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SUBIC



Submarine Integrated Control

OFFICE OF
NAVAL
RESEARCH

GENERAL DYNAMICS CORPORATION
ELECTRIC BOAT DIVISION
GROTON, CONNECTICUT

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GENERAL DYNAMICS CORPORATION
Electric Boat Division
Groton, Connecticut

EXPERIMENTAL EVALUATION
OF THE
EFFECT OF OCEANOGRAPHIC PARAMETERS
ON
SUBMARINE SONAR PERFORMANCE(U)

USS PERMIT (SSN594) AND USS BLUEGILL (SS242)
PACIFIC OCEAN - JANUARY 1966

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ABSTRACT

The results of measuring the effects of environmental variables on acoustic transmission in the ocean are summarized in this report. The environmental variables were measured both before and during a controlled-geometry submarine exercise, using sensors on a research vessel and an aircraft. The acoustic signals were obtained from the submarines. During the submarine exercises, the SUBIC DDP-24 computer was used to predict the best listening depths for each run, using the most recent sound velocity profile data measured from the submarine as the input to a ray-trace program. The interpretation of the acoustic signals in the context of the measured environmental variables is the major result of this report.

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FOREWORD

The work described in this report was performed by the Information Processing Section of the Applied Sciences Department, Electric Boat division of General Dynamics Corporation, as part of the Submarine Integrated Control Program (SUBIC). Electric Boat division is prime contractor and coordinator of this program under contract NOmr 2512(00). Lcdr. W. Billing, USN, is Project Officer for ONR. Dr. R. D. Collier, Senior Staff Scientist, is Project Coordinator for Electric Boat division under the direction of Dr. A. J. van Woerkom, Chief Scientist of the Applied Sciences Department.

The cooperation of Commander, Submarine Squadron Three, his staff and the ship's company of USS PERMIT (SSN594) is gratefully acknowledged.

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INTRODUCTION AND SUMMARY

One of the primary objectives of the SUBIC Research Program is to develop techniques of applying knowledge of the physical ocean environment to the tactical deployment of attack submarines.

An initial approach is to develop display techniques which can be utilized by the submarine commanding officer in decision making. An important development of the recent past is an acoustic ray pattern display of the sound energy generated by a sound source (own ship or target), and the adaption of a high speed, real-time, compact digital computer with cathode ray tube display for implementation of shipboard ray pattern display.

The first use of this computer-display system at sea took place in February 1965 aboard the USS DACE (SSN607) and demonstrated the applicability of ray trace techniques for tactical decisions.

The second use of this system took place in July 1965 aboard the USS TINOSA (SSN606) and further extended ranging techniques.

The need for improved environmental models to provide more realistic inputs to the ray trace program and computations of transmission loss is recognized. For example, the space-time variations in the sound velocity vs. depth profile can introduce significant changes in the ray paths and sound intensities for given depth/range combinations.

The third at-sea test, in January 1966, was designed to measure the environmental variables and their direct effect upon sound propagation. These propagation studies were conducted by the USS PERMIT in conjunction with the USS BLUEGILL (SS242) off the United States West Coast, at which time R/V SEA SERPENT obtained time series measurements of oceanographic parameters. This report describes the results of that experiment.

As planned, the exercise resulted in two sets of data: the signal data from the submarines and the environmental data from the research vessel. The interpretation of the former in the context of the latter was the principal objective of the exercise. How this was done by utilizing the simulation capability of the SUBIC Ray Trace Program constitutes the major result to be reported.

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Briefly, an order of magnitude difference in the variance of the received acoustic signal was recorded at ranges of 5, 000 and 10, 000 yards (Section III). Furthermore, the variance was smaller at the longer range, discounting volume and surface reverberation as possible explanations. A difference in variance of comparable magnitude was apparent in both passive and active runs, eliminating phase effects of multiple transmission, or other frequency effects, as possible explanations. An explanation was found, however, in the environmental data.

The measurement of the thermal structure of the upper 500 feet of the ocean, taken from the surface ship in the general locale of the submarine exercise, revealed a large scale fluctuation in the depth of the surface sound channel with range (Section II). The cause of this fluctuation is explained by the overall view of the surface temperature distribution obtained by aircraft infrared thermometer runs.

The ray trace program was recently expanded to include a model of internal waves (Section III). With the proper interpretation, this model was used to simulate the measured variations in the surface channel depth. This simulation resulted in a confirmation of the signal data: that the 5, 000-yard data was taken in a region where, because of the particular conditions observed, the variable surface channel would cause considerable fluctuation in the signal with time, while the 10, 000-yard data was in a region where, fortuitously for the comparison, the signal strength was practically undisturbed by the varying depth of the channel.

The result is not entirely conclusive. No quantitative comparison is possible from the existing data and a good description of the channel depth was not obtained. Nonetheless, an otherwise unexplainable observation of signal variability, and an observation of such contrast as to be undeniable, is qualitatively explained by the observation of large scale fluctuations in the medium.

Also included (Section IV) are the autocorrelation functions of the signal about its mean. A time scale of the magnitude of a few minutes is indicated for signal coherency and this too can be explained on the basis of the submarines cutting through spatially periodic variations in channel depth of a magnitude commensurate with what was observed.

In summary, although a detailed survey of the area was made at the time of the test, it was far from sufficient to provide all of the data necessary for an absolute calibration of the propagation model. It did, however, show that inhomogeneities did exist in the sound velocity structure and that these were of sufficient magnitude to cause variances in the sonar signal received. In addition, it was determined that the SUBIC at-sea ray trace was applicable to active as well as passive signals in predicting average transmission loss, and that an internal

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wave ray trace model programmed on a laboratory computer was able to roughly predict the variance in both the active and passive signals.

The D/E angle was monitored for the first time during a SUBIC at-sea test. The results indicated that the vertical beamwidth is too wide to accurately track a target in the surface channel, thus severely handicapping passive ranging based upon the D/E angle. However, there are indications that a new method of passive ranging based upon the variance in S/N may be developed.

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II

OPERATION AREA ENVIRONMENTAL DATA

The main purpose of the presence of the R/V SEA SERPENT and the aircraft during the PERMIT - BLUEGILL tests was to sample the environment in such a way that the variability in S/N and transmission loss as measured by the submarines could be correlated with fluctuations in the oceanographic parameters. In this way, data would be provided for improvement in environmental models used as input to the ray trace program. Although the environmental data collection results were limited, the path for future investigation was indicated.

The surface ship and aircraft sampling programs were designed to provide maximum possible background data on the local oceanographic conditions and to provide detailed data on the variability in the acoustic field during the submarine tests. The surface ship program consisted of tests to determine spatial, temporal and directional characteristics of temperature and sound velocity changes in the test area. In general terms, the surface ship program during the tests was to sample continually on a square track, the dimensions of which corresponded to typical transmission ranges. Each leg of the box was made up of thermistor chain tows, whereas the vertices of the box were stationary thermistor chain recordings and sound velocity profiles. The instrument suite consisted of a thermistor chain, velocimeter and bathythermograph. The aircraft program consisted of gathering data on the gross water mass distribution by using a Barnes IT-2S infrared thermometer to record the distribution and fluctuations in sea surface isotherms. These flights were to take place over the three-day period of the submarine tests and were to cover a 30- by 60-mile area.

The general oceanography of the region has been well established. Water of subarctic origin moves south down the coast of California, becoming modified by atmospheric conditions and entrainment of nearshore coastal water. This southbound current, the California Current, is an extension of the Aleutian Current and extends from about 48°N to 23°N where it converges with equatorial water. During the winter, from November through January, a countercurrent or eddy is well developed inshore of the California Current. This circulation tends to carry relatively warm saline water northward and has been named the Davidson Current. Beneath the southbound, meandering California Current is a northbound current of equatorial origin.

It was expected that January tracklines running west from the coast at 34°N would pass from the region dominated by northbound water into the southbound water where acoustic conditions were good. Additionally, the track would pass through a frontal region which might be ill-defined by slow-moving meanders and eddies

in the circulation. This mixing region could be delineated by a plot of the sea surface isotherms. The movement of these disturbances could be tracked by successive sampling of the surface isotherms. These were the factors that augured for the use of aerial sea surface temperature survey techniques.

Since it was known that equatorial water was both inshore of and beneath the California Current, the boundary between the two water masses must leave the surface and increase in depth as one headed west from the coast. This implies a general negative slope or increase in depth in the mixing layer as one proceeds out into the southbound water. In addition to the perturbations in the acoustic field introduced by the vertical structure of the meanders and eddies in the circulation, temporal and spatial changes were expected from other causes. In the subsurface boundary region between the north and southbound water masses, internal waves (Helmholtz) can exist. Also, internal waves propagating onshore from distant generating areas can be expected. More important, due to the proximity of the test area to the continental slope, internal waves generated by tidal forces over the slope can be expected. It is interesting to consider that the propagation directions of some of these waves would be normal to each other, implying a spiked field analogous to crossing seas.

One of the functions of the surface ship was to delineate the test area. The requirement was to find an acoustically reliable area for the experiment that the submarines could reach and return from, as well as complete the tests, within the allotted time. Additionally, the area was to be within surface ship range. In general terms, it was a problem of determining the location of the intersection of four sets of conditions: operating conditions on two submarines and one surface ship, and sonar conditions in the environment. Bathythermographs on file at the National Oceanographic Data Center were reviewed and it was concluded that the area approximately 100 miles due west of Point Arguello was optimal to search for the exact test site. It had been planned to locate the exact test site, radio in the coordinates, proceed with equipment checkout, and then initiate the intensive environmental survey. B.T.'s # 103 through # 112 are the results of the test site location program (see Figure 2-1).

B.T. # 103 is located southeast of Rodriguez Dome in 750 fathoms of water. When compared with the rest of the run, and especially B.T. # 104 on the other side of Rodriguez Dome, it may be indicative of upwelling caused by strong (NNE, 22 kts) offshore winds.

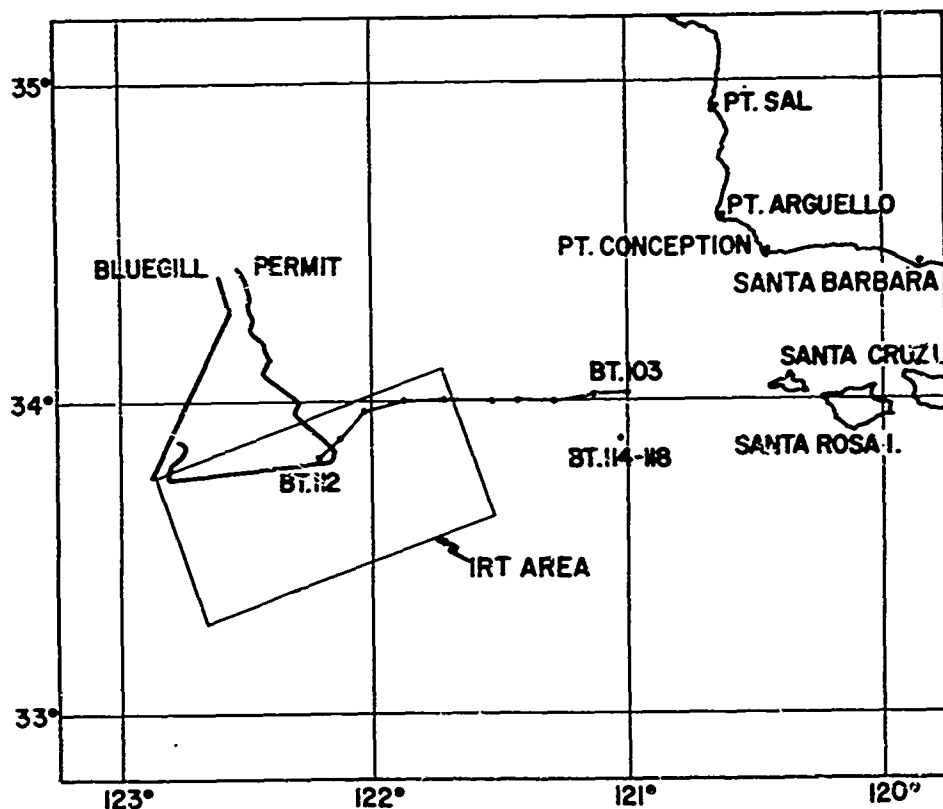


Figure 2-1 Location of Experiment

B.T.'s # 104 through # 108 show a surface layer 150 to 200 feet thick and at least 1°F warmer than the layer to the east (B.T. # 103) or to the west (B.T. # 110 through 112). This may be indicative of a warm tongue of northbound equatorial water (Figure 2-2).

B.T. # 109 shows a slightly negative gradient in the surface layer. This is indicative of a frontal or transition region, and, when compared to B.T.'s # 104 through # 108 and # 110 through # 112, can be construed to be in the transition region between northbound and southbound water. (See infrared thermometer survey discussion for further analysis of this region.)

B.T.'s # 110 through # 112 show a surface layer of colder water 190 to 230 feet thick. It was assumed that the southbound water mass exhibiting good sonar characteristics had been reached, and test site coordinates were radioed in to San Diego at the completion of B.T. # 112.

A plot of layer depth, as read from B.T. # 104 through # 112, versus distance, measured from the location of B.T. # 104 (Figure 2-3), can be fitted with the following linear regression line:

$$z = 159 + 0.82 x$$

where:

z = layer depth in feet
 x = distance in nautical miles from $34^{\circ} 01'N$, $121^{\circ} 08'W$ (location of B.T. # 104) in a westerly direction

This indicates a general increase in layer depth proceeding west from the continental shelf break. Superimposed on the sloping linear regression line, representing the mean layer depth, is an apparent trigonometric variation of layer depth. This variation appears to be a cosine wave with a slight phase shift, as zero phase would be a few miles east of the location of B.T. # 104. The height of this wave is 50 feet and its length 36 miles (58 km). More detailed analysis of this waveform indicates that it does not represent internal waves, but rather is a result of the water mass circulation and upwelling due to wind. Specifically, the rise in the mixed layer toward an apparent crest when approaching the location of B.T. # 104 from the west appears to be due to northerly winds and the concomitant wind drift upwelling. Additionally, the rise in the mixed layer towards a crest in the vicinity of B.T. # 108 appears due to sampling in the transition zone or front between the warmer and cooler water referred to before. So it may be said that the waveform of the mixed layer depth versus distance plot is an apparent wave and has little to do with internal waves.

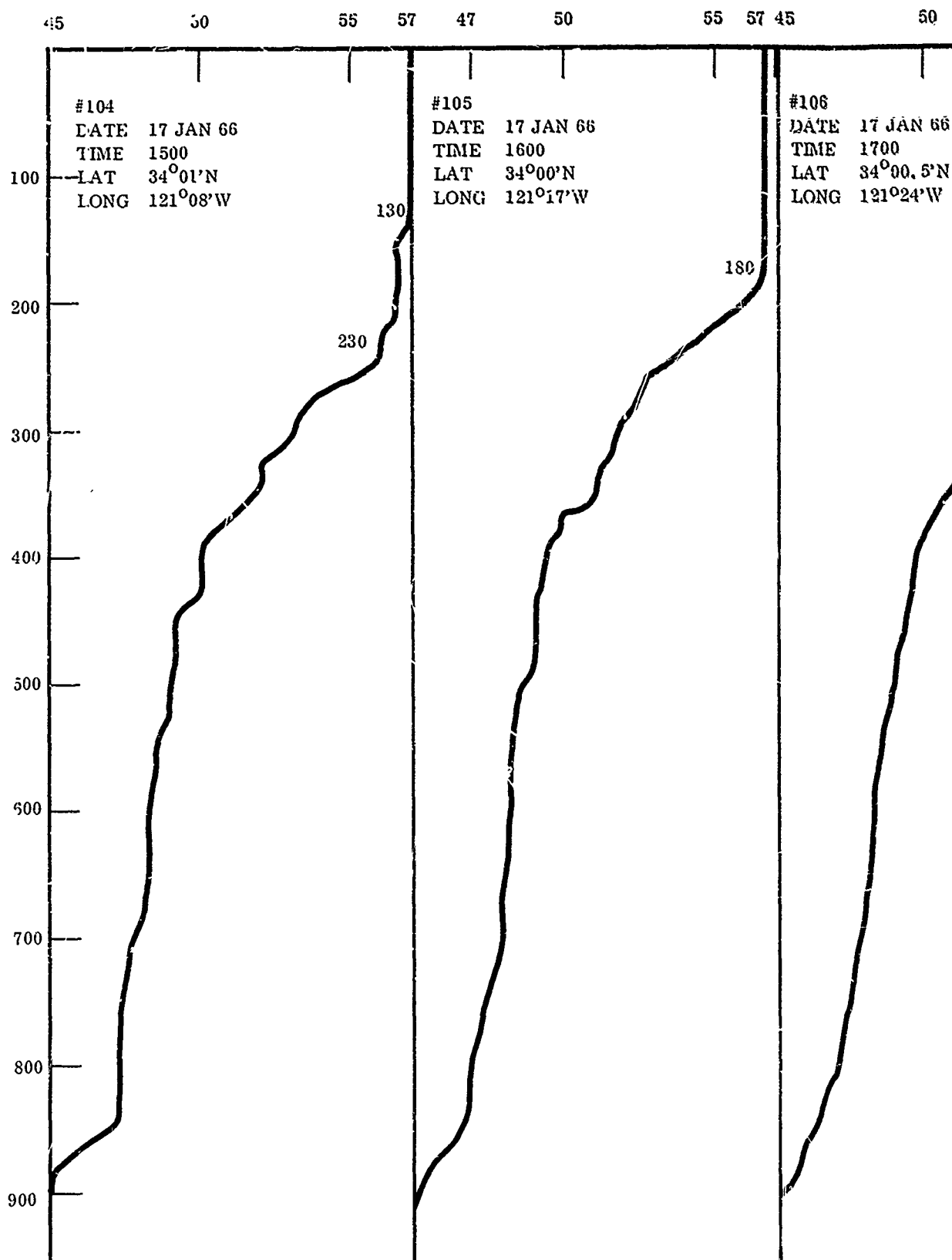
In Figure 2-3, it appears that the thermocline can be adequately described by the bundle of isotherms contained within the 53° to $55^{\circ}F$ range, so that the $55^{\circ}F$ isotherm was assumed to be representative. It is of interest to note that Emery and Summers¹ chose the $55^{\circ}F$ isotherm as the thermocline indicator in their work of March and August 1961. They noted variations of up to 90 feet in isotherm depth. The plot of $55^{\circ}F$ isotherm depth versus distance can be fitted with the following linear regression line (Figure 2-3):

$$z = 242 - 0.49 x$$

where:

z = $55^{\circ}F$ isotherm depth in feet (thermocline)
 x = distance in nautical miles from $34^{\circ} 01'N$, $121^{\circ} 08'W$ is a westerly direction

This indicates a gradual decrease in the depth of the thermocline as opposed to the increase in the depth of the mixed layer over this same interval. Superimposed on this sloping linear regression line, representing the mean depth of the



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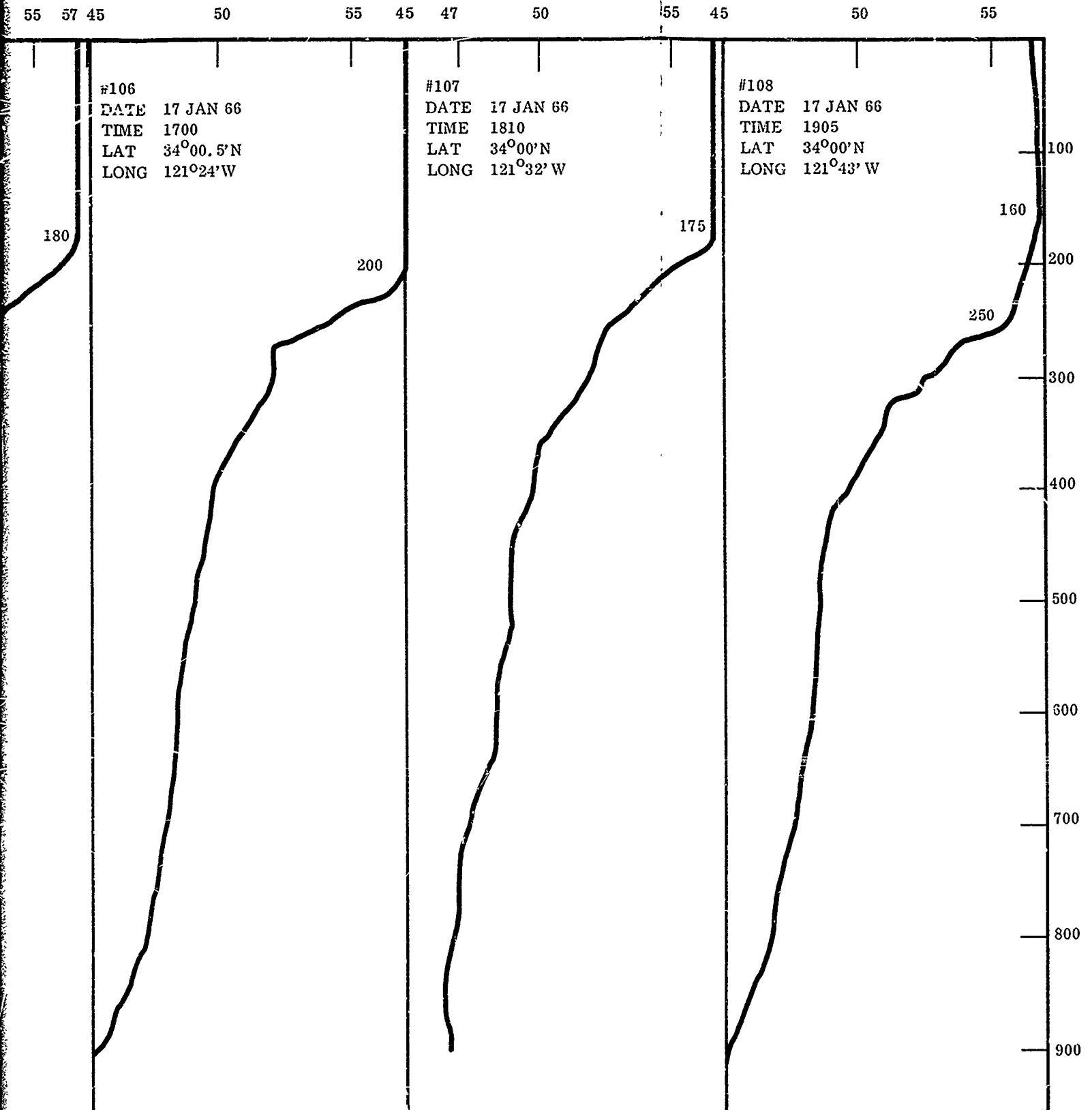
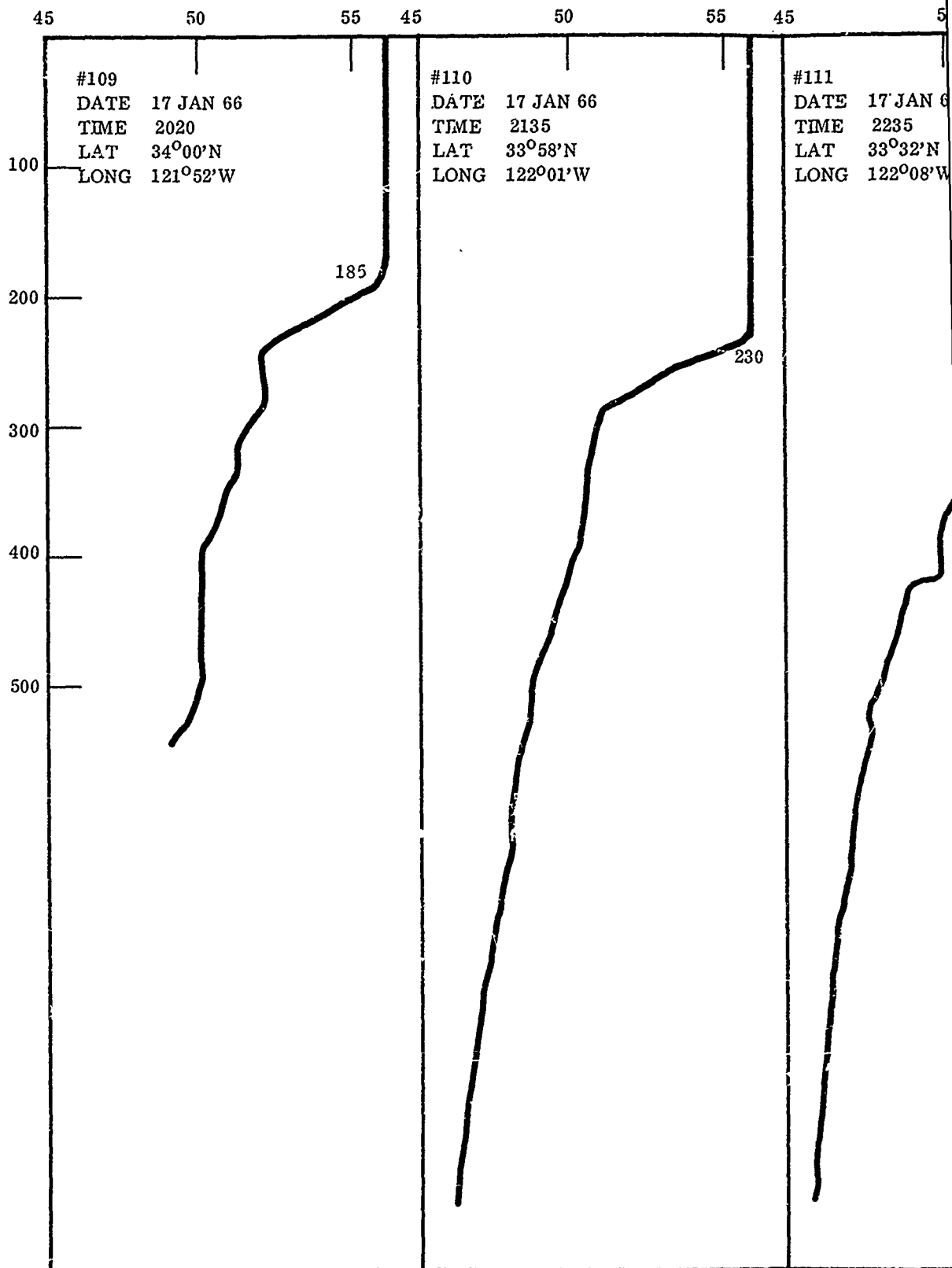


Figure 2-2a B.T.'s #104 through #108

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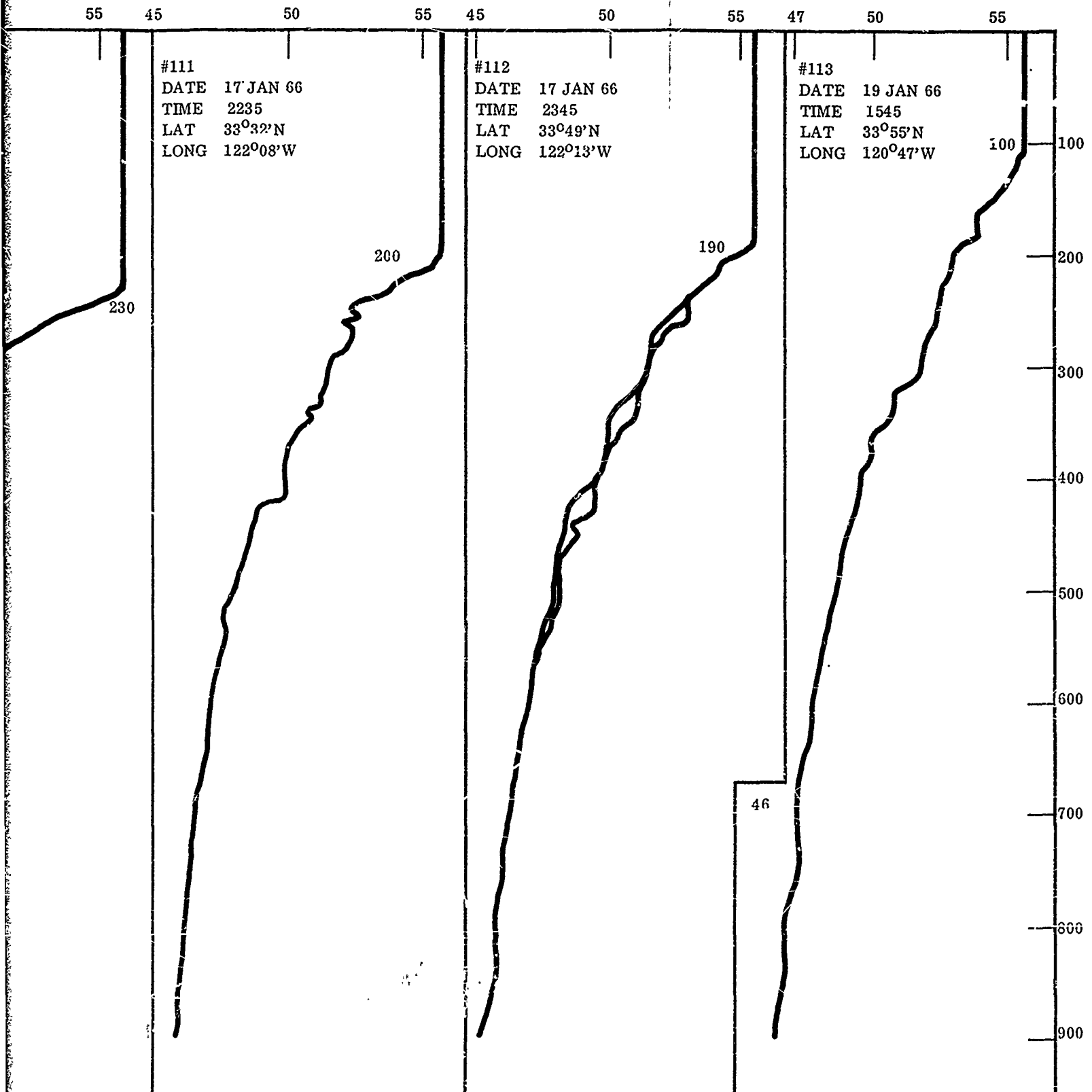


Figure 2-2b B.T.'s #109 through #113

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thermocline, is a different apparent periodic variation of the thermocline depth. This variation appears to be a phase-shifted cosine wave or possibly a sum of cosine waves. The wave height is of the same order as the apparent mixed layer wave height, namely about 50 feet.

The wavelength is deemed to be spurious in any application to internal waves as it is probably forced by the sampling interval in the B.T. run. The variations in depth of this isotherm are, however, taken to be real. It should be noted that only B.T. # 104 and # 108 cause the discrepancy between apparent wavelengths of the mixed layer and thermocline.

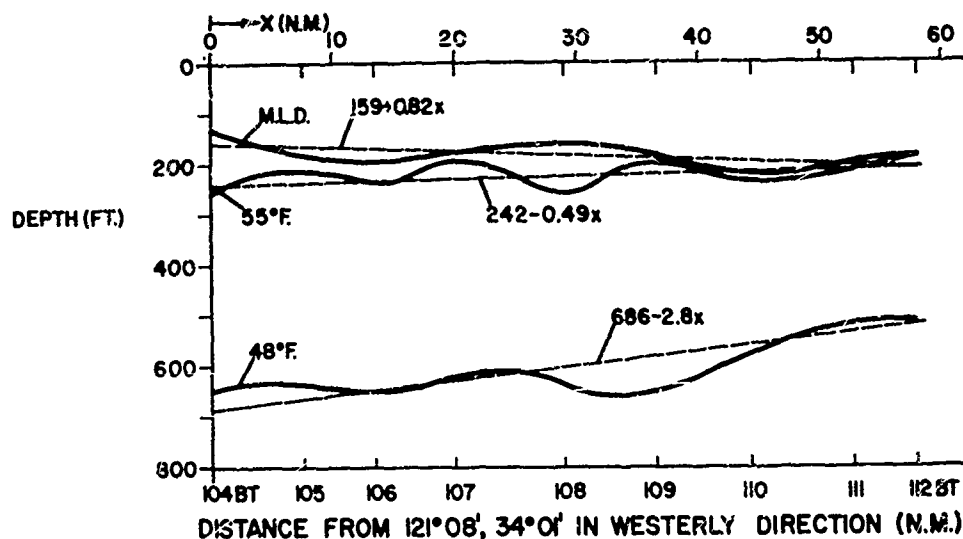


Figure 2-3 Thermal Structure

The 48°F isotherm depth has been plotted in Figure 2-3 and can be compared to the 55°F isotherm. The following linear regression line describes the mean depth of the 48°F isotherm:

$$z = 686 + 2.8x$$

where:

$$z = 48^{\circ}\text{F isotherm depth in feet}$$

$$x = \text{distance in nautical miles from } 34^{\circ} 01' \text{N, } 121^{\circ} 08' \text{W (B.T. \# 104) in a westerly direction}$$

This indicates a decrease in the mean depth of the isotherm proceeding west in the sampling area. It is noted also that this slope is five times as great as the 55°F isotherm (2.8 vs. 0.49). As was mentioned previously, the general circulation has been well studied in this area. Northbound water of equatorial origin has been determined to flow beneath the generally southbound California Current. If the assumptions are made that the slope of the isotherms at this depth are indicative of the slope of the isopycnals and the fields of mass and pressure are in mutual adjustment, then the isobars tend to slope down from

east to west resulting in a northbound current at these depths. Although this conclusion is based on speculation, it does agree with what has been measured.

Unfortunately, the lack of data on the slope of the isohalines precludes a stronger analysis. Under the assumptions, however, the increased slope of the isotherms with depth is expected. This again points up the need for data and knowledge of the oceanography of a region so as to be able to predict, albeit in gross terms, the structure of the acoustic field.

Four hourly B.T.'s (# 114 through # 118) were taken on January 19, 1966 at 33°53'N, 121°02'W (Figure 2-4). The total excursion of the mixed layer depth was 60 feet, from 140 feet to 200 feet in depth. The mixed layer temperature increased by 0.5°F during this time. B.T. # 118 shows a slight inversion in the surface layer, which may be due to radiative cooling. The 55.5°F isotherm increased in depth from 180 feet to 232 feet, or a 52-foot excursion. The warming of the surface layer in this manner, during the time 16:55 to 20:10, indicates an intrusion of warmer water with its leading edge at the surface. Rather than due to internal waves alone, it appears that a meander in the circulation passed into the test area or, possibly, the incursion was due to the tidal advection of warmer, inshore water.

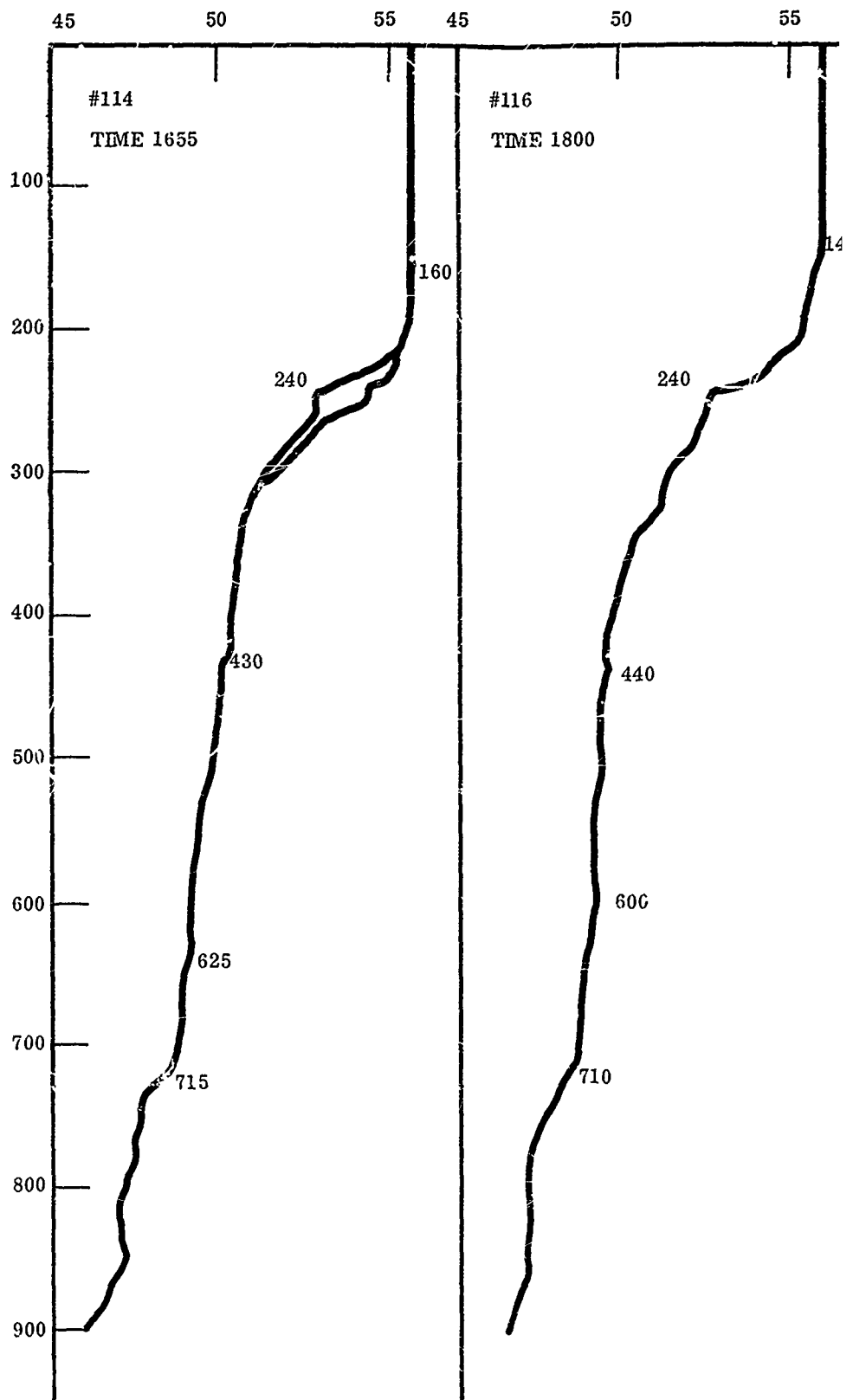
Although the bathythermograph run was completed two days before the first infrared radiation thermometer (IRT) flight and four days before the flight on which good data was taken, the B.T.'s tie in with the IRT data and the sound velocity profiles (SVP) taken by PERMIT. The picture that unfolds when interpreting the data, as limited as it is, from these three sources reveals a complexity in the environment that implies the necessity of refined environmental sampling in any acoustic experiment.

Three IRT runs were scheduled, one of which was to be at night to document the day-night effect. The sampling track was set up such that the longer sampling legs were normal (northeast-southwest) to the coastline with shorter interconnecting legs running parallel (northwest-southeast) to the coast. The sampling pattern was designed this way on the assumption that the general orientation of the sea surface isotherms would be parallel to the coast, with colder water offshore. This assumption was based on the known circulation of the California-Davidson Currents system and verified by researchers on the West Coast.

As can be seen from Figure 2-5, the isotherm pattern existing at the time of the tests was far more complicated. Figure 2-5 shows a pincerlike formation of cold water in the top (northwest) section of the 30- by 60-mile wide survey area and warmer water in the bottom (southeast) section. This anomalous situation was noted by the Tiburon Marine Laboratory (BCF) and a week earlier by the Fisheries Research Board (Canada) personnel. As was mentioned previously,

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DATE 19 JAN 66
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LONG 121° 02'W



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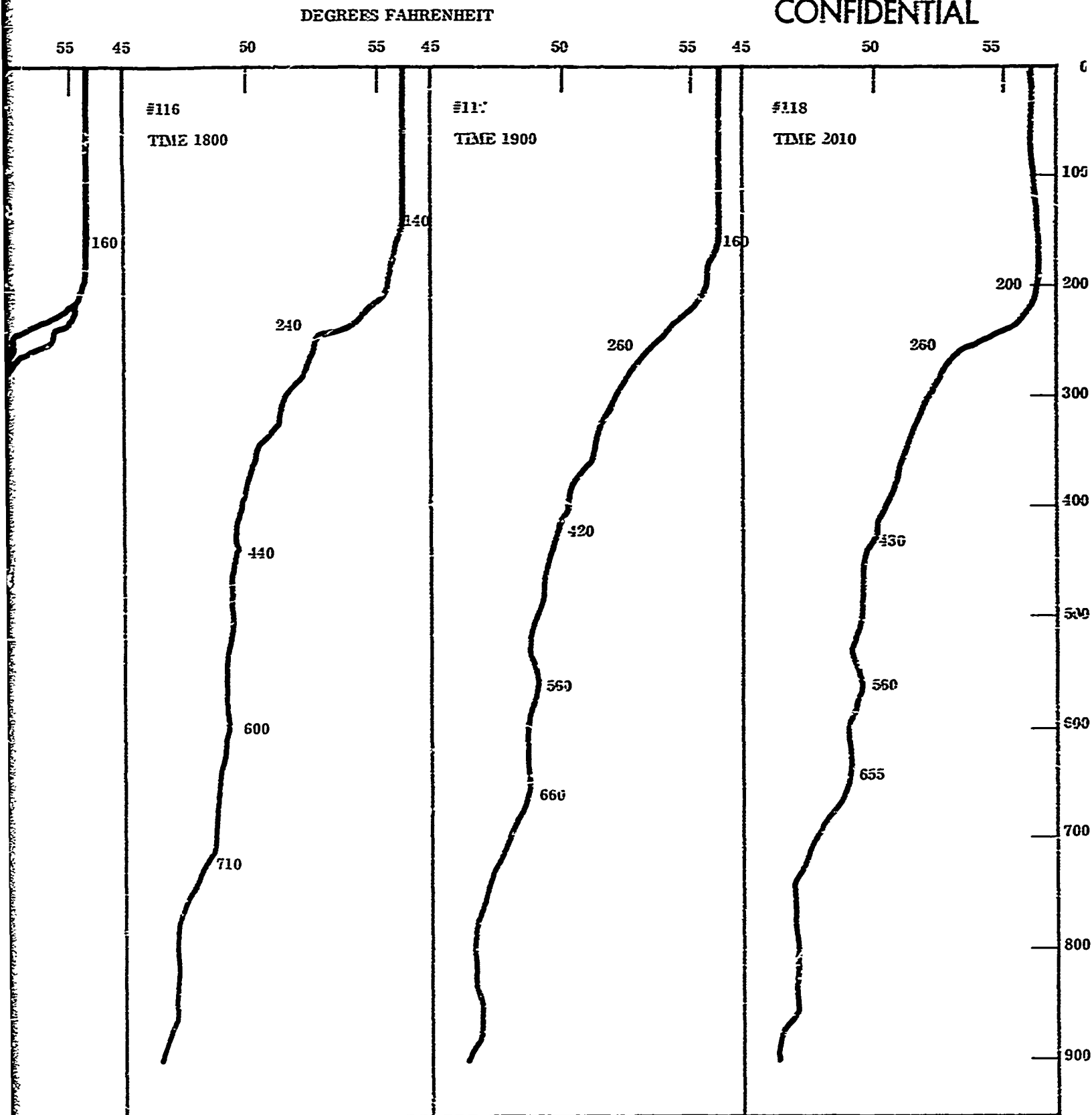


Figure 2-4 B.T.'s #114 through #118

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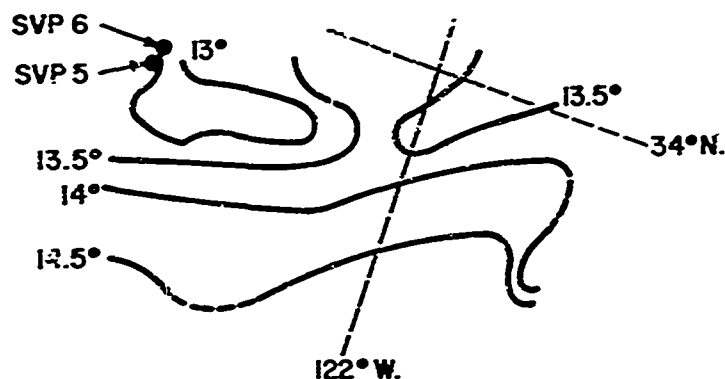


Figure 2-5 Isotherm Field At the Time of Test

the isotherms were expected to be running generally northwest to southeast, but, as is evident from this plot, they are generally running northeast-southwest. This indicates a renewed flux of cold water from the north or a meander in the circulation. This plot was one of three based on a good trace, or one in which the noise level was low. Some information is available from the previous runs and can be tied into this plot to indicate a time history of the circulation pattern over these three days (Figure 2-6).

