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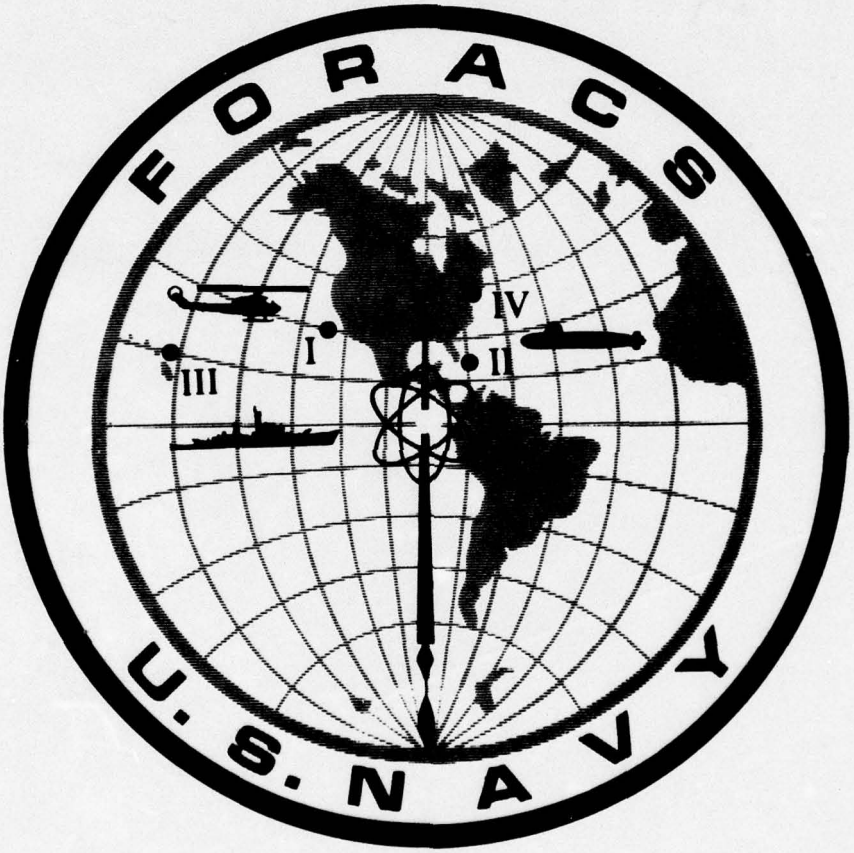


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Technical Document 491

FORACS DATA BANK MANUAL



HM Blanchard

15 OCTOBER 1976

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Fleet Operational Readiness Accuracy Check Sites (FORACS) test the performance accuracy of sensors installed aboard ships and submarines. This information is forwarded to NELC for permanent storage on magnetic tape and is subject to rapid recall with respect to desired analysis parameters. Document explains how this effort is conducted.

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PREFACE

Material contained in this publication was prepared by members of FORACS Operational Support Division of the Naval Electronics Laboratory Center under program element 60000N, project SEA, task area OMN and NELC work unit R112. This document was approved for publication on 15 October 1976.

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INTRODUCTION

The Fleet Operational Readiness Accuracy Check Site (FORACS) program was established to determine the range and/or bearing accuracy of various ship sensors: gyrocompass, sonar, gun fire-control system, surface-search radar, pelorus, and periscope. FORACS ranges currently in operation are located at San Clemente Island, California, St. Croix, Virgin Islands, Oahu, Hawaii, Fishers Island, New York, and Andros Island in the Bahamas. These ranges collect sensor information and report results to the ship and others in the Navy community.

Test data come to NELC in the form of magnetic tape, computer listings, and bound reports. At NELC the incoming data are reprocessed and retrieval programs allow these data to be extracted in a variety of computer sorts. Special reports can be generated with the addition of minimum amounts of new software. Summary information is published at regular intervals to give an updated history of sensor performance.

NELC FORACS TAPE LIBRARY

Information for the NELC FORACS tape library is submitted by the ranges in the forms shown in table 1. After checking, this information is entered into the NELC computer and is maintained in mark-by-mark, interval, and summary files in the data bank (figure 1). Mark-by-mark files consist of all individual bearing and range errors for each sensor tested. Interval files consist of bearing- and range-error parameters for bearing sectors and range intervals. Summary files consist of statistical parameters computed for each sensor and are used for producing summary reports.

Once the range data have been checked for accuracy, the three files are merged into the library for permanent storage. Thus, the files are being continually expanded as additional ship tests are performed. Programs are available in the NELC computer to edit the files should erroneous information be discovered in them or if it becomes necessary to change any particular file.

Data may be retrieved from the files by equipment type, ship name, ship class, FORACS range number, or other desired parameters. As data are extracted in this manner, they are merged on a scratch tape for ease in providing answers to special queries.

TABLE 1. MATERIAL REQUIRED FROM RANGES.

Bound volume of the test report
Computer listings from programs DAY, ED, NORM, GSE, and PERCAL (for submarines)
Magnetic tapes containing data from the programs NORM, ED, GSE, and PERCAL (for submarines)

NELC FORACS DATA BANK FIELD LAYOUT

The NELC FORACS data bank makes use of the fields shown in figure 2. The following is a discussion and description of these fields.

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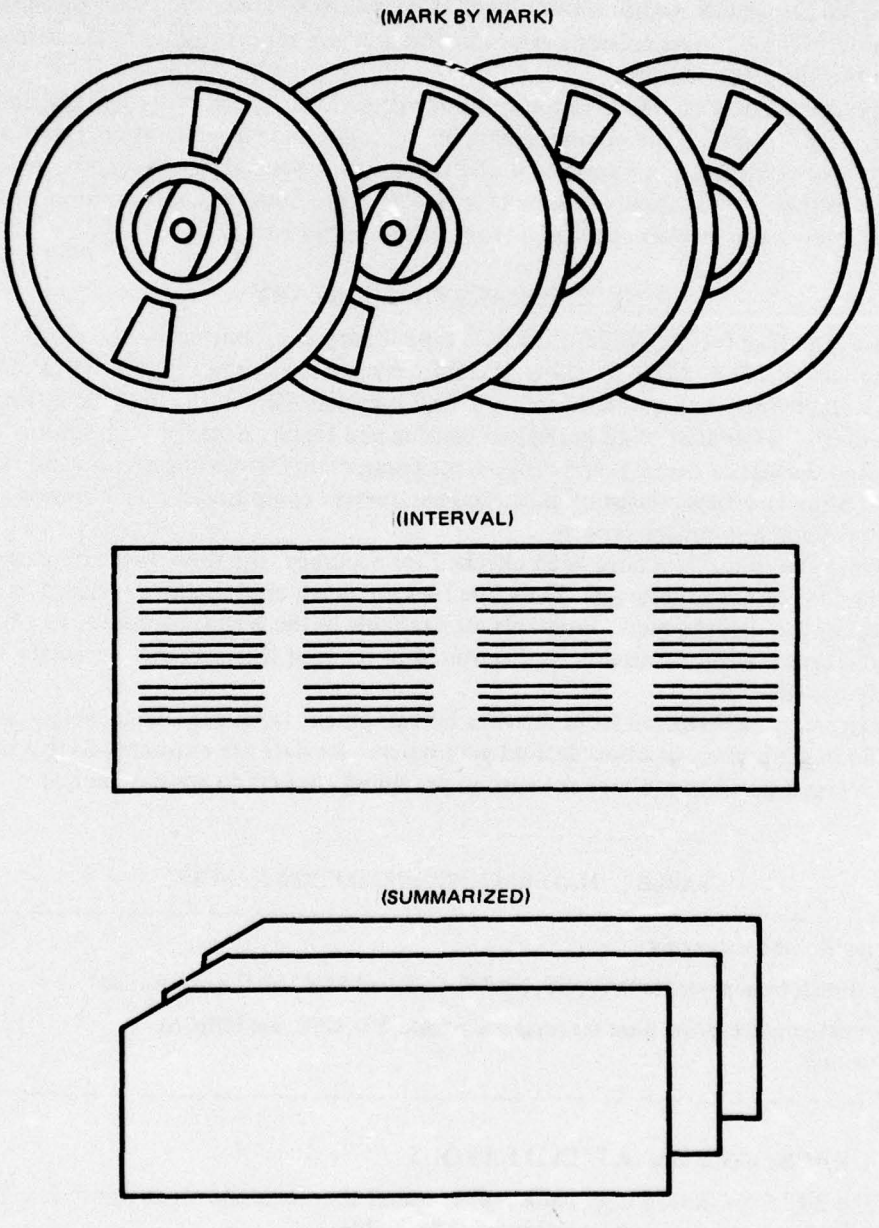


Figure 1. FORACS data bank.

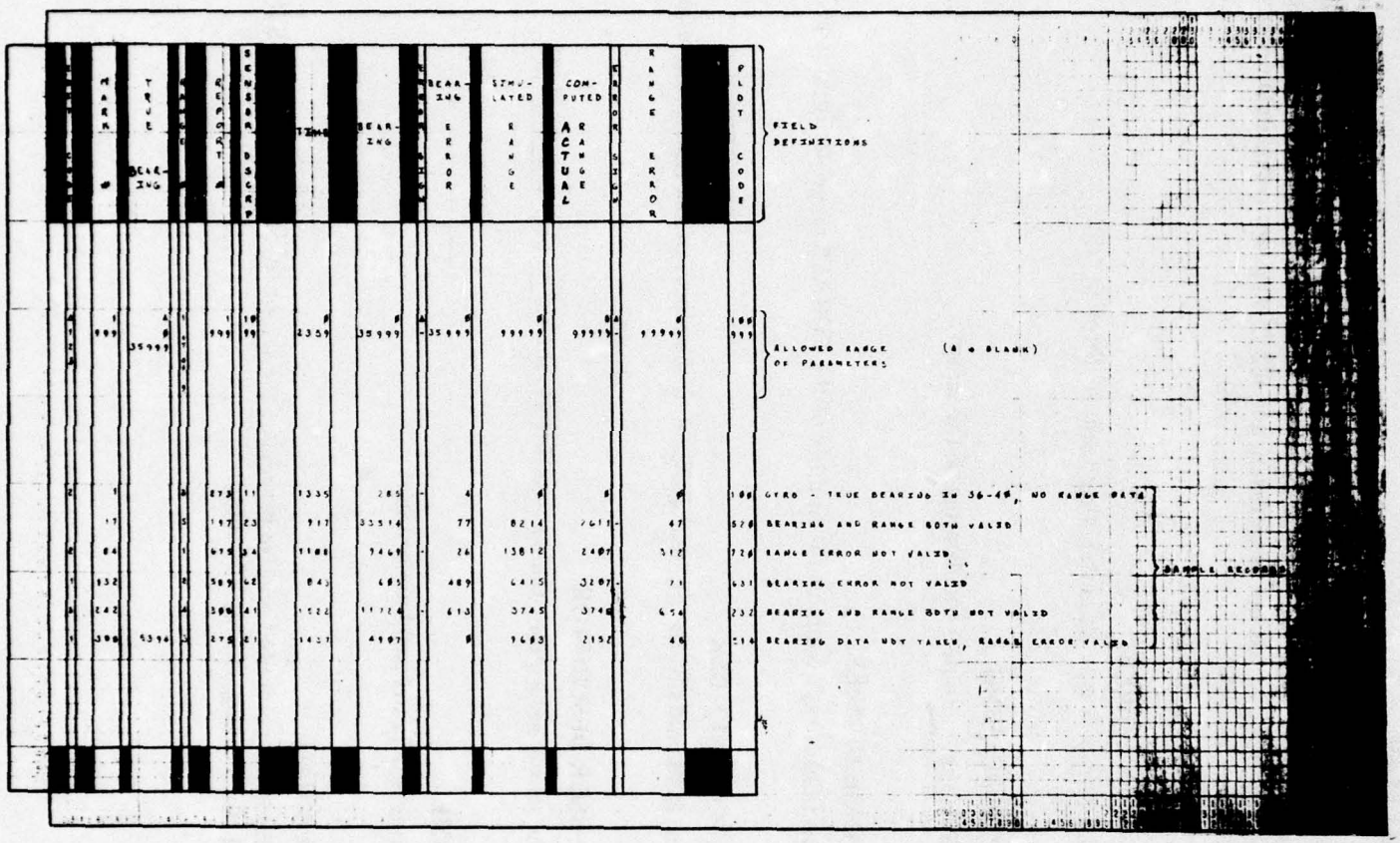


Figure 2. NELC data bank records.

EDIT CODE

If the edit-code field is left blank it indicates that both range and bearing errors are valid; if a '1' is placed in this field, the range error is valid and the bearing error is not valid or has not been taken; if a '2' appears in this field, the bearing error is valid and the range error is not valid or has not been taken; and if a '3' appears in this field neither range nor bearing errors are valid.

MARK NUMBERS

Mark numbers may be in the range from '1' through '999'.

TRUE BEARING

This is the computed true bearing of the sensor.

RANGE NUMBER

This field always contains the number of the FORACS range performing the test.

REPORT NUMBER

This field contains the number assigned to the report of the tests being processed.

SENSOR DESCRIPTOR

The sensor descriptor number (see table 4) should be placed in this field.

TIME

Time is in hours and hundredths.

BEARING

This is the computed relative bearing of the sensor (except for gyro/SINS it is the computed true bearing, ie, ship's heading).

BEARING SIGN AND ERROR

The sign for this field is '-' for negative errors, 'blank' for zero and positive errors. The error value may be relative, true, or normalized (relative or true) as appropriate for the particular sensor. If bearing data were not taken this field contains a '0'.

SIMULATED RANGE

This field contains the computed range to the target plus any range simulated by time delay (ie, the range that the sensor should have read for zero error). This field contains a '0' if range data were not taken.

COMPUTED RANGE

This field contains the range computed from the target's on-range coordinates and the sensor's computed on-range coordinates. This range is a repeat of the simulated range if transponding equipment is not used for introducing time delays. This field contains a '0' if range data were not taken.

RANGE SIGN AND ERROR

In this field the sign is '-' for negative errors. 'blank' for zero and positive errors. This field contains a '0' if range data were not taken.

PLOT CODE

In this field the plot code (see table 2) is inserted.

All bearing data have two decimal places assumed and are in degrees and hundredths. All range data have zero decimal places assumed and are in whole yards. All fields are right-justified and are output without leading zeroes. It should be noted that the '-' sign for negative errors may be placed only in positions 43 or 65. The error magnitude is then right-justified as a positive value in the appropriate columns.

TABLE 2. PLOT CODES.

SONAR

1st Digit	Meaning	Meaning (Coast Guard) Indicate by '1' in cc 80 of Vehicle Header Card	Meaning (SQS-26, SQS-53)	Meaning BQS-11, 12, 13
1	Passive	Passive		(5) 0-10K
2	1K R.S.	600 yd R.S.		(7) 10K-20K
3	2.5K R.S.	1.5K R.S.		(9) 20K-30K
4	5K R.S.	3.7K-4K R.S.		
5	10K R.S.	6K R.S.	0-10K (ODT; BBT zero-zone start)	
6	15K R.S.	2K R.S.		
7	20K R.S.	8K R.S.	10-20K (ODT; BBT zero-zone start)	
8	40K R.S.	16K R.S.	BBT-10K zone start	
9	25K R.S.		20-30K (ODT; BBT zero zone start)	

2nd Digit	Mode	Meaning	Type of Run
1	DIFF		Range
2	DIFF		Bearing
5	SUM		Range
6	SUM		Bearing

GUN FIRE CONTROL SYSTEM

First digit must always be '1'

Second Digit	Meaning
1	Automatic track passive target
2	Automatic track active target
3	Manual track passive target
4	Manual track active target

SURFACE SEARCH RADAR

1st Digit	Meaning
1	7K full scale range (3.5 mi)
2	8K full scale range (4 mi)
3	10K full scale range (5 mi)
4	20K full scale range (10 mi)
5	40K full scale range (20 mi)
6	60K full scale range (30 mi)
7	15K full scale range
8	30K full scale range

PELORUS

First digit=second digit of Sensor Descriptor

ESM

First digit=band number (1 through 9)

DATA EDITING AND HEADER INSERTION

The magnetic-tape data files received from the ranges must be edited and be provided with header information. The program which performs this function is called ED AND INSERT. A flow diagram of this process is shown in figure 3. The editing commands and header information are punched on IBM cards and are merged with the mark data from the range magnetic tape. This program produces a composite magnetic-tape record (mark-by-mark) of identifiable test information.

Vehicle record information is obtained from the range report of the tests. When the information is keypunched, a vehicle-header record precedes all of the data for one

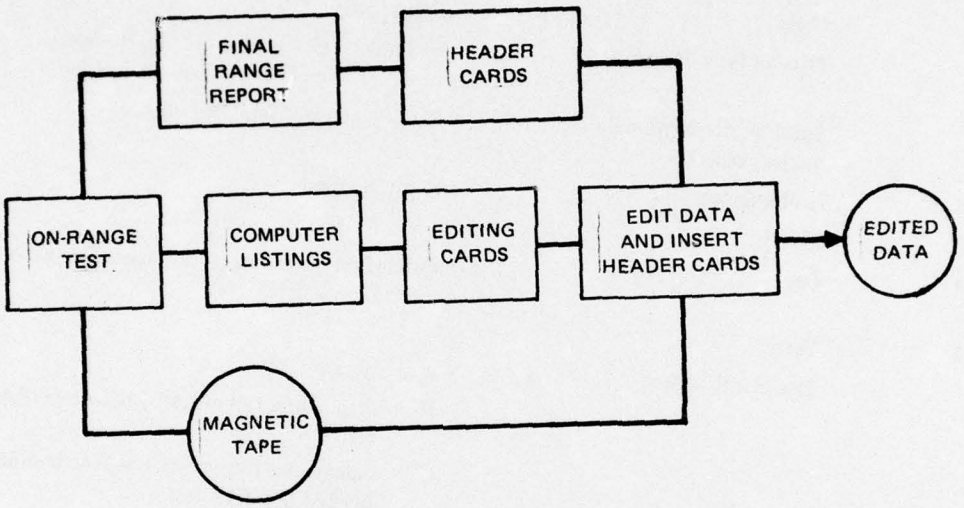


Figure 3. ED AND INSERT processing procedure.

complete test. This record identifies the ship by name, hull number and type, and the FORACs range making the test. The date of the test, and the report number (sequentially assigned to each report) are also placed in this record together with any other information pertinent to special tests. Table 3 lists the information contained in the vehicle records and the card columns assigned to each item.

Equipment header records are used to identify the data for each sensor. These records precede the sensor data entries. A code is used which carries unique information in the form of a triad consisting of the range number, the report number, and the sensor "descriptor" number. This latter number is a two-digit one which identifies the sensor under test. Table 4 lists the descriptors assigned to US sensors. In addition to the triad coding, the equipment header record contains the nomenclature of the sensor and other information pertinent to the test.

TABLE 3. VEHICLE HEADER CARD FOR SHIPS AND SUBMARINES.

IBM Card Column	Data	Remarks
1	Specifies header card	1 = header card
2	FORACS range number	
3-6	Report number	Right justified
7-8	Sensor descriptor	Blank or 00 = vehicle header card
13-36	Vehicle name	Right justified
38-41	Class	Right justified
42	Mission type designation	Example: G = guided missile; R = radar picket; B = ballistic missile
43	Specifies conventional or nuclear vehicle	Blank = conventional; N = nuclear
45-49	Hull number	Right justified
51-52	Month	
53-54	Day	Date of on-range test (if on range 2 days, use second day's date)
55-56	Year	
78	Test identification	A = WSAT B = diagnostics run at SACS before FORACS test C = diagnostics run at SACS before combined FORACS/WSAT test
79	Reference instrument for test (submarine)	P = periscope; D = deck transit; B = both
80	Type vehicle	Blank = surface ship; 1 = Coast Guard; 2 = helicopter; 3 = foreign; 9 = submarine

Each type of sensor (gyrocompass, radar, sonar, etc) has its own unique header-record format. These formats and the information which is coded and retained for US equipment are shown in tables 5 through 12. During the dockside portion of FORACS tests, alignment and lost-motion checks are made on periscopes and gun fire-control systems. These results are contained in the bound range report. In order to put this information into the data bank, cards are punched as shown in figures 4 and 5.

Benchmark checks taken at dockside on periscopes (alignment error and lost-motion values) are placed on periscope header cards (clockwise motion, ie, descriptors 73 and 75) in decimal degrees. The appropriate columns are shown in figure 4. For gun fire-control benchmark checks, alignment-error and lost-motion values are entered in hundredths of minutes on a gun fire-control system header card with a '3' in column nine (fig 5).

TABLE 4. SENSOR DESCRIPTORS.

GYROCOMPASS/SINS (Surface ship or submarine)

10 = Settled error (immediately precedes on-range data for same gyro)
11 = Forward master
12 = Aft auxiliary
13 = Gyro CW*
14 = Gyro CCW*
15 = SINS CW*
16 = SINS CCW* or SQS-35 gyro deployed
17 = SQS-35 transducer gyro in cradle
18 = SINS multi-speed repeater
19 = SINS console

*In-harbor tests – data taken during periscope calibration test

SURFACE SHIP SONAR (Except SQS-35)

21 = Console
22 = Other than console or computer
23 = Data computer or converter (or Unit 14 or 23 of SQS-26)
34 = Synchro monitor (not used when "recorded at data converter using a SYMON" – only when SYMON is used with manual compensating switch)
38 = TRR (Tactical Range Recorder)

SQS-35 SONAR

21 = Unit 1, normalized relative bearing
22 = Unit 1, true bearing (not norm)
23 = Unit 3, normalized relative bearing
24 = Unit 3, true bearing (not norm)

SUBMARINE SONAR

24 = TDC
25 = Console or control indicator
26 = Analyzer
27 = Compensator 1 (passive)*
28 = Compensator 2 (active or two-track)*
29 = Computer indicator (BQA-3** of BQS-6 or BQS-11, 12, 13; Auxiliary Active Digital Display** of BQS-11, 12, 13)
31 = Signal data converter
32 = Bearing and range indicator Mk 4
33 = Position keeper
34 = Synchro monitor
35 = Unit 13 of BQS-6 or Unit 18 of BQS-11, 12, 13 or Amplifier Scanner Unit 3 of BQR-7
36 = Angle solver

*Use only if read directly at compensator, not if read at Unit 13 or Unit 18.
**BQA-3 or AADD will appear as nomenclature on equipment header card.

TABLE 4 (Continued)

HELICOPTER SONAR

39 = Helicopter sonar

GUN FIRE CONTROL SYSTEM

41 = Main system (director, barbette, console)
42 = Main system (computer readouts)
43, 45, 47, 49, 51 = Other systems (director)
44, 46, 48, 50, 52 = Other systems (computer)
57 = Second gunmount
58 = Gunmount
59 = NTDS

SURFACE SEARCH RADAR

61 = Master indicator (CIC)
62-67 = Other indicators
68-69 = NTDS

PERISCOPE

71 = Scope #1 on-range
72 = Scope #2 on-range
73 = Periscope calibration – scope #1-CW
74 = Periscope calibration – scope #1-CCW
75 = Periscope calibration – scope #2-CW
76 = Periscope calibration – scope #2-CCW

PELORUS – (Normalized True Bearing Error)

81 = Port
82 = Starboard
83-84 = Others
85 = Centerline

PELORUS – (Relative Bearing Error)

86 = Centerline
87 = Port
88 = Starboard
89 = Others

PUFFS

91-94

ESM

95

RDF

96

BRD-7

97

TABLE 5. GYROCOMPASS/SINS EQUIPMENT HEADER CARD.

Column	Data	Remarks
1	Specifies header card	1 = header card
2	FORACS range number	
3-6	Report number	Right justified
7-8	Sensor descriptor	
29-32	GYRO or SINS	
34-36	Mark number (digits)	Right justified*
37-38	Mark number (letters)	Left justified*
40-41	Mod number (digits/letters)	Right justified*
42	Mod number (letters/digits)	
44-48	Settled error (hundredths)	Codes for no data (cols. 45-46): 99 = Test not performed (always used with sensor descriptor 16 for SQS-35); 97 = Test performed incorrectly (or insufficient data); 95 = gyro not settled
68	Why equipment not tested or not used in FORACS data bank	F = FORACS malfunction; E = equipment malfunction; W = weather; N = no reason given; T = taken in true bearing; I = insufficient data; Z = data not retrievable; R = other reasons; S = ship's request; U = SQS=35 gyro unsettled when deployed (use only with sensor descriptor 16)
71	Adjustment code	A = bearing data taken before adjustment; J = bearing data taken after adjustment; blank = no adjustments made during test
80	Type vehicle	Blank = surface ship; 1 = Coast Guard; 2 = Helicopter; 3 = foreign; 9 = submarine

*Gyro designation

TABLE 6. SURFACE-SHIP SONAR EQUIPMENT HEADER CARD.

