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IN-SITU FIELD DATA GATHERING STATIONS, SAN FRANCISCO BAY-DELTA:--ETC(U)
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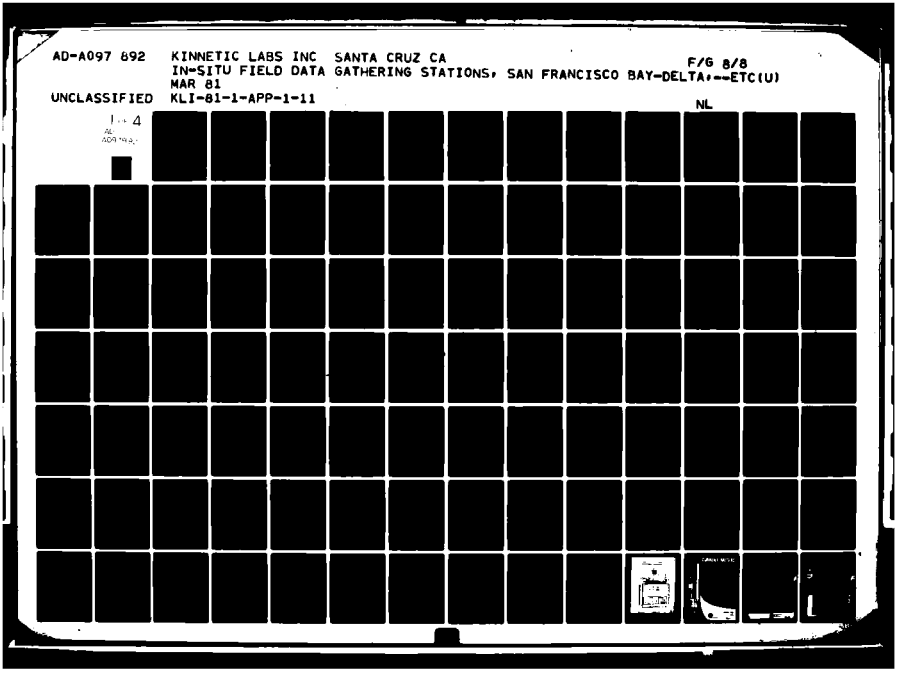

IN-SITU FIELD DATA GATHERING STATIONS SAN FRANCISCO BAY-DELTA, SALINITY INTRUSION WITH NAVIGATION CHANNELS.

Contract No. DACW07-78-C-0049

FINAL REPORT.

APPENDICES 1-11

To: Department of the Army
San Francisco District, Corps of Engineers
211 Main Street
San Francisco, California 94105

KLI-81-1-APP. 1-11
16 January 1981
Revised 18 March 1981

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APPENDIX 1

Scope of Services

Contract No. DACW07-78-C-0049

SCHEDULE "A"

SCOPE OF SERVICES

1. Obligation of the Contractor. The Contractor shall: (a) install and maintain instrumentation suitable for gathering prototype data on San Francisco Bay-Delta; (b) develop the necessary software to convert the data into the specified form as set forth in paragraph 3; (c) furnish documentation of required computer programs; and (d) furnish the results to the Government in the form and at the times set forth below, and furnish all necessary personnel, facilities, equipment, materials and transportation to perform the work described herein in a professional manner. His representatives shall be available to meet with Government personnel at checkpoints and at other times as requested by the Contracting Officer. The Contractor shall perform his services in accordance with this Schedule and the General Provisions. He shall make appropriate use of information furnished by the Government.

2. Obligation of the Government. Government personnel will be available for advice and comments on all work under this contract. They will meet with the Contractor at the checkpoints to discuss his progress and to give guidance. Any comment, advice and/or guidance given by Government personnel will be to assist the Contractor in performing his work and will not change his scope of services or release the Contractor from performing all work required hereunder unless written notification of such, signed by the Contracting Officer, is received by the Contractor.

3. Description of the Work. The purpose of prototype data acquisition under this study is to obtain a quantitative, detailed, data base on salinity, temperature and turbidity variants with tides and currents. The information will be used to evaluate the "noise" and short and long term response time of the prototype and the results of physical model tests. The data by itself will serve as a historic hydrodynamic model of Carquinez Strait. Two types of stations are to be installed: detailed in-situ stations and limited in-situ stations.

The detailed in-situ stations will observe at three levels in the water column (near surface, mid-depth and near bottom) the following parameters: current velocity (magnitude and direction), salinity (from electrical conductivity), temperature, and turbidity (percent transmission). Information of tidal elevation will be obtained using a pressure sensor in the water column. Sample interval will be thirty minutes over a two-year period. Station locations are:

			Longitude	Latitude
a.	Suisun Bay at Chipps Island	Pile "27"	121°55'59"	38°03'06"
b.	Suisun Bay at Port Chicago	Pile "17"	122°01'12"	38°03'46"
c.	Suisun Bay above Benicia Br.	Pile "6"	122°06'32"	38°02'33"
d.	Carquinez Strait	Pile "20"	122°11'39"	38°03'15"
e.	San Pablo Bay	Pile "9"	122°21'04"	38°02'32"

A limited in-situ station shall be installed to record mid-depth salinity, turbidity, and temperature at the following location:

		Longitude	Latitude
a.	Grizzly Bay	122°02'19"	38°07'04"

Exact station locations and installation shall be cleared with the Coast Guard.

For the above instrumentation, the precision of parameter measurements shall be:

a. Tidal stage ($\pm$ 1 cm MLLW 10 sec. sample)

b. Currents (magnitude $\pm$ 0.05 m/s and direction $\pm$ 5°)

c. Electrical conductivity corresponding to salinities of one to twenty-five parts per thousand (0.02 millimho/cm)

d. Temperature $\pm$ 0.1°C

e. Turbidity (optical transmissibility) $\pm$ 2% full scale

The government will furnish the necessary electronic data-gathering and recording equipment. The Contractor shall furnish all mechanical equipment necessary for proper field installation. He shall also obtain mooring insurance on the government-furnished equipment. He shall maintain all equipment in operating condition so that specifications are met. Contractor shall safeguard government equipment in his care and shall report the use of spare parts in his monthly report and shall return the spares or their substitutes at the completion of this contract.

Data from the detailed stations shall be collected on tape and computer reduced by the Contractor using government-furnished computer (LBL) as follows:

a. Tidal Elevation.

(1) For each station, plot filtered data versus time

(2) For HH, LH, HL and LL, plot elevations versus time versus distance

(3) For HH, LH, HL, and LL, plot time lag versus time versus distance.

b. Currents.

(1) For each station and each depth plot data versus time.

(2) For each station and slack, maximum ebb and maximum flood, plot vertical lag time versus time.

(3) For each depth and slack, maximum ebb and maximum flood, plot lag time between stations versus time.

c. Salinity.

(1) For each station and each depth, plot data versus time.

(2) For each depth, plot salinity versus distance versus time.

(3) For each station, plot salinity versus depth versus time.

d. Temperature.

(1) For each station and each depth, plot data versus time.

(2) For each depth, plot temperature versus distance versus time.

(3) For each station, plot temperature versus depth versus time.

e. Turbidity.

(1) For each station and each depth, plot data versus time.

(2) For each depth, plot turbidity versus distance versus time.

(3) For each station, plot turbidity versus depth versus time.

(4) Plot turbidity versus salinity.

Data from the limited station shall be collected on tape and computer reduced by the Contractor as follows:

a. Salinity - plot data versus time.

b. Temperature - plot data versus time.

c. Turbidity - plot data versus time.

The maximum data gap shall not exceed one month for any one station. Total down time during the period of observation shall not exceed 30 days per year.

4. Checkpoints.

Checkpoint 1	Details for station installation including location, support systems, instrumentation, calibration procedures and data reduction.
Checkpoint 2	Report of installation completion including description of sites, stations, instrumentation, data reduction format (tape layout), users manual, and calibration reports.
Checkpoint 3 thru 14	Monthly reporting of data with edited computer reduction plots in microfiche, and raw and reduced data on tapes.
Checkpoint 15	Final Report, including complete data reduction for the period of installation, and final user's manual for the data reduction programs.

5. Period of Services and Reports. The Contractor shall perform the work to obtain data for a one-year period. The raw and reduced data for each month and twenty copies of the specified plots in microfiche form shall be delivered to the Government within fifteen days after the end of each month. The raw data shall be delivered to the Government in the following form:

a. 9-track, 800 bpi tape, ASCII.

b. Tape shall be blocked 12 80-character records per block, even parity.

c. The first tape record will be a header containing the following information: an identifying label of 1-10 characters; data and time (GMT) of first sampling on the tape; date and time (GMT) of the last sampling; number of tapes in month's submittal, sequence number of reel, if a multi-reel submittal, and the number of records on the reel.

d. Each record will represent one data sampling and will contain at least a station ID, data and time (GMT) of sampling, current magnitude in cm/sec, current direction, salinity to tenths in parts per thousand, temperature, turbidity, and tidal stage in centimeters.

e. One month of data per tape.

The schedule for checkpoints commencing with the notice to proceed is as follows:

Checkpoint 1 - 15 Calendar Days

Checkpoint 2 - 45 Calendar Days

Checkpoints 3-14 - Monthly starting 45 days after Checkpoint 2

Checkpoint 15 - 430 Calendar Days

A final report will be submitted 430 days after the notice to proceed. The final report will discuss instrumentation at the sites and present composite plots of the two years of data. The final report will be typed single spaced on 8x10-1/2 inch sheets. Illustrations shall be computer plots, paper or microfiche, suitable for reproduction.

Optional Services.

I. The government may, at its option, authorize the Contractor to attempt recovery in the event of loss or damage to government equipment. If this option is exercised, the Contractor shall search and recover such items as may be found within a two-day search.

II. If the equipment is recovered in operating condition, the government may, at its option, authorize reinstallation of the equipment. Should it exercise this option, the Contractor shall perform such reinstallation.

III. If the equipment is not recovered in operating condition, the government may, at its option, authorize repair or replacement, and should it exercise this option, the Contractor shall pay for the cost of such repair or replacement and reinstall the equipment.

IV. The government may elect to extend the period of services another year by giving notice to the Contractor at least 90 calendar days before checkpoint 14. If this option is exercised, the checkpoint definitions and schedules will be modified by changing "Checkpoints 3-14" to read "Checkpoints 3-26," "Checkpoint 15" to read "Checkpoint 27," and "430" days to read "795" days.

Payment for optional services shall be as stated in article 4, Compensation to the Contractor.

APPENDIX 2

Field Data Sheet Forms

CORPS OF ENGINEERS PROJECT DACW07-78-C-0049
SAN PABLO - CHIPPS ISLAND
GROUND TRUTH DATA SHEET

In use from February 1979 to February 1980

STATION(spell out):_____ STATION NO.:_____

CALIFORNIA
CALENDAR DATE: MONTH(spell out):_____ DAY_____YEAR_____

(leave blank)

CALIFORNIA ARRIVAL TIME:_____

DEPARTURE TIME:_____

RECORDER'S SIGNATURE:_____

PURPOSE OF STATION VISIT:

1) Visual Inspection ☐ 2) Instrument Check ☐
3) Tape Change ☐ 4) Battery Change ☐
5) Damage Repair ☐ 6) Other ☐ :_____

PHYSICAL DATA: _____

DIRECTION TOWARD WHICH CURRENT IS FLOWING (degrees magnetic):_____

TIME:_____ EBB OR FLOOD?:_____

FLOW METER READINGS (start):_____(end):_____

FLOW METER TIMES (in water):_____ (out of water):_____

(leave blank)

COMMENTS ON CURRENT:_____

BUCKET TEMPERATURE ^{o}C:_____

SALINITY BOTTLE NUMBER:_____

(leave blank)

REMARKS (problems with equipment, etc.):

REVISED FORM--In use
from February-July 1980

CORPS OF ENGINEERS PROJECT DACW07-C-0049
SAN PABLO - CHIPPS ISLAND
GROUND TRUTH DATA SHEET

INITIAL_____

STATION (spell out):_____STATION NO._____

CALIFORNIA
CALENDAR DATE: MONTH (spell out):_____ DAY_____ YEAR_____

(leave blank)

CALIFORNIA ARRIVAL TIME:_____DEPARTURE TIME:_____

TASKS ACCOMPLISHED ON THIS STATION VISIT:_____

_____

PHYSICAL DATA:

DIRECTION TOWARD WHICH CURRENT IS FLOWING (degrees magnetic):_____

TIME:_____EBB OR FLOOD?:_____

FLOW MTR REVS (start):_____(end):_____(diff):_____

FLOW MTR TIME (in water):_____(out):_____(diff):_____

REVS/MIN:_____SPEED:_____

COMMENTS ON CURRENT:_____

BUCKET TEMPERATURE °C:_____

SALINITY BOTTLE NUMBER:_____ FIELD SALINITY:_____

(leave blank)

REMARKS (problems with equipment, etc.):

In use from
February 1979 -
February 1980

CORPS OF ENGINEERS PROJECT DACW07-78-C-0049

SAN PABLO - CHIPPS ISLAND

DATA LOGGER CHECK SHEET

STATION (spell out) _____ * STATION NUMBER * _____

CALIFORNIA
CALENDAR DATE: MONTH (spell out) _____ * DAY _____ * YEAR _____ *

CALIFORNIA ARRIVAL TIME _____

DEPARTURE TIME _____

(leave blank)

RECORDER'S SIGNATURE _____

TASKS ACCOMPLISHED ON THIS STATION VISIT

1) Visual Inspection ☐ 2) Instrument Check ☐
3) Tape Change ☐ 4) Battery Change ☐
5) Damage Repair ☐ 6) Other _____

INTERROGATION VALUES

	ZERO	+BATT	-BATT	+ID	V_x	V_y	DIR	-ID/DEPTH	C	T	Tr
PROBE 1 (top)											
PROBE 2 (mid)											
PROBE 3 (bottom)											

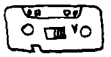
INTERROGATION TIME _____

TIME METERS OUT OF WATER: Probe 1 _____ Probe 2 _____ Probe 3 _____

TIME OLD CASSETTE REMOVED _____

OLD CASSETTE LABEL:* C E [ ][ ] . [ ] ← write A or B

↑Station Number (2 digits) ↑ Start Month (2 digits)

IS NEW TAPE IN CORRECTLY?  ☐ DID YOU WRITE THE CORRECT INFORMATION ON BOTH TAPE CASSETTES? * ☐ DID YOU CLOSE THE LATCH? ☐

TIME RECORDER RESET _____

TIME ALL METERS SUBMERGED: Probe 3 _____ Probe 2 _____ Probe 1 _____

IF YOU HAVE SEEN THE TAPE ADVANCE, PLEASE NOTE TIME AND DATE (spell month):

_____

REMARKS (problems with equipment, etc.):

REVISED FORM--In use from February - July 1980

CORPS OF ENGINEERS PROJECT DACW07-78-C-0049

SAN PABLO - CHIPPS ISLAND

DATA LOGGER CHECK SHEET

INITIAL_____

STATION (spell out)_____* STATION NUMBER*_____

CALIF. CALENDAR DATE: MONTH (spell out)_____* DAY_____* YEAR_____*

CALIF. ARRIVAL TIME_____ DEPARTURE TIME_____

(leave blank)

TASKS ACCOMPLISHED ON THIS STATION VISIT:_____

INTERROGATION VALUES

	MTR#	+ID	V_x	V_y	DIR	R	θ	-ID/DP	C	T	TURB
TOP											
MID											
BOT											

OLD BATTERY + -	BM TO DPTH	BM TO WL	DPTH	DK DPTH	CALC SALT
NEW BATTERY + -					top bot

INTERROGATION TIME_____

TIME METERS OUT OF WATER: Probe 1_____ Probe 2_____ Probe 3_____

TIME OLD CASSETTE REMOVED_____

OLD CASSETTE LABEL:* CE [ ] [ ] . [ ] ← write A or B

Station Number (2 digits) Start Month (2 digits)

IS NEW TAPE IN CORRECTLY? [ ] DID YOU WRITE THE CORRECT INFORMATION ON THE CASSETTE AND DID YOU CLOSE THE LATCH? [ ]

TIME RECORDER RESET_____

TIME ALL METERS SUBMERGED: Probe 3_____ Probe 2_____ Probe 1_____

IF YOU HAVE SEEN THE TAPE ADVANCE, PLEASE NOTE TIME AND DATE (SPELL MONTH):_____

REMARKS (PROBLEMS WITH EQUIPMENT, ETC.):

CLOCK READING:_____ TIME OBSERVED:_____

CORPS OF ENGINEERS PROJECT DACW07-78-0049

SAN PABLO BAY - CHIPPS ISLAND

NOTICE OF INSTRUMENT CHANGE OR DATA INTERRUPT

DATE:

STATION:

INSTRUMENT PACKAGES INVOLVED:

DATE OF CHANGE:

NATURE OF CHANGE OR DATA INTERRUPT (INCLUDE ALL TIMES):

APPENDIX 3

Summaries of Project and Field Activities

Summaries of Project and Field Activities

In-Situ Field Data Gathering Stations,
San Francisco Bay/Delta Salinity
Intrusion with Navigation Channels
(Contract DACW07-78-C-0049)

15 December 1978 - InterOcean monitoring equipment received in Santa Cruz.

18 December 1978 - Unpacked equipment.

19 December 1978 - Initial equipment checkout and station assignment - results: found one meter (SN 6271004, top meter, Port Chicago) with a non-functional compass and one (SN6271012, top meter, Chipps Island) with intermittent problems with all sensors.

20 December 1978 - InterOcean Systems, Inc. sent electronic engineer to aid in meter testing. He fixed a loose connection in meter SN6271004 to fix compass problem and meter SN6271012 would not malfunction as before. A short test was run during the day of each station system--results showed everything was fine. A long-term test was set up for each station system.

27 December 1978 - Each current meter system was tested to check definition of V_x and V_y relative to orientation marks found on the meter. The results showed that only one meter had probe oriented as defined in the literature; the rest were opposite. The one meter (SN6271001) was altered (KLI personnel) to read consistently with the others.

Another test was conducted to check each of the recorders--all tested satisfactorily.

2 - 25 January 1979 - The original tow tank data compiled by InterOcean Systems had never been delivered to the Corps or KLI, so during this time numerous calls between KLI, the Corps, and InterOcean were made. Current meter performance data variations were never made clear by InterOcean, and KLI was reluctant to install the meters until it was certain that all equipment met the project specifications. Late in this time period, tow tank tests (conducted 9 - 10 December 1978) results were delivered, and it was determined that 3 meters (SN's 6271004, 6271014, and 6271017) were not within specs. Since InterOcean Systems would not retow the meters, KLI arranged to retow the meters at its own expense at Berkeley.

During this time period, the tape reader was received in Santa Cruz from InterOcean Systems, Inc. After successfully mating the reader to the computer, it was found that it would not read tapes which had been previously read at InterOcean. The reader was then returned to San Diego where it was discovered that the tape read head had been misaligned. After receipt back in Santa Cruz, tapes were then successfully translated. It was noticed, however, that interrupts in tape reading with accompanying data shifts happened at irregular intervals. InterOcean claimed this was normal and no more repairs were carried out.

26 January 1979 - A final checkout of all meters was carried out. All systems seemed OK in air except one, SN 6271012, the same one found to have intermittent problems during the initial checkout but not since then. Since no operation manuals had ever been received from InterOcean and none of their personnel was available to fix the problem, it was necessary to troubleshoot the problems by phone. The problem was finally located as a bad voltage regulator board. It was replaced with the spare board which had been supplied with the spares package and everything checked out fine.

31 January 1979 - Conducted tow tank tests at Berkeley with the meters listed above and with recorder #6330225. Results showed only 2 of the 3 meters were recorded, except for the very first record when all 3 meters were recorded. Of the records available, little to no improvement over the data provided by InterOcean was evident.

It was also noted during the tow tank tests using the surface readout, that the turbidity readings of each meter was greater than 100%, one reading 123%.

1 February 1979 - Each meter was tested for turbidity in a tank of tap water. All meters except one (SN 6271001) were found to be off; the range was 92 - 124% with most meters over 100%.

2 February 1979 - Since InterOcean would not travel to Santa Cruz to recalibrate the turbidity sensors, KLI personnel opened each pressure case and recalibrated each meter using distilled water.

2 - 5 February 1979 - Since one meter did not record during the tow tank tests, a test was set up using the 3 meters and the recorder used on tow tests. Using the same data acquision rate to be used during actual data collection on two different recorders, it was found there was no problem. The problem noted during the tow tests was then assumed to have been caused by the extensive turning on and off of the recorder between tows.

It was noted, however, that recorder #6330228 (that assigned to the Benicia-Martinez Bridge Station) would give variable data recording lengths upon reset. The spare recorder was then substituted for that station, and the faulty recorder returned to InterOcean for repair.

6 February 1979 - Each recorder was checked again for cycling - all except that noted above checked out fine. The Operation manuals arrived from InterOcean Systems.

7 February 1979 - Unsuccessful attempt to install San Pablo station.

8 February 1979 - San Pablo Bay station installed.

9 February 1979 - Benicia-Martinez Bridge and Grizzly Bay stations installed.

14 February 1979 - Carquinez Straits, Port Chicago, and Chipps Island stations installed.

28 February 1979 - First scheduled bi-monthly "fly-by" service. Changed tapes at all stations and did meter by meter checkout using surface readout system. All checked out fine except the depth sensors at San Pablo and Chipps Island were reading much shallower depths than possible. It was assumed that these were defective.

2 March 1979 - San Pablo station was revisited, the meters pulled up and the bottom sensor (SN 6271019, I.D. 0.9v) replaced with the spare meter on hand (SN 6271015, I.D. 1.1v). The defective sensor was shipped back to InterOcean for repair.

9 March 1979 - Received back repaired meter from InterOcean and replaced bottom sensor at Chipps Island (SN 6271020, I.D. 1.6v) with the repaired meter (SN 6271019, I.D. 0.9v). Returned the defective meter to InterOcean for repair.

19 March 1979 - First day of first scheduled monthly service trips to each station. Visited San Pablo station, pulled all meters, replaced badly corroded sacrificial zincs on all meters, cleaned turbidity sensors, and checked depth sensor on bottom meter. The turbidity sensors on all meters were noted to be defective upon surface checkout after reinstallation.

Went to Carquinez Straits station and pulled all sensors. Since the cable and tensioning turnbuckle in the mooring had been noted to be corroding, the whole assembly was changed (all moorings are now heavily zinced). Upon reinstallation of the meters, the depth sensor on the bottom meter was reading too high as noted for the other defective meters.

20 March 1979 - Full monthly service carried out on Benicia-Martinez Bridge station - all was fine. Also full monthly service carried out on the Port Chicago station. Everything

checked out fine except that the recorder would not initiate a new record when the reset switch was flicked. The spare recorder was exchanged for the faulty one. Also the depth sensor showed signs of having the same problem as noted earlier for other stations.

The stations at Grizzly Bay and Chipps Island had tape and battery changes only.

21 March 1979 - Since so much trouble was being noted with equipment, a technician was ordered from InterOcean to fix the defective equipment in the field. InterOcean complied and sent a man late on 20 March 1979. He then accompanied the field crew on 21 March 1979. The Port Chicago station was raised and the defective meter (SN 6271018, I.D. 1.2v) replaced by the meter which had been shipped to InterOcean and had come back up with the technician (SN 6271020, I.D. 1.6v). All checked out fine using the surface readout system after reinstallation. The problems with the depth sensors turned out to be improperly tightened fittings inside the instrument. This allowed leakage of the very viscous silicon fluid which fills the sensor after the sensor was underwater. The pipe fittings had not been wrapped with teflon tape nor tightened sufficiently.

The station at Carquinez Straits was then raised and the defective meter (SN 6271007, I.D. 1.0v) replaced with the repaired meter from Port Chicago (SN 6271018, I.D. 1.2v). After reinstallation, however, the surface readout system showed that the sensor was not operating. The instruments were again raised and the original meter from that station (SN 6271007, I.D. 1.0v) which had been repaired was replaced on the mooring. After reinstallation, the surface readout check showed all was working fine. The defective meter (SN 6271018, I.D. 1.2v) was found to have a badly soldered connector which had grounded out during repair operations.

22 March 1979 - The InterOcean technician spent the day repairing the defective meter and recorder. The recorder, however, required factory repairs and had to be shipped back to InterOcean.

23 March 1979 - Pulled the San Pablo station and replaced the electrical cables connecting the turbidity sensor with the internal electronics. It appears that the very strong currents in the area buffet and flex the cable and connectors sufficiently to allow leakage of salt water and therefore eventual but inevitable failure.

4 April 1979 - Bi-monthly service check. All stations had batteries and tapes changed and all probes checked using the surface readout system. The San Pablo and Carquinez Straits stations each had dead batteries upon arrival and a reduced amount of data on tape. A bad turbidity sensor was also discovered on the mid probe at Carquinez, the symptons being very much like

those exhibited earlier by the San Pablo station which had been cured by new cabling on the sensors. InterOcean was contacted for new cables, but none were available off the shelf. Production was held up by a faulty batch of components according to InterOcean and shipment was not received until around 14 April 1979.

The remaining stations checked out in good condition.

9 April 1979 - The Carquinez station was checked to see if the batteries were OK. At that time everything appeared in good condition, although the turbidity sensor was still out on probe 2. A surprisingly small amount of tape was taken up on the data reel. Since the recorder was seen to advance on schedule, it was assumed that all was OK.

19 April 1979 - The beginning of the monthly full service check. All the probes were raised, cleaned, zincs changed, and the turbidity interconnecting cables secured to prevent further flexing in the strong currents and subsequent failure. Again, both San Pablo and Carquinez Straits had dead batteries and nearly empty tapes upon arrival. Also, the San Pablo recorder would not initialize a new program, so it was replaced by the spare recorder. Subsequent repair by InterOcean revealed a faulty cable interconnecting two circuit boards which caused the probes to be continuously powered up and thus draining the batteries.

At the Carquinez Straits station, it was necessary to replace the mid-depth probe with the spare since changing turbidity cables or circuit boards did not correct the problem. The recorder also would not initialize a new program using new batteries but manually moving the tape drive spindles seemed to remedy the situation. Subsequent repairs on the sensor revealed a broken bulkhead connector in the endplate of the meter which had shorted out. Physical damage was indicated. Since this was not a result of shipboard handling, it can only be assumed that something drifting in the water column struck the probe.

20 April 1979 - The remaining stations were raised and checked. All checked out well except at Port Chicago where the recorder acted like the tape drive was sticky but did not seem to be malfunctioning. Also at this station, the mid sensor was reading very high in all functions after being on board, cleaned, handled, etc. Changing circuit boards, cables, etc. did not solve the problem so the probe was not replaced but sent back for repairs. Subsequent repairs showed a short in a connector to the mother circuit board. Also, for some unknown reason, the mooring cables had become twisted. This is difficult to explain since this would require the anchor to spin. Divers reported that the anchor was partially buried. The twists were removed from the mooring.

26 April 1979 - The repaired meters(2) and recorder were received from InterOcean late on 25 April 1979. A check of San Pablo station indicated all was in order. The Carquinez Straits station,

however, again had dead batteries. The repaired recorder from San Pablo was exchanged for the faulty one. Subsequent repairs on this recorder showed another component failure, but different from what failed in the other stations. The repaired mid-depth sensor was not replaced on the mooring; that is planned for the next full service trip (late May 1979).

The mid-depth sensor package was then replaced at the Port Chicago station. No recorder problems were noticed on that visit.

2 May 1979 - The regularly scheduled mid-month fly-by. The repaired recorder was also received back from InterOcean and was picked up on the way from Santa Cruz to Martinez. Attempts to exchange this recorder with the Port Chicago recorder were unsuccessful because the repaired recorder (from Carquinez Straits) would not work. The old recorder appeared to be working satisfactorily so it was retained at the station. Since intermittent problems had been previously noticed, it was desired to have a factory check of the recorder to be completely sure it was fully operative.

All stations checked out 100% with the exception of the mid-depth probe at Port Chicago where the conductivity sensor did not appear to be functioning.

3 May 1979 - The recorder described above was opened and a loose connection was found. Upon reconnection, the recorder functioned again as expected.

7 May 1979 - The Port Chicago station was pulled and the apparent errant meter (6271008, I.D. 0.1 v) taken off and replaced by the recently repaired "spare" (6271010, I.D. 1.4v). After reinstallation of all the meters, the surface readout check showed that the same problems were still present at the mid-depth position. The connecting cable was therefore suspected of being the problem. Checking the meter removed from the station with a new cable confirmed this suspicion. Unfortunately, the cable length for the center position is 33 feet and the spare cables that have all connectors in place are 31 feet. Longer spare cables have one end unterminated to accommodate all lengths of cable, so one had to be cut and terminated to replace the defective one on the station.

Also, the mooring cables which have been noted to have been twisted at this station were untwisted and secured so that no further twisting would occur. It appears that while tightening the turnbuckle to tension the line, one side of the anchor was lifted just sufficiently to allow erosion from under one side. The strong current forces on the meters and mooring must have been enough to allow a slow spinning of the anchor with a resultant twist to the mooring.

17 - 18 May 1979 - Full monthly service check. The Carquinez Straits station mooring wire had corroded in half and the meters were suspended by the electrical cables. Upon recovery, all meters tested fine. The mooring was reinstalled, the mid meter that had been there (SN 6271018, I.D. 1.2v containing a depth

sensor) was replaced with another with no depth sensor (SN 6271008, I.D. 0.1v).

The mid depth cable was replaced with a new one at the Port Chicago station even though the old cable now seemed to be functioning properly.

All other stations checked out in good shape.

31 May 1979 - During the bi-monthly servicing of the stations, spurious data was discovered from surface checks of meter outputs at station 1 (San Pablo). At this station all parameters from the meter at the mid-depth (SN 6271013, I.D. 0.8v) gave spurious data, and the turbidity sensor from the meter at the top-depth (SN 6271017, I.D. 0.6v) was out of service.

Also during this period of servicing the recorder at the Port Chicago station failed to initiate properly. A quick check revealed a loose hex head on the tape drive, which was tightened in the field. The recorder was returned to service after checking it for proper initiation response.

8 June 1979 - During this repair visit to the San Pablo station, the meters at the surface and mid-water depths were raised in an effort to correct problems previously noted during the service visit of 31 May 1979. The mid-water meter (SN 6271013, I.D. 0.8v) was replaced with (SN 6271018, I.D. 1.2v) and sent to InterOcean for repair. The surface meter (SN 6271017, I.D. 0.6v) was returned to service after carefully cleaning the turbidity cable connector.

During this visit our suspicions that heavy growths of fouling organisms, i.e. hydroids, barnacles, and isopods, had accumulated on the submerged equipment were confirmed. Further fouling of submerged sensors was alleviated by periodic retrieval and cleaning of the meters.

14 June 1979 - Once again the recorder (SN 6330226) at the Port Chicago station had failed in service, so it was replaced with the spare recorder (SN 6330227) and sent to InterOcean for evaluation and repair.

27 June 1979 - This bi-monthly service check revealed the failures of the surface meter (total failure) (SN 6271012, I.D. 1.7v) and bottom meter (current and depth failure) (SN 6271020, I.D. 1.6v) at the Chipps Island station and the turbidity sensors of the meters at the mid and bottom depths at the Carquinez Straits station (SN 6271010, I.D. 1.4v and SN 6271007, I.D. 1.0v, respectively).

2 July 1979 - During this repair visit the surface meter at the Chipps Island station was raised and replaced with SN 6271013, I.D. 0.8v and sent to InterOcean for repair. Evidently, the replaced meter had been struck by a submerged object, breaking the shaft of the current sensor and flooding the interior of the electronics package with water.

The failure of the turbidity sensors at the Carquinez station was not corrected at this time. Heavy seas prevented safely retrieving and solving the problems.

13 July 1979 - The bi-monthly service check revealed spurious readings from the depth and turbidity sensors of the bottom meter at the Port Chicago station.

At this time the meters at mid and bottom depths of the Carquinez Straights station were raised for repair of the turbidity sensors. The connections to the sensors of both meters were carefully cleaned and reconnected. The meter at the bottom depth was returned to service, but the mid-depth sensor failed to respond. Further tests isolated the problem as a failure of the main cable which connected the meter to the recorder.

The original recorder (SN 6330226) at Port Chicago was reinstalled for recorder SN 6330227.

17 - 18 July 1979 - Meter number 6271012 (I.D. 1.7) was installed at San Pablo mid-position to free meter number 6271018 (I.D. 1.2v) for use at the bottom position at Chipps Island. Meter number 6271020 (I.D. 1.6v) was then removed, and number 6271018 (I.D. 1.2v) was replaced at the bottom position at Chipps Island.

The mid-position probe at Carquinez Straits (SN 6271010, I.D. 1.4 v) was raised to fix bad conductivity and turbidity sensors. New circuit boards and cable connection cleanings did not correct the problems.

6 August 1979 - A spare cable was installed at the mid-depth probe at Carquinez Straits which corrected all problems.

A brief survey of all stations indicated that the turbidity sensor at the mid-depth meter (SN 6271012, I.D. 1.7v) had failed

at the San Pablo station, and that both meters at the bottom and surface depths at the Port Chicago station were out of service. After raising the meters at the Port Chicago station, both electronics packages were discovered flooded in the manner described previously for the surface depth meter at the Chipps Island station.. Both meters were sent to InterOcean for repair, leaving only the meter at mid-depth in service at the Port Chicago station.

22 August 1979 - Throughout the bi-monthly check of all stations a survey indicated that all bottom and some mid-depth turbidity sensors were fouled with marine growth as previously described. These sensors were cleaned of growth and their meter zincs replaced before being returned to service.

During this visit the meter at the bottom depth at the Port Chicago station (SN 6271019, I.D. 0.9v) was returned to service. However, the surface depth meter had not been repaired at InterOcean and could not be returned to service at this time.

17 September 1979 - During the bi-monthly service visit the meter for the surface depth at the Port Chicago station was to be reinstalled. However, the meter could not be placed in position at this time, because InterOcean failed to replace the mounting tabs after removing them in the course of repairing the meter at the factory.

20 September 1979 - After manufacturing extra sets of mounting tabs and installing the meter for the surface depth at the Port Chicago station (SN 6271004, I.D. 0.7v), a faulty recorder at the Chipps Island station was discovered and replaced with the spare recorder. The station was returned to service and the recorder sent to InterOcean for repair and evaluation.

2 - 3 October 1979 - At this time all meters and recording equipment at the six stations were removed and delivered to Kinnetic Laboratories in preparation for cleaning, recalibration, and shipment to InterOcean for modification as needed (refer to letter of 21 November 1979).

2 November 1979 - All stations were re-established following instrument recalibration and treatment for fouling growth. The meters were painted with a semi-hard boat bottom paint, toxic to fouling organisms.

All parameters at each of the six stations were functioning except for turbidity at the mid-depth meter at the San Pablo station, conductivity at the bottom depth meter at the Benicia Bridge station, and the Grizzly Bay station.. No solution was found for these problems -- the spare turbidity board had been used and not yet replaced by InterOcean and spare boards and cable cleanings did not help the conductivity problem.

6 November 1979 - The Grizzly Bay station was raised and the cable connections cleaned to restore the station to full service.

27 - 28 November 1979 - During the bi-monthly service check several problems were discovered at a few of the stations. Turbidity sensors at the surface and mid-depths had failed at the San Pablo station. The conductivity sensor at mid-depth at the Benicia Bridge station produced substantially lower readings than either the surface or bottom (now functioning) sensors. The standoff at the Port Chicago station was bent and twisted, probably as a result of being hit by a ship. The surface readout indicated that the meters were still functioning, but mechanical damage to the mooring prevented recovery. At this station the compass and turbidity data from the meter at the bottom depth was spurious and could not be corrected until a replacement for the standoff was manufactured and the meters raised.

4 December 1979 - At this time a repair visit was made to the stations, and the turbidity sensor at the mid-depth meter was returned to service at the San Pablo station after a faulty cable connecting the sensor to the electronics package was replaced with spares recently received from InterOcean. Probe 1 turbidity was still nonfunctional after standard repair efforts were tried. A recorder malfunction at the Carquinez Straits station detected by periodic spot checks of raw data, was corrected by replacement with the spare recorder. A quick inspection of the faulty recorder revealed a loose connection within the electronics package. After reconnecting the internal fitting, the unit was satisfactorily field tested and returned to service.

11-12 December 1979 - During the bi-monthly servicing trip, the meters at the Carquinez Straits station were rezinced and inspected for fouling. Also, a faulty turbidity sensor was returned to service after the connectors were carefully cleaned.

Since the previous week, the station at Benicia Bridge was struck by a ship, destroying the main power batteries and damaging the recorder. However, surface readout values indicated that the meters escaped damage and were easily returned to service after replacing the batteries and the spare recorder. The conductivity at mid-depth now appears to be functioning properly.

At this time, the surface instrumentation check device ("blue box") failed midway through the service check, and the operations of the stations at Grizzly Bay, Chipps Island, and Port Chicago were unconfirmed.

18 December 1979 - With the repaired blue box device (at Kinnetic Laboratories) and a replacement for the standoff destroyed at the Port Chicago station, the repairs and the bi-monthly service check were completed. The standoff was replaced and reinforced. However, due to time constraints, repair of the meter at the bottom depth at Port Chicago was not attempted. In addition, checks revealed all parameters of the meter at the surface depth at this station were high by a factor of ten, necessitating its future removal and examination.

26 - 27 December 1979 - During this bi-monthly service visit, several problems were discovered at the Port Chicago station. All the parameters of the meter at the surface depth (SN 6271006, I.D. 0.3v) were nonfunctional, and the meter was removed and inspected. The power input of the mother board was shorted out and had to be taken out of the field for repair. The compass and turbidity outputs of the meter at the bottom depth (SN 6271019, I.D. 0.9v) were out, and it was raised for repair. The turbidity sensor was returned to service after the cable from the sensor to the electronics package was replaced with a new one. However, the compass would have to be returned to InterOcean for repair before being returned to service. At this time the surface readout instrument failed. Data logger data could not be taken for the Port Chicago, Benicia Bridge, Carquinez Straits, and San Pablo Stations, and the instrument will have to be repaired before the instrumentation at these stations can be checked for functionality.

Addendum for 27-28 November 1979 - During the final stages of this visit the Port Chicago station was revisited in an effort to recover probe #3(SN6271020 ID 1.6 v.) and replace its non-functioning compass with repaired meter (SN6271019 I.D. 0.9 v.). The exchange was accomplished with a great deal of effort, although the standoff could not be replaced at this time.

10 January 1980 - Having had some recent bad experiences with "repaired" equipment back from InterOcean, we checked out the "blue box" device with a repaired meter (SN62710 I.D. 1.4 v) and later with two meters at the San Pablo Station (SN6271017 I.D. 0.6 v and SN 6271012 I.D. 1.7 v). Evidently InterOcean had not checked out the box before sending it to us because the same symptoms persisted as had been noted before sending the equipment to InterOcean for evaluation and repair. As a result, we could not check the functionality of the meters on the stations or use the blue box readings as a cross check on ground truth data at this service visit.

However, we continued with our normal bimonthly servicing of the stations, and discovered that the station at Port Chicago had been hit again since our last visit of the 26th and 28th of December 1979. The standoff, which was constructed of ¼ inch stainless steel, was bent, and the contents of the white instrument case were damaged. The case had probably fallen from the tower causing the two motorcycle batteries to fall against the recorder, breaking the batteries and the power plug fixture against the inside of the white instrument case. The recorder and the batteries were replaced with the spares. Probe #3 (SN6271019 I.D. 0.9 v) was raised, and its compass was removed for repair at InterOcean since the spare meter available was used to replace the missing one at the probe #1 position (top).

29-30 January 1980 - After receiving the now repaired blue box yet again from InterOcean, we made another bimonthly service check and found that the San Pablo station had been vandalized beyond immediate repair. At the station the recorder and cables to the meters were destroyed, the batteries missing, the instrument case destroyed, the standoff slightly bent, and the winch badly cut. The meters were retrieved and were evidently unharmed. (Please see letter of 31 January 1980 for details.)

At the Port Chicago station, the meter (SN6271019 I.D. 0.9 v) at probe #3 position (bottom) was raised and the repaired compass from InterOcean installed. However, it remained in a non-functional status and was replaced with the spare meter also recently returned by InterOcean (SN6271020 I.D. 1.6 v.) All three meters were returned to their positions, but the temperature at probe #1 position (top) was giving nonsensical "blue box" readings.

14 February 1980 - During this bimonthly service visit the recorder at the Carquinez Station was replaced with the spare because data tapes from that recorder continued to jam during readout procedures at data processing. The replacement of the recorder at Carquinez prevented the re-establishment of the San Pablo station since that station is being used as spares.

The following problems were also detected. At Carquinez the meter at probe #2 (middle) (SN6271008 I.D. 0.1v) gave spurious turbidity data. At the Benicia Station, the conductivity data at probe #2 (SN6271001 I.D. 0.5 v) was incorrect. At the Port Chicago station the compass was out of service at the probe #1 position (top) (SN6271006 I.D. 0.3 v). At the Chipps Island station the turbidity sensor at probe #2 position (middle) is out of service (SN6271013 I.D. 0.8 v.)

26 February 1980 - Since InterOcean had not repaired the faulty recorder from Carquinez, we did not anticipate re-establishing the San Pablo station at this time. Armed with this knowledge we intended to use the meters from the San Pablo station as replacements for faulty ones at other stations.

Faulty meters at other stations included those mentioned above. Briefly, SN6271008, I.D. 0.1 v. was replaced with SN6271012, I.D. 1.7 v. (faulty current sensor) at the Carquinez station; SN6271001, I.D. 0.5 v. was replaced with SN6271015, I.D. 1.1 v. (faulty conductivity and current sensors at the Benicia station); and SN5271006, I.D. 0.3 v. was replaced with SN6271017, I.D. 0.6 v. (faulty compass at the Port Chicago station).

In addition other sensor and recorder problems were discovered. The turbidity sensors on SN6271007 I.D. 1.0 v. (probe #3, bottom), SN6271002 I.D. 1.5 v (probe #1, top) at the Carquinez and Benicia stations, respectively, were out of service, as was the compass (SN6271013 I.D. 0.8 v.) of the probe #2 position (middle) at the Chipps Island station. The recorder at the Port Chicago station refused to initiate or tape advance, so the data could not be recorded at this time. The spare meter was still out of service and not repaired by InterOcean since 14 February 1980 so no replacements could be made. Presently, the Port Chicago station and the San Pablo stations are out of service, because both recorders are at InterOcean for evaluation and repair, as are the four probes previously mentioned.

12 March 1980 - Reinstall recorder at Port Chicago.

19 March 1980 - Install probes SN6271006 (0.3v, top) and SN6271001 (0.5, mid) at Benicia. (Installation of SN6271006 was not planned. The wake of a U.S. Navy ship during the servicing procedure was thought to have effected damage to the turbidity sensor wire on SN6271002 (1.5, top), necessitating a change. Probes SN6271002 and SN6271015 checked out satisfactorily. These changes were necessary because probe SN6271015 has a depth sensor and was needed at San Pablo.

21 March 1980 - Reinstall San Pablo Station with probes SN6271002 (1.5, top), SN6271008 (0.1, mid), SN6271015 (1.1, bottom), and recorder SN6630229.

25 March 1980 - Polarity on digital data scanner ("blue box") SN6271021 inadvertently reversed, causing instrument to be damaged. Digital data scanner sent to InterOcean for repairs. No ground truth data are available for bimonthly service of 25 March.

10 April 1980 - Digital data scanner returned to service for bimonthly service.

28 - 30 April 1980 - Recorder SN6330229 at San Pablo found to be non-functional. All equipment removed and recorder sent to InterOcean. Replaced probe SN6271006 (0.3 top) with SN6271002 (1.5) to correct faulty temperature sensor at Benicia. Sent SN6271006 to InterOcean. Replaced SN6271020 (1.6, bot) with SN6271015 (1.1) for testing of SN6271020's depth sensor.

16 - 19 May 1980 - Analyses of Berkeley data displays on microfiche indicated possible recorder problems at Benicia. Change recorder SN633025 for SN6330229 which had been returned from InterOcean (previously at San Pablo). Exchange probe SN6271010 (1.4, mid) at Port Chicago station with faulty current sensor for probe SN6271006 (0.3) (recently returned from InterOcean). Send probes SN6271010 and SN6271008 and recorder Sn6330225 to InterOcean for service.

2 - 3 June 1980 - At Chipps Island, replace recorder SN6330228 for recorder SN6330225 recently returned from InterOcean. Send recorder SN6330228 to InterOcean for service.

20 June 1980 - Reinstall San Pablo Station using recorder SN6330228. Install probes SN6271010 (1.4 , mid) (recently returned from InterOcean) and SN6271020 (1.6, bot). The planned installation of probe SN6271008 was aborted and SN6271019 (0.9, top) was substituted (SN6271008, newly returned from InterOcean was found to be completely non-functional). Probe SN6271008 was subsequently returned to InterOcean.

24 June 1980 - Exchange battery at San Pablo (severe weather 20 June had resulted in cracking a new battery, thus necessitating using a battery which had been in service elsewhere.) An excessive amount of tape on the output side of the cassette was noted. The cassette was exchanged and the battery replaced. Subsequent study of the cassette record has shown recorder failure: 1) wrong number of data lines; 2) loss of data from one probe; 3) missing turbidity and compass words to such an extent as to make the retrieval of data unfeasible (recorder SN6330228).

2, 3 July 1980 - All instruments removed.

21 July 1980 - Except for probe SN6271009 (at InterOcean) and recorder SN6330228 (at Kinnetic Laboratories), the transfer of all recorders, conductor cables, probes to USGS personnel completed.

APPENDIX 4

Significant Contract Modifications

STANDARD FORM 30, JULY 1966
GENERAL SERVICES ADMINISTRATION
FED PROC REG (41 CFR) 1-16.101

AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT

PAGE 1 OF 1

1. AMENDMENT/MODIFICATION NO	2. EFFECTIVE DATE	3. REQUISITION/PURCHASE REQUEST NO	4. PROJECT NO. (If applicable)
P00001	78 Oct 27		

5. ISSUED BY CODE

US Army Engineer District, San Francisco
Corps of Engineers
211 Main Street
San Francisco, CA 94105

6. ADMINISTERED BY (If other than block 5) CODE

7. CONTRACTOR NAME AND ADDRESS CODE FACILITY CODE

(Street, city, county, state, and ZIP Code)
Kinnetic Laboratories, Inc.
P. O. Box 1252
Santa Cruz, CA 95060

8.
☐ AMENDMENT OF SOLICITATION NO. _____
DATED _____ (See block 9)
☒ MODIFICATION OF CONTRACT/ORDER NO. DACW07-78-C-0049
DATED 27 Jul 78 (See block 11)

9. THIS BLOCK APPLIES ONLY TO AMENDMENTS OF SOLICITATIONS

☐ The above numbered solicitation is amended as set forth in block 12. The hour and date specified for receipt of Offers ☐ is extended, ☐ is not extended.

Offerors must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation, or as amended, by one of the following methods:

(a) By signing and returning _____ copies of this amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKOWLEDGMENT TO BE RECEIVED AT THE ISSUING OFFICE PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If, by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided such telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

10. ACCOUNTING AND APPROPRIATION DATA (If required)

11. THIS BLOCK APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS

(a) ☒ This Change Order is issued pursuant to: Article 2, Changes
The Changes set forth in block 12 are made to the above numbered contract/order.

(b) ☐ The above numbered contract/order is modified to reflect the administrative changes (such as changes in paying office, appropriation data, etc.) set forth in block 12.

(c) ☐ This Supplemental Agreement is entered into pursuant to authority of _____
It modifies the above numbered contract as set forth in block 12.

12. DESCRIPTION OF AMENDMENT/MODIFICATION

Checkpoint 2 (report of installation completion) is not on schedule due to the fact that the Government was late in delivering the government furnished equipment to the Contractor. As a result, Checkpoint 2 is changed to read 122 days in lieu of 45 days.

There is no additional cost to the Government as a result of this modification.

Except as provided herein, all terms and conditions of the document referenced in block 8, as heretofore changed, remain unchanged and in full force and effect.