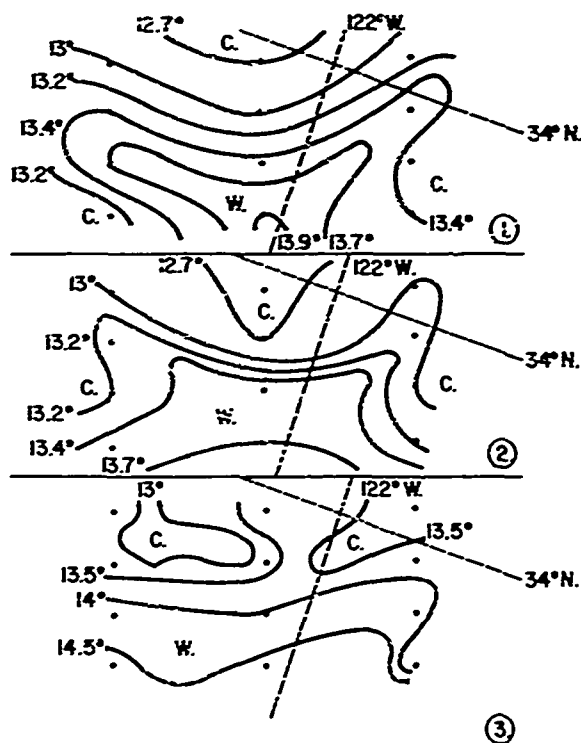


Figure 2-6 Three-Day Surface Temperature (Airborne IR) Pattern

The IRT run on January 19, 1966 from 1401 to 1557 hours shows a general east-west orientation to the isotherms, slightly concave northwards, showing a gradual influx of cold water from the north into the survey area. There is also indication of warmer water pushing southwest on the east side of the survey area.

The IRT run on January 20, 1966 from 0509 to 0656 hours shows a gradual destruction of the east-west orientation of the isotherms, especially on the north side of the survey area. The influx of colder water from the north is becoming more apparent as the concavity of the isotherms to the north is increasing. On the west side of the survey area another influx, or pincer, of colder water is apparent. On the east side, the intrusion of warmer water to the northeast has abated, as the temperatures in this tongue have dropped somewhat. It may be that this was not warm water pushing northeast and cooler water pushing southwest, but only the latter. This inference seems strengthened by the general temperature decrease in the southeast part of the survey area and the increase in the temperature gradient in this region coupled with the decrease in the gradient in the northeast part of the area.

The first two runs, although composed of noisy data, do show a flow of cold water from the north and pincers of cold water coming in from the sides of the survey area. It is interesting to note the change in location of the most southerly part of the 12°C isotherm. In the thirteen hours from run one to two, it had moved ten miles or at an average velocity of 0.75 knots.

The third IRT run, on January 21, 1966 (#3) from 1022 to 1213 hours, shows the complete destruction of the previous orientation of the isotherms on the northern side of the area. It appears that the influx of cold water on the northern side has abated while the pincer movement of colder water from the sides has intensified. The southern side of the area has regained the east-west orientation of isotherms.

The net effect of what has happened over the three-day period is that cold water has moved in from the north and, in a pincer-like movement, detached a portion of the warmer water.

In attempting to integrate the IRT and B.T. data, it should be noted that B.T. # 112 was taken on January 17 at 2345 while the first IRT run was on January 19 at 1500. As a result, one must assume that the general structure of the sea surface isotherms in evidence on the first IRT run was existent during the B.T. run. On this assumption, it then appears that although the B.T. run did pass from warmer water to colder, the end of the run was through an eddy or meander rather than a well-defined water mass boundary oriented northwest to southeast. Since the vertical stratification varies when sampling through a warm intrusion or a cold pincer formation, as noted, isotherms will also vary in depth during the sampling run. This variation in isotherms' depth is a

result of the stratification associated with meanders as well as internal waves present in the area (Figures 2-7 and 2-8).

Experience gained during this exercise indicates that future IRT sampling programs should be of two distinct types. The first type of IRT sampling program should be on a large scale, both before and after the tests. This type of sampling would yield information on the gross changes in the environment during the tests. The second type should be on the scale of the tests and the flight tracks should be closely spaced. This type of sampling would yield data on the fine structure of the test area and would be integrated with thermistor and/or bathythermograph data.

The sound velocity profiles (Figure 2-9), seven in number, taken by the PERMIT have been adjusted to account for separation of approximately 30 feet between the pressure transducer and the velocimeter. The range of mixed layer depth varies from 100 feet (SVP # 5) to 240 feet (SVP # 7), and the mean depth is 194 feet. This compares well with a mean layer depth of 190 feet from the bathythermograph data. SVP's #2 and 3 were about two nautical miles apart in space and two hours apart in time. The surface layer sound velocity value did not change but the layer depth increased by 20 feet, from 180 to 200 feet. Of more interest is a comparison of SVP's #5 and #6, taken some 18 hours after #2 and #3, and about 20 miles away. SVP's #5 and #6 (Figure 2-10) are about two miles apart in space and one hour in time. The mixed layer depth increased from 100 feet to 210 feet, an excursion of 110 feet, during this sampling interval. The surface layer velocity did not change nor did the velocity at 470 feet. In addition, there is a slight positive velocity gradient or bump in both profiles at about 420 feet. Therefore, it is concluded that the measurement is real and not due to instrumental error.

The maximum change in velocity occurred at a depth of 210 feet and was 25 feet per second. Assuming a constant salinity, the temperature must have changed by 4°F at that depth during the sampling interval to bring about this velocity change. This temperature change at constant depth is the greatest measured, although the change at 240 feet from B.T. # 109 to # 110 was 3°F . An evaluation of horizontal temperature gradients between the SVP's and B.T.'s cannot be made because of the differing sampling intervals. The third IRT run over the area was completed about five hours after SVP's #5 and #6 were taken. The cold tongue, or pincer, on the northwest side of the survey area, as noted previously, extended through the area of SVP's #5 and #6. If the variation in layer depth was not caused by internal waves, it may well be that the sampling interval extended over the leading edge, or a cold wedge, of the intrusion. If, on the other hand, the sampling interval extended through a meander from an upwelling to a sinking region, the mixed layer would exhibit this change also.

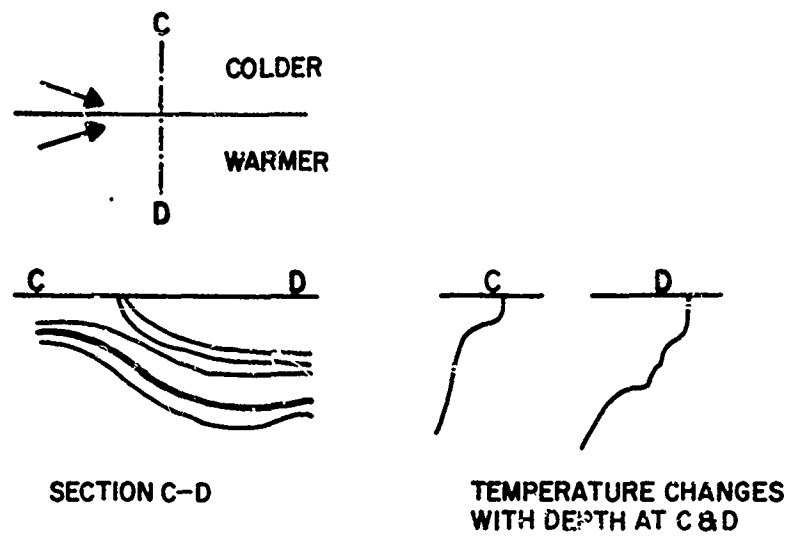


Figure 2-7 Structural Models of Convergences

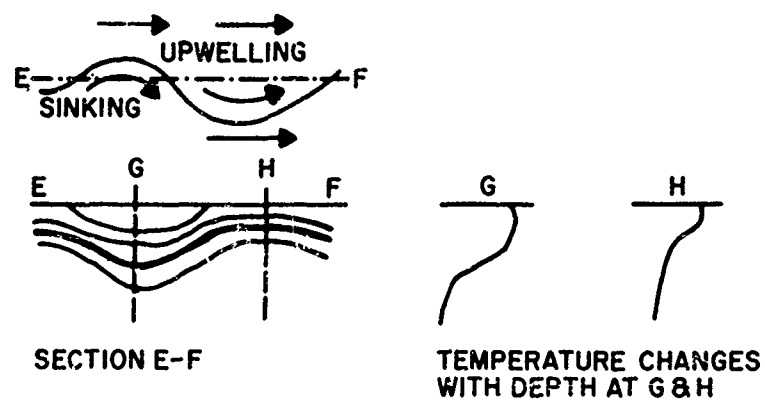


Figure 2-8 Upwelling and Sinking at a Meandering Boundary

VELOCITY (FT/SEC)

4900 4910 4920

4900 4910 4920

4890 4900 4910 4920 4930

4890 49

#1
33°17'N
122°06'W
1-20-66
1050

#2
33°58'N
122°20'W
1-20-66
1300

#3
33°58'N
122°20'W
1-20-66
1300

100

200

300

400

DEPTH (FT)

1

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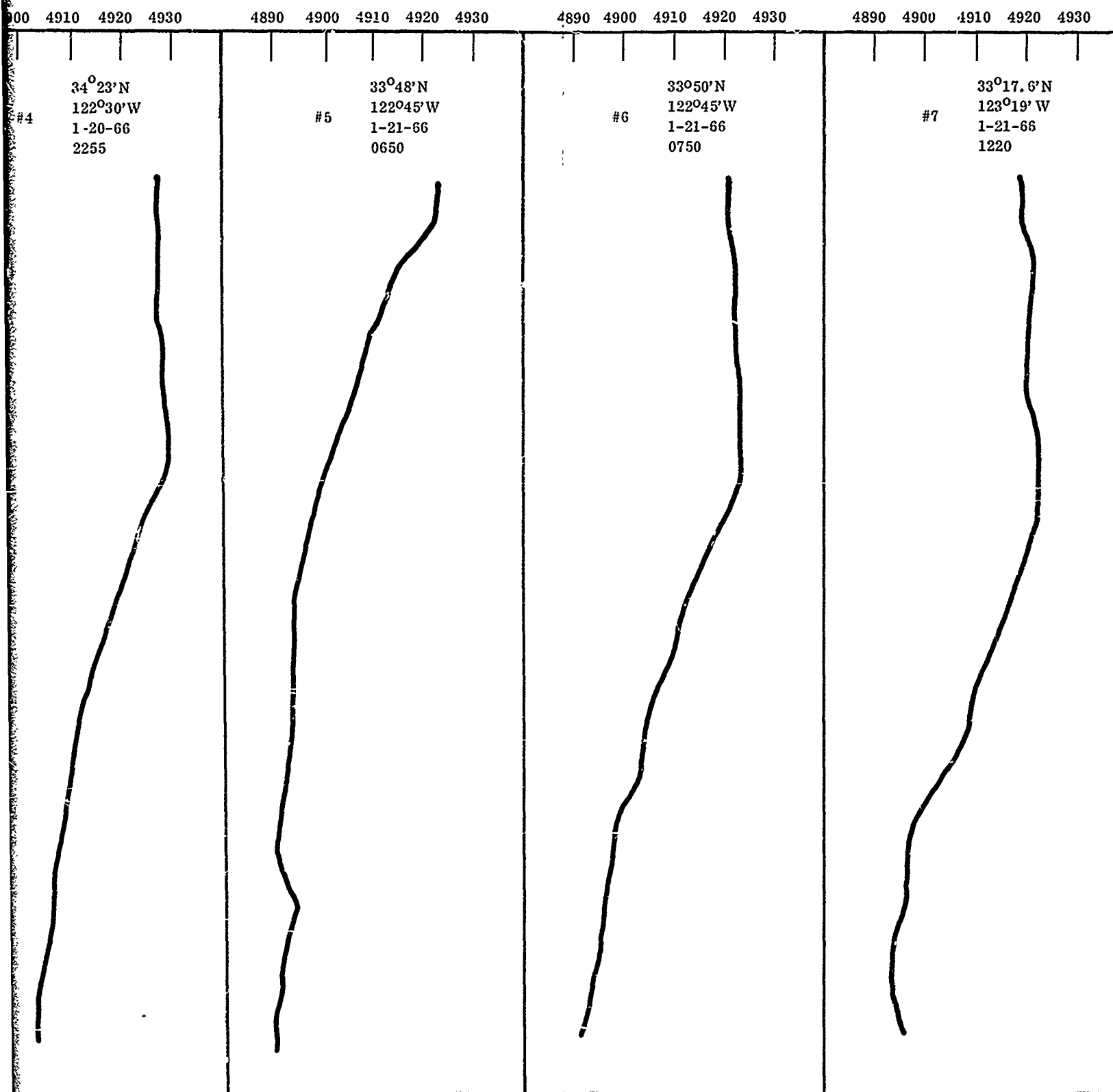


Figure 2-9 SVP's From USS PERMIT

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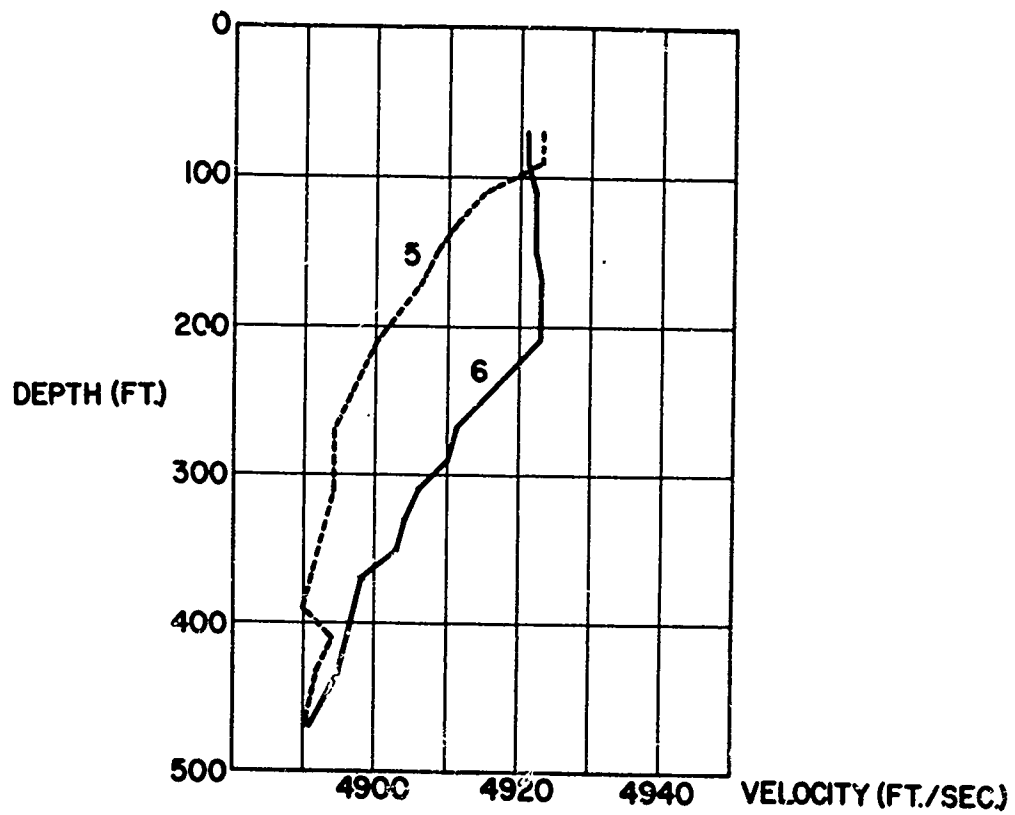


Figure 2-10 Comparison of SVP's 5 and 6

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III

EFFECTS OF ENVIRONMENT ON ACOUSTIC TRANSMISSION

The purpose of the submarine tests involving the USS PERMIT and the USS BLUEGILL was to measure various transmission parameters, in particular signal-to-noise ratio (S/N). At the time of the experiment, a surface channel existed whose depth was approximately 200 feet, as determined from SVP's taken during the test, although this varied from a maximum of 240 feet to a minimum of 140 feet. Data was taken with the BQS-6 sonar in both active and passive modes. The results were compared to predictions made by a ray trace program and good agreement was obtained.

SINGLE-FREQUENCY MEASUREMENTS (ACTIVE SONAR)

Recordings of one-way transmission of active sonar signals from the USS PERMIT, as received on the USS BLUEGILL, were made with both ships moving at constant speed, on parallel courses, and at ranges of 5400 and 10,000 yards (Figure 3-1). Both ships were in the surface channel with the PERMIT at a depth of 165 feet and the BLUEGILL snorkeling at a depth of

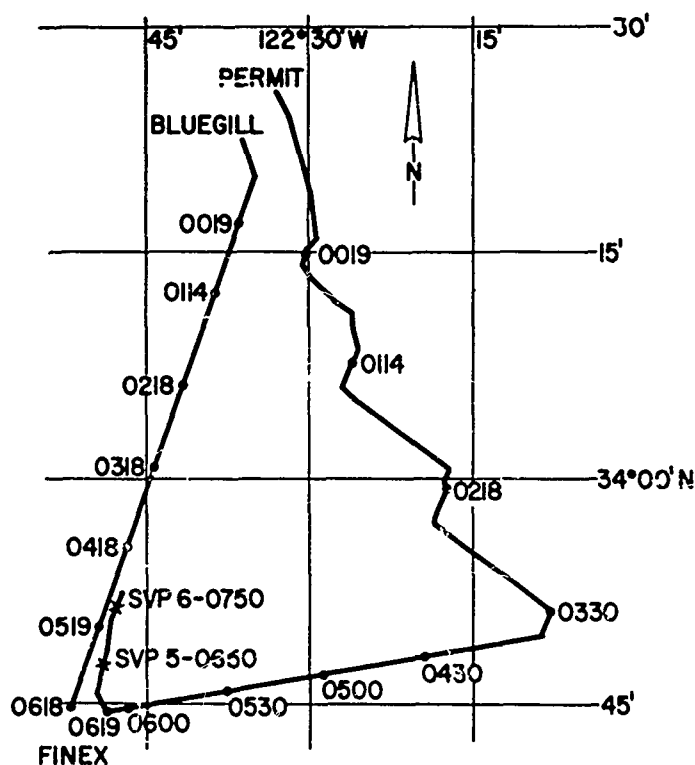


Figure 3-1 Track Chart for Run 2

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TABLE 3-1
SUMMARY OF TEST CONDITIONS

<u>Run #</u>	<u>Leg #</u>	<u>Nominal Range (yds)</u>	<u>Actual Range (yds)</u> ¹		<u>Depth</u> ²
II-1 5 knots	1	5K	4680E	ATF	165
	2	10K	9500	ATF	165
	3	20K	23500E	-	165
	4	40K	41000	-	165
	5	60K	56350	ATF	165
II-2 5 knots	1	5K	5430E	ATF	165
	2	10K	10350	ATF	165
	(Note course change during passive run)				
	3	20K	21300	-	180
	4	40K	40000	ATF	150
II-3 8 knots	5	60K	60000	-	150
	1	5K	5000	ATF	150
	2	10K	9900	ATF	150
	3	20K	20000	ATF	150
	4	40K	40000	ATF	120
	5	60K	59500	-	120

¹ Where range is followed by B or E, sonar range at beginning or end of run is indicated. Otherwise, range is estimated.

² Depth refers to tracking ship keel depth. Center of BQS-6 sphere is approximately 15 feet less. Target keel depth equals approximately 55 to 60 feet for all runs.

60 feet. The sonar signals consisted of 150 msec pulses at a frequency of 3.5 KHz. Operating conditions are specified in Table 3-1.

Test instrumentation located on board the BLUEGILL consisted of a two-channel Ampex A. M. (direct) tape recorder. One channel was used to record the signal received by a single hydrophone of the BLUEGILL's sonar array; the other channel was used as a voice channel.

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Test instrumentation on board the PERMIT (source ship) consisted of a 14-channel Precision Instrument F.M. tape recorder. Three of the channels were used to monitor a single MASSA hydrophone located on the sail 50 feet from the center of the BQS-6 sphere. The three channels recorded the same signal at three different amplifications in order to extend the dynamic range of the recording system. A fourth channel was used as a voice channel and the other ten were used to record signals unrelated to this experiment. Approximately 6-1/2 minutes of data were collected at each range.

Upon return to the laboratory, the signals recorded on both ships were played back, using the same machines on which they were recorded, and processed using a TR-48 analog computer. A block diagram of the computer program is shown in Figure 3-2. As indicated in Figure 3-2, the signals were processed to obtain the power envelope, the sum of the areas of all power envelopes, and the sum of the areas of the log of each power envelope. Each of these quantities was recorded on a Sanborn strip chart recorder. The peak amplitudes of the power envelope and log of the power envelope of each ping, i.e., instantaneous peak power, received on the BLUEGILL were read from the strip chart and used to calculate the mean and variance of the received signal (Figure 3-3). A similar calculation was made for the pings received by the MASSA hydrophone located on the PERMIT. This gave a measure of the variance of the transmitted signal. In addition to calculating the mean instantaneous peak power of the signals received on the BLUEGILL, the mean power of each ping was calculated by dividing the sum of power contained in all pings by the number of pings times the length of each ping. This was done for both the actual power and the log of the power in order to convert the power to dbv.

The analysis of the signals as received on the BLUEGILL is summarized in Figure 3-4.

The variance at 5400 yards is four times greater than that at 10,000 yards, while at the same time the mean power is 2 dbv less, or about 63% of the mean power at 10,000 yards. A similar analysis of the signals received by the MASSA hydrophone located on the PERMIT indicated that the signal level was constant to within ± 0.05 dbv of the mean value for all pings (both 5400- and 10,000-yard ranges). Since the transmitted signal was constant, it is apparent that the variation in the received signal was introduced by the environment. (A direct comparison of the power received on the BLUEGILL and the power transmitted by the PERMIT is not possible because of the different recording techniques and hydrophones used.)

WIDEBAND MEASUREMENTS (PASSIVE SONAR)

The test geometry for the wideband measurements was identical with that used for the single-frequency measurements. The two ships were moving on parallel courses at constant speed (five knots) at each of the two ranges. The wideband

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noise source was simply a snorkeling submarine (BLUEGILL) and the receiver consisted of the passive section of the BQS-6 sonar aboard the PERMIT. The received signal was filtered for the 1-2 KHz band.

Instrumentation for the wideband measurements was located entirely on board the PERMIT. It consisted of two TR-10 analog computers and the SUBIC At-Sea DDP-24 digital computer and associated peripheral equipment. The analog computers were used to obtain the signal-to-noise ratio because a recording of the received signal alone would be difficult to obtain due to masking by the ambient noise field.

The analog computers accepted signals from the right half and left half of the BDI loop of the BQS-6 sonar set, processed them, and fed them to the digital computer where the analog-processed signals were further processed to obtain signal-to-noise ratio. The digital computer also accepted information from the ship's sensors, such as target bearing, course, and speed (Figure 3-5). All of this information was averaged for about 2.5 seconds, and the average value of each quantity during this time was punched on paper tape. Approximately 20 minutes of data were taken at each range.

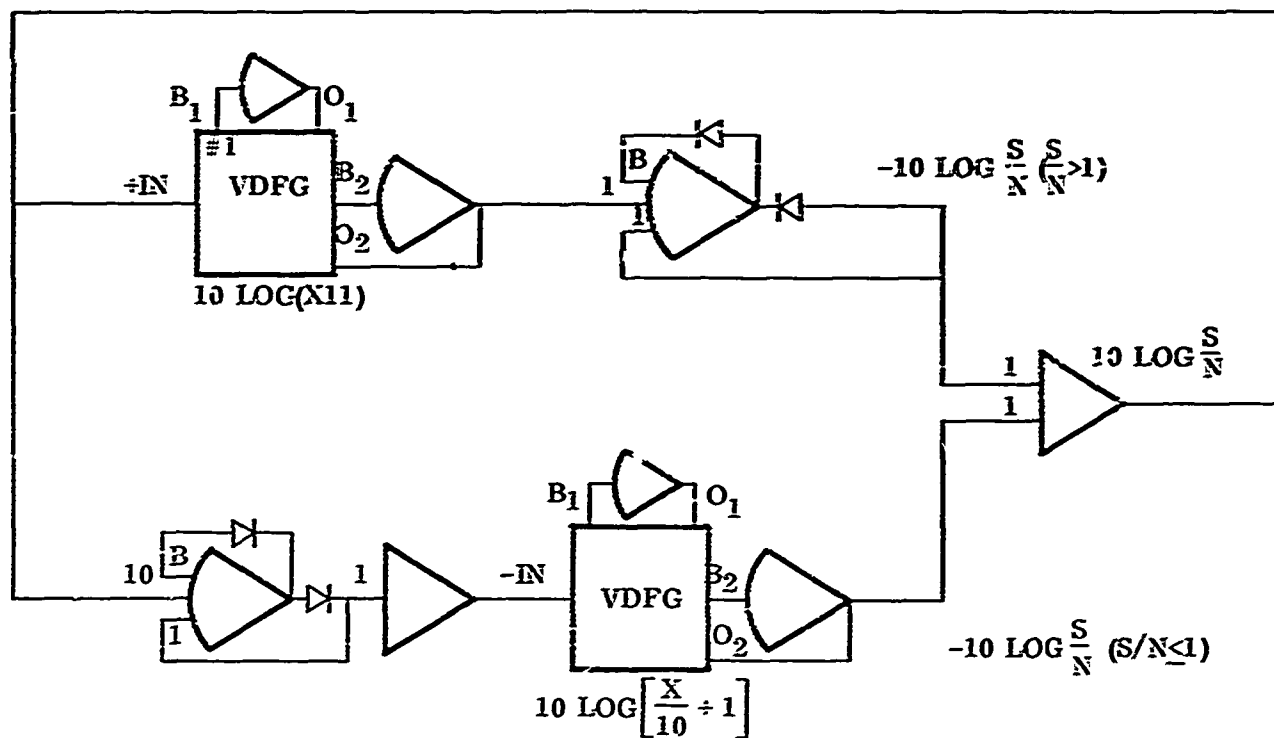
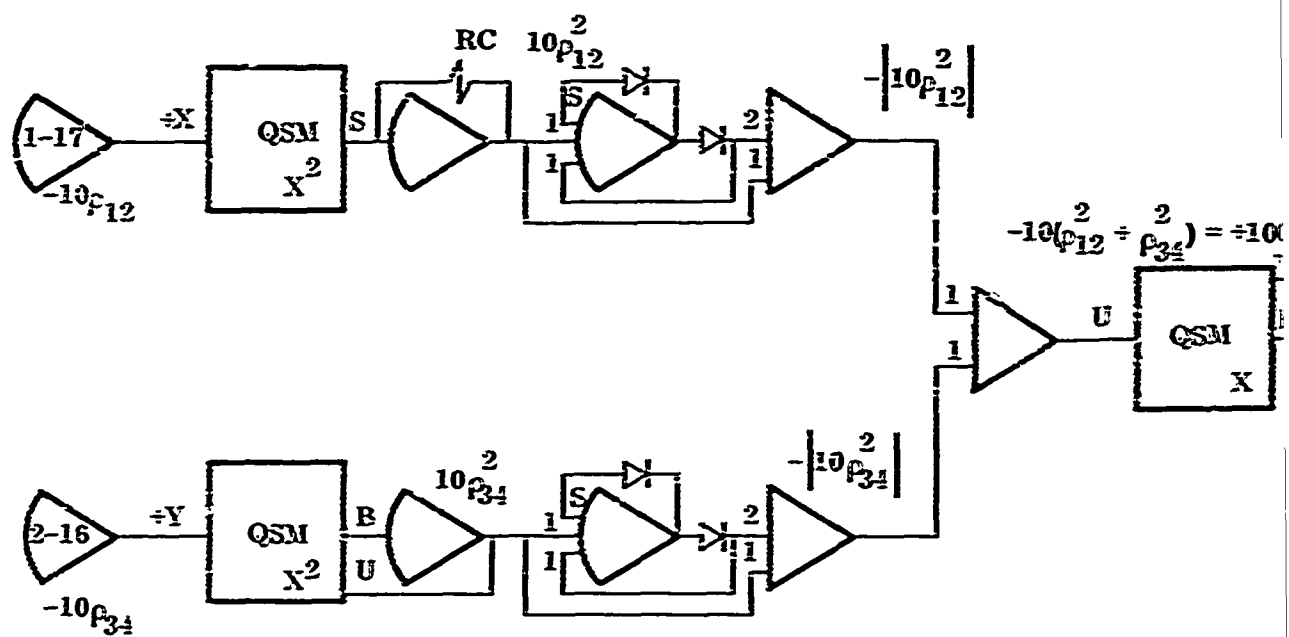
Upon return to the laboratory, the data tapes were printed in hard copy by the computer's typewriter. In addition, the mean, variance, autocorrelation functions for different lag times, and power spectrum of each of the recorded quantities was computed by the DDP-24 (see Section IV). A summary of the mean and variance of the signal-to-noise data is given in Figure 3-4.

At each range during the wideband noise measurements the BLUEGILL (noise source) was moving at constant speed, depth, and course and maintained the same position in relation to the PERMIT. During this portion of the experiment the BQS-6 sonar was in ATF mode. The PERMIT was also moving at constant course, speed and depth. Therefore, it may be reasonably assumed that the self-noise of each of the submarines, and the directivity index of the BLUEGILL relative to the PERMIT, remained constant during the experiment and that all variations in the signal (and, hence, signal-to-noise) were introduced by the environment.

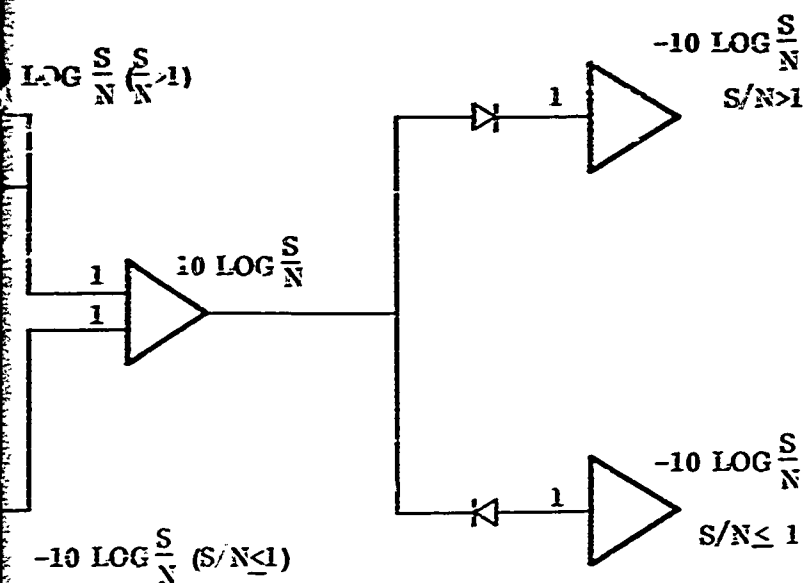
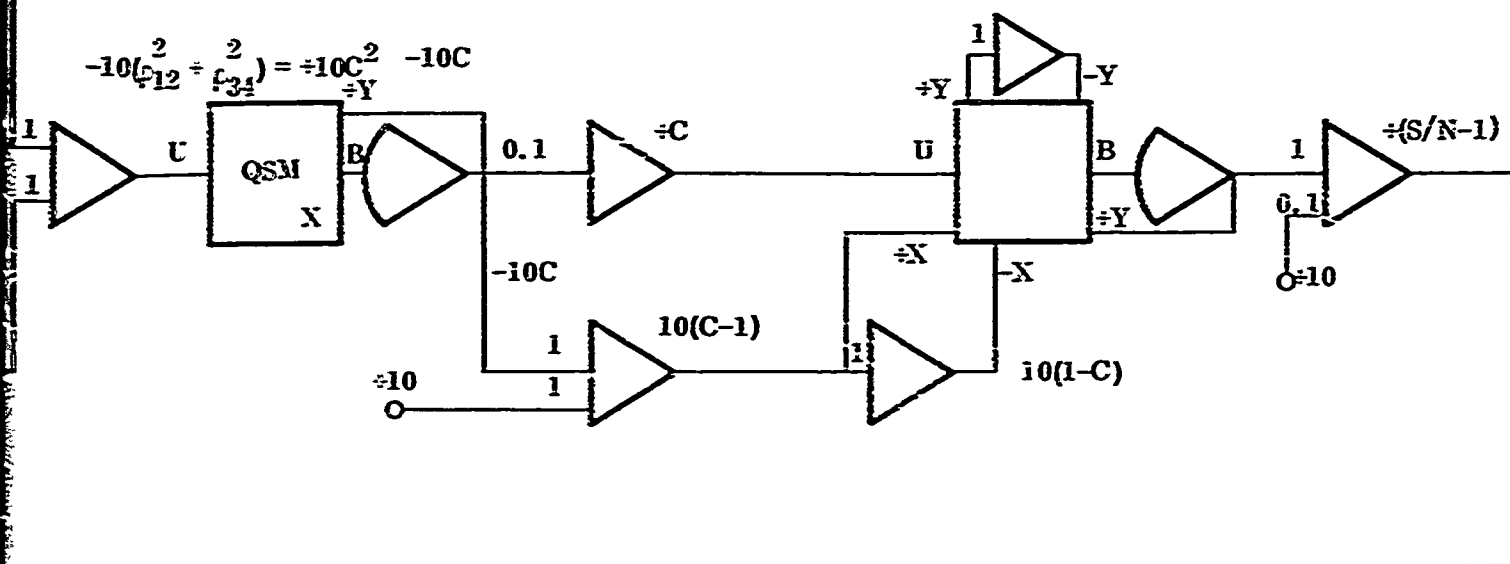
COMPARISON OF WIDEBAND AND SINGLE-FREQUENCY MEASUREMENTS WITH RAY TRACE PREDICTIONS

Description of Operational Ray Trace Program Through Internal Wave Fields

The ray trace program used for propagation loss computations can consider a particular class of sound velocity profiles which vary with range as well as depth. The class of variations includes a model of the perturbations to the



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Figure 3-2 TR-48 Computer Program for S/N

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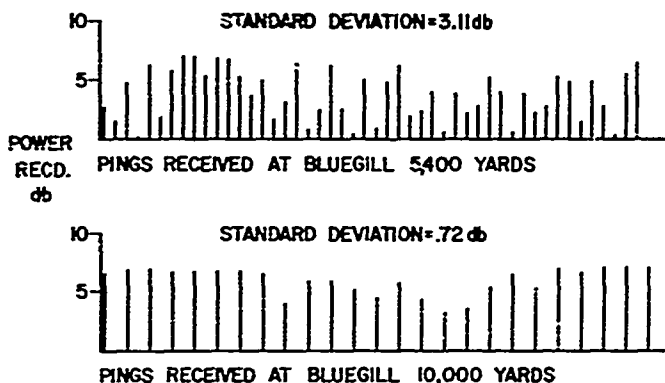


Figure 3-3 Time Series Record of Pings Received at BLUEGILL

		<u>ACTIVE</u>	<u>PASSIVE</u>
5.4 K YARDS	<u>VARIANCE</u>	6.22 (db) ²	6.62 (db) ²
	<u>MEAN</u>	5.91 db	-4.47 db
10 K YARDS	<u>VARIANCE</u>	1.44 (db) ²	-5.85 (db) ²
	<u>MEAN</u>	7.84 db	-5.47 db

Figure 3-4 Comparison of Active and Passive One-Way Transmission Loss Data

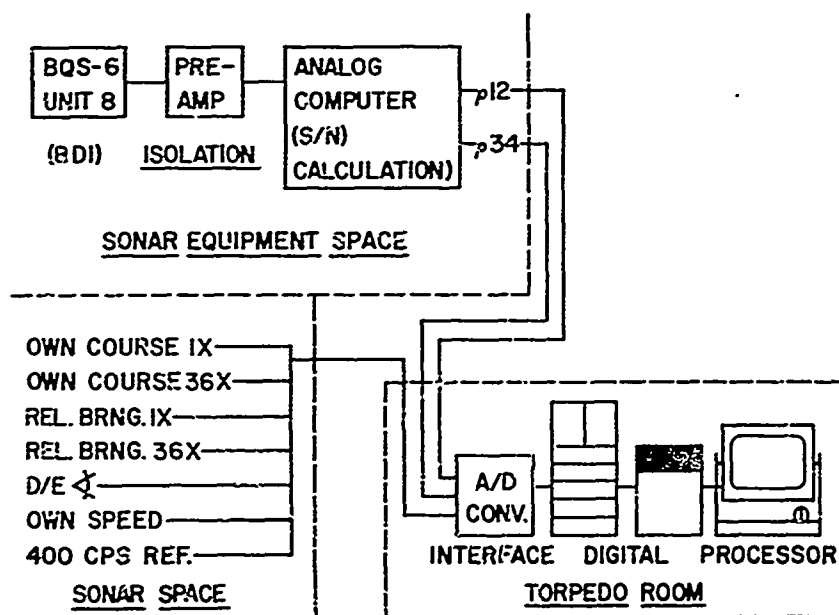


Figure 3-5 PERMIT Installation Block Diagram

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profile normally associated with the presence of internal waves in the thermocline. The usual ray tracing program traces a ray through layers of constant sound velocity gradient. As a layer is defined by parallel lines, the velocity profile is implied to be stationary over the range of interest. This is a convenient oversimplification and one which, in the region of a thermocline particularly, is often incorrect. The existence of an internal wave field in the region of the thermocline, a phenomenon which has been repeatedly documented directly by thermistor chain measurements and indirectly suggested by acoustic measurements, disturbs the layer representation. The extension to ray trace being discussed purports to model this range dependent disturbance after the layer model.

Operationally, we will define the thermocline as a region of relatively sharply decreasing temperature. In many areas of interest in the ocean this occurs once or twice within a thousand or so feet of the surface; termed the permanent and the seasonal thermocline, these regions are capable of sustaining complex (water) wave motions called internal waves. As a result of this internal disturbance, a systematic change in sound velocity with range is set up which is, however, strongly confined to the strata defined by the thermoclines.

A simplified model of this variation was suggested by Lee^{2,3} when he considered the stratum of a thermocline to be a sinusoidally bounded region of constant sound velocity gradient (Figure 3-6). We have adopted this technique with the exception that the program can easily be extended to consider a sum of sinusoids to represent the boundaries, that is, a finite Fourier representation can be made of any periodic boundary. The final model will then consist of N "layers," each with its own velocity gradient. N-3 of these are layers in the full sense of the word. The two layers bounding the thermocline have only one boundary parallel to the surface and the last, the thermocline, has prescribed periodic boundaries. By necessity, given the N gradients and one boundary of the thermocline, the second boundary is not arbitrary. Instead, it is calculated by fulfilling the condition that at some depth below the thermocline, the medium, and therefore the sound velocity profile, is undisturbed.

To trace through the thermocline we have to return to the basic eikonal equations, as the literature is concerned almost entirely with layered media. The basis of calculations using a single velocity profile at all ranges, the ray constant, is no longer valid. On the other hand, the internal wave field in the thermocline is quantitatively only responsible for a perturbation on the ray paths and, therefore, the trajectory can still be thought of (to a good approximation) as continuous circular arcs. The radius of curvature at each point in space, directly derived from the eikonal equations, assuming cylindrical symmetry, is:

$$\frac{d\theta}{ds} = \sin\theta \frac{\partial c}{\partial r} - \cos\theta \frac{\partial c}{\partial z},$$

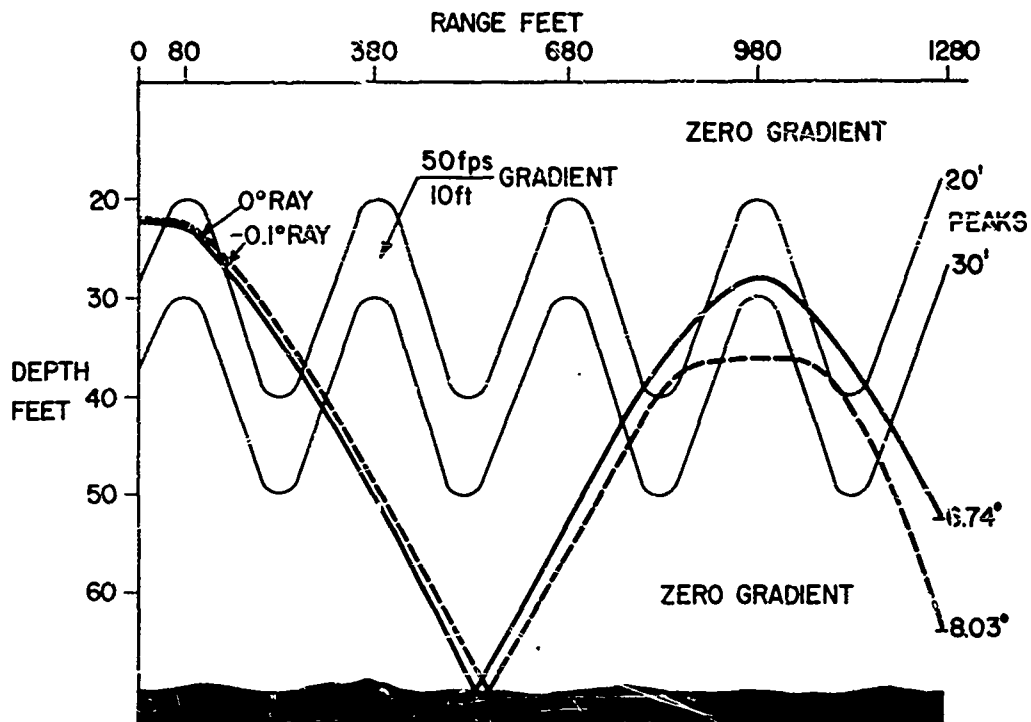


Figure 3-6 Model of Internal Wave

where θ is the angle the ray makes to the horizontal at the point (r, z) , c is the speed of sound at that point, and s is the arc length along the ray to that point. By taking finite arc steps and calculating a new curvature at the end of each step, a differential approximation to the exact trajectory is achieved. The resulting program has been found to yield results numerically equivalent to Lee's study despite the fact that he used a very different approach to trace the rays and then an independent method of calculating energy.

The perturbation to the ray paths can be visualized as follows: the effect of a region of negative gradient is to bend rays towards the minimum velocity. The rate of bending (curvature) depends on the amplitude of the vector product $\frac{d\mathbf{r}}{ds} \times \nabla c$, and the amount of bending brings into consideration the total arc length required to pass through the region. In the case of an undisturbed layer, $\text{grad } c$ is always downward and the grazing angle to the layer, $\frac{dx}{ds}$, which is a monotonic function over a range of adjacent rays, requires that both the rate and the amount of bending will be monotonic over such a range. When the layer is disturbed, the direction of ∇c varies so that the local grazing angle and the arc length to pass

through the region are no longer a function of $\frac{dx}{ds}$ alone, and the range of incoming rays over which monotonic bending applies is restricted by the scale of the disturbance. Over a characteristic wavelength of the disturbance, differential bending can occur for bundles of adjacent rays. This convergence and divergence of ray paths will result in corresponding changes in the sound intensity beyond the disturbed layer.

The ray trace program described above was used in an attempt to predict transmission loss and signal variance at the ranges of interest (5400 and 10,000 yards). The SVP taken immediately prior to the 5400-yard measurement (SVP #4) was used as a base, with a sinusoidal perturbation inserted having an amplitude of 50 feet, based on results of the environmental survey, and a mean depth of 200 feet. The source was placed at 50 feet, corresponding to the depth of the BLUEGILL. Energy was calculated at 100-yard intervals at a depth of 150 feet, corresponding to the depth of the PERMIT.

Wavelengths (for internal waves) of 3000, 5000, and 9000 yards were chosen from the results of the autocorrelation analysis. The average decay time (to zero) of the autocorrelation function of S/N is approximately 150 seconds at 5 knots. When this is translated to distance, a result of

$$150 \text{ sec} \times \frac{5 \text{ N.M.}}{1 \text{ hour}} \times \frac{1 \text{ hour}}{3600 \text{ sec}} \times \frac{2000 \text{ yds}}{1 \text{ N.M.}} = \frac{15000 \text{ yards}}{36} = 420 \text{ yards}$$

is obtained. Recalling that the autocorrelation function of a sinusoid is another sinusoid of the same frequency, it is evident that the time required for such an autocorrelation function to decay to zero is equal to one-fourth the period (or one-fourth the wavelength). On the basis of the foregoing, the disturbance which caused the observed modulation of the S/N ratio and of the active signal must have dimensions of approximately 1700 yards. However, the disturbance is not a perfect sinusoid and, therefore, it is felt that this dimension simply represents the order of magnitude of the disturbance size.

