8	5	1	2	1	0	0	3136
0	0	1	4	4	4	8	29	170	1008	1344	295	27	14	4	0	1	1	0	1	2915
0	1	0	3	1	1	5	18	57	182	303	132	24	8	6	3	0	2	0	0	746
0	0	0	3	1	3	5	11	16	33	37	19	12	3	0	1	0	1	0	0	145
0	1	0	2	0	1	1	3	5	10	15	12	5	3	1	1	2	0	0	0	62
0	0	0	1	1	2	0	1	5	1	9	4	3	4	1	1	0	0	0	0	33
0	0	1	0	0	0	2	1	1	2	1	2	1	3	0	1	1	0	0	0	16
0	0	1	0	0	1	1	1	1	1	0	3	0	2	1	0	0	0	0	0	12
0	0	0	0	0	0	0	0	1	0	2	1	0	2	0	0	0	0	1	0	7
1	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	2	1	0	0	6
0	0	0	1	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	3

T12 DISTRIBUTION

3	7	5	18	19	23	47	133	755	3045	3070	750	129	70	30	10	10	9	1	4

TCTAL NO. PAIRS = 8192
T11,12 EDIT SIGMA = 0.6278
EDITING LEVEL = 6 SIGMA
T11 EDIT PAIRS = 22
T12 EDIT PAIRS = 18
T11,12 EDIT PAIRS = 14
T11 AVERAGE = 0.0984
T12 AVERAGE = 0.9253

Fig. G-32 Histogram of First-Stage Edited Data Taken at Georgetown, DE, After Frequency Filtering; Data Segment 3

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