13. ☐ CONTRACTOR/OFFEROR IS NOT REQUIRED TO SIGN THIS DOCUMENT ☒ CONTRACTOR/OFFEROR IS ~~XXXXXX~~ requested TO SIGN THIS DOCUMENT AND RETURN 1 COPIES TO ISSUING OFFICE

14. NAME OF CONTRACTOR/OFFEROR	17. UNITED STATES OF AMERICA
BY _____ (Signature of person authorized to sign)	BY John M Adsit (Signature of Contracting Officer)
15. NAME AND TITLE OF SIGNER (Type or print)	16. DATE SIGNED
	18. NAME OF CONTRACTING OFFICER (Type or print): JOHN M. ADSIT, Colonel, CE
	19. DATE SIGNED: 20 Nov 78

30-101-08

4-1

*U.S. GOVERNMENT PRINTING OFFICE: 1976 O-226

EXCEPTION TO SF 30 APPROVED BY NARS 7-76

STANDARD FORM 30 (REV. 7-76)
GENERAL SERVICES ADMINISTRATION
FED. PROC. REG. (41 CFR) 1-16.101

AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT

PAGE 1 OF 1

1. AMENDMENT/MODIFICATION NO.	2. EFFECTIVE DATE	3. REQUISITION/PURCHASE REQUEST NO.	4. PROJECT NO. (If applicable)
P00002	79 Feb 08		

5. ISSUED BY CODE

US Army Engineer District, San Francisco
Corps of Engineers
211 Main Street
San Francisco, CA 94105

6. ADMINISTERED BY (If other than block 5) CODE

7. CONTRACTOR NAME AND ADDRESS (Street, city, county, state, and ZIP Code) CODE FACILITY CODE

Kinnetic Laboratories, Inc.
1820 West Cliff Drive
Santa Cruz, CA 95060

8.
☐ AMENDMENT OF SOLICITATION NO. _____
DATED _____ (See block 9)
☒ MODIFICATION OF CONTRACT/ORDER NO. DACW07-78-C-0049
DATED 78 Jul 27 (See block 11)

9. THIS BLOCK APPLIES ONLY TO AMENDMENTS OF SOLICITATIONS

☐ The above numbered solicitation is amended as set forth in block 12. The hour and date specified for receipt of Offers ☐ is extended, ☐ is not extended.

Offerors must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation, by or as amended, by one of the following methods:

(a) By signing and returning _____ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE ISSUING OFFICE PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If, by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

10. ACCOUNTING AND APPROPRIATION DATA (If required)

963121 General Investigations CE Civil 04203 AA108 02 20B2 0000 284 GA
96X3123 Operations & Maintenance CE Civil 04203 CA103 07 20A0 0000 284 GA

11. THIS BLOCK APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS

(a) ☒ This Change Order is issued pursuant to: Article 2, Changes
The Changes set forth in block 12 are made in the above numbered contract/order.

(b) ☐ The above numbered contract/order is modified to reflect the administrative changes (such as changes in pay office, appropriation data, etc.) set forth in block 12.

(c) ☐ This Supplemental Agreement is entered into pursuant to authority of _____
It modifies the above numbered contract as set forth in block 12.

12. DESCRIPTION OF AMENDMENT/MODIFICATION

A change in accounting and appropriation data as reflected in Block 10.

Also, as referenced in the Contractor's letter dated 12 December 1978, a field station relocation (from Pile #17 to Pile #19) is authorized due to the removal of Pile #17 by the Coast Guard.

Finally, since it is likely that the precision of speed observations required of the Contractor may not be attainable by the equipment furnished him by the Government, Paragraph 3.b which now reads "Currents (magnitude ± 0.05 m/s and direction ± 5°)" is changed to read "Currents (magnitude ± 10% of full scale and direction ± 5°)".

There is no additional cost to the Government as a result of this modification.

Except as provided herein, all terms and conditions of the document referenced in block 8 as heretofore changed, remain unchanged and in full force and effect.

13. ☐ CONTRACTOR/OFFEROR IS NOT REQUIRED TO SIGN THIS DOCUMENT ☒ CONTRACTOR/OFFEROR IS requested TO SIGN THIS DOCUMENT AND RETURN 1 COPIES TO ISSUING OFFICE

14. NAME OF CONTRACTOR/OFFEROR
BY Philip L. Carpenter
(Signature of person authorized to sign)

15. NAME AND TITLE OF SIGNER (Type or print)

16. DATE SIGNED

17. UNITED STATES OF AMERICA
BY John M. Adsit
(Signature of Contracting Officer)

18. NAME OF CONTRACTING OFFICER (Type or print)
JOHN M. ADSIT
Colonel, CE

19. DATE SIGNED
13 Feb 79

30-105-04

AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT

1 1

2. AMENDMENT/MODIFICATION NO.	3. EFFECTIVE DATE	4. REQUISITION/PURCHASE REQUEST NO.	5. PROJECT NO. (If applicable)
P00003	80 Jan 17		

6. ISSUED BY (CODE)
US Army Engineer District, San Francisco
Corps of Engineers
211 Main Street
San Francisco, CA 94105

6. ADMINISTERED BY (If other than item 6) (CODE)

7. CONTRACTOR/OFFEROR (NAME AND ADDRESS) (CODE) (FACILITY CODE)

(Street, city, county, state and ZIP Code)
Kinnetic Laboratories, Inc.
1820 West Cliff Drive
Santa Cruz, CA 95060

8.
☐ AMENDMENT OF SOLICITATION NO. _____
DATED _____ (See block 9)
☒ MODIFICATION OF CONTRACT/ORDER NO. DACW07-78-C-0049
DATED 78 Jul 27 (See block 11)

9. THIS BLOCK APPLIES ONLY TO AMENDMENTS OF SOLICITATIONS

☐ The above numbered solicitation is amended as set forth in block 12. The hour and date specified for receipt of Offers ☐ is extended ☐ is not extended.

Offerors must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation, or as amended, by one of the following methods:

(a) By signing and returning _____ copies of this amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGEMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

10. ACCOUNTING AND APPROPRIATION DATA (If required)

11. THIS BLOCK APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS

(a) ☒ This Change Order is issued pursuant to: Article 2, Changes

The Changes set forth in block 12 are made to the above numbered contract/order.

(b) ☐ The above numbered contract/order is modified to reflect the administrative changes (such as changes in paying office, appropriation data, etc.) set forth in block 12.

(c) ☐ This Supplemental Agreement is entered into pursuant to authority of _____

It modifies the above numbered contract as set forth in block 12.

12. DESCRIPTION OF AMENDMENT/MODIFICATION

This change reflects display methods developed during design of the analysis program under the contract. These display methods appeared more workable than the methods originally specified, once actual data began to become available.

Item b. on page 3 of Schedule "A", Scope of Services is changed as follows:

(1) For each station and each depth plot speed and true direction versus time.
(2) For each station and each depth plot mainstream and transverse components of speed versus time.
(3) For each station plot speed for all depths versus time.
(4) For each depth plot speed for all stations versus time.

There is no additional cost to the Government as a result of this modification.

Except as provided herein, all terms and conditions of the document referenced in block 8, as heretofore changed, remain unchanged and in full force and effect.

☐ CONTRACTOR/OFFEROR IS NOT REQUIRED TO SIGN THIS DOCUMENT ☒ CONTRACTOR/OFFEROR IS REQUESTED TO SIGN THIS DOCUMENT AND RETURN 1 COPIES TO ISSUING OFFICE

15A. NAME OF CONTRACTOR/OFFEROR	15B. DATE SIGNED	16A. UNITED STATES OF AMERICA	16B. DATE SIGNED
BY _____ (Signature of person authorized to sign)		BY _____ (Signature of Contracting Officer)	
15C. NAME AND TITLE OF SIGNER (Type or print)		16C. NAME OF CONTRACTING OFFICER (Type or print) JOHN M. ADSIT Colonel, CE	80 Feb 01

STANDARD FORM 30, JULY 1956
GENERAL SERVICES ADMINISTRATION
FED. PROC. REG. (41 CFR) 1-16.101

AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT

PAGE 1 OF 1

1. AMENDMENT/MODIFICATION NO.	2. EFFECTIVE DATE	3. REQUISITION/PURCHASE REQUEST NO.	4. PROJECT NO. (If applicable)
P00005	80 May 05		

5. ISSUED BY CODE

US Army Engineer District, San Francisco
Corps of Engineers
211 Main Street
San Francisco, California 94105

6. ADMINISTERED BY (If other than block 5) CODE

7. CONTRACTOR NAME AND ADDRESS CODE FACILITY CODE

(Street, city, county, state, and ZIP Code)

Kinnetic Laboratories, Inc.
1820 West Cliff Drive
Santa Cruz, CA 95060

8.
- ☐ AMENDMENT OF SOLICITATION NO. _____
- DATED _____ (See block 9)
- ☒ MODIFICATION OF CONTRACT/ORDER NO. DACW07-78-C-0049
- DATED 78 Jul 27 (See block 11)

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☐ The above numbered solicitation is amended as set forth in block 12. The hour and date specified for receipt of Offers ☐ is extended, ☐ is not extended.

Offerors must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation, or as amended, by one of the following methods.

(a) By signing and returning _____ copies of this amendment. (b) By acknowledging receipt of this amendment on each copy of the offer submitted, or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE ISSUING OFFICE PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided such telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

10. ACCOUNTING AND APPROPRIATION DATA (If required)

96X3122 Construction General CE Civil 04203 BB326 30 1XCB 0000 284 GA

11. THIS BLOCK APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS

(a) ☐ This Change Order is issued pursuant to _____

The Changes set forth in block 12 are made to the above numbered contract/order.

(b) ☐ The above numbered contract/order is modified to reflect the administrative changes (such as changes in paying office, appropriation data, etc.) set forth in block 12.

(c) ☒ This Supplemental Agreement is entered into pursuant to authority of Option IV under the contract

It modifies the above numbered contract as set forth in block 12.

12. DESCRIPTION OF AMENDMENT/MODIFICATION

Delays in installation caused by the failure of the Government to furnish calibration curves for its equipment and the late delivery of the equipment interrupted the initial data gathering period thus necessitating this modification for an additional six (6) month monitoring period. Work remains as described in the Option IV to the contract except the period of services is only to include the period of January through June 1980 for this additional monitoring period, and until 30 Sep 80 for completion of final report.

In consideration of the work and services to be performed hereunder, the Contractor shall be paid ONE HUNDRED TWENTY-FIVE THOUSAND AND NO/100THS DOLLARS ($125,000.00) which sum shall constitute payment in full. The total contract amount is increased to THREE HUNDRED SEVENTEEN THOUSAND THREE HUNDRED SIXTY-FIVE AND NO/100THS DOLLARS ($317,365.00.).

This modification amends our letter dated 22 January 1980 regarding the exercise of Option No. IV in the amount of ONE HUNDRED THIRTY SIX THOUSAND AND NO/100THS DOLLARS ($136,000.00) as to the period of services and the renegotiated consideration.

The period for data processing is changed to 45 days in lieu of 15 days.

Except as provided herein, all terms and conditions of the document referenced in block 8, as heretofore changed, remain unchanged and in full force and effect.

13.
- ☐ CONTRACTOR/OFFEROR IS NOT REQUIRED TO SIGN THIS DOCUMENT
- ☒ CONTRACTOR/OFFEROR IS REQUIRED TO SIGN THIS DOCUMENT AND RETURN 3 COPIES TO ISSUING OFFICE

requested

14. NAME OF CONTRACTOR/OFFEROR	17. UNITED STATES OF AMERICA
KINNETIC LABORATORIES, INC.	
BY Philip D. Carpenter (Signature of person authorized to sign)	BY John M. Adsit (Signature of Contracting Officer)
15. NAME AND TITLE OF SIGNER (Type or print): PHILIP D. CARPENTER, VICE-PRESIDENT	16. DATE SIGNED: 27 May 1980
18. NAME OF CONTRACTING OFFICER (Type or print): JOHN M. ADSIT, Colonel, CE	19. DATE SIGNED: 80 May 29

30 101 08

* U. S. GOVERNMENT PRINTING OFFICE 1977-247-048

APPENDIX 5

Documentation of Vandalism to San Pablo Station

_PARTMENT OF TRANSPORTAT.
UNITED STATES COAST GUARD

MAILING ADDRESS
OFFICER IN CHARGE
USCG ANT
Yerba buena Island
San Francisco, CA 94130

16500
8 February 1980

From: Officer--in-Charge, ANT San Francisco
To: District Engineer, Army Corps of Engineer
Subject: San Pablo Bay Light # 9

1. On 18 January 1980 The CG 55101 Went to San Pablo Bay Channel Light # 9 (LLNR-769.10) in response to a reported outage. Upon arriving at the light they found our batteries and battery box missing, the army Corps of engineer gear was hanging over the side, excessive damage to box, the box was still sealed. I attributed this lose to excessive vibration of the pile due to an abnormally heavy run-off from the delta during an ebb tide at this time of year.

2. On the 25 January 1980, Light #9 was reported extinguished again. This time upon arrival at the light, Army corps box was hanging from the platform. Again we found a broken wire in the Coast Guard batteries, also attributed to pile vibration.

3. I learn that two motorcycle batteries that ran the equipment were missing and that there was extensive damage to other equipment inside the box. I have no explanation for the missing batteries or the damage inside the box except for vandalism or vibration.

Gary "B" Earl Scott
Officer-in-Charge

KINNETIC
LABORATORIES
INCORPORATED

P.O. BOX 1252
LABORATORY: ONE POTRERO STREET
SANTA CRUZ, CALIFORNIA 95061
(408) 423-6830

31 January 1980

John M. Adsit
Colonel, CE
Contracting Officer
Department of the Army
San Francisco District, Corps of Engineers
211 Main Street
San Francisco, California 94105

cc: Hugh Taylor - Project Leader
James Brown - A-E Contract Negotiator

Subject: Vandalism to Station 1, San Pablo Bay, Contract No. DACW07-78-C-0049, "In-Situ Field Data Gathering, San Francisco Bay Salinity Intrusion with Navigation Channels.

On or about 19 January 1980, the station established on Coast Guard Navigational Aid Pile #9 in central San Pablo Bay was severely vandalized. The above date was learned from Mr. Wayne Wheeler, U.S. Coast Guard, during a telephone conversation between Mr. Wheeler and Mr. Hugh Taylor of your office on 29 January 1980. The Coast Guard property on this Pile was also destroyed as well as the Corps of Engineers equipment listed below. Our first knowledge of the vandalism was during a routine servicing trip carried out on 29 January 1980 by Kinnetic Laboratory personnel. Mr. Taylor of your office was informed of the incident on 29 January 1980 as soon as it was learned from the field crew. Irreparable damage was caused to the following equipment:

1 Model 680-MUX Recorder, Serial No. 6330227	$ 7635.00
1 time clock, Model 680-TCG	1400.00
3 underwater cables	1000.00
1 power cable	50.00
2 batteries (16 Amp-hr. motorcycle)	90.00
1 weather proof box with lock	95.00
1 stainless steel standoff	350.00
1 winch (including fiberglassing to build up the drum @ $40)	115.00
100 ft - 1/4" stainless steel wire (which had to be cut in order to retrieve the subsurface probes)	100.00
Total Damage	$10,835.00

Proceedings for reimbursement for this loss from the mooring insurance have been initiated.

Sincerely yours,

Philip D. Carpenter

Philip D. Carpenter, Ph.D.
Vice President

APPENDIX 6

Station Elevations

Monument Record Sheets

Towill, Inc. 27 October 1979

Towill, inc.

CIVIL ENGINEERS
AERIAL PHOTOGRAPHERS
SURVEYORS
HYDROGRAPHERS
PHOTOGRAMMETRIC ENGINEERS

608 HAYWARD STREET, SAN FRANCISCO, CALIFORNIA 94105 • TELEPHONE 415 • 982-1758

TRANSMITTAL

TO: Kinnetic Laboratories, Inc.
1820 West Cliff Drive
Santa Cruz, CA 95060

Attention: Philip D. Carpenter

DATE: October 29, 1979

JOB NUMBER: 5583

RE:

FROM: J. S. Kor

We are forwarding to you via mail the following:

Monument Record Sheets for TBM's 1, 2, 3, 4 and 5

Please sign and return one copy to acknowledge the receipt of the above

Received By _____ Date _____

ZONE III

MONUMENT RECORD
CALIFORNIA COORDINATE SYSTEM

SHEET OF

HORIZONTAL CONTROL DATA
TYPE –
ORDER –
AGENCY COP

LATITUDE ° ' "	Y (NORTH)
LONGITUDE ° ' "	X (EAST)

STATION (NAME, SET BY, YEAR SET) (YEAR RECOVERED)
TBM 1. TOWILL, INC. 1979

INDEX SHEET (QUADRANGLE SHEET)
Mare Island

ALAMEDA COUNTY		CONTRA COSTA COUNTY	XX	OTHER COUNTY

VERTICAL CONTROL DATA	
ELEVATION IN FEET	DATUM
9.45±	MEAN SEA LEVEL
12.25±	MLLW
ORDER – TOWILL, INC.	
AGENCY	COP

TO STATION OR MARK	AZIMUTH CLOCKWISE FROM GRID SOUTH	GRID DISTANCE IN FEET
GRID NORTH	180°00'00".000	
TRUE NORTH	° ' "	

ESTABLISHING AGENCY'S REFERENCE — VERTICAL DATA — HORIZONTAL DATA
COMPLETED — CHECKED —

COUNTY SURVEYOR'S REFERENCE — VERTICAL DATA — HORIZONTAL DATA
RECEIVED — VERIFIED —

DESCRIPTION, PLAT, REMARKS, ETC.: Set a cut crows foot on Channel Marker 9, 0.85' above the pulley arm, located on the north side of Pinole ShoalChannel, approximately 2.1 miles NNE of Pinole Point. Reference Bench Mark used is NGS TIDAL BM 5056-A at Pinole Point, elevation 7.41' MLLW = 4.61' NGVD. See Tidal Bench Marks California - III - 25, 941-5056. The elevation on TBM 1 was established by a combination of zenith distance reductions and direct leveling using corrections for curvature and refraction. The standard error of the mean result was plus or minus 0.10 feet.

ZONE III

MONUMENT RECORD
CALIFORNIA COORDINATE SYSTEM

SHEET
OF

HORIZONTAL CONTROL DATA
TYPE –
ORDER –
AGENCY COP

LATITUDE ° ' "	Y (NORTH)
LONGITUDE ° ' "	X (EAST)
STATION (NAME, SET BY, YEAR SET) TBM 2, TOWILL, INC., 1979	(YEAR RECOVERED)
INDEX SHEET (QUADRANGLE SHEET) BENICIA	
ALAMEDA COUNTY	CONTRA COSTA COUNTY X — OTHER COUNTY

VERTICAL CONTROL DATA	
ELEVATION IN FEET	DATUM
8.56	MEAN SEA LEVEL
11.17	MLLW
ORDER – Third	
TOWILL, INC.	
AGENCY COP	

TO STATION OR MARK	AZIMUTH CLOCKWISE FROM GRID SOUTH	GRID DISTANCE IN FEET
GRID NORTH	180°00'00".000	
TRUE NORTH	° ' "	

ESTABLISHED BY SURVEYOR'S REFERENCE — VERTICAL DATA — HORIZONTAL DATA
COMPLETED
PENDING
RECEIVED

DESCRIPTION, PLAT, REMARKS, ETC.: Set a 60d spike in the west face of a pile on the north side of an abandoned pier, 30' west of the east end of the pier, 6' east of Kinnetic Labs station, approximately 1.25 miles east of the Carquinez Bridge on Highway 80, on the south side of Carquinez Strait. Reference Bench Mark is NGS BM A-555, 1956 located at Eckley. The elevation of BM A-555 is 14.73' MLLW or 12.116' NGVD. See NGS quad 381222, page 2 and page 16.

COUNTY SURVEYOR'S REFERENCE — VERTICAL DATA — HORIZONTAL DATA
RECEIVED
PENDING
COMPLETED

ZONE III

MONUMENT RECORD
CALIFORNIA COORDINATE SYSTEM

SHEET OF

HORIZONTAL CONTROL DATA	LATITUDE	Y (NORTH)
TYPE –	LONGITUDE	X (EAST)
ORDER –	STATION (NAME, SET BY, YEAR SET) TBM 3, TOWILL, INC., 1979	(YEAR RECOVERED)
	INDEX SHEET (QUADRANGLE SHEET) Port Chicago	
AGENCY COP	ALAMEDA COUNTY	CONTRA COSTA COUNTY X — OTHER COUNTY

ESTABLISHING AGENCY'S REFERENCE

	VERTICAL DATA	HORIZONTAL DATA
ORDERED		
COMPLETED		

VERTICAL CONTROL DATA		TO STATION OR MARK	AZIMUTH CLOCKWISE FROM GRID SOUTH	GRID DISTANCE IN FEET
ELEVATION IN FEET	DATUM	GRID NORTH	180°00'00".000	
9.38	MEAN SEA LEVEL	TRUE NORTH	° ' "	
11.77	MLLW			
ORDER – Third				
TOWILL, INC.				
AGENCY COP				

DESCRIPTION, PLAT, REMARKS, ETC.: Set a cut crows foot on Channel Marker No. 6, located on the south side of Bulls Head Channel, approximately 0.4 miles east of the Benicia-Martinez Bridge on Highway 680. Reference Bench Mark Tidal 5, 1937, located on the SPRR bridge was used as a basis for the elevation. Tidal 5, 1937, elevation is 10.57 MLLW or 8.176 NGVD., See Tidal Bench Marks, California - III - 29, 941-5103.

COUNTY SURVEYOR'S REFERENCE

	VERTICAL DATA	HORIZONTAL DATA
VERIFIED		
RECEIVED		

ZONE III

MONUMENT RECORD
CALIFORNIA COORDINATE SYSTEM

SHEET OF

HORIZONTAL CONTROL DATA		LATITUDE ° ' "	Y (NORTH)
TYPE –		LONGITUDE ° ' "	X (EAST)
ORDER –		STATION (NAME, SET BY, YEAR SET) TBM 4, TOWILL, INC., 1979	(YEAR RECOVERED)
		INDEX SHEET (QUADRANGLE SHEET) HONKER BAY	
AGENCY	COP	ALAMEDA COUNTY / CONTRA COSTA COUNTY / OTHER COUNTY SOLANO	

VERTICAL CONTROL DATA	
ELEVATION IN FEET	DATUM
6.68	MEAN SEA LEVEL
8.74	MLLW
ORDER – Third	
TOWILL, INC.	
AGENCY	COP

TO STATION OR MARK	AZIMUTH CLOCKWISE FROM GRID SOUTH	GRID DISTANCE IN FEET
GRID NORTH	180°00'00".000	
TRUE NORTH	° ' "	

ESTABLISHING AGENCY'S REFERENCE — VERTICAL DATA / HORIZONTAL DATA
RECEIVED
COMPLETED

COUNTY SURVEYOR'S REFERENCE — VERTICAL DATA / HORIZONTAL DATA
VERIFIED
RECEIVED

DESCRIPTION, PLAT, REMARKS, ETC.: Set a cut crows foot on Channel Marker 19, 3.0' below the pulley arm, located on the north side Roe Island Channel at the angle point of West Reach and East Reach, south of Middle Ground Island. Reference Bench Mark used is NGS BM L-555, 1955, elevation 7.10 MLLW = 5.04' NGVD. See NGS Quad 381213, page 2 and page 55.

DR-T-P-84

ZONE III

MONUMENT RECORD
CALIFORNIA COORDINATE SYSTEM

SHEET OF

HORIZONTAL CONTROL DATA		LATITUDE ° ' "	Y (NORTH)
TYPE -		LONGITUDE ° ' "	X (EAST)
ORDER -		STATION (NAME, SET BY, YEAR SET) TBM 5, TOWILL, INC., 1979	(YEAR RECOVERED)
		INDEX SHEET (QUADRANGLE SHEET) HONKER BAY	
AGENCY COP		ALAMEDA COUNTY / CONTRA COSTA COUNTY / OTHER COUNTY SOLANO	

VERTICAL CONTROL DATA	
ELEVATION IN FEET	DATUM
9.34	MEAN SEA LEVEL
10.92	MLLW
ORDER - Third	
TOWILL, INC.	
AGENCY COP	

TO STATION OR MARK	AZIMUTH CLOCKWISE FROM GRID SOUTH	GRID DISTANCE IN FEET
GRID NORTH	180°00'00".000	
TRUE NORTH	° ' "	

ESTABLISHING AGENCY'S REFERENCE — VERTICAL DATA / HORIZONTAL DATA
CHECKED
COMPLETED

COUNTY SURVEYOR'S REFERENCE — VERTICAL DATA / HORIZONTAL DATA
VERIFIED
RECEIVED

DESCRIPTION, PLAT, REMARKS, ETC.: Set a cut crows foot on Channel Marker 27, 2.20' below the pulley arm, located on the north side of the channel, near the west end of Chipps Island, south of Simmons Point. Reference Bench Mark used is NGS Tidal BM 1, 1932, elevation 9.68' MLLW = 8.10' NGVD. See Tidal Bench Marks, California - III - 31, 941-5112.

APPENDIX 7

Special Study of Tide (Pressure) Sensors for Response and Calibration

Special Study of Tide (Pressure) Sensors for Response and Calibration

On 5 May 1980 the probes SN6271019 and SN6271020 were taken to a freshwater reservoir and suspended for special testing at working depths using marked wire ropes. Three experiments were conducted:

1) Suspending the probe at 30 feet after an indefinite period at the surface, recording the output at 5-minute intervals;

2) Suspending the probe at 30 feet after an indefinite period at 25 feet, recording the output at 5-minute intervals; and,

3) Allowing the probe to stabilize (30-60 minutes) at 10, 15, 20 foot depths with a view toward recording sensor output values over a range of depths.

These experiments provided a means of evaluating the response of the sensors in time (Figures 7-1, 7-2) and a means of evaluating (at least tentatively) the output at various depths (Figure 7-3).

After the instruments were removed from the field (2, 3 July 1980) meters SN6271007, SN6271014, SN6271015, SN6271018 were treated similarly on 16 July 1980:

1) Suspending the probe at 30 feet after an indefinite period at the surface, recording the output at 5-minute intervals;

2) Suspending the probe at 30 feet after an indefinite period at 25 feet, recording the output at 5-minute intervals; and,

3) Suspending SN6271015 at 30 feet after an indefinite period at 25 feet, recording the output at 10-second intervals.

These experiments, like those of 5 May 1980, provided a means of evaluating the response of the sensors in time (Figures 7-4, 7-5) and a means of studying the actual response function for an InterOcean depth sensor system (Figure 7-6).

Of greatest immediate interest was the necessity of correcting field data for depth (below MLLW) and sensor error. The sensor error for each probe was determined from the voltage value which represented the output after a period of stabilization (Figures 7-1, 7-2, 7-4, 7-5). The values have been selected and the "best" correction decided upon (Table 7-1). Corrections were based upon field sensor distance measurements, Towill, Inc. survey mark positions (Figure 7-7) and studies of individual sensor responses.

These results are only properly applicable to the period 2 November - 3 July 1979 as the depth sensors' circuitry was set to factory specifications during the period when the probes were out of the field (3 October 1979 - 2 November 1979).

These results indicate the following:

1) the response of each sensor will differ;

2) response probably does not differ with depth, and is probably different for each sensor;

3) the functional relationship between response and depth (as in Figure 3) may differ with each sensor.

Analysis of the response function (Figure 7-6) will provide some insight as to the strategy for designing an algorithm to cope computationally with accurate tide height measurement in the field.

Knowledge of a suitable correction for each sensor was necessary to render field tide height measurements as accurate as practicable. To that end, the sensor corrections and actual probe depth values (below MLLW) were integrated so as to produce a correction for each probe at each station over the study duration; noting that individual sensor corrections are really useful after data month 11 (2 November 1979).

These values have been tabulated (Table 7-2 with a view toward rendering tide heights as accurate as possible. Note that these corrections are based upon a single value observed at 30 foot depth. More precise corrections could probably be made available pending additional studies of these sensors.

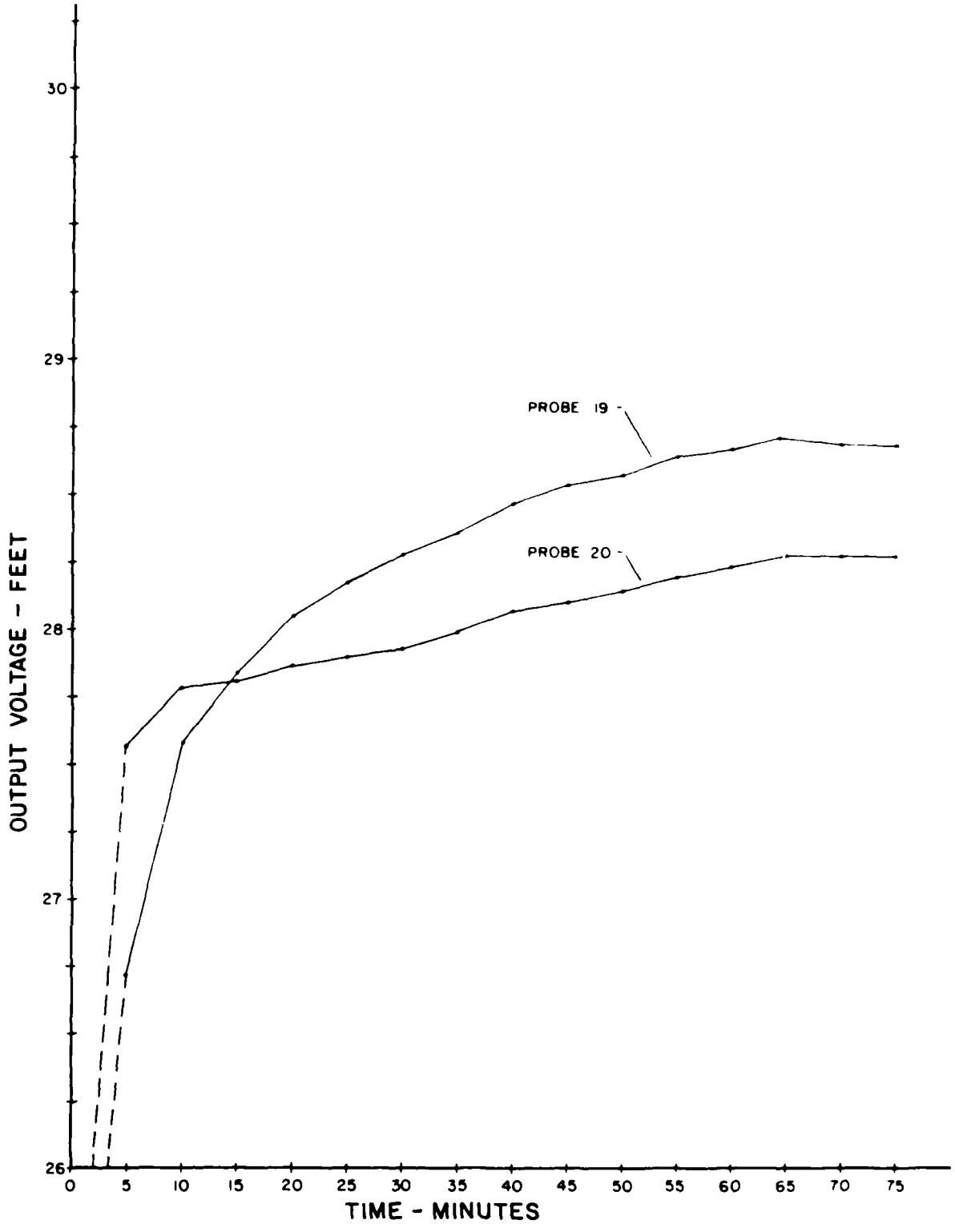


Figure 7-1. Depth sensor output in freshwater 5 May 1980 from probes SN6271019 and SN6271020 at 30 feet after being lowered from the surface.

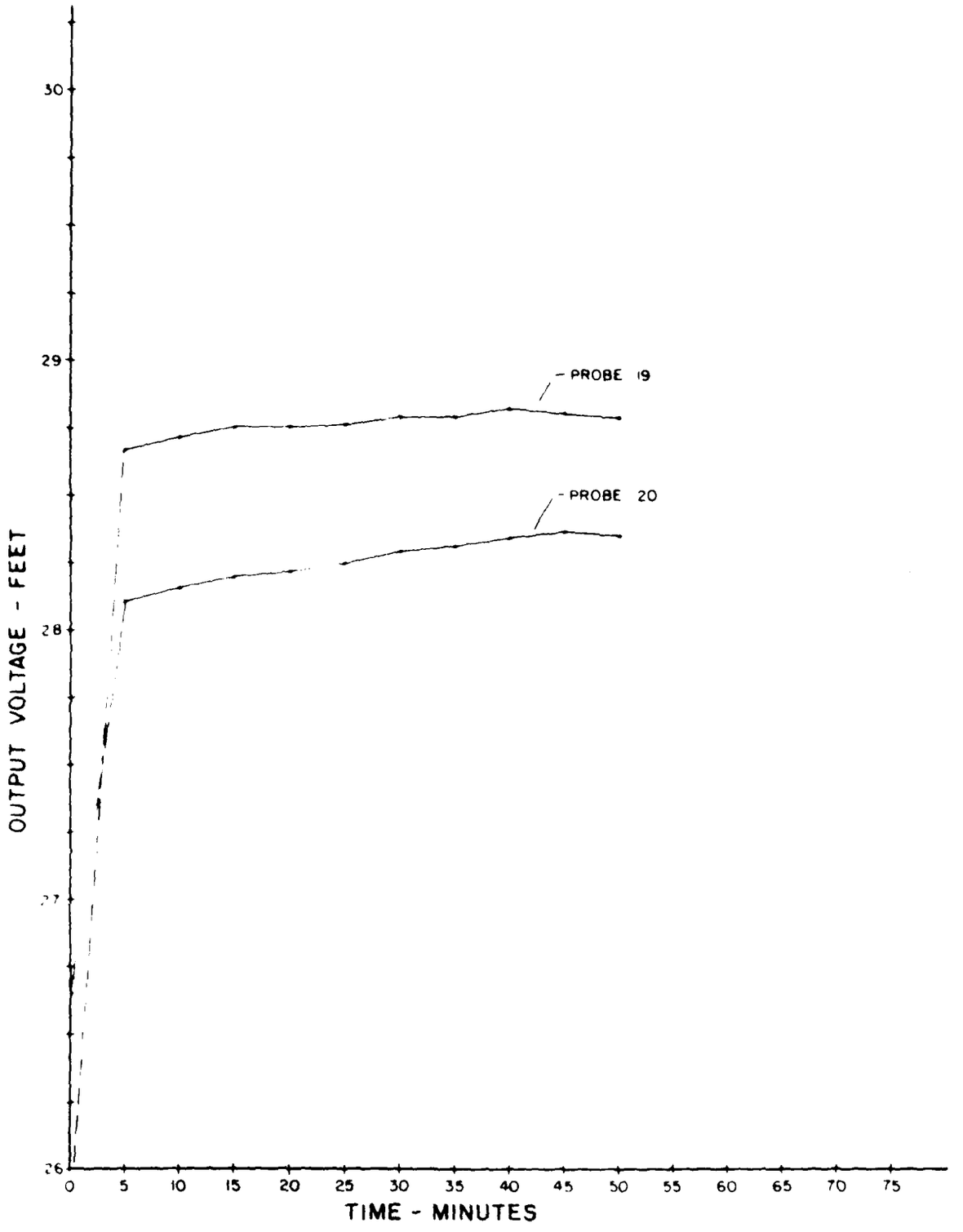


Figure 7-2. Depth sensor output in freshwater 5 May 1980 from probes SN6271019 and SN6271020 at 30 feet after being lowered from (about 45 minutes) 25 feet.

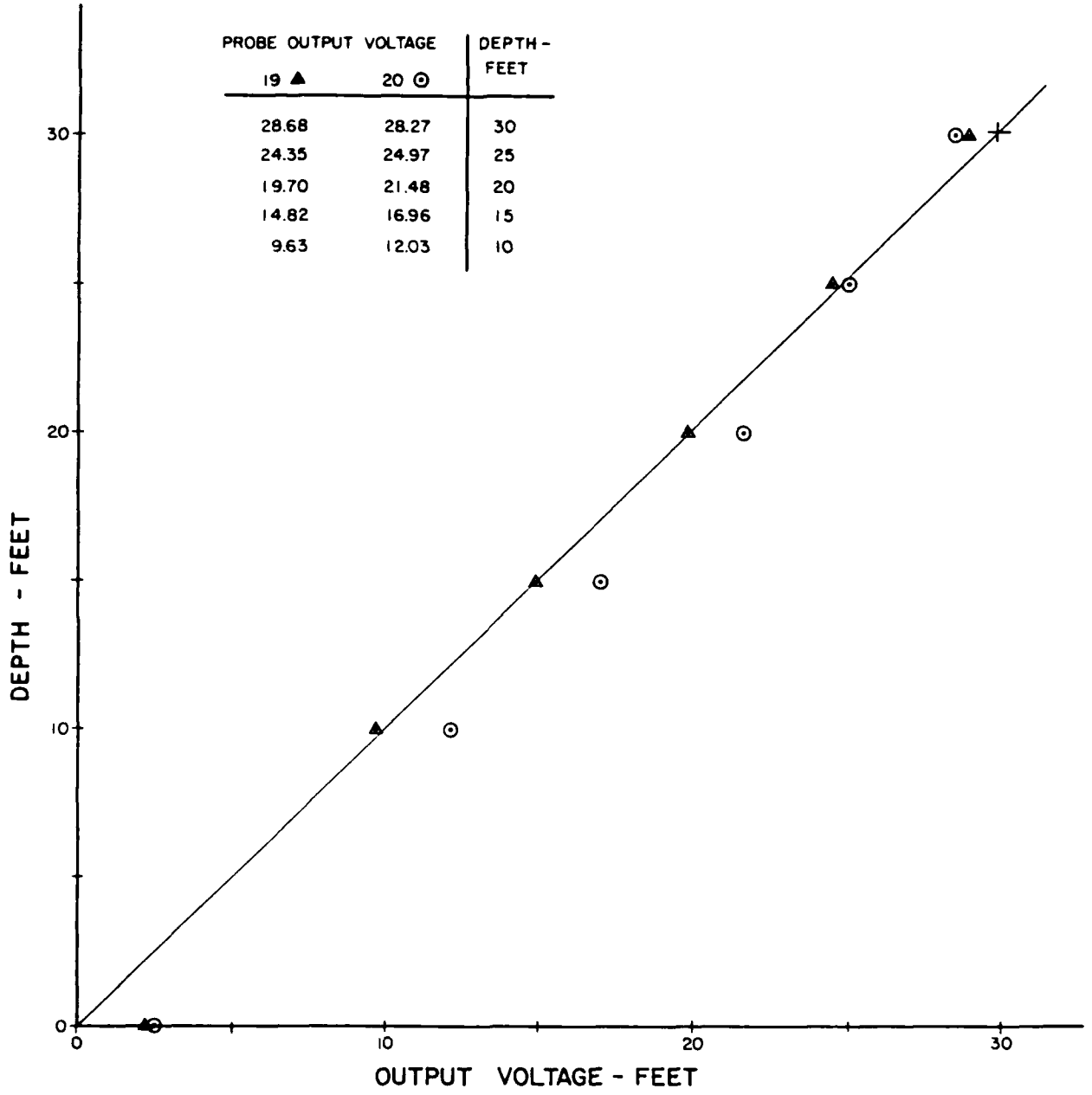


Figure 7-3. Depth sensor outputs in freshwater 5 May 1980 from probes SN6271019 and SN6271020 at various depths. Outputs (voltages = feet) have been recorded after allowing the sensor to stabilize at each depth (30-60 minutes).

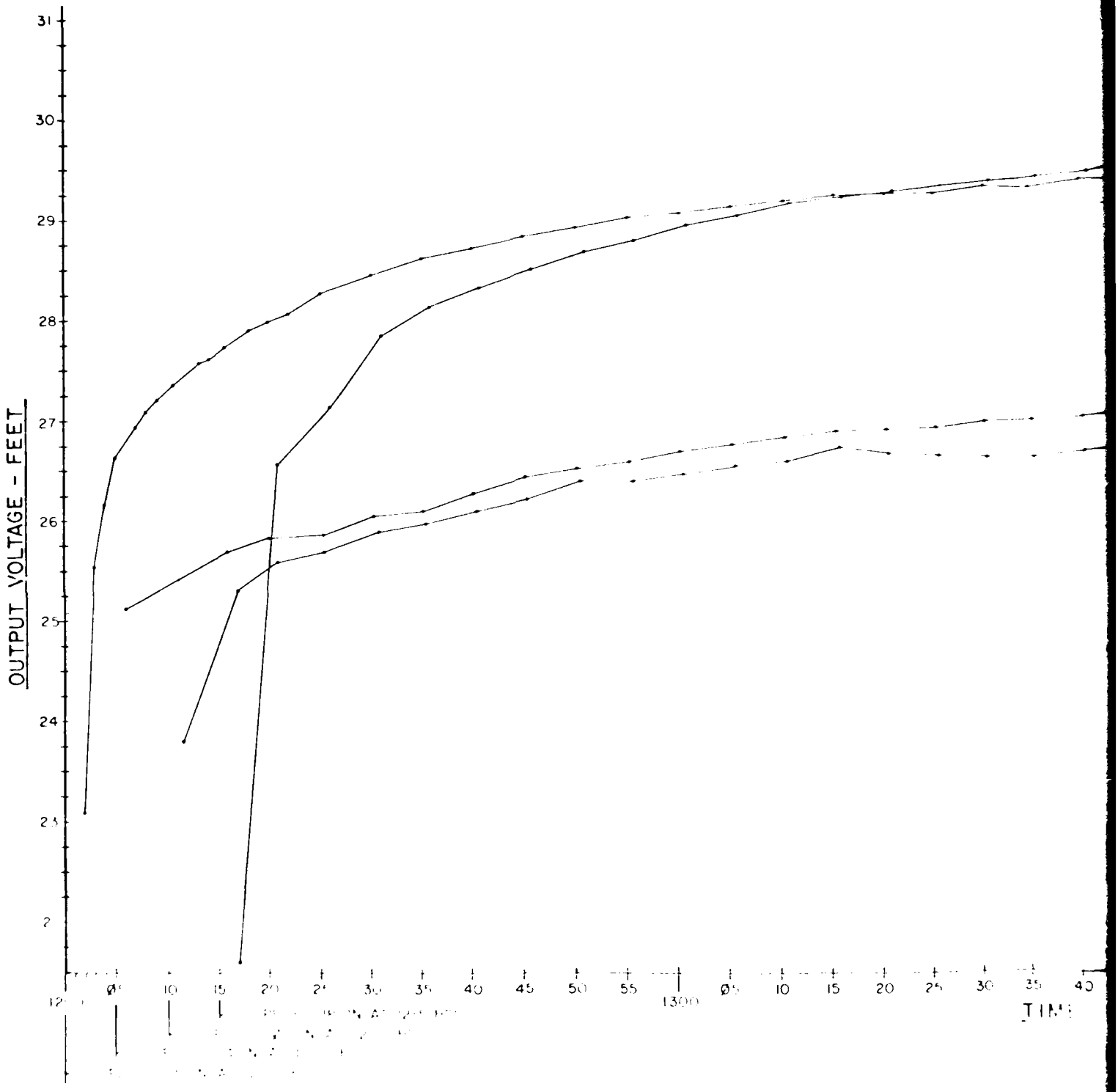
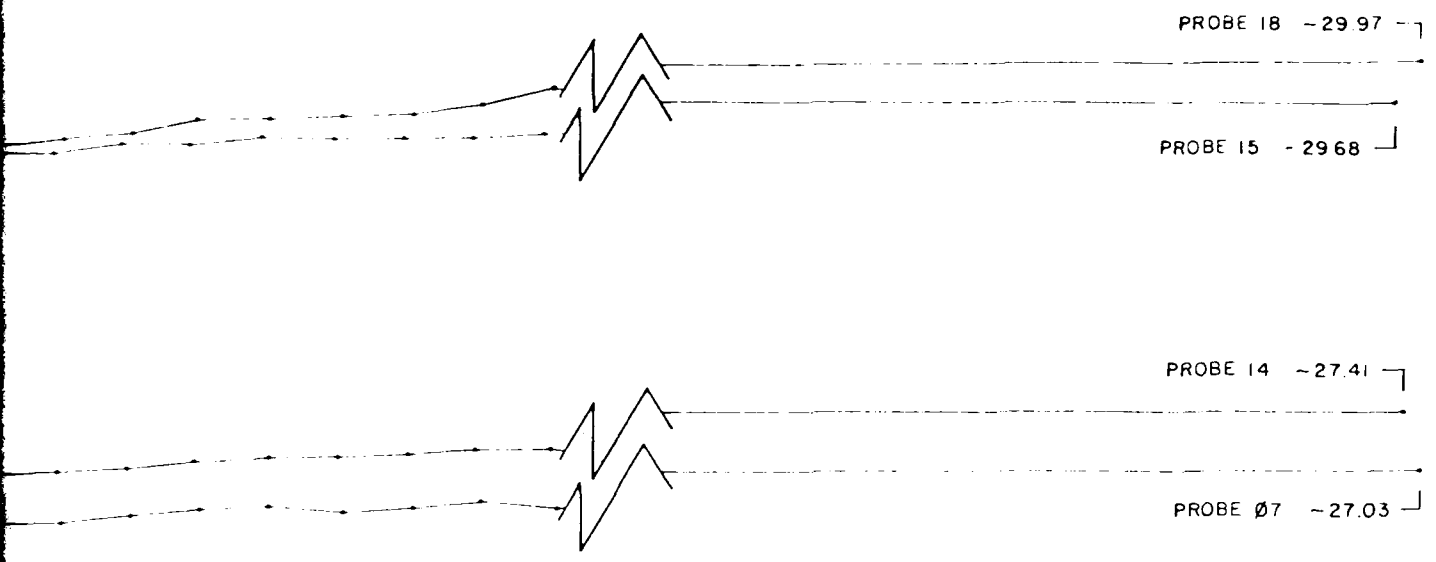
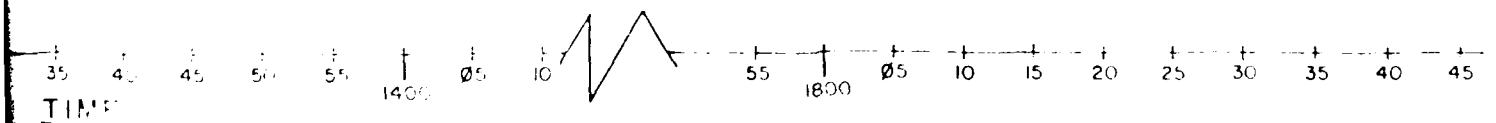


Figure 2-4. Depth sensor output in free probe, 50-foot, and 30-foot from the





TIME

tp[illegible] in fr[illegible] 16 July 1983
27[illegible], S[illegible]014, S[illegible]015,
t[illegible]
e.

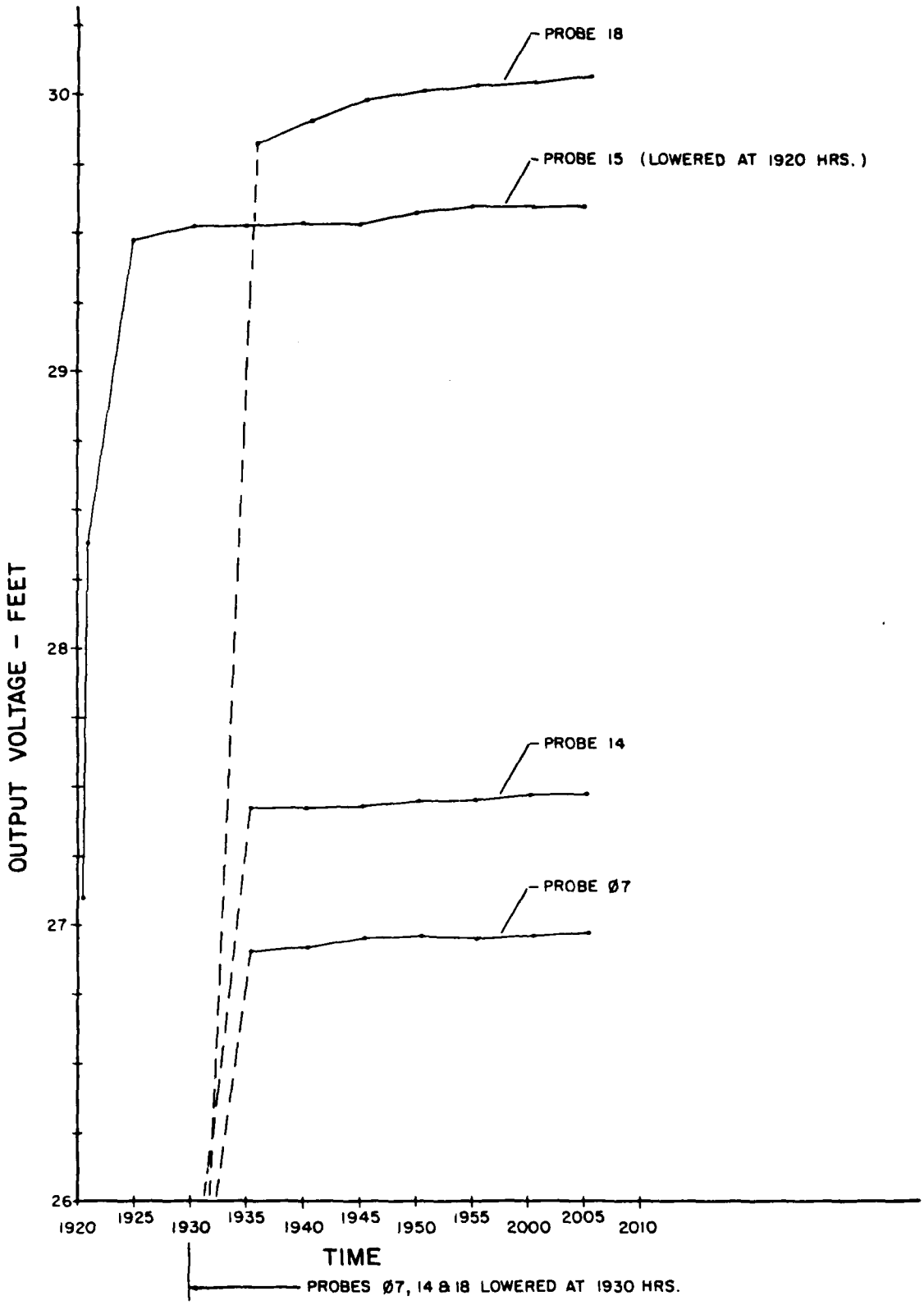


Figure 7-5. Depth sensor output in freshwater 16 July 1980 from probes SN6271007, SN6271014, SN6271015, SN6271018 at 30 feet after being lowered from 25 feet.