Column	Data	Remarks
1	Specifies header card	1 = header card
2	FORACS range number	
3-6	Report number	Right justified
7-8	Sensor descriptor	
9	Type run	1 = Range runs; 2 = Bearing runs; 3 = no data; Blank = both range & bearing runs
10-16	Range scale in yards	Right justified
28-32	SONAR	
34-36	Digits	Right justified*
37-38	Letters	Left justified*
45	Process with or w/o baffle limits	Blank = normal baffle limits; B = no baffle limits
46	MIK or modification	M = MIK (or modification); W = without MIK or mod
47	Mounting position	B = bow mounted; blank = dome mounted
48	Signal processing	S = SUM; D = DIFF; B = both
49	Active or Passive mode	Blank = Active; P = passive
50-52	Sector width (degrees)	Number if only one sector width was used; V = sector width was varied (52)
54-57	Sound speed ft/sec	
62-64	Pulse length in ms	Number if given, otherwise use col. 64; C = short; M = medium; G = long; A = combinations
65-67	Mode	RDT, SDT, (SQS-23); ODT, BBT (SQS-26); FHS SHS (SQS-35); OMN, ATT (SQS-38)
68	Why equipment not tested, or not used in FORACS data bank	F = FORACS malfunction; E = equipment malfunction; W = weather; N = no reason given; T = taken in true bearing; I = insufficient data; Z = data not retrievable; R = other reasons; S = ships request; U = SQS-35 gyro unsettled when deployed invalidates bearing data; Q = when one header card serves to identify more than one file, indicates one of the files is invalid
71	Adjustment codes	Blank = no adjustments made during test; A = bearing data before adjustment; J = bearing data after adjustment; B = range data before adjustment; K = range data after adjustment; C = both range & bearing before the adjustment; L = both range & bearing after adjustment
80	Type vehicle	Blank = surface ship; 1 = Coast Guard; 3 = foreign

*Sonar type designation (SQQ-23 PAIR = 23P)

TABLE 7. SUBMARINE SONAR EQUIPMENT HEADER CARD.

Column	Data	Remarks
1	Specifies header card	1 = header card
2	FORACS Range number	
3-6	Report number	Right justified
7-8	Sensor descriptor	
9	Type run	1 = Range runs; 2 = Bearing runs; 3 = no data; Blank = both bearing & range runs
10-16	Range scale in yds	Right justified
30-32	Nomenclature	Sonar nomenclature (e.g., BQR, BQS, BQA)* If BQS-6 or BQS-11, 12, 13 read at BQA-3, use BQA-3 nomenclature designation; same for AADD.
34-36	Digits	Right justified*
37-38	Letters	Left justified*
45	Process with or w/o limits	Blank = normal baffle limits; B = without baffle limits
46	Modification	M = modified (or with field change); W = without modification
47	Mounting position	B = bow mounted; blank = dome mounted
48	Signal processing	S = SUM; D = DIFF; B = both
49	Active or Passive mode	A = active; P = passive; T = two track
54-57	Sound speed ft/sec	
62-64	Pulse length in ms	Number if given; otherwise use col. 64; C = short; M = medium; G = long; A = combination
65-67	Mode (when given)	ATF (BQR-2, 7, BQS-6 Pass.) G (gated) or N (normal) in col. 65 for BQS-11, 12, 13 Active; blank = combination of modes
68	Why equipment not tested or used in FORACS data bank	F = FORACS malfunction; E = equipment malfunction; W = weather; N = no reason given; T = taken in true bearing; I = insufficient data; Z = data not retrievable; R = other reasons; S = ship's request; Q = when one header serves to identify more than one file, indicates one of the files is invalid.
71	Adjustment code	Blank = no adjustments made during test; A = bearing data before adjustment; J = bearing data after adjustment; B = range data before adjustment; K = range data after adjustment; C = both range & bearing data before adjustment; L = both range and bearing data after adjustment
80	Type vehicle	9 = submarine

*Sonar type designation

TABLE 8. GUN FIRE-CONTROL SYSTEM EQUIPMENT HEADER CARD.

Column	Data	Remarks
1	Specifies header card	1 = header card
2	FORACS range number	
3-6	Report number	Right justified
7-8	Sensor descriptor	
9	Type data	1 = range only; 2 = bearing only; 3 = no data; blank = both bearing and range
29-32	GFCS	
34-36	Digits	Right justified*
37-38	Letters	Left justified*
44	Mode	Tracking mode for range data: T = auto track; M = manual track; B = both
56-60	Alignment error	in hundredths of minutes**
62-66	Lost motion	in hundredths of minutes**
68	Why equipment not tested or used in FORACS data bank	F = FORACS malfunction; E = equipment malfunction; W = weather; N = no reason given; T = taken in true bearing; I = insufficient data; Z = data not retrievable; R = other reasons; S = ship's request; Q = when one header card serves to identify more than one file, indicates one or more of the files is invalid.
71	Adjustment codes	Blank = no adjustment made during test; A = bearing data before adjustment; J = bearing data after adjustment; B = range data before adjustment; K = range data after adjustment; C = both range and bearing before adjustment; L = both range and bearing after adjustment
80	Type vehicle	Blank = surface ship; 1 = Coast Guard; 3 = foreign

*GFCS designation

**Benchmark checks (make a separate header card for benchmark checks – use a "3" in column 9

TABLE 9. SURFACE-SEARCH RADAR EQUIPMENT HEADER CARD.

Column	Data	Remarks
1	Specifies header card	1 = header card
2	FORACS range number	
3-6	Report number	Right justified
7-8	Sensor descriptor	
9	Type data	1 = range only; 2 = bearing only; 3 = no data; blank = both bearing and range
10-16	Range scale in yards	Right justified. Should appear on header card only if all data were taken on same range scale.
25-32 OR	SS RADAR	Surface ships only
30-32	Radar nomenclature	Submarines only (BPS, SS – right justified)
34-36	Digits	Right justified*
37-38	Letters	Left justified *
40-41	Digits	Right justified**
42	Letters	
68	Why equipment not tested or not used in FORACS data bank	F = FORACS malfunction; E = equipment malfunction; W = weather; N = no reason given; T = taken in true bearing (or normalized true bearing error given); I = insufficient data; semi-color; Z = data not retrievable; R = other reasons; S = ship's request; Q = when one header card serves to identify more than one file, indicates one of the files is invalid.
71	Adjustment code	Blank = no adjustment made during test; A = bearing data taken before adjustment; J = bearing data taken after adjustment; B = range data taken before adjustment; K = range data taken after adjustment; C = both range & bearing data taken before adjustment; L = both range & bearing data taken after adjustment
80	Type vehicle	Blank = surface ship; 1 = Coast Guard; 2 = helicopter; 3 = foreign; 9 = submarine

*Radar designation
**Radar indicator (enter only if AN/SPA- indicator)

TABLE 10. ESM EQUIPMENT HEADER CARD.

Column	Data	Remarks
1	Specifies header card	1 = header card
2	FORACS range number	
3-6	Report number	Right justified
7-8	Sensor descriptor	95 = ESM; 96 = RDF; 97 = BRD-7
14	Band designation	Lowest band no. used
26-28	ESM	Alphanumeric input for identification
30-32	TYPE	WLR or BLR, RDF, BRD
34-36	NUMBER DIGITS	ESM identification – right justified
37	LETTER	ESM identification
39-42	Antenna type	Digits only – right justified
68	Why equipment not tested or used in FORACS data bank	F = FORACS malfunction; E = equipment malfunction; W = weather; N = no reason given; T = taken in true bearing; I = insufficient data; Z = data not retrievable; R = other reasons; S = ship's request; Q = when one header card serves to identify more than one file, indicates one of the files is invalid.
80	Type vehicle	1 = Coast Guard; 3 = foreign; 9 = submarine; blank = surface ship

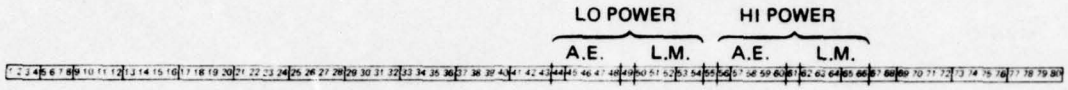
TABLE 11. PELORUS EQUIPMENT HEADER CARD.

Column	Data	Remarks
1	Specifies header card	1 = header card
2	FORACS range number	
3-6	Report number	Right justified
7-8	Sensor descriptor	
25-32	PEL ALID	Alphanumeric input for pelorus alidade
34-36	Mark number	Alidade designation – right justified
40-41	Mod number	Alidade designation – right justified
68	Why equipment not tested or used in FORACS data bank	F = FORACS malfunction; E = equipment malfunction; W = weather; N = no reason given; I = insufficient data; Z = data not retrievable; R = other reasons; S = ship's request; Q = when one header card serves to identify more than one file, indicates one of the files is invalid.
80	Type vehicle	1 = Coast Guard; 3 = foreign; blank = surface ship

TABLE 12. PERISCOPE EQUIPMENT HEADER CARD.

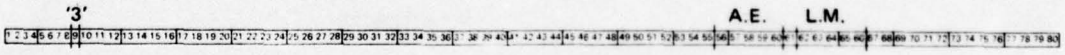
Column	Data	Remarks
1	Specifies header card	1 = header card
2	FORACS range number	
3-6	Report number	Right justified
7-8	Sensor descriptor	
30-32	PER	
34-36	Digits	Right justified*
37-38	Letters	Left justified *
40-42	Readout	Left justified – Analyzer = AN (e.g., Analyzer B = ANB) TDC, Position Keeper = PK; Bearing Transmitter = BT; Angle S Solver = AS; Periscope Ring = PR; Synchro Monitor = SYM (before 1 Oct 72). After Oct. 1 72, any symon used is SEACO SYMON; indicate by adding "S" to first two letters of designation for indicator the symon was used to read (ANS, PKS, etc.)
44-48	Low power alignment error	Benchmark checks; enter on "clockwise" header cards (descriptors 73 & 75) in hundredths of degrees. Leave blank if not read. Minus sign for AE in columns 45-46.
50-54	Low power lost motion	
56-60	High power alignment error	
62-66	High power lost motion	
68	Why equipment not tested or used in FORACS data bank	F = FORACS malfunction; E = equipment malfunction; W = weather; N = no reason given; T = taken in true bearing; I = insufficient data; Z = data not retrievable; R = other reasons; S = ship's request
71	Adjustment code	Blank = no adjustments made during the test; A = bearing data taken before adjustment; J = bearing data taken after adjustment
80	Type vehicle	9 = submarine

*Periscope designation



A.E. – ALIGNMENT ERROR
L.M. – LOST MOTION
MINUS SIGN (IF APPLICABLE) COLUMNS 44 AND 56

Figure 4. Periscope benchmark checks.



MINUS SIGN (IF APPLICABLE) COLUMN 56

Figure 5. Gun fire-control system benchmark checks.

Data associated with each mark are punched in standard format and are divided into nine fields as shown in figure 6.

STANDARD-CARD FORMAT

The following is a brief discussion of the standard-card fields and the type of information which is punched. It should be noted that all bearing data assume two decimal places and are expressed in degrees and hundredths of a degree. All fields are right-justified. Also to be noted is that the sign '–' for negative errors may be placed only in positions 43 or 65. The error magnitude is then right-justified as a positive value in the appropriate field.

EDIT CODE

This code field is left blank if the range and bearing errors are valid. A '1' is punched if the range error is valid but the bearing error is not or has not been taken. A '2' is punched if the bearing error is valid but the range error is not or has not been taken, and a '3' is punched if both errors are invalid.

MARK NUMBER

Mark numbers are punched in the range from '1' through '999'. This field is always right-justified.

REPORT NUMBER

The number assigned to the test report is punched in this field.

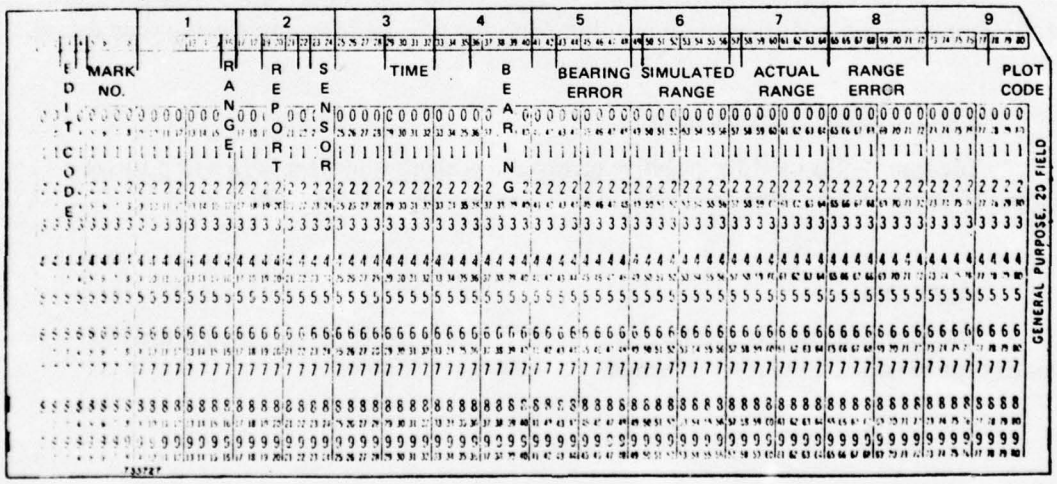


Figure 6. Standard card format.

TIME

Time is punched in hours and hundredths of hours.

SENSOR DESCRIPTOR

The number, taken from table 4, which identifies the sensor is punched in this field.

BEARING

This number represents the computed relative bearing of the sensor (except for gyro/SINS, it is the computed true bearing, ie, ship's heading).

BEARING SIGN AND ERROR

The sign "–" is used for negative errors and a blank is left in this field for zero and positive errors. The error value may be relative, true, or normalized (relative or true) as appropriate for the particular sensor. If bearing data were not taken, an "0" is punched in this field.

SIMULATED RANGE

This is the computed range to the target plus any range simulated by time delay (the range that the sensor should have read for zero error).

ACTUAL RANGE

This is the range computed from the target's on-range coordinates. This is a repeat of the simulated range if transponding equipment was not used for introducing time delays.

RANGE SIGN AND ERROR

The sign "–" is used for negative errors and a blank is left for zero and positive errors. If no range data were taken a "0" must be punched in this field.

PLOT CODE

The plot code number, taken from table 2, contains three digits and is used to identify range scales, zone start information, and other variables.

EDITING FUNCTIONS

The editing portion of the program allows any desired changes to be made to the magnetic-tape data. Changes can be made to any field to replace the entire mark, remove it, or to accept only selected data. In addition, editing cards can be used to delete specific data from statistical analyses without disturbing the permanent magnetic-tape record.

Setting of upper and lower limits on data values can also be accomplished with editing cards so as to exclude from statistical analyses any values which are not true indicators of equipment performance. These values are termed "outliers" and may be caused by incorrect readings, typographical errors, tracking of the wrong target, or other events. The editing program also permits the identification and retention of data collected beyond sonar baffle limits.

EDITING CARD DOCUMENTATION

Ten unique cards are used in the editing program. These cards are designated A, B, C, D, E, P, K, R, and I.

A CARD

The A card is used to remove marks from the tape record. If one mark number is to be removed, columns 5 through 8 are used.

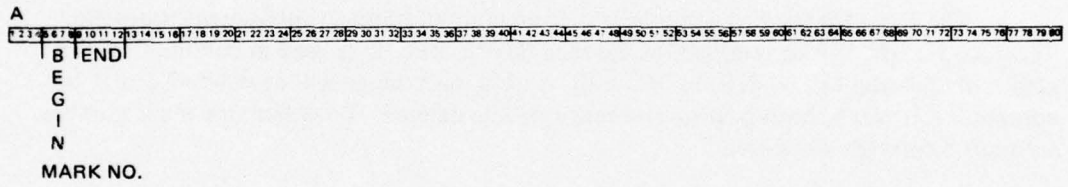


Figure 7. A card format.

B CARD

The B card is used to remove any editing from bearing data outside baffle limits so that the data will appear on the Compute Sensor Listing but will not be used as a valid sonar sector. If an editing card deletes baffle data (because of the limits which were used), the B card is placed after the editing card. Then, if there are outliers in the baffle area, D cards are used to delete.

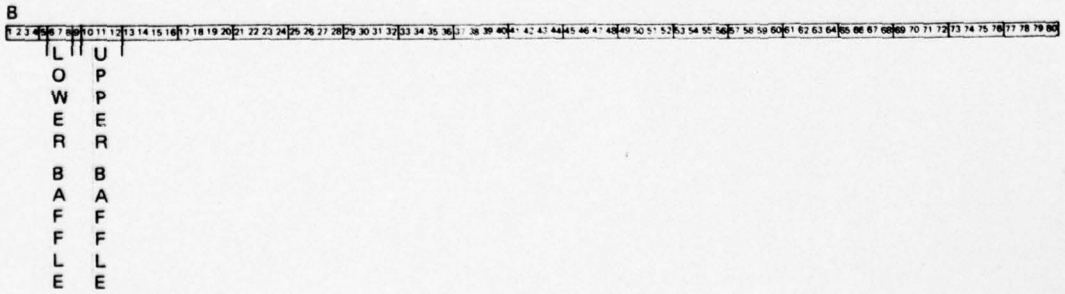


Figure 8. B card format.

C CARD

The C card is used to edit by plot codes (setting limits or bounds on data with specific plot codes). When an 'L' is placed in column 2, editing by setting limits will be accomplished. If a 'B' is placed in this column, only bearing will be deleted; if an 'R' is used, only range will be deleted; if an 'A' is used, the data with that plot code will be removed from the tape; and if the column is left blank, both bearing and range will be deleted.

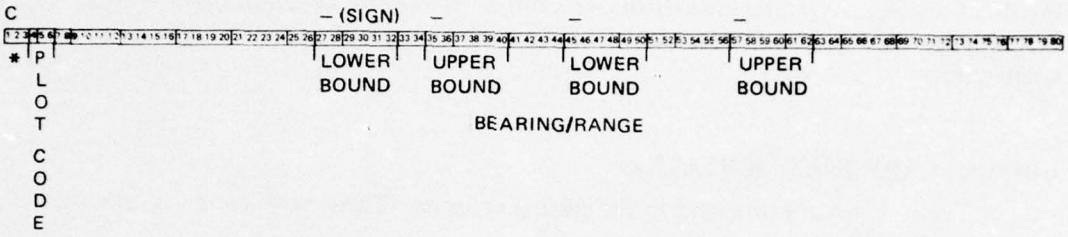


Figure 9. C card format.

D CARD

The D card is used to delete marks from computations in subsequent processing. The coded marks will be retained on the tape record. If a 'B' is used in column 2 of this card, only bearing will be deleted. If an 'R' is used, only range will be deleted, and if the column is left blank, both bearing and range will be deleted. To delete one mark number, columns 5 through 8 are used.

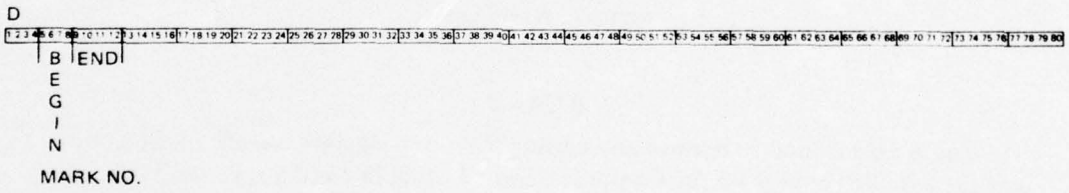


Figure 10. D card format.

E CARD

The E card is used to set limits or bounds on bearing or range errors. The marks which fall beyond the limits remain on the tape record but are coded so that they will not be used in any computations in subsequent processing. The E card is also used to clear range or bearing editing in all preceding editing (except for A cards). Therefore, all other editing cards should follow the E card. A 'B' in column 2 clears all bearing editing and an 'R' in this column clears all range editing. For an 'EB' or 'ER' on one mark number, columns 5 through 8 are used.

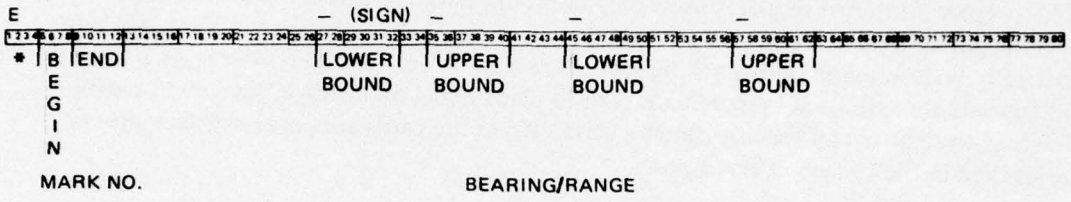


Figure 11. E card format.

P CARD

The P card is used to partially replace any information in the standard card format. It can also be used to change the entire data set for information contained in fields 1 and 2, including the same information on the equipment header record (card). In column 2, '1' is the range number replacement, '2' is the report number and sensor descriptor replacement, '3' is the time replacement, '4' is bearing replacement, '5' is bearing error replacement, '6' is adjusted range replacement, '7' is actual range replacement, '8' is range error replacement, and '9' is plot code replacement. To partially replace only one mark number, columns 5 through 8 are used. When replacing a range or report number or a sensor descriptor (changing fields 1 or 2) the header card and <u>all</u> the data cards will be changed by leaving columns 5 through 12 blank. If no mark numbers are entered for any P card, the field replaced will be changed for all marks.

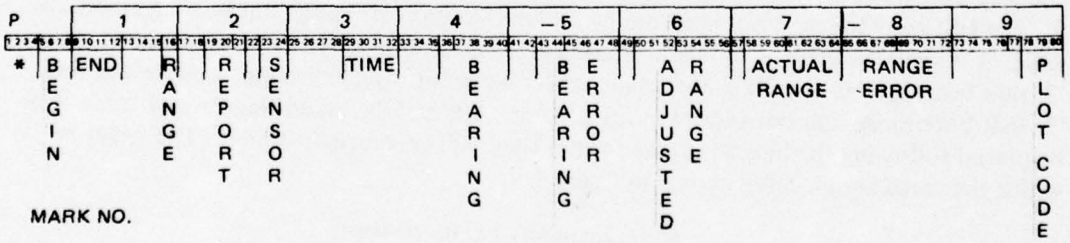


Figure 12. P card format.

K CARD

The K card is used when data run together and must be separated (when sensors are given the same sensor descriptor number and are run back-to-back on the tape file). The K card is the header card for the second group of data. For example, tape descriptor 40 contains bearing data taken at a gun mount (descriptor 58) and range data taken at a director (descriptor 41). Marks 1 through 58 and 102 through 385 represent gun-mount data and marks 59 through 101 and 386 through 422 represent director data. Editing is accomplished as follows: prepare a P card with '2' in column 2 which changes the descriptor to 58; prepare two A cards to remove marks 59 through 101 and marks 386 through 422; prepare an E card to place limits on gun-mount data; prepare a D card to delete specific gun-mount data; prepare a K card for director data (descriptor numbers will automatically be inserted in individual marks); prepare two A cards to remove marks 1 through 58 and 102 through 385; prepare an E card to place limits on director data; and prepare a D card to remove any specific director data. When the cards are processed they are to be stacked in the order just discussed.

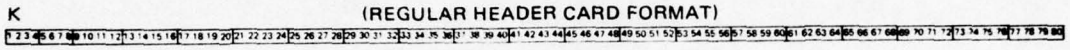


Figure 13. K card format.

R or I CARDS

An R card is a replacement mark number and an I card is an inserted mark. Both are cut in standard card format except for column 1 which may contain either an 'R' or 'I'. The letter is not critical in this one case because the same routine in the program is used for either 'R' or 'I'. All values should be key-punched for consistency. If, for example, there were no range data, the last columns for adjusted, actual, and error (columns 56, 64, and 72) should contain a '0'. Leading zeroes are not to be key-punched. If, for example, the listing reads –0.08, only '8' is to be on the card. Trailing zeroes are essential, thus 0.50 must be shown on the card as '50' as a bearing error. Whenever any data are replaced or inserted, editing has not been performed. For this reason, the mark should be checked against the desired limits and the proper editing code should be placed in column 3. The edit code for this card (column 3): 'blank' to indicate range and bearing errors are valid, '1' that range error is valid and bearing error is either not valid or has not been taken, '2' that bearing error is valid and range error is either not valid or has not been taken, and '3' that both range and bearing errors are invalid. Alternately, an editing card or cards may be placed following the inserted cards so that they will be properly edited. The order in which the cards are placed is shown in figure 15.