The sinusoidal internal waves defined by the above parameters were moved past the sound source in 30° phase increments, yielding 12 values for energy at each range. These 12 values at the ranges of interest were then averaged to obtain the mean value of predicted transmission loss at that range, and also were used to obtain an estimate of the variance. The values of the mean and variances for each wavelength were plotted and may be found in Figures 3-7, 3-8, and 3-9. Figure 3-10 presents a summary of the predicted mean and variance of the transmission loss at the ranges of interest.

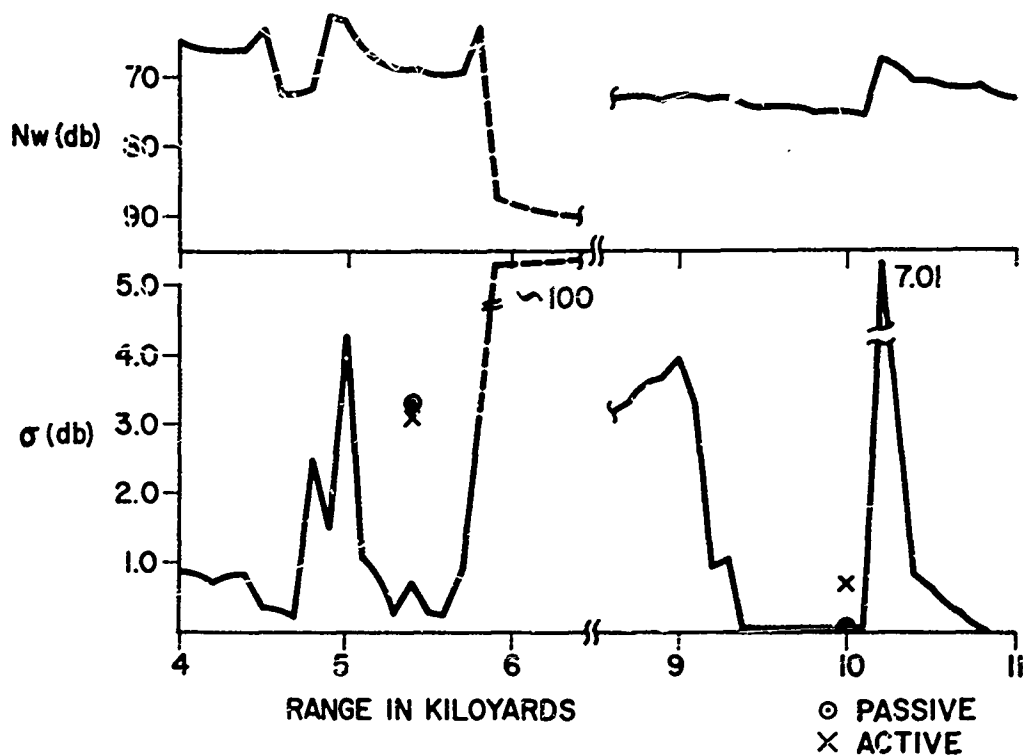


Figure 3-7 Predicted N_w and σ ($\lambda = 3K$ YDS)

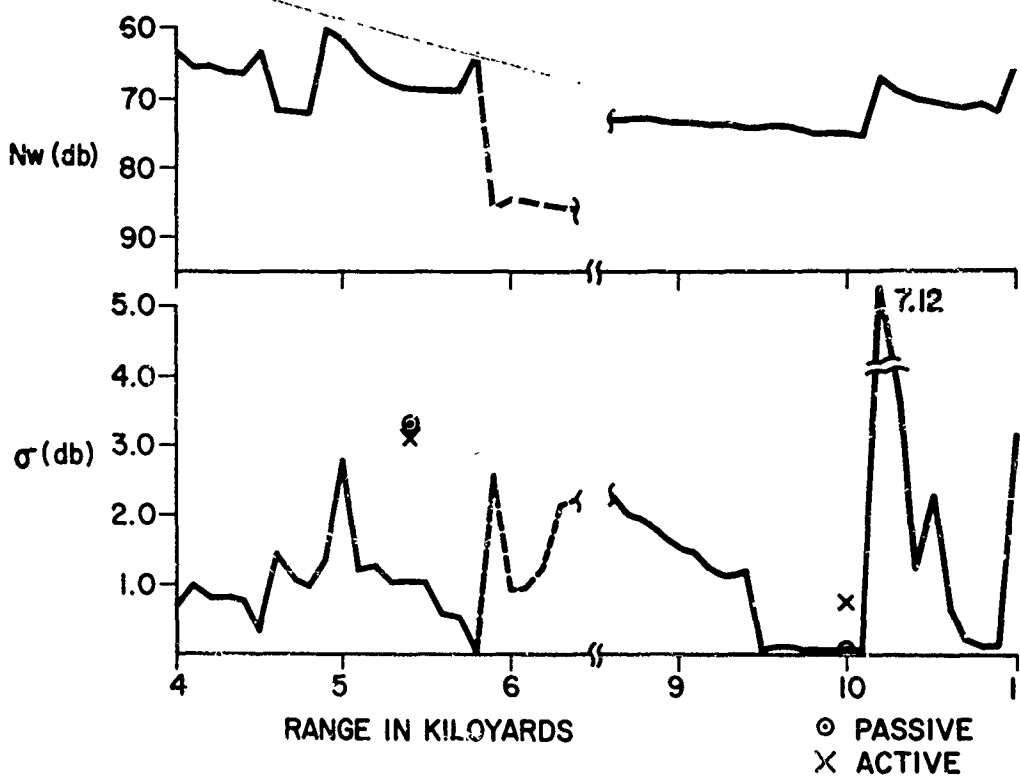


Figure 3-8 Predicted N_w and σ ($\lambda = 5K$ YDS)

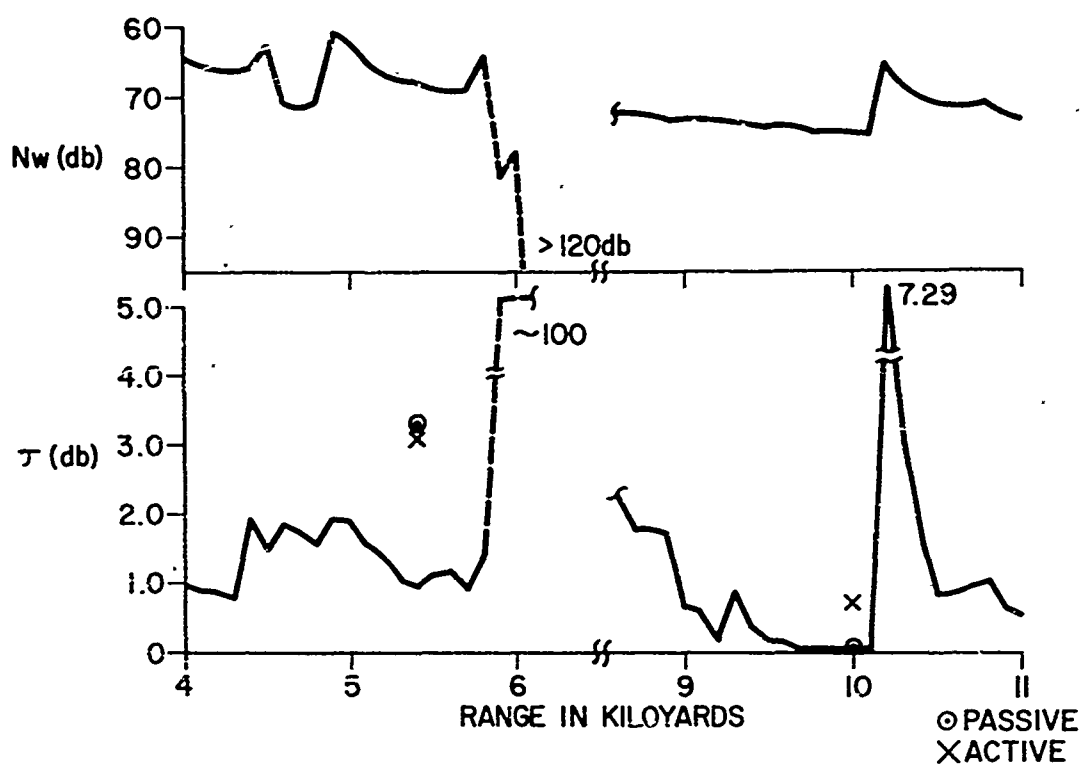


Figure 3-9 Predicted N_w and σ ($\lambda = 9K$ YDS)

λ	RANGE	5.3K	5.4K	5.5K	9.9K	10.0K	10.1K
3K	MEAN (db)	68.68	68.94	69.60	75.20	75.20	75.60
	VAR.	0.06	2.48	0.09	0	0	0
5K	MEAN (db)	68.84	68.99	69.32	75.20	75.20	75.60
	VAR.	1.16	1.06	0.32	0	0	0
9K	MEAN (db)	65.67	67.76	68.67	75.20	75.20	75.20
	VAR.	1.29	0.95	1.17	0	0	0

Figure 3-10 Predicted mean and variance

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From Figures 3-7, 3-8, and 3-9, the mean and variance of the transmission loss are, in general, independent of the wavelengths of the internal wave chosen. Also, in the range 5300 to 5500 yards, there is a moderate variation predicted in the signal strength, whereas in the neighborhood of 10,000 yards, the variation predicted is zero. Referring to Figure 3-4, this prediction agrees favorably with results obtained for both the wideband and single-frequency measurements discussed in the preceding sections. It is emphasized that both ships were in the surface channel, i. e., above the internal waves, and there is still a noticeable effect on the signal strength.

The physical explanation for the higher variance at 5400 yards may perhaps be most easily seen by referring to Figure 3-11. This figure shows a simplified ray diagram, indicating the positions of the PERMIT at 5400 and 10,000 yards. The calculation was based on the sound velocity profile taken immediately before the 5400-yard test, and was done without any internal wave representation being included. It may be seen that, at a range of 5400 yards and a depth of 150 ± 5 feet, the PERMIT was at the edge of the ensonified region. By contrast, at a range of 10,000 yards and a depth of 150 ± 5 feet, the PERMIT was in the middle of the acoustic field. Under these conditions, a small disturbance to the depth of the thermocline would have a major effect on the acoustic energy at the 5400-yard range, while it would have a minor (if any) effect on the acoustic energy at 10,000 yards.

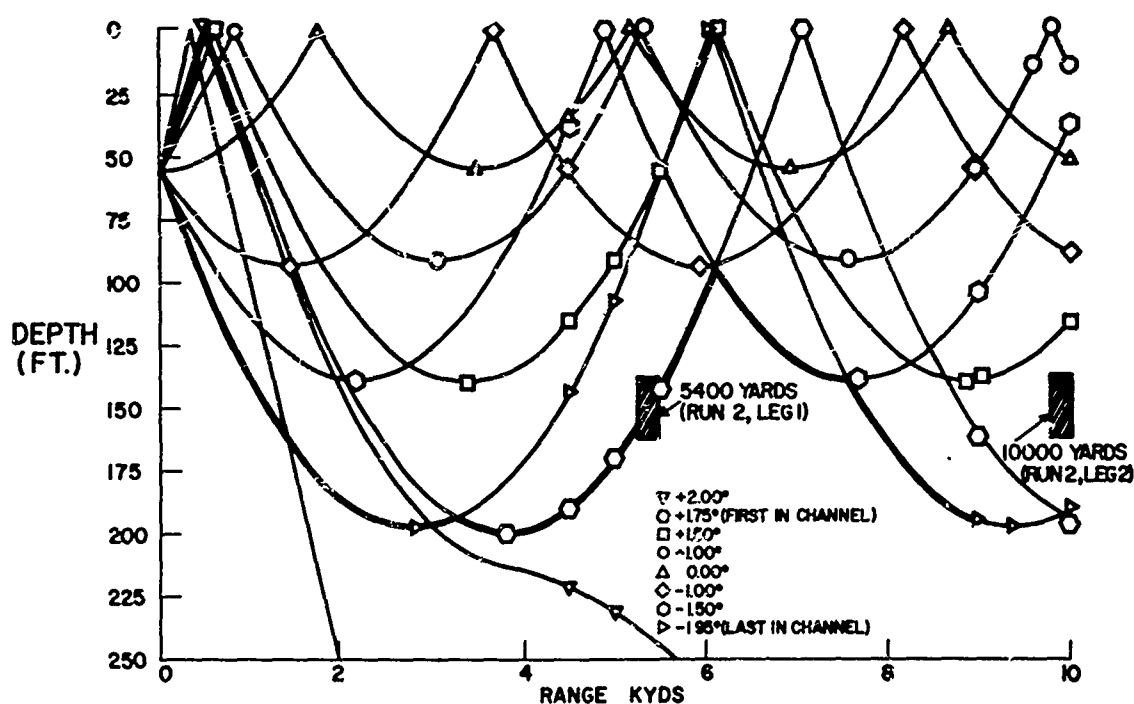


Figure 3-11 Position of PERMIT Relative to Predicted Acoustic Field,
Run 2, Legs 1 and 2

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It may be argued that the observed variance might also be due to the influence of surface fluctuations, causing the surface-reflected rays to deviate from specular reflection from an ideal flat surface. At the time of the test, surface conditions observed were 9- to 10-second swells. Therefore, it may be expected that this period would show up as a strong component in the S/N power spectrum if the surface were affecting the signal in the 1 to 2 KHz band. An estimation of the spectrum, calculated by the DDP-24 computer, does not show any peak in the 1 Hz region for either the 5400- or 10,000-yard ranges. It is therefore concluded that the surface fluctuations did not have an important effect in the 1 to 2 KHz band.

Referring again to Figure 3-4 for the wideband measurements, the mean value of energy at 10,000 yards dropped to about 63% of the value that it had at 5400 yards, or a drop of about 2 db. At the same time, the mean value of energy at 10,000 yards for the single-frequency measurements increased by about 2 db over the value at 5400 yards. These results, which at first may seem contradictory, are not inconsistent with the data.

If we let:

S_1 = mean value of single-frequency signal at 5400 yards

S_2 = mean value of single-frequency signal at 10000 yards

S_3 = mean value of wideband frequency signal at 5400 yards

S_4 = mean value of wideband frequency signal at 10000 yards

N_1 = noise (broadband)

N_2 = noise (single frequency)

C = amplification factor for single-frequency signals

We may now obtain the following independent equations.

$$\frac{S_3}{N_2} = 4.30 \quad (1)$$

$$\frac{S_4}{N_2} = 2.66 \quad (2)$$

$$(S_1 + N_1) = 3.90C \quad (3)$$

$$(S_2 + N_1) = 3.00C \quad (4)$$

It is evident that these are six unknowns (C is a parameter) and only four independent equations. In order to obtain unambiguous results, it is necessary to know either $S_3 + N_2$ and $S_4 + N_2$ or $\frac{S_1}{N_1}$ and $\frac{S_2}{N_1}$. This would yield six independent expressions from which it would be possible to determine all of the unknown quantities.

The present ray trace program considers the signal as a broadband one, treating all frequencies with equal weight. Referring to Figure 3-10, it is seen that the predicted result[†] is a loss of about 7 db between the 5400-yard and the 10,000-yard ranges. This corresponds, qualitatively, to the experimental observations in the wideband case where there was a loss of about 2 db. The difference between the predicted and observed transmission loss for the single-frequency measurements may be explained by several different phenomena. First, phase interference at 5400 yards, phase reinforcement at 10,000 yards, or a combination of both may account for the discrepancy. Second, the assumption of a constant noise field at both ranges may not have been correct. This would also possibly account for the discrepancy in the magnitude of the predicted and observed transmission loss between the two ranges. There are, in addition, many other factors which may contribute to this difference, some of which may be completely unknown to us.

IV

AUTOCORRELATION RESULTS

INTRODUCTION

Part of the analysis of the S/N data performed after returning to the laboratory consisted of obtaining the autocorrelation of the data about its least-square fit line as a function of lag time. This was done using the DDP-24 computer with a special data reduction program. This program displays the raw data (S/N, bearing, course, speed, or D/E angle) in blocks of up to 100 data points at one time. Sections of up to 1000 data points, on consecutive scope displays, may then be selected by the light pen for statistical analysis.

The statistical analysis section of the program computes the least-square fit, mean, and variance of the selected data. These quantities are then used to compute the autocorrelation about either the mean or the least-square fit line, which is then displayed on the scope. The values may then be printed by the typewriter, the power spectrum of the data may be computed and displayed (and printed, if desired), or the computer may be instructed to return to data inspection. All of these alternatives are selected by means of the light pen. Typical scope displays generated by this program are illustrated in Figures 4-1 through 4-7.

The form of the autocorrelation function about its mean suggests that it consists of two statistically unrelated components. Thus, for a stationary random function of time, $f(t)$, which can be written as

$$f(t) = f_1(t) + f_2(t)$$

$$\text{when } \frac{\langle f_1 f_2 \rangle}{\langle f_1^2 \rangle} \ll 1$$

$$\text{and } \frac{\langle f_1 f_2 \rangle}{\langle f_2^2 \rangle} \ll 1,$$

$$\text{then } \langle f^2 \rangle \approx \langle f_1^2 \rangle + \langle f_2^2 \rangle$$

$$\text{Here, } S/N = 10 \log_{10} S - 10 \log_{10} N$$

$$\text{and } f(t) = S/N - \langle S/N \rangle$$

$$= 10 \log_{10} S - 10 \log_{10} N - \langle 10 \log_{10} S - 10 \log_{10} N \rangle$$

$$= 10 (\log_{10} S - \langle \log_{10} S \rangle) - 10 (\log_{10} N - \langle \log_{10} N \rangle)$$

Suppose that both the signal and the noise are random, and, furthermore, that the correlation between the two is negligible. In this case, the "signal" is the noise radiated from the target ship as it appears at the position of the listening ship. It therefore includes any distortions introduced by the environment. The "noise" in this case is all other information received by the sonar system coming from the same direction as the target. We can then interpret the autocorrelation as the sum of two independent autocorrelations, related to the noise and signal terms. For convenience, these two independent functions have been termed the high- and low-frequency components of the autocorrelation, respectively.

The high-frequency component of the autocorrelation then is a measure of the variation in the noise, while the low-frequency component is a measure of the variation in the signal, induced by its passage through the medium. The lag time at which the autocorrelation crosses the zero axis is the time shift necessary for the signal and the time-shifted signal to become completely uncorrelated.

If the signal is thought of as a pure sinusoid, its autocorrelation would be zero when the two components are out of phase by $\pi/2$. Thus, as an approximation, it may be said that the time at which the autocorrelation crosses zero is equal to one-fourth of the period. If it is assumed that the signal is constant and is modulated by its passage through the medium, then the phenomenon causing the modulation has a period of approximately 600 seconds. If the ship's speed is taken into account, then this phenomenon has a spatial component of approximately

$$\begin{aligned} & 5 \text{ knots} \times \frac{6080 \text{ ft/hour}}{1 \text{ knot}} \times \frac{1 \text{ hour}}{3600 \text{ sec}} \times 600 \text{ sec} \\ & = 5000 \text{ feet} = 1700 \text{ yards} \end{aligned}$$

Because the signal we are dealing with is not a pure sinusoid, it is felt that this only gives an indication of the order of magnitude rather than an absolute measure of the size of the phenomenon (internal waves?) causing the modulation. This figure was used as a basis for the internal wave models described in the previous section.



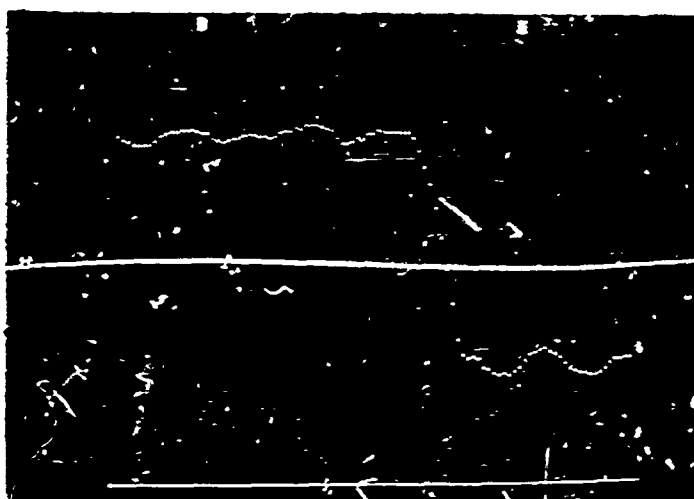
BEARING (AFT IN)
 RUN2 LEG2
 10,000 YARDS
 EACH POINT = 2.5 SEC
 293°

Figure 4-1 Typical DDP-24
 Scope Display of Bearing



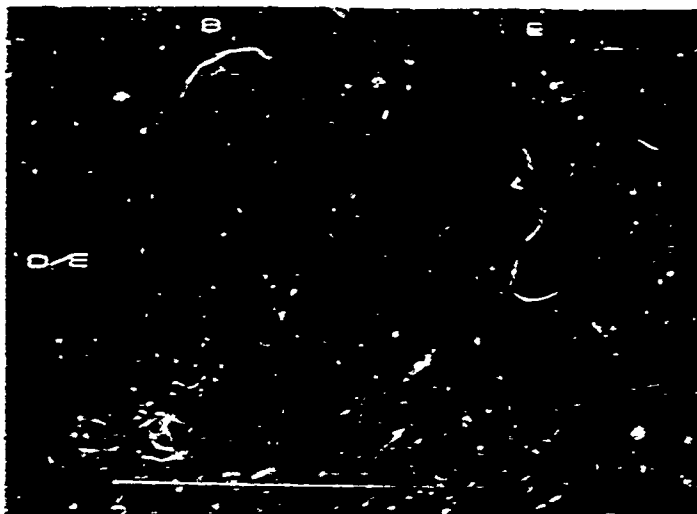
SPEED (SLOWING FROM
 12 TO 5KTS)
 RUN2 LEG1
 5000 YARDS
 EACH POINT = 2.5 SEC

Figure 4-2 Typical DDP-24
 Scope Display of Speed



COURSE (SHOWING 20° TURN)
 220°
 RUN2 LEG2
 10,000 YARDS
 EACH POINT = 7.5 SEC
 200°

Figure 4-3 Typical DDP-24
 Scope Display of Course



D/E ANGLE

**RUN 1 LEG 4
40,000 YARDS
(MANUAL-SEARCHING)
EACH POINT = 2.5 SEC**

**Figure 4-4 Typical DDP-24
Scope Display of D/E Angle**



S/N

**RUN 3 LEG 1
5000 YARDS
(ATF IN - S/N=+3)
EACH POINT = 2.5 SEC**

**Figure 4-5 Typical DDP-24
Scope Display of S/N**

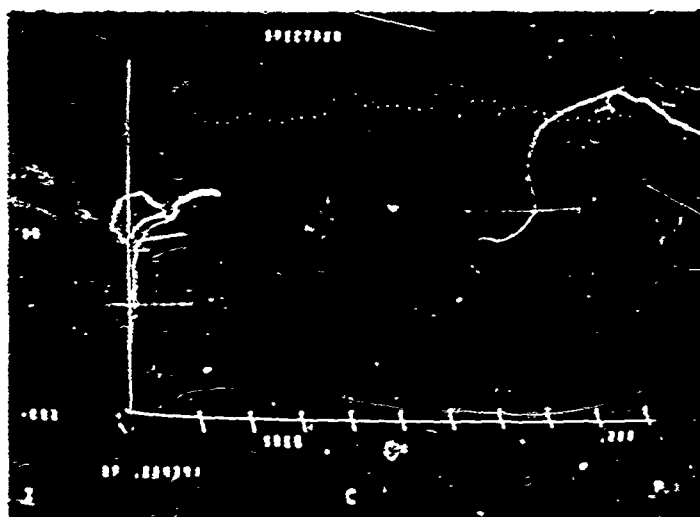


AUTOCORRELATION OF
SIGNAL - TO - NOISE

RUN 3 LEG 1
5000 YARDS
MAXIMUM LAG=42 SEC

TOTAL SAMPLE IS 420 SECONDS

Figure 4-6 Typical DDP-24
Scope Display of Autocorrelation
of S/N



SPECTRUM OF S/N

RUN 2 LEG 1
5000 YARDS

Figure 4-7 Typical DDP-24
Scope Display of Spectrum of S/N

The high- and low-frequency components of the total variance, as determined by autocorrelation analysis, were found to exhibit an interesting effect when examined as a function of range (Figure 4-8). It may be seen from the figure

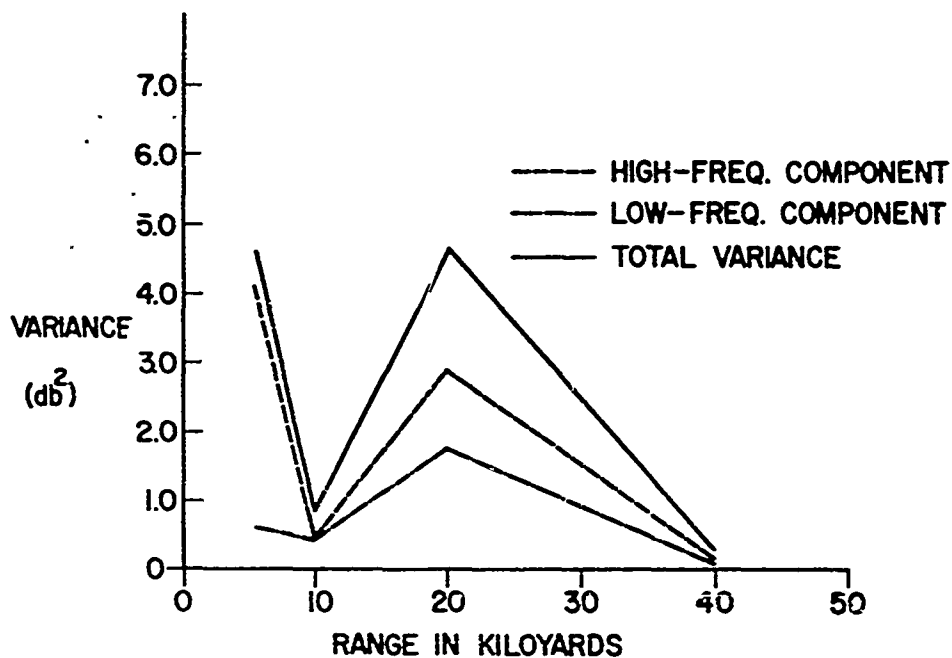


Figure 4-8 Variance of S/N vs. Range

that the two components of variance seem to be related through some sort of feedback loop. When one of these components decreases, the other decreases, and vice versa. This suggests that at least some of the "noise" (high-frequency component) is induced by the system itself and that a high signal variance seems to amplify the system variance. This effect should be studied in more detail, and could lead to an improved sonar capability.

The complete results of the autocorrelation analysis are given in Appendix B.

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V

CONCLUSIONS AND RECOMMENDATIONS FOR FUTURE WORK

Although a detailed study of the area was made beforehand by examination of records of the Navy and the Hydrographic Office, it required the presence of the oceanographic sensors to delineate the conditions on a rough scale. The combination of the B.T.'s, SVP's, and IRT's determined some of the general characteristics of the area.

This survey, however, was far from sufficient to determine the fine structure of the oceanographic conditions in the area in terms of providing all of the data necessary for an absolute calibration of the tactical propagation models under test. The survey was sufficient to show that the inhomogeneities in the surface channel and the overall structure did exist, and that these were of sufficient magnitude to cause variances in the signal detected by the sonar system employed. These variances, moreover, affected the tactical operation of both the sonar system and the submarine.

The results of the acoustic experiment showed that the SUBIC at-sea ray trace was applicable to active signals as well as to passive signals in predicting average transmission loss terms. In addition, an internal wave ray trace model, programmed on a UNIVAC 1107 computer, explained some of the variance in the S/N as detected by the submarine sonar system. It is important to emphasize that these variances can exist even at ranges as close as 5000 yards and that they are highly dependent on both the overall shape of the SVP and on its spatial and temporal stability.

In order to more effectively utilize the existing sonar system, better and more frequent, and perhaps continuous, sampling of the environment is essential. This will enable accurate predictions of sonar conditions and facilitate passive ranging, either by D/E tracking (from deep convergence zone only), shadow zone (circle chart) tracking⁴, or variance tracking (described below). One suggested method of sampling the environment is described in the following paragraph.

When the submarine arrives in its operating area, it should take a sound velocity profile from the surface to its full depth capability. Based upon this SVP, it chooses the best listening depth and cruises at this depth, taking continuous sound velocity measurements. When the velocity changes by a predetermined amount (ΔV), then a new SVP would be taken. The ΔV would be based upon the environmental history of the area, the time of year, the depth at which the submarine is operating, and possibly other factors. In this way, the submarine may obtain the most up-to-date picture of the environment without interfering with normal ship operations.

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For the first time during a SUBIC at-sea test with the DDP-24 computer system, the D/E angle of the sonar system was monitored. Results of this test showed that the vertical beamwidth (13°) of the BQS-6 sonar system was too wide to permit automatic D/E tracking for operation in the surface channel. It is suggested, therefore, that future sonar designs have provision for a narrow vertical beamwidth for tracking, as well as a wide one for search operations.

As a result of the PERMIT experiment, it appears that a passive ranging technique based upon the variance in the signal-to-noise ratio may be feasible. This technique would require an at-sea computer which would be utilized to predict the signal variance at different ranges, as described in Section III. The observed variance of an incoming signal could be measured at several different own-ship depths and compared with the prediction made for these depths. Ideally, there would only be one solution which satisfies all the necessary conditions. Even if this were not so, however, this process would yield additional information which, when combined with circle chart and D/E angle methods, will yield a unique range and depth solution. It is suggested that this procedure be tested on future at-sea experiments.

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APPENDIX A
COMPLETE ATF DATA

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Run 2 Leg 1

BEARING IX	BEARING 36X	RELATIVE BEARING	COURSE	TRUE BEARING	SPEED	S/N	DEFL. ANGLE
0457.668	0412.627	0412.62	04159.74	04262.37	0411.066	044.448	-023.135
0457.668	0412.627	0412.62	04159.81	04262.41	0411.169	041.057	-0.396
0457.734	0412.556	0412.55	04159.86	04262.41	0411.163	043.127	-0.593
0457.778	0412.558	0412.55	04159.86	04262.41	0411.023	041.935	-0.461
0457.734	0412.563	0412.56	04159.83	04262.39	0410.773	045.524	-0.615
0457.734	0412.606	0412.60	04159.83	04262.41	0410.657	041.013	-0.527
0457.693	0412.558	0412.55	04159.87	04262.43	0410.706	046.606	-044.122
0457.693	0412.595	0412.59	04160.06	04262.45	0410.815	046.606	-029.118
0457.515	0412.324	0412.318	04160.13	04262.45	0410.878	041.170	-141.116
0457.51	0412.322	0412.32	04160.11	04262.43	0410.706	043.044	-0.701
0457.537	0412.465	0412.46	04159.94	04262.43	0410.437	041.121	-0.615
0457.581	0412.523	0412.52	04159.38	04262.43	0410.229	049.158	-0.154
0457.646	0412.483	0412.48	04159.961	04262.44	0410.309	044.042	-0259.91
0457.559	0412.381	0412.37	04160.07	04262.45	0410.485	049.158	-020.259
0457.525	0412.366	0412.36	04160.08	04262.44	0410.553	043.784	-0.659
0457.559	0412.419	0412.41	04159.99	04262.41	0410.431	041.199	-0.396
0457.633	0412.494	0412.49	04159.92	04262.41	0410.181	041.341	-0.374
0457.537	0412.457	0412.45	04159.98	04262.44	040.979	041.164	-060.095
0457.427	0412.277	0412.27	04160.20	04262.43	040.919	042.377	-0.396
0457.251	0412.116	0412.10	04160.40	04262.51	0410.199	042.479	-0.769
0457.397	0411.981	0411.98	04160.52	04262.51	0410.284	042.574	-0.615
0457.141	0411.948	0411.94	04160.55	04262.49	0410.048	042.225	-0.374
0457.053	0411.942	0411.94	04160.54	04262.49	040.747	040.772	-040.144
0457.053	0411.954	0411.95	04160.53	04262.49	040.601	042.361	-0.374
0457.353	0411.896	0411.89	04160.62	04262.52	040.729	041.370	-0.417
0456.943	0411.771	0411.76	04160.75	04262.52	040.912	041.517	-0.439
0456.833	0411.693	0411.69	04160.82	04262.51	040.875	041.712	-0.417
0456.724	0411.672	0411.67	04160.821	04262.49	040.564	043.044	-0.615
0456.76	0411.755	0411.75	04160.73	04262.485	040.324	046.653	-0259.87
0456.763	0411.786	0411.785	04160.71	04262.51	040.332	046.653	-033.332
0456.724	0411.642	0411.64	04160.884	04262.52	040.497	046.208	-0.703
0456.548	0411.451	0411.45	04161.069	04262.510	040.619	041.852	-0.571
0456.468	0411.374	0411.37	04161.11	04262.48	040.418	041.852	-0.725
0456.433	0411.373	0411.37	04161.13	04262.47	040.418	043.417	-040.166
0456.468	0411.451	0411.45	04161.021	04262.47	040.253	046.274	-0.242
0456.526	0411.519	0411.51	04160.96	04262.43	040.131	046.441	-0.242
0456.433	0411.552	0411.55	04160.94	04262.43	040.113	041.536	-0.264
0456.534	0411.561	0411.56	04160.923	04262.43	040.222	043.801	-0.154
0456.614	0411.653	0411.65	04160.82	04262.43	040.131	046.722	-0.193
0456.768	0411.850	0411.85	04160.63	04262.47	040.976		
0457.053	0412.182	0412.18	04160.38	04262.47	040.936		
0457.141	0412.186	0412.18	04160.28	04262.47	040.905		
0457.237	0412.195	0412.19	04160.27	04262.47	040.801		
0457.251	0412.265	0412.26	04160.17	04262.44	040.722		

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4437.471	81159.93	81252.37	818.643	-149	-226
4437.472	81159.92	81252.32	818.569	-149	-264
4437.473	81159.91	81252.31	818.527	-149	-225
4437.474	81159.90	81252.30	818.484	-149	-333
4437.475	81159.89	81252.29	818.362	-149	-198
4437.476	81159.88	81252.28	818.282	-149	-102
4437.477	81159.87	81252.27	818.222	-149	-193
4437.478	81159.86	81252.26	818.154	-149	-543
4437.479	81159.85	81252.25	818.037	-149	-396
4437.480	81159.84	81252.24	817.971	-149	-725
4437.481	81159.83	81252.23	817.911	-149	-747
4437.482	81159.82	81252.22	817.853	-149	-659
4437.483	81159.81	81252.21	817.797	-149	-747
4437.484	81159.80	81252.20	817.747	-149	-659
4437.485	81159.79	81252.19	817.697	-149	-637
4437.486	81159.78	81252.18	817.648	-149	-681
4437.487	81159.77	81252.17	817.593	-149	-747
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4437.492	81159.72	81252.12	817.350	-149	-769
4437.493	81159.71	81252.11	817.301	-149	-791
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4437.495	81159.69	81252.09	817.203	-149	-857
4437.496	81159.68	81252.08	817.154	-149	-857
4437.497	81159.67	81252.07	817.105	-149	-923
4437.498	81159.66	81252.06	817.056	-149	-857
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4437.500	81159.64	81252.04	816.942	-149	-857
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4437.604	81158.60	81251.00	811.014	-149	-857
4437.605	81158.59	81250.99	810.957	-149	-857
4437.606	81158.58	81250.98	810.900	-149	-857
4437.607	81158.57	81250.97	810.843	-149	-857
4437.608	81158.56	81250.96	810.786	-149	-857
4437.609	81158.55	81250.95	810.729	-149	-857
4437.610	81158.54	81250.94	810.672	-149	-857
4437.611	81158.53	81250.93	810.615	-149	-857
4437.612	81158.52	81250.92	810.558	-149	-857
4437.613	81158.51	81250.91	810.501	-149	-857
4437.614	81158.50	81250.90	810.444	-149	-857
4437.615	81158.49	81250.89	810.387	-149	-857
4437.616	81158.48	81250.88	810.330	-149	-857
4437.617	81158.47	81250.87	810.273	-149	-857
4437.618	81158.46	81250.86	810.216	-149	-857
4437.619	81158.45	81250.85	810.159	-149	-857
4437.620	81158.44	81250.84	810.102	-149	-857
4437.621	81158.43	81250.83	810.045	-149	-857
4437.622	81158.42	81250.82	809.988	-149	-857
4437.623	81158.41	81250.81	809.931	-149	-857
4437.624	81158.40	81250.80	809.874	-149	-857
4437.625	81158.39	81250.79	809.817	-149	-857
4437.626	81158.38	81250.78	809.760	-149	-857
4437.627	81158.37	81250.77	809.703	-149	-857
4437.628	81158.36	81250.76	809.646	-149	-857
4437.629	81158.35	81250.75	809.589	-149	-857
4437.630	81158.34	81250.74	809.532	-149	-857
4437.631	81158.33	81250.73	809.475	-149	-857
4437.632	81158.32	81250.72	809.418	-149	-857
4437.633	81158.31	81250.71	809.361	-149	-857
4437.634	81158.30	81250.70	809.304	-149	-857
4437.635	81158.29	81250.69	809.247	-149	-857
4437.636	81158.28	81250.68	809.190	-149	-857
4437.637	81158.27	81250.67	809.133	-149	-857
4437.638	81158.26	81250.66	809.076	-149	-857
4437.639	81158.25	81250.65	809.019	-149	-857
4437.640	81158.24	81250.64	808.962	-149	-857
4437.641	81158.23	81250.63	808.905	-149	-857
4437.642	81158.22	81250.62	808.848	-149	-857
4437.643	81158.21	81250.61	808.791	-149	-857
4437.644	81158.20	81250.6			

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6457.64J	612.08J	6J12.933	6J159.238	6J22.220	6J5.072	-07.063	-01.516
457.322	6J12.935	6J12.933	6J159.32	6J22.225	6J5.085	-0J.021	-01.472
57.778	6J12.981	6J12.982	6J159.235	6J22.226	6J4.895	-04.426	-01.516
6457.844	6J13.011	6J13.014	6J159.241	6J22.225	6J4.740	-07.292	-01.508
6457.91J	6J13.066	6J13.065	6J159.17	6J22.225	6J4.81J	-7.773	-01.508
6457.976	6J13.111	6J13.109	6J159.11	6J22.222	6J4.94J	-06.943	-01.516
6458.064	6J13.152	6J13.15J	6J159.060	6J22.221	6J4.92J	-05.686	-01.516
6458.042	6J13.105	6J13.104	6J159.01	6J22.221	6J4.797	-07.941	-01.518
6458.02J	6J13.205	6J13.203	6J159.00	6J22.202	6J4.773	-06.848	-01.516
6457.998	6J13.237	6J13.235	6J159.00	6J22.205	6J4.813	-6.088	-01.508
6458.064	6J13.181	6J13.181	6J159.04	6J22.222	6J4.834	-07.281	-01.518
6457.954	6J13.137	6J13.137	6J159.09	6J22.223	6J4.816	-04.911	-01.648
6457.998	6J13.126	6J13.126	6J159.10	6J22.222	6J4.773	-06.021	-01.518
6457.954	6J13.127	6J13.126	6J159.10	6J22.222	6J4.736	-05.527	-01.518
6457.954	6J13.053	6J13.051	6J159.21	6J22.226	6J4.797	-07.408	-01.472
6457.84J	6J12.933	6J12.931	6J159.35	6J22.223	6J4.919	-07.408	-01.508
6457.756	6J12.892	6J12.890	6J159.38	6J22.227	6J4.773	-01.000	-1.094
6457.756	6J12.891	6J12.889	6J159.37	6J22.226	6J4.602	-05.773	-01.476
6457.646	6J12.889	6J12.889	6J159.30	6J22.220	6J4.669	-07.000	-01.648
6457.559	6J12.775	6J12.774	6J159.50	6J22.223	6J4.895	-07.502	-01.516
6457.537	6J12.736	6J12.735	6J159.63	6J22.223	6J4.839	-0.031	-01.518
6457.471	6J12.704	6J12.703	6J159.63	6J22.223	6J4.796	-113.619	-01.50J
6457.433	6J12.632	6J12.631	6J159.642	6J22.223	6J4.603	-05.646	-01.472
6457.361	6J12.612	6J12.612	6J159.70	6J22.223	6J4.716	-05.638	-01.50J
6457.339	6J12.582	6J12.582	6J159.70	6J22.223	6J4.633	-02.603	-01.494
6457.330	6J12.582	6J12.582	6J159.70	6J22.223	6J4.770	-07.538	-01.494
6457.317	6J12.551	6J12.549	6J159.82	6J22.223	6J4.607	-07.508	-01.274
6457.295	6J12.528	6J12.527	6J159.86	6J22.223	6J4.490	-05.567	-01.302
6457.339	6J12.526	6J12.524	6J159.86	6J22.223	6J4.462	-07.811	-01.538
6457.273	6J12.525	6J12.524	6J159.86	6J22.223	6J4.675	-07.811	-01.428
6457.273	6J12.505	6J12.505	6J159.90	6J22.223	6J4.718	-03.029	-01.486
6457.141	6J12.41J	6J12.409	6J160.02	6J22.223	6J4.529	-07.941	-01.302
6457.141	6J12.389	6J12.387	6J160.03	6J22.223	6J4.400	-7.766	-1.45J
6457.105	6J12.429	6J12.428	6J159.96	6J22.223	6J4.505	-01.218	-01.486
6457.185	6J12.473	6J12.472	6J159.93	6J22.223	6J4.645	-07.941	-01.406
6457.207	6J12.468	6J12.466	6J159.94	6J22.223	6J4.517	-7.914	-01.472
6457.185	6J12.448	6J12.447	6J159.96	6J22.223	6J4.584	-05.757	-01.45J
6457.207	6J12.451	6J12.450	6J159.96	6J22.223	6J4.602	-03.000	-01.304
6457.141	6J12.449	6J12.447	6J159.96	6J22.223	6J4.565	-05.717	-01.472
6457.251	6J12.465	6J12.464	6J159.93	6J22.223	6J4.425	-07.623	-01.304
6457.119	6J12.486	6J12.486	6J159.98	6J22.223	6J4.456	-04.758	-01.538
6457.141	6J12.484	6J12.483	6J159.91	6J22.223	6J4.584	-07.050	-1.406
6457.237	6J12.485	6J12.483	6J159.92	6J22.223	6J4.584	-07.050	-1.406

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8457.471	8312.319	892.318	8159.541	8252.35	64.425	-01.047
8457.493	812.768	892.758	8159.541	8252.35	64.425	-02.742
8457.499	812.750	892.758	8159.57	8252.35	64.425	-03.681
8457.427	812.722	892.719	8159.67	8252.35	64.425	-04.997
8457.229	812.614	892.612	8159.77	8252.35	64.425	-05.938
8457.317	812.559	892.557	8159.82	8252.35	64.425	-06.167
8457.251	812.545	892.543	8159.84	8252.35	64.425	-07.994
8457.251	812.545	892.541	8159.84	8252.35	64.425	-08.334
8457.237	812.542	892.541	8159.84	8252.35	64.425	-09.478
8457.229	812.551	892.549	8159.82	8252.37	64.425	-10.922
8457.135	812.485	892.483	8159.93	8252.42	64.425	-11.934
8457.153	812.377	892.376	8159.16	8252.44	64.425	-12.912
8457.153	812.353	892.351	8159.16	8252.44	64.425	-13.918
8457.197	812.426	892.425	8159.97	8252.46	64.425	-14.878
8457.141	812.438	892.438	8159.91	8252.46	64.425	-15.878
8457.163	812.462	892.461	8159.14	8252.46	64.425	-16.878
8457.197	812.462	892.461	8159.14	8252.46	64.425	-17.878
8456.965	812.344	892.343	8159.09	8252.44	64.425	-18.908
8457.197	812.344	892.343	8159.09	8252.44	64.425	-19.908
8457.197	812.348	892.346	8159.13	8252.44	64.425	-20.908
8457.197	812.348	892.346	8159.13	8252.44	64.425	-21.908
8457.197	812.427	892.425	8159.97	8252.46	64.425	-22.908
8457.119	812.533	892.532	8159.86	8252.39	64.425	-23.908
8457.119	812.542	892.541	8159.87	8252.41	64.425	-24.908
8457.207	812.483	892.483	8159.94	8252.42	64.425	-25.908
8457.185	812.493	892.497	8159.96	8252.44	64.425	-26.908
8457.273	812.633	892.631	8159.73	8252.36	64.425	-27.908
8457.295	812.702	892.703	8159.65	8252.35	64.425	-28.908
8457.295	812.706	892.715	8159.64	8252.35	64.425	-29.908
8457.317	812.717	892.715	8159.65	8252.35	64.425	-30.908
8457.339	812.733	892.735	8159.65	8252.35	64.425	-31.908
8457.339	812.712	892.711	8159.64	8252.35	64.425	-32.908
8457.343	812.832	892.832	8159.52	8252.32	64.425	-33.908
8457.625	812.869	892.867	8159.43	8252.30	64.425	-34.908
8457.581	812.923	892.922	8159.37	8252.30	64.425	-35.908
8457.608	812.932	892.931	8159.36	8252.29	64.425	-36.908
8457.581	812.876	892.876	8159.45	8252.32	64.425	-37.908
8457.559	812.853	892.851	8159.46	8252.31	64.425	-38.908
8457.613	812.943	892.947	8159.52	8252.32	64.425	-39.908
8457.625	812.983	892.983	8159.28	8252.26	64.425	-40.908
8457.646	812.971	892.969	8159.32	8252.20	64.425	-41.908
8457.625	812.938	892.936	8159.35	8252.28	64.425	-42.908
8457.693	812.935	892.933	8159.35	8252.28	64.425	-43.908
8457.693	812.878	892.878	8159.44	8252.29	64.425	-44.908
8457.581	812.815	892.812	8159.51	8252.32	64.425	-45.908
8457.581	812.819	892.818	8159.43	8252.32	64.425	-46.908
8457.668	812.982	892.983				