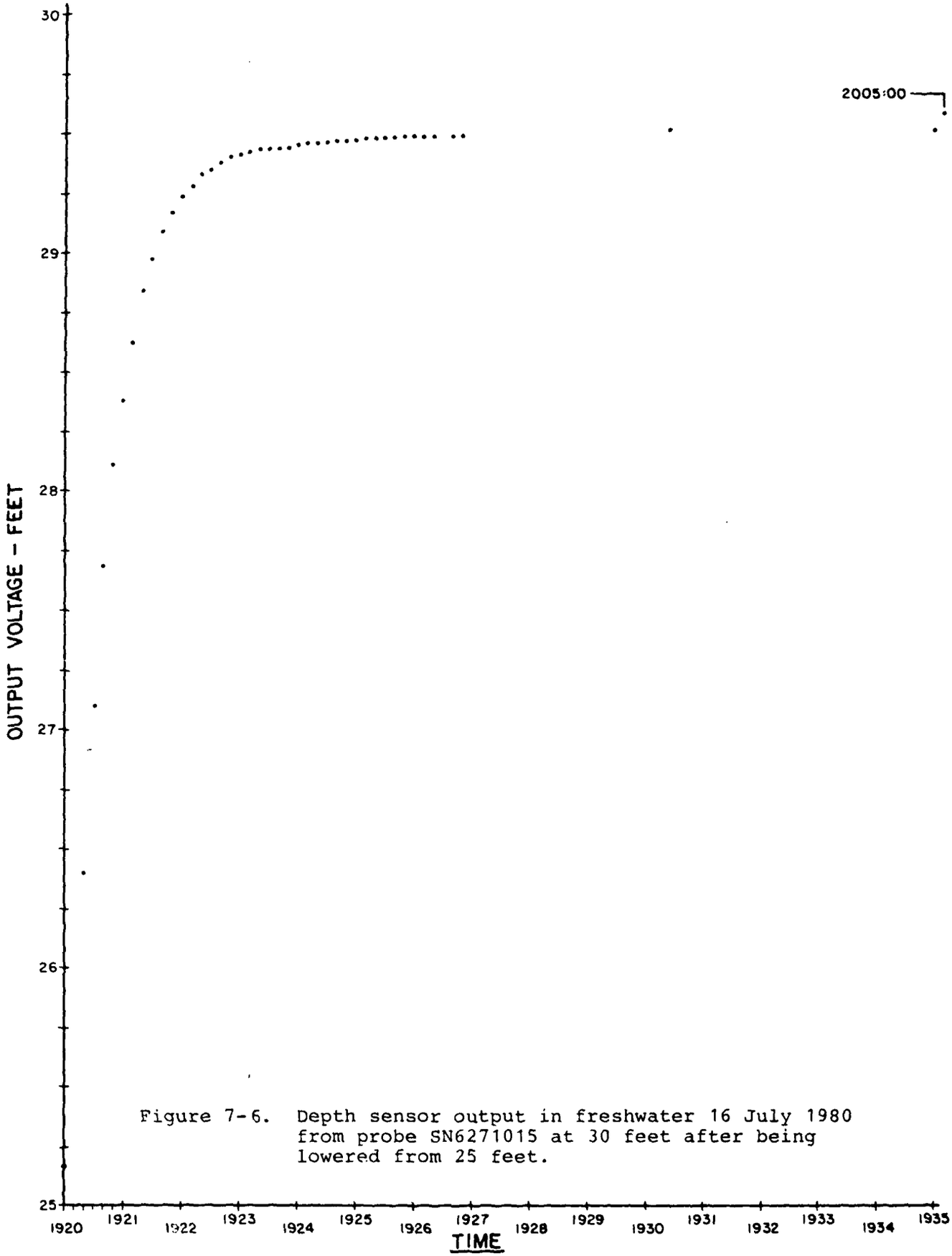


Figure 7-6. Depth sensor output in freshwater 16 July 1980 from probe SN6271015 at 30 feet after being lowered from 25 feet.

Table 7-1. Summary of 30 ft Fresh Water Depth Sensor Corrections for Probes Deployed 2 November 1979 to 3 July 1980

Probe	30 ft Value (0-30 ft)	30 ft Value (25-30 ft)	Best 30 ft Value (ft)	Correction (ft)	Correction (cm)
Test date: 16 July 80					
15	29.68	29.59	29.6	0.4	12
14	27.41	27.47	27.4	2.6	79
7	27.03	26.97	27.0	3.0	91
18	29.97	30.06	30.0	0.0	0
Test date: 15 May 80					
19	28.68	28.78	28.7	1.3	40
20	28.27	28.35	28.3	1.7	52

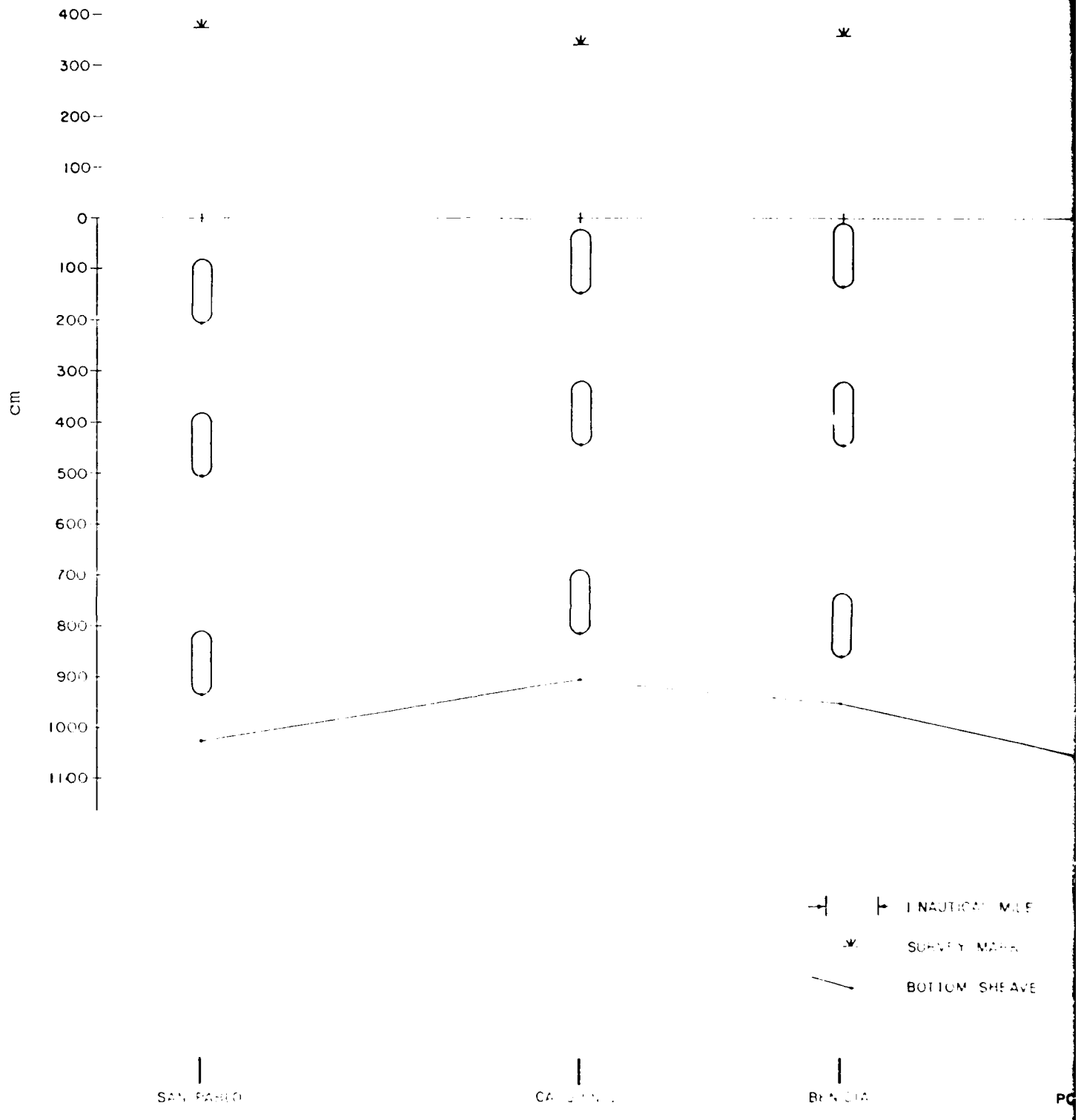
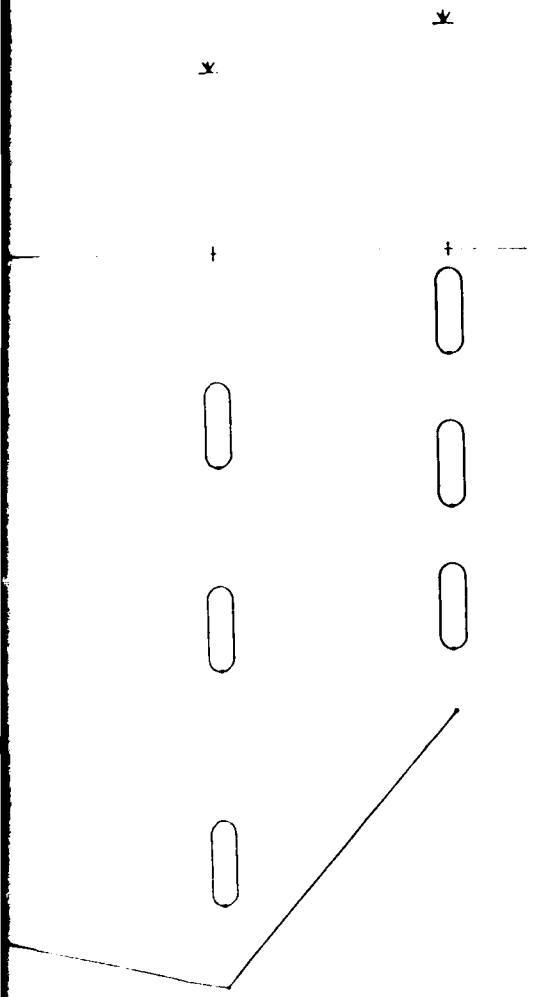


Figure 7-7. Probe Position and Towfish Survey Mark Positions.



TICAL M
EY M
OM SHEAVE

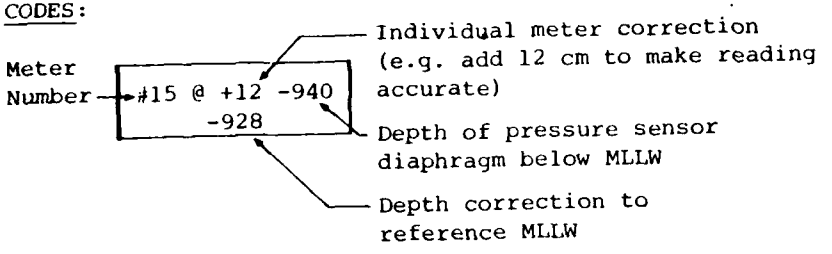
PO C
CH

Table 7-2. Monthly Corrections (centimeters) for Converting Project Screened Tide Height Data to Tide Heights Referenced to MLLW*

Tape	Month	San Pablo	Carquinez	Benicia	Port Chicago	Chipps Island
0645	2	#15 @ +12 -940 -928	#7 @ +91 -816 -725	#14 @ +79 -865 -786	#18 @ ±0 -971 -971	#19 @ +40 -584 -544
5301	3				#20 @ +52 -971 -919	
5332	4					
5347	5					
5350	6					
5352	7					#18 @ ±0 -584 -584
5354	8				#19 @ +40 -971 -931	

(continued)

CODES:

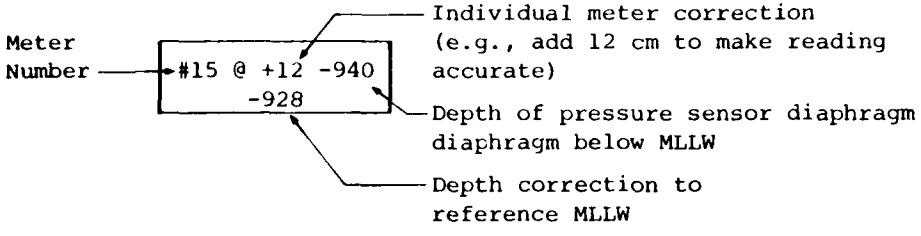


*Corrections are based upon field sensor distance measurements, Towill, Inc. survey mark positions, and studies of individual sensor responses 5 May 80 and 16 July 80. Corrections for month 2 to month 8 are included as logical extensions only: verified corrections for these months are not available. (See Figure 7-7 for probe positions and Towill survey mark positions.)

Table 7-2. (continued)

Tape	Month	San Pablo	Carquinez	Benicia	Port Chicago	Chipps Island
5376	11	#15 @ +12 -940 -928	#7 @ +91 -816 -725	#14 @ +79 -865 -786	#20 @ +52 -951 -899	#18 @ 0 -584 -584
5380	12	↓	↓	↓	#19 @ +40 -951 -911	↓
5410	13	↓	↓	↓	↓	↓
5441	14	X	↓	↓	#20 @ +52 -951 -899	↓
5467	15	X	↓	↓	↓	↓
5471	16	#15 @ +12 -940 -928	↓	↓	↓	↓
5490	17	X	↓	↓	#15 @ +12 -951 -939	↓
5511	18	#20 @ +52 -940 -888	↓	↓	↓	↓

CODES:



APPENDIX 8

FORTRAN Salinity Computation

```
      SUBROUTINE SALTY(COND,TEMP,SAL)
      DOUBLE PRECISION S,R,RT,T,C,RPRIME
      C=COND
      T=TEMP
      RT=(0.676516)
     1+((0.200402*(T))/(10.))
     1+((0.122700*(T**2))/(10**3))-
     1-((0.216091*(T**3))/(10**5))
     1+((0.663405*(T**4))/(10**7))
     1-((0.95646*(T**5))/(10**9))
      R=C/((RT)*(42.896))
      RPRIME=
     1((0.442*T)/(10.))
     1-((0.460*(T**2))/(10**3))
     1-((4*(R*T))/(10**5))
      S=-(0.08996)
     1+((28.8567)*R)
     1+((12.18882)*(R**2))
     1-((10.61869)*(R**3))
     1+((5.98624)*(R**4))
     1-((1.32311)*(R**5))+((R*(R-1.0))*RPRIME)
      SAL=S
      RETURN
      END
```

(Bennet, A. S. (1976). Conversion of in situ measurements of conductivity to salinity. Deep-Sea Research 23:157-165.)

APPENDIX 9

Clocks and Time Marks for Cassette Recorders

KINNETIC
LABORATORIES
INCORPORATED

P O BOX 1252
LABORATORY ONE POTRERO STREET
SANTA CRUZ CALIFORNIA 95061
(408) 423 6830

1 November 1979

Mr. Joel Sigalove, Sales Engineer
InterOcean Systems, Inc.
3540 Aero Court
San Diego, CA 92123

Dear Mr. Sigalove:

In this letter I would like to make you aware of the problems we are having with recorder clocks. To begin with, I would like to review for you why these clocks were desired.

Early on in using InterOcean data recorders, we encountered severe difficulties in reading data cassettes. Spurious records, illegal characters, word shifts, and missing records typify data records produced by this equipment. Where problems (e.g., power failures) occur during the writing of a cassette tape, missing records, shifts, and illegal characters appear with increasing frequency. At our own expense, we have developed a body of interactive computer software to make these files readable. The user must carefully judge, using field records, exactly when files end and begin. Meticulous attention to detail is required.

No matter how careful the record-keeping has been, the user, because of the above mentioned inherent flaws in the design of the equipment, often must use judgment in deciding when a particular file begins. For this reason alone, having the ability to know the time when a particular record in a file was taken is extremely valuable. Knowing absolute time would enable the user to sequence files without risk of error.

Having time in a data file has important implications. If time were available, the procedure for sequencing the file could be automated since a computer program could key on time and perform the routine tasks now performed by the data manager.

Secondly, if a master, clock-recorder clock system were devised where all stations were set to a universal time, the use of automated procedures could be expanded to vastly decrease potential human error through bypassing some of the elaborate bookkeeping processes now in use.

We performed a series of tests on the recorder you have sent to us. From these tests, we conclude that you have delivered a time-keeping system which does not improve our data handling ability significantly.

Our second experience with the clocks after you had added an independent power supply was that we experienced problems setting them. The switch was too fast to permit setting the clocks to a desired voltage. You now have supplied us with instructions for installing a "slow" switch; yet, as you will note below, the clocks are impossible to set, not because of a setting switch, but because the clocks (time) cannot be accurately read, apparently due to inherent noise in the system.

Enclosed are tabulated results from several preliminary tests of recorder clock performance.

Table 9-1 indicates readings of the master clock over a 44 minute period. These have been graphed in order to visualize the clock's overall response (Figure 9-1). Please note that the slope of the "eye fitted" line departs (@7.62 mvolt/hr) from the specified 10 mvolt/hr.

Table 9-2 is a similar test to that outlined above but it spans a longer time period (200 min). The "slope" is now 9.6 mvolt/hr. Again note the variation about the line (see Figure 9-2).

Table 9-3 summarizes a two point-in-time study of several recorders. The purpose of the test was to examine how close the recorders were to the master clock and to each other. Exemplary responses were graphed in Figure 9-3. For the San Pablo recorder we have a slope, based upon start and end points of:

$$m = \frac{720 \text{ mvolt} - 112 \text{ mvolt}}{4908 \text{ min} - 1194 \text{ min}} = \frac{608 \text{ mvolt}}{3714 \text{ min}} = 0.163 \frac{\text{mvolt}}{\text{min}} = 9.82 \frac{\text{mvolt}}{\text{hr}}$$

(0948 day 4 - 1954 day 1)

For the Benicia recorder we have:

$$m = \frac{733 \text{ mvolt} - 111 \text{ mvolt}}{4909 \text{ min} - 1190 \text{ min}} = \frac{622 \text{ mvolt}}{3719 \text{ min}} = 0.167 \frac{\text{mvolt}}{\text{min}} = 10.0 \frac{\text{mvolt}}{\text{hr}}$$

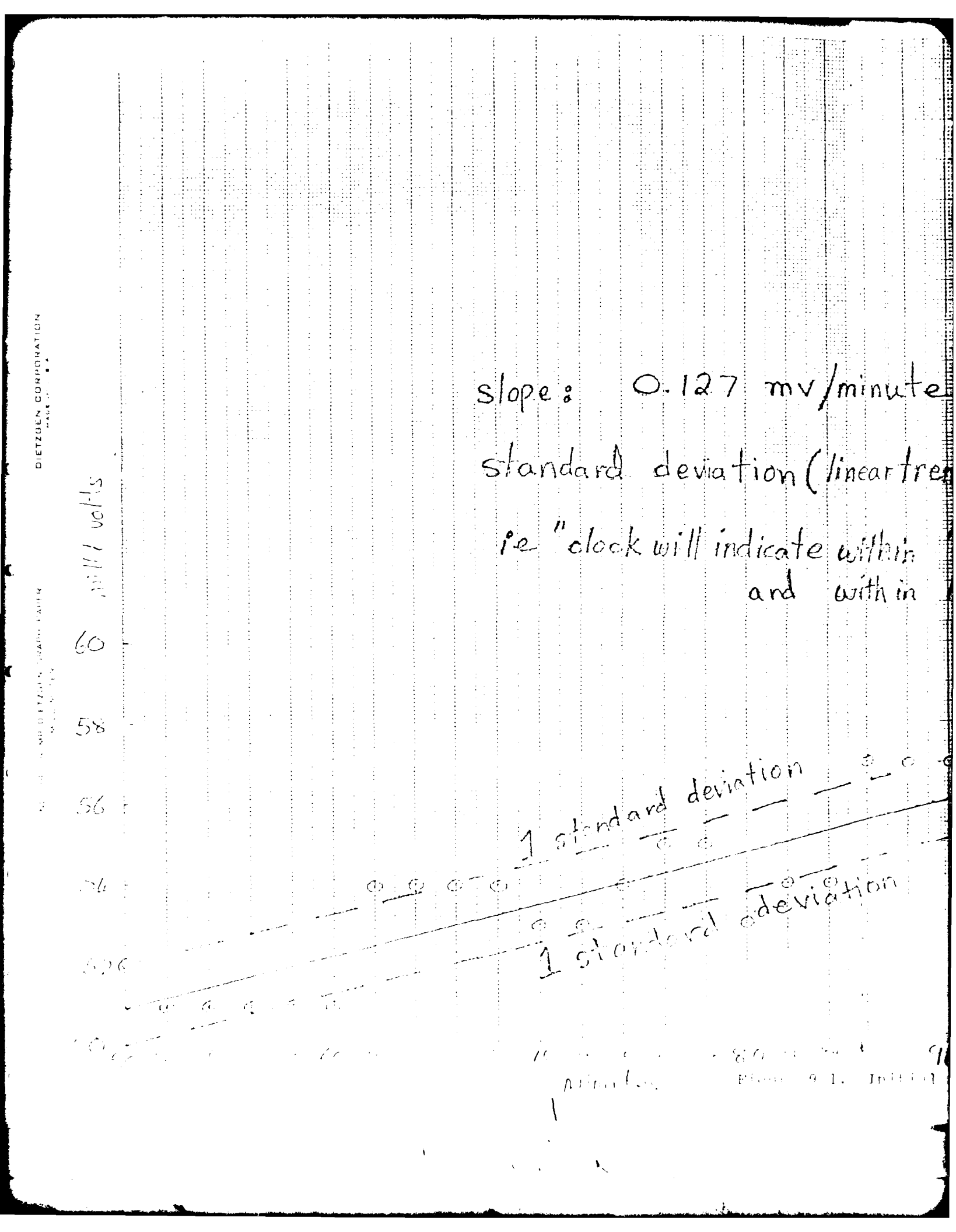
(0949 day 4 - 1950 day 1)

Note the discrepancy between final recorder values and master clock values. The discrepancy of 72 minutes for the San Pablo recorder is disturbing. Further study using regression techniques would be required to say if the recorders were "together" in time or not.

Table 9-1.

Initial Study of Master Clock

Elapsed Minutes	"Blue Box" millivolts
50	52
52	51
54	51
56	51
58	51
60	51
62	54
64	54
66	54
68	54
70	53
72	53
74	54
76	55
78	55
80	53
82	54
84	54
86	57
88	57
90	57
92	56
94	56


slope: 0.127 mv/minute
standard deviation (linear tre
ie "clock will indicate within
and within
1 standard deviation
1 standard deviation
60
58
56
millivolts
DIETZGEN CORPORATION

nute. (7.62 mv/hour)

ear trend removed } = 0.98 mv

thin 7.7 min. 68% of the time
th in 15.4 min. 95% of the time

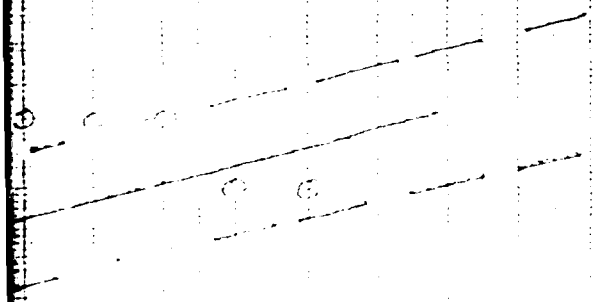


Table 9-2.

Study of master clock over a 200 minute period

Time	"Blue Box" millivolts
1006	2570
1010	2574
1011	2574
1012	2574
1013	2574
1016	2575
1017	2575
1018	2575
1019	2578
1021	2576
1023	2576
1024	2576
1025	2576
1026	2575
1028	2579
1030	2579
1038	2577
1044	2582
1059	2581
1100	2581
1131	2590
1132	2590
1135	2587
1139	2592
1140	2591
1142	2591
1144	2591
1146	2588
1153	2594
1159	2590
1204	2596
1316	2608
1317	2607
1319	2607
1324	2604
1326	2605
1328	2609
1330	2605

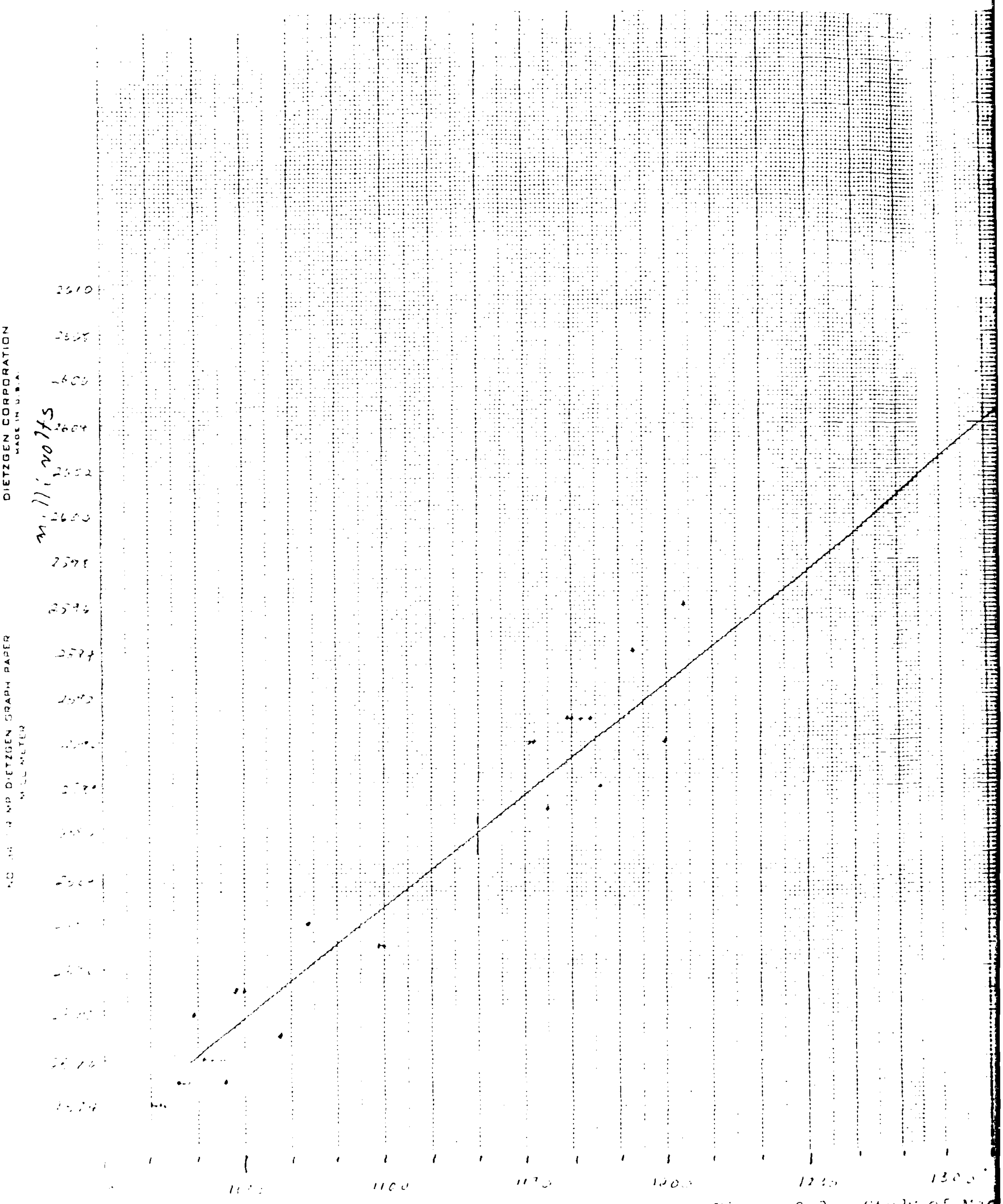
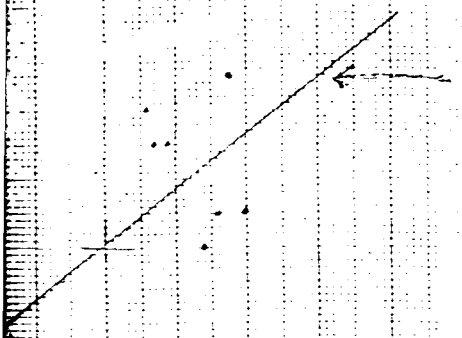


Figure 9.2. Study of Mas



← FITTED BY "EYE"
NOT A REGRESSION LINE

$$\text{SLOPE} = \frac{2604 - 2586}{190 - 80} = 18/110 = .16 \text{ mvolt/min}$$

$$= 9.6 \text{ mvolt/hour}$$

Table 9-3.

Recorder clock function*

Day	Time	Recorder Identifier	Recorder Clock millivolts	Master Clock millivolts	Recorder Clock minus Master Clock millivolts	Recorder Clock minus Master Clock minutes
1	1954	San Pablo	112	111	1	6
1	1950	Benicia	111	111	0	0
1	1958	Port Chicago	111	110	1	6
1	2005	Chipps Island	114	113	1	6
1	2000	Extra	111	110	1	6
4	0944	Chipps Island	730	728	2	12
4	0946	Extra	723	728	-5	-30
4	0947	Port Chicago	729	728	1	6
4	0948	San Pablo	720	732	-12	-72
4	0949	Benicia	733	732	1	6

*All recorders set to master clock and times observed three days later. Readings from "blue box" voltmeter.

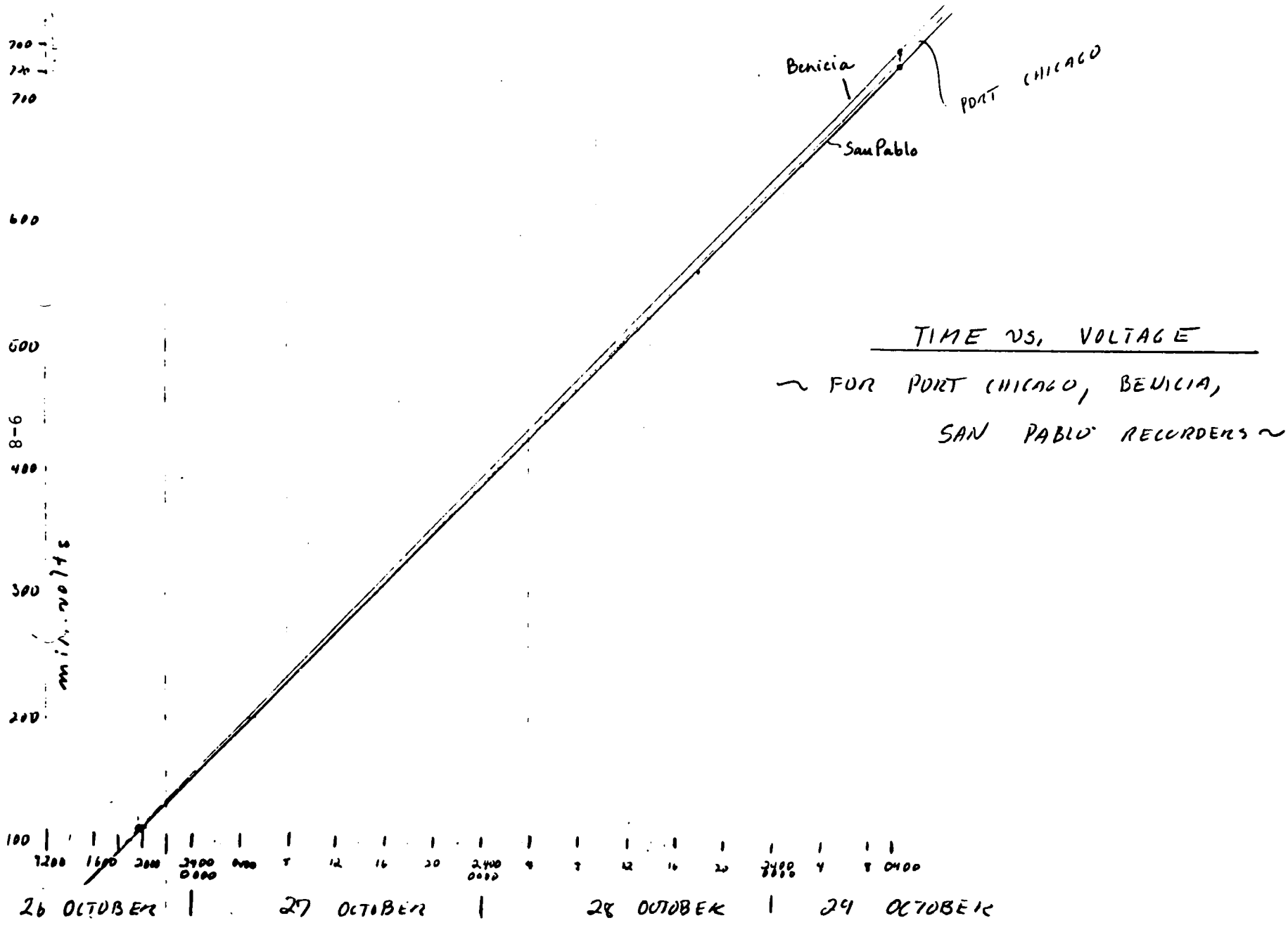


Figure 9-3. Recorder Clock Functioning.

Table 9-4 summarizes voltages actually recorded over a period of 16 hr 30 min. A print of the cassette data file is presented in Appendix 9.A. Observed and "expected" voltages have been tabulated. The slope is based upon observed end times and a hypothesized start time (The start voltage was not successfully recorded. See data blocks 1 and 2):

$$m = \frac{3164 \text{ mvolt} - 3000 \text{ mvolt}}{16.5 \text{ hr}} = 164/16.5 \text{ mvolt/hr} = 9.93 \text{ mvolt/hr}$$

Note the error columns of Table 9-4 where departures from expectation are recorded. The voltages which are more than 3 mvolt (18 min) different from expectation would cause an error in placing a data burst in time sequence (Recall that our instruments sample on the half-hour. To be correct, time must be known to the nearest 15 min of the half-hour). In 34 bursts, 3 mvolt departures have taken place 15 times (44% error). A deviation of 6 mvolt (36 min), which could cause misplacement of two bursts, occurred once.

A closer examination of the recording is warranted. This recorder registered a "time" of 3.00 volt about 30 sec before the beginning of the recording. The time of the first half-hour was not recorded (due to recorder design). Note that on every 12th record (i.e., on the hour) time increments by 10 ± 2 mvolt. Also, every hour on the half-hour time also increments by 10 ± 2 mvolt. Differences between adjacent half-hours are as small as 0 mvolt (30 min error).

A recording printed yesterday is included in Appendix 9.B. This recorder clock registered a "time" of 67 mvolt 19 min before the recording began. Note that the first recorded time in the shifted record is 66 mvolt. Thereafter on every 12th record (on the hour) time increments by 10 ± 1 mvolt. The intermediate records (half-hours) behave similarly, but time voltages are too close to the hour voltages.

The time voltage behavior on these recordings by itself is acceptable. We could key on the hour beginning at either half-hour. (This is a preliminary estimate. We need more information to be absolutely sure we can do this). We are left with the critical problem, however, of what the real time of a given record actually is.

Based on the foregoing, we have arrived at the following conclusions:

1. Most clocks seem to be keeping time according to the specified formula of approximately 10 mvolt/hr.

2. With the present level of noise in the system, any reading or clock setting is usually good to ± 1 hour.

Table 9-4.

Summary of test recording (Appendix A)
with instances of "misleading" clock voltages

Time	Observed Voltage	Expected Voltage	Observed minus Expected	Minutes Error	Half Hour Record Error Risk	Hour Record Error Risk
0000	--	3000	--	--	--	--
0030	3004	3004	0	0	--	--
0100	3005	3010	-5	-30	*	--
0130	3015	3014	+1	+6	--	--
0200	3015	3020	-5	-30	*	--
0230	3025	3024	+1	+6	--	--
0300	3026	3030	-4	-24	*	--
0330	3034	3034	0	0	--	--
0400	3036	3040	-4	-24	*	--
0430	3044	3044	0	0	--	--
0500	3044	3050	-6	-36	*	*
0530	3054	3054	0	0	--	--
0600	3057	3060	-3	-30	*	--
0630	3065	3064	1	+6	--	--
0700	3066	3070	-4	-24	*	--
0730	3075	3074	+1	+6	--	--
0800	3077	3080	-3	-18	*	--
0830	3085	3084	0	0	--	--
0900	3087	3090	-3	-18	*	--
0930	3096	3094	+2	+12	--	--
1000	3096	3100	-4	-24	*	--
1030	3105	3104	-1	-6	--	--
1100	3106	3110	-4	-24	*	--
1130	3114	3114	0	0	--	--
1200	3116	3120	-4	-24	*	--
1230	3125	3124	-1	-6	--	--
1300	3125	3130	-5	-30	*	--
1330	3135	3134	+1	+6	--	--
1400	3136	3140	-4	-24	*	--
1430	3144	3144	0	0	--	--
1500	3145	3150	-5	-30	*	--
1530	3155	3154	+1	+6	--	--
1600	3157	3160	-3	-18	*	--
1630	3164	3164	0	0	--	--

3. Recorded time voltages could be used to sequence records once the recording starts by keying on the hour. However, there is still the problem of relating recorded time to real time.

These conclusions have certain implications in our treatment of the data:

1. The concept of master and recorder clocks operating together is not workable. Since the clocks cannot be precisely set, we cannot synchronize our stations in time. Keeping the stations together in time would have decreased the occurrence of human error in correctly starting and sequencing data files.

2. At best, the clock data will allow us to read ± 1 hour. We believe that our present data managing procedures accomplish that, and better, at present. There is little likelihood of a significant increase in the precision of our data sequencing ability. The present engineering of the clocks will preclude our devising any really useful automated procedure (e.g., computer programs) for smoothing data flow, lessening potential human errors, and decreasing man-hours.

We offer several suggestions for any future redesign efforts:

1. The basic concept of an incrementing clock is sound.

2. Any clock which is used must be capable of being set to the nearest minute.

3. The clock must increment precisely on time.

4. The clock time must be readable (i.e., one must be able to tell the time).

Note that the important factor is that at least one moment (in real time) in a file of data must be known. Note that time range is not as important as precision.

This week we are returning our instruments to the field. We believe that the clocks at present are little more than a qualitative aid. You should be aware that we have lost the I.D. voltage which is checked by our data screening program (We also have to re-write our screen program to accommodate time). At present, we use the shape of the tidal wave as a qualitative aid in helping us sequence records. Note that tide can be considered as a clock set in real time.

I think that we need to look at how we can improve the reading (i.e., with the voltmeter) of the clocks. Somehow we must know when the clock increments so that we can associate the time of incrementing with what appears on the recording.

In summary, we are disappointed. One would throw away a $5 watch that kept time like these clocks.

Your thoughts on finding a solution to our problem would be appreciated.

Thank you for your attention to this matter.

Sincerely yours,

Conrad Recksiek

Conrad Recksiek, Ph.D.
Oceanographer

CR/cd

APPENDIX 9.A

Test file of data from two probes with time voltages. Half hour bursts (6 lines) are underlined and time voltages are outlined. Clock at time zero was read at 3.00 volt. At the end of the experiment, the clock read 3.16 volt (The voltmeter used reads to the nearest 10 mvolt in the 2 to 10 volt range). Carquinez recorder.

```
 0001999999999999599 999999999999999999999999999999999999999999999999999
 9999999999999999999 9999999999999999999999999 99999999999999999999999
 9999999999999999999 99999999999999999999999999 99999999999999999999999
 9999999999999999999999999999999999999999999999999999999999999999999999
  2          0                  tclockoct18
 -0597-0010 1892 0892-0597-0010 1892 0892-0597-0010 1893 0892-0597-0010 1
  0583-0265-0001 1206 0583-0331-0056 1207 0584-0356-0066 1203 0584-0179-0
  0001 0006 0002 0002 0001 0004 0002 0002 0001 0004 0002 0002 0001 0004 0
  0001 0004 0002 0001 0001 0004 0002 0001 0001 0004 0002 0001 0001 0004 0
0000 3          0                  tclockoct18
 -1368-0009 1914 2440-1368-0009 1914 2440-1369-0009 1914 2440-1369-0009 1
  3004 0069 0240 1192 3004 0371 0305 1191 3004 0422 0539 1191 3004 0301 C
 -0596-0010 1906 0888-0596-0010 1905 0888-0596-0010 1906 0888-0596-0010 1
  0584 0840 1476 1217 0584 0766 0862 1217 0584-0977-1257 1218 0584-0303-C
  4          0                  tclockoct18
  0001 0007 0002 0003 0001 0004 0002 0002 0001 0004 0002 0002 0001 0004 C
0020 0001 0004 0002 0002 0001 0004 0002 0002 0001 0004 0002 0002 0001 0004 C
 -1368-0010 1915 2445-1368-0009 1916 2445-1368-0010 1916 2445-1368-0010 1
  3005 0107 0553 1192 3005 0066 0483 1192 3005 0484 0290 1192 3005 0238 C
  5          0                  tclockoct18
 -0596-0010 1908 0887-0596-0010 1909 0889-0596-0010 1909 0889-0596-0010
  0584 1158-1071 1215 0584-0587 2517 1215 0584-3082 4557 1218 0584-3230
  0001 0007 0002 0003 0001 0004 0002 0002 0001 0004 0002 0002 0001 0004 (
  0001 0004 0002 0001 0001 0005 0002 0001 0001 0005 0002 0001 0001 0005 (
0100 6          0                  tclockoct18
 -1368-0009 1910 2447-1368-0009 1910 2447-1368-0010 1910 2447-1368-0009
  3015 0273 0139 1192 3015 0355 0025 1192 3015 0032-0240 1191 3015-0524-(
 -0596-0010 1904 0888-0596-0010 1904 0889-0596-0010 1904 0889-0596-0010
  0584-0206 0419 1220 0584-0306 0408 1216 0584-0325 0344 1219 0584-0244 (
  7          0                  tclockoct18
  0002 0008 0003 0002 0002 0005 0003 0002 0002 0005 0003 0002 0002 0005
0150 0002 0005 0003 0001 0002 0005 0003 0001 0002 0005 0003 0002 0002 0005
 -1368-0009 1905 2448-1369-0009 1905 2448-1368-0009 1904 2448-1368-0010
  3015-0256-0297 1192 3015-0290-0279 1191 3015-0268-0305 1191 3015-0257-
  8          0                  tclockoct18
 -0595-0010 1899 0887-0596-0010 1899 0888-0596-0010 1899 0889-0596-0010
  0584-0220 0392 1219 0584-0365 0369 1218 0584-0393 0325 1218 0584-0329
  0001 0008 0002 0003 0001 0005 0002 0002 0001 0005 0002 0002 0001 0005
  0001 0005 0002 0001 0001 0005 0002 0001 0001 0005 0002 0001 0001 0005
  9          0                  tclockoct18
0200-1368-0009 1899 2449-1368-0010 1899 2449-1368-0009 1899 2448-1368-0009
  3025-0273-0326 1191 3025-0271-0279 1191 3025-0283-0285 1191 3025-0276-
 -0596-0010 1896 0889-0596-0010 1897 0889-0596-0010 1896 0889-0596-0010
  0584-0256 0380 1220 0584-0384 0352 1218 0584-0435 0310 1217 0584-0370
  10         0                  tclockoct18
  0001 0009 0003 0002 0001 0006 0002 0002 0001 0005 0002 0002 0001 0005
0230 0001 0005 0002 0001 0001 0006 0002 0001 0001 0006 0002 0001 0001 0005
 -1368-0009 1897 2449-1369-0009 1897 2449-1368-0009 1897 2449-1369-0009
  3026-0300-0308 1192 3026-0275-0302 1191 3026-0283-0282 1191 3026-0341-
  11         0                  tclockoct18
 -0596-0010 1894 0888-0596-0010 1894 0889-0596-0010 1894 0889-0596-0010
  0584-0258 0383 1215 0584-0369 0347 1213 0584-0444 0274 1214 0584-0372
  0001 0009 0002 0002 0001 0006 0002 0002 0001 0006 0002 0003 0001 0006
  0001 0005 0002 0001 0001 0006 0003 0001 0002 0006 0003 0001 0002 0006
0300 12         0                  tclockoct18
 -1368-0009 1893 2448-1368-0009 1893 2448-1368-0009 1893 2448-1368-0009
  3034-0311-0321 1191 3034-0310-0271 1191 3034-0310-0282 1191 3034-0383
 -0596-0010 1890 0888-0596-0010 1891 0888-0596-0010 1891 0889-0596-0010
  0584-0263 0386 1214 0584-0382 0342 1211 0584-0442 0272 1211 0584-0373
  13         0                  tclockoct18
  0001 0009 0002 0002 0001 0006 0002 0002 0001 0006 0002 0002 0001 0005
  0001 0005 0002 0002 0001 0006 0002 0002 0001 0006 0002 0002 0001 0005
0330-1368-0009 1887 2447-1368-0009 1888 2447-1368-0009 1888 2447-1369-0009
  3036-0314-0308 1191 3036-0274-0296 1191 3036-0320-0300 1191 3036-0363
```

```
 0583-0233 0385 1209 0584-0370 0330 1211 0584-0456 0257 1210 0584-0371 03
 0002 0010 0003 0002 0002 0006 0003 0002 0002 0006 0003 0002 0002 0006 00
 0002 0006 0003 0002 0002 0006 0003 0002 0002 0006 0003 0002 0002 0006 00
0400 15                0                tclockoct18
 -1368-0009 1881 2446-1368-0009 1882 2446-1369-0010 1882 2446-1369-0010 18
 3044-0309-0290 1191 3044-0285-0250 1190 3044-0313-0276 1190 3044-0372-03
 -0596-0010 1883 0886-0596-0010 1883 0886-0596-0010 1883 0887-0596-0010 18
 0584-0240 0367 1212 0584-0381 0374 1211 0584-0450 0300 1213 0584-0394 03
 16                0                tclockoct18
 0001 0010 0002 0003 0001 0006 0002 0002 0001 0006 0002 0002 0001 0006 00
0430 0001 0006 0002 0002 0001 0006 0002 0002 0001 0006 0002 0002 0001 0006 00
 -1368-0009 1876 2444-1369-0009 1877 2444-1369-0009 1877 2444-1369-0009 18
 3044-0324-0296 1191 3044-0290-0286 1190 3044-0325-0276 1190 3044-0374-02
 17                0                tclockoct18
 -0596-0010 1878 0887-0596-0010 1878 0887-0596-0010 1879 0888-0596-0010 18
 0584-0251 0355 1211 0584-0376 0331 1210 0584-0479 0263 1210 0584-0399 03
 0002 0011 0003 0002 0002 0007 0003 0002 0002 0007 0003 0002 0002 0007 00
 0002 0006 0003 0001 0002 0007 0003 0002 0002 0007 0003 0002 0002 0007 00
0500 18                0                tclockoct18
 -1368-0009 1871 2444-1369-0009 1872 2445-1369-0009 1872 2444-1369-0009 18
 3054-0306-0293 1190 3054-0285-0270 1189 3054-0270-0263 1188 3054-0331-02
 -0596-0010 1871 0887-0596-0010 1871 0887-0596-0010 1871 0888-0596-0010 18
 0583-0247 0348 1207 0584-0382 0332 1207 0584-0419 0279 1207 0584-0386 03
 19                0                tclockoct18
 0001 0011 0003 0002 0001 0007 0002 0002 0001 0007 0002 0002 0001 0006 00
0530 0001 0006 0002 0002 0001 0007 0002 0002 0001 0007 0002 0002 0001 0006 00
 -1369-0009 1867 2444-1369-0009 1867 2444-1369-0010 1867 2444-1369-0010 18
 3057-0302-0332 1191 3057-0260-0282 1189 3057-0287-0307 1189 3057-0327-03
 20                0                tclockoct18
 -0596-0010 1866 0886-0596-0010 1866 0886-0596-0010 1866 0886-0596-0010 18
 0583-0244 0378 1211 0584-0367 0372 1208 0584-0447 0270 1209 0584-0398 03
 0002 0010 0003 0003 0002 0007 0003 0002 0002 0006 0003 0002 0002 0006 00
 0002 0006 0003 0002 0002 0007 0003 0002 0002 0007 0003 0002 0002 0007 00
0600 21                0                tclockoct18
 -1369-0009 1868 2443-1369-0010 1869 2443-1369-0010 1869 2443-1369-0010 18
 3065-0328-0326 1190 3065-0288-0291 1187 3065-0307-0293 1185 3065-0365-03
 -0596-0010 1870 0885-0596-0010 1870 0886-0596-0010 1870 0886-0596-0010 18
 0584-0221 0390 1210 0584-0394 0351 1208 0584-0462 0267 1208 0584-0424 03
 22                0                tclockoct18
 0002 0010 0003 0003 0002 0007 0002 0002 0001 0007 0002 0002 0001 0006 00
0630 0001 0006 0002 0002 0001 0007 0002 0002 0001 0007 0002 0002 0001 0007 00
 -1369-0009 1867 2442-1369-0009 1867 2442-1369-0009 1867 2442-1369-0010 18
 3066-0322-0319 1190 3066-0284-0283 1188 3066-0295-0306 1187 3066-0359-03
 23                0                tclockoct18
 -0596-0010 1868 0883-0596-0010 1868 0884-0596-0010 1868 0885-0596-0010 18
 0584-0244 0382 1208 0584-0397 0343 1207 0584-0430 0284 1209 0584-0392 03
 0002 0010 0003 0002 0002 0007 0003 0002 0002 0007 0003 0002 0002 0007 00
 0002 0007 0003 0002 0002 0007 0003 0002 0002 0007 0003 0002 0002 0007 00
0700 24                0                tclockoct18
 -1368-0009 1863 2441-1369-0009 1864 2441-1369-0010 1864 2441-1369-0010 18
 3075-0304-0330 1188 3075-0300-0294 1185 3075-0307-0315 1186 3075-0352-03
 -0596-0010 1864 0883-0596-0010 1864 0884-0596-0010 1864 0884-0596-0010 18
 0584-0261 0371 1207 0584-0365 0317 1209 0584-0456 0261 1208 0583-0380 03
 25                0                tclockoct18
 0002 0010 0003 0003 0002 0007 0002 0002 0001 0007 0002 0002 0001 0007 00
0730 0001 0007 0003 0001 0001 0007 0003 0001 0002 0008 0003 0001 0002 0007 00
 -1369-0009 1863 2440-1369-0010 1864 2440-1369-0009 1864 2439-1369-0010 18
 3077-0315-0323 1190 3077-0302-0287 1188 3077-0312-0299 1189 3077-0401-03
 26                0                tclockoct18
 -0596-0010 1866 0882-0596-0010 1866 0883-0596-0010 1866 0883-0596-0010 18
 0583-0269 0392 1208 0584-0392 0356 1208 0584-0473 0271 1209 0584-0410 03
 0002 0010 0003 0003 0002 0007 0003 0002 0002 0007 0003 0002 0002 0007 00
 0002 0006 0003 0002 0002 0007 0003 0002 0002 0007 0003 0002 0001 0007 00
0800 27                0                tclockoct18
```

APPENDIX 9.B

Beginning of test data file from two probes
with time voltages. Half hour bursts (6 lines)
are underlined and time voltages are outlined.
Clock at 19 min before start was read as 67 mvolt.
Carquinez recorder.