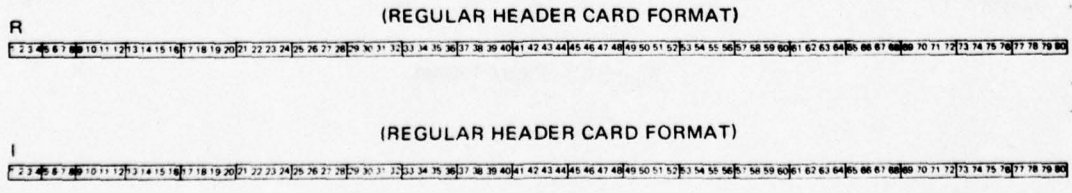


Figure 14. R or I card format.

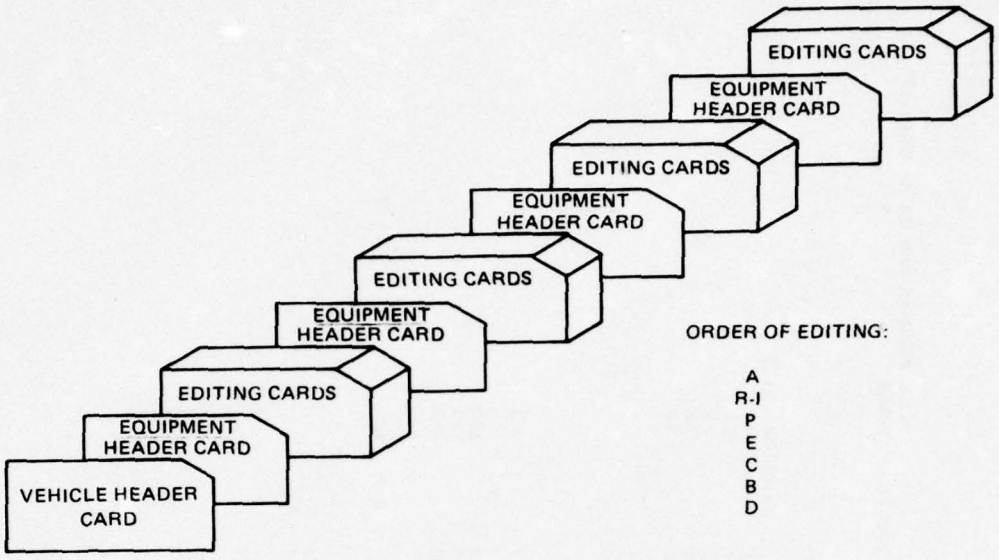


Figure 15. Card assembly for editing.

ED AND INSERT SAMPLE PRINTOUTS

Listings from the ED AND INSERT program are shown in figure 16. The first page of this figure is a listing of the editing deck showing header cards followed by editing cards. The second page is a listing of header cards generated by the ED AND INSERT program using the information on the preceding header card and dividing the data into appropriate range scales as designated by plot codes. These pages are followed by output listings consisting of vehicle header information followed by editing, equipment headers, and mark-by-mark listings for the following components: gyrocompass (page 26), sonar (pages 27 through 31), GFCS (pages 32 and 33), surface-ship radar (pages 34 through 37), periscope (pages 38 and 39), and peloruses (pages 40 and 41).

```
EDITING DECK                                                                    THIS PROGRAM RUN ON 07 OCT 1976
          17 88800              JOAN CATHERINE    SS    9999 122576    999CB                 9
          17 888112                  GYRO 999    99A -   16
          E                       -    50       20
          D      6
          D    421
          D    430
          17 88821   10000          SONAR 999CB        M D     50535050  GSDT
          CL 52                   -   200      100    -   40          90
          CL 3                                       -   10          25
          CL 4                                       -   40          35
          CL 51                                      -   40          90
          CL 7                                       -  120          40
          8     135 225
          D      18  19
          DB   311
          DR   489
          17 888412                  GFCS 999C
          E                       -    36       0
          17 888441                  GFCS 999C
          E                                     -   27           0
          17 88861               SS RADAR 999A  99D
          CL 2                    -   150      100    -   20         120
          CL 3                    -   150      100    -   50         120
          CL 4                    -   150      100    -  140         140
          DB   304
          DB   306
          17 888732                   PER 999A  ABC -   4     0 -   6     0              9
          A     13
          A     22
          P4    17                          32749
          P5    17                                -   10
          E                       -    20        5
          17 888742                   PER 999A  ABC                                      9
          E                       -    15       10
          D    227
          17 88881               PEL ALID 999   99
          P4   277                         8435
          CL 1                    - 100        0
          CL 2                    -  100      20
          D     15
          D    371
```

Figure 16. ED AND INSERT listing (part 1).

```
THIS PROGRAM RUN ON 07 OCT 1976                                                                    18 JUNE 1973 VERSION

17 88800          JOAN CATHERINE   SS     9999 122576     999CB                    9
17 868112              GYRO 999    99A -   16
17 868212  10000       SONAR 999CB          M D      50505050   GSDT
17 868211   2500       SONAR 999CB          M D      50505050   GSDT
17 868211   5000       SONAR 999CB          M D      50505050   GSDT
17 868211  10000       SONAR 999CB          M D      50505050   GSDT
17 868211  20000       SONAR 999CB          M D      50505050   GSDT
17 888412              GFCS 999C       T
17 888441              GFCS 999C       TP
17 868612           SS RADAR 999A   99D
17 868611   8000    SS RADAR 999A   99D
17 888611  10000    SS RADAR 999A   99D
17 868611  20000    SS RADAR 999A   99D
17 868732              PER 999A    ABC -    4      0 -    6      0                 9
17 888742              PER 999A    ABC                                            9
17 888812           PEL ALID 999    99
17 868822           PEL ALID 999    99
```

Figure 16. ED AND INSERT listing (part 2).

```
THIS PROGRAM RUN ON 07 OCT 1976

                                17 86800              JUAN CATHERINE    SS     9999 122576     999CB              9

BEARING LIMITS    -50 TO     20 FOR MARKS     1 THRU    433
MARK      6 DELETED FROM COMPUTATIONS
MARK    421 DELETED FROM COMPUTATIONS
MARK    430 DELETED FROM COMPUTATIONS

SENSOR    1                   17 868112                    GYRO 999   99A -  16
```

EDIT CODE	MARK NUM	RAN	REP	SEN DES	TIME	ACTUAL BEAR	BEAR ERROR	ADJUST RANGE	ACTUAL RANGE	RANGE ERROR	PLOT CODE
2	1	7	888	11	1007	6075	- 15	0	0	0	102
2	3	7	888	11	1010	6033	- 15	0	0	0	102
2	4	7	888	11	1012	6046	- 16	0	0	0	102
2	5	7	888	11	1018	6233	- 13	0	0	0	102
3	6	7	888	11	1018	6285	- 35	0	0	0	102
2	7	7	888	11	1020	6186	- 11	0	0	0	102
2	8	7	888	11	1022	6302	- 11	0	0	0	102
2	9	7	888	11	1023	6425	- 17	0	0	0	102
2	11	7	888	11	1025	6505	- 14	0	0	0	102
2	12	7	888	11	1027	6217	- 12	0	0	0	102
2	13	7	888	11	1027	6264	- 15	0	0	0	102
2	14	7	888	11	1028	6208	- 18	0	0	0	102
2	16	7	888	11	1030	5960	- 5	0	0	0	102
2	17	7	888	11	1030	5901	- 12	0	0	0	102
3	18	7	888	11	1032	5719	151	0	0	0	102
2	19	7	888	11	1033	5220	- 20	0	0	0	102
2	20	7	888	11	1037	4749	- 14	0	0	0	102
2	412	7	888	11	1663	4031	- 14	0	0	0	102
2	413	7	888	11	1667	4243	- 18	0	0	0	102
2	414	7	888	11	1667	4391	- 11	0	0	0	102
2	415	7	888	11	1668	4534	- 18	0	0	0	102
2	416	7	888	11	1668	4661	- 21	0	0	0	102
2	417	7	888	11	1670	4777	- 19	0	0	0	102
2	418	7	888	11	1670	4916	- 21	0	0	0	102
2	419	7	888	11	1672	5029	- 19	0	0	0	102
3	421	7	888	11	1677	4074	9	0	0	0	102
2	422	7	888	11	1677	4247	- 22	0	0	0	102
2	423	7	888	11	1678	4390	- 28	0	0	0	102
2	424	7	888	11	1678	4528	- 19	0	0	0	102
2	425	7	888	11	1678	4637	- 20	0	0	0	102
2	426	7	888	11	1680	4739	- 17	0	0	0	102
2	427	7	888	11	1687	5585	- 19	0	0	0	102
2	428	7	888	11	1688	5476	- 14	0	0	0	102
3	430	7	888	11	1690	4952	20	0	0	0	102
2	431	7	888	11	1690	4651	- 11	0	0	0	102
2	432	7	888	11	1692	4725	- 17	0	0	0	102
2	433	7	888	11	1693	4865	- 17	0	0	0	102

Figure 16. ED AND INSERT listing (part 3).

```
BEARING LIMITS   -200 TO    100 FOR MARKS WITH PLOT CODE OF 527
RANGE LIMITS     -40 TO     90 FOR MARKS WITH PLOT CODE OF 527
RANGE LIMITS     -10 TO     25 FOR MARKS WITH PLOT CODE OF 377
RANGE LIMITS     -40 TO     35 FOR MARKS WITH PLOT CODE OF 477
RANGE LIMITS     -40 TO     90 FOR MARKS WITH PLOT CODE OF 517
RANGE LIMITS    -120 TO     40 FOR MARKS WITH PLOT CODE OF 777
MARKS     1 THRU     19 DELETED FROM COMPUTATIONS
BEARING DATA DELETED FROM MARK  311
RANGE DATA DELETED FROM MARK  489

SENSOR    2                17 88212  10000          SONAR 999CB      M D     50505050  GSDT
```

EDIT CODE	MARK NUM	RAN	REP	SEN DES	TIME	ACTUAL BEAR	BEAR ERROR	ADJUST RANGE	ACTUAL RANGE	RANGE ERROR	PLOT CODE
	2	7	888	21	898	517	- 137	8597	0	68	522
	3	7	888	21	900	744	- 119	8539	0	66	522
	4	7	888	21	902	521	- 121	8043	0	59	522
	6	7	888	21	905	1006	- 66	7920	0	10	522
	7	7	888	21	907	1041	- 21	7884	0	26	522
	8	7	888	21	907	1005	- 55	7861	0	13	522
	9	7	888	21	908	908	- 68	7838	0	35	522
	10	7	888	21	910	673	- 123	7795	0	35	522
	11	7	888	21	910	590	- 130	7745	0	40	522
	12	7	888	21	912	821	- 121	8089	0	26	522
	13	7	888	21	913	1063	- 23	8029	0	36	522
	14	7	888	21	915	1124	- 24	7988	0	20	522
	15	7	888	21	915	1057	- 32	7945	0	29	522
	16	7	888	21	917	764	- 134	7903	0	22	522
	17	7	888	21	917	124	- 74	7862	0	30	522
3	18	7	888	21	918	35765	10	7822	0	66	522
3	19	7	888	21	918	35755	65	7782	0	28	522
	20	7	888	21	920	35941	- 66	7741	0	44	522
	21	7	888	21	922	423	- 123	8501	0	54	522
3	22	7	888	21	922	535	- 245	8463	0	149	522
	312	7	888	21	1443	7471	- 71	8411	0	4	522
	313	7	888	21	1443	7851	- 91	8413	0	5	522
	314	7	888	21	1445	8234	- 59	8419	0-	1	522
	315	7	888	21	1445	8589	- 49	8427	0	5	522
	316	7	888	21	1447	8897	- 22	8438	0-	6	522
	317	7	888	21	1447	9188	12	8451	0	1	522
	318	7	888	21	1448	9644	- 19	7640	0	32	522
	319	7	888	21	1450	9843	37	7658	0	44	522
	320	7	888	21	1450	10163	17	7685	0	20	522
	321	7	888	21	1452	10395	- 45	7706	0	42	522
	322	7	888	21	1452	10598	- 23	7728	0	38	522
	323	7	888	21	1453	10863	- 13	7763	0	31	522
	324	7	888	21	1455	11079	- 29	7787	0	47	522
	325	7	888	21	1455	11360	- 10	7814	0	31	522
	326	7	888	21	1457	11819	- 39	7858	0	50	522
	327	7	888	21	1458	12113	- 53	7890	0	49	522
	328	7	888	21	1458	12617	- 47	7937	0	48	522
	329	7	888	21	1460	12984	- 4	7971	0	47	522

Figure 16. ED AND INSERT listing (part 4).

SENSOR 3 17 868211 2500 SONAR 999CB M D 50505050 GSDT

EDIT CODE	MARK NUM	RAN	REP	SEN DES	TIME	ACTUAL BEAR	BEAR ERROR	ADJUST RANGE	ACTUAL RANGE	RANGE ERROR	PLOT CODE
1	483	7	888	21	1700	112	- 12	2510	0-	5	312
1	484	7	888	21	1702	35943	- 18	2472	0	11	312
3	486	7	888	21	1703	35866	34	0	0	0	312
1	487	7	888	21	1705	0	0	2347	0	18	312
1	488	7	888	21	1705	21	- 81	2317	0	3	312
3	489	7	888	21	1708	35950	- 325	2652	0	8	312
1	490	7	888	21	1710	71	- 11	2154	0	11	312
1	491	7	888	21	1710	27	- 7	2125	0	20	312
1	492	7	888	21	1712	35992	- 17	2088	0	22	312
1	493	7	888	21	1712	35978	- 28	2052	0	18	312
1	494	7	888	21	1713	35951	- 51	2017	0	1	312
1	502	7	888	21	1723	96	- 86	1685	0	4	312
1	503	7	888	21	1723	61	- 21	1670	0-	2	312
1	504	7	888	21	1725	0	0	1658	0-	8	312
1	505	7	888	21	1725	35982	- 7	1648	0-	4	312
1	506	7	888	21	1727	35971	- 31	1641	0	2	312
1	507	7	888	21	1727	35992	- 62	1634	0-	4	312
1	508	7	888	21	1733	87	13	1512	0-	7	312
1	509	7	888	21	1735	101	- 21	1484	0-	2	312
1	510	7	888	21	1735	0	0	1454	0-	4	312
1	511	7	888	21	1737	35997	- 22	1423	0-	5	312
1	512	7	888	21	1737	29	- 9	1392	0-	2	312
1	513	7	888	21	1738	43	- 18	1354	0-	4	312

Figure 16. ED AND INSERT listing (part 5).

SENSOR 4 17 868211 5000 SONAR 999CB M D 50505050 GSDT

EDIT CODE	MARK NUM	RAN	REP	SEN DES	TIME	ACTUAL BEAR	BEAR ERROR	ADJUST RANGE	ACTUAL RANGE	RANGE ERROR	PLOT CODE
1	442	7	888	21	1650	35530	- 20	4658	0	16	412
1	446	7	888	21	1657	35818	- 8	4502	0	3	412
1	447	7	888	21	1657	35839	- 9	4471	0	14	412
1	448	7	888	21	1658	35887	53	4442	0	20	412
1	449	7	888	21	1658	35844	- 24	4412	0	33	412
1	450	7	888	21	1660	35849	- 9	4383	0	22	412
1	451	7	888	21	1660	35776	49	4351	0	21	412
1	458	7	888	21	1673	91	34	4175	0	30	412
1	459	7	888	21	1677	43	77	3619	0	20	412
1	460	7	888	21	1678	7	- 117	3469	0	26	412
1	461	7	888	21	1680	23	2	3426	0	4	412
1	462	7	888	21	1680	26	- 1	3371	0	9	412
1	463	7	888	21	1682	17	- 77	3318	0	20	412
1	464	7	888	21	1682	35877	- 2	3280	0	25	412
1	465	7	888	21	1683	35828	- 53	3242	0	6	412
1	466	7	888	21	1685	104	- 64	4432	0	17	412
1	467	7	888	21	1685	0	0	4398	0	12	412
1	468	7	888	21	1687	35905	- 55	4362	0	20	412
1	469	7	888	21	1688	35950	- 50	4725	0	29	412
1	470	7	888	21	1688	35938	2	4689	0	23	412
1	471	7	888	21	1690	35904	- 54	4654	0	27	412
1	472	7	888	21	1692	0	0	2903	0	18	412
1	473	7	888	21	1692	61	19	2865	0	13	412
1	474	7	888	21	1693	35962	- 22	2837	0	13	412
1	475	7	888	21	1693	35912	- 52	2800	0	25	412
1	476	7	888	21	1695	35894	- 44	2764	0	21	412
1	477	7	888	21	1695	35946	- 36	2728	0	28	412
1	497	7	888	21	1718	35901	- 1	1811	0-	6	412
1	498	7	888	21	1718	35780	- 55	1790	0-	35	412
1	499	7	888	21	1720	35718	22	1771	0-	6	412
1	501	7	888	21	1722	63	- 3	1728	0-	24	412

Figure 16. ED AND INSERT listing (part 6).

SENSOR 5 17 868211 10000 SONAR 999CB M D 50505050 GSDT

EDIT CODE	MARK NUM	RAN	REP	SEN DES	TIME	ACTUAL BEAR	BEAR ERROR	ADJUST RANGE	ACTUAL RANGE	RANGE ERROR	PLOT CODE
1	385	7	888	21	1592	359	- 59	9529	0	46	512
1	386	7	888	21	1592	291	- 51	9504	0	66	512
1	387	7	888	21	1593	289	- 49	9481	0	73	512
1	388	7	888	21	1593	298	- 58	9460	0	88	512
1	389	7	888	21	1595	335	- 35	9439	0	66	512
1	390	7	888	21	1597	320	- 45	9419	0	75	512
1	391	7	888	21	1597	356	- 126	9400	0	73	512
1	392	7	888	21	1598	227	- 52	9383	0	71	512
1	393	7	888	21	1600	253	- 23	8511	0	70	512
1	394	7	888	21	1600	258	- 18	8496	0	68	512
1	395	7	888	21	1602	232	- 12	8481	0	70	512
1	396	7	888	21	1602	196	- 46	8466	0	80	512
1	397	7	888	21	1603	236	- 36	8451	0	59	512
1	398	7	888	21	1603	253	- 28	8435	0	70	512
1	399	7	888	21	1605	256	- 46	8419	0	69	512
1	430	7	888	21	1638	234	- 34	6720	0	4	512
1	431	7	888	21	1638	199	- 24	6717	0	7	512
1	432	7	888	21	1640	188	- 38	6715	0	9	512
1	433	7	888	21	1640	185	- 25	6715	0	9	512
1	434	7	888	21	1642	171	- 11	6716	0	23	512
1	435	7	888	21	1642	113	- 13	6719	0	20	512
1	436	7	888	21	1643	35907	13	5884	0	16	512
1	437	7	888	21	1645	35722	18	5891	0	9	512
1	438	7	888	21	1645	35472	28	5899	0	6	512
1	439	7	888	21	1647	35176	- 6	5908	0	25	512
1	440	7	888	21	1647	35225	25	5913	0	15	512
1	441	7	888	21	1648	35034	- 14	5920	0	5	512
1	478	7	888	21	1697	0	0	2690	0-	12	512
1	479	7	888	21	1697	63	- 33	2663	0-	18	512
1	480	7	888	21	1698	35937	- 17	2629	0-	37	512
1	481	7	888	21	1698	35832	- 57	2594	0-	29	512
1	482	7	888	21	1700	0	- 25	2560	0-	30	512

Figure 16. ED AND INSERT listing (part 7).

SENSOR 6 17 868211 20000 SONAR 999CB M D 50505050 GSDT

EDIT CODE	MARK NUM	RAN	REP	SEN DES	TIME	ACTUAL BEAR	BEAR ERROR	ADJUST RANGE	ACTUAL RANGE	RANGE ERROR	PLOT CODE
1	400	7	888	21	1607	345	- 70	10482	0-	5	712
1	401	7	888	21	1608	384	- 44	10471	0-	36	712
1	402	7	888	21	1608	337	- 37	10460	0-	13	712
1	403	7	888	21	1610	35992	- 17	10441	0-	36	712
1	404	7	888	21	1610	35200	20	10410	0-	5	712
1	405	7	888	21	1612	34289	- 59	10379	0-	20	712
1	406	7	888	21	1613	33790	- 50	12868	0	32	712
1	407	7	888	21	1613	34321	- 61	12845	0-	5	712
1	408	7	888	21	1615	35183	- 33	12823	0-	41	712
1	409	7	888	21	1617	35596	- 46	12802	0-	20	712
1	410	7	888	21	1617	35783	- 23	12784	0-	39	712
1	411	7	888	21	1618	35847	28	12771	0-	26	712
1	412	7	888	21	1620	35863	- 33	16969	0-	56	712
1	413	7	888	21	1620	35880	- 20	16966	0-	53	712
1	414	7	888	21	1622	35895	- 20	16965	0-	35	712
1	415	7	888	21	1622	35924	- 24	16964	0-	34	712
1	416	7	888	21	1622	35914	6	16964	0-	34	712
1	417	7	888	21	1623	35886	- 11	16968	0-	38	712
1	418	7	888	21	1625	35715	10	18659	0-	56	712
1	419	7	888	21	1627	35536	14	18665	0-	15	712
1	420	7	888	21	1627	35310	15	18671	0-	49	712
1	421	7	888	21	1627	35065	- 35	18676	0-	54	712
1	422	7	888	21	1628	34805	- 765	18675	0-	53	712
1	424	7	888	21	1632	618	- 43	8042	0-	62	712
1	425	7	888	21	1633	679	- 149	8029	0-	74	712
1	426	7	888	21	1633	550	- 70	8020	0-	65	712
1	427	7	888	21	1635	530	- 60	8012	0-	57	712
1	428	7	888	21	1635	411	- 51	8003	0-	64	712
1	429	7	888	21	1637	311	- 41	7995	0-	65	712
1	452	7	888	21	1662	35749	- 9	4705	0-	65	712
1	453	7	888	21	1663	35755	- 80	4669	0-	69	712
1	454	7	888	21	1663	35928	- 28	4630	0-	30	712
1	455	7	888	21	1665	35961	- 61	4592	0-	70	712
1	456	7	888	21	1665	35844	31	4542	0-	20	712
1	457	7	888	21	1667	35976	- 146	4502	0-	102	712

Figure 16. ED AND INSERT listing (part 8).

BEARING LIMITS -36 TO 0 FOR MARKS 1 THRU 419

SENSOR 7 17 888412 GFCS 999C T

EDIT CODE	MARK NUM	RAN	REP	SEN DES	TIME	ACTUAL BEAR	BEAR ERROR	ADJUST RANGE	ACTUAL RANGE	RANGE ERROR	PLOT CODE
2	1	7	888	41	897	35377	- 2	5268	5268	0	110
3	3	7	888	41	900	35222	- 247	5012	5012	0	110
2	4	7	888	41	903	35207	- 15	4795	4795	0	110
2	5	7	888	41	905	35291	- 33	4701	4701	0	110
3	6	7	888	41	905	35223	- 115	4654	4654	0	110
2	7	7	888	41	907	35294	- 36	4557	4557	0	110
2	9	7	888	41	908	35202	- 36	4461	4461	0	110
2	10	7	888	41	910	35075	- 33	4393	4393	0	110
2	11	7	888	41	910	35151	- 26	4322	4322	0	110
2	12	7	888	41	912	35037	- 29	4275	4275	0	110
2	13	7	888	41	913	34976	- 10	4113	4113	0	110
2	14	7	888	41	913	35039	- 6	4042	4042	0	110
2	15	7	888	41	915	35115	- 23	3946	3946	0	110
2	16	7	888	41	917	34992	- 17	3874	3874	0	110
2	17	7	888	41	918	34835	- 19	3780	3780	0	110
2	18	7	888	41	918	34830	- 22	3710	3710	0	110
2	19	7	888	41	920	34903	- 19	3663	3663	0	110
2	20	7	888	41	920	34926	- 9	3592	3592	0	110
3	21	7	888	41	922	34973	977	3543	3543	0	110
2	22	7	888	41	922	34874	- 16	3497	3497	0	110
2	402	7	888	41	1757	24943	- 9	3943	3943	0	110
2	403	7	888	41	1758	24856	- 17	3966	3966	0	110
2	404	7	888	41	1758	24766	- 16	3991	3991	0	110
2	405	7	888	41	1758	24683	- 20	4017	4017	0	110
2	408	7	888	41	1762	24289	- 23	4134	4134	0	110
2	409	7	888	41	1762	24169	- 16	4166	4166	0	110
2	410	7	888	41	1763	24076	- 16	4200	4200	0	110
2	411	7	888	41	1763	23952	- 20	4233	4233	0	110
2	412	7	888	41	1765	23873	- 25	4270	4270	0	110
2	413	7	888	41	1765	23737	- 25	4306	4306	0	110
2	414	7	888	41	1765	23689	- 28	4346	4346	0	110
2	415	7	888	41	1767	23639	- 26	4383	4383	0	110
2	416	7	888	41	1767	23594	- 20	4424	4424	0	110
2	417	7	888	41	1768	23474	- 19	4483	4483	0	110
2	418	7	888	41	1768	23342	- 22	4545	4545	0	110
2	419	7	888	41	1770	23258	- 13	4589	4589	0	110

Figure 16. ED AND INSERT listing (part 9).