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0457.221	0412.514	0402.571	04159.75	0252.32	044.412	-15.471	-03.867
0457.119	0412.637	0402.637	04159.67	0252.31	044.205	-07.053	-3.757
0457.217	0412.653	0402.657	04159.65	0252.31	044.235	-01.605	-03.845
0457.251	0412.662	0402.655	04159.65	0252.31	044.303	-05.062	-03.867
0457.361	0412.724	0402.661	04159.64	0252.30	044.443	-04.282	-03.757
0457.383	0412.819	0402.722	04159.56	0252.282	044.449	-02.152	-3.845
0457.443	0412.843	0402.857	04159.45	0252.26	044.333	-01.323	-3.933
0457.493	0412.843	0402.843	04159.41	0252.25	044.224	-06.141	-03.845
0457.493	0412.853	0402.853	04159.40	0252.25	044.325	-04.004	-03.823
0457.493	0412.835	0402.834	04159.35	0252.24	044.456	-02.203	-03.845
0457.493	0412.885	0402.884	04159.35	0252.24	044.308	-07.315	-03.831
0457.623	0412.896	0402.895	04159.33	0252.22	044.245	6.352	-03.845
0457.712	0413.011	0403.010	04159.189	0252.19	044.150	-1.197	-03.845
0457.696	0413.043	0403.046	04159.17	0252.216	044.327	-03.148	-03.845
0457.646	0412.930	0402.938	04159.36	0252.26	044.517	-03.039	-3.839
0457.550	0412.784	0402.782	04159.03	0252.203	044.456	-05.449	-03.867
0457.559	0412.828	0402.826	04159.39	0252.22	044.235	-05.253	-03.831
0457.734	0412.991	0402.991	04159.21	0252.23	044.121	3.488	-03.867
0457.693	0413.037	0403.035	04159.24	0252.21	044.373	-2.113	-03.845
0457.693	0412.919	0402.917	04159.33	0252.25	044.578	-07.303	-03.823
0457.646	0412.832	0402.831	04159.37	0252.25	044.498	-03.214	-03.867
0457.663	0413.034	0403.032	04159.18	0252.19	044.193	6.115	-03.867
0457.883	0413.106	0403.104	04159.01	0252.23	044.102	-03.083	-03.911
0457.822	0413.222	0403.222	04159.04	0252.22	044.447	-06.932	-03.977
0457.844	0413.069	0403.066	04159.15	0252.22	044.645	-1.167	-03.867
0457.833	0412.986	0402.985	04159.24	0252.19	044.456	-04.612	-03.823
0457.734	0413.035	0403.035	04159.16	0252.19	044.156	-04.534	-03.911
0457.954	0413.223	0403.227	04158.96	0252.19	044.126	-02.751	-03.845
0458.023	0413.239	0403.232	04158.96	0252.20	044.474	-02.543	-3.845
0457.803	0413.038	0403.038	04159.17	0252.21	044.637	-04.588	-03.911
0457.778	0412.980	0402.977	04159.23	0252.21	044.302	-04.944	-03.867
0457.344	0413.019	0403.018	04159.15	0252.17	044.192	-02.109	-03.845
0457.033	0413.035	0403.034	04159.09	0252.17	044.213	-05.725	043.911
0457.322	0413.044	0403.043	04159.16	0252.21	044.474	-07.592	-03.977
0457.646	0412.395	0402.395	04159.35	0252.25	044.572	-01.615	-03.809
0457.550	0412.785	0402.785	04159.49	0252.27	044.362	-05.953	-03.845
0457.515	0412.751	0402.749	04159.53	0252.28	044.187	-03.970	-03.845
0457.449	0412.747	0402.747	04159.54	0252.29	044.285	-01.096	-03.911
0457.493	0412.733	0402.730	04159.571	0252.30	044.468	-01.777	-03.867
0457.427	0412.659	0402.659	04159.65	0252.31	044.535	-06.091	-03.845
0457.427	0412.626	0402.626	04159.69	0252.32	044.291	-04.513	-03.867
0457.361	0412.621	0402.623	04159.711	0252.33	044.236	-05.239	-03.977
0457.339	0412.601	0402.598	04159.74	0252.33	044.352	-06.321	-03.867
0457.361	0412.582	0402.582	04159.75	0252.33	044.486	-06.274	-03.845
0457.361	0412.584	0402.582	04159.73	0252.32	044.437	-02.442	-03.831
0457.361	0412.625	0402.623	04159.67	0252.30	044.285	-03.561	-03.867
0457.449	0412.631	0402.631	04159.68	0252.31	044.279	-05.331	-03.867
0457.361	0412.609	0402.606	04159.72	0252.33	044.467	-1.037	-03.867
0457.333	0412.597	0402.595	04159.72	0252.32	044.462	-05.717	-03.889
0457.617	0412.617	0402.615	04159.67	0252.29	044.348	-3.668	-03.823
0457.646	0412.607	0402.606	04159.67	0252.29	044.348	-3.668	-03.823

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BEARING 1X	BEARING 36X	RELATIVE BEARING	COURSE	TRUE BEARING	SPEED	S/N	DEFL ANGL
0438.201	0013.531	0073.529	00219.92	00293.45	04.602	-05.547	-02.988
0438.311	0013.597	0073.597	00219.83	00293.42	04.572	-06.870	-3.010
0438.442	0013.694	0073.693	00219.71	00293.40	04.565	-07.202	-02.988
0438.618	0013.794	0073.792	00219.60	00293.43	04.596	-05.577	-02.944
0438.508	0013.842	0073.842	00219.55	00293.39	04.602	-06.185	-03.032
0438.640	0013.919	0073.919	00219.46	00293.38	04.590	-06.610	-3.032
0438.772	0014.017	0074.015	00219.35	00293.37	04.590	-05.585	-03.010
0438.753	0014.069	0074.067	00219.30	00293.37	04.602	-05.434	-02.988
0438.728	0014.131	0074.130	00219.30	00293.37	04.639	-05.509	-03.032
0438.926	0014.213	0074.213	00219.15	00293.302	04.602	-06.202	-03.032
0439.014	0014.333	0074.333	00219.04	00293.373	04.626	-05.516	-03.010
0438.992	0014.390	0074.388	00218.99	00293.38	04.626	-06.728	-03.142
0439.036	0014.385	0074.383	00218.99	00293.38	04.645	-06.246	-02.922
0438.992	0014.382	0074.380	00218.99	00293.37	04.663	-05.547	-03.054
0439.102	0014.493	0074.493	00218.87	00293.302	04.633	-05.789	-03.142
0439.211	0014.588	0074.586	00218.79	00293.38	04.639	-05.390	-3.076
0439.211	0014.570	0074.570	00218.83	00293.40	04.669	-05.593	-02.944
0439.058	0014.519	0074.517	00218.86	00293.38	04.639	-05.995	-03.032
0439.167	0014.520	0074.517	00218.85	00293.37	04.663	-05.701	-03.032
0439.014	0014.409	0074.408	00218.98	00293.39	04.694	-06.779	-03.032
0439.014	0014.276	0074.273	00219.10	00293.373	04.687	-05.494	-03.032
0438.904	0014.160	0074.158	00219.22	00293.38	04.633	-05.441	-03.032
0438.038	0014.022	0074.020	00219.364	00293.38	04.657	-05.600	-2.944
0438.596	0013.919	0073.919	00219.46	00293.38	04.675	-05.346	-02.856
0438.442	0013.817	0073.814	00219.55	00293.36	04.657	-05.379	-02.856
0438.333	0013.688	0073.688	00219.68	00293.37	04.687	-05.623	-02.856
0438.223	0013.565	0073.564	00219.83	00293.39	04.712	-05.608	-02.856
0438.201	0013.491	0073.490	00219.902	00293.39	04.706	-05.120	-2.834
0438.135	0013.478	0073.477	00219.91	00293.39	04.681	-04.818	-02.731
0438.135	0013.446	0073.444	00219.95	00293.40	04.669	-05.895	-02.731
0438.003	0013.371	0073.369	00220.04	00293.41	04.675	-05.196	-02.812
0437.915	0013.317	0073.314	00220.10	00293.415	04.718	-02.775	-02.856
0437.959	0013.303	0073.301	00220.10	00293.401	04.718	-05.024	-02.791
0437.915	0013.349	0073.347	00220.08	00293.43	04.736	-05.140	-2.878
0437.805	0013.289	0073.287	00220.16	00293.45	04.749	-05.945	-02.856
0437.805	0013.239	0073.238	00220.20	00293.43	04.718	-05.361	-02.856
0437.805	0013.237	0073.235	00220.20	00293.43	04.724	-05.281	-02.769
0437.871	0013.233	0073.232	00220.21	00293.442	04.712	-05.085	-02.791
0437.146	0012.750	0072.749	00220.27	00293.02	04.761	-05.189	-02.329

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6436.267	6436.289	6436.355	6436.389	6436.465	6436.575	6436.641	6436.635	6436.720	6436.882	6436.970	6437.014	6437.026	6437.036	6437.044	6437.053	6437.062	6437.070	6437.078	6437.085	6437.092	6437.100	6437.108	6437.116	6437.124	6437.132	6437.140	6437.148	6437.156	6437.164	6437.172	6437.180	6437.188	6437.196	6437.204	6437.212	6437.220	6437.228	6437.236	6437.244	6437.252	6437.260	6437.268	6437.276	6437.284	6437.292	6437.300	6437.308	6437.316	6437.324	6437.332	6437.340	6437.348	6437.356	6437.364	6437.372	6437.380	6437.388	6437.396	6437.404	6437.412	6437.420	6437.428	6437.436	6437.444	6437.452	6437.460	6437.468	6437.476	6437.484	6437.492	6437.500	6437.508	6437.516	6437.524	6437.532	6437.540	6437.548	6437.556	6437.564	6437.572	6437.580	6437.588	6437.596	6437.604	6437.612	6437.620	6437.628	6437.636	6437.644	6437.652	6437.660	6437.668	6437.676	6437.684	6437.692	6437.700	6437.708	6437.716	6437.724	6437.732	6437.740	6437.748	6437.756	6437.764	6437.772	6437.780	6437.788	6437.796	6437.804	6437.812	6437.820	6437.828	6437.836	6437.844	6437.852	6437.860	6437.868	6437.876	6437.884	6437.892	6437.900	6437.908	6437.916	6437.924	6437.932	6437.940	6437.948	6437.956	6437.964	6437.972	6437.980	6437.988	6437.996	6438.004	6438.012	6438.020	6438.028	6438.036	6438.044	6438.052	6438.060	6438.068	6438.076	6438.084	6438.092	6438.100	6438.108	6438.116	6438.124	6438.132	6438.140	6438.148	6438.156	6438.164	6438.172	6438.180	6438.188	6438.196	6438.204	6438.212	6438.220	6438.228	6438.236	6438.244	6438.252	6438.260	6438.268	6438.276	6438.284	6438.292	6438.300	6438.308	6438.316	6438.324	6438.332	6438.340	6438.348	6438.356	6438.364	6438.372	6438.380	6438.388	6438.396	6438.404	6438.412	6438.420	6438.428	6438.436	6438.444	6438.452	6438.460	6438.468	6438.476	6438.484	6438.492	6438.500	6438.508	6438.516	6438.524	6438.532	6438.540	6438.548	6438.556	6438.564	6438.572	6438.580	6438.588	6438.596	6438.604	6438.612	6438.620	6438.628	6438.636	6438.644	6438.652	6438.660	6438.668	6438.676	6438.684	6438.692	6438.700	6438.708	6438.716	6438.724	6438.732	6438.740	6438.748	6438.756	6438.764	6438.772	6438.780	6438.788	6438.796	6438.804	6438.812	6438.820	6438.828	6438.836	6438.844	6438.852	6438.860	6438.868	6438.876	6438.884	6438.892	6438.900	6438.908	6438.916	6438.924	6438.932	6438.940	6438.948	6438.956	6438.964	6438.972	6438.980	6438.988	6438.996	6439.004	6439.012	6439.020	6439.028	6439.036	6439.044	6439.052	6439.060	6439.068	6439.076	6439.084	6439.092	6439.100	6439.108	6439.116	6439.124	6439.132	6439.140	6439.148	6439.156	6439.164	6439.172	6439.180	6439.188	6439.196	6439.204	6439.212	6439.220	6439.228	6439.236	6439.244	6439.252	6439.260	6439.268	6439.276	6439.284	6439.292	6439.300	6439.308	6439.316	6439.324	6439.332	6439.340	6439.348	6439.356	6439.364	6439.372	6439.380	6439.388	6439.396	6439.404	6439.412	6439.420	6439.428	6439.436	6439
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6436.750	612.487	6072.276	60219.56	60202.11	604.834	-04.052	-03.274
6436.729	612.390	6072.307	60219.56	60202.13	604.852	-04.071	-03.274
6436.663	612.308	6072.307	60219.70	60202.18	604.852	-04.211	-03.274
6436.531	612.278	6072.276	60219.91	60202.20	604.834	-05.412	-03.274
6436.553	612.277	6072.276	60219.91	60202.19	604.705	-05.239	-03.274
6436.487	612.198	6072.197	60220.04	60202.24	604.820	-02.223	-03.274
6436.390	612.098	6072.098	60220.13	60202.13	604.852	-05.201	-03.274
6436.223	612.075	6072.073	60220.16	60202.27	604.852	-05.201	-03.274
6436.377	612.113	6072.111	60220.16	60202.27	604.852	-05.201	-03.274
6436.245	612.113	6072.111	60220.16	60202.27	604.852	-05.201	-03.274
6436.289	611.981	6071.980	60220.19	60202.27	604.852	-05.201	-03.274
6436.157	611.943	6071.941	60220.298	60202.27	604.852	-05.201	-03.274
6436.091	611.893	6071.892	60220.34	60202.27	604.852	-05.201	-03.274
6436.135	611.887	6071.886	60220.37	60202.26	604.852	-05.201	-03.274
6436.025	611.937	6071.936	60220.42	60202.26	604.852	-05.201	-03.274
6436.047	611.861	6071.860	60220.44	60202.29	604.852	-05.201	-03.274
6435.981	611.721	6071.719	60220.56	60202.29	604.852	-05.201	-03.274
6435.959	611.772	6071.771	60220.59	60202.29	604.852	-05.201	-03.274
6435.886	611.603	6071.603	60220.59	60202.29	604.852	-05.201	-03.274
6435.752	611.583	6071.581	60220.59	60202.29	604.852	-05.201	-03.274
6435.784	611.603	6071.603	60220.59	60202.29	604.852	-05.201	-03.274
6435.762	611.712	6071.710	60220.59	60202.29	604.852	-05.201	-03.274
6435.718	611.733	6071.732	60220.59	60202.29	604.852	-05.201	-03.274
6435.828	611.792	6071.790	60220.59	60202.29	604.852	-05.201	-03.274
6435.937	611.827	6071.826	60220.59	60202.29	604.852	-05.201	-03.274
6435.894	611.885	6071.884	60220.59	60202.29	604.852	-05.201	-03.274
6435.981	612.014	6072.013	60220.59	60202.29	604.852	-05.201	-03.274
6436.113	612.072	6072.070	60220.59	60202.29	604.852	-05.201	-03.274
6436.135	612.100	6072.100	60220.59	60202.29	604.852	-05.201	-03.274
6436.245	612.109	6072.109	60220.59	60202.29	604.852	-05.201	-03.274
6436.443	612.385	6072.385	60220.59	60202.29	604.852	-05.201	-03.274
6436.619	612.567	6072.567	60220.59	60202.29	604.852	-05.201	-03.274
6436.685	612.632	6072.631	60220.59	60202.29	604.852	-05.201	-03.274
6436.750	612.642	6072.642	60220.59	60202.29	604.852	-05.201	-03.274
6436.970	612.858	6072.856	60220.59	60202.29	604.852	-05.201	-03.274
6437.234	613.099	6073.098	60220.59	60202.29	604.852	-05.201	-03.274
6437.360	613.127	6073.125	60220.59	60202.29	604.852	-05.201	-03.274
6437.270	613.029	6073.026	60220.59	60202.29	604.852	-05.201	-03.274
6437.322	613.033	6073.032	60220.59	60202.29	604.852	-05.201	-03.274
6437.380	613.098	6073.098	60220.59	60202.29	604.852	-05.201	-03.274
6437.344	612.992	6072.990	60220.59	60202.29	604.852	-05.201	-03.274
6437.014	612.867	6072.867	60220.59	60202.29	604.852	-05.201	-03.274
6437.168	612.856	6072.856	60220.59	60202.29	604.852	-05.201	-03.274
6437.036	612.845	6072.845	60220.59	60202.29	604.852	-05.201	-03.274
6436.948	612.720	6072.719	60220.59	60202.29	604.852	-05.201	-03.274
6436.860	612.691	6072.691	60220.59	60202.29	604.852	-05.201	-03.274

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8437.981	8013.981	8073.979	80217.83	80291.31	804.584	805.962	803.494
8438.267	8014.469	8074.406	80217.351	80291.81	804.543	805.991	803.538
8438.369	8015.028	8075.026	80216.84	80291.87	804.513	805.991	803.538
8439.277	8015.663	8075.663	80216.32	80291.90	804.584	807.396	803.647
8439.937	8016.243	8076.242	80215.83	80292.00	804.541	806.954	803.819
8440.442	8016.815	8076.814	80215.27	80292.00	804.541	806.954	803.819
8441.277	807.457	8077.456	80214.52	80291.98	804.406	806.220	803.538
8442.068	808.073	8078.072	80213.79	80291.86	804.504	806.342	803.530
8442.771	808.668	8078.668	80213.14	80291.81	804.572	806.639	803.406
8443.584	809.476	8079.475	80212.36	80291.84	804.570	806.620	803.428
8444.551	8010.584	8080.582	80211.45	80292.03	804.535	807.114	803.318
8445.496	8011.576	8081.573	80210.60	80292.17	804.406	808.064	803.252
8446.287	8012.308	8082.307	80209.83	80292.13	804.572	807.502	803.252
8447.034	8013.001	8083.000	80208.96	80291.96	804.584	807.490	803.318
8447.935	8013.967	8083.966	80207.62	80291.79	804.504	807.431	803.516
8449.055	8015.210	8085.210	80206.658	80291.86	804.407	808.290	803.604
8450.000	8016.315	8086.314	80205.74	80292.06	804.449	808.171	803.684
8450.923	8017.150	8087.149	80204.87	80292.02	804.474	808.356	803.582
8452.172	808.047	8088.047	80203.81	80291.86	804.468	807.270	803.406
8453.318	809.109	8089.107	80202.68	80291.70	804.437	807.202	803.428
8454.307	8010.211	8090.209	80201.75	80291.96	804.462	807.747	803.340
8454.988	8011.026	8091.024	80201.49	80292.11	804.462	807.530	803.340
8455.647	8011.498	8091.497	80200.70	80292.20	804.504	806.392	803.164
8455.845	8011.742	8091.741	80200.49	80292.231	804.517	807.635	803.230
8456.042	8011.940	8091.939	80200.27	80292.21	804.474	807.443	803.100
8456.240	8012.090	8092.087	80200.12	80292.20	804.474	806.943	803.142
8456.152	8012.096	8092.096	80200.13	80292.22	804.507	808.214	803.200
8455.977	8011.882	8091.881	80200.37	80292.25	804.584	806.912	803.252
8455.999	8011.804	8091.802	80200.43	80292.23	804.559	806.373	803.252
8456.042	8011.920	8091.920	80200.275	80292.19	804.468	806.448	803.252
8456.086	8012.042	8092.041	80200.17	80292.21	804.517	807.037	803.200
8456.152	8012.059	8092.057	80200.16	80292.22	804.553	807.635	803.120
8456.196	8012.097	8092.096	80200.10	80292.20	804.523	807.361	803.230
8456.526	8012.316	8092.315	80199.84	80292.15	804.504	806.523	803.274
8456.746	8012.676	8092.675	80199.41	80292.15	804.474	807.100	803.252
8456.790	8012.742	8092.741	80199.34	80292.09	804.474	806.690	803.310
8456.899	8012.798	8092.796	80199.26	80292.08	804.547	806.020	803.420
8457.031	8012.890	8092.889	80199.20	80292.06	804.565	806.406	803.304
8457.163	8013.015	8093.013	80198.99	80292.06	804.406	806.678	803.384
8457.295	8013.152	8093.150	80198.811	80291.96	804.449	806.870	803.296
8457.493	8013.214	8093.214	80198.74	80291.95	804.462	805.906	803.310
8457.405	8013.098	8093.098	80198.91	80292.01	804.500	805.457	803.274
8457.295	8013.012	8093.010	80198.995	80292.01	804.510	806.030	803.186
8457.449	8013.230	8093.230	80198.699	80292.06	804.510	806.912	803.310
8457.559	8013.417	8093.417	80198.50	80291.92	804.480	806.429	803.384
8457.449	8013.361	8093.359	80198.58	80291.94	804.620	805.078	803.420
8457.471	8013.235	8093.233	80198.73	80291.90	804.572	806.572	803.362
8457.449	8013.28	8093.216	80198.72	80291.93	804.462	806.097	803.404
8457.427	8013.295	8093.293	80198.61	80291.91	804.443	806.022	803.304
8457.493	8013.204	8093.203	80198.64	80291.87	804.400	806.000	803.274

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8457.383	8013.122	8093.120	8198.864	8291.907	804.553	81.324	83.340
8457.251	8013.088	8093.087	8198.90	8291.90	804.553	85.140	83.252
8457.295	8013.051	8093.049	8198.95	8291.90	804.474	86.246	83.318
8457.163	8012.935	8092.933	8199.13	8292.00	804.462	85.725	83.296
8456.965	8012.728	8092.727	8199.42	8292.06	804.541	85.339	83.186
8456.746	8012.537	8092.535	8199.67	8292.14	804.547	85.569	83.252
8456.614	8012.421	8092.420	8199.803	8292.20	804.529	85.361	83.252
8456.328	8012.358	8092.357	8199.88	8292.22	804.480	85.267	83.186
8456.198	8012.209	8092.208	8199.88	8292.24	804.500	86.476	83.200
8455.955	8011.969	8091.967	8199.88	8292.28	804.500	86.158	83.310
8455.867	8011.841	8091.840	8199.88	8292.31	804.506	86.799	83.318
8455.845	8011.846	8091.846	8199.88	8292.31	804.559	86.255	83.274
8455.801	8011.913	8091.912	8199.88	8292.29	804.523	85.693	83.362
8455.647	8011.724	8091.722	8199.88	8292.33	804.553	85.375	83.310
8455.647	8011.495	8091.494	8199.88	8292.33	804.633	85.753	83.274
8455.537	8011.437	8091.436	8199.88	8292.31	804.663	85.096	83.230
8455.537	8011.579	8091.577	8199.88	8292.28	804.572	85.911	83.318
8455.691	8011.673	8091.673	8199.88	8292.26	804.504	85.895	83.230
8455.625	8011.539	8091.538	8199.88	8292.26	804.504	86.617	83.200
8455.493	8011.461	8091.461	8199.88	8292.29	804.541	85.441	83.252
8455.449	8011.461	8091.461	8199.88	8292.32	804.557	85.441	83.252
8455.647	8011.635	8091.634	8199.88	8292.29	804.645	86.639	83.296
8455.625	8011.631	8091.631	8199.88	8292.29	804.523	86.401	83.274
8455.581	8011.667	8091.664	8199.88	8292.28	804.504	85.434	83.252
8455.537	8011.648	8091.648	8199.88	8292.30	804.500	85.346	83.400
8455.713	8011.810	8091.810	8199.88	8292.31	804.526	85.805	83.384
8455.889	8011.942	8091.939	8199.88	8292.27	804.500	85.471	83.362
8455.955	8012.012	8092.010	8199.88	8292.27	804.578	85.300	83.316
8456.174	8012.138	8092.137	8199.88	8292.26	804.596	85.700	83.296
8456.328	8012.317	8092.315	8199.88	8292.20	804.596	89.329	83.340
8456.482	8012.453	8092.453	8199.88	8292.23	804.633	86.167	83.252
8456.570	812.537	8092.535	8199.88	8292.18	804.640	84.731	83.318
8456.636	8012.586	8092.584	8199.88	8292.15	804.584	85.995	83.274
8456.790	8012.685	8092.686	8199.88	8292.13	804.565	87.428	83.296
8457.043	8012.866	8092.865	8199.88	8292.12	804.614	89.769	83.296
8457.031	8012.968	8092.966	8199.88	8292.09	804.651	84.186	83.318
8457.075	8012.973	8092.972	8199.88	8292.04	804.578	86.021	83.318
8457.141	8012.974	8092.972	8199.88	8292.03	804.565	84.827	83.406
8457.207	8013.048	8093.046	8199.88	8292.02	804.500	85.434	83.296
8457.273	8013.162	8093.161	8199.88	8292.03	804.633	85.130	83.340
8457.317	8013.193	8093.192	8199.88	8292.03	804.614	85.201	83.274
8457.295	8013.193	8093.192	8199.88	8292.03	804.584	85.201	83.274
8457.273	8013.204	8093.203	8199.88	8291.99	804.584	86.373	83.340
8457.339	8013.278	8093.277	8199.88	8291.97	804.553	85.078	83.362
8457.361	8013.333	8093.332	8199.88	8291.97	804.553	85.208	83.340
8457.449	8013.373	8093.373	8199.88	8291.97	804.651	84.794	83.318
8457.383	8013.375	8093.375	8199.88	8291.98	804.651	85.419	83.296
8457.427	8013.296	8093.296	8199.88	8291.96	804.596	85.945	83.340
8457.440	8013.255	8093.255	8199.88	8291.937	804.596	85.547	83.362
				8291.92	804.584	85.516	83.384
				8291.94	804.596	85.516	83.384
				8291.95	804.620	85.516	83.384
				8291.956	804.620	85.516	83.384
				8291.956	804.620	85.516	83.384

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Run 2 Leg 4 1/21/66 Printed 6/6/66

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BEARING 1X	BEARING 36X	RELATIVE BEARING	COURSE	TRUE BEARING	SPEED	S/N	DEFL ANGL
0455.713	0012.191	0092.189	00202.40	00294.59	04.327	-05.494	-08.921
0455.361	0011.965	0091.964	00202.67	00294.64	04.346	-05.895	-08.987
0454.438	0011.727	0091.725	00202.95	00294.675	04.346	-05.494	-08.987
0454.131	0011.821	0091.821	00203.11	00294.93	04.364	-06.072	-08.987
0452.109	009.650	009.648	00203.18	00292.83	04.376	-05.368	-09.053
0451.890	009.440	009.440	00203.184	00292.62	04.333	-05.813	-09.053
0451.846	009.308	0089.308	00203.12	00292.42	04.358	-05.196	-09.053
0451.934	009.371	0089.362	00203.06	00292.43	04.388	-05.516	-09.053
0451.956	009.527	0089.506	00202.96	00292.48	04.364	-05.701	-09.053
0452.203	009.807	0089.805	00202.63	00292.48	04.364	-06.523	-09.053
0452.153	009.555	0089.555	00202.37	00291.93	04.395	-05.457	-09.053
0452.241	009.724	0089.723	00202.09	00291.81	04.462	-05.486	-09.053
0452.241	009.642	0089.642	0021.789	00291.42	04.437	-05.911	-08.943
0452.631	0013.206	0090.203	00201.39	00291.59	04.413	-05.701	-08.965
0453.104	0013.771	0090.769	00200.95	00291.72	04.401	-05.953	-08.943
0453.625	0011.221	0091.219	00200.59	00291.81	04.425	-05.539	-08.943
0454.131	0011.769	0091.769	00200.30	00292.07	04.431	-05.339	-08.943
0453.625	0017.746	0097.748	00200.08	00297.83	04.462	-05.646	-08.943
0448.418	0011.024	0091.022	00199.90	00290.92	04.462	-05.471	-08.943
0454.903	012.288	0092.285	00199.54	00285.77	04.462	-05.274	-08.943
0453.779	0011.484	0091.483	00199.39	00291.83	04.388	-05.595	-08.943
0453.713	0011.393	0091.392	00199.53	00290.88	04.364	-05.539	-08.943
0453.560	011.113	0091.112	00199.78	00290.89	04.431	-05.995	-08.943
0453.472	0011.176	0091.176	00199.66	00290.84	04.431	-05.733	-08.943
0453.933	0011.642	0091.642	00199.292	00290.93	04.433	-05.539	-08.943
0453.839	0011.520	0091.527	00199.21	00290.73	04.431	-05.862	-08.943
0453.713	0011.329	0091.329	00199.35	00290.68	04.431	-05.920	-08.943
0454.614	0011.284	0091.283	00199.38	00290.662	04.431	-05.464	-08.943
0454.878	0011.497	0091.494	00199.13	00290.63	04.376	-05.593	-08.943
0455.098	0011.716	0091.714	00198.94	00290.66	04.388	-05.717	-08.943
0455.164	0011.784	0091.782	00198.90	00290.69	04.335	-05.353	-08.943
0455.203	0011.783	0091.782	00198.93	00290.71	04.431	-05.569	-08.943
0455.164	0011.776	0091.774	00198.93	00290.67	04.431	-06.089	-08.943
0455.186	0011.799	0091.799	00198.85	00290.67	04.431	-05.646	-08.943
0455.054	0011.586	0091.585	00198.91	00290.709	04.431	-05.547	-08.943
0454.790	011.347	0091.346	00199.16	00290.745	04.431	-05.846	-08.943
0454.724	0011.255	0091.255	00199.40	00290.75	04.431	-06.106	-08.943
0454.732	0011.241	0091.241	00199.51	00290.75	04.431	-05.593	-08.943
0454.504	0010.903	0090.901	00199.89	00290.79	04.498	-05.449	-08.943

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8453.757	8018.064	890.058	80200.55	8293.608	804.462	-05.322	-0355.49
8453.735	8018.164	890.162	80200.45	80200.61	804.462	-05.749	-0355.93
8453.669	8018.118	890.118	80200.52	80200.64	804.456	-05.911	-0357.73
8453.153	89.731	889.731	80200.82	80200.55	804.551	-05.353	-0339.28
8453.252	809.510	889.508	80200.98	80200.49	804.456	-04.898	-0359.40
8453.186	809.499	889.497	80200.95	80200.45	804.456	-06.328	-0358.08
8453.233	89.647	889.646	80200.85	80200.49	804.449	-06.880	-0358.00
8453.218	809.570	889.569	80200.94	80200.51	804.504	-06.768	-0339.78
8453.032	809.373	889.371	80201.08	80200.45	804.474	-06.364	-0358.33
8452.966	809.365	889.363	80201.06	80200.42	804.443	-06.639	-0355.82
8453.123	89.566	889.566	80200.91	80200.47	804.474	-05.339	-0354.90
8453.252	809.624	889.624	80200.88	80200.503	804.492	-06.533	-0355.34
8453.274	809.625	889.624	80200.88	80200.50	804.510	-06.211	-0356.48
8453.252	809.634	889.632	80200.87	80200.50	804.474	-05.434	-0356.24
8453.516	809.910	889.909	80200.63	80200.54	804.456	-06.072	-0356.02
8453.801	8018.311	889.310	80200.319	80200.63	804.462	-05.717	-0357.07
8453.955	8018.591	889.590	80200.886	80200.67	804.504	-05.554	-0350.52
8454.037	8018.722	889.720	80200.979	80200.69	804.510	-06.115	-03.538
8454.175	8018.809	889.807	80199.89	80200.70	804.498	-06.411	-05.933
8454.438	8011.063	889.063	80199.64	80200.71	804.449	-06.337	-05.438
8454.614	8011.317	889.316	80199.41	80200.72	804.498	-05.585	-03.767
8454.614	8011.346	889.346	80199.41	80200.75	804.553	-05.274	-031.997
8454.614	8011.216	889.214	80199.53	80200.75	804.553	-05.854	-013.425
8454.591	8011.228	889.219	80199.51	80200.73	804.474	-05.846	-013.030
8454.604	8011.367	889.365	80199.36	80200.76	804.510	-06.176	-013.997
8454.526	8011.093	889.090	80199.421	80200.74	804.541	-05.733	-015.381
8454.417	8018.986	889.986	80199.71	80200.70	804.517	-06.467	-017.622
8454.417	8011.050	889.050	80199.64	80200.69	804.437	-05.593	-020.676
8454.438	8011.100	889.107	80199.62	80200.73	804.395	-05.995	-022.742
8454.329	8018.821	889.818	80199.89	80200.71	804.468	-06.020	-024.170
8453.999	8018.557	889.555	80200.11	80200.60	804.498	-07.202	-026.763
8453.955	8018.420	889.417	80200.22	80200.638	804.474	-05.457	-025.57
8453.823	8018.400	889.398	80200.22	80200.62	804.462	-05.516	-0358.74
8453.977	8018.643	889.643	80200.13	80200.62	804.462	-05.765	-0358.72
8454.021	8018.673	889.673	80200.14	80200.68	804.413	-06.038	-0358.13
8453.801	8018.320	889.319	80200.36	80200.68	804.523	-05.532	-0358.74
8453.757	8018.237	889.236	80200.39	80200.63	804.633	-05.065	-0358.77
8453.977	8018.638	889.637	80200.05	80200.69	804.547	-05.569	-0358.83
8454.219	8018.838	889.838	80200.91	80200.69	804.437	-04.904	-0358.81
8454.131	8018.613	889.612	80200.08	80200.71	804.510	-4.984	-0358.77
8453.889	8018.453	889.453	80200.17	80200.63	804.553	-05.126	-0358.70
8454.065	8018.720	889.720	80200.946	80200.66	804.523	-05.361	-0358.79
8454.263	8018.995	889.994	80200.74	80200.66	804.437	-05.813	-0358.79
8454.329	8011.021	889.019	80200.73	80200.73	804.498	-05.196	-0358.81
8454.241	8018.984	889.983	80200.75	80200.75	804.547	-05.245	-0358.85
8454.526	8011.228	889.228	80200.49	80200.74	804.480	-4.997	-0358.79
8454.658	8011.403	889.401	80200.33	80200.717	804.401	-05.239	-0358.77
8454.746	8011.415	889.414	80200.32	80200.74	804.504	-05.346	-0358.79
8454.502	8011.432	889.431	80200.29	80200.72	804.565	-04.885	-0358.77

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2454.088	2011.682	2091.681	20199.02	20290.73	204.419	-04.944	-0358.81
2455.032	2011.635	2091.634	20199.11	20290.74	204.590	-5.501	-0358.79
2454.878	2011.395	2091.392	20199.35	20290.75	204.603	-05.479	-0358.85
2454.724	2011.323	2091.321	20199.41	20290.73	204.565	-05.085	-0358.83
2454.724	2011.341	2091.347	20199.374	20290.71	204.781	-04.781	-0358.85
2454.732	2011.328	2091.327	20199.42	20290.75	204.486	-05.175	-0358.81
2454.417	2010.987	2090.986	20199.78	20290.77	204.639	-05.457	-0358.87
2454.131	2010.582	2090.582	20200.11	20290.69	204.639	-05.120	-0358.92
2453.911	2010.365	2090.363	20200.28	20290.64	204.529	-05.878	-0358.85
2453.823	2010.266	2090.264	20200.36	20290.62	204.474	-06.211	-0358.83
2453.669	2010.057	2090.055	20200.52	20290.58	204.529	-05.457	-0358.83
2453.318	2009.686	2089.684	20200.80	20290.49	204.626	-06.429	-0358.85
2453.098	2009.399	2089.398	20201.01	20290.41	204.504	-05.434	-0358.94
2453.054	2009.355	2089.354	20201.02	20290.38	204.504	-05.245	-0358.83
2453.164	2009.555	2089.555	20200.91	20290.46	204.456	-05.113	-0358.81
2453.164	2009.578	2089.577	20200.92	20290.50	204.593	-5.024	-0358.85
2453.013	2009.271	2089.269	20201.13	20290.48	204.669	-05.078	-0358.85
2452.900	2009.167	2089.165	20201.18	20290.35	204.596	-05.018	-0358.83
2454.263	2009.053	2089.053	20200.90	20290.95	204.449	-05.071	-0358.95
2468.545	2022.054	2012.05	20200.71	20312.76	204.474	-06.033	-0358.79
2329.041	2022.435	2032.43	20200.79	20173.23	204.694	-05.317	-0358.87
2333.025	2010.103	2030.10	20200.84	20140.99	204.712	-05.161	-0358.92
2333.420	2010.532	2030.53	20200.46	20140.99	204.456	-05.196	-0358.92
2333.082	2011.053	2031.05	20200.09	20141.06	204.456	-05.434	-0358.90
2334.146	2011.292	2031.28	20199.81	20141.10	204.623	-5.346	-0358.90
2334.233	2011.382	2031.38	20199.718	20141.09	204.724	-05.397	-0358.90
2334.453	2011.617	2031.61	20199.43	20141.05	204.645	-05.331	-0358.90
2335.082	2012.015	2032.01	20198.98	20140.99	204.486	-04.984	-0358.92
2335.315	2012.208	2032.20	20198.66	20140.94	204.474	-04.833	-0358.93
2335.424	2012.378	2032.37	20198.56	20140.94	204.614	-04.911	-0358.94
2335.032	2012.413	2032.41	20198.50	20140.91	204.675	-05.295	-0358.92
2335.881	2012.578	2032.57	20198.27	20140.847	204.578	-05.134	-0358.96
2335.969	2012.759	2032.75	20198.04	20140.80	204.510	-4.833	-0358.98
2335.947	2012.814	2032.81	20197.99	20140.803	204.535	-05.024	-0359.03
2335.881	2012.813	2032.81	20198.01	20140.82	204.572	-05.253	-0359.01
2335.859	2012.732	2032.73	20198.10	20140.83	204.565	-05.781	-0358.93
2335.903	2012.710	2032.709	20198.13	20140.839	204.547	-05.085	-0359.01
2335.815	2012.708	2032.70	20198.12	20140.82	204.541	-04.971	-0358.98
2335.508	2012.616	2032.61	20198.26	20140.87	204.535	-05.018	-0359.03
2335.200	2012.589	2032.58	20198.59	20140.97	204.523	-05.045	-0358.94
2335.002	2012.187	2032.18	20198.85	20141.04	204.559	-05.078	-0358.92
2334.673	2011.982	2031.98	20199.12	20141.10	204.596	-05.288	-0358.92
2334.387	2011.735	2031.73	20199.42	20141.16	204.565	-05.078	-0358.87
2333.948	2011.426	2031.42	20199.77	20141.193	204.535	-04.991	-0358.85
2333.574	2011.033	2031.028	20200.15	20141.18	204.523	-05.295	-0358.85
2333.333	2010.622	2030.62	20200.49	20141.11	204.553	-05.346	-0358.85
2333.113	2010.289	2030.28	20200.74	20141.03	204.614	-05.140	-0359.057
2333.113	2010.073	2030.07	20200.97	20140.97	204.590	-5.725	-0358.90
2333.113	2010.015	2030.01	20200.93	20140.95	204.541	-05.813	-0358.87
2333.047	2009.992	2029.99	20200.954	20140.94	204.523	-05.346	-0358.90

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834.871	839.785	83299.74	83241.17	83140.87	834.584	85.000	858.901
834.865	839.648	83299.64	83241.19	83140.836	834.553	85.217	858.90
834.849	839.854	83299.85	83241.02	83140.87	834.529	85.310	858.879
834.847	839.145	83299.14	83240.81	83140.96	84.498	85.295	858.85
834.829	839.367	83299.36	83240.64	83141.01	834.559	85.397	858.87
834.820	839.53	83299.56	83240.49	83141.06	834.596	85.509	858.92
834.818	839.772	83299.77	83240.514	83141.08	834.596	85.539	858.83
834.809	839.84	83299.84	83240.09	83141.09	834.599	85.539	858.879
834.808	839.188	83299.18	83199.92	83141.11	834.596	85.920	858.813
834.807	839.1307	83299.13	83199.80	83141.11	834.645	85.903	858.87
834.803	839.1465	83299.14	83199.63	83141.10	834.608	85.837	858.85
834.802	839.1589	83299.15	83199.52	83141.108	834.608	86.176	858.92
834.801	839.1621	83299.16	83199.48	83141.10	834.608	86.255	858.85
834.800	839.1619	83299.16	83199.50	83141.12	834.608	85.600	858.879
834.799	839.1550	83299.15	83199.591	83141.14	834.559	85.532	858.85
834.798	839.1380	83299.13	83199.75	83141.14	834.572	85.733	858.85
834.797	839.1146	83299.11	83199.99	83141.14	834.596	86.158	858.90
834.796	839.132	83299.13	83240.09	83141.12	834.573	86.337	858.87
834.795	839.1008	83299.10	83240.11	83141.12	834.517	86.220	858.879
834.794	839.917	83299.91	83240.21	83141.12	834.559	85.749	858.85
834.793	839.763	83299.76	83240.36	83141.122	834.608	85.773	858.85
834.792	839.585	83299.58	83240.51	83141.09	834.614	85.608	858.85
834.791	839.468	83299.46	83240.59	83141.06	834.559	85.509	858.90
834.790	839.449	83299.44	83240.61	83141.05	834.535	85.686	858.83
834.789	839.378	83299.37	83240.67	83141.05	834.559	85.608	858.90
834.788	839.233	83299.23	83240.79	83141.02	834.596	85.346	858.85
834.787	839.107	83299.10	83240.88	83141.085	834.608	85.569	858.85
834.786	839.005	83299.00	83240.94	83141.094	834.565	85.616	858.87
834.785	839.977	83299.97	83240.96	83141.093	834.553	85.532	858.85
834.784	839.979	83299.97	83240.86	83141.094	834.529	85.623	858.90
834.783	839.217	83299.21	83240.78	83141.09	834.572	86.185	858.87
834.782	839.104	83299.10	83240.81	83141.08	834.645	85.353	858.87
834.781	839.195	83299.19	83240.79	83141.08	834.645	85.435	858.90
834.780	839.504	83299.50	83240.54	83141.05	834.559	85.390	858.879
834.779	839.716	83299.71	83240.36	83141.08	834.559	85.686	858.81
834.778	839.858	83299.85	83240.24	83141.10	834.584	85.196	858.90
834.777	839.998	83299.99	83240.11	83141.11	834.614	85.217	858.85
834.776	839.153	83299.15	83199.35	83141.10	834.596	85.331	858.87
834.775	839.293	83299.29	83199.81	83141.11	834.553	85.259	858.87
834.774	839.344	83299.34	83199.77	83141.12	834.541	85.773	858.92
834.773	839.346	83299.34	83199.77	83141.12	834.541	85.970	858.901
834.772	839.336	83299.33	83199.80	83141.136	834.565	86.255	858.87
834.771	839.238	83299.23	83199.90	83141.14	834.584	85.562	858.87
834.770	839.147	83299.14	83199.98	83141.13	834.548	85.751	858.87
834.769	839.130	83299.13	83199.95	83141.12	834.498	86.132	858.85
834.768	839.136	83299.13	83199.97	83141.11	834.547	85.600	858.879
834.767	839.086	83299.08	83240.04	83141.13	834.675	86.467	858.87
834.766	839.045	83299.04	83240.05	83141.09	834.651	85.608	858.85
834.765	839.318	83299.31	83240.75	83141.07	834.523	85.639	858.90
834.764	839.546	83299.54	83199.53	83141.08	834.547	86.106	858.92