NOTE SHIFT

```
 1            8              ce.clock.test02
9999999999999999999999999999999999999999999999999999999999999999999999999999
9999999999999999999999999999999999999999999999999999999999999999999999999999
9999999999999999999999999999999999999999999999999999999999999999999999999999
9999999999999999999999999999999999999999999999999999999999999999999999999999
 2            0              ce.clock.test02
 2844 0000 0000 0000 0000 0000 0000 0000 0000 2000 0000 0000 0000 0000 0000
 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
 0000-1366-0002 1946 2451-1366-0002 1946 2451-1366-0002 1946 2451-1366-0002
 2451 0066-0343 0065 1114 0066-0315 0059 1111 0066-0256-0012 1113 0066-0320
 3            0              ce.clock.test02
-0593-0002 1991 0789-0593-0002 1991 0789-0593-0002 1991 0789-0593-0002 1992
 0588-0135 0070 1145 0589-0316 0121 1145 0589-0268 0126 1146 0589-0224 0113
-0000-0000-0000-0000-0000-0000-0000-0000-0000-0000 0000 0000 0000 0000 0000
 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
 4            0              ce.clock.test02
-1366-0002 1993 2471-1366-0002 1993 2471-1366-0002 1994 2471-1366-0002 1994
 0070-0348 0086 1110 0070-0363 0052 1112 0072-0403 0078 1112 0072-0172-0239
-0593-0002 2023 0780-0593-0002 2023 0780-0593-0002 2023 0781-0593-0002 2023
 0588-0251 0092 1145 0589-0138 0012 1145 0589-0296 0153 1145 0589-0267 0129
 5            0              ce.clock.test02
-0000-0000-0000-0000-0000-0000-0000-0000-0000-0000 0000-0000-0000-0000 0000
 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
-1366-0001 2039 2482-1366-0001 2039 2481-1366-0001 2040 2481-1366-0001 2240
 0076 0022 0052 1112 0076 0022 0013 1112 0076 0020 0012 1115 0076 0015 0009
 6            0              ce.clock.test02
-0593-0002 2062 0775-0593-0002 2263 0776-0593-0002 2263 0776-0593-0002 2263
 0588 0049 0068 1139 0588 0072 0249 1137 0589 0122 0049 1137 0589 0125 0253
-0000-0000-0000-0000-0000-0000-0000 0000-0000 0000-0000-0000 0000 0000 0000
 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
 7            0              ce.clock.test02
-1366-0001 2053 2473-1366-0001 2054 2474-1366-0001 2254 2473-1366-0001 2254
 0079 0054 0045 1110 0079 0057 0219 1113 0079 0051 0015 1112 0079 0051 0000
-0593-0002 2062 0771-0593-0002 2062 0772-0593-0002 2262 0773-0593-0002 2262
 0588 0070 0070 1145 0589 0106 0045 1145 0589 0146 0051 1145 0589 0169 0045
 8            0              ce.clock.test02
-0000-0000-0000-0000 0000-0000-0000 0000 0000 0000 0000 0000 0000 0000 0000
 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
-1366-0001 2031 2473-1366-0001 2031 2474-1366-0001 2031 2473-1366-0001 2031
 0086 0057 0054 1112 0086 0265 0016 1115 0086 0261 0015 1113 0086 0259 0011
 9            0              ce.clock.test02
-0593-0002 2227 0771-0593-0002 2227 0772-0593-0002 2027 0772-0593-0002 2027
 0588 0073 0072 1145 0589 0107 0045 1145 0589 0146 0045 1145 0589 0170 0057
-0000-0000 0000-0200 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
 10           0              ce.clock.test02
-1366-0001 1996 2473-1366-0001 1996 2473-1366-0001 1996 2473-1366-0001 1996
 0088 0052 0052 1113 0088 0059 0003 1112 0088 0057 0011 1115 0088 0055 0020
-0593-0002 1981 0774-0593-0002 1981 0775-0593-0003 1981 0775-0593-0002 1981
 0588 0041 0062 1145 0589 0069 0037 1145 0589 0099 0041 1145 0589 0132 0047
 11           0              ce.clock.test02
 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
-1366-0001 1961 2472-1366-0001 1961 2472-1366-0001 1962 2472-1366-0001 1962
 0096 0059 0051 1113 0096 0264 0008 1113 0096 0265 0007 1113 0096 0264 0003
 12           0              ce.clock.test02
```

```
-0593-0002 1944 0776-0593-0002 1944 0776-0593-0002 1944 0777-0593-0001 1944 0
 0588 0031 0067 1145 0589 0049 0037 1145 0589 0073 0042 1145 0589 0056 0032 1
 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0
 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0
 13              0              ce.clock.test02
-1366-0001 1929 2471-1366-0001 1929 2471-1366-0001 1928 2470-1366-0001 1928 2
 0099 0060 0046 1113 0099 0066 0010 1110 0099 0066 0009 1114 0101 0067 0015 1
-0593-0001 1906 0778-0593-0002 1906 0778-0593-0001 1906 0779-0593-0001 1906 0
 0588 0020 0053 1138 0589 0029 0034 1140 0589 0049 0027 1139 0589 0062 0028 1
 14              0              ce.clock.test02
 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0
 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0
-1366-0001 1865 2469-1366-0001 1866 2469-1366-0001 1867 2469-1366-0001 1866 2
 0106 0060 0050 1111 0106 0073 0012 1113 0106 0074 0012 1114 0106 0074 0007 1
 15              0              ce.clock.test02
-0593-0002 1856 0778-0593-0001 1857 0779-0593-0001 1858 0778-0593-0001 1859 0
 0588 0054 0063 1145 0589 0053 0038 1145 0589 0049 0024 1145 0589 0056 0036 1
 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0
 0000 0000 0000 0000 0000 0000 0000 0000 0001 0000 0000 0000 0001 0000 0001 0
 16              0              ce.clock.test02
-1366-0001 1856 2468-1366-0001 1856 2468-1366-0001 1857 2467-1366-0001 1859 2
 0109 0066 0045 1112 0109 0077-0002 1111 0109 0082-0000 1113 0109 0084 0001 1
-0592-0001 1854 0779-0592-0001 1854 0780-0593-0001 1853 0782-0592-0001 1852 0
 0588 0009 0052 1145 0589-0007 0020 1145 0589-0013 0013 1145 0589-0022 0017 1
 17              0              ce.clock.test02
 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0
 0001 0000 0000 0000 0000 0000 0000 0000 0001 0000 0000 0000 0001 0000 0001 0
-1366-0001 1816 2467-1366-0001 1817 2467-1366-0001 1816 2467-1366-0001 1817 2
 0116 0064 0038 1109 0116 0082 0003 1111 0116 0085 0024 1116 0116 0092-0002 1
 18              0              ce.clock.test02
-0592-0001 1805 0780-0592-0001 1804 0780-0592-0001 1803 0781-0592-0001 1804 0
 0589 0007 0048 1136 0589-0018 0012 1137 0589-0037 0005 1137 0589-0049 0004 1
 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0
 0000 0000 0000 0000 0000 0001 0000 0000 0000 0000 0000 0000 0000 0000 0001 0
 19              0              ce.clock.test02
-1366-0001 1784 2466-1366-0001 1784 2466-1366-0001 1783 2465-1366-0001 1784 2
 0118 0069 0046 1111 0118 0089 0002 1110 0118 0102 0003 1113 0118 0098-0004 1
-0592-0001 1776 0780-0592-0001 1776 0781-0592-0001 1776 0781-0592-0001 1776 0
 0589 0030 0059 1144 0589-0005 0017 1144 0589-0032 0007 1145 0589-0055-0001 1
 20              0              ce.clock.test02
 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0
 0000 0000 0000 0000 0001 0001 0000 0001 0001 0000 0001 0001 0001 0001 0001 0
-1366-0001 1768 2465-1366-0001 1770 2465-1366-0001 1770 2464-1366-0001 1770 2
 0125 0069 0049 1109 0126 0093 0006 1109 0126 0123-0005 1115 0126 0113-0004 1
 21              0              ce.clock.test02
-0592-0001 1757 0780-0592-0001 1756 0780-0592-0001 1755 0781-0592-0001 1755 0
 0589-0015 0046 1138 0589-0051 0006 1137 0589-0066-0004 1136 0589-0075-0010 1
 0000 0000 0000 0000 0000 0000 0000 0000 0001 0000 0000 0000 0000 0000 0000 0
 0000 0000 0000 0000 0000 0001 0000 0001 0001 0000 0001 0001 0001 0001 0000 0
 22              0              ce.clock.test02
-1366-0001 1743 2464-1366-0001 1744 2464-1366-0001 1745 2463-1366-0001 1744 2
 0130 0071 0041 1111 0130 0096 0003 1111 0130 0107-0010 1113 0130 0101-0006 1
-0592-0001 1725 0779-0592-0001 1726 0780-0592-0001 1727 0782-0592-0001 1728 0
 0589 0023 0060 1144 0589-0031 0005 1144 0589-0063-0007 1144 0589-0089-0012 1
 23              0              ce.clock.test02
 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0
```

APPENDIX 10

Equipment Descriptions and Specifications

I. INTRODUCTION

1.1 General Description

The InterOcean Model 195SP Probe is a ruggedly constructed, compact, portable unit designed to operate in conjunction with the InterOcean Model 680/195 Recorder or 514D/195 Readout.

The 195SP Probe incorporates precision sensors to provide an in situ measurement of seven parameters and Probe Identification number including conductivity, temperature; tide, turbidity, current (Vx, Vy) and direction.

The Probe utilizes an internal electronics package, which includes voltage regulators and all required circuitry to convert the sensor input signals to output signals which can be displayed directly in the appropriate engineering units.

1.2 Specifications

1.2.1 Electrical

Conductivity	0-65 millimos ± .02 Output = 1 volt/10 millimhos Time constant 20ms
Temperature	-5 to 45°C ± .02 Output = 1 volt/10°C Time constant 1.4 sec
Tide/Depth	0-50 feet ± .01 feet Output = 1 volt/10ft. ** Time constant 200 sec Transducer depth limit, 25% over range
Current (Vx & Vy)	0 to ± 300 cm/sec Output = 5 volt/300 cm/sec ± 10% Time constant 1 sec
Direction	0 to 360° ± 4° Output = .01 volt/degree Time constant = 8 ms.
Turbidity	0-100% Transmission Output = 0-1V ± 2% Time constant = 400 ms.

**OTHER RANGES AVAILABLE ON REQUEST

1.2.2 Mechanical

Weight	23 Kg in air - 11.5 in water
Overall Height	106.7 cm
Maximum Diameter	18.5 cm

1.2.3 Environmental

Operating Temperature Range	-5 to +50°C
Storage Temperature	-5 to +50°C

1.0 INTRODUCTION

1.1 General Description

The InterOcean Model 680 Digital Recorder is a self-contained data acquisition system, containing an eight channel analog multiplexer, an analog to digital converter, and a digital cassette recorder.

The Recorder multiplexes parameters from three probes, processes up to eight channels of analog data, and records the result in four digit Binary Coded Decimal (BCD) form on a standard magnetic tape cassette.

The Recorder features operator selection of the following controls:

1. Channel Selection - the number of analog input channels to be processed.

2. Scan Rate Selection - the length of time, in seconds, between the first channel in a data scan and the first channel in the next data scan, assuming that more than one data scan has been selected for recording.

3. Repetition Rate Selection - The time, in hours, the recorder waits before recording the next set of data scans. The time is measured from the first scan in a record interval to the same place in the next record interval.

4. Data Sets or Groups Selection - Allows a data scan to consist of either data sets or groups.

NOTE: See section 3.1, General Operation, for switch settings peculiar to operation of 680 Multiplex Recorder.

1.2 Recorder Specifications

1.2.1 Mechanical

Size	4" w X 3" d X 13" l
Weight	5 lb.
Material	Aluminium

1.2.2 Electrical

Power Requirements	+12V DC ± 20%, Current drain is 7mA in standby, 400mA while tape is advancing.
Analog Inputs	0 to ±7.999V DC

1.2.3 Analog to Digital Converter

Resolution	16 bits
Relative Accuracy	±1/2 LSB
Gain Error	±1/2 LSB
Gain Error Drift	1 PPM/°C
Input Resistance	200 K ohm

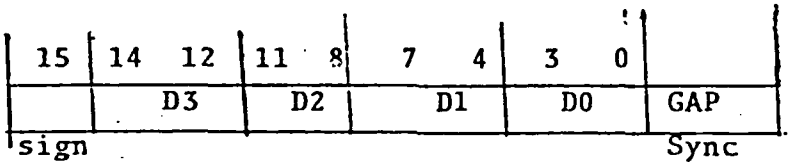
1.2.4 Recorder

Record Media	Standard Phillips certified data Cassette, 300 ft. length
Number of Tracks	2
Recording Density	615 BPI
Recording Format	2 track NRZI, 2 bit word sync 16 bit file gap.
Storage Capacity	2,214,000 bits/300 ft. cassette
Write speed	256 Hz
Step angle	1.5°
Angular Accuracy	±8 min of arc non accumulative
Start/Stop Time	Not applicable
Tape tension	0.4 oz inches
Error Rate	1 bit in 10^7
Operating Mode	Write only
Type of cassette loading	Front

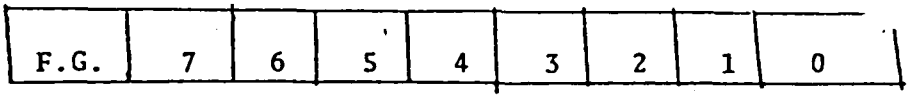
1.2.5	Recording Head	Dual Channel single gap, high quality digital type ECMA standard
	Motor	Single 7.5° angle stopper motor with 5:1 gear reduction coupled to take up reel by slip clutch mechansim.
	Operating Temperature	-10°C to +50°C
	Storage Temperature	-35°C to +70°C
	Relative Humidity	10% to 95% without condensation

1.2.6 Data Format

2 Bit gap for word syncronization followed by a 16 bit word. Eight (8) words make up a line; 8 lines make up a group. Each group is followed by a 16 bit gap called a file gap, for group syncronization. (See Figure 1.0)



Word (16 Bits)
4 Digits and Sign and Sync



Group:
F. G. - 16 bit File Gap
Lines - 0 thru 7

Fig. 1.0

PROBE 1
0072 0016 1476 0784 0072 0016 1476 0790
0072 0016 1476 0793 0072 0016 1476 0795
0890 0012 0008 0296 0890-0005-0002 0295
0890-0011-0006 0295 0890-0004-0004 0296

PROBE 2
-0802 3918 1424 0836-0802 3918 1424 0836
-0802 3917 1424 0836-0802 3918 1424 0837
0807 0021 0018 2448 0807 0007 0004 2453
0807 0014 0010 2453 0808 0017 0036 2450

PROBE 3
-0592 3839 1429 0789-0592 3839 1429 0789
-0592 3839 1429 0789-0592 3839 1429 0789
0589 0010 0042 2743 0589-0000 0017 2743
0589 0001 0010 2741 0589-0001 0005 2741

PROBE 1
0070 0014 1515 0763 0070 0014 1515 0774
0070 0014 1515 0780 0070 0014 1516 0784
0890-0008-0009 0295 0890-0005-0012 0295
0890-0005-0002 0296 0890-0004 0003 0296

PROBE 2
-0802 3928 1442 0836-0802 3928 1442 0836
-0802 3928 1442 0836-0802 3928 1442 0836
0807 0020 0019 2461 0807 0007 0013 2460
0807-0003 0001 2460 0808-0002 0003 2461

PROBE 3
-0592 3849 1444 0789-0592 3849 1444 0789
-0592 3849 1444 0789-0592 3849 1444 0789
0589 0009 0041 2741 0589 0007 0011 2741
0589-0001 0004 2741 0589 0002 0008 2741

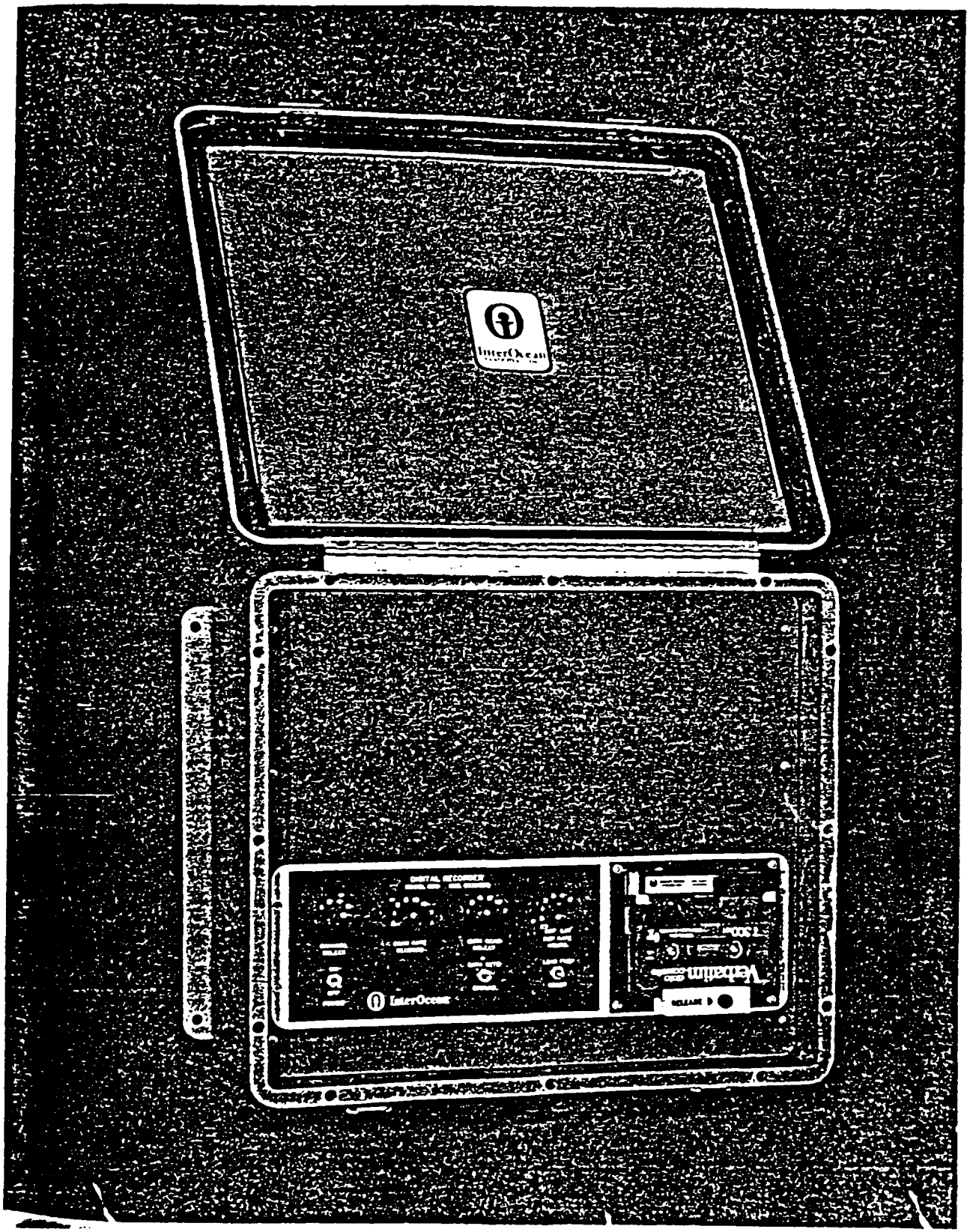
} 1 GROUP

DATA FORMAT FOR PROBE W/DEPTH

D	C	T	TR	D	C	T	TR
0095	3834	1400	0768	0095	3834	1400	0778
0095	3835	1399	0784	0095	3835	1399	0789
0890	0020	0010	0188	0890-0000		0010	0188
0890	0008	0009	0194	0890	0006	0003	0190
+ID	V_x	V_y	Dir.	+ID	V_x	V_y	Dir.

DATA FORMAT FOR PROBE WITHOUT DEPTH

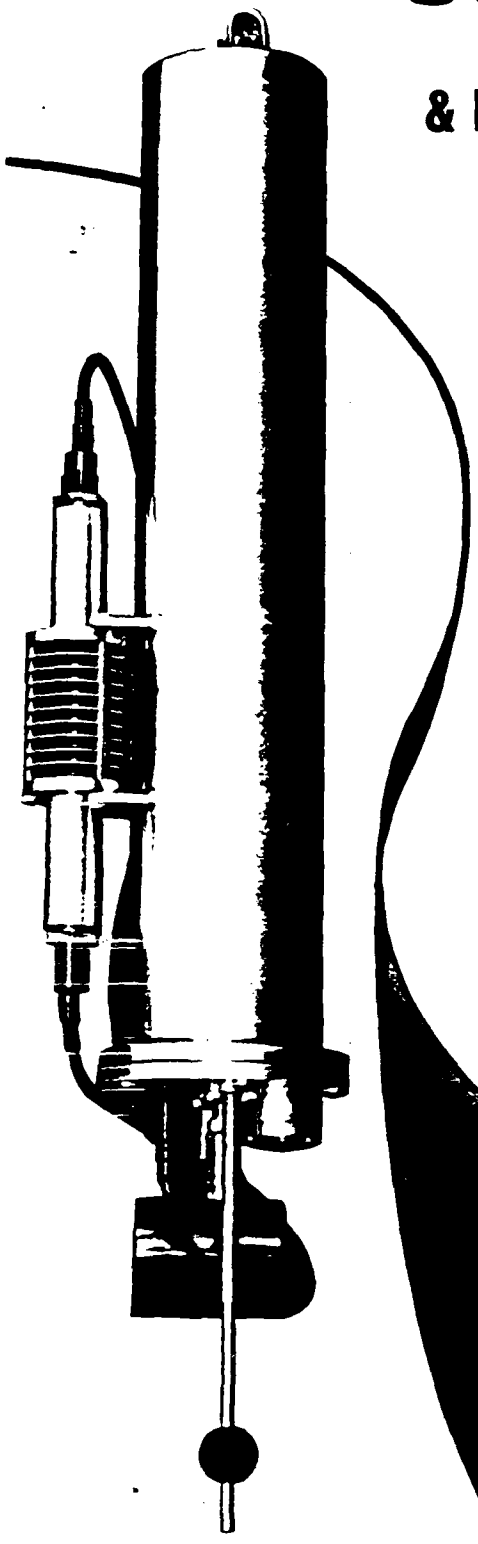
-ID	C	T	TR	-ID	C	T	TR
-0592	3823	1404	0789	-0592	3823	1404	0789
-0592	3823	1404	0789	-0592	3823	1404	0789
0589	0012	0042	2739	0589	0004	0019	2736
0589	-0002	0007	2736	0589	-0003	0008	2738
+ID	V_x	V_y	Dir.	+ID	V_x	V_y	Dir.


InterOcean
DIGITAL RECORDER
InterOcean
Verbatim

CURRENT METERS

ELECTROMAGNETIC

& INTEGRATED OCEANOGRAPHIC/ WATER QUALITY MEASURING STATIONS



- NO MOVING PARTS
- ELECTROMAGNETIC CURRENT SPEED AND DIRECTION
- CHOICE OF MULTIPLE SENSORS
- EXCELLENT DIRECTION & TILT RESPONSES
- LONG TERM STABILITY
- LOW MAINTENANCE
- FOR PROFILING OR SELF CONTAINED MAG. TAPE RECORDING

SERIES 195
196

InterOcean

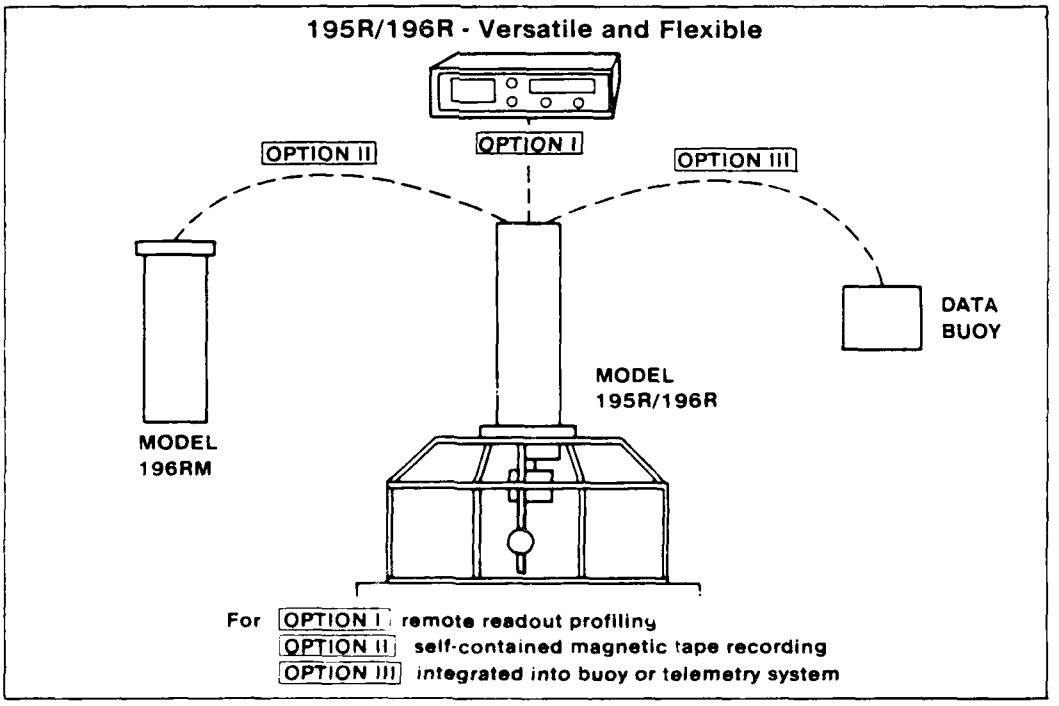
INTRODUCTION

The **InterOcean Model 195/196** series current meters are uggedly built instruments intended for use in the severest environments where corrosion, bio-fouling, and the threat of physical damage would greatly limit the use of mechanical rotor or impellor devices. The 195 series uses a spherical, solid state, no moving parts, electromagnetic current velocity sensor. Two pairs of orthogonal electrodes sense the X and Y components of the velocity vector with a fast response. A flux gate compass that is substantially immune to local magnetic materials is used to determine the orientation of the instrument with reference to magnetic north.

The excellent cosinusoidal tilt response of the spherical sensor permits the measurement of horizontal water velocities in the presence of vertical water motion. Large components of vertical water motion are often introduced by the orbital motion of a mooring or while making vertical current meter profiles. It is therefore extremely important for the sensor to reject the effects of vertical velocity in order to avoid large errors in the measurements of the true horizontal velocities.

This combination of rugged construction, no moving parts, fast response, and superior performance on a mooring or while profiling makes the 195/196 series ideally suited to applications in hazardous environments and for long term installations without the need for frequent servicing and maintenance.

APPLICATIONS



InterOcean Systems, Inc.
3540 Aero Court
San Diego, CA 92123
(714) 565-8400/cable InterOcean/TELEX 695082

196R

- NO MOVING PARTS
- CURRENT SPEED AND DIRECTION
- CHOICE OF MULTIPLE SENSORS: C/S/T/D/Do/pH/Tr/Tide/Splon/SV
- RELIABLE, STABLE, ENCAPSULATED SENSORS
- MODULAR CONSTRUCTION
- FOR MOORINGS WITH MAGNETIC TAPE RECORDING OR RADIO LINK
- FOR PROFILING WITH ON BOARD DIGITAL DISPLAY AND RECORDING

MODEL 196R

INTEGRATED OCEANOGRAPHIC AND WATER QUALITY MONITORING SYSTEM.

196R

19

The **InterOcean Model 196R** permits the user to simultaneously obtain in-situ data from a wide choice of commonly measured parameters. Included are current speed and direction, using a no moving parts electromagnetic current speed sensor and a no moving parts flux gate compass. The user may also select any combination of the following parameters: Conductivity, Salinity, Temperature, Depth, Sound velocity, Dissolved Oxygen, pH, Turbidity, Oxidation Reduction Potential, and Tide measurement. Parameters may be selected initially or may be easily added later in the field by the user.

All data channels are transmitted via cable to a remote data display, data recorder, or radio telemetry link. Alternatively, the data may be recorded in-situ on a self contained, programmable digital data cassette recorder. The system may be used as a profiler, and it may be installed for long term monitoring projects.

The Model 196R is ruggedly built for the severest environments where corrosion, bio-fouling, and the threat of physical damage would greatly limit the use of mechanical rotor or impellor devices. The 196R uses a spherical, solid state, no moving parts, electromagnetic current velocity sensor. Two pairs of orthogonal electrodes sense the X and Y components of the velocity vector with a fast response. A flux gate compass is used to determine the orientation of the instrument with reference to magnetic north.

The excellent cosinusoidal tilt response of the spherical sensor permits the measurement of horizontal water velocities in the presence of vertical water motion. Large components of vertical water motion are often introduced by the orbital motion of a mooring or while making vertical current meter profiles. It is therefore extremely important for the sensor to reject the effects of vertical velocity in order to avoid large errors in the measurements of the true horizontal velocities.

This combination of rugged construction, no moving parts, fast response, and superior performance on a mooring or while profiling makes the 196R ideally suited to applications in hazardous environments and for long term installations without the need for frequent servicing and maintenance.

SPECIFICATIONS

Parameter	Range	Precision	Time Constant	Comments
Current Speed	0-300 cm/sec	± 2 cm/sec	1 sec	Electromagnetic, no moving parts
Current Direction	0-360	± 2	100 m sec	Flux gate compass
Conductivity	0-65 mmhos/cm	± 0.02 mmhos/cm	20 m sec.	By induction encapsulated sensor
Salinity	0-45 PPT	± 0.02 PPT	1 sec. stnd.	Automatic, continuous output
Temperature	-5 to +45 C	± 0.02 C	1 sec. stnd; 80m sec. opt.	Linearized thermistor platinum resistance sensor
Depth	0-100m to 0-6000m	± 0.15% fs	80m sec.	Silicon Semi-Conductor pressure transducer
Sound Velocity	1400-1600m/sec	± 0.1m/sec	30m sec.	Sing-around sensor
Dissolved Oxygen	0-20 PPM	± 1% fs	5-10 sec.	Voltaic, polarographic membrane sensor, stirrer is not required
pH	2-12 pH	± 0.05 pH	4m sec.	Sealed combination electrode
Turbidity	0-100% trans 0-200 JTU	± 2% fs	60m sec.	10cm path length
Specific Ions		- Request information for specific application -		
Redox	-400 to +400 mv	± 10mv	60 sec.	Platinum electrode

Power Input: ± 12 VDC ± 15% 100ma

Signal Output: High level DC voltage for each data channel automatically scaled in engineering units

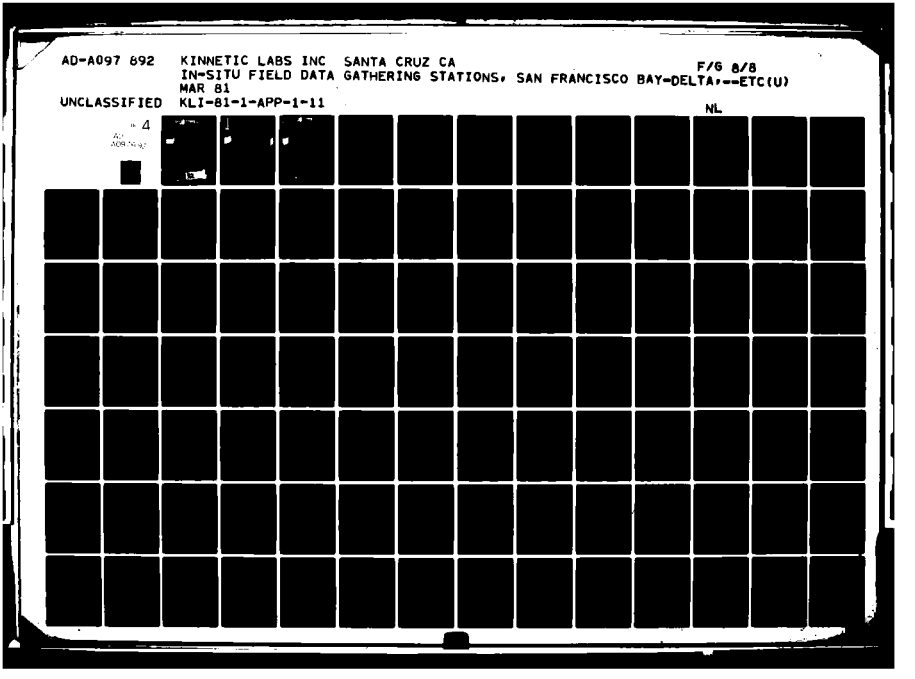
* Also see detailed description of sensors and electronics listed for Model 195M current meter and Model 513D probe

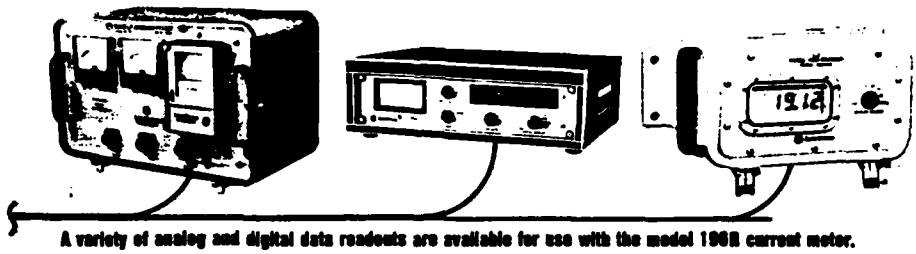
Pressure Case
Material: 316 stainless steel

Depth Capability:	(a) 1000 m	(b) 7000 m
Weight in Air:	(a) 23 kg	(b) 45 kg
Weight in Water:	(a) 10.5 kg	(b) 33 kg

Length: 76 cm **Pressure Case:** 112 cm overall **Diameter:** 15 cm

AD-A097 892 KINNETIC LABS INC SANTA CRUZ CA F/G 8/8
IN-SITU FIELD DATA GATHERING STATIONS, SAN FRANCISCO BAY-DELTA,--ETC(U)
MAR 81
UNCLASSIFIED KLI-81-1-APP-1-11 NL





A variety of analog and digital data readouts are available for use with the model 196R current meter.

R/196RM

MODEL 196RM
DIGITAL RECORDING MODULE

The **Model 196RM** may be used as a direct plug in module to the Model 196R integrated sensor module. This combination forms a self contained, digital magnetic tape recording package which may be used for profiling from a ship or which may be installed on a mooring for long term data recording.

The 196RM contains batteries which power the recorder as well as the 196R sensor package. The interface electronics assure direct plug in compatibility.

Some researchers use the 196R with a long length of cable and the Model 514D digital data scanner and display for their profiling requirements. They can then disconnect the cable and attach the 196RM for their in-situ long term monitoring requirement. The flexibility of this system increases the cost effectiveness of their equipment budget.

SPECIFICATIONS

Recorder

Input Channels: 1, 2, 4, or 8, switch selectable
Scan Repetition Rate: 0.5, 1, 2, 5, 10, 15, 30, 60, seconds, switch selectable
Recording Duration 1, 2, 4, 8, 16, 32 data scans or 1, 2, 4, 8, 16, 32 data groups of 64 words each plus continuous. This corresponds to a minimum recording duration time of 0.5 sec. and a maximum recording duration time of 2048 minutes plus continuous recording. Switch selectable.
Recording Periodicity: 0.25 through 12 hours, plus continuous and external trigger (5V logic), switch selectable.
Accuracy: ± 0.01%, ± 1 digit
Power Requirements: Internal, alkaline standard flashlight batteries. D cell size, 20 units. Power is sufficient to record one complete cassette tape.
Record Media: Standard Phillips certified data cassette, 300' or 450' length
Data Rate: 0 to 180 bits per second
Recording Method: 2 track NRZI
Recording Format: 16 bit word (4 digit BCD with polarity), 2 bit *word sync; 8 word line; 8 line group; 16 bit file gap at end of* each group.
Recording Density: 615 bits per inch
Recording Capacity: 180,000 data words (2.88×10^6 bits) using 450' length cassette tape.

Recording Duration

(a) Recording Duration (sec) in Continuous Mode $= \frac{180{,}000 \text{ data words}}{\text{number of parameters}} \times$ Scan Repetition Rate (sec.)

Example: Speed, direction, conductivity, temperature, depth, sound velocity, dissolved oxygen, at scan repetition rate of 1 second. Recording capacity is 22,500 seconds.

(b) Recording Duration (days) in Programmed Mode $= \frac{180{,}000}{\frac{\text{number of parameters}}{\text{scan repetition rate (min)}} \times \frac{24 \text{ hours}}{\text{recording periodicity (hours)}} \times \text{Recording duration (minutes)}}$

Example: Speed, direction, conductivity, temperature, tide, dissolved oxygen, turbidity, at scan rate of 10 seconds for 5 minutes every one hour. Recording capacity is 30 days.

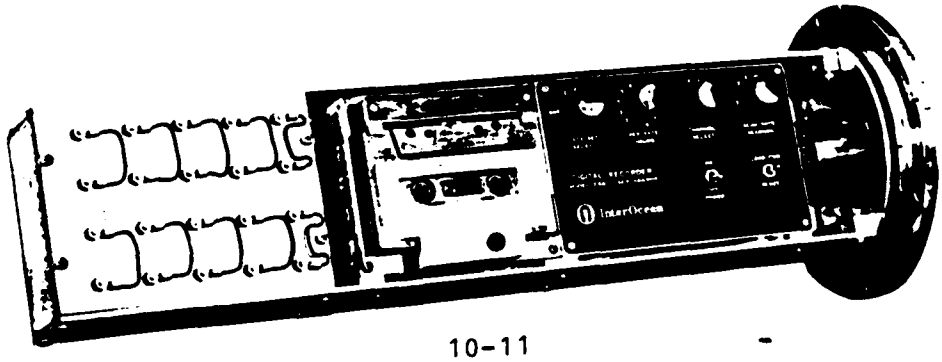
Note: Scan rate, recording duration and recording periodicity may be selected by operator to meet any requirements.

Pressure Case

Material: 316 stainless steel

Depth Capacity:	(a) 1000 m.	(b) 7000 m.
Weight in Air:	(a) 23 kg.	(b) 45 kg.
Weight in Water:	(a) 10.5 kg.	(b) 33 kg.

Length: 76 cm.
Diameter: 15 cm.



195M

- **NO MOVING PARTS**
- **RESISTS BIO-FOULING, CORROSION AND MECHANICAL DAMAGE**
- **EXCELLENT DIRECTION AND TILT RESPONSES**
- **INSENSITIVE TO VERTICAL MOORING LINE MOTION**
- **LONG TERM STABILITY**
- **LOW MAINTENANCE**

MODEL 195M

ELECTROMAGNETIC CURRENT METER, MAGNETIC TAPE RECORDING

The **Model 195M** is a self contained, digital magnetic tape cassette recording instrument. A unique and extremely useful feature of the instrument is that it provides switch selectable programming of data rate, recording duration, and recording periodicity. The user may therefore select the optimum recording program for any particular specific environment or application. He then can easily change this program after examining the data. Changes in the program can also be made to better suit some other environment for the next project or application.

The fast data acquisition rate of the recorder suits the rapid response of the electromagnetic sensor. The X and Y vector components of flow and the direction are recorded each time. Data capacity is 330,000 data words which permits the acquisition of high density data or very long term deployment.

Temperature and depth sensors are also available as options.

SPECIFICATIONS

Speed Sensor:

Type: Electromagnetic, solid state sensor with no moving parts. Measures components of flow in two directions.
Theory of Operation: Faraday's Law - a conductor moving through a magnetic field produces a voltage. The water velocity vector component perpendicular to the magnetic field flux lines (created by the sensor) produces a mutually orthogonal electromotive force within the water. The induced voltage is measured by two orthogonal pairs of electrodes (located in the sensor) which define a Cartesian set of axes with respect to the transducer. The magnitude of the voltage is directly proportional to the magnitude of the water velocity.
Dimensions: Spherical, 3.8 cm. diameter.
Range: 0-300 cm/sec. standard; other on special application
Threshold: 0.6 cm/sec.
Resolution: 0.15 cm/sec.
Zero Stability: ± 0.6 cm/sec.
Precision: ± 2 cm/sec.

Direction Sensor:

Direction: The onentation of the sensor is determined by a flux gate (no moving parts) compass mounted inside the pressure case. Water flow direction relative to the sensor is determined by resolving the Cartesian coordinate vectors into a polar coordinate vector.
Range: 0-360°
Precision: ± 2°
Response Time: 50 m sec.

Temperature Option:

Sensor Type: Linearized thermistor
Range: 0-30°C and 0-15°C with scale expansion.
Precision: ± 0.1°C

Depth Option:

Sensor Type: Potentiometric
Range: 0-100 meters; 0-300 meters; 0-1000 meters. For special range, consult factory.
Precision: ± 0.5% F.S.

Recorder:

Type: Incremental digital magnetic tape cassette
Cassette: Standard Phillips type, 300 ft. or 450 ft. data certified, two-track.
Format: Serial Binary NRZ
Capacity: 330,000, 8 bit words
Writing Speed: 50 m sec/word
Scan Rate: 1 scan (1 to 4 parameters) every ½ to 16 sec. (4 sec. standard)
Duty Cycle Programmer: Continuous or adjustable to record for 2 to 30 min. every 1 to 15 hrs.
Recording Capacity: 330,000 data words. When recording four parameters every 4 seconds for a 10 min. duration, every 3 hrs, the deployment life is 70 days.

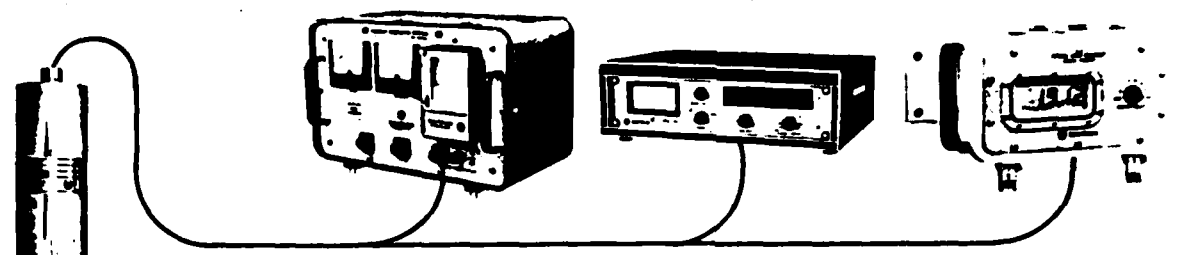
Power Supply:

Type: Alkaline standard "D" size flashlight batteries
Cell: 1.5 volt; D cell; 18 units
Capacity: To record one complete cassette tape (330,000 measurements)

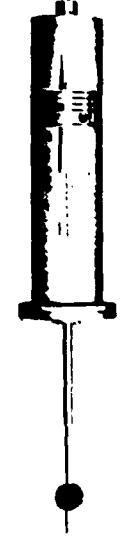
Instrument Case - 195M self recording current meter.
Material: 316 stainless steel
Coating: Electropolish, antifouling (optional)
Depth Capability: 1,000 m standard, (others available)
Weight in Air: 20.5 kg.
Weight in Water: 8.2 kg.
Dimensions: Case 15 cm. diameter x 92 cm.

Accessories

Field Service Kit - P/N 195M-FSK
Depot Spares Kit - P/N 195M-DSK
Certified Digital Cassette Tapes
Subsurface Buoy - Model 1800 Series
Acoustic Command Release - Model 1090 or 2090
Timed Release - Model 5000T



A variety of analog and digital data readouts are available for use with the model 195R current meter.



195R

- NO MOVING PARTS
- PERMITS RAPID VERTICAL PROFILING
- RAPID RESPONSE
- INSENSITIVE TO VERTICAL WATER MOTION
- REAL TIME DATA DISPLAY AND RECORDING

MODEL 195R
ELECTROMAGNETIC CURRENT METER, REMOTE READOUT

The **Model 195R** consists of a sensor package and remote readout data display with interconnecting cable. The readout box has panel meters for each parameter measured and a recorder output connector to permit simultaneous recording of each parameter measured. Current speed and current direction are standard. Water temperature and depth sensors are available as options. The parameters of speed, temperature, and depth have dual range scale expansion. Integral analog data recorders are available as options as well as separate, compact digital data loggers. The 195R may also be used with any of the digital data scanners and data display instruments that are manufactured by InterOcean Systems, Inc.

SPECIFICATIONS

Speed Sensor:

Type: Electromagnetic, solid state sensor with no moving parts. Measures components of flow in two directions.
Theory of Operation: Faraday's Law - a conductor moving through a magnetic field produces a voltage. The water velocity vector component perpendicular to the magnetic field flux lines (created by the sensor) produces a mutually orthogonal electromotive force within the water. The induced voltage is measured by two orthogonal pairs of electrodes (located in the sensor) which define a Cartesian set of axes with respect to the transducer. The magnitude of the voltage is directly proportional to the magnitude of the water velocity.
Dimensions: Spherical, 3.8 cm diameter
Range: 0-300 cm/sec standard, other on special application
Threshold: 0.6 cm/sec
Resolution: 0.15 cm/sec
Zero Stability: ± 0.6 cm/sec
Precision: ± 2 cm/sec

Direction Sensor:

Direction: The orientation of the sensor is determined by a flux gate (no moving parts) compass mounted inside the pressure case. Water flow direction relative to the sensor is determined by resolving the Cartesian coordinate vectors into a polar coordinate vector.
Range: 0-360
Precision: ± 2
Response Time: 50 m sec

Temperature Option:

Sensor Type: Linearized thermistor
Range: 0-30°C and 0-1 °C with scale expansion
Precision: ± 0.1 C

Depth Option:

Sensor Type: Potentiometric
Range: 0-100 meters; 0-300 meters; 0-1000 meters. For special range, consult factory.
Precision: ± 0.5% F.S.