RANGE LIMITS -27 TO 0 FOR MARKS 1 THRU 419

SENSOR 8 17 888441 GFCS 999C TP

EDIT CODE	MARK NUM	RAN	REP	SEN DES	TIME	ACTUAL BEAR	BEAR ERROR	ADJUST RANGE	ACTUAL RANGE	RANGE ERROR	PLOT CODE
1	5	7	888	44	905	35291	0	4701	4701-	21	110
1	6	7	888	44	905	35223	0	4654	4654-	16	110
1	7	7	888	44	907	35254	0	4557	4557-	16	110
1	9	7	888	44	908	35202	0	4461	4461-	18	110
1	10	7	888	44	910	35075	0	4393	4393-	13	110
1	11	7	888	44	910	35151	0	4322	4322-	13	110
1	12	7	888	44	912	35037	0	4275	4275-	16	110
1	13	7	888	44	913	34976	0	4113	4113-	14	110
1	14	7	888	44	913	35039	0	4042	4042-	12	110
1	15	7	888	44	915	35115	0	3946	3946-	6	110
1	16	7	888	44	917	34992	0	3874	3874-	15	110
1	17	7	888	44	918	34835	0	3780	3780-	16	110
1	18	7	888	44	918	34830	0	3710	3710-	22	110
1	19	7	888	44	920	34903	0	3663	3663-	21	110
1	23	7	888	44	922	34646	0	3355	3355-	15	110
1	24	7	888	44	925	34730	0	3283	3283-	18	110
1	25	7	888	44	927	34768	0	3234	3234-	14	110
1	26	7	888	44	927	34920	0	3073	3073-	13	110
1	27	7	888	44	928	34895	0	3001	3001-	16	110
1	28	7	888	44	930	34595	0	2930	2930-	9	110
1	29	7	888	44	930	34555	0	2883	2883-	17	110
1	401	7	888	44	1757	25057	0	3920	3920-	17	110
1	402	7	888	44	1757	24943	0	3943	3943-	17	110
1	403	7	888	44	1758	24856	0	3966	3966-	12	110
1	404	7	888	44	1758	24766	0	3991	3991-	11	110
1	405	7	888	44	1758	24683	0	4017	4017-	15	110
1	408	7	888	44	1762	24289	0	4134	4134-	14	110
3	409	7	888	44	1762	24169	0	4166	4166-	29	110
1	410	7	888	44	1763	24076	0	4200	4200-	18	110
1	411	7	888	44	1763	23992	0	4233	4233-	13	110
1	412	7	888	44	1765	23873	0	4270	4270-	12	110
1	413	7	888	44	1765	23737	0	4306	4306-	18	110
1	414	7	888	44	1765	23689	0	4346	4346-	20	110
1	415	7	888	44	1767	23639	0	4383	4383-	20	110
1	416	7	888	44	1767	23594	0	4424	4424-	24	110
1	417	7	888	44	1768	23474	0	4483	4483-	19	110
1	418	7	888	44	1768	23342	0	4545	4545-	20	110
1	419	7	888	44	1770	23258	0	4589	4589-	13	110

Figure 16. ED AND INSERT listing (part 10).

```
BEARING LIMITS   -150 TO    100 FOR MARKS WITH PLOT CODE OF 2??
RANGE LIMITS     -20 TO    120 FOR MARKS WITH PLOT CODE OF 2??
BEARING LIMITS   -150 TO    100 FOR MARKS WITH PLOT CODE OF 3??
RANGE LIMITS     -50 TO    120 FOR MARKS WITH PLOT CODE OF 3??
BEARING LIMITS   -150 TO    100 FOR MARKS WITH PLOT CODE OF 4??
RANGE LIMITS    -140 TO    140 FOR MARKS WITH PLOT CODE OF 4??
BEARING DATA DELETED FROM MARK  304
BEARING DATA DELETED FROM MARK  306

SENSOR    9                  17 868612                SS RADAR 999A  990
```

EDIT CODE	MARK NUM	RAN	REP	SEN DES	TIME	ACTUAL BEAR		BEAR ERROR	ADJUST RANGE	ACTUAL RANGE	RANGE ERROR	PLOT CODE
	8	7	888	61	1205	35223		7	6061	6061	59	212
	9	7	888	61	1207	34821	-	11	6048	6048	62	212
	10	7	888	61	1207	34707	-	17	6042	6042	83	212
	11	7	888	61	1208	34561	-	11	6036	6036	29	212
	12	7	888	61	1208	34395	-	5	6031	6031	64	212
	13	7	888	61	1210	34266	-	6	6026	6026	59	212
	14	7	888	61	1210	34174	-	4	6020	6020	85	212
	15	7	888	61	1212	34041	-	21	6014	6014	46	212
	16	7	888	61	1213	33797	-	27	6000	6000	50	212
	17	7	888	61	1213	33720	-	30	5988	5988	57	212
	18	7	888	61	1215	33692	-	12	5979	5979	61	212
	19	7	888	61	1215	33647		3	5969	5969	76	212
	20	7	888	61	1217	33580	-	20	5960	5960	0	212
	21	7	888	61	1217	33490	-	30	5950	5950	80	212
	22	7	888	61	1218	33447	-	47	5940	5940	55	212
	23	7	888	61	1218	33412	-	62	5930	5930	65	212
	24	7	888	61	1220	33391	-	21	5921	5921	79	212
	25	7	888	61	1220	33400	-	50	5912	5912	68	212
	26	7	888	61	1222	33383	-	43	5902	5902	18	212
	27	7	888	61	1222	33265	-	5	5889	5889	36	212
	346	7	888	61	1800	24265	-	5	12556	12556-	41	422
	347	7	888	61	1802	24205	-	5	12590	12590	95	422
	348	7	888	61	1802	24082	-	22	12624	12624	41	422
	349	7	888	61	1803	24041	-	11	12658	12658-	33	422
	350	7	888	61	1803	23901	-	11	12689	12689	86	422
	351	7	888	61	1805	23830	-	30	11455	11455-	125	422
	352	7	888	61	1807	23833	-	33	11488	11488	87	422
	353	7	888	61	1807	23853	-	33	11521	11521	29	422
	355	7	888	61	1808	23695	-	15	11589	11589-	89	422
	356	7	888	61	1810	23584	-	34	11658	11658-	63	422
	357	7	888	61	1812	23521	-	31	11693	11693	27	422
	358	7	888	61	1812	23506	-	56	9544	9544-	4	422
	359	7	888	61	1813	23423	-	23	9596	9596-	76	422
	360	7	888	61	1813	23503	-	73	9633	9633-	53	422
	361	7	888	61	1817	23377	-	57	9717	9717-	62	422
	362	7	888	61	1817	23356	-	56	9753	9753-	103	422
1	363	7	888	61	1818	23319		181	9789	9789-	59	422

Figure 16. ED AND INSERT listing (part 11).

SENSOR 10 17 866611 8000 SS RADAR 999A 99D

EDIT CODE	MARK NUM	RAN	REP	SEN DES	TIME	ACTUAL BEAR	BEAR ERROR	ADJUST RANGE	ACTUAL RANGE	RANGE ERROR	PLOT CODE
	8	7	888	61	1205	35223	7	6061	6061	59	212
	9	7	888	61	1207	34821	- 11	6048	6048	62	212
	10	7	888	61	1207	34707	- 17	6042	6042	83	212
	11	7	888	61	1208	34561	- 11	6036	6036	29	212
	12	7	888	61	1208	34395	- 5	6031	6031	64	212
	13	7	888	61	1210	34266	- 6	6026	6026	59	212
	14	7	888	61	1210	34174	- 4	6020	6020	85	212
	15	7	888	61	1212	34041	- 21	6014	6014	46	212
	16	7	888	61	1213	33797	- 27	6000	6000	50	212
	17	7	888	61	1213	33720	- 30	5988	5988	57	212
	18	7	888	61	1215	33692	- 12	5979	5979	61	212
	19	7	888	61	1215	33647	3	5969	5969	76	212
	20	7	888	61	1217	33580	- 20	5960	5960	0	212
	21	7	888	61	1217	33490	- 30	5950	5950	80	212
	22	7	888	61	1218	33447	- 47	5940	5940	55	212
	23	7	888	61	1218	33412	- 62	5930	5930	65	212
	24	7	888	61	1220	33391	- 21	5921	5921	79	212
	25	7	888	61	1220	33400	- 50	5912	5912	68	212
	26	7	888	61	1222	33383	- 43	5902	5902	18	212
	27	7	888	61	1222	33265	- 5	5889	5889	36	212
	28	7	888	61	1223	33137	- 37	5874	5874	51	212
	299	7	888	61	1702	11523	- 63	2069	2069	1	212
	300	7	888	61	1703	11659	- 19	2093	2093	22	212
	301	7	888	61	1703	11650	- 10	2117	2117	3	212
	302	7	888	61	1705	11821	- 51	2141	2141	79	212
	303	7	888	61	1705	11915	- 15	2166	2166	34	212
1	304	7	888	61	1707	11710	80	2202	2202	28	212
	305	7	888	61	1708	11502	- 2	2237	2237	38	212
1	306	7	888	61	1708	11291	49	2260	2260	45	212
	307	7	888	61	1710	11264	- 34	2281	2281	74	212
	308	7	888	61	1710	11384	- 24	2302	2302	48	212
	309	7	888	61	1712	11678	- 28	2333	2333	22	212
	311	7	888	61	1713	12593	- 33	2384	2384	11	212
	312	7	888	61	1715	13420	- 50	2450	2450	30	212
	314	7	888	61	1717	13531	- 41	2523	2523	17	212
	315	7	888	61	1717	13623	- 23	2559	2559	41	212
	316	7	888	61	1718	13316	- 6	2595	2595	80	212
	317	7	888	61	1718	12935	15	2629	2629	36	212
	318	7	888	61	1720	12963	- 13	2660	2660	40	212
	319	7	888	61	1720	13141	- 41	2691	2691	29	212

Figure 16. ED AND INSERT listing (part 12).

SENSOR 11 17 868611 10000 SS RADAR 999A 99D

EDIT CODE	MARK NUM	RAN	REP	SEN DES	TIME	ACTUAL BEAR	BEAR ERROR	ADJUST RANGE	ACTUAL RANGE	RANGE ERROR	PLOT CODE
	97	7	888	61	1382	6915	- 5	4694	4694	76	312
	98	7	888	61	1383	7073	- 53	4693	4693	87	312
	99	7	888	61	1383	7242	- 42	4694	4694	56	312
	100	7	888	61	1385	7639	- 29	4698	4698	82	312
	101	7	888	61	1387	7859	- 59	4703	4703	67	312
	102	7	888	61	1387	8077	- 47	4708	4708	62	312
	103	7	888	61	1388	8263	- 63	4715	4715	55	312
	104	7	888	61	1390	8660	- 70	4733	4733	97	312
	105	7	888	61	1390	8892	- 52	4745	4745	30	312
	106	7	888	61	1392	9120	- 50	4757	4757	63	312
	107	7	888	61	1392	9367	- 67	4773	4773	37	312
	108	7	888	61	1393	9601	- 61	4791	4791	34	312
	110	7	888	61	1395	10001	- 101	4829	4829	41	312
	111	7	888	61	1395	10236	- 126	4851	4851	29	312
	112	7	888	61	1397	10481	- 111	4875	4875	25	312
	113	7	888	61	1397	10608	- 48	4901	4901	29	312
	114	7	888	61	1398	11977	- 57	5601	5601	69	312
	115	7	888	61	1415	12077	- 57	5634	5634	56	312
	116	7	888	61	1417	12071	- 41	5668	5668	22	312
	117	7	888	61	1417	12065	- 15	5702	5702	53	312
	263	7	888	61	1670	3135	45	2508	2508	2	312
	264	7	888	61	1670	3413	- 30	2462	2462	43	312
	265	7	888	61	1672	3400	10	2435	2435	0	312
	266	7	888	61	1672	3369	- 19	2407	2407	68	312
	267	7	888	61	1673	3512	- 42	2381	2381	89	312
	268	7	888	61	1675	3931	- 41	2344	2344	1	312
	269	7	888	61	1675	4299	- 29	2322	2322-	22	312
	270	7	888	61	1677	4528	- 28	2302	2302-	2	312
	271	7	888	61	1677	4452	- 2	2283	2283	32	312
	272	7	888	61	1677	4509	- 9	2264	2264	6	312
	273	7	888	61	1678	4606	- 46	2245	2245	45	312
	274	7	888	61	1678	4632	- 62	2226	2226	49	312
	275	7	888	61	1680	4827	- 47	2207	2207-	12	312
	276	7	888	61	1680	5074	- 24	2187	2187	23	312
	277	7	888	61	1682	5389	41	2168	2168	22	312
	278	7	888	61	1682	5839	11	2146	2146	34	312
	279	7	888	61	1683	6010	10	2118	2118	27	312
	280	7	888	61	1685	5812	18	2101	2101	49	312
	281	7	888	61	1685	5906	24	2085	2085	40	312

Figure 16. ED AND INSERT listing (part 13).

SENSOR 12 17 868611 20000 SS RADAR 999A 99D

EDIT CODE	MARK NUM	RAN	REP	SEN DES	TIME	ACTUAL BEAR	BEAR ERROR	ADJUST RANGE	ACTUAL RANGE	RANGE ERROR	PLOT CODE
	133	7	888	61	1433	6461	- 11	6331	6331	89	422
	320	7	888	61	1772	26716	- 16	19452	19452	48	422
	321	7	888	61	1773	26564	6	19459	19459	31	422
	322	7	888	61	1773	26380	- 10	19466	19466	14	422
	323	7	888	61	1775	26272	- 72	19489	19489	11	422
	324	7	888	61	1777	26371	- 31	19500	19500-	30	422
	325	7	888	61	1778	26333	17	19513	19513	47	422
	326	7	888	61	1780	26124	36	19533	19533	97	422
	327	7	888	61	1780	26062	- 12	17546	17546	29	422
	328	7	888	61	1782	26077	- 27	17558	17558	42	422
	329	7	888	61	1782	26043	7	17569	17569	76	422
	330	7	888	61	1783	25895	55	17583	17583	42	422
	331	7	888	61	1783	25785	- 25	17596	17596	104	422
	332	7	888	61	1785	25792	- 22	17621	17621	134	422
	333	7	888	61	1787	25461	- 11	15350	15350	20	422
	334	7	888	61	1788	25540	- 50	15367	15367	43	422
2	335	7	888	61	1788	25604	- 54	15385	15385	215	422
	336	7	888	61	1790	25393	7	15404	15404	66	422
	337	7	888	61	1790	25362	- 12	15424	15424	11	422
	338	7	888	61	1792	25212	- 12	15447	15447	93	422
	339	7	888	61	1793	24963	17	13413	13413-	63	422
	340	7	888	61	1795	24849	1	13442	13442	123	422
	341	7	888	61	1797	24694	6	13490	13490-	25	422
	342	7	888	61	1797	24640	- 10	13519	13519-	14	422
	343	7	888	61	1798	24544	26	13550	13550	25	422
	344	7	888	61	1798	24504	- 4	13580	13580	100	422
	345	7	888	61	1800	24372	- 12	12525	12525	10	422
	346	7	888	61	1800	24265	- 5	12556	12556-	41	422
	347	7	888	61	1802	24205	- 5	12590	12590	95	422
	348	7	888	61	1802	24082	- 22	12624	12624	41	422
	349	7	888	61	1803	24041	- 11	12658	12658-	33	422
	350	7	888	61	1803	23901	- 11	12689	12689	86	422
	351	7	888	61	1805	23830	- 30	11455	11455-	125	422
	352	7	888	61	1807	23833	- 33	11488	11488	87	422
	353	7	888	61	1807	23853	- 33	11521	11521	29	422
	355	7	888	61	1808	23695	- 15	11589	11589-	89	422
	356	7	888	61	1810	23584	- 34	11658	11658-	63	422
	357	7	888	61	1812	23521	- 31	11693	11693	27	422
	358	7	888	61	1812	23506	- 56	9544	9544-	4	422
	359	7	888	61	1813	23423	- 23	9596	9596-	76	422
	360	7	888	61	1813	23503	- 73	9633	9633-	53	422
	361	7	888	61	1817	23377	- 57	9717	9717-	62	422
	362	7	888	61	1817	23356	- 56	9753	9753-	103	422
1	363	7	888	61	1818	23319	181	9789	9789-	59	422

Figure 16. ED AND INSERT listing (part 14).

MARK 13 ANNIHILATED
MARK 22 ANNIHILATED
PARTIAL REPLACEMENT FROM MARK 17 THRU 17 OF 32749
PARTIAL REPLACEMENT FROM MARK 17 THRU 17 OF - 10
BEARING LIMITS -20 TO 5 FOR MARKS 1 THRU 448

SENSOR 13 17 868732 PER 999A ABC - 4 0 - 6 0 9

EDIT CODE	MARK NUM	RAN	REP	SEN DES	TIME	ACTUAL BEAR	BEAR ERROR	ADJUST RANGE	ACTUAL RANGE	RANGE ERROR	PLOT CODE
3	3	7	868	73	902	30731	- 114	0	0	0	102
2	5	7	888	73	903	30744	- 6	0	0	0	102
3	7	7	888	73	905	31059	7	0	0	0	102
2	8	7	888	73	905	31296	- 16	0	0	0	102
2	9	7	888	73	907	31520	- 9	0	0	0	102
3	10	7	888	73	907	31802	- 87	0	0	0	102
2	11	7	888	73	907	31942	- 15	0	0	0	102
3	12	7	888	73	908	32204	- 94	0	0	0	102
3	14	7	888	73	908	32349	82	0	0	0	102
2	15	7	888	73	910	32591	- 10	0	0	0	102
2	17	7	888	73	910	32749	- 10	0	0	0	102
2	18	7	888	73	912	32998	- 11	0	0	0	102
3	19	7	888	73	912	33118	12	0	0	0	102
3	20	7	888	73	912	33318	13	0	0	0	102
3	21	7	888	73	913	33563	- 108	0	0	0	102
2	23	7	888	73	913	33884	- 9	0	0	0	102
2	24	7	888	73	915	34006	- 7	0	0	0	102
3	26	7	888	73	915	34433	14	0	0	0	102
2	27	7	888	73	917	34648	- 9	0	0	0	102
2	28	7	888	73	917	34871	- 16	0	0	0	102
2	217	7	888	73	1048	29797	- 7	0	0	0	102
2	218	7	888	73	1048	29964	- 6	0	0	0	102
2	219	7	888	73	1048	30168	- 12	0	0	0	102
2	220	7	888	73	1050	30318	- 10	0	0	0	102
2	223	7	888	73	1058	31878	- 7	0	0	0	102
2	435	7	888	73	1225	4984	- 11	0	0	0	102
2	436	7	888	73	1225	5191	- 8	0	0	0	102
2	437	7	888	73	1227	5382	- 8	0	0	0	102
3	438	7	888	73	1227	5569	- 5011	0	0	0	102
2	439	7	888	73	1227	5727	- 15	0	0	0	102
2	440	7	888	73	1228	5872	- 13	0	0	0	102
2	441	7	888	73	1228	6018	- 12	0	0	0	102
2	442	7	888	73	1228	6148	- 13	0	0	0	102
2	443	7	868	73	1230	6281	- 12	0	0	0	102
2	444	7	888	73	1230	6407	- 13	0	0	0	102
2	445	7	888	73	1230	6512	- 12	0	0	0	102
2	446	7	868	73	1232	6608	- 12	0	0	0	102
2	447	7	868	73	1232	6703	- 12	0	0	0	102
2	448	7	888	73	1232	6796	- 10	0	0	0	102

Figure 16. ED AND INSERT listing (part 15).

BEARING LIMITS -15 TO 10 FOR MARKS 1 THRU 460
MARK 227 DELETED FROM COMPUTATIONS

SENSOR 14 17 888742 PER 999A ABC 9

EDIT CODE	MARK NUM	RAN	REP	SEN DES	TIME	ACTUAL BEAR	BEAR ERROR	ADJUST RANGE	ACTUAL RANGE	RANGE ERROR	PLOT CODE
2	224	7	888	74	1060	31807	1	0	0	0	202
2	225	7	888	74	1060	31620	0	0	0	0	202
3	226	7	888	74	1060	31375	11	0	0	0	202
3	227	7	888	74	1062	31036	10	0	0	0	202
3	228	7	888	74	1062	30755	14	0	0	0	202
2	229	7	888	74	1062	30486	2	0	0	0	202
2	230	7	888	74	1063	30264	3	0	0	0	202
2	231	7	888	74	1063	30110	3	0	0	0	202
2	232	7	888	74	1063	29893	7	0	0	0	202
2	233	7	888	74	1065	29701	2	0	0	0	202
2	234	7	888	74	1065	29575	- 3	0	0	0	202
2	235	7	888	74	1065	29450	4	0	0	0	202
2	236	7	888	74	1067	29297	2	0	0	0	202
2	237	7	888	74	1067	29140	2	0	0	0	202
2	238	7	888	74	1067	28996	2	0	0	0	202
2	239	7	888	74	1068	28863	6	0	0	0	202
2	240	7	888	74	1068	28728	2	0	0	0	202
2	242	7	888	74	1070	28497	- 1	0	0	0	202
2	243	7	888	74	1070	28402	4	0	0	0	202
2	244	7	888	74	1070	28267	3	0	0	0	202
2	422	7	888	74	1200	34285	- 2	0	0	0	202
2	423	7	888	74	1200	33983	- 3	0	0	0	202
2	425	7	888	74	1202	33236	3	0	0	0	202
3	426	7	888	74	1202	32876	18	0	0	0	202
2	427	7	888	74	1203	32656	- 1	0	0	0	202
2	428	7	888	74	1203	32497	0	0	0	0	202
2	429	7	888	74	1203	32366	0	0	0	0	202
2	430	7	888	74	1205	32313	0	0	0	0	202
3	431	7	888	74	1205	32400	- 102	0	0	0	202
2	432	7	888	74	1205	32273	1	0	0	0	202
2	433	7	888	74	1207	32222	- 1	0	0	0	202
2	450	7	888	74	1233	6794	- 2	0	0	0	202
2	451	7	888	74	1235	6701	- 5	0	0	0	202
2	452	7	888	74	1235	6586	- 6	0	0	0	202
2	453	7	888	74	1235	6455	- 4	0	0	0	202
2	454	7	888	74	1237	6337	- 5	0	0	0	202
2	457	7	888	74	1238	5944	0	0	0	0	202
2	458	7	888	74	1238	5815	- 6	0	0	0	202
2	459	7	888	74	1238	5608	- 6	0	0	0	202
2	460	7	888	74	1240	5486	0	0	0	0	202

Figure 16. ED AND INSERT listing (part 16).