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0334.541	0311.649	00331.64	00199.42	00141.07	004.657	-05.221	-0358.94
0334.871	0011.915	00331.91	00199.10	00141.01	004.590	-5.464	-0358.90
0335.266	0012.235	00302.23	00198.72	00140.95	004.535	-05.313	-0358.92
0335.552	0012.465	00302.46	00198.42	00140.89	004.529	-05.375	-0358.96
0335.684	0012.571	00302.56	00198.30	00140.87	004.572	-04.918	-0358.96
0335.746	0012.585	00302.58	00198.28	00140.86	004.596	-05.986	-0358.94
0335.771	0012.648	00302.64	00198.18	00140.82	004.590	-5.316	-0358.939
0335.991	0012.851	00302.84	00197.92	00140.77	004.486	-04.891	-0359.03
0336.123	0012.928	00302.92	00197.83	00140.76	004.529	-05.274	-0359.01
0336.057	0012.805	00302.80	00198.02	00140.82	004.651	-05.509	-0359.01
0335.859	0012.602	00302.66	00198.185	00140.84	004.602	-05.805	-0359.01
0335.815	0012.624	00302.62	00198.22	00140.84	004.492	-05.168	-0359.01
0335.703	0012.586	00302.58	00198.28	00140.87	004.474	-05.419	-0358.96
0335.640	0012.490	00302.489	00198.43	00140.92	004.578	-05.600	-0359.01
0335.308	0012.311	00302.31	00198.69	00141.00	004.602	-05.134	-0358.96
0335.156	0012.137	00302.13	00198.92	00141.06	004.565	-05.147	-0358.90
0335.134	0012.074	00302.07	00198.99	00141.06	004.510	-5.837	-0358.96
0335.024	0011.974	00301.97	00199.14	00141.12	004.553	-05.346	-0358.92
0334.673	0011.694	00301.69	00199.48	00141.17	004.602	-05.639	-0358.92
0334.409	0011.461	00301.45	00199.72	00141.18	004.572	-05.303	-0358.90
0334.124	0011.357	00301.35	00199.81	00141.18	004.474	-05.397	-0358.90
0334.816	0011.346	00301.34	00200.02	00141.14	004.620	-5.427	-0358.85
0333.640	0010.635	00300.63	00200.47	00141.10	004.590	-5.383	-0358.87
0333.464	0010.422	00300.42	00200.64	00141.06	004.547	-05.646	-0358.87
0333.201	0010.032	00300.03	00200.93	00140.96	004.596	-05.757	-0358.90
0332.893	009.706	00299.70	00201.17	00140.87	004.602	-05.441	-0358.92
0332.783	009.520	00299.517	00201.31	00140.83	004.572	-04.944	-0358.94
0332.476	009.250	00299.248	00201.55	00140.80	004.547	-05.741	-0358.90
0332.132	008.815	00298.81	00201.97	00140.79	004.590	-5.078	-0358.90
0331.625	008.380	00298.378	00202.44	00140.82	004.596	-05.424	-0359.03
0331.377	008.116	00298.11	00202.73	00140.85	004.510	-5.120	-0359.05
0331.245	007.982	00297.98	00202.89	00140.87	004.437	-05.231	-0359.07
0330.959	007.744	00297.74	00203.21	00140.95	004.492	-05.593	-0359.09
0330.410	007.300	00297.208	00203.74	00141.04	004.547	-05.887	-0359.07
0330.225	007.047	00297.04	00204.02	00141.07	004.535	-06.132	-0359.14
0330.103	007.068	00297.06	00203.96	00141.03	004.431	-06.542	-0359.09
0330.103	007.138	00297.13	00203.89	00141.03	004.449	-05.524	-0359.07
0330.059	007.054	00296.95	00204.14	00141.10	004.590	-5.822	-0359.18
0299.861	006.839	00296.829	00204.26	00141.089	004.596	-05.878	-0359.16
0299.949	006.962	00296.96	00204.071	00141.03	004.504	-06.072	-0359.12
0330.168	007.147	00297.14	00203.87	00141.02	004.480	-6.240	-0359.09
0330.146	007.153	00297.15	00203.81	00140.97	004.547	-05.608	-0359.07
0330.234	007.225	00297.22	00203.70	00140.924	004.590	-5.903	-0359.07
0330.432	007.413	00297.41	00203.45	00140.86	004.541	-05.516	-0359.09
0330.606	007.596	00297.59	00203.11	00140.70	004.492	-05.524	-0359.03
0330.916	007.825	00297.82	00202.73	00140.55	004.492	-05.457	-0359.03
0331.135	008.036	00298.03	00202.42	00140.45	004.535	-05.051	-0359.01
0331.311	008.190	00298.188	00202.22	00140.41	004.614	-05.346	-0359.03
0331.553	008.413	00298.41	00201.95	00140.36	004.535	-05.608	-0358.96

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332.124	339.816	33299.81	33281.31	33148.33	334.474	33.196	3330.92
332.168	339.889	33299.88	33281.26	33148.35	334.474	33.196	3330.92
332.308	339.302	33299.33	33281.19	33148.39	334.474	33.196	3330.92
332.337	339.925	33299.92	33281.59	33148.51	334.474	33.196	3330.92
333.538	3311.535	33308.53	33281.21	33148.74	334.474	33.196	3330.92
333.538	3311.544	33308.54	33281.12	33148.66	334.474	33.196	3330.92
333.610	3311.734	33308.73	33199.93	33148.64	334.474	33.196	3330.92
334.124	3311.222	33308.23	33199.39	33148.63	334.474	33.196	3330.92
334.629	3311.717	33308.71	33198.86	33148.57	334.474	33.196	3330.92
334.885	3311.901	33308.89	33198.68	33148.53	334.474	33.196	3330.92
334.885	3311.882	33308.88	33198.73	33148.61	334.474	33.196	3330.92
334.761	3311.826	33308.82	33198.80	33148.62	334.474	33.196	3330.92
334.803	3311.918	33308.91	33198.62	33148.53	334.474	33.196	3330.92
335.082	3312.034	33308.03	33198.45	33148.49	334.474	33.196	3330.92
334.980	3312.084	33308.08	33198.53	33148.54	334.474	33.196	3330.92
334.783	3311.885	33308.88	33198.80	33148.61	334.474	33.196	3330.92
334.563	3311.622	33308.62	33198.82	33148.64	334.474	33.196	3330.92
334.321	3311.305	33308.38	33198.24	33148.63	334.474	33.196	3330.92
334.189	3311.218	33308.21	33198.39	33148.68	334.474	33.196	3330.92
334.146	3311.203	33308.20	33198.42	33148.62	334.474	33.196	3330.92
334.102	3311.112	33308.12	33198.77	33148.65	334.474	33.196	3330.92
334.863	3311.861	33308.86	33198.77	33148.63	334.474	33.196	3330.92
334.758	3311.799	33308.79	33198.85	33148.65	334.474	33.196	3330.92
334.772	3311.829	33308.82	33198.82	33148.65	334.474	33.196	3330.92
334.758	3311.873	33308.87	33198.77	33148.64	334.474	33.196	3330.92
334.716	3311.787	33308.78	33198.85	33148.64	334.474	33.196	3330.92
334.706	3311.764	33308.76	33198.87	33148.63	334.474	33.196	3330.92
334.706	3311.829	33308.82	33198.79	33148.62	334.474	33.196	3330.92
334.634	3311.875	33308.87	33198.75	33148.62	334.474	33.196	3330.92
334.684	3311.822	33308.81	33198.91	33148.63	334.474	33.196	3330.92
334.758	3311.817	33308.81	33198.82	33148.64	334.474	33.196	3330.92
334.772	3311.909	33308.90	33198.71	33148.62	334.474	33.196	3330.92
334.772	3311.972	33308.97	33198.67	33148.62	334.474	33.196	3330.92
334.704	3311.934	33308.93	33198.67	33148.61	334.474	33.196	3330.92
334.816	3311.906	33308.90	33198.65	33148.60	334.474	33.196	3330.92
334.772	3311.936	33308.93	33198.65	33148.56	334.474	33.196	3330.92
334.926	3311.867	33308.86	33198.49	33148.70	334.474	33.196	3330.92
334.289	3311.316	33308.31	33198.44	33148.72	334.474	33.196	3330.92
334.267	3311.275	33308.27	33198.45	33148.76	334.474	33.196	3330.92
334.245	3311.259	33308.25	33198.50	33148.75	334.474	33.196	3330.92
334.245	3311.234	33308.23	33198.52	33148.75	334.474	33.196	3330.92
334.157	3311.153	33308.15	33198.50	33148.65	334.474	33.196	3330.92
334.113	3311.086	33308.08	33198.55	33148.63	334.474	33.196	3330.92
334.027	3311.060	33308.06	33198.03	33148.36	334.474	33.196	3330.92
334.542	3311.487	33308.48	33198.05	33148.16	334.474	33.196	3330.92
334.308	3311.281	33308.28	33198.06	33148.21	334.474	33.196	3330.92
334.299	3311.183	33308.18	33198.02	33148.38	334.474	33.196	3330.92
334.672	3311.498	33308.49	33198.31	33148.88	334.474	33.196	3330.92
334.409	3311.205	33308.20	33198.51	33148.84	334.474	33.196	3330.92

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0305.265	0013.262	00303.26	00200.52	0103.70	004.510	-0.170	-0110.90
0306.475	0013.434	00303.43	00200.39	00103.82	004.474	-06.060	-180.000
0306.19	0013.464	00303.46	00200.37	00103.03	004.553	-00.000	-0100.00
0306.409	0013.291	00303.29	00200.52	00103.00	004.550	-00.000	-0100.00
0306.365	0013.237	00303.23	00200.57	00103.01	004.520	-0.355	-0140.01
0306.453	0013.365	00303.36	00200.44	0103.00	004.553	-05.995	-000.024
0306.694	0013.583	00303.58	00200.22	00103.81	004.507	-05.813	-0120.01
0306.760	0013.641	00303.64	00200.174	00103.01	004.565	-05.960	-0100.00
0306.760	0013.599	00303.59	00200.20	00103.00	004.578	-05.900	-000.000
0306.716	0013.527	00303.52	00200.24	00103.76	004.572	-05.797	-0100.00
0306.782	0013.617	00303.61	00200.19	0103.806	004.553	-05.797	-0100.00
0307.591	0014.742	00304.74	00200.06	00104.00	004.584	-05.471	-0120.01
0307.925	0014.797	00304.79	00200.03	00104.03	004.572	-05.020	-000.002
0307.903	0014.802	00304.80	00200.03	00104.00	004.523	-05.980	-0100.00
0308.035	0014.921	00304.92	00200.06	00104.01	004.406	-05.741	-000.001
0308.105	0015.036	00305.03	00200.00	00104.04	004.553	-05.310	-000.008
0308.188	0015.082	00305.08	00200.78	00104.00	004.500	-5.030	-020.061
0308.188	0015.094	00305.09	00200.76	00104.05	004.517	-05.022	-0100.00
0308.210	0015.145	00305.14	00200.71	00104.05	004.406	-05.062	-000.000
0308.254	0015.149	00305.14	00200.70	00104.05	004.490	-05.970	-00.100
0308.188	0015.096	00305.09	00200.77	00104.07	004.553	-05.945	-000.000
0308.123	0015.118	00305.11	00200.84	00104.05	004.572	-05.480	-000.000
0308.123	0014.973	00304.97	00200.07	00104.04	004.547	-05.693	-000.003
0308.079	0014.971	00304.96	00200.07	00104.04	004.520	-05.911	-000.000
0308.057	0014.969	00304.96	00200.00	00104.00	004.520	-05.701	-0120.01
0307.925	0014.891	00304.89	00200.02	00104.05	004.535	-00.141	-000.000
0307.859	0014.834	00304.83	00200.99	00104.03	004.535	-06.046	-000.000
0307.903	0014.839	00304.83	00200.99	00104.01	004.504	-05.781	-020.001
0307.969	0014.886	00304.88	00200.94	00104.03	004.517	-06.020	-020.001
0307.947	0014.879	00304.87	00200.97	00104.00	004.553	-06.128	-000.000
0307.771	0014.698	00304.69	00200.99	00104.00	004.520	-05.928	-000.000
0307.112	0011.167	00301.16	00200.92	00101.00	004.400	-05.140	-00.105
0305.280	0012.380	00302.38	00200.93	0102.210	004.517	-05.870	-100.003
0308.276	0015.419	00305.41	00200.75	00105.17	004.517	-06.220	-120.059
0309.133	0016.363	00306.36	00200.71	00106.00	004.517	-06.220	-20.140
0309.331	0016.553	00306.55	00200.78	00106.25	004.535	-06.176	-020.140
0309.529	0016.698	00306.69	00200.49	00106.10	004.523	-05.539	-000.161
0309.749	0016.924	00306.92	00200.27	00106.19	004.520	-06.060	-000.161
0309.800	0017.084	00307.08	00200.22	00106.19	004.520	-06.310	-020.140
0309.002	0016.987	00306.98	00200.27	00106.22	004.547	-05.928	-000.134
0309.880	0016.962	00306.96	00200.28	00106.24	004.517	-05.835	-020.140
0309.858	0016.966	00306.96	00200.29	00106.25	004.520	-06.660	-00.100
0309.358	0016.895	00306.89	00200.38	00106.25	004.520	-06.533	-00.100
0309.771	0016.865	00306.86	00200.48	00106.26	004.504	-05.440	-00.176
0309.771	0016.803	00306.80	00200.49	00106.29	004.517	-05.320	-00.127
0309.551	0016.613	00306.61	00200.72	00106.33	004.535	-05.780	-020.127
0309.265	0016.301	00306.30	00200.96	00106.34	004.550	-05.911	-020.127
0309.309	0016.233	00306.23	00200.10	00106.34	004.400	-05.670	-000.112

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8306.955	8016.156	80306.13	8200.22	8146.36	804.553	85.725	110
8308.543	815.664	80305.66	8200.60	8146.321	804.602	85.805	127
8310.254	815.391	80305.39	8200.309	8146.23	804.535	85.631	132
8312.254	815.435	80305.43	8200.708	8146.22	804.449	85.846	105
8314.254	815.517	80305.51	8200.74	8146.26	804.541	85.110	110
8316.188	8015.273	80305.27	8200.95	8146.22	804.633	85.603	132
8318.913	8015.147	80305.14	8200.13	8146.17	804.584	85.789	144
8320.141	8015.273	80305.27	8200.91	8146.191	804.513	85.945	144
8322.123	8015.383	80305.38	8200.93	8146.212	804.498	85.486	149
8324.145	8015.379	80305.37	8200.84	8146.22	804.505	85.741	149
8326.123	8015.359	80305.35	8200.95	8146.21	804.541	85.616	155
8328.123	8015.483	80305.48	8200.74	8146.21	804.492	85.427	155
8330.323	815.612	80305.61	8200.63	8146.242	804.584	85.281	103
8332.562	8015.715	80305.71	8200.53	8146.25	804.541	85.434	104
8334.584	8015.819	80305.81	8200.44	8146.26	804.559	85.317	129
8336.628	8015.901	80305.90	8200.34	8146.24	804.535	85.464	149
8338.871	816.077	80306.07	8200.15	8146.23	804.584	85.383	161
8340.133	8016.234	80306.23	80199.96	8146.24	804.578	85.267	106
8342.133	8016.404	80306.40	80199.86	8146.26	804.614	85.603	122
8344.237	8016.547	80306.54	80199.69	8146.23	804.547	85.501	124
8346.595	8016.743	80306.74	80199.47	8146.21	804.486	85.373	103
8348.795	8016.884	80306.88	80199.39	8146.25	804.504	85.434	103
8350.836	8016.965	80306.96	80199.22	8146.18	804.529	85.678	247
8352.056	8017.120	80307.12	8199.358	8146.17	804.529	85.502	176
8354.134	87.172	80307.17	80199.82	8146.19	804.633	85.943	176
8356.144	807.137	80307.13	80199.11	8146.25	804.645	85.200	144
8358.078	8017.060	80307.06	8199.102	8146.24	804.553	85.403	171
8360.034	8017.054	80307.05	80199.16	8146.21	804.510	85.843	176
8362.012	8017.077	80307.07	80199.16	8146.23	804.572	85.457	220
8364.833	816.873	80306.87	8199.457	8146.32	804.620	85.349	144
8366.529	8016.668	80306.66	80199.65	8146.31	804.584	85.095	127
8368.529	8016.613	80306.61	80199.67	8146.28	804.534	85.021	127
8370.529	8016.623	80306.62	80199.66	8146.28	804.565	85.303	176
8372.463	8016.562	80306.56	80199.78	8146.34	804.608	85.337	108
8374.339	8016.371	80306.37	8199.976	8146.34	804.633	85.779	176
8376.199	8016.327	80306.32	80199.99	8146.310	804.596	85.132	132
8378.375	8016.550	80306.55	80199.68	8146.23	804.594	85.813	127
8380.617	8016.750	80306.75	80199.49	8146.239	804.557	85.550	117
8382.573	8016.658	80306.65	80199.67	8146.32	804.657	85.089	132
8384.397	8016.402	80306.40	8199.806	8146.29	804.669	85.072	176
8386.298	8015.206	80305.20	80199.61	8144.31	804.541	85.467	117
8388.337	8014.719	80304.71	80199.34	8143.92	804.492	85.176	132
8390.991	8014.944	80304.94	80199.18	8144.13	804.639	85.115	132
8392.123	8015.031	80305.03	8199.440	8144.170	804.718	85.238	183
8394.057	8014.957	80304.95	80199.48	8144.44	804.657	85.339	100
8396.386	8015.461	80305.45	80199.21	80144.67	804.523	85.123	176
8398.716	8015.768	80305.76	80199.08	80144.84	804.541	85.805	176
8400.738	8015.762	80305.76	8199.127	80144.88	804.626	85.701	155
8402.628	8015.541	80305.54	80199.32	80144.86	804.651	85.646	103

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3338.496	3215.431	3335.433	3319.37	3314.33	33.523	-5.239
3338.498	3215.508	3335.51	3319.31	3314.32	34.541	-363.117
3338.498	3215.322	3335.32	3319.52	3314.34	34.639	-5.535
3338.123	3214.983	3334.983	3319.819	3314.83	34.681	-344.078
3337.925	3214.838	3334.838	3319.95	3314.75	34.595	-5.623
3337.935	3214.793	3334.798	3319.96	3314.75	34.534	-35.298
3337.969	3214.783	3334.78	3319.97	3314.75	34.541	-35.638
3337.735	3214.517	3334.51	3319.24	3314.76	34.645	-35.638
3337.397	3214.264	3334.27	3319.44	3314.71	34.651	-35.631
3337.375	3214.244	3334.26	3319.41	3314.67	34.652	-36.302
3337.551	3214.481	3334.43	3319.23	3314.71	34.529	-36.158
3337.617	3214.574	3334.57	3319.16	3314.73	34.572	-36.167
3337.639	3214.575	3334.57	3319.16	3314.73	34.669	-36.749
3337.735	3214.577	3334.57	3319.16	3314.73	34.669	-36.943
3337.903	3214.788	3334.78	3319.92	3314.71	34.595	-6.123
3338.167	3215.128	3335.12	3319.63	3314.756	34.596	-35.674
3338.342	3215.373	3335.373	3319.429	3314.83	34.608	-36.457
3338.452	3215.483	3335.483	3319.359	3314.83	34.663	-35.995
3338.496	3215.543	3335.538	3319.27	3314.81	34.626	-363.117
3338.606	3215.641	3335.64	3319.166	3314.83	34.572	-345.122
3338.628	3215.732	3335.73	3319.124	3314.85	34.638	-326.115
3338.474	3215.401	3335.44	3319.54	3314.84	34.602	-325.149
3338.342	3215.264	3335.26	3319.54	3314.80	34.529	-35.589
3338.213	3215.153	3335.15	3319.65	3314.83	34.529	-345.378
3337.991	3214.896	3334.89	3319.89	3314.78	34.626	-36.929
3337.639	3214.562	3334.56	3319.193	3314.75	34.639	-345.378
3337.485	3214.378	3334.37	3319.34	3314.72	34.559	-345.324
3337.419	3214.312	3334.31	3319.464	3314.71	34.553	-345.346
3337.283	3214.131	3334.12	3319.55	3314.679	34.608	-345.312
3337.134	3213.958	3333.95	3319.69	3314.646	34.657	-345.356
3337.024	3213.912	3333.91	3319.77	3314.62	34.626	-363.151
3337.222	3214.158	3334.15	3319.52	3314.57	34.529	-345.501
3337.313	3214.255	3334.25	3319.46	3314.71	34.541	-36.054
3337.244	3214.092	3334.09	3319.56	3314.66	34.651	-37.017
3337.203	3214.103	3334.10	3319.53	3314.64	34.669	-36.282
3337.441	3214.456	3334.45	3319.24	3314.70	34.547	-37.179
3337.743	3214.799	3334.79	3319.93	3314.73	34.517	-363.073
3337.947	3215.004	3335.00	3319.77	3314.772	34.651	-325.061
3338.013	3215.033	3335.03	3319.74	3314.77	34.755	-35.163
3338.145	3215.103	3335.10	3319.65	3314.75	34.675	-35.361
3338.452	3215.554	3335.55	3319.21	3314.761	34.535	-35.379
3338.834	3215.887	3335.88	3319.85	3314.83	34.584	-36.383
3338.766	3215.823	3335.82	3319.08	3314.91	34.712	-36.255
3338.636	3215.598	3335.59	3319.24	3314.83	34.681	-35.441
3338.672	3215.708	3335.70	3319.08	3314.78	34.565	-36.319
3338.834	3215.889	3335.88	3319.98			

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8330.138	8315.128	8305.118	83192.69	8144.893	804.541	-86.429	-84.486
8337.925	8314.779	8334.77	83230.91	80144.78	804.596	-87.301	-84.486
8337.537	8314.417	8334.41	83230.32	80144.73	804.609	-87.319	-84.486
8337.332	8314.225	8334.22	83230.45	80144.68	804.608	-87.350	-84.486
8337.244	8314.204	8334.20	83230.47	80144.67	804.541	-86.543	-84.486
8337.314	8314.204	8334.20	83230.47	80144.67	804.541	-86.319	-84.486
8337.134	8314.079	8334.07	83230.58	80144.66	804.572	-86.738	-84.486
8336.519	8313.517	8333.51	83230.72	80144.24	804.506	-85.427	-84.486
8335.332	8312.531	8332.53	83230.78	80143.31	804.573	-85.569	-84.486
8335.332	8312.532	8332.53	83230.77	80143.30	804.608	-86.003	-84.486
8335.376	8312.597	8332.59	83230.68	80143.28	804.639	-86.364	-84.486
8335.486	8312.654	8332.65	83230.63	80143.281	804.602	-85.749	-84.486
8335.582	8312.663	8332.66	83230.58	80143.25	804.572	-85.974	-84.486
8335.464	8312.636	8332.63	83230.58	80143.21	804.620	-7.338	-84.486
8335.548	8312.662	8332.66	83230.547	80143.20	804.669	-87.242	-84.486
8335.728	8312.846	8332.84	83230.32	80143.17	804.584	-85.878	-84.486
8339.792	8316.798	8336.79	83230.95	80146.87	804.565	-86.319	-84.486
8312.473	809.471	8339.46	83199.95	80149.42	804.633	-86.167	-84.486
8312.517	809.509	8339.49	83199.94	80149.439	804.675	-86.282	-84.486
8312.583	809.579	8339.57	83199.84	80149.42	804.638	-85.585	-84.486
8312.869	809.933	8339.93	83199.52	80149.45	804.602	-86.591	-84.486
8313.176	8010.351	8331.35	8199.188	80149.53	804.559	-86.891	-84.486
8313.418	8010.620	8331.62	80198.96	80149.58	804.590	-85.995	-84.486
8313.462	8010.685	8331.68	80198.91	80149.59	804.645	-85.471	-84.486
8313.434	8010.714	8331.71	80198.88	80149.59	804.620	-7.871	-84.486
8313.664	810.842	8331.84	80198.75	80149.60	804.572	-86.123	-84.486
8313.748	810.968	8331.96	80198.63	80149.60	804.541	-86.457	-84.486
8313.857	811.033	8331.03	80198.58	80149.61	804.572	-86.467	-84.486
8313.879	8011.019	8331.01	80198.61	80149.62	804.614	-86.274	-84.486
8313.726	8010.806	8331.80	80198.82	80149.623	804.602	-87.592	-84.486
8313.572	8010.600	8331.60	80198.94	80149.58	804.578	-86.758	-84.486
8313.528	8010.541	8331.54	80199.034	80149.57	804.565	-87.252	-84.486
8313.484	8010.488	8331.48	80199.09	80149.58	804.608	-87.994	-84.486
8313.264	8010.255	8331.25	80199.31	80149.57	804.626	-86.891	-84.486
8312.957	809.882	8330.88	80199.646	80149.52	804.706	-87.103	-84.486
8312.671	809.634	8330.63	80199.84	80149.48	804.645	-87.574	-84.486
8312.715	809.604	8330.60	80199.87	80149.47	804.553	-87.225	-84.486
8312.649	809.568	8330.56	80199.91	80149.48	804.573	-86.849	-84.486
8312.693	809.711	8330.71	80199.157	80149.86	804.700	-86.678	-84.486
8313.286	8010.306	8331.30	80230.36	80150.76	804.742	-86.996	-84.486
8313.242	8010.397	8331.39	80230.41	80150.81	804.626	-87.338	-84.486
8313.638	8010.904	8331.90	80230.43	80151.33	804.547	-87.039	-84.486
8313.616	8010.737	8331.73	80230.58	80151.32	804.559	-86.985	-84.486
8313.308	8010.484	8331.48	80230.78	80151.26	804.645	-86.659	-84.486
8313.229	8010.316	8331.31	80230.89	80151.21	804.694	-86.808	-84.486
8313.264	8010.289	8331.28	80230.92	80151.20	804.614	-86.610	-84.486
8313.198	8010.292	8331.29	80230.916	80151.109	804.547	-86.581	-84.486
8313.220	810.325	8331.32	80230.89	80151.21	804.553	-86.728	-84.486
8313.132	8010.143	8331.14	80231.03	80151.18	804.694	-86.533	-84.486

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8313.003	810.041	80310.04	8201.096	80151.13	804.724	-06.085	-080.058
8313.008	810.225	80310.22	8200.93	80151.16	804.572	-06.870	-40.056
8313.374	810.552	80310.55	8200.70	80151.25	804.510	-6.985	-310.052
8313.404	810.677	80310.67	8200.61	80151.29	804.572	-06.467	-020.083
8313.462	810.653	80310.65	8200.66	8151.312	804.712	-06.985	-020.105
8313.484	810.623	80310.62	8200.67	80151.29	804.669	-06.799	-000.024
8313.726	810.939	80310.93	8200.36	8151.298	804.547	-06.282	-014.003
8314.099	811.290	80310.289	8200.03	80151.32	804.523	-06.600	-99.008
8314.107	811.385	80311.38	8200.96	80151.34	804.633	-07.017	-010.002
8314.143	811.313	80311.31	8200.05	80151.36	804.742	-06.698	-340.073
8314.165	811.257	80311.25	8200.08	80151.34	804.687	-07.419	-040.078
8314.121	811.329	80311.32	8200.99	80151.32	84.565	-06.901	-20.061
8000.00	8000.00	8000.00	8000.00	8000.00	8000.00	8000.00	-20.061
8000.00	8000.00	8000.00	8000.00	8000.00	8000.00	8000.00	-20.061
8000.00	8000.00	8000.00	8000.00	8000.00	8000.00	8000.00	-20.061

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BEARING IX	BEARING	36X	RELATIVE BEARING	COURSE	TRUE BEARING	SPEED	S/N	DEFL ANGL
0633.955	015.195		0275.19	0184.46	0095.655	007.471	003.077	-0338.64
0638.042	015.217		0275.21	0184.32	0095.537	007.397	006.999	-0350.46
0638.130	015.328		0275.32	0184.23	0095.505	007.510	007.510	-0358.418
0638.174	015.356		0275.35	0184.24	0095.562	007.587	005.441	-0358.46
0638.174	015.356		0275.35	0184.24	0095.559	007.520	03.634	-0358.48
0638.218	015.412		0275.41	0184.15	0095.562	007.440	04.883	-0358.46
0638.353	015.586		0275.58	0179.98	0095.570	07.454	004.594	-0358.44
0638.328	015.645		0275.64	0179.94	0095.534	007.495	005.256	-0358.35
0638.416	015.652		0275.65	0179.945	0095.595	007.599	003.442	-0358.48
0638.459	015.681		0275.68	0179.387	0095.567	007.581	002.363	-0358.48
0638.657	015.869		0275.86	0179.67	0095.540	07.501	001.719	-0358.52
0638.723	015.978		0275.97	0179.60	0095.581	007.489	002.691	-0358.52
0638.701	015.914		0275.91	0179.72	0095.633	007.599	005.862	-0358.50
0638.657	015.819		0275.81	0179.74	0095.565	007.648	004.184	-0358.50
0638.899	016.129		0276.12	0179.37	0095.499	007.501	003.025	-0358.55
0639.250	016.453		0276.45	0179.06	0095.515	007.373	003.273	-0358.57
0639.294	016.519		0276.51	0179.03	0095.543	007.410	01.505	-0358.57
0639.250	016.408		0276.40	0179.22	0095.636	007.593	002.322	-0358.55
0639.097	016.290		0276.29	0179.297	0095.587	007.684	003.828	-0358.50
0639.207	016.360		0276.36	0179.14	0095.501	007.581	004.122	-0358.55
0639.404	016.616		0276.61	0178.87	0095.485	007.416	003.177	-0358.50
0639.536	016.741		0276.74	0178.772	0095.512	007.397	003.697	-0358.59
0639.580	016.693		0276.69	0178.92	0095.611	007.581	003.577	-0358.55
0639.294	016.459		0276.45	0179.17	0095.628	007.751	004.457	-0358.50
0639.207	016.350		0276.35	0179.22	0095.581	007.684	003.731	-0358.50
0639.250	016.462		0276.46	0179.022	0095.482	007.416	002.234	-0358.55
0639.470	016.680		0276.68	0178.302	0095.482	007.349	005.665	-0358.55
0639.492	016.746		0276.74	0178.73	0095.534	007.568	005.010	-0358.528
0639.404	016.584		0276.58	0179.05	0095.639	007.709	004.026	-0358.46
0639.207	016.353		0276.35	0179.280	0095.630	07.721	001.938	-0358.55
0639.119	016.271		0276.27	0179.327	0095.598	007.591	002.666	-0358.50
0639.119	016.277		0276.27	0179.29	0095.567	007.301	003.080	-0358.506
0639.141	016.334		0276.33	0179.23	0095.570	07.433	006.021	-0358.52
0639.097	016.266		0276.26	0179.38	0095.630	07.623	002.834	-0358.50
0638.987	016.136		0276.13	0179.48	0095.620	07.617	002.000	-0358.506
0638.943	016.091		0276.09	0179.52	0095.617	007.495	002.881	-0358.48
0638.833	015.935		0275.93	0179.65	0095.644	007.465	004.321	-0358.46
0638.635	015.812		0275.81	0179.65	0095.625	007.629	003.327	-0358.46
0638.547	015.725		0275.72	0179.87	0095.600	07.672	002.934	-0358.46
0638.613	015.801		0275.80	0179.74	0095.540	007.556	002.255	-0358.44
0638.745	015.997		0275.99	0179.58	0095.578	007.446	-006	-0358.52
0638.767	016.014		0276.01	0179.62	0095.639	007.501	001.850	-0358.462
0638.657	015.893		0275.89	0179.83	0095.639	007.697	001.864	-0358.44

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033.745	015.965	0275.96	0179.56	095.529	07.495	01.937	038.43
033.965	016.230	0276.229	0179.31	095.545	07.385	01.543	038.54
039.409	016.265	0276.26	0179.38	095.647	07.550	01.945	038.46
038.311	015.942	0275.94	0179.72	095.661	07.782	01.046	038.46
038.657	015.786	0275.78	0179.82	095.611	07.764	03.669	038.44
038.723	015.870	0275.869	0179.68	095.551	07.544	01.946	038.44
038.899	016.102	0276.10	0179.470	095.570	07.434	01.838	038.50
038.899	016.144	0276.14	0179.47	095.614	07.513	02.121	038.46
038.767	015.928	0275.92	0179.73	095.660	07.715	02.062	038.44
038.569	015.716	0275.71	0179.89	095.646	07.745	02.809	038.44
038.547	015.716	0275.71	0179.85	095.573	07.581	02.331	038.46
038.679	015.905	0275.90	0179.67	095.573	07.469	02.447	038.44
038.767	015.995	0275.99	0179.61	095.600	07.520	03.358	038.45
038.723	015.953	0275.95	0179.69	095.650	07.642	01.620	038.44
038.657	015.815	0275.81	0179.79	095.609	07.642	02.226	038.44
038.741	015.836	0275.80	0179.79	095.603	07.599	02.729	038.48
038.679	015.806	0275.80	0179.79	095.598	07.593	02.828	038.46
038.635	015.762	0275.76	0179.85	095.623	07.599	02.500	038.44
038.459	015.597	0275.59	0179.99	095.592	07.629	02.097	038.44
038.394	015.532	0275.53	0180.04	095.573	07.611	02.283	038.41
038.340	015.484	0275.48	0180.04	095.578	07.587	02.514	038.41
038.328	015.462	0275.46	0180.110	095.573	07.581	02.832	038.37
038.346	015.456	0275.45	0180.11	095.567	07.574	02.271	038.41
038.372	015.616	0275.61	0179.93	095.551	07.556	02.407	038.41
038.613	015.857	0275.85	0179.72	095.531	07.537	02.132	038.39
038.723	015.986	0275.98	0179.61	095.603	07.538	02.380	038.44
038.657	016.011	0276.01	0179.61	095.628	07.532	01.523	038.44
038.569	015.850	0275.847	0179.80	095.650	07.503	02.310	038.374
038.437	015.723	0275.72	0179.86	095.534	07.503	02.419	038.30
038.591	015.973	0275.97	0179.55	095.526	07.612	02.012	038.28
038.899	016.209	0276.20	0179.34	095.526	07.574	02.936	038.28
038.899	016.185	0276.18	0179.47	095.548	07.483	02.614	038.44
038.591	015.841	0275.83	0179.76	095.628	07.538	01.436	038.48
038.459	015.749	0275.74	0179.82	095.628	07.660	02.153	038.41
038.745	016.029	0276.02	0179.49	095.570	07.703	02.141	038.39
039.009	016.297	0276.29	0179.23	095.521	07.581	02.201	0278.67
038.987	016.364	0276.36	0179.23	095.532	07.507	02.030	020.05
038.745	016.171	0276.16	0179.48	095.603	07.538	01.232	0179.95
038.723	015.980	0275.99	0179.59	095.655	07.562	01.805	0199.95
038.811	016.052	0276.05	0179.51	095.603	07.635	02.058	039.89
038.701	016.050	0276.048	0179.56	095.576	07.562	02.116	0279.88
038.723	015.907	0275.90	0179.69	095.566	07.556	02.438	0219.92
038.591	015.875	0275.87	0179.70	095.617	07.560	01.705	0259.87
038.679	015.983	0275.98	0179.57	095.603	07.593	01.623	0270.91
038.701	016.071	0276.07	0179.508	095.573	07.593	02.998	0299.83
038.723	016.080	0276.07	0179.508	095.578	07.587	02.543	0299.83
038.723	016.072	0276.07	0179.528	095.584	07.550	02.144	0339.85
038.741	016.072	0276.07	0179.528	095.598	07.623	02.224	0299.88
038.741	016.072	0276.07	0179.528	095.598	07.745	02.460	0319.856

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6338.723	6316.048	63276.04	63179.54	6395.592	637.623	633.332	6339.33
6338.679	6316.047	63276.04	63179.54	6395.589	637.544	632.256	6339.40
6338.781	6316.039	63276.03	63179.55	6395.592	637.532	634.354	6358.41
6338.657	6315.936	63275.93	63179.84	6395.622	637.587	635.152	6358.72
6338.569	6315.765	63275.76	63179.84	6395.649	637.629	635.856	6358.77
6338.437	6315.693	63275.69	63179.90	6395.592	637.611	633.696	6359.07
6338.459	6315.714	63275.71	63179.85	6395.576	637.538	631.016	6358.81
6338.481	6315.832	63275.83	63179.74	6395.576	637.489	63.737	6358.48
6338.525	6315.353	63275.85	63179.73	6395.584	637.629	631.373	6358.59
6338.525	6315.311	63275.80	63179.79	6395.649	637.678	631.707	6358.54
6338.481	6315.777	63275.77	63179.82	6395.603	637.611	632.470	6358.879
6338.503	6315.817	63275.81	63179.75	6395.576	637.568	63.966	6359.07
6338.547	6315.880	63275.878	63179.78	6395.584	637.562	6.281	6359.07
6338.569	6315.833	63275.83	63179.78	6395.611	637.660	6.808	6359.09
6338.481	6315.715	63275.71	63179.68	6395.595	637.660	62.066	6359.12
6338.437	6315.643	63275.64	63179.65	6395.592	637.611	631.130	6359.099
6338.350	6315.555	63275.55	63180.12	6395.576	637.574	632.120	6359.099
6338.346	6315.492	63275.49	63180.035	6395.576	637.605	632.131	6359.07
6338.328	6315.477	63275.47	63180.09	6395.573	637.642	631.854	6359.09
6338.284	6315.477	63275.47	63180.09	6395.573	637.666	631.584	6359.09
6338.218	6315.477	63275.47	63180.09	6395.573	637.605	633.158	6359.12
6338.152	6315.339	63275.33	63180.16	6395.559	637.587	633.627	6359.07
6338.152	6315.332	63275.32	63180.22	6395.551	637.605	634.134	6359.07
6338.130	6315.323	63275.32	63180.22	6395.548	637.611	63.905	6359.07
6338.174	6315.334	63275.33	63180.19	6395.529	637.611	632.097	6359.09
6338.174	6315.352	63275.35	63180.184	6395.534	637.562	633.686	6359.14
6338.130	6315.259	63275.25	63180.27	6395.534	637.562	632.797	6359.12
6338.130	6315.231	63275.22	63180.29	6395.523	637.599	632.789	6359.14
6338.152	6315.309	63275.30	63180.20	6395.512	637.617	631.849	6359.12
6338.249	6315.430	63275.427	63180.11	6395.543	637.617	631.923	6359.14
6338.262	6315.469	63275.46	63180.08	6395.551	637.581	632.751	6359.16
6338.284	6315.476	63275.47	63180.07	6395.551	637.593	632.104	6359.14
6338.306	6315.480	63275.479	63180.06	6395.545	637.623	631.321	6359.09
6338.416	6315.651	63275.65	63179.898	6395.548	637.623	6.302	6359.16
6338.525	6315.829	63275.82	63179.75	6395.578	637.562	6.811	6359.07
6338.657	6315.907	63275.90	63179.69	6395.598	637.489	6.209	6359.16
6338.701	6316.051	63275.94	63179.59	6395.592	637.532	632.728	6359.14
6338.767	6316.033	63275.999	63179.59	6395.598	637.642	633.555	6359.14
6338.811	6316.058	63276.05	63179.53	6395.589	637.678	632.903	6359.16
6338.921	6316.125	63276.12	63179.47	6395.633	637.599	632.013	6359.16
6338.965	6316.210	63276.210	63179.385	6395.595	637.471	632.106	6359.18
6339.009	6316.243	63276.24	63179.33	6395.581	637.544	632.823	6359.18
6339.031	6316.257	63276.25	63179.34	6395.606	637.776	631.742	6359.18
6338.987	6316.166	63276.16	63179.46	6395.628	637.739	632.458	6359.16
6338.987	6316.138	63276.13	63179.48	6395.595	637.599	632.134	6359.13
6338.965	6316.119	63276.11	63179.45	6395.576	637.592	633.694	6359.18
6339.009	6316.165	63276.16	63179.42	6395.589	637.581	634.030	6359.165
6338.877	6316.042	63276.04	63179.613	6395.613	637.632	634.332	6359.16
6338.745	6315.882	63275.88	63179.731	6395.611	637.690	64.763	6359.18
6338.745	6315.882	63275.88	63179.703	6395.584	637.581	633.663	6359.12

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6638.899	6016.140	6276.139	60179.44	6095.578	607.599	603.347	6359.20
6638.877	6016.107	6276.10	60179.53	6095.639	607.721	602.645	6359.16
6638.789	6015.891	6275.88	60179.73	6095.622	607.721	602.651	6359.20
6638.701	6015.828	6275.82	60179.74	6095.570	67.642	604.184	6359.18
6638.789	6015.989	6275.98	60179.54	6095.529	607.551	64.522	6359.18
6638.943	6016.113	6276.11	60179.46	6095.578	607.611	601.840	6359.187
6638.899	6016.043	6276.04	60179.60	6095.647	607.733	601.412	6359.18
6638.767	6015.834	6275.83	60179.71	6095.598	607.764	604.677	6359.18
6638.811	6015.898	6275.89	60179.65	6095.556	607.660	65.085	6359.20
6638.899	6016.380	6276.078	60179.45	6095.529	607.593	603.044	6359.20
6639.009	6016.177	6276.17	60179.39	6095.570	67.635	602.668	6359.20
6639.009	6016.161	6276.16	60179.44	6095.603	607.697	602.802	6359.20
6638.965	6016.069	6276.06	60179.52	6095.592	607.709	604.331	6359.20
6638.943	6016.054	6276.05	60179.52	6095.581	607.635	605.913	6359.20
6638.943	6016.075	6276.07	60179.48	6095.559	607.623	604.781	6359.20
6639.009	6016.102	6276.10	60179.478	6095.578	607.629	603.687	6359.20
6638.965	6016.093	6276.09	60179.50	6095.598	607.642	605.212	6359.18
6638.965	6016.089	6276.08	60179.51	6095.598	607.648	604.937	6359.23
6638.877	6015.952	6275.94	60179.69	6095.647	607.642	606.271	6359.18
6638.437	6015.479	6275.47	60180.12	6095.603	607.635	605.307	6359.16
6637.822	6014.824	6274.82	60180.65	6095.482	607.623	606.899	6359.05
6637.185	6014.140	6274.139	60181.20	6095.348	607.550	64.955	6359.09
6636.433	6013.422	6273.41	60181.92	6095.342	607.495	605.129	6359.18
6635.427	6012.506	6272.58	60182.96	6095.548	607.544	605.706	6359.20
6634.205	6011.576	6271.57	60184.17	6095.749	607.551	606.944	6359.20
6633.230	6010.309	6270.39	60185.22	6095.625	607.532	607.823	6359.20
6632.241	609.214	6269.21	60186.15	6095.370	67.452	604.703	6359.47
6631.033	608.012	6268.01	60187.39	6095.411	607.477	602.795	6359.47
6629.341	606.634	6266.63	60189.04	6095.680	67.629	602.772	6359.29
6627.693	6014.932	6264.93	60190.588	6095.518	607.684	603.348	6359.18
6626.000	6000.000	6260.00	6000.00	6000.00	6000.00	6000.00	6359.187
6625.000	6000.000	6250.00	6000.00	6000.00	6000.00	6000.00	6359.187
6624.000	6000.000	6240.00	6000.00	6000.00	6000.00	6000.00	6359.187