Instrument Case

Material: 316 Stainless steel
Depth Capability: 1,000 meters
Weight in Air: 16 kg
Weight in Water: 7.7 kg
Dimensions: Case: 15.2 cm diameter x 55 cm
Case: Splash proof 20 cm x 20 cm x 30 cm
Recorder Outputs: 0-1 VDC into 1 K ohm
Options Temperature and Depth dual range switch selectable

R_2 - Recorder Option: Integral unit built into readout case, to record two parameters as a function of time

R_3 - Recorder Option: Integral unit built into readout case, to record three parameters as a function of time

Accessories

Field Service Kit - P/N 195R-FSK
Depot Spares Kit - P/N 195R-DSK
Winch, manual or electric drive with slip rings

InterOcean
3540 Aero Court
San Diego, California, U.S.A. 92123
Telex 69-5082 Telephone (714) 565-8400

APPENDIX 11

Instrument Calibration Test Sheets

EM SENSOR S/O. TOW TANK

9 & 10 DEC. 1978

	PROBE #	AVG. X mV OUTPUT AT 30 ± 200 cm/sec.	AVG. Y	AVG. X VOLTS/m/sec.	AVG Y VOLTS/m/sec	X ÷ cos 45°	Y ÷ cos 45°
		1	2	3	4	5	6
1	001	759 ± 37	718 ± 54	1.265 ± .06	1.19 ± .09	1.79 ± .09	1.68 ± .13
3	002	722 ± 34	678 ± 19	1.20 ± .05	1.13 ± .03	1.70 ± .07	1.60 ± .04
5	004	694 ± 23	658 ± 71	1.16 ± .03	1.09 ± .12	1.64 ± .04	1.54 ± .17
7	006	757 ± 28	714 ± 31	1.26 ± .04	1.19 ± .05	1.78 ± .05	1.68 ± .07
9	007	702 ± 21	650 ± 10	1.17 ± .03	1.08 ± .02	1.65 ± .04	1.53 ± .03
11	008	721 ± 36	698 ± 24	1.20 ± .06	1.16 ± .04	1.70 ± .08	1.64 ± .05
13	010	616 ± 19	648 ± 18	1.03 ± .03	1.08 ± .03	1.46 ± .04	1.53 ± .04
15	011	683 ± 24	780 ± 12	1.14 ± .04	1.30 ± .02	1.61 ± .05	1.84 ± .03
17	012	764 ± 28	777 ± 5	1.27 ± .04	1.29 ± .01	1.80 ± .05	1.82 ± .01
19	013	662 ± 19	775 ± 15	1.10 ± .03	1.29 ± .02	1.56 ± .04	1.82 ± .03
21	014	649 ± 5	746 ± 88	1.08 ± .01	1.24 ± .15	1.53 ± .01	1.75 ± .21
23	015	669 ± 9	652 ± 35	1.11 ± .01	1.08 ± .05	1.57 ± .01	1.53 ± .07
25	017	638 ± 88	640 ± 82	1.06 ± .15	1.07 ± .14	1.50 ± .21	1.51 ± .12
27	018	667 ± 24	696 ± 18	1.11 ± .04	1.16 ± .03	1.57 ± .05	1.64 ± .04
29	019	664 ± 40	704 ± 42	1.14 ± .06	1.17 ± .07	1.61 ± .08	1.65 ± .1
31	020	795 ± 17	687 ± 38	1.32 ± .02	1.14 ± .06	1.87 ± .03	1.61 ± .08
33					MEAN X + Y	1.697	
34					MEAN σ	± .007	

InterOcean

EQUIPMENT CHECK-OUT FORM

Job No.: 6271

Customer: U.S. Army Corps of Engineers (c/o Kinnetic Laboratories, Inc.)

Date: 12/20/78

Probe
Serial Number: 6271001

External Physical Appearance:

Good

Parameter		Zero		Check Reading
Conductivity		___		~~30~~ mmho 35.50
Temperature		N/A		Room + 11.69
Turbidity		N/A		In Air 70.4
Tide/-ID		N/A		Ambient -.3502
+ID		N/A		+.3500
V_x	Air	___		N/A + 0000 + 0
V_y	Air	___		N/A + 0000 + 0
Direction		N/A	360.5	~~360~~ 181.5

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InterOcean Systems, Inc.
Engineer

Kinnetic Laboratories, Inc.

InterOcean

EQUIPMENT CHECK-OUT FORM

Job No.: 6271

Customer: U.S. Army Corps of Engineers (c/o Kinnetic Laboratories, Inc.)

Date: 12/20/78

Probe
Serial Number: 6271002

External Physical Appearance:

Parameter	Zero	Check Reading
Conductivity	____	~~30~~ mmho 36.09
Temperature	N/A	Room 12.11
Turbidity	N/A	In Air 67.1
Tide/-ID	N/A	Ambient -1494
+ID	N/A	+1511
V_x	Air ____	N/A +0024, +0035
V_y	Air ____	N/A -0021, -0035
Direction	N/A	361.5 ~~360°~~ 222.6

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Engineer

Kinnetic Laboratories, Inc.

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EQUIPMENT CHECK-OUT FORM

Job No.: 6271

Customer: U.S. Army Corps of Engineers (c/o Kinnetic Laboratories, Inc.)

Date: ____________________

Probe Serial Number: 6271 004

External Physical Appearance:

Good

Parameter	Zero	Check Reading
Conductivity	____	~~30~~ mmho 37.90
Temperature	N/A	Room 13.22
Turbidity	N/A	In Air 89.6
Tide/-ID	N/A	Ambient -0695
+ID	N/A	+0689
V_x	Air ____	N/A ± 0004
V_y	Air ____	N/A ± 000[illegible]
* Direction	N/A 361.3	~~360~~ 49.2

* [illegible]

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InterOcean Systems, Inc. Engineer

Kinnetic Laboratories, Inc.

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EQUIPMENT CHECK-OUT FORM

Job No.: 6271

Customer: U.S. Army Corps of Engineers (c/o Kinnetic Laboratories, Inc.)

Date: 12-20-78 1220

Probe
Serial Number: 6271006 +12.34 -12.32

External Physical Appearance:

Good

MID

Parameter		Zero		Check Reading
Conductivity		____		~~30~~ mmho 37.97
Temperature		N/A		Room 14.18
Turbidity		N/A		In Air 83.8
Tide/-ID		N/A		Ambient -0301
+ID		N/A		+0301
V_x	Air	____		N/A +0005 -0001
V_y	Air	____		N/A =0004
Direction		N/A	360.8	~~360~~ 121.8

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InterOcean Systems, Inc.
Engineer

Kinnetic Laboratories, Inc.

InterOcean

EQUIPMENT CHECK-OUT FORM

Job No.: 6271

Customer: U.S. Army Corps of Engineers (c/o Kinnetic Laboratories, Inc.)

Date: 12/20/84

Probe
Serial Number: 137007

External Physical Appearance:

Good

Parameter		Zero		Check Reading
Conductivity		____		~~30~~ mmho 36.44
Temperature		N/A		Room 11.58
Turbidity		N/A		In Air 78.5
Tide/-ID		N/A		Ambient -.48
+ID		N/A		+9.5-
V_x	Air ____			N/A +0008
V_y	Air ____			N/A +0008
Direction		N/A	360.4	~~360~~ 158.6

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InterOcean Systems, Inc.
Engineer

Kinnetic Laboratories, Inc.

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EQUIPMENT CHECK-OUT FORM

Job No.: 6271

Customer: U.S. Army Corps of Engineers (c/o Kinnetic Laboratories, Inc.)

Date: _____

Probe
Serial Number: 6271008

External Physical Appearance:

Good

M.O

Parameter	Zero		Check Reading
Conductivity	____		~~30~~ mmho 37.26
Temperature	N/A		Room 13.26
Turbidity	N/A		In Air 68.5
Tide/-ID	N/A		Ambient -0098
+ID	N/A		0100
V_x	Air ____		N/A ±0004
V_y	Air ____		N/A ±0003, +0010
Direction	N/A	360.7	~~360~~ 261.5

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Engineer

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EQUIPMENT CHECK-OUT FORM

Job No.: 6271

Customer: U.S. Army Corps of Engineers (c/o Kinnetic Laboratories, Inc.)

Date: 12/20/78

Probe
Serial Number: 010

External Physical Appearance:

Good

LOWER CLAMP MISPOSITIONED

Parameter		Zero		Check Reading
Conductivity		___		~~30~~ mmho 35.66
Temperature		N/A		Room 11.52
Turbidity		~~N/A~~ 0.0		In Air 91.4
Tide/-ID		N/A		Ambient -1381
+ID		N/A		1392
V_x	Air	___		N/A ± 0.07
V_y	Air	___		N/A ± 0.07
Direction		N/A	360.8	~~360~~ 333.5

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InterOcean Systems, Inc.
Engineer

Kinnetic Laboratories, Inc.

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EQUIPMENT CHECK-OUT FORM

Job No.: 6271

Customer: U.S. Army Corps of Engineers (c/o Kinnetic Laboratories, Inc.)

Date: _____

Probe
Serial Number: 011

External Physical Appearance:

_____

_____

Parameter	Zero	Check Reading
Conductivity	____	~~26~~ mmho 35.08
Temperature	N/A	Room 11.75
Turbidity	N/A	In Air 60.3
Tide/-ID	N/A	Ambient − 1.99
+ID	N/A	+ 1.97
V_x	Air ____	N/A ± 0006
V_y	Air ____	N/A ± 0006
Direction	N/A	363.5 − ~~360~~ 239.4

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_____ _____

InterOcean Systems, Inc. Engineer

Kinnetic Laboratories, Inc.

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EQUIPMENT CHECK-OUT FORM

Job No.: 6271

Customer: U.S. Army Corps of Engineers (c/o Kinnetic Laboratories, Inc.)

Date: _____

Probe
Serial Number: 6271012

External Physical Appearance:

Good

Top

Parameter		Zero	Check Reading
Conductivity		____	~~30~~ mmho 37.92
Temperature		N/A	Room 14.25
Turbidity		N/A	In Air 79.7
Tide/-ID		N/A	Ambient −1688
+ID		N/A	+1685
V_x	Air	____	N/A ± 0005
V_y	Air	____	N/A ± 0005
Direction		N/A	~~360~~° 127.4

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InterOcean Systems, Inc.
Engineer

Kinnetic Laboratories, Inc.

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EQUIPMENT CHECK-OUT FORM

Job No.: 6271

Customer: U.S. Army Corps of Engineers (c/o Kinnetic Laboratories, Inc.)

Date: 12/20/78

Probe
Serial Number: 6271013

External Physical Appearance:

Good (RUST IN HOLES OF FLANGE BOLT)

Parameter		Zero		Check Reading
Conductivity				~~30~~ mmho 36.32
Temperature		N/A		Room 11.48
Turbidity		N/A		In Air 85.8
Tide/-ID		N/A		Ambient 806
+ID		N/A		812
V_x	Air			~~N/A~~ ±0003
V_y	Air			~~N/A~~ 0009
Direction		N/A	361	~~360~~ 237.3

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Engineer

Kinnetic Laboratories, Inc.

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EQUIPMENT CHECK-OUT FORM

Job No.: 6271

Customer: U.S. Army Corps of Engineers (c/o Kinnetic Laboratories, Inc.)

Date: 12/2./78

Probe
Serial Number: 6271014

External Physical Appearance:

Parameter		Zero		Check Reading
Conductivity				~~30~~ mmho 36.32
Temperature		N/A		Room 11.89
Turbidity		N/A		In Air 77.5
Tide/-ID		N/A		Ambient 01.23
+ID		N/A		+ 0400
V_x	Air			N/A ± 0004
V_y	Air			N/A = 0029
Direction		N/A	361.3	~~360~~ 207.8

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Engineer

Kinnetic Laboratories, Inc.

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EQUIPMENT CHECK-OUT FORM

Job No.: 6271

Customer: U.S. Army Corps of Engineers (c/o Kinnetic Laboratories, Inc.)

Date: 12/20/78

Probe
Serial Number: 371015 SPARE

External Physical Appearance:

GOOD

Parameter	Zero	Check Reading
Conductivity	0000	30 mmho 30.08
Temperature	N/A	Room 16.62
Turbidity	N/A	In Air 85.1
Tide/-ID	N/A	Ambient + [illegible]
+ID	N/A	[illegible]
V_x	Air ~.300	N/A
V_y	Air ~.000	N/A
Direction	N/A 360.0	~~360~~ 360.0

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EQUIPMENT CHECK-OUT FORM

Job No.: 6271

Customer: U.S. Army Corps of Engineers (c/o Kinnetic Laboratories, Inc.)

Date: 12/20/78

Probe
Serial Number: 6221016

External Physical Appearance:

OK

Parameter	Zero	Check Reading
Conductivity	___	30 mmho 37.16
Temperature	N/A	Room 13.06
Turbidity	~~N/A~~ .0005	In Air 1018
Tide/-ID	N/A	Ambient -1302
+ID	N/A	-1512
V_x	Air ___	N/A ___
V_y	Air ___	N/A ___
Direction	N/A	360° ___

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InterOcean Systems, Inc. Engineer

Kinnetic Laboratories, Inc.

InterOcean systems, inc. / 3540 aero ct., san diego, ca 92123 / 714-565-8400 / telex 69-5082

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EQUIPMENT CHECK-OUT FORM

Job No.: 6271

Customer: U.S. Army Corps of Engineers (c/o Kinnetic Laboratories, Inc.)

Date: 12/20/78

Probe
Serial Number: 6771017

External Physical Appearance:

Good

Parameter	Zero		Check Reading
Conductivity	___		~~30~~ mmho 35.31
Temperature	N/A		Room 11.31
Turbidity	N/A		In Air 79.5
Tide/-ID	N/A		Ambient - 594
+ID	N/A		+ 591
V_x	Air ___		N/A -0004
V_y	Air ___		N/A +0004
Direction	N/A	360.5	~~360~~° 71.0

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Engineer

Kinnetic Laboratories, Inc.

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EQUIPMENT CHECK-OUT FORM

Job No.: 6271

Customer: U.S. Army Corps of Engineers (c/o Kinnetic Laboratories, Inc.)

Date: _____

Probe
Serial Number: 6271018

External Physical Appearance:

Good

OOT

Parameter		Zero		Check Reading
Conductivity		____		~~30~~ mmho 37.43
Temperature		N/A		Room 13.35
Turbidity		N/A		In Air 93.5
Tide/-ID		N/A		Ambient +.57
+ID		N/A		+1205
V_x	Air	____		N/A ± 0006
V_y	Air	____		N/A + 0007 - 0002
Direction		N/A	360.5	~~360~~ 277.3

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Engineer

Kinnetic Laboratories, Inc.

InterOcean

EQUIPMENT CHECK-OUT FORM

Job No.: 6271

Customer: U.S. Army Corps of Engineers (c/o Kinnetic Laboratories, Inc.)

Date: 12/20/78

Probe
Serial Number: 6271019

External Physical Appearance:

GOOD

Parameter	Zero	Check Reading
Conductivity	____	30 mmho SEA WATER 35.15
Temperature	N/A	Room 11.28
Turbidity	N/A	In Air 81.8
Tide/-ID	N/A	Ambient 1.65
+ID	N/A	896
V_x	Air ____	N/A ±0006
V_y	Air ____	N/A ±0006
Direction	N/A	360° 32.1

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InterOcean Systems, Inc.
Engineer

Kinnetic Laboratories, Inc.

InterOcean

EQUIPMENT CHECK-OUT FORM

Job No.: 6271

Customer: U.S. Army Corps of Engineers (c/o Kinnetic Laboratories, Inc.)

Date: _____

Probe
Serial Number: 6271020

External Physical Appearance:

_____

_____

OUT

Parameter	Zero		Check Reading
Conductivity	____		30 mmho 38.28
Temperature	N/A		Room 13.49
Turbidity	N/A		In Air 88.9
Tide/-ID	N/A		Ambient +0.70
+ID	N/A		+1561
V_x	Air ____		N/A [illegible]
V_y	Air ____		N/A −0005 0016
Direction	N/A	360.1	360° 360.2

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_____ _____

InterOcean Systems, Inc. Engineer

Kinnetic Laboratories, Inc.

InterOcean systems, inc. / 3540 aero ct., san diego, ca 92123 / 714-565-8400 / telex 69-5082

InterOcean

EQUIPMENT CHECK-OUT FORM

Job No.: 6271

Customer: U.S. Army Corps of Engineers (c/o Kinnetic Laboratories, Inc.)

Date: _____

Recorder Serial Number: 6330223

External Physical Appearance:

GOOD

Functions:

Format:

Parameter: 19 13 17 START ARRAY 13.00 PROBE

Conductivity	19
Temperature	13
Turbidity	17
Tide/-ID	
+ID	
V_x	
V_y	
Direction	

System checked out after delivery to Santa Cruz, California, Kinnetic Laboratories, Inc. By:

InterOcean Systems, Inc. Engineer

Kinnetic Laboratories, Inc.

InterOcean

EQUIPMENT CHECK-OUT FORM

Job No.: 6271

Customer: U.S. Army Corps of Engineers (c/o Kinnetic Laboratories, Inc.)

Date: 12/20/78

Recorder Serial Number: 6330224

External Physical Appearance:

OK

Functions:

OK

Format:

START 3:33 PM

Parameter: 010 — 015

Conductivity

Temperature

Turbidity

Tide/-ID

+ID

V_x

V_y

Direction

System checked out after delivery to Santa Cruz, California, Kinnetic Laboratories, Inc. By:

InterOcean Systems, Inc.
Engineer

Kinnetic Laboratories, Inc.

InterOcean systems, inc. / 3540 aero ct., san diego, ca 92123 714-565-8400 / telex 69-5082

InterOcean

EQUIPMENT CHECK-OUT FORM

Job No.: 6271

Customer: U.S. Army Corps of Engineers (c/o Kinnetic Laboratories, Inc.)

Date: 12/20/78

Recorder Serial Number: 6330225

External Physical Appearance:

OKA-1

Functions:

CMT

Format:

Parameter: START 3:49

Conductivity	015 — —
Temperature	
Turbidity	
Tide/-ID	
+ID	
V_x	
V_y	
Direction	

System checked out after delivery to Santa Cruz, California, Kinnetic Laboratories, Inc. By:

InterOcean Systems, Inc. Engineer

Kinnetic Laboratories, Inc.

InterOcean systems, inc. / 3540 aero ct., san diego, ca 92123 / 714-565-8400 / telex 69-5082

InterOcean

EQUIPMENT CHECK-OUT FORM

Job No.: 6271

Customer: U.S. Army Corps of Engineers (c/o Kinnetic Laboratories, Inc.)

Date: 12/20/78

Recorder Serial Number: 6330226

External Physical Appearance:

Good

Functions:

OIC

Format:

Parameter: 07 10 11

START 11:24 AM
PWR INTERRUPT (+12V)
3:05

Conductivity

Temperature

Turbidity

Tide/-ID

+ID

V_x

V_y

Direction

System checked out after delivery to Santa Cruz, California, Kinnetic Laboratories, Inc. By:

InterOcean Systems, Inc.
Engineer

Kinnetic Laboratories, Inc.

InterOcean

EQUIPMENT CHECK-OUT FORM

Job No.: 6271

Customer: U.S. Army Corps of Engineers (c/o Kinnetic Laboratories, Inc.)

Date: 12/20/78

Recorder Serial Number: 6330227

External Physical Appearance:

GOOD

Functions:

OKAY

Format:

Parameter:	018	018	004
Conductivity			
Temperature			
Turbidity			
Tide/-ID			
+ID			
V_x			
V_y			
Direction			

STARTED 2327 PM
STARTED W/O PROBE #1
PROBE #1 ADDED @ 2:32

System checked out after delivery to Santa Cruz, California, Kinnetic Laboratories, Inc. By:

J.D.

InterOcean Systems, Inc. Engineer

Kinnetic Laboratories, Inc.

InterOcean

EQUIPMENT CHECK-OUT FORM

Job No.: 6271

Customer: U.S. Army Corps of Engineers (c/o Kinnetic Laboratories, Inc.)

Date: 12/20/78

Recorder Serial Number: 6330228

External Physical Appearance:

good

Functions:

OK

Format:

Parameter: 01 001 002 START 1204 PM

Conductivity

Temperature

Turbidity

Tide/-ID

+ID

V_x

V_y

Direction

System checked out after delivery to Santa Cruz, California, Kinnetic Laboratories, Inc. By:

InterOcean Systems, Inc. Engineer

Kinnetic Laboratories, Inc.

InterOcean

EQUIPMENT CHECK-OUT FORM

Job No.: 6271

Customer: U.S. Army Corps of Engineers (c/o Kinnetic Laboratories, Inc.)

Date: _____

Recorder Serial Number: 6330229

External Physical Appearance:

GOOD

Functions:

OK

Format:

Parameter: 020 006 012 START 3:02 PM

Conductivity _____

Temperature _____

Turbidity _____

Tide/-ID _____

+ID _____

V_x _____

V_y _____

Direction _____

System checked out after delivery to Santa Cruz, California, Kinnetic Laboratories, Inc. By:

InterOcean Systems, Inc. Engineer

Kinnetic Laboratories, Inc.

InterOcean

Dir ✓
-ID -.50
Vx ✓
Vy ✓

195
~~515~~

CSTD CALIBRATION

Probe S/N 627/001

Date & Initial 11-30-78 R.H.

		Test Point	Voltage or Scope Picture	DATA
1.	Current Regulator	RED	+15 ± 4VDC	+13
		BLK	-15 ± 4VDC	-13
		WH	0.000 ± .002	0.0004
2.	Voltage Regulator	RED	+8.00 ± .01VDC	+8.00
		BLK	-8.00 ± .01	-8.00
3.	Chopper	YEL	Fig A 180° out of phase	✓
4.	Amplifier	GR	Fig B	✓
		NOTE 1-GR	Fig C	✓
5.	Demodulator	YEL	Fig D 180° out of phase	✓
		GREY	0.00 ± .01	0.001
		NOTE 1-GREY	* -2.6 ± .2VDC	-2.570
6.	Conductivity	BLUE	0.000 ± 0.002	0.000
		NOTE 1-BLUE	* +4.800 ± .10	+4.787
7.	Salinity 0-20 ppt	BLUE	0.000 ± .002	N/A
8.	Salinity 20-40 ppt	GR	See table 2.1 in manual	N/A
		BLUE	See table 2.1 in manual	
9.	Temperature	NOTE 2-BLUE	-1.002°C Thermometer	.002
		NOTE 3-BLUE	+22.38 °C Thermometer	+2.73

CSTD Calibration Cont.

	Test Point	Voltage or Scope Picture	DATA
10. Depth	NOTE 5-BLUE	Shunt Value ____	NA
11. Auto-Range	GREY	+2.005 ± .005	
	GREEN	+6.50 ± .75	
	*GREY	+1.99 ± .01	
	*GREEN	-6.50 ± .75	
12. Dissolved Oxygen			
	NOTE 6-GREEN	0.00 ± .01	
	GREEN	See calibration sheet	
13. pH	NOTE 7		
	pH 7 - YELLOW	.70 ± .01	
	pH - YELLOW	.1v/pH ± .01	
	pH - YELLOW	.1v/pH ± .01	
14. Redox	NOTE 7-YELLOW	0.00 ± .005	
	Fe^{++} Fe^{+++} YELLOW	.439 ± .005	NA
15. Turbidity	GREY	0.00 ± .01	.000
	GREY	1.00 ± .01	+1.000 in Distilled H_2O

InterOcean

513 PROBE
FINAL CHECK-OFF

SERIAL No. 6271 001

INITIALS R.H.

DATE 11-30-76

READOUT	COMPUTED VALUES
CONDUCTIVITY 0.00 +51.13	CONDUCTIVITY 0.00 mV/cm 51.13 mV/cm at 22.38°C
SALINITY	SALINITY 35.64 PPT
TEMPERATURE - 0.02 - +22.38	TEMPERATURE - 0.02°C +22.38 °C
DEPTH	DEPTH
DO_2	DO_2
pH	pH
REDOX	REDOX
TURBIDITY .0 +100.0	TURBIDITY .0 % 100 %

InterOcean

CONDUCTIVITY CALIBRATION

DATE 11-30-76
INSPECTOR AER
PROBE S/N 6271001

CONDUCTIVITY CALIBRATION STANDARD
Model 500CS #6271

Probe value will be obtained when probe is calibrated

Conductivity Millimhos	Probe Value
0	0.00
10	10.02
20	19.95
30	30.05
40	40.09
50	50.08
60	59.99
70	70.06

NOTE: Probe value can be obtained from either 514-A C.S.T.D. Readout digital display or from Pin D on the Recorder outlet with a digital volt meter.

Make certain that the lead that is passed through the conductivity head is a very low resistance.

CSTD Calibration Cont.

Notes to CSTD DO pH Calibration

1. This value obtained by inserting a 50 ohm resistor through conductivity head using clip leads.

2. This value obtained by immersion of temp. sensor in ice water as close to 0°C as possible while continuously monitoring ice water with a calibrated thermometer.

3. This value obtained by immersion of temp. sensor in room temperature water while continuously monitoring temperature with a calibrated thermometer.

4. Steps #2 and #3 are done with stainless steel shield removed. Care must be taken not to damage sensor while shield is removed.

5. This value is obtained after depth calibration with dead weight tester.

6. Zero adjust is set with sensor enveloped in atmosphere of inert gas (helium; argon).
Gain adjust obtained in fully air saturated fresh water.

7. Temporary connection is made between circuit common and the shield wire of the pH electrode. (Or the shield wire of the redox electrode.)

Job No: 6271 Date: 11-30-78

Customer Name: [illegible] By: R.H.

Part Number	Description	Serial No.	Remarks
5138005/5136001	Pressure Case & Base Plate with mother board	6271 201	[illegible]
5138001-1	Conductivity Sensor	149	Short Shallow T.C
5138006-11	Temperature Sensor	714	[illegible]
5138105	Temperature Sensor Platinum	—	—
5138006-2	Salinity Compensation Network	—	—
5138101	Pressure Transducer	—	—
5138020	pH Sensor	—	—
5138021	Dissolved Oxygen Sensor	—	
5138002	Turbidity Sensor	6271 214	[illegible]
	~~[illegible]~~ Velocity Sensor	5/169	
5132010	Current Regulator	6361 361	Bipolar
5132011	Voltage Regulator	6080020	
5132014	Conductivity	6080 159	0-65
5132015	Salinity 0-20 PPT	—	—
5132015-1	Salinity 20-40 PPT	—	—
5132019	Salinity Auto Range	—	—
5132016	Temperature	6361 276	
5132116	Temperature, Platinum Thermistor	—	—
5132017	Depth	—	—
5132013	Demodulator	6361 220	
5132012	Amplifier	6080105	T.C.
5132018	Chopper	6080266	Lo Noise
5132126	Dissolved Oxygen	—	—
5132125	pH	—	—
5139300	Protective Cage	—	—
5138110	Schryway Carrying Case	—	—
5134011A	Turbidity	6080 389	
	~~[illegible]~~ Velocity Unit	5/169	
	Switch Board	6361 543	
	Compass	6120007	

InterOcean

Corps of Engineers

195
~~513~~

Vx –
Vy –
Dir ✓
-ID -1.5

CSTD CALIBRATION

Probe S/N 6271 002

Date & Initial 11-22-78 R.H.

	Test Point	Voltage or Scope Picture	DATA
1. Current Regulator	RED	+15 ± 4VDC	+13
	BLK	-15 ± 4VDC	-13
	WH	0.000 ± .002	0.001
2. Voltage Regulator	RED	+8.00 ± .01VDC	+8.00
	BLK	-8.00 ± .01	-8.00
3. Chopper	YEL	Fig A 180° out of phase	✓
4. Amplifier	GR	Fig B	✓
	NOTE 1-GR	Fig C	✓
5. Demodulator	YEL	Fig D 180° out of phase	✓
	GREY	0.00 ± .01	.000
	NOTE 1-GREY	★ -2.6 ± .2VDC	-2.559
6. Conductivity	BLUE	0.000 ± 0.002	0.001
	NOTE 1-BLUE	★ +4.800 ± .10	+4.793
7. Salinity 0-20 ppt	BLUE	0.000 ± .002	
8. Salinity 20-40 ppt	GR	See table 2.1 in manual	N/A
	BLUE	See table 2.1 in manual	
9. Temperature	NOTE 2-BLUE	-.002°C Thermometer	.002
	NOTE 3-BLUE	21.21°C Thermometer	±2.12

CSTD Calibration Cont.

	Test Point	Voltage or Scope Picture	DATA
10. Depth	NOTE 5-BLUE	Shunt Value____	N/A
11. Auto-Range	GREY	+2.005 ± .005	
	GREEN	+6.50 ± .75	
	*GREY	+1.99 ± .01	N/A
	*GREEN	-6.50 ± .75	
12. Dissolved Oxygen			
	NOTE 6-GREEN	0.00 ± .01	
	GREEN	See calibration sheet	N/A
13. pH	NOTE 7		
	pH 7 - YELLOW	.70 ± .01	
	pH - YELLOW	.1v/pH ± .01	N/A
	pH - YELLOW	.1v/pH ± .01	
14. Redox	NOTE 7-YELLOW	0.00 ± .005	
	Fe^{++} Fe^{+++} YELLOW	.439 ± .005	N/A
15. Turbidity	GREY	0.00 ± .01	.000
	GREY	1.00 ± .01	+1.000 in Distilled H_2O

InterOcean

513 PROBE
FINAL CHECK-OFF

SERIAL No. 1271 002

INITIALS R.H.

DATE 11-27-78

READOUT	COMPUTED VALUES
CONDUCTIVITY -0.001 + 51.12	CONDUCTIVITY 0.0C mv/cm 51.12 mv/cm at 22.26°C
SALINITY —	SALINITY 35.73 ppT
TEMPERATURE — 0.02 +22.26	TEMPERATURE -0.02°C +22.26 °C
DEPTH —	DEPTH —
DO_2 —	DO_2 —
pH —	pH —
REDOX —	REDOX —
TURBIDITY .0 +100.0	TURBIDITY 0 % 100 %

InterOcean

CONDUCTIVITY CALIBRATION

DATE 11-27-76
INSPECTOR R.H.
PROBE S/N 6271007

CONDUCTIVITY CALIBRATION STANDARD
Model 500CS # 6271

Probe value will be obtained when probe is calibrated

Conductivity Millimhos	Probe Value
0	0.00
10	10.04
20	19.98
30	30.09
40	40.15
50	50.15
60	60.08
70	70.14

NOTE: Probe value can be obtained from either 514-A C.S.T.D. Readout digital display or from Pin D on the Recorder outlet with a digital volt meter.

Make certain that the lead that is passed through the conductivity head is a very low resistance.

CSTD Calibration Cont.

Notes to CSTD DO pH Calibration

1. This value obtained by inserting a 50 ohm resistor through conductivity head using clip leads.

2. This value obtained by immersion of temp. sensor in ice water as close to 0°C as possible while continuously monitoring ice water with a calibrated thermometer.

3. This value obtained by immersion of temp. sensor in room temperature water while continuously monitoring temperature with a calibrated thermometer.

4. Steps #2 and #3 are done with stainless steel shield removed. Care must be taken not to damage sensor while shield is removed.

5. This value is obtained after depth calibration with dead weight tester.

6. Zero adjust is set with sensor enveloped in atmosphere of inert gas (helium; argon).
Gain adjust obtained in fully air saturated fresh water.

7. Temporary connection is made between circuit common and the shield wire of the pH electrode. (Or the shield wire of the redox electrode.)

Job No: 6271 Date: 11-22-78

Customer Name: Corps of Engineers By: R.H.

Part Number	Description	Serial No.	Remarks
5138005/5136001	Pressure Case & Base Plate with mother board	6271/002	CUPRO NICKEL 12 PIN SCURIN
5138001-1	Conductivity Sensor	151	SHORT SHALLOW T.C.
5138006-11	Temperature Sensor	713	S.S.
5138105	Temperature Sensor Platinum	—	—
5138006-2	Salinity Compensation Network	—	—
5138101	Pressure Transducer	—	—
5138020	pH Sensor	—	—
5138021	Dissolved Oxygen Sensor	—	—
5138002	Turbidity Sensor	6271/205	CUPRO NICKEL L.E.D
	~~Sound~~ Velocity Sensor	42516/5175	
5132010	Current Regulator	6361375	BIPOLAR
5132011	Voltage Regulator	6080028	
5132014	Conductivity	6080146	0-65
5132015	Salinity 0-20 PPT	—	—
5132015-1	Salinity 20-40 PPT	—	—
5132019	Salinity Auto Range	—	—
5132016	Temperature	1080 235	
5132116	Temperature, Platinum Thermistor	—	—
5132017	Depth	—	—
5132013	Demodulator	6020134	
5132012	Amplifier	6080-111	T.C.
5132018	Chopper	6080269	Lo Noise
5132126	Dissolved Oxygen	—	—
5132125	pH	—	—
5139300	Protective Cage	—	—
5138110	Schryway Carrying Case	—	—
5134011A	Turbidity	6080320	
	~~Sound~~ Velocity Unit	5175	
	SWITCH BOARD	6361528	1955
	Compass	6420016	

InterOcean

1955
~~513~~

CSTD CALIBRATION

Vx ✓
Vy ✓
DIR ✓
-Io -.7

Probe S/N 6271004

Date & Initial 11-22-73 R.H.

	Test Point	Voltage or Scope Picture	DATA
1. Current Regulator	RED	+15 ± 4VDC	+13
	BLK	-15 ± 4VDC	-13
	WH	0.000 ± .002	+0.001
2. Voltage Regulator	RED	+8.00 ± .01VDC	+8.00
	BLK	-8.00 ± .01	-8.00
3. Chopper	YEL	Fig A 180° out of phase	✓
4. Amplifier	GR	Fig B	✓
	NOTE 1-GR	Fig C	✓
5. Demodulator	YEL	Fig D 180° out of phase	✓
	GREY	0.00 ± .01	+0.002
	NOTE 1-GREY	-2.6 ± .2VDC	-2.56
6. Conductivity	BLUE	0.000 ± 0.002	0.000
	NOTE 1-BLUE	+4.800 ± .10	+4.812
7. Salinity 0-20 ppt	BLUE	0.000 ± .002	N/A
8. Salinity 20-40 ppt	GR	See table 2.1 in manual	
	BLUE	See table 2.1 in manual	N/A
9. Temperature	NOTE 2-BLUE	0.020C Thermometer	± .002 VOLTS
	NOTE 3-BLUE	22.32°C Thermometer	± 2.232

CSTD Calibration Cont.

	Test Point	Voltage or Scope Picture	DATA
10. Depth	NOTE 5-BLUE	Shunt Value_____	N/A
11. Auto-Range	GREY	+2.005 ± .005	
	GREEN	+6.50 ± .75	N/A
	*GREY	+1.99 ± .01	
	*GREEN	-6.50 ± .75	
12. Dissolved Oxygen			
	NOTE 6-GREEN	0.00 ± .01	
	GREEN	See calibration sheet	N/A
13. pH	NOTE 7		
	pH 7 - YELLOW	.70 ± .01	
	pH - YELLOW	.1v/pH ± .01	N/A
	pH - YELLOW	.1v/pH ± .01	
14. Redox	NOTE 7-YELLOW	0.00 ± .005	
	Fe^{++} Fe^{+++} YELLOW	.439 ± .005	N/A
15. Turbidity	GREY	0.00 ± .01	.000
	GREY	1.00 ± .01	±1.000 in Distilled H_2O

InterOcean

1955
~~513~~ PROBE

FINAL CHECK-OFF

SERIAL No. 6271004

INITIALS R.H.

DATE 11-22-78

READOUT	COMPUTED VALUES
CONDUCTIVITY 0.00 + 48.98	CONDUCTIVITY 0.00 mS/cm + 48.98 at 22.32°C & 33.20 ppt Sal
SALINITY	SALINITY
TEMPERATURE − 0.002 + 2.232	TEMPERATURE − 0.02°C 22.32°C
DEPTH	DEPTH
DO_2	DO_2
pH	pH
REDOX	REDOX
TURBIDITY .00 +100.0	TURBIDITY .00 FTU 100.0 FTU

InterOcean

CONDUCTIVITY CALIBRATION

DATE 11-22-76

INSPECTOR R.H.

PROBE S/N 6271004

LAB

CONDUCTIVITY CALIBRATION STANDARD STANDARD #2

Model 500CS

Probe value will be obtained when probe is calibrated

Conductivity Millimhos	Probe Value
0	0.000
10	9.95
20	19.78
30	29.82
40	39.79
50	49.72
60	59.58
70	69.59

NOTE: Probe value can be obtained from either 514-A C.S.T.D. Readout digital display or from Pin D on the Recorder outlet with a digital volt meter.

Make certain that the lead that is passed through the conductivity head is a very low resistance.

CSTD Calibration Cont.

Notes to CSTD DO pH Calibration

1. This value obtained by inserting a 50 ohm resistor through conductivity head using clip leads.

2. This value obtained by immersion of temp. sensor in ice water as close to 0°C as possible while continuously monitoring ice water with a calibrated thermometer.

3. This value obtained by immersion of temp. sensor in room temperature water while continuously monitoring temperature with a calibrated thermometer.

4. Steps #2 and #3 are done with stainless steel shield removed. Care must be taken not to damage sensor while shield is removed.

5. This value is obtained after depth calibration with dead weight tester.

6. Zero adjust is set with sensor enveloped in atmosphere of inert gas (helium; argon).
Gain adjust obtained in fully air saturated fresh water.

7. Temporary connection is made between circuit common and the shield wire of the pH electrode. (Or the shield wire of the redox electrode.)

Job No: 0211 Date: 11-14-78

Customer Name: Corps of Engineers By: R.H.

Part Number	Description	Serial No.	Remarks
5138005/5136001	Pressure Case & Base Plate with mother board	6271 004	CUPER NICKEL 12 PIN Shorin
5138001-1	Conductivity Sensor	138	SHORT SHALLOW T.C.
5138006-11	Temperature Sensor	069	3.5
5138105	Temperature Sensor Platinum	—	—
5138006-2	Salinity Compensation Network	—	—
5138101	Pressure Transducer	—	—
5138020	pH Sensor	—	—
5138021	Dissolved Oxygen Sensor	—	—
5138002	Turbidity Sensor	6271 216	CUPER NICKEL LED
	~~Sound~~ Velocity Sensor	S/189	
5132010	Current Regulator	6361365	Bi Polar
5132011	Voltage Regulator	6080 013	
5132014	Conductivity	1.080 148	0-65
5132015	Salinity 0-20 PPT	—	—
5132015-1	Salinity 20-40 PPT	—	—
5132019	Salinity Auto Range	—	—
5132016	Temperature	6080240	
5132116	Temperature, Platinum Thermistor	—	—
5132017	Depth	—	—
5132013	Demodulator	6080124	
5132012	Amplifier	6080 106	T.C.
5132018	Chopper	6080268	LONG
5132126	Dissolved Oxygen	—	—
5132125	pH	—	—
5139300	Protective Cage	—	—
5138110	Schryway Carrying Case	—	—
5134011A	Turbidity	1.080 361	
	~~Sound~~ Velocity Unit	8265/189	
	SWITCH BOARD	6361532	195 S
	Compass	6420 010	

InterOcean

V_x ✓
V_y ✓

195 ~~515~~ Die —
- Id ± .3

CSTD CALIBRATION

Probe S/N 62710006

Date & Initial 11-30-77 R.H

		Test Point	Voltage or Scope Picture	DATA
1.	Current Regulator	RED	+15 ± 4VDC	+13
		BLK	-15 ± 4VDC	-13
		WH	0.000 ± .002	+0.0004
2.	Voltage Regulator	RED	+8.00 ± .01VDC	+8.00
		BLK	-8.00 ± .01	-8.00
3.	Chopper	YEL	Fig A 180° out of phase	✓
4.	Amplifier	GR	Fig B	✓
		NOTE 1-GR	Fig C	✓
5.	Demodulator	YEL	Fig D 180° out of phase	✓
		GREY	0.00 ± .01	.000
		NOTE 1-GREY	✱ -2.6 ± .2VDC	-2.555
6.	Conductivity	BLUE	0.000 ± 0.002	0.000
		NOTE 1-BLUE	✱ +4.800 ± .10	+4.800
7.	Salinity 0-20 ppt	BLUE	0.000 ± .002	N/A
8.	Salinity 20-40 ppt	GR	See table 2.1 in manual	↓
		BLUE	See table 2.1 in manual	
9.	Temperature	NOTE 2-BLUE	-0.02°C Thermometer	0.002
		NOTE 3-BLUE	22.52°C Thermometer	+22.5

CSTD Calibration Cont.

	Test Point	Voltage or Scope Picture	DATA
10. Depth	NOTE 5-BLUE	Shunt Value____	N/A
11. Auto-Range	GREY	+2.005 ± .005	
	GREEN	+6.50 ± .75	
	*GREY	+1.99 ± .01	
	*GREEN	-6.50 ± .75	
12. Dissolved Oxygen			
	NOTE 6-GREEN	0.00 ± .01	
	GREEN	See calibration sheet	
13. pH	NOTE 7		
	pH 7 - YELLOW	.70 ± .01	
	pH - YELLOW	.1v/pH ± .01	
	pH - YELLOW	.1v/pH ± .01	
14. Redox	NOTE 7-YELLOW	0.00 ± .005	
	Fe^{++} Fe^{+++} YELLOW	.439 ± .005	N/A
15. Turbidity	GREY	0.00 ± .01	.000
	GREY	1.00 ± .01	+1.000 in Distilled H_2O

InterOcean

513 PROBE

FINAL CHECK-OFF

SERIAL NO. 6871 004

INITIALS AER

DATE 11-[illegible]

READOUT	COMPUTED VALUES
CONDUCTIVITY 0.00 51.27	CONDUCTIVITY 0.00 mV/cm 51.27 mV/cm @ 22.52 °C
SALINITY	SALINITY 35.64
TEMPERATURE − 0.02 +22.52	TEMPERATURE − 0.02 °C 22.52 °C
DEPTH	DEPTH
DO_2	DO_2
pH	pH
REDOX	REDOX
TURBIDITY .0 +100.0	TURBIDITY .0 % 100 %

InterOcean

CONDUCTIVITY CALIBRATION

DATE 11/30/78
INSPECTOR AER
PROBE S/N 1027 00[illegible]

CONDUCTIVITY CALIBRATION STANDARD
Model 500CS # 6271

Probe value will be obtained when probe is calibrated

Conductivity Millimhos	Probe Value
0	.00
10	10.05
20	20.01
30	30.14
40	40.21
50	50.22
60	60.13
70	70.17

NOTE: Probe value can be obtained from either 514-A C.S.T.D. Readout digital display or from Pin D on the Recorder outlet with a digital volt meter.

Make certain that the lead that is passed through the conductivity head is a very low resistance.

CSTD Calibration Cont.

Notes to CSTD DO pH Calibration

1. This value obtained by inserting a 50 ohm resistor through conductivity head using clip leads.

2. This value obtained by immersion of temp. sensor in ice water as close to 0°C as possible while continuously monitoring ice water with a calibrated thermometer.

3. This value obtained by immersion of temp. sensor in room temperature water while continuously monitoring temperature with a calibrated thermometer.

4. Steps #2 and #3 are done with stainless steel shield removed. Care must be taken not to damage sensor while shield is removed.

5. This value is obtained after depth calibration with dead weight tester.

6. Zero adjust is set with sensor enveloped in atmosphere of inert gas (helium; argon).
Gain adjust obtained in fully air saturated fresh water.

7. Temporary connection is made between circuit common and the shield wire of the pH electrode. (Or the shield wire of the redox electrode.)

Job No: 6271 Date: 11-30-78

Customer Name: Corps of Engineers By: R.H.

Part Number	Description	Serial No.	Remarks
5138005/5136001	Pressure Case & Base Plate with mother board	6271006	Cupro Nickel 12-Pin Souriau
5138001-1	Conductivity Sensor	139	Cross Shallow C.
5138006-11	Temperature Sensor	703	S.S.
5138105	Temperature Sensor Platinum	—	—
5138006-2	Salinity Compensation Network	—	—
5138101	Pressure Transducer	—	—
5138020	pH Sensor	—	—
5138021	Dissolved Oxygen Sensor	—	—
5138002	Turbidity Sensor	6271 210	Cupro Nickel LED
	[redacted] Velocity Sensor		
5132010	Current Regulator	6361 362	Dipolar
5132011	Voltage Regulator	6361 332	
5132014	Conductivity	1.361 268	0-65
5132015	Salinity 0-20 PPT	—	—
5132015-1	Salinity 20-40 PPT	—	—
5132019	Salinity Auto Range	—	—
5132016	Temperature	3240233	
5132116	Temperature, Platinum Thermistor	—	—
5132017	Depth	—	—
5132013	Demodulator	6080132	
5132012	Amplifier	4991205	T.C.
5132018	Chopper	6361031	LoNoise
5132126	Dissolved Oxygen	—	—
5132125	pH	—	—
5139300	Protective Cage	—	—
5138110	Schryway Carrying Case	—	—
5134011A	Turbidity		
	[redacted] Velocity Unit		
	Switch Board	6361537	
	Compass	6420503	

InterOcean

195
~~513~~

DIR ✓
V_x ✓
V_y ✓

CSTD CALIBRATION

-ID ±1.0

Probe S/N 6271-1007

Date & Initial 11-17-78 R.H.

	Test Point	Voltage or Scope Picture	DATA
1. Current Regulator	RED	+15 ± 4VDC	+13
	BLK	-15 ± 4VDC	-13
	WH	0.000 ± .002	0.000
2. Voltage Regulator	RED	+8.00 ± .01VDC	+8.000
	BLK	-8.00 ± .01	-8.000
3. Chopper	YEL	Fig A 180° out of phase	✓
4. Amplifier	GR	Fig B	✓
	NOTE 1-GR	Fig C	✓
5. Demodulator	YEL	Fig D 180° out of phase	✓
	GREY	0.00 ± .01	0.000
	NOTE 1-GREY	✡ -2.6 ± .2VDC	-2.564
6. Conductivity	BLUE	0.000 ± 0.002	0.000
	NOTE 1-BLUE	✡ +4.800 ± .10	+4.800
7. Salinity 0-20 ppt	BLUE	0.000 ± .002	N/A
8. Salinity 20-40 ppt	GR	See table 2.1 in manual	N/A
	BLUE	See table 2.1 in manual	
9. Temperature	NOTE 2-BLUE	— 0.0[illegible]°C Thermometer	0.00
	NOTE 3-BLUE	+ 23.33°C Thermometer	+23.3

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CSTD Calibration Cont.

	Test Point	Voltage or Scope Picture	DATA
10. Depth	NOTE 5-BLUE	Shunt Value 40.421	
11. Auto-Range	GREY	+2.005 ± .005	
	GREEN	+6.50 ± .75	N/A
	*GREY	+1.99 ± .01	
	*GREEN	-6.50 ± .75	
12. Dissolved Oxygen			
	NOTE 6-GREEN	0.00 ± .01	N/A
	GREEN	See calibration sheet	
13. pH	NOTE 7		
	pH 7 - YELLOW	.70 ± .01	N/A
	pH - YELLOW	.1v/pH ± .01	
	pH - YELLOW	.1v/pH ± .01	
14. Redox	NOTE 7-YELLOW	0.00 ± .005	
	Fe^{++} Fe^{+++} YELLOW	.439 ± .005	N/A
15. Turbidity	GREY	0.00 ± .01	.000
	GREY	1.00 ± .01	+1.000in Distilled H_2O

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513 PROBE
FINAL CHECK-OFF

SERIAL No. 6271007

INITIALS RH,

DATE 11-29-78

READOUT	COMPUTED VALUES
CONDUCTIVITY 0,00 +51.29	CONDUCTIVITY 0.00 mv/cm +5129 MV/cm at 22.5C °C
SALINITY	SALINITY
TEMPERATURE - .02 + 22.56	TEMPERATURE - 0.020C +22.56
DEPTH 0.000 5.040	DEPTH 0.00 FT 50.45 FT
DO_2	DO_2
pH	pH
REDOX	REDOX
TURBIDITY .0 +100.0	TURBIDITY 0 % 100 %

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DEPTH SENSOR CALIBRATION

DATE: 11-28-78
INSPECTOR: K.H.
MODEL NO: 4161-0030
SERIAL NO: E-274
DEPTH BOARD S/N: 6361003
PROBE S/N: 6271007

For electrical calibration, use shunt resistor value 30.1KOHMS for Depth Indicaiton of 44.21 FEET ~~Meters~~.