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PARTIAL REPLACEMENT FROM MARK   277 THRU   277 OF     8435
BEARING LIMITS   -100 TO      0 FOR MARKS WITH PLOT CODE OF 177
BEARING LIMITS   -100 TO     20 FOR MARKS WITH PLOT CODE OF 277
MARK    15 DELETED FROM COMPUTATIONS
MARK   371 DELETED FROM COMPUTATIONS

SENSOR   15                17 868812                PEL ALID 999   99
```

EDIT CODE	MARK NUM	RAN	REP	SEN DES	TIME	ACTUAL BEAR	BEAR ERROR	ADJUST RANGE	ACTUAL RANGE	RANGE ERROR	PLOT CODE
2	13	7	868	81	1155	34101	- 51	0	0	0	102
2	14	7	888	81	1157	33886	- 41	0	0	0	102
3	15	7	868	81	1157	33606	- 11	0	0	0	102
3	16	7	868	81	1158	33428	- 120	0	0	0	102
2	17	7	888	81	1158	33311	- 33	0	0	0	102
2	18	7	868	81	1160	33403	- 46	0	0	0	102
2	19	7	888	81	1160	33347	- 45	0	0	0	102
2	21	7	888	81	1162	32837	- 79	0	0	0	102
2	22	7	868	81	1163	32701	- 39	0	0	0	102
2	23	7	888	81	1163	32544	- 33	0	0	0	102
3	24	7	868	81	1165	32238	- 150	0	0	0	102
2	25	7	868	81	1165	32014	- 82	0	0	0	102
2	26	7	868	81	1167	31788	- 63	0	0	0	102
2	27	7	868	81	1167	31633	- 81	0	0	0	102
2	28	7	888	81	1168	31434	- 58	0	0	0	102
2	30	7	888	81	1178	29963	- 65	0	0	0	102
3	31	7	888	81	1178	30057	8	0	0	0	102
2	32	7	888	81	1180	30014	- 72	0	0	0	102
2	33	7	888	81	1180	29913	- 70	0	0	0	102
2	34	7	888	81	1182	29821	- 51	0	0	0	102
2	336	7	888	81	1575	24991	- 60	0	0	0	102
2	337	7	868	81	1575	24835	- 60	0	0	0	102
2	338	7	888	81	1575	24681	- 41	0	0	0	102
2	339	7	888	81	1577	24540	- 64	0	0	0	102
2	340	7	888	81	1577	24275	- 45	0	0	0	102
2	341	7	888	81	1578	23782	- 37	0	0	0	102
2	342	7	886	81	1580	23380	- 54	0	0	0	102
2	343	7	868	81	1580	23090	- 60	0	0	0	102
2	344	7	888	81	1582	22788	- 63	0	0	0	102
2	345	7	868	81	1582	22480	- 80	0	0	0	102
2	347	7	888	81	1583	22119	- 43	0	0	0	102
2	348	7	888	81	1585	21993	- 64	0	0	0	102
2	351	7	888	81	1587	21225	- 66	0	0	0	102
2	352	7	888	81	1587	20867	- 64	0	0	0	102
2	353	7	888	81	1588	20524	- 54	0	0	0	102
2	354	7	868	81	1588	20119	- 67	0	0	0	102
2	355	7	868	81	1590	19670	- 76	0	0	0	102
3	356	7	968	81	1590	19477	- 239	0	0	0	102
2	357	7	888	81	1592	18882	- 53	0	0	0	102

Figure 16. ED AND INSERT listing (part 17).

SEE PRECEEDING DATA FOR EDITING

SENSOR 16 17 888822 PEL ALID 999 99

EDIT CODE	MARK NUM	RAN	REP	SEN DES	TIME	ACTUAL BEAR	BEAR ERROR	ADJUST RANGE	ACTUAL RANGE	RANGE ERROR	PLOT CODE
2	143	7	888	82	1360	748	- 31	0	0	0	201
2	144	7	888	82	1360	693	- 27	0	0	0	201
2	145	7	888	82	1362	683	- 32	0	0	0	201
2	146	7	888	82	1362	911	- 41	0	0	0	201
2	147	7	888	82	1363	1037	- 41	0	0	0	201
2	148	7	888	82	1363	1182	- 61	0	0	0	201
2	149	7	888	82	1363	1454	- 43	0	0	0	201
2	150	7	888	82	1365	1826	- 34	0	0	0	201
2	151	7	888	82	1365	2201	- 33	0	0	0	201
2	152	7	888	82	1367	2545	- 40	0	0	0	201
2	153	7	888	82	1367	2913	- 48	0	0	0	201
2	154	7	888	82	1367	3333	- 53	0	0	0	201
2	155	7	888	82	1368	3689	- 26	0	0	0	201
2	156	7	888	82	1368	3897	- 39	0	0	0	201
2	157	7	888	82	1370	4044	- 37	0	0	0	201
2	158	7	888	82	1370	4235	11	0	0	0	201
2	159	7	888	82	1372	4302	- 22	0	0	0	201
2	160	7	888	82	1372	4375	- 4	0	0	0	201
2	161	7	888	82	1372	4439	- 39	0	0	0	201
2	162	7	888	82	1373	4467	- 21	0	0	0	201
2	163	7	888	82	1373	4577	- 37	0	0	0	201
2	274	7	888	82	1497	8213	- 26	0	0	0	201
2	275	7	888	82	1497	8289	- 14	0	0	0	201
2	276	7	888	82	1497	8290	- 22	0	0	0	201
3	277	7	888	82	1498	8435	- 8945	0	0	0	201
2	279	7	888	82	1500	8849	- 10	0	0	0	201
2	280	7	888	82	1500	9078	- 29	0	0	0	201
2	281	7	888	82	1502	9350	- 24	0	0	0	201
2	282	7	888	82	1502	9629	- 39	0	0	0	201
2	283	7	888	82	1503	9852	- 67	0	0	0	201
2	284	7	888	82	1503	9982	- 47	0	0	0	201
2	286	7	888	82	1505	10576	- 36	0	0	0	201
2	363	7	888	82	1597	15156	- 38	0	0	0	201
2	364	7	888	82	1598	14904	- 39	0	0	0	201
2	365	7	888	82	1598	14950	- 63	0	0	0	201
2	367	7	888	82	1600	15619	- 35	0	0	0	201
3	369	7	888	82	1602	16276	-10041	0	0	0	201
3	371	7	888	82	1603	16955	- 77	0	0	0	201

2826 CARDS ARE ON OUTPUT TAPE

Figure 16. ED AND INSERT listing (part 18).

DATA BANK PROGRAMS

COMPUTE SENSOR ERROR PROGRAM

This program uses the output tape of ED AND INSERT. It sectors data automatically from the sensor descriptor and plot codes on the "ED AND INSERT" tape. Data are sectored by time, bearing, or range. The time sector is 0.20 hour, the bearing is 10 degrees, and range is 1 000 yards (except for sonar-range scales less than 10 000 yards when it is 10 percent of scale). For each sector, the program prints out the number of data points, their average value, standard deviation, and confidence factor. It retains on the tape the number of data points, the sum of X, and the sum of X^2. Figure 17 shows the report critique function using the output of this program. Figure 18 shows the output of the COMPUTE SENSOR ERROR program. All those statistical values which are used in the written report to analyze sensor performance are checked against those computed by this program (tables 13 through 18). If any deficiencies are found, the reasons for such deficiencies are determined. If the range has made an error, this information is forwarded to range personnel. If mistakes were made in the editing of the data, corrections are made and the data reprocessed.

Figure 19 illustrates the types of printouts produced by this program. For each sensor the first page is a list of interval statistics followed by statistical computations appropriate to the sensor.

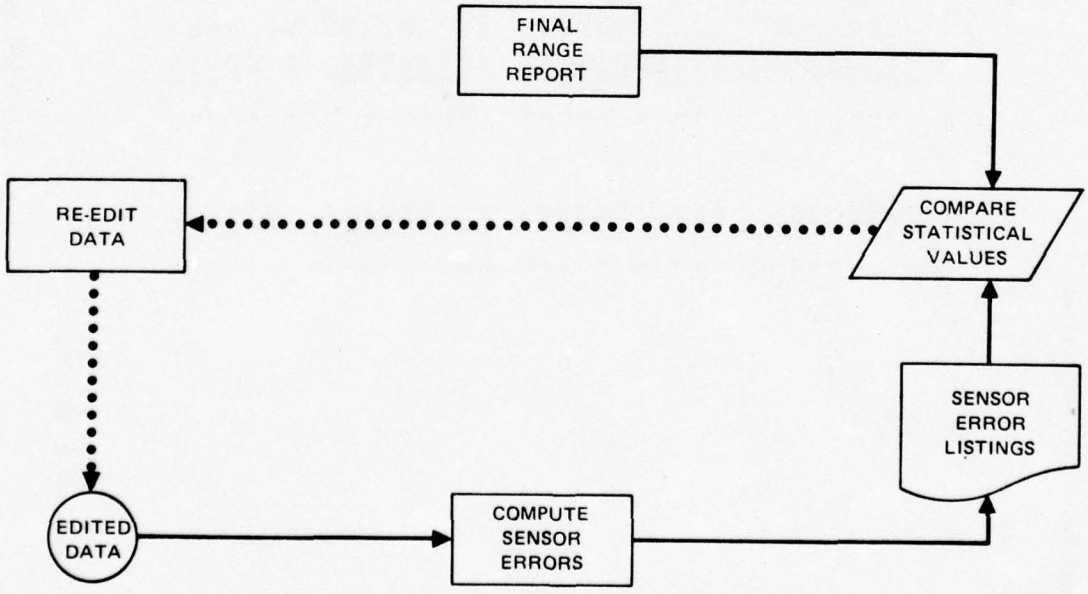


Figure 17. Critique function using COMPUTE SENSOR ERROR output.

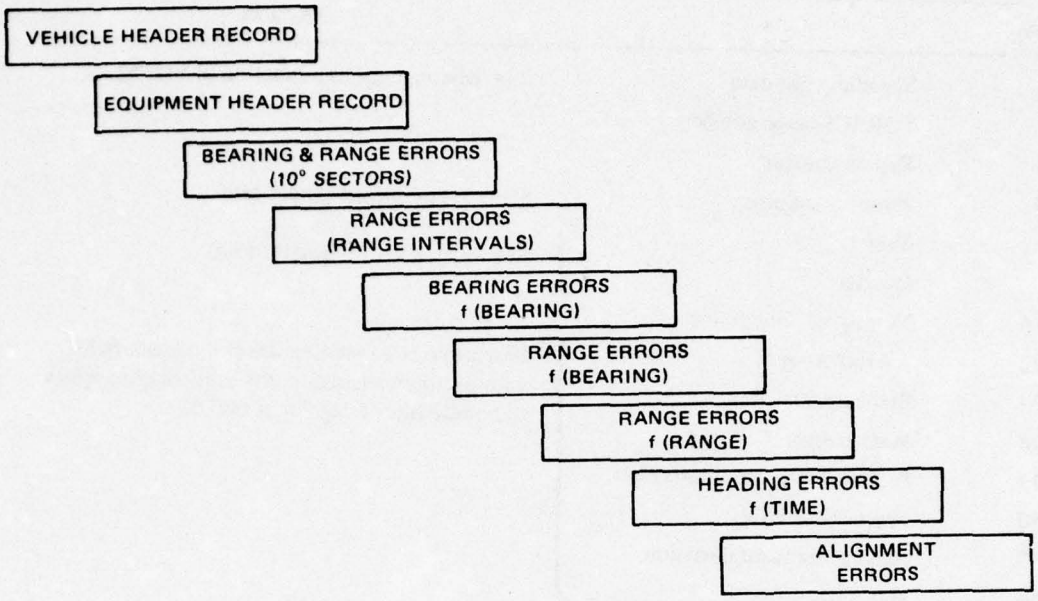


Figure 18. COMPUTE SENSOR ERROR outputs.

TABLE 13. DATA BANK RECORD, GYRO ERRORS

Column	Data	Remarks
1	Specifies type data	7 = gyro error
2	FORACS range number	
3-6	Report number	
7-8	Sensor descriptor	Same as equipment header card
9	Year	Example: 61 = 1st quarter 1976
10	Quarter	
18-22	Settled error	Gyro error parameters are five column fields with overpunched sign in the first column, values to hundredths of degrees, ie 000.00
25-29	Average standard deviation	
32-36	Max mean error	
39-43	Excursion from settled error	
46-50	Peak-to-Valley variation (PVV)	
53-57	Midpoint of PVV	

TABLE 14. DATA BANK RECORD, BEARING ERRORS.

Column	Data	Remarks
1	Specifies type data	2 = bearing error as a function of bearing
2	FORACS range number	
3-6	Report number	
7-8	Sensor descriptor	Same as equipment header card
9	Year	Example: 61 = 1st quarter 1976
10	Quarter	
12-15	Number of data points	
18-22	Average error	Bearing error parameters are five column fields with overpunched sign in the first column, values to hundredths of degrees, ie 000.00
25-29	Standard deviation	
32-36	Median error	
39-43	Peak-to-Valley variation (PVV)	
46-50	Midpoint of PVV	
53-57	Average standard deviation	
60-64	Maximum error	

TABLE 15. DATA BANK RECORD, RANGE ERRORS.

Column	Data	Remarks
1	Specifies type data	3 = range error as a function of bearing 4 = range error as a function of range
2	FORACS range number	
3-6	Report number	
7-8	Sensor descriptor	Same as equipment header card
9	Year	Example: 61 = 1st quarter 1976
10	Quarter	
12-15	Number of data points	
16-22	Average error	Range error parameters are seven column fields with overpunched sign in the first column, values to tenths of yards, ie 000000.0
23-29	Standard deviation	
30-36	Median error	
37-43	Peak-to-Valley variation (PVV)	
44-50	Midpoint of PVV	
51-57	Average standard deviation	
58-64	Maximum error	

TABLE 16. DATA BANK RECORD OF PERISCOPE ALIGNMENT ERROR AND LOST MOTION FROM CALIBRATION TEST DATA.

Column	Data	Remarks
1	Specifies alignment check	A = Alignment check
2	FORACS range number	
3-6	Report number	
7-8	Field descriptor	
9	Year	
10	Quarter	
18-22	Alignment error	Bearing error parameters are five column fields with overpunched sign in the first column, values to hundredths of degrees, ie 000.00
25-29	Lost motion	

TABLE 17. DATA BANK RECORD OF PERISCOPE BENCHMARK ALIGNMENT.

Column	Data	Remarks
1	Specifies benchmark checks	"B" = BM check
2	FORACS range number	
3-6	Report number	
7-8	Field descriptor	
9	Year	
10	Quarter	
18-22	Alignment error (Lo power)	Bearing error parameters are five column fields with overpunched sign in the first column, values to hundredths of degrees, ie 000.00
25-29	Lost motion (Lo power)	
32-36	Alignment error (Hi power)	
39-43	Lost motion (Hi power)	

TABLE 18. DATA BANK RECORD OF GUN FIRE-CONTROL BENCHMARK CHECKS.

Column	Data	Remarks
1	Specifies benchmark checks	"B" = BM check
2	FORACS range number	
3-6	Report number	
7-8	Sensor descriptor	
9	Year	
10	Quarter	
32-36	Alignment error	Bearing error parameters are five column fields with overpunched sign in the first column, values to hundredths of degrees, ie 000.00
39-43	Lost Motion error	

LISTING OF GYRO INTERVAL MEANS

GYRO 999 99A JOAN CATHERINE SS 9999 DATE: 12/25/76 FORACS 7 REPORT NO 888, FIELD 11

17 888112 GYRO 999 99A - 16

START TIME	FINISH TIME	NO OF POINTS	AVERAGE	ST. DEV
1000	1020	4	-0.15	0.01
1020	1040	13	-0.14	0.04
1040	1060	13	-0.15	0.02
1060	1080	15	-0.16	0.05
1080	1100	3	-0.21	0.01
1100	1120	5	-0.23	0.04
1120	1140	15	-0.16	0.03
1140	1160	16	-0.07	0.04
1160	1180	11	-0.07	0.04
1180	1200			
1200	1220			
1220	1240			
1240	1260			
1260	1280	13	-0.04	0.05
1280	1300	21	-0.09	0.06
1300	1320	10	-0.13	0.04
1320	1340	19	-0.19	0.07
1340	1360	18	-0.25	0.06
1360	1380	18	-0.33	0.06
1380	1400	1	-0.32	0.00
1400	1420			
1420	1440	3	-0.05	0.10
1440	1460	14	-0.01	0.07
1460	1480	11	0.09	0.07
1480	1500			
1500	1520	12	0.01	0.06
1520	1540	19	-0.05	0.08
1540	1560	13	-0.06	0.06
1560	1580	16	-0.11	0.06
1580	1600			
1600	1620	19	-0.12	0.05
1620	1640	8	-0.12	0.06
1640	1660	8	-0.15	0.04
1660	1680	16	-0.17	0.05
1680	1700	6	-0.16	0.03
1700	1720			

Figure 19. COMPUTE SENSOR ERROR program output (part 1).

LISTING OF GYRO STATISTICS

GYRO 999 99A JOAN CATHERINE SS 9999 DATE: 12/25/76 FORACS 7 REPORT NO 888, FIELD 11

17 886112 GYRO 999 99A - 16

SETTLED ERROR (SE)	-0.16	DEGREES
PEAK-TO-VALLEY VARIATION (PVV)	0.42	DEGREES
MAXIMUM EXCURSION FROM SE (MESE)	0.25	DEGREES
MIDPOINT OF PVV (MP)	-0.12	DEGREES
PEAK	0.09	DEGREES
VALLEY	-0.33	DEGREES
MAXIMUM MEAN ERROR (MME)	-0.33	DEGREES
AVERAGE STANDARD DEVIATION (ASD)	0.05	DEGREES

A VALID INTERVAL IS DEFINED AS HAVING AT LEAST FOUR DATA POINTS

THIS PROGRAM RUN ON 29 SEP 1976 THIS IS SENSOR NUMBER 1

Figure 19. COMPUTE SENSOR ERROR program output (part 2).

ERRORS AS A FUNCTION OF BEARING

SONAR 999CB JUAN CATHERINE SS 9999 DATE: 12/25/76 FORACS 7 REPORT NO 888, FIELD 21

17 888212 10000 SONAR 999CB M D 50505050 GSDT

	RANGE ERRORS				BEARING ERRORS				
BEARING	NUMB	AVG	SD	CONF	NUMB	AVG	SD	CONF	
185 TO 195									
195 TO 205									
205 TO 215									
215 TO 225	7	-20.4	6.6	4.9	11	-0.43	0.73	0.43	BEARING DATA NOT USED
225 TO 235	9	-9.1	14.2	9.3	9	-0.93	0.19	0.12	
235 TO 245	10	5.9	7.0	4.3	10	-0.65	0.28	0.17	
245 TO 255	10	11.3	5.5	3.4	10	-0.31	0.14	0.09	
255 TO 265	9	21.8	5.3	3.5	9	-0.40	0.25	0.16	
265 TO 275	10	33.1	9.1	5.7	10	0.11	0.22	0.14	
275 TO 285	11	45.7	11.3	6.7	11	-0.04	0.37	0.22	
285 TO 295	16	49.9	13.0	6.4	15	-0.12	0.30	0.15	
295 TO 305	14	58.0	10.3	5.4	13	-0.46	0.18	0.10	
305 TO 315	13	55.8	9.7	5.3	12	-0.43	0.20	0.11	
315 TO 325	7	28.0	10.6	7.9	7	-0.55	0.24	0.17	
325 TO 335	10	31.4	8.1	5.0	10	-0.27	0.13	0.08	
335 TO 345	19	37.4	7.3	3.3	20	-0.76	0.30	0.13	
345 TO 355	5	51.2	13.7	12.0	1	-0.85	0.00	0.00	
355 TO 5	4	47.8	14.2	13.9	4	-0.74	0.36	0.36	
5 TO 15	28	39.8	19.4	7.2	29	-0.75	0.40	0.14	
15 TO 25	7	24.7	5.4	4.0	7	-1.01	0.47	0.34	
25 TO 35	9	18.9	7.4	4.8	9	-0.59	0.21	0.14	
35 TO 45	5	8.8	14.2	12.5	5	-0.45	0.19	0.16	
45 TO 55	6	-3.2	12.6	10.1	6	-0.72	0.32	0.26	
55 TO 65	8	4.1	9.9	6.9	8	-0.48	0.33	0.23	
65 TO 75	9	6.6	9.7	6.4	8	-0.75	0.12	0.08	
75 TO 85	6	5.2	3.3	2.6	6	-0.78	0.18	0.14	
85 TO 95	13	5.5	11.1	6.1	13	-0.33	0.28	0.15	
95 TO 105	10	27.0	11.0	6.8	10	-0.06	0.26	0.16	
105 TO 115	19	30.5	7.8	3.5	19	-0.26	0.21	0.09	
115 TO 125	9	45.4	11.9	7.8	9	-0.24	0.30	0.19	
125 TO 135	7	45.7	4.4	3.2	7	-0.07	0.27	0.20	
135 TO 145	3	44.0	6.6	7.4	3	-0.13	0.12	0.13	BEARING DATA NOT USED
145 TO 155									
155 TO 165									
165 TO 175									
175 TO 185									

Figure 19. COMPUTE SENSOR ERROR program output (part 3).

LISTING OF ERROR STATISTICS AS A FUNCTION OF BEARING

SONAR 999CB JEAN CATHERINE SS 9999 DATE: 12/25/76 FORACS 7 REPORT NO 888, FIELD 21

17 888212 10000 SONAR 999CB M D 50505050 GSDT

BAFFLE LIMITS USED ARE 135 TO 225 DEGREES

SONAR IS IN ACTIVE SDT MODE

MODIFICATION IS INSTALLED

HULL MOUNTED SONAR

SONAR RANGE SCALE IS 10000 YARDS

BEARING ERROR PARAMETERS ARE IN ********** * DEGREES * **********

	BEARING ERRORS	RANGE ERRORS
PEAK-TO-VALLEY VARIATION (PVV)	1.13	78.4
MIDPOINT OF PVV (MP)	-0.45	18.8
AVERAGE STANDARD DEVIATION (ASD)	0.26	9.8
PEAK	0.11	58.0
VALLEY	-1.01	-20.4
MAXIMUM MEAN ERROR (MME)	-1.01	58.0
AVERAGE STANDARD DEVIATION	0.26	9.8
TOTAL NUMBER OF DATA POINTS	277	293
OVERALL MEAN	-0.46	28.6
OVERALL STANDARD DEVIATION	0.39	22.3
MEDIAN OF ERRORS	-0.45	30.0
NUMBER OF VALID INTERVALS	26	28
WEIGHTED AVERAGE STANDARD DEVIATION	0.26	10.5
AVERAGE OF VALID INTERVAL MEANS	-0.46	25.2
AVERAGE OF VALID INTERVAL ABSOLUTE MEANS	0.47	27.6
MEAN OF ABSOLUTE ERRORS	0.50	31.1

A VALID INTERVAL IS DEFINED AS HAVING AT LEAST FOUR DATA POINTS

Figure 19. COMPUTE SENSOR ERROR program output (part 4).

ERRORS AS A FUNCTION OF RANGE FOR THE 2.5K RANGE SCALE

SONAR 999CB JOAN CATHERINE SS 9999 DATE: 12/25/76 FORACS 7 REPORT NO 888, FIELD 21

17 888211 2500 SONAR 999CB M D 50505050 GSDT

	RANGE ERRORS				BEARING ERRORS			
RANGE	NUMB	AVG	SD	CONF	NUMB	AVG	SD	CONF
0 TO 250								
250 TO 500								
500 TO 750								
750 TO 1000								
1000 TO 1250								
1250 TO 1500	5	-3.4	1.3	1.2				
1500 TO 1750	7	-2.7	4.4	3.3				
1750 TO 2000								
2000 TO 2250	5	14.4	8.6	7.5				
2250 TO 2500	3	10.7	7.5	8.5				
2500 TO 2750	1	-5.0	0.0	0.0				

Figure 19. COMPUTE SENSOR ERROR program output (part 5).

LISTING OF ERROR STATISTICS AS A FUNCTION OF RANGE FOR THE 2.5K RANGE SCALE

SONAR 999CB JOAN CATHERINE SS 9999 DATE: 12/25/76 FORACS 7 REPORT NO 888, FIELD 21

17 888211 25C0 SONAR 999CB M D 90505050 GSDT

MODIFICATION IS INSTALLED

BEARING ERROR PARAMETERS ARE IN ********** * DEGREES * **********

	BEARING ERRORS	RANGE ERRORS
MAXIMUM MEAN ERROR (MME)	0.00	14.4
AVERAGE STANDARD DEVIATION (ASD)	0.00	4.8
PEAK-TO-VALLEY VARIATION (PVV)	0.00	17.8
MIDPOINT OF PVV (MP)	0.00	5.5
AVERAGE STANDARD DEVIATION	0.00	4.8
PEAK	0.00	14.4
VALLEY	0.00	-3.4
TOTAL NUMBER OF DATA POINTS	0	21
OVERALL MEAN	0.00	3.5
OVERALL STANDARD DEVIATION	0.00	9.6
MEDIAN OF ERRORS	0.00	-2.0
NUMBER OF VALID INTERVALS	0	3
WEIGHTED AVERAGE STANDARD DEVIATION	0.00	5.2
AVERAGE OF VALID INTERVAL MEANS	0.00	2.8
AVERAGE OF VALID INTERVAL ABSOLUTE MEANS	0.00	6.8
MEAN OF ABSOLUTE ERRORS	0.00	7.5

A VALID INTERVAL IS DEFINED AS HAVING AT LEAST FOUR DATA POINTS

THIS PROGRAM RUN ON 29 SEP 1976 THIS IS SENSOR NUMBER 3

Figure 19. COMPUTE SENSOR ERROR program output (part 6).

ERRORS AS A FUNCTION OF RANGE FOR THE 5.0K RANGE SCALE

SONAR 999CB JOAN CATHERINE SS 9999 DATE: 12/25/76 FORACS 7 REPORT NO 888, FIELD 21

17 888211 50C0 SONAR 999CB M D 50505050 GSDT

	RANGE ERRORS				BEARING ERRORS			
RANGE	NUMB	AVG	SD	CONF	NUMB	AVG	SD	CONF
0 TO 500								
500 TO 1000								
1000 TO 1500								
1500 TO 2000	4	-17.8	14.3	14.0				
2000 TO 2500								
2500 TO 3000	6	19.7	6.2	4.9				
3000 TO 3500	6	15.0	9.8	7.9				
3500 TO 4000	1	20.0	0.0	0.0				
4000 TO 4500	9	21.0	6.8	4.5				
4500 TO 5000	5	19.6	10.5	9.2				
5000 TO 5500								

Figure 19. COMPUTE SENSOR ERROR program output (part 7).

LISTING OF ERROR STATISTICS AS A FUNCTION OF RANGE FOR THE 5.0K RANGE SCALE

SONAR 999CB JOAN CATHERINE SS 9999 DATE: 12/25/76 FORACS 7 REPORT NO 88a, FIELD 21

17 88a211 50C0 SONAR 999CB M D 50505050 GSDT

MODIFICATION IS INSTALLED

BEARING ERROR PARAMETERS ARE IN **********
* DEGREES *
****

	BEARING ERRORS	RANGE ERRORS
MAXIMUM MEAN ERROR (MME)	0.00	21.0
AVERAGE STANDARD DEVIATION (ASD)	0.00	9.5
PEAK-TO-VALLEY VARIATION (PVV)	0.00	38.8
MIDPOINT OF PVV (MP)	0.00	1.6
AVERAGE STANDARD DEVIATION	0.00	9.5
PEAK	0.00	21.0
VALLEY	0.00	-17.8
TOTAL NUMBER OF DATA POINTS	0	31
OVERALL MEAN	0.00	14.3
OVERALL STANDARD DEVIATION	0.00	15.2
MEDIAN OF ERRORS	0.00	20.0
NUMBER OF VALID INTERVALS	0	5