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BEARING 1X	BEARING 36X	RELATIVE BEARING	COURSE	TRUE BEARING	SPEED	S/N	DEFL ANGL
6626.243	6613.473	6263.469	66191.94	6695.378	667.568	663.185	-6359.13
6644.172	6611.288	66281.28	66179.78	66141.17	663.142	664.196	-6358.98
6644.222	6611.383	66281.38	66179.78	66141.17	663.142	664.196	-6358.98
6644.326	6611.416	66281.41	66179.67	66141.09	663.142	664.196	-6358.98
6644.373	6611.466	66281.46	66179.61	66141.07	663.142	664.196	-6358.98
6644.414	6611.537	66281.53	66179.53	66141.07	663.142	664.196	-6358.98
6644.436	6611.544	66281.54	66179.54	66141.07	663.142	664.196	-6358.98
6644.414	6611.482	66281.48	66179.62	66141.14	663.142	664.196	-6358.98
6644.414	6611.497	66281.49	66179.54	66141.14	663.142	664.196	-6358.98
6644.730	6611.763	66281.76	66179.23	66141.07	663.142	664.196	-6358.98
6644.832	6611.874	66281.87	66179.16	66141.07	663.142	664.196	-6358.98
6644.766	6611.777	66281.77	66179.28	66141.16	663.142	664.196	-6358.98
6644.722	6611.739	66281.73	66179.28	66141.07	663.142	664.196	-6358.98
6645.073	6612.166	66282.16	66178.36	66141.07	663.142	664.196	-6358.98
6645.513	6612.399	66282.39	66178.46	66141.07	663.142	664.196	-6358.98
6645.633	6612.526	66282.52	66178.31	66141.07	663.142	664.196	-6358.98
6645.667	6612.532	66282.53	66178.36	66141.07	663.142	664.196	-6358.98
6645.611	6612.417	66282.41	66178.46	66141.07	663.142	664.196	-6358.98
6649.424	6616.222	66286.22	66178.28	66141.51	667.843	661.395	-6359.14
6651.163	6617.786	6627.779	66178.42	66141.51	667.843	661.395	-6359.14
6651.533	6618.127	66283.12	66177.96	66141.51	667.843	661.395	-6359.14
6651.835	6618.499	66283.49	66178.13	66141.51	667.843	661.395	-6359.14
6651.841	6618.533	66283.53	66178.34	66141.51	667.843	661.395	-6359.14
6651.379	6617.988	66237.98	66178.53	66141.51	667.843	661.395	-6359.14
6651.372	6617.654	66237.65	66178.64	66141.51	667.843	661.395	-6359.14
6651.913	6617.541	66237.54	66178.715	66141.51	667.843	661.395	-6359.14
6651.754	6617.413	66237.413	66178.83	66141.51	667.843	661.395	-6359.14
6649.450	6618.625	66238.62	66179.04	66141.51	667.843	661.395	-6359.14
6647.446	6614.818	66284.81	66179.29	66141.51	667.843	661.395	-6359.14
6647.383	6613.925	66283.92	66179.37	66141.51	667.843	661.395	-6359.14
6647.358	6613.913	66283.91	66179.38	66141.51	667.843	661.395	-6359.14
6647.358	6613.917	66283.91	66179.38	66141.51	667.843	661.395	-6359.14
6647.356	6613.917	66283.91	66179.38	66141.51	667.843	661.395	-6359.14
6647.271	6613.839	66283.83	66179.47	66141.51	667.843	661.395	-6359.14
6647.195	6613.692	66283.69	66179.63	66141.51	667.843	661.395	-6359.14
6646.963	6613.695	66283.69	66179.72	66141.51	667.843	661.395	-6359.14
6647.337	6613.695	66283.69	66179.71	66141.51	667.843	661.395	-6359.14
6647.337	6613.729	66283.72	66179.56	66141.51	667.843	661.395	-6359.14
6647.337	6613.745	66283.74	66179.57	66141.51	667.843	661.395	-6359.14
6646.875	6613.516	66283.51	66179.85	66141.51	667.843	661.395	-6359.14
6646.699	6613.353	66283.35	66179.85	66141.51	667.843	661.395	-6359.14
6646.699	6613.369	66283.36	66179.96	66141.51	667.843	661.395	-6359.14
6646.699	6613.533	66283.53	66179.797	66141.51	667.843	661.395	-6359.14
6646.375	6613.555	66283.55	66179.78	66141.51	667.843	661.395	-6359.14
6646.319	6613.473	66283.47	66179.83	66141.51	667.843	661.395	-6359.14

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8646.309	8313.478	83283.47	83179.83	83133.31	837.678	83.936	-358.98
8646.375	8313.541	83283.54	83179.78	83133.32	837.672	-81.667	-8359.01
8646.919	8313.582	83283.57	83179.72	83133.33	837.669	-1.823	-358.98
8647.395	8313.754	83283.75	83179.53	83133.282	837.617	-81.289	-8359.01
8647.358	8313.962	83283.96	83179.33	83133.26	837.581	-436	-8359.03
8647.383	8314.026	83284.02	83179.25	83133.27	837.611	-0.978	-8359.03
8647.358	8313.946	83283.94	83179.36	83133.31	87.690	-1.839	-8358.98
8647.358	8313.943	8283.939	83179.33	83133.27	837.623	83.343	-359.033
8647.556	8314.203	8284.203	83179.09	83133.23	837.581	-22.648	-8359.03
8647.713	8314.325	8284.32	83179.93	83133.25	837.495	831.227	-8359.00
8647.644	8314.208	8284.20	83179.22	83133.29	837.562	83.135	-8359.03
8647.512	8314.058	8284.049	83179.22	83133.24	837.611	831.569	-8359.07
8647.446	8314.031	8284.03	83179.23	83133.25	837.544	8.119	-8359.05
8647.446	8314.044	8284.04	83179.25	83133.27	837.617	832.991	-8359.05
8647.468	8314.019	8284.01	83179.46	83133.28	837.678	83.397	-8359.01
8647.249	8313.859	8283.85	83179.46	83133.23	837.526	832.034	-8359.01
8647.161	8313.818	8283.81	83179.34	83133.24	837.501	833.694	-8359.01
8647.227	8313.891	8283.88	83179.22	83133.25	837.581	-81.937	-8359.01
8647.292	8314.016	8284.01	83179.253	83133.26	837.678	8.125	-8359.01
8647.314	8314.011	8284.01	83179.44	83133.293	87.654	832.377	-8359.01
8647.183	8313.856	8283.85	83179.63	83133.31	837.553	83.135	-8358.98
8647.029	8313.737	8283.73	83179.68	83133.31	837.489	833.832	-8358.98
8646.941	8313.629	8283.62	83179.71	83133.31	837.532	832.074	-8359.01
8646.919	8313.604	8283.60	83179.72	83133.32	837.556	833.629	-8358.94
8646.853	8313.552	8283.55	83179.77	83133.32	837.611	834.366	-8358.98
8646.787	8313.513	8283.51	83179.82	83133.33	837.599	832.557	-8358.96
8646.765	8313.512	8283.49	83179.83	83133.329	837.538	831.838	-358.989
8646.765	8313.592	8283.59	83179.703	83133.30	837.533	832.631	-8359.03
8646.853	8313.632	8283.63	83179.62	83133.32	837.629	833.524	-8219.68
8646.839	8313.632	8283.63	83179.69	83133.32	837.666	835.314	-838.178
8646.831	8313.622	8283.62	83179.761	83133.28	837.611	835.173	-83.233
8646.985	8313.794	8283.79	83179.665	83133.28	837.553	83.282	-848.034
8647.073	8313.853	8283.848	83179.48	83133.28	837.524	82.061	-828.03
8647.051	8313.853	8283.85	83179.43	83133.28	837.581	832.393	-838.026
8647.051	8313.826	8283.82	83179.49	83133.31	837.629	835.878	-8348.03
8647.029	8313.764	8283.76	83179.55	83133.313	837.642	835.968	-8179.93
8647.029	8313.864	8283.83	83179.47	83133.27	837.581	831.735	-868.051
8647.249	8314.024	8284.02	83179.23	83133.26	87.581	832.637	-868.051
8647.292	8314.075	8284.07	83179.19	83133.26	837.538	833.607	-838.024
8647.295	8313.943	8283.94	83179.36	83133.31	87.593	833.636	-838.036
8647.095	8313.811	8283.81	83179.478	83133.28	837.642	835.631	-838.046
8647.139	8313.912	8283.91	83179.31	83133.23	87.568	832.837	-868.029
8647.446	8314.189	8284.18	83179.05	83133.24	837.471	835.533	-168.005
8647.493	8314.195	8284.19	83179.09	83133.23	837.547	834.112	-868.073
8647.227	8313.926	8283.92	83179.36	83133.29	837.617	835.591	-818.034
8647.073	8313.795	8283.79	83179.53	83133.293	837.629	833.467	-8119.99
8647.073	8313.769	8283.76	83179.51	83133.23	837.553	83.329	-8148.01

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8647.424	8313.737	83283.73	83179.53	8313.29	837.446	837.538	833.824
8647.468	8313.736	83283.73	83179.56	8313.31	837.465	835.595	833.846
8647.336	8313.596	83283.59	83179.69	8313.29	837.428	833.484	833.873
8647.292	8313.563	83283.56	83179.73	8313.27	837.416	835.934	833.882
8647.336	8313.672	83283.67	83179.62	8313.29	837.465	836.713	834.034
8647.358	8313.641	83283.64	83179.676	8313.31	837.537	835.738	833.868
8647.139	8313.435	83283.43	83179.86	8313.29	837.471	834.319	833.881
8647.117	8313.391	83283.39	83179.987	8313.29	837.385	836.599	833.824
8647.139	8313.481	83283.48	83179.819	8313.29	837.416	836.046	833.883
8647.235	8313.533	83283.53	83179.84	8313.34	837.524	837.929	834.033
8646.985	8313.272	83283.27	83183.08	8313.35	837.574	838.503	833.99
8646.853	8313.181	83283.18	83183.17	8313.351	837.483	838.513	833.883
8646.853	8313.196	83283.19	83183.13	8313.33	837.385	835.922	836.007
8647.007	8313.358	83283.35	83179.98	8313.33	837.379	836.916	833.99
8646.985	8313.393	83283.39	83179.94	8313.33	837.556	832.726	833.824
8647.029	8313.387	83283.38	83179.96	8313.35	837.617	831.518	833.99
8647.037	8313.358	83283.35	83183.08	8313.357	837.532	832.116	834.036
8647.073	8313.503	83283.50	83179.83	8313.31	87.471	837.836	834.033
8647.383	8313.691	83283.68	83179.61	8313.33	837.422	834.285	833.99
8647.432	8313.758	83283.75	83179.55	8313.367	837.446	836.329	833.881
8647.490	8313.798	83283.79	83179.51	8313.33	837.477	833.987	833.883
8647.534	8313.835	83283.83	83179.47	8313.28	837.489	834.376	836.031
8647.603	8313.895	83283.89	83179.38	8313.28	837.452	834.562	833.883
8647.666	8313.957	83283.95	83179.32	8313.27	87.416	834.768	833.886
8647.666	8313.969	83283.96	83179.33	8313.27	837.422	835.441	833.881
8647.666	8313.925	83283.92	83179.37	8313.30	837.446	837.495	833.881
8647.556	8313.794	83283.79	83179.51	8313.31	837.452	832.809	833.881
8647.463	8313.685	83283.68	83179.60	8313.29	87.453	832.809	833.881
8647.383	8313.621	83283.62	83179.659	8313.28	837.373	835.765	834.038
8647.292	8313.524	83283.52	83179.76	8313.28	837.349	835.385	833.881
8647.161	8313.417	83283.41	83179.87	8313.29	837.456	833.385	833.881
8647.117	8313.383	83283.38	83179.93	8313.29	837.526	832.283	833.881
8647.133	8313.474	83283.47	83179.81	8313.28	837.433	837.717	833.881
8647.271	8313.582	83283.57	83179.72	8313.28	837.336	831.891	833.881
8647.249	8313.555	83283.55	83179.78	8313.335	837.324	861.891	833.881
8647.205	8313.457	83283.45	83179.88	8313.34	837.446	86.547	833.881
8647.161	8313.463	83283.46	83179.85	8313.31	837.550	832.556	833.881
8647.314	8313.623	83283.62	83179.67	8313.293	837.379	832.556	833.881
8647.432	8313.792	83283.79	83179.594	8313.29	837.275	831.498	833.881
8647.432	8313.713	83283.71	83179.57	8313.28	837.336	832.598	833.881
8647.432	8313.714	83283.71	83179.57	8313.28	837.526	834.579	833.881
8647.446	8313.734	83283.73	83179.59	8313.29	837.526	833.669	833.881
8647.363	8313.659	83283.65	83179.61	8313.27	837.464	832.379	833.881
8647.446	8313.739	83283.73	83179.53	8313.27	837.324	832.966	833.881
8647.534	8313.811	83283.81	83179.473	8313.283	837.361	831.562	833.881
8647.556	8313.815	83283.81	83179.47	8313.285	837.526	84.518	833.881
8647.578	8313.827	83283.82	83179.45	8313.29	837.507	833.314	833.881
8647.776	8314.053	83284.05	83179.25	8313.25	837.391	834.672	833.881

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600,000
-339.59

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8647.823	814.027	86284.82	86179.25	86133.28	87.523	84.312	-8168.46
8647.864	814.039	86284.83	86179.25	86133.26	87.452	83.585	-8239.96
8647.938	814.172	86284.17	86179.06	86133.23	87.355	83.302	-8359.23
8648.018	814.266	86284.26	86178.98	86133.25	87.331	83.710	-359.099
8647.996	814.196	86284.19	86179.09	86133.28	87.477	83.353	-8359.69
8647.886	814.046	86284.04	86179.22	86133.266	87.513	8.364	-8359.69
8647.886	814.033	86284.03	86179.22	86133.25	87.416	83.701	-8359.71
8647.933	814.136	86284.15	86179.07	86133.23	87.349	88.888	8359.69
8647.974	814.232	86284.23	86179.019	86133.25	87.385	83.484	-8359.75
8647.996	814.223	86284.22	86179.04	86133.26	87.434	83.484	-8359.69
8647.939	814.182	86284.18	86179.09	86133.27	87.446	82.741	-8359.71
8647.974	814.246	86284.24	86179.058	86133.259	87.397	82.943	-8359.69
8648.033	814.345	86284.34	86178.89	86133.24	87.373	8.431	-8359.69
8648.171	814.437	86284.43	86178.86	86133.27	87.397	84.732	-8359.73
8648.062	814.094	86284.09	86179.17	86133.26	87.416	83.431	-8359.69
8647.952	814.094	86284.09	86179.17	86133.25	87.385	-349	-8359.67
8647.864	814.019	86284.01	86179.23	86133.25	87.397	82.844	-8359.69
8647.864	813.993	86283.99	86179.25	86133.25	87.465	82.476	-8359.69
8647.823	813.989	86283.98	86179.25	86133.24	87.428	85.843	-8359.67
8647.864	813.936	86283.93	86179.25	86133.24	87.336	83.395	-8359.69
8647.864	813.994	86283.99	86179.23	86133.22	87.312	83.356	-8359.69
8647.864	814.019	86284.01	86179.29	86133.24	87.443	84.038	-8359.67
8647.864	813.975	86283.97	86179.29	86133.26	87.587	84.705	-8359.67
8647.823	813.962	86283.96	86179.36	86133.26	87.513	83.025	-8359.67
8647.842	813.983	86283.98	86179.25	86133.24	87.336	81.808	-8359.69
8647.996	814.161	86284.15	86179.05	86133.21	87.336	82.616	-8359.71
8648.033	814.269	86284.26	86178.97	86133.24	87.477	84.952	-8359.71
8648.062	814.254	86284.25	86179.01	86133.26	87.617	84.389	-8359.69
8648.033	814.159	86284.15	86179.09	86133.25	87.513	83.654	-8359.71
8648.062	814.145	86284.14	86179.13	86133.24	87.373	84.180	-8359.69
8648.044	814.131	86284.13	86179.12	86133.25	87.477	8.737	-8359.69
8647.933	814.013	86284.01	86179.25	86133.25	87.355	85.109	-8359.69
8647.842	813.933	86283.93	86179.32	86133.25	87.523	84.180	-359.692
8647.823	813.991	86283.99	86179.376	86133.27	87.477	81.035	-8359.67
8647.578	813.721	86283.71	86179.56	86133.28	87.446	82.549	-8359.64
8647.358	813.514	86283.51	86179.78	86133.29	87.403	82.285	-8359.67
8647.292	813.458	86283.45	86179.83	86133.28	87.471	82.815	-8359.62
8647.462	813.575	86283.57	86179.69	86133.26	87.434	84.788	-359.648
8647.468	813.672	86283.67	86179.626	86133.29	87.428	81.995	-8359.67

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BEARING-1X	BEARING	RELATIVE BEARING	COURSE	TRUE BEARING	SPEED	S/N	DEFL ANGL
6636.399	6616.398	66276.39	66176.35	662.747	667.065	66.165	66.555
6638.943	6616.458	66276.05	66176.46	662.516	667.678	66.161	66.527
6638.336	6615.474	66275.47	66176.96	662.433	667.684	66.1736	66.358
6637.888	6614.933	66274.93	66177.39	662.532	667.642	66.163	66.461
6637.693	6614.635	66274.63	66177.63	662.271	667.551	66.1813	66.396
6637.471	6614.483	66274.48	66177.78	662.263	667.532	66.1646	66.396
6637.251	6614.282	66274.28	66177.97	662.258	667.532	66.359	66.352
6637.009	6614.041	66274.04	66178.226	662.266	667.556	66.274	66.374
6636.799	6613.898	66273.89	66178.46	662.274	667.524	66.911	66.286
6636.592	6613.653	66273.65	66178.63	662.291	667.471	66.624	66.242
6636.438	6613.526	66273.52	66178.78	662.313	667.452	66.518	66.286
6636.196	6613.366	66273.36	66178.97	662.343	667.416	66.664	66.286
6636.042	6613.213	66273.21	66179.16	662.378	667.422	66.953	66.264
6635.891	6613.072	66273.07	66179.35	662.378	667.379	66.822	66.198
6635.669	6612.956	66272.95	66179.45	662.416	667.318	66.644	66.254
6635.471	6612.895	66272.89	66179.64	662.444	667.308	66.356	66.242
6635.361	6612.719	66272.71	66179.73	662.447	667.281	66.167	66.215
6635.295	6612.733	66272.73	66179.74	662.447	667.251	66.222	66.188
6635.251	6612.684	66272.68	66179.77	662.461	667.258	66.945	66.224
6635.054	6612.539	66272.53	66180.08	662.516	667.227	66.192	66.198
6634.856	6612.367	66272.36	66180.15	662.519	667.245	66.193	66.198
6634.834	6612.396	66272.39	66180.07	662.472	667.172	66.298	66.063
6635.019	6612.574	66272.57	66179.86	662.442	667.088	66.439	66.193
6635.032	6612.594	66272.59	66179.87	662.442	667.111	66.523	66.224
6634.878	6612.437	66272.43	66180.08	662.521	667.166	66.623	66.144
6634.834	6612.386	66272.38	66180.12	662.519	667.111	66.820	66.166
6634.922	6612.510	66272.50	66179.92	662.436	666.982	66.202	66.176
6635.076	6612.626	66272.62	66179.82	662.447	666.946	66.571	66.144
6635.019	6612.574	66272.57	66179.82	662.447	667.031	66.723	66.176
6634.944	6612.462	66272.46	66180.03	662.494	666.964	66.236	66.171
6634.966	6612.548	66272.54	66179.88	662.431	666.946	66.324	66.171
6634.131	6611.749	66271.74	66179.74	662.494	666.963	66.143	66.242
6634.131	6611.847	66271.84	66179.84	662.494	666.934	66.467	66.134
6634.197	6611.843	66271.84	66179.973	662.494	666.869	66.637	66.193
6634.197	6611.859	66271.85	66179.91	662.494	666.835	66.995	66.166
6634.263	6611.999	66271.99	66179.77	662.494	666.891	66.359	66.176
6634.329	6612.015	66272.01	66179.76	662.494	666.891	66.733	66.198
6634.241	6611.990	66271.99	66179.81	662.494	666.818	66.794	66.171
6634.263	6611.965	66271.96	66179.80	662.494	666.702	66.902	66.166
6634.438	6612.082	66272.08	66179.66	662.494	666.683	66.834	66.144
6634.463	6612.137	66272.12	66179.62	662.494	666.812	66.793	66.193
6634.417	6612.123	66272.12	66179.643	662.494	666.835	66.468	66.224
6634.417	6612.086	66272.08	66179.68	662.494	666.763	66.999	66.224

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8634.544	812.162	8272.16	8179.58	891.744	86.047	-02.369	-193
8634.544	812.171	8272.17	8179.574	891.744	86.720	-3.718	-198
8634.544	812.175	8272.17	8179.56	891.741	86.720	-6.943	-220
8634.614	812.268	8272.26	8179.43	891.697	86.653	-4.333	-242
8634.724	812.352	8272.35	8179.33	891.686	86.622	-01.343	-028.193
8634.724	812.357	8272.35	8179.33	891.689	86.622	-05.427	-028.193
8634.724	812.358	8272.35	8179.33	891.692	86.696	-03.456	-020.215
8634.856	812.452	8272.45	8179.182	891.651	86.592	-03.331	-398
8635.010	812.568	8272.56	8179.04	891.609	86.598	-03.414	-396
8634.988	812.581	8272.49	8179.16	891.662	86.677	-04.498	-396
8634.798	812.368	8272.359	8179.32	891.631	86.714	-04.485	-352
8634.834	812.371	8272.37	8179.278	891.648	86.604	-05.011	-417
8634.944	812.412	8272.41	8179.07	891.483	86.555	-03.285	-374
8635.164	812.659	8272.65	8179.02	891.686	86.641	-03.595	-417
8636.812	813.763	8273.76	8179.11	892.376	86.732	-02.976	-461
8637.888	813.589	8273.58	8179.16	892.755	86.696	-06.698	-308
8637.866	813.599	8273.59	8179.14	892.744	86.683	-02.502	-374
8637.932	813.707	8273.70	8179.01	892.716	86.738	-01.834	-374
8637.976	813.802	8273.80	8178.91	892.714	86.812	-01.877	-352
8638.026	813.809	8273.80	8178.92	892.727	86.799	-04.861	-308
8637.844	813.597	8273.59	8179.11	892.705	86.865	-01.029	-374
8637.734	813.513	8273.51	8179.165	892.675	86.865	-3.351	-338
8637.344	813.703	8273.70	8178.99	892.694	86.891	81.004	-396
8638.020	813.834	8273.83	8178.97	892.711	86.940	-4.017	-330
8637.976	813.782	8273.78	8178.93	892.719	86.946	-05.045	-352
8637.822	813.638	8273.63	8179.05	892.686	86.909	-03.270	-308
8637.844	813.630	8273.628	8179.04	892.672	86.909	-04.044	-020.215
8637.932	813.719	8273.71	8179.99	892.714	86.774	-03.713	-020.209
8637.756	813.599	8273.59	8179.12	892.722	86.784	-03.514	-338
8637.668	813.460	8273.458	8179.24	892.705	86.778	-04.600	-308
8637.646	813.466	8273.46	8179.23	892.697	86.717	-05.002	-338
8637.800	813.624	8273.62	8179.09	892.719	86.700	-4.333	-330
8637.756	813.645	8273.64	8179.08	892.725	86.733	-03.104	-286
8637.756	813.571	8273.57	8179.18	892.752	86.739	-02.100	-330
8637.712	813.549	8273.54	8179.18	892.736	86.7343	-06.123	-330
8637.866	813.719	8273.71	8178.98	892.700	86.739	-04.104	-330
8637.976	813.840	8273.840	8178.868	892.708	86.7251	-05.539	-396
8638.004	813.828	8273.82	8178.88	892.711	86.7367	-03.377	-308
8637.910	813.690	8273.689	8178.99	892.683	86.7465	-04.706	-396
8637.866	813.654	8273.65	8179.00	892.656	86.7452	-01.323	-352
8637.976	813.818	8273.81	8178.87	892.692	86.7324	-03.542	-352
8638.064	813.879	8273.87	8178.82	892.700	86.7263	-03.753	-396
8637.932	813.708	8273.70	8179.00	892.708	86.7385	-02.664	-338
8637.625	813.460	8273.458	8179.25	892.711	86.7574	-03.295	-308
8637.559	813.393	8273.39	8179.31	892.719	86.7489	-01.768	-352
8637.712	813.516	8273.51	8179.20	892.719	86.7489	-01.730	-286
8637.734	813.583	8273.58	8179.16	892.741	86.7599	-03.437	-330
8637.646	813.422	8273.42	8179.33	892.752	86.752	-03.738	-286
8637.403	813.301	8273.30	8179.44	892.747	86.7617	-03.738	-286

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8637.251	8113.254	80273.25	80179.56	802.813	807.721	-02.751	-193
8637.185	8113.191	80273.18	80179.66	802.856	807.825	-04.766	-264
8637.097	8113.087	80273.08	80179.78	802.873	807.837	-04.837	-286
8637.075	8113.094	80273.09	80179.76	802.854	807.794	-03.763	-286
8637.297	8113.243	80273.24	80179.57	802.812	807.727	-05.554	8.396
8637.317	8113.293	80273.29	80179.51	802.821	807.727	-2.04	-040.160
8637.273	8113.236	80273.23	80179.591	802.802	807.794	-0.970	-220
8637.141	8113.102	80273.10	80179.70	802.802	807.812	-04.138	-040.138
8637.141	8113.087	80273.08	80179.71	802.796	807.770	-7.350	-176
8637.075	8113.087	80273.08	80179.70	802.796	807.788	-013.585	-060.073
8637.141	8113.098	80273.09	80179.69	802.791	807.776	-03.419	-020.193
8637.141	8113.111	80273.11	80179.67	802.788	807.721	-05.168	-0120.01
8637.163	8113.115	80273.11	80179.67	802.788	807.745	-05.808	-020.215
8637.141	8113.113	80273.11	80179.67	802.791	807.751	-03.728	-060.205
8637.163	8113.109	80273.10	80179.69	802.807	807.776	-01.740	-223
8637.185	8113.087	80273.08	80179.70	802.796	807.745	-05.340	-40.144
8637.097	8113.089	80273.08	80179.70	802.796	807.684	-09.239	-0100.04
8637.141	8113.139	80273.13	80179.65	802.796	807.672	-01.602	-020.193
8637.229	8113.206	80273.20	80179.62	802.832	807.739	-05.961	-242
8637.207	8113.179	80273.17	80179.67	802.843	807.819	-03.043	-154
8637.119	8113.132	80273.13	80179.75	802.851	807.806	-07.490	-40.122
8637.163	8113.090	80273.09	80179.70	802.854	807.733	-05.945	-060.095
8637.097	8113.090	80273.09	80179.75	802.837	807.635	-06.001	-060.051
8637.163	8113.105	80273.10	80179.74	802.843	807.721	-07.315	-040.166
8637.131	8113.015	80273.01	80179.86	802.873	807.306	-05.921	-60.095
8636.921	8112.992	80272.99	80179.88	802.875	807.788	-07.236	-0120.05
8637.099	8112.993	80272.99	80179.80	802.867	807.727	-05.038	-176
8637.099	8112.984	80272.97	80179.80	802.873	807.690	-3.943	-020.105
8636.077	8112.875	80272.87	80180.03	802.909	807.733	-05.554	-020.083
8636.724	8112.833	80272.83	80180.08	802.920	87.816	-06.891	-030.112
8636.768	8112.827	80272.82	80180.09	802.922	807.825	-03.165	-040.122
8636.630	812.828	80272.82	80180.03	802.914	807.751	-06.996	-040.078
8636.700	812.858	80272.88	80180.04	802.895	807.684	-05.331	-134
8636.768	812.885	80272.88	80180.03	802.914	807.825	-07.169	-132
8636.746	812.813	80272.81	80180.11	802.931	807.794	-05.887	-154
8636.877	812.815	80272.81	80180.10	802.917	807.770	-05.887	-020.105
8636.877	812.932	80272.93	80179.94	802.873	87.660	-4.662	-020.171
8636.987	812.916	80272.91	80179.84	802.862	87.654	-5.585	-060.073
8636.987	812.938	80272.93	80179.82	802.862	807.721	-07.811	-060.095
8636.965	812.940	80272.93	80179.82	802.865	807.758	-04.693	-198
8636.965	812.933	80272.93	80179.85	802.865	807.758	-05.945	-110
8637.031	812.983	80272.98	80179.75	802.839	807.831	-07.697	-020.103
8637.317	812.911	80272.91	80179.473	802.782	807.743	-07.747	-020.149
8637.493	812.955	80272.95	80179.30	802.782	807.605	-07.315	-220
8637.537	812.944	80272.94	80179.30	802.758	807.635	-04.186	-198
8637.449	812.945	80272.94	80179.28	802.769	807.770	-7.994	-176
8637.339	812.945	80272.94	80179.43	802.780	87.867	-07.648	-176
8637.405	812.949	80272.94	80179.51	802.769	87.800	-12.007	-040.144
	812.946	80272.94	80179.40	802.747	807.684	-03.228	-198

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6637.646	613.584	6179.14	692.733	67.642	-17.466	-223
6637.734	613.644	6179.08	692.725	697.684	-18.564	-176
6637.663	613.597	6179.16	692.745	697.745	-19.591	-198
6637.625	613.522	6179.22	692.733	697.727	-20.635	-242
6637.646	613.513	6179.22	692.733	697.727	-21.666	-323.237
6637.663	613.523	6179.23	692.747	697.778	-22.562	-198
6637.646	613.535	6179.23	692.741	697.788	-23.126	-176
6637.756	613.699	6179.33	692.703	697.703	-25.878	-198
6637.998	613.859	6178.84	692.703	67.623	-24.438	-323.259
6637.327	613.327	6178.88	692.714	697.799	-27.371	-338
6637.344	613.636	6179.08	692.689	697.398	-26.912	-264
6637.891	613.613	6179.05	692.664	697.367	-25.797	-223
6638.118	613.971	6178.69	692.664	697.642	-27.147	-242
6638.372	614.132	6178.487	692.667	697.642	-25.979	-264
6638.372	614.211	6178.487	692.683	697.715	-22.446	-264
6638.306	614.144	6178.55	692.743	67.825	-25.725	-286
6638.358	614.139	6178.52	692.659	697.849	-24.555	-264
6638.335	614.436	6178.23	692.639	697.758	-26.571	-338
6638.377	614.726	6177.93	692.659	697.666	-23.763	-338
6638.337	614.830	6177.87	692.703	67.697	-24.357	-333
6638.077	614.923	6178.07	692.727	697.319	-27.202	-308
6638.513	614.376	6178.49	692.747	67.831	-26.985	-286
6638.547	614.352	6178.35	692.653	697.770	-29.992	-242
6638.591	614.293	6178.355	692.645	697.751	-25.741	-264
6638.547	614.293	6178.355	692.645	697.727	-22.617	-333
6638.525	614.288	6178.36	692.653	697.727	-24.339	-264
6638.525	614.249	6178.41	692.661	697.721	-26.562	-286
6638.543	614.245	6178.41	692.661	697.771	-7.219	-264
6638.543	614.272	6178.36	692.637	697.394	-23.6	-286
6638.635	614.429	6178.19	692.626	697.759	-27.859	-338
6638.767	614.576	6178.06	692.645	697.617	-210.235	-338
6638.833	614.647	6178.02	692.672	697.693	-4.474	-338
6638.833	614.656	6178.02	692.678	697.349	-27.147	-338
6638.833	614.656	6178.02	692.681	697.861	-24.248	-352
6638.377	614.735	6177.95	692.664	697.684	-27.315	-352
6638.965	614.795	6177.89	692.686	697.623	-26.637	-374
6638.965	614.769	6177.93	692.705	697.690	-6.141	-374
6638.899	614.635	6178.04	692.681	697.880	-2.679	-338
6638.833	614.633	6178.07	692.671	697.916	-27.271	-352
6638.355	614.712	6177.946	692.656	697.758	-23.313	-338
6638.391	614.797	6177.90	692.697	697.666	-27.253	-323.347
6638.877	614.628	6178.06	692.697	697.666	-24.421	-374
6638.745	614.583	6178.16	692.661	697.764	-27.538	-352
6638.741	614.492	6178.16	692.661	697.735	-27.735	-338
6638.635	614.493	6178.17	692.667	697.874	-24.656	-338
6638.525	614.525	6178.267	692.667	697.874	-27.623	-338
6638.459	614.257	6178.40	692.656	697.739	-26.426	-264
6638.431	614.224	6178.45	692.653	697.654	-4.756	-296
6638.547	614.357	6178.41	692.634	697.690	-25.825	-338
6638.547	614.357	6178.28	692.642	697.825	-24.927	-338
6638.547	614.357	6178.28	692.642	697.825	-24.927	-338

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BEARING 1X	BEARING 35X	RELATIVE WEARING	COURSE	TRUE HEARING	SPOKE	S/H	DEFL	ANGL
6630.110	6615.312	66275.31	6177.605	6622.694	667.667	-4.166		-1.352
6630.105	6615.353	66275.35	66177.66	662.711	667.640	-10.514		-1.352
6630.163	6614.998	66274.99	66177.74	6622.744	667.653	-6.991		-1.352
6630.119	6614.921	66274.91	66177.70	6622.714	667.663	-6.441		-1.352
6630.397	6614.934	66274.93	66177.81	6622.716	667.642	-35.639		-1.352
6630.355	6614.653	66274.65	66178.34	6622.697	667.684	-35.741		-1.352
6630.657	6614.591	66274.49	66178.41	6622.617	667.774	-1.127		-1.352
6630.569	6614.369	66274.359	66178.50	6622.639	667.749	-67.114		-1.352
6630.591	6614.378	66274.378						
6638.591	6614.378	66274.378	6178.542	6622.611	667.684	-33.394		-1.352
6638.591	6614.463	66274.46	6178.445	6622.646	667.684	-34.446		-1.352
6638.591	6614.421	66274.42	66178.52	662.939	667.794	-34.675		-1.352
6638.394	6614.254	66274.25	66178.76	6622.964	667.801	-35.693		-1.352
6638.174	6613.992	66273.99	66178.98	6622.933	67.791	-31.705		-1.352
6638.342	6613.893	66273.89	66179.09	6622.953	67.764	-36.354		-1.352
6638.323	6613.854	66273.85	66179.14	6622.955	667.733	-33.213		-1.352
6637.993	6613.849	66273.84	66179.09	6622.944	667.776	-34.345		-1.352
6637.993	6613.818	66273.81	66179.14	6622.941	667.764	-37.315		-1.352
6637.778	6613.635	66273.63	66179.34	6622.933	667.727	-35.113		-1.352
6637.581	6613.467	66273.46	66179.52	6622.934	667.837	-35.616		-1.352
6637.537	6613.432	66273.43	66179.577	6622.937	667.812	-32.179		-1.352
6637.383	6613.320	66273.32	66179.74	6622.929	667.764	-31.943		-1.352
6637.227	6613.226	66273.22	66179.82	6622.951	667.721	-35.065		-1.352
6637.267	6613.157	66273.15	66179.89	6622.951	667.751	-33.083		-1.352
6637.497	6613.109	66273.10	66179.96	6622.973	667.849	-34.693		-1.352
6637.489	6613.081	66272.99	66180.39	6622.990	667.874	-34.660		-1.352
6636.855	6612.911	66272.909	66180.29	6622.949	667.794	-35.663		-1.352
6636.877	6612.895	66272.89	66180.24	6622.941	667.674	-32.660		-1.352
6636.377	6612.976	66272.97	66180.09	6622.966	667.666	-4.731		-1.352
6636.921	6613.019	66273.01	66180.06	6622.973	667.813	-35.132		-1.352
6636.355	6612.924	66272.92	66180.24	6622.973	667.957	-36.220		-1.352
6636.812	6612.828	66272.82	66180.29	6622.926	667.837	-32.214		-1.352
6636.812	6612.875	66272.87	66180.29	6622.982	667.846	-33.126		-1.352
6636.987	6613.049	66273.04	66180.31	6622.965	667.829	-32.314		-1.352
6637.053	6613.091	66273.09	66179.975	6622.965	667.825	-32.161		-1.352
6636.907	6613.027	66273.02	66180.37	6622.941	667.886	-32.292		-1.352
6636.921	6612.943	66272.94	66180.17	6622.915	667.846	-4.320		-1.352
6636.877	6612.977	66272.97	66180.21	6622.963	667.663	-2.485		-1.352
6636.877	6612.897	66272.89	66180.21	6622.963	667.663	-4.936		-1.352
6636.921	6612.966	66272.96	66180.19	6622.968	667.713	-31.840		-1.352
6636.965	6613.037	66273.03	66180.33	6622.960	667.745	-35.311		-1.352
6637.039	6613.044	66273.04	66180.33	6622.971	667.704	-34.040		-1.352
6637.039	6613.041	66273.04	66180.33	6622.979	667.745	-34.316		-1.352
6637.031	6613.030	66273.03	66179.964	6622.954	667.727	-35.663		-1.352
6637.295	6613.311	66273.31	66179.796	6622.916	667.715	-33.740		-1.352
6637.071	6613.056	66273.05	66179.55	6622.946	667.783	-32.350		-1.352

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6637.550	6113.493	66273.49	66179.53	6637.721	667.794	66.949	625.103
6637.559	6113.501	66273.49	66179.51	6637.713	667.866	66.949	625.103
6637.692	6113.629	66273.62	66179.35	6637.988	667.715	66.949	625.103
6637.344	6113.779	66273.77	66179.19	6637.969	667.666	66.949	625.103
6637.666	6113.814	66273.81	66179.14	6637.961	667.715	66.949	625.103
6637.866	6113.817	66273.81	66179.16	6637.974	667.837	66.949	625.103
6637.366	6113.796	66273.79	66179.19	6637.935	667.843	66.949	625.103
6637.954	6113.351	66273.85	66179.13	6637.958	667.666	66.949	625.103
6637.864	6113.948	66273.94	66179.81	6637.961	667.635	66.949	625.103
6637.954	6113.925	66273.92	66179.86	6637.985	667.743	66.949	625.103
6637.913	6113.777	66273.77	66179.21	6637.983	667.825	66.949	625.103
6637.866	6113.726	66273.72	66179.25	6637.974	667.925	66.949	625.103
6637.866	6113.723	66273.72	66179.24	6637.969	667.715	66.949	625.103
6637.833	6113.759	66273.75	66179.19	6637.955	667.642	66.949	625.103
6637.932	6113.795	66273.75	66179.16	6637.958	667.664	66.949	625.103
6637.838	6113.789	66273.78	66179.18	6637.969	667.739	66.949	625.103
6637.756	6113.638	66273.63	66179.36	6637.987	667.739	66.949	625.103
6637.633	6113.538	66273.53	66179.47	6637.985	667.645	66.949	625.103
6637.591	6113.533	66273.529	66179.48	6637.981	667.773	66.949	625.103
6637.646	6113.538	66273.53	66179.46	6637.999	667.629	66.949	625.103
6637.581	6113.481	66273.48	66179.501	6637.984	667.764	66.949	625.103
6637.539	6113.273	66273.27	66179.81	6637.984	667.874	66.949	625.103
6637.229	6113.222	66273.22	66179.36	6637.987	667.764	66.949	625.103
6637.361	6113.354	66273.35	66179.67	6637.982	667.645	66.949	625.103
6637.471	6113.473	66273.469	66179.56	6637.985	667.629	66.949	625.103
6637.449	6113.422	66273.41	66179.63	6637.981	667.782	66.949	625.103
6637.339	6113.202	66273.27	66179.78	6637.982	667.861	66.949	625.103
6637.273	6113.241	66273.24	66179.81	6637.954	667.732	66.949	625.103
6637.273	6113.258	66273.25	66179.77	6637.935	667.654	66.949	625.103
6637.317	6113.354	66273.35	66179.66	6637.916	667.623	66.949	625.103
6637.339	6113.362	66273.36	66179.65	6637.913	667.733	66.949	625.103
6637.361	6113.362	66273.36	66179.67	6637.921	667.812	66.949	625.103
6637.359	6113.358	66273.35	66179.67	6637.932	667.697	66.949	625.103
6637.482	614.866	66274.86	66179.62	6637.918	667.562	66.949	625.103
6637.609	6113.186	66273.18	66179.57	6637.934	667.599	66.949	625.103
6637.229	6113.278	66273.27	66179.44	6637.928	667.721	66.949	625.103
6637.339	6113.375	66273.367	66179.34	6637.919	667.642	66.949	625.103
6637.339	6113.333	66273.33	66179.41	6637.918	667.568	66.949	625.103
6637.597	6113.193	66273.193	66179.71	6637.911	667.642	66.949	625.103
6637.965	6112.994	66272.99	66179.81	6637.912	667.715	66.949	625.103
6637.849	6113.158	66273.15	66179.71	6637.925	667.521	66.949	625.103
6637.185	6113.223	66273.22	66179.51	6637.933	667.465	66.949	625.103
6637.163	6113.192	66273.19	66179.57	6637.926	667.581	66.949	625.103
6637.899	6112.971	66272.96	66179.87	6637.943	667.745	66.949	625.103
6637.746	6112.862	66272.86	66179.97	6637.934	667.634	66.949	625.103
6637.855	6112.973	66272.97	66179.79	6637.971	667.477	66.949	625.103
6637.853	6113.154	66273.15	66179.68	6637.964	667.446	66.949	625.103
6637.831	6113.432	66273.43	66179.725	6637.964	667.721	66.949	625.103

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6636.79J	612.361	63272.85	69189.61	692.874	67.355	-62.147	-646.122
6636.724	6312.783	63272.78	69189.95	692.837	697.666	-67.396	-176
6636.333	6312.952	63272.95	6179.815	692.755	697.422	-66.758	-154
6636.965	6313.355	63273.05	69179.97	692.771	697.531	-66.310	-198
6636.812	6312.874	63272.87	69179.97	692.851	697.846	-64.997	-176
6636.525	6312.673	63272.673	6180.195	692.865	697.855	-64.731	-154
6636.432	6312.632	63272.68	69189.13	692.818	697.556	-65.368	-623.127
6636.768	6312.882	63272.88	69179.90	692.788	697.391	-64.484	-176
6636.794	6312.895	63272.89	69179.93	692.829	697.501	-63.999	-29.171
6636.574	6312.653	63272.648	69189.24	692.889	697.855	-67.317	-626.185
6636.372	6312.543	63272.538	69189.34	692.878	697.782	-63.391	-623.127
6636.574	6312.684	63272.68	69189.13	692.815	697.581	-64.237	-626.149
6636.658	6312.811	63272.81	6183.388	692.873	697.452	-63.274	-626.127
6636.592	6312.712	63272.71	69189.16	692.829	697.664	-64.144	-46.144
6636.463	6312.568	63272.56	69189.32	692.889	697.849	-64.918	-629.171
6636.416	6312.545	63272.54	69189.33	692.873	697.788	-64.253	-626.127
6636.534	6312.642	63272.64	69189.18	692.829	697.617	-63.954	-176
6636.592	6312.748	63272.74	69189.07	692.821	697.525	-1.556	-176
6636.636	6312.789	63272.78	69189.04	692.829	697.593	-64.308	-198
6636.614	6312.712	63272.71	69189.13	692.837	697.764	-63.228	-626.149
6636.592	6312.693	63272.69	69189.13	692.843	697.812	-63.668	-154
6636.746	6312.839	63272.83	69189.13	692.829	697.666	-61.443	-176
6636.746	6312.896	63272.89	69179.95	692.791	697.483	-62.827	-176
6636.658	6312.782	63272.78	69189.18	692.851	697.788	-63.571	-154
6636.57J	6312.674	63272.67	69189.18	692.859	697.788	-62.737	-132
6636.526	6312.666	63272.66	69189.18	692.854	697.599	-62.624	-626.171
6636.57J	6312.726	63272.72	69189.09	692.818	697.526	-65.353	-626.149
6636.636	6312.796	63272.79	69189.02	692.818	697.605	-64.552	-176
6636.636	6312.797	63272.79	69189.01	692.818	697.703	-63.728	-646.144
6636.636	6312.762	63272.76	69189.07	692.837	697.776	-61.298	-626.149
6636.614	6312.731	63272.73	69189.06	692.826	697.753	-62.343	-154
6636.312	6312.914	63272.91	69179.85	692.763	697.587	-61.954	-198
6637.353	6313.124	63273.12	69179.61	692.736	697.562	-64.997	-226
6637.141	6313.162	63273.16	69179.59	692.752	697.694	-4.328	-198
6637.353	6313.063	63273.06	69179.72	692.782	697.844	-2.137	-176
6637.379	6313.033	63273.03	69179.73	692.763	697.715	-62.695	-176
6637.141	6313.204	63273.20	69179.50	692.733	697.553	-6.083	-198
6637.317	6313.328	63273.318	69179.36	692.683	697.553	-6.768	-242
6637.295	6313.279	63273.27	69179.44	692.727	697.745	-66.961	-626.149
6637.135	6313.137	63273.13	69179.61	692.749	697.834	62.340	-198
6637.141	6313.148	63273.139	69179.58	692.722	697.678	602.181	-626.171
6637.273	6313.297	63273.29	69179.37	692.675	697.645	-64.093	-226
6637.449	6313.397	63273.39	69179.26	692.664	697.611	-66.639	-198
6637.493	6313.428	63273.42	69179.23	692.667	697.629	-64.099	-626.237
6637.515	6313.447	63273.44	69179.21	692.659	697.664	69.304	-626.215
6637.625	6313.509	63273.499	69179.13	692.637	697.684	-63.571	-242
6637.693	6313.597	63273.59	69179.01	692.639	697.654	-65.313	-242
6637.932	6313.793	63273.79	69178.786	692.576	697.599	-63.941	-242
6638.152	6413.078	63273.07	69178.58	692.557	697.567	-63.941	-242