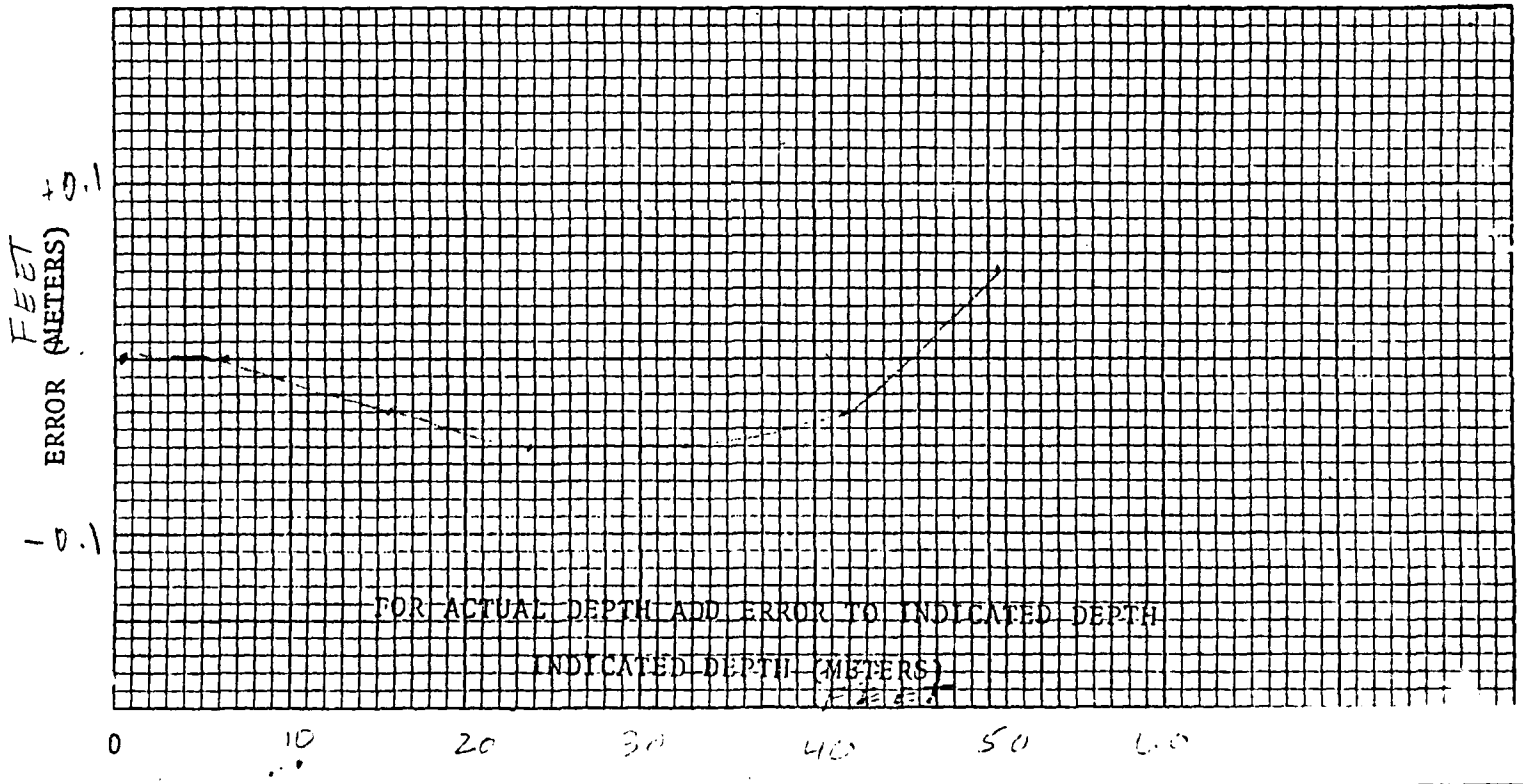
0-5V
0-250FT

TYPE OF CALIBRATION

___ Fresh Water 62.41b/cuFt. Conversion Constant 0.7033 M/PSI

✓ Salt Water 64.0 1b/cuFt. Conversion Constant 0.6858 M/PSI

22.5007 mv = 1 FT



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513 PROBE ASSEMBLY RECORD

Job No: 6271 Date: 11-27-76

Customer Name: Corps of Engineers By: E.H.

Part Number	Description	Serial No.	Remarks
5138005/5136001	Pressure Case & Base Plate with mother board	6271 017	Super Tech II Version
5138001-1	Conductivity Sensor	141	Short, Stainless
5138006-11	Temperature Sensor	686	SS.
5138105	Temperature Sensor Platinum	—	—
5138006-2	Salinity Compensation Network	—	—
5138101	Pressure Transducer	—	—
5138020	pH Sensor	—	—
5138021	Dissolved Oxygen Sensor	—	—
5138002	Turbidity Sensor	627 213	Super Tech L.S.D.
	~~Sound~~ Velocity Sensor	825 5176	
5132010	Current Regulator	6361 95	Bipolar
5132011	Voltage Regulator	6361340	
5132014	Conductivity	6080749	0-65
5132015	Salinity 0-20 PPT	—	—
5132015-1	Salinity 20-40 PPT	—	—
5132019	Salinity Auto Range	—	—
5132016	Temperature	6080738	
5132116	Temperature, Platinum Thermistor	—	—
5132017	Depth	—	—
5132013	Demodulator	6361214	
5132012	Amplifier	6361045	J.G.
5132018	Chopper	6361032	[illegible]
5132126	Dissolved Oxygen	—	—
5132125	pH	—	—
5139300	Protective Cage	—	—
5138110	Schryway Carrying Case	—	—
5134011A	Turbidity	6080390	
	~~Sound~~ Velocity Unit	5176	
	Switch Panel	6361527	1955
	Compass	6420005	

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V_x ✓
V_y ✓
Die ✓

195
~~513~~

ID ± 1.2

CSTD CALIBRATION

Probe S/N 6271018

Date & Initial AER 12/01/98

		Test Point	Voltage or Scope Picture	DATA
1.	Current Regulator	RED	+15 ± 4VDC	+15
		BLK	-15 ± 4VDC	-15
		WH	0.000 ± .002	.001
2.	Voltage Regulator	RED	+8.00 ± .01VDC	+8.000
		BLK	-8.00 ± .01	-8.000
3.	Chopper	YEL	Fig A 180° out of phase	✓
4.	Amplifier	GR	Fig B	✓
		NOTE 1-GR	Fig C	✓
5.	Demodulator	YEL	Fig D 180° out of phase	✓
		GREY	0.00 ± .01	.000
		NOTE 1-GREY	* -2.6 ± .2VDC	-2.564
6.	Conductivity	BLUE	0.000 ± 0.002	.000
		NOTE 1-BLUE	* +4.800 ± .10	+4.770
7.	Salinity 0-20 ppt	BLUE	0.000 ± .002	NA
8.	Salinity 20-40 ppt	GR	See table 2.1 in manual	NA
		BLUE	See table 2.1 in manual	NA
9.	Temperature	NOTE 2-BLUE	-1.022°C Thermometer	-1.0
		NOTE 3-BLUE	+22.72°C Thermometer	+22.7

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CSTD Calibration Cont.

	Test Point	Voltage or Scope Picture	DATA
10. Depth	NOTE 5-BLUE	Shunt Value	4.63
11. Auto-Range	GREY	+2.005 ± .005	N/A
	GREEN	+6.50 ± .75	
	*GREY	+1.99 ± .01	
	*GREEN	-6.50 ± .75	
12. Dissolved Oxygen			
	NOTE 6-GREEN	0.00 ± .01	
	GREEN	See calibration sheet	
13. pH	NOTE 7		
	pH 7 - YELLOW	.70 ± .01	
	pH - YELLOW	.1v/pH ± .01	
	pH - YELLOW	.1v/pH ± .01	
14. Redox	NOTE 7-YELLOW	0.00 ± .005	N/A
	Fe^{++} Fe^{+++} YELLOW	.439 ± .005	
15. Turbidity	GREY	0.00 ± .01	.000
	GREY	1.00 ± .01	+1.000 in Distilled H2O

InterOcean

513 PROBE

FINAL CHECK-OFF

SERIAL No. 6271018

INITIALS AER

DATE 12/01/78

READOUT	COMPUTED VALUES
CONDUCTIVITY .00 +51.63	CONDUCTIVITY .00 m ℧/cm 51.63 m ℧/cm at 22.72°C
SALINITY —	SALINITY 35.76 ppt
TEMPERATURE -0.02 +22.72	TEMPERATURE — 0.02°C 22.72 °C
DEPTH 0.000 + 5.030	DEPTH 0.000 FT + 50.24 FT
DO_2 —	DO_2 —
pH —	pH —
REDOX —	REDOX —
TURBIDITY 10 +100.0	TURBIDITY 0 % 100 %

DEPTH SENSOR CALIBRATION

InterOcean

For electrical calibration, use shunt resistor value 30.1KOHMS for Depth Indicaiton of 4613 FEET Meters.

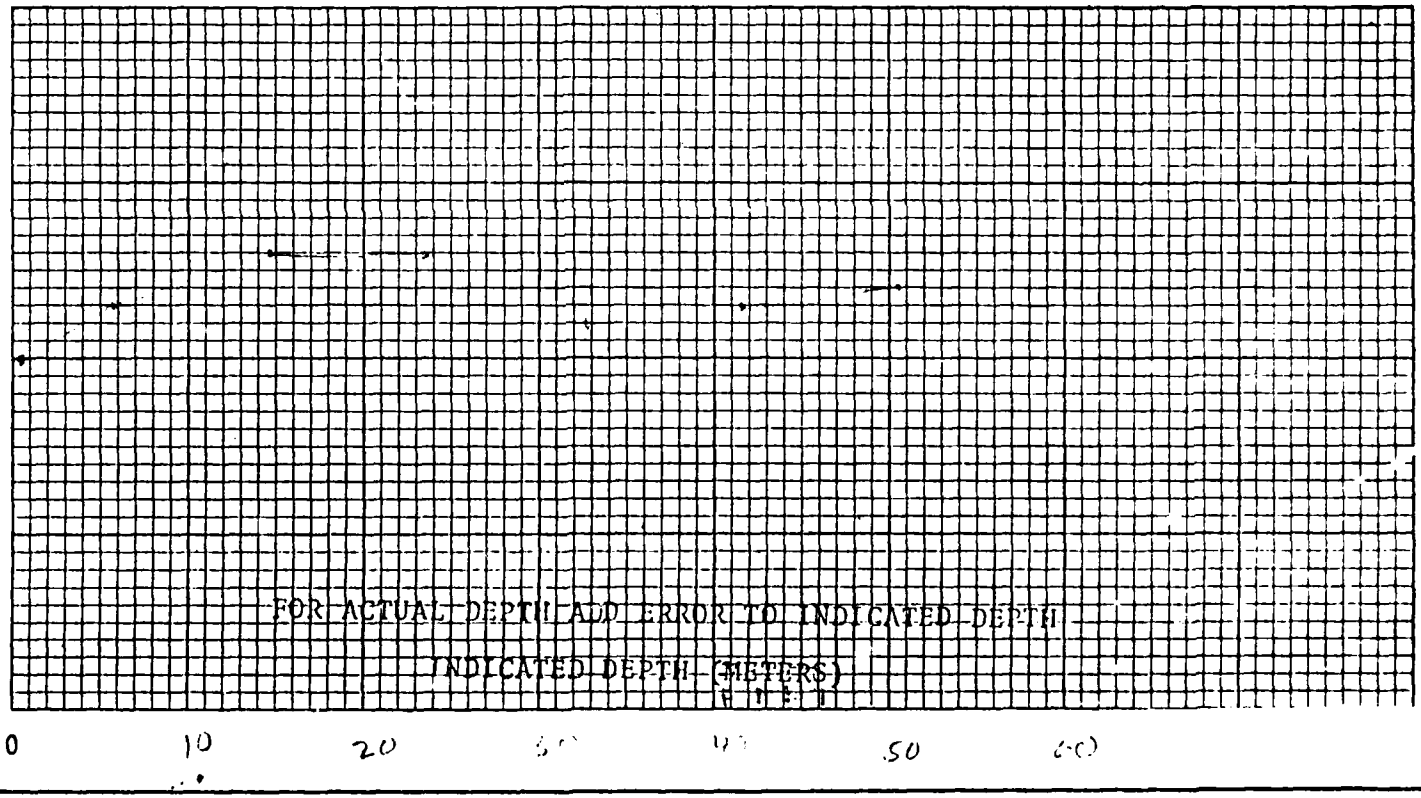
DATE: 7-16
INSPECTOR: [illegible]
MODEL NO: [illegible]
SERIAL NO: E-354
DEPTH BOARD S/N: [illegible]1007
PROBE S/N: [illegible]

TYPE OF CALIBRATION

0 - >5V
0 - >5015

___ Fresh Water 62.41b/cuFt. Conversion Constant 0.7033 M/PSI

✓ Salt Water 64.0 1b/cuFt. Conversion Constant 0.6858 M/PSI



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CSTD Calibration Cont.

Notes to CSTD DO pH Calibration

1. This value obtained by inserting a 50 ohm resistor through conductivity head using clip leads.

2. This value obtained by immersion of temp. sensor in ice water as close to 0°C as possible while continuously monitoring ice water with a calibrated thermometer.

3. This value obtained by immersion of temp. sensor in room temperature water while continuously monitoring temperature with a calibrated thermometer.

4. Steps #2 and #3 are done with stainless steel shield removed. Care must be taken not to damage sensor while shield is removed.

5. This value is obtained after depth calibration with dead weight tester.

6. Zero adjust is set with sensor enveloped in atmosphere of inert gas (helium; argon).
Gain adjust obtained in fully air saturated fresh water.

7. Temporary connection is made between circuit common and the shield wire of the pH electrode. (Or the shield wire of the redox electrode.)

513 PROBE ASSEMBLY RECORD

Job No: 6271 Date: 11-29-78

Customer Name: Corps of Engineers D C By: R. H.

Part Number	Description	Serial No.	Remarks
5138005/5136001	Pressure Case & Base Plate with mother board	6271018	Cooper Metal 12 pin Sorrin
5138001-1	Conductivity Sensor	144	Short Stalk T.C.
5138006-11	Temperature Sensor	701	S.S.
5138105	Temperature Sensor Platinum	—	—
5138006-2	Salinity Compensation Network	—	—
5138101	Pressure Transducer	E-384	4181-0050 30PSI
5138020	pH Sensor	—	—
5138021	Dissolved Oxygen Sensor	—	—
5138002	Turbidity Sensor	6271207	Temporary Cell E.E.O.
	~~Sound~~ Velocity Sensor	5172	—
5132010	Current Regulator	6361378	Bipolar
5132011	Voltage Regulator	6361351	
5132014	Conductivity	6361254	0-65
5132015	Salinity 0-20 PPT	—	—
5132015-1	Salinity 20-40 PPT	—	—
5132019	Salinity Auto Range	—	—
5132016	Temperature		
5132116	Temperature, Platinum Thermistor	—	—
5132017	Depth	6361007	0-5V
5132013	Demodulator	6361213	
5132012	Amplifier	6361091	T.C.
5132018	Chopper	6361042	LO Noise
5132126	Dissolved Oxygen	—	—
5132125	pH	—	—
5139300	Protective Cage	—	—
5138110	Schryway Carrying Case	—	—
5134011A	Turbidity	6080378	
	~~Sound~~ Velocity UNIT	3242/5172	—
Switch Board		6361533	1955
Terminals		6420002	

InterOcean

195
~~513~~

CSTD CALIBRATION

Probe S/N 16271019

Date & Initial 11-27-78 RH.

		Test Point	Voltage or Scope Picture	DATA
1.	Current Regulator	RED	+15 ± 4VDC	+13
		BLK	-15 ± 4VDC	-13
		WH	0.000 ± .002	0.004
2.	Voltage Regulator	RED	+8.00 ± .01VDC	+8.00
		BLK	-8.00 ± .01	-8.00
3.	Chopper	YEL	Fig A 180° out of phase	✓
4.	Amplifier	GR	Fig B	✓
		NOTE 1-GR	Fig C	✓
5.	Demodulator	YEL	Fig D 180° out of phase	✓
		GREY	0.00 ± .01	0.001
		NOTE 1-GREY	-2.6 ± .2VDC	-2.558
6.	Conductivity	BLUE	0.000 ± 0.002	0.000
		NOTE 1-BLUE	☆ +4.800 ± .10	+4.786
7.	Salinity 0-20 ppt	BLUE	0.000 ± .002	N/A
8.	Salinity 20-40 ppt	GR	See table 2.1 in manual	N/A
		BLUE	See table 2.1 in manual	
9.	Temperature	NOTE 2-BLUE	-0.02°C Thermometer	0.00
		NOTE 3-BLUE	+2 2 20°C Thermometer	2.220

CSTD Calibration Cont.

	Test Point	Voltage or Scope Picture	DATA
10. Depth	NOTE 5-BLUE	Shunt Value	4.772
11. Auto-Range	GREY	+2.005 ± .005	N/A
	GREEN	+6.50 ± .75	
	*GREY	+1.99 ± .01	
	*GREEN	-6.50 ± .75	
12. Dissolved Oxygen			
	NOTE 6-GREEN	0.00 ± .01	
	GREEN	See calibration sheet	
13. pH	NOTE 7		
	pH 7 - YELLOW	.70 ± .01	
	pH - YELLOW	.1v/pH ± .01	
	pH - YELLOW	.1v/pH ± .01	
14. Redox	NOTE 7-YELLOW	0.00 ± .005	
	Fe^{++} Fe^{+++} YELLOW	.439 ± .005	N/A
15. Turbidity	GREY	0.00 ± .01	.000
	GREY	1.00 ± .01	+1.000 in Distilled H2O

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513 PROBE
FINAL CHECK-OFF

SERIAL NO. 6271019

INITIALS R.N

DATE 11-28-78

READOUT	COMPUTED VALUES
CONDUCTIVITY 0.000 5.064	CONDUCTIVITY mV/cm 0.00 50.64 mV/cm at 22.19°C
SALINITY	SALINITY
TEMPERATURE -0.002 +2.220	TEMPERATURE -0.02°C +22.20°C
DEPTH 0.000 FT 5.024	DEPTH 0.00 FT 50.19 FT
DO_2	DO_2
pH	pH
REDOX	REDOX
TURBIDITY .00 +100.0	TURBIDITY .00 100%

InterOcean

DEPTH SENSOR CALIBRATION

DATE: 11-28-78
INSPECTOR: R.H
MODEL NO: 4181-0030
SERIAL NO: _____
DEPTH BOARD S/N: _____
PROBE S/N: 6271019

For electrical calibration, use shunt resistor ~~=eet~~ value 30.1KOHMS for Depth Indicaiton of 47.72 ~~Meters~~.

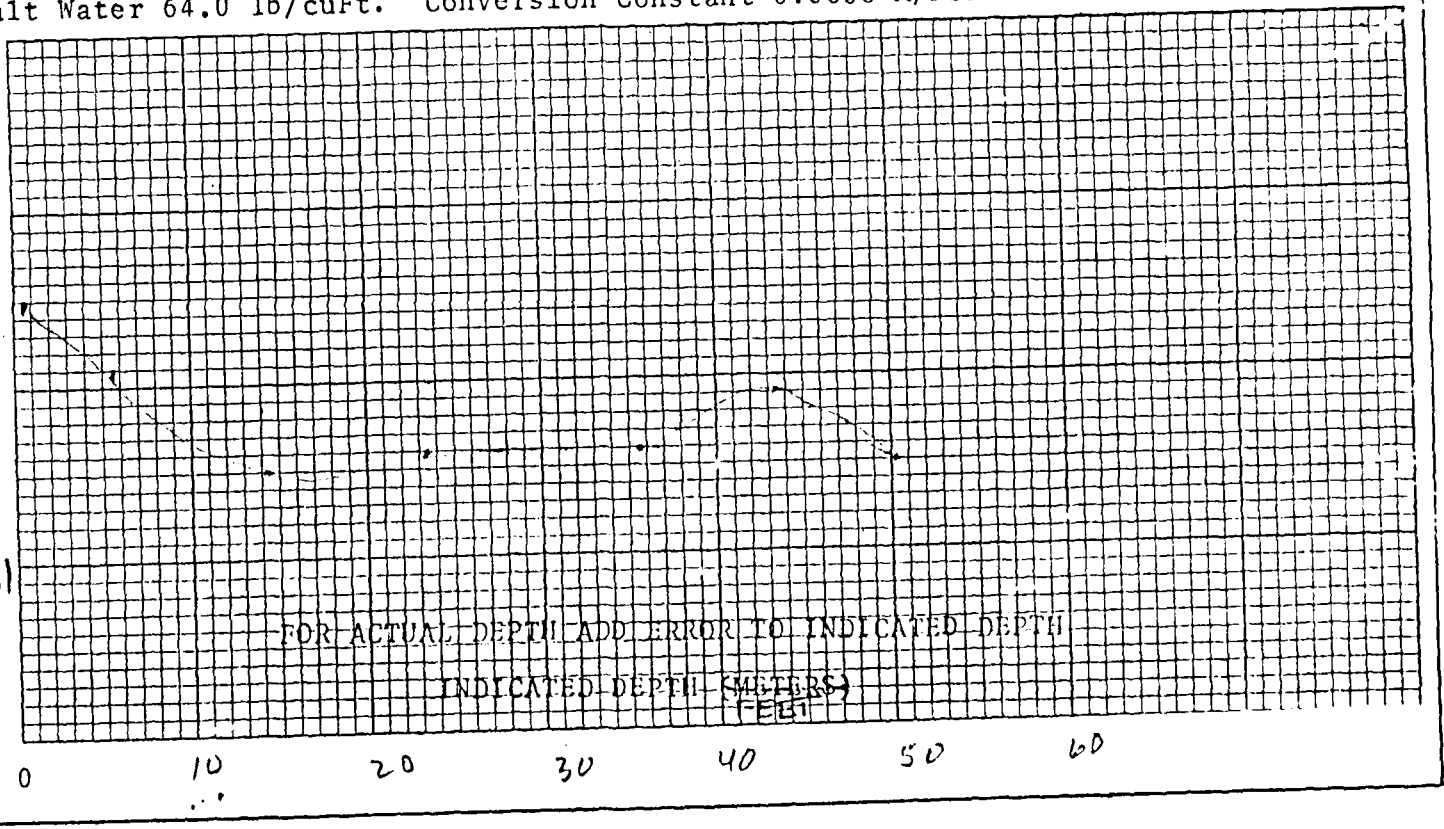
TYPE OF CALIBRATION

0-5 ✓
0 → 50 FT

___ Fresh Water 62.41b/cuFt. Conversion Constant 0.7033 M/PSI

✓ Salt Water 64.0 1b/cuFt. Conversion Constant 0.6858 M/PSI

22.5007 MMHG / FT



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InterOcean

CONDUCTIVITY CALIBRATION

DATE 11-28-78

INSPECTOR R.H

PROBE S/N 6211019

LAB STANDARD #2

CONDUCTIVITY CALIBRATION STANDARD

Model 500CS

Probe value will be obtained when probe is calibrated

Conductivity Millimhos	Probe Value
0	0.000
10	10.11
20	20.12
30	30.34
40	40.47
50	50.57
60	60.58
70	70.73

NOTE: Probe value can be obtained from either 514-A C.S.T.D. Readout digital display or from Pin D on the Recorder outlet with a digital volt meter.

Make certain that the lead that is passed through the conductivity head is a very low resistance.

CSTD Calibration Cont.

Notes to CSTD DO pH Calibration

1. This value obtained by inserting a 50 ohm resistor through conductivity head using clip leads.

2. This value obtained by immersion of temp. sensor in ice water as close to 0°C as possible while continuously monitoring ice water with a calibrated thermometer.

3. This value obtained by immersion of temp. sensor in room temperature water while continuously monitoring temperature with a calibrated thermometer.

4. Steps #2 and #3 are done with stainless steel shield removed. Care must be taken not to damage sensor while shield is removed.

5. This value is obtained after depth calibration with dead weight tester.

6. Zero adjust is set with senso enveloped in atmosphere of inert gas (helium; argon).
Gain adjust obtained in fully air saturated fresh water.

7. Temporary connection is made between circuit common and the shield wire of the pH electrode. (Or the shield wire of the redox electrode.)

513 PROBE ASSEMBLY RECORD

Jct No: 6271 Date: 11-28-78

Customer Name: Corps of Engineers By: R.H

Part Number	Description	Serial No.	Remarks
5138005/5136001	Pressure Case & Base Plate with mother board	6271019	Copper Nickel 12 pin Souriau
5138001-1	Conductivity Sensor	147	Short Shallow T.C.
5138006-11	Temperature Sensor	669	S.S.
5138105	Temperature Sensor Platinum	—	—
5138006-2	Salinity Compensation Network	—	—
5138101	Pressure Transducer	E-381	4181-0030 0-30 PSI
5138020	pH Sensor	—	—
5138021	Dissolved Oxygen Sensor	—	—
5138002	Turbidity Sensor	6271212	Copper Nickel L.E.D
	~~Sound~~ Velocity Sensor	S/179	
5132010	Current Regulator	6361364	Bipolar
5132011	Voltage Regulator	6080022	
5132014	Conductivity	6080154	0-65
5132015	Salinity 0-20 PPT	—	—
5132015-1	Salinity 20-40 PPT	—	—
5132019	Salinity Auto Range	—	—
5132016	Temperature	6080234	
5132116	Temperature, Platinum Thermistor	—	—
5132017	Depth	6361 009	0-5V
5132013	Demodulator	6361226	
5132012	Amplifier	6361082	T.C
5132018	Chopper	6083279	Lo Noise
5132126	Dissolved Oxygen	—	—
5132125	pH	—	—
5139300	Protective Cage	—	—
5138110	Schryway Carrying Case	—	—
5134011A	Turbidity	6080 381	
	~~Sound~~ Velocity Unit	S/256/179	
	Switch Board	6361531	1955
	Jumper	6420013	

Vx ✓
Vy ✓
Dir ✓
-ID-1.60

InterOcean

195
~~513~~

CSTD CALIBRATION

~~4.70~~ Volts
2.06 Volts

Probe S/N 6271020 Serial # SN 1872

Date & Initial 11-30-78 RLK

		Test Point	Voltage or Scope Picture	DATA
1.	Current Regulator	RED	+15 ± 4VDC	+13
		BLK	-15 ± 4VDC	-13
		WH	0.000 ± .002	-0.0005
2.	Voltage Regulator	RED	+8.00 ± .01VDC	+8.000
		BLK	-8.00 ± .01	-8.000
3.	Chopper	YEL	Fig A 180° out of phase	✓
4.	Amplifier	GR	Fig B	
		NOTE 1-GR	Fig C	
5.	Demodulator	YEL	Fig D 180° out of phase	✓
		GREY	0.00 ± .01	-0.001
		NOTE 1-GREY	☆ -2.6 ± .2VDC	-2.550
6.	Conductivity	BLUE	0.000 ± 0.002	0.000
		NOTE 1-BLUE	☆ +4.800 ± .10	+4.791
7.	Salinity 0-20 ppt	BLUE	0.000 ± .002	N/A
8.	Salinity 20-40 ppt	GR	See table 2.1 in manual	N/A
		BLUE	See table 2.1 in manual	
9.	Temperature	NOTE 2-BLUE	-0.02°C Thermometer	0.00
		NOTE 3-BLUE	+ 22.08°C Thermometer	+22.0

CSTD Calibration Cont.

	Test Point	Voltage or Scope Picture	DATA
10. Depth	NOTE 5-BLUE	Shunt Value 2.06	
11. Auto-Range	GREY	+2.005 ± .005	N/A
	GREEN	+6.50 ± .75	
	*GREY	+1.99 ± .01	
	*GREEN	-6.50 ± .75	
12. Dissolved Oxygen			
	NOTE 6-GREEN	0.00 ± .01	
	GREEN	See calibration sheet	
13. pH	NOTE 7		
	pH 7 - YELLOW	.70 ± .01	
	pH - YELLOW	.1v/pH ± .01	
	pH - YELLOW	.1v/pH ± .01	
14. Redox	NOTE 7-YELLOW	0.00 ± .005	
	Fe^{++} Fe^{+++} YELLOW	.439 ± .005	N/A
15. Turbidity	GREY	0.00 ± .01	.000
	GREY	1.00 ± .01	

Voltage on our pcb → 900mVolts

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513 PROBE
FINAL CHECK-OFF

SERIAL No. 627/020

INITIALS E.H.

DATE 11-30-78

READOUT	COMPUTED VALUES
CONDUCTIVITY .00 +5627	CONDUCTIVITY .00 mmho/cm 51.27 mmho/cm at 22.62 °C
SALINITY —	SALINITY 35.64
TEMPERATURE − C.02 +22.62	TEMPERATURE − 0.02°C 22.62°C
DEPTH 0.00m +50.85	DEPTH 0.00FT +50.85 FT
DO_2 —	DO_2 —
pH —	pH —
REDOX —	REDOX —
TURBIDITY .0 +100.0	TURBIDITY 0 % 100 %

4 SOUNDS

InterOcean

DEPTH SENSOR CALIBRATION

DATE: 11-29-78
INSPECTOR: C.H.
MODEL NO: 4811-5020
SERIAL NO: E-915
DEPTH BOARD S/N: 6361005
PROBE S/N: 1.2 71020

For electrical calibration, use shunt resistor FEET value 30.1KOHMS for Depth Indicaiton of 20.6 ~~Meters~~.

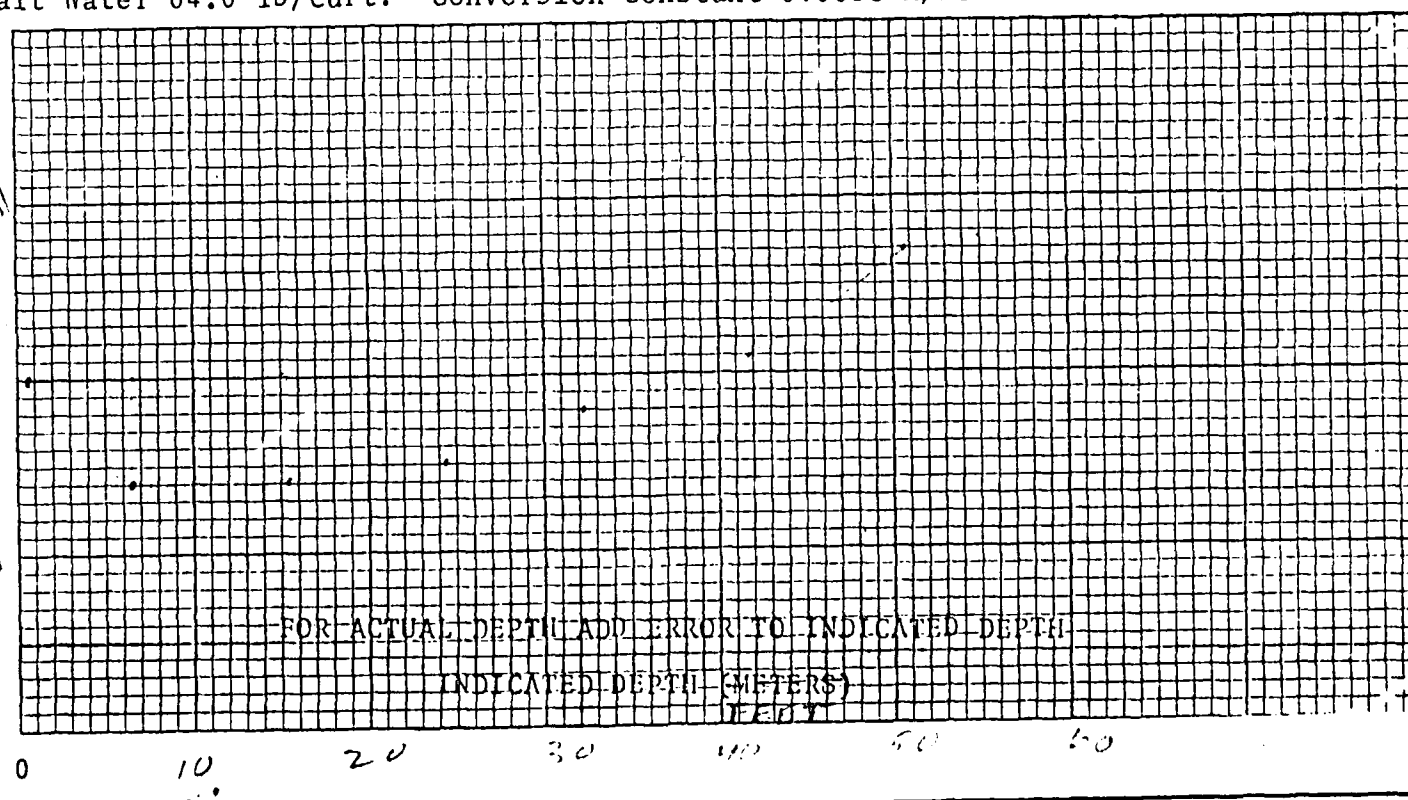
TYPE OF CALIBRATION

0 - 5 V
0 - 50 FT

____ Fresh Water 62.41b/cuFt. Conversion Constant 0.7033 M/PSI

___✓ Salt Water 64.0 1b/cuFt. Conversion Constant 0.6858 M/PSI

22.5007 mm Hg/FT



InterOcean systems, inc. / 3540 aero ct., san diego, ca 92123 / 714-565-8400 / telex 69-5082

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CONDUCTIVITY CALIBRATION

DATE 11-30-81

INSPECTOR R.H

PROBE S/N 6271020

CONDUCTIVITY CALIBRATION STANDARD

Model 500CS # 6271

Probe value will be obtained when probe is calibrated

Conductivity Millimhos	Probe Value
0	.00
10	10.03
20	19.94
30	30.06
40	40.11
50	50.09
60	60.01
70	70.06

NOTE: Probe value can be obtained from either 514-A C.S.T.D. Readout digital display or from Pin D on the Recorder outlet with a digital volt meter.

Make certain that the lead that is passed through the conductivity head is a very low resistance.

CSTD Calibration Cont.

Notes to CSTD DO pH Calibration

1. This value obtained by inserting a 50 ohm resistor through conductivity head using clip leads.

2. This value obtained by immersion of temp. sensor in ice water as close to 0°C as possible while continuously monitoring ice water with a calibrated thermometer.

3. This value obtained by immersion of temp. sensor in room temperature water while continuously monitoring temperature with a calibrated thermometer.

4. Steps #2 and #3 are done with stainless steel shield removed. Care must be taken not to damage sensor while shield is removed.

5. This value is obtained after depth calibration with dead weight tester.

6. Zero adjust is set with sensor enveloped in atmosphere of inert gas (helium; argon).
Gain adjust obtained in fully air saturated fresh water.

7. Temporary connection is made between circuit common and the shield wire of the pH electrode. (Or the shield wire of the redox electrode.)

513 PROBE ASSEMBLY RECORD

Job No: 6271 Date: 11-29-78

Customer Name: [illegible] By: R.H.

Part Number	Description	Serial No.	Remarks
5138005/5136001	Pressure Case & Base Plate with mother board	6271020	Cupertwin...
5138001-1	Conductivity Sensor	154	Shaft Stainless
5138006-11	Temperature Sensor	711	S.S.
5138105	Temperature Sensor Platinum	—	—
5138006-2	Salinity Compensation Network	—	—
5138101	Pressure Transducer	E-915	4181-0030 300 PSI
5138020	pH Sensor	—	—
5138021	Dissolved Oxygen Sensor	—	—
5138002	Turbidity Sensor	6271206	Sugar-coated [illegible]
	~~Sound~~ Velocity Sensor	S186	
5132010	Current Regulator	6361399	Bipolar
5132011	Voltage Regulator	6261331	
5132014	Conductivity	[illegible]7305	0-65
5132015	Salinity 0-20 PPT	—	—
5132015-1	Salinity 20-40 PPT	—	—
5132019	Salinity Auto Range	—	—
5132016	Temperature	6080231	
5132116	Temperature, Platinum Thermistor	—	—
5132017	[illegible]th	6361005	0-5V
5132013	[illegible]ator	6361217	
5132012	Amplifier	6080112	T.C.
5132018	Chopper	[illegible]0278	Lo Noise
5132126	Dissolved Oxygen	—	—
5132125	pH	—	—
5139300	Protective Cage	—	—
5138110	Schryway Carrying Case	—	—
5134011A	Turbidity		
	~~Sound~~ Velocity Unit	/S186	
	[illegible]	6361530	195
	Compass	6420006	4180-8000

InterOcean

CONDUCTIVITY CALIBRATION

DATE 11-30-78

INSPECTOR R.H.

PROBE S/N 6271007

CONDUCTIVITY CALIBRATION STANDARD

Model 500CS #6271

Probe value will be obtained when probe is calibrated

Conductivity Millimhos	Probe Value
0	.00
10	10.05
20	20.01
30	30.14
40	40.20
50	50.23
60	60.17
70	70.26

NOTE: Probe value can be obtained from either 514-A C.S.T.D. Readout digital display or from Pin D on the Recorder outlet with a digital volt meter.

Make certain that the lead that is passed through the conductivity head is a very low resistance.

CSTD Calibration Cont.

Notes to CSTD DO pH Calibration

1. This value obtained by inserting a 50 ohm resistor through conductivity head using clip leads.

2. This value obtained by immersion of temp. sensor in ice water as close to 0°C as possible while continuously monitoring ice water with a calibrated thermometer.

3. This value obtained by immersion of temp. sensor in room temperature water while continuously monitoring temperature with a calibrated thermometer.

4. Steps #2 and #3 are done with stainless steel shield removed. Care must be taken not to damage sensor while shield is removed.

5. This value is obtained after depth calibration with dead weight tester.

6. Zero adjust is set with sensor enveloped in atmosphere of inert gas (helium; argon).
Gain adjust obtained in fully air saturated fresh water.

7. Temporary connection is made between circuit common and the shield wire of the pH electrode. (Or the shield wire of the redox electrode.)

513 PROBE ASSEMBLY RECORD

Job No: 62-71 Date: 11-29-72

Customer Name: Corps of Engineers By: R.H

Part Number	Description	Serial No.	Remarks
5138005/5136001	Pressure Case & Base Plate with mother board	627/007	Cupronickel
5138001-1	Conductivity Sensor	148	Short Sensor
5138006-11	Temperature Sensor	700	S.S.
5138105	Temperature Sensor Platinum	—	—
5138006-2	Salinity Compensation Network	—	—
5138101	Pressure Transducer	F-274	4161-0030 30PSI
5138020	pH Sensor	—	—
5138021	Dissolved Oxygen Sensor	—	—
5138002	Turbidity Sensor	627/203	Cupronickel
	~~Sound~~ Velocity Sensor	5170	
5132010	Current Regulator	6080055	Bipolar
5132011	Voltage Regulator	6361335	
5132014	Conductivity	5462207	0-65
5132015	Salinity 0-20 PPT	—	—
5132015-1	Salinity 20-40 PPT	—	—
5132019	Salinity Auto Range	—	—
5132016	Temperature	3246227	
5132116	Temperature, Platinum Thermistor		—
5132017	Depth	6361003	0 – 5V
5132013	Demodulator		
5132012	Amplifier	5462103	T.C.
5132018	Chopper	6080271	LO Noise
5132126	Dissolved Oxygen	—	—
5132125	pH	—	—
5139300	Protective Cage	—	—
5138110	Schryway Carrying Case	—	—
5134011A	Turbidity		
	~~Sound~~ Velocity Unit	3240/5172	—
	Mother Board	6361 535	1953
	Compass	6420 004	

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Dir ✓
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513

CSTD CALIBRATION

Probe S/N 6271008

Date & Initial 11-30-78 R.H

		Test Point	Voltage or Scope Picture	DATA
1.	Current Regulator	RED	+15 ± 4VDC	+13
		BLK	-15 ± 4VDC	-13
		WH	0.000 ± .002	0.0006
2.	Voltage Regulator	RED	+8.00 ± .01VDC	+8.00
		BLK	-8.00 ± .01	-8.00
3.	Chopper	YEL	Fig A 180° out of phase	✓
4.	Amplifier	GR	Fig B	✓
		NOTE 1-GR	Fig C	✓
5.	Demodulator	YEL	Fig D 180° out of phase	✓
		GREY	0.00 ± .01	.000
		NOTE 1-GREY	-2.6 ± .2VDC	-2553
6.	Conductivity	BLUE	0.000 ± 0.002	.000
		NOTE 1-BLUE	+4.800 ± .10	+4.796
7.	Salinity 0-20 ppt	BLUE	0.000 ± .002	N/A
8.	Salinity 20-40 ppt	GR	See table 2.1 in manual	N/A
		BLUE	See table 2.1 in manual	
9.	Temperature	NOTE 2-BLUE	-0.02°C Thermometer	-.002
		NOTE 3-BLUE	+22.48°C Thermometer	+22.24

CSTD Calibration Cont.

	Test Point	Voltage or Scope Picture	DATA
10. Depth	NOTE 5-BLUE	Shunt Value_____	N/A
11. Auto-Range	GREY	+2.005 ± .005	
	GREEN	+6.50 ± .75	
	*GREY	+1.99 ± .01	
	*GREEN	-6.50 ± .75	
12. Dissolved Oxygen			
	NOTE 6-GREEN	0.00 ± .01	
	GREEN	See calibration sheet	
13. pH	NOTE 7		
	pH 7 - YELLOW	.70 ± .01	
	pH - YELLOW	.1v/pH ± .01	
	pH - YELLOW	.1v/pH ± .01	
14. Redox	NOTE 7-YELLOW	0.00 ± .005	
	Fe^{++} Fe^{+++} YELLOW	.439 ± .005	N/A
15. Turbidity	GREY	0.00 ± .01	.000
	GREY	1.00 ± .01	+1.000 in Distilled H_2O

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513 PROBE
FINAL CHECK-OFF

SERIAL No. 627/002

INITIALS AFR

DATE 11/30/78

READOUT	COMPUTED VALUES
CONDUCTIVITY .00 +51.23	CONDUCTIVITY .00 mmho/cm 51.23 mmho/cm at 22.48 °C
SALINITY	SALINITY 35.64 PSU
TEMPERATURE -0.02 +22.48	TEMPERATURE -0.02 °C +22.48 °C
DEPTH	DEPTH
DO_2	DO_2
pH	pH
REDOX	REDOX
TURBIDITY .0 +100.0	TURBIDITY .0 % 100 %

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CONDUCTIVITY CALIBRATION

DATE 11/30/78
INSPECTOR AER
PROBE S/N 6271008

CONDUCTIVITY CALIBRATION STANDARD
Model 500CS # 6271

Probe value will be obtained when probe is calibrated

Conductivity Millimhos	Probe Value
0	0.00
10:	10.00
20	19.91
30	29.99
40	40.00
50	49.97
60	59.86
70	69.89

NOTE: Probe value can be obtained from either 514-A C.S.T.D. Readout digital display or from Pin D on the Recorder outlet with a digital volt meter.

Make certain that the lead that is passed through the conductivity head is a very low resistance.

CSTD Calibration Cont.

Notes to CSTD DO pH Calibration

1. This value obtained by inserting a 50 ohm resistor through conductivity head using clip leads.

2. This value obtained by immersion of temp. sensor in ice water as close to 0°C as possible while continuously monitoring ice water with a calibrated thermometer.

3. This value obtained by immersion of temp. sensor in room temperature water while continuously monitoring temperature with a calibrated thermometer.

4. Steps #2 and #3 are done with stainless steel shield removed. Care must be taken not to damage sensor while shield is removed.

5. This value is obtained after depth calibration with dead weight tester.

6. Zero adjust is set with sensor enveloped in atmosphere of inert gas (helium; argon).
Gain adjust obtained in fully air saturated fresh water.

7. Temporary connection is made between circuit common and the shield wire of the pH electrode. (Or the shield wire of the redox electrode.)

513 PROBE ASSEMBLY RECORD

Job No: 5271 Date: 11-30-78

Customer Name: Corps of Engineers By: R.H.

Part Number	Description	Serial No.	Remarks
5138005/5136001	Pressure Case & Base Plate with mother board	6271 008	Copper Nickel 12 Din Conn
5138001-1	Conductivity Sensor	144	Short Shielded T.C.
5138006-11	Temperature Sensor	691	S.S.
5138105	Temperature Sensor Platinum	—	—
5138006-2	Salinity Compensation Network	—	—
5138101	Pressure Transducer	—	—
5138020	pH Sensor	—	—
5138021	Dissolved Oxygen Sensor	—	—
5138002	Turbidity Sensor	6271 217	Copper Nickel L.E.D
	~~Sound~~ Velocity Sensor	5165	
5132010	Current Regulator	6361 323	Bipolar
5132011	Voltage Regulator	6361 350	
5132014	Conductivity	6361 264	C-65
5132015	Salinity 0-20 PPT	—	—
5132015-1	Salinity 20-40 PPT	—	—
5132019	Salinity Auto Range	—	—
5132016	Temperature	6361 280	
5132116	Temperature, Platinum Thermistor	—	—
5132017	Depth	—	—
5132013	Demodulator	6361 133	
5132012	Amplifier	6361 089	T.C.
5132018	Chopper	4997 720	Lo Noise
5132126	Dissolved Oxygen	—	—
5132125	pH	—	—
5139300	Protective Cage	—	—
5138110	Schryway Carrying Case	—	—
5134011A	Turbidity	5462 607	
	~~Sound~~ Velocity Unit	8256/5165	
	Switch Board	6361 541	
	Pressure	6420 001	

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Corps of Engineers

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CSTD CALIBRATION

Probe S/N 6271 010

Date & Initial 11-27-78 R.H.

	Test Point	Voltage or Scope Picture	DATA
1. Current Regulator	RED	+15 ± 4VDC	+13
	BLK	-15 ± 4VDC	-13
	WH	0.000 ± .002	-0.0007
2. Voltage Regulator	RED	+8.00 ± .01VDC	+8.00
	BLK	-8.00 ± .01	-8.00
3. Chopper	YEL	Fig A 180° out of phase	✓
4. Amplifier	GR	Fig B	✓
	NOTE 1-GR	Fig C	✓
5. Demodulator	YEL	Fig D 180° out of phase	✓
	GREY	0.00 ± .01	+0.0007
	NOTE 1-GREY	-2.6 ± .2VDC	-2.55
6. Conductivity	BLUE	0.000 ± 0.002	0.0000
	NOTE 1-BLUE	+4.800 ± .10	+4.784
7. Salinity 0-20 ppt	BLUE	0.000 ± .002	N/A
8. Salinity 20-40 ppt	GR	See table 2.1 in manual	N/A
	BLUE	See table 2.1 in manual	N/A
9. Temperature	NOTE 2-BLUE	-0.0[illegible]°C Thermometer	0.0
	NOTE 3-BLUE	21.38°C Thermometer	+2.13

CSTD Calibration Cont.

	Test Point	Voltage or Scope Picture	DATA
10. Depth	NOTE 5-BLUE	Shunt Value	N/A
11. Auto-Range	GREY	+2.005 ± .005	
	GREEN	+6.50 ± .75	N/A
	*GREY	+1.99 ± .01	
	*GREEN	-6.50 ± .75	
12. Dissolved Oxygen			
	NOTE 6-GREEN	0.00 ± .01	
	GREEN	See calibration sheet	N/A
13. pH	NOTE 7		
	pH 7 - YELLOW	.70 ± .01	
	pH - YELLOW	.1v/pH ± .01	N/A
	pH - YELLOW	.1v/pH ± .01	
14. Redox	NOTE 7-YELLOW	0.00 ± .005	
	Fe^{++} Fe^{+++} YELLOW	.439 ± .005	N/A
15. Turbidity	GREY	0.00 ± .01	.000
	GREY	1.00 ± .01	+1.000 in Distilled H_2O

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513 PROBE
FINAL CHECK-OFF

SERIAL No. 6271010

INITIALS R.H.

DATE 11-27-78

READOUT	COMPUTED VALUES
CONDUCTIVITY +0.000 +5.0023	CONDUCTIVITY +0.000 mv/cm +50.02 mv/cm @ 21.61°C
SALINITY	SALINITY
TEMPERATURE -0.002 +21.61	TEMPERATURE -0.02°C +21.61°C
DEPTH	DEPTH
DO_2	DO_2
pH	pH
REDOX	REDOX
TURBIDITY .00 100.0	TURBIDITY .00 % 100.0 %

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CONDUCTIVITY CALIBRATION

DATE 11-27-78
INSPECTOR R.H.
PROBE S/N 6271010
Lab standard #2

CONDUCTIVITY CALIBRATION STANDARD

Model 500CS

Probe value will be obtained when probe is calibrated

Conductivity Millimhos	Probe Value
0	0.000
10	10.05
20	19.98
30	30.13
40	40.20
50	50.23
60	60.18
70	70.27

NOTE: Probe value can be obtained from either 514-A C.S.T.D. Readout digital display or from Pin D on the Recorder outlet with a digital volt meter.

Make certain that the lead that is passed through the conductivity head is a very low resistance.

CSTD Calibration Cont.

Notes to CSTD DO pH Calibration

1. This value obtained by inserting a 50 ohm resistor through conductivity head using clip leads.

2. This value obtained by immersion of temp. sensor in ice water as close to 0°C as possible while continuously monitoring ice water with a calibrated thermometer.

3. This value obtained by immersion of temp. sensor in room temperature water while continuously monitoring temperature with a calibrated thermometer.

4. Steps #2 and #3 are done with stainless steel shield removed. Care must be taken not to damage sensor while shield is removed.

5. This value is obtained after depth calibration with dead weight tester.

6. Zero adjust is set with sensor enveloped in atmosphere of inert gas (helium; argon).
Gain adjust obtained in fully air saturated fresh water.

7. Temporary connection is made between circuit common and the shield wire of the pH electrode. (Or the shield wire of the redox electrode.)

513 PROBE ASSEMBLY RECORD

J.S. No: 6271 Date: 11-27-78

Customer Name: Corps of Engineers By: R.H.