WEIGHTED AVERAGE STANDARD DEVIATION	0.00	8.4
AVERAGE OF VALID INTERVAL MEANS	0.00	11.3
AVERAGE OF VALID INTERVAL ABSOLUTE MEANS	0.00	18.6
MEAN OF ABSOLUTE ERRORS	0.00	18.9

A VALID INTERVAL IS DEFINED AS HAVING AT LEAST FOUR DATA POINTS

THIS PROGRAM RUN ON 29 SEP 1976 THIS IS SENSOR NUMBER 4

Figure 19. COMPUTE SENSOR ERROR program output (part 8).

ERRORS AS A FUNCTION OF RANGE FOR THE 10.0K RANGE SCALE

SONAR 999CB JOAN CATHERINE SS 9999 DATE: 12/25/76 FORACS 7 REPORT NO 888, FIELD 21

17 888211 10000 SONAR 999CB M D 50505050 GSOT

	RANGE ERRORS			BEARING ERRORS			
RANGE	NUMB	AVG	SD	CONF	NUMB	AVG	SD	CONF
0 TO 1000								
1000 TO 2000								
2000 TO 3000	5	-25.2	10.0	8.8				
3000 TO 4000								
4000 TO 5000								
5000 TO 6000	6	12.7	7.6	6.0				
6000 TO 7000	6	12.0	7.6	6.1				
7000 TO 8000								
8000 TO 9000	7	69.4	6.1	4.5				
9000 TO 10000	8	69.8	11.8	8.2				
10000 TO 11000								

Figure 19. COMPUTE SENSOR ERROR program output (part 9).

LISTING OF ERROR STATISTICS AS A FUNCTION OF RANGE FOR THE 10.0K RANGE SCALE

SONAR 999CB JUAN CATHERINE SS 9999 DATE: 12/25/76 FORACS 7 REPORT NO 688, FIELD 21

17 888211 10000 SONAR 999CB M D 50505050 GSOT

MODIFICATION IS INSTALLED

BEARING ERROR PARAMETERS ARE IN **********
* DEGREES *
****

	BEARING ERRORS	RANGE ERRORS
MAXIMUM MEAN ERROR (MME)	0.00	69.8
AVERAGE STANDARD DEVIATION (ASD)	0.00	8.6
PEAK-TO-VALLEY VARIATION (PVV)	0.00	94.9
MIDPOINT OF PVV (MP)	0.00	22.3
AVERAGE STANDARD DEVIATION	0.00	8.6
PEAK	0.00	69.8
VALLEY	0.00	-25.2
TOTAL NUMBER OF DATA POINTS	0	32
OVERALL MEAN	0.00	33.3
OVERALL STANDARD DEVIATION	0.00	37.8
MEDIAN OF ERRORS	0.00	24.0
NUMBER OF VALID INTERVALS	0	5
WEIGHTED AVERAGE STANDARD DEVIATION	0.00	8.4
AVERAGE OF VALID INTERVAL MEANS	0.00	27.7
AVERAGE OF VALID INTERVAL ABSOLUTE MEANS	0.00	37.8
MEAN OF ABSOLUTE ERRORS	0.00	41.2

A VALID INTERVAL IS DEFINED AS HAVING AT LEAST FOUR DATA POINTS

THIS PROGRAM RUN ON 29 SEP 1976 THIS IS SENSOR NUMBER 5

Figure 19. COMPUTE SENSOR ERROR program output (part 10).

ERRORS AS A FUNCTION OF RANGE FOR THE 20.0K RANGE SCALE

SONAR 999CB JOAN CATHERINE SS 9999 DATE: 12/25/76 FORACS 7 REPORT NO 888, FIELD 21

17 888211 20000 SONAR 999CB M D 50505050 GSDT

	RANGE ERRORS			BEARING ERRORS		
RANGE	NUMB	AVG	SD	CONF	NUMB	AVG	SD	CONF
0 TO 1000								
1000 TO 2000								
2000 TO 3000								
3000 TO 4000								
4000 TO 5000	6	-59.3	29.9	23.9				
5000 TO 6000								
6000 TO 7000								
7000 TO 8000	1	-65.0	0.0	0.0				
8000 TO 9000	5	-64.4	6.2	5.4				
9000 TO 10000								
10000 TO 11000	6	-19.2	14.2	11.4				
11000 TO 12000								
12000 TO 13000	6	-16.5	27.2	21.7				
13000 TO 14000								
14000 TO 15000								
15000 TO 16000								
16000 TO 17000	6	-41.7	10.1	8.1				
17000 TO 18000								
18000 TO 19000	5	-45.4	17.2	15.1				
19000 TO 20000								
20000 TO 21000								

Figure 19. COMPUTE SENSOR ERROR program output (part 11).

LISTING OF ERROR STATISTICS AS A FUNCTION OF RANGE FOR THE 20.0K RANGE SCALE

SONAR 999CB JOAN CATHERINE SS 9999 DATE: 12/25/76 FORACS 7 REPORT NO 888, FIELD 21

17 886211 20000 SONAR 999CB M 0 >0909090 GSOT

MODIFICATION IS INSTALLED

BEARING ERROR PARAMETERS ARE IN ********** * DEGREES * **********

	BEARING ERRORS	RANGE ERRORS
MAXIMUM MEAN ERROR (MME)	0.00	-64.4
AVERAGE STANDARD DEVIATION (ASD)	0.00	17.5
PEAK-TO-VALLEY VARIATION (PVV)	0.00	47.9
MIDPOINT OF PVV (MP)	0.00	-40.4
AVERAGE STANDARD DEVIATION	0.00	17.5
PEAK	0.00	-16.5
VALLEY	0.00	-64.4
TOTAL NUMBER OF DATA POINTS	0	35
OVERALL MEAN	0.00	-41.0
OVERALL STANDARD DEVIATION	0.00	26.0
MEDIAN OF ERRORS	0.00	-39.0
NUMBER OF VALID INTERVALS	0	6
WEIGHTED AVERAGE STANDARD DEVIATION	0.00	18.0
AVERAGE OF VALID INTERVAL MEANS	0.00	-41.1
AVERAGE OF VALID INTERVAL ABSOLUTE MEANS	0.00	41.1
MEAN OF ABSOLUTE ERRORS	0.00	42.3

A VALID INTERVAL IS DEFINED AS HAVING AT LEAST FOUR DATA POINTS

THIS PROGRAM RUN ON 29 SEP 1976 THIS IS SENSOR NUMBER 6

Figure 19. COMPUTE SENSOR ERROR program output (part 12).

ERRORS AS A FUNCTION OF BEARING

GFCS 999C JOAN CATHERINE SS 9999 DATE: 12/25/76 FORACS 7 REPORT NO 888, FIELD 41

17 888412 GFCS 999C T

BEARING	RANGE ERRORS NUMB	AVG	SD	CONF	BEARING ERRORS NUMB	AVG	SD	CONF
185 TO 195								
195 TO 205								
205 TO 215								
215 TO 225								
225 TO 235					3	-0.18	0.05	0.05
235 TO 245					9	-0.22	0.04	0.03
245 TO 255					9	-0.17	0.04	0.02
255 TO 265					5	-0.19	0.07	0.06
265 TO 275					13	-0.21	0.04	0.02
275 TO 285					7	-0.23	0.09	0.07
285 TO 295					2	-0.12	0.04	0.06
295 TO 305					11	-0.21	0.09	0.05
305 TO 315					7	-0.17	0.07	0.06
315 TO 325					2	-0.17	0.06	0.09
325 TO 335					5	-0.17	0.05	0.05
335 TO 345					48	-0.19	0.08	0.02
345 TO 355					70	-0.19	0.07	0.02
355 TO 5					21	-0.18	0.06	0.02
5 TO 15					24	-0.17	0.07	0.03
15 TO 25					26	-0.18	0.06	0.02
25 TO 35					8	-0.17	0.06	0.04
35 TO 45					7	-0.19	0.05	0.04
45 TO 55					5	-0.18	0.06	0.05
55 TO 65					8	-0.25	0.05	0.04
65 TO 75					12	-0.21	0.06	0.04
75 TO 85					10	-0.19	0.09	0.06
85 TO 95					7	-0.23	0.05	0.04
95 TO 105					6	-0.23	0.04	0.03
105 TO 115					4	-0.17	0.08	0.08
115 TO 125								
125 TO 135					5	-0.17	0.07	0.06
135 TO 145					1	-0.22	0.00	0.00
145 TO 155								
155 TO 165								
165 TO 175								
175 TO 185								

Figure 19. COMPUTE SENSOR ERROR program output (part 13).

LISTING OF ERROR STATISTICS AS A FUNCTION OF BEARING

GFCS 999C JOAN CATHERINE SS 9999 DATE: 12/25/76 FORACS 7 REPORT NO 86a, FIELD 41

17 888412 GFCS 999C T

RADAR IN AUTO TRACK MODE

BEARING ERROR PARAMETERS ARE IN ********** * MINUTES * **********

	BEARING ERRORS	RANGE ERRORS
PEAK-TO-VALLEY VARIATION (PVV)	4.72	0.0
MIDPOINT OF PVV (MP)	-12.49	0.0
AVERAGE STANDARD DEVIATION (ASD)	3.78	0.0
PEAK	-10.13	0.0
VALLEY	-14.85	0.0
MAXIMUM MEAN ERROR (MME)	-14.85	0.0
AVERAGE STANDARD DEVIATION	3.78	0.0
TOTAL NUMBER OF DATA POINTS	335	0
OVERALL MEAN	-11.43	0.0
OVERALL STANDARD DEVIATION	4.31	0.0
MEDIAN OF ERRORS	-11.40	0.0
NUMBER OF VALID INTERVALS	23	0
WEIGHTED AVERAGE STANDARD DEVIATION	3.84	0.0
AVERAGE OF VALID INTERVAL MEANS	-11.67	0.0
AVERAGE OF VALID INTERVAL ABSOLUTE MEANS	11.67	0.0
MEAN OF ABSOLUTE ERRORS	11.43	0.0

A VALID INTERVAL IS DEFINED AS HAVING AT LEAST FOUR DATA POINTS

THIS PROGRAM RUN ON 29 SEP 1976 THIS IS SENSOR NUMBER 7

Figure 19. COMPUTE SENSOR ERROR program output (part 14).

ERRORS AS A FUNCTION OF RANGE FOR THE 10.0K RANGE SCALE

GFCS 999C JOAN CATHERINE SS 9999 DATE: 12/25/76 FORACS 7 REPORT NO 888, FIELD 44

17 888441 GFCS 999C TP

RANGE	RANGE ERRORS NUMB	RANGE ERRORS AVG	RANGE ERRORS SD	RANGE ERRORS CONF	BEARING ERRORS NUMB	BEARING ERRORS AVG	BEARING ERRORS SD	BEARING ERRORS CONF
0 TO 1000								
1000 TO 2000	7	-14.0	3.8	2.8				
2000 TO 3000	105	-13.3	4.1	0.8				
3000 TO 4000	104	-15.5	4.4	0.8				
4000 TO 5000	72	-15.9	4.2	1.0				
5000 TO 6000	28	-16.4	4.1	1.5				
6000 TO 7000	20	-14.7	4.4	1.9				
7000 TO 8000	1	-17.0	0.0	0.0				
8000 TO 9000								
9000 TO 10000								
10000 TO 11000								

Figure 19. COMPUTE SENSOR ERROR program output (part 15).

LISTING OF ERROR STATISTICS AS A FUNCTION OF RANGE FOR THE 10.0K RANGE SCALE

GFCS 999C JOAN CATHERINE SS 9999 DATE: 12/25/76 FORACS 7 REPORT NO 888, FIELD 44

17 888441 GFCS 999C TP

BEARING ERROR PARAMETERS ARE IN ********** * MINUTES * **********

	BEARING ERRORS	RANGE ERRORS
MAXIMUM MEAN ERROR (MME)	0.00	-16.4
AVERAGE STANDARD DEVIATION (ASD)	0.00	4.2
PEAK-TO-VALLEY VARIATION (PVV)	0.00	3.1
MIDPOINT OF PVV (MP)	0.00	-14.9
AVERAGE STANDARD DEVIATION	0.00	4.2
PEAK	0.00	-13.3
VALLEY	0.00	-16.4
TOTAL NUMBER OF DATA POINTS	0	337
OVERALL MEAN	0.00	-14.9
OVERALL STANDARD DEVIATION	0.00	4.3
MEDIAN OF ERRORS	0.00	-15.0
NUMBER OF VALID INTERVALS	0	6
WEIGHTED AVERAGE STANDARD DEVIATION	0.00	4.2
AVERAGE OF VALID INTERVAL MEANS	0.00	-15.0
AVERAGE OF VALID INTERVAL ABSOLUTE MEANS	0.00	15.0
MEAN OF ABSOLUTE ERRORS	0.00	14.9

A VALID INTERVAL IS DEFINED AS HAVING AT LEAST FOUR DATA POINTS

THIS PROGRAM RUN ON 29 SEP 1976 THIS IS SENSOR NUMBER 8

Figure 19. COMPUTE SENSOR ERROR program output (part 16).

ERRORS AS A FUNCTION OF BEARING

SS RADAR 999A 99D JOAN CATHERINE SS 9999 DATE: 12/25/76 FORACS 7 REPORT NO 888, FIELD 61

17 888612 SS RADAR 999A 99D

	RANGE ERRORS				BEARING ERRORS			
BEARING	NUMB	AVG	SD	CONF	NUMB	AVG	SD	CONF
185 TO 195								
195 TO 205								
205 TO 215								
215 TO 225								
225 TO 235	17	14.9	58.9	28.0	16	-0.26	0.29	0.14
235 TO 245	30	12.7	53.9	19.3	30	-0.20	0.22	0.08
245 TO 255	16	32.3	47.8	23.4	16	0.07	0.19	0.09
255 TO 265	17	45.8	39.4	18.7	18	-0.02	0.39	0.18
265 TO 275	14	28.9	18.4	9.6	14	0.06	0.31	0.16
275 TO 285	18	44.1	21.4	9.9	19	-0.32	0.21	0.10
285 TO 295	11	46.0	33.5	19.8	11	-0.30	0.29	0.17
295 TO 305	7	51.0	26.8	19.9	7	-0.19	0.22	0.16
305 TO 315	8	62.0	21.7	15.1	8	-0.05	0.18	0.13
315 TO 325	10	61.8	19.2	11.9	11	0.03	0.33	0.19
325 TO 335	20	61.3	25.4	11.1	20	-0.16	0.28	0.12
335 TO 345	11	54.3	22.4	13.3	11	-0.14	0.13	0.07
345 TO 355	12	62.9	14.2	8.0	12	-0.34	0.25	0.14
355 TO 5	8	72.3	27.8	19.3	7	-0.21	0.13	0.10
5 TO 15	10	55.1	32.2	19.9	10	0.23	0.40	0.25
15 TO 25	5	51.2	30.1	26.4	4	0.32	0.26	0.25
25 TO 35	7	23.7	25.8	19.1	7	0.01	0.29	0.22
35 TO 45	8	41.5	36.8	25.5	8	-0.50	0.28	0.19
45 TO 55	11	31.4	26.9	15.9	11	-0.41	0.37	0.22
55 TO 65	10	49.5	25.5	15.8	10	-0.10	0.42	0.26
65 TO 75	12	61.4	24.0	13.6	13	-0.19	0.23	0.13
75 TO 85	8	57.9	22.2	15.4	7	-0.48	0.11	0.08
85 TO 95	11	43.8	27.6	16.3	11	-0.35	0.24	0.14
95 TO 105	11	40.9	17.9	10.6	11	-0.71	0.45	0.27
105 TO 115	10	43.7	19.2	11.9	9	-0.70	0.30	0.20
115 TO 125	14	40.4	26.3	13.8	13	-0.39	0.25	0.14
125 TO 135	9	37.7	31.6	20.7	9	-0.35	0.29	0.19
135 TO 145	8	47.8	26.1	18.1	8	-0.40	0.16	0.11
145 TO 155								
155 TO 165								
165 TO 175								
175 TO 185								

Figure 19. COMPUTE SENSOR ERROR program output (part 17).

LISTING OF ERROR STATISTICS AS A FUNCTION OF BEARING

SS RADAR 999A 99D JOAN CATHERINE SS 9999 DATE: 12/25/76 FORACS 7 REPORT NO 888, FIELD 61

17 888612 SS RADAR 999A 99D

BEARING ERROR PARAMETERS ARE IN ********** * DEGREES * **********

	BEARING ERRORS	RANGE ERRORS
PEAK-TO-VALLEY VARIATION (PVV)	1.03	99.6
MIDPOINT OF PVV (MP)	-0.20	42.9
AVERAGE STANDARD DEVIATION (ASD)	0.27	28.7
PEAK	0.32	72.3
VALLEY	-0.71	12.7
MAXIMUM MEAN ERROR (MME)	-0.71	72.3
AVERAGE STANDARD DEVIATION	0.27	28.7
TOTAL NUMBER OF DATA POINTS	331	333
OVERALL MEAN	-0.21	42.8
OVERALL STANDARD DEVIATION	0.35	35.9
MEDIAN OF ERRORS	-0.23	46.3
NUMBER OF VALID INTERVALS	28	28
WEIGHTED AVERAGE STANDARD DEVIATION	0.27	32.2
AVERAGE OF VALID INTERVAL MEANS	-0.22	45.6
AVERAGE OF VALID INTERVAL ABSOLUTE MEANS	0.27	45.6
MEAN OF ABSOLUTE ERRORS	0.33	48.9

A VALID INTERVAL IS DEFINED AS HAVING AT LEAST FOUR DATA POINTS

THIS PROGRAM RUN ON 29 SEP 1976 THIS IS SENSOR NUMBER 9

Figure 19. COMPUTE SENSOR ERROR program output (part 18).

ERRORS AS A FUNCTION OF RANGE FOR THE 8.0K RANGE SCALE

SS RADAR 999A 99D JOAN CATHERINE SS 9999 DATE: 12/25/76 FORACS 7 REPORT NO 888, FIELD 61

17 888611 8000 SS RADAR 999A 99D

	RANGE ERRORS				BEARING ERRORS			
RANGE	NUMB	AVG	SD	CONF	NUMB	AVG	SD	CONF
0 TO 1000								
1000 TO 2000	7	38.9	30.1	22.3	6	-0.16	0.17	0.14
2000 TO 3000	26	35.5	21.7	8.3	25	-0.28	0.41	0.16
3000 TO 4000	10	71.8	16.3	10.1	11	0.12	0.25	0.15
4000 TO 5000	15	58.7	14.3	7.2	15	-0.56	0.25	0.13
5000 TO 6000	61	62.2	22.0	5.5	60	-0.28	0.29	0.07
6000 TO 7000	9	59.7	17.4	11.4	9	-0.11	0.10	0.07
7000 TO 8000	8	56.9	28.3	19.6	8	-0.31	0.20	0.14
8000 TO 9000								

(44)

Figure 19. COMPUTE SENSOR ERROR program output (part 19).

LISTING OF ERROR STATISTICS AS A FUNCTION OF RANGE FOR THE 8.0K RANGE SCALE

SS RADAR 999A 99D JOAN CATHERINE SS 9999 DATE: 12/25/76 FORACS 7 REPORT NO 888, FIELD 61

17 888611 8000 SS RADAR 999A 99D

BEARING ERROR PARAMETERS ARE IN ********** * DEGREES * **********

	BEARING ERRORS	RANGE ERRORS
MAXIMUM MEAN ERROR (MME)	-0.56	71.8
AVERAGE STANDARD DEVIATION (ASD)	0.24	21.4
PEAK-TO-VALLEY VARIATION (PVV)	0.08	36.3
MIDPOINT OF PVV (MP)	-0.22	53.6
AVERAGE STANDARD DEVIATION	0.24	21.4
PEAK	0.12	71.8
VALLEY	-0.56	35.5
TOTAL NUMBER OF DATA POINTS	134	136
OVERALL MEAN	-0.26	55.7
OVERALL STANDARD DEVIATION	0.33	24.3
MEDIAN OF ERRORS	-0.28	58.0
NUMBER OF VALID INTERVALS	7	7
WEIGHTED AVERAGE STANDARD DEVIATION	0.29	21.9
AVERAGE OF VALID INTERVAL MEANS	-0.23	54.8
AVERAGE OF VALID INTERVAL ABSOLUTE MEANS	0.26	54.8
MEAN OF ABSOLUTE ERRORS	0.34	55.9

A VALID INTERVAL IS DEFINED AS HAVING AT LEAST FOUR DATA POINTS

THIS PROGRAM RUN ON 29 SEP 1976 THIS IS SENSOR NUMBER 10

Figure 19. COMPUTE SENSOR ERROR program output (part 20).

ERRORS AS A FUNCTION OF RANGE FOR THE 10.0K RANGE SCALE

SS RADAR 999A 99D JOAN CATHERINE SS 9999 DATE: 12/25/76 FORACS 7 REPORT NO 888, FIELD 61

17 888611 10000 SS RADAR 999A 99D

	RANGE ERRORS				BEARING ERRORS			
RANGE	NUMB	AVG	SD	CONF	NUMB	AVG	SD	CONF
0 TO 1000								
1000 TO 2000								
2000 TO 3000	22	24.9	27.0	11.3	22	-0.10	0.31	0.13
3000 TO 4000	74	38.5	25.2	5.7	74	0.03	0.30	0.07
4000 TO 5000	16	54.4	23.2	11.3	16	-0.61	0.30	0.15
5000 TO 6000	9	50.2	32.0	20.9	9	-0.56	0.19	0.13
6000 TO 7000	8	59.4	28.4	19.7	8	-0.42	0.15	0.10
7000 TO 8000	6	47.2	20.6	16.4	6	-0.35	0.13	0.11
8000 TO 9000	7	43.4	23.0	17.0	7	-0.56	0.34	0.25
9000 TO 10000	12	10.2	27.5	15.5	12	-0.31	0.32	0.18
10000 TO 11000								

Figure 19. COMPUTE SENSOR ERROR program output (part 21).

LISTING OF ERROR STATISTICS AS A FUNCTION OF RANGE FOR THE 10.0K RANGE SCALE

SS RADAR 999A 99D JEAN CATHERINE SS 9999 DATE: 12/25/76 FORACS 7 REPORT NO 888, FIELD 61

17 888611 10000 SS RADAR 999A 99D

BEARING ERROR PARAMETERS ARE IN **********
* DEGREES *
****

	BEARING ERRORS	RANGE ERRORS
MAXIMUM MEAN ERROR (MME)	-0.61	59.4
AVERAGE STANDARD DEVIATION (ASD)	0.26	25.8
PEAK-TO-VALLEY VARIATION (PVV)	0.65	49.2
MIDPOINT OF PVV (MP)	-0.29	34.8
AVERAGE STANDARD DEVIATION	0.26	25.8
PEAK	0.03	59.4
VALLEY	-0.61	10.2
TOTAL NUMBER OF DATA POINTS	154	154
OVERALL MEAN	-0.18	38.3
OVERALL STANDARD DEVIATION	0.38	28.0
MEDIAN OF ERRORS	-0.21	36.5
NUMBER OF VALID INTERVALS	8	8
WEIGHTED AVERAGE STANDARD DEVIATION	0.28	25.2
AVERAGE OF VALID INTERVAL MEANS	-0.36	41.0
AVERAGE OF VALID INTERVAL ABSOLUTE MEANS	0.37	41.0
MEAN OF ABSOLUTE ERRORS	0.34	40.4

A VALID INTERVAL IS DEFINED AS HAVING AT LEAST FOUR DATA POINTS

THIS PROGRAM RUN ON 29 SEP 1976 THIS IS SENSOR NUMBER 11

Figure 19. COMPUTE SENSOR ERROR program output (part 22).

ERRORS AS A FUNCTION OF RANGE FOR THE 20.0K RANGE SCALE

SS RADAR 999A 99D JOAN CATHERINE SS 9999 DATE: 12/25/76 FORACS 7 REPORT NO 888, FIELD 61

17 888611 20000 SS RADAR 999A 99D

RANGE	RANGE ERRORS NUMB	RANGE ERRORS AVG	RANGE ERRORS SD	RANGE ERRORS CONF	BEARING ERRORS NUMB	BEARING ERRORS AVG	BEARING ERRORS SD	BEARING ERRORS CONF
0 TO 1000								
1000 TO 2000								
2000 TO 3000								
3000 TO 4000								
4000 TO 5000								
5000 TO 6000								
6000 TO 7000	1	89.0	0.0	0.0	1	-0.11	0.00	0.00
7000 TO 8000								
8000 TO 9000								
9000 TO 10000	6	-59.5	32.5	26.0	5	-0.53	0.18	0.16
10000 TO 11000								
11000 TO 12000	6	-22.3	82.1	65.7	6	-0.29	0.07	0.06
12000 TO 13000	6	26.3	58.0	46.4	6	-0.11	0.06	0.05
13000 TO 14000	6	24.3	73.5	58.8	6	0.06	0.13	0.11
14000 TO 15000								
15000 TO 16000	5	46.6	33.6	29.5	6	-0.22	0.24	0.20
16000 TO 17000								
17000 TO 18000	6	71.2	41.3	33.0	6	-0.04	0.31	0.25
18000 TO 19000								
19000 TO 20000	7	31.1	39.4	29.2	7	-0.13	0.31	0.23
20000 TO 21000								

Figure 19. COMPUTE SENSOR ERROR program output (part 23).

LISTING OF ERROR STATISTICS AS A FUNCTION OF RANGE FOR THE 20.0K RANGE SCALE

SS RADAR 999A 99D JOAN CATHERINE SS 9999 DATE: 12/25/76 FORACS 7 REPORT NO 886, FIELD 61

17 888611 20000 SS RADAR 999A 99D

BEARING ERROR PARAMETERS ARE IN ********** * DEGREES * **********

	BEARING ERRORS	RANGE ERRORS
MAXIMUM MEAN ERROR (MME)	-0.53	71.2
AVERAGE STANDARD DEVIATION (ASD)	0.19	51.5
PEAK-TO-VALLEY VARIATION (PVV)	0.59	130.7
MIDPOINT OF PVV (MP)	-0.23	5.8
AVERAGE STANDARD DEVIATION	0.19	51.5
PEAK	0.06	71.2
VALLEY	-0.53	-59.5
TOTAL NUMBER OF DATA POINTS	43	43
OVERALL MEAN	-0.17	18.1
OVERALL STANDARD DEVIATION	0.26	65.3
MEDIAN OF ERRORS	-0.12	27.0
NUMBER OF VALID INTERVALS	7	7
WEIGHTED AVERAGE STANDARD DEVIATION	0.20	50.0
AVERAGE OF VALID INTERVAL MEANS	-0.18	16.8
AVERAGE OF VALID INTERVAL ABSOLUTE MEANS	0.20	50.2
MEAN OF ABSOLUTE ERRORS	0.24	57.2