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6635.249	614.955	62274.92	61178.51	6324.306	607.679	62.390	1.200
6635.249	614.959	62274.96	61178.55	6324.310	607.683	62.394	1.204
6635.253	614.963	62274.97	61178.58	6324.314	607.687	62.398	1.208
6635.257	614.967	62274.98	61178.61	6324.318	607.691	62.402	1.212
6635.261	614.971	62274.99	61178.64	6324.322	607.695	62.406	1.216
6635.265	614.975	62274.99	61178.67	6324.326	607.699	62.410	1.220
6635.269	614.979	62274.99	61178.70	6324.330	607.703	62.414	1.224
6635.273	614.983	62274.99	61178.73	6324.334	607.707	62.418	1.228
6635.277	614.987	62274.99	61178.76	6324.338	607.711	62.422	1.232
6635.281	614.991	62274.99	61178.79	6324.342	607.715	62.426	1.236
6635.285	614.995	62274.99	61178.82	6324.346	607.719	62.430	1.240
6635.289	614.999	62274.99	61178.85	6324.350	607.723	62.434	1.244
6635.293	615.003	62274.99	61178.88	6324.354	607.727	62.438	1.248
6635.297	615.007	62274.99	61178.91	6324.358	607.731	62.442	1.252
6635.301	615.011	62274.99	61178.94	6324.362	607.735	62.446	1.256
6635.305	615.015	62274.99	61178.97	6324.366	607.739	62.450	1.260
6635.309	615.019	62274.99	61179.00	6324.370	607.743	62.454	1.264
6635.313	615.023	62274.99	61179.03	6324.374	607.747	62.458	1.268
6635.317	615.027	62274.99	61179.06	6324.378	607.751	62.462	1.272
6635.321	615.031	62274.99	61179.09	6324.382	607.755	62.466	1.276
6635.325	615.035	62274.99	61179.12	6324.386	607.759	62.470	1.280
6635.329	615.039	62274.99	61179.15	6324.390	607.763	62.474	1.284
6635.333	615.043	62274.99	61179.18	6324.394	607.767	62.478	1.288
6635.337	615.047	62274.99	61179.21	6324.398	607.771	62.482	1.292
6635.341	615.051	62274.99	61179.24	6324.402	607.775	62.486	1.296
6635.345	615.055	62274.99	61179.27	6324.406	607.779	62.490	1.300
6635.349	615.059	62274.99	61179.30	6324.410	607.783	62.494	1.304
6635.353	615.063	62274.99	61179.33	6324.414	607.787	62.498	1.308
6635.357	615.067	62274.99	61179.36	6324.418	607.791	62.502	1.312
6635.361	615.071	62274.99	61179.39	6324.422	607.795	62.506	1.316
6635.365	615.075	62274.99	61179.42	6324.426	607.799	62.510	1.320
6635.369	615.079	62274.99	61179.45	6324.430	607.803	62.514	1.324
6635.373	615.083	62274.99	61179.48	6324.434	607.807	62.518	1.328
6635.377	615.087	62274.99	61179.51	6324.438	607.811	62.522	1.332
6635.381	615.091	62274.99	61179.54	6324.442	607.815	62.526	1.336
6635.385	615.095	62274.99	61179.57	6324.446	607.819	62.530	1.340
6635.389	615.099	62274.99	61179.60	6324.450	607.823	62.534	1.344
6635.393	615.103	62274.99	61179.63	6324.454	607.827	62.538	1.348
6635.397	615.107	62274.99	61179.66	6324.458	607.831	62.542	1.352
6635.401	615.111	62274.99	61179.69	6324.462	607.835	62.546	1.356
6635.405	615.115	62274.99	61179.72	6324.466	607.839	62.550	1.360
6635.409	615.119	62274.99	61179.75	6324.470	607.843	62.554	1.364
6635.413	615.123	62274.99	61179.78	6324.474	607.847	62.558	1.368
6635.417	615.127	62274.99	61179.81	6324.478	607.851	62.562	1.372
6635.421	615.131	62274.99	61179.84	6324.482	607.855	62.566	1.376
6635.425	615.135	62274.99	61179.87	6324.486	607.859	62.570	1.380
6635.429	615.139	62274.99	61179.90	6324.490	607.863	62.574	1.384
6635.433	615.143	62274.99	61179.93	6324.494	607.867	62.578	1.388
6635.437	615.147	62274.99	61179.96	6324.498	607.871	62.582	1.392
6635.441	615.151	62274.99	61179.99	6324.502	607.875	62.586	1.396
6635.445	615.155	62274.99	61180.02	6324.506	607.879	62.590	1.400
6635.449	615.159	62274.99	61180.05	6324.510	607.883	62.594	1.404
6635.453	615.163	62274.99	61180.08	6324.514	607.887	62.598	1.408
6635.457	615.167	62274.99	61180.11	6324.518	607.891	62.602	1.412
6635.461	615.171	62274.99	61180.14	6324.522	607.895	62.606	1.416
6635.465	615.175	62274.99	61180.17	6324.526	607.899	62.610	1.420
6635.469	615.179	62274.99	61180.20	6324.530	607.903	62.614	1.424
6635.473	615.183	62274.99	61180.23	6324.534	607.907	62.618	1.428
6635.477	615.187	62274.99	61180.26	6324.538	607.911	62.622	1.432
6635.481	615.191	62274.99	61180.29	6324.542	607.915	62.626	1.436
6635.485	615.195	62274.99	61180.32	6324.546	607.919	62.630	1.440
6635.489	615.199	62274.99	61180.35	6324.550	607.923	62.634	1.444
6635.493	615.203	62274.99	61180.38	6324.554	607.927	62.638	1.448
6635.497	615.207	62274.99	61180.41	6324.558	607.931	62.642	1.452
6635.501	615.211	62274.99	61180.44	6324.562	607.935	62.646	1.456
6635.505	615.215	62274.99	61180.47	6324.566	607.939	62.650	1.460
6635.509	615.219	62274.99	61180.50	6324.570	607.943	62.654	1.464
6635.513	615.223	62274.99	61180.53	6324.574	607.947	62.658	1.468
6635.517	615.227	62274.99	61180.56	6324.578	607.951	62.662	1.472
6635.521	615.231	62274.99	61180.59	6324.582	607.955	62.666	1.476
6635.525	615.235	62274.99	61180.62	6324.586	607.959	62.670	1.480
6635.529	615.239	62274.99	61180.65	6324.590	607.963	62.674	1.484
6635.533	615.243	62274.99	61180.68	6324.594	607.967	62.678	1.488
6635.537	615.247	62274.99	61180.71	6324.598	607.971	62.682	1.492
6635.541	615.251	62274.99	61180.74	6324.602	607.975	62.686	1.496
6635.545	615.255	62274.99	61180.77	6324.606	607.979	62.690	1.500
6635.549	615.259	62274.99	61180.80	6324.610	607.983	62.694	1.504
6635.553	615.263	62274.99	61180.83	6324.614	607.987	62.698	1.508
6635.557	615.267	62274.99	61180.86	6324.618	607.991	62.702	1.512
6635.561	615.271	62274.99	61180.89	6324.622	607.995	62.706	1.516
6635.565	615.275	62274.99	61180.92	6324.626	607.999	62.710	1.520
6635.569	615.279	62274.99	61180.95	6324.630	608.003	62.714	1.524
6635.573	615.283	62274.99	61180.98	6324.634	608.007	62.718	1.528
6635.577	615.287	62274.99	61181.01	6324.638	608.011	62.722	1.532
6635.581	615.291	62274.99	61181.04	6324.642	608.015	62.726	1.536
6635.585	615.295	62274.99	61181.07	6324.646	608.019	62.730	1.540
6635.589	615.299	62274.99	61181.10	6324.650	608.023	62.734	1.544
6635.593	615.303	62274.99	61181.13	6324.654	608.027	62.738	1.548
6635.597	615.307	62274.99	61181.16	6324.658	608.031	62.742	1.552
6635.601	615.311	62274.99	61181.19	6324.662	608.035	62.746	1.556
6635.605	615.315	62274.99	61181.22	6324.666	608.039	62.750	1.560
6635.609	615.319	62274.99	61181.25	6324.670	608.043	62.754	1.564
6635.613	615.323	62274.99	61181.28	6324.674	608.047	62.758	1.568
6635.617	615.327	62274.99	61181.31	6324.678	608.051	62.762	1.572
6635.621	615.331	62274.99	61181.34	6324.682	608.055	62.766	1.576
6635.625	615.335	62274.99	61181.37	6324.686	608.059	62.770	1.580
6635.629	615.339	62274.99	61181.40	6324.690	608.063	62.774	1.584
6635.633	615.343	62274.99	61181.43	6324.694	608.067	62.778	1.588
6635.637	615.347	62274.99	61181.46	6324.698	608.071	62.782	1.592
6635.641	615.351	62274.99	61181.49	6324.702	608.075	62.786	1.596
6635.645	615.355	62274.99	61181.52	6324.706	608.079	62.790	1.600
6635.649	615.359	62274.99	61181.55	6324.710	608.083	62.794	1.604
6635.653	615.363	62274.99	61181.58	6324.714	608.087	62.798	1.608
6635.657	615.367	62274.99	61181.61	6324.718	608.091	62.802	1.612
6635.661	615.371	62274.99	61181.64	6324.722	608.095	62.806	1.616
6635.665	615.375	62274.99	61181.67	6324.726	608.099	62.810	1.620
6635.669	615.379	62274.99	61181.70	6324.730	608.103	62.814	1.624
6635.673	615.383	62274.99	61181.73	6324.734	608.107	62.818	1.628
6635.677	615.387	62274.99	61181.76	6324.738	608.111	62.822	1.632
6635.681	615.391	62274.99	61181.79	6324.742	608.115	62.826	1.636
6635.685	615.395	62274.99	61181.82	6324.746	608.119	62.830	1.640
6635.689	615.399	62274.99	61181.85	6324.750	608.123	62.834	1.644
6635.693	615.403	62274.99	61181.88	6324.754	608.127	62.838	1.648
6635.697	615.407	62274.99	61181.91	6324.758	608.131	62.842	1.652
6635.701	615.411	62274.99	61181.94	6324.762	608.135	62.846	1.656
6635.705	615.415	62274.99	61181.97	6324.766	608.139	62.850	1.660
6635.709	615.419	62274.99	61182.00	6324.770	608.143	62.854	1.664
6635.713	615.423	62274.99	61182.03	6324.774	608.147	62.858	1.668
6635.717	615.427	62274.99	61182.06	6324.778	608.151	62.862	1.672
6635.721	615.431	62274.99	61182.09	6324.782	608.155	62.866	1.676
6635.725	615.435	62274.99	61182.12	6324.786	608.159	62.870	1.680
6635.729	615.439	62274.99	61182.15	6324.790	608.163	62.874	1.684

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BEARING 1X	BEARING 36X	RELATIVE BEARING	COURSE	TRUE BEARING	SPEED	C/N	DEFL AIRL
8643.591	838.164	82278.16	8178.76	8096.927	807.898	804.084	-0358.11
8643.579	808.181	80288.18	8178.723	80106.90	807.819	802.736	-0358.35
8643.557	808.179	80288.17	80178.73	80106.90	807.855	803.311	-0358.37
8643.469	808.028	80288.02	80179.00	80107.02	808.069	804.017	-0358.33
8643.423	807.667	80287.66	80179.48	80107.15	808.191	805.570	-0358.352
8642.832	807.453	80287.45	80179.74	80107.16	808.038	807.280	-0358.280
8642.923	87.586	80287.58	80179.45	80107.03	807.770	82.803	-0358.30
8643.118	807.797	80287.79	80179.25	80107.04	807.773	83.706	-0358.35
8642.964	807.617	80287.61	80179.56	80107.18	808.099	806.976	-0358.33
8642.458	807.205	80287.20	80180.03	80107.23	808.246	803.693	-0358.37
8642.283	807.078	80287.07	80180.13	80107.21	808.026	802.726	-0358.24
8642.590	817.319	80287.31	80179.78	80107.09	807.770	81.237	-0358.33
8642.898	807.534	80287.53	80179.56	80107.10	807.831	803.419	-0358.33
8642.678	807.452	80287.45	8179.821	80107.22	808.130	83.865	-0358.30
8642.261	807.065	80287.06	80180.17	80107.24	808.203	805.450	-0358.242
8642.195	807.025	80287.02	80180.15	80107.18	807.965	-05.175	-0358.26
8642.612	807.369	80287.36	80179.71	80107.08	807.773	-474	-0358.33
8642.832	807.563	80287.56	80179.53	80107.10	807.825	-0.891	-0358.30
8642.656	807.400	80287.40	8179.821	80107.22	808.130	8.914	-0358.28
8642.335	807.140	80287.13	80180.07	80107.21	808.160	-1.343	-0358.26
8642.415	807.197	80287.19	80179.94	80107.136	807.904	-02.182	-0358.26
8642.254	807.507	80287.50	80179.56	80107.06	807.800	81.426	-0358.41
8642.923	87.634	80287.63	80179.44	80107.07	807.886	80.631	-0358.41
8642.898	87.628	80287.62	80179.48	80107.10	808.136	801.213	-0358.44
8642.854	807.513	80287.51	80179.59	80107.14	808.081	801.495	-0358.30
8642.964	807.681	80287.68	80179.330	80107.10	807.928	801.000	-0358.352
8643.134	807.858	80287.85	80179.14	80107.00	807.892	801.064	-0358.39
8643.206	807.895	80287.89	80179.12	80107.01	807.977	802.239	-0358.46
8643.162	807.872	80287.86	80179.16	80107.03	808.038	6.483	-0358.33
8643.162	807.867	80287.86	80179.13	80107.04	807.930	-0.032	-0358.41
8643.293	807.995	80287.99	80178.95	80106.94	807.922	-0.781	-0358.35
8643.403	808.117	80288.11	80178.81	80106.92	807.916	803.469	-0358.30
8643.513	808.232	80288.23	80178.67	80106.90	807.898	801.533	-0358.37
8643.447	808.139	80288.13	80178.59	80106.73	807.928	8.399	-0358.30
8642.593	807.184	80287.18	80178.59	80106.77	807.904	-0.805	-0358.35
8642.371	807.171	80287.16	80178.62	80106.75	807.886	8.397	-0358.35
8642.371	807.198	80287.19	80178.55	80106.746	807.886	-0.135	-0358.33
8642.437	807.293	80287.29	80178.45	80106.74	807.892	-0.123	-0358.33
8642.546	807.303	80287.30	80178.45	80106.75	807.904	-01.718	-0358.33
8642.458	807.247	80287.24	80178.51	80106.76	807.867	-04.243	-0358.37
						-04.248	-0358.39

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8641.953	8016.847	80286.84	80178.98	80105.83	807.898	-05.887	-0358.30
8642.107	8016.925	80286.92	80178.87	80105.79	807.886	-04.731	-0358.30
8642.217	8016.975	80286.97	80178.82	80105.84	807.884	-6.141	-0358.33
8642.385	8016.885	80286.88	80178.97	80105.80	807.886	-05.005	-0358.35
8641.975	8016.796	80286.79	80179.37	80105.86	807.874	-02.332	-0358.35
8641.997	8016.794	80286.79	80179.06	80105.85	807.886	6.088	-0358.39
8642.019	8016.831	80286.83	80179.00	80105.83	807.886	-05.757	-0358.39
8642.019	8016.832	80286.83	80179.02	80105.85	807.904	-06.328	-0358.35
8641.975	8016.810	80286.809	80179.03	80105.84	807.831	-05.086	-0358.30
8641.997	8016.886	80286.88	80179.92	80105.81	807.745	-06.383	-0358.28
8641.975	8016.848	80286.84	80179.01	80105.80	807.837	-04.528	-0358.33
8641.733	8016.635	80286.63	80179.28	80105.914	807.971	-06.943	-0358.33
8641.667	8016.537	80286.53	80179.39	80105.927	807.935	-05.267	-0358.26
8641.689	8016.536	80286.53	80179.39	80105.925	807.776	-05.003	-0358.30
8641.646	8016.539	80286.53	80179.32	80105.88	807.733	-07.773	-0358.28
8641.316	8016.266	80286.26	80179.39	80105.93	807.886	-05.623	-0358.33
8641.206	8016.102	80286.10	80179.69	80105.96	807.965	-06.392	-0358.26
8641.236	8016.111	80286.11	80179.846	80105.94	807.764	-02.743	-0358.26
8641.338	8016.248	80286.24	80179.81	80105.919	807.758	-03.585	-0358.28
8641.294	8016.223	80286.22	80179.67	80105.95	807.747	-07.747	-0358.24
8641.113	8016.042	80286.04	80179.73	80105.95	807.886	-05.368	-0358.26
8641.038	8015.966	80285.96	80179.909	80105.94	808.002	-03.605	-0358.26
8640.986	8015.933	80285.93	80179.97	80105.93	807.928	-06.064	-0358.22
8640.964	8015.923	80285.92	80179.995	80105.92	807.831	-01.246	-0358.30
8641.003	8015.925	80285.92	80180.00	80105.922	807.806	-05.031	-0358.17
8640.964	8015.892	80285.89	80180.00	80105.92	807.843	-07.538	-0358.15
8640.964	8015.873	80285.87	80180.03	80105.92	807.935	-04.736	-0358.24
8640.942	8015.873	80285.87	80180.04	80105.91	807.983	-05.224	-0358.22
8641.050	8015.966	80285.96	80179.94	80105.91	807.843	-02.011	-0358.26
8641.404	8016.281	80286.27	80179.85	80105.903	807.745	-04.408	-0358.28
8641.426	8016.366	80286.36	80179.81	80106.13	807.637	-03.345	-0358.22
8641.514	8016.381	80286.38	80179.80	80106.18	808.038	-01.484	-0356.50
8641.624	8016.445	80286.44	80179.72	80106.18	808.026	801.736	-0356.33
8641.733	8016.617	80286.61	80179.53	80106.164	807.849	-03.010	-0356.265
8641.799	8016.680	80286.68	80179.53	80106.15	807.703	-03.143	-0356.66
8641.733	8016.533	80286.53	80179.492	80106.17	807.892	-03.713	-0356.74
8641.558	8016.398	80286.39	80179.69	80106.22	808.124	-03.267	-0356.68
8641.733	8016.512	80286.51	80179.78	80106.18	808.063	-05.134	-0356.85
8641.931	8016.675	80286.67	80179.629	80106.13	807.704	-03.936	-0356.75
8641.777	8016.601	80286.60	80179.49	80106.17	807.600	-6.021	-0356.79
			80179.624	80106.22	807.953	-05.040	-0356.77

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0010.2967	0017.501	0010.29	001.148	00.514
0016.256	0017.9.68	0010.16	007.947	00.577
0016.475	0017.9.68	0010.15	007.721	00.596
0016.476	0017.9.72	0010.20	007.703	00.898
0016.227	0017.9.98	0010.21	007.983	00.892
0016.105	0018.0.08	0010.18	008.112	00.892
0016.118	0018.0.05	0010.17	007.935	00.533
0016.200	0017.9.98	0010.18	007.733	00.697
0015.933	0018.0.25	0010.20	007.788	00.768
0015.629	0018.0.51	0010.14	008.118	00.820
0015.562	0018.0.55	0010.12	00.148	00.564
0015.633	0018.0.47	0010.10	007.922	00.182
0015.784	0018.0.35	0010.139	007.745	00.520
0015.779	0018.0.38	0010.16	007.812	00.794
0015.522	0018.0.58	0010.13	007.983	00.169
0015.452	0018.0.67	0010.09	008.020	00.562
0015.398	0018.0.67	0010.07	007.928	00.625
0015.525	0018.0.58	0010.08	007.751	00.276
0015.537	0018.0.55	0010.10	007.758	00.337
0015.339	0018.0.75	0010.09	007.941	00.386
0015.054	0018.0.96	0010.01	008.032	00.431
0014.996	0018.0.98	0010.5.97	007.941	00.985
0015.262	0018.7.58	0010.05	007.727	00.356
0015.458	0018.0.62	0010.08	007.684	00.717
0015.357	0018.0.75	0010.10	007.898	00.635
0015.011	0018.9.97	0010.00	008.032	00.539
0015.032	0018.0.93	0010.5.96	007.947	00.612
0015.482	0018.5.71	0010.05	007.776	00.533
0015.757	0018.0.37	0010.12	007.745	00.421
0015.796	0018.0.35	0010.15	007.843	00.253
0015.760	0018.3.96	0010.15	007.935	00.591
0015.846	0018.0.28	0010.13	007.935	00.931
0015.957	0018.0.20	0010.16	007.880	00.595
0015.976	0018.0.20	0010.177	007.812	00.437
0016.004	0018.0.15	0010.15	007.849	00.631
0016.061	0018.0.11	0010.17	007.898	00.825
0016.069	0018.0.11	0010.177	007.898	00.912
0016.163	0017.9.96	0010.122	007.806	00.707
0016.344	0017.9.85	0010.15	007.837	00.738

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8641.368	816.324	8286.32	8179.84	8186.17	897.922	-84.964	-8356.66
8641.333	816.325	8286.32	8179.84	8186.17	897.898	-81.655	-8356.61
8641.424	816.355	8286.35	8179.79	8186.15	897.819	-84.271	-8356.63
8641.492	816.477	8286.47	8179.66	8186.14	897.812	-85.295	-8356.59
8641.536	816.535	8286.53	8179.61	8186.15	897.836	-85.639	-8356.78
8641.667	816.578	8286.57	8179.55	8186.13	897.928	-86.176	-8356.63
8641.733	816.676	8286.67	8179.43	8186.18	897.886	-84.964	-8356.68
8641.953	816.816	8286.81	8179.43	8186.18	897.984	-84.984	-8356.72
8642.063	816.971	8286.97	8179.49	8186.16	897.782	-85.397	-8356.72
8642.195	817.031	8287.02	8179.43	8186.16	897.892	-84.368	-8356.79
8642.187	817.029	8287.02	8179.43	8186.16	898.059	-83.668	-8356.77
8642.195	817.066	8287.05	8178.97	8186.13	897.959	-83.698	-8356.78
8642.437	817.258	8287.25	8178.69	8186.13	897.773	-84.318	-8356.77
8642.766	817.536	8287.53	8178.33	8186.13	897.727	-86.448	-8356.79
8643.533	817.692	8287.69	8178.18	8186.13	897.831	-86.728	-8356.81
8642.964	817.669	8287.66	8178.25	8186.13	897.993	-87.598	-8356.74
8642.942	817.593	8287.59	8178.31	8186.13	897.947	-87.396	-8356.77
8643.074	817.747	8287.74	8178.03	8186.13	897.761	-83.753	-8356.83
8643.433	818.034	8288.03	8177.78	8186.13	897.715	-86.274	-8356.81
8643.533	818.176	8288.17	8177.56	8186.13	897.807	-83.891	-8356.81
8643.513	818.195	8288.19	8177.56	8186.13	898.618	-84.594	-8356.85
8643.557	818.205	8288.23	8177.53	8186.13	897.953	-87.353	-8356.83
8643.843	818.435	8288.43	8177.24	8186.13	897.721	-84.984	-8356.85
8644.269	818.797	8288.79	8176.88	8186.13	897.663	-85.134	-8356.92
8644.392	818.973	8288.97	8176.72	8186.13	897.883	-85.154	-8356.91
8644.379	818.992	8288.99	8176.718	8186.13	898.114	-86.718	-8356.83
8644.414	819.039	8289.03	8176.65	8186.13	897.922	-82.935	-8356.83
8644.788	819.498	8289.49	8176.26	8186.13	897.693	-86.467	-8356.85
8645.117	819.874	8289.87	8176.03	8186.13	897.623	-83.839	-8356.77
8645.183	819.961	8289.95	8175.95	8186.13	897.867	-82.498	-8356.81
8645.293	819.184	8290.18	8175.83	8186.13	898.026	-85.303	-8356.81
8645.623	819.573	8290.57	8175.46	8186.13	897.861	-85.623	-8356.77
8646.166	811.136	8281.13	8174.99	8186.13	897.642	-86.381	-8356.79
8646.436	811.414	8291.41	8174.75	8186.13	897.642	-86.649	-8356.77
8646.523	811.478	8291.47	8174.72	8186.13	897.933	-83.819	-8356.68
8646.941	811.528	8281.52	8174.63	8186.13	898.081	-83.986	-8356.72
8647.432	811.921	8291.92	8174.194	8186.13	897.337	-85.887	-8356.77
8647.556	812.272	8292.27	8173.79	8186.13	897.642	-83.819	-8356.78
8647.718	812.436	8292.43	8173.68	8186.13	897.693	-86.383	-8356.59
8647.842	812.515	8292.51	8173.49	8186.13	897.971	-85.494	-8356.77
8647.938	812.616	8292.61	8173.36	8186.13	898.081	-86.698	-8356.68
8648.171	812.765	8292.76	8173.17	8186.13	897.855	-85.631	-8356.78
	819.999	8292.99	8172.86	8186.13	897.773	-87.773	-8356.78

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6643.413	6013.131	60293.09	60172.73	60135.83	607.794	-0356.63
6643.457	6013.191	60293.13	60172.64	60135.83	607.836	-0356.59
6643.479	6013.203	60293.20	60172.639	60135.83	607.886	-356.638
6643.435	6013.166	60293.16	60172.69	60135.85	607.819	-0356.61
6643.479	6013.162	60293.16	60172.67	60135.83	607.819	-0356.72
6643.633	6013.310	60293.307	60172.48	60135.79	607.819	-356.748
6643.677	6013.369	60293.36	60172.43	60135.84	607.831	-0356.52
6643.655	6013.370	60293.368	60172.44	60135.81	607.843	-0356.59
6643.677	6013.321	60293.31	60172.50	60135.82	607.861	-0356.68
6643.589	6013.300	60293.299	60172.51	60135.81	607.825	-0356.70
6643.655	6013.349	60293.34	60172.43	60135.78	607.812	-0356.68
6643.984	6013.546	60293.54	60172.22	60135.76	607.812	-0356.72
6643.962	6013.604	60293.60	60172.18	60135.78	607.861	-0356.70
6643.743	6013.369	60293.36	60172.47	60135.83	607.922	-0356.68
6643.567	6013.235	60293.23	60172.61	60135.85	607.788	-0356.63
6643.545	6013.220	60293.220	60172.617	60135.83	607.642	-0356.71
6643.591	6013.098	60293.09	60172.84	60135.936	607.733	-0356.63
6647.754	6012.578	60292.57	60173.59	60136.17	607.971	-0356.72
6647.183	6012.013	60292.01	60174.28	60136.29	607.910	-0356.74
6646.897	6011.655	60291.65	60174.65	60136.30	607.690	-356.792
6646.655	6011.241	60291.23	60175.08	60136.32	607.678	-0356.83
6646.820	6010.340	60290.338	60175.81	60136.15	607.745	-0356.814
6644.563	609.252	60289.25	60176.65	60135.90	607.806	-0356.88
6644.238	608.515	60288.509	60177.38	60135.89	607.794	-0356.83
6643.535	607.960	60287.960	60177.995	60135.95	607.794	-0356.79
6643.535	607.477	60287.47	60178.55	60136.03	607.794	-0356.74
6642.437	607.029	60287.02	60179.14	60136.17	607.819	-0356.77
6641.777	606.435	60286.43	60179.81	60136.24	607.806	-0356.63
6641.452	605.735	60285.73	60180.46	60136.19	607.764	-0356.61
6641.371	605.200	60285.200	60180.865	60136.06	607.751	-356.572
6640.173	604.925	60284.92	60181.06	60135.99	607.770	-0356.63
6639.822	604.647	60284.64	60181.29	60135.93	607.782	-0356.63
6639.602	604.265	60284.26	60181.61	60135.83	607.770	-0356.66
6639.229	603.922	60283.92	60181.928	60135.84	607.739	-0356.70
6638.937	603.699	60283.69	60182.13	60135.83	607.776	-0356.68
6638.745	603.497	60283.49	60182.34	60135.83	607.776	-0356.66
6638.547	603.337	60283.33	60182.49	60135.83	607.739	-0356.66
6638.437	603.292	60283.29	60182.54	60135.83	607.672	-0356.66
6638.459	603.289	60283.28	60182.55	60135.83	607.690	-0356.68
6638.306	603.134	60283.13	60182.76	60135.90	607.788	-0356.70
6638.020	602.883	60282.88	60183.08	60135.96	607.776	-0356.68
6637.888	602.828	60282.83	60183.09	60135.93	607.654	-356.660
6638.042	602.730	60273.04	60182.040	60135.88	607.599	-0356.66
6638.262	602.633	60283.13	60182.78	60135.92	607.776	-0356.74
6638.218	602.630	60283.07	60182.85	60135.93	607.855	-0356.63
6638.174	602.630	60283.08	60182.82	60135.90	607.739	-0356.68
6638.481	602.633	60283.35	60182.50	60135.85	607.648	-0356.72
6638.701	602.630	60283.57	60182.23	60135.81	607.678	-0356.66
6638.943	602.630	60283.78	60181.98	60135.77	607.819	-0356.66
6639.185	602.630	60284.02	60181.73	60135.76	607.800	-0356.65
6639.510	602.630	60284.02	60181.73	60135.76	607.800	-0356.65

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6642.803	6614.732	66284.73	6181.112	66115.84	667.666	-68.214	-6356.59
6642.805	6615.023	66285.62	66189.91	66115.94	667.727	-62.664	-6356.616
6642.806	6615.203	66275.26	66189.74	6696.684	667.794	-65.895	-6356.63
6642.807	6615.613	66275.61	66189.43	6696.681	667.794	-62.747	-6356.61
6642.808	6615.967	66275.96	66189.13	6696.119	667.806	-4.619	-6356.66
6642.809	6616.169	66276.16	66179.95	6696.119	667.799	-66.542	-6356.59
6642.810	6616.334	66276.33	66179.79	6696.128	667.721	-67.202	-6356.59
6642.811	6616.517	66276.51	66179.66	6696.119	667.794	-64.944	-6356.64
6642.812	6616.658	66286.65	66179.45	6696.111	667.874	-64.534	-6355.82
6642.813	6616.772	66276.77	66179.316	6696.686	667.831	-63.527	-6355.75
6642.814	6616.945	66286.94	66179.88	6696.684	667.733	-65.631	-6357.23
6642.815	6617.162	66287.16	66178.84	6696.684	667.793	-65.161	-6358.13
6642.816	6617.231	66287.22	66178.79	6696.682	667.721	-67.169	-6358.13
6642.817	6617.489	66287.48	66178.91	6696.689	667.825	-62.621	-6357.34
6642.818	6617.744	66287.74	66178.99	6696.681	667.831	-66.985	-6357.29
6642.819	6617.882	66287.88	66178.86	6696.687	667.758	-64.977	-6357.29
6642.820	6617.931	66287.93	66178.53	6696.684	667.648	-65.263	-6357.38
6642.821	6617.973	66287.97	66178.37	6696.684	667.660	-66.229	-6357.38
6642.822	6617.973	66287.97	66178.36	6696.684	667.819	-64.239	-6357.36
6642.823	6617.973	66287.97	66178.54	6696.684	667.892	-64.159	-6357.31
6642.824	6617.973	66287.97	66178.48	6696.684	667.764	-66.738	-6357.38
6642.825	6617.973	66287.97	66178.17	6696.684	667.617	-67.685	-6357.38
6642.826	6617.973	66287.97	66178.11	6696.684	667.666	-64.391	-6357.42
6642.827	6617.973	66287.97	66178.11	6696.684	667.812	-66.229	-6357.42
6642.828	6617.973	66287.97	66178.14	6696.684	667.837	-66.514	-6357.38
6642.829	6617.973	66287.97	66178.32	6696.684	667.782	-66.476	-6356.68
6642.830	6617.973	66287.97	66178.36	6696.684	667.697	-66.943	-6356.24
6642.831	6617.973	66287.97	66178.31	6696.684	667.703	-65.281	-6356.26
6642.832	6617.973	66287.97	66178.32	6696.684	667.812	-65.945	-6356.22
6642.833	6617.973	66287.97	66178.58	6696.684	667.849	-62.699	-6356.22
6642.834	6617.973	66287.97	66178.71	6696.684	667.782	-62.457	-6356.26
6642.835	6617.973	66287.97	66178.63	6696.684	667.789	-62.492	-6356.19
6642.836	6617.973	66287.97	66178.55	6696.684	667.739	-63.268	-6356.24
6642.837	6617.973	66287.97	66178.81	6696.684	667.892	-63.286	-6356.24
6642.838	6617.973	66287.97	66179.08	6696.684	667.861	-67.623	-6356.15
6642.839	6617.973	66287.97	66179.18	6696.684	667.733	-66.461	-6356.17
6642.840	6617.973	66287.97	66179.17	6696.684	667.666	-66.678	-6356.15
6642.841	6617.973	66287.97	66179.13	6696.684	667.812	-67.722	-6356.17
6642.842	6617.973	66287.97	66179.45	6696.684	667.935	-65.646	-6356.17
6642.843	6617.973	66287.97	66179.53	6696.684	667.849	-65.295	-6356.15
6642.844	6617.973	66287.97	66179.55	6696.684	667.739	-64.397	-6356.06
6642.845	6617.973	66287.97	66179.41	6696.684	667.733	-65.168	-6356.04
6642.846	6617.973	66287.97	66179.39	6696.684	667.928	-65.113	-6356.04
6642.847	6617.973	66287.97	66179.47	6696.684	667.977	-67.994	-6356.06
6642.848	6617.973	66287.97	66179.50	6696.684	667.794	-65.449	-6356.06
6642.849	6617.973	66287.97	66179.53	6696.684	667.733	-66.703	-6356.06
6642.850	6617.973	66287.97	66179.53	6696.684	667.831	-67.438	-6356.02
6642.851	6617.973	66287.97	66179.74	6696.684	667.814	-67.443	-6356.02
6642.852	6617.973	66287.97	66179.83	6696.684	667.953	-64.852	-6355.97
6642.853	6617.973	66287.97	66179.66	6696.684	667.745	-65.383	-6355.97
6642.854	6617.973	66287.97	66179.66	6696.684	667.678	-66.678	-6355.97

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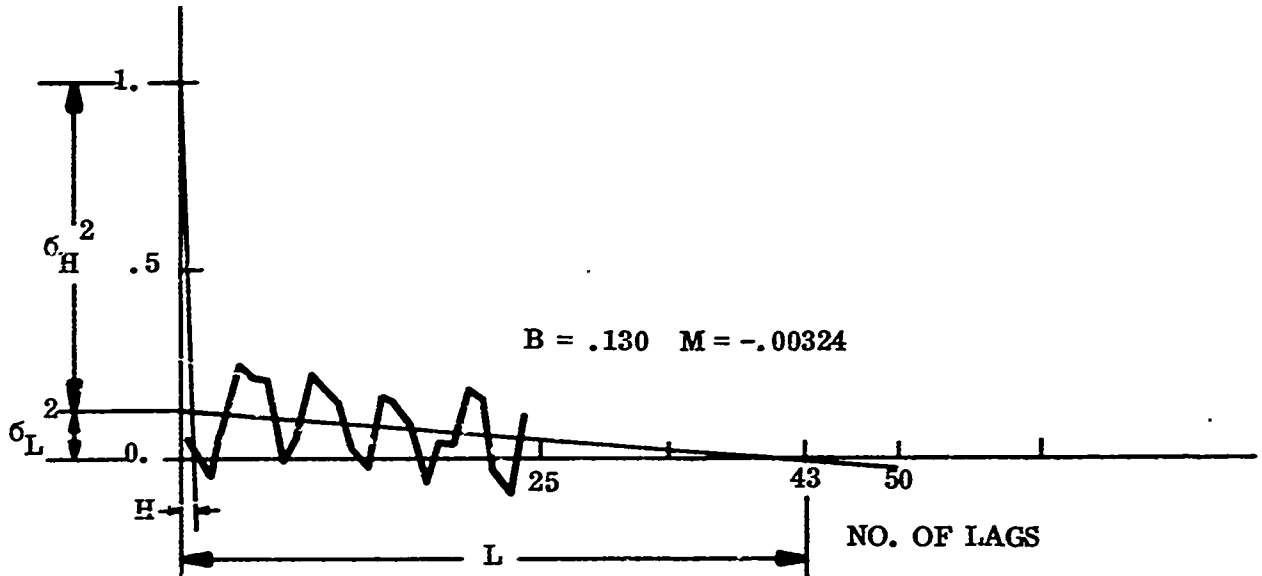
一、二、三、四、五、六、七、八、九、十、十一、十二、十三、十四、十五、十六、十七、十八、十九、二十、二十一、二十二、二十三、二十四、二十五、二十六、二十七、二十八、二十九、三十、三十一、三十二、三十三、三十四、三十五、三十六、三十七、三十八、三十九、四十、四十一、四十二、四十三、四十四、四十五、四十六、四十七、四十八、四十九、五十、五十一、五十二、五十三、五十四、五十五、五十六、五十七、五十八、五十九、六十、六十一、六十二、六十三、六十四、六十五、六十六、六十七、六十八、六十九、七十、七十一、七十二、七十三、七十四、七十五、七十六、七十七、七十八、七十九、八十、八十一、八十二、八十三、八十四、八十五、八十六、八十七、八十八、八十九、九十、九十一、九十二、九十三、九十四、九十五、九十六、九十七、九十八、九十九、一百。