Part Number	Description	Serial No.	Remarks
5138005/5136001	Pressure Case & Base Plate with mother board	6271010	Super Nickel 12 pin Sourin
5138001-1	Conductivity Sensor	150	short shallow T.C.
5138006-11	Temperature Sensor	707	S.S.
5138105	Temperature Sensor Platinum	—	—
5138006-2	Salinity Compensation Network	—	—
5138101	Pressure Transducer	—	—
5138020	pH Sensor	—	—
5138021	Dissolved Oxygen Sensor	—	—
5138002	Turbidity Sensor	6271204	Super Nickel I.E.D.
	~~Board~~ Velocity Sensor	5174	
5132010	Current Regulator	6361398	Bipolar
5132011	Voltage Regulator	6361352	
5132014	Conductivity	6080150	D-65
5132015	Salinity 0-20 PPT	—	—
5132015-1	Salinity 20-40 PPT	—	—
5132019	Salinity Auto Range	—	—
5132016	Temperature	6361277	
5132116	Temperature, Platinum Thermistor	—	—
5132017	Depth	—	—
5132013	Demodulator	6361219	
5132012	Amplifier	6361087	T.C
5132018	Chopper	6080274	LO Noise
5132126	Dissolved Oxygen	—	—
5132125	pH	—	—
5139300	Protective Cage	—	—
5138110	Schryway Carrying Case	—	—
5134011A	Turbidity	6361322	
	~~Solid~~ Velocity unit	8264/5174	
	Sub-Sea Board	6361540	1955
	Temp	6240011	

Large engineers

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CSTD CALIBRATION

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Vx ✓
Vy ✓

Probe S/N 6271011

Date & Initial 11-27-78 RH

	Test Point	Voltage or Scope Picture	DATA
1. Current Regulator	RED	+15 ± 4VDC	+13
	BLK	-15 ± 4VDC	-13
	WH	0.000 ± .002	+0.001
2. Voltage Regulator	RED	+8.00 ± .01VDC	+8.000
	BLK	-8.00 ± .01	-8.000
3. Chopper	YEL	Fig A 180° out of phase	✓
4. Amplifier	GR	Fig B	✓
	NOTE 1-GR	Fig C	✓
5. Demodulator	YEL	Fig D 180° out of phase	✓
	GREY	0.00 ± .01	-0.001
	NOTE 1-GREY	✱ -2.6 ± .2VDC	-2.562
6. Conductivity	BLUE	0.000 ± 0.002	0.000
	NOTE 1-BLUE	✱ +4.800 ± .10	+4.796
7. Salinity 0-20 ppt	BLUE	0.000 ± .002	N/A
8. Salinity 20-40 ppt	GR	See table 2.1 in manual	N/A
	BLUE	See table 2.1 in manual	N/A
9. Temperature	NOTE 2-BLUE	-.0022 Thermometer	-.0022
	NOTE 3-BLUE	+2.1825 Thermometer	+2.182

CSTD Calibration Cont.

	Test Point	Voltage or Scope Picture	DATA
10. Depth	NOTE 5-BLUE	Shunt Value_____	
11. Auto-Range	GREY	+2.005 ± .005	
	GREEN	+6.50 ± .75	N/A
	*GREY	+1.99 ± .01	
	*GREEN	-6.50 ± .75	
12. Dissolved Oxygen			
	NOTE 6-GREEN	0.00 ± .01	
	GREEN	See calibration sheet	N/A
13. pH	NOTE 7		
	pH 7 - YELLOW	.70 ± .01	
	pH - YELLOW	.1v/pH ± .01	N/A
	pH - YELLOW	.1v/pH ± .01	
14. Redox	NOTE 7-YELLOW	0.00 ± .005	
	Fe^{++} Fe^{+++} YELLOW	.439 ± .005	N/A
15. Turbidity	GREY	0.00 ± .01	.000
	GREY	1.00 ± .01	+1.000 in Distilled H2O

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513 PROBE
FINAL CHECK-OFF

SERIAL No. 6271011

INITIALS R.H.

DATE 11-27-7Y

READOUT	COMPUTED VALUES
CONDUCTIVITY .00 +51.32	CONDUCTIVITY 51.32 m.mho/cm @ 22.57 °C
SALINITY	SALINITY 35.64 PPT
TEMPERATURE -0.02 +22.57	TEMPERATURE -0.02 22.57 °C
DEPTH	DEPTH
DO_2	DO_2
pH	pH
REDOX	REDOX
TURBIDITY .0 +100.0	TURBIDITY .0 % 100 %

AD-A097 892 KINNETIC LABS INC SANTA CRUZ CA F/G 8/8
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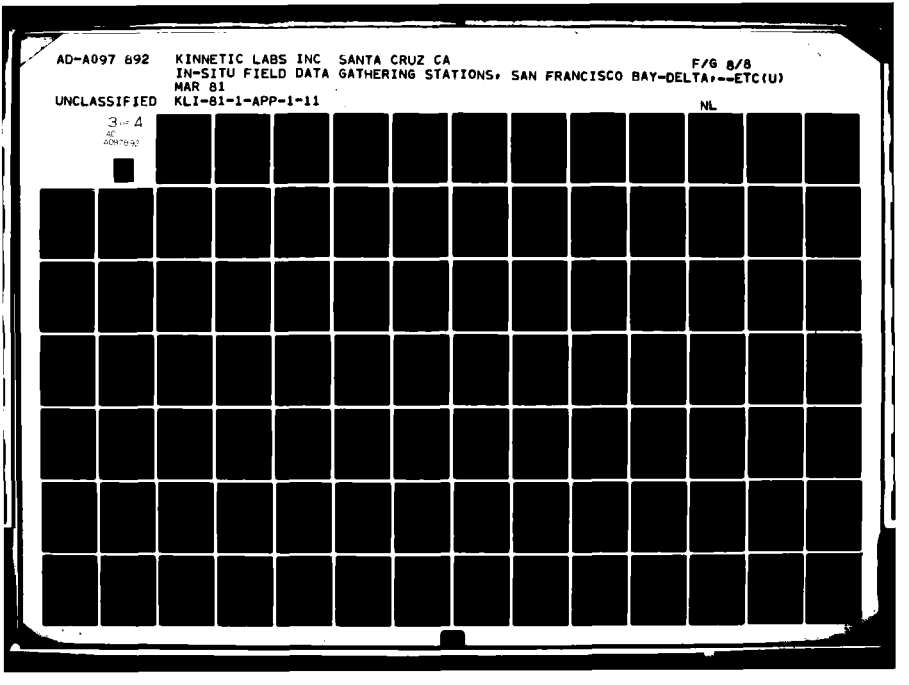

Inter Ocean

CONDUCTIVITY CALIBRATION

DATE 11-27-78

INSPECTOR [illegible]

PROBE S/N 6271 011

CONDUCTIVITY CALIBRATION STANDARD

Model 500CS # 6271

Probe value will be obtained when probe is calibrated

Conductivity Millimhos	Probe Value
0	0.00
10:	10.04
20	19.99
30	30.11
40	40.17
50	50.18
60	60.11
70	70.19

NOTE: Probe value can be obtained from either 514-A C.S.T.D. Readout digital display or from Pin D on the Recorder outlet with a digital volt meter.

Make certain that the lead that is passed through the conductivity head is a very low resistance.

CSTD Calibration Cont.

Notes to CSTD DO pH Calibration

1. This value obtained by inserting a 50 ohm resistor through conductivity head using clip leads.

2. This value obtained by immersion of temp. sensor in ice water as close to 0°C as possible while continuously monitoring ice water with a calibrated thermometer.

3. This value obtained by immersion of temp. sensor in room temperature water while continuously monitoring temperature with a calibrated thermometer.

4. Steps #2 and #3 are done with stainless steel shield removed. Care must be taken not to damage sensor while shield is removed.

5. This value is obtained after depth calibration with dead weight tester.

6. Zero adjust is set with sensor enveloped in atmosphere of inert gas (helium; argon).
Gain adjust obtained in fully air saturated fresh water.

7. Temporary connection is made between circuit common and the shield wire of the pH electrode. (Or the shield wire of the redox electrode.)

513 PROBE ASSEMBLY RECORD

Job No: 6271 Date: 11-27-78

Customer Name: Coastal Engineering By: R.H.

Part Number	Description	Serial No.	Remarks
5138005/5136001	Pressure Case & Base Plate with mother board	6271011	Cuper Nickel 12pin Sourin
5138001-1	Conductivity Sensor	142	Short Shallow T.C.
5138006-11	Temperature Sensor	698	S.S.
5138105	Temperature Sensor Platinum	—	—
5138006-2	Salinity Compensation Network	—	—
5138101	Pressure Transducer	—	—
5138020	pH Sensor	—	—
5138021	Dissolved Oxygen Sensor	—	—
5138002	Turbidity Sensor	6271 204	Cuper Nickel T.C.B.
	~~Sonic~~ Velocity Sensor	S/166	
5132010	Current Regulator	6361394	Bipolar
5132011	Voltage Regulator	6080 027	
5132014	Conductivity	6080157	0-65
5132015	Salinity 0-20 PPT	—	—
5132015-1	Salinity 20-40 PPT	—	—
5132019	Salinity Auto Range	—	—
5132016	Temperature	4997354	
5132116	Temperature, Platinum Thermistor	—	—
5132017	Depth	—	—
5132013	Demodulator	6080135	
5132012	Amplifier	6080 110	T.C.
5132018	Chopper	6080277	20 Nov
5132126	Dissolved Oxygen	—	—
5132125	pH	—	—
5139300	Protective Cage	—	—
5138110	Schryway Carrying Case	—	—
5134011A	Turbidity	6080 377	
	~~Sonic~~ Velocity Unit	8252/5166	
	Switch Board	6361 526	1955
	Compass	6420-008	

InterOcean

ID -1.69
Vx ✓
Vy ✓
Dir ✓

513

CSTD CALIBRATION

Probe S/N 6271 012

Date & Initial 11/29/78 AER

		Test Point	Voltage or Scope Picture	DATA
1.	Current Regulator	RED	+15 ± 4VDC	+13.04
		BLK	-15 ± 4VDC	-13.88
		WH	0.000 ± .002	.000
2.	Voltage Regulator	RED	+8.00 ± .01VDC	+8.000
		BLK	-8.00 ± .01	-8.000
3.	Chopper	YEL	Fig A 180° out of phase	OK
4.	Amplifier	GR	Fig B	OK
		NOTE 1-GR	Fig C	OK
5.	Demodulator	YEL	Fig D 180° out of phase	OK
		GREY	0.00 ± .01	.0000
		NOTE 1-GREY	* -2.6 ± .2VDC	-2.556
6.	Conductivity	BLUE	0.000 ± 0.002	.0000
		NOTE 1-BLUE	* +4.800 ± .10	+4.846
7.	Salinity 0-20 ppt	BLUE	0.000 ± .002	N/A
8.	Salinity 20-40 ppt	GR	See table 2.1 in manual	NA
		BLUE	See table 2.1 in manual	N/A
9.	Temperature	NOTE 2-BLUE	-.02 °C	Thermometer -.00
		NOTE 3-BLUE	+21.78 °C	Thermometer +21.7

InterOcean

CONDUCTIVITY CALIBRATION

DATE 12-7-78
INSPECTOR R.H.
PROBE S/N 627/012

CONDUCTIVITY CALIBRATION STANDARD
Model 500CS

Probe value will be obtained when probe is calibrated

Conductivity Millimhos	Probe Value
0	0.000
10	10.15
20	20.19
30	30.41
40	40.57
50	50.67
60	60.69
70	70.84

NOTE: Probe value can be obtained from either 514-A C.S.T.D. Readout digital display or from Pin D on the Recorder outlet with a digital volt meter.

Make certain that the lead that is passed through the conductivity head is a very low resistance.

CSTD Calibration Cont.

	Test Point	Voltage or Scope Picture	DATA
10. Depth	NOTE 5-BLUE	Shunt Value_____	NA
11. Auto-Range	GREY	+2.005 ± .005	
	GREEN	+6.50 ± .75	
	*GREY	+1.99 ± .01	
	*GREEN	-6.50 ± .75	
12. Dissolved Oxygen			
	NOTE 6-GREEN	0.00 ± .01	
	GREEN	See calibration sheet	
13. pH	NOTE 7		
	pH 7 - YELLOW	.70 ± .01	
	pH - YELLOW	.1v/pH ± .01	
	pH - YELLOW	.1v/pH ± .01	
14. Redox	NOTE 7-YELLOW	0.00 ± .005	
	Fe^{++} Fe^{+++} YELLOW	.439 ± .005	NA
15. Turbidity	GREY	0.00 ± .01	
	GREY	1.00 ± .01	

InterOcean

513 PROBE
FINAL CHECK-OFF

SERIAL No. _____

INITIALS AER

DATE _____

READOUT	COMPUTED VALUES
CONDUCTIVITY .00 +50.35	CONDUCTIVITY .00 mS/cm 50.35 mS/cm 21.78°C
SALINITY — NA	SALINITY .00 PPT 35.52 PPT
TEMPERATURE —.02 +21.78	TEMPERATURE —.02 °C 21.78°C
DEPTH NA	DEPTH NA
DO_2 NA	DO_2 NA
pH NA	pH NA
REDOX NA	REDOX NA
TURBIDITY	TURBIDITY .00 %. 100.0 %

CSTD Calibration Cont.

Notes to CSTD DO pH Calibration

1. This value obtained by inserting a 50 ohm resistor through conductivity head using clip leads.

2. This value obtained by immersion of temp. sensor in ice water as close to 0°C as possible while continuously monitoring ice water with a calibrated thermometer.

3. This value obtained by immersion of temp. sensor in room temperature water while continuously monitoring temperature with a calibrated thermometer.

4. Steps #2 and #3 are done with stainless steel shield removed. Care must be taken not to damage sensor while shield is removed.

5. This value is obtained after depth calibration with dead weight tester.

6. Zero adjust is set with sensor enveloped in atmosphere of inert gas (helium; argon).
Gain adjust obtained in fully air saturated fresh water.

7. Temporary connection is made between circuit common and the shield wire of the pH electrode. (Or the shield wire of the redox electrode.)

513 PROBE ASSEMBLY RECORD

Job No: 6271 Date: 11/27/78

Customer Name: ~~Corps of Engineers~~ By: RH

Part Number	Description	Serial No.	Remarks
5138005/5136001	Pressure Case & Base Plate with mother board	6271012	Copper Nickel Brass Screws Short Cable
5138001-1	Conductivity Sensor	153	
5138006-11	Temperature Sensor	656	SS
5138105	Temperature Sensor Platinum	NA	
5138006-2	Salinity Compensation Network	NA	
5138101	Pressure Transducer	NA	
5138020	pH Sensor	NA	
5138021	Dissolved Oxygen Sensor	NA	
5138002	Turbidity Sensor	6271208	Copper-Nickel LED
	~~Sound~~ Velocity Sensor	8256/5187	
5132010	Current Regulator		Bipolar
5132011	Voltage Regulator	6361368	
5132014	Conductivity	6361348	
5132015	Salinity 0-20 PPT	—	—
5132015-1	Salinity 20-40 PPT	—	—
5132019	Salinity Auto Range	—	—
5132016	Temperature	6361279	
5132116	Temperature, Platinum Thermistor	—	—
5132017	Depth	—	—
5132013	Demodulator	6361315	
5132012	Amplifier	6361084	T.C.
5132018	Chopper	6361041	LO Noise
5132126	Dissolved Oxygen	—	—
5132125	pH	—	—
5139300	Protective Cage	—	—
5138110	Schryway Carrying Case	—	—
5134011A	Turbidity	6080376	
	~~Sound~~ Velocity	5/187	

Compass 6420015

Switch Board 6361529

InterOcean

1955
~~513~~

Vx
Vy
Dir
-Id

CSTD CALIBRATION

Probe S/N 6271013

Date & Initial 11-20-78 R.H.

		Test Point	Voltage or Scope Picture	DATA
1.	Current Regulator	RED	+15 ± 4VDC	+13
		BLK	-15 ± 4VDC	-13
		WH	0.000 ± .002	0.000
2.	Voltage Regulator	RED	+8.00 ± .01VDC	+8.00
		BLK	-8.00 ± .01	-8.00
3.	Chopper	YEL	Fig A 180° out of phase	✓
4.	Amplifier	GR	Fig B	✓
		NOTE 1-GR	Fig C	✓
5.	Demodulator	YEL	Fig D 180° out of phase	✓
		GREY	0.00 ± .01	0.00
		NOTE 1-GREY	-2.6 ± .2VDC	-2.55
6.	Conductivity	BLUE	0.000 ± 0.002	0.000
		NOTE 1-BLUE	☆ +4.800 ± .10	+4.775
7.	Salinity 0-20 ppt	BLUE	0.000 ± .002	N/A
8.	Salinity 20-40 ppt	GR	See table 2.1 in manual	N/A
		BLUE	See table 2.1 in manual	
9.	Temperature	NOTE 2-BLUE	-0.02°C Thermometer 0	
		NOTF 3-BLUE	+22.58°C Thermometer 2.23	

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CSTD Calibration Cont.

	Test Point	Voltage or Scope Picture	DATA
10. Depth	NOTE 5-BLUE	Shunt Value____	N/A
11. Auto-Range	GREY	+2.005 ± .005	
	GREEN	+6.50 ± .75	N/A
	*GREY	+1.99 ± .01	
	*GREEN	-6.50 ± .75	
12. Dissolved Oxygen			
	NOTE 6-GREEN	0.00 ± .01	N/A
	GREEN	See calibration sheet	
13. pH	NOTE 7		
	pH 7 - YELLOW	.70 ± .01	N/A
	pH - YELLOW	.1v/pH ± .01	
	pH - YELLOW	.1v/pH ± .01	
14. Redox	NOTE 7-YELLOW	0.00 ± .005	
	Fe^{++} Fe^{+++} YELLOW	.439 ± .005	N/A
15. Turbidity	GREY	0.00 ± .01	.000
	GREY	1.00 ± .01	+1.000 in Distilled H_2O

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513 PROBE
FINAL CHECK-OFF

SERIAL No. 621013

INITIALS R.H.

DATE 11-20-78

READOUT	COMPUTED VALUES
CONDUCTIVITY 0.00 49.92	CONDUCTIVITY 0.00 mT/cm 49.92 at 22.38°C
SALINITY N/A	SALINITY N/A
TEMPERATURE 0.002 2.238	TEMPERATURE 0.02°C 22.38°C
DEPTH N/A	DEPTH N/A
DO_2 N/A	DO_2 N/A
pH N/A	pH N/A
REDOX N/A	REDOX N/A
TURBIDITY .00 +100.0	TURBIDITY 0.00 100.0 %

InterOcean

CONDUCTIVITY CALIBRATION

DATE 11-20-78
INSPECTOR R.H.
PROBE S/N 6271013
Lab Standard #2

CONDUCTIVITY CALIBRATION STANDARD
Model 500CS

Probe value will be obtained when probe is calibrated

Conductivity Millimhos	Probe Value
0	0.00
10	10.02
20	19.92
30	30.04
40	40.06
50	50.06
60	59.97
70	70.04

NOTE: Probe value can be obtained from either 514-A C.S.T.D. Readout digital display or from Pin D on the Recorder outlet with a digital volt meter.

Make certain that the lead that is passed through the conductivity head is a very low resistance.

CSTD Calibration Cont.

Notes to CSTD DO pH Calibration

1. This value obtained by inserting a 50 ohm resistor through conductivity head using clip leads.

2. This value obtained by immersion of temp. sensor in ice water as close to 0°C as possible while continuously monitoring ice water with a calibrated thermometer.

3. This value obtained by immersion of temp. sensor in room temperature water while continuously monitoring temperature with a calibrated thermometer.

4. Steps #2 and #3 are done with stainless steel shield removed. Care must be taken not to damage sensor while shield is removed.

5. This value is obtained after depth calibration with dead weight tester.

6. Zero adjust is set with sensor enveloped in atmosphere of inert gas (helium; argon).
Gain adjust obtained in fully air saturated fresh water.

7. Temporary connection is made between circuit common and the shield wire of the pH electrode. (Or the shield wire of the redox electrode.)

513 PROBE ASSEMBLY RECORD

Job No: 6271 Date: 11-20-78

Customer Name: Corps of Engineers By: R.H.

Part Number	Description	Serial No.	Remarks
5138005/5136001	Pressure Case & Base Plate with mother board	6271013	Cupper Nickel 12 PIN Souri[illegible]
5138001-1	Conductivity Sensor	145	[illegible] T.C.
5138006-11	Temperature Sensor	696	S.S.
5138105	Temperature Sensor Platinum	—	—
5138006-2	Salinity Compensation Network	—	—
5138101	Pressure Transducer	—	—
5138020	pH Sensor	—	—
5138021	Dissolved Oxygen Sensor	—	—
5138002	Turbidity Sensor		Cupper Nickel LED
	~~Sensor~~ Velocity Sensor		
5132010	Current Regulator	6361366	Bi Polar
5132011	Voltage Regulator	6080026	
5132014	Conductivity	6361258	0-65
5132015	Salinity 0-20 PPT	—	—
5132015-1	Salinity 20-40 PPT	—	—
5132019	Salinity Auto Range	—	—
5132016	Temperature	6080233	
5132116	Temperature, Platinum Thermistor		—
5132017	Depth	—	—
5132013	Demodulator	4997271	
5132012	Amplifier	6080108	T.C.
5132018	Chopper	6361037	Lo Noise
5132126	Dissolved Oxygen	—	—
5132125	pH	—	—
5139300	Protective Cage	—	—
5138110	Schryway Carrying Case	—	—
5134011A	Turbidity		—
	~~Sensor~~ Velocity Unit		
	Switch Board	6361533	1955
	Compass		

InterOcean

195
~~515~~

CSTD CALIBRATION

Vx ✓
Vy ✓
DR ✓
-Id -4

Probe S/N 6271 014

Date & Initial 11-21-78 R.H.

		Test Point	Voltage or Scope Picture	DATA
1.	Current Regulator	RED	+15 ± 4VDC	+13
		BLK	-15 ± 4VDC	-13
		WH	0.000 ± .002	0.000
2.	Voltage Regulator	RED	+8.00 ± .01VDC	+8.00
		BLK	-8.00 ± .01	-8.00
3.	Chopper	YEL	Fig A 180° out of phase	✓
4.	Amplifier	GR	Fig B	✓
		NOTE 1-GR	Fig C	✓
5.	Demodulator	YEL	Fig D 180° out of phase	✓
		GREY	0.00 ± .01	0.00
		NOTE 1-GREY	-2.6 ± .2VDC	-2.578
6.	Conductivity	BLUE	0.000 ± 0.002	0.000
		NOTE 1-BLUE	☆ +4.800 ± .10	+4.795
7.	Salinity 0-20 ppt	BLUE	0.000 ± .002	N/A
8.	Salinity 20-40 ppt	GR	See table 2.1 in manual	N/A
		BLUE	See table 2.1 in manual	
9.	Temperature	NOTE 2-BLUE	-0.02°C Thermometer	0...
		NOTE 3-BLUE	+21.94°C Thermom...	±2.1°...

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CSTD Calibration Cont.

	Test Point	Voltage or Scope Picture	DATA
10. Depth	NOTE 5-BLUE	Shunt Value	4.346
11. Auto-Range	GREY	+2.005 ± .005	
	GREEN	+6.50 ± .75	N/A
	*GREY	+1.99 ± .01	
	*GREEN	-6.50 ± .75	
12. Dissolved Oxygen			
	NOTE 6-GREEN	0.00 ± .01	
	GREEN	See calibration sheet	N/A
13. pH	NOTE 7		
	pH 7 - YELLOW	.70 ± .01	
	pH - YELLOW	.1v/pH ± .01	N/A
	pH - YELLOW	.1v/pH ± .01	
14. Redox	NOTE 7-YELLOW	0.00 ± .005	
	Fe^{++} Fe^{+++} YELLOW	.439 ± .005	N/A
15. Turbidity	GREY	0.00 ± .01	.000
	GREY	1.00 ± .01	+1.000 m Distilled H_2O

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513 PROBE
FINAL CHECK-OFF

SERIAL No. 6271 014

INITIALS R H.

DATE 11-21-78

READOUT	COMPUTED VALUES
CONDUCTIVITY 0.00 49.58	CONDUCTIVITY 0.00 mr/cm 49.58 mN/cm at 21.94° C
SALINITY	SALINITY
TEMPERATURE - 0.002 + 21.94°C	TEMPERATURE - 0.02°C + 21.94 °C
DEPTH 0.00 5.010 FT	DEPTH 0.00 FT 5.010 FT
DO_2	DO_2
pH	pH
REDOX	REDOX
TURBIDITY .00 +100.0	TURBIDITY .00 +100%

DEPTH SENSOR CALIBRATION

InterOcean

DATE: 11-22-76
INSPECTOR: R.H.
MODEL NO: 4181-0030
SERIAL NO: E-916
DEPTH BOARD S/N: _____
PROBE S/N: 6271014

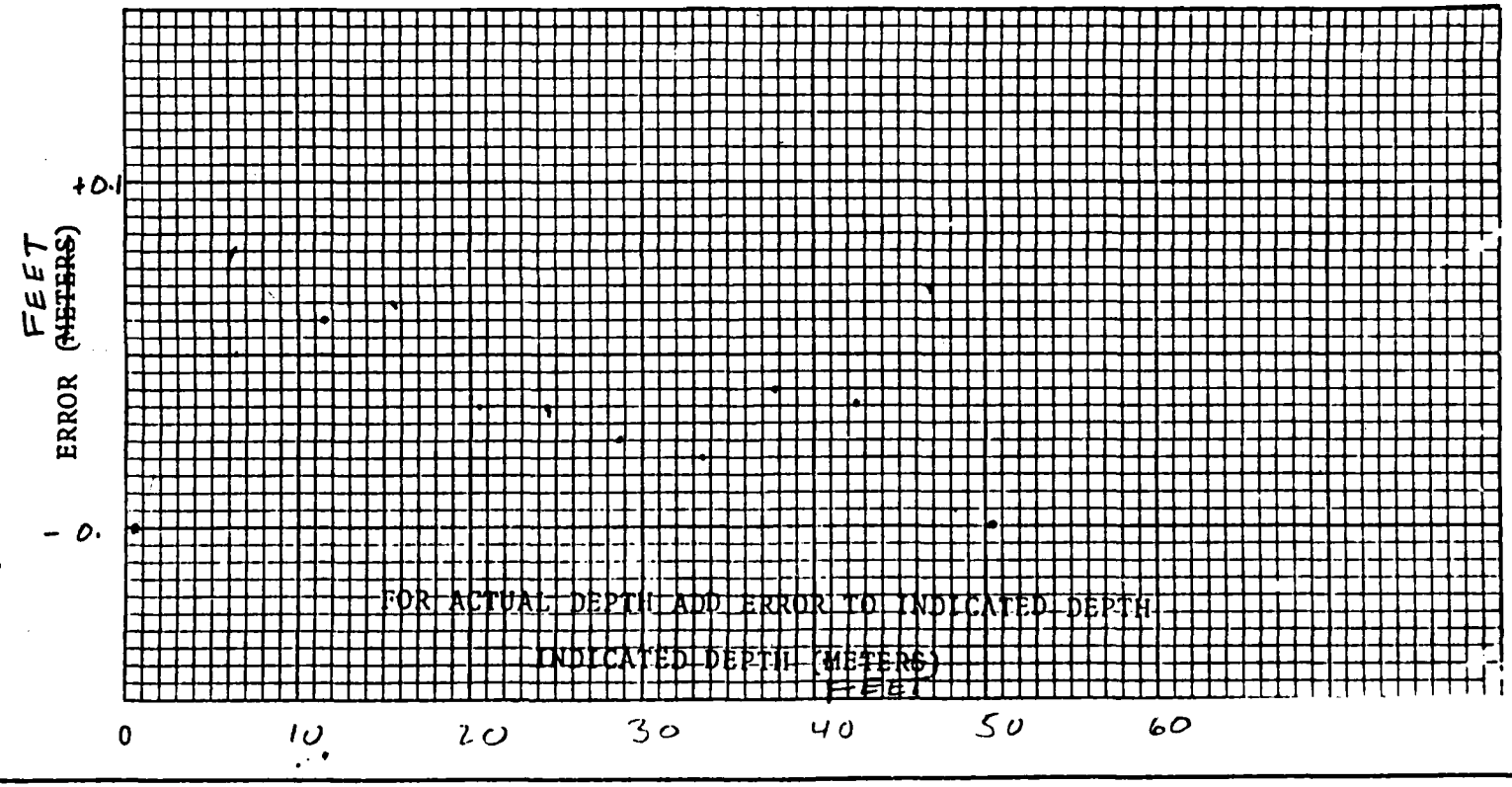
For electrical calibration, use shunt resistor value 30.1KOHMS for Depth Indicaiton of 43.46 ~~Meters~~ FEET.

0 → 5V
0 → 50 FT

TYPE OF CALIBRATION

___ Fresh Water 62.4lb/cuFt. Conversion Constant 0.7033 M/PSI

✓ Salt Water 64.0 lb/cuFt. Conversion Constant 0.6858 M/PSI 3.28084 FT/M



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CONDUCTIVITY CALIBRATION

DATE 11-22-78

INSPECTOR R.H.

PROBE S/N 6271014

LAB STANDARD 2'2

CONDUCTIVITY CALIBRATION STANDARD
Model 500CS

Probe value will be obtained when probe is calibrated

Conductivity Millimhos	Probe Value
0	0.000
10	10.03
20	19.94
30	30.07
40	40.11
50	50.12
60	60.016
70	70.14

NOTE: Probe value can be obtained from either 514-A C.S.T.D. Readout digital display or from Pin D on the Recorder outlet with a digital volt meter.

Make certain that the lead that is passed through the conductivity head is a very low resistance.

CSTD Calibration Cont.

Notes to CSTD DO pH Calibration

1. This value obtained by inserting a 50 ohm resistor through conductivity head using clip leads.

2. This value obtained by immersion of temp. sensor in ice water as close to 0°C as possible while continuously monitoring ice water with a calibrated thermometer.

3. This value obtained by immersion of temp. sensor in room temperature water while continuously monitoring temperature with a calibrated thermometer.

4. Steps #2 and #3 are done with stainless steel shield removed. Care must be taken not to damage sensor while shield is removed.

5. This value is obtained after depth calibration with dead weight tester.

6. Zero adjust is set with sensor enveloped in atmosphere of inert gas (helium; argon).
Gain adjust obtained in fully air saturated fresh water.

7. Temporary connection is made between circuit common and the shield wire of the pH electrode. (Or the shield wire of the redox electrode.)

513 PROBE ASSEMBLY RECORD

Job No: 6271 Date: 11-22-78

Customer Name: Corps of Engineers By: R.H.

Part Number	Description	Serial No.	Remarks
5138005/5136001	Pressure Case & Base Plate with mother board	6271 014	Cupro Nickel 12pin Souriau
5138001-1	Conductivity Sensor	140	BLUE/WHITE AND BLUE REVERSED IN LEAD! SHORT T.C
5138006-11	Temperature Sensor	705	SS.
5138105	Temperature Sensor Platinum	—	—
5138006-2	Salinity Compensation Network	—	—
5138101	Pressure Transducer	E-916	4181-0030 30PSI
5138020	pH Sensor	—	—
5138021	Dissolved Oxygen Sensor	—	—
5138002	Turbidity Sensor	6271 215	CUPRO NICKEL L.E.D.
	~~Sound~~ Velocity Sensor	5/168	
5132010	Current Regulator	1.36/374	Bi Polar
5132011	Voltage Regulator	6080618	
5132014	Conductivity	6361.267	0-65
5132015	Salinity 0-20 PPT	—	—
5132015-1	Salinity 20-40 PPT	—	—
5132019	Salinity Auto Range	—	—
5132016	Temperature	6080232	
5132116	Temperature, Platinum Thermistor	—	—
5132017	Depth	6361 001	0—5V
5132013	Demodulator	6080129	
5132012	Amplifier	6080107	T.C.
5132018	Chopper	6361 039	LO NOISE
5132126	Dissolved Oxygen	—	—
5132125	pH	—	—
5139300	Protective Cage	—	—
5138110	Schryway Carrying Case	—	—
5134011A	Turbidity	6080382	
	~~Sound~~ Velocity Unit	6254 / 5168	
	SWITCH BOARD	6361354	1955
	Compass	6420 014	

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Die ✓
ID ± 1.1
V_x ✓
V_y ✓

513
CSTD CALIBRATION

Probe S/N 6271015

Date & Initial AER 12/01/78

		Test Point	Voltage or Scope Picture	DATA
1.	Current Regulator	RED	+15 ± 4VDC	+15
		BLK	-15 ± 4VDC	-15
		WH	0.000 ± .002	0.000
2.	Voltage Regulator	RED	+8.00 ± .01VDC	+8.000
		BLK	-8.00 ± .01	-8.000
3.	Chopper	YEL	Fig A 180° out of phase	✓
4.	Amplifier	GR	Fig B	
		NOTE 1-GR	Fig C	
5.	Demodulator	YEL	Fig D 180° out of phase	✓
		GREY	0.00 ± .01	.000
		NOTE 1-GREY	☆ -2.6 ± .2VDC	-2.570
6.	Conductivity	BLUE	0.000 ± 0.002	.000
		NOTE 1-BLUE	☆ +4.800 ± .10	+4.798
7.	Salinity 0-20 ppt	BLUE	0.000 ± .002	
8.	Salinity 20-40 ppt	GR	See table 2.1 in manual	N/A
		BLUE	See table 2.1 in manual	
9.	Temperature	NOTE 2-BLUE	-0.02°C Thermometer	±0.002
		NOTE 3-BLUE	23.62°C Thermometer	±0.2%

CSTD Calibration Cont.

	Test Point	Voltage or Scope Picture	DATA
10. Depth	NOTE 5-BLUE	Shunt Value	4.46
11. Auto-Range	GREY	+2.005 ± .005	N/A
	GREEN	+6.50 ± .75	
	*GREY	+1.99 ± .01	
	*GREEN	-6.50 ± .75	
12. Dissolved Oxygen			
	NOTE 6-GREEN	0.00 ± .01	
	GREEN	See calibration sheet	
13. pH	NOTE 7		
	pH 7 - YELLOW	.70 ± .01	
	pH - YELLOW	.1v/pH ± .01	
	pH - YELLOW	.1v/pH ± .01	
14. Redox	NOTE 7-YELLOW	0.00 ± .005	
	Fe^{++} Fe^{+++} YELLOW	.439 ± .005	N/A
15. Turbidity	GREY	0.00 ± .01	.000
	GREY	1.00 ± .01	+1.000 in Distilled H2O

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513 PROBE
FINAL CHECK-OFF

SERIAL No. 627/015

INITIALS AER

DATE 12/01/78

READOUT	COMPUTED VALUES
CONDUCTIVITY .00 +51.58	CONDUCTIVITY .00 m℧/cm 51.58 m℧/cm at 22.67 °C
SALINITY	SALINITY 35.76 ppt
TEMPERATURE 0.02 +22.67	TEMPERATURE −0.02°C 22.67 °C
DEPTH 0.000 + 5.037	DEPTH 0.000 FT + 50.43 FT
DO_2	DO_2
pH	pH
REDOX	REDOX
TURBIDITY .0 +100.0	TURBIDITY 0 % 100 %

InterOcean

DEPTH SENSOR CALIBRATION

DATE: 11-29-76
INSPECTOR: R.H.
MODEL NO: 11171-0030
SERIAL NO: E-385
DEPTH BOARD S/N: 6361002
PROBE S/N: 6271015

For electrical calibration, use shunt resistor FEET value 30.1KOHMS for Depth Indicaiton of 44.6 Meters.

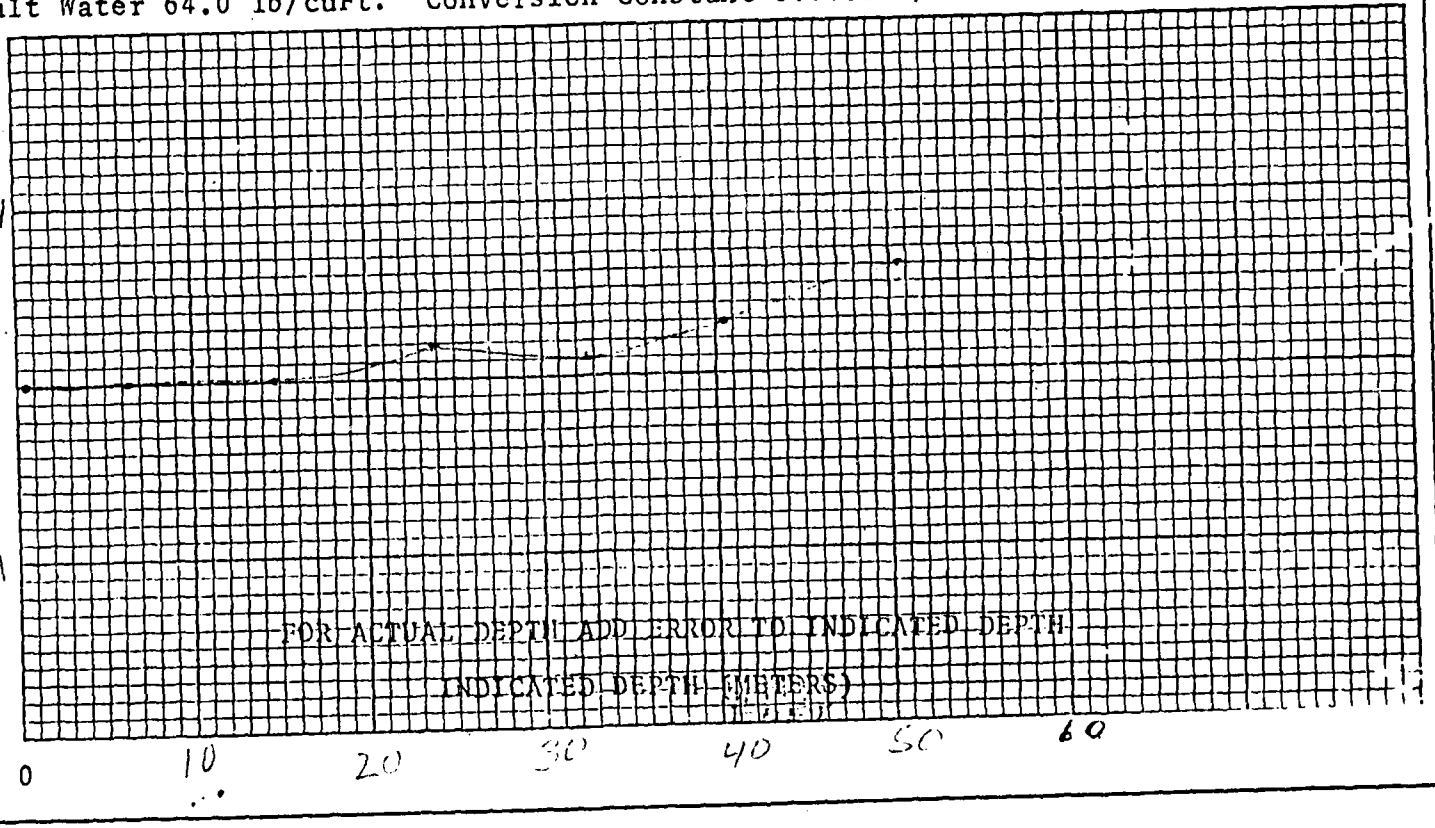
0->5 V
0 -> 50 FT

22.500 ohms/FT

TYPE OF CALIBRATION

___ Fresh Water 62.41b/cuFt. Conversion Constant 0.7033 M/PSI

✓ Salt Water 64.0 1b/cuFt. Conversion Constant 0.6858 M/PSI



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CONDUCTIVITY CALIBRATION

DATE 12/01/78
INSPECTOR AER
PROBE S/N 6271015

CONDUCTIVITY CALIBRATION STANDARD
Model 500CS #6271

Probe value will be obtained when probe is calibrated

Conductivity Millimhos	Probe Value
0	.00
10	10.05
20	20.00
30	30.12
40	40.19
50	50.21
60	60.15
70	70.24

NOTE: Probe value can be obtained from either 514-A C.S.T.D. Readout digital display or from Pin D on the Recorder outlet with a digital volt meter.

Make certain that the lead that is passed through the conductivity head is a very low resistance.

CSTD Calibration Cont.

Notes to CSTD DO pH Calibration

1. This value obtained by inserting a 50 ohm resistor through conductivity head using clip leads.
2. This value obtained by immersion of temp. sensor in ice water as close to 0°C as possible while continuously monitoring ice water with a calibrated thermometer.
3. This value obtained by immersion of temp. sensor in room temperature water while continuously monitoring temperature with a calibrated thermometer.
4. Steps #2 and #3 are done with stainless steel shield removed. Care must be taken not to damage sensor while shield is removed.
5. This value is obtained after depth calibration with dead weight tester.
6. Zero adjust is set with sensor enveloped in atmosphere of inert gas (helium; argon).
   Gain adjust obtained in fully air saturated fresh water.
7. Temporary connection is made between circuit common and the shield wire of the pH electrode. (Or the shield wire of the redox electrode.)

513 PROBE ASSEMBLY RECORD

Job No: 6271 Date: 11-29-78

Customer Name: Camp & Scripps By: R. H.

Part Number	Description	Serial No.	Remarks
5138005/5136001	Pressure Case & Base Plate with mother board	6271015	Cupernickel 12 pin Souriau
5138001-1	Conductivity Sensor	143	Short Shallow T.C.
5138006-11	Temperature Sensor	704	S.S.
5138105	Temperature Sensor Platinum	—	—
5138006-2	Salinity Compensation Network	—	—
5138101	Pressure Transducer	E-385	4181-0030 30PSI
5138020	pH Sensor	—	—
5138021	Dissolved Oxygen Sensor	—	—
5138002	Turbidity Sensor	6271211	Cupernickel L.E.D.
	~~Sound~~ Velocity Sensor	5171	—
5132010	Current Regulator	6361363	Bipolar
5132011	Voltage Regulator	6080002	
5132014	Conductivity	6080152	0-65
5132015	Salinity 0-20 PPT	—	—
5132015-1	Salinity 20-40 PPT	—	—
5132019	Salinity Auto Range	—	—
5132016	Temperature	6361278	
5132116	Temperature, Platinum Thermistor	—	—
5132017	Depth	6361002	0-5V
5132013	Demodulator	6361221	
5132012	Amplifier	6361077	T.C.
5132018	Chopper	6361036	LONoise
5132126	Dissolved Oxygen	—	—
5132125	pH	—	—
5139300	Protective Cage	—	—
5138110	Schrywa[illegible] Carrying Case	—	—
5134011A	Turbidity	6080383	
	~~Sound~~ Velocity Unit	8261/5171	—
	Switch board	6361536	195S
	Compass	6420-009	

InterOcean

Dir ✓

I.D. — +1.1
V_x ✓
V_y ✓

~~515~~ 195

CSTD CALIBRATION

Probe S/N 6271015

Date & Initial 10/15/79 DBS

		Test Point	Voltage or Scope Picture	DATA
1.	Current Regulator	RED	+15 ± 4VDC	+12.5
		BLK	-15 ± 4VDC	-12.5
		WH	0.000 ± .002	-.001
2.	Voltage Regulator	RED	+8.00 ± .01VDC	+8.000
		BLK	-8.00 ± .01	-8.000
3.	Chopper	YEL	Fig A 180° out of phase	✓
4.	Amplifier	GR	Fig B	✓
		NOTE 1-GR	Fig C	✓
5.	Demodulator	YEL	Fig D 180° out of phase	✓
		GREY	0.00 ± .01	.000
		NOTE 1-GREY	-2.6 ± .2VDC	-2.561
6.	Conductivity	BLUE	0.000 ± 0.002	.000
		NOTE 1-BLUE	+4.800 ± .10	4.7944
7.	Salinity 0-20 ppt	BLUE	0.000 ± .002	N/A
8.	Salinity 20-40 ppt	GR	See table 2.1 in manual	N/A
		BLUE	See table 2.1 in manual	N/A
9.	Temperature	NOTE 2-BLUE	0.000 Thermometer	0.000 °C
		NOTE 3-BLUE	22267 Thermistor	22.267°

CSTD Calibration Cont.

	Test Point	Voltage or Scope Picture	DATE
10. Depth	NOTE 5-BLUE	Shunt Value 4.000	
11. Auto-Range	GREY	+2.005 ± .005	
	GREEN	+6.50 ± .75	
	*GREY	+1.99 ± .01	
	*GREEN	-6.50 ± .75	
12. Dissolved Oxygen			
	NOTE 6-GREEN	0.00 ± .01	
	GREEN	See calibration sheet	
13. pH	NOTE 7		
	pH 7 - YELLOW	.70 ± .01	
	pH - YELLOW	.1v/pH ± .01	
	pH - YELLOW	.1v/pH ± .01	
14. Redox	NOTE 7-YELLOW	0.00 ± .005	
Fe^{++} Fe^{+++}	YELLOW	.439 ± .005	
15. Turbidity	GREY	0.00 ± .01	
	GREY	1.00 ± .01	

InterOcean

513 PROBE

FINAL CHECK-OFF

SERIAL No. C271015

INITIALS DSS

DATE 10/15/79

READOUT Volts	COMPUTED VALUES
CONDUCTIVITY 0.000 4.966	CONDUCTIVITY 0.000 mmho 49.66 mmho
SALINITY	SALINITY 34.310
TEMPERATURE 0.000 2.2606	TEMPERATURE 0.000 °C 22.606 °C
DEPTH 0 +4.410	DEPTH 0 Meters 4460 Meters
DO_2	DO_2
pH	pH
REDOX	REDOX
TURBIDITY +1.000	TURBIDITY 100 %

DEPTH SENSOR CALIBRATION

InterOcean

DATE: 10/11/79
INSPECTOR: AFT
MODEL NO: 418I-C038
SERIAL NO: E-385
DEPTH BOARD S/N: [illegible]
PROBE S/N: [illegible]

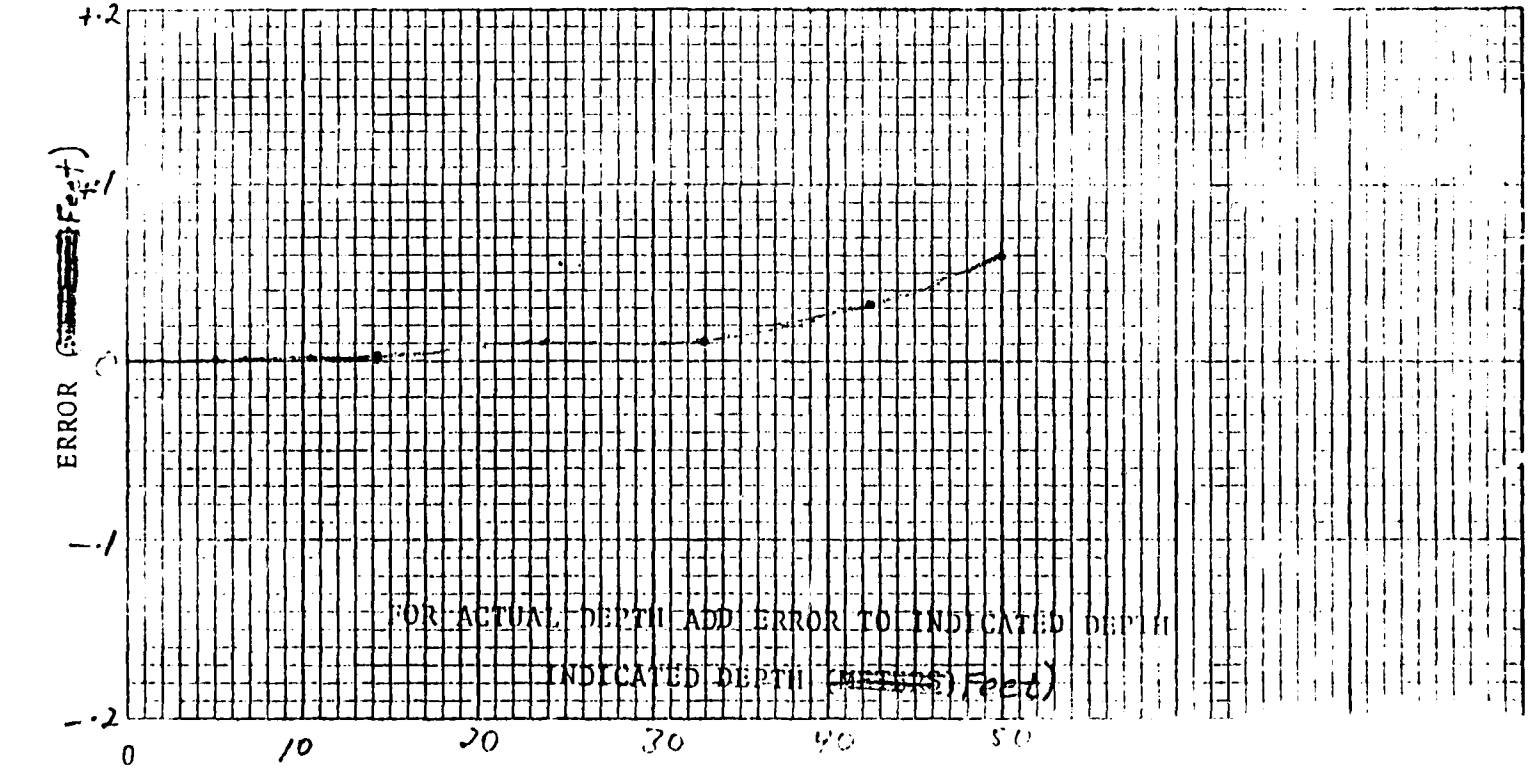
For electrical calibration, use shunt resistor value 50.1KOHMS for Depth Indicaiton of 44.0 Meters. Feet

TYPE OF CALIBRATION

0 → 5V
0 → 50FT.