A VALID INTERVAL IS DEFINED AS HAVING AT LEAST FOUR DATA POINTS

THIS PROGRAM RUN ON 29 SEP 1976 THIS IS SENSOR NUMBER 12

Figure 19. COMPUTE SENSOR ERROR program output (part 24).

ERRORS AS A FUNCTION OF BEARING

PER 999A ABC JOAN CATHERINE SS 9999 DATE: 12/25/76 FORACS 7 REPORT NU 888, FIELD 73

17 888732 PER 999A ABC - 4 0 - 6 0 9

	RANGE ERRORS				BEARING ERRORS			
BEARING	NUMB	AVG	SD	CONF	NUMB	AVG	SD	CONF
185 TO 195					3	-0.05	0.03	0.03
195 TO 205					8	-0.06	0.03	0.02
205 TO 215					8	-0.09	0.02	0.01
215 TO 225					6	-0.08	0.01	0.01
225 TO 235					6	-0.07	0.03	0.03
235 TO 245					2	-0.06	0.00	0.00
245 TO 255					4	-0.08	0.05	0.04
255 TO 265					5	-0.08	0.03	0.03
265 TO 275					5	-0.10	0.04	0.03
275 TO 285					6	-0.06	0.03	0.02
285 TO 295					7	-0.08	0.02	0.01
295 TO 305					4	-0.09	0.03	0.03
305 TO 315					2	-0.11	0.07	0.10
315 TO 325					3	-0.10	0.04	0.05
325 TO 335					2	-0.10	0.01	0.01
335 TO 345					2	-0.08	0.01	0.02
345 TO 355					4	-0.05	0.04	0.04
355 TO 5					7	-0.04	0.02	0.02
5 TO 15					6	-0.04	0.03	0.03
15 TO 25					4	-0.03	0.04	0.04
25 TO 35					6	-0.06	0.02	0.02
35 TO 45					4	-0.08	0.01	0.01
45 TO 55					4	-0.09	0.01	0.01
55 TO 65					6	-0.13	0.01	0.01
65 TO 75					4	-0.11	0.01	0.01
75 TO 85					4	-0.10	0.01	0.01
85 TO 95					3	-0.09	0.01	0.01
95 TO 105					4	-0.06	0.01	0.01
105 TO 115					8	-0.06	0.01	0.01
115 TO 125					6	-0.05	0.02	0.02
125 TO 135					5	-0.05	0.02	0.01
135 TO 145					7	-0.05	0.03	0.02
145 TO 155					7	-0.07	0.02	0.02
155 TO 165					4	-0.05	0.01	0.01
165 TO 175					7	-0.06	0.04	0.03
175 TO 185					7	-0.07	0.03	0.02

Figure 19. COMPUTE SENSOR ERROR program output (part 25).

LISTING OF ERROR STATISTICS AS A FUNCTION OF BEARING

PER 999A ABC JOAN CATHERINE SS 9999 DATE: 12/25/76 FORACS 7 REPORT NO 888, FIELD 73

17 888732 PER 999A ABC - 4 0 - 6 0 9

BEARING ERROR PARAMETERS ARE IN ********** * MINUTES * **********

	BEARING ERRORS	RANGE ERRORS
PEAK-TO-VALLEY VARIATION (PVV)	6.00	0.0
MIDPOINT OF PVV (MP)	-4.80	0.0
AVERAGE STANDARD DEVIATION (ASD)	1.44	0.0
PEAK	-1.80	0.0
VALLEY	-7.80	0.0
MAXIMUM MEAN ERROR (MME)	-7.80	0.0
AVERAGE STANDARD DEVIATION	1.44	0.0
TOTAL NUMBER OF DATA POINTS	180	0
OVERALL MEAN	-4.31	0.0
OVERALL STANDARD DEVIATION	1.96	0.0
MEDIAN OF ERRORS	-4.20	0.0
NUMBER OF VALID INTERVALS	32	0
WEIGHTED AVERAGE STANDARD DEVIATION	1.42	0.0
AVERAGE OF VALID INTERVAL MEANS	-4.33	0.0
AVERAGE OF VALID INTERVAL ABSOLUTE MEANS	4.33	0.0
MEAN OF ABSOLUTE ERRORS	4.33	0.0

FOR PERISCOPE CALIBRATION, A VALID INTERVAL IS ONE WITH A MINIMUM OF THREE DATA POINTS

YEAH, YOU GOT A B CARD WITH
LOW POWER: AE = -0.04 LM = 0.00
HIGH POWER: AE = -0.06 LM = 0.00

THIS PROGRAM RUN ON 29 SEP 1976 THIS IS SENSOR NUMBER 13

Figure 19. COMPUTE SENSOR ERROR program output (part 26).

ERRORS AS A FUNCTION OF BEARING

PER 999A ABC JOAN CATHERINE SS 9999 DATE: 12/25/76 FORACS 7 REPORT NO 888, FIELD 74

17 888742 PER 999A ABC 9

	RANGE ERRORS				BEARING ERRORS			
BEARING	NUMB	AVG	SD	CONF	NUMB	AVG	SD	CONF
185 TO 195					6	-0.01	0.04	0.03
195 TO 205					4	0.01	0.01	0.01
205 TO 215					5	-0.01	0.03	0.03
215 TO 225					6	0.04	0.03	0.02
225 TO 235					8	-0.02	0.03	0.02
235 TO 245					5	-0.02	0.03	0.02
245 TO 255					6	-0.00	0.03	0.03
255 TO 265					9	-0.01	0.03	0.02
265 TO 275					5	-0.03	0.02	0.02
275 TO 285					7	0.02	0.02	0.01
285 TO 295					6	0.03	0.02	0.01
295 TO 305					6	0.02	0.03	0.03
305 TO 315								
315 TO 325					7	0.00	0.01	0.01
325 TO 335					2	0.01	0.03	0.04
335 TO 345					6	-0.01	0.01	0.01
345 TO 355					4	-0.02	0.05	0.05
355 TO 5					4	-0.03	0.02	0.02
5 TO 15					6	-0.03	0.04	0.03
15 TO 25					5	-0.05	0.01	0.01
25 TO 35					5	-0.06	0.04	0.03
35 TO 45					6	-0.06	0.02	0.02
45 TO 55					7	-0.06	0.03	0.02
55 TO 65					5	-0.04	0.02	0.02
65 TO 75					4	-0.05	0.02	0.02
75 TO 85					2	-0.06	0.04	0.06
85 TO 95					1	-0.02	0.00	0.00
95 TO 105					6	-0.01	0.02	0.02
105 TO 115					6	-0.02	0.02	0.02
115 TO 125					4	-0.05	0.02	0.02
125 TO 135					6	-0.01	0.02	0.01
135 TO 145					6	0.00	0.01	0.01
145 TO 155					4	-0.00	0.03	0.03
155 TO 165					7	0.01	0.02	0.02
165 TO 175					7	0.01	0.01	0.01
175 TO 185					3	0.01	0.02	0.02

Figure 19. COMPUTE SENSOR ERROR program output (part 27).

LISTING OF ERROR STATISTICS AS A FUNCTION OF BEARING

PER 999A ABC JOAN CATHERINE SS 9999 DATE: 12/25/76 FORACS 7 REPORT NO 888, FIELD 74

17 888742 PER 999A ABC 9

BEARING ERROR PARAMETERS ARE IN ********** * MINUTES * **********

	BEARING ERRORS	RANGE ERRORS
PEAK-TO-VALLEY VARIATION (PVV)	6.20	0.0
MIDPOINT OF PVV (MP)	-0.70	0.0
AVERAGE STANDARD DEVIATION (ASD)	1.44	0.0
PEAK	2.40	0.0
VALLEY	-3.80	0.0
MAXIMUM MEAN ERROR (MME)	-3.80	0.0
AVERAGE STANDARD DEVIATION	1.44	0.0
TOTAL NUMBER OF DATA POINTS	186	0
OVERALL MEAN	-0.84	0.0
OVERALL STANDARD DEVIATION	2.10	0.0
MEDIAN OF ERRORS	-0.60	0.0
NUMBER OF VALID INTERVALS	32	0
WEIGHTED AVERAGE STANDARD DEVIATION	1.40	0.0
AVERAGE OF VALID INTERVAL MEANS	-0.90	0.0
AVERAGE OF VALID INTERVAL ABSOLUTE MEANS	1.44	0.0
MEAN OF ABSOLUTE ERRORS	1.78	0.0

FOR PERISCOPE CALIBRATION, A VALID INTERVAL IS ONE WITH A MINIMUM OF THREE DATA POINTS

FOR THIS PERISCOPE CALIBRATION AND THE PRECEEDING ONE, THESE VALUES ARE OBTAINED

	DEGREES	MINUTES
ALIGNMENT ERROR (AE)	-0.05	-2.75
LOST MOTION (LM)	0.07	4.10

THIS PROGRAM RUN ON 29 SEP 1976 THIS IS SENSOR NUMBER 14

Figure 19. COMPUTE SENSOR ERROR program output (part 28).

ERRORS AS A FUNCTION OF BEARING

PEL ALID 999 99 JOAN CATHERINE SS 9999 DATE: 12/25/76 FORACS 7 REPORT NO 888, FIELD 81

17 888812 PEL ALID 999 99

	RANGE ERRORS				BEARING ERRORS			
BEARING	NUMB	AVG	SD	CONF	NUMB	AVG	SD	CONF
185 TO 195					4	-0.72	0.15	0.15
195 TO 205					9	-0.65	0.14	0.09
205 TO 215					7	-0.68	0.13	0.10
215 TO 225					5	-0.64	0.13	0.12
225 TO 235					6	-0.61	0.05	0.04
235 TO 245					7	-0.48	0.17	0.13
245 TO 255					13	-0.61	0.15	0.08
255 TO 265					3	-0.58	0.06	0.07
265 TO 275					8	-0.60	0.13	0.09
275 TO 285					9	-0.62	0.14	0.09
285 TO 295					8	-0.61	0.18	0.13
295 TO 305					17	-0.67	0.10	0.05
305 TO 315					12	-0.63	0.11	0.06
315 TO 325					6	-0.61	0.18	0.14
325 TO 335					17	-0.51	0.14	0.07
335 TO 345					12	-0.50	0.07	0.04
345 TO 355					8	-0.39	0.17	0.12
355 TO 5					10	-0.39	0.10	0.06
5 TO 15								
15 TO 25								
25 TO 35								
35 TO 45								
45 TO 55								
55 TO 65								
65 TO 75								
75 TO 85								
85 TO 95								
95 TO 105								
105 TO 115								
115 TO 125								
125 TO 135								
135 TO 145								
145 TO 155								
155 TO 165								
165 TO 175								
175 TO 185								

Figure 19. COMPUTE SENSOR ERROR program output (part 29).

LISTING OF ERROR STATISTICS AS A FUNCTION OF BEARING

PEL ALID 999 99 JOAN CATHERINE SS 9999 DATE: 12/25/76 FORACS 7 REPORT NO 888, FIELD 81

17 888812 PEL ALID 999 99

PORT PELORUS

BEARING ERROR PARAMETERS ARE IN ********** * DEGREES * **********

	BEARING ERRORS	RANGE ERRORS
PEAK-TO-VALLEY VARIATION (PVV)	0.34	0.0
MIDPOINT OF PVV (MP)	-0.55	0.0
AVERAGE STANDARD DEVIATION (ASD)	0.13	0.0
PEAK	-0.39	0.0
VALLEY	-0.72	0.0
MAXIMUM MEAN ERROR (MME)	-0.72	0.0
AVERAGE STANDARD DEVIATION	0.13	0.0
TOTAL NUMBER OF DATA POINTS	161	0
OVERALL MEAN	-0.58	0.0
OVERALL STANDARD DEVIATION	0.15	0.0
MEDIAN OF ERRORS	-0.58	0.0
NUMBER OF VALID INTERVALS	17	0
WEIGHTED AVERAGE STANDARD DEVIATION	0.13	0.0
AVERAGE OF VALID INTERVAL MEANS	-0.58	0.0
AVERAGE OF VALID INTERVAL ABSOLUTE MEANS	0.58	0.0
MEAN OF ABSOLUTE ERRORS	0.58	0.0

A VALID INTERVAL IS DEFINED AS HAVING AT LEAST FOUR DATA POINTS

THIS PROGRAM RUN ON 29 SEP 1976 THIS IS SENSOR NUMBER 15

Figure 19. COMPUTE SENSOR ERROR program output (part 30).

ERRORS AS A FUNCTION OF BEARING

PEL ALID 999 99 JOAN CATHERINE SS 9999 DATE: 12/25/76 FORACS 7 REPORT NO 888, FIELD 82

17 888822 PEL ALID 999 99

	RANGE ERRORS				BEARING ERRORS			
BEARING	NUMB	AVG	SD	CONF	NUMB	AVG	SD	CONF
185 TO 195								
195 TO 205								
205 TO 215								
215 TO 225								
225 TO 235								
235 TO 245								
245 TO 255								
255 TO 265								
265 TO 275								
275 TO 285								
285 TO 295								
295 TO 305								
305 TO 315								
315 TO 325								
325 TO 335								
335 TO 345								
345 TO 355								
355 TO 5					2	-0.20	0.28	0.39
5 TO 15					12	-0.44	0.14	0.08
15 TO 25					4	-0.40	0.12	0.12
25 TO 35					4	-0.43	0.09	0.09
35 TO 45					9	-0.24	0.17	0.11
45 TO 55					13	-0.26	0.14	0.08
55 TO 65					8	-0.34	0.19	0.13
65 TO 75					12	-0.24	0.15	0.09
75 TO 85					11	-0.18	0.07	0.04
85 TO 95					7	-0.24	0.11	0.08
95 TO 105					7	-0.30	0.23	0.17
105 TO 115					11	-0.21	0.10	0.06
115 TO 125					4	-0.26	0.05	0.05
125 TO 135					5	-0.13	0.14	0.12
135 TO 145					8	-0.24	0.12	0.08
145 TO 155					9	-0.28	0.19	0.12
155 TO 165					2	-0.31	0.06	0.08
165 TO 175					1	-0.37	0.00	0.00
175 TO 185								

Figure 19. COMPUTE SENSOR ERROR program output (part 31).

LISTING OF ERROR STATISTICS AS A FUNCTION OF BEARING

PEL ALID 999 99 JUAN CATHERINE SS 9999 DATE: 12/25/76 FORACS 7 REPORT NO 888, FIELD 82

17 888822 PEL ALID 999 99

STARBOARD PELORUS

BEARING ERROR PARAMETERS ARE IN ********** * DEGREES * **********

	BEARING ERRORS	RANGE ERRORS
PEAK-TO-VALLEY VARIATION (PVV)	0.31	0.0
MIDPOINT OF PVV (MP)	-0.29	0.0
AVERAGE STANDARD DEVIATION (ASD)	0.14	0.0
PEAK	-0.13	0.0
VALLEY	-0.44	0.0
MAXIMUM MEAN ERROR (MME)	-0.44	0.0
AVERAGE STANDARD DEVIATION	0.14	0.0
TOTAL NUMBER OF DATA POINTS	129	0
OVERALL MEAN	-0.27	0.0
OVERALL STANDARD DEVIATION	0.16	0.0
MEDIAN OF ERRORS	-0.26	0.0
NUMBER OF VALID INTERVALS	15	0
WEIGHTED AVERAGE STANDARD DEVIATION	0.14	0.0
AVERAGE OF VALID INTERVAL MEANS	-0.28	0.0
AVERAGE OF VALID INTERVAL ABSOLUTE MEANS	0.28	0.0
MEAN OF ABSOLUTE ERRORS	0.28	0.0

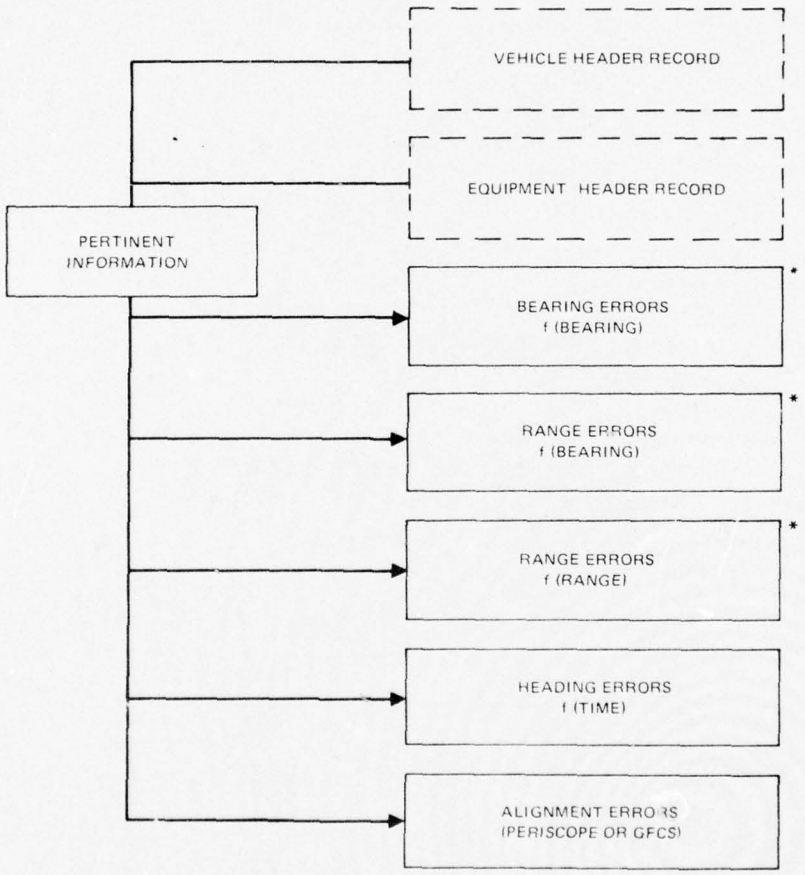
A VALID INTERVAL IS DEFINED AS HAVING AT LEAST FOUR DATA POINTS

THIS PROGRAM RUN ON 29 SEP 1976 THIS IS SENSOR NUMBER 16

Figure 19. COMPUTE SENSOR ERROR program output (part 32).

SUMMARY DATA BANK PROGRAM

The input to this program is the data tape of the COMPUTE SENSOR ERROR program. The program skips the sectored output and transfers selected information from vehicle and equipment header cards to the summarized data records (fig 20). The information transferred by this program consists of the records shown in table 19. Statistical information contained in this data bank includes number of marks, mean or bias, standard deviation, median, peak-to-valley variation, midpoint, average standard deviation, and maximum error. The information shown in table 19 is added to the records shown as tables 13 through 18.



*THESE HAVE THE FOLLOWING STATISTICAL VALUES

- NUMBER OF DATA MARKS
- MEAN OR BIAS
- STANDARD DEVIATION
- MEDIAN
- PEAK-TO-VALLEY VARIATION
- MIDPOINT
- AVERAGE STANDARD DEVIATION
- MAXIMUM ERROR

Figure 20. SUMMARY DATA BANK program output.

TABLE 19. SUMMARY DATA BANK CARD PUNCHING.

Column	Data	Remarks
		GYRO ERROR
65	Type test (ie, WSAT)	Column 78 of Vehicle Header Card
72-80	Equipment designation	Columns 43-42 of Equipment Header Card
		BEARING ERROR
65	Type test	Column 78 of Vehicle Header Card
66	Mode	Sonar or GFCS operational mode. R = RDT 0 = ODT, etc for sonar, T = auto, M = manual, etc for GFCS
67	Modification change	Sonar
68-70	Range scale	In hundreds of yards
71	Adjustment code	Column 71 of Equipment Header Card
72-80	Equipment designation	Columns 34-42 of Equipment Header Card
(Submarine Sonar only)		
72-79	Equipment designation	Columns 30-37 of Equipment Header Card
80	Mode	A = active, P = passive
(ESM only)		
66-67	Equipment designation	Columns 30-31 of Equipment Header Card
		RANGE ERROR
65	Type test	Column 78 of Vehicle Header Card
66	Mode	Sonar or GFCS operational mode. R = RDT, 0 = ODT, etc for sonar; T = auto, M = manual, etc for GFCS
67	Modification change	Sonar
68-70	Range scale	Hundreds of yards
71	Adjustment code	Column 71 of Equipment Header Card
72-80	Equipment designation	Columns 34-42 of Equipment Header Card
(Submarine Sonar only)		
72-79	Equipment designation	Columns 30-37 of Equipment Header Card
80	Mode	A = active, P = passive, T = two track From column 49 of Equipment Header Card

TABLE 19. (Continued)

Column	Data	Remarks
	PERISCOPE ALIGNMENT AND LOST MOTION	
65	Type test	Column 78 of Vehicle Header Card
72-80	Equipment designation	Columns 31-42 of Equipment Header Card
	PERISCOPE BENCHMARK ALIGNMENT	
65	Type test	Column 78 of Vehicle Header Card
72-80	Equipment designation	Columns 34-42 of Equipment Header Card
	GUN FIRE CONTROL BENCHMARK CHECKS	
65	Type test	Column 78 of Vehicle Header Card
66	Mode	
72-80	Equipment designation	Columns 34-42 of Equipment Header Card

LIST AND PLOT PROGRAM

This program is used to generate listings and plots for summary reports. It makes use of a deck of control cards for each equipment to identify data to be selected, to provide title and/or heading information, to list performance standards for the equipment, and to provide formatting information for printing and plotting. Figure 21 is a sample listing and figure 22 are sample plots.

The cumulative graphs show the data for the current period plotted as individual points, and the background data plotted as a line segment. The abscissa is a continuous scale representing one of the error parameters. The ordinate is a continuous scale representing cumulative percentage (ie, the parameter having the largest magnitude falls at one hundred percent on the ordinate).

The modified bar graphs show the data for the current period plotted as individual points, and the background data plotted as vertical bars. As before, the abscissa represents one of the error parameters, but is broken into discrete intervals. For the background data, the ordinate is a continuous scale representing percentage. A vertical bar plotted over an interval shows the percentage of background data falling in that interval. For current period data, the ordinate is broken into discrete points, and is dimensionless. Each point plotted over an interval represents one error value falling in that interval.

TYPE TYPE SONAR 10.0 K RANGE SCALE PLOT TITLE IS TYPE 4

SONAR TYPE, SONAR READOUT, SONAR MODE - BEARING DATA

RANGE REPORT	S H I P	N A M E	CLASS	NUMB		PVV			PASSED	CUML	SEQUENCED
	INTERIM STANDARD FOR THIS SENSOR IS					2.50	2.5	3			
1	639	ANY SHIP	HULL NO.	(P)		1.60	1.6	2	IN	IN	1.19
5	159	ANY SHIP	HULL NO.	(A)		1.24	1.2	1	IN	IN	1.24
						1.97	2.0	2	IN	IN	1.32
2	555	ANY SHIP	HULL NO.	(A)		1.68	1.7	2	IN	IN	1.47
1	636	ANY SHIP	HULL NO.	(P)		1.47	1.5	2	IN	IN	1.60
1	639	ANY SHIP	HULL NO.	(P)		1.19	1.2	1	IN	IN	1.69
1	643	ANY SHIP	HULL NO.	(P)		2.44	2.4	2	IN	IN	1.79
3	313	ANY SHIP	HULL NO.	(P)		1.75	1.8	2	IN	IN	1.97
						2.47	2.5	3	IN	IN	2.44
1	637	ANY SHIP	HULL NO.	(P)		1.32	1.3	1	IN	IN	2.47

AVERAGE OF NEW DATA 1.71 NUMBER OF POINTS IS 10
AVERAGE OF OLD DATA 1.84 NUMBER OF POINTS IS 40

OVERALL AVERAGE 1.81 NUMBER OF POINTS IS 50

NEW DATA	SUMMARY	OLD DATA
10	SYSTEMS CHECKED	40
10	NUMBER IN	36
0	NUMBER OUT	4
100	PERCENT IN	90
0	INVALID POINTS	0

CUMULATIVE RESULTS

10	SYSTEMS CHECKED	40
10	NUMBER IN	36
0	NUMBER OUT	4
100	PERCENT IN	90
0	INVALID POINTS	0

Figure 21. LIST AND PLOT listing (part 1).

TYPE TYPE SONAR 10.0 K RANGE SCALE PLOT TITLE IS TYPE 5

SONAR TYPE, SONAR READOUT, SONAR MODE - BEARING DATA

RANGE	REPORT	S H I P N A M E	CLASS	NUMB		MID PVV			PASSED	CUML	SEQUENCED
		STANDARD FOR THIS SENSOR IS				0.40	0.4	0			
1	639	ANY SHIP	HULL NO.	(P)		0.05	0.1	0	IN	IN	0.01
5	159	ANY SHIP	HULL NO.	(A)		-0.34	-0.3	-0	IN	IN	0.03
						-0.17	-0.2	-0	IN	IN	0.17
2	555	ANY SHIP	HULL NO.	(A)		1.36	1.4	1	OUT	OUT	0.17
1	636	ANY SHIP	HULL NO.	(P)		0.29	0.3	0	IN	IN	0.25
1	638	ANY SHIP	HULL NO.	(P)		0.35	0.4	0	IN	IN	0.29
1	643	ANY SHIP	HULL NO.	(P)		0.25	0.3	0	IN	IN	0.34
3	313	ANY SHIP	HULL NO.	(P)		-0.63	-0.6	-1	OUT	OUT	0.35
						-0.01	-0.0	-0	IN	IN	0.63
1	637	ANY SHIP	HULL NO.	(P)		0.17	0.2	0	IN	IN	1.36

AVERAGE OF NEW DATA 0.13 NUMBER OF POINTS IS 10
AVERAGE OF OLD DATA 0.18 NUMBER OF POINTS IS 40

OVERALL AVERAGE 0.17 NUMBER OF POINTS IS 50

NEW DATA SUMMARY OLD DATA

10	SYSTEMS CHECKED	40
2	NUMBER IN	22
2	NUMBER OUT	18
50	PERCENT IN	55
0	INVALID POINTS	0

CUMULATIVE RESULTS

10	SYSTEMS CHECKED	40
8	NUMBER IN	20
2	NUMBER OUT	20
80	PERCENT IN	50
0	INVALID POINTS	0

Figure 21. LIST AND PLOT listing (part 2).