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APPENDIX B

COMPLETE AUTOCORRELATION RESULTS

**SIMPLIFIED AUTOCORRELATION FUNCTIONS
NORMALIZED VARIANCE VS. TIME
(EACH LAG = 2.5 SEC)**



$$\sigma_L^2 = 13\% = 0.60$$

$$\sigma_L = 0.774$$

$$\sigma_H^2 = 87\% = 3.98$$

$$\sigma_H = 1.95$$

$$\sigma_T^2 = 4.58 = \text{VARIANCE}$$

$$\sigma_T = 2.14$$

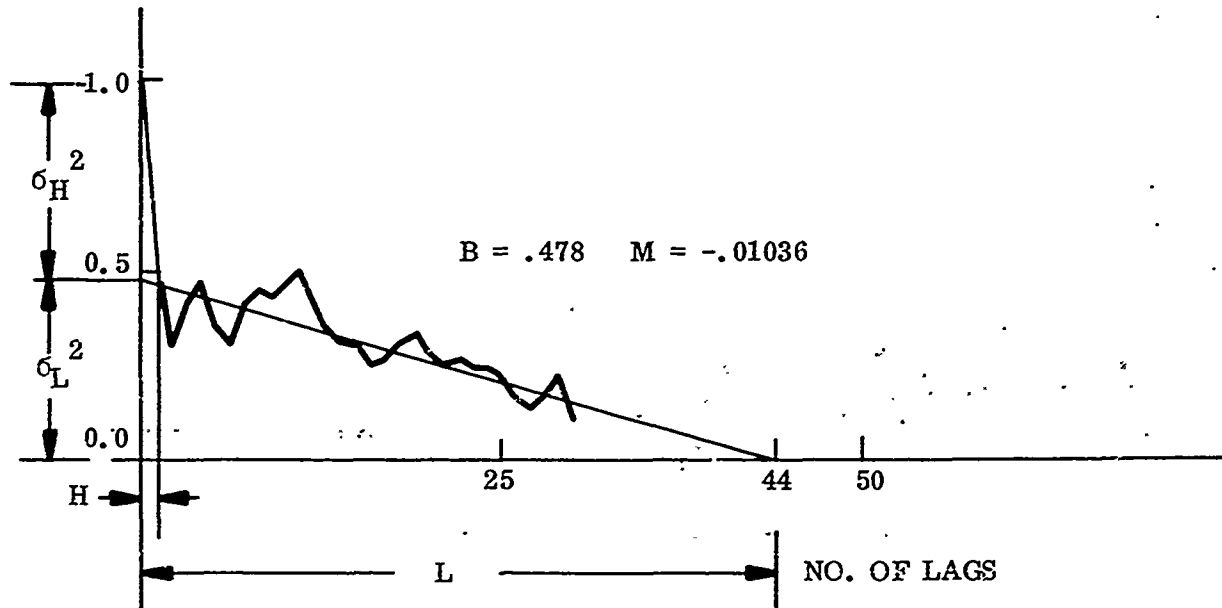
$$L = 107 \text{ SEC}$$

$$\overline{S/N} = -4.47$$

$$H = 2.5 \text{ SEC}$$

RUN 2 LEG 1 SIGNAL-TO-NOISE
5,000 YARDS
DATA BASED ON 247 SELECTED FRAMES
(617 SECONDS), 10% LAG

SIMPLIFIED AUTOCORRELATION RESULTS NORMALIZED VARIANCE VS. TIME



$$\sigma_L^2 = 48\% = 0.413$$

$$\sigma_L = 0.642$$

$$\sigma_H^2 = 52\% = 0.449$$

$$\sigma_H = 0.668$$

$$\sigma_T^2 = 0.86 = \text{VARIANCE}$$

$$\sigma_T = 0.926$$

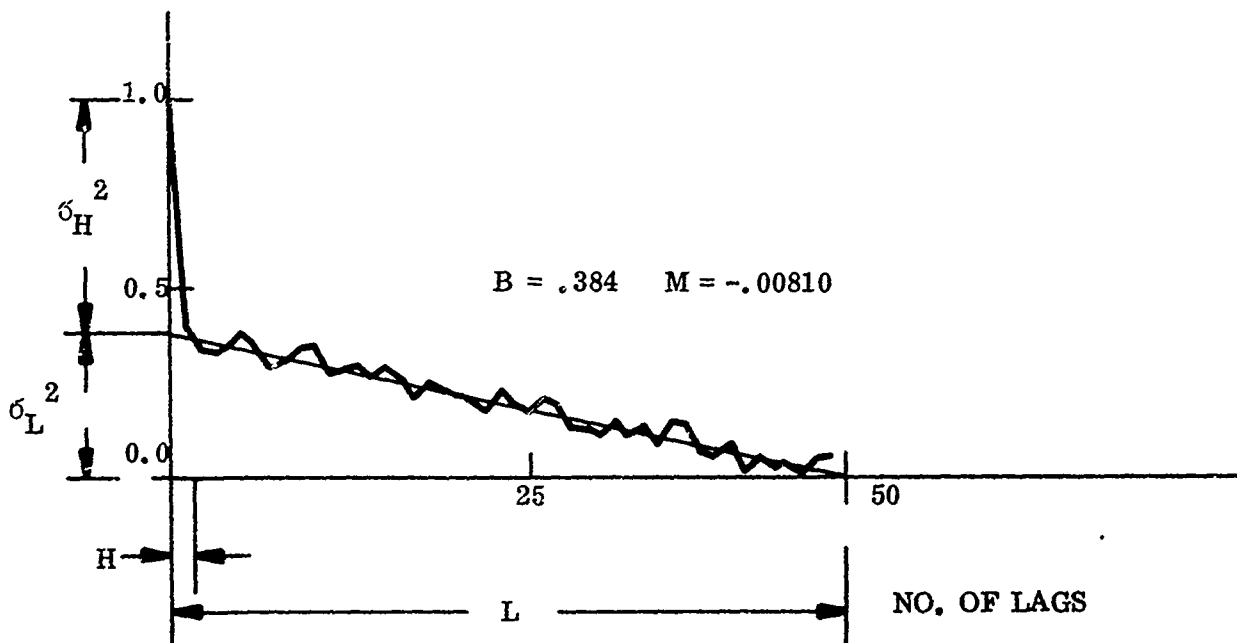
$$L = 111 \text{ SEC}$$

$$\overline{S/N} = -5.47$$

$$H = 3.75 \text{ SEC}$$

RUN 2 LEG 2 SIGNAL-TO-NOISE
10,000 YARDS
DATA BASED ON 308 FRAMES
(ENTIRE RUN) OR 770 SECONDS WITH 10% LAG

SIMPLIFIED AUTOCORRELATION RESULTS
NORMALIZED VARIANCE VS. TIME



$$\sigma_L^2 = 38\% = 1.77$$

$$\sigma_L = 1.33$$

$$\sigma_H^2 = 62\% = 2.89$$

$$\sigma_H = 1.70$$

$$\sigma_T^2 = 4.66 = \text{VARIANCE}$$

$$\sigma_T = 2.16$$

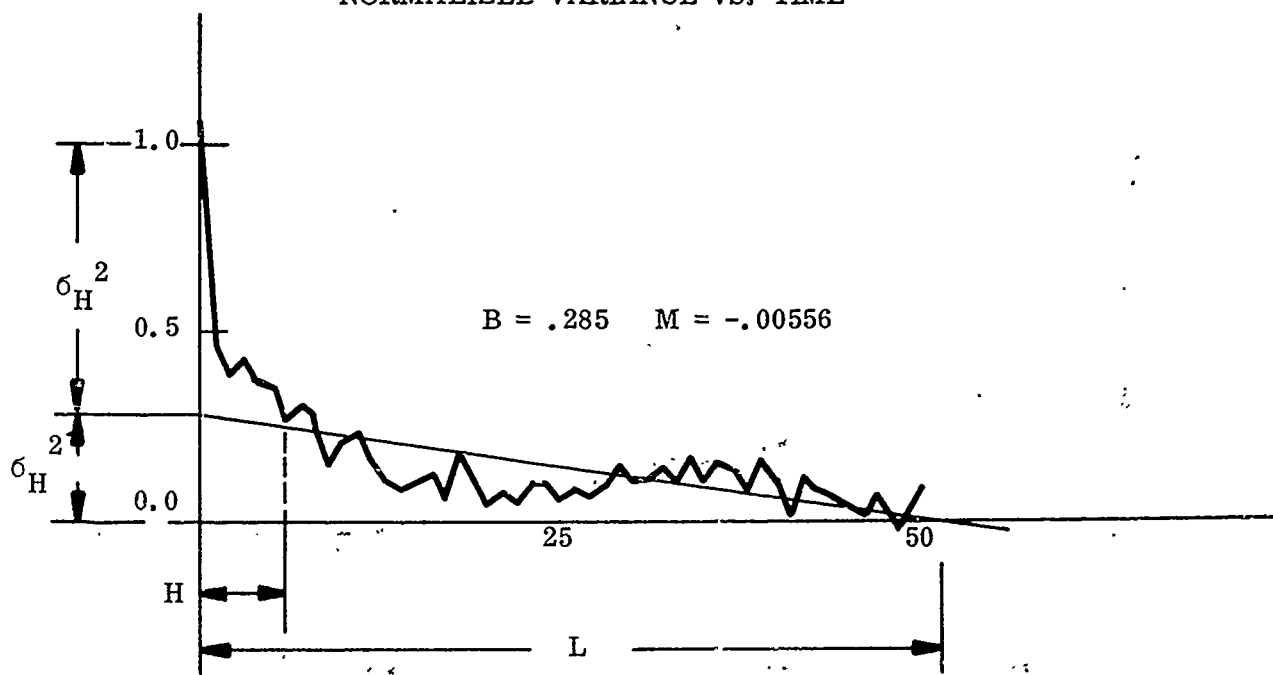
$$L = 117.5 \text{ SEC}$$

$$S/N = -7.83$$

$$H = 3.75 \text{ SEC}$$

RUN 2 LEG 3 SIGNAL-TO-NOISE
20,000 YARDS
DATA BASED ON 467 FRAMES
(ENTIRE RUN) OR 1170 SECONDS WITH 10% LAG

SIMPLIFIED AUTOCORRELATION FUNCTIONS
NORMALIZED VARIANCE VS. TIME



$$\sigma_L^2 = 28.5\% = .077$$

$$\sigma_L = .277$$

$$\sigma_H^2 = 71.5\% = .193$$

$$\sigma_H = .439$$

$$\sigma_T^2 = 0.27 = \text{VARIANCE}$$

$$\sigma_T = .509$$

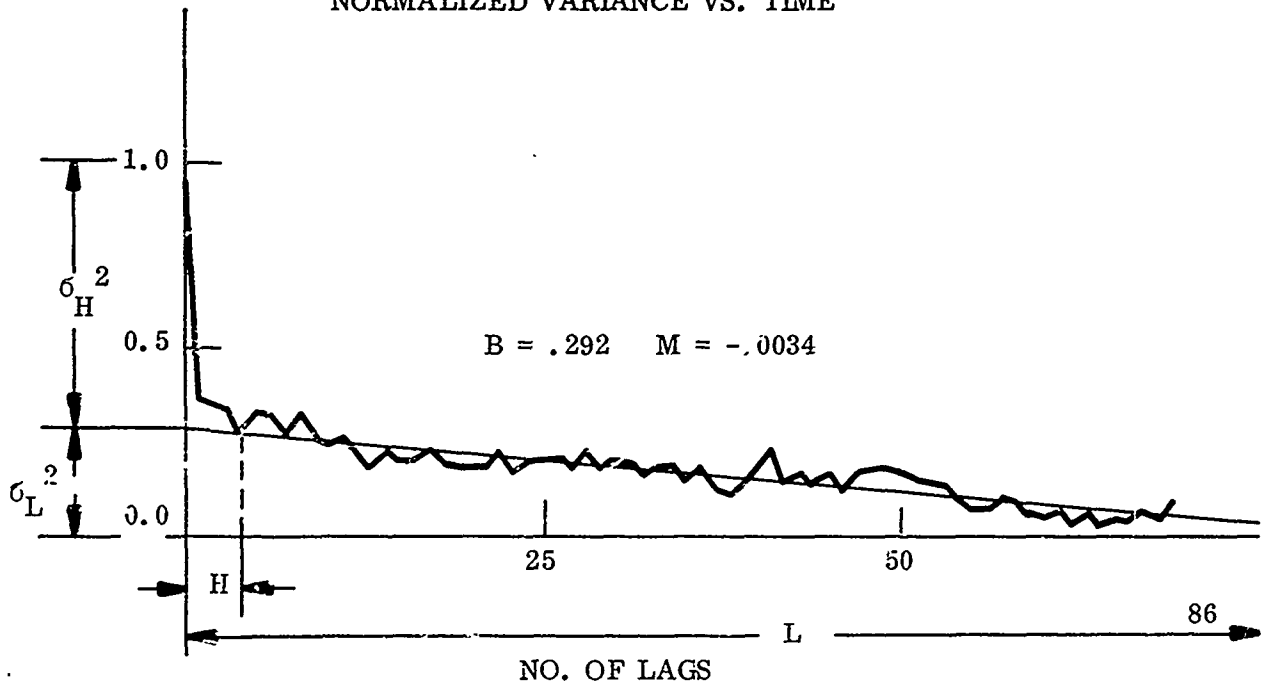
$$L = 127 \text{ SEC}$$

$$\overline{S/N} = -5.33$$

$$H = 15 \text{ SEC}$$

RUN 2 LEG 4 SIGNAL-TO-NOISE
40,000 YARDS
DATA BASED ON 505 FRAMES
(ENTIRE RUN) - 1266 SECONDS, 10% LAG

SIMPLIFIED AUTOCORRELATION FUNCTIONS
NORMALIZED VARIANCE VS. TIME



$$\sigma_L^2 = 29\% = .246$$

$$\sigma_L = .496$$

$$\sigma_H^2 = 71\% = .604$$

$$\sigma_H = .776$$

$$\sigma_T^2 = 0.85 = \text{VARIANCE}$$

$$\sigma_T = .921$$

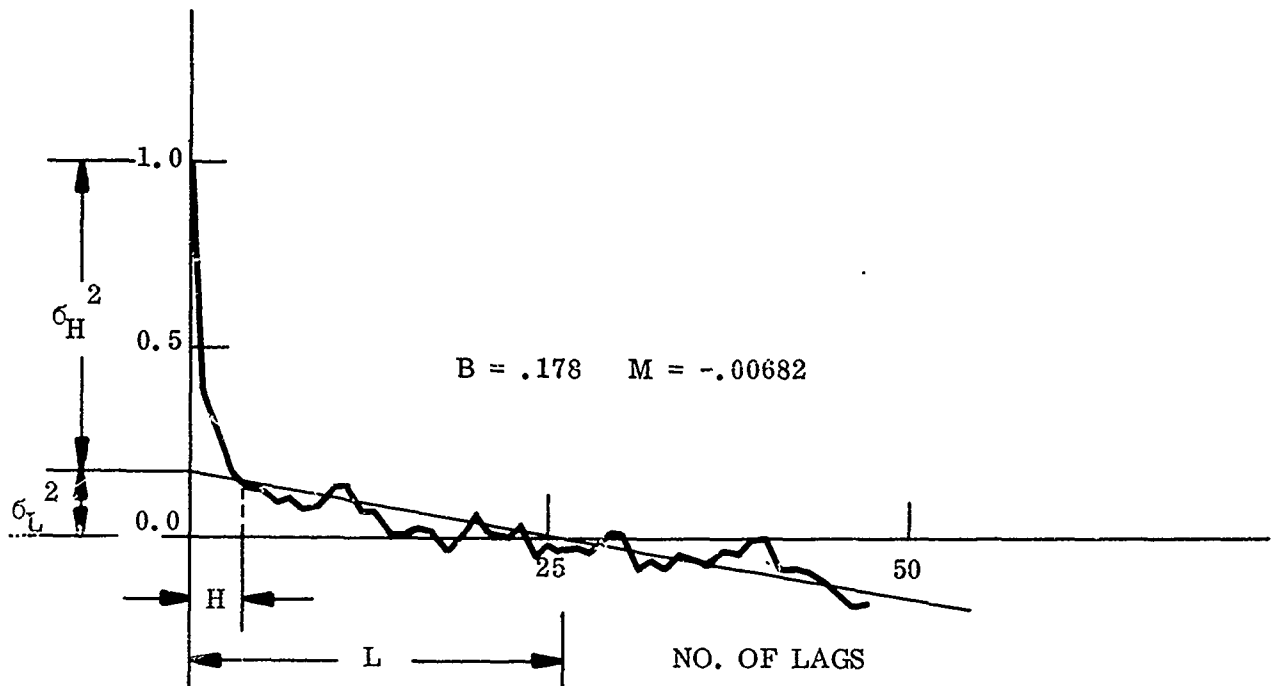
$$L = 215 \text{ SEC}$$

$$\bar{S}/N = -6.36$$

$$H = 10 \text{ SEC}$$

RUN 2 CLOSING SIGNAL-TO-NOISE
DATA BASED ON FIRST 693 FRAMES
(1730 SECONDS), 10% LAG

SIMPLIFIED AUTOCORRELATION FUNCTIONS NORMALIZED VARIANCE VS. TIME



$$\sigma_L^2 = 18\% = 0.402$$

$$\sigma_L = 0.634$$

$$\sigma_H^2 = 82\% = 1.830$$

$$\sigma_H = 1.352$$

$$\sigma_T^2 = 2.23 = \text{VARIANCE}$$

$$\sigma_T = 1.493$$

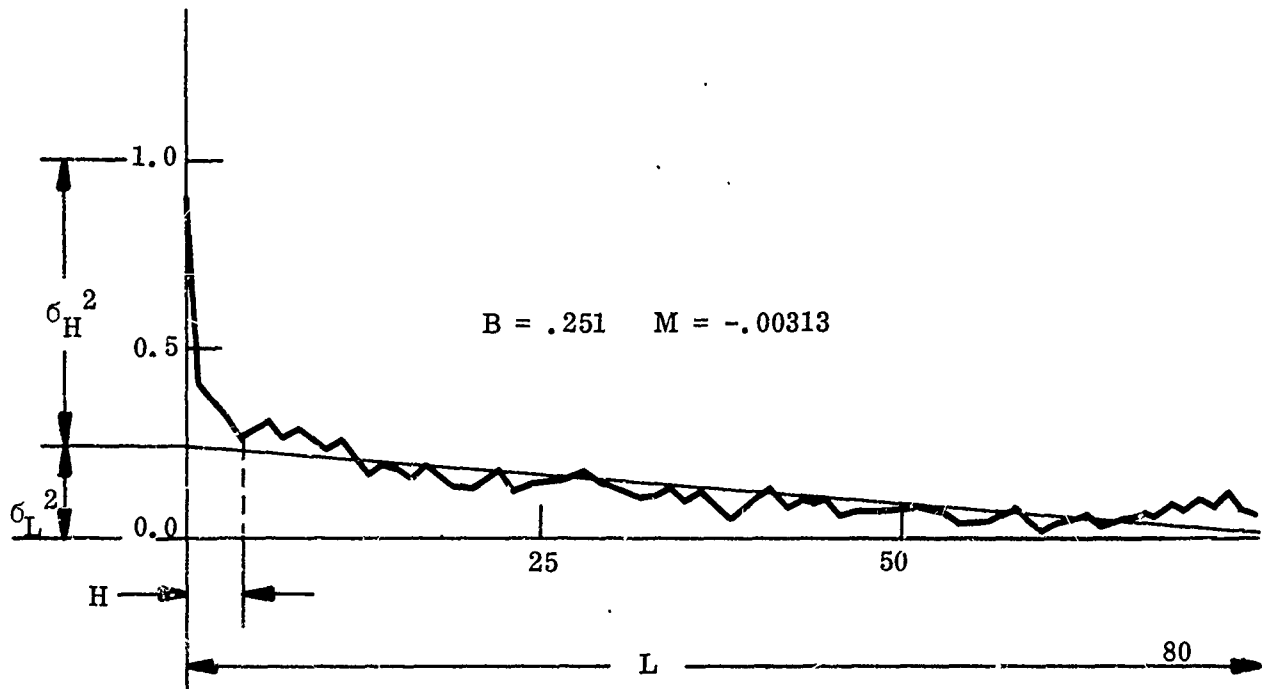
$$L = 65 \text{ SEC}$$

$$\overline{S/N} = -7.80$$

$$H = 9.4 \text{ SEC}$$

RUN 2 CLOSING SIGNAL-TO-NOISE
DATA BASED ON 476 FRAMES
(693-1169) - 1190 SECONDS, 10% LAG

SIMPLIFIED AUTOCORRELATION FUNCTIONS
NORMALIZED VARIANCE VS. TIME



$$\sigma_L^2 = 25\% = 2.48$$

$$\sigma_L = .498$$

$$\sigma_H^2 = 75\% = .742$$

$$\sigma_H = .861$$

$$\sigma_T^2 = 0.99 = \text{VARIANCE}$$

$$\sigma_T = .995$$

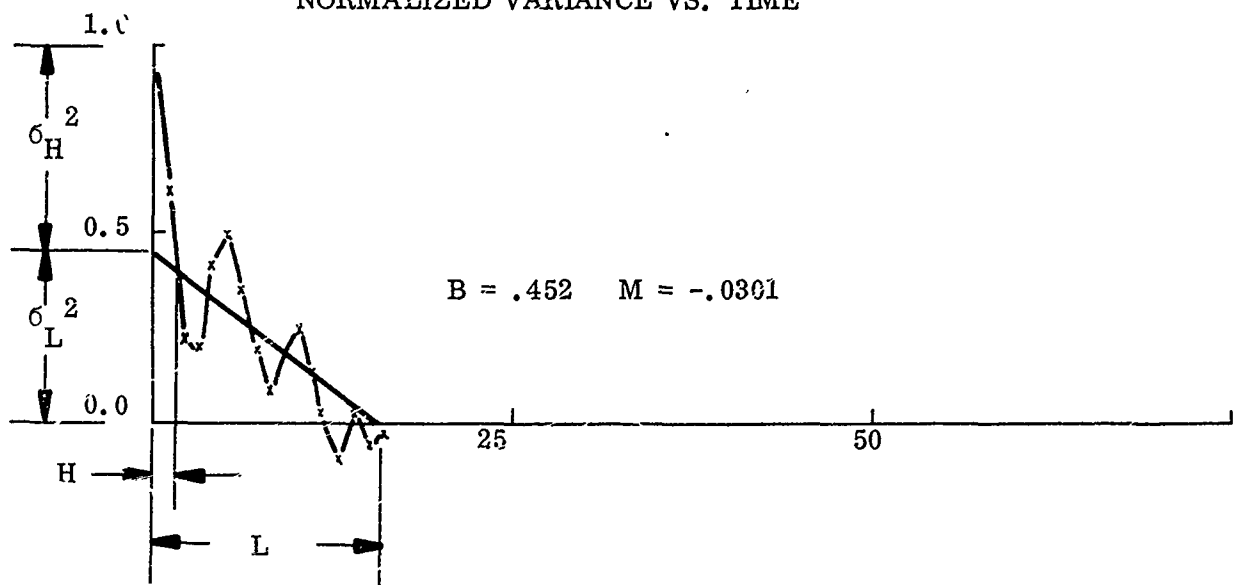
$$L = 200 \text{ SEC}$$

$$\overline{S/N} = -6.30$$

$$H = 10 \text{ SEC}$$

RUN 2 CLOSING SIGNAL-TO-NOISE
DATA BASED ON 792 FRAMES
(0-792) 1980 SECONDS, 10% LAG

SIMPLIFIED AUTOCORRELATION RESULTS NORMALIZED VARIANCE VS. TIME



$$\sigma_L^2 = 46\% = 1.69$$

$$\sigma_L = 1.30$$

$$\sigma_H^2 = 54\% = 1.99$$

$$\sigma_H = 1.41$$

$$\sigma_T^2 = 3.68 = \text{VARIANCE}$$

$$\sigma_T = 1.92$$

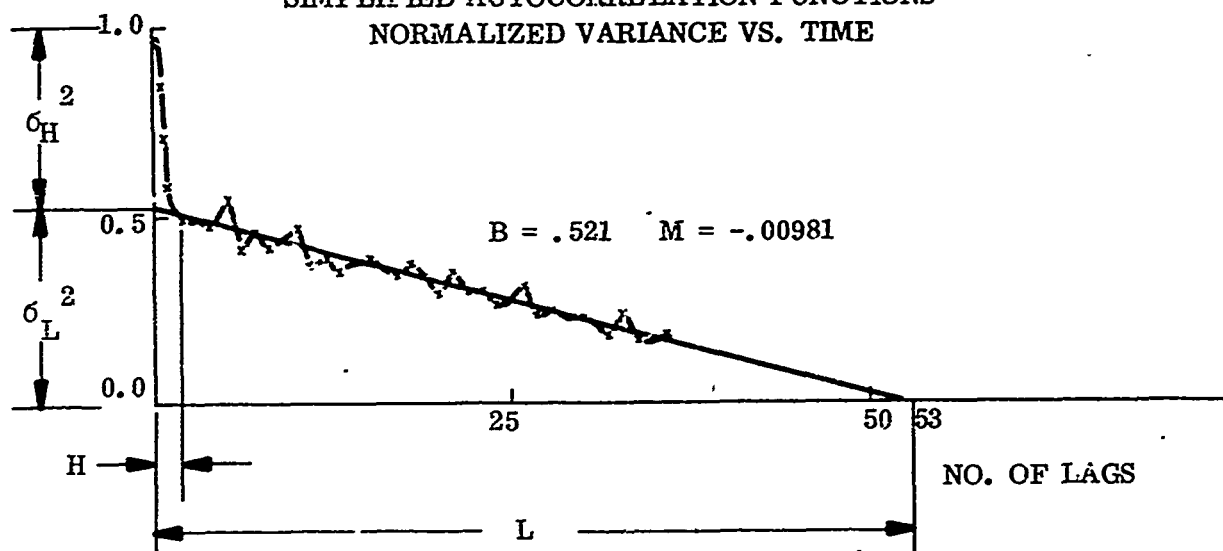
$$L = 39.2 \text{ SEC}$$

$$\overline{S/N} = +3.25$$

$$H = 3.75 \text{ SEC}$$

RUN 3 LEG 1 SIGNAL-TO-NOISE
DATA BASED ON 175 FRAMES
(ENTIRE RUN) OR 435 SECONDS (10% LAG)

SIMPLIFIED AUTOCORRELATION FUNCTIONS NORMALIZED VARIANCE VS. TIME



$$\sigma_L^2 = 52\% = 4.16$$

$$\sigma_L = 2.04$$

$$\sigma_H^2 = 48\% = 3.85$$

$$\sigma_H = 1.96$$

$$\sigma_T^2 = 8.01 = \text{VARIANCE}$$

$$\sigma_T = 2.83$$

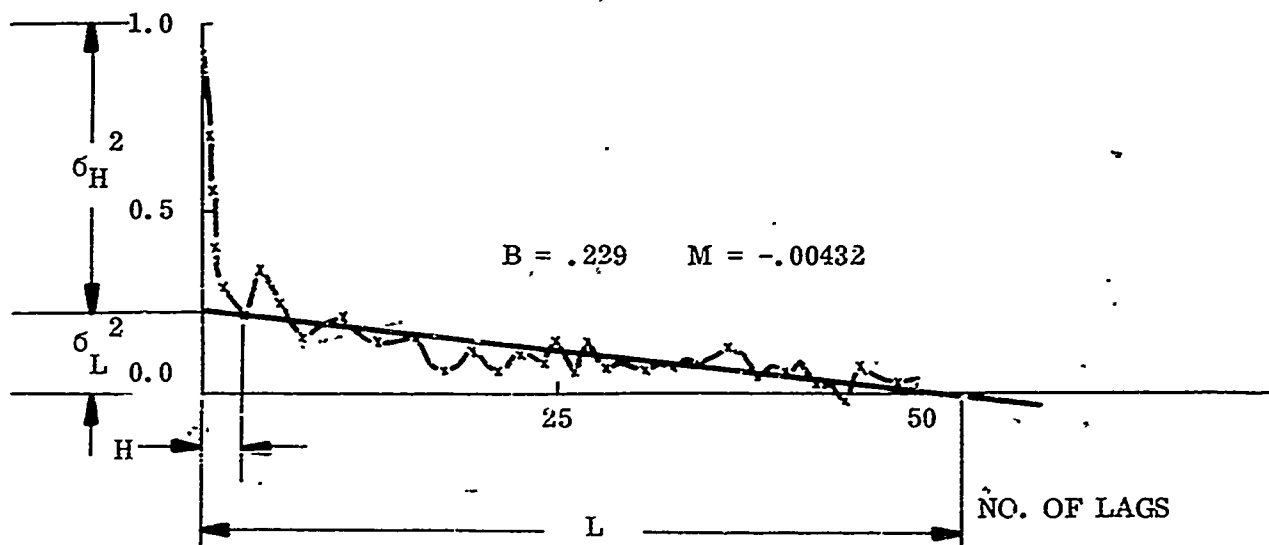
$$L = 132 \text{ SEC}$$

$$\overline{S/N} = +2.91$$

$$H = 5 \text{ SEC}$$

RUN 3 LEG 2 SIGNAL-TO-NOISE
10,000 YARDS
DATA BASED ON 364 FRAMES
(ENTIRE RUN) - (910 SECONDS) 10% LAG

SIMPLIFIED AUTOCORRELATION FUNCTIONS
-NORMALIZED VARIANCE VS. TIME



$$\sigma_L^2 = 23\% = 1.24$$

$$\sigma_L = 1.11$$

$$\sigma_H^2 = 77\% = 4.15$$

$$\sigma_H = 2.04$$

$$\sigma_T^2 = 5.39 = \text{VARIANCE}$$

$$\sigma_T = 2.32$$

$$L = 132 \text{ SEC}$$

$$S/N = -4.67$$

$$H = 7.5 \text{ SEC}$$

RUN 3 LEG 3 SIGNAL-TO-NOISE
20,000 YARDS
DATA BASED ON 508 FRAMES
(ENTIRE RUN) - 1270 SECONDS, 10% LAG

$$\sigma_L = .370$$

$$\sigma_{\text{E}} = 1.72$$

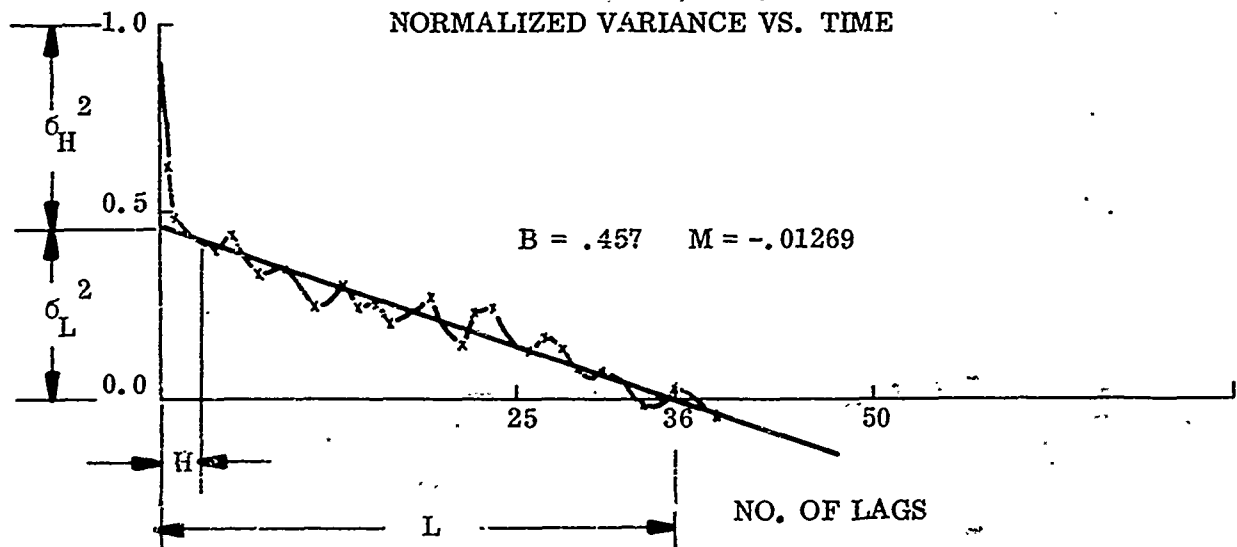
$$\delta_T = 1.76$$

$$\overline{S/N} = -4.56$$

$\sigma_L^2 = 4\% = .137$	$\sigma_L = .370$
$\sigma_H^2 = 96\% = 2.97$	$\sigma_H = 1.72$
$\sigma_T^2 = 3.11 = \text{VARIANCE}$	$\sigma_T = 1.76$
$L = 32.5 \text{ SEC}$	$\frac{T}{S/N} = -4.56$
$H = 7.5 \text{ SEC}$	

DATA BASED ON 296 FRAMES
(043 TO 339) - 740 SECONDS, 10% LAG

SIMPLIFIED AUTOCORRELATION FUNCTIONS NORMALIZED VARIANCE VS. TIME



$$\sigma_L^2 = 46\% = 3.40$$

$$\sigma_L = 1.84$$

$$\sigma_H^2 = 54\% = 4.05$$

$$\sigma_H = 2.01$$

$$\sigma_T^2 = 7.45 = \text{VARIANCE}$$

$$\sigma_T = 2.38$$

$$L = 90 \text{ SEC}$$

$$\frac{S}{N} = -2.58$$

$$H = 7.5 \text{ SEC}$$

RUN 3 LEG 4 SIGNAL-TO-NOISE
40,000 YARDS
DATA BASED ON 393 FRAMES
(ENTIRE RUN) - 980 SECONDS, 10% LAG

Figure 1 is a graph titled "NORMALIZED VARIANCE VS. TIME". The vertical axis is labeled σ_H^2 and has tick marks at 0.0, 0.5, and 1.0. The horizontal axis is labeled σ_L^2 and has tick marks at 25 and 50. The curve starts at (0, 1.0), drops sharply to near 0.0, and then exhibits small oscillations before settling near 0.0. Parameters $B = .013$ and $M = -.00114$ are indicated. A horizontal line is labeled H , and a vertical line is labeled L .

$$\sigma_L = 0.20$$

$$\sigma_H = 1.97$$

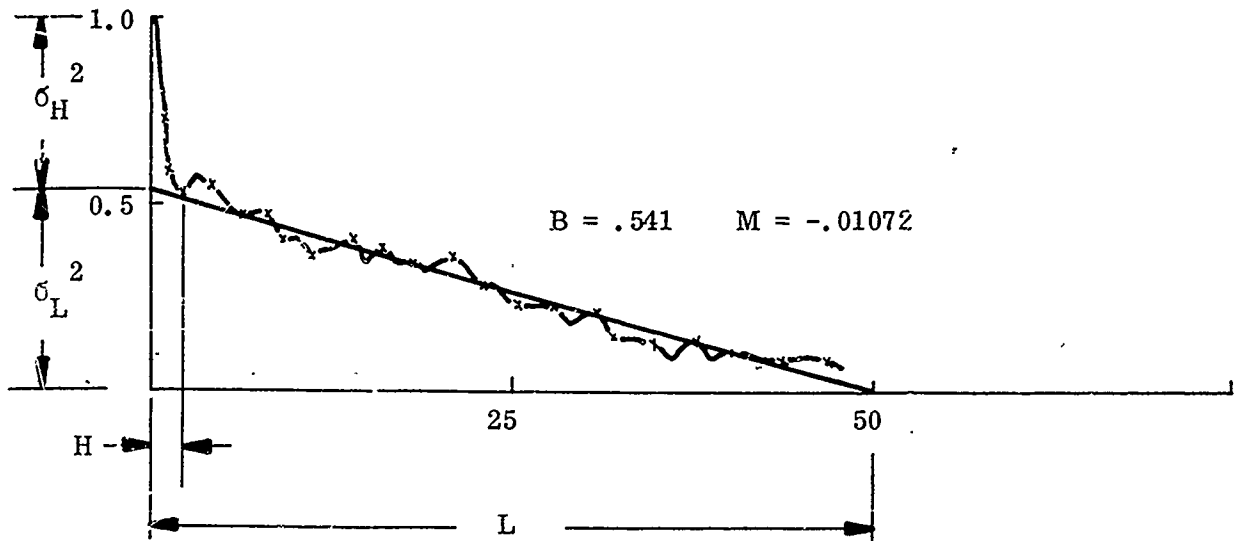
$$\sigma_T = 1.98$$

$$\overline{S/N} = -5.75$$

H = 5 SEC

B-13

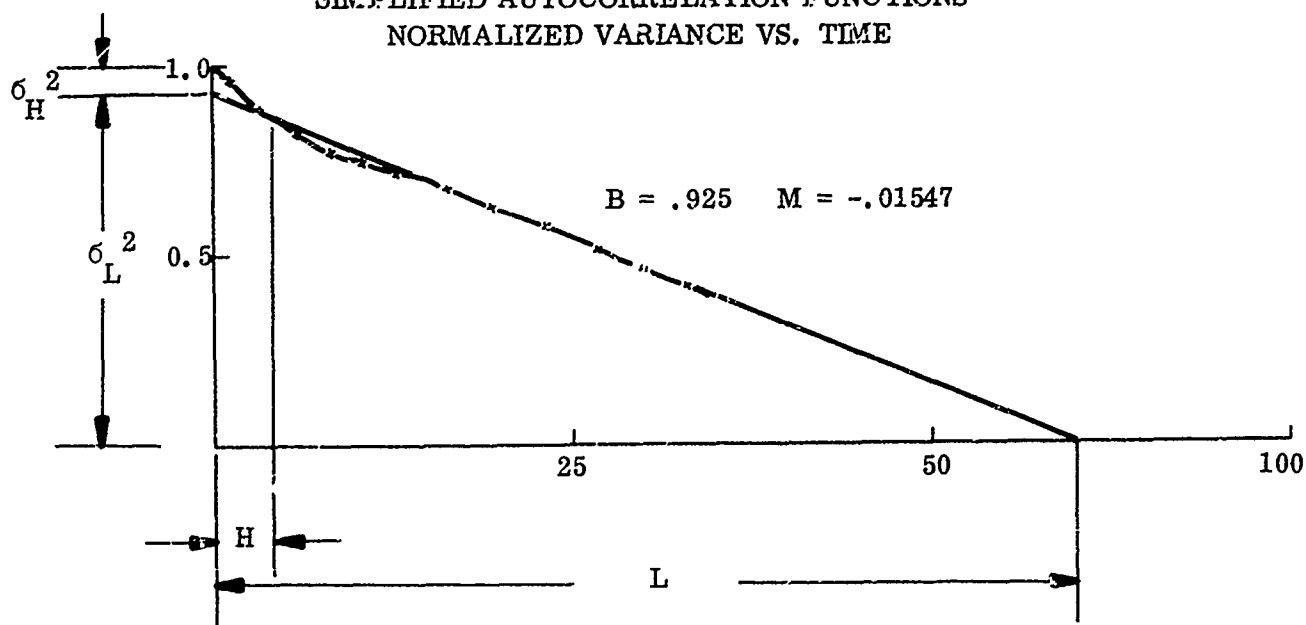
SIMPLIFIED AUTOCORRELATION FUNCTIONS NORMALIZED VARIANCE VS. TIME



$$\begin{aligned} \sigma_L^2 &= 54\% = 5.55 & \sigma_L &= 2.35 \\ \sigma_H^2 &= 46\% = 4.71 & \sigma_H &= 2.17 \\ \sigma_T^2 &= 10.26 = \text{VARIANCE} & \sigma_T &= 3.20 \\ L &= 125 \text{ SEC} \\ H &= 3 \text{ SEC} \end{aligned}$$

RUN 3 LEG 5 SIGNAL-TO-NOISE
60,000 YARDS
DATA BASED ON 484 FRAMES
(ENTIRE RUN) - 1210 SECONDS, 10% LAG

SIMPLIFIED AUTOCORRELATION FUNCTIONS
NORMALIZED VARIANCE VS. TIME



$$\sigma_L^2 = 92\% = .00394$$

$$\sigma_L = .0628$$

$$\sigma_H^2 = 8\% = .000343$$

$$\sigma_H = .0185$$

$$\sigma_T^2 = .00429 = \text{VARIANCE}$$

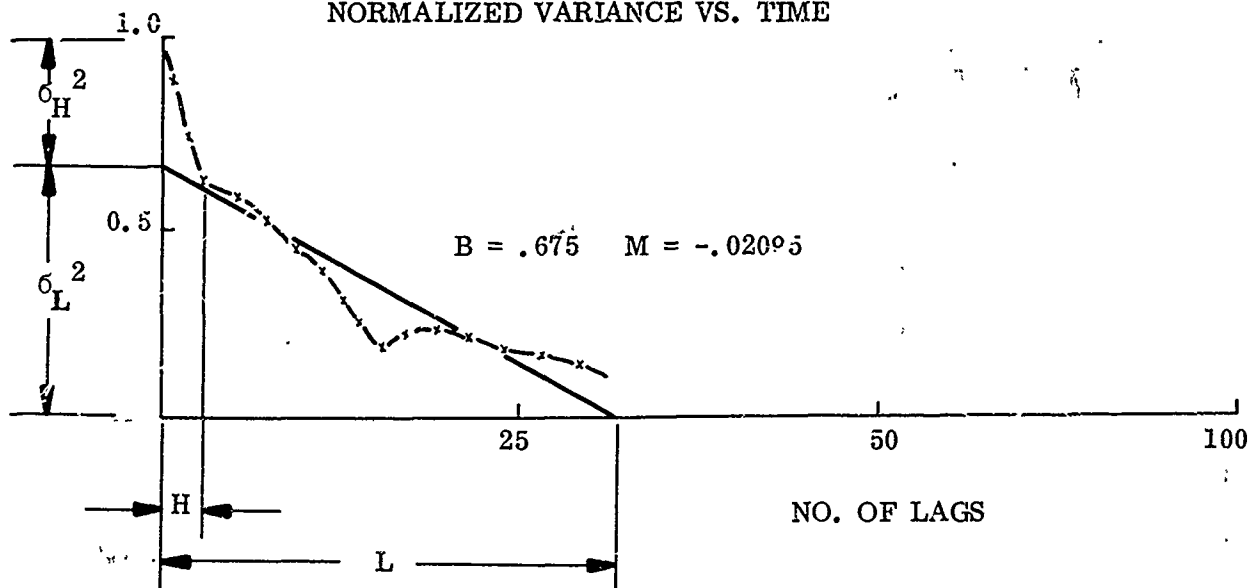
$$\sigma_T = .0654$$

$$L = 150 \text{ SEC}$$

$$H = 10 \text{ SEC}$$

RUN 2 LEG 4 (BEARING)
40,000 YARDS
DATA BASED ON 346 FRAMES
(114-460) - 865 SECONDS, 10% LAG

SIMPLIFIED AUTOCORRELATION FUNCTIONS
NORMALIZED VARIANCE VS. TIME



$$\sigma_L^2 = 67\% = .01740$$

$$\sigma_H^2 = 33\% = .00855$$

$$\sigma_T^2 = .0259 = \text{VARIANCE}$$

$$L = 80 \text{ SEC}$$

$$H = 7.5 \text{ SEC}$$

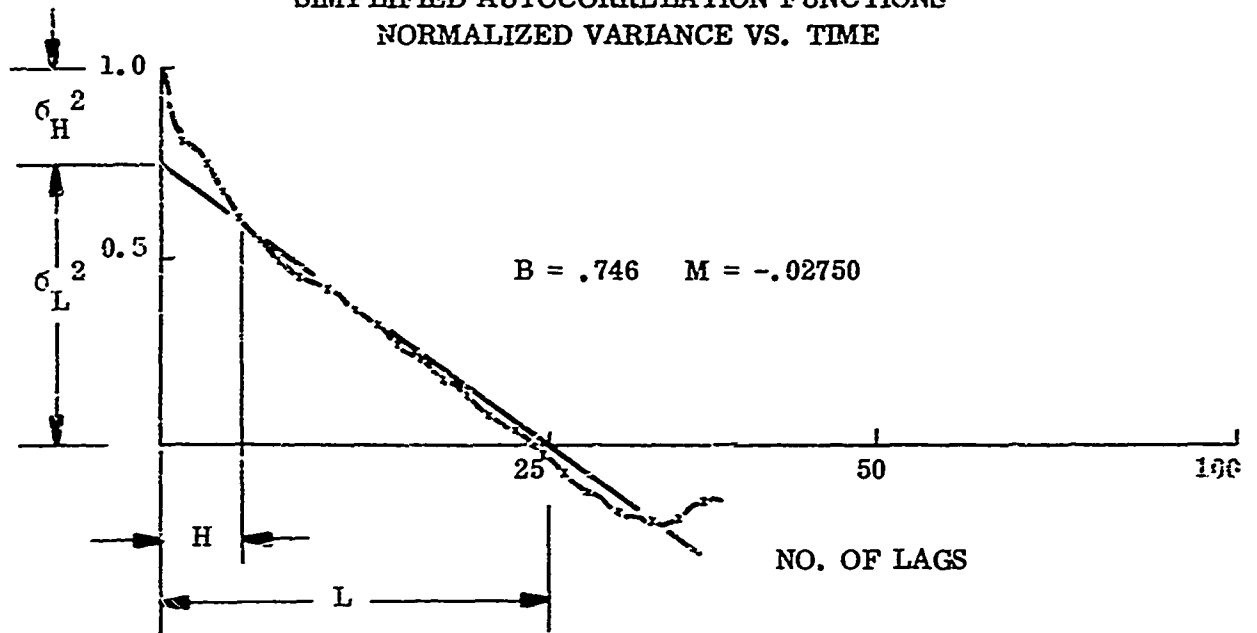
$$\sigma_L = .132$$

$$\sigma_H = .0924$$

$$\sigma_T = .161$$

RUN 3 LEG 4 (D/E)
40,000 YARDS
DATA BASED ON 317 FRAMES
(076-393) 792 SECONDS, 10% LAG

SIMPLIFIED AUTOCORRELATION FUNCTIONS
NORMALIZED VARIANCE VS. TIME



$$\sigma_L^2 = 75\% = .00281$$

$$\sigma_L = .0530$$

$$\sigma_H^2 = 25\% = .000938$$

$$\sigma_H = .00969$$

$$\sigma_T^2 = .00375 = \text{VARIANCE}$$

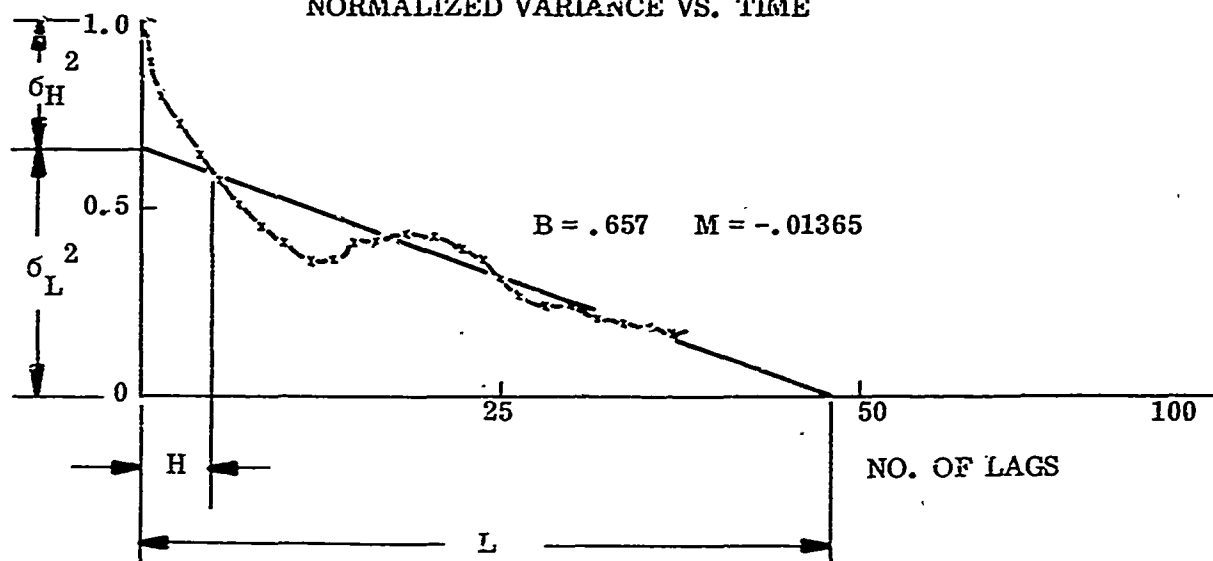
$$\sigma_T = .0612$$

$$L = 67.5 \text{ SEC}$$

$$H = 13.7 \text{ SEC}$$

RUN 3 LEG 4 (BEARING)
40,000 YARDS
DATA BASED ON 393 FRAMES
(ENTIRE RUN) - 980 SECONDS, 10% LAG

SIMPLIFIED AUTOCORRELATION FUNCTIONS
NORMALIZED VARIANCE VS. TIME



$$\sigma_L^2 = 66\% = .00629$$

$$\sigma_L = .0792$$

$$\sigma_H^2 = 34\% = .00323$$

$$\sigma_H = .0568$$

$$\sigma_T^2 = .00952 = \text{VARIANCE}$$

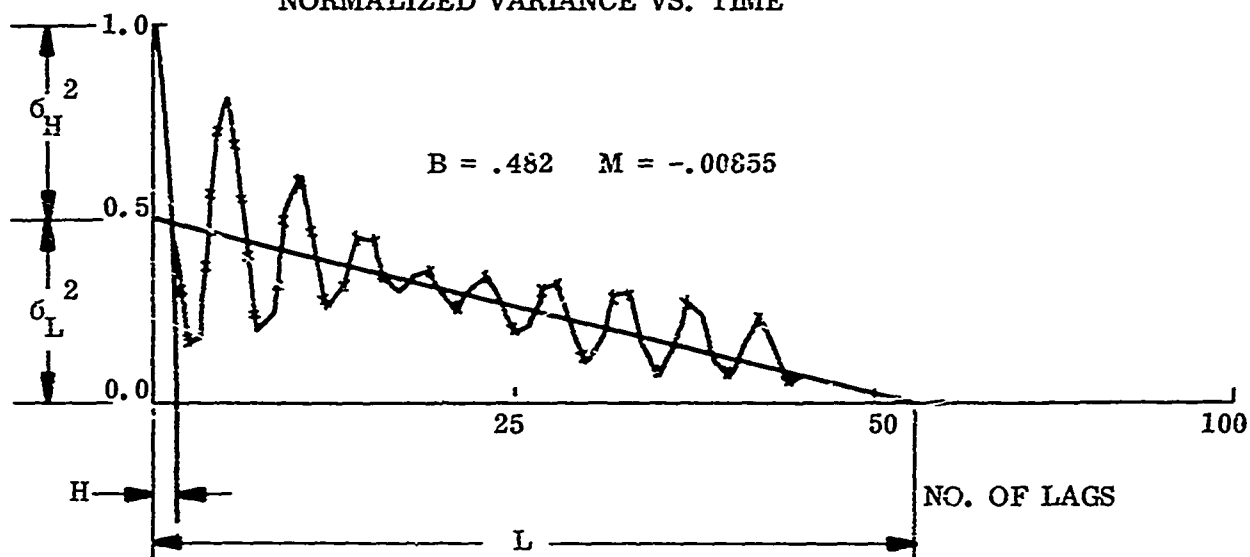
$$\sigma_T = .0975$$

$$L = 120 \text{ SEC}$$

$$H = 12.5 \text{ SEC}$$

RUN 3 LEG 5 (D/E)
60,000 YARDS
DATA BASED ON 386 FRAMES
(0-386) - 965 SECONDS, 10% LAG

SIMPLIFIED AUTOCORRELATION FUNCTIONS
NORMALIZED VARIANCE VS. TIME



$$\sigma_L^2 = 48\% = .00786$$

$$\sigma_L = .0886$$

$$\sigma_H^2 = 52\% = .00852$$

$$\sigma_H = .0923$$

$$\sigma_T^2 = .0164 = \text{VARIANCE}$$

$$\sigma_T = .128$$

$$L = 132 \text{ SEC}$$

$$H = 3.75 \text{ SEC}$$

RUN 3 LEG 5 (SPEED)
60,000 YARDS
DATA BASED ON 454 FRAMES
(ENTIRE RUN) - 1135 SECONDS, 10% LAG

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