____ Fresh Water 62.41b/cuFt. Conversion Constant 0.7033 M/PSI

____ Salt Water 64.0 1b/cuFt. Conversion Constant 0.6858 M/PSI



InterOcean systems, inc. / 3540 aero ct., san diego, ca 92123 / 714-565-8401 / telex 69-5082

InterOcean

CONDUCTIVITY CALIBRATION

DATE 12/11/79
INSPECTOR JRT
PROBE S/N. 122015

CONDUCTIVITY CALIBRATION STANDARD
Model 500CS Lab Standard #2

Probe value will be obtained when probe is calibrated

Conductivity Millimhos	Probe Value
0	.001
10	10.086
20	20.048
30	30.200
40	40.272
50	50.324
60	60.277
70	70.402

NOTE: Probe value can be obtained from either 514-A C.S.T.D. Readout digital display or from Pin D on the Recorder outlet with a digital volt meter.

Make certain that the lead that is passed through the conductivity head is a very low resistance.

CSTD Calibration Cont.

Notes to CSTD DO pH Calibration

1. This value obtained by inserting a 50 ohm resistor through conductivity head using clip leads.

2. This value obtained by immersion of temp. sensor in ice water as close to 0°C as possible while continuously monitoring ice water with a calibrated thermometer.

3. This value obtained by immersion of temp. sensor in room temperature water while continuously monitoring temperature with a calibrated thermometer.

4. Steps #2 and #3 are done with stainless steel shield removed. Care must be taken not to damage sensor while shield is removed.

5. This value is obtained after depth calibration with dead weight tester.

6. Zero adjust is set with sensor enveloped in atmosphere of inert gas (helium; argon).
Gain adjust obtained in fully air saturated fresh water.

7. Temporary connection is made between circuit common and the shield wire of the pH electrode. (Or the shield wire of the redox electrode.)

170 ~~513~~ PROBE ASSEMBLY RECORD

Job No: 1-6271 Date: 10/11/79

Customer Name: Fisco Coast Engr. By: dct

Part Number	Description	Serial No.	Remarks
5138005/5136001	Pressure Case & Base Plate with mother board	6271015	BRASS
5138001-1	Conductivity Sensor	143	EDO'11
5138006-11	Temperature Sensor	655	
5138105	Temperature Sensor Platinum	—	
5138006-2	Salinity Compensation Network	—	
5138101	Pressure Transducer	385	0-30 PSI
5138020	pH Sensor	—	
5138021	Dissolved Oxygen Sensor	—	
5138002	Turbidity Sensor	NO S/N	
	Sound Velocity Sensor	—	
5132010	Current Regulator	6361363	BLOCK
5132011	Voltage Regulator	6080021	
5132014	Conductivity		
5132015	~~Salinity 0-20~~ SWITCH BOARD PPT	6361505	
5132015-1	Salinity 20-40 PPT	—	
5132019	Salinity Auto Range	—	
5132016	Temperature	6361278	
5132116	Temperature, Platinum Thermistor	—	
5132017	Depth	6361002	
5132013	Demodulator	6361221	
5132012	Amplifier	6361077	TC
5132018	Chopper	6361036	LO NOISE
5132126	Dissolved Oxygen	—	
5132125	pH	—	
5139300	Protective Case	—	
138110	Sonde Carrying Case	—	
5138011	Turbidity	6080323	
	Sound Velocity	—	

InterOcean

Vx None
Vy None
Id ± 1.3
Dir None

513
CSTD CALIBRATION

Probe S/N 6271016

Date & Initial 11-30-78 R.H.

		Test Point	Voltage or Scope Picture	DATA
1.	Current Regulator	RED	+15 ± 4VDC	+13
		BLK	-15 ± 4VDC	-13
		WH	0.000 ± .002	0.0000
2.	Voltage Regulator	RED	+8.00 ± .01VDC	+8.00
		BLK	-8.00 ± .01	-8.00
3.	Chopper	YEL	Fig A 180° out of phase	✓
4.	Amplifier	GR	Fig B	—
		NOTE 1-GR	Fig C	✓
5.	Demodulator	YEL	Fig D 180° out of phase	✓
		GREY	0.00 ± .01	.000
		NOTE 1-GREY	-2.6 ± .2VDC	-2.603
6.	Conductivity	BLUE	0.000 ± 0.002	0.000
		NOTE 1-BLUE	+4.800 ± .10	+4.798
7.	Salinity 0 20 ppt	BLUE	0.000 ± .002	
8.	Salinity 20-40 ppt	GR	See table 2.1 in manual	N/A
		BLUE	See table 2.1 in manual	N/A
9.	Temperature	NOTE 2 BLUE	[illegible] Thermometer [illegible]	
		NOTE 3 BLUE	22.?? °C Thermometer [illegible]	

InterOcean

CSTD Calibration Cont.

	Test Point	Voltage or Scope Picture	DATA
10. Depth	NOTE 5-BLUE	Shunt Value	N/A
11. Auto-Range	GREY	+2.005 ± .005	
	GREEN	+6.50 ± .75	
	*GREY	+1.99 ± .01	
	*GREEN	-6.50 ± .75	
12. Dissolved Oxygen			
	NOTE 6-GREEN	0.00 ± .01	
	GREEN	See calibration sheet	
13. pH	NOTE 7		
	pH 7 - YELLOW	.70 ± .01	
	pH - YELLOW	.1v/pH ± .01	
	pH - YELLOW	.1v/pH ± .01	
14. Redox	NOTE 7-YELLOW	0.00 ± .005	
	Fe^{++} Fe^{+++} YELLOW	.439 ± .005	N/A
15. Turbidity	GREY	0.00 ± .01	.000
	GREY	1.00 ± .01	+/.000 in Distilled H2O

InterOcean

513 PROBE
FINAL CHECK-OFF

SERIAL No. 6271 016

INITIALS AER

DATE 12/01/78

READOUT	COMPUTED VALUES
CONDUCTIVITY .00 +51.29	CONDUCTIVITY .00 mmho/cm 51.29 mmho/cm at 22.39 °C
SALINITY —	SALINITY 35.75 ppt
TEMPERATURE — 0.002 +22.39	TEMPERATURE — 002 °C 22.39 °C
DEPTH —	DEPTH —
DO_2 —	DO_2 —
pH —	pH —
REDOX —	REDOX —
TURBIDITY 0 +100.0	TURBIDITY 0 % 100 %

InterOcean

CONDUCTIVITY CALIBRATION

DATE 12/21/73
INSPECTOR AER
PROBE S/N 6271 016

CONDUCTIVITY CALIBRATION STANDARD
Model 500CS # 6271

Probe value will be obtained when probe is calibrated

Conductivity Millimhos	Probe Value
0	.00
10:	10.05
20	20.00
30	30.12
40	40.18
50	50.20
60	60.14
70	70.21

NOTE: Probe value can be obtained from either 514-A C.S.T.D. Readout digital display or from Pin D on the Recorder outlet with a digital volt meter.

Make certain that the lead that is passed through the conductivity head is a very low resistance.

CSTD Calibration Cont.

Notes to CSTD DO pH Calibration

1. This value obtained by inserting a 50 ohm resistor through conductivity head using clip leads.

2. This value obtained by immersion of temp. sensor in ice water as close to 0°C as possible while continuously monitoring ice water with a calibrated thermometer.

3. This value obtained by immersion of temp. sensor in room temperature water while continuously monitoring temperature with a calibrated thermometer.

4. Steps #2 and #3 are done with stainless steel shield removed. Care must be taken not to damage sensor while shield is removed.

5. This value is obtained after depth calibration with dead weight tester.

6. Zero adjust is set with sensor enveloped in atmosphere of inert gas (helium; argon).
Gain adjust obtained in fully air saturated fresh water.

7. Temporary connection is made between circuit common and the shield wire of the pH electrode. (Or the shield wire of the redox electrode.)

513 PROBE ASSEMBLY RECORD

Job No: 6271 Date: 11-30-77

Customer Name: Corps of Engineers By: R. H.

Part Number	Description	Serial No.	Remarks
5136005/5136001	Pressure Case & Base Plate with mother board	6271016	Cupronickel 12 pin Sonin
5138001-1	Conductivity Sensor	152	Short Shallow T.C.
5138006-11	Temperature Sensor	716	S.S.
5138105	Temperature Sensor Platinum	—	—
5138006-2	Salinity Compensation Network	—	—
5138101	Pressure Transducer	—	—
5138020	pH Sensor	—	—
5138021	Dissolved Oxygen Sensor	—	—
5138002	Turbidity Sensor	6271 201	Cupronickel L.E.D.
	Sound Velocity Sensor	none	
5132010	Current Regulator	6361396	Bipolar
5132011	Voltage Regulator	60RD024	
5132014	Conductivity	6080151	0-65
5132015	Salinity 0-20 PPT	—	—
5132015-1	Salinity 20-40 PPT	—	—
5132019	Salinity Auto Range	—	—
5132016	Temperature	6080239	
5132116	Temperature, Platinum Thermistor	—	—
5132017	Depth	—	—
5132013	Demodulator	6361212	
5132012	Amplifier	6361088	T.C.
5132018	Chopper	6361033	Lo Noise
5132126	Dissolved Oxygen	—	—
5132125	pH	—	—
5139300	Protective Cage	—	—
5138110	Schryway Carrying Case	—	—
5134011A	Turbidity	6080386	
	~~Sound~~ Velocity Unit	none	
	Switch Board	6361542	1955

No Compass

No accelerometer

InterOcean

Across the Sea

513

CSTD CALIBRATION

Probe S/N 627/017

Date & Initial 4-27-18 RH

		Test Point	Voltage or Scope Picture	DATA
1.	Current Regulator	RED	+15 ± 4VDC	+13
		BLK	-15 ± 4VDC	-13
		WH	0.000 ± .002	+0.0009
2.	Voltage Regulator	RED	+8.00 ± .01VDC	+8.000
		BLK	-8.00 ± .01	-8.000
3.	Chopper	YEL	Fig A 180° out of phase	✓
4.	Amplifier	GR	Fig B	✓
		NOTE 1-GR	Fig C	✓
5.	Demodulator	YEL	Fig D 180° out of phase	✓
		GREY	0.00 ± .01	+0.000
		NOTE 1-GREY	-2.6 ± .2VDC	-2.55
6.	Conductivity	BLUE	0.000 ± 0.002	-0.000
		NOTE 1-BLUE	+4.800 ± .10	+4.794
7.	Salinity 0-20 ppt	BLUE	0.000 ± .002	N/A
8.	Salinity 20-40 ppt	GR	See table 2.1 in manual	
		BLUE	See table 2.1 in manual	N/A
9.	Temperature	NOTE 2-BLUE	-0.[illegible] Thermometer	
		NOTE 3-BLUE	+21.75°C Thermometer	+2.17

CSTD Calibration Cont.

	Test Point	Voltage or Scope Picture	DATA
10. Depth	NOTE 5-BLUE	Shunt Value	N/A
11. Auto-Range	GREY	+2.005 ± .005	
	GREEN	+6.50 ± .75	
	*GREY	+1.99 ± .01	
	*GREEN	-6.50 ± .75	
12. Dissolved Oxygen			
	NOTE 6-GREEN	0.00 ± .01	
	GREEN	See calibration sheet	
13. pH	NOTE 7		
	pH 7 - YELLOW	.70 ± .01	
	pH - YELLOW	.1v/pH ± .01	
	pH - YELLOW	.1v/pH ± .01	
14. Redox	NOTE 7-YELLOW	0.00 ± .005	
	Fe^{++} Fe^{+++} YELLOW	.439 ± .005	
15. Turbidity	GREY	0.00 ± .01	.000
	GREY	1.00 ± .01	+1.000 in Distilled

InterOcean

513 PROBE
FINAL CHECK-OFF

SERIAL No. 6271017

INITIALS R.H.

DATE 11-27-78

READOUT	COMPUTED VALUES
CONDUCTIVITY 0.000 + 5.017	CONDUCTIVITY 6.000 mv/cm 50.17 mv/cm at 24.75°C
SALINITY	SALINITY
TEMPERATURE -0.002 + 21.75	TEMPERATURE - 0.02°C + 21.75°C
DEPTH	DEPTH
DO_2	DO_2
pH	pH
REDOX	REDOX
TURBIDITY .00 +100.0	TURBIDITY .00 100%

InterOcean

CONDUCTIVITY CALIBRATION

DATE 4-27-71

INSPECTOR R. H.

PROBE S/N 6271017

LAB STANDARD # 2

CONDUCTIVITY CALIBRATION STANDARD

Model 500CS

Probe value will be obtained when probe is calibrated

Conductivity Millimhos	Probe Value
0	0.000
10	10.10
20	20.07
30	30.27
40	40.27
50	50.44
60	60.43
70	70.54

NOTE: Probe value can be obtained from either 514-A C.S.T.D. Readout digital display or from Pin D on the Recorder outlet with a digital volt meter.

Make certain that the lead that is passed through the conductivity head is a very low resistance.

CSTD Calibration Cont.

Notes to CSTD DO pH Calibration

1. This value obtained by inserting a 50 ohm resistor through conductivity head using clip leads.
2. This value obtained by immersion of temp. sensor in ice water as close to 0°C as possible while continuously monitoring ice water with a calibrated thermometer.
3. This value obtained by immersion of temp. sensor in room temperature water while continuously monitoring temperature with a calibrated thermometer.
4. Steps #2 and #3 are done with stainless steel shield removed. Care must be taken not to damage sensor while shield is removed.
5. This value is obtained after depth calibration with dead weight tester.
6. Zero adjust is set with sensor enveloped in atmosphere of inert gas (helium; argon).
   Gain adjust obtained in fully air saturated fresh water.
7. Temporary connection is made between circuit common and the shield wire of the pH electrode. (Or the shield wire of the redox electrode.)

Instrument Calibration Test Sheets

October 1979

CSTD CALIBRATION

Probe S/N 62710 01

Date & Initial _____ _____

	Test Point	Voltage or Scope Picture	DATA
1. Current Regulator	Difference		.6 mV
	input		- 12.34
			+ 12.19
2. Voltage Regulator	output		+ 8.98
			- 8.98
3. Chopper	OK		
4. Amplifier	OK		
5. Demodulator	OK		
6. Conductivity	OK		
7. Salinity 0-20 ppt			
8. Salinity 20-40 ppt			
9. Temperature			
10. Turbidity			

PROBE

FINAL CHECK-OFF

SERIAL NO. 6271001

INITIALS _____

DATE _____

READOUT		COMPUTED VALUES	NOTES
CONDUCTIVITY BEFORE ZERO/SPAN .000 6.98	AFTER ZERO/SPAN	CONDUCTIVITY	Didn't change settings 29 oct 79
SALINITY		SALINITY	
TEMPERATURE 0.00	0.00	TEMPERATURE 0.00	@ 0°C 17 Oct 79 SP
DEPTH		DEPTH	
DO_2		DO_2	
~~pH~~		pH	
~~REDOX~~		REDOX	
TURBIDITY Air .010 .875	.000 .709	TURBIDITY	was 1.245 Water set 1.000 29 oct 79

CONDUCTIVITY CALIBRATION

DATE _____

INSPECTOR _____

PROBE S/X _____

CONDUCTIVITY CALIBRATION STANDARD

Model 500 CS

Probe value will be obtained when probe is calibrated

Conductivity Milliohms		Probe Value
0	29 oct 79 Dennis	0.00
10		1.00
20		1.99
30		3.00
40		4.00
50		4.99
60		5.98
70		6.98

NOTE: Probe value can be obtained from either 514-A C.S.T.D. Readout digital display or from Pin D on the Recorder outlet with a digital volt meter.

Make certain that the lead that is passed through the conductivity head is a very low resistance.

CSTD CALIBRATION

Probe S/N 0271002

Date & Initial ______ ______

	Test Point	Voltage or Scope Picture	DATA
			+ 27 oct 79 Demarts
1. Current Regulator	Difference		.1 mV +
	input		+ 12.19 + − 12.35 +
2. Voltage Regulator	output		+ 7.99 + − 7.98 +
3. Chopper	ok		
4. Amplifier	ok		
5. Demodulator	ok		
6. Conductivity			
7. Salinity 0-20 ppt			
8. Salinity 20-40 ppt			
9. Temperature			
10. Turbidity			

Setting isn't good to 4th Digit ± [illegible] hundredths

PROBE

FINAL CHECK-OFF

SERIAL NO. 6271002

INITIALS _____

DATE _____

READOUT		COMPUTED VALUES	NOTES
CONDUCTIVITY BEFORE ZERO/SPAN	CONDUCTIVITY AFTER ZERO/SPAN .000 / 7.00	CONDUCTIVITY	Didn't change the setting
SALINITY		SALINITY	
TEMPERATURE 0.00	0.00	TEMPERATURE 0.00	at 0°C 17Oct79 SP
DEPTH		DEPTH	
DO_2		DO_2	
pH		pH	
REDOX		REDOX	
Air TURBIDITY 1.002 / .960	Air .000 / .193	TURBIDITY	set 1.010 water 1.400 was

CONDUCTIVITY CALIBRATION

DATE_____

INSPECTOR_____

PROBE S/X_____

CONDUCTIVITY CALIBRATION STANDARD

Model 500 CS

Probe value will be obtained when probe is calibrated

29 oct 79
Dennis

Conductivity Milliohms	Probe Value
ø	ø
1	1.00
2	1.99
3	3.00
4	4.00
5	5.00
6	6.99
7	7.99

NOTE: Probe value can be obtained from either 514-A C.S.T.D. Readout digital display or from Pin D on the Recorder outlet with a digital volt meter.

Make certain that the lead that is passed through the conductivity head is a very low resistance.

CSTD CALIBRATION

Probe S/N 6Z7J004

Date & Initial _____ _____

	Test Point	Voltage or Scope Picture	DATA
1. Current Regulator	Difference input		+ 29 oct 79 Dem .2 mV + - 12.35 + + 12.20 +
2. Voltage Regulator	o wtput		+ 8.00 + - 8.00 +
3. Chopper	ok		
4. Amplifier	ok		
5. Demodulator	ok		
6. Conductivity	ok		
7. Salinity 0-20 ppt			
8. Salinity 20-40 ppt			
9. Temperature			
10. Turbidity			

PROBE

FINAL CHECK-OFF

SERIAL NO. 6271004

INITIALS _____

DATE _____

READOUT		COMPUTED VALUES	NOTES
CONDUCTIVITY BEFORE ZERO/SPAN .000 7.000	AFTER ZERO/SPAN	CONDUCTIVITY ok	Didn't change setting 29 oct 79
SALINITY		SALINITY	
TEMPERATURE		TEMPERATURE 0.00	60°c 17 oct 79 sp
0.02	0.00		
DEPTH		DEPTH	
DO_2		DO_2	
pH		pH	
REDOX		REDOX	
TURBIDITY Air .006 .91	.000 .371	TURBIDITY	Boiled 1.260 water 1.000 29 oct 79

CONDUCTIVITY CALIBRATION

DATE_____

INSPECTOR_____

PROBE S/X_____

CONDUCTIVITY CALIBRATION STANDARD

Model 500 CS

Probe value will be obtained when probe is calibrated

29, oct 79
Dan

Conductivity Milliohms	Probe Value
ø	ø.00
10	1.00
20	1.99
30	3.00
40	4.00
50	5.00
60	6.00
7	7.00

NOTE: Probe value can be obtained from either 514-A C.S.T.D. Readout digital display or from Pin D on the Recorder outlet with a digital volt meter.

Make certain that the lead that is passed through the conductivity head is a very low resistance.

CSTD CALIBRATION

Probe S/N 6271-1007

Date & Initial Oct 15 79 Dan

	Test Point	Voltage or Scope Picture	DATA
			+ 29 oct 79 Dan
1. Current Regulator	Difference		.2 mV
	input		- 12.34 V + 12.A V
2. Voltage Regulator	output		+ 7.98 V - 7.99 V
3. Chopper	OK		
4. Amplifier	OK		
5. Demodulator	OK		
6. Conductivity	OK		
7. Salinity 0-20 ppt			
8. Salinity 20-40 ppt			
9. Temperature			
10. Turbidity			

Ø was OK.?

BAD turb sensor - receiver size? Reading dumped after removing water

On 29 Oct 79 - tried again all OK. ALL OK Dan 29 oct 79

PROBE

FINAL CHECK-OFF

SERIAL NO. 6Z71007

INITIALS _____

DATE _____

READOUT		COMPUTED VALUES	NOTES
CONDUCTIVITY BEFORE ZERO/SPAN .001 / 7.01	AFTER ZERO/SPAN	CONDUCTIVITY	DIDN'T change the setting
SALINITY		SALINITY	
TEMPERATURE Zero adj. 0.03	0.00	TEMPERATURE 0.00	at 0°c 17oct79 SP
DEPTH ZERO ADJ 4.42	4.42	DEPTH 4.421	Diaphram & oil Replaced 17oct79 SP
DO_2		DO_2	
pH		pH	
REDOX		REDOX	
TURBIDITY Air .000 / .97	.000 / .85	TURBIDITY	WAS .97 — 1.00 WATER 1.08 — 1.01

CONDUCTIVITY CALIBRATION

DATE_____

INSPECTOR_____

PROBE S/X_____

CONDUCTIVITY CALIBRATION STANDARD

Model 500 CS

Probe value will be obtained when probe is calibrated

29 oct 79
Dem

Conductivity Milliohms	Probe Value
Ø	Ø.00
10	1.00
20	2.00
30	3.00
40	4.00
50	5.01
60	6.00
70	7.01

NOTE: Probe value can be obtained from either 514-A C.S.T.D. Readout digital display or from Pin D on the Recorder outlet with a digital volt meter.

Make certain that the lead that is passed through the conductivity head is a very low resistance.

CSTD CALIBRATION

Probe S/N 627J006

Date & Initial _____ _____ 30 oct 79

	Test Point	Voltage or Scope Picture	DATA
1. Current Regulator	Difference input		.5mv -12.37 +12.20
2. Voltage Regulator	owtpwt		+ 8.00 - 7.99
3. Chopper	OK		
4. Amplifier	OK		
5. Demodulator	O/K		
6. Conductivity			
7. Salinity 0-20 ppt			
8. Salinity 20-40 ppt			
9. Temperature			
10. Turbidity	DIDN'T change setting	30 oct 79	OK

PROBE

FINAL CHECK-OFF

SERIAL NO. 6271006

INITIALS _____

DATE _____

READOUT		COMPUTED VALUES	NOTES
CONDUCTIVITY BEFORE ZERO/SPAN .000 700	AFTER ZERO/SPAN	CONDUCTIVITY	Didn't change setting
SALINITY		SALINITY	
TEMPERATURE 0.005	0.000	TEMPERATURE	SP at 0°C 25Oct79
DEPTH		DEPTH	
DO_2		DO_2	
pH		pH	
REDOX Air		REDOX	Wash
TURBIDITY .000 / .86		TURBIDITY	1.01

30 Oct 79

CONDUCTIVITY CALIBRATION

DATE_____

INSPECTOR_____

PROBE S/X_____

CONDUCTIVITY CALIBRATION STANDARD

Model 500 CS

Probe value will be obtained when probe is calibrated

30 oct 79

Conductivity Milliohms	Probe Value
Ø	0.00
10	1.01
20	2.00
30	3.01
40	4.01
50	6.01
60	6.00
70	7.00

NOTE: Probe value can be obtained from either 514-A C.S.T.D. Readout digital display or from Pin D on the Recorder outlet with a digital volt meter.

Make certain that the lead that is passed through the conductivity head is a very low resistance.

CSTD CALIBRATION

Probe S/N 62740 08

Date & Initial _____ _____

	Test Point	Voltage or Scope Picture	DATA
			+ 29 oct 79
1. Current Regulator	Difference input		1.8 mV - 12.53 + 12.18
2. Voltage Regulator	output		+ 7.99
3. Chopper	OK		- 7.99
4. Amplifier	OK		
5. Demodulator	OK		
6. Conductivity	OK		
7. Salinity 0-20 ppt			
8. Salinity 20-40 ppt			
9. Temperature			
10. Turbidity			

PROBE

FINAL CHECK-OFF

SERIAL NO. 6271008

INITIALS _____

DATE _____

READOUT		COMPUTED VALUES	NOTES
CONDUCTIVITY BEFORE ZERO/SPAN over 5.00	AFTER ZERO/SPAN	CONDUCTIVITY	Didn't change the settings 29 oct 79
SALINITY		SALINITY	
TEMPERATURE 0.00	0.00	TEMPERATURE 0.00	@ 0°c 17 Oct 79 SP
DEPTH		DEPTH	
DO_2		DO_2	
pH		pH	
REDOX		REDOX	
TURBIDITY .000 / 1.11	.000 / 1.11	TURBIDITY	was 1.00 !! Didn't change 29 oct 79

CONDUCTIVITY CALIBRATION

DATE _____

INSPECTOR _____

PROBE S/X _____

CONDUCTIVITY CALIBRATION STANDARD

Model 500 CS

Probe value will be obtained when probe is calibrated

Conductivity Milliohms	Probe Value
Ø	Ø.00
10	1.00
20	2.00
30	3.00
40	4.00
50	5.00
60	6.00
70	7.00

NOTE: Probe value can be obtained from either 514-A C.S.T.D. Readout digital display or from Pin D on the Recorder outlet with a digital volt meter.

Make certain that the lead that is passed through the conductivity head is a very low resistance.

CSTD CALIBRATION

Probe S/N 627010

Date & Initial _____ _____

	Test Point	Voltage or Scope Picture	DATA
			29 oct 79
1. Current Regulator	Difference input		.9 mV - 12.34 + 12.19
2. Voltage Regulator	output		- 7.99 + 7.99
3. Chopper	OK		
4. Amplifier	OK		
5. Demodulator	OK		
6. Conductivity			
7. Salinity 0-20 ppt			
8. Salinity 20-40 ppt			
9. Temperature			
10. Turbidity			

PROBE

FINAL CHECK-OFF

SERIAL NO. 6Z71010

INITIALS _____

DATE _____

READOUT	COMPUTED VALUES	NOTES
CONDUCTIVITY BEFORE ZERO/SPAN: 1.000 / 2.00 AFTER ZERO/SPAN	CONDUCTIVITY	WAS 6.94 ➡ 29 oct 79
SALINITY	SALINITY	
TEMPERATURE 0.00 | 0.00	TEMPERATURE 0.00	@ 0° 17 Oct 79 SP
DEPTH	DEPTH	
DO_2	DO_2	
pH	pH	
REDOX Air	REDOX	water
TURBIDITY 1.000 / 2.43 | .000 / .78	TURBIDITY	WAS 2.83 1.00 29 oct 79

CONDUCTIVITY CALIBRATION

DATE _____

INSPECTOR _____

PROBE S/X _____

CONDUCTIVITY CALIBRATION STANDARD

Model 500 CS

Probe value will be obtained when probe is calibrated

29 oct 79

Dan

Conductivity Milliohms	Probe Value
Ø	Ø.00
10	1.00
20	1.99
30	3.00
40	4.00
50	6.00
60	5.99
70.	7.00

NOTE: Probe value can be obtained from either 514-A C.S.T.D. Readout digital display or from Pin D on the Recorder outlet with a digital volt meter.

Make certain that the lead that is passed through the conductivity head is a very low resistance.

CSTD CALIBRATION

Probe S/N 627011

Date & Initial _____ _____

	Test Point	Voltage or Scope Picture	DATA
			29 oct 79
1. Current Regulator		input	+ 12.15
			- 12.30
		Difference	1.2 mV
2. Voltage Regulator	+8.41 ↓ 8.00	output	+ 7.99
	Adjust + to 8.00 sp		- 7.99
3. Chopper OK	26 oct 79		
4. Amplifier	OK		
5. Demodulator	OK		
6. Conductivity			
7. Salinity 0-20 ppt			
8. Salinity 20-40 ppt			
9. Temperature			
10. Turbidity			

PROBE

FINAL CHECK-OFF

SERIAL NO. 6271011

INITIALS _____

DATE _____

READOUT		COMPUTED VALUES	NOTES
CONDUCTIVITY BEFORE ZERO/SPAN .000 6.94	AFTER ZERO/SPAN 1000 7.00	CONDUCTIVITY	Reset 29 oct 79
SALINITY		SALINITY	
TEMPERATURE 0.008	0.000	TEMPERATURE	0°C on 25 Oct 79 SP
DEPTH		DEPTH	
DO_2		DO_2	
pH		pH	
REDOX air		REDOX	
TURBIDITY 1000 / 1.93	.000 / .39	TURBIDITY	WAS 2.29 1.00 29 oct 79

CONDUCTIVITY CALIBRATION

DATE_____

INSPECTOR_____

PROBE S/X_____

CONDUCTIVITY CALIBRATION STANDARD

Model 500 CS

WAS 6.94
↓
7.00

Probe value will be obtained when probe is calibrated

Conductivity Milliohms	Probe Value	
		29 oct 79
Ø	Ø.00	
10	1.00	
20	1.99	
30	3.00	
40	4.00	
50	5.00	
60	5X.99	5.99
70	7.00	

NOTE: Probe value can be obtained from either 514-A C.S.T.D. Readout digital display or from Pin D on the Recorder outlet with a digital volt meter.

Make certain that the lead that is passed through the conductivity head is a very low resistance.

CSTD CALIBRATION

Probe S/N 6278012

Date & Initial _____ _____

	Test Point	Voltage or Scope Picture	DATA
1. Current Regulator	Difference		.4 mV
	input		− 12.35 V
			+ 12.20 V
2. Voltage Regulator	output		− 7.99
			+ 7.99
3. Chopper	OK		
4. Amplifier	OK		
5. Demodulator	OK		
6. Conductivity	OK		
7. Salinity 0-20 ppt			
8. Salinity 20-40 ppt			
9. Temperature			
10. Turbidity			

PROBE

FINAL CHECK-OFF

SERIAL NO. 6271012

INITIALS _____

DATE _____

READOUT		COMPUTED VALUES	NOTES
CONDUCTIVITY BEFORE ZERO/SPAN .000/7.00	AFTER ZERO/SPAN	CONDUCTIVITY	Didn't change settings 29 oct 79
SALINITY		SALINITY	
TEMPERATURE 0.00	0.00	TEMPERATURE 0.00	at 0°c 17Oct79 sp
DEPTH		DEPTH	
DO_2		DO_2	
pH		pH	
REDOX		REDOX	
TURBIDITY Air .009/1.43	.000/.700	TURBIDITY	Before 1.8 in water Set 1.0

29 oct 79

CONDUCTIVITY CALIBRATION

DATE_____

INSPECTOR_____

PROBE S/X_____

CONDUCTIVITY CALIBRATION STANDARD

Model 500 CS

Probe value will be obtained when probe is calibrated

29 oct 79 Dennis

Conductivity Milliohms	Probe Value
ϕ	ϕ.00
1	1.00
2	2.00
3	3.01
4	4.01
5	5.01
6	6.01
7	7.00

NOTE: Probe value can be obtained from either 514-A C.S.T.D. Readout digital display or from Pin D on the Recorder outlet with a digital volt meter.

Make certain that the lead that is passed through the conductivity head is a very low resistance.

CSTD CALIBRATION

Probe S/N 6271013

Date & Initial _____ _____

	Test Point	Voltage or Scope Picture	DATA
			29 oct 79
1. Current Regulator	input	+12.16 - 12.32	
	Difference		1 mV
2. Voltage Regulator			- 7.98 + 7.99
	output		
3. Chopper	OK		
4. Amplifier	OK		
5. Demodulator	OK		
6. Conductivity			
7. Salinity 0-20 ppt			
8. Salinity 20-40 ppt			
9. Temperature			
10. Turbidity	COULD NOT Get turbidity to work		29 oct 79

EXCHANGED CASES
NEW #6 OLD # 13

PROBE

FINAL CHECK-OFF

SERIAL NO. 6271013

INITIALS _____

DATE _____

READOUT		COMPUTED VALUES	NOTES
CONDUCTIVITY BEFORE ZERO/SPAN .000 / 6.99	AFTER ZERO/SPAN	CONDUCTIVITY	Didn't change settings 29 oct 79
SALINITY		SALINITY	
TEMPERATURE ~~0.000~~ reboo	0.00	TEMPERATURE	at 0°c 25oct79 sp
DEPTH		DEPTH	
DO_2		DO_2	
pH		pH	
REDOX Air		REDOX	Water
TURBIDITY .014 / .000 / .193 / .000 / .225	.000 / .400	TURBIDITY	.443 / 1.00 29 oct 79

CONDUCTIVITY CALIBRATION

DATE _____

INSPECTOR _____

PROBE S/X _____

CONDUCTIVITY CALIBRATION STANDARD

Model 500 CS

Probe value will be obtained when probe is calibrated

29 oct 79

Conductivity Milliohms	Probe Value
Ø	Ø.00
10	1.00
20	1.99
30	2.99
40	3.99
50	5.00
60	5.98
70	6.99

NOTE: Probe value can be obtained from either 514-A C.S.T.D. Readout digital display or from Pin D on the Recorder outlet with a digital volt meter.

Make certain that the lead that is passed through the conductivity head is a very low resistance.

CSTD CALIBRATION

Probe S/N 6ZZ014

Date & Initial _____ _____

	Test Point	Voltage or Scope Picture	DATA
1. Current Regulator	Difference input		.4 mV - 12.33 + 12.19
2. Voltage Regulator	output		+ 7.98 - 7.98
3. Chopper	OK		
4. Amplifier	OK		
5. Demodulator	OK		
6. Conductivity	OK		
7. Salinity 0-20 ppt			
8. Salinity 20-40 ppt			
9. Temperature			
10. Turbidity			

PROBE

FINAL CHECK-OFF

SERIAL NO. 6271014

INITIALS _____

DATE _____

READOUT	COMPUTED VALUES	NOTES
CONDUCTIVITY BEFORE ZERO/SPAN .000 6.99 | AFTER ZERO/SPAN	CONDUCTIVITY OK	DiDN't change SETTINGS 29 oct 79
SALINITY	SALINITY	
TEMPERATURE 0.00 | 0.00	TEMPERATURE 0.00	0°C 170ct79 SP
DEPTH SPAN ADJ 4.34 → 4.56	DEPTH 4.346	Diaphragm & oil Replaced 170ct79 SP
DO_2	DO_2	
pH	pH	
REDOX	REDOX	
TURBIDITY .000 .268 | .000 .751	TURBIDITY	WAS .369 Set 1.0 29 Oct 79

CONDUCTIVITY CALIBRATION

DATE_____

INSPECTOR_____

PROBE S/X_____

CONDUCTIVITY CALIBRATION STANDARD

Model 500 CS

Probe value will be obtained when probe is calibrated

Conductivity Milliohms	Probe Value
Ø	Ø.00
10	1.00
20	1.99
30	3.00
40	4.00
50	5.00
60	5.99
70	6.99

NOTE: Probe value can be obtained from either 514-A C.S.T.D. Readout digital display or from Pin D on the Recorder outlet with a digital volt meter.

Make certain that the lead that is passed through the conductivity head is a very low resistance.

CSTD CALIBRATION

Probe S/N 6271015

Date & Initial _____ _____

	Test Point	Voltage or Scope Picture	DATA
			29 oct 79
1. Current Regulator	Difference input		.7mV
			+ 12.15
			- 12.30
2. Voltage Regulator	output		+ 7.99
			- 7.99
3. Chopper OK			
4. Amplifier OK			
5. Demodulator OK			
6. Conductivity			
7. Salinity 0-20 ppt			
8. Salinity 20-40 ppt			
9. Temperature			
10. Turbidity			

PROBE

FINAL CHECK-OFF

SERIAL NO. 6271015

INITIALS _____

DATE _____

READOUT		COMPUTED VALUES	NOTES
CONDUCTIVITY BEFORE ZERO/SPAN .000 7.02	AFTER ZERO/SPAN .000 / 7.00	CONDUCTIVITY	Recent 29 oct 79
SALINITY		SALINITY	
TEMPERATURE -0.008	0.000	TEMPERATURE	at 0°c 25oct79 sp.
DEPTH 1.4 ~~0.008~~	~~0.000~~ to 4.46	DEPTH 4.46	Denis SP 29oct79
DO_2		DO_2	
pH		pH	
REDOX Air		REDOX	Water
TURBIDITY 1.000 .59	1.000 / .81	TURBIDITY	~~1.00~~ .60 WAS / 1.00 29 oct 79

CSTD CALIBRATION

Probe S/N _____

Date & Initial _____ _____

	~~Test Point~~	Voltage or ~~Scope Picture~~ ~~DATA~~ 29 oct 79
1. ~~Current~~ Regula~~tor~~	Ø	Ø.00
	10	1.00
2. Vo~~ltage Regulat~~or	20	1.99
3. ~~Chopper~~	30	3.00
	40	4.00
4. ~~Amplifier~~	50	5.01
5. ~~Demodulator~~	60	6.00
	70	7.00

6. Conductivity

7. Salinity 0-20 ppt

8. Salinity 20-40 ppt

9. Temperature

10. Turbidity

CSTD CALIBRATION

Probe S/N 6271016

Date & Initial _____ Dennis + 29 oct 79

	Test Point	Voltage or Scope Picture	DATA
1. Current Regulator	Difference		.4 mV +
	input		+ 12.34 + - 12.19 +
2. Voltage Regulator	output		+ 7.99 + - 7.99 +
3. Chopper	ok		
4. Amplifier	ok		
5. Demodulator	ok		
6. Conductivity			
7. Salinity 0-20 ppt			
8. Salinity 20-40 ppt			
9. Temperature			
10. Turbidity			

PROBE

FINAL CHECK-OFF

SERIAL NO. 6271016

INITIALS _____

DATE _____

READOUT		COMPUTED VALUES	NOTES
CONDUCTIVITY BEFORE ZERO/SPAN .005 7.02	AFTER ZERO/SPAN .000 7.00	CONDUCTIVITY	29 oct 79
SALINITY		SALINITY	
TEMPERATURE 0.00	0.00	TEMPERATURE 0.00	0 at 17 Oct '79 SP
DEPTH		DEPTH	
DO_2		DO_2	
pH		pH	
REDOX		REDOX	
TURBIDITY Air .000 1000 .704 .378		TURBIDITY	WAS .534 water set 1.000 water 29 oct 79

CONDUCTIVITY CALIBRATION

DATE_____

INSPECTOR_____

PROBE S/X_____

CONDUCTIVITY CALIBRATION STANDARD

Model 500 CS

Probe value will be obtained when probe is calibrated

Conductivity Milliohms		Probe Value
Ø	29 oct 79	Ø
10	Dennis	1.00
20		1.99
30		3.00
40		4.00
50		5.00
60		5.99
70		7.00

NOTE: Probe value can be obtained from either 514-A C.S.T.D. Readout digital display or from Pin D on the Recorder outlet with a digital volt meter.

Make certain that the lead that is passed through the conductivity head is a very low resistance.

CONDUCTIVITY CALIBRATION

DATE _____

INSPECTOR _____

PROBE S/X _____

CONDUCTIVITY CALIBRATION STANDARD

Model 500 CS

Probe value will be obtained when probe is calibrated

Conductivity Milliohms	Probe Value
Ø	Ø.00
10	1.00
20	1.99
30	3.00
40	4.00
50	5.00
60	5.99
70	7.00

NOTE: Probe value can be obtained from either 514-A C.S.T.D. Readout digital display or from Pin D on the Recorder outlet with a digital volt meter.

Make certain that the lead that is passed through the conductivity head is a very low resistance.

PROBE

FINAL CHECK-OFF

SERIAL NO. 6271017

INITIALS _____

DATE _____

READOUT		COMPUTED VALUES	NOTES
CONDUCTIVITY BEFORE ZERO/SPAN .000 7.00	AFTER ZERO/SPAN	CONDUCTIVITY	Didn't change settings 29 oct 79
SALINITY		SALINITY	
TEMPERATURE 0.00	0.00	TEMPERATURE 0.00	AT 0°C 17 Oct 79 SP
DEPTH		DEPTH	
DO_2		DO_2	
pH		pH	
REDOX		REDOX	
TURBIDITY kif .000 / .79	.000 / .76	TURBIDITY	WAS 1.16 1.01 29 Oct 79

CSTD CALIBRATION

Probe S/N 6271017

Date & Initial _____ _____

	Test Point	Voltage or Scope Picture	DATA
1. Current Regulator	Difference input	29 oct 79 + 12.22 - 12.38	1 mv
2. Voltage Regulator	output	+ 7.99 - 7.99	
3. Chopper			
4. Amplifier	OK		
5. Demodulator	OK		
6. Conductivity	OK		
7. Salinity 0-20 ppt			
8. Salinity 20-40 ppt			
9. Temperature			
10. Turbidity			

CONDUCTIVITY CALIBRATION

DATE_____

INSPECTOR_____

PROBE S/X_____

CONDUCTIVITY CALIBRATION STANDARD

Model 500 CS

Probe value will be obtained when probe is calibrated

Conductivity Milliohms	Probe Value
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

NOTE: Probe value can be obtained from either 514-A C.S.T.D. Readout digital display or from Pin D on the Recorder outlet with a digital volt meter.

Make certain that the lead that is passed through the conductivity head is a very low resistance.

PROBE

FINAL CHECK-OFF

SERIAL NO. 6271018

INITIALS ______

DATE ______

READOUT		COMPUTED VALUES	NOTES
CONDUCTIVITY BEFORE ZERO/SPAN .000 6.99	AFTER ZERO/SPAN .000 7.00	CONDUCTIVITY	oct 29 79
SALINITY		SALINITY	
TEMPERATURE 0.00	0.00	TEMPERATURE 0.00	at 0°c 17 Oct 79 SP
DEPTH SPAN ADJ. 5.09	4.63	DEPTH 4.63	Diaphragm & oil Replaced 17 Oct 79 SP
DO_2		DO_2	
pH		pH	
REDOX		REDOX	
TURBIDITY Air -.065 B [illegible] 1.065	.000 after water .695	TURBIDITY	old ~~Set @ 1.016 water~~ New BD set @ 1,000 water 29 oct 79

Zero 7000 old SPAN

New BD .000 / .149 Air 29 oct 79

CSTD CALIBRATION

Probe S/N 6271,018

Date & Initial 16Oct79 SP

	Test Point	Voltage or Scope Picture	DATA
	Difference .6mV		.6mV ✓
1. Current Regulator	~~[illegible]~~ input.	OK	-12.16 ✓ +12.32 ✓
2. Voltage Regulator	output	OK	-7.99 ✓ +7.98 ✓
3. Chopper		OK	
4. Amplifier		OK	
5. Demodulator		OK	
6. Conductivity		~~span trimpot jumps~~	
7. Salinity 0-20 ppt			
8. Salinity 20-40 ppt			
9. Temperature			
10. Turbidity			

span trimpot jumps
SHOWED Replace BOARD
CHANGED this BOARD x 29 Oct 79
Dennis

CSTD CALIBRATION

Probe S/N 6271019

Date & Initial oct 15 Dan

Test Point	Voltage or Scope Picture	DATA
1. Current Regulator		
2. Voltage Regulator		
3. Chopper	Pictures	
4. Amplifier	GOOD	
5. Demodulator	GOOD	
6. Conductivity		
7. Salinity 0-20 ppt		
8. Salinity 20-40 ppt		
9. Temperature		
10. Turbidity	Ø WAS OK	

PROBE

FINAL CHECK-OFF

SERIAL NO. 6271019

INITIALS _____

DATE _____

READOUT		COMPUTED VALUES	NOTES
CONDUCTIVITY BEFORE ZERO/(SPAN)	AFTER ZERO/SPAN	CONDUCTIVITY	
~~SALINITY~~		~~SALINITY~~	
TEMPERATURE 0.00	0.00	TEMPERATURE 0.00°	AT 0°C 17 Oct '79 SP OK SP
DEPTH CHANGE SPAN 5.89		DEPTH 4.772	COULDN'T LOWER SPAN to computed value 17 Oct '79 SP Dipplumm oil Replaced 17 Oct
~~DO_2~~		~~DO_2~~	
~~pH~~		~~pH~~	
~~REDOX~~		~~REDOX~~	
TURBIDITY		TURBIDITY	

CONDUCTIVITY CALIBRATION

DATE_____

INSPECTOR_____

PROBE S/X_____

CONDUCTIVITY CALIBRATION STANDARD

Model 500 CS

Probe value will be obtained when probe is calibrated

Conductivity Milliohms	Probe Value
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

NOTE: Probe value can be obtained from either 514-A C.S.T.D. Readout digital display or from Pin D on the Recorder outlet with a digital volt meter.

Make certain that the lead that is passed through the conductivity head is a very low resistance.

AD-A097 892 KINNETIC LABS INC SANTA CRUZ CA F/G 8/8
IN-SITU FIELD DATA GATHERING STATIONS, SAN FRANCISCO BAY-DELTA,--ETC(U)
MAR 81
UNCLASSIFIED KLI-81-1-APP-1-11 NL

4 - 4
AD
A097892

END
DATE FILMED
5-81
DTIC

CONDUCTIVITY CALIBRATION

DATE _____

INSPECTOR _____

PROBE S/X _____

CONDUCTIVITY CALIBRATION STANDARD

Model 500 CS

Probe value will be obtained when probe is calibrated

30 oct 79

Conductivity Milliohms	Probe Value
Ø	Ø.00
10	1.00
20	1.99
30	3.00
40	4.00
50	5.00
60	6.00
70	7.00

NOTE: Probe value can be obtained from either 514-A C.S.T.D. Readout digital display or from Pin D on the Recorder outlet with a digital volt meter.

Make certain that the lead that is passed through the conductivity head is a very low resistance.

PROBE

FINAL CHECK-OFF

SERIAL NO. _____

INITIALS _____

DATE _____

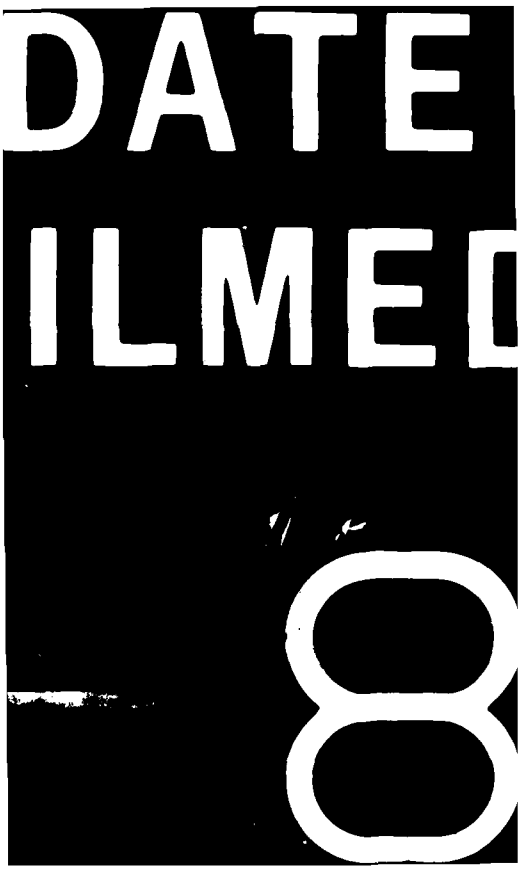
READOUT	COMPUTED VALUES	NOTES
CONDUCTIVITY BEFORE ZERO/SPAN: .000 / 6.98 AFTER ZERO/SPAN: .000 / 7.00	CONDUCTIVITY	Reset 30 oct 79 Dennis
SALINITY	SALINITY	
TEMPERATURE: .68 / .03	TEMPERATURE	Set Zero SPAN Looks OK
DEPTH: .28 / .00	DEPTH	Set Zero
DO_2	DO_2	
pH	pH	
REDOX	REDOX	
TURBIDITY: .000 / .83 ; .000 / .86	TURBIDITY	1.1 WAS 1.00 30 oct 79

CSTD CALIBRATION

Probe S/N 6271 020

Date & Initial _____ _____

	Test Point	Voltage or Scope Picture	DATA
		30 oct 79	
1. Current Regulator	Difference		1A[m]J
	input		- 12.30 + 12.14
2. Voltage Regulator	output	[illegible]	- 7.99 + 7.99
3. Chopper OK			
4. Amplifier OK			
5. Demodulator OK			
6. Conductivity			
7. Salinity 0-20 ppt			
8. Salinity 20-40 ppt			
9. Temperature			
10. Turbidity			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