```
TYPE TYPE      SONAR   10.0 K RANGE SCALE  PLOT TITLE IS TYPE  6

SONAR TYPE, SONAR READOUT, SONAR MODE - BEARING DATA


RANGE REPORT      S H I P   N A M E   CLASS  NUMB          AVG STD                PASSED   CUML   SEQUENCED
        INTERIM STANDARD FOR THIS SENSOR IS              0.70      0.7      1
                                                        --------  -------  ------

  1     639                ANY SHIP  HULL NO.   (P)     0.55      0.6      1      IN       IN       0.38

  5     159                ANY SHIP  HULL NO.   (A)     0.40      0.4      0      IN       IN       0.39
                                                         0.38      0.4      0      IN       IN       0.40

  2     555                ANY SHIP  HULL NO.   (A)     0.55      0.6      1      IN       OUT      0.48

  1     636                ANY SHIP  HULL NO.   (P)     0.48      0.5      1      IN       IN       0.48

  1     638                ANY SHIP  HULL NO.   (P)     0.60      0.6      1      IN       IN       0.48

  1     643                ANY SHIP  HULL NO.   (P)     0.56      0.6      1      IN       IN       0.55

  3     313                ANY SHIP  HULL NO.   (P)     0.39      0.4      0      IN       OUT      0.55
                                                         0.48      0.5      1      IN       IN       0.56

  1     637                ANY SHIP  HULL NO.   (P)     0.48      0.5      1      IN       IN       0.60

AVERAGE OF NEW DATA     0.49      NUMBER OF POINTS IS   10
AVERAGE OF OLD DATA     0.51      NUMBER OF POINTS IS   40

OVERALL AVERAGE     0.50      NUMBER OF POINTS IS   50

NEW DATA    SUMMARY    OLD DATA

    10  SYSTEMS CHECKED     40
    10     NUMBER IN        39
     0     NUMBER OUT        1
   100     PERCENT IN       98
     0   INVALID POINTS      0

     CUMULATIVE RESULTS

    10  SYSTEMS CHECKED     40
     8     NUMBER IN        20
     2     NUMBER OUT       20
    80     PERCENT IN       50
     0   INVALID POINTS      0
```

Figure 21. LIST AND PLOT listing (part 3).

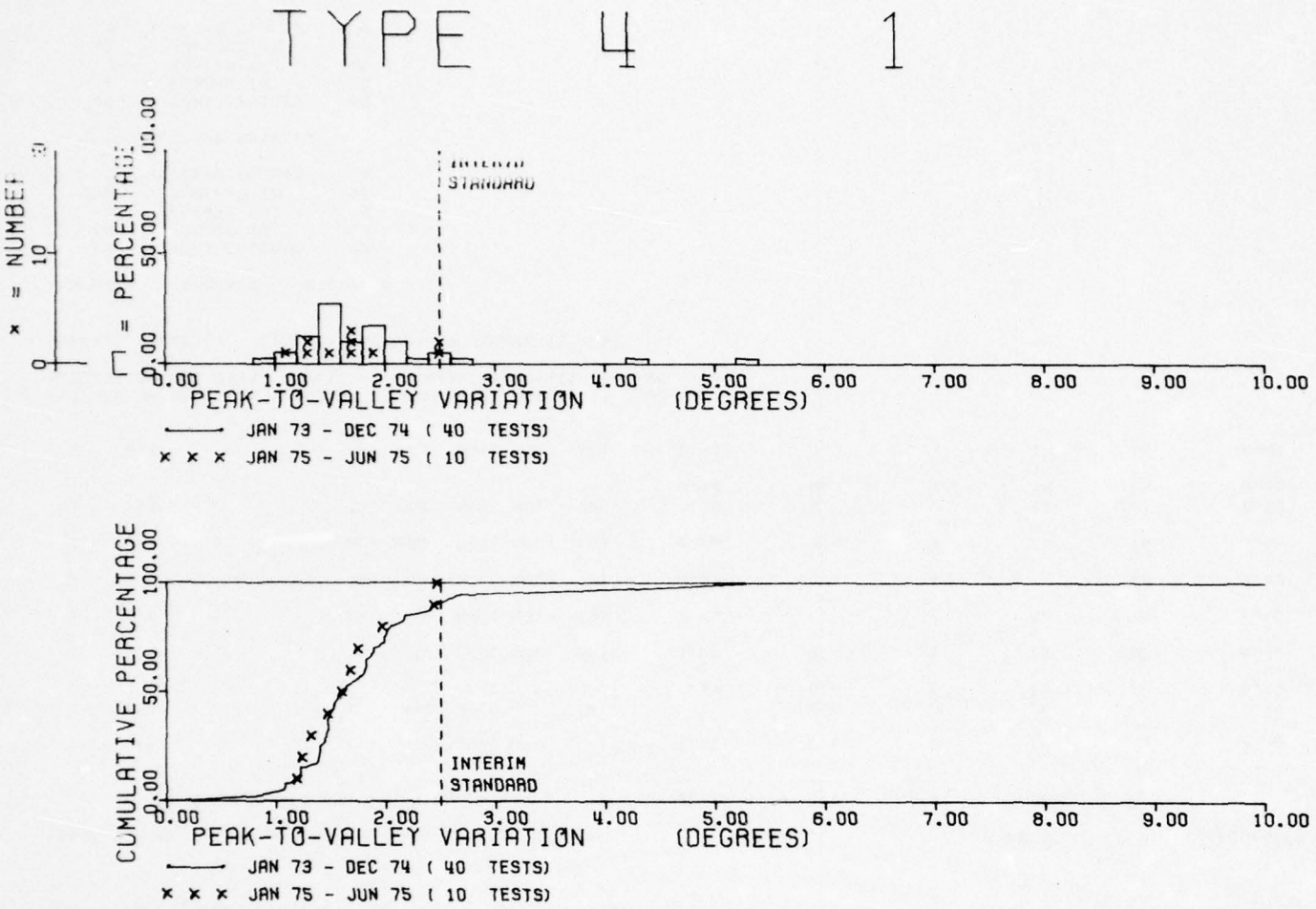


Figure 22. LIST AND PLOT sample plots (part 1).

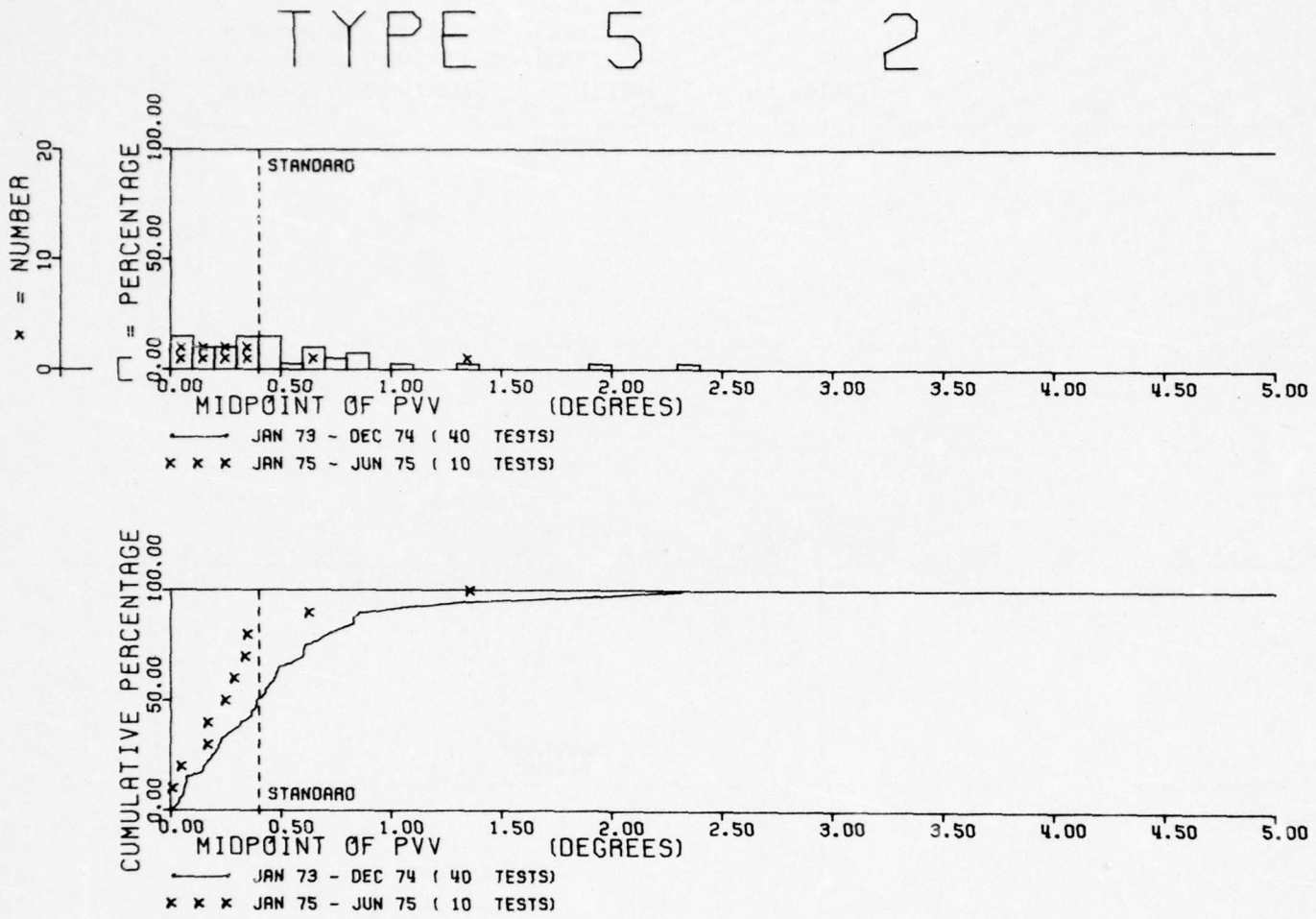


Figure 22. LIST AND PLOT sample plots (part 2).

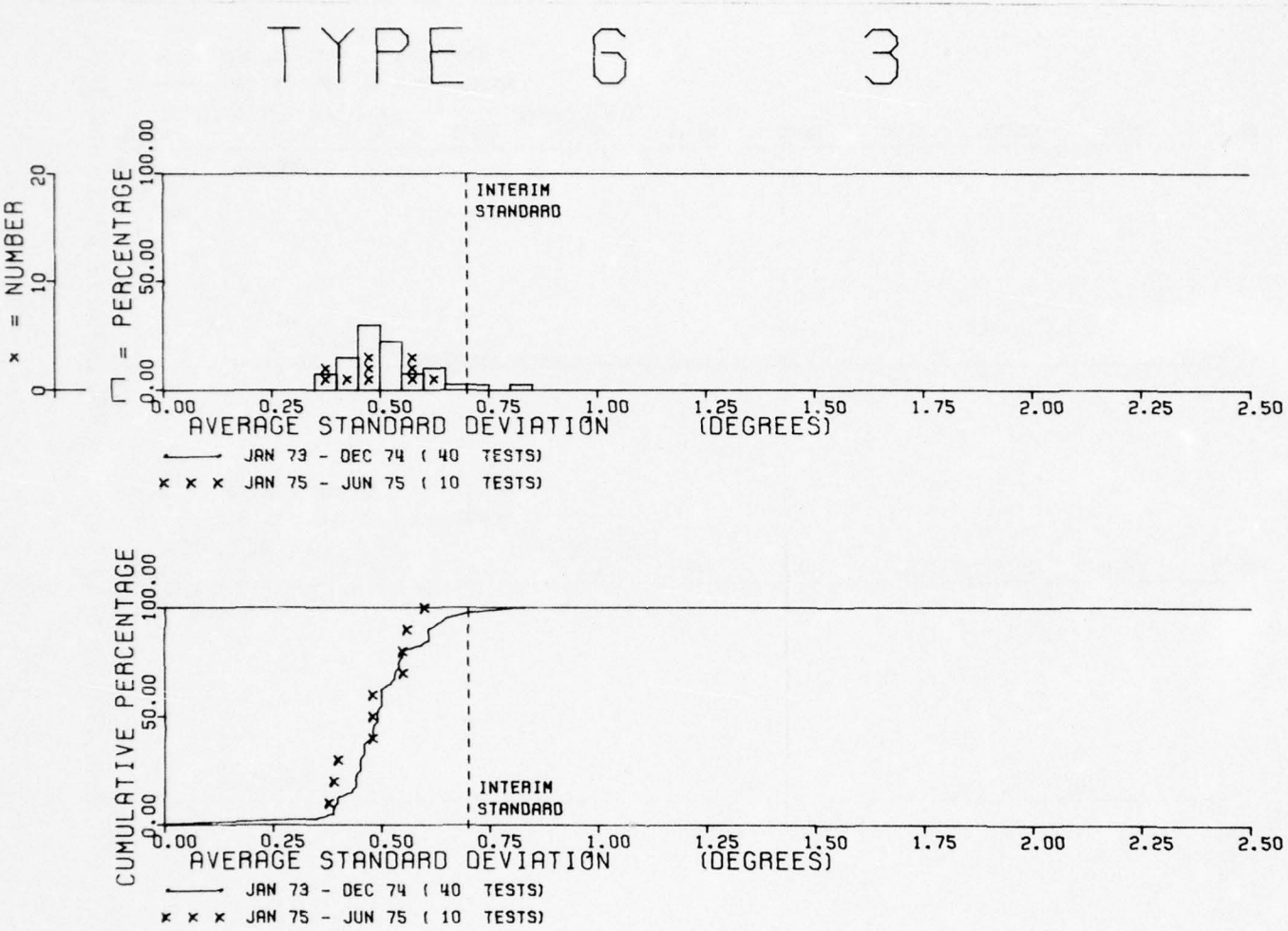


Figure 22. LIST AND PLOT sample plots (part 3).

OTHER PROGRAMS

Other programs in the NELC FORACS library include those that can regenerate any plot, list any portion of any tape, and extract information from vehicle header cards to generate a file of range activity. Other information which can be extracted includes data on selected ships, particular sensors, and range activity by period. Sorts may be made by country and any information on vehicle or equipment header records can be transferred to tape for further analysis. Another program used for analysis is the "COMPOSITE CURVE" program.

COMPOSITE CURVE PROGRAM

For each ten-degree bearing sector of each sensor the sensor data bank contains the number of error samples, the sum of these errors, and the sum of the squared errors. From these data, a mean and standard deviation for each bearing sector may be computed.

The COMPOSITE CURVE program permits the combined processing of many sensors to compute a single mean and standard deviation for each ten-degree bearing sector. This program outputs a listing and a plot for each set of sensors which are processed. The listing identifies each sector, the total number of points in the sector, the mean error for the sector and the standard deviation of the data in that sector. The plot shows the mean of each sector and the plus or minus one standard deviation value plotted about the mean. Figure 23 is a sample listing and figure 24 is a sample plot.

SECTOR	NUMBER	AVERAGE	STD. DEV.
-170	0	0.00	0.00
-160	0	0.00	0.00
-150	0	0.00	0.00
-140	7	2.41	1.54
-130	11	-0.15	0.21
-120	53	0.21	0.75
-110	139	0.37	0.92
-100	136	0.58	0.72
-90	124	0.50	0.87
-80	120	0.45	0.90
-70	131	0.50	0.93
-60	121	0.43	0.97
-50	125	0.45	0.85
-40	150	0.48	0.75
-30	117	0.31	0.71
-20	148	0.34	0.77
-10	183	0.50	0.75
0	232	0.46	0.77
10	155	0.47	0.69
20	140	0.53	0.80
30	137	0.45	0.72
40	141	0.46	0.96
50	146	0.61	1.04
60	147	0.61	1.00
70	142	0.51	0.85
80	148	0.66	0.80
90	130	0.57	0.81
100	125	0.42	0.87
110	154	0.56	0.81
120	66	0.71	0.83
130	13	0.19	0.44
140	13	-2.26	0.74
150	0	0.00	0.00
160	0	0.00	0.00
170	0	0.00	0.00
180	0	0.00	0.00

Figure 23. COMPOSITE CURVE plot listing.

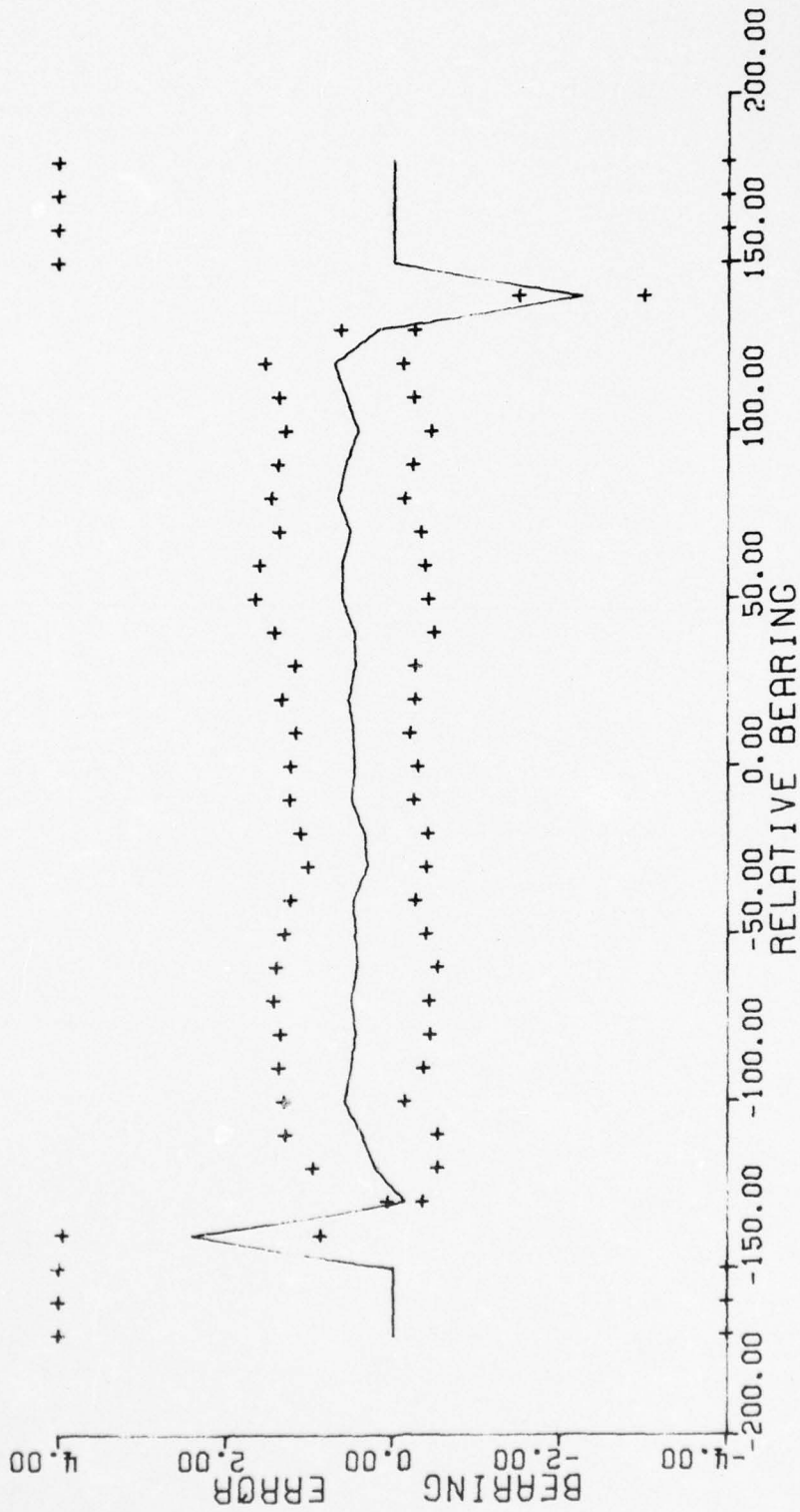


Figure 24. COMPOSITE CURVE plot.

END
